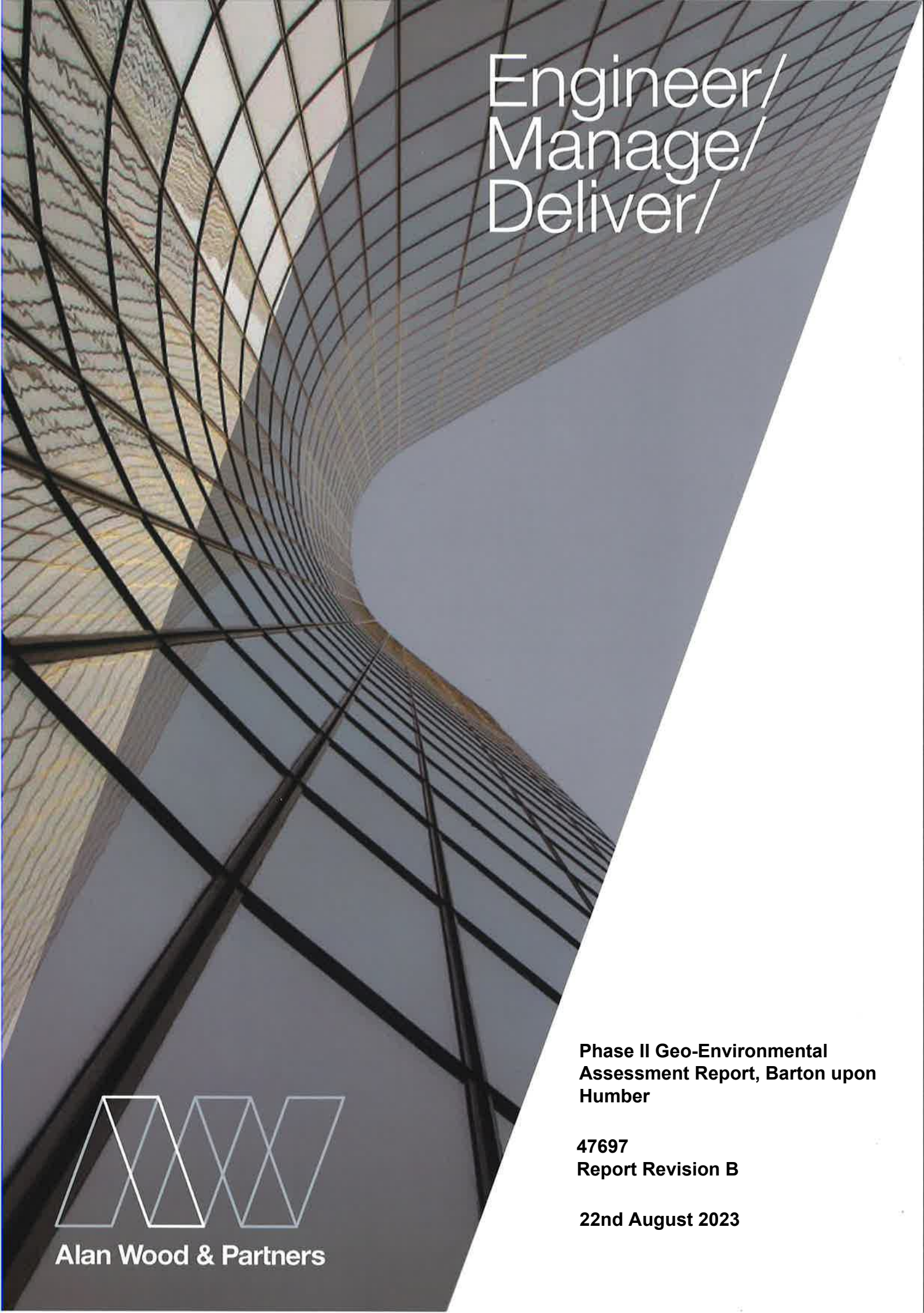

Phase II Geo-Environmental Assessment Report, Barton upon Humber

47697
Report Revision B

22nd August 2023

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PHASE II GEO-ENVIRONMENTAL INVESTIGATION REPORT

Barrow Road, Barton Upon Humber

for

Strata

Project Reference: JMS/SW/47967-Rp-002 Rev B

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Date: 13th October 2022

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Date: 13th October 2022

Issue	Revision	Revised by	Approved by	Revised Date
A	Minor adjustments	AC	SLR	09/02/2023
B	Updated Development Plan	AC	JMS	22/08/2023

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EXECUTIVE SUMMARY

Site Location	The site is located to the south of the A1077 on Barrow Road, approximately 11.79km southwest of Hull and is centred at National Grid Reference (NGR) 504209mE 421598mN.
Historical Land Use	The site has never been developed and has remained as open agricultural land with residential development to the north and west.
Geology	Superficial: Mixture of clay, sand, gravel and boulders varying in size and shape (diamicton) (Glacial Till). Solid geology: Welton Chalk Formation to the north and Burnham Chalk Formation to the south.
Hydrogeology	**Aquifer within Superficial Deposits:** Secondary Undifferentiated. **Aquifer within Bedrock:** Principal. **Source Protection Zones:** There are 3 source protection zones within 500m of the site with Source Protection Zone 1 to the southwest, Source Protection Zone 2 covering the majority of the site and Source Protection Zone 3 to the north east of the site.
Mining Assessment	On the basis of available information risk associated with shallow coal mining subsidence is considered to be negligible.
Geotechnical Assessment	The calculated modified plasticity index (NHBC Chapter 4.2) was found to be between 16.6% and 20.7%, which is equivalent to a **medium** volume change potential, according to the NHBC guidelines.
Foundations	It is considered due to the shallow bedrock that strip foundations will be suitable across the site.
Ground Slabs	It is considered that ground bearing floor slabs will be suitable for the majority of the proposed development.
Precautions near Trees	There are some trees around the boundary of the site, so precautions may be required should structures lie within influencing distance when in clay. In addition, precautions may be required where trees are to be removed or where new planting is proposed. All foundations should be constructed in accordance with current guidelines (e.g. NHBC Standards, Chapter 4.2). If foundations are built off competent bedrock, no precautions are likely to be required.
Drainage	The superficial deposits are not suitable for soakaway drainage as proven by three soakaway tests which were performed on the 2nd of September 2022. Therefore, alternative methods of disposal of surface water will need to be determined.
Obstruction & Excavations	Localised obstructions are anticipated due to the shallow bedrock encountered during the intrusive investigation.
Sulphate	A Design Sulphate classification of DS-1 may be adopted along with an ACEC class of AC-1. However, it is recommended that where made ground be encountered DS2 sulphate precautions should be adopted in foundation construction.
Roads	Laboratory remoulded CBR testing has been carried out to determine estimated CBR values of the near surface soils. Values ranged between 38% and 57.3% with an average of 54% on the western side of the site and 45% on the eastern side of the site.
Environmental Assessment	A total of twenty-two soil samples were analysed for inorganic and organic contaminants. Assessment of the soils data indicates that there are no elevated concentrations of potential contaminants of concern that exceed relevant GAC criteria.
Potable Water Supplies	Risk to potable water supply pipes is considered to be very low. On the basis of available test results it is unlikely that protective measures will be required.

Gas Protection Measures	It is considered unlikely that elevated concentrations of CO_2 and CH_4 may be present due to a lack of potential sources within the vicinity of the site.
Further Works	Additional sampling and analysis of existing topsoil on site to confirm its suitability for re-use within garden areas to the proposed development. Assessment of the influence of trees in relation to foundations and floor slabs where clays are present at founding depth.

NB. The Executive Summary presented above is an overview of the key findings and conclusions of the report. There may be other information contained within the body of the report which puts into context the findings of the Executive Summary. No reliance should therefore be placed on the Executive Summary until the report as a whole has been read in full.

1 INTRODUCTION

1.1 Appointment

1.1.1 Alan Wood & Partners were appointed by the Strata (the 'Client') to undertake a Phase II Geo-Environmental Assessment.

1.1.2 This report provides geotechnical and environmental information in relation to the proposed redevelopment of the site for a residential end use assuming that ground levels will remain similar to present. Interpretation and recommendations should not be assumed valid for adjacent areas of land, or for alternative land uses. Should the proposed site usage change, the recommendations and conclusions presented in this report may need to be re-assessed.

1.2 Development Proposals

1.2.1 It is understood that the site is to be redeveloped for a residential end-use. A proposed preliminary development layout was provided to Alan Wood and Partners, which is appended to this report.

1.3 Report Status

1.3.1 The geoenvironmental investigation of the site has been carried out in two phases. A Phase I preliminary assessment (desk-based study) has previously been completed by Alan Wood & Partners (Ref: JMS/SLR/SW/47697-Rp-001, dated 5th of October). A subsequent Phase II (intrusive) investigation has been completed on the basis of the findings of the previous report. The results of the recent intrusive investigation are presented in this report.

1.3.2 The contents of the Phase I report are nor reproduced herein. Salient points have been summarised which form the basis of the Phase II work. For full detail, reference should be made to the Phase I report referenced above.

1.4 Objectives of the Investigation

1.4.1 The scope of works undertaken as part of this appraisal was to:

- Investigate the ground conditions present on-site and identify their geotechnical properties in relation to the site's proposed end use;
- Identify the nature and concentration of any contamination within the on-site soils and undertake a tiered risk assessment to establish likely risks to sensitive receptors. Defining a Conceptual Site Model of potential contaminant linkages relevant to the proposed redevelopment of the site;
- Carry out *in-situ* permeability tests to assess the potential for soakaway use at the site;
- Provide preliminary advice in relation to any environmental or geotechnical issues associated with the site including foundation recommendations and other recommendations needed to facilitate the proposed redevelopment, including, where necessary, identifying any additional phases of work or remediation that need to be carried out.

1.5 Site Works

1.5.1 The findings and recommendations given in this report are based on fieldwork undertaken on the 31st of August to the 2nd of September 2022, comprising the completion of twenty-nine mechanically excavated trial holes and three soakaway percolation test.

1.6 Limitations of Study

1.6.1 This report presents factual and interpretative geotechnical and environmental information, along with provisional construction proposals and recommendations relevant to the objectives of the investigation for the site end-use given above. The report has been prepared for the titled project and Alan Wood and Partners can accept no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned.

1.6.2 For the purposes of this report and thus defining risk to the proposed end-use from an environmental point of view, a residential development has been adopted. Interpretation and recommendations should not be assumed valid for alternate land

uses. Where the proposed site usage changes, the findings of this report should be re-assessed to accommodate the change in proposed end-use.

1.6.3 The conclusions and recommendations presented in this report are based on site-specific information obtained during the desk study, ground conditions encountered and laboratory analysis and are considered reasonable on the basis of available information at the time the assessment was carried out. They should not necessarily be relied upon to represent site conditions at a substantially later date.

1.6.4 The findings and opinions provided in this report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described. Factual information has been obtained from a variety of sources. Alan Wood and Partners assumes that third party data is reliable, but has not independently confirmed this. The validity and accuracy of this information is therefore outside the control of Alan Wood and Partners. Professional judgement and experience is however used to ensure that uncertainties are reduced to a level appropriate to the site conditions, the purpose of the investigation and the resources devoted to it by the Client.

1.6.5 Whilst every effort has been made to carry out an assessment that enables a realistic characterisation of the geotechnical and environmental parameters at the site, the possibility of significant spatial variation in actual ground, groundwater and environmental (gas and contamination) conditions existing between or beyond exploratory hole locations cannot be discounted. Where information or opinion is given this is for guidance only. Further information, ground investigation, construction activities, change of site use or the passage of time may reveal conditions that were not indicated in the data and therefore could not have been considered in the preparation of this report. Where such information might impact upon stated opinions, Alan Wood and Partners cannot accept responsibility for conditions not encountered and reserves the right to modify or retract the opinions expressed in this report. Where opinions expressed are based on current available guidelines and legislation, no liability can be accepted by AWP for the effects of any future changes to such guidelines and legislation. New information of improved practices and changes in legislation may require reinterpretation of the report as a whole, or in part.

1.6.6 This report does not constitute an archaeological or ecological assessment, nor does it constitute an asbestos inspection. A suitably qualified consultant should be consulted where these aspects of work are required.

1.6.7 A flood risk assessment in accordance with Planning Policy Statement 25, *Development and Flood Risk* (2010) has not been undertaken as part of this commission. However, a Flood Risk Assessment has been undertaken by AWP (report ref. JAG/AD/JF/47658-Rp001, dated February 2023).

1.6.8 All ground investigation works and soil descriptions were undertaken in general accordance with BS EN ISO 14688-1 'Geotechnical Investigation and Testing – Identification and Classification of Soil' (2018), BS10175 (2011), BS 5930 (2015) and/or BS EN 1997-1:2004 (Part 1, General Rules) and BS EN 1997-2:2007 (Part 2, Ground Investigation and Testing).

2 SITE DETAILS AND DESCRIPTION

2.1 Introduction

2.1.1 Published environmental, geological and historical data relating to the site area has been reviewed, in conjunction with a walkover survey undertaken on 31st of August 2022, the findings of which are presented below. The principal considerations of immediate relevance are presented in the following sections.

2.2 Site Location & Description

2.2.1 The site is located to the south of the A1077 on Barrow Road and is centred at National Grid Reference (NGR) 504209mE 421598mN. A site location plan is presented as Figure 001.

2.2.2 There are hedges around the border of the site with a few trees. There is a road which stops at the site boundary called Cornhill Drive and the A1077 runs adjacent to the northern boundary with a hedge between the road and the site.

2.2.3 The site slopes with increasing steepness from the north to south.

2.2.4 Invasive plant species, including Japanese Knotweed and Giant Hogweed were not observed during the site walkover.

2.2.5 The site is currently covered with the stubble from a recently harvested cereal crop.

2.2.6 Barrow Road forms the northern site boundary.

3 PHASE I GEO-ENVIRONMENTAL ASSESSMENT

3.1 Anticipated Geology, Hydrogeology & Mining

3.1.1 Full details of the information reviewed is presented in the Phase I report for the site. Salient points are summarised below in relation to the sites geological and hydrogeological setting.

Table 3.1 - Geological Information

Made Ground and Surface Ground Workings	Information presented in the Groundsure report indicates that there are no areas of artificial/made ground within 500m of the site. There are numerous entries in the Groundsure report that refer to historical surface ground working features within 250m of the site. The nearest lies between 131m and 132m to the north of the site and relates to a cemetery. Other surface features refer to unspecified quarries and pits.
Geology	Superficial soils are reported to be present on site compromising of a mixture of clay, sand, gravel and boulders varying in size and shape (diamicton) (Till, Devensian). The solid geology underlying the site is recorded as being the Welton Chalk Formation to the north and the Burnham Chalk Formation to the south. There are localised BGS boreholes to the north of the site, records of which have been reviewed. The closest borehole with accessible records indicates that there is likely to be clay, sand and gravel (superficial deposits) overlying the chalk (Welton Chalk Formation)
Discontinuities	Information presented in the Groundsure report indicates that there are no normal geological (inferred) faults within 500m of the site.
Hydrogeology	**Aquifer within Superficial Deposits:** 'Secondary Undifferentiated'. Secondary undifferentiated aquifers are assigned where it is not possible to assign either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. **Aquifer within Bedrock:** 'Principal'. Principal aquifers are rock deposits with high intergranular and/or fracture permeability and can provide a high level of water storage and may support water supply/river base flow on a strategic scale. **Source Protection Zones:** There are 3 source protection zones within 500m of the site with Source Protection Zone 1 to the south west, Source Protection Zone 2 covering the majority of the site and Source Protection Zone 3 to the north east of the site. **Source Protection Zones within Confined Aquifer:** There are no source protection zones within 500m of the site. **Vulnerability & Leaching Potential:** The superficial soils are deemed as having an intermediate leaching potential. The bedrock has a low vulnerability.
Hydrology	There is one reported surface water feature within 250m of the site. This is an inland river which lies 85m to the north. There is no biological quality data available. Chemical quality data exists for surface water features further from the site. Barrow Beck river lies

	1064m south of the site and has a failed chemical rating.
Mining & Ground Stability	***Historic Underground Working Features*** There are no records of historical underground working features within 1km of the site. ***Coal Mining*** Information presented on the Coal Authority website (*www.coal.decc.gov.uk*) indicates that the site does not lie within a Development High Risk area nor does it lie within a Coal Mining Reporting area. On the basis of available information risk associated with shallow coal mining subsidence is considered to **negligible**.
Non-coal Mining	There are no non-coal mining areas within 1km of the site.
Natural Cavities	The GroundSure data indicates that there are no natural cavities recorded within 1km of the study site.
Radon, Landfill and Mine Gas	Radon protective measures are **not** required in construction.

3.2 Environmental Records

3.2.1 A summary of the available environmental information is presented in Table 3.2.

Table 3.2 - Environmental Data

Potentially Harmful Discharges (Red List) to Controlled Waters	There are no records of red list discharge consents reported to be within 500m of the site.
Licensed Discharge Consents	There is one record of a licensed discharge consents reported to be within 500m of the site. This is located 473m south of the site on Barrow Road, where the effluent type is unspecified.
EA Recorded Pollution Incidents to Controlled Waters	There are no EA recorded pollution incidents within 500m of the site.
Landfill and Other Waste Sites	There is one recorded Environment Agency landfill site within 500m of the site. This lies 489m west. There are no BGS/DoE non-operational landfill sites within 500m of the site. There are also no records of Local Authority landfill sites within 500m of the site. There are no recorded waste sites within 500m of the site.
Flooding	The Groundsure report indicates that the site does not lie within 250m of any Environment Agency Flood Zones. The Groundsure report indicates that there is a low risk of groundwater flooding on site.
Abstractions	There are four groundwater abstractions located within 2km of the site. Three of these are active potable water supplies and are located between 426m and 454m southwest of the site. This refers to the borehole abstraction of groundwater as a source of supply. There are four surface water abstractions within 2km of the site. The

	nearest is 1148m northwest of the site and refers to pollution remediation of a drain in 2002.
Invasive Plant Species	Japanese Knotweed was not observed during the site walkover. It would be prudent however to undertake an invasive plant species survey to confirm this prior to redevelopment.
Public Register of Contaminated Land: Part 2A (EPA 1990)	There are no sites designated as contaminated land under, Section 78R of the EPA 1990, within 500m of the site.
Dangerous or Hazardous Sites	There are no NIHHS or COMAH sites or high pressure underground pipelines within 500m of the site. There are no open, closed, under development or obsolete petrol stations within 500m of the site
Potentially Contaminative Current Land Uses	There are two potentially contaminative industrial sites located within 250m of the site, although these are unlikely to have affected the site or its intended redevelopment. These are electricity sub stations.

3.3 Historical Land Use

3.3.1 A full record of the historical period reviewed is presented in the desk study report. A summary of significant findings is presented below.

3.3.2 From the earliest map examined, there has been no recorded development on the site and it has remained as open agricultural land. Development has taken place to the north and west of the site with the land immediately to the south and east also remaining as agricultural fields.

3.4 Anticipated Ground Conditions

3.4.1 Made Ground

3.4.2 Although the site has never been developed, development has taken place to the immediate south and west of the site. It may be that some localised made ground are present on the southern and western boundaries of the site.

3.4.3 Given the agricultural land-use, other areas of made ground may also be present.

3.4.4 The presence, type and extent of any on-site made ground soils will need to be established through ground investigation.

3.4.5 Natural Strata

3.4.6 The site is shown to be underlain by superficial Glacial Till comprising of a mixture of clay, sand, gravel and boulders (diamicton).

3.4.7 The solid geology underlying the site is recorded as being the Welton Chalk Formation to the north and the Burnham Chalk Formation to the south.

3.4.8 Groundwater

3.4.9 Localised perched lenses of groundwater may be present within the superficial deposits where granular material is present.

3.4.10 It is anticipated that true groundwater will be present at depth within the chalk bedrock below the site.

3.5 Preliminary Conceptual Site Model

3.5.1 Introduction

3.5.1.1 The following section summaries the Preliminary Phase I Conceptual Site Model (CSM), which has been produced following the review of available pertinent desk study and third-party information. The CSM summarises the understanding of surface and sub-surface features, the potential sources of contamination, pathways and receptors in order to support the identification and assessment of plausible contaminated linkages.

3.5.2 Initial Conceptual Site Model & Risk Assessment

3.5.3 The risk assessment has been carried out to assess the likelihood of risk to human health and the wider environment, on the basis of information reviewed. The risk assessment is a qualitative source-pathway-receptor assessment and its function is to assess the likelihood that each possible linkage exists and to decide whether they pose potentially unacceptable risks to identified receptors (i.e. people, structures, water bodies or ecosystems) that may be harmed.

3.5.4 Risk can be defined as the combination of the consequence of a harmful effect and the probability of its occurrence. The existence of a contaminant linkage is dependent on-site use, as well as environmental conditions: **if no contaminant linkage(s) can be proven, then the risk(s) may be discounted**.

3.5.5 Site Summary & Environmental Sensitivity

3.5.5.1 A review of available desk study information indicates that the proposed development area and the adjacent land to the south and east has remained open agricultural land, with the area to the north and west developed for residential housing. The site itself has remained as open land for the whole of historical period reviewed.

3.5.5.2 Made ground soils are not expected on site, although its presence will need to be discounted through ground investigation.

3.5.5.3 The underlying superficial geology is indicated to be Glacial Till. The underlying geology is indicated to comprise of chalk from the Welton Chalk Formation to the north and the Burnham Chalk Formation to the south.

3.5.5.4 Some perched/shallow groundwater may be present within the near surface deposits, but this is likely to be localised.

3.5.5.5 It is considered unlikely that elevated concentrations of CO_2 and CH_4 may be present due to a lack of potential sources (see BS 8576:2013, 'Guidance on Investigations for Ground Gas - Permanent Gases and Volatile Organic Compounds).

3.5.5.6 Although the likely sources of significant contamination are expected to be limited, there remains the potential for on-site soils to contain elevated concentrations of metals and metalloids (e.g. arsenic), non-metal inorganics and organic contamination (e.g. PAH). Asbestos containing materials may also be present where historic made ground exists which may contain it.

3.5.5.7 The potential leaching of mobile contaminants of concern to the underlying aquifer is considered to be moderate given the reported intermediate leaching potential of soils within the vicinity to the site.

3.5.5.8 In summary, given the site history, the anticipated contaminant load within the on-site soils, its underlying geology, gassing potential and the nature of controlled waters receptors, sensitivity of the site is considered, at this stage, to be **low** to **moderate**. The nature and concentration of any contamination will need to be confirmed through testing.

3.5.6 Potential Sources

3.5.6.1 A potential source is defined as 'a contaminant which is in, or under the land and has the potential to cause harm to human health or to cause pollution of controlled waters'.

3.5.6.2 The following potential contaminants that may be associated with the site are summarised in Table 3.3.

Table 3.3 - Summary of Potential Contaminant Sources

Potential Sources	**Associated Potential Contaminants** (*not limited to*)	
	Metals, inorganics and other contaminants	*Organics*
Potentially contaminated made ground soils, underlying natural strata / perched groundwater	Heavy metals, metalloids, sulphates, asbestos	PAH, Pesticides

* Invasive plant species to be assessed separately if encountered.

3.5.7 Potential Receptors

3.5.7.1 A receptor is the potential target of the source contaminant, to which either significant harm or deterioration in quality may be caused.

3.5.7.2 The potential sensitive receptors with respect to the potential contamination hazards identified above are considered in Table 3.4.

Table 3.4 - Summary of Potential Receptors

Potential Receptor	**Comment**
Human Health	Site end-users Site operatives (during construction phase only)
Construction	Potable water supply pipes Foundations
Underlying natural strata	Near surface soils and/or any perched groundwater Principal aquifer

3.5.8 Plausible Pathways

3.5.8.1 Migration pathways are routes by which contaminant sources may come into contact with receptors. Potential pathways for different types of contaminants vary depending on the properties of the contaminant, the mechanism of its release and the nature of

the receptor. The principal potential pollution pathways by which receptors might become exposed to potential contamination at the site are summarised as follows in Table 3.5.

Table 3.5 - Summary of Plausible Pathways

Potential Source	Pathway
Potentially contaminated made ground soils, underlying natural strata / perched groundwater	Direct ingestion, dermal contact, dust and/or vapour inhalation
	Direct ingestion and/or dermal contact with liquid contaminants
	Leaching and direct contact with foundations and potable water supply pipes. Lateral migration of contaminants through preferential pathways

3.5.9 Risk Assessment

3.5.9.1 The potential contaminant linkages listed above are based on available data and the features noted during the 'walkover'. Therefore, the linkages identified are tentative in nature and are subject to the following uncertainties (to be followed up through ground investigation):

- Presence of made ground at the site although considered unlikely;
- Nature of the underlying natural strata at the site;
- The actual distribution of contaminants within the near surface soils and underlying natural soils;
- The hydrogeological regime beneath the site.

3.5.9.2 The assessment presented herein assumes that the site end-use is to be residential with gardens. The assessment is not valid for other land uses. Should the proposed end-use of the site change, the assessment contained herein would need to be revised to accommodate this.

3.5.9.3 The identified potential contaminants and receptors have been considered in relation to the pathways that may link them. The risk classification has been estimated in accordance with those methods prescribed in CIRIA publication C552 'Contaminated Land Risk Assessment: A Guide to Good Practice', 2001.

3.5.9.4 Risk is regarded as a combination of the likelihood of an 'event' occurring and its severity: both elements must be taken into account when assessing risk. The method

for risk assessment, or evaluation, is purely qualitative. As defined in CIRIA C552:2001, the magnitude of the potential 'severity' of risk occurring may be assessed against:

- **Severe**: short term risk to human health likely to result in significant harm as defined under EPA 1990, Part 2A. Short term risk of pollution to sensitive water receptor;
- **Medium**: significant harm to human health, pollution of sensitive water resource or significant change to an ecosystem or specific organism;
- **Mild**: pollution of non-sensitive water resource but significant damage to crops, buildings, structures and services or the environment;
- **Minor**: harm, which may result in financial loss, or expenditure to resolve. Non-permanent effects to human health. Easily repairable effects of damage to buildings, structures and services.

3.5.9.5 Similarly, the classification of the magnitude of the 'probability' of the risk occurring may be assessed against*:*

- **High Likelihood**: a contaminant linkage exists and an event appears very likely in the short term, or almost inevitable in the long term, or pollution is causing harm at the receptor;
- **Likely**: a contaminant linkage exists and it is probable that an event will occur. An event may not occur, but it is possible in the short term and likely over the long term;
- **Low Likelihood**: a contaminant linkage exists and it is possible that an event will occur. It is not certain that an event will occur over time but it is less likely in the short term;
- **Unlikely**: a contaminant linkage exists but it is not possible to say if an event will occur even over a very long time.

3.5.9.6 Following completion of the severity and probability assessment, classifications can be compared to indicate the actual risk each contaminant linkage presents: this can only be undertaken where there is a possibility of there being an active contaminant linkage.

3.5.9.7 The risk categories which can be assigned are presented in Table 3.6 and range between 'very high risk' to 'very low risk'. NB - it is not possible to classify an identified risk as 'no-risk'.

Table 3.6 - Risk Categories

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**Highly Likely**	Very High	High	Moderate	Moderate / Low
	Likely	High	Moderate	Moderate / Low	Low
	Low Likelihood	Moderate	Moderate / Low	Low	Very Low
	Unlikely	Moderate / Low	Low	Very Low	Very Low

Reproduced from Table 6.5, CIRIA C552/2001.

- **Very High** – severe harm could arise to a designated receptor or that severe harm is occurring. Urgent investigation and remediation is likely to be required;
- **High** – harm could occur to a designated receptor and that urgent investigation and remediation may be needed in the short term, but are likely over the longer term;
- **Moderate** – harm could occur. It is unlikely to be severe, most probably relatively mild. Investigation is normally required to clarify the risk with some remedial works being required in the longer term;
- **Low** – possible that harm could occur, but if it did, at worst it would be mild;
- **Very Low** – low possibility of harm arising, and that if it does it is not likely to be severe.

3.5.9.8 The identified potential contaminants and receptors have been considered in relation to the pathways that may link them. The resulting contaminant linkages are presented in Table 3.7.

Table 3.7 - Summary of Phase I Conceptual Site Model & Risk Assessment

Potential Source	Potential Receptor	Plausible Pathway	Probability	Severity	Initial Risk Rating	Solution
Potentially contaminated made ground, near surface natural strata / perched groundwater	Human Health Site end-users, inc. maintenance and site workers (short term risk during construction)	Direct ingestion or dermal contact with soil, dust and/or vapour inhalation	Low likelihood	Medium	**Moderate/Low**	Soil capping or removal of contaminated soils where necessary
		Direct ingestion and/or dermal contact with liquid contaminants	Unlikely	Mild	**Very Low**	
		Inhalation of asbestos fibres	Unlikely	Severe	**Moderate/Low**	Appropriate removal and disposal, burial at depth or soil capping where necessary
	Construction (Potable Water Supply Pipes)	Direct contact/leaching (tainting)	Low likelihood	Mild	**Low**	Upgraded water pipes/clean backfill material where necessary
	Construction (Foundations)	Direct contact/leaching	Low likelihood	Mild	**Low**	Appropriate concrete specification
	Controlled Waters	Surface run-off / lateral migration	Low Likelihood	Mild	**Low**	Low risk anticipated due to high soil leaching potential

3.5.9.9 The preliminary conceptual site model (CSM) presented above has indicated that a small number of contaminant linkages may exist on-site.

4 GROUND INVESTIGATION FIELDWORK

4.1 Introduction

4.1.1 The investigation requirements at the site were twofold: to undertake a geotechnical investigation and an environmental investigation. A ground investigation was carried out to identify geotechnical and environmental liabilities in relation to the proposed development work at the site.

4.1.2 The positions of the exploratory locations are limited to areas of the site, within the site boundary, that were accessible during the works.

4.1.3 Alan Wood and Partners scoped the intrusive investigation on the basis of information submitted in the desk study report and in general accordance with guidance given in BS5930:1999+A2:2010, BS10175:2011+A1:2013 and BS EN 1997:2004 and 2013.

4.2 Site Works

4.2.1 The findings and recommendations given in this report are based on fieldwork undertaken between the 31st of August and the 2nd of September 2022 and comprised of 28 trial pits being excavated and three soakaways which were conducted on the 2nd of September.

4.2.2 The infiltration tests were carried out by Humberside Materials Laboratory Ltd.

4.2.3 The positions of the exploratory holes are shown on the appended ground investigation plan, Figure No. 47697/003. They were positioned on the basis of the findings of the site conceptual model and distributed in general accordance with the requirements of BS10175:2011+A1:2013 and the working site conditions at the time each phase of investigation was completed.

4.2.4 No specific areas of interest were targeted from either a geotechnical or environmental point of view.

4.2.5 Samples of topsoil and subsoil were collected in sterile containers appropriate to the nature of potential contaminants present for subsequent laboratory chemical and geotechnical testing.

4.2.6 Representative samples of the on-site soils were therefore recovered from the exploratory holes. Sampling was undertaken in accordance with those guidelines prescribed in BS 10175:2011. All environmental samples were collected in 500ml plastic tubs with sealable lids, 250ml glass amber jars or vials (subject to analytical requirements). Care was taken to minimise cross contamination (i.e. wiping of equipment) between sampling. Environmental samples were packed into cool boxes with ice packs and transported by courier to Chemtech Environmental, an MCERTS and UKAS accredited laboratory for analysis and subsequent storage.

4.2.7 No groundwater samples were taken from the trial pits excavated.

4.3 Geotechnical Investigation

4.3.1 A geotechnical investigation was carried out to identify constraints in relation to the proposed construction works at the site and aid the design of appropriate foundation solutions. The following objectives of the ground investigation were therefore to:

- Confirm the lateral and vertical extent of any made ground soils, the nature of the underlying natural ground and the depth to bedrock at selected positions across the area under investigation;
- Determine the depth to groundwater and the stability of excavation;
- Recover bulk samples for geotechnical testing where necessary;
- Undertake *in situ* hand shear vane testing (in cohesive soils in trial holes) where encountered and this test could be undertaken (i.e. within soils that were not friable or gravelly);
- Assess the potential for soakaway use as a means of surface water disposal through *in situ* permeability testing.

4.3.2 Standard strata descriptions of the soils encountered are in general compliance with BS EN 1997:2004, BS EN 1997:2007, BS EN ISO 14688:2002, BS EN ISO 14688:2004 and BS EN ISO 14689:2003. The individual strata depths recorded on each trial pit are those from existing ground levels.

4.3.3 Geotechnical laboratory testing was undertaken on a selection of soil samples in accordance with those techniques outlined in BS 1377:1990 'Methods of Test for Soils for Civil Engineering Purposes' at the laboratory of Professional Soils Laboratory in Doncaster. This laboratory is a fully UKAS compliant laboratory.

4.4 Environmental Investigation

4.4.1 The environmental investigation was designed so that site-specific data could be obtained with respect to any potential soil contamination associated with the site so that risks could be quantified in relation to the *source-pathway-receptor* scenarios and plausible contaminant linkages postulated in the initial Conceptual Site Model summarised above.

4.4.2 Given the potentially historic contaminative nature of the on-site soils, it was considered possible that, when considered within the context of proposed end-use, the on-site soils may present an (albeit low) unacceptable risk to human health and/or the wider environment.

4.4.3 The scope of works undertaken, were therefore to:

- Inspect and identify the general soil conditions that prevail across the site;
- Assess the potential for soil contamination within any made ground, the underlying natural strata or groundwater;
- Recover soil samples to test for heavy metals, metalloids, non-metal inorganics, organics and asbestos fibres.

4.4.4 The analytical strategy adopted for the environmental investigation was designed to provide an overall assessment of potential contaminants thought to likely be present within the on-site soils. Whilst no specific contaminants of concern were anticipated in significant concentrations, the soil testing undertaken was for a suite of contaminants in general accordance with NHBC Standards Chapter 4.1 ‘Land Quality – Managing Ground Conditions’ and CLR 8 ‘Potential Contaminants for the Assessment of Land’ (withdrawn but used for reference purposes where applicable). The testing of the following analytes was scheduled on selected samples:

- Heavy metals suite (including As, Cd, Cr, Cu, Hg, Pb, Ni, Zn);
- Speciated Polycyclic Aromatic Hydrocarbons;
- Cyanide (free and total) and Thiocyanate;
- Phenol (total);
- Sulphates (Total and Water Soluble);
- Asbestos fibres;

- Sulphide; and
- pH.

5 RESULTS OF INVESTIGATION

5.1 Ground Conditions Encountered

5.1.1 The ground conditions encountered are summarised in Table 5.1, while discussion about each one is given in the following paragraphs.

5.1.2 A copy of the ground investigation logs are presented in Appendix A. It should be noted that TP15 was not excavated.

Table 5.1 - Summary of Ground Conditions

Lithology	Exploration Location	Approximate proven depth (m) to base from existing ground level	Approximate Thickness (m)	Approximate allowable bearing capacity (kN/m^2)
Topsoil	All locations	0.3 – 0.55	0.3 – 0.55	Nil
Sand	TP01, TP02, TP03, TP07, TP10, TP18, TP19, TP22, TP23,	0.35 – 1.05	0.20 – 0.95	100
Clay	CBR02, CBR03, CBR04, CBR05, CBR06, TP12, TP13, TP14, TP20	0.3 – 1.5	0.25 – 1.1	150
Sand containing weathered chalk	TP01, TP18 AND CBR04	0.80 – 1.90	0.10 – 1.10	150
Bedrock	All locations except TP12	Base not proven		150
Groundwater	No groundwater was encountered at any location			

5.1.3 Topsoil: Topsoil was encountered within all locations to a maximum depth of 0.55m bgl in TP16.

5.1.4 Natural Strata: The underlying ground conditions comprised of a clayey silty sand with a silty sandy clay in some places over a gravelly sand. This in turn was underlaid with moderately strong chalk. These strata are classified as Glacial Till deposits.

5.1.5 In accordance with Table 6 of BS EN ISO 14688-2:2004+A1:2018 the consistency index (IC) of the underlying cohesive soils may be described as stiff to very stiff.

5.1.6 **Groundwater:** No groundwater was encountered at any location.

5.2 Visual & Olfactory Evidence of Contamination

5.2.1 No visual or olfactory evidence of gross contamination, such as hydrocarbons, was recorded during the ground investigation.

5.3 In-Situ Infiltration tests

5.3.1 *In situ* permeability testing was carried out in three trial holes (TP12, TP13 and TP18). The location of the tests is shown on Figure 47697/002. Three tests were carried out and were all unsuccessful. None of the tests had a suitable permeability rate for soakaways to be successful.

5.3.2 The results of the permeability testing is summarised in Table 5.2 below.

Table 5.2 - Summary of Soakaway Testing

Location	Soakage Area Dimensions (average m^2)	Test Depth (m bcgl)	Test Number	Infiltration Rate (m/sec)
TP12 (SA1)	0.95	1.20	1	Unable to calculate infiltration rate as 25% effective depth not achieved
TP13 (SA2)	0.8	1.40	1	
TP18 (SA3)	0.675	1.40	1	

5.3.3 The results of soakaway testing indicate that infiltration of water does not occur within the granular deposits. Soakaway drainage is therefore not suitable for use at the site.

5.4 Geotechnical Testing & Material Properties

Atterbergs, Moisture Content & Volume Change Potential

5.4.1 The geotechnical laboratory testing was carried out on five samples of cohesive soil by Professional Soils LTD. A copy of the test results are presented in Appendix C but are summarised in Table 5.3.

Table 5.3 - Plasticity Index Test Results

Borehole Number	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Volume Change Potential*
TP12	0.60	35	16	19	94	Low
TP13	0.50	39	17	22	94	Medium
TP14	0.50	37	16	21	93	Low
TP20	0.50	33	15	18	92	Low
CBR5	1.00	36	17	19	93	Low

* VCP: 10-19% = Low, 20-39% = Medium, 40% and greater = High (after NHBC:2022).

5.4.2 The Plasticity Index (Ip) of a soil is a measure of its Volume Change Potential (VCP) and is determined by Atterberg Limits tests, the results of which are given in the above table. All tests to determine the liquid limit (w_L) and plastic limit (w_p) were also performed by PSL LTD. A Modified Plasticity Index (I'p) has been calculated for the samples tested, which is defined as the Plasticity Index multiplied by the percentage of particles less than 425µm. The conversion factor applied is presented in NHBC Standards (2022), Chapter 4.2.

5.4.3 The calculated modified plasticity index (NHBC Chapter 4.2) was found to be between 16.6% and 20.7%, which is equivalent to a **low to medium** volume change potential, according to the NHBC guidelines. A medium volume change potential should be adopted in design.

5.5 Hand Shear Vane Testing

5.5.1 Field examination hand shear vane readings were attempted at trial pits; TP14, TP20 and CBR05, on excavated chunks of cohesive residual soil recovered from the trial pits but these broke up when the shear vane was pushed in. Hand shear vanes were also attempted in the trial pit wall, but these were unsuccessful as the shear vane could not be pushed in.

5.6 Remoulded CBR Testing

5.6.1 Laboratory remoulded CBR testing was carried out on seven samples of sandy clay material by Professional Soils LTD. A copy of the test results are presented in Appendix C but are summarised in Table 5.4.

Table 5.4 – Remoulded CBR Test Results

Borehole Number	Depth (m)	Top (%)	Bottom (%)
CBR1	0.45	54.00	53.10
CBR2	0.40	57.30	51.20
CBR3	0.30	46.40	38.00
CBR4	0.80	58.80	45.50
CBR5	0.50	50.90	42.50
CBR6	0.70	44.50	40.30
CBR7	0.40	49.60	44.00

5.7 Contamination and Performance of Building Materials (Cementitious Products)

5.7.1 Twenty-two soil samples were analysed for a suite of contaminants consistent with BRE Special Digest 1 ‘Concrete in Aggressive Ground' (2005). A copy of the individual test results is given in the appended laboratory certificates in Appendix D.

5.7.2 The pH values recorded for the soil samples ranged between 5.3 and 7.4 (pH units) with an average of 6.4, indicating slightly acidic conditions prevail within the on-site soils.

5.7.3 Water soluble sulphate analysis of the soils yielded concentrations between <0.01g/l (<10mg/l) and 0.017g/l (17mg/l) in the samples (0.014g/l on average).

5.8 Chemical Testing

5.8.1 Twenty-two representative samples of soil from within the near surface and at depth were analysed for the suite of contaminants outlined in Section 4.4.5. This was in order to assess the general degree and nature of contamination within the on-site soils in relation to the site's proposed redevelopment.

5.8.2 A summary of the test results is given in the following tables, whilst a copy of the individual test results is presented in full in Appendix D.

Table 5.5 - Summary of Total Soil Concentrations

Contaminant of Concern	GAC* (mg/kg)	Contaminant Concentrations (mg/kg)		No. of Samples Tested	No. of Samples >GAC	Pass/Fail Tier 1 GAC Screen
		Min	Max			
Metals						
Arsenic (inorganic)	37*	9.8	16	18	0	Pass
Cadmium	22**	0.3	0.5	18	0	Pass
Chromium	910**	21	74	18	0	Pass
Copper	2400**	21	32	18	0	Pass
Mercury (inorganic)	40**	<0.5	<0.5	18	0	Pass
Nickel	130**	19	41	18	0	Pass
Lead	200*	31	70	18	0	Pass
Selenium	250**	0.7	1.0	18	0	Pass
Zinc	3700**	60	96	18	0	Pass

* DEFRA (2014). Development of Category 4 Screening Levels (SP1010)
** LQM/CIEH (2015). S4UL for Human Health Risk Assessment.

Table 5.6 - Summary of Chemical Test Results (PAH)

Contaminant of Concern	GAC* (mg/kg)	Contaminant Concentrations (mg/kg)		No. of Samples Tested	No. of Samples >GAC	Pass/Fail Tier 1 GAC Screen
		Min	Max			
Naphthalene	1	<0.02	0.07	18	0	Pass
Acenaphthylene	170	<0.02		18	0	Pass
Acenaphthene	200	<0.02		18	0	Pass
Fluorene	165	<0.02		18	0	Pass
Phenanthrene	95	0.03	0.11	18	0	Pass
Anthracene	2300	<0.02	0.03	18	0	Pass
Fluoranthene	280	0.04	0.33	18	0	Pass
Pyrene	620	0.03	0.24	18	0	Pass
Benzo(a)anthracene	7.5	0.03	0.30	18	0	Pass
Chrysene	15	<0.03	0.29	18	0	Pass
Benzo(b)fluoranthene	2.6	0.03	0.32	18	0	Pass
Benzo(k)fluoranthene	77	<0.03	0.09	18	0	Pass
Benzo(a)pyrene	2.2	<0.02	0.19	18	0	Pass
Dibenzo(a,h)anthracene	0.24	<0.02	0.03	18	0	Pass
Indeno(1,2,3-cd)pyrene	27	<0.02	0.17	18	0	Pass
Benzo(g,h,i)perylene	315	<0.02	0.10	18	0	Pass

* [CLEA/LQM/CIEH, 2015] Calculated for residential end-use scenario, with plant uptake in CLEA v1.071. GAC range for 1.0% SOM used unless stated otherwise. Values will be more conservative for cohesive soils.

5.8.3 Four soil samples were sent for analysis for pesticides. Analysis showed no detectable pesticides in any of the samples.

5.9 Asbestos

5.9.1 Twenty-two soil samples were sent for analysis for asbestos fibres. Analysis showed no trace of asbestos fibres in any of the samples.

6 GEOTECHNICAL ASSESSMENT

6.1 Mining Risk

6.1.1 On the basis of available information, the potential for there to be shallow mine workings beneath the site is considered to be negligible.

6.2 Foundations

6.2.1 Given the shallow bedrock recorded on site, it is recommended that strip foundations are adopted in for the proposed development.

6.3 Floor Slabs

6.3.1 Where strip foundations are utilised, a ground bearing floor slab can be used. Protective measures may be required where foundations lie within the heave zone of trees as defined by NHBC Standards (Chapter 4.2), or where seasonally desiccated soils are present at the time of construction.

6.3.2 Where ground bearing slabs are implemented, care must be taken to ensure that shallow strata do not become heavily disturbed by site clearance/construction activities (especially during inclement weather). Where this occurs, this could result in an increased requirement for suspended floor slabs.

6.4 Precautions Near Trees

6.4.1 There are some trees around the boundary to the site, so precautions are likely to be required where structures lie within influencing distance given the underlying (clay) ground conditions that prevail at the site; this will be subject to a tree survey and plot specific foundation schedule.

6.4.2 In addition, precautions would be required where trees are to be removed or where new planting is proposed. All foundations should be constructed in accordance with NHBC Standards (i.e. Chapter 4.2).

6.5 Drainage and Soakaways

6.5.1 *In situ* permeability testing was carried out in three trial holes (TP12, TP13 and TP18).

6.5.2 The results of soakaway testing indicates that there is very little infiltration of water so the use of soakaway drainage is considered to be unsuitable for the site.

6.6 Roads and Car Parks

6.6.1 Laboratory remoulded CBR testing has been carried out to determine estimated CBR values of the near surface soils. Values ranged between 38% and 57.3% with an average of 54% on the western side of the site and 45% on the eastern side of the site.

6.6.2 Highways Agency document CD225 Interim Advice Note 73/06 Revision 1 (2009) states that where a subgrade has a CBR lower than 2.5%, it is considered unsuitable support for a pavement foundation since it would tend to deform under construction traffic and must be improved. All road design should be discussed with the local authority if highways are to be subject to a Section 38 agreement.

6.7 Ground Stability

6.7.1 Shallow excavations are stable as no groundwater was encountered but where groundwater is encountered it is anticipated that granular deposits would be unstable. Instability should be anticipated where weak strata is encountered and where excavations are left open over prolonged periods of time and where excavations are left open during prolonged periods of wet weather (e.g. in service trenches). Allowance for instability of the near surface granular deposits should be made where necessary.

6.7.2 An adequate drainage system for surface water may need to be installed by a competent contractor in order to prevent surface water ponding or collection, both during and post construction, as this may lead to deterioration and weakening of the founding stratum.

6.7.3 Where excavations are proposed close to site boundaries and there is the possibility of weak/unstable ground passing across that boundary and beneath adjacent structures, a risk assessment of the integrity/stability should be undertaken prior to such works being carried out. Designed and engineered temporary/permanent measures should be adopted to ensure their continued stability where necessary.

6.8 Excavations

6.8.1 Localised obstructions are anticipated due to the shallow bedrock.

6.8.2 No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 97 (1983) should be made to establish suitable means of support, or battering of excavation sides.

6.9 Sulphate Attack and Aggressive Ground Conditions

6.9.1 An assessment of the data was carried out in accordance with Section C4 'Site Investigation for Aggressive Ground Conditions' and the procedure prescribed in Section C5 'Classification of Site Locations for Chemicals Aggressive to Concrete' of BRE SD1 (2005) to assess whether ground conditions at the site are potentially aggressive to buried concrete products.

6.9.2 The results of the assessment indicate that a Design Sulphate classification of DS-1 may be adopted along with an ACEC class of AC-1. However, it is recommended that where made ground is encountered DS2 sulphate precautions should be adopted in foundation construction.

6.9.3 Mobile groundwater conditions have been assumed in this assessment.

7 ENVIRONMENTAL ASSESSMENT

7.1 Guidance for Analytical Results - Assessment Criteria

Soil

7.1.1 With reference to the proposed end use of the site, the results of the chemical testing were assessed as part of an environmental risk assessment against a number of potential receptors, considering risks to human health, environmental quality and the built environment. Such risk assessment comprises the initial comparison of the measured soil concentrations with Generic Assessment Criteria (GAC), which in this instance are considered protective of a residential end use, with plant uptake.

7.1.2 In line with current best practice in the UK, initial screening of contaminant concentrations is carried out against appropriate published generic assessment criteria. Currently the authoritative generic assessment criteria are considered to be DEFRAs SGVs, DEFRAs Category 4 Screening Levels (2014) and the LQM/CIEH Suitable 4 Use Levels (2015). The assessment criteria have been derived on the basis of currently widely accepted assumptions relating to the modelling of human exposure to soil contaminants for the standard land uses: residential (with and without home-grown produce), allotments, commercial and public open spaces (close to residential properties and parks).

7.1.3 The general consensus between contaminated land practitioners is that the C4SL values, which are based on the low level of toxicological concern (LLTC), are less cautious than the GAC values published by LQM/CIEH and may not, therefore, be wholly applicable for use outside the context of Part 2A Statutory Guidance. Although both publications in no way undermine the validity of existing Environment Agency guidance presented in, for example, SR2, SR3 and the existing CLEA software, we are of the mind that the LQM/CIEH S4UL values, which are based on Health Criteria that represents minimal or tolerable levels of risks to health (as described in the Environment Agency's SR2 guidance) but incorporates the current exposure assumptions presented in DEFRAs C4SL guidance, provide a better starting point from which to generate determine assessment criteria that can be applied to brownfield development sites and are 'suitable for use' under the planning system.

7.1.4 It should be noted that all approaches are based on sandy loam soil with 6% soil organic matter (SOM). Whilst this does not affect metal contaminants, as they are not

dependent on soil type or SOM, the algorithms used to model plant uptake and volatilisation for organic contaminants do take account of SOM content in the soil. The GAC values for metals in the standard land uses may therefore be directly applied, whether these are SGVs, C4SL or S4UL derived, whilst independent GAC values for organics (e.g. PAH, TPH) have been generated using CLEA Version 1.071 and the toxicological updates presented in the aforementioned documents. These have also been adjusted for soil type and are calculated for SOM contents at 1%, 2.5% and 6% for a sandy soil.

7.2 Human Health Receptors

7.2.1 In order to assess the significance of the recorded concentrations of potential contaminants of concern in relation to human health laboratory analysis was compared with the adopted generic assessment criteria.

Metals, Metalloids and Other Inorganic Analytes

7.2.2 A total of twenty-two soil samples were analysed. Assessment of the soils data indicates that there are no elevated concentrations of potential contaminants of concern that exceed relevant GAC criteria.

7.2.3 There is considered to be no significant risk to human health in a residential site end use scenario with plant uptake, with respect to metals, metalloids and non-metal inorganics.

Organics (PAH, TPH, BTEX and MTBE)

7.2.4 A total of eighteen soil samples were analysed for PAH contaminants.

7.2.5 None of the samples analysed for PAH returned concentrations above relevant GAC's.

7.2.6 There is considered to be no significant risk to human health in a residential site end use scenario with plant uptake, with respect to organic contaminants.

Asbestos

7.2.7 A total of twenty-two soil samples were analysed. No asbestos fibres were detected in the samples tested.

7.2.8 There is considered to be no significant risk associated with asbestos containing materials within soils at the site.

Topsoil

7.2.9 Environmental analysis has been completed on eighteen samples of topsoil. Concentrations of all potential contaminants of concern were below the adopted GAC value for a residential site end-use, with plant uptake. The existing topsoil deposit is considered likely to be suitable for continued use at the site. However, additional testing should be undertaken in accordance with the requirements of YALPAG guidance to confirm suitability for re-use.

7.3 Controlled Waters Receptors

7.3.1 No sources of potentially significant contamination have been identified which could present a risk to controlled water receptors.

7.4 Ecological Receptors

7.4.1 There are no known ecological receptors at the site.

7.5 Utilities

7.5.1 It is considered unlikely that protection for utilities will be required. However, it is recommended that the results of the chemical testing and details of the proposed redevelopment of the site are provided to the appropriate utility companies to determine the necessity for service protection.

7.6 Potable Water Supplies

7.6.1 Risk to potable water supply pipes is considered to be very low. On the basis of available test results it is unlikely that protective measures will be required. Consultation should however be undertaken with the local water authority with respect to any precautions they may require, prior to construction.

7.7 Refined Conceptual Site Model

7.7.1 Introduction

7.7.1.1 The preliminary CSM given above presented our initial understanding of the site, being based on available geological information, site location, likely contamination status and the overall risk it presented to the identified receptors through various pollution pathways.

7.7.1.2 This section revises the initial CSM in light of the ground investigation findings and chemical analysis results presented above.

7.7.1.3 The revised conceptual site model has been developed for the proposed future residential site end-use, with plant uptake. This summarises our understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors assuming that no remediation has been undertaken at the site.

7.7.2 Ground Conditions - Summary.

7.7.2.1 No made ground was encountered at the site.

7.7.2.2 Natural Strata: The site is underlain by superficial Glacial Till deposits comprising slightly clayey sand, gravel and infrequent boulders. The solid geology underlying this is chalk.

7.7.2.3 No perched groundwater was encountered within the superficial deposits

7.7.2.4 A total of twenty-two soil samples were analysed for inorganic and organic contaminants. Assessment of the soils data indicates that there are no elevated concentrations of potential contaminants of concern that exceed relevant GAC criteria.

7.7.3 Qualitative Contaminated Land Risk Assessment

7.7.3.1 Current UK legislation on contaminated land is principally contained in Sections 78(A) to (YC) in Part 2A of the Environmental Protection Act 1990, which was retrospectively inserted by Section 57 of the Environment Act 1995. The Contaminated Land Regulations 2000 were amended in 2005. The Environmental Protection Act 1990: Part 2A Contaminated Land, Statutory Guidance, Edition 2, 2006, promulgates the

revised statutory guidance with respect to the operation of the Contaminated Land Regime following the implementation of the Contaminated Land Regulations, 2005.

7.7.3.2 The definition of contaminated land is central to the operation of Part 2A. Legislation adopts the principle of a 'suitable for use' approach for the assessment of contaminated land, the rationale reflected in the site-specific risk assessment and determination of remedial strategy. Action is only required if unacceptable risks are posed to human health or to the environment, taking into account the current land use and geo-environmental setting.

7.7.3.3 The legislation places a responsibility on the Local Authority to determine whether the land under its jurisdiction is contaminated by consideration of whether:

- Significant harm is being caused;
- There is a significant possibility of significant harm being caused;
- Significant pollution of controlled waters is being caused or is likely to be caused.

7.7.4 Assessment Framework

7.7.4.1 The statutory guidance describes a risk assessment methodology in terms of ‘significant contaminants’ and ‘contaminant linkages’, using ‘source-pathway-receptor’ scenarios for the site. Contaminant linkages are formed when there is a linkage between a contaminant source and a receptor by means of a pathway. Each element has to be present, or no linkage can be formed.

7.7.4.2 Risk assessment and the procedure of identifying sources, pathways and receptors is recognised as an approach to determine the extent and significance of contamination either within the context of Part 2A (when assessing current site status or when considering the acquisition of an existing development) or the planning process (for the redevelopment of an existing site, or when considering the acquisition of a site for redevelopment purposes). Either way, the ‘suitable for use’ approach is adopted when assessing risk and the source-pathway-receptor assessment defines the conceptual model for the site.

7.7.4.3 Within the context of this report therefore, the revised risk assessment has been undertaken on the basis that the ‘suitable for use’ approach remains aligned with the site being redeveloped for the end use given above.

7.8 Summary of Identified Contaminant Linkages

7.8.1.1 On the basis of the ground investigation and laboratory test results, on-site soils have been found to not contain elevated concentrations of inorganic and/or organic contaminants in excess of the adopted GACs.

7.8.1.2 There is considered to be no significant risk to human health, the development or the wider environment, with respect to the identified levels of contaminants within the on-site soils.

7.8.1.3 A summary of the revised risk assessment is given in Table 7.1.

Table 7.1 - Summary of Revised Conceptual Site Model & Risk Assessment

Potential Source	Potential Receptor	Plausible Pathway	Initial Risk Rating	Probability	Severity	Revised Risk Rating	Solution
Localised potentially contaminated made ground, near surface natural strata / perched groundwater	Human Health Site end-users, inc. maintenance and site workers (short term risk during construction)	Direct ingestion or dermal contact with soil, dust and/or vapour inhalation	**Moderate/Low**	Unlikely	Mild	**Very Low**	No risk anticipated
		Direct ingestion and/or dermal contact with liquid contaminants	**Very Low**	Unlikely	Mild	**Very Low**	
		Inhalation of Asbestos fibres	**Moderate/Low**	Unlikely	Severe	**Moderate / Low**	**Risk rating cannot be downgraded due to severity**
	Construction (Potable Water Supply Pipes)	Direct contact/leaching (tainting)	**Low**	Unlikely	Mild	**Very Low**	No risk anticipated
	Construction (Foundations)	Direct contact/leaching	**Low**	Unlikely	Mild	**Very Low**	No risk anticipated. Appropriate concrete specification
	Controlled Waters	Surface run-off / lateral migration	**Very Low**	Unlikely	Mild	**Very Low**	No risk anticipated

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 This geo-environmental appraisal has been carried out in relation to the redevelopment of land off Barrow Road in Barton Upon Humber.

8.1.2 It has been assumed in the production of this report that the site is to be redeveloped for a residential site end use, with plant uptake.

8.2 Contamination Risk Evaluation

8.2.1 The revised Conceptual Site Model confirms that no significant potential contaminant linkages exist at the site in relation to existing on-site soils.

8.2.2 There is considered to be no significant potential risk to sensitive receptors from soil contamination at the site.

8.2.3 Potential risk to construction worker is considered to be very low.

8.2.4 Contaminant levels are not considered unlikely to be potentially mobile and no significant sources of liquid contaminants have been identified. Controlled water receptors are not considered to be at risk from soil contamination at the site.

8.2.5 No significant potential sources of ground gases have been identified within influencing distance of the site. Therefore no ground gas monitoring was warranted and no protection measures will be required in proposed development.

8.2.6 No radon protection measures will be required.

8.2.7 On the basis of available information and the intrusive investigation undertaken, the site is deemed to be suitable for a residential end-use with plant uptake. This is subject to additional testing of topsoil in accordance with Yorkshire and Lincolnshire Pollution Advisory Group and the NHBC.

8.3 Outline Remediation Requirements

8.3.1 On the basis of available information, it is considered that no particular remediation is required at the site.

8.3.2 Confirmation of the chemical condition of any materials brought to site should be confirmed prior to importation.

8.4 Disposal of Soils

8.4.1 Should brightly coloured or odorous soil be encountered during the proposed construction works, Alan Wood and Partners should be notified immediately. An experienced geo-environmental engineer will visit site for further sampling, analysis and risk assessment, where required.

8.4.2 Any materials removed from site should be undertaken in accordance with the Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005. There will also be a requirement to classify the waste in accordance with the European Waste Catalogue. The waste should also be subject to Waste Acceptance Criteria (WAC) testing.

8.5 Further Work

8.5.1 Additional sampling and analysis of existing topsoil on site to confirm its suitability for re-use within garden areas to the proposed development.

8.5.2 Assessment of the influence of trees in relation to foundations and floor slabs where clays are present at founding depth.

9 REGULATORY APPROVAL

9.1.1 The conclusions and recommendations presented in this report are considered reasonable on the basis of available information and the assessment of the site as carried out by Alan Wood and Partners.

9.1.2 It should be noted however that the works undertaken cannot be guaranteed to gain approval by the Regulatory Authorities and your Warranty Provider, so copies of this report should be made available to the relevant organisations (as appropriate) for their comment and approval, prior to undertaking any irrecoverable works associated with the site.

10 INFORMATION SOURCES

In addition to the specific references cited in the text, the following references have been referred to in the production of this report, where relevant to the defined project objectives.

1 BRE *BR211* (2015) *Radon: guidance on protective measures for new dwellings*;

2 BRE GBG 75 (2015), '*Radon Protection For New Large Buildings';*

3 BS5930 (2015), *Code of practice for site investigations*;

4 BS:8576 (2013), *Guidance on Investigations for Ground Gas - Permanent Gases and Volatile Organic Compounds (VOCs)*;

5 BSEN 1997-1 (2004), *Geotechnical Design Part 1 – General Rules*;

6 BSEN 1997-2 (2007), *Geotechnical Design Part 2 – Ground investigation and testing*;

7 Chartered Institute of Environmental Health (CIEH): *Professional Practice Note: Reviewing human health risk assessment reports invoking contaminant oral bioavailability measurements or estimates* (2009);

8 CIRIA C552 (2001), *Contaminated Land Risk Assessment, A Guide to Good Practice*;

9 CIRIA C665 (2007), *Assessing risks posed by hazardous ground gases to buildings*;

10 CL:AIRE / EIC / AGS: *Soil Generic Assessment Criteria for Human Health Risk Assessment* (updated January 2010 version);

11 Coal Authority, *www.coal.decc.gov.uk*;

12 DEFRA SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Policy Companion Document*, December 2014;

13 DETR Circular 02/2000 (2000). *Environmental Protection Act 1990 Part 2A. Contaminated Land.* Department of the Environment, Transport and the Regions, Circular 02/2000, Dated 20th March 2000;

14 Environment Agency (EA) & DEFRA: Model Procedures for the Management of Land Contamination – Contaminated Land Report 11 (CLR11) (2004);

15 NHBC Chapter 4.2 (2022), *Building near trees,* NHBC Publication, July 2018.

16 Environment Agency, *www.environment-agency.org.uk*;

17 Environment Agency (2009). *Human Health Toxicological Assessment of Contaminants in Soil*, Science Report SC050021/SR2;

18 Environment Agency (2009).*Updated Technical Background to the CLEA Model*, Science Report SC050021/SR3;

19 Land Quality Management / CIEH: *The LQM/CIEH S4UL's for Human Health Risk Assessment*, Land Quality Press, Nottingham, 2015. Publication Number S4UL3286;

Alan Wood & Partners

FIGURES

BARROW ROAD | BARTON UPON HUMBER

All work to be carried out in accordance with the requirements of the Building Regulations,Water Authority and the Construction (Design and Management) Regulations currently in force.

Do not scale from this drawing. Architect to be notified of any discrepancies.

Verify relevant dimensions on site before commencing work or preparing shop drawings. This drawing is copyright.

Rev	Date	Description	By	Checked
A	-	-	-	-
B	04.01.23	Layout revised plot numbers have increased to 169 from 168. Raised tables included, sales area relocated, sheds and paths moved to retain hedgerow.	AW	LA
C	17.01.23	Welcome centre relocated inside double garage. Private drive near plots 1-5 straightened and now includes turning head. Access added from front of plots to public highway. Plots 7 & 8 parking re-worked. Gates and paths re-worked across the site. Plots 12 & 13 mirrored. Eliminated paths and created shared ones where possible. 'Dead ' POS space worked into rear gardens where possible. Plots 36, 53, 128 & 135 parking moved towards front of plot. Roads rounded off to eliminate harsh corners. Drive rotated to be perpendicular to plots 135-138, bin collection added. Reworked plots 121-124. Mirrored plots 158-159 to have meter boxes to drives. Pedestrian link added to existing path near plot 52. Plots 29-32, 80-81, 42-45 pulled to align with build line. Low level hedging added along main spine road.	GF	LA
D	08.02.23	Layout revised following tracking comments. Visibility splays on bends and private drives have been included.	AW	GF
E	20.03.23	Layout revised following title boundary updated and ransom strip. Plots 53 and 54 rear boundary revised to offset from existing building. Plots 36-52 moved north.	AW	GF
F	16.06.23	Layout revised to updated drainage and link road.	AW	GF
G	02.08.23	Layout revised following updated roundabout and link road design.	AW	GF
H	04.08.23	Red line boundary revised to incorporate the roundabout. Bin collection points added to private drives.	AW	KM
I	15.08.23	Layout revised following forward visibility and tracking comments.	AW	KM

SITE LAYOUT KEY:

- 1800 HIGH SCREEN WALL
  standard detail reference: SD10.EX.06 & 07
  - refer to materials plan for brick/stone
- 1800 HIGH CLOSE BOARDED TIMBER FENCE
  standard detail reference: SD10.EX.17
- 1200 HIGH CLOSE BOARDED TIMBER FENCE
  standard detail reference: SD10.EX.153
- RED LINE APPLICATION BOUNDARY
- 900mm WIDE REAR ACCESS GATE
- 1800x2700 HARD STANDING AREA FOR REFUSE BINS
- SH — SHOW HOMES
- WC — WELCOME CENTRE
- WELCOME CENTRE VISITOR PARKING
- LOW LEVEL BOUNDARY HEDGING
- DENOTES TURF (PRIVATE)
- DENOTES TURF (PUBLIC)
  - turf areas to Public Open Spaces to be maintained by Management Company
- ELECTRIC VEHICLE CHARGING POINTS
- DENOTES 6'x4' TIMBER SHED
  - refer to specific detail for shed base
- DENOTES 900mm WIDE PATH
  - refer to specific detail for composition
- DENOTES SUB STATION
  - refer to services layout for details
- DENOTES LANDSCAPED BIN COLLECTION POINT
  900x900mm hard standing area per plot served.
  Refer to standard detail SD.10.113

PLEASE REFER TO LANDSCAPE DRAWINGS FOR ALL LANDSCAPE DETAILS

PLEASE REFER TO ENGINEERING DRAWINGS FOR ALL ENGINEERING DETAILS

ACCOMMODATION SCHEDULE

SITE NAME:
DRAWING NUMBER:

HOUSE TYPE	SALES NAME	NO	SQ.FT	TOTAL SQ.FT	SQ.M	TOTAL SQ.M	%	REGULATORY COMPLIANCE	BEDS	PEOPLE	STOREY	CONFIGURATION	LAND SEGMENT
OPEN MARKET - CORE (#MIY)													
2-300	205-M43 (WHEEL CHAIR USER BUNGALOW)	1	858	858	80	80	0.6%	M4/3 / NDSS	2	3	1	BUNGALOW	A
3-703	MALMO	46	998	45,908	93	4,265	26.6%	M4/2 / NDSS	3	4	2	SEMI-DETACHED/TERRACE	B
MY-PL-302	GENEVA	57	1,204	68,628	112	6,376	32.9%	M4/1 / NDSS	3	5	2.5	SEMI-DETACHED/TERRACE	B
MY PL 404	ROSAS (3 BED PLUS STUDY)	28	1,246	34,888	116	3,241	16.2%	M4/1 / NDSS	3	5	2.5	SEMI-DETACHED	B
S-301	BOLOGNA (CT) (3 BED PLUS STUDY)	7	1,235	8,645	115	803	4.0%	M4/1 / NDSS	3	5	2	DETACHED	B/C
S-102	OPORTO (3 BED PLUS STUDY)	24	1,345	32,280	125	2,999	13.9%	M4/1 / NDSS	3	6	2.5	SEMI-DETACHED /DETACHED	B/C
4-301	COPENHAGEN	10	1,350	13,500	125	1,254	5.8%	TBC	4	6	2	DETACHED	B/C
	OPEN MARKET TOTALS:	173		203,849		18,938	100.0%						
	TOTALS:	173		203,849		18,938	100.0%						

Area Gross:	6.56	Hectares
Area Gross:	16.210088	Acres
Non Developable/POS area	0.5	Hectares
Non Developable/POS area	1.235525	Acres
Developable area	6.06	Hectares
Developable area	14.974563	Acres
Density:	28.55	Units / Hectare
Density:	11.55	Units / Acre
Sq.ft/acre	13613.02	Sq.ft/acre
Sq. Metres/Hectare	3125.09	Sq. Metres/Hectare

M4/2 PERCENTAGE	M4/2 PLOT TOTAL
32.4%	56

M4/3 PERCENTAGE	M4/3 PLOT TOTAL
0.6%	1

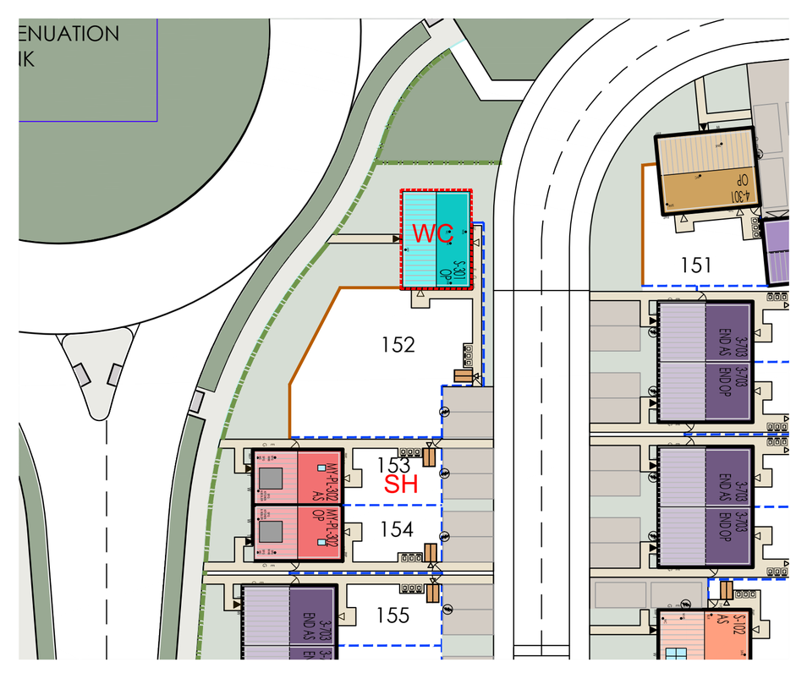
HOUSETYPE RANGE: MIY

SPECIFICATION TYPE: TBC

LAND CLUSTER: 3 (E. YORKS)

LAND SEGMENT: B

DRAWING STAGE: 3-PLANNING



SHOW HOME COMPLEX

LANDSCAPE SPEC: SILVER

strata homes limited | quay point | lakeside | doncaster | DN4 5PL
t: 01302 308508 www.strata.co.uk

scale: 1:500 @ A0 | drawn by: AW | date: 19/12/2022

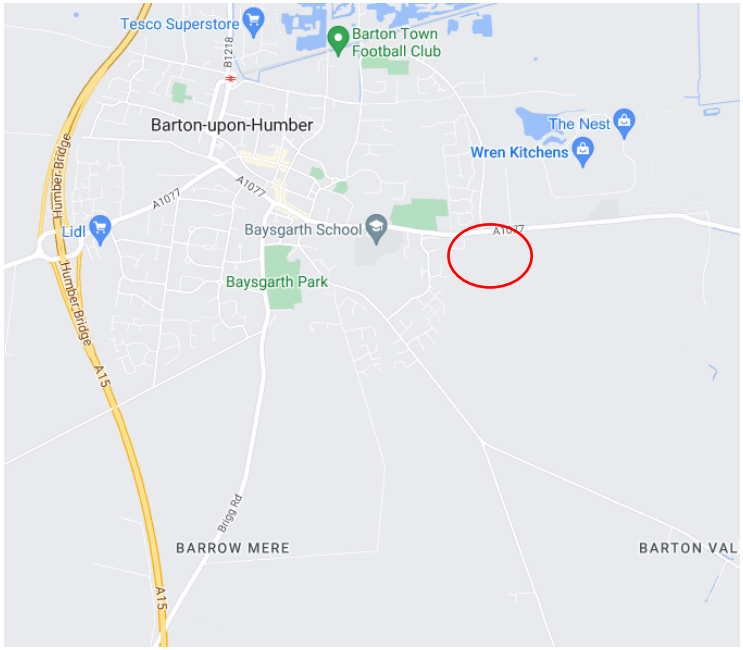
Project: Barrow Road, Barton upon Humber DN18 6DB

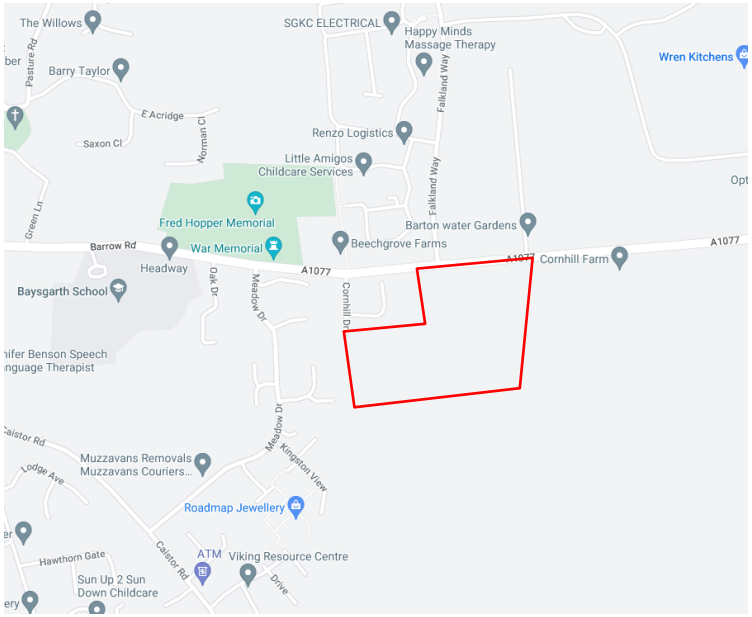
Drawing: Planning layout

Planning Ref: N/A

Drawing Number: 22-CL3-SEGB-BR-01-PL

Revision: I





Key

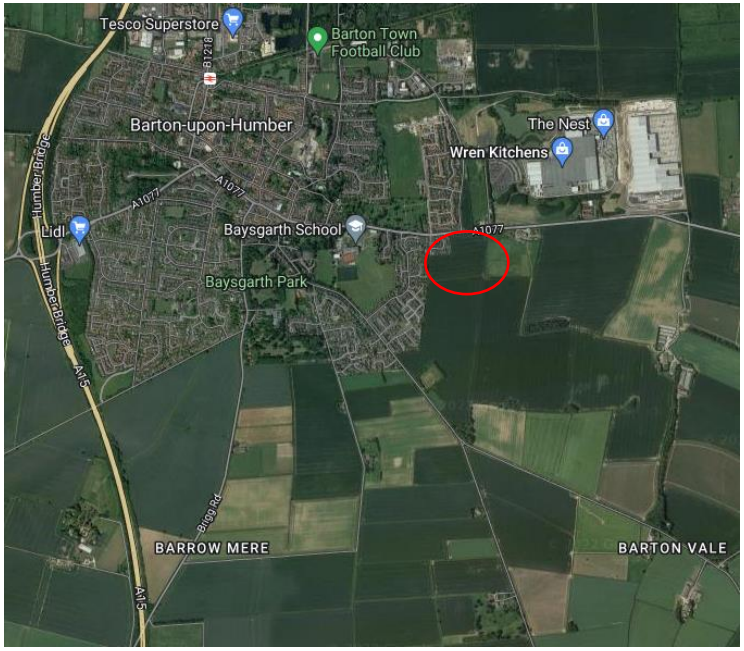
Site Location

Approximate Red Line Boundary

N

DO NOT SCALE

Alan Wood & Partners



Client. **Strata Homes Yorkshire Limited**		
Project. **Barrow Road, Barton Upon Humber**		
Drawing. **Site Location Plan**		
Date. **16.09.22**	Scale. **NTS**	
Drawn by. **SW**	Check by. **SLR**	Approved by. **SLR**
Status: **INFO**		
Job no. **47697**	Fig. no. **001**	Rev.

DO NOT SCALE

TP# Approximate Trial Pit Location

CBR# Approximate CBR Test Location

Alan Wood & Partners

Client.	**Strata Homes Yorkshire Ltd**		
Project.	**Barrow Road, Barton Upon Humber**		
Drawing.	**Exploratory Hole Location Plan**		
Date. **16.09.22**		Scale. **NTS**	
Drawn by. **SW**	Check by. **SLR**	Approved by. **SLR**	
Status:	**FOR INFORMATION**		
Job no. **47697**	Fig. no. **003**	Rev.	

APPENDIX A

GROUND INVESTIGATION LOGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
CBR01
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504085.80 - 421573.20 Level: 30.52	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.45	B		0.45	30.07		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	29.72		End of pit at 0.80 m

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Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
CBR02
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504097.00 - 421494.50 Level: 34.59	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.40	B		0.35	34.24		Medium dense orangish brown silty, sandy gravelly CLAY. Gravel of angular and subangular chalk and angular flint
				0.60	33.99		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
	0.80	D		0.80	33.79		End of pit at 0.80 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Trial Pit Log

Alan Wood & Partners

Trialpit No **CBR03**

Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504225.00 - 421516.10 Level: 33.81	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.30	B		0.30	33.51		Medium dense orangish brown silty, sandy gravelly CLAY. Gravel of angular and subangular chalk and angular flint
	0.40	B					
	0.40	D		0.55	33.26		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	33.01		End of pit at 0.80 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
CBR04
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504220.70 - 421654.50 Level: 25.54	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 2.10	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40	25.14		TOPSOIL: Brown silty SAND with frequent rootlets
	0.70	D					Medium dense orangish brown silty, sandy gravelly CLAY. Gravel of angular and subangular chalk and angular flint
	0.80	B		0.80	24.74		
	0.90	D					Medium dense light brown silty gravelly SAND. Gravel of angular and subangular weathered chalk and subrounded fine and medium mudstone
	1.00	B					
				1.90	23.64		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				2.10	23.44		End of pit at 2.10 m

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Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
CBR05
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504208.00 - 421713.60 Level: 22.04	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10 0.10	B D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.50	B		0.45	21.59		Stiff orangish brown silty, sandy and gravelly CLAY. Gravel of angular and subangular chalk and angular flint
	1.00	D					
				1.50	20.54		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.80	20.24		End of pit at 1.80 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
CBR06
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504302.10 - 421668.90 Level: 26.02	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.10	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40	25.62		TOPSOIL: Damp brown silty SAND with frequent rootlets
	0.50	D					Stiff orangish brown silty, sandy gravelly CLAY with infrequent boulders. Gravel of angular and subangular chalk and angular flint
	0.60	B					
	0.70	B					
				0.90	25.12		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.10	24.92		End of pit at 1.10 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
CBR07
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504280.60 - 421521.20 Level: 33.84	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.75	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.40	B		0.35	33.49		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.75	33.09		End of pit at 0.75 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP01
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504065.00 - 421481.20 Level: 35.08	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.50	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D		0.35	34.73		TOPSOIL: Brown silty SAND with frequent rootlets
	0.90	D		0.90	34.18		Medium dense orangish brown silty slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
				1.30	33.78		Medium dense light brown silty gravelly SAND. Gravel of angular and subangular weathered chalk
				1.50	33.58		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint End of pit at 1.50 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP02
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504045.30 - 421534.60 Level: 32.70	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.35	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.45	32.25		TOPSOIL: Brown silty SAND with frequent rootlets
	0.60	D					Medium dense orangish brown silty slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
				1.05	31.65		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.35	31.35		End of pit at 1.35 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Trial Pit Log

Alan Wood & Partners

Trialpit No **TP03**

Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504034.80 - 421595.90 Level: 29.77	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.25	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.40	29.37		Medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
				0.85	28.92		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.25	28.52		End of pit at 1.25 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Trial Pit Log

Alan Wood & Partners

Trialpit No **TP04**

Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504137.80 - 421541.50 Level: 32.40	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.40	32.00		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	31.60		End of pit at 0.80 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP05
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504144.90 - 421586.10 Level: 29.74	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Damp brown silty SAND with frequent rootlets
	0.50	D		0.40	29.34		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	28.94		End of pit at 0.80 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP06
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504163.50 - 421496.40 Level: 34.72	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.75	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40	34.32		TOPSOIL: Brown silty SAND with frequent rootlets
	0.70	D		0.75	33.97		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint End of pit at 0.75 m

Remarks: No groundwater encountered

Stability: Stable

AGS

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Trial Pit Log

Trialpit No
TP07
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504196.10 - 421549.40 Level: 31.98	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.00	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.40	B		0.40	31.58		Medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
	0.50	D		0.60	31.38		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.00	30.98		End of pit at 1.00 m

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Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP08
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504252.80 - 421560.00 Level: 31.52	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.90	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.35	31.17		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.90	30.62		End of pit at 0.90 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP09
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504320.40 - 421519.00 Level: 33.96	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.60	D		0.50	33.46		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	33.16		End of pit at 0.80 m

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Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP10
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504331.10 - 421568.10 Level: 31.74	Date 31/08/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.85	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.45	31.28		Medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
	0.70	D		0.65	31.08		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.85	30.88		End of pit at 0.85 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP11
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504329.40 - 421633.70 Level: 28.26	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Damp brown silty SAND with frequent rootlets
				0.40	27.86		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	27.46		End of pit at 0.80 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP12
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504343.70 - 421723.80 Level: 24.33	Date 02/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.20	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							TOPSOIL: Damp brown silty SAND with frequent rootlets
	0.50	B		0.50	23.82		
	0.60	D					Damp stiff orangish brown silty and sandy CLAY.
	0.60	D					
				1.20	23.12		End of pit at 1.20 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP13
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: - Level:	Date 02/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.40	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Damp brown silty SAND with frequent rootlets
	0.50	D		0.40			Damp stiff orangish brown silty, sandy gravelly CLAY. Gravel of angular and subangular chalk and angular flint
				1.10			Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.40			End of pit at 1.40 m

1
2
3
4
5

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP14
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504258.70 - 421684.80 Level: 24.26	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.10	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
	0.50	D		0.40	23.86		Stiff orangish brown silty, sandy gravelly CLAY. Gravel of angular and subangular chalk and angular flint
				0.90	23.36		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.10	23.16		End of pit at 1.10 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Trial Pit Log

Alan Wood & Partners

Trialpit No **TP16**

Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504250.60 - 421631.50 Level: 27.39	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.90	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.55	26.84		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.90	26.49		End of pit at 0.90 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP17
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504174.30 - 421624.30 Level: 27.47	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.60	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	D					TOPSOIL: Damp brown silty SAND with frequent rootlets
				0.35	27.12		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.60	26.87		End of pit at 0.60 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP18
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504176.30 - 421710.80 Level: 22.35	Date 02/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.20	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	D					TOPSOIL: Damp brown silty SAND with frequent rootlets
	0.40	B		0.40	21.95		Damp medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
	0.90	D		0.90	21.45		Medium dense light brown silty and gravelly SAND. Gravel of angular and subangular weathered chalk
				1.00	21.35		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.20	21.15		End of pit at 1.20 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP19
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504162.60 - 421664.50 Level: 25.05	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.80	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.40	24.65		Medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
				0.60	24.45		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.80	24.25		End of pit at 0.80 m

1
2
3
4
5

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP20
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504344.90 - 421680.60 Level: 26.02	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.20	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40	25.62		TOPSOIL: Brown silty SAND with frequent rootlets
	0.50 0.50	D D					Stiff orangish brown silty, sandy gravelly CLAY. Gravel of angular and subangular chalk and angular flint
				1.00	25.02		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.20	24.82		End of pit at 1.20 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP21
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504306.80 - 421680.60 Level: 29.06	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 0.90	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.40	28.66		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				0.90	28.16		End of pit at 0.90 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP22
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504226.70 - 421598.90 Level: 29.13	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.00	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	D					TOPSOIL: Brown silty SAND with frequent rootlets
				0.40	28.73		
				0.50	28.63		Medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
							Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint
				1.00	28.13		End of pit at 1.00 m

Remarks: No groundwater encountered

Stability: Stable

AGS

Alan Wood & Partners

Trial Pit Log

Trialpit No
TP23
Sheet 1 of 1

Project Name: Barton Upon Humber	Project No. 47697	Co-ords: 504196.30 - 421664.20 Level: 24.84	Date 01/09/2022
Location: Barrow Road, Barton Upon Humber		Dimensions (m): Depth 1.00	Scale 1:25
Client: Strata Homes Yorkshire			Logged SW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.45	24.39		TOPSOIL: Brown silty SAND with frequent rootlets
	0.60	D		0.80	24.04		Medium dense orangish brown slightly clayey, silty gravelly SAND. Gravel of angular and subangular chalk and angular flint
				1.00	23.84		Moderately strong white CHALK recovered as angular and subangular medium and coarse gravel with occasional flint End of pit at 1.00 m

Remarks: No groundwater encountered

Stability: Stable

AGS

APPENDIX B

IN-SITU INFILTRATION TEST RESULTS

Our Ref: 0016/G
Your Ref: Barton Upon Humber
Date: 21st September 2022

Alan Wood and Partners
341 Beverley Road
Hull
HU5 1LD

Humberside Materials Laboratory LTD
Atherton Way, Brigg
North Lincs DN20 8AR
Tel & fax 01652 652753
Email: info@humbersidematerialslab.co.uk

Dear Sophie Williams
Barton Upon Humber, Soakaway testing

Further to your instruction soakaway testing to assess soil infiltration rates was undertaken at Barton Upon Humber during your site investigation. The soakaway testing included three trial pits (SA1, SA2 and SA3) to circa 1.4m below ground level as part of your site investigation. The trial pit locations were selected and recorded by you.

Trial pit SA1 (TP SA1) was excavated to 1.20m below ground level (bgl) with a width of 0.50m and a length of 1.90m. Water was introduced to the pit and monitored against time elapsed. An initial water level after filling was recorded at 0.90m bgl with an end depth after 180minutes of 0.90m bgl. With no drop in water level of its monitored period testing was ceased and this location was deemed unsuitable for soakaways.

Trial pit SA2 (TP SA2) was excavated to 1.40m below ground level (bgl) with a width of 0.50m and a length of 1.60m. Water was introduced to the pit and monitored against time elapsed. An initial water level after filling was recorded at 1.09m bgl with an end depth after 180minutes of 1.13m bgl. With no noticeable drop in water level of its monitored period testing was ceased and this location was deemed unsuitable for soakaways.

Trial pit SA3 (TP SA3) was excavated to 1.40m below ground level (bgl) with a width of 0.50m and a length of 1.35m. Water was introduced to the pit and monitored against time elapsed. An initial water level after filling was recorded at 0.90m bgl with an end depth after 180minutes of 0.98m bgl. With no noticeable drop in water level of its monitored period testing was ceased and this location was deemed unsuitable for soakaways.

All three trial pit (TP SA1 – SA3) locations have been deemed unsuitable for soakaways as no or negligible drop in water levels have been recorded throughout 180minutes of monitoring per pit. Available test data may deem this site as unsuitable for the inclusion of soakaways at the investigated depths. Site test data is enclosed.

If you require any further information, please contact the laboratory.

Yours Sincerely

D. Driver *Director*

Enclosed: *Test data*

Table 1: site test data from soakaway testing			
Time (minutes)	Depth to water from existing ground level (m)		
	SA1	SA2	SA3
0	0.90	1.09	0.90
0.5	0.90	1.09	0.90
1	0.90	1.09	0.90
2	0.90	1.10	0.90
5	0.90	1.10	0.91
10	0.90	1.10	0.91
15	-	1.10	0.94
30	0.90	1.12	0.95
45	0.90	-	0.96
60	0.90	1.12	0.97
75	-	-	0.98
90	0.90	1.125	0.98
105	-		0.98
120	0.90	1.13	0.98
180	0.90	1.13	0.98

APPENDIX C

LABORATORY TEST RESULTS: GEOTECHNICAL

LABORATORY REPORT

4043

Contract Number: PSL22/5847

Report Date: 23 September 2022

Client's Reference: S4911/47697

Client Name: Alan Wood & Partners
Hallamshire House
Meadow Court
Hayland Street
Sheffield
S9 1BY

For the attention of: Andy Borthwick

Contract Title: Barrow Road, Barton Upon Humber

Date Received: 7/9/2022
Date Commenced: 7/9/2022
Date Completed: 21/09/2022

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

[redacted]

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
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awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP12	2	D	0.60		Brown slightly gravelly sandy CLAY.
TP13	2	D	0.50		Brown slightly gravelly sandy CLAY.
TP14	1	D	0.50		Brown slightly gravelly sandy CLAY.
TP20	2	D	0.50		Brown slightly gravelly sandy CLAY.
CBR5	3	D	1.00		Brown slightly gravelly sandy CLAY.
TP07	1	B	0.40		Brown TOPSOIL.
TP12	3	B	0.50		Brown TOPSOIL.
TP18	3	B	0.40		Brown TOPSOIL.
CBR3	4	B	0.40		Brown very gravelly very sandy CLAY.
CBR4	2	B	1.00		Brown very sandy clayey silty GRAVEL.
CBR5	2	B	0.10		Brown TOPSOIL.
CBR6	2	B	0.60		Brown TOPSOIL.
CBR1	2	B	0.45		Brown very gravelly very sandy CLAY.
CBR2	3	B	0.40		Brown very gravelly very sandy CLAY.
CBR3	3	B	0.30		Brown gravelly very sandy CLAY.
CBR4	1	B	0.80		Brown gravelly very sandy CLAY.
CBR5	1	B	0.50		Brown gravelly very sandy CLAY.
CBR6	1	B	0.70		Brown slightly gravelly sandy CLAY.
CBR7	2	B	0.40		Brown very sandy clayey silty GRAVEL.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP12	2	D	0.60		16			35	16	19	94	Intermediate Plasticity CI
TP13	2	D	0.50		12			39	17	22	94	Intermediate Plasticity CI
TP14	1	D	0.50		11			37	16	21	93	Intermediate Plasticity CI
TP20	2	D	0.50		10			33	15	18	92	Low Plasticity CL
CBR5	3	D	1.00		12			36	17	19	93	Intermediate Plasticity CI

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

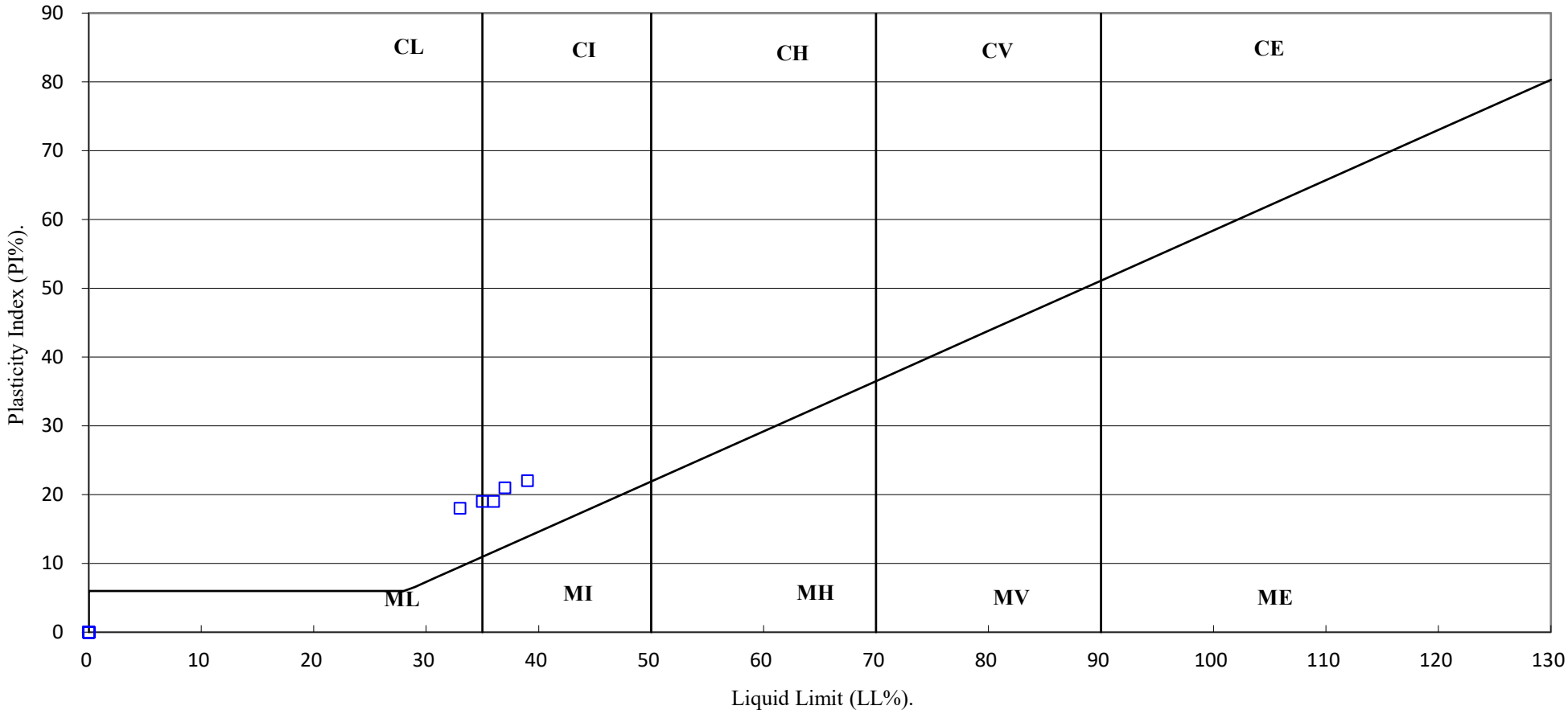
Contract No:

PSL22/5847

Client Ref:

S4911/47697

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Barrow Hill, Barton Upon Humber	Contract No: PSL22/5847
			Client Ref: S4911/47697

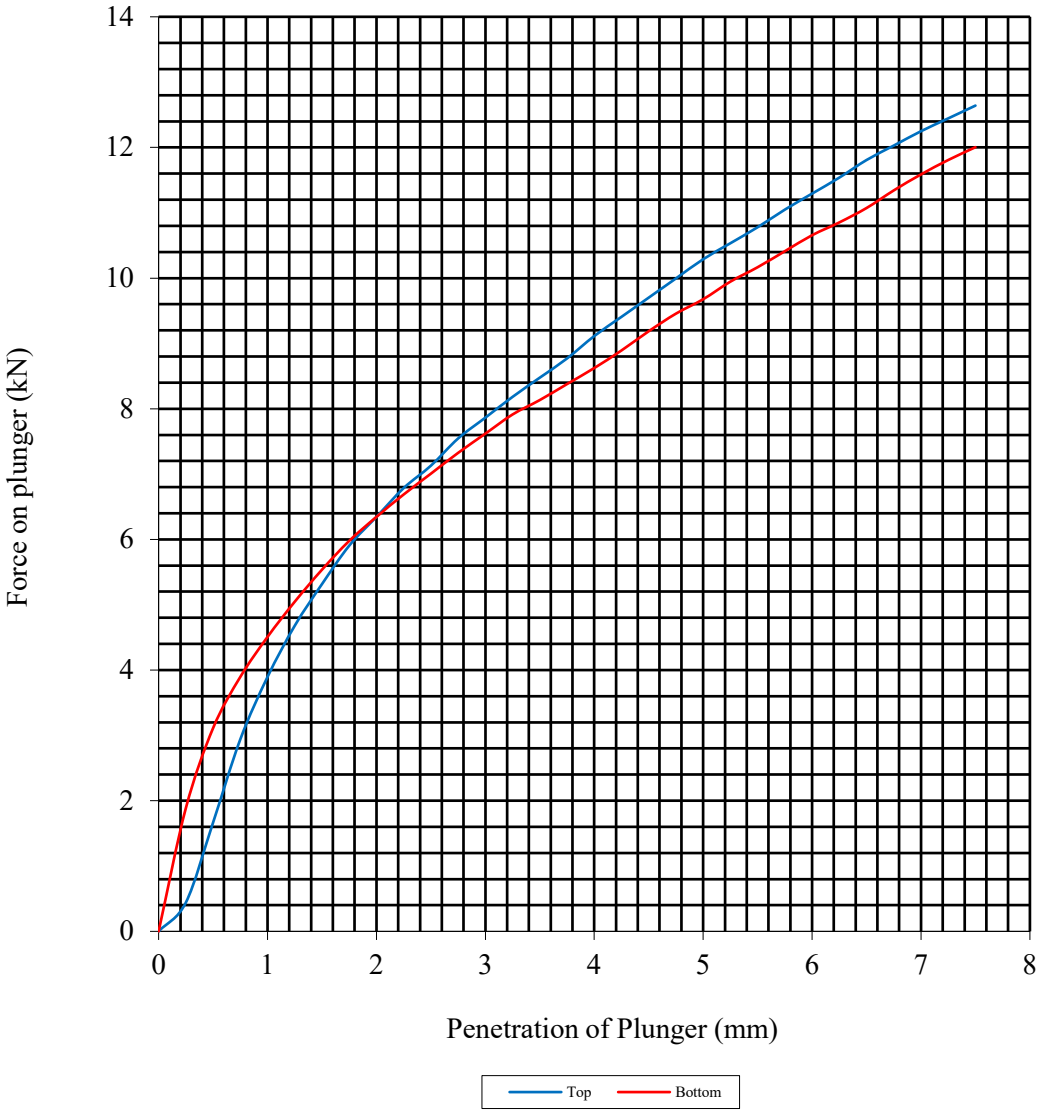
CALIFORNIA BEARING RATIO TEST

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: CBR1 **Top Depth (m):** 0.45

Sample Number: 2 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	5.9	Surcharge Kg:	4.00	Sample Top	5.9	Sample Top	54.0
Bulk Density Mg/m3:	1.86	Soaking Time hrs	0	Sample Bottom	5.9	Sample Bottom	53.1
Dry Density Mg/m3:	1.76	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			28.8				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

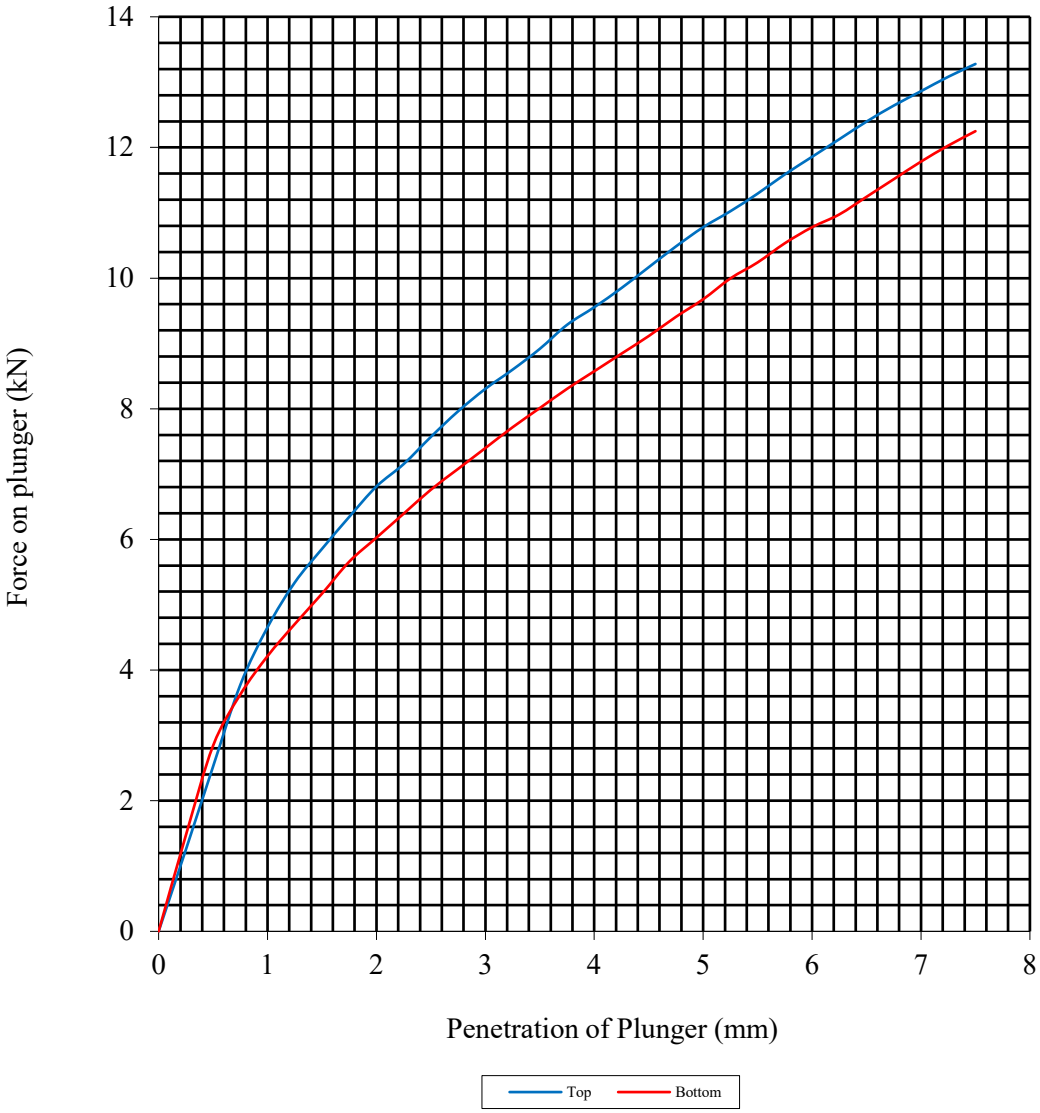
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: CBR2 **Top Depth (m):** 0.40

Sample Number: 3 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	5.8	Surcharge Kg:	4.00	Sample Top	5.8	Sample Top	57.3
Bulk Density Mg/m3:	1.89	Soaking Time hrs	0	Sample Bottom	5.8	Sample Bottom	51.2
Dry Density Mg/m3:	1.78	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			18.3				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

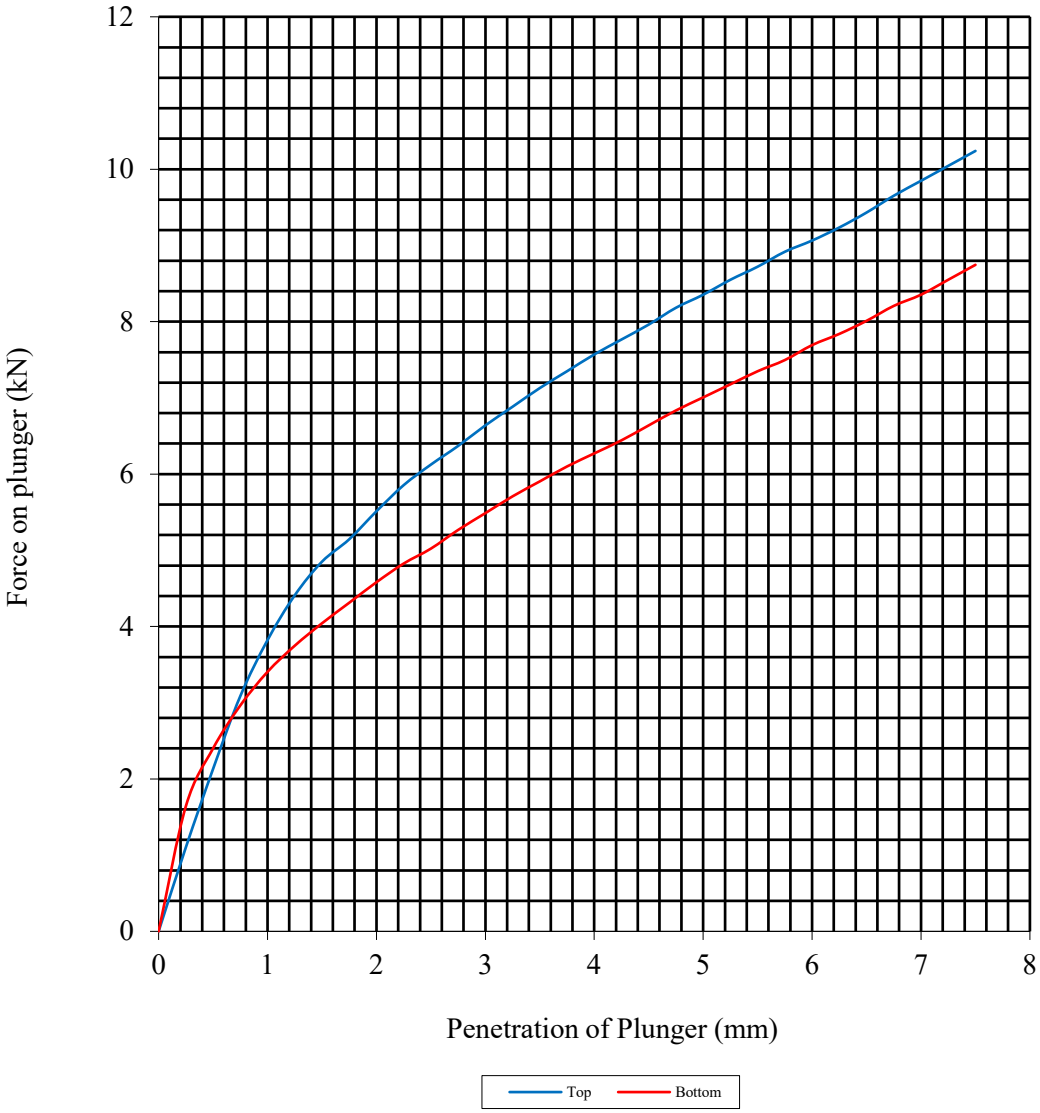
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: CBR3 **Top Depth (m):** 0.30

Sample Number: 3 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	7.7	Surcharge Kg:	4.00	Sample Top	7.7	Sample Top	46.4
Bulk Density Mg/m3:	1.87	Soaking Time hrs	0	Sample Bottom	7.7	Sample Bottom	38.0
Dry Density Mg/m3:	1.74	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			2.7				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

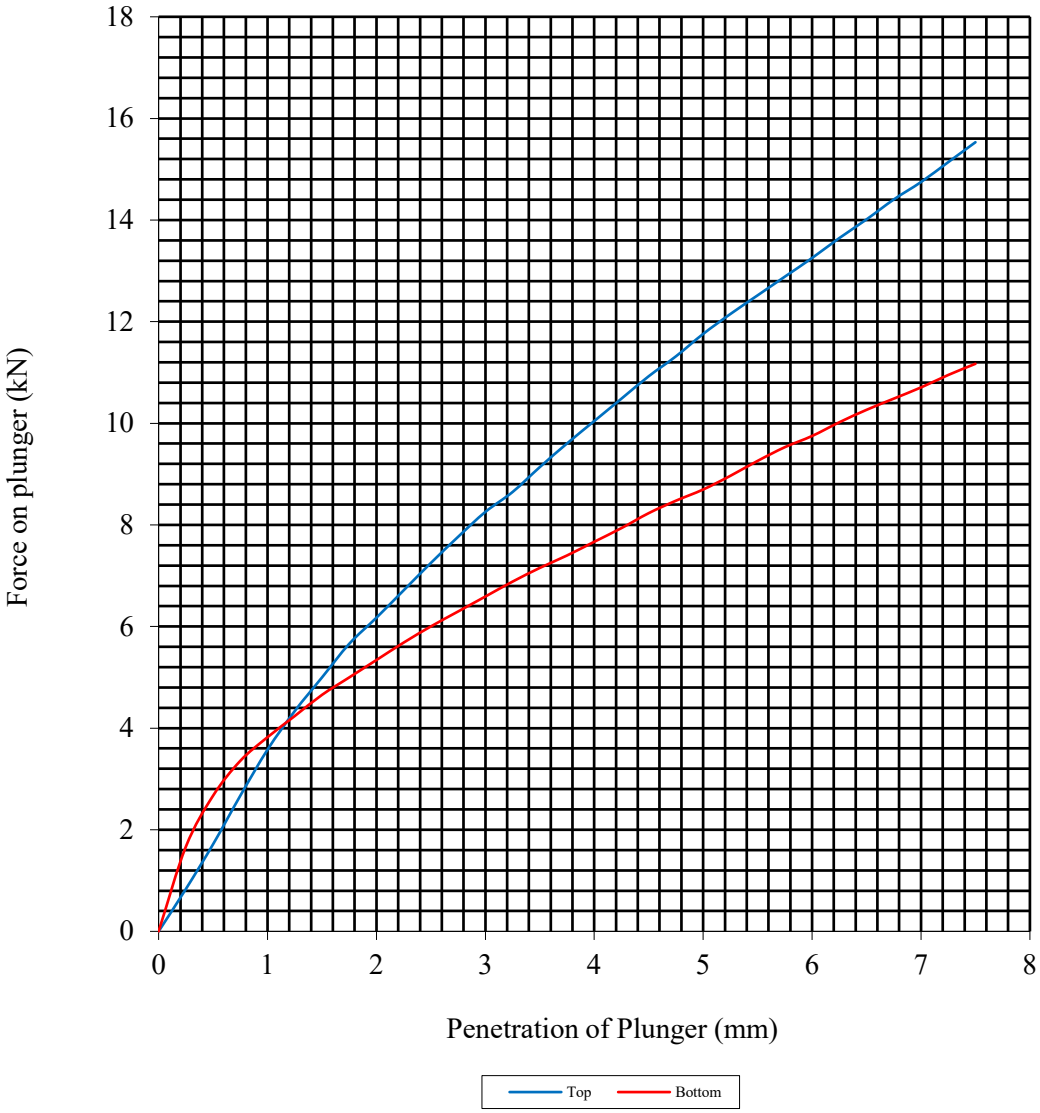
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: CBR4 **Top Depth (m):** 0.80

Sample Number: 1 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	4.8	Surcharge Kg:	4.00	Sample Top	4.8	Sample Top	58.8
Bulk Density Mg/m3:	1.84	Soaking Time hrs	0	Sample Bottom	4.8	Sample Bottom	45.5
Dry Density Mg/m3:	1.76	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			5.4				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

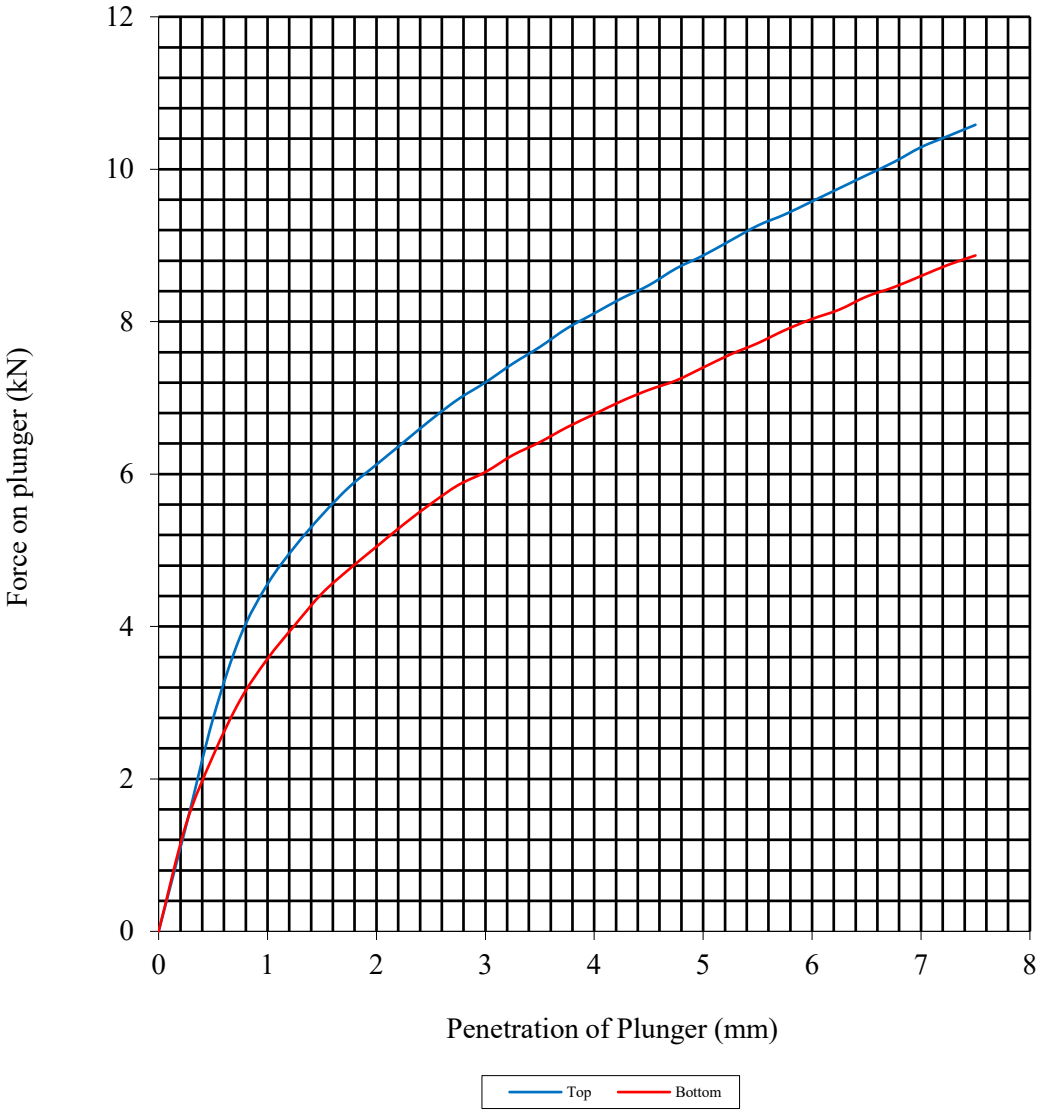
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: CBR5 **Top Depth (m):** 0.50

Sample Number: 1 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	7.6	Surcharge Kg:	4.00	Sample Top	7.6	Sample Top	50.9
Bulk Density Mg/m3:	1.87	Soaking Time hrs	0	Sample Bottom	7.6	Sample Bottom	42.5
Dry Density Mg/m3:	1.73	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			1.2				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

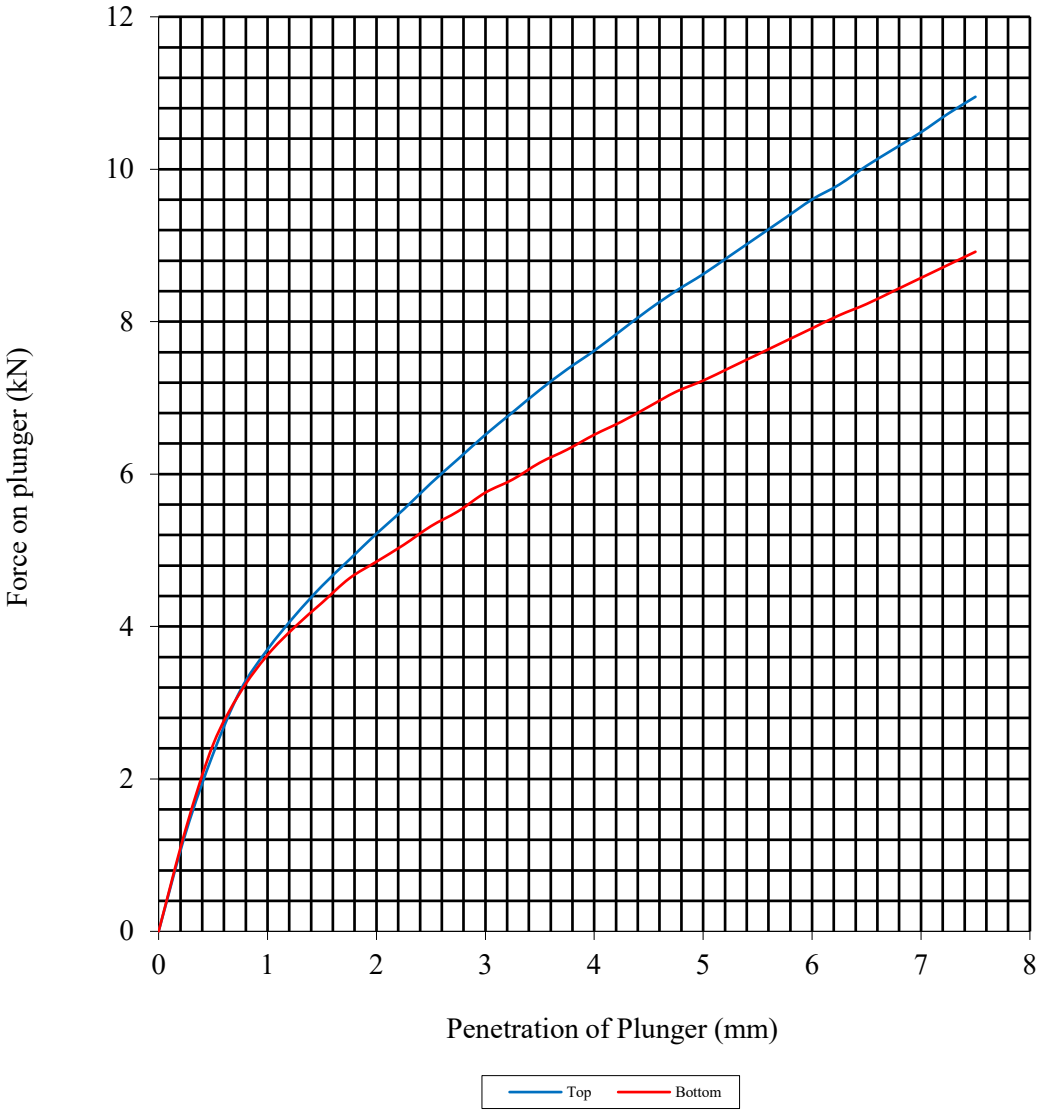
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: CBR6 **Top Depth (m):** 0.70

Sample Number: 1 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	6.8	Surcharge Kg:	4.00	Sample Top	6.8	Sample Top	44.5
Bulk Density Mg/m3:	1.84	Soaking Time hrs	0	Sample Bottom	6.8	Sample Bottom	40.3
Dry Density Mg/m3:	1.72	Swelling mm:	0.0000	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			4				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

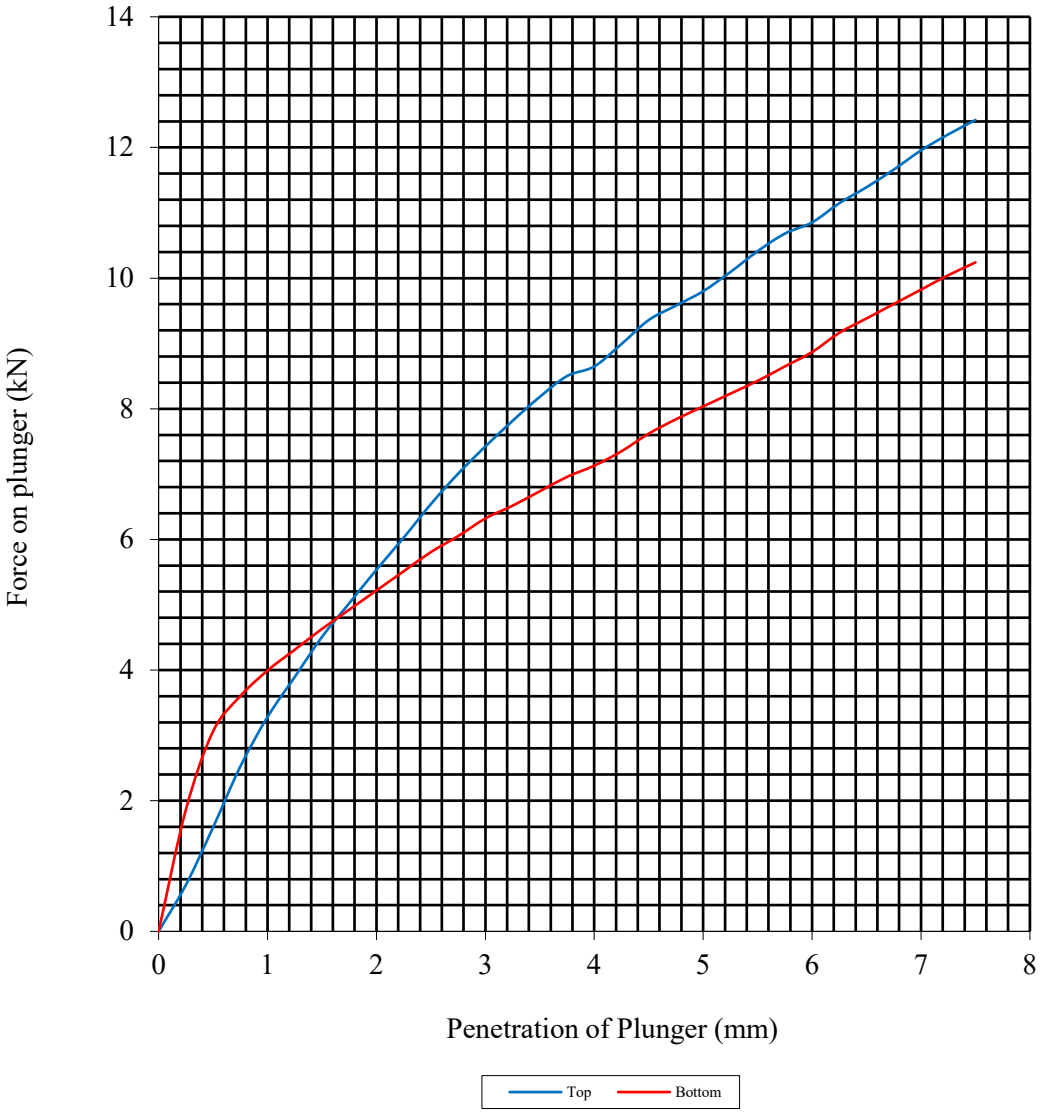
CALIFORNIA BEARING RATIO TEST

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: CBR7 **Top Depth (m):** 0.40

Sample Number: 2 **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	7.9	Surcharge Kg:	4.00	Sample Top	7.9	Sample Top	49.6
Bulk Density Mg/m3:	1.85	Soaking Time hrs	0	Sample Bottom	7.9	Sample Bottom	44.0
Dry Density Mg/m3:	1.71	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			46.5				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Barrow Hill, Barton Upon Humber

Contract No: PSL22/5847

Client Ref: S4911/47697

PARTICLE SIZE DISTRIBUTION TEST

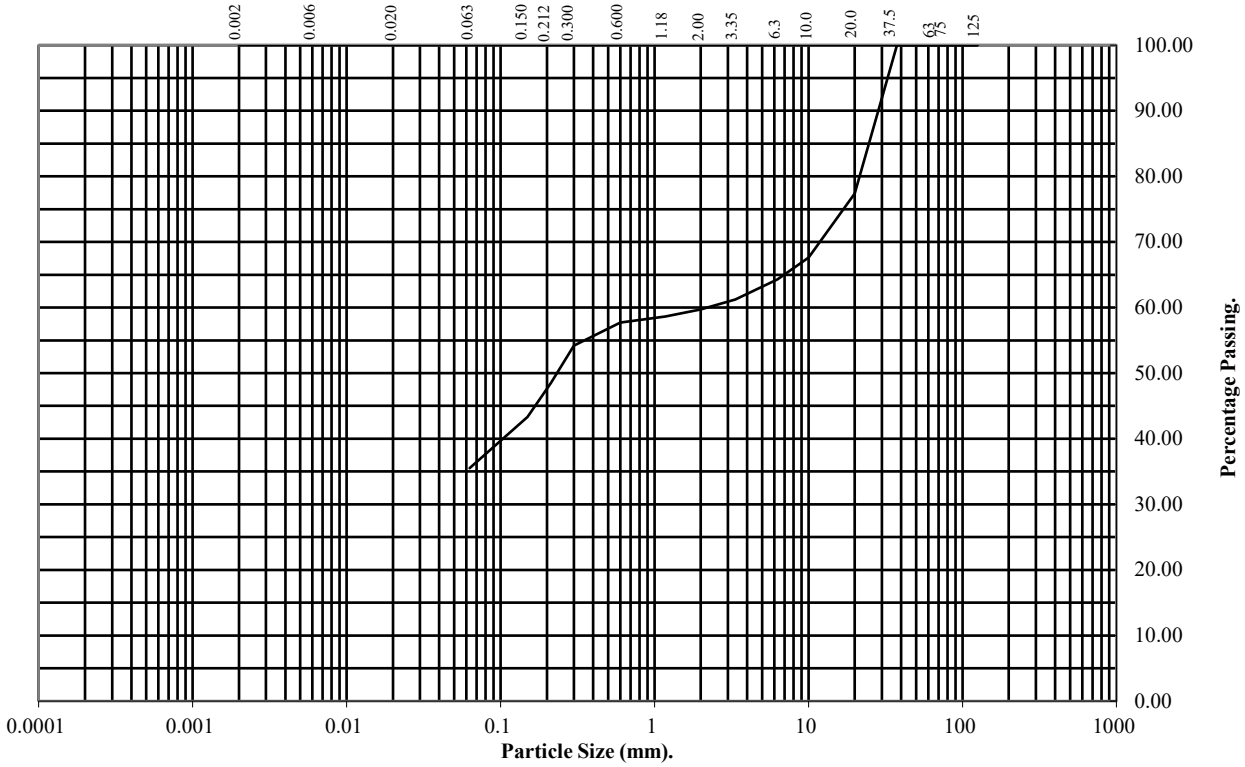
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CBR3 **Top Depth (m):** 0.40

Sample Number: 4 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	77
10	68
6.3	64
3.35	61
2	60
1.18	59
0.6	58
0.3	54
0.212	48
0.15	43
0.063	36

Soil Fraction	Total Percentage
Cobbles	0
Gravel	40
Sand	24
Silt/Clay	36

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

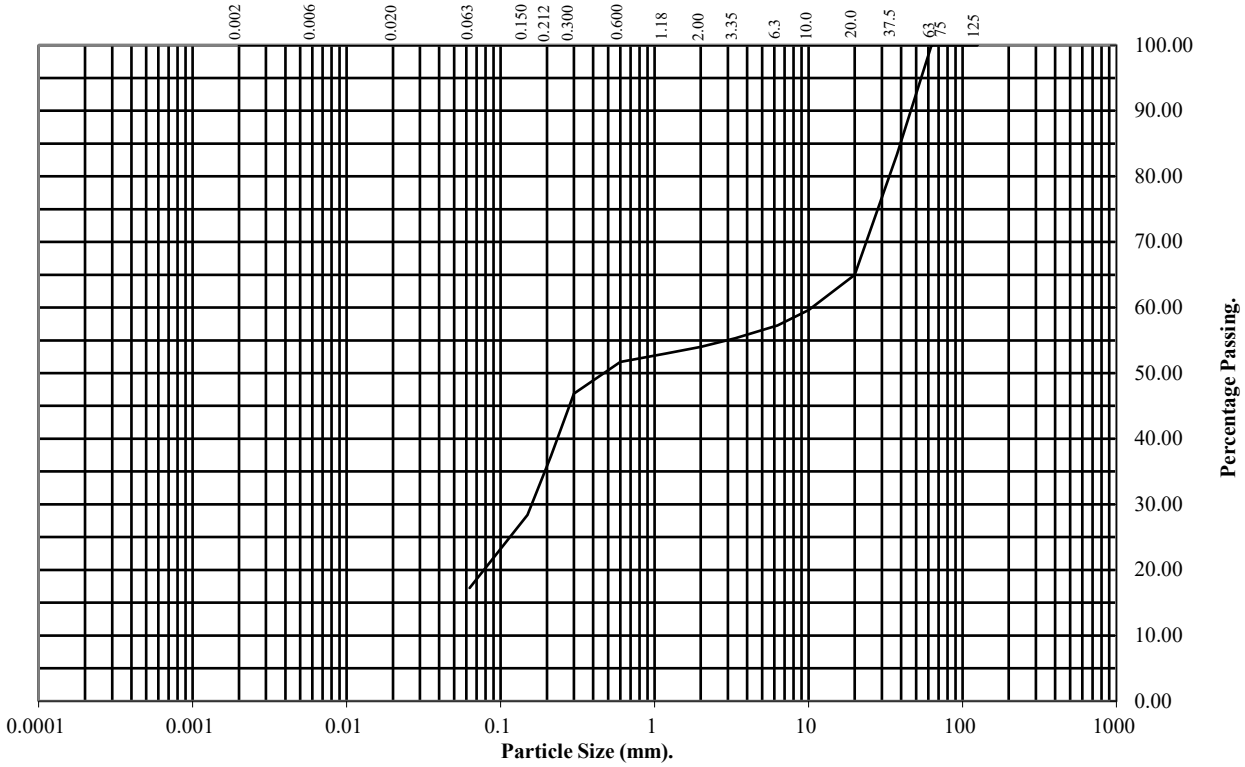
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CBR4 **Top Depth (m):** 1.00

Sample Number: 2 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	83
20	65
10	60
6.3	57
3.35	55
2	54
1.18	53
0.6	52
0.3	47
0.212	37
0.15	28
0.063	17

Soil Fraction	Total Percentage
Cobbles	0
Gravel	46
Sand	37
Silt/Clay	17

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

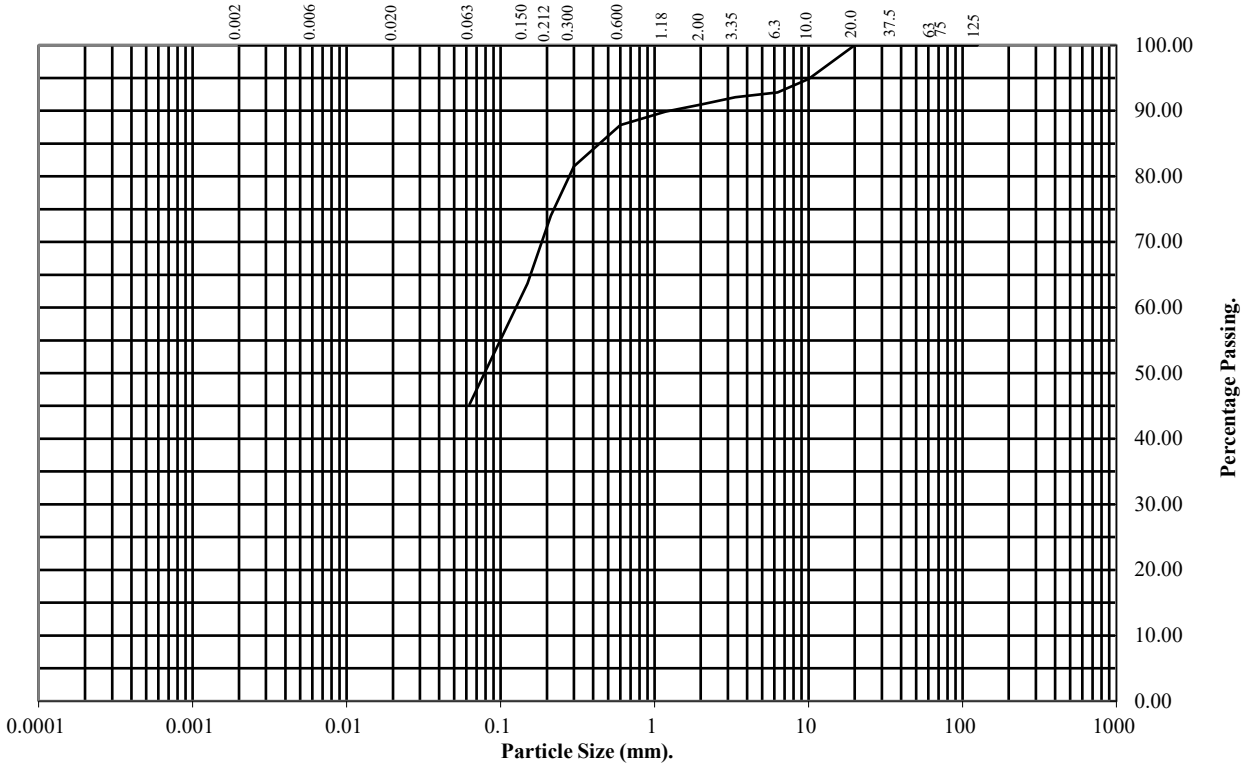
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CBR5 **Top Depth (m):** 0.10

Sample Number: 2 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	95
6.3	93
3.35	92
2	91
1.18	90
0.6	88
0.3	82
0.212	74
0.15	64
0.063	45

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	46
Silt/Clay	45

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

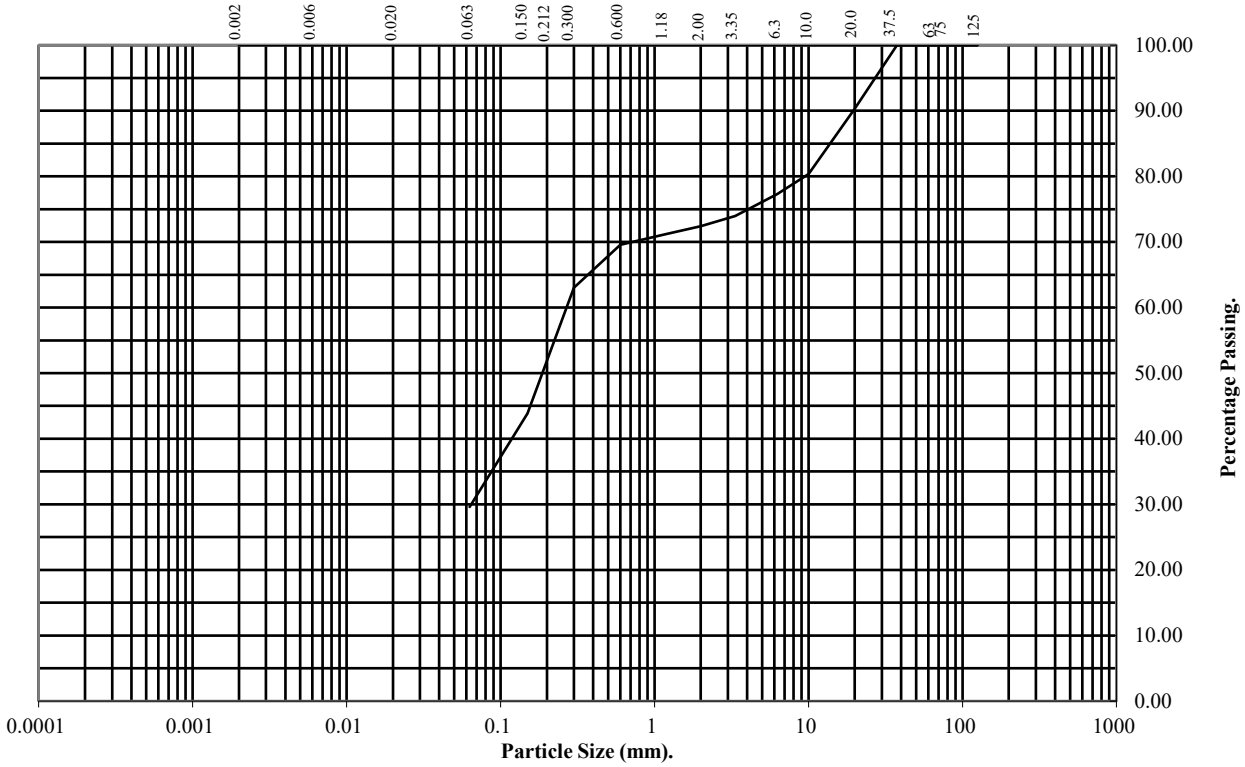
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CBR6 **Top Depth (m):** 0.60

Sample Number: 2 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	90
10	80
6.3	77
3.35	74
2	72
1.18	71
0.6	70
0.3	63
0.212	53
0.15	44
0.063	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	28
Sand	42
Silt/Clay	30

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

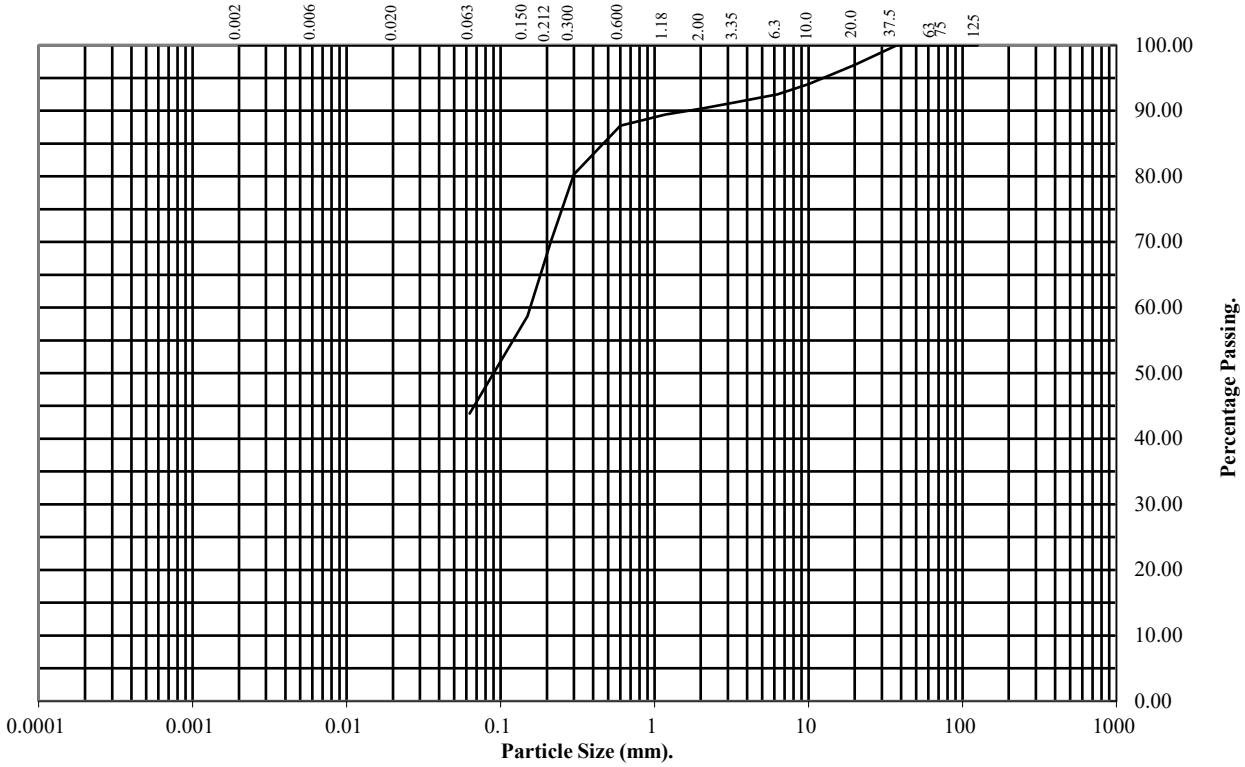
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP07 **Top Depth (m):** 0.40

Sample Number: 1 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	94
6.3	93
3.35	91
2	90
1.18	89
0.6	88
0.3	80
0.212	70
0.15	59
0.063	44

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	46
Silt/Clay	44

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

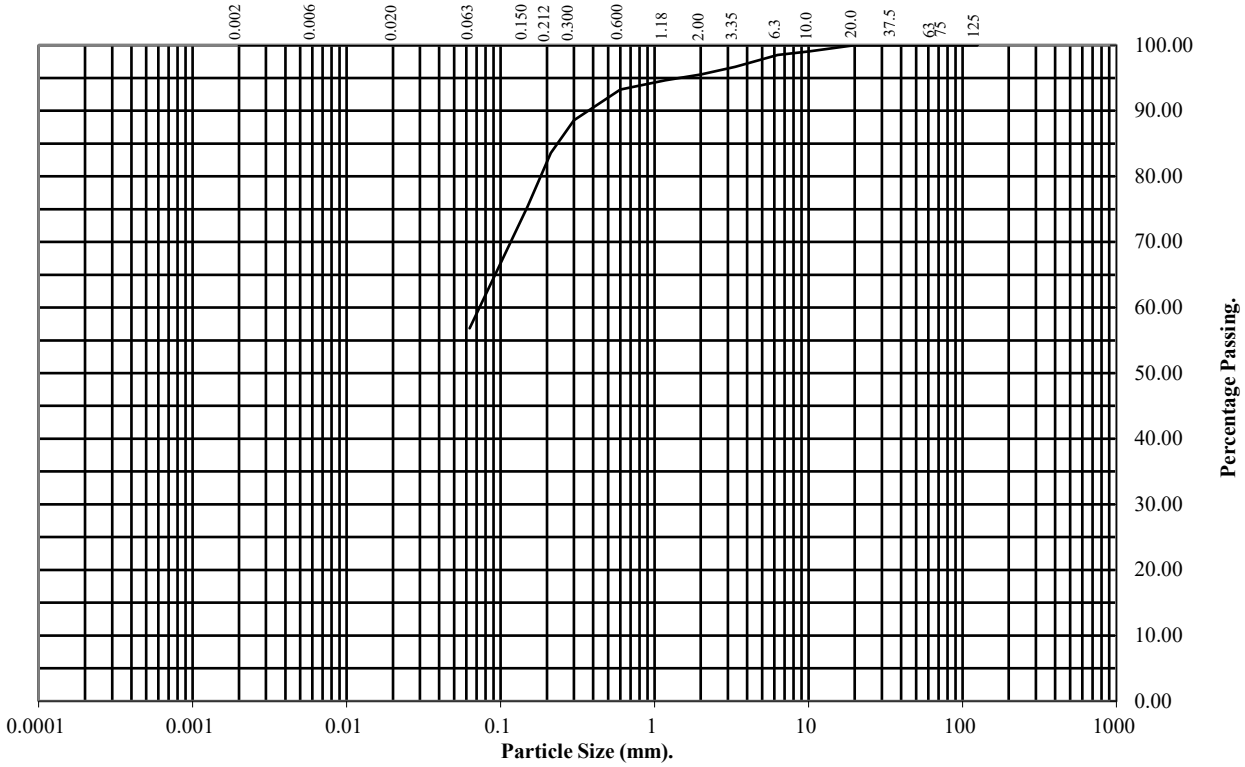
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP12 **Top Depth (m):** 0.50

Sample Number: 3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	98
3.35	97
2	96
1.18	95
0.6	93
0.3	89
0.212	84
0.15	75
0.063	57

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	39
Silt/Clay	57

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

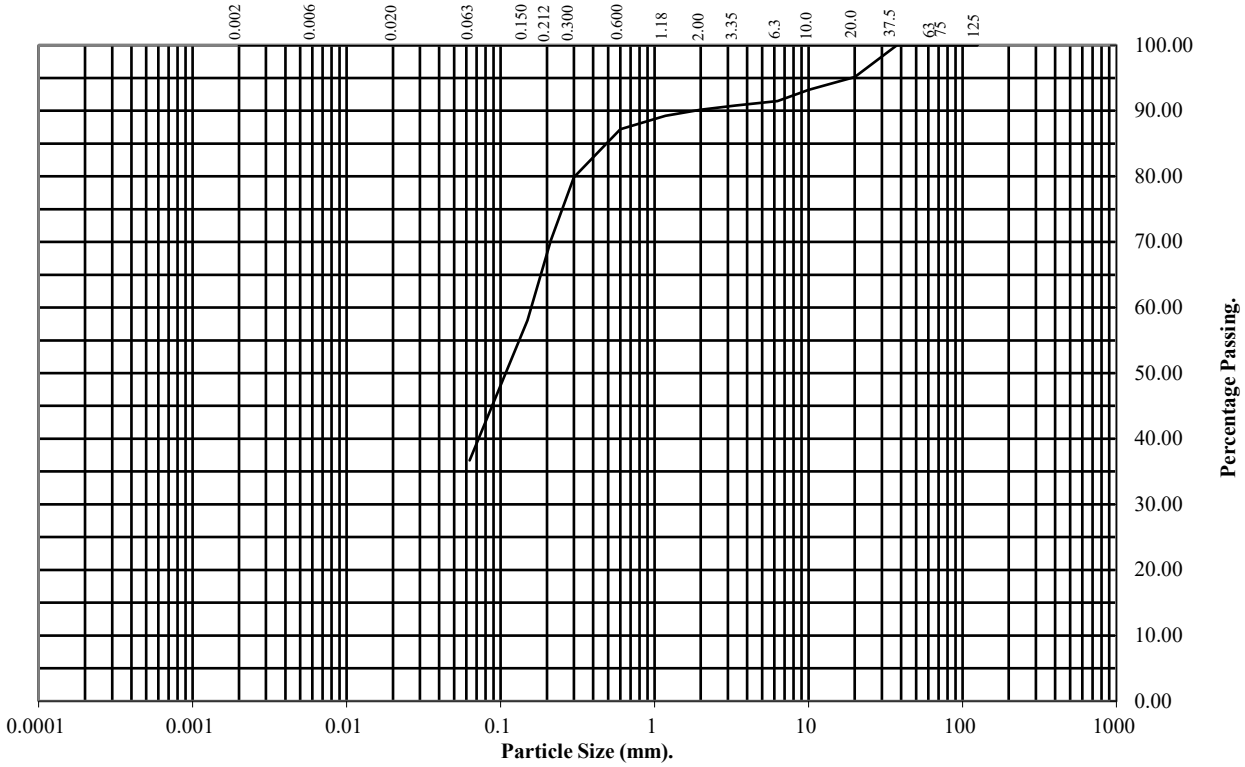
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP18 **Top Depth (m):** 0.40

Sample Number: 3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	93
6.3	91
3.35	91
2	90
1.18	89
0.6	87
0.3	80
0.212	70
0.15	58
0.063	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	53
Silt/Clay	37

Remarks:

See Summary of Soil Descriptions

APPENDIX D

LABORATORY TEST RESULTS: CHEMICAL

ANALYTICAL TEST REPORT

Contract no: 113306

Contract name: Barton upon Humber

Client reference: 47697

Clients name: Alan Wood & Partners

Clients address: Hallamshire House
Hayland Street
Sheffield
S9 1BY

Samples received: 07 September 2022

Analysis started: 07 September 2022

Analysis completed: 21 September 2022

Report issued: 21 September 2022

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing
NAD	No Asbestos Detected

Approved by: [redacted]

Abbie Neasham-Bourn

Senior Reporting Administrator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
113306-1	CBR1 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.2
113306-2	CBR2 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	6.5
113306-3	CBR3 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	7.8
113306-4	CBR5 D2	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	7.7
113306-5	CBR7 D1	0.20	Sandy Clayey Loam with Gravel & Roots	-	-	8.0
113306-8	TP04 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	7.8
113306-9	TP05 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.3
113306-10	TP07 D3	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	9.3
113306-11	TP08 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	7.2
113306-13	TP10 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.1
113306-14	TP11 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.0
113306-15	TP13 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.2
113306-16	TP14 D2	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	6.7
113306-17	TP16 D1	0.20	Sandy Clayey Loam with Gravel & Roots	-	-	7.9
113306-18	TP17 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.8
113306-19	TP18 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	8.6
113306-21	TP21 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	9.0
113306-22	TP22 D1	0.10	Sandy Clayey Loam with Gravel & Roots	-	-	7.3

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SOILS

Lab number			113306-1	113306-2	113306-3	113306-4	113306-5	113306-6
Sample id			CBR1 D1	CBR2 D1	CBR3 D1	CBR5 D2	CBR7 D1	TP01 D1
Depth (m)			0.10	0.10	0.10	0.10	0.20	0.20
Date sampled			31/08/2022	31/08/2022	31/08/2022	01/09/2022	31/08/2022	31/08/2022
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	12	13	11	16	11	-
Boron (water soluble)	CE063 U	mg/kg B	1.2	1.2	0.9	1.0	0.9	-
Cadmium (total)	CE127 M	mg/kg Cd	0.4	0.4	0.4	0.5	0.3	-
Chromium (total)	CE127 M	mg/kg Cr	27	26	21	27	31	-
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	-
Copper (total)	CE127 M	mg/kg Cu	26	29	26	32	23	-
Lead (total)	CE127 M	mg/kg Pb	56	62	48	70	42	-
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	-
Nickel (total)	CE127 M	mg/kg Ni	23	21	19	24	25	-
Selenium (total)	CE127 M	mg/kg Se	1.0	1.0	0.9	0.9	0.9	-
Zinc (total)	CE127 M	mg/kg Zn	68	67	61	96	60	-
pH	CE004 M	units	6.7	6.6	6.3	7.4	7.3	-
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	17	<10	10	11	10	-
Sulphate (total)	CE062 M	mg/kg SO_4	376	342	312	334	305	-
Sulphide	CE016	mg/kg S^{2-}	<10	<10	<10	<10	<10	-
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	<1	-
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	-
Thiocyanate	CE145 M	mg/kg SCN	<1	<1	<1	<1	<1	-
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	0.6	<0.5	<0.5	-
Total Organic Carbon (TOC)	CE197	% w/w C	1.8	1.7	2.0	2.1	1.8	-
Estimate of OMC (calculated from TOC)	CE197	% w/w	3.1	3.0	3.4	3.6	3.1	-
PAH								
Naphthalene	CE087 M	mg/kg	0.03	0.03	<0.02	0.02	0.07	-
Acenaphthylene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	-
Acenaphthene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	-
Fluorene	CE087 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	-
Phenanthrene	CE087 M	mg/kg	0.09	0.09	0.05	0.09	0.06	-
Anthracene	CE087 U	mg/kg	0.03	0.03	<0.02	<0.02	<0.02	-
Fluoranthene	CE087 M	mg/kg	0.24	0.33	0.09	0.20	0.10	-
Pyrene	CE087 M	mg/kg	0.19	0.24	0.07	0.16	0.09	-
Benzo(a)anthracene	CE087 U	mg/kg	0.17	0.30	0.06	0.14	0.09	-
Chrysene	CE087 M	mg/kg	0.18	0.29	0.06	0.14	0.09	-
Benzo(b)fluoranthene	CE087 M	mg/kg	0.22	0.32	0.08	0.18	0.09	-
Benzo(k)fluoranthene	CE087 M	mg/kg	0.05	0.09	<0.03	0.06	0.04	-
Benzo(a)pyrene	CE087 U	mg/kg	0.11	0.17	0.03	0.09	0.05	-
Indeno(123cd)pyrene	CE087 M	mg/kg	0.14	0.17	0.05	0.10	0.06	-
Dibenz(ah)anthracene	CE087 M	mg/kg	0.02	0.03	<0.02	<0.02	<0.02	-
Benzo(ghi)perylene	CE087 M	mg/kg	0.07	0.08	0.02	0.06	0.03	-
PAH (total of USEPA 16)	CE087	mg/kg	1.52	2.17	0.50	1.25	0.76	-
Organochlorine Pesticides								
2,4'-DDD (O,P'-DDD)	$	mg/kg DW	-	-	-	-	-	< 0.02

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SOILS

Lab number			113306-1	113306-2	113306-3	113306-4	113306-5	113306-6
Sample id			CBR1 D1	CBR2 D1	CBR3 D1	CBR5 D2	CBR7 D1	TP01 D1
Depth (m)			0.10	0.10	0.10	0.10	0.20	0.20
Date sampled			31/08/2022	31/08/2022	31/08/2022	01/09/2022	31/08/2022	31/08/2022
Test	**Method**	**Units**						
4,4'-DDD (P,P'-DDD)	$	mg/kg DW	-	-	-	-	-	< 0.02
2,4'-DDE (O,P'-DDE)	$	mg/kg DW	-	-	-	-	-	< 0.02
4,4'-DDE (P,P'-DDE)	$	mg/kg DW	-	-	-	-	-	< 0.02
2,4'-DDT (O,P'-DDT)	$	mg/kg DW	-	-	-	-	-	< 0.02
4,4'-DDT (P,P'-DDT)	$	mg/kg DW	-	-	-	-	-	< 0.02
chlorfenvinphos, alpha	$	mg/kg DW	-	-	-	-	-	< 0.10
chlorfenvinphos, beta	$	mg/kg DW	-	-	-	-	-	< 0.10
Aldrin	$	mg/kg DW	-	-	-	-	-	< 0.02
Alpha-HCH	$	mg/kg DW	-	-	-	-	-	< 0.02
fenthion	$	mg/kg DW	-	-	-	-	-	< 0.10
Beta-HCH	$	mg/kg DW	-	-	-	-	-	< 0.02
mevinphos, (E)	$	mg/kg DW	-	-	-	-	-	< 0.10
mevinphos, (Z)	$	mg/kg DW	-	-	-	-	-	< 0.10
cis-Chlordane	$	mg/kg DW	-	-	-	-	-	< 0.02
Delta-HCH	$	mg/kg DW	-	-	-	-	-	< 0.02
Dieldrin	$	mg/kg DW	-	-	-	-	-	< 0.02
Endosulphan A	$	mg/kg DW	-	-	-	-	-	< 0.02
Endosulphan B	$	mg/kg DW	-	-	-	-	-	< 0.02
Endrin	$	mg/kg DW	-	-	-	-	-	< 0.02
Gamma-HCH (Lindane)	$	mg/kg DW	-	-	-	-	-	< 0.02
HCB	$	mg/kg DW	-	-	-	-	-	< 0.02
Heptachlor	$	mg/kg DW	-	-	-	-	-	< 0.02
Heptachlor epoxide	$	mg/kg DW	-	-	-	-	-	< 0.02
Isodrin	$	mg/kg DW	-	-	-	-	-	< 0.02
Methoxychlor	$	mg/kg DW	-	-	-	-	-	< 0.02
trans-Chlordane	$	mg/kg DW	-	-	-	-	-	< 0.02
Trifluralin	$	mg/kg DW	-	-	-	-	-	< 0.02
Organophosphate Pesticides								
Azinphos methyl	$	mg/kg DW	-	-	-	-	-	< 0.10
Chlorpyriphos methyl	$	mg/kg DW	-	-	-	-	-	< 0.10
Diazinon	$	mg/kg DW	-	-	-	-	-	< 0.10
Dichlorvos	$	mg/kg DW	-	-	-	-	-	< 0.10
Dimethoate	$	mg/kg DW	-	-	-	-	-	< 0.10
Fenitrothion	$	mg/kg DW	-	-	-	-	-	< 0.10
Malathion	$	mg/kg DW	-	-	-	-	-	< 0.10
parathion-ethyl	$	mg/kg DW	-	-	-	-	-	< 0.10
Parathion methyl	$	mg/kg DW	-	-	-	-	-	< 0.10
Phorate	$	mg/kg DW	-	-	-	-	-	< 0.10
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	-

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SOILS

Lab number			113306-7	113306-8	113306-9	113306-10	113306-11	113306-12
Sample id			TP03 D1	TP04 D1	TP05 D1	TP07 D3	TP08 D1	TP09 D1
Depth (m)			0.10	0.10	0.10	0.10	0.10	0.20
Date sampled			31/08/2022	31/08/2022	01/09/2022	31/08/2022	31/08/2022	31/08/2022
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	-	10	10	11	11	-
Boron (water soluble)	CE063 U	mg/kg B	-	0.9	1.2	1.2	1.2	-
Cadmium (total)	CE127 M	mg/kg Cd	-	0.4	0.4	0.4	0.4	-
Chromium (total)	CE127 M	mg/kg Cr	-	30	24	21	36	-
Chromium (VI)	CE146	mg/kg CrVI	-	<1	<1	<1	<1	-
Copper (total)	CE127 M	mg/kg Cu	-	22	22	22	23	-
Lead (total)	CE127 M	mg/kg Pb	-	41	53	43	51	-
Mercury (total)	CE127 M	mg/kg Hg	-	<0.5	<0.5	<0.5	<0.5	-
Nickel (total)	CE127 M	mg/kg Ni	-	23	20	20	28	-
Selenium (total)	CE127 M	mg/kg Se	-	0.7	1.0	0.9	1.0	-
Zinc (total)	CE127 M	mg/kg Zn	-	61	62	61	63	-
pH	CE004 M	units	-	7.0	7.0	5.3	5.5	-
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	-	10	11	10	11	-
Sulphate (total)	CE062 M	mg/kg SO_4	-	288	375	391	354	-
Sulphide	CE016	mg/kg S^{2-}	-	<10	<10	11	<10	-
Cyanide (free)	CE077	mg/kg CN	-	<1	<1	<1	<1	-
Cyanide (total)	CE077	mg/kg CN	-	<1	<1	<1	<1	-
Thiocyanate	CE145 M	mg/kg SCN	-	<1	<1	1.1	<1	-
Phenols (total)	CE078	mg/kg PhOH	-	<0.5	<0.5	<0.5	<0.5	-
Total Organic Carbon (TOC)	CE197	% w/w C	-	1.6	2.2	1.9	2.1	-
Estimate of OMC (calculated from TOC)	CE197	% w/w	-	2.7	3.7	3.3	3.6	-
PAH								
Naphthalene	CE087 M	mg/kg	-	0.02	<0.02	<0.02	0.02	-
Acenaphthylene	CE087 M	mg/kg	-	<0.02	<0.02	<0.02	<0.02	-
Acenaphthene	CE087 M	mg/kg	-	<0.02	<0.02	<0.02	<0.02	-
Fluorene	CE087 U	mg/kg	-	<0.02	<0.02	<0.02	<0.02	-
Phenanthrene	CE087 M	mg/kg	-	0.04	0.06	0.03	0.05	-
Anthracene	CE087 U	mg/kg	-	<0.02	<0.02	<0.02	<0.02	-
Fluoranthene	CE087 M	mg/kg	-	0.08	0.11	0.06	0.07	-
Pyrene	CE087 M	mg/kg	-	0.07	0.09	0.05	0.06	-
Benzo(a)anthracene	CE087 U	mg/kg	-	0.07	0.09	0.05	0.05	-
Chrysene	CE087 M	mg/kg	-	0.07	0.08	0.04	0.05	-
Benzo(b)fluoranthene	CE087 M	mg/kg	-	0.08	0.11	0.04	0.07	-
Benzo(k)fluoranthene	CE087 M	mg/kg	-	<0.03	0.03	<0.03	<0.03	-
Benzo(a)pyrene	CE087 U	mg/kg	-	0.04	0.05	<0.02	0.03	-
Indeno(123cd)pyrene	CE087 M	mg/kg	-	0.04	0.05	<0.02	0.03	-
Dibenz(ah)anthracene	CE087 M	mg/kg	-	<0.02	<0.02	<0.02	<0.02	-
Benzo(ghi)perylene	CE087 M	mg/kg	-	0.02	0.03	<0.02	<0.02	-
PAH (total of USEPA 16)	CE087	mg/kg	-	0.53	0.68	<0.34	0.43	-
Organochlorine Pesticides								
2,4'-DDD (O,P'-DDD)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02

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SOILS

Lab number			113306-7	113306-8	113306-9	113306-10	113306-11	113306-12
Sample id			TP03 D1	TP04 D1	TP05 D1	TP07 D3	TP08 D1	TP09 D1
Depth (m)			0.10	0.10	0.10	0.10	0.10	0.20
Date sampled			31/08/2022	31/08/2022	01/09/2022	31/08/2022	31/08/2022	31/08/2022
Test	**Method**	**Units**						
4,4'-DDD (P,P'-DDD)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
2,4'-DDE (O,P'-DDE)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
4,4'-DDE (P,P'-DDE)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
2,4'-DDT (O,P'-DDT)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
4,4'-DDT (P,P'-DDT)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
chlorfenvinphos, alpha	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
chlorfenvinphos, beta	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Aldrin	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Alpha-HCH	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
fenthion	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Beta-HCH	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
mevinphos, (E)	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
mevinphos, (Z)	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
cis-Chlordane	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Delta-HCH	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Dieldrin	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Endosulphan A	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Endosulphan B	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Endrin	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Gamma-HCH (Lindane)	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
HCB	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Heptachlor	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Heptachlor epoxide	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Isodrin	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Methoxychlor	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
trans-Chlordane	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Trifluralin	$	mg/kg DW	< 0.02	-	-	-	-	< 0.02
Organophosphate Pesticides								
Azinphos methyl	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Chlorpyriphos methyl	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Diazinon	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Dichlorvos	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Dimethoate	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Fenitrothion	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Malathion	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
parathion-ethyl	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Parathion methyl	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Phorate	$	mg/kg DW	< 0.10	-	-	-	-	< 0.10
Subcontracted analysis								
Asbestos (qualitative)	$	-	-	NAD	NAD	NAD	NAD	-

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SOILS

Lab number			113306-13	113306-14	113306-15	113306-16	113306-17	113306-18
Sample id			TP10 D1	TP11 D1	TP13 D1	TP14 D2	TP16 D1	TP17 D1
Depth (m)			0.10	0.10	0.10	0.10	0.20	0.10
Date sampled			31/08/2022	01/09/2022	02/09/2022	01/09/2022	01/09/2022	01/09/2022
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	10	10	12	11	13	12
Boron (water soluble)	CE063 U	mg/kg B	0.9	1.1	0.6	0.7	1.0	0.8
Cadmium (total)	CE127 M	mg/kg Cd	0.4	0.3	0.4	0.4	0.5	0.4
Chromium (total)	CE127 M	mg/kg Cr	24	32	74	35	33	22
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	22	21	23	23	28	24
Lead (total)	CE127 M	mg/kg Pb	47	31	54	52	60	50
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	20	30	41	25	27	23
Selenium (total)	CE127 M	mg/kg Se	0.9	1.0	0.8	1.0	1.0	1.0
Zinc (total)	CE127 M	mg/kg Zn	65	68	56	62	76	67
pH	CE004 M	units	6.6	6.6	5.7	5.7	5.9	6.5
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	<10	<10	10	14	<10	12
Sulphate (total)	CE062 M	mg/kg SO_4	323	330	278	273	333	414
Sulphide	CE016	mg/kg S^{2-}	29	<10	<10	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1	<1
Thiocyanate	CE145 M	mg/kg SCN	<1	<1	<1	<1	<1	1.3
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE197	% w/w C	1.7	1.3	1.9	1.6	1.8	2.0
Estimate of OMC (calculated from TOC)	CE197	% w/w	2.9	2.2	3.2	2.8	3.1	3.4
PAH								
Naphthalene	CE087 M	mg/kg	<0.02	<0.02	0.02	<0.02	0.02	0.03
Acenaphthylene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	CE087 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	CE087 M	mg/kg	0.04	0.03	0.07	0.05	0.04	0.06
Anthracene	CE087 U	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.07	0.04	0.18	0.08	0.06	0.10
Pyrene	CE087 M	mg/kg	0.06	0.03	0.15	0.07	0.05	0.09
Benzo(a)anthracene	CE087 U	mg/kg	0.06	0.03	0.13	0.06	0.05	0.09
Chrysene	CE087 M	mg/kg	0.05	<0.03	0.13	0.06	0.05	0.07
Benzo(b)fluoranthene	CE087 M	mg/kg	0.06	0.03	0.19	0.07	0.07	0.11
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.03	<0.03	0.04	<0.03	<0.03	0.04
Benzo(a)pyrene	CE087 U	mg/kg	0.02	<0.02	0.08	0.03	0.02	0.04
Indeno(123cd)pyrene	CE087 M	mg/kg	0.03	<0.02	0.10	0.04	0.03	0.06
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(ghi)perylene	CE087 M	mg/kg	<0.02	<0.02	0.06	0.02	<0.02	0.03
PAH (total of USEPA 16)	CE087	mg/kg	0.40	<0.34	1.15	0.48	0.40	0.74
Organochlorine Pesticides								
2,4'-DDD (O,P'-DDD)	$	mg/kg DW	-	-	-	-	-	-

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SOILS

Lab number			113306-13	113306-14	113306-15	113306-16	113306-17	113306-18
Sample id			TP10 D1	TP11 D1	TP13 D1	TP14 D2	TP16 D1	TP17 D1
Depth (m)			0.10	0.10	0.10	0.10	0.20	0.10
Date sampled			31/08/2022	01/09/2022	02/09/2022	01/09/2022	01/09/2022	01/09/2022
Test	**Method**	**Units**						
4,4'-DDD (P,P'-DDD)	$	mg/kg DW	-	-	-	-	-	-
2,4'-DDE (O,P'-DDE)	$	mg/kg DW	-	-	-	-	-	-
4,4'-DDE (P,P'-DDE)	$	mg/kg DW	-	-	-	-	-	-
2,4'-DDT (O,P'-DDT)	$	mg/kg DW	-	-	-	-	-	-
4,4'-DDT (P,P'-DDT)	$	mg/kg DW	-	-	-	-	-	-
chlorfenvinphos, alpha	$	mg/kg DW	-	-	-	-	-	-
chlorfenvinphos, beta	$	mg/kg DW	-	-	-	-	-	-
Aldrin	$	mg/kg DW	-	-	-	-	-	-
Alpha-HCH	$	mg/kg DW	-	-	-	-	-	-
fenthion	$	mg/kg DW	-	-	-	-	-	-
Beta-HCH	$	mg/kg DW	-	-	-	-	-	-
mevinphos, (E)	$	mg/kg DW	-	-	-	-	-	-
mevinphos, (Z)	$	mg/kg DW	-	-	-	-	-	-
cis-Chlordane	$	mg/kg DW	-	-	-	-	-	-
Delta-HCH	$	mg/kg DW	-	-	-	-	-	-
Dieldrin	$	mg/kg DW	-	-	-	-	-	-
Endosulphan A	$	mg/kg DW	-	-	-	-	-	-
Endosulphan B	$	mg/kg DW	-	-	-	-	-	-
Endrin	$	mg/kg DW	-	-	-	-	-	-
Gamma-HCH (Lindane)	$	mg/kg DW	-	-	-	-	-	-
HCB	$	mg/kg DW	-	-	-	-	-	-
Heptachlor	$	mg/kg DW	-	-	-	-	-	-
Heptachlor epoxide	$	mg/kg DW	-	-	-	-	-	-
Isodrin	$	mg/kg DW	-	-	-	-	-	-
Methoxychlor	$	mg/kg DW	-	-	-	-	-	-
trans-Chlordane	$	mg/kg DW	-	-	-	-	-	-
Trifluralin	$	mg/kg DW	-	-	-	-	-	-
Organophosphate Pesticides								
Azinphos methyl	$	mg/kg DW	-	-	-	-	-	-
Chlorpyriphos methyl	$	mg/kg DW	-	-	-	-	-	-
Diazinon	$	mg/kg DW	-	-	-	-	-	-
Dichlorvos	$	mg/kg DW	-	-	-	-	-	-
Dimethoate	$	mg/kg DW	-	-	-	-	-	-
Fenitrothion	$	mg/kg DW	-	-	-	-	-	-
Malathion	$	mg/kg DW	-	-	-	-	-	-
parathion-ethyl	$	mg/kg DW	-	-	-	-	-	-
Parathion methyl	$	mg/kg DW	-	-	-	-	-	-
Phorate	$	mg/kg DW	-	-	-	-	-	-
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			113306-19	113306-20	113306-21	113306-22
Sample id			TP18 D1	TP019 D1	TP21 D1	TP22 D1
Depth (m)			0.10	0.10	0.10	0.10
Date sampled			02/09/2022	01/09/2022	01/09/2022	01/09/2022
Test	**Method**	**Units**				
Arsenic (total)	CE127 M	mg/kg As	13	-	12	9.8
Boron (water soluble)	CE063 U	mg/kg B	0.7	-	0.6	0.5
Cadmium (total)	CE127 M	mg/kg Cd	0.4	-	0.5	0.3
Chromium (total)	CE127 M	mg/kg Cr	40	-	53	21
Chromium (VI)	CE146	mg/kg CrVI	<1	-	<1	<1
Copper (total)	CE127 M	mg/kg Cu	27	-	27	21
Lead (total)	CE127 M	mg/kg Pb	56	-	58	40
Mercury (total)	CE127 M	mg/kg Hg	<0.5	-	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	28	-	37	19
Selenium (total)	CE127 M	mg/kg Se	0.9	-	1.0	0.9
Zinc (total)	CE127 M	mg/kg Zn	74	-	78	62
pH	CE004 M	units	6.7	-	6.9	7.0
Sulphate (2:1 water soluble)	CE061 U	mg/l SO_4	14	-	11	<10
Sulphate (total)	CE062 M	mg/kg SO_4	340	-	371	296
Sulphide	CE016	mg/kg S^{2-}	<10	-	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	-	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	-	<1	<1
Thiocyanate	CE145 M	mg/kg SCN	<1	-	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	-	<0.5	<0.5
Total Organic Carbon (TOC)	CE197	% w/w C	2.4	-	1.9	1.6
Estimate of OMC (calculated from TOC)	CE197	% w/w	4.1	-	3.3	2.7
PAH						
Naphthalene	CE087 M	mg/kg	0.03	-	<0.02	0.02
Acenaphthylene	CE087 M	mg/kg	<0.02	-	<0.02	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02	-	<0.02	<0.02
Fluorene	CE087 U	mg/kg	<0.02	-	<0.02	<0.02
Phenanthrene	CE087 M	mg/kg	0.11	-	0.04	0.04
Anthracene	CE087 U	mg/kg	0.02	-	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.27	-	0.06	0.06
Pyrene	CE087 M	mg/kg	0.23	-	0.05	0.06
Benzo(a)anthracene	CE087 U	mg/kg	0.19	-	0.05	0.04
Chrysene	CE087 M	mg/kg	0.18	-	0.04	0.03
Benzo(b)fluoranthene	CE087 M	mg/kg	0.29	-	0.06	0.06
Benzo(k)fluoranthene	CE087 M	mg/kg	0.09	-	<0.03	<0.03
Benzo(a)pyrene	CE087 U	mg/kg	0.19	-	<0.02	0.03
Indeno(123cd)pyrene	CE087 M	mg/kg	0.16	-	0.03	0.04
Dibenz(ah)anthracene	CE087 M	mg/kg	0.02	-	<0.02	<0.02
Benzo(ghi)perylene	CE087 M	mg/kg	0.10	-	<0.02	0.02
PAH (total of USEPA 16)	CE087	mg/kg	1.89	-	<0.34	0.41
Organochlorine Pesticides						
2,4'-DDD (O,P'-DDD)	$	mg/kg DW	-	< 0.02	-	-

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SOILS

Lab number			113306-19	113306-20	113306-21	113306-22
Sample id			TP18 D1	TP019 D1	TP21 D1	TP22 D1
Depth (m)			0.10	0.10	0.10	0.10
Date sampled			02/09/2022	01/09/2022	01/09/2022	01/09/2022
Test	**Method**	**Units**				
4,4'-DDD (P,P'-DDD)	$	mg/kg DW	-	< 0.02	-	-
2,4'-DDE (O,P'-DDE)	$	mg/kg DW	-	< 0.02	-	-
4,4'-DDE (P,P'-DDE)	$	mg/kg DW	-	< 0.02	-	-
2,4'-DDT (O,P'-DDT)	$	mg/kg DW	-	< 0.02	-	-
4,4'-DDT (P,P'-DDT)	$	mg/kg DW	-	< 0.02	-	-
chlorfenvinphos, alpha	$	mg/kg DW	-	< 0.10	-	-
chlorfenvinphos, beta	$	mg/kg DW	-	< 0.10	-	-
Aldrin	$	mg/kg DW	-	< 0.02	-	-
Alpha-HCH	$	mg/kg DW	-	< 0.02	-	-
fenthion	$	mg/kg DW	-	< 0.10	-	-
Beta-HCH	$	mg/kg DW	-	< 0.02	-	-
mevinphos, (E)	$	mg/kg DW	-	< 0.10	-	-
mevinphos, (Z)	$	mg/kg DW	-	< 0.10	-	-
cis-Chlordane	$	mg/kg DW	-	< 0.02	-	-
Delta-HCH	$	mg/kg DW	-	< 0.02	-	-
Dieldrin	$	mg/kg DW	-	< 0.02	-	-
Endosulphan A	$	mg/kg DW	-	< 0.02	-	-
Endosulphan B	$	mg/kg DW	-	< 0.02	-	-
Endrin	$	mg/kg DW	-	< 0.02	-	-
Gamma-HCH (Lindane)	$	mg/kg DW	-	< 0.02	-	-
HCB	$	mg/kg DW	-	< 0.02	-	-
Heptachlor	$	mg/kg DW	-	< 0.02	-	-
Heptachlor epoxide	$	mg/kg DW	-	< 0.02	-	-
Isodrin	$	mg/kg DW	-	< 0.02	-	-
Methoxychlor	$	mg/kg DW	-	< 0.02	-	-
trans-Chlordane	$	mg/kg DW	-	< 0.02	-	-
Trifluralin	$	mg/kg DW	-	< 0.02	-	-
Organophosphate Pesticides						
Azinphos methyl	$	mg/kg DW	-	< 0.10	-	-
Chlorpyriphos methyl	$	mg/kg DW	-	< 0.10	-	-
Diazinon	$	mg/kg DW	-	< 0.10	-	-
Dichlorvos	$	mg/kg DW	-	< 0.10	-	-
Dimethoate	$	mg/kg DW	-	< 0.10	-	-
Fenitrothion	$	mg/kg DW	-	< 0.10	-	-
Malathion	$	mg/kg DW	-	< 0.10	-	-
parathion-ethyl	$	mg/kg DW	-	< 0.10	-	-
Parathion methyl	$	mg/kg DW	-	< 0.10	-	-
Phorate	$	mg/kg DW	-	< 0.10	-	-
Subcontracted analysis						
Asbestos (qualitative)	$	-	NAD	-	NAD	NAD

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	U	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO_4
CE062	Sulphate (total)	HCl extract, analysed by ICP-OES	Dry	M	100	mg/kg SO_4
CE016	Sulphide	Distillation, Titration	Dry		10	mg/kg S^{2-}
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE145	Thiocyanate	Weak acid extraction, Colorimetry	Dry	M	1	mg/kg SCN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE197	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
$	2,4'-DDD (O,P'-DDD)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	4,4'-DDD (P,P'-DDD)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	2,4'-DDE (O,P'-DDE)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	4,4'-DDE (P,P'-DDE)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	2,4'-DDT (O,P'-DDT)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	4,4'-DDT (P,P'-DDT)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
$	chlorfenvinphos, alpha	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	chlorfenvinphos, beta	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Aldrin	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Alpha-HCH	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	fenthion	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Beta-HCH	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	mevinphos, (E)	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	mevinphos, (Z)	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	cis-Chlordane	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Delta-HCH	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Dieldrin	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Endosulphan A	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Endosulphan B	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Endrin	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Gamma-HCH (Lindane)	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	HCB	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Heptachlor	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Heptachlor epoxide	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Isodrin	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Methoxychlor	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	trans-Chlordane	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Trifluralin	Solvent extraction, GC-MS	As received		0.02	mg/kg DW
$	Azinphos methyl	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Chlorpyriphos methyl	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Diazinon	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Dichlorvos	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Dimethoate	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Fenitrothion	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Malathion	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	parathion-ethyl	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Parathion methyl	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Phorate	Solvent extraction, GC-MS	As received		0.1	mg/kg DW
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
113306-1	CBR1 D1	0.10	N	
113306-2	CBR2 D1	0.10	N	
113306-3	CBR3 D1	0.10	N	
113306-4	CBR5 D2	0.10	N	
113306-5	CBR7 D1	0.20	N	
113306-8	TP04 D1	0.10	N	
113306-9	TP05 D1	0.10	N	
113306-10	TP07 D3	0.10	N	
113306-11	TP08 D1	0.10	N	
113306-13	TP10 D1	0.10	N	
113306-14	TP11 D1	0.10	N	
113306-15	TP13 D1	0.10	N	
113306-16	TP14 D2	0.10	N	
113306-17	TP16 D1	0.20	N	
113306-18	TP17 D1	0.10	N	
113306-19	TP18 D1	0.10	N	
113306-21	TP21 D1	0.10	N	
113306-22	TP22 D1	0.10	N	

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ADDITIONAL INFORMATION

Notes

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

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones, where applicable.

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APPENDIX E

AWP GENERIC ASSESSMENT CRITERIA

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Generic Assessment Criteria for Soils

Revision Version: V.8 - September 2018

Parameter	Residential		Commercial	Allotment	Public Open Space near Residential land (POS_{resi})	Public Park Land (POS_{park})	Source
	With Plant Uptake	Without Plant Uptake					
	1-6% SOM	1-6% SOM	1-6% SOM	1-6% SOM	1-6% SOM	1-6% SOM	
Metals/Metalloids [a]							
Arsenic (inorganic)	37	40	640	49	79	170	DEFRA C4SL [b]
Beryllium	1.7	1.7	12	35	22	63	LQM/CIEH [c]
Boron	290	11,000	240,000	45	21,000	46,000	LQM/CIEH [c]
Cadmium [d]	22	150	410	3.9	220	880	DEFRA C4SL [b]
Chromium (III)	910	910	8,600	18,000	1,500	33,000	LQM/CIEH [c]
Chromium (VI) [e]	21	21	49	170	21	250	DEFRA C4SL [b]
Copper	2,400	7,100	68,000	520	12,000	44,000	LQM/CIEH [c]
Lead [f]	200	310	2,300	80	630	1,300	DEFRA C4SL [b]
Mercury (inorganic)	40	56	1,100	19	120	240	LQM/CIEH [c]
Nickel	130	180	980	53	230	800	LQM/CIEH [c]
Selenium	250	430	12,000	88	1,100	1,800	LQM/CIEH [c]
Vanadium	410	1,200	9,000	91	2,000	5,000	LQM/CIEH [c]
Zinc	3,700	40,000	730,000	620	81,000	170,000	LQM/CIEH [c]
Other Inorganics							
pH	<5	<5	<5	<5	<5	<5	-
Total Sulphate	2400	2400	2400	2400	2400	2400	BRE (2005) [g]
Water-Soluble Sulphate	0.5g/l	0.5g/l	0.5g/l	0.5g/l	0.5g/l	0.5g/l	BRE (2005)

Parameter	Residential						Commercial [i]			Allotment			Public Open Space near Residential land (POS_{resi})			Public Park Land (POS_{park})			Source
	With Plant Uptake			Without Plant Uptake															
	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	
Organics [h]																			
Acenaphthene	200	490	1,080	2,000	3,600	5,200	75,000	92,000	100,000	34	85	202	15,000	15,000	15,000	29,000	30,000	30,000	CLEA/LQM/CIEH
Acenaphthylene	170	400	900	2,000	3,600	5,200	76,000	92,000	100,000	28	68	163	15,000	15,000	15,000	29,000	30,000	30,000	CLEA/LQM/CIEH
Anthracene	2,300	5,400	10,700	30,000	34,000	36,000	520,000	530,000	540,000	380	947	2,230	74,000	74,000	74,000	150,000	150,000	150,000	CLEA/LQM/CIEH
Benzo(a)anthracene	7.5	11	13	12	14	15	170	170	180	2.9	6.5	13	29	29	29	49	56	62	CLEA/LQM/CIEH
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	35	35	36	3.6	3.7	3.7	5.7	5.7	5.7	11	12	13	CLEA/LQM/CIEH
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	45	45	1	2.2	3.9	7.1	7.2	7.2	13	15	16	CLEA/LQM/CIEH
Benzo(g,h,i)perylene	315	340	350	360	360	360	3,900	4,000	4,000	290	480	646	640	640	640	1,400	1,500	1,600	CLEA/LQM/CIEH
Benzo(k)fluoranthene	77	93	100	110	110	110	1,200	1,200	1,200	37	76	129	190	190	190	370	410	440	CLEA/LQM/CIEH
Chrysene	15	22	27	30	31	32	350	350	350	4.1	9.5	19	57	57	57	93	110	120	CLEA/LQM/CIEH
Dibenz(a,h)anthracene	0.24	0.28	0.30	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.27	0.44	0.57	0.57	0.58	1.1	1.3	1.4	CLEA/LQM/CIEH
Fluoranthene	280	560	890	1,500	1,600	1,600	23,000	23,000	23,000	52	127	288	3,100	3,100	3,100	6,300	6,300	6,400	CLEA/LQM/CIEH
Fluorene	165	390	850	2,200	3,400	4,200	60,000	67,000	70,000	27	67	158	9,900	9,900	9,900	20,000	20,000	20,000	CLEA/LQM/CIEH
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	9.5	21	40	82	82	82	150	170	180	CLEA/LQM/CIEH
Naphthalene	1	2.3	5.5	1	2.4	6	100	260	600	4	9.8	23	4900	4900	4900	1200	1900	3000	CLEA/LQM/CIEH
Phenanthrene	95.0	220	440	1,300	1,400	1,500	22,000	22,000	23,000	15	38	90	3,100	3,100	3,100	6,200	6,200	6,300	CLEA/LQM/CIEH
Pyrene	620	1,200	2,000	3,700	3,800	3,800	54,000	54,000	55,000	111	271	620	7,400	7,400	7,400	15,000	15,000	15,000	CLEA/LQM/CIEH
Aliphatic EC 5-6 (benzene)	24	40	80	24	40	80	2,400	4,000	8,000	752	1,730	3,900	570,000	590,000	600,000	95,000	130,000	180,000	CLEA/LQM/CIEH
Aliphatic EC >6-8 (toluene)	52	110	250	52	110	250	5,200	11,000	25,000	2,304	5,580	13,000	600,000	610,000	620,000	150,000	220,000	320,000	CLEA/LQM/CIEH
Aliphatic EC >8-10	13	30	70	13	30	70	1,300	3,000	7,000	321	770	1,700	13,000	13,000	13,000	14,000	18,000	21,000	CLEA/LQM/CIEH
Aliphatic EC >10-12	60	150	360	60	150	360	6,000	15,000	32,000	2,153	4,300	7,150	13,000	13,000	13,000	21,000	23,000	24,000	CLEA/LQM/CIEH
Aliphatic EC >12-16	500	1,200	2,600	500	1,200	2,600	42,000	72,000	90,000	10,800	12,400	13,200	13,000	13,000	13,000	25,000	25,000	26,000	CLEA/LQM/CIEH
Aliphatic EC >16-35	41,000	69,000	94,000	41,000	69,000	94,000	140,000	160,000	180,000	240,000	260,000	260,000	250,000	250,000	250,000	450,000	480,000	490,000	CLEA/LQM/CIEH
Aliphatic EC >35-44	41,000	69,000	94,000	41,000	69,000	94,000	140,000	160,000	180,000	240,000	260,000	260,000	250,000	250,000	250,000	450,000	480,000	490,000	CLEA/LQM/CIEH

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Generic Assessment Criteria for Soils

Revision Version: V.8 - Septmeber 2018

Parameter	Residential						Commercial [i]			Allotment			Public Open Space near Residential land (POS_{resi})			Public Park Land (POS_{park})			
	With Plant Uptake			Without Plant Uptake															
	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	
Organics contd./ [h]																			
Aromatic EC >5-7	50	110	240	155	300	630	15,000	28,000	55,000	12	25	57	56,000	56,000	56,000	76,000	84,000	92,000	CLEA/LQM/CIEH
Aromatic EC >7-8	100	240	550	370	800	1,800	33,000	68,000	130,000	21	50	117	56,000	56,000	56,000	87,000	95,000	100,000	CLEA/LQM/CIEH
Aromatic EC >8-10	20	50	110	20	53	125	2,000	5,000	120,000	8.6	21	50	5,000.0	5,000	5,000	7,200.0	8,500	9,300	CLEA/LQM/CIEH
Aromatic EC >10-12	63	150	340	120	280	650	11,000	22,000	31,000	12.5	31	74	5,000.0	5,000	5,000	9,200.0	9,700	10,000	CLEA/LQM/CIEH
Aromatic EC >12-16	140	320	660	1,100	1,900	2,300	35,000	37,000	38,000	23	57	134	5,100	5,100	5,000	10,000	10,000	10,000	CLEA/LQM/CIEH
Aromatic EC >16-21	260	540	930	1,800	1,900	1,900	28,000	28,000	28,000	47	112	260	3,800	3,800	3,800	7,600	7,700	7,800	CLEA/LQM/CIEH
Aromatic EC >21-35	1,100	1,400	1,700	1,900	1,900	1,900	28,000	28,000	28,000	370	820	1,500	3,800	3,800	3,800	7,800	7,800	7,900	CLEA/LQM/CIEH
Aromatic EC >35-44	1,100	1,400	1,700	1,900	1,900	1,900	28,000	28,000	28,000	370	820	1,500	3,800	3,800	3,800	7,800	7,800	7,900	CLEA/LQM/CIEH
Benzene	0.06	0.13	0.30	0.16	0.30	0.64	15	28	57	0.016	0.033	0.073	72	72	73	90	100	110	CLEA/LQM/CIEH
Toluene	104	240	550	370	830	1800	33,000	68,000	130,000	22	50	117	56,000	56,000	56,000	87,000	95,000	100,000	CLEA/LQM/CIEH
Ethylbenzene	30	62	150	34	81	190	3,200	7,000	16,000	16	38	91	24,000	24,000	25,000	1,700	22,000	27,000	CLEA/LQM/CIEH
o-xylene	30	70	170	40	90	200	3,700	8,000	19,000	28	67	160	41,000	42,000	43,000	17,000	24,000	33,000	CLEA/LQM/CIEH
m-xylene	30	70	160	34	80	190	3,400	8,000	18,000	30	74	170	41,000	42,000	43,000	17,000	24,000	32,000	CLEA/LQM/CIEH
p-xylene	30	70	160	33	80	180	3,200	8,000	17,000	28	69	160	41,000	42,000	43,000	17,000	23,000	31,000	CLEA/LQM/CIEH

NOTES

- All values are rounded to 1 or 2 significant figures. All values mg/kg unless otherwise stated.

(a) Generic Assessment Criteria presented by DEFRA (2014) and LQM/CIEH (2015) for metals are not sensitive to Soil Organic Matter content and may be applied directly across the SOM range 1-6% for the land uses given.

(b) Final Category 4 Screening Levels given in DEFRA SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Policy Companion Document, December 2014. Calculated for sandy loam soils with 6% SOM.

(c) Nathanial, C.P., McCaffrey, C., Gillett, A.C., Ogden, R.C. And Nathanial, J.F. (2015). The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. Publication Number **S4UL3286**.

(d) GAC for cadmium are calculated for soils with pH values between 6 and 8. Care should be applied when using the GAC values outside this range and particularly below 5.

(e) Additional site specific risk assessment may be required where elevated concentrations of Chromium (VI) are measured on site.

(f) DEFRA (2014) indicate that the BGS have derived 'normal' background lead concentrations for England & Wales. In England normal background concentrations are 180mg/kg for the principal domain, 2400mg/kg for the mineralisation domain and 820mg/kg for the urban domain (DEFRA, 2012). Calculated C4SL values to be adopted for residential, allotment and POS_{resi} are lower therefore than the 'normal' background concentration of lead in urban areas.

(g) BRE (2005) Special Digest 1, 3rd Edition 'Concrete in Aggressive Ground'. GAC is the upper limit for DS-1 sulphate class concrete.

(h) Organic contaminant GAC values calculated using CLEA v1.06 for sandy soil with SOM of 1%, 2.5% and 6%. Sandy soil type is considered to be conservative for the majority of soils, including brownfield soils on (potentially contaminated) sites. Changes made to default CLEA exposure parameters as per updated information given in DEFRA (2014) (C4SL Tables 3.2 and 3.5) and LQM/CIEH (2015).

(i) GAC derived for pre-1970 office buildings using default commercial CLEA model with adjustment to CLEA exposure parameters as per DEFRA (2014) (C4SL Tables 3.2 and 3.5).

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