

LCRM: Intrusive Site Investigation

LAND TO REAR OF 32 QUEENS ROAD, BARNSELY

Project Ref: GUK-0425-02

For: Whitshaw Developments Ltd

SITE REFERENCE:

**Land to rear of 32 Queens Road
Barnsley**

CLIENT:

Whitshaw Developments Ltd

PROJECT:

Residential Development

REPORT REFERENCE:

GUK-0425-03/Rp-002



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EXECUTIVE SUMMARY

This summary presents the salient points of the Report but should not be referred to in isolation of the body text. There will be other information contained within the Report which puts into context the findings of this summary. No reliance should therefore be placed on the summary until the Report has been read in full. The recommendations given are considered reasonable based on available information and the assessment of the Site as carried out by Groundsmiths (UK) Ltd at this time, although other interested parties may hold differing opinions.

1 ENVIRONMENTAL CONSTRAINTS

Radon: No radon precautions were indicated to be required in construction on the basis of available information. This should be confirmed with Building Control, however, as they may have different requirements.

General Soil Contamination: Elevated lead to above the residential with home-grown produce GAC has been measured within some of the made ground soils, although no elevated contaminant concentrations were identified within the underlying natural strata.

Asbestos: No asbestos fibres were identified within the made ground or natural strata. There is no perceived risk to human health on this basis.

Construction Workers: Other than for the made ground deposits, the on-Site ground conditions do not appear to present any particular risk to construction workers involved with the Site's redevelopment. However, all in-ground works should automatically be assessed and completed in accordance with current regulatory guidance.

Soil Remediation Requirements: Given the contaminated nature of the made ground, formal remediation to areas of proposed soft landscaping would be required to be protective of Site end users. Development proposals are such, however, that level reduction and some regrading of the formation is required and this will result in the made ground material (and the contaminant source) being removed from Site in its entirety.

Should any soils remediation be found to be required, proposals detailing the installation and verification procedure to be followed would need to be confirmed with the Local Planning Authority. All remedial activities would need to be compliant with the requirements of YALPAG.

Ground Gas Remediation Requirements: Monitoring is ongoing. The results of the monitoring and risk assessment will be issued under separate cover once complete, with any recommendation for mitigation being made at that time. Allow for Characteristic Situation 2 conditions until confirmed otherwise.

Controlled Waters Receptors: Risk from the off-site discharge of any leachable contaminants is considered to be very low as no perched or shallow-depth water was encountered during the investigation, the site is underlain by cohesive deposits, and the contaminant source (made ground) is to be removed. No further assessment is considered necessary.

Invasive Plant Species: Risk from invasive plant species has not been identified. Other assessments should be completed as required.

2 GEOTECHNICAL & GENERAL DEVELOPMENT CONSTRAINTS

Buried Concrete: Concrete to DS1/AC-1s is anticipated given the range of sulphate concentrations measured within the on-Site soils. This determination does not make any necessary allowance for the requirements of structural strength or durability so further consultation with the Designing Engineer should be made accordingly.

Anticipated Foundation Type: With cognisance to the likely imposed loads and required settlement tolerances of the development, it is anticipated that traditional reinforced spread foundations should be suitable. Further consultation should be made with the Designing Engineer with respect to the final foundation depths to be achieved.

Anticipated Ground Floor Type: Suspended (e.g. beam and block) floor with underlying clear void and ventilation.

Heave Precautions: A worst case high Volume Change Potential has been identified. All necessary precautions in construction will need to be provided where foundations lie within the influencing distance of existing, removed, or proposed planting and trees when in clay soils.

Excavation: It is possible that some in-ground obstruction associated with prior development could exist. Excavation difficulties at depth could be encountered where deep service connections need to be made, so machinery of sufficient size and strength will need to be allowed for.

Potable Water Supplies: It is considered that standard potable water supply pipework should be sufficient, when laid in the underlying natural strata, and that measures compliant with BS8588:2017 (e.g. Protecta-Line) are unlikely to be required. It is recommended, however, that the results of the chemical testing and details of the development proposals are provided to the utility company for their comment, prior to installation of any pipework.

Slopes: Global slope stability problems are not expected.

General Ground Stability: The general instability of the underlying soils should be allowed for, particularly during prolonged periods of wet weather and/or where excavations are left open for protracted periods of time. Where there is the possibility of weak/unstable ground being present or passing across any boundary, a geotechnical risk assessment of the integrity/stability should be undertaken prior to works being carried out. Designed and engineered temporary or permanent measures should be deployed to ensure their continued stability, as required.

Groundwater: No perched or shallow-depth groundwater was encountered during the investigation. The large-scale dewatering of excavations is not anticipated, although all necessary equipment should be made available should differing groundwater conditions be encountered during construction.

Surface Water Drainage: It is considered that the use of soakaways for the discharge of surface water would not be possible in development given that the Site is underlain by stiff clay and mudstone soils which will have negligible infiltration potential. It is understood that soakaways should also be located 5m or more from foundations and road construction. Further consultation with a specialist drainage consultant should be made as required, although at this stage it is anticipated that a piped connection will need to be implemented. All drainage proposals will be subject to obtaining the necessary approvals from the Regulatory Authorities.

Pavement: It is considered that the localised excavation and replacement of any unsuitable material with suitably compacted engineered fill will be needed for proposed access and parking areas. Frost susceptibility should be assumed.

3 MINING LEGACY CONSTRAINTS

Shallow coal of the Two Foot seam was recorded during the rotary borehole investigation, although there was no evidence of working or other such disturbance in it. Furthermore, no evidence of the Adby Coal was recorded, as previous studies suggested that this deeper seam could be present at around 20.0m bgl. No other coal or mining-induced instability to a terminal depth of 30.0m bgl was recorded either.

Should coal be encountered at shallow depth in any foundation excavation, this shall be suitably blinded with lean-mix concrete to prevent air ingress into the seam.

1 INTRODUCTION

1.1 Appointment

Groundsmiths (UK) Ltd ('Groundsmiths') were appointed by Whitshaw Developments Ltd (the 'Client') to provide professional services in relation to the geotechnical and geo-environmental characterisation of land located to the rear of 32 Queens Road, Barnsley, South Yorkshire (herein referred to as the 'Site').

Groundsmiths have prepared this report (the 'Report') for the sole use of the Client that commissioned it in accordance with the agreement under which our services are performed. No other warranty, expressed or implied, is made as to the professional advice included. Any unauthorised third parties using the information presented in this Report do so entirely at their own risk and are duly excluded from any warranty, duty of care or skill. Furthermore, no part of this Report shall be reproduced or redistributed without the prior written consent of Groundsmiths. However, it may be issued by the Client or their Agent to the Local Planning Authority (the 'LPA') to support the discharge of any pre-commencement or other such pre-occupancy planning condition as may be imposed in relation to the Site's assessment under the Town and Country Planning Act 1990.

1.2 General Objectives

The aim of this Report is to present the findings of an intrusive ground investigation carried out to support the Client's intentions to redevelop of the Site. It follows on from the preliminary risk assessment ^[1] and therefore seeks to update the Conceptual Site Model on the basis of site-specific data obtained with respect to 1) the general properties of the underlying soils encountered, 2) their environmental status (considering the presence, extent, and nature of any contamination encountered, be it soil or ground gas) and the potential impact this may have on sensitive receptors, and 3) any mining legacy that exists.

Furthermore, the Report aims to identify where any additional Site-based works, risk assessment, and/or remediation is considered necessary to facilitate development within the framework of a generic residential with home-grown produce exposure scenario as defined by the Environment Agency ^[2].

1.3 Limitations of Study

It is understood that it is the Client's intention to redevelop the Site for residential end use, with this comprising four dwellings with associated soft landscaping and parking within its curtilage. For reference, the general arrangement of the development is indicated on appended drawing Ref: 24110D-11-P01.

This Report has been compiled subject to the limitations detailed in Section 9 and any other limitations stated specifically in the text.

All investigation works presented herein were completed in general accordance with the requirements of BS 10175:2011+A2:2017 ^[3] and BS 5930:2015+A1:2020 ^[4]. Mining legacy investigation works were completed by Demolition & Geotechnical Ltd ('D&G') under direct commission with the Client, although their data has been incorporated into this Report; all works

undertaken by D&G were in accordance with the Mining Remediation Authority (the 'MRA') permit 29855, dated 13th May 2025, and their general terms and conditions.

This Report should not be assumed valid for adjacent areas of land, or for alternate land use. Should the proposed Site usage change, the recommendations and conclusions presented in this Report will need to be re-assessed in accordance with all relevant and current guidance. Where any other works are found to be required, over and above those reported herein, they shall be completed within the LCRM framework ^[5,6], any other relevant UK guidance, and/or specific regulatory requirements.

2 SUMMARY CONCEPTUAL SITE MODEL

2.1 General Details

Table 2.1, below, summarises the Site’s general setting and is taken from the preliminary risk assessment report cited herein. Reference to that document should be made as required if further details are needed.

Table 2.1 - General Site Details

National Grid Reference	The National Grid Reference (NGR) for the Site is indicated to be 434898mE 406474mN.
Area of Development	The area of development is indicated to be 0.12ha.
Ground Elevations	General topographic data indicates that the Site lies broadly at 99.3m AOD in the north, reducing to around 96.5m AOD in the south. Localised variation should be assumed.
General Site Layout and Boundary Development	<p>The Site comprises, in its current condition, an area of open and derelict land that has become vegetated with self-seeded weeds, bramble, and grasses. It is confined by metal security fencing along its southern and western boundaries, beyond which lie, respectively, the residential dwelling of 32 Queens Road and a short-unmarked road that provides access to a row of privately-owned garages; this road will also provide access to the new dwellings.</p> <p>The eastern and northern boundaries to the Site are marked by a semi-derelict brick wall (partly collapsed and leaning), against which some of the former buildings appear to have once been attached. Beyond the northern boundary are the houses that own the garages, whilst to the east (at a higher elevation) is Queens Road Academy.</p>
Ground covering	The Site is largely unsurfaced and comprises a mixture of exposed soil, granular made ground, and demolition material (bricks, concrete) with the exception of an area of remnant tarmac and concrete paving across its southern parts. Some localised fly-tipping is evident.
Invasive Species	No invasive plant species were observed during the Site visit. Further specialist assessments are unlikely to be required, but should be commissioned as deemed necessary.

2.2 Anticipated Ground Conditions & Other Considerations

A summary of the ground conditions thought likely to be encountered at the Site, in addition to salient published environmental data that could potentially affect the Site, is given in Tables 2.2 and 2.3, overleaf.

Table 2.2 - Geology and Hydrogeology

Radon	Third party data indicates that <1% of properties exceed the Radon Action Level in the area. No radon protective measures are indicated to be required in construction on this basis.
Bedrock Faults	There are no recorded geological faults within at least 500m.
Superficial Geology	Data obtained from the BGS indicates that there are no superficial deposits present on Site or within approximately 500m.
Solid Geology	The solid geology underlying the Site was identified as being mudstone, siltstone, and sandstone of the Pennine Middle Coal Measures. Specifically, the majority of the Site is shown to be underlain from surface by sandstone of the Woolley Edge Road, but with undifferentiated mudstone and siltstone deposits along its western edge. BGS data suggested that the dip of the bedrock across the local area is relatively shallow, with this being broadly between 5° and 8° towards the north-east.
Groundwater	On the basis of available information, the Site's setting, and its indicated geology, significant shallow-depth groundwater was not expected.
Coal	<p>Risk associated with potential coal mining legacy beneath the Site had been assessed initially by Wardell Armstrong ^[7], but latterly by William Saunders ^[8] and Lyons CMC ^[9] with respect to other schemes that were ultimately terminated. Actual investigation works were undertaken by Wardell Armstrong, who recorded intact coal (interpreted as being the Two Foot seam) from between 3.4m bgl and 4.6m bgl, and for there to be no other coal(s) or evidence of working to 15.0m bgl.</p> <p>As indicated in the 2025 preliminary risk assessment report, the other studies suggested that the Abdy Coal could be present to about 20.0m bgl, so further investigation was required to quantify this. The results of such investigation, as recently completed by D&G, is reported herein in Section 3.</p>
Natural Cavities	GroundSure data indicates that there are no recorded natural cavities within at least 500m.
Mining Cavities	GroundSure data indicates that there are no recorded mining cavities within at least 1km.
Non-coal Mining	GroundSure data indicates that underground iron ore mining may have occurred in the past, although the potential for difficult ground conditions associated with this are unlikely and are at a level where they need not be considered further.
Natural Ground Subsidence (within 50m)	GroundSure data indicates a negligible risk rating for the ground dissolution of soluble rocks, running sands, and compressible deposits hazards; and a very low risk rating for landslides, shrink swell clay soils and collapsible deposits hazards.

Table Contd./

Mass Movement Deposits	In providing a preliminary assessment of risk associated with potential landslip, current information obtained from GroundSure at the 1:10,000 and 1:50,000 scales indicated that there are no records of mass movement deposits within 500m, whilst the hazard rating for slope instability (landslide potential) on-Site is very low. The GroundSure data also indicates that there are no records of landslip permeability (i.e. the estimated rate of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposit) within 50m.
UXO	Information obtained from Zetica (https://zeticaxo.com) suggests that the Site lies within a low risk zone from unexploded ordnance. Further detailed risk assessment is unlikely to be required.

Table 2.3 - Environmental Data

Landfill	Available data indicated that there are no historical, recent, or active landfill sites within a radius of at least 429m.
Infilled or Made Ground Deposits	Records at the 1:10,000 and 1:50,000 scales indicate the nearest area of artificial deposit to be located from 143m to the south.
Mine Gases	Mine gas emission requiring action by the MRA was not identified. This does not preclude, however, the presence of any other biogenic gases (i.e. carbon dioxide and/or methane) that may be present.
Ground Gas	<p>It was reported by Wardell Armstrong that monitoring completed between 29th July and the 19th August 2008 recorded carbon dioxide concentrations in WS104 (to the north of the property at 32 Queens Road) between 12.1%v/v and 16.9%v/v and for flow to be between -0.1 l/hr and 3.4 l/hr.</p> <p>The measured concentrations were considered likely to be linked to the underlying coal and/or made ground. Wardell Armstrong indicated a worst-case Gas Screening Value of 0.6 l/hr for the Site, and for it to be determined as Characteristic Situation 2.</p> <p><i>(NOTE: Further monitoring is currently being undertaken so that an up to date assessment of the Site's gassing regime can be established. The results of that monitoring will be provided under separate cover, once complete).</i></p>

2.3 Plausible Source-Pathway-Receptor Linkages for Contamination

Current UK legislation on contaminated land is set out in Part 2A of the Environmental Protection Act 1990 ^[10], which was retrospectively inserted by Section 57 of the Environment Act 1995 ^[11]. The Contaminated Land Regulations 2000 ^[12] 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. 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. The legislation places a responsibility on the LPA to determine whether the land under its jurisdiction is contaminated by consideration of whether:

- The presence of substances (potential contaminants) are present at concentrations that are causing significant harm or have the significant possibility of causing significant harm;
- There are receptors which may be harmed (e.g. the water environment, human health, buildings, fauna and flora), and/or
- There is in existence a pathway between the identified sources and receptors.

To qualitatively assess the level of risk at the Site from soil and/or any waterborne contamination the above rationale was applied. This approach is consistent with the preliminary risk assessment procedure defined in LCRM. The following section summarises Groundsmiths' understanding of the surface and sub-surface features of the Site, the potential sources of contamination, transport pathways, and receptors in order to support the identification and assessment of plausible potential contaminant linkages that needed to be investigated.

Sources

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 contamination of controlled waters'.

In reviewing the Site's history, it was evident that it'd had previous use for a long period of time. This, on the basis of available information, was assumed to have been light-industrial (although the exact use is unknown). Contamination associated with its former use could potentially have had an adverse effect on some of the soils to be encountered, with this being derived from any combustion residues (ash, clinker), or where any oils or fuels were potentially stored or used in the buildings or machinery. Furthermore, contamination was also thought possible to be potentially associated with the [relatively recent] demolition of the former on-Site buildings and the soils that were derived from that, as well as any mining related sources (i.e. ground gas).

Risk from off-Site sources having a direct impact on the Site through any contaminant mobility was considered to be very low to unlikely and was therefore discounted, although it was considered possible for any imported materials used to raise Site levels or infill areas to be contaminated; such material was considered to present the greatest risk to the proposed development.

Within the context of the CSM, therefore, the following potential sources and contaminants (as summarised in Table 2.4, overleaf) that warranted further assessment were identified.

Table 2.4 - Summary of Potential Sources and Contaminants

Potential Sources	Potential Contaminants of Concern (not limited to)
Any potentially contaminated made ground associated with previous development, and/or if imported from other sites?	Metals, metalloids, inorganic contaminants, phytotoxic contaminants, sulphates, PAH, TPHCWG, VOC, SVOC, and asbestos
Any potentially contaminated made ground derived from recent demolition activities?	
Any potentially contaminated shallow-depth underlying natural strata?	
On-Site sources of ground gas from any underground coal mine workings, and/or should deep made ground be present?	CO ₂ and CH ₄
Off-site sources of ground gas including any nearby underground coal mine workings, and/or should any areas of infilled localised ground working exist?	

Migration Pathways

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 contaminant pathways by which sensitive receptors were anticipated to become exposed to potential contamination at the Site are summarised in Table 2.5, below and overleaf.

Table 2.5 - Summary of Plausible Pathways

Potential Sources	Pathways
Any potentially contaminated made ground and/or shallow-depth underlying natural strata to the Site	Direct ingestion, dermal contact, and the inhalation of dust, vapour or fibres
	Direct ingestion and/or dermal contact with liquid contaminants
	Leaching and direct contact with potable water supply pipes

Potential Sources	Pathways
Contd./	Leachable contaminants via surface run-off, vertical and lateral migration via any permeable strata with the potential to impact controlled waters receptors
	Soft landscaping (to garden curtilage)
Sources of ground gas (e.g. underground coal mine workings, made ground)	Migration of gases and/or accumulation in void spaces via transport through service conduit, any permeable made ground and/or any permeable underlying natural strata

Receptors

A receptor is the potential target of the source contaminant, to which either significant harm or deterioration in quality may be caused. The potential sensitive receptors with respect to the potential contamination hazards identified in the preliminary risk assessment are given in Table 2.6, below.

Table 2.6 - Summary of Potential Receptors

Potential Receptor	Comment
Human Health	Site end-users in the residential with home-grown produce end use scenario Site operatives (during construction phase only) Future workers involved with any in-ground maintenance works
Construction	Potable water supply pipes Foundations and service conduit
Controlled Waters	'Secondary A' aquifer soils

Environmental Risk Assessment

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. The statutory guidance describes a risk assessment methodology in terms of 'significant contaminants' and 'contaminant linkages', using the '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. The existence of a contaminant linkage is dependent on-site use, as well as environmental conditions. If no

contaminant linkages can be proven, then the risks may be discounted. However, it is not to say that remediation is required even if contamination is proven.

The potential contaminants and receptors for the Site as identified in the preliminary study were considered in relation to the pathways that may link them. To that end, risk is regarded as a combination of the likelihood of an 'event' occurring and its severity: both elements must be considered when assessing risk. The method for risk assessment, or evaluation, is purely qualitative. As defined in CIRIA C552 (Tables 6.3 and 6.4) ^[13], the magnitude of the potential 'severity' of risk occurring may be assessed against:

- **Severe (acute):** short term risk to human health likely to result in significant harm as defined under Environmental Protection Act 1990, Part 2A. Short term risk of pollution to sensitive water receptor (may result in death).
- **Medium (chronic):** long term risk and significant harm to human health, contamination of sensitive water resource or significant change to an ecosystem or specific organism (may result in death).
- **Mild (chronic, but applicable to less sensitive receptors):** contamination of non-sensitive water resource but significant damage to crops, buildings, structures and services or the environment.
- **Minor (not significant):** 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.

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 contamination is causing harm at the receptor. Urgent action is required.
- **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.

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 linkage.

The risk categories which can be assigned are presented in Table 2.7, overleaf, and range between 'very high' to 'very low' (NB - it is not possible to classify an identified risk as 'no-risk').

Table 2.7 - Risk Categorisation

		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

Source: Table 6.5, C552 (2001).

- **Very High** – there is a high probability that severe harm could arise or that severe harm is occurring. Urgent investigation and remediation are likely to be required.
- **High** – harm is likely to occur, 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** – it is 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.

The identified potential contaminants and receptors for the Site were considered in relation to the potential pathways that may link them; the resultant contaminant linkages, as identified at the preliminary risk assessment stage, are summarised in Table 2.8, below and overleaf.

Table 2.8 - Summary of Environmental Risk

Potential Sources	Potential Receptors	Plausible Pathways	Probability	Severity	Risk Rating
Any potentially contaminated made ground and/or shallow-underlying natural strata to the Site	Human Health Site end-users, inc. maintenance and site workers (short term risk during redevelopment)	Direct ingestion, dermal contact with soil or inhalation of dust and/or vapour (Site end user)	Likely	Mild	Moderate/ Low
		Inhalation of asbestos fibres in made ground soils (Site end user)	Low Likelihood	Severe	Moderate
		Direct ingestion, dermal contact with soil or inhalation of dust and/or vapour (In-ground worker)	Likely	Mild	Moderate/ Low

Table Contd./

Potential Sources	Potential Receptors	Plausible Pathways	Probability	Severity	Risk Rating
Any potentially contaminated made ground and/or shallow-underlying natural strata to the Site	<u>Human Health</u>	Inhalation of asbestos fibres in made ground soils (In-ground worker)	Low Likelihood	Severe	Moderate
	Site end-users, inc. maintenance and site workers (short term risk during redevelopment)	Direct ingestion and/or dermal contact with liquid contaminants (Site end user / In-ground worker)	Unlikely	Mild	Very Low
	Potable Water Supply Pipes	Direct contact/leaching (tainting)	Low Likelihood	Mild	Low
	Vegetation	Uptake via root system in soft landscaping	Low Likelihood	Mild	Low
	Foundations	Direct contact/leaching	Low Likelihood	Mild	Low
	Controlled Waters	Vertical and/or lateral migration	Unlikely	Mild	Very Low
	Site End Users	Inhalation (via ingress and accumulation into buildings)	Low Likelihood	Medium	Moderate/ Low

3 INTRUSIVE SITE INVESTIGATION

3.1 Rationale

The overall objectives of the investigation were to assess and characterise the nature of the ground conditions underlying the Site in order to quantify the identified geotechnical and environmental risks postulated in the aforementioned preliminary risk assessment. This was based on the anticipated condition of the Coal Measures deposits (including mining legacy) and the levels of potential contaminants of concern in relation to the identified plausible source-pathway-receptor linkages.

3.2 Objectives

The specific objectives of the investigation were to:

- Investigate the general nature and thickness of any made ground and the depth to, condition, and nature of the underlying natural strata;
- Determine the geotechnical parameters of the underlying natural strata via in situ testing and laboratory based analysis;
- Identify the nature and concentration of any contamination within individual soil matrices, including sulphate analysis to assist with buried concrete design, and undertake some Waste Acceptance Criteria testing for soils disposal purposes;
- Investigate the shallow-depth hydrogeological regime beneath the Site;
- Report the presence of any buried obstructions and/or other excavation difficulties encountered during the works;
- Investigate the depth to, condition, and extent of any shallow (to 30m depth) coal seams and any workings within them (NOTE: *to be completed by D&G, but reported herein*);
- Investigate the general level of risk associated with any on- and off-Site fugitive ground gases, and
- Provide general advice in relation to any environmental or geotechnical issues associated with the Site and/or any other recommendations needed to facilitate the proposed development, including, where necessary, identifying any additional phases of investigation, assessment, or remediation that may need to be carried out.

3.3 Scope of Investigation

The scope of works completed at this time is summarised in Table 3.1, overleaf, whilst the locations of the exploratory holes are shown on the appended investigation locations plan, Ref. 0425-03-001.

Table 3.1 - Summary of Site-Specific Ground Investigation Works

Element of Work	Date Completed	Investigation Position Reference	No. of Positions	Maximum Recorded Depth (m bgl)	Installations	Rationale
Percussive boring with in-situ SPT	7 th & 8 th May 2025	BH1 – BH10	10	3.0	GW1 – GW3	To inspect the underlying soils and obtain representative samples for laboratory analysis
Rotary Openhole Boring		RO1 – RO6	6	30.0	-	To confirm the depth to, thickness, and condition of shallow underlying coal seams

Intrusive fieldwork was undertaken in general accordance with the requirements of BS 5930:2015+A1:2020, BS 10175:2011+A2:2017, BS EN 1997-1:2004+A1:2013 ^[14] and BS EN 1997-2:2007 ^[15].

Strata descriptions of the soils encountered are in general compliance with BS EN ISO 14688-1:2002+A1:2013 ^[16], BS EN ISO 14688-2:2004+A1:2014 ^[17], and BS EN ISO 14689:2003 ^[18]. The individual strata depths and reduced levels recorded on the investigation logs are those from existing ground elevations. All survey data is based on that indicated on ADP drawing Ref: 22062D-01-P02, dated 17th August 2022 and is taken as guidance only.

3.4 Testing

Environmental

Environmental sampling was undertaken for the purposes of collecting representative samples of the on-Site soils for laboratory analysis. The intention of the testing was to establish the nature, concentration, and spatial distribution of any contamination present within the individual soil matrices encountered.

Soil samples were recovered from within the following approximate depth range: Ground Level-0.5m bgl, 0.5-1.0m bgl, and then at 1.0m centres thereafter, or as ground conditions required/allowed. All environmental soil samples were collected in a combination of 500ml plastic tubs with sealable lids, 250ml glass amber jars and 60ml glass VOC jars. Care was taken to minimise cross contamination between sampling events.

Where analysis was scheduled, testing of all samples was undertaken at the premises of Construction Testing Solutions Ltd. The analytical strategy adopted for the investigation was designed to provide an overall assessment of contaminant concentrations within the identified soil matrices, taking account of the potential contaminants of concern indicated in the preliminary CSM. The testing of the following principal analytes was therefore undertaken:

- 12 No. CLEA standard suite for metals/metalloids (including As, Ba, Bo, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn) and Thiocyanate;
- 12 No. pH, Soil Organic Matter and Total Organic Carbon;
- 12 No. Total and Water Soluble Sulphate, Sulphide, Total Sulphur, and Total Potential Sulphate;
- 12 No. Speciated Polycyclic Aromatic Hydrocarbon;
- 6 No. Speciated Total Petroleum Hydrocarbon, Monoaromatics and Oxygenates;
- 6 No. VOC;
- 6 No. SVOC;
- 12 No. Electrical Conductivity & Redox Potential;
- 12 No. Asbestos identification;
- 12 No. Monohydric Phenol (Total), and
- 2 No. Full Waste Acceptance Criteria (Single Stage 10:1 leachate extraction).

Geotechnical

With respect to the general material composition of the natural on-Site soils encountered, the following laboratory geotechnical tests were carried out:

- 19 No. Natural Water (Moisture) Content, and
- 19 No. Plasticity Indices (Atterberg Single Point).

All laboratory testing was carried out in accordance with current British Standard guidance ^[19,20] and other in-house procedure by Professional Soils Laboratory Limited ('PSL').

In-situ standard penetration testing ('SPT') ^[21] was undertaken at 1.0m centres in all percussive boreholes to establish a general understanding of the ground strength with depth (to refusal wherever possible) across the Site; refusal for SPT was taken to be where the penetration count N was 50.

3.5 Proven Ground Conditions

NOTE: The account given herein is based on the ground conditions observed during the investigation only. It is important to note that there is likely to be the potential for there to be lateral and/or vertical variation in the reported ground conditions between each of the investigation positions completed given the nature of the Coal Measures deposits to be encountered at this Site. This should be allowed for at the detailed design-phase stage.

A generalised summary of the lithologies encountered is given in Table 3.2, overleaf.

For a full description of the ground conditions recorded at each investigation position, reference should be made to the individual investigation records provided in Appendix A.

Table 3.2 - Summary of General Soils Profile

Lithology	Typical Descriptions (not limited to)
Made Ground (Reconstituted Ground)	<ul style="list-style-type: none"> - Brown sandy gravelly clay with much brick and brick fragments, some aggregate, concrete fragments and vegetation; - Brown sandy gravelly clay with concrete fragments;
Coal Measures	<ul style="list-style-type: none"> - Firm becoming stiff orange-grey-brown slightly sandy CLAY with mudstone lithorelicts; - Stiff grey mottled brown CLAY with mudstone lithorelicts; - Extremely weak light grey clayey thinly laminated weathered MUDSTONE with lithorelicts; - Extremely weak becoming very weak grey thinly laminated clayey weathered MUDSTONE with shale partings; - Very weak brown-grey-orange clayey thinly laminated weathered MUDSTONE with much lithorelicts; - Poor quality COAL.

As indicated in the aforementioned preliminary assessment report, it was noted that made ground soils associated with previous development were evident on-Site, although the actual thickness, composition, and environmental condition was unknown at that time. The underlying undisturbed natural strata were indicated to comprise Coal Measures sandstone and mudstone bedrock deposits, which were expected to be weathered within the near surface. On the basis of the ground investigation completed, the following may be given:

Made Ground

The Site is underlain by a thin mantle of made ground to broadly 0.5m thickness, but deepening locally to about 1.0m across part of the Site’s southern area (BH3 and BH4). Typically, the made ground soils were noted to comprise brown sandy gravelly clay with much brick, brick fragments, concrete fragments, aggregate, and some clinker.

Where the made ground was observed beneath the undisturbed areas of hard paving, notably across the far southern end of the Site, these clearly represent materials that were placed prior to the surfacing being completed. For the remainder of the Site, the made ground encountered likely represents a mixture of that placed beneath the surfacing that was once present, and that associated with more recent demolition works; some intermixing appears to have occurred. Vegetation masks much of the ground surface, but there is clear evidence of demolition material (e.g. bricks and concrete).

Coal Measures

The underlying natural soils represent a typical weathered profile routinely observed in Coal Measures deposits across the district and wider area.

Notwithstanding some localised variation with spatial extent and depth, the underlying and undisturbed natural strata were noted to typically comprise interbedded and discontinuous horizons of firm becoming stiff and stiff becoming very stiff thinly laminated slightly sandy slightly gravelly clays, with these having some sandstone, mudstone, and ironstone lithorelicts. Below these, from approximately 1.0-2.0m bgl, the soils typically transitioned into an extremely weak or very weak thinly laminated and dry highly weathered mudstone. Poor quality coal was interbedded in places and recorded in boreholes BH1 (1.2-1.8m bgl), BH3 (1.3-1.9m bgl), BH5 (from 2.3-2.5m bgl, base not proven), BH7 (2.1-2.6m bgl), and BH10 (2.1-2.6m bgl).

A summary of the soil matrices, based on field observations, is given in Table 3.3, below.

Table 3.3 - Summary of General Field Observations

Typical Description	Investigation Position and Recorded Depths (m bgl)
Firm becoming stiff CLAY	BH1 (0.4-1.2), BH2 (0.4-1.0), BH4 (1.0-1.7), BH5 (0.3-1.0), BH7 (0.3-1.5), BH8 (0.6-1.2), BH9 (0.5-1.5), BH10 (0.5-1.0)
Stiff becoming very stiff CLAY	BH3 (0.9-1.3), BH3 (1.9-2.6), BH4 (1.7-2.3+), BH5 (1.0-2.3), BH6 (0.6-1.5)
Extremely weak and/or Very weak thinly laminated MUDSTONE (+ = base not proven)	BH1 (1.8-3.0+), BH2 (1.0-3.0+), BH3 (2.6-3.0+), BH6 (1.5-2.0+), BH7 (1.5-2.1), BH7 (2.6-3.0+), BH8 (1.2-2.0+), BH9 (1.5-3.0+), BH10 (1.0-2.0), BH10 (2.6-3.0+)
COAL	BH1 (1.2-1.8), BH3 (1.3-1.9), BH5 (2.3-2.5+), BH7 (2.1-2.6), BH10 (2.1-2.6)

Groundwater

It may be reported that no groundwater was recorded in any of the investigation positions.

Seasonal variation due to fluctuations in groundwater levels should always be anticipated, although groundwater influx to shallow depth given the cohesive nature of the underlying natural strata and the Site's geographical placement is considered unlikely to occur.

Coal

Ground investigation data has been obtained from D&G so that an assessment of the mining legacy status of the Site may be made.

Based upon the data provided, it may be reported that six rotary openhole boreholes (RO1 to RO6) were advanced to a terminal depth of 30m bgl. The positions of the boreholes is indicated on the appended investigation locations plan, Ref. 0425-03-001.

Within the Coal Measures bedrock, coal was recorded in all six boreholes. In all instances only one bed was noted at shallow depth; this is assumed to be the Two Foot Coal.

No evidence of the Adby Coal was recorded at or around 20m bgl (where boreholes were advanced to 30m bgl), and no evidence of any other mining-induced instability or weakness was recorded either with depth. Risk from shallow coal mining legacy is not expected on the basis of available information.

The depths and thicknesses of the coal as encountered are summarised in Table 3.4, below.

Table 3.4 - Proven Coals

Borehole Position	Borehole Terminal Depth (m)	Depth to Top of Coal Mining Feature (m)	Depth to Base of Coal Mining Feature (m)	Thickness of Coal Mining Feature (m)	Comment
RO1	30.0	2.2	3.1	0.9	Thin intact coal recorded in all instances. Intact bedrock soils to terminal depths. No recorded working. No indicated loss of flushing medium.
RO2	30.0	1.8	2.8	1.0	
RO3	30.0	3.0	4.0	1.0	
RO4	15.0	4.5	5.5	1.0	
RO5	15.0	1.7	2.7	1.0	
RO6	15.0	2.9	3.9	1.0	

4 GEOTECHNICAL FIELD TESTING & MATERIAL PROPERTIES

Test data obtained from the ground investigation works completed for the Site has been assessed in order to allow for the classification of the on-Site cohesive soils and to identify the presence of any typical ranges, trends, and/or anomalies as may exist. The following data was assessed:

- Liquid and plastic limits (Atterberg).
- Water (moisture) contents, and
- In Situ Standard Penetration tests.

4.1 Soil Classification

Shrinkable soils such as clays are subject to changes in volume as their water (moisture) content increases or decreases, this being affected by seasonal change and/or other factors such as the water demand of trees. The resulting shrinkage or swelling of soil can cause subsidence or heave damage to foundations, the structures they support, and underground services.

Geotechnical laboratory index testing in conjunction with water content determination was carried out on representative samples of the Coal Measures deposits so that a basic assessment of the cohesive fraction could be established¹. All tests to determine the water content, liquid limit, plastic limit, and the plasticity index of the soil samples recovered were performed by PSL.

The results of the testing for the dataset are summarised in Table 4.1, below and overleaf, whilst a copy of the individual laboratory certification (Ref. PSL25/3614) is presented in Appendix B.

Table 4.1 - Summary of Natural Water Content & Atterberg Limits Results

Determinand	No. of Samples	Depth Range (m bgl)	Range (%) (mean value)	Comment
Water Content (W)	19	1.0 - 3.0	12.7 - 30.6* (22.4)	Typical range of values for weathered Coal Measures mudstone and sandstone deposits.
Liquid Limit (wL)			42 - 66 (52.3)	
Plastic Limit (Wp)			19 - 26 (22.4)	
Plasticity Index (Ip)			22 - 40** (29.9)	

Table Contd./

¹ The fine soil component represented by clay and silt and containing clay minerals (both alone and/or in mixture with coarser material) are typically classified according to their plasticity characteristics. This is determined by Atterberg Limits tests which are carried out on fine soils and any fine and medium sand particles to measure the liquid limit and plastic limit; this being in accordance with those methods prescribed in BS1377-2: 1990+Amendment No.1. The degree of plasticity of fine soils is classified using the following terms: non-plastic; low; intermediate, and high (after BS EN ISO 14688-2+A1: 2004+A1:2014).

Determinand	No. of Samples	Depth Range (m bgl)	Range (%)	Comment
Passing 425µm test sieve	19	1.0 - 3.0	98 - 100	Few samples as tested contained gravel.

* Moisture content of the samples at the time they were received by the laboratory.

** Plasticity index as determined by the laboratory, not the modified plasticity index²

Water Content, Plastic Limit, and Plasticity Index

As indicated in Table 4.1, above, the range of water content values within the overall dataset for the cohesive (clay and mudstone) samples analysed ranged between 12.7% and 30.6%. With respect to the broadly identified soil types, however, the breakdown in Table 4.2, below, may be given as:

Table 4.2 - Summary of Measured Water Contents

Description	Depth Range (m bgl)	Water Content Range (%)
Firm becoming stiff and Stiff becoming very stiff CLAY	1.0	16.8 - 30.6
Extremely weak and Very weak thinly laminated MUDSTONE	2.0 - 3.0	12.7 - 27.2

The data shows, as indicated on Figure 1 overleaf, that the water content within the upper horizons of clay is quite variable and has a wide range, whilst the underlying mudstone deposits exhibit a generally lower water content and a little less variance. The data is consistent with the field observations, in that the deeper soils were noticeably drier and more friable.

Unlike water content, there appears to be less distinction between the other index values, notably given the overlap between the water content and the plastic limits (see Figure 2, overleaf). On the basis of plasticity therefore, it would be expected for the weathered bedrock deposits as a whole to exhibit a typically medium to high strength profile, increasing with depth; this is consistent with the general field descriptions and observations made during the investigation, but variation should be expected.

² In accordance with current guidance (e.g. NHBC Standards [22]) shrinkable soils may be classified as containing more than 35% fine particles and having a modified plasticity index of 10%, or greater. Soils which fall below 10% may be regarded as being non-plastic.

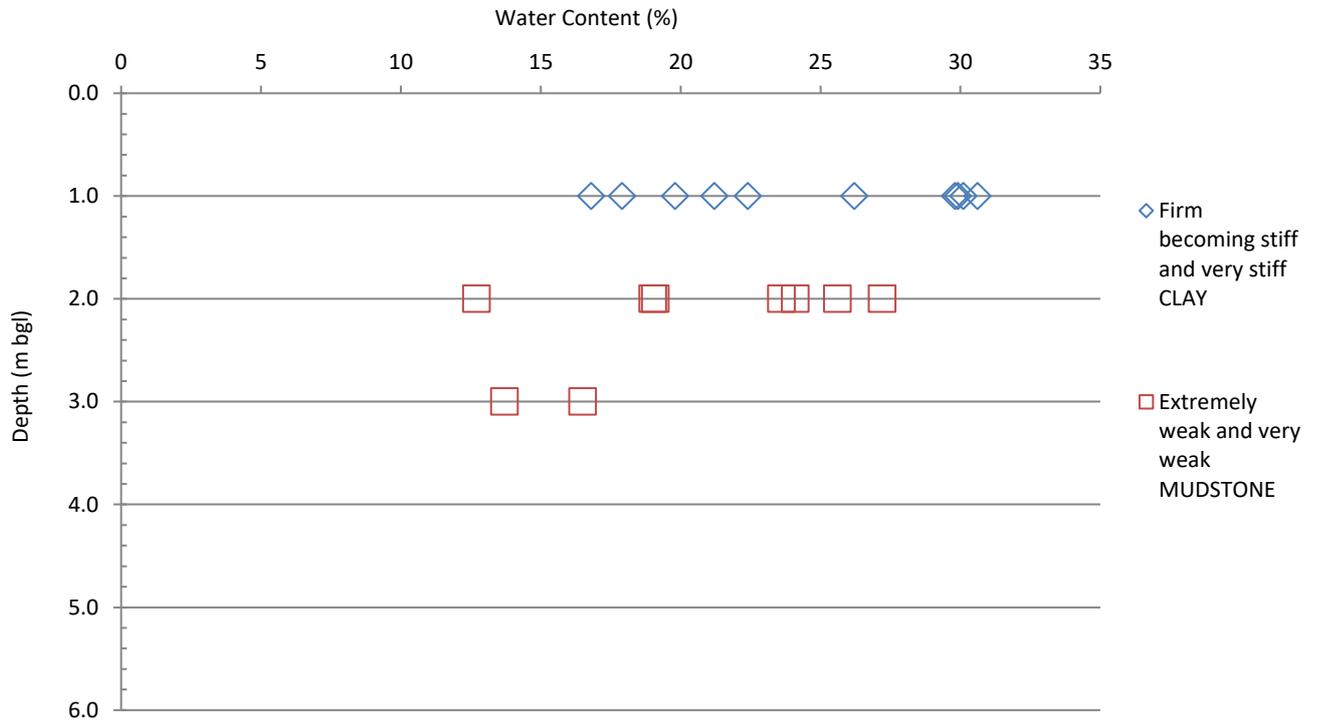


Figure 1 - Summary of Water Content (%) with Depth (m bgl)

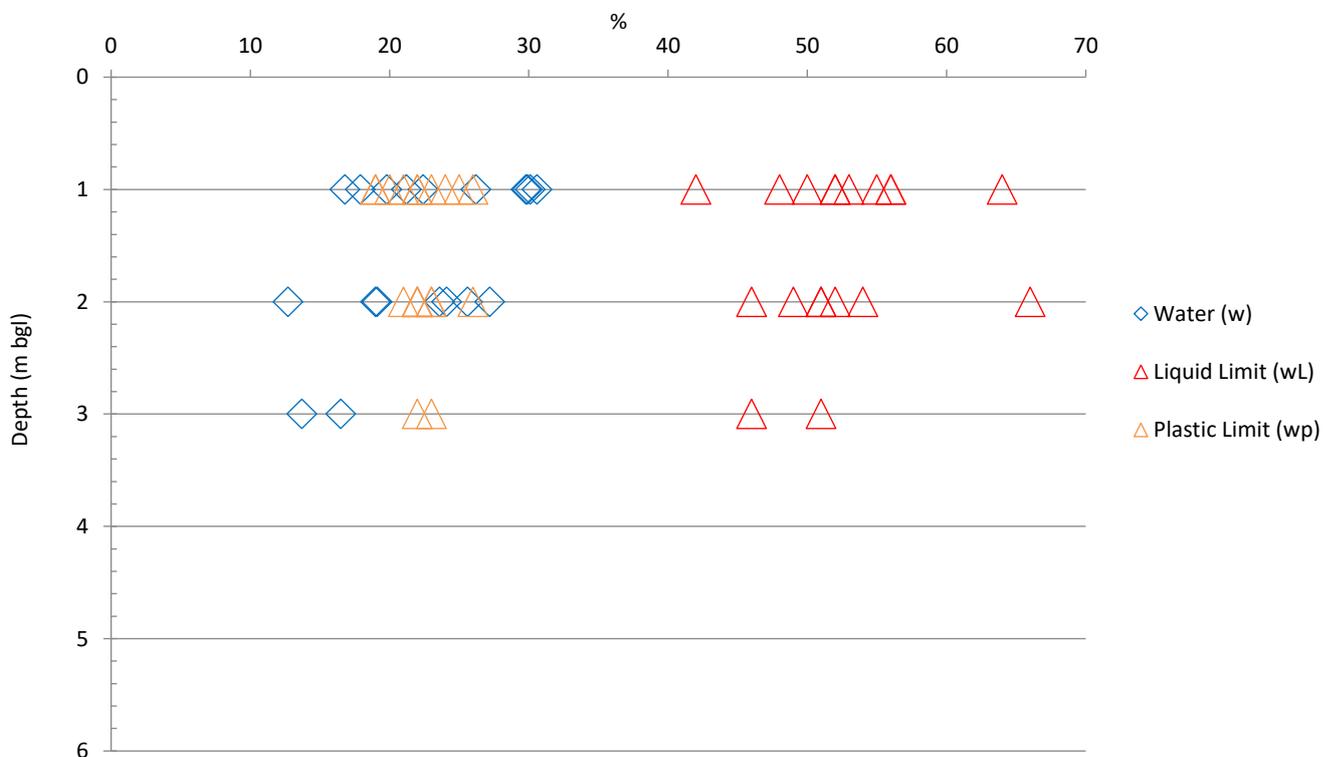


Figure 2 - Summary of Plasticity Data with Depth (m bgl)

4.2 Consistency & Liquidity Indices

Field observations indicate that the clay and mudstone deposits exhibit variable albeit typically medium to high undrained shear strengths. Correlation of the laboratory results in accordance with BS EN ISO 14688-2:2002+A1:2013 to determine the Consistency Index (I_c) of the cohesive fraction for these has been undertaken, where:

$$I_c = (w_L - w) / I_p$$

I_c = Consistency Index; w_L = Liquid Limit; w = Water Content; I_p = Plasticity Index

A summary of the data, ordered in relation to sample depth, is given in Table 4.3 below and overleaf. It is cautioned that variation between sampling positions will likely occur given the nature of the soils and their state of weathering. The given classifications should, therefore, be assumed to be an approximation of strength only.

Table 4.3 - Summary of Consistency Index Values for Clays and Silts

Sample	Depth (m bgl)	Water Content (%)	Liquid Limit (%)	Plasticity Index (%)	Consistency Index (I_c)*	General Field Observed Consistency
<i>Firm becoming stiff and Stiff becoming very stiff CLAY</i>						
BH1-DS1	1.0	16.8	56	34	1.15	Very Stiff
BH2-DS1	1.0	19.8	56	37	0.98	Stiff
BH3-DS1	1.0	30.1	48	24	0.75	Stiff
BH4-DS1	1.0	29.8	42	22	0.55	Firm becoming stiff
BH5-DS1	1.0	30.6	55	32	0.76	Stiff
BH6-DS1	1.0	21.2	52	30	1.03	Stiff becoming very stiff
BH7-DS1	1.0	26.2	50	25	0.95	Stiff
BH8-DS1	1.0	29.9	64	38	0.90	Firm
BH9-DS1	1.0	17.9	52	33	1.03	Stiff
BH10-DS1	1.0	22.4	53	32	0.96	Stiff
<i>Extremely weak and Very weak thinly laminated MUDSTONE</i>						
BH1-DS2	2.0	23.6	54	32	0.95	Extremely weak / Very weak^
BH2-DS2	2.0	12.7	46	23	1.45	
BH4-DS2	2.0	27.2	66	40	0.97	
BH6-DS2	2.0	19.1	51	29	1.10	
BH7-DS2	2.0	19.0	49	26	1.15	
BH8-DS2	2.0	24.1	52	31	0.90	

Table Contd./

Sample	Depth (m bgl)	Water Content (%)	Liquid Limit (%)	Plasticity Index (%)	Consistency Index (I_c)*	General Field Observed Consistency
BH10-DS2	2.0	25.6	51	29	0.88	Extremely weak / Very weak^
BH3-DS2	3.0	16.5	51	28	1.23	
BH9-DS2	3.0	13.7	46	24	1.35	

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* I_c : <0.25 = Very soft; 0.25 - 0.5 = Soft; 0.5 - 0.75 = Firm; 0.75 - 1.0 = Stiff; >1.0 = Very Stiff (BS EN ISO 14688-2:2002+A1:2013, Table 6).

^ Laboratory index testing implies that the strata has weathered to clay. Comparison of data is not valid for rock. Field observations for the weathered mudstone samples are consistent with descriptions given in Table 25 of BS 5930:2015+A1:2020 and are therefore regarded, in terms of UCS, as being extremely weak (0.6-1.0MPa) to very weak (1.0-5.0MPa).

For comparison, soil classification was assessed in accordance with the Liquidity Index. The liquidity index is a measure of soil consistency and strength at a given water content, this being the numerical difference between the natural water content and the plastic limit (expressed as a percentage ratio of the plasticity index), where:

$$I_L = (w - w_p) / I_p$$

I_L = Liquidity Index; w = Water Content; w_p = Plastic Limit; I_p = Plasticity Index

A summary of the data, ordered on the basis of depth, is given in Table 4.4, below and overleaf. For comparison, in situ SPT field test data and an estimate of undrained strength based on this is provided for information. As with the consistency data, the given classifications should be assumed to be an approximation of strength only.

Table 4.4 - Summary of Liquidity Index Values of Clays & Silts

Sample	Depth (m bgl)	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (I_L)*	SPT (N)^*	Estimated Undrained Strength (c_u) from SPT^^ (kPa)
<i>Firm becoming stiff and Stiff becoming very stiff CLAY</i>								
BH1-DS1	1.0	16.8	56	22	34	-0.15	20	100
BH2-DS1	1.0	19.8	56	19	37	0.02	21	105
BH3-DS1	1.0	30.1	48	24	24	0.25	19	95
BH4-DS1	1.0	29.8	42	20	22	0.45	12	60
BH5-DS1	1.0	30.6	55	23	32	0.24	15	75
BH6-DS1	1.0	21.2	52	22	30	-0.03	17	85
BH7-DS1	1.0	26.2	50	25	25	0.05	12	60
BH8-DS1	1.0	29.9	64	26	38	0.10	9	45
BH9-DS1	1.0	17.9	52	19	33	-0.03	11	55
BH10-DS1	1.0	22.4	53	21	32	0.04	10	50

Table Contd./

Sample	Depth (m bgl)	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (I_L)*	SPT (N)^*	Estimated Undrained Strength (c_u) from SPT^^ (kPa)
<i>Extremely weak and Very weak thinly laminated MUDSTONE</i>								
BH1-DS2	2.0	23.6	54	22	32	0.05	27	135
BH2-DS2	2.0	12.7	46	23	23	-0.45	50	250
BH4-DS2	2.0	27.2	66	26	40	0.03	50	250
BH6-DS2	2.0	19.2	51	22	29	-0.10	50	250
BH7-DS2	2.0	19.0	49	23	26	-0.15	20	100
BH8-DS2	2.0	24.1	52	21	31	0.10	50	250
BH10-DS2	2.0	25.6	51	22	29	0.12	17	85
BH3-DS2	3.0	16.5	51	23	28	-0.23	50	250
BH9-DS2	3.0	13.7	46	22	24	-0.35	29	145

FOR GUIDANCE ONLY:

* Suggested parameters for liquidity index (I_L) comparison are given in Waltham, A.C. (2009) *Foundations of Engineering Geology: Third Edition* as: >0.5 = Soft; 0.2 - 0.5 = Firm; -0.1 - 0.2 = Stiff; -0.4 - -0.1 = Very Stiff; < -0.4 = Hard.

^* Uncorrected numerical in situ SPT 'N' value recorded in the field.

^^ Estimated shear strength is based on the Stroud Correlation ^[23,24,25], conservatively assuming $c_u = f_1 \times$ uncorrected SPT (N) where f_1 is 5.0 (see 4.2, below).

4.3 Volume Change Potential

The plasticity index results have been assessed in accordance with NHBC guidance. The Standards issued by the NHBC allow for an assessment of the index data so that a modified plasticity index (I'_p) may be calculated; this is expressed as the plasticity index multiplied by the percentage of particles less than 425 μ m. The resultant Volume Change Potential (VCP) is expressed using the following terms: High, Intermediate or Low.

For pure clay soils and other soils with 100% of particles less than 425 μ m the modified result will be the same, however, for mixed materials where gravelly clay soils are derived from weathered underlying bedrock material, such as mudstone or sandstone, the use of the modified plasticity index can often result in a more economic foundation design.

A summary of the VCP for the samples tested is given in Table 4.5, overleaf.

Table 4.5 - Summary of Volume Change Potential

Sample	Depth (m bgl)	Plasticity Index (%)	% Passing 425µm	I_p^*	Volume Change Potential
<i>Firm becoming stiff and Stiff becoming very stiff CLAY</i>					
BH1-DS1	1.0	34	100	34	Intermediate
BH2-DS1	1.0	37	100	37	Intermediate
BH3-DS1	1.0	24	95	22.8	Intermediate
BH4-DS1	1.0	22	98	21.56	Intermediate
BH5-DS1	1.0	32	100	32	Intermediate
BH6-DS1	1.0	30	100	30	Intermediate
BH7-DS1	1.0	25	90	22.5	Intermediate
BH8-DS1	1.0	38	100	38	Intermediate
BH9-DS1	1.0	33	100	33	Intermediate
BH10-DS1	1.0	32	100	32	Intermediate
<i>Extremely weak and Very weak thinly laminated MUDSTONE</i>					
BH1-DS2	2.0	32	100	32	Intermediate
BH2-DS2	2.0	23	100	23	Intermediate
BH4-DS2	2.0	40	100	40	High
BH6-DS2	2.0	29	100	29	Intermediate
BH7-DS2	2.0	26	100	26	Intermediate
BH8-DS2	2.0	31	100	31	Intermediate
BH10-DS2	2.0	29	100	29	Intermediate
BH3-DS2	3.0	28	98	27.44	Intermediate
BH9-DS2	3.0	24	100	24	Intermediate

* <10% = Non-plastic. 10-19% = Low. 20-39% = Intermediate. 40% & greater = High (after NHBC: 2024).

The result of the VCP assessment indicate that the underlying clay soils have an generally intermediate plasticity, but for there to be some high plasticity material. The highest reported VCP should be adopted in construction where foundations lie within influencing distance of existing, removed, or proposed trees and planting.

4.4 In Situ Standard Penetration Testing

Standard Penetration Testing ('SPT') was carried out in each of the percussive boreholes to obtain and understanding of the general strength profile of the underlying soils with increasing depth. All (uncorrected) penetration data is presented on the individual borehole records in Appendix A, whilst a graphical representation of the data, presented as 'step diagrams', is also provided.

The SPT test has become one of the most frequently used *in situ* ground investigation tools to determine density and aid in the assessment of the strength profile of granular deposits, weak rocks, and fine (cohesive) soils. There has been much debate (e.g. Stroud, Stroud & Butler, Charles [26], and Tomlinson [27]) over the use of such data however, with research dating back to the mid 1970's where Stroud investigated and established that there was a simple relationship between the SPT N value collected in the field, undrained shear strength (c_u), and the plasticity index (I_p) of cohesive overconsolidated soils, amongst other parameters. The outcome of that assessment is indicated in Figure 3, below.

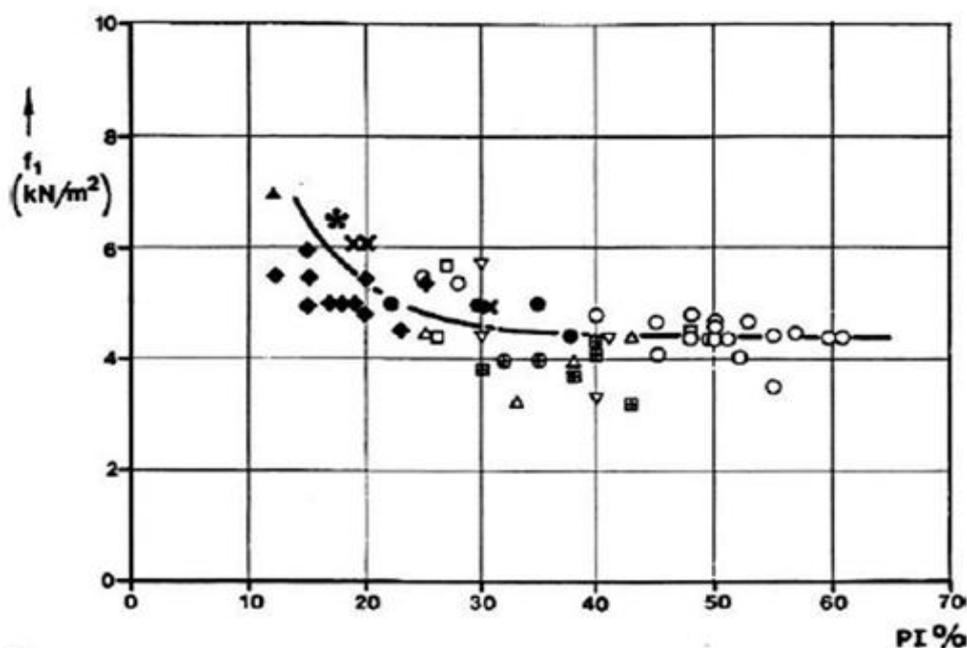


Figure 3 – Relationship between mass shear strength, plasticity and SPT (after Stroud, 1975)

In reviewing the various research articles and publications that sought to further knowledge of this matter, it is evident that it became the norm to adopt a 'rule of thumb' approach, based on the Stroud data, when seeking to estimate undrained shear strength values for cohesive soils from SPT N data. Although various empirical relationships have since been postulated, the general approach has been to multiply N by an independent factor, or f_1 value as it was characterised, so that undrained shear strength may be determined as $c_u = f_1 \times N$. The f_1 value to be adopted is widely reported to be 5.0 (as kN/m²).

In providing brief commentary on the SPT data collected for this Site, N values measured during the investigation at each of the incremental test depths that were achieved ranged between: 9 and 21 at 1.0m bgl (average = 14.6), 17 and 50 at 2.0m bgl (average = 36.2) and 50 at 3.0m bgl. Further advancement of the boreholes when refusal at SPT N = 50 was achieved was not possible due to the penetration resistance encountered.

Although data presented in the various studies has indicated, for fine soils, that there appears to be little demonstrable relationship between SPT N and the undrained shear strength, or indeed

other parameters such as the coefficient of volume compressibility, in assuming a conservative conversion of SPT N by an f_1 of 5.0, data given above in Table 4.4 is tentatively presented. As with other geotechnical tests, however, the interpretation of in situ penetration test results is not definitive and should be regarded as guidance only given the variations that will undoubtedly occur between test positions, depths, and the fabric of the soils the tests are carried out in.

Although for this Site refusal was achieved at relatively shallow depth, there is scatter within the SPT dataset which will be associated with localised variations in the degree of weathering and the impact of granular material and/or other lithorelicts on the tests. The data suggests, however, that c_u versus water content shows an underlying trend for a decline in strength as the water content increases; this would be expected of cohesive soils. A plot of this relationship is given as Figure 4, below.

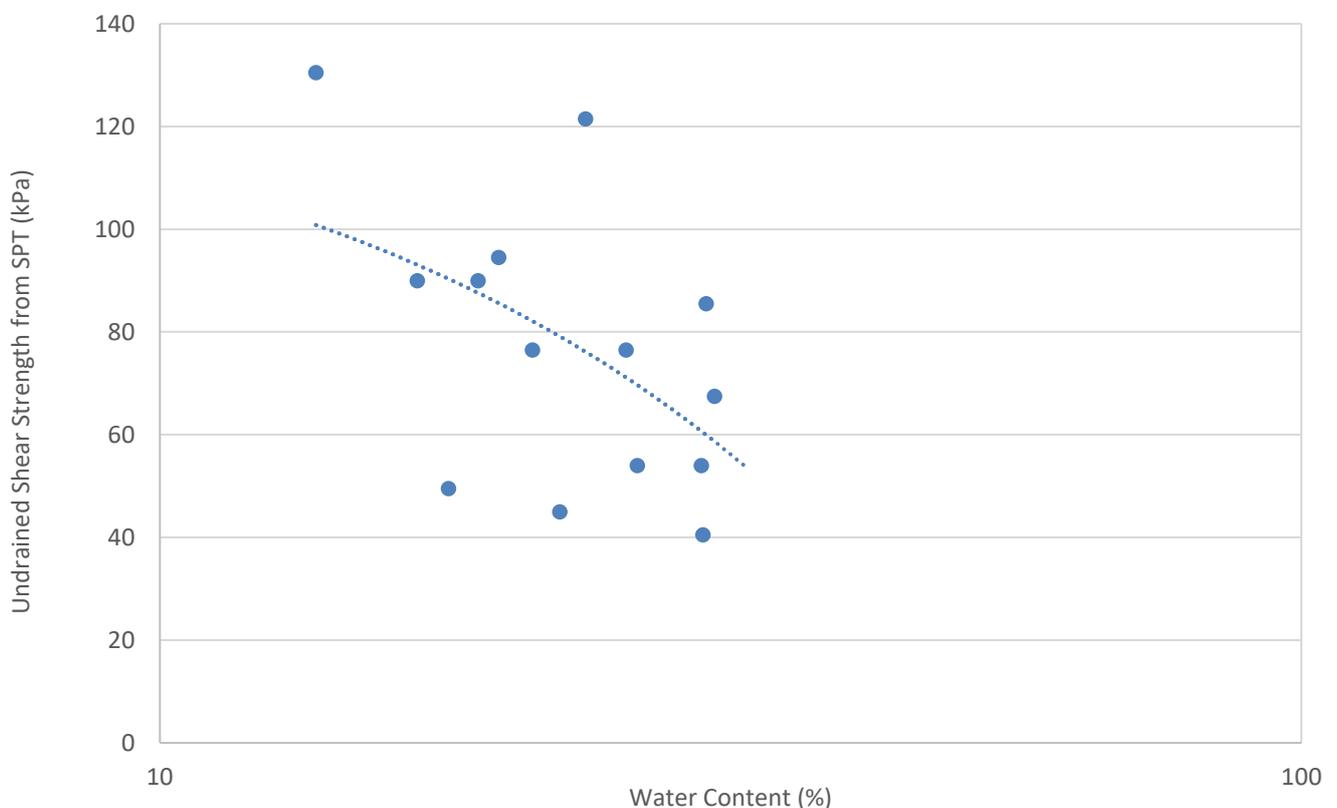


Figure 4 – Undrained Shear Strength with Water Content

Overall, it is considered that caution should be applied when using SPT N data given the variation in the character of the soils encountered and the variability/uncertainty in the bearing capacities they offer. Data should therefore be assessed within the context of all other Site-based observations, the laboratory plasticity data, any predicted settlement characteristics, and in relation to the development proposals (e.g. line loads that need to be achieved etc).

5 ENVIRONMENTAL TESTING

5.1 Preamble

Representative disturbed samples of the made ground and the underlying natural strata were selected for laboratory chemical analysis. These samples were analysed for the suite of contaminants outlined in Section 3.4 above. A summary of the pertinent test results is given in the following tables, whilst a copy of the individual certification (Ref. L25/04777/GRS – 25-65497) is presented in full in Appendix C.

5.2 Guidance for Laboratory Analytical Results - Assessment Criteria

Soil – Human Health

Change to UK human health risk assessment has seen the introduction of DEFRA's Category 4 Screening Levels (C4SL) ^[28] and the LQM/CIEH Suitable 4 Use Levels (S4UL) ^[29]. Both sets of guidance aim to provide Generic Assessment Criteria ('GAC') on the basis of updated assumptions relating to the modelling of human exposure to soil contaminants for the standard land uses: residential (with or without home-grown produce), allotments, commercial and public open space. With reference to the Site, the results of the chemical testing appended herein have been assessed as part of an environmental risk assessment against a number of potential receptors, considering risks to human health and the built environment. In this instance, comparison against the residential with home-grown produce GAC values was undertaken; these values are provided in Appendix D for reference.

The general consensus between contaminated land practitioners has been that C4SL values, which are based on the 'Low Level of Toxicological Concern', are less cautious than the revised 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 ^[30], SR3 and the existing CLEA software, Groundsmiths are of the mind that the LQM/CIEH 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 updated exposure assumptions presented in DEFRA's C4SL guidance, provide a better starting point from which to generate GAC that can be applied to development sites and are 'suitable for use' under the planning system.

It should be noted that both the C4SL and S4UL GAC values are based on sandy 'loam'. The C4SL values are derived for loam soils having a Soil Organic Matter (SOM) content of 6.0%, although more often than not soils on development sites are different in nature and have SOM contents much less than this. Whilst this is not a problem for metals and metalloids, as their environmental behaviour is not dependent on soil type or SOM content and may be applied directly, the algorithms used to model plant uptake and volatilisation for organic contaminants (such as PAH for instance) do take account of SOM in the soil; it is considered, therefore, that the application of SOM at 6.0% by default may lead to sites being incorrectly assessed in some instances.

In the same way that the LQM/CIEH values take account of SOM at 1.0%, 2.5% and 6.0% for organic contaminants (which better reflects soils routinely encountered in the UK), Groundsmiths adjust the GAC values we apply to contaminated land assessment in CLEA Version 1.071 ^[31], utilising the toxicological updates presented in the aforementioned documents. Our approach

adopts the same SOM grouping as LQM/CIEH, but with some further minor adjustments to reflect a more granular component. On the basis of the observed ground conditions recorded during the investigation and the measured SOM values reported by the laboratory, a conservative value of 2.5% has been adopted for the assessment of organic contaminants in the natural strata whilst for the made ground a value of 6.0% is used. These GAC values would be more conservative when applied to cohesive deposits given the effects of retardation, however.

5.3 Laboratory Analytical Results

A summary of the complete laboratory chemical test results is presented on the master datasheet in Appendix C, whilst an individual breakdown of the results is given in Tables 5.1 to 5.4, below and overleaf.

Table 5.1 - Inorganic Contaminant Concentrations (Made Ground)

Contaminant of Concern	GAC [^] (mg/kg) Cc	Contaminant Concentration Range (mg/kg)	Sample Size (n)	UCL ₉₅ (mg/kg)	No. Of Samples >GAC	Outliers (mg/kg)	Result
Metals							
Arsenic	37*	<10 (dl) - 31	5	na	0	na	<Cc
Barium	1,300 ^{^^}	57 - 950	5	na	0	na	<Cc
Boron	290**	<2.5 (dl)	5	na	0	na	<Cc
Cadmium	22*	0.5 - 9.9	5	na	0	na	<Cc
Chromium (III)	910**	<1.0 (dl) - 270	5	na	0	na	<Cc
Chromium (VI)	21*	<1.0 (dl)	5	na	0	na	<Cc
Copper	2,400**	36 - 400	5	na	0	na	<Cc
Mercury (inorganic)	40**	<2.5 (dl)	5	na	0	na	<Cc
Nickel	130**	13 - 51	5	na	0	na	<Cc
Lead	200*	13 - 410	5	637.89	3	none	≥Cc
Selenium	250**	<8 (dl)	5	na	0	na	<Cc
Zinc	3,700**	51 - 960	5	na	0	na	<Cc

[^] Published residential with home-grown produce GAC values applied for 1-6% SOM (Cc = Critical Concentration).

(dl) Laboratory detection limit.

na Not applicable as contaminant concentrations are below individual GAC values.

* DEFRA (2014). Development of Category 4 Screening Levels (SP1010).

** LQM/CIEH (2015). S4UL for Human Health Risk Assessment.

^{^^}CL:AIRE (2010). Soil Generic Assessment Criteria for Human Health Risk Assessment. ISBN 978-1-905046-20-1.

Table 5.2 - Inorganic Contaminant Concentrations (Natural Strata)

Contaminant of Concern	GAC [^] (mg/kg) Cc	Contaminant Concentration Range (mg/kg)	Sample Size (n)	UCL ₉₅ (mg/kg)	No. Of Samples >GAC	Outliers (mg/kg)	Result
Metals							
Arsenic	37*	<10 (dl) - 12	7	na	0	na	<Cc
Barium	1,300 ^{^^}	66 - 460	7	na	0	na	<Cc
Boron	290**	<2.5 (dl)	7	na	0	na	<Cc
Cadmium	22*	<0.2 (dl) - 1	7	na	0	na	<Cc
Chromium (III)	910**	<1.0 (dl) - 9.1	7	na	0	na	<Cc
Chromium (VI)	21*	<1.0 (dl)	7	na	0	na	<Cc
Copper	2,400**	19 - 58	7	na	0	na	<Cc
Mercury (inorganic)	40**	<2.5 (dl)	7	na	0	na	<Cc
Nickel	130**	7.5 - 26	7	na	0	na	<Cc
Lead	200*	16 - 47	7	na	0	na	<Cc
Selenium	250**	<8.0 (dl)	7	na	0	na	<Cc
Zinc	3,700**	17 - 66	7	na	0	na	<Cc

[^] Published residential with home-grown produce GAC values applied for 1-6% SOM (Cc = Critical Concentration).

(dl) Laboratory detection limit.

na Not applicable as contaminant concentrations are below individual GAC values.

* DEFRA (2014). Development of Category 4 Screening Levels (SP1010).

** LQM/CIEH (2015). S4UL for Human Health Risk Assessment.

^{^^}CL:AIRE (2010). Soil Generic Assessment Criteria for Human Health Risk Assessment. ISBN 978-1-905046-20-1.

Table 5.3 - Speciated PAH Contaminant Concentrations (Made Ground)

Contaminant of Concern	GAC [^] (mg/kg) Cc	Contaminant Concentration Range (mg/kg)	Sample Size (n)	UCL ₉₅ (mg/kg)	No. Of Samples >GAC	Outliers	Result
Acenaphthene	1,080	<0.02 (dl) - <0.2	5	na	0	na	<Cc
Acenaphthylene	900	<0.02 (dl) - 0.16	5	na	0	na	<Cc
Anthracene	10,700	<0.02 (dl) - 0.64	5	na	0	na	<Cc
Benzo (a) anthracene	13	<0.02 (dl) - 1.3	5	na	0	na	<Cc
Benzo (a) pyrene	3	<0.02 (dl) - 1.4	5	na	0	na	<Cc
Benzo (b) fluoranthene	3.7	<0.02 (dl) - 1.7	5	na	0	na	<Cc

Table Contd./

Contaminant of Concern	GAC [^] (mg/kg) Cc	Contaminant Concentration Range (mg/kg)	Sample Size (n)	UCL ₉₅ (mg/kg)	No. Of Samples >GAC	Outliers	Result
Benzo (g,h,i) perylene	350	<0.02 (dl) - 1.3	5	na	0	na	<Cc
Benzo (k) fluoranthene	100	<0.02 (dl) - 0.66	5	na	0	na	<Cc
Chrysene	27	<0.02 (dl) - 1.8	5	na	0	na	<Cc
Dibenzo (a,h) anthracene	0.30	<0.02 (dl) - 0.28	5	na	0	na	<Cc
Fluoranthene	890	<0.02 (dl) - 2.5	5	na	0	na	<Cc
Fluorene	850	<0.02 (dl) - 0.05	5	na	0	na	<Cc
Indeno (1,2,3,-cd) pyrene	41	<0.02 (dl) - 0.85	5	na	0	na	<Cc
Naphthalene	5.5	<0.02 (dl) - 2.0	5	na	0	na	<Cc
Phenanthrene	440	<0.02 (dl) - 1.4	5	na	0	na	<Cc
Pyrene	2,000	<0.02 (dl) - 2.2	5	na	0	na	<Cc

[^] [CLEA/LQM/CIEH, 2015] Calculated for a residential with home-grown produce end-use scenario in CLEA v1.071. GAC range for 6.0% SOM unless stated otherwise. Values will be more conservative for cohesive soils due to the effects of retardation.

(dl) - Laboratory detection limit. (Cc = Critical Concentration).

na - Not applicable as contaminant concentrations are below or equal to individual GAC values.

Table 5.4 - Speciated PAH Contaminant Concentrations (Natural Strata)

Contaminant of Concern	GAC [^] (mg/kg) Cc	Contaminant Concentration Range (mg/kg)	Sample Size (n)	UCL ₉₅ (mg/kg)	No. Of Samples >GAC	Outliers	Result
Acenaphthene	490	<0.02 (dl)	7	na	0	na	<Cc
Acenaphthylene	400	<0.02 (dl)	7	na	0	na	<Cc
Anthracene	5,400	<0.02 (dl)	7	na	0	na	<Cc
Benzo (a) anthracene	11	<0.02 (dl)	7	na	0	na	<Cc
Benzo (a) pyrene	2.7	<0.02 (dl)	7	na	0	na	<Cc
Benzo (b) fluoranthene	3.3	<0.02 (dl)	7	na	0	na	<Cc
Benzo (g,h,i) perylene	340	<0.02 (dl)	7	na	0	na	<Cc
Benzo (k) fluoranthene	93	<0.02 (dl)	7	na	0	na	<Cc
Chrysene	22	<0.02 (dl)	7	na	0	na	<Cc
Dibenzo (a,h) anthracene	0.28	<0.02 (dl)	7	na	0	na	<Cc
Fluoranthene	560	<0.02 (dl)	7	na	0	na	<Cc

Table Contd./

Contaminant of Concern	GAC [^] (mg/kg) Cc	Contaminant Concentration Range (mg/kg)	Sample Size (n)	UCL ₉₅ (mg/kg)	No. Of Samples >GAC	Outliers	Result
Fluorene	390	<0.02 (dl)	7	na	0	na	<Cc
Indeno (1,2,3,-cd) pyrene	36	<0.02 (dl)	7	na	0	na	<Cc
Naphthalene	2.3	<0.02 (dl)	7	na	0	na	<Cc
Phenanthrene	220	<0.02 (dl) - 0.04	7	na	0	na	<Cc
Pyrene	1,200	<0.02 (dl) - 0.05	7	na	0	na	<Cc

[^] [CLEA/LQM/CIEH, 2015] Calculated for a residential with home-grown produce end-use scenario in CLEA v1.071. GAC range for 2.5% SOM unless stated otherwise. Values will be more conservative for cohesive soils due to the effects of retardation.

(dl) - Laboratory detection limit. (Cc = Critical Concentration).

na - Not applicable as contaminant concentrations are below or equal to individual GAC values.

Metals & Metalloids

Made Ground

Elevated lead concentrations of between 380mg/kg and 410mg/kg were measured within the shallow-depth made ground samples recovered from boreholes BH2, BH4, and BH7, all of which exceed the GAC threshold of 200mg/kg. No other elevated concentrations were recorded. A summary of the statistical assessment of the data is provided in Table 5.5, below, whilst the statistical output for this contaminant of concern is provided in Appendix C.

Table 5.5 - Inorganic Contaminant Data (Made Ground)

Contaminant of Concern	GAC (mg/kg) Cc [^]	Measured Elevated Concentration Range (mg/kg)	Sample Mean of Dataset	Upper Confidence Limit (95 th %ile) mg/kg	Distribution	Statistical Approach
Lead	200	380 - 410	242	637.89	Non-Normal	Chebychev

[^] Published residential with home-grown produce GAC values applied for 1-6% SOM (Cc = Critical Concentration).

There are no outliers within the metal/metalloid dataset, and therefore all data points have been included. Since elevated lead concentrations were recorded in three of the five made ground samples tested, it would be reasonable to conclude that the made ground soils to be encountered across the Site in general are contaminated and present a risk to the proposed development.

Natural Strata

No elevated inorganic contaminant concentrations were measured above the allowable residential GAC values within any of the natural strata samples tested.

Organics – PAH

Made Ground

No elevated PAH concentrations were measured above the allowable residential GAC values within any of the made ground samples tested.

Natural Strata

No elevated PAH concentrations were measured above the allowable residential GAC values within any of the natural strata samples tested.

Organics (Other)

All concentrations of phenol were measured at less than the laboratory limits of detection (<1.0mg/kg) for all twelve made ground and natural strata samples tested.

All TPHCWG, BTEX, MTBE, VOC, and SVOC concentrations were below individual GAC in all samples tested.

Asbestos

No positive asbestos fibre identification was made in any of the made ground or natural strata samples tested.

5.4 Contamination & Performance of Cementitious Products

Made ground and natural strata samples were analysed for general inorganics including water soluble sulphate so that an assessment of risk could be made in relation to those guidelines prescribed in BRE Special Digest 1 ^[32]. A copy of the laboratory test certification is presented in Appendix C, whilst a summary of the dataset is given in Table 5.6, below.

Table 5.6 - Summary of Sulphate & Sulphide Concentrations

Analytical Parameter	Units	Allowable Concentration	Concentration Range	
			Made Ground	Natural Strata
pH	pH units	<5	5.3 - 10.6	5.1 - 7.7
Total Sulphate (as SO ₄)	mg/kg	2,400	100 - 3,600	100 - 500
Water Soluble Sulphate (as SO ₄)	g/l (mg/l)	0.5	0.029 (29) - 0.074 (74)	<0.01 (<10) - 0.084 (84)

Table Contd./

Analytical Parameter	Units	Allowable Concentration	Concentration Range	
			Made Ground	Natural Strata
Total Potential Sulphate (TPS)	%	0.24 [^]	0.03 - 0.46	0.04 - 0.99
Sulphide	mg/kg	-	<15 (dl) - 110	<15 (dl) - 20

(dl) – laboratory detection limit.

[^] This refers to the upper DS-1 TPS value and is applicable only to locations where concrete will be exposed to sulphate ions, which may result from the oxidation of sulphides such as pyrite following ground disturbance (e.g. within colliery spoil materials, opencast back fill etc). There is no evidence to suggest that such conditions prevail at the subject Site.

A qualitative assessment of the data was carried out in accordance with Sections C4 and C5 of BRE SD1, to assess whether the soil conditions at the Site would be aggressive to any new buried concrete products. In accordance with Table C2 of BRE SD1 and assuming a worst case water soluble sulphate concentration (based on a 2:1 water/soil extract) of 84mg/l for the underlying natural strata, a Design Sulphate Classification of DS1 and an ACEC of AC-1s is indicated. This is based on classification for a brownfield location and having a static groundwater regime at pH ≥ 2.5 .

Risk for new in-ground concrete products to be exposed to oxidisable sulphides (OS) is not expected, since the levels of sulphate and TPS in the natural strata are typically low to very low and the made ground soils will be removed to facilitate the development. Due consideration for the potential for risk should always be allowed for by the Designing Engineer at the detailed design-phase stage, although precautions are considered unlikely to be required. Due consideration will also need to be given to the durability and structural strength of all in-ground concrete products to be used. Design parameters for concrete should be discussed with the Designing Engineer, utilising the laboratory data presented herein. The Designing Engineer should refer to BS 8500-1 ^[33] or any other relevant guidance to determine the correct concrete mix, as required.

5.5 Waste Acceptance Criteria (WAC)

Where arisings are generated during redevelopment works, and they are intended for disposal to landfill, there is a requirement to determine if they would be classified as inert, non-hazardous, or hazardous. Similarly, this would apply if soils to be removed as part of any remedial activity were to be disposed to landfill. Given that it is a statutory requirement to ensure that wastes are characterised to meet specific acceptance criteria if disposal to landfill is to be undertaken, Waste Acceptance Criteria (WAC) testing was carried out on a representative sample of the underlying natural strata. Technical Guidance WM3³ 'Guidance on the Classification and Assessment of Waste, (1st Edition)', which was introduced on the 1st July 2015 and is adapted from the third edition of Technical Guidance WM2, sets out the requirement for

³ WM3 provides guidance on waste classification and the assigning of classification codes (also referred to as List of Waste or European Waste Catalogue codes) for hazardous and non-hazardous waste materials.

classification. The classification assesses the composition of the material and determines the concentrations of hazardous substances within it, in relation to particular thresholds.

Two soil samples were scheduled for full WAC (single stage 10:1 leachate) analysis to determine whether soils considered likely to go to landfill (i.e. the made ground and arisings from foundation excavations) meet the acceptance criteria for inert waste disposal. This testing is recommended by the Environment Agency and replaced the traditional two stage batch test. A summary of the samples tested for WAC is given in Table 5.7, below. A copy of the individual WAC test results is provided in Appendix C for reference.

Table 5.7 - Summary of Soils Tested for WAC

Sample	Typical Description*
BH2-ES2 (1.0)	Extremely weak grey mottled brown clayey weathered MUDSTONE. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
BH7-ES1 (0.2)	MADE GROUND: Brown sandy gravelly clay with hardcore and clinker (RECONSTITUTED GROUND).

* Where soils are to be disposed, classification data and the general spectrum testing presented herein will need to be submitted to the disposal site(s) for individual assessment. Any other specific requirements of the receiving site(s) would need to be met as required, prior to material disposal.

5.6 UKWIR

UK Water Industry Research ('UKWIR')^[34] published guidance in relation to the selection of appropriate water supply pipes to be laid at brownfield sites. This guidance supersedes the Water Regulations Advisory Scheme ('WRAS') Information and Guidance Note 9-04-03 "Laying Pipes in Contaminated Land", which has been withdrawn.

In general accordance with the testing requirements of the UKWIR guidance, representative samples of the underlying undisturbed natural strata (in which potable water supply pipes would be laid) were recovered from depths between 0.5m bgl and 2.0m bgl⁴; as indicated herein, made ground soils are to be removed to facilitate development.

Notwithstanding the general suite chemical testing reported above, testing for UKWIR comprised those determinands summarised in Table 5.8, overleaf [NOTE: *Given that not all contaminants assessed under UKWIR were assumed to be present at the initial risk assessment stage, not all determinands have values that may be assigned to them*].

⁴ UKWIR guidance states that water pipes are normally laid between 0.75m and 1.35m from finished ground level to crown of pipe. Samples taken for testing shall represent a) the soil in which the pipes are to be laid, and b) those to at least 500mm below the underside of the proposed pipes. Where proposed pipe depths are unknown at the time of investigation, soil samples representative of the ground conditions between surface level and 1.5m below finished ground level shall be taken as a minimum.

Table 5.8 - Summary of UKWIR Contaminant Data

Determinand	PE Threshold (mg/kg)	Laboratory Limit of Detection	Concentration Range (mg/kg)
			Natural Strata
Total VOC	0.5	0.005	<dl
Total BTEX and MTBE	0.1	0.005	<dl
Total SVOC (excluding PAH)	2.0	Variable	<dl
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2.0	Variable	<dl
EC10-EC16 Aliphatic and Aromatic Hydrocarbons	10.0	1 (EC10-12)	<dl - 2.3
		2 (EC12-16)	<dl - 4.2
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	8 (EC16-35 Aliphatic)	<dl - 8.3
		10 (EC16-35 Aromatic)	<dl - 9.1
Phenol (from SVOC)	2.0	0.2	<dl
Cresols and Chlorinated Phenol (from SVOC)**	2.0	0.1-0.3	<dl
Ethers	0.5	Variable	Not identified
Nitrobenzene	0.5	0.3	<dl
Ketones	0.5	-	Not identified
Aldehydes	0.5	-	Not identified
Corrosiveness^^ (Electrical conductivity, redox potential (Eh) and pH)	Conductivity (µS/cm)	10	68 - 135
	Redox (mV)	-800	82 - 248
	pH (pH units)	No LoD	5.1 - 7.7

<dl – Laboratory limit of detection.

**Sum of 2-Chlorophenol, 2-Methylphenol, 4-Methylphenol, 2-Nitrophenol, 2,4-Dimethylphenol, 2,4-Dichlorophenol, 4-Chloro-3-Methylphenol, 2,4,6-Trichlorophenol and 2,4,5-Trichlorophenol.

^^For wrapped steel (ground is corrosive if pH is <7 and conductivity is >400µS/cm); for wrapped ductile iron (ground is corrosive if pH is <5, redox is not neutral and conductivity is >400µS/cm); for copper (ground is corrosive if pH is <5 or >8 and redox is positive).

5.7 Ground Gas

Ground gas monitoring in accordance with current guidance ^[35] is currently underway, utilising the piezometers installed as part of the ground investigation.

Once the monitoring period has been completed, all results will be provided under separate cover with any recommendation for mitigation being made at that time.

6 PHASE 2 ENVIRONMENTAL APPRAISAL

A phase of intrusive ground investigation has been completed at the Site, with this being to facilitate the proposed development. The following updated CSM is therefore based on the ground investigation data presented herein.

The revised CSM provided below summarises Groundsmiths' current understanding of the surface and sub-surface features to the Site, the identified contaminant sources and concentrations, their potential transport pathways, and sensitive receptors.

Ground Conditions & Contamination Status

The ground investigation completed within the remit of this assessment identified the presence of a variable thickness of anthropogenic soil associated with previous development (and demolition), and for the underlying natural and undisturbed material (i.e. clay over thinly laminated mudstone) to be consistent with the weathered upper layers of the Coal Measures bedrock.

No perched or shallow-depth groundwater was recorded during the investigation in the observed soils.

Contaminant levels within the on-Site made ground materials indicate the presence of lead to in excess of the critical concentration. There was no apparent pattern to the spatial distribution of the contamination identified within the made ground, so it should be assumed to be Site-wide and therefore be treated as such. It is understood, however, that due to required finished levels in development, the made ground materials are to be removed from Site in their entirety.

Contaminant levels within the underlying natural strata were very low or measurable at less than the limits of laboratory detection.

No asbestos fibres were identified in any of the made ground or natural strata samples.

Notwithstanding some TPS determinations in excess of 0.24%, risk from sulphate with respect to new buried concrete products in the underlying natural strata appears to be low.

Risk from ground gases is to be confirmed following the completion of on-Site monitoring.

Revised Conceptual Site Model & Risk Assessment

Within the context of this Report, a revised risk assessment has been undertaken on the basis that the 'suitable for use' approach remains aligned with the Site being redeveloped for a residential with home-grown produce end use (all dwellings are to have private garden curtilage).

The identified potential contaminants and receptors have been considered in relation to the pathways that may link them, but for the Site's post-development case following removal of the made ground. The resultant contaminant linkages are given in Table 6.1, overleaf.

Table 6.1 - Revised Environmental Risk (Post-development Case)

Sources & Potential Source	Potential Receptors	Plausible Pathways	Probability	Severity	Revised Risk Rating	Comment
Contaminated made ground	<u>Human Health</u> Site end-users, inc. maintenance and site workers (short term risk during enabling works / construction)	Direct ingestion or dermal contact with soil, dust, and/or vapour inhalation (Site end user)	Unlikely	Mild	Very Low	The made ground soils encountered across the Site have been found to contain some elevated concentrations of lead. These soils are to be removed as part of the Site's enabling works, so therefore it is considered that the level of risk to human health may be downgraded to very low on this basis. The CIRIA C552 risk profile suggests that risk from asbestos is moderate to low in the post-development case. Since no fibres were identified, in any of the soil matrices tested, it is considered that there is no risk from asbestos fibres.
		Direct ingestion or dermal contact with soil, dust, and/or vapour inhalation (In-ground worker)	Unlikely	Mild	Very Low	
		Direct ingestion and/or dermal contact with liquid contaminants	Unlikely	Mild	Very Low	
		Inhalation of asbestos fibres (Site end user)	Unlikely	Severe	Moderate / Low	
		Inhalation of asbestos fibres (In-ground worker)	Unlikely	Severe	Moderate / Low	
	<u>Construction (Potable Water Supply Pipes)</u>	Direct contact/leaching (tainting)	Unlikely	Mild	Very Low	Measures compliant with BS8588:2017 (e.g. Protecta-Line) are unlikely to be required. Consultation should be made with the water provider given the Site's brownfield status.
	<u>Construction (Foundations)</u>	Direct contact/leaching	Low Likelihood	Mild	Low	Sulphate resistant substructure concrete when in natural strata is unlikely to be required.
	Vegetation	Uptake via root system in soft landscaping	Unlikely	Mild	Very Low	See Section 7, below.
Controlled Waters	Vertical and/or lateral migration	Unlikely	Mild	Very Low	No risk to controlled waters receptors is anticipated based on the Site's setting.	
Ground gas sources	<u>Human Health</u>	Inhalation (via ingress and accumulation into buildings)	Low Likelihood	Medium	Moderate / Low	The requirement for precautions in construction is to be confirmed.

7 CONCLUSIONS

7.1 Contamination – Risk Evaluation

Soil - Human Health Receptors – Site End Users

Having reviewed the investigation-specific data acquired within the remit of this study, it is apparent that anthropogenic activity has had a minor impact on the condition of the Site.

The ground investigation completed identified the presence of a relatively thin but Site-wide mantle of made ground associated with previous development and demolition, with this comprising a brown sandy gravelly clay with much brick, brick fragments, concrete fragments, aggregate, and some clinker. The underlying undisturbed natural strata were cohesive (to varying consistency) over mudstone and typical of those associated with weathered Coal Measures deposits.

The made ground soils encountered yielded typically low contaminant concentrations with spatial extent given the age of the Site, but with the exception of some lead to in excess of the allowable residential with home-grown produce threshold of 200mg/kg. Historic data associated with the 2008 Wardell Armstrong investigation indicated the presence of localised elevated lead concentrations of 290mg/kg (WS105) and 550mg/kg (WS106) within the dataset (based on eleven soil samples).

It is understood that enabling works are to be undertaken to facilitate development, with this involving the removal of the made ground and some regrading of the formation. In their current condition the contaminated made ground deposits would present a potential ‘moderate’ risk to Site end users should such soils remain within areas of soft landscaping (i.e. gardens), although in the post-development case the level of risk may be downgraded to ‘very low’ as the source of the contamination will be removed and Site end users can no longer come into contact with it.

Notwithstanding the above, concentrations of general inorganic and organic contaminants of concern were below critical concentrations for the underlying natural strata. On this basis, they would be expected to present no risk to human health.

Soil - Human Health Receptors – In-ground Construction Workers

Consideration should be given to the level of risk workers involved with Site enabling works and other in-ground construction will be exposed to, given the increased potential for general dermal contact and the ingestion/inhalation of contaminated dusts.

It should be noted that UK contaminated land assessment tools available to practitioners cannot be used as the basis to assess the acute (short term exposure) risk that groundworkers or other such personnel in close contact with soils may experience during in-ground works activities. On this basis, it is not practicable to generate allowable threshold limits for potential contaminants of concern as is ordinarily undertaken to determine whether a Site requires remediating, or not.

Given that Site-wide made ground soils have been identified, which contain some contamination, all works to be undertaken with that material should be specifically assessed by

the Client as part of a normal health and safety evaluation to mitigate the exposure of workers to any emissions as may be released.

Asbestos

The laboratory data indicates that no fibres were identified in any of the made ground or natural strata samples tested. Although the C552 risk classification prescribes a moderate to low risk for asbestos in soil, principally based on the severity of the contaminant, given that no fibres were recorded it is considered reasonable to downgrade the risk to human health (i.e. Site end users and/or construction workers) to very low.

Data reported in 2008 by Wardell Armstrong indicated that asbestos fibres had not been recorded within the underlying soils they tested. It appears that their investigation was completed prior to demolition, though, as they intimated that there could be asbestos containing materials in the fabric of the buildings. Since demolition has been undertaken and there is demonstrable made ground associated with that across the Site's footprint, it is evident that either there was no asbestos containing materials used in construction, or that there has been no cross-contamination. Either way, risk from asbestos fibres is not expected.

Unforeseen Contamination

As with any development site there is the potential for hotspots or other areas of contamination to be encountered, that have not currently been identified. This is unavoidable and may only come to light during clearance and enabling works. It would be expected, however, for all of the made ground to contain a level of contamination given the nature of what has already been proven.

If other grossly contaminated or suspected contaminated soils were encountered during development, these would need to be investigated further on a separate basis, with an appropriate level of testing and risk assessment being carried out as required.

Soil Remediation

Given that made ground excavation and removal is proposed to facilitate construction, unless any residual material remains within the areas of proposed garden curtilage (and/or any of area of soft landscaping) it is considered that no formal 'soils remediation' (i.e. the provision of engineered soil capping to 600mm thickness) will be needed.

If any made ground remains, then remediation will need to be implemented in accordance with those guidelines prescribed by the Yorkshire and Lincolnshire Pollution Advisory Group ('YALPAG')^[36]. The primary objective of such remedial works would be to ensure that the development is suitable for its proposed residential end use, whilst mitigating short and long term risks to sensitive receptors, this being in this instance, human health from the contaminated made ground that is present within the near surface.

Ground Gas

As indicated herein, monitoring is currently ongoing to assess the level of risk associated with fugitive ground gases. Should the monitoring identify an unacceptable level of risk to Site end users, specific remediation proposals and verification methodology for any gas protection measures to be introduced into the dwellings would need to be submitted to the LPA. Such works would need to be undertaken in accordance with the requirements of YALPAG guidance [37].

At this time, it would be considered prudent to allowance for the provision of measures to Characteristic Situation 2 of BS8485 until the final monitoring dataset is confirmed.

Radon

Third party reporting indicates that no radon precautions are required in construction. Consultation with Building Control should be made as required as they may have different requirements.

Controlled Waters Receptors

No risk is anticipated in relation to controlled waters receptors as no perched or shallow groundwater was encountered during the investigation, the underlying natural strata is clay/mudstone (cohesive), and made ground soils are to be removed. No further assessment of the underlying groundwater conditions is considered necessary.

7.2 Construction – Risk Evaluation

Potable Water Supplies

Water providers are required to maintain the safety of staff, contractors, and customers. On this basis, water providers work with a range of trigger values when laying mains pipes or services in contaminated ground, in the same way that assessment is made by contaminated land practitioners.

Testing to full UKWIR was not considered necessary on the basis of the identified source-pathway-receptor linkages, although a broad spectrum of testing in addition to extensive redox/electrical conductivity, and pH determination has been completed to assess the contaminative status of the Site. On the basis of the available laboratory data, and although the Site is brownfield in nature, it is considered that standard potable water pipework should be sufficient when laid in the underlying natural strata and that measures compliant with BS8588:2017 (e.g. Protecta-Line) are unlikely to be required. It is recommended, however, that the results of the chemical testing and details of the development proposals are provided to the utility company for their comment, prior to installation of any pipework.

Sulphate Attack

A Design Sulphate Classification of DS1 is indicated on the basis of the laboratory data, with the Aggressive Chemical Environment Class being AC-1s.

No evidence of gypsum crystals, red-brown ferric oxide, or yellow-brown hydrated ferric oxide was recorded on any of the soils encountered, although it is noted that some elevated TPS values have been determined (the made ground is to be removed). Due consideration for the potential for risk should be allowed for by the Designing Engineer at the detailed design-phase stage, although precautions are considered unlikely to be required and a low risk is postulated.

Stress Relief

Risk associated with stress relief is considered to be low.

Coal Mining

Mining legacy investigation works to assess the potential for there to be any underground coal mining activity recorded only one seam at shallow depth; this coal is attributed to being the Two Foot seam and was intact in all instances.

No underlying coal associated with the Abdy seam was recorded at 20m bgl, or indeed any other coal that could be present to 30m bgl. Intact Coal Measures mudstone and sandstone deposits were recorded throughout.

Anticipated Foundation Type

With cognisance to the likely imposed loads and required settlement tolerances of the new-build development, it is anticipated that traditional reinforced spread foundations should be suitable for a lightly loaded structure of typical construction.

Where traditional spread foundations can be used, these shall be taken down through any loose, soft, or otherwise unsuitable materials to be founded on strata having sufficient bearing capacity at a minimum depth as directed by the Designing Engineer. It would be advisable for a bearing capacity assessment to be completed by the Designing Engineer during foundation design to ensure that the serviceability limit state of the structure is not compromised. Although considered to be a low risk, this should take account of the amount of total and/or differential settlement that could potentially occur if founding on strata of different type (e.g. clay, mudstone...).

The widening and strengthening and/or deepening of foundations in accordance with current engineering standards would be required if foundations were found to straddle strata of different type, and/or where areas of softer or weaker ground were encountered at founding depth. In addition to this, the depth of footing could potentially vary across the Site, so other adjustments to final depth may need to be based on excavation as construction progresses and in discussion with Building Control.

Where coal is encountered at founding depth this shall be blinded with lean-mix concrete to prevent air ingress into the seam. Further consultation should be made with the Designing Engineer and Building Control with respect to the final foundation depths to be achieved.

Ground Slab

It is anticipated that the ground floor in construction will be suspended (i.e. beam and block).

Heave Precautions

The geotechnical test results indicate that the on-Site cohesive soils have a worst-case high Volume Change Potential ('VCP') when assessed in accordance with the Modified Plasticity Index.

Precautions in construction would need to be taken where foundations lie within influencing distance of existing, removed, and/or proposed planting and trees when in cohesive soils (as defined by NHBC Standards, Chapter 4.2) or where seasonally desiccated soils are present at the time of construction. Further consultation should be made with the Designing Engineer to ensure that the correct level of protection is provided, with this being in conjunction with the foundation solution to be adopted.

Slopes

Global slope stability problems are not expected. However, due consideration to potential problems associated with adjacent land impacting on the Site should always be made.

Obstructions & Excavation

Although not encountered during the ground investigation, it is possible that some remnant in-ground obstruction (e.g. foundations or brick walling) associated with prior development could exist.

No entry into any unsupported excavations shall be allowed without an appropriate risk assessment. All excavation works shall be carried out in accordance with current HSE guidance, 'Structural Stability During Excavation' ^[38].

Where deep excavations are required (e.g. for foul water service connections) it should be noted that some difficulty could potentially be encountered given the presence of very stiff clays and mudstone at shallow depth. Machinery of sufficient size and strength should therefore be allowed for.

Superstructure Precautions

The need for superstructure precaution, such as masonry reinforcement, is not anticipated, although further consultation should be made with the Designing Engineer as required.

Surface Water Drainage

It is considered that the use of soakaways ^[39] for the discharge of surface water would not be possible in development given that the Site is underlain by stiff clay and mudstone soils which will have negligible infiltration potential. It is understood that soakaways should also be located 5m or more from foundations and road construction. Further consultation with a specialist

drainage consultant should be made as required, although at this stage it is anticipated that a piped connection will need to be implemented.

All drainage proposals will be subject to obtaining the necessary approvals from the Regulatory Authorities.

Pavement

It is considered that the localised excavation and replacement of any unsuitable material with suitably compacted engineered fill will be needed for proposed access and parking areas. Since the minimum permitted design CBR is 2.5%, it is recommended at this stage that this conservative value for subgrade be used.

Frost susceptibility should be expected.

8 REGULATORY APPROVAL

The conclusions presented herein are considered reasonable on the basis of available information and the assessment of the Site as carried out by Groundsmiths. However, it remains the responsibility of the Client to ensure that the Site poses no significant risk to any sensitive receptors and that it remains aligned with the proposed end-use and assessment framework adopted in this Report.

If at any time in the future, additional information comes to light that puts into doubt the accuracy of the professional opinion or third party information presented herein, then it may be necessary to revisit the assessment.

Works undertaken cannot be guaranteed to gain approval by the regulators as the acceptability of the levels of risk presented may depend on the viewpoint of the Local Planning Authority and their Consultees. A copy of this Report should therefore be made available for comment and approval, prior to undertaking any irrecoverable works associated with the Site.

9 REPORTING LIMITS

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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 contained within the Report has been obtained from a variety of sources. Where third party data has been used, Groundsmiths assumes that this is reliable but cannot independently confirm this as the validity and accuracy of this information is outside our control. No guarantee can therefore be given as to the completeness of the information gathered during the study and no responsibility is accepted for errors or omissions in the third party information used. Groundsmiths' 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 assessment and the resources devoted to it by the Client.

Whilst every effort has been made to carry out an assessment that enables a realistic characterisation of the environmental and geotechnical parameters to be identified, the likelihood of variation in actual ground and groundwater conditions between investigation positions cannot be discounted. The findings and opinions presented in this Report are relevant to the time this assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date. Further information, supplementary ground investigation, construction activities, change of site use, or the passage of time may reveal conditions that were not indicated in the data presented herein and therefore could not have been considered in the preparation of this Report. Where such information might impact upon stated opinions, Groundsmiths reserve the right to modify the opinions expressed in this Report.

Where opinions expressed in this Report are based on current available guidelines and legislation, no liability can be accepted for the effects of any future changes to such guidelines and legislation. New information or improved practices and changes in legislation may require reinterpretation of the Report as a whole, or in part.

The recommendations presented in this Report are based on the site-specific assessment but utilising third party-provided information as appropriate. They are, however, limited to those that could be reasonably made at the time the assessment was undertaken. Where assessments of site areas affected in particular ways are given, these are approximate.

This Report does not constitute an archaeological, ecological, arboriculturalist / invasive plant species or UXO survey. Any comment given in relation to these is for information only. Further assessments to assess these may be required as part of any planning condition and should therefore be undertaken by suitably qualified experts as required.

Groundsmiths reserve the right to edit and / or retract any conclusion or recommendation made in this Report should any further information, with respect to the Site, become available.

Groundsmiths disclaim any obligation to update the Report for events taking place after the time during which the assessment was carried out.

Groundsmiths do not provide or purport to provide legal advice. Should the Client require such advice then that of lawyers should be sought.

Groundsmiths accept no responsibility if any findings given in this Report are not implemented by the Client or their agents.

Groundsmiths accept no responsibility if any further works, as requested by the Local Planning Authority in the discharge of their duty of care, are not implemented by the Client or their agents.

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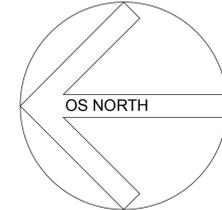
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FIGURES & DRAWINGS

This drawing has been prepared specifically for the purpose of obtaining Planning Permission and/or Building Regulation Approval. Its suitability for other purposes, without supplementary details and specifications cannot be guaranteed. The Permissions and/or Approvals are beyond the Architects control, and no guarantee that such will be granted is given or to be inferred by reason of the preparation of this drawing. Only figured dimensions are to be used. All dimensions to be checked on site. This drawing together with the design is the property and copyright of the Architect and must not be reproduced without prior written permission.

P01 Drawing originated 16.12.24 NG AS
 rev description date drawn approv



ADP

project Proposal for housing development on land at 32, Queens Road, Barnsley, S71 1AR for Whitshaw Builders Ltd

title site plan & street scene elevation - as prop
 number 24110D-11-P01
 scale 1:100
 size A1

The Old Police Station 16 Bridge Lane Holmthorpe HD9 7AN
 T: 01484 685411 E: hello@adp-architects.com
ARCHITECTURE AND DESIGN **RIBA** Chartered Practice



street scene elevation

96.00 Datum

Queens Road



Position	Easting	Northing	Approx. Elevation (m AOD)
BH1	434890	406471	97.00
BH2	434906	406469	98.20
BH3	434886	406456	96.40
BH4	434894	406451	96.90
BH5	434893	406462	97.20
BH6	434910	406493	99.20
BH7	434902	406497	99.00
BH8	434904	406487	98.60
BH9	434905	406476	97.80
BH10	434892	406480	97.40
RO1	434893	406475	97.40
RO2	434905	406495	99.10
RO3	434907	406483	98.90
RO4	434901	406457	97.10
RO5	434887	406464	96.70
RO6	434906	406469	98.20

-  Rotary openhole borehole
-  Percussive sampler borehole
-  Gas well

Sources:

ADP Architects (2024). Site Plan & Street Scene Elevation - As proposed. 32 Queens Road, Barnsley, S71 1AR (Ref: 24110D-11-P01, dated 16th December).

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Project: Queens Road, Barnsley		Client: Whitshaw Developments Ltd	
Drawing: Investigation Location Plan		Drawn/Checked: AJS	
Project No: 0425-03	Drawing No: 001	Date: June 2025	

APPENDIX A
Ground Investigation Records

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434890, 406471
Location: Land off Queens Road, Barnsley		Approx. Level: 97.00 mAOD
Client: Whitshaw Developments Ltd		Date: 07/05/2025

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
GW2		0.0-0.4							97.00	MADE GROUND: Brown sandy gravelly clay with bricks, brick fragments, concrete fragments, and vegetation (RECONSTITUTED GROUND).	
		0.4-1.2	0.5	ES1					96.60	Firm becoming stiff to very stiff brown mottled orange CLAY. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).	
		1.2-1.8	1.0	DS1	1,3-4,5,5,6 (20)	16.8	56	34	22	COAL. Poor quality (COAL MEASURES).	
		1.8-2.0	1.5						95.20	Very weak grey mottled brown clayey weathered MUDSTONE (COAL MEASURES).	
		2.0-2.6	2.0	DS2	5,6-6,6,7,8 (27)	23.6	54	32	22	Extremely weak light grey clayey thinly laminated weathered MUDSTONE with lithorelicts. Dry. High undrained shear strength. Intermediate plasticity (COAL MEASURES).	
		2.6-3.0	2.5						94.40	Weak orange-brown clayey thinly laminated weathered MUDSTONE. Dry. High undrained shear strength. Intermediate plasticity (COAL MEASURES).	
			3.0		8,10-12,13,15,10/50mm (50)					Borehole complete at 3.0m bgl	
			3.5								
			4.0								
			4.5								
		5.0									
		5.5									
		6.0									
		6.5									
		7.0									

Boring Progress and Water Observations					Chiselling			General Remarks
Date	Water Depth	Casing		From	To	Hours		
		Depth	Dia. mm					
07/05/2025	None	-	-				ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified	

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434906, 406469
Location: Land off Queens Road, Barnsley	Approx. Level: 98.20 mAOD	Plant 110
Client: Whitshaw Developments Ltd	Date: 07/05/2025	Logged By AS

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.2	ES1						0.0-0.4	98.20	MADE GROUND: Brown sandy gravelly clay with bricks, brick fragments, concrete fragments, and vegetation (RECONSTITUTED GROUND).
		0.5							0.4-1.0	97.80	Firm becoming stiff to very stiff brown mottled orange CLAY with mudstone lithorelicts. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.0	ES2 DS1	3,3-4,5,6,6 (21)	19.8	56	37	19	1.0-1.5	97.20	Extremely weak grey mottled brown clayey weathered MUDSTONE. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.5							1.5-3.0	96.70	Extremely weak becoming very weak grey thinly laminated clayey weathered MUDSTONE with shale partings. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	DS2	8,10-12,13,14,11/50mm (50)	12.7	46	23	23			Borehole complete at 2.0m bgl
		2.5									
		3.0									
		3.5									
		4.0									
		4.5									
		5.0									
		5.5									
		6.0									
		6.5									
		7.0									

Boring Progress and Water Observations					Chiselling			General Remarks
Date	Water Depth	Casing		From	To	Hours		
	Depth	Depth	Dia. mm					
07/05/2025	None	-	-				ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified	

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434886, 906456
Location: Land off Queens Road, Barnsley		Approx. Level: 96.40 mAOD
Client: Whitshaw Developments Ltd		Date: 07/05/2025

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.5	ES1						0.0-0.9	96.40	MADE GROUND: Brown sandy gravelly clay with much brick and brick fragments, some aggregate, concrete fragments, and vegetation (RECONSTITUTED GROUND).
		1.0	DS1	2,2-3,5,5,6 (19)	30.1	48	24	24	0.9-1.3	95.50	Stiff becoming very stiff brown slightly gravelly CLAY. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.3-1.9							1.3-1.9	95.10	COAL. Poor quality (COAL MEASURES).
		2.0	ES2	2,3-4,4,5,6 (19)					1.9-2.6	94.50	Very stiff light grey mottled brown thinly laminated CLAY with mudstone lithorelicts and ironstone fragments. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		3.0	DS2	6,8-11,13,15,11/35mm (50)	16.5	51	28	23	2.6-3.0	93.80	Extremely weak becoming very weak grey mottled orange thinly laminated clayey weathered MUDSTONE. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		Borehole complete at 3.0m bgl									

Boring Progress and Water Observations							General Remarks		
Date	Water Depth	Casing		Chiselling			From	To	Hours
		Depth	Dia. mm						
07/05/2025	None	-	-						

ES - Environmental Sample
D - Small Disturbed Sample
B - Large Disturbed Sample

Strength and/or plasticity denoted indicate field observations only
SPT 'N' is uncorrected
*Plasticity data is non-modified

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434894, 406451
Location: Land off Queens Road, Barnsley	Approx. Level: 96.90 mAOD	Plant 110
Client: Whitshaw Developments Ltd	Date: 07/05/2025	Logged By AS

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description	
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)				
GW3		0.5	0.5	ES1					0.0-0.1	96.90	Tarmac over concrete (RECONSTITUTED GROUND).	
									0.1-1.0	96.80	MADE GROUND: Brown sandy gravelly clay with concrete fragments (RECONSTITUTED GROUND).	
		1.0	1.0 1.0	ES2 DS1	1,2-2,3,3,4 (12)	29.8	42	22	20	1.0-1.7	95.90	Firm becoming stiff orange-grey-brown slightly gravelly CLAY. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.5										
		2.0	2.0	DS2	6,9-13,15,17,5/75mm (50)	27.2	66	40	26	1.7-2.3	95.20	Extremely weak becoming very weak grey mottled orange thinly laminated clayey weathered MUDSTONE. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.5										
		3.0										
		3.5										
		4.0										
		4.5										
	5.0											
	5.5											
	6.0											
	6.5											
	7.0											
Borehole complete at 2.0m bgl												

Boring Progress and Water Observations					Chiselling			General Remarks
Date	Water Depth	Casing		From	To	Hours		
		Depth	Dia. mm					
07/05/2025	None	-	-				ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified	

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434893, 406461
Location: Land off Queens Road, Barnsley		Approx. Level: 97.20 mAOD
Client: Whitshaw Developments Ltd		Date: 07/05/2025

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.5							0.0-0.3	97.20	MADE GROUND: Brown sandy gravelly clay (RECONSTITUTED GROUND).
		1.0	ES1 DS1	2,2-3,3,4,5 (15)	30.6	55	32	23	0.3-1.0	96.90	Firm becoming stiff grey-brown slightly sandy CLAY. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.0 1.0							1.0-2.3	96.20	Stiff becoming very stiff grey mottled brown CLAY with mudstone lithorelicts. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	ES2						2.3-2.5	94.90	COAL. Poor quality (COAL MEASURES).
		2.5		12,13/40mm-20,25,5/75mm (50)							Borehole complete at 2.5m bgl
		3.0									
		3.5									
		4.0									
		4.5									
		5.0									
		5.5									
		6.0									
		6.5									
		7.0									

Boring Progress and Water Observations						General Remarks			
Date	Water Depth	Casing		Chiselling			From	To	Hours
		Depth	Dia. mm						
07/05/2025	None	-	-						

ES - Environmental Sample
D - Small Disturbed Sample
B - Large Disturbed Sample

Strength and/or plasticity denoted indicate field observations only
SPT 'N' is uncorrected
*Plasticity data is non-modified

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434910, 406493
Location: Land off Queens Road, Barnsley		Approx. Level: 99.20 mAOD
Client: Whitshaw Developments Ltd		Date: 07/05/2025

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
GW1									0.0-0.6	99.20	MADE GROUND: Brown sandy gravelly clay (RECONSTITUTED GROUND).
		0.5	ES1						0.6-1.5	98.60	Stiff becoming very stiff grey-brown slightly sandy CLAY with mudstone lithorelicts. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.0	ES2 DS1	2,2-3,4,5,5 (17)	21.2	52	30	22			
		1.5							1.5-2.0	97.70	Extremely weak becoming very weak grey mottled brown clayey weathered MUDSTONE with much lithorelicts. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	DS2	7,10-12,13,14,11/45mm (50)	19.1	51	29	22			
		2.0									Borehole complete at 2.0m bgl
		7.0									

Boring Progress and Water Observations						General Remarks			
Date	Water Depth	Casing		Chiselling			From	To	Hours
		Depth	Dia. mm						
07/05/2025	None	-	-						

ES - Environmental Sample
D - Small Disturbed Sample
B - Large Disturbed Sample

Strength and/or plasticity denoted indicate field observations only

SPT 'N' is uncorrected

*Plasticity data is non-modified

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434902, 406497
Location: Land off Queens Road, Barnsley	Approx. Level: 99.00 mAOD	Plant 110
Client: Whitshaw Developments Ltd	Date: 08/05/2025	Logged By AS

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.2	ES1						0.0-0.3	99.00	MADE GROUND: Brown sandy gravelly clay with hardcore and clinker (RECONSTITUTED GROUND).
		0.5							0.3-1.5	98.70	Firm becoming stiff orange-grey-brown slightly sandy slightly gravelly CLAY. Gravel is subangular sandstone. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.0	ES2 DS1	1,1-2,3,3,4 (12)	26.2	50	25	25	1.5-2.1	97.50	Very weak grey mottled brown clayey weathered MUDSTONE with much lithorelicts. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	DS2	4,5-4,5,5,6 (20)	19	49	26	23	2.1-2.6	96.90	COAL. Poor quality (COAL MEASURES).
		3.0		11,11-12,13,13,12/60mm (50)					2.6-3.0	96.40	Very weak dark grey clayey weathered MUDSTONE with much lithorelict. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		3.5									Borehole complete at 3.0m bgl
		4.0									
		4.5									
		5.0									
		5.5									
		6.0									
		6.5									
		7.0									

Boring Progress and Water Observations					Chiselling			General Remarks
Date	Water Depth	Depth	Casing Dia. mm		From	To	Hours	
08/05/2025	None	-	-					ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified

Project: Residential Development		Project No: GUK-0425-03		Approx. Coordinates: 434904, 406487	
Location: Land off Queens Road, Barnsley				Approx. Level: 98.60 mAOD	
Client: Whitshaw Developments Ltd				Date: 08/05/2025	
				Logged By: AS	

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.5	ES1						0.0-0.6	98.60	MADE GROUND: Brown sandy gravelly clay with hardcore (RECONSTITUTED GROUND).
		1.0	ES2 DS1	2,2-2,2,2,3 (9)	29.9	64	38	26	0.6-1.2	98.00	Firm orange-grey-brown slightly sandy thinly laminated CLAY. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	DS2	8,10-12,12,13,13/60mm (50)	24.1	52	31	21	1.2-2.0	97.40	Extremely weak grey mottled brown clayey thinly laminated weathered MUDSTONE with much lithorelicts. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		Borehole complete at 2.0m bgl									

Boring Progress and Water Observations							General Remarks			
Date	Water Depth	Casing		Chiselling			From	To	Hours	ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample
		Depth	Dia. mm	From	To	Hours				
08/05/2025	None	-	-							Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434905, 406476
Location: Land off Queens Road, Barnsley		Approx. Level: 97.80 mAOD
Client: Whitshaw Developments Ltd		Date: 08/05/2025

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.5							0.0-0.5	97.80	MADE GROUND: Brown sandy gravelly clay with much hardcore (RECONSTITUTED GROUND).
		1.0	ES1 DS1	2,2-2,2,3,4 (11)	17.9	52	33	19	0.5-1.5	97.30	Firm becoming stiff yellow-brown slightly sandy CLAY. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.5							1.5-3.0	96.30	Extremely weak becoming very weak grey mottled brown clayey thinly laminated weathered MUDSTONE with lithorelicts and carbonaceous material. Locally ironstained. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	ES2	7,6-7,7,7,8 (29)							
		2.5									
		3.0	DS2	11,11-14,13,14,9/30mm (50)	13.7	46	24	22			
		3.5									Borehole complete at 3.0m bgl
		4.0									
		4.5									
		5.0									
		5.5									
		6.0									
		6.5									
		7.0									

Boring Progress and Water Observations							General Remarks			
Date	Water Depth	Casing		Chiselling			From	To	Hours	ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample
		Depth	Dia. mm							
08/05/2025	None	-	-							Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified

Project: Residential Development		Project No: GUK-0425-03		Approx. Coordinates: 434892, 406480	
Location: Land off Queens Road, Barnsley				Approx. Level: 97.40 mAOD	
Client: Whitshaw Developments Ltd				Date: 08/05/2025	
				Logged By: AS	

Well	Water (m bgl)	Samples & Field Testing			Water Content & Plasticity Indices*				Depth (m bgl)	Level (mAOD)	Stratum Description
		Depth (m)	Type	SPT (N)	Water Content (%)	Liquid Limit (wL)	Plasticity Index (Ip)	Plastic Limit (Wp)			
		0.5	ES1						0.0-0.5	97.40	MADE GROUND: Brown sandy gravelly clay with much hardcore (RECONSTITUTED GROUND).
		1.0	DS1 ES2	2,2-1,2,3,4 (10)	22.4	53	32	21	0.5-1.0	96.90	Firm grey-brown slightly sandy CLAY with mudstone lithorelicts. Medium to high undrained shear strength. Intermediate plasticity (COAL MEASURES).
		1.0	DS1 ES2						1.0-2.0	96.40	Extremely weak becoming very weak grey mottled brown clayey thinly laminated weathered MUDSTONE with lithorelicts. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
		2.0	DS2 ES3	3,5-4,4,5,4 (17)	25.6	51	29	22	2.1-2.6	95.30	COAL. Poor quality (COAL MEASURES).
		3.0	DS3	5,5-8,13,13,16/70mm (50)					2.6-3.0	94.80	Very weak brown-grey-orange clayey thinly laminated weathered MUDSTONE with much lithorelicts. High undrained shear strength. Intermediate plasticity (COAL MEASURES).
											Borehole complete at 3.0m bgl

Boring Progress and Water Observations							General Remarks			
Date	Water Depth	Casing		Chiselling			From	To	Hours	ES - Environmental Sample D - Small Disturbed Sample B - Large Disturbed Sample Strength and/or plasticity denoted indicate field observations only SPT 'N' is uncorrected *Plasticity data is non-modified
		Depth	Dia. mm							
08/05/2025	None	-	-							

Project: Residential Development

Location: Land off Queens Road, Barnsley

Client: Whitshaw Developments Ltd

Project No: GUK-0425-03

Logged:	LTS	Approx. Coordinates:	434890, 406471	Approx. Level:	97.00	mAOD	Date:	07/05/2025	BH1
Depth m bgl	Seating Drives		Test Drives				(N)		
	75mm	75mm	75mm	75mm	75mm	75mm	300mm		
1.00	1	3	4	5	5	6	20		
2.00	5	6	6	6	7	8	27		
3.00	8	10	12	13	15	10	50		
4.00									
5.00									
6.00									
7.00									
8.00									
9.00									

Logged:	LTS	Approx. Coordinates:	434906, 406469	Approx. Level:	98.20	mAOD	Date:	07/05/2025	BH2
Depth m bgl	Seating Drives		Test Drives				(N)		
	75mm	75mm	75mm	75mm	75mm	75mm	300mm		
1.00	3	3	4	5	6	6	21		
2.00	8	10	12	13	14	11	50		
3.00									
4.00									
5.00									
6.00									
7.00									
8.00									
9.00									

Logged:	LTS	Approx. Coordinates:	434886, 906456	Approx. Level:	96.40	mAOD	Date:	07/05/2025	BH3
Depth m bgl	Seating Drives		Test Drives				(N)		
	75mm	75mm	75mm	75mm	75mm	75mm	300mm		
1.00	2	2	3	5	5	6	19		
2.00	2	3	4	4	5	6	19		
3.00	6	8	11	13	15	11	50		
4.00									
5.00									
6.00									
7.00									
8.00									

Logged:	LTS	Approx. Coordinates:	434894, 406451	Approx. Level:	96.90	mAOD	Date:	07/05/2025	BH4
Depth m bgl	Seating Drives		Test Drives				(N)		
	75mm	75mm	75mm	75mm	75mm	75mm	300mm		
1.00	1	2	2	3	3	4	12		
2.00	6	9	13	15	17	5	50		
3.00									
4.00									
5.00									
6.00									
6.45									
7.00									
8.00									

Logged:	LTS	Approx. Coordinates:	434893, 406461	Approx. Level:	97.20	mAOD	Date:	07/05/2025	BH5
Depth m bgl	Seating Drives		Test Drives				(N)		
	75mm	75mm	75mm	75mm	75mm	75mm	300mm		
1.00	2	2	3	3	4	5	15		
2.50	12	13	20	25	5		50		
3.00									
4.00									
5.00									
6.00									
7.00									
8.00									
9.00									

Project: Residential Development

Location: Land off Queens Road, Barnsley

Client: Whitshaw Developments Ltd

Project No: GUK-0425-03

Logged:	LTS	Approx. Coordinates:	434910, 406493		Approx. Level:	99.20	mAOD	Date:	07/05/2025	BH6
Depth m bgl	Seating Drives		Test Drives				(N)			
	75mm	75mm	75mm	75mm	75mm	75mm	300mm			
1.00	2	2	3	4	5	5	17			
2.00	7	10	12	13	14	11	50			
3.00										
4.00										
5.00										
6.00										
7.00										
8.00										
9.00										

Logged:	LTS	Approx. Coordinates:	434902, 406497		Approx. Level:	99.00	mAOD	Date:	08/05/2025	BH7
Depth m bgl	Seating Drives		Test Drives				(N)			
	75mm	75mm	75mm	75mm	75mm	75mm	300mm			
1.00	1	1	2	3	3	4	12			
2.00	4	5	4	5	5	6	20			
3.00	11	11	12	13	13	12	50			
4.00										
5.00										
6.00										
7.00										
8.00										
9.00										

Logged:		Approx. Coordinates:	434904, 406487		Approx. Level:	98.60	mAOD	Date:	08/05/2025	BH8
Depth m bgl	Seating Drives		Test Drives				(N)			
	75mm	75mm	75mm	75mm	75mm	75mm	300mm			
1.00	2	2	2	2	2	3	9			
2.00	8	10	12	12	13	13	50			
3.00										
4.00										
5.00										
6.00										
7.00										
8.00										
9.00										

Logged:		Approx. Coordinates:	434905, 406476		Approx. Level:	97.80	mAOD	Date:	08/05/2025	BH9
Depth m bgl	Seating Drives		Test Drives				(N)			
	75mm	75mm	75mm	75mm	75mm	75mm	300mm			
1.00	2	2	2	2	3	4	11			
2.00	7	6	7	7	7	8	29			
3.00	11	11	14	13	14	9	50			
4.00										
5.00										
6.00										
7.00										
8.00										
9.00										

Logged:		Approx. Coordinates:	434892, 406480		Approx. Level:	97.40	mAOD	Date:	08/05/2025	BH10
Depth m bgl	Seating Drives		Test Drives				(N)			
	75mm	75mm	75mm	75mm	75mm	75mm	300mm			
1.00	2	2	1	2	3	4	10			
2.00	3	5	4	4	5	4	17			
3.00	5	5	8	13	13	16	50			
4.00										
5.00										
6.00										
7.00										
8.00										
9.00										

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434893, 406475	Sheet 1 of 1
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Location: Land off Queens Road, Barnsley	Approx. Level: 97.40 mAOD	Plant: SM15
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Client: Whitshaw Developments Ltd	Date: 07/05/2025	Logged By: D&G
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Well	Water (m bgl)	Depth (m)	Samples & Field Testing		Thickness (m)	Depth (m bgl)	Level (mAOD)	Stratum Description
			Type	SPT (N)				
					0.5	0.0-0.5	97.40	MADE GROUND.
					1.7	0.5-2.2	96.90	Grey MUDSTONE (COAL MEASURES).
					0.9	2.2-3.1	95.20	COAL (COAL MEASURES).
		5				3.1-30.0	94.30	Grey MUDSTONE with SANDSTONE bands (COAL MEASURES).
		10						
		15						
		20			26.9			
		25						
		30						
Borehole complete at 30.0m bgl								

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Boring Progress and Water Observations							General Remarks	
Date	Water Depth	Casing			Chiselling			Driller's descriptions only One coal seam encountered No workings encountered 100% water flush returns
		Depth	Dia. mm		From	To	Hours	
07/05/2025	none	-	-					

Project:
Residential Development

Project No:
GUK-0425-03

Approx. Coordinates:
434905, 406495

Sheet 1 of 1

Location: Land off Queens Road, Barnsley

Approx. Level: 99.10 mAOD

Plant:
SM15

Client: Whitshaw Developments Ltd

Date: 07/05/2025

Logged By:
D&G

Well	Water (m bgl)	Depth (m)	Samples & Field Testing		Thickness (m)	Depth (m bgl)	Level (mAOD)	Stratum Description
			Type	SPT (N)				
		5			0.4	0.0-0.4	99.10	MADE GROUND.
		10			1.4	0.4-1.8	98.70	Grey MUDSTONE (COAL MEASURES).
		15			1.0	1.8-2.8	97.30	COAL (COAL MEASURES).
		20			27.2	2.8-30.0	96.30	Grey MUDSTONE with SANDSTONE bands (COAL MEASURES).
		25						
		30						
Borehole complete at 30.0m bgl								

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Boring Progress and Water Observations							General Remarks	
Date	Water Depth	Casing			Chiselling			
		Depth	Dia. mm		From	To	Hours	
07/05/2025	none	-	-					Driller's descriptions only One coal seam encountered No workings encountered 100% water flush returns

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434907, 406483	Sheet 1 of 1
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Location: Land off Queens Road, Barnsley	Approx. Level: 98.90 mAOD	Plant: SM15
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Client: Whitshaw Developments Ltd	Date: 08/05/2025	Logged By: D&G
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Well	Water (m bgl)	Depth (m)	Samples & Field Testing		Thickness (m)	Depth (m bgl)	Level (mAOD)	Stratum Description
			Type	SPT (N)				
					0.6	0.0-0.6	98.90	MADE GROUND.
					2.4	0.6-3.0	98.30	Grey MUDSTONE (COAL MEASURES).
					1.0	3.0-4.0	95.90	COAL (COAL MEASURES).
		5				4.0-30.0	94.90	Grey MUDSTONE (COAL MEASURES).
		10						
		15						
		20			26.0			
		25						
		30						
Borehole complete at 30.0m bgl								

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Boring Progress and Water Observations							General Remarks	
Date	Water Depth	Casing			Chiselling			Driller's descriptions only One coal seam encountered No workings encountered 100% water flush returns
		Depth	Dia. mm		From	To	Hours	
08/05/2025	none	-	-					

Project:
Residential Development

Project No:
GUK-0425-03

Approx. Coordinates:
434901, 406457

Sheet 1 of 1

Location: Land off Queens Road, Barnsley

Approx. Level: 97.10 mAOD

Plant
SM15

Client: Whitshaw Developments Ltd

Date: 07/05/2025

Logged By
D&G

Well	Water (m bgl)	Depth (m)	Samples & Field Testing		Thickness (m)	Depth (m bgl)	Level (mAOD)	Stratum Description
			Type	SPT (N)				
					0.6	0.0-0.6	97.10	MADE GROUND.
						0.6-4.5	96.50	Grey MUDSTONE (COAL MEASURES).
		5			3.9			
					1.0	4.5-5.5	92.60	COAL (COAL MEASURES).
						5.5-15.0	91.60	Grey MUDSTONE (COAL MEASURES).
		10			9.5			
		15						
								Borehole complete at 15.0m bgl
		20						
		25						
		30						

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Boring Progress and Water Observations							General Remarks	
Date	Water Depth	Casing			Chiselling			Driller's descriptions only One coal seam encountered No workings encountered 100% water flush returns
		Depth	Dia. mm		From	To	Hours	
07/05/2025	none	-	-					

Project:
Residential Development

Project No:
GUK-0425-03

Approx. Coordinates:
434887, 406464

Sheet 1 of 1

Location: Land off Queens Road, Barnsley

Approx. Level: 96.70 mAOD

Plant: SM15

Client: Whitshaw Developments Ltd

Date: 07/05/2025

Logged By: D&G

Well	Water (m bgl)	Depth (m)	Samples & Field Testing		Thickness (m)	Depth (m bgl)	Level (mAOD)	Stratum Description
			Type	SPT (N)				
					0.4	0.0-0.4	96.70	MADE GROUND.
					1.3	0.4-1.7	96.30	Grey MUDSTONE (COAL MEASURES).
					1.0	1.7-2.7	95.00	COAL (COAL MEASURES).
		5				2.7-15.0	94.00	Grey MUDSTONE (COAL MEASURES).
		10			12.3			
		15						Borehole complete at 15.0m bgl
		20						
		25						
		30						

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Boring Progress and Water Observations							General Remarks	
Date	Water Depth	Casing			Chiselling			Driller's descriptions only One coal seam encountered No workings encountered 100% water flush returns
		Depth	Dia. mm		From	To	Hours	
07/05/2025	none	-	-					

Project: Residential Development	Project No: GUK-0425-03	Approx. Coordinates: 434906, 406469	Sheet 1 of 1
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Location: Land off Queens Road, Barnsley	Approx. Level: 98.20 mAOD	Plant SM15
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Client: Whitshaw Developments Ltd	Date: 08/05/2025	Logged By D&G
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Well	Water (m bgl)	Depth (m)	Samples & Field Testing		Thickness (m)	Depth (m bgl)	Level (mAOD)	Stratum Description
			Type	SPT (N)				
					0.5	0.0-0.5	98.20	MADE GROUND.
					2.4	0.5-2.9	97.70	Grey MUDSTONE (COAL MEASURES).
					1.0	2.9-3.9	95.30	COAL (COAL MEASURES).
		5				3.9-15.0	94.30	Grey MUDSTONE (COAL MEASURES).
		10			11.1			
		15						Borehole complete at 15.0m bgl
		20						
		25						
		30						

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Boring Progress and Water Observations							General Remarks	
Date	Water Depth	Casing			Chiselling			Driller's descriptions only One coal seam encountered No workings encountered 100% water flush returns
		Depth	Dia. mm		From	To	Hours	
08/05/2025	none	-	-					

APPENDIX B
Laboratory Geotechnical Data



LABORATORY REPORT



Contract Number: PSL25/3614

Report Date: 28 May 2025
Client's Reference: GUK-0425-03
Client Name: Groundsmiths (UK) Ltd
12 Spruce Close
Brampton
Chesterfield
S40 3FG

For the attention of: Andrew Spooner

Contract Title: Queens Road, Barnsley
Date Received: 14/05/2025
Date Commenced: 14/05/2025
Date Completed: 28/05/2025

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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:

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(Managing Director)

R Berriman
(Associate Director)

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(Laboratory Manager)

L Knight
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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH1	DS1	D	1.00		Brown CLAY.
BH1	DS2	D	2.00		Brown slightly sandy CLAY.
BH2	DS1	D	1.00		Brown highly weathered MUDSTONE.
BH2	DS2	D	2.00		Brown highly weathered MUDSTONE.
BH3	DS1	D	1.00		Brown highly weathered MUDSTONE.
BH3	DS2	D	3.00		Brown highly weathered MUDSTONE.
BH4	DS1	D	1.00		Brown mottled grey slightly sandy slightly gravelly CLAY.
BH4	DS2	D	2.00		Brown CLAY.
BH5	DS1	D	1.00		Brown mottled grey CLAY.
BH6	DS1	D	1.00		Brown mottled grey CLAY.
BH6	DS2	D	2.00		Brown mottled grey highly weathered MUDSTONE.
BH7	DS1	D	1.00		Brown slightly sandy slightly gravelly CLAY.
BH7	DS2	D	2.00		Brown highly weathered MUDSTONE.
BH8	DS1	D	1.00		Brown mottled grey CLAY.
BH8	DS2	D	2.00		Dark brown highly weathered MUDSTONE.
BH9	DS1	D	1.00		Dark brown highly weathered MUDSTONE.
BH9	DS2	D	3.00		Dark brown highly weathered MUDSTONE.
BH10	DS1	D	1.00		Dark brown highly weathered MUDSTONE.
DS10	DS2	D	2.00		Brown mottled grey highly weathered MUDSTONE.



Queens Road, Barnsley

Contract No:

PSL25/3614

Client Ref:

GUK-0425-03

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377 - Part 2 : 2022 in accordance with BS EN ISO 17892 (as below)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Water Content %	Linear Shrinkage	Particle Density Mg/m ³	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 0.425mm %	Remarks
BH1	DS1	D	1.00		16.8			56	22	34	100	High Plasticity CIH
BH1	DS2	D	2.00		23.6			54	22	32	100	High Plasticity CIH
BH2	DS1	D	1.00		19.8			56	19	37	100	High Plasticity CIH
BH2	DS2	D	2.00		12.7			46	23	23	100	Medium Plasticity CIM
BH3	DS1	D	1.00		30.1			48	24	24	95	Medium Plasticity CIM
BH3	DS2	D	3.00		16.5			51	23	28	98	High Plasticity CIH
BH4	DS1	D	1.00		29.8			42	20	22	98	Medium Plasticity CIM
BH4	DS2	D	2.00		27.2			66	26	40	100	High Plasticity CIH
BH5	DS1	D	1.00		30.6			55	23	32	100	High Plasticity CIH
BH6	DS1	D	1.00		21.2			52	22	30	100	High Plasticity CIH
BH6	DS2	D	2.00		19.1			51	22	29	100	High Plasticity CIH
BH7	DS1	D	1.00		26.2			50	25	25	90	High Plasticity CIH
BH7	DS2	D	2.00		19.0			49	23	26	100	Medium Plasticity CIM
BH8	DS1	D	1.00		29.9			64	26	38	100	High Plasticity CIH
BH8	DS2	D	2.00		24.1			52	21	31	100	High Plasticity CIH

Water Content - BS 1377 - Part 2 : 2022 : Clause 4 in accordance with BS EN ISO 17892 - 1 : 2014 + A1 : 2022

Linear Shrinkage - BS 1377 - Part 2 : 2022 : Clause 7

Particle Density (Gas Jar method) - BS 1377 - Part 2 : 2022 : Clause 9

Liquid, Plastic Limit & Plasticity Index - BS 1377 - Part 2 : 2022 : Clause 5 & 6 in accordance with BS EN ISO 17892 - 12 : 2018 + A2 : 2022

SYMBOLS : NP = Non Plastic

 	<p>Queens Road, Barnsley</p>	Contract No:
		PSL25/3614
		Client Ref:
		GUK-0425-03

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377 - Part 2 : 2022 in accordance with BS EN ISO 17892 (as below)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Water Content %	Linear Shrinkage	Particle Density Mg/m ³	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 0.425mm %	Remarks
BH9	DS1	D	1.00		17.9			52	19	33	100	High Plasticity CIH
BH9	DS2	D	3.00		13.7			46	22	24	100	Medium Plasticity CIM
BH10	DS1	D	1.00		22.4			53	21	32	100	High Plasticity CIH
DS10	DS2	D	2.00		25.6			51	22	29	100	High Plasticity CIH

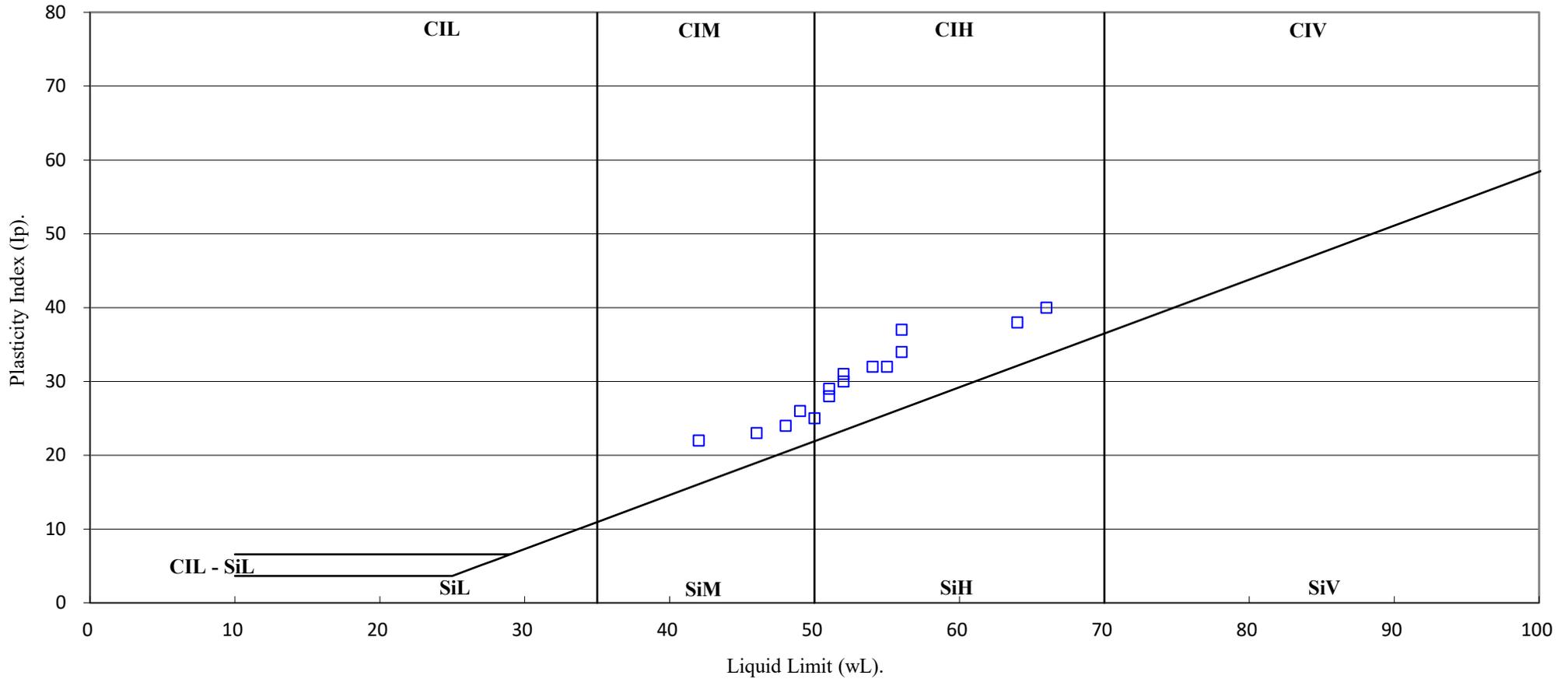
Water Content - BS 1377 - Part 2 : 2022 : Clause 4 in accordance with BS EN ISO 17892 - 1 : 2014 + A1 : 2022
 Linear Shrinkage - BS 1377 - Part 2 : 2022 : Clause 7
 Particle Density (Gas Jar method) - BS 1377 - Part 2 : 2022 : Clause 9
 Liquid, Plastic Limit & Plasticity Index - BS 1377 - Part 2 : 2022 : Clause 5 & 6 in accordance with BS EN ISO 17892 - 12 : 2018 + A2 : 2022

SYMBOLS : NP = Non Plastic

		<p style="font-size: 1.2em; font-weight: bold;">Queens Road, Barnsley</p>	Contract No:
			PSL25/3614
			Client Ref:
			GUK-0425-03

PLASTICITY CHART

BS EN ISO 14688-2:2017 Clause 4.4



Queens Road, Barnsley

Contract No:

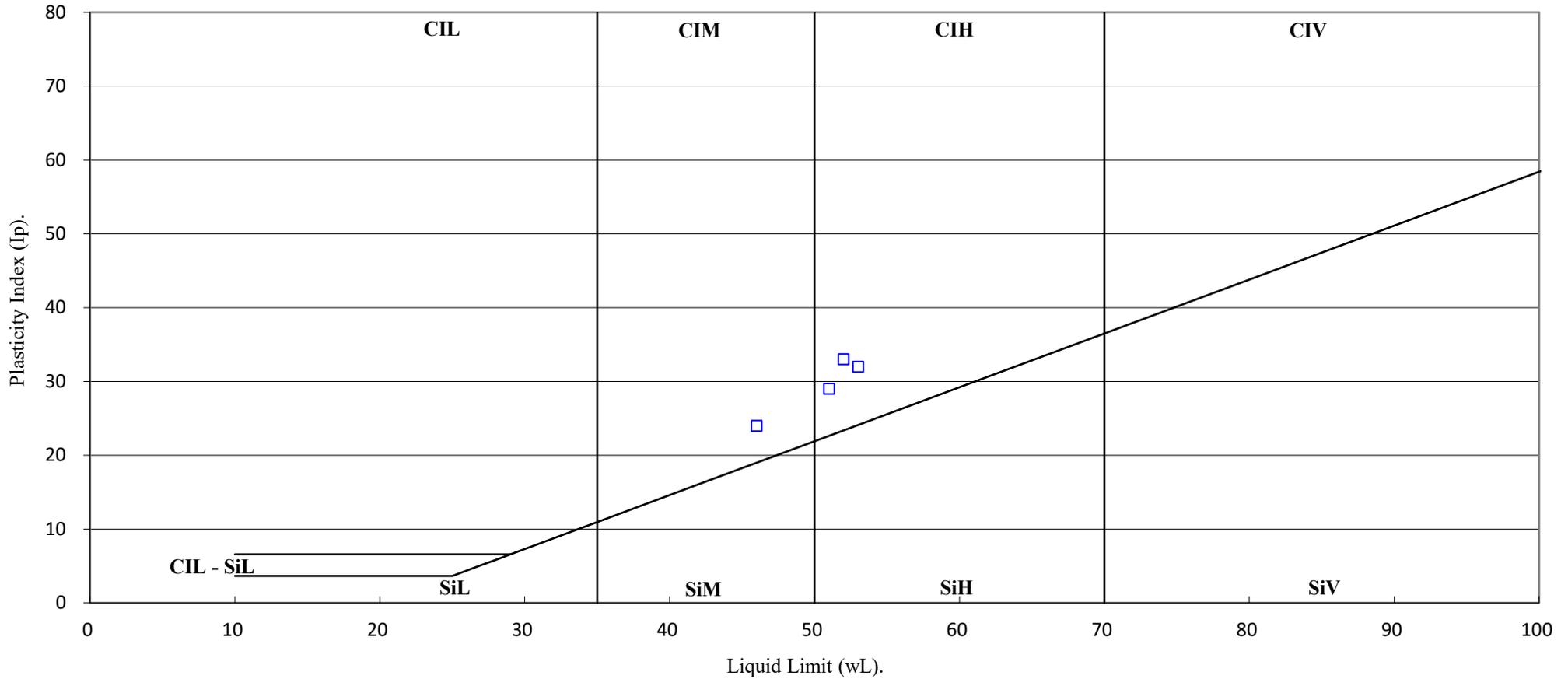
PSL25/3614

Client Ref:

GUK-0425-03

PLASTICITY CHART

BS EN ISO 14688-2:2017 Clause 4.4



Queens Road, Barnsley

Contract No:

PSL25/3614

Client Ref:

GUK-0425-03

APPENDIX C

Laboratory Chemical Data & Statistical Output

Analytical Test Results - Soil - Queens Road, Barnsley

Lab Reference Client Sample ID Client Sample Location Depth (m bgl) Date Sampled			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)		Made Ground					Natural Strata			
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504756 ES1 BH2 0.20 07/05/2025	504759 ES1 BH4 0.50 07/05/2025	504764 ES1 BH7 0.20 08/05/2025	504762 ES1 BH6 0.50 07/05/2025	504766 ES1 BH8 0.50 08/05/2025	504755 ES1 BH1 0.50 07/05/2025	504758 ES2 BH3 2.00 07/05/2025	504760 ES2 BH4 1.00 07/05/2025	504761 ES2 BH5 2.00 07/05/2025
Analytical Parameter (Soil)	Units	Accreditation											
Moisture Content	%	u	-	-	24	13	21	20	27	16	13	28	23
Stone Content	%	u	-	-	6	17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos													
Asbestos in Soil Detected/Not Detected	-	UKAS	Presence		No asbestos detected								
General Inorganics													
pH	pH Units	MCERTS	<5		7.9	10.6	7.6	6.4	5.3	7.7	5.8	7.6	5.1
Electrical Conductivity	(µs/cm)	u	See report text		256	491	108	79	108	68	87	89	83
Redox Potential	(mV)	u	See report text		140	-113	181	159	233	140	180	82	186
Total Sulphate as SO ₄ (Acid Soluble)	(%)	u	-		0.11	0.36	0.11	0.01	0.04	0.02	0.04	0.01	0.03
Total Sulphate as SO ₄ (Acid Soluble)	mg/kg	u	2,400		1,100	3,600	1,100	100	400	200	400	100	300
Sulphate (Water soluble as SO ₄)	(mg/l)	u	-		59	62	29	49	74	36	48	< 10	63
Sulphate (Water soluble as SO ₄)	(g/l)	u	0.5		0.059	0.062	0.029	0.049	0.074	0.036	0.048	<0.01	0.063
Sulphide	(mg/kg)	u	-		40	110	59	< 15	< 15	20	< 15	16	< 15
Sulphur (Total)	(%)	UKAS	-		0.15	0.03	0.10	0.01	0.02	0.05	0.33	0.01	0.04
Total Potential Sulphate	(%)	(%)	0.24 (DS1 of BRE SD1)		0.46	0.08	0.31	0.03	0.07	0.16	0.99	0.04	0.12
Thiocyanate	(mg/kg)	u	-		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TOC	(%)	MCERTS	-		5.6	8.8	14	< 0.5	0.7	3.0	0.8	1.0	2.4
Soil Organic Matter (via TOC)	(%)	UKAS	-		9.7	15	25	< 0.9	1.2	5.2	1.3	1.7	4.2
Metals/Metalloids													
Arsenic	(mg/kg)	MCERTS	37		17	31	26	< 10	< 10	12	< 10	< 10	< 10
Barium	(mg/kg)	MCERTS	1,300		520	950	850	57	60	72	460	66	98
Boron (w/s)	(mg/kg)	u	290		< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	22		1.6	9.9	1.2	0.5	0.7	1.0	< 0.2	0.6	0.3
Chromium (Total)	(mg/kg)	UKAS	910		8.6	270	< 1.0	6.7	3.9	< 1.0	2.2	9.1	8.3
Chromium (Hexavalent)	(mg/kg)	u	21		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0
Copper	(mg/kg)	MCERTS	2,400		150	400	100	36	51	43	27	48	58
Lead	(mg/kg)	MCERTS	200		380	380	410	13	27	47	21	24	18
Mercury	(mg/kg)	UKAS	40		< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	130		29	51	26	19	13	16	7.5	13	26
Selenium	(mg/kg)	u	250		< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	3,700		960	480	77	51	54	51	17	45	18
Speciated PAH*													
Acenaphthene	(mg/kg)	MCERTS	1,080	490	< 0.02	< 0.20	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	900	400	< 0.02	< 0.20	0.16	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	10,700	5,400	< 0.02	0.64	0.28	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	13	11	< 0.02	1.3	0.85	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	3	2.7	< 0.02	1.4	0.93	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	3.7	3.3	0.03	1.7	1.3	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	350	340	< 0.02	1.3	0.68	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	100	93	< 0.02	0.66	0.49	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	27	22	< 0.02	1.8	0.97	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.30	0.28	< 0.02	0.28	0.18	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	890	560	< 0.02	2.5	1.3	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluorene	(mg/kg)	MCERTS	850	390	< 0.02	< 0.20	0.05	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

Analytical Test Results - Soil - Queens Road, Barnsley

			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)		Made Ground					Natural Strata			
Lab Reference			Residential with home-grown produce GAC @ 6.0% SOM	Residential with home-grown produce GAC @ 2.5% SOM	504756	504759	504764	504762	504766	504755	504758	504760	504761
Client Sample ID			(mg/kg) for organics in Made Ground*	(mg/kg) for organics in Natural Strata*	ES1	ES1	ES1	ES1	ES1	ES1	ES2	ES2	ES2
Client Sample Location					BH2	BH4	BH7	BH6	BH8	BH1	BH3	BH4	BH5
Depth (m bgl)					0.20	0.50	0.20	0.50	0.50	0.50	2.00	1.00	2.00
Date Sampled					07/05/2025	07/05/2025	08/05/2025	07/05/2025	08/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025
Analytical Parameter (Soil)	Units	Accreditation											
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	41	36	< 0.02	0.85	0.65	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	5.5	2.3	< 0.02	0.33	2.0	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	440	220	0.04	1.4	0.90	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	2,000	1,200	0.11	2.2	1.1	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	-	-	0.50	17	12	< 0.32	< 0.32	< 0.32	< 0.32	< 0.32	0.42
Total Phenols (Monohydric)*													
Total Phenols	(mg/kg)	MCERTS	380	200	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons and Oxygenates*													
Benzene	(mg/kg)	MCERTS	0.3	0.13						< 0.01	< 0.01	< 0.01	
Toluene	(mg/kg)	MCERTS	550	240						< 0.01	< 0.01	< 0.01	
Ethylbenzene	(mg/kg)	MCERTS	150	62						< 0.01	< 0.01	< 0.01	
m&p Xylene	(mg/kg)	MCERTS	160	70						< 0.02	< 0.02	< 0.02	
o-Xylene	(mg/kg)	MCERTS	170	70						< 0.01	< 0.01	< 0.01	
MTBE	(mg/kg)	MCERTS	-	-						< 0.01	< 0.01	< 0.01	
Aliphatic >C ₅ to C ₆ [HS_MS_1D_AL]	(mg/kg)	MCERTS	80	40						< 0.06	< 0.06	< 0.06	
Aliphatic >C ₆ to C ₈ [HS_MS_1D_AL]	(mg/kg)	MCERTS	250	110						< 0.06	< 0.06	< 0.06	
Aliphatic >C ₈ to C ₁₀ [HS_MS_1D_AL]	(mg/kg)	MCERTS	70	30						< 0.06	< 0.06	< 0.06	
Aliphatic >C ₁₀ to C ₁₂ [EH_2D_AL]	(mg/kg)	MCERTS	360	150						2.3	< 1.0	< 1.0	
Aliphatic >C ₁₂ to C ₁₆ [EH_2D_AL]	(mg/kg)	MCERTS	2600	1200						3.0	< 1.0	< 1.0	
Aliphatic >C ₁₆ to C ₂₁ [EH_2D_AL]	(mg/kg)	MCERTS	94000	69000						2.5	< 1.0	< 1.0	
Aliphatic >C ₂₁ to C ₃₅ [EH_2D_AL]	(mg/kg)	MCERTS	94000	69000						5.8	< 2.0	< 2.0	
Aliphatic >C ₃₅ to C ₄₄ [EH_2D_AL]	(mg/kg)	u	94000	69000						< 5.0	< 5.0	< 5.0	
Aromatic >C ₅ to C ₇ [HS_MS_1D_AR]	(mg/kg)	MCERTS	240	110						< 0.01	< 0.01	< 0.01	
Aromatic >C ₇ to C ₈ [HS_MS_1D_AR]	(mg/kg)	MCERTS	550	240						< 0.01	< 0.01	< 0.01	
Aromatic >C ₈ to C ₁₀ [HS_MS_1D_AR]	(mg/kg)	MCERTS	110	50						< 0.06	< 0.06	< 0.06	
Aromatic >C ₁₀ to C ₁₂ [EH_2D_AR]	(mg/kg)	MCERTS	340	150						< 1.0	< 1.0	< 1.0	
Aromatic >C ₁₂ to C ₁₆ [EH_2D_AR]	(mg/kg)	MCERTS	660	320						1.2	< 1.0	< 1.0	
Aromatic >C ₁₆ to C ₂₁ [EH_2D_AR]	(mg/kg)	MCERTS	930	540						3.3	1.9	1.5	
Aromatic >C ₂₁ to C ₃₅ [EH_2D_AR]	(mg/kg)	MCERTS	1700	1400						5.8	2.3	3.0	
Aromatic >C ₃₅ to C ₄₄ [EH_2D_AR]	(mg/kg)	u	1700	1400						< 5.0	< 5.0	< 5.0	
Total >C ₅ to C ₃₅ [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	-	-						24	< 10	< 10	
Total >C ₅ to C ₄₀ [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	-	-						24	< 10	< 10	
VOC*													
Benzene	(mg/kg)	MCERTS	0.3	0.13						< 0.01	< 0.01	< 0.01	
Toluene	(mg/kg)	MCERTS	550	240						< 0.01	< 0.01	< 0.01	
Ethylbenzene	(mg/kg)	MCERTS	150	62						< 0.01	< 0.01	< 0.01	
m&p Xylene	(mg/kg)	MCERTS	160	70						< 0.02	< 0.02	< 0.02	
o-Xylene	(mg/kg)	MCERTS	170	70						< 0.01	< 0.01	< 0.01	
Dichlorodifluoromethane	(mg/kg)	UKAS	-	-						< 0.05	< 0.05	< 0.05	
Chloromethane	(mg/kg)	UKAS	-	-						< 0.02	< 0.02	< 0.02	
Vinyl Chloride	(mg/kg)	MCERTS	-	-						< 0.02	< 0.02	< 0.02	
Bromomethane	(mg/kg)	u	-	-						< 0.05	< 0.05	< 0.05	
Chloroethane	(mg/kg)	MCERTS	-	-						< 0.01	< 0.01	< 0.01	
Trichlorofluoromethane	(mg/kg)	MCERTS	-	-						< 0.01	< 0.01	< 0.01	

Analytical Test Results - Soil - Queens Road, Barnsley

			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)		Made Ground					Natural Strata			
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504756 ES1 BH2 0.20 07/05/2025	504759 ES1 BH4 0.50 07/05/2025	504764 ES1 BH7 0.20 08/05/2025	504762 ES1 BH6 0.50 07/05/2025	504766 ES1 BH8 0.50 08/05/2025	504755 ES1 BH1 0.50 07/05/2025	504758 ES2 BH3 2.00 07/05/2025	504760 ES2 BH4 1.00 07/05/2025	504761 ES2 BH5 2.00 07/05/2025
Analytical Parameter (Soil)	Units	Accreditation											
1,1-Dichloroethylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	-	-							0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	-	-							< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	-	-							< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	-	-							< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	-	-							< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	-	-							< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	-	-							< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	-	-							< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	-	-							< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	-	-							< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	-	-							< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	-	-							< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	-	-							< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	-	-							< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	-	-							< 0.05	< 0.05	< 0.05

Analytical Test Results - Soil - Queens Road, Barnsley

Lab Reference Client Sample ID Client Sample Location Depth (m bgl) Date Sampled			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)		Made Ground					Natural Strata			
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504756 ES1 BH2 0.20 07/05/2025	504759 ES1 BH4 0.50 07/05/2025	504764 ES1 BH7 0.20 08/05/2025	504762 ES1 BH6 0.50 07/05/2025	504766 ES1 BH8 0.50 08/05/2025	504755 ES1 BH1 0.50 07/05/2025	504758 ES2 BH3 2.00 07/05/2025	504760 ES2 BH4 1.00 07/05/2025	504761 ES2 BH5 2.00 07/05/2025
Analytical Parameter (Soil)	Units	Accreditation											
SVOC*													
1,2,4-Trichlorobenzene	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
1,3-Dichlorobenzene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
1-Chloronaphthalene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	(mg/kg)	u	-	-							< 0.6	< 0.6	< 0.6
2,4,5-Trichlorophenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	(mg/kg)	u	-	-							< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
2,4-Dinitrophenol	(mg/kg)	u	-	-							< 2.0	< 2.0	< 2.0
2,6-Dichlorophenol	(mg/kg)	u	-	-							< 0.3	< 0.3	< 0.3
2,6-Dinitrotoluene	(mg/kg)	u	-	-							< 0.6	< 0.6	< 0.6
2-Chlorophenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
2-Methylphenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
2-Nitroaniline	(mg/kg)	u	-	-							< 0.4	< 0.4	< 0.4
2-Nitrophenol	(mg/kg)	u	-	-							< 0.6	< 0.6	< 0.6
3,3-Dichlorobenzidine	(mg/kg)	u	-	-							< 0.3	< 0.3	< 0.3
3/4-Methylphenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
3-Nitroaniline	(mg/kg)	u	-	-							< 0.6	< 0.6	< 0.6
4 Chlorophenyl phenyl ether	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
4,6-Dinitro-2-methylphenol	(mg/kg)	u	-	-							< 1.0	< 1.0	< 1.0
4-Bromophenyl phenyl ether	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
4-Chloro-3-methylphenol	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
4-Chloroaniline	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
4-Nitroaniline	(mg/kg)	u	-	-							< 0.3	< 0.3	< 0.3
4-Nitrophenol	(mg/kg)	u	-	-							< 0.6	< 0.6	< 0.6
Acenaphthene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Acenaphthylene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Aniline	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Anthracene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Azobenzene	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Benz[a]anthracene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Benzo[ghi]perylene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Benzo[a]pyrene	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Benzo[b]fluoranthene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Benzo[k]fluoranthene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Benzyl Alcohol	(mg/kg)	u	-	-							< 0.3	< 0.3	< 0.3
Benzyl butyl phthalate	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Bis(2-chloroethoxy)methane	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Bis(2-ethylhexyl) phthalate	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Chrysene	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	(mg/kg)	u	-	-							< 0.2	< 0.2	< 0.2
Dibenzofuran	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1
Dibutyl phthalate	(mg/kg)	u	-	-							< 0.1	< 0.1	< 0.1

Analytical Test Results - Soil - Queens Road, Barnsley

			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)		Made Ground					Natural Strata			
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504756	504759	504764	504762	504766	504755	504758	504760	504761
					ES1	ES1	ES1	ES1	ES1	ES1	ES2	ES2	ES2
					BH2	BH4	BH7	BH6	BH8	BH1	BH3	BH4	BH5
					0.20	0.50	0.20	0.50	0.50	0.50	2.00	1.00	2.00
					07/05/2025	07/05/2025	08/05/2025	07/05/2025	08/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025
Analytical Parameter (Soil)	Units	Accreditation											
Diethyl Phthalate	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Dimethyl phthalate	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Di-n-octyl phthalate	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Diphenylamine	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	
Fluoranthene	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	
Fluorene	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	
Hexachlorobenzene	(mg/kg)	u	-	-						< 0.3	< 0.3	< 0.3	
Hexachlorobutadiene	(mg/kg)	u	-	-						< 0.3	< 0.3	< 0.3	
Hexachlorocyclopentadiene	(mg/kg)	u	-	-						< 1.0	< 1.0	< 1.0	
Hexachloroethane	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Indeno[1,2,3-cd]pyrene	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Isophorone	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Methyl Methanesulfonate	(mg/kg)	u	-	-						< 0.3	< 0.3	< 0.3	
Naphthalene	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	
NitroBenzene	(mg/kg)	u	-	-						< 0.3	< 0.3	< 0.3	
N-Nitrosodimethylamine	(mg/kg)	u	-	-						< 0.2	< 0.2	< 0.2	
Pentachlorophenol	(mg/kg)	u	-	-						< 1.0	< 1.0	< 1.0	
Phenanthrene	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	
Phenol	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	
Pyrene	(mg/kg)	u	-	-						< 0.1	< 0.1	< 0.1	

Analytical Test Results - Soil - Queens Road, Barnsley

Lab Reference Client Sample ID Client Sample Location Depth (m bgl) Date Sampled			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)				
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504763 ES2 BH6 1.00 07/05/2025	504765 ES2 BH7 1.00 08/05/2025	504767 ES2 BH9 2.00 08/05/2025
Analytical Parameter (Soil)	Units	Accreditation					
Moisture Content	%	u	-	-	18	22	18
Stone Content	%	u	-	-	<0.1	<0.1	<0.1
Asbestos							
Asbestos in Soil Detected/Not Detected	-	UKAS	Presence		No asbestos detected	No asbestos detected	No asbestos detected
General Inorganics							
pH	pH Units	MCERTS	<5		5.4	7.6	6.4
Electrical Conductivity	(µs/cm)	u	See report text		135	92	75
Redox Potential	(mV)	u	See report text		248	200	182
Total Sulphate as SO ₄ (Acid Soluble)	(%)	u	-		0.05	0.03	0.03
Total Sulphate as SO ₄ (Acid Soluble)	mg/kg	u	2,400		500	300	300
Sulphate (Water soluble as SO ₄)	(mg/l)	u	-		84	56	41
Sulphate (Water soluble as SO ₄)	(g/l)	u	0.5		0.084	0.056	0.041
Sulphide	(mg/kg)	u	-		< 15	< 15	< 15
Sulphur (Total)	(%)	UKAS	-		0.03	0.02	0.03
Total Potential Sulphate	(%)	(%)	0.24 (DS1 of BRE SD1)		0.08	0.05	0.09
Thiocyanate	(mg/kg)	u	-		< 5.0	< 5.0	< 5.0
TOC	(%)	MCERTS	-		0.6	0.5	1.0
Soil Organic Matter (via TOC)	(%)	UKAS	-		1.0	0.9	1.6
Metals/Metalloids							
Arsenic	(mg/kg)	MCERTS	37		< 10	< 10	< 10
Barium	(mg/kg)	MCERTS	1,300		75	79	67
Boron (w/s)	(mg/kg)	u	290		< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	22		0.8	0.8	0.8
Chromium (Total)	(mg/kg)	UKAS	910		1.7	2.9	1.6
Chromium (Hexavalent)	(mg/kg)	u	21		< 1.0	< 1.0	< 1.0
Copper	(mg/kg)	MCERTS	2,400		45	22	19
Lead	(mg/kg)	MCERTS	200		20	16	18
Mercury	(mg/kg)	UKAS	40		< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	130		26	14	15
Selenium	(mg/kg)	u	250		< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	3,700		66	42	45
Speciated PAH*							
Acenaphthene	(mg/kg)	MCERTS	1,080	490	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	900	400	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	10,700	5,400	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	13	11	< 0.02	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	3	2.7	< 0.02	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	3.7	3.3	< 0.02	< 0.02	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	350	340	< 0.02	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	100	93	< 0.02	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	27	22	< 0.02	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.30	0.28	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	890	560	< 0.02	< 0.02	< 0.02
Fluorene	(mg/kg)	MCERTS	850	390	< 0.02	< 0.02	< 0.02

Analytical Test Results - Soil - Queens Road, Barnsley

			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)				
Lab Reference			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504763 ES2 BH6 1.00 07/05/2025	504765 ES2 BH7 1.00 08/05/2025	504767 ES2 BH9 2.00 08/05/2025
Client Sample ID							
Client Sample Location							
Depth (m bgl)							
Date Sampled							
Analytical Parameter (Soil)	Units	Accreditation					
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	41	36	< 0.02	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	5.5	2.3	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	440	220	< 0.02	< 0.02	0.04
Pyrene	(mg/kg)	MCERTS	2,000	1,200	< 0.02	< 0.02	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	-	-	< 0.32	< 0.32	0.39
Total Phenols (Monohydric)*							
Total Phenols	(mg/kg)	MCERTS	380	200	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons and Oxygenates*							
Benzene	(mg/kg)	MCERTS	0.3	0.13	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	550	240	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	150	62	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	160	70	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	170	70	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Aliphatic >C ₅ to C ₆ [HS_MS_1D_AL]	(mg/kg)	MCERTS	80	40	< 0.06	< 0.06	< 0.06
Aliphatic >C ₆ to C ₈ [HS_MS_1D_AL]	(mg/kg)	MCERTS	250	110	< 0.06	< 0.06	< 0.06
Aliphatic >C ₈ to C ₁₀ [HS_MS_1D_AL]	(mg/kg)	MCERTS	70	30	< 0.06	< 0.06	< 0.06
Aliphatic >C ₁₀ to C ₁₂ [EH_2D_AL]	(mg/kg)	MCERTS	360	150	< 1.0	< 1.0	< 1.0
Aliphatic >C ₁₂ to C ₁₆ [EH_2D_AL]	(mg/kg)	MCERTS	2600	1200	< 1.0	< 1.0	1.3
Aliphatic >C ₁₆ to C ₂₁ [EH_2D_AL]	(mg/kg)	MCERTS	94000	69000	< 1.0	< 1.0	< 1.0
Aliphatic >C ₂₁ to C ₃₅ [EH_2D_AL]	(mg/kg)	MCERTS	94000	69000	< 2.0	< 2.0	3.1
Aliphatic >C ₃₅ to C ₄₄ [EH_2D_AL]	(mg/kg)	u	94000	69000	< 5.0	< 5.0	< 5.0
Aromatic >C ₅ to C ₇ [HS_MS_1D_AR]	(mg/kg)	MCERTS	240	110	< 0.01	< 0.01	< 0.01
Aromatic >C ₇ to C ₈ [HS_MS_1D_AR]	(mg/kg)	MCERTS	550	240	< 0.01	< 0.01	< 0.01
Aromatic >C ₈ to C ₁₀ [HS_MS_1D_AR]	(mg/kg)	MCERTS	110	50	< 0.06	< 0.06	< 0.06
Aromatic >C ₁₀ to C ₁₂ [EH_2D_AR]	(mg/kg)	MCERTS	340	150	< 1.0	< 1.0	< 1.0
Aromatic >C ₁₂ to C ₁₆ [EH_2D_AR]	(mg/kg)	MCERTS	660	320	< 1.0	< 1.0	< 1.0
Aromatic >C ₁₆ to C ₂₁ [EH_2D_AR]	(mg/kg)	MCERTS	930	540	1.4	1.4	1.4
Aromatic >C ₂₁ to C ₃₅ [EH_2D_AR]	(mg/kg)	MCERTS	1700	1400	3.0	< 2.0	3.1
Aromatic >C ₃₅ to C ₄₄ [EH_2D_AR]	(mg/kg)	u	1700	1400	< 5.0	< 5.0	< 5.0
Total >C ₅ to C ₃₅ [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	-	-	< 10	< 10	< 10
Total >C ₅ to C ₄₀ [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	-	-	< 10	< 10	< 10
VOC*							
Benzene	(mg/kg)	MCERTS	0.3	0.13	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	550	240	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	150	62	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	160	70	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	170	70	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	-	-	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	-	-	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	-	-	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	-	-	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01

Analytical Test Results - Soil - Queens Road, Barnsley

Lab Reference
 Client Sample ID
 Client Sample Location
 Depth (m bgl)
 Date Sampled

Analytical Parameter (Soil)	Units	Accreditation	GAC (Residential with home-grown produce) mg/kg (1-6% SOM)				
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504763 ES2 BH6 1.00 07/05/2025	504765 ES2 BH7 1.00 08/05/2025	504767 ES2 BH9 2.00 08/05/2025
1,1-Dichloroethylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	-	-	< 0.10	< 0.10	0.24
MTBE	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	-	-	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	-	-	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	-	-	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	-	-	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	-	-	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	-	-	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	-	-	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	-	-	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	-	-	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	-	-	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	-	-	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	-	-	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	-	-	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	-	-	< 0.05	< 0.05	< 0.05

Analytical Test Results - Soil - Queens Road, Barnsley

Lab Reference Client Sample ID Client Sample Location Depth (m bgl) Date Sampled			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)				
			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504763 ES2 BH6 1.00 07/05/2025	504765 ES2 BH7 1.00 08/05/2025	504767 ES2 BH9 2.00 08/05/2025
Analytical Parameter (Soil)	Units	Accreditation					
SVOC*							
1,2,4-Trichlorobenzene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
1,3-Dichlorobenzene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
1-Chloronaphthalene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	(mg/kg)	u	-	-	< 0.6	< 0.6	< 0.6
2,4,5-Trichlorophenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
2,4-Dinitrophenol	(mg/kg)	u	-	-	< 2.0	< 2.0	< 2.0
2,6-Dichlorophenol	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
2,6-Dinitrotoluene	(mg/kg)	u	-	-	< 0.6	< 0.6	< 0.6
2-Chlorophenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
2-Methylphenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
2-Nitroaniline	(mg/kg)	u	-	-	< 0.4	< 0.4	< 0.4
2-Nitrophenol	(mg/kg)	u	-	-	< 0.6	< 0.6	< 0.6
3,3-Dichlorobenzidine	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
3/4-Methylphenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
3-Nitroaniline	(mg/kg)	u	-	-	< 0.6	< 0.6	< 0.6
4 Chlorophenyl phenyl ether	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
4,6-Dinitro-2-methylphenol	(mg/kg)	u	-	-	< 1.0	< 1.0	< 1.0
4-Bromophenyl phenyl ether	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
4-Chloro-3-methylphenol	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
4-Chloroaniline	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
4-Nitroaniline	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
4-Nitrophenol	(mg/kg)	u	-	-	< 0.6	< 0.6	< 0.6
Acenaphthene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Acenaphthylene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Aniline	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Anthracene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Azobenzene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Benz[a]anthracene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Benzo[a]pyrene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Benzo[b]fluoranthene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Benzo[k]fluoranthene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
Benzyl butyl phthalate	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Bis(2-chloroethoxy)methane	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Bis(2-ethylhexyl) phthalate	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Chrysene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Dibenzofuran	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Dibutyl phthalate	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1

Analytical Test Results - Soil - Queens Road, Barnsley

			GAC (Residential with home-grown produce) mg/kg (1-6% SOM)				
Lab Reference			Residential with home-grown produce GAC @ 6.0% SOM (mg/kg) for organics in Made Ground*	Residential with home-grown produce GAC @ 2.5% SOM (mg/kg) for organics in Natural Strata*	504763	504765	504767
Client Sample ID					ES2	ES2	ES2
Client Sample Location					BH6	BH7	BH9
Depth (m bgl)					1.00	1.00	2.00
Date Sampled					07/05/2025	08/05/2025	08/05/2025
Analytical Parameter (Soil)	Units	Accreditation					
Diethyl Phthalate	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Dimethyl phthalate	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Di-n-octyl phthalate	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Diphenylamine	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Fluoranthene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Fluorene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
Hexachlorobutadiene	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	(mg/kg)	u	-	-	< 1.0	< 1.0	< 1.0
Hexachloroethane	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Indeno[1,2,3-cd]pyrene	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Isophorone	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Methyl Methanesulfonate	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
Naphthalene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
NitroBenzene	(mg/kg)	u	-	-	< 0.3	< 0.3	< 0.3
N-Nitrosodimethylamine	(mg/kg)	u	-	-	< 0.2	< 0.2	< 0.2
Pentachlorophenol	(mg/kg)	u	-	-	< 1.0	< 1.0	< 1.0
Phenanthrene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Phenol	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1
Pyrene	(mg/kg)	u	-	-	< 0.1	< 0.1	< 0.1

Test Results

Client/client ref: Whitshaw Dev Site ref: Queens Road

Date: 01-Jun-2025

Project ref: GUK-0425-03

Data description: Contamination Assessment

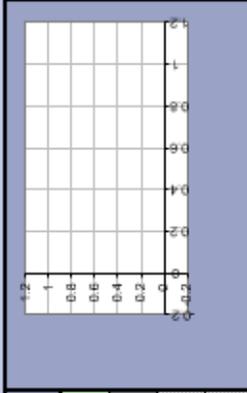
User details: Groundsmiths

Dataset: Lead	▼
Sample mean, \bar{x}	242
Sample standard deviation, s	203.09
Sample size, n	5
Critical concentration, Cc	200

Outliers & non-detects

Outliers present?	NO
Significance level	5% ▼
Outliers removed?	0
Non-detects	0

Use Normal distribution to t_i ▼



Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

Test scenario: Planning: is true mean lower than critical concentration ($\mu < C_c$) ▼

Null hypothesis: The true mean concentration is equal to or greater than the critical concentration: $\mu \geq C_c$

Alternative hypothesis: The true mean concentration is less than the critical concentration: $\mu < C_c$

Evidence against Null hypothesis:

Base decision on:	evidence level	0%
Evidence level required:		95%
Balance of probability?		N/A
Reject Null Hypothesis?		No

$\mu \geq C_c$

Project: Queens Road, Barnsley

Date: June 2025

Contaminant: Lead

Checked: AJS

Project No: GUK-0425-03

Client: Whitshaw Developments Limited





Groundsmiths (UK) Ltd

7 - 11 Harding Street
Leicester
LE1 4DH

Analytical Test Report: L25/04777/GRS - 25-65497

Your Project Reference:	GUK-0425-03 Queens Road, Barnsley		
Your Order Number:	004	Samples Received / Instructed:	12/05/2025 / 12/05/2025
Report Issue Number:	1	Sample Tested:	12/05 to 22/05/2025
Samples Analysed:	13 sample(s)	Report issued:	22/05/2025

Signed

James Gane
Analytical Services Manager
CTS

Notes:

General

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

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

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

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

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

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where further analysis is required samples identified as containing asbestos are screened and tested on an as received basis. No correction is made for moisture content and other than the asbestos test(s) these results are not covered by our accreditation

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

WAC Testing

Samples were leached to our inhouse method statement in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated to report in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

This report shall not be reproduced except in full

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test, subMCERTS - Subcontracted to a laboratory MCERTS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

UKAS accreditation on waters only covers the Ground water and Surface water matrices

Date of Issue: 21.05.25

Issued by: J. Gane

Issue No: 4

Rev No: 27



4161



L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road,
Barnsley

Analytical Test Results - Solid

Lab Reference			504755	504756	504758	504759	504760	504761	504762
Client Sample ID			ES1	ES1	ES2	ES1	ES2	ES2	ES1
Client Sample Location			BH1	BH2	BH3	BH4	BH4	BH5	BH6
Client Sample Type			-	-	-	-	-	-	-
Client Sample Number			-	-	-	-	-	-	-
Depth - Top (m)			0.50	0.20	2.00	0.50	1.00	2.00	0.50
Depth - Bottom (m)			0.50	0.20	2.00	0.50	1.00	2.00	0.50
Date of Sampling			07/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025
Time of Sampling			-	-	-	-	-	-	-
Sample Matrix			Clay	Clay	Clay	Sand	Clay	Clay	Clay
Determinant	Units	Accreditation							
Arsenic	(mg/kg)	MCERTS	12	17	< 10	31	< 10	< 10	< 10
Barium	(mg/kg)	MCERTS	72	520	460	950	66	98	57
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	1.0	1.6	< 0.2	9.9	0.6	0.3	0.5
Chromium (Total)	(mg/kg)	UKAS	< 1.0	8.6	2.2	270	9.1	8.3	6.7
Copper	(mg/kg)	MCERTS	43	150	27	400	48	58	36
Lead	(mg/kg)	MCERTS	47	380	21	380	24	18	13
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	16	29	7.5	51	13	26	19
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	51	960	17	480	45	18	51
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
Sulphate (Acid Soluble)	(%)	u	0.02	0.11	0.04	0.36	0.01	0.03	0.01
pH	pH Units	MCERTS	7.7	7.9	5.8	10.6	7.6	5.1	6.4
Sulphate (Water soluble as SO ₄)	(mg/l)	u	36	59	48	62	< 10	63	49
Sulphide	(mg/kg)	u	20	40	< 15	110	16	< 15	< 15
Sulphur (Total)	(%)	UKAS	0.05	0.15	0.33	0.03	0.01	0.04	0.01
Total Potential Sulphate	(%)	(%)	0.16	0.46	0.99	0.08	0.04	0.12	0.03
Thiocyanate	(mg/kg)	u	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.20	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.20	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	0.64	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	1.3	< 0.02	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	1.4	< 0.02	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02	0.03	< 0.02	1.7	< 0.02	< 0.02	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	1.3	< 0.02	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	0.66	< 0.02	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	1.8	< 0.02	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	0.28	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	2.5	< 0.02	< 0.02	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.20	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	0.85	< 0.02	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	0.33	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02	0.04	< 0.02	1.4	< 0.02	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02	0.11	< 0.02	2.2	< 0.02	0.05	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32	0.50	< 0.32	17	< 0.32	0.42	< 0.32
TOC	(%)	MCERTS	3.0	5.6	0.8	8.8	1.0	2.4	< 0.5
SOM (via TOC)	(%)	UKAS	5.2	9.7	1.3	15	1.7	4.2	< 0.9
Asbestos	-	UKAS	No asbestos detected						
Conductivity	(µs/cm)	u	68	256	87	491	89	83	79



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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road,
Barnsley

Analytical Test Results - Solid

Lab Reference	504755	504756	504758	504759	504760	504761	504762		
Client Sample ID	ES1	ES1	ES2	ES1	ES2	ES2	ES1		
Client Sample Location	BH1	BH2	BH3	BH4	BH4	BH5	BH6		
Client Sample Type	-	-	-	-	-	-	-		
Client Sample Number	-	-	-	-	-	-	-		
Depth - Top (m)	0.50	0.20	2.00	0.50	1.00	2.00	0.50		
Depth - Bottom (m)	0.50	0.20	2.00	0.50	1.00	2.00	0.50		
Date of Sampling	07/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025	07/05/2025		
Time of Sampling	-	-	-	-	-	-	-		
Sample Matrix	Clay	Clay	Clay	Sand	Clay	Clay	Clay		
Determinant	Units	Accreditation							
Redox	(mV)	u	140	140	180	-113	82	186	159



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7 - 11 Harding Street
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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road,
Barnsley

Analytical Test Results - Solid

Lab Reference			504763	504764	504765	504766	504767
Client Sample ID			ES2	ES1	ES2	ES1	ES2
Client Sample Location			BH6	BH7	BH7	BH8	BH9
Client Sample Type			-	-	-	-	-
Client Sample Number			-	-	-	-	-
Depth - Top (m)			1.00	0.20	1.00	0.50	2.00
Depth - Bottom (m)			1.00	0.20	1.00	0.50	2.00
Date of Sampling			07/05/2025	08/05/2025	08/05/2025	08/05/2025	08/05/2025
Time of Sampling			-	-	-	-	-
Sample Matrix			Clay	Sand	Clay	Clay	Clay
Determinant	Units	Accreditation					
Arsenic	(mg/kg)	MCERTS	< 10	26	< 10	< 10	< 10
Barium	(mg/kg)	MCERTS	75	850	79	60	67
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.8	1.2	0.8	0.7	0.8
Chromium (Total)	(mg/kg)	UKAS	1.7	< 1.0	2.9	3.9	1.6
Copper	(mg/kg)	MCERTS	45	100	22	51	19
Lead	(mg/kg)	MCERTS	20	410	16	27	18
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	26	26	14	13	15
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	66	77	42	54	45
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sulphate (Acid Soluble)	(%)	u	0.05	0.11	0.03	0.04	0.03
pH	pH Units	MCERTS	5.4	7.6	7.6	5.3	6.4
Sulphate (Water soluble as SO ₄)	(mg/l)	u	84	29	56	74	41
Sulphide	(mg/kg)	u	< 15	59	< 15	< 15	< 15
Sulphur (Total)	(%)	UKAS	0.03	0.10	0.02	0.02	0.03
Total Potential Sulphate	(%)	(%)	0.08	0.31	0.05	0.07	0.09
Thiocyanate	(mg/kg)	u	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	0.16	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	0.28	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02	0.85	< 0.02	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02	0.93	< 0.02	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02	1.3	< 0.02	< 0.02	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	0.68	< 0.02	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	0.49	< 0.02	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02	0.97	< 0.02	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	0.18	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	< 0.02	1.3	< 0.02	< 0.02	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02	0.05	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	0.65	< 0.02	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	2.0	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02	0.90	< 0.02	< 0.02	0.04
Pyrene	(mg/kg)	MCERTS	< 0.02	1.1	< 0.02	< 0.02	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32	12	< 0.32	< 0.32	0.39
TOC	(%)	MCERTS	0.6	14	0.5	0.7	1.0
SOM (via TOC)	(%)	UKAS	1.0	25	0.9	1.2	1.6
Asbestos	-	UKAS	No asbestos detected				
Conductivity	(µs/cm)	u	135	108	92	108	75



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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road,
Barnsley

Analytical Test Results - Solid

Lab Reference	504763	504764	504765	504766	504767		
Client Sample ID	ES2	ES1	ES2	ES1	ES2		
Client Sample Location	BH6	BH7	BH7	BH8	BH9		
Client Sample Type	-	-	-	-	-		
Client Sample Number	-	-	-	-	-		
Depth - Top (m)	1.00	0.20	1.00	0.50	2.00		
Depth - Bottom (m)	1.00	0.20	1.00	0.50	2.00		
Date of Sampling	07/05/2025	08/05/2025	08/05/2025	08/05/2025	08/05/2025		
Time of Sampling	-	-	-	-	-		
Sample Matrix	Clay	Sand	Clay	Clay	Clay		
Determinant	Units	Accreditation					
Redox	(mV)	u	248	181	200	233	182



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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road,
Barnsley

Analytical Test Results - VPH / EPH

Lab Reference	504755	504758	504760	504763	504765	504767
Client Sample ID	ES1	ES2	ES2	ES2	ES2	ES2
Client Sample Location	BH1	BH3	BH4	BH6	BH7	BH9
Client Sample Type	-	-	-	-	-	-
Client Sample Number	-	-	-	-	-	-
Depth - Top (m)	0.50	2.00	1.00	1.00	1.00	2.00
Depth - Bottom (m)	0.50	2.00	1.00	1.00	1.00	2.00
Date of Sampling	07/05/2025	07/05/2025	07/05/2025	07/05/2025	08/05/2025	08/05/2025
Time of Sampling	-	-	-	-	-	-
Sample Matrix	Clay	Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation				
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C ₅ to C ₆ [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic >C ₆ to C ₈ [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic >C ₈ to C ₁₀ [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic >C ₁₀ to C ₁₂ [EH_2D_AL]	(mg/kg)	MCERTS	2.3	< 1.0	< 1.0	< 1.0
Aliphatic >C ₁₂ to C ₁₆ [EH_2D_AL]	(mg/kg)	MCERTS	3.0	< 1.0	< 1.0	1.3
Aliphatic >C ₁₆ to C ₂₁ [EH_2D_AL]	(mg/kg)	MCERTS	2.5	< 1.0	< 1.0	< 1.0
Aliphatic >C ₂₁ to C ₃₅ [EH_2D_AL]	(mg/kg)	MCERTS	5.8	< 2.0	< 2.0	3.1
Aliphatic >C ₃₅ to C ₄₄ [EH_2D_AL]	(mg/kg)	u	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic >C ₅ to C ₇ [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C ₇ to C ₈ [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C ₈ to C ₁₀ [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06	< 0.06
Aromatic >C ₁₀ to C ₁₂ [EH_2D_AR]	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic >C ₁₂ to C ₁₆ [EH_2D_AR]	(mg/kg)	MCERTS	1.2	< 1.0	< 1.0	< 1.0
Aromatic >C ₁₆ to C ₂₁ [EH_2D_AR]	(mg/kg)	MCERTS	3.3	1.9	1.5	1.4
Aromatic >C ₂₁ to C ₃₅ [EH_2D_AR]	(mg/kg)	MCERTS	5.8	2.3	3.0	3.0
Aromatic >C ₃₅ to C ₄₄ [EH_2D_AR]	(mg/kg)	u	< 5.0	< 5.0	< 5.0	< 5.0
Total >C ₅ to C ₃₅ [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	24	< 10	< 10	< 10
Total >C ₅ to C ₄₀ [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	24	< 10	< 10	< 10



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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, I

Analytical Test Results - VOC

Lab Reference	504755	504758	504760	504763	504765	504767
Client Sample ID	ES1	ES2	ES2	ES2	ES2	ES2
Client Sample Location	BH1	BH3	BH4	BH6	BH7	BH9
Client Sample Type	-	-	-	-	-	-
Client Sample Number	-	-	-	-	-	-
Depth - Top (m)	0.50	2.00	1.00	1.00	1.00	2.00
Depth - Bottom (m)	0.50	2.00	1.00	1.00	1.00	2.00
Date of Sampling	07/05/2025	07/05/2025	07/05/2025	07/05/2025	08/05/2025	08/05/2025
Time of Sampling	-	-	-	-	-	-
Sample Matrix	Clay	Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation				
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	0.10	< 0.10	< 0.10	0.24
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,2-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,2-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05	< 0.05

L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, I

Analytical Test Results - SVOC

Lab Reference	504755	504758	504760	504763	504765	504767
Client Sample ID	ES1	ES2	ES2	ES2	ES2	ES2
Client Sample Location	BH1	BH3	BH4	BH6	BH7	BH9
Client Sample Type	-	-	-	-	-	-
Client Sample Number	-	-	-	-	-	-
Depth - Top (m)	0.50	2.00	1.00	1.00	1.00	2.00
Depth - Bottom (m)	0.50	2.00	1.00	1.00	1.00	2.00
Date of Sampling	07/05/2025	07/05/2025	07/05/2025	07/05/2025	08/05/2025	08/05/2025
Time of Sampling	-	-	-	-	-	-
Sample Matrix	Clay	Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation				
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dichlorobenzene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
1-Chloronaphthalene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	(mg/kg)	u	< 0.6	< 0.6	< 0.6	< 0.6
2,4,5-Trichlorophenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dinitrophenol	(mg/kg)	u	< 2.0	< 2.0	< 2.0	< 2.0
2,6-Dichlorophenol	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
2,6-Dinitrotoluene	(mg/kg)	u	< 0.6	< 0.6	< 0.6	< 0.6
2-Chlorophenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylphenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitroaniline	(mg/kg)	u	< 0.4	< 0.4	< 0.4	< 0.4
2-Nitrophenol	(mg/kg)	u	< 0.6	< 0.6	< 0.6	< 0.6
3,3-Dichlorobenzidine	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
3/4-Methylphenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
3-Nitroaniline	(mg/kg)	u	< 0.6	< 0.6	< 0.6	< 0.6
4-Chlorophenyl phenyl ether	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
4,6-Dinitro-2-methylphenol	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0
4-Bromophenyl phenyl ether	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
4-Chloro-3-methylphenol	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
4-Chloroaniline	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
4-Nitroaniline	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
4-Nitrophenol	(mg/kg)	u	< 0.6	< 0.6	< 0.6	< 0.6
Acenaphthene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Aniline	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Anthracene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Benz[a]anthracene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Benzo[ghi]perylene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Benzo[a]pyrene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Benzo[b]fluoranthene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Benzo[k]fluoranthene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
Benzyl butyl phthalate	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroethoxy)methane	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-ethylhexyl) phthalate	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Chrysene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz[a,h]anthracene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzofuran	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Dibutyl phthalate	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Diethyl Phthalate	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Dimethyl phthalate	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octyl phthalate	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Diphenylamine	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorobutadiene	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0
Hexachloroethane	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Indeno[1,2,3-cd]pyrene	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Isophorone	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Methyl Methanesulfonate	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
NitroBenzene	(mg/kg)	u	< 0.3	< 0.3	< 0.3	< 0.3
N-Nitrosodimethylamine	(mg/kg)	u	< 0.2	< 0.2	< 0.2	< 0.2
Pentachlorophenol	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0
Phenanthrene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1
Phenol	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1

L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, I

Analytical Test Results - SVOC

Lab Reference	504755	504758	504760	504763	504765	504767
Client Sample ID	ES1	ES2	ES2	ES2	ES2	ES2
Client Sample Location	BH1	BH3	BH4	BH6	BH7	BH9
Client Sample Type	-	-	-	-	-	-
Client Sample Number	-	-	-	-	-	-
Depth - Top (m)	0.50	2.00	1.00	1.00	1.00	2.00
Depth - Bottom (m)	0.50	2.00	1.00	1.00	1.00	2.00
Date of Sampling	07/05/2025	07/05/2025	07/05/2025	07/05/2025	08/05/2025	08/05/2025
Time of Sampling	-	-	-	-	-	-
Sample Matrix	Clay	Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation				
Pyrene	(mg/kg)	u	< 0.1	< 0.1	< 0.1	< 0.1



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Project Reference - GUK-0425-03 Queens Road, Barnsley

Certificate Of Analysis - WAC Suite

Lab Reference	504757
Client Sample ID	ES2
Client Sample Location	BH2
Client Sample Type	-
Client Sample Number	-
Depth - Top (m)	1
Depth - Bottom (m)	1
Date of Sampling	07/05/2025
Time of Sampling	-
Sample Description	Mottled grey brown slightly gravelly silty clay
Sample Matrix	Clay
Moisture Content (%)	18
Stone content (%)	< 0.1

	Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
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Solid Analysis

Parameter	Unit	MCERTS	Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Total Organic Carbon	%	MCERTS	1.2	3.0	5.0	6.0
Loss on Ignition	%	UKAS	4.6	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	MCERTS	< 0.025	1.00	-	-
Mineral Oil (>C10 to C40) [EH_1D_Total]	mg/kg	MCERTS	24	500	-	-
PAH	mg/kg	u	0.4	100	-	-
pH	units	MCERTS	5.3	-	> 6	-

Eluate Analysis

Parameter	Unit	UKAS	Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Arsenic	mg/kg	UKAS	< 0.0050	0.50	2	25
Barium	mg/kg	UKAS	0.11	20	100	300
Cadmium	mg/kg	UKAS	< 0.0025	0.04	1	5
Chromium (total)	mg/kg	UKAS	< 0.0050	0.5	10	70
Copper	mg/kg	UKAS	0.03	2.0	50	100
Mercury	mg/kg	UKAS	< 0.00050	0.01	0.2	2
Molybdenum	mg/kg	UKAS	< 0.010	0.5	10.0	30
Nickel	mg/kg	UKAS	< 0.075	0.4	10.0	40
Lead	mg/kg	UKAS	< 0.035	0.5	10.0	50
Antimony	mg/kg	UKAS	< 0.050	0.06	0.7	5
Selenium	mg/kg	UKAS	< 0.0050	0.1	0.5	7
Zinc	mg/kg	u	< 0.25	4	50	200
Chloride	mg/kg	UKAS	43	800	15000	25000
Fluoride	mg/kg	u	1	10	150	500
Sulphate (as SO ₄)	mg/kg	UKAS	100	1000	20000	50000
Total Dissolved Solids	mg/kg	u	300	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	UKAS	< 20	500	800	1000



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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, Barnsley

Certificate Of Analysis - WAC Suite

Lab Reference	504764
Client Sample ID	ES1
Client Sample Location	BH7
Client Sample Type	-
Client Sample Number	-
Depth - Top (m)	0.2
Depth - Bottom (m)	0.2
Date of Sampling	08/05/2025
Time of Sampling	-
Sample Description	Made Ground- dark brownish grey gravelly slightly clayey silty sand with occasional slag brick fragments organic matter
Sample Matrix	Sand
Moisture Content (%)	21
Stone content (%)	< 0.1

Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
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Solid Analysis

Parameter	Unit	MCERTS	Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Total Organic Carbon	%	MCERTS	14.0	3.0	5.0	6.0
Loss on Ignition	%	UKAS	6.4	-	-	10.0
BTEX	mg/kg	MCERTS	0.9	6.00	-	-
PCB's (7 Congeners)	mg/kg	MCERTS	< 0.025	1.00	-	-
Mineral Oil (>C10 to C40) [EH_1D_Total]	mg/kg	MCERTS	282	500	-	-
PAH	mg/kg	u	12	100	-	-
pH	units	MCERTS	7.6	-	> 6	-

Eluate Analysis

Parameter	Unit	UKAS	Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Arsenic	mg/kg	UKAS	0.07	0.50	2	25
Barium	mg/kg	UKAS	0.36	20	100	300
Cadmium	mg/kg	UKAS	< 0.0025	0.04	1	5
Chromium (total)	mg/kg	UKAS	0.01	0.5	10	70
Copper	mg/kg	UKAS	< 0.025	2.0	50	100
Mercury	mg/kg	UKAS	< 0.00050	0.01	0.2	2
Molybdenum	mg/kg	UKAS	0.06	0.5	10.0	30
Nickel	mg/kg	UKAS	< 0.075	0.4	10.0	40
Lead	mg/kg	UKAS	0.04	0.5	10.0	50
Antimony	mg/kg	UKAS	< 0.050	0.06	0.7	5
Selenium	mg/kg	UKAS	< 0.0050	0.1	0.5	7
Zinc	mg/kg	u	< 0.25	4	50	200
Chloride	mg/kg	UKAS	5	800	15000	25000
Fluoride	mg/kg	u	5	10	150	500
Sulphate (as SO ₄)	mg/kg	UKAS	19	1000	20000	50000
Total Dissolved Solids	mg/kg	u	690	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	UKAS	< 20	500	800	1000



L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, Barnsley

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
504755	ES1	BH1	-	-	Brown slightly gravelly slightly sandy silty clay	16	< 0.1	100
504756	ES1	BH2	-	-	Dark greyish brown slightly gravelly slightly sandy silty clay with rare rootlets plastic	24	5.9	100
504757	ES2	BH2	-	-	Mottled grey brown slightly gravelly silty clay	18	< 0.1	100
504758	ES2	BH3	-	-	Brownish grey slightly gravelly silty clay with rare brick fragments	13	< 0.1	100
504759	ES1	BH4	-	-	Made Ground- dark brownish grey gravelly slightly clayey silty sand with frequent concrete slag	13	17	100
504760	ES2	BH4	-	-	Mottled brownish grey silty clay	28	< 0.1	100
504761	ES2	BH5	-	-	Dark brownish grey silty clay	23	< 0.1	100
504762	ES1	BH6	-	-	Mottled grey brown silty clay with rare rootlets	20	< 0.1	100
504763	ES2	BH6	-	-	Mottled grey brown silty clay with rare rootlets	18	< 0.1	100
504764	ES1	BH7	-	-	Made Ground- dark brownish grey gravelly slightly clayey silty sand with occasional slag brick fragments organic matter	21	< 0.1	100
504765	ES2	BH7	-	-	Brown silty clay with rare rootlets	22	< 0.1	100
504766	ES1	BH8	-	-	Greyish brown silty clay with rare rootlets	27	< 0.1	100
504767	ES2	BH9	-	-	Brown silty clay with rare rootlets	18	< 0.1	100



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Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
504755	ES1	BH1	-	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace
504756	ES1	BH2	-	-	
504757	ES2	BH2	-	-	VPH/BTEX - Sample taken from container with headspace.
504758	ES2	BH3	-	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace
504759	ES1	BH4	-	-	PAHAR 1/10 - dark-coloured extract
504760	ES2	BH4	-	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace
504761	ES2	BH5	-	-	Chromium(Hexavalent)/ Phenol (Total) - Reporting limit raised due to sample matrix interference.
504762	ES1	BH6	-	-	
504763	ES2	BH6	-	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace
504764	ES1	BH7	-	-	VPH/BTEX - Sample taken from container with headspace.
504765	ES2	BH7	-	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace
504766	ES1	BH8	-	-	
504767	ES2	BH9	-	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace



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L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, Barnsley

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
CONDS	MS - CL - pH & Conductivity	As received	Passing 10mm test sieve	Determination of conductivity in soils by probe measurement
WACMETALS1	MS-CL-Metals in Waters by ICP-MS (WAC)	As received	MS-CL-Soil Leachate Preparation	Determination of dissolved metals in leachates via ICP-MS, expressed as quantity of analyte leached from the original material.
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
SULPHIDES	MS - CL - Sulphide in Soils	As received	Passing 10mm test sieve	Determination of sulphide in soil via titration
SVOCS	MS - CL - Semi VOC	As received	Passing 10mm test sieve	Determination of Semi volatile organic compounds in soil via GC-MS
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
SKALARPHS	MS - CL - Phenols by Skalar	As received	Passing 10mm test sieve	Determination of total phenols in soil using Skalar segmented flow analyser
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
GXCXCS	MS - CL - TPH & EPH by GCXGC	As received	Passing 10mm test sieve	Determination of TPH and EPH in soils via GCXGC-FID



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Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
CWGS	Calculation from VPH-S and EPH-S	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-GC-FID respectively
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
LEACH-SS-P	MS-CL-Soil Leachate Preparation (SS)	As Received	All crushed to pass 4mm test sieve	Preparation of single stage soil leachates in accordance with MS-CL-Soil Leachate Preparation
1377LOI	BS1377 Loi	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)



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Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided

W - No time of sampling provided for water sample

C - Received in inappropriate container

H - Contains headspace

T - Temperature on receipt exceeds storage temperature

R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
504755	ES1	BH1	-	-	MS - CL - pH in Soils	R
504755	ES1	BH1	-	-	MS - CL - VOC and MBTEX	R
504755	ES1	BH1	-	-	MS - CL - VPH	R
504756	ES1	BH2	-	-	MS - CL - pH in Soils	R
504757	ES2	BH2	-	-	MS - CL - pH in Soils (WAC)	R
504757	ES2	BH2	-	-	MS - CL - VPH	R
504758	ES2	BH3	-	-	MS - CL - pH in Soils	R
504758	ES2	BH3	-	-	MS - CL - VOC and MBTEX	R
504758	ES2	BH3	-	-	MS - CL - VPH	R
504759	ES1	BH4	-	-	MS - CL - pH in Soils	R
504760	ES2	BH4	-	-	MS - CL - pH in Soils	R
504760	ES2	BH4	-	-	MS - CL - VOC and MBTEX	R
504760	ES2	BH4	-	-	MS - CL - VPH	R
504761	ES2	BH5	-	-	MS - CL - pH in Soils	R
504762	ES1	BH6	-	-	MS - CL - pH in Soils	R
504763	ES2	BH6	-	-	MS - CL - pH in Soils	R
504763	ES2	BH6	-	-	MS - CL - VOC and MBTEX	R
504763	ES2	BH6	-	-	MS - CL - VPH	R
504764	ES1	BH7	-	-	MS - CL - pH in Soils	R
504764	ES1	BH7	-	-	MS - CL - pH in Soils (WAC)	R
504764	ES1	BH7	-	-	MS - CL - VPH	R
504765	ES2	BH7	-	-	MS - CL - pH in Soils	R
504765	ES2	BH7	-	-	MS - CL - VOC and MBTEX	R
504765	ES2	BH7	-	-	MS - CL - VPH	R
504766	ES1	BH8	-	-	MS - CL - pH in Soils	R
504767	ES2	BH9	-	-	MS - CL - pH in Soils	R
504767	ES2	BH9	-	-	MS - CL - VOC and MBTEX	R
504767	ES2	BH9	-	-	MS - CL - VPH	R



4161



A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

L25/04777/GRS - 25-65497

Project Reference - GUK-0425-03 Queens Road, Barnsley

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided

W - No time of sampling provided for water sample

C - Received in inappropriate container

H - Contains headspace

T - Temperature on receipt exceeds storage temperature

R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
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HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

APPENDIX D
Generic Assessment Criteria Values

Groundsmiths (UK) Ltd
Generic Assessment Criteria for Soils

Revision Version: V.12 - December 2023

Parameter	Residential						Commercial			Allotment			Public Open Space near Residential housing (POS _{res})			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						
Metals/Metalloids^(a)																			
Arsenic (inorganic)	37			40			640			49			79			170			DEFRA C4SL ^(b)
Barium	1,300			-			22,000			-			-			-			EIC/AGS/CL:AIRE ^(j)
Beryllium	1.7			1.7			12			35			2.2			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) ^(g)

Parameter	Residential						Commercial ⁽ⁱ⁾			Allotment			Public Open Space near Residential housing (POS _{res})			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^(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
Dibenzo(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	4,900	4,900	4,900	1,200	1,900	3,000	CLEA/LQM/CIEH
Phenanthrene	95	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

Parameter	Residential						Commercial ⁽ⁱ⁾			Allotment			Public Open Space near Residential housing (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	5,000	5,000	7,200	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	5,000	5,000	92,000	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	17,000	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
Phenol	120	200	380	440	690	1200	440	690	1300	23	42	83	440	690	1300	440	690	1300	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) Nathaniel, C.P., McCaffrey, C., Gillett, A.C., Ogden, R.C. And Nathaniel, J.F. (2015). The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. Publication Number **S4UL3339**.

(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'.

(h) Organic contaminant GAC values calculated using CLEA v1.071 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).

(j) CL:AIRE (2010). Soil Generic Assessment Criteria for Human Health Risk Assessment. ISBN 978-1-905046-20-1.

