APPENDIX C

GROUND CONDITIONS

Manor Road, Richmond

Ground Investigation Report

July 2021

FAIRHURST

CONTROL SHEET

CLIENT: **Avanton Richmond Development Limited**

PROJECT TITLE: **Manor Road, Richmond**

REPORT TITLE: **Ground Investigation Report**

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1.0 INTRODUCTION AND OBJECTIVES

1.1 GENERAL

Fairhurst have been appointed by Avanton Richmond Development Limited (the 'client') to provide a Ground Investigation Report (GIR) for a site that currently comprises a warehouse structure occupied by a DIY and pets store, positioned to the west of Manor Road, Richmond (Post Code - TW9 1YB) (herein referred to as the 'site'). A site location plan is presented in **Appendix A**.

The purpose of the ground investigation and this report is to:

- Review the available environmental, historical and geological data;
- Characterise the soil and groundwater profile that exists at the site in a phased ground investigation;
- Confirm the findings of a Phase 1 Desk Stop Study carried out by Fairhurst (Geo-Environmental and Geotechnical Preliminary Risk Assessment, 126782, R1.6); and,
- Identify geotechnical site risks and constraints with respect to the proposed development.

This report includes the results of the first phase of ground investigation undertaken whilst the site remained operational. The second phase of investigation will be undertaken once demolition is complete. This Ground Investigation Report aims to confirm the findings of the Preliminary Risk Assessment in line with the Environment Agency's (EA) Land Contamination Risk Management (LCRM) Guidance and to inform the design under Building Regulations Part C with respect to contamination.

1.2 DEVELOPMENT PROPOSAL AND PLANNING CONTEXT

A planning application for the redevelopment of the Site was submitted to London Borough of Richmond Upon Thames (LBRuT) in February 2019 (ref. 19/0510/FUL) (the 'Original Proposed Development'), and was considered at LBRuT Planning Committee on 3 July 2019. The Planning Committee resolved that they were minded to refuse the Application, however on 29 July 2019 it was confirmed that the Greater London Authority (GLA) would act as the local planning authority for the purposes of determining the application.

Amendments to the Original Application

Following review of LBRuT's reasons for refusal and discussions with Officers at the GLA and Transport for London (TfL), the Applicant sought to review the scheme, with the principal aim of increasing the delivery of affordable housing through additional density and addressing other issues raised in the Mayor's Stage 2 Report.

The proposed changes necessitate an amendment to the Application's description of development. The revised description of development (hereafter referred to as the 'Amended Proposed Development') is as follows:

The current proposed development comprises the demolition of the current retail units and the development of 4 No. residential buildings, permeable paving, soakaway drainage and soft landscaping. Building A is a part 3, part 4, part 7 and 8 storey building, Building B is an 11 storey building, Building C is a part 8 and 10 storey building and Building D is a part 4, part 7 and part 8 storey building. In addition, a basement plant room is proposed beneath Building A.

The application is currently at assessment stage before it is due to go to committee.

Proposed development plans are presented in **Appendix A**.

1.3 SOURCES OF INFORMATION

The following existing information and documents relating to the site have been reviewed and form the basis of the assessment:

- British Geological Survey (BGS) Sheet 270 South London, Solid and Drift, 1:50,000 Scale (dated 2006);
- BGS Online Geology Viewer - https://mapapps.bgs.ac.uk/geologyofbritain/home.html (accessed 19/05/2021);
- CIRIA C665 'Assessing risks posed by Hazardous Ground Gases to Buildings' (2007);
- BS8485(2015)+A1(2019) Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings;
- CIRIA (1989) Special Publication 69 – the Engineering Implications of Rising Groundwater Levels in the Deep Aquifer beneath London;
- DEFRA's MagicMaps website - https://magic.defra.gov.uk/magicmap.aspx (accessed 09/04/2021);
- London Borough of Richmond upon Thames Planning Portal - Search planning applications - London Borough of Richmond upon Thames (accessed 19/05/2021);
- LMB Geosolutions, Factual Report on Ground Investigation (dated April 2021, see **Appendix B**);
- Series 600 Specification for Highway Works (dated 2017);
- SoBRA's Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater Version 1 (dated February 2017);

1.4 LEGISLATIVE CONTEXT

This assessment has been undertaken with due regard to Contaminated Land Guidance documents including the EA's LCRM. The methods used follow a phased, risk-based approach, with the potential environmental risk assessed qualitatively within the PRA, using the 'source-pathway-receptor contaminant linkage' concept. The S-P-R linkages are then targeted by intrusive investigation works, the results of which form the basis of a Generic Quantitative Risk Assessment presented herein. The reports aim to assess risks as introduced in Part IIA of the Environmental Protection Act 1990 (EPA, 1990) and Contaminated Land Statutory Guidance 2012.

1.5 CONFIDENTIALITY AND REPORTING LIMITATIONS

This report has been prepared for the sole use and reliance of Avanton Richmond Development Limited and should not be relied upon or transferred to any other parties without the express written authorisation of Fairhurst. Fairhurst accepts no duty or responsibility (including negligence) to any party other than the stated client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

2.0 SITE SETTING AND HISTORY

This section provides a brief summary of pertinent information from Fairhurst's PRA. For a more detailed review the reader is referred to Fairhurst's Geo-Environmental and Geotechnical Preliminary Risk Assessment, 126782, R1.6.

2.1 SITE DESCRIPTION

The site is located approximately 0.6km north-east of Richmond town centre at approximate post code TW9 1YB and centred on National Grid Reference 518890, 175430. It is accessed via Manor Road, which bounds the site to the east. Railway lines form the north-western and southern boundaries.

The site is approximately triangular in shape, covering an area of about 1.8Ha and is currently occupied by a retail warehouse building (Homebase) in the central third, with associated car / bus parking in the north-eastern third and storage areas in the south-western third of the site.

2.2 SURROUNDING LAND USES

Surrounding land uses are mixed residential and commercial with the redeveloped Richmond gas works site located to the east.

2.3 SITE HISTORY

The site remained undeveloped until the late 1890s when a timber yard was noted on site. Railway siding were denoted to the south and west of the site by the early 20th century. A depot is shown on site by the 1960s together with railway cottages. By the 1970s on-site structures were redeveloped, with a possible warehouse style structure within the central portion. A fuel depot, electrical substation, coal hoppers and timber yard are detailed on site. Of these only the electrical substation is last identified in the early 1990s. By 1999 the site is presented in its current layout.

2.4 GEOLOGY

The 1:50,000 British Geological Survey (BGS) map for South London (Survey Sheet Number 270, dated 1998) and BGS online map viewer, including borehole records, have been reviewed to provide information on the published underlying geology and ground conditions.

The geology on site is summarised in Table 1.

Table 1 – Site Geology

Stratum	Area Covered	Estimated thickness (m)	Typical Description
Made Ground	Whole site	0.5m to 1.0m	Brown clayey silty sand with some gravel of brick, flint, concrete and clinker and some lenses of soft to firm brown sandy clay with occasional brick cobbles.
Kempton Park Gravel Member	Whole site	5.0m to 5.5m	The Kempton Park Gravel Member comprises sand and gravel, locally with lenses of silt, clay or peat.

Stratum	Area Covered	Estimated thickness (m)	Typical Description
London Clay Formation	Whole site	>50m	Silty sandy clay, described as stiff clay in borehole records TQ17NE436 and TQ17NE62.

Mining and Mineral Extraction

The Envirocheck identifies no records of mining, mineral sites or natural cavities within 250m of the site.

2.5 HYDROLOGY AND HYDROGEOLOGY

Hydrology

The River Thames is positioned approximately 1.4km to the north-west and 1.3km to the south-east at its closes positions, and generally flows in an easterly or south-easterly direction at these locations.

The nearest surface water feature is a pond, located circa 310m south of the site. The OS Water Network Map indicates the presence of possible field drains/ditches flowing in a southerly direction towards the pond, before trending to the east towards the River Thames.

Hydrogeology

The Environment Agency (EA) classifies the London Clay Formation as Unproductive Stratum whilst the Kempton Park Gravel Member is a Secondary A Aquifer.

The site and the surrounding area (<500m of the site boundary) are not situated within a groundwater source protection zone and there are no groundwater abstraction points situated within 500m of the site.

2.6 LANDFILL AND WASTE FACILITY RECORDS

According to the Envirocheck report, there are no current or historical landfills situated within 1,000 m of the site boundary.

2.7 RADON

A review of Public Health England's UK Maps of Radon website indicates the site to be situated within the lowest band of radon potential where less than 1% of homes are above the radon Action Level.

3.0 PERTINENT INFORMATION FROM THE PRA

The following section includes a summary of the Conceptual Site Model and the Geotechnical Engineering Assessment

3.1 Summary of Conceptual Site Model

Source Characterisation

A number of on-site and offsite potential sources of contamination were identified within the PRA. The most pertinent are summarised below:

On-site

- Made Ground
- car parking facility and bus stand
- Electricity Substation
- Historical uses including car wash facility, timber yard, crane, railway sidings, fuel depot, coal hoppers, electrical substation and power station

Offsite

- Richmond gas works and associated activities, including railway sidings, gas holders, tank etc (1867 - present), later detailed as works / depot
- Railway lines
- Historical uses including laundry, corporation depot, goods depot, later coach repair works, nursery, timber yard, smithy and 3no garages

Contaminants of concern associated with the selected sources outlined above are listed in Table 2 below. Whilst they have been withdrawn, Department of Environment (DoE) industry profiles have been utilised for reference, where available.

Table 2 – Contaminants of Concern

Source	Contaminants of Concern
On-site	
Made Ground	Metals, PAH, asbestos, TPH, ground gas
Former car wash	Metals, PAH , TPH, VOC, SVOC
Car parking	Metals, TPH, SVOC, VOC PAH
Historical uses including timber yard, crane, railway sidings, fuel depot, coal hoppers, electrical substation and power station	Metals, PAH, asbestos, TPH, PCB, VOC, SVOC, phenols, pesticides
Electrical substation	PCB, TPH, PAH, metals, VOC, SVOC
Off-site	

Source	Contaminants of Concern
Railway lines (1867 - present)	DoE industry profiles note the following potential contaminants in the vicinity of tracks: metals, VOC, PAH, pesticides
Richmond gas works and associated activities, including railway sidings, gas holders, tank etc (1867 - present) Later detailed as works / depot (1975 - 1990s)	Metals, TPH, PCB, PAH, VOC, SVOC, ammonia, phenols, cyanide (total), sulphates
Laundry (1896 - 1898)	VOC, solvents
Corporation depot (1896 - 2004) Goods depot (1960 - 1970s). Later coach repair works (1970s - 1980s) and depot (late 1980s)	Metals, TPH, VOC, SVOC, and PAH
Nursery (1896 - 1913)	Metals, pesticides
3no garages (1960 - 1990s)	Metals, TPH, VOC, SVOC, and PAH

Metals and inorganic compounds including but not limited to As, B, Cd, Cr total, Cr VI and III, Cu, Hg, Ni, Pb, Se, Zn/ phenols, cyanide (free and total), asbestos and sulphates / VOC: volatile organic compounds / SVOC: semi volatile organic compounds / PAH: polycyclic aromatic hydrocarbons / TPH CWG: total petroleum hydrocarbons / PCB: polychlorinated biphenyls / Ground gas including but not limited to CO2, CH4, CO, H2S

Potential Pathways

The potential pathways by which receptors might be exposed to contaminants (sources) at the site can vary depending on the proposed or current land use (i.e. commercial or residential land use). Noting that the proposed development is to include multi-storey apartment buildings and therefore assumed shared landscaping spaces the assessment has been based on a residential end use without plant uptake.

For humans, the following are considered plausible exposure pathways:

- Migration, accumulation and inhalation of soil gas / vapours via permeable soils and groundwater;
- Direct contact and ingestion / inhalation of contaminated soils in areas of soft landscaping; and
- Ingress of contaminants into conduits, contaminating drinking water supplies.

For building materials and below ground structures (including foundations and services), the following are considered plausible exposure pathways:

- Soil gas / vapour accumulation in confined spaces and voids within or beneath structures; and
- Direct contact of building fabric with contaminated soils.

For controlled waters, the following pathways may be present:

- Vertical leaching and migration of contaminants from the soil to groundwater; and
- Lateral migration of on-site groundwater off-site or from off-site groundwater on-site.

Potential Receptors

The following receptors are identified at the site:

- Human health: future site workers and residents and off-site adjacent land users, including neighbours and members of the public;
- Building materials and below ground structures (foundations and services); and
- Controlled waters: the underlying Secondary A Aquifer (Kempton Park Gravel Member).

The River Thames is not considered a receptor, noting its distance to the site (>1.6km). The off-site pond positioned circa 310m to the south is likely to be up hydraulic gradient and therefore is not considered to be a receptor from on-site contamination. Three groundwater abstractions were identified during council liaison, and were noted to be positioned west and north-west of the site and at closest 920m from the site; therefore, these have been discounted as they are not considered to be in hydraulic connectivity with the site.

It is assumed that appropriate Health & Safety measures, based upon a qualitative environmental risk assessment of site conditions by the contractor will be adopted during any future below ground maintenance works. This is likely to include personal protective equipment (PPE). It is considered that these measures will adequately mitigate the risk to construction and future maintenance workers from potential sources of contamination. Therefore, future construction and maintenance workers are not discussed further as part of this risk assessment.

Pollution linkages have not been identified to ecology as a Part IIA and Non-Part IIA Receptor at this stage. However, this report does not purport to be making ecological recommendations, for which a specialist should be consulted.

PRELIMINARY CONCEPTUAL SITE MODEL

Table 3 provides an evaluation of the potential contaminant linkages that were considered to be plausible on the basis of the information currently available.

Table 3 – Preliminary Conceptual Site Model

Source	Potential contaminants	Potential Pathway (s)	Potential receptor (s)	Assessment	Potential Severity	Potential Probability	Risk Class
On-site sources	Metals, TPH, PAH, PCB, VOC, SVOC, sulphates, asbestos, pesticides	Direct contact with contaminated soils Direct ingestion / inhalation of contaminated soils Ingestion of contaminated water from drinking water supply pipes	Human health (on-site)	Development proposals include areas of soft landscaping. Residential end use is more sensitive than existing commercial. Possible that new drinking water supply pipes are to be laid.	Medium	Likely	Moderate
	Ground gases / VOC	Inhalation of accumulated soil ground gases or vapours Lateral migration of volatile compounds in groundwater	Human health (on and off site)	Potential for ground gases to be present attributable to Made Ground or the degradation of organic contamination. Furthermore, potential sources of VOC identified.	Severe	Low	Moderate
	Ground gases / VOC	Soil gas / vapour accumulation in confined spaces and voids within or beneath structures	Buildings and service conduits (on and off-site)	As above.	Severe	Low	Moderate
	Metals, TPH, PAH, PCB, VOC, SVOC, pesticides Sulphates in London Clay Formation	Direct contact of building fabric with contaminated soils	Buildings and service conduits (on and off-site)	Sources of contamination identified on-site and associated with historic uses which may result in aggressive chemical conditions within Made Ground. Soft landscaping associated with proposed development may increase vertical leaching of contamination. Plausible that proposed building foundations are positioned beneath the groundwater table.	Mild	Likely	Moderate / Low
	Metals, TPH, PAH, PCB, VOC, SVOC, asbestos, pesticides	Vertical leaching and migration of contaminants from the soil to groundwater Lateral migration of groundwater off-site	Secondary A Aquifer (on and off-site)	Soft landscaping associated with proposed development may increase vertical leaching of contamination. Whilst no abstractions / surface water features are identified, the resource potential of the Secondary A Aquifer should be considered. Shallow groundwater was encountered from 1.5m bgl within BGS borehole records in the Kempton Park Gravel Formation.	Medium	Likely	Moderate

Source	Potential contaminants	Potential Pathway (s)	Potential receptor (s)	Assessment	Potential Severity	Potential Probability	Risk Class
Off-site sources	Ground gases / VOC	Inhalation of accumulated soil ground gases or vapours Lateral migration of volatile compounds in groundwater	Human health (on-site)	Potential sources of ground gases identified and there is potential for these to migrate in the unsaturated zone onto site. Potential for VOCs to migrate in groundwater or via the unsaturated zone to beneath the site.	Severe	Low	Moderate
	Ground gases / VOC	Soil gas / vapour accumulation in confined spaces and voids within or beneath structures	Buildings and service conduits (on - site)	As above.	Severe	Low	Moderate
	Metals, TPH, PCB, PAH, VOC, SVOC, ammonia, cyanide (total), sulphates, pesticides	Contact with building structures and services with contaminated groundwater migrating onto site	Buildings and service conduits (on - site)	Plausible that proposed building foundations will be positioned beneath the groundwater table and therefore in contact with contaminated groundwater migrating onto site.	Mild	Likely	Moderate / Low
	Metals, TPH, PCB, PAH, VOC, SVOC, ammonia, cyanide (total), sulphates, pesticides	Vertical leaching and migration of contaminants from the soil to groundwater Lateral migration of off-site groundwater on-site	Secondary A Aquifer (on-site)	Potential for contaminated groundwater to be flowing onto site. No abstractions identified on-site; however, resource potential could be impacted.	Medium	Likely	Moderate

3.2 *Engineering Assessment*

The proposed development, summarised in **Section 1.2,** is understood to comprise No.6 residential apartment blocks ranging between six and eight storeys with a small single-level basement. The basement will be approximately 3m below the proposed ground-floor level, located near the centre of the site and covers a smaller area than the above-ground structure. It is envisaged to be used as a plant room. A temporary sheet pile wall will be required to facilitate the construction of the basement.

Ancillary structures including the bin store and external masonry walls are proposed in the eastern part of the site, which could potentially be likely to be founded on shallow footings within the London Clay or Kempton Park Gravel Member. The external areas will be at similar levels to the existing ground surface.

POTENTIAL GEOTECHNICAL CONSTRAINTS

The following geotechnical considerations are associated with the development.

Basement Development

Consultation with LBRuT identifies that the basement development would be subject to Policy LP 11 from their local plan, which details:

A. The Council will resist subterranean and basement development of more than one storey below the existing ground level to residential properties or those which were previously in residential use.

B. Proposals for subterranean and basement developments will be required to comply with the following:

1. Extend to no more than a maximum of 50% of the existing garden land or more than half of any other undeveloped garden area (this excludes the footprint of the original building);
2. Demonstrate the scheme safeguards the structural stability of the existing building, neighbouring buildings and other infrastructure, including related to the highway and transport; a Structural Impact Assessment will be required where a subterranean development or basement is added to, or adjacent to, a listed building.
3. Use natural ventilation and lighting where habitable accommodation is provided;
4. Include a minimum of 1 metre naturally draining permeable soil above any part of the basement beneath the garden area, together with a minimum 200mm drainage layer, and provide a satisfactory landscaping scheme;
5. Demonstrate that the scheme will not increase or otherwise exacerbate flood risk on the site or beyond, in line with policy LP 21 Flood Risk and Sustainable Drainage;
6. Demonstrate as part of a Construction Management Statement that the development will be designed and constructed so as to minimise the impact during construction and occupation stages (in line with the Local Environmental Impacts, Pollution and Land Contamination policy of this Plan);

C. Proposals for subterranean and basement developments, including extensions, as well as light-wells and railings, will be assessed against the advice set out in the Council's SPDs relating to character and design as well as the relevant Village Planning Guidance

and the forthcoming SPD on Basements and Subterranean Developments. Applicants will be expected to follow the Council's Good Practice Guide on Basement Developments.

Furthermore, the LBRuT planning advice note 'Good Practice Guide on Basement Developments', May 2015 Consultation with LBRuT identifies that the basement development would be subject to Policy LP 11 from their local plan, which details potential requirements including: contacting utilities, Network Rail and Transport for London to confirm that works will not interfere with their infrastructure; flood risk assessment taking consideration of groundwater and potential groundwater flooding; assessment of land stability; structural assessment taking consideration of ground conditions and groundwater, existing trees and infrastructure and drainage; site investigation; and assessment of ground movements.

On the basis of the foregoing, it is considered that a Basement Impact Assessment and/or Ground Movement Assessment may be required to confirm the absence of adverse impacts to existing offsite infrastructure assets or neighbouring structures, subject to the development details/design and liaison with TFL/LUL and/or Network Rail and the Local Planning Authority.

Below Ground Structures and Utilities

Council correspondence notes that the site is within a National Grid safeguard zone (unknown if this relates to the former Richmond Gas Works) and a possible Southern Gas Network structure was identified in the south-eastern corner of the site. Furthermore, existing utilities are likely to be present on-site associated with the existing development, including the electrical substation. Existing services may require removal, capping and diversion associated with the development. Furthermore, it is recommended that full service plans are obtained in advance of any below ground investigation works;

Relic foundations and structures may be present associated with the historic development of the site. Obstructions may need to be delineated and grubbed out as part of any future earthworks at the site; and

The site is within a high risk area with respect to unexploded ordnance. It is recommended that a UXO specialist is contacted prior to any below ground works.

Foundation Appraisal

There is the potential for aggressive sulphates in the Made Ground and the London Clay Formation, which may impact buried concrete and as such will require further consideration as part of any ground investigation;

Trees are present bounding the site and pre-application consultation with LBRuT identifies that there are tree preservation orders at the site. It is considered probable that existing tree roots are present in the Kempton Park Gravel Formation and should this formation prove to be cohesive in nature the volume change potential should be considered where trees are to be removed or planted associated with the development;

Structural loads are unknown at this stage. Noting proposed development heights of potentially up to 10 No. storeys (plus ground and basement floors), it is considered that loads may exceed traditional shallow foundations (i.e. pads and strips) and foundations may need to be piled. Following ground investigation consideration could be given to shallow foundations and raft basement slabs, dependent on settlement tolerances and the thickness and density of the Kempton Park Gravels;

Based on BGS borehole records, it is considered that a piled foundation solution would extend into the London Clay Formation. Foundation design will be subject to structural loads and ground investigation findings.

Adjacent Railways

District, Overground and National Rail tracks bound the site to the south and the west. It is likely that additional assessments will be required to confirm the potential impacts of development on these assets, including during ground investigation and future development.

Further Considerations

Soakaways may be feasible within the granular Kempton Park Gravel Formation; however, given the potential for contamination identified, further risk assessments may be required to ensure that these do not result in increased mobilisation of potential contamination. Furthermore, BGS borehole logs have identified a groundwater table from circa 1.5m bgl and the shallow depth to groundwater may preclude the use of soakaway drainage.

4.0 GROUND INVESTIGATION

Following development of the preliminary CSM and assessment of engineering considerations, Fairhurst scoped and designed a preliminary intrusive ground investigation targeted to refine the understanding of the site for geo-environmental and geotechnical purposes.

The preliminary ground investigation was carried out by LMB Geosolutions Ltd, under the management of Fairhurst, between the 21st April and 27th April 2021 with three post-fieldwork monitoring visits between the 5th and 26th May 2021. All exploratory locations were surveyed for below ground utilities and inspection hand pits were dug to 1.2 m bgl prior to drilling.

The original scope of works comprised the following:

- 5 No. rotary percussive boreholes to 15 m bgl (BH101 to BH105);
- 3 No. trial pits to 5 m bgl (TP01 to TP03);
- Standard Penetration testing in all boreholes;
- Logging of soils in accordance with BS 5930:2015+A1:2020;
- Geotechnical and geo-environmental soil sampling;
- Field screening of soil samples using a photo-ionisation detector (PID);
- Installation of groundwater and ground gas monitoring installations at all borehole locations;
- 3 No. return monitoring visits across a 1 month period;
- 1 No. round of groundwater sampling; and,
- Geotechnical and geo-environmental laboratory testing.

The ground investigation was specified in accordance with the ICE UK Specification for Ground Investigation (2012) and was undertaken in general accordance with techniques outlined in Eurocodes 7 - BS EN 1997-1:2004, BS 5930:2015+A1:2020 Code of Practice for Ground Investigations and BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites. The works were carried out by LMB Geosolutions with a part-time site presence from Fairhurst.

An exploratory hole location plan is shown on **Figure 2**, **Appendix A**. The LMB Factual Report which includes a detailed account of the ground investigation including the methodologies undertaken, is presented within **Appendix B**, should be referred to for the logs and all details relating to ground investigation techniques and methods adopted.

4.1 PRELIMINARY GROUND INVESTIGATION STRATEGY

Access was severely restricted due to ongoing commercial activities at the site. Exploratory hole locations were chosen on the basis of accessibility, geotechnical and geo-environmental requirements as set out in Table 4.

Table 4 - Ground Investigation Strategy

Exploratory Hole Location	Rationale	Samples / Installation	Comment
BH101	Geotechnical requirements – proposed building footprint Geo-environmental – in the vicinity of former car wash and assessment of Made Ground	Geotechnical and environmental soil samples Groundwater and ground gas installations	Groundwater sampling to target possible off-site sources: Richmond gas works and associated activities, including railway sidings, gas holders, tank etc (1867 - present) Later detailed as works / depot (1975 - 1990s) North / east of the site
BH102	Geotechnical requirements – proposed building footprint Geo-environmental – in the vicinity of former railway sidings and coal hoppers, assessment of Made Ground	Geotechnical and environmental soil samples Groundwater and ground gas installations	Groundwater sampling to assess onsite conditions
BH103	Geotechnical requirements – proposed building footprint Geo-environmental – assessment of Made Ground and car parking	Geotechnical and environmental soil samples Groundwater and ground gas installations	Groundwater sampling to target possible off-site sources: Richmond gas works and associated activities, including railway sidings, gas holders, tank etc (1867 - present) Later detailed as works / depot (1975 - 1990s) North / east of the site
BH104	Geotechnical requirements – proposed building footprint Geo-environmental – Ground and car parking	Geotechnical and environmental soil samples Groundwater and ground gas installations	Centre of the site, groundwater sampling to assess onsite conditions
BH105	Geotechnical requirements – proposed building footprint Geo-environmental – Ground and car parking	Geotechnical and environmental soil samples Groundwater and ground gas installations	Groundwater sampling to target possible off-site sources: Corporation depot (1896 - 2004), Goods depot. Later coach repair works (1970s - 1980s) and depot (late 1980s)
TP101	Geotechnical requirements – proposed building footprint Geo-environmental – in the vicinity of Former coal hopper, crane, substation	Geotechnical and environmental soil samples	Assessment of shallow ground conditions

	and assessment of Made Ground		
TP102	Geotechnical requirements – proposed building footprint Geo-environmental – assessment of Made Ground and in the vicinity of former depot	Geotechnical and environmental soil samples	Assessment of shallow ground conditions
TP103	Geotechnical requirements – proposed building footprint Geo-environmental – assessment of Made Ground and in the vicinity of former railway siding	Geotechnical and environmental soil samples	Assessment of shallow ground conditions

4.2 Limitations

As the ground investigation was undertaken during the operational phase of the site, the locations selected did not target all identified on-site and off-site sources of contamination and some areas of the site remain un-investigated (principally areas beneath exiting building footprints). As previously stated, the GI Strategy set out above is the first phase in a two-stage investigation. The next phase of ground investigation is planned post demolition and will likely comprise the drilling and installation of additional boreholes and trial pitting to fill the data gaps.

5.0 GROUND CONDITIONS ENCOUNTERED

The following section of this report describes the ground conditions encountered during the Fairhurst ground investigation works on the subject site.

5.1 GEOLOGY

The ground conditions encountered on site were consistent with the BGS records.

A summary of the ground conditions encountered during the ground investigation is presented in **Table 5**, exploratory hole logs are presented in LMB's Factual Report in **Appendix B**.

Table 5 – Summary of Ground Conditions Encountered

LITHOLOGY	PROVEN BASE OF LITHOLOGY (m bgl)	PROVEN BASE OF LITHOLOGY (m AOD)	THICKNESS (m)	TYPICAL DESCRIPTION
Surfacing	0.1 – 0.3	6.02 – 6.48	0.1 – 0.3	Brick paving and subbase (0.1m bgl) and tarmac over roadstone gravel (0.3m bgl)
Made Ground	0.65 – 2.2	4.05 – 5.64	0.4 – 2.0	Brown to dark brown clayey gravelly sand with occasional brick and concrete cobbles. Gravel sub-angular fine to coarse flint, brick, concrete and rare clinker.
Kempton Park Gravel Member	4.3 – 7.0	-0.3 – 1.95	1.55 - 4.1	Brown to orange slightly gravelly medium to coarse SAND. Gravel sub-angular to rounded medium to coarse flint.
London Clay Formation	Proven to 7.45 – 25.00	Proven to -1.75 - -18.75	Proven thickness 1.35 – 20.70	Dark grey to grey brown CLAY. Closely fissured.

5.2 SURFACING

Brick paving over a sub-base was encountered in boreholes BH102, BH103, BH104 and trial pits TP101 and TP102. Trial pit TP102 also reported a weak concrete layer between 0.3m and 0.5m bgl.

The surfacing in trial pit TP103 was reportedly reinforced concrete, which was present to a depth of 0.24m bgl. Borehole BH105 was covered with 0.18m of asphalt over road-stone gravel the base of which was recorded at 0.30m bgl.

Grass over clayey sand with rootlets was encountered at ground level within BH101 and recorded to a depth of 0.25m bgl.

5.3 MADE GROUND

Made Ground was encountered at all exploratory hole locations beneath the surfacing. The top of the Made Ground deposits were encountered at depths of between 0.06m and 0.25m bgl (6.02m and 6.45m AOD), with the base of this material recorded at depths of between 0.65m and 2.20m bgl (5.61m and 4.05m AOD). The maximum recorded thickness of Made Ground was within BH104, were these deposits were 2.14m thick, with this sampling position undertaken towards the centre of the site.

The Made Ground was generally granular in nature, typically comprising of brown to dark brown clayey gravelly SAND with occasional brick and concrete cobbles. Gravel was described as sub-angular fine to coarse flint, brick, concrete, glass and clinker. Ash deposits were encountered within the Made Ground in BH101, with this material present at depths of between 0.70m and 1.70m bgl.

Made Ground was inherently heterogeneous and varied in composition locally and reference should be made to the borehole logs for further details.

5.4 KEMPTON PARK GRAVEL MEMBER (RIVER TERRACE DEPOSITS)

Superficial deposits interpreted as the Kempton Park Gravel Member were encountered at all exploratory hole locations beneath the Made Ground. This material was predominantly granular in nature, however, locally with BH01, TP01 and TP02 cohesive material was initially encountered and proven to depths of between 1.80m and 3.00m bgl (3.70m and 4.40m AOD).

The top of the strata was encountered at depths of between 0.65m and 2.20m bgl (5.61m and 4.05m AOD), and where the base of the superficial deposits was proven, BH101 to BH105, this was recorded at depths of between 4.30m and 7.00m bgl (1.95m and -0.30m AOD). The base of the strata was not proven within three exploratory positions, TP101, TP102 and TP103, with these exploratory positions terminated within this strata, all at a depth of 2.50m bgl. The maximum thickness was 5.30m encountered at BH101, which was undertaken in the north east of the site.

The granular deposits were generally found to comprise of brown to orange slightly gravelly to gravelly SAND, whilst the cohesive material was typically described as brown to orange sandy CLAY.

5.5 LONDON CLAY FORMATION

London Clay Formation was encountered within five of the eight exploratory positions, the five exploratory boreholes, with the top of the stratum encountered between 4.30m (BH104) and 7.00m (BH101) bgl (1.95m and -0.30m AOD). The base of the London Clay Formation was not proven within any of the exploratory boreholes which encountered this stratum, but it was recorded to extend to depths of between 7.45m and 25m (-1.05m and -18.75m AOD), with a maximum thickness of 20.70m recorded at BH104.

The London Clay was generally described as dark grey to grey brown CLAY with a weathered layer at the top of the stratum described as brown with orange brown mottling CLAY with sand and rare flint gravel. The weathered layer was limited in thickness ranging between 0.05m (BH105) and 0.10m (BH101, BH102, BH103 and BH104).

A Mudstone band, comprising very weak to moderately weak grey mudstone, was encountered within the London Clay Formation at one exploratory position, namely BH104, at a depth of 12.70m bgl (-

6.45m AOD) and the base of this was proven at a of depth of 13.00m bgl (-6.75m AOD), with a thickness of 0.30m.

Shell fragments were encountered at 6.00m bgl (0.25m AOD) in BH104 and 13.00m bgl (-6.75m AOD) in BH105 whilst pyrite nodules were encountered at 13.90m and 23.00m bgl (-7.65m and -16.75m AOD) in BH105. Additionally, bioturbation traces were recorded within BH103 at 8.00m bgl (-1.46m AOD) and within BH104 at 6.00m bgl and 8.00m bgl (0.25m and -1.75m AOD).

5.6 GAS AND GROUNDWATER INSTALLATIONS

All boreholes were installed with 50mm diameter combined ground gas and groundwater monitoring wells within the Made Ground, Kempton Park Gravel Member and London Clay Formation. A summary of the monitoring wells installed is presented in **Table 6** below with a full list presented on the exploratory hole logs within LMB's Factual Report (**Appendix B**).

Table 6– Summary of Monitoring Wells

EXPLORATORY HOLE LOCATION (SURFACE ELEVATION – m AOD)	TOP AND BASE OF RESPONSE ZONE (m bgl)	TOP AND BASE OF RESPONSE ZONE (m AOD)	STRATA TARGETED
BH101 (6.70)	1.50 to 8.45	5.20 to -1.75	MG / KPGM / LCF
BH102 (6.40)	1.00 to 7.00	5.40 to -0.60	MG / KPGM / LCF
BH103 (6.54)	2.00 to 8.00	4.54 to -1.46	KPGM / LCF
BH104 (6.25)	1.00 to 5.00	5.25 to 1.25	MG / KPGM / LCF
BH105 (6.25)	1.00 to 6.00	5.25 to 0.25	MG / KPGM / LCF

MG – Made Ground, KPGM – Kempton Park Gravel Member, LCF – London Clay Formation

Three return visits for ground gas / groundwater level monitoring were completed by LMB on the 5th, 13th and 26th May 2021.

The wells were developed on 29th April 2021 and groundwater was sampled on 5th May 2021 using low-flow sampling techniques with a peristatic pump so groundwater was micro-purged and directed via a flow cell installed with a multi-parameter probe so that indicator parameters (i.e. pH, electrical conductivity, oxidation reduction potential, dissolved oxygen and temperature) could be monitored to ensure stability prior to sampling into dedicated sampling containers.

The combined groundwater and ground gas monitoring visits included the use of a PID to provide a semi-quantitative measure of Volatile Organic Compounds (VOC), an interface probe to measure product thickness, if and where present, and groundwater level, and measurement of ground gases including carbon monoxide (CO), carbon dioxide (CO_2), hydrogen sulphide (H_2S), methane (CH_4) and oxygen (O_2). Atmospheric pressure readings and gas flow rates were also undertaken.

5.7 GROUNDWATER

Groundwater strikes reported by LMB during the ground investigation are summarised in **Table 7**.

Table 7 – Summary of Groundwater Strikes Recorded During Investigation

Borehole	Groundwater Level		Stratum
	m bgl	m AOD	
BH101	4.50 rising to 4.30	2.20 rising to 2.40	Kempton Park Gravel Member
BH102	4.50 rising to 3.90	1.90 rising to 2.50	Kempton Park Gravel Member
BH103	3.50 rising to 2.80	3.04 rising to 3.74	Kempton Park Gravel Member
BH104	3.20 rising to 2.60	3.05 rising to 3.65	Kempton Park Gravel Member
BH105	2.80 rising to 3.00	3.45 rising to 3.25	Kempton Park Gravel Member

In order to understand the groundwater regime more comprehensively following the completion of site investigation work, groundwater monitoring rounds were undertaken on 5th, 13th and 26th May 2021 as summarised in **Table 8**.

Table 8 – Summary of Groundwater Levels Recorded During Return Visit Monitoring

BOREHOLE	RESPONSE ZONE		GROUNDWATER LEVEL	
	m bgl	STRATA	m bgl	m AOD
BH101	1.50 to 8.45	MG / KPGM / LC	2.46 to 2.56	4.24 to 4.14
BH102	1.00 to 7.00	MG / KPGM / LC	2.32 to 2.41	4.08 to 3.99
BH103	2.00 to 8.00	KPGM / LC	3.88 to 4.26	2.66 to 2.28
BH104	1.00 to 5.00	MG / KPGM / LC	3.66 to 4.68	2.59 to 1.57
BH105	1.00 to 6.00	MG / KPGM / LC	3.45 to 4.03	2.80 to 2.22

MG – Made Ground, KPGM – Kempton Park Gravel Member, LC – London Clay Formation

The findings suggest that a shallow body of groundwater is situated within the Kempton Park Gravel Member. The Kempton Park Gravel Member was saturated at varying levels across the site with recorded groundwater levels at between 4.24m to 3.99m AOD in the north of the site (BH101 and BH102) lowering to between 2.80m to 1.57m AOD in the central and southern area of the site (BH103, BH104 and BH105).

It should be noted that groundwater levels are subject to variation as a result of seasonal changes and during/following periods of adverse weather conditions.

5.8 VISUAL OR OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination was recorded by the logging engineer in the following positions:

- Black ashy material and clinker recorded at BH101 between 0.70m and 1.70m bgl;
- Grey colouration and a hydrocarbon odour recorded at BH102 at a depth of 4.00m bgl;
- A strong hydrocarbon odour recorded at BH104 between 2.20m and 4.30m bgl; and,
- Black colouration was recorded at TP101 between 0.60m and 0.90m bgl.

5.9 LABORATORY TESTING

Geotechnical and geo-environmental laboratory testing was scheduled by Fairhurst and undertaken by i2 Analytical, an MCERTS and UKAS accredited laboratory.

Selected geo-environmental soil samples were tested for the following analytes:

- Metals – arsenic, boron, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium and zinc;
- Organic Compounds - TPH criteria working group (CWG), BTEX, phenols, PAHs, VOCs and SVOCs;
- Inorganic Compounds – asbestos identification, total cyanide, total sulphate, total organic carbon (TOC), organic matter, sulphide and pH;
- Polychlorinated biphenyls (PCBs); and,
- Waste Acceptance Criteria (WAC) testing.

Selected groundwater samples were tested for the following analytes:

- Metals – antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, hexavalent chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, potassium, selenium, sodium, tin, vanadium and zinc;
- Organic Compounds - TPH criteria working group (CWG), BTEX, phenols, PAHs, VOCs and SVOCs;
- Inorganic Compounds – total cyanide, free cyanide, complex cyanide, sulphate as SO4, TOC, sulphide and pH; and,
- Other – electrical conductivity at 20 C, pesticide screen.

Selected geotechnical samples were scheduled for the following tests:

- Particle size distribution;
- Atterberg limit testing;
- Moisture content;
- Dry density / moisture content relationship light compaction;
- California Bearing Ratio (CBR);
- Unconsolidated undrained single stage triaxial compression tests; and,
- One-dimensional oedometer consolidation tests.

5.10 SAMPLE DEVIATIONS

Several samples obtained during the investigation were recorded as deviated, details of which are provided below:

- Sample holding times were exceeded for soil samples BH101 (0.80 m bgl), BH102 (0.50 m bgl), BH103 (0.20 m bgl) and TP103 (0.50m bgl) for sulphide and total cyanide analysis; and,

- Sample holding times were exceeded for soil samples TP103 (0.50m bgl) for BTEX and MTBE (Monoaromatics) analysis.

6.0 GEOTECHNICAL TESTING & ENGINEERING PROPERTIES

The following section discusses the ground conditions determined from the Fairhurst ground investigation and laboratory testing described in **Section 5**.

The below figures should be referenced accordingly in relation to the field and laboratory testing results:

- **Figure 3 – Moisture Content versus Depth**
- **Figure 4 – Casagrande Plasticity Chart**
- **Figure 5 – SPT-N_{60} versus Depth**

The laboratory data referred to is provided within the LMB Factual Report (**Appendix B**). A summary of the tests undertaken during the Fairhurst ground investigation is presented in **Table 9**.

Table 9 - Summary of Geotechnical Testing Undertaken

GEOTECHNICAL TEST		SURFACING	MADE GROUND	KEMPTON PARK GRAVELS	LONDON CLAY FORMATION
In-situ	Standard Penetration Tests (SPT)	-	3	16	22
Laboratory	Moisture Content Determination	-	4	9	19
	Atterberg Limit Determination	-	-	2	12
	Particle Size Distribution (PSD) Analysis	-	-	4	-
	California Bearing Ratio (CBR)	-	-	1	-
	Undrained Unconsolidated (UU) Single Stage Triaxial Testing	-	-	-	10
	Dry Density / Moisture Content Relationship Light Compaction	-	-	1	-
	One-dimensional Oedometer Consolidation Testing	-	-	-	5
	BRE Sulphate Suite D	-	2	4	13

6.1 SURFACING

Due to the limited thicknesses of the surfacing encountered on site and the nature of the proposed development, no geotechnical in-situ or laboratory testing was undertaken on the surfacing material.

6.2 MADE GROUND

Moisture Content and Classification Testing

Four Moisture Content tests were undertaken on samples of the granular Made Ground from between 0.75m (BH101 and BH105) to 1.20m (BH101) bgl. The moisture contents of the samples ranged between 7% (BH105, 0.75m bgl) and 19% (BH101, 0.80m bgl), with an average moisture content of 12.4%.

Strength and Stiffness

Three SPTs were undertaken within the Made Ground, with corrected N_{60} values of between 8 and 9. However, due to the lack of data collected from the stratum and the inherent variability within Made Ground, caution should be exercised when determining parameters for design purposes.

Chemical Analysis and Sulphate Classification

Two soil samples of the Made Ground were scheduled for Suite D aggressive chemical environment for concrete (ACEC) classification in accordance with BRE Special Digest 1:2005, Concrete in Aggressive Ground.

The concentrations of Water Soluble Sulphate were 223mg/l (BH101 at 1.2m) and 30.5mg/l (BH103 at 0.80m), with the pH for the soil being 9.3 and 8.5, respectively. The groundwater analysis recorded a maximum sulphate (as SO_4) value of 156 mg/l and the characteristic pH is 7.26, giving a Design Sulphate Class of DS-1 and ACEC class of AC-1, assuming mobile groundwater conditions.

6.3 KEMPTON PARK GRAVEL MEMBER

Particle Size Distribution

Particle Size Distribution testing was undertaken on four samples of the Kempton Park Gravel Member deposits at depths of between 2.00m (TP103) and 6.00m (BH101) bgl. Three samples, recovered from BH101, 6.00m bgl, BH102, 4.00m bgl and TP102, 2.30m bgl, were described as slightly clayey slightly silty gravelly SAND whilst the sample recovered from TP103, 2.00m bgl was described as slightly clayey slightly silty very sandy GRAVEL. The samples were shown to comprise between 15% and 49% of gravel, between 46% and 81% of sand and between 4% and 10% of fines (silt and clay), which is consistent with the on-site descriptions

The initial PSD testing suggests that the material might be suitable as a Class 1 material for re-use as general fill, in accordance with Series 600 Specification for Highway Works. However, further testing should be undertaken under a site-specific earthworks specification when the requirements for material re-use are confirmed.

Moisture Content and Classification Testing

Nine Moisture Content and two Atterberg Limit tests were undertaken on samples of the Kempton Park Gravel Member. The moisture contents of the samples ranged between 5.4% and 18%, with an average moisture content of 9.5%. The Atterberg Limit tests presented liquid limit results of 29% and 35% and plasticity index results of 16% and 17%, consistent with low to medium plasticity clays. The modified plasticity indices are between 8% and 9 %, described as having a medium to high volume change potential in accordance with NHBC Standards Chapter 4.2 (2017).

Using the relationship between moisture content and Atterberg limits proposed by Driscoll (1983), one of the samples appeared to have been desiccated at the time of sampling.

Compaction Testing

One California Bearing Ratio (CBR) test was undertaken on the Kempton Park Gravel Member from a sample recovered from BH101 at a depth of 3.00m bgl which recorded a result of 17%.

One compaction test to determine the moisture content to dry density relationship has been undertaken on Kempton Park Gravel Member from a sample recovered from TP103 at a depth of 1.00m bgl. The test recorded an optimum moisture content of 9.2% and a maximum dry density of 2.16Mg/m^3. The average moisture content for the Kempton Park Gravel Member is consistent with the optimum moisture content.

Strength and Stiffness

A total of sixteen SPTs were undertaken within the Kempton Park Gravel Member, with corrected N_{60} values ranging from 15 (BH102, 5.0m bgl) to >50 (BH105, 2.0m bgl), correlating to medium dense to very dense.

Chemical Analysis and Sulphate Classification

Four soil samples of the Kempton Park Gravels were scheduled for Suite D aggressive chemical environment for concrete (ACEC) classification in accordance with BRE Special Digest 1:2005, Concrete in Aggressive Ground.

The two maximum concentrations of Water Soluble Sulphate were 1,840mg/l (BH101 at 2.0m) and 463mg/l (BH101 at 2.75m), with the pH for the soil being 7.8 for both, giving a Design Sulphate Class of DS-3 and ACEC class of AC-3, assuming mobile groundwater conditions.

6.4 LONDON CLAY FORMATION

Moisture Content and Classification Testing

Nineteen Moisture Content and twelve Atterberg Limit tests were undertaken on samples of the London Clay Formation. The moisture contents of the samples ranged between 18% and 32%, with an average moisture content of 27%. The Atterberg Limit tests presented liquid limit results that ranged from 55% to 81% and plasticity index results from 32% to 50%, consistent with high to very high plasticity clays. The modified plasticity indices are between 9% and 50 %, described as having a low to high volume change potential in accordance with NHBC Standards Chapter 4.2 (2017). In the majority of occasions the volumetric change potential would be high.

Unit Weight

The bulk unit weight of the London Clay Formation has been determined from eleven triaxial tests and three one-dimensional oedometer tests. The results ranged from 1.88 to 2.21 Mg/m^3.

Strength and Stiffness

A total of twenty-two SPTs were undertaken within the London Clay Formation, with corrected N_{60} values ranging from 8 (BH103 and BH105, both at 5.0m bgl) to >50 (BH104, 12.50m bgl). Using the correlation proposed by Stroud (1974) and an f_1 factor of 4.5, the undrained shear strength of the material is derived to be between 36.45kPa and >225kPa, corresponding to low to very high strength material in accordance with BS EN ISO 14688-2:2018.

The undrained shear strength of the material was further assessed by ten laboratory triaxial tests on undisturbed soil samples from 6.50m (BH102) to 23.00m (BH104) bgl. The results of the triaxial tests ranged from 93kPa to 338kPa, indicative of high to extremely high strength clay in accordance with BS EN ISO 14688-2:2018.

One-dimensional Consolidation Properties

Five one-dimensional oedometer consolidation tests were undertaken on samples taken from 6.50m (BH104) to 18.50m (BH105) bgl within the London Clay Formation. The tests consisted of four to five load stages and one unloading stage, applying pressures of between 65kPa and 2,960kPa. The coefficient of volume compressibility, m_v, ranged between 0.031 and 0.31 m²/MN, indicative of a very low to medium compressibility soil.

Chemical Analysis and Sulphate Classification

Thirteen soil samples of the London Clay were scheduled for Suite D aggressive chemical environment for concrete (ACEC) classification in accordance with BRE Special Digest 1:2005, Concrete in Aggressive Ground.

The two maximum concentrations of Water Soluble Sulphate were 777mg/l (BH105 at 23.0m) and 671mg/l (BH105 at 17.0m), with the pH for the soil being 8.5 for both, giving a Design Sulphate Class of DS-2 and ACEC class of AC-2, assuming mobile groundwater conditions.

8.0 GEOTECHNICAL ASSESSMENT

8.1 GENERAL

The proposed development, summarised in **Section 1.2**, is understood to comprise a series of residential apartment blocks ranging in storey heights from three to eleven, with locally a single-level basement in one of the blocks. The basement will be approximately 3m below the proposed ground-floor level, located near the centre of the proposed building and covers a smaller footprint area than the above-ground structure. It is envisaged to be used as a plant room.

The site is generally flat and situated at an elevation between 33.78m and 33.95m above ordnance datum (AOD). There is a retaining wall adjacent to Manor Road on the eastern site boundary. Furthermore, trees and vegetation were noted during Fairhurst's walkover along the western and north-western site boundaries.

8.2 GEOTECHNICAL CONSIDERATIONS

Presence of Existing Services

Council correspondence notes that the site is within a National Grid safeguard zone (unknown if this relates to the former Richmond Gas Works) and a possible Southern Gas Network structure was identified in the south-eastern corner of the site. Furthermore, existing utilities are likely to be present on-site associated with the existing development, including the electrical substation. Existing services may require removal, capping and diversion associated with the development. Furthermore, it is recommended that full service plans are obtained in advance of any below ground investigation works

Unexploded Ordnance (UXO)

The site is within a high risk area with respect to unexploded ordnance. An UXO specialist watching brief is required for any below ground works.

Variability of Made Ground and Natural Deposits

The presence of Made Ground has been proven through the intrusive ground investigation. The Made Ground was generally found to be between 0.41m and 2.14m thick and comprised both cohesive and granular material with local variations in composition.

Although limited geotechnical testing was undertaken on the Made Ground, the material is anticipated to be variable in nature and comprise predominantly low strength material. As such, it is not considered to be a suitable founding strata.

With regard to the superficial deposits, these belonged to the Kempton Park Gravel Member, which were predominantly granular in nature, although locally cohesive in the upper parts. With regard to the cohesive deposits, this was visually assessed as being of firm consistency, and would be expected to have an undrained shear strength in the order of 50 kPa.

With respect to the granular deposits, these were typically medium dense to very dense soils, with the average 'N' value being 30, which is the boundary of medium dense / dense in accordance with BS 5930:2015. Generally, these deposits were found to directly underlie the Made Ground and the depths stated above; however, locally underling the cohesive deposits at depths of 1.80m to 3.00m. For initial design purposes these deposits would be expected to support an Allowable Bearing Capacity of in the order of 175 kN/m^2.

The top of the London Clay Formation was encountered at depths of between 4.30m and 7.00m bgl, with this encountered in all five borehole locations. The thickness of the weathered horizon also appears to be consistent across these locations, and relatively limited in terms of thickness. The laboratory testing within this material have shown that this is of high to very high strength, with undrained shear strengths typically in excess of 100 kPa.

Relic Foundations and Underground Structures / Obstructions

Due to the historical and present site use, existing foundations of the former buildings on site will likely be encountered during the construction process with these resulting in constraints to the new proposed development. The nature of below ground structures associated with existing structures, which are in uninvestigated areas of the site, is unknown and requires further supplementary investigation.

Further, there is a retaining wall adjacent to Manor Road on the eastern boundary of the site which requires investigation to determine the existing foundation depths and toe width.

Cohesive Deposits with Volume Change Potential

Cohesive Made Ground and the London Clay Formation have been determined to have a low to high volume change potential in accordance with NHBC Standards Chapter 4.2 (2017). Any proposals for new vegetation near structures should be reviewed in order to assess the risk of seasonal shrink/ swell movement in cohesive soils leading to differential settlement. Should any ground-bearing or shallow foundations be proposed, reference should be made to the NHBC recommendations regarding the minimum foundation depths required in shrinkable soils.

Foundation Options

Given the proposed development and the anticipated high magnitude loading, non-standard foundations in the form of piled foundations would be a feasible foundation solution, with the piles terminated within the London Clay Formation. Based on the ground conditions encountered on site and its proximity to nearby structures, rotary bored or continuous flight auger (CFA) piles are considered to be the most suitable pile types. However, consideration should be given to the potential presence of mudstone bands within the London Clay Formation and shallow groundwater ingress. Advice should be obtained from specialist piling contractors in terms of whether the higher torque CFA rigs would be able to penetrate the identified mudstone bands at the depths where these have been identified to be present.

Ancillary structures including the bin store and external masonry walls are proposed in the eastern part of the site, which are likely to be founded on shallow traditional footings. The external areas will be at similar levels as existing ground as no significant changes in levels are believed to be proposed.

Given the proximity of the railway land, consultation with the rail operator will be required before any intrusive works.

It should be noted that at the detailed design stage an assessment should be undertaken to ascertain whether the granular Kempton Park Gravel Member deposits would provide a suitable bearing stratum for some of the structures on site. Given the depths these deposits were encountered at, they would be present within the realms of conventional foundation, albeit locally with trench fill methods required. Due consideration should be given to the shallow groundwater, which may preclude trench foundations being a viable technical option.

With respect to the cohesive Kempton Park Gravel Member deposits these are only likely to provide a suitable bearing stratum for the Ancillary structures including the bin store and external masonry walls are proposed in the eastern part of the site, albeit this will require to be reviewed at detailed design stage.

Proposed Basements

The anticipated basement depth is 3m bgl, which is within the Kempton Park Gravels and beneath the resting groundwater table; however, there may be further excavation beneath this depth for proposed foundations.

Floor Slab

Due to variability in the composition and geotechnical properties of the Made Ground, it is not recommended to found the proposed ground level floor slab on the material. It is recommended that either a pile supported suspended floor slabs or suspended floor should the detailed design indicate that the granular deposits provide a suitable bearing stratum.

External Paved Areas

One laboratory California Bearing Ratio (CBR) tests was undertaken on the Kempton Park Gravel Member deposits from a sample recovered from BH101 at a depth of 3.00m bgl which recorded a result of 17%.

Where undertaken formation levels for access roads and road pavements within the external area of the proposed development are likely to be within the Made Ground deposits. Due to the variable composition and thickness of the Made Ground deposits across the site, further investigations in the form of CBR testing may be required for the determination of capping thicknesses and pavement design due to their variability, albeit typically provision of a sufficiently thick capping layer should be assumed to be required. The use of geogrid reinforcement may also permit a reduced capping layer to be adopted.

Earthworks and Material Re-use

Preliminary geotechnical laboratory testing suggests that the granular deposits would be classified as Class 1A/B material for re-use as general fill, in accordance with Series 600 Specification for Highway Works. A proportion of the as-dug materials are likely to require some degree of natural or artificial drying out, where wetter than optimum, in order to permit their placement at or close to the optimum moisture content. Further testing will be required in order to provide recommendations on the classification and placement of the material under a site-specific earthworks specification.

Groundwater and Excavations

Groundwater monitoring from the ground investigation suggests that groundwater may be encountered below 2.32m bgl during excavations. Close side support (temporary shoring) and appropriate dewatering measures, such as provision of sump and pump type water control systems may be required during the excavation of the basement and service corridors. It is understood that a temporary sheet pile wall will be installed to facilitate the construction of the basement which should provide groundwater cut-off.

The main contractor should provide details on how they intend to ensure the safety and short to medium duration stability of excavations. Safety precautions in accordance with industry best practice should be adopted for entry into excavations.

Drainage and Soakaways

Following excavation, soakaway testing was completed in general accordance with BRE 365 (2016). The trial pits were surcharged with water from a bowser and the fall in depth of water with time recorded. Due to the relatively slow rate of infiltration repeat tests were not feasible.

The infiltration test data was assessed in accordance with the methodology outlined in BRE Digest 365 (2016): Soakaway Design. This document describes '*design and construction procedures for soakaways explains how to calculate rainfall design values and soil infiltration rates and gives design examples.*'

None of the soakaway infiltration tests proceeded through the required 75% to 25% effective depth of the excavation in accordance with BRE365.

Based on the cohesive and low permeability nature of the ground conditions on site and the expected shallow groundwater levels, the use of soakaways is unlikely to be feasible.

Chemical Attack on Buried Concrete

Based on chemical laboratory test results, the stratum beneath the site has been categorised as Design Sulphate Class and ACEC Class in accordance with BRE Special Digest 1:2005, Concrete in Aggressive Ground, as follows:

- Groundwater testing was consistent with a Design Sulphate Class DS-1 AC-1s;
- Made Ground testing was consistent with a Design Sulphate Class DS-1 AC-1;
- Kempton Park Gravels testing was consistent with a Design Sulphate Class DS-3 AC-3;
- London Clay testing was consistent with a Design Sulphate Class DS-2 AC-2.

It is recommended that a concrete classification of DS-3 AC-3 should be specified in the design and construction of substructures.

9.0 GEO-ENVIRONMENTAL RISK ASSESSMENT

9.1 SUMMARY OF ANALYTICAL LABORATORY TESTING UNDERTAKEN

Geo-environmental laboratory testing was undertaken on soil samples collected during the ground investigation, as summarised in **Table 10**:

Table 10 – Geo-environmental Laboratory Soil Testing

GEO-ENVIRONMENTAL TEST	NO. SCHEDULED
Metals – arsenic, boron, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium and zinc	8
TPHCWG, PAHs, Phenols and BTEX	8
SVOCs and VOCs	2
Asbestos screen	8
SOM	2
TOC, pH, sulphide, total cyanide and total sulphate	8
PCBs	1
Waste Acceptance Criteria Testing (BSEN 12457/3)	1

Table 11 provides a summary of the chemical analysis completed on the groundwater samples which was collected from the 5 No. installations on 5th May 2021.

Table 11 – Geo-environmental Laboratory Groundwater Testing.

GEO-ENVIRONMENTAL TEST	NO. SCHEDULED
Metals – antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, hexavalent chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, potassium, selenium, sodium, tin, vanadium and zinc	5
TPHCWG, PAHs, Phenols and BTEX	5
SVOCs and VOCs	5
PCBs	1
Pesticide screen	3
Total cyanide, free cyanide, complex cyanide, sulphate as SO4, TOC, sulphide, electrical conductivity at 20 C and pH	5

9.2 ASSESSMENT CRITERIA AND APPROACH – RISKS TO HUMAN HEALTH

For the assessment of the soil analytical results, with the exception of Lead, the human health assessment criteria applied are the 2015 LQM/CIEH 'Suitable 4 Use Levels' (S4ULs) for residential without plant uptake end use. The S4ULs are based on Health Criteria that represent minimal or

tolerable levels of risks to health as described in the EA's SR2 guidance, ensuring that the resulting assessment criteria are 'suitable for use' under planning.

For Lead, S4ULs are not available and the 'low risk' Category 4 Screening Level (C4SL) for the residential without home grown produce land-use was adopted.

The assessment criteria outlined above have been used to provide a Generic Quantitative Risk Assessment (GQRA). No statistical analysis has been completed and recorded concentrations have been compared directly to the applied S4ULs / C4SL.

SOM testing was undertaken on 2 No. samples with recorded values of 1.10% and 1.80%. As such, adoption of criteria on the basis of a 1% SOM has been undertaken as a conservative approach.

The most sensitive human health receptors on-site are considered to be future residents within the apartment buildings. No formal residential gardens are proposed therefore the home grown vegetables or fruit pathways is excluded. Laboratory results have been compared against assessment criteria derived for this land-use. Should any future development plans vary from this end use, the contaminated land risk assessment should be revised.

Individual laboratory results are presented in the LMB Factual Report (**Appendix B**). A summary of soil laboratory test results in comparison to assessment criteria is included within **Appendix C** of this report.

Soil Contamination

Utilising the assessment criteria discussed above, the results of the 8 No. samples sent for geo-environmental soil laboratory analysis have been compared against the relevant assessment criteria. **Table 12** provides a summary of human health exceedances with respect to a Residential (without plant uptake) end use at 1 % SOM.

Table 12 – Summary of Human Health Screening Criteria Exceedances

EXPLORATORY HOLE	SAMPLE DEPTH (m bgl)	CONTAMINANT	GAC (mg/kg)	CONCENTRATION (mg/kg)
BH101	0.80	Dibenzo(a,h)anthracene	0.31	0.54
		Arsenic	40	65
		Lead	310	440
TP101	0.80	Total Cyanide	34 (free)	120
		1,3-Dichlorobenzene	0.44	0.5
TP102	0.40	Asbestos	Detection	Chrysotile, 0.005%
TP103	0.50	Asbestos	Detection	Chrysotile, 0.008%

An exceedance above the relevant screening criteria with regard to arsenic has been recorded within a sample recovered from BH101 at a depth of 0.80m bgl. Additionally within this sample, the concentrations of Dibenzo(a,h)anthracene and lead have been recorded above the relevant screening criteria. The exceedances are likely linked to the 'black ashy material' described in the borehole log to be present between 0.7m and 1.7m bgl.

An exceedance of the relevant screening criteria with regard to total cyanide has been recorded within a sample recovered from TP101 at a depth of 0.80m bgl. Additionally, concentrations of 1,3-Dichlorobenzene have been recorded to exceed the relevant screening criteria within this sample. The TP101 trial pit log reports black colouration between 0.6 and 0.9m bgl. The exceedances are likely linked to historic contamination of the shallow ground.

Asbestos has been detected within two samples, recovered from TP102 at a depth of 0.40m bgl and TP103 0.50m bgl. Subsequent asbestos quantification has confirmed the presence of chrysotile asbestos at concentrations of 0.005% and 0.008% respectively. The presence of further asbestos across the site cannot be ruled out.

According to the proposed development plans (presented in **Appendix A**), the site encompasses the residential building footprints and hardstanding therefore direct contact between impacted soils and future site users / maintenance workers is considered unlikely in these areas. In areas of proposed soft landscaping, in proximity to the impacted soils, the placement of an engineered environmental capping layer formed from imported, chemically 'clean' soils should act as a pathway break between impacted soils and the future site user. An engineered anti-dig layer comprising a high visibility geotextile separator or geogrid should also be incorporated within the capping layer, within soft landscaped areas. Appropriate maintenance regimes should be in place to ensure that this capping layer remains functional. In addition, its presence should be recorded within the health and safety file for the site.

During excavation and other earthwork activities as part of the future development, adequate dust suppression and stockpile management is anticipated to mitigate likely dust generation which may migrate onto neighbouring residential and commercial properties, particularly given the presence of asbestos.

On completion of the remedial works it is considered that the risks to future site users, maintenance workers and third party neighbours from impacted soils on-site are considered to be **Low.**

9.3 CONTAMINATION IN SOILS – RISKS TO DRINKING WATER SUPPLY PIPES

A preliminary assessment of the recorded soil concentrations against the UKWIR threshold concentrations for PE or PVE pipes (the water supply pipes most susceptible to the migration of contaminants migrating through the pipe material) has been undertaken. The results indicate that concentrations of PAHs and mineral oil across the site are above the threshold values for PE and PVC water piping. It should be noted that the laboratory limit of detection for phenols and also, cresols and chlorinated phenols is recorded to be elevated above the UKWIR threshold for PVC pipe. Given that this pipe material was deemed unsuitable due to elevated PAH concentrations exceeding the UKWIR thresholds, it was not considered necessary to undertake any additional testing in relation to phenols, cresols and chlorinated phenols. In addition, pH and electrical conductivity values recorded indicate that the use of wrapped steel and copper pipe material may not be suitable and therefore specialist drinking water supply pipes, such as barrier pipes (PE-Al-PE), may be required in the future development.

9.4 CONTROLLED WATERS – RISK TO GROUNDWATER

A series of groundwater samples were collected, and screened for the contaminants stated in Table 11. Chemical laboratory analytical results from the investigation have been screened against controlled

waters generic assessment criteria (GAC) selected in view of the site setting where the River Terrace Gravel Member is classified by the EA as Secondary (A) Aquifer.

The generic assessment criteria have been selected to be protective of aquifer resource potential. Whilst Drinking Water Standards (DWS) have been used for the assessment criteria with respect to aquifer protection it is recognised that these are overly stringent as the closest groundwater abstraction, located 920m west, is used for irrigation purposes. Where UK Drinking Water Standards are not available for specific determinands, World Health Organisation (WHO) guidelines values were adopted.

Overall concentrations were found to comply with the screening criteria, however limited exceedances of manganese and antimony were noted in boreholes BH101, BH102 and BH103.

Table 13 – Summary of EQS Exceedances

LOCATION	ANALYTE	DWS (ug/l)	CONCENTRATION (ug/l)
BH101	Manganese	50	93
BH102	Manganese	50	96
BH103	Manganese	50	380
BH104	Antimony	5	23

Manganese concentrations are highest in borehole BH103 and dissipate quickly across the site based on a north easterly groundwater flow direction. Antimony exceedance was noted in one borehole only and does not appear to be widespread across the site.

Based on the above, it is considered that the site poses a **LOW risk** to the shallow groundwater within the Kempton Park Gravel Member.

9.5 GROUNDWATER VAPOUR RISK

Groundwater data obtained during this investigation was assessed against residential end-use groundwater vapour criteria set out in SoBRA's Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater Version 1, dated February 2017. Concentrations of contaminants above the assessment criteria were not identified. Therefore risks to future residents, maintenance workers and buildings from volatile vapours originating from impacted groundwater are considered to be **Low**.

9.6 GROUND GAS RISK ASSESSMENT

3 No. rounds of ground gas monitoring were undertaken between 5th and 26th May 2021 by LMB, a full record of which is provided in the LMB Factual Report (**Appendix B**). The available results have been assessed using the methods described in CIRIA Report C665 and BS8485:2015 +A1: 2019. Atmospheric pressures are presented in **Table 14** below:

Table 14 – Atmospheric Pressure Summary

MONITORING ROUND	ATMOSPHERIC PRESSURE RANGE (m bar)	PRESSURE TREND
5th May 2021	1009	Steady
13th May 2021	1006 to 1004	Falling
26th May 2021	1015	Steady

Ground gas monitoring results are summarised in **Table 15** below:

Table 15 – Ground Gas Summary

MONITORING WELL	STRATUM MONITORED	MAX FLOW RATE (l/hr)	MAX METHANE (% v/v)	MAX CARBON DIOXIDE (% v/v)	METHANE GSV* (l/hr)	CARBON DIOXIDE GSV# (l/hr)
BH101	MG / RTC	0.1*	0.1*	4.80	0.0001	0.0048
BH102	MG / RTC	0.1*	0.1*	1.90	0.0001	0.0019
BH103	RTC	0.1*	0.1*	3.30	0.0001	0.0033
BH104	MG	0.1*	0.1*	0.20	0.0001	0.0002
BH105	RTC	0.1*	0.1*	0.10*	0.001	0.0001

MG – Made Ground, RTD – River Terrace Deposits, LC – London Clay Formation
#GSV = Gas Screening Value, in accordance with BS 8485:2015

*detection limit of the monitoring equipment utilised.

In accordance with BS8485:2015 +A1:2019, the hazardous Gas Screening Value (GSV) is based on a 'worst-case' scenario whereby GSV equals the maximum hazardous gas concentration multiplied by the maximum flow rate recorded in any of the monitored boreholes. Based on the results in **Table 15**, GSVs for the site are below the threshold of 0.07 l/hr for Characteristic Situation (CS) 1 (**Very Low Risk**). Classification of the site as CS1 is also indicated by the maximum carbon dioxide concentration and methane concentration being below the limiting values of 5 % and 1 %, respectively.

Other ground-gas constituents, such as hydrogen sulphide, carbon monoxide, methane and PID (photo-ionisation detector, which measures VOCs) results were equally found at low levels (generally at or below detection limits). The low PID results are consistent with the absence of VOCs above detection limits in soil or groundwater samples analysed and, as such, risks from VOCs are considered to be **Very Low**.

RB17 Risk Assessment

To supplement the limited ground gas data available and to provide further lines of evidence, a RB 17 Ground Gas Risk Assessment was undertaken. CL:AIRE research bulletin RB17 - A Pragmatic Approach to Ground Gas Risk Assessment, dated November 2012 describes specific, practical aspects of research which have direct application in "real world environments". The purpose of the document is to provide a more robust assessment of the risk posed by the presence of ground gas, which is achieved by considering information and data that allows the likely gas generation from source to be estimated. The document proposes a pragmatic approach to ground gas assessment using data that can be collected quickly and at low cost.

RB17 and Section D within BS8485:2015 +A1:2019, state that where Made Ground soils are present, determination of the characteristic situation is based on the total organic carbon (TOC) content of the material, where a TOC content of <1% corresponds to a Characteristic Situation 1 scenario. Other aspects to consider are the age and the average thickness of the Made Ground. It was stated, soils that have been in place for 20 years or more are likely to have a low gassing potential and Made Ground with an average thickness of 3m and maximum thickness of 5m are unlikely to generate significant quantities of ground gas.

The historical map review indicated the site was in its current day layout by 1999 with no discernible changes to the site since. This would suggest that soils have been in place for more than 20 years and their gassing potential is likely low. A review of the logs indicate Made Ground soils on-site (not including surfacing) to have an average thickness of 1.20m. The Made Ground stratum across the site is therefore of insufficient thickness to generate significant ground gas volumes. Organic material has been recorded within the Made Ground deposits at two locations TP101 and TP102 which was noted on the logs as organic material at TP101 (0.60m to 0.90m bgl) and relict topsoil, wood and large roots at TP102 (0.70m to 1.40m bgl). TOC testing undertaken on the Made Ground samples collected were generally low (TOC < 1 %) with the exception of samples at BH101, 0.80m bgl (TOC of 5.0%) and TP101, 0.80m bgl (TOC of 1.1%). The sample taken from the Made Ground within BH101 was described as ashy slightly gravelly sand within the logs, which may explain the relatively high TOC concentrations. According to RB17 ash inclusions can give high TOC results that are not representative of the gas emissions risk. The sample taken from the Made Ground within TP101 was noted to include organic material within the logs at this depth. Therefore, a CS1 (**Very Low risk**) classification is considered to be applicable for the site following a qualitative RB17 risk assessment.

In addition to the above and as additional line of evidence, groundwater underlying the site was recorded at a relatively shallow depth, limiting the unsaturated zone through which soil gases migrate.

10.0 REVISED CONCEPTUAL SITE MODEL

The findings of the Fairhurst ground investigation have been used to update the preliminary conceptual site model discussed in **Section 3.0** of this report. This has been revised in the context of risks to Human Health (residential end use without plant uptake) and buildings based on the data gathered during the course of the investigation. The revised CSM is presented in **Table 16** below.

Table 16 – Updated Conceptual Site Model

SOURCE			PATHWAY	HAZARD TO RECEPTOR	RISK ASSESSMENT (FOLLOWING CIRIA C552)			COMMENT ON HAZARD REALISATION
ORIGIN	CONTAMINANT OF CONCERN	ZONE AFFECTED			CONSEQUENCE	PROBABILITY	RISK	
Made Ground	Arsenic, Lead, Dibenzo(a,h)anthracene in borehole BH101, Total cyanide and 1,3-Dichlorobenzene in trial pit TP101 and asbestos fibres in trial pits TP102 and TP103	Site-wide	Direct / dermal contact, ingestions and inhalation of soil bound contaminants / dust.	Health impact to future residents, maintenance workers and third party neighbours.	**Medium**	**Unlikely**	**Low**	Impacted Made Ground soils were recorded across the site. Exposure to future residents are limited to areas of soft landscaping. However due to the site predominantly comprising building cover and hardstanding and the anticipated import of chemically 'clean' soils within the limited soft landscaped areas providing a pathway break between underlying impacted soils and residents / maintenance workers at the surface, risks to future residents and maintenance workers were considered to be **Low**. Furthermore, during excavation and other earthworks activities as part of the future development, adequate dust suppression and stockpile management is anticipated to mitigate likely dust generation which may migrate onto neighbouring residential and commercial properties. Therefore risks to third party neighbours are considered to be **Low**.
Made Ground	PAHs and mineral oils	Made Ground on site	Direct contact with water supply pipes	Contaminant migration through pipe material and subsequent health impact to end-user	**Medium**	**Unlikely**	**Low**	Based on the ground conditions recorded, the use of barrier pipes is recommended. This approach should be agreed with the local water company.
Made Ground	Ground gas / Vapours	Site-wide	Migration into buildings, followed by inhalation of accumulated ground gases and / or soil vapours	Health impact to future residents and explosive risk to buildings.	**Medium**	**Unlikely**	**Low**	Assessment of the limited monitoring results indicated a Characteristic Situation CS1 (**Very Low risk**) for the site. A qualitative RB17 assessment also concludes a CS1 (**Very Low risk**). A vapour risk assessment was undertaken and concluded a low risk to site end-users.

Risk Ratings:

- **High** - The available information indicates a significant possibility of harm to a receptor requiring further investigation, assessment or treatment.
- **Moderate** - The available information indicates a potential for significant harm to a receptor requiring further investigation and assessment.
- **Low** - The available information does not indicate a significant potential for harm to a receptor requiring further investigation. This does not indicate zero risk.

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 GENERAL

The current proposed development comprises the demolition of the current retail units and the development of 4 No. residential buildings, permeable paving, soakaway drainage and soft landscaping. Building A is a part 3, part 4, part 7 and 8 storey building, Building B is an 11 storey building, Building C is a part 8 and 10 storey building and Building D is a part 4, part 7 and part 8 storey building. In addition, a basement plant room is proposed beneath Building A. The basement will be approximately 3 m below the proposed ground-floor level, located near the centre of the proposed building and covers a smaller area than the above-ground structure. It is envisaged to be used as a plant room. A temporary sheet pile wall will be required to facilitate the construction of the basement.

Ancillary structures including the bin store and external masonry walls are proposed in the eastern part of the site, which are likely to be founded on shallow footings. The external areas will be at similar levels as existing ground.

11.2 GROUND AND GROUNDWATER CONDITIONS

The intrusive ground investigation undertaken generally confirmed the anticipated ground conditions based on the British Geological Society (BGS) mapping.

The ground investigation indicated that the ground conditions on-site comprise hardstanding over Made Ground with a maximum thickness of 2.14m, underlain by the Kempton Park Gravel Member, with a maximum proven thickness of 5.30m. The Kempton Park Gravel Member was recorded to be underlain by the London Clay Formation; the base of this strata was not proven in this investigation.

The post-fieldwork groundwater monitoring results record groundwater to be encountered within the Kempton Park Gravel Member from 2.32m to 4.68m bgl. However, the potential for groundwater seepage in the sandy layers and claystone bands at greater depths within the London Clay Formation should not be discounted.

11.3 GEOTECHNICAL ASSESSMENT

The site is within a high risk area with respect to unexploded ordnance. An UXO specialist watching brief is required for any below ground works.

Although limited geotechnical testing was undertaken on the Made Ground, the material is anticipated to be variable in nature and comprise predominantly low strength material. As such, it is not considered to be a suitable founding strata. Preliminary geotechnical laboratory testing suggests that the granular deposits would be classified as Class 1A/B material for re-use as general fill, in accordance with Series 600 Specification for Highway Works, though these deposits are likely to require drying out to permit their placement at or close to the optimum moisture content.

With regard to the superficial deposits, these belonged to the Kempton Park Gravel Member. The cohesive deposits would be expected to have an undrained shear strength in the order of 50 kPa. The granular deposits would be expected to support an Allowable Bearing Capacity of in the order of 175 kN/m^2.

The London Clay Formation has been encountered as high to very high strength, with undrained shear strengths typically in excess of 100 kPa.

Cohesive Made Ground and the London Clay Formation have been determined to have a low to high volume change potential in accordance with NHBC Standards Chapter 4.2 (2017). Any proposals for new vegetation near structures should be reviewed in order to assess the risk of seasonal shrink/swell movement in cohesive soils leading to differential settlement. Should any ground-bearing or shallow foundations be proposed, reference should be made to the NHBC recommendations regarding the minimum foundation depths required in shrinkable soils.

Given the proposed development and the anticipated high magnitude loading, non-standard foundations in the form of piled foundations would be a feasible foundation solution, with the piles terminated within the London Clay Formation. Based on the ground conditions encountered on site and its proximity to nearby structures, rotary bored or continuous flight auger (CFA) piles are considered to be the most suitable pile types. However, consideration should be given to the potential presence of mudstone bands within the London Clay Formation and shallow groundwater ingress. Advice should be obtained from specialist piling contractors in terms of whether the higher torque CFA rigs would be able to penetrate the identified mudstone bands at the depths where these have been identified to be present.

Ancillary structures including the bin store and external masonry walls are proposed in the eastern part of the site, which are likely to be founded on shallow traditional footings.

The anticipated basement depth is 3m bgl, which is within the Kempton Park Gravels and beneath the resting groundwater table; however, there may be further excavation beneath this depth for proposed foundations. Close side support (temporary shoring) and appropriate dewatering measures may be required during the excavation of the basement and service corridors. It is understood that a temporary sheet pile wall will be installed to facilitate the construction of the basement which should provide groundwater cut-off.

Based on the cohesive and low permeability nature of the ground conditions on site and the expected shallow groundwater levels, the use of soakaways is unlikely to be feasible.

Council correspondence notes that the site is within a National Grid safeguard zone (unknown if this relates to the former Richmond Gas Works) and a possible Southern Gas Network structure was identified in the south-eastern corner of the site. Furthermore, existing utilities are likely to be present on-site associated with the existing development, including the electrical substation.

Buried obstructions such as existing foundations of the buildings on-site are likely to be encountered during construction. Contingency measures should be in place should they impact on the design and construction of the foundations and basement excavation. The nature of below ground structures associated with existing structures, which are in uninvestigated areas of the site, is unknown and requires further supplementary investigation.

It is recommended that a concrete classification of DS-3 AC-3 should be specified in the design and construction of substructures.

11.4 GEO-ENVIRONMENTAL ASSESSMENT

The purpose of the geo-environmental assessment was to confirm the findings of a Preliminary Risk Assessment carried out by Fairhurst and develop the conceptual site model.

Potential on-site sources of contamination included Made Ground, a former car wash, historical uses including timber yard, crane, railway sidings, fuel depot and coal hoppers and an electrical substation. Various off-site sources including, but not limited to, railway sidings and the Richmond Gas Works were also identified.

Laboratory results of soil samples were compared against residential generic assessment criteria (residential without plant uptake). Exceedances of the relevant GAC were recorded for arsenic, lead and Dibenzo(a,h)anthracene within a sample recovered from BH101 at a depth of 0.80m bgl and exceedances of the relevant GAC were recorded for total cyanide and 1,3-Dichlorobenzene within a sample recovered from TP101 at a depth of 0.80m bgl. Furthermore, asbestos has been detected within the two samples tested recovered from TP102 at a depth of 0.40m bgl and TP103 0.50m bgl. Subsequent asbestos quantification has confirmed the presence of chrysotile asbestos at concentrations of 0.005% and 0.008% respectively.

Due to the site predominantly comprising building cover and hardstanding direct contact between impacted soils and future site users / maintenance workers is considered unlikely in these areas. In areas of proposed soft landscaping the placement of an engineered environmental capping layer formed from imported, chemically 'clean' soils should act as a pathway break between impacted soils and the future site user. An engineered anti-dig layer comprising a high visibility geotextile separator or geogrid should also be incorporated within the capping layer, within soft landscaped areas. Appropriate maintenance regimes should be in place to ensure that this capping layer remains functional. In addition, its presence should be recorded within the health and safety file for the site.

On completion of the remedial works it is considered that the risks to future site users, maintenance workers and third party neighbours from impacted soils on-site are considered to be **Low.**

Furthermore, during excavation and other earthworks type activities as part of the future development, adequate dust suppression and stockpile management is anticipated to mitigate likely dust generation which may migrate onto neighbouring residential and commercial properties. Therefore risks to third party neighbours are considered to be **Low**.

Groundwater samples analysed from across the site were largely compliant with UKDWS with limited exceedances for manganese and antimony noted in boreholes BH101, BH102, BH103 and BH104. Given the stringent nature of the assessment criteria selected, the localised nature of antimony exceedance coupled with a likely off-site source of manganese, it is considered that the site poses a **Low risk** to the shallow groundwater within the Kempton Park Gravel Member.

Assessment of the ground gas monitoring results indicated a Characteristic Situation (CS) 1 (**very low risk**) for the site. This was confirmed by an RB17 assessment. An assessment of concentrations of volatile contaminants within groundwater samples indicated a **Low risk** to future residents, maintenance and buildings from volatile contaminants in shallow perched water.

A preliminary assessment of the recorded soil concentrations against the UKWIR assessment criteria for PE or PVE pipes (the water supply pipes most susceptible to the migration of contaminants migrating through the pipe material) has been undertaken. The results indicate that concentrations of PAHs and mineral oil across the site are above the threshold values for PE and PVC water piping. In addition, pH and electrical conductivity values recorded indicate that the use of wrapped steel and copper pipe material may not be suitable and therefore specialist drinking water supply pipes, such as barrier pipes (PE-Al-PE), are recommended in the future development.

11.5 RECOMMENDATIONS

Based upon the results of the investigation the following recommendations are made:

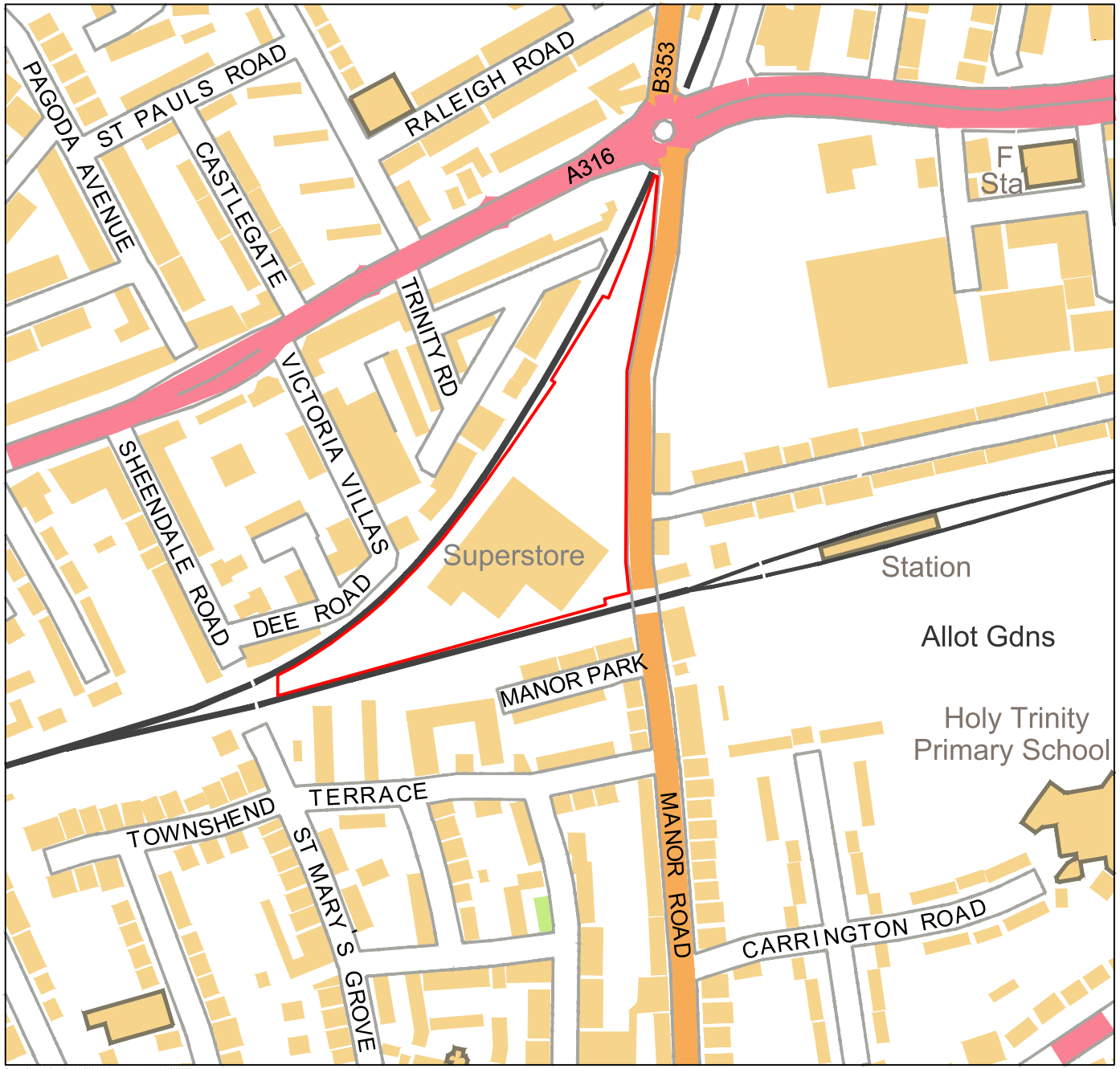
- The inspection of asbestos registers of the buildings is recommended to ensure all asbestos in buildings is removed by a licensed asbestos contractor prior to demolition. Asbestos clearance certificates should be held on file;
- The possibility of processing and re-using demolition material on site under the WRAP protocol should be explored;
- Fairhurst to provide a watching brief during all earthworks and removal of the existing slabs;
- It is anticipated that a Remediation Strategy will be required for the proposed development, which will comprise the following;
    - In areas of proposed soft landscaping, an engineered environmental capping layer formed from imported, chemically 'clean' soils should act as a pathway break between impacted soils and the future site user. An engineered anti-dig layer comprising a high visibility geotextile separator or geogrid should also be incorporated within the capping layer, within soft landscaped areas. Appropriate maintenance regimes should be in place to ensure that this capping layer remains functional. In addition, its presence should be recorded within the health and safety file for the site;
    - The use of barrier pipes for drinking water supply is recommended and should be agreed with the local water company prior to installation;
    - Based on the ground gas risk assessment, the site is classed as a Characteristic Situation (CS)1 (very low risk) site, where no gas protection measures are required;
    - Risks from volatiles in soils and shallow groundwater were classed as low, no special protection measures are required;
    - A concrete classification of DS-3 AC-3 should be specified in the design and construction of substructures.

A second phase of ground investigation is planned once the buildings and associated structures have been demolished to supplement the existing data and should include, but not be limited to, the following;

- Additional Cable Percussive boreholes (to depths of c. 25m) and Window Sample boreholes (to depths of c. 5m) in previously inaccessible areas;
- Trial pitting along the eastern boundary of the site to investigate the existing retaining wall along Manor Way and across the site to identify the location of services entering the site;
- Installation of gas and groundwater monitoring wells and 3 No. additional return monitoring rounds to confirm the low ground gas risk and groundwater risk;
- Additional geo-environmental sampling and testing to inform any subsequent contamination remediation measures;
- Additional geotechnical in-situ and laboratory testing for design.

Prior to the supplementary ground investigation the Local Planning Authority should be consulted and any associated Planning Conditions reviewed against the proposed scope of investigation.

APPENDIX A – FIGURES



KEY:

SITE BOUNDARY

0 100 200
m

Client:
AVANTON RICHMOND DEVELOPMENT LIMITED

Project Title:
MANOR ROAD
RICHMOND

Drawing Title:
SITE LOCATION PLAN

Scale @ A1: AS SHOWN

Job No: 126782/0100

Key:

BH Rotary percussive borehole location

TP Machine excavated trial pit location

IMPORTANT – Please Read

This drawing is for illustrative purposes only and is for use only in conjunction with associated reports relating to the project details below. LMB accepts no liability for the mis-interpretation or use of this illustration by any other parties.

LMB
Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

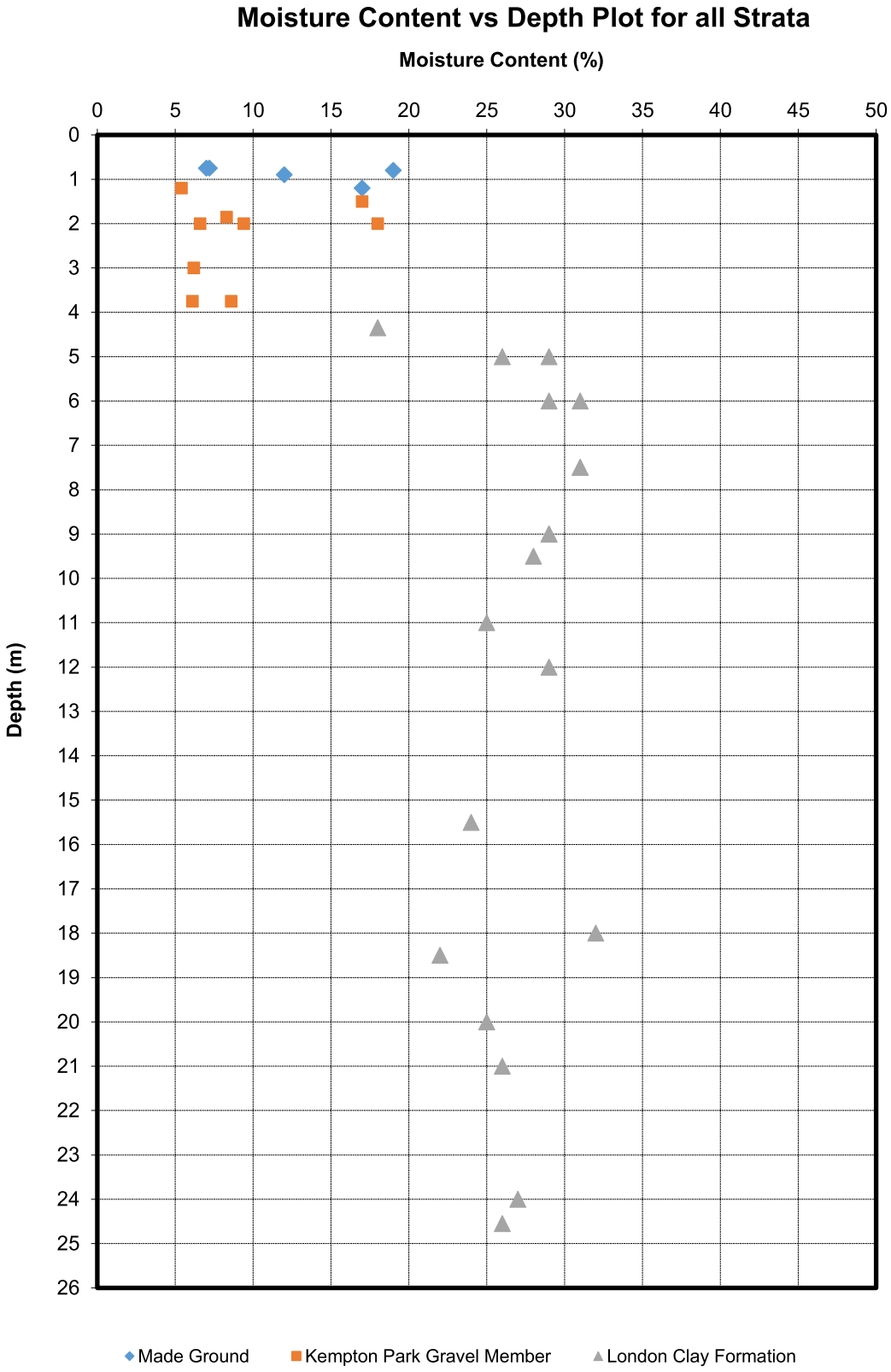
Site: Manor Road, Richmond TW9

Figure Number: Figure 2

Title: Exploratory Hole Location Plan

Project No:	Created By:	Date:
	PIL	May 2021

Client: Avanton Richmond Development Ltd


Moisture Content vs Depth Plot for all Strata
Moisture Content (%)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
0
1
2
3
4
5
6
7
8
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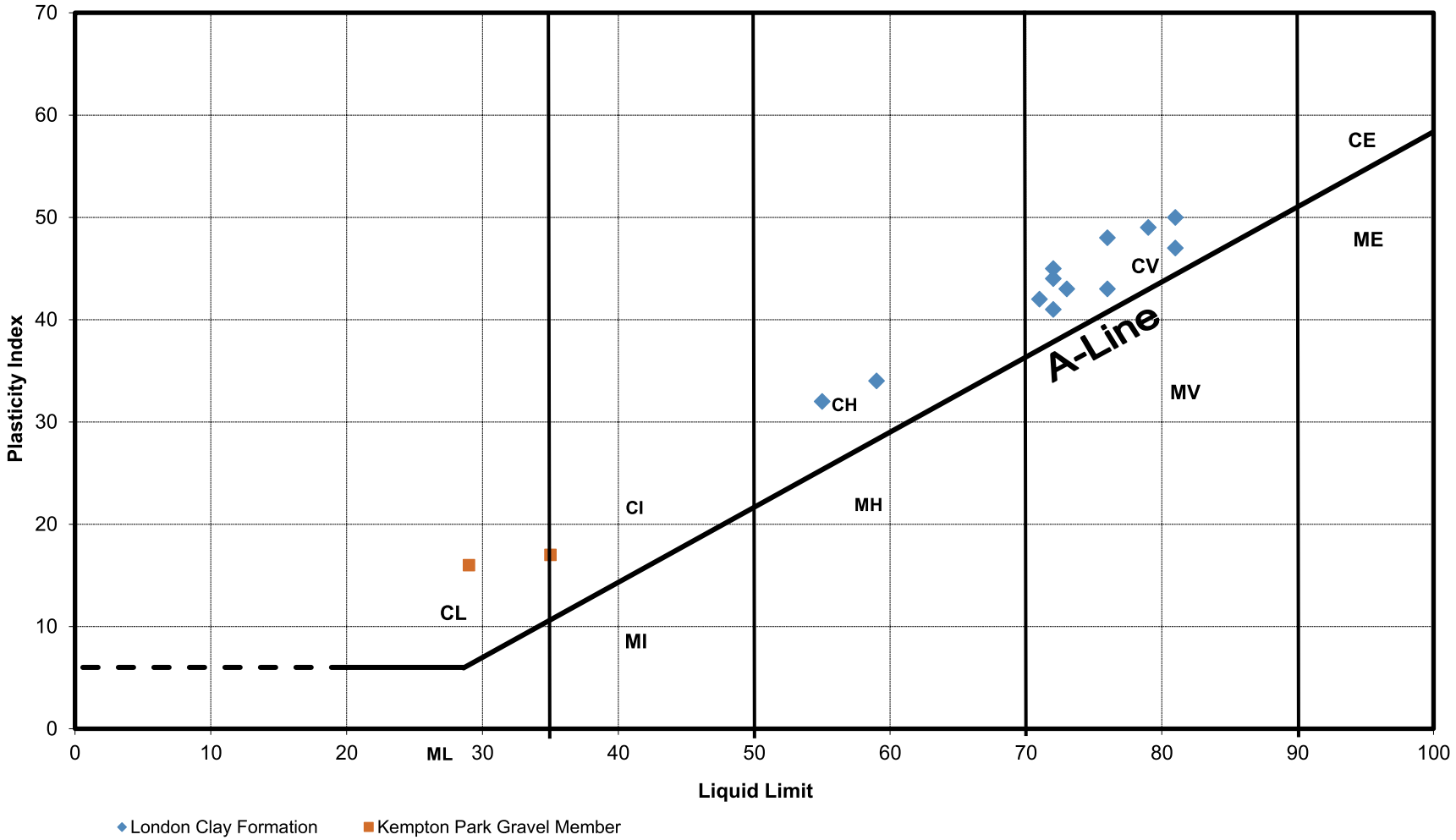
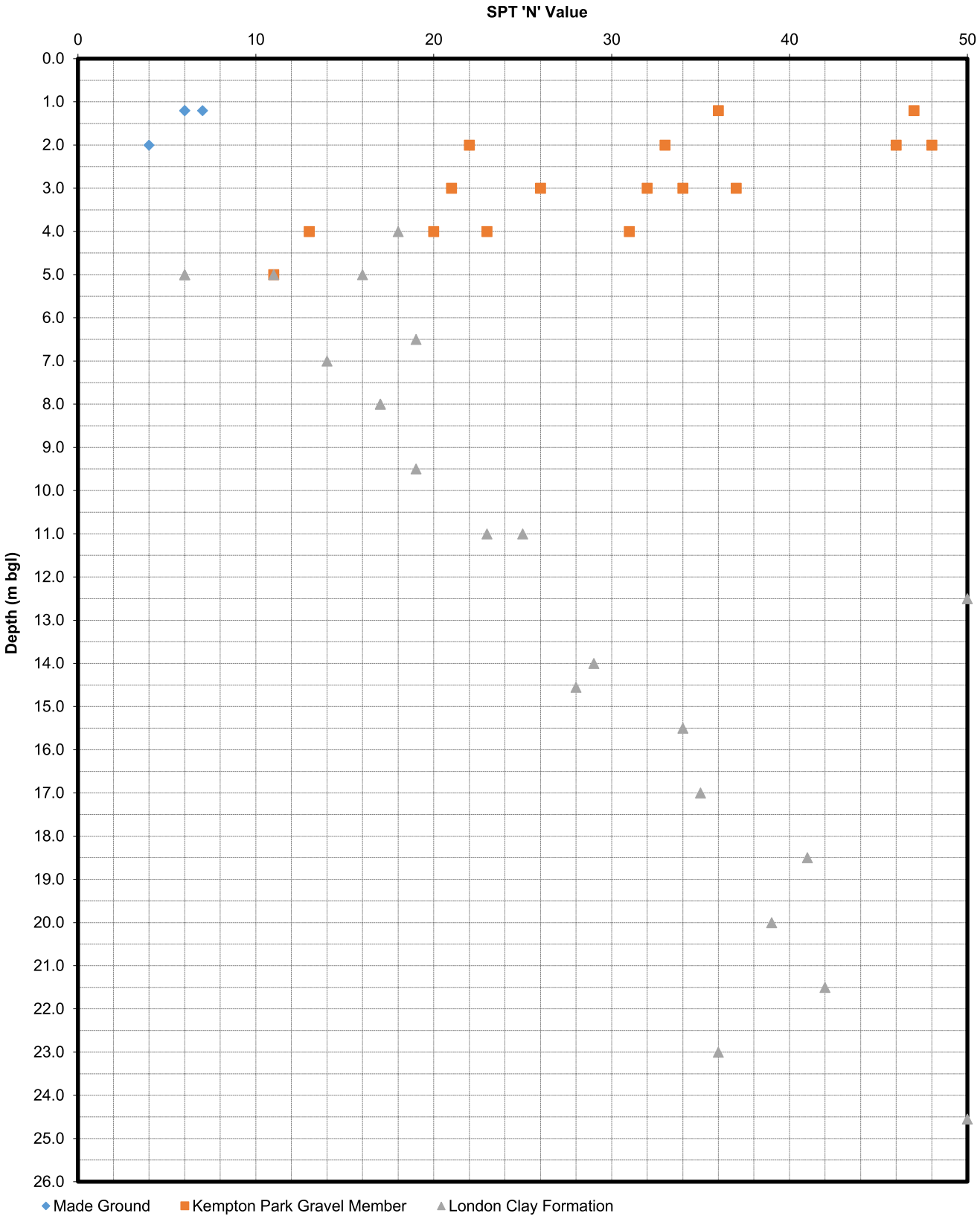
Made Ground
Kempton Park Gravel Member
London Clay Formation

FAIRHURST

Plasticity Chart for all Strata



SPT 'N' Value vs Depth Plot for All Strata



APPENDIX B – LMB FACTUAL REPORT

LMB GEOSOLUTIONS LTD

FACTUAL REPORT FOR GROUND INVESTIGATION

84 MANOR ROAD, RICHMOND TW9

June 2021

DOCUMENT RECORD

Document Title	Factual Report for Ground Investigation
Site	84 Manor Road, Richmond TW9 1YB
Document Date	21st June 2021
Document Version	Issue 2: Updated following comments from Fairhurst
Document Authorisation	Philip Lewis BSc (Hons), MSc, CGeol, FGS
	

LMB
Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology
Company No. 8303397

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INTRODUCTION

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AUTHORISATION

LMB Geosolutions Ltd (LMB) was instructed by Fairhurst (Consultant Engineers) on behalf of Avanton Richmond Development Ltd (the Client) to undertake ground investigation works to support the proposed development at 84 Manor Road, Richmond TW9 1YB (the Site).

PROJECT AND SITE DETAILS

Site Address	84 Manor Road, Richmond TW9 1YB. A Site Location Plan is provided as **Figure 1**.
Site/Building Area	The site currently comprises an operational retail park that includes Homebase, Pets at Home, We Buy any Car along with car parking and a rear service yard.
Proposed Development	Information provided by the Consultant Engineers indicates that the site is to be redeveloped to include residential apartment buildings with a basement car park, commercial areas, soft landscaping and infrastructure.

SCOPE OF WORKS

The scope of works has been completed:

- Site set up including liaison with the Client and appointment of sub-contractors;
- Mobilisation to site and transport of the rigs and plant to the proposed locations;
- Completion of a service avoidance, level and positioning survey at proposed exploratory hole locations;
- Concrete coring/breaking at proposed locations;
- Completion of five rotary percussive borehole to depths of between 7.45m and 25.00m below ground level (bgl) with insitu SPT and collection of disturbed and undisturbed samples for laboratory testing;
- Completion of three machine excavated trial pits to depths of 2.50m bgl with collection of disturbed samples for laboratory testing;
- Completion of three infiltration soakaway tests within trial pit locations in general accordance with BRE 365;
- Installation of monitoring wells within all borehole locations to depths of between 6.00m and 8.00m bgl;
- Field headspace screening of soil samples using a photo-ionisation detector (PID);
- Supervision and geological logging (in general accordance with BS 5930) by an appropriately experienced geo-environmental engineer;
- Well development and groundwater sampling using low flow techniques;

INTRODUCTION

- Return monitoring of groundwater and ground gas levels on 6no. occasions[1];
- Geotechnical and chemical laboratory testing of soil and groundwater samples;
- Completion of a factual report that will include;
  - Details of the ground and groundwater conditions encountered.
  - Geological logs (AGS format if required) and foundation sections.
  - Presentation of chemical analytical.
  - Presentation of geotechnical laboratory testing results.

PUBLISHED GEOLOGY

Reference to the relevant British Geological Survey map for the area and information provided by the Consultant Engineers indicates that the ground conditions at the site comprise Made Ground overlying the Kempton Park Gravel Member which in turn overlies the London Clay Formation.

LIMITATIONS

LMB has prepared this report solely for the use of the named Client and those parties with whom a warranty agreement and/or assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from LMB and the Client.

LMB accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) issue of this document to any third party with whom an agreement has not been executed.

The information provided, among other things, take in to consideration currently available guidance and best available techniques. No liability can be accepted for the retrospective effects of any future changes or amendments to best available techniques.

[1] This version of the report includes 3no. rounds and an updated report will be issued following completion of the full 6no. rounds.

Ground Investigation

INTRODUCTION

The ground investigation works were undertaken between 21st April and 27th April 2021 and comprised the progression of 5no. rotary percussive boreholes and 3no. machine excavated trial pits, with sampling of soil for laboratory testing and geological logging.

An exploratory hole location plan produced by the Consultant Engineers is provided as **Figure 2**.

Ground gas and groundwater monitoring was undertaken following completion of the fieldworks between 5th May and 26th May 2021.

Monitoring well development was completed on 29th April 2021 and groundwater sampling was completed on 5th May 2021.

Details of the ground investigation completed, along with the findings of the investigation, are provided in the following sections. The exploratory hole logs laboratory results and monitoring results are presented in **Appendix A, B**, **C** and **D** respectively.

Guidance Documents

Details of the best practice guidance documents and reference information used in undertaking the ground investigation and assessment are provided at the end of this report (see REFERENCES & GUIDANCE).

Investigation Strategy

The ground investigation was designed based on the requirements and specification from the Consultant Engineers. All works and exploratory holes were supervised and logged by an appropriately experienced geo-environmental engineer.

FIELDWORKS

Concrete Breaking & Coring

Hard surfacing and concrete surfacing were removed from exploratory hole locations with the use of a concrete coring rig and/or a hydraulic breaker.

Rotary Percussive Boreholes

Five rotary percussive boreholes were completed to depths of between 7.45 and 25.00m bgl. Environmental, disturbed and/or bulk samples were generally collected at regular intervals.

GROUND INVESTIGATION

Standard Penetration Tests (SPTs) were generally completed at alternate 1.0m intervals in the upper 5.0m and at alternating 1.50m thereafter. Undisturbed samples were generally collected at alternate1.0m intervals in the upper 5.0m and at alternating 1.50m thereafter where cohesive soils were encountered.

In Situ Tests

Standard Penetration Tests (SPTs) were carried out in the rotary percussion boreholes in accordance with BS EN ISO 22476-3. A calibration certificate for the SPT hammer is provided in **Appendix E**.

Machine Excavated Trial Pits

Three machine excavated trial pits were completed to depths of 2.50m bgl using a 3cx excavator. Environmental and disturbed samples were generally collected at regular intervals for laboratory testing.

An exploratory hole location plan provide by the consultant engineers is presented as **Figure 2**.

Soakaway Testing

Following excavation, soakaway testing was completed in general accordance with BRE 365 (2016). The trial pits were surcharged with water from a bowser and the fall in depth of water with time recorded. Due to the relatively slow rate of infiltration repeat tests were not feasible.

The infiltration test data was assessed in accordance with the methodology outlined in BRE Digest 365 (2016): Soakaway Design. This document describes '*design and construction procedures for soakaways explains how to calculate rainfall design values and soil infiltration rates and gives design examples.*'

The methodology applied in this assessment specifically relates to the calculation of soil infiltration rate within the unsaturated zone.

None of the soakaway infiltration tests proceeded through the required 75% to 25% effective depth. The soakaway infiltration test worksheets are provided in **Appendix F**.

Field Headspace Testing

Field screening of soil samples was undertaken using a *mini-rae Lite* photo ionisation detector (PID). Soil arisings were collected at regular intervals and placed in sealed plastic bags, agitated by shaking and left for a minimum of 30 minutes prior to testing of 'headspace' using the PID.

Details are provided on the exploratory hole logs presented in **Appendix A** and calibration certificates are provided in **Appendix G**.

GROUND INVESTIGATION

Groundwater Sampling

Groundwater samples were collected from all monitoring wells. All wells were developed using an electrical submersible pump, washed and cleaned between holes on 29th April 2021.

Monitoring wells were sampled on 5th May 2021 using low flow sampling techniques with a peristaltic pump so groundwater was micro-purged and directed via a flow cell installed with a multi-parameter probe so that indicator parameters (i.e. pH, EC, ORP, DO and temperature etc) could be monitored to ensure stability prior to sampling into dedicated sampling containers.

Low flow sampling indicator parameters are provided in **Appendix D**.

Monitoring

Three rounds of monitoring have been completed at the site. Ground gas monitoring was undertaken using a GFM 436 gas analyser, volatile vapour monitoring was completed using a mini-rae Lite PID.

Calibration certificates are provided in **Appendix G**.

Visual and Olfactory Evidence of Contamination

Observations of potential visual and/or olfactory evidence of contamination observed during the fieldworks were limited to the following:

- BH01 (0.70-1.70m) black ashy material and clinker.
- BH02 (4.00m) grey colouration and hydrocarbon odour.
- BH04 (2.20-4.30m) strong hydrocarbon odour.
- TP01 (0.60-0.90m) black colouration

However, Made Ground was observed in all exploratory hole locations and can be indicative of the presence of contamination.

LABORATORY TESTING

Soil and groundwater samples were submitted to the UKAS and MCERTS accredited laboratories of i2 Analytical for chemical and geotechnical testing.

Laboratory test results are provided in **Appendix B** and **C.**

GROUND INVESTIGATION

SUMMARY OF GROUND & GROUNDWATER CONDITIONS

Ground Conditions

The table below provides a summary of ground conditions encountered with full descriptions provided in the associated exploratory hole logs provided in **Appendix A**:

Strata	Depth Range to Top (m bgl)	Depth Range to Base (m bgl)
Made Ground	Ground Level	0.65 – 2.20
Kempton Park Gravel Member(1)	0.65 – 2.20	4.30 – 7.00
London Clay Formation (2)	4.30 – 7.00	7.45 – 25.00

(1) Base not determined in all locations.
(2) Base not determined.

Groundwater Observations

During the ground investigation works water strikes were recorded at the following depths:

Location	Depth to Water Strike (m bgl)
BH101	4.50
BH102	4.30
BH103	3.50
BH104	3.20
BH105	3.00

During return monitoring groundwater was recorded at depths of between 1.57m and 4.24m bgl.

Details are provided on the exploratory hole logs presented in **Appendix A** and the monitoring results presented in **Appendix D**.

MONITORING AND INSTRUMENTATION

Dual groundwater and ground gas monitoring wells were installed in all borehole locations. Details of the monitoring well installations can be viewed on the exploratory hole logs in **Appendix A**.

REFERENCES & GUIDANCE

1. Land Contamination Risk Management Guidance (published 8th October 2020, ref https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm)
2. Environment Agency/Defra. Contaminated Land Statutory Guidance (April 2012).
3. BS 10175 (2011) Investigation of Potentially Contaminated Sites. Code of Practice.
4. BS5930 (2007) Code of Practice for Site Investigations.
5. BS 5667-11:2009. Water quality sampling. Part 11: Guidance on sampling of groundwaters.
6. BS 8002 (1994) Code of Practice for Earth Retaining Structures
7. Tomlinson, M.J. (1986) Foundation Design and Construction.
8. Department of the Environment Industry Profiles.
9. Environment Agency/Defra (2002). Sampling strategies for contaminated land (CLR4)2
10. Environment Agency/Defra (2002). Priority Contaminants for the Assessment of Land (CLR8)3
11. CIRIA (2007). Assessing risks posed by hazardous ground gases to buildings
12. BS 8485:2007. Code of Practice for the Characterisation and Remediation from Ground Gas in affected Development.
13. NHBC (2007). Guidance on the Evaluation of Development proposals on sites where Methane and Carbon dioxide are present.
14. CL:AIRE (December 2013). Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination.
15. CL:AIRE / CIEH (2008), Guidance on Comparing Soil Contamination Data with a Critical Concentration, May 2008;
16. CL:AIRE / EIC (2009), The Soil Generic Assessment Criteria for Human Health, December 2009.
17. Environment Agency (2003), Review of fate & transport of selected contaminants in the Environment, Report P5-079-TR1;
18. Environment Agency (2004), Model Procedures for the Management of Land Contamination, September 2004, ISBN: 1844322955;
19. Environment Agency (2008a), Compilation of Data for Priority Organic Pollutants, Report SC050021/SR7, November 2008;
20. Environment Agency (2009a), Human Health Toxicological Assessment of Contaminants in Soil, Report SC050021/SR2, January 2009;
21. Environment Agency (2009b), CLEA Software (Version 1.04) Handbook (and Software), Report SC050021/SR4, January 2009;
22. Environment Agency (2009c), Updated Technical Background to the CLEA Model, Report SC050021/SR3, January 2009;

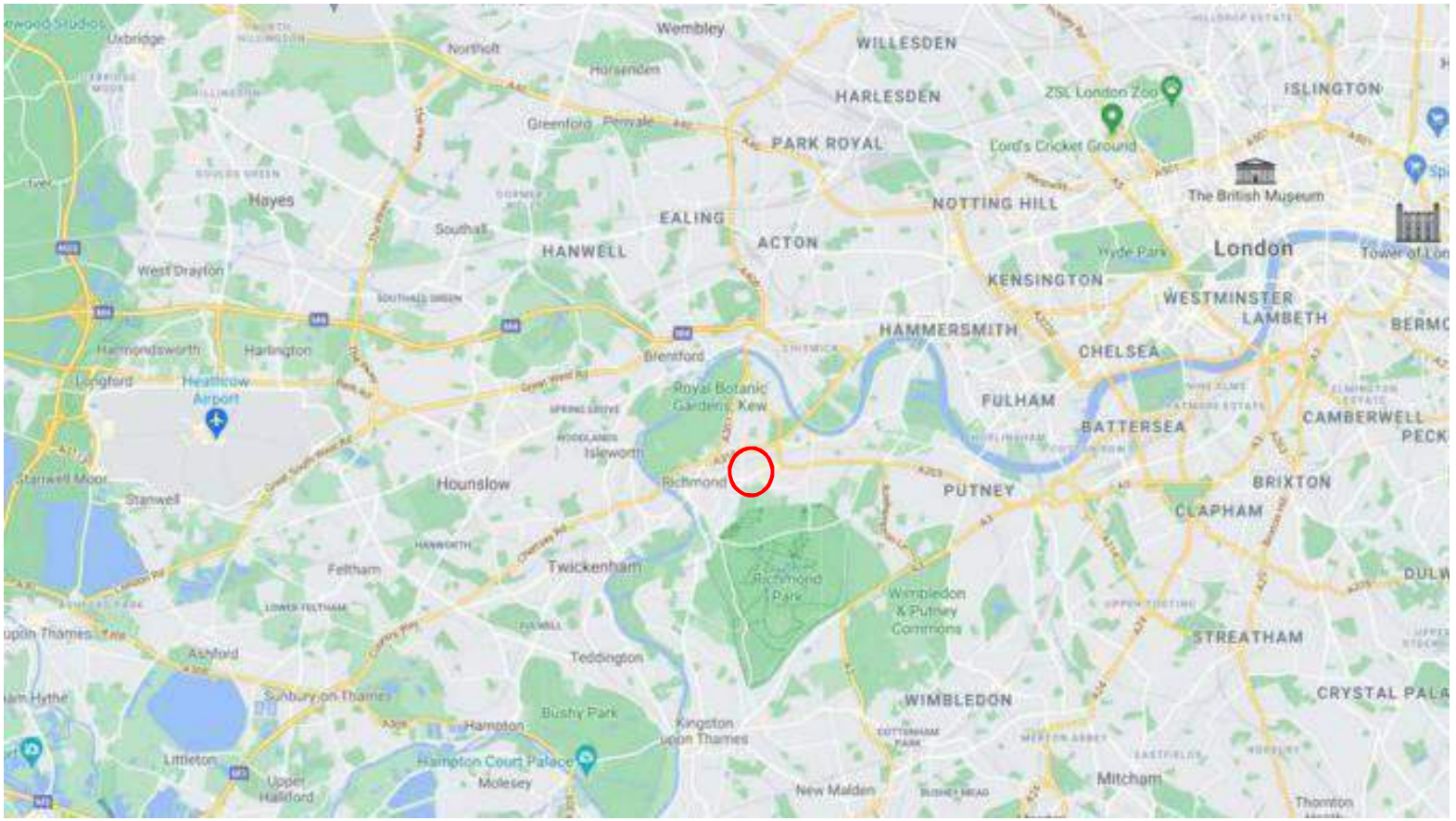
[2] This document has been withdrawn but is considered to remain useful in proving technical background for designing ground investigation works.

[3] This document has been withdrawn but is considered to remain useful in proving technical background for designing ground investigation works.

REFERENCES & GUIDANCE

23. Environment Agency (2009d), A Review of Body Weight and Height Data Used in the CLEA Model, Report SC050021/Final Technical Review 1, January 2009;
24. Nathanial et. al., (2009), The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition), Land Quality Press, Nottingham, ISBN 0-9547474-7-X
25. USEPA (2004), User's Guide for Evaluating Subsurface Vapour Intrusion into Buildings
26. Environment Agency (2013). Groundwater Protection: Principles and Practice (GP3)
27. Water Framework Directive (2000/60/EC)
28. Groundwater Regulations (2009).
29. Drinking Water Quality Standards England & Wales 2000 (Amended 2004, DWS).
30. World Health Organisation (WHO) Petroleum Products in Drinking Water.
31. Environmental Quality Standards (EQS). The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010.
32. Environment Agency (2006). Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination.
33. Environment Agency (2013). Technical Guidance WM2 (v3). Interpretation of the definition and classification of hazardous waste.

FIGURES



Key:

Approximate Site Location

IMPORTANT – Please Read

This drawing is for illustrative purposes only and is for use only in conjunction with associated reports relating to the project details below. LMB accepts no liability for the mis-interpretation or use of this illustration by any other parties.

LMB
Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Site: Manor Road, Richmond TW9

Figure Number: Figure 1

Title: Site Location Plan

Project No:	Created By:	Date:
	PIL	May 2021

Client: Avanton Richmond Development Ltd

N

Key:

BH Rotary percussive borehole location

TP Machine excavated trial pit location

IMPORTANT – Please Read

This drawing is for illustrative purposes only and is for use only in conjunction with associated reports relating to the project details below. LMB accepts no liability for the mis-interpretation or use of this illustration by any other parties.

LMB
Ground Investigation
Land Contamination
Hydrogeology
Engineering Geology

Site: Manor Road, Richmond TW9

Figure Number: Figure 2

Title: Exploratory Hole Location Plan

Project No:	Created By:	Date:
	PIL	May 2021

Client: Avanton Richmond Development Ltd

APPENDICES

Appendices

APPENDIX A EXPLORATORY HOLE LOGS

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518965.60 N175513.60
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH101	RO	6.70m AoD	PIL	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES					MADE GROUND: grass over brown slightly clayey sand with rootlets and occasional flint and rare brick gravel.
		0.10	PID	PID=0.20	0.25	6.45		
		0.25	D					MADE GROUND: grey to grey brown gravelly sand concrete and occasional brick cobbles.
		0.40	D					
		0.40	ES		0.70	6.00		MADE GROUND: grey to black ashy slightly gravelly sand. Gravel sub-angular fine to coarse flint, brick, clinker and glass. Rare brick cobbles.
		0.40	PID	PID=0.20				
		0.50	D					
		0.75	D					
		0.80	D					
		0.80	ES					
		0.80	PID	PID=0.20				
		1.00	D		1.70	5.00		Brown to orange brown sandy CLAY with occasional fine to medium flint gravel. (KEMPTON PARK GRAVEL MEMBER).
		1.20	D					
		1.20	SPT	N=6 (1,1/2,1,1,2)				
		1.50	ES					
		1.50	PID	PID=0.40				
		1.85	D					
		1.90	ES					
		1.90	PID	PID=0.30				
		2.00	D					
		2.00	SPT	N=22 (4,5/5,5,6,6)	3.00	3.70		Brown to orange brown slightly clayey slightly gravelly to gravelly medium SAND. Gravel sub-angular to rounded fine to coarse flint (damp). KEMTPON PARK GRAVEL MEMBER).
		2.75	D					
		3.00	D					
		3.00 - 4.00	B					
		3.00	SPT	N=26 (4,5/6,6,7,7)				
		3.10	ES					
		3.10	PID	PID=0.30				
		3.75	D					
	▼	4.00	D					
	▽	4.00	ES					
		4.00	SPT	N=18 (4,5/5,5,4,4)	4.50	2.20		Brown slightly gravelly medium to coarse SAND. Gravel sub-angular to rounded medium to coarse flint. (KEMTPON PARK GRAVEL MEMBER).
		4.00	PID	PID=0.40				
		4.60	ES					
		4.60	PID	PID=1.00				
		4.75	D					
		5.00	D					
		5.00 - 6.00	B					
		5.00	SPT	N=16 (3,3/3,4,4,5)				
		6.00	D					
		6.00 - 7.00	B					
		6.50	D					
		6.50	ES					
		6.50	SPT	N=19 (3,4/4,4,5,6)				
		6.50	PID	PID=0.20	7.00	-0.30		brown with orange brown mottling CLAY - recovered with sand and rare flint gravel possibly pulled down from overlying granular deposits. (LONDON CLAY FORMATION).
		7.05	ES		7.10	-0.40		
		7.05	PID	PID=0.10				dark grey to grey brown CLAY. Closely fissured. (LONDON CLAY FORMATION).
		7.50	D					
		7.50	ES					
		7.50	PID	PID=0.10				
		8.00	U					
					8.45	-1.75		End of Borehole at 8.450m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021 - 27/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518938.50 N175516.76
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH102	RO	6.40m AoD	PIL&DN	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	ES		0.06	6.34		Brick paving.
		0.15	PID	PID=0.10	0.13	6.27		MADE GROUND: yellow brown slightly gravelly sand (sub-base).
		0.50	D		0.25	6.15		MADE GROUND: red brown to grey gravelly sand / sandy raodstone gravel (sub-base).
		0.50	ES					
		0.50	PID	PID=0.30	0.75	5.65		MADE GROUND: grey to brown gravelly sand with concrete and occasional brick cobbles. Gravel sub-angular fine to coarse brick, flint and concrete.
		0.90	D					
		0.90	ES					
		0.90	PID	PID=0.30	1.20	5.20		MADE GROUND: brown to dark brown clayey gravelly sand with occasional brick and concrete cobbles. Gravel sub-angular fine to coarse flint, brick, concrete and rare clinker.
		1.20	D					
		1.20	SPT	N=7 (1,1/1,1,4,1)	1.60	4.80		MADE GROUND: dark brown clay with fine to medium brick and concrete gravel and slate fragments.
		1.50	ES					
		1.50	PID	PID=0.40				brown to orange brown gravelly medium SAND / sandy sub-angular to rounded fine GRAVEL. Gravel sub-angular to rounded fine flint. (KEMPTON PARK GRAVEL MEMBER).
		1.85	D					
		2.00	ES					
		2.00 - 2.45	B					
		2.00	SPT	N=33 (6,4/8,8,9,8)				
		2.00	PID	PID=0.30				
		2.75	D					
		3.00	D					
		3.00	SPT	N=21 (3,4/5,5,6,5)				
	▼	3.75	D					
		4.00 - 4.45	B		4.00	2.40		brown to orange brown gravelly medium SAND with occasional to frequent flint cobbles. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
	▽	4.00	SPT	N=20 (3,4/5,4,5,6)				
		4.00	PID	PID=18.60				*4.0m grey colouration and hydrocarbon odour.*
		4.50	ES					
		4.50	PID	PID=3.70				
		4.75	D					
		5.00	D					
		5.00	SPT	N=11 (2,3/2,3,3,3)				
		5.00	PID	PID=0.80				
		5.50	PID	PID=0.60				
					5.70	0.70		brown to orange brown gravelly medium to coarse SAND with occasional to frequent flint cobbles. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
		5.80	ES		5.70	0.70		
		5.80	PID	PID=0.20	5.80	0.60		*4.0m grey colouration and hydrocarbon odour.*
		6.00	D					brown with occasional orange brown mottling CLAY. (LONDON CLAY FORMATION).
		6.50	U					dark grey brown CLAY. Closely fissured with occasional grey silty partings. (LONDON CLAY FORMATION).
		7.00	D					
		7.00	SPT	N=14 (2,3/3,3,3,5)				
					7.45	-1.05		End of Borehole at 8.450m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518965.67 N175454.29
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH103	RO	6.54m AoD	PIL	1:50	Sheet 1 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.06	6.48		Brick paving.
		0.20	D		0.10	6.44		MADE GROUND: yellow brown medium sand (sub-base).
		0.20	ES		0.35	6.19		MADE GROUND: red to red brown sandy roadstone gravel (sub-base).
		0.20	PID	PID=0.20	0.60	5.94		MADE GROUND: grey brown sandy fine to coarse sub-angular to angular concrete, brick and flint gravel and cobbles.
		0.50	D		0.90	5.64		MADE GROUND: dark brown slightly clayey silty fine sand with occasional brick gravel.
		0.50	ES					*0.60m thin layer of yellow sand.*
		0.50	PID	PID=0.10				Brown to dark brown slightly gravelly slightly clayey silty fine to medium SAND. Gravel sub-angular to rounded medium to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
		0.80	D					*2.0m becomes more gravelly and dark brown to orange brown in colour.*
		0.80	ES					
		0.80	PID	PID=0.10				
		1.00	D					
		1.00	ES					
		1.00	PID	PID=0.10				
		1.20 - 1.65	B					
		1.20	SPT	N=36 (4,7/9,9,9,9)				
		1.85	D					
		2.00	D					
		2.00	SPT	N=46 (6,10/11,12,11,12)				
		2.75	D					
		3.00	D					
		3.00	ES					
		3.00	SPT	N=37 (5,7/8,9,10,10)				
		3.00	PID	PID=0.20				
		3.75	D					
		4.00	D					
		4.00	SPT	N=23 (5,6/7,5,5,6)				
					4.80	1.74		
		4.85	ES		4.90	1.64		Brown with occasional orange brown mottling CLAY. Some fissuring visible. (LONDON CLAY FORMATION).
		4.85	PID	PID=0.20				Dark grey to grey brown CLAY. Closely fissured with some brown staining along surfaces. (LONDON CLAY FORMATION).
		5.00	D					
		5.00	SPT	N=6 (1,2/1,2,2,1)				
		5.50	ES					
		5.50	PID	PID=0.20				
		6.00	D					*6.0m becomes very closely fissured.*
		6.50	U					
		7.50	D					
		8.00	D					*8.0m occasional light grey bioturbation traces.*
		8.00	SPT	N=17 (2,3/3,4,5,5)				
		9.00	D					
		9.00	ES					
		9.00	PID	PID=0.10				
		9.50	U					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518965.67 N175454.29
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH103	RO	6.54m AoD	PIL	1:50	Sheet 2 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	D					Dark grey to grey brown CLAY. Closely fissured with some brown staining along surfaces. (LONDON CLAY FORMATION).
								10.0m grey silty fine sand partings along some surfaces.
		11.00	D					
		11.00	SPT	N=23 (2,3/4,5,7,7)				
		12.50	U					
		13.75	D					
		14.55	D					
		14.55	SPT	N=28 (4,5/7,6,7,8)				
					15.00	-8.46		End of Borehole at 15.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021 - 23/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518946.14 N175473.06
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH104	RO	6.25m AoD	PIL	1:50	Sheet 1 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.06	6.19		Brick paving.
					0.10	6.15		MADE GROUND: yellow brown medium sand (sub-base).
		0.40	D		0.35	5.90		
		0.40	ES					MADE GROUND: red brown sandy roadstone gravel (sub-base).
		0.40	PID	PID=0.20	0.65	5.60		
		0.90	D					MADE GROUND: grey brown gravelly sand with brick and concrete cobbles.
		0.90	ES					
		0.90	PID	PID=0.20				MADE GROUND: brown to grey brown gravelly sand. Gravel sub-angular to rounded fine to coarse flint, brick and concrete.
		1.20	D					
		1.20	SPT	N=6 (2,1/2,2,1,1)				
		1.30	ES					
		1.30	PID	PID=0.70				
		1.80	ES					
		1.80	PID	PID=1.60				
		1.85	D		2.20	4.05		
		2.00	D					Grey slightly silty gravelly fine to medium and locally medium SAND with strong hydrocarbon odour. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
	▼	2.00	SPT	N=4 (1,2/1,1,1,1)				
		2.30	ES					
		2.30	PID	PID=10.50				
		2.70	ES					
	▽	2.70	PID	PID=21.30				
		2.75	D					
		3.00	D					
		3.00	SPT	N=34 (3,4/8,7,9,10)				
		3.70	ES					
		3.70	PID	PID=5.40				
		3.75	D					
		4.00	D		4.30	1.95		
		4.00	SPT	N=13 (5,6/4,3,3,3)	4.40	1.85		Brown with occasional orange brown and grey mottling CLAY with rare rounded flint gravel. (LONDON CLAY FORMATION).
		4.35	D					
		4.35	ES					
		4.50	PID	PID=1.80				Dark grey brown CLAY. Closely fissured. (LONDON CLAY FORMATION).
		4.75	D					
		5.00	D					
		5.00	SPT	N=11 (2,3/2,3,3,3)				
								5.50m becomes very closely fissured.
		6.00	D					*6.0m very rare fine white shell fragments and rare bioturbation traces.*
		6.50	U					
		7.50	D					
		7.50	ES					
		7.50	PID	PID=0.20				
		8.00	U					*8.0m frequent grey veining and bioturbation traces.*
		9.00	D					
		9.00	ES					*9.0m becomes extremely closely fissured with some lamination.*
		9.00	PID	PID=1.10				
		9.50	D					
		9.50	SPT	N=19 (1,3/4,4,5,6)				
		10.00	D					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021 - 23/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518946.14 N175473.06
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH104	RO	6.25m AoD	PIL	1:50	Sheet 2 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dark grey brown CLAY. Closely fissured. (LONDON CLAY FORMATION).
		10.50	D					
		10.50	PID	PID=0.90				
		11.00	U					
		12.00	D					
		12.00	PID	PID=0.30				
		12.50	D					
		12.50	SPT	88 (5,11/38,50,,)	12.70	-6.45		
								Very weak to moderately weak grey MUDSTONE. (LONDON CLAY FORMATION).
					13.00	-6.75		
								Stiff becoming very stiff dark grey brown CLAY. Extremely closely fissured with rare to occasional grey veining. (LONDON CLAY FORMATION).
		13.50	D					
		13.50	ES					
		13.50	PID	PID=0.80				
		14.00	U					
		15.00	B					*15.0m occasional grey silty partings and rare weathering along laminations.*
		15.50	D					
		15.50	SPT	N=34 (5,6/7,9,8,10)				
		16.50	D					
		16.50	PID	PID=0.30				
		17.00	U					
		18.00	D					
		18.00	ES					
		18.00	PID	PID=0.10				
		18.50	D					
		18.50	SPT	N=41 (5,6/7,10,12,12)				
		19.50	D					
		20.00	U					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 21/04/2021 - 23/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518946.14 N175473.06
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH104	RO	6.25m AoD	PIL	1:50	Sheet 3 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Stiff becoming very stiff dark grey brown CLAY. Extremely closely fissured with rare to occasional grey veining. (LONDON CLAY FORMATION).
		21.00	D					
		21.50	D					
		21.50	SPT	N=42 (4,7/9,10,10,13)				
		22.50	D					
		23.00	U					
		24.00	D					
		24.55	D					
		24.55	SPT	N=50 (7,9/10,13,13,14)				
					25.00	-18.75		End of Borehole at 25.000m

21 22 23 24 25 26 27 28 29 30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 23/04/2021 - 26/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518843.62 N175378.64
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH105	RO	6.25m AoD	PIL&NB	1:50	Sheet 1 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.18	6.07		Tarmac.
		0.20	ES					
		0.20	PID	PID=1.30	0.30	5.95		MADE GROUND: red brown to red grey sandy roadstone gravel.
		0.25	D					MADE GROUND: brown to grey brown gravelly sand with concrete and brick cobbles (very compact).
		0.50	D					
		0.50	ES					
		0.50	PID	PID=0.90				
		0.75	D		1.10	5.15		brown to orange brown gravelly medium to medium coarse SAND with occasional flint cobbles. (KEMPTON PARK GRAVEL MEMBER).
		0.90	ES					
		1.00	D					
		1.20	D					
		1.20	SPT	N=47 (6,9/10,12,12,13)				
		1.50	ES					
		1.50	PID	PID=0.60				
		1.85	D					
		2.00	D					
		2.00	SPT	N=48 (8,10/12,12,12,12)				
		2.75	D					
		3.00	D					
		3.00	ES					
		3.00	SPT	N=32 (4,5/6,8,8,10)				
		3.00	PID	PID=0.50				
		3.75	D					
		4.00	D					
		4.00	SPT	N=31 (3,5/6,8,8,9)				
		4.20	ES					
		4.20	PID	PID=0.70				
		4.75	D		4.75	1.50		brown with occasional orange brown mottling CLAY. (LONDON CLAY FORMATION).
		4.80	ES		4.85	1.40		Stiff dark grey to grey brown CLAY. Closely fissured. (LONDON CLAY FORMATION).
		5.00	D					
		5.00	ES					
		5.00	SPT	N=6 (1,2/1,2,1,2)				
		5.00	PID	PID=0.10				
		6.00	D					
		6.50	U					
								>7.0m occasional fine whitish inclusions.
		7.50	D					
		7.90 - 8.00	ES					
		7.90	PID	PID=0.00				
		8.00	D					
		8.00	SPT	N=17 (3,4/4,4,4,5)				
		9.00	D					
		9.50	U					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 23/04/2021 - 26/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518843.62 N175378.64
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH105	RO	6.25m AoD	PIL&NB	1:50	Sheet 2 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Stiff dark grey to grey brown CLAY. Closely fissured. (LONDON CLAY FORMATION).
		10.50	B					
		10.90 - 11.00	ES					
		10.90	PID	PID=0.00				
		11.00	D					*>11.0m becomes slightly sandy. Sand fine and micaceous.*
		11.00	SPT	N=25 (3,4/5,6,6,8)				
		12.00	D					
		12.50	U					
								>13.0m occasional fine shell fragments.
		13.50	D					
		13.90 - 14.00	ES					
		13.90	PID	PID=0.10				*13.90m dark grey coarse gravel sized pyrite nodule.*
		14.00	D					
		14.00	SPT	N=29 (4,4/6,6,8,9)				
		15.00	D					*>15.0m becomes very stiff.*
		15.50	U					
		16.50	D					
		16.90 - 17.00	ES					
		16.90	PID	PID=0.30				
		17.00	D					
		17.00	SPT	N=35 (5,6/7,9,9,10)				
		18.00	D					
		18.50	U					
		19.50	D					
		20.00	D					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Percussion Drilling Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 23/04/2021 - 26/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518843.62 N175378.64
Project No. : LMB_Manor	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH105	RO	6.25m AoD	PIL&NB	1:50	Sheet 3 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00 - 20.10	ES					Stiff dark grey to grey brown CLAY. Closely fissured. (LONDON CLAY FORMATION).
		20.00	SPT	N=39 (5,6/8,9,10,12)				
		20.00	PID	PID=0.40				
		21.00	B					
		21.50	U					
		22.50	D					
		23.00	D					
		23.00 - 23.10	ES					*23.0m occasional pyritic nodules.*
		23.00	SPT	N=36 (4,6/6,8,10,12)				
		23.00	PID	PID=0.10				
		24.00	D					
		24.50	U					
					25.00	-18.75		End of Borehole at 25.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Trial Pit Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 26/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518915.06 N175486.16
Project No. : LMB_Manor	Crew Name:	Equipment: 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP101	TP	6.20m AoD	DN	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	6.10		Brick paving over sand
					0.30	5.90		MADE GROUND: red to red brown sandy roadstone gravel (sub-base).
		0.50	ES					MADE GROUND: brown to grey brown gravelly sand with brick and concrete cobbles and whole brick.
		0.50	PID	PID=0.30				
					0.60	5.60		MADE GROUND: black gravelly sand. Gravel rounded fine to coarse flint, fine brick, organic material and chalk/lime fragments.
		0.80	ES					
		0.80	PID	PID=0.10				
					0.90	5.30		Firm brown with grey mottling sandy gravelly CLAY. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
		1.50	D					
		1.50	ES					
		1.50	PID	PID=0.10				
					1.80	4.40		Greenish grey to brown clayey gravelly medium SAND. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
		2.00	B					
		2.00	ES					
		2.00	PID	PID=0.10				
								2.3m becomes damp.
					2.50	3.70		End of Borehole at 2.500m

1
2
3

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.60	0.60						

Remarks

Trial Pit Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 27/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518955.11 N175494.54
Project No. : LMB_Manor	Crew Name:	Equipment: 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP102	TP	6.50m AoD	DN	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	6.40		Brick paving over sand.
					0.30	6.20		MADE GROUND: red to red brown sandy roadstone gravel (sub-base).
		0.40	ES					Weak Concrete.
		0.40	PID	PID=0.20	0.50	6.00		MADE GROUND: brown sandy gravel and brick cobbles.
					0.70	5.80		MADE GOUND: relict topsoil with brick and concrete fragments, wood, glass, clinker and large roots.
		1.00	ES					
		1.00	PID	PID=0.30				
					1.40	5.10		MADE GROUND: dark grey to greenish black silty sandy gravelly clay. Gravel sub-angular fine flint and brick with occasional flint cobbles.
		1.50	ES					
		1.50	PID	PID=0.60	1.60	4.90		Firm orange brown with grey mottling sandy gravelly CLAY with partings of coarse SAND. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
		2.00	D					
		2.00	ES					
		2.00	PID	PID=0.20	2.10	4.40		Greenish to orange brown slightly clayey gravelly SAND. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER)
		2.30	B					
					2.50	4.00		End of Borehole at 2.500m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.70	0.60						

Remarks

Trial Pit Log

Project Name: Manor Road	Client: Avanton Richmond Development Ltd	Date: 26/04/2021
Location: 84 Manor Rd, Richmond TW9	Contractor: SADS	Co-ords: E518836.30 N175397.23
Project No. : LMB_Manor	Crew Name:	Equipment: 3CX

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP103	TP	6.26m AoD	DN	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.24	6.02		Concrete with reinforcement.
		0.50	ES					MADE GROUND: red to red brown sandy roadstone gravel (sub-base).
		0.50	PID	PID=0.20				
					0.65	5.61		Orange brown to grey slightly clayey gravelly SAND with occasional lenses of gravelly sandy CLAY. Gravel sub-angular to rounded fine to coarse flint. (KEMPTON PARK GRAVEL MEMBER).
		1.00	B					
		1.00	ES					
		1.00	PID	PID=0.20				
					1.20	5.06		Orange brown slightly clayey sandy sub-angular to rounded fine to coarse flint GRAVEL. Becoming more cobbly with clay lenses with depth. (KEMPTON PARK GRAVEL MEMBER).
		2.00	B					
		2.00	ES					
		2.00	PID	PID=0.20				
								2.3m becomes damp.
					2.50	3.76		End of Borehole at 2.500m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.70	0.60						

Remarks

APPENDICES

TRIAL PIT PHOTOGRAPHS

Plate 1: TP01 Arisings

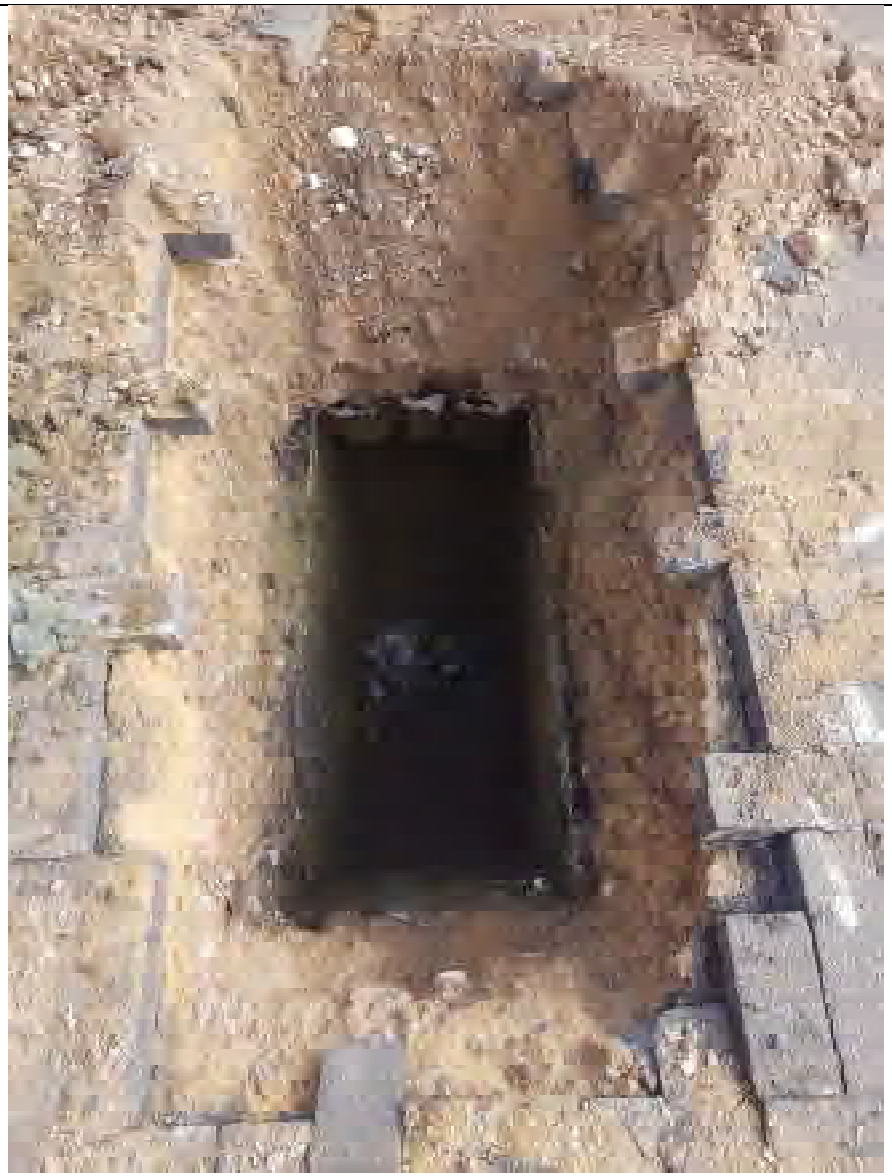


Plate 2: TP01 excavation.

Photographic Record

Project: Manor Road

Plates 1 & 2

Plate 3: TP02 excavation

Plate 4: TPO2 arisings

	Photographic Record	Project: Manor Road
		Plates 3 & 4

Plate 5: TP03 excavation

Plate 6: TP03 arisings

	Photographic Record	Project: Manor Road
		Plates 5 & 6

APPENDICES

APPENDIX B CHEMICAL LABORATORY RESULTS

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Analytical Report Number : 21-71560

Replaces Analytical Report Number: 21-71560, issue no. 1
Additional analysis undertaken.

Project / Site name:	Manor Road	**Samples received on:**	26/04/2021
Your job number:	LMB MANOR	**Samples instructed on/ Analysis started on:**	28/04/2021
Your order number:		**Analysis completed by:**	12/05/2021
Report Issue Number:	2	**Report issued on:**	13/05/2021
Samples Analysed:	7 soil samples		

Signed:

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	8.0	3.6	7.3	4.5
Total mass of sample received	kg	0.001	NONE	1.0	1.2	1.2	0.50	0.50
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	10.3	7.7	7.9	7.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	3800	6100	630	240	4000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.095	0.67	0.022	0.096	0.46
Sulphide	mg/kg	1	MCERTS	2.8	17	21	3.2	13
Organic Matter	%	0.1	MCERTS	-	-	-	-	1.1
Total Organic Carbon (TOC)	%	0.1	MCERTS	5.0	0.5	0.1	0.2	0.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2.0	1.7	< 0.05	0.59	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.46	0.44	< 0.05	0.27	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	4.6	2.6	0.35	1.9	0.49
Pyrene	mg/kg	0.05	MCERTS	4.3	2.8	0.39	1.9	0.74
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.6	1.5	< 0.05	0.71	< 0.05
Chrysene	mg/kg	0.05	MCERTS	3.0	1.5	< 0.05	1.2	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.3	1.4	< 0.05	1.1	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	2.1	0.55	< 0.05	0.72	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.2	1.0	< 0.05	1.1	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.6	0.67	< 0.05	0.60	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.54	0.24	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.0	0.71	< 0.05	0.72	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	29.7	15.1	< 0.80	10.8	1.23

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	65	14	26	20	9.9
Boron (water soluble)	mg/kg	0.2	MCERTS	1.3	2.6	0.3	< 0.2	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.0	0.4	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	25	11	27	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	37	11	15	28
Lead (aqua regia extractable)	mg/kg	1	MCERTS	440	120	58	20	40
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.3	0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	33	19	9.9	22	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	3.6	2.2	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	310	130	140	63	68
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	74	220	< 10	100	470
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	1.1	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	5.9	< 2.0	2.6	10
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	16	< 8.0	< 8.0	35
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	62	< 8.0	41	250
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	85	< 10	49	300
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	7.1	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	12	7.0	< 2.0	< 2.0	5.7
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	19	24	< 10	14	24
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	36	62	< 10	32	85
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	74	93	< 10	46	110

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Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-

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Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	1.7	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	0.44	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	2.6	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	2.8	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	1.5	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	1.5	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	1.4	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	0.55	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	1.0	-	-	-

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Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.67	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.24	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.71	-	-	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	21	5.8
Total mass of sample received	kg	0.001	NONE	0.80	1.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile- Loose Fibrous Debris
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.4	10.1
Total Cyanide	mg/kg	1	MCERTS	120	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1000	1000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.46	0.15
Sulphide	mg/kg	1	MCERTS	140	17
Organic Matter	%	0.1	MCERTS	1.8	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.1	0.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80

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Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	14
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	62	35
Lead (aqua regia extractable)	mg/kg	1	MCERTS	270	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	2.9	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	150
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0
Petroleum Hydrocarbons					
TPH C10 - C40	mg/kg	10	MCERTS	49	< 10
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	13	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	18	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	18	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	49	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
VOCs					
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-
Chloroethane	µg/kg	1	NONE	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-
Benzene	µg/kg	1	MCERTS	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-
Styrene	µg/kg	1	MCERTS	< 1.0	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
SVOCs					
Aniline	mg/kg	0.1	NONE	< 0.1	-
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	0.5	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-
Carbazole	mg/kg	0.3	MCERTS	< 0.3	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
PCBs by GC-MS					
PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	-
Total PCBs by GC-MS					
Total PCBs	mg/kg	0.007	MCERTS	< 0.007	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-71560
Project / Site name: Manor Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1852805	BH101	None Supplied	0.8	Brown sandy loam with gravel and rubble.
1852806	BH102	None Supplied	0.5	Brown sandy loam with gravel and rubble.
1852807	BH103	None Supplied	0.2	Brown sandy loam with gravel.
1852808	BH104	None Supplied	1.8	Brown loam and sand with gravel.
1852809	BH105	None Supplied	0.5	Brown loam and sand with gravel and brick.
1852810	TP101	None Supplied	0.8	Brown loam and clay with gravel and brick.
1852811	TP102	None Supplied	0.4	Light brown loam and sand with rubble.

Analytical Report Number : 21-71560
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 21-71560
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-71560
Project / Site name: Manor Road

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH101	None Supplied	S	1852805	c	Sulphide in soil	L010-PL	c
BH101	None Supplied	S	1852805	c	Total cyanide in soil	L080-PL	c
BH102	None Supplied	S	1852806	c	Sulphide in soil	L010-PL	c
BH102	None Supplied	S	1852806	c	Total cyanide in soil	L080-PL	c
BH103	None Supplied	S	1852807	c	Sulphide in soil	L010-PL	c
BH103	None Supplied	S	1852807	c	Total cyanide in soil	L080-PL	c

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Analytical Report Number : 21-71560

Replaces Analytical Report Number: 21-71560, issue no. 2
Additional analysis undertaken.

Project / Site name:	Manor Road	**Samples received on:**	26/04/2021
Your job number:	LMB MANOR	**Samples instructed on/ Analysis started on:**	28/04/2021
Your order number:		**Analysis completed by:**	19/05/2021
Report Issue Number:	3	**Report issued on:**	19/05/2021
Samples Analysed:	7 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	8.0	3.6	7.3	4.5
Total mass of sample received	kg	0.001	NONE	1.0	1.2	1.2	0.50	0.50

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	10.3	7.7	7.9	7.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	3800	6100	630	240	4000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.095	0.67	0.022	0.096	0.46
Sulphide	mg/kg	1	MCERTS	2.8	17	21	3.2	13
Organic Matter	%	0.1	MCERTS	-	-	-	-	1.1
Total Organic Carbon (TOC)	%	0.1	MCERTS	5.0	0.5	0.1	0.2	0.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2.0	1.7	< 0.05	0.59	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.46	0.44	< 0.05	0.27	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	4.6	2.6	0.35	1.9	0.49
Pyrene	mg/kg	0.05	MCERTS	4.3	2.8	0.39	1.9	0.74
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.6	1.5	< 0.05	0.71	< 0.05
Chrysene	mg/kg	0.05	MCERTS	3.0	1.5	< 0.05	1.2	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.3	1.4	< 0.05	1.1	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	2.1	0.55	< 0.05	0.72	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.2	1.0	< 0.05	1.1	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.6	0.67	< 0.05	0.60	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.54	0.24	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.0	0.71	< 0.05	0.72	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	29.7	15.1	< 0.80	10.8	1.23

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	65	14	26	20	9.9
Boron (water soluble)	mg/kg	0.2	MCERTS	1.3	2.6	0.3	< 0.2	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.0	0.4	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	25	11	27	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	37	11	15	28
Lead (aqua regia extractable)	mg/kg	1	MCERTS	440	120	58	20	40
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.3	0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	33	19	9.9	22	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	3.6	2.2	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	310	130	140	63	68
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	74	220	< 10	100	470
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	1.1	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	5.9	< 2.0	2.6	10
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	16	< 8.0	< 8.0	35
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	62	< 8.0	41	250
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	85	< 10	49	300
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	7.1	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	12	7.0	< 2.0	< 2.0	5.7
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	19	24	< 10	14	24
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	36	62	< 10	32	85
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	74	93	< 10	46	110

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Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-

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Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

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Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	1.7	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	0.44	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	2.6	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	2.8	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	1.5	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	1.5	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	1.4	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	0.55	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	1.0	-	-	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852805	1852806	1852807	1852808	1852809
Sample Reference				BH101	BH102	BH103	BH104	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.80	0.50	0.20	1.80	0.50
Date Sampled				21/04/2021	21/04/2021	21/04/2021	22/04/2021	23/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.67	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.24	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.71	-	-	-
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	21	5.8
Total mass of sample received	kg	0.001	NONE	0.80	1.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.005
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.005

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.4	10.1
Total Cyanide	mg/kg	1	MCERTS	120	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1000	1000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.46	0.15
Sulphide	mg/kg	1	MCERTS	140	17
Organic Matter	%	0.1	MCERTS	1.8	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.1	0.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	14
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	62	35
Lead (aqua regia extractable)	mg/kg	1	MCERTS	270	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	2.9	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	150
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0
Petroleum Hydrocarbons					
TPH C10 - C40	mg/kg	10	MCERTS	49	< 10
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	13	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	18	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	18	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	49	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
VOCs					
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-
Chloroethane	µg/kg	1	NONE	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-
Benzene	µg/kg	1	MCERTS	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-
Styrene	µg/kg	1	MCERTS	< 1.0	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
SVOCs					
Aniline	mg/kg	0.1	NONE	< 0.1	-
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	0.5	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-
Carbazole	mg/kg	0.3	MCERTS	< 0.3	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-

Analytical Report Number: 21-71560
Project / Site name: Manor Road

Lab Sample Number				1852810	1852811
Sample Reference				TP101	TP102
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	0.40
Date Sampled				26/04/2021	27/04/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	-
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	-

Total PCBs by GC-MS

Total PCBs	mg/kg	0.007	MCERTS	< 0.007	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: **21-71560**
Project / Site name: **Manor Road**
Your Order No:

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1852811	TP102	0.40	188	Loose Fibrous Debris	**Chrysotile**	0.005	**0.005**

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

Analytical Report Number : 21-71560
Project / Site name: Manor Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1852805	BH101	None Supplied	0.8	Brown sandy loam with gravel and rubble.
1852806	BH102	None Supplied	0.5	Brown sandy loam with gravel and rubble.
1852807	BH103	None Supplied	0.2	Brown sandy loam with gravel.
1852808	BH104	None Supplied	1.8	Brown loam and sand with gravel.
1852809	BH105	None Supplied	0.5	Brown loam and sand with gravel and brick.
1852810	TP101	None Supplied	0.8	Brown loam and clay with gravel and brick.
1852811	TP102	None Supplied	0.4	Light brown loam and sand with rubble.

Analytical Report Number : 21-71560
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 21-71560
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-71560
Project / Site name: Manor Road

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH101	None Supplied	S	1852805	c	Sulphide in soil	L010-PL	c
BH101	None Supplied	S	1852805	c	Total cyanide in soil	L080-PL	c
BH102	None Supplied	S	1852806	c	Sulphide in soil	L010-PL	c
BH102	None Supplied	S	1852806	c	Total cyanide in soil	L080-PL	c
BH103	None Supplied	S	1852807	c	Sulphide in soil	L010-PL	c
BH103	None Supplied	S	1852807	c	Total cyanide in soil	L080-PL	c

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

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Analytical Report Number : 21-74598

Replaces Analytical Report Number: 21-74598, issue no. 1
Additional analysis undertaken.

Project / Site name:	Manor Road	**Samples received on:**	28/04/2021
Your job number:		**Samples instructed on/ Analysis started on:**	14/05/2021
Your order number:		**Analysis completed by:**	24/05/2021
Report Issue Number:	2	**Report issued on:**	24/05/2021
Samples Analysed:	1 soil sample		

Signed:

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-74598
Project / Site name: Manor Road

Lab Sample Number				1869216
Sample Reference				TP103
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				26/04/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	3.6
Total mass of sample received	kg	0.001	NONE	1.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.008
Asbestos Quantification Total	%	0.001	ISO 17025	0.008

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1500
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.17
Sulphide	mg/kg	1	MCERTS	33
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.39
Pyrene	mg/kg	0.05	MCERTS	0.42
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.38
Chrysene	mg/kg	0.05	MCERTS	0.33
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.47
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.27
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.46
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.35
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.40

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	3.47

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11
Boron (water soluble)	mg/kg	0.2	MCERTS	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.4
Lead (aqua regia extractable)	mg/kg	1	MCERTS	52
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	96

Analytical Report Number: 21-74598
Project / Site name: Manor Road

Lab Sample Number				1869216
Sample Reference				TP103
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				26/04/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	MCERTS	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0
Petroleum Hydrocarbons				
TPH C10 - C40	mg/kg	10	MCERTS	190
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	4.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	18
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	91
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	110
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	34
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	37

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: **21-74598**
Project / Site name: **Manor Road**
Your Order No:

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1869216	TP103	0.50	194	Loose Fibrous Debris	**Chrysotile**	0.008	**0.008**

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

Analytical Report Number : 21-74598
Project / Site name: Manor Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1869216	TP103	None Supplied	0.5	Brown sand with gravel.

Analytical Report Number : 21-74598
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	W	MCERTS

Analytical Report Number : 21-74598
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-74598
Project / Site name: Manor Road

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP103	None Supplied	S	1869216	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
TP103	None Supplied	S	1869216	c	Sulphide in soil	L010-PL	c
TP103	None Supplied	S	1869216	c	Total cyanide in soil	L080-PL	c

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

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Analytical Report Number : 21-75177

Project / Site name:	Manor Road	**Samples received on:**	23/04/2021
Your job number:	LMB- MANOR ROAD	**Samples instructed on/ Analysis started on:**	23/04/2021
Your order number:		**Analysis completed by:**	25/05/2021
Report Issue Number:	1	**Report issued on:**	25/05/2021
Samples Analysed:	19 soil samples		

Signed:

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-75177
Project / Site name: Manor Road

Lab Sample Number				1872362	1872363	1872364	1872365	1872366
Sample Reference				BH101	BH101	BH102	BH102	BH103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00	2.75	1.20	7.00	0.80
Date Sampled				Deviating	Deviating	21/04/2021	27/04/2021	21/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	7.1	8.8	17	6.2
Total mass of sample received	kg	0.001	NONE	0.40	1.0	0.90	0.90	0.50

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8	7.8	9.3	8.3	8.5
Total Sulphate as SO4	%	0.005	MCERTS	0.380	0.121	0.129	0.103	0.047
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.8	0.46	0.22	0.43	0.031
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	1840	463	223	426	30.5
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	5.9	5.6	5.2	13	6.3
Total Sulphur	%	0.005	MCERTS	0.140	0.041	0.057	0.453	0.021
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	27	14	7.2	56	9.5
Magnesium (leachate equivalent)	mg/l	2.5	NONE	14	6.8	3.6	28	4.8

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-75177
Project / Site name: Manor Road

Lab Sample Number				1872367	1872368	1872369	1872370	1872371
Sample Reference				BH103	BH103	BH104	BH104	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.75	6.00	10.50	13.50	18.00
Date Sampled				21/04/2021	21/04/2021	22/04/2021	22/04/2021	22/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	6.2	15	16	14	15
Total mass of sample received	kg	0.001	NONE	1.0	1.0	1.0	0.90	0.70

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.8	8.9	8.6	8.3
Total Sulphate as SO4	%	0.005	MCERTS	0.032	0.097	0.077	0.108	0.146
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.051	0.22	0.37	0.49	0.25
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	51.2	222	366	491	255
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	10	21	12	32	37
Total Sulphur	%	0.005	MCERTS	0.018	0.366	0.377	0.699	0.742
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	8.0	27	45	60	30
Magnesium (leachate equivalent)	mg/l	2.5	NONE	4.0	13	22	30	15

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-75177
Project / Site name: Manor Road

Lab Sample Number				1872372	1872373	1872374	1872375	1872376
Sample Reference				BH104	BH105	BH105	BH105	BH105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				19.50	4.75	7.50	12.00	14.00
Date Sampled				22/04/2021	23/04/2021	26/04/2021	26/04/2021	26/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.1	17	18	19	11
Total mass of sample received	kg	0.001	NONE	0.40	0.70	0.90	1.0	0.30

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	8.0	8.4	8.4	8.5
Total Sulphate as SO4	%	0.005	MCERTS	0.106	0.047	0.090	0.089	0.109
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.63	0.019	0.15	0.39	0.55
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	628	19.0	148	395	554
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	23	5.4	4.4	4.2	46
Total Sulphur	%	0.005	MCERTS	0.701	0.012	0.362	0.896	0.453
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	63	13	20	53	64
Magnesium (leachate equivalent)	mg/l	2.5	NONE	32	6.6	10	27	32

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-75177
Project / Site name: Manor Road

Lab Sample Number				1872377	1872378	1872379	1875497
Sample Reference				BH105	BH105	TP102	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				17.00	23.00	2.00	22.50
Date Sampled				26/04/2021	26/04/2021	27/04/2021	22/04/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	12	4.7	16
Total mass of sample received	kg	0.001	NONE	0.30	0.50	0.40	1.0
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	8.5	8.5	8.8	8.8
Total Sulphate as SO4	%	0.005	MCERTS	0.142	0.136	0.032	0.125
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.67	0.78	0.12	0.60
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	671	777	117	596
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	51	70	4.6	50
Total Sulphur	%	0.005	MCERTS	0.405	0.402	0.018	0.330
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	73	78	12	51
Magnesium (leachate equivalent)	mg/l	2.5	NONE	37	39	5.9	25

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-75177
Project / Site name: Manor Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1872362	BH101	None Supplied	2	Brown loam and clay with gravel.
1872363	BH101	None Supplied	2.75	Brown loam and clay with gravel.
1872364	BH102	None Supplied	1.2	Brown loam and clay with gravel.
1872365	BH102	None Supplied	7	Brown clay.
1872366	BH103	None Supplied	0.8	Brown loam and sand with gravel.
1872367	BH103	None Supplied	2.75	Brown loam and sand with gravel.
1872368	BH103	None Supplied	6	Brown clay.
1872369	BH104	None Supplied	10.5	Brown clay.
1872370	BH104	None Supplied	13.5	Brown clay.
1872371	BH104	None Supplied	18	Brown clay.
1872372	BH104	None Supplied	19.5	Brown clay.
1872373	BH105	None Supplied	4.75	Brown clay and sand with gravel.
1872374	BH105	None Supplied	7.5	Brown clay.
1872375	BH105	None Supplied	12	Brown clay.
1872376	BH105	None Supplied	14	Brown clay.
1872377	BH105	None Supplied	17	Brown clay.
1872378	BH105	None Supplied	23	Brown clay.
1872379	TP102	None Supplied	2	Brown loam and sand with gravel.
1875497	BH104	None Supplied	22.5	Brown clay.

Analytical Report Number : 21-75177
Project / Site name: Manor Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-75177
Project / Site name: Manor Road

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH101	None Supplied	S	1872362	a	None Supplied	None Supplied	None Supplied
BH101	None Supplied	S	1872363	a	None Supplied	None Supplied	None Supplied

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

APPENDICES

APPENDIX C GEOTECHNICAL LABORATORY RESULTS

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

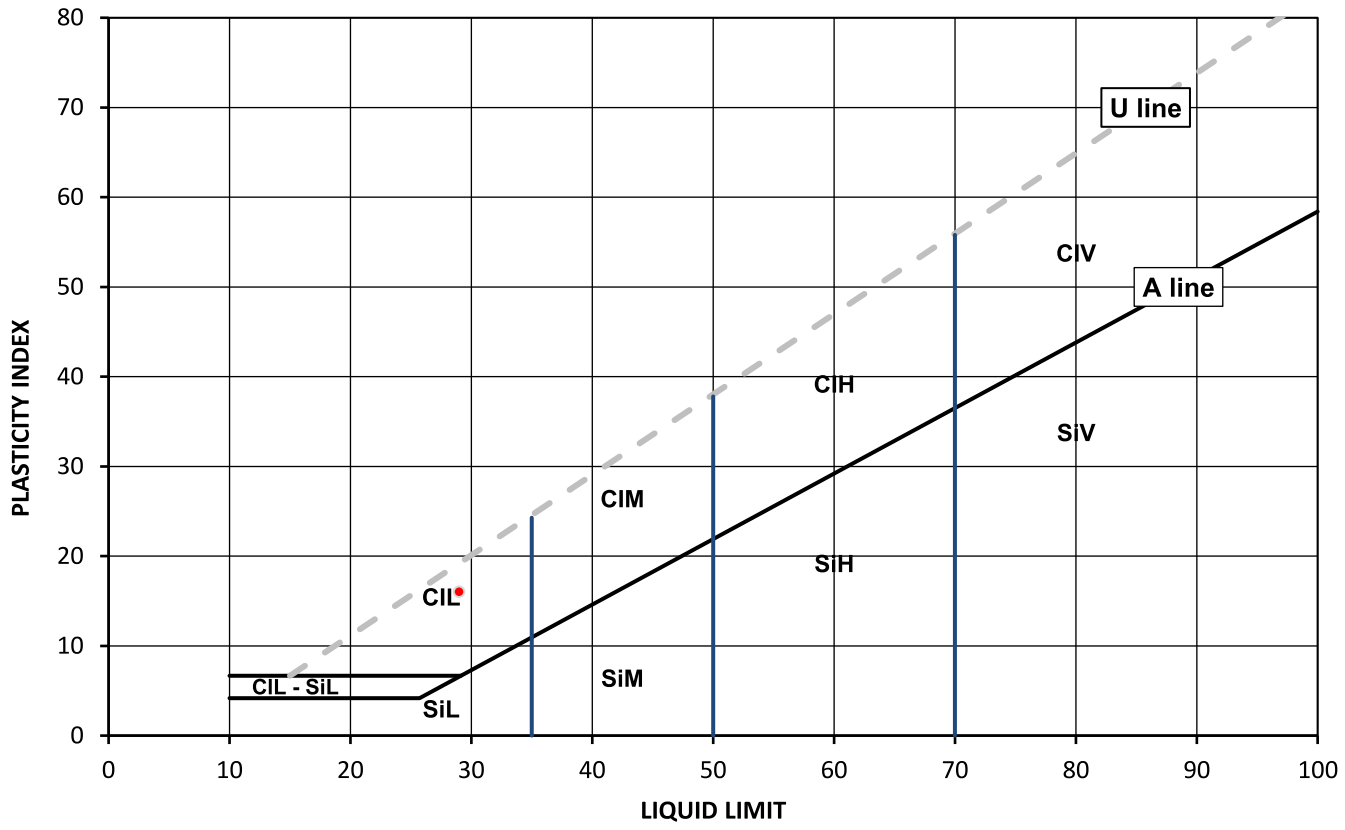
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	Not Given
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872319	Depth Top [m]:	2.00
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
9.4	29	13	16	51



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

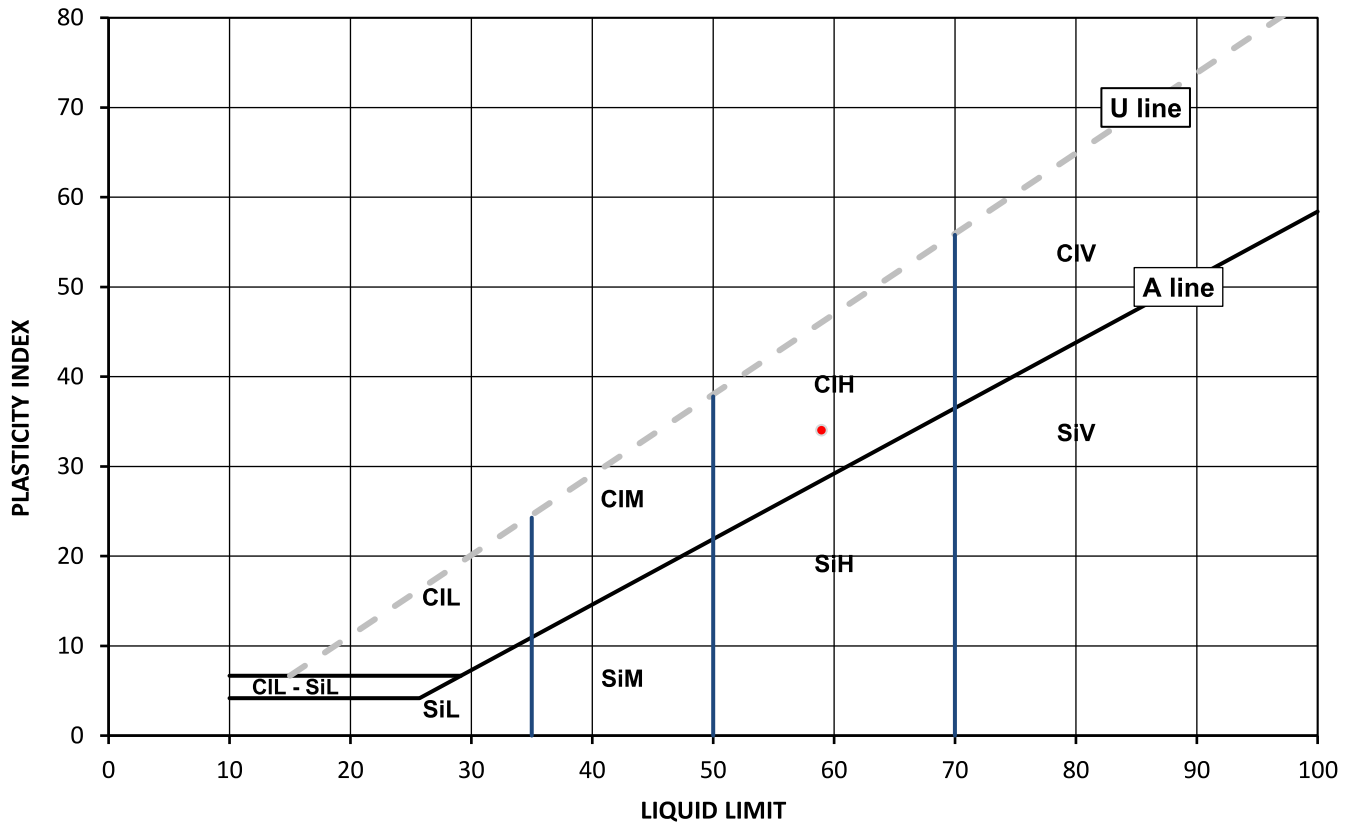
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	Not Given
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872321	Depth Top [m]:	7.50
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
31	59	25	34	95



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

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Liquid and Plastic Limits

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

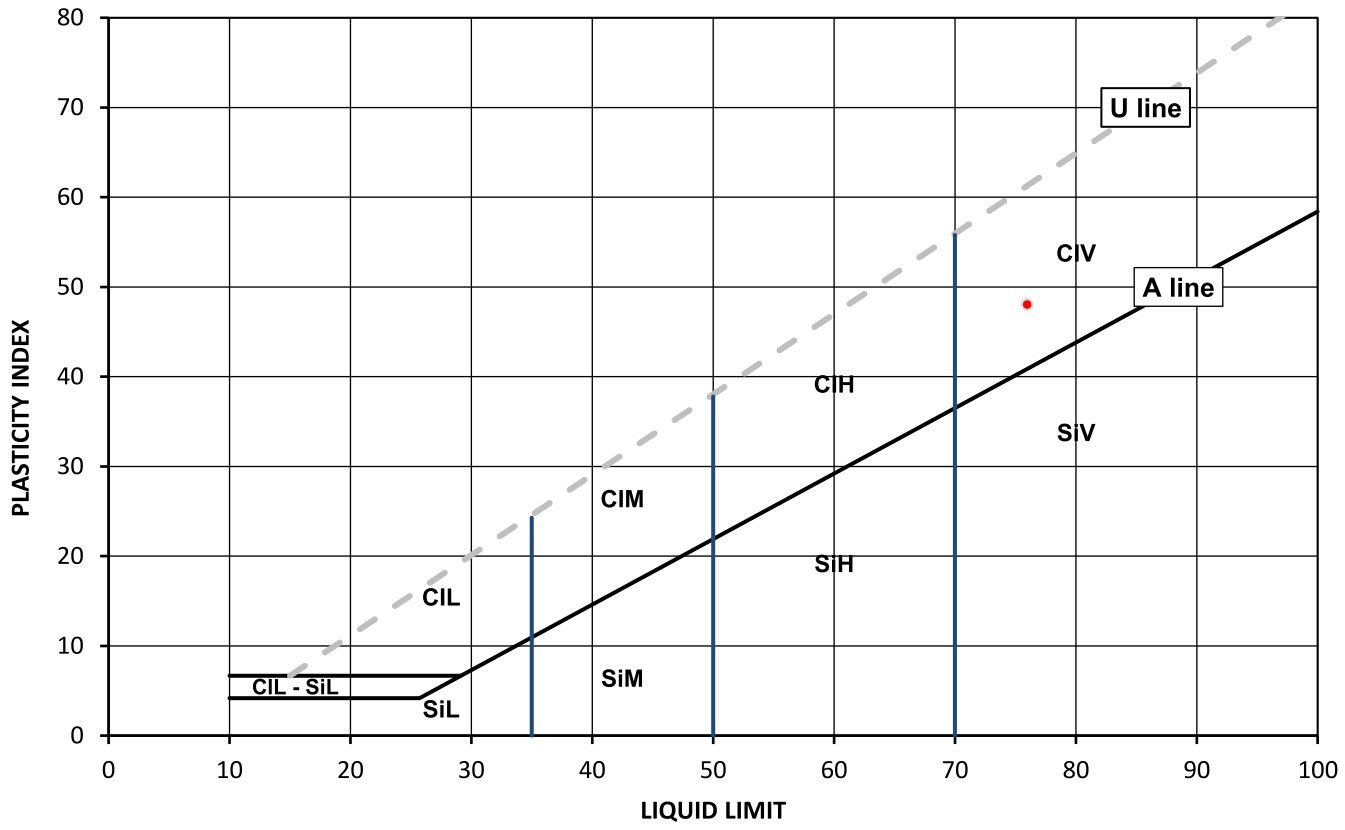
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	27/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872323	Depth Top [m]:	6.00
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
29	76	28	48	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

			Plasticity	Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

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TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	21/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

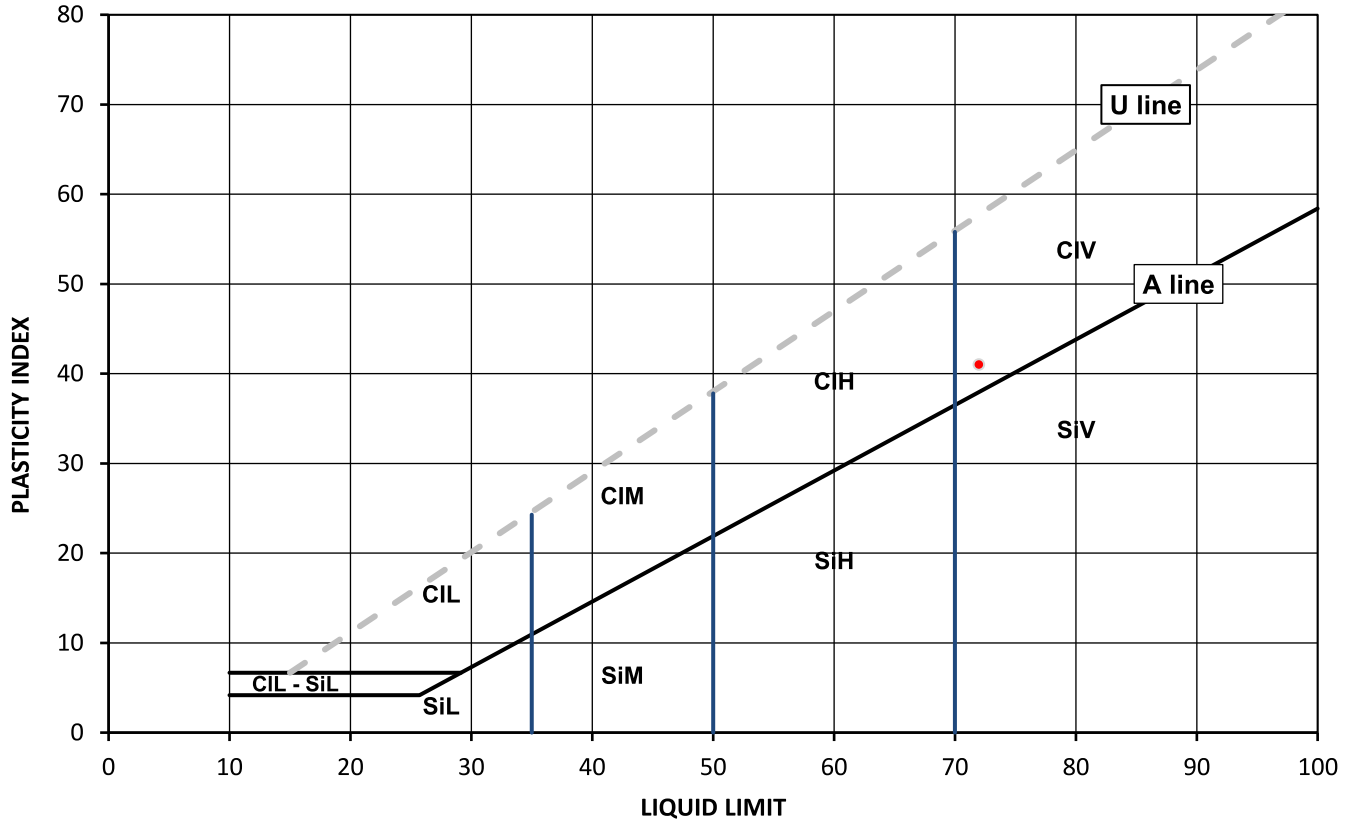
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872326	Depth Top [m]:	5.00
Hole No.:	BH103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
26	72	31	41	53



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

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Date Reported: 02/06/2021

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Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

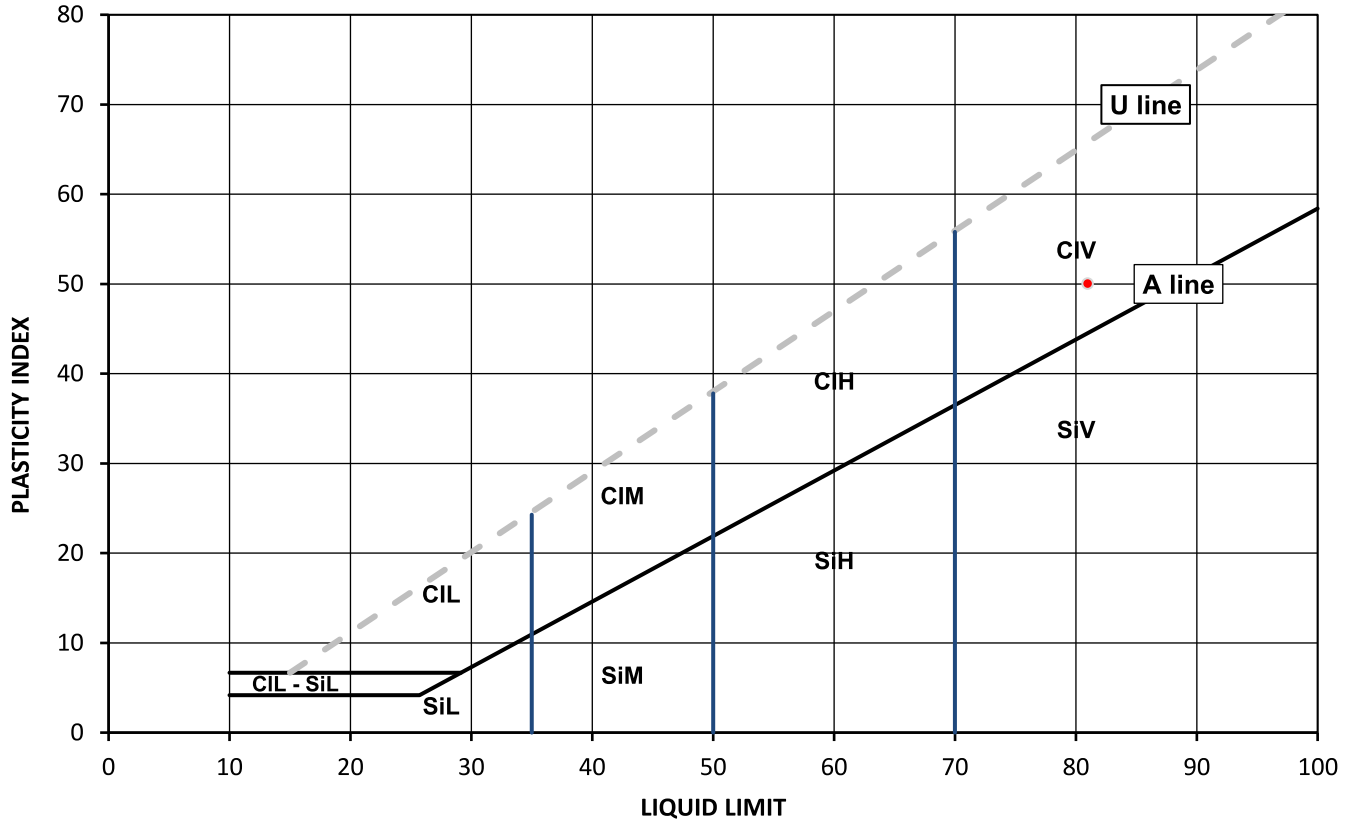
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	21/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872327	Depth Top [m]:	9.00
Hole No.:	BH103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
29	81	31	50	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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4041

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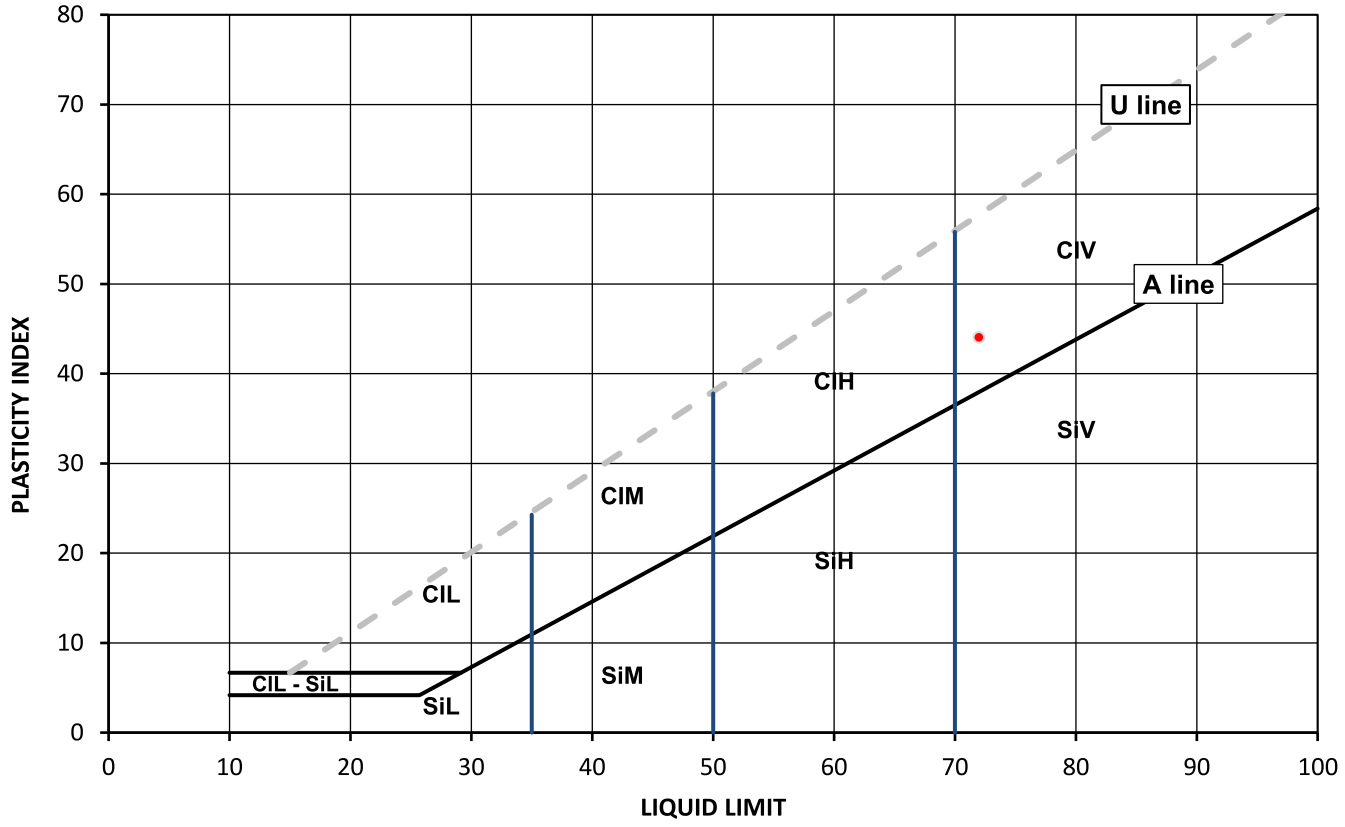
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	21/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872328	Depth Top [m]:	11.00
Hole No.:	BH103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown slightly gravelly CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
25	72	28	44	94



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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i2 Analytical Ltd
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Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

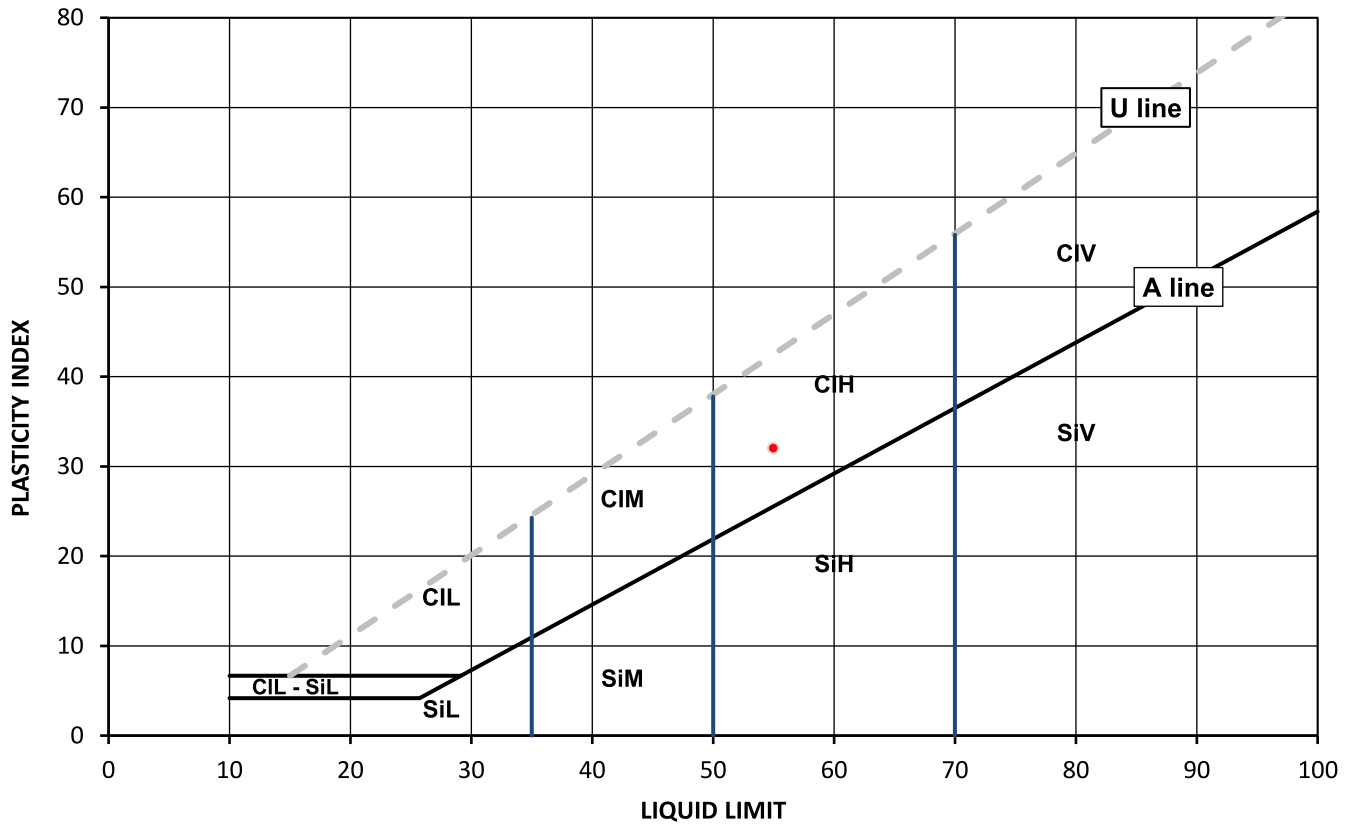
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872329	Depth Top [m]:	4.35
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Yellowish brown very gravelly slightly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
18	55	23	32	30



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

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PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

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Northampton NN4 7EB

4041

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Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

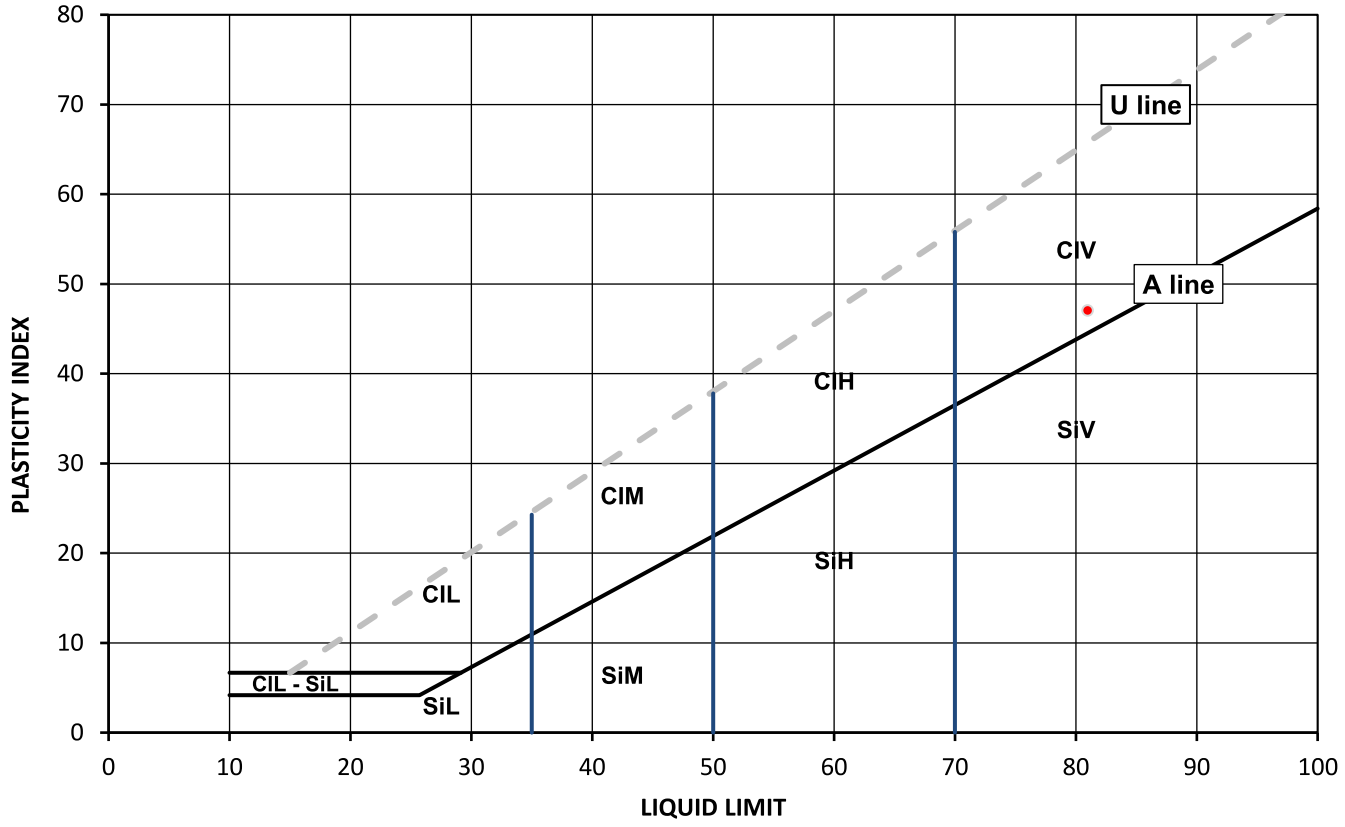
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872332	Depth Top [m]:	9.50
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
28	81	34	47	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

			Plasticity	Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Monika Janoszek
PL Deputy Head of Geotechnical Section
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Date Reported: 02/06/2021

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Liquid and Plastic Limits

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4041

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Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

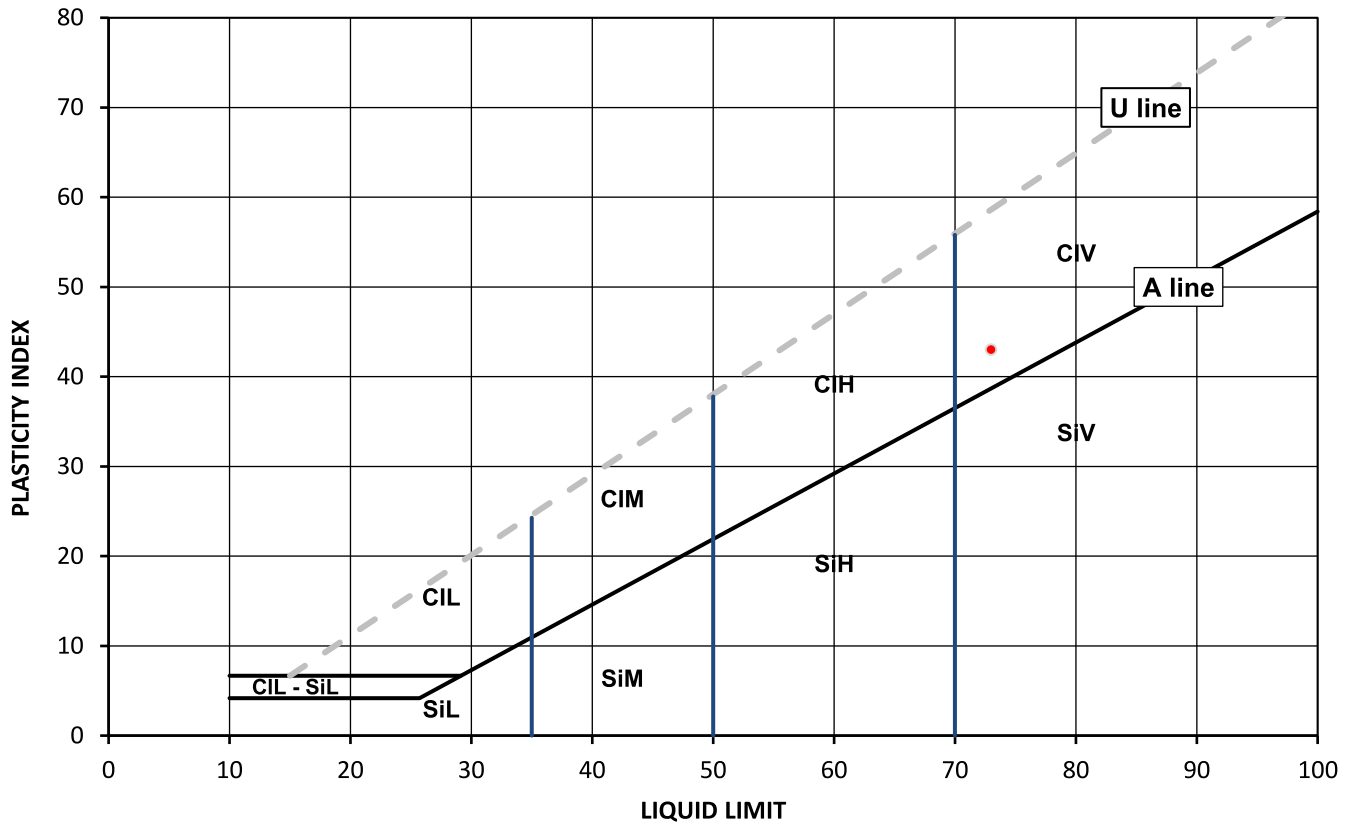
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872333	Depth Top [m]:	12.00
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
29	73	30	43	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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PL Deputy Head of Geotechnical Section
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TEST CERTIFICATE

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Brackmills Industrial Estate
Northampton NN4 7EB

4041

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Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

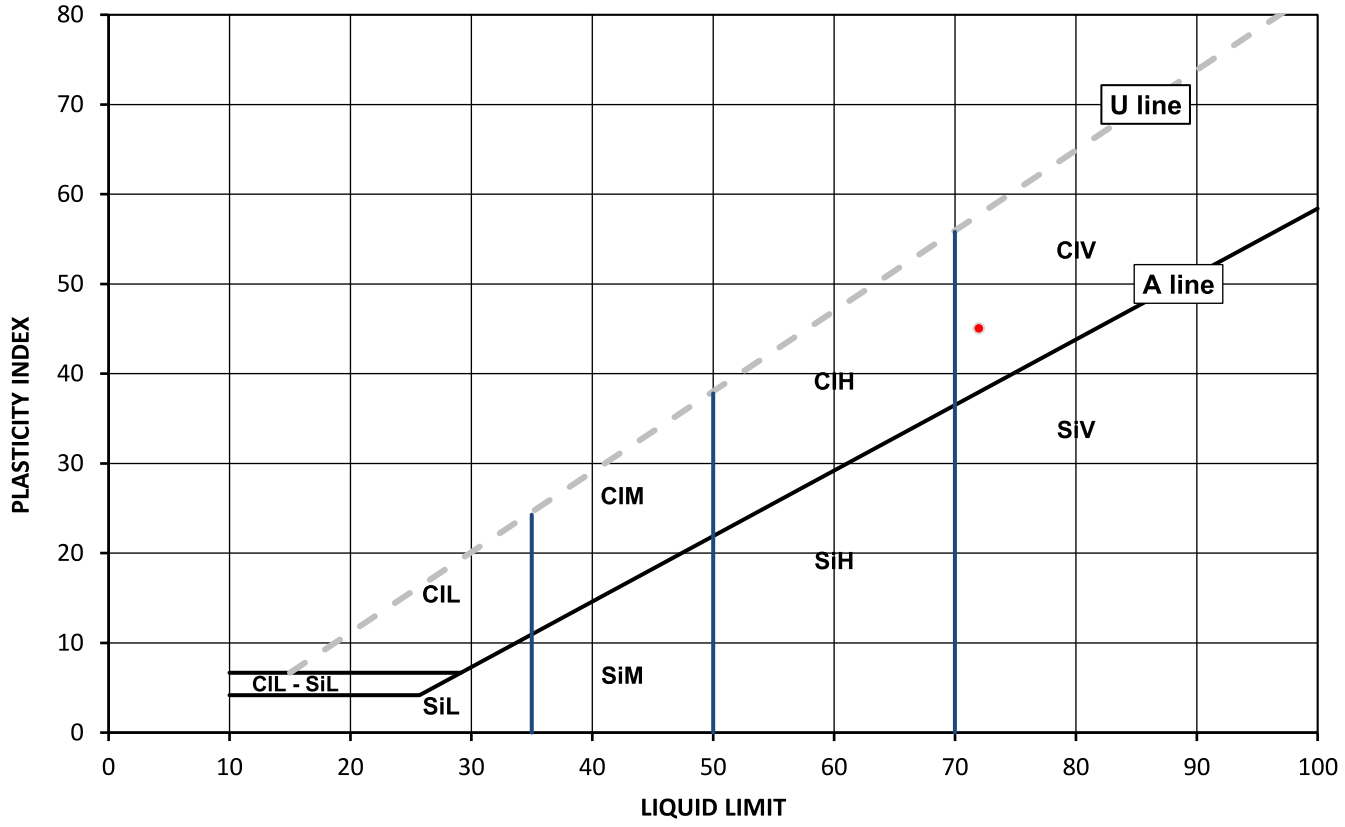
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872334	Depth Top [m]:	15.50
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
24	72	27	45	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

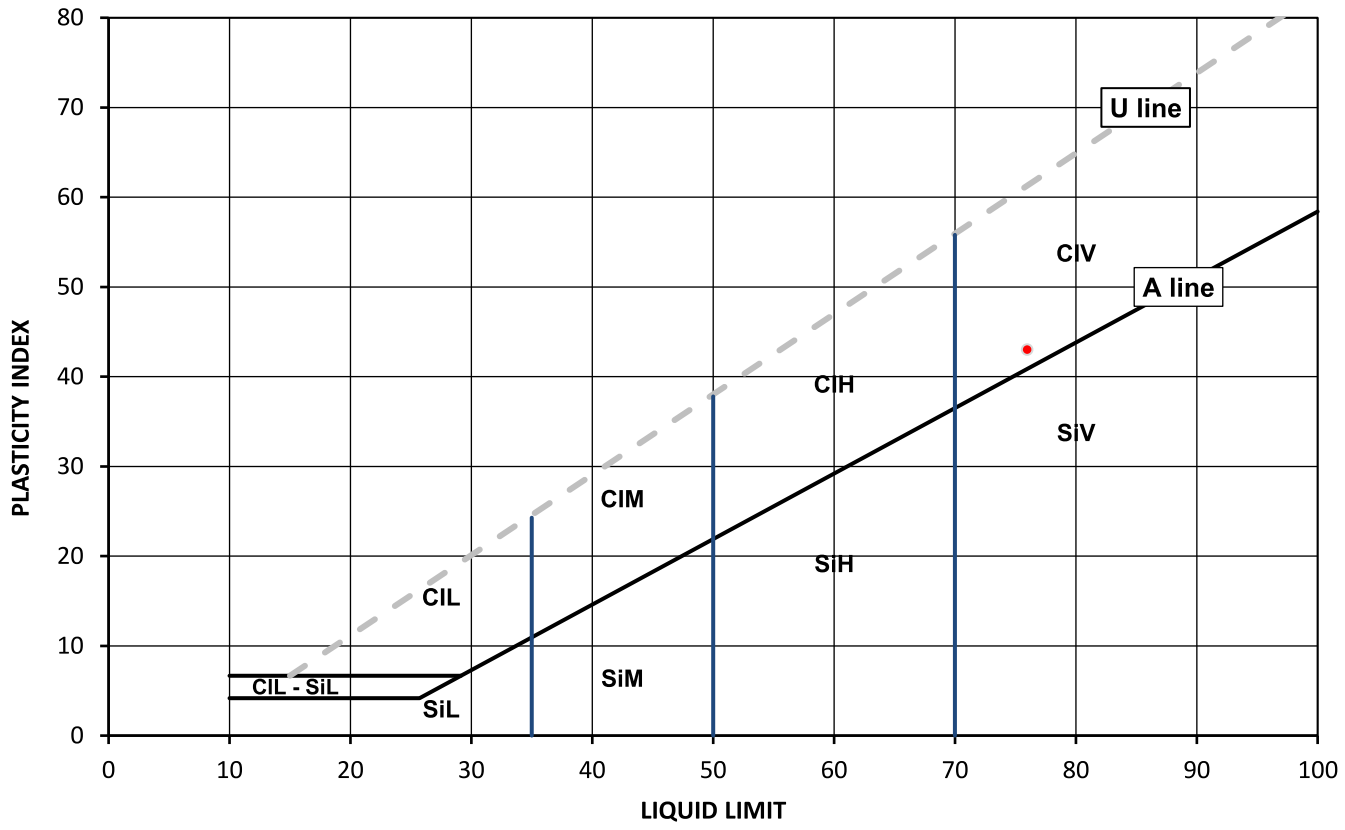
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872336	Depth Top [m]:	21.00
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
26	76	33	43	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

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PL Deputy Head of Geotechnical Section
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Date Reported: 02/06/2021

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Northampton NN4 7EB

4041

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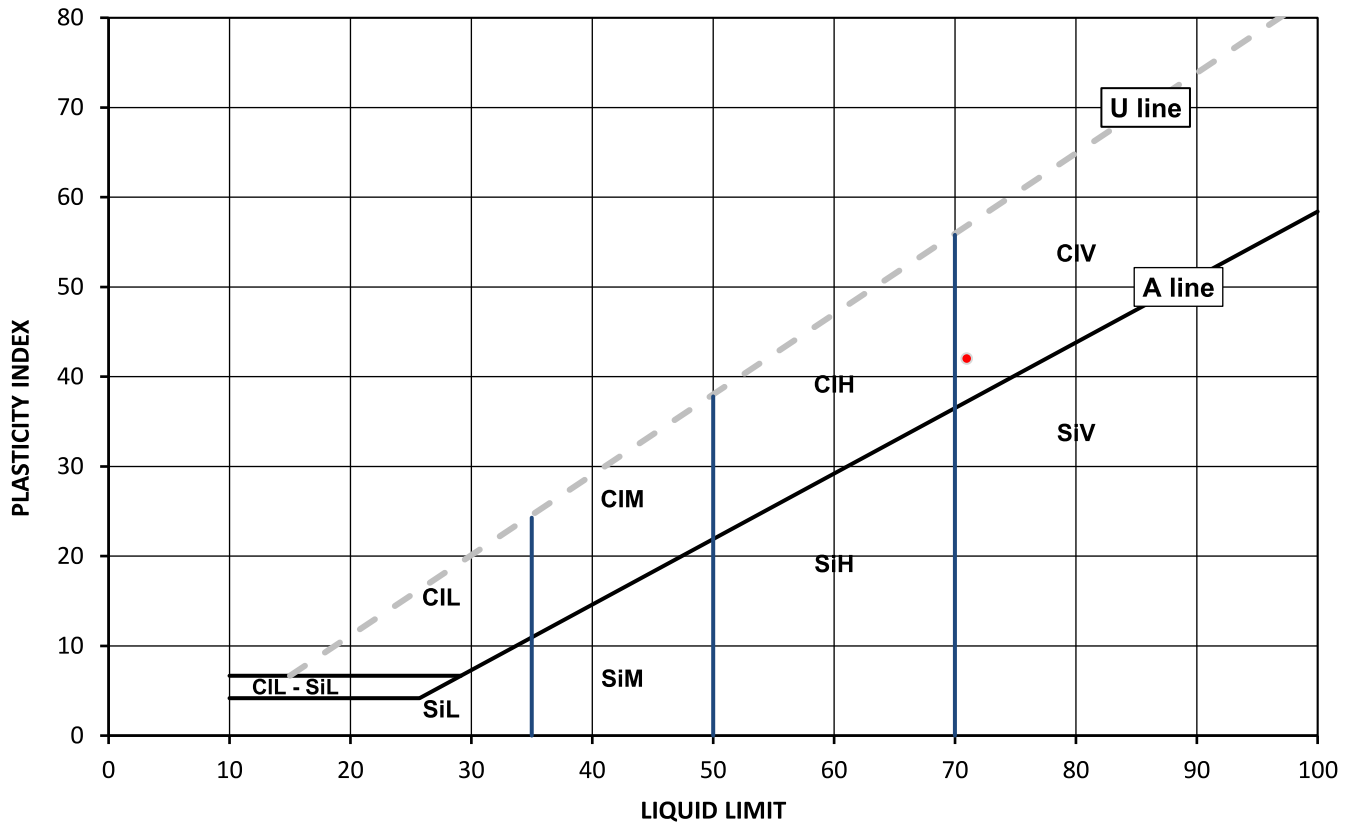
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872343	Depth Top [m]:	18.00
Hole No.:	BH105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Dark brown CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
32	71	29	42	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	25/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

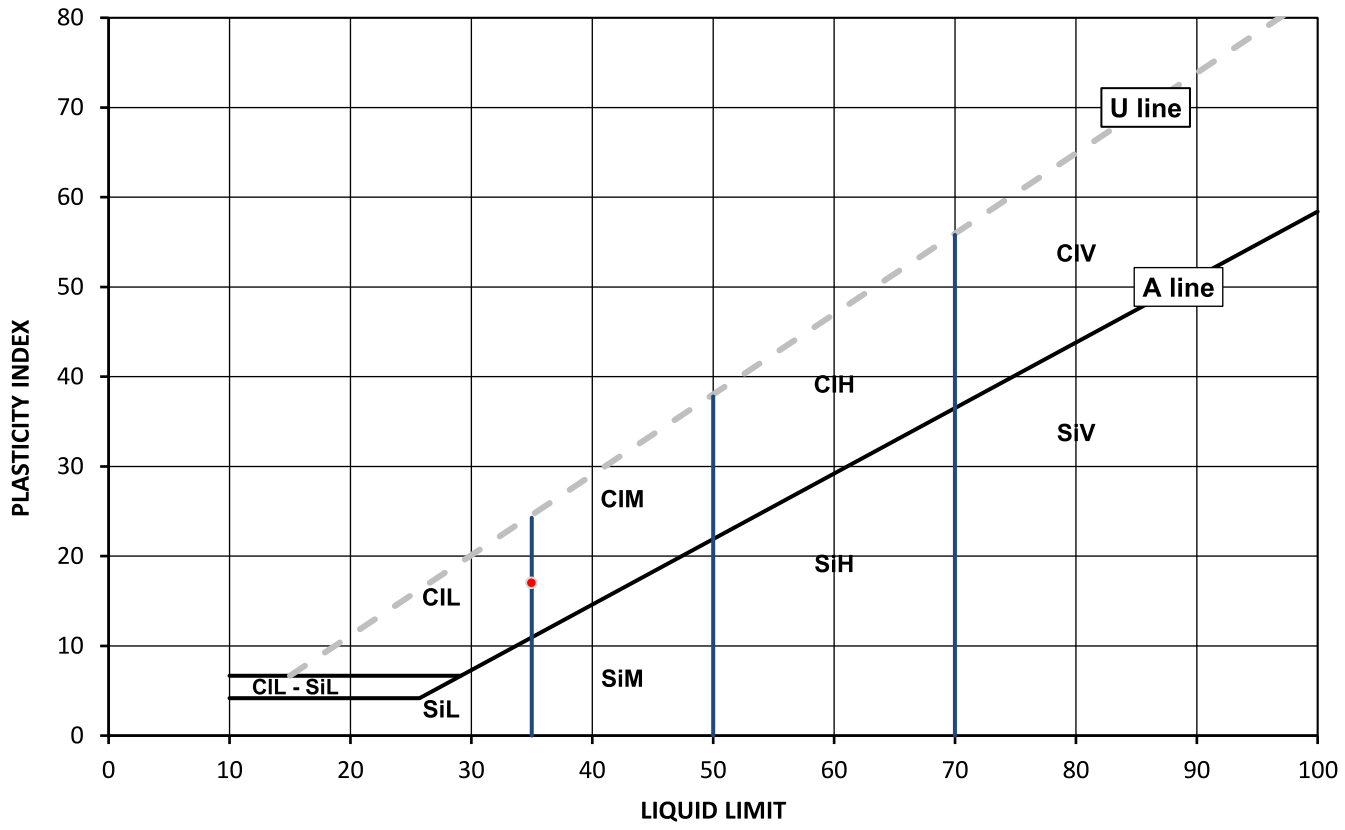
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872345	Depth Top [m]:	1.50
Hole No.:	TP101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown gravelly sandy CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
17	35	18	17	54



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

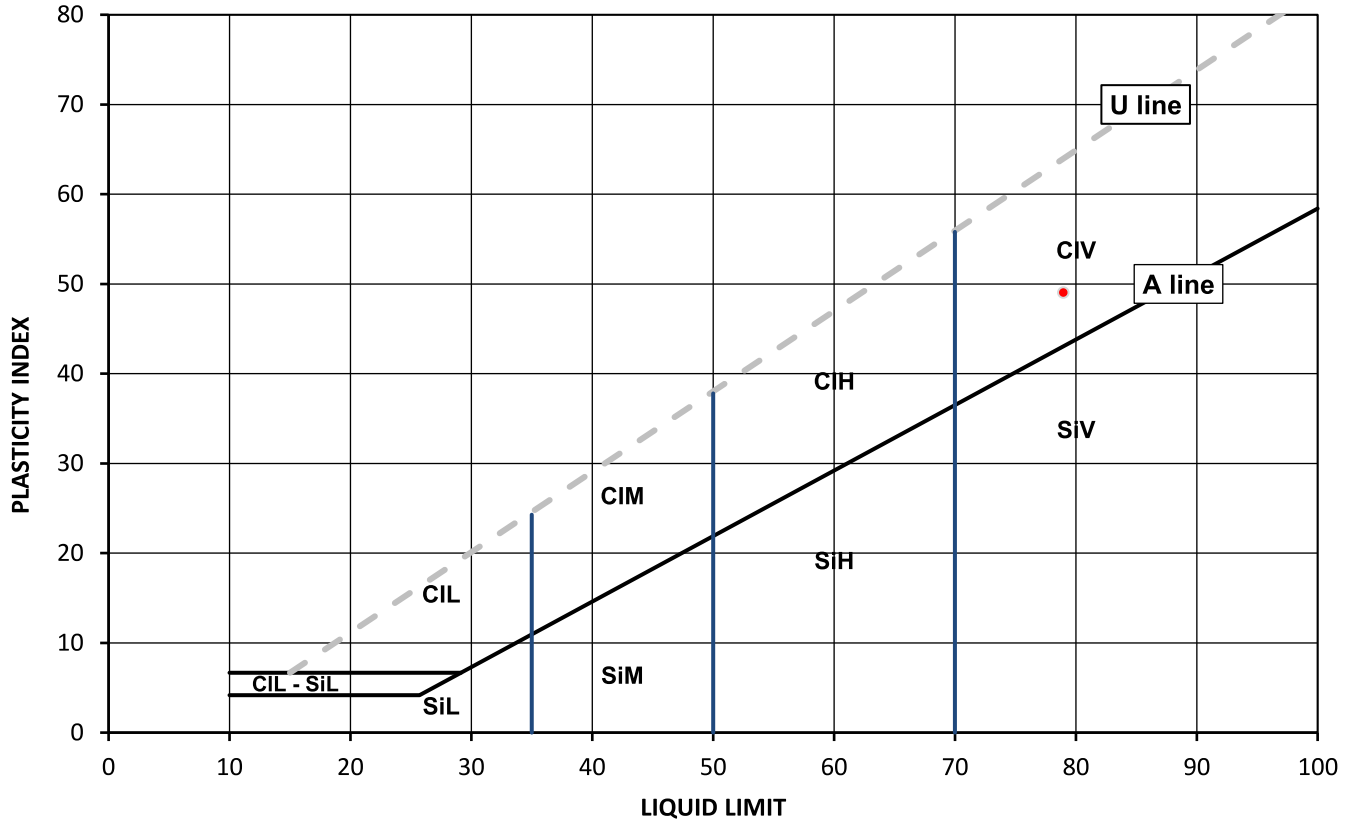
Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	Not Given
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	26/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1875456	Depth Top [m]:	24.55
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Greyish brown CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
26	79	30	49	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

			Plasticity	Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 232.10

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: LMB Geosolutions Ltd

Client Address: 28 Dresden Road, London, N19 3BD

Contact: Philip Lewis

Site Address: Manor Road

Client Reference: LMB-MANOR ROAD
Job Number: 21-75176
Date Sampled: 21/04 - 27/04/2021
Date Received: 26/04/2021
Date Tested: 25/05 - 26/05/2021
Sampled By: Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
1872316	BH101	Not Given	0.75	Not Given	D	Dark brown sandy GRAVEL		7.2											
1872317	BH101	Not Given	0.80	Not Given	D	Dark brown slightly gravelly sandy CLAY		19											
1872318	BH101	Not Given	1.20	Not Given	D	Dark brown slightly gravelly sandy CLAY		17											
1872319	BH101	Not Given	2.00	Not Given	D	Brown gravelly very sandy CLAY	Atterberg 1 Point	9.4		51	29	13	16						
1872320	BH101	Not Given	3.75	Not Given	D	Brown very gravelly SAND		8.6											
1872321	BH101	Not Given	7.50	Not Given	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	31		95	59	25	34						
1872322	BH102	Not Given	0.90	Not Given	D	Dark brown slightly clayey very sandy GRAVEL		12											
1872323	BH102	Not Given	6.00	Not Given	D	Dark brown CLAY	Atterberg 1 Point	29		100	76	28	48						
1872324	BH103	Not Given	1.85	Not Given	D	Yellowish brown sandy GRAVEL		8.3											
1872325	BH103	Not Given	3.00	Not Given	D	Yellowish brown sandy GRAVEL		6.2											

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 234.12

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: LMB Geosolutions Ltd

Client Address: 28 Dresden Road, London, N19 3BD

Contact: Philip Lewis

Site Address: Manor Road

Client Reference: LMB-MANOR ROAD
Job Number: 21-75176
Date Sampled: 21/04 - 22/04/2021
Date Received: 26/04/2021
Date Tested: 25/05 - 26/05/2021
Sampled By: Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
1872326	BH103	Not Given	5.00	Not Given	D	Dark brown gravelly CLAY	Atterberg 1 Point	26		53	72	31	41						
1872327	BH103	Not Given	9.00	Not Given	D	Dark brown CLAY	Atterberg 1 Point	29		100	81	31	50						
1872328	BH103	Not Given	11.00	Not Given	D	Dark brown slightly gravelly CLAY	Atterberg 1 Point	25		94	72	28	44						
1872329	BH104	Not Given	4.35	Not Given	D	Yellowish brown very gravelly slightly sandy CLAY	Atterberg 1 Point	18		30	55	23	32						
1872330	BH104	Not Given	5.00	Not Given	D	Brownish grey slightly gravelly CLAY		29											
1872331	BH104	Not Given	7.50	Not Given	D	Brown CLAY		31											
1872332	BH104	Not Given	9.50	Not Given	D	Brown CLAY	Atterberg 1 Point	28		100	81	34	47						
1872333	BH104	Not Given	12.00	Not Given	D	Brown CLAY	Atterberg 1 Point	29		100	73	30	43						
1872334	BH104	Not Given	15.50	Not Given	D	Brown CLAY	Atterberg 1 Point	24		100	72	27	45						
1872335	BH104	Not Given	18.50	Not Given	D	Brown sandy CLAY		22											

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 234.12

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: LMB Geosolutions Ltd

Client Address: 28 Dresden Road, London, N19 3BD

Contact: Philip Lewis

Site Address: Manor Road

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client Reference: LMB-MANOR ROAD
Job Number: 21-75176
Date Sampled: 22/04 - 26/04/2021
Date Received: 26/04/2021
Date Tested: 25/05 - 26/05/2021
Sampled By: Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
1872336	BH104	Not Given	21.00	Not Given	D	Dark brown CLAY	Atterberg 1 Point	26		100	76	33	43						
1875455	BH104	Not Given	24.00	Not Given	D	Greyish brown CLAY		27											
1875456	BH104	Not Given	24.55	Not Given	D	Greyish brown CLAY	Atterberg 1 Point	26		100	79	30	49						
1872337	BH105	Not Given	0.75	Not Given	D	Brown sandy GRAVEL		7.0											
1872338	BH105	Not Given	1.20	Not Given	D	Yellowish brown slightly clayey very sandy GRAVEL		5.4											
1872339	BH105	Not Given	2.00	Not Given	D	Brown sandy GRAVEL		6.6											
1872340	BH105	Not Given	3.75	Not Given	D	Brown sandy GRAVEL		6.1											
1872341	BH105	Not Given	6.00	Not Given	D	Dark brown CLAY		31											
1872342	BH105	Not Given	9.00	Not Given	D	Dark brown CLAY		29											
1872343	BH105	Not Given	18.00	Not Given	D	Dark brown CLAY	Atterberg 1 Point	32		100	71	29	42						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 234.12

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: LMB Geosolutions Ltd

Client Address: 28 Dresden Road, London, N19 3BD

Contact: Philip Lewis

Site Address: Manor Road

Client Reference: LMB-MANOR ROAD
Job Number: 21-75176
Date Sampled: 26/04 - 27/04/2021
Date Received: 26/04/2021
Date Tested: 25/05 - 26/05/2021
Sampled By: Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
1872344	BH105	Not Given	20.00	Not Given	D	Dark brown CLAY		25											
1872345	TP101	Not Given	1.50	Not Given	D	Brown gravelly sandy CLAY	Atterberg 1 Point	17		54	35	18	17						
1872346	TP102	Not Given	2.00	Not Given	D	Brown sandy CLAY		18											

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 234.12

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

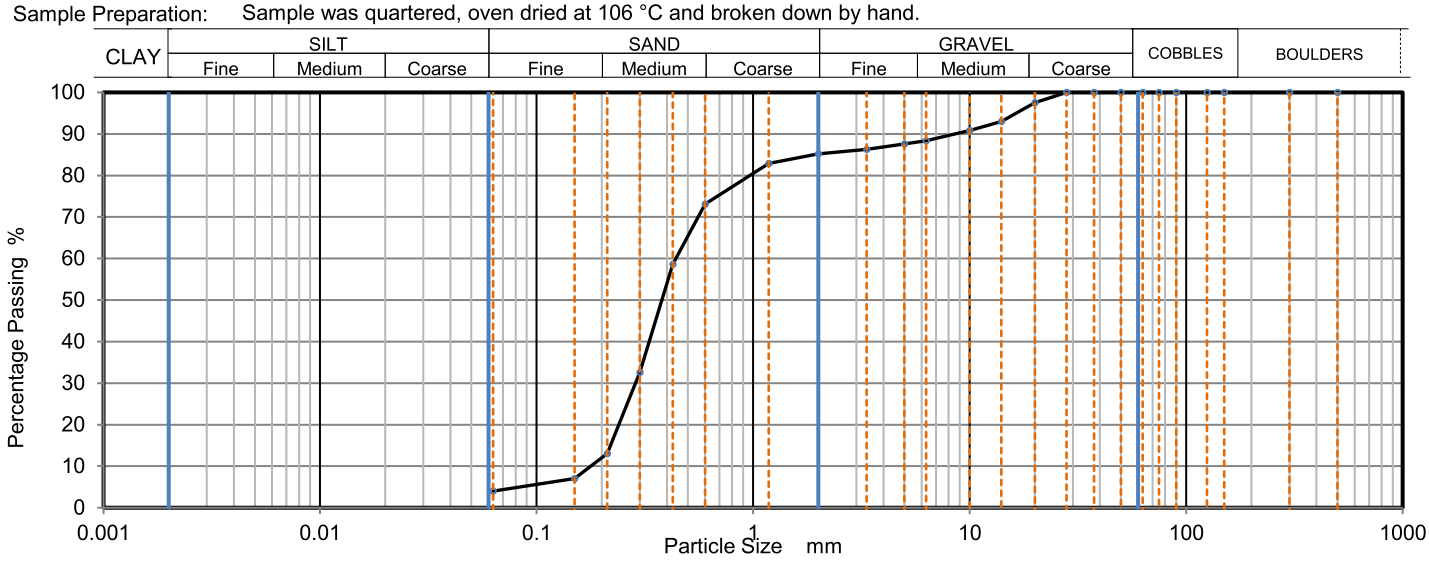
UKAS TESTING 4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	Not Given
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	26/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872307	Depth Top [m]:	6.00
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey slightly silty gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	93		
10	91		
6.3	88		
5	88		
3.35	86		
2	85		
1.18	83		
0.6	73		
0.425	59		
0.3	33		
0.212	13		
0.15	7		
0.063	5		

Sample Proportions	% dry mass
Very coarse	0
Gravel	15
Sand	81
Fines <0.063mm	5

Grading Analysis		
D100	mm	28
D60	mm	0.44
D30	mm	0.287
D10	mm	0.179
Uniformity Coefficient		2.5
Curvature Coefficient		1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

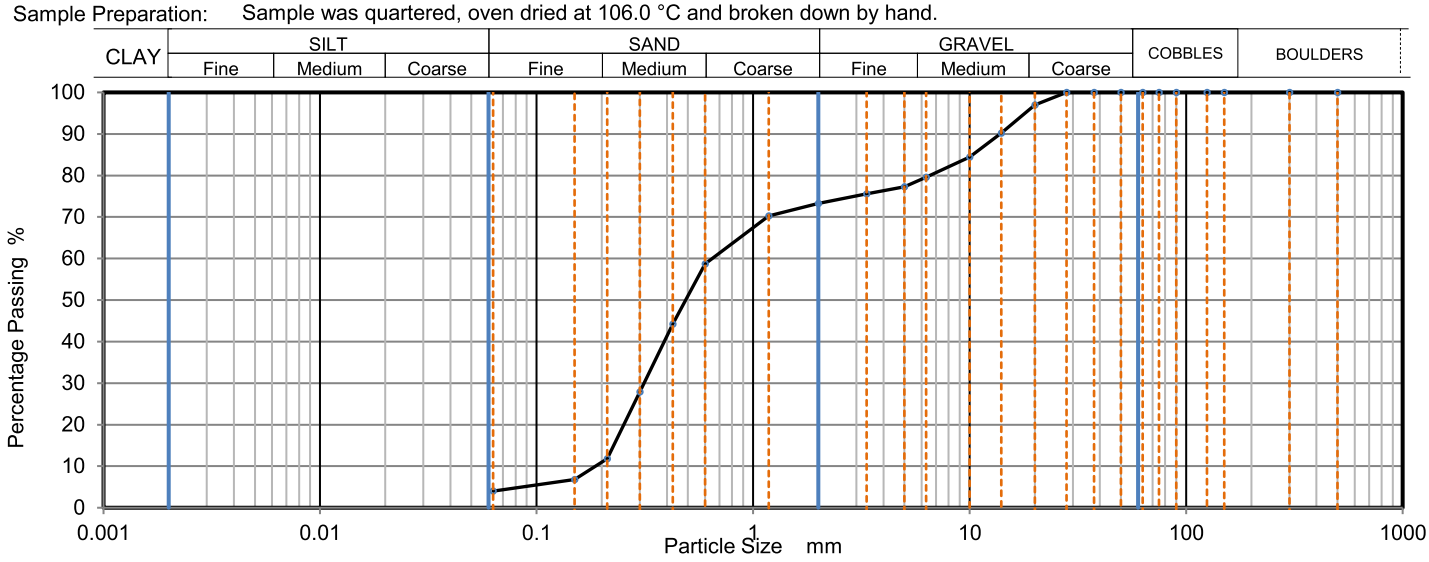
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	27/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	26/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872309	Depth Top [m]:	4.00
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey slightly silty gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	90		
10	84		
6.3	80		
5	77		
3.35	76		
2	73		
1.18	70		
0.6	59		
0.425	44		
0.3	28		
0.212	12		
0.15	7		
0.063	4		

Sample Proportions	% dry mass
Very coarse	0
Gravel	27
Sand	69
Fines <0.063mm	4

Grading Analysis		
D100	mm	28
D60	mm	0.647
D30	mm	0.314
D10	mm	0.187
Uniformity Coefficient		3.5
Curvature Coefficient		0.81

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

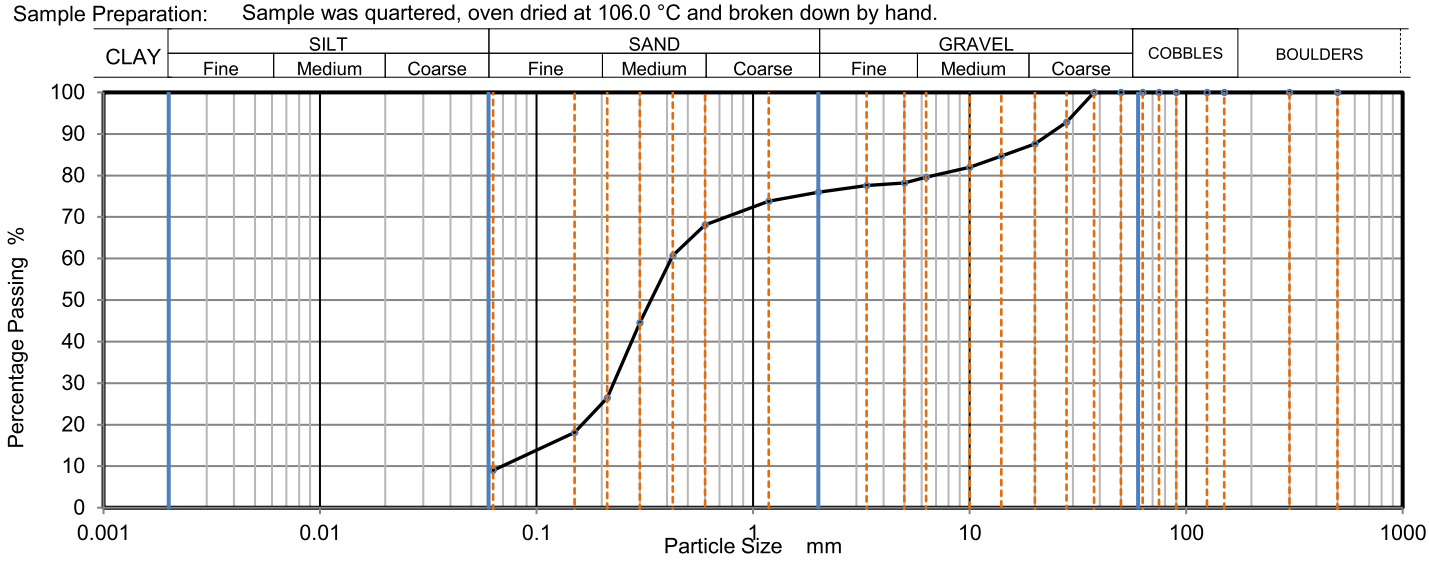
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	27/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	26/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872312	Depth Top [m]:	2.30
Hole No.:	TP102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey slightly silty gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	93		
20	88		
14	85		
10	82		
6.3	80		
5	78		
3.35	78		
2	76		
1.18	74		
0.6	68		
0.425	61		
0.3	45		
0.212	26		
0.15	18		
0.063	10		

Sample Proportions	% dry mass
Very coarse	0
Gravel	24
Sand	66
Fines <0.063mm	10

Grading Analysis		
D100	mm	37.5
D60	mm	0.418
D30	mm	0.227
D10	mm	0.064
Uniformity Coefficient		6.5
Curvature Coefficient		1.9

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

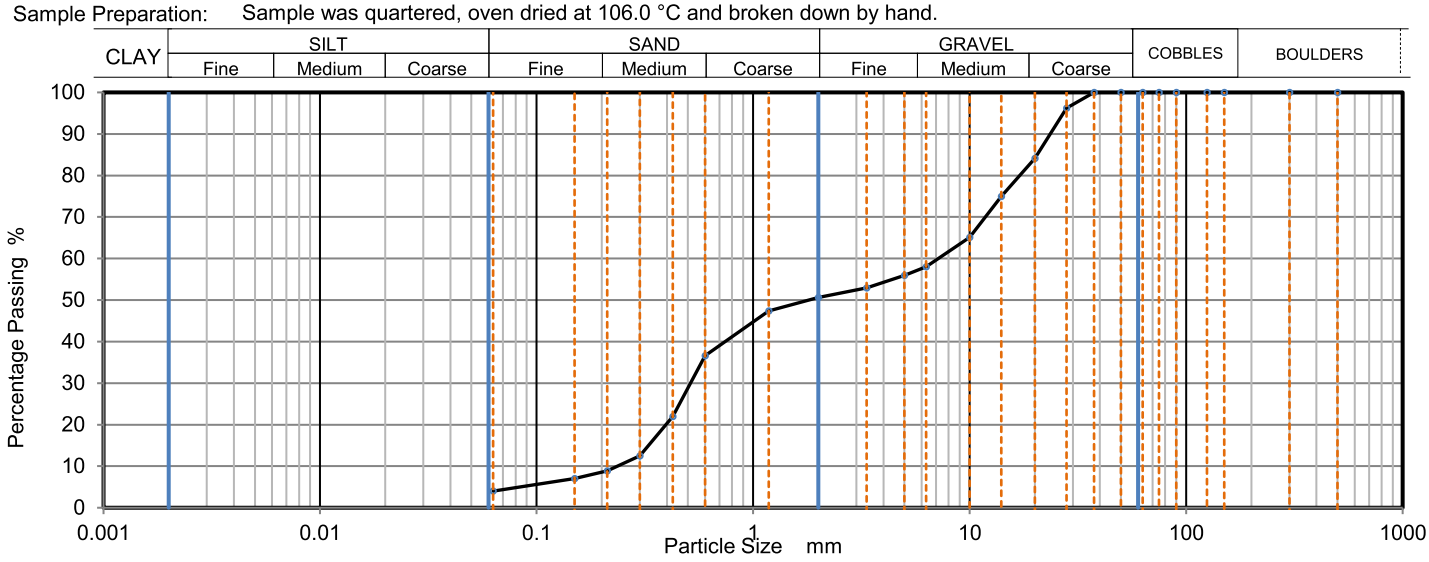
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	26/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872314	Depth Top [m]:	2.00
Hole No.:	TP103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly clayey slightly silty very sandy GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	96		
20	84		
14	75		
10	65		
6.3	58		
5	56		
3.35	53		
2	51		
1.18	47		
0.6	37		
0.425	22		
0.3	13		
0.212	9		
0.15	7		
0.063	5		

Sample Proportions	% dry mass
Very coarse	0
Gravel	49
Sand	46
Fines <0.063mm	5

Grading Analysis		
D100	mm	37.5
D60	mm	7.19
D30	mm	0.513
D10	mm	0.236
Uniformity Coefficient		31
Curvature Coefficient		0.16

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 100.20

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Light Compaction

Tested in Accordance with:
BS 1377-4: 1990

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

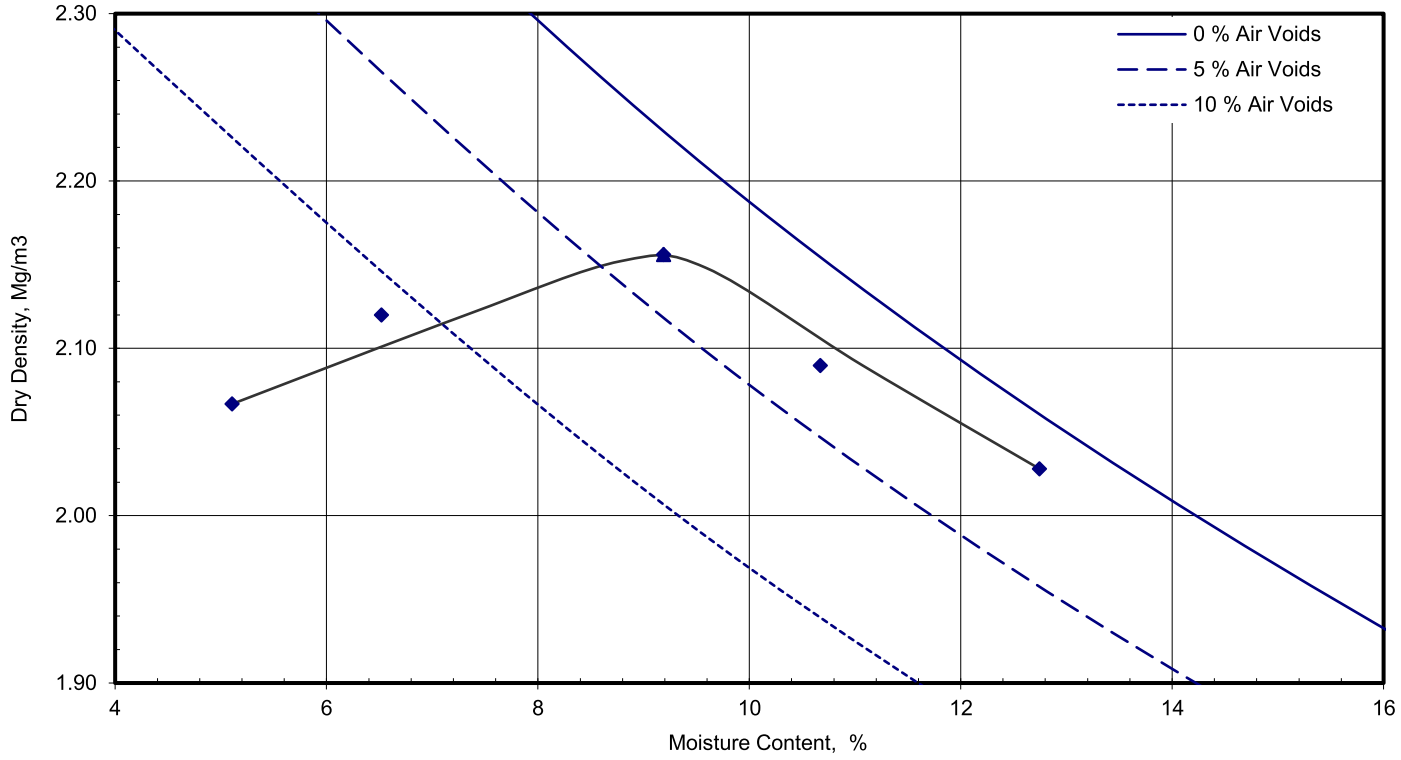
UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	31/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872313	Depth Top [m]:	1.00
Hole No.:	TP103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Yellowish brown gravelly clayey SAND		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	5.1	6.5	9.2	11	13
Dry Density	Mg/m³	2.07	2.12	2.16	2.09	2.03

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	3
Material Retained on 20.0 mm Sieve	%	19
Particle Density - Assumed	Mg/m³	2.80
As received Moisture Content	%	5.1
Maximum Dry Density	Mg/m³	**2.16**

Optimum Moisture Content	%	**9.2**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.4 using 2.5kg [light] Rammer

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 109.21

TEST CERTIFICATE

Determination of California Bearing Ratio

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-4: 1990: Clause 7

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	Not Given
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	01/06/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

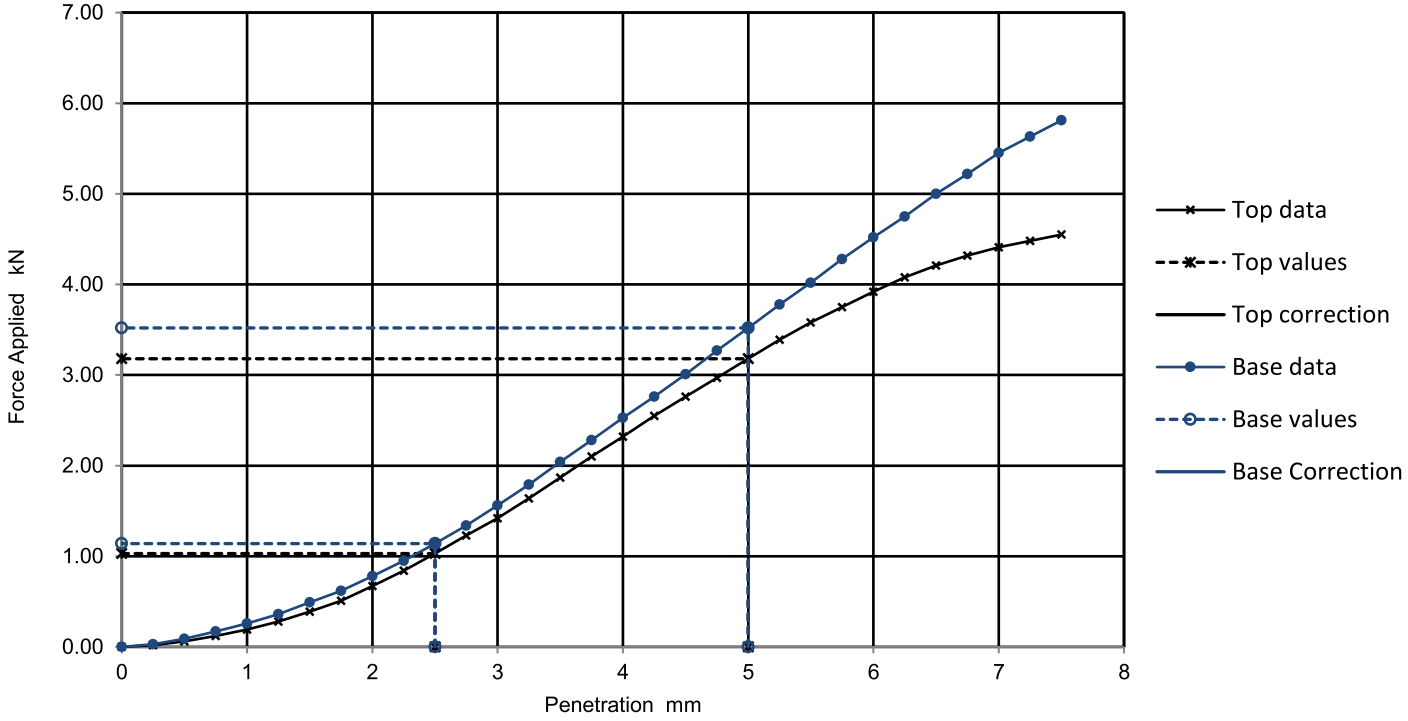
Laboratory Reference:	1872306	Depth Top [m]:	3.00
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Yellowish brown slightly gravelly SAND		

Specimen Preparation:

Condition	Remoulded	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	10 %	Dry density after soaking	Mg/m3

Initial Specimen details	Bulk density	2.16	Mg/m3	Surcharge applied	8 kg
	Dry density	1.93	Mg/m3		4.8 kPa
	Moisture content	12	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	7.8	16.0	16.0	17.0	12
BASE	No	8.6	18.0	18.0		11

Remarks:

Test/ Specimen specific remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 108.15

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	27/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

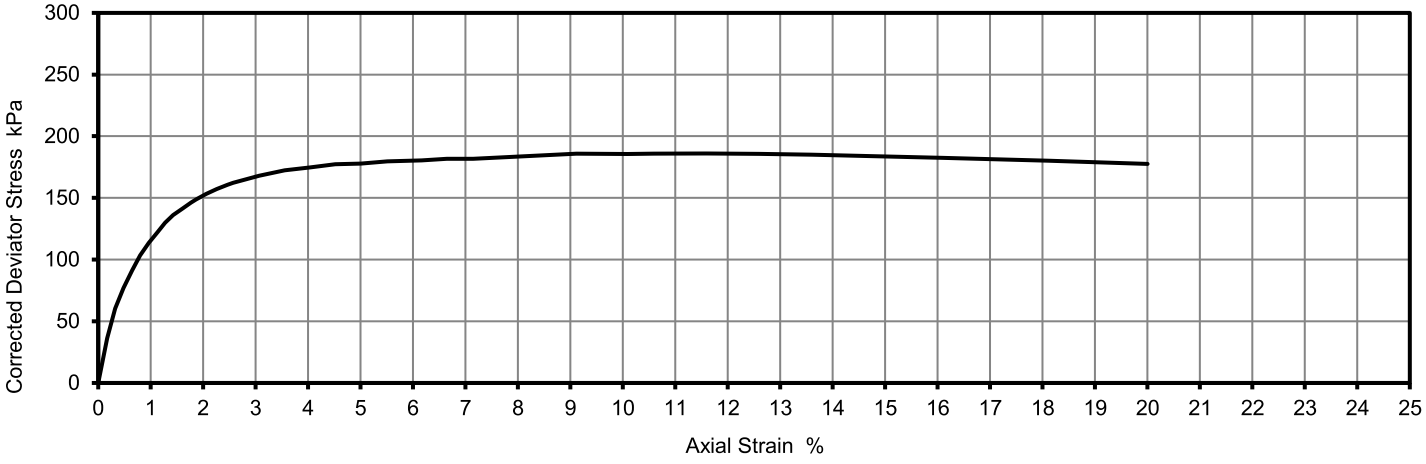
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

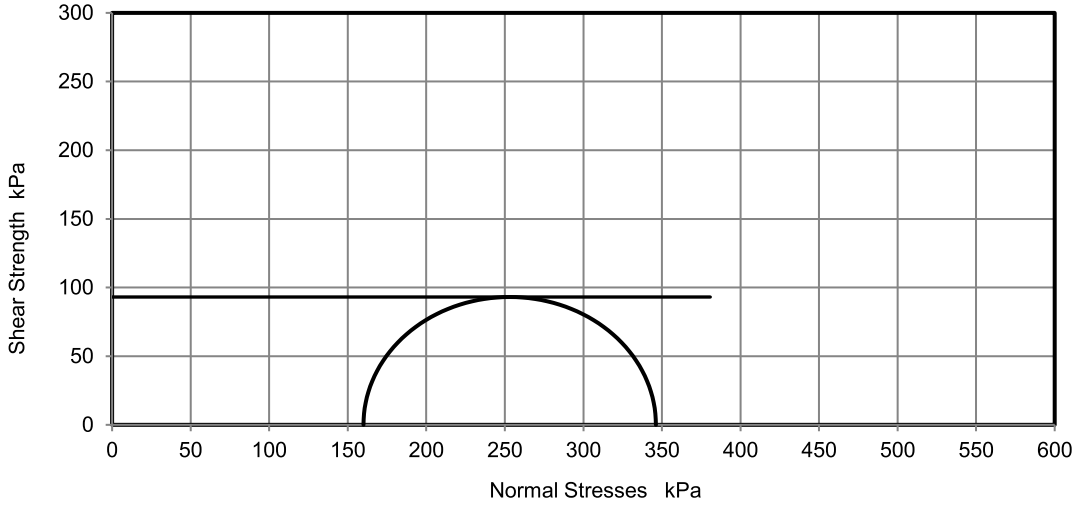
Laboratory Reference:	1872347	Depth Top [m]:	8.00
Hole No.:	BH101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.97	%/min
Length	202.93	mm	Cell Pressure	160	kPa
Diameter	103.01	mm	Axial Strain at failure	11.6	%
Bulk Density	1.97	Mg/m3	Deviator Stress, (σ1 - σ3)f	186	kPa
Moisture Content	30	%	Undrained Shear Strength, cu	93	kPa ½(σ1 - σ3)f
Dry Density	1.51	Mg/m3	Mode of Failure	Compound	
Membrane Correction	0.72	kPa	Membrane thickness	0.30	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample

Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	27/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

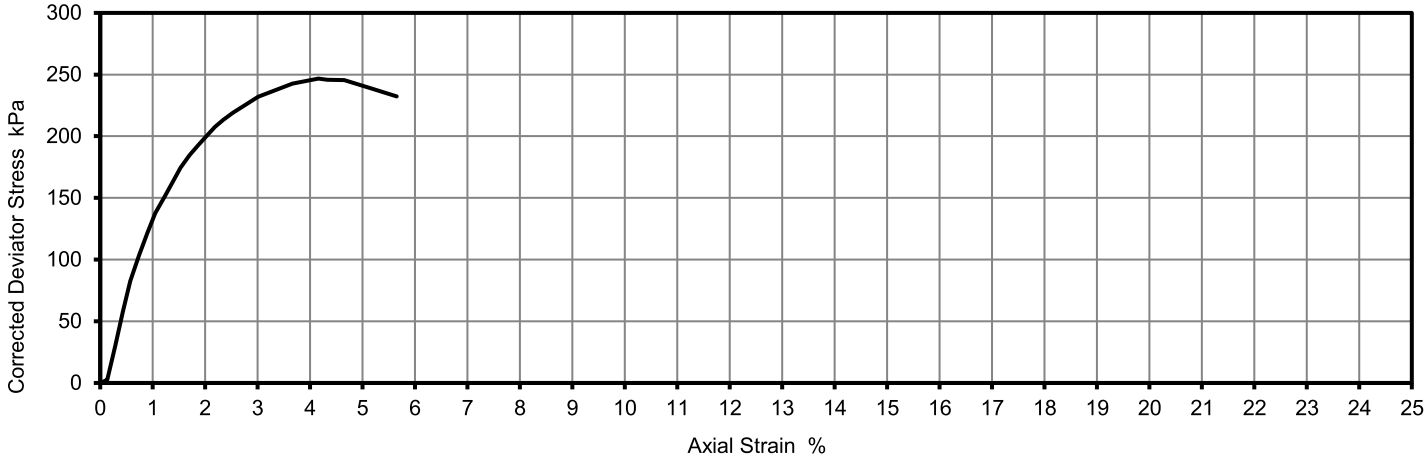
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

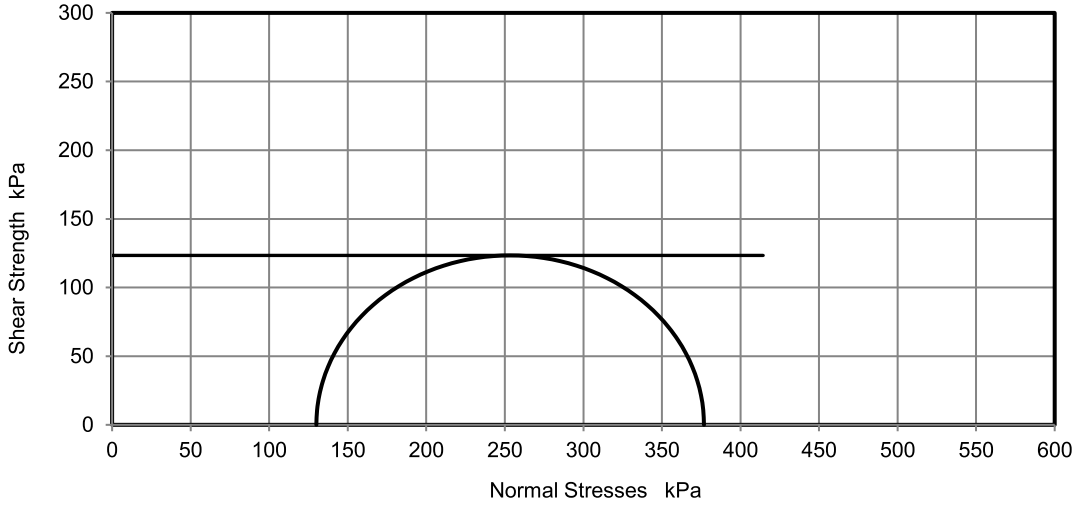
Laboratory Reference:	1872348	Depth Top [m]:	6.50
Hole No.:	BH102	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.97	%/min
Length	202.62	mm	Cell Pressure	130	kPa
Diameter	103.03	mm	Axial Strain at failure	4.2	%
Bulk Density	1.97	Mg/m3	Deviator Stress, (σ1 - σ3)f	247	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	123	kPa ½(σ1 - σ3)f
Dry Density	1.55	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.30	kPa	Membrane thickness	0.27	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample

Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	21/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

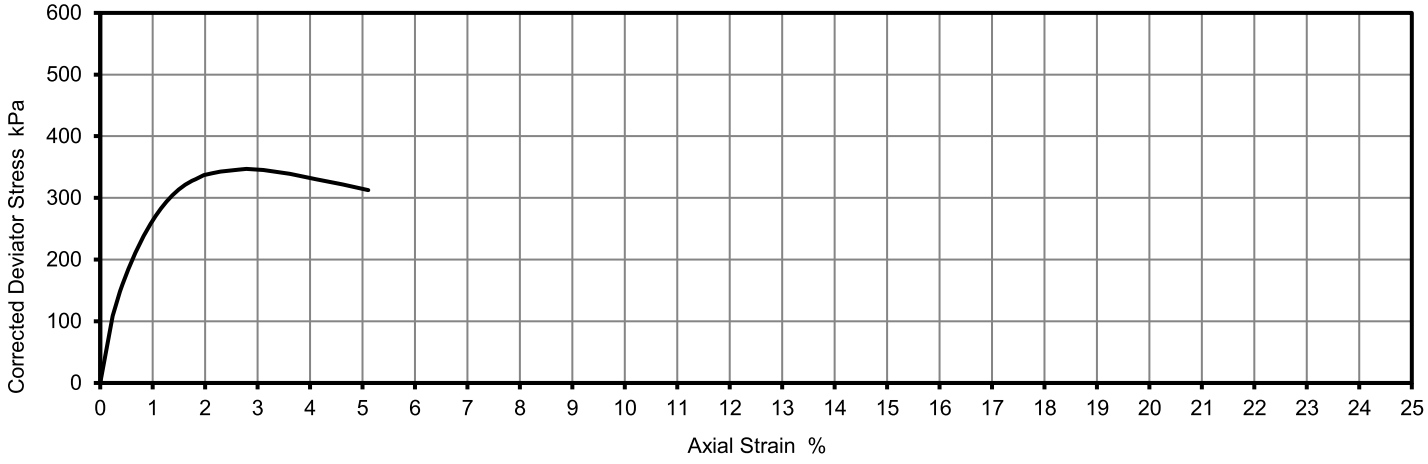
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

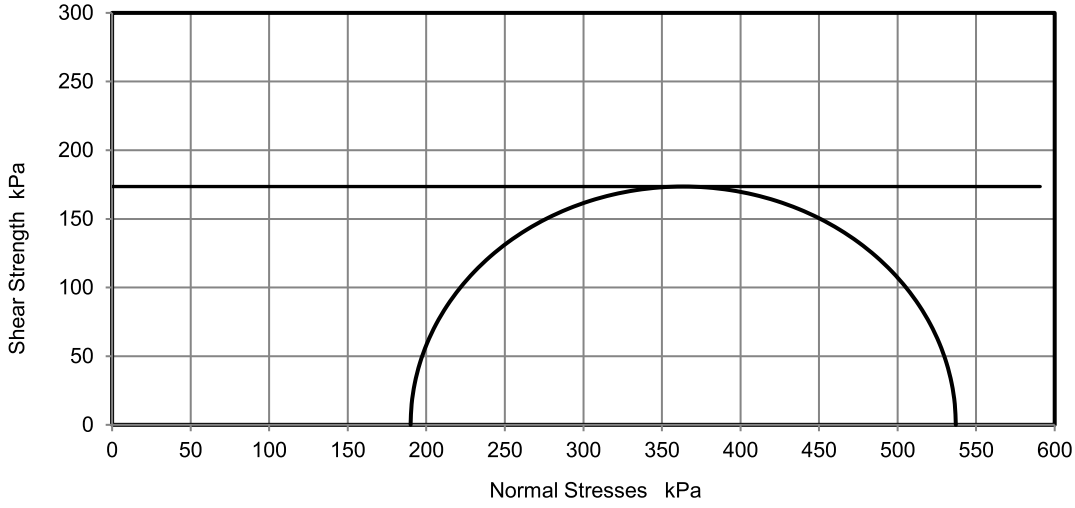
Laboratory Reference:	1872350	Depth Top [m]:	9.50
Hole No.:	BH103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.98	%/min	
Length	201.79	mm	Cell Pressure	190	kPa	
Diameter	103.49	mm	Axial Strain at failure	2.8	%	
Bulk Density	2.00	Mg/m3	Deviator Stress, (σ1 - σ3)f	347	kPa	
Moisture Content	26	%	Undrained Shear Strength, cu	174	kPa	½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle		
Membrane Correction	0.21	kPa	Membrane thickness	0.28	mm	

Deviator Stress v Axial Strain



Mohr Circles



Position within sample

Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

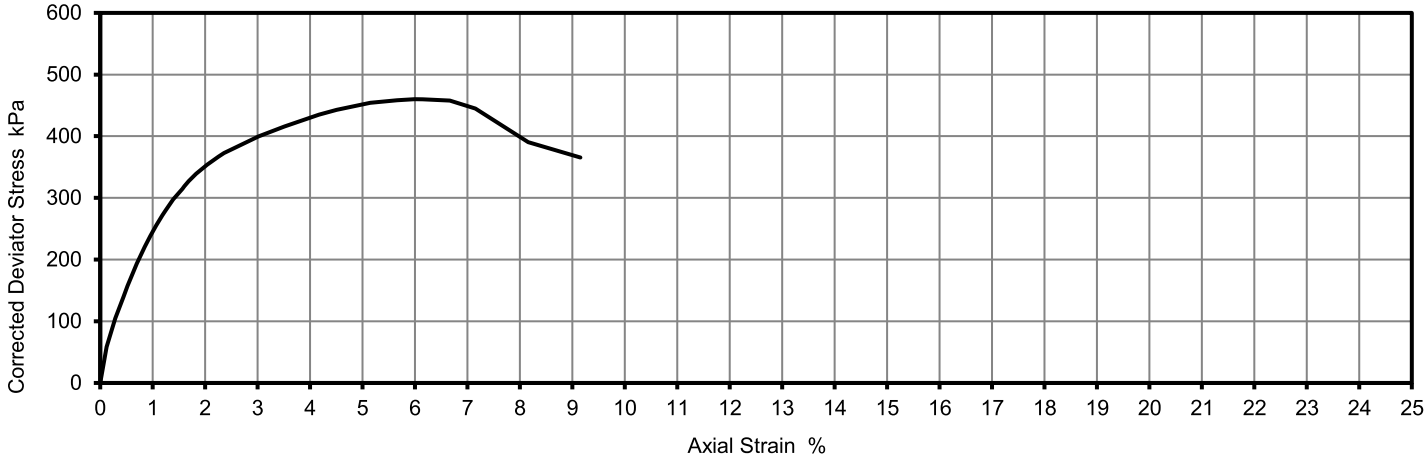
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

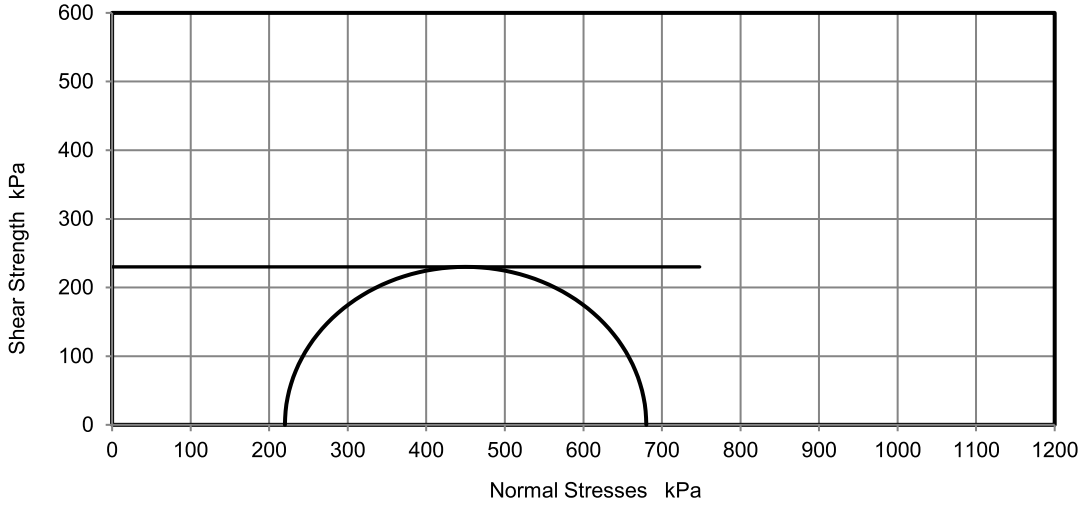
Laboratory Reference:	1872353	Depth Top [m]:	11.00
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.98	%/min	
Length	201.69	mm	Cell Pressure	220	kPa	
Diameter	102.29	mm	Axial Strain at failure	6.0	%	
Bulk Density	2.04	Mg/m3	Deviator Stress, (σ1 - σ3)f	460	kPa	
Moisture Content	24	%	Undrained Shear Strength, cu	230	kPa	½(σ1 - σ3)f
Dry Density	1.64	Mg/m3	Mode of Failure	Brittle		
Membrane Correction	0.45	kPa	Membrane thickness	0.29	mm	

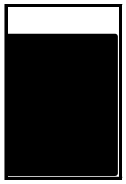
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

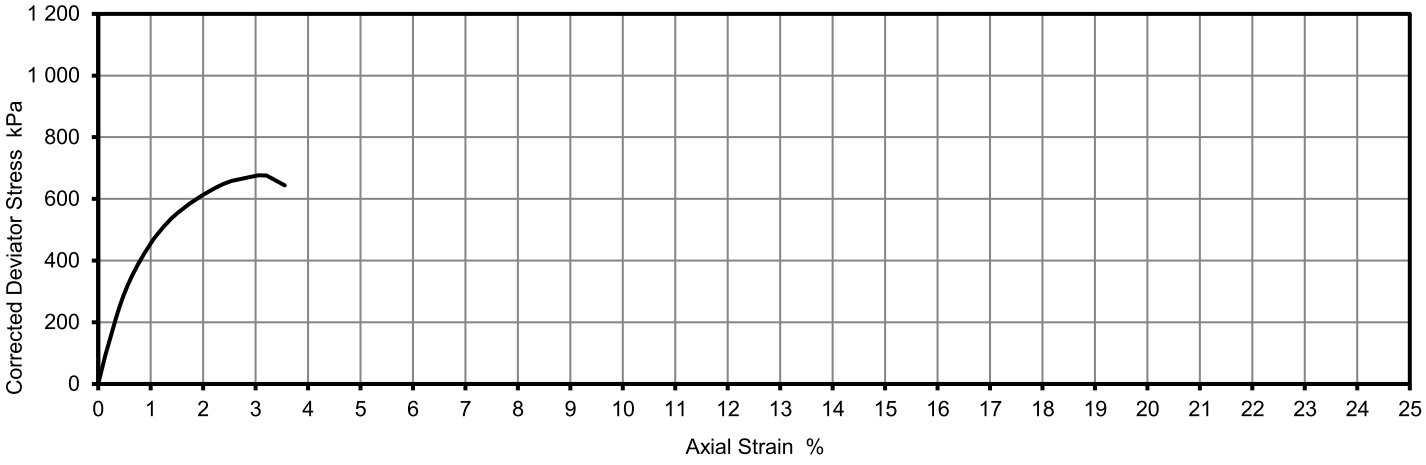
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

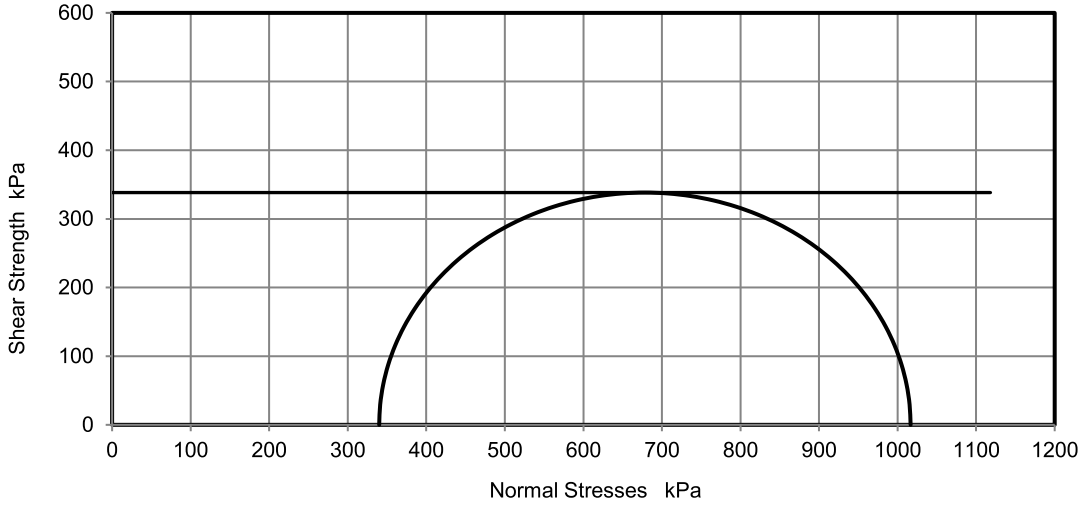
Laboratory Reference:	1872354	Depth Top [m]:	17.00
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.99	%/min	
Length	200.84	mm	Cell Pressure	340	kPa	
Diameter	102.44	mm	Axial Strain at failure	3.0	%	
Bulk Density	2.06	Mg/m3	Deviator Stress, (σ1 - σ3)f	677	kPa	
Moisture Content	24	%	Undrained Shear Strength, cu	338	kPa	½(σ1 - σ3)f
Dry Density	1.66	Mg/m3	Mode of Failure	Brittle		
Membrane Correction	0.24	kPa	Membrane thickness	0.30	mm	

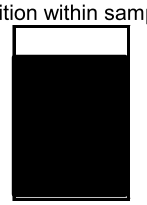
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression
Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

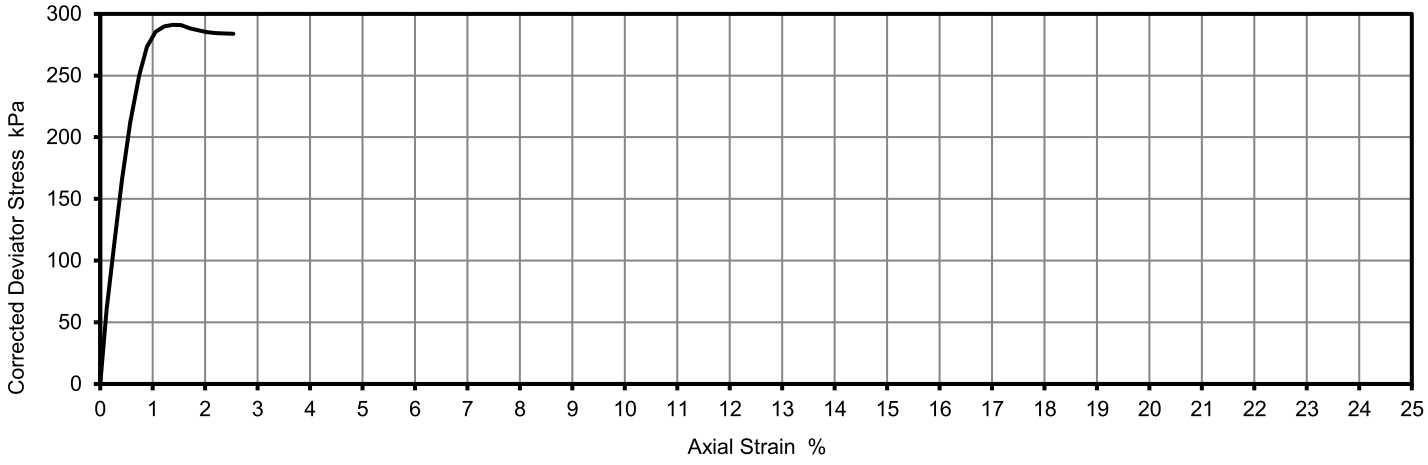
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

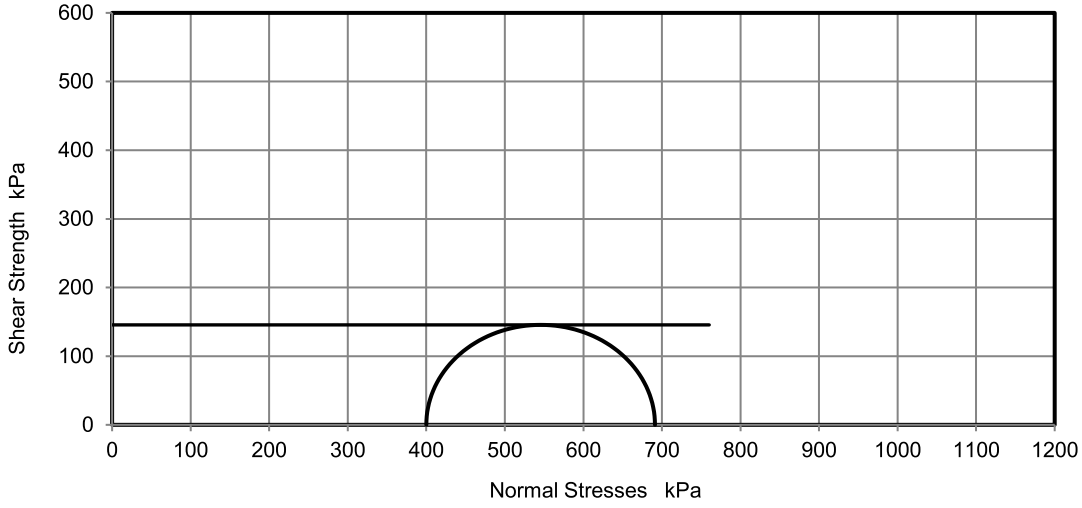
Laboratory Reference:	1872355	Depth Top [m]:	20.00
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.99	%/min
Length	200.60	mm	Cell Pressure	400	kPa
Diameter	102.82	mm	Axial Strain at failure	1.4	%
Bulk Density	2.01	Mg/m3	Deviator Stress, (σ1 - σ3)f	291	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	146	kPa ½(σ1 - σ3)f
Dry Density	1.60	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.10	kPa	Membrane thickness	0.27	mm

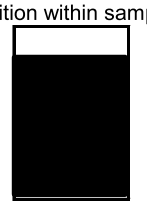
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression
Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	23/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

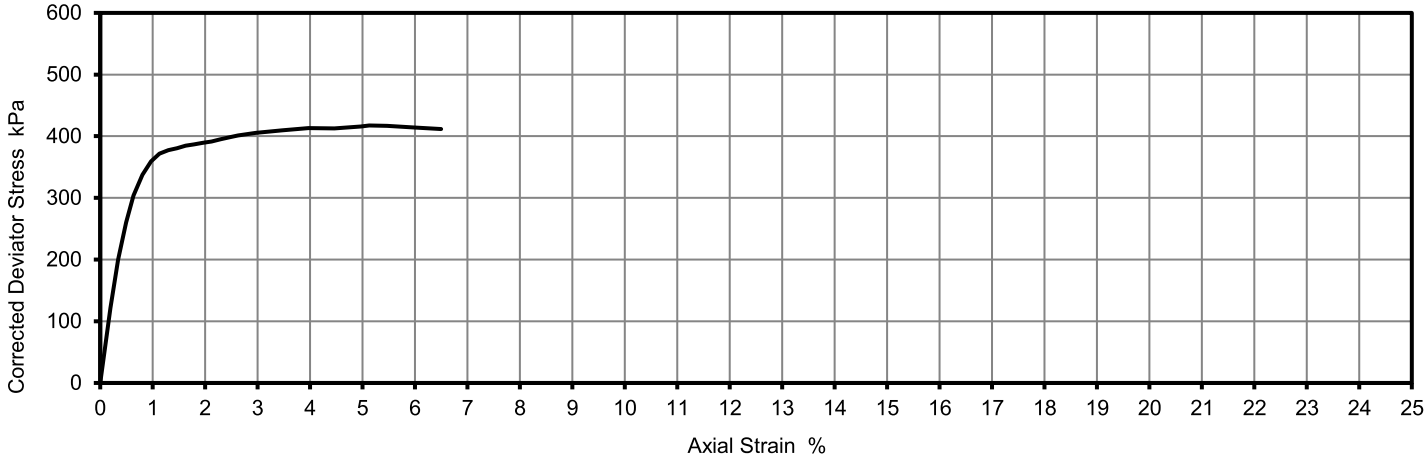
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

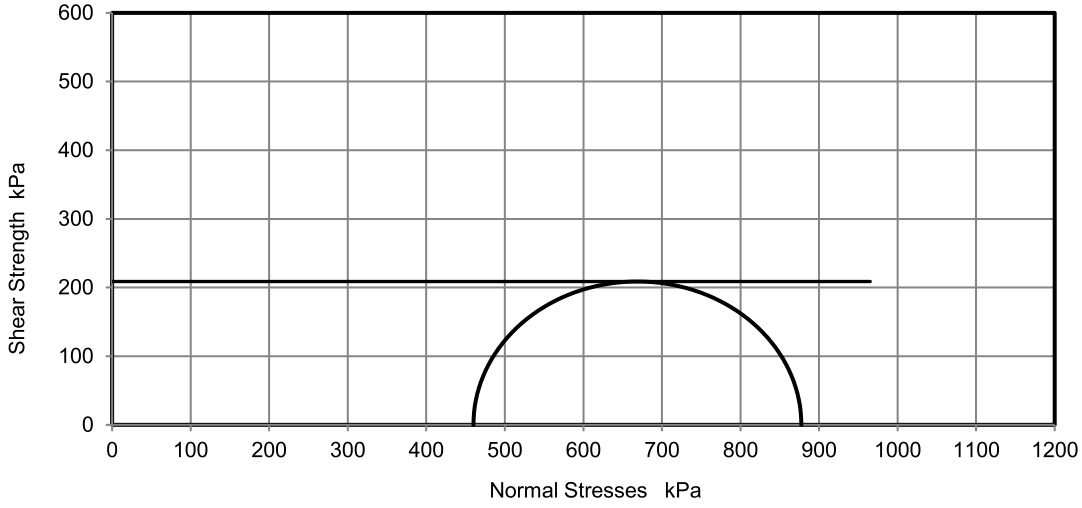
Laboratory Reference:	1872356	Depth Top [m]:	23.00
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	2.00	%/min
Length	199.61	mm	Cell Pressure	460	kPa
Diameter	103.41	mm	Axial Strain at failure	5.1	%
Bulk Density	2.01	Mg/m3	Deviator Stress, (σ1 - σ3)f	417	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	209	kPa ½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.39	kPa	Membrane thickness	0.28	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample

Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

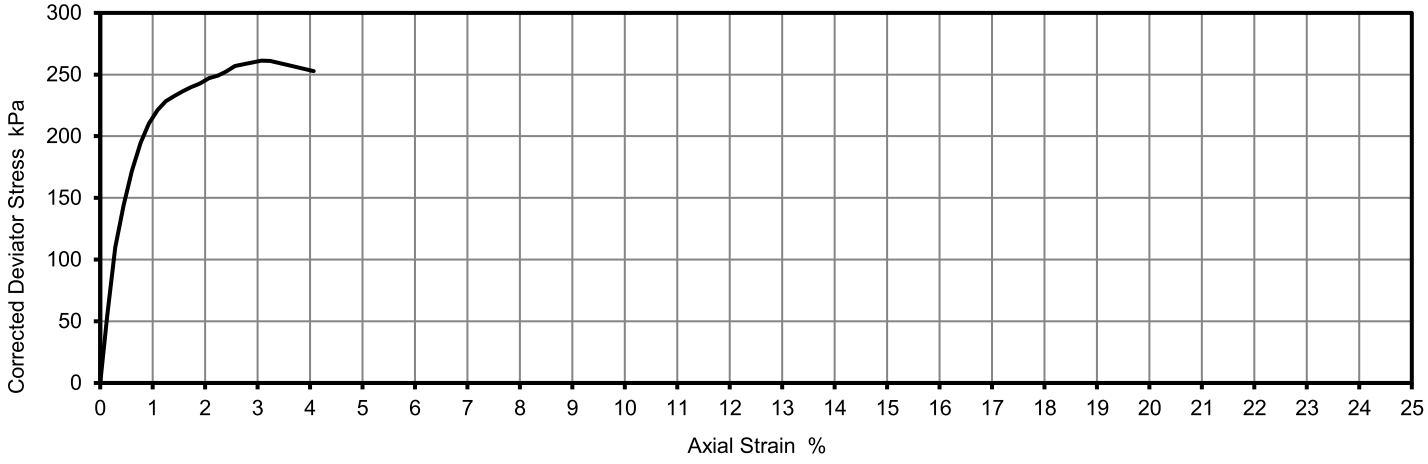
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

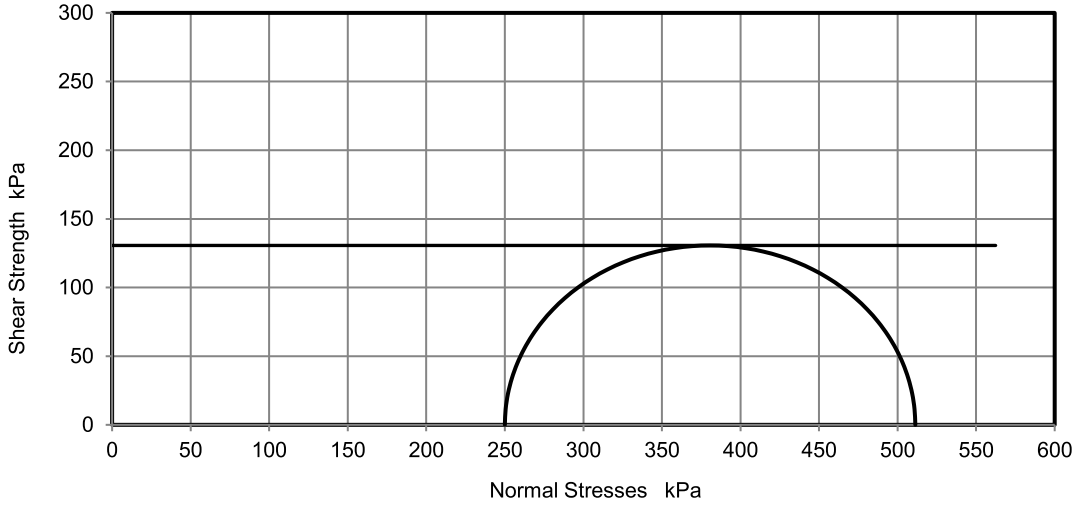
Laboratory Reference:	1872358	Depth Top [m]:	12.50
Hole No.:	BH105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.99	%/min
Length	201.29	mm	Cell Pressure	250	kPa
Diameter	103.59	mm	Axial Strain at failure	3.1	%
Bulk Density	2.00	Mg/m3	Deviator Stress, (σ1 - σ3)f	261	kPa
Moisture Content	26	%	Undrained Shear Strength, cu	131	kPa ½(σ1 - σ3)f
Dry Density	1.58	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.24	kPa	Membrane thickness	0.29	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample

Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression
Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

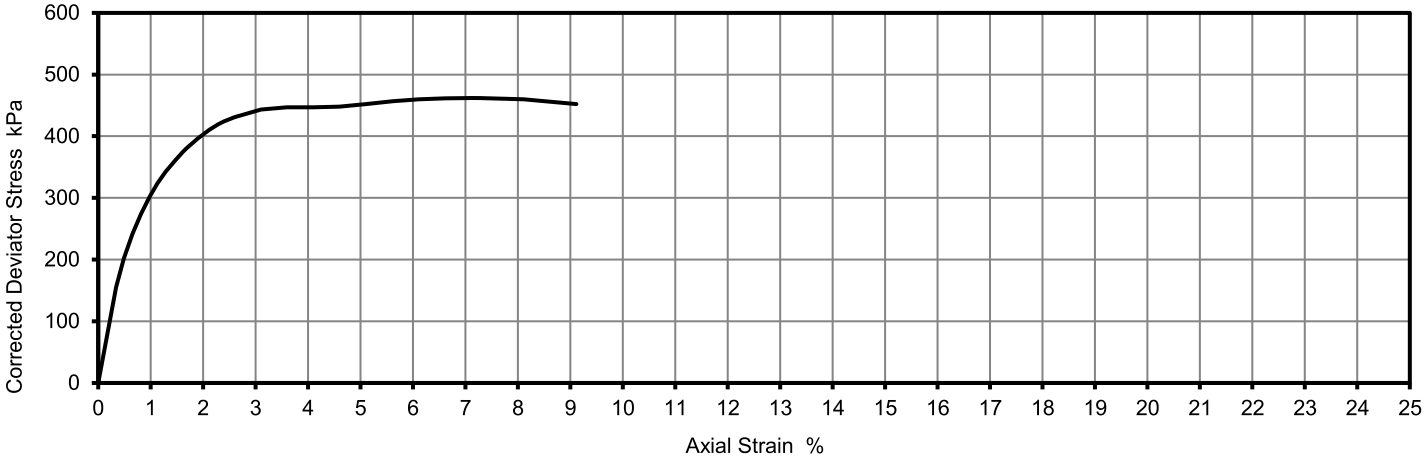
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

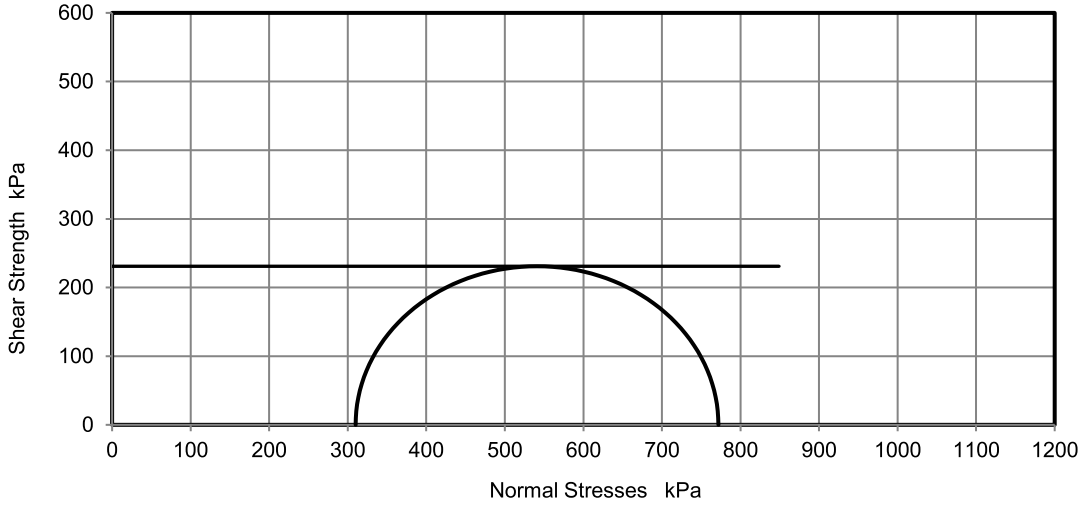
Laboratory Reference:	1872359	Depth Top [m]:	15.50
Hole No.:	BH105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	2.00	%/min
Length	200.23	mm	Cell Pressure	310	kPa
Diameter	102.67	mm	Axial Strain at failure	7.3	%
Bulk Density	2.05	Mg/m3	Deviator Stress, (σ1 - σ3)f	462	kPa
Moisture Content	25	%	Undrained Shear Strength, cu	231	kPa ½(σ1 - σ3)f
Dry Density	1.64	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.49	kPa	Membrane thickness	0.28	mm

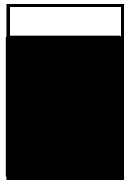
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

Unconsolidated Undrained
Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

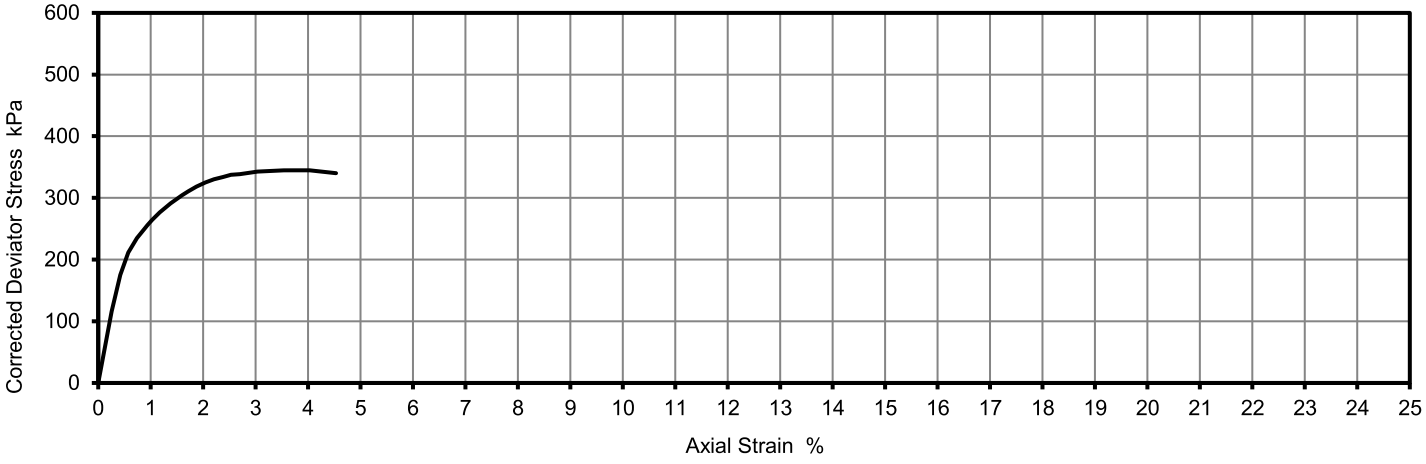
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

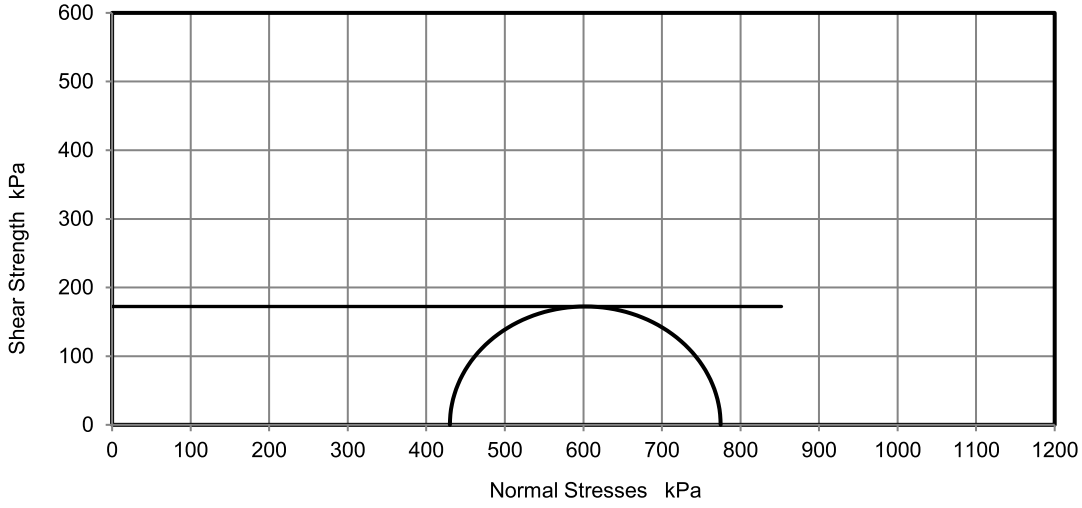
Laboratory Reference:	1872361	Depth Top [m]:	21.50
Hole No.:	BH105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown CLAY		

Test Number	1		Rate of Strain	1.99	%/min	
Length	201.21	mm	Cell Pressure	430	kPa	
Diameter	103.33	mm	Axial Strain at failure	3.5	%	
Bulk Density	2.02	Mg/m3	Deviator Stress, (σ1 - σ3)f	345	kPa	
Moisture Content	27	%	Undrained Shear Strength, cu	172	kPa	½(σ1 - σ3)f
Dry Density	1.59	Mg/m3	Mode of Failure	Brittle		
Membrane Correction	0.27	kPa	Membrane thickness	0.29	mm	

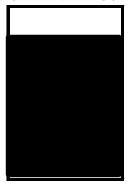
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 184.11

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

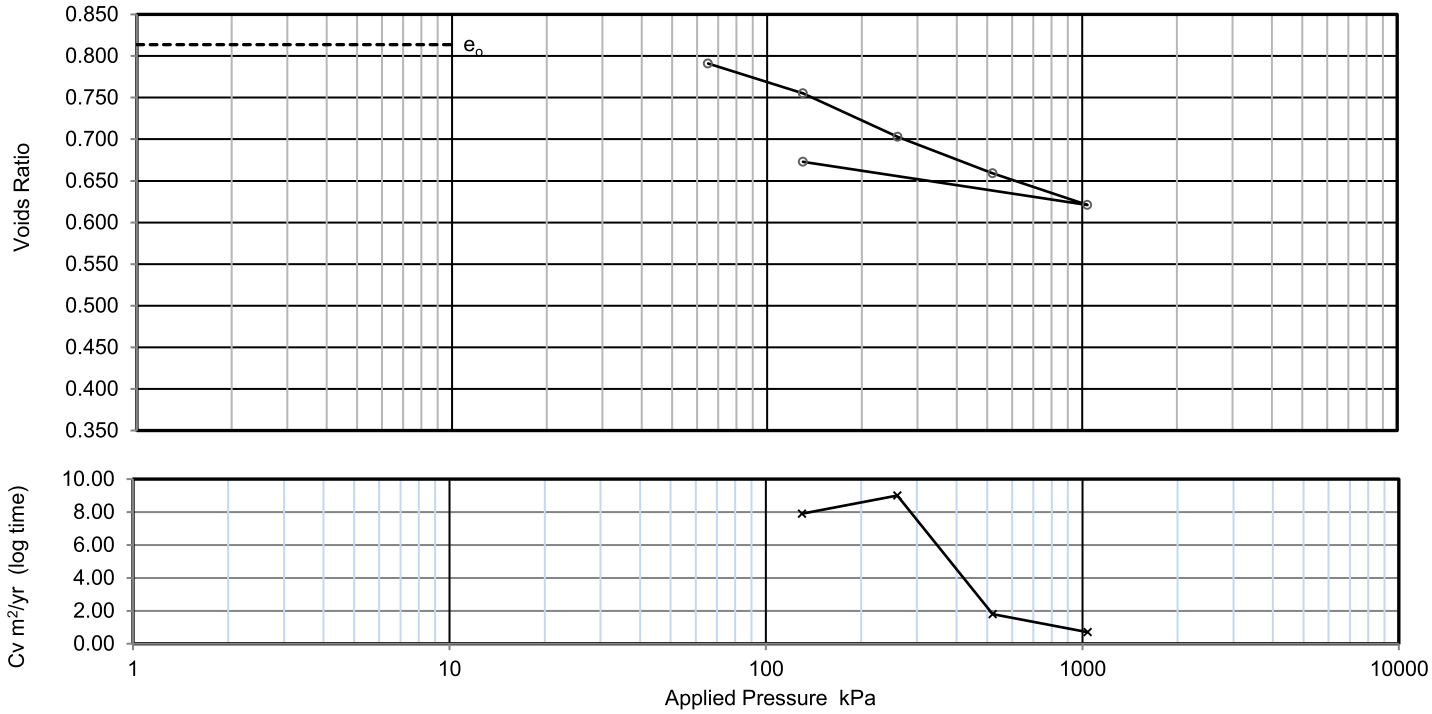
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	21/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872349	Depth Top [m]:	6.50
Hole No.:	BH103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.814	-	-	-	-
65	0.791	0.19	N/A	N/A	N/A
130	0.755	0.31	7.9	13	0.00064
260	0.703	0.23	9	18	0.00064
520	0.659	0.098	1.8	15	0.0013
1 040	0.621	0.044	0.7	2.2	0.0013
130	0.673	0.035			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.02	18.46	mm
Moisture Content	29	30	%
Bulk density	1.88	2.06	Mg/m3
Dry density	1.46	1.58	Mg/m3
Voids Ratio	0.814	0.673	
Saturation	93	118	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 172.15

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

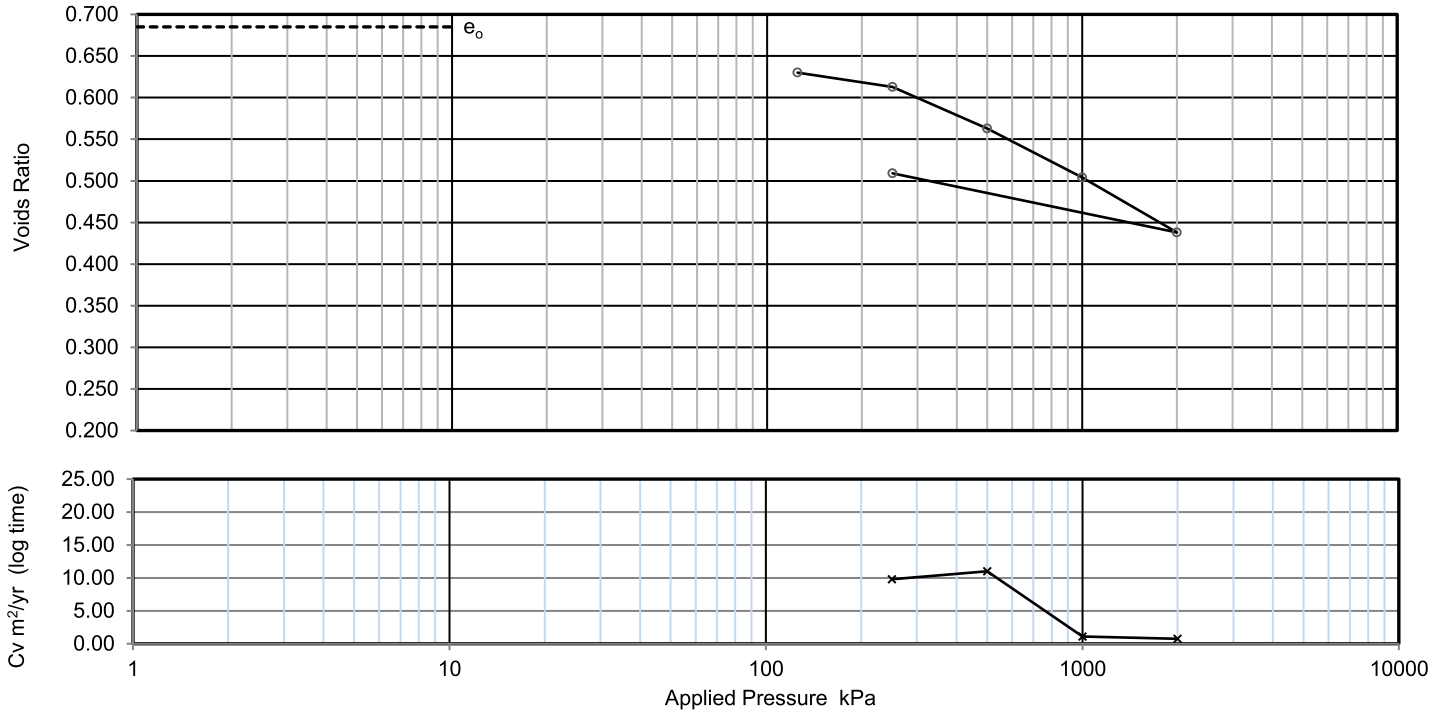
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	21/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872351	Depth Top [m]:	12.50
Hole No.:	BH103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.685	-	-	-	-
125	0.630	0.26	N/A	N/A	N/A
250	0.613	0.083	9.8	25	0.00062
500	0.563	0.12	11	14	0.0013
1 000	0.504	0.075	1.1	4.8	0.0019
2 000	0.438	0.044	0.75	1.1	0.0025
250	0.509	0.028			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.00	-	mm
Height	20.13	18.03	mm
Moisture Content	25	26	%
Bulk density	1.96	2.21	Mg/m3
Dry density	1.57	1.76	Mg/m3
Voids Ratio	0.685	0.509	
Saturation	96	134	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 172.15

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

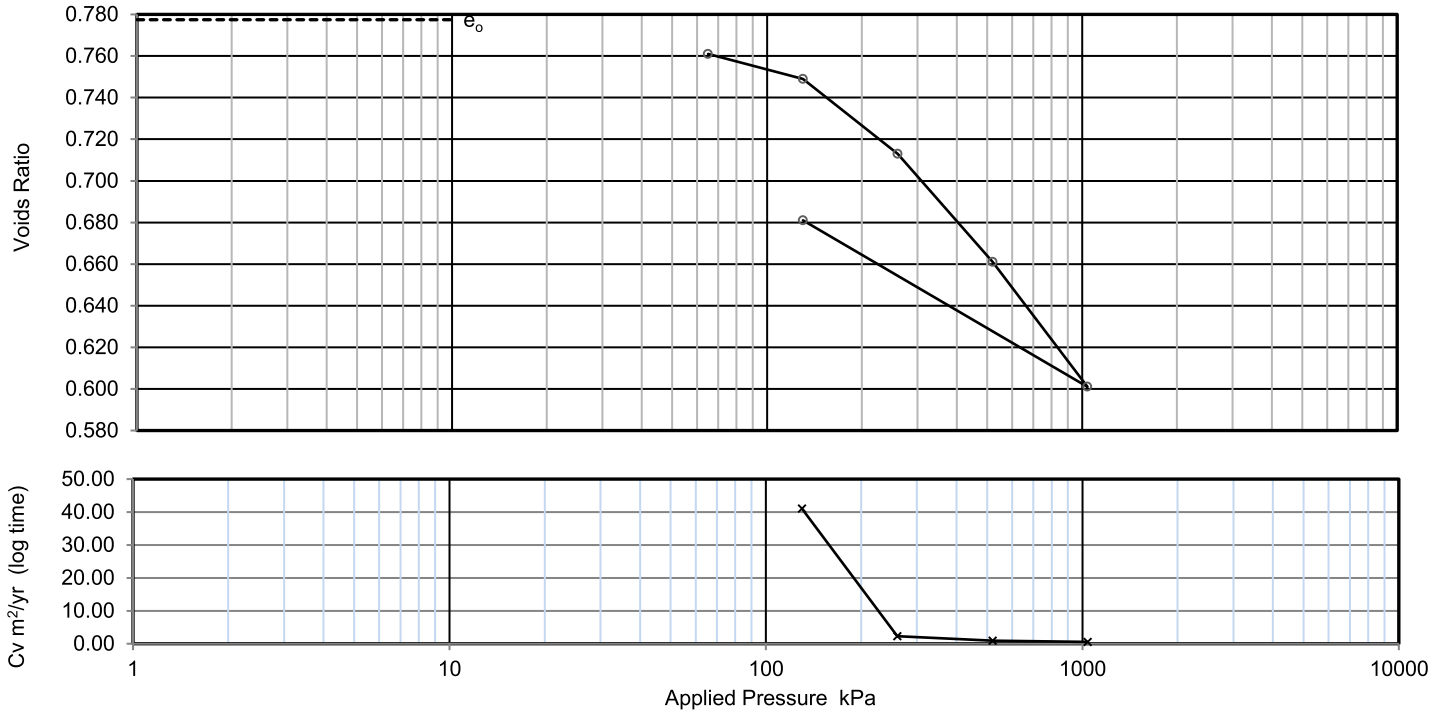
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	22/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872352	Depth Top [m]:	6.50
Hole No.:	BH104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.777	-	-	-	-
65	0.761	0.14	N/A	N/A	N/A
130	0.749	0.1	41	45	0.00043
260	0.713	0.16	2.3	12	0.0013
520	0.661	0.12	0.88	3.5	0.0019
1 040	0.601	0.069	0.55	0.96	0.0013
130	0.681	0.054			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.10	-	mm
Height	20.04	18.95	mm
Moisture Content	29	30	%
Bulk density	1.93	2.04	Mg/m3
Dry density	1.49	1.58	Mg/m3
Voids Ratio	0.777	0.681	
Saturation	100	115	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 172.15

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

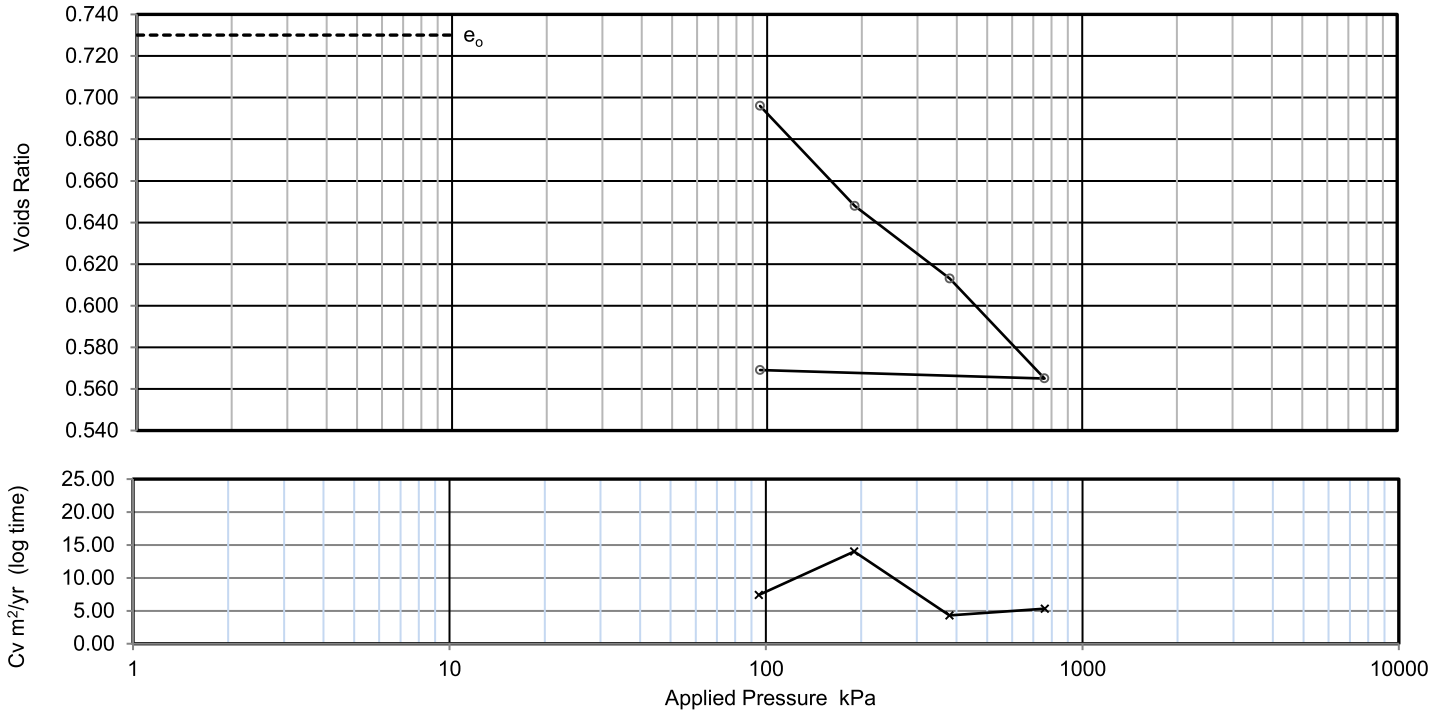
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872357	Depth Top [m]:	9.50
Hole No.:	BH105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.730	-	-	-	-
95	0.696	0.21	7.4	11	0.00021
190	0.648	0.3	14	16	0.0013
380	0.613	0.11	4.3	6.6	0.0016
760	0.565	0.079	5.3	6.4	0.0012
95	0.569	0.0036			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.05	-	mm
Height	20.09	18.22	mm
Moisture Content	26	27	%
Bulk density	1.93	2.14	Mg/m3
Dry density	1.53	1.69	Mg/m3
Voids Ratio	0.730	0.569	
Saturation	94	126	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 172.15

TEST CERTIFICATE

One Dimensional Consolidation Test

i2 Analytical Ltd
Unit 5 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

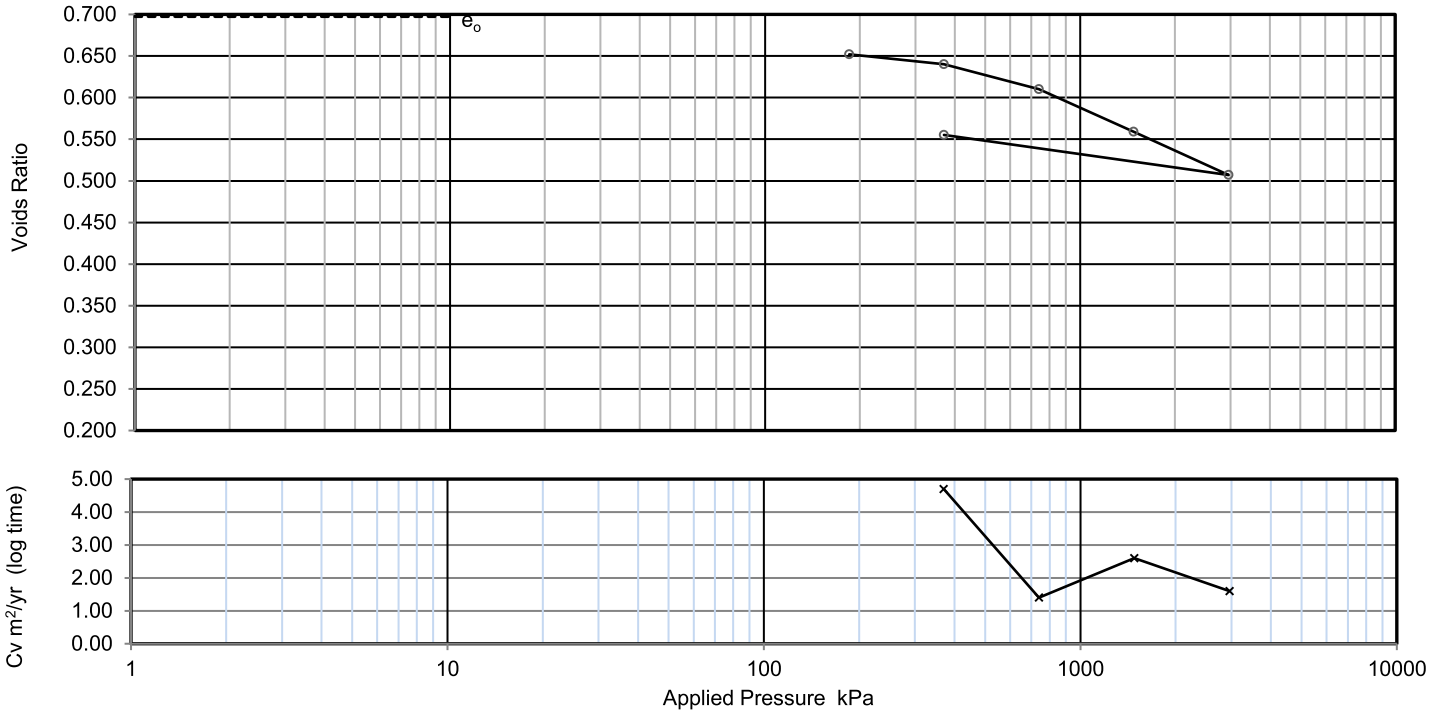
Tested in Accordance with: BS 1377-5: 1990: Clause 3

Client:	LMB Geosolutions Ltd	Client Reference:	LMB-MANOR ROAD
Client Address:	28 Dresden Road, London, N19 3BD	Job Number:	21-75176
		Date Sampled:	26/04/2021
		Date Received:	26/04/2021
Contact:	Philip Lewis	Date Tested:	20/05/2021
Site Address:	Manor Road	Sampled By:	Client - PIL, DN & HB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1872360	Depth Top [m]:	18.50
Hole No.:	BH105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.698	-	-	-	-
185	0.652	0.15	N/A	N/A	N/A
370	0.640	0.038	4.7	N/A	N/A
740	0.610	0.05	1.4	N/A	N/A
1 480	0.559	0.043	2.6	23	N/A
2 960	0.507	0.023	1.6	8.2	0.0025
370	0.555	0.012			

Preparation

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.06	-	mm
Height	20.03	18.35	mm
Moisture Content	25	26	%
Bulk density	1.95	2.14	Mg/m3
Dry density	1.56	1.70	Mg/m3
Voids Ratio	0.698	0.555	
Saturation	95	122	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%

Note: Cv corrected to 20°C

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 02/06/2021

GF 172.15

APPENDICES

APPENDIX D MONITORING RESULTS

APPENDICES

GROUND GAS & GROUNDWATER

PROJECT: **Manor Road, Richmond**

Date 05/05/2021 Operator PIL

Start 1009 Weather Dry, sunny & cold
Atmospheric Pressure (mb) Finish 1009 Time: 08:15

Location	Time(s)	CH_4 (%)	CO_2 (%)	O_2 (%)	CO(ppm)	H_2S (ppm)	Flow (l/hr)	PID (ppm)	Groundwater Level		Ground Elevation
									m AOD	mbgl	
BH101	60	0.00	3.30	17.40	0.00	0.00	0.00	1.50	2.47	4.23	6.703
	120	0.00	3.30	17.40	0.00	0.00					
	240	0.00	3.30	17.40	0.00	0.00					
BH102	60	0.00	0.30	17.30	0.00	0.00	0.00	0.80	2.32	4.08	6.399
	120	0.00	0.30	17.30	0.00	0.00					
	240	0.00	0.30	17.30	0.00	0.00					
BH103	60	0.00	3.00	17.60	0.00	0.00	0.00	2.30	3.88	2.66	6.539
	120	0.00	3.00	17.60	0.00	0.00					
	240	0.00	3.00	17.60	0.00	0.00					
BH104	60	0.00	0.00	18.70	0.00	0.00	0.00	1.40	3.66	2.59	6.246
	120	0.00	0.00	18.70	0.00	0.00					
	240	0.00	0.00	18.70	0.00	0.00					
BH105	60	0.00	0.00	14.40	0.00	0.00	0.00	1.50	3.45	2.80	6.254
	120	0.00	0.00	14.40	0.00	0.00					
	240	0.00	0.00	14.40	0.00	0.00					

PROJECT: **Manor Road, Richmond**

Date 13/05/2021 Operator PIL

Start 1006 Weather cloudy with rain

Atmospheric Pressure (mb) Finish 1004 Time: 09:30

Location	Time	CH_4 (%)	CO_2 (%)	O_2 (%)	CO(ppm)	H_2S (ppm)	Flow (l/hr)	PID (ppm)	Groundwater Level		Ground Elevation
									m AOD	mbgl	
BH101	60	0.00	3.80	15.10	0.00	0.00	0.00	0.90	2.46	4.24	6.703
	120	0.00	3.80	15.10	0.00	0.00					
	240	0.00	3.80	15.10	0.00	0.00					
BH102	60	0.00	1.90	6.60	0.00	0.00	0.00	0.80	2.32	4.08	6.399
	120	0.00	1.90	6.60	0.00	0.00					
	240	0.00	1.90	6.60	0.00	0.00					
BH103	60	0.00	2.70	17.60	0.00	0.00	0.00	0.00	3.91	2.63	6.539
	120	0.00	2.70	17.60	0.00	0.00					
	240	0.00	2.70	17.60	0.00	0.00					
BH104	60	0.00	0.20	17.40	0.00	0.00	0.00	1.40	3.84	2.41	6.246
	120	0.00	0.20	17.40	0.00	0.00					
	240	0.00	0.20	17.40	0.00	0.00					
BH105	60	0.00	0.00	13.50	0.00	0.00	0.00	1.20	3.54	2.71	6.254
	120	0.00	0.00	13.50	0.00	0.00					
	240	0.00	0.00	13.50	0.00	0.00					

PROJECT: **Manor Road, Richmond**

Date 26/05/2021 Operator PIL

Start 1015 Weather cloud with sunny spells

Atmospheric Pressure (mb) Finish 1015 Time: 14:10

Location	Time	CH_4 (%)	CO_2 (%)	O_2 (%)	CO(ppm)	H_2S (ppm)	Flow (l/hr)	PID (ppm)	Groundwater Level		Ground Elevation
									m AOD	mbgl	
BH101	60	0.00	4.80	13.30	0.00	0.00	0.00	0.90	2.56	4.14	6.703
	120	0.00	4.80	13.30	0.00	0.00					
	240	0.00	4.80	13.30	0.00	0.00					
BH102	60	0.00	0.30	4.80	0.00	0.00	0.00	0.60	2.41	3.99	6.399
	120	0.00	0.30	4.80	0.00	0.00					
	240	0.00	0.30	4.80	0.00	0.00					
BH103	60	0.00	3.30	16.90	0.00	0.00	0.00	0.90	4.26	2.28	6.539
	120	0.00	3.30	16.90	0.00	0.00					
	240	0.00	3.30	16.90	0.00	0.00					
BH104	60	0.00	0.10	17.90	0.00	0.00	0.00	1.40	4.68	1.57	6.246
	120	0.00	0.10	17.90	0.00	0.00					
	240	0.00	0.10	17.90	0.00	0.00					
BH105	60	0.00	0.00	14.10	0.00	0.00	0.00	0.40	4.03	2.22	6.254
	120	0.00	0.00	14.10	0.00	0.00					
	240	0.00	0.00	14.10	0.00	0.00					

PROJECT: **Manor Road, Richmond**

Date 26/05/2021 Operator PIL

Start 1015 Weather cloudy with sunny spells
Atmospheric Pressure (mb) Finish 1015 Time 14:10

Location	Time	CH_4 (%)	CO_2 (%)	O_2 (%)	CO(ppm)	H_2S (ppm)	Flow (l/hr)	PID (ppm)	Groundwater Level		Ground Elevation
									m AOD	mbgl	
BH101	60	0.00	4.80	13.30	0.00	0.00	0.00	0.90	2.56	4.14	6.703
	120	0.00	4.80	13.30	0.00	0.00					
	240	0.00	4.80	13.30	0.00	0.00					
BH102	60	0.00	0.30	4.80	0.00	0.00	0.00	0.60	2.41	3.99	6.399
	120	0.00	0.30	4.80	0.00	0.00					
	240	0.00	0.30	4.80	0.00	0.00					
BH103	60	0.00	3.30	16.90	0.00	0.00	0.00	0.90	4.26	2.28	6.539
	120	0.00	3.30	16.90	0.00	0.00					
	240	0.00	3.30	16.90	0.00	0.00					
BH104	60	0.00	0.10	17.90	0.00	0.00	0.00	1.40	4.68	1.57	6.246
	120	0.00	0.10	17.90	0.00	0.00					
	240	0.00	0.10	17.90	0.00	0.00					
BH105	60	0.00	0.00	14.10	0.00	0.00	0.00	0.40	4.03	2.22	6.254
	120	0.00	0.00	14.10	0.00	0.00					
	240	0.00	0.00	14.10	0.00	0.00					

APPENDICES

LOW FLOW SAMPLING PARAMETERS

Project: Manor Road, Richmond
Title: Low flow groundwater sampling parameters

BH101

Date Time	RDO (mg/L)	RDO (%Sat)	Actual Cond (µS/cm)	Temp (°C)	Specific Cond (µS/cm)	Salinity (PSU)	TDS (ppt)	pH	pH mV (mV)	ORP (mV)
05/05/2021 10:42	7.713585	77.23751	668.1374	15.11404	823.6628	0.4066848	0.5353808	8.380178	-79.69743	68.12289
05/05/2021 10:43	1.801131	17.65158	660.3032	14.1179	833.5562	0.4112798	0.5418115	8.408581	-80.95766	69.90865
05/05/2021 10:44	0.8812332	8.457654	657.9756	13.17078	850.0297	0.4191783	0.5525193	8.426181	-81.67908	69.56227
05/05/2021 10:45	0.6462054	6.133173	656.4459	12.67223	858.616	0.4232542	0.5581004	8.427472	-81.60744	68.86504
05/05/2021 10:46	0.4581451	4.316171	655.8508	12.34008	865.0154	0.4263009	0.56226	8.424559	-81.35359	67.8484
05/05/2021 10:47	0.377678	3.547046	655.0607	12.20251	866.9779	0.4272072	0.5635357	8.416949	-80.89933	66.8737
05/05/2021 10:48	0.3584114	3.352278	654.3108	12.02267	869.9403	0.4285914	0.5654612	8.407463	-80.33058	65.83188
05/05/2021 10:49	0.3818104	3.570752	654.348	12.01759	870.1019	0.4286702	0.5655662	8.39649	-79.73145	65.0733
05/05/2021 10:50	0.3366215	3.148088	654.0021	12.01967	869.5961	0.4284134	0.5652375	8.386305	-79.17606	64.52388
05/05/2021 10:51	0.3100819	2.90106	655.4849	12.0367	871.1909	0.4292408	0.566274	8.37446	-78.53481	63.99355
05/05/2021 10:52	0.3183666	2.980915	655.2318	12.0733	870.0461	0.4286825	0.56553	8.362201	-77.87997	63.63115
05/05/2021 10:53	0.314369	2.946393	655.0823	12.11124	869.0115	0.4281812	0.5648575	8.346134	-77.01004	63.54078
05/05/2021 10:54	0.2920138	2.736843	654.6047	12.11308	868.3375	0.4278381	0.5644194	8.33438	-76.36929	63.04823
05/05/2021 10:55	0.2586502	2.421644	654.0107	12.06799	868.5419	0.4279098	0.5645522	8.32434	-75.80959	62.56103
05/05/2021 10:56	0.2176058	2.033168	652.9325	11.97938	869.0632	0.4281114	0.5648911	8.319927	-75.54541	62.10019

BH102

Date Time	RDO (mg/L)	RDO (%Sat)	Actual Cond (µS/cm)	Temp (°C)	Specific Cond (µS/cm)	Salinity (PSU)	TDS (ppt)	pH	pH mV (mV)	ORP (mV)
05/05/2021 10:13	7.556651	74.23085	730.4267	14.21008	920.0342	0.4556993	0.5980222	8.660214	-94.83688	121.2939
05/05/2021 10:14	7.200423	70.66264	721.5174	14.16933	909.7041	0.450364	0.5913076	8.614758	-92.32573	104.9369
05/05/2021 10:15	6.911228	67.82539	720.3942	14.16412	908.4019	0.4496917	0.5904613	8.576219	-90.2065	93.85905
05/05/2021 10:16	6.707414	65.84639	720.8614	14.18246	908.5897	0.4497985	0.5905833	8.550323	-88.78932	86.01592
05/05/2021 10:17	6.598314	64.8259	720.5057	14.21325	907.4686	0.4492395	0.5898547	8.525223	-87.42088	78.50063
05/05/2021 10:18	6.402911	62.96823	719.4929	14.26148	905.1428	0.4480707	0.5883428	8.49988	-86.04246	71.43269
05/05/2021 10:19	6.194984	60.97193	717.878	14.30086	902.2576	0.4466094	0.5864674	8.479771	-84.94746	66.62542
05/05/2021 10:20	6.001934	58.94492	717.4919	14.20103	903.9386	0.4474182	0.5875601	8.460907	-83.88134	61.10301
05/05/2021 10:21	5.669492	55.66006	719.9942	14.17816	907.5905	0.4492825	0.5899339	8.447599	-83.14591	56.95773
05/05/2021 10:22	2.830679	27.85766	721.6919	14.29475	907.1841	0.4491384	0.5896697	8.42918	-82.1646	53.44404
05/05/2021 10:23	1.205499	11.86955	718.9145	14.32755	902.9816	0.4469961	0.5869381	8.412368	-81.24643	49.79145
05/05/2021 10:24	0.9306892	9.127595	715.3638	14.1367	902.6547	0.4467225	0.5867255	8.401535	-80.60056	47.28468
05/05/2021 10:25	1.103255	10.77306	712.7466	13.93971	903.6425	0.4471175	0.5873676	8.399355	-80.42566	44.15204
05/05/2021 10:26	0.920544	8.95225	711.3823	13.75588	905.9456	0.4481923	0.5888646	8.396805	-80.23419	41.84929
05/05/2021 10:27	0.9257274	8.985035	711.4564	13.66727	907.9969	0.4491925	0.590198	8.392066	-79.9495	39.77244

BH103

Date Time	RDO (mg/L)	RDO (%Sat)	Actual Cond (µS/cm)	Temp (°C)	Specific Cond (µS/cm)	Salinity (PSU)	TDS (ppt)	pH	pH mV (mV)	ORP (mV)
05/05/2021 11:54	7.854099	78.85471	614.6922	15.2622	755.1427	0.3717332	0.4908428	8.444586	-83.29088	66.68552
05/05/2021 11:55	1.908258	18.89764	609.6241	14.61986	760.3771	0.3741436	0.4942451	8.525248	-87.52925	74.56171
05/05/2021 11:56	0.5908131	5.794157	608.7193	14.20306	766.8629	0.3772646	0.4984609	8.551888	-88.87122	76.82431
05/05/2021 11:57	0.3603535	3.510677	607.2022	13.89342	770.6937	0.3790705	0.5009509	8.548281	-88.58092	76.8114
05/05/2021 11:58	0.2784219	2.694971	604.6499	13.57339	773.455	0.3803175	0.5027457	8.5406	-88.05513	75.88409
05/05/2021 11:59	0.2340062	2.249701	603.3826	13.26607	777.6732	0.3823043	0.5054876	8.526593	-87.20631	74.41362
05/05/2021 12:00	0.2204192	2.115569	606.7093	13.19312	783.3676	0.3851647	0.509189	8.507113	-86.11819	73.39217
05/05/2021 12:01	0.2062463	1.978378	607.6974	13.16553	785.1776	0.3860715	0.5103654	8.488784	-85.10545	72.29496
05/05/2021 12:02	0.1948431	1.868985	607.8431	13.16349	785.4055	0.3861865	0.5105136	8.472677	-84.22292	71.2588
05/05/2021 12:03	0.1852591	1.775463	607.0056	13.12517	785.0657	0.3859922	0.5102927	8.452774	-83.1222	70.25278
05/05/2021 12:04	0.1746506	1.673551	604.7597	13.11855	782.2891	0.3845743	0.5084879	8.438547	-82.34122	69.36745
05/05/2021 12:05	0.1579125	1.513112	602.097	13.1181	778.8534	0.3828245	0.5062547	8.425121	-81.60609	68.66571
05/05/2021 12:06	0.1571626	1.508888	599.1669	13.20772	773.3507	0.3800721	0.502678	8.408623	-80.72845	67.90296
05/05/2021 12:07	0.1562812	1.502141	595.3541	13.25695	767.4979	0.3771196	0.4988736	8.398083	-80.16466	67.75018
05/05/2021 12:08	0.1487668	1.431327	586.3081	13.30412	754.9594	0.3707662	0.4907236	8.384337	-79.42491	66.55438

BH104

Date Time	RDO (mg/L)	RDO (%Sat)	Actual Cond (µS/cm)	Temp (°C)	Specific Cond (µS/cm)	Salinity (PSU)	TDS (ppt)	pH	pH mV (mV)	ORP (mV)
05/05/2021 09:43	9.312669	94.31985	389.2034	15.68669	473.4167	0.2296761	0.3077209	8.687489	-96.83071	197.6958
05/05/2021 09:44	3.01545	29.78647	382.5605	14.52226	478.2752	0.231836	0.3108789	8.73497	-99.0365	156.0789
05/05/2021 09:45	2.312242	22.40708	380.3952	13.64614	485.7299	0.2353119	0.3157244	8.747896	-99.45983	140.4572
05/05/2021 09:46	2.168454	20.76633	378.4934	13.11353	489.6621	0.2371057	0.3182804	8.753529	-99.56835	132.3889
05/05/2021 09:47	2.032953	19.29364	377.9351	12.70611	493.9122	0.2390853	0.321043	8.75579	-99.56538	126.2875
05/05/2021 09:48	1.985983	18.79078	379.8044	12.57513	497.9832	0.2410663	0.3236891	8.741215	-98.72332	120.9547
05/05/2021 09:49	1.940698	18.43806	381.0872	12.74226	497.5828	0.2409259	0.3234288	8.728199	-98.07315	117.1655
05/05/2021 09:50	1.900233	18.12527	381.6316	12.93248	495.9408	0.2401734	0.3223615	8.719353	-97.65157	113.6895
05/05/2021 09:51	1.872091	17.909	382.3911	13.0647	495.3023	0.2398995	0.3219465	8.710004	-97.18412	112.5821
05/05/2021 09:52	1.849281	17.72472	382.3281	13.14524	494.2359	0.2393946	0.3212534	8.70082	-96.71082	108.749
05/05/2021 09:53	1.838203	17.61024	381.5777	13.1279	493.4771	0.2390109	0.3207601	8.694304	-96.34608	106.4446
05/05/2021 09:54	1.822003	17.42799	381.7734	13.05921	494.5694	0.2395325	0.3214701	8.689225	-96.04498	104.2928
05/05/2021 09:55	1.798749	17.20867	382.6132	13.06584	495.576	0.2400362	0.3221244	8.687118	-95.93182	102.2902
05/05/2021 09:56	1.780209	17.04882	381.556	13.1076	493.6967	0.2391136	0.3209029	8.681256	-95.62495	100.6576
05/05/2021 09:57	1.769164	16.89458	381.6548	12.97907	495.398	0.2399186	0.3220087	8.681218	-95.57556	99.0428

BH105

Date Time	RDO (mg/L)	RDO (%Sat)	Actual Cond (µS/cm)	Temp (°C)	Specific Cond (µS/cm)	Salinity (PSU)	TDS (ppt)	pH	pH mV (mV)	ORP (mV)
05/05/2021 11:09	9.233512	87.19529	297.5347	12.52288	390.6259	0.1878497	0.2539069	8.489305	-84.94285	53.2842
05/05/2021 11:10	2.834426	26.65323	288.3651	12.32883	380.4386	0.1827776	0.2472851	8.534806	-87.36933	36.66759
05/05/2021 11:11	1.316173	12.31678	286.8521	12.11583	380.4847	0.1827408	0.2473151	8.561427	-88.75644	29.19265
05/05/2021 11:12	1.118409	10.43116	286.2044	11.9681	381.0517	0.1829775	0.2476836	8.588018	-90.16037	26.54598
05/05/2021 11:13	1.008641	9.381794	285.9891	11.86282	381.7871	0.1833085	0.2481616	8.611401	-91.397	25.57231
05/05/2021 11:14	0.9173736	8.517929	285.5616	11.77821	382.0408	0.1834081	0.2483265	8.630667	-92.42249	25.61559
05/05/2021 11:15	0.8525192	7.909876	285.3089	11.74223	382.0539	0.1834038	0.248335	8.649614	-93.44305	25.69355
05/05/2021 11:16	0.8036265	7.463638	286.9645	11.78006	383.8995	0.1843232	0.2495347	8.666391	-94.37147	26.13738
05/05/2021 11:17	0.7597883	7.086498	288.3802	11.96972	383.9328	0.1843958	0.2495563	8.682321	-95.30289	26.35827
05/05/2021 11:18	0.7724446	7.232401	289.0989	12.13975	383.2326	0.1841002	0.2491012	8.695709	-96.09018	26.35078
05/05/2021 11:19	0.7282129	6.827741	287.7785	12.19998	380.9014	0.1829696	0.2475859	8.705824	-96.66245	26.39953
05/05/2021 11:20	0.7026778	6.601953	290.0841	12.29278	383.0545	0.1840556	0.2489854	8.714114	-97.1464	26.39124
05/05/2021 11:21	0.693967	6.538225	290.9618	12.4142	383.0404	0.1840822	0.2489763	8.723189	-97.68332	26.3683
05/05/2021 11:22	0.7013745	6.607172	289.1287	12.40891	380.6777	0.1829172	0.2474405	8.729288	-98.01459	26.37948
05/05/2021 11:23	0.6716852	6.311593	287.6305	12.29461	379.7969	0.1824522	0.246868	8.735367	-98.30719	26.37241

APPENDICES

APPENDIX E SPT CALIBRATION CERTIFICATES

SPT Hammer Energy Test Report

In accordance with BSEN ISO 22476-3:2005

Southern Testing
Unit 11
Charlwood Road
East Grinstead
West Sussex
RH19 2HU

SPT Hammer Ref: 110RP113
Test Date: 21/09/2020
Report Date: 21/09/2020
File Name: 110RP113.spt
Test Operator: NPB

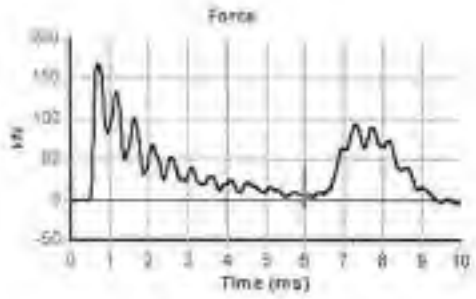
Instrumented Rod Data

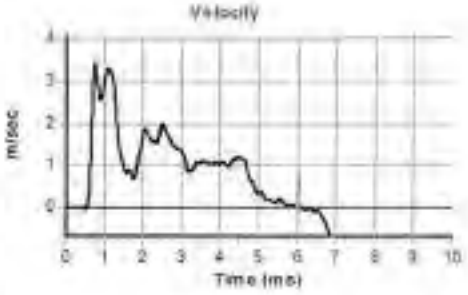
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.3
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	6458
Accelerometer No.2:	9607

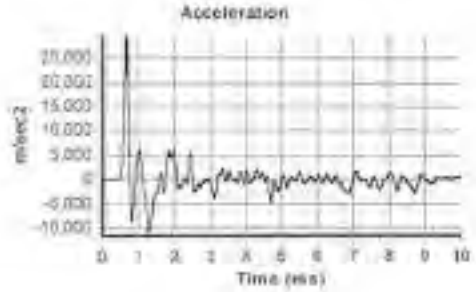
SPT Hammer Information

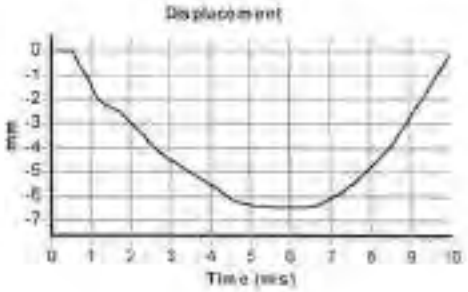
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

Comments / Location
CHARLWOODS









Calculations

Area of Rod A (mm2):	944
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	384

Energy Ratio E_r (%): **81**

Signed: Neil Burrows
Title: Field Operations Manager

The recommended calibration interval is 12 months

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing
Unit 11
Charlwood Road
East Grinstead
West Sussex
RH19 2HU

SPT Hammer Ref:	110RP88
Test Date:	23/09/2020
Report Date:	23/09/2020
File Name:	110RP88.spt
Test Operator:	NPB

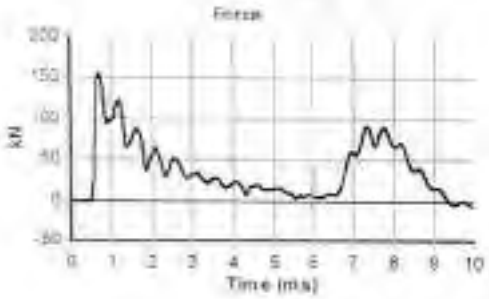
Instrumented Rod Data

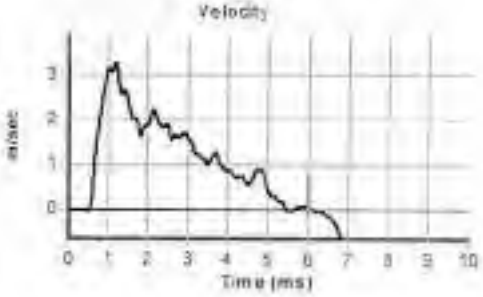
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.3
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	6458
Accelerometer No.2:	9607

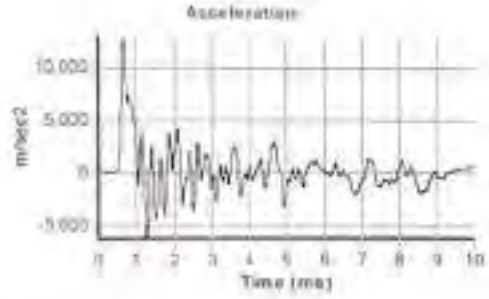
SPT Hammer Information

Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

Comments / Location
CHARLWOODS







Calculations

Area of Rod A (mm2):	944
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	384

Energy Ratio E_r (%): **81**

Signed: Stuart Simmonds
Title: Field Operations Technician

The recommended calibration interval is 12 months

APPENDICES

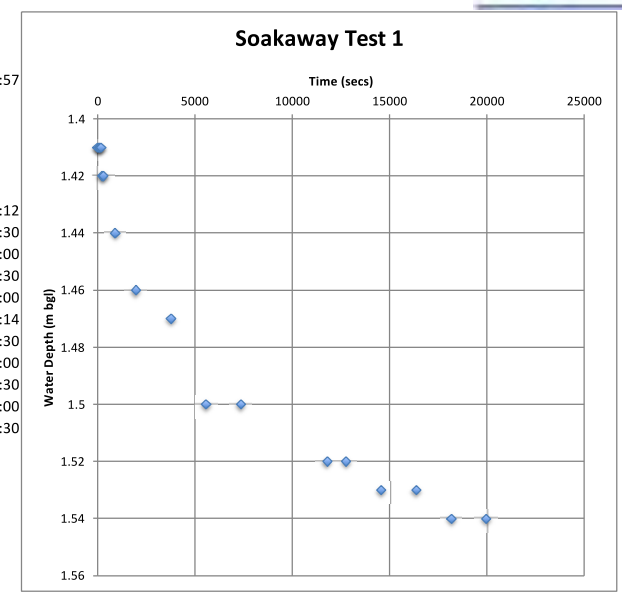
APPENDIX F SOAKAWAY INFILTRATION TEST WORKSHEETS

LMB GEOSOLUTIONS LTD

Soakaway Test (TP101)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)		
1.41	0	0	09:57
1.41	60	1	
1.41	120	2	
1.41	180	3	
1.42	240	4	
1.42	300	5	
1.44	900	15	10:12
1.46	1980	33	10:30
1.47	3780	63	11:00
1.5	5580	93	11:30
1.5	7380	123	12:00
1.52	11820	197	13:14
1.52	12780	213	13:30
1.53	14580	243	14:00
1.53	16380	273	14:30
1.54	18180	303	15:00
1.54	19980	333	15:30



Dimensions (m)

Depth	2.32
Top Length	1.6
Base Length	1.3
Width	0.6

Infiltration Test Calcualtion

Soil Infiltration Rate

f = Vp75 - 25 / ap50 x tp75 - 25 = FAIL m/s

i) Vp75 - 25

Applying and effective storage depth of = 0.91

d25 = 1.6375

d75 = 2.0925

Vp75 - 25 = 0.40 m^3

ii) ap50

ap50 = 2.74 m^2

iii) tp75 - 25

tp75 - 25 = N/A seconds

Notes

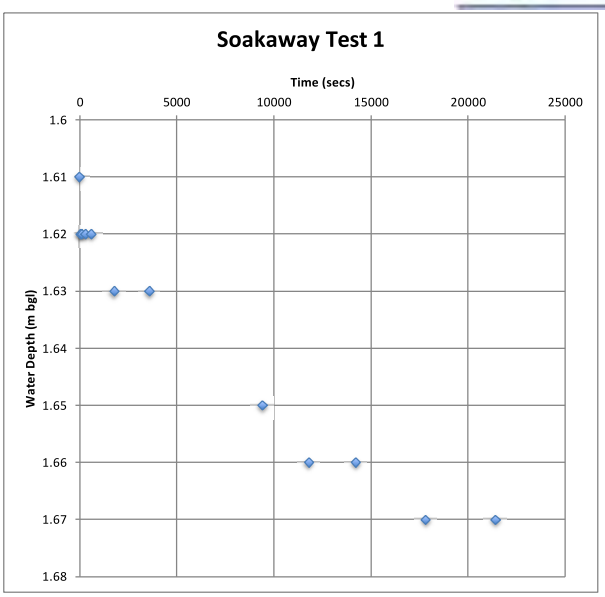
1. Invert Level assumed to be coincident with start depth of water.
2. Soil infiltration rate is calculated from the time taken for the water level to fall from 75% to 25% effective depth.

LMB GEOSOLUTIONS LTD

Soakaway Test (TP102)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)		
1.61	0	0	09:33
1.62	60	1	
1.62	120	2	
1.62	300	5	
1.62	600	10	
1.63	1800	30	
1.63	3600	60	
1.65	9420	157	11:10
1.66	11820	197	
1.66	14220	237	
1.67	17820	297	
1.67	21420	357	



Dimensions (m)

Depth	2.31
Top Length	1.7
Base Length	1.5
Width	0.6

Infiltration Test Calcualtion

Soil Infiltration Rate

f = Vp75 - 25 / ap50 x tp75 - 25 = FAIL m/s

i) Vp75 - 25

Applying and effective storage depth of = *0.70*

d25 = 1.785

d75 = 2.135

Vp75 - 25 = 0.34 m^3

ii) ap50

ap50 = 2.50 m^2

iii) tp75 - 25

tp75 - 25 = N/A seconds

Notes

1. Invert Level assumed to be coincident with start depth of water.

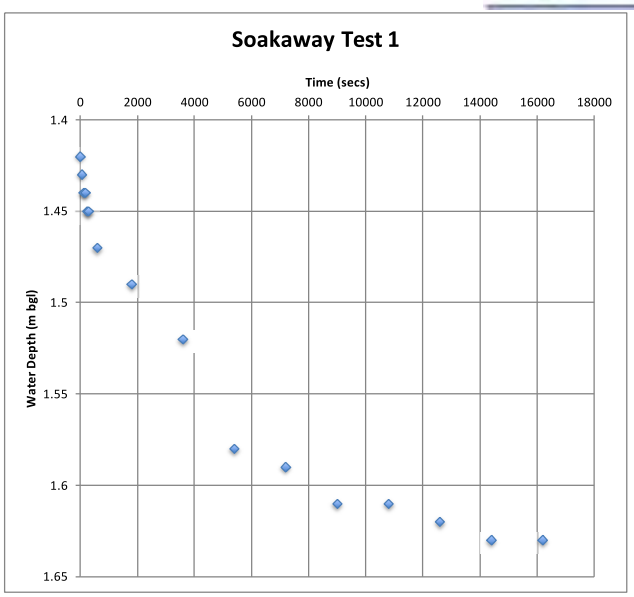
2. Soil infiltration rate is calculated from the time taken for the water level to fall from 75% to 25% effective depth.

LMB GEOSOLUTIONS LTD

Soakaway Test (TP103)

(Based on BRE Digets 365: Soakaway Design)

depth (bgl)	time (sec)	
1.42	0	0
1.43	60	1
1.44	120	2
1.44	180	3
1.45	240	4
1.45	300	5
1.47	600	10
1.49	1800	30
1.52	3600	60
1.58	5400	90
1.59	7200	120
1.61	9000	150
1.61	10800	180
1.62	12600	210
1.63	14400	240
1.63	16200	270



Dimensions (m)

Depth	2.46
Top Length	1.7
Base Length	1.3
Width	0.6

Infiltration Test Calcualtion

Soil Infiltration Rate

f = Vp75 - 25 / ap50 x tp75 - 25 = FAIL m/s

i) Vp75 - 25

Applying and effective storage depth of = *1.04*

d25 = 1.68

d75 = 2.2

Vp75 - 25 = 0.47 m^3

ii) ap50

ap50 = 3.08 m^2

iii) tp75 - 25

tp75 - 25 = N/A seconds

Notes

1. Invert Level assumed to be coincident with start depth of water.

2. Soil infiltration rate is calculated from the time taken for the water level to fall from 75% to 25% effective depth.

APPENDICES

APPENDIX G GAS ANALYSER & PID CALIBRATION CERTIFICATES

TEST DATE AND CONDITIONS		
Date	10/06/2020	
Atmospheric Pressure	998	mB
Ambient Temperature	22.2	°C
Environics Serial No.	5089	

GFM436 Final Inspection & Calibration Check Certificate

GAS DATA LTD
Unit 4, Fairfield Court
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LJ
Tel 02476303311 Fax 02476307711

Customer	LMB Geosolutions Ltd
Certificate Number	121787
Order Number	325987

Serial Number	12102
Software Version	G436-00.0027/0009

Recalibration DUE Date
10/06/21

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	500	(Range = 200 to 800)	Pump Flow @ 200ml/	300	Accept = 200 to 400
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
	CH_4		CO_2		O_2	
Sensor	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %
	60.2	60	39.5	40	20.9	20.9
	Accept ±3.0		Accept ±3.0		Accept ±0.3	
	5	5	5	5	6	6
	Accept ±0.3		Accept ±0.3		Accept ±0.3	
Zero Reading 100% N2	0	0	0	0	0	0
	Accept ±0.0		Accept ±0.0		Accept ±0.3	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings (ppm)			
			Zero Reading		Instrument Gas Reading	
Gas Type	Range (ppm)					
H2S	5000	1500	0	Accept ±0.0	1500	Accept ±5.0
CO	2000	1000	0	Accept ±0.0	1000	Accept ±5.0
Hexane	2.0%	2.0%	0	Accept ±0.0	1.99	Accept ±10.0

Calibration Certificate

Calibration Date: 28/10/2020

Customer: LMB Geosolutions
Model: MiniRAE Lite (PGM-7350)
Serial Number: 595-002144
Date of Purchase: 11/07/2017
Date of Last In-Situ Calibration: 31/10/2019

Visual Inspection: New inlet plastic filter fitted.

Calibrated at 0 ppm
Calibrated at 100 ppm
Method: Isobutelene Gas:- Batch No: WO229218-2

APPENDIX C – ASSESSMENT SCREENING TABLES

Exceedances

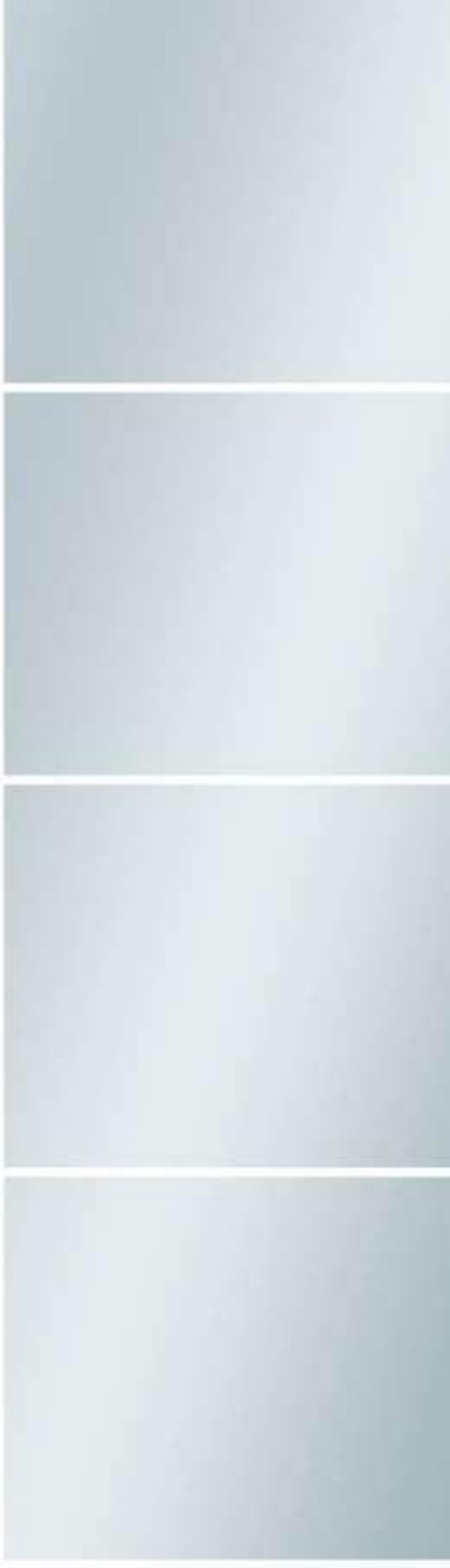
DWS | EQS | Both

Analyte	Units	Location		BH101	BH102	BH103	BH104	BH105
		Date		05/05/2021	05/05/2021	05/05/2021	05/05/2021	05/05/2021
		DWS (µg/l)	EQS (µg/l)					
pH	pH			6.9	7	6.8	7.5	8.1
Electrical Conductivity at 20 °C	uS/cm			780	810	680	450	350
Total Cyanide	µg/l	50		21	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l			21	< 10	< 10	< 10	< 10
Free Cyanide	µg/l		1	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l			121000	84700	156000	90900	14600
Sulphide	µg/l			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l			67	90	47	23	49
Ammoniacal Nitrogen as N	µg/l			110	-	24	-	-
Ammoniacal Nitrogen as NH3	µg/l	500	15	130	-	29	-	-
Ammoniacal Nitrogen as NH4	µg/l			140	47	30	680	800
Total Organic Carbon (TOC)	mg/l			3.32	4.17	3.5	11.3	4.23
Total Phenols								
Total Phenols (monohydric)	µg/l			< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l		2.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l		0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l		0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l		0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.1		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.1	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.1		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l		0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l			< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	1000	2000	170	110	200	32	58
Calcium (dissolved)	mg/l			140	130	110	93	43
Chromium (hexavalent)	µg/l		3.4	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	200	1000	0.018	0.02	0.046	0.016	0.1
Magnesium (dissolved)	mg/l			10	7.7	11	4.9	1.6
Phosphorus (dissolved)	µg/l			97.2	40.3	208	51.9	385
Potassium (dissolved)	mg/l			12	13	15	4.8	5.4
Sodium (dissolved)	mg/l			63	83	55	22	57
Antimony (dissolved)	µg/l	5		0.4	< 0.4	< 0.4	23	0.7
Arsenic (dissolved)	µg/l	10	50	0.71	2.54	0.94	0.75	2.98
Barium (dissolved)	µg/l	700		53	63	57	84	14
Beryllium (dissolved)	µg/l	4		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	5	0.25	< 0.02	< 0.02	< 0.02	0.03	< 0.02
Chromium (dissolved)	µg/l			1.3	1.5	1.1	1	0.7
Cobalt (dissolved)	µg/l		3	0.7	0.9	2.6	0.3	0.6
Copper (dissolved)	µg/l	2000	1	2.7	4	1.3	9.2	2.5
Lead (dissolved)	µg/l	25	7.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	50		93	96	390	9.6	39
Mercury (dissolved)	µg/l	1	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l			0.92	0.76	0.37	3.5	1.7
Nickel (dissolved)	µg/l	20	20	3.8	5.2	5.2	3.1	1.8
Selenium (dissolved)	µg/l	10		1.5	1	1.9	< 0.6	< 0.6
Tin (dissolved)	µg/l		25	0.26	< 0.20	< 0.20	0.72	< 0.20
Vanadium (dissolved)	µg/l		20	0.9	4.6	0.6	1.9	1.7
Zinc (dissolved)	µg/l	3000	8	8.9	19	4.3	11	2.7
Monoaromatics & Oxygenates								
Benzene	µg/l	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	700	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	300	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40)	µg/l			< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25)	µg/l			< 10	< 10	< 10	< 10	< 10
TPH1 (C10 - C40)	µg/l			< 10	< 10	< 10	< 10	< 10
TPH2 (C6 - C10)	µg/l			< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6	µg/l	300	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	300	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	300	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	300	20	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	300	20	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l			< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l			< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l			< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	700	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	300	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	100	20	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	100	20	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	90	20	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	90	20	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l			< 10	< 10	< 10	< 10	< 10
VOCs								
Chloromethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	0.5		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	200	100	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	700	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	5	400	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	10		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	0.4		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	100		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	300	20	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/l	20	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l		600	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l		80	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
SVOCs								
Aniline	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	7.7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	2.4		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l		0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l		0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l		0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.1	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.1	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.1	0.002	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l		0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.1	0.002	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l			< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PCBs by GC-MS								
PCB Congener 28	µg/l			-	< 0.02	-	-	-
PCB Congener 52	µg/l			-	< 0.02	-	-	-
PCB Congener 101	µg/l			-	< 0.02	-	-	-
PCB Congener 118	µg/l			-	< 0.02	-	-	-
PCB Congener 138	µg/l			-	< 0.02	-	-	-
PCB Congener 153	µg/l			-	< 0.02	-	-	-
PCB Congener 180	µg/l			-	< 0.02	-	-	-
PCBs by GC-MS								
Total PCBs	µg/l		25 - biphenyl	-	< 0.14	-	-	-
Pesticide and Herbicide Screen								
GC/MS Pesticide Screen				-	None Detected	None Detected	-	None Detected

Human Health Screening Table
Residentiial Without Plant Uptake GAC (SOM 1%)

Exceedance

Analyte	Unit	GAC (mg/kg)	Location	BH101	BH102	BH103	BH104	BH105	TP101	TP102	TP103
			Depth (m bgl)	0.80	0.50	0.20	1.80	0.50	0.80	0.40	0.5
Asbestos in Soil Screen / Identification Name	Type			-	-			-		Chrysotile	Chrysotile
Asbestos in Soil	Type			Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Detected	Detected
Asbestos Quantification (Stage 2)	%			-	-	-	-	-	-	0.005	0.008
Asbestos Quantification Total	%			-	-	-	-	-	-	0.005	0.008
General Inorganics											
pH - Automated	pH Units			7.9	10.3	7.7	7.9	7.7	7.4	10.1	9.5
Total Cyanide	mg/kg	34 (free)		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	120	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg			3800	6100	630	240	4000	1000	1000	1500
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l			0.095	0.67	0.022	0.096	0.46	0.46	0.15	0.17
Sulphide	mg/kg			2.8	17	21	3.2	13	140	17	33
Organic Matter	%			-	-	-	-	1.1	1.8	-	
Total Organic Carbon (TOC)	%			5	0.5	0.1	0.2	0.6	1.1	0.2	0.2
Total Phenols											
Total Phenols (monohydric)	mg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs											
Naphthalene	mg/kg	2.3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	2900		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	3000		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	2800		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	1300		2	1.7	< 0.05	0.59	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	31000		0.46	0.44	< 0.05	0.27	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	1500		4.6	2.6	0.35	1.9	0.49	< 0.05	< 0.05	0.39
Pyrene	mg/kg	3700		4.3	2.8	0.39	1.9	0.74	< 0.05	< 0.05	0.42
Benzo(a)anthracene	mg/kg	11		2.6	1.5	< 0.05	0.71	< 0.05	< 0.05	< 0.05	0.38
Chrysene	mg/kg	30		3	1.5	< 0.05	1.2	< 0.05	< 0.05	< 0.05	0.33
Benzo(b)fluoranthene	mg/kg	3.9		3.3	1.4	< 0.05	1.1	< 0.05	< 0.05	< 0.05	0.47
Benzo(k)fluoranthene	mg/kg	110		2.1	0.55	< 0.05	0.72	< 0.05	< 0.05	< 0.05	0.27
Benzo(a)pyrene	mg/kg	3.2		3.2	1	< 0.05	1.1	< 0.05	< 0.05	< 0.05	0.46
Indeno(1,2,3-cd)pyrene	mg/kg	45		1.6	0.67	< 0.05	0.6	< 0.05	< 0.05	< 0.05	0.35
Dibenz(a,h)anthracene	mg/kg	0.31		0.54	0.24	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	360		2	0.71	< 0.05	0.72	< 0.05	< 0.05	< 0.05	0.4
Total PAH											
Speciated Total EPA-16 PAHs	mg/kg			29.7	15.1	< 0.80	10.8	1.23	< 0.80	< 0.80	3.47
Heavy Metals / Metalloids											
Arsenic (aqua regia extractable)	mg/kg	40		65	14	26	20	9.9	15	14	11
Boron (water soluble)	mg/kg	11000		1.3	2.6	0.3	< 0.2	0.6	1.8	0.5	0.2
Cadmium (aqua regia extractable)	mg/kg	85		1	0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	6		< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	910		20	25	11	27	22	28	19	14
Copper (aqua regia extractable)	mg/kg	7100		110	37	11	15	28	62	35	9.4
Lead (aqua regia extractable)	mg/kg	310		440	120	58	20	40	270	140	52
Mercury (aqua regia extractable)	mg/kg	15		1.3	0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	180		33	19	9.9	22	15	17	17	12
Selenium (aqua regia extractable)	mg/kg	430		< 1.0	< 1.0	3.6	2.2	< 1.0	2.9	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	40000		310	130	140	63	68	130	150	96
Monoaromatics & Oxygenates											
Benzene	µg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons											
TPH C10 - C40	mg/kg			74	220	< 10	100	470	49	< 10	190
TPH-CWG - Aliphatic >EC5 - EC8	mg/kg	42		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC8	mg/kg	100		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	27		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	130		< 1.0	1.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	1100		< 2.0	5.9	< 2.0	2.6	10	13	< 2.0	4
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg			< 8.0	16	< 8.0	< 8.0	35	18	< 8.0	18
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg			< 8.0	62	< 8.0	41	250	18	< 8.0	91
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg			< 10	85	< 10	49	300	49	< 10	110
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	370		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	860		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	47		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	250		7.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	1800		12	7	< 2.0	< 2.0	5.7	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	1900		19	24	< 10	14	24	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	1900		36	62	< 10	32	85	< 10	< 10	34
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg			74	93	< 10	46	110	< 10	< 10	37
VOCs											
Chloromethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Chloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Bromomethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Vinyl Chloride	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Trichlorofluoromethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1-Dichloroethene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Cis-1,2-dichloroethene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1-Dichloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
2,2-Dichloropropane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Trichloromethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1,1-Trichloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2-Dichloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1-Dichloropropene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Trans-1,2-dichloroethene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Benzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Tetrachloromethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2-Dichloropropane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Trichloroethene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Dibromomethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Bromodichloromethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Cis-1,3-dichloropropene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Trans-1,3-dichloropropene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Toluene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1,2-Trichloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,3-Dichloropropane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Dibromochloromethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Tetrachloroethene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2-Dibromoethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Chlorobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1,1,2-Tetrachloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Ethylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
p & m-Xylene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Styrene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Tribromomethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
o-Xylene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,1,2,2-Tetrachloroethane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Isopropylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Bromobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
n-Propylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
2-Chlorotoluene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
4-Chlorotoluene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,3,5-Trimethylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
tert-Butylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2,4-Trimethylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
sec-Butylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,3-Dichlorobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
p-Isopropyltoluene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2-Dichlorobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,4-Dichlorobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Butylbenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2-Dibromo-3-chloropropane	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2,4-Trichlorobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
Hexachlorobutadiene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
1,2,3-Trichlorobenzene	µg/kg			-	< 1.0	-	-	-	< 1.0	-	
SVOCs											
Aniline	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
Phenol	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
2-Chlorophenol	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
Bis(2-chloroethyl)ether	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
1,3-Dichlorobenzene	mg/kg	0.44		-	< 0.2	-	-	-	0.5	-	
1,2-Dichlorobenzene	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
1,4-Dichlorobenzene	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
Bis(2-chloroisopropyl)ether	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
2-Methylphenol	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Hexachloroethane	mg/kg			-	< 0.05	-	-	-	< 0.05	-	
Nitrobenzene	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
4-Methylphenol	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
Isophorone	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
2-Nitrophenol	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
2,4-Dimethylphenol	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Bis(2-chloroethoxy)methane	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
1,2,4-Trichlorobenzene	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Naphthalene	mg/kg			-	< 0.05	-	-	-	< 0.05	-	
2,4-Dichlorophenol	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
4-Chloroaniline	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
Hexachlorobutadiene	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
4-Chloro-3-methylphenol	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
2,4,6-Trichlorophenol	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
2,4,5-Trichlorophenol	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
2-Methylnaphthalene	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
2-Chloronaphthalene	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
Dimethylphthalate	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
2,6-Dinitrotoluene	mg/kg			-	< 0.1	-	-	-	< 0.1	-	
Acenaphthylene	mg/kg	2900		-	< 0.05	-	-	-	< 0.05	-	
Acenaphthene	mg/kg	3000		-	< 0.05	-	-	-	< 0.05	-	
2,4-Dinitrotoluene	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
Dibenzofuran	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
4-Chlorophenyl phenyl ether	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Diethyl phthalate	mg/kg	1800		-	< 0.2	-	-	-	< 0.2	-	
4-Nitroaniline	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
Fluorene	mg/kg	2800		-	< 0.05	-	-	-	< 0.05	-	
Azobenzene	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Bromophenyl phenyl ether	mg/kg			-	< 0.2	-	-	-	< 0.2	-	
Hexachlorobenzene	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Phenanthrene	mg/kg	1300		-	1.7	-	-	-	< 0.05	-	
Anthracene	mg/kg	31000		-	0.44	-	-	-	< 0.05	-	
Carbazole	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Dibutyl phthalate	mg/kg	450		-	< 0.2	-	-	-	< 0.2	-	
Anthraquinone	mg/kg			-	< 0.3	-	-	-	< 0.3	-	
Fluoranthene	mg/kg	1500		-	2.6	-	-	-	< 0.05	-	
Pyrene	mg/kg	3700		-	2.8	-	-	-	< 0.05	-	
Butyl benzyl phthalate	mg/kg	42000		-	< 0.3	-	-	-	< 0.3	-	
Benzo(a)anthracene	mg/kg	11		-	1.5	-	-	-	< 0.05	-	
Chrysene	mg/kg	30		-	1.5	-	-	-	< 0.05	-	
Benzo(b)fluoranthene	mg/kg	3.9		-	1.4	-	-	-	< 0.05	-	
Benzo(k)fluoranthene	mg/kg	110		-	0.55	-	-	-	< 0.05	-	
Benzo(a)pyrene	mg/kg	3.2		-	1	-	-	-	< 0.05	-	
Indeno(1,2,3-cd)pyrene	mg/kg	45		-	0.67	-	-	-	< 0.05	-	
Dibenz(a,h)anthracene	mg/kg	0.31		-	0.24	-	-	-	< 0.05	-	
Benzo(ghi)perylene	mg/kg	360		-	0.71	-	-	-	< 0.05	-	
PCBs by GC-MS											
PCB Congener 28	mg/kg			-	-	-	-	-	< 0.001	-	
PCB Congener 52	mg/kg			-	-	-	-	-	< 0.001	-	
PCB Congener 101	mg/kg			-	-	-	-	-	< 0.001	-	
PCB Congener 118	mg/kg			-	-	-	-	-	< 0.001	-	
PCB Congener 138	mg/kg			-	-	-	-	-	< 0.001	-	
PCB Congener 153	mg/kg			-	-	-	-	-	< 0.001	-	
PCB Congener 180	mg/kg			-	-	-	-	-	< 0.001	-	
Total PCBs by GC-MS											
Total PCBs	mg/kg	220 (biphenyl)		-	-	-	-	-	< 0.007	-	



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Manor Road, Richmond

Geo-Environmental Site Investigation Report

Taylor Wimpey West London Limited

DATE OF ISSUE:
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Contents

Appendices

1.0 Introduction

a. This report has been prepared by Manhire Associates Geo-Environmental Ltd to assess the environmental risks and factors associated with the soils and groundwater encountered on the site following a programme of sampling and contaminant testing undertaken (Phase 2) at the Homebase site, located to the west of Manor Road, Richmond Upon Thames. This report supplements a previous investigation by Fairhurst [1] and should be read in conjunction with it.

b. **Planning condition 25** requires that "*Development shall not commence until a strategy to deal with the potential risks associated with any contamination of the site has been submitted to, and approved in writing by, the Local Planning Authority*"

c. A Phase 1 Geo-Environmental and Geotechnical Preliminary Risk Assessment and a Phase 2 Ground Investigation Report has previously been prepared by Fairhurst as part of the Amended Application. Their Phase I Report identified potential sources of contamination on-site and a moderate risk was identified typically. It recommended that a ground investigations be undertaken to further quantify potential risks. The Phase 2 investigation undertaken by Fairhurst in July 2021 found low levels of contamination in 2 trial pits and detected asbestos in 2 samples. The report recommended that in areas of proposed soft landscaping, the placement of an engineered capping layer formed from imported, chemically 'clean' soils be installed and noted that on completion of these remedial works it would be considered that the risks to future site users would be considered **Low.** Ground water samples analysed were largely compliant with UKDWS with limited exceedances in 4 boreholes but were considered **Low Risk** to the shallow groundwater within the Kempton Park Gravel Member. Assessment of the ground gas indicated **Very Low Risk** for the site. The report recommended a second round of ground investigations to include boreholes, window sampling groundwater monitoring and geo-environmental and geo-technical sampling and testing to supplement the existing data.

d. The purpose of this additional Phase 2 investigation and sampling was to determine the following:

- Provision of sufficient geotechnical data to provide design parameters for the economic design of the foundations, earthworks and temporary works.
- Assessment of problems and constraints associated with the construction of the works arising from the soil or ground water conditions, including temporary works, excavation, extraction and drainage.
- Consideration of changes in the stability, drainage or other geotechnical aspects of the site and the surrounding ground and buildings which may arise from the works.
- Assessment of the ground water regime.
- Sampling and testing for an environmental risk assessment in accordance with CLEA guidelines, and the Environmental Protection Act 1990.

- Pile design – assessment of pile design parameters and assessment of various capacities for various pile diameters and recommendations for factors of safety.

e. The intrusive site investigation consisted of three boreholes to a depth of 30m and a series of six continuous dynamic windowless sampler holes were carried out, supported by a programme of laboratory testing.

- The ground conditions revealed by the investigation comprised Made Ground overlying Kempton Park Gravel with London Clay at depth.

- Contamination testing found low levels of contamination, which were below the relevant trigger concentrations, however chemical analysis found some contamination above trigger levels in 3 isolated locations which will require limited remediation.

- Standpipe readings found groundwater varied across the site with readings indicating groundwater at some 2.5m depth below ground level in BH1 and some 4.2m below ground level in BH2 & BH3.

- The groundwater in BH3 was recorded at 2.36m AOD which is below the proposed basement excavation level and thus groundwater control will not be required.

f. With regards to potential remediation of soil contaminated with PAH. metals or asbestos, it is considered that where in areas of hardstanding or below building footprints, contaminants can remain in situ, as the pathway in a source-pathway-receptor model will be blocked. Where they coincide with areas of soft landscaping, remediation will be necessary. A 450mm thick cap should be utilised, comprising imported clean soils with a capillary break layer at the base underlain by a geotextile barrier. This is to block the pathway in a source-pathway-receptor model and to discourage excavation below that level.

g. **Planning Condition 26** requires that *"Prior to occupation, a verification report demonstrating the completion of works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to, and approved in writing, by the Local Planning Authority".*

h. **Planning Condition 27** requires that "If, during development, contamination not *previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until a remediation strategy detailing how this contamination will be dealt with has been submitted to and approved in writing by the Local Planning Authority".*

i. This Report also describes measures being adopted on site so that any unexpected contamination identified on site is reported and details of what the post remediation verification report needs to include.

j. This Report is prepared for the use of Taylor Wimpy West London in connection with the development. The report is not intended for, and should not be relied upon by any third party, and no responsibility is undertaken to any third party, without the express written agreement of Manhire Associates Geo-Environmental Ltd.

2.0 Site description

The site is a triangular plot of land currently occupied by Homebase and Pets at Home retail outlets with associated car parking and yard area in Richmond upon Thames. Manor Road forms the southern boundary in the northern and western are marked by railway lines. To the east of the building is car parking whilst the yard is to the north. An Autoglass repair centre and "We Buy Any Car" franchises are located within the main car park area.

Figure 1 of Appendix E illustrates the general layout of the site and its immediate environs as they presently stand.

3.0 Development proposals

It is intended to construct a series of multi-storey blocks on the site with a small basement located under Block A measuring 31m x 6m extending approximately 3m below the existing ground level.

The proposed ground floor layouts are provided at Figure 2 of Appendix E.

4.0 Geology

Published records of the British Geological Survey indicate the site to lie Kempton Park Gravel overlying London Clay at depth.

5.0 Field work

The extent of the field work was specified by the client and comprised three boreholes drilled by light percussive techniques to 30m. These were supplemented by six windowless sampler holes to a maximum of 2½m depth. The location of the exploratory points is shown on Figure 1 at Appendix E.

Representative soil and water samples were recovered from the boreholes for subsequent laboratory examination and testing; whilst Standard Penetration Tests (SPT) were carried out as appropriate. Details of the strata encountered are provided on the Borehole and Trial Pit Records at Appendix A; together with particulars of the samples recovered, groundwater observations and SPT results. The profile of SPT verses depth is provided at Figure 3 of Appendix E.

Standpipes were installed in the three percussive boreholes to allow monitoring of groundwater levels. Three sets of monitoring of the standpipes have been undertaken and the results of this are presented at Appendix B.

6.0 Laboratory testing

The following laboratory tests were conducted on samples recovered during the field work: -

- Natural moisture content: to assess the in situ condition of the soil.
- Liquid and Plastic Limits: to classify cohesive soil into behavioural groups.
- Particle size distribution: by sieve analysis to classify granular material.

- Unconsolidated undrained triaxial compression: to determine the shear strength of cohesive material and thus to assess its load bearing capacity.
- One-dimensional consolidation: to determine the deformation characteristics of clay under applied loading and unloading.
- Soluble sulphate concentration and pH value: for the specification of buried concrete.
- Soluble sulphate concentration and pH value: for the specification of buried concrete.
- Contamination: chemical analyses to detect the presence of contaminants as detailed in the Fairhurst report, viz: -

Metals & metalloids:	Total arsenic, cadmium, chromium, copper, lead, mercury, nickel
Inorganics:	Water soluble boron.
Organic:	Petroleum hydrocarbons (TPH), polyaromatic hydrocarbons (PAH), volatile organic compounds (VOC), semi volatile organic compounds (SVOC) and phenols.
Others:	Asbestos screen and Waste Acceptance Criteria (WAC) for off site disposal of construction arisings.

Results of these tests are presented at Appendix C, whilst original testing house sheets are at Appendix D.

7.0 Ground conditions

7.1 Stratigraphy

The stratigraphy of the site as revealed by the boreholes is consistent with that previously found by Fairhurst and are described in detail at Appendix A.

7.2 Groundwater

Groundwater was encountered at some 3 – 3½m depth. However, the speed of drilling, the requirement to add water in granular material and the use of casing to support the bore will have masked some inflows. Groundwater monitoring standpipes were installed in the three boreholes.

Details of all groundwater observations from the standpipes are provided on the standpipe monitoring records and Appendix B; but it should be noted that this work was undertaken at the end of a very long dry summer and water levels may be depressed below normal levels.

8.0 Discussion

8.1 General

The site has evidently already carried development and the investigation has revealed a some Made Ground to be present. It is possible that other pockets of Made Ground may also be present; perhaps deeper, of different character or associated with the remains of underground construction; even though not detected by this investigation.

All remnants of previous construction should be removed prior to redevelopment to enable the proposals to be constructed without hindrance and to perform satisfactorily.

The magnitude of the expected loading is such that piled foundations are recommended.

8.2 Piled foundations

Either driven or bored piles would be suitable in the ground conditions found at this site. However, compared with bored piling, construction of driven piles generates greater noise and vibration which is unlikely to be acceptable in this environment. In particular, high levels of ground - borne vibrations could damage nearby structures. Consideration of the various advantages and disadvantages of the different pile types suggests CFA piles to be preferred.

They avoid many of the installation difficulties that would otherwise be experienced, particularly the need for casing and the control of groundwater inflows. Parameters for their preliminary design are provided in Tables 1 and 2.

Table 1: Design parameters for CFA piles - Shaft friction

Stratum	Typical depth, m	Ultimate unit shaft friction
All material	0.0 – 3.0	Ignore
Kempton Park Gravel	3.0 - 6.0	Increases linearly from 30 to 50 kPa
London Clay	6.0 - 30.0	Increases linearly from 40 to 145* kPa

* the average unit shaft friction on the pile must not exceed 100kPa

Table 1 has been derived in conjunction with an adhesion factor of 0.6 in the cohesive London Clay. For the Kempton Park Gravel a value of 1.0 is assumed for the coefficient of earth pressure at rest (K_0) as the gravel is assumed to be over-consolidated. The ratio between the lateral earth pressure (K_s) and K_0 is taken as 0.90 for CFA piles. For these piles the angle of friction between pile shaft and soil is assumed to be equal to the angle of internal friction of the soil itself (ø').

Table 2: Design parameters for CFA piles - End bearing capacity

Stratum	Typical depth, m	Ultimate unit end bearing capacity
London Clay	6.0 - 30.0	Increases linearly from 630 to 2205 kPa

A factor of safety must be applied to derive the allowable working load from the ultimate values obtained from Tables 1 and 2. An overall value of 2.5 is commonly employed in compression.

Working pile load tests could be carried out to verify the chosen FoS on a development of this scale. This could result in a lower factor of safety than 2.5 which could result in significant cost savings. The actual factor of safety will be dependent upon the knowledge and experience of the chosen pilling contractor and agreement with relevant parties but is generally in the order of 2.25.

Tables 1 and 2 predict that a CFA pile of 600 mm diameter, bored 24 m depth, will have an allowable load capacity 1400kPa under an overall factor of safety of 2.5.

Settlement of a single pile is not expected to exceed some 1 to 1½% of the pile diameter as the working load assuming it will be carried entirely on skin friction.

Table 3 provides preliminary load capacity for bored piles in compression under a factor of safety (FoS) of 2.5 for various pile diameters.

Table 3: Pile diameters and capacities for bored piles

Depth Below g.l.	Cohesion	Ultimate Unit Capacity			Pile dia. 0.45					Pile d.a. 0.60				
		Shaft friction kPa		End Bearing	Ultimate Load Capacity Shaft friction kN		End Bearing	Total	Allowable Load Capacity	Ultimate Load Capacity Shaft friction kN		End Bearing	Total	Allowable Load Capacity
m	kPa	Gravel	L. Clay	kPa	Gravel	L. Clay	kN	kN	kN	Gravel	L. Clay	kN	kN	kN
3.0		30			0			0		0			0	
3.5		33			22			22		30			30	
4.0		37			47			47		63			63	
4.5		40			74			74		99			99	
5.0		43			104			104		138			138	
5.5		47			135			135		181			181	
6.0	70	50	42	630	170	170	160	330		226	226	178	404	
6.5	74		44	663		202	195	396			267	187	454	
7.0	77		45	695		232	171	343			309	197	506	
7.5	81		49	728		266	118	380	153		354	206	560	224
8.0	85		51	761		301	121	422	169		401	215	616	247
8.5	88		53	794		337	126	464	185		450	225	674	270
9.0	92		55	827		376	132	507	203		501	234	735	294
9.5	96		57	860		415	137	552	221		554	243	797	319
10.0	99		60	893		457	142	599	239		609	252	861	344
10.5	103		62	926		496	147	647	259		656	262	928	371
11.0	106		64	958		544	152	696	278		725	271	996	398
11.5	110		66	991		590	158	747	299		786	280	1067	427
12.0	114		68	1024		637	163	800	320		850	289	1139	456
12.5	117		70	1057		686	168	854	342		916	299	1214	486
13.0	121		72	1089		737	173	910	364		982	308	1290	516
13.5	125		75	1122		789	178	967	387		1052	317	1369	548
14.0	128		77	1155		843	184	1026	411		1123	327	1450	580
14.5	132		79	1188		898	189	1087	435		1197	336	1533	613
15.0	136		81	1221		955	194	1149	459		1273	345	1618	647
15.5	139		84	1253		1013	199	1212	485		1350	354	1703	682
16.0	143		86	1286		1073	205	1277	511		1430	364	1794	718
16.5	147		88	1319		1134	210	1344	538		1512	373	1885	754
17.0	150		90	1352		1197	215	1412	565		1596	382	1978	791
17.5	154		92	1385		1261	220	1482	593		1682	392	2073	829
18.0	158		95	1418		1327	225	1552	621		1770	401	2171	868
18.5	161		97	1450		1395	231	1626	650		1860	410	2270	908
19.0	165		99	1483		1464	236	1700	680		1952	419	2372	949
19.5	168		101	1516		1535	241	1776	710		2046	429	2475	990
20.0	172		103	1549		1607	246	1853	741		2143	438	2581	1032
20.5	176		106	1582		1681	252	1932	773		2241	447	2688	1075
21.0	179		108	1614		1756	257	2013	806		2341	458	2798	1119
21.5	183		110	1647		1833	262	2096	838		2444	466	2910	1164
22.0	187		112	1680		1911	267	2179	871		2548	476	3023	1209
22.5	190		114	1713		1991	272	2264	906		2655	484	3139	1255
23.0	194		116	1746		2073	278	2350	940		2764	494	3257	1303
23.5	198		119	1778		2156	283	2439	976		2874	503	3377	1351
24.0	201		121	1811		2240	288	2528	1011		2987	513	3499	1400
24.5	205		123	1844		2327	293	2620	1048		3103	521	3623	1449
25.0	209		125	1877		2414	299	2713	1085		3219	531	3750	1500
25.5	212		127	1910		2503	304	2807	1123		3338	540	3878	1551
26.0	216		130	1943		2594	309	2903	1161		3459	549	4008	1603
26.5	219		132	1975		2686	314	3001	1200		3582	559	4140	1656
27.0	223		134	2008		2780	319	3100	1240		3707	568	4275	1710
27.5	227		136	2041		2876	325	3200	1280		3834	577	4411	1765
28.0	230		138	2074		2973	330	3303	1321		3964	586	4550	
28.5	234		140	2107		3071	335	3406	1362		4096	596	4691	
29.0	238		143	2139		3171	340	3511			4228	605	4833	
29.5	241		145	2172		3273	346	3618			4364	614	4978	
30.0	245		147	2205		3376	351	3727			4501	623	5125	

Single piles stress soil in excess of depth of investigation: prove ground conditions throughout zone of stress before using
Pile groups should be considered separately

The actual load capacity achieved in practice depends upon the precise installation procedures. Advice should therefore be sought from specialist contractors to verify the load capacity and settlement characteristics of their particular piles in the ground conditions revealed by this investigation. In any event, it is recommended that the chosen pile configuration be confirmed by preliminary load tests conducted before installation of the contract piles in order to take advantage of minimum FoS and thus minimum cost.

8.3 Excavations

All material should be regarded as unstable. Some apparent stability may be present immediately on excavation, especially where there is a high clay content, but this must not be relied upon. All excavations should therefore be supported at all times unless battered to a safe angle of repose.

Provision of adequate support is especially important for the safety of personnel when required to work in or close to excavations. Particular care should be exercised where excavations are close to existing structures to ensure they do not experience any loss of support. Temporary and permanent works should be designed to resist the additional lateral earth pressures arising from any superimposed loads in addition to those generated by the soil itself, without significant deformation.

Groundwater was encountered at some 2½m depth in BH1 and over 4m in the other boreholes and thus is expected to be below the depth of general construction activities.

8.4 Contaminant analysis

8.4.1 Solid phase

Contaminant testing was undertaken on selected soil samples and the results compared with the limited number of CLEA[2] Soil Guideline Values (SGVs) that have been published to date. Where not available from that source, reference has also been made to the LQM CIEH Generic Assessment Criteria[3]. Appropriate trigger levels are given with the results at Appendix C.

Analysis for metals/metalloids revealed all determinands to be below the triggers for Residential land use without plant uptake.

There is no trigger presently available for lead, but the results are below the previous trigger of 450mg/kg. However, two results from BH1 & 3 are above the value of 276mg/kg provided in the AtRiskSoil database produced by Atkins and the more modern Category 4 Screening Levels of 310/kg produced by DEFRA for residential use without plant uptake.

The results for TPH analysis found very low levels that are below triggers or of little environmental interest. The PAH analysis also found the majority of determinands to be below the residential trigger levels apart from BH2,3 & WSA in which some individual determinands are above trigger levels.

Analysis for asbestos was carried out on ten selected samples. Two samples recorded some fibres being from WSB & E.

The results of this analysis are in broad agreement with that previously found by Fairhurst.

With regards to potential remediation of soil contaminated with PAH. metals or asbestos, it is considered that where in areas of hardstanding or below building footprints,

contaminants can remain in situ, as the pathway in a source-pathway-receptor model will be blocked. Where they coincide with areas of soft landscaping, remediation will be necessary.

A 450mm thick cap should be utilised, comprising imported clean soils with a capillary break layer at the base underlain by a geotextile barrier. This is to block the pathway in a source-pathway-receptor model and to discourage excavation below that level.

Nevertheless, in view of the foregoing, it is recommended that appropriate health and safety precautions, such as detailed in HS(G)66[4] and elsewhere, should be followed by the construction workforce and others who may come into contact with potentially contaminated soil. They should be agreed with the Health and Safety Executive and are likely to include, but not be restricted to, the following: -.

- maintenance of good standards of personal hygiene.
- wearing personal protective clothing that is changed and cleaned frequently to eliminate skin contact.
- prevention of ingestion by using washing and changing facilities at all break times.
- prohibition of eating, drinking or smoking between break times.
- controlling the spread of dust and airborne mists to prevent inhalation.

8.4.2 Waste Acceptance Criteria (WAC) analysis

Four samples were subject to the WAC full solid waste and leachate suite. The results are presented at Appendix D. The results have been compared to the criteria contained in the Landfill Regulations 2002 as amended and are presented at Appendix D.

Within the compliance leachate waste suite, all determinands were within the Inert Waste Landfill criteria limits. Similarly, all parameters determined on the solid test were also within the Inert Waste Landfill criteria.

The contamination test results, and the WAC results should be forwarded to the contractor appointed to undertake any spoil removal. Transfer notes and chain of custody sheets should be retained for all arising removed from site.

8.5 Buried concrete

Laboratory tests for this work found soil samples yielding a characteristic soluble sulphate concentration of 0.46g/l which results in a Design Sulphate Class[5] of DS-1. Although the previous works should also be assessed to see if this level needs to be ungraded.

Ground conditions are such that groundwater must be considered to be mobile, and all pH determinations were in excess of 6.5. Therefore, the Aggressive Chemical Environment for Concrete, ACEC, is classed as AC-1.

9.0 Remedial Action Plan

9.1 General

Contaminant testing was undertaken on selected soil samples and the results compared with the limited number of CLEA[1] Soil Guideline Values (SGVs) for residential land use that have been published to date. Where not available from that source, reference has also been made to the LQM CIEH Generic Assessment Criteria[2]. Appropriate trigger levels are given with the results at Appendix C and individual values exceeding the triggers have been highlighted.

Further WAC tests will be undertaken by the Ground Works Contractor as necessary during the works to categorize the soil arisings prior to disposal off site.

A Discovery Strategy and Watching Brief is also being adopted on site so that any unexpected contamination identified on site is reported.

9.2 Prevention of Pollution

Care should be taken in order to minimize the production of dust generated on the site, especially in dry climatic conditions.

All vehicles leaving the site should be clear of any potential contaminated debris other than that to be specifically removed. Vehicles transporting wastes for disposal should be appropriate for the required means in order to prevent release during transit.
Specific materials removed from site for subsequent disposal should be transported to a suitably approved and licensed facility. The contractor shall maintain a full documentary record in accordance with Duty of Care including copies of all Waste Transfer Notes for verification.

The programme of works and any subsequent modification should be maintained in such a manner as to avoid potential cross-contamination. A watching brief should be maintained and Manhire Geo-Environmental Ltd contacted in the event that evidence of any additional 'contamination' is encountered. The contractor should allow for any delays resulting from the presence of possible contamination and the necessary measures thereof.

It is the responsibility of all personnel on site to report any evidence of possible contamination to the suitably qualified and experienced Site Agent who will contact Manhire Geo-Environmental Ltd where there is any doubt about this contamination.

9.3 Remediation

Based on the previous investigations, it is considered that where contamination coincides with areas of soft landscaping, remediation will be necessary. A 450mm thick cap should be utilised, comprising imported clean soils with a capillary break layer at the base underlain by a geotextile barrier. This is to block the pathway in a source-pathway-receptor model and to discourage excavation below that level.

9.4 Validation of Imported/ Site Sourced Materials - Demolition Materials & Waste

Imported / site sourced materials can generally be split into two categories imported or site sourced demolition materials and imported soils validation of both types of materials will be required.

It should be noted that should material come from more than one source then the minimum following specified samples per source will be required.

9.4.1 Site Sourced / Imported Demolition Materials

All material should be visually assessed to check for any contamination, including asbestos presence. Any suspected materials should be removed from site. For all material the following amount of validation testing is required as a minimum number of samples per source should be 4 and samples should be analysed at a rate of 1 sample per 100m3 of material, but allowing for the above minimum. Assuming no other contamination is suspected all samples should be analysed for asbestos, CLEA metals, phenols, speciated PAH and TPH.

9.4.2 Imported Soils

All imported soils should be certified clean by the supplying facility, with tests certificates supplied.

In addition, on site sampling of the soils will be required, this should ideally be done when it has been placed, but as a minimum be undertaken on site. The following amount of validation testing is required. A minimum number of samples per source should be 4 and samples should be analysed at a rate of 1 samples per 50m3 of material but allowing for the above minimum.

All samples should be analysed for asbestos, CLEA metals, phenols, speciated PAH and TPH

9.5 Discovery Strategy and Watching Brief

During the course of the development, it will be the responsibility of the on-site manager to ensure watching briefs are undertaken and documented.
The watching brief will consist of a record of:

a. Observations of contamination made during the course of the development by any member of site staff, contractor or visitor; and

b. The key stages of the development and occurrences including contamination found during the course of the development, the formation levels of excavations, any reduced level dig/mass excavation, formation of landscaped or garden areas, etc. with supporting photographs.

9.6 Watching Brief Written Statement

Upon completion of the development, a written and signed statement will be prepared by the following parties:

a. Ground Works Contractor(s) - upon completion of foundations and ground works;

b. On-site manager - upon completion of groundworks and landscaping work; and

The written statement will clearly state whether or not evidence of contamination was identified during the course of the development along with any remedial action that was taken.

9.7 Staff Training

All site staff, contractors and visitors, will be briefed on the potential presence of land, groundwater or airborne contamination before commencing work on the site.

This will include the following information:

a. Relevant health & safety considerations;

b. The type of land, water or airborne contamination present and potentially present at the site;

c. Any particular areas of the site which are likely to be affected; and

d. Staff responsibilities under the discovery strategy.

The on-site manager will provide written confirmation that site staff were briefed about contaminated land in line with these recommendations.

9.8 Construction Workers Risk Assessments

A detailed health and safety risk assessment will be carried out, in accordance with current guidance, before works commence on-site and appropriate personal protective equipment will be worn by all construction workers.

10.0 Discovery Strategy & Watching Brief

If unexpected contamination is found at any time, then this will be reported to Environmental Health, The Royal Borough of Richmond Upon Thames (RBRUT) within seven days and 2 weeks notice given prior to undertaking any remediation if considered necessary.

The discovery strategy sets out the actions that will be taken if contamination is encountered during the course of a development. Examples of the types of observations that will be considered are detailed in Table 1 below, following which examples of the general actions that will be taken are set out in Table 2, and examples of any emergency actions are detailed in Table 3.

Evidence	Description
Visual	• Fuel or oil-like substances mixed in with or smeared on the soil or floating on perched, groundwater or surface waters. • Waste materials (refuse, barrels, industrial wastes, ash, tar, etc.) Buried at specific location across the site. • Marked variation in colour, e.g., red, orange, yellow, green, light or dark blue, etc. may indicate contamination from a variety of contaminants. • Soils including large amounts of ash and clinker where such contamination of soils wasn't expected. • Evidence of suspected asbestos.
Odours	• Fuel, oil and chemical-type odours. • Unusual odours such as sweet or fishy odours.
Well-being	• Lightheadedness and/or nausea when in excavations, at the working face of an excavation, when visual or olfactory evidence of contamination exists, etc. • Burning of nasal passages, throat, lungs or skin. • Blistering or reddening of skin due to contact with soil.

Table 1 - Potentially significant observations (not exhaustive)

▫ Person observing contamination	▫ To be reported to	▫ Action to be taken
▫ Site visitor	▫ Must report observations to the site manager.	▫ Stop work and where possible, make area safe and secure area before reporting to site manager.
▫ Contractor	▫ Must report observations to the site manager.	▫ Stop work and where possible, make area safe and secure area before reporting to site manager.
▫ On site manager	▫ Must report observations to their direct manager, the appointed Environmental Consultant, the Planning Authority and Contaminated Land Officer at LBS.	▫ Stop work and, where possible, make area safe and secure area before reporting to others.
▫ Environmental Consultant	▫ Must report observations to the site manager, the planning Authority and Contaminated Land Officer LBS.	▫ Advise that work stops and where possible, make sure the area is made safe before reporting to others.

Table 2 - General actions to be performed

Occurrence	Description	Contact
Risk to the public	If at any point residents, the public or other may be at risk as a result of contamination found during the course of investigation, remediation or development works.	• Contact the emergency services if there is a risk to life. • Contaminated Land Officer at LBS. • Health & Safety Executive.
Nuisance to residents/the public	If a nuisance has been or is likely to be caused to nearby residents, the public and others - for example, odours, dust, noise, vibration, etc.	• Environmental Health at LBS.
Pollution of controlled waters	If any surface, culverted or groundwater has been polluted, e.g., slurry, contaminated soil/water or a chemical spillage entering a river or canal.	• Environmental Agency. • Planning Authority and Contaminated Land Officer at LBS.
Pollution of adjoining land	If land outside the boundary of the development site is polluted from site activities, e.g., slurry, contaminated soil/water or a chemical spillage.	• The owner of the land. • Planning Authority and contaminated Land Officer at LBS.

Table 3 - Emergency actions to be performed

In addition to the above, the following should also be noted:

a. Should gross contamination be encountered during groundworks, then the advice of an environmental consultant will be sought;

b. Any soil arising from areas where visual or olfactory evidence of contamination has been observed will be handled as potentially hazardous waste and temporarily stockpiled appropriately;

c. Stockpiled soils may undergo validation testing to determine whether they can be used elsewhere on the site at or close to the ground; and

d. The Contaminated Land Officer at RBKUT will be contacted to agree any further remedial works that become necessary during the course of the development.

11.0 Verification Report

Following the completion of any remedial action and the development of the site, a post -remediation verification report will be produced and submitted to the planning authority.

The report will detail fully any actions undertaken, including any report from the discovery strategy and watching brief.

All work undertaken will be supported by photographic evidence, along with any other documented items such as waste transfer noted, asbestos removal reports, soil invoices etc.

All imported soil will undergo confirmatory analysis in order to satisfy their suitability for use. Laboratory certificated results will be included within the report.

Finally the report will include the aforementioned declaration from the site manager, groundworks contractor and appointed environmental consultant stating that wither no suspected additional contamination was detected, or, that all additional detected contamination has been addressed appropriately.

References

[1] The Contaminated Land Exposure Assessment Model Department for Environment, Food and Rural Affairs The Environment Agency
R & D Publications SGV 1 *et al*., March 2002

[2] Protection of workers and the general public during the development of contaminated land HS(G)66
Health and Safety Executive, 1991

[3] Waste Management Paper 27 : Landfill gas
Department of the Environment
HMSO, Fourth impression 1996

[4] Concrete in aggressive ground
BRE Special Digest 1, 3rd Edition
Building Research Establishment, 2005

PROCEDURAL NOTES for GROUND INVESTIGATIONS

General

This report is based upon data obtained from field descriptions of the strata and examination of the samples by an engineer, together with the results of in situ and laboratory tests as appropriate. Responsibility cannot be accepted for variations in ground conditions between and around any of the exploratory points that is not revealed by the data. Whilst the report may offer an opinion on the ground conditions between exploratory points and below the depth of investigation, this is for guidance only and no liability is accepted for its accuracy.

Drilling procedure

Boring by light cable percussion drilling allows the ground conditions to be reasonably well established. However, a certain amount of disturbance is inevitable, and some mixing of soils can occur.

Sampling procedure

"Undisturbed" samples of predominantly cohesive soils are taken with a 100mm diameter open tube sampler, generally in accordance with BS 5930: 1999.

Where appropriate, or where an undisturbed sample is unsuccessful, disturbed samples are recovered and sealed into polythene bags.

Groundwater samples are taken when water is encountered in sufficient quantity.

Standard penetration tests

The test is conducted generally in accordance with BS 1377: Part 9: 1990. The sampler tube is subject to a seating drive of 150mm into the soil at the base of the borehole. Results are given on the Borehole Records as the number of blows required to drive the sampler tube a further 300mm and this is known as the “N” value. Where the driving resistance is such that full penetration is not achieved, the test is generally terminated after 50 blows and the actual distance penetrated is recorded.

Groundwater

Groundwater observations necessarily reflect the conditions encountered at the time of the exploratory work. Long term monitoring of standpipes is usually required to establish an equilibrium water level since the normal rate of boring is too fast to permit steady state conditions to be achieved.

Groundwater levels are subject to variations caused by changes in drainage conditions and seasonal climatic changes.

Water may necessarily be added to advance the bore whilst casing may be required to maintain an open hole. These can both mask subsequent groundwater observations and are therefore noted on the individual Borehole Record.

APPENDIX A

BOREHOLE AND TRIAL PIT RECORDS

SYMBOLS and ABBREVIATIONS

Samples

Undisturbed

U	Standard open drive "undisturbed" 102mm dia. in boreholes 38mm dia. in trial pits, window sampler and hand auger
T	Thin wall open drive
P	Piston
CBR	CBR mould
L	Windowless sampler liner

Disturbed

D	Small
B	Bulk
W	Water
C	Contaminants: plastic tub
J	Contaminants: brown glass jar

In situ tests

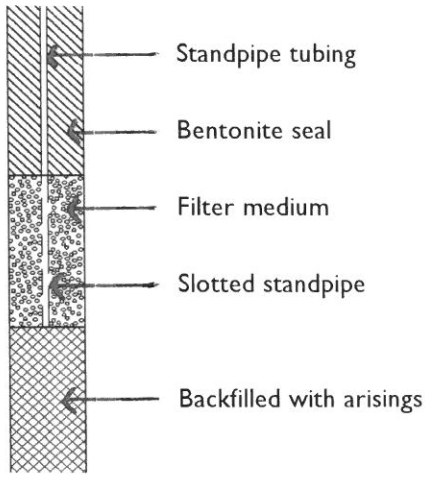
SPT CPT	Standard Penetration Test, open shoe solid cone N value is number of blows for 300mm penetration. Blow count also given as seating drive followed by four increments of 75mm.
V ( )	Vane test (c_u kPa)
P ( )	Hand penetrometer (c_u kg/cm^2)
M ( )	Mexe probe (CBR %)

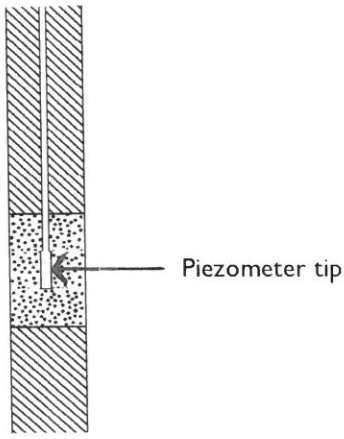
Water records

$\blacktriangledown_2$	Standing level
$\triangledown_2$	Depth encountered

suffix identifies separate strikes

Standpipes





MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21031
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	08/08/2022-09/08/2022		1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.10)	BLOCK PAVING			
						0.10				
						(0.10)	MADE GROUND: Sand			
						0.20				
						(0.80)	MADE GROUND: Reddy brown angular gravel			
1.00-1.50	B1					1.00				
1.20-1.65	SPT(C) N=29	1.20	WET	2,4/6,6,8,9		(0.50)	MADE GROUND: Brick rubble with some orange brown sand and gravel			
						1.50				
2.00-2.45 2.00-2.50	SPT(C) N=44 B2	2.00	1.50	3,7/9,11,11,13			Medium dense to dense brown and orange brown sandy GRAVEL			
3.00-3.45 3.00-3.50	SPT(C) N=41 B3	3.00	2.00	3,7/9,11,13,8						
4.00-4.45 4.00-4.50	SPT(C) N=25 B4	4.00	3.00	3,5/5,6,7,7		(5.20)				
5.00-5.45 5.00-5.50	SPT(C) N=16 B5	5.00	4.00	2,3/3,4,4,5						
6.50-6.95 6.50-7.00	SPT(C) N=15 B6	6.50	4.00	2,2/3,3,4,5		6.70	Stiff becoming very stiff fissured dark grey silty CLAY with some sandy laminations			
8.00-8.45	U1	7.00	DRY	100 blows						
8.50	D1									
9.50-9.95	SPT N=24	7.00	DRY	2,4/5,6,6,7						

Remarks
UXO survey taken at 1.2m, 2.0m, 4.0m, 6.0, 8.0, 10.m
Chiselling from 0.00m to 1.20m for 1.0 hour. Water added from 0.70m to 6.50m.

Scale (approx)	Logged By
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Figure No.
5567.BH1

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
HOMEBASE, 84 MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21031
Location	**Dates**	**Engineer**		**Sheet**
See site plan	08/08/2022-09/08/2022			2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							Stiff becoming very stiff fissured dark grey silty CLAY with some sandy laminations			
11.00-11.45	U2	7.00	DRY	100 blows						
11.50	D2									
12.50-12.95	SPT N=29	7.00	DRY	3,4/6,6,8,9						
14.00-14.45	U3	7.00	DRY	100 blows						
14.50	D3									
15.50-15.95	SPT N=32	7.00	DRY	3,4/6,7,9,10						
17.00-17.45	U4	7.00	DRY	100 blows						
17.50	D4									
18.50-18.95	SPT N=36	7.00	DRY	3,4/6,9,10,11						

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH1

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21631

Location	Dates	Engineer	Sheet
See site plan	08/08/2022-09/08/2022		3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
20.00-20.30	U5	7.00	DRY	100 blows			Very stiff fissured dark grey silty CLAY with some sandy laminations			
20.35	D5									
21.50-21.95	SPT N=41	7.00	DRY	3,6/9,10,11,11						
23.00-23.30	U6	7.00	DRY	100 blows						
23.35	D6									
24.50-24.95	SPT N=42	7.00	DRY	3,6/9,10,10,13		(23.30)				
26.00-26.35	U7	7.00	DRY	100 blows						
26.40	D7									
27.50-27.95	SPT N=47	7.00	DRY	3,6/10,13,11,13						
29.00-29.45	U8	7.00	DRY	100 blows						
29.50	D8									
				09/08/2022:DRY		30.00				

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH1

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	[illegible]
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	08/08/2022-09/08/2022		4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
30.00-30.45	SPT N=49	7.00	DRY	4,6/10,12,13,14						

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH1

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21031
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	05/08/2022		1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.01)				
						0.01	BLOCK PAVING			
0.30-0.70	B1					(0.29)	MADE GROUND: Sand			
						0.30				
						(0.40)	MADE GROUND: Reddy brown angular gravel			
0.80-1.20	B2					0.70	MADE GROUND: Brick rubble with some orange brown sand and gravel			
						(0.80)				
1.50-1.95	SPT N=17	1.50	DRY	2,2/3,4,5,5		1.50	Medium dense to dense orange brown and brown sandy GRAVEL			
2.00-2.45 2.00	SPT N=22 D1	2.00	DRY	2,2/3,4,6,9						
3.00-3.45 3.00-3.50	SPT(C) N=39 B3	3.00	DRY	5,7/9,10,11,9						
						(3.90)				
4.00-4.45	SPT(C) N=40	4.00	DRY	7,9/10,10,11,9						
5.00-5.45 5.00-5.50	SPT(C) N=32 B4	5.00	WET	4,7/9,9,7,7						
						5.40	Stiff becoming very stiff fissured dark grey silty CLAY with some sandy laminations			
6.50-6.95	SPT N=16	6.00	DRY	2,2/3,4,4,5						
8.00-8.45	U1	6.00	DRY	50 blows						
8.50	D2									
9.50-9.95	SPT N=20	6.00	DRY	2,2/4,5,5,6						

Remarks
UXO survey taken at 1.50m 3.0m, 5.0m, 7.0m, 9.0m, 11.0m
Chiselling from 0.00m to 1.20m for 1 hour. Water added from 4.00m to 6.00m.

Scale (approx)	Logged By
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Figure No.
5567.BH2

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21/031
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	05/08/2022		2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							Stiff becoming very stiff fissured dark grey silty CLAY with some sandy laminations			
11.00-11.45	U2	6.00	DRY	90 blows						
11.50	D3									
12.50-12.95	SPT N=25	6.00	DRY	2,3/4,5,7,9						
14.00-14.45	U3	6.00	DRY	100 blows						
14.50	D4									
15.50-15.95	SPT N=26	6.00	DRY	2,3/5,5,8,8						
17.00-17.30	U4	6.00	DRY	100 blows						
17.35	D5									
18.50-18.95	SPT N=28	6.00	DRY	3,3/4,6,8,10						

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH2

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21031
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	05/08/2022		3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
20.00-20.35	U5	6.00	DRY	100 blows			Very stiff fissured dark grey silty CLAY with some sandy laminations			
20.40	D6									
21.50-21.95	SPT N=35	6.00	DRY	3,4/6,9,10,10						
23.00-23.40	U6	6.00	DRY	100 blows						
23.45	D7									
24.50-24.95	SPT N=41	6.00	DRY	3,6/9,10,10,12						
				05/08/2022:DRY		(25.10)				
26.00-26.45	SPT N=45	6.00	DRY	3,7/10,11,11,13						
27.50-27.95	SPT N=44	6.00	DRY	4,7/9,10,11,14						
30.00-30.45	SPT N=47	6.00	DRY	4,8/11,11,11,14						

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH2

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.00m		Taylor Wimpey West London	21031
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	05/08/2022		4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(25.10)	Very stiff fissured dark grey silty CLAY with some sandy laminations			
						30.50	Complete at 30.50m			

Remarks

Scale (approx)	Logged By
1:50	ljs

Figure No. 5567.BH2

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 5.50m		Taylor Wimpey West London	21031
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	10/08/2022-11/08/2022		1/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.10) 0.10	BLOCK PAVING			
						(0.10) 0.20	MADE GROUND: Sand			
						(0.40) 0.60	MADE GROUND: Reddy brown angular gravel			
0.60-1.00	B1					(0.70) 1.30	MADE GROUND: Brick rubble with some orange brown sand and gravel			
1.50-1.95	SPT(C) N=34		DRY	3,4/7,7,7,13			Medium dense to dense orange brown and brown sandy GRAVEL			
1.50-2.00	B2									
2.00-2.31	SPT(C) 50/160	2.00	DRY	10,15/0,24,20,6						
2.00-2.50	B3									
3.00-3.45	SPT(C) N=22	3.00	2.00	3,6/6,6,5,5		(3.80)				
3.00-3.50	B4									
4.00-4.45	SPT(C) N=27	4.00	3.00	3,6/7,7,6,7						
4.00-4.50	B5									
5.00-5.45	SPT(C) N=10	5.00	4.00	2,2/3,2,2,3		5.10	Very stiff fissured dark grey silty CLAY with some sandy laminations			
5.00-5.50	B6									
6.50-6.95	SPT N=14	5.50	DRY	1,2/2,3,4,5						
8.00-8.45	U1	5.50	DRY	100 blows						
8.50	D1									
9.50-9.95	SPT N=21	5.50	DRY	2,3/5,5,5,6						

Remarks
Borehole was dry
UXO survey taklen at 1.5m, 3.0m, 5.0m, 9.0m, 10.0m
Chiselling from 0.00m to 1.20m for 1 hour. Water added from 2.00m to 5.00m.

Scale (approx)	Logged By
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Figure No.
5567.BH3

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 5.50m		Taylor Wimpey West London	21631
	Location	**Dates**	**Engineer**	**Sheet**
	See site plan	10/08/2022-11/08/2022		2/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							Stiff becoming very stiff fissured dark grey silty CLAY with some sandy laminations			
11.00-11.40	U2	5.50	DRY	100 blows						
11.45	D2									
12.50-12.95	SPT N=29	5.50	DRY	3,4/6,6,8,9						
14.00-14.40	U3	5.50	DRY	100 blows						
14.45	D3									
15.50-15.95	SPT N=34	5.50	DRY	3,6/7,8,9,10						
17.00-17.30	U4	5.50	DRY	100 blows						
17.35	D4									
18.50-18.95	SPT N=34	5.50	DRY	3,6/6,9,9,10						

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH3

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 5.50m		Taylor Wimpey West London	21031
Location	**Dates**	**Engineer**		**Sheet**
See site plan	10/08/2022-11/08/2022			3/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
20.00-20.40	U5	5.50	DRY	100 blows			Very stiff fissured dark grey silty CLAY with some sandy laminations			
20.45	D5									
21.50-21.95	SPT N=39	5.50	DRY	3,6/7,9,10,13						
23.00-23.30	U6	5.50	DRY	100 blows						
23.35	D6									
24.50-24.95	SPT N=46	5.50	DRY	4,6/7,13,13,13		(24.95)				
26.00-26.30	U7	5.50	DRY	100 blows						
26.30	D7									
27.50-27.95	SPT N=46	5.50	DRY	4,7/9,10,13,14						
29.00-29.30	U8	5.50	DRY	100 blows						
29.35	D8									
30.00-30.45	SPT N=47	5.50	DRY	4,7/9,10,14,14		30.05				

Remarks

Scale (approx)	Logged By
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Figure No. 5567.BH3

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Borehole Number
Manor Road, Richmond	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 5.50m		Taylor Wimpey West London	21031
Location	**Dates**		**Engineer**	**Sheet**
See site plan	10/08/2022-11/08/2022			4/4

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(24.95) 30.05	Very stiff fissured dark grey silty CLAY with some sandy laminations			
							Complete at 30.50m			

Remarks	Scale (approx)	Logged By
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	Figure No.	5567.BH3

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Number
Manor Road, Richmond	WSA

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Taylor Wimpey West London	21631
	Location See site plan	**Dates** 10/08/2022	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.06) 0.06	BLOCK PAVING		
					(0.06) 0.12	MADE GROUND: Sand		
					(0.14) 0.26	MADE GROUND: Reddy brown angular gravel		
					(0.30)	MADE GROUND: Dark brown and grey gravelly sand with some clayey pockets and brick fragments		
0.50	C1				0.56			
					(0.17) 0.73	MADE GROUND: Brown sandy gravel		
1.00	C2					Moderately compact orange brown and brown sandy GRAVEL		
					(1.39)			
1.50	C3							
2.00	C4				2.12			
						Complete at 2.12m		

Remarks

Scale (approx)	Logged By
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Figure No. 5567.WSA

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Number
Manor Road, Richmond	WSB

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Taylor Wimpey West London	21631
	Location See site plan	**Dates** 10/08/2022	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.06) 0.06	BLOCK PAVING		
					(0.06) 0.12	MADE GROUND: Sand		
					(0.16) 0.28	MADE GROUND: Reddy brown angular gravel		
0.50	C1					MADE GROUND: Brown sandy clay with some gravel, brick and concrete fragments		
1.00	C2				(1.82)			
1.50	C3							
2.10	C4				2.10	Complete at 2.10m		

Remarks

Scale (approx)	Logged By
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Figure No. 5567.WSB

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Number
Manor Road, Richmond	WSC

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Taylor Wimpey West London	21631
	Location See site plan	**Dates** 11/08/2022	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.06) 0.06	BLOCK PAVING		
					(0.06) 0.12	MADE GROUND: Sand		
					(0.32) 0.44	MADE GROUND: Reddy brown angular gravel		
					(0.13) 0.57	MADE GROUND: Granite blocks		
					(0.27) 0.84	MADE GROUND: Brown sandy gravel with some bricks and concrete		
0.80	C1				(0.27) 1.11	MADE GROUND: Dark grey rounded gravel		
1.05	C2				(0.46) 1.57	MADE GROUND: Grey and brown sandy clay with occasional brick fragments		
1.50	C3				(0.56) 2.13	Moderately compact orange brown and brown sandy GRAVEL		
2.13	C4					Complete at 2.13m		

Remarks

Scale (approx)	Logged By
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Figure No. 5567.WSC

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Number
Manor Road, Richmond	WSD

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Taylor Wimpey West London	21031
	Location See site plan	**Dates** 12/08/2022	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: Brown sandy clay with some rounded gravel		
					0.40			
					(0.32)	MADE GROUND: Concrete rubble with some brown silty clay and occasional gravel		
					0.72			
0.80	C1				(0.22)	MADE GROUND: Orange brown and brown sandy clay with some gravel and brick fragments		
					0.94			
1.00	C2				(0.53)	MADE GROUND: Dark grey and brown sandy gravel		
1.45	C3				1.47			
2.00	C4				(1.23)	Moderately compact orange brown and brown sandy GRAVEL		
2.70	C5				2.70			
						Complete at 2.70m		

Remarks

Scale (approx)	Logged By
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Figure No. 5567.WSD

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Number
Manor Road, Richmond	WSE

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Taylor Wimpey West London	21031
	Location See site plan	**Dates** 11/08/2022	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25) 0.25	MADE GROUND: Tarmac		
					(0.28) 0.53	MADE GROUND: Reddy brown angular gravel		
0.60	C1				(0.63) 1.16	MADE GROUND: Brick and concrete rubble with some gravel		
1.10	C2							
1.50	C3				(0.90) 2.06	Moderately compact orange brown and brown sandy GRAVEL		
2.06	C4					Complete at 2.06m		

Remarks

Scale (approx)	Logged By
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Figure No. 5567.WSE

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

Site	Number
Manor Road, Richmond	WSF

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Taylor Wimpey West London	21031
	Location See site plan	**Dates** 11/08/2022	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.37)	MADE GROUND: Brown sandy clay with some gravel		
					0.37			
0.50	C1				(0.73)	MADE GROUND: Brown and light brown mottled silty clay with some gravel		
1.00	C2				1.10			
1.50	C3				(1.11)	Moderately compact orange brown and brown sandy GRAVEL		
2.20	C4				2.21			
						Complete at 2.21m		

Remarks

Scale (approx)	Logged By
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Figure No. 5567.WSF

APPENDIX B

STANDPIPE RECORDS

STANDPIPE RECORDS

WATER LEVELS

Project: HOMEBASE, 84 MANOR ROAD, RICHMOND UPON THAMES
Client: Taylor Wimpey West London

Project No. 21031
Sheet No. 1/1

Location	BH1		BH2		BH3											
Red. level																
Date	Water level															
	m bgl	m OD	m bgl	m OD												
19/08/2022	2.51		4.11		4.15											
23/09/2022	2.54		4.15		4.17											
11/10/2022	2.61		4.21		4.23											

Remarks

MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

APPENDIX C

LABORATORY TEST RESULTS

SUMMARY OF GEOTECHNICAL TESTS

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 1/3

Location	Sample No	Depth m	Description	CLASSIFICATION							TRIAXIAL COMPRESSION - TOTAL STRESS							CHEMICAL		
				Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plast. Index %	Passing 425µm %	Mod. Plast. Index %	Class	Type	Moisture Content %	Bulk Density Mg/m³	Radial Stress kPa	Deviator Stress kPa	Cohesion cu, kPa assuming Øu = 0	Cohesion cu, kPa Øu, deg	Sulphate (SO4) Water g/l	Sulphate (SO4) Soil (Sol) g/l	pH
BH1	U	8.00	Firm to stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	26	2.02	160	133	67			0.46	7.92
	U	11.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	27	2.07	220	273	139			0.36	8.15
	U	14.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	24	2.01	280	201	100				
	U	17.00	Very stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	25	2.07	340	355	177				
	U	20.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	27	2.01	400	237	117			0.25	7.84
	U	23.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	24	2.09	460	160	80				
	U	26.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	29	2.04	520	277	139				
	U	29.00	Very stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	26	2.06	580	371	186				

Note: Soil Classification based upon unmodified Plasticity Index

MANSHIRE ASSOCIATES GEO-ENVIRONMENTAL LIMITED

SUMMARY OF GEOTECHNICAL TESTS

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 2/3

Location	Sample No	Depth m	Description	CLASSIFICATION							TRIAXIAL COMPRESSION - TOTAL STRESS							CHEMICAL		
				Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plast. Index %	Passing 425µm %	Mod. Plast. Index %	Class	Type	Moisture Content %	Bulk Density Mg/m³	Radial Stress kPa	Deviator Stress kPa	Cohesion cu, kPa assuming Øu = 0	Cohesion cu, kPa Øu, deg	Sulphate (SO4) Water g/l	Sulphate (SO4) Soil (Sol) g/l	pH
BH2	U	8.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	30	2.00	160	115	58			0.23	7.99
	U	11.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	25	2.04	220	267	134				
	U	14.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	27	2.04	280	250	125				
	U	17.00	Very stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	25	2.10	340	382	191			0.27	7.96
	U	20.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	26	2.03	400	260	130				
	U	23.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	26	2.02	460	264	132			0.17	7.87

Note: Soil Classification based upon unmodified Plasticity Index

SUMMARY OF GEOTECHNICAL TESTS

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 3/3

Location	Sample No	Depth m	Description	CLASSIFICATION							TRIAXIAL COMPRESSION - TOTAL STRESS							CHEMICAL		
				Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plast. Index %	Passing 425µm %	Mod. Plast. Index %	Class	Type	Moisture Content %	Bulk Density Mg/m³	Radial Stress kPa	Deviator Stress kPa	Cohesion cu, kPa assuming Øu = 0	Cohesion cu, kPa Øu, deg	Sulphate (SO4) Water g/l	Sulphate (SO4) Soil (Sol) g/l	pH
BH3	U	8.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	28	1.99	160	235	117			0.48	7.94
	U	11.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	25	2.05	220	225	113			0.29	7.83
	U	14.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	23	2.02	280	167	84				
	U	17.00	Very stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	25	2.08	340	307	154				
	U	20.00	Stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	27	2.03	400	271	136			0.34	7.77
	U	23.00	Very stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	26	2.06	460	366	183				
	U	29.00	Very stiff fissured dark grey silty CLAY with some sandy laminations								UU 102	27	2.03	580	392	196				

Note: Soil Classification based upon unmodified Plasticity Index

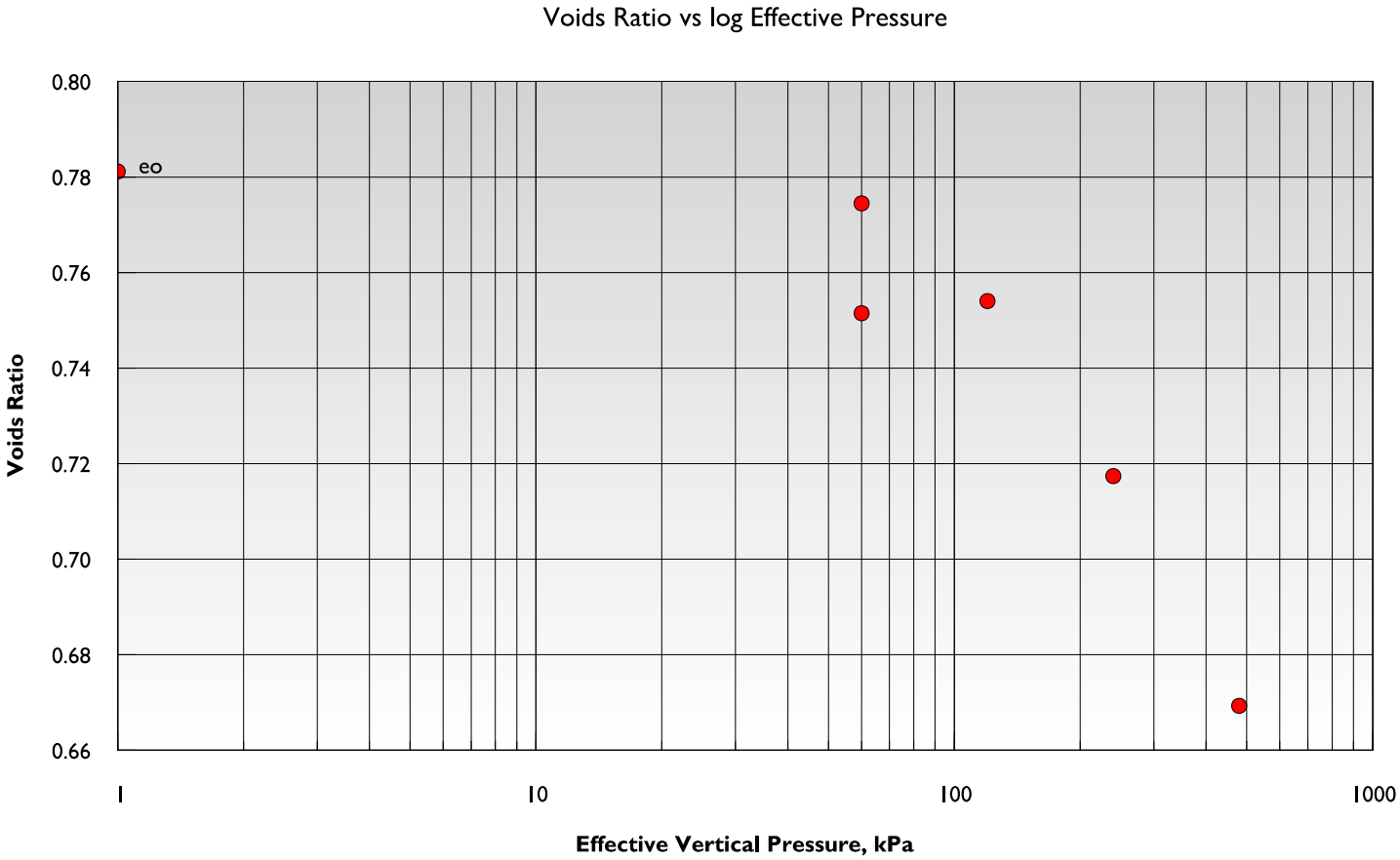
MANSHIRE ASSOCIATES GEO-ENVIRONMENTAL LIMITED

ONE - DIMENSIONAL CONSOLIDATION TEST

Project: HOMEBASE, 84 MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No. 1/3

Borehole	Sample	Depth, m
BH1	U1	8.00
Description		
Stiff dark brown intact clean CLAY		
Specific Gravity	Moisture Cont. %	Dry Density Mg/m³
2.750 measured	start 26 finish 25	1.544
Pressure kPa	Coefficient of Consolidation m²/year	Coefficient of Compressibility m²/MN
0		
	0.839	0.062
60		
	0.599	0.192
120		
	0.440	0.174
240		
	0.595	0.117
480		
	0.289	0.117
60		



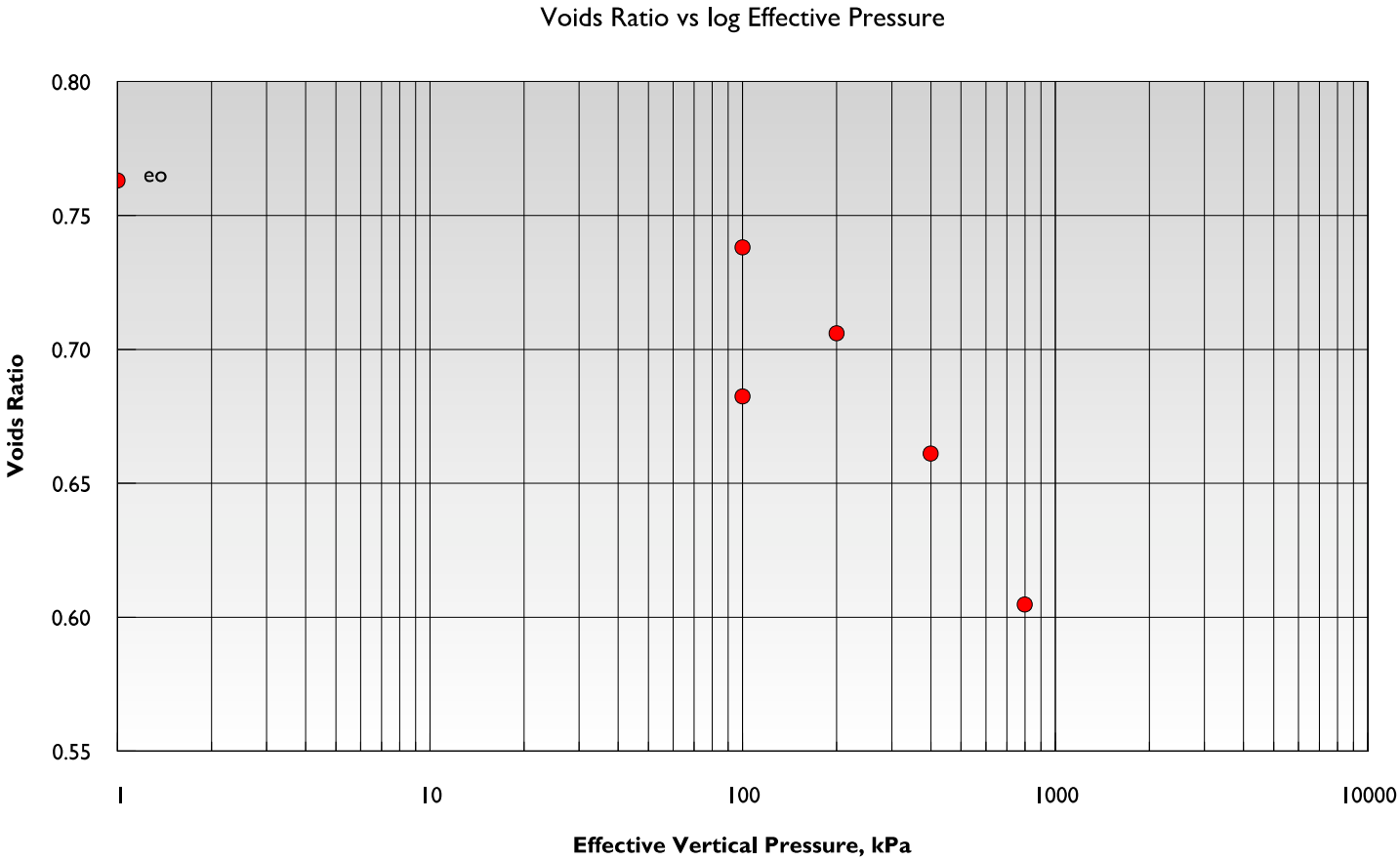
MANNING ASSOCIATES GEO-ENVIRONMENTAL LIMITED

ONE - DIMENSIONAL CONSOLIDATION TEST

Project: HOMEBASE, 84 MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No. 2/3

Borehole	Sample	Depth, m
BH2	U5	20.00
Description		
Very stiff dark brown fissured clean CLAY		
Specific Gravity	Moisture Cont. %	Dry Density Mg/m³
2.720 measured	start 23 finish 22	1.543
Pressure kPa	Coefficient of Consolidation m²/year	Coefficient of Compressibility m²/MN
0		
	1.216	0.142
100		
	0.583	0.184
200		
	0.472	0.132
400		
	0.702	0.085
800		
	0.288	0.069
100		



MANHIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

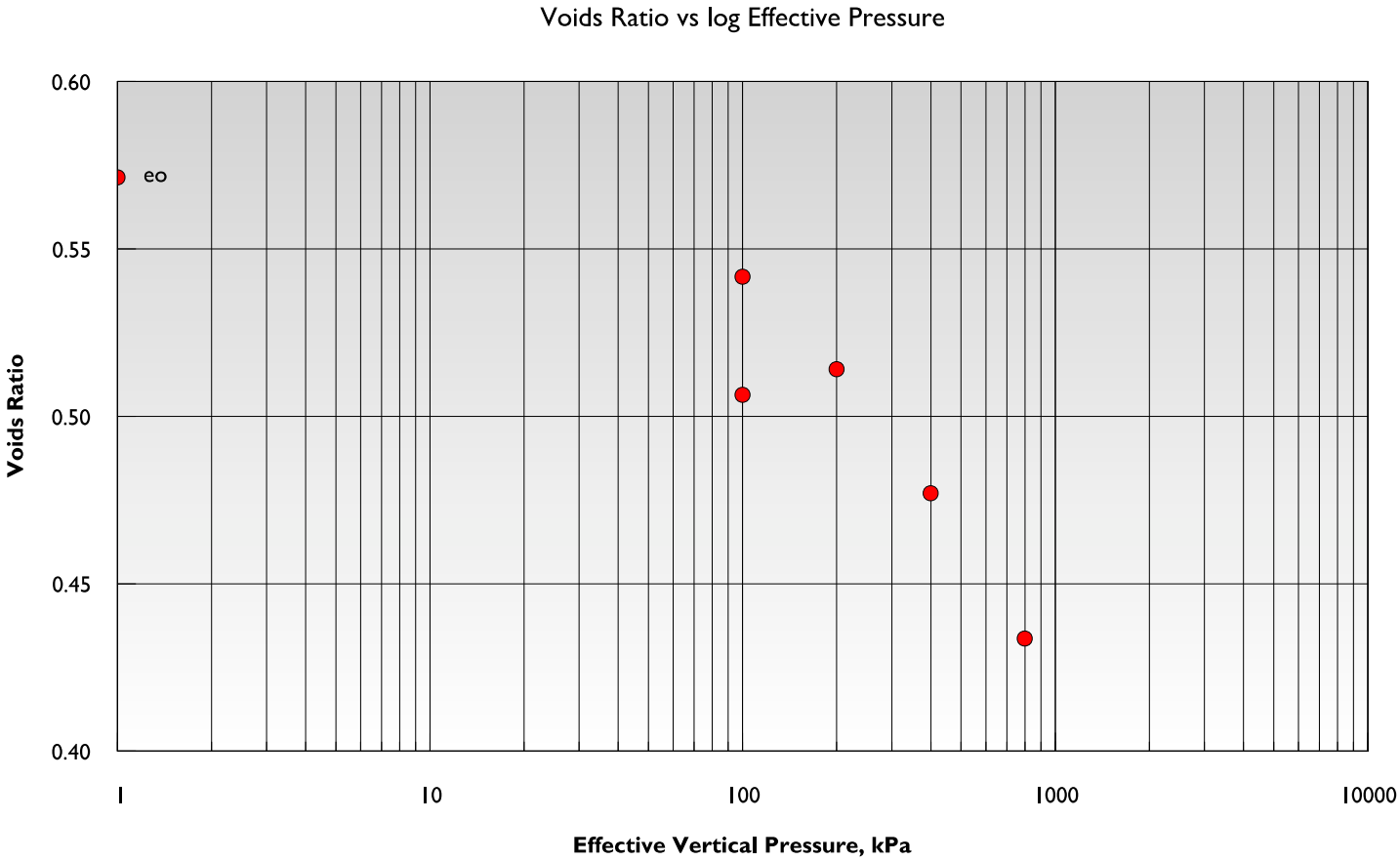
ONE - DIMENSIONAL CONSOLIDATION TEST

Project: HOMEBASE, 84 MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No. 3/3

Borehole	Sample	Depth, m
BH3	U7	26.00
Description		
Very stiff dark brown intact clean CLAY		
Specific Gravity	Moisture Cont. %	Dry Density Mg/m³
2.750	start 20	1.750
measured	finish 19	

Pressure kPa	Coefficient of Consolidation m²/year	Coefficient of Compressibility m²/MN
0		
	0.646	0.188
100		
	0.592	0.179
200		
	0.502	0.122
400		
	0.682	0.073
800		
	0.433	0.073
100		

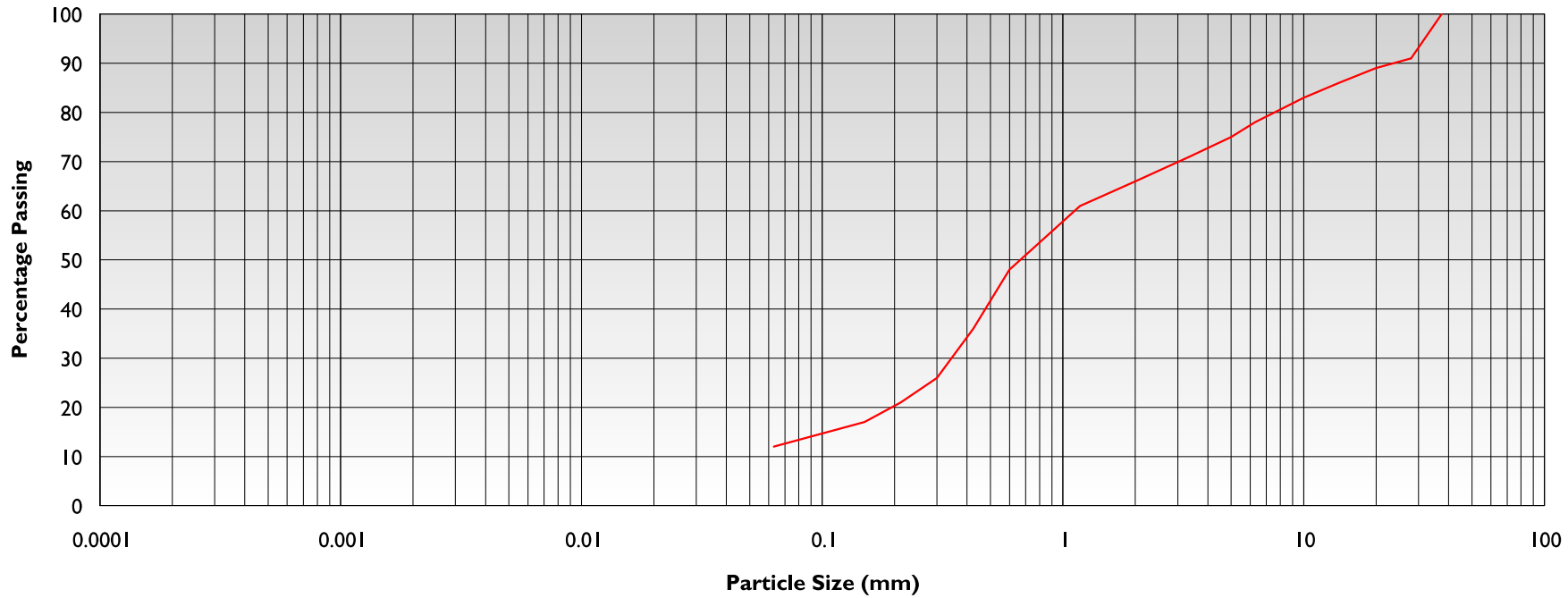


MANNIRE ASSOCIATES
GEO-ENVIRONMENTAL LIMITED

PARTICLE SIZE DISTRIBUTION

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 1/4



	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	
Clay	Silt			Sand			Gravel			Cobbles
Hydrometer				Sieve						

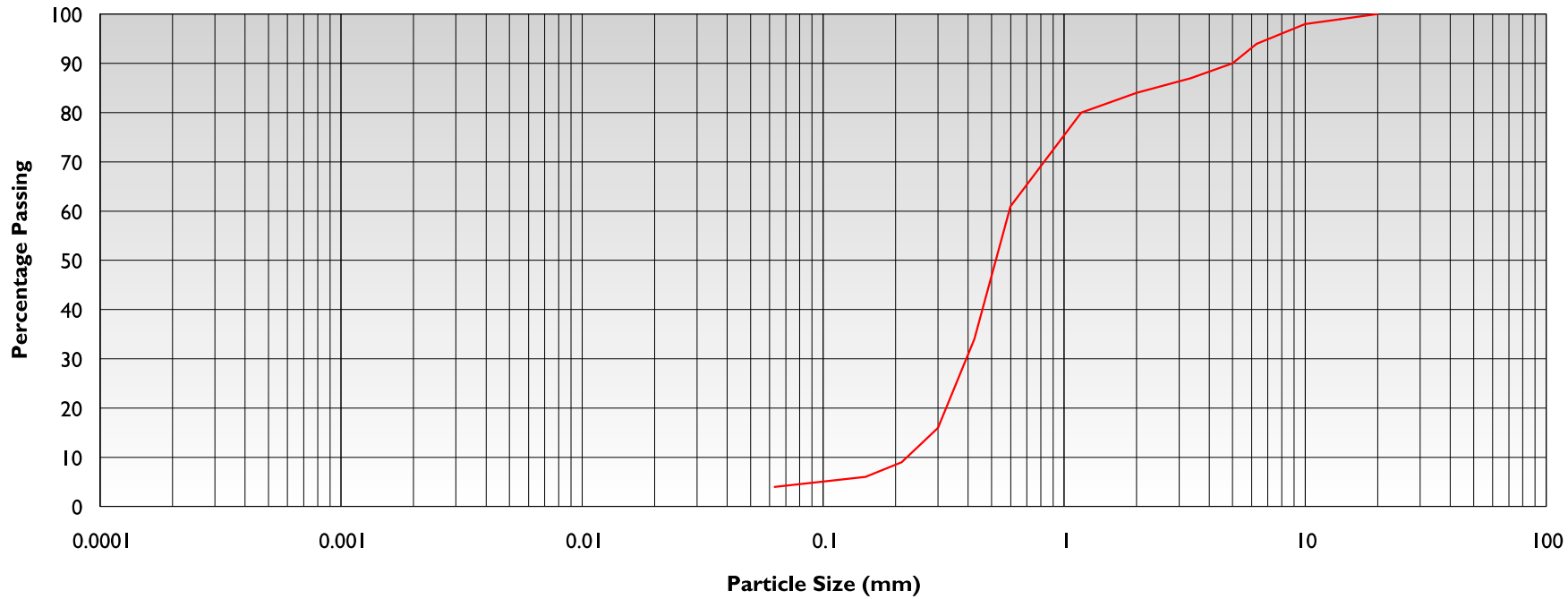
Location: **BH1**
Sample: **B**
Depth, m: **2.00**

Description:-
Brown and orange brown SAND & GRAVEL

PARTICLE SIZE DISTRIBUTION

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 2/4



	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	
Clay	Silt			Sand			Gravel			Cobbles
Hydrometer				Sieve						

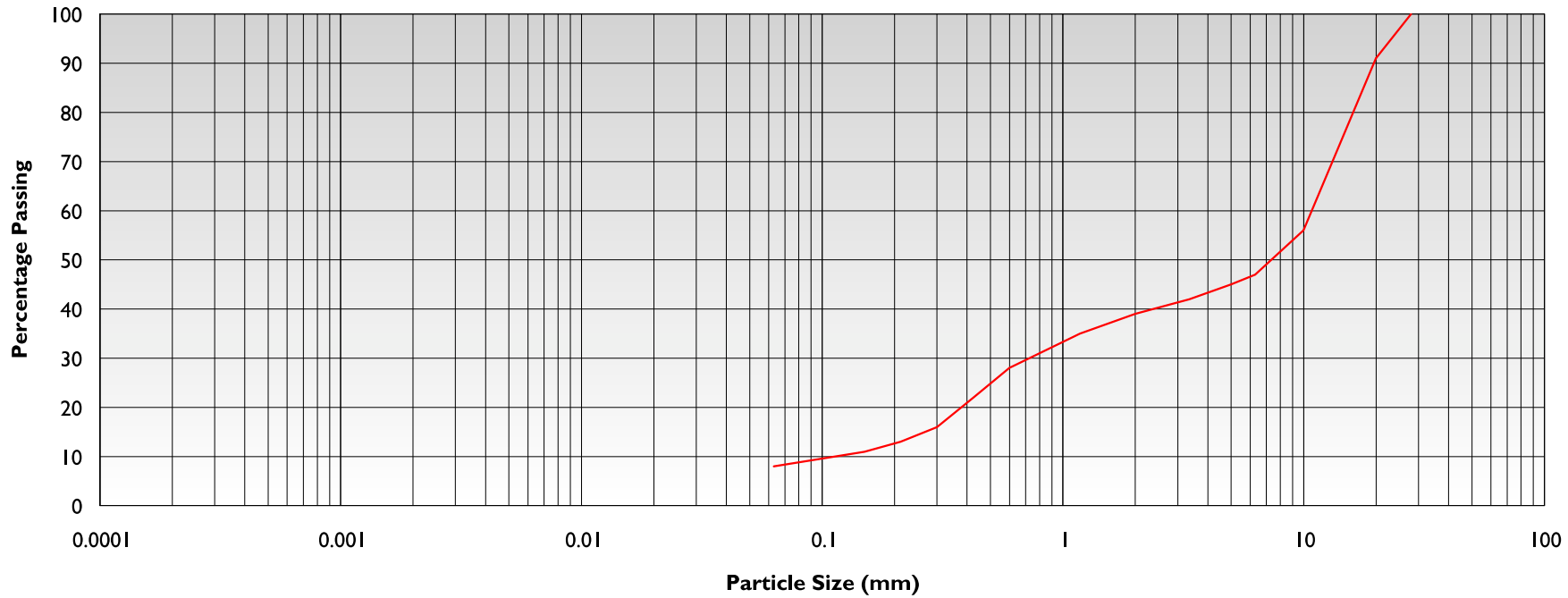
Location: **BH1**
Sample: **B**
Depth, m: **5.00**

Description:-
Brown and orange brown gravelly medium SAND

PARTICLE SIZE DISTRIBUTION

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 3/4



	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	
Clay	Silt			Sand			Gravel			Cobbles
Hydrometer				Sieve						

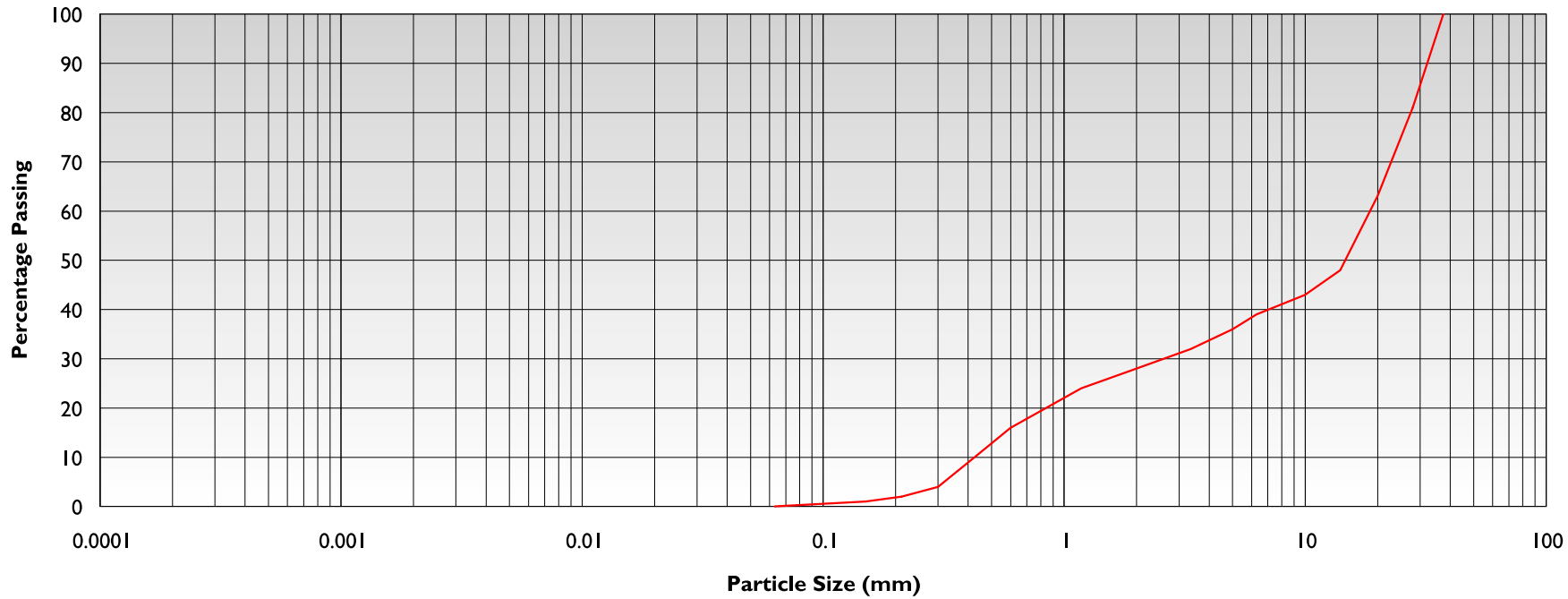
Location: **BH3**
Sample: **B**
Depth, m: **2.00**

Description:-
Brown and orange brown sandymedium to coarse GRAVEL

PARTICLE SIZE DISTRIBUTION

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 4/4



	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	
Clay	Silt			Sand			Gravel			Cobbles
Hydrometer				Sieve						

Location: **BH3**
Sample: **B**
Depth, m: **4.00**

Description:-
Brown and orange brown sandy coarse GRAVEL

MANNING ASSOCIATES GEO-ENVIRONMENTAL LIMITED

CONTAMINANTS IN SOIL

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 1/2

Location	Sample	Depth m	Arsenic	Barium	Beryllium	Boron water sol.	Cadium	Chromium trivalent	Copper	Lead	Mercury inorganic	Nickel	Selenium	Vanadium	Zinc	TPH by GCMS C10 - C20	TPH by GCMS C20 - C30	TPH by GCMS C30 - C40	TPH by GCMS Total	TPH by GCMS	Phenols tot. monohydric
BH1		1.00	17	110	0.79	0.7	<0.2	31	21	450	0.6	21	<1.0	44	170						<1.0
BH2		0.80	14	110	0.76	3.1	<0.2	22	27	110	<0.3	16	<1.0	37	64						<1.0
BH3		0.60	22	150	1.0	0.8	<0.2	18	67	420	0.8	21	<1.0	44	110						<1.0
WSA		0.50	18	150	0.84	1.0	<0.02	27	39	120	0.7	21	<1.0	45	100						<1.0
WSB		0.50	11	110	0.61	3.4	<0.2	22	89	76	<0.3	14	<1.0	27	88						<1.0
		1.00	12	150	0.64	2.1	<0.2	20	49	100	<0.3	13	<1.0	29	130						<1.0
WSC		0.80	17	330	0.8	2.1	<0.2	23	82	200	<0.3	19	<1.0	32	140						<1.0
S4UL[1]	residential[3]		37		1.7	290	11	910	2400		40	180	250	410	3700						380
	residential[3a]		40		1.7	11000	85	910	7100		56	180	430	1200	40000						1200
	commercial		640		12	240000	190	8600	68000		1100	980	12000	9000	730000						1300
	POS resi*		79		2.2	21000	120	1500	12000		120	230	1100	2000	81000						
CLEA[2]	residential		32						130				350								
	commercial		640						1800				13000								

Notes

1. S4UL given at 6% soil organic matter
2. CLEA SGVs given at 6% soil organic matter
3. Residential with plant uptake

3a. Residential without plant uptake

*. Public open space near residential housing

All units are mg/kg dry weight of soil unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus: Residential XX
Commercial XX

CONTAMINANTS IN SOIL

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 2/2

Location	Sample	Depth m	Arsenic	Barium	Beryllium	Boron water sol.	Cadium	Chromium trivalent	Copper	Lead	Mercury inorganic	Nickel	Selenium	Vanadium	Zinc	TPH by GCMS C10 - C20	TPH by GCMS C20 - C30	TPH by GCMS C30 - C40	TPH by GCMS Total	TPH by GCMS	Phenols tot. monohydric
WSD		0.80	19	51	0.66	0.5	<0.2	27	27	74	0.6	21	<1.0	45	81						<1.0
		1.00	24	99	0.73	1.6	<0.2	18	56	720	1.1	23	<1.0	34	130						<1.0
WSE		0.60	13	63	0.47	2.0	<0.2	19	26	170	<0.3	13	<1.0	26	54						<1.0
S4UL[1]	residential[3]		37		1.7	290	11	910	2400		40	180	250	410	3700						380
	residential[3a]		40		1.7	11000	85	910	7100		56	180	430	1200	40000						1200
	commercial		640		12	240000	190	8600	68000		1100	980	12000	9000	730000						1300
	POS resi*		79		2.2	21000	120	1500	12000		120	230	1100	2000	81000						
CLEA[2]	residential		32						130				350								
	commercial		640						1800				13000								

Notes

1. S4UL given at 6% soil organic matter
2. CLEA SGVs given at 6% soil organic matter
3. Residential with plant uptake

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*. Public open space near residential housing

All units are mg/kg dry weight of soil unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus: Residential XX
Commercial XX

CONTAMINANTS IN SOIL

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 1/2

Speciated Total Petroleum Hydrocarbons (Aromatic / Aliphatic Split with BTEX)

Location	BH1	BH2	BH3	WSA	WSB	WSB	WSC		LQM/CIEH S4UL		
Sample											
Depth, m	1.00	0.80	0.60	0.50	0.50	1.00	0.80		residential	allotments	commercial
Determinand	Concentration, mg/kg										
Aromatic Hydrocarbons											
C5 - C7	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		300	57	86000
>C7 - C8	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		660	120	180000
>C8 - C10	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		190	51	17000
>C10 - C12	<1.0	<1.0	<1.0	<1.0	11	8.8	<1.0		380	74	34000
>C12 - C16	<2.0	6.5	9.7	7.3	23	19	8.3		660	130	38000
>C16 - C21	<10	23	37	30	49	37	23		930	260	28000
>C21 - C35	<10	60	82	74	92	70	54		1700	1600	28000
Total Aromatic Hydrocarbons	**<10**	**89**	**130**	**110**	**180**	**140**	**85**				
Aliphatic Hydrocarbons											
C5 - C6	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		160	3900	12000
>C6 - C8	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		530	13000	40000
>C8 - C10	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		150	1700	11000
>C10 - C12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		760	7300	47000
>C12 - C16	<2.0	13	<2.0	11	20	10	7		4300	13000	90000
>C16 - C21	<8.0	22	<8.0	24	43	31	22				
>C21 - C35	<8.0	48	<8.0	51	110	91	53				
Total Aliphatic Hydrocarbons	**<10**	**83**	**<10**	**85**	**170**	**130**	**83**				
Total Petroleum Hydrocarbons	**<10**	**172**	**130**	**195**	**350**	**270**	**168**				
BTEX	Concentration, µg/kg										
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		370	75	90000
Toluene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		660000	120000	180000000
Ethyl Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		260000	91000	27000000
p & m-xylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		310000	160000	30000000
o-xylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0				
MTBE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0				

Notes
Total = Sum of compounds above detection limit.
S4UL given at 6% soil organic matter
*Results given as total of (ortho), (meta) and (para) xylene. SGV given is the lowest permissible value for any xylene compound

Exceptions denoted thus: Residential XX
Commercial XX

CONTAMINANTS IN SOIL

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 2/2

Speciated Total Petroleum Hydrocarbons (Aromatic / Aliphatic Split with BTEX)											
Location	WSD	WSD	WSE						LQM/CIEH S4UL		
Sample											
Depth, m	0.80	1.00	0.60						residential	allotments	commercial
Determinand	Concentration, mg/kg										
Aromatic Hydrocarbons											
C5 - C7	<0.001	<0.001	<0.001						300	57	86000
>C7 - C8	<0.001	<0.001	<0.001						660	120	180000
>C8 - C10	<0.001	<0.001	<0.001						190	51	17000
>C10 - C12	<1.0	<1.0	<1.0						380	74	34000
>C12 - C16	<2.0	<2.0	<2.0						660	130	38000
>C16 - C21	<10	<10	<10						930	260	28000
>C21 - C35	<10	15	<10						1700	1600	28000
Total Aromatic Hydrocarbons	**<10**	**23**	**<10**								
Aliphatic Hydrocarbons											
C5 - C6	<0.001	<0.001	<0.001						160	3900	12000
>C6 - C8	<0.001	<0.001	<0.001						530	13000	40000
>C8 - C10	<0.001	<0.001	<0.001						150	1700	11000
>C10 - C12	<1.0	<1.0	<1.0						760	7300	47000
>C12 - C16	<2.0	<2.0	26						4300	13000	90000
>C16 - C21	<8.0	<8.0	83								
>C21 - C35	<8.0	<8.0	190								
Total Aliphatic Hydrocarbons	**<10**	**<10**	**300**								
Total Petroleum Hydrocarbons	**<10**	**23**	**300**								
BTEX	Concentration, µg/kg										
Benzene	<1.0	<1.0	<1.0						370	75	90000
Toluene	<1.0	<1.0	<1.0						660000	120000	180000000
Ethyl Benzene	<1.0	<1.0	<1.0						260000	91000	27000000
p & m-xylene	<1.0	<1.0	<1.0						310000	160000	30000000
o-xylene	<1.0	<1.0	<1.0								
MTBE	<1.0	<1.0	<1.0								

Notes
Total = Sum of compounds above detection limit.
S4UL given at 6% soil organic matter
*Results given as total of (ortho), (meta) and (para) xylene. SGV given is the lowest permissible value for any xylene compound

Exceptions denoted thus: Residential XX
Commercial XX

CONTAMINANTS IN SOIL

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 1/1

Speciated Polyaromatic Hydrocarbons by GCMS

Location	BH2	BH3	WSB	WSB	WSC	WSD	WSE					LQM/CIEH S4UL[3]		
Sample														
Depth, m	0.80	0.60	0.50	1.00	0.80	1.00	0.60					residential4	residential5	allotments	commercial
Determinand	Concentration, mg/kg														
PAH															
Naphthalene	<0.05	0.35	0.4	0.43	0.37	0.6	<0.05					13	13	24	1100
Acenaphthylene	<0.05	0.38	<0.05	<0.05	<0.05	<0.05	<0.05					920	6000	160	100000
Acenaphthene	<0.05	0.32	0.67	0.98	0.41	<0.05	<0.05					1100	6000	200	100000
Fluorene	<0.05	0.3	0.69	0.95	0.44	<0.05	<0.05					860	4500	160	71000
Phenanthrene	1.6	5	4.5	5.6	3	1.5	0.22					440	1500	90	23000
Anthracene	0.44	1.1	0.66	0.87	0.51	0.21	<0.05					11000	37000	2200	540000
Fluoranthene	3.0	11	3.9	4.9	3.1	2.2	0.7					890	1600	290	23000
Pyrene	3.3	9.8	3.1	3.9	2.6	1.9	0.9					2000	3800	620	54000
Benzo(a)anthracene	2.2	6.5	1.7	2.1	1.6	1.4	0.5					13	15	13	180
Chrysene	1.9	6.8	1.1	1.4	1.4	1.1	0.6					27	32	19	350
Benzo(b)fluoranthene	2.3	7.2	1.2	1.9	1.7	1.5	0.58					3.7	4.0	3.9	45
Benzo(k)fluoranthene	1.6	4.4	0.87	0.67	0.58	0.55	0.39					100	110	130	1200
Benzo(a)pyrene	2.4	7.2	1.0	1.6	1.5	1.2	0.48					3	3.2	3.5	36
Indeno(123-cd)pyrene	1.2	3.8	0.61	0.73	0.62	0.59	0.28					41	46	39	510
Dibenzo(ah)anthracene	0.36	0.99	<0.05	<0.05	<0.05	<0.05	<0.05					0.3	0.32	0.43	3.6
Benzo(ghi)perylene	1.6	4.6	0.77	0.92	0.88	0.74	0.37					350	360	640	4000
Total PAH (16)	**21.9**	**69.7**	**21.4**	**26.9**	**18.7**	**13.3**	**4.98**								

Notes

1. Total PAH = Sum of EPA16 identified components
2. The results are expressed as mg/kg dry weight soil after correction for moisture content
3. S4UL given at 6% soil organic matter
4. Residential with plant uptake
5. Residential without plant uptake

Exceptions denoted thus: Residential XX
Commercial XX

MANNIRE ASSOCIATES GEO-ENVIRONMENTAL LIMITED

CONTAMINANTS IN SOIL

Project: HOMEBASE, MANOR ROAD, RICHMOND UPON THAMES, TW9 1YB
Client: Taylor Wimpey West London

Project No: 21031
Sheet No: 1/2

Semi-Volatile Organic Compounds by GC-MS										
Location	BH1	WSA	WSD							
Sample										
Depth, m	1.00	0.50	0.80							
Determinand	Concentration, µg/kg									
Aniline	<0.1	<0.1	<0.1							
Phenol	<0.2	<0.2	<0.2							
2-Chlorophenol	<0.1	<0.1	<0.1							
Bis(2-chloroethyl)ether	<0.2	<0.2	<0.2							
1,3-Dichlorobenzene	<0.2	<0.2	<0.2							
1,2-Dichlorobenzene	<0.1	<0.1	<0.1							
1,4-Dichlorobenzene	<0.2	<0.2	<0.2							
Bis(2-chloroisopropyl)ether	<0.1	<0.1	<0.1							
2-Methylphenol	<0.3	<0.3	<0.3							
Hexachloroethane	<0.05	<0.05	<0.05							
Nitrobenzene	<0.3	<0.3	<0.3							
4-Methykphenol	<0.2	<0.2	<0.2							
Isophorone	<0.2	<0.2	<0.2							
2-Nitrophenol	<0.3	<0.3	<0.3							
2,4-Dimethylphenol	<0.3	<0.3	<0.3							
Bis(2-chloroethoxy)methane	<0.3	<0.3	<0.3							
1,2,4-Trichlorobenzene	<0.3	<0.3	<0.3							
Naphthalene	<0.05	0.25	<0.05							
2,4-Dichlorophenol	<0.3	<0.3	<0.3							
4-Chloroaniline	<0.1	<0.1	<0.1							
Hexachlorobutadiene	<0.1	<0.1	<0.1							
4-Chloro-3-methylphenol	<0.1	<0.1	<0.1							
2,4,6-Trichlorophenol	<0.1	<0.1	<0.1							
2,4,5-Trichlorophenol	<0.2	<0.2	<0.2							
2-Methylnaphthalene	<0.1	0.6	<0.1							
2-Chloronaphthalene	<0.1	0.1	<0.1							
Dimethylphthalate	<0.1	<0.1	<0.1							
2,6-Dinitrotoluene	<0.1	<0.1	<0.1							
Acenaphthylene	<0.05	<0.05	<0.05							
Acenaphthene	<0.05	0.3	<0.05							
2,4-Dinitrotoluene	<0.2	<0.2	<0.2							
Dibenzofuran	<0.2	<0.2	<0.2							
4-Chlorophenyl phenyl ether	<0.3	<0.3	<0.3							
Diethyl phthalate	<0.2	<0.2	<0.2							
4-Nitroaniline	<0.2	<0.2	<0.2							
Fluorene	<0.05	0.23	<0.05							
Azobenzene	<0.3	<0.3	<0.3							
Bromophenyl phenyl ether	<0.2	<0.2	<0.2							
Hexachlorobenzene	<0.3	<0.3	<0.3							
Phenanthrene	0.8	2.7	0.23							