

Phase 2 Ground Investigation

Client: Lidl Great Britain
Ltd

Ickenham Road, Ruislip

Report No: 1246.02.01

April 2024





Executive Summary

Remada Ltd was commissioned by Lidl Great Britain Ltd to conduct a Phase 2 Ground Investigation for a proposed store at the Orchard Beefeater/Premier Inn located off Ickenham Road, Ruislip. This report follows a Phase 1 Preliminary Risk Assessment previously prepared for the site (Remada report reference 1246.01.01 dated March 2024).

Summary of Phase 1 Desk Study

The earliest available mapping of 1865 indicates the site to be predominantly occupied by woodland, with a footpath intersecting site along its eastern boundary. By 1914, a residential housing had been constructed fronting onto Sharps Lane in the western area of the site. By 1935, the site was occupied by the 'Orchard Hotel' with associated outbuildings, access road / driveway. Several outbuildings were subsequently constructed adjacent to the western and north-eastern boundaries, but all have now been removed. Between the mapping of 1999 and the present day, the Premier Inn hotel building has been constructed in the north-western area of the site.

Geological mapping indicates that the site is directly underlain by the London Clay Formation, classified as Unproductive Strata. The site is located within an Environment Agency-designated Zone III (Total Catchment) Source Protection Zone, associated with permeable strata underlying the protective, lower permeability London Clay.

The site is not located within an area which may be affected by coal mining activity.

Intrusive Investigation

The investigation comprised the drilling of nine (9 No) window sample holes (WS1 – WS9) and four (4 No) CBR tests at locations between 25th and 26th March 2024.

Made ground was encountered in all locations across the site, overlain by bituminous surfacing or topsoil, and present to depths of between 0.20m and 0.70m bgl. Bedrock geology was found to comprise London Clay Formation deposits, which were encountered in all locations to a proven maximum depth of 7.0m bgl. The uppermost layer of the London Clay Formation encountered was described as soft to firm, orangish/yellowish-brown, slightly gravelly, micaceous silty CLAY; and stiff, orangish-brown, slightly calcareous, very silty CLAY.

Human Health Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. Exceedances for PAHs were identified within one the samples tested at concentrations that exceeded the human health GAC protective of on-site workers.

Asbestos was identified within one of the five samples analysed; however, the result was below the limit of detection (<0.001%).

Water Resources Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. Therefore, the risk to groundwater from contaminants within the made ground at the site is considered to be low and does not warrant further consideration.

Waste Classification

In general, the results of the chemical analyses indicate that the material would be classified as non-



hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, four of the five samples selected for analysis remained below the 3% TOC limit for disposal in an inert landfill. Therefore, it is considered that some of the waste could potentially be classified as inert. However, a full assessment of contaminants has not been undertaken and the final disposal classification should be confirmed by the receiving site.

Two samples of bituminous surfacing were analysed for concentrations of PAH compounds. The results indicated a maximum PAH-17 concentration of PAH-17 of 59.7mg/kg being recorded. The maximum concentration of benzo(a)pyrene of 5.4mg/kg in WS7 was below the 50mg/kg limit defined in WM3. Therefore, the bituminous surfacing represented by these samples would be classified as non-hazardous waste and assigned the List of Wastes code 17 03 02 for bituminous mixtures other than those mentioned in 17 03 01.

Geotechnical Assessment

A plain slab or stiffened edge raft bearing directly on compacted made ground of minimum specified bearing capacity is a potential solution. Alternatively, pad or strip foundations end bearing in the natural superficial deposits and/or bedrock would offer a suitable alternative.

Preliminary calculations indicate that for a traditional pad foundation (up to 2.0m wide) at a minimum of 1.5m depth, bearing within the firm CLAY (with a minimum undrained shear strength of 50kN/m²), a design bearing resistance of 100kN/m² will be appropriate in order to satisfy the ultimate and serviceable limit states in accordance with BS EN 1997-1: 2004. This is only applicable for foundations with loads that are applied vertically and centrally. To satisfy the serviceable limit state settlement has been limited to 25mm. Foundations will need to fully penetrate any made ground and extend a minimum of 150mm into the bearing stratum.

A Design Sulphate Class DS-1 is considered appropriate for buried concrete and an ACEC Class of AC-1 is considered appropriate for the location.

Given the generally heterogeneous nature of the Made Ground, side slopes are unlikely to remain stable even in the short term without support of without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during the excavation and a risk assessment carries out to fully assess the support measures required.

Soakaway tests were not undertaken as part of this investigation. However, based on cohesive ground conditions encountered, soakaways are not considered to be suitable for the proposed development.

Deeper deposits of Made Ground may be present beneath the existing Beefeater and Premier Inn buildings. Further investigation will be required post-demolition to ascertain the exact nature of the ground conditions these currently inaccessible areas of the proposed store footprint.

Ground Gas

The results of four rounds of gas monitoring visits placed the site into Characteristic Situation 1 and therefore ground gas protection measures will not be required within the proposed buildings.

The site is located in a Lower Probability Radon Area as less than 1% of properties are above the Action Level but no radon protective measures are necessary.



Contents

1	INTRODUCTION	4
1.1	OBJECTIVES	4
1.2	SCOPE OF WORK	4
1.3	PROPOSED DEVELOPMENT	5
1.4	PREVIOUS REPORTS	5
1.5	LIMITATIONS	5
2	SUMMARY OF PHASE 1 DESK STUDY	6
3	ENVIRONMENTAL & GEOTECHNICAL INVESTIGATION METHODOLOGY	8
3.1	INVESTIGATION STRATEGY	8
3.2	INTRUSIVE INVESTIGATION	8
3.3	IN-SITU TESTING	8
3.4	SOIL SAMPLING	9
3.5	GAS & GROUNDWATER	9
3.6	QUALITY ASSURANCE AND QUALITY CONTROL	9
3.7	LABORATORY ANALYSIS & TESTING	9
4	GEOTECHNICAL & ENVIRONMENTAL INVESTIGATION FINDINGS	11
4.1	GROUND CONDITIONS	11
4.2	IN-SITU TESTING	12
4.3	SOIL OBSERVATIONS	14
4.4	GROUNDWATER OBSERVATIONS	14
4.5	CHEMICAL ANALYSIS	14
4.6	GEOTECHNICAL TEST RESULTS	14
4.7	GROUND GAS MONITORING RESULTS	15
5	GENERIC QUANTITATIVE RISK ASSESSMENT	16
5.1	HUMAN HEALTH RISK ASSESSMENT	16
5.2	COMPARISON OF SOIL ANALYSIS RESULTS WITH HUMAN HEALTH GAC	16
5.3	CONTROLLED WATERS RISK ASSESSMENT	17
5.4	GROUND GAS ASSESSMENT	17
5.5	REVISED CONCEPTUAL SITE MODEL	18
5.6	WASTE CLASSIFICATION & WASTE ACCEPTANCE	18
5.7	HEALTH & SAFETY CONSIDERATIONS	19
6	GEOTECHNICAL SITE ASSESSMENT	21
6.1	GEOTECHNICAL CONSIDERATIONS	21
6.2	DESIGN APPROACH	21
6.3	SHRINKAGE AND SWELLING	22
6.4	FLOOR SLAB	23
6.5	EXCAVATIONS AND TEMPORARY WORKS	23
6.6	EXTERNAL CAR PARK CONSTRUCTION	23
6.7	PROTECTION OF BURIED CONCRETE	23
6.8	GENERAL CONSTRUCTION ADVICE	23
7	CONCLUSIONS & RECOMMENDATIONS	25
7.1	CONCLUSIONS	25
7.2	RECOMMENDATIONS	26
7.3	GROUND GAS	26
	STUDY LIMITATIONS	28

TABLES

Table 1	Outline Conceptual Site Model
Table 2	Gas & Groundwater Monitoring Data
Table 3	Comparison of Soil Chemical Analyses with GAC
Table 4	Plasticity Indices and Volume Change Potentials of the Cohesive Strata.
Table 5	Refined Conceptual Site Model



Table 6 Summary of Partial Factors Applied to Actions, Soil Parameters and Resistance Factors
Table 7 NHBC 2023 Table 4 – Minimum Foundation Depths

GRAPHS

Graph 1 Plot of Corrected SPT N Values vs Depth
Graph 2 Plot of Mass Shear Strength vs Depth




FIGURES

Figure 1 Site Location Plan
Figure 2 Existing and Proposed Layout and Exploratory Location Plan
Figure 3 Proposed Site Layout

EXPLORATORY HOLE LOGS

APPENDICES

Appendix A SPT Hammer Energy Test Certificate
Appendix B Dynamic Cone Penetrometer Test Results
Appendix C Laboratory Chemical Analysis
Appendix D Laboratory Geotechnical Test Results

Issue No	Date	Prepared By	Technical Review	Authorised
01	24.04.2024	J Ramos 	P Dickinson 	G Jones 



1 INTRODUCTION

Remada Ltd was commissioned by Lidl Great Britain Ltd (hereafter 'the Client') to undertake a Phase 2 Ground Investigation for a proposed store at the Orchard Beefeater/Premier Inn located off Ickenham Road, Ruislip, HA4 7DF, at the location indicated in **Figure 1**.

1.1 Objectives

The objectives of this assessment are as follows:

- to examine whether there have been any potentially contaminative uses on the site or nearby land;
- to develop a conceptual model of the site to identify plausible pollutant linkages;
- to assess ground conditions in relation to the proposed development in relation to construction design issues including the presence, nature, likely severity and extent of soil and groundwater contamination, which may be present, its potential environmental impact and likely requirement for further work; and
- Provide preliminary foundation design recommendations for the proposed development.

1.2 Scope of Work

The scope and layout of this investigation and report is generally in accordance with BS10175:2011+A2 2017 and the Environment Agency's Land Contamination Risk Management guidance for land contamination reports.

The scope of work comprised:

- 5 No. window sample boreholes with in-situ testing (SPTs) at 1m intervals to a target depth of 7.0m within the store footprint to prove competent natural strata.
- 4 No. window sample boreholes with in-situ testing (SPTs) at 1m intervals to a target depth of 5.0m within the car park / delivery bay area to prove competent natural strata.
- Installation of 3 No. gas / groundwater monitoring wells.
- 4 No. rounds of gas/groundwater monitoring at different atmospheric pressures.
- 4 No. CBR tests within the car park area on Made Ground or natural soil that will be at the development formation level. In the absence of any specific Information the pavement formation level shall be considered to be a maximum of 500mm below the existing ground level or below organic topsoil.
- Suite of geotechnical classification and strength test as appropriate to the soil and 4 No. BRE Sulphate suites in accordance with BRE SD1.
- 5 No. Chemical Analysis for asbestos (quantitative), pH, Arsenic, Beryllium, Cadmium, Chromium (trivalent & hexavalent), Copper, Mercury, Nickel, Lead, Selenium, Vanadium, Zinc, Fraction of Organic Carbon, TPHCWG, PAH (16) and Phenol.
- 2 No. bitumen suits on asphalt samples for waste classification; and
- Combined Factual & Interpretative Geoenvironmental Report.

The investigation methodology is presented in Section 3, findings in Section 4 and the exploratory locations are indicated on **Figure 2**.



1.3 Proposed Development

It is understood that the proposed site use for the majority of the site will be a Lidl retail store with associated car park and soft landscaping. This development will comprise a site area of 6460m² to the west of Ickenham Road as shown in **Figure 2**.

1.4 Previous Reports

The following Phase 1 Desk Study had been previously prepared for the site:

- Phase 1 Site Investigation & Preliminary Risk Assessment. Remada Ltd Report ref: 1246.01.01, issued in March 2024.

1.5 Limitations

The comments given in this report and the opinions expressed are based on the information reviewed and observations during site work. However, there may be conditions pertaining to the site that have not been disclosed by this assessment and therefore could not be taken into account.



2 SUMMARY OF PHASE 1 DESK STUDY

The Executive Summary and Conceptual Site Model presented within the Phase 1 Desk Study are reproduced below:

Site Setting

The site comprises an irregular plot of land, bounded by Ickenham Road (B466) to the east and Sharps Lane to the west. At the time of writing, the site is occupied by a former Beefeater public house / restaurant, located in the western and central areas of the site, which first appears on the mapping of 1935 as the 'Orchard Hotel'. A two storey 'Premier Inn' building of brick construction is present in the north-western area of the site. The remainder of the northern and eastern areas of the site are occupied by associated car parking. The southern area of the site is occupied by soft landscaping and a War Memorial.

Site History

The earliest available mapping of 1865 indicates the site to be predominantly occupied by woodland, with a footpath intersecting site along its eastern boundary. By 1914, a residential housing had been constructed fronting onto Sharps Lane in the western area of the site. By 1935, the site was occupied by the 'Orchard Hotel' with associated outbuildings, access road / driveway. Several outbuildings were subsequently constructed adjacent to the western and north-eastern boundaries, but all have now been removed. Between the mapping of 1999 and the present day, the Premier Inn hotel building has been constructed in the north-western area of the site.

Geology / Hydrogeology

Published geological maps record that the site is directly underlain by the London Clay Formation, classified as Unproductive Strata. The site is located within an Environment Agency-designated Zone III (Total Catchment) Source Protection Zone, associated with permeable strata underlying the protective, lower permeability London Clay.

Mining

The site is not located within an area which may be affected by coal mining activity.

Radon

The site is located in a Lower Probability Radon Area as less than 1% of properties are above the Action Level but no radon protective measures are necessary.

Environmental Risk Assessment

The desk study has identified a number of on-site and off-site potential sources of contamination that would require further investigation. The following is recommended:

- *Investigation of the lateral and vertical extent of made ground/fill beneath the proposed store footprint;*
- *Collection of soil and groundwater samples from the areas identified above for contaminants of concern;*
and
- *Ground gas monitoring.*

Geotechnical Assessment

It is recommended that a ground investigation is undertaken to enable preliminary foundation design.



Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Unmitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
<p>On-site Sources</p> <p>General Made Ground associated with historic development and demolished outbuildings.</p> <p>Existing Orchard/Beefeater restaurant, Premier Inn and car park areas.</p> <p>Off-site Sources</p> <p>Residential housing</p> <p>Electricity Substation</p> <p>Builders Yard</p> <p>Unspecified Depot</p>	<p>Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, V, Zn, Boron, TPH /PAH/PCBs.</p>	<p>Disturbance due to construction plant causing direct contact, dusts, vapours.</p> <p>Direct Contact with occupants of the proposed development (<u>retail & off-site residential</u>)</p> <p>Inhalation of fibres / vapours / gases by occupants of proposed development</p> <p>Permeation of water supply pipework</p>	<p>Occupants of the development / building fabric</p> <p>Adjacent residents during construction</p>	Direct Soil Ingestion	Yes	To be assessed (TBA)	Potential risk	To be assessed (TBA)	To be assessed (TBA)
				Indoor Dust ingestion	Yes	As above	Potential risk	TBA	TBA
				Skin Contact with Soils	Yes	As above	Potential risk	TBA	TBA
				Skin Contact with Dust	Yes	As above	Potential risk	TBA	TBA
				Inhalation of Outdoor Dust	Yes	As above	Potential risk	TBA	TBA
				Inhalation of Outdoor Vapours	Yes	As above	Potential risk	TBA	TBA
				Inhalation of ground gas	Yes	As above	Potential risk	TBA	TBA
				Inhalation of radon gas	No	Lower Probability Area	Negligible	None	Negligible
			Inhalation of Indoor Vapours	Yes	As above	Potential risk	TBA	TBA	
			Ingestion via permeated water supply pipework	Yes	As above	Potential risk	TBA	TBA	
			<p>Source Protection Zone III</p>	No superficial deposits recorded on BGS mapping	No	N/A	N/A	N/A	N/A
		<p>Leachate</p>		Direct Contact with Unproductive Strata	Protective thickness of London Clay over Protection Zone	N/A	Negligible	None	Negligible

Table 1: Outline Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.



3 ENVIRONMENTAL & GEOTECHNICAL INVESTIGATION METHODOLOGY

3.1 Investigation Strategy

The investigation comprised the drilling of nine (9 No.) windowless sampler boreholes between 25th and 26th March 2024; five (5 No.) of which were advanced within the footprint of proposed store and delivery pod area, and four (4 No.) within the car park/delivery bay area. Four (4 No.) CBR tests were conducted in the proposed car park. Exploratory hole and test locations are indicated on **Figure 2**.

Four (4 No.) ground gas monitoring visits were scheduled for the site to provide the minimum required C665.

All exploratory holes were logged by a suitably qualified Geo-environmental Engineer in general accordance with the recommendations of BS5930:2015+A1:2020. Detailed descriptions, together with relevant comments, are given in the **Exploratory Hole Logs**.

The weather conditions at the site during the fieldwork period were generally dry, with no standing water nor slippery ground conditions being noted.

3.2 Intrusive Investigation

All nine window sample boreholes (WS1-WS9) were undertaken using a Geotool tracked window sampling rig and advanced to a target depth of between 5.00m and 7.00m below existing ground level (bgl) dependent on position.

Combined Groundwater and Ground Gas monitoring standpipes were installed in WS1, WS2 and WS4, located within the proposed Lidl store footprint.

3.3 In-Situ Testing

3.3.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) in the window samples were carried out at 1.0m intervals as recorded on the borehole logs to assess the relative density and consistency of soils.

SPTs were conducted in accordance with BS EN ISO 22476-3 and the recorded SPT N-values are summarised on the borehole logs.

The SPT N-values have been corrected based on the Energy Ratio of 65% for the SPT hammer on the window sampling rig. The SPT Hammer Energy Test Report, undertaken in accordance with BS EN ISO 22476-3:2005 is presented in **Appendix A**.

3.3.2 Hand Shear Vane

Hand shear vane tests were undertaken using an Impact SL810 and in general accordance with the manufacturer's instructions on selected samples of cohesive soils.

3.3.3 Dynamic Cone Penetrometer (DCP) Tests

Four DCP tests were conducted in order to determine California Bearing Ratio (CBR) values for near surface soils, at the locations in **Figure 2**. A known mass is dropped through a known distance to drive a cone into the ground. The penetration distance per blow is recorded in order to enable the CBR value to be calculated. Test results are presented in **Appendix B**.



3.4 Soil Sampling

3.4.1 Environmental

Made ground and natural soils were selected by visual and olfactory means for subsequent analysis. Samples for chemical laboratory testing purposes were collected in amber glass jars, amber glass vials and plastic tubs and retained in a cool box for transport to the laboratory.

3.4.2 Geotechnical

Geotechnical samples were collected at depths indicated on the window sample logs with samples retrieved from within a sleeve line. The disturbed samples were placed in sealed and correctly labelled plastic tubs or bags as appropriate. All geotechnical samples were dispatched to the laboratory for testing with a completed chain of custody.

3.5 Gas & Groundwater

3.5.1 Installations

Combined ground gas and groundwater monitoring standpipes were installed in selected wells with a 50mm diameter slotted HDPE pipe and packed with gravel surround as recorded on the exploratory logs. Wells were completed with 1m of plain HDPE pipe and bentonite seal, with a gas bung and tap being installed at the top of the pipe.

3.5.2 Monitoring

Ground gas monitoring was undertaken using a GasData GFM436 gas analyser for the parameters reported below. Groundwater levels were measured with a GeoSense OWP30 oil water interface probe. Permanent ground gas monitoring involved the measurement of the following in the prescribed order:

- Pressure difference between the monitoring well and the atmosphere;
- Peak and steady flow rates of gas into or out of the monitoring well;
- Peak and steady concentrations of carbon dioxide, methane, oxygen (minimum and steady recorded), carbon monoxide, hydrogen sulphide; and
- Depth to groundwater.

Four ground gas monitoring visits were undertaken as a minimum required for a commercial development in accordance with CIRIA C665. Ground gas concentrations were recorded on 1st, 9th, 18th and 23rd April 2024 at WS1, WS2 and WS4 and the results are presented in **Table 2**.

3.6 Quality Assurance and Quality Control

All samples were submitted to a United Kingdom Accredited Laboratory (UKAS) under a completed chain of custody. The laboratory carried out its own QA/QC programme to ensure that the quality of the analytical data conformed to the appropriate test method protocols.

3.7 Laboratory Analysis & Testing

3.7.1 Chemical Analysis – Soil

Five (5 No) soil samples were scheduled for the analysis of asbestos, arsenic, barium, beryllium, cadmium, chromium (III & VI), copper, mercury, nickel, lead, selenium, zinc, fraction of organic carbon, Total Petroleum Hydrocarbons (TPHCWG), Polyaromatic Hydrocarbons (PAH), BTEX compounds (benzene, toluene, ethylbenzene and xylene) and phenols.

In addition, two samples of bituminous surfacing were analysed for PAH compounds.



The results of laboratory chemical analyses are presented at **Appendix C**.

3.7.2 Geotechnical

Samples recovered from the boreholes were submitted to an accredited laboratory for the following tests in general accordance with BS1377:1990:

- 5 No Natural Moisture Contents
- 5 No Plasticity Indices
- 3 No Particle Size Distribution tests; and
- 4 No BRE SD1 Suite.

The results of the geotechnical testing are presented at **Appendix D**.



4 GEOTECHNICAL & ENVIRONMENTAL INVESTIGATION FINDINGS

4.1 Ground Conditions

A brief description of the published geology is provided together with a summary of the ground conditions encountered during the intrusive investigation. Exploratory logs are presented at the end of the report.

4.1.1 Published Geology

Published geological mapping indicates the site to be directly underlain by London Clay Formation bedrock. The British Geological Survey (BGS) describes this formation as typically comprising *'bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt or sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite'*.

The bedrock is classified as Unproductive Strata. The site is located within an Environment Agency-designated Zone III (Total Catchment) Source Protection Zone. This is defined by the EA as *'the total area needed to support the discharge from the protected groundwater source'*.

4.1.2 Made Ground

Made Ground was encountered within all Remada's exploratory holes on-site and was present to a maximum depth of 0.7m bgl (WS5 and WS9).

Asphalt surfacing was encountered in eight exploratory holes (all except WS1) and was 0.05m thick. Concrete was encountered underlying the asphalt within one location (WS8) and was present to a basal depth of 0.2m bgl.

Within WS1, in the southern area of the site, the entirety of the made ground comprised reworked clay topsoil with brick fragments to a basal depth of 0.2m bgl.

The Made Ground underlying the hardstanding typically comprised granular deposits, recorded on-site as either slightly sandy clayey GRAVEL or sandy GRAVEL. The gravels were typically angular to subangular, fine to coarse lithologies including brick fragments, concrete fragments, plastic fragments, and glass fragments. However, within the WS2 in the western area of the site, soft yellowish-brown slightly gravelly CLAY was encountered between 0.30m and 0.50m bgl containing brick fragments.

4.1.3 Natural Strata

The natural strata underlying the made ground in all nine exploratory holes typically comprised soft to stiff orangish / yellowish brown, locally silty, sandy and gravelly CLAY, becoming bluish grey with depth.

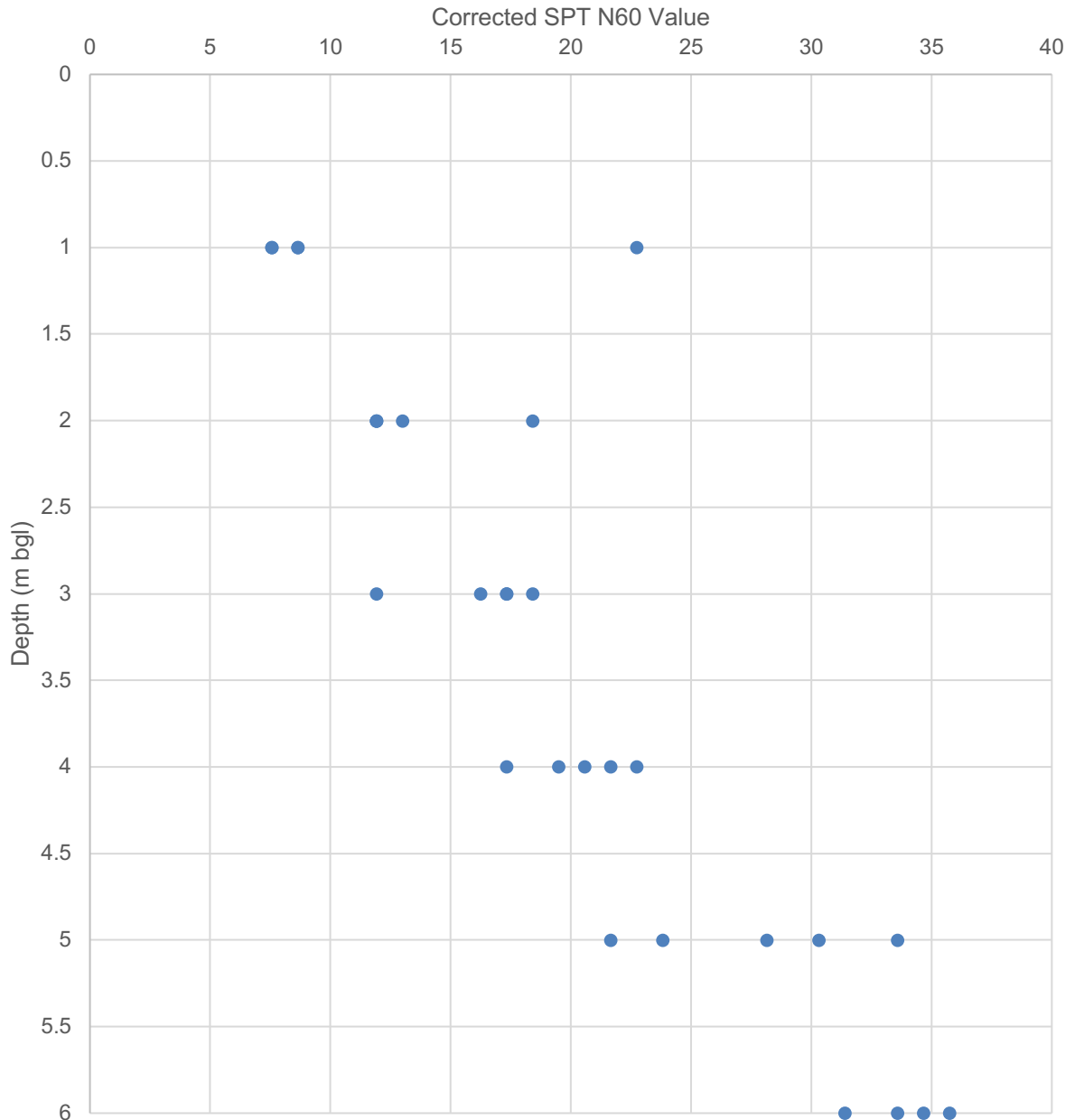
Within WS4 in the north-western area of the site, a deposit of fine SAND was encountered 6.7m and 6.9m bgl interbedded within a stiff very silty clay.

On the basis of the published geological mapping and the encountered ground conditions on-site, the cohesive natural deposits are considered to be representative of the London Clay Formation.

4.2 In-situ Testing

4.2.1 Standard Penetration Tests (SPTs)

In-situ SPTs were undertaken to assist with the interpretation of strata encountered. The results of corrected N-values versus depth are plotted in the graph below:



Graph 1: Plot of Corrected SPT N-Values Versus Depth

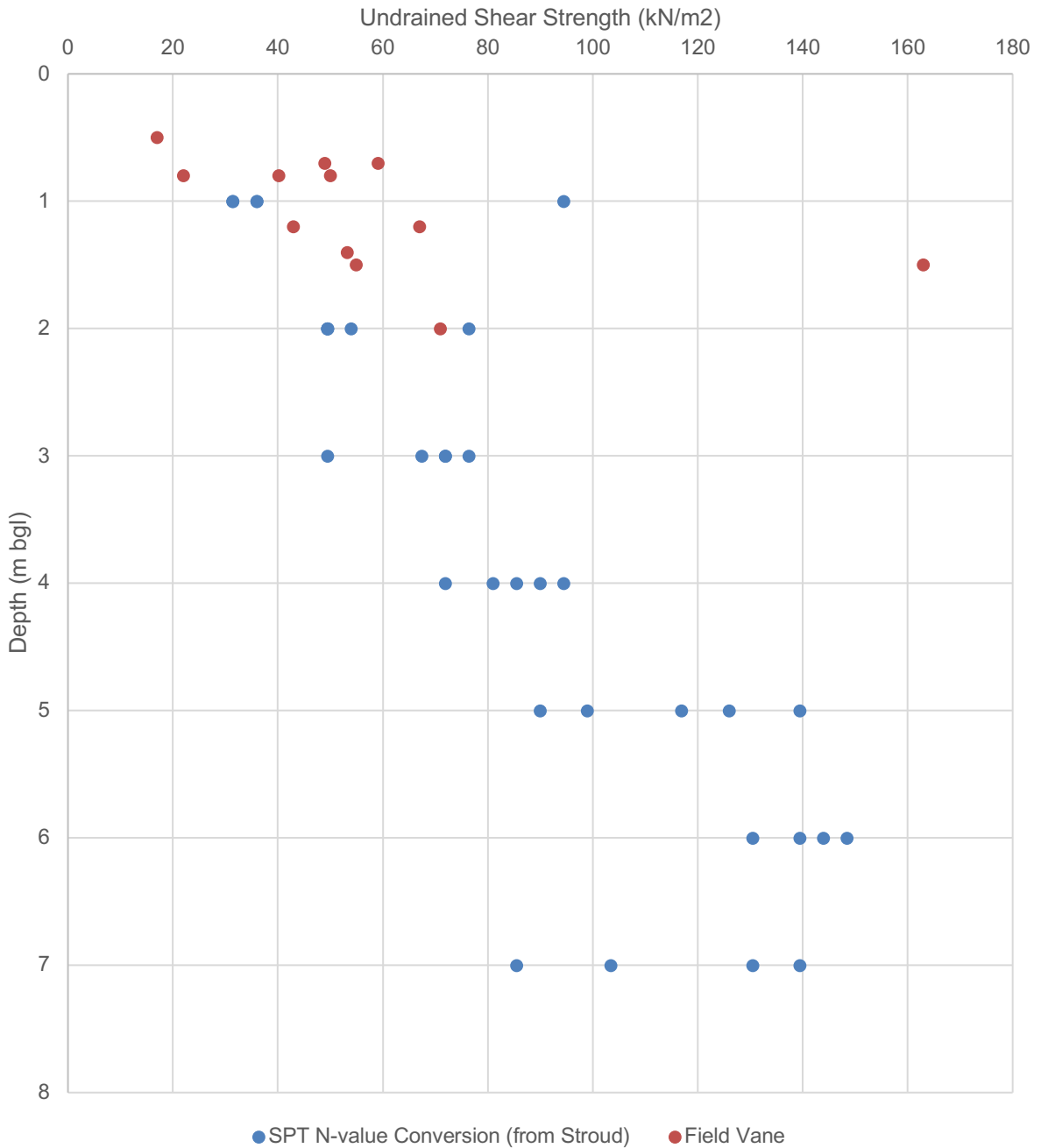
The following graph depicts the corrected SPT N values undertaken within the cohesive materials of the weathered London Clay Formation bedrock.

Undrained shear strengths have been estimated from uncorrected SPT N values using the relationship developed by Stroud (*The standard penetration test in incentive clays and soft rocks*) and summarised in Tomlinson where:

$$\text{Mass shear strength} = f_1 \times N$$

Where f_1 is based on the plasticity index.

A Plasticity Index of 37% has been assumed (based on geotechnical laboratory testing) which equates to an f_1 factor of 4.5.



Graph 2: Plot of Mass Shear Strength Versus Depth.

4.2.2 Hand Shear Vane

The results ranged between 17kPa (in WS8 at 0.5m) and 163kPa (in WS1 at 1.50m bgl). The hand shear vane test results have been plotted along with the results interpreted from the SPT N values in Graph 2.



4.2.3 CBR Tests

The results of the four DCP tests within the proposed car park area produced values typically 2% within the upper 1m.

4.3 Soil Observations

Made Ground was recovered at all locations as a heterogeneous granular material containing a variety of man-made materials including brick, concrete, asphalt, with plastic fragments, and glass fragments. There were no visible or olfactory indicators of contamination within the sampled soils.

4.4 Groundwater Observations

Perched groundwater seepage was recorded in one window sample borehole (WS9) at a depth of 0.50m bgl within the Made Ground deposits. In addition, groundwater was recorded in WS4 at 7.00m bgl and WS5 at 5.00m bgl within a band of sand in the natural deposits.

4.5 Chemical Analysis

Results of the soil chemical analysis are presented in **Table 3** and summarised as follows.

The average FOC and pH were 3 and 8 respectively. Asbestos was detected in one sample from WS4a at 0.30m bgl, collected within the Made Ground. Detectable concentrations of metals were identified, although these are generally within the range that would typically be expected for made ground.

Concentrations of PAHs were detected above the relevant critical criteria in one sample collected from WS9 at 0.50m within the Made Ground.

Two samples of asphalt from WS7 and WS9 were scheduled for PAH (17) analysis. The concentrations of coronene were less than method detection limit (MDL).

4.6 Geotechnical Test Results

4.6.1 Plasticity Testing

Plasticity testing was undertaken on five samples of cohesive soils recovered from the window sample boreholes, with the results ranging between 36% and 38%. These indicate the soils to be of high (CH) plasticity and medium volume change potential as summarised in the table below:

Location	Depth (m)	Plasticity Index (%)	Passing .425mm (%)	Modified Plasticity Index	Volume Change Potential
WS1	0.80	37	100	37	Medium
WS3	2.00	36	98	35	Medium
WS4A	2.00	38	100	38	Medium
WS6	1.00	36	98	35	Medium
WS7	2.00	36	100	36	Medium

Table 4: Plasticity Indices and Volume Change Potentials of the Cohesive Strata.

4.6.2 Particle Size Distribution (PSDs)

The Particle Size Distribution (PSD) tests produced the following:

- Natural deposits in WS3 at 1.0 – 2.0m comprised brown slightly sandy CLAY.
- Natural deposits in WS4A at 1.0 – 2.5m comprised brown slightly sandy CLAY.



- Natural deposits in WS5 at 0.8m – 2.0m comprised brown silty sandy CLAY.

4.6.3 BRE SD1 Analysis

The water-soluble sulphate contents varied from 22.4 and 166mg/l in the four soil samples analysed, with pH varying from 6.8 to 8.1. The total sulphur content varied from 0.011 to 0.02% and acid soluble sulphate varied from 0.032 to 0.045%.

4.7 Ground Gas Monitoring Results

The results of the ground gas and groundwater monitoring programme are summarised below:

- Methane concentrations were recorded below the instruction detection limit (<0.1% v/v) within all three monitoring wells throughout the programme.
- A maximum steady state concentration of Carbon Dioxide was recorded as 1.7% v/v in WS2 on 1st April 2024. Detectable concentrations of carbon dioxide were recorded in all the monitoring wells;
- A minimum steady state concentration of Oxygen was recorded as 18.4 % v/v in WS1 on 9th April 2024;
- Ground gas flow rates were recorded at a maximum of 3.3 litres per hour (l/hr) in WS4 on 1st April 2024;
- Groundwater was encountered within all three standpipes over the course of the monitoring programme, ranging in depths between 0.33m (WS4) and 1.77m bgl (WS2); and
- Atmospheric pressure at the time of sampling varied between a high of 1013 millibar (mbar) on 18th and 23rd April 2024 and a low of 986 mbar on 1st April 2024. The monitoring visits were undertaken during periods of rising, steady and falling pressure trends over the preceding forty-eight hours.



5 GENERIC QUANTITATIVE RISK ASSESSMENT

5.1 Human Health Risk Assessment

In order to provide an up to date assessment of the risks to human health, Remada has adopted the most recent Generic Assessment Criteria (GAC) published by LQM/CIEH (S4ULs) and CL:AIRE/EIC/AGS for the assessment of potential risks to human health. The derivation of GAC, methodology, input parameters and technical guidance (CLEA) may be obtained upon request.

The proposed site layout retail store and car park is presented in **Figure 3**.

Default parameters have been adopted for sandy loam of pH 7 and commercial land use. FOC ranged from 0.0054 to 0.056 giving a Soil Organic Matter (SOM) content range of between 1 to 10% with an average result of 3%. In order to present a conservative assessment, the SOM content of 2.5% has been adopted for the assessment.

The depth to potential sources of contamination for indoor air pathways has been assumed to be 0.5m below building foundation level. The source has been conservatively assumed to be at ground level for outdoor air and direct contact pathways.

For commercial land use the CLEA version 1.06 critical receptor is conservatively modelled as a female working adult with an exposure duration of 49 years. In accordance with the default parameters, it was assumed that employees spend most of their time indoors and that 80% of outdoor area is covered by hardstanding. As such, the potential exposure pathways have been assumed to be:

- Direct Soil and Indoor Dust Ingestion;
- Skin contact with soils and dusts;
- Inhalation of indoor and outdoor dusts and vapours.

Where GAC values for individual TPH fractions are not exceeded, the potential additive effect has been assessed by calculating overall TPH hazard index for each sample.

5.2 Comparison of Soil Analysis Results with Human Health GAC

A comparison of soil chemical analysis with GAC is presented as **Table 3**.

TPH, PAH & BTEX

Concentrations of PAHs were detected above the relevant critical criteria (GAC) in one of the samples collected from WS9 at 0.50m bgl within the Made Ground, for three contaminants as follows:

- Benzo(b)fluoranthene = 200mg/kg (compared to respective GAC of 45mg/kg).
- Benzo(a)pyrene = 170mg/kg (compared to respective GAC of 35mg/kg); and
- Dibenzo (a, h) anthracene = 200mg/kg (compared to respective GAC of 3.6mg/kg)

Metals & Inorganics Excluding Asbestos

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.



Asbestos

Five soil samples were screened for asbestos identification. The asbestos identified was amosite loose fibres (WS4a at 0.30m bgl) from a sample collected within the Made Ground. However, quantification of asbestos identified was below detection limit of <0.001%.

5.3 Controlled Waters Risk Assessment

5.3.1 Sensitivity – Groundwater

The site is indicated to be within a Zone III (Total Catchment) Source Protection Zone. The London Clay Formation bedrock underlying the site is designated as Unproductive Strata. There are eighteen (18 No.) groundwater abstractions recorded within 1km of the site.

5.3.2 Sensitivity – Surface Waters

The nearest surface water feature is a pond, located 460m north-east of the site. The nearest named watercourse is River Pinn, located 578m west of the study site.

5.3.3 Risk Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range that would be expected for 'typical' made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site.

Groundwater strikes were encountered with the made ground at 0.5m in WS9, and within granular bands in WS4 and WS5 at depths of 7.0m and 5.0m bgl respectively. The variation in depths and absence of groundwater in some borehole locations is indicative of perched water within the underlying strata, rather than a continuous groundwater body. During the subsequent monitoring programme, groundwater was encountered within all three standpipes over the course of the monitoring programme, ranging in depths between 0.33m (WS4) and 1.77m bgl (WS2). Standing water level in WS2 was consistently deeper than those in WS1 and WS4.

Post-development, the site will continue to be predominantly covered by a retail building and areas of hardstanding. Consequently, the risk of leaching of contaminants as a result of infiltration of groundwater is limited. Therefore, the risk to controlled waters from contaminants within the made ground at the site is considered to be low and does not warrant further consideration at this stage.

5.4 Ground Gas Assessment

In order to understand the gassing regime at the site, a Characteristic Situation (as defined in CIRIA C665 and BS8576:2013) is determined for the site. CIRIA C665 and BS8576 provides definitions for each Characteristic Situation based on Gas Screening Values (GSV) which are calculated as follows:

- $GSV = \text{Gas Concentration (\% v/v)} \times \text{Measured Borehole Flow Rate (l/hr)}$

BS8576 makes a distinction between the GSV and the Hazardous Gas Flow Rate (Q_{hg}) which is also calculated using the above calculation. BS8576 states that Q_{hg} is calculated for each individual borehole for each monitoring visit, whereas the GSV is taken as the representative value for the site or site zone.



As a worst-case assessment, the GSV for the site is therefore taken as the maximum steady-state carbon dioxide/methane concentration recorded in the boreholes which is multiplied by the maximum flow rate recorded during the same monitoring event.

- Methane GSV = 0.1 % x 3.3 l/hr = 0.0033 l/hr (methane concentration taken as equal to the instrument detection limit of 0.1%).
- Carbon Dioxide GSV = 1.7 % x 3.3 l/hr = 0.056 l/hr

The calculated GSV of less than 0.07 l/hr for methane and carbon dioxide places the site into Characteristic Situation 1. BS 8485:2015+A1:2019 states that for Characteristic Situation 1 the methane concentration would typically be less than 1% and carbon dioxide less than 5% and that if concentrations are above these limits then consideration should be given to placing the site into Characteristic Situation 2. As the concentrations of methane and carbon dioxide were both within these typical limits it is considered that the Characteristic Situation 1 classification is appropriate for the site. Therefore, gas protection measures are not deemed necessary for the proposed development.

5.5 Revised Conceptual Site Model

A revised Conceptual Site Model is presented as **Table 5** below.

5.6 Waste Classification & Waste Acceptance

Waste classification has been undertaken following guidance set out in WM3 EA Technical Guidance 'Guidance on the classification and assessment of waste', 1st Edition, Version 1.2GB, October 2021. The results of this assessment determine the appropriate List of Waste (LoW) Code and whether the waste should be classified as hazardous or non-hazardous. Classification is undertaken using the results of solid (total) analyses and not on the results of the WAC analyses.

Once the waste has been classified as either hazardous or non-hazardous then the WAC testing determines if the waste meets the requirements for disposal in the required landfill. Therefore, if the waste is classified as hazardous waste, then the waste would also need to meet the hazardous waste WAC requirements to be disposed of in a hazardous waste landfill. However, if the final destination of the waste is not to landfill then WAC analysis is not required.

The WAC testing also allows for a distinction to be made between inert and non-hazardous waste. Waste that does not fall within the hazardous waste category and meets the requirements for disposal in an inert landfill can therefore be disposed of in an inert landfill. However, waste that does not meet the requirements for inert landfill will need to be disposed of in a non-hazardous landfill. In certain circumstances hazardous waste can be disposed of in a designated cell within a non-hazardous landfill. In this case the waste would need to meet more stringent leachate requirements for stable non-reactive hazardous waste.

5.6.1 Waste Classification

The results of the assessment indicated that contaminant concentrations within the made ground and natural soils were generally low and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

Bitumen / Coal Tars

Two (2 No.) samples of asphalt from WS7 and WS9 were scheduled for PAH(17) analysis. The



concentration of benzo(a)pyrene was very low (<10mg/kg) and ranged between 4.7mg/kg in WS9 and 5.4mg/kg in WS7 below the 50mg/kg limit defined in WM3. Coronene was also scheduled as an indicator compound and concentrations were less than the method detection limit. Therefore, the bituminous surfacing represented by this sample would be classified as non-hazardous waste and assigned the List of Wastes code 17 03 02 for bituminous mixtures other than those mentioned in 17 03 01.

5.6.2 Waste Acceptance

While Waste Acceptance Criteria (WAC) analysis has not been undertaken, the assessment has included determination of the fraction of organic carbon (FOC) which can be converted to TOC. As four of the five samples selected for analysis were below the 3% TOC limit (all except WS9), it is considered that some of the waste could potentially be classified as inert. However, a full assessment of contaminants has not been undertaken and the final disposal classification should be confirmed by the receiving site.

As a significant proportion of the soils likely to be generated on site are clean it is recommended that where possible that the soils could be recycled at a suitable local waste treatment plant or transfer station rather than a landfill disposal route.

5.7 Health & Safety Considerations

To ensure direct exposure of construction workers involved in the site redevelopment to any impacted contaminated shallow soils is minimised, the guidance stated in HSG 66 "Protection of Workers and the General Public During Redevelopment of Contaminated Land" should be followed.



Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Unmitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
On-site Sources General Made Ground associated with historic development and demolished outbuildings. Existing Orchard Beefeater restaurant, Premier Inn and car park areas. Off-site Sources Residential housing Electricity Sub Station Builders Yard Unspecified Depot	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, Boron, TPH /PAH/PCBs.	Disturbance due to construction plant causing direct contact, dusts, vapours. Direct Contact with occupants of the proposed development (<u>retail & off-site residential</u>) Inhalation of fibres / vapours / gases by occupants of proposed development Permeation of water supply pipework Leachate	Occupants of the development / building fabric	Direct Soil Ingestion	Yes	PAHs exceedances of GAC within the Made Ground	Potential Risk	Hardstanding to cover retail site minimising direct contact.	Negligible
				• Indoor Dust ingestion	Yes	As above	Potential Risk	As above	Negligible
				• Skin Contact with Soils	Yes	As above	Potential Risk	As above	Negligible
				• Skin Contact with Dust	Yes	As above	Potential Risk	As above	Negligible
				• Inhalation of Outdoor Dust	Yes	As above	Potential Risk	As above	Negligible
			Adjacent residents during construction	• Inhalation of Outdoor Vapours	Yes	As above	Potential Risk	As above	Negligible
				• Inhalation of Indoor Vapours	Yes	As above	Potential Risk	As above	Negligible
				• Ingestion via permeated water supply pipework	Yes	As above	Potential Risk	As above	Negligible
				• Inhalation of ground gas	Yes	CS1	Negligible	None	Negligible
				• Inhalation of radon gas	No				
Source Protection Zone III	• No superficial deposits recorded on BGS mapping	No	Low Probability Radon Area	Very low	None required	Negligible			
	• Direct Contact with Unproductive Strata	Protective thickness of London Clay over Protection Zone	Concentrations within typical range of made ground (< GAC)	Low	Hardstanding to prevent precipitation infiltration and leaching.	Negligible			

Table 5: Refined Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.



6 GEOTECHNICAL SITE ASSESSMENT

6.1 Geotechnical Considerations

An indicative site layout has been made available to Remada, illustrating the proposed store footprint to be in the western area of the site and occupying the footprint of the existing building on-site. The proposed delivery ramp would be located adjacent to the north-western boundary, partially occupying the footprint of the existing parking area. The other areas of the site would be occupied by car parking and soft landscaping.

Remada's boreholes WS1 to WS6 were located along the north-western and south-western sides of the proposed store, as indicated in **Figure 2**. Within WS1 to WS6, Made Ground was found to be extended to depths of between 0.20m and 0.70m bgl, resting upon cohesive deposits that have been interpreted as London Clay Formation. In addition, deeper Made Ground may be present beneath existing building. Further investigation will be required post-demolition to ascertain the exact nature of the ground conditions beneath the proposed building.

Field vane testing undertaken within the top 1.0m recorded variable shear strengths within the natural clays. However, below this depth the shear strengths recorded were typically 40 – 80kPa between 1.0m and 2.0m, as shown in **Graph 2**.

Uncorrected SPT N-values at 1.0m bgl within the nine exploratory boreholes ranged between 7 and 21, whilst at 2.0m depth these ranged between 9 and 17. Groundwater seepages were noted in WS9 at 0.50m bgl within the Made Ground deposits, and in WS4 at 7.00m bgl and WS5 at 5.00m bgl within the natural deposits.

Details of the proposed permanent and variable design loads (actions) are not currently known although an indicative column load of 400kN has been provided.

6.2 Design Approach

Design calculations in accordance with BS EN 1997-1: 2004 require the establishment of design values for actions, ground properties and ground resistances, definition of the limits that must not be exceeded (usually a serviceability limit state), the setting up of calculation models for the relevant ultimate or serviceability limit state, and the showing by such calculation that these limits will not be exceeded.

Design values for such calculations are derived by applying partial factors to characteristic values for actions, ground properties and ground resistances, and based upon the geotechnical model and following requirements of Design Approach 1, Combination 2 calculations have been undertaken. **Table 6** provides a summary of the partial factors applied to actions, soil parameters and resistance factors. To satisfy the serviceable limit state settlement has been limited to 25mm.



Geotechnical parameter			Symbol	Combination 1		Combination 2			
Partial factors ¹ on actions (γ_F) or effects of actions (γ_E)	Permanent	Unfavourable ²	γ_G	A1	1.35	A2	1.0		
		Favourable ³							
	Variable ⁴	Unfavourable	γ_Q					1.0	1.0
		Favourable ⁵						1.5	1.3
					0	0			
Partial factors on soil parameters (γ_M)	Angle of shearing resistance ⁶		$\gamma_{\phi'}$	M1	1.0	M2	1.25		
	Effective cohesion		$\gamma_{c'}$					1.0	1.25
	Undrained shear strength		γ_{cu}					1.0	1.4
	Unconfined strength		γ_{qu}					1.0	1.4
	Weight density		$\gamma_{\gamma'}$					1.0	1.0
Partial resistance factors (γ_R) for spread foundations	Bearing		$\gamma_{R;v}$	R1	1.0	R1	1.0		
	Slidings		$\gamma_{R;h}$					1.0	1.0

¹These factors are given for buildings only. Different factors apply to bridges and other structures
²In this case the upper characteristic value ($G_{k,sup}$) of the permanent action is used
³In this case the lower characteristic value ($G_{k,inf}$) of the permanent action is used
⁴There may be more than one variable action. The partial factor is applied to the leading variable action and modified (reduced) values
⁵The UK National Annex states that when variable actions are favourable Q_k is zero, rather than g_Q is zero
⁶This is applied to $\tan\phi'$ or $\tan\phi_{cv}'$ although it might be more appropriate to determine the design value ϕ_{cv} directly

Table 6: Summary of Partial Factors Applied to Actions, Soil Parameters and Resistance Factors

In the absence of design loads the bearing capacity assessment has been undertaken for Design Approach 1, Combination 2 only, and a further assessment taking account of anticipated loadings (permanent and variable) will be required during detailed design in order to confirm the limit states are satisfied. All foundations will need to fully penetrate any made ground and be founded a minimum of 150mm into the founding stratum.

Preliminary calculations indicate that for a shallow traditional pad foundation (up to 2.0m wide) at a minimum of 1.5m depth, bearing within the firm cohesive materials (with a minimum undrained shear strength of 50kN/m²), a design bearing resistance of 100kN/m² will be appropriate in order to satisfy the ultimate and serviceable limit states in accordance with BS EN 1997-1: 2004. This is only applicable for foundations with loads that are applied vertically and centrally. To satisfy the serviceable limit state settlement has been limited to 25mm. Foundations will need to fully penetrate any made ground including fill material used to raise site levels and extend a minimum of 150mm into the bearing stratum.

A plain slab or stiffened edge raft bearing directly on compacted made ground of minimum specified bearing capacity is a potential solution. Alternatively, pad or strip foundations end bearing in the natural superficial deposits would offer a suitable alternative.

If strip foundations are adopted, they are likely to be supported by soils of variable compressibility, and as such it is recommended that mesh reinforcement be incorporated in the strip foundation to help limit differential settlement. Where foundations are to be stepped this should be in accordance with good building practice.

6.3 Shrinkage and Swelling

All samples of CLAY were reported as being HIGH plasticity with between 98% and 100% passing a 0.425mm sieve. The modified plasticity index equates to Medium Volume Change Potential.



BRE 412 states that where the natural moisture content is less than 0.4 times the Liquid Limit ($w < 0.4 w_L$) it is indicative of desiccation. Within all five samples analysed, the moisture content remained higher than 0.4x Liquid Limit, so it is unlikely that soil desiccation has occurred.

The minimum foundation depths outside the zone of tree influence as specified by the NHBC have been reproduced in **Table 7** below, however:

Volume Change Potential	A) Minimum foundation depth (m) (allowing for restricted new planting)	B) Minimum foundation depth (m) (where planting is outside the zone of influence of trees)
High	1.50	1.0
Medium	1.25	0.9
Low	0.9	0.75

Table 7: NHBC 2023 Table 4 - Minimum Foundation Depths

6.4 Floor Slab

It is anticipated that the proposed finished floor level will be similar to the existing ground level and a ground bearing slab may be suitable provided that it is placed on suitable thickness of engineered fill as specified by the engineer. Based on the ground conditions encountered, it is considered likely that a raft foundation would also be suitable for the site.

6.5 Excavations and Temporary Works

Side slopes within the clay are likely to remain stable in the short term without support or without being battered back to a safe slope gradient. However, side slopes within the made ground deposits are unlikely to remain stable even in the short term without support or without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during excavation and a risk assessment carried out to fully assess the support measures required.

Groundwater seepage was noted in three of the nine window sample boreholes at depths of between 0.50m and 7.00m bgl. The variation in depths is indicative of perched water within the Made Ground and underlying natural strata, rather than a continuous groundwater body.

6.6 External Car Park Construction

CBR values estimated from the DCP tests indicated that, near surface the CBR values were variable and a value of 2% should be adopted at a depth of 0.4m below existing car park level. Poorly compacted made ground backfill resulting from the demolition works should be excavated, processed as necessary to produce a 6F2 material and replaced in compacted layers in accordance with an engineering specification.

6.7 Protection of Buried Concrete

In accordance with BRE SD1 for buried concrete in a brownfield site with mobile groundwater, analyse of selected samples for water soluble sulphate returned values of up to 166 mg/l and pH >6.8. A total potential sulphate value of 0.06% was also calculated from the total sulphur results. Therefore, a Design Sulphate Class DS-1 is considered appropriate for buried concrete and an ACEC Class of AC-1s is considered appropriate for the location.

6.8 General Construction Advice

All formations should be cleaned, and subsequently inspected, by a suitably qualified engineer prior to



placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Where applicable ground beneath the proposed building footprint and potentially car parking may require to be stripped to reveal localised areas of made ground and structures. Excavations should be backfilled with suitably re-compacted materials to achieve formation level.

During foundation excavation works arisings should be constantly monitored for the presence of contamination.

Deeper Made Ground may be encountered within existing building footprint post-demolition, along with a number of obstructions including boulder size fragments of concrete and former foundations associated with the existing Orchard Beefeater/ Premier Inn building.



7 CONCLUSIONS & RECOMMENDATIONS

7.1 Conclusions

The following conclusions have been made based on the findings of this investigation.

7.1.1 Phase 2 Site Investigation

The site was historically occupied by the 'Orchard Hotel' which was subsequently converted into a Beefeater public house/ restaurant located in the western and central areas of the site. A two storey 'Premier Inn' building of brick had been constructed in the north-western area of the site. At the time of the investigation the former Beefeater public house / restaurant and the Premier Inn were still present on site. The remainder of the northern and eastern areas of the site are occupied by associated parking. The southern area of the site is occupied by soft landscaping and a War Memorial.

Geological mapping indicates the site to be underlain by the London Clay Formation, classified as Unproductive Strata.

The investigation comprised nine (9 No.) window sample holes which encountered asphalt surfacing at seven (7 No.) locations and asphalt surfacing overlying concrete surfacing at one (1 No.) location. Beneath the surfacing material, Made Ground was observed to comprise typically of angular to subangular, fine to coarse sandy clayey or sandy gravel of mixed lithologies including brick fragments, concrete fragments, plastic fragments, and glass fragments. However, within exploratory hole WS2 located in the western area of the site, soft yellowish-brown slightly gravelly clay was encountered between 0.30m and 0.50m bgl containing brick fragments. In addition, Made Ground consisting of reworked TOPSOIL was encountered within WS1 to a depth of 0.20m bgl.

Bedrock geology was found to comprise London Clay Formation which the uppermost layer was described as soft to firm, orangish-brown, mottled grey, slightly gravelly, micaceous, silty CLAY; and stiff, orangish-brown, slightly calcareous, very silty CLAY.

7.1.2 Human Health Risk Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. Exceedances for PAHs were identified within one the samples tested at concentrations that exceeded the human health GAC protective of on-site workers. Asbestos was identified within one of the five samples analysed; however, the result was below the limit of detection (<0.001%).

7.1.3 Water Resources Risk Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. Therefore, the risk to groundwater from contaminants within the made ground at the site is considered to be low and does not warrant further consideration.

7.1.4 Waste Classification

In general, the results of the chemical analyses indicate that the material would be classified as non-hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, four of



the five samples selected for analysis remained below the 3% TOC limit for disposal in an inert landfill. Therefore, it is considered that some of the waste could potentially be classified as inert. However, a full assessment of contaminants has not been undertaken and the final disposal classification should be confirmed by the receiving site.

Two samples of bituminous surfacing were analysed for concentrations of PAH compounds. The results indicated a maximum PAH-17 concentration of PAH-17 of 59.7mg/kg being recorded. The maximum concentration of benzo(a)pyrene of 5.4mg/kg in WS7 was below the 50mg/kg limit defined in WM3. Therefore, the bituminous surfacing represented by these samples would be classified as non-hazardous waste and assigned the List of Wastes code 17 03 02 for bituminous mixtures other than those mentioned in 17 03 01.

7.2 Recommendations

A plain slab or stiffened edge raft bearing directly on compacted made ground of minimum specified bearing capacity is a potential solution. Alternatively, pad or strip foundations end bearing in the natural superficial deposits and/or bedrock would offer a suitable alternative.

Preliminary calculations indicate that for a traditional pad foundation (up to 2.0m wide) at a minimum of 1.5m depth, bearing within the firm CLAY (with a minimum undrained shear strength of 50kN/m²), a design bearing resistance of 100kN/m² will be appropriate in order to satisfy the ultimate and serviceable limit states in accordance with BS EN 1997-1: 2004. This is only applicable for foundations with loads that are applied vertically and centrally. To satisfy the serviceable limit state settlement has been limited to 25mm. Foundations will need to fully penetrate any made ground and extend a minimum of 150mm into the bearing stratum.

A Design Sulphate Class DS-1 is considered appropriate for buried concrete and an ACEC Class of AC-1 is considered appropriate for the location.

Given the generally heterogeneous nature of the Made Ground, side slopes are unlikely to remain stable even in the short term without support of without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during the excavation and a risk assessment carries out to fully assess the support measures required.

Soakaway tests were not undertaken as part of this investigation. However, based on cohesive ground conditions encountered, soakaways are not considered to be suitable for the proposed development.

Deeper deposits of Made Ground may be present beneath the existing Beefeater and Premier Inn buildings. Further investigation will be required post-demolition to ascertain the exact nature of the ground conditions these currently inaccessible areas of the proposed store footprint.

7.3 Ground Gas

The results of four rounds of gas monitoring visits placed the site into Characteristic Situation 1 and therefore ground gas protection measures will not be required within the proposed buildings.

The site is located in a Lower Probability Radon Area as less than 1% of properties are above the Action Level but no radon protective measures are necessary.



REFERENCES & GUIDANCE

- AGS, *Guidance on the Waste Classification for Soils – A Practitioners' Guide* 2019.
- Barnes, G. 2010, *Soil Mechanics Principles and Practice*. 3rd Edition.
- BRE, *Special Digest 1:2005 (3rd Edition), Concrete in Aggressive Ground*. 2005.
- BR 211, *Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)*, 2023.
- BRE Digest 412 *Desiccation in Clay Soils* 1996
- BRE Digest 365 *Soakaway Design*, 2003..
- BRE465 *Cover Systems for Land Regeneration* 2004.
- BS 10175:2011+A1:2013, *Investigation of potentially contaminated sites: Code of practice*.
- BS 1377:1999. *Methods of test for soils for civil engineering purposes*.
- BS 5930:2015+A1:2020, *Code of practice for site investigations*.
- BS 8485:2015+A1 2019, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*.
- BS 8576:2013, *Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.
- BS EN ISO 22476-3:2005, *Geotechnical investigation and testing: Field testing - Standard penetration test*.
- CIRIA, C504, *Engineering in glacial tills*, 1999.
- CIRIA, C665, *Assessing risks posed by hazardous ground gases to buildings*, 2007.
- CIRIA, C682, *The VOCs Handbook: Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination*, 2009.
- CIRIA, C716, *Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination*, 2012.
- CIRIA C733, *Asbestos in Soil and Made Ground: A Guide to Understanding & Managing Risks*.
- CL:AIRE/EIC/AGS, *The Soil Generic Assessment Criteria for Human Health Risk Assessment*, 2009.
- CL:AIRE, SP1010, *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination -Final Project Report*. 2013.
- CL:AIRE, *The Definition of Waste: Development Industry Code of Practice Version 2*
- DEFRA, Circular 01/2006, *Contaminated Land Environmental Protection Act 1990, Part 2A*. 2006.
- DEFRA, SP1010, *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*. March 2014.
- Environment Agency, *Verification of Remediation of Land Contamination Science Report – NC/00/38/SR*
- Environment Agency, *Waste Classification, Guidance on the classification and assessment of waste (1st Edition V1.2GB) Technical Guidance WM3*. October 2021.
- Health & Safety Executive, HSG 66, *Protection of Workers and the General Public During Redevelopment of Contaminated Land*. 1991.
- Highways Agency, IAN 73/06 Rev 1, *Design of Pavement Foundations*, 2009.
- Land Contamination Risk Management* www.gov.uk 08.10.2020.
- LCM/CIEH, *The LQM/CIEH S4ULs for Human Health Risk Assessment*. Land Quality Press, S4UL3146, 2015.
- NHBC Standards, 2023.
- Tomlinson, M.J., 2001, *Foundation Design and Construction*, 7th Edition.
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015*
- The Definition of Waste: Development Industry Code of Practice*, CL:AIRE 2011.
- UKWIR, *Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites*. 2011



STUDY LIMITATIONS

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Remada, Ltd with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with (the 'Client'). Remada does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.

3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Remada is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have published, more stringent objectives. Further work may be required by these parties.

4. All work carried out in preparing this report has used, and is based on, Remada's professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice pending changes in legislation, of which Remada is aware, have been considered. Following delivery of the report Remada has no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are to the best of Remada's belief, Remada cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have received.

8. This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of changes in the condition of the site since the time of the investigation.

9. The content of this report represents the professional opinion of experienced environmental consultants. Remada does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.


12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13. Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have NOT been analysed or assessed for waste classification purposes.




TABLES

Table 2: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA																			
SITE		Ickenham Road, Ruislip																	
PROJECT No.		1246.02		Atmospheric & Ground Conditions															
Visit 1 of 4		Atmospheric Pressure Variations During Visit										Ground Surface Conditions							
Carried Out by:		Will Jones		986mb										Wet					
Date:		01.04.24		Atmospheric Pressure Trend Over Previous 48hrs										Weather Conditions					
Instrument Details		GFM436 14048		Falling										Overcast					
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs) [^]	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS1	54.650	50	0.0	0.0	-	0.8	0.7	20.2	18.6	60	0.0			985	0.740	53.910	7.000		
WS2	54.040	50	0.0	0.0	-	2.0	1.7	20.2	19.6	60	0.0			986	1.770	52.270	7.000		
WS4	53.380	50	0.0	0.0	-	0.4	0.4	19.6	19.6	60	3.3			985	0.340	53.040	7.000		

NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA																			
SITE		Ickenham Road, Ruislip																	
PROJECT No.		1246.02		Atmospheric & Ground Conditions															
Visit 2 of 4		Atmospheric Pressure Variations During Visit										Ground Surface Conditions							
Carried Out by:		Will Jones		993mb										Wet					
Date:		09.04.24		Atmospheric Pressure Trend Over Previous 48hrs										Weather Conditions					
Instrument Details		GFM436 14048		Steady										Cloudy, some rain					
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs) [^]	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS1	54.650	50	0.0	0.0	-	0.8	0.7	18.4	18.4	60	0.1	0.00		993	0.900	53.750	7.000		
WS2	54.040	50	0.0	0.0	-	1.3	1.3	19.8	19.8	60	0.0	0.00		993	1.750	52.290	7.000		
WS4	53.380	50	0.0	0.0	-	0.4	0.3	19.6	19.6	60	0.0	0.00		993	0.430	52.950	7.000		

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

Table 2: Gas and Groundwater Monitoring Data

Table 2: Gas Groundwater Monitoring Data



GAS & GROUNDWATER MONITORING DATA																			
SITE		Ickenham Road, Ruislip																	
PROJECT No.		1246.02																	
Visit 3 of 4		Atmospheric Pressure Variations During Visit										Ground Surface Conditions							
Carried Out by:		Will Jones										Damp							
Date:		18-Apr-24										1011 - 1013 mb							
Instrument Details		GFM436 14048										Weather Conditions							
		Rising										Clear							
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS1	54.650	50	0.0	0.0	0.0	0.8	0.8	19.6	20.2	60	0.0		-	-	1011	1.420	53.230	7.000	
WS2	54.040	50	0.0	0.0	0.0	1.0	0.4	20.1	20.5	60	0.0		-	-	1013	1.500	52.540	7.000	
WS4	53.380	50	0.0	0.0	0.0	1.0	0.8	19.2	20.1	60	0.1		-	-	1013	0.330	53.050	7.000	

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA																			
SITE		Ickenham Road, Ruislip																	
PROJECT No.		1246.02																	
Visit 4 of 4		Atmospheric Pressure Variations During Visit										Ground Surface Conditions							
Carried Out by:		William Jones										Damp							
Date:		23.04.24										1011 - 1013 mb							
Instrument Details		GFM436 14048										Weather Conditions							
		Falling										Clear							
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS5	54.650	50	0.0	0.0	0.0	1.7	0.7	15.3	19.0	60	0.0	5.84	-	-	1013	1.430	53.220	7.000	
WS6	54.040	50	0.0	0.0	0.0	0.5	0.1	20.2	20.6	60	0.0	0.14	-	-	1012	1.510	52.530	7.000	
WS7	53.380	50	0.0	0.0	0.0	0.1	0.1	20.1	20.1	60	0.0	2.88	-	-	1011	0.330	53.050	7.000	

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

Table 3: Comparison of Soil Analysis with GAC

Sample Reference			Commercial GAC 2.5% SOM		WS1	WS2	WS3	WS4a	WS9
Soil Type					Clay	Clay	Clay	Made Ground	Made Ground
Depth (m)					0.40	0.50	0.60	0.30	0.50
Date Sampled					25/03/2024	25/03/2024	25/03/2024	25/03/2024	26/03/2024
Determinand	Units	Limit of detection	[mg/kg unless stated]	MAX					
Stone Content	%	0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01			23	23	23	7.4	10
Asbestos									
Asbestos in Soil Detected/Not Detected	Type	N/A			Not-detected	Not-detected	Not-detected	Detected	Not-detected
Amosite detected	Type								
Asbestos % by hand picking/weighing	%	0.001			-	-	-	< 0.001	-
Asbestos Containing Material Types Detected (ACM)	Type	N/A			-	-	-	Loose Fibres	-
General Inorganics									
pH	pH Units	N/A			7.4	8	7.9	10.2	7.8
Total Cyanide	mg/kg	1			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Organic Matter	%	0.1			1.1	1	0.9	4.6	9.6
Fraction Organic Carbon (FOC)	N/A	0.00	MCERTS		0.0064	0.0059	0.0054	0.026	0.056
Calculated SOM from FOC	-	-	-		1.10	1.02	0.93	4.48	9.66
Calculated TOC from FOC	-	-	-		0.64	0.59	0.54	2.6	5.6
SOM based on FOC / 0.0058					1	1	1	4	10
Total Phenols (monohydric)	mg/kg	1	690dir (30000) (total)	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs									
Naphthalene	mg/kg	0.05	460sol (183)	2.5	< 0.05	< 0.05	< 0.05	2.5	1.4
Acenaphthylene	mg/kg	0.05	97000sol (212)	2.4	< 0.05	< 0.05	< 0.05	0.48	2.4
Acenaphthene	mg/kg	0.05	97000sol (141)	26	< 0.05	< 0.05	0.28	14	26
Fluorene	mg/kg	0.05	68000	33	< 0.05	< 0.05	0.35	16	33
Phenanthrene	mg/kg	0.05	22000	190	0.1	0.15	3.1	120	190
Anthracene	mg/kg	0.05	540000	76	< 0.05	< 0.05	0.56	29	76
Fluoranthene	mg/kg	0.05	23000	320	0.08	0.08	2	95	320
Pyrene	mg/kg	0.05	54000	280	0.05	0.07	1.5	74	280
Benzo(a)anthracene	mg/kg	0.05	170	160	< 0.05	< 0.05	0.61	33	160
Chrysene	mg/kg	0.05	350	140	< 0.05	< 0.05	0.52	29	140
Benzo(b)fluoranthene	mg/kg	0.05	45	200	< 0.05	< 0.05	0.5	32	200
Benzo(k)fluoranthene	mg/kg	0.05	1200	80	< 0.05	< 0.05	0.27	13	80
Benzo(a)pyrene	mg/kg	0.05	35	170	< 0.05	< 0.05	0.37	26	170
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	510	80	< 0.05	< 0.05	0.15	12	80
Dibenzo(a,h)anthracene	mg/kg	0.05	3.6	21	< 0.05	< 0.05	< 0.05	3.7	21
Benzo(ghi)perylene	mg/kg	0.05	4000	87	< 0.05	< 0.05	0.19	14	87
Coronene	mg/kg	0.05	-	-	-	-	-	-	-
Total PAH									
Speciated Total EPA-16 PAHs	mg/kg	0.8	-	-	< 0.80	< 0.80	10.5	519	1860
Total WAC-17 PAHs	mg/kg	0.85	-	-	-	-	-	-	-
Heavy Metals / Metalloids									
Arsenic (aqua regia extractable)	mg/kg	1	640	26	17	18	18	16	26
Beryllium (aqua regia extractable)	mg/kg	0.06	12	4.1	1.8	1.9	1.6	0.97	4.1
Boron (water soluble)	mg/kg	0.2	240000	5.1	1.2	1.8	3.6	5.1	1.3
Cadmium (aqua regia extractable)	mg/kg	0.2	190	0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	33	0	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	8600	75	55	58	75	49	42
Chromium (aqua regia extractable)	mg/kg	1	-	75	55	58	75	49	42
Copper (aqua regia extractable)	mg/kg	1	68000	64	31	32	36	64	52
Lead (aqua regia extractable)	mg/kg	1	NC	96	24	19	20	84	96
Mercury (aqua regia extractable)	mg/kg	0.3	58** (25.8)	0.7	< 0.3	< 0.3	< 0.3	< 0.3	0.7
Nickel (aqua regia extractable)	mg/kg	1	980	67	40	67	35	19	21
Selenium (aqua regia extractable)	mg/kg	1	12000	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	9000	91	86	91	90	60	71
Zinc (aqua regia extractable)	mg/kg	1	730000	200	75	86	79	160	200
Petroleum Hydrocarbons									
Aliphatic TPH >C5-C6	mg/kg	0.02	5900sol (558)	0	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Aliphatic TPH >C6-C8	mg/kg	0.02	17000sol (322)	0	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Aliphatic TPH >C8-C10	mg/kg	0.05	4800vap (190)	0	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Aliphatic TPH >C10-C12	mg/kg	1	23000vap (118)	2.2	< 1.0	< 1.0	< 1.0	2.2	< 1.0
Aliphatic TPH >C12-C16	mg/kg	2	82000sol (59)	29	< 2.0	< 2.0	< 2.0	17	29
Aliphatic TPH >C16-C21	mg/kg	8	-	680	< 8.0	< 8.0	< 8.0	64	100
Aliphatic TPH >C21-C35	mg/kg	8	1700000	680	< 8.0	< 8.0	< 8.0	680	450
TPHCWG - Aliphatic >C5 - C35	mg/kg	10	-	-	< 10	< 10	< 10	760	580
Aromatic TPH >C5-C7	mg/kg	0.01	46000sol (2260)	0	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aromatic TPH >C7-C8	mg/kg	0.01	11000sol (1920)	0	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aromatic TPH >C8-C10	mg/kg	0.05	8100vap (1500)	0	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Aromatic TPH >C10-C12	mg/kg	1	28000sol (859)	8.4	< 1.0	< 1.0	< 1.0	8.4	< 1.0
Aromatic TPH >C12-C16	mg/kg	2	37000	170	< 2.0	< 2.0	< 2.0	100	170
Aromatic TPH >C16-C21	mg/kg	10	28000	1600	< 10	< 10	< 10	480	1600
Aromatic TPH >C21-C35	mg/kg	10	28000	4000	< 10	< 10	< 10	1000	4000
TPHCWG - Aromatic >EC5 - EC35	mg/kg	10	-	-	< 10	< 10	< 10	1600	5800
VOCs									
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	47*	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	11000vap (1920)*	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	13000vap (1220)*	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	14000sol (1350)*	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	15000sol (1129)*	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	13000	0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

	Determinand concentration below the GAC
	Determinand concentration in exceedance of GAC
	Determinand concentration in exceedance of the vapour/solubility saturation limit.

NC: No published criteria, U/S: Unsuitable sample.

vap: Screening criteria presented exceed the vapour saturation limit, which is presented in brackets.

sol: Screening criteria presented exceed the solubility saturation limit, which is presented in brackets.

dir: Screening criteria based on threshold protective of direct skin contact (guideline in brackets based on health effects following long term exposure provided for illustration only).

(1): For assessment based on the use of the surrogate marker approach the GAC for Coal Tar must be used instead of benzo(a)pyrene.



* Value presented in mg/kg



FIGURES



Site Location

Notes	Revision	Approved	Date	Project Title	Scale	Drawn	Size
				Ickenham Road, Ruislip	as shown	JR	A4
				Drawing Title	Date	Job No.	Figure No.
				Figure 1: Site Location Plan	12.04.24	1246.02	01
			Client	 			
			Lidl Great Britain Ltd				



PARKING

Standard		47
Disabled		4
Parent & Child		4
EVCP 22kW & 50kW DC Rapid Charging Spaces		2
Passive Infrastructure for future EVCP Charging Spaces		14
Total Customer Parking		71
Short Stay Cycle		24
Long Stay Cycle		12

- Legend
- WS02 Window Sample
 - CBR1 CBR Test
 - WS01 Window Sample & Installation

Notes

Existing and proposed site layout plan overlay, reproduced from KLH Architects 'Site Planning as Existing' drawing ref: 4478-0100 P02 dated 8th August 2023, and KLH Architects 'Site Plan as Proposed Option C', drawing ref: 4478-0105, Revision P01, dated 31st August 2023.

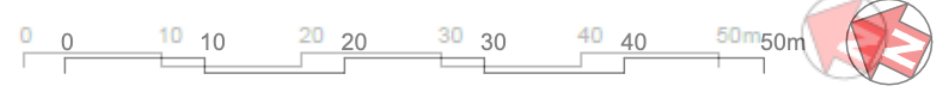
Revision	Approved	Date

Project Title
Ickenham Road, Ruislip

Drawing Title
Figure 2: Existing and Proposed Layout and Exploratory Hole Location Plan

Client
Lidl Great Britain Ltd

Scale as shown	Drawn JR	Size A4
Date 12.04.24	Job No. 1246.02	Figure No. 02





PARKING

Standard		47
Disabled		4
Parent & Child		4
EVCP 22KW & 50KW DC Rapid Charging Spaces		2
Passive Infrastructure for future EVCP Charging Spaces		14
Total Customer Parking		71
Short Stay Cycle		24
Long Stay Cycle		12

Legend

Notes
 Proposed site layout plan reproduced from KLH Architects 'Site Plan as Proposed Option C', drawing ref: 4478-0105, Revisio P01, dated 31st August 2023.

The proposed site layout plan presented here is indicative only and may be subject to change following publication of Remada's Phase 1 report.

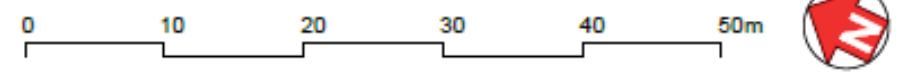
Revision	Approved	Date

Project Title
 Lidl, Ickenham Road, Ruislip

Drawing Title
 Figure 3: Proposed Indicative Site Layout

Client
 Lidl Great Britain Ltd

Scale as shown	Drawn JR	Size A4
Date 18.03.24	Job No. 1246.01	Figure No. 03





EXPLORATORY HOLE LOGS

Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 25/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508811.00 N187138.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS1	Hole Type WS	Level 54.65m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES	HVP=59	0.20	54.45	MADE GROUND: Soft, dark brown, slightly sandy, slightly gravelly clay, with moderate roots and rootlets. Gravel is angular to subangular, fine to medium of flint and brick. (Reworked TOPSOIL).		
		0.70	D				Firm, yellowish-brown, mottled orange, slightly gravelly CLAY, with low roots content. Gravel is subangular to subrounded, fine to medium of flint.	1	
		0.80	D						
		1.00	D			1.00	53.65	Stiff, yellowish-brown, mottled grey CLAY.	
		1.00	SPT	N=21 (3,3/4,4,6,7)					
		1.50		HVP=163					
		2.00	SPT	N=17 (3,3/3,4,5,5)	2.00	52.65	Firm, yellowish brown, slightly gravelly CLAY. Gravel is subrounded to rounded, fine of mudstone.	2	
		3.00	SPT	N=17 (3,2/3,4,5,5)	3.00	51.65	Firm, yellowish-brown, slightly calcareous, silty CLAY.	3	
		4.00	SPT	N=21 (3,4/4,5,6,6)	4.00	50.65	<i>Becoming stiff below 3.5m bgl.</i> Stiff, greyish-brown, mottled orange, silty CLAY.	4	
		5.00	SPT	N=31 (5,5/6,7,9,9)					5
	6.00	SPT	N=32 (5,5/7,8,9,8)					6	
	7.00	SPT	N=23 (6,6/6,5,6,6)	7.00	47.65	End of Borehole at 7.000m	7		
								8	
								9	
								10	

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

- No groundwater encountered.
- Install with 1.0m plain and 6.0m slotted pipe.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 25/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508793.00 N187168.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS2	Hole Type WS	Level 54.04m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.05			0.05	53.99	MADE GROUND: Asphalt.		
		0.30			0.30	53.74	MADE GROUND: Black-greyish, slightly clayey, slightly sandy gravel. Gravel is angular to subangular, fine to medium asphalt, brick and concrete.		
		0.50	ES		0.50	53.54	MADE GROUND: Yellowish-brown, slightly gravelly clay. Gravel is angular, coarse of brick.		
		0.80	D	HVP=50					
		0.80		N=8 (1,2/1,2,3,2)					
		1.00	SPT						
		2.00	SPT	N=11 (2,1/2,3,3,3)	2.00	52.04	Soft, greenish-brown, mottled grey, slightly gravelly, silty CLAY. Gravel is subangular to subrounded, fine to medium of siltstone. <i>Becoming firm below 1.7m bgl.</i>	1	
		3.00	SPT	N=16 (3,2/3,4,4,5)					
		4.00	SPT	N=20 (4,4/4,4,6,6)					
		5.00	SPT	N=28 (5,5/5,6,8,9)	5.00	49.04	Firm, yellowish brown, mottled grey, micaceous silty CLAY. <i>Becoming stiff below 4.5m bgl.</i>	2	
	6.00	SPT	N=31 (6,6/6,8,8,9)						
	7.00	SPT	N=29 (5,5/6,7,8,8)	7.00	47.04	Stiff, yellowish-brown, orange, slightly gravelly, very silty CLAY. Gravel is subangular to subrounded, fine to medium of siltstone.	5		
							End of Borehole at 7.000m	7	
								8	
								9	
								10	

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

- No groundwater encountered.
- Install with 1.0m plain and 6.0m slotted pipe.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 25/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508795.00 N187189.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS4	Hole Type WS	Level 53.38m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.05	53.33	MADE GROUND: Asphalt.		
					0.60	52.78	MADE GROUND: Black, dark-brown, slightly clayey, sandy gravel. Gravel is angular to subangular, fine to medium of asphalt, concrete and brick, with fragments of plastic and glass.		
		1.00	B						1
		1.00	D						
		1.00	SPT	N=7 (1,1/1,1,2,3)				Soft, greyish-blue, mottled brown, slightly silty CLAY.	
		1.50		HVP=55				<i>Becoming firm below 1.6m bgl.</i>	
		2.00	D		2.00	51.38		Firm, yellowish-brown, mottled grey, slightly gravelly, silty CLAY. Gravel is subrounded to rounded, fine of siltstone.	2
		2.00	SPT	N=11 (2,2/2,2,3,4)					
		3.00	SPT	N=11 (1,2/2,3,3,3)				<i>Becoming greyish-brown, very silty CLAY below 3.2m bgl.</i>	3
		4.00	SPT	N=16 (2,3/3,4,4,5)					4
	5.00	SPT	N=26 (4,5/5,6,7,8)	5.00	48.38		<i>Becoming stiff below 4.7m bgl.</i>	5	
	6.00	SPT	N=33 (6,6/7,8,9,9)				Stiff, orangish-brown, slightly calcareous, very silty CLAY.	6	
	7.00	SPT	N=31 (5,7/7,7,8,9)	7.00	46.38		<i>Fine SAND between 6.7m and 6.9m bgl.</i>	7	
							End of Borehole at 7.000m	7	
								8	
								9	
								10	

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
 1. Groundwater encountered at 7.0mbgl
 2. Install with 1.0m plain and 6.0m slotted pipe.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 26/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508792.00 N187195.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS5	Hole Type WS	Level 53.44m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▼		0.05			0.05	53.39	MADE GROUND: Asphalt. MADE GROUND: Black, light grey, brownish, sandy gravel. Gravel is angular to subangular, fine to coarse of brick, concrete and asphalt.		
	0.80	B		HVP=22	0.70	52.74	Soft, greenish-brown, brown, slightly mottled grey CLAY.	1	
	0.80	SPT		N=7 (1,1/1,2,2,2)			<i>Becoming firm below 1.5m bgl.</i>		
	1.00			HVP=43					
	1.20								
	2.00	SPT		N=11 (2,2/2,3,3,3)	2.00	51.44	Firm, yellowish-brown, slightly gravelly, micaceous, silty CLAY. Gravel is rounded, fine of siltstone.	2	
	3.00	SPT		N=15 (3,2/3,3,4,5)				3	
	4.00	SPT		N=19 (4,3/4,4,5,6)			<i>Becoming stiff below 4.5m bgl.</i>	4	
5.00	SPT		N=22 (5,4/5,5,6,6)	5.00	48.44	Stiff, orangish-brown, micaceous, very silty CLAY.	5		
6.00	SPT		N=30 (6,6/6,7,9,8)				6		
7.00	SPT		N=30 (5,6/6,6,9,9)	7.00	46.44	End of Borehole at 7.000m	7		
								8	
								9	
								10	

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
 1. Groundwater encountered at 5mbgl.
 2. Backfilled with arisings.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 25/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508807.00 N187210.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS6	Hole Type WS	Level 53.28m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
Well					0.05	53.23		MADE GROUND: Asphalt.	
					0.40	52.88		MADE GROUND: Black, grey, slightly sandy gravel. Gravel is angular to subangular, fine to coarse of asphalt and concrete.	
					1.00	52.28		Soft, greenish, bluish-grey CLAY, with low root and rootlets. Moderate organic odour.	
			1.00	D	N=7 (1,1/1,2,2,2)			Firm, yellowish-brown, slightly gravelly, silty CLAY. Gravel is subrounded to rounded, fine of siltstone.	1
			1.60	D				<i>No Recovery between 1m and 1.5m bgl.</i>	
			2.00	SPT	N=14 (3,2/3,3,4,4)				2
			3.00	SPT	N=15 (3,2/3,4,4,4)			<i>No Recovery between 3.0m and 3.2m bgl.</i>	3
		4.00	SPT	N=17 (3,2/3,4,5,5)			<i>No Recovery between 4.0m and 4.2m bgl.</i>	4	
		5.00	SPT	N=24 (4,4/4,6,7,7)	5.00	48.28		End of Borehole at 5.000m	5
								6	
								7	
								8	
								9	
								10	

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
 1. No groundwater encountered.
 2. Backfilled with arisings.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 26/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508840.00 N187196.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS7	Hole Type WS	Level 54.52m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.05 0.30	54.47 54.22		MADE GROUND: Asphalt. MADE GROUND: Black, dark-grey, slightly sandy gravel. Gravel is angular to subangular, fine to coarse of brick, concrete and asphalt (subbase). Soft to firm, greenish-grey CLAY, with moderate roots and rootlets. Strong organic odour. Firm, greenish brown, mottled orange CLAY.	1
		0.80		HVP=40	0.70	53.82			
		1.00	SPT	N=8 (1,1/2,1,2,3)					
		1.40		HVP=53	1.20	53.32		Firm, yellowish-brown, micaceous, slightly gravelly, silty CLAY. Gravel is subrounded to rounded, fine of siltstone.	
		2.00							2
		2.00	D SPT	N=10 (1,2/2,3,2,3)					
		3.00	SPT	N=15 (2,2/3,3,5,4)					3
		4.00	SPT	N=20 (3,3/4,4,6,6)				Firm, yellowish-brown, mottled grey, micaceous, slightly calcareous, silty CLAY.	4
		4.30			4.30	50.22		Stiff, yellowish-brown, micaceous, slightly gravelly, silty CLAY. Gravel is subrounded to rounded, fine of siltstone.	
		5.00	SPT	N=25 (4,4/5,6,7,7)	5.00 5.00	49.52 49.52		End of Borehole at 5.000m	5
								6	
								7	
								8	
								9	
								10	

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
 1. No groundwater encountered.
 2. Backfilled with arisings.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 26/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508825.00 N187201.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS8	Hole Type WS	Level 53.63m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.20			0.20	53.43		MADE GROUND: Hardstanding consisting of asphalt and reinforced concrete.		
		0.40			0.40	53.23		MADE GROUND: Brown, black, grey, slightly sandy gravel. Gravel is subangular to subrounded, concrete, asphalt and mixed lithologies (subbase). Soft to firm, greenish-grey CLAY, with moderate root content. Strong organic odour.		
		1.00	SPT	N=4 (0,0/1,1,1,1)						<i>Becoming firm becoming 1.5m bgl.</i>
		2.00	SPT	N=10 (1,2/2,3,2,3)	2.00	51.63		Firm, orangish-brown, mottled grey, silty CLAY.		
		3.00	SPT	N=12 (2,3/2,3,3,4)						<i>Becoming micaceous, very silty CLAY below 3.4m bgl.</i>
		4.00	SPT	N=13 (3,3/2,3,4,4)						
		5.00	SPT	N=17 (4,4/4,4,4,5)	5.00	48.63	End of Borehole at 5.000m			

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

- No groundwater encountered.
- Backfilled with arisings.



Percussion Drilling Log

Project Name: LIDL RUISLIP		Client: Lidl Great Britain Ltd		Date: 26/03/2024	
Location: Ickenham Road, Ruislip		Contractor:		Co-ords: E508843.00 N187223.00	
Project No. : 1246.02		Crew Name:		Drilling Equipment: Tracked Rig	
Borehole Number WS9	Hole Type WS	Level 53.54m AoD	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
Well	▼	0.30	ES		0.05	53.49	MADE GROUND: Asphalt.	MADE GROUND: Black, grey, slightly sandy, clayey gravel. Gravel is angular to subangular, fine to medium of asphalt, brick and concrete.	1	
		0.50	ES		0.70	52.84				
		1.00	SPT	N=6 (1,1/1,1,2,2)	1.50	52.04	Soft, greenish-grey, mottled brown CLAY, with low roots content. Moderate organic odour.	Firm, orangish-brown, mottled grey, silty CLAY.		2
		1.20		HVP=67						
		2.00	SPT	N=9 (2,2/1,2,3,3)	<i>Becoming micaceous, very silty CLAY below 2.0m bgl.</i>		Becoming micaceous, very silty CLAY below 2.0m bgl.	Becoming micaceous, very silty CLAY below 2.0m bgl.		3
		3.00	SPT	N=12 (3,3/2,3,3,4)						
		4.00	SPT	N=14 (3,2/3,4,3,4)	Becoming micaceous, very silty CLAY below 2.0m bgl.	Becoming micaceous, very silty CLAY below 2.0m bgl.	5			
		5.00	SPT	N=16 (3,4/3,4,4,5)				5.00		48.54
End of Borehole at 5.000m									7	
End of Borehole at 5.000m									8	
End of Borehole at 5.000m									9	
End of Borehole at 5.000m									10	

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

- Perched groundwater encountered at 0.50mbgl.
- Backfilled with arisings.





APPENDIX A

SPT Hammer Energy Test Certificate

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: DART300
Test Date: 01/09/2023
Report Date: 01/09/2023
File Name: DART300.spt
Test Operator: CM

Instrumented Rod Data

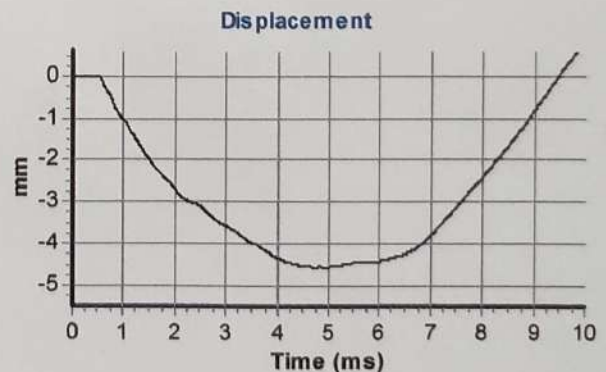
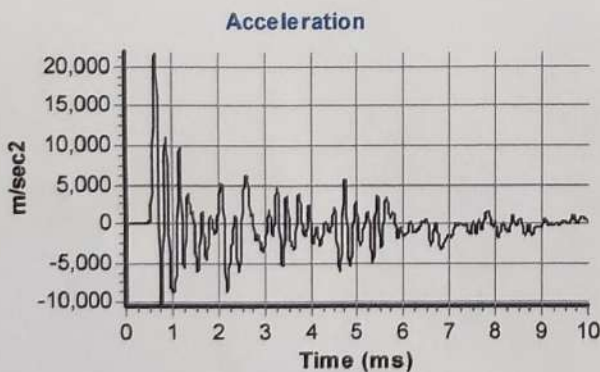
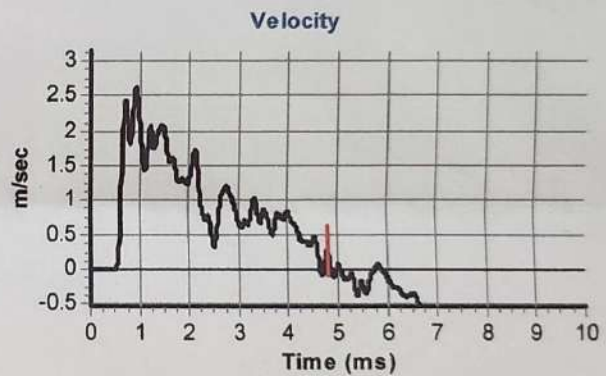
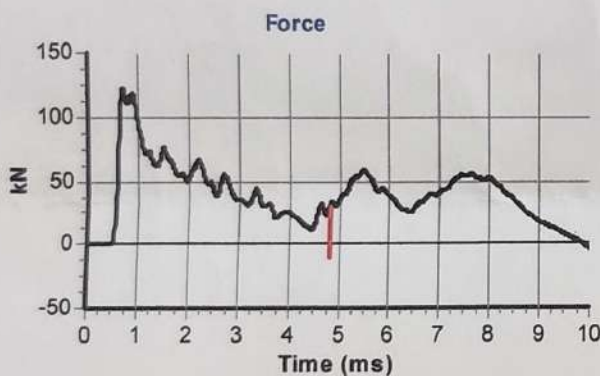
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.5
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 72572
Accelerometer No.2: 72757

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

REGIONAL DRILLING LTD - 86346



Calculations

Area of Rod A (mm²): 970
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 308

Energy Ratio E_r (%): **65**

Signed: C. McCLUSKEY

Title: FITTER

The recommended calibration interval is 12 months



APPENDIX B

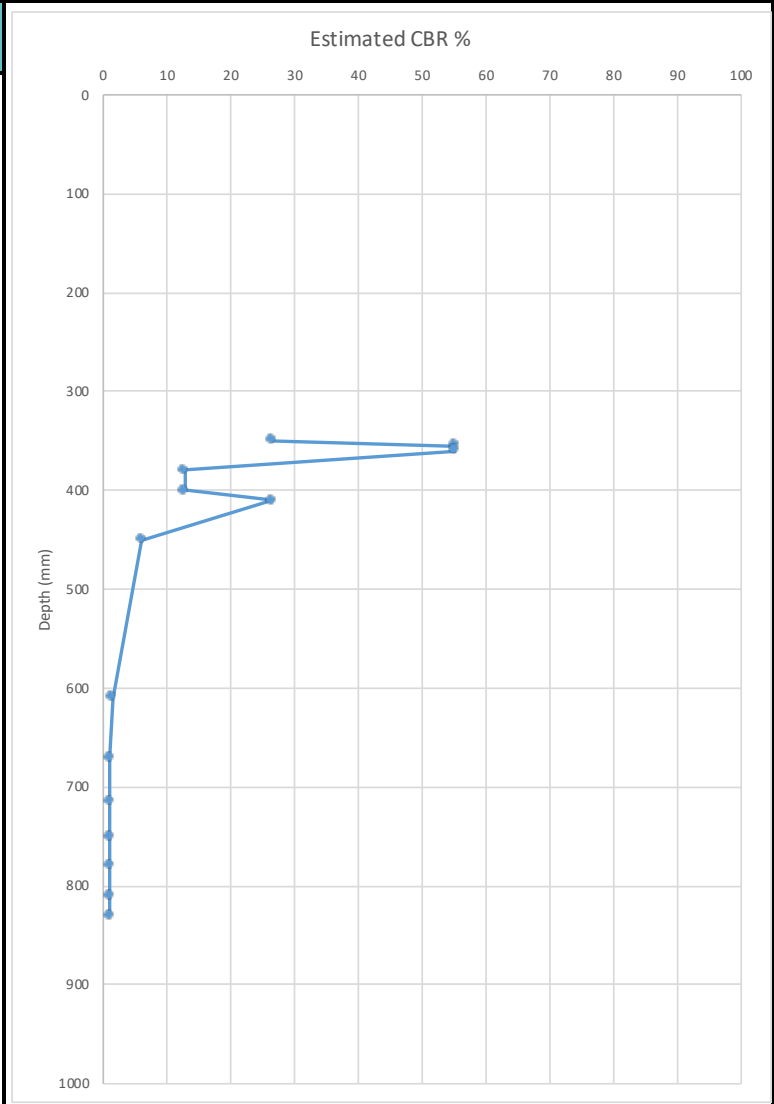
Dynamic Cone Penetrometer (DCP) Test Results

TRL Dynamic Cone Penetrometer Test Results



Client:	Lidl Great Britain Ltd	Site Location:	Ickenham Road, Ruislip	Test No:	CBR1	Location:	508843, 187223
Project No:	1246.02	Date:	26.03.24	Start Depth:	Surface	Test Strata:	Made Ground/ Soft clay
$\text{Log}_{10}(\text{CBR}) = 2.480 - 1.057 \times \text{Log}_{10}(\text{mm}/\text{blow})$						Weather:	Dry Sunny

No of Blows	Depth Reading mm	Penetration/ Blow mm	CBR %
0	340	0	
1	350	10.0	26.5
2	355	5.0	55.1
3	360	5.0	55.1
4	380	20.0	12.7
5	400	20.0	12.7
6	410	10.0	26.5
7	450	40.0	6.1
8	610	160.0	1.4
9	670	60.0	1.0
10	715	45.0	1.0
11	750	35.0	1.0
12	780	30.0	1.0
13	810	30.0	1.0
14	830	20.0	1.0



Notes:

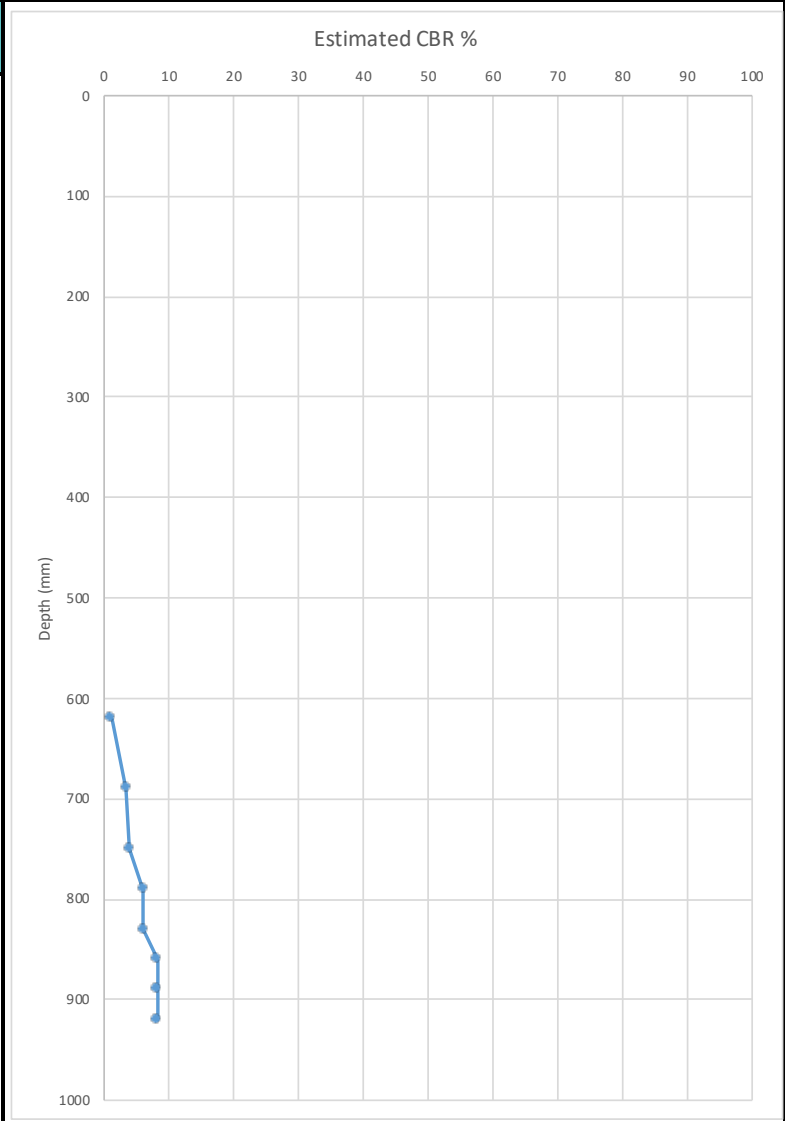
Tested by : J Ramos
 Date: 25.03.2024
 Checked by: P Dickinson
 Date: 22.04.2024

TRL Dynamic Cone Penetrometer Test Results



Client:	Lidl Great Britain Ltd	Site Location:	Ickenham Road, Ruislip	Test No:	CBR2	Location:	508825, 187201
Project No:	1246.02	Date:	26.03.24	Start Depth:	0.20m	Test Strata:	Made Ground/ Soft to firm clay
$Log_{10}(CBR) = 2.480 - 1.057 \times Log_{10}(mm/blow)$						Weather:	Dry Sunny

No of Blows	Depth Reading mm	Penetration/ Blow mm	CBR %
0	435	0	
1	620	185.0	1.2
2	690	70.0	3.4
3	750	60.0	4.0
4	790	40.0	6.1
5	830	40.0	6.1
6	860	30.0	8.3
7	890	30.0	8.3
8	920	30.0	8.3



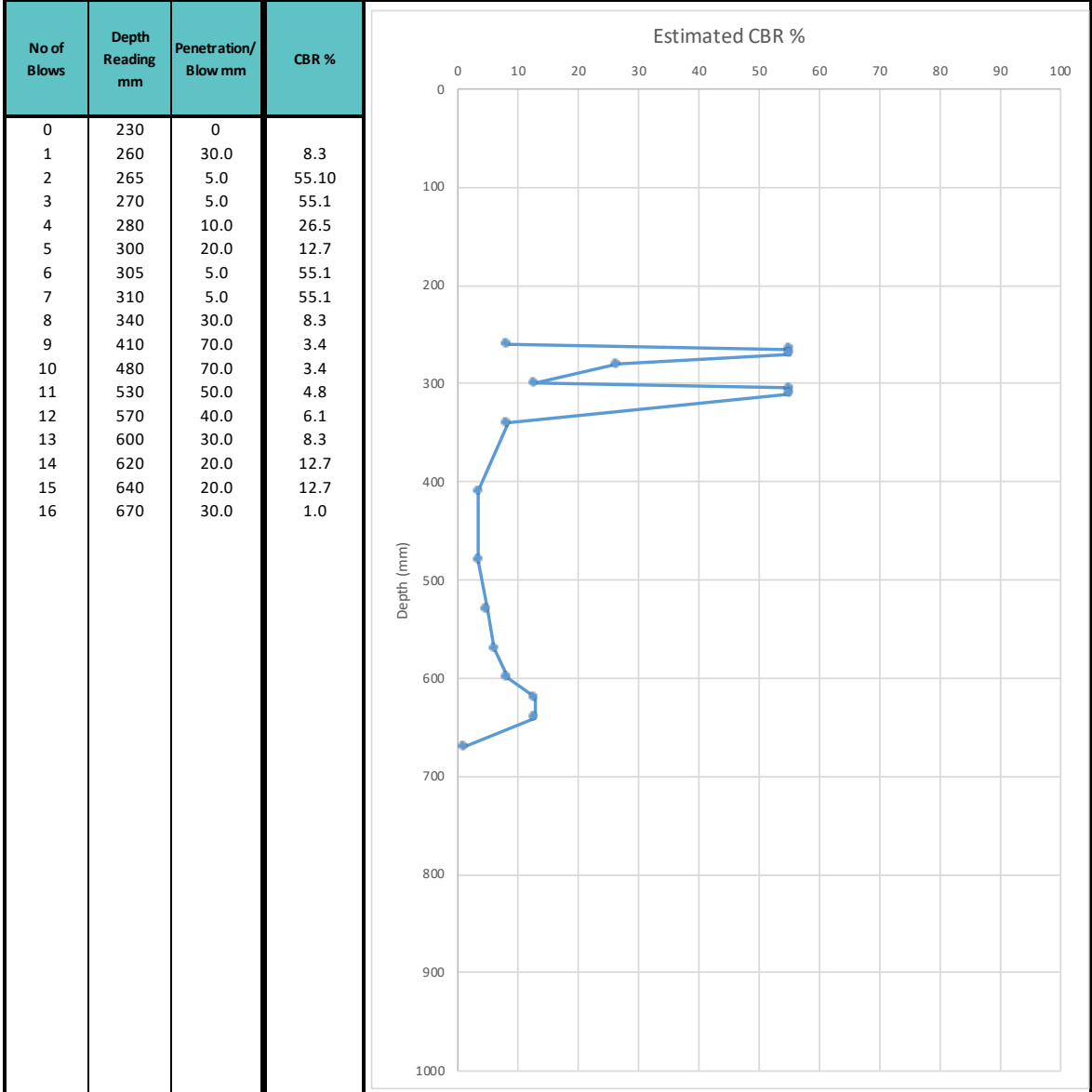
Notes:

Tested by J Ramos Date: 25.03.2024	Checked by: P Dickinson Date: 22.04.2024
---------------------------------------	---

TRL Dynamic Cone Penetrometer Test Results



Client:	Lidl Great Britain Ltd	Site Location:	Ickenham Road, Ruislip	Test No:	CBR4	Location:	508840, 187196
Project No:	1246.02	Date:	26.03.24	Start Depth:	Surface	Test Strata:	Subbase/ Soft to firm clay
$Log_{10}(CBR) = 2.480 - 1.057 \times Log_{10}(mm/blow)$						Weather:	Dry Sunny



Notes:

Tested by J Ramos Date: 25.03.2024	Checked by: P Dickinson Date: 22.04.2024
---------------------------------------	---



APPENDIX C

Laboratory Chemical Analysis



Remada Ltd
Forward House
17 High Street
Henley-in-Arden
Warwickshire
B955AA

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

e: joana.ramos@remada.co.uk

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-011512

Project / Site name:	Ruislip	Samples received on:	27/03/2024
Your job number:	1246.02	Samples instructed on/ Analysis started on:	27/03/2024
Your order number:	1246.02	Analysis completed by:	08/04/2024
Report Issue Number:	1	Report issued on:	09/04/2024
Samples Analysed:	11 soil samples		


Signed: _____

Adam Fenwick
Technical Reviewer
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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: 24-011512

Project / Site name: Ruislip

Your Order No: 1246.02

Lab Sample Number				157753	157754	157755	157756	157757
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.00	0.50	0.80	0.60
Date Sampled				25/03/2024	25/03/2024	25/03/2024	25/03/2024	25/03/2024
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	23	23	23	22	23
Total mass of sample received	kg	0.1	NONE	1.2	0.8	1.5	0.5	1.5

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO	-	PDO	-	PDO
Actinolite detected	Type	N/A	ISO 17025	-	-	-	-	-
Amosite detected	Type	N/A	ISO 17025	-	-	-	-	-
Anthophyllite detected	Type	N/A	ISO 17025	-	-	-	-	-
Chrysotile detected	Type	N/A	ISO 17025	-	-	-	-	-
Crocidolite detected	Type	N/A	ISO 17025	-	-	-	-	-
Tremolite detected	Type	N/A	ISO 17025	-	-	-	-	-

Asbestos % by hand picking/weighing	%	0.001	ISO 17025	-	-	-	-	-
-------------------------------------	---	-------	-----------	---	---	---	---	---

Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-	-	-	-	-
---	------	-----	-----------	---	---	---	---	---

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	7.4	7.5	8	8.1	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	-	0.037	-	0.042	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	210	-	250	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	107	-	125	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	20	-	31	-
Total Sulphur	mg/kg	50	MCERTS	-	200	-	190	-
Total Sulphur	%	0.005	MCERTS	-	0.02	-	0.019	-
Ammoniacal Nitrogen as NH ₄ ⁺	mg/kg	0.5	MCERTS	-	< 0.5	-	1.5	-
Ammonium as NH ₄ ⁺ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	< 0.05	-	0.09	-
Organic Matter (automated)	%	0.1	MCERTS	1.1	-	1	-	0.9
Fraction Organic Carbon (FOC) Automated	%	0.001	MCERTS	0.0064	-	0.0059	-	0.0054
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	-	< 2.0	-	< 2.0	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	< 2.0	-	< 2.0	-

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.28
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.35
Phenanthrene	mg/kg	0.05	MCERTS	0.1	-	0.15	-	3.1
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.56
Fluoranthene	mg/kg	0.05	MCERTS	0.08	-	0.08	-	2
Pyrene	mg/kg	0.05	MCERTS	0.05	-	0.07	-	1.5
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.61
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.52
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	-	< 0.05	-	0.5
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	-	< 0.05	-	0.27
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.37
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.15
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-011512

Project / Site name: Ruislip

Your Order No: 1246.02

Lab Sample Number				157753	157754	157755	157756	157757
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.00	0.50	0.80	0.60
Date Sampled				25/03/2024	25/03/2024	25/03/2024	25/03/2024	25/03/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.19
Coronene	mg/kg	0.05	NONE	-	-	-	-	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	-	< 0.80	-	10.5
Total WAC-17 PAHs	mg/kg	0.85	NONE	-	-	-	-	-

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17	-	18	-	18
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.8	-	1.9	-	1.6
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	-	1.8	-	3.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	< 1.8	-	< 1.8
Chromium (III)	mg/kg	1	NONE	55	-	58	-	75
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	55	-	58	-	75
Copper (aqua regia extractable)	mg/kg	1	MCERTS	31	-	32	-	36
Lead (aqua regia extractable)	mg/kg	1	MCERTS	24	-	19	-	20
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	40	-	67	-	35
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	86	-	91	-	90
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	75	-	86	-	79

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	19	-	19	-
Magnesium (water soluble)	mg/kg	5	NONE	-	38	-	37	-

Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	-	< 0.020	-	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	-	< 0.020	-	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	-	< 0.050	-	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	-	< 2.0	-	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	< 8.0
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	-	< 10	-	< 10

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	-	< 0.050	-	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	-	< 2.0	-	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	-	< 10	-	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	-	< 5.0	-	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-011512
 Project / Site name: Ruislip
 Your Order No: 1246.02

Lab Sample Number	157758			157759		157760		157761		157762	
Sample Reference	WS4a			WS4a		WS6		WS7		WS9	
Sample Number	None Supplied			None Supplied		None Supplied		None Supplied		None Supplied	
Depth (m)	0.30			1.00		1.69		0.00-0.30		0.00-0.30	
Date Sampled	25/03/2024			25/03/2024		26/03/2024		26/03/2024		26/03/2024	
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	7.4	22	22	7.3	1.9
Total mass of sample received	kg	0.1	NONE	1.5	0.5	0.5	0.3	0.3

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Detected	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO	-	-	-	-
Actinolite detected	Type	N/A	ISO 17025	Not-detected	-	-	-	-
Amosite detected	Type	N/A	ISO 17025	Detected	-	-	-	-
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected	-	-	-	-
Chrysotile detected	Type	N/A	ISO 17025	Not-detected	-	-	-	-
Crocidolite detected	Type	N/A	ISO 17025	Not-detected	-	-	-	-
Tremolite detected	Type	N/A	ISO 17025	Not-detected	-	-	-	-

Asbestos % by hand picking/weighing	%	0.001	ISO 17025	< 0.001	-	-	-	-
-------------------------------------	---	-------	-----------	---------	---	---	---	---

Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Loose Fibres	-	-	-	-
---	------	-----	-----------	--------------	---	---	---	---

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	10.2	7.5	6.8	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1.0	-	-	-	-
Total Sulphate as SO ₄	%	0.005	MCERTS	-	0.045	0.032	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	330	45	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	166	22.4	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	37	41	-	-
Total Sulphur	mg/kg	50	MCERTS	-	180	110	-	-
Total Sulphur	%	0.005	MCERTS	-	0.018	0.011	-	-
Ammoniacal Nitrogen as NH ₄ ⁺	mg/kg	0.5	MCERTS	-	< 0.5	4.4	-	-
Ammonium as NH ₄ ⁺ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	< 0.05	0.26	-	-
Organic Matter (automated)	%	0.1	MCERTS	4.6	-	-	-	-
Fraction Organic Carbon (FOC) Automated	%	0.001	MCERTS	0.026	-	-	-	-
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	-	< 2.0	< 2.0	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	< 2.0	< 2.0	-	-

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	2.5	-	-	0.14	0.08
Acenaphthylene	mg/kg	0.05	MCERTS	0.48	-	-	0.16	0.35
Acenaphthene	mg/kg	0.05	MCERTS	14	-	-	0.32	0.91
Fluorene	mg/kg	0.05	MCERTS	16	-	-	0.3	0.93
Phenanthrene	mg/kg	0.05	MCERTS	120	-	-	2.6	7.6
Anthracene	mg/kg	0.05	MCERTS	29	-	-	0.77	2.4
Fluoranthene	mg/kg	0.05	MCERTS	95	-	-	5.8	10
Pyrene	mg/kg	0.05	MCERTS	74	-	-	6.1	8.5
Benzo(a)anthracene	mg/kg	0.05	MCERTS	33	-	-	3.5	4.2
Chrysene	mg/kg	0.05	MCERTS	29	-	-	3.6	4.2
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	32	-	-	7.2	6.6
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	13	-	-	2.1	2.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	26	-	-	5.4	4.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	12	-	-	3.7	2.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3.7	-	-	0.85	0.6

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-011512

Project / Site name: Ruislip

Your Order No: 1246.02

Lab Sample Number				157758	157759	157760	157761	157762
Sample Reference				WS4a	WS4a	WS6	WS7	WS9
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	1.00	1.69	0.00-0.30	0.00-0.30
Date Sampled				25/03/2024	25/03/2024	26/03/2024	26/03/2024	26/03/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	14	-	-	4.4	3.8
Coronene	mg/kg	0.05	NONE	-	-	-	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	519	-	-	-	-
Total WAC-17 PAHs	mg/kg	0.85	NONE	-	-	-	47	59.7

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	-	-	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.97	-	-	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	5.1	-	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	-	-	-
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	-	-	-
Chromium (III)	mg/kg	1	NONE	49	-	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	49	-	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	64	-	-	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	84	-	-	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	-	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	-	-	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	60	-	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	-	-	-	-

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	18	9.2	-	-
Magnesium (water soluble)	mg/kg	5	NONE	-	36	18	-	-

Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	-	-	-	-
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	-	-	-	-
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	-	-	-	-
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	2.2	-	-	-	-
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	17	-	-	-	-
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	64	-	-	-	-
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	680	-	-	-	-
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	760	-	-	-	-

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	-	-	-	-
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	-	-	-	-
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	-	-	-	-
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	8.4	-	-	-	-
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	100	-	-	-	-
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	480	-	-	-	-
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	1000	-	-	-	-
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	1600	-	-	-	-

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	-	-	-	-
Benzene	µg/kg	5	MCERTS	< 5.0	-	-	-	-
Toluene	µg/kg	5	MCERTS	< 5.0	-	-	-	-
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	-	-	-
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	-	-	-	-
o-Xylene	µg/kg	5	MCERTS	< 5.0	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-011512

Project / Site name: Ruislip

Your Order No: 1246.02

Lab Sample Number				157763
Sample Reference				WS9
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				26/03/2024
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	10
Total mass of sample received	kg	0.1	NONE	1.7

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO
Actinolite detected	Type	N/A	ISO 17025	-
Amosite detected	Type	N/A	ISO 17025	-
Anthophyllite detected	Type	N/A	ISO 17025	-
Chrysotile detected	Type	N/A	ISO 17025	-
Crocidolite detected	Type	N/A	ISO 17025	-
Tremolite detected	Type	N/A	ISO 17025	-

Asbestos % by hand picking/weighing	%	0.001	ISO 17025	-
-------------------------------------	---	-------	-----------	---

Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-
---	------	-----	-----------	---

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	7.8
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-
Total Sulphur	mg/kg	50	MCERTS	-
Total Sulphur	%	0.005	MCERTS	-
Ammoniacal Nitrogen as NH ₄ ⁺	mg/kg	0.5	MCERTS	-
Ammonium as NH ₄ ⁺ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-
Organic Matter (automated)	%	0.1	MCERTS	9.6
Fraction Organic Carbon (FOC) Automated	%	0.001	MCERTS	0.056
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	1.4
Acenaphthylene	mg/kg	0.05	MCERTS	2.4
Acenaphthene	mg/kg	0.05	MCERTS	26
Fluorene	mg/kg	0.05	MCERTS	33
Phenanthrene	mg/kg	0.05	MCERTS	190
Anthracene	mg/kg	0.05	MCERTS	76
Fluoranthene	mg/kg	0.05	MCERTS	320
Pyrene	mg/kg	0.05	MCERTS	280
Benzo(a)anthracene	mg/kg	0.05	MCERTS	160
Chrysene	mg/kg	0.05	MCERTS	140
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	200
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	80
Benzo(a)pyrene	mg/kg	0.05	MCERTS	170
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	80
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	21

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-011512

Project / Site name: Ruislip

Your Order No: 1246.02

Lab Sample Number				157763
Sample Reference				WS9
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				26/03/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	87
Coronene	mg/kg	0.05	NONE	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	1860
Total WAC-17 PAHs	mg/kg	0.85	NONE	-

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	26
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	4.1
Boron (water soluble)	mg/kg	0.2	MCERTS	1.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (III)	mg/kg	1	NONE	42
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	42
Copper (aqua regia extractable)	mg/kg	1	MCERTS	52
Lead (aqua regia extractable)	mg/kg	1	MCERTS	96
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	71
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	200

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-
Magnesium (water soluble)	mg/kg	5	NONE	-

Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	29
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	100
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	450
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	580

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	170
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	1600
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	4000
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	5800

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-011512
Project / Site name: Ruislip
Your Order No: 1246.02

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 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
157758	WS4a	0.30	158	Loose Fibres	Amosite	< 0.001	< 0.001

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



4041



Environmental Science

Analytical Report Number : 24-011512**Project / Site name: Ruislip**

* 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 *
157753	WS1	None Supplied	0.4	Brown clay
157754	WS1	None Supplied	1	Brown clay with vegetation
157755	WS2	None Supplied	0.5	Brown clay with gravel
157756	WS2	None Supplied	0.8	Brown clay with gravel
157757	WS3	None Supplied	0.6	Brown clay with gravel
157758	WS4a	None Supplied	0.3	Brown loam with gravel and vegetation
157759	WS4a	None Supplied	1	Brown clay
157760	WS6	None Supplied	1.69	Brown clay
157761	WS7	None Supplied	0.00-0.30	Brown loam and gravel
157762	WS9	None Supplied	0.00-0.30	Brown loam and gravel
157763	WS9	None Supplied	0.5	Brown loam and gravel

Analytical Report Number : 24-011512

Project / Site name: Ruislip

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references	HSE Report No: 83/1996, HSG 248 (2021), HSG 264 (2012) & SCA Blue Book (draft)	A006B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
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.	L019B	D	NONE
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	L038B	D	MCERTS
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	L038B	D	MCERTS
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	L038B	D	NONE
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
TPH Chromatogram in soil	TPH Chromatogram in soil	In-house method	L064B	D	NONE
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	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 Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078B	W	NONE

Analytical Report Number : 24-011512

Project / Site name: Ruislip

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chromium III in soil	In-house method by calculation from total Cr and Cr VI	In-house method by calculation	L080	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
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	L080	W	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	L080	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
Ammonium as NH ₄ in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082B	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate	In-house method	L009B	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' 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 30°C.

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.

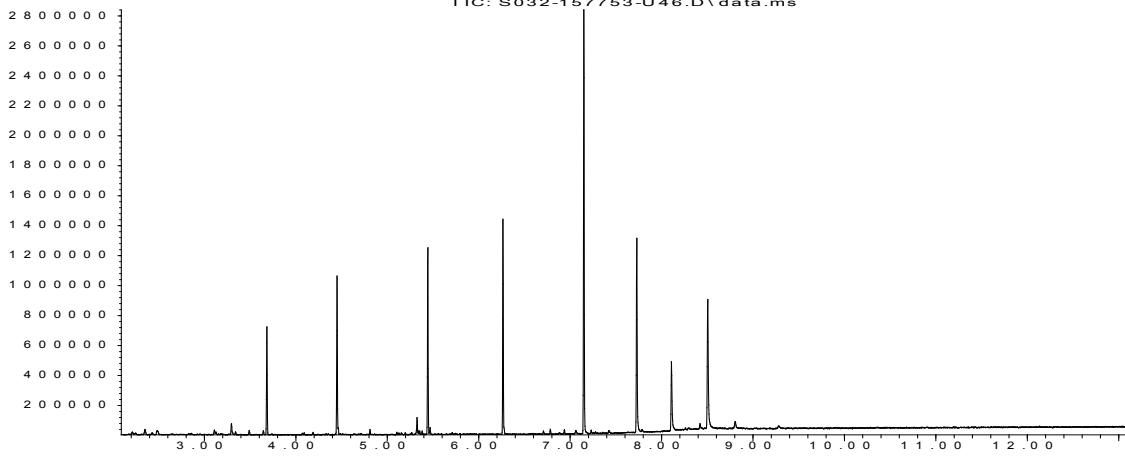
Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Abundance

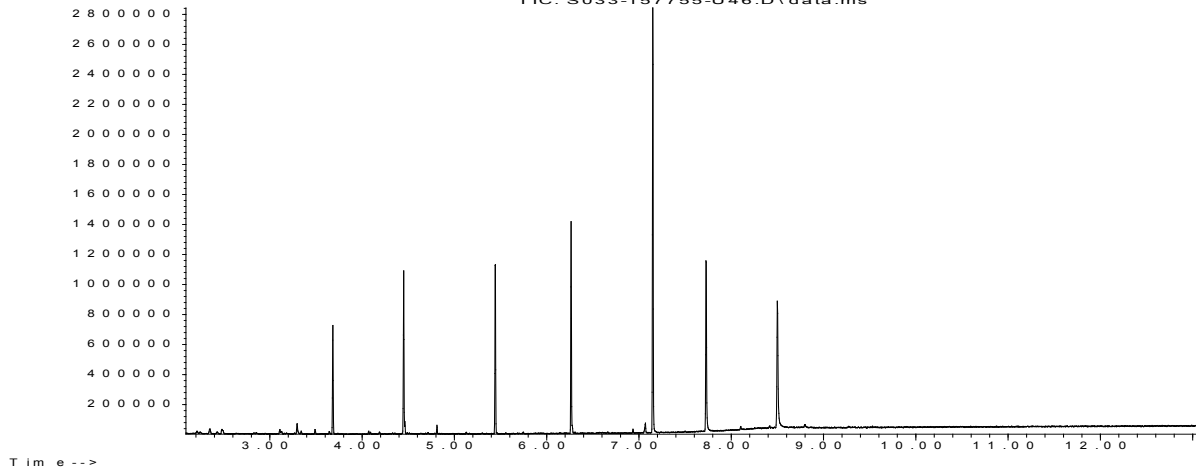
TIC: S032-157753-U46.D\data.ms



Time -->

Abundance

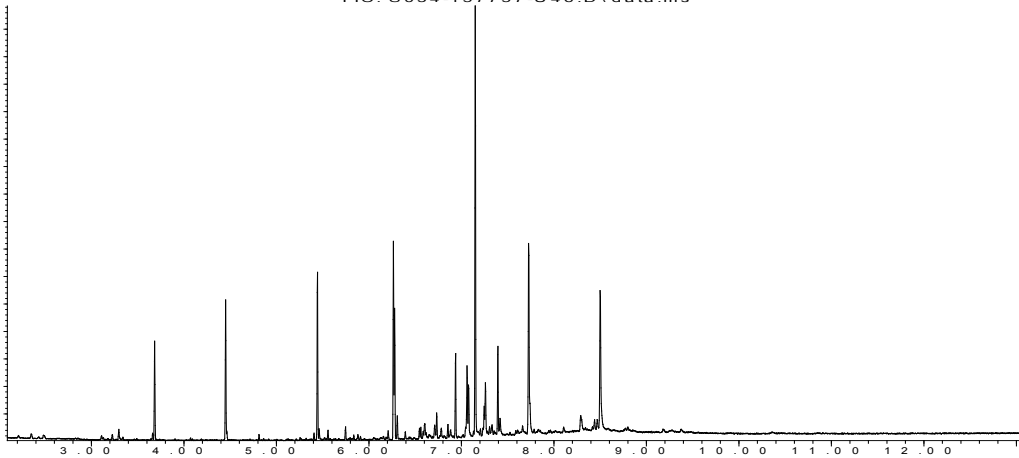
TIC: S033-157755-U46.D\data.ms

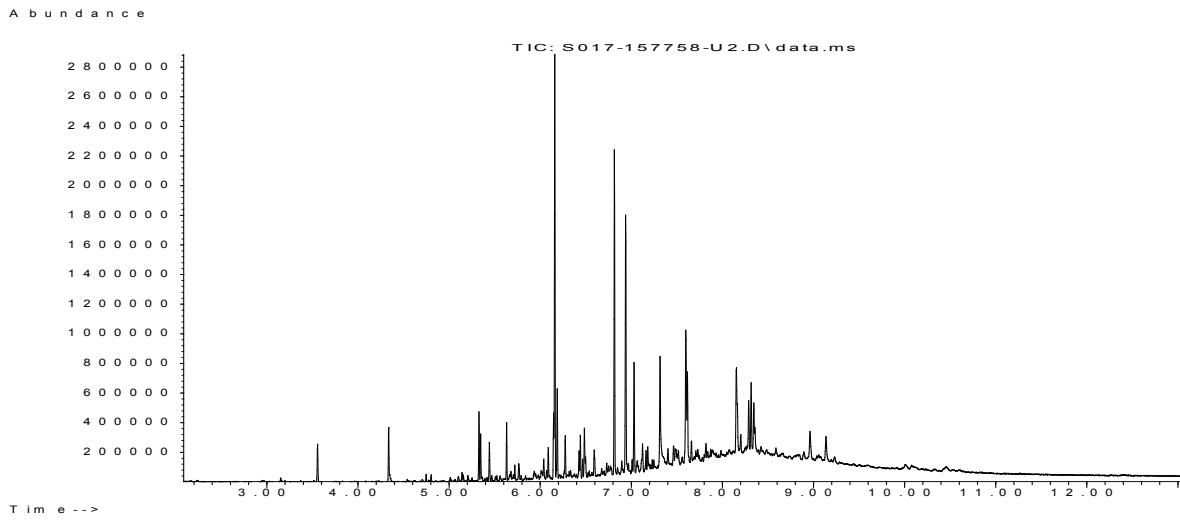


Abundance

TIC: S034-157757-U46.D\data.ms

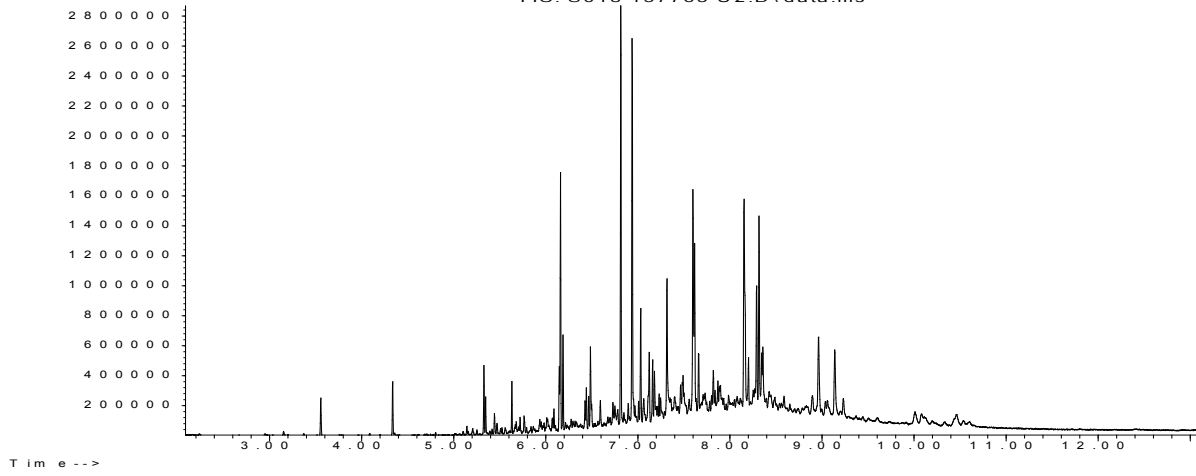
3 0 0 0 0 0 0
2 8 0 0 0 0 0
2 6 0 0 0 0 0
2 4 0 0 0 0 0
2 2 0 0 0 0 0
2 0 0 0 0 0 0
1 8 0 0 0 0 0
1 6 0 0 0 0 0
1 4 0 0 0 0 0
1 2 0 0 0 0 0
1 0 0 0 0 0 0
8 0 0 0 0 0 0
6 0 0 0 0 0 0
4 0 0 0 0 0 0
2 0 0 0 0 0 0





Abundance

TIC: S018-157763-U2.D\data.ms



Time-->



Analytical Report Number : 24-011512

Project / Site name: Ruislip

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

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

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS1	N/A	S	157753	b	BTEX and/or Volatile organic compounds in soil	L073B	b
WS1	N/A	S	157753	b	Monohydric phenols in soil	L080	b
WS1	N/A	S	157753	b	Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in soil	L064B	b
WS1	N/A	S	157753	b	TPH Chromatogram in soil	L064B	b
WS1	N/A	S	157753	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b



APPENDIX D

Laboratory Geotechnical Test Results



LABORATORY REPORT



Contract Number: PSL24/2285

Report Date: 08 April 2024
Client's Reference: 1246.02
Client Name: Remada Limited
Forward House
17 High Street
Henley-in-Arden
Warwickshire
B95 5AA

For the attention of: Joana Ramos

Contract Title: Ruislip
Date Received: 28/3/2024
Date Commenced: 28/3/2024
Date Completed: 8/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:


A Watkins
(Managing Director)

R Berriman
(Associate Director)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

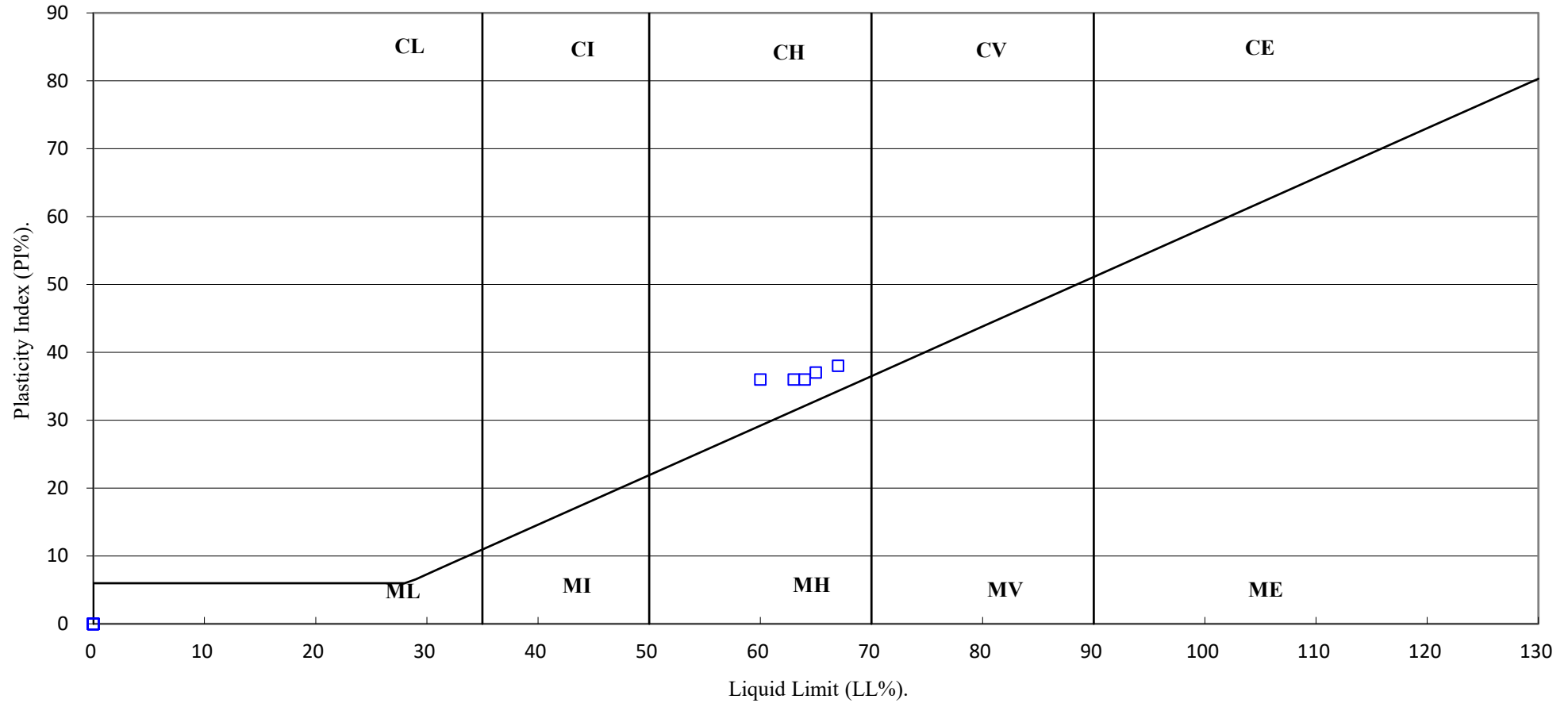
S Eyre
(Senior Technician)


T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Ruislip

Contract No:

PSL24/2285

Client Ref:

1246.02

PARTICLE SIZE DISTRIBUTION TEST

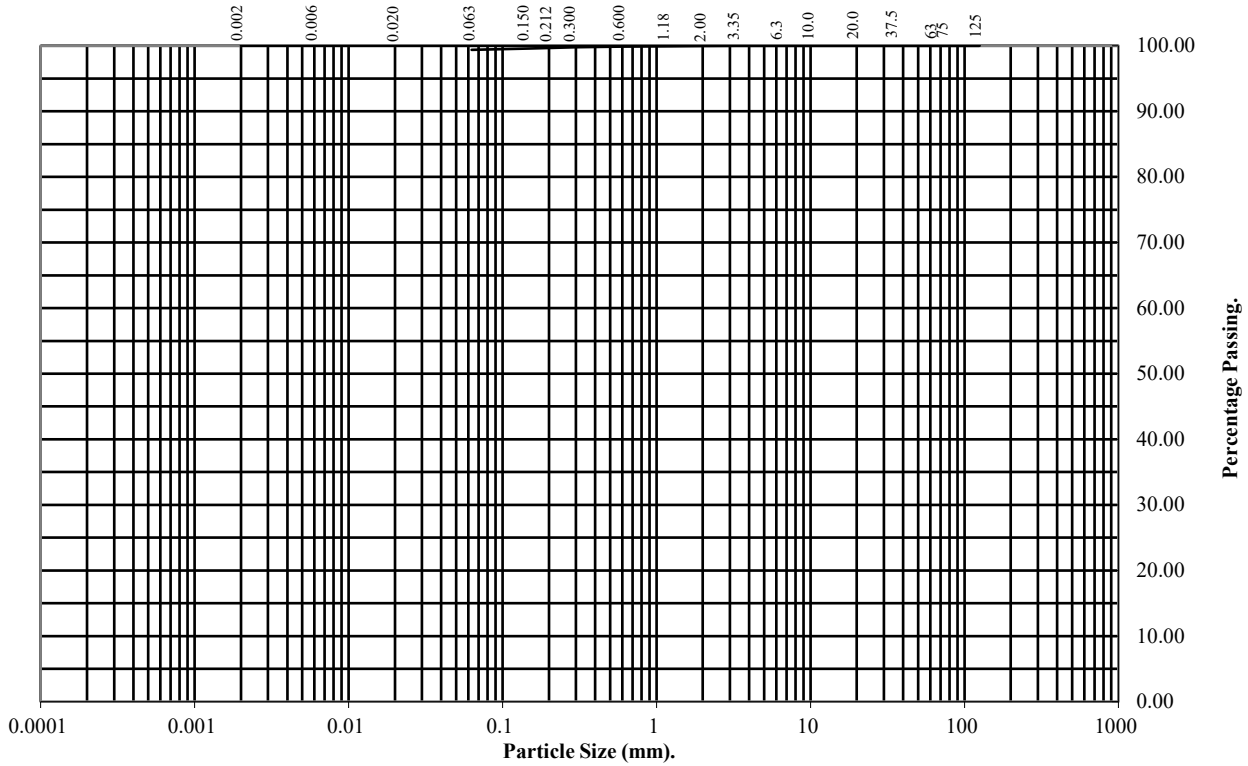
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS5** **Top Depth (m):** **0.80**

Sample Number: **Base Depth(m):** **2.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	100
0.212	100
0.15	100
0.063	99

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	1
Silt/Clay	99

Remarks:
See Summary of Soil Descriptions



Ruislip

Contract No:
PSL24/2285
Client Ref:
1246.02

