



***10 Ellington Road, Muswell Hill, London,
N10 3DG***

J CLARKE & SONS ENTERPRISES LLP

GEOTECHNICAL GROUND INVESTIGATION REPORT

Project No. 1896-22



September, 2022

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Your ref:

Our ref: SKZ_1896/22

J CLARKE & SONS ENTERPRISES LLP

213 Muswell Hill Broadway,

London, United Kingdom

N10 3RS

**REPORT ON GEOTECHNICAL GROUND INVESTIGATION
AT 10 ELLINGTON ROAD, MUSWELL HILL, LONDON, N10 3DG**

1. INTRODUCTION

AVZGeoEng Limited have been commissioned by J CLARKE & SONS ENTERPRISES LLP ('the Client') to carry out a Geotechnical Investigation in regards to the proposed redevelopment at the above site and in accordance with the AVZGeoEng quotation ref: SKZ_1896/22.

The proposed is for demolition of existing buildings and design either a 2.5 storey plus basement housing, flatted or more likely a mixed housing and flatted scheme.

2. THE SITE

The site, which may be found by approximate National Grid reference OS Grid Ref: E: 528777, N: 189186, is situated at 10 Ellington Road, Muswell Hill, London, N10 3DG.

An extract of the Ordnance Survey map showing the location of the site is included in **Figure 1**.

The published 1:50,000 scale geological map of the area indicates that the site is underlain by London Clay Formation – Clay, Silt and Sand as bedrock geology. No superficial deposits are expected at the location.

It is thought that the London Clay formation was deposited during a period of sea inundation in the area up to 200m in depth. The London Clay can be up to 150m thick beneath south Essex thinning across London to about 90m near Reading. The formation consists of mainly dark blue to brown grey clay containing variable amounts of fine-grained sand and silt. London Clay generally weathers to an orange-brown colour with pockets of silty fine sand. The formation is particularly susceptible to swelling and shrinking when subjected to moisture content changes. It usually contains selenite crystals, often grouped in bands or layers, which are thought to have originated from the decomposition of shell

fragments. London Clay contains clay minerals in the form of illite, kaolinite and smectite. The presence of smectite renders the London Clay particularly susceptible to heave caused by alternate wetting and drying near the surface.

The existing topography and history of development of the site suggest that in addition to these natural strata some made ground may be present on the site.

3. LIMITATIONS

Any opinions and interpretations expressed in this report are based on the ground conditions encountered during the site work and on the results of tests made in the field, together with AVZGeoEng conjectural interpretation between exploratory holes. There may, however, be other conditions prevailing at the site which have not been revealed by the investigation and which have therefore not been taken into account in this report. While the report may offer opinions on the possible configuration of strata, both between the excavations and below the maximum depth achieved by the investigation, these comments are for guidance only. It should also be noted that groundwater levels vary due to seasonal or other effects and may at times differ to those measured during the investigation. For investigations, which include environmental issues, the data obtained relate to the conditions which are relevant at the time of the investigation.

This report is not an engineering design and the figures and calculations enclosed to the report should be used by the Structural Engineer taking note that variations may apply depending on design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.

This report has been prepared by AVZGeoEng limited. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

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4. GROUND INVESTIGATION

The site work was carried out between 10th and 12th August 2022, aimed to obtain geotechnical parameters in regards to the proposed development. The investigation and soil descriptions were carried out in general accordance with BS5930:2015 – Code of Practice for Site Investigations.

The ground investigation comprised the following works:

- 4No boreholes advanced by drive-in sampler techniques to a max 20.0m depth;
- A single Ø35mm standpipe installed to 6.0mbgl for future groundwater/gas monitoring;

- In situ testing and logging.

The borehole location was determined approximately by reference to physical features present on the site at the time of investigation and the ground level at the borehole locations was not determined.

The location of the borehole is presented on **Figure 2**, the borehole logs and the geotechnical testing results are presented in the **Appendix A** and **Appendix B**, respectively.

5. GEOTECHNICAL TESTING

The programme of geotechnical tests undertaken on samples obtained from the intrusive investigation is presented in **Table 1**, the main purpose of which was to classify the ground beneath the site and assist in determining its physical and mechanical properties. Where appropriate, testing was undertaken in accordance with BS 1377:1990 & EN ISO 14688-2 2004+A1:2013 Method of Tests for Soils for Civil Engineering Purposes and was carried out by the AVZGeoEng Ltd in-house laboratory and GEO Site & Testing Services Ltd.

Tests carried out in order to classify the concrete class required on site have been undertaken following the procedures within BRE SD1:2005 by a UKAS accredited laboratory (The Environmental Laboratory Ltd).

Table 1 – Summary of Geotechnical Testing Programme

Strata	Tests undertaken	No of Tests
Made Ground	pH & Water Soluble Sulphates	2
London Clay Formation	Natural Moisture Content	11
	Plasticity Index	11
	Quick Triaxial shear test	4
	pH & Water Soluble Sulphates	7

6. GROUND CONDITIONS

6.1 General Succession of Strata

The exploratory holes revealed that the site is underlain by made ground with variable and significant thickness, over the London Clay Formation at depth. The borehole logs (**Appendix A**) show a general image of the lithological composition of the encountered materials.

The ground conditions are summarised in **Table 2** below.

Table 2 – General succession of strata encountered

Brief Description	Depth to top of stratum m.bgl	Thickness (m)
Made Ground	G.L	1.4 to 3.8
London Clay Formation	2.3 to 4.3	Not proven

6.2 Made Ground

The made ground encountered during the site investigation was found as heterogeneous, comprising mainly grey to dark grey with occasional black spots, sandy silt and clay with occasional coal ash clinker and occasional to frequent brick fragments, or clayey sand and gravel only in boreholes BH1 and BH2. The infilled ground was likely used to form the platform on which the existing structures on site were built.

Visual/olfactory evidence of contamination was not encountered during the site work, the slight organic odour noted in part of the core samples is likely associated with decay vegetation/roots present in the fill.

More precise image of the made ground composition is shown in the borehole logs (**Appendix A**).

6.3 London Clay Formation

The London Clay Formation was encountered below the Made Ground, as firm becoming stiff and very stiff with depth, brown slightly grey, occasionally blue mottled, silty clay and clayey silt, with occasional sandy laminas and selenite crystals.

The measured and inferred soil parameters for the stratum are listed in **Table 3** below.

Table 3 – Summary of Soil Parameters for the London Clay Formation

Soil Parameters	Range	Results
Liquid Limit (%)	45 to 80	Appendix B
Plastic Limit (%)	27 to 36	Appendix B
Plastic Index (%)	18 to 48	Appendix B
Modified Plasticity Index (%)	18 to 48	Appendix B
Plasticity Term	Intermediate to very high	
Volume Change Potential (NHBC)	High	
Moisture Content (%)	27.8 to 34	Appendix B
SPT 'N' Values	12 to 40	Appendix A, Figure 3
Undrained Shear Strength (kN/m ²) inferred by Triaxial Test	26 to 82	Figure 4, Appendix B
Undrained Shear Strength (kN/m ²) inferred by SPT ⁽¹⁾	52 to 172 ⁽¹⁾	Figure 4

Soil Parameters	Range	Results
Undrained Shear Strength (kN/m ²) inferred by HV ⁽²⁾	50 to >130	Figure 4
Strength Term	Soft to very stiff	

⁽¹⁾ SPT – Standard Penetration Tests

⁽²⁾ HV – Hand Vane Tests (130kPa is limit of the hand vane tool)

7. GROUNDWATER CONDITIONS

All boreholes remained dry as no groundwater was recorded during the site works. A Ø35mm standpipe was installed to 6.0mbgl for future groundwater monitoring if required.

8. ENGINEERING CONSIDERATION

8.1 Geotechnical Hazards

A summary of commonly occurring geotechnical hazards is given in **Table 4** below, together with an assessment of whether the site may be affected by each of the stated hazards.

Table 4 – Summary of Main Potential Geotechnical Hazards that May Affect the Site.

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions			✓	Likely to affect the foundation design
Shrinkable clay soils	✓	London Clay with medium high volume change potential		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)			✓	Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓	Sandy silty clay of the London Clay Formation.		Likely to affect ground engineering and foundation design and construction
Running sand at and below water table			✓	Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)			✓	May affect ground engineering and foundation design and construction.
Evaporite dissolution features and/or subsidence			✓	May affect ground engineering and foundation design and construction

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Ground subject to or at risk from landslides	✓	The current structures were built on a platform formed by infilling and is supported by high retaining wall on the southern site boundary. The wall is in poor state of repair with visible cracks and sign of distress. The cracks on the floor slab in the back yard also suggest significant movement of the platform.		It needs prompt attention and remediation to prevent further movements and possible collapse. The stability or remediation of the retaining wall is beyond the scope of this ground investigation and Report.
Ground subject to peri-glacial valley cambering with gulls possibly present			✓	Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion			✓	Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)			✓	My affect the excavation of the basement. The groundwater level may be subject to seasonal variations and rainfall.
Rising groundwater table due to diminishing abstraction in urban area			✓	May affect foundations, basements or other exceptional as tunnels etc.
Underground mining			✓	Likely to require special stabilisation measures
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓	Possible remains of the foundations associated with the current/former structures on site,		Could affect ground engineering/piling, however not the foundation design and construction as would be removed from ground during the excavation of the proposed basement.
Filled and made ground (including embankments, infilled ponds and quarries)	✓	Made Ground with variable and significant thickness encountered into the boreholes.		Likely to affect ground engineering, foundation design and construction

Note: Seismicity is not included in the above Table as this is not normally a design consideration in the UK.

8.2 Preliminary Retaining Wall Parameters

It is understood that the proposed construction would include basement and the construction would likely involve excavation of up to 3.5m from ground level to the underside of the basement slab

formation. The details of the proposed design and structural method statement was not available for review at the time of writing this report.

The following soil parameters detailed within **Table 5** below is recommended for preliminary design purposes and based on in situ tests carried out during the site work.

Table 5 Preliminary Parameters for retaining wall design

Soil Type	Average SPT N	Unit Weight (kN/m ³)	Short Term Characteristics		Long Term Strength Characteristics	
			Cu (kN/m ²)	Ø' (°)	c' (kN/m ²)	Ø' (°)
Made Ground	6	18	-	22	0	22
London Clay	25	20	50 + 9z kN/m ² where z = depth into clay ¹	-	3 ²⁾	25 ²⁾

¹⁾ Undrained Shear Strength (kN/m²) inferred by combination of SPT, Share Vane and Triaxial Test. Undrained Shear Strength (kN/m²) increase with depth based on the site test results and published data (moderately conservative approach).

²⁾ Based on published data, moderately conservative approach

8.3 Basement Slab

From the soil profile indicated above and assuming a proposed formation level of approximately 4.0mbgl, a basement raft would find within the London Clay Formation, interfering with generally cohesive strata. Therefore, for preliminary design purposes a safe bearing pressure in order of 80kN/m² is considered suitable, although it will be necessary to check that the associated settlements/heave movements are acceptable to the proposed structure and the existing building on and around the site.

8.4 Piled Foundations

The recommendations for the design and construction of piled foundations in relation to the ground conditions are set out in **Table 6**.

Table 6 – Design and Construction of Piled Foundations

Design/construction considerations	Design/construction recommendations
Pile type	The construction of bored or driven piles is considered technically feasible at this site.
Possible constraints on choice of pile type	Given the close proximity of the site to other properties the use of driven piles may not be acceptable due to ground vibration and noise related problems.
Temporary casing where groundwater is present	Bored piles may require temporary casing throughout their depth where presence of groundwater is possible. Use of CFA piles may overcome the issue.
Man-made obstructions	The presence of buried sub-structures or other obstructions within made ground (expected some remains of the former structures,) may lead to

Design/construction considerations	Design/construction recommendations	
	some difficulty during piling, therefore it is recommended the pile contractor should take that in consideration when quoting the job. Where buried obstructions are encountered, it will be necessary to either relocate the pile(s) or make allowance for removing the obstruction.	
Hard strata	An allowance should be made for chiselling thin 'rock' bands (claystone, limestone or cemented sandstone) within the London Clay Formation.	
Soil and pile design parameters for London Clay - bored piles (cohesive soils)	Adhesion Factor (α)	0.5/0.6
	Bearing Capacity Factor (N_c)	9
	Undrained Shear Strength (c_u)	50 + 9z kN/m ² where z = depth into clay
	Global Safety Factor	3.0/2.5
	Limiting Shaft Friction	110 kN/m ²
	Limiting Concrete Stress	7.5N/mm ²

The design procedure for piles varies considerably, depending on the proposed type of pile.

8.5 Heave Movement

The excavation for the basement and subsequent building construction will be accompanied by a sequence of ground movements, including immediate elastic and longer-term swelling heave on unloading and elastic and longer-term consolidation settlement on reloading. The amounts of each component of movement will depend upon a number of factors, not least the construction timetable and ultimate loadings. As a preliminary order of magnitude guide, it is considered possible that the single basement formation could heave by the order of 10mm to 20mm over a typical construction period of months, much of which would subsequently be recaptured on loading, depending upon the details of the foundation arrangements. The ground movements will affect the ground outside of the immediate construction envelope and could potentially affect adjoining properties.

8.6 Desiccation Assessment

There are two mature trees along the retaining wall at the southern boundary of the site, that we understand will remain in place.

In order to assess whether the soils present are currently desiccated a comparison of the soil moisture profiles and soil index properties have been considered.

- Comparison of soil water content with soil index properties (**Table 7**)
- Moisture content profiles (**Figure 5**)

Comparisons of soil water content with soil index properties

One of available methods to assess desiccation is to compare measured moisture contents with the Driscoll criteria. This indicates that the "onset of desiccation" occurs when the moisture content of the

soil is less than 50% of its liquid limit and that "significant desiccation" is present when the moisture content is less than 40% of its liquid limit. The results of the assessment are shown in the table below.

Table 7 Desiccation Assessment

TP/Depth (m)	Moisture Content (%)	Atterberg Limits			Driscoll Criteria ¹		Desiccated ⁽¹⁾
		LL (%)	PL (%)	PI (%)	0.5 x LL (%)	0.4 x LL (%)	
BH1 @ 2.30-4.80m	28.2	72	31	41	36	28.8	Yes
BH2 @ 3.30-4.00m	33.9	76	31	45	38	30.4	Onset
BH2 @ 4.00-6.00m	32.5	77	31	46	38.5	30.8	Onset
BH3 @ 4.50m	34.0	80	33	47	40	32.0	Onset
BH4 @ 4.60m	31.8	78	30	48	39	31.2	Onset
BH4 @ 6.50m	30.9	77	32	45	38.5	30.8	Onset
BH4 @ 6.50-6.95m	30.0	61	28	33	30.5	24.4	Onset
BH4 @ 9.50-9.95m	30.0	45	27	18	22.5	18	No
BH4 @ 11.00m	30.1	79	35	44	39.5	31.6	Yes
BH4 @ 14.00m	26.9	78	35	43	39	31.2	Yes
BH4 @ 19.00m	27.8	78	36	42	39	31.2	Yes

1. Moisture contents > 0.4 x LL but < 0.5 x LL are reported as having "onset" of desiccation

The assessment based on the above methods shows that most of the samples tested show some degree of desiccation. However, It should be stressed that this is a provisional assessment as the general level of desiccation may be inherent from the soils present by the over-consolidation and not related to the trees.

9. RADON

Indicative Atlas of Radon in the UK indicates that the property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level and no radon protective measures are necessary. However, it should be noted that radon need to be considered in relation to any development with a basement regardless of the location.

Additional information about Radon Affected Areas could be obtained from the publication 'Radon - Guidance on protective measures for new buildings BRE211 (BRE and HPA, 2007)' and the "Indicative Atlas of Radon in England and Wels" published by the Health Protection Agency and British Geological Survey, see www.ukradon.org for more details.

10. CHEMICAL ATTACK ON BURIED CONCRETE

The results of chemical tests carried out on soil samples from the made ground and natural soil indicate 2:1 water soil extract sulphate with max content of 3460 mg/l with alkaline pH values.

These results indicate that, in accordance with BRE Special Digest 1:2005 Concrete in aggressive ground, the Aggressive Chemical Environment for Concrete (ACEC) Classification is **AC-3s** with a Design Sulphate Class for the site of **DS-4**.

This assumes nominally static groundwater conditions and that no significantly disturbed clay comes into contact with concrete foundations or structures. This would apply for designing the concrete class for shallow foundations and concrete elements.

11. CHEMICAL ANALYSIS OF SOIL SAMPLES

The client requested preliminary contamination assessment for the site in regards to the proposed redevelopment. A full Desk Study in accordance with the requirements of BS 10175:2011+A1:2013 for a preliminary (desk-based) investigation was commissioned and carried out by Contaminated Land Solutions Limited. The Desktop Study recommended some site investigation to be carried starting with preliminary investigation where soil samples will be taken and tested for typical range of determinands comprising asbestos, heavy metals, pH, banded aromatic and aliphatic hydrocarbons and speciated poly-aromatic hydrocarbons (PAHs).

Following the findings and recommendations of the Desktop Study, this report and scope of work carried out is intended to provide preliminary information for existence of contamination in the shallow ground around the site and this investigation was not designed to satisfy the full requirements as defined by BS 10175:2001 "Code of Practice for the Investigation of Potentially Contaminated Sites".

An asbestos survey of existing structures and infrastructure (as defined under Section 5(a) of the Control of Asbestos Regulations 2012) was beyond the brief of this report. The risk assessment has been undertaken on the basis that should asbestos be identified within buildings or infrastructure, these materials will be removed appropriately by licensed contractors and asbestos materials disposed of in accordance with legal requirements prior to demolition or other works in order to avoid contaminating soils at the site.

Visual/olfactory evidence of contamination was not encountered during the site work into any of the trial pits or boreholes.

The programme of chemical tests was undertaken on samples obtained from the intrusive investigation as presented in **Table 6**. Testing was undertaken by a UKAS accredited laboratory (The Environmental Laboratory Ltd), MCERTS accredited test methods were specified where applicable.

Table 6 – Summary of Chemical Testing Programme

Test Suite	Number of Samples	Soil Tested
Metals Suite - As, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V & Zn	5	Made Ground/natural ground

Test Suite	Number of Samples	Soil Tested
Asbestos Screening	5	
TPH CWG with BTEX (Soil)	5	
Speciated PAH EPA16 by GC-MS	5	
Total organic carbon	6	

Chemical analyses have been performed on a total of 5No. soil samples. In addition to the chemical analyses, a total of 5No. samples were screened in the laboratory for the presence of asbestos fibres.

The visual inspection at the laboratory identified no materials suspected of potentially containing asbestos and the scheduled laboratory screening for asbestos found no detectable asbestos fibres within the sample.

The full chemical results are presented within **Appendix C**. The results have been assessed with respect to Human Health Risk Assessment conducted on the results of the laboratory tests on soils sampled from the site were evaluated by the Atkins ATRISK^{soil} SSVs derived using CLEA v1.071 software and up to date exposure assumptions based on the principles of minimal toxicological risk at 1% and 6% soil organic matter. Given the proposed end use, the site was treated as residential without consumption of home-grown vegetables.

On the basis of the above assessment, there was a single elevated concentration of Lead found in a sample from the made ground recovered from BH2, 796mg/kg compared to 313mg/kg as suggested with the SGV value, which could pose a potential risk to human health assuming the future residential land use scenario.

As per the brief currently available to us, the proposed redevelopment of the site would involve a lower ground floor with the top 3.5m below the existing ground level being removed and disposed off site including the shallow made ground in the area around BH2 where the elevated concentration of Lead was discovered, therefore removing the source of contamination. These materials should not be reused on site.

In conclusion, the findings of this limited investigation and testing have provided no evidence of significant ground contamination on site with regards to its proposed end-use. It is recommended that imported topsoil/subsoil to be used in any landscaped areas should be clean and suitably tested.

Notwithstanding to the above, adequate health and safety measures may be required during groundworks. In respect of the risk posed to the construction workers who will come into contact with the made ground during the development works, protection measures including regular use of standard PPE equipment (gloves, hard hats, safety boots etc.) and maintenance of self-hygiene should be sufficient to overcome this issue.

Water supply infrastructure should be considered the most sensitive receptor with respect to buried services. It is recommended that the results of this investigation be presented to the water utility company as soon as reasonably practicable in order to confirm the pipe material. As a matter of good practice, and to maximise the protection to utilities, it is recommended that clean, granular backfill is used in service runs and that marker tapes are used for all buried services.

It is possible however, that groundwork may encounter different conditions from those revealed by the site investigation. It is therefore recommended that the groundworks be monitored for previously undetected suspect materials and if found appropriate additional testing and advice is sought.

It is recommended that this report is referenced in the site Health and Safety Plan and that normal good hygiene practice is observed during the works and subsequent building and grounds maintenance.

12. RECOMMENDATION IN RELATION TO FOUNDATIONS

From the results of site investigation, the following recommendations are given in respect to ground engineering and foundation design of the underlying soils:

- The site investigation consisted of 4 (four) drive-in sampler boreholes up to 20.0mbgl, aimed to confirm the ground profile below the site and recover samples for laboratory testing. All boreholes remained dry as no groundwater was recorded during the site works. A Ø35mm standpipe was installed to 6.0mbgl for future groundwater monitoring.
- The investigation found that the site is underlain by made ground with variable and significant thickness over London Clay Formation – Clay, Silt and Sand as bedrock geology. This appears to generally confirm the stratigraphical succession suggested by the published geological records.
- It is understood that the proposed development would include lower ground floor/basement and the construction would likely involve excavation of up to 3.5m from ground level to the underside of the basement slab formation. In order to prevent damage to adjacent properties and highway, the design of the retaining wall and basement excavation must address the risk of excessive deformation of the wall and bracing, both in the temporary and permanent condition, to ensure that the horizontal and vertical soil movement around and below the excavation remain within acceptable levels.
- For a basement slab, a safe bearing pressure in order of 80kN/m² is considered suitable for preliminary design purposes, alternatively piled foundations could be adopted, particularly for any moderate to heavy or sensitive foundation loads.
- Foundations should be taken to a minimum depth of 1m below finished ground level and at least 0.1m into the founding stratum below any overlying made ground or to any greater depth required in respect of the special design considerations given below. Conventional spread footings at the foundations level of 3.5mbgl and a width of up to 1m, may be designed using a net bearing pressure of 140kN/m², that includes a factor of safety against bearing capacity failure and with total settlements associated with the bearing pressure estimated to be less than 25mm. This is a provisional assessment based on the information provided from the ground investigation, for detailed bearing capacity assessment the current standards (BS EN 1997-1: 2004+A1:2013) require information for the design loads imposed on the ground to be taken in account and make sure the associated ULS and SLS safety factors are satisfied.
- Advise on design and construction of piled foundations is included in **Table 6** of this Report. It should be stressed that these parameters are suitable to be used for preliminary design purposes, the detailed design should be provided by the specialist piling contractor and would depend of the type of piles adopted for the project.

- In accordance with BRE 412 Desiccation in Clay Soils and the results presented in **Table 7**, an assessment of the state of desiccation of soil have been made by comparison of measured moisture contents with those calculated using Driscoll's criteria based on soil index properties. In addition, the c_u Vs depth profile presented on **Figure 4** and the Natural Moisture Content MC Vs Dept presented on **Figure 5** were also created for further consideration. The assessment based on the above methods shows that most of the samples tested show some degree of desiccation. It should be stressed that if the trees remain in place the proposed foundations will need to be designed in accordance with the NHBC standards Chapter 4.2 building near trees regardless of desiccation status of the ground at certain time when tested and assessed.
- Special Design Consideration:
 1. Due to the presence of shrinkable soils, foundations should be designed taking into account all the normal precautions, including minimum depths, to minimise the risk of future foundation movements in accordance with NHBC Standards, or similar. The findings of the ground investigation indicate that foundations should be designed for shrinkable soils of high-volume change potential.
- The water-soluble soil extract sulphate contents tests indicate that, in accordance with BRE Special Digest 1:2005 Concrete in aggressive ground, the Aggressive Chemical Environment for Concrete (ACEC) Classification is **AC-3s** with a Design Sulphate Class for the site of **DS-4**.
- All foundation excavations should be inspected and any made ground, soft, organic or otherwise unsuitable materials removed and replaced with mass concrete.

We trust that the above meets with your requirements, however, if should wish to discuss any of the matters further, please do not hesitate to contact us.

Yours Sincerely,

For AVZGeoEng Ltd

Author:

BSc (Hons) Silvanka Kadieva-Zarkovska

Senior Geotechnical Engineer

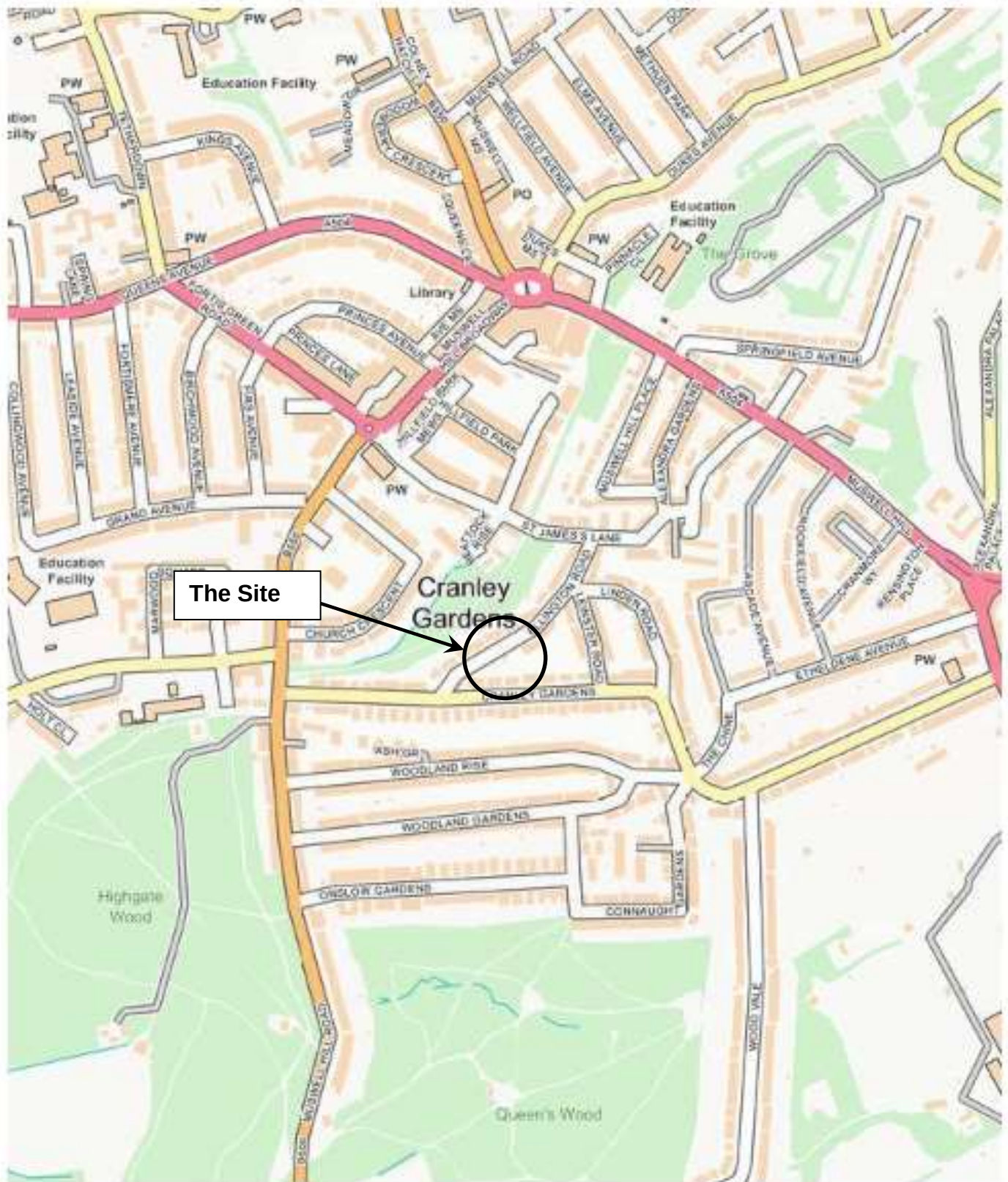


Approved:

Dipl. Ing. Boban Zarkovski CEng MICE



FIGURES



Client: J CLARKE & SONS
ENTERPRISES LLP

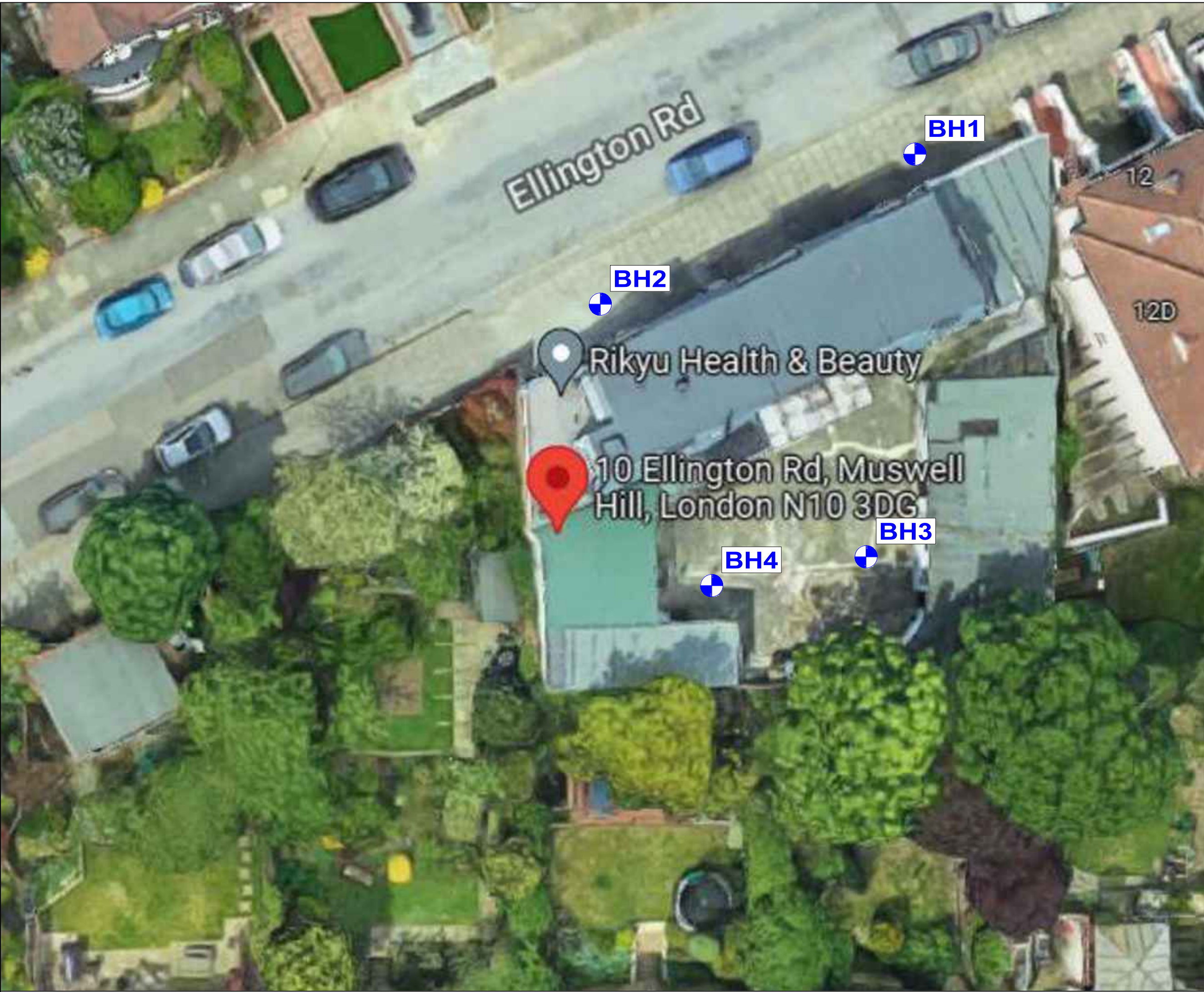
Scale: NTS

Site: 10 Ellington Road, Muswell Hill, London, N10 3DG

SITE LOCATION PLAN

Job No: 1896/22

Figure No: 1



LEGEND:
BH - Borehole



Birch Grove
70 Copthorne Road
Felbridge, Surrey
RH19 2NU
United Kingdom
Email: info@avzgeoeng.co.uk
Web: www.avzgeoeng.co.uk
Mob: 07885977732
Tel: 01342457117

J CLARKE & SONS
ENTERPRISES LLP

10 Ellington Road, Muswell Hill,
London, N10 3DG

Layout Investigation
Points Plan

Drawn	Date	Checked	Date	Approved	Date
SKZ	05/09/2022	BZ	05/09/2022	BZ	05/09/2022

Scale	Orig Size	Dimensions
NTS		M

Project No.	Drawing File
1896/22	

Drawing No.	Rev.
FIGURE_2	

	Site	SPT N Vs Depth Profile	
	10 Ellington Road, Muswell Hill, London, N10 3DG	Client: J CLARKE & SONS ENTERPRISES LLP	Job Number 1896/22

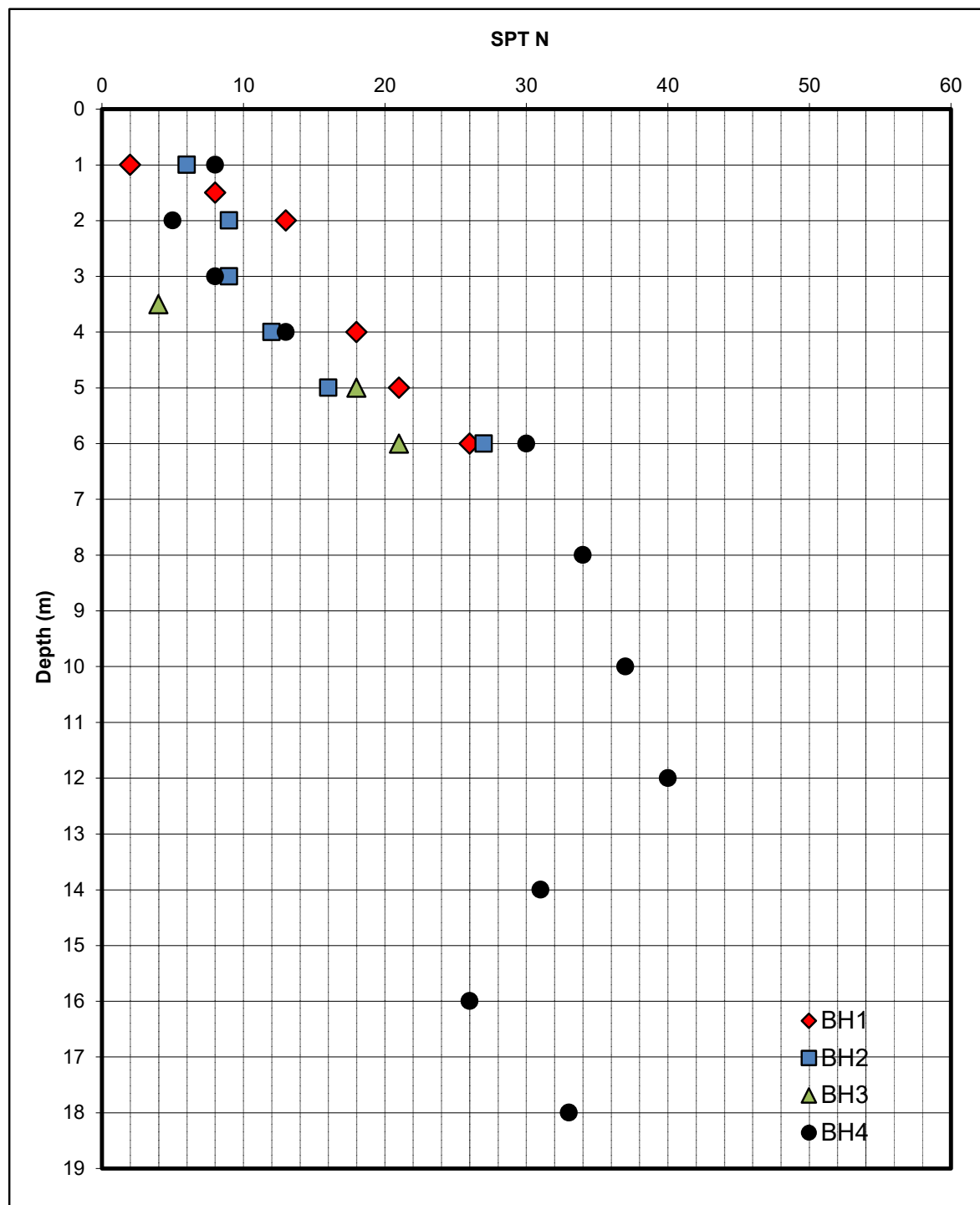


Figure 3_1

	Site	SPT N Vs Depth Profile	
	10 Ellington Road, Muswell Hill, London, N10 3DG	Client: J CLARKE & SONS ENTERPRISES LLP	Job Number 1896/22

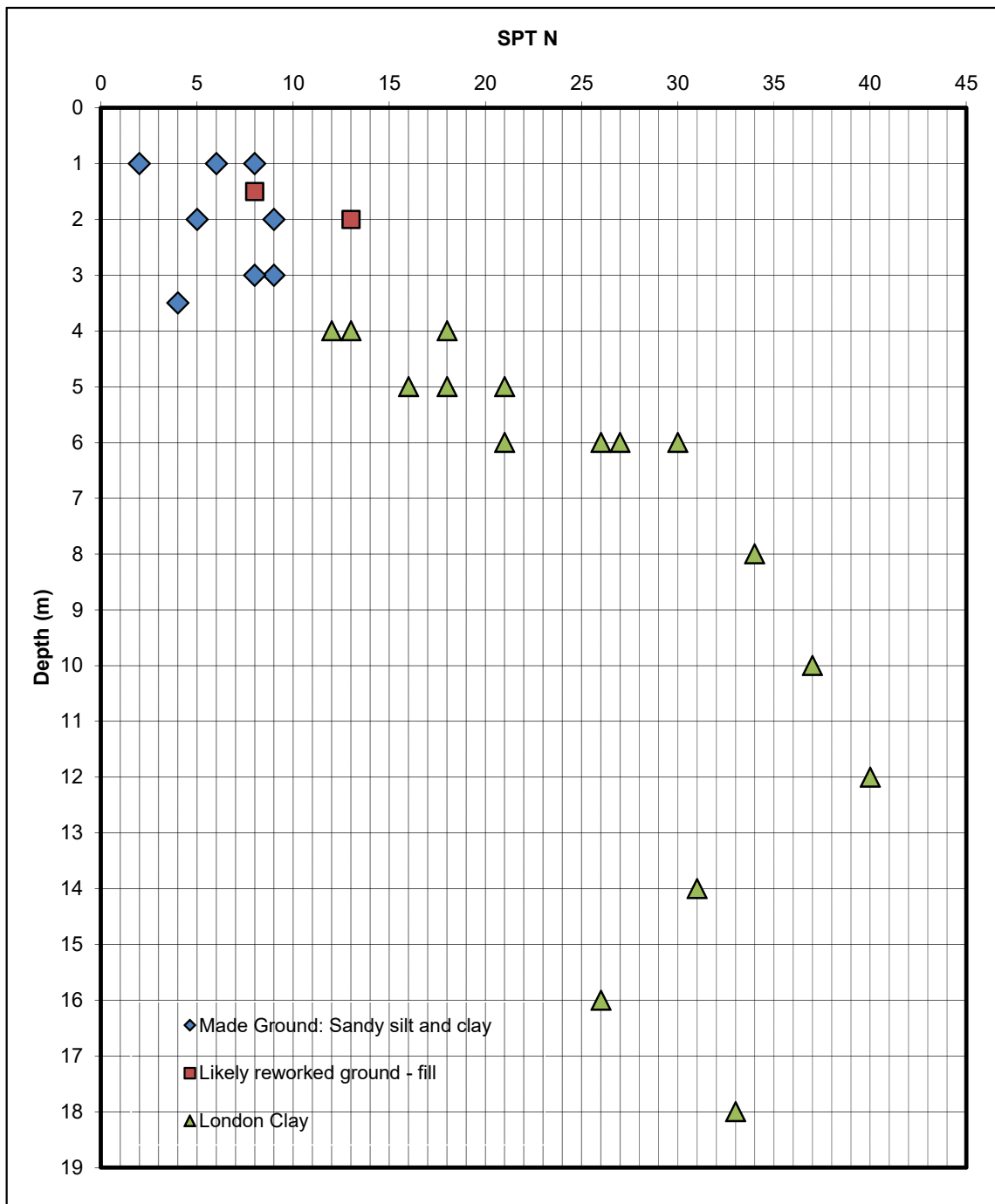


Figure 3_2

	Site	c_u Vs Depth Profile	
	10 Ellington Road, Muswell Hill, London, N10 3DG	Client: J CLARKE & SONS ENTERPRISES LLP	Job Number 1896/22

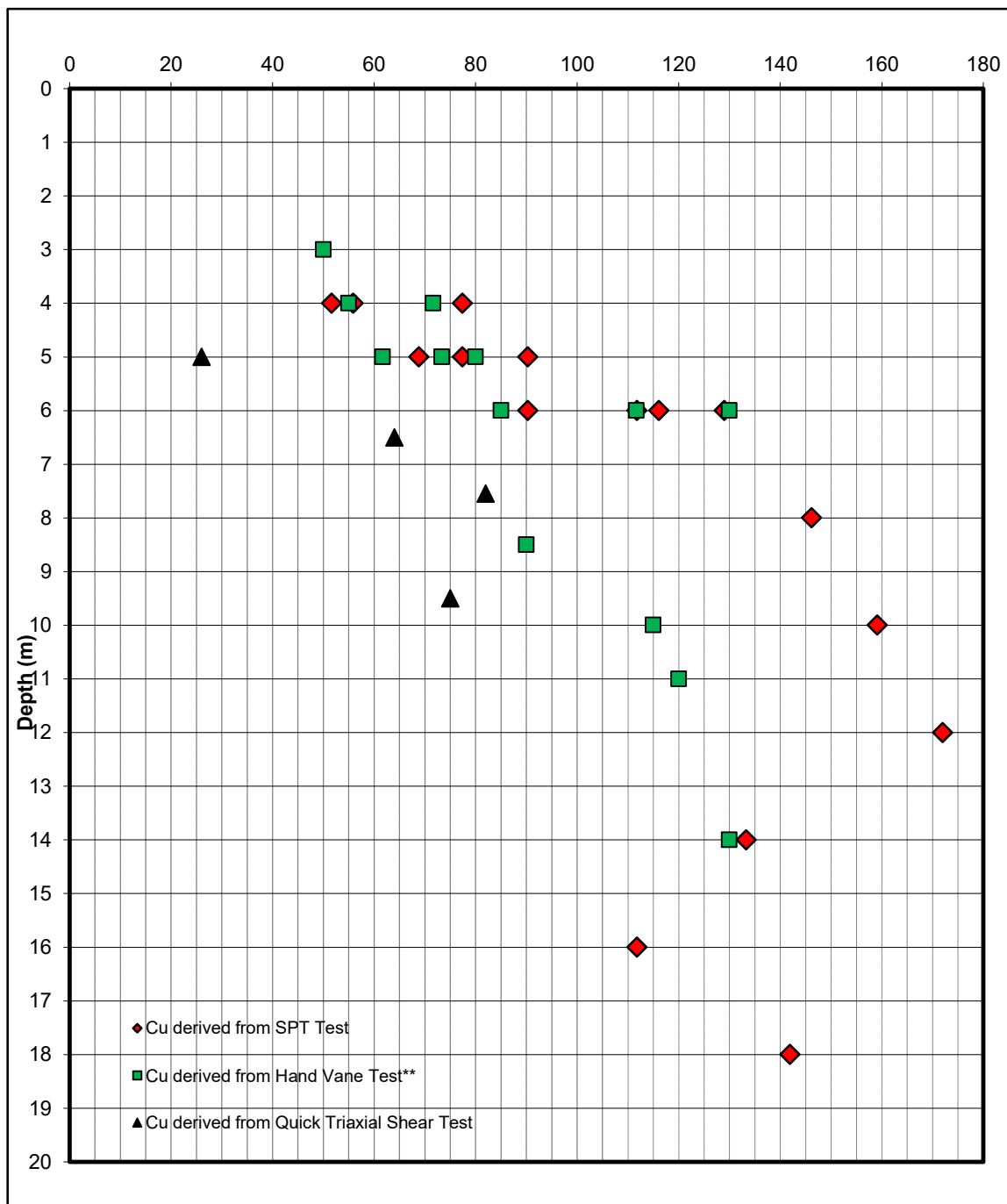


Figure 4

	Site	NMC Vs Depth Profile	
	10 Ellington Road, Muswell Hill, London, N10 3DG	Client: J CLARKE & SONS ENTERPRISES LLP	Job Number 1896/22

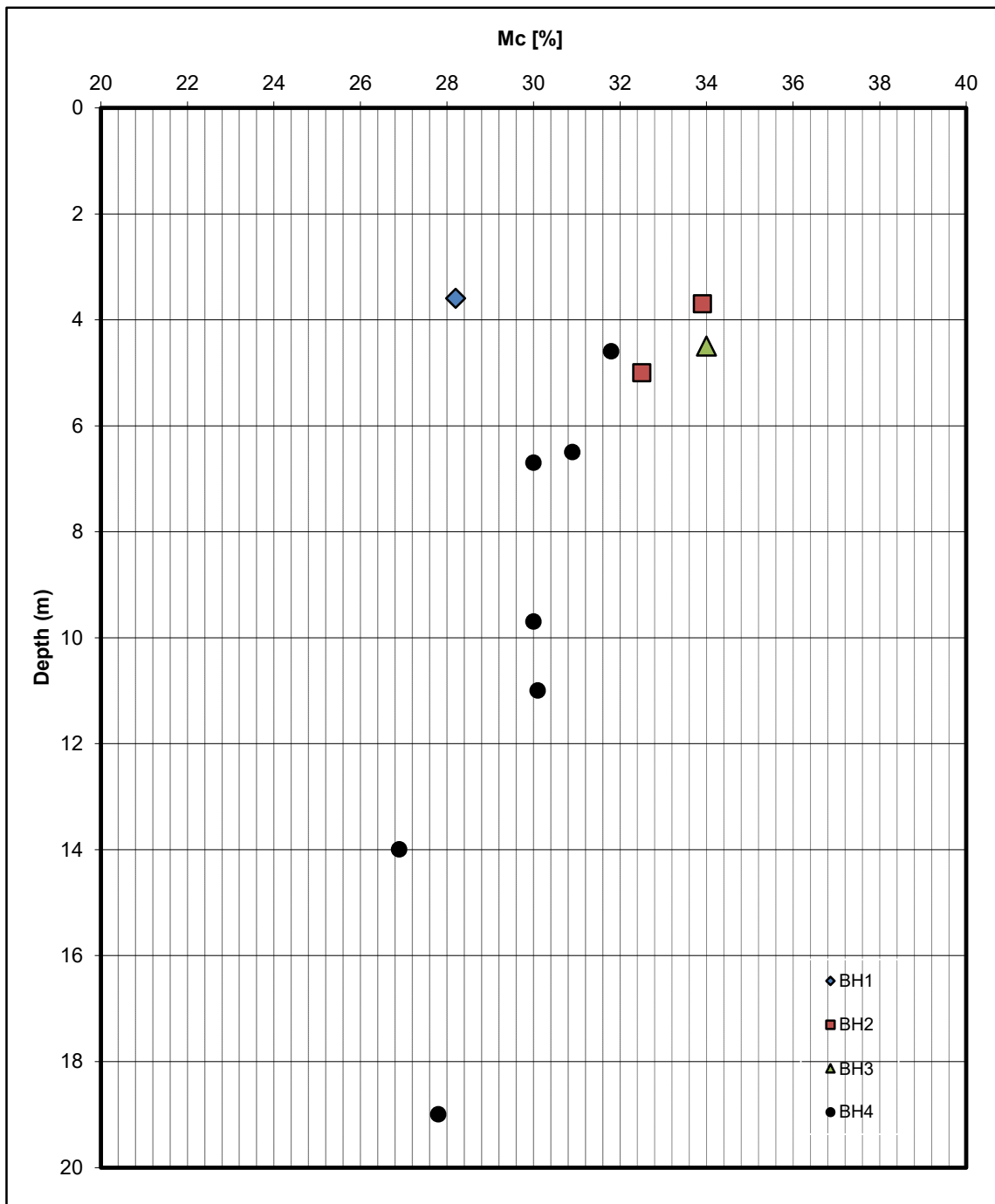


Figure 5

		Factual Report on Ground Investigation		PHOTOGRAPHIC LOG	
Client: J CLARKE & SONS ENTERPRISES LLP			Site: 10 Ellington Road, Muswell Hill, London, N10 3DG		Job No: 1896/22
Photo No.1	Figure 6				
Description: Terrier Rig Performing Drilling at the location					
Photo No.2	Figure 6				
Description: Core Recovered From BH1					

Figure 6

Photo No.3	Figure 6	
Description: Core Recovered From BH2		

Photo No.4	Figure 6	
Description: Core Recovered From BH3		

Figure 6

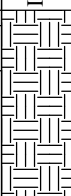
Photo No.5	Figure 6	
Description: Core Recovered From BH4		

Figure 6

APPENDIX A

BOREHOLE LOG

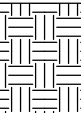
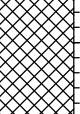
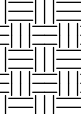
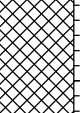
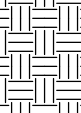
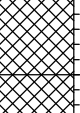
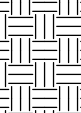
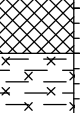
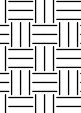
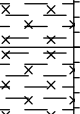
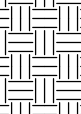
Project 10 Ellington Road, Muswell Hill, London, N10 3DG				BOREHOLE No BH1	
Job No SKZ_1896/22	Date 10-08-22 12-08-22	Ground Level (m)	Co-Ordinates (Local)		
Contractor AVZGeoEng Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water				STRATA	Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
1.00-1.45 1.00	SPT1	N2			0.10	MADE GROUND: Reinforced Concrete slab.			
					0.40	MADE GROUND: Grey brown melange of clayey sand and gravel, with concrete fragments, coal ash and clinker.			
					(1.00)	MADE GROUND: Brown grey, slightly sand silty clay.			
						1.40			
1.50-1.95 1.50	SPT2	N8			(0.90)	Grey to dark grey with black spots, sandy silt and clay with roots and slight organic odour. (Likely reworked ground - fill)			
2.00 2.00-2.45 2.00	HV1 SPT3	35,35,35 N13			2.30	Firm, brown, occasionally blue mottled, silty CLAY. Occasional sandy laminae and selenite crystals present in the sample. (London Clay)			
3.00	HV2	50,50,50			(2.50)				
4.00 4.00-4.45 4.00	HV3 SPT4	75,70,70 N18			4.80				
5.00 5.00-5.45 5.00	HV4 SPT5	70,75,75 N21			(1.20)	Firm to stiff, brown slightly grey, occasionally blue mottled, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay)			
6.00 6.00-6.45 6.00	HV5 SPT6	115,110,110 N26							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											The location was CAT scanned and inspection pit excavated by hand prior the commencement of the drilling. The borehole was backfilled with arisings on completion. Borehole remained dry.
All dimensions in metres Scale 1:50			Client GARY J CLARKE			Method/ Plant Used Terrier Drive in Sampling				Logged By B Žarkovski	

BOREHOLE LOG

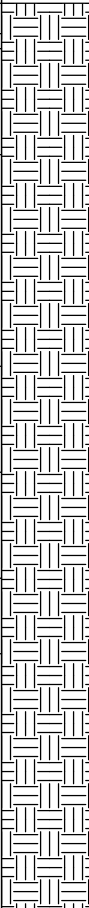
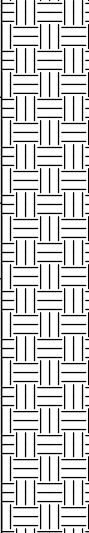
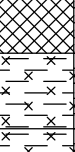
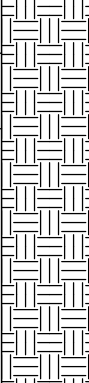
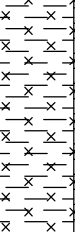
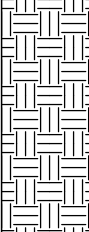
Project 10 Ellington Road, Muswell Hill, London, N10 3DG				BOREHOLE No BH2	
Job No SKZ_1896/22	Date 10-08-22 12-08-22	Ground Level (m)	Co-Ordinates (Local)		
Contractor AVZGeoEng Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00-1.45 1.00	SPT1	N6				0.10	MADE GROUND: Concrete slab.		
						0.20	MADE GROUND: Lean concrete and bricks.		
						(0.50)	MADE GROUND: Grey to dark grey clayey sand and gravel, with frequent bricks, brick fragments and coal ash/clinker.		
						0.70	MADE GROUND: Grey to dark grey and occasional black spots, sandy silt and clay, with occasional coal ash/clinker and slight organic odour.		
2.00-2.45 2.00	SPT2	N9				(2.00)			
						2.70			
3.00-3.45 3.00	SPT3	N9				(0.60)	MADE GROUND: Grey to dark grey and occasional black spots, sandy silt and clay, with occasional coal ash clinker and frequent brick fragments.		
						3.30			
4.00-4.45 4.00	HV1 SPT4	55,50,60 N12				(0.70)	Firm, brown, occasionally blue mottled, silty CLAY. Occasional sandy laminas and selenite crystals present in the sample. (London Clay)		
						4.00			
5.00-5.45 5.00	HV2 SPT5	60,60,65 N16				(2.00)	Firm to stiff, brown slightly grey, occasionally blue mottled, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay)		
						6.00			
6.00-6.45 6.00	HV3 SPT6	>130 N27							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											The location was CAT scanned and inspection pit excavated by hand prior the commencement of the drilling. The borehole was backfilled with arisings on completion. Borehole remained dry.
All dimensions in metres Scale 1:50			Client GARY J CLARKE			Method/ Plant Used Terrier Drive in Sampling				Logged By B Žarkovski	

BOREHOLE LOG

Project 10 Ellington Road, Muswell Hill, London, N10 3DG				BOREHOLE No BH3	
Job No SKZ_1896/22	Date 10-08-22 12-08-22	Ground Level (m)	Co-Ordinates (Local)		
Contractor AVZGeoEng Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
3.50-3.95 3.50	SPT1	N4				0.20	MADE GROUND: Concrete slab.		
						0.30	MADE GROUND: Tarmacadam		
						(0.70)	MADE GROUND: Tarmacadam/clinker rubble		
						1.00			
						(1.40)	MADE GROUND: Melange of brown grey sand and tarmacadam/clinker rubble.		
						2.40			
						(0.70)	MADE GROUND: Brown grey sand with occasional tarmacadam rubble and clinker.		
						3.10			
5.00-5.45 5.00	SPT2	N18				(0.70)	MADE GROUND: Grey to dark grey and occasional black spots, sandy silt and clay, with occasional coal ash clinker and brick fragments.		
						3.80			
6.00-6.45 6.00	SPT3	N21				(0.50)	Grey with black spots silty clay.		
						4.30			
						(1.70)	Firm to stiff, brown slightly grey, occasionally blue mottled, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay)		
						6.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											The location was CAT scanned and inspection pit excavated by hand prior the commencement of the drilling. The borehole was backfilled with arisings on completion. Borehole remained dry.
All dimensions in metres Scale 1:50			Client GARY J CLARKE			Method/ Plant Used Terrier Drive in Sampling				Logged By B Žarkovski	

BOREHOLE LOG

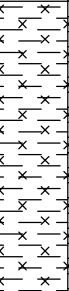
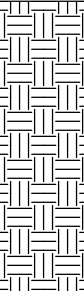
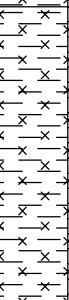
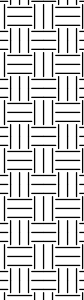
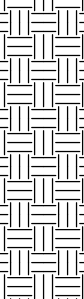
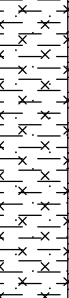
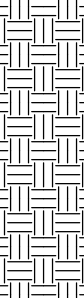
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Job No SKZ_1896/22	Date 10-08-22 12-08-22	Ground Level (m)	Co-Ordinates (Local)		
Contractor AVZGeoEng Ltd				Sheet 1 of 3	

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill	
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)			DESCRIPTION
						0.20	MADE GROUND: Concrete slab		
1.00-1.45 1.00	SPT1	N8			(2.80)		MADE GROUND: Brown grey melange of sandy silt, clay with frequent brick fragments, occasional glass, slate and clinker.		
2.00-2.45 2.00	SPT2	N5				3.00			
3.00-3.45 3.00	SPT3	N8			(0.50) 3.50		MADE GROUND: Brown grey with black spots, silty clay with occasional coal ash.		
4.00 4.00-4.45 4.00	HV1 SPT4	80,80,80 N13			(0.70) 4.20		Light grey and light brown slightly blue, silty clay. (Likely fill)		
5.00	HV2	80,80,80			(1.80) 6.00		Firm to stiff, brown slightly grey, occasionally blue mottled, silty CLAY. Occasional sandy laminae and selenite crystals present in the sample. (London Clay)		
6.00 6.00-6.45 6.00	HV3 SPT5	85,85,85 N30					Stiff, grey brown, laminated and fissured, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay)		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											The location was CAT scanned and inspection pit excavated by hand prior the commencement of the drilling. A 35mm standpipe was installed on completion of the work to allow for future monitoring. Borehole remained dry.
All dimensions in metres Scale 1:50			Client GARY J CLARKE			Method/ Plant Used Terrier Drive in Sampling				Logged By B Žarkovski	

BOREHOLE LOG

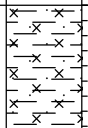
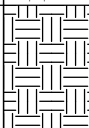
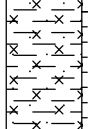
Project 10 Ellington Road, Muswell Hill, London, N10 3DG				BOREHOLE No BH4	
Job No SKZ_1896/22	Date 10-08-22 12-08-22	Ground Level (m)	Co-Ordinates (Local)		
Contractor AVZGeoEng Ltd				Sheet 2 of 3	

SAMPLES & TESTS			Water				STRATA	Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
8.00-8.45 8.00	SPT6	N34			(4.00)	Stiff, grey brown, laminated and fissured, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay) <i>(continued)</i>			
8.50	HV4	90,90,90							
10.00 10.00-10.45 10.00	HV5 SPT7	115,115,115 N37			10.00	Stiff to very stiff, grey occasionally brown, laminated and fissured, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay)			
11.00	HV6	120,120,120							
12.00-12.45 12.00	SPT8	N40			(3.50)	12.67 - 12.72 @ weak claystone			
14.00 14.00-14.45 14.00	HV7 SPT9	>130 N31			13.50	Stiff, grey to dark grey, laminated and fissured, silty CLAY and clayey silt. Occasional to frequent sandy laminae and selenite crystals present in the sample. (London Clay)			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											The location was CAT scanned and inspection pit excavated by hand prior the commencement of the drilling. A 35mm standpipe was installed on completion of the work to allow for future monitoring. Borehole remained dry.
All dimensions in metres Scale 1:50			Client GARY J CLARKE			Method/ Plant Used Terrier Drive in Sampling					Logged By B Zarkovski

BOREHOLE LOG

Project 10 Ellington Road, Muswell Hill, London, N10 3DG				BOREHOLE No BH4	
Job No SKZ_1896/22	Date 10-08-22 12-08-22	Ground Level (m)	Co-Ordinates (Local)		
Contractor AVZGeoEng Ltd				Sheet 3 of 3	

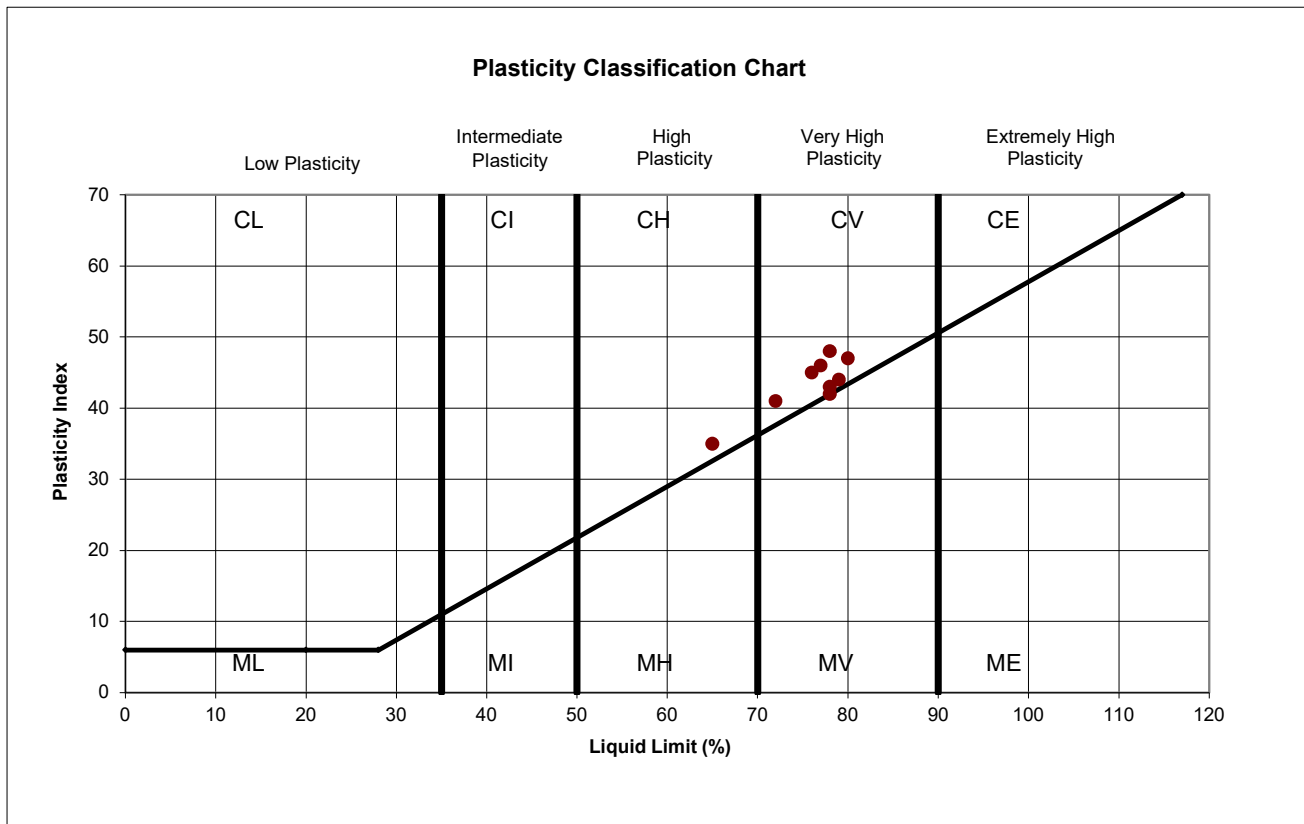
SAMPLES & TESTS			Water				STRATA	Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)	DESCRIPTION		
16.00- 16.45 16.00	SPT10	N26			(6.50)	Stiff, grey to dark grey, laminated and fissured, silty CLAY and clayey silt. Occasional to frequent sandy laminaes and selenite crystals present in the sample. (London Clay) (continued)			
18.00- 18.45 18.00	SPT11	N33			20.00				

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											The location was CAT scanned and inspection pit excavated by hand prior the commencement of the drilling. A 35mm standpipe was installed on completion of the work to allow for future monitoring. Borehole remained dry.
All dimensions in metres Scale 1:50			Client GARY J CLARKE			Method/ Plant Used Terrier Drive in Sampling				Logged By B Žarkovski	

APPENDIX B

PLASTICITY SHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2 (BS EN ISO 17892-12)



Liquid Limit - LL (%)

Sample Identification			BS Test Method #	Preparation Method +	MC (%)	LL (%)	PL (%)	PI (%)	PI' (%)	<425 (%)
Exploratory Position ID	Sample	Depth (m)								
BH1	D	2.3-4.8	3.2/4.3/5.3/5.4	4.2.3	28.2	72	31	41	41	99.9
BH2	D	3.3-4.0	3.2/4.3/5.3/5.4	4.2.3	33.9	76	31	45	45	100
BH2	D	4.0-6.0	3.2/4.3/5.3/5.4	4.2.3	32.5	77	31	46	46	99.5
BH3	D	4.5	3.2/4.3/5.3/5.4	4.2.3	34.0	80	33	47	47	100
BH4	D	4.6	3.2/4.3/5.3/5.4	4.2.3	31.8	78	30	48	48	100
BH4	D	6.5	3.2/4.3/5.3/5.4	4.2.3	30.9	65	30	35	35	100
BH4	D	11	3.2/4.3/5.3/5.4	4.2.3	30.1	79	35	44	44	98.2
BH4	D	14	3.2/4.3/5.3/5.4	4.2.3	26.9	78	35	43	43	100
BH4	D	19	3.2/4.3/5.3/5.4	4.2.3	27.8	78	36	42	42	99.6

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

3.2 - Moisture Content

4.3 - Cone Penetrometer Method

4.4 - One Point Cone Penetrometer Method

4.6 - Three Point Casagrande Method

5.3 - Plastic Limit Method

5.4 - Plasticity Index

Key: * = Non standard test,

NP = Non Plastic

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

4.2.3 - Natural State

4.2.4 - Wet Sieved

Client: J CLARKE & SONS ENTERPRISES LLP

Site: 10 Ellington Road, Muswell Hill, London, N10 3DG



AVZGeoEng Ltd

Registered office

8 Tanyard Avenue East Grinstead West Sussex RH19 4LU UK

Registered in England No. 7824020

Email: info@avzgeoeng.co.uk

Web: www.avzgeoeng.co.uk

Mob: 07885977732

Tel: 01342457117

Date: 31/8/2022

Completed by: SKZ

Project No: SKZ_ 1896/22

Appendix B



Laboratory Report



Contract Number: 60934

Client Ref: **SKZ_1896/22**

Client PO:

Date Received: **19-08-2022**

Date Completed: **13-09-2022**

Report Date: **13-09-2022**

Client: **AVZ GeoEng Ltd**

70 Copthorne Road

Felbridge

East Grinstead

RH19 2NU

This report has been checked and approved by:

Brendan Evans

Contract Title: **10 Ellington Road, Muswell Hill, London, N10 3DG**

For the attention of: **Boban Zarkovski**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	2
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	2
Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter) BS 1377:1990 - Part 7 : 8 - * UKAS	4
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

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 test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:

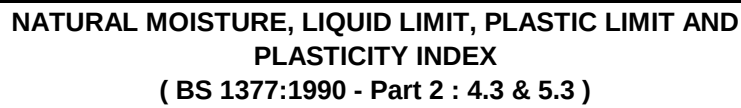
Brendan Evans (Office Administrator) - Paul Evans (Director) - Richard John (Quality/Technical Manager)

Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (Human Resources/ Health and Safety Coordinator)

GEO Site & Testing Services Ltd

Units 3-4, Heol Aur, Dafen, Llanelli, Carmarthenshire, Wales SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk



Contract Number	60934	
Site Name	10 Ellington Road, Muswell Hill, London, N10 3DG	
Date Tested	08/09/2022	
	DESCRIPTIONS	

[illegible]

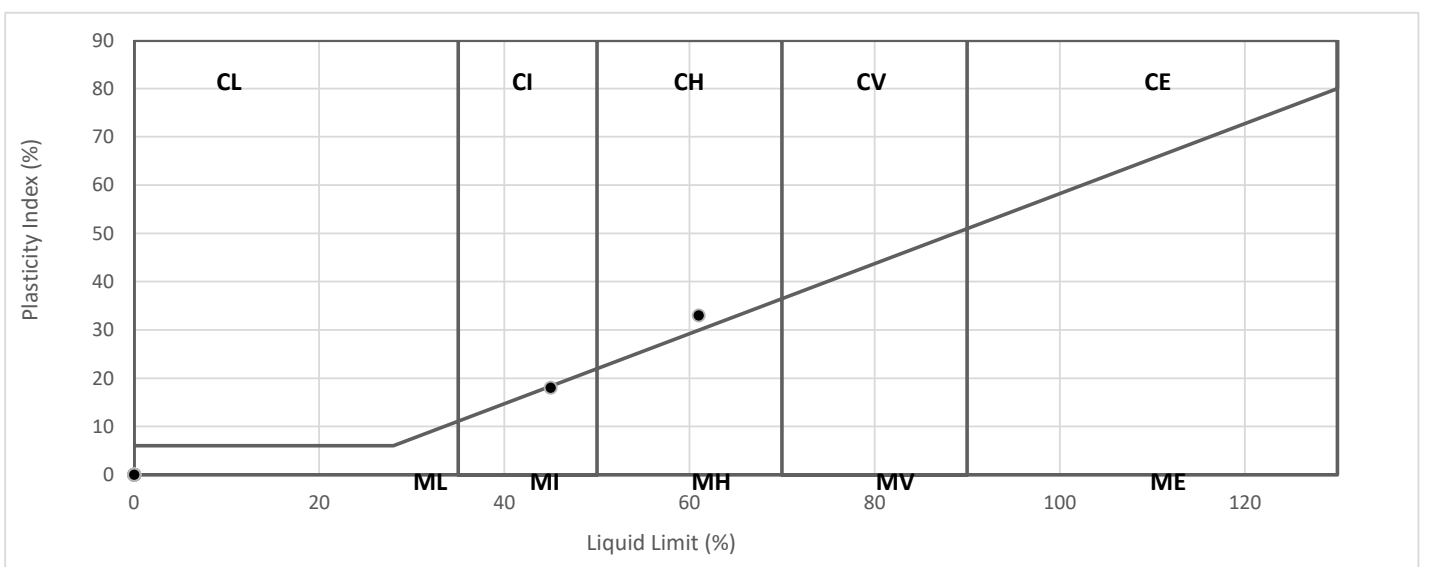
Operators
Darcy Etheridge

Contract Number	60934	
Project Location	10 Ellington Road, Muswell Hill, London, N10 3DG	
Date Tested	08/09/2022	

[illegible]

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION BS 5930:1999+A2:2010



Operators
Darcy Etheridge

Single Stage Unconsolidated-Undrained Triaxial Test
BS 1377 : 1990 Part 7 : 8

Contract Number 60934

Borehole/Pit No. BH4

Site Name 10 Ellington Road, Muswell Hill, London, N10 3DG

Sample No. U-100

Soil Description Brown gravelly sandy silty CLAY

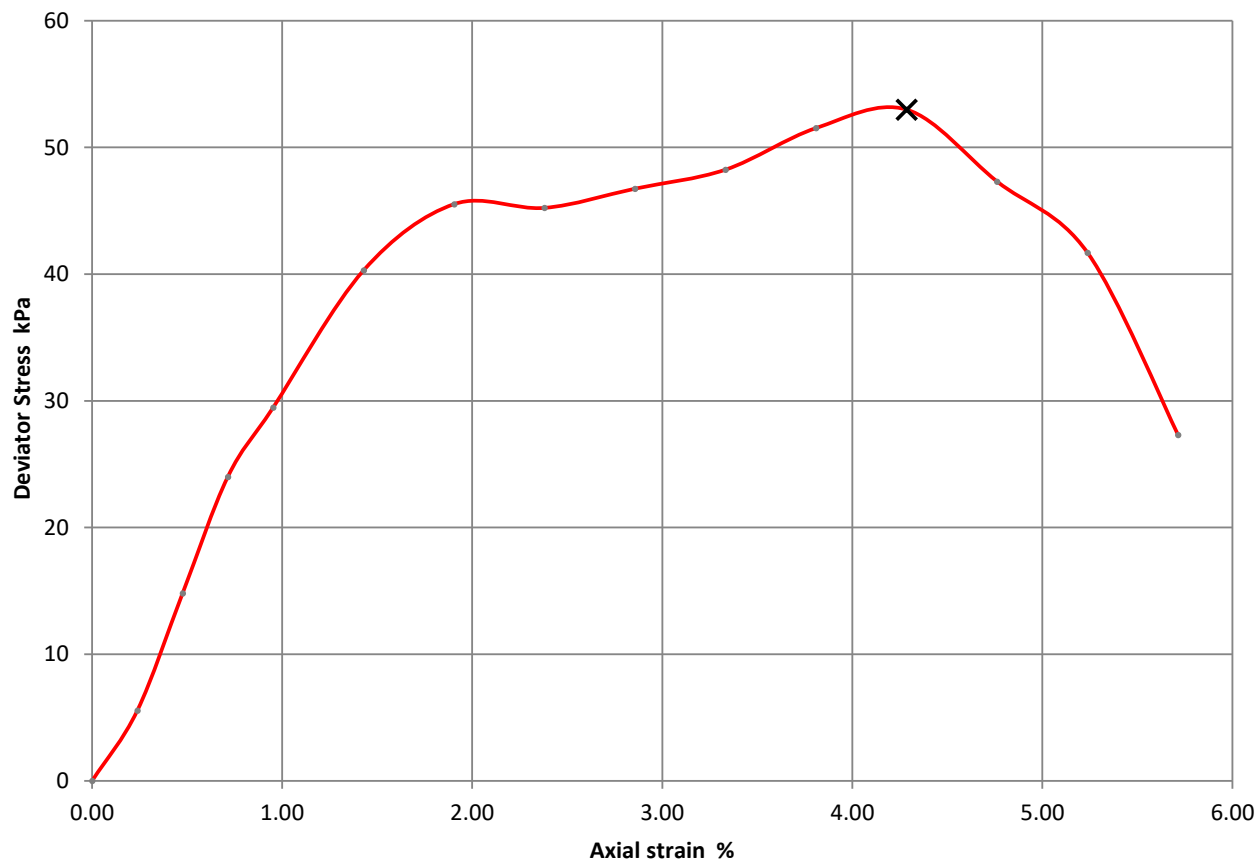
Depth Top (m) 5.00

Depth Base (m) 5.45

Date Tested 07/09/2022

Sample Type U

Technician Christopher



Moisture Content (%)	25
Bulk Density (Mg/m ³)	1.60
Dry Density (Mg/m ³)	1.28
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	100
Deviator Stress (kPa)	53
Undrained Shear Strength (kPa)	26
Failure Strain (%)	4
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number 60934

Borehole/Pit No. BH4

Site Name 10 Ellington Road, Muswell Hill, London, N10 3DG

Sample No. U-100

Soil Description Brown gravelly sandy silty CLAY

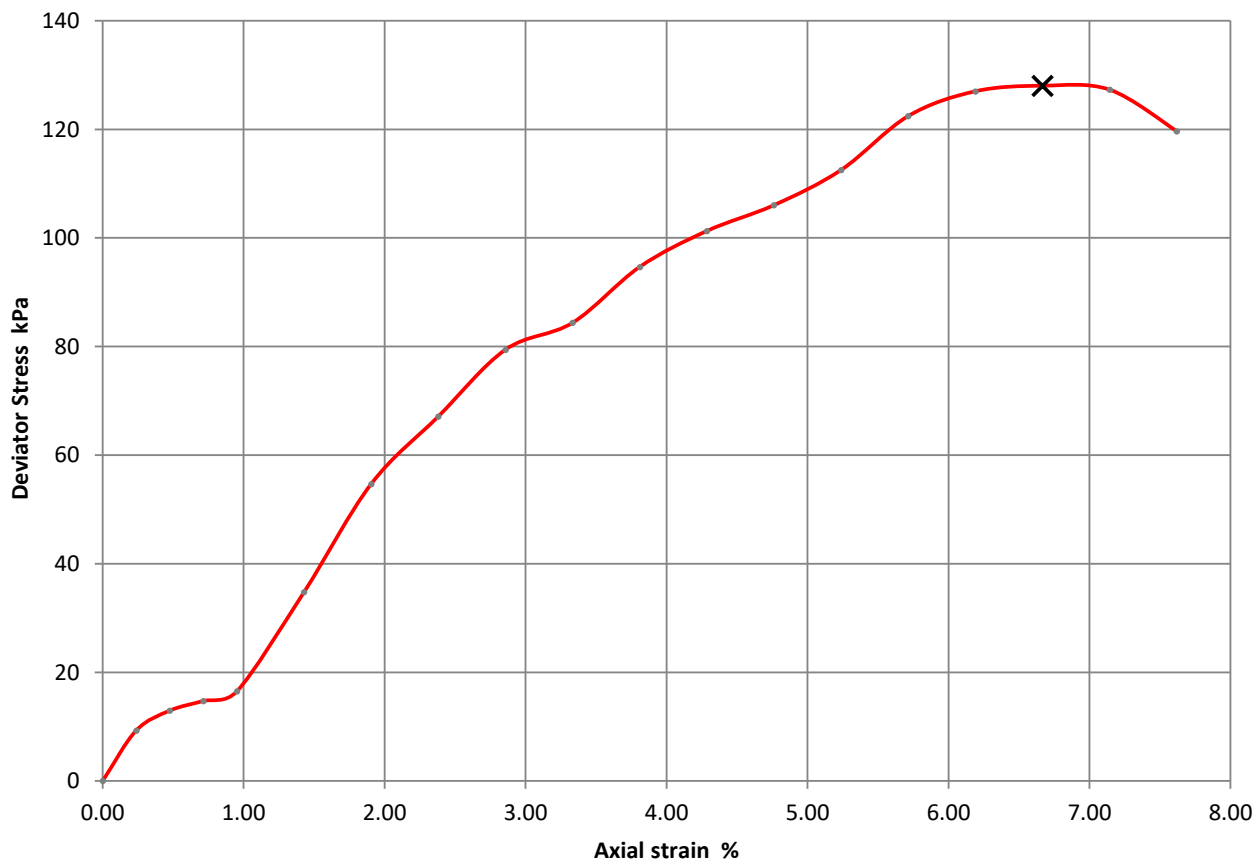
Depth Top (m) 6.50

Depth Base (m) 6.95

Date Tested 07/09/2022

Sample Type U

Technician Christopher



Moisture Content (%)	30
Bulk Density (Mg/m ³)	1.73
Dry Density (Mg/m ³)	1.33
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	100
Deviator Stress (kPa)	128
Undrained Shear Strength (kPa)	64
Failure Strain (%)	7
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Single Stage Unconsolidated-Undrained Triaxial Test
BS 1377 : 1990 Part 7 : 8

Contract Number 60934

Borehole/Pit No. BH4

Site Name 10 Ellington Road, Muswell Hill, London, N10 3DG

Sample No. U-100

Soil Description Brown silty CLAY

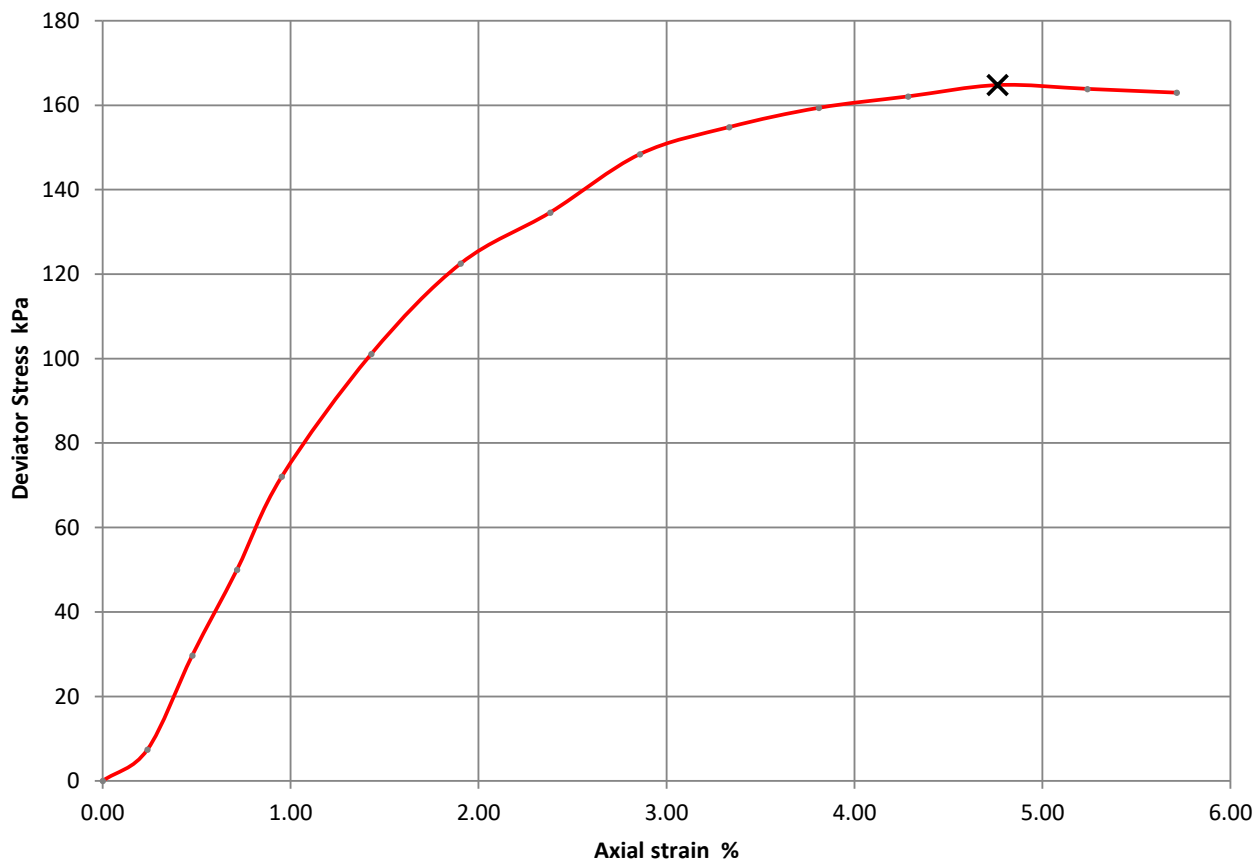
Depth Top (m) 7.55

Depth Base (m) 8.00

Date Tested 07/09/2022

Sample Type U

Technician Christopher



Moisture Content (%)	29
Bulk Density (Mg/m ³)	1.79
Dry Density (Mg/m ³)	1.39
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	150
Deviator Stress (kPa)	165
Undrained Shear Strength (kPa)	82
Failure Strain (%)	5
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43



**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number 60934

Borehole/Pit No. BH4

Site Name 10 Ellington Road, Muswell Hill, London, N10 3DG

Sample No. U-100

Soil Description Brown clayey SILT

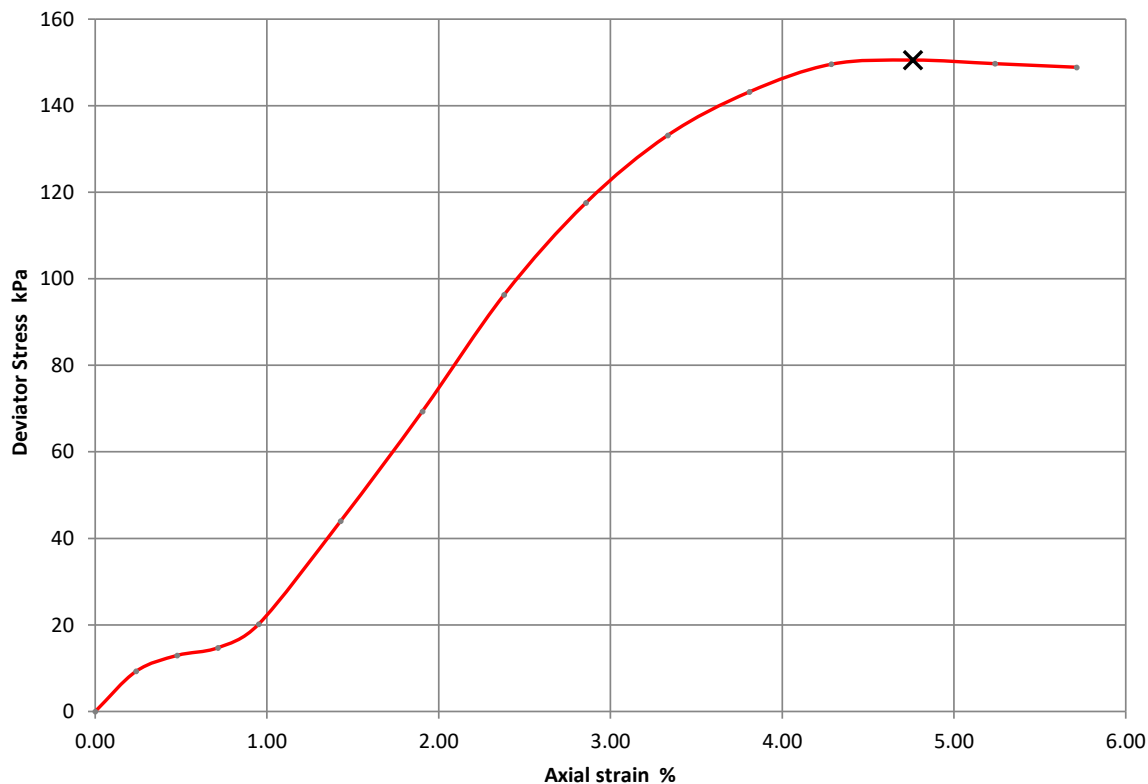
Depth Top (m) 9.50

Depth Base (m) 9.55

Date Tested 07/09/2022

Sample Type U

Technician Christopher



Moisture Content (%)	30
Bulk Density (Mg/m ³)	1.75
Dry Density (Mg/m ³)	1.35
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	200
Deviator Stress (kPa)	151
Undrained Shear Strength (kPa)	75
Failure Strain (%)	5
Mode Of Failure	Compound
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43



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APPENDIX C



Unit A2
Windmill Road
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East Sussex
TN38 9BY
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info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 22-42753

Issue: 1

Date of Issue: 25/08/2022

Contact: Silvanka K. Zarkovska

Customer Details: AVZ GeoEng Ltd
Birch Grove
70 Copthorne Road
Felbridge
Surrey RH19 2NU

Quotation No: Q22-02754

Order No: SKZ_1896/22

Customer Reference: SKZ_1896/22

Date Received: 18/08/2022

Date Approved: 25/08/2022

Details: 10 Ellington Road, Muswell Hill, London, N10 3DG

Approved by:

Mike Varley, General Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

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Sample Summary

Report No.: 22-42753, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
290586	BH1 2.30 - 4.80	12/08/2022	18/08/2022	Silty clayey loam	
290587	BH2 3.30 - 4.00	12/08/2022	18/08/2022	Silty clayey loam	
290588	BH2 4.60 - 6.60	12/08/2022	18/08/2022		
290589	BH3 4.50	12/08/2022	18/08/2022	Silty clayey loam	
290590	BH4 4.50 - 5.00	12/08/2022	18/08/2022	Silty clayey loam	
290591	BH4 6.50	12/08/2022	18/08/2022		
290592	BH4 8.50	12/08/2022	18/08/2022	Silty clayey loam	
290593	BH4 11.00	12/08/2022	18/08/2022	Silty clayey loam	
290594	BH4 14.00	12/08/2022	18/08/2022	Clayey loam	
290595	BH1 1.40 - 2.30	12/08/2022	18/08/2022	Silty loam	
290596	BH1 0.10 - 0.40	12/08/2022	18/08/2022		
290597	BH2 0.20 - 0.70	12/08/2022	18/08/2022	Sandy silty loam	
290598	BH2 0.70 - 2.70	12/08/2022	18/08/2022	Silty clayey loam	
290599	BH3 0.30 - 2.40	12/08/2022	18/08/2022	Sandy loam	
290600	BH3 3.10 - 3.90	12/08/2022	18/08/2022		
290601	BH4 0.20 - 3.00	12/08/2022	18/08/2022	Silty clayey loam	
290602	BH4 3.50 - 4.20	12/08/2022	18/08/2022		
290603	BH4 Combined 3.50 - 4.20	12/08/2022	18/08/2022	Silty clayey loam	

Results Summary

Report No.: 22-42753, issue number 1

ELAB Reference				290586	290587	290589	290590
Customer Reference							
Sample ID							
Sample Type				SOIL	SOIL	SOIL	SOIL
Sample Location				BH1	BH2	BH3	BH4
Sample Depth (m)				2.30 - 4.80	3.30 - 4.00	4.50	4.50 - 5.00
Sampling Date				12/08/2022	12/08/2022	12/08/2022	12/08/2022
Determinand	Codes	Units	LOD				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	17.7	21.6	21.0	20.6
Material removed	N	%	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Description of Inert material removed	N		0	None	None	None	None
Metals							
Arsenic	M	mg/kg	1	n/t	n/t	n/t	n/t
Barium	U	mg/kg	10	n/t	n/t	n/t	n/t
Beryllium	U	mg/kg	1	n/t	n/t	n/t	n/t
Cadmium	M	mg/kg	0.5	n/t	n/t	n/t	n/t
Chromium	M	mg/kg	5	n/t	n/t	n/t	n/t
Copper	M	mg/kg	5	n/t	n/t	n/t	n/t
Lead	M	mg/kg	5	n/t	n/t	n/t	n/t
Mercury	M	mg/kg	0.5	n/t	n/t	n/t	n/t
Nickel	M	mg/kg	5	n/t	n/t	n/t	n/t
Selenium	M	mg/kg	1	n/t	n/t	n/t	n/t
Vanadium	M	mg/kg	5	n/t	n/t	n/t	n/t
Zinc	M	mg/kg	5	n/t	n/t	n/t	n/t
Anions							
Water Soluble Sulphate	M	g/l	0.02	0.28	0.21	0.18	2.43
Inorganics							
Water Soluble Boron	N	mg/kg	0.5	n/t	n/t	n/t	n/t
Miscellaneous							
Acid Neutralisation Capacity	N	mol/kg	0.1	n/t	n/t	n/t	n/t
Loss on Ignition	M	%	0.01	n/t	n/t	n/t	n/t
pH	M	pH units	0.1	8.8	8.4	8.4	7.8
Total Organic Carbon	N	%	0.01	n/t	n/t	n/t	n/t
Polyaromatic hydrocarbons							
Total (of 17) PAHs	N	mg/kg	2	n/t	n/t	n/t	n/t
Naphthalene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Acenaphthylene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Acenaphthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Fluorene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Phenanthrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Benzo(a)anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Chrysene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Benzo(b)fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Benzo(k)fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Benzo(a)pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Indeno(1,2,3-cd)pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Dibenzo(a,h)anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Benzo(g,h,i)perylene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	n/t
Total PAH(16) GCMS	N	mg/kg	0.04	n/t	n/t	n/t	n/t



Results Summary

2683

Report No.: 22-42753, issue number 1

ELAB Reference				290586	290587	290589	290590
Customer Reference							
Sample ID							
Sample Type				SOIL	SOIL	SOIL	SOIL
Sample Location				BH1	BH2	BH3	BH4
Sample Depth (m)				2.30 - 4.80	3.30 - 4.00	4.50	4.50 - 5.00
Sampling Date				12/08/2022	12/08/2022	12/08/2022	12/08/2022
Determinand	Codes	Units	LOD				
BTEX							
Benzene	M	ug/kg	10	n/t	n/t	n/t	n/t
Toluene	M	ug/kg	10	n/t	n/t	n/t	n/t
Ethylbenzene	M	ug/kg	10	n/t	n/t	n/t	n/t
Xylenes	M	ug/kg	10	n/t	n/t	n/t	n/t
MTBE	U	ug/kg	10	n/t	n/t	n/t	n/t
Total BTEX	N	mg/kg	0.01	n/t	n/t	n/t	n/t
TPH CWG							
>C5-C6 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C6-C8 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C8-C10 Aliphatic (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	n/t	n/t	n/t	n/t
>C10-C12 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C12-C16 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C16-C21 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C21-C35 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C35-C40 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	n/t
Total aliphatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	n/t	n/t	n/t	n/t
>C5-C7 Aromatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C7-C8 Aromatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	n/t
>C8-C10 Aromatic (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	n/t	n/t	n/t	n/t
>C10-C12 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C12-C16 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C16-C21 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C21-C35 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	n/t
>C35-C40 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	n/t
Total aromatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	n/t	n/t	n/t	n/t
Total petroleum hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_Total)	N	mg/kg	1	n/t	n/t	n/t	n/t
Total Petroleum Hydrocarbons							
Mineral Oil w Florisil (EH_CU_1D_Total)	N	mg/kg	5	n/t	n/t	n/t	n/t
PCB (ICES 7 congeners)							
Total PCBs (7 congeners)	M	mg/kg	0.03	n/t	n/t	n/t	n/t

Results Summary

Report No.: 22-42753, issue number 1

ELAB Reference				290592	290593	290594	290595
Customer Reference							
Sample ID							
Sample Type				SOIL	SOIL	SOIL	SOIL
Sample Location				BH4	BH4	BH4	BH1
Sample Depth (m)				8.50	11.00	14.00	1.40 - 2.30
Sampling Date				12/08/2022	12/08/2022	12/08/2022	12/08/2022
Determinand	Codes	Units	LOD				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	21.2	20.2	18.5	20.6
Material removed	N	%	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Description of Inert material removed	N		0	None	None	None	None
Metals							
Arsenic	M	mg/kg	1	n/t	n/t	n/t	6.8
Barium	U	mg/kg	10	n/t	n/t	n/t	35.6
Beryllium	U	mg/kg	1	n/t	n/t	n/t	< 1.0
Cadmium	M	mg/kg	0.5	n/t	n/t	n/t	< 0.5
Chromium	M	mg/kg	5	n/t	n/t	n/t	36.9
Copper	M	mg/kg	5	n/t	n/t	n/t	13.9
Lead	M	mg/kg	5	n/t	n/t	n/t	39.4
Mercury	M	mg/kg	0.5	n/t	n/t	n/t	< 0.5
Nickel	M	mg/kg	5	n/t	n/t	n/t	14.8
Selenium	M	mg/kg	1	n/t	n/t	n/t	< 1.0
Vanadium	M	mg/kg	5	n/t	n/t	n/t	49.4
Zinc	M	mg/kg	5	n/t	n/t	n/t	47.3
Anions							
Water Soluble Sulphate	M	g/l	0.02	3.35	3.46	1.40	n/t
Inorganics							
Water Soluble Boron	N	mg/kg	0.5	n/t	n/t	n/t	2.2
Miscellaneous							
Acid Neutralisation Capacity	N	mol/kg	0.1	n/t	n/t	n/t	n/t
Loss on Ignition	M	%	0.01	n/t	n/t	n/t	n/t
pH	M	pH units	0.1	7.9	7.9	8.0	n/t
Total Organic Carbon	N	%	0.01	n/t	n/t	n/t	1.1
Polyaromatic hydrocarbons							
Total (of 17) PAHs	N	mg/kg	2	n/t	n/t	n/t	n/t
Naphthalene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	0.03
Acenaphthylene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Acenaphthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Fluorene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Phenanthrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	0.01
Anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Benzo(a)anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Chrysene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Benzo(b)fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Benzo(k)fluoranthene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Benzo(a)pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	0.02
Indeno(1,2,3-cd)pyrene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Dibenzo(a,h)anthracene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
Benzo(g,h,i)perylene GCMS	N	mg/kg	0.01	n/t	n/t	n/t	0.01
Total PAH(16) GCMS	N	mg/kg	0.04	n/t	n/t	n/t	0.14

Results Summary

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Report No.: 22-42753, issue number 1

ELAB Reference	290592	290593	290594	290595
Customer Reference				
Sample ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sample Location	BH4	BH4	BH4	BH1
Sample Depth (m)	8.50	11.00	14.00	1.40 - 2.30
Sampling Date	12/08/2022	12/08/2022	12/08/2022	12/08/2022

Determinand	Codes	Units	LOD				
BTEX							
Benzene	M	ug/kg	10	n/t	n/t	n/t	< 10.0
Toluene	M	ug/kg	10	n/t	n/t	n/t	< 10.0
Ethylbenzene	M	ug/kg	10	n/t	n/t	n/t	< 10.0
Xylenes	M	ug/kg	10	n/t	n/t	n/t	< 10.0
MTBE	U	ug/kg	10	n/t	n/t	n/t	< 10.0
Total BTEX	N	mg/kg	0.01	n/t	n/t	n/t	n/t
TPH CWG							
>C5-C6 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
>C6-C8 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
>C8-C10 Aliphatic (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	n/t	n/t	n/t	< 1.0
>C10-C12 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	< 1.0
>C12-C16 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	< 1.0
>C16-C21 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	1.4
>C21-C35 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	1.4
>C35-C40 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t	n/t	n/t	< 1.0
Total aliphatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	n/t	n/t	n/t	3.2
>C5-C7 Aromatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
>C7-C8 Aromatic (HS_1D_MS)	N	mg/kg	0.01	n/t	n/t	n/t	< 0.01
>C8-C10 Aromatic (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	n/t	n/t	n/t	< 1.0
>C10-C12 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	< 1.0
>C12-C16 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	1.9
>C16-C21 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	< 1.0
>C21-C35 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	2.6
>C35-C40 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t	n/t	n/t	< 1.0
Total aromatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	n/t	n/t	n/t	7.3
Total petroleum hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_Total)	N	mg/kg	1	n/t	n/t	n/t	10.5
Total Petroleum Hydrocarbons							
Mineral Oil w Florisil (EH_CU_1D_Total)	N	mg/kg	5	n/t	n/t	n/t	n/t
PCB (ICES 7 congeners)							
Total PCBs (7 congeners)	M	mg/kg	0.03	n/t	n/t	n/t	n/t

Results Summary

Report No.: 22-42753, issue number 1

ELAB Reference				290597	290598	290599	290601
Customer Reference							
Sample ID							
Sample Type				SOIL	SOIL	SOIL	SOIL
Sample Location				BH2	BH2	BH3	BH4
Sample Depth (m)				0.20 - 0.70	0.70 - 2.70	0.30 - 2.40	0.20 - 3.00
Sampling Date				12/08/2022	12/08/2022	12/08/2022	12/08/2022
Determinand	Codes	Units	LOD				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	12.9	18.9	13.2	15.5
Material removed	N	%	0.1	11.7	< 0.1	11.0	< 0.1
Description of Inert material removed	N		0	Stones	None	Stones	None
Metals							
Arsenic	M	mg/kg	1	25.8	12.1	28.2	16.2
Barium	U	mg/kg	10	288	76.0	267	123
Beryllium	U	mg/kg	1	2.2	< 1.0	3.0	1.7
Cadmium	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium	M	mg/kg	5	37.9	45.4	43.6	58.4
Copper	M	mg/kg	5	72.5	42.6	103	37.1
Lead	M	mg/kg	5	796	122	44.2	165
Mercury	M	mg/kg	0.5	0.7	< 0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5	38.0	22.0	63.0	40.2
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium	M	mg/kg	5	58.6	57.2	94.5	94.1
Zinc	M	mg/kg	5	281	79.7	65.0	106
Anions							
Water Soluble Sulphate	M	g/l	0.02	0.26	0.05	n/t	n/t
Inorganics							
Water Soluble Boron	N	mg/kg	0.5	1.2	2.2	2.3	3.7
Miscellaneous							
Acid Neutralisation Capacity	N	mol/kg	0.1	n/t	n/t	n/t	n/t
Loss on Ignition	M	%	0.01	n/t	n/t	n/t	n/t
pH	M	pH units	0.1	10.7	8.9	n/t	n/t
Total Organic Carbon	N	%	0.01	2.4	1.2	12	0.80
Polyaromatic hydrocarbons							
Total (of 17) PAHs	N	mg/kg	2	n/t	n/t	n/t	n/t
Naphthalene GCMS	N	mg/kg	0.01	0.15	0.03	0.11	0.16
Acenaphthylene GCMS	N	mg/kg	0.01	0.02	< 0.01	< 0.01	0.21
Acenaphthene GCMS	N	mg/kg	0.01	0.03	< 0.01	< 0.01	0.16
Fluorene GCMS	N	mg/kg	0.01	0.02	< 0.01	< 0.01	0.15
Phenanthrene GCMS	N	mg/kg	0.01	0.39	0.03	0.09	2.09
Anthracene GCMS	N	mg/kg	0.01	0.12	< 0.01	0.02	0.60
Fluoranthene GCMS	N	mg/kg	0.01	0.66	0.02	0.04	3.63
Pyrene GCMS	N	mg/kg	0.01	0.59	0.02	0.04	3.43
Benzo(a)anthracene GCMS	N	mg/kg	0.01	0.30	< 0.01	0.02	1.67
Chrysene GCMS	N	mg/kg	0.01	0.41	0.02	0.04	1.99
Benzo(b)fluoranthene GCMS	N	mg/kg	0.01	0.25	0.01	0.02	1.31
Benzo(k)fluoranthene GCMS	N	mg/kg	0.01	0.42	0.01	0.02	1.88
Benzo(a)pyrene GCMS	N	mg/kg	0.01	0.35	0.01	0.01	1.99
Indeno(1,2,3-cd)pyrene GCMS	N	mg/kg	0.01	0.20	0.01	< 0.01	1.13
Dibenzo(a,h)anthracene GCMS	N	mg/kg	0.01	0.07	< 0.01	< 0.01	0.41
Benzo(g,h,i)perylene GCMS	N	mg/kg	0.01	0.25	0.02	0.02	1.38
Total PAH(16) GCMS	N	mg/kg	0.04	4.23	0.21	0.45	22.2

Results Summary

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ELAB Reference	290597	290598	290599	290601
Customer Reference				
Sample ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sample Location	BH2	BH2	BH3	BH4
Sample Depth (m)	0.20 - 0.70	0.70 - 2.70	0.30 - 2.40	0.20 - 3.00
Sampling Date	12/08/2022	12/08/2022	12/08/2022	12/08/2022

Determinand	Codes	Units	LOD				
BTEX							
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0
MTBE	U	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0
Total BTEX	N	mg/kg	0.01	n/t	n/t	n/t	n/t
TPH CWG							
>C5-C6 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C6-C8 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aliphatic (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aliphatic (EH_2D_AL)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aliphatic (EH_2D_AL)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 Aliphatic (EH_2D_AL)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C21-C35 Aliphatic (EH_2D_AL)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C35-C40 Aliphatic (EH_2D_AL)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
Total aliphatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C5-C7 Aromatic (HS_1D_MS)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C7-C8 Aromatic (HS_1D_MS)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aromatic (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aromatic (EH_2D_AR)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aromatic (EH_2D_AR)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 Aromatic (EH_2D_AR)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	1.2
>C21-C35 Aromatic (EH_2D_AR)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	2.3
>C35-C40 Aromatic (EH_2D_AR)	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
Total aromatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	4.0
Total petroleum hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	4.1
Total Petroleum Hydrocarbons							
Mineral Oil w Florisil (EH_CU_1D_Total)	N	mg/kg	5	n/t	n/t	n/t	n/t
PCB (ICES 7 congeners)							
Total PCBs (7 congeners)	M	mg/kg	0.03	n/t	n/t	n/t	n/t

Results Summary

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Report No.: 22-42753, issue number 1

ELAB Reference	290603
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	BH4 Combined
Sample Depth (m)	0.20 - 3.00
Sampling Date	12/08/2022

Determinand	Codes	Units	LOD	
Soil sample preparation parameters				
Moisture Content	N	%	0.1	16.3
Material removed	N	%	0.1	< 0.1
Description of Inert material removed	N		0	None
Metals				
Arsenic	M	mg/kg	1	n/t
Barium	U	mg/kg	10	n/t
Beryllium	U	mg/kg	1	n/t
Cadmium	M	mg/kg	0.5	n/t
Chromium	M	mg/kg	5	n/t
Copper	M	mg/kg	5	n/t
Lead	M	mg/kg	5	n/t
Mercury	M	mg/kg	0.5	n/t
Nickel	M	mg/kg	5	n/t
Selenium	M	mg/kg	1	n/t
Vanadium	M	mg/kg	5	n/t
Zinc	M	mg/kg	5	n/t
Anions				
Water Soluble Sulphate	M	g/l	0.02	n/t
Inorganics				
Water Soluble Boron	N	mg/kg	0.5	n/t
Miscellaneous				
Acid Neutralisation Capacity	N	mol/kg	0.1	< 0.1
Loss on Ignition	M	%	0.01	2.84
pH	M	pH units	0.1	8.3
Total Organic Carbon	N	%	0.01	0.61
Polyaromatic hydrocarbons				
Total (of 17) PAHs	N	mg/kg	2	12
Naphthalene GCMS	N	mg/kg	0.01	n/t
Acenaphthylene GCMS	N	mg/kg	0.01	n/t
Acenaphthene GCMS	N	mg/kg	0.01	n/t
Fluorene GCMS	N	mg/kg	0.01	n/t
Phenanthrene GCMS	N	mg/kg	0.01	n/t
Anthracene GCMS	N	mg/kg	0.01	n/t
Fluoranthene GCMS	N	mg/kg	0.01	n/t
Pyrene GCMS	N	mg/kg	0.01	n/t
Benzo(a)anthracene GCMS	N	mg/kg	0.01	n/t
Chrysene GCMS	N	mg/kg	0.01	n/t
Benzo(b)fluoranthene GCMS	N	mg/kg	0.01	n/t
Benzo(k)fluoranthene GCMS	N	mg/kg	0.01	n/t
Benzo(a)pyrene GCMS	N	mg/kg	0.01	n/t
Indeno(1,2,3-cd)pyrene GCMS	N	mg/kg	0.01	n/t
Dibenzo(a,h)anthracene GCMS	N	mg/kg	0.01	n/t
Benzo(g,h,i)perylene GCMS	N	mg/kg	0.01	n/t
Total PAH(16) GCMS	N	mg/kg	0.04	n/t



Results Summary

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ELAB Reference	290603
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	BH4 Combined
Sample Depth (m)	0.20 - 3.00
Sampling Date	12/08/2022

Determinand	Codes	Units	LOD	
BTEX				
Benzene	M	ug/kg	10	n/t
Toluene	M	ug/kg	10	n/t
Ethylbenzene	M	ug/kg	10	n/t
Xylenes	M	ug/kg	10	n/t
MTBE	U	ug/kg	10	n/t
Total BTEX	N	mg/kg	0.01	< 0.01
TPH CWG				
>C5-C6 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	n/t
>C6-C8 Aliphatic (HS_1D_MS)	N	mg/kg	0.01	n/t
>C8-C10 Aliphatic (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	n/t
>C10-C12 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t
>C12-C16 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t
>C16-C21 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t
>C21-C35 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t
>C35-C40 Aliphatic (EH_2D_AL)	M	mg/kg	1	n/t
Total aliphatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AL)	N	mg/kg	1	n/t
>C5-C7 Aromatic (HS_1D_MS)	N	mg/kg	0.01	n/t
>C7-C8 Aromatic (HS_1D_MS)	N	mg/kg	0.01	n/t
>C8-C10 Aromatic (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	n/t
>C10-C12 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t
>C12-C16 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t
>C16-C21 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t
>C21-C35 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t
>C35-C40 Aromatic (EH_2D_AR)	M	mg/kg	1	n/t
Total aromatic hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_AR)	N	mg/kg	1	n/t
Total petroleum hydrocarbons (>C5 - C40) (HS_1D_MS+EH_2D_Total)	N	mg/kg	1	n/t
Total Petroleum Hydrocarbons				
Mineral Oil w Florisil (EH_CU_1D_Total)	N	mg/kg	5	< 5
PCB (ICES 7 congeners)				
Total PCBs (7 congeners)	M	mg/kg	0.03	< 0.03

Results Summary

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WAC Analysis

Elab Ref:	290603					Landfill Waste Acceptance Criteria Limits*		
Sample Date:	12/08/2022					Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:	BH4 Combined							
Depth (m)								
Site:	10 Elmington Road, Muswell Hill, London, N10 3DG							
Determinand		Code	Units					
Total Organic Carbon		N	%		0.61	3	5	6
Loss on Ignition		M	%		2.8	--	--	10
Total BTEX		M	mg/kg		< 0.01	6	--	--
Total PCBs (7 congeners)		M	mg/kg		< 0.03	1	--	--
TPH Total WAC (EH_CU_1D_Total)		N	mg/kg		< 5	500	--	--
Total (of 17) PAHs		N	mg/kg		12.0	100	--	--
pH		M			8.3	--	>6	--
Acid Neutralisation Capacity		N	mol/kg		< 0.1	--	To evaluate	To evaluate

Eluate Analysis

			10:1	10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg		
			mg/l	mg/kg			
Arsenic		N	< 0.005	< 0.05	0.5	2	25
Barium		N	0.012	0.12	20	100	300
Cadmium		N	< 0.001	< 0.01	0.04	1	5
Chromium		N	< 0.005	< 0.05	0.5	10	70
Copper		N	< 0.005	< 0.05	2	50	100
Mercury		N	< 0.005	< 0.01	0.01	0.2	2
Molybdenum		N	< 0.005	< 0.05	0.5	10	30
Nickel		N	< 0.001	< 0.05	0.4	10	40
Lead		N	< 0.001	< 0.05	0.5	10	50
Antimony		N	< 0.005	< 0.05	0.06	0.7	5
Selenium		N	< 0.005	< 0.05	0.1	0.5	7
Zinc		N	0.057	0.57	4	50	200
Chloride		N	46	463.00	800	15000	25000
Fluoride		N	< 5	< 10	10	150	500
Sulphate		N	3	28.40	1000	20000	50000
Total Dissolved Solids		N	126	1260.00	4000	60000	100000
Phenol Index		N	< 0.01	< 0.10	1	-	-
Dissolved Organic Carbon		N	11.300	113.00	500	800	1000

Leach Test Information

pH		N	8.0				
Conductivity (uS/cm)		N	188				
Dry mass of test portion (g)			102.000				
Dry Matter (%)			82				
Moisture (%)			22				
Eluent Volume (ml)			970				

Results are expressed on a dry weight basis, after correction for moisture content where applicable

* Stated limits are for guidance only, and not for conformity assessment.



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Results Summary
Report No.: 22-42753, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
290595	1.40 - 2.30	BH1	Brown Soil, Stones, Clinker	No asbestos detected	n/t	n/t	n/t	n/t
290597	0.20 - 0.70	BH2	Brown Soil, Stones, Clinker, Brick, Concrete	No asbestos detected	n/t	n/t	n/t	n/t
290598	0.70 - 2.70	BH2	Brown Soil, Stones, Clinker	No asbestos detected	n/t	n/t	n/t	n/t
290599	0.30 - 2.40	BH3	Grey Soil, Stones, Clinker, Concrete	No asbestos detected	n/t	n/t	n/t	n/t
290601	0.20 - 3.00	BH4	Brown Soil, Stones, Clinker, Brick	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

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Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
PAH (GC-MS)	N	As submitted sample	22/08/2022		GC-MS
Aqua regia extractable metals	M	Air dried sample	22/08/2022	118	ICPMS
Water soluble anions	M	Air dried sample	22/08/2022	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	23/08/2022	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	23/08/2022	181	GC-MS
Water soluble boron	N	Air dried sample	22/08/2022	202	Colorimetry
TPH CWG soil by gc-gc	M	As submitted sample	19/08/2022	271	
Asbestos identification	U	Air dried sample	23/08/2022	280	Microscopy
Leachate					
Arsenic	N		25/08/2022	301	ICPMS
Cadmium	N		25/08/2022	301	ICPMS
Chromium	N		25/08/2022	301	ICPMS
Lead	N		25/08/2022	301	ICPMS
Nickel	N		25/08/2022	301	ICPMS
Copper	N		25/08/2022	301	ICPMS
Zinc	N		25/08/2022	301	ICPMS
Mercury	N		25/08/2022	301	ICPMS
Selenium	N		25/08/2022	301	ICPMS
Antimony	N		25/08/2022	301	ICPMS
Barium	N		25/08/2022	301	ICPMS
Molybdenum	N		25/08/2022	301	ICPMS
pH Value	N		25/08/2022	113	Electrometric
Electrical Conductivity	N		25/08/2022	136	Probe
Dissolved Organic Carbon	N		25/08/2022	102	TOC analyser
Chloride	N		25/08/2022	131	Ion Chromatography
Fluoride	N		25/08/2022	131	Ion Chromatography
Sulphate	N		25/08/2022	131	Ion Chromatography
Total Dissolved Solids	N		25/08/2022	144	Gravimetric
Phenol index	N		25/08/2022	121	HPLC
WAC Solids analysis	N				
pH	M	Air dried sample	23/08/2022	113	Electrometric
Total Organic Carbon	N	Air dried sample	23/08/2022	210	IR
Loss on Ignition	M	Air dried sample	23/08/2022	129	Gravimetric
Acid Neutralisation Capacity	N	Air dried sample	23/08/2022	NEN 737	Electrometric
Total BTEX	M	As submitted sample	23/08/2022	181	GCMS
Mineral Oil (EH_CU_1D_Total)	N	As submitted sample	22/08/2022	117	GCFID
Total PCBs (7 congeners)	M	Air dried sample	22/08/2022	120	GCMS
Total (of 17) PAHs	N	As submitted sample	24/08/2022	133	GCFID

Tests marked N are not UKAS accredited

Report Information

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Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination. Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed. ELAB are unable to provide an interpretation or opinion on the content of this report. The results relate only to the sample received. PCB congener results may include any coeluting PCBs Uncertainty of measurement for the determinands tested are available upon request Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
 All water samples will be retained for 7 days following the date of the test report
 Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry