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BASIC GEOTECHNICAL ASSESSMENT & BASEMENT IMPACT ASSESSMENT REPORT

15 Belsize Park Mews

Camden

NW3 5BL

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Report Title:	**Ground Investigation & Basement Impact Assessment for 15 Belsize Park Mews, Camden NW3 5BL**
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EXECUTIVE SUMMARY

Site Details	**Site Address**	15 Belsize Park Mews, Camden, NW3 5BL
	National Grid	E: 527737, N: 179077
	Site Area	42m^2 (approx.)
	Proposed Development	The proposed development for this site is understood to comprise the construction of a basement and addition of a mansard roof to the existing two-storey mews house.
Summary of Stage 1 & 2 BIA (Screening & Scoping)		A Stage 1 & 2 BIA (Screening & Scoping) Report has been produced for the site and issued separately (Jomas, June 2023). A brief overview of the findings is presented below. Reference should be made to the full report for detailed information. On the earliest available maps (1871-74), the site was shown as vacant and appears to be situated within farmland associated with Belsize Farm. An underground railway and associated ventilation shaft were shown ~100m north of site. Two ponds were shown within 250m and a culverted stream was shown 300m west of site. By the maps dated 1894/96, the site had been developed into residential mews property resembling the present-day layout. The surrounding area had undergone large-scale residential development with the previously identified ponds, and culverted stream no longer shown. No significant observational changes then occurred to the site until the most recent map dated 2023. The British Geological Survey indicated that the site was directly underlain by solid deposits of the London Clay Formation. The underlying London Clay Formation was identified as unproductive strata. There are no surface water features or water networks were reported within 250m of the site. The site was located within an EA Flood Zone 1. The site was not within an area with a RoFRaS rating. The site was not within an area benefiting from flood defences. Groundsure stated that the site was at negligible risk of both surface water and groundwater flooding. The Groundsure data identified a moderate risk of shrink swell clays beneath the site due to the underlying London Clay Formation. A geotechnical ground investigation was recommended to inform foundation design. The screening and scoping assessments concluded the following: • A ground investigation was recommended to confirm the ground conditions including groundwater levels (if any) beneath the site, and to establish existing foundations. The presence of Made Ground and/or clay should be established, with Atterberg Limits undertaken to assess shrink/swell potential of the soils. • A Ground Movement Assessment was recommended. • A drainage strategy/SUDS report was recommended.

Encountered	**Ground Conditions**	The ground conditions encountered broadly consistent with those anticipated from the desk-based report, and comprised around 1.2m of Made Ground, underlain by the London Clay Formation to the base of the borehole at 9m bgl (below ground level).
	Groundwater	No groundwater strikes were reported during drilling of the borehole. During return monitoring visits conducted in November 2023, groundwater was reported within the monitoring well at depths of 0.48mbgl and 1.29mbgl.
Geotechnical Considerations	**Foundations**	Based on the ground and groundwater conditions encountered, it is considered that cast in-situ cantilever retaining walls may be formed within the underlying London Clay Formation at a depth of approximately 3.0m for an allowable bearing capacity of 160kPa. Total and differential settlements should be contained within tolerable limits.
	Sulphates	Buried concrete for foundations should be designed to Class DS-3 (AC-2s).
	Floor Slabs	If a cantilever retaining wall is utilised, then a ground bearing floor slab could be used. In this case, formations of the structures should be inspected by a competent person. Any loose or soft material should be removed and replaced with well-graded, properly compacted granular fill or lean mix concrete. The formation should be blinded if left exposed for more than a few hours or if inclement weather is expected.
	Excavations	Temporary excavations within the Made Ground are unlikely to remain stable and some form of temporary support or battering back to a safe angle and dewatering are likely to be required. Temporary excavations within the cohesive soils are likely to remain relatively stable in the short term though some spalling may be anticipated.
Basement Impact Assessment		The overall assessment of the site is that the creation of a basement for the existing development should not adversely impact the site or its immediate environs, providing measures are taken to protect surrounding land and properties during construction. The proposed basement excavation will be within 5m of a public pavement. It is also laterally within 5m of neighbouring properties. Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground and any associated services. During the construction phase careful and regular monitoring will need to be undertaken to ensure that the property above, is not adversely affected. This may mean that the property needs to be suitably propped and supported.
Recommended Further Work		The following items are required as part of Camden Planning Guidance Basements (January 2021): • Ground Movement Assessment (GMA). • Drainage assessment.

	• Construction Sequence Methodology. • Proposals for monitoring during construction. • Programme for enabling works, construction and restoration. • Plans and sections to show foundation details of adjacent structures. • Evidence of consultation with neighbours.
This Executive Summary is intended to provide a brief summary of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the main report ref. P5188J2818/SC.	

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Electron Holdings Management Ltd ("The Client") has commissioned Jomas Associates Ltd ("Jomas"), to undertake an investigation of the geotechnical factors pertaining to the proposed development, and to prepare a Basement Impact Assessment at a site referred to as 15 Belsize Park Mews, Camden, NW3 5BL.

1.1.2 A Stage 1 & 2 Basement Impact Assessment report has been produced for the site and issued separately (detailed in Table 1.1 below), followed by an intrusive investigation (detailed in this report).

1.1.3 The intrusive investigation was undertaken in accordance with Jomas' proposal dated 17 October 2023.

1.2 Proposed Development

1.2.1 The proposed development for this site is understood to comprise the construction of a basement and addition of a mansard roof to the existing two-storey mews house.

1.2.2 A plan of the proposed development is included in Appendix 1.

1.2.3 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1.

1.3 Objectives

1.3.1 The objectives of Jomas' investigation were as follows:

- To undertake an intrusive investigation, to determine the ground and groundwater conditions present at the site;
- To determine soil properties to inform the preliminary geotechnical assessment for foundations, excavation stability and buried concrete and recommendations for further action (if required); and,
- To undertake a Basement Impact Assessment to assess the potential impacts that the proposal may have on ground stability, the hydrogeology and hydrology on the site and its environs.

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- An intrusive investigation to determine shallow ground conditions;
- Undertaking of laboratory geotechnical and chemical testing upon samples obtained;
- Return groundwater monitoring;

- Carrying out a Basement Impact Assessment;
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.5 Scope of Basement Impact Assessment

1.5.1 As the site lies within the purview of the London Borough of Camden, their document "Camden Planning Guidance Basements" (CPGB) (January 2021) has been used to form the methodology utilised in undertaking this BIA.

1.5.2 Jomas' BIA covers most items required under CPGB, with the exception of;

- Plans and sections to show foundation details of adjacent structures.
- Programme for enabling works, construction and restoration.
- Evidence of consultation with neighbours.
- Ground Movement Assessment (GMA), to include assessment of significant adverse impacts and specific mitigation measures required, as well as confirmatory and reasoned statement identifying likely damage to nearby properties according to the Burland Scale.
- Construction Sequence Methodology.
- Proposals for monitoring during construction.
- Drainage assessment.

1.5.3 This Jomas BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided.

1.5.4 A number of the requirements set out in the London Borough of Camden document CPGB will need to be addressed in a construction management plan, this stage is not within the scope of work that Jomas Associates have been commissioned.

1.6 Previous Documentation

1.6.1 A report has been previously prepared by Jomas Associates as detailed in Table 1.1:

Table 1.1: Previous Reports

Title	Author	Reference	Date
Stage 1 & 2 Basement Impact Assessment (Screening & Scoping) Report for 15 Belsize Park Mews Camden NW3 5BL	Jomas Associates Ltd	P5188J288/SC	22 June 2023

1.7 Limitations

1.7.1 Jomas Associates Ltd ('Jomas') has prepared this report for the sole use of Electron Holdings Management Ltd in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.7.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas has actual knowledge to the contrary, information obtained from public sources or provided to Jomas by site personnel and other information sources, have been assumed to be correct. Jomas does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.

1.7.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.

2 EXISTING INFORMATION

2.1 Site Information

2.1.1 The site location plan is appended to this report as Figure 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	15 Belsize Park Mews, Camden, London, NW3 5BL
Approx. National Grid Ref.	527737, 179077
Site Area (Approx)	42m^2
Site Occupation	Residential
Local Authority	London Borough of Camden

2.2 Summary of Stage 1 & 2 Basement Impact Assessment (June 2023)

2.2.1 As detailed in Table 1.1, a report has been previously produced for the site and issued separately. The findings of the report are summarised in the following section, and reference should be made to the full report for detailed information.

Site Setting

2.2.2 On the earliest available maps (1871-74), the site was shown as vacant and appears to be situated within farmland associated with Belsize Farm. An underground railway and associated ventilation shaft were shown ~100m north of site. Two ponds were shown within 250m and a culverted stream was shown 300m west of site.

2.2.3 By the maps dated 1894/96, the site had been developed into residential mews property resembling the present-day layout. The surrounding area had undergone large-scale residential development with the previously identified ponds, and culverted stream no longer shown. No significant observational changes then occurred to the site until the most recent map dated 2023.

2.2.4 The British Geological Survey indicated that the site was directly underlain by solid deposits of the London Clay Formation.

2.2.5 The underlying London Clay Formation was identified as unproductive strata.

2.2.6 There are no surface water features or water networks were reported within 250m of the site.

2.2.7 The site was located within an EA Flood Zone 1.

2.2.8 The site was not within an area with a RoFRaS rating.

2.2.9 The site was not within an area benefiting from flood defences.

2.2.10 Groundsure stated that the site was at negligible risk of both surface water and groundwater flooding.

2.2.11 The Groundsure data identified a moderate risk of shrink swell clays beneath the site due to the underlying London Clay Formation.

2.2.12 The presence of London Clay Formation may be a source of elevated sulphate associated with disseminated pyrite noted by BGS to be within this deposit. If such levels are noted, then sulphate resistant concrete may be required.

2.2.13 It was recommended that a geotechnical ground investigation is undertaken to inform foundation design.

Screening and Scoping (Basement Impact Assessment)

2.2.14 Screening identifies the areas that require further (usually intrusive) investigation whilst Scoping is the activity of defining in further detail the matters to be investigated as part of the BIA process. Scoping comprises of the definition of the required investigation needed in order to determine in detail the nature and significance of the potential impacts identified during screening.

2.2.15 These issues are summarised below:

- A ground investigation was recommended to confirm the ground conditions including groundwater levels (if any) beneath the site, and to establish existing foundations. The presence of Made Ground and/or clay should be established, with Atterberg Limits testing undertaken to assess shrink/swell potential of the soils.
- A Ground Movement Assessment was recommended.
- A drainage strategy/SUDS report was recommended.

3 GROUND INVESTIGATION

3.1 Scope of Works

3.1.1 A ground investigation was undertaken on the 25th and 26th October 2023.

3.1.2 A summary of the fieldwork carried out at the site, with justifications for exploratory hole positions, is presented in Table 3.1 below.

Table 3.1: Scope of Intrusive Investigation

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved	Justification
Windowless Sampler Boreholes (restricted-access/low-headroom equipment)	1	WS1	9mbgl	Obtain samples for laboratory geotechnical testing. To allow in-situ geotechnical testing.
Monitoring Wells	1	WS1	5mbgl	Groundwater monitoring well.

3.1.3 The ground investigation was undertaken in accordance with British Standard BS5930:2015+A1:2020 "Code of practice for ground investigations", NHBC Standards, Chapter 4.1, and AGS Guidelines for Good Practice in Site Investigations.

3.1.4 The exploratory hole location plan is presented in Figure 2, Appendix 1 and the exploratory hole records are included in Appendix 2.

3.2 Geotechnical Testing

In-situ

3.2.1 In-situ geotechnical testing included Standard Penetration Tests. The determined 'N' values have been used to determine the relative density of granular materials and have been used with standard correlations to infer various other derived geotechnical parameters including the undrained shear strength of the cohesive strata. The results of the individual tests are on the appropriate exploratory hole logs in Appendix 2.

Laboratory

3.2.2 Soil samples were obtained and submitted to the UKAS Accredited laboratory of K4 Soils for a series of analyses.

3.2.3 This testing was designed to classify the samples; and to obtain parameters (either directly or sufficient to allow relevant correlations to be used) relevant to the technical objectives of the investigation.

3.2.4 The following laboratory geotechnical testing was carried out:

Table 3.2 Laboratory Geotechnical Analysis

Methodology	Test Description	Number of tests
BS1377:1990	Moisture Content Determination	6
BS1377:1990	Liquid and Plastic Limit Determination (Atterberg Limits)	6

3.2.5 In addition, 4No. soil samples were submitted to Derwentside Environmental Testing Services Ltd (which holds UKAS and MCERTS accreditations for a wide range of determinands) and analysed for a modified BRE Special Digest 1 suite (acid and water-soluble sulphate, total sulphur and pH) to assist with the ACEC classification for buried concrete.

3.2.6 Laboratory test certificates are included in Appendices 3 and 4.

4 ENCOUNTERED CONDITIONS

4.1.1 A factual record of the conditions encountered during the physical investigation of the site is presented in the following section.

4.1.2 For further details of the ground conditions, reference should be made to the exploratory hole location plan presented in Appendix 1, exploratory hole logs presented in Appendix 2, the geotechnical testing results in Appendix 3 and the chemical testing results in Appendix 4.

4.2 Ground Conditions

4.2.1 The ground conditions encountered were broadly consistent with those anticipated, i.e. a thickness of Made Ground overlying the London Clay Formation, and are summarised in Table 4.1 below.

Table 4.1 : Ground Conditions Encountered

Stratum and Description	Encountered from (mbgl)	Base of strata (mbgl)	Thickness range (m)
Tile flooring over reinforced concrete with screed. (MADE GROUND)	0.0	0.4	0.4
Light brown gravelly sandy clay. Sand is medium to coarse. Gravel consists of medium to coarse sub-angular to sub-rounded flint, brick, concrete and possible asphalt. (MADE GROUND)	0.4	1.2	0.8
Soft** becoming firm** and stiff** grey and brown/orange brown mottled silty CLAY. (LONDON CLAY FORMATION)	1.2	5.4	4.2
Light grey GRAVEL with high cobble content. Gravel consists of medium to coarse subangular to subrounded claystone and carbonate concretions. Cobbles consist of carbonate concretions. (LONDON CLAY FORMATION)	5.4	6.0	0.6
Firm to stiff** grey CLAY. (LONDON CLAY FORMATION)	6.0	>9.0 [base not proven]	>3.0 [thickness not proven]

**Field description*
***Consistency estimated using semi-empirical correlations with SPT N-values, Plasticity Indices and published literature*

4.3 Groundwater

4.3.1 Groundwater was not encountered during drilling.

4.3.2 2No. return groundwater monitoring visits were undertaken on 3rd and 11th November 2023, the results are presented in Appendix 5 and are summarised below.

Table 4.2: Groundwater Monitoring Summary

Exploratory Hole ID	Depth Encountered (m bgl)	Depth base of well (m bgl)
WS1	0.48 – 1.29	4.8

4.3.3 It should be noted that changes in groundwater levels can occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a standpipe or piezometer installed within appropriate response zones. Changes in groundwater level can have a direct effect on excavation stability and dewatering requirements, and cohesive soils can soften under rising or high groundwater levels.

4.4 Limitations

4.4.1 During the intrusive ground investigation, no impenetrable obstructions were encountered. However, the possible presence of natural and/or manmade obstructions on site cannot be discounted.

5 DERIVATION OF GEOTECHNICAL PARAMETERS

5.1 Introduction

5.1.1 A summary of ground conditions obtained from the ground investigation and the derived geotechnical parameters is provided below.

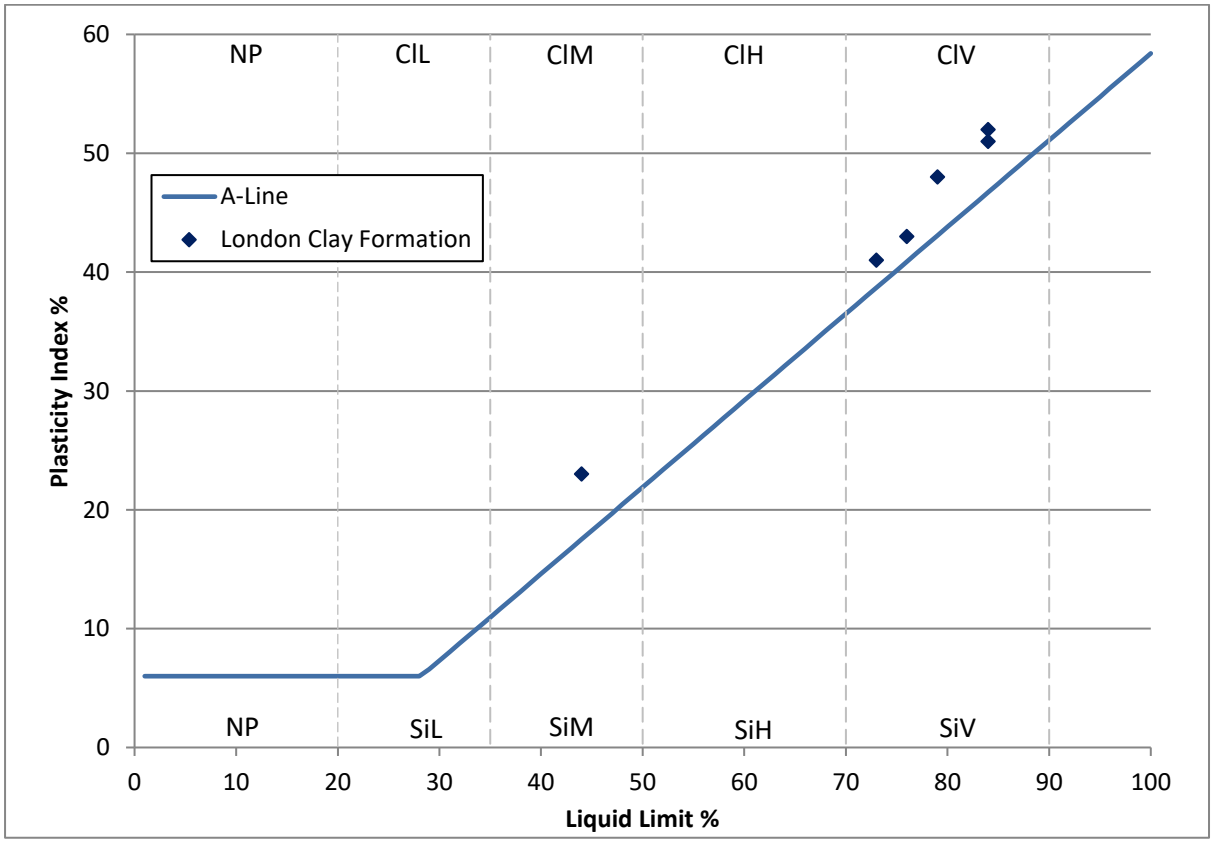
5.2 Plasticity of Cohesive Materials

5.2.1 Atterberg Limit determination was undertaken on 6No. samples of the London Clay Formation, at depths ranging from 1.5m to 8.5m bgl.

5.2.2 Plasticity Index values ranged from 23% to 52% and were indicative of intermediate to very high plasticity, as illustrated in Figure 5.1 below.

5.2.3 Modified Plasticity Index values in these strata ranged from 21.9% to 52%, indicating soils with medium to high volume change potential.

Figure 5.1: Plasticity Chart



5.2.4 The sample at 1.5m was anomalous when compared with other deeper results. This may be due to slight disturbance or weathering near the boundary with Made Ground (1.2m).

5.3 Undrained Shear Strength

5.3.1 Standard Penetration Tests (SPTs) were undertaken at regular intervals throughout the cable percussive borehole. The results of the SPTs have been used to infer the undrained shear strength using the correlation suggested by Stroud (1974).

$c_u = f_1 \times N$ can be applied,

in which

c_u= mass shear strength (kN)

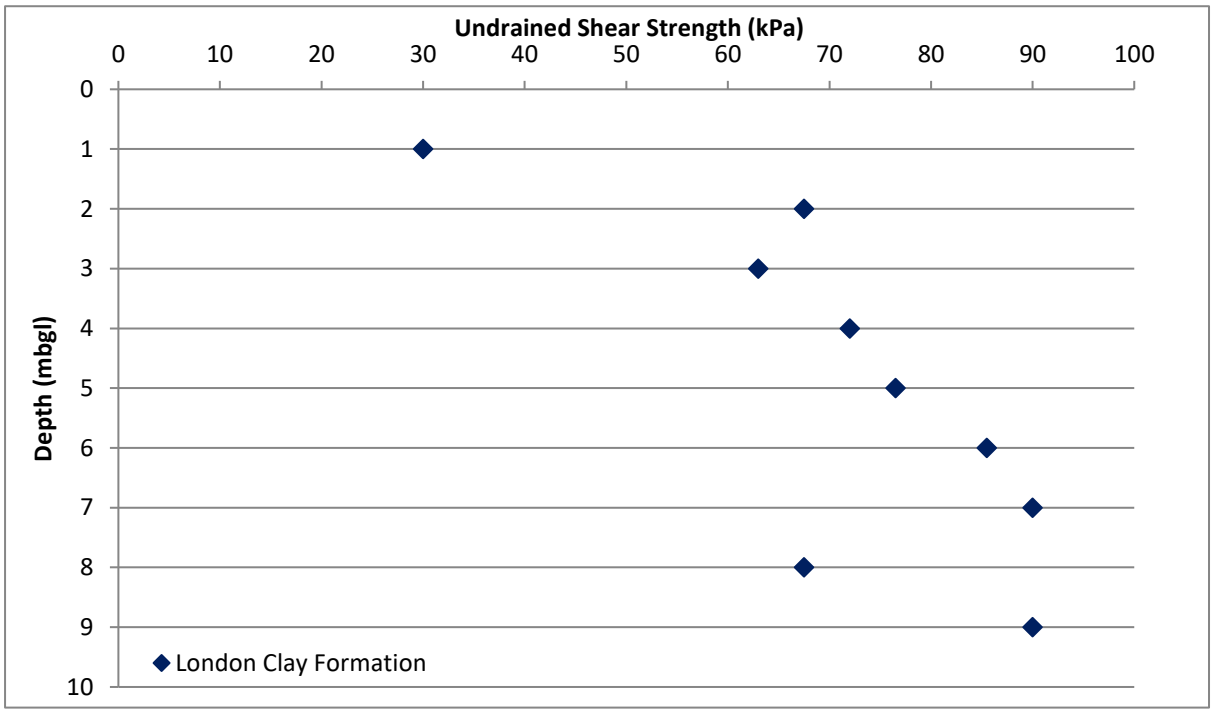
f_1 = constant

N= SPT value achieved during boring operations

5.3.2 In the above equation f_1 is dependent on the plasticity of the material that the SPT is being carried out in. As the plasticity indices were generally shown to be greater than 25% a value for f_1 of 4.5 has been adopted after Tomlinson (2001).

5.3.3 The graph below shows the shear strength profile of the encountered cohesive materials at the site, based on the SPT to shear strength correlation described above.

Figure 5.2: Undrained Shear Strength v Depth



5.4 Coefficient of Compressibility

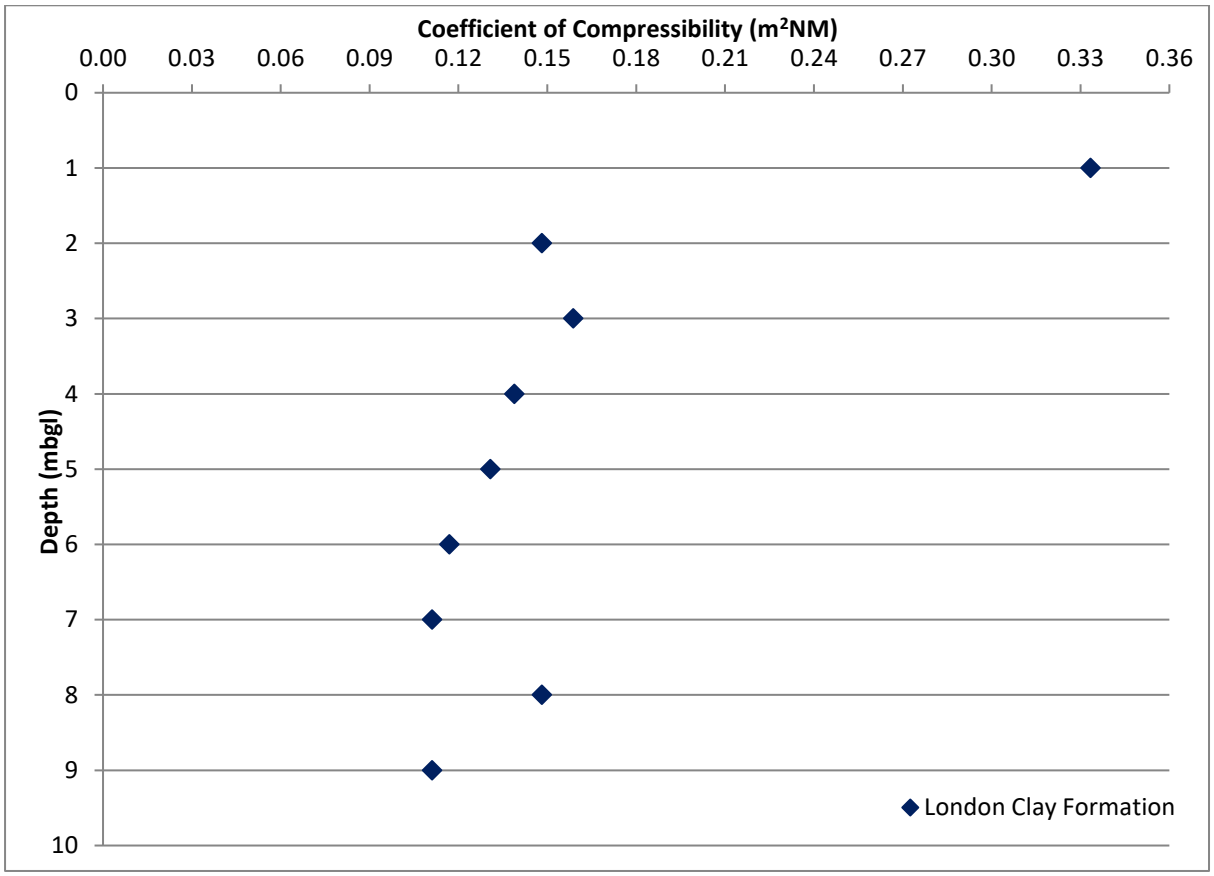
5.4.1 Stroud and Butler (1974) developed a relationship between the coefficient of compressibility (m_v) and SPT N-value.

$m_v = 1/ f_2 \times N$ can be applied,

in which
m_v = coefficient of compressibility (m^2/MN)
f_2 = constant dependent on the plasticity index
N = SPT value achieved during boring operations

5.4.2 Using the plasticity indices obtained and the graphs provided in Tomlinson (2001) a value of f_2 of 0.45 has been taken and used with the SPT N-values to infer coefficient of compressibility (m_v).

Figure 5.3: Coefficient of Volume Compressibility (mv) v Depth



5.4.3 The results from of the London Clay Formation are generally of "medium compressibility".

5.5 Density

5.5.1 In the absence of geotechnical laboratory test results, the correlations and suggested values for cohesive materials given in BS8004:2015 have been used to derive unit weight values.

5.5.2 A characteristic unit weight of 19kN/m^3 has been adopted for the London Clay Formation.

5.5.3 A unit weight of 17kN/m^3 has been adopted for the Made Ground based on correlations and suggested values given in BS8004:2015.

5.6 Effective Angle of Shearing Resistance / Angle of Friction

5.6.1 In cohesive soils, the effective angle of shearing resistance can be derived from the plasticity index of the soil, using the following equation presented in BS8004:2015.

$$\emptyset' = 42 - (12.5xLOG10(PI))$$

Where PI = Plasticity Index.

5.6.2 Values have been calculated for all available Plasticity Index results and are presented in Table 5.1.

Table 5.1: Derived Angles of Shearing Resistance

Sample	Stratum	Derived Angle of Shearing Resistance (°)
WS1 at 1.5m	London Clay Formation	25.0
WS1 at 3.5m		21.6
WS1 at 4.5m		21.8
WS1 at 6.5m		21.0
WS1 at 7.5m		20.7
WS1 at 8.5m		20.5

5.7 Stiffness Moduli

5.7.1 In cohesive soils of the London Clay Formation, the undrained stiffness modulus (Young's Modulus) can be derived using the correlation with undrained shear strength as postulated by Jardine et al. (1985):

$$\underline{Eu\ (kPa) = 400 * Cu}$$

5.7.2 The drained Young's Modulus for the London Clay Formation can then be derived from Eu, as follows:

$$E' = 0.6 * Eu$$

5.8 Summary of Derived General Properties

5.8.1 Based on the analysis of the ground investigation data and past experience with similar deposits, the following derived general parameters are given in Table 5.2.

Table 5.2: Derived General Parameters

Property	London Clay Formation
Unit Weight [1)]	19
Drained Friction, φ' (◦) [2)]	20.5 – 25.0
Drained Cohesion, c' (kPa)	0
SPT N-value	6 – 20
Undrained Young's Modulus, E_u (MPa) [3)]	12.0 – 36.0
Drained Young's Modulus E' (MPa) [4)]	7.2 – 21.6
Undrained Shear Strength, c_u (kPa) [5)]	30 – 90
Plasticity Index (%)	23 – 52
Modified Plasticity Index (%)	21.9 – 52
Volume Change Potential [NHBC]	Medium to High
Modulus of Volume Compressibility, m_v (m^2/MN) [6)]	0.111 – 0.333

[1)] Derived from Figures 1 and 2 of BS8004:2015

[2)] Calculated from: φ' = (42°- 12.5log10I_p) for 5% ≤ I_p ≤ 100% Where, I_p is the soil's plasticity index (BS8004:2015).

[3)] Calculated from: E_u = 0.4 c_u MPa, based on correlations derived in Jardine et al (1985).

[4)] Calculated from E' = 0.6 E_u MPa, based on correlations derived in Jardine et al (1985).

[5)] The undrained shear strength (c_u) of the cohesive soils was correlated to the SPT N-values using Stroud (1974), where c_u=f_1N and f_1 is factor related to the Plasticity Index (PI) of the clay (a value of f_1 equal to 5.0 for PI ≤ 25% and a value of f_1 value equal to 4.5 for PI>25).

[6)] Calculated from: m_v = 1/f_2 N m^2/MN, f_2 is a coefficient proposed by Stroud and Butler (1975) and varies with Plasticity Index (PI) as presented in Figure 27 of CIRIA Report 27 or 10/c_u.

6 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

6.1 General

6.1.1 Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.

6.2 Proposed Foundations

General

6.2.1 From review of the proposed drawings, Jomas have inferred that the proposed basement floor will be formed at approximately 3mbgl.

6.2.2 The Made Ground is not considered to provide suitable bearing strata due its low and variable bearing properties, and the unacceptable risk of total and differential settlement.

6.2.3 All foundations should be deepened beneath these deposits and any soft/loose soils encountered in order to found within underlying competent strata.

6.2.4 As soils of high volume change potential are present, heave precautions will be required against the side of foundations and ground beams in accordance with the requirements set out in NHBC Standards Chapter 4.2.

Conventional Foundations

6.2.5 It is considered that cast in-situ cantilever retaining walls may be formed within the underlying London Clay Formation at a depth of approximately 3.0m for an allowable bearing capacity of 160kPa. Total and differential settlements should be contained within tolerable limits.

6.2.6 Foundations greater than 2.50m deep require structure-specific design by a structural engineer.

6.2.7 Foundations should be designed in accordance with NHBC requirements.

6.2.8 Where any unexpected or soft ground conditions are encountered during the groundworks, works in that area should cease and the advice of a suitably qualified geotechnical engineer sought.

6.3 Retaining Walls

6.3.1 It is anticipated that retaining structure(s) will be required.

6.3.2 Based on the analysis of the available site investigation data and past experience with similar deposits the parameters in Table 6.1 are considered appropriate for the potential retaining structure(s).

Table 6.1: Geotechnical Parameters for Retaining Wall Design

	London Clay Formation
Critical state angle of shearing resistance (ϕ')°	21
Effective Cohesion kN/m^2	0
Saturated Bulk Weight (γ_{sat}) kN/m^3	19

6.3.3 In addition, the specialist contractor should ensure the stability of the cut-face during the temporary works.

6.3.4 As an alternative to cantilever retaining walls, fully embedded retaining walls comprising a contiguous/secant piled basement box could be formed. The piles would need to act as retaining walls as well as carry the structural loadings. The piles should be designed to withstand the earth pressures, and still meet the required structural requirements regarding issues such as deflection, deformation and bending.

6.3.5 To provide sufficient support for the excavation, it is recommended that un-propped piles are formed to at least three times the depth of excavation.

6.3.6 If these piles can be suitably propped, then this depth may be reduced. Suitable propping could be provided by the basement floor and the ground floor if they are suitably tied into the piles and suitably reinforced. This may require specialist construction techniques.

6.4 Aggressive Ground Conditions

6.4.1 Sulphate attack on building foundations occurs where sulphate solutions react with the various products of hydration in Ordinary Portland Cement (OPC) or converted High-Alumina Cement (HAC). The reaction is expansive, and therefore disruptive, not only due to the formation of minute cracks, but also due to loss of cohesion in the matrix.

6.4.2 In accordance with BRE Special Digest 1, the characteristic values of sulphate used to determine the concrete classification are determined using the methodology summarised in the table below.

Table 6.2: Concrete in the Ground Characteristic Value Determination

No Samples in the dataset	Method for determining the sulphate characteristic value
1 - 4	Highest value
5 - 9	Mean of the top 2No highest results
10 or greater	Mean of the top 20% highest results

6.4.3 Table 6.3 summarises the analysis of the aggressive nature of the ground for each of the strata encountered within the ground investigation.

Table 6.3: Concrete in the Ground Classes

Stratum	No Samples	pH range	Characteristic WS Sulphate (mg/l)	Characteristic Total Potential Sulphate (%)[1)]	Design Sulphate Class	ACEC Class
Made Ground	1	9.0	932	N/A	DS-2	AC-2
London Clay Formation	3	7.3 – 7.7	2120	1.2	DS-3	AC-2s

1) Applies to soils containing more than 0.3% of oxidisable sulphides, calculated in accordance with BRE SD-1

6.4.4 Analysis of the results indicates that the London Clay Formation contains significant concentrations of oxidisable sulphides (e.g. pyrite), which can be oxidised to form additional sulphate on disturbance and exposure to air as outlined in BRE SD-1:2005. The Total Potential Sulphate must therefore also be considered in the designation of a Design Class, in cases where the London Clay Formation is to be disturbed and exposed to air.

6.4.5 The concrete structures, including foundations, will need to be designed in accordance with BS EN 1992-1-1:2004+A1:2014. It is recommended that the advice of this publication be taken for the design and specification of all sub-surface concrete.

6.5 Floor Slabs

6.5.1 It is anticipated that finished floor level of the proposed basement will be approximately 3.0m below the existing ground floor level.

6.5.2 If a cantilever retaining wall is utilised then a ground bearing floor slab could be used. In this case, formations of the structures should be inspected by a competent person. Any loose or soft material should be removed and replaced with well-graded, properly compacted granular fill or lean mix concrete. The formation should be blinded if left exposed for more than a few hours or if inclement weather is experienced.

6.5.3 All floor slabs would also need to be suitably reinforced, not only to distribute the structural loading but also to ensure that the floor slab can prop the retaining walls and does not buckle from the lateral pressures imposed by the cantilever retaining walls.

6.5.4 The floor slab (and basement walls) would need to be constructed to conform to BS: 8102 (2009).

6.6 Excavations

6.6.1 Temporary excavations within the Made Ground are unlikely to remain stable and some form of temporary support or battering back to a safe angle and dewatering are likely to be required.

6.6.2 Temporary excavations within the cohesive soils are likely to remain relatively stable in the short term though some spalling may be anticipated.

6.6.3 Ground works should always be designed in such a manner to avoid entry into excavations by construction or maintenance personnel. However, in the event that such works cannot be avoided or designed out, they should only be undertaken in accordance with a safe system of work, following an appropriate risk assessment and in accordance with any legislative requirements, e.g. Confined Spaces Regulations.

6.7 Groundwater Control

6.7.1 Groundwater was not reported during drilling.

6.7.2 During return monitoring visits conducted in November 2023, groundwater was reported within the monitoring well at depths of 0.48mbgl and 1.29mbgl.

6.7.3 The decrease in water level over the week between monitoring events indicates a perched water table. Due to the presence of the London Clay Formation (unproductive strata) beneath the site, it is anticipated that the encountered water represents perched water from Made Ground that has collected in the monitoring well, as opposed to a groundwater table in continuity with a wider aquifer.

6.7.4 Subject to seasonal variations, any groundwater encountered during site works could be readily dealt with by conventional pumping from a sump used to collate waters.

6.7.5 Surface water or rainfall ingress could be similarly dealt with

7 BASEMENT IMPACT ASSESSMENT

7.1 Geological Impact

7.1.1 The published geological maps indicate that the site is underlain by the London Clay Formation. The proposed basement will be founded within this stratum.

7.1.2 The London Clay at the founding depth is unlikely to be prone to seasonal shrinkage and swelling that arises due to changing water content in the soil. This is due to a lack of significant vegetation capable of removing water within the zone of influence and extensive hard cover minimising the amount of water entering the ground.

7.2 Hydrology and Hydrogeology Impact

7.2.1 Based on all the information available at the time of writing, the risk of flooding from groundwater is considered to be low. The proposed basement is unlikely to have a detectable impact on the local groundwater regime. Appropriate water proofing measures should be included within the whole of the proposed basement wall/floor design as a precaution.

7.2.2 The proposed development will lie outside of flood risk zones and is therefore assessed as being at a low probability of fluvial flooding.

7.2.3 There are no surface water features on or in the immediate vicinity of the site. It is therefore not anticipated that the site will make any impact upon the hydrology of the area.

7.2.4 The information available suggests that the site lies in an area that is at low risk of surface water flooding.

7.2.5 The London Borough of Camden SWMP indicates that the overall groundwater flooding risk across the Borough is considered to be low.

7.2.6 The proposed basement construction is considered unlikely to create a reduction of impermeable area in the post development scenario.

7.2.7 No risk of flooding to the site from artificial sources has been identified.

7.3 Other Impacts

7.3.1 Impacts such as changes to areas of external hardstanding, past flooding, and impacts to adjacent properties and pavement are addressed within the Phase 1 Desk Study and Stage 1 & 2 Basement Impact Assessment (Screening & Scoping) for 15 Belsize Park Mews, Camden, NW3 5BL (Jomas Associates Ltd, P5188J2818/SC, June 2023).

7.3.2 Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement should be submitted by the Developer to the London Borough of Camden.

7.4 Ground Movement

7.4.1 CIRIA C580 Table 2.5 uses information on the damage to walls of buildings based on Burland et al (1977), Boscardin and Cording (1989) and Burland (2001) to categorise damage into 5 categories. A summary of Table 2.5 from CIRIA C580 is provided below.

7.4.2 It would be generally good practise to ensure that the design and construction should aim to limit damage to all buildings to a maximum of Category 2 (Slight) as set out in CIRIA Report 580.

Table 7.1: Summary of CIRIA C580 Table 2.5 (after Burland et al (1977), Boscardin and Cording (1989) and Burland (2001))

Category of damage		Description of Typical Damage	Approximate crack width (mm)	Limiting tensile strain (%)
0	Negligible	Hairline cracks of less than about 0.1mm are classes as negligible.	< 0.1	0.0-0.05
1	Very Slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	<1	0.05-0.075
2	Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weather tightness. Doors and windows may stick slightly	<5	0.075-0.15
3	Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired.	5-15 or a number of cracks >3	0.15 – 0.3
4	Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floors sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15-25 but also depends on number of cracks	>0.3
5	Very Severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25 but depends on number of cracks	

7.4.3 The first two categories (namely Negligible and Very Slight categories) are generally regarded by Camden as acceptable for buildings where no structural damage is permissible.

7.4.4 Using an underpinning methodology, it is considered that in the short term maintaining the category of damage to Category 1 could be relatively easily achieved. It would be recommended that a full inspection of the property should be undertaken prior to starting work and a watching brief of the structure, the excavations and the adjacent structure is maintained during the works.

7.4.5 In the long term a suitably designed and constructed retaining wall should provide sufficient support to ensure that post construction movement is minimal and the damage classification post construction of any cracks caused in the short term should not get worse. It is considered unlikely that new cracks would occur post construction.

7.4.6 This advice is provided based on the limited ground investigation undertaken and is not a full Ground Movement Assessment.

8 REFERENCES

AGS Guidelines for Good Practice in Geotechnical Ground Investigation, 2016

BRE Special Digest 1: Concrete in Aggressive Ground, 2005. BRE: Watford

British Standards Institution BS 10175:2011+A2:2017 Code of practice for the investigation of potentially contaminated sites. BSI: London

British Standards Institution BS 5930:2015+A1:2020 Code of practice for ground investigations. BSI:London

British Standards Institution BS 8002:2015 Code of practice for earth retaining structures. BSI: London

British Standards Institution BS 8004:2015 Code of practice for foundations. BSI: London

British Standards Institution BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules. BSI: London

Campbell Reith (March 2018) *"Pro Forma Basement Impact Assessment"*, London Borough of Camden

CIRIA C760 (2017), Guidance on embedded retaining wall design

CIRIA Report R143 The standard penetration test (SPT): methods and use, 1995: CIRIA: London

London Borough of Camden (January 2021) *"Camden Planning Guidance Basements"*

Ministry of Housing, Communities & Local Government: National Planning Policy Framework. February 2019.

NHBC Standards 2023. NHBC, Milton Keynes

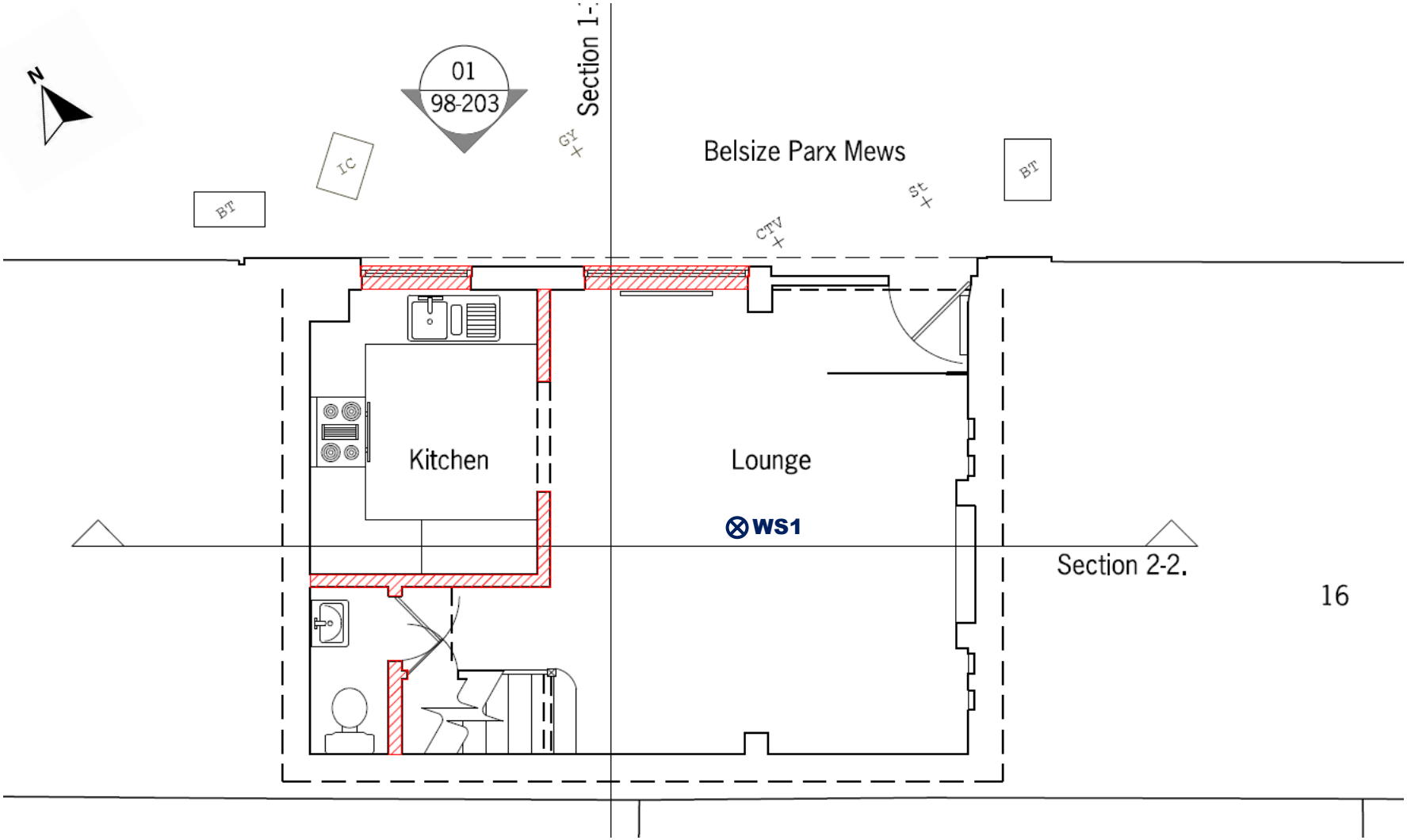
Tomlinson M.J (2001): Foundation Design and Construction 7th Edition. Pearson prentice Hall: Harlow

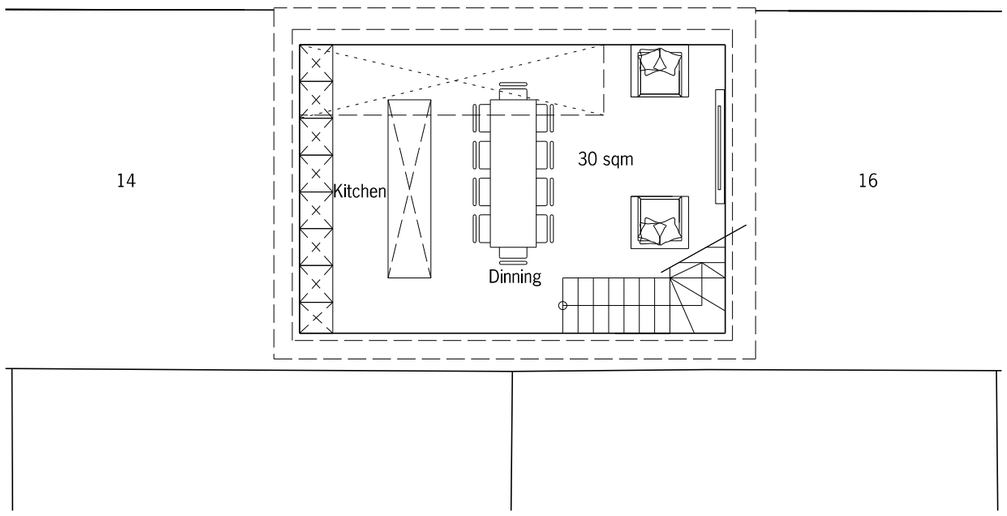
APPENDICES

APPENDIX 1 – FIGURES

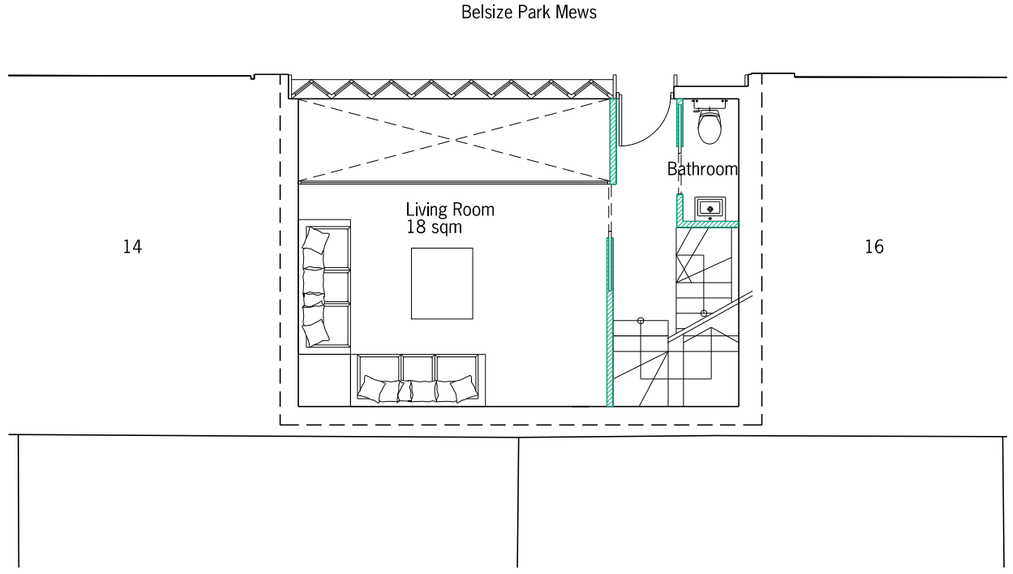
PROJECT NAME	15 Belsize Park Mews	**CLIENT**	Electron Holdings Management Ltd
TITLE	Site Location Plan	**PROJECT NO.**	P5188J2818
DATE	June 2023	**FIGURE NO.**	1

PROJECT NAME	15 Belsize Park Mews	**CLIENT**	Electron Holdings Management Ltd
TITLE	GI Plan	**PROJECT NO.**	P5188J2818
DATE	October 2023	**FIGURE NO.**	2

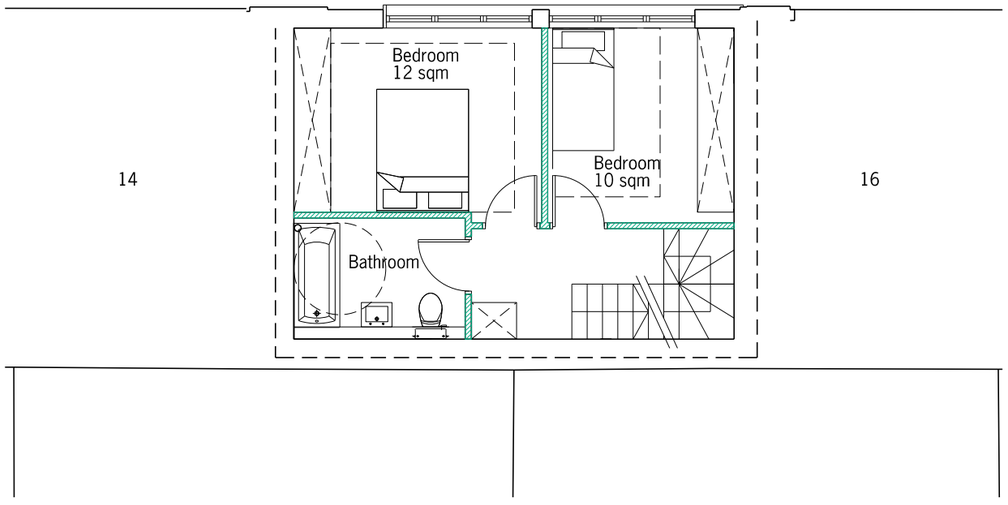




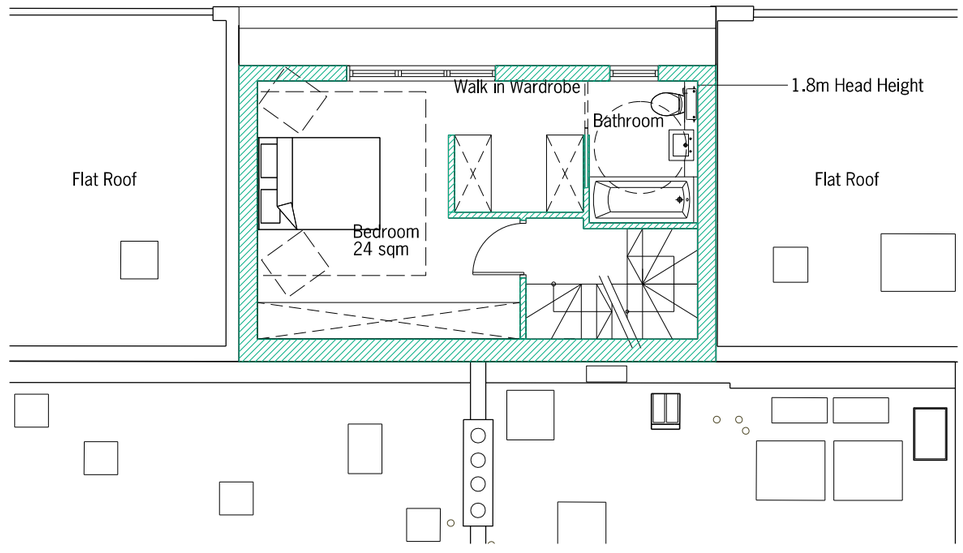
01 Proposed Basement Plan
1:100@A3



02 Proposed Ground Floor Plan
1:100@A3



03 Proposed First Floor Plan
1:100@A3



04 Proposed Second Floor Plan
1:100@A3

0 1 2 3 4 5m

Rev	Date	Description	Chk
P01	23.01.23	For Information	NP

PAPA ARCHITECTS
222 Archway Road, Highgate, London N6 5AX
w: papaarchitects.co.uk t:+44 20 8348 8411

Drawing Title:			Project Name:		Client	
Proposed Floor Plans			**15 Belsize Park Mews NW3 5BL**			
Project No:	Drawing No:	Rev:	Scale:	Status	Date:	Drawn:
2211	**00-201**	**P01**	**1:100@A3**	**PLANNING**	**11.01.23**	**TN**

Datum: 64.00m.

01 Proposed Front Elevation
1:100@A3

01 Standing Seam Aluminium Cladding

02 Aluminium Frame - Double Glazed Windows

03 Perforated Screening

04 Render

0 1 2 3 4 5m

Rev	Date	Description	Chk
P01	14.02.23	For Information	NP

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Drawing Title:			Project Name:		Client	
Proposed Front Elevation			**15 Belsize Park Mews NW3 5BL**			
Project No:	Drawing No:	Rev:	Scale:	Status	Date:	Drawn:
2211	**00-210**	**P01**	**1:100@A3**	**PLANNING**	**23.01.23**	**TN**

APENDIX 2 – EXPLORATORY HOLE RECORD

JOMAS ENGINEERING ENVIRONMENTAL LAND REMEDIATION

WINDOWLESS SAMPLER RECORD

Borehole Number **WS1**

Project Name: Belsize Park Mews	Client: Electron Holdings Management Limited	Date: 25/10/2023 - 26/10/2023
Location: 15 Belsize Park Mews, Camden, NW3 5BL	Logged by: JOB	
Project No. : P5188J2818	Crew Name:	Drilling Equipment: Confined Access Low-Headroom Windowless Sampler

Log Status	Hole Type	Level	Approved By	Scale	Page Number
	WS		SC	1:25	Sheet 1 of 2

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05			Tile floor. (MADE GROUND)
								Reinforced concrete with flint screed. Flint is medium to coarse subangular to subrounded. (MADE GROUND)
					0.40			
		0.50	D					Light brown gravelly sandy clay. Sand is medium to coarse. Gravel consists of medium to coarse sub-angular to sub-rounded flint, brick, concrete and possible asphalt. (MADE GROUND)
		1.00	D					
		1.00	SPT	N=6 (2,3/2,1,2,1)				1
					1.20			Soft** greyish brown slightly silty CLAY. (LONDON CLAY FORMATION)
		1.50	D					
		2.00	SPT	N=15 (1,2/3,4,4,4)	2.00			Firm** brown mottled orange and grey slightly silty CLAY. Becoming darker brown with depth. (LONDON CLAY FORMATION)
		2.50	D					2
		3.00	SPT	N=14 (2,2/3,3,4,4)				3
		3.50	D					
		4.00	SPT	N=16 (3,3/4,4,4,4)				4
		4.50	D					
		5.00	D		5.00			5

Remarks:

*Field description.

**Consistency estimated using semi-empirical correlations with SPT N-values, Plasticity Indices and published literature. || No groundwater reported

Key:
ES - Environmental Sample
D - Small Disturbed Sample
B - Bulk Disturbed Sample
PID - Photo-ionisation Detector Reading

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JOMAS ENGINEERING ENVIRONMENTAL LAND REMEDIATION

WINDOWLESS SAMPLER RECORD

Borehole Number **WS1**

Project Name: Belsize Park Mews	Client: Electron Holdings Management Limited	Date: 25/10/2023 - 26/10/2023
Location: 15 Belsize Park Mews, Camden, NW3 5BL	Logged by: JOB	
Project No. : P5188J2818	Crew Name:	Drilling Equipment: Confined Access Low-Headroom Windowless Sampler

Log Status	Hole Type	Level	Approved By	Scale	Page Number
	WS		SC	1:25	Sheet 2 of 2

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		5.00	SPT	N=17 (3,3/4,4,4,5)				Stiff** light brown silty CLAY. (LONDON CLAY FORMATION)
		5.50	D		5.40			Light grey GRAVEL with high cobble content. Gravel consists of medium to coarse subangular to subrounded claystone and carbonate concretions. Cobbles consist of carbonate concretions. (LONDON CLAY FORMATION)
					5.70			Firm consistency* light grey silty CLAY. (LONDON CLAY FORMATION)
		6.00	D		6.00			Firm to stiff** grey CLAY. (LONDON CLAY FORMATION)
		6.00	SPT	N=19 (3,4/4,5,4,6)				
		6.50	D					
		7.00	D					
		7.00	SPT	N=20 (3,4/5,5,5,5)				
		7.50	D					
		8.00	SPT	N=15 (3,3/4,4,3,4)				
		8.50	D					
		9.00	D		9.00			End of Borehole at 9.00m
		9.00	SPT	N=20 (16,9/5,6,5,4)				

Remarks:

*Field description.

**Consistency estimated using semi-empirical correlations with SPT N-values, Plasticity Indices and published literature. || No groundwater reported

Key:
ES - Environmental Sample
D - Small Disturbed Sample
B - Bulk Disturbed Sample
PID - Photo-ionisation Detector Reading

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APPENDIX 3 – CHEMICAL LABORATORY TEST RESULTS

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Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-13435

Site Reference:	15 Belsize Park Mews Camden NW3 5BL
Project / Job Ref:	J2818
Order No:	P5188J2818.6
Sample Receipt Date:	30/10/2023
Sample Scheduled Date:	30/10/2023
Report Issue Number:	1
Reporting Date:	06/11/2023

Authorised by:

Steve Knight
Customer Support Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 23-13435	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Jomas Associates Limited	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 15 Belsize Park Mews Camden NW3 5BL	**TP / BH No**	WS1	WS1	WS1	WS1	
Project / Job Ref: J2818	**Additional Refs**	D	D	D	D	
Order No: P5188J2818.6	**Depth (m)**	1.00	2.50	5.50	7.00	
Reporting Date: 06/11/2023	**DETS Sample No**	682962	682963	682964	682965	

Determinand	Unit	RL	Accreditation			(n)		
pH	pH Units	N/a	MCERTS	9.0	7.3	7.7	7.5	
Total Sulphate as SO_4	mg/kg	< 200	MCERTS	3634	1704	550	4004	
Total Sulphate as SO_4	%	< 0.02	MCERTS	0.36	0.17	0.06	0.40	
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	932	773	218	2120	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.93	0.77	0.22	2.12	
Total Sulphur	%	< 0.02	NONE	0.11	0.06	0.14	0.40	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)
(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 23-13435	
Jomas Associates Limited	
Site Reference: 15 Belsize Park Mews Camden NW3 5BL	
Project / Job Ref: J2818	
Order No: P5188J2818.6	
Reporting Date: 06/11/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 682962	WS1	D	1.00	17.3	Brown sandy clay with stones and brick
^ 682963	WS1	D	2.50	19.9	Brown clay
^ 682964	WS1	D	5.50	2.6	Brown clayey gravel with stones
^ 682965	WS1	D	7.00	21.3	Brown clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S
^ no sampling date provided; unable to confirm if samples are within acceptable holding times

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Kent ME17 2JN
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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-13435
Jomas Associates Limited
Site Reference: 15 Belsize Park Mews Camden NW3 5BL
Project / Job Ref: J2818
Order No: P5188J2818.6
Reporting Date: 06/11/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

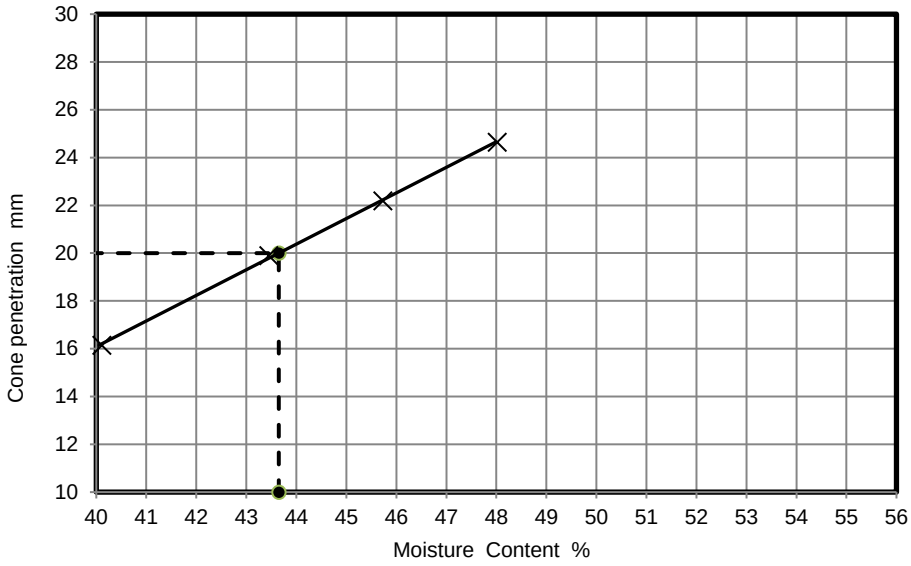
List of HWOL Acronyms and Operators
DETS Report No: 23-13435
Jomas Associates Limited
Site Reference: 15 Belsize Park Mews Camden NW3 5BL
Project / Job Ref: J2818
Order No: P5188J2818.6
Reporting Date: 06/11/2023

Acronym	**Description**
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym

APPENDIX 4 – GEOTECHNICAL LABORATORY TEST RESULTS

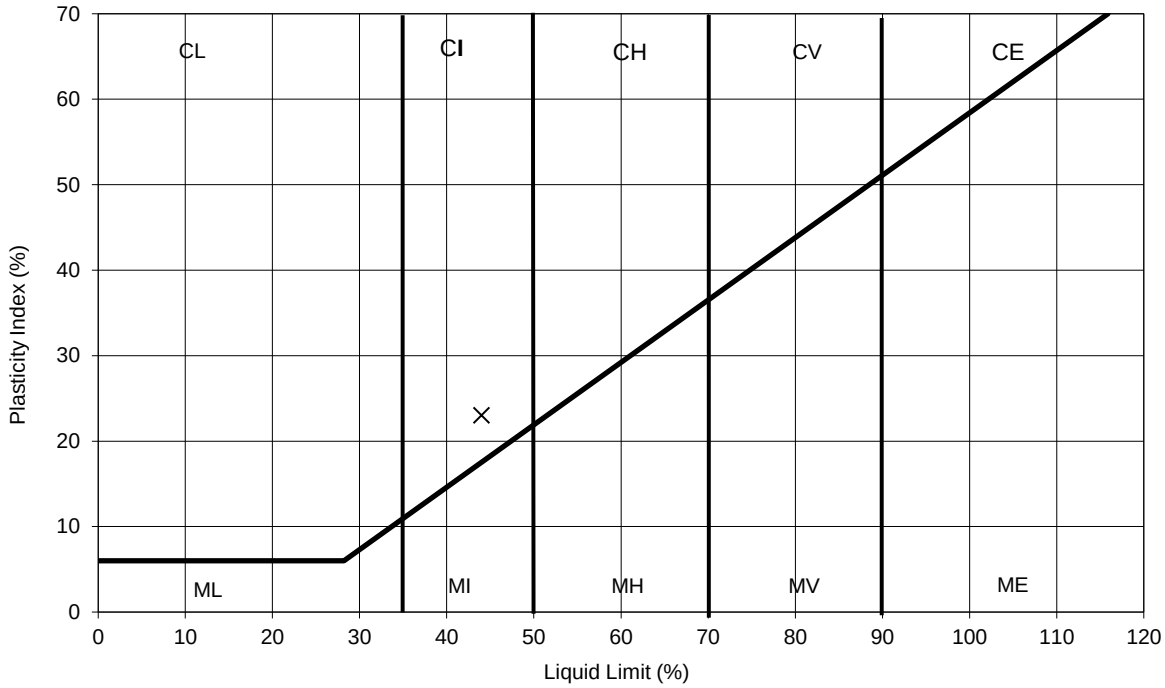
K4 SOILS	**LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX**			Job No.	34289
				Borehole/Pit No.	WS1
Site Name	15 Belsize Park Mews, Camden, NW3 5BL			Sample No.	-
Project No.	-	Client	Jomas Associates	Depth Top	1.50 m
Soil Description	Orangish brown slightly mottled bluish grey slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)			Depth Base	- m
				Sample Type	D
				Samples received	30/10/2023
				Schedules received	30/10/2023
				Project Started	30/10/2023
				Date Tested	10/11/2023



NATURAL MOISTURE CONTENT	**32**	**%**
% PASSING 425µm SIEVE	**95**	**%**
LIQUID LIMIT	**44**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**23**	**%**

Remarks

PLASTICITY INDEX



UKAS TESTING

TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 13/11/2023

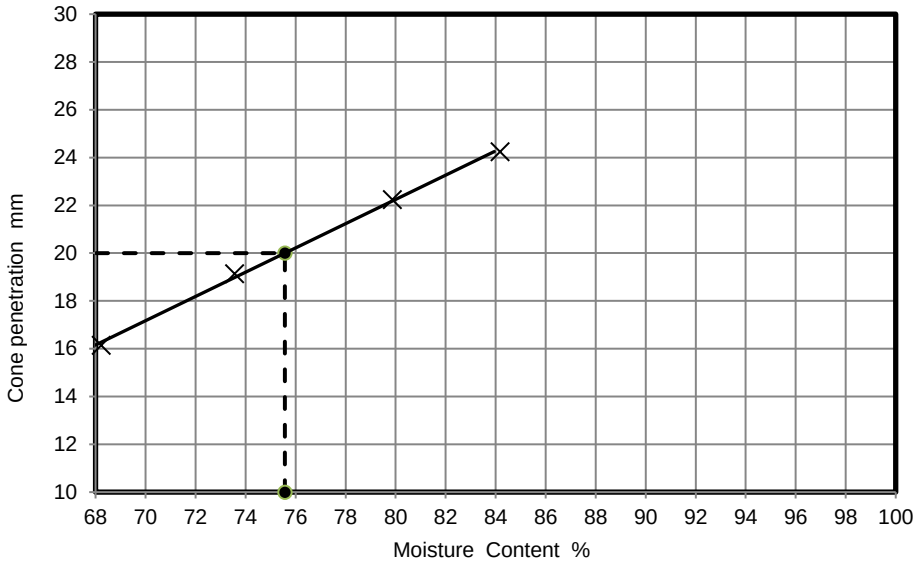
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

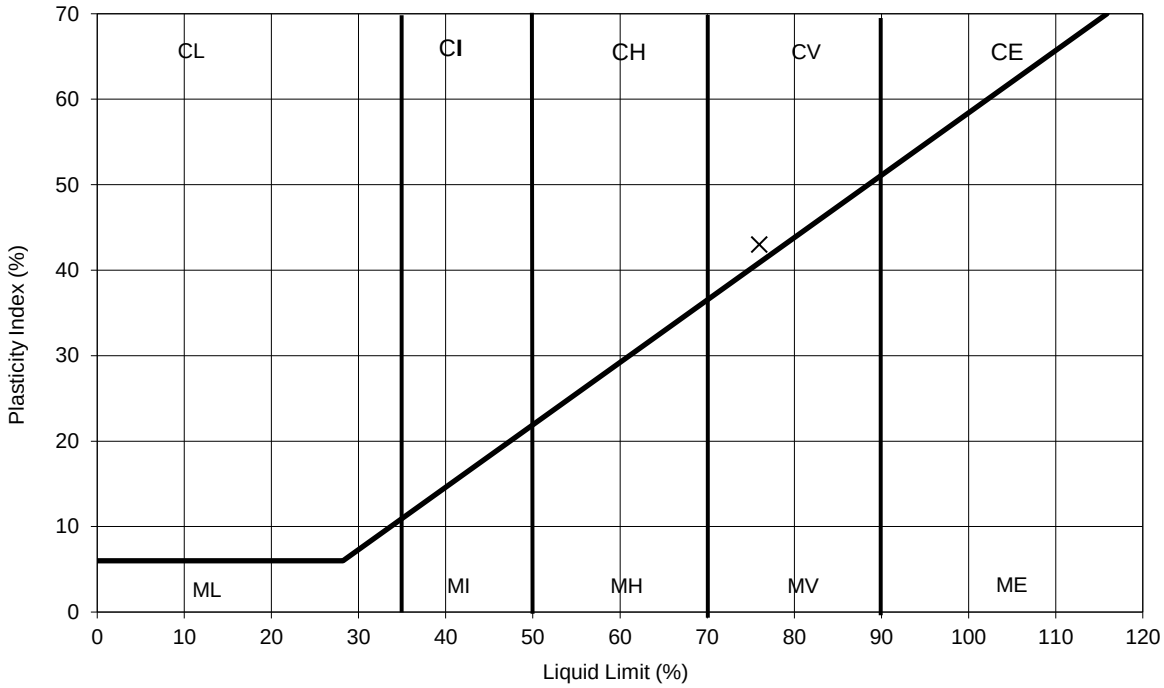
				Job No.	34289
				Borehole/Pit No.	WS1
Site Name	15 Belsize Park Mews, Camden, NW3 5BL			Sample No.	-
Project No.	-	Client	Jomas Associates	Depth Top	3.50 m
Soil Description	Orangish brown slightly mottled grey silty CLAY with scattered selenite crystals			Depth Base	- m
				Sample Type	D
				Samples received	30/10/2023
				Schedules received	30/10/2023
				Project Started	30/10/2023
				Date Tested	10/11/2023



NATURAL MOISTURE CONTENT	**32**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**76**	**%**
PLASTIC LIMIT	**33**	**%**
PLASTICITY INDEX	**43**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
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Checked and Approved

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Tel: 01923 711 288 Email: James@k4soils.com

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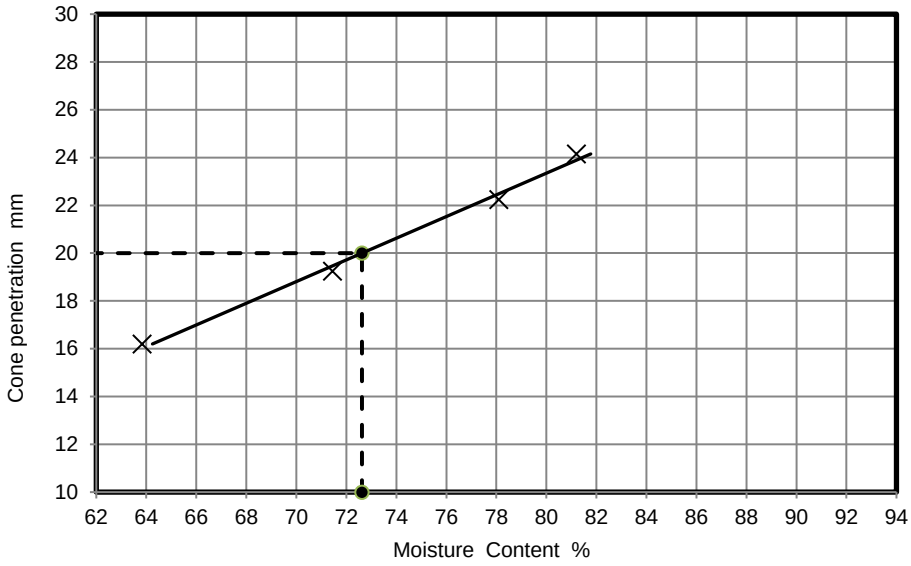
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

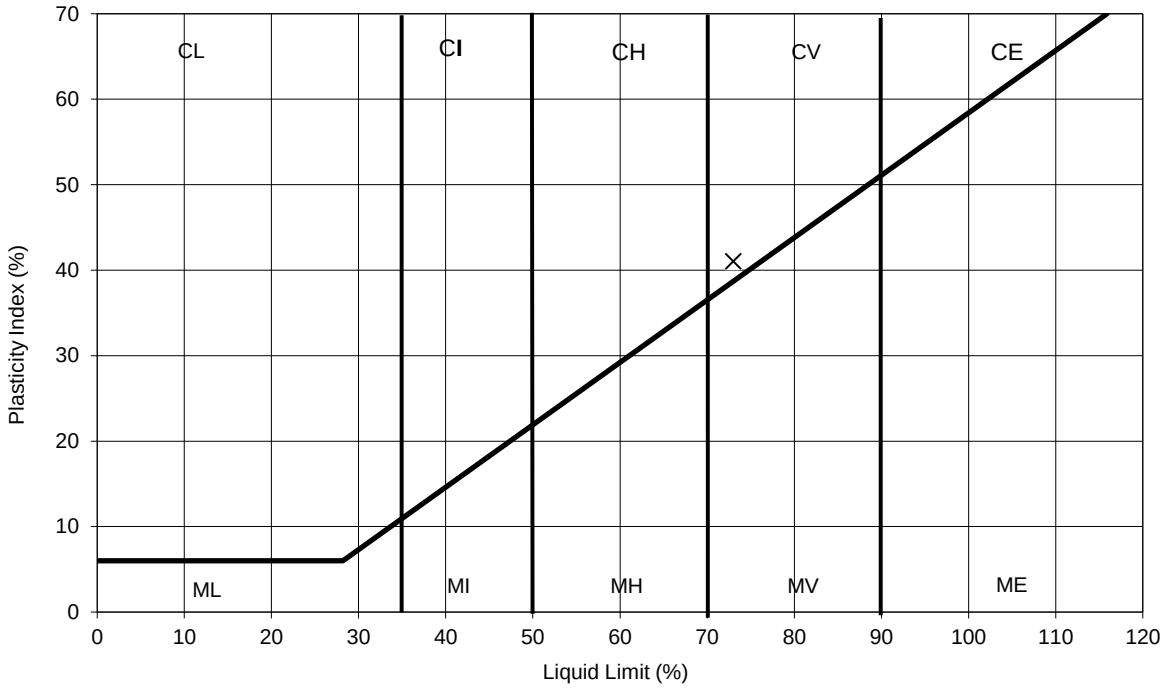
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	34289
				Borehole/Pit No.	WS1
Site Name	15 Belsize Park Mews, Camden, NW3 5BL			Sample No.	-
Project No.	-	Client	Jomas Associates	Depth Top	4.50 m
Soil Description	Orangish brown slightly mottled grey silty CLAY with scattered selenite crystals			Depth Base	- m
				Sample Type	D
				Samples received	30/10/2023
				Schedules received	30/10/2023
				Project Started	30/10/2023
				Date Tested	10/11/2023



NATURAL MOISTURE CONTENT	**30**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**73**	**%**
PLASTIC LIMIT	**32**	**%**
PLASTICITY INDEX	**41**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 13/11/2023

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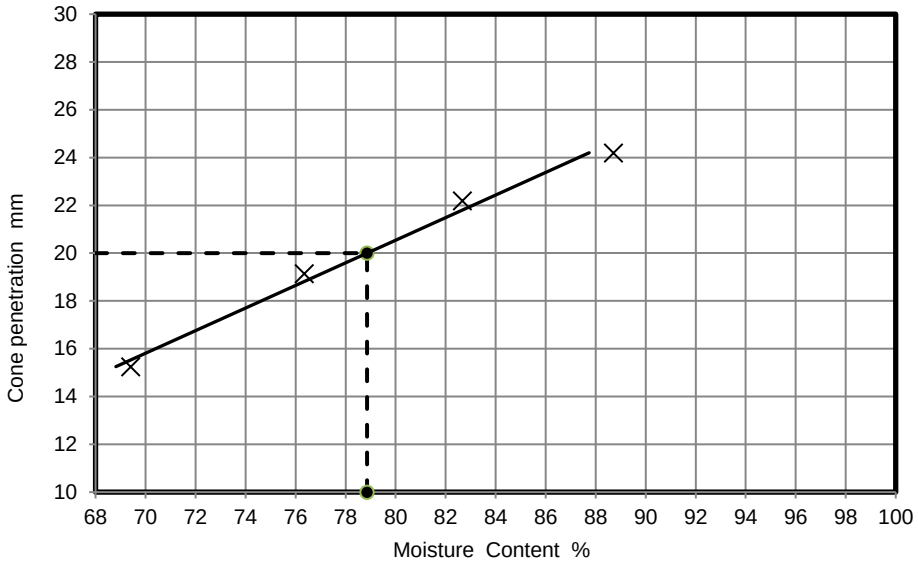
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

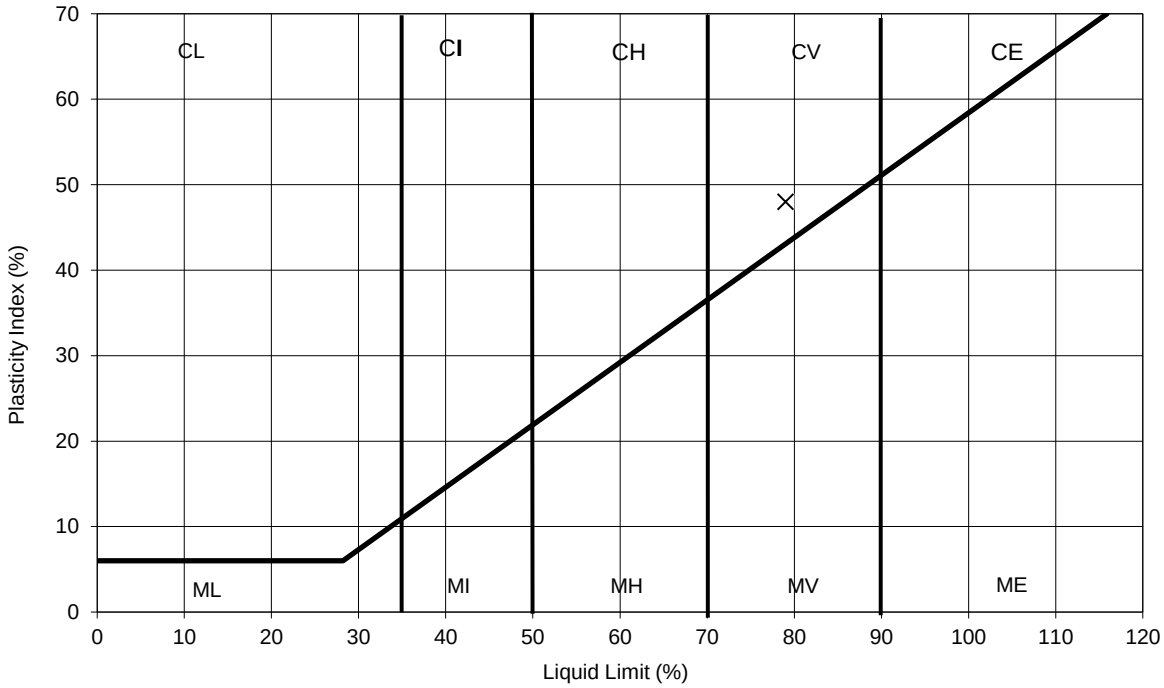
				Job No.	34289
				Borehole/Pit No.	WS1
Site Name	15 Belsize Park Mews, Camden, NW3 5BL			Sample No.	-
Project No.	-	Client	Jomas Associates	Depth Top	6.50 m
Soil Description	Dark grey silty CLAY with scattered selenite crystals			Depth Base	- m
				Sample Type	D
				Samples received	30/10/2023
				Schedules received	30/10/2023
				Project Started	30/10/2023
				Date Tested	10/11/2023



NATURAL MOISTURE CONTENT	**32**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**79**	**%**
PLASTIC LIMIT	**31**	**%**
PLASTICITY INDEX	**48**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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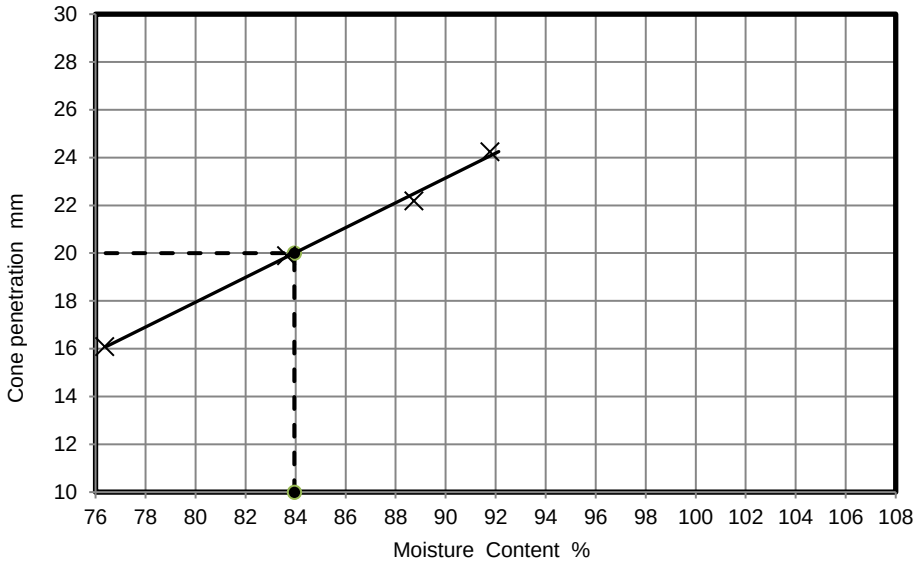
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

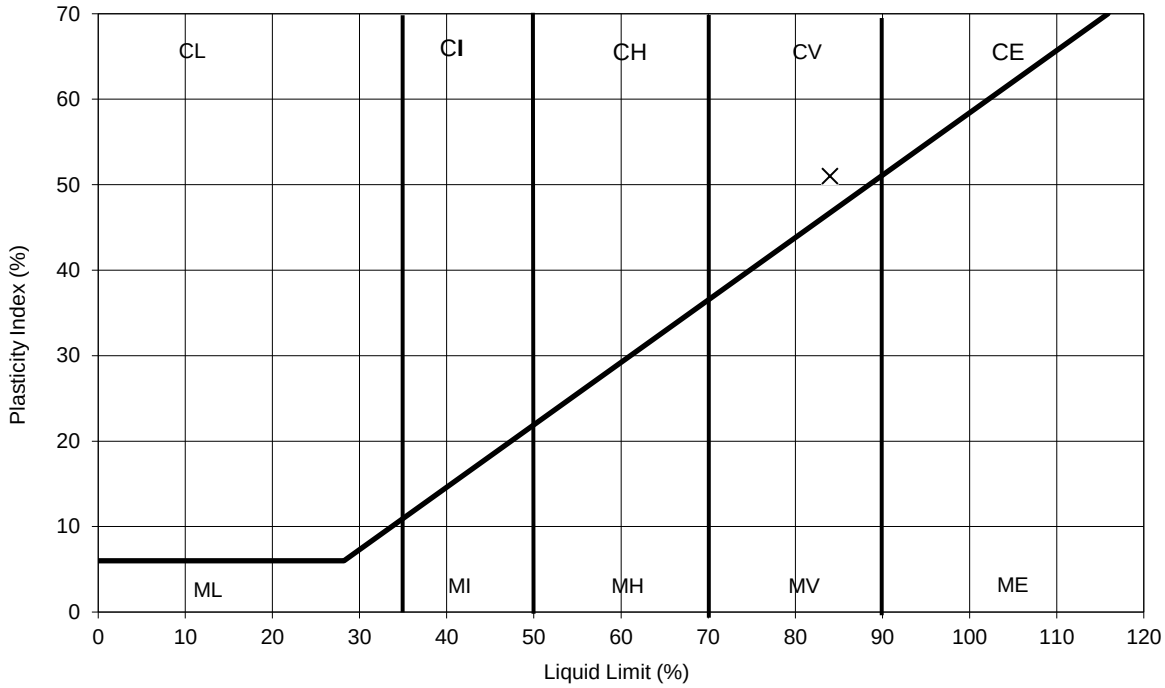
				Job No.	34289
				Borehole/Pit No.	WS1
Site Name	15 Belsize Park Mews, Camden, NW3 5BL			Sample No.	-
Project No.	-	Client	Jomas Associates	Depth Top	7.50 m
Soil Description	Dark grey silty CLAY			Depth Base	- m
				Sample Type	D
				Samples received	30/10/2023
				Schedules received	30/10/2023
				Project Started	30/10/2023
				Date Tested	10/11/2023



NATURAL MOISTURE CONTENT	**30**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**84**	**%**
PLASTIC LIMIT	**33**	**%**
PLASTICITY INDEX	**51**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
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Tel: 01923 711 288 Email: James@k4soils.com

UKAS TESTING

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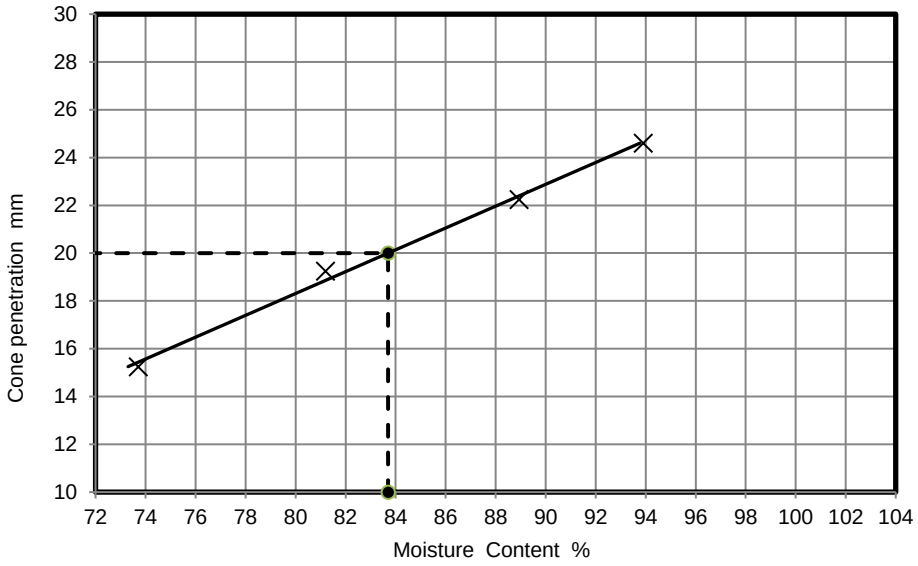
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

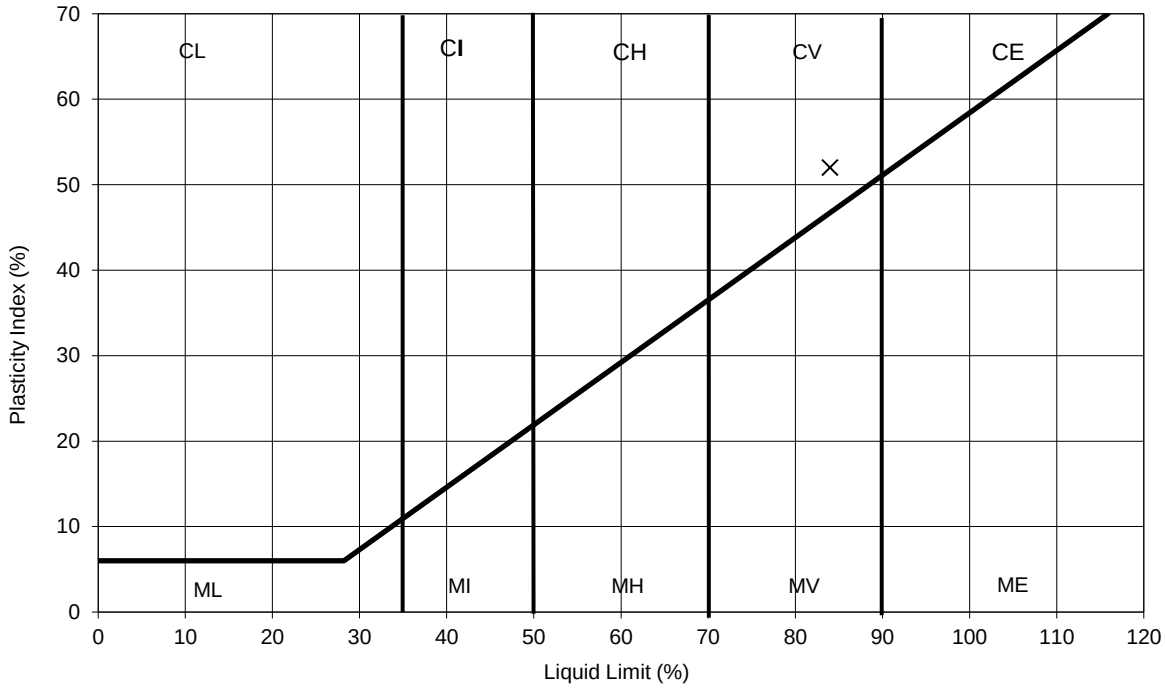
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	34289
				Borehole/Pit No.	WS1
Site Name	15 Belsize Park Mews, Camden, NW3 5BL			Sample No.	-
Project No.	-	Client	Jomas Associates	Depth Top	8.50 m
Soil Description	Dark grey silty CLAY			Depth Base	- m
				Sample Type	D
				Samples received	30/10/2023
				Schedules received	30/10/2023
				Project Started	30/10/2023
				Date Tested	10/11/2023



NATURAL MOISTURE CONTENT	**30**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**84**	**%**
PLASTIC LIMIT	**32**	**%**
PLASTICITY INDEX	**52**	**%**

Remarks

PLASTICITY INDEX



UKAS TESTING

TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 13/11/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
34289	15 Belsize Park Mews, Camden, NW3 5BL	Samples received	30/10/2023
		Schedule received	30/10/2023
Project No.	Client	Project started	30/10/2023
-	Jomas Associates	Testing Started	10/11/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
WS1	-	1.50	-	D	Orangish brown slightly mottled bluish grey slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)	32	95	44	21	23	
WS1	-	3.50	-	D	Orangish brown slightly mottled grey silty CLAY with scattered selenite crystals	32	100	76	33	43	
WS1	-	4.50	-	D	Orangish brown slightly mottled grey silty CLAY with scattered selenite crystals	30	100	73	32	41	
WS1	-	6.50	-	D	Dark grey silty CLAY with scattered selenite crystals	32	100	79	31	48	
WS1	-	7.50	-	D	Dark grey silty CLAY	30	100	84	33	51	
WS1	-	8.50	-	D	Dark grey silty CLAY	30	100	84	32	52	

UKAS TESTING

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

NOTE: The report shall not be reproduced except in full without authority of the laboratory

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials **J.P**

Date: 13/11/2023

APPENDIX 5 – GROUNDWATER MONITORING RECORDS

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET

Site: 15 Belsize Park Mews.	**Operative(s):** JOB	**Date:** 03/11/2023	**Time:** 9:30	**Round:** 1	**Page:** 1

MONITORING EQUIPMENT

Instrument Type	Instrument Make	Serial No.	Date Last Calibrated
Dip Meter	GeoTech		

MONITORING CONDITIONS

Weather Conditions: overcast/windy	**Ground Conditions:** Dry	**Temperature**: 10
Barometric Pressure (mbar): 974	**Barometric Pressure Trend (24hr):**	**Ambient Concentration:**

MONITORING RESULTS

Monitoring Point Location	Flow		Atmospheric Pressure (mbar)	CH_4 %	CH_4 % LEL	CO_2 %	O_2 %	VOC (ppm)		H_2S (ppm)	CO (ppm)	Depth to product (mbgl)	Depth to water (mbgl)	Depth to base of well (mbgl)
	Peak	Steady						Peak	Steady					
WS1	-	-	-	-	-	-	-	-	-	-	-	-	0.48	4.78

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET

Site: 15 Belsize Park Mews.	**Operative(s):** RAY	**Date:** 09/11/2023	**Time:** 9:30	**Round:** 2	**Page:** 1

MONITORING EQUIPMENT

Instrument Type	Instrument Make	Serial No.	Date Last Calibrated
Dip Meter	GeoTech		

MONITORING CONDITIONS

Weather Conditions: Sunny	**Ground Conditions:** Dry	**Temperature**: 8c
Barometric Pressure (mbar): 990	**Barometric Pressure Trend (24hr):** Stable	**Ambient Concentration:**

MONITORING RESULTS

Monitoring Point Location	Flow		Atmospheric Pressure (mbar)	CH_4 %	CH_4 % LEL	CO_2 %	O_2 %	VOC (ppm)		H_2S (ppm)	CO (ppm)	Depth to product (mbgl)	Depth to water (mbgl)	Depth to base of well (mbgl)
	Peak	Steady						Peak	Steady					
WS1	-	-	-	-	-	-	-	-	-	-	-	NMP	1.29	4.81

* **NMP = No Measurable Product**

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silc – Specialist in Land Condition

The Geological Society

IEMA – Transforming the world to sustainability

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Uxbridge

UB8 2RZ

CONTACT US

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Tel: 0333 305 9054

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