



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Basement Impact Assessment

26 Sheldon Avenue

London

N6 4JT

Report Ref: B2538/22/BIA/1

December 2022



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Prepared on Behalf of:

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Prepared for: Dr. S. Patel & qR Architects

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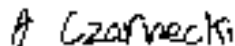
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1.0 EXECUTIVE SUMMARY

Site Name	26 Sheldon Avenue, London, N6 4JT
Site Description	National Grid Reference TQ 27482 87875. The site is bounded to the NW by Sheldon Avenue and is located in a residential area. Currently occupied by a single three storey brick building with associated driveway, garden areas and swimming pool.
Proposed Development	It is proposed to demolish the existing building on site and construct a new two-storey private dwelling above ground with a one-storey basement. Existing garden areas, swimming pool and driveway will be retained.
Assessments included in Report	Desk Study, Screening Assessment, Scoping Assessment, Ground Investigation, Foundations & Basement Construction Recommendations, Contamination Assessment.
Ground Conditions Encountered	The borehole has encountered Made Ground (thickness 1.0m) overlying soft to firm, becoming stiff with depth, sandy clay, proven to a maximum depth of 20.0mbgl. Groundwater was encountered at a depth of 8.5mbgl in CP01 during drilling. Subsequent monitoring indicated groundwater levels at depths ranging between 3.43m and 3.58mbgl. Slightly elevated levels of land gas encountered.
Construction Methods	Piles will be used to form the sides of the basement. Low level gas protection measures required.
Structural Monitoring	It is recommended monitoring of adjacent road and buildings for instability to be carried out during the construction period.
Potential land stability impacts	<u>Shrink-Swell Subsidence</u> . Perceived risk is Moderate to Low. Mitigation measures required – all exposed excavation faces to be protected from effects of weather. <u>Surrounding structures</u> . Perceived risk is Moderate. Construction methods to allow for suitable support of excavation sides. Monitoring of adjacent ground and structures for instability to be carried out during the construction period.
Potential hydrological impacts	Site is not at risk from surface water flooding.
Potential hydrogeological impacts	Basement construction unlikely to encounter water table.
Flood Risk	Identified as very low risk/negligible.

2.0 INTRODUCTION

2.1 Background & Terms of Reference

A Basement Impact Assessment has been commissioned by qR Architects, acting on behalf of Dr. S. Patel (the Client) for a proposed residential development at 26 Sheldon Avenue in Hornsey, London.

Earth Environmental and Geotechnical (Southern) Ltd (EEGSL) was commissioned by the Client to undertake a Geo-Environmental Investigation of the site in accordance with a proposal B2538rev, dated 5th October 2022.

EEGSL has also prepared a combined Phase I/II Geo-Environmental Report for the site, reference B2538/22/GEO/1, dated 21ST December 2022.

2.2 Objectives

This report comprises a Basement Impact Assessment (BIA). This document describes a risk-based impact assessment with regard to hydrology, hydrogeology and land stability. This has been used as relevant background technical guidance to the development of the BIA.

This report supersedes the EEGSL Preliminary Report for the site, reference B2538/22/BIA (November 2022).

The objective of this report was to establish the impact and risk of the proposed basement development at 26 Sheldon Avenue in London. The assessment will determine the impact on the surrounding structures with respect to groundwater and land stability and in particular to assess whether the development will affect the stability of neighbouring properties, local and regional hydrogeology and whether any identified impacts can be mitigated by the design of the development.

It is recognised that any BIA is subject to review and that further detailed assessments will be ongoing, if appropriate, as the design and construction progresses.

2.3 Sources of Information

The following references have been used in compiling this Basement Impact Assessment Report:

- 1) EEGSL Geoenvironmental Investigation Report *26 Sheldon Avenue, London* Report Reference B2538/22/GEO (November 2022).
- 2) Groundsure Enviro+Geo Insight Report GS-8991752 '*26 Sheldon Avenue, Hornsey, London N6 4JR*', dated 17th November 2022.
- 3) Groundsure Floodview Report GS-9225934 '*26 Sheldon Avenue, Hornsey, London, N6 4JT*', dated 28th November 2022.
- 4) Environment Agency Flood Map on-line Database.

2.4 Existing and Proposed Development

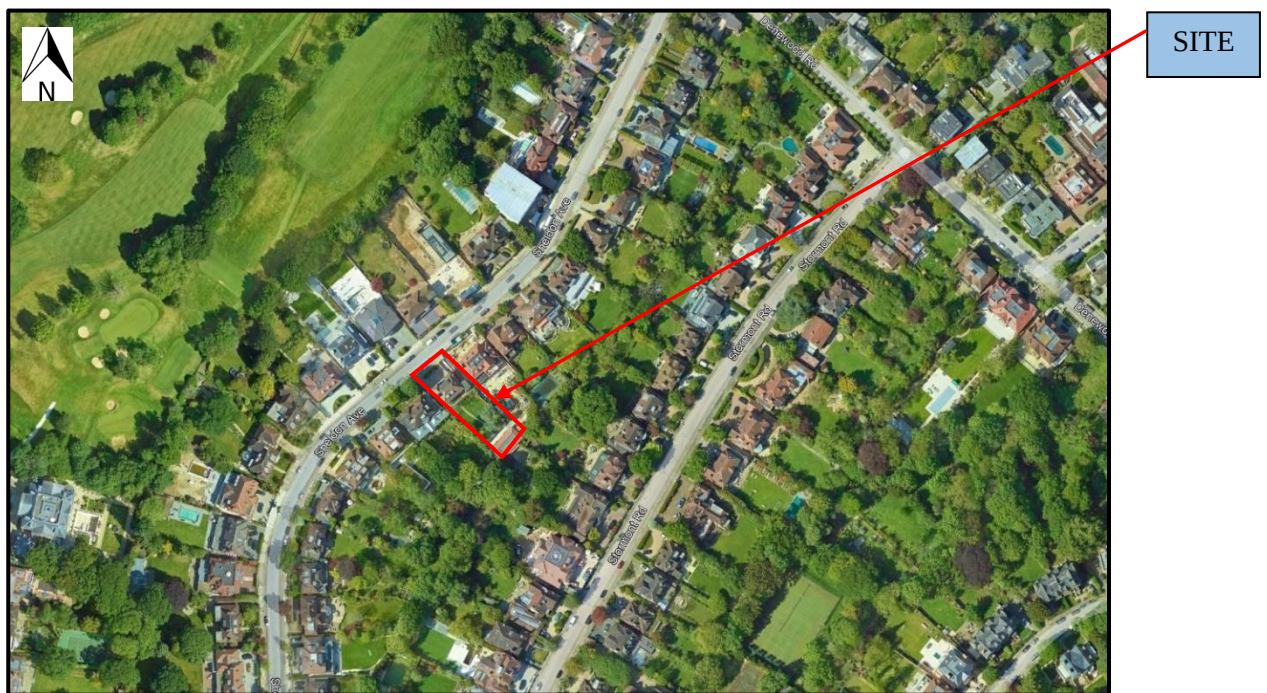
2.4.1 Existing Site

The site is located in Highgate, London, approximately 0.91km from Highgate Centre at approximate National Grid Reference TQ 27482 87875 and with a closest postcode of N6 4JT.

The site is a near rectangular shaped parcel of land with current access via a driveway off Sheldon Avenue to the northwest of the site. The site occupies an area of approximately 0.93 hectares and is currently occupied by a single three storey brick building with associated driveway, garden areas and swimming pool.

The surrounding area comprises predominantly of residential properties with Highgate Golf Course located to the north of the site.

Figure 1 – Aerial Photograph Showing Site Location and Surrounding Area



General site photographs are presented in Figure 2 overleaf.

Figure 2 – General Site Photographs



Rear of property



Front of property including CP01

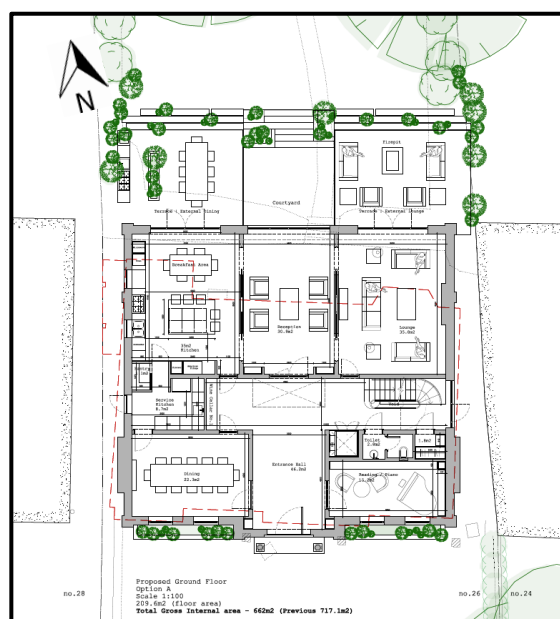


2.4.2 Proposed Development

It is proposed to demolish the existing building on site and construct a new two-storey private dwelling above ground with a one-storey basement. Existing garden areas, swimming pool and driveway will be retained.

The proposed development layout details are shown in Figure 3 below.

Figure 3 – Proposed Development Details (Ground Floor)



2.5 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices or changes in legislation may require a reinterpretation of the report in whole or in part. EEGSL reserve the right to amend either conclusions or recommendations in light of any further information that may become available. This report is provided for the sole use by the client and is confidential to them.

Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes and trial pits, particularly at intervening locations. Whilst every effort is made to ensure accuracy of data supplied, all opinions expressed as to the spatial distribution of strata between sampling locations is for guidance only and no responsibility is accepted as to its accuracy.

3.0 DESK STUDY

3.1 Site History

The historical development of the site has been determined by reference to historical plans and Google Earth imagery. The reviewed historical plans comprise only readily available records and may be limited; however, the information available to date indicates that additional searches are unlikely to add to our understanding of the site. The earliest available historical mapping covering the site dates back to 1864. The site history is summarised in Table 1 below.

Table 1 - Summary of Site History

Date	Site	Surrounding Land Use (Within 250m of Site)
1864	Site is an open field	Fields surround the site. Bishops Wood 150m SW.
1896	No significant change	Residential development to SE. Stonemont Road 90m SE.
1914	Residential property associated garden intersects the southern corner of site.	No significant change
1920	No significant change.	Golf club present 100m NW
1935	Site present day layout. Large residential building to the northern end of site with associated garden to the rear.	Increased residential development in all directions.
1950 - 1991	No significant change	No significant change
2003	Building to the rear of the garden now present.	No significant change
2010-2022	No significant change	No significant change

3.2 Geology

The British Geological Survey (BGS) states that the site is not underlain by artificial ground (Made Ground) or superficial deposits.

According to the BGS, the site is underlain by the Claygate Member, of Eocene age. The Claygate Member comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.

There are no faults located within 250m of site.

There are 7 historical borehole records within 250m of the site, confirming the depth of the Claygate Member to be between 1.40mbgl and 3.0mbgl. The Claygate member is underlain by the London Clay formation between depths of 5.4mbgl and 6.3mbgl.

3.3 Hydrogeology

The bedrock permeability on site has been classed as low to high with mixed flow type.

The bedrock beneath the site is classified as 'Secondary A' by the Environment Agency. The EA definition is given overleaf:

“Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers”

Soils on site are classified as having intermediate leaching potential.

The site is not located within a source protection zone.

There are no recorded groundwater abstraction, surface water or potable water licenses within 250m of the site.

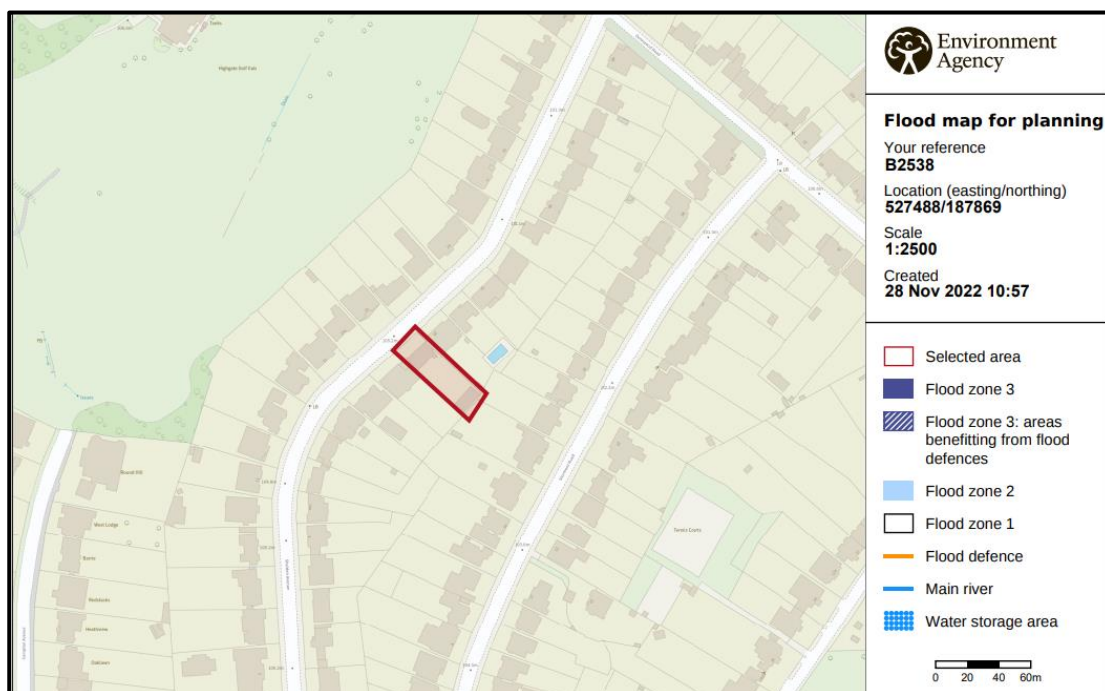
3.4 Hydrology & Flood Risk

There are 9 records of surface water features within 250m of site. The closest is 149m NW of site, described as an inland river not influenced by normal tidal action. The other 8 records appear to be the same water course running between 200m W and 249m W of site.

The site falls within the Dollis Brook and Upper Brent water body catchment area.

According to Environment Agency records the site is located within a Flood Zone 1, with a low probability of flooding from rivers or the sea, as shown in Figure 4 overleaf.

Figure 4 – EA Flood Risk Map



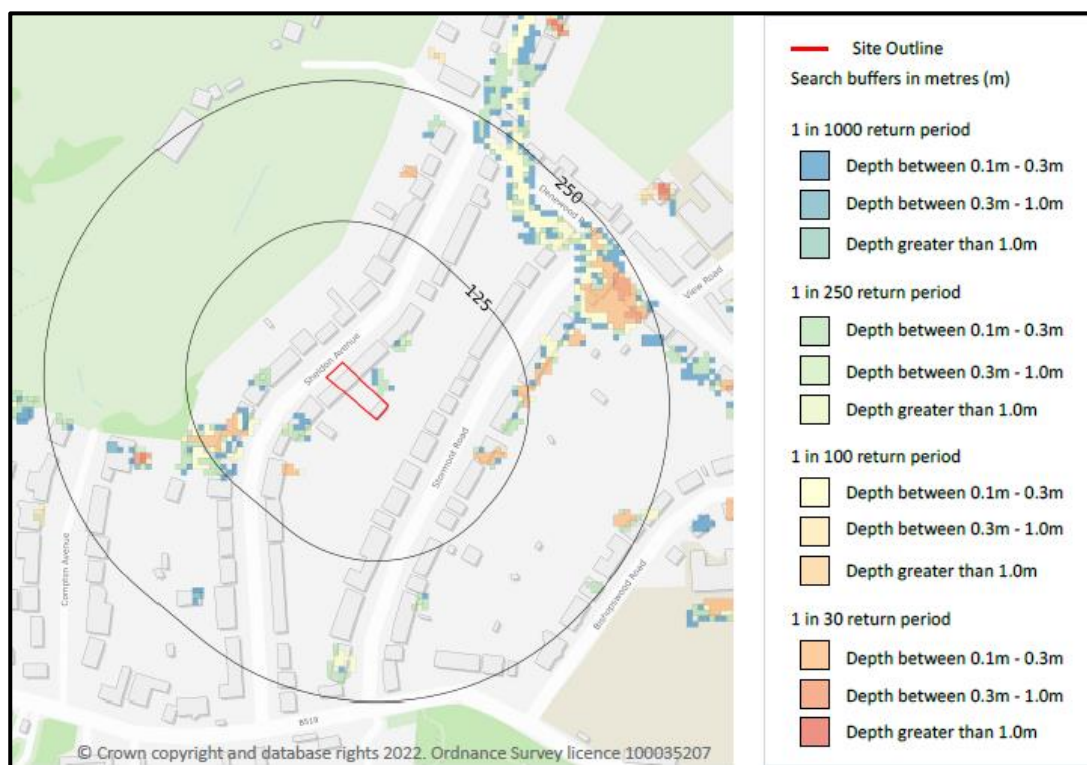
According to the Groundsure Floodview Report (included in Appendix 1) the risk from flooding is summarised as follows:

Table 2 - Summary of Groundsure Floodview Report Risks

Feature	Risk
Rivers and the sea	Very Low
Historical Flooding	Not identified
Flood defences	No
Surface Water Flooding	Negligible
Groundwater	Negligible

The area in which the property is located has been assessed to be at a negligible risk of surface water flooding, as shown in Figure 6 overleaf. The area adjacent to the site is considered to have a 1 in 250 to 1 in 1000 probability of surface water flooding due to rainfall in a given year to a depth of between 0.3m and 1.0m. However, as is the case with probability statistics and predictions, this information should be used as a guideline only. The area may flood several years in a row, or not at all for many years. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Figure 5 – Surface Water Flood Risk.



3.5 Other Information

Environmental conditions are covered by Environment Agency (EA) and British Geological Survey (BGS) online data, and the site-specific Groundsure Insight report, included in the EEGSL Geo-Environmental Report (November 2022).

The following sections are generally limited to locations within 250m of the site boundary unless it is considered that installations or activities beyond that range could potentially have an impact on the site or be affected by the redevelopment of the site.

3.5.1 *Natural Ground Subsidence*

The site is in an area where the hazard rating for compressible deposits and ground dissolution of rocks is negligible. A very low hazard rating exists for running sands, landslides and collapsible deposits and a moderate hazard rating for shrink swell clays.

3.5.2 *Mining, Ground Workings & Natural Cavities*

There are no recorded mining or natural cavities within 250m of the site.

3.5.3 *Railways & Tunnels*

There are no records of historical or correct railway features within 250m of the site.

3.5.4 *Radon Potential*

The property is in a Radon Affected Area where less than 1% of properties are above the Action Level. Radon protection measures are not required.

3.5.5 *Landfill & Waste Management Activity*

There are no historical or current landfill sites, waste exemptions or waste facilities within 250m of the site.

3.5.6 *Environmentally Sensitive Sites*

The site is not located within an environmentally sensitive site. However the site is located within a SSSI Impact risk zone where infrastructure, mineral oil and gas, residential (more than 100 properties or more than 50 properties outside existing settlements), air pollution, combustion, waste, composting, discharges and water supply require consultations.

3.5.7 *Industrial Land Use Information*

Historical and current industrial land usage on-site and within 250m of the site is summarised in Table 3 overleaf.

Table 3 - Summary of Industrial Land Use

Description	Records within 250m of site	Details
Historical Industrial Land Uses	0	
Historical Tanks	1	232m NW: Tank 1973
Historical Energy Features	0	-
Historical Petrol Station	0	-
Historical Garage	0	-
Historical Military Land	0	-
Historical Railway Features	0	-
Recent Industrial Land Use	1	233m NW: Tank
Current/Recent Petrol Stations	0	-
Electricity Cables	0	-
Gas Pipelines	0	-
Current Railway Features	0	-

3.5.8 Environmental Permits, Incidents & Registers

There are no records of environmental permits, incidents and registers within 250m of the site.

4.0 SCREENING

A screening process has been undertaken and the findings are described below.

4.1 Land Stability

Table 4 - Summary of Land Stability Screening Process

Question	Response	Evidence
Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	No	The site is flat and level.
Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No	Redevelopment comprises residential building with no slopes.
Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	No	All neighbouring land is generally flat
Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8)?	No	
Is the London Clay the shallowest strata at the site?	No	Geological map indicates bedrock of Claygate Member. (Section 3.2)
Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained?	No	Trees are present on site.
Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	Unknown	No evidence of shrink-swell subsidence has been observed on site. The site has a moderate hazard rating in regard to shrink-swell clay. (Section 3.5.1)
Is the site within 100m of a watercourse or a potential spring line?	No	The closest recorded surface water feature is 149m NW.
Is the site within an area of previously worked ground?	No	There are no recorded ground workings, or mining activities on or immediately adjacent to the site.
Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	Claygate Member classified as 'Secondary A'. Groundwater was encountered at 8.5mbgl during drilling, during monitoring groundwater was measured at depths between 3.43m and 3.58mbgl.
Is the site within 5m of a highway or pedestrian right of way?	Yes	Front of site is bounded by Sheldon Avenue and associated footpath.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	There are existing buildings immediately to the north east and south west of the site.
Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	

4.2 Surface Water & Flooding

Table 5 - Summary of Surface Water & Flooding Screening Process

Question	Response	Evidence
Is the site located directly above an aquifer?	Yes	Claygate Member classified as 'Secondary A'.
Will the proposed basement extend beneath the water table surface?	No	Groundwater was encountered at 8.5mbgl during drilling.
Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	No	The closest recorded surface water feature is 149m NW.
Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	Existing site and proposed development are hard cover.
As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	Existing site and proposed development are hard cover.
As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	Existing site and proposed development are hard cover.
Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	Existing site and proposed development are hard cover.
Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	Existing site and proposed development are hard cover.
Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	Existing site and proposed development are hard cover.
Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature.	No	Risk from surface water flooding is negligible.

4.3 Summary of Screening Process

The above screening processes have identified the following issues of concern.

- An existing road is located close to the N boundary of the site.
- There are existing properties immediately adjacent to the site.

No other significant issues concerning the proposed basement development and immediate surrounding area have been identified.

5.0 SCOPING

5.1 Introduction

The purpose of scoping is to assess in more detail any issues of concern identified in the screening process (i.e. where the answer is 'yes' or 'unknown' to any of the questions posed) to be investigated in the impact assessment. Potential hazards are assessed for each of the identified potential impact factors.

The scoping stage is furthermore to assist in defining the nature of the ground investigation required to assess the impact of the issues of concern identified in the screening process.

5.2 Potential Impacts

Potential impacts, identified from the screening process, are summarised in Table 6 below.

Table 6 - Potential Impacts

Screening Question	Potential Impacts	Discussion
Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	Potential for soil heave/shrinkage is moisture content regime is changed in soils beneath the site due to construction of basement.	Site Investigation required to investigate strength and volume change potential of clay soils.
Is the site within 5m of a highway or pedestrian right of way?	Excavation of a basement could result in structural damage to the roads/footways or buried services. Site investigation required to establish spoil conditions. Effects mitigated at design stage.	Site investigation to establish conditions. Effects mitigated at design stage.
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Basement could undermine or destabilise existing foundations on or close to the site boundary.	There are existing buildings immediately adjacent to the proposed basement. Effects mitigated at design stage.
Will the proposed basement extend beneath the water table surface?	The groundwater flow regime could be altered by the proposed basement. Changes in flow regime could potentially cause the groundwater level within the zone encompassed by the flow route to increase or decrease locally. For existing nearby structures degree of dampness or seepage may potentially increase as a result in change of groundwater level.	Site investigation to establish soil and groundwater conditions.

6.0 GROUND INVESTIGATION / ADDITIONAL ASSESSMENTS

6.1 Ground Investigation

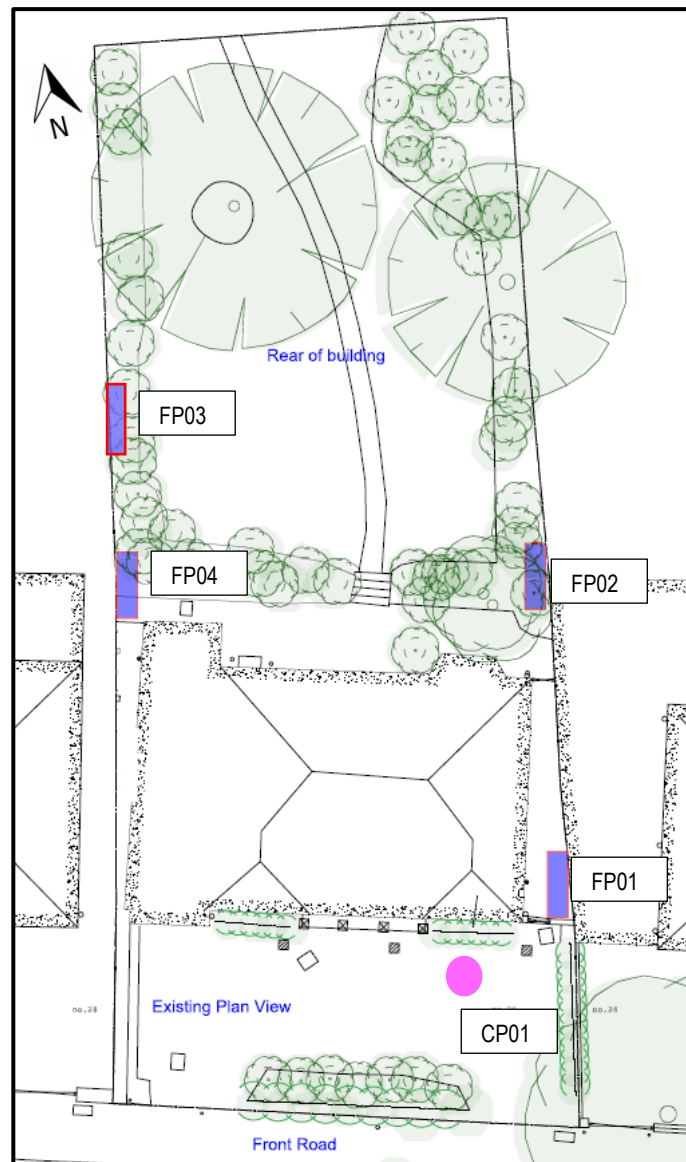
6.1.1 *Exploratory Fieldwork*

The fieldwork, scheduled by the Client, was carried out by EEGSL between 25th and 28th October 2022 and comprised:

- 1 No. 150 mm diameter borehole (designated CP01) was sunk to a depth of 20m below existing ground level, using a light cable percussion boring rig. With this type of rig boreholes are advanced by the percussive action of drill tools suspended on a winch-driven steel cable. The tools generally include a clay-cutter for penetrating fine-grained soils, and a shell for use in coarse-grained, or “granular”, soils. Representative disturbed samples were recovered as boring proceeded. In addition, “undisturbed” 100mm diameter samples (U100’s) were recovered, as appropriate, using standard thick-walled, open-drive samplers, with a steel cutting shoe, dynamically driven by a sliding hammer. Standard penetration tests (SPT’s) were conducted in suitable materials. Chiselling techniques were not required to penetrate the materials encountered. Details of groundwater conditions were noted and are indicated on the attached borehole logs included in Appendix 2. These observations relate only to the time of boring, and do not necessarily reflect possible seasonal fluctuations. They may have been affected by the installation of casing, or the addition of water to aid boring. A 50mm diameter standpipe was installed at a depth of 15m below ground level. Installation and backfill details are shown with the appropriate borehole logsheet in Appendix 2.
- To supplement the borehole investigation 4No. foundation pits were excavated to depths of between 0.6m and 1.5m below existing ground level, using hand tools, under the direct and continuous supervision of EEGSL. Representative disturbed samples were recovered from the excavated material as pitting proceeded. Details of ground and groundwater conditions were noted. The trial pits were backfilled immediately on completion of sampling and testing. Trial pit logs are included in Appendix 2.
- EEGSL carried out groundwater/gas monitoring in standpipes after the fieldwork period, the results of which are discussed in Section 6.1.3.

The fieldwork was carried out generally in accordance with BS 5930:2015 Code of Practice for Site Investigations, Eurocode 7, unless otherwise stated. The exploratory hole locations were determined on site by EEGSL and are shown approximately on the Exploratory Hole Location Plan overleaf.

Figure 6 - Exploratory Hole Location Plan



Each exploratory location was scanned using a Cable Avoidance Tool (CAT) in order to locate unrecorded underground services, and the exploratory locations were repositioned if necessary. On completion, all samples recovered from the site were taken to a specialist laboratory for testing.

All site investigation work was supervised full time by a representative of EEGSL. The logging of soils and rocks has been carried out in accordance with BS5930⁽²⁰¹⁵⁾ except where superseded by the soil and rock description methodology in BS EN14688-1⁽²⁰⁰²⁾, BS EN 14688-2⁽²⁰⁰⁴⁾ and BS EN 14689-1⁽²⁰⁰³⁾.

6.1.2 Laboratory Testing

A programme of laboratory testing was carried out on samples taken from the various strata to assist in classification and determine the engineering properties of the materials underlying the site. The testing was scheduled by EEGSL and carried out by Geo Site & Testing Services Ltd. The test procedures used were generally in accordance with the methods described in

BS1377:1990 and ISRM Methods. Details of the specific tests used in each case are given in Table 8 below.

Table 7 - Summary of Geotechnical Laboratory Tests Undertaken

TEST	STANDARD	No.
Moisture Content	BS1377:1990 Part 2, Clause 3.2	2
Liquid Limit, Plastic Limit, Plasticity Index	BS1377:1990 Part 2, Clause 4/5	2
Sulphate content of 2:1 soil:water extract	BS1377:1990 Part 3, Clause 5	4
pH value	BS1377:1990 Part 3, Clause 9	4
Triaxial tests - "Quick" undrained	BS1377:1990 Part 7, Clause 8	8

The environmental chemistry of the ground was investigated by specialist chemical analysis of selected samples, scheduled by EEGSL and carried out by Chemtest Ltd. Chemical analyses were carried out on 3 soil samples and were submitted for the following suite of determinants:

Asbestos Screen, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Thiocyanate, Sulphate (SO₄), Sulphide, pH, Sulphur, Soil Organic Matter, Phenol, Extractable Petroleum Hydrocarbons (EPH) and speciated Polyaromatic Hydrocarbons (PAH).

6.1.3 Ground Conditions Encountered

The sequence of strata encountered beneath the site was as follows:

- **Topsoil** – encountered in FP03, thickness 0.25m.
- **Made Ground** – Variable Made Ground was encountered in all the exploratory holes, comprising:
 - Asphalt (FP01 only), thickness 0.07m.
 - Paving slab (CP01 only), thickness 0.1m.
 - Gravelly Sand gravel of various lithologies including brick and concrete (All exploratory holes except FP03), thickness 0.15m to 0.40m.
 - Sandy clay with brick, concrete, (All exploratory holes except FP03) thickness 0.43m to 0.55m.
- **Claygate Member** was encountered in all the boreholes with the exception of FP03 and comprised:
 - Slightly silty Sandy CLAY.

The depths of the various materials encountered in each of the exploratory holes are summarised in Table 8 below.

Table 8 - Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m)						GROUND-WATER
	TOPSOIL	MADE GROUND				CLAYGATE MEMBER	
		Paving Slab	Asphalt	Gravelly sand	Sandy clay	Sandy CLAY	
CP01		GL – 0.10		0.10 – 0.50	0.50 – 1.00	1.00 – 20.00	8.50m
FP01			GL – 0.07	0.07 – 0.27	0.27 – 0.70	0.70 – 1.50	
FP02				GL – 0.15	0.15 – 0.70	0.70 – 1.10	
FP03	GL – 0.25					0.25 – 0.60	
FP04				GL- 0.35	0.35 – 0.80		

Underground man-made obstructions were not encountered during the investigation.

Groundwater was encountered at a depth of 8.5mbgl in CP01 within the Claygate Member. Subsequent monitoring of groundwater in standpipes indicated groundwater levels at depths ranging between 3.43m and 3.58m.

Results obtained during the monitoring visits indicated levels of Methane (CH₄) in the range 0% to 0.4% by volume, Carbon Dioxide (CO₂) in the range 5.0% to 5.5% by volume, and Oxygen (O₂) in the range 5.3% to 6.9% by volume. Hydrogen Sulphide levels of 0ppm and Carbon Monoxide levels ranging from 0ppm to 11ppm were recorded. Borehole pressures ranging from -0.35Pa to -11Pa and gas flows ranging from 0l/hr to -1.9l/hr were recorded. Atmospheric pressure was recorded in the range 980mb to 994mb.

Details of the existing foundation are summarised in the following table:

Table 9 - Existing Foundation Details

Location	Depth to Top of Foundation	Depth to Base of Foundation	Comments
FP01	0.2mbgl	1.30mbgl	Concrete foundation stepped 0.18m from wall.
FP02	0mbgl	0.60mbgl	Concrete foundation stepped 0.20m from wall.
FP03	0.27mbgl	0.45mbgl	Concrete foundation stepped 0.05m from wall.
FP04	0mbgl	0.60mbgl	Concrete foundation stepped 0.11m from wall overlaying 0.15m of brick, overlaying 0.2m of concrete.

No visual or olfactory evidence of contamination was identified in the exploratory holes during the investigation.

6.1.4 Engineering Properties of Soils Encountered

This section discusses the engineering properties of the strata encountered based on results of in situ testing and laboratory testing obtained during the investigation.

Table 11 overleaf summarises results of laboratory testing.

Table 10 - Summary of Laboratory Geotechnical Test Results

Location	Depth (m)	Strata	CLASSIFICATION						STRENGTH	CHEMICAL	
			Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Shear Strength (kN/m ²)	Water Soluble Sulphate (mg/l)	pH Value
CP01	1.2	CM	27	49	17	32					
CP01	2.0	CM	24	40	14	26					
CP01	4.5	CM								398	8.2
CP01	5.0	CM	14				1.98	1.73	57		
CP01	7.5	CM	7.7				2.00	1.85	97		
CP01	9.0	CM	11				2.05	1.85	126		
CP01	10.0	CM								322	8.2
CP01	11.5	CM	11				2.03	1.83	87		
CP01	13.5	CM	7.5				2.00	1.86	93		
CP01	15.0	CM	9.1				1.90	1.75	113	338	8.0
CP01	17.5	CM	12				1.94	1.73	142		
CP01	19.5	CM	12				2.05	1.83	149		
CP01	20.0	CM								102	8.2

CM = Claygate Member

Claygate Member

Atterberg Limit tests have given values of **liquid limit** in the range 40% to 49% and **plastic limit** values in the range 14% to 17%, resulting in values of **plasticity index** in the range 26% to 32%. These results suggest the samples tested are a clay of intermediate plasticity as shown on the Plasticity Chart included in the Appendices. For design purposes, a value of plasticity index = 31% is recommended, based on the upper quartile value of the results.

In accordance with NHBC Chapter 4.2 Building Near Trees⁽²⁰⁰³⁾ soils can be classified in terms of volume change potential. Based on the laboratory test results, the samples of Claygate Member are shown to have **medium volume change potential**.

SPT N values range from 8 to 38 and show a gradual increase with depth. These results suggest the clay is soft to firm becoming firm to stiff to very stiff with depth.

Triaxial tests give values of **undrained shear strength**, c_u , ranging from 57kN/m² to 149kN/m², suggesting the clay is firm to stiff and has medium to high strength.

Shear strength may also be estimated from a correlation by Stroud and Butler⁽¹⁹⁷⁵⁾: for a clay with a plasticity index of 31%, $c_u = 4.7 \times \text{SPT N value}$. Based on the above N values this correlation gives values of c_u in the range 38kN/m² to 179kN/m², suggesting the clay has low to very high strength.

Using all strength results, the following strength profile is recommended for design purposes:

- At 1.0m depth $c_u = 40\text{kN/m}^2$, increasing linearly to;
- $c_u = 155\text{kN/m}^2$ at 20.0m depth.

Effective stress strength parameters may also be obtained from correlations with plasticity index. For a plasticity index of 31%:

- BS8002⁽¹⁹⁹⁴⁾, Table 2 gives $\phi'_{crit} \approx 25^\circ$;
- Gibson⁽¹⁹⁵³⁾, gives $\phi_d = 26.2^\circ$.

Based on all the above, design values of $\phi' = 25^\circ$ and $c' = 0\text{ kN/m}^2$ are recommended.

Laboratory tests have given values of **water soluble sulphate** in the range 102mg/l to 398mg/l, together with **pH Values** in the range 8.0 to 8.2.

6.2 Foundations & Basement Assessment

6.2.1 Ground Conditions Encountered

The borehole has encountered Made Ground (thickness 1.0m) overlying soft to firm, becoming stiff with depth, sandy clay, proven to a maximum depth of 20.0mbgl. Groundwater was encountered at a depth of 8.5mbgl in CP01 during drilling. Subsequent monitoring indicated groundwater levels at depths ranging between 3.43m and 3.58mgl. Slightly elevated levels of land gas have been encountered.

6.2.2 Foundations

The proposed development may be founded on a system of ground beams spanning onto piles taken down into the stiff clay at depth.

A variety of pile types may be used, including bored and continuous flight auger (CFA) piles. Driven piles are unlikely to be suitable, due to noise/vibration constraints.

Because of the various advantages and limitations of each pile type, and the cost implications, advice should be sought from specialist piling contractors to determine the most suitable and cost-effective type. They should also be able to give recommended pile diameters and depths and likely pile capacities, with guaranteed performance. It is recommended a pile test be carried out to confirm pile capacities. In assessing the pile capacities, contractors should make an allowance for the effects of negative skin friction, particularly in the near surface Made Ground and soft clay.

There may be differential settlement between piled structures and the surrounding ground level. Provision should, therefore, be made to make up ground levels at threshold positions, loading bays, vehicle access doorways, etc. Alternatively, these materials should be removed and replaced in a controlled manner by suitable existing materials or imported engineered fill.

It is essential the advice of a specialist piling contractor is sought and that positive assurances are provided by the piling contractor that their proprietary system is capable of providing the required working loads in the ground conditions encountered.

6.2.3 Basement Construction

It is understood the basement walls will be formed using a secant piled wall.

The piles will need to be toed well into the underlying strata, to reduce settlements and resist rotation/uplift.

For design of basement walls, the coefficient of earth pressure at rest, K_0 should be taken in estimating earth pressures. Settlement will depend on the depth of toe-in and the material properties at the lower part of the piling. Settlement should be checked once the design is finalised.

Consideration should be given to how the retained material is drained in the basement. Normally weep holes would be incorporated into retaining structures to prevent build-up of pore water pressure. Clearly this will not be possible where the retaining wall forms part of a basement. In this case alternative methods of drainage will be required such as granular backfill with drainage pipes and pumps.

6.2.4 Chemical Attack on Buried Concrete

Chemical tests (see Appendices) show generally low levels of water soluble sulphates together with near neutral to slightly alkaline conditions. Based on these conditions, it is recommended that for buried concrete the Design Sulphate Class for the site, as defined in BRE Special Digest 1⁽²⁰⁰⁵⁾, be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification be taken as AC-1s.

6.2.5 Temporary Works

Formations will be susceptible to damage both by weather and trafficking, and should be protected immediately on exposure, particularly in areas where construction plant will access the site.

Excavations in the Made Ground are likely to be unstable and should be battered back to an angle of 1 in 2, or a system of close sheeting and shoring adopted to ensure stability, and in particular where personnel are required to enter excavations. All excavations should be adequately supported where personnel are required to enter.

Groundwater seepages could be encountered in basement excavations, depending on depth of excavation. Pumping of excavations from a suitable located sump will be required to keep excavations dry.

All natural materials on site should be capable of being excavated using conventional excavating machinery.

6.3 Contamination Risk Assessment

6.3.1 Soil Risk Assessment – Groundworkers During Development

To assess the risk of soil contamination to construction and ground workers during development, guidelines from the HSE Document 'Protection of workers and the general public during development of contaminated land'⁽¹⁹⁹¹⁾ are used. The document assesses soil contamination test results and classifies the site as being uncontaminated or contaminated with varying degrees of contamination from 'slight' to 'unusually heavy'.

The guideline values and laboratory test results are summarised in Table 11 overleaf.

Table 11 - Summary of Guideline Values for Protection of Workers and the General Public During Development of Contaminated Land

Contaminant	Typical Values* for:					Test Results	Class
	Uncontaminated Soils	Slight Contamination	Contaminated	Heavy Contamination	Unusually Heavy Contamination		
	Class A	Class B	Class C	Class D	Class E		
pH (acid)	6-7	5-6	4-5	2-4	<2	6.8	A
pH (alkaline)	7 - 8	8 - 9	9 - 10	10 - 12	12	7.8-9.1	A-C
Arsenic	0 - 30	30 - 50	50 - 100	100 - 500	500	8.8-19	A
Cadmium	0 - 1	1 - 3	3 - 10	10 - 50	50	<0.10-0.19	A
Chromium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	19-31	A
Copper	0 - 100	100 - 200	200 - 500	500 - 2500	2500	9.1-15	A
Lead	0 - 500	500 - 1000	1000 - 2000	2000 - 1%	1.0%	8.3-180	A
Mercury	0 - 1	1 - 3	3 - 10	10 - 50	50	<0.05-0.33	A
Nickel	0 - 20	20 - 50	50 - 200	200 - 1000	1000	11-20	A
Zinc	0 - 250	250 - 500	500 - 1000	1000 - 5000	5000	32-180	A
Boron	0 - 2	2 - 5	5 - 50	50 - 250	250	<0.40	A
Selenium	0 - 1	1 - 3	3 - 10	10 - 50	50	0.54-0.90	A
Barium	0-500	500-1000	1000-2000	2000-1.0%	1.0%	19-280	A
Beryllium	0 - 5	5 - 10	10 - 20	20 - 50	50	<0.5-0.8	A
Vanadium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	35-37	A
Sulphate	0 - 2000	2000 - 5000	5000 - 1%	1% - 5%	5.05%	110-1300	A
Sulphide	0 - 10	10 - 20	20 - 100	100 - 500	500	2.3-4.3	A
Cyanide (free)	0 - 1	1 - 5	5 - 50	50 - 100	100	<0.50	A
Coal Tar	0-500	500-1000	1000-2000	2000-1.0%	1.0%	15-13.3	-
Phenol	0 - 2	2 - 5	5 - 50	50 - 250	250	<0.10	A

Based on the above results there is a low potential risk from soil contamination to construction workers, ground workers and members of the public, and appropriate measures, such as PPE, site health plans, appropriate disposal of material arisings will mitigate any risk.

6.3.2 Soil Risk Assessment – Future Site Users

As part of the contamination assessment, the chemical results obtained by EEGSL have been screened against accepted compliance criteria, namely:

- Defra C4SL Health Criteria Values^(March 2014), where available; and
- Tier 1 assessment values - based on LQM/CIEH Sutable 4 Use Levels⁽²⁰¹⁵⁾ (S4ULs).

As a preliminary screening assessment, all results have been compared to residential end use criteria.

The comparison of results is summarised in Table 12 overleaf.

From Table 12 it can be the samples have levels of contamination below the guidance levels for residential end use.

Asbestos has not been encountered in any of the samples tested

Significantly elevated levels of **Total Petroleum Hydrocarbons** have not been encountered.

Table 12 - Soil Results Comparison with C4SL/S4UL Levels

Determinand	C4SL/S4UL Levels (mg/kg)*		CP01 0.0m	CP01 0.7m	CP01 3.0m	No of Exceedences
	Residential with homegrown produce (1)	Residential without homegrown produce (2)				
Metals						
Arsenic	37	40	19	8.8	9.4	0
Beryllium	1.7	1.7	0.6	< 0.5	0.8	0
Boron	290	11000	< 0.40	< 0.40	< 0.40	0
Cadmium	26	149	0.19	< 0.10	0.11	0
Chromium	910	910	19	27	31	0
Chromium VI	21	21	< 0.50	< 0.50	< 0.50	0
Copper	2400	7100	15	10	9.1	0
Lead	200	310	180	13	8.3	0
Mercury	1.2	1.2	0.33	< 0.05	< 0.05	0
Nickel	180	180	20	11	20	0
Selenium	250	430	0.54	0.71	0.90	0
Vanadium	410	1200	37	35	37	0
Zinc	3700	4000	180	32	44	0
Petroleum Hydrocarbons						
Benzene	0.87	0.38	<0.001	<0.001	<0.001	0
Toluene	130	880	<0.001	<0.001	<0.001	0
Ethylbenzene	47	83	<0.001	<0.001	<0.001	0
o-xylenes	60	88	<0.001	<0.001	<0.001	0
m-xylenes	59	82	<0.001	<0.001	<0.001	0
p-xylenes	56	79	<0.001	<0.001	<0.001	0
Polycyclic Aromatic Hydrocarbons						
Naphthalene	2.3	2.3	< 0.10	< 0.10	< 0.10	0
Acenaphthylene	170	2900	< 0.10	< 0.10	< 0.10	0
Acenaphthene	210	3000	< 0.10	< 0.10	< 0.10	0
Fluorene	170	2800	< 0.10	< 0.10	< 0.10	0
Phenanthrene	95	1300	0.78	< 0.10	< 0.10	0
Anthracene	2400	31000	0.32	< 0.10	< 0.10	0
Fluoranthene	280	1500	1.5	< 0.10	< 0.10	0
Pyrene	620	3700	1.5	< 0.10	< 0.10	0
Benz(a)anthracene	7.2	11	0.70	< 0.10	< 0.10	0
Chrysene	15	30	0.67	< 0.10	< 0.10	0
Benzo(a)pyrene	5.0	5.3	0.97	< 0.10	< 0.10	0
Benzo(b)fluoranthene	2.6	3.9	0.88	< 0.10	< 0.10	0
Benzo(k)fluoranthene	77	110	0.43	< 0.10	< 0.10	0
Indeno(1,2,3-cd)pyrene	27	45	< 0.10	< 0.10	< 0.10	0
Dibenz(a,h)anthracene	0.24	0.31	< 0.10	< 0.10	< 0.10	0
Benzo(ghi)perylene	320	360	< 0.10	< 0.10	< 0.10	0
Phenols						
Phenol	280	750	<0.10	<0.10	<0.10	0

6.3.3 Soil Waste Assessment

Environment Agency Technical Guidance WM3.1: Hazardous Waste; "Guidance on the classification and assessment of waste", May 2018, published by Environment Agency of England and Wales, SEPA, NIEA and Natural Resources Wales has been used to characterise soil materials.

HazWasteOnline™ a cloud-based software application for the management, analysis and reporting of hazardous waste materials has been used to make this assessment.

The Hazardous Waste Assessment confirms that the samples tested can be classified as **Non-Hazardous**.

6.3.4 Land Gas Assessment

Results of monitoring suggest the site can be given a characteristic situation of (2) i.e. 'low risk'. Low level gas protection measures will be required.

6.4 Ground Contamination Conclusions and Recommendations

Based on available soil contamination test results there is a low potential risk from soil contamination to construction workers and ground workers during development and appropriate measures such as PPE, site health plans, appropriate disposal of material arisings will mitigate any risk. The groundworks contractor must provide a soil management plan including methods of dealing with unanticipated soil contamination encountered during groundworks.

As discussed in the above sections, the contamination tests indicate generally low concentrations of the potential contaminants, below the recommended levels for residential end use with and without homegrown produce. Based on these results, remediation of soils will not be required on site.

Soils should be disposed of at a suitable site, registered to take the levels of contamination encountered. All samples tested have been classified as Non-Hazardous in accordance with Environment Agency guidance WM3.1.

Based on results of monitoring, land gas protection measures will be required. Radon protection measures will not be required.

Based on the results of laboratory testing it is considered non-standard materials are likely to be required for new water pipes.

As with all construction sites, personnel working on the site during the construction period should be encouraged to maintain a high standard of personal hygiene and on-site washing facilities should be available.

Due diligence is required during the construction period, and should any further evidence of contamination be found, appropriate investigation and / or action should be taken. The significance of any contamination not discovered by this investigation is outside the scope of this report.

7.0 CONSTRUCTION METHODOLOGY

7.1 Outline Geotechnical Design Parameters

The basement will be formed mainly in the Claygate member (sandy clay).

The following design parameters are recommended for the superficial deposits, based on in-situ and laboratory tests carried out during the ground investigation.

Table 13 - Geotechnical Design Parameters

Strata	Property	Design Value
Claygate Member	Plasticity Index	31%
	Volume Change Potential	Medium
	Bulk Density*	2.00Mg/m ³
	Shear Strength	At 1.0m depth $c_u = 40\text{kN/m}^2$, increasing linearly to $c_u = 155\text{kN/m}^2$ at 20.0m depth.
	Effective shear strength	$c' = 0\text{kN/m}^2$, $\phi' = 25^\circ$
	Water Soluble Sulphate (SO ₄)	398mg/l

7.2 Outline Temporary & Permanent Works Proposals

The basement walls will be formed using piled foundations, which will act as retaining structures.

Given the access constraints on site it will not be possible to batter excavation slopes to provide stability, therefore vertically sided excavations will be required. These should be adequately supported using either a system of sheeting and shoring or piling to provide stability. Piles will need to be toed well into the underlying stiff clays, to reduce settlements and resist uplift.

It is essential both temporary and permanent support works are designed by a suitable qualified Engineer.

7.3 Ground Movement and Damage Impact Assessment

When the basement is excavated the reduction in pressure on the soils could give rise to heave as the clay tries to expand vertically to be restored back to what it was prior to being compressed in the past.

The calculation of potential heave in excavations will depend on factors such as shape/dimensions of the excavation, depth of excavation, strength and density of the alluvial soils and also types/methods of support in the excavation. At the time of writing the details of the basement were not known and it is therefore recommended assessment of heave is carried out as part of the design process, once the dimensions/details for the basement are confirmed.

Providing excavations are adequately supported, instability and damage to adjacent ground/structures will be kept to a minimum.

All excavations will require protection from the adverse effects of weather and in particular rainfall, which could cause softening of exposed excavation surfaces.

7.4 Control of Construction Works

All construction works should be supervised and carried out by suitably qualified personnel.

It is recommended any structures on adjacent sites, close to the site boundary, are monitored for signs of movement/instability during the construction period. A programme of monitoring should be included in the Construction Plan for the site.

It is likely the Local Authority will require a 'Considerate Construction' approach to the development. The Council expects contractors to minimise noise nuisance, dust, debris, clean and safe pavements and driveways, safe movement of pedestrians, safeguarding access for emergency vehicles, avoidance of inconvenient construction times and sequences to local residents. The Council will use its powers under the Control of Pollution Act to control noise from demolition and construction sites. As a general guide, the Council will likely limit the times at which demolition and construction can take place, such that any works which can be heard outside the site boundary must only be carried out: Monday to Friday 8.00am to 6.00pm; Saturday 8.00am to 1.00pm; and, not at all on Sundays, Public and Bank Holidays.

8.0 BASEMENT IMPACT ASSESSMENT

This section of the report addresses the potential impacts identified in the scoping assessment and the relevant findings of the ground investigation and mitigation measures, where required.

8.1 Shrink-Swell Subsidence

Potential Impacts: Potential for soil heave/shrinkage is moisture content regime is changed in soils beneath the site due to construction of basement.

Ground Investigation Findings: Clay has medium volume change potential influenced by change in moisture content. Ground Investigation encountered groundwater at 8.5m depth.

Risk: **Moderate to Low.** Excavation and construction will likely be within these soils, potentially changing groundwater conditions.

Mitigation Measures: All exposed excavations to be protected from effects of weather to avoid moisture content changes and softening.

8.2 Surrounding Structures

Potential Impacts: Excavation of a basement could result in structural damage to the roads/footways, buried services or adjacent structures (including boundary walls and dwellings). Effects mitigated at design stage. Basement could undermine or de-stabilise existing roads close to the site boundary.

Ground Investigation Findings: There is a public footpath and road located along the northern boundary of the site and buildings immediately adjacent to the site. The site is underlain by variable Made Ground and superficial clay/gravel. Vertically sided excavations will require support during excavation.

Risk: **Moderate.** Excavation could cause instability in adjacent ground and structures unless adequately supported.

Mitigation Measures: Construction methods to allow for suitable support of excavation sides. Monitoring of adjacent ground and structures for instability to be carried out during the construction period.

8.3 Flooding

Potential Impacts: The basement could be inundated with flood waters.

Ground Investigation Findings: The site is located within a Flood Zone 1 with a low risk from flooding from rivers/sea. The site is not located within an area with a significant risk from surface water flooding.

Risk: **Low/Negligible**

Mitigation Measures: None required other than temporary protection from surface run-off during rainfall.

APPENDIX 1

FLOODVIEW REPORT

26, SHELDON AVENUE, HORNSEY, LONDON, N6 4JT

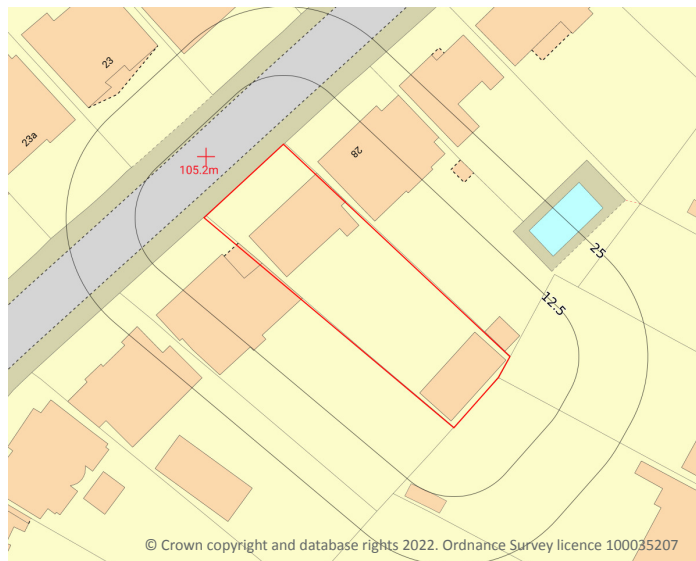
Overall Flood Risk



NEGLECTIBLE

Complies with relevant Law Society practice notes on flood risk in property transactions.

Site plan



Search Results



Rivers and the Sea
Very Low



Historic Flood
Not identified



Flood Defences
No



Surface Water
Negligible



Groundwater
Negligible



FloodScore™ insurance rating
Very Low



NPPF Requirements

page 2

Full assessments for other environmental risks are available in other Groundsure searches including Groundsure Review report. Contact Groundsure or your search provider for further details.

Overview of findings and recommendations

To save you time when assessing the report, we only provide maps and data tables of features within the search radius that we have identified to be of note. These relate to environmental risks that may have liability implications, affect insurance premiums, property values and/or a lender's willingness to lend.

You can view the fully comprehensive library of information we have searched on **page 4**.



Flooding

National Planning Policy Framework (NPPF)

A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use. The NPPF states that the flood risk assessment should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account. Those proposing developments should take advice from the emergency services when producing an evacuation plan for the development as part of the flood risk assessment.



Datasets searched

This is a full list of the data searched in this report. If we have found results of note we will state "Identified". If no results of note are found, we will state "Not identified". Our intelligent filtering will hide "Not identified" sections to speed up your workflow.

Flooding

Risk of flooding from rivers and the sea	Not identified
Flood storage areas: part of floodplain	Not identified
Historical flood areas	Not identified
Areas benefiting from flood defences	Not identified
Flood defences	Not identified
Proposed flood defences	Not identified
Surface water flood risk	Not identified
Groundwater flooding	Not identified

Flood information

The Flood Risk Assessment section is based on datasets covering a variety of different flooding types. No inspection of the property or of the surrounding area has been undertaken by Groundsure or the data providers. The modelling of flood hazards is extremely complex and in creating a national dataset certain assumptions have been made and all such datasets will have limitations. These datasets should be used to give an indication of relative flood risk rather than a definitive answer. Local actions and minor variations, such as blocked drains or streams etc. can greatly alter the effect of flooding. A low or negligible modelled flood risk does not guarantee that flooding will not occur. Nor will a high risk mean that flooding definitely will occur. Groundsure's overall flood risk assessment takes account of the cumulative risk of river and coastal data, historic flood events and areas benefiting from flood defences provided by the Environment Agency/Natural Resources Wales (in England and Wales) and surface water (pluvial) and groundwater flooding provided by Ambiantal Risk Analytics. In Scotland the river and coastal flood models are also provided by Ambiantal Risk Analytics.

Risk of flooding from rivers and the sea

This is an assessment of flood risk for England and Wales produced using local data and expertise, provided by the Environment Agency (RoFRaS model) and Natural Resources Wales (FRAW model). It shows the chance of flooding from rivers or the sea presented in categories taking account of flood defences and the condition those defences are in. The model uses local water level and flood defence data to model flood risk.

The categories associated with the Environment Agency and Natural Resources Wales models are as follows:

RoFRaS (rivers and sea) and FRAW (rivers):

Very Low - The chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.

Low - The chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

Medium - The chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.

High - The chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

FRAW (sea):

Very Low - The chance of flooding from the sea is considered to be less than 1 in 1000 (0.1%) in any given year.

Low - The chance of flooding from the sea is considered to be less than 1 in 200 (0.5%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

Medium - The chance of flooding from the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 200 (0.5%) in any given year.

High - The chance of flooding from the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

Historic flood events

Over 86,000 events are recorded within this database. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that Environment Agency/Natural Resources Wales do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

Surface water flooding

Ambiantal Risk Analytics surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or "pluvial" flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1000 year rainfall events. The flood risks for these rainfall events are reported where the depth would be greater than the threshold for a standard property to modern building standards. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

Proposed flood defences

The data includes all Environment Agency/Natural Resources Wales's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards.

Flood storage areas

Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and Environment Agency/Natural Resources Wales, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

Groundwater flooding

Groundwater flooding is flooding caused by unusually high groundwater levels. It occurs as excess water emerging at the ground surface or within underground structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and it can result in significant damage to property. This risk assessment is based on a 5m Digital Terrain Model (DTM) and 1 in 100 year and 1 in 250 year return periods.



Conveyancing Information Executive and our terms & conditions

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Groundsure Ltd, Sovereign House, Church Street, Brighton, BN1 1UJ. Tel: 08444 159 000. Email: info@groundsure.com. Groundsure adheres to the Conveyancing Information Executive Standards.

The Standards

- Conveyancing Information Executive Members shall act in a professional and honest manner at all times in line with the Conveyancing Information Executive Standards and carry out the delivery of the Search with integrity and due care and skill.
- Compliance with the Conveyancing Information Executive Standards will be a condition within the Conveyancing Information Executive Member's Terms and Conditions.
- Conveyancing Information Executive Members will promote the benefits of and deliver the Search to the agreed standards and in the best interests of the customer and associated parties.

Complaints Advice

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure.

If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Standards.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs.

COMPLAINTS PROCEDURE: If you want to make a complaint, we will:

- acknowledge it within 5 working days of receipt
- normally deal with it fully and provide a final response, in writing, within 20 working days of receipt
- liaise, at your request, with anyone acting formally on your behalf

Complaints should be sent to:

Operations Director, Groundsure Ltd, Sovereign House, Church Street, Brighton, BN1 1UJ. Tel: 08444 159 000. Email: info@groundsure.com If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk We will co-operate fully with the Ombudsman during an investigation and comply with their final decision.

Groundsure's Terms and Conditions can be viewed online at this link: <https://www.groundsure.com/terms-and-conditions-jan-2020/>

Important consumer protection information

All of the advice and reports that Groundsure produces are covered by a comprehensive Remediation Contribution policy to ensure customers are protected, see <https://www.groundsure.com/remediation> for full details.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information in your Floodview report. To find out who they are and their areas of expertise see <https://www.groundsure.com/sources-reference>.

APPENDIX 2

EXPLORATORY HOLE LOGS

Percussion Drilling Log

Project Name: 26 Sheldon Avenue		Client: qR Architects Ltd		Date: 25/10/2022 - 27/10/2022	
Location: 26 Sheldon Avenue, London, N6 4JT		Contractor: DJR Geotechnical Drilling Ltd			
Project No. : B2538		Crew Name: DJR		Drilling Equipment: Dando 150	
Borehole Number CP01	Hole Type CP	Level	Logged By CA	Scale 1:25	Page Number Sheet 1 of 5

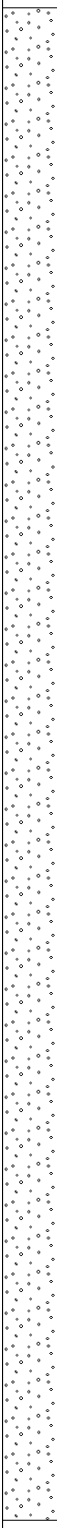
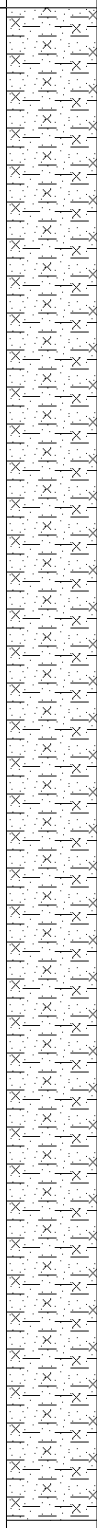
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.50	B ES		0.10			MADE GROUND: Paving Slab	1
		0.50 - 1.20	B		0.50			MADE GROUND: Yellow brown fine to coarse SAND with large fragments of red brick and concrete.	
		0.70 - 1.00	D ES		1.00			MADE GROUND: Brown/orange mottled grey sandy CLAY with large fragments of red brick. Sand is fine to coarse.	
		1.20	SPT	N=8 (1,1/1,2,2,3)				Brown mottled grey slightly silty sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	
		1.30	D						
		2.00	D SPT	N=11 (1,1/2,3,3,3)				...becoming brown mottled dark yellow and very sandy.	
		2.00							
		3.00	D ES						
		3.00	SPT	N=15 (1,2/3,4,4,4)					
		3.00							
		4.00	D B		4.00			Friable firm to very stiff dark grey slightly silty very sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	4
		4.00 - 5.00	SPT	N=12 (1,2/2,3,3,4)					
		4.00							5
		4.50	D ES						
		4.50							5
		5.00 - 5.45	UT						

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		11.00	150								

Remarks Hand dug pit to 0.50mbgl. Groundwater was encountered at 8.50mbgl.										 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Percussion Drilling Log

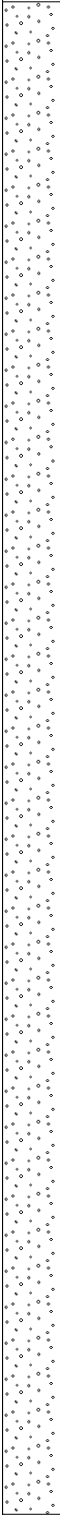
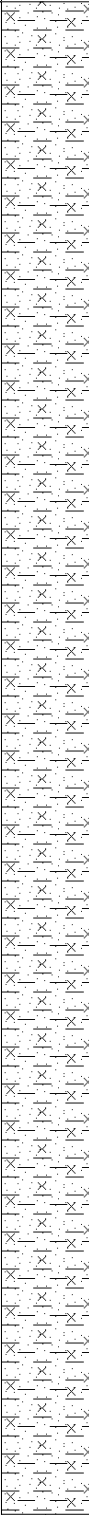
Project Name: 26 Sheldon Avenue		Client: qR Architects Ltd		Date: 25/10/2022 - 27/10/2022	
Location: 26 Sheldon Avenue, London, N6 4JT		Contractor: DJR Geotechnical Drilling Ltd			
Project No. : B2538		Crew Name: DJR		Drilling Equipment: Dando 150	
Borehole Number CP01	Hole Type CP	Level	Logged By CA	Scale 1:25	Page Number Sheet 2 of 5

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		6.00 6.00	D SPT	N=17 (2,3/4,4,4,5)				Friable firm to very stiff dark grey slightly silty very sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	6
		6.50	ES						
		7.00 7.00 - 7.45	D UT						7
		7.50	D						
		8.00 8.00	D SPT	N=16 (2,2/3,4,4,5)					8
		8.50	ES						
		9.00 9.00 - 9.45	D UT						9
		9.50	D						
		10.00	D						10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		11.00	150								

Remarks Hand dug pit to 0.50mbgl. Groundwater was encountered at 8.50mbgl.										 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.00	SPT	N=20 (3,3/4,5,5,6)				Friable firm to very stiff dark grey slightly silty very sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	
		10.50 10.50	D ES						
		11.00 11.00 - 11.45	D UT						
		11.50	D						
		12.00 12.00 12.00	D ES SPT	N=22 (3,4/5,5,5,7)					
		13.00 13.00 13.00 - 13.45	D ES UT						
		14.00 14.00 14.00	D ES SPT	N=24 (3,4/5,6,6,7)					
		15.00	D						

Remarks Hand dug pit to 0.50mbgl. Groundwater was encountered at 8.50mbgl.	 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Percussion Drilling Log

Project Name: 26 Sheldon Avenue		Client: qR Architects Ltd		Date: 25/10/2022 - 27/10/2022	
Location: 26 Sheldon Avenue, London, N6 4JT		Contractor: DJR Geotechnical Drilling Ltd			
Project No. : B2538		Crew Name: DJR		Drilling Equipment: Dando 150	
Borehole Number CP01	Hole Type CP	Level	Logged By CA	Scale 1:25	Page Number Sheet 4 of 5

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		15.00	ES					Friable firm to very stiff dark grey slightly silty very sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	16
		15.00 - 15.45	UT						
		15.50	D						
		16.00	D						
		16.00	ES	N=27 (4,5/6,7,7,7)					
		16.00	SPT						
		17.00	D						17
		17.00	ES						
		17.00 - 17.45	UT						
		17.50	D						
		18.00	D	N=38 (4,6/8,10,10,10)				...with rare shell fragments.	18
		18.00	ES						
		18.00	SPT						
		19.00	D						19
		19.00 - 19.45	UT						
		19.50	D						
		20.00	D						
		20.00			20.00				20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		11.00	150								

Remarks Hand dug pit to 0.50mbgl. Groundwater was encountered at 8.50mbgl.										 EARTH ENVIRONMENTAL & GEOTECHNICAL
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EARTH ENVIRONMENTAL
& GEOTECHNICAL

		Trial Pit Log												
Project Name: 26 Sheldon Avenue					Client: qR Architects Ltd					Date: 26/10/2022				
Location: 26 Sheldon Avenue, London, N6 4JT					Contractor: DJR Geotechnical Drilling Ltd									
Project No. : B2538					Crew Name:					Equipment:				
Location Number FP01			Location Type IP		Level		Logged By			Scale 1:10		Page Number Sheet 1 of 1		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.07 - 0.27	ES		0.07			MADE GROUND: Asphalt	1					
								MADE GROUND: Yellow gravelly fine to coarse SAND with fragments of red brick, asphalt and concrete. Gravel is subangular-subrounded fine-coarse of flint						
		0.30	ES		0.27			MADE GROUND: Brown orange sandy CLAY with fragments of red brick. Sand is fine to coarse.						
								MADE GROUND: Brown orange sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).						
		1.00	ES		0.70				2					
					1.50			End of Borehole at 1.500m						

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

Remarks

No groundwater was encountered.



Trial Pit Log

Project Name: 26 Sheldon Avenue		Client: qR Architects Ltd		Date: 26/10/2022	
Location: 26 Sheldon Avenue, London, N6 4JT		Contractor: DJR Geotechnical Drilling Ltd			
Project No. : B2538		Crew Name:		Equipment:	
Location Number FP02	Location Type IP	Level	Logged By	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.15	ES		0.15			MADE GROUND: Black clayey fine to coarse SAND with fragments of red brick and concrete.	1
								MADE GROUND: Brown/orange mottled pale grey sandy CLAY with fragments of red brick and concrete. Sand is fine to coarse.	
		0.50	ES		0.70				
		0.80 0.80	D ES					Brown /orange mottled pale grey sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	
					1.10			End of Borehole at 1.100m	2

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

Remarks No groundwater was encountered.								 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Trial Pit Log

Project Name: 26 Sheldon Avenue		Client: qR Architects Ltd		Date: 26/10/2022	
Location: 26 Sheldon Avenue, London, N6 4JT		Contractor: DJR Geotechnical Drilling Ltd			
Project No. : B2538		Crew Name:		Equipment:	
Location Number FP03	Location Type IP	Level	Logged By	Scale 1:10	Page Number Sheet 1 of 1

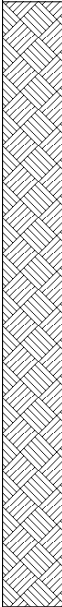
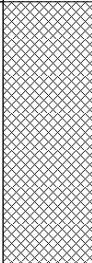
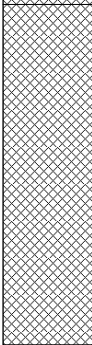
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			TOPSOIL: Dark brown slightly clayey fine to coarse SAND.	
								Brown/orange mottled pale grey sandy CLAY. Sand is fine to coarse. (CLAYGATE MEMBER).	
		0.60 0.60	D ES		0.60			End of Borehole at 0.600m	
									1
									2

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

Remarks No groundwater was encountered.							 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Trial Pit Log

Project Name: 26 Sheldon Avenue		Client: qR Architects Ltd		Date: 26/10/2022	
Location: 26 Sheldon Avenue, London, N6 4JT		Contractor: DJR Geotechnical Drilling Ltd			
Project No. : B2538		Crew Name:		Equipment:	
Location Number FP04	Location Type IP	Level	Logged By	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.35	ES					MADE GROUND: Dark brown/black clayey fine to coarse SAND with fragments of glass, red brick, concrete, metal and asphalt.	
		0.40	ES		0.35			MADE GROUND: Brown/orange sandy CLAY with fragments of asphalt and red brick. Sand is fine to coarse.	
					0.80			End of Borehole at 0.800m	
									1
									2

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

Remarks

No groundwater was encountered.

APPENDIX 3

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with 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, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2022 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.