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Description	Basement Impact Assessment.
Site	8 Hughes Road, Hayes, UB3 3AN
Reference	A496.20a
Status	Final
Client	CONSTRUCTION SERVICES MANAGEMENT LIMITED
Issue date	28/02/2020

Prepared and Reviewed by

Name	Paolo Pitasi <i>Paolo Pitasi</i>
Position	Chartered Engineer and BGA membership;
Date	07/03/2020



- **1. INTRODUCTION**

1.1 CONSTRUCTION SERVICES MANAGEMENT LIMITED commissioned this Basement Impact Assessment (BIA) as a supporting document to the planning application for the proposed basement at 8 Hughes Road, Hayes, UB3 3AN. The local planning authority is the London Borough of Hillingdon.

1.2 This document states that the assessment should address the impact of proposals on surface water flow and flooding, groundwater flow and structural stability, as well as the cumulative effect on the surrounding area, and identify suitable construction methods and mitigation measures, and a method for monitoring local ground conditions, water movement, subsidence, and drainage.

- **2.0 TOPOGRAPHIC SETTING.**

2.1 The new residential redevelopment is in an area relatively flat, with no significant topographical features located within the suburban area of constituency of Townfield ward/electoral division, which is part of the London Borough of Hillingdon

2.2 The surrounding areas were found to be generally residential or commercial.

2.3 The new property has the entrance from the Hughes Road which is in a road consisting mostly of semi-detached properties of similar design.

- **3.0 PLANNING SEARCHES (HISTORICAL MAPS).**

The Old maps online indicate that:

3.1 Map published in the year 1897 the area was open land.



3.2 Map published in the year 1914 the area was open land.



3.2 Map published in the year 1920 the area was open land.



3.4 Map published in the year 1936: the area was developed with semi-detached houses which remains unchanged over the years.



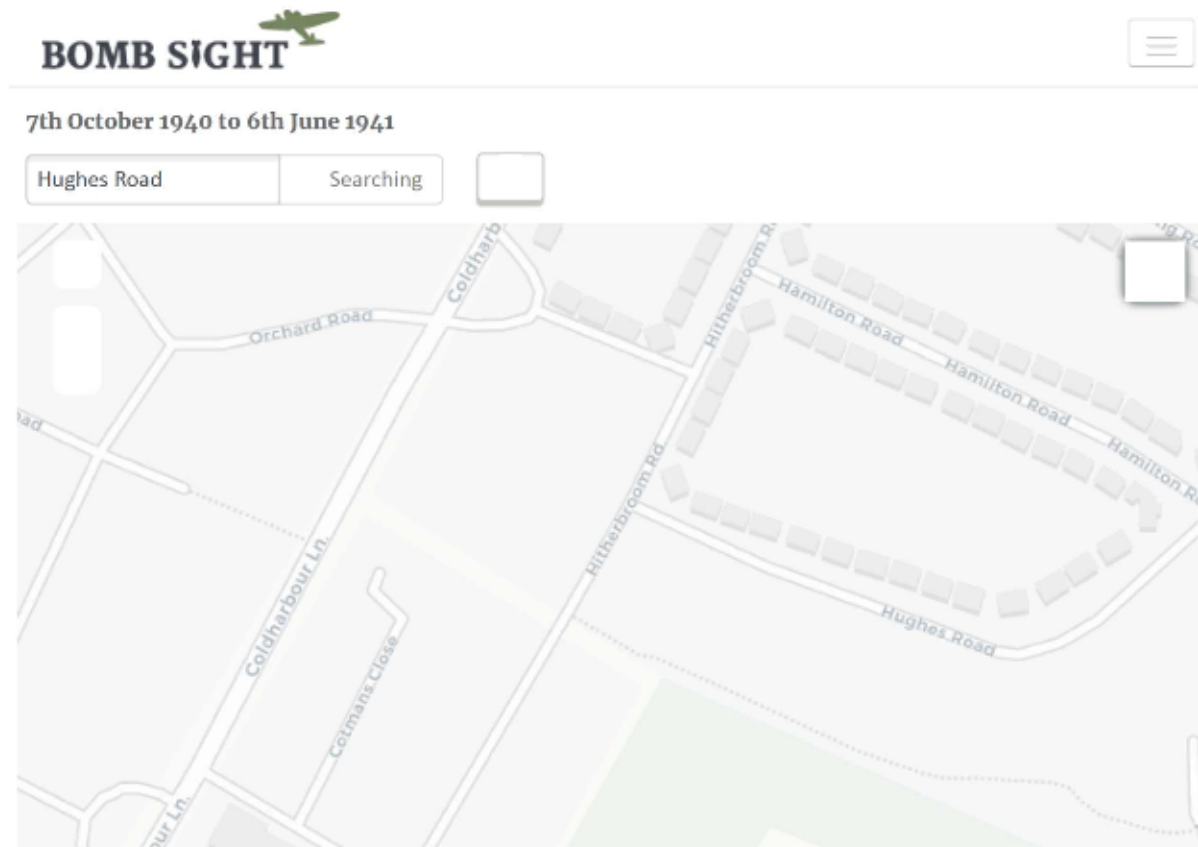
3.3 Ariel photographs of the location from google maps, confirm this.

Aerial photograph taken from google map.



- **4.0 PLANNING SEARCHES: BOMB DAMAGE MAPS**

4.1 The London County Council Bomb Damage Map for this area indicates that no properties within 50m of n. 8 Hughes Road, Hayes, UB3 3AN did not suffered any bomb damage.



- **5.0 GEOLOGICAL SETTING.**

5.1 The published BGS Geological mapping 1:50000 indicates:

- Superficial deposit: Langley Silt Member - Clay and Silt.
- Bedrock is formed by London Clay Formation - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period.

5.2 Langley Silt Member: Varies from silt to clay, commonly yellow-brown and massively bedded.

5.3 The London Clay Formation is well documented (e.g. Ellison et al., 2004) as consisting of over-consolidated, firm to very stiff, grey to blueish grey, fissured, bioturbated, slightly calcareous, silty to very silty clay. It contains well-graded beds of clayey silt to fine silty sand, pyrite, and various sized carbonate concretions (claystone).

5.4 The London Clay formation is of high or very high plasticity and high-volume change potential. As a result, the clays undergo considerable volume changes in response to variations in natural moisture content (they shrink on drying and swell on subsequent

rehydration). These changes can occur seasonally in response to normal climatic variations to depths of up to 1.5m, and much greater depths in the presence of trees whose roots abstract moisture from the clays. The clays will also swell when unloaded by excavations such as those required for the construction of basements.

The London clay formation is a high sulphate content due to the included selenite, and sulphate resisting cement should be used for the basement construction.

The London Clay Formation is classified as unproductive strata with soils that have a low permeability and negligible significance to local water supply, as defined by the Environment Agency (EA).

5.5 A ground investigation report was performed by SUB SURFACE SOUTH EAST LIMITED at January 2018 ref. n.SE1433.

Three mini boreholes were put down to depths of between 2.15m and 3.58m which confirms as reported on the BGS Geological mapping 1:50000.

In fact, the exploratory holes found localized made ground then natural cohesive and granular strata.

No groundwater was encountered in any of the exploratory holes.

5.6 The full report is attached at the end reporting all the outputs of the field and laboratory testing.

• **6.0 HYDROLOGICAL SETTING (SURFACE WATER FLOODING)**

6.1 The Environment Agency (EA) published a new map of 'Risk of Flooding from Surface Water' on their website in January 2014; This map identifies four levels of risk (high, medium, low, and very low).

6.2 The EA's definitions of the categories are:

'Very low' risk: Each year, these areas have a chance of flooding of less than 1 in 1000 (0.1%).

'Low' risk: Each year, these areas have a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)

'Medium' risk: Each year, these areas have a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).

'High' risk: Each year, these areas have a chance of flooding of greater than 1 in 30 (3.3%).

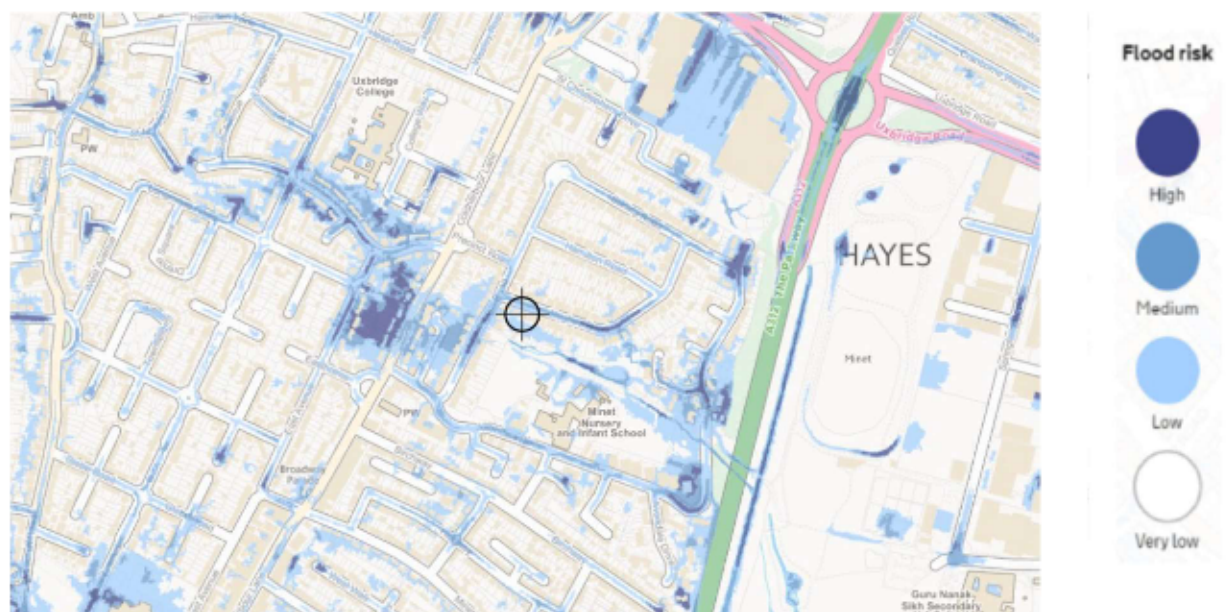
6.3 This modelling indicates that the area at n. 8 Hughes Road, Hayes, UB3 3AN has very low risk of flooding from rivers or sea and medium risk from surface water.

Surface water flooding, sometimes known as flash flooding:

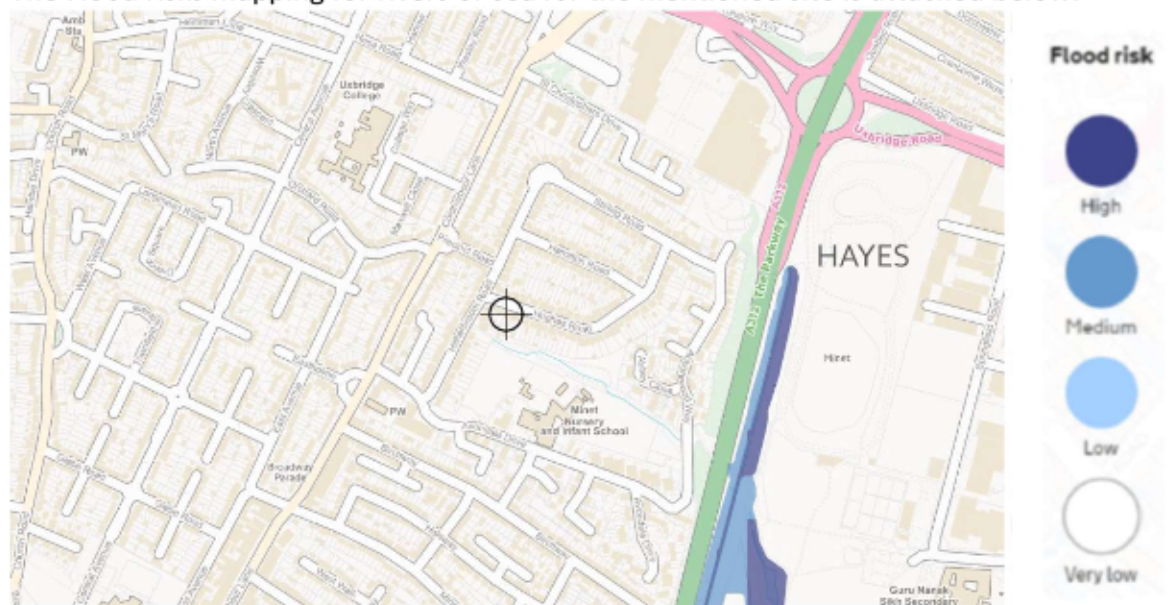
- happens when heavy rain cannot drain away
- is difficult to predict as it depends on rainfall volume and location
- can happen up hills and away from rivers and other bodies of water
- is more widespread in areas with harder surfaces like concrete

Lead local flood authorities (LLFA) Hillingdon council are responsible for managing the flood risk from surface water.

The Flood risks mapping for surface water for the mentioned site is attached below:



The Flood risks mapping for rivers or sea for the mentioned site is attached below:



• **7.0 HYDROGEOLOGICAL SETTING (GROUNDWATER)**

7.1 Examining the increased potential for elevated Ground water map, the site was not at risk from groundwater flooding. As the three exploratory boreholes mentioned in the Ground investigation report, indicate a superficial granular deposit overlying the London Clay, a perched groundwater could create in this stratum that could affect the basement. For which a suitable drainage system will have to be designed to protect the basement from this type of issue.



Legend

	Borough Administrative Boundary		
	Main River		Culverted Watercourse (Main River)
	Ordinary Watercourse		Groundwater Flood Incident (EA Records)
	Groundwater Flood Incident (Other Records)		Permeable Superficial Deposits
			Consolidated Aquifers

Notes

1. The increased Potential for Elevated Groundwater map shows those areas within the London Boroughs where there is an increased potential for groundwater to rise sufficiently to interact with the ground surface or be within 2 m of the ground surface. Such groundwater rise could lead to the following consequences:
 - flooding of basements of buildings below ground level;
 - flooding of buried services or other assets below ground level;
 - inundation of farmland, roads, commercial, residential and amenity areas;
 - flooding of ground floors of buildings above ground level; and
 - overflowing of sewers and drains.
2. Incident records shown are generally unconfirmed and may include issues such as water main bursts or non-groundwater related problems.
3. Areas not shown to have increased potential for elevated groundwater should be considered to have a low potential for elevated groundwater – Lack of information does not imply 'no potential' of elevated groundwater in that area.
4. Includes groundwater flood mapping provided by JBA Consulting
Copyright © Jeremy Benn Associates Limited 2008 - 2011, partially derived from data supplied by the Environment Agency

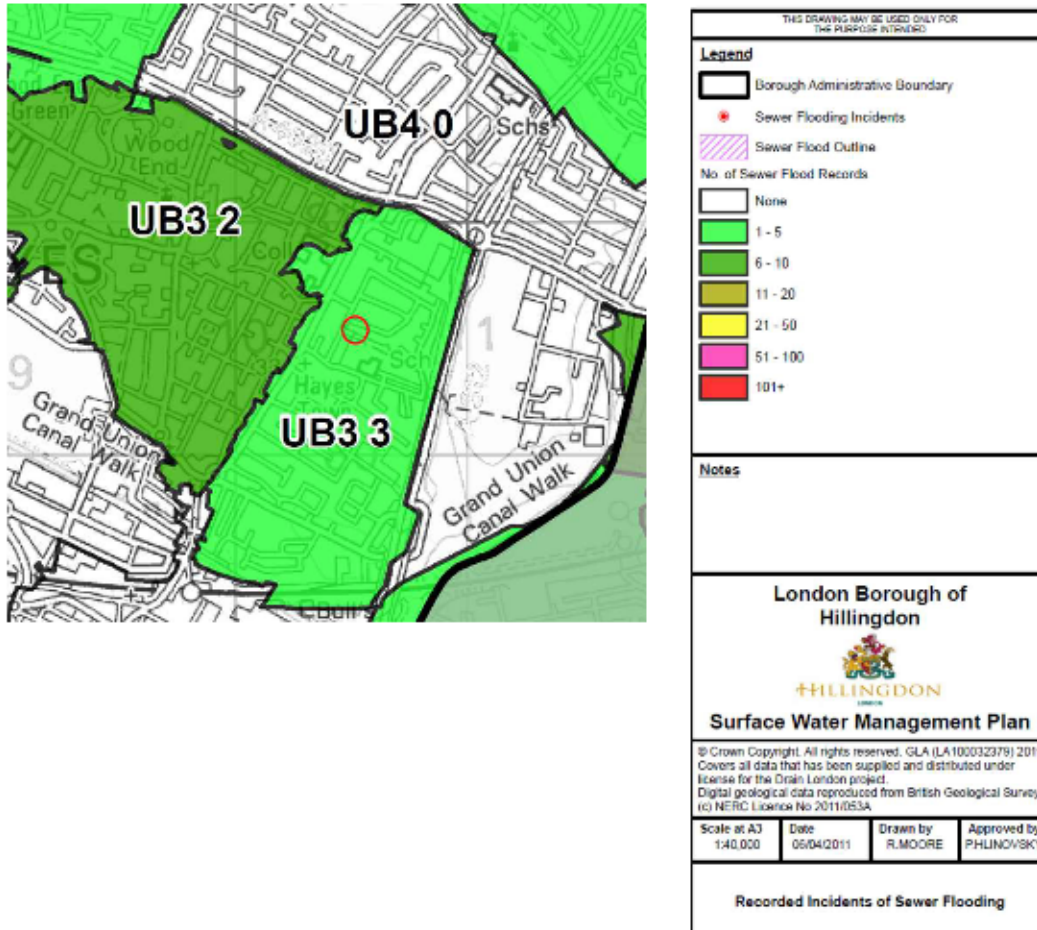
London Borough of Hillingdon



- **8.0 Flooding from Sewers**

8.1 The recorded incidents of Sewer Flooding map indicate that n. 8 Hughes Road, Hayes, UB3 3AN suffered between 1 to n.5 sewer flooding incidents.

For which a suitable drainage system will have to be designed to protect the basement from this type of issue.



- **9.0 IMPACT WITH EXISITING TREES.**

9.1 The basement construction will not be affected by the existing trees because its foundation base is placed at a suitable depth.

- **10.0 RAILWAYS, TUNNELS, AND UNDERGROUND STRUCTURE**

10.1 Railways, underground tunnels for transport do not pass below or close to the site.

10.2 Other underground infrastructure as human-made cavities under the main drainage, sewers, cables or communications might be present within the zone of influence of the proposed basement, so an appropriate services/utility search should be undertaken before carrying out the construction of the basement. If any such infrastructure is identified, then its potential influence on the proposed basement must be assessed.

- **11.0 LANDSLIDES**

11.1 The topography of the site and the surrounding land is relatively flat for which slope instability problems are unlikely to be present and no actions required to avoid problems due to landslides.

- **12.0 SHRINKING /SWELLING CLAYS.**

12.1 Below the outputs of the laboratory tests on soil samples of the superficial cohesive deposit are represented which were carried out to determine its susceptibility to shrinkage and swelling which classifies the soil as CL Low plasticity clay.

No tests were performed on the bedrock although London clay is typically clay with a high shrinkage potential.

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel: (01772) 501135 Fax: (01772) 204907							Laboratory Test Results						
Site : 8 HUGHES ROAD, HAYES, GREATER LONDON												Job Number SE1433	
Client : CONSTRUCTION SERVICES MANAGEMENT LIMITED												Sheet 1 / 1	
Engineer:													
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY AND LIQUIDITY INDEX													
Borehole/ Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Group Symbol	Laboratory Description		
				Percentage %	Moisture Content %								
M1	1.10	D	19	98	19	31	14	17	0.29	CL	Brown slightly sandy CLAY.		
M2	0.90	D	22	87	25	35	17	18	0.44	CL/CI	Brown mottled orange sandy gravelly CLAY.		
M3	0.80	D	22	92	24	29	17	12	0.58	CL	Orange to brown silty CLAY.		

- **13.0 PROPOSED NEW DEVELOPMENT AND IMPACT WITH THE EXISTING NEIGHBOURING SUPERSTRUCTURE**

13.1 The development of the basement may impact on adjacent properties if mitigating measures and appropriate temporary and permanent design are not undertaken. Care should be taken to design a retention system that always maintains stability to all adjacent structures during the works. It would be prudent to investigate the depth of foundations of the adjacent property before construction. It would be prudent to undertake a structural condition survey of adjacent properties on both sides of the site before work commences. This should be covered by the Party Wall Surveyor.

The proposed basement will be built far from a boundary wall about 1.0m. Lateral 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 boundary wall.

- **14.0 Underground Concrete.**

Below the outputs of the laboratory chemicals tests on soil samples of the superficial cohesive deposit are represented which were carried out to determine its sulphate content. As the soil contains less than 0.5 g/L of soluble sulphate it can be categorised as a class 1 site in accordance with the BRE Digest and as such the concrete in contact with this subsoil needs no special precautions.



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel: (01772) 581135 Fax: (01772) 204907

Laboratory Test Results

Site

: 8 HUGHES ROAD, HAYES, GREATER LONDON

Client

: CONSTRUCTION SERVICES MANAGEMENT LIMITED

Engineer

:

Job Number

SE1433

Sheet

1 / 1

DETERMINATION OF THE pH VALUE AND THE SULPHATE CONTENT OF SOIL AND GROUNDWATER

Borehole/ Trial Pit	Depth (m)	Sample	Concentration of Soluble Sulphate		Groundwater g/l	Percentage of sample passing 2mm Sieve %	pH	Classification	Laboratory Description
			Soil						
			Total SO ₄ %	SO ₄ in 2:1 water:soil g/l					
M1	1.10	D		<0.01			7.6	DS-1	Brown slightly sandy CLAY.
M1	1.80	D		0.01			8.0	DS-1	Orange to brown slightly clayey medium to coarse SAND.
M2	0.90	D		<0.01			7.8	DS-1	Brown mottled orange sandy gravelly CLAY.
M2	2.50	D		<0.01			8.0	DS-1	Orange mottled brown silty very gravelly medium to coarse SAND.
M3	2.60	D		<0.01			7.9	DS-1	Orange and brown silty very gravelly medium to coarse SAND.

- **15.0 NEW DEVELOPMENT CONSTRUCTION STAGES AND IMPACT WITH THE EXISTING NEIGHBOURING SUPERSTRUCTURE.**

15.1 Architectural drawings are supplied in support of the planning application where the proposed new development is illustrated.

An underground substructure and superstructure will form the proposed development. The underground part of the building will be a reinforced concrete structure; Instead, the superstructure of the one will be a traditional masonry structure.

15.2 The proposed sequences of the works will be illustrated in the section structural calculation of the basement.

15.3 Some ground movement is inevitable when an underground structure is constructed, and the magnitude of the movement depends on:

- the geology.
- the adequacy of temporary support that will be used during the underpinning excavations.
- the quality of workmanship when constructing the permanent structure.

In any case, the possible ground movement will not create any damage to the adjacent structures because they are adequately far from the new development.

15.4 It would be prudent to undertake a structural condition survey of adjacent properties on both sides of the site before work commences. This should be covered by the Party Wall Surveyor.

15.5 Temporary horizontal supports will be required when the mentioned retaining wall pins will be built and must be maintained until the pins have been completed, including allowing time for the concrete to gain adequate strength.

Under UK standard practice, the contractor is responsible for designing and implementing the temporary works, so it is considered essential that the contractor employed for these works should have completed similar schemes successfully.

Full details of the temporary works should be provided in the contractor's method statements. By conforming to normal health and safety good practice, the requirements for temporary support of any excavation must be assessed by a competent person at the start of every shift, and at each significant change in the geometry of the excavations as the work progresses.

15.6 The unloaded clays at/beneath formation level will readily absorb any available water which would lead to softening and loss of strength. It will, therefore, be essential to ensure that the clays at formation level (onto which the underpin/retaining wall bases and the basement slab will bear) are protected from all sources of water, with suitable channelling to sumps for any groundwater seeping into the excavations. The formation clays should be inspected and then blinded with concrete immediately after completion of final excavation to grade. Any unacceptably soft/weak areas must be excavated and replaced with concrete.

15.7 The time between excavation and placing of concrete to be kept as short as possible, but no longer than 24 hours unless by prior agreement. The excavations are to be protected from collapse, are to be kept clean and dry, and must be inspected by the competent person. The concrete is to be placed immediately after this inspection. Any collapse of the trench, standing water or softened trench base is to be removed and cleaned out before the placement of the concrete.

15.8 After constructing a concrete RC wall 'pin', allow a minimum of 48 hours min for the concrete to cure before excavating an adjacent pin.

15.9 It needs to incorporate 600x10mm mild steel dowel bars between each pin (300mm embedment into each pin). For safety and access reasons and if they are returned to straight when casting, these bars may be bent out of the way during excavation. Minimum cover to all reinforcement to be 75mm.

- **16.0 DRAINAGE SYSTEM.**

16.1 Drainage systems are designed to operate under 'surcharge' at times of peak rainfall, which means that the level of effluent in the sewers may rise to ground level. Non-return valves and pumped above ground loop systems must, therefore, be fitted on the drains serving the basement, courtyard and lightwell, to ensure that water from the mains sewer system cannot enter the basement when the adjacent sewer is operating under surcharge. All drains which discharge via the same outfall as the basement must be protected, including those carrying foul water and roof/surface water. A battery powered reserve pump should be fitted to ensure that the system remains functional during power cuts.

16.2 The pumped above-ground loop must rise high enough above ground level to create sufficient pressure head to open the non-return valve when the sewer flow is surcharged to ground level. Otherwise, the basement would once again be vulnerable to flooding while the surcharged flow continues. If it is not possible to achieve a sufficient rise of the loop above ground level, then temporary interception storage should be provided as recommended above.

16.3 At the end of this report there are attached the estimation of the greenfield runoff for the site and the stormwater attenuation design.

- **17.0 WATERPROOFING**

17.1 The proposed basement will need to be fully waterproofed to provide adequate long- term control of moisture ingress from the groundwater. Detailed recommendations for the waterproofing system are beyond the scope of this report although it is noted that, as a minimum, it would be prudent for the system to be designed in compliance with the requirements of BS8102:2009.

17.2 The waterproofing measures must include sealing of all services which pass through the perimeter walls and floor of the basement, including the sumps for the drainage systems.

17.3 The National House Building Council published new guidance on the waterproofing of basements in November 2014 (NHBC Standards, Chapter 5.4). Compliance would be compulsory if an NHBC warranty is required. Otherwise, it may provide a useful guide to best practice.

- **18.0 DESIGN STANDARDS**

18.1 The works shall be designed in accordance with all current prevailing British Standard Codes

of Practice and current best practice including but not limited to:

- Loading: BS6399
- Concrete: BS8110
- Steel: BS5950
- Timber: BS5268
- Masonry: BS5628
- Temporary Works: BS5975

18.2 Design of the basement retaining walls must take into consideration:

- Earth pressures from the surrounding ground.
- Dead and live loads from the structures above, including loads from the adjoining properties.
- Surcharge load.
- Swelling displacements/pressures from the underlying clays.
- A provisional design groundwater level at ground level.

- **19.0 ASSESSMENT METHODOLOGY**

19.1 The evaluation will be carried out at short term and at long terms after the construction of the reinforced concrete retaining wall pin.

According the BS codes, the retaining wall must be checked against the ultimate limit state and serviceability limit state.

For the ultimate limit, it needs to verify that relevant potential collapse mechanisms will occur and to check the external stability:

- a) Bearing capacity failure.
- b) Overturning.
- c) Forward sliding.
- d) Overall, rotational, or global slip surface stability.

19.2 For the serviceability limit state, it needs to verify that during working condition, the structure will retain its characteristics without the need for abnormal maintenance and to check the internal stability:

- a) Settlement.

- **20 RECOMMENDATIONS**

20.1 The development of the basements is unlikely to impact on groundwater, surface water or flooding, unlikely to impact on drainage or ground infiltration of rainwater.

20.2 Watertight design to the basement.

20.3 Check on foundations to adjacent properties before construction.

20.5 Monitoring of any ground movements to ensure they are within expectations.

20.6 Use of compressible material beneath floor slab to accommodate any future heave in London Clay.

20.7 Construction of underpinned or other foundations on the unweathered London Clay.

This may be achieved by ensuring best practice engineering and design of the proposed scheme by competent persons and in full accordance with the Construction (Design and Management) Regulations.

This will include:

- Determination of the most appropriate methods of construction of the proposed basement.
- Undertake pre-condition surveys of adjacent structures.
- Establishment of contingencies to deal with adverse performance.
- Ensuring quality of workmanship by competent persons.

Calculated by: Tom Jayne
Site name: 8 Hughes Road
Site location: Hayes, Hillingdon

Site coordinates
Latitude: 51.51312° N
Longitude: 0.40888° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6094638
Date: 2017-09-05T14:36:54

Methodology

IH124

Site characteristics

Total site area (ha)	0.1
----------------------	-----

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	4	4
HOST class	---	---
SPR/SPRHOST	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm)	617	617
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

(1) Is $Q_{BAR} < 2.0$ l/s/ha?
(2) Are flow rates < 5.0 l/s?
Where flow rates are less than 5.0 l/s consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements
(3) Is $SPR/SPRHOST \leq 0.3$?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	0.42	0.42
1 in 1 year (l/s)	0.35	0.35
1 in 30 years (l/s)	0.96	0.96
1 in 100 years (l/s)	1.33	1.33

ATTENUATION

Steve Morgan Associates Ltd

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Newport

S Wales

NP20 4PB

Tel: 01633 266244

e-Mail: engineers@smalimited.co.uk

STEVE MORGAN ASSOCIATES
CONSULTING ENGINEERS

Project: 8 Hughes Road

Project No. 1176304

Designed by: TDJ

Date: 01/09/2017

Checked by:

Date:

Sheet No: 001

8 Hughes Road, Hayes, Hillingdon**Site Parameters**

Area (drained) 93.0 m²
 Area Reduction Factor 0.9 (Typical)
 Climate Change (+) 30 %

Effective Area 108.8 m²**Discharge Rate**

Greenfield
 Runoff 1.33 l/s

**From Masterdrain Printout
for HILLINGDON**

r value 0.43
 M5-60 19.9 mm

Storm Parameters

Return Period: 1 in 100 years

Time	Z1 Value	y mm	Z2 Value	p mm	Inflow	Outflow	Storage
5min	0.39	7.76	1.84	14.28	1.55	0.40	1.155
10min	0.54	10.75	1.91	20.52	2.23	0.80	1.435
15min	0.64	12.74	1.91	24.33	2.65	1.20	1.450
30min	0.81	16.12	1.99	32.08	3.49	2.39	1.096
1hr	1.00	19.90	1.99	39.60	4.31	4.79	-0.479
2hr	1.18	23.48	2.03	47.67	5.19	9.58	-4.389
4hr	1.39	27.66	2.01	55.60	6.05	19.15	-13.102
6hr	1.56	31.04	1.97	61.16	6.65	28.73	-22.074
10hr	1.74	34.63	1.97	68.21	7.42	47.88	-40.458
24hr	2.20	43.78	1.89	82.74	9.00	114.91	-105.909
48hr	2.49	49.55	1.89	93.65	10.19	229.82	-219.634

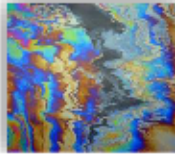
Critical Storm Duration 15min

Min Storage Required 1.5262 m³ @ VR95

Void Ratio 95%



INVESTIGATE



REMEDiate



REGENERATE

TECHNICAL REPORT

**GROUND INVESTIGATION
AT
8 HUGHES ROAD,
HAYES, GREATER LONDON
FOR
CONSTRUCTION SERVICES
MANAGEMENT LIMITED**

**REPORT NO. SE1433
JANUARY 2018**



SUB SURFACE SOUTH EAST LIMITED

Victoria House
Desborough Street
High Wycombe
Buckinghamshire
HP11 2NF

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Email: southeast@subsurface.co.uk



CONTENTS

1. INTRODUCTION	1.1 Site Location and Description
	1.2 Proposed Development and Purpose of the Ground Investigation
2. INVESTIGATION	2.1 Investigation Details
	2.2 Sub Surface Detail
3. SAMPLING, TESTING AND MONITORING	3.1 Sampling
	3.2 Field Testing
	3.3 Installations and Monitoring
	3.4 Laboratory Testing
4. APPRAISAL AND RECOMMENDATIONS	4.1 Comments on the Profile
	4.2 Foundations
	4.3 Floor Slab Construction
	4.4 Excavations and Groundwater
	4.5 Buried Concrete
	4.6 General
APPENDICES	Insitu Test results
	Laboratory Test results
	Mini Borehole Record sheets
	Figures

GROUND INVESTIGATION AT 8 HUGHES ROAD, HAYES, GREATER LONDON**CLIENT: CONSTRUCTION SERVICES MANAGEMENT LIMITED**

1. INTRODUCTION

This report has been prepared in accordance with an email, dated 28th November 2017, from the Client.

The brief was set out in our estimate, ref. ESE2088 and dated 27th November 2017, with amendments as the investigation proceeded and includes:

- 3 No. mini boreholes
- Geotechnical laboratory testing
- Installation of standpipes followed by groundwater monitoring
- Provision of an interpretative report on the above.

1.1 Site Location and Description

The site is located to the south of Hughes Road, Hayes, Greater London as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is TQ104805.

As shown on Figure 2, the site comprises the garden to a two storey semi-detached house fronting onto Hughes Road. The site is bound to the north by Hughes Road, to the east and west by the gardens of other houses fronting onto Hughes Road, and to the south by trees, a footpath and a small brook.

1.2 Proposed Development and Purpose of the Ground Investigation

We understand that it is proposed to construct a basement extension to the existing house in the current garden area, as shown on Figure 2.

The purpose of the investigation was to determine the ground conditions at the positions of the exploratory holes, to assess the likelihood of a general pattern of strata being present below the site and to establish the load bearing characteristics of the strata deriving if possible an assessment of the suitability of appropriate founding techniques.

2. INVESTIGATION**2.1 Investigation Details**

Three mini boreholes were put down to depths of between 2.15m and 3.58m using a mini sampling rig fitted with windowless sample tubes of 97mm reducing to 57mm diameter at the positions determined and set out by Sub Surface South East Limited, as shown on Figure 2. The samples were subsequently logged in accordance with BS EN ISO 14688-1: 2002 and BS EN ISO 14689-1: 2003 and the resulting Mini Borehole Records are appended.

2.2 Sub Surface Detail

Details of the strata encountered in the ground investigation are given on the appended Mini Borehole Records. The exploratory holes found localised made ground then natural cohesive and granular strata.

2.2.1 Made Ground

Made ground was encountered in M2 and comprised soft brown sandy gravelly clay. The gravel sized fragments comprised fine to coarse brick, concrete and flint.

2.2.2 Drift Deposits

Drift deposits were encountered from ground level in M1, below the made ground at 0.40m in M2 and below a paving slab in M3 and comprised beds of soft brown locally gravelly locally sandy silty clay (topsoil) then beds of soft or soft to firm orange brown or brown sandy locally gravelly silty clay to a depth of some 0.80m to 1.30m. Below the clay medium dense locally dense orange brown silty sand was encountered to a depth of between 1.50m and 1.70m, underlain by very dense orange brown very gravelly silty sand. The gravel sized component in the natural clay and sand deposits comprised mainly subrounded fine to coarse flint and quartz.

2.2.3 Groundwater

No groundwater was encountered in any of the exploratory holes.

The standpipes installed in M1 and M3 were found to be dry during both monitoring visits.

3. SAMPLING, TESTING AND MONITORING

3.1 Sampling

Continuous core and small disturbed and bulk disturbed samples were obtained for the strata encountered and were subjected to careful examination.

The samples will be retained for a period of one month after the issue of this report, for reference purposes, and then disposed of unless otherwise instructed.

3.2 Field Testing

Ten Standard Penetration Tests (SPTs) were performed in natural cohesive and granular strata, the results of which are recorded on the appended Standard Penetration Test Results Sheet with 'N' values and indicative relative density and shear strength, where appropriate, given on the appended Mini Borehole Records.

3.3 Installations and Monitoring

On completion of M1 and M3 hdpe standpipes were installed to depths of 1.50m and 3.50m respectively. The standpipes are slotted from 1.00m depth, have an internal diameter of 50mm and have removable caps to enable groundwater monitoring and sampling to be undertaken. Details of the installations are given on the appended Mini Borehole Records.

Monitoring of the standpipes for groundwater levels has been undertaken on two occasions using portable equipment. The results of the monitoring are given on the appended Groundwater Monitoring Results sheet.

3.4 Laboratory Testing

The following laboratory tests were carried out in accordance with BS.1377: 1990, where applicable, and the results are appended.

- Moisture content, plastic limit and liquid limit tests
- Soluble sulphate content and pH value tests

4. APPRAISAL AND RECOMMENDATIONS

4.1 Comments on the Profile

At the outset it should be appreciated that only a small proportion of the area to be developed has been investigated and consequently the recommendations made and opinions expressed in this report can only be applied to such conditions as were encountered in the exploratory holes.

The exploratory holes indicate a nature and degree of similarity to the extent that we consider them likely to be representative of the natural ground conditions. However, no guarantee can be given.

Due to the nature of made ground localised variations in thickness and composition should be anticipated and hence interpolation or extrapolation from the exploratory holes to adjoining areas should only be undertaken with caution.

Details of the findings of the investigation are given on the appended Mini Borehole Records and a summary of the ground conditions is given in Section 2.2.

4.2 Foundations

We understand that it is proposed to construct a basement extension to the existing house in the current garden area, as shown on Figure 2. However, at the time of writing this report no specific details regarding the proposed foundations, the depth of the proposed basement excavation or the design loadings were available and consequently the recommendations given are in general terms only.

The ground investigation found localised made ground to a depth of 0.40m then natural beds of soft or soft to firm orange brown or brown sandy locally gravelly silty clay to a depth of some 0.80m to 1.30m, underlain by medium dense locally dense orange brown silty sand was encountered to a depth of between 1.50m and 1.70m, in turn underlain by very dense orange brown very gravelly silty sand.

We would not recommend founding in the made ground in its present condition because of its inherent variability in consistency and compaction, and in parts the nature of its constituents.

Providing there is sufficient load bearing capability we recommend that the proposed extension is founded on strip footings for wall loads and pad foundations for column loads in the natural granular strata encountered below depths of 1.30m in M1, at 1.10m in M2 and at 0.80m in M3.

Atterberg limit tests on the cohesive strata indicate clays of low plasticity which are considered to have a low susceptibility to shrinkage and swelling with varying moisture content. Given the above foundations should be taken down to a minimum 0.75m below finished ground level to avoid the zone which is subject to seasonal moisture content variation and frost action. If buildings are to be constructed adjacent to existing trees, trees are to be removed and/or trees are to be planted then the guidelines given in the National House Building Council (NHBC) Standards Chapter 4.2, 'Building Near Trees', should be followed for clays of low shrinkage and swelling potential.

Taking the results of the field tests we have determined the safe bearing capacity of the natural strata, as follows:

TABLE 1 SAFE BEARING CAPACITY

Expl Hole No.	Depth (m)	SPT 'N' Value	Shear Strength (kN/m ²)	Safe Bearing Pressure* (kN/m ²)		Recommended Minimum Foundation Depth (m)
				Strip Footing	Square Pad	
M1	1.15	15	60	110	135	1.30
	2.08	24/75mm	-	600	600	
M2	1.15	23	-	265	265	1.10
	2.00	25/75mm	-	600	600	
	3.15	56	-	600	600	
M3	1.15	22	-	250	250	0.80
	2.15	62	-	600	600	
	3.00	25/75mm	-	600	600	

* For footings on granular strata, the safe bearing capacity given is based upon a footing width of less than 1.50m. For wider footings a reduction would be necessary.

Appreciable variations in safe bearing capacity are indicated in Table 1 and as a consequence of this, and the need to utilise a generally applicable safe bearing pressure to enable designs to be reasonably formulated, we recommend that values of 250kN/m² for strip footings and square pads should not be exceeded for the recommended minimum foundation depth given.

All formation levels should be carefully inspected by an experienced and qualified engineer to confirm the appropriateness of the design figures used with any loose zones removed and replaced with lean mix concrete. The formation should then be blinded with lean mix concrete as soon as possible after exposure, if there is to be a delay before construction, to prevent water softening or disturbance.

Should granular and cohesive strata be present at the proposed formation level we recommend that foundation excavations should be locally deepened in order that the formation is entirely within similar strata. If this is not possible we recommend that reinforcement in foundations is provided to give adequate strength to bridge or cantilever over areas of significantly differing rates of settlement and to induce an increase in the settlement where relatively low settlements are expected.

Basement Wall

Given that the proposed extension will be a basement consideration needs to be given to temporary and permanent retention of excavation sides.

Parameters for retention of the excavation sides are based on effective angles of friction (Φ'). No effective stress testing was undertaken and hence we have also determined Φ' values from SPT 'N' Values for the granular strata and from Plasticity Index for the cohesive strata.

The Earth Pressure Coefficients, K_o , K_a and K_p , for the strata encountered in the exploratory holes are as follows:

TABLE 2 EARTH PRESSURE COEFFICIENTS FOR COHESIVE STRATA

Hole No.	Depth (m)	SPT 'N' Value	PI (%)	c' (kN/m ²)	Φ' (degrees)	K_o	K_a	K_p
M1	1.10	15	17	60	29	0.52	0.35	2.88
M2	0.90	-	18	-	28	0.53	0.36	2.77
M3	0.60	-	12	-	30	0.50	0.33	3.00

TABLE 2 EARTH PRESSURE COEFFICIENTS FOR GRANULAR STRATA

Hole No.	Depth (m)	SPT 'N' Value	Φ' (degrees)	K_o	K_a	K_p
M1	2.00	24/75mm	44	0.31	0.18	5.55
M2	1.15	23	33	0.46	0.29	3.39
M2	2.00	25/75mm	44	0.31	0.18	5.55
M2	3.15	56	42	0.33	0.20	5.04
M3	1.15	22	33	0.46	0.29	3.39
M3	2.15	62	43	0.32	0.19	5.29
M3	3.00	25/75mm	44	0.31	0.18	5.55

4.3 Floor Slab Construction

With regard to the design and construction of floor slabs we would recommend the removal of any topsoil and/or made ground and the level brought up as required using a graded granular hardcore placed and compacted in layers of not greater than 150mm followed by the construction of a concrete ground bearing floor slab.

4.4 Excavations and Groundwater

There should be no particular difficulties in excavating the strata indicated in the exploratory holes utilising an appropriate and suitably sized mechanical excavator.

It is recommended that all excavations to greater than 1.20m depth, or for shallower excavations where groundwater is encountered above this level, are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle.

The mini boreholes did not encounter groundwater.

The standpipes installed in M1 and M3 were found to be dry during both monitoring visits.

4.5 Buried Concrete

For the design of buried concrete the recommendations given in Building Research Establishment (BRE) Special Digest 1 (February 2017 revision), "Concrete in Aggressive Ground", should be followed.

Determination of pH on the soil samples gave values in the range of 7.6 to 8.0.

Soluble sulphate concentrations were also determined for the soil samples and the results ranged from <0.01 to 0.012 g/l.

The results indicate that the Design Sulphate Class for the site should be DS-1.

Our knowledge of the site and ground conditions indicates that the site is "brownfield" with potentially mobile groundwater.

Consequently, in accordance with the Design Sulphate Class for the site together with the site and groundwater conditions an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1 should be used as detailed on the appended extract.

4.6 General

In the preparation of this report no consideration has been given to the possible presence of contamination or the possible presence of ground gas as this was outside our brief.

4.6 General

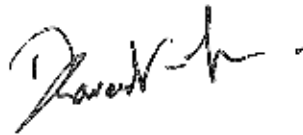
In the preparation of this report no consideration has been given to the possible presence of contamination or the possible presence of ground gas as this was outside our brief.

We recommend that consultation should be undertaken with the Local Authority Environmental Health Officer and the Local Authority Building Control Officer prior to development

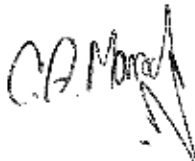
We would be happy to undertake the above or alternatively the Client should undertake such consultations before proceeding.

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or Mr Gurbinder Singh Mann at our High Wycombe office.

SUB SURFACE CONSULTANTS LIMITED
REPORT No. SE1433
JANUARY 2018



D. Ravenscroft-Jones Cert Nat Sci (Open), BSc.(Hons.), MSc., CEnv, MSEE, MIEEnvSc
Senior Geoenvironmental Engineer
For and on behalf of
Sub Surface Consultants Limited



C. A. Marsden B.Sc.(Hons.), C.Eng., M.I.C.E.
Director
For and on behalf of
Sub Surface Consultants Limited.

INSITU TEST RESULTS

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907							Standard Penetration Test Results						
Site : 8 HUGHES ROAD, HAYES, GREATER LONDON												Job Number SE1433	
Client : CONSTRUCTION SERVICES MANAGEMENT LIMITED												Sheet	
Engineer:												1 / 1	
Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments	
					1	2	1	2	3	4			
M1	1.00	1.15	1.45	CPT	2	2	5	4	3	3	N=15		
M1	2.00	2.08	2.15	CPT	14		24				14*/75mm 24/75mm		
M2	1.00	1.15	1.45	CPT	2	4	5	5	5	8	N=23	Hammer Bouncing Hammer Bouncing Hammer Bouncing	
M2	2.00	2.00	2.08	CPT			25				0*/0mm 25/75mm		
M2	3.00	3.15	3.45	CPT	12	14	12	14	13	17	N=56		
M2	3.50	3.50	3.58	CPT			25				0*/0mm 25/75mm		
M3	1.00	1.15	1.45	CPT	2	3	3	6	6	7	N=22	Hammer Bouncing Hammer Bouncing	
M3	2.00	2.15	2.45	CPT	8	9	14	15	17	16	N=62		
M3	3.00	3.00	3.08	CPT			25				0*/0mm 25/75mm		
M3	3.50	3.50	3.58	CPT			25				0*/0mm 25/75mm		



Site: 8 HUGHES ROAD, HAYES, GREATER LONDON
Client: CONSTRUCTION SERVICES MANAGEMENT LIMITED
Engineer:

Job Number	SE1433
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Sheet: 1 / 1

Groundwater Monitoring Results Sheet

[illegible]

Remarks:

LABORATORY TEST RESULTS



Site : 8 HUGHES ROAD, HAYES, GREATER LONDON Client : CONSTRUCTION SERVICES MANAGEMENT LIMITED Engineer:	Job Number SE1433 Sheet 1 / 1
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Borehole/ Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Group Symbol	Laboratory Description
				Percentage %	Moisture Content %						
M1	1.10	D	19	98	19	31	14	17	0.29	CL	Brown slightly sandy CLAY.
M2	0.90	D	22	87	25	35	17	18	0.44	CL/CI	Brown mottled orange sandy gravelly CLAY.
M3	0.60	D	22	92	24	29	17	12	0.58	CL	Orange to brown silty CLAY.

Remarks :



Site : 8 HUGHES ROAD, HAYES, GREATER LONDON
Client : CONSTRUCTION SERVICES MANAGEMENT LIMITED
Engineer:

Job Number	SE1433
Sheet	1 / 1

Borehole/ Trial Pit	Depth (m)	Sample	Concentration of Soluble Sulphate			Percentage of sample passing 2mm Sieve %	pH	Classification	Laboratory Description
			Soil		Groundwater g /l				
			Total S03 %	S04 in 2:1 water:soil g /l					
M1	1.10	D		<0.01			7.6	DS-1	Brown slightly sandy CLAY.
M1	1.80	D		0.01			8.0	DS-1	Orange to brown slightly clayey medium to coarse SAND.
M2	0.90	D		<0.01			7.8	DS-1	Brown mottled orange sandy gravelly CLAY.
M2	2.50	D		<0.01			8.0	DS-1	Orange mottled brown silty very gravelly medium to coarse SAND.
M3	2.80	D		<0.01			7.9	DS-1	Orange and brown silty very gravelly medium to coarse SAND.

Remarks : Classification relates to Design Sulphate Class of BRE Special Digest 1 (2005)



AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) SITE CLASSIFICATION

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations^a

Sulfate Design Sulfate Class for Location	2:1 water/soil extract ^b	Groundwater	Total potential sulfate ^c	Groundwater		ACEC Class for location
				Static water	Mobile water	
1	2 (SO ₄ mg/l)	3 (SO ₄ mg/l)	4 (SO ₄ %)	5 (pH)	6 (pH)	7
DS-1	<500	<400	<0.24	≥2.5	>5.5 ^d 2.5 - 5.5	AC-1s AC-1 ^d AC-2z
DS-2	500 - 1500	400 - 1400	0.24 - 0.6	>3.5 2.5-3.5	>5.5 2.5 - 5.5	AC-1s AC-2 AC-2s AC-3z
DS-3	1600-3000	1500-3000	0.7 - 1.2	>3.5 2.5 - 3.5	>5.5 2.5 - 5.5	AC-2s AC-3 AC-3s AC-4
DS-4	3100 - 6000	3100 - 6000	1.3 - 2.4	>3.5 2.5 - 3.5	>5.5 2.5 - 5.5	AC-3s AC-4 AC-4s AC-5
DS-5	>6000	>6000	>2.4	>3.5 2.5 - 3.5	≥2.5	AC-4s AC-5

Notes

- a. Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie not brownfield - Table C2) or clean fill derived from such ground.
- b. The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- c. Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- d. For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that included the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

Table C2 Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations^a

Sulfate						Groundwater		
Design Sulfate Class for Location	2:1 water:soil extract ^b		Groundwater		Total potential sulfate ^c	Static water	Mobile water	ACEC Class for location
1	2 (SO ₄ mg/l)	3 (Mg mg/l)	4 (SO ₄ mg/l)	5 (Mg mg/l)	6 (SO ₄ %)	7 (pH) ^d	8 (pH) ^d	9
DS-1	<500		<400		<0.24	≥2.5	>6.5 ^d 5.5 - 6.5 4.5 - 5.5 2.5 - 4.5	AC-1s AC-1 AC-2z AC-3z AC-4z
DS-2	500 - 1500		400 - 1400		0.24 - 0.6	>5.5 2.5 - 5.5	>6.5 5.5 - 6.5 4.5 - 5.5 2.5 - 5.5	AC-1s AC-2 AC-2s AC-3z AC-4z AC-5z
DS-3	1600 - 3000		1500 - 3000		0.7 - 1.2	>5.5 2.5 - 5.5	>6.5 5.5 - 6.5 2.5 - 5.5	AC-2s AC-3 AC-3s AC-4 AC-5
DS-4	3100 - 6000	≤1200	3100 - 6000	≤1000	1.3 - 2.4	>5.5 2.5 - 5.5	>6.5 2.5 - 6.5	AC-3s AC-4 AC-4s AC-5
DS-4m	3100 - 6000	>1200 ^e	3100 - 6000	>1000 ^e	1.3 - 2.4	>5.5 2.5 - 5.5	>6.5 2.5 - 6.5	AC-3s AC-4m AC-4ms AC-5m
DS-5	>6000	≤1200	>6000	≤1000	>2.4	>5.5 2.5 - 5.5	≥2.5	AC-4s AC-5
DS-5m	>6000	>1200 ^e	>6000	>1000 ^e	>2.4	>5.5 2.5 - 5.5	≥2.5	AC-4ms AC-5m

Notes

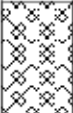
- a. Brownfield sites are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).
- b. The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- c. Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- d. An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).
- e. The limit on water soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17000 mg/l). This allows 'm' to be omitted from the relevant ACEC Classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class

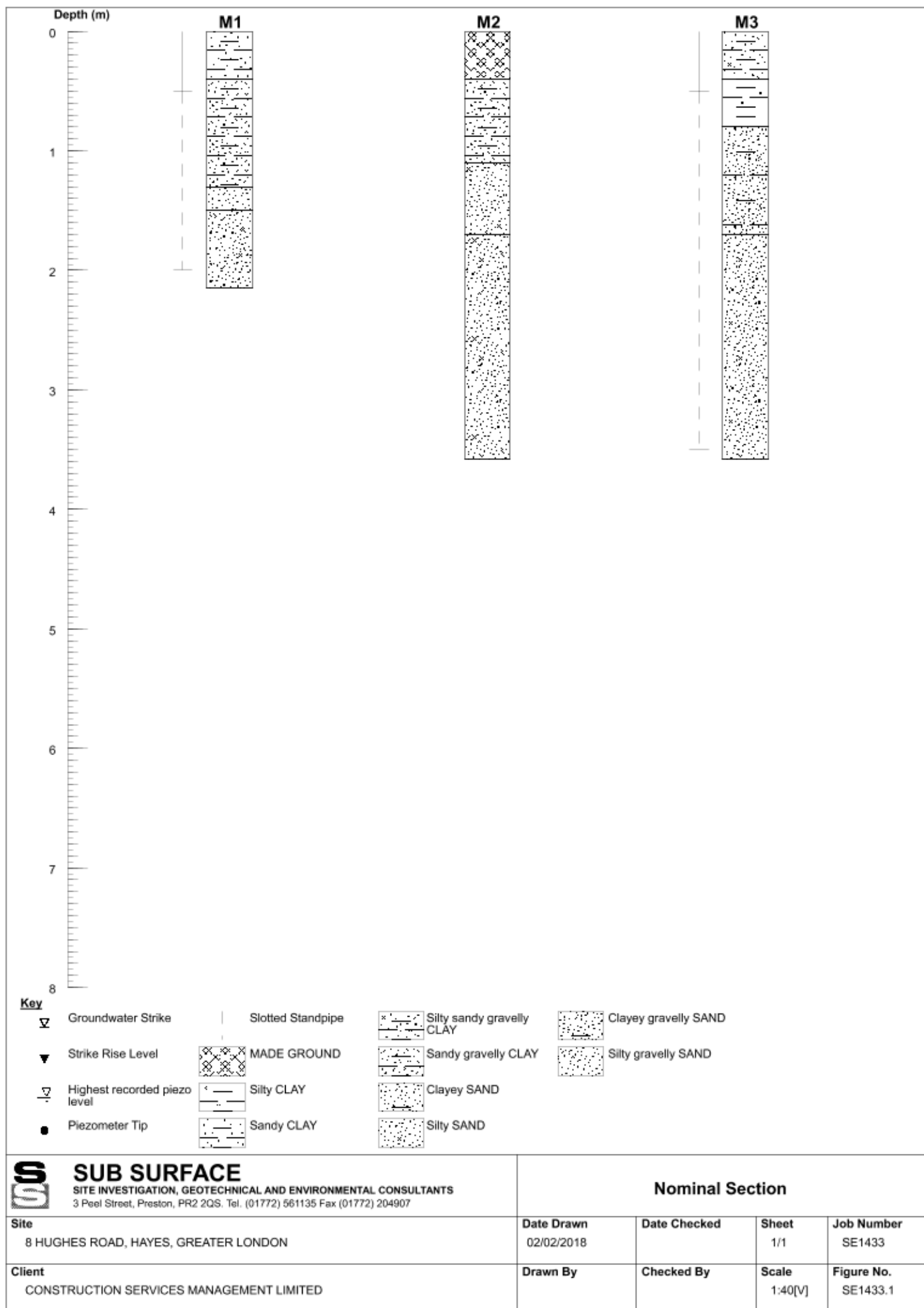
- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that included the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.
- Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

MINI BOREHOLE RECORD SHEETS

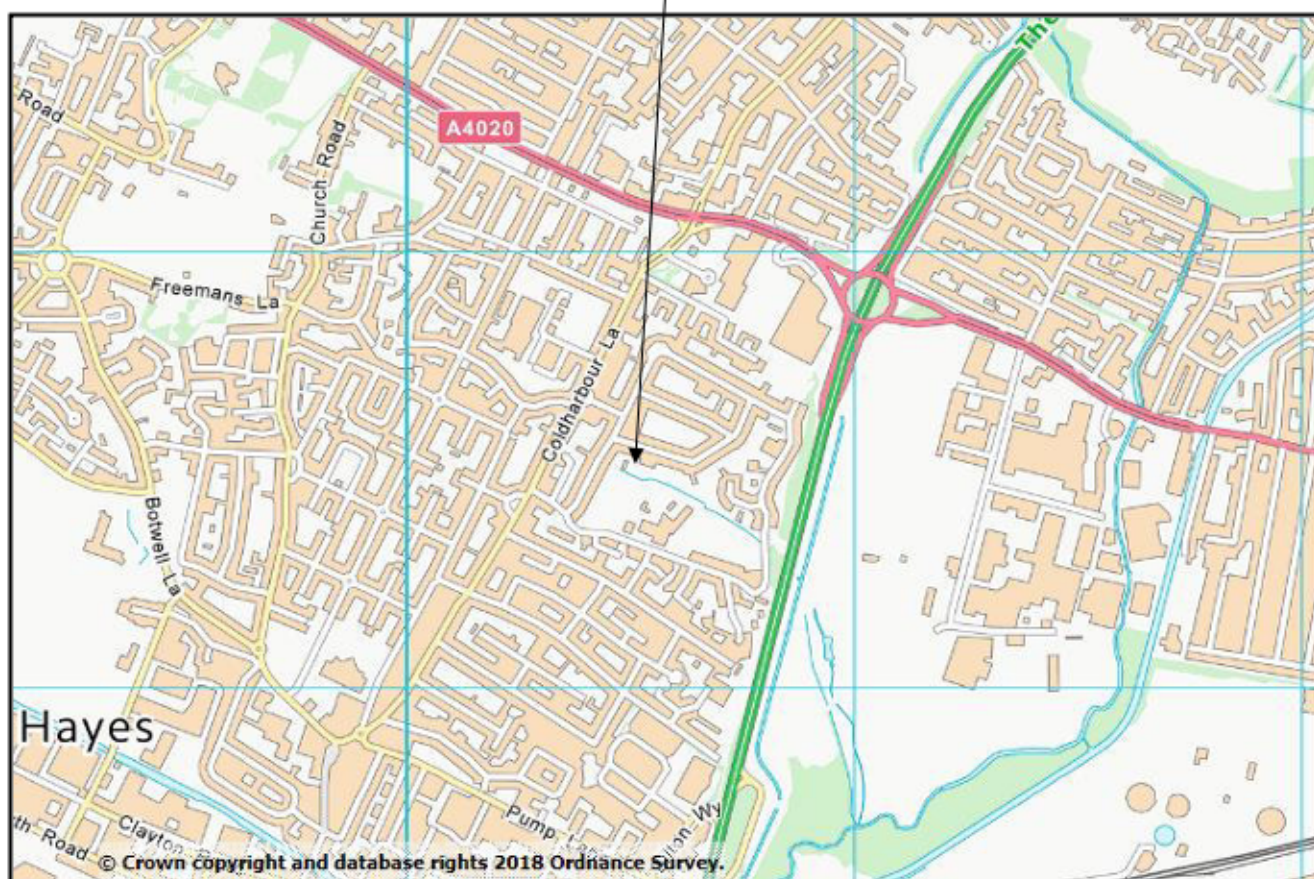
 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907							Site 8 HUGHES ROAD, HAYES, GREATER LONDON			Borehole Number M1	
Boring Method MINI PERCUSSIVE		Casing Diameter			Ground Level (mOD)		Client CONSTRUCTION SERVICES MANAGEMENT LIMITED			Job Number SE1433	
							Engineer			Sheet 1/1	
Location AS PLAN		Dates 07/12/2017									
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
0.30	DA V					(0.40)	Grass over soft to firm brown slightly sandy CLAY. (Topsoil).				
0.70	D					0.40	Firm medium strength brown sandy slightly gravelly CLAY. Gravel comprises of subrounded fine to coarse flint and quartz.				
1.00-1.45 1.00-2.00 1.10	SPT(C) N=15 C D			2,2/5,4,3,3 1.00m to 2.00m - 100% recovery		(0.90)	 at 0.80m : becoming more gravelly				
1.30	D					1.30 (0.20)	Medium dense orange to brown slightly clayey medium to coarse SAND.				
1.80	D					1.50	Very dense orange to brown very gravelly silty SAND. Gravel is subrounded fine to coarse flint and quartz. at 1.50m : hammer bouncing				
2.00-2.15	SPT(C) 14*/75 24/75			14/24 07/12/2017:DRY		(0.65)	 at 2.00m : refusal				
						2.15	Complete at 2.15m				
Remarks Hand dug inspection pit from GL to 1.00m to check for services. C = Plastic lined core sample Core diameter : 87mm to 2.00m A = Amber Glass Jar sample V = Vial sample On completion installed a 50mm dia slotted standpipe with a gravel surround to 2.00m, a Bentonite seal from 0.50m to 0.20m and a concreted in lockable steel protective from 0.20m to GL.								Scale (approx) 1:25	Logged By GM/SJ	Figure No. SE1433.M1	

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907							Site 8 HUGHES ROAD, HAYES, GREATER LONDON		Borehole Number M2
Boring Method MINI PERCUSSIVE		Casing Diameter		Ground Level (mOD)		Client CONSTRUCTION SERVICES MANAGEMENT LIMITED		Job Number SE1433	
		Location AS PLAN		Dates 07/12/2017		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	DA V					(0.40)	MADE GROUND: grass over soft brown sandy gravelly clay. Gravel sized fragments are angular fine to coarse brick, concrete and flint.		
						0.40	Soft to firm brown mottled orange sandy gravelly CLAY. Gravel is subrounded fine to coarse flint and quartz.		
0.90	D					(0.70)			
1.00-1.45	SPT(C) N=23			2,4/5,5,5,8		1.10	Medium dense orange to brown silty clayey coarse SAND.		
1.00-2.00	C			1.00m to 2.00m - 100% recovery					
1.30	D					(0.60)	 between 1.30m to 1.40m : soft brown clay lenses		
1.60	D					1.70	Very dense orange mottled brown silty very gravelly medium to coarse SAND. Gravel is subrounded fine to coarse flint and quartz.		
1.80	D						 from 1.70m : hammer bouncing		
2.00-2.08	SPT(C) 0*/0			/25					
2.00-3.00	25/75 C			2.00m to 3.00m - 100% recovery					
2.50	D					(1.88)			
3.00-3.45	SPT(C) N=56			12,14/12,14,13,17			 between 3.00m to 3.50m : no recovery		
3.00-3.50	C			3.00m to 3.50m - No recovery					
3.50-3.58	SPT(C) 0*/0			/25		3.58	Complete at 3.58m		
	25/75			07/12/2017: DRY					
Remarks Hand dug inspection pit from GL to 1.20m to check for services. C = Plastic lined core sample Core diameter : 97mm to 2.00m, 57mm to 3.50m A = Amber Glass Jar sample V = Vial sample On completion backfilled with arisings.								Scale (approx) 1:25	Logged By GM/SJ
								Figure No. SE1433.M2	

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907						Site 8 HUGHES ROAD, HAYES, GREATER LONDON			Borehole Number M3	
Boring Method MINI PERCUSSIVE		Casing Diameter		Ground Level (mOD)		Client CONSTRUCTION SERVICES MANAGEMENT LIMITED			Job Number SE1433	
		Location AS PLAN		Dates 07/12/2017		Engineer			Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30	DA V					(0.40)	Concrete paving slab over soft brown silty slightly gravelly CLAY. Gravel is subrounded fine to coarse flint.			
0.60	D					0.40	Soft orange to brown silty CLAY.			
0.90	D					0.80	Medium dense becoming dense orange and brown clayey gravelly medium SAND. Gravel is subrounded fine to medium flint and quartz.			
1.00-1.45 1.00-2.00	SPT(C) N=22 C			2,3/3,6,6,7 1.00m to 2.00m - 100% recovery		(0.90)	 at 1.20m : less gravelly			
1.50	D					1.70	Very dense orange and brown silty very gravelly medium to coarse SAND. Gravel is subrounded fine to coarse flint and quartz. at 1.70m: hammer bouncing.			
1.80	D					(1.88)				
2.00-2.45 2.00-3.00	SPT(C) N=62 C			8,9/14,15,17,16 2.00m to 3.00m - 100% recovery						
2.20	D									
2.80	D									
3.00-3.08 3.00-3.50	SPT(C) 0*/0 25/75 C			/25 3.00m to 3.50m - No recovery						
3.50-3.58 3.50-3.95	SPT(C) 0*/0 25/75 C			/25 07/12/2017: DRY		3.58	Complete at 3.58m			
Remarks Hand dug inspection pit from GL to 1.00m to check for services. C = Plastic lined core sample Core diameter : 97mm to 2.00m, 77mm to 3.00m and 57mm to 3.50m A = Amber Glass Jar sample V = Vial sample On completion installed a 50mm dia slotted standpipe with a gravel surround to 3.50m, a Bentonite seal from 0.50m to 0.20m and a concreted in lockable steel protective from 0.20m to GL.								Scale (approx) 1:25	Logged By GM/SJ	
								Figure No. SE1433.M3		



FIGURES



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 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Site Location			
Site 8 HUGHES ROAD, HAYES, GREATER LONDON	Date Drawn 17/01/2018	Date Checked	Orientation 	Job No. SE1433
Client CONSTRUCTION SERVICES MANAGEMENT LIMITED	Drawn By DJ	Checked By	Scale -	Figure No. 1

SUB SURFACE

