TAYLOR WHALLEY SPRYA

5B PRINCE ARTHUR RD, LONDON NW3 6AX

HYDROGEOLOGICAL IMPACT ASSESSMENT

REV 0

May 2020

DISCLAIMER

REVISION HISTORY

Revision	Date	Prepared by	Reviewed by	Description
Draft	27/05/2020	A. Gasparre Dott,Ing, PhD, DIC, CEng, MICE	J. A. Davis EurGeol CGeol BSc MSc DIC FGS	Issued for comments
Rev 0	28/05/2020	A. Gasparre Dott,Ing, PhD, DIC, CEng, MICE	J. A. Davis EurGeol CGeol BSc MSc DIC FGS	Adjustment of existing structure figure

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EXECUTIVE SUMMARY

The proposed redevelopment of 5B Prince Arthur Rd comprises the demolition of the existing house, and the construction of a new house and basement.

A hydrogeological study has been undertaken to assess the impact of the proposal on the local hydrogeology and on the adjacent structures.

The site is on ground sloping southwards and westwards with an approximate gradient of 1: 14 (Ref [OS Map appendix A]). It is underlain the Bagshot Formation to approximately 3.5m below ground level, followed by the Claygate Member, proved to 11m below ground level.

Groundwater at the site has been measured from July 2019 to August 2019 (Ref. [1]). Perched water has been found to be present from 3.2m below ground level, while the groundwater table has been measured at approximately 7.6m depth. This is expected to flow southwards and westwards following the topography of the ground. There are lost rivers in the proximity of the site, which are likely to represent the preferential pathway for groundwater flow.

The new basement would be above the groundwater level but could intercept perched water present across the site. Although it is unlikely that this water flows with a significant gradient, the new basement box could create a local barrier to any underground water flow.

This is unlikely to have any significant impact on the local hydrogeology and on the surrounding properties.

Water ingress could occur during construction and provision should be made to excavate in the dry.

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TABLE OF CONTENTS **Page No.**

LIST OF FIGURES

Page No.

1 Introduction

The proposed redevelopment of 5B Prince Arthur Road (National grid reference TQ264854) comprises the demolition of the existing house and the construction of a new house and basement.

The Geotechnical Consulting Group (GCG) have been commissioned to estimate the impact of the proposed basement construction on the local hydrogeology.

This report discusses the issues related to groundwater and considers the land drainage design measures (if required) to minimise the potential risks of adverse effects of the project on groundwater and neighbouring properties.

Information on the proposal has been provided by Taylor Whalley Spyra, the structural engineer consultants for the project.

This report has been prepared as part of the requirements set by the DP27/CPG4 and LB Camden's 'Guidance for Subterranean Development'. It addresses the issues of the subterranean (ground water) flow screening chart.

2 The site and the proposed redevelopment

The site lies within the Frognal & Fitzjohns Ward of Camden Administrative Boundary and is located on the south side of Prince Arthur Rd, approximately 100m to the east of Ellerdale Road (Figure 1a).

It has a rectangular shape, approximately 14m x 35m in plan, orientated along a north-west to south-east direction. The ground level is relatively uniform across the property with an Ordnance Datum (OD) of approximately +100.2mOD (Ref. [2]).

The site includes a detached house with a paved patio wrapping around the house, a small front garden, and a larger garden at the rear. There is a large Copper Beach Tree in the back yard, that is considered to be an asset by the owners and will be conserved. Figure 1b and Figure 2a show the current layout of the site.

The house footprint has an area of 117m^2 and is approximately 12m long and 10m wide Figure 2a (Ref. [3]).

In the rear garden there is also an existing single-story garden shed.

Figure 3 shows a plan of the existing ground floor, as well as a side, front, and back elevation of the existing house (Ref [4,16]).

It is proposed to demolish the existing house and construct a new dwelling, creating a new single storey basement underneath the original footprint of the house and its rear patio. Two small light wells will also be formed at the front and rear of the house. Figure 4 shows a plan of the proposed basement and ground floor. Figure 5 shows two perpendicular sections through the proposed structure.

The finished floor level of the new basement will be at approximately +96.4mOD and will require an excavation of approximately 4.3m under the house.

It is understood that the basement will be formed by installing sheet piles around the basement perimeter. During excavation, the sheet piles will be supported by 2 levels of temporary hydraulic props. A watertight Reinforced Concrete (RC) basement structure will then be constructed from the bottom, upwards. Removal of temporary props will take place on completion of the basement structure and installation of the ground floor slab.

3 Topography and geology

The site is on a roughly level plot of land at approximately +100.2mOD. The ground in the surrounding area slopes downward toward the south-west at an approximate gradient of 1:15 (Figure 1b).

The ground and groundwater conditions have been established on the basis of record information (British Geological Survey, BGS, maps and record boreholes) and a site-specific ground investigation carried out by Risk Management (Ref. [1]).

The 1:10,560 scale geological map seen in Figure 6 shows that the site is underlain by the Bagshot Formation, which is, in turn, underlain by the Claygate Member, the uppermost Member of the London Clay Formation (Ref. [5]).

The Bagshot Sand Formation includes horizontally bedded sands with occasional thin gravel beds and lenses of silt and clay. The base of the Bagshot Formation is distinguishable by an erosional surface marking a change from the clay, silt, and fine-grained sand of the underlying Claygate Member, to a basal layer of gravel and sand.

The Claygate Member comprises interbedded layers of fine-grained sands, silts, and clays. The geological map in Figure 6 shows this stratum to be present at surface less than 50m to the west of the site. (Ref. [6]).

Below the Claygate Member the stratigraphy at the site includes London Clay, Lambeth Group, Thanet Sand and Chalk.

The London Clay outcrops about 150m to the west of the site at approximately +90mOD), which suggests that the thickness of the Claygate Members at the site could be in the order of about 10m. The thickness of the London Clay in the area is expected to exceed 60m (Ref. [6]).

The site specific ground investigation carried out by Risk Management (Ref. [1]) included the sinking of a light percussion borehole (BH1) to 11m depth in the front driveway, a Drive-in Sampler borehole (BH2) to 4.5m depth in the rear garden, and two trial pits at the northernmost and southernmost corner of the house. The location of the investigation holes is shown in Figure 7.

BH1, at the front of the property, identified Bagshot Formation to a depth of 6.4m (i.e. +93.6mOD) over Claygate Beds, proved of the end of the borehole. BH2 proved the Bagshot Formation to the end of the borehole at 4.5m depth.

The Bagshot formation included a sequence of gravel and sand and, in BH1 only, an upper layer of clay, 1.1m thick. The layer of gravel extended consistently to 3.2-3.4m depth and was found to be about 2.2m thick at the rear of the site and 1.2m at the front, where it was overlain by the clay layer.

The Claygate Member was found in BH1 below 6.4m depth and included layers of orange-brown and grey silty sand and silty sandy clay. The colour of the soil indicates that it has been weathered.

The topography of the area and the geological information indicates that the sandy and gravelly deposit of the Bagshot Formation reduces in thickness towards the west, where the Claygate Member and then the London Clay Formation outcrop.

4 Hydrogeological conditions and hazards

The OS topographic maps show that the house sits on top of a watershed ridge dropping to the south and to the west of site, with Hampstead to the north. A map in the Lost Rivers of London (Ref. [9]) (Figure 8) and the 1920 1:10,560 scale BGS map (Figure 6) show that numerous streams exist in the area of the site.

About 170m to the west of the site a former stream runs southwards along Frognal Road, to feed a tributary of the Westbourne River further to the south-west. Approximately 220m to the south-east there is a former tributary of the Tyburn River, which is further south-east of site. Site works should not affect these rivers as they are too far away.

Other streams are further than 100m from the site and flow into various drainage channels to form tributaries of the four main rivers within the London Borough of Camden. All these springs would be expected to be culverted or filled in.

The site is roughly 900m away from the Hampstead Chain Catchment. The closest ponds appear to be at approximately 900m to the north east of the site (Hampstead No. 1 Pond), although smaller ponds are known to be present within West Heath, to the north of site.

4.1 Aquifers

Within the London area there are two recognised principle aquifers. The major aquifer is a deep aquifer below the London Clay, while the shallow aquifer lies predominantly within the deposits above the London Clay. The London Clay acts as a barrier between the two aquifers.

4.1.1 Deep Aquifer

The deep aquifer lies within the Chalk and Thanet Sand Formation that extends under the London Basin. Historically, extraction of water from this aquifer for drinking and industrial purposes has caused a significant drop in the aquifer level. Since the mid-1960s, extraction of water from the deep aquifer has declined greatly, and as a result the water level has been recovering. Due to the implications that this rising groundwater level has for the infrastructure of London, the aquifer level is now monitored and the rise in its level is controlled by pumping (Ref. [10]).

Currently, the deep aquifer beneath the site lies at approximately -25mOD (Figure 9). The London Clay and clay sub-units of the Lambeth Group that overlie the Thanet Sand and Chalk are of very low permeability and of sufficient thickness that the proposed development will have no impact on the deep aquifer.

4.1.2 Shallow aquifer

The shallow aquifer lies within the superficial deposits above the London Clay. It is variable in both level and thickness and is discontinuous. It has also been heavily modified by human activity throughout the history of London.

Groundwater in the shallow aquifer tends to flow above the underlying impermeable layers of clays following the underground topography of the area.

The presence of lost rivers or streams generally indicate the preferential ways of groundwater flow within the shallow aquifer.

4.2 Site conditions

The general trend in groundwater flow direction within the Upper Aquifer in the area should gravitate towards the above mentioned old river courses. Ground water is also anticipated to travel radially from the outcrop of the Bagshot Formation at Hamstead Heath, exiting as springlines at the base of the formation and feeding various tributaries.

Groundwater in the area of the site would be expected to flow off the watershed westwards into the Westbourne catchment and southwards into the Tyburn catchment. Groundwater flow along the watershed ridge is likely to be insignificant.

Due to the nature of the Bagshot Formation and Claygate Member, discontinuous and localised groundwater might also be present within the sandy bands above the more clayey layers.

Groundwater has been recorded during the investigation works and standpipes were installed to monitor groundwater on completion of the works.

During the investigation groundwater was encountered at 7.6m depth in BH1 and 3.2m in BH2, which, considering the ground levels of these holes, correspond to levels of +92.6mOD and +96.9mOD respectively.

Standpipes extended to 10m below ground level (bgl) in BH1 and 4.5mbgl in BH2.

Groundwater level readings were taken on three return visits and are provided in the table below in depths bgl and with reference to mOD. They are also plotted in Figure 10.

Date [-]	BH1 [mbgl]	BH2 [mbgl]	BH1 [mOD]	BH2 [mOD]
29/07/2019	7.58	dry	92.62	95.6
21/08/2019	7.61	3.23	92.59	96.87
18/09/2019	7.62	3.31	92.58	96.79

The readings indicate an apparent difference of about 4m in groundwater levels between the front and rear of the site. However, the stratigraphy across the site and the pattern of readings suggest that the values in BH2 are not representative of the effective groundwate levels at the site and ae likely to have been affected by rainwater trapped into the standpipe. This is supported by the following considerations:

- No water was observed during the investigation works at depths shallower than 4.5m. Given the granular and drained nature of the deposits at the site, water seepage would have been noted if present. This was in fact the case for BH1, but at 7.6m depth.

- BH2 was found to be dry in the first monitoring visit, 10 days after the installation of the standpipe. Given the coarse nature of the deposit, any groundwater would have fully stabilised within the period of 10 days as, in fact, it was the case for

BH1, where the water level has been consistently found at levels of approximately 7.6m during and after the investigation works.

- There is continuous layer of gravel across the site, from front to rear. If any water was present in this layer (i.e. above 3.6m depth) it would be noted in the standpipes of both boreholes.

It is therefore concluded that the groundwater levels at the site are more representatively provided by BH1 and the groundwater is likely to be at depths of approximately 7.5m.

It should also be noted that the site investigation and the monitoring were carried out over a summer period, although the rainfall between July to September 2019 was around the annual average, as shown in Figure 9b. This indicates that the groundwater readings can be taken as representative of an annual average, although, given the granular nature of the soil deposits at the site, little seasonal variation of groundwater would be expected in any case.

4.3 Surface Flooding

The Environment Agency data indicates that the area of the site is at very low risk of flooding from surface water, rivers or sea and reservoirs (Figure 12a).

Prince Arthur Road is not in the list of roads of Camden affected by flooding in 1975 or 2002 (Figure 10b).

It is understood that the new extension will include an additional 18m^2 of brown roof and will have a net decrease of hard standing areas in the order of 6m^2.

This will not result in an increase of risk of flowing due to surface water for the site because there will be no increase in water-run off into the ground or into the local sewer.

The site is not included in a Source Protection Zone and is also not in a sensitive land use or in a potentially contaminative industrial land use.

5 Impact of the development and land drainage requirements

The excavation for the proposed basement will extend to an approximate level of +95.9mOD. It will remain approximately 3m above the groundwater level measured at the front part of the house. As mentioned above, the groundwater level measured at the rear of the site in the last two monitoring visits are likely to be due to rainwater tapped in the standpipe and are not representative of groundwater levels at the site.

The new basement box would remain above the groundwater level, but the sheet piles forming the retaining walls might extend to 7.5m depth and intercept the groundwater flow across the site.

However, groundwater would be expected to deviate around the perimeter walls of the basement without adverse impacts on the local hydrogeology because the soil is granular, there is space around the basement and the groundwater is deep below ground.

The sheet piles should be constructed in such a way as to allow free flow of ground water beneath the basement, but, given the negligible impact of these piles on the local hydrogeology it would be advisable to ensure that these provide a watertight seal during construction should any perched water above clay lenses be present.

The new basement walls should be designed accounting for a potential increase of groundwater above the measured level.

In the permanent condition there will need to be a suitable internal construction to bring the structure to an acceptable standard with regard to moisture ingress.

6 Conclusions

The proposed redevelopment of 5b Prince Arthur Road comprises the demolition of the existing house, the construction of a new basement, and construction of a new dwelling.

The results of the site investigations carried out in August 2019 indicate that the site is underlain by the Bagshot Formation to a depth of approximately 6.4m below ground level followed by the Claygate Member, proved to 11m below ground level.

Perched water has been found to be present from approximately 7.5m below ground level, although localised and discontinuous water ingress might be encountered also at shallower depths.

The new basement would be above the groundwater level but its retaining walls could intercept perched water across the site. Although it is unlikely that this water flows across the site with a significant gradient, the new walls could create a local barrier to this flow but this is unlikely to cause other than a negligible increase of groundwater levels on the uphill side of the wall with no adverse effects on the local hydrogeology.

The site is situated close to the watershed between the Westbourne and Tyburn drainage catchments. There are lost river in the vicinity of the site, but no other known ponds and wells. The site is outside the Hampstead pond chain catchment area.

The proposed construction will decrease the proportion of hard surfaced/paved areas and therefore would not alter the currently very low risk of flooding of the area.

The proposal should have no impact on the deeper aquifer.

7 References

[1] Risk Management (2019). Site Investigation at 5b Arthur Road, Hampstead on behalf of Mr. & Mrs Palsson. London.

[2] Simpson – TWS drawing number 9634-BIA_02 (2020). Titled *Existing Topographical Survey*.

[3] Simpson – TWS drawing number 9634-BIA_08 (2020). Titled *Comparison of Existing and Proposed Hard and Soft Landscaping Areas*.

[4] Drawing number TP9005356 (1990). Titled *5B Prince Arthur Rd, Attic Conversion, Existing Floor Plans*

[5] BGS 1:10,560 Map Sheets 1SE, 2SW, 5Nw 1920 Ed reproduced in Camden Geological, Hydrogeological, and Hydrological Study (2010).

[6] British Geological Survey (BGS). [online] https://www.bgs.ac.uk.

[7] Ordnance Survey (2019). © Crown copyright. All rights reserved. License number LAN1000953.

[8] CIRIA 760. Guidance on embedded retaining wall design. London, 2017.

[9] Barton N. and Myers S. (2006): The Lost Rivers of London. Historical Publications Ltd

[10] Environment Agency. 2017. Management of the London Basin Chalk Aquifer.

[11] Camden Development Policies DP27. Basements and Lightwells

[12] Camden Planning Guidance CPG4. Basements and Lightwells

[13] CIRIA Special Publication 69. 1989. The engineering implications of rising groundwater levels in the deep aquifer beneath London

[14] Ove Arup & Partners Ltd. Camden geological, hydrogeological and hydrological study – Guidance for subterranean development. LB Camden Guidance Document.

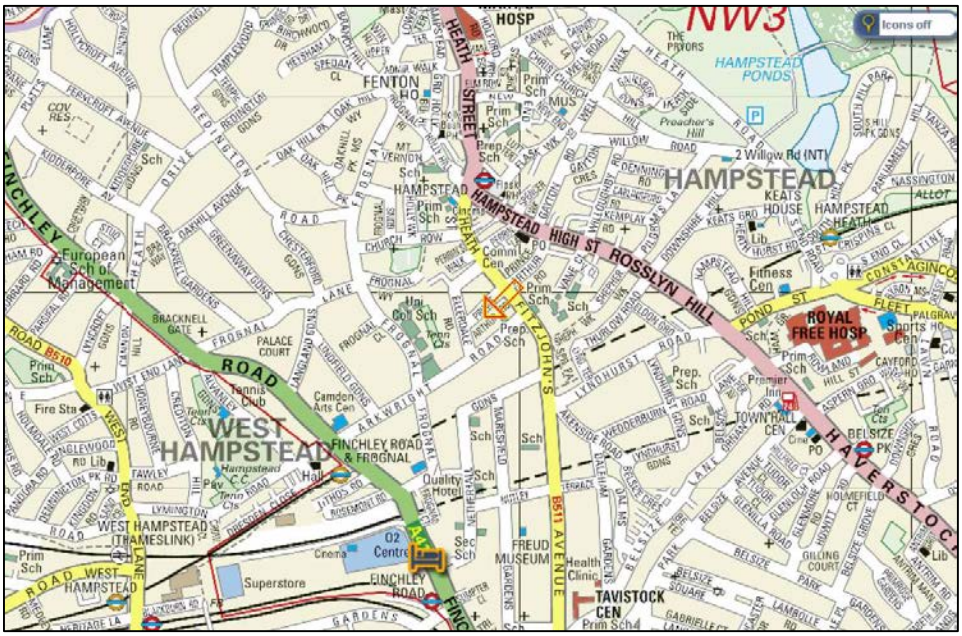
[15] Ove Arup & Partners Ltd.(2020) RedFrog Hydrogeological Mapping

[16] Drawing number TP9005356 (1990). Titled *5B Prince Arthur Rd, Attic Conversion, Existing Elev.S/Roof*

[17] Charlton Brown Architecture and Interiors (2019). Pre-Planning Application Document for Copper Beech House, 5B Prince Arthur Road.

FIGURES

(a)



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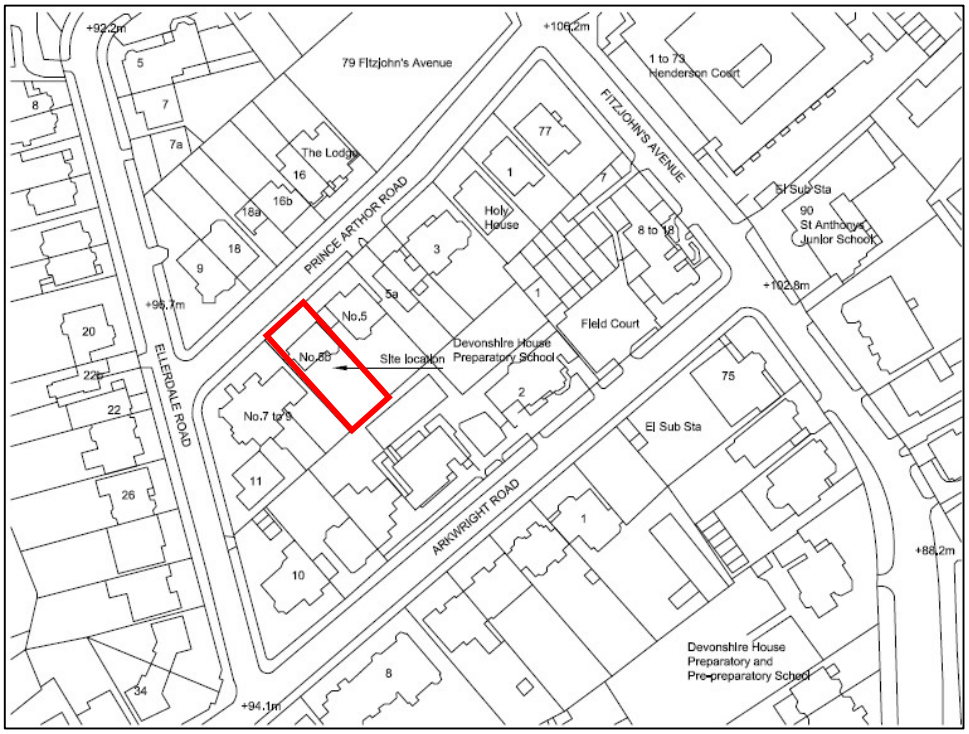
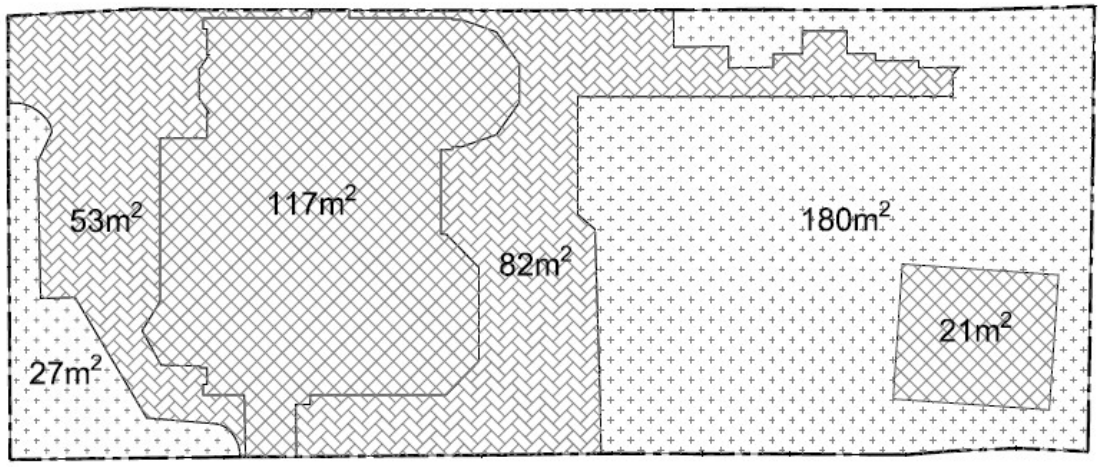


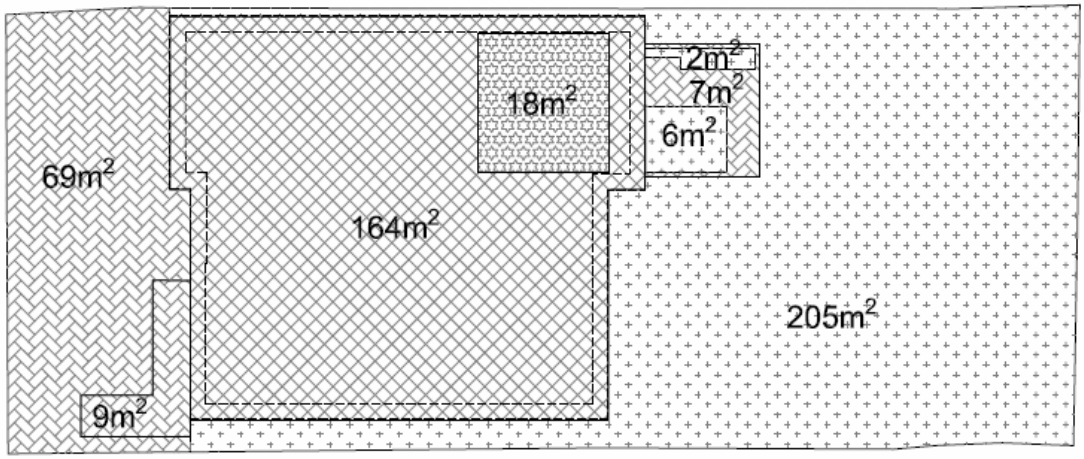
	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **1**
	The Site a) Location b) site layout	

(a)



EXISTING SITE HARD AND SOFT LANDSCAPED AREAS

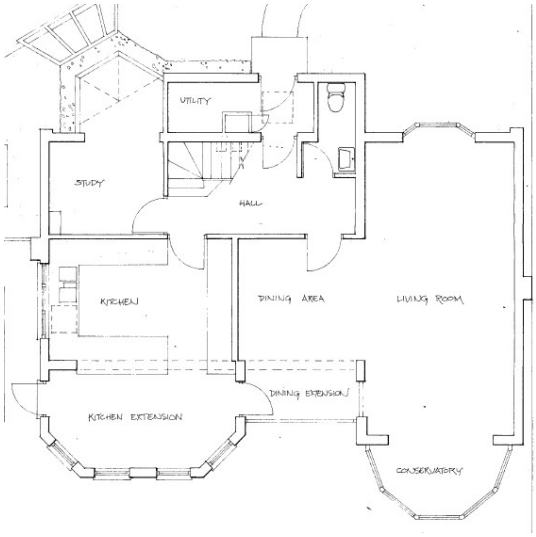
(b)



PROPOSED SITE HARD AND SOFT LANDSCAPED AREAS
(SCALE 1:150)

	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure**
	Hard and soft landscaped areas on site a) Existing b) Proposed	**2**

(a)



(b)

SIDE ELEVATION

(c)

NORTHWEST ELEVATION (FRONT)

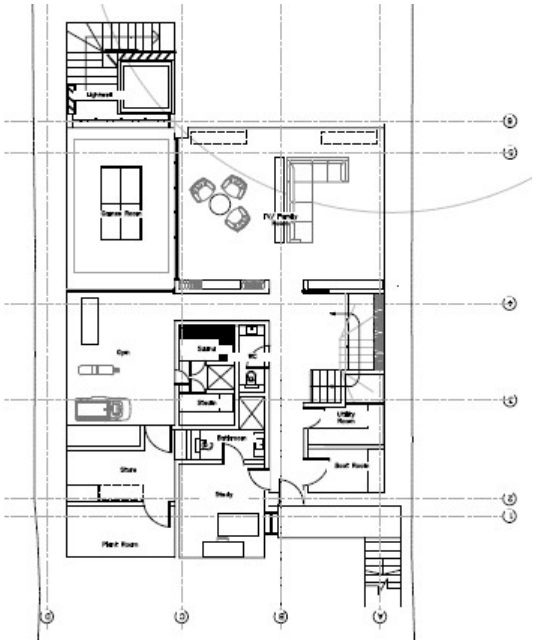
(d)

GARDEN (SOUTH WEST) ELEVATION (REAR)

	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **3**
	Existing Structure (a) Plan, (b) Side, (c) Front and (d) Rear elevation	

(a)

(b)



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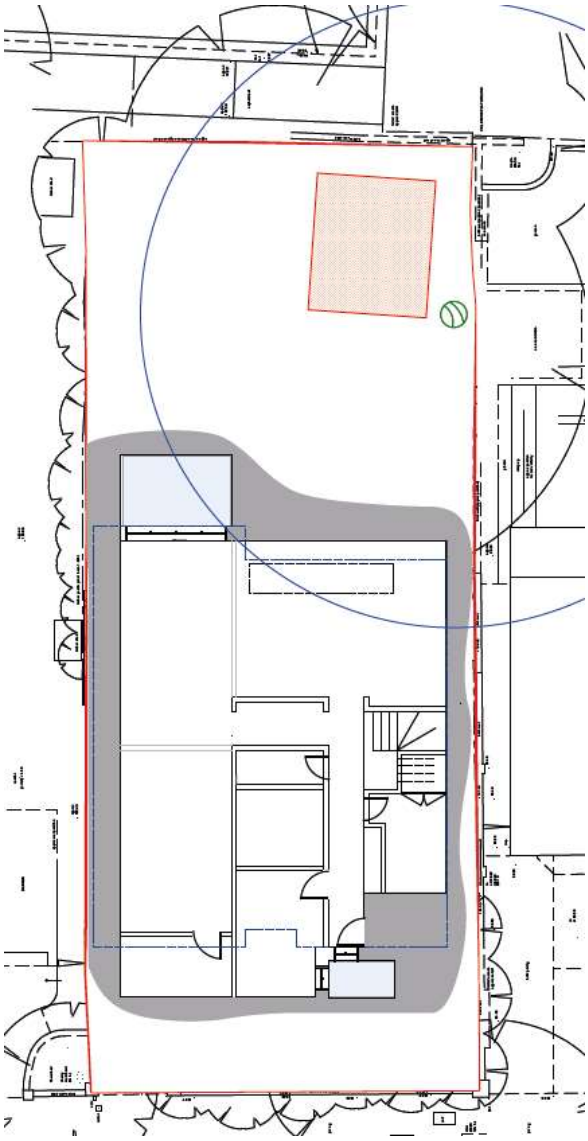
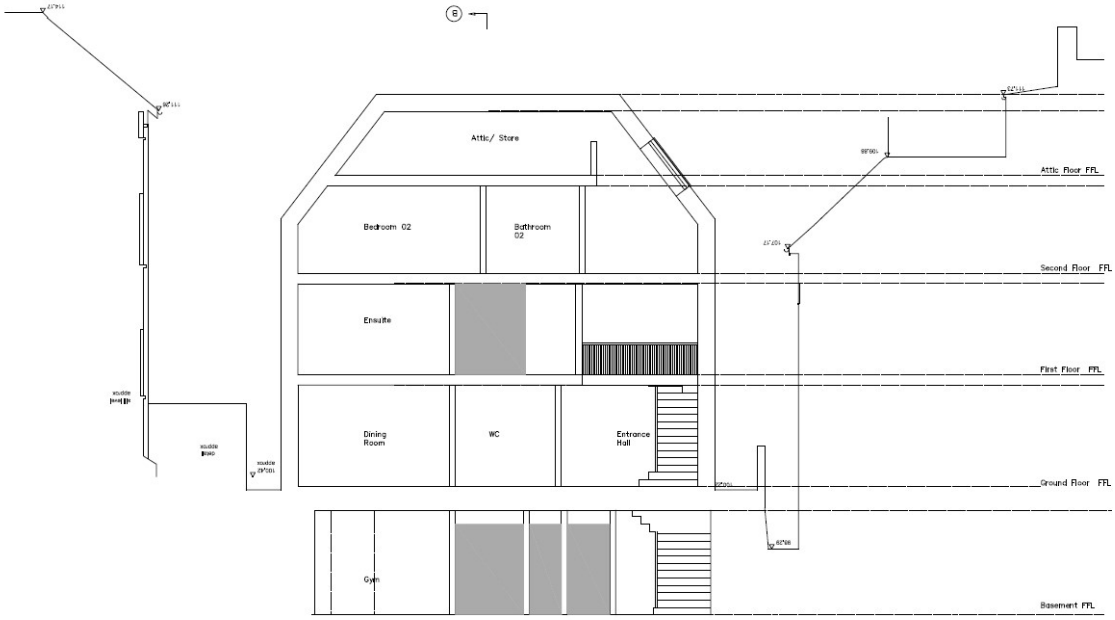


	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **4**
	Proposed basement (a) Plans of the ground floor and (b,c) basement	

(a)



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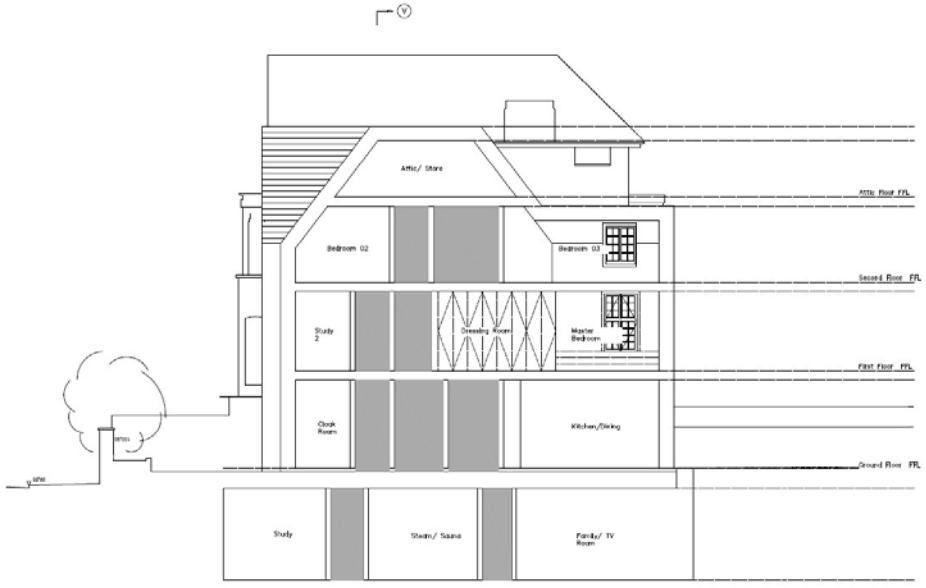
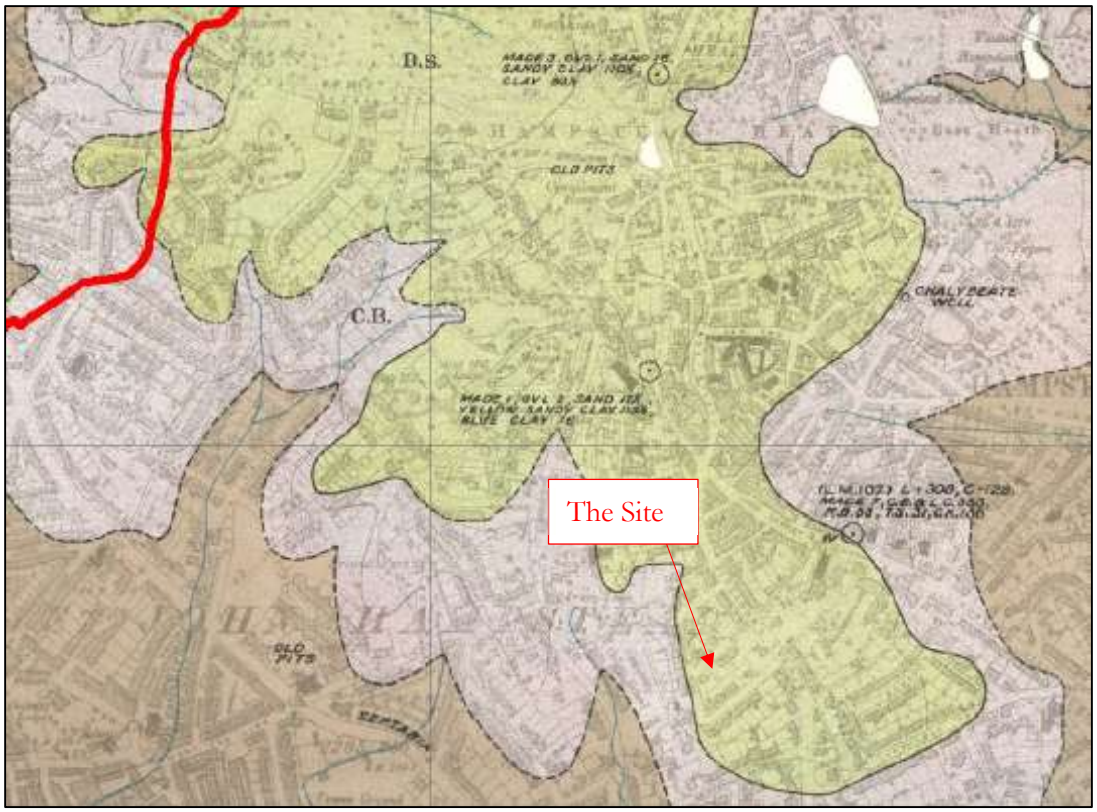
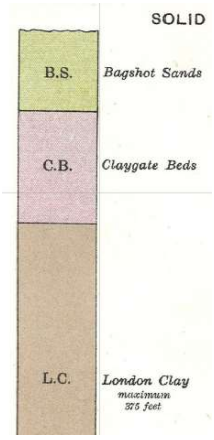
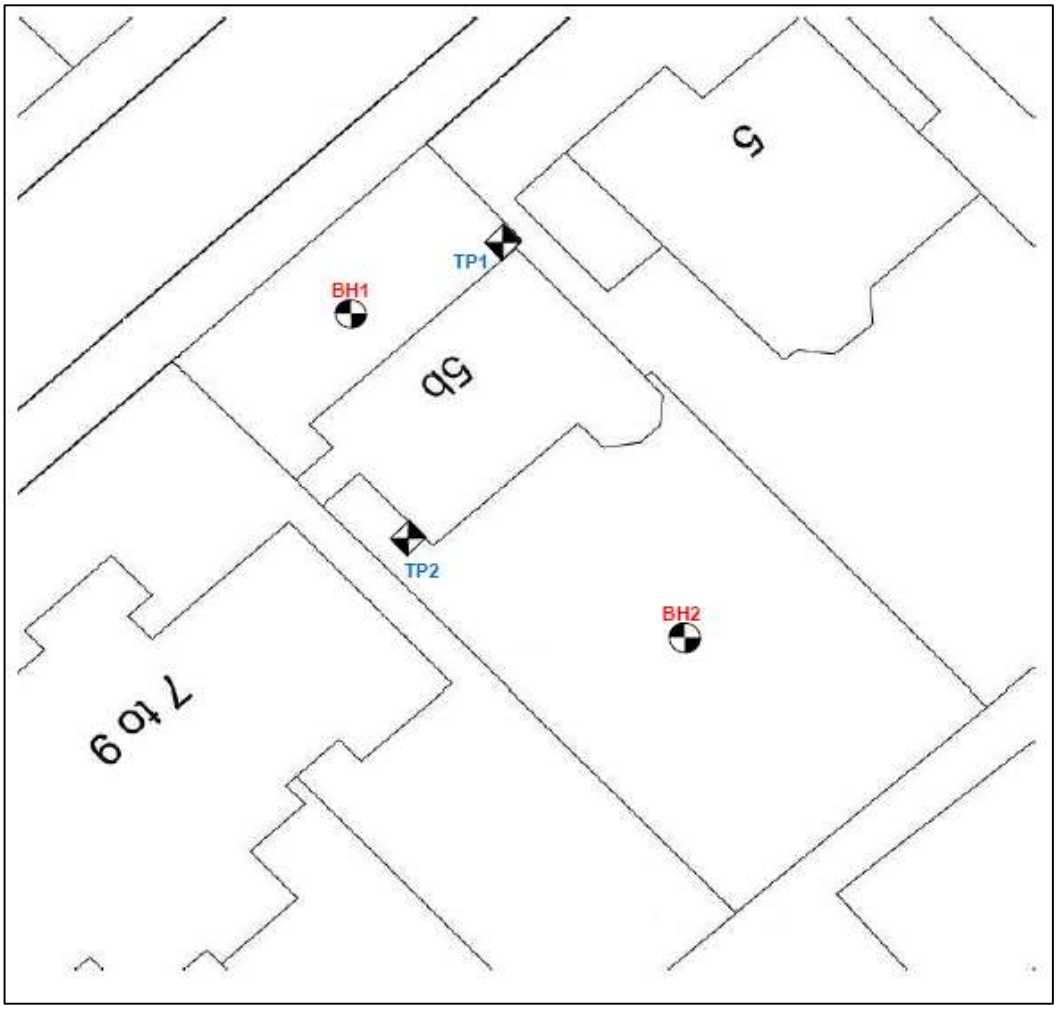


	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure**
	Proposed basement (a) North-east to south-west and (b) north-west to south-east section	**5**

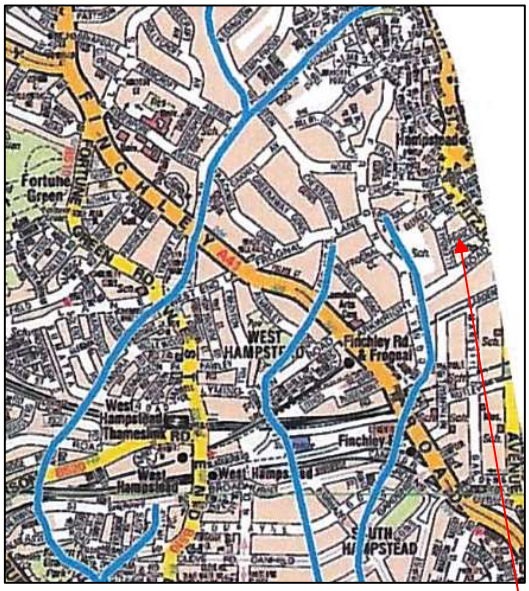


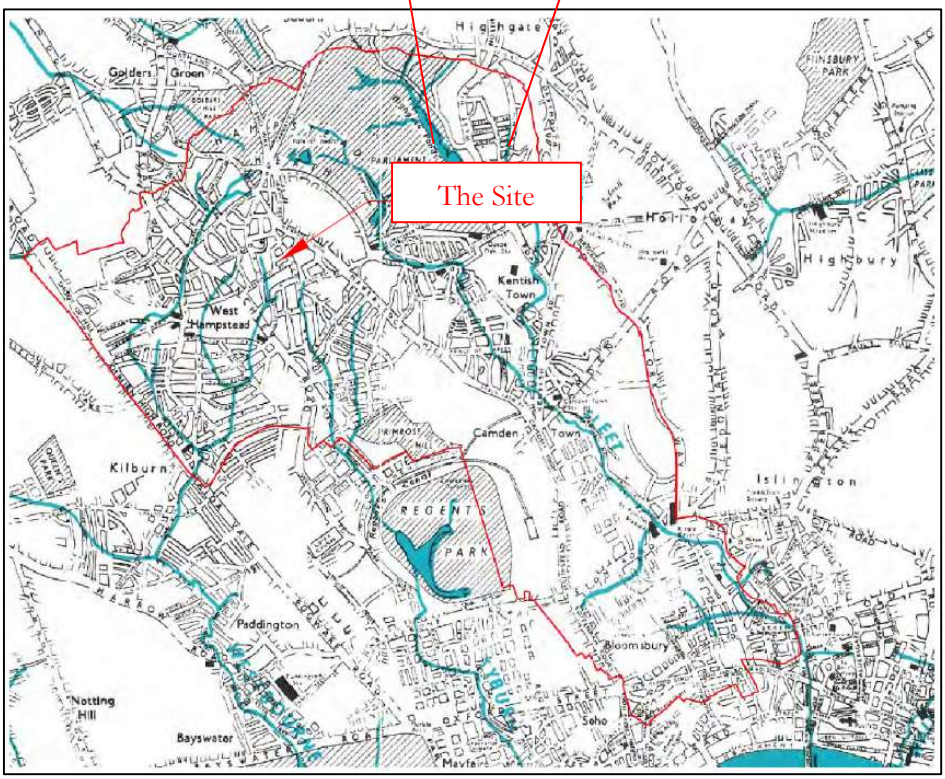


	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **6**
	BGS Geological map (1920) Reference [XX]	

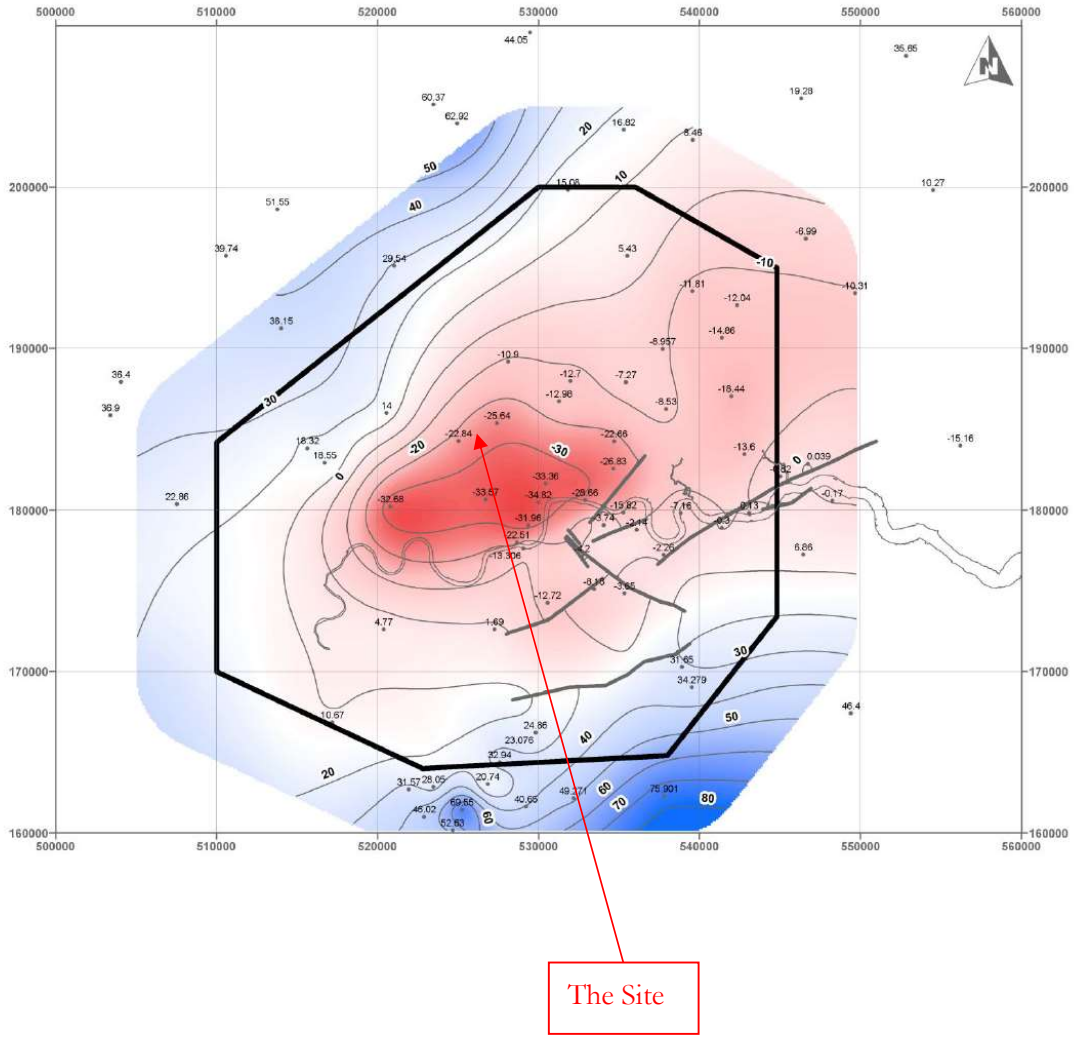


	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure**
	Location of investigation points Reference [XX]	**7**

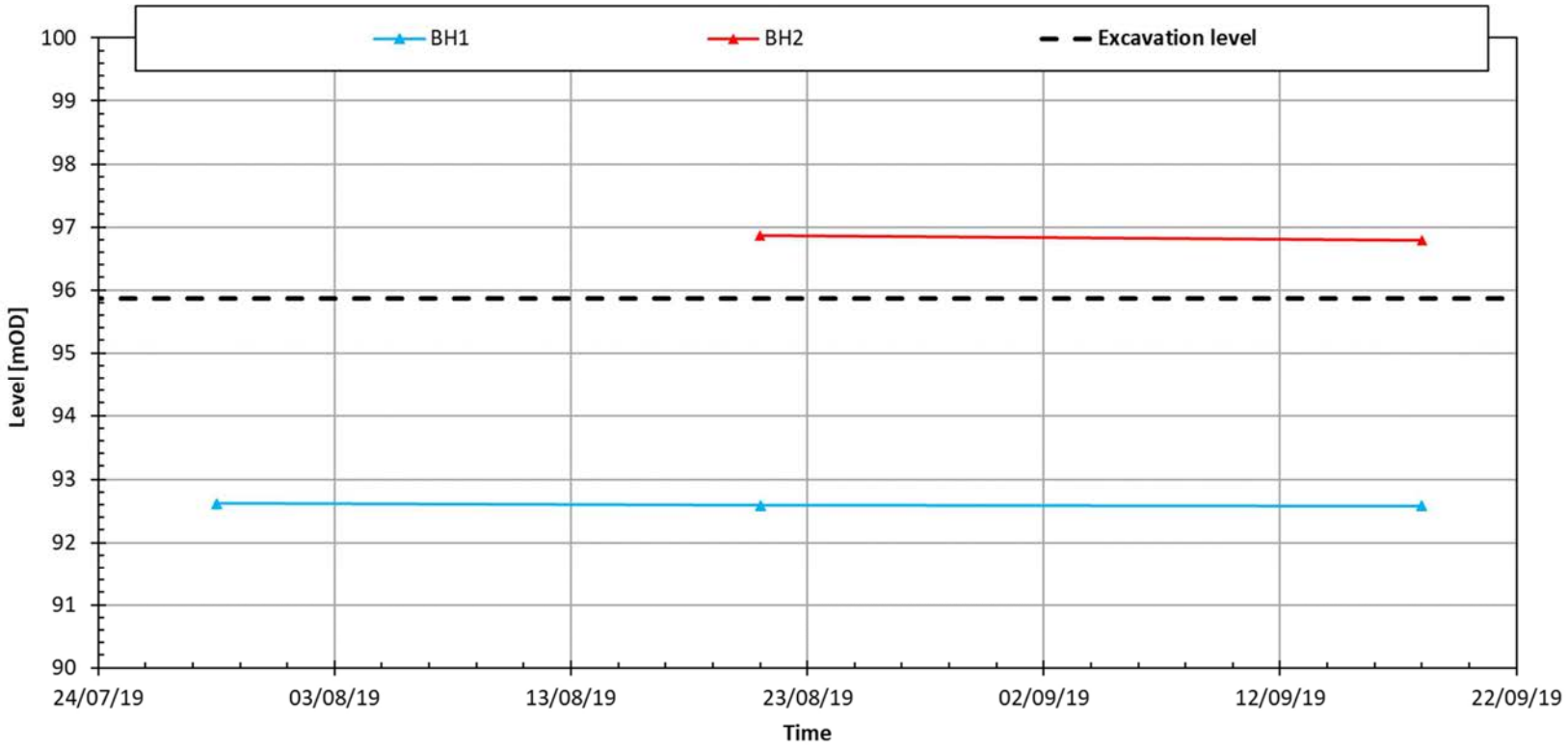




	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX **Extract from the Lost Rivers of London (Barton 1992)**	**Figure** **8**



	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **9**
	Level of deep aquifer Environment Agency 2016	



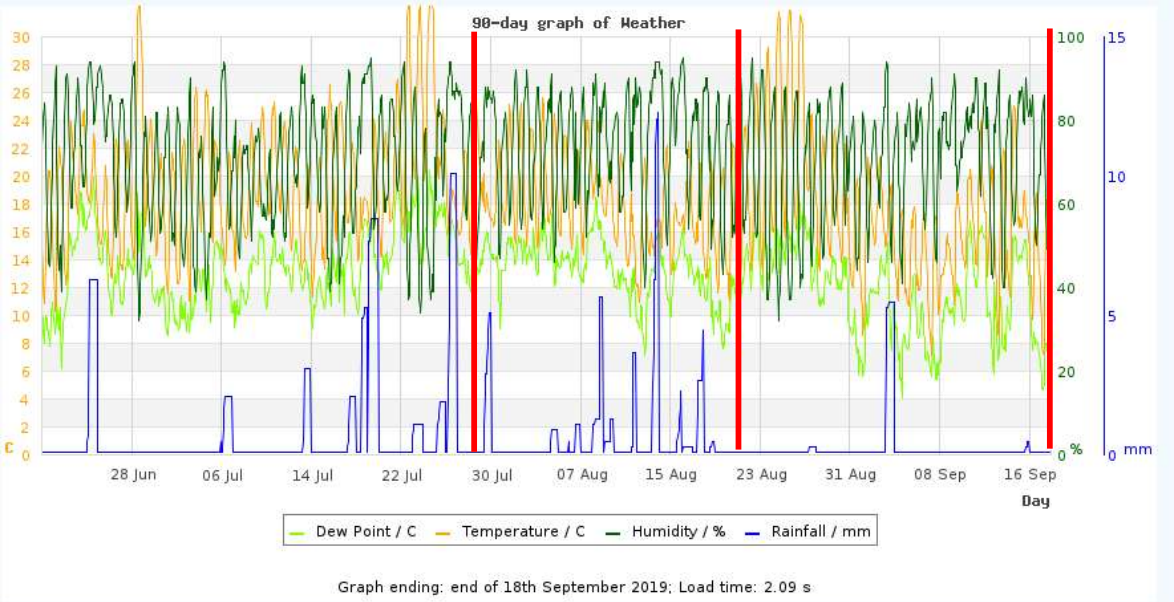
Taylor Whalley Sprya

5B Prince Arthur Rd, London NW3 6AX

Groundwater levels across the site

Figure 10

(a)



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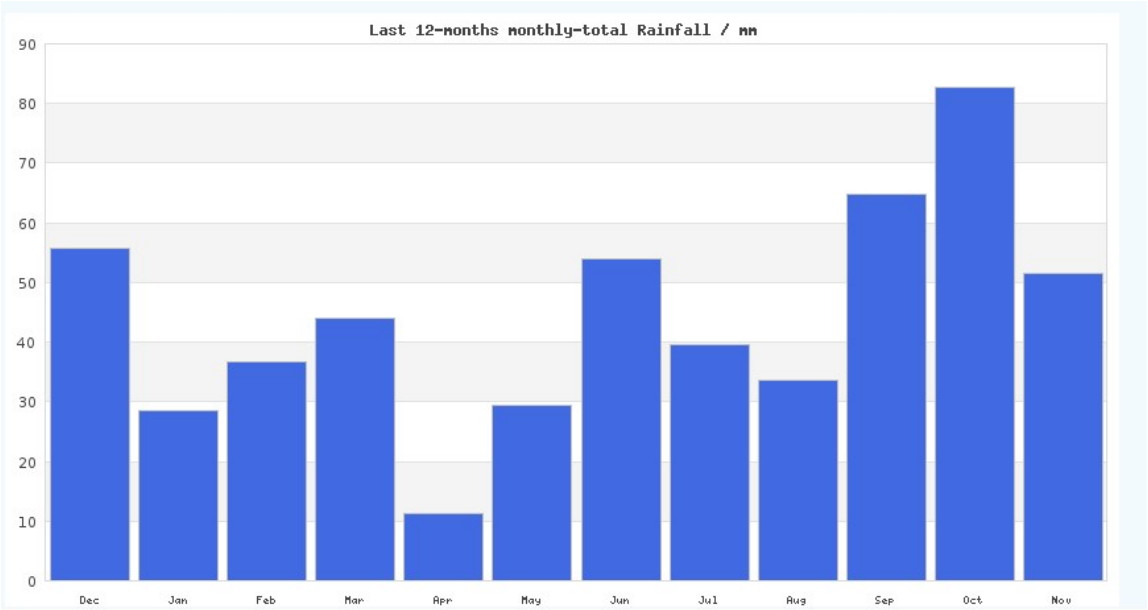
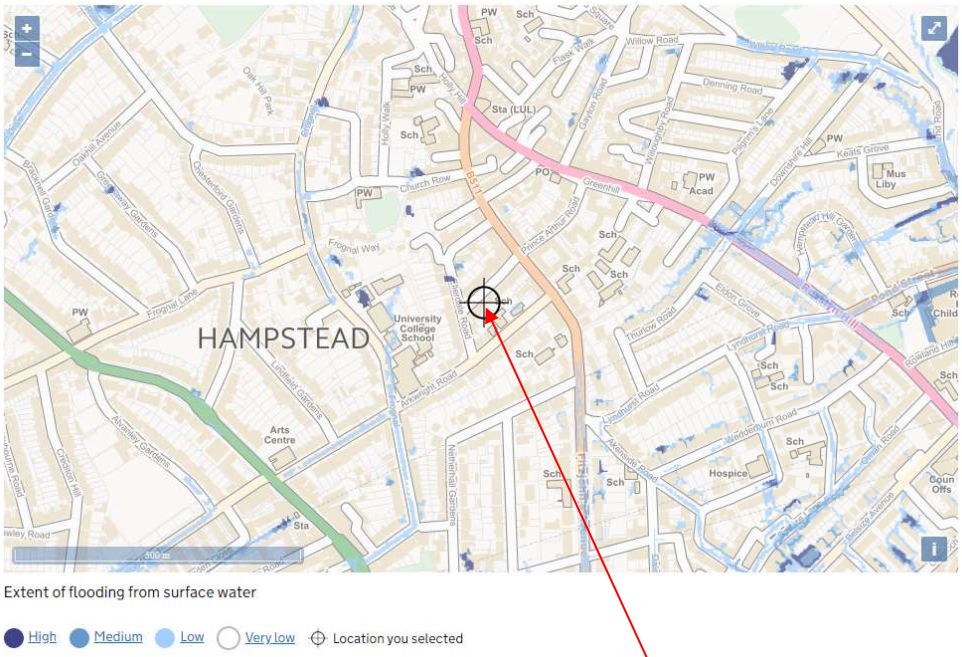


	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **11**
	Rainfall levels a) March to April 2019 b) April 2018 to April 2019	

(a)



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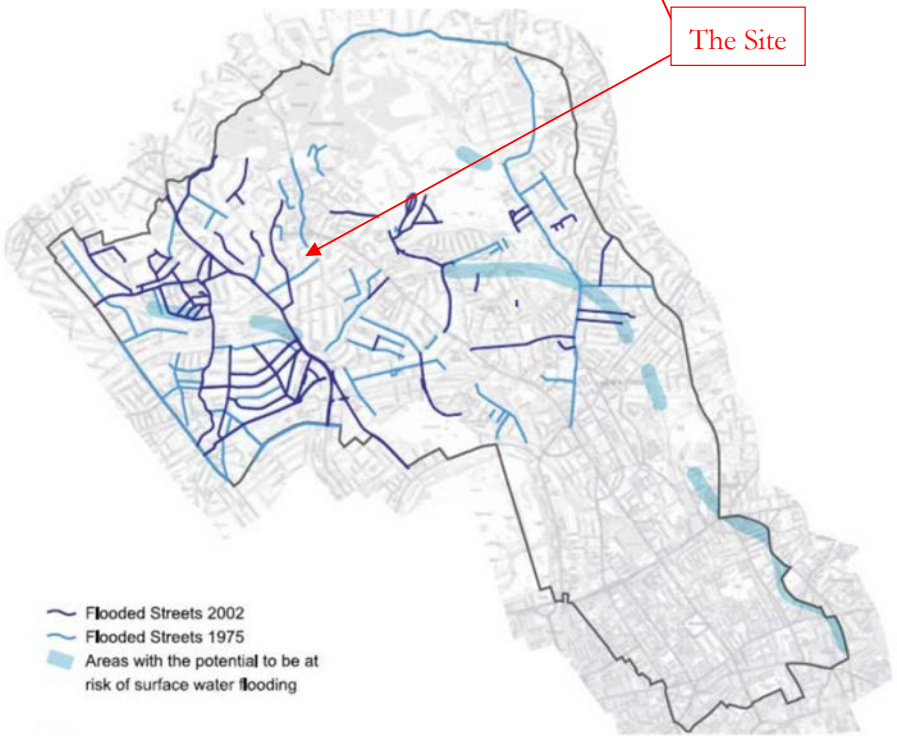


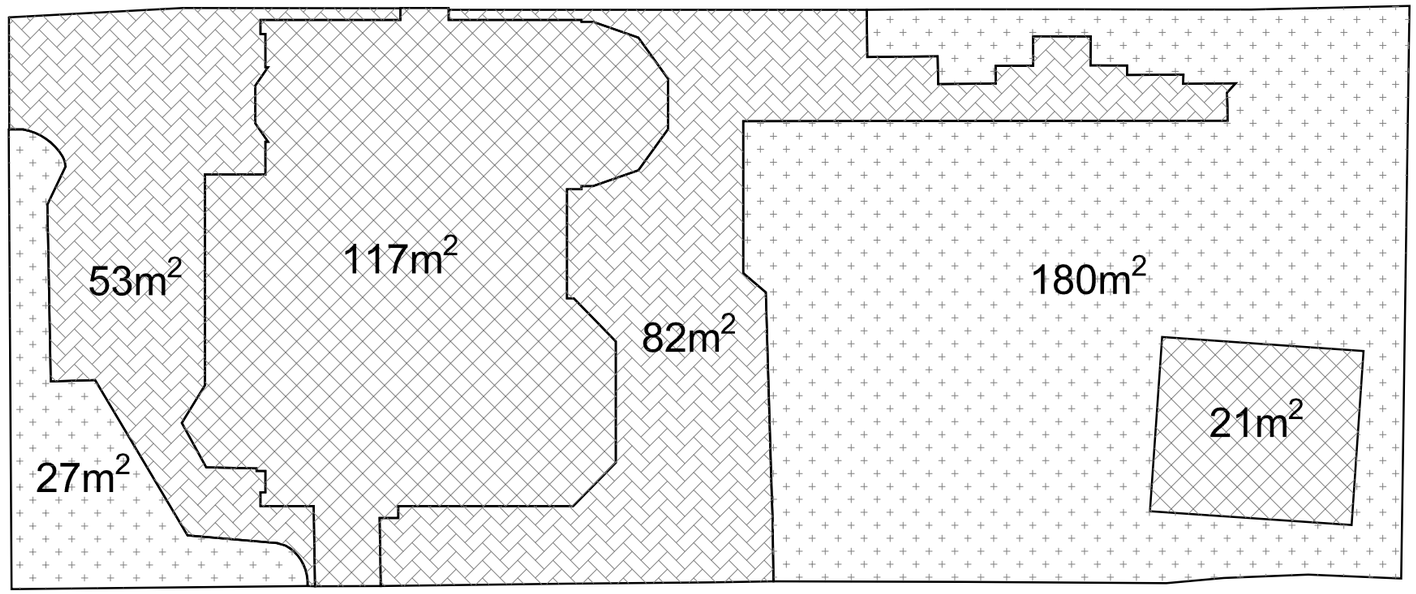
	Taylor Whalley Sprya 5B Prince Arthur Rd, London NW3 6AX	**Figure** **12**
	Surface flooding risk	

Appendix I

TWS - 9634_BIA_08 _ Comparison of existing and proposed hard & soft landscaping areas

KEY Total Site Area (480m²)

- Building (138m²)
- Paved Area (135m²)
- Landscaped Area (207m²)

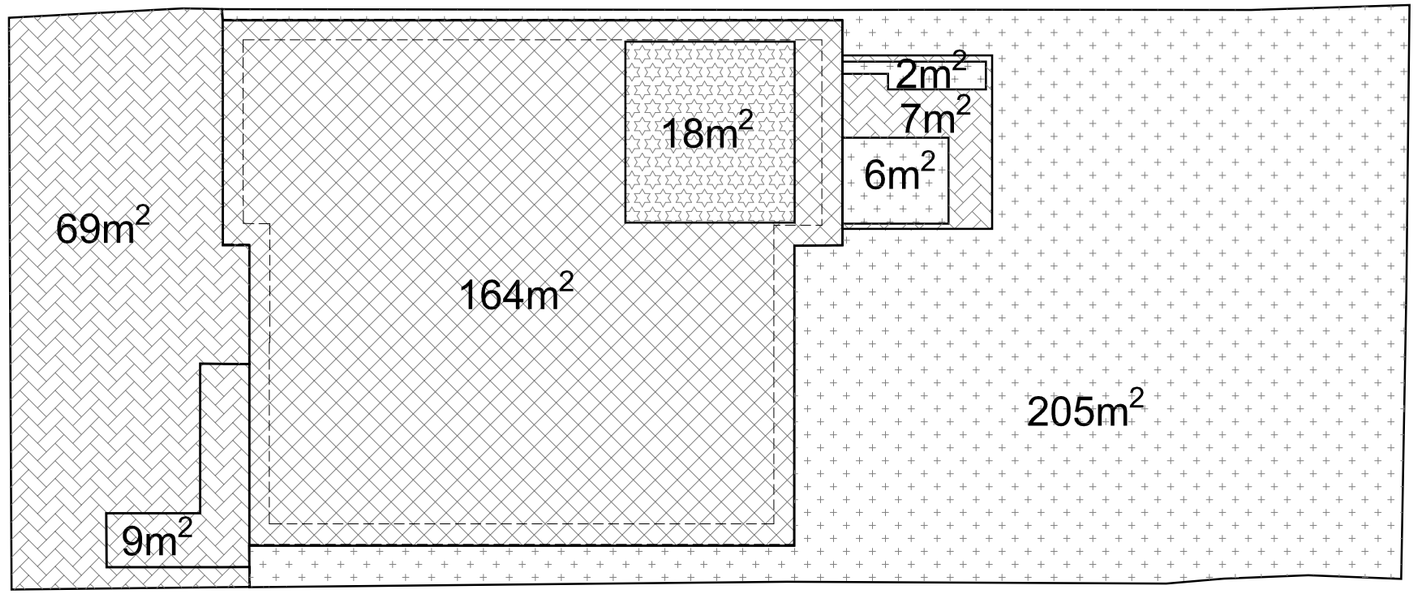


EXISTING SITE HARD AND SOFT LANDSCAPED AREAS

(SCALE 1:150)

KEY Total Site Area (480m²)

- Building (164m²)
- Paved Area (85m²)
- Landscaped Area (213m²)
- Brown roof (18m²)



PROPOSED SITE HARD AND SOFT LANDSCAPED AREAS

(SCALE 1:150)

simpson | tws
3 Dufferin Avenue
London EC1Y 8PQ
T.0207 253 2626
www.simpsoneng.com

Contract	Title	Scale at A3	Date	Drawn By
COPPER BEECH HOUSE, 5b PRINCE ARTHUR ROAD, HAMPSTEAD, LONDON, NW3 6AX	COMPARISON OF EXISTING AND PROPOSED HARD & SOFT LANDSCAPING AREAS	NTS	07/01/20	GB
		Job No. 9634	Drawing No. BIA_08	Rev. -

Appendix J

Risk Management Limited Site Investigation report reference RML 7044

Risk Management Limited updated ground water monitoring results

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PROJECT No. RML 7044

SITE INVESTIGATION
AT
5b ARTHUR ROAD, HAMPSTEAD

ON BEHALF OF
Mr. & Mrs. PALSSON

August 2019

CONTENTS

APPENDICES

1.0 INTRODUCTION & SCOPE OF WORKS

1.1 This report has been prepared by Risk Management Limited to the instructions of the Consulting Engineers for the work, Messrs. Taylor Whalley Spyra, under cover of their e-mail dated 12th July 2019.

1.2 The Clients for the project are Mr. & Mrs. Palsson.

1.3 The site under consideration is No. 5b Prince Arthur Road, Hampstead, London NW3 6AX.

1.4 It is understood that the existing property is to be demolished and replaced with a new house over a slightly larger footprint. The new house will include a basement over the whole of the new properties footprint and possibly extending out into the rear garden.

1.5 The current work was therefore commissioned to was therefore commissioned to provide information on the sub-soil conditions at this site, together with laboratory testing, in order to allow foundations to be designed and a Basement Impact Assessment (BIA) to be undertaken by others.

1.6 This report presents the work carried out and discusses the findings.

2.0 FIELDWORK

2.1 All fieldwork was generally executed in accordance with the recommendations given in British Standard BS 5930:2015, "Code of Practice for Ground Investigations".

2.2 Borehole and trial pit locations were chosen by the Consulting Engineers and are shown on the appended Sketch Fieldwork Location Plan, Drawing No. RML 7044/1.

2.3 Fieldwork was undertaken on the 18th and 19th April 2019 and comprised the following;

Light Percussion Borehole

2.4 One light percussion borehole (BH1) was drilled to the front of the existing property to a depth of 11.00m below existing ground level.

2.5 The drilling rig used was a Premier tracked drive-in-sampler rig which includes a 98mm diameter casing system driven into the ground with a series of 1 metre long metal tubes, varying in diameter from 80mm down to 35mm, driven through the casing to obtain disturbed samples at regular depth intervals.

2.6 Standard Penetration Tests (SPT's) were carried out within the borehole in order to provide information on the consistency of the material encountered. The appended SPT versus Depth Profile plots the 'N' values against depth for borehole BH1 at this site.

2.7 The Dynamic Probe employed comprises a weight of 63.6 kg dropping through a free-fall height of 762mm in accordance with British Standard BS 1377 : Part 9. The weight drives a 50mm diameter "split-spoon" sampler into the ground. The resistance to penetration is recorded for 6 consecutive 75mm increments with the SPT 'N' value calculated from an addition of the final four 4 readings.

2.8 Upon completion of borehole BH1 a combined groundwater/gas monitoring standpipe was installed to a depth of 10.00m below existing ground level.

2.9 The monitoring installation comprised a 1 metre length of plain 50mm diameter HDPE pipe followed by slotted geotextile wrapped HDPE pipe, capped at the base. A cement/bentonite seal was installed from 1.00m to ground level and the installation finished with a gas valve on top of the pipe and a lockable stopcock cover concreted in flush with ground level.

2.9 Full details of the light percussion borehole findings are given on the appended borehole record sheets.

Drive-in-Sampler Borehole

2.10 In addition to the above noted light percussion borehole, and owing to access restrictions to the rear garden area, one drive-in-sampler borehole (BH2) was drilled in the rear garden at this site to a depth of 4.50m below existing ground level, before terminating owing to the borehole 'caving in'.

2.11 The drive-in-sampler comprises a series of 1 and 2 metre long metal tubes, varying in diameter from 80mm down to 35mm, driven into the ground using a mini-hydraulic breaker unit. The tubes are subsequently jacked out of the ground and side windows enable the tubes to be cleaned and small disturbed samples to be taken at regular intervals within each stratum.

2.12 Small disturbed samples were taken at regular depth intervals down the boreholes.

2.13 Upon completion of borehole BH2 a combined groundwater/gas monitoring standpipe was installed to a depth of 4.50m below existing ground level.

2.14 The monitoring installation comprised a 1 metre length of plain 19mm diameter pipe followed by slotted geotextile wrapped HDPE pipe, capped at the base. A cement/bentonite seal was installed from 1.00m to ground level and the installation finished with a gas valve on top of the pipe and a lockable stopcock cover concreted in flush with ground level.

2.15 Full details of the drive-in-sampler borehole findings are given on the appended borehole record sheet.

Hand Excavated Trial Pits

2.16 In addition to the above noted boreholes, two hand excavated trial pits (TP1 & TP2) were undertaken against the sides of the existing building at locations chosen by the Consulting Engineers.

2.17 Trial Pit TP1 found that the existing brick wall extended down from ground level some 600mm resting on a concrete footing with a step out of 200mm. The concrete footing was found to extend some 380mm before the underside was founded at approximately 0.98m below existing ground level.

2.18 Trial Pit TP2 found that the existing brick wall extended down from ground level some 400mm resting on a concrete footing with a step out of 60mm. The concrete footing was found to extend a further 700mm before the Trial Pit was terminated at 1.10m depth.

2.19 Full details of the trial pit sections are given on the appended Figures 1 & 2 and include photographs of the trial pit excavations.

Landfill Gas Monitoring

2.20 Following the initial site work, two return gas/groundwater monitoring visits have currently been undertaken to the installations fitted within boreholes BH1 and BH2 on the 29th July and 21 August 2019. One further monitoring visit is scheduled towards the end of September 2019 and the results of this monitoring visit will be issued as an addendum to this report.

2.21 On each visit the barometric pressure was recorded together with the level of Carbon Dioxide, Oxygen and Methane. In addition, gas flow measurements were taken and the depth to groundwater recorded.

2.22 Full details of the readings are included on the appended Gas/Groundwater Monitoring Record Sheet.

3.0 GROUND CONDITIONS

3.1 According to information published by the British Geological Survey (1:50,000 Series Sheet 256, North London) the underlying geology at this site is shown as being the Claygate Member overlying London Clay, both of the Eocene Period.

3.2 The youngest part of the London Clay formation is known as the Claygate Member which forms a transition between the deep water, dominantly argillaceous London Clay and the shallower water Bagshot Beds. Claygate beds occur widely in Surrey and generally comprise well-laminated orange-brown sands interbedded with pale grey clays and can be up to 15 metres thick near Claygate and Esher.

3.3 London Clay was not encountered during the current investigation.

3.4 Full details of the ground conditions encountered are presented on the borehole records appended to this report and can be summarised as follows.

Depth from (m)	Depth to (m)	Description
0.00	0.05/0.25	Paving/Grass over Topsoil.
0.05/0.25	0.40/1.10	MADE GROUND.
0.40	1.20	Clayey SAND (DIS2 only).
1.10	2.20	Silty sandy CLAY (BH1 only).
1.20/2.20	3.40/3.60	Sandy GRAVEL.
3.40/3.60	4.50+/6.40	Silty SAND.
6.40	9.50	Silty sandy CLAY (BH1 only).
9.50	11.00 +	Clayey silty SAND (BH1 only).

3.4 Groundwater was noted during boring in borehole BH1 only at a depth of 9.50m below existing ground level.

3.5 Groundwater was noted on the initial two return monitoring visits within the installation fitted within borehole BH1 at depths of between 7.58m and 7.61m below existing ground level. Groundwater was noted in borehole BH2 at 3.23m depth on the second monitoring visit only.

3.6 Roots were evident in borehole BH2 only, to a depth of at least 1.00m below existing ground level.

4.0 LABORATORY TESTING

4.1 The following geotechnical tests have been carried out on samples recovered from the boreholes at this site.

4.2 Unless otherwise stated, the geotechnical tests have generally been carried out in accordance with the recommendations given in British Standard 1377:1990, "Methods of Test for Soils for Civil Engineering Purposes".

4.3 *Natural Moisture Content Tests*

The natural moisture content has been determined for a total of three samples from borehole BH1 at 1.50m, 7.00m and 8.00m depth.

The natural moisture content was found to be 11%, 24% and 23%, respectively.

4.4 *Atterberg Limits*

The Atterberg Limits have been determined for one sample of clay from borehole BH1 at 1.50m depth.

The liquid limit (LL) was found to be 26%, the plastic limit (PL) 11%, and the plasticity index (PI) 15.

These results indicate that the sample tested can be classified as being a clay of 'low' plasticity (CL) in accordance with the Casagrande Geotechnical classification system.

In addition, the sample tested would be classified as having a 'low' potential for swelling/shrinking, all in accordance with the National House Building Councils (NHBC) classification system given in Part 4 of their Standards.

4.5 *Quick Undrained Triaxial Compression Tests.*

The undrained shear strength has been determined in single-stage triaxial compression for three, re-moulded, 38mm diameter samples.

The resulting mean shear stress (undrained cohesion) C_u values varied between 57 kN/m^2 and 79 kN/m^2 indicating that the samples tested were 'firm' to 'stiff' in consistency.

4.6 *Particle Size Distribution*

The particle size distribution has been determined for four samples of the more granular soil encountered.

The results are presented as grading curves in the appendix to this report.

4.7 *pH and Sulphate Tests*

The pH and sulphate contents have been determined for two samples from borehole BH1 at 1.00m and 2.50m depth.

The pH was found to be 9.1 and 7.0 and the sulphate content, on a 2:1 water:soil extract, was found to be 0.07 g/l and < 0,02 g/l.

5.0 DISCUSSION

SCOPE OF WORKS

5.1 As discussed in Section 1 above, it is understood that the existing property is to be demolished and replaced with a new house over a slightly larger footprint. The new house will include a basement over the whole of the new properties footprint and possibly extending out into the rear garden.

5.2 Current proposals are that the basement will comprise a concrete raft with reinforced concrete walls excavated within cantilevered sheet piles. The new property will be masonry brick/block with steel beams and concrete floors with a mansard steel frame roof.

5.3 The current work was therefore commissioned to provide information on the sub-soil conditions at this site, together with laboratory testing, in order to allow foundations to be designed and a Basement Impact Assessment (BIA) to be undertaken by others.

FOUNDATION DESIGN

5.4 Beneath Paving or Grass over Topsoil, MADE GROUND was encountered in both boreholes to a depth of between 0.40m and 1.10m. Beneath the MADE GROUND, were interbedded sandy CLAY, silty SAND and GRAVEL down to the maximum borehole termination depth of 11.00m below existing ground level.

5.5 From the evidence of the boreholes, basement excavations will require support in the short term in the silty SAND and GRAVEL stratum encountered.

5.6 Groundwater was encountered during boring in borehole BH1 at 9.50m depth rising to between 7.58m and 7.61m below existing ground level during the return monitoring visits. Groundwater was noted in borehole BH2 at 3.23m depth on the second monitoring visit only. Therefore, should water accumulate at the base of new basement excavations it is very important that these are kept dry by, for example, pumping from a sump, the foundation base is kept square and that any soft spots are replaced and compacted prior to pouring foundation concrete.

5.7 Further, we recommend that where groundwater or surface water flows into foundation basement excavations, 'blinding' concrete is used at the base of the foundation excavations and that foundation concrete is poured as soon as possible thereafter.

5.8 For conventional strip or pad foundations set below any MADE GROUND, within the underlying silty sandy CLAY at 1.25m depth, an allowable bearing pressure of 100 kN/m^2 could be adopted. This could be increased to some 125 kN/m^2 at 2.00m depth and 150 kN/m^2 at 3.00m depth.

5.9 Settlement due to the above noted order of loadings would not be expected to exceed 20-25mm.

5.10 The results of the Atterberg Limit tests indicate that the superficial silty sandy CLAY would have a 'low' potential for swelling and/or shrinking in accordance with the National House Building Councils (NHBC) classification system given in Part 4 of their Standards. The majority of the remaining superficial material was granular and would be classified as being 'non-shrinkable'. Therefore, precautions against foundation sides in the form of compressible material, will not be required at this site where they fall within the 'zone of influence' of any past, existing or any proposed trees.

5.11 It should be noted that should ground conditions differing significantly from those described in our report be encountered during foundation excavation, then Risk Management Limited should be contacted immediately and that the above noted allowable bearing pressure or recommended foundation type may need to be altered accordingly.

BASEMENT

5.12 As discussed in paragraph 5.8 above, an allowable bearing pressure of 150 kN/m^2 could be adopted for a new basement slab founding at about 3.00m depth. However, to keep settlements to within acceptable limits any uniformly distributed load on the basement slab itself should be kept to a minimum.

5.13 Note that, even if groundwater is not encountered during basement construction, there is always a possibility that the basement excavation will act as a local "sump" for surface groundwater and run-off. Therefore, we would recommend that the basement construction is "tanked" to prevent any future problems with ingress of groundwater.

RETAINING WALL DESIGN

5.14 It is understood that the basement formation at this site will be circa 4.4 metres below existing ground level.

5.15 The full design of temporary and permanent retaining structures is beyond the scope of this report. However, the following values are given as a ***guide only*** to assist in the design of these structures

Superficial silty sandy CLAY.

Bulk Density	1.90 Mg/m^3.
Undrained Cohesion (C_u)	75-80 kN/m^2
Undrained Angle of Internal Friction (ϕ_u)	0^o
Effective Cohesion (c')	0 kN/m^2
Effective Angle of Internal Friction (ϕ')	25^o

Superficial Cohesionless SAND and GRAVEL.

Bulk Density	2.00 Mg/m^3.
Undrained Cohesion (C_u)	0 kN/m^2
Undrained Angle of Internal Friction (ϕ_u)	35^o-40^o

Silty sandy CLAY. (6.40m-9.50m)

Bulk Density	1.90 Mg/m^3.
Undrained Cohesion (C_u)	55-60 kN/m^2
Undrained Angle of Internal Friction (ϕ_u)	0^o
Effective Cohesion (c')	0 kN/m^2
Effective Angle of Internal Friction (ϕ')	25^o

Clayey silty SAND (9.50m-11.00m+)

Bulk Density	2.00 Mg/m^3.
Undrained Cohesion (C_u)	0 kN/m^2
Undrained Angle of Internal Friction (ϕ_u)	35^o

BURIED CONCRETE

5.16 The results of the chemical tests at this site indicate that the samples tested, down to 1.50m depth, would fall into Class DS-1 of the Building Research Establishments (BRE) classification system.

LANDFILL GAS

5.17 During the current two return gas/groundwater monitoring visits to the installations fitted within boreholes BH1 and BH2, no Methane was detected. Carbon Dioxide was detected on both visits to a maximum concentration of 2.3%. Oxygen concentrations ranged between 18.4% and 19.0%. No Flow was recorded in any of the boreholes.

5.18 The monitoring equipment's flow detection limit of 0.1 l/hr will be used to calculate the maximum hazardous gas concentration.

5.19 With reference to BS 8485:2015 Section 6 and Section 7:

From Clause 6.3.4, the maximum hazardous gas flow rate (in litres per hour) is calculated by:-

$Q_{hg} = q(C_{hg}/100)$ where;

q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe.

C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

Therefore, for the highest CO_2 level recorded in borehole BH1 $Q_{hg} = 0.1(2.3/100) = 0.0023$ l/h

From Clause 6.3.7.4 - The calculated Q_{hg} is adopted as the worst-case Gas Screening Value (GSV) therefore the site characteristic GSV = 0.0023 l/h

From Clause 6.4 - Table 2 the site characteristic situation (CS) is shown to fall under CS1 for the Gas Screening Value, which has a **"very low"** hazard potential.

From Table 3 - The building is type A.

From Table 4 – The minimum gas protection score required for this site is 0.

Therefore, no land borne gas remedial measures would be required at this site.

SOIL SAMPLES

5.20 All soil samples will be kept for a period of 28 days after the date of the invoice for this project unless otherwise notified to Risk Management Limited in writing. Should samples be required to be stored for longer than 28 days then a storage charge may be levied.

Prepared By : Richard Price B.Sc., F.G.S., M.I.Env.Sc.
Project Engineer

Checked By : Malcolm S. Price B.Sc., M.Sc., M.I.C.E., C.Eng., M.I.Env.Sc.
Director

Distribution : Taylor Whalley Spyra – 1 pdf copy

The recommendations made and the opinions expressed in this report are based on the borehole records, examination of samples and the results of site and laboratory tests.

The report is issued on the condition that Risk Management Limited will under no circumstances be liable for any loss arising directly or indirectly from ground conditions between the boreholes or trial pits which have not been shown by the boreholes, trial pits or other tests carried out during the investigation.

In addition, Risk Management Limited will not be liable for any loss whatsoever arising directly or indirectly from any opinion given on the possible configuration of strata both between the borehole and/or trial pit positions and/or below the maximum depth of the investigation. Such opinions, where given, are for guidance only.

Groundwater levels may also vary with time from those reported during our site investigation due to factors such as tidal conditions, heavy pumping from nearby wells or seasonal changes.

No person other than the client to whom this report is addressed, shall rely on it in any respect and no duty of care shall be owed to any such third party.

Risk Management Limited
Unit 10 Coopers Place
Combe Lane
Godalming
Surrey GU8 5SZ

Borehole Log

Borehole No.
BH1
Sheet 1 of 2

Project No.	RML 7044	**Coordinates:**		**Drilling Technique:** Light Percussion Rig	**Level (m):**
Site Address:	5b Prince Arthur Road, Hampstead, London NW3 6AX	**Date:**	18/07/2019	**Diameter (mm):** 80	**Scale:** 1:50

Stratum Description	Legend	Depth (m)	Level (m)	Samples and In Situ Testing: Depth (m)	Sample Type	Test Type	Results	Water Strikes	Well
Paving (block paving over crushed concrete, brick and stone sub-base).		0.25		0.15	D1				
				0.50	D2				
MADE GROUND (orange-brown sand with occasional whole brick and brick fragments).		1.10		1.00	D3	SPT	N=9 (3,4/3,2,2,2)		
				1.50	D4				
Firm orange-brown silty sandy CLAY with occasional sub-angular to rounded gravel.		2.20		2.00	D5	SPT	N=21 (4,4/3,6,5,7)		
				2.50	D6				
Fine to coarse sub-angular to rounded GRAVEL with a little orange-brown and grey sand.				3.00	D7				
		3.60		3.50	D8				
Medium-dense, light grey-green, silty SAND				4.00	D9	CPT	N=17 (3,3/5,4,4,4)		
				4.50	D10				
				5.00	D11				
				5.50	D12				
				6.00	D13	CPT	N=13 (2,3/3,3,3,4)		
		6.40		6.50	D14				
Soft to firm orange-brown and light grey silty sandy CLAY.				7.00	D15				
				7.50	D16				
				8.00	D17	SPT	N=6 (1,1/2,1,2,1)		
				8.50	D18				
				9.00	D19				
		9.50		9.50	D20			▼	
Loose brown clayey silty SAND.									
Continued on next sheet				10.00	D21	CPT	N=8 (2,2/2,2,2,2)		

Remarks: Service Pit excavated to 1.20m depth. Groundwater encountered at 9.50m depth. Standpipe installed to 10.00m depth.

KEY

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
W = Water Sample

CPT = Cone Penetration Test
SPT = Standard Penetration Test
V = Vane Test
PP = Pocket Penetrometer
MEXE = Insitu CBR test

AGS

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Borehole Log

Borehole No.
BH1
Sheet 2 of 2

Project No.	RML 7044	**Coordinates:**	**Drilling Technique:** Light Percussion Rig	**Level (m):**
Site Address:	5b Prince Arthur Road, Hampstead, London NW3 6AX	**Date:** 18/07/2019	**Diameter (mm):** 80	**Scale:** 1:50

Stratum Description	Legend	Depth (m)	Level (m)	Samples and In Situ Testing				Water Strikes	Well
				Depth (m)	Sample Type	Test Type	Results		
Loose brown clayey silty SAND.				10.50	D22				
Borehole terminated at 11.00m depth		11.00		11.00	D23				

Remarks: Service Pit excavated to 1.20m depth. Groundwater encountered at 9.50m depth. Standpipe installed to 10.00m depth.

KEY

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
W = Water Sample

CPT = Cone Penetration Test
SPT = Standard Penetration Test
V = Vane Test
PP = Pocket Penetrometer
MEXE = Insitu CBR test

Risk Management

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Godalming
Surrey GU8 5SZ

Borehole Log

Borehole No.
BH2
Sheet 1 of 1

Project No. RML 7044	**Coordinates:**	**Drilling Technique:** Drive-in-Sampler	**Level (m):**
Site Address: 5b Prince Arthur Road, Hampstead, London NW3 6AX	**Date:** 19/07/2019	**Diameter (mm):** 75	**Scale:** 1:50

Stratum Description	Legend	Depth (m)	Level (m)	Samples and In Situ Testing: Depth (m)	Sample Type	Test Type	Results	Water Strikes	Well
Grass over Topsoil		0.05		0.15	D1				
MADE GROUND (brick earth with roots).		0.40		0.50	D2				
Brown clayey SAND with occasional sub-angular to rounded gravel and roots.		1.20		1.00	D3				
roots in evidence until at least 1.00m depth				1.50	D4				
Fine to coarse sub-angular to rounded GRAVEL with a little orange-brown clayey sand.				2.00	D5				
				2.50	D6				
				3.00	D7				
Grey-green SAND with fine to coarse sub-angular to rounded gravel.		3.40		3.50	D8				
				4.00	D9				
Borehole terminated at 4.50m depth		4.50		4.50	D10				

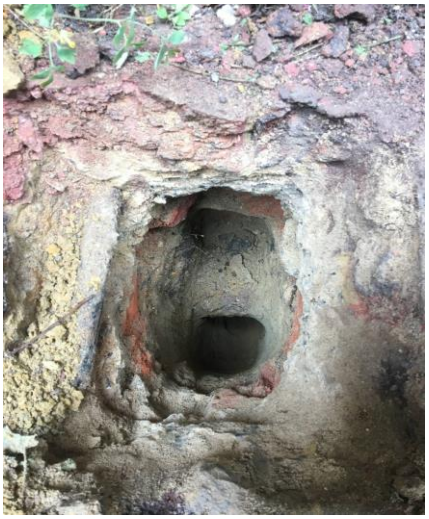
Remarks: Service Pit excavated to 1.20m depth. Groundwater not noted during boring. Standpipe installed to 4.50m depth. Roots in evidence until at least 1.00m depth.

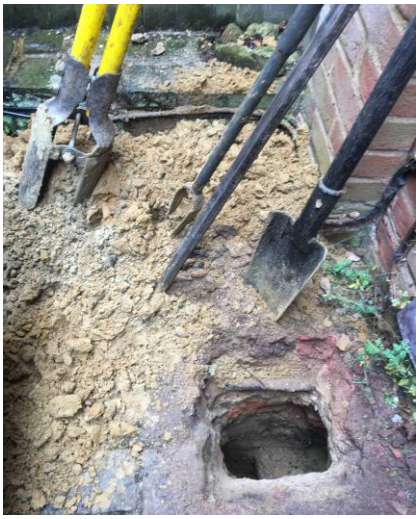
KEY

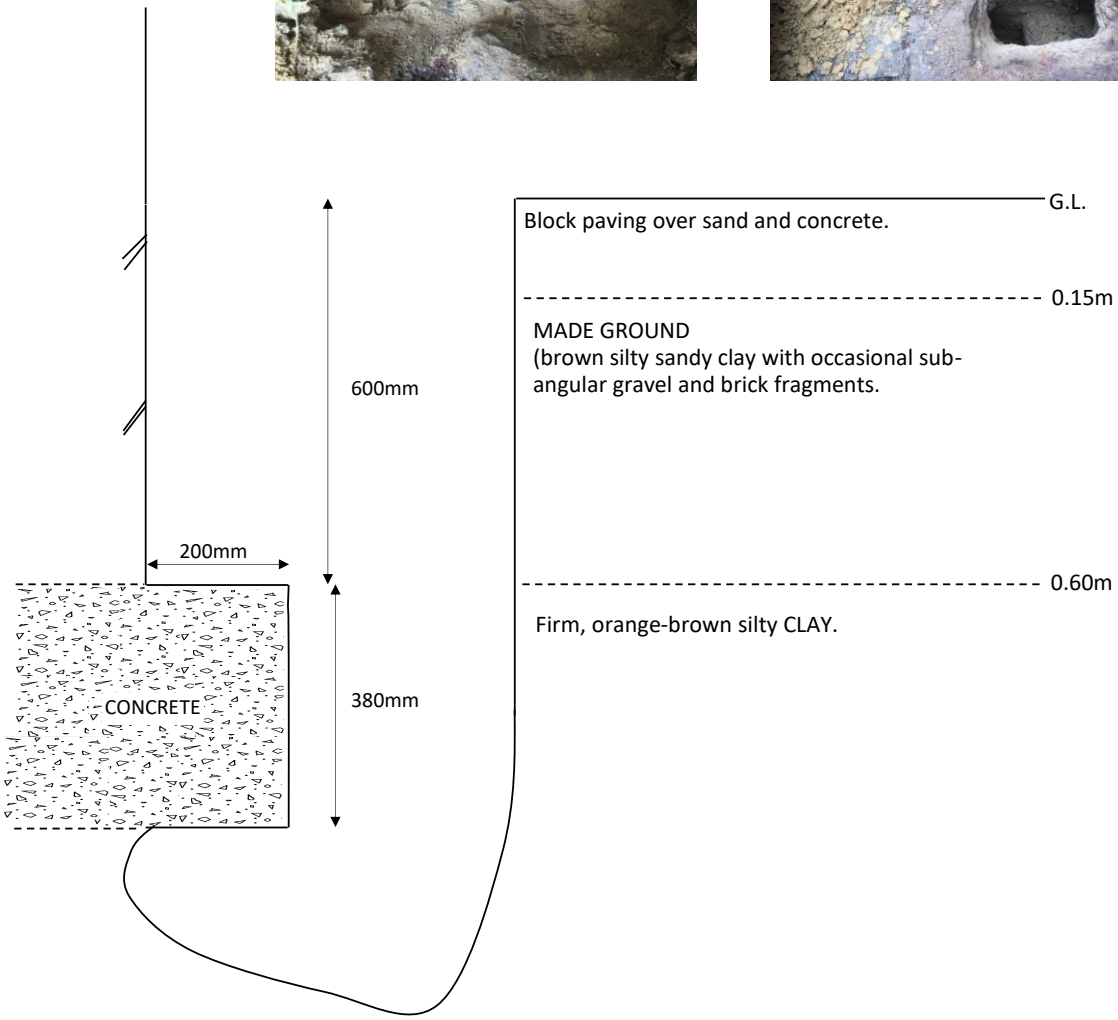
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
W = Water Sample

CPT = Cone Penetration Test
SPT = Standard Penetration Test
V = Vane Test
PP = Pocket Penetrometer
MEXE = Insitu CBR test

AGS

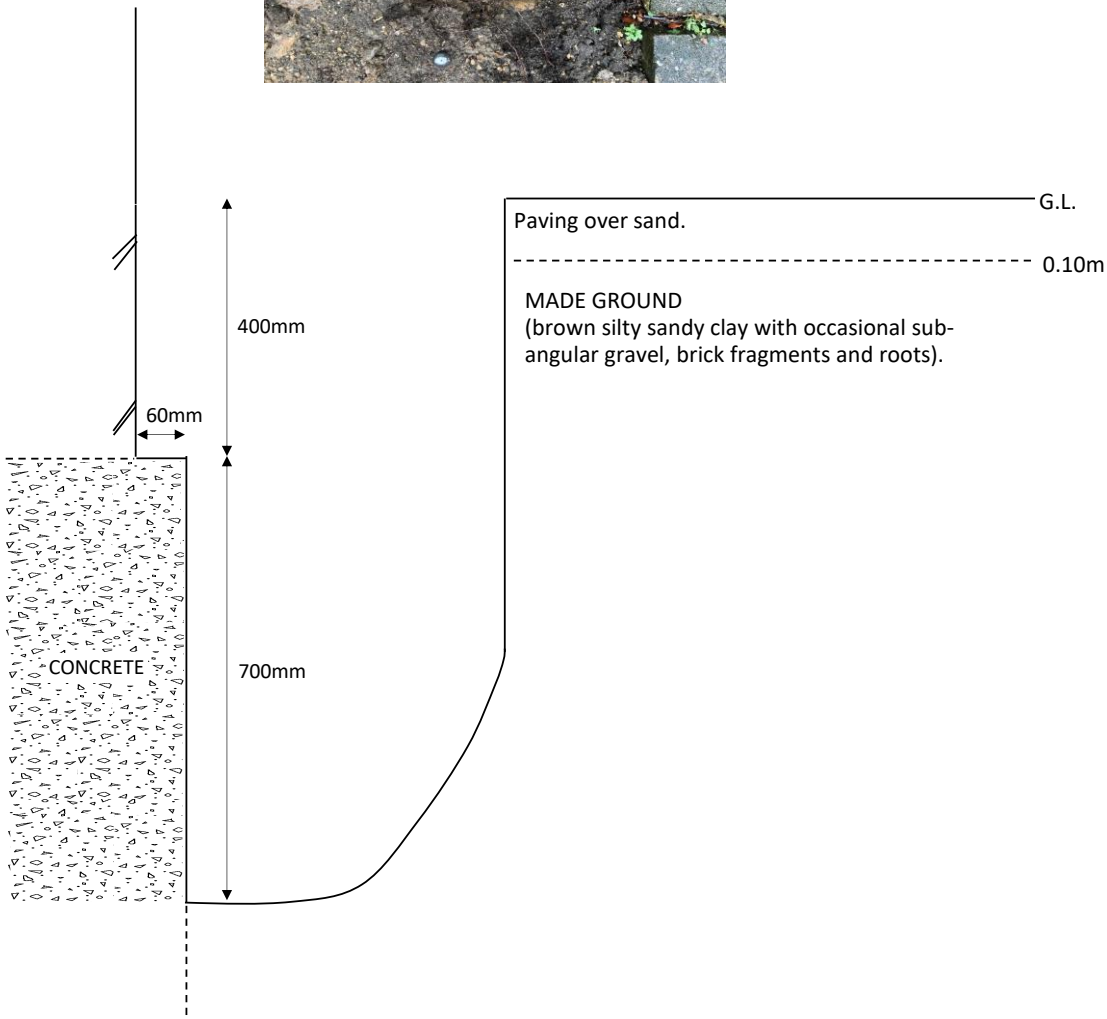






Underside of foundation approximately 0.98m depth

Risk Management	Title : **TRIAL PIT 1**		
	Project Location : 5b Prince Arthur Road, Hampstead, London NW3 6AX		
RECORD OF HAND EXCAVATED TRIAL PIT	Job No : RML 7044	Scale : Not To Scale	
	Figure No. **1**	Date : 18th July 2019	



Underside of foundation not determined, > 1.10m depth

Risk Management	Title : **TRIAL PIT 2**		
	Project Location : 5b Prince Arthur Road, Hampstead, London NW3 6AX		
RECORD OF HAND EXCAVATED TRIAL PIT	Job No : RML 7044	Scale : Not To Scale	
	Figure No. **2**	Date : 18th July 2019	

Standard Penetration Test (SPT) versus Depth Profile

Risk Management Limited
Tel : 01883 343572

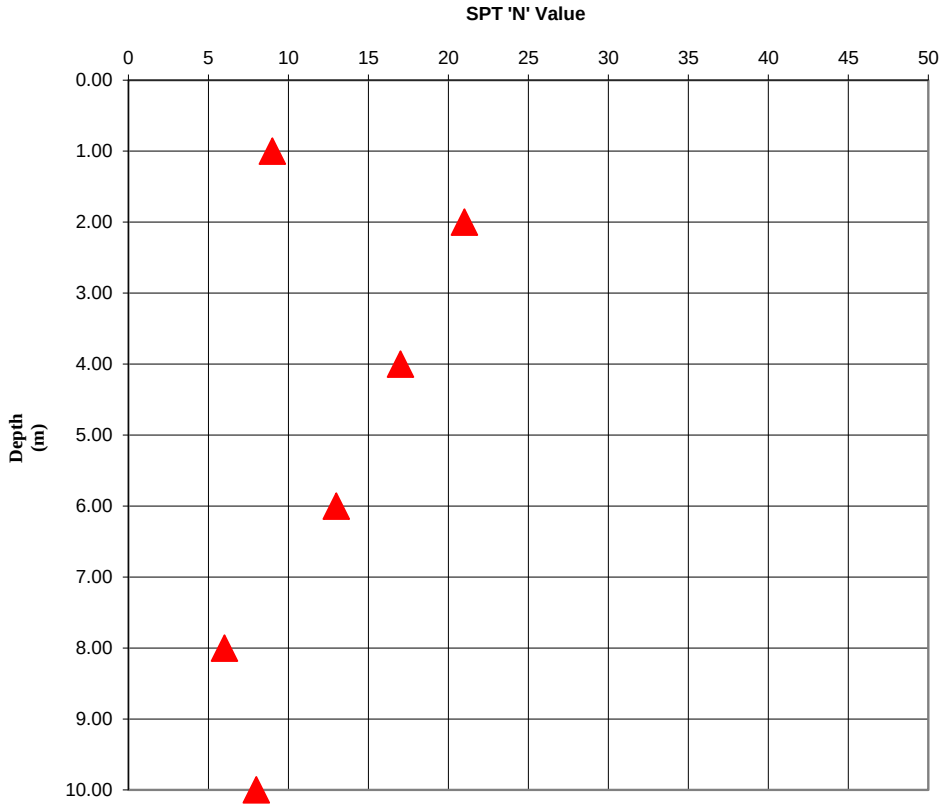
Project Name : 5b Prince Arthur Road, Hampstead, London NW3 6AX

Job No. : RML 7044

Date : August 2019

BH1

Depth (m)	SPT 'N' value
1.00	9
2.00	21
4.00	17
6.00	13
8.00	6
10.00	8



Risk Management

PROJECT NAME : 5b Prince Arthur Road, Hampstead, London NW3 6AX

PROJECT NO: RML 7044

Date	August 2019
Page	1 of 1

Sample Details				Classification Tests					Density Tests		Undrained Triaxial Compression Tests			Chemical Results				
BH No.	Depth (m)	Sample No.	Description	MC (%)	LL (%)	PL (%)	PI	<425 mic (%)	Bulk (Mg/m^3)	Dry (Mg/m^3)	Cell Pressure kPa	Deviator Stress kPa	Mean Shear Stress kPa	pH	W/S SO_4 (g/l)	Total SO_4 (%)	Water SO_4 (g/l)	Other tests and comments
BH1	1.00	D3												9.1	0.07			
BH1	1.50	D4	Stiff red-brown sandy CLAY with occasional fine to medium rounded gravel.	11	26	11	15	90	2.05	1.84	30	159	79					Class CL
BH1	2.50	D6												7.0	< 0.02			
BH1	7.00	D15	Firm orange-brown and light grey silty sandy CLAY.	24					2.06	1.67	140	114	57					
BH1	8.00	D17	Firm orange-brown and light grey silty sandy CLAY.	23					2.03	1.65	160	119	59					

SUMMARY OF GEOTECHNICAL TESTING

Risk Management

Risk Management Limited
Tel : 01883 343572

GROUNDWATER & GAS MONITORING RESULTS

Project Name:	5b Prince Arthur Road, Hampstead, London NW3 6AX	Project No. : RML 7044
		Date : August 2019

BH No.	Date	Pressure (mb)	Oxygen (%)	Carbon Dioxide (%)	Methane (%)	Methane LEL (%)	Flow Rate (l/hr)	Groundwater Level (m)
BH1	29th July 2019	1009	19.0	1.0	0.0	0.0	0.0	7.58
	21st August 2019	1015	18.4	1.6	0.0	0.0	0.0	7.61
BH2	29th July 2019	1009	18.9	1.1	0.0	0.0	0.0	Dry (>4.50m)
	21st August 2019	1015	19.0	2.3	0.0	0.0	0.0	3.23

Key

Borehole Location

Trial Pit Location

Risk Management

Title : **SKETCH FIELDWORK LOCATION PLAN**

RISK MANAGEMENT LIMITED
Unit 10 Coopers Place, Combe Lane,
Godalming, Surrey GU8 5SZ
Tel : 01883 343572

Project Location : 5b Prince Arthur Road, Hampstead, London NW3 6AX

Report Date : August 2019	Scale : NTS
Drawn By : MSP	Drg. No. RML 7044 /1

Risk Management Limited
Tel : 01883 343572

GROUNDWATER & GAS MONITORING RESULTS

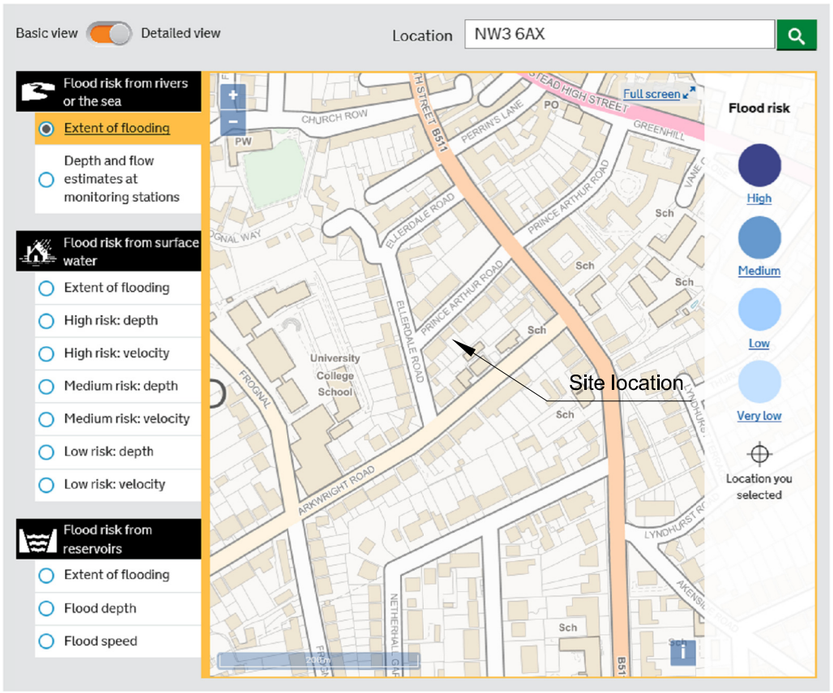
Project Name:	5b Prince Arthur Road, Hampstead, London NW3 6AX	Project No. :	RML 7044
		Date :	August 2019

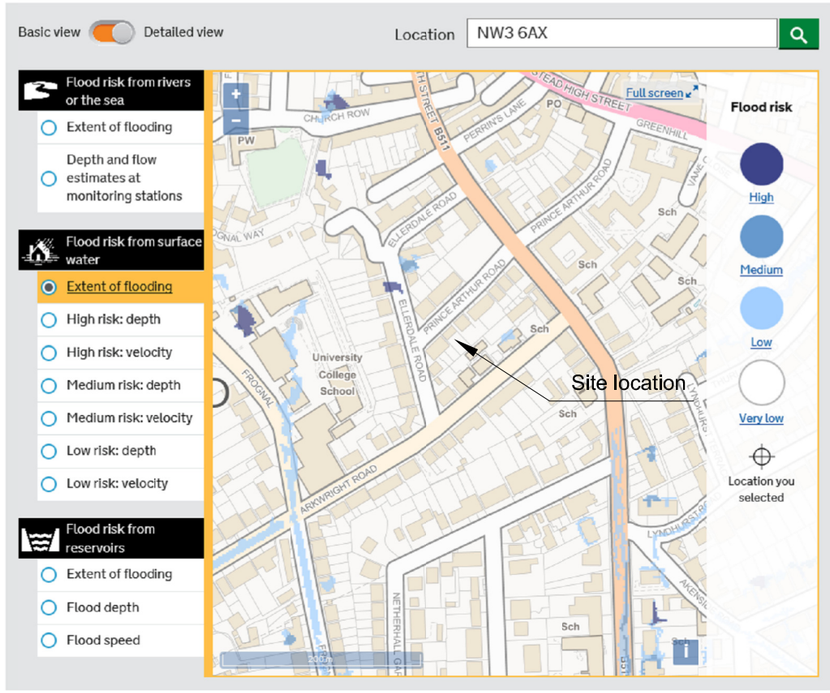
BH No.	Date	Pressure (mb)	Oxygen (%)	Carbon Dioxide (%)	Methane (%)	Methane LEL (%)	Flow Rate (l/hr)	Groundwater Level (m)
BH1	29th July 2019	1009	19.0	1.0	0.0	0.0	0.0	7.58
	21st August 2019	1015	18.4	1.6	0.0	0.0	0.0	7.61
	18th Sept 2019	1018	19.5	1.7	0.0	0.0	0.0	7.62
BH2	29th July 2019	1009	18.9	1.1	0.0	0.0	0.0	Dry (>4.50m)
	21st August 2019	1015	19.0	2.3	0.0	0.0	0.0	3.23
	18th Sept 2019	1018	19.5	1.9	0.0	0.0	0.0	3.31

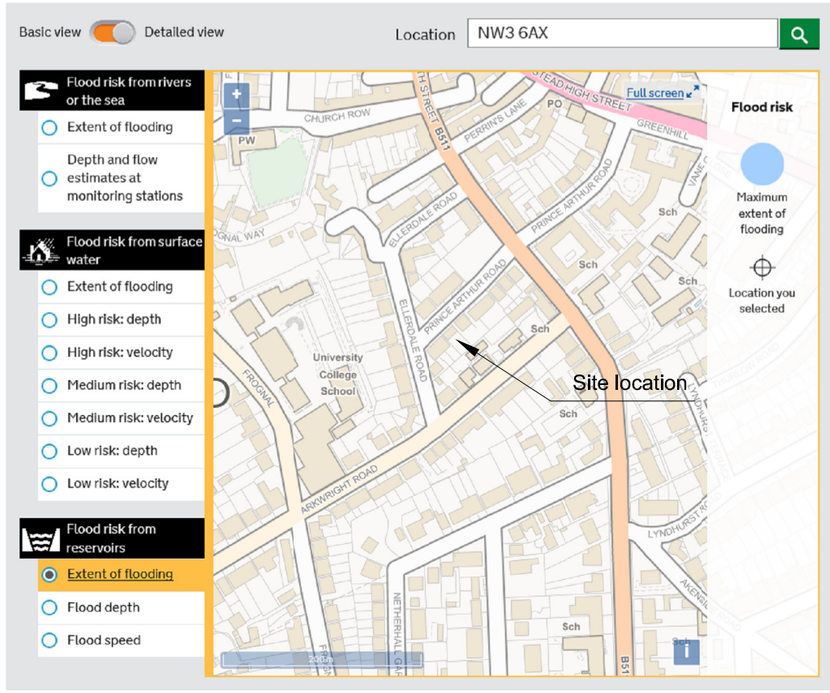
Appe**ndix K**

TWS - 9634_BIA_09 _ GOV.UK Map for extent of flooding

Thames Water Sewer Flooding History Enquiry ref SFH/SFNStandard/2019_4128240







simpson | tws
3 Dufferin Avenue
London EC1Y 8PQ
T.0207 253 2626
www.simpsoneng.com

Contract	Title	Scale at A3	Date	Drawn By
COPPER BEECH HOUSE, 5b PRINCE ARTHUR ROAD, HAMPSTEAD, LONDON, NW3 6AX	GOV.UK MAPS FOR EXTENT OF FLOODING	NTS	07/01/20	GB
		Job No. 9634	Drawing No. BIA_09	Rev. -

Sewer Flooding
History Enquiry

Property Searches

Taylor Whalley Spyra Limited

Dufferin Avenue

Search address supplied	Prince Arthur Road 5B London NW3 6TR
Your reference	9635
Our reference	SFH/SFH Standard/2019_4128240
Received date	**17 December 2019**
Search date	**17 December 2019**

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: Prince Arthur Road,5B,London,NW3 6TR

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
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0845 070 9148

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

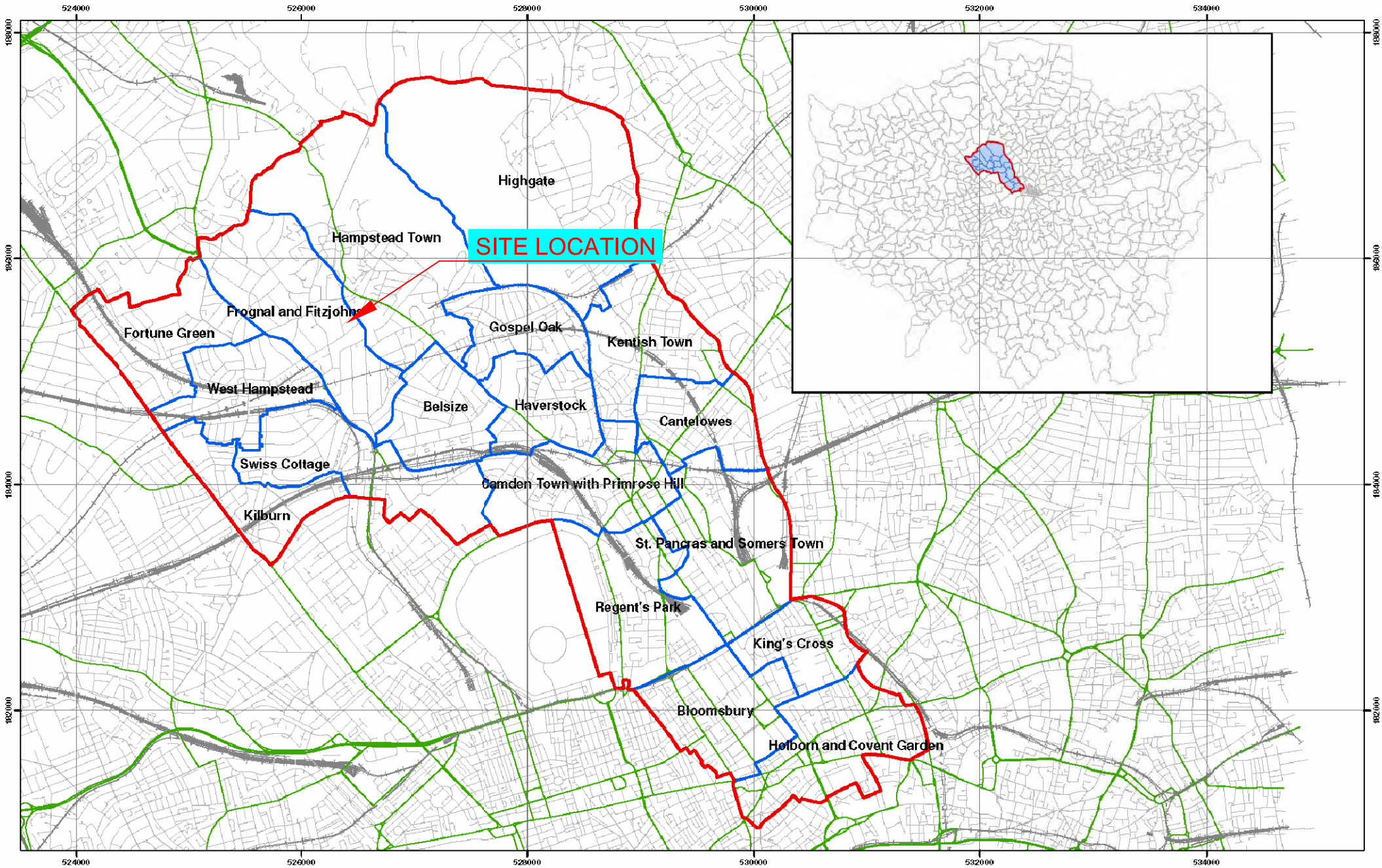
searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Appendix L

The London Borough of Camden Geological, Hydrogeological and Hydrological Study Maps

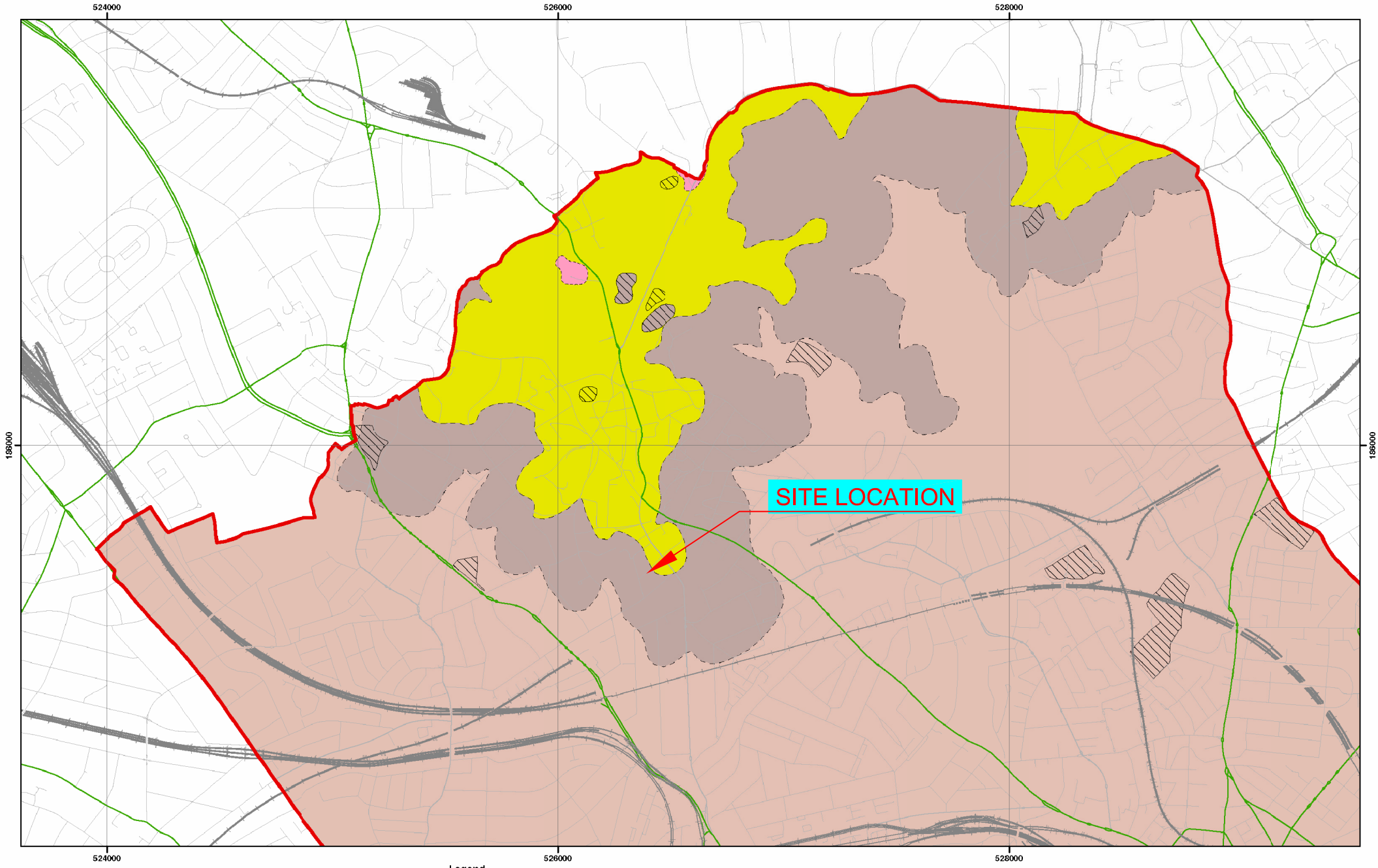
The London Borough of Camden Geological SFRA Maps



Camden Geological, Hydrogeological and Hydrological Study

Camden Administrative Boundaries

213923 FIGURE **1**



Data Source: BGS Mapping - Scale 1:10,000

N

Scale at A3: 1:15,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.25 0.5 1 1.5
Kilometers

Legend

- London Borough of Camden
- Railway Lines
- A Roads

BGS 1:10K Artificial Ground

- MADE GROUND
- WORKED GROUND

BGS 1:10K Drift Geology

- ALLUVIUM
- HACKNEY GRAVEL FORMATION
- LANGLEY SILT FORMATION
- LYNCH HILL GRAVEL FORMATION
- STANMORE GRAVEL FORMATION

BGS 1:10K Solid Geology

- BAGSHOT FORMATION
- CLAYGATE MEMBER
- LAMBETH GROUP
- LONDON CLAY FORMATION

NB. Geological boundaries are largely indicative based on available geological mapping data

Camden Geological, Hydrogeological and Hydrological Study

North Camden Geological Map

213923 **FIGURE 4**