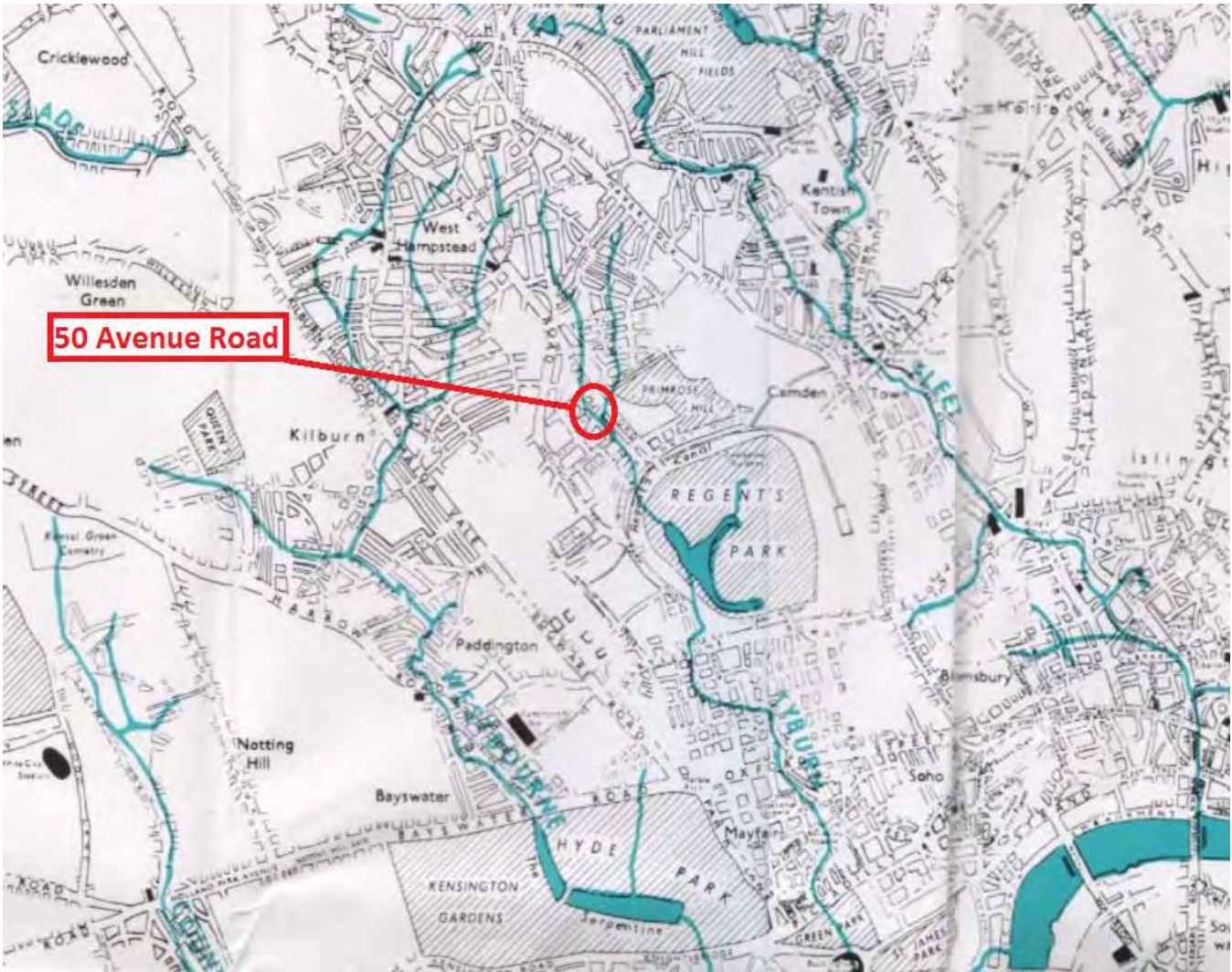


B Lost Rivers of London Map



Lost Rivers of London Map

Avenue Road appears to be in the vicinity of the historic river Tyburn.

Ref: A portion of the map showing the course of the Lost River Tyburn taken from Lost Rivers of London © 1962 and 1992 by Nicholas Barton, used by kind permission of Historical Publications Ltd

C Basement Impact Assessment

Site Analytical Services Ltd.

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Your Ref:

Our Ref: **Ref: 13/20821-3**
June 2014

Basement Impact Assessment

At

50 Avenue Road, London, NW8 6HS

For

The Shri Krishna Trust C/O HSBC Trustee (C.I.) Limited



Site Analytical Services Ltd.

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1.0 INTRODUCTION

1.1 Project Objectives

The purpose of this assessment is to consider the effects of a proposed basement construction on the local slope stability and groundwater regime at the residential property at 50 Avenue Road, London, NW8 6HS. For this assessment a representative of SAS Limited visited the property on 31st July 2013.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the Client and other parties including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

1.2 Planning Policy Context

Camden Planning Guidance for Basements and Lightwells has been recently revised (CPG4, April 2011) and requires proposed developments to mitigate against the effects of ground and surface water flooding and to include drainage systems that do not impact neighbouring property of the site or the water environment by way of changing the groundwater regime.

Camden Guidance CPG4 sets out 5 Stages:

1. Screening
2. Scoping
3. Site Investigation
4. Impact Assessment
5. Review and decision making

This report is intended to address the scoping process set out in CPG4 and the Camden Geological, Hydrogeological and Hydrological Study (CGHHS). It will review existing site investigation data and provide a preliminary assessment of the issues identified by the Site Analytical Services Limited screening process.

As part of this guidance a slope stability screening chart is provided. The completed chart in relation to this development is provided as Table 1, to this report.

1.3 Qualifications

The report has been prepared by Mr Andrew Smith, a Fellow of the Geological Society (FGS) with over 8 years post graduate experience in co-ordination with Mr Mike Brice of Applied Geotechnical Engineering, a Chartered Geologist (CGEOL) and Mr Gary Povey of Elliott Wood Partnerships, a Chartered Engineer (CEng).

2.0 SITE DETAILS

(National Grid Reference: TQ 270 837)

2.1 Site Location

The site is situated at an existing residential property at 50 Avenue Road, London, NW8 6HS. The existing usage of the site is an existing large detached house and extensive rear garden and covers an area of approximately 0.13 hectares with the general area being under the authority of Camden Council.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid & Drift Edition) indicates the site to be underlain by the Eocene London Clay Formation. However, Superficial Head Deposits are located to the east and west of the site.

The BGS 1:625000 Solid Geology Deposits indicate the site to be underlain by the Eocene London Clay Formation.

2.3 Previous Reports

The results from a Phase 1 Preliminary Risk Assessment and Phase 2 Intrusive Investigation are presented under separate cover in Site Analytical Services Limited reports (Project No's. 13/20821-1 and 13/20821) dated August 2013. The findings from these reports are described in this basement impact assessment.

2.4 Site Layout and History

The site was attended on 31st July 2013 for the purposes of conducting the site walkover.

The site comprises of an extensive three-storey detached house with a large rear garden and gated driveway from Avenue Road. The rear garden is mainly set to lawn, with flower beds and small shrubs. The garden is bordered by a low brick wall with some large trees present at the end of the garden. A small wooden summer house is present at the rear of the garden. The main house has a large gated driveway at the front, including a small raised lawn and hedge.

The site itself is essentially flat, although there is a general slight slope across the site from north-west to south-east away from Primrose Hill down towards the Thames Basin.

From a review of the historical maps it would appear that the site was occupied by a large detached building with front and rear gardens from 1871 (the date of the earliest available OS map) and has not changed in use to the present day, although rebuilding and/or extensions are evident to the main building circa 1954-1967.

2.5 Proposed Development

It is proposed to construct a two storey basement beneath the footprint of the existing property and part of the garden. The majority of the basement is founded at approximately 8m below ground level with a deeper section containing a swimming pool at 10m below ground level.

2.6 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site in accordance with CPG4 and the results are summarised in Table 1 below:

Table 1: Summary of screening results

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	No	The Bedrock geology underlying the site (solid permeable formations) associated with the London Clay Formation has been classified as Unproductive Strata; rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
	1b. Will the proposed basement extend beneath the water table surface.	Yes - refer to section 4.2 for scoping	The minimum depth of the proposed basement floor level of 8.0m will be below the current water level of approximately 3.49m below ground level as encountered in Borehole 1.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	Yes - refer to section 4.3 for scoping	The nearest existing surface water feature is recorded as a pond located 490m north-west of the site. However, according to the Lost Rivers of London the site is within 100m of the tributaries of the former River Tyburn.
	3. Is the site within the catchment of the pond chains on Hampstead Heath.	No	The site is away from this area.
	4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	Yes- refer to section 4.4 for scoping	The amount of hardstanding on-site is expected to increase.
	5. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS).	No	Soakaways or SUDs are not expected as part of the development due to the presence of cohesive sub strata.
	6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line.	No	The nearest surface water feature is recorded as a pond located 490m north-west of the site.

Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 1 in 8.	No	The site is essentially flat with only minor undulations present at angles of between 3° and 6°.
	2. Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 1 in 8.	No	The slope to the front boundary will be slightly changed, but will be kept close to 1:14, locally max. at 1:10
	3. Does the development neighbor land, including railway cuttings and the like, with a slope greater than 1 in 8.	No	The neighbouring land is essentially flat with only minor undulations present, sloping mainly towards the south east, at angles of between 3° and 6°.
	4. Is the site within a wider hillside setting in which the general slope is greater than 1 in 8.	Yes - refer to section 5.2 for scoping	There is a general slight slope in the wider hillside setting from north-west to south-east away from Primrose Hill down towards the Thames Basin up to approximately 8°.
	5. Is the London Clay the shallowest strata at the site.	No	The site is underlain by Made Ground overlying the London Clay Formation; the London Clay is the shallowest natural strata below the site.
	6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained.	Yes - refer to section 5.3 for scoping	It is understood that trees are to be felled as part of the development.
	7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site.	Yes - refer to section 5.4 for scoping	The site lies above the London Clay Formation that is well known to have a high tendency to shrink and swell.
	8. Is the site within 100m of a watercourse or a potential spring line.	Yes - refer to section 4.2 for scoping	The nearest surface water feature is recorded as a pond located 490m north-west of the site. However, according to the Lost Rivers of London the site is within 100m of an ancient river.
	9. Is the site within an area of previously worked ground.	Yes - refer to section 5.7 for scoping	Made Ground has been encountered at the site.

	10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction.	scoping No	The Bedrock geology underlying the site (solid permeable formations) associated with the London Clay Formation has been classified as Unproductive Strata.
	11. Is the site within 50m of the Hampstead Heath ponds.	No	The site is not located near Hampstead Heath.
	12. Is the site within 5m of a highway or pedestrian right of way.	Yes - refer to section 5.8 for scoping	The site lies adjacent to Avenue Road.
	13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	Yes - refer to section 5.9 for scoping	The development will increase the depths of foundation at the site, although the foundation depths of adjacent properties are not known.
	14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	No	Communication with LUL Operational Property Division (attached as Appendix A to this report) indicates that the nearest tube line is located over 50m from the site and runs along Finchley Road towards the west of the site. A Map of the nearby Primrose Hill tunnels located 150m north of the site, is also attached as Appendix A to this report.



The Screening Exercise has identified the following potential issues which will be carried forward to the Scoping Phase

Subterranean Groundwater Flow

- Is the site within 100m of a watercourse, well (used / disused) or potential spring line
- Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas

Slope Stability

- Is the site within a wider hillside setting in which the general slope is greater than 1 in 8
- Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained
- Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site
- Is the site within 100m of a watercourse or a potential spring line
- Is the site within an area of previously worked ground
- Is the site within 5m of a highway or pedestrian right of way
- Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties



3.0 EXISTING SITE INVESTIGATION DATA

3.1 Records of site investigations

Ground conditions at the site were investigated by Site Analytical Services Limited in June and July 2013 (Report Reference 13/20821). The ground conditions revealed by the investigation are summarised in the following table.

Strata	Depth to top of strata, mbgl	Description
Made Ground	0.00	Surface layer of topsoil underlain by a mixture of medium dense clayey silty sand and sandy silty clay with brick fragments and crushed concrete
London Clay Formation	1.10	Stiff becoming very stiff silty clay with occasional partings of silty fine sand, scattered gypsum crystals

Groundwater was not encountered in either borehole during drilling operations and the material remained essentially dry throughout. Water was subsequently recorded at a depth of 3.49m below ground level in the monitoring standpipe installed in Borehole 1 after a period of approximately seven to eight weeks, but was not recorded in the standpipe placed in Borehole 2 above a level of approximately 10.00m below ground level (i.e. the base of the standpipe) after the same period.

3.2 Hydrological Context

During the monitoring visit on the 31st July 2012 a falling head permeability test was carried out in Borehole 2. Water was added to the borehole over a 10 minute period and was measured at 3.52m below ground level at the start of the test. Subsequently the decrease in water level over a 30 minute period was recorded:

Time after purging well (minutes)	Water Level (mbgl)
0	3.52
5	4.06
10	4.09
15	4.10
30	4.11

4.0 SUBTERRANEAN (GROUNDWATER FLOW) - SCOPING ASSESSMENT

4.1 Introduction

This section addresses outstanding issues raised by the screening process regarding the presence of an ancient watercourse within 100m of the site and the fact that groundwater was encountered in the ground investigation above the level of the proposed basement depth.

4.2 Groundwater Flow and Depth to Groundwater

The ground floor level of the proposed development is at a minimum depth of approximately 8.0m below ground level. In Borehole 1, located towards the southern section of the site, the encountered groundwater during the groundwater monitoring period is approximately 4.51m above proposed floor level whilst, conversely in Borehole 2, located towards the north-east section of the site groundwater is at least 10.0m below ground level.

During the first groundwater monitoring period groundwater was not recorded in Borehole 1. This may be due to slow recharge of the local groundwater following installation of the monitoring standpipe.

It is suggested that this large difference in groundwater level across the site is due to the presence of more permeable Made Ground soils at the location of Borehole 1 compared to those present at the location of Borehole 2 and that the water in Borehole 1 represents an accumulation of surface water in the Made Ground lying above the effectively impermeable London Clay soils below.

Given the presence of a non-aquifer below the site it is likely that groundwater within these soils is recharged via intermittent seepages from surface water associated with weather conditions rather than any large scale subterranean groundwater flow. As a result the impact from the basement development on the local groundwater regime is likely to be minimal.

However as it may be necessary to control this water during the construction period and consideration could be given to conventional internal pumping methods from open sumps.

4.3 Springs, Wells and Watercourses

The nearest surface water feature is recorded as a pond located 490m north-west of the site. There are no fluvial or tidal floodplains located within 1km of the site.

With reference to 'The Lost Rivers of London' (Barton, 1992) and 'London's Lost River's (Talling, 2011), the site lies within 100m and between two tributaries of the former River Tyburn, which ran in a southerly direction from Hampstead to Pimlico and Westminster via Regents Park, Marylebone, Mayfair and Buckingham Palace. The River Tyburn is now completely enclosed and flows through underground conduits for its entire length.

Given the predominantly clayey and low permeability nature of the near-surface soils, it is expected that there is very limited surface water infiltration potential and groundwater flow rates in the vicinity of the property will be very low. The historic development of the area for housing will have further limited surface water infiltration.

As a result it is considered that the proposed development will have minimal impact on any nearby watercourses.

4.4 Hardstanding

It is understood that the proposed basement development may result in a small change in the proportion of hard surfaced paved external areas and therefore the proposals may potentially affect the overall volume of surface water generated by the site unless mitigation is provided.

However it is also understood that formal drainage is proposed for new hard-standing areas with attenuation provided as required by detailed design and therefore it is unlikely that any increase in surface water generated will cause an increase in peak runoff from the site.

5.0 SCOPING ASSESSMENT - SLOPE AND GROUND STABILITY

5.1 Introduction

This section addresses outstanding issues raised by the screening process regarding land stability (see Table 1).

5.2 Slope Stability

The 1:50,000 scale geological map for the area indicates that the site does not lie within an 'Area of Significant Landslide Potential'. No mapped areas of landslips are present in the vicinity of the site and the natural ground stability hazards dataset supplied by the BGS (present in the desk study report for the site (Reference 19250-1) gives the hazard rating for landslides in the site area as 'very low'.

Information obtained from the site walkover, site plans and ordnance survey maps indicates that the site itself is essentially flat with only minor undulations present, sloping mainly towards the south-east, at angles of between 3° and 6°. There is however, a greater slope angle across the site from north-west to south-east away from Primrose Hill down towards the Thames Basin up to around 8°, although it should be noted that the immediate site area is heavily urbanised and slopes at the site and in the close vicinity may have been altered historically or as part of developments and landscaping.

The slope angle map produced as Figure 16 of the ARUP report indicates that slope angles in the site are less than 7° and that the site does not neighbour any land that contains cuttings / embankments or any other feature with slope angles in excess of 7°.

The proposed development does not include any remodeling of slopes to angles greater than 7° that could potentially result in slope stability issues. It is therefore considered that slope stability can be maintained through the proper design of any necessary mitigation measures described in Section 4.2.

5.3 Shrinking / Swelling Clays

A single Atterberg Limit Test was conducted on a sample taken from 6.00m depth in the essentially cohesive natural soils encountered in Borehole 1 and showed the sample tested to have a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2.

It is understood that trees are to be removed from the site as part of the development. Given the minimum depth of the proposed basement floor is approximately 8.0m below ground level, foundations for the structure are unlikely to be affected by the removal of these trees. However, shallower foundations may need to be taken deeper should they be within the zones of influence of either existing or recently felled trees. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, "Building near Trees" and it is considered that this document is relevant in this situation.

5.4 Heave of underlying soils

The main phase of uplift or heave from the cohesive soils will come immediately following the excavation of the basement when the greatest elastic rebound of the soil (caused by the loss of the overburden pressure) will occur. Heave can be reduced by proceeding with the excavation in stages and observing and recording any movement that occurs over a set period of time. It may therefore be advantageous to delay the construction until an adequate proportion of the uplift has occurred. Once this monitoring period has elapsed and a suitably qualified engineer is confident that the majority of uplift has occurred, basement construction can commence. These processes and other ways of dealing with ground movements are described at length in BS8004 (British Standard Code of Practice for Foundations).

In addition, it is understood that a suspended concrete slab will be constructed at basement level and therefore heave is unlikely to be an issue at the site.

5.5 Compressible / Collapsible Ground

The natural ground stability hazards dataset supplied by the BGS gives the hazard rating for compressible ground as 'very low' and collapsible ground at the site is listed as 'no hazard'.

5.6 Springs, Wells and Watercourses

As discussed in Section 4.2 it is considered that the proposed development will have minimal impact on any nearby watercourses.

5.7 Made Ground

In the boreholes drilled at the site, Made Ground was found to extend down to depths of up to 1.50m below ground level and comprised of a surface layer of topsoil underlain by a mixture of medium dense clayey silty sand and sandy silty clay with brick fragments and crushed concrete.

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any made ground and either into, or onto suitable underlying natural strata of adequate bearing characteristics.

The bearing capacity of the Made Ground should therefore be assumed to be less than 30kN/m² because of the likelihood of extreme variability within the material.

Contamination testing of the Made Ground is likely to be required during any second phase of ground investigation.

5.8 Location of public highway

The proposed basement is not to be extended below Avenue Road and therefore it is suggested that the impact on this local access road is likely to be minimal.

There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.

5.9 Structural Stability of Adjacent Properties

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures.

The proposed development may also result in differential foundation depths between the site and adjacent property and as such it is recommended that the Party Wall Act will be used and considered during the design phase. For basement developments in densely built urban areas, the Party Wall Act (1996) will usually apply because neighbouring houses would typically lie within a defined space around the proposed building works. Specifically, the Party Wall Act applies to any excavation that is within 3m of a neighbouring structure; or that would extend deeper than that structure's foundation; or which is within 6m of the neighbouring structure and which also lies within a zone defined by a 45° line from the foundation of that structure. The Party Wall process should be followed and adhered to during this development.

A ground movement assessment was carried out at the site by Applied Geotechnical Engineering under the instruction of Site Analytical Services Limited (Report Reference P2358). The report is provided as Appendix B to this report and concludes that given good workmanship, the basement excavations can be constructed without imposing more than a 'very slight' level of damage on the adjoining properties.



7.0 CONCLUSIONS AND NON TECHNICAL SUMMARY

1. It is proposed to demolish the existing building on the site, construct a two storey basement beneath the footprint of the property and part of the garden and rebuild a three storey house above. The majority of the basement is founded at approximately 8m below ground level, with a deeper section containing a swimming pool at 10m below ground level.
2. Ground conditions at the site were investigated by Site Analytical Services Limited in June, July and August 2013 (Report Reference 13/20821). The exploratory holes revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised between up to 1.50m thickness of Made Ground overlying materials typical of the London Clay Formation.
3. Water levels in the immediate vicinity of the property have been recorded above floor level of the proposed basement. However given the presence of a non-aquifer below the site it is likely that groundwater within these soils is recharged via intermittent seepages from surface water associated with weather conditions rather than any large scale subterranean groundwater flow. As a result the impact from the basement development on the local groundwater regime is likely to be minimal.
4. The nearest surface water feature is recorded as a pond located 490m north-west of the site. The site lies within 100m and between two tributaries of the former River Tyburn, although the River Tyburn is now completely enclosed and flows through underground conduits for its entire length. As a result it is considered that the proposed development will have minimal impact on any nearby watercourses.
5. The implementation of the attenuation measures will ensure the proposals would not cause an increase in peak runoff from the site.
6. The proposed development does not include any remodeling of slopes to angles greater than 12.5° that could potentially result in slope stability issues. It is therefore considered that slope stability can be maintained through the proper design of any necessary mitigation measures.
7. It is understood that trees are to be removed from the site as part of the development. Given the proposed basement floor is up to 8.0m below ground level foundations for the structure are unlikely to be affected by the removal of these trees.
8. The natural ground stability hazards dataset supplied by the BGS gives the hazard rating for compressible ground as 'very low' and collapsible ground at the site is listed as 'no hazard'.
9. The main phase of uplift or heave from the cohesive soils will come immediately following the excavation of the basement when the greatest elastic rebound of the soil (caused by the loss of the overburden pressure) will occur.



10. Contamination testing of the Made Ground is likely to be required during any second phase of ground investigation.
11. There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.
12. The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures.
13. The proposed basement is not to be extended below Avenue Road and therefore it is suggested that the impact on this local access road is likely to be minimal.
14. Given good workmanship, the basement excavations can be constructed without imposing more than a 'very slight' level of damage on the adjoining properties.

p.p. SITE ANALYTICAL SERVICES LIMITED

A P Smith BSc (Hons) FGS
Senior Geologist



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APPENDIX A.

Email Correspondence between SAS and LUL 25th July 2013

Date 25 July 2013
 Our Ref 20878-SI-3-250713
 Your Ref
 To Andy Smith
 Site Analytical Services
 AndyS@siteanalytical.co.uk



Hello Andy,

50 Avenue Road London NW8 6HS

Thank you for your communication of 24th July 2013.

I can confirm that London Underground has no assets within 50 metres of your site as shown on the plan you provided.

Should you have any further enquiries, please do not hesitate to contact me.

Shahina Inayathusein
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