APPENDIX 1: LAND STABLITY REPORT

BASEMENT IMPACT ASSESSMENT REPORT: 'LAND STABILITY'

PROPOSED DEVELOPMENT:

53-55 CHALTON STREET NW1 1HY, 60 CHURCHWAY and 70 CHURCHWAY, LONDON NW1 1LT

Client -	**RANGEPAY LTD** **53-55 Chalton Street, London NW1 1HY**
Engineer -	**DIVINE IDEAS (UK) Ltd** **Legacy Business Centre, Suite 126,** **2A Ruckholt Road, London E10 5NP**
Report Ref -	**10371/KOG**
Date -	**18th June 2019 (Rev.0)**

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BASEMENT IMPACT ASSESSMENT: 'LAND STABILITY'

PROPOSED REDEVELOPMENT:

53-55 CHALTON STREET NW1 1HY, 60 CHURCHWAY and 70 CHURCHWAY, LONDON NW1 1LT

DOCUMENT ISSUE STATUS:

Issue	Date	Description	Author	Checked/approved
Rev 0	**18 June 2019**	**First issue**	**Keith Gibbs** BSc, MSc, FGS **Terry Rickeard** BSc, MSc, CEng, CGeol, MICE, MIMMM, FGS	**Opher Tolkovsky** BSc [Hons], MSc, DIC, CGeol, FGS

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LUL Infrastructure Repsonse Letter
(Ref 20878-SI-V036 & N122 10486/RS/14/0898, dated 4 July 2014)

1.0 INTRODUCTION

Consideration is being given to re-development of this site, which comprises the existing properties at 53-55 Chalton Street, 60 Churchway and 70 Churchway, London, and which will involve the following;

53-55 Chalton Street and 60 Churchway- demolition of the existing two to four storey building, which has a basement below the property at Nos.53-55, and the construction of a new five storey hotel building. The existing single level basement will be extended below 60 Churchway.

70 Churchway – demolition of the existing two storey building and the construction of a new four storey residential apartment building. A new single level basement is to be excavated beneath the full footprint of the new building, the rear section of which will form a small external garden area.

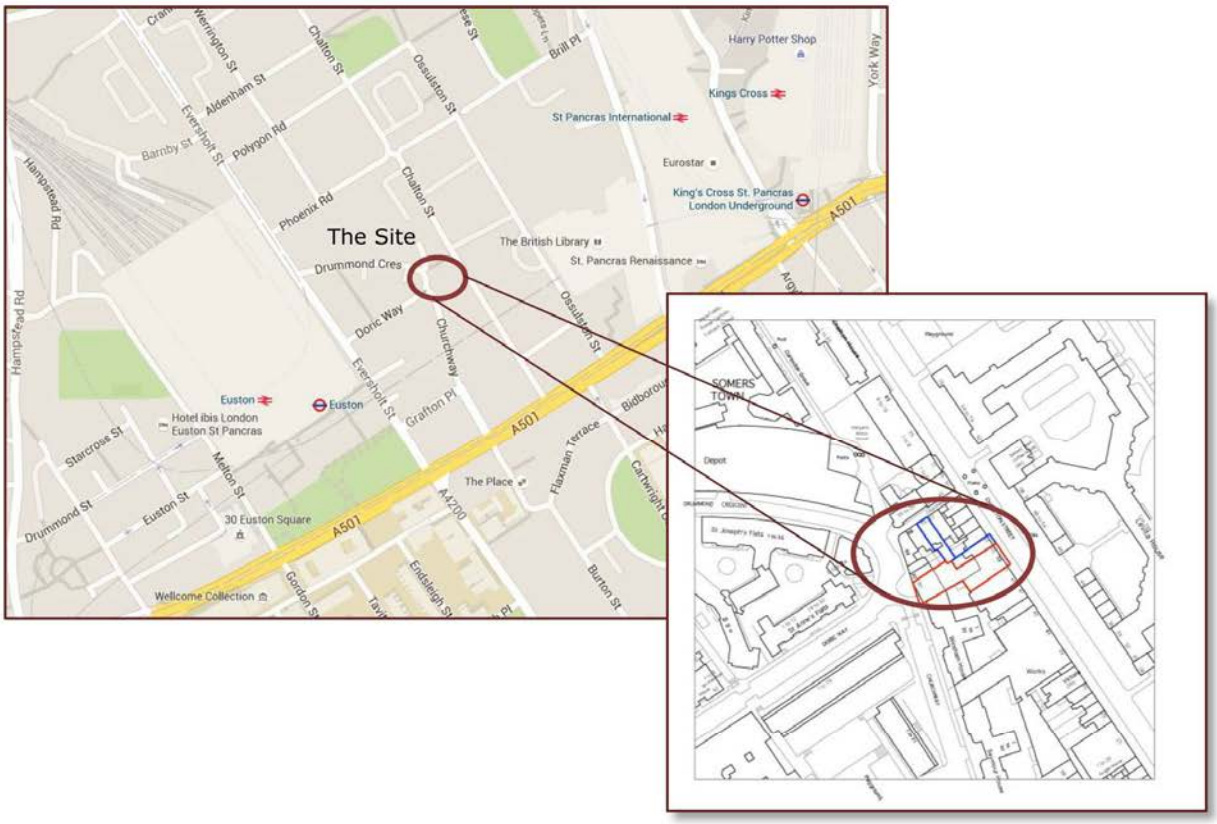
This report presents the potential impact relating to the proposed subterranean development in terms of 'land stability' as presented in the guidance documents published by Arup 2010: 'Camden geological, hydrogeological and hydrological study: Guidance for subterranean development', Issue 01 dated November 2010 and Camden Planning Guidance 'Basements', published by Camden Council in 2018. Annotated relevant figures and plans from the Arup guidance are included as Appendix A to this report.

Soil Consultants Ltd separate Site Investigation Report (Ref 10371/KOG, dated 18th June 2019), provides site-specific information on the ground and groundwater conditions at this site and allows an informed assessment to be made in this report.

This Land Stability Report should be read in conjunction with a separate hydrological/ hydrogeological BIA by Steve Buss Environmental Consulting Ltd, 'Surface Water and Subsurface Flow Basement impact assessment: screening and scoping report' (Ref. 2019-003-025-004, dated 11th June 2019) and a separate Ground Movement Analysis (GMA) report are being prepared on behalf of the client by A Squared Studio (Ref 0913-A2S-XX-XX-RP-Y-0001-00).

2.0 SITE DESCRIPTION AND PROPOSED BASEMENT

The site of our investigation comprises the existing terraced properties of No 53-55 Chalton Street NW1 1HY together with 60 and 70 Churchway NW1 1LT, located at approximate OS Grid Ref. TQ 29753 82813 in the Euston district of the London Borough of Camden, as shown below.



The proposed development area or site extends from Chalton Street to Churchway, both to the south-west and north-west, and is very approximately 'Y' shaped in plan. Existing two to four storey buildings occupy the whole of the site.

The Chalton Street frontage is about 10m wide and measures about 40m to the boundary along the south-western side with Churchway (No.60). The frontage at 70 Churchway measures about 5.5m wide and extends about 22m in south-easterly direction.

A vacant former Nisa food retail store occupies the ground floor of the Chalton Street property and there are partly occupied residential flats above ground floor level in all the current buildings on site.

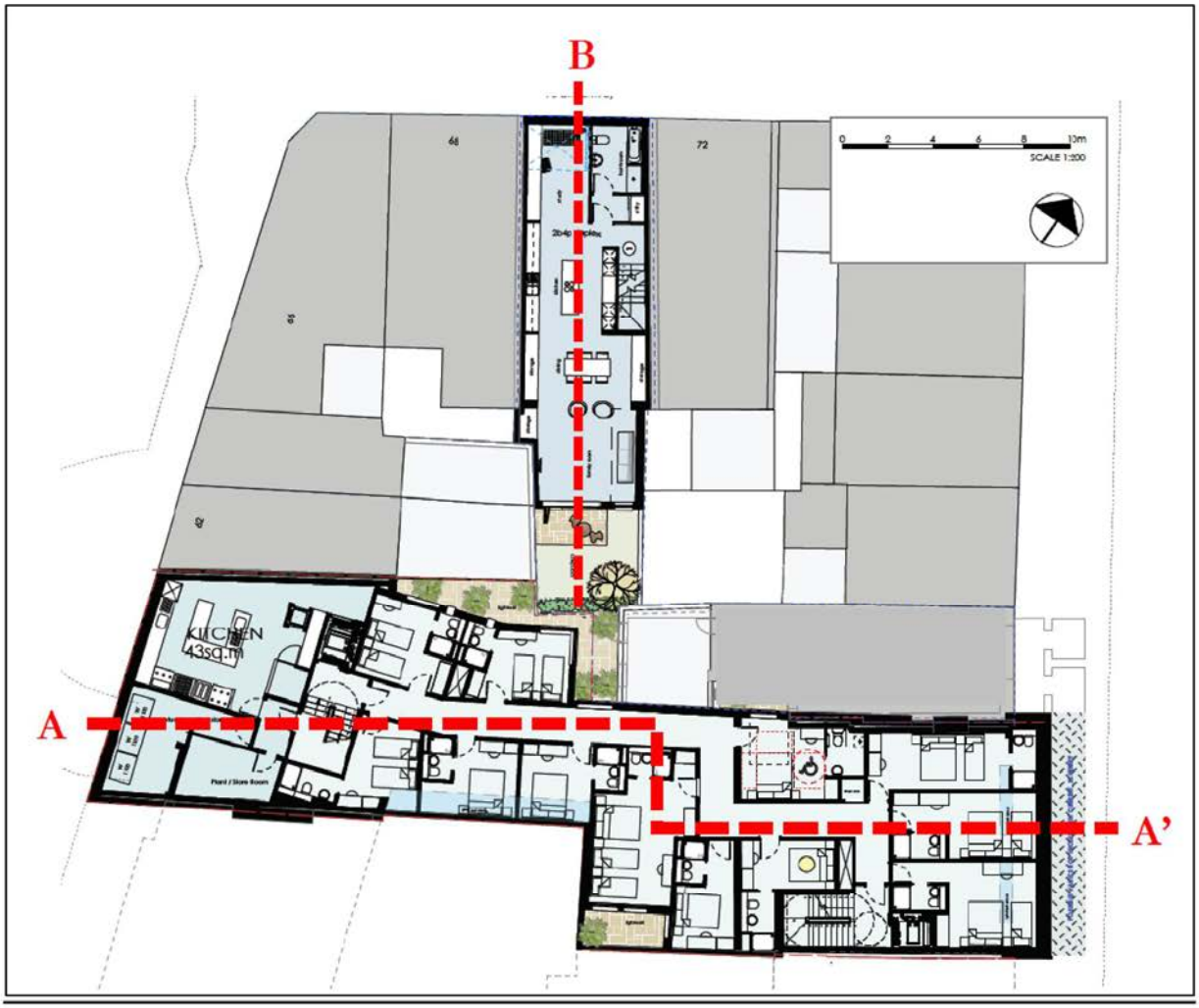
The surrounding area comprises mixed residential/office and commercial properties.

The topography of the site is slightly sloping down to the west and north-west. Ground elevation data shown on the Architects 'Existing Ground Floor Plan' (Ref 1103-A- 101-A) indicates that ground levels along the pavement outside 60 Churchway to be +18.6mOD and on the pavement outside 53-55

Chalton Street to be +19.5mOD. The architect has separately determined the pavement outside 70 Churchway to be at +18.4mOD.

There are no significant/mature trees within a relevant distance of the site, although there is a small ornamental tree within the pavement several metres beyond the Churchway boundary to the south-west.

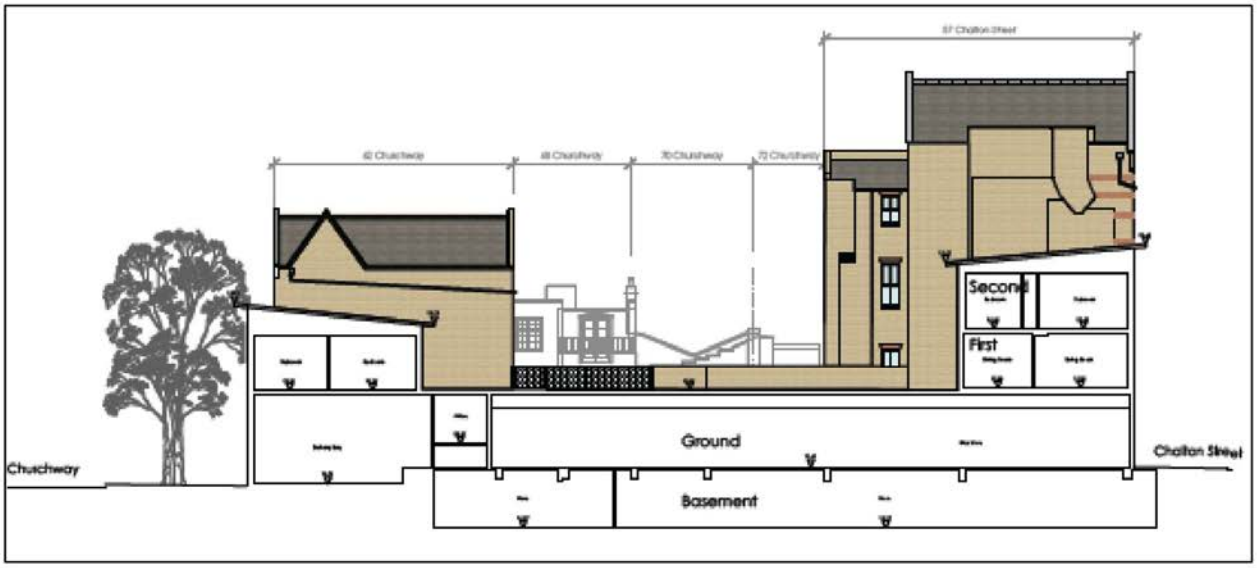
Plan of the proposed development (not to scale)



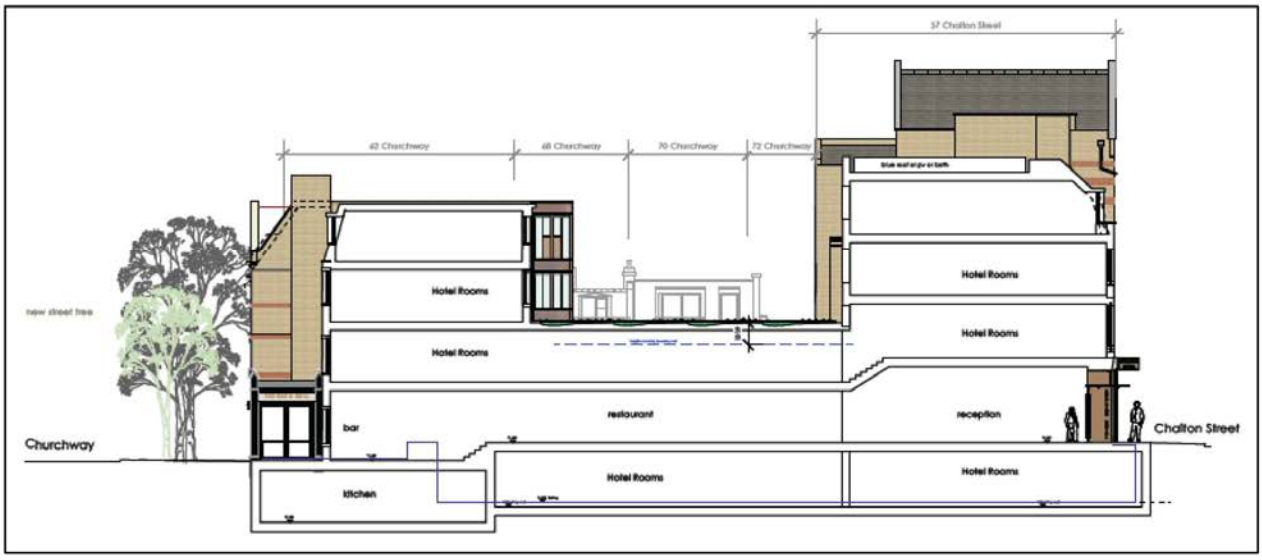
Chalton Street

As part of the scheme the existing single level basement for this property is to be extended so that it is beneath the full footprint of the new building. The existing basement and proposed scheme are shown below:

Existing cross section A- A'



Proposed cross section A-A'

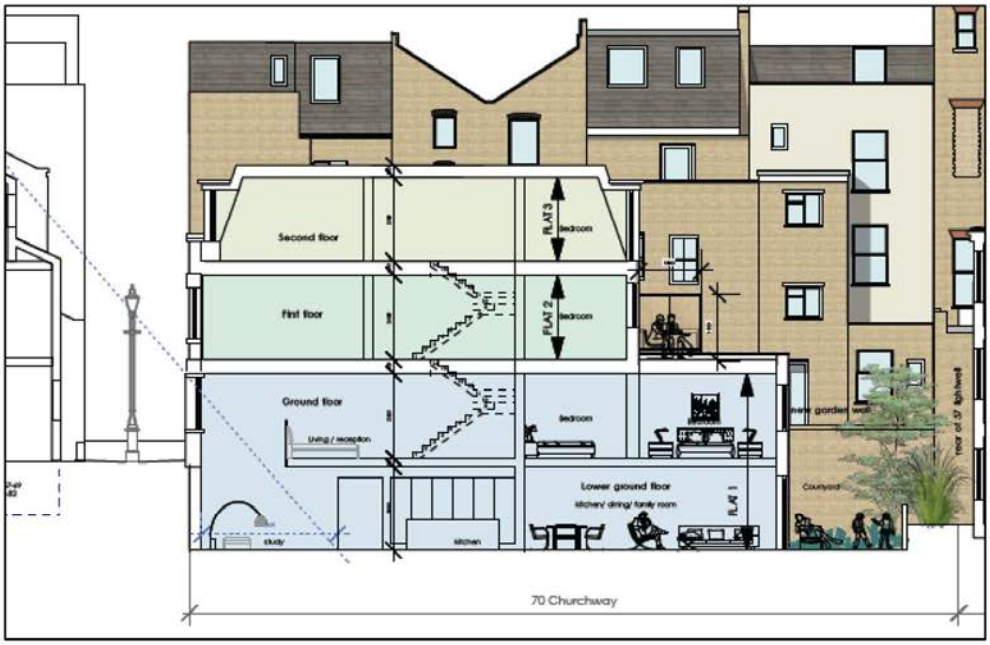


Churchway

A new single level basement (approximately 3m to 3.5m deep) is to be excavated beneath the full footprint of the new building which will also incorporate a small garden at the rear. Extracts of the Architects section drawings (Ref 1512A/101 and 1512A/250/F) are shown below.

Existing cross section B

Proposed section drawing



3.0 STAGE 1 - SCREENING

The purpose of the screening stage is to determine whether a full Basement Impact Assessment is required and the CPG provides flowcharts for each of the three disciplines (subterranean (groundwater) flow, land stability and surface flow and flooding) for this purpose, identifying a series of questions. An answer of 'Yes' or 'Unknown' will require progression to Stage 2 (scoping) of the CPG categories. Answers of 'No' indicate that no further investigation is generally required - these answers require written justification. The purpose of this section is to present the screening stage for the land stability discipline.

The screening stage for land stability has been considered as set out in Figure 13 of the CPG and the results have been tabulated in Table 1 below. Responses of note are as follows:

- Question 7 [shrink/swell] is answered 'Unknown'. Although the London Clay is expected to be the shallowest strata present [Question 5], Notwithstanding the 'normal' seasonal movement of the soils, the absence of any significant nearby trees would suggest that related shrink/swell concerns should not be an issue and the answer would likely be 'No'. However, this cannot be fully addressed without an intrusive ground investigation and this question is considered further in Stage 2.

- Question 10 [aquifer depth], are answered 'Unknown'. These cannot be fully addressed without an intrusive ground investigation and desk study. This question is considered further in Stage 2.

- Question 12 [adjacent to highway and pedestrian right of way], answered 'Yes' and considered further in Stage 2.

- Question 13 [differential foundation depths] are answered 'Yes' and are considered further in Stage 2.

- Question 14 [is the site over or within the exclusion zone of any tunnels, e.g. railway lines?] Answered 'Yes'. Information provided by LUL in their letter dated 4 July 2014 (Ref 20878-SI-V036 & N122 10486/RS/14/0898) and included as Appendix B, suggests a tunnel lies below the northern part of the site.

All other questions are answered 'No' and supporting evidence supplied as required.

Table 1: Impact of proposed basement works on land stability

Impact question	Answer	Justification	Reference
1] Does the existing site include slopes, natural or man-made greater than 7 degrees [approximately 1 in 8]?	No	No significant slope indicated by survey plans/online data	Slope angle map Arup Figure 16 indicates slopes <7 degrees
2] Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees?	No	There are no plans to alter these site levels	Site plans / proposed development plans
3] Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees?	No	Available survey information shows no other slopes greater than 7 degrees within a relevant distance	Slope angle map Arup Figure 16
4] Is the site within a wider hillside setting in which the general slope is greater than 7 degrees?	No	Map review and assessment of slope angles from survey data	Slope angle map Arup 2010 Figure 16
5] Is the London Clay the shallowest stratum at the site?	Unknown	Available data shows the London Clay to be the shallowest strata, though some made ground and unmapped superficial soils may also be present	Arup Figure 5 BGS geology maps
6] Will any trees be felled as part of the proposed development and/or any works proposed within any tree protection zones where trees are to be retained?	No	Significant/mature trees are not present on [or within an influencing distance from] the site. A small ornamental tree is present in the pavement several metres beyond the Churchway boundary	Site plans and public domain photographs
7] Is there a history of seasonal shrinkage/swelling subsidence to the local area, and or evidence of such effects at the site?	Unknown	The London Clay is generally classified as a soil with a high shrinkage/volume change potential. However, this stratum may not have been adversely affected because significant trees are not present with an influencing radius of the site. Notwithstanding the effects of root growth, clay soils could be affected seasonally and affect foundations if these are very shallow	Previous ground investigations in the London Clay Public domain photographs and survey plans
8] Is the site within 100m of a watercourse or a potential spring line?	No	See comments in hydrogeology BIA report	Arup Figure xxx Steve Buss Environmental Consulting Ltd Report Ref 2019-003-025-003)
9] Is the site within an area of previously worked ground?	No	Published geological data suggests worked ground nearby to the W/SW but not beneath the site.	BGS Published Geology and Arup 2010 Figure 16

Impact question	Answer	Justification	Reference
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?	Unknown	The BGS map and Arup data show the site be underlain by the London Clay Formation which is classified as "Unproductive" A perched water table may be present in any permeable layers of made ground or other superficial soils The hydrogeological BIA report concludes that there is no permeable aquifer beneath the site that is capable of maintaining a significant water table A determination of whether groundwater will be encountered during basement excavation can only be confirmed following intrusive investigations	BGS Published Geology Arup 2010 Figure 16 Steve Buss Environmental Consulting Ltd Report Ref 2019-003-025-003)
11] Is the site within 50m of the Hampstead Heath Ponds?	No	No	Ref Arup 2010 Figure 12
12] Is the site within 5m of a highway or pedestrian right of way?	Yes	Chalton Street pavement along north-eastern boundary and Churchway pavement along south-western boundary	Site plans
13] Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Basement retaining walls are likely to extend below founding levels to adjacent properties. The movement expected from a properly constructed and supported wall should be relatively small	Proposed development plans. Detailed GMA is being undertaken separately
14] Is the site over [or within] the exclusion zone of any tunnels, e.g. railway lines?	Yes	Site lies above Northern Line underground tunnel [map shows level at -4.50mOD which equates to about 23m below ground level]. Additional tunnels located about 25m to south and run in an approximate SW to NE direction Nearest over ground railway lines are about 200m to the west and east	LUL Data APPX B

4.0 STAGE 2 - SCOPING

The purpose of Stage 2 is to assess the potential impacts of the proposed scheme that Stage 1 has indicated require further consideration.

These are addressed below for each of the relevant questions.

As discussed in Section 3.0, soil volume change [Question 7] is unlikely to be a significant issue as there are no significant nearby trees. The new founding depth for the proposed basement will be about 3.0m to 3.5m below ground level so well below the influence of current vegetation and seasonal variations.

The depth of the aquifer in relation to the basement [Question 10] is assessed further in the BIA report by Steve Buss Environmental Reporting Ltd which concludes that there is no permeable aquifer beneath the site that is capable of maintaining a significant water table. This aspect will also need to be addressed by a later intrusive investigation.

With regard to the impact on adjacent highways/pedestrian right of way [Question 12], the proposed basement extension will coincide with the front of the site along Chalton Street and along Churchway. This means that there will be a new excavation within influencing distance of these two footpaths which will need to be addressed in the design of any ground investigation and during design and construction of the basement structure. A GMA has been provided by A Squared Studio (Ref 0913-A2S-XX-XX-RP-Y-0001-00) to assess potential ground movements in detail.

The differential depth of the proposed foundations in relation to neighbouring properties [Question 13] is such that underpinning of party wall foundations may be required and this will need be investigated and assessed as part of any desk study and ground investigation.

Underground rail lines are shown below/within close proximity to the site; the level of which has been shown on the LUL map to be about -4.5mOD [appx 23m to 25m below ground level]. The detailed location and depth of these tunnels should be ascertained as these may influence the construction of foundations and stress changes within the ground would need to be modelled in due course to ensure adverse effects are not experienced by the tunnels. All works would require approval from LUL/rail operators.

5.0 STAGE 3 – SITE INVESTIGATION

The purpose of Stage 3 is to review the findings of any intrusive investigation to provide additional information relevant to the basement impact assessment. The relevant findings of Soil Consultants Ltd (SCL) separate Site Investigation Report (Ref 10371/KOG, dated 18 June 2019) have been assessed together with selected development plans supplied by the client.

6.0 STAGE 4 – IMPACT ASSESSMENT

6.1 Land Stability

Information from the site investigation report has been consulted to provide responses to the questions previously answered 'yes' or 'unknown' [Nos. 5,7,10,12,13 and 14] and the results have been tabulated in the Revised Table 2 below.

Table 2: Revised Impact of proposed basement works on land stability

Impact question	Answer	Justification	Reference
1] Does the existing site include slopes, natural or man-made greater than 7 degrees [approximately 1 in 8]?	No	No significant apparent slope indicated by survey plans/online data	Slope angle map Arup Figure 16
2] Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees?	No	There are no plans to alter these site levels	Site plans / proposed development plans
3] Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees?	No	Available survey information shows no other slopes greater than 7 degrees within a relevant distance	Slope angle map Arup Figure 16
4] Is the site within a wider hillside setting in which the general slope is greater than 7 degrees?	No	Map review and assessment of slope angles from survey data.	Slope angle map Arup 2010 Figure 16
5] Is the London Clay the shallowest stratum at the site?	No	Made ground is present above the London Clay	SCL Site Investigation Report (Ref 10371/KOG)
6] Will any trees be felled as part of the proposed development and/or any works proposed within any tree protection zones where trees are to be retained?	No	Significant/mature trees are not present on [or within an influencing distance from] the site. A small ornamental tree is present in the pavement several metres beyond the Churchway boundary.	Site plans and public domain photographs

Impact question	Answer	Justification	Reference
7] Is there a history of seasonal shrinkage/swelling subsidence to the local area, and or evidence of such effects at the site?	Unknown (but no desiccated soil on site)	The London Clay is generally classified as a soil with a high shrinkage/volume change potential. However, this stratum may not have been adversely affected because significant trees are not present with an influencing radius of the site. Notwithstanding the effects of root growth, clay soils could be affected seasonally and affect foundations if these are very shallow.	Previous ground investigations in the London Clay No evidence of desiccation effects in SCL Site Investigation Report (Ref 10371/KOG) Public domain photographs and survey plans
8] Is the site within 100m of a watercourse or a potential spring line?	No	See comments in report presented by Steve Buss Environmental Reporting Ltd	Steve Buss Environmental Consulting Ltd Report Ref 2019-003-025-003)
9] Is the site within an area of previously worked ground?	No	Published geological data suggests worked ground nearby to the W/SW but not beneath the site. No evidence of worked ground from SCL desk study.	BGS Published Geology and Arup 2010 Figure 16 SCL Site Investigation Report (Ref 10371/KOG)
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?	No (only ground water in the made ground)	The BGS map shows the site be underlain by the London Clay which is normally classified as 'Unproductive' A perched water table appears to be present in the permeable layers of made ground. Some minor groundwater seepages of limited volume were noted in the London Clay. Water has been measured in he installed standpipes which we attribute to that largely collected from the made ground above The hydrogeological BIA report concludes that there is no permeable aquifer beneath the site that is capable of maintaining a significant water table	BGS Published Geology Arup 2010 Figure 16 SCL Site Investigation Report (Ref 10371/KOG) Steve Buss Environmental Consulting Ltd Report Ref 2019-003-025-003)
11] Is the site within 50m of the Hampstead Heath Ponds?	No	See comments in report presented by Steve Buss Environmental Reporting Ltd	Ref Arup 2010 Figure 14 Steve Buss Environmental Consulting Ltd Report Ref 2019-003-025-003)

Impact question	Answer	Justification	Reference
12] Is the site within 5m of a highway or pedestrian right of way?	Yes	Chalton Street pavement along north-eastern boundary and Churchway pavements along south-western and north-western boundaries.	Site plans
13] Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Basement retaining walls are likely to extend below founding levels of adjacent properties. The movement expected from a properly constructed and supported wall should be relatively small. A GMA is being undertaken separately to assess likely movements and damage	Proposed development plans
14] Is the site over [or within] the exclusion zone of any tunnels, e.g. railway lines?	Yes	Site lies partially above Northern Line underground tunnel [map shows level at about 4.5m below OD (-4.50mOD) which equates to about 23m below ground level], additional tunnels located about 25m to south and run in an approximate SW to NE direction Nearest over ground railway lines are about 200m to the west and east GMA report (A Squared Studio, Ref 0913-A2S-XX-XX-RP-Y-0001-00). is being undertaken separately	Site location maps LUL response letter dated 4 July 2014 (Ref 20878-SI-V036 & N122 10486/RS/14/0898)

7.0 CONCLUSIONS

From the available information we consider that the impact on baseline conditions from the proposed development would be low, provided that the scheme design and construction is supported by an appropriate ground movement analysis, construction methodology and action plan of measurement, monitoring and response, and confirmation that the construction would not influence rail and other infrastructure and adjacent buildings. The works must be undertaken diligently by reputable specialists, and the temporary and permanent works must be adequately designed and supported with due consideration to the geology and hydrogeology of the site and surrounding areas.

We conclude that for the proposed basement construction, it could be possible to design the construction methods to ensure that ground movements do not adversely affect either adjacent properties or infrastructure. This would of course depend on the magnitude of stress change within the ground and associated movement and approval from the rail operators. A detailed ground movement analysis report (A Squared Studio, Ref 0913-A2S-XX-XX-RP-Y-0001-00).is being separately commissioned.

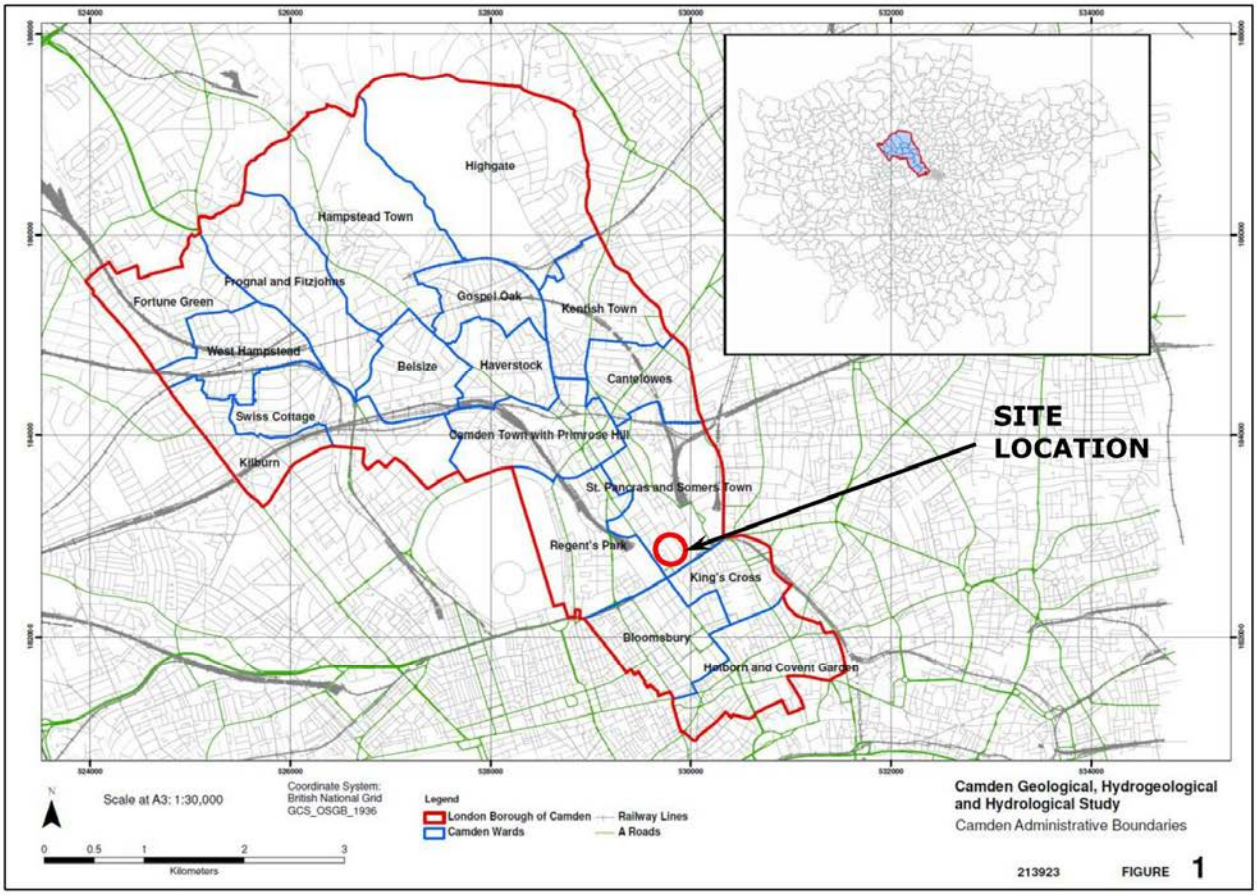
Assuming that the above design and works procedures are correctly undertaken then the impact would be regarded as LOW.

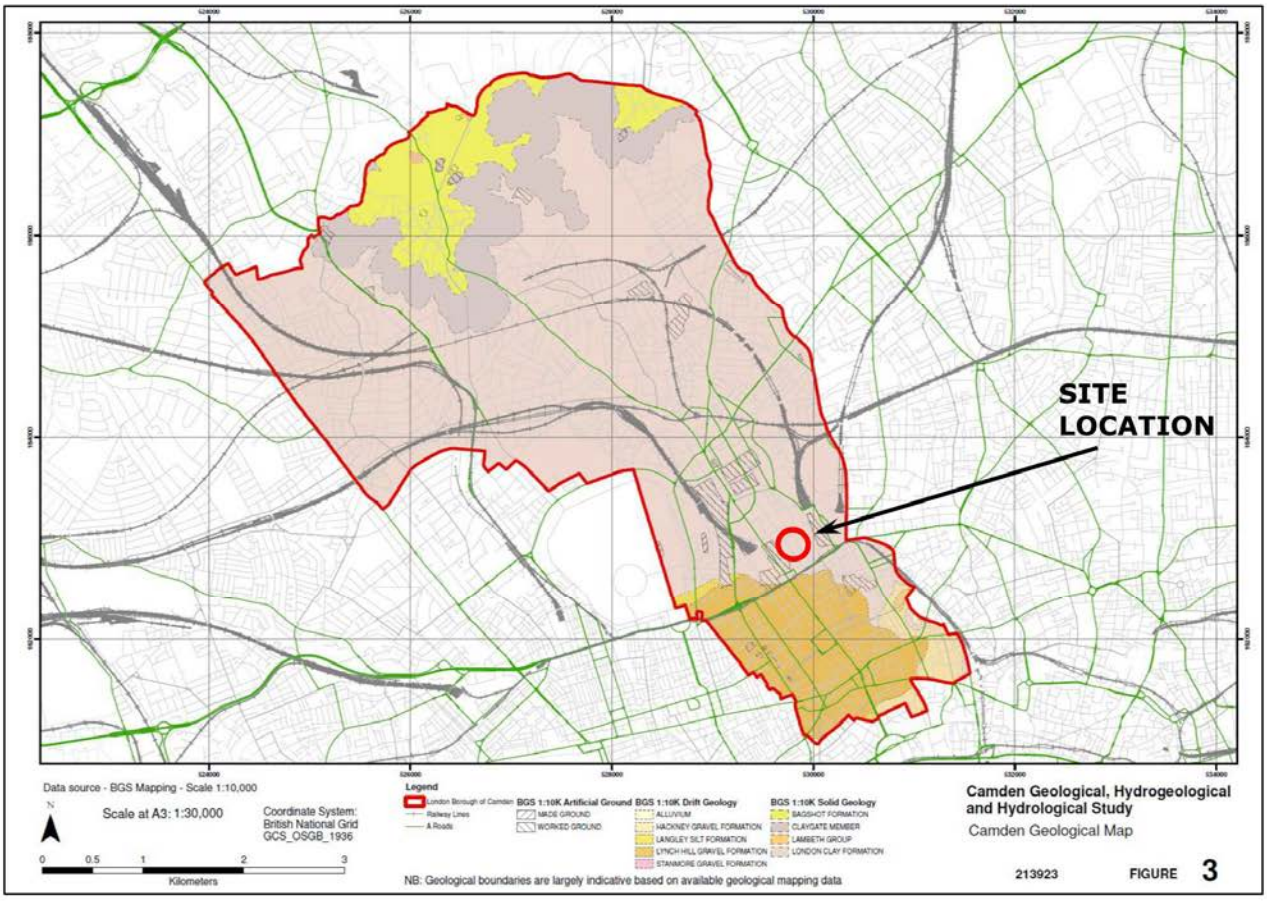
APPENDIX A

Ove Arup figures/maps

Site & Location	**53-55 Chalton Street NW1 1HY, 60 Churchway and 70 Churchway, London NW1 1LT**	Report No: **10371/KOG**

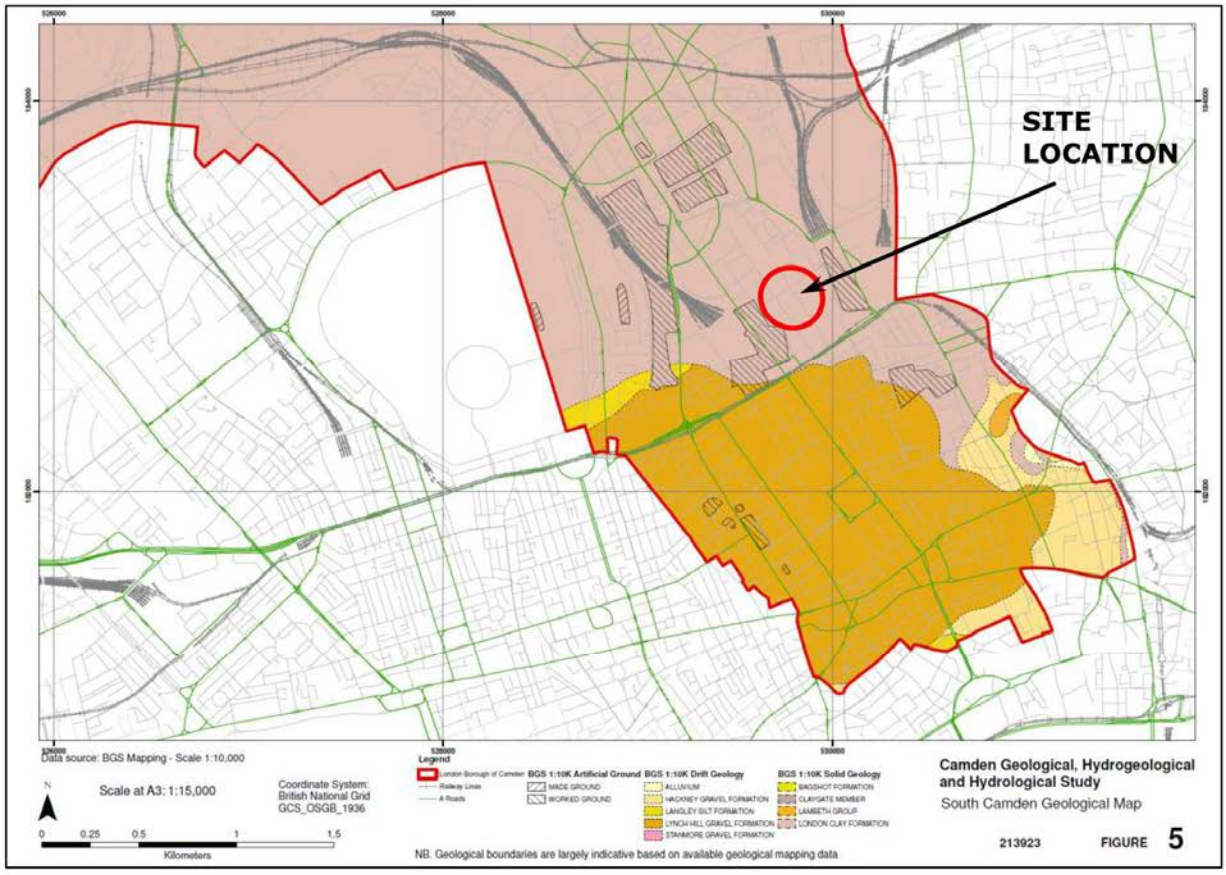
Arup Figs for BIA

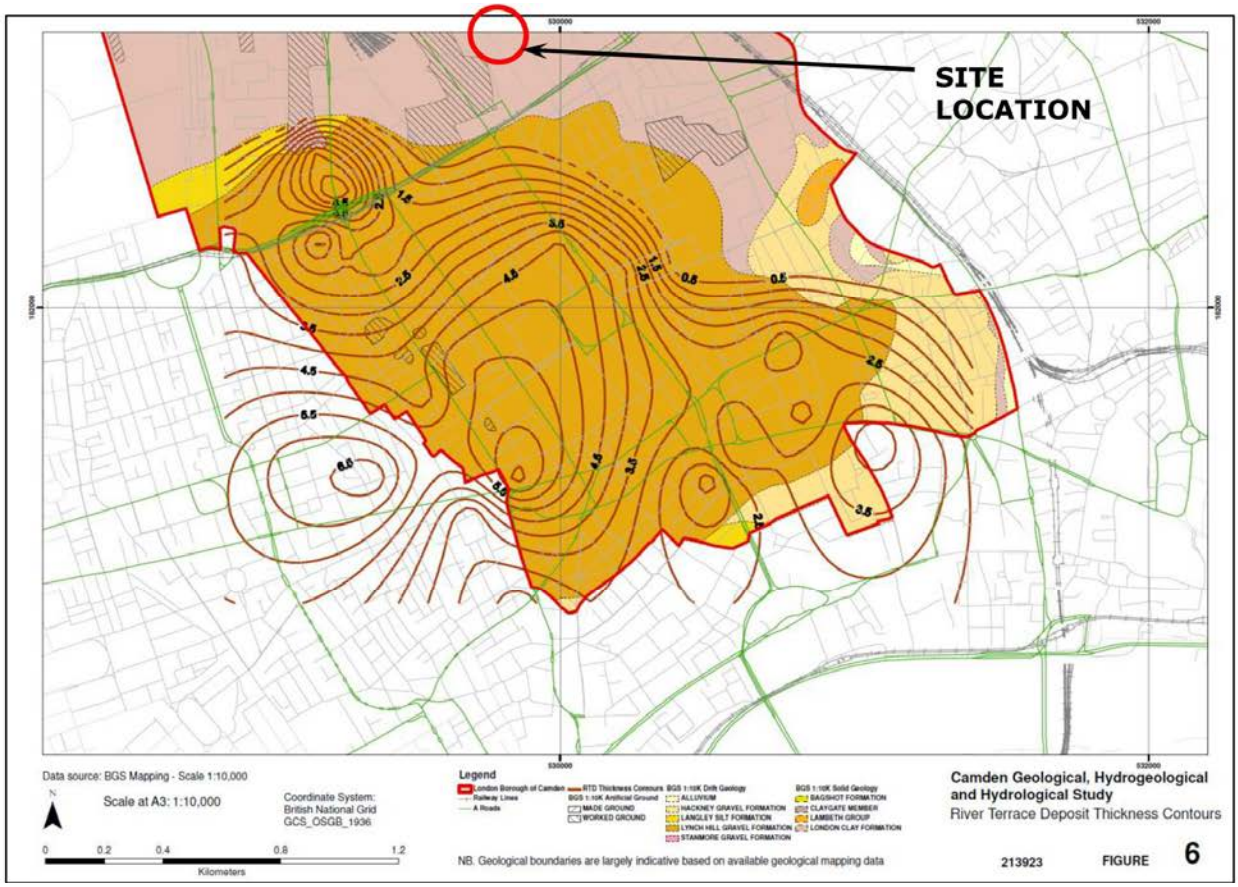




Site & Location	53-55 Chalton Street NW1 1HY, 60 Churchway and 70 Churchway, London NW1 1LT	Report No: 10371/KOG

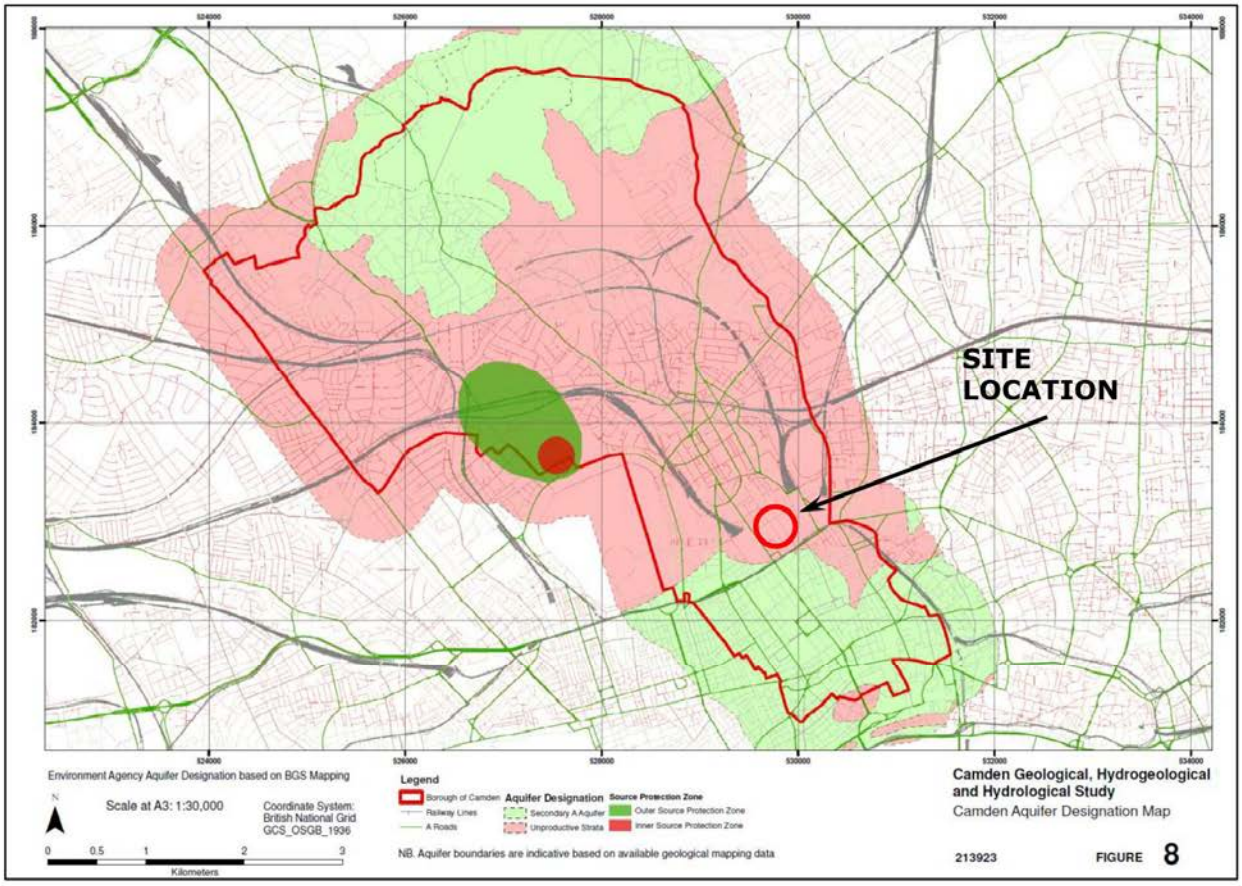
Arup Figs for BIA

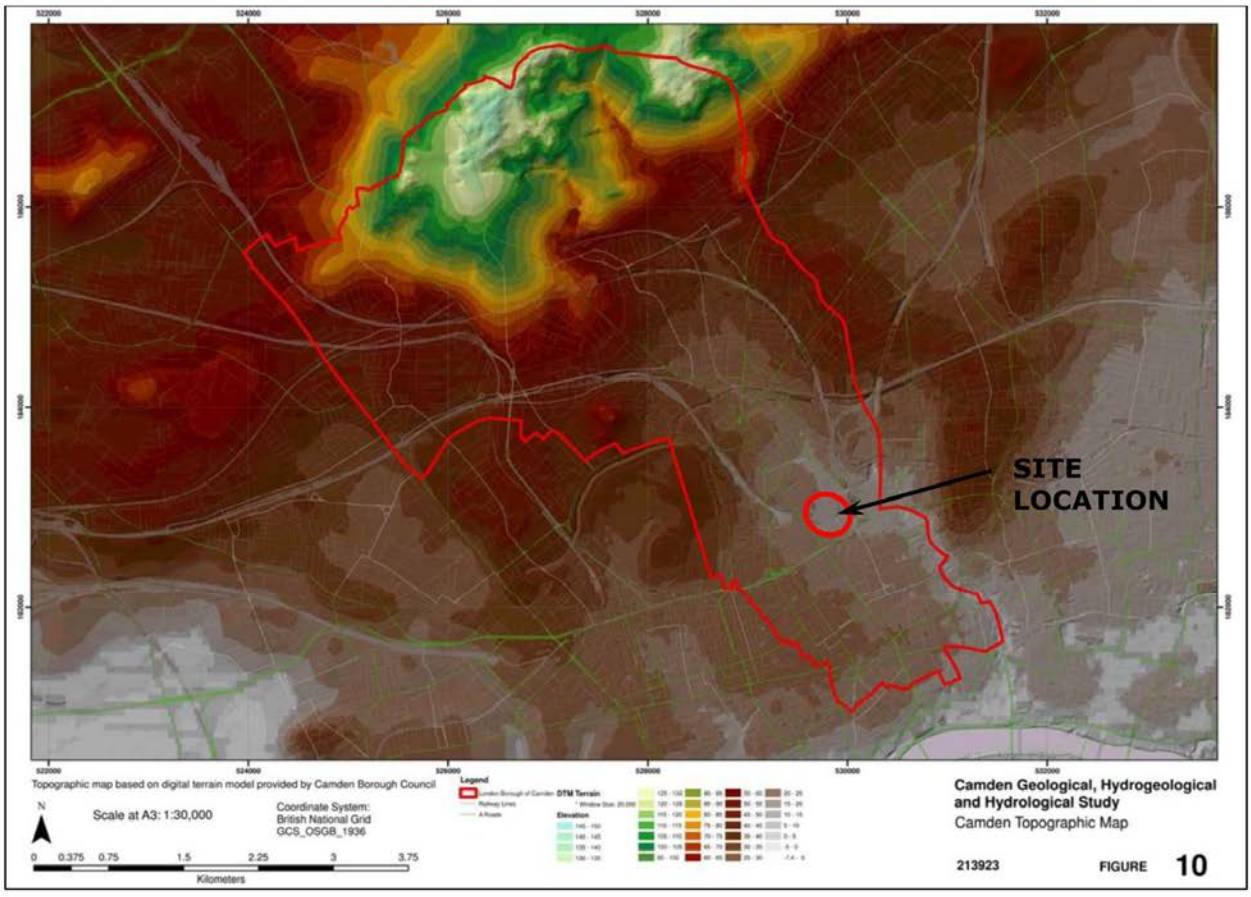




Site & Location	53-55 Chalton Street & 70 Churchway, London NW1 1LT	Report No: 10371/KOG

Arup Figs for BIA

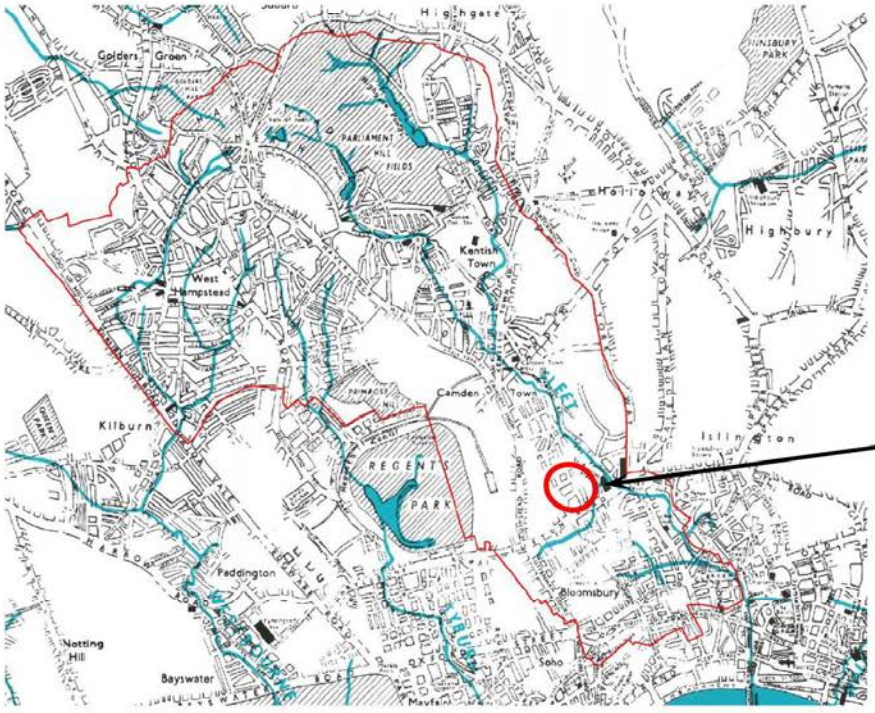




Soil Consultants

Site & Location	**53-55 Chalton Street NW1 1HY, 60 Churchway and 70 Churchway, London NW1 1LT**	Report No: **10371/KOG**

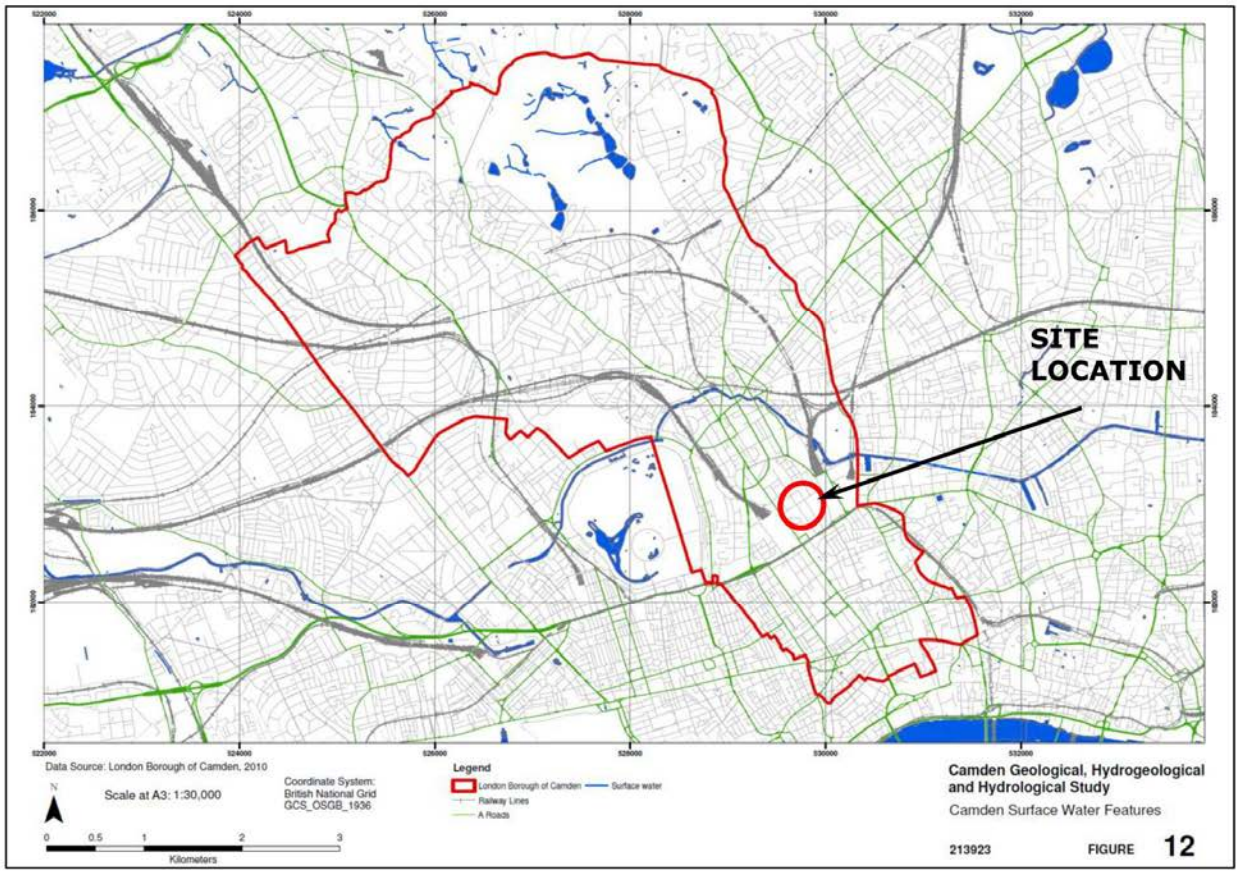
Arup Figs for BIA



Source – Barton, Lost Rivers of London

Camden Geological, Hydrogeological and Hydrological Study
Watercourses

213923 FIGURE **11**



Camden Geological, Hydrogeological and Hydrological Study
Camden Surface Water Features

213923 FIGURE **12**

Site & Location	**53-55 Chalton Street NW1 1HY, 60 Churchway and 70 Churchway, London NW1 1LT**	Report No: **10371/KOG**

Arup Figs for BIA

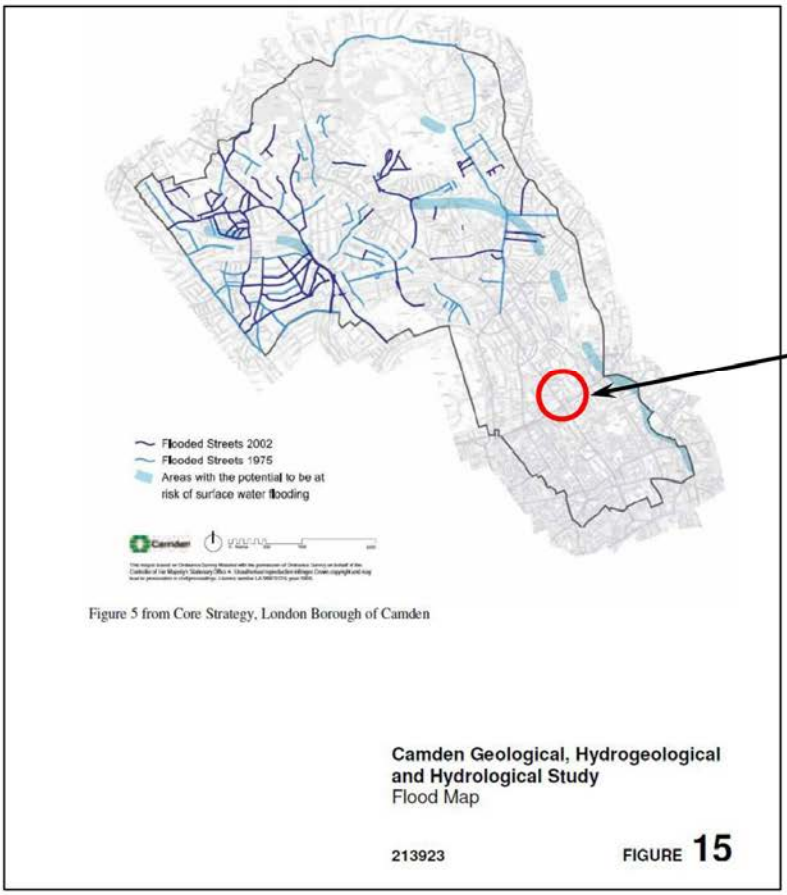
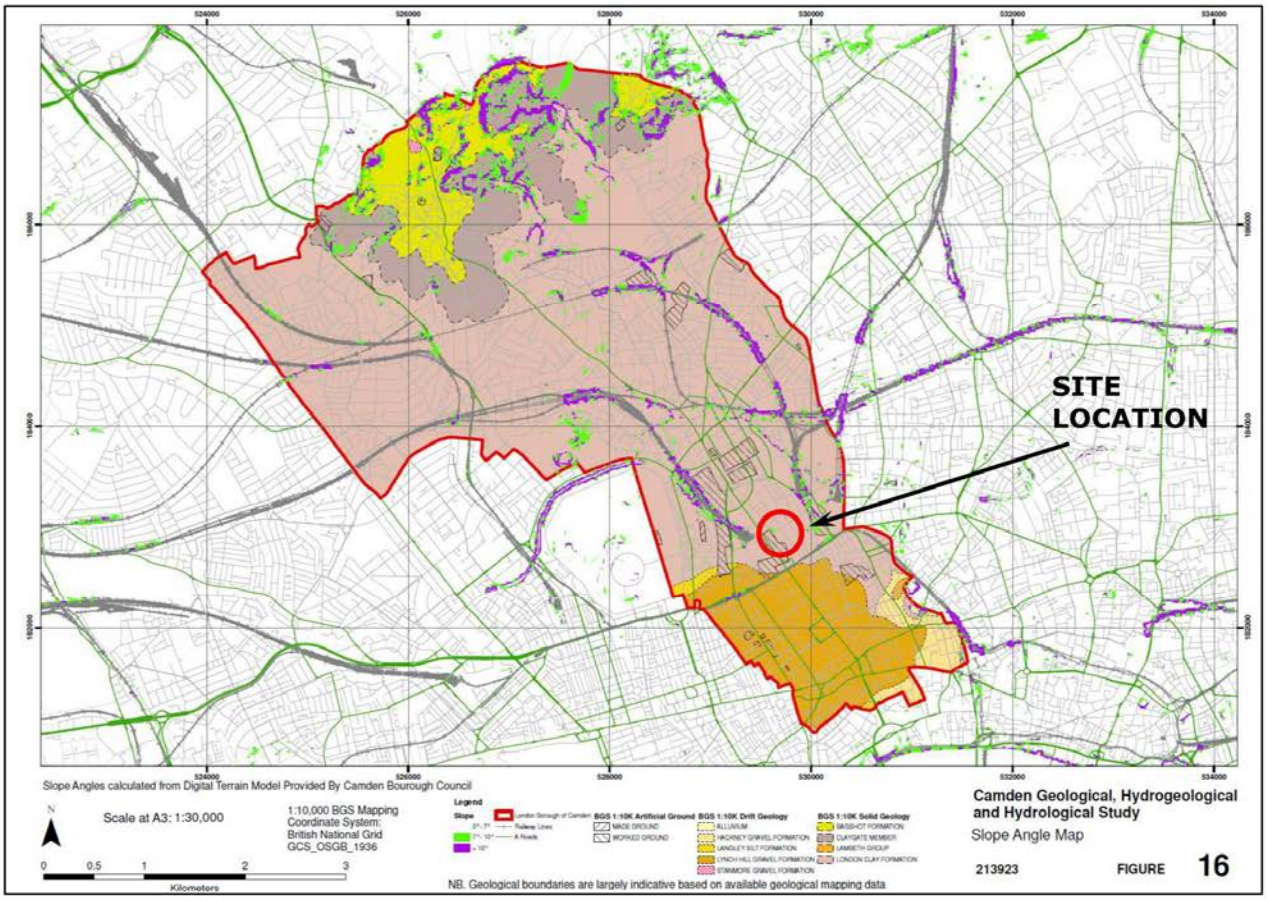
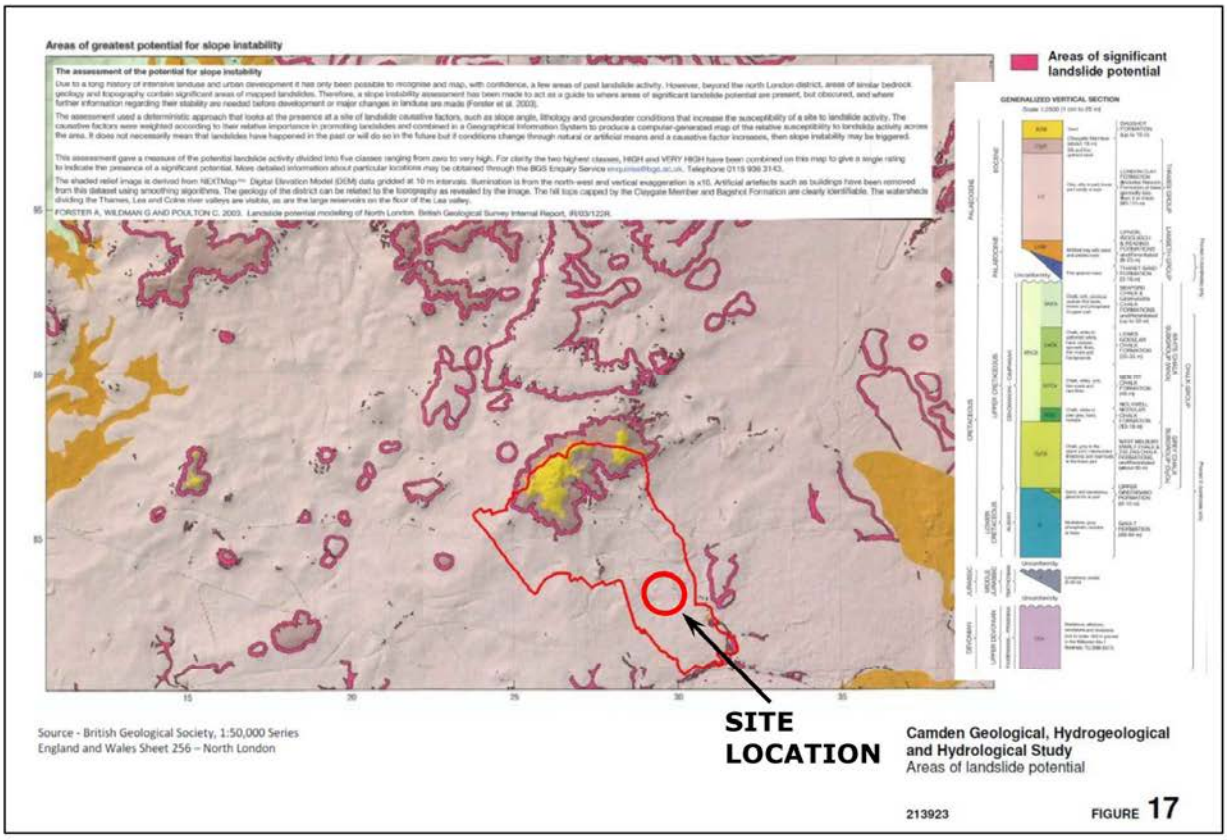


Figure 5 from Core Strategy, London Borough of Camden



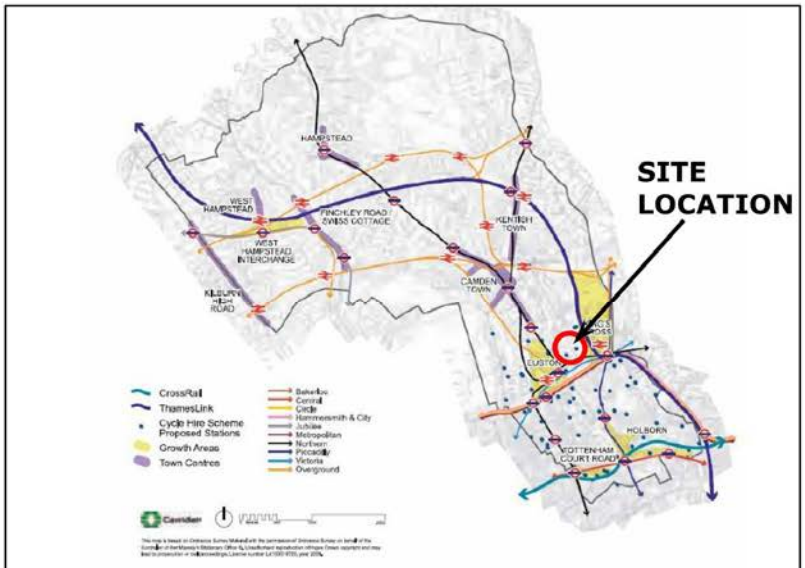
Arup Figs for BIA



Source - British Geological Society, 1:50,000 Series England and Wales Sheet 256 – North London

Camden Geological, Hydrogeological and Hydrological Study
Areas of landslide potential

213923 FIGURE 17



Source - London Borough of Camden, January 2010. *Camden Core Strategy Proposed Submission.*

Camden Geological, Hydrogeological and Hydrological Study
Transport Infrastructure

213923 FIGURE 18

APPENDIX B

LUL Infrastructure Repsonse Letter
(Ref 20878-SI-V036 & N122 10486/RS/14/0898, dated 4 July 2014)

Date 04 July 2014

Our Ref 20878-SI-V036 & N122 10486/RS/14/0898

Your Ref NRSWA- 53-55 Chalton St & 60 Church way

To Katie Guest
Utility Consultancy and Engineering Limited
katie.guest@uce-ltd.co.uk

London Underground Limited

Hello Katie,

53-55 Chalton Street & 60 Church way London NW11 1HY

Thank you for your communication of 2nd July 2014.

Attached is a 1:1250 plan @A4 showing the alignment and tunnel crown levels of the Victoria and Northern lines in relation to the above location.

Please note:

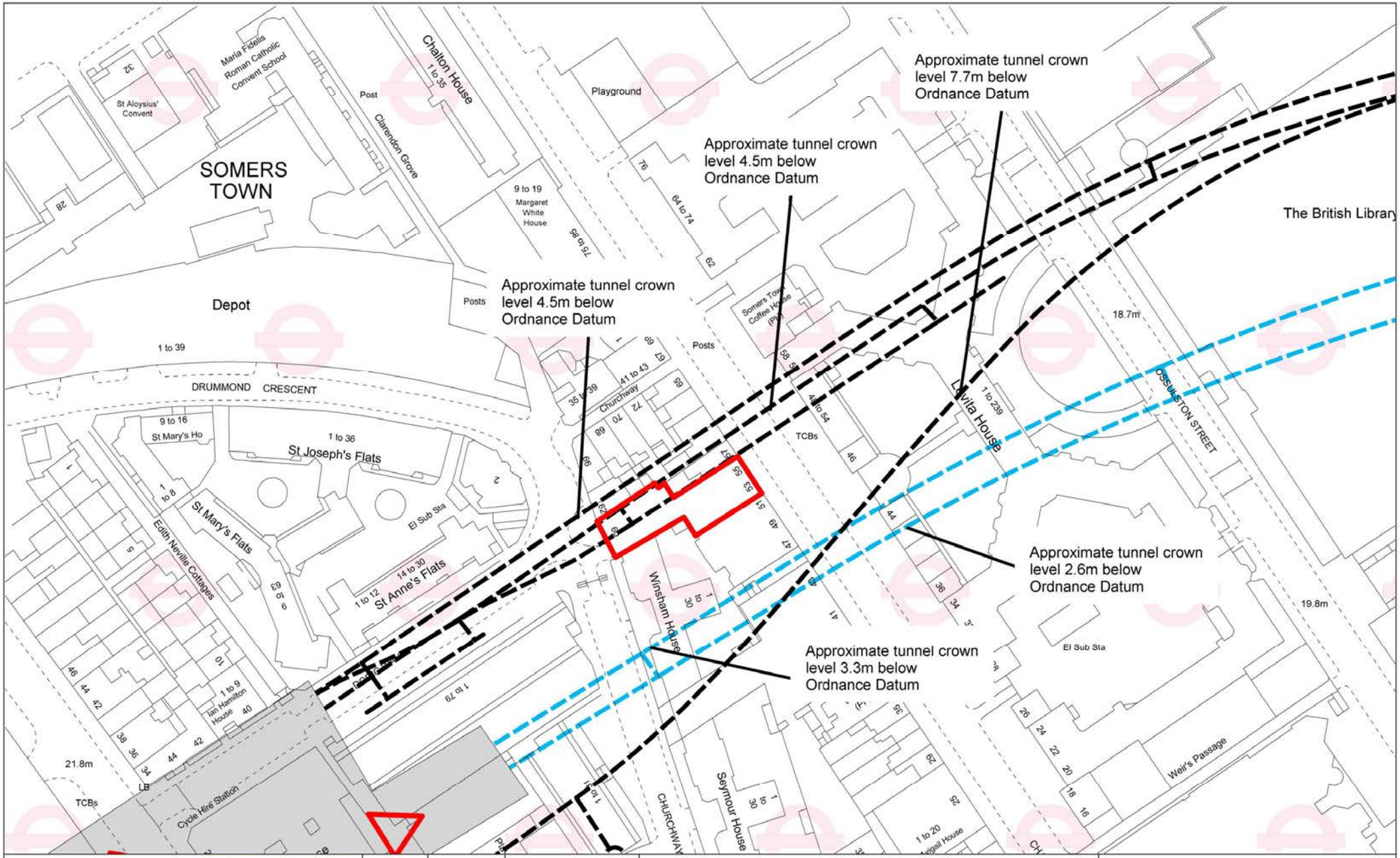
- shaded areas represent sub-surface structures which can be as shallow as 0.2 metres below surface level
- the positions of the tunnels on this plan are indicative only and must not be used for design purposes
- for more accurate tunnel location information a survey will need to be undertaken
- this letter must be distributed with the drawing which it refers to

If you or any other intends undertaking the following at the above location London Underground Infrastructure Protection must be provided with details of the proposals so that the safety of our railway can be assured:

- demolition
- structural works
- excavation
- boreholes or piling
- highway works above shaded areas

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

Shahina Inayathusein
Information Manager
LUL Infrastructure Protection
E-mail: locationenquiries@tube.tfl.gov.uk
Tel: 020 7918 0016



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Date	04 July 2014
LCS Code	V036 & N122
Drawn by	S. Inayathusein
Scale	1:1250 at A4

1. All dimensions and LUL asset locations are approximate
2. This drawing must be read in conjunction with the accompanying letter sent by LUL
3. This drawing is for planning purposes only
4. For more accurate tunnel location information a survey will need to be undertaken.

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