Contents

1 Introduction

2 The Site

3 Desk Study

4 Stage 1 – Screening Assessment

5 Stage 2 - Scoping Assessment

6 Stage 3 - Site Investigation

7 Stage 4 - Impact Assessment

Appendices

A Mapping

B Envirocheck Report

C GEA Site Investigations

D GEA Ground Movement Analysis

E Heyne Tillett Steel Flood Risk Assessment

Status: Basement Impact Assessment
Date: 18/02/2015 ~~06/02/2015~~
Revision: B ~~A~~
Job no: 1247
Prepared by: Neil Cameron
Approved by: Andy Heyne

HEYNE TILLETT STEEL

1 Introduction

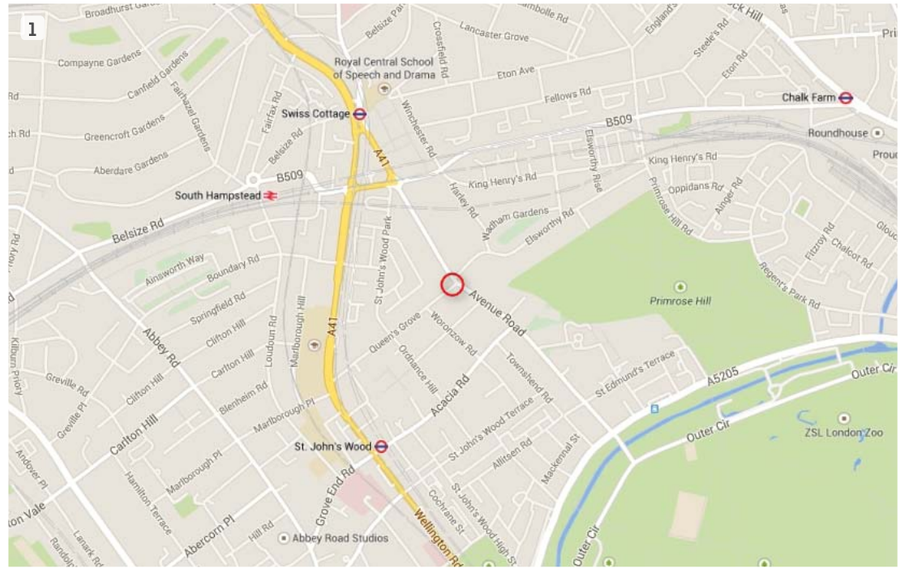
Heyne Tillett Steel have been appointed by Deroda Investments Ltd to provide structural engineering advice for the proposed development of 73 – 75 Avenue Road, in support of a planning application. This basement Impact Assessment follows the guidance set out by Camden Borough Council in the Supplementary Planning Guidance CPG4 document (2103) in order to satisfy the specific requirements of Camden Planning Policy DP27 on Basements and Lightwells,

Both project director Andy Heyne and project engineer Neil Cameron are chartered members of the Institution of Structural Engineers and have extensive experience designing new basement extensions beneath existing buildings throughout London and the UK.
This report is based upon the proposals prepared to date by Purcell Architects.

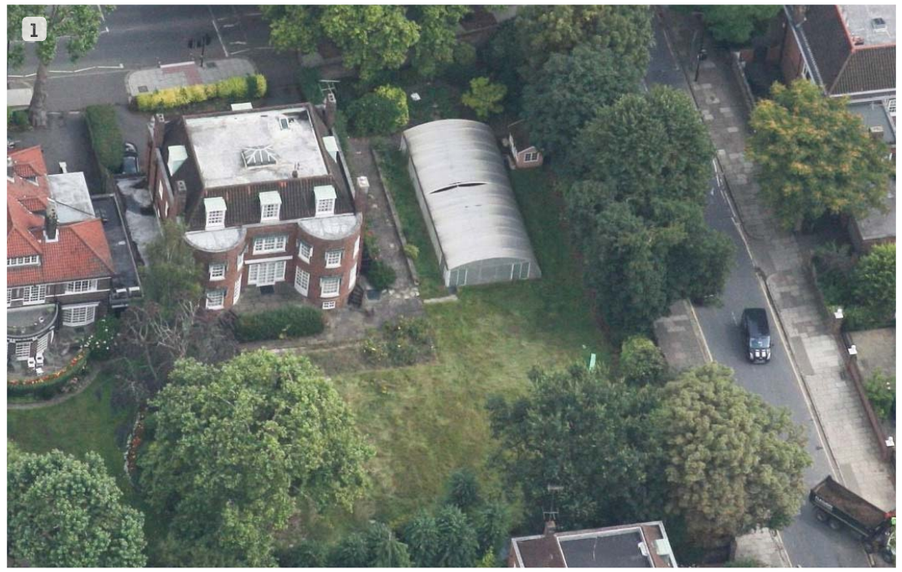
1.1 Background

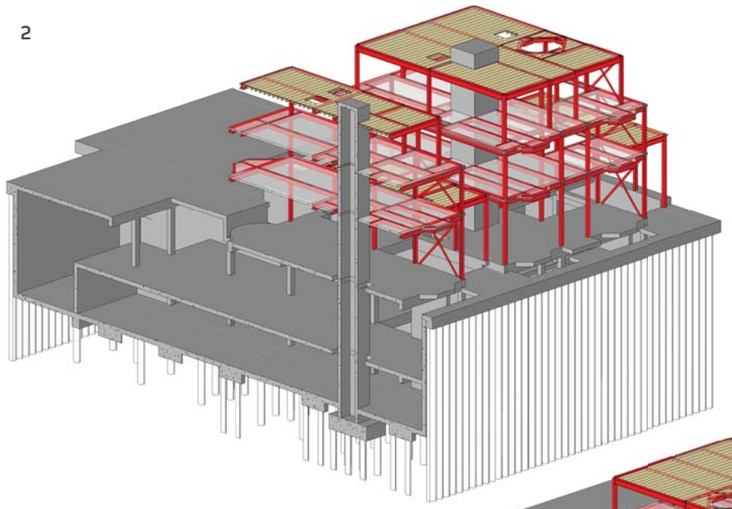
It is proposed to redevelop this site currently occupied by one large detached residential property and a swimming pool building into two large detached residential properties each with three storeys above ground and two storeys below ground.

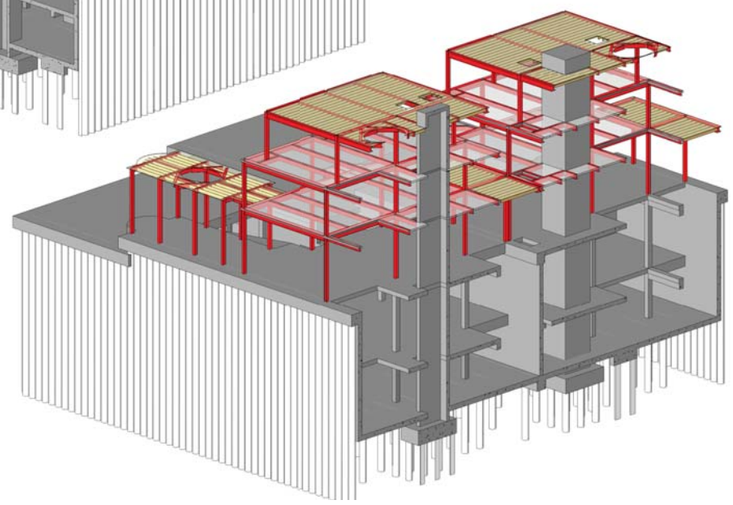
The site currently has an existing planning permission for the redevelopment of the site into one very large detached property consisting of three storeys of above ground accommodation and two below ground.



Images
1 Site Location Plan
2 Site Plan







2 The Site

2.2 Site Location

The site is located at the junction of Avenue Road and Queens Grove. The site can be located by the National Grid reference 526943,183831 or approximately by the postcode NW8 6HP. The site is approximately 575m south southeast from Swiss Cottage Underground station and approximately 525m northeast from St Johns Wood Underground Station.

The site is bounded by no.77 Avenue Road to the north, Avenue Road Carriageway to the east, Queens Grove carriageway to the south and no.38 Queens Grove to the west.

2.2 Existing Site Description

The site is currently occupied by no.75 Avenue Road and a private swimming pool building constructed on the no.73 Avenue Road Plot. The site gently slopes from north to south. The site is largely soft landscaped with the exception of the buildings and the front driveway area.

2.3 Proposed Development

The proposals include the demolition of the existing buildings on the site, the division of the site back to two separate plots and the formation of two new detached properties. The properties will each have three storeys of above ground accommodation and two storeys of below ground accommodation. The structures will be formed from reinforced concrete below ground with a piled basement wall and a steel framed building above ground supporting a composite floor deck and a masonry façade.

Images
1 Birds Eye View of the Site
2 3D View of Proposed Structurefrom South East
3 3D View of Proposed Structure from North West

3 Desk Study

3.1 Site History

The earliest historic maps of the site seen show that the site was developed with two detached properties as early as 1872, very little change occurred to the site until No.73 Avenue Road was demolished in 1939 and a new residential property was partly constructed before the outbreak of the war saw the construction halted.

The bomb maps of London show that the no.73 Avenue Road plot was used as a rubble clearance site to store demolished material from local bomb damaged properties.

Following the war the partly built no.73 property was demolished and the private swimming pool structure was constructed in 1970 as part of no.75 Avenue Road.

The course of the original River Tyburn flowed close to the current site until it was diverted into a culverted sewer constructed beneath Avenue Road.

3.2 Geological Information

The geology of the area is shown on the British Geological Survey 1:10560 sheet TQ28NE and 1:50000 map sheet 256: North London. The site is underlain by the London Clay formation, which is believed here to be of the order of 60m thick. A BGS borehole shown on Figure 3, 350m from the site, indicates that the geology consists of about 5m of Made Ground and drift deposits overlying nearly 80m of London Clay.

The soils of the Lambeth Group underlay the London Clay and this stratum is probably about 16 metres thick at this location. About 8 metres of Thanet Sand is believed to underlay the Lambeth Group here, and Chalk is encountered thereafter.

3.3 Hydrogeological / Hydrological Information

The nearest surface water feature is the now culverted River Tyburn which it is believed to flow beneath the Avenue Road carriageway.

The site is underlain by London Clay with very low permeability and no water was encountered ion any of the ground investigations.

There was a speculation that the original disused channel of the original River Tyburn may cross the site and may provide a higher permeability route for groundwater to follow. Further window sampling has been carried out to prove or disprove this speculation.

1

Historical Maps of 73-75 Avenue Road

Images
1 Historical Maps

4 Stage 1 – Screening Assessment

4.1 Purpose and Methodology

The screening process uses checklists to identify any areas of concern which should be investigated through the production of a BIA. The screening process determines whether or not a BIA is required and governs the following three topics;

Subterranean (groundwater) flow
Slope stability
Surface water flow and flooding

4.2 Screening Checklist for Subterranean (Groundwater) Flow

Question		Response	Justification
1	Is the site located directly above an aquifer?	No	The BGS records show that the London clay deposits extend to between 30 – 50m below the ground level of the site.
	Will the proposed basement extend beneath the water table surface?	No	The London Clay is not a waterbearing strata and extends between 30 – 60m below the ground level of the site.
2	Is the site within 100m of a watercourse, well (used/disused) or a potential spring line?	Yes	The culverted River Tyburn runs beneath the Avenue Road Carriageway to the east of the site. Carried forward to scoping.
3	Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is located downstream of any of the catchment areas for the Hampstead Heath pond chains.
4	Will the proposed basement development result in a change in the area of hard surfaced / paved areas?	Yes	Carried forward to scoping
5	As part of the 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	The site is underlain by London clay so infiltration is not a possible option for the drainage of the site.
6	Is the lowest point of the proposed?		

4.3 Screening Checklist for Surface Flow and Flooding Impact Identification

Question		Response	Justification
1	Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is located downstream of any of the catchment areas for the Hampstead Heath pond chains.
2	As part of the site drainage, will surface water flows (e.g. rainfall and run-off) be materially changed from the existing route?	Yes	Carried forward to scoping
3	Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is located downstream of any of the catchment areas for the Hampstead Heath pond chains.
4	Will the proposed basement development result in a change in the area of hard surfaced / paved areas?	Yes	Carried forward to scoping
5	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	All hardstandings will drain to sewer as per the existing condition.

4.4 Screening Checklist for Stability

Question		Response	Justification
1	Does the existing site include slopes natural or manmade, greater than 7° (approximately 1 in 8)?	No	No the site is generally level
2	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7° (approximately 1 in 8)?	No	No re-profiling of the site boundaries are planned, the site boundaries are also largely covered by tree RPA's
3	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7° (approximately 1 in 8)?	No	The neighbouring land to all boundaries is generally flat
4	Is the site within a wider hillside setting in which the general slope is greater than 7° (approximately 1 in 8)?	No	Figure 16 of the CGHHS shows the site to be in an area of 0° to 7° slope
5	Is London Clay the shallowest strata at the site	Yes	Carried forward to scoping
6	Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree protection zones where tress are to be retained?	Yes	Carried forward to scoping
7	Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	No evidence of cracking or building movements were evident on site or on adjacent properties.
8	Is the site within 100m of a watercourse, well (used/disused) or a potential spring line?	Yes	The culverted River Tyburn runs beneath the Avenue Road Carriageway to the east of the site. Carried forward to scoping
9	Is the site within an area of previously worked ground?	Yes	River Tyburn Channel???
10	Is the site within an aquifer?	No	The London Clay formation is classified as Unproductive Strata
	If yes will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	he London Clay is not a waterbearing strata and extends between 30 – 60m below the ground level of the site
11	Is the site within 50m of the Hampstead Heath ponds?	No	The site lies approximately 2000m to the southwest of the Hampstead Heath ponds
12	Is the site within 5m of a highway or pedestrian right of way?	No	Refer to the site plan
13	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Carried forward to scoping
14	Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	The closest tunnels are the Jubilee line tunnels approximately 300m to the west and the metropolitan line tunnels approximately 300m to the east

5 Stage 2 – Scoping Assessment

Where any of the responses to any of the questions within the three checklist is yes, these subjects have been carried forward to the scoping assessment stage of the BIA. These subjects then form the basis of the site specific BIA that is carried out and documented in stages 3 and 4.

The issues that have been identified as being areas of concern from the checklists are;

- **The site within 100m of a watercourse, well (used/disused) or a potential spring line.**
  The flow from a spring, well or watercourse may increase or decrease if the groundwater flow regime which supports that water feature is affected by a proposed basement. If the flow is diverted, it may result in the groundwater flow finding another location to issue from with new springs forming or old springs being reactivated. A secondary impact is on the quality of the water issuing or abstracted from the spring or water well respectively.

- **The proposals will result in a change in the area of hard surfacing / paving.**
  The sealing off of the ground surface by pavements and buildings to rainfall will result in decreased recharge to the underlying ground. In areas underlain by an aquifer, this may impact upon the groundwater flow or levels. In areas of non-aquifer (i.e. on the London Clay) this may mean changes in the degree of wetness which in turn may affect stability.

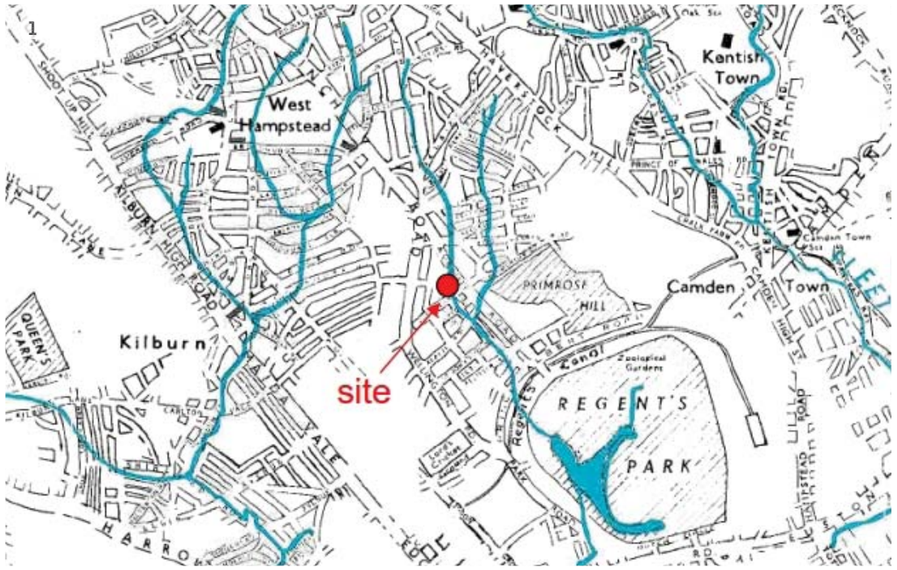
- **London Clay is the shallowest strata on the site.**
  Of all of the at-surface strata in the LB Camden, the London Clay is the most prone to seasonal shrink-swell.

- **Work will be carried out within the tree protect zones.**
  The removal of tree roots may have an adverse effect on the soil strength which could affect slope stability.

- **The site is within an area of reworked ground.**
  Previously reworked ground may be less homogeneous than natural strata, and may include relatively uncontrolled backfill zones

- **The proposed basement will significantly increase the differential depth of foundations relative to the neighbouring properties.**
  Excavation of a basement may result in structural damage to the neighbouring properties if there is a significant differential depth between adjacent foundations.

- **The proposed basement will result in a change in the proportion of hard surfaced / paved areas.**
  A change in the proportion of hard surfaced or paved areas of a property will affect the way in which rainfall and surface water are transmitted away from a property. This includes changes to the surface water received by underlying aquifers, adjacent properties and nearby watercourses. Changes could result in decreased flow which may increase the risk of flooding.



Images
1 London's Lost Rivers
2 Extract of BGS 1:10560 sheet TQ28NW

HEYNE TILLETT STEEL

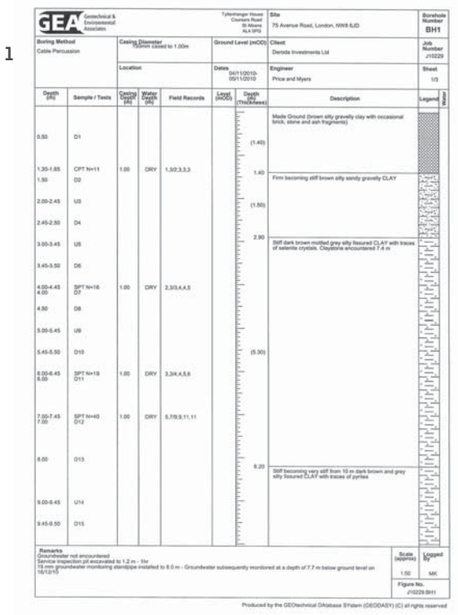
6 Stage 3 – Site Investigation

A site investigation was undertaken by GEA in February 2011 and consisted of a number trial pits and two 25m deep boreholes. Groundwater monitoring standpipes were installed in both boreholes, no water was encountered during the investigations.

A further site investigation was carried out GEA in January 2015 which consisted of a number of window samples to try to ascertain the location of the original River Tyburn channel if present on site.

The results of both site investigations are covered in detail in the GEA reports appended to this BIA.

1


GEA Geotechnical & Environmental Associates

Site: 75 Avenue Road, London, NW8 6JD — Borehole Number: BH1

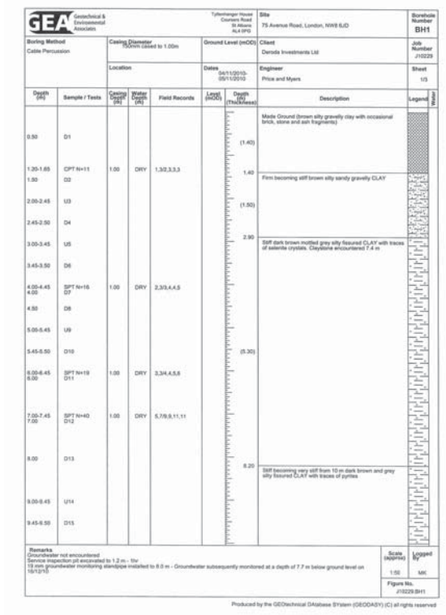
Boring Method: Cable Percussion — Casing Diameter: 150mm cased to 1.00m — Ground Level (mOD): — Client: Deroda Investments Ltd — Job Number: J10229

Location: — Dates: 04/11/2010-05/11/2010 — Engineer: Price and Myers — Sheet: 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.50	D1					(1.40)	Made Ground (brown silty gravelly clay with occasional brick, stone and ash fragments)	
1.20-1.65	CPT N=11	1.00	DRY	1,3/2,3,3,3		1.40		
1.50	D2					(1.50)	Firm becoming stiff brown silty sandy gravelly CLAY	
2.00-2.45	U3					2.90		
2.45-2.50	D4						Stiff dark brown mottled grey silty fissured CLAY with traces of selenite crystals. Claystone encountered 7.4 m	
3.00-3.45	U5							
3.45-3.50	D6							
4.00-4.45 4.00	SPT N=16 D7	1.00	DRY	2,3/3,4,4,5				
4.50	D8							
5.00-5.45	U9							
5.45-5.50	D10					(5.30)		
6.00-6.45 6.00	SPT N=19 D11	1.00	DRY	3,3/4,4,5,6				
7.00-7.45 7.00	SPT N=40 D12	1.00	DRY	5,7/8,9,11,11				
8.00	D13							
9.00-9.45	U14							
9.45-9.50	D15					8.20	Stiff becoming very stiff from 10 m dark brown and grey silty fissured CLAY with traces of pyrites	

Remarks: Groundwater not encountered. Service inspection pit excavated to 1.2 m - 1tv. 19 mm groundwater monitoring standpipe installed to 8.0 m - Groundwater subsequently monitored at a depth of 7.7 m below ground level on 15/12/15

Scale (original): 1:50 — Logged By: MK — Figure No.: J10229.BH1


GEA Geotechnical & Environmental Associates

Site: 75 Avenue Road, London, NW8 6JD — Borehole Number: BH1

Boring Method: Cable Percussion — Casing Diameter: 150mm cased to 1.00m — Ground Level (mOD): — Client: Deroda Investments Ltd — Job Number: J10229

Location: — Dates: 04/11/2010-05/11/2010 — Engineer: Price and Myers — Sheet: 1/3

Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend

0.50 D1 (1.40) Made Ground (brown silty gravelly clay with occasional brick, stone and ash fragments)
1.20-1.65 CPT N=11 | 1.00 | DRY | 1,3/2,3,3,3
1.50 D2 1.40 Firm becoming stiff brown silty sandy gravelly CLAY (1.50)
2.00-2.45 U3
2.45-2.50 D4 2.90 Stiff dark brown mottled grey silty fissured CLAY with traces of selenite crystals. Claystone encountered 7.4 m
3.00-3.45 U5
3.45-3.50 D6
4.00-4.45 4.00 SPT N=16 D7 | 1.00 | DRY | 2,3/3,4,4,5
4.50 D8
5.00-5.45 U9
5.45-5.50 D10 (5.30)
6.00-6.45 6.00 SPT N=19 D11 | 1.00 | DRY | 3,3/4,4,5,6
7.00-7.45 7.00 SPT N=40 D12 | 1.00 | DRY | 5,7/8,9,11,11
8.00 D13
9.00-9.45 U14
9.45-9.50 D15 8.20 Stiff becoming very stiff from 10 m dark brown and grey silty fissured CLAY with traces of pyrites

Remarks: Groundwater not encountered. Service inspection pit excavated to 1.2 m - 1tv. 19 mm groundwater monitoring standpipe installed to 8.0 m - Groundwater subsequently monitored at a depth of 7.7 m below ground level on 15/12/15

Scale (original): 1:50 — Logged By: MK — Figure No.: J10229.BH1

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

Images
1 Borehole Logs

7 Stage 4 – Impact Assessment

The screening assessment has identified that there are potential issues associated with groundwater flows, surface water flows and flooding impact. These items are addressed in detail in the flood risk assessment prepared by Heyne Tillett Steel and appended to this document however the salient points are described below;

7.1 Subterranean (Groundwater) Flow

The site is located within 100m of the culverted River Tyburn however because the watercourse is now culverted groundwater flows do not contribute to the flow regime of the watercourse and the construction of the proposed basement will not alter the flows to or from the watercourse. Refer to the FRA for details.

The proposals do increase the amount of hardstandings / pavements on the site however the SUDS system designed and detailed within the Flood Risk Assessment prepared by Heyne Tillett Steel and appended to this document mitigates this. Refer to the FRA for details.

7.2 Stability Impact

London Clay is the shallowest strata however the depth of the proposed basement foundation obviates any concerns regarding seasonal shrink swell of the clay. The proposed construction methodology and permanent and temporary works design accounts for maintaining stability to the adjacent ground at all times.

For details of tree felling and works within the root protection zones refer to the Barrell report appended to this document.

The site is located within 100m of the culverted River Tyburn however because the watercourse is now culverted groundwater flows do not contribute to the flow regime of the watercourse and the construction of the proposed basement will not alter the flows to or from the watercourse or stability of adjacenet ground. Refer to the FRA for details.

There are elements of reworked ground present on the site which comprise of silty, sandy, gravelly clay layer is believed to be a transported and reworked mix of London Clay, Claygate Member and Bagshot Formation, with a firm becoming stiff consistency and is believed to form the infill to the original river Tyburn channel. Refer to the GEA site investigation reports appended to this BIA.

The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties. A detailed ground movement analysis has been carried out by GEA and is appended to this report showing that the movements will result is a worst case category 2 damage.

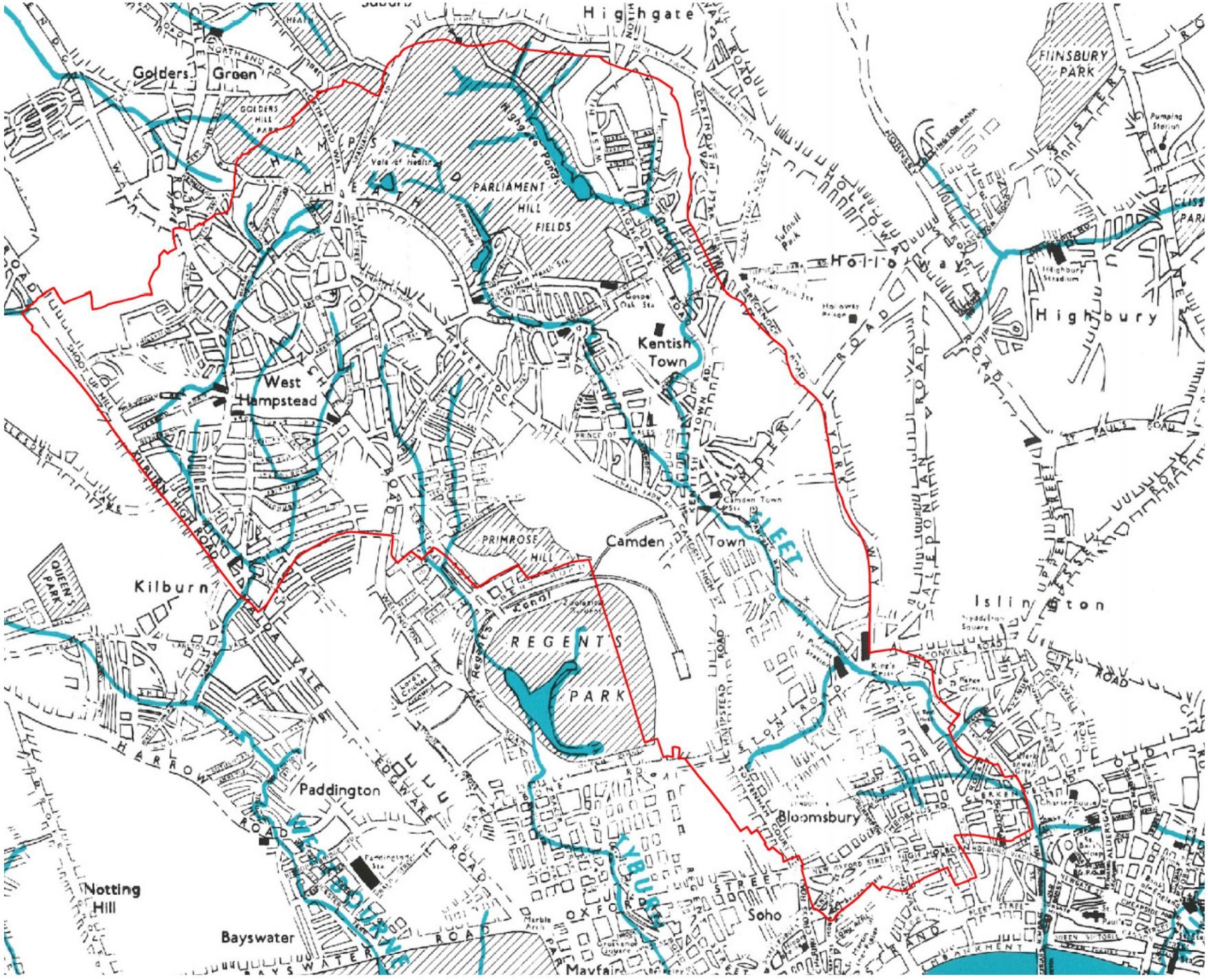
7.3 Surface Flow and Flooding Impact

The surface water flows will be materially changed from the existing route by the construction of the new basemen. A suds design is to be implemented in line with the attached Heyne Tillett Steel flood risk assessment appended to this BIA.

The area of hard surfaced / paved areas will be altered as part of the proposed basement construction. A suds design is to be implemented in line with the attached Heyne Tillett Steel flood risk assessment appended to this BIA.

Appendix A

Mapping



Source – Barton, Lost Rivers of London

Camden Geological, Hydrogeological and Hydrological Study
Watercourses

213923 FIGURE **11**

522000 524000 526000 528000 530000 532000

186000 184000 182000

Data Source: London Borough of Camden, 2010

N

Scale at A3: 1:30,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.5 1 2 3
Kilometers

Legend

- London Borough of Camden
- Surface water
- Railway Lines
- A Roads

Camden Geological, Hydrogeological and Hydrological Study

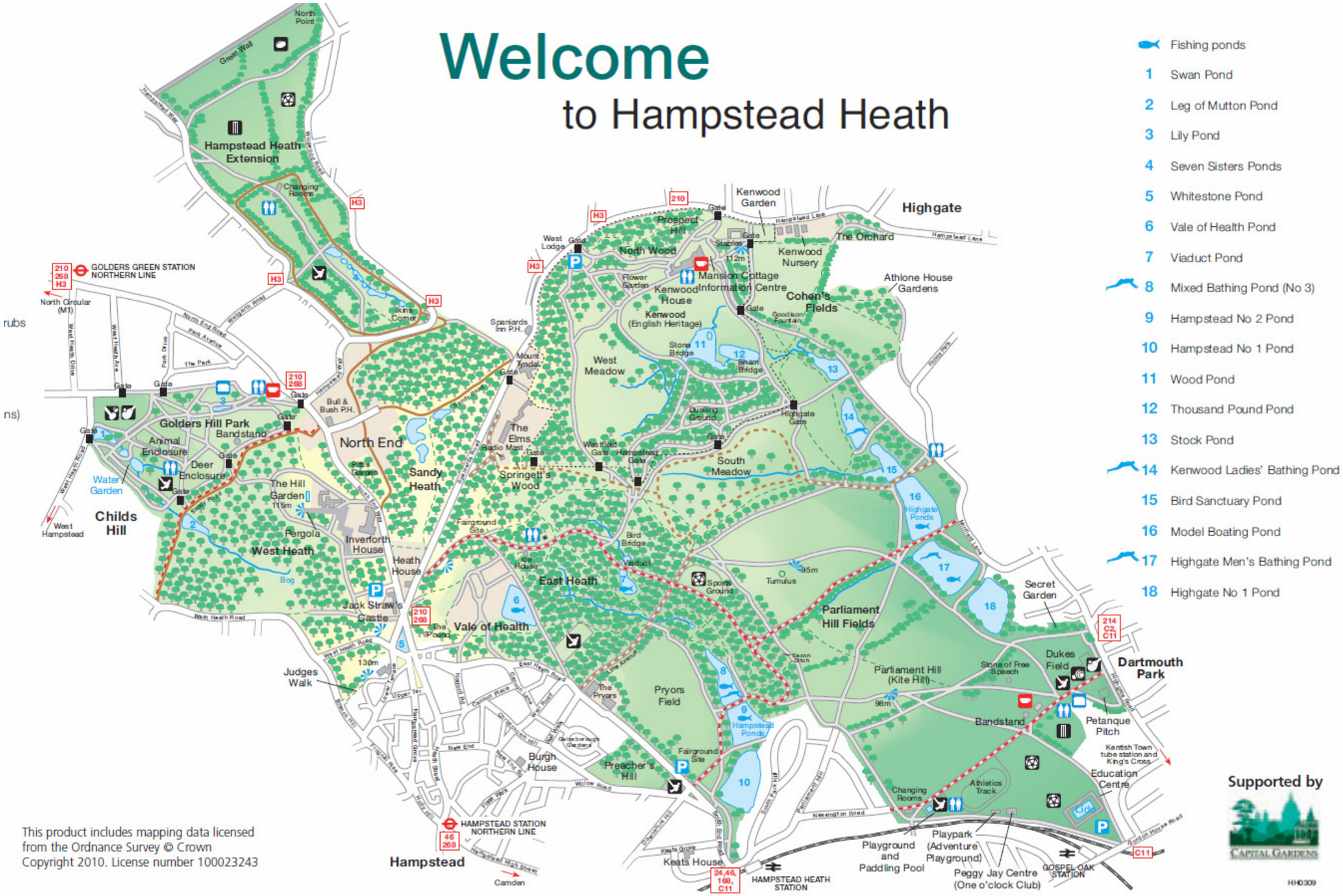
Camden Surface Water Features

213923

FIGURE **12**

Welcome

to Hampstead Heath



Supported by

HH0309

Source – City of London, 2010, Welcome to Hampstead Heath Leaflet

Camden Geological, Hydrogeological and Hydrological Study
Hampstead Heath Map

213923

FIGURE **13**

526000

528000

188000

186000

Catchments and Drainage after Haycock, 2010

N

Scale at A3: 1:10,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.125 0.25 0.5 0.75 1

Kilometers

Legend

- London Borough of Camden
- Railway Lines
- A Roads
- Surface Water
- Highgate Chain Catchment
- Golders Hill Chain Catchment
- Hampstead Chain Catchment
- Hampstead Heath Extension Chain Catchment

Camden Geological, Hydrogeological and Hydrological Study

Hampstead Heath Surface Water Catchments and Drainage

213923

FIGURE 14

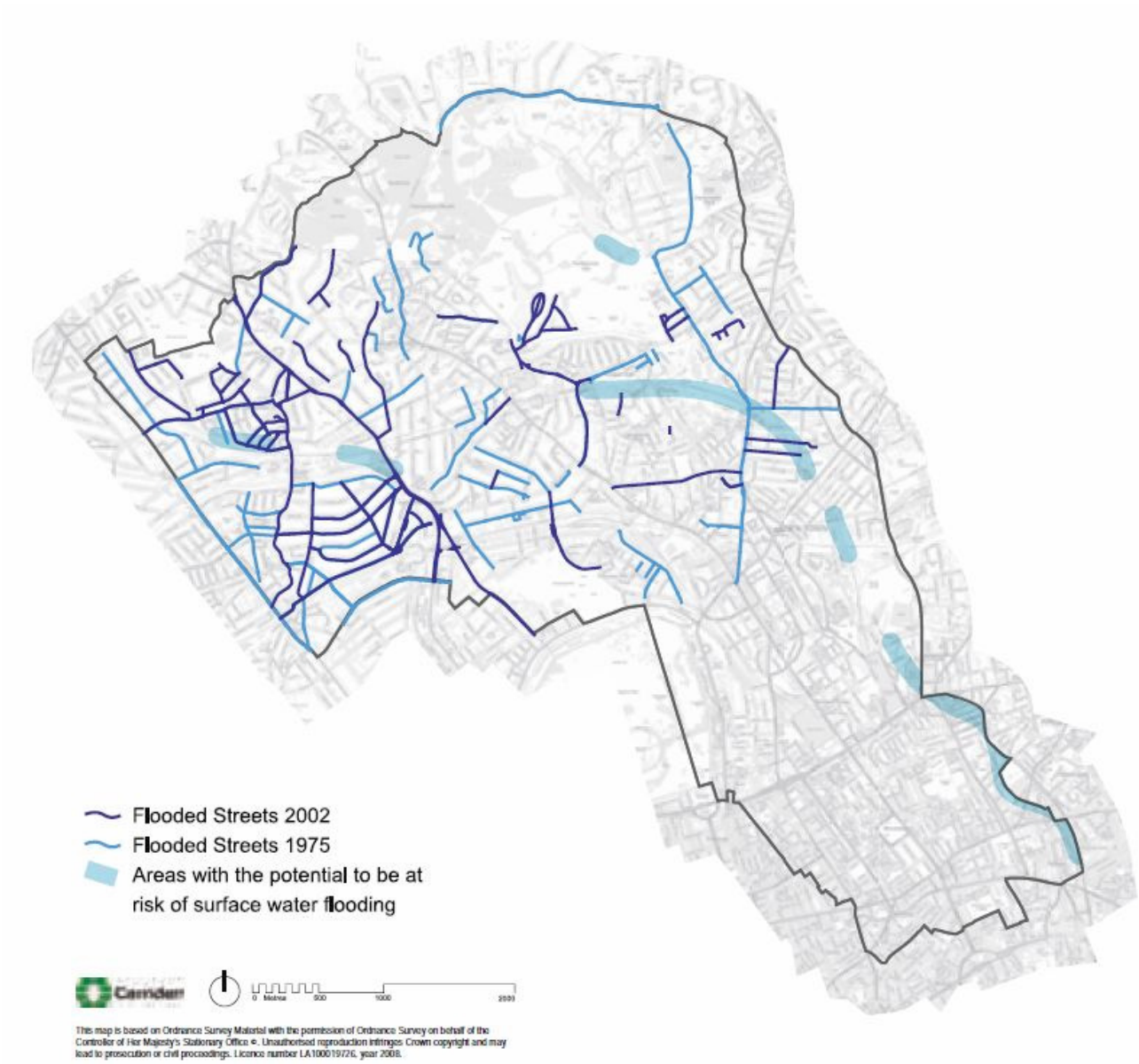


Figure 5 from Core Strategy, London Borough of Camden

Camden Geological, Hydrogeological and Hydrological Study
Flood Map

213923 FIGURE **15**

524000 526000 528000 530000 532000 534000

186000

184000

182000

Slope Angles calculated from Digital Terrain Model Provided By Camden Bourough Council

N

Scale at A3: 1:30,000

1:10,000 BGS Mapping
Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.5 1 2 3
Kilometers

Legend

Slope
- 0° - 7°
- 7° - 10°
- > 10°

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

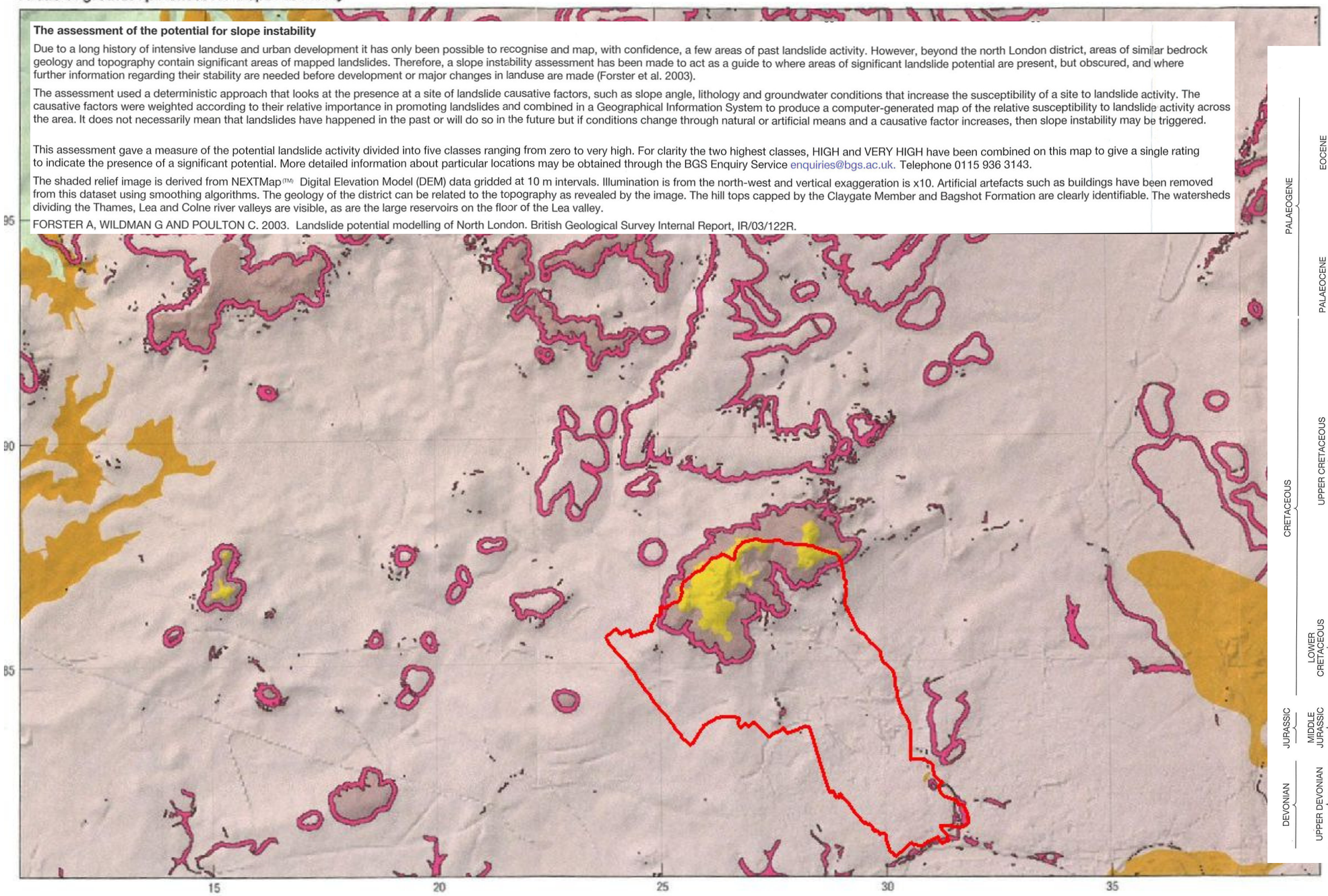
Camden Geological, Hydrogeological and Hydrological Study

Slope Angle Map

213923

FIGURE 16

Areas of greatest potential for slope instability



The assessment of the potential for slope instability

Due to a long history of intensive landuse and urban development it has only been possible to recognise and map, with confidence, a few areas of past landslide activity. However, beyond the north London district, areas of similar bedrock geology and topography contain significant areas of mapped landslides. Therefore, a slope instability assessment has been made to act as a guide to where areas of significant landslide potential are present, but obscured, and where further information regarding their stability are needed before development or major changes in landuse are made (Forster et al. 2003).

The assessment used a deterministic approach that looks at the presence at a site of landslide causative factors, such as slope angle, lithology and groundwater conditions that increase the susceptibility of a site to landslide activity. The causative factors were weighted according to their relative importance in promoting landslides and combined in a Geographical Information System to produce a computer-generated map of the relative susceptibility to landslide activity across the area. It does not necessarily mean that landslides have happened in the past or will do so in the future but if conditions change through natural or artificial means and a causative factor increases, then slope instability may be triggered.

This assessment gave a measure of the potential landslide activity divided into five classes ranging from zero to very high. For clarity the two highest classes, HIGH and VERY HIGH have been combined on this map to give a single rating to indicate the presence of a significant potential. More detailed information about particular locations may be obtained through the BGS Enquiry Service enquiries@bgs.ac.uk. Telephone 0115 936 3143.

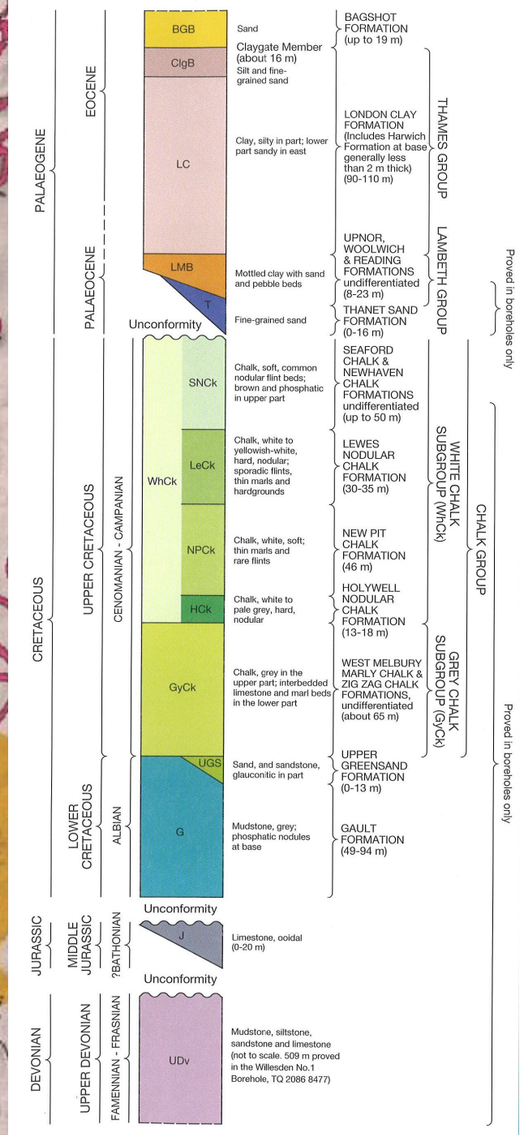
The shaded relief image is derived from NEXTMap(TM) Digital Elevation Model (DEM) data gridded at 10 m intervals. Illumination is from the north-west and vertical exaggeration is x10. Artificial artefacts such as buildings have been removed from this dataset using smoothing algorithms. The geology of the district can be related to the topography as revealed by the image. The hill tops capped by the Claygate Member and Bagshot Formation are clearly identifiable. The watersheds dividing the Thames, Lea and Colne river valleys are visible, as are the large reservoirs on the floor of the Lea valley.

FORSTER A, WILDMAN G AND POULTON C. 2003. Landslide potential modelling of North London. British Geological Survey Internal Report, IR/03/122R.

Areas of significant landslide potential

GENERALIZED VERTICAL SECTION

Scale 1:2500 (1 cm to 25 m)



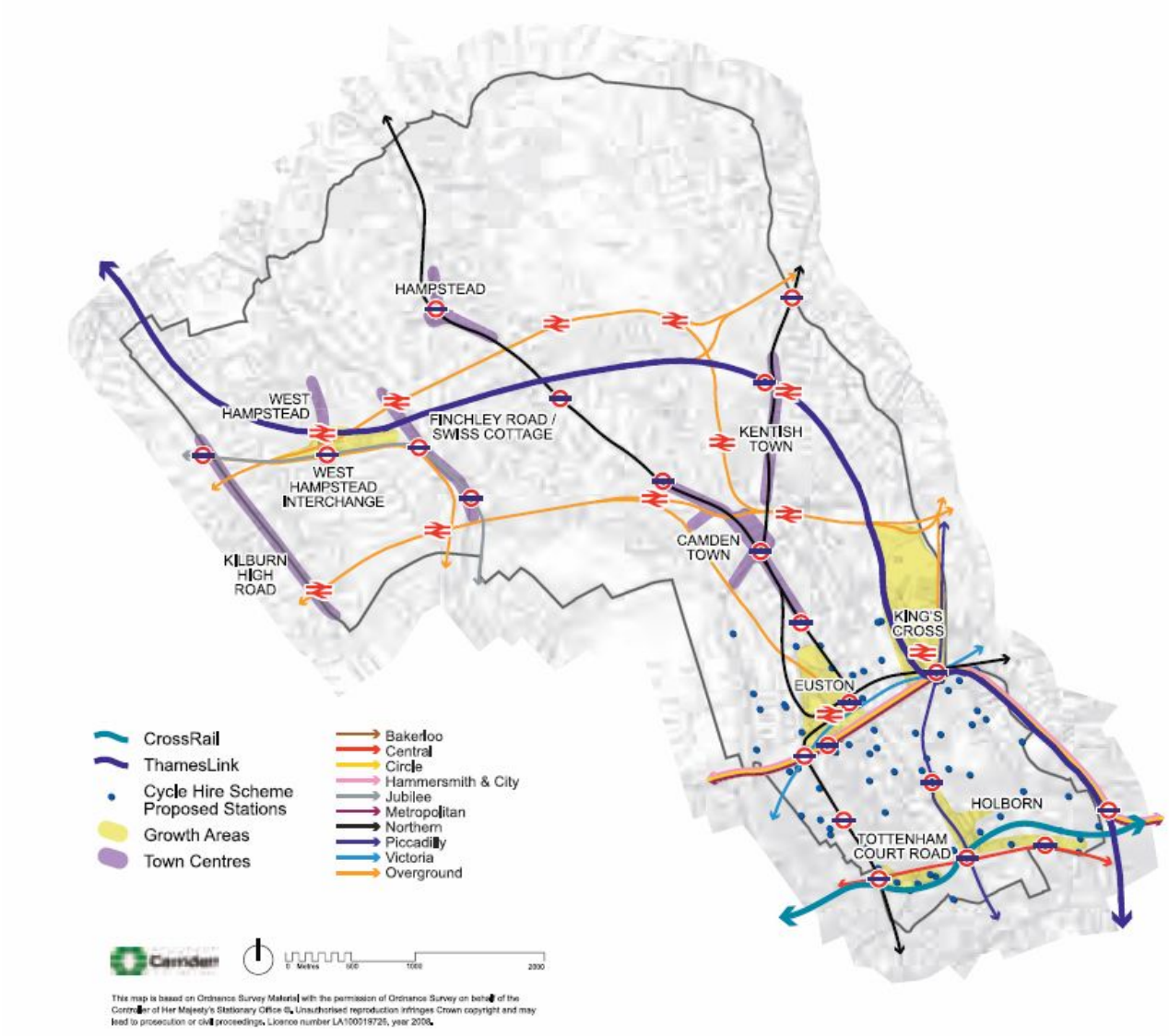
Source - British Geological Society, 1:50,000 Series
England and Wales Sheet 256 – North London

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**