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St Giles Circus
No. 7 Denmark Street

BASEMENT IMPACT ASSESSMENT

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Revision History

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1 INTRODUCTION

1.1 Objective

This Basement Impact Assessment (BIA) has been produced in response to the guidance for basement construction adopted by the London Borough of Camden (LBC) to support the Planning submission for St Giles Circus and deals with the proposed basement to No. 7 Denmark Street that extends from the rear of the existing basement beneath the main property to the rear wall of the yard and workshop building. This part of the project is an additional application to the main project referred to as 'Zone 3' as defined in figure 1.1 below which is covered by a separate BIA (report number 029-S-REP-007. A separate BIA (report number 029-S-REP-006) has been prepared for the proposed basement North of Denmark Street that is bounded by Charing Cross Road, Andrew Borde Street, St Giles High Street and Denmark Street, see figure 1.1.

Figure 1.1 Site plan showing Listed Buildings – Pink, No.7 DMS within Red Line.

The information contained within this BIA has been produced to cover the information required within a BIA as set out by Camden Planning Guidance - Basements and Lightwells (CPG4 –July 2015) including Camden Development Policies DP27 – Basements and Lightwells, in respect of the subterranean development proposal.

This BIA is additional to the previously submitted Zone 3 BIA to support the December 2012 planning application for the project (revised June 2015) and incorporates the results of the intrusive Site Investigation undertaken on the site by Concept Consulting between October 2014 and March 2015.

The purpose of this BIA document is to outline the key points for the method of safe excavation and construction of the proposed basement to the rear of No. 7 Denmark Street. It also sets out how the neighboring buildings will be protected as well as local environment and amenity.

The topics covered within the appendices are extracts from relevant maps, Camden CPG4 Appendix with notes and relevant drawings for the scheme. The successful main contractor will liaise with London Borough of Camden and the local residents to ensure that the principles outlined are established in detail prior to the commencement of construction.

1.2 Proposed Works – No. 7 Denmark Street

The client is proposing to construct a single level basement covering the footprint of the existing rear yard area and workshops to No. 7 Denmark. The approximate extent of the basement is shown in figure 1.2 below.

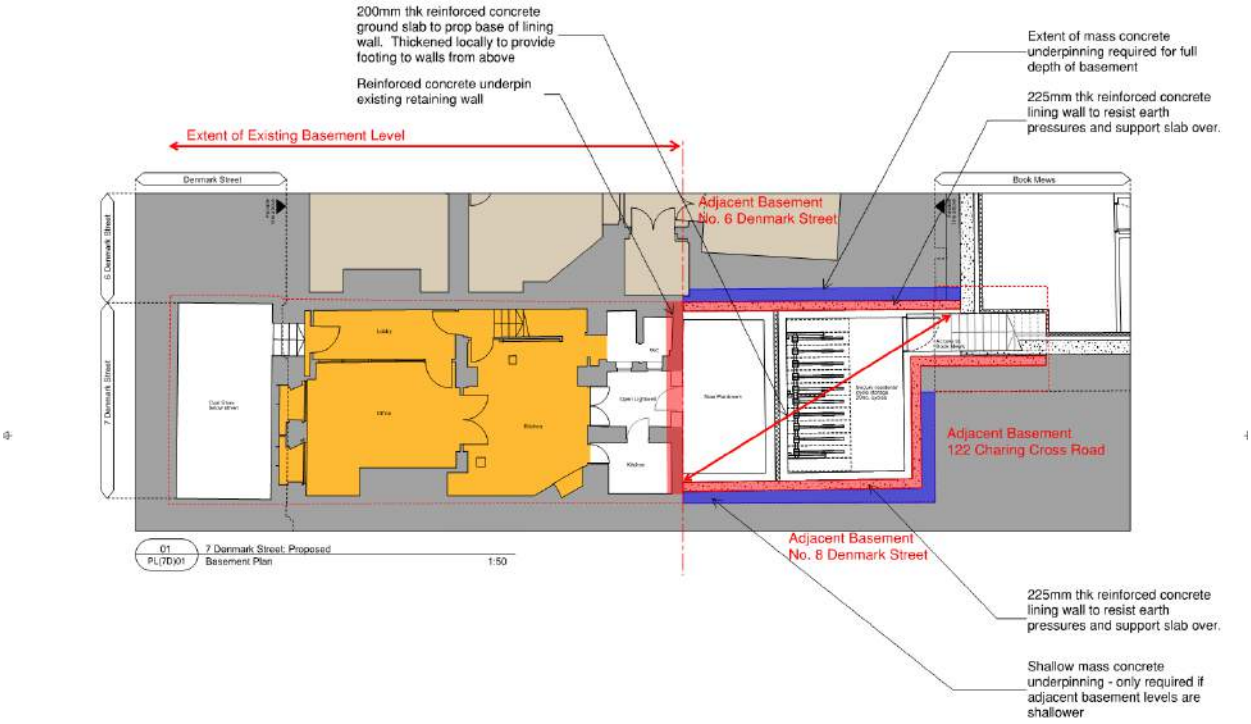


Figure 1.2 Extent of new basement to 7Denmark Street.

The proposed basement is currently bounded by existing basements of a very similar depth at No. 6 Denmark Street, the existing front basement of No. 7 Denmark Street, a vault stepped back within No. 8 Denmark Street and the basement to 122 Charing Cross Road.

The works will require relatively minor underpinning works to align levels to the existing adjacent basements, and is expected to require mass / reinforced concrete underpinning works to the perimeter of the proposed basement.

It is expected that the modest change in levels to existing adjacent basements (approx. 1m) should allow a mass concrete underpin to be proven to resist the relatively minor lateral pressures incident on it. If required a reinforced lining wall will be incorporated.

For full depth basement wall construction on the 6 Denmark Street side it is expected that a double wall and footing has been built as the buildings were constructed at different times. A mass concrete footing is proposed to the rear footing of the adjacent building and a reinforced concrete lining wall proposed beneath our own wall line to resist the lateral earth pressure. This in turn will be resisted by the ground floor concrete slab and return walls of the basement construction.

Above the basement the existing workshop building will be retained at the rear of the site with an additional storey added to it. The kitchen extension beyond the closet wing of the main building will be rebuilt.

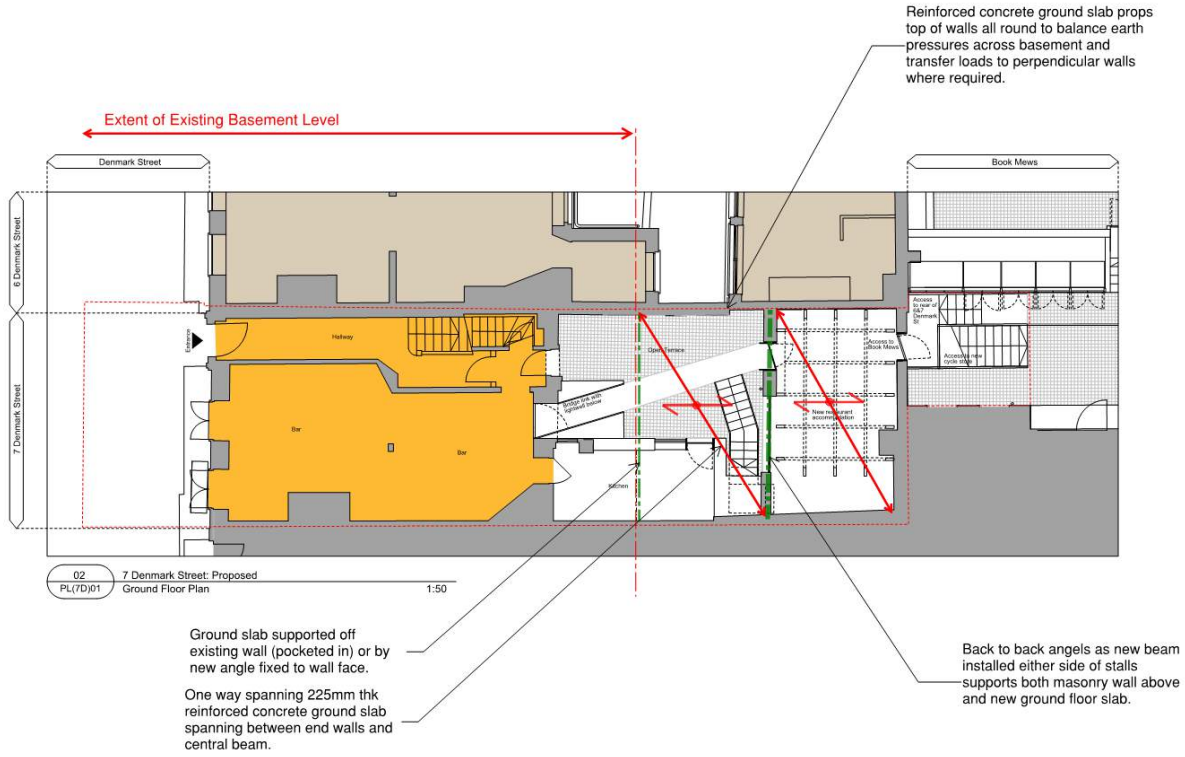


Figure 1.3 Extent of ground slab for new basement.

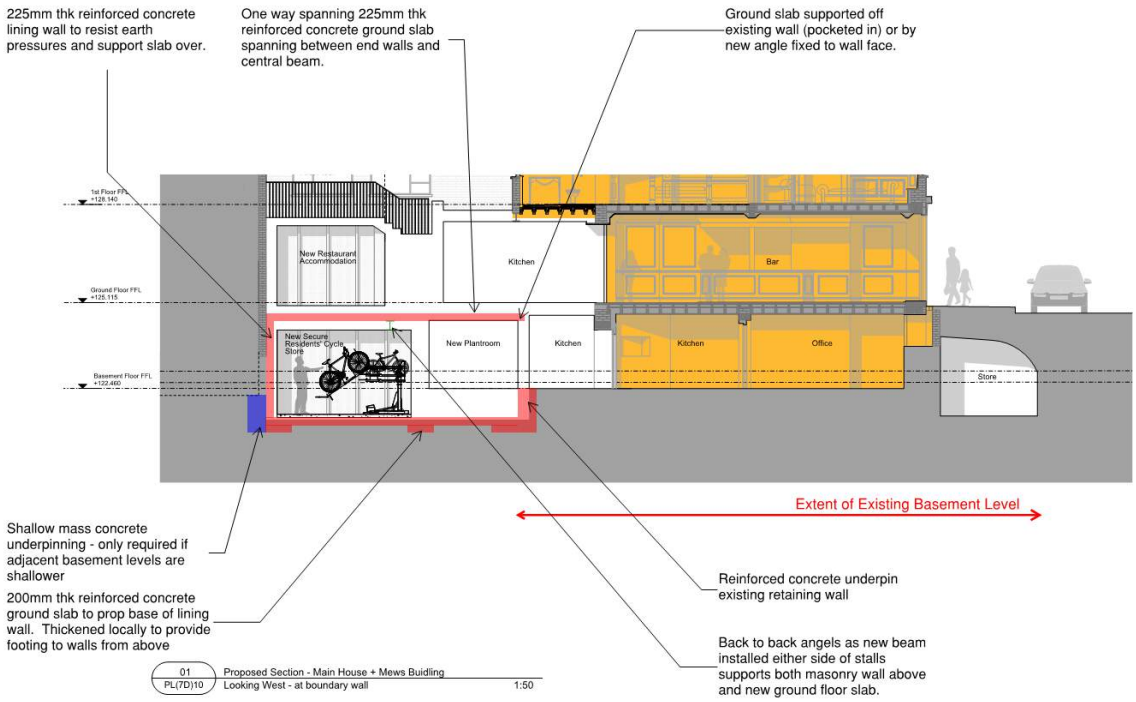


Figure 1.4 Section through proposed basement.

2 SCREENING

The following screening stage was reviewed to see the effect of the basement on the surrounding area. The following Figures 2.1, 2.2 and 2.3 outline the results of the screening stage within this BIA report and reference them to supporting information in the Appendices.

Figure 2.1-Subterranean (ground water) screening chart

Q 1a: Is the site located directly above an aquifer?	Yes	The site sits on the Lynch Hill Gravel Formation, classified as Secondary A Aquifer. See Appendix A, B
Q 1b: Will the proposed basement extend beneath the water table surface?	No	Groundwater monitoring showed levels between 3.7m and 4.4m below ground level (20.4mAOD and 20.1mAOD respectively). See Appendix C, G
Q 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No	See Appendix A, B
Q 3: Is the site within the catchment of the pond Chains on Hampstead Heath?	No	See Appendix B
Q 4: Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	No	The Site was previously entirely impermeable and still is. See Appendix C.
Q 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 existing surface drainage regime will be maintained
Q6: 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 ponds chains on Hampstead Heath) or spring line.	No	See Appendix B

Figure 2.2 - Slope stability screening chart

Q 1: Does the existing site include slopes, natural or manmade, greater than 7°? (approximately 1 in 8)	No	See Appendix A
Q 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	See Appendix C
Q 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7° ? (approximately 1 in 8)	No	See Appendix A
Q 4: Is the site within a wider hillside setting in which the general slope is greater than 7° ? (approximately 1 in 8)	No	See Appendix A, B
Q 5: Is the London Clay the shallowest strata at the site?	No	See Appendix A
Q 6: Will any tree/s be felled as part of the proposed	No	No tree will be felled as

development and/or are any works proposed within any tree zones where trees are to be retained?		part of the proposed basement development. See Appendix C
Q 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	There is no evidence of heave related movement in the existing buildings See Appendix G
Q 8: Is the site within 100m of a watercourse or a potential spring line?	No	See Appendix A
Q 9: Is the site within an area of previously worked ground?	Yes	Due to historical developments in the area, made ground is present at the site and extends below existing foundation level. See Appendix G
Q 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?	Yes / No	See Appendix A, B, C, G
Q 11: Is the site within 50m of the Hampstead Heath ponds?	No	See Appendix A, B
Q 12: Is the site within 5m of a highway or pedestrian right of way?	Yes	See Appendix A, C
Q 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	See Appendix C, E
Q 14: Is the site over (or within the exclusion zone of) any tunnels e.g. railway lines?	No	See Appendix A

Figure 2.3 - Surface flow and flooding screening chart

Q 1: Is the site within the catchment of the ponds on Hampstead Heath	No	See Appendix B
Q 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	See Appendix C. The existing surface drainage regime will be maintained
Q 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	The entire basement footprint is currently occupied by existing buildings and existing paved areas. See Appendix C
Q 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	See Appendix C
Q 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	See Appendix C

Q 6: Is the site in an area known to be at risk from Surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	No	See Appendix B

3 INTERPRETATIVE REPORT

3.1 Site Investigation

A site investigation has been carried out directly adjacent to site by GEA on behalf of Consolidated Developments Ltd (see figure 3.1). The works were carried out during the period between 5th October and 8th November 2012. A further site investigation has been carried out adjacent to the site by CONCEPT Ltd on behalf of Consolidated Developments Ltd (see figure 3.2). The works were carried out during the period between 28th October 2014 and 20th March 2015. Please Note that the restricted size and access to the site negates the possibility of working within it directly.

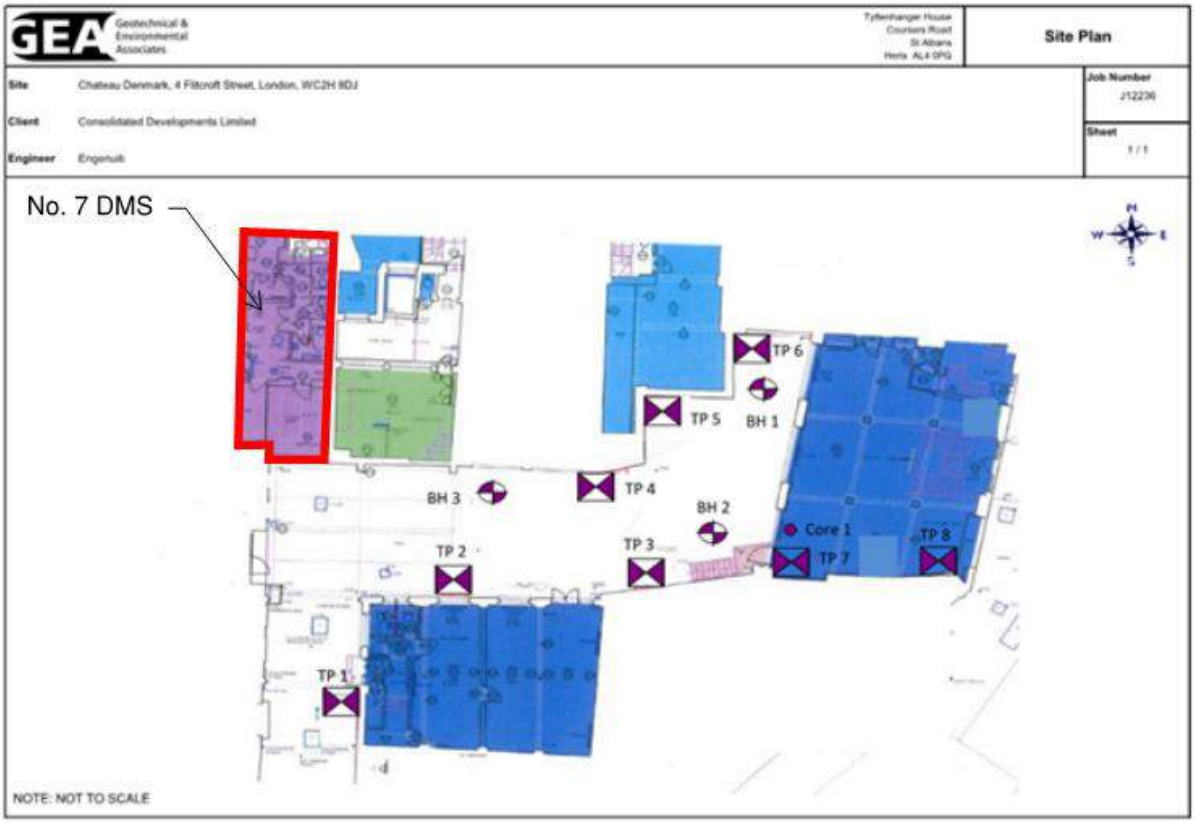


Fig 3.1 GEA Site Investigation Scope

The GEA investigation included the sinking of three cable percussive boreholes (BH) to a depth of 6mbgl with standard penetration tests (SPT) undertaken at regular interval to assess the strength of the soils. Groundwater monitoring standpipes were installed in each borehole and monitored over the period of the investigation. Soil samples were taken from the boreholes and laboratory tested to confirm the classification of the soils.

Trial pits were hand dug in eight locations around the perimeter of the proposed basement to identify the existing foundations of the walls around the basement footprint.

Full details of the Ground Investigation are presented within the GEA Factual Ground Investigation Report, Chateau Denmark, 4 Flitcroft Street (GEA, November 2012), included in Appendix G.

The CONCEPT investigation included two cable percussive boreholes to 30mbgl with in situ testing, sampling and laboratory testing. The factual report (CONCEPT, March 2015), is included in Appendix G.

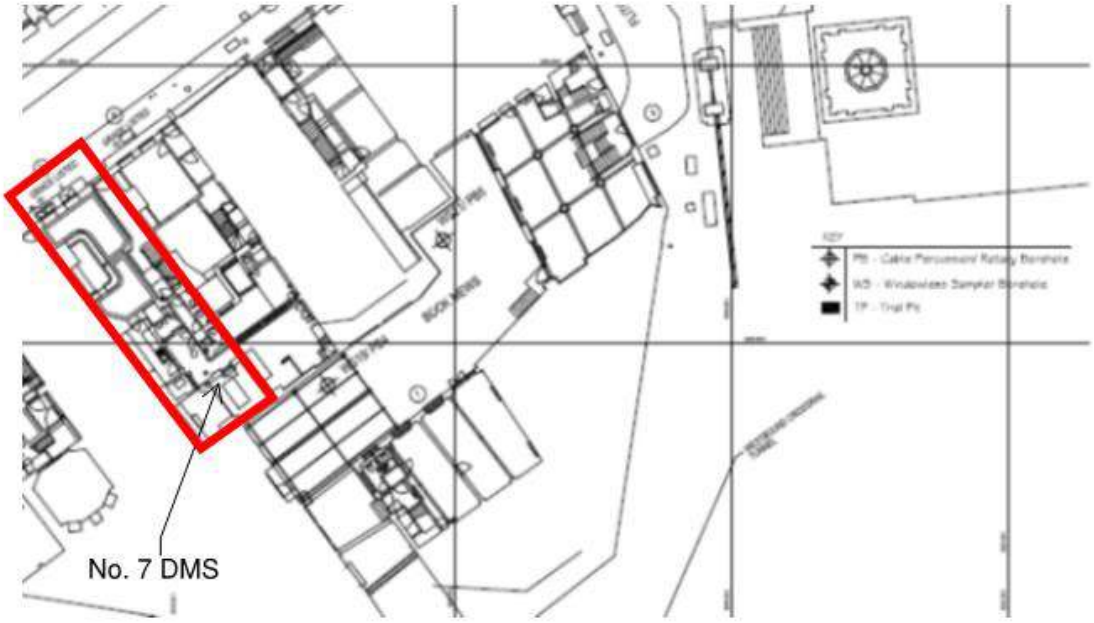


Fig 3.2 CONCEPT Site Investigation Scope

3.2 Stratigraphy

The investigation revealed the following strata:

Table 3.1 Design Stratum Levels

Stratum	Top Of Stratum Level	Thickness (m)	Description
	mAOD		
Made Ground	+24.4 to +24.1	2.7 to 4.5	Greyish brown sandy clay, fragments of brick, clinker, ash, pottery, wood and chalk.
Lynch Hill Gravel Member	+21.7 to +19.6	0.3 to 3.1	Dense to very dense gravelly sand, sandy gravel and sand and gravel, occasional sandy silt.
London Clay	+19.3 to +18.6	Proven to -6mOD	Variably soft to stiff, fissured silty clay.

3.3 Groundwater

Groundwater was encountered in all boreholes with an initial strike at between 2.5m and 4.8m below ground in the Lynch Hill Gravel member, or in the case of BH3 in the Made Ground. Groundwater monitoring took place between October and November 2012, and between November 2014 and March 2015 with a maximum recorded level of 20.4mAOD in borehole BH3 on the 8th November 2012. The groundwater is perched above the London Clay.

Boreholes north of Denmark Street recorded the groundwater in the Lynch Hill Gravels and indicate a slight fall in groundwater level from the site north of Denmark Street (groundwater +21.0mAOD) to the max level of +20.2mAOD recorded in the Lynch Hill Gravels. This is consistent with a slight groundwater flow from north to south.

The site investigation on nearby Denmark Place (see report number 029-S-REP-006) demonstrated with piezometric monitoring that the London Clay is under drained, it is likely that the London Clay at 4 Flitcroft Street is also under drained.

3.4 Geotechnical parameters

The recommended soil parameters used in the design are as follows:

Soil Parameter	Made Ground	Lynch Hill Gravel Member	London Clay
Undrained strength	NA	NA	s_u=100kPa
Drained strength	Φ'=28° c'=0	Φ'=36° c'=0	Φ'=24° c'=0
Stiffness (MPa)	E=10 Mpa	E=60 MPa	E_u=80MPa (total stress)
At rest earth pressure	k_o=0.53	k_o=0.41	k_o=1.5
Unit weight (kN/m^3)	γ=18.0	γ=20.0	γ=20.0
Poisson's Ratio	0.2	0.2	0.5 undrained 0.2 drained

These values are consistent with the nearby STATS geotechnical investigation (see report number 029-S-REP-006) and have been verified against the GEA and CONCEPT investigations by reviewing the soil description and the SPT test results in the Factual Reports.

3.5 Earthworks and drainage

The proposed basement involves excavation to a maximum depth of 3.5m over the footprint of the No. 7 Denmark Street rear yard and workshop.

Single storey basement
The formation level of the basement slab will be at approximately 21.0mAOD and will therefore be founded within the Lynch Hill, although in some areas the Made Ground may extend below this level.

The excavation will generate a volume of material to be removed from the site. Access to and from the site will be predominantly from Book Mews at the rear of the property. A more detailed assessment of the construction traffic generated and routes to and from the site will be included in the Construction Management Plan prepared by the Principal Contractor.

In order to maintain slope stability during the excavation a system of underpinned retaining walls is proposed around the perimeter of the basement. In order to minimise ground movement the underpins will be constructed in a series of 'hit and miss' panels no more than 1.2m long. As the underpins will be largely in Made Ground or the Lynch Hill Gravels it is recommended that a bulk excavation to just above the existing foundations takes place prior to the underpinning. Temporary support and propping will have to be adopted during underpinning construction to ensure ground stability and prevent excessive undermining of existing foundations. It is recommended that the underpinning operation is done in two stages to limit the maximum depth of the underpin to 1.5m. In order to maintain stability in the temporary case propping will be required to the underpinned retaining walls to resist the earth and water pressures behind the underpins.

Bulk excavations within the retaining wall will use battered slopes to maintain slope stability in the temporary case.

The new basement will drain in to the existing Basement drainage of No. 7 Denmark Street. If required a small sump and pump will be provided. A CCTV survey of the drainage in the yard has been undertaken and does not identify any other existing connections that will require diversion as part of the works.

The surface water connections for the existing buildings on the site will be maintained wherever possible with all connections on Denmark Street continuing in use.

The total run off from the South of Denmark Street site (including retained buildings) in response to a rainfall event with an annual probability of 1% will be 13.5 litres per second. This compares with 15.4 litres per second pre-development.

The foul water connections for the existing buildings that are retained on the site will be maintained wherever possible with all connections on Denmark Street continuing in use.

3.6 Retaining Wall Design

The retaining wall is required to resist surcharge loads, earth and water pressures generated by the basement excavation in both the temporary and permanent conditions. As noted above a system of temporary props is envisaged during the construction phase to reduce the vertical span of the retaining wall and therefore reduce the deflection of the retaining wall and associated horizontal and vertical movements of the surrounding ground.

As noted above, around the majority of the single storey basement the retaining wall will consist of concrete underpinning to the existing party walls.

In the permanent condition the retaining walls will be propped by the basement slab and the ground floor which will transfer the horizontal pressures across the basement footprint to the balancing horizontal pressures opposite. The varying depth of retained ground around the basement footprint due to the existing basements on the other side of the retaining wall will result in some out of balance earth pressures, however these are relatively small compared to the passive resistance of the retained soil below the existing footing levels. In order to ensure that water pressure is resisted and the existing masonry and concrete footings above the underpins are restrained an in situ concrete liner wall is provided to the basement.

The toe of the underpins is connected to the basement slab to provide a robust structure and spread the long term vertical loads over a larger footprint.

In order to accommodate a rise in groundwater level or the accidental discharge of a large water main the retaining wall is designed to resist a water pressure 1.0m below existing ground level. The

provision of the drained cavity inside the retaining wall will enable the basement to achieve grade 3 in accordance with BS8102:2009.

The 2:1 water/soil extract laboratory testing from the GEA investigation indicates that the soil samples have a sulfate level of up to 1.0g/l, which would normally require a design sulfate class of DS-1, however in order to maintain a consistency across the development a design sulfate class of DS-2 is proposed as this is required for the basement north of Denmark Street.

4 ISSUES BROUGHT FORWARD FOR SCREENING AND FURTHER STUDY

Subterranean (ground water) screening chart

Q1: The site is located on the Lynch Hill Gravel Formation which is designated by the Environment Agency as a 'secondary A' aquifer. The topography of the site is such that the land falls very slightly from North to South. The limited groundwater information from the Site Investigation appears to show a fall on the base of the aquifer from west towards east (0.7m difference between BH3 and BH2/1), however it would be reasonable to assume that the ground water within it would be draining southwards towards the River Thames.

Q1a: Possible Impact: The construction of a basement across the flow of ground water could modify/divert the ground water flow around the basement leading to increased ground water levels immediately upstream of the development and reduced ground water levels immediately downstream of the development.

Site Conditions: The level of the existing basement at 7 Denmark Street is 22.46mAOD. Street level is approximately 25.115mAOD. The proposed basement will extend to a level of approximately 21.6mAOD (top of basement slab level). Data from the Site Investigation at the nearby St Giles Circus site indicates perched water table level at 21.0mAOD. Ground water monitoring undertaken as part of the Site Investigation showed groundwater levels of 20.4mAOD to 20.1mAOD.

Impact Assessment: Immediately to the north of the proposed basement are a series of terraced buildings along the south side of Denmark Street. Some of these buildings have single level basements, extending to a minimum level of approximately 22mAOD. Due to the difference in level (at least 1.6m) between perched groundwater table and existing basement and considering the relatively limited extent of the proposed basement footprint in relation to the global groundwater seepage regime in the area, it is considered unlikely that a significant increase in perched water table level would occur to the north of the basement and therefore is unlikely to pose flooding problems to the existing basements.

A groundwater level increase in the Denmark Street area is also considered unlikely in view of the presence, at a minimum distance of approximately 50m to the north of the development (upstream), of the proposed St Giles Circus basement (considered in a separate Basement Impact Assessment, part of this same planning application), Centre Point and Tottenham Court Road tube station redevelopment (including enlargement of existing station and extensive Crossrail infrastructure construction). All these existing developments have subground structures which extend into the London Clay (6 to 7m below ground level) and would lower the groundwater level in the Denmark Street area.

In addition, it is worth noting that the perched groundwater table level is broadly consistent with the brick sewer invert level in proximity of the site. There is a possibility that the sewer may be acting as a drain and keeping the groundwater at its current level. If this is the case, the sewer would prevent any potential rise in groundwater table, providing an additional level of resilience against the risk of existing basement flooding.

Slope stability screening chart

Q9: The site is within an area of previously worked ground. Made ground is present at the site, due to historical developments in the area.

Possible Impact: Previously worked ground may be less homogeneous than natural strata, and may include relatively uncontrolled backfill zones. The presence of made ground increases the risk of slope instability during excavation due to variable ground conditions. Previous uses of the site also increase the risk of contamination being present on the site and being disturbed by the excavation. The risk of potential contamination is dealt with separately in the EIA and a written scheme of assessment for contamination investigations on site has been submitted to Camden.

Site Conditions: The GEA Site Investigation found made ground reaching significant depths (between 2.2m and 4.5m below ground level), in areas extending below the level of the existing foundations.

Impact Assessment: Potential slope instability that could be triggered by basement excavation will be mitigated by means of staged construction and adoption of appropriate temporary earth support such as trench sheeting and props. An initial lowering of the ground level in the courtyard to the level of adjacent existing basements will be followed by localised excavation for underpinning construction (the first stage of underpinning will be above the water table). This will be carried out in phases, undermining a limited width of foundation (max 1.2m) at each time. In addition trench sheeting and props will be used to prevent the occurrence of local collapse mechanisms in the made ground and terrace gravel. The appointed contractor shall submit a detailed method statement with an appropriate construction sequence to mitigate such risk for the engineer to review prior to any construction work taking place.

Q10: The site is founded on the Lynch Hill Gravel Formation which is designated by the Environment Agency (EA) as a 'secondary A' aquifer. The proposed basement does not extend beneath the water table.

Possible Impact: There should be no impact as the basement level is above the water table.

Site Conditions: The highest monitored groundwater table measured as part of the GEA Site Investigation is 20.4mAOD. The underside of the proposed basement slab will be located at approximately 18.7mAOD and will therefore involve excavation below the water table.

Impact Assessment: There should be no impact as the basement level is above the water table.

Q12: The site is within 5m of Denmark Street, however the basement is at the rear of the property in excess of 12m from the road. To the rear the Basement will be adjacent to Book Mews, ownwed by the client.
Possible Impact: Excavation for a basement may result in damage to the road, pathway or any underground services buried in trenches beneath the road or pathway within Book Mews, but not Denmark Street.

Site Conditions: Excavation for the construction of the proposed basement will induce ground movements in its proximity. The magnitude and extent of ground movements is related to ground and groundwater conditions, means and methods, sequence and in general quality of the construction works.

Impact Assessment: Traditional underpinning will have to be constructed following a "hit and miss" sequence in order to minimize the induced foundation settlements. Temporary support and propping will have to be adopted during underpinning construction to insure ground stability and prevent excessive undermining of existing foundations. The scale of excavation is limited, and as the client will be resurfacing and levelling the Mews beyond as part of the project – any overall impact will be mitigated.

5 SURVEYS

This report is based on site survey, search of current and historic ordnance survey maps and geological maps of the area and the intrusive site investigations, as presented in the Appendices.

6 SITE HOARDINGS AND SECURITY

It is intended that the perimeter of the site will be protected by hoardings with a vehicular and pedestrian gate which will be secured at night. All necessary permits will be obtained by the main contractor prior to start of relevant works.

The hoarding will be positioned wholly within the site boundary and will not adversely affect the highway, associated pavements or boundary walls and will act to reduce noise emanating from the site during the works.

Safety signage will be installed on the hoarding as necessary at points of access to the site and around the boundary. In additional the hoarding will also have Considerate Constructors Scheme Signs (which the contractor will be required to register with), details of the developer and consultants and contact numbers for the site manager.

7 HEALTH, SAFETY AND ENVIRONMENT

Health, Safety and Environment is an integral part of the planning process for each project. Implementation of a comprehensive Health, Safety and Environmental System and Procedures ensures every facet of the construction process is planned, managed and monitored. This also ensures compliance with statutory obligations.

Noisy working hours will be in accordance with the Planning Consent.

8 CONSTRUCTION METHODOLOGY

8.1 Pre-Construction

During the preconstruction phase of the project the contractor will undertake a full review of the scheme and all background information.

The contractor will follow Camden's Considerate Contractors Manual this will involve incorporating the Guide for Contractors Works in Camden within the Construction Management Plan.

8.2 Logistics

As will all construction projects, the efficient and effective management of the site logistics is paramount to the success of the project. The logistical challenges posed by the construction of the structure call for a robust and carefully considered management plan to ensure the programme is met and that disruption to the neighbours and transport routes are kept to a minimum.

8.3 Neighbourhood Liaison

During the project the contractor will ensure that all works are carried out safely and in such a manner that it will not inconvenience pedestrians or other road users and with a positive consideration of the needs of the local residents, site personnel and visitors as well as the general public. If necessary airborne dust will be dealt with by dampening down areas with water prior to the works being undertaken.

Public footways and carriageways will be kept tidy, in safe condition and regularly inspected and washed down. Hoardings, safety barriers, lights and other features will be maintained in a safe and tidy condition. The site is to be kept clean and in good order at all times with surplus materials and rubbish controlled within the site and not allowed to spill over into the surroundings.

In addition to this, working times as stipulated within the contract particulars will be complied with and contractor would look to discuss with London Borough of Camden these times as a proactive approach to control of noise emissions from the site.

9 BASEMENT WORKS

An important consideration for any basement construction involving underpinning of existing foundations is the control of ground movement and ground water during excavation to ensure that any effect on adjacent buildings and infrastructure is minimal and within acceptable limits.

Relevant geological and hydrological maps and data have been reviewed with respect to the site at 7 Denmark Street (see Appendices). These studies show that it is likely that the existing building at 7 Denmark Street is founded into the Lynch Hill Gravel Formation, which is classified as a 'secondary A' aquifer by the Environment Agency.

The proposed scheme comprises a new single storey basement beneath the rear external out-building footprint. The basement retaining structures will be constructed by means of traditional underpinning of the existing building foundations for the single storey basement with party walls.

The underside of the new basement slab is located above the expected groundwater table, identified by the Ground Investigation undertaken as part of this BIA process.

A key risk associated with the construction of the proposed basement is related to the potential occurrence of ground movements (settlement and horizontal movements) during the underpinning construction process. The method involves localised undermining of existing strip foundations and construction of mass concrete piers to transfer the building load to a deeper zone. The adoption of a carefully planned construction sequence (involving a "hit and miss" pattern of construction) together with high quality workmanship will mitigate the risks related to ground movements. The risk of movement during and post construction will also be mitigated by installing the piled foundations and propping the existing structure off the piled foundations in advance of the underpinning works. By adopting this approach the underpins will only support the self-weight of the party walls during the construction process and will be tied to the piled basement slab in the permanent condition.

Preliminary calculations have been undertaken to assess the impact of the works on a number of existing structures located in proximity of the site. The tensile strains and associated crack widths induced by the proposed works on various sensitive elements (brittle masonry walls, subject to cracking induced by ground movements) have been evaluated and the potential damage assessed in line with the Burland (1995) damage classification procedure, widely adopted within the industry and recommended by the CPG4 document. The predicted levels of damage to the elements considered fall in the 0 to 1 Negligible to Very Slight category, for the existing buildings adjacent. This is considered acceptable in line with the CPG4 (2015) recommendations.

Prior to undertaking the works a system of monitoring will be installed to the boundary walls around the site. This will be regularly surveyed during the works so that the movements of the adjacent structures can be monitored against the predicted movements, with movements larger than predicted triggering a response – an investigation into the causes of the movement and a review of construction methodology for movements slightly larger than predicted; stopping work until remedial measures are in place and agreed for movements that are significantly larger than predicted.

Prior to commencement a full schedule of condition will be carried out to all relevant buildings as defined within The Party Wall etc Act 1996.

No trees are to be removed as part of the development.

10 CONCLUSIONS

A design analysis has been undertaken of the various aspects of construction and how these may affect the local amenity and neighbouring properties with regard temporary and permanent stability and the ground and surface water regime.

A review of maps, historic information and associated studies coupled with site inspections and intrusive site investigations have demonstrated that the development will not have an adverse effect on the local ground and surface water regime and will have an acceptable level of impact on neighbouring existing properties.

The risk of potential perched groundwater table rise in the area upstream on the north side of the basement (and associated potential issues related to existing basement flooding) is considered low in view of the following considerations:

- There is a relatively large difference in level between perched groundwater table and existing basements along Denmark Street.
- A number of significant substructures in the zone north of Denmark Street, including the proposed St Giles Circus basement, Centre Point and Tottenham Court Road tube station redevelopment (including enlargement of existing station and extensive Crossrail infrastructure construction) would lower the groundwater level in the Denmark Street area.
- Relatively large diameter brick sewers are present around the site, with invert levels roughly consistent with the perched groundwater table level, which may be acting as a drain would therefore prevent any potential rise is groundwater table.

APPENDIX A – Geological Map and Ordnance Survey Maps

Extract from British Geological Survey 1:50,000 Online Map

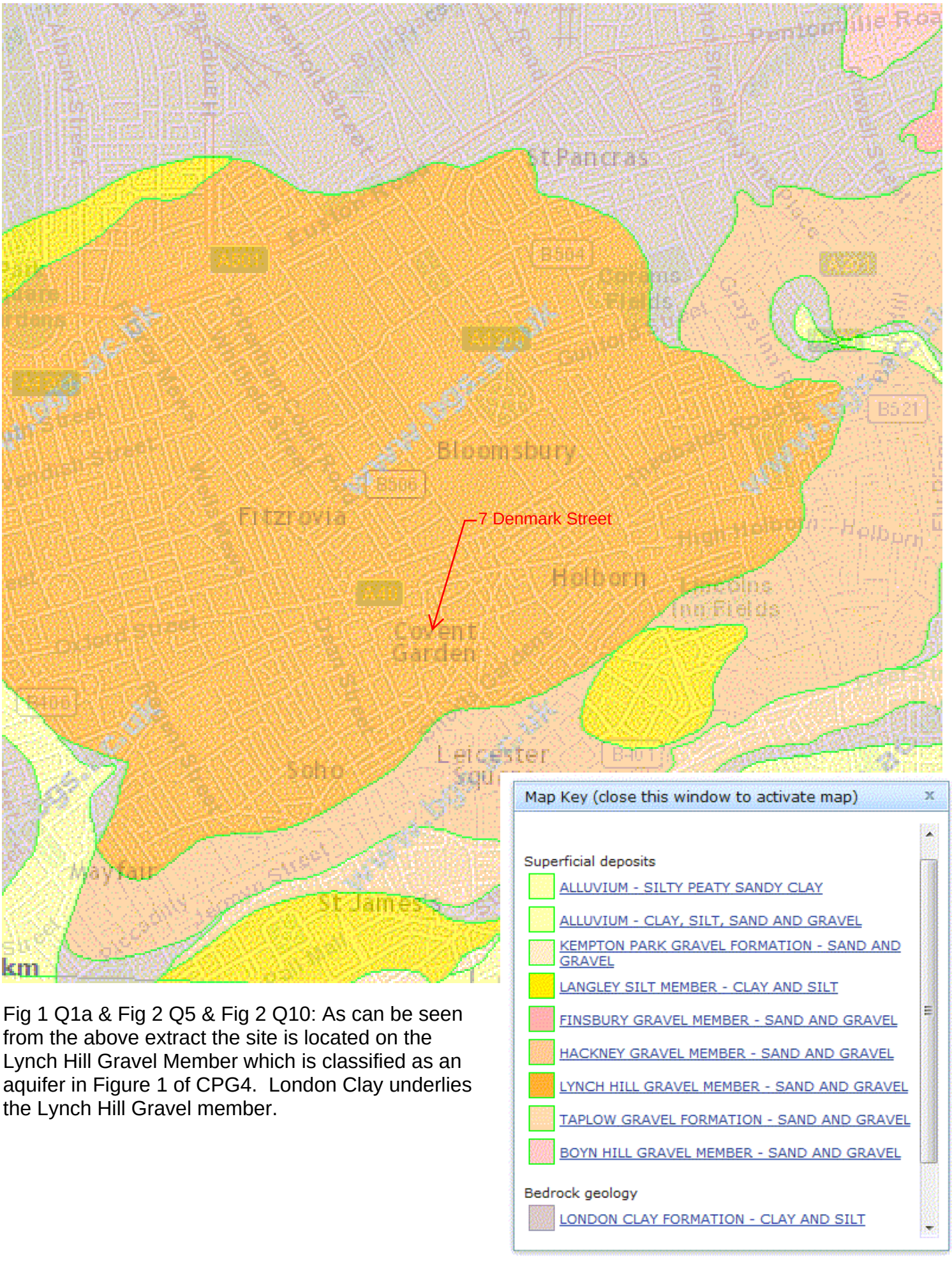


Fig 1 Q1a & Fig 2 Q5 & Fig 2 Q10: As can be seen from the above extract the site is located on the Lynch Hill Gravel Member which is classified as an aquifer in Figure 1 of CPG4. London Clay underlies the Lynch Hill Gravel member.

Extract from Ordnance Survey 1:25,000 Sheet No 173 - London North

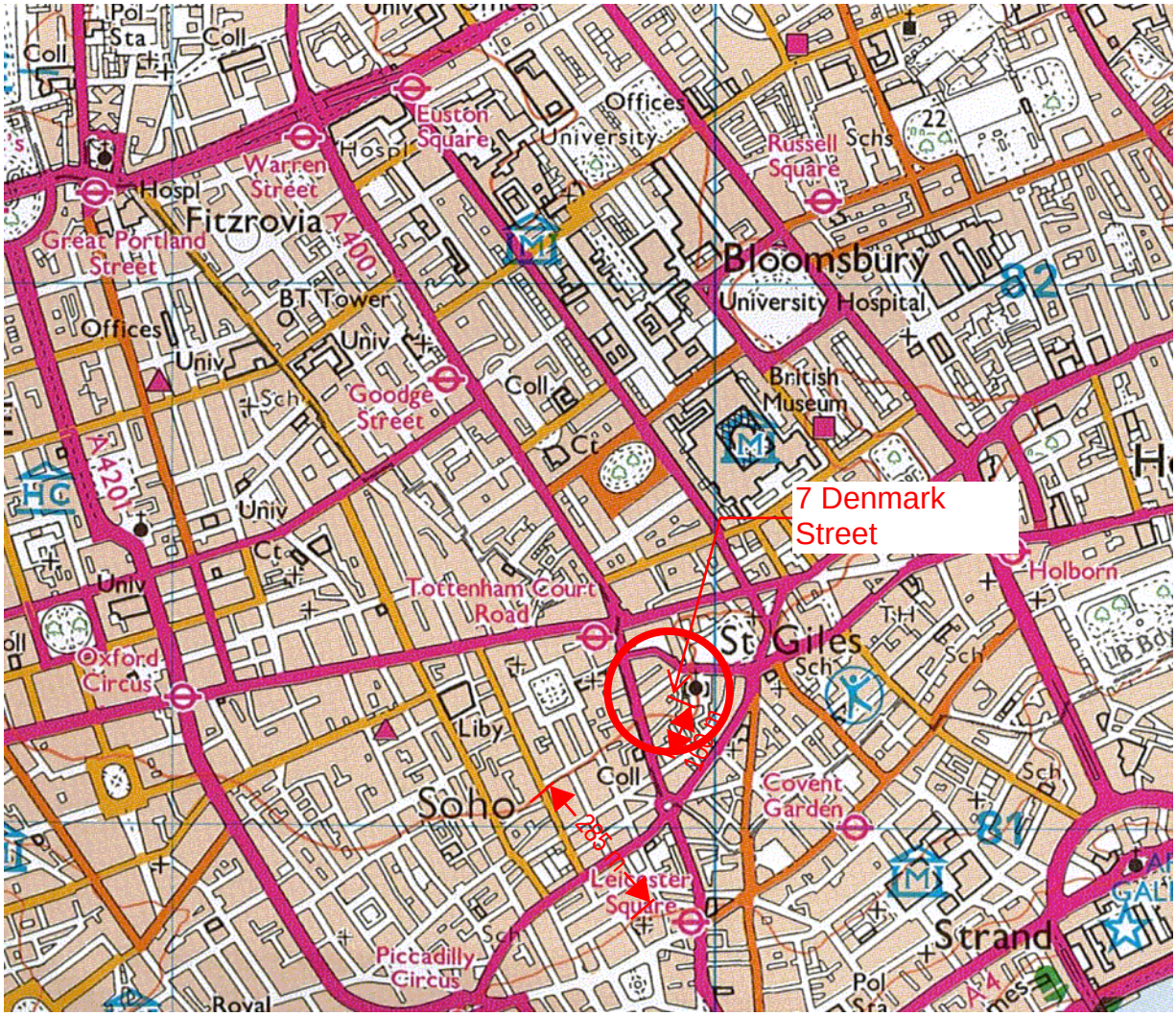


Fig 1 Q2 and Fig 2 Q8: No watercourses, wells or springs are identified near the site.

Fig 2 Q3 and Fig 2 Q4: No neighboring land has a slope greater than 7 degrees. Steepest gradient between contours on the map in the vicinity of the site (south towards Leicester Square) is 1.0 degrees.

Fig 2 Q11: The site is over 50m from Hampstead Heath ponds.

Extract from Ordnance Survey
1:1250 map

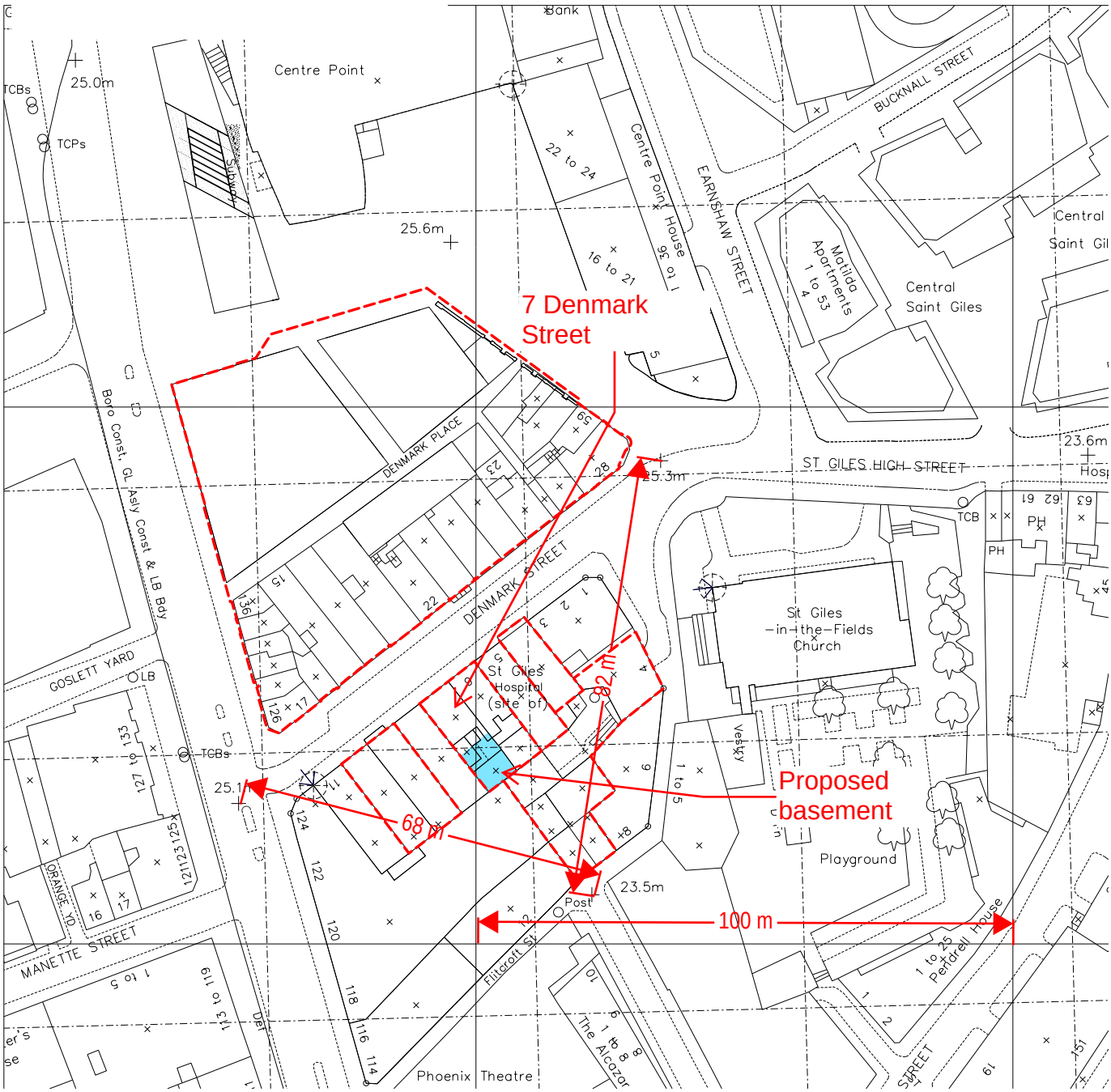
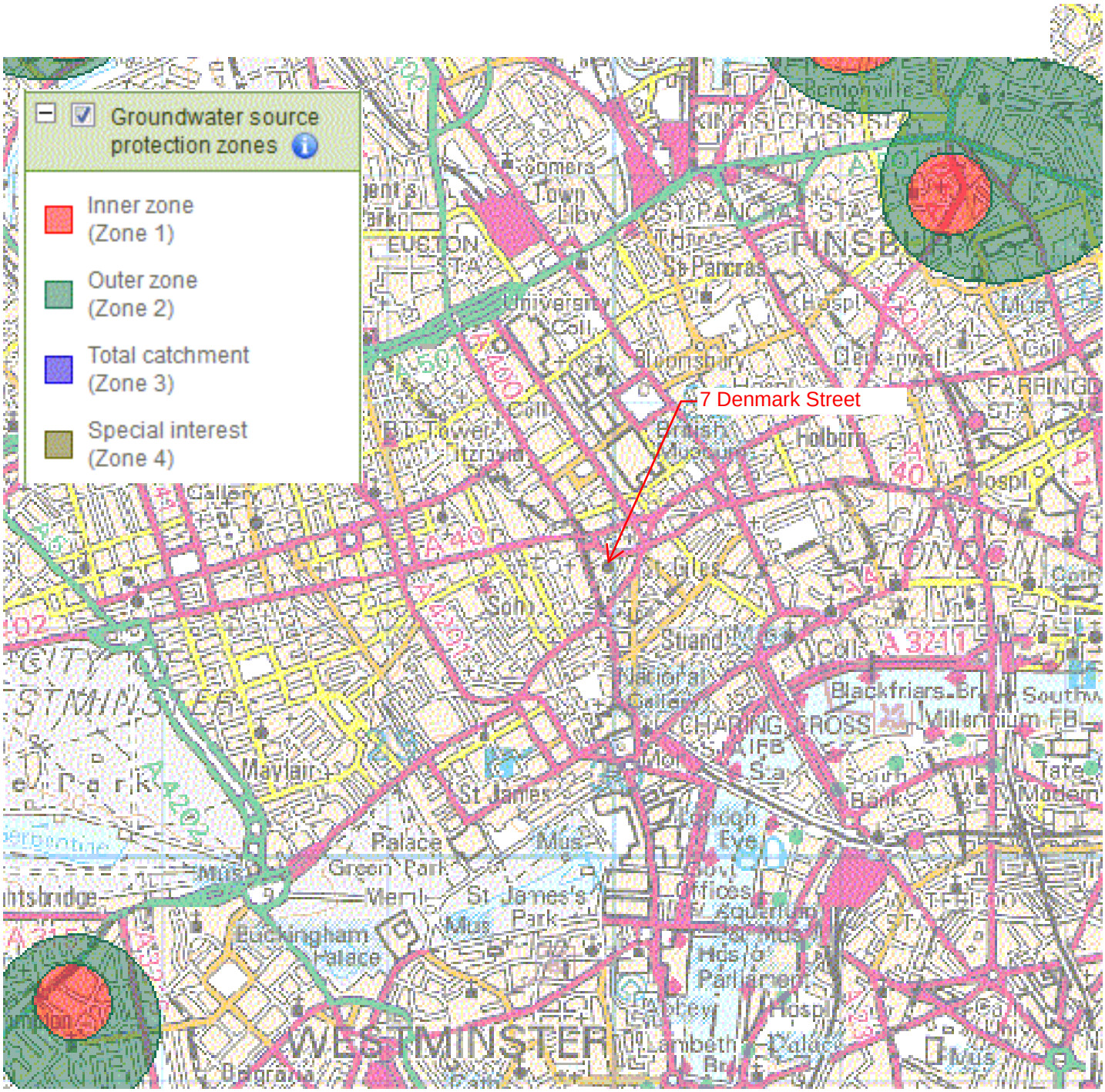


Fig 2 Q1 and Q4: Existing site has negligible slopes. Gradient on Charing Cross Road, Denmark Street and Site Giles High Street adjacent to site is negligible. Flitcroft Street is approx 1.3 degrees.

Fig 2 Q12: The basement site is within 5m of a highway or pedestrian right of way on Flitcroft Street.

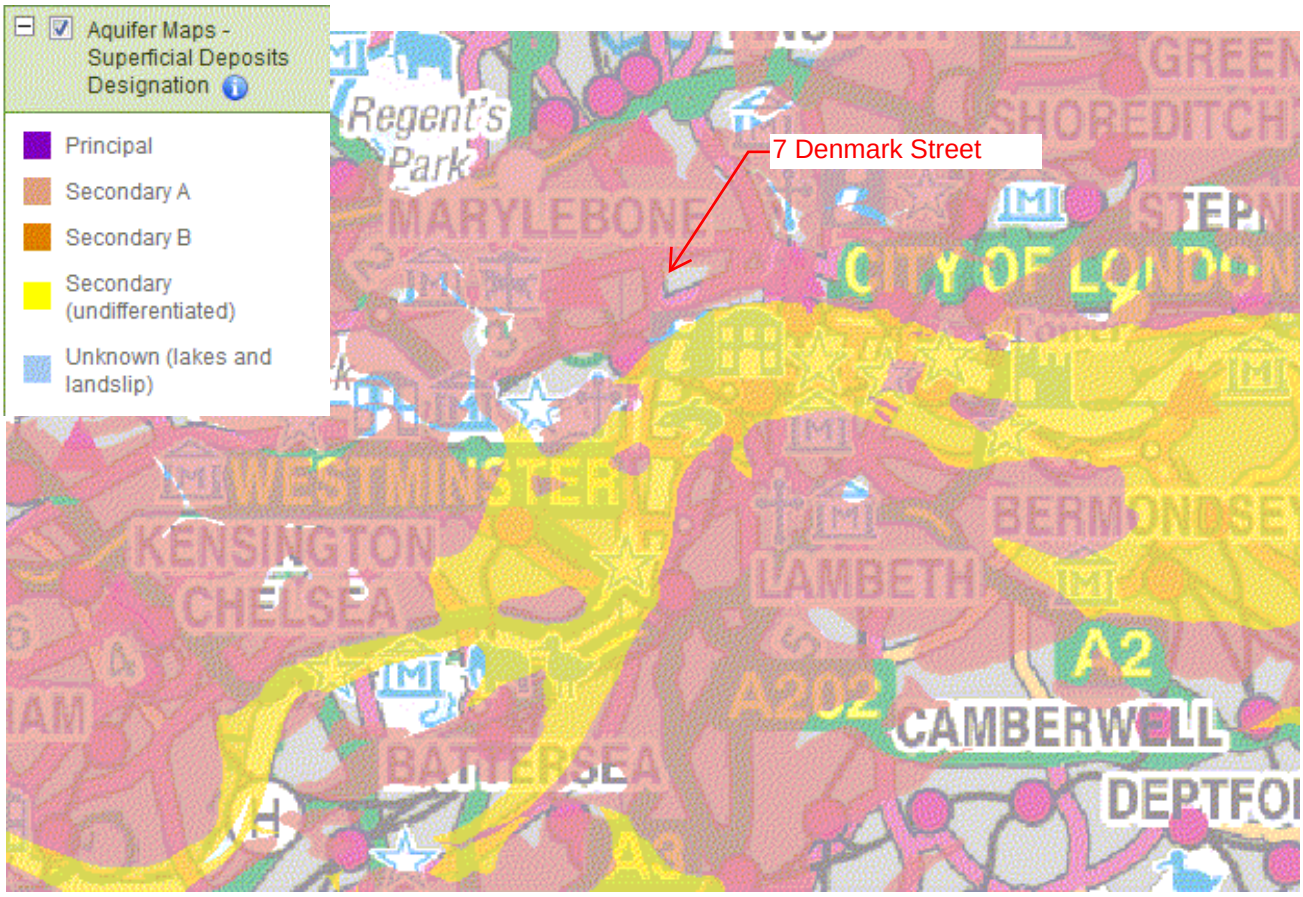
APPENDIX B – Aquifer, Well Record, Water Catchments and Flood Maps

Extract from Environment Agency Aquifer Designation Map



The above extract confirms that the site lies outside Groundwater protection zone.

Extract from Environment Agency Aquifer Designation Map



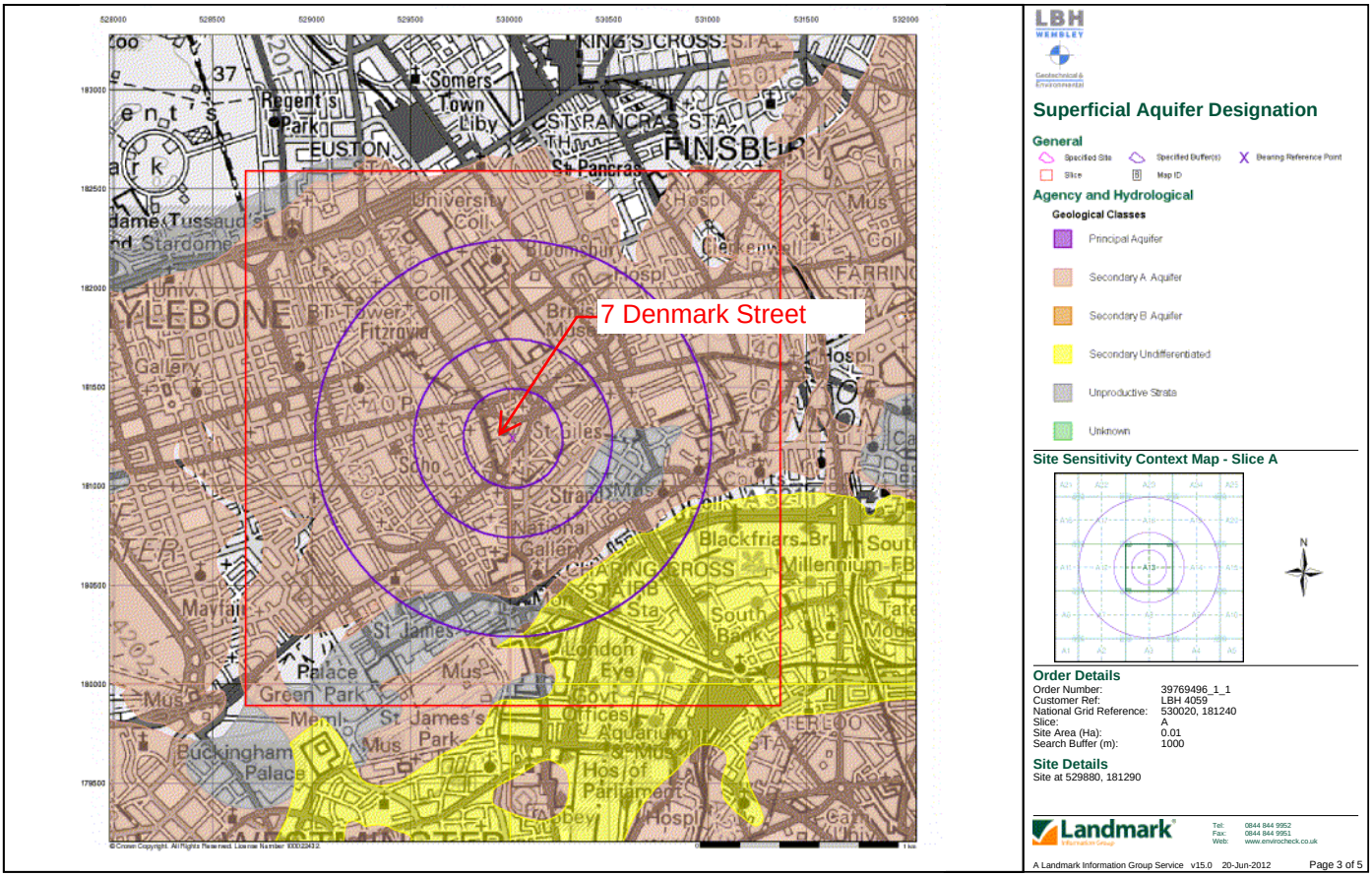


Fig 1 Q1a, Fig 2 Q10: The above extracts confirm that the site lies on a secondary (minor) aquifer.

Extract from BGS 'Water Well' records

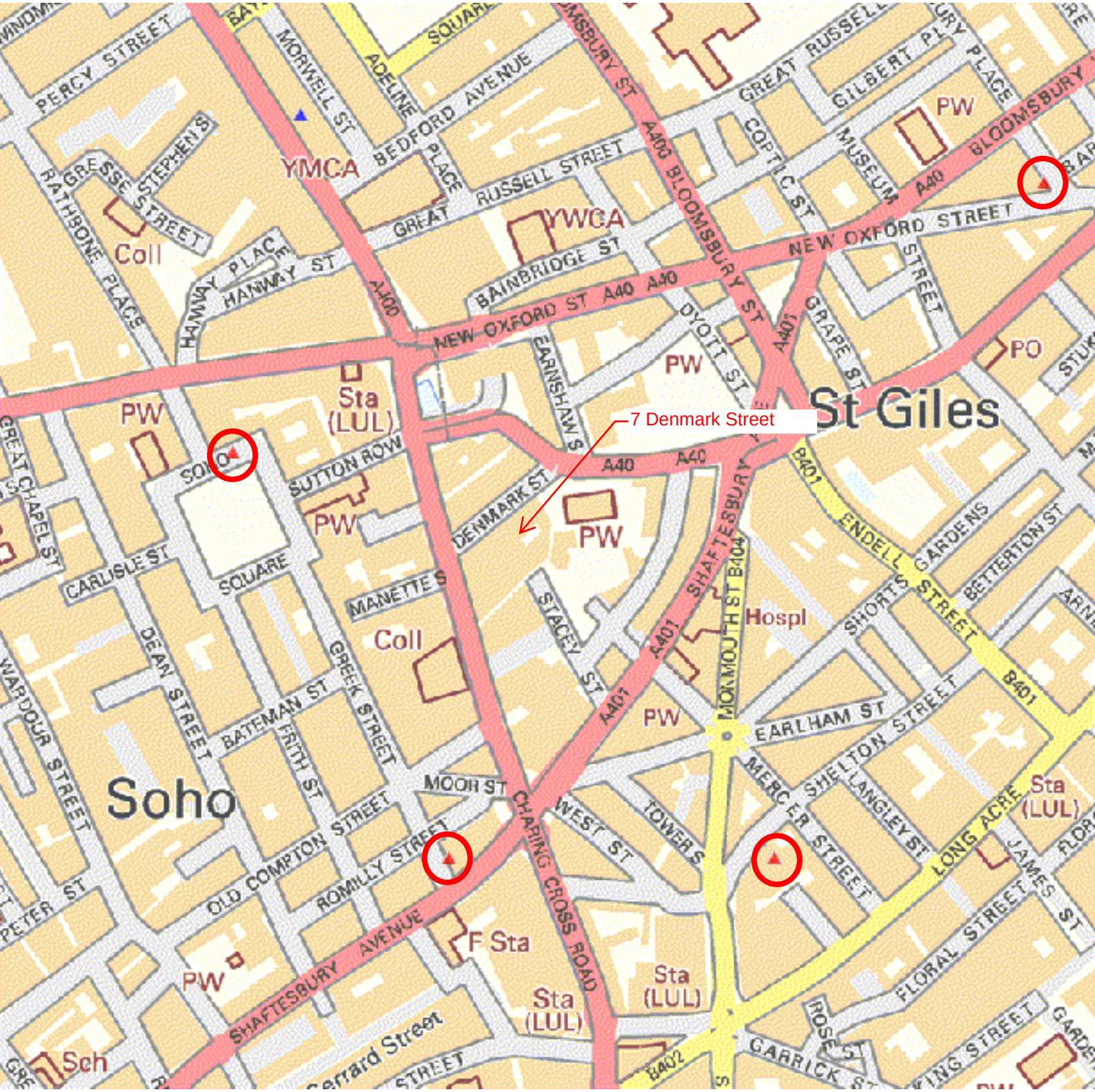


Fig 1 Q2: Nearest well is recorded as being in the Astoria and extending to the chalk aquifer below.

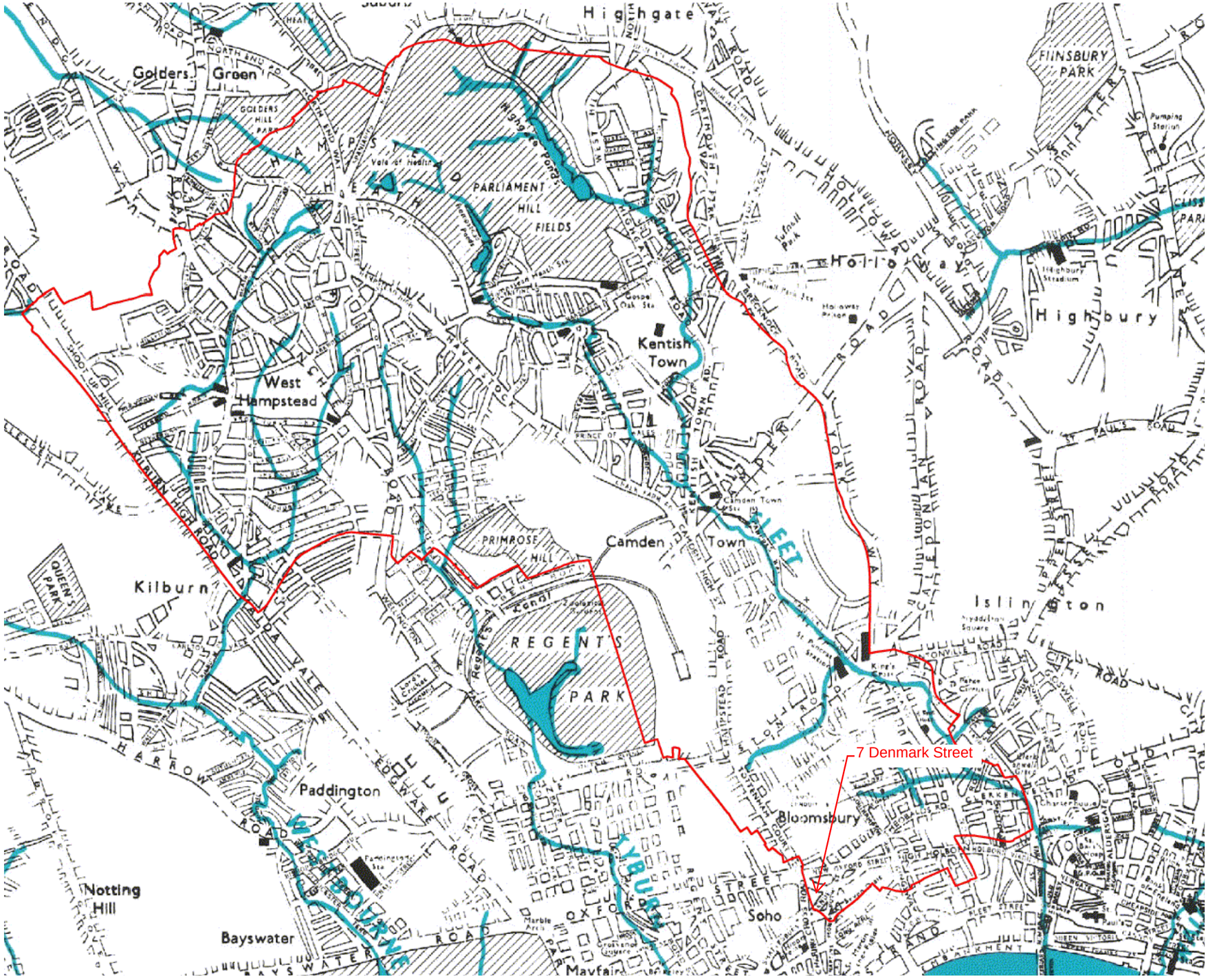


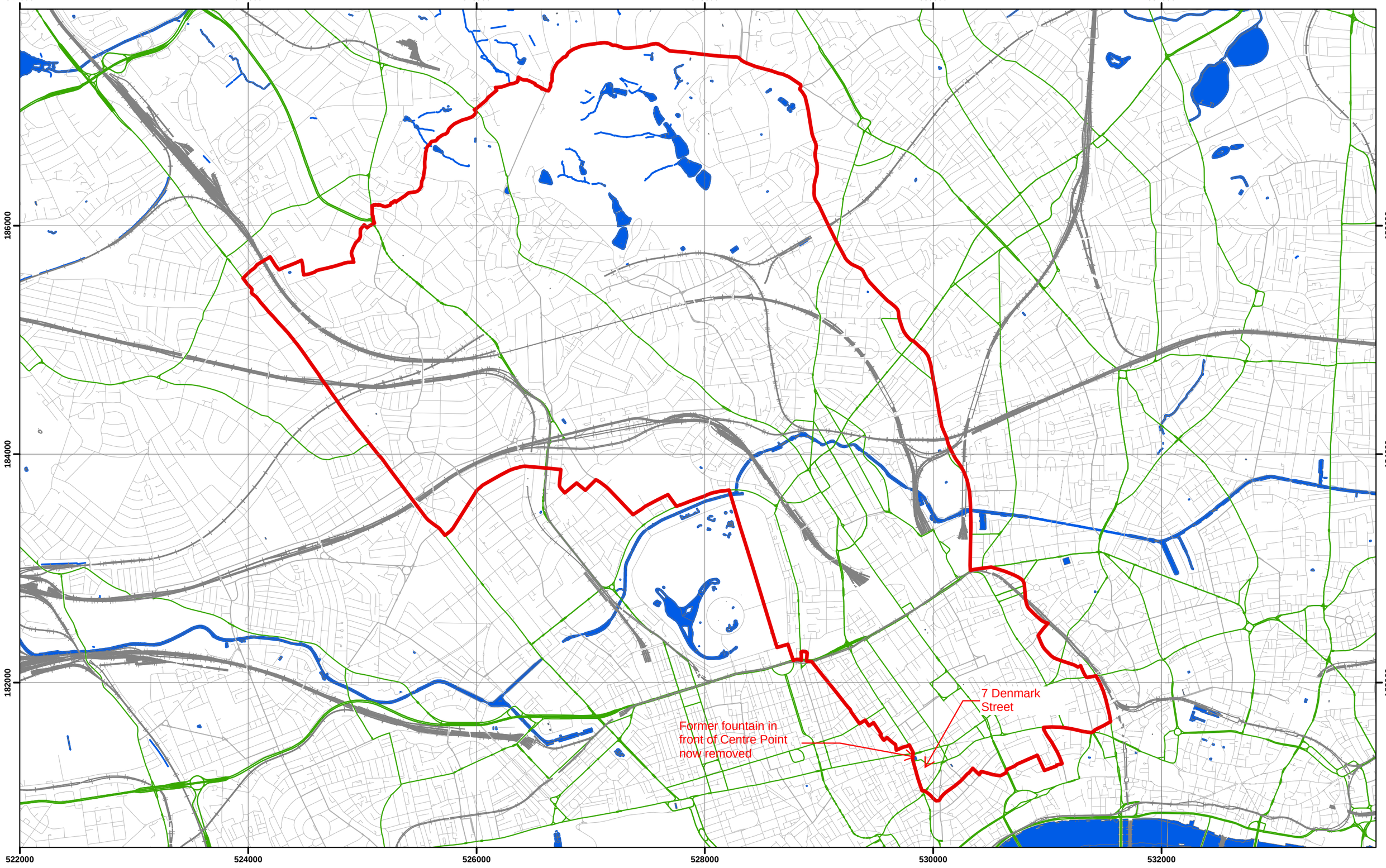
Fig 1 Q2 and Fig 2 Q8: No watercourses, wells or springs are identified near the site.

Source – Barton, Lost Rivers of London

Camden Geological, Hydrogeological and Hydrological Study
Watercourses

213923

FIGURE **11**



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

Fig 1 Q6: No local ponds are identified near the site

Camden Geological, Hydrogeological and Hydrological Study

Camden Surface Water Features

213923 **FIGURE** **12**

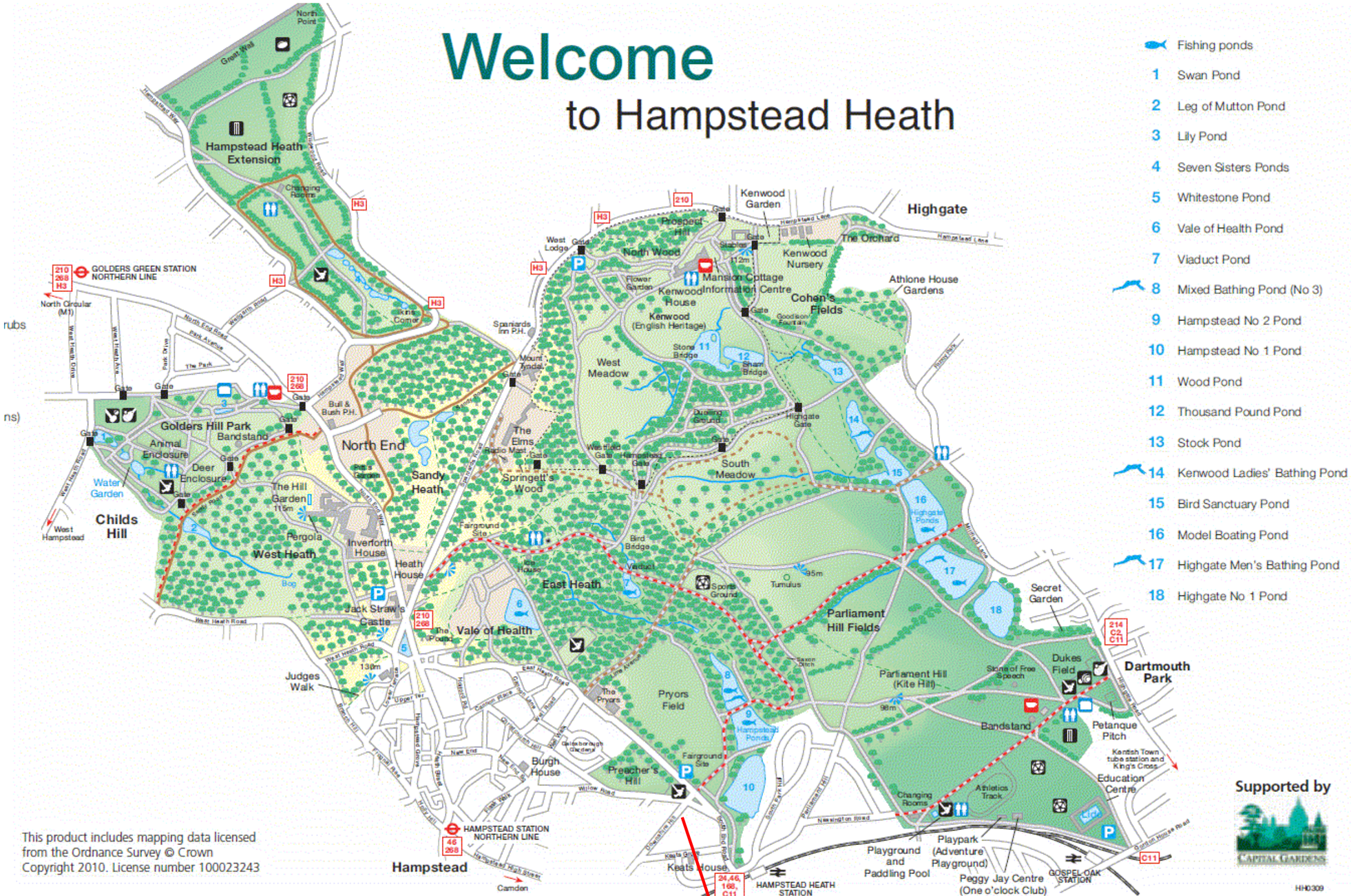


Fig 2 Q11: The site is not within 50m of Hampstead Heath ponds.

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

4 Flitcroft Street

Camden Geological, Hydrogeological and Hydrological Study
Hampstead Heath Map

213923

FIGURE **13**

526000

528000

188000

186000

Fig 1 Q3 & Fig 3 Q1: The site is not within the catchment of the pond chains on Hampstead Heath.

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

7 Denmark Street

Camden Geological, Hydrogeological and Hydrological Study

Hampstead Heath Surface Water Catchments and Drainage

213923

FIGURE **14**

Fig 3 Q6: The site is not in an area known to be at risk from surface water flooding.

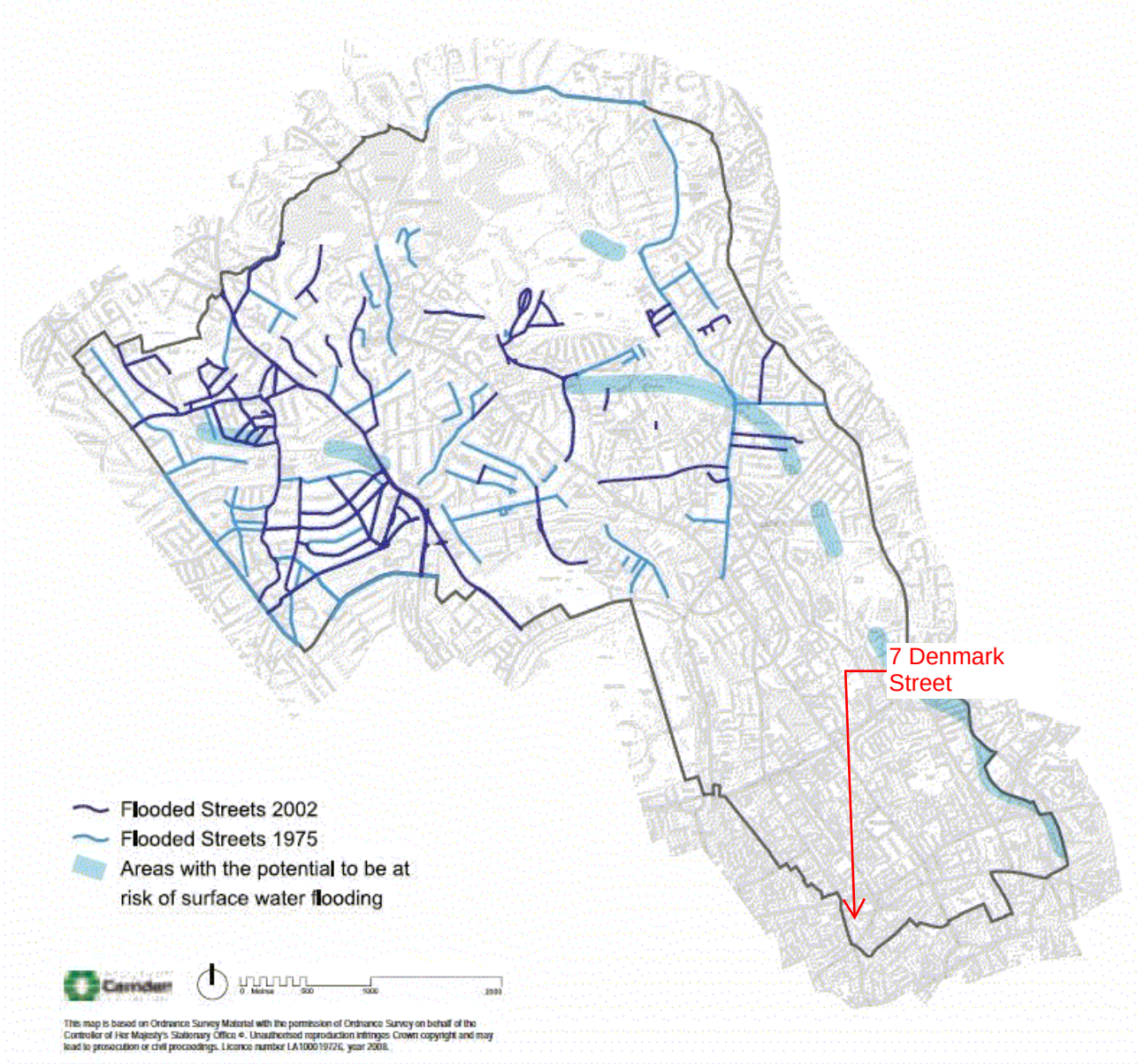


Figure 5 from Core Strategy, London Borough of Camden

Camden Geological, Hydrogeological and Hydrological Study
Flood Map

213923 **FIGURE 15**