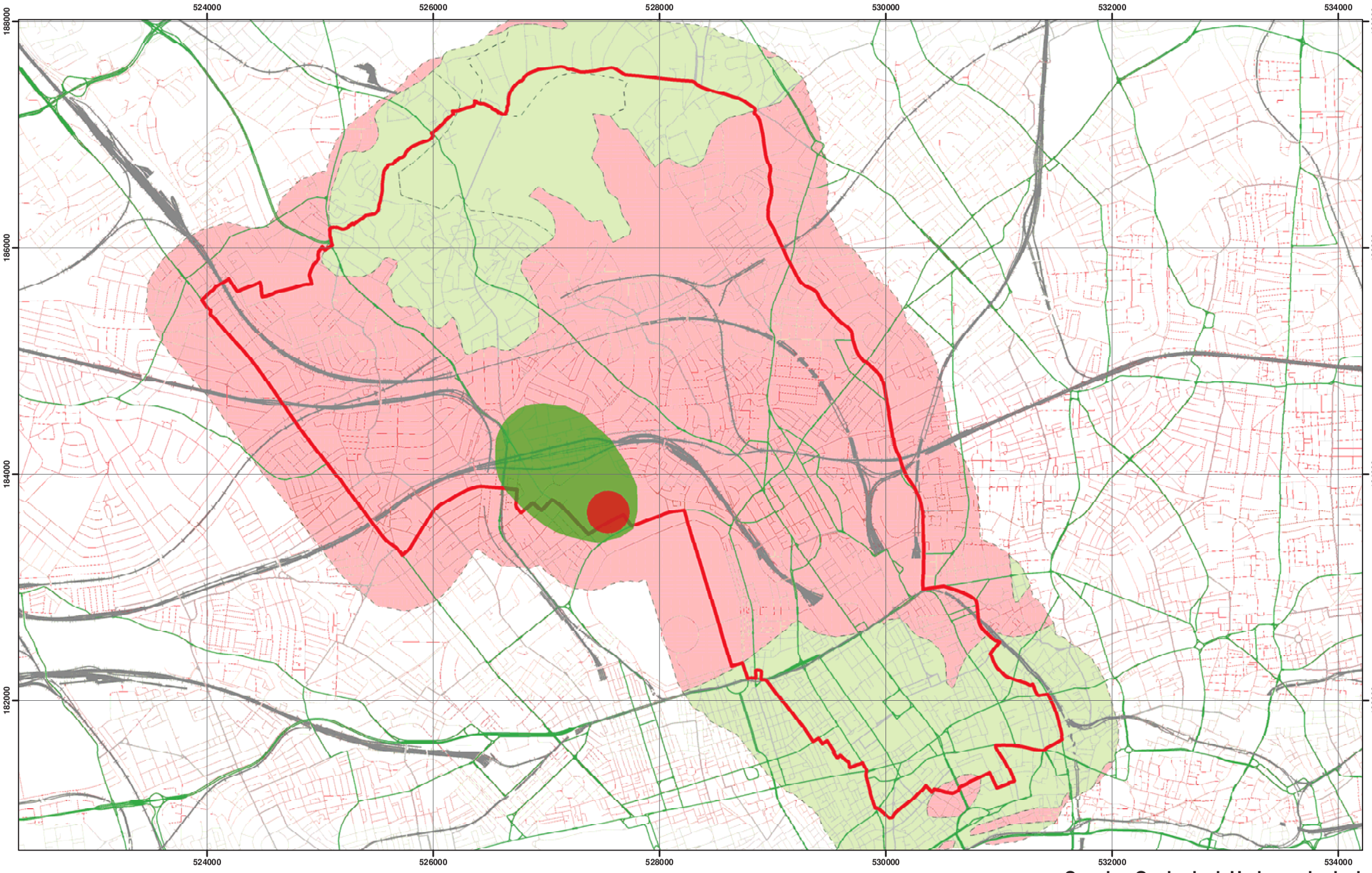


Environment Agency Aquifer Designation based on BGS Mapping

N

Scale at A3: 1:30,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.5 1 2 3
Kilometers

Legend

- Borough of Camden
- Railway Lines
- A Roads

Aquifer Designation

- Secondary A Aquifer
- Unproductive Strata

Source Protection Zone

- Outer Source Protection Zone
- Inner Source Protection Zone

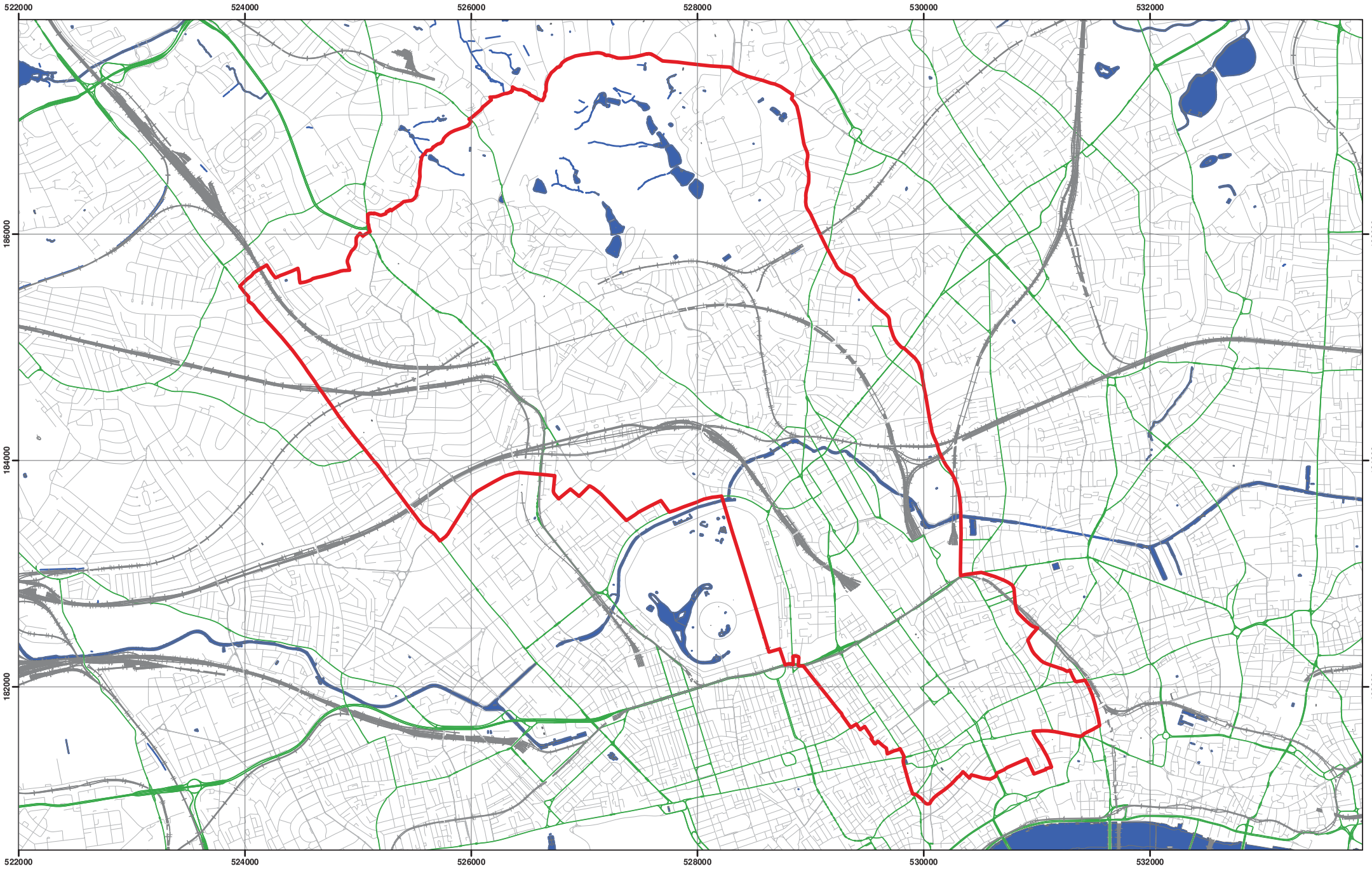
NB. Aquifer boundaries are indicative based on available geological mapping data

Camden Geological, Hydrogeological and Hydrological Study

Camden Aquifer Designation Map

213923

FIGURE 8



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

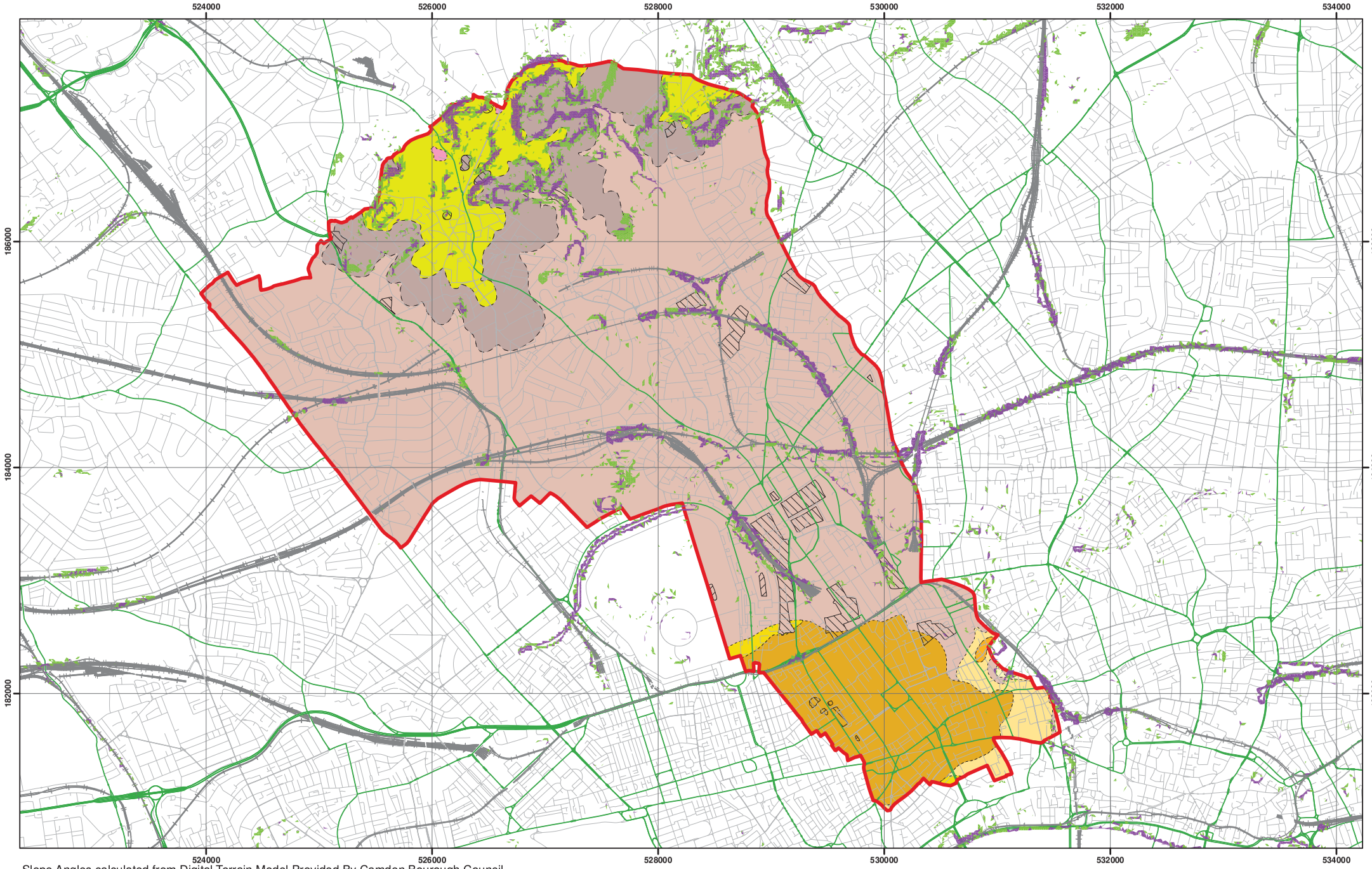
- London Borough of Camden
- Surface water
- Railway Lines
- A Roads

Camden Geological, Hydrogeological and Hydrological Study

Camden Surface Water Features

213923

FIGURE 12



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

Stephen Buss
Environmental Consulting Ltd

63 Goldhurst Terrace: screening and scoping basement impact assessment

Version control log

Document number	Issued by	Issued to	Comments
2015-007-004-002	SBEC	Client	Final
2015-007-004-001	SBEC	Client	First draft

DISCLAIMER

This report has been prepared by Stephen Buss Environmental Consulting Ltd (SBEC) in its professional capacity as hydrogeologist, in a manner consistent with the level of care and skill ordinarily exercised by members of the geological and engineering professions practising at this time, within the agreed scope and terms of contract, and taking account of the manpower and resources devoted to it by agreement with its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole. As with any environmental appraisal or investigation, the conclusions and observations are based on limited data. The risk of undiscovered environmental impairment of the property cannot be ruled out. SBEC cannot therefore warrant the actual conditions at the site and advice given is limited to those conditions for which information is held by SBEC at the time. The findings are based on the information made available to SBEC at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time.

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The findings do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

TABLE OF CONTENTS

Figures

1. Introduction

1.1 Background

This report presents the outcome of a basement impact assessment for the proposed development of 63 Goldhurst Terrace, London, NW6 3HB

Figure 1 Location of 63 Goldhurst Terrace

1.2 Proposed basement works

The site comprises No 63 Goldhurst Terrace, which is a terraced, four-storey house, including a lower ground floor, on the east side of Goldhurst Terrace. To the north, west and south of the site are neighbouring residential properties.

The proposed development involves excavating down to a depth of 3.0m below existing ground level, to construct a basement level..

1.3 Scope of Report

This report presents a basement impact assessment that complies with CPG4 screening and scoping stages. Site investigation results are presented in Appendix B.

1.4 Authorship of Report

This report has been prepared by the following qualified persons:

- Dr Stephen Buss MA MSc CGeol. Dr Buss is a UK-based independent hydrogeologist with more than 15 years' consulting experience in solving groundwater issues for regulators, water companies and other private sector organisations. **Dr Buss is a Chartered Geologist with the Geological Society of London.**
- Rupert Evans MSc CEnv C.WEM MCIWEM AIEMA is a UK-based independent hydrologist with more than 10 years' consultancy experience in flood risk assessment, surface water drainage schemes and hydrology/hydraulic modelling. **Mr Evans is a Chartered Water and Environmental Manager (C.WEM) and a Member of the Chartered Institution of Water and Environmental Management.**
- Alan Watson BSc[Eng] CEnv CEng MICE is a UK-based geotechnical engineer with 28 years' experience of ground investigations, geotechnical interpretation and contamination assessments. **Mr Watson is a civil engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialises in ground engineering.**

2. Basement Impact Assessment Screening: Surface water

Surface flow and flooding screening follows the procedure outlined in Figure 3 (surface flow and flooding screening flowchart) of the Camden Planning Guidance 4 (CPG4) entitled Basements and Lightwells dated 2013.

1) *Is the site within the catchment of the pond chains on Hampstead Heath?*

   NO. Figure 14 of the Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010, confirms that the site is not located within this catchment area.

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. There will be no surface expression of the basement development, so surface water flows and drainage will be unchanged. Furthermore, the basement will not extend into an area of the plot which is currently vegetated (i.e. the above surface comprises an impermeable patio) so the surface water regime will not change as a result of the proposed basement. As there will be no net increase in man-made impermeable area, there will also be no increase or material change in runoff rate or volume as a result of the proposed basement.

3) *Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?*

   NO. There will be no surface expression of the basement development. The basement will extend into an area of the plot across which the surface currently comprises an impermeable patio so there will be no net increase in man-made impermeable area.

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. There will be no surface expression of the basement development, so the surface water flow regime will be unchanged.

5) *Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?*

   NO. There will be no surface expression of the basement development, so surface water flows and quality of runoff will be unchanged.

6) *Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?*

   NO. The Camden Flood Risk Management Strategy dated 2013, North London Strategic Flood Risk Assessment dated 2008, and Environment Agency online flood maps show that the site has a low flooding risk from surface water, sewers, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses.

3. Basement Impact Assessment Screening: Groundwater

Subterranean (groundwater) screening follows the procedure outlined in Figure 1: Subterranean (ground water) flow screening chart of the Camden Planning Guidance 4 (CPG4) entitled Basements and Lightwells dated 2013. These findings have been informed by a ground investigation undertaken at the site in April 2014 (Appendix B).

1a) Is the site located directly above an aquifer?

NO. The geological map, on site boreholes and the nearest off-site boreholes indicate that permeable superficial deposits are not present beneath the site. Site investigation boreholes show between 1 and 2 m of made ground lying on 0.4 – 1.4 m clayey head deposits, over London Clay. None of these can be considered an aquifer. Beneath made ground a considerable thickness of London Clay isolates the deeper aquifer units of the London Basin aquifer from the surface.

1b) Will the proposed basement extend beneath the water table surface?

NO. There is no aquifer directly beneath the site, and a consistent water table was not observed during the site investigation. There was a small, temporary, seepage in one borehole that is not considered to be related to a body of groundwater.

2) Is the site within 100m of a watercourse, well (used/disused) or potential spring line?

NO. There are no current surface water bodies within 100 m of the site. The site lies between two former tributaries of the 'lost' River Fleet. Both are quite high up in the catchment of the river. One flowed southwards about 100 m east of the site, and (if it exists) is most likely now culverted along Strathay Gardens. A second flowed southwards about 200 m west of the site.

There are no known water wells within 100 m of the site; there is one at 300 m south east of site, which is operated by the London Borough of Camden, and which exploits groundwater from the Chalk.

Geological conditions indicate no potential for development of a spring line here.

3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

NO. There will be no additional surface expression of the basement development, so surface water flows will be unchanged.

4) As part of the site drainage, will more surface water (e.g. rainfall and runoff) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?

NO. Discharge to the ground is not in the proposal.

5) 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 or spring line?

NO. The nearest water body is Hampstead Number 1 Pond, about 1750 m to the north east, while the Grand Union Canal is 2150 m to the east. These are both too far from the site to be a concern, especially given that there are no permeable superficial deposits beneath the site.

4. Basement Impact Assessment Screening: Slope stability

Slope stability screening follows the procedure outlined in Figure 2: Slope stability screening chart of the Camden Planning Guidance 4 (CPG4) entitled Basements and Lightwells dated 2013. This has been undertaken by Soil Consultants Ltd and the screening and scoping assessment is presented in Appendix A of this report. Its findings have been informed by a ground investigation undertaken at the site in April 2014 (Appendix B).

The development is considered to be at low risk of stability problems, if undertaken by reputable experienced specialists, and if the temporary and permanent works are adequately designed and implemented with due consideration to the geology and hydrogeology of the site and surrounding areas.

5. Conceptual Site Model

5.1 Drainage and topography

Ground surface around the site slopes gently southwards. Elevation of the ground is about 41 m above Ordnance Datum. There are no current surface water features near the site. Historically, two tributaries of the River Fleet passed by the site (Figure 2). These rivers are now 'lost' and mostly culverted beneath the city[1].

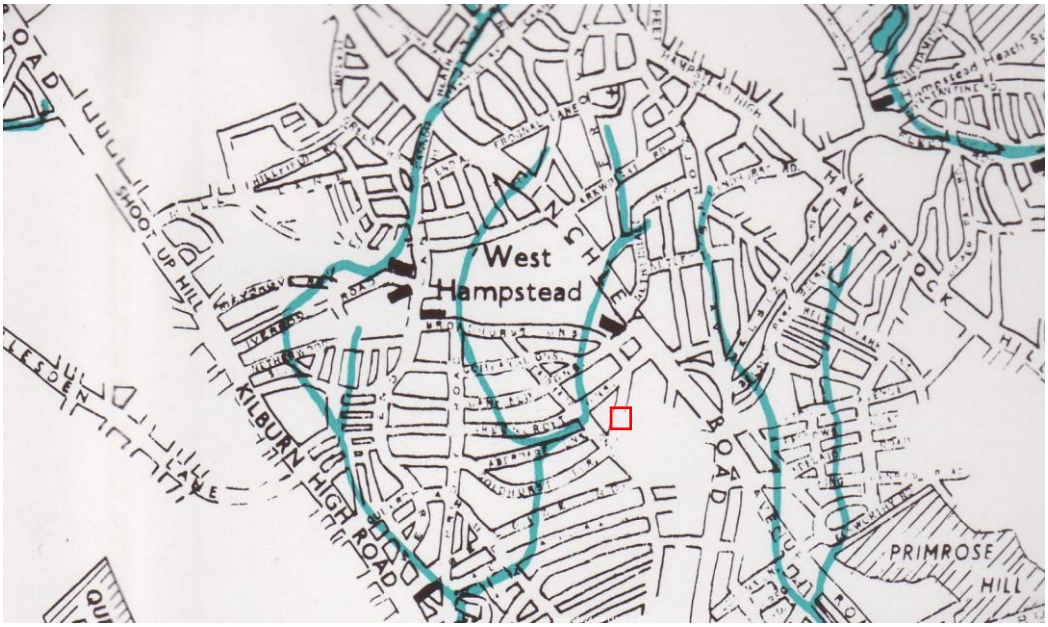

Figure 2 Location of the River Fleet tributaries relative to 63 Goldhurst Terrace

5.2 Geology and hydrogeology

Bedrock at the site comprises London Clay. This is about 83 m thick at the Swiss Cottage open space borehole[2] (about 300 m to the south west of the site) and isolates the main aquifer of the London Basin from the surface.

Nearby borehole records available from the British Geological Survey also show no superficial deposits, just thin Made Ground over London Clay. (Borehole TQ28SE2337[3] is the closest from a site investigation centred around 3, 5 and 7 Fitzjohn`s Avenue 350 m north west of the site; and the Swiss Cottage open space borehole also shows no superficial deposits.) These are considered to be representative of geological conditions around the site. A thickness of clayey head was observed in two of the site boreholes.

All of the boreholes were dry on excavation, as were the boreholes with records in BGS GeoIndex. This is typical of the London Clay.

Referring back to the screening, a detailed assessment of the near-surface geology reinforces the view that there is not an aquifer directly beneath the site, and there is no water table in the low permeability near-surface formations.

[1] Barton, N.J., 1993. The Lost Rivers of London 3rd edition.
[2] http://scans.bgs.ac.uk/sobi_scans/boreholes/15020820
[3] http://scans.bgs.ac.uk/sobi_scans/boreholes/18393270

5.3 Slope stability

As identified in Appendix A the slopes within influential distance of the site are all shallow [<7 °] and no significant impact is anticipated on sloping ground in terms of land stability provided that the design and construction of the scheme ensure that ground movements are kept to an absolute minimum.

Presence of London Clay near the ground surface is unlikely to be a significant issue due to the depth of the proposed basement being below the root affected zone within the clay. The advantage of this stratum is that groundwater is unlikely to be a significant issue affecting construction and any impact on groundwater caused by the construction should be minimal. Soil volume change is unlikely to be a significant issue despite the presence of nearby trees as the founding depth for the proposed basement should be well below the influence of any vegetation. Some measures may be necessary to cater for potential clay swell exerting pressure on the basement retaining walls if trees are removed and desiccated clay is proven to be present.

The depth of the aquifer in relation to the basement is assessed in Section 5.2; and the London Clay does not usually contain significant groundwater within the likely construction depths. Uplift/heave pressures due to soil heave following excavation, and hydrostatic pressures will both have to be considered in the design and should not impact on land stability if properly designed and constructed.

With regard to the impact on adjacent highways / pedestrian right of way, the proposed basement construction will be within influencing distance of Goldhurst Terrace. The construction methodology must be carefully considered to ensure that adequate support is maintained at all times and significant ground movement does not occur. The differential depth of the proposed foundations in relation to neighbouring properties is such that underpinning of party wall foundations will be required.

6. Conclusions

Potential environmental impacts of the proposed basement development at Goldhurst Terrace have been considered. The following summary conclusions are made:

- There will be no change in the area of impermeable surface at the site so that surface water drainage will not be changed from present.
- Available geological information strongly indicates that there is no aquifer directly beneath the site. This indicates that there is insignificant risk of changing groundwater flow patterns beneath 63 Goldhurst Terrace. This finding is based on a recent intrusive site investigation and other local geological information.
- The development is considered to be low risk of stability problems, if undertaken by reputable experienced specialists, and if the temporary and permanent works are adequately designed and implemented with due consideration to the geology and hydrogeology of the site and surrounding areas.

These conclusions are considered to be robust and no further investigations are recommended.