HR Wallingford
Working with water

Grove Lodge, Admiral's Walk

Basement Impact Assessment

MAM7409-RT002-R05-00 August 2015

Document information

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Client representative	Julian Birch (Michael Barclay Partnership)
Project manager	Mike Briggs
Project director	Andrew Tagg

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	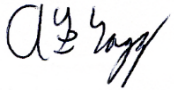	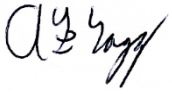

Document history

Date	Release	Prepared	Approved	Authorised	Notes
03 Aug 2015	05-00	MCB	AFT	AFT	To accompany Planning Application
31 Jul 2015	04-00	MCB	AFT	AFT	
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19 Jun 2015	02-00	MCB	AFT	AFT	For pre-application independent review. Updated report references
15 Jun 2015	01-00	MCB	AFT	AFT	For review

Executive Summary

HR Wallingford was appointed by Michael Barclay Partnership (MBP) to prepare a Basement Impact Assessment (BIA) for a proposed new basement at Grove Lodge, Admiral's Walk, Hampstead, NW3 6RS. The BIA forms part of the planning application documentation.

HR Wallingford was to provide hydrological and hydrogeological inputs for the BIA, and incorporate into it geotechnical and structural assessment information prepared by others. The MBP Structural Engineer's Report is produced as Appendix D. Appropriately qualified professionals have written and contributed to this and to associated reports. This BIA relates to the Grove Lodge planning application – Planning Portal reference PP/04366481.

This assessment has been based on the requirements of various planning documents prepared by the London Borough of Camden, including Core Strategy 14 – "Promoting high quality places and conserving our heritage" (CS14) – and Development Policy 27 – "Basements and Lightwells" (DP27). In particular the format is based on the planning guidance document CPG4 (Basements and Lightwells) – September 2013 version. We have also reviewed the proposals in the light of the emerging Policy A5 "Basements and Lightwells" of the draft Local Plan. The BIA assesses the potential impacts of the proposed development on surrounding areas, including adjoining properties, with respect to the following key issues:

- Subterranean flow (groundwater);
- Land stability;
- Surface flow and flooding.

The following are the key conclusions:

- The proposed works take full account of groundwater levels. The design allows groundwater flow under and around the basement. It will not adversely affect groundwater flows and levels;
- It is proposed that existing surfaces and drainage systems will be reinstated, with no net changes to the volumes of runoff and to their discharge rates;
- Areas of additional runoff will be served by soakaways, with no net change of infiltration to the ground;
- There will be no changes to flood risks at the site or experienced elsewhere;
- There are no issues anticipated with underground services running through or close to the site;
- There are no slope stability issues of concern;
- The tree specialist has advised that although six individual trees and a group of three trees are to be removed there are no significant issues, with the proposed 11 new trees mitigating the removals. Incursions into root protection areas of five trees are minor;
- The proposed design takes full account of existing foundations and of other structures. It will include CFA secant piling around the basement wall, temporary propping and monitoring for movement;
- There are no adverse geological or hydrological impacts, both for the proposed basement on its own and also when considered in conjunction with other basements in the area – cumulative effects;

- The proposals are in line with the principles of emerging policy A5 with respect to the structural stability of properties;
- The proposed works will not compromise the long-term structural stability of this or other listed buildings. The structural integrity and features of architectural / historic importance will be preserved;
- Release 3.0 of this report was subjected to an independent pre-application audit by Campbell Reith, on behalf of Camden Council. It was agreed that the hydrology and hydrogeology would not be affected by the proposals and that the nearby well at Admiral's House would not be impacted;
- This latest BIA, with the associated Structural Engineer's Report, will also be subject to a detailed verification and audit process - commissioned by Camden and carried out by a suitably qualified and independent external party. The review will form part of the final stage of the Camden BIA decision-making process.

It is concluded that the proposed basement meets the relevant requirements of DP27 and CS14 and should be approved with respect to CPG4.

Contents

Tables

Photographs

1. Introduction

In January 2015 HR Wallingford was appointed by Michael Barclay Partnership (MBP) to prepare a Basement Impact Assessment (BIA) for the proposed new basement works at Grove Lodge, Admiral's Walk, Hampstead, London NW3 6RS. The BIA forms part of the documentation in support of a planning application. HR Wallingford was to prepare hydrological and hydrogeological information, as well as drawing on material prepared by other members of the client's project team. This BIA document therefore includes the Structural Engineer's Report prepared by MBP.

A planning application for work at Grove Lodge was initially submitted in February 2015 (2015/1032/L). However, the application was subsequently withdrawn, with amendments being made to the proposals. This BIA relates to the updated proposals, and as such forms part of the new planning application documentation – Planning Portal reference PP/04366481.

2. Report Authors and Contributors

This BIA is based in accordance with the requirements of the current version of the London Borough of Camden planning guidance document CPG4 (Basements and Lightwells), September 2013. However, it has also considered the potential changes, as indicated in the 2015 PPG4 consultation document.

The people undertaking and contributing to the BIA have qualifications relevant to the issues being considered, and as outlined in Section 2.11 of CPG4. This is summarised in Table 2.1 and discussed in detail below.

Table 2.1: Summary of BIA Inputs

Discipline	Inputs
Overall	The BIA information has been collated and presented by Mike Briggs and staff at HR Wallingford, using inputs from various experts with appropriate specialist qualifications and experience.
Surface flow and flooding	Assessment carried out by Mike Briggs, CEng, a Chartered Civil Engineer (MICE). Mike specialises in surface water drainage and flood risk management. Detailed review carried out by Andy Tagg (MICE, MCIWEM).
Subterranean (groundwater) flow	Detailed information prepared by Steve Fleming, a Chartered Geologist (CGeol) and by other geotechnical experts, included as appendices in the BIA.
Land stability	Structural Engineer's Report prepared by Julian Birch, a Chartered Structural Engineer specialising in basements and in ground engineering, from MBP. Report included as Appendix D in the BIA. Reviewed by Keith Jeremiah of MBP (FICE, MIStructE, FGS). This has also used the detailed information prepared by Steve Fleming (CGeol).

The information in this document has been prepared by **Mike Briggs**, MICE - a Chartered Civil Engineer, with an Honours degree in Civil Engineering. He specialises in flood risk management and in surface water drainage. He has 26 years of experience carrying out and managing a wide range of drainage studies, flood risk assessments and other flood studies, often providing expert advice. He is experienced in the review of

existing and proposed basement projects, including the preparation of BIAs for residential basement planning applications. He has also prepared many FRA reports, contributed to Environmental Statements and other documents to support planning applications and inquiries. His CV is reproduced as Appendix B.

He has drawn on information prepared by specialists in relevant fields, including **Julian Birch** of Michael Barclay Partnership – a Chartered Structural Engineer and specialist in basements and ground engineering. Julian has designed many basement structures across London and frequently contributes information for BIAs. Julian prepared the Structural Engineer's Report (ref. 5954) that forms Appendix D of this BIA. His report has been reviewed by Keith Jeremiah of Michael Barclay Partnership – a Chartered Civil Engineer specialising in ground engineering.

Geotechnical support has been given by **Steve Fleming** (M.Sc., MCSM, C. Geol., FGS). Steve is Director of Ground Engineering Ltd., and prepared the second Ground Investigation Report (C13390A, Feb 2015). He has provided geotechnical advice with respect to the proposals for Grove Lodge.

David Jordan, BSc (Civil Engineering), MSc Soil Mechanics, MICE provides specialist geotechnical support as part of the HR Wallingford team. He is a Technical Director with 40 years of experience in foundation engineering and in soil mechanics. He has worked on basement / foundation aspects of many major construction projects in London, including underground stations, prestigious new building structures with basements and the foundation aspects of the refurbishment of listed buildings. He also contributes to the preparation of expert witness reports.

Specialist hydrogeological support is provided by **Aodhín McBride**, an MSc qualified Hydrogeologist and Fellow of the Geological Society of London, employed by HR Wallingford. Aodhín has been responsible for hydrogeological inputs to numerous groundwater resources projects including characterisation of groundwater systems, model development and implementation. She has also been involved in several BIAs in London ranging from the redevelopment of residential properties to hospitals. She has developed conceptual and numerical models of groundwater flow in sand and gravel superficial deposits and has assessed the risks of proposed structures on groundwater flow regimes.

This BIA has been reviewed by **Andy Tagg**, BSc (Hons.), MSc, MICE, MCIWEM, Member of British Hydrological Society. He is a Group Manager at HR Wallingford and has 30 years of experience on most aspects of the water environment, and in particular hydrology, drainage and flood risk matters. He acts as an expert witness on water-related projects and has a particular interest in flood resilient construction – he is a member of BSI Committee CB/501 (Flood risk and watercourses) and the ICE SE England Water Expert Panel.

CVs of these staff can be provided if necessary.

3. Site Details

3.1. Site location and topography

The property is located at Admiral's Walk, at the south-western end of the ridge along Spaniards Lane. It is approximately 200m south of Whitestone Pond, a man-made pond that is fed by artificial means. The property is in the London Borough of Camden, to the west of Hampstead Heath and the south of West Heath. Its location is shown on Figure 3.1.

Ground around the property falls to the south / south-west, with surface water flowing through West Hampstead, to the former River Westbourne – one of the "Lost Rivers of London" – see Figure 3.8. This

forms part of the combined drainage system in London. The local topography is depicted on Figure 3.2, with contours at 10m intervals. The ground level at the site is approximately 127.5m. The location of the property is shown on Figure 3.3.

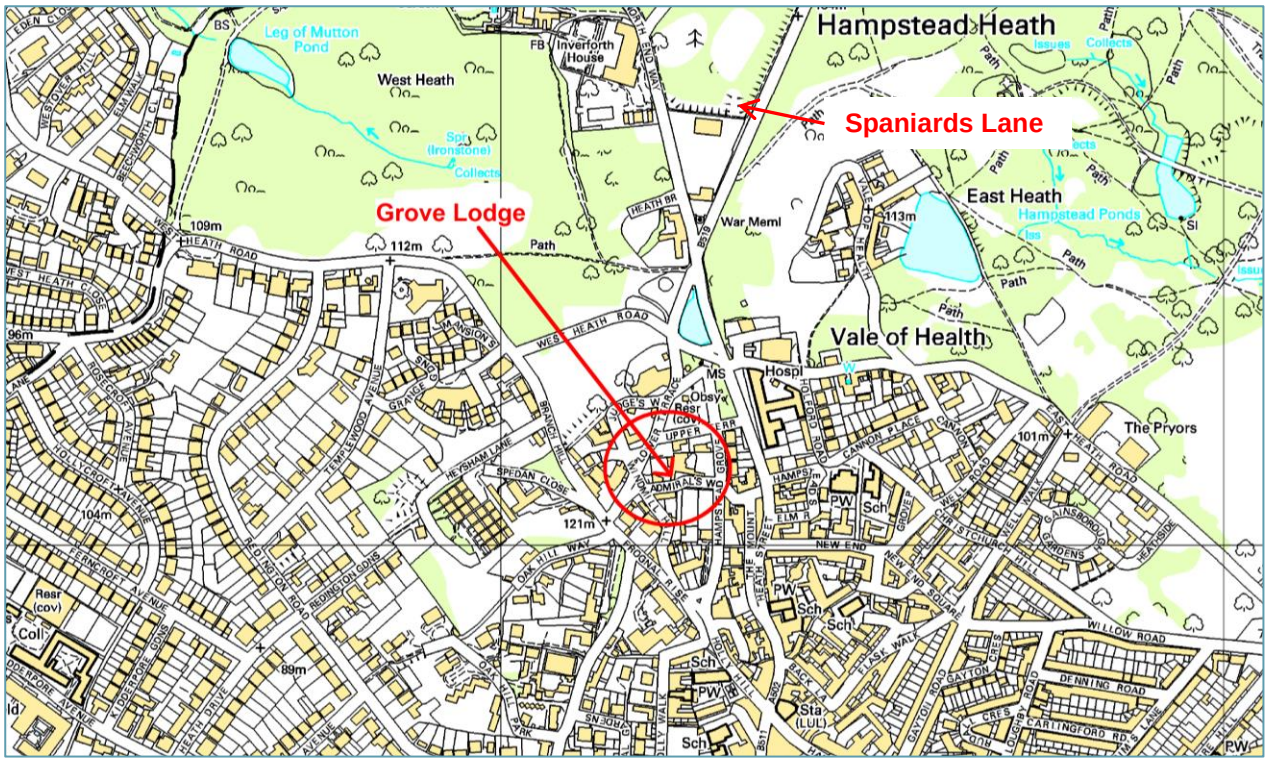

Figure 3.1: Location plan

Source: Contains Ordnance Survey data © Crown copyright and database right 2015.

3.2. Existing property

Grove Lodge is a 2 storey semi-detached residential property within the London Borough of Camden, located on an elevated site to the south-west of Hampstead Heath. It also has an attic and a one room basement.

It is understood that the property was constructed in the early 18th century, with a number of later alterations / extensions. It is designated as a Grade II Listed Building and is linked to the older Admiral's House – which is also Grade II listed. It is also linked to Netley Cottage, Lower Terrace, which is a late 18th Century property.

Further details of the property history are included in the Heritage Appraisal, prepared by Portico Heritage Ltd - see Section 3.4 for a list of documents referred to during the preparation of this BIA.

There is a garden to the rear (west) of the property, extending about 40m back to Lower Terrace. Whilst there is a patio area adjacent to the building most of the garden – which is a lawn – is at a slightly higher elevation than the ground floor of the property. The garden area includes a vegetable garden, located beyond a brick wall and close to Lower Terrace.

The front elevation of the property is shown in Photograph 3.1 and the rear of the property in Photograph 3.2. A long-section of the existing property is reproduced as Figure 3.4. These are extracts of

some of the plans and long-sections that have been prepared by Design-NA Architects. The full set of plans are included with the planning application documentation.

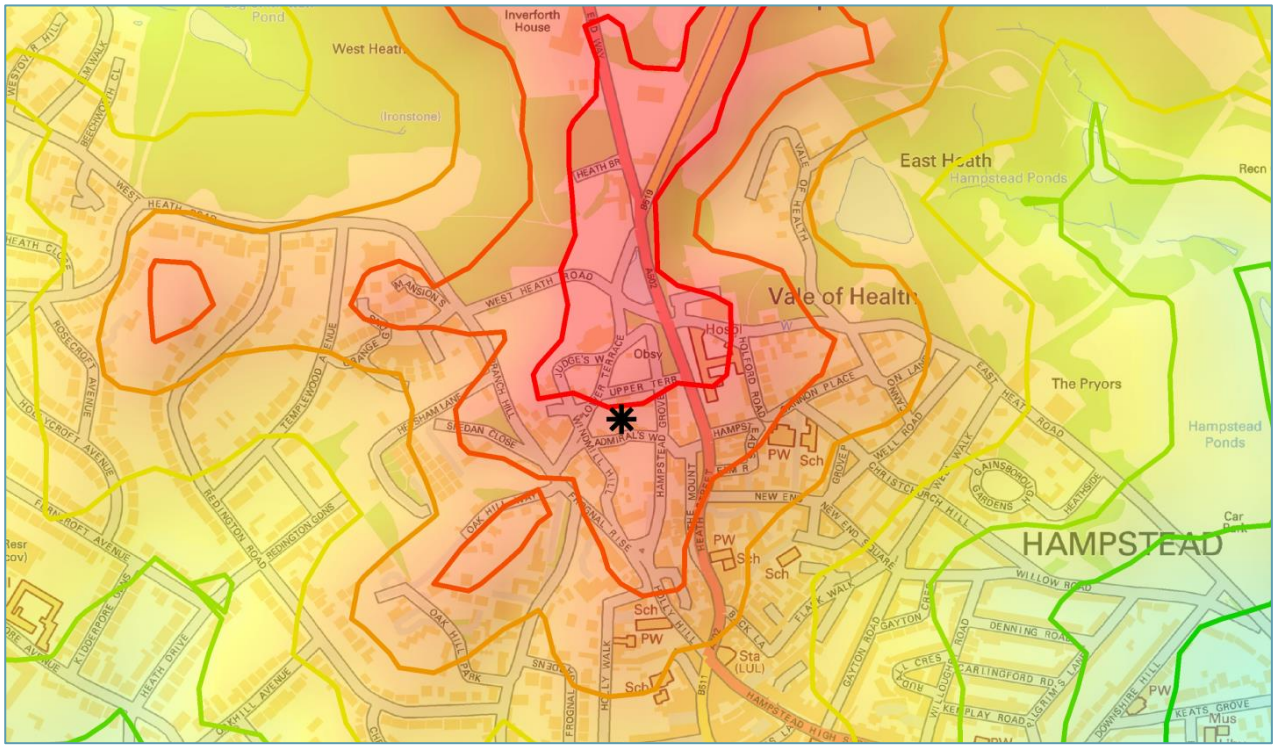

Figure 3.2: Local topography (10m contours)

Source: Contains Ordnance Survey data © Crown copyright and database right 2015.

3.3. Outline of proposed works

A planning application for work at Grove Lodge was submitted in February 2015 (2015/1032/L). However, that application was subsequently withdrawn. Amendments have been made to the proposals, with an amended planning application being submitted. This BIA relates to the amended proposals, and as such forms part of the amended planning application documentation for the following:

- Listed Building Consent for internal and external alterations and refurbishment of the listed house, demolition and replacement of part of the southern wing with a two storey extension, replacement garage, along with an extension to the existing one storey basement. Demolition of garden structures, permanent and temporary demolition to interior and exterior garden walls, plus the construction of an Orangery within the garden.
- Planning Consent for the demolition and replacement of part of the southern wing with a two storey extension, replacement garage, along with an extension to the existing one storey basement. Demolition of garden structures, permanent and temporary demolition to interior and exterior garden walls, plus the construction of an Orangery and works to trees, including the removal of 9 category 'C' trees including 1 TPO lime tree and the planting of 11 new trees.

The proposed new basement will extend beyond the existing building footprint into the rear garden. There will also be a small area of new basement at the front of the existing building. As part of the work it is

proposed to underpin part of the existing building and to lower and expand the existing basement area under the main building. The whole basement floor level will be about 3.9m below the existing rear patio level.

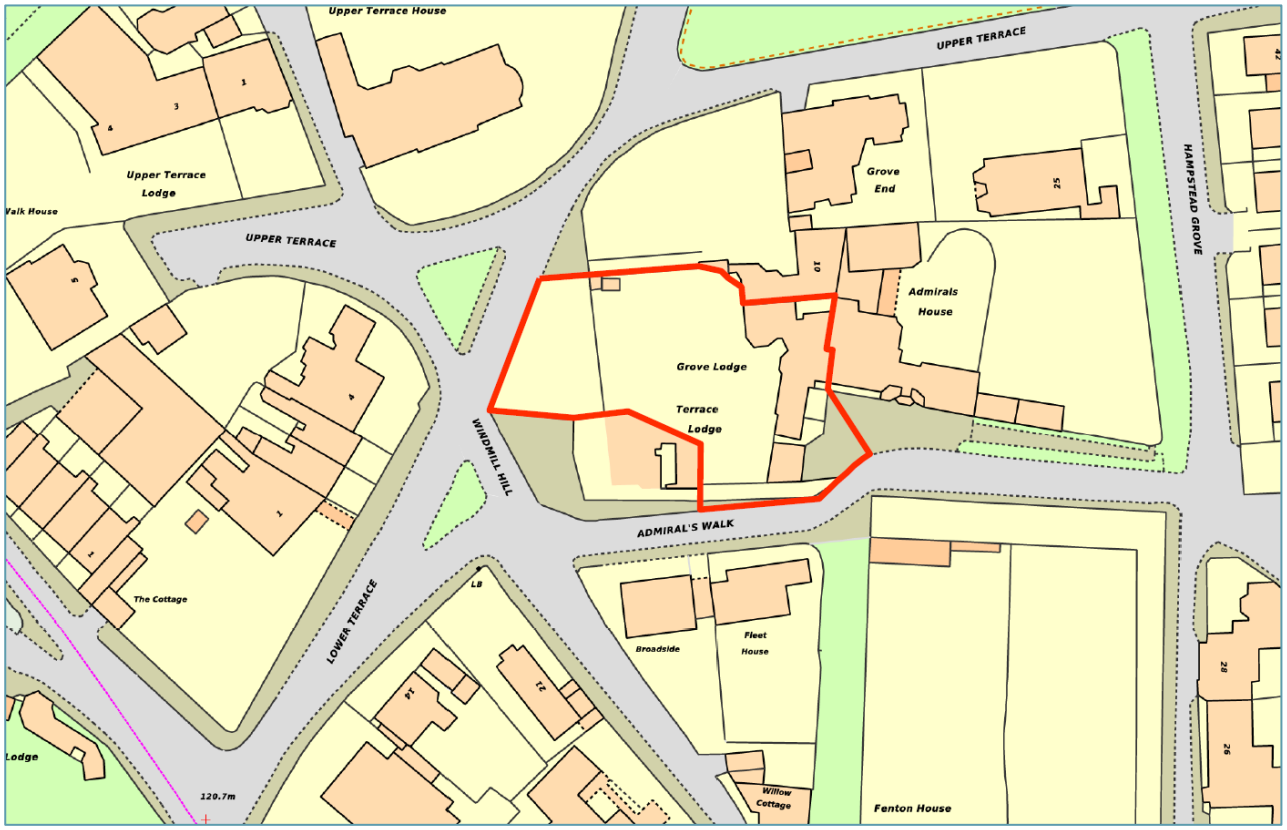

Figure 3.3: Grove Lodge site area

Source: Design-NA Architects (extract from plan dNA GLR 00 000, P1).

A long-section of the proposed main basement work and the existing property is reproduced as Figure 3.5, and a plan view as Figure 3.6. These are both extracts from the architectural plans and illustrate the proposed main basement layout, with areas of new basement under the existing building, as well as extending into the front and rear gardens.

The full plans and other proposed plans and long-sections have been prepared by Design-NA Architects and have been submitted with the planning application documentation. The associated Planning Statement contains more details of the proposals, as well as references to other useful documents. It is anticipated that details of the key construction issues and proposals for the basement, and including the stability of Grove Lodge and the nearby buildings, will be covered in a Basement Construction Plan. This will draw on the details contained in the BIA and Structural Engineer's Reports.

Photograph 3.1: Grove Lodge: front view – from Admiral's Walk. Admiral's House on the right

3.4. Additional information

Information relating to the site and to the surrounding area has been prepared to support the development of the proposals and to assist in the preparation of the BIA. This includes the following documents that have been used in the preparation of this BIA. Many are included with the planning application:

- **Architectural drawings – Design-NA Architects.** Include plans and long-sections of the existing building and proposed works. Included with the planning application documents. Some extracts are reproduced in this BIA.
- **Structural Engineer's Report (ref. 5954) - Michael Barclay Partnership.** A key document, which forms Appendix D of this BIA.
- **Heritage Appraisal – Portico Heritage Ltd.** - included with the planning application documents.
- **Arboricultural Implications Report (ref. 14042) – Simon Jones Associates**. To be read in conjunction with this BIA and included with the planning application documents.
- **Geotechnical information – Envirocheck search**.
- **Services checks – Utilities companies**.

- **Site Investigation Report – Southern Testing (ref. J11827, July 2014).** This includes an interpretative report. A key document, which forms Appendix E of this BIA.
- **Ground Investigation Report (ref. C13390A, Feb 2015) – Ground Engineering Ltd.** This forms Appendix F of this BIA.
- **Construction Management Plan – Burke Hunter Adams, July 2015** - included with the planning application documents.
- **Soils Site Report – National Soil Research Institute (NSRI)**.
- **Site and building survey details – ELS Land Consultants.** Data available for the BIA and used in the development of the architectural drawings.

Photograph 3.2: Grove Lodge: rear view – from within garden: basement location

Other document that provide explanations of the consultation undertaken prior to the submission of this planning application and the reasons for certain decisions during the design development stage are as follows:

- **Consultation Statement**, prepared by GL Hearn.
- **Design and Access Statement** – prepared by design-NA Architects.
- **Planning Statement** – prepared by Planning Potential.

In addition, a review of information in the Camden Strategic Flood Risk Assessment (SFRA) prepared by URS in 2014, was carried out.

Figure 3.4: Existing building long-section

Source: Design NA Architects (extract from plan dNA GLR 00 300, P1).

Figure 3.5: Proposed long-section through building and basement

Source: Design NA Architects (extract from plan dNA GLR 03 300, P1).

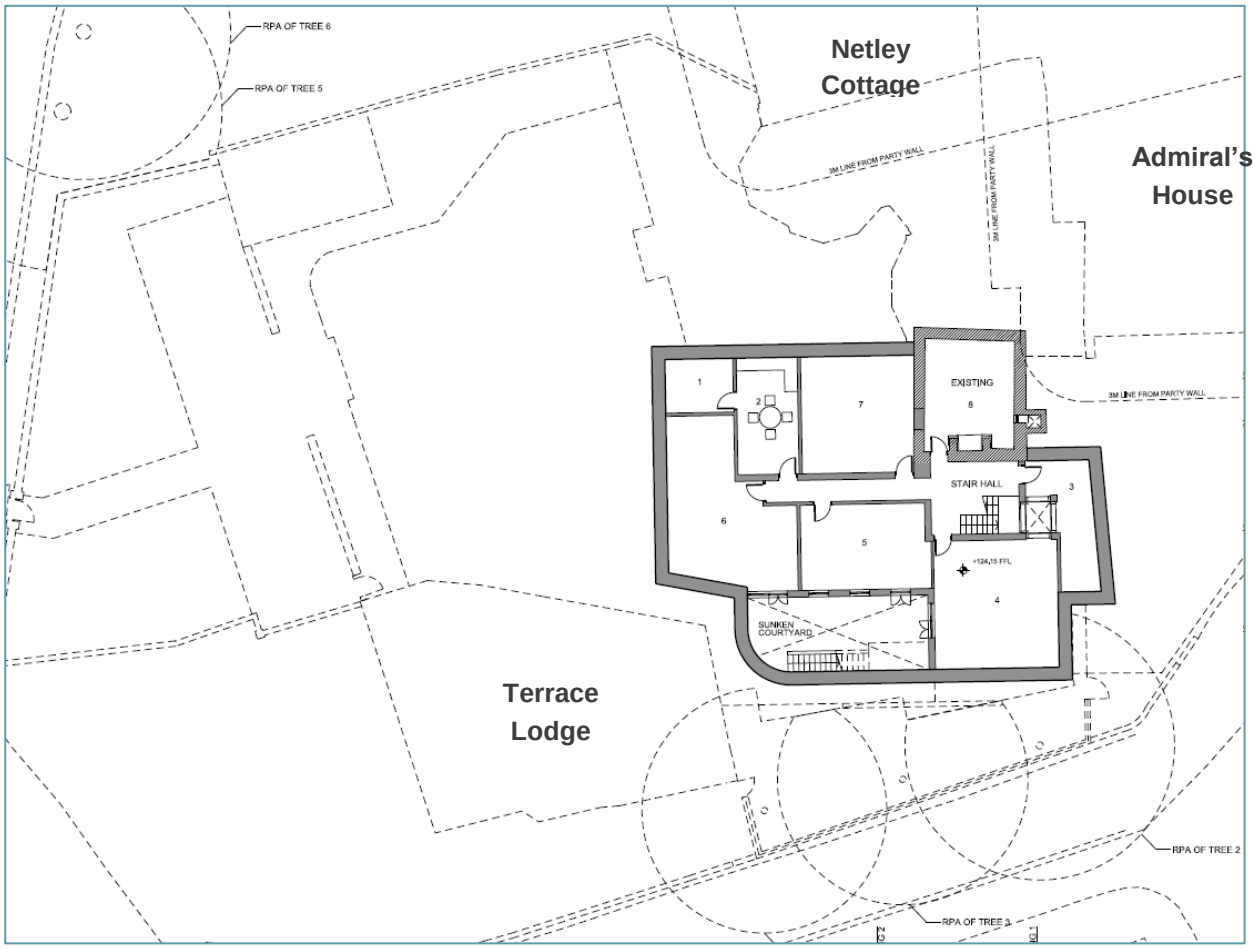

Figure 3.6: Proposed basement layout

Source: Design NA Architects (extract from plan dNA GLR 01 100, P1).

Key elements of this additional information are summarised in Table 3.1.

Table 3.1: Sources of additional information

Source	Comments
Envirocheck report	• This provides overall details of ground conditions in the area (Bagshot Beds outcropping at the site and within at least 250m in all directions); • Claygate layer (CLGB) below Bagshot Beds (BGS) – see BGS Geological Sheet N1 SE (Figure 3.7); • Small area of worked ground well to the north of the site, beyond Judges' Walk; • Old streams (starting at the edge of the Bagshot Beds) appear on the 1879 map; • No indication of any mining or ground stability issues in the area.
NSRI Soils Site Report	• Identifies Soil Type 3 (free draining permeable soils on soft sandstone substrates with relatively high permeability and high storage capacity); • Low ground movement potential.

Source	Comments
Walkover of site area	• The walkover survey confirmed that the site is on locally high ground, very near the top of a relatively narrow ridge. The upstream catchment is relatively small; • No local drainage issues were identified.
Ground investigation (Southern Testing and Ground Engineering)	• Initial ground investigation in May 2014 - **Southern Testing**, report J11827: – Single 15.45m shell and auger borehole at front of property, in front of garage; – Reported depth of 2.3m of made ground; – Bagshot formation below made ground, consisting of gravel and sandy gravel, sandy clay and clayey fine sand. Permeability varied between good and low; – Water initially observed at about 4.5m depth (123m). Monitoring gave a fairly steady depth of 3.8m (123.7m). This was considered to be perched water; – No water identified at a lower level; – Report includes discussion on basement construction and soil parameters. • Second ground investigation - Feb 2015 – **Ground Engineering Ltd.,** report C13390A. Includes details of the investigation, with discussion of ground conditions and comments on design and construction issues related to ground conditions: – 2 cable percussive boreholes (15m depth), window sample borehole (6m depth) and 3 inspection pits in rear garden; – Groundwater at both boreholes, with long-term monitoring – see Section 4.5.2; – Once below topsoil / made ground (1.2m to 2.8m) the Bagshot Beds extended the full depth of the investigations.
Other Geotechnical Information	• Members of the project team have been involved in other recent basement projects in the area, so already have some understanding of the local soils; • The Bagshot Formation (typically about 20m deep in this area) includes occasional thin layers of clay – likely to be responsible for local perched water; • The Claygate Member of the London Clay consists of transition layers of sand, silt and clay, with an overall transition from the dominant sand to the clay.
Utilities information	• Inquiries covered all relevant utilities. Many companies had no services in the area; • Only small scale / local services identified - nothing unusual / particularly significant; • LV cables in roads / footpaths around the property. No HV in the area; • Low pressure gas mains in roads / footpaths around the property; • Virgin Media cabling in roads / footpaths around the property; • London Underground – Northern Line about 60m below ground, 50m east of the site; • Network Rail – no lines / equipment in the vicinity; • BT – local underground services in roads / footpaths around the property; • Public sewers – 300mm combined sewer in Lower Terrace, 225mm sewer in Admiral's Walk, flowing to a large combined sewer in Frognal Rise, via Lower Terrace; • 4" water main in road / footpath in Admiral's Walk and three water mains in Lower Terrace (sizes unknown). Associated with nearby reservoir.

Source	Comments
Topographic Survey	• Site survey data, plus review of OS Terrain 50 data (licence-free topographic data); • Indicates a slope away from the property to the south (generally down Windmill Hill); • Rear garden slightly higher than the front garden of the property.
Trees	• Details of trees at and close to Grove Lodge and other properties are recorded. Advice on issues related to trees in and near the garden is presented in the Simon Jones Associates Arboricultural Implications Report (14042).
Structural Design Issues	• Michael Barclay Partnership has considered the structural engineering aspects of the basement design and construction, in their Structural Engineer's Report, reference 5954, June 2015. See Section 4.4.2 for comments. Report included as Appendix D.

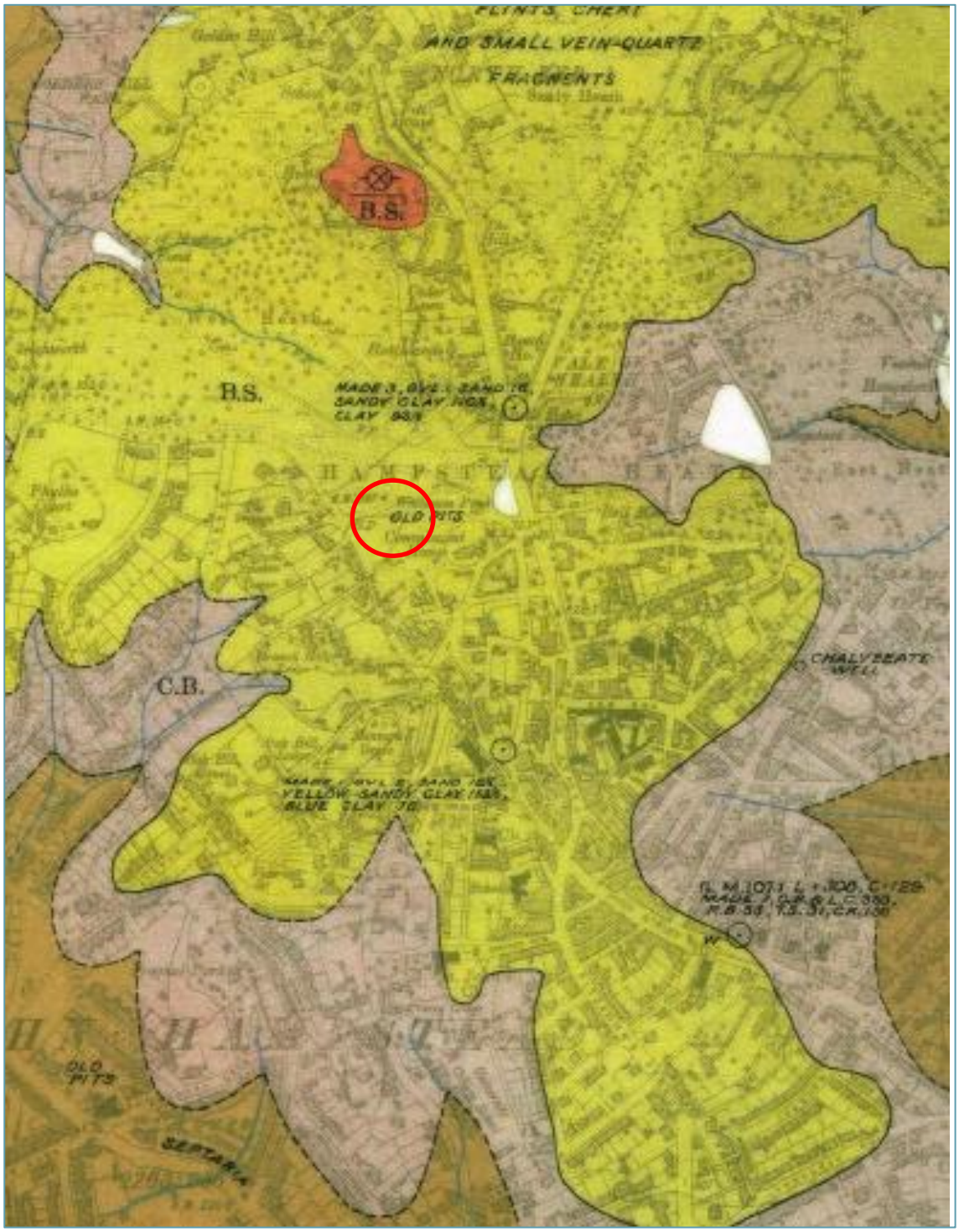

Figure 3.7: BGS Geological Sheet N1 S E (1:10,560)

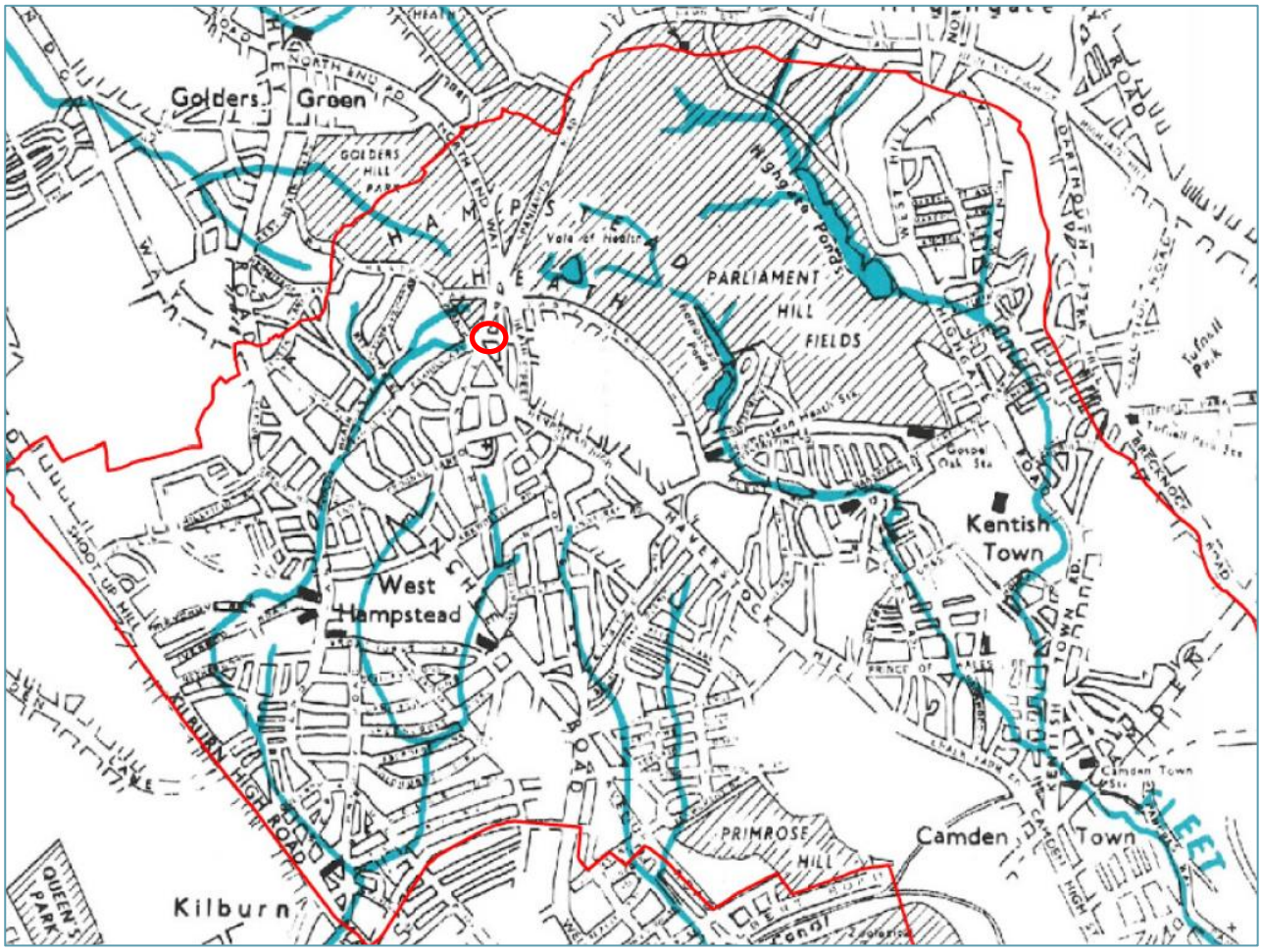

Figure 3.8: Extract from Lost Rivers of London

Source: Camden geological, hydrogeological and hydrological study: Guidance for subterranean development.

4. Basement Impact Assessment

4.1. Introduction

The construction of basements is increasingly popular and the London Borough of Camden (LBC) requires the preparation of a Basement Impact Assessment (BIA) as part of the planning documentation.

This report has been prepared in consideration of the following Camden planning documents:

- Development Policy **DP27**: "Basements and Lightwells";
- Core Strategy 14 (**CS14**) "Promoting high quality places and conserving our heritage";
- Planning Guidance Note **CPG4** "Basements and Lightwells" (revised September 2013);
- "Camden Geological, Hydrogeological and Hydrological Study" (Arup 2010). This provides a great deal of detail in support of CPG4.

This report demonstrates that the proposed underground development will not cause harm to the built and the natural environments and to local amenities, with particular consideration being given to the local water environment and to ground conditions. Detailed consideration of structural engineering issues related to the short term and long term stability of adjacent properties and the support of excavations is discussed in the Structural Engineer's Report, prepared by Michael Barclay Partnership (ref. 5954). This forms part of the overall BIA.

Thus, this document collates information provided by various disciplines, specifically covering the following three key areas identified in CPG4:

- Subterranean flow (groundwater);
- Land stability;
- Surface flow and flooding.

This document addresses all of the potential impacts identified in CPG4 under each of the key areas.

As such, this approach also covers the following three key issues of DP27:

1. Maintaining structural stability of buildings;
2. Avoiding adverse drainage / run-off / water environment impacts;
3. Avoiding cumulative structural stability issues and water environment impacts.

Whilst the other requirements of DP27 (d to k) are met these are covered in other sections of the planning documentation.

It is noted that LBC Camden is currently preparing a new local plan, which includes updated basement and heritage policies. However, the emerging Camden Local Plan currently has no status in the determination of this proposal as it is yet to be the subject of full consultation and Examination. We have had regard to the objectives of the emerging policies and associated text in assessment of this development proposal. These objectives are explained as being to protect the environment and adjoining neighbours' properties and buildings from a range of impacts. With particular reference to listed buildings; not to harm the fabric, structural integrity, layout, inter-relationships and hierarchy of spaces and architectural features.

4.2. Approach of the Basement Impact Assessment

4.2.1. CPG4 requirements

CPG4 states:

> *"The purpose of a BIA is to enable the Council to 'assess whether any predicted damage to neighbouring properties and the water environment is acceptable or can be satisfactorily ameliorated by the developer' as stated in DP27.3".*

It also describes a staged approach to carrying out BIAs, with the five stages being as follows:

- Stage 1: Screening;
- Stage 2: Scoping;
- Stage 3: Site investigation and study;
- Stage 4: Impact assessment;
- Stage 5: Review and decision making.

4.2.2. Stage 1: Screening

This initial stage seeks to identify any areas of concern that should be investigated. It is based on a number of flow charts and questions, with the responses to these determining whether a full BIA is required.

4.2.3. Stage 2: Scoping

During the scoping stage one seeks to identify potential impacts for each of the areas of concern identified during the screening stage. As part of this one may enter into pre-consultation discussions with the local authority and also liaise with local residents. Prior to this application there have been discussions with officers of Camden London Borough Council and detailed discussions with local residents, prior to and during the preparation of the BIA for the revised planning application.

4.2.4. Stage 3: Site investigation and study

The key element of this stage is to carry out site investigation work in order to gain an understanding of the conditions at the site and nearby. This typically includes a desk study, site walkover, field investigation – with trial pits, boreholes, etc., as appropriate – and subsequent monitoring, reporting and interpretation. The details / scale of this work will depend upon the site location, basement proposals, etc.

4.2.5. Stage 4: Impact assessment

This requires an evaluation of the implications of the proposed project, considering both the existing and future situations. It will often be necessary to include technical information and backup to the proposed design in order demonstrate that the consequences are acceptable and that the proposed mitigation measures – such as drainage, underpinning, piling, temporary works, monitoring, etc. - are suitable.

4.2.6. Stage 5: Review and decision making

In this stage Camden London Borough Council will carry out an audit of the BIA and proposals – often carried out by an independent external party. This review will feed into the decision as to whether the BIA and the basement proposals are considered acceptable.

4.2.7. Adopted approach

Several members of the project team have had significant previous experience in the design of basement developments and in preparing BIAs. Thus, the importance of the data collection – and in particular the site investigation work - was appreciated well in advance. Thus, this and much of the other data collection was carried out in the early stages of the project development, prior to HR Wallingford being commissioned to prepare a BIA. This included the provision of the two site investigation reports.

As a consequence of this initial work it was not appropriate to carry out and report on the BIA exactly in the format of the staged approach, as detailed in CPG4. Rather, the available information / supporting documentation would be outlined – see Section 3.4 – and the questions that are raised in the screening assessment in CPG4 (Stage 1) would be considered and commented on to a suitable level of detail. Where appropriate, supporting information from site investigations, survey work, etc. would be referred to and discussed in the impact assessment and review. This approach in effect combines Stages 2 to 4. Indeed, in CPG4 it is recognized that the stages are not always separate activities – for example, in paragraph 2.19 it

says "*When doing work for scoping stage, it is mostly likely you will have to carry out some works under Stage 3 of the BIA – Site investigation and study*".

Thus, when considering the key issues and the data obtained as part of this study, the information collected is described and reviewed and the key issues evaluated in the light of the details. The BIA covers all of the issues related to sub-terranean flow (groundwater), land stability and surface flow and flooding.

4.3. Subterranean flow (groundwater)

4.3.1. Summary of issues

It is important that the potential consequences of the underground development on groundwater flows in the immediate area and wider afield are considered. This is presented in Table 4.1, with reference to the questions raised in Figure 1 of CPG4.

Table 4.1: Subterranean (groundwater) issues

Ref.	Consideration	Comments
1a	Is the site located directly above an aquifer?	**Yes:** Camden considers all sites which do not outcrop with London Clay (LC) to be above an aquifer. The surface outcrop is the Bagshot Beds – the Upper Aquifer. EA mapping confirms this as an area of a minor aquifer. However, there are no groundwater protection issues. No impacts on the Bagshot Beds aquifer are expected – the basement does not extend into the aquifer - see 1b.
1b	Will the proposed basement extend beneath the water table surface?	**Possibly:** The first ground investigation indicated perched water at 123.7m AoD - a depth of 3.8m below ground level at BH1 at the front of the property (see Figure 4.1). This is a similar level to the deepest excavation level. The second ground investigation for the basement indicates a groundwater level of about 122.5m AoD (a depth of about 6m below ground level in the main garden). This is substantially lower than the lowest level of the proposed excavation in that area – approximately 123.65m AoD. The basement will not act as a barrier to the principal (lower) groundwater flow. However, the issue of the perched water table is considered in detail – see Section 4.3.2 and Appendix B for a discussion of this issue.
2	Is the site within 100m of a watercourse or potential spring line? (In the notes linked to this question, wells are included in this assessment.)	**Yes:** There is a well – reported to be 270 years old - located within the footprint of the adjacent Admiral's House. Whilst detailed information on this well is incomplete it is reported that typically the water level is about 8m down (approximately 118m AoD), with water entering its sides part way down and cascading to the

Ref.	Consideration	Comments
		bottom. This supports the reports of a perched water table at a higher level, with the well acting to connect this to the lower groundwater level. This well and the search for records of other wells is discussed in Section 4.3.2 and in Appendix B. No watercourses are marked on the geological map in the immediate vicinity of the site. The nearest watercourses on the BGS Geological Sheet N1 SE are over 300m away to the west, being near the outcrop of the Claygate Beds. They flow in a south-west direction – tributaries of the River Westbourne. Note: the "Lost Rivers of London" map (Figure 3.8) shows the streams originating slightly closer to the site. According to EA records reproduced in the Camden SFRA the nearest location of a groundwater flooding incident is in excess of 400m to the south of the site.
3	Is the site within the catchment of the pond chains on Hampstead Heath?	**No:** The area drains to the south and west and is not within any of the pond catchments. This is clear from Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (Arup).
4	Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	**Yes:** There will be a small overall increase in the total area of hard surfacing – a combination of the increased building roofs and the changes in paved area in the rear garden. However, this will be addressed through the use of soakaways. See Section 4.3.3 for further discussion.
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 drainage systems for the roofs and patio are to be reinstated. The additional area will be drained to soakaways and so will infiltrate into the ground – as existing. Thus, changes to flows discharged to the ground are not anticipated.
6	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	**No:** There are no relevant local ponds and the spring line is significantly downhill from the site. Whilst the Whitestone Pond (about 200m to the north) is at a higher elevation it is a lined pond and has no bearing on the groundwater regime in the Admiral's Walk area. Based on the BGS Geological Sheet N1 SE (1:10,560) the natural spring line is at / near the interface of the Claygate and Bagshot Beds, with the nearest outcrop being more than 300m away.

Source: Camden Planning Guidance: CPG4 – Basements and lightwells.

4.3.2. Question 1a, 1b, and 2: aquifer, water table and wells

This section covers a number of the issues raised from Table 4.1, because they are in practice inter-related. A fuller discussion of the issues raised is given in Appendix B, with this being a summary.

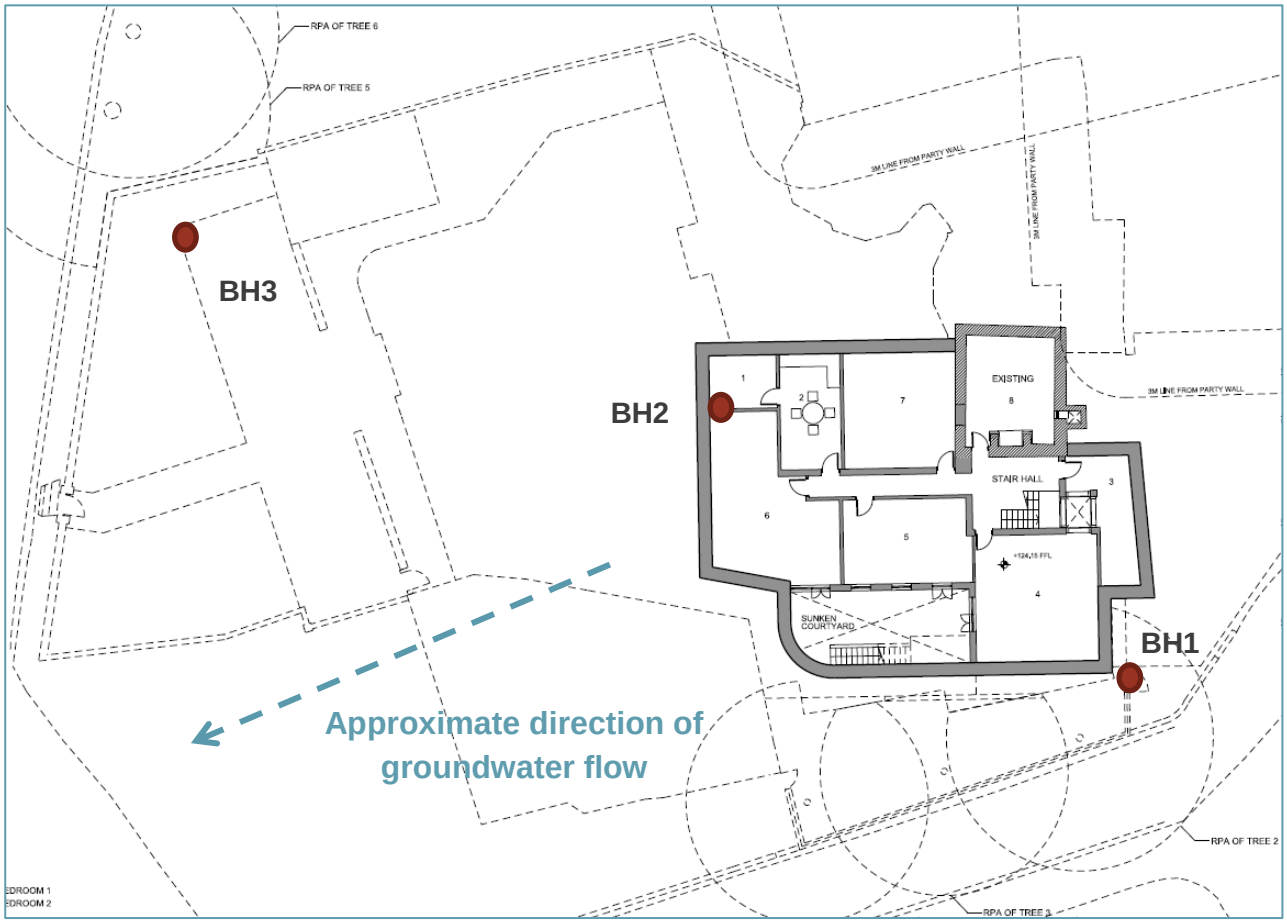

Figure 4.1: Borehole locations and basement plan

Source: Design NA Architects (extract from plan dNA GLR 01 100 P1).

Aquifer (Question 1a)

Based on the Camden definition the site lies directly above an aquifer. The EA reports the Bagshot formation as a secondary A aquifer – "*permeable layers capable of supporting water supplies at a local rather than strategic scale*" but considers that there are no groundwater source protection issues. The key consideration related to the aquifer concerns the groundwater level.

Water Table (Question 1b)

The elevation of the proposed basement relative to the local water table is particularly important, as this might have short-term impacts on the construction of the proposed works, the stability of adjacent ground, etc., as well as longer-term matters, such as groundwater levels and flows.

Wells (Question 2)

There is an old well located under the adjacent Admiral's House. The water levels within and close to this are important and so should be considered. Some details are given in Section A.2.2 of Appendix A.

There have also been a suggestion made by a local resident that there are sites of several other wells in the vicinity. Thus, records have been investigated to seek details of these. However, this review specifically identified only one local well. Information reviewed included:

- OS1:10,000 scale mapping;
- British Geological Survey (BGS) mapping and "Water Well" records;
- Envirocheck records – a well is depicted at Fenton House on a 1879 OS map, but on no other mapping;
- "Records of London Wells", by Barrow and Wills.

No details of the Fenton House well are available, including its location and whether it still exists. It is well to the south-east of Grove Lodge, a lot further away than the Admiral's House well. As such it is of little if any relevance and will not be affected by the proposals.

Whilst there is the famous Chalybeate Well in Well Walk, Hampstead, this is located approximately 0.5km east of the site.

Groundwater Summary

The issues of ground conditions and groundwater levels are covered in detail in Appendix B. Key points are as follows:

- **Three boreholes were drilled at the site** (one at the front, two in the rear garden, including one in the basement footprint and another very close). The 3 boreholes in close proximity give far more information than often occurs for proposed basements;
- **Bagshot Formation** was identified at all boreholes (sands with layers of clay, silt and flint gravels). It lies above the Claygate Member;
- The Bagshot Formation has **varying permeability**, with some layers of clay – low permeability. This can lead to areas of perched water;
- The **principal groundwater level** – of the order of **114m AoD** – is well below the basement slab level (approximately 123.65m AoD);
- There is also **perched water** - encountered at different levels;
- A **reduction in the perched water level was observed from east to west**;
- There was **little long-term variation in groundwater levels** observed at the boreholes. Small and quick reactions to rainfall were observed;
- At **BH1** (front of property, very close to basement) the **perched water (typically 123.74m AoD)** was observed as being marginally above the underside of the base of the basement slab;
- At **BH2** (rear garden in basement footprint) the **perched water table was considerably lower (122.6m AoD)**;
- **Detailed evidence related to the well was limited**. Reported levels and depths are approximations. However, the available information indicated perched water at one or more levels;
- **Low permeability material in the Bagshot Formation is punctured at the well**, causing water to drop several metres, to a water level estimated to be of the order of 118m AoD;
- **Local groundwater levels** at Admiral's House and Grove Lodge are therefore **influenced by the well**;
- **Detailed evidence of the basement swimming pool at Admiral's House was limited**. However, it is understood that during construction groundwater was encountered at a level of the order of 123.8m AoD;
- Based on all of the available information, even if **groundwater is encountered in the excavation** (base level of approximately 123.65m AoD) **the depth water in the excavation will be very shallow**;

- **The effects of the proposed basement on groundwater flows and levels are very small**;
- **In addition, the cumulative impacts of several basements** in a dispersed residential area such as this **are also considered to be small. The effects of the well are likely to be more significant.** See Section B 5.2, Appendix B, for a discussion of these issues;
- The proposed piling arrangement (CFA secant piles, with alternate long and short piles – see Appendix D) was selected to minimise any loss of groundwater conveyance at the basement. **Groundwater will be able to flow around the basement sides and below the shorter / between the longer piles**.

Groundwater Conclusions

There is a possibility that shallow groundwater may be encountered in the base of the excavation and this eventuality is being designed for. The construction approach for the basement takes the soil and potential groundwater conditions into account, with the proposed piling arrangement tailored to the site requirements. It is concluded that the proposed works will not have any significant impacts on groundwater levels or the flow of groundwater below and around the structure. Indeed, the effect of the existing well on the local groundwater regime is likely to be considerably greater.

4.3.3. Question 4: increase in hard surfacing

With the proposed works the footprint of the building and the associated roof area will increase slightly. However, much of this additional roof area is currently paved. The western edge of the patio area will be moved a small distance to the west and part of the main basement will be under the rear garden. The top of the slab will be at approximately 127.5m AoD and the reinstated garden surface about 1m above this. The increase in hard area equates to the area of lawn lost along the side of the patio. This change will mean that more rainwater is intercepted and there is a slight increase in runoff.

The existing Grove Lodge drainage system transfers both foul water from the property and runoff from the roof to the 225mm Thames Water combined sewer in Admiral's Walk. It is proposed to retain this drainage system as much as possible, although some changes to some of the pipework details will be required.

It is proposed that the additional contributing area is connected to soakaways, for infiltration into the ground. These will be constructed to the west of the house and in the vegetable garden area. This approach is applicable for this area – in the Camden SFRA the area is described as "highly compatible for infiltration SuDS". If from a practical point of view it is more appropriate to connect some of the additional area at the house to the Thames Water combined system then an equivalent existing area will be removed from the Thames Water system, such that there is no overall increase in the discharge to the public sewer.

With the provision of soakaways to take the runoff from the additional hard areas there will be no increase in the runoff to the Thames Water combined sewer. In addition, the amount of infiltration into the ground will be maintained. Thus the proposed basements will not affect the amount of water that infiltrates into and through the ground.

The section of basement under the rear garden will have a depth of reinstated soil of about 1m – double the minimum required depth of 0.5m, as stated in paragraph 2.66 of CPG4, equal to the current advisory depth and also equal to the required depth proposed in the emerging basement and lightwell policy A5.

4.3.4. Conclusions – subterranean flow

- Although the site is considered to be above an aquifer there are no groundwater protection issues.
- The proposed basement will not extend as far as the main water table. However, it will be at / near the perched water identified at BH1.
- CFA secant piles will be used, with alternate piles extending only a small distance below the basement slab level. This will allow groundwater to flow between them and to continue to flow under the structure, as well as around it. The impact on local groundwater levels will be negligible.
- Even if the local groundwater level is sometimes higher than expected, the scale of the basement relative to the areas available for groundwater flow is very small.
- In view of all of the above it is concluded that basement can be designed and built with no significant effects on the groundwater flow regime.
- There will be no cumulative impacts associated with this and with other local basements.
- The site is close to a well but a significant distance from the nearest watercourses, springs and the Hampstead Heath Ponds. The basement will have no significant impact on groundwater conditions at the well. Indeed, the well – which links perched water to a lower level – has a far more significant impact on the local groundwater regime.
- The additional runoff from the buildings will be accommodated through the use of soakaways. Flows to the Thames Water sewer will not increase and infiltration rates will be retained.

This section of the assessment has identified that with the proposed works there should be no significant issues related to groundwater flows.

4.4. Land stability

4.4.1. Summary of issues

Underground construction sometimes presents stability issues, particularly in areas of deep excavation, close to buildings / retaining walls and where there are steep slopes. Slope stability issues for the site and for the surrounding area are presented in Table 4.2, with reference to the questions raised in Figure 2 of CPG4.

Although there are several questions that have been given a “Yes” answer, in many cases there is an accompanying explanation, referring to appropriate information, such that no further review or explanation is required.

Table 4.2: Slope stability issues

Ref.	Consideration	Comments
1	Does the existing site include slopes, natural or manmade, greater than 7° (approx. 1 in 8)?	**Yes:** There is a small tree-lined bank along the southern edge of the site, adjacent to Admiral's Walk. This is also slightly higher than the Grove Lodge garden immediately to its north, with a short retaining wall. This wall is damaged in places and requires some reconstruction work. Whilst there are a few other small retaining walls there are no other areas of significant slopes greater than 7°at the site. This issue is discussed further in Section 4.4.2.
2	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7° (approx. 1 in 8)?	**No:** The proposed re-profiling of site ground levels will not change slopes at the property boundary to more than 7°.
3	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7° (approx. 1 in 8)?	**No:** There are no known areas with 7° slopes near the site.
4	Is the site within a wider hillside setting in which the general slope is greater than 7° (approx. 1 in 8)?	**No:** The average slope to the SSW is approx. 1 in 12 (5°). The average slope gradients to the NE and to the SE are considerably flatter. Slopes of less than 7° are confirmed on Figure 16 of the Camden Geological, Hydrogeological and Hydrological Study.
5	Is the London Clay the shallowest strata at the site?	**No:** Site investigations have confirmed that the Bagshot Beds are the shallowest strata (Southern Testing and Ground Engineering Ltd. reports).
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 trees are to be retained?	**Yes / Yes:** A detailed Arboricultural Implications Report was prepared by Simon Jones Associates (ref. 14042). This provides details of all the trees in the garden, the root protection areas and how they will be affected by the works. As stated in the Arboricultural Assessment Report, a total of 6 individual trees and a group of 3 trees will be removed from various parts of the garden. There will be minor root incursions for 5 trees. It is intended to repair the damaged wall adjacent to Admiral's Walk, which helps support the tree-lined bank. It is concluded that "*the arboricultural impact of this scheme is of negligible magnitude, and … the proposals comply with local and national planning policy guidance*". No further comments are considered necessary in this BIA.

Ref.	Consideration	Comments
7	Is there a history of seasonal shrink-swell subsidence in the local area, and / or evidence of such effects at the site?	**No:** Site-specific investigation confirmed that Bagshot Beds are the shallowest strata (Southern Testing and Ground Engineering Ltd. reports).
8	Is the site within 100m of a watercourse or potential spring line?	**Yes:** See response to Question 2 under Subterranean (ground water) screening.
9	Is the site within an area of previously worked ground?	**No:** There is no evidence of worked ground at the site. BGS Geological Sheet N1 S E (1:10,560) shows old sand pits to the north and worked ground well beyond Judge's Walk – about 200m away.
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 / Possibly:** Based on the EA's aquifer designations the site is considered to be on a Secondary A aquifer. This consists of "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*". Water level information from the borehole at the front of the property suggests the possibility of localised perched water, at more or less the foundation level of the basement. The principal groundwater level is substantially lower. See Section 4.3.2 and Appendix B for a discussion of the groundwater levels. This construction issue is considered in Section 10 of the Structural Engineer's Report, which forms part of this BIA and is included as Appendix D.
11	Is the site within 50m of Hampstead Heath Ponds?	**No:** See Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (Arup).
12	Is the site within 5m of a highway or pedestrian right of way? (this relates to critical infrastructure).	**Yes:** There are highways to the south and the west of the property (Admiral's Walk and Lower Terrace respectively). Details of local infrastructure have been obtained. There is some infrastructure within the adjacent roads, but nothing critical or particularly significant, has been identified, either within the site or in the surrounding area. The basement excavation is located sufficiently far from the highway for it not to be impacted. See Table 3.1 for utilities details.
13	Will the proposed development significantly increase the differential depth of foundations relative to neighbouring properties?	**Yes:** Several properties in the surrounding area have basements – normally single storey (see Appendix A). Foundations will typically be about 3m below ground. The differential foundation depth relative to Terrace Lodge

Ref.	Consideration	Comments
		will increase. However, it is proposed that the tops of the piles in that part of the basement are set at a higher level, at / above the existing Terrace Lodge wall foundation level. The existing wall will not require underpinning. Compared to the original proposals the basement layout has changed and so it is now significantly further from Admiral's House, which already has a large basement. Foundation depths will be similar. A CFA secant piling solution for the construction of the new basement has been chosen to minimise the risk of damage. It is intended that underpinning be limited to existing walls at Grove Lodge. Appropriate Party Wall notices will be served. Note: There has been careful consideration by the structural design team regarding the design and construction of the works, to ensure the stability of the existing structure, as well as adjacent walls and properties. See Section 4.4.2.
14	Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	**No:** Enquiries made with all statutory authorities including London Underground and Network Rail. The Northern Line runs about 60m below ground, approximately 50m east of the site.

Source: Camden Planning Guidance: CPG4 – Basements and lightwells.

4.4.2. Questions 1 and 13: slopes and structural / geotechnical considerations

MBP has considered appropriate arrangements for temporary and permanent works for the proposed basement. These issues are outlined in their Structural Engineer's Report – reproduced as Appendix D. The following text, from the Executive Summary, outlines the purpose and findings of the report:

> *"The purpose of this report is to demonstrate that the structural stability of the host building or its neighbouring buildings will not be put at risk by the proposed development.*
>
> *This report forms an integral part of the Basement Impact Assessment prepared by HR Wallingford and has been prepared with reference to London Borough of Camden (LBC) Planning Guidance for Basements and Light-wells (CPG 4). This report provides support to the Land Stability element of the BIA by including and/or referring to the following supporting evidence:*
>
> – *A desk study and detailed site investigation to confirm the ground and groundwater conditions around the property.*
> – *A detailed investigation of the foundations of the host building and those of the adjacent buildings.*
> – *A detailed assessment of ground movements and their impact on the host buildings and its neighbouring buildings.*
> – *A detailed construction sequence and methodology describing in detail how the host building and neighbouring buildings are to be protected in the temporary and permanent situations.*

– *A detailed monitoring and contingency plan which is sufficiently robust to enable mitigation to be effectively implemented in the event of agreed trigger values for vertical and horizontal movements being exceeded at agreed monitoring positions.*

This report concludes that the construction of the proposed basement will not have an adverse effect on the stability of the host building or its neighbouring properties."

It is proposed to use a combination of underpinning of some of the existing building at Grove Lodge and CFA secant piling around the new structure. As previously noted, there will be no discernible effect on any groundwater flows. Propping of the new walls will be provided during the construction period, as well as a movement monitoring strategy. Appropriate strategies are outlined in the Structural Engineer's Report.

A reinforced concrete "box" will be constructed inside the piling envelope, to act as the primary waterproof barrier, with a secondary internal system also proposed.

In addition, care will be taken when excavating close to the tree-lined bank on the southern edge of the property. This is a requirement related to the potential presence of roots from the trees. Requirements are discussed in the SJA Arboricultural Implications Report. In order to ensure its long-term stability it is intended to repair the damaged wall that forms the edge of this tree-lined bank, adjacent to Admiral's Walk.

In addition, the following should be noted:

- The use of alternating long and short (male and female) piles will allow groundwater to continue to flow under and around the basement structure;
- The alternate shorter piles will be long enough to ensure that flow paths are sufficient to avoid possible piping in the excavation.

An outline construction sequence is provided in Section 10 of the Structural Engineer's Report, indicating how the works will progress to ensure the ongoing stability of Grove Lodge, adjacent buildings and the basement.

4.4.3. Conclusions – land stability

- Natural ground slopes at the site and in the surrounding area are not steep. The introduction of the basements will not adversely affect slope stability.
- The site is far enough away from watercourses, potential spring lines, the Hampstead Heath ponds and areas of previous working for these issues not to be of a concern.
- The existing property is immediately adjacent to – and in part above - the construction site. This will be fully supported throughout the construction process.
- There may be a little if any requirement for dewatering during construction.
- The works have been designed to limit adverse effects on all trees. The arboricultural impact of the scheme is of negligible magnitude.
- The proposed design is to take full account of ground conditions, existing foundations and other structures. It will include temporary propping of the works and monitoring for movement.
- The structural stability of Grove Lodge itself and of the neighbouring properties will be maintained.

It is therefore concluded that the proposed basement works will not compromise the long-term structural stability of this or of adjoining listed buildings and that the existing fabric, the structural integrity and features of architectural / historic importance will be preserved. This is in accordance with requirements outlined in paragraph 27.11, of the Camden Development Policies.

Whilst this section of the assessment has identified the need to provide suitable supports to existing structures this issue is fully addressed – see Structural Engineer's Report.

4.5. Surface flow and flooding

4.5.1. Summary of issues

This section considers the possibility of localized surface water flooding, related to local topography and soil conditions. This primarily concerns flooding during periods of intense rainfall when the local drainage system may not be able to accommodate very high flow rates and large runoff volumes. This is presented in Table 4.3, with reference to the questions raised in Figure 3 of CPG4.

Table 4.3: Surface flow and flooding issues

Ref.	Consideration	Comments
1	Is the site within the catchment of the pond chains on Hampstead Heath?	**No:** See Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (Arup).
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:** Existing surfacing and drainage systems are to be replaced as existing / reinstated, with no overall changes to the flows discharged to sewers and to the ground.
3	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**Yes:** Increase in the total area of roof and paved surface. See comment to Question 4 in the Subterranean flow (groundwater) section.
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:** Equivalent area to still be connected to combined sewer. Runoff from additional hard areas to be discharged to ground, for local infiltration, as existing. No net change in flow characteristics.
5	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**No:** There are no proposed net changes to surface flows that discharge to the ground, to local drainage systems or watercourses. There will be no water quality changes.
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:** Whilst an area at risk of surface flooding is shown for Windmill Hill (Figure 15 of Camden Geological, Hydrogeological and Hydrological Study (flooded in 1975) it is west of the site. The topography means at it does not affect the property. There will be no changes to flood risks elsewhere. All sources of flood map show no anticipated risk of groundwater or fluvial flooding. There is no history of such flooding at the site.

Source: Camden Planning Guidance: CPG4 – Basements and lightwells.

4.5.2. Conclusions – drainage and flooding

- The site is not within the catchment of the Hampstead Heath ponds.
- Existing surfaces and drainage systems will be used / reinstated. There are no proposed changes that would affect the net amount or rate of runoff. Runoff from additional hard areas will be directed to soakaways or onto the garden.
- There will be no changes to the amount or quality of surface runoff from the site.
- The site is not in a flood risk area and there will be no risk of surface water flooding arising from this development.
- Thus, the proposed works will no adversely affect drainage and run-off at / from the site and will not cause damage to the water environment.

This section of the assessment has identified no significant issues related to surface flows and flooding.

5. BIA Pre-Application Audit

5.1. Introduction

In July 2015 release 3.0 of this BIA report, including the Structural Engineer's report and other associated documentation was subjected to an independent pre-application audit, carried out by Campbell Reith Consulting Engineers, on behalf of Camden Council. The audit was based on Camden Council's audit process for Basement Impact Assessments. Such an audit is a normal part of the planning process for basement planning applications.

5.2. Audit findings

The audit considered issues including:

- Suitability / qualifications of the authors;
- Soil conditions at the basement location;
- Groundwater conditions – principal groundwater level and perched water;
- Slope stability;
- Suitability of the proposed piled retaining wall system, linked to soil and groundwater conditions;
- Ground movement and building damage issues, including monitoring proposals;
- The locations of springs, wells and watercourses.

It was agreed by Campbell Reith that the local hydrology and hydrogeology in the area would not be affected by the proposed development and in particular that the well at the adjacent Admiral's House would not be impacted. It was considered that the monitoring proposals were acceptable.

It was requested that some additional ground movement and building damage assessment calculations be carried out, to confirm that the Burland damage category will not be exceeded. Further appropriate calculations can be carried out.

The pre-application audit is discussed in the Planning Statement.

6. Conclusions

The following are the key conclusions from the work carried out for the Basement Impact Assessment:

- The proposed design takes full account of groundwater levels. The proposed basement piling will allow groundwater flow under as well as around the basement structure;
- The Admiral's House well, which punctures the local perched water table, affects local groundwater conditions. However, the proposed works will not adversely affect groundwater flows and levels;
- It is proposed that existing surfaces and drainage systems will be reinstated, with no net changes to the volumes of runoff and to their discharge rates to the Thames Water system;
- Areas of additional runoff will be served by soakaways, with no net change of infiltration to the ground;
- There will be no changes to the flood risks at the site or experienced elsewhere;
- There are no issues anticipated with underground services running through or close to the site;
- There are no slope stability issues of concern;
- The tree specialist has advised that although six individual trees and a group of three trees are to be removed there are no significant issues, with the proposed 11 new trees mitigating the removals. Incursions into root protection areas of five trees are minor;
- The proposed design takes full account of existing foundations and of other structures. It will include CFA secant piling around the basement wall, temporary propping and monitoring for movement;
- There are no adverse geological or hydrological impacts. This is true for the individual basement and when considered in conjunction with other basements in the area – cumulative effects;
- The proposed works will not compromise the long-term structural stability of this or other listed buildings. The structural integrity and features of architectural / historic importance will be preserved.

In carrying out this BIA we have also reviewed the proposals in the light of emerging Policy A5 "Basements and Lightwells" of the draft Local Plan, and have concluded that the proposals are in line with the principles of this emerging policy.

Release 3.0 of this BIA report was subjected to an independent pre-application audit by Campbell Reith, on behalf of Camden Council. It was agreed that the local hydrology and hydrogeology would not be affected by the proposals and that the nearby well at Admiral's House would not be impacted.

This latest BIA, with the associated Structural Engineer's Report, will also be subject to a detailed verification and audit process - commissioned by Camden and carried out by a suitably qualified and independent external party. The review will form part of the final stage of the Camden BIA decision-making process.

It is concluded that the proposed basement meets the relevant requirements of DP27 and CS14 and should be approved with respect to CPG4.

Appendices

A. Basements at nearby properties

A.1. Summary of basements

Although there are basements at a number of nearby properties it is difficult to obtain details such as depths, extents, ages, construction information, etc. The following information has been obtained primarily from local knowledge and from searches of online planning applications, accessed via the Borough of Camden website.

A.1.1. Admiral's Walk

- Broadside – no records of a basement;
- Fleet House – existing single storey basement, but the property is to be rebuilt shortly, with a substantially increased area of basement – see Section A.2.1;
- Terrace Lodge – no records of a basement;
- Admiral's House – single storey basement under the whole of the main house, plus an underground swimming pool – see Section A.2.2.

A.1.2. Upper Terrace

- 1 Upper Terrace – has a single storey basement covering the building footprint;
- Highview House, 2 Upper Terrace – has a single storey basement covering the building footprint;
- 3 Upper Terrace – has a single storey basement covering the building footprint;
- Upper Terrace Lodge, 4 Upper Terrace – has an existing single storey basement. A new (deeper) one is currently under construction;
- The Priory, 5 Upper Terrace – has a basement;
- Grove End, Upper Terrace – has a basement;
- Upper Terrace House – no records of a basement.

A.1.3. Windmill Hill

- Capo Di Monte, Windmill Hill – single storey basement, with a planning application including a basement extension recently approved;
- Willow Cottage – no records of a basement;
- Windmill House – has a basement;
- Volta House – has a basement;
- Bolton House – has a basement;
- 2 Windmill Hill – has a basement;
- 2a Windmill Hill – has a basement;
- 3 Windmill Hill – has a basement;

- 6 Windmill Hill – has a basement;
- Fenton House, Windmill Hill / Hampstead Grove – has a basement.

A.1.4. Lower Terrace

- Summit Lodge (Hawthorne House) – has a large basement car park and multiple basement swimming pools;
- 1 Lower Terrace – no records of a basement;
- 2 Lower Terrace – has a basement;
- 3 Lower Terrace – has a basement;
- Fountain House, 4 Lower Terrace – has a basement;
- Netley Cottage, 10 Lower Terrace – no records of a basement.

A.1.5. Hampstead Grove

- 6 Hampstead Grove – has a basement;
- 10 Hampstead Grove – has a basement;
- 26 Hampstead Grove – has a basement;
- 40 Hampstead Grove – planning permission granted for a basement;
- 42 Hampstead Grove – planning permission granted for a basement.

A.1.6. Holly Bush Hill

- Romney's House, 4 – 5 Holly Bush Hill – has a basement;
- 2 Holly Bush Hill has a basement;
- 3 Holly Bush Hill has a basement.

Whilst many of the properties are in the vicinity of Grove Lodge others are some distance away – some on higher ground to the north and east and some on lower ground to the south and west.

Whilst there are many basements in the area, the density and layout of the housing means that they are well spread out. They generally have only one storey, with the underside of the construction likely to be of the order of 3m below ground. With observed ground water levels generally being at or lower than this depth the basements individually and collectively have very little impact on groundwater flows.

A.2. Local basement details

A.2.1. Fleet House

Fleet House is located on the opposite (southern) side of Admiral's Walk and is a two storey detached house dating from the 1950s. It had a basement added in the 1990s. Permission has recently been granted for the demolition of the property and for the construction of a new home in its place. The new building will be substantially larger and will have a bigger basement. It is understood that work is due to commence on site relatively soon. Some details of the existing and proposed properties and the site, obtained from the planning application details are as follows:

- Ground level (Admiral's Walk): approximately 125.7m AoD;
- Principal groundwater level: approximately 114m AoD;
- Existing basement floor level: 122.58m AoD (3.1m below ground level);
- Existing basement gross external area: 88m^2;
- Proposed basement floor level: 121.97m AoD (3.7m below ground level);
- Underside of basement slab: approximately 4m below ground level;
- Proposed basement gross external area: 181m^2.

Thus, the proposed basement is considerably bigger than the existing one, as well as being about 0.6m deeper.

Ground investigation work for this re-development included two boreholes. The associated SI report indicates that there are similar ground conditions to those at Grove Lodge – which would be expected due to the close proximity. A depth of up to 4.4m of made ground was reported, followed by Bagshot Formation, down to a depth of about 17m to 20.5m. Groundwater was encountered at approximately 11m to 12m below ground (114m AoD), as well as there being perched water at 3m to 4m below ground. This is at / close to the interface of the made ground and the Bagshot Formation.

As well as there being uncertainty / variability in the composition of the made ground it is important to recognise that layers of low permeability clay are common within the Bagshot Formation. Thus, there can be areas of locally perched water.

A.2.2. Admiral's House

This building, which adjoins Grove Lodge, has a multi-roomed basement, which includes access to a well – reported to be 270 years old – which was formerly outside of the property but is now within the building footprint - as a result of a previous building extension.

Photographs accompanying a previous planning application for Admiral's House show a brickwork collar at the top of the well, such that this is raised slightly above the basement floor level.

Four figures – from previous planning applications for work at Admiral's House - are reproduced as Figure A.1 to Figure A.4.

Based on information from these figures and from the topographic survey and from photographic evidence, the top of the brickwork collar for the well has been estimated to be at approximately 126.1m AoD. This was determined as follows:

> **Admiral's House Ground Floor Level** - estimated to be approximately 128.8m AoD - based on a ground level of 127.47m AoD at the Grove Lodge gate, the bottom of the Admiral's House steps being about 0.4m higher than this and the Admiral's House front steps being about 0.9m high. This has used survey and historical photographic evidence.
>
> **Top of Well** – estimated to be 126.1m AoD – based on plans of Admiral's House – from previous planning applications - indicating that the basement floor is approximately 2.75m below the ground floor level and the brick collar being about 0.1m above the basement floor.
>
> (Note: some of the values used in these calculations are estimated, some of the data is old and it is recognised that there may have been changes to the top of the well collar since the dates of the

records. Thus, it is anticipated that the suggested top level of the well is indicative, rather than absolutely correct).

It has been reported by an eye-witness and is also stated in a consultation response to the first planning application, that water enters through the side of the well part way down, falling to a significantly lower level. This suggests that there is a perched water table, that was punctured by the well. Thus, the well transfers water directly from an area of perched water to the lower principal ground water level. The initial information provided was that water entered at about 5m down (approximately 121m AoD) and that the standing water was at a depth of about 8m (118m AoD).

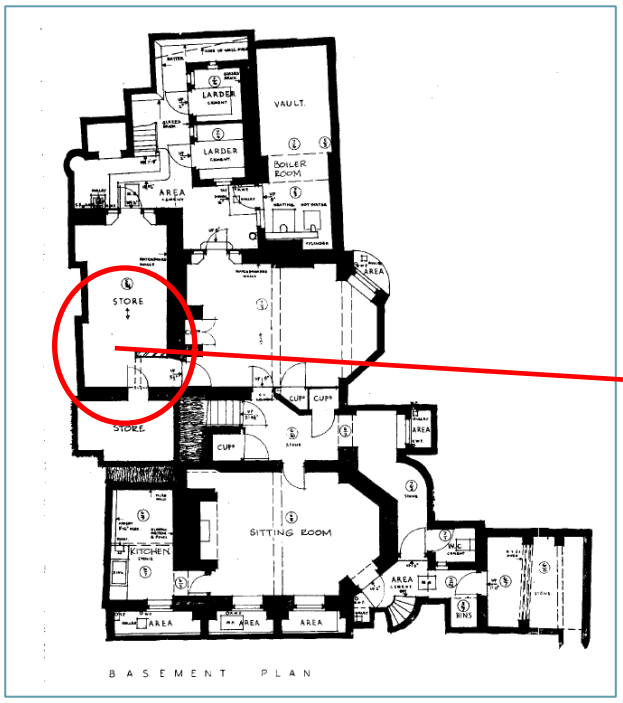

Figure A.1: Admiral's House – basement plan 1

Source: Planning appl^n. CTP/D6/13/3/HB1386 (1976).

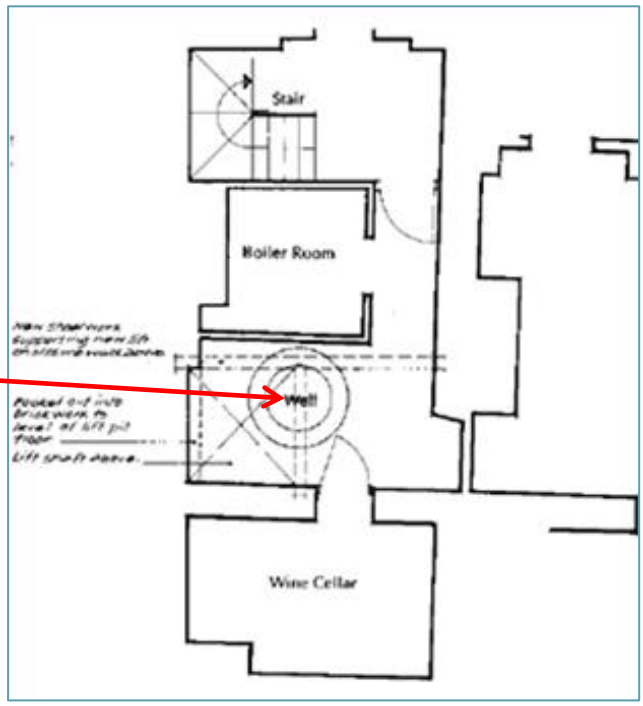

Figure A.2: Admiral's House – basement plan 2

Source: Planning appl^n. PWX0103260 (2001).

In a separate consultation response prepared by consultants on behalf of the owner of Admiral's House, it is stated that the standing water level in the well on 20/03/2015 was at a depth of about 8m (118m AoD). This is the same as previously noted. The total well depth was advised to be about 9.3m.

Whilst some depths are reported with respect to the level(s) of water flowing into the well and cascading down it, the details are in fact unclear. It may be that there is water coming in at more than 1 level.

The observed perched water level in BH1 is equivalent to a depth of about 2.5m down from the top of the well.

It has also been advised that there is a basement swimming pool at Admiral's House, under part of the garden behind the property (planning permission granted in 1988). This required a basement-type of structure to be constructed. Based on drawings from the planning application - reproduced as Figure A.5 and Figure A.6 - it would appear that the pool itself is about 10m long, 3.5m wide and 1.5m deep.

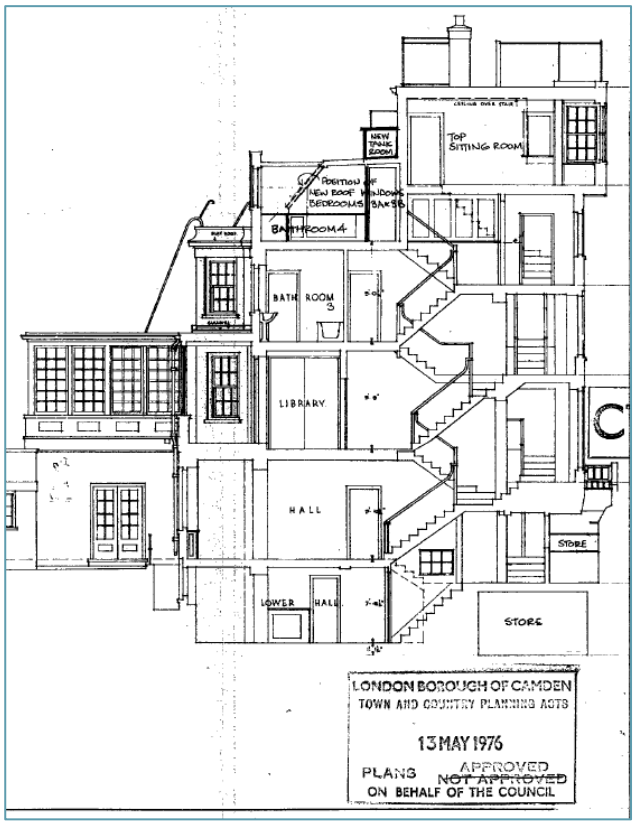

Figure A.3: Admiral's House – section 1

Source: Planning appl^n. CTP/D6/13/3/HB1386 (1976).

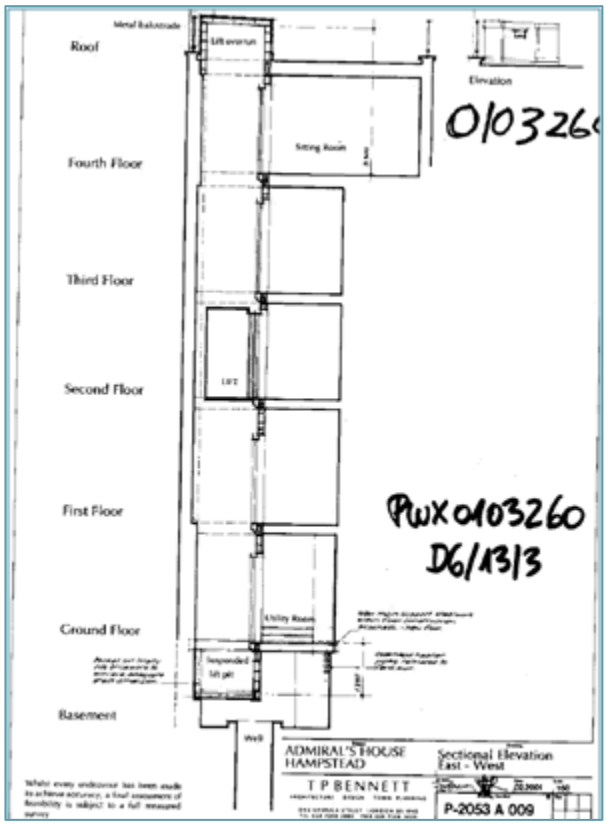

Figure A.4: Admiral's House – section 2

Source: Planning appl^n. PWX0103260 (2001).

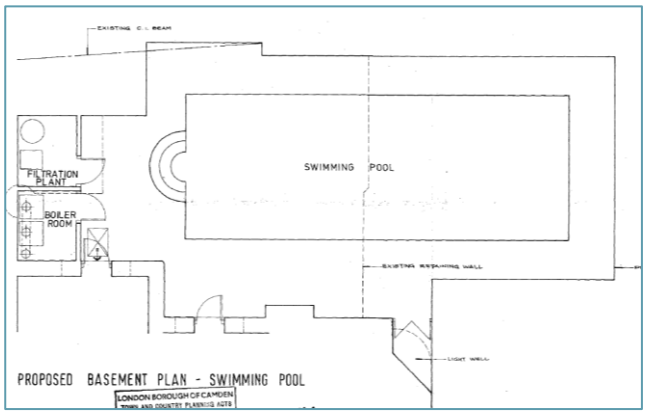

Figure A.5: Basement pool – plan view

Source: Planning appl^n. HB/8770402 (1987).

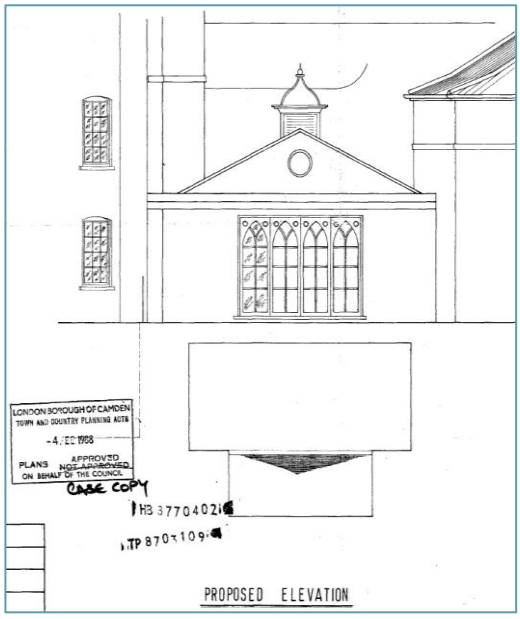

Figure A.6: Basement pool - elevation

Source: Planning appl^n. HB/8770402 (1987).

It has been reported that groundwater was encountered during the construction of the swimming pool. It is not clear whether or not this was expected. This might occur if there was insufficient ground investigation for the swimming pool. It would seem that the water could not readily be managed and that as a consequence the base thickness was greater than originally intended and the pool depth limited to 1.5m. A comment has also been made concerning difficulties in draining down the pool – presumably due to concerns about possible uplift forces associated with the groundwater.

We have estimated that the underside of the slab for the swimming pool is at a maximum level of the order of 123.6m, or lower. This is 2.5m or more below the top of the well and is at a similar level to the base of the proposed Grove Lodge basement structure (123.65m AoD). If correct these levels would indicate that the uplift issue for the swimming pool is not as serious as suggested.

This estimate is based on an assumed ground level of 128.5m AoD in the rear garden, a roof slab / above ground surfacing thickness of 0.4m, a minimum room height above the pool top water level of 2.5m, a swimming pool water depth of 1.5m – advised by the owner - and a base slab depth of 0.5m. In practice one or more of these figures is likely to be higher, giving a lower base level.

B. Ground conditions, ground water levels and basement design principles

B.1. Introduction

Information in this appendix relates to Question 1b - water table issues – in the subterranean flow section of the BIA (Section 4.3). It draws on information from various sources, including the two site investigations and reported information about the Admiral's House well.

B.2. Overview of geological sequence

An overview of the site geology, based on geotechnical reports and the site investigation findings for the area is as follows:

Made Ground: Ranging between 1.2m and 2.3m at the site, and up to 4.4 m at the adjacent Fleet House.

Bagshot Formation: Fine sands with occasional layers of clay, silt and local beds of flint gravels, typically 30m to 45m thick, with varying permeabilities. Locally perched water is widespread and is referred to in the Camden Geological, Hydrogeological and Hydrological Study, prepared by Arup. The Bagshot formation was identified at all site boreholes, with some clay layers (low permeabilities) encountered. Overall a free draining material.

Claygate Member: Sandy transition layers at the top of the London Clay, containing layers of sand and clay. Outcrops of this are observed approximately 300m to the south-east and the south-west of the site. Claygate was not reported at BH1, but was noted at BH2 and BH3 (approximately 7m below ground). Bearing in mind the variability of the Bagshot Formation this difference may be explained by different interpretations of similar materials. Spatial varying permeability.

London Clay: A stiff fissured clay, about 100m thick in this area. Outcrops are observed approximately 600m to the south-east and the south-west of the site. Not encountered at any of the boreholes.

An extract from a plan from the 2014 Camden Strategic Flood Risk Assessment report, depicting the extents of the bedrock – as defined by the BGS - is shown in Figure B.1. The Bagshot Formation is shown in light blue, the Claygate Member in yellow and the London Clay in green.

B.3. Southern Testing Site Investigation

During the first site investigation at BH1 (15m depth belwo ground level) at the front of the property, adjacent to the basement site (site work May 2014) groundwater, was encountered. The initial strike was between 4.5m and 5.5m, with standing water recorded at about 4.5m. This water – within the anticipated area of the bottom of the basement floor slab - was monitored, with data available from 10/6/2014 to 6/5/2015 – an 11 month period. This showed a typical groundwater level of 123.74m AoD - a depth of 3.76m. No other water strikes were identified, but it was noted that material became damp in the 13m to 15m depth range (112.5m AoD to 114.5m AoD).

The locations of this and the two boreholes from the second ground investigation are given on Figure B.2.

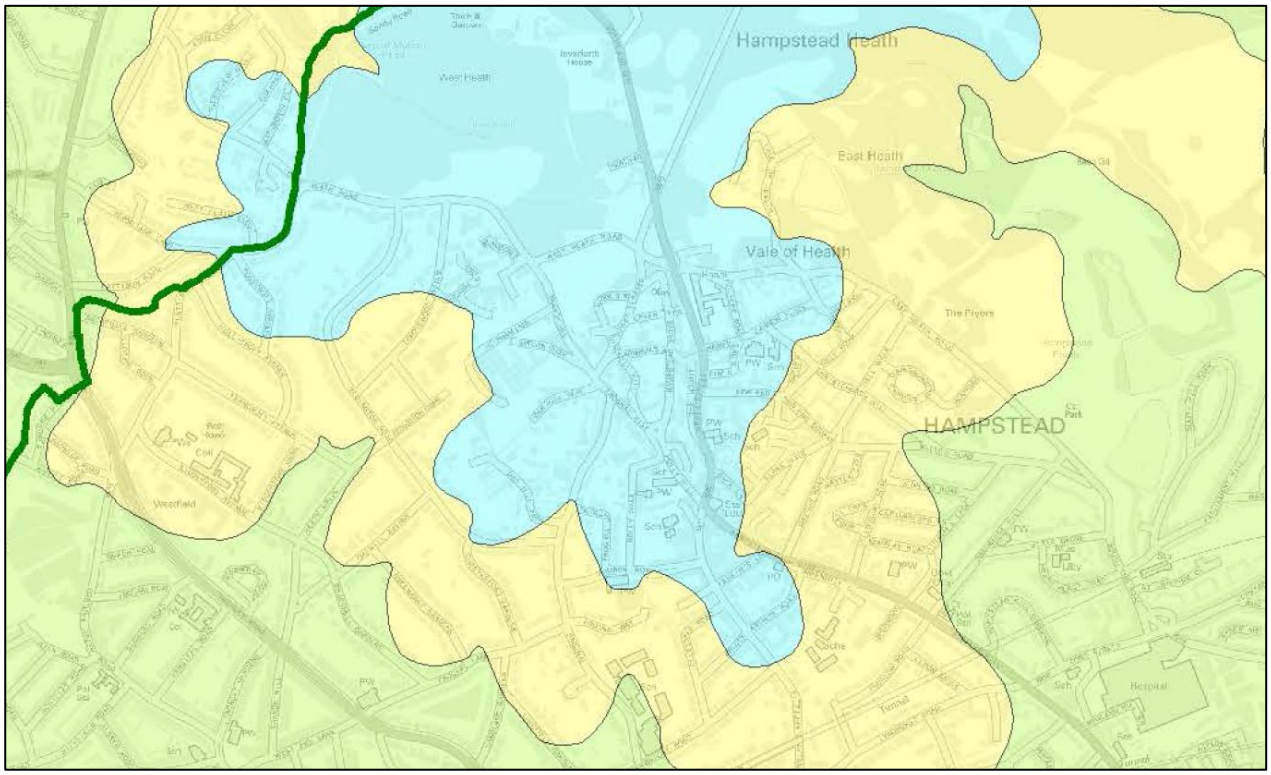

Figure B.1: Local bedrock

Source: BGS data depicted in the Camden Strategic Flood Risk Assessment report.

The water level at BH1 is shown in Figure B.3, along with a record of the daily rainfall depth recorded at the NW3 amateur weather station located on the southern edge of Hampstead Heath, about 1.7km to the east.

Whilst there are observed variations in the groundwater level these are relatively small, with a maximum range of 0.2m over the 11 month period. Depths can be seen to broadly respond to the rainfall record, with some noticeable increases in depth occurring very soon after periods of high rainfall depth. This quick response is consistent with a small contributing area and a relatively high soil permeability. The groundwater level drops gradually during dry periods.

There are step changes in the recorded level on two occasions (22/10/14 and 26/11/14). One was a decrease of about 0.05m and the other an increase of about 0.07m. These coincided with occasions when the borehole was visited and the sensor removed, at the start and finish of the second ground investigation. It is likely that it was replaced at a slightly different level. Relative to the initial readings the observed data for this period is a little low and after 26/11/14 it is a little high. However, the differences are very small and are not significant to the overall scheme.

In their site investigation report Southern Testing indicates that this observed water is likely to be perched water. Indeed, such conditions have been encountered at another nearby basement site in the area (Upper Terrace).

The base of the basement excavation is at about 123.65m AoD – just below the peak level of recorded water.

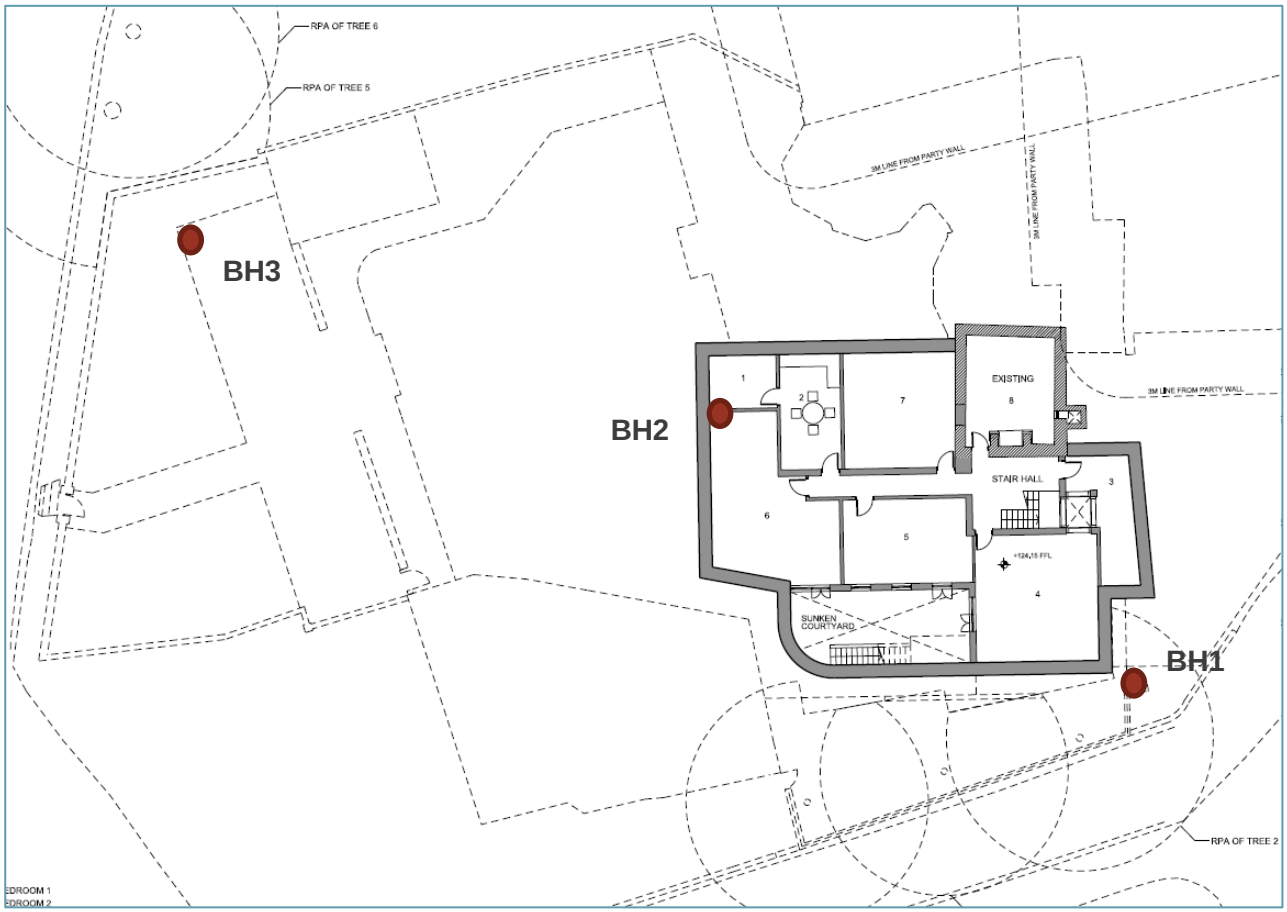

Figure B.2: Borehole locations and basement plan

Source: Design NA Architects (extract from plan dNA GLR 01 100, P1).

B.4. Ground Engineering Site Investigation

B.4.1. Borehole 2

BH2 (from the second site investigation in September 2014) was 15m deep and only about 20m from BH1– being in the main lawn behind the property and within the footprint of the main new basement. The principal water table was encountered at a depth of about 14.5m (a level of about 114m AoD). In addition, perched water was encountered and recorded at BH2 at a depth of about 6.0m below ground level, with fluctuations of no more than 0.2m either side of this. This gives a typical perched water level of about 122.6m – see Figure B.4.

Water levels in BH2 were recorded for a seven week period in October and November, and were also checked on a few subsequent occasions. The BH2 level on 10th February 2015 was 122.4m AoD – well within the range previously recorded, and slightly below the average level.

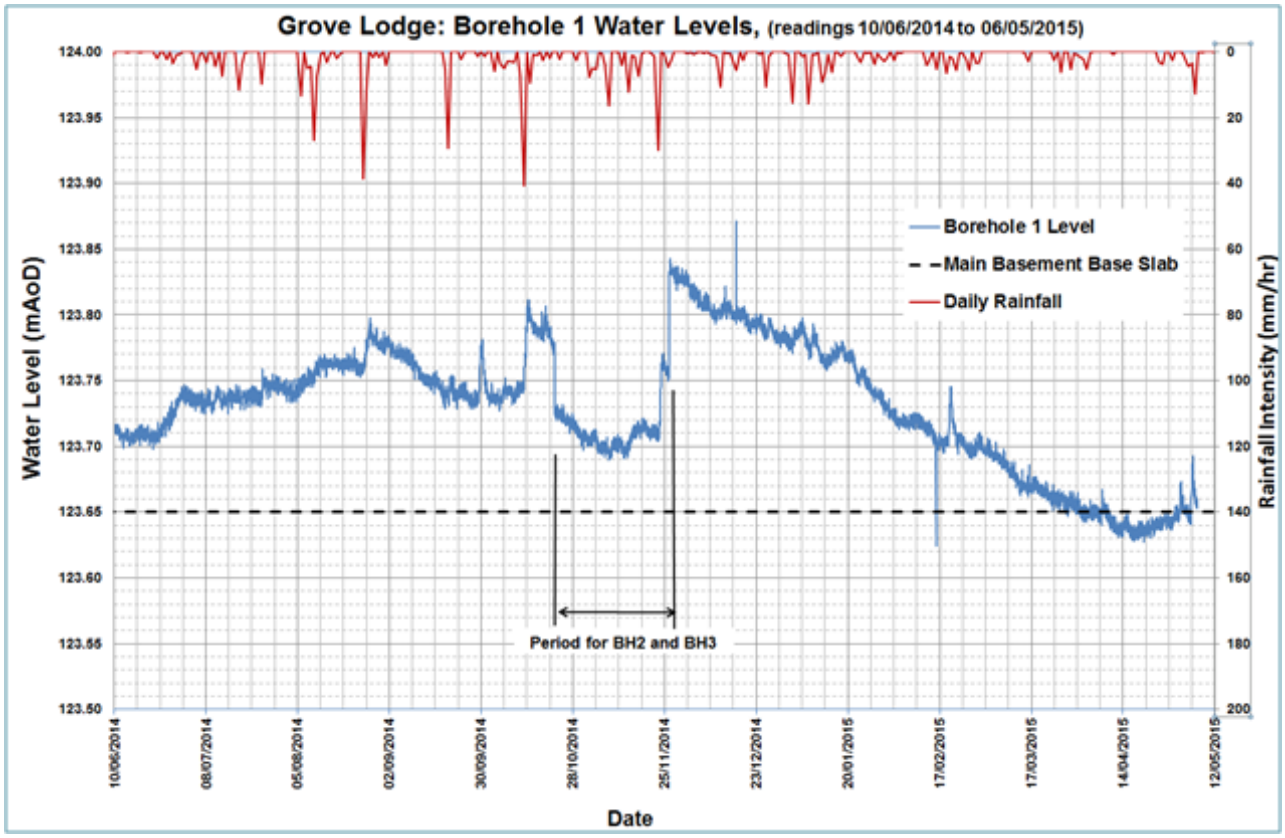

Figure B.3: Groundwater levels – borehole 1

Source: Data from Southern Testing.

B.4.2. Borehole 3

BH3 (also from the second site investigation) was also about 15m deep and was about 40m from BH1– being in the vegetable garden near the far end of the rear garden. Again, perched water was encountered and monitored over a 5 week period. The average recorded groundwater depth was 6.9m below ground, with similar fluctuations to those at BH2. With a higher ground elevation the average perched water level at BH3 was about 122.2m AoD. It was consistently about 0.3m below the level at BH2. This borehole stopped at a level of about 114m AoD, which is the level that the principal groundwater table was identified at BH2. It is also the level that it was encountered in the boreholes at Fleet House – see Section A.2.1 of Appendix A.

Comparison of these groundwater levels suggests a local groundwater flow with a westerly component. This is entirely consistent with our understanding of the local hydrogeology and topography. The BH3 level on 10th February 2015 was 122.14m AoD – again, well within the range previously recorded, and slightly below the average level.

As with BH1 a quick but limited response to rainfall is observed at these two sites. This can be seen on Figure B.4.

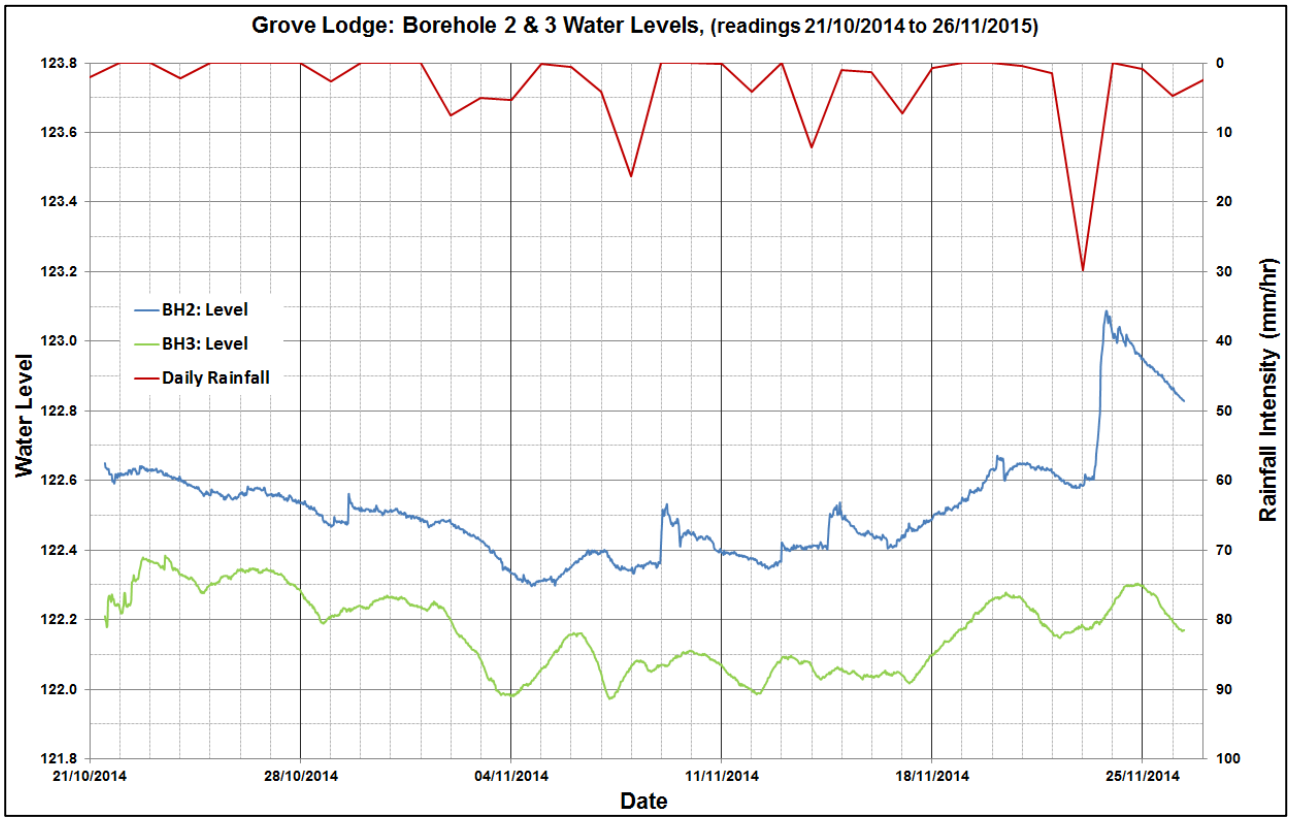

Figure B.4: Groundwater levels – boreholes 2 and 3

Source: Data from Ground Engineering Ltd.

B.4.3. Admiral's House well and swimming pool

During the consultation stage of the previous planning application some information on a well in the basement of the adjacent Admiral's House emerged – see Section A.2.2 of Appendix A.

Discussion on this was included in a planning response prepared by consultants on behalf of the owner of Admiral's House. Issues raised in the response have been considered and where appropriate are addressed in this document. Information is also provided in the Consultation Statement, prepared by GL Hearn. In addition, certain individual responses to experts are to be provided.

Information on this well is given in Appendix A and is summarised as follows:

- Estimated top of the well about 126.1m AoD;
- Well depth of about 9.3m, from the collar in the basement;
- Standing water reported to be at a depth of about 8m (of the order of 118m AoD). The owner advised that it is sometimes higher. It is important to note that no measurements of the groundwater level in the well relative to datum have been carried out and that some assumptions were required to reach the estimated 118m AoD figure. This value should therefore be treated as being an estimate, and not as an accurate level;
- Water cascades down the well – from an estimated depth of 2.0m to 2.5m – although the meaning of some of the description of this was unclear;

- The local ground water level (perched) is estimated to be between 124.9m AoD and 124.4m AoD, based on reported 2.0m to 2.5m depths. Again, these are not necessarily accurate figures.

There is limited information available on the swimming pool – see Section A.2.2 in Appendix A. However, it would appear that groundwater was encountered at a level of the order of 123.8m AoD.

B.5. Discussion of groundwater levels

B.5.1. Summary of observations

All of the available evidence points to the principal groundwater level being many metres below the bottom of the basement slab construction. However, there is also evidence of perched water - possibly at more than one level. There has been perched water observed at BH1 just above the base of the slab. However, at BH2 the perched water level is about 1m lower. Thus, there is a reduction in the perched water level as one moves from east to west. Based on the available information, if groundwater is encountered at the base of the excavation it is likely to be shallow.

The limited information available regarding groundwater levels at the Admiral's Walk well and the swimming pool is consistent with the borehole information obtained during the two site investigation contracts for Grove Lodge and for Fleet House. Local groundwater levels at Admiral's House and Grove Lodge are influenced by the well, which has punctured the perched water and provides a mechanism to discharge it to a lower level.

An indicative section from BH3, to BH2 and then BH1 is given as Figure B.5. This depicts the approximate existing ground levels and the typical recorded levels of perched water (linked by a dashed line for clarity, but it is recognised that in practice this is indicative only, with the actual levels depending on the local soil conditions, rainfall, etc.).

The approximate level of water entering the side of the well is also shown on Figure B.5. This location is set back 15m to 20m from the line of the section, and thus one would normally anticipate a higher groundwater level at the well.

B.5.2. Effects of basements on groundwater flows, including cumulative impacts

As discussed in paragraphs 168 to 174 of the Camden Geological, Hydrogeological and Hydrological Study, prepared by Arup, there are potential impacts on local groundwater levels from the construction of individual basements. There can also be cumulative impacts if there are a large number of basements in close proximity, providing a substantial barrier to groundwater flows.

However, it is also stated that the loss of groundwater flow capacity is normally small for individual basements, being significantly less than the reduction in the area of the flow path. There will also be an associated increase in the groundwater level upstream of the basement and a decrease in level at the downstream side. However, such changes will be small and very local in nature.

It is also important to recognise that such changes will only occur if there is a restriction to the groundwater flow. In practice the majority of the basements will be relatively shallow, being at / above the area of groundwater flow. They will therefore not cause an obstruction at all. Even if a basement does extend below the groundwater level the extent of the obstruction will normally be very small – both in terms of its depth and its plan area.

Whilst the proposed basement might cause a very small local increase in the groundwater level to the immediate north and east of the Grove Lodge basement this will have little or no effect at other properties in the area. Indeed, it should be recognised that the presence of the Admiral's House well, which allows groundwater to cascade from one level down to another, has a more significant impact on groundwater levels in the immediate area.

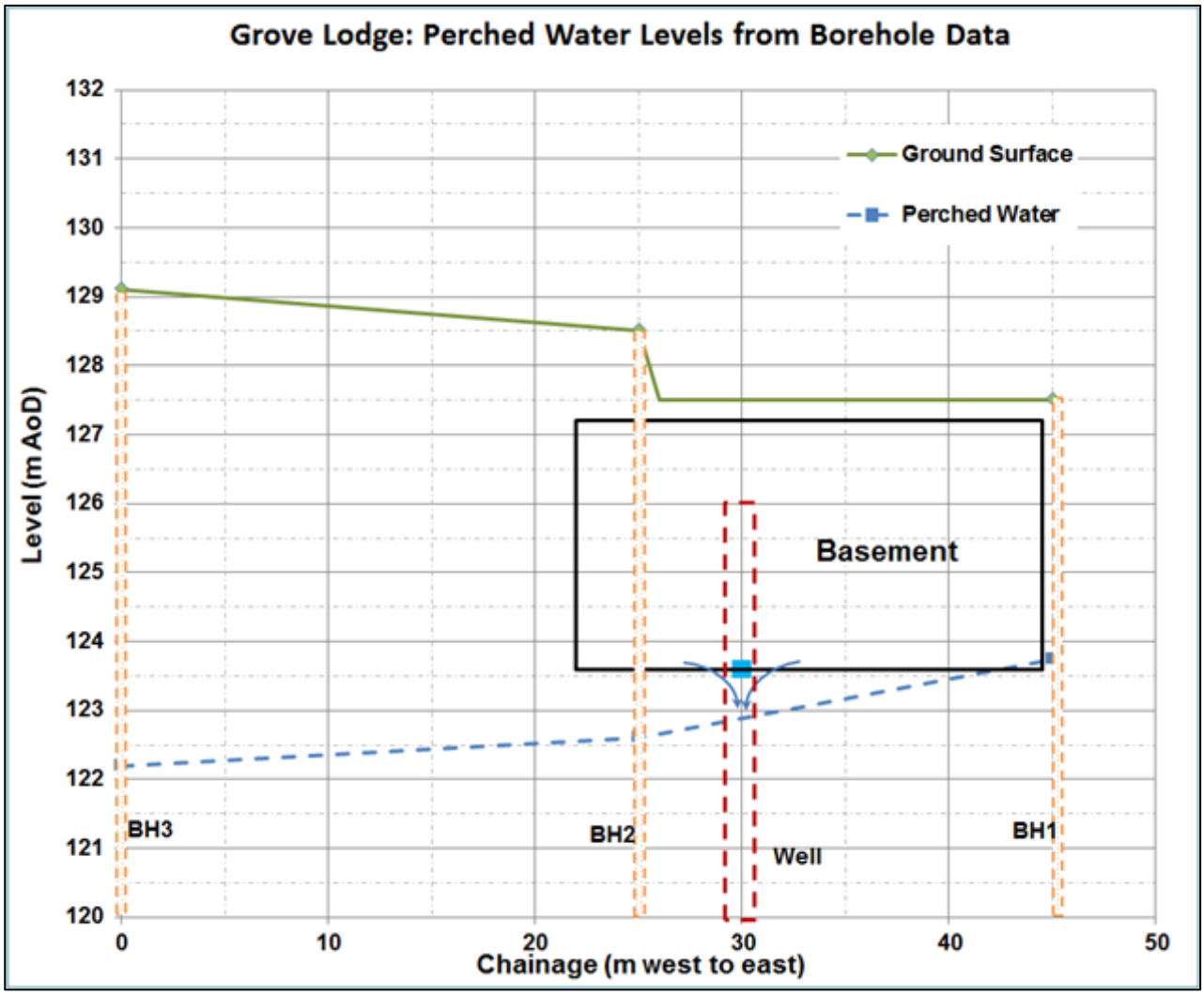

Figure B.5: Section through boreholes – perched water levels

In view of the properties in the local area being well dispersed, with the vast majority of the underground area being undeveloped, any cumulative impacts of this proposed basement and any other existing ones, or new ones with a similar footprint to the existing buildings, will be very minor.

Thus, it is concluded that the construction of the main basement will not affect the flow of groundwater below the structure or in the area as a whole and will not have any significant impact on groundwater levels.

B.5.3. Design approach adopted by MBP

It is proposed that the base of the excavation for the main basement floor slab will be at about 123.65m AoD. This is shown on Figure B.3, being about 1m above the BH2 groundwater level and at about the perched water level encountered at BH1.

With all of this in mind, it is assumed that groundwater may be encountered. This is reflected in the proposed basement design and in the piling system. The depth of any groundwater will be shallow.

A secant pile wall is proposed for the basement construction, with alternate full length piles and piles at a reduced depth. The shorter ones will extend to below the excavation level but will be short enough to allow the continued flow of groundwater below them and thus below the basement – both during and after construction. Water will flow through the gaps between the longer piles. Whilst locally there will be a small reduction in the groundwater flow capacity, in practice water will flow under the shorter piles / between the longer ones, as well as around the sides of the structure.

Assessments for the pile requirements, the temporary support arrangements, underpinning requirements for parts of Grove Lodge, monitoring of movement, etc. are included as part of the MBP Structural Engieer's Report (ref. 5954) – reproduced in Appendix D.

C. CV: Mike Briggs

Mike Briggs

Project Manager

Current position

Project Manager

Profession

Civil Engineer

Qualifications

BEng Civil Engineering

Professional memberships

Chartered Engineer, Member of Institution of Civil Engineers

Nationality

British

Areas of expertise

- Management of drainage and floods projects
- Extensive experience carrying out and supervising drainage studies - including surveys, model build and verification (InfoWorks CS), system performance assessments and the development of improvements
- Widely experienced in Flood Risk Assessments (FRAs) associated with proposed developments
- Experienced in the review of existing and proposed basement projects, including preparation of Basement Impact Assessment
- Preparation of documents to support planning applications and for use at planning meetings and inquiries
- Provision of expert drainage and flood risk advice to clients
- Quality and Environmental Auditor at HR Wallingford

Mike Briggs is a Chartered Civil Engineer and Project Manager with 26 years of experience at HR Wallingford and Babtie Group (Jacobs) carrying out and managing drainage strategy studies, Drainage Area Plans, flood risk assessments and other drainage and hydrological studies. This includes model development, detailed analysis of existing and future performance and the development of improvement and development strategies.

Mike provides expert drainage and flood risk advice. He has prepared many Flood Risk and Basement Impact Assessments, contributed to Environmental Statements and prepared documents related to planning applications and inquiries. He manages many of HR Wallingford's drainage and flood risk projects, working for local authorities and developers, as well as providing specialist support to other consultants.

He has managed and carried out evaluations and detailed design projects for sewerage and sewage treatment schemes and has been an auditor of models and of proposed drainage improvement schemes for the Environment Agency.

He is an internal quality and environmental auditor at HR Wallingford.

Project highlights

Project H, Hampstead, London, UK (ongoing)
Provision of specialist support related to several new large basements and for new drainage and irrigation systems for the redevelopment of a large private residence. Assistance to project team in satisfying planning requirements – including preparation of Basement Impact Assessments and reviewing / developing surface water drainage proposals. Planning permissions achieved.

Grove Lodge BIA, Hampstead, London (ongoing)
Preparation of a Basement Impact Assessment (BIA) for a basement extension that forms part proposed works on a Listed building in Hampstead. Includes collation and review of geotechnical and hydrological data for the site and for neighbouring areas and review of consultation responses.

Flooded new basement, Kingsclere, Hampshire, UK (ongoing)
Provision of expert services related to basement flooding at a newly constructed country house. Identified causes – related to high groundwater and poor design and construction. Developed solutions to prevent future flooding.

Grovelands development, Warminster, UK (ongoing)
Developing hydrological and hydraulic models for a part rural, part urban catchment. Supporting client in the development of proposals for a substantial new residential development close to watercourses. Preparation of flood risk / hydrological reports to support planning process. Detailed flood modelling used in the development of landscaping / flood storage proposals.

HS2 Hydrology support to National Trust (ongoing)
Supporting the National Trust in identifying potential hydrological / flood-related issues at and near their properties close to the proposed route of the HS2 line.

Flood Risk Assessment and Management (FRAM) Course, UK (ongoing)
Mike presents parts of the HR Wallingford FRAM course - lectures on Drainage Principles, Development Planning and Sustainable Drainage Systems.

Capo Di Monte BIA, Hampstead, London (2014 - 2015)
Review of geotechnical and hydrological data for the preparation of a Basement Impact Assessment (BIA) for a basement extension - proposed as part of the re-development of a Grade II Listed building in Hampstead. BIA required as part of planning documentation. Planning permission successfully achieved.

4 Upper Terrace BIA Hampstead, London (2014)
Preparation of a Basement Impact Assessment in support of a planning application for a large basement extension, for recreational uses. Included assessments of potential groundwater, stability and flooding issues. Planning permission successfully achieved.

Stormwater Drainage Masterplan, Riyadh, Saudi Arabia (2014)
Audit of hydrological and drainage modelling work and preparation of new stormwater models for existing and future catchments to assess suitability of previous studies and a proposed drainage strategy Masterplan for the city.

Abu Hamour Pumping Station, Doha, Qatar (2014)
Working with CDM Smith to assess storm flow rates for the design of a major surface water pumping station. Involves reviewing, updating and using a detailed InfoWorks CS model to confirm flow conditions and to test pumping options. Flows include a substantial groundwater component.

Sewer network improvement scheme, Drogheda, Ireland (2007 – 2012)
Working as sub-consultant to Tobin, using InfoNet and InfoWorks CS to build and verify models of the drainage systems in Drogheda. Identified flow survey requirements and supported the Tobin team during surveys. Supervised HR Wallingford's modelling team. Models used to identify existing and future hydraulic and water quality deficiencies and develop improvement options.

Bath upstream flood compensation storage, UK (2011 – 2012)
Working for major landowner to provide independent flood risk advice and represent client at the Planning Inquiry for the Bath LDF. Reviews of reports prepared by others and assessment of initial proposals for the provision of compensatory flood storage upstream of the City.

Short term flow and water quality survey: Dublin, Ireland (2010 – 2012)
Assisted Dublin City Council arranging an extensive short-term sewer flow and water quality survey for the Dublin City Centre catchment. Identified flow monitor requirements and locations, using previous models and knowledge of the catchment. Assisting DCC with the contract development.

Surface water modelling for Metro North, Ballymun, Ireland (2010 – 2011)
InfoWorks CS 1D modelling to assess options for the diversion of surface water sewers in Ballymun, North Dublin, to facilitate construction of a new railway. Improvements, including storage and flow control systems, developed so that there would be no deterioration in the levels of service provided by the system.

Drainage and flood studies at a key military site, UK (2006 – 2010)
Mike has managed several studies and provided technical support on a wide range of drainage issues for the re-development of a major UK military site. This has included projects on SuDS, drainage design requirements and impacts of extreme rainfall. Development and use of 2D flood and drainage models (InfoWorks CS2D and TUFLOW) to assess existing and future flood conditions and improvement options. Managed HR Wallingford's technical input.

Eastern Region WFD - TSR modelling, Ireland (2006 – 2007)
Project Manager and model reviewer for a detailed Time Series Rainfall (TSR) modelling study. The project used existing and future InfoWorks CS models of foul/combined and storm drainage systems to assess the typical annual discharge characteristics of overflows and surface water outfalls. Covered over 40 catchments in the Greater Dublin region.

Monksmoor Farm flood risk assessment, Daventry, UK (2005 – 2009)
Carried out a Flood Risk Assessment for a proposed major residential development close to an existing reservoir. Detailed dam break analysis and assessment of possible downstream flooding. Provided client with detailed flood advice and information to support a planning application and Environmental Impact Assessment. Liaised closely with the Environment Agency to enable flood risk objections to be overcome prior to the planning inquiry.

Greater Dublin strategic drainage study (GDSDS), Ireland (2001 – 2006)
HR Wallingford Project Manager in a joint venture team to assess the performance of existing sewage and surface water networks and river systems in the Dublin region. Improvement of existing models and the construction / verification of new models. Responsible for nine detailed catchment studies.

HR Wallingford
Working with water

HR Wallingford is an independent engineering and environmental hydraulics organisation. We deliver practical solutions to the complex water-related challenges faced by our international clients. A dynamic research programme underpins all that we do and keeps us at the leading edge. Our unique mix of know-how, assets and facilities includes state of the art physical modelling laboratories, a full range of numerical modelling tools and, above all, enthusiastic people with world-renowned skills and expertise.

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