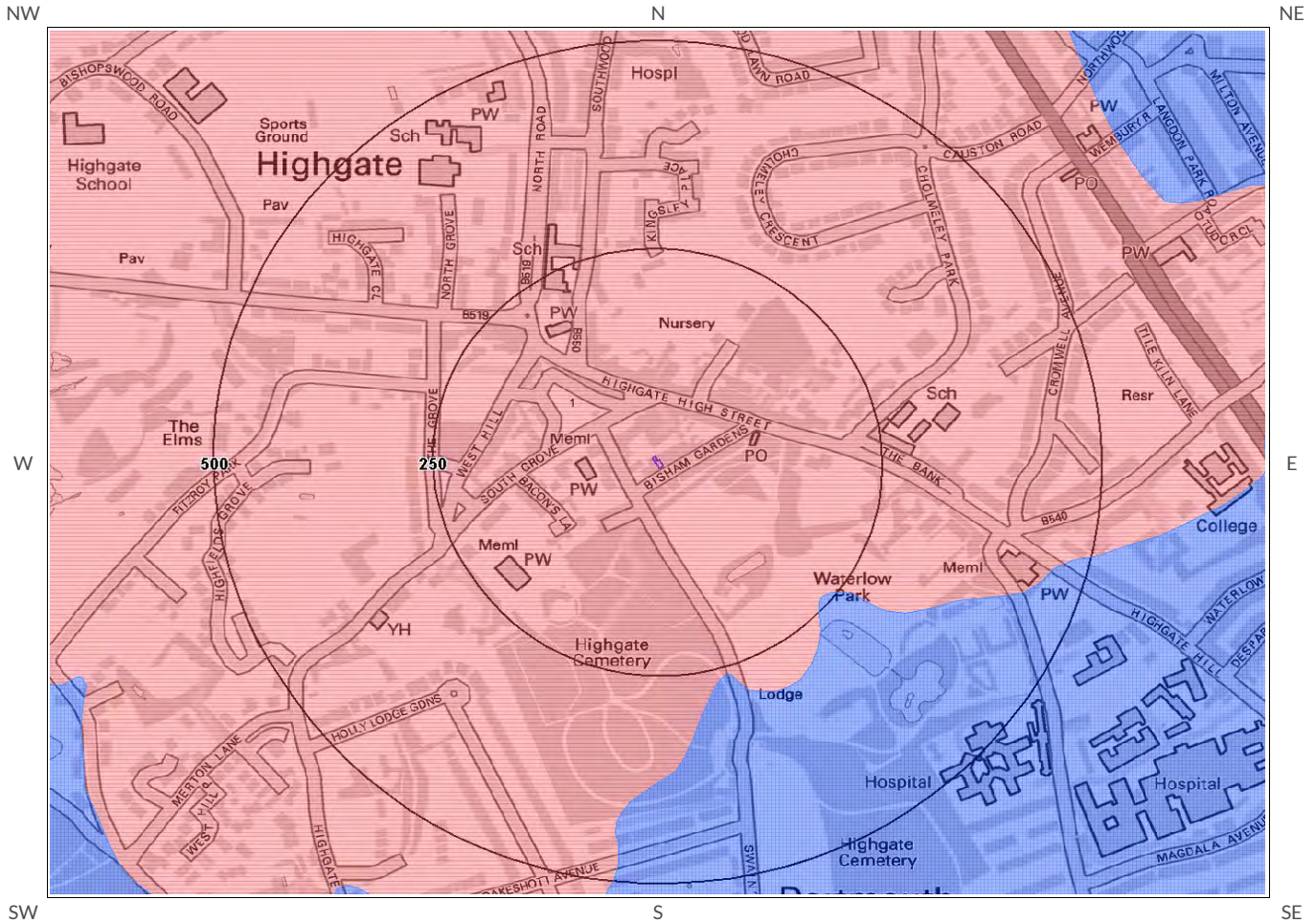


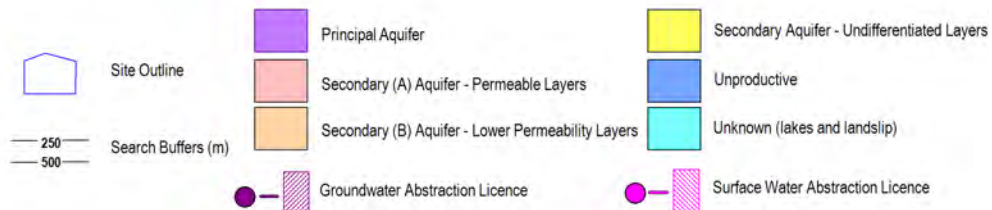
# 5b Aquifer Within Bedrock Geology and Abstraction Licenses



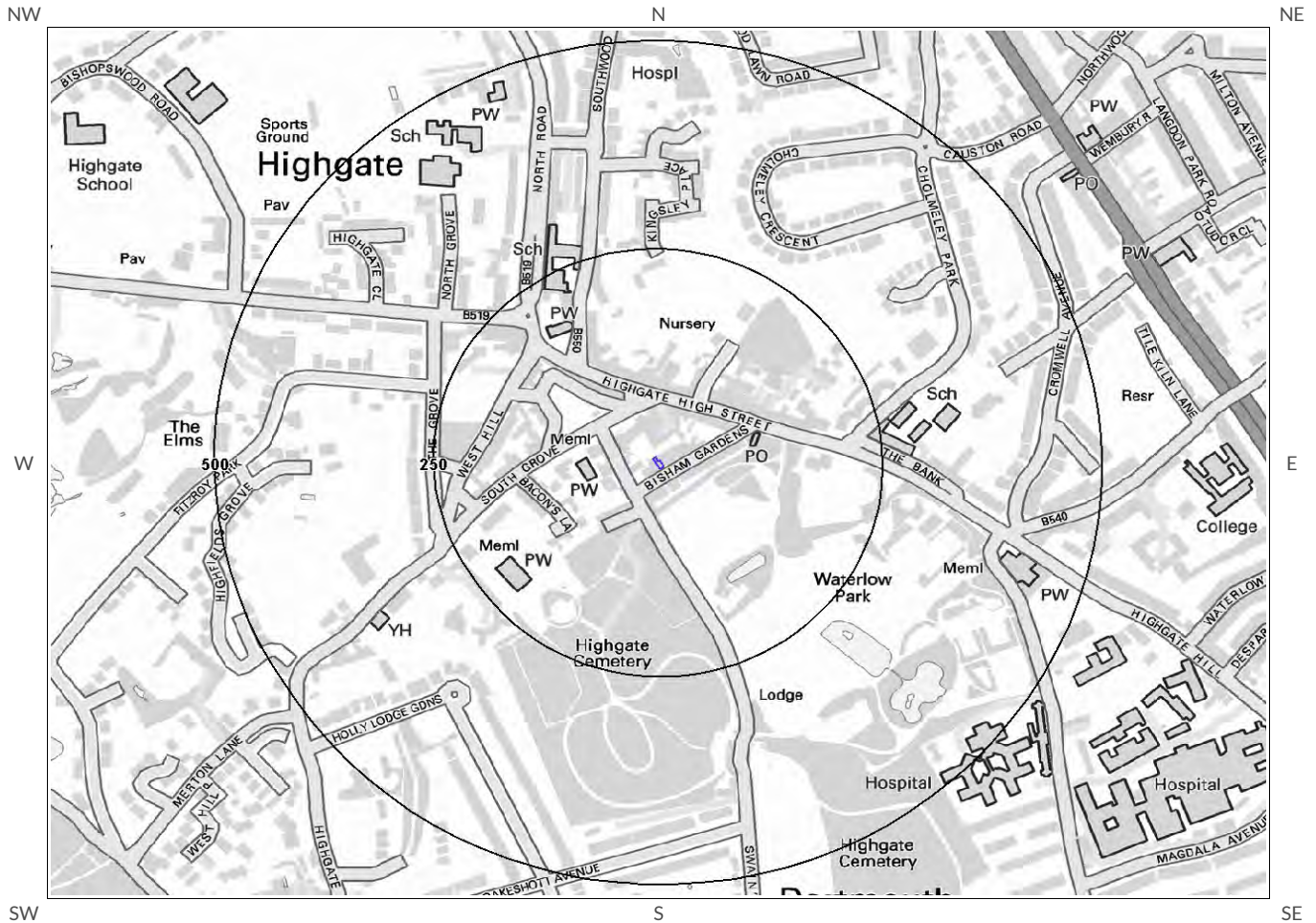
Map Legend



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

# 5c Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



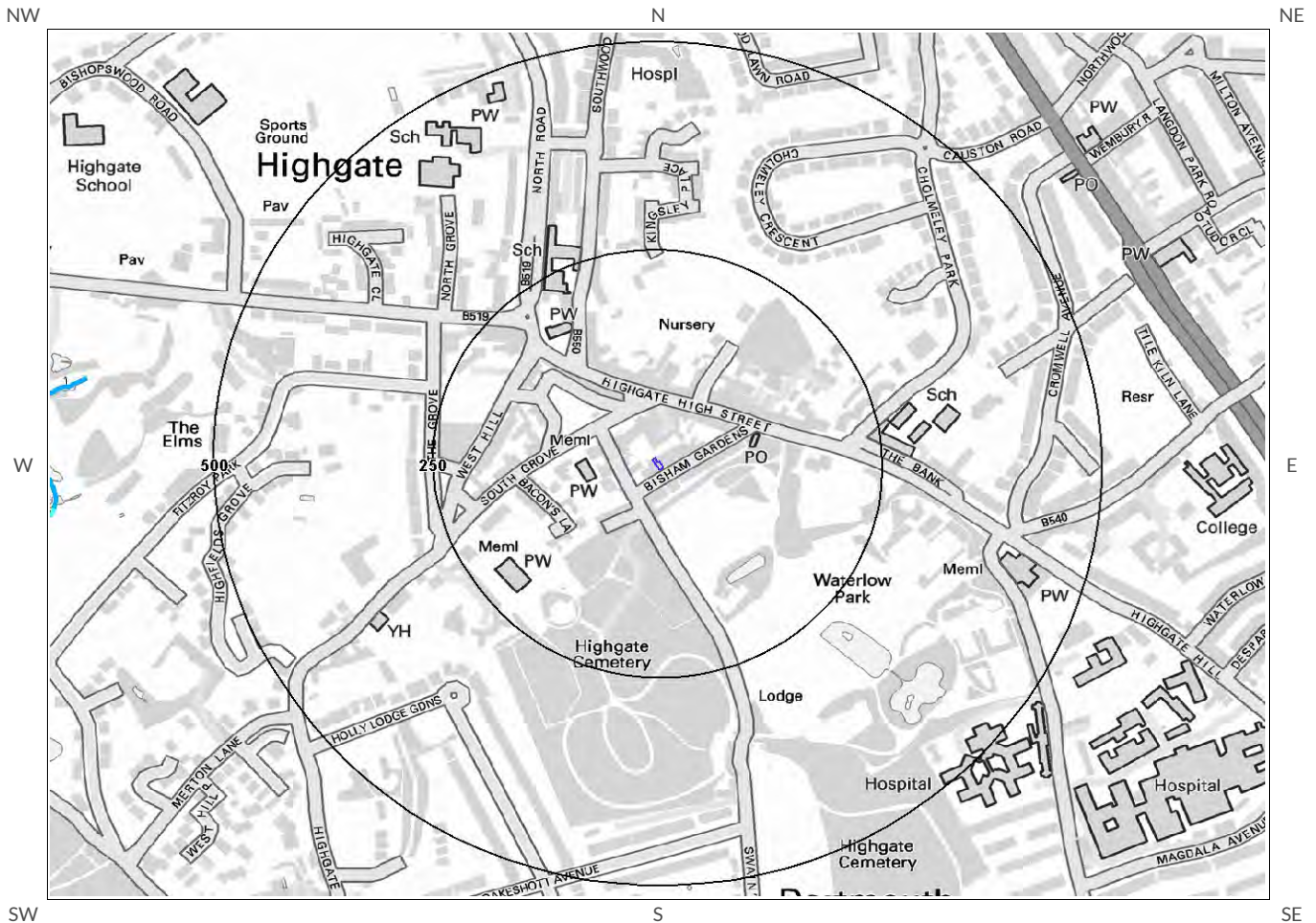
Map Legend



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-  Site Outline
-  Source Protection Zone 1 - Inner Catchment
-  Source Protection Zone 2 - Outer Catchment
-  Source Protection Zone 3 - Total Catchment
-  Source Protection Zone 4 - Zone of Special Interest
-  Search Buffers (m)
-  Potable Water Abstraction Licence

# 5d Hydrology - Detailed River Network and River Quality



Map Legend



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- |                    |                                       |                                     |
|--------------------|---------------------------------------|-------------------------------------|
| Site Outline       | Primary River                         | Canal                               |
| Search Buffers (m) | Secondary River                       | Canal Tunnel                        |
|                    | Tertiary River                        | Culvert                             |
|                    | Lake/Reservoir                        | Multiple Channel Culvert            |
|                    | Underground River (inferred)          | Underground River (Potential Sewer) |
|                    | General Quality Assessment: Biology   | Underground River (local knowledge) |
|                    | General Quality Assessment: Chemistry |                                     |



# 5 Hydrogeology and Hydrology

## 5.1 Aquifer within Superficial Deposits

Are there records of productive strata within the superficial geology at or in proximity to the property? No

Database searched and no data found.

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the GroundSure Enviroinsight User Guide.

## 5.2 Aquifer within Bedrock Deposits

Are there records of productive strata within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the GroundSure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (5b):

ID	Distance (m)	Direction	Designation	Description
1	0.0	On Site	Secondary A	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
2	240.0	SE	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

## 5.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

## 5.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

---

## 5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

---

## 5.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? No

Database searched and no data found.

---

## 5.7 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? No

---

### 5.7.1 Biological Quality:

Database searched and no data found.

---

### 5.7.2 Chemical Quality:

Database searched and no data found.

---

## 5.8 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? No

Database searched and no data found.

---

## 5.9 Surface Water Features

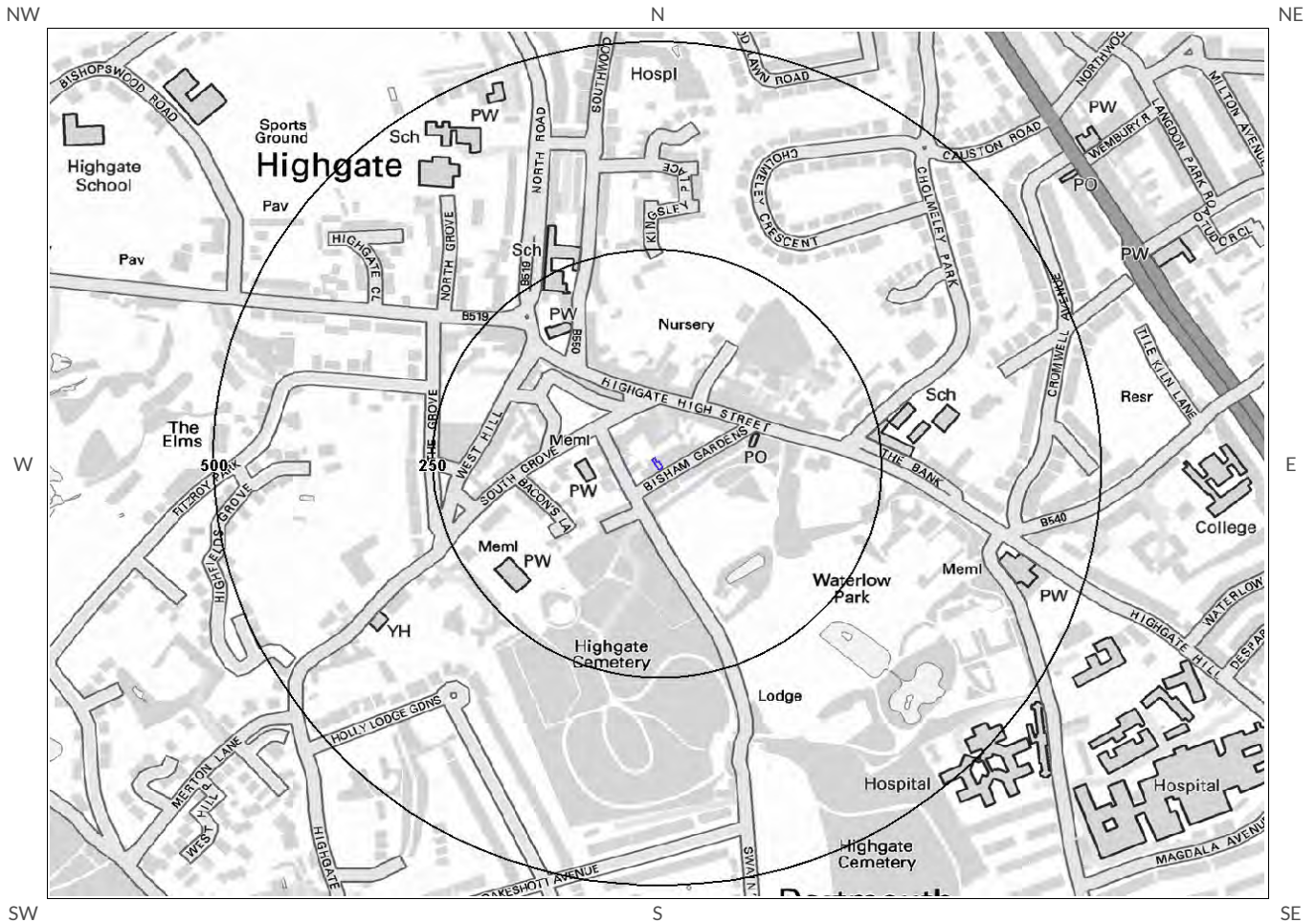
Are there any surface water features within 250m of the study site?

No

Database searched and no data found.

---








# 6 Environment Agency Flood Map



Map Legend



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-  Site Outline
-  Search Buffers (m)
-  Zone 2 Floodplain
-  Zone 3 Floodplain
-  Flood Storage Area
-  Area Benefiting from Flood Defences
-  Flood Defences



# 6 Flooding

## 6.1 Zone 2 Flooding

Zone 2 floodplain estimates the annual probability of flooding as one in one thousand (0.1%) or greater from rivers and the sea but less than 1% from rivers or 0.5% from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 2 floodplain? No

Database searched and no data found.

---

## 6.2 Zone 3 Flooding

Zone 3 estimates the annual probability of flooding as one in one hundred (1%) or greater from rivers and a one in two hundred (0.5%) or greater from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 3 floodplain? No

Database searched and no data found.

---

## 6.3 Flood Defences

Are there any Flood Defences within 250m of the study site? No

Database searched and no data found.

---

## 6.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

---

## 6.5 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

---



## 6.6 Groundwater Flooding Susceptibility Areas

6.6.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site?

Yes

---

6.6.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Very Low

---

## 6.7 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?

Low

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

---









# 7 Designated Environmentally Sensitive Sites Map

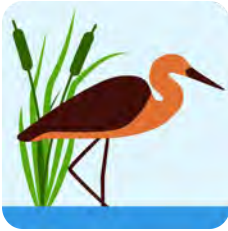


Map Legend



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 Site Outline	 SAC	 SSSI	 NNR	 World Heritage Sites
 Areas of Outstanding Natural Beauty	 SPA	 Ramsar	 LNR	 Environmentally Sensitive Areas
	 Nitrate Vulnerable Zones	 Nitrate Sensitive Areas	 National Parks	 Ancient Woodlands



# 7 Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? No

---

7.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site: 2

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Countryside Council for Wales and Scottish Natural Heritage are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
1	1072.0	W	Hampstead Heath Woods	Natural England
2	1296.0	W	Hampstead Heath Woods	Natural England

7.2 Records of National Nature Reserves (NNR) within 2000m of the study site: 0

Database searched and no data found.

---

7.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site: 0

Database searched and no data found.

---

7.4 Records of Special Protection Areas (SPA) within 2000m of the study site: 0

Database searched and no data found.

---

7.5 Records of Ramsar sites within 2000m of the study site: 0

Database searched and no data found.

---

7.6 Records of Ancient Woodland within 2000m of the study site:

4

The following Ancient Woodland records are supplied by English Nature/Scottish Natural Heritage/Countryside Council for Wales and are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
7	929.0	N	QUEENS WOOD	Ancient and Semi-Natural Woodland
8A	1009.0	N	QUEENS WOOD	Ancient and Semi-Natural Woodland
9	1072.0	W	KEN WOOD	Ancient and Semi-Natural Woodland
Not shown	1871.0	W	BISHOPS WOOD	Ancient and Semi-Natural Woodland

7.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

4

The following Local Nature Reserve (LNR) records provided by Natural England/Countryside Council for Wales and Scottish Natural Heritage are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	LNR Name	Data Source
3	759.0	NE	Parkland Walk	Natural England
4A	1009.0	N	Queen's Wood	Natural England
Not shown	1618.0	E	Parkland Walk	Natural England
Not shown	1830.0	N	Parkland Walk	Natural England

7.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

7.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

7.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

---

7.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

---

7.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

---

7.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

0

Database searched and no data found.

---



# 8 Natural Hazards Findings

## 8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a **GroundSure GeoInsight**, available from our [website](#). The following information has been found:

---

### 8.1.1 Shrink Swell

What is the maximum Shrink-Swell\* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

---

Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

---

---

### 8.1.2 Landslides

What is the maximum Landslide\* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

---

Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

---

---

### 8.1.3 Soluble Rocks

What is the maximum Soluble Rocks\* hazard rating identified on the study site? Null - Negligible

Soluble rocks are not present in the search area. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

---

---

\* This indicates an automatically generated 50m buffer and site.

### 8.1.4 Compressible Ground

What is the maximum Compressible Ground\* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

---

No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

---

### 8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks\* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

---

Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

---

### 8.1.6 Running Sand

What is the maximum Running Sand\*\* hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

---

Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build -consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property -no significant increase in insurance risk due to running sand problems is likely.

---

---

\* This indicates an automatically generated 50m buffer and site.



# 9 Mining

## 9.1 Coal Mining

Are there any coal mining areas within 75m of the study site?

No

Database searched and no data found.

---

## 9.2 Shallow Mining

What is the subsidence hazard relating to shallow mining on-site\*?

Negligible

\*Please note this data is searched with a 150m buffer.

---

## 9.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site?

No

Guidance: No Guidance Required.

---



# Contact Details

CENTREMAPS  
Telephone: 01886 832972  
groundsure@centremaps.co.uk  
CENTREMAPS, Brockamin House, Leigh, Worcester, London, WR6 5JU

Directors: M C Walker, MInst C.E.S., C M Walker,  
S J Hawkins BSc (Hons), S E Stewart BSc (Hons)  
Registered No. 1890261 Registered in England and Wales  
Registered Company: Laser Surveys Limited  
Brockamin House, Leigh, Worcester, WR6 5JU.

## British Geological Survey Enquiries

Kingsley Dunham Centre  
Keyworth, Nottingham NG12 5GG  
Tel: 0115 936 3143.  
Fax: 0115 936 3276.  
Email: [enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)  
Web: [www.bgs.ac.uk](http://www.bgs.ac.uk)

BGS Geological Hazards Reports and general geological enquiries

centremapslive.com  
the mapping portal from Laser Surveys



## Environment Agency

National Customer Contact Centre, PO Box 544  
Rotherham, S60 1BY  
Tel: 08708 506 506

Web: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)  
Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)



## Public Health England

Public information access office  
Public Health England, Wellington House  
133-155 Waterloo Road, London, SE1 8UG  
<https://www.gov.uk/government/organisations/public-health-england>  
Email: [enquiries@phe.gov.uk](mailto:enquiries@phe.gov.uk)  
Main switchboard: 020 7654 8000



## The Coal Authority

200 Lichfield Lane  
Mansfield  
Notts NG18 4RG  
Tel: 0845 762 6848  
DX 716176 Mansfield 5  
[www.coal.gov.uk](http://www.coal.gov.uk)



## Ordnance Survey

Romsey Road  
Southampton SO16 4GU  
Tel: 08456 050505



## Local Authority

Authority: Camden London Borough Council  
Phone: 020 7278 4444  
Web: [www.camden.gov.uk](http://www.camden.gov.uk)  
Address: Camden Town Hall, Judd Street, Camden, London, WC1H 9JE

## Gemapping PLC

Virginia Villas, High Street, Hartley Witney,  
Hampshire RG27 8NW  
Tel: 01252 845444



Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, English Nature who retain the Copyright and Intellectual Property Rights for the data. PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028]. This report has been prepared in accordance with the GroundSure Ltd standard Terms and Conditions of business for work of this nature.

# Standard Terms and Conditions

## 1 Definitions

In these terms and conditions unless the context otherwise requires:

**"Beneficiary"** means the person or entity for whose benefit the Client has obtained the Services.

**"Client"** means the party or parties entering into a Contract with GroundSure.

**"Commercial"** means any building or property which is not Residential.

**"Confidential Information"** means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by GroundSure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

**"Support Services"** means Support Services provided by GroundSure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

**"Contract"** means the contract between GroundSure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

**"Third Party Data Provider"** means any third party providing Third Party Content to GroundSure.

**"Data Reports"** means reports comprising factual data with no accompanying interpretation.

**"Fees"** has the meaning set out in clause 5.1.

**"GroundSure"** means GroundSure Limited, a company registered in England and Wales under number 03421028.

**"GroundSure Materials"** means all materials prepared by GroundSure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

**"Intellectual Property"** means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

**"Mapping"** means a map, map data or a combination of historical maps of various ages, time periods and scales.

**"Order"** means an electronic, written or other order form submitted by the Client requesting Services from GroundSure in respect of a specified Site.

**"Ordnance Survey"** means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

**"Order Website"** means the online platform through which Orders may be placed by the Client and accepted by GroundSure.

**"Report"** means a Risk Screening Report or Data Report for Commercial or Residential property.

**"Residential"** means any building or property used as or intended to be used as a single dwelling.

**"Risk Screening Report"** means a risk screening report comprising factual data with an accompanying interpretation by GroundSure.

**"Services"** means any Report, Mapping and/or Support Services which GroundSure has agreed to provide by accepting an Order pursuant to clause 2.6.

**"Site"** means the area of land in respect of which the Client has requested GroundSure to provide the Services.

**"Third Party Content"** means data, database information or other information which is provided to GroundSure by a Third Party Data Provider.

**"User Guide"** means the user guide, as amended from time to time, available upon request from GroundSure and on the website ([www.GroundSure.com](http://www.GroundSure.com)) and forming part of this Contract.

## 2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 GroundSure agrees to provide the Services in accordance with the Contract.

2.2 GroundSure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of GroundSure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions

implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, GroundSure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and GroundSure will have no liability therefor. In addition you acknowledge and agree that GroundSure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 GroundSure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by GroundSure. GroundSure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by GroundSure. GroundSure's acceptance of an Order shall be binding only when made in writing and signed by GroundSure's authorised representative or when accepted through the Order Website.

## 3 The Client's obligations

3.1 The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to GroundSure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to GroundSure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as GroundSure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable GroundSure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the GroundSure Materials, or use the GroundSure Materials in a manner for which they were not intended. The Client may make the GroundSure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that GroundSure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

## 4 Reliance

4.1 The Client acknowledges that the Services provided by GroundSure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by GroundSure to be reliable.

4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;

(i) the Beneficiary,

(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),

(iv) the first purchaser or first tenant of the Site, and

(v) the professional advisers and lenders of the first purchaser or tenant of the Site.

4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by GroundSure. Any party considering such Reports and Services does so at their own risk.

## 5 Fees and Disbursements

5.1 GroundSure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by GroundSure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").

5.2 The Client shall pay all outstanding Fees to GroundSure in full without deduction, counterclaim or set off within 30 days of the date of GroundSure's invoice or such other period as may be agreed in writing between GroundSure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.

5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of GroundSure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

## 6 Intellectual Property and Confidentiality

### 6.1 Subject to

(i) full payment of all relevant Fees and

(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the GroundSure Materials.

6.2 All Intellectual Property in the GroundSure Materials are and shall remain owned by GroundSure or GroundSure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.

6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client shall, and shall procure that any recipients of the GroundSure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to GroundSure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the GroundSure Materials in order to advise the Beneficiary in a professional capacity. However, GroundSure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.

6.6 The Client shall procure that any person to whom the Services are made available shall notify GroundSure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

## 7. Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of GroundSure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by GroundSure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death

or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.

7.4 GroundSure shall not be liable for

- (i) loss of profits;
- (ii) loss of business;
- (iii) depletion of goodwill and/or similar losses;
- (iv) loss of anticipated savings;
- (v) loss of goods;
- (vi) loss of contract;
- (vii) loss of use;
- (viii) loss or corruption of data or information;
- (ix) business interruption;
- (x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;

(xi) loss or damage that arise as a result of the use of all or part of the GroundSure Materials in breach of the Contract;

(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the GroundSure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;

(xiii) loss or damage to a computer, software, modem, telephone or other property; and

(xiv) loss or damage caused by a delay or loss of use of GroundSure's internet ordering service.

7.5 GroundSure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.

7.6 GroundSure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of GroundSure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against GroundSure in relation to the Services or other matters arising pursuant to the Contract.

## 8 GroundSure's right to suspend or terminate

8.1 If GroundSure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, GroundSure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.

8.2 GroundSure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to GroundSure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

## 9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.

9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon GroundSure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event

(b) by their nature cannot be returned.

## 10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) GroundSure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in

GroundSure's possession or control; and

(ii) the Client shall pay to GroundSure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay GroundSure any additional costs incurred in relation to the termination or suspension of the Contract.

## 11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of GroundSure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to GroundSure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

## 12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.

12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through GroundSure.

12.3 GroundSure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of GroundSure.

12.4 No failure on the part of GroundSure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.

12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.

12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

12.7 GroundSure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

- (i) the Client or Beneficiary's failure to provide facilities, access or information;
- (ii) fire, storm, flood, tempest or epidemic;
- (iii) Acts of God or the public enemy;
- (iv) riot, civil commotion or war;
- (v) strikes, labour disputes or industrial action;
- (vi) acts or regulations of any governmental or other agency;
- (vii) suspension or delay of services at public registries by Third Party Data Providers;
- (viii) changes in law; or
- (ix) any other reason beyond GroundSure's reasonable control.

In the event that GroundSure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then GroundSure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English

law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 GroundSure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at GroundSure who will respond in a timely manner.

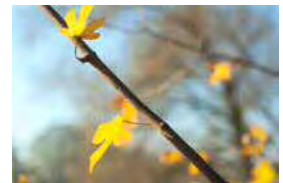
12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law. © GroundSure Limited June 2013

## **APPENDIX G**

# **H Fraser Consulting: BIA Assessment: Groundwater, Report ref 30057R1**

# 19 Bisham Gardens Basement Impact Assessment: Groundwater

Prepared for: Fastrack Site Investigations Ltd  
Tyndales Farm,  
Southend Road,  
Woodham Mortimer,  
Essex  
CM9 6TQ



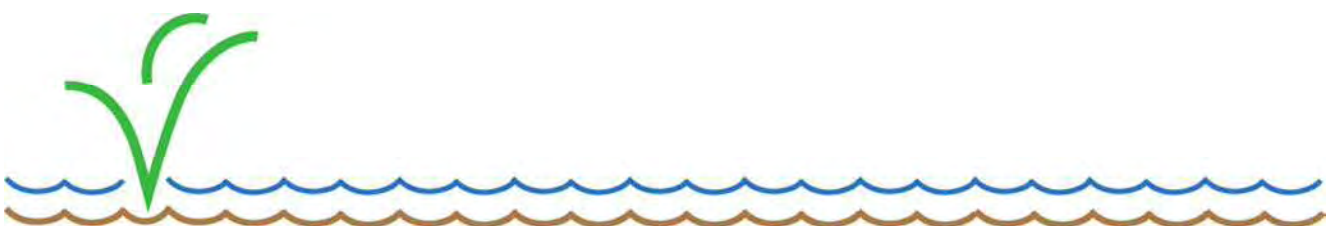
Date: 23/10/2014

Status: Final

Reference: 30057R1

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Prepared by: H Fraser Consulting Ltd



# H FRASER CONSULTING

## CONTAMINATED LAND AND HYDROGEOLOGY

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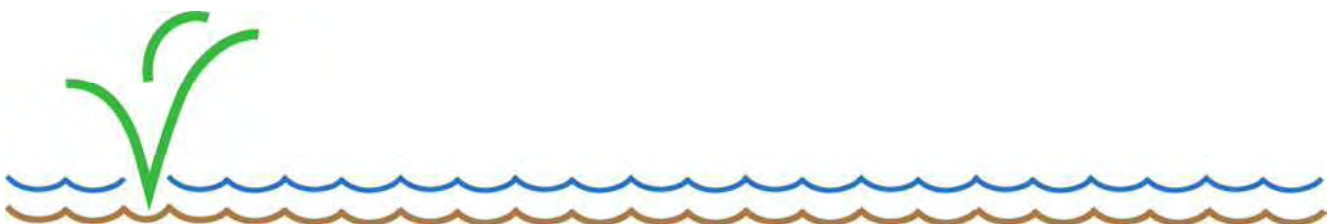
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The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to H Fraser Consulting at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client, Fastrack Site Investigations Ltd, and to Green Structural Engineering Ltd. Unless otherwise agreed in writing by H Fraser Consulting Ltd, no other party may use, make use of or rely on the contents of the report. No liability is accepted by H Fraser Consulting Ltd for any use of this report, other than for the purposes for which it was originally prepared and provided.

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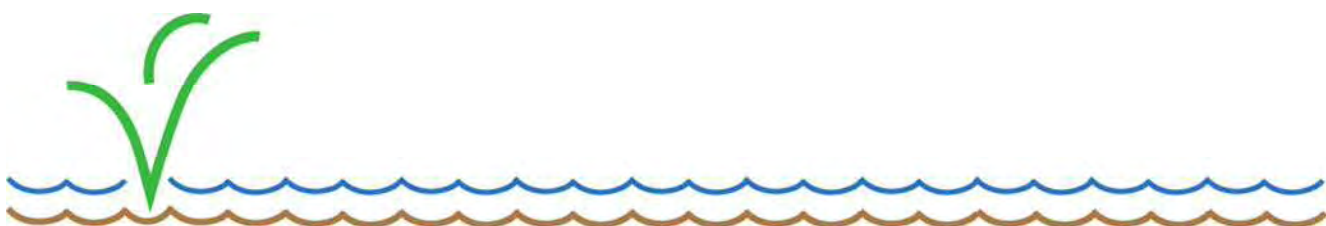
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## **1. INTRODUCTION**

Fastrack Site Investigations Ltd (Fastrack) has instructed H Fraser Consulting Ltd (HFCL) to provide the hydrogeological aspects of a Basement Impact Assessment at the following property:

19 Bisham Gardens, London, N6 6DJ.

The site is in the London Borough of Camden.

### **1.1 Objective**

The objective of this report is to provide the hydrogeological aspects of a Basement Impact Assessment to support a planning application for construction of a basement at 19 Bisham Gardens.

### **1.2 Scope of works**

The following works have been undertaken:

- Screening assessment with regards to groundwater
- Scoping assessment to identify potential impacts
- Impact assessment with regard to groundwater attributes
- Reporting

The work has been undertaken in accordance with the requirements of London Borough of Camden (LBC) Planning Guidance CPG4 'Basements and Lightwells' (referred to as CPG4) and Arup's 'Geological Hydrogeological and Hydrological Study, Guidance for Subterranean Development' (Arup, 2012, referred to throughout this report as the GHHS).

This assessment is limited to an assessment of the hydrogeological aspects of the proposed development and does not purport to make any comment on surface water flooding, contamination or pollution, engineering, slope stability, design or construction issues.

The work has been undertaken by Hannah Fraser, Director of HFCL, who is a Chartered Geologist with 17 years' experience as a hydrogeologist and consultant.

## 2 BACKGROUND INFORMATION

Background information has been derived from a site investigation report provided by Fastrack (Fastrack, 2014) which includes a Groundsure report for the site; geological information has been derived from on-line BGS sources (Geology of Britain Viewer, GeoIndex, Lexicon); on-line mapping and aerial photography have been derived from Streetmap and GoogleEarth. Table 2.1 presents relevant background information for the site. The site location is shown in Figure 2.1.

**Table 2.1 Background information**

<b>Address</b>	19 Bisham Gardens, N6 6DJ.
<b>NGR</b>	528460, 187308
<b>Description</b>	<p>The site comprises a terraced property with front and rear gardens. The approximate site area is estimated as 144 m<sup>2</sup>; the footprint of the house and paved rear garden area is approximately 110 m<sup>2</sup>, with the front garden having an area of approximately 9m<sup>2</sup>. The front garden is understood to comprise planted shrubs, and the extent of soft or hard landscaping is not known. The rear garden comprises a patio with steps leading up to a soft landscaped area; the area of the raised part of the garden is estimated as 25 m<sup>2</sup>.</p> <p>The property has three storeys, plus a small shallow basement which extends partially below the footprint of the house under the entrance hall area to an approximate depth of 0.75 m below street level. The ground floor is raised approximately 0.8 m - 1.0 m above street level, there is a first floor and then a second floor which is housed in the roof space, with dormer windows. Site plans and elevations are presented in Appendix A.</p> <p>Streetmap<sup>1</sup> 1:25,000 mapping shows the site to be just above 120 m above Ordnance Datum (OD), with elevations dropping to the south-southeast from a high of 130 m OD on Highgate High Street. The datum of a site borehole located in the raised area of the back garden has been surveyed at 123.46 m OD. Figure 2.1 shows topographical contours for the local area.</p>
<b>Proposed development</b>	<p>The proposed development is to extend the existing basement throughout the entire footprint of the building, and to extend the depth to approximately 2.4 m below street level, or 118 m OD (estimated from site drawings as 5.5 m below the site borehole datum of 123.46). There will be lightwells at the front and rear of the property; the front lightwell will extend below the area of the front garden, and the rear lightwell will extend below the patio area. Proposed site plans and elevations are included in Appendix A.</p>
<b>Geology</b>	<p>Geological mapping<sup>2</sup> shows the area to be underlain by the Bagshot Formation, underlain by the Claygate member and then the London Clay. The London Clay is extensive across the area, and the Claygate member and Bagshot Formation form the elevated area of Highgate. The boundary between the Bagshot Formation and the Claygate member is approximately 75 m southwest of the site, and the boundary</p>

<sup>1</sup> <http://www.streetmap.co.uk/>

<sup>2</sup> <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

of the Claygate member with the London Clay is approximately 335 m southwest of the site.

The Bagshot Formation consists of pale yellow-brown to pale grey or white, locally orange or crimson, fine- to coarse-grained sand that is frequently micaceous and locally clayey, with sparse glauconite and sparse seams of gravel. The underlying Claygate member comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt.

Table 2.2 presents geological data from selected BGS borehole records.<sup>3</sup> Figure 2.1 shows the location of the boreholes.

Site investigations have been undertaken at the site by Fastrack Ltd (Fastrack, 2013, and Fastrack, 2014). In October 2013, a borehole and trial pit were excavated. The borehole extended to 2 m bgl. In August 2014 a further borehole was drilled to 10 m bgl (NGR 528576.31,187264.65, datum 123.46 m OD). The geological data are provided in Table 2.3.

**Aquifer status** The Bagshot Formation is classified by the Environment Agency as a Secondary A aquifer (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). The alluvium is classified as a Secondary (undifferentiated) aquifer.

A groundwater elevation was measured by Fastrack on two occasions as 9.75 m bgl, or 113.71 m OD, as shown in Table 2.4. It is likely that groundwater flow directions will be broadly with topography, to the south-southwest.

**Watercourses** A Groundsure report<sup>4</sup> for the site states that there are no surface water features within 250 m of the site, and no detailed River Network entries within 500 m of the site.

OS Mapping (see Figure 2.1) shows three surface water features in Waterlow Park, 137 m, 237 m, and 377 m southwest of the site. It is noted that the underlying geology in this area is the Claygate Member and the London Clay, rather than the Bagshot Formation. The ground elevation is less than 110 m OD.

**Spring lines** There are no springs shown on OS mapping, however the geological boundary between the Bagshot Formation and the Claygate member, and the Claygate member and the London Clay may give rise to springs. The water features in Waterlow park may be associated with such geological boundaries.

**Wells** There are no groundwater abstraction licenses within 2 km of the site, and no source protection zones within 500 m of the site.<sup>5</sup>

There are no Water Well records within 500 m of the site.<sup>6</sup>

**Groundwater** British Geological Survey Groundwater flood risk mapping reports the

<sup>3</sup> <http://mapapps2.bgs.ac.uk/geoindex/home.html>

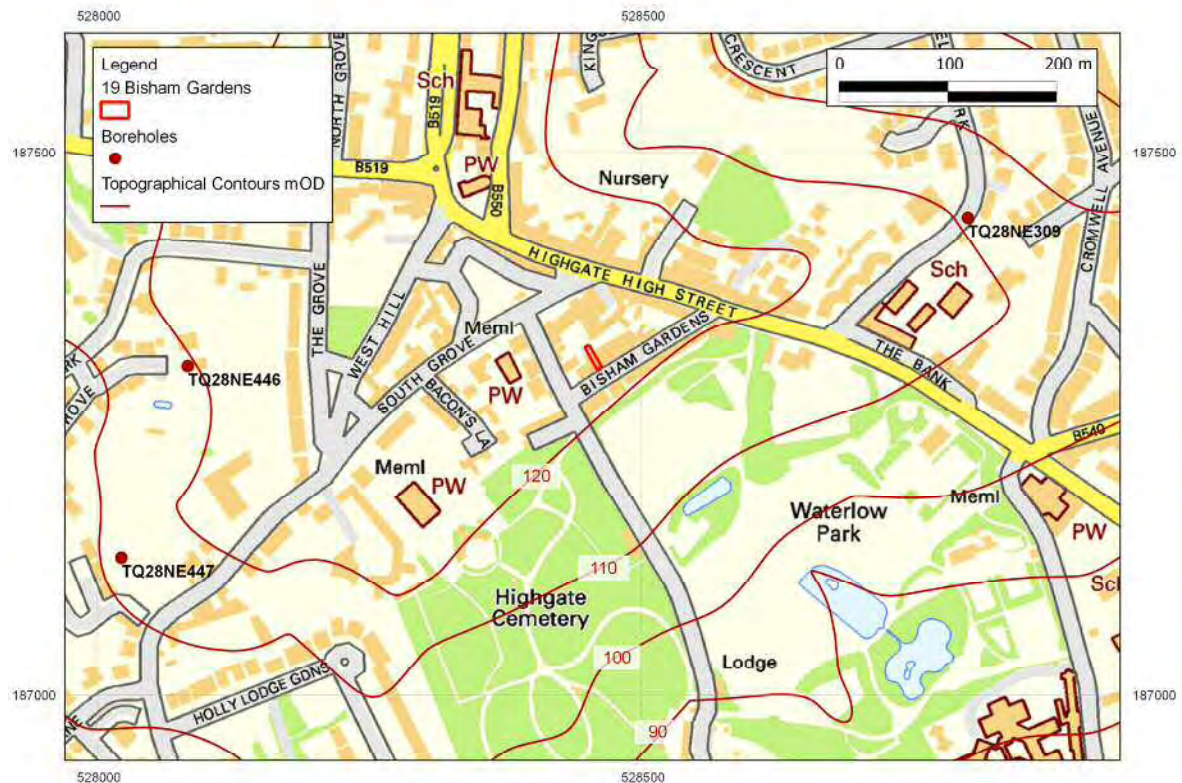
<sup>4</sup> Groundsure report, Fastrack (2013)

<sup>5</sup> Groundsure report, Fastrack (2013)

<sup>6</sup> <http://mapapps2.bgs.ac.uk/geoindex/home.html>

**flooding** site to be within 50 m of a zone of Very Low Risk of Groundwater flooding, in an area with a low confidence rating that the assessment is very low.

**Soil Moisture** Soil samples were obtained and analysed for soil moisture content (SMC), as reported by Fastrack (2014) and presented in Table 2.5. The SMC profile is consistent with reasonably well draining sandy strata with a saturated zone at the base of the deposit.



**Figure 2.1 Site location**

Contains Ordnance Survey data © Crown copyright and database right 2014

**Table 2.2 BGS Borehole records**

Reference	Name	Length (m)	Easting	Northing	Distance (m)	Observations
TQ28NE309	Cromwell Lodge Highgate BH1	15.2	528800	187440	364.72	Made ground to 0.75 m, yellowish brown slightly clayey silty fine sand to 2m, underlain by soft to firm yellowish brown and grey mottled silty sandy clay, firm to stiff dark greyish brown silty sandy clay and firm dark greyish brown silty sandy Clay. Groundwater measurement of 4.3 m (101.77 m OD).
TQ28NE447	41 West Hill Highgate BH2	206	528022	187127	473.93	Made Ground to 1m, London Clay to 127m, Thanet Sands to 144 m, Chalk with Flints to 206 m. Water level on completion was 138 m below datum.
TQ28NE446	41 West Hill Highgate BH1	204	528083	187303	377.03	Made Ground to 1m, London Clay to 129m, Thanet Sands to 147 m, Chalk with Flints to 204 m. Water level on completion was 146 m below datum.

The borehole records in Table 2.2 were selected from the BGS on-line Geindex<sup>7</sup> as those records closest to the site.

<sup>7</sup> <http://mapapps2.bgs.ac.uk/geindex/home.html>

Geological data from site investigations in October 2013 and August 2014 are presented in Table 2.3.

**Table 2.3 Site investigation data**

Description	Thickness (m)	Depth to base (m)
Dark brown sandy clayey made ground with brick pieces and gravel.	0.075 – 1.2	0.075 – 1.2
Mid Brown sand and gravel, dense dark brown clayey sand and gravel, dense yellow clayey sand – Bagshot Formation	8.1	9.3
Orange silty sandy gravelly clay (possibly Claygate member?)	>0.3	Borehole finished at 10 m bgl

Groundwater dip data were provided to HFCL by Fastrack; the reduced groundwater elevation data are presented in Table 2.4.

**Table 2.4 Groundwater level data**

Date	Dip (m bgl)	Water level elevation (m OD)
2-Sep-14	9.75	113.71
17-Sep-14	9.75	113.71

Soil samples were taken from the 10 m borehole and analysed for soil moisture content (SMC), as reported by Fastrack (2014). The data are reproduced in Table 2.5.

**Table 2.5 Soil moisture content profile**

Depth (m)	Soil Moisture Content (%)	Description
1	14.4	Brown sandy clayey MADE GROUND containing gravel and brick
2	5.7	Brown sandy GRAVEL
3	16.2	Brown SAND
4	16.5	Brown clayey SAND containing gravel
5	15.7	Brown silty SAND
6	19.1	Brown SAND containing gravel
7	28.3	Brown silty SAND
8	32.3	Brown silty SAND
9	25.6	Brown silty SAND
10	21.1	Brown silty SAND containing gravel

### 3 SCREENING

A screening assessment has been undertaken in accordance with the methodology set out in Section 6.2 and Appendix E2 of the GHHS (Arup, 2012). The results are presented in Table 3.1.

**Table 3.1 Screening assessment**

<b>Ref</b>	<b>Question</b>	<b>Answer (yes/no/unknown)</b>	<b>Action</b>
Q1a	Is the site located directly above an aquifer?	Yes	Take forward to scoping stage
Q1b	Will the proposed basement extend beneath the water table surface?	No	No further action
Q2	Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No	No further action
Q3	Is the site within the catchment of the pond chains on Hampstead Heath?	No	No further action
Q4	Will the proposed basement development result in a change in the proportion of hard surface/paved areas?	Unknown	Take forward to scoping stage
Q5	As part of the 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)	Unknown	Take forward to scoping stage
Q6	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than the mean water level in any local pond or spring line?	No	No further action

## **4 SCOPING**

This section of the report summarises the pertinent information as a Conceptual Model, and then describes the matters of concern that need to be considered in the Impact Assessment.

### **4.1 Conceptual model**

The proposal is to extend an existing shallow basement to greater depth and to fill the footprint of the existing property. Lightwells will be constructed to the front and rear, with the front lightwell extending below the entire area of the front garden (approximately 9 m<sup>2</sup>), and the rear lightwell extending below an area that is currently paved). The base of the excavation is estimated as 118 m OD.

The underlying geology comprises the Bagshot Formation, which comprises relatively free draining sands, with variable clay content. Site investigation data confirm the presence of clayey sand (or sand and gravel) to 10 m bgl. Groundwater elevations have been measured at 113.71 m OD, 4 m below the base of the proposed basement excavation.

Groundwater flow directions are likely to be broadly in the direction of topography, that is to the south-southeast.

There are no surface waters within 100 m of the site, and three surface water features that lie in Waterlow Park to the southeast are at a lower elevation than the proposed development and unlikely to be in hydraulic connection with the development as the underlying geology in this area is the Claygate member or London Clay.

### **4.2 Matters of concern**

Five attributes are considered as potential matters of concern, as discussed below.

1. Groundwater level – the development has the potential to affect groundwater levels, and this is carried forward for further assessment.
2. Range of seasonal fluctuation in groundwater levels – the development has the potential to affect seasonal variations in groundwater levels and this is carried forward for further assessment.
3. Spring/stream hydrographs – there is no evidence that local streams or springs are likely to be affected and these are not considered further.
4. Soil moisture – there is the potential for soil moisture content to be affected, and this is carried forward for further assessment.
5. Water quality – there is no evidence that the development will affect water quality, provided good practice is followed with regard to pollution management. This is not considered further.



## 5 IMPACT ASSESSMENT

The impact assessment has been undertaken by considering groundwater attributes, how these are likely to change under the proposed development and the consequence of any predicted changes. The assessment is qualitative at this stage. The results are presented in Table 5.1.

**Table 5.1 Impact assessment**

Groundwater Attribute	Predicted Change	Consequence of change and mitigation
<p><b>Groundwater levels</b> – groundwater elevations have been measured at 113.71 m OD.</p>	<p>Groundwater elevations have been measured at 4 m below the proposed base of the basement excavation. As such, it is not anticipated that construction of the basement will have a significant effect on groundwater levels. However, the assessment is based on a sparse data set and it is recommended that further groundwater level measurements are made to confirm the findings of this assessment.</p> <p>The construction of the front lightwell will have the potential to reduce rainfall recharge to groundwater. It is understood that the rear lightwell will extend below an area that is currently surfaced with impermeable materials, hence the development will not make a difference in this area. In the front garden, the affected area may be up to 9m<sup>2</sup>, or 6% of the total plot area. This is unlikely to have a significant effect on groundwater levels, however drainage design in this area should comply with the requirements of sustainable urban drainage.</p>	<p>There is no anticipated significant change to groundwater elevations, however due to the sparsity of data it is recommended that ongoing groundwater monitoring is undertaken as a condition of planning permission being granted.</p> <p>There may be minor inflows of groundwater to the excavation under wet conditions, and provision should be made to keep the excavation dry.</p> <p>Changes to surfacing and drainage that might affect recharge to groundwater should be appropriately designed so that groundwater levels are not adversely affected. Design of drainage systems should consider the requirements of sustainable urban drainage.</p>
<p><b>Range of seasonal fluctuation in groundwater levels</b> – the magnitude of seasonal variation has not been evaluated</p>	<p>The range of water level variation has not been established. It is not considered likely that the development will have an effect on the range of water level variation, as the basement elevation is above measured groundwater elevations.</p>	<p>It is recommended that ongoing groundwater level monitoring should include winter high groundwater levels, to confirm that the highest groundwater levels will not affect the development.</p>
<p><b>Soil moisture</b> – SMC data indicate a relatively well draining sandy soil and a saturated zone at the base of the deposit.</p>	<p>It is not anticipated that soil moisture levels will be significantly affected by the development.</p>	<p>The proposed basement structure should be adequately protected against permeation of soil moisture, for example by construction of a cavity wall drainage system.</p>

## **6 CONCLUSIONS**

A one storey basement extension is proposed at 19 Bisham Gardens. The site is underlain by Made Ground, and the Bagshot Formation. The Bagshot formation comprises relatively free draining sands, with variable clay content, and has been proven to comprise clayey sands to at least 9.3 m bgl at the site.

Ground elevation at the rear of the site is 123.5 m OD, with street elevations at front of the site of approximately 121 m OD. Groundwater elevations have been measured on two occasions at 113.71 m OD.

The proposed basement structure will extend to approximately 117 m OD, 4 m above the measured elevation of the water table. It is not anticipated that the development will have significant effects on groundwater elevations, or on the range of seasonal groundwater fluctuations.

The assessment is based on a sparse data set, and it is recommended that ongoing groundwater monitoring is undertaken as a condition of planning permission being granted. This should include for monitoring of winter high groundwater levels, to confirm that the highest groundwater levels will not affect the development.

There may be minor inflows of groundwater to the excavation under wet conditions, and provision should be made to keep the excavation dry.

The construction of a lightwell at the front of the property may reduce the permeable surface area of the site by 9 m<sup>2</sup>, or 6% of the total plot area. Changes to surfacing and drainage that might affect recharge to groundwater should be appropriately designed so that groundwater levels are not adversely affected. Design of drainage systems should consider the requirements of sustainable urban drainage.

## **7 REFERENCES**

**Arup, 2012.** Geological Hydrogeological and Hydrological Study, Guidance for subterranean development

**Fastrack, 2013.** Geotechnical Survey Report, 19 Bisham Gardens. Ref 8328.

**Fastrack, 2014.** Geotechnical Survey Report, 19 Bisham Gardens. Ref 8328a.

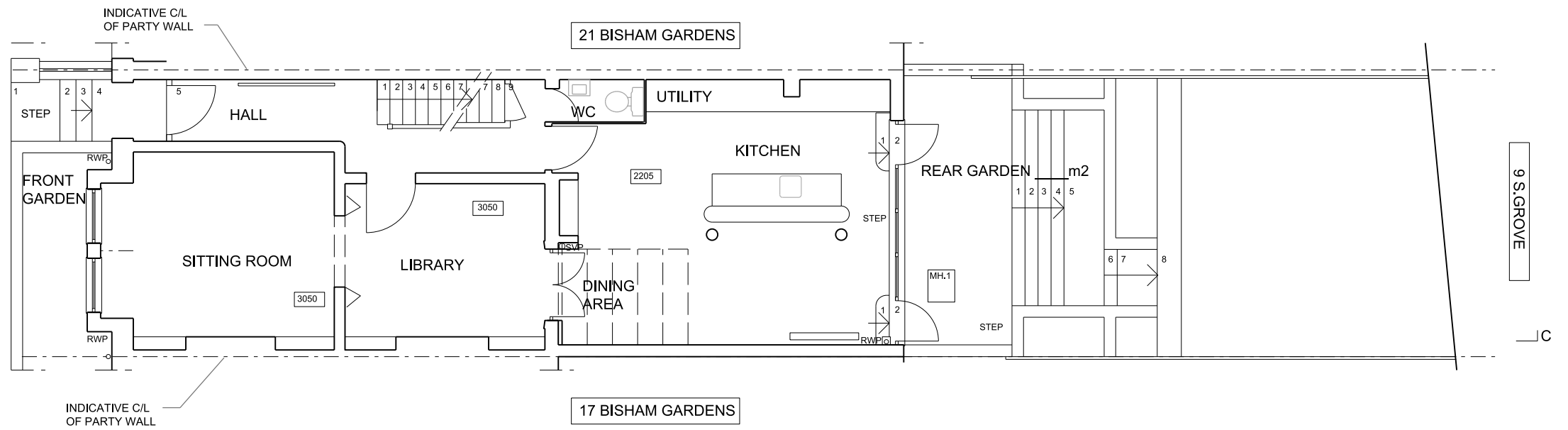
**London Borough of Camden** CPG4 'Basements and Lightwells'

# APPENDIX A

Site plans and elevations

BISHAM GARDENS

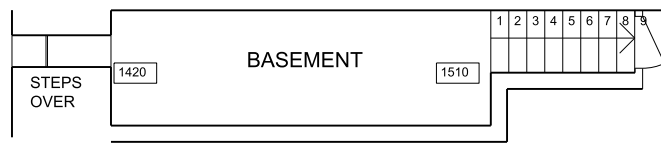
C



01 B GROUND FLOOR PLAN AS EXISTING

INDICATIVE C/L OF PARTY WALL

21 BISHAM GARDENS



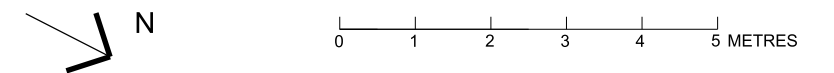
INDICATIVE C/L OF PARTY WALL

17 BISHAM GARDENS

01 A BASEMENT FLOOR PLAN AS EXISTING

**KEY** — — HIDDEN LINE OVER/BEHIND SVP = SOIL VENT PIPE [2600] FLOOR TO CEILING HEIGHT  
RWP = RAINWATER PIPE

APPROXIMATE FLOOR AREAS:  
MEASURED TO INSIDE OF EXTERNAL WALLS  
GROUND FLOOR= 70.1m<sup>2</sup>  
BASEMENT FLOOR= 9.2m<sup>2</sup>



REVISIONS

NOTES

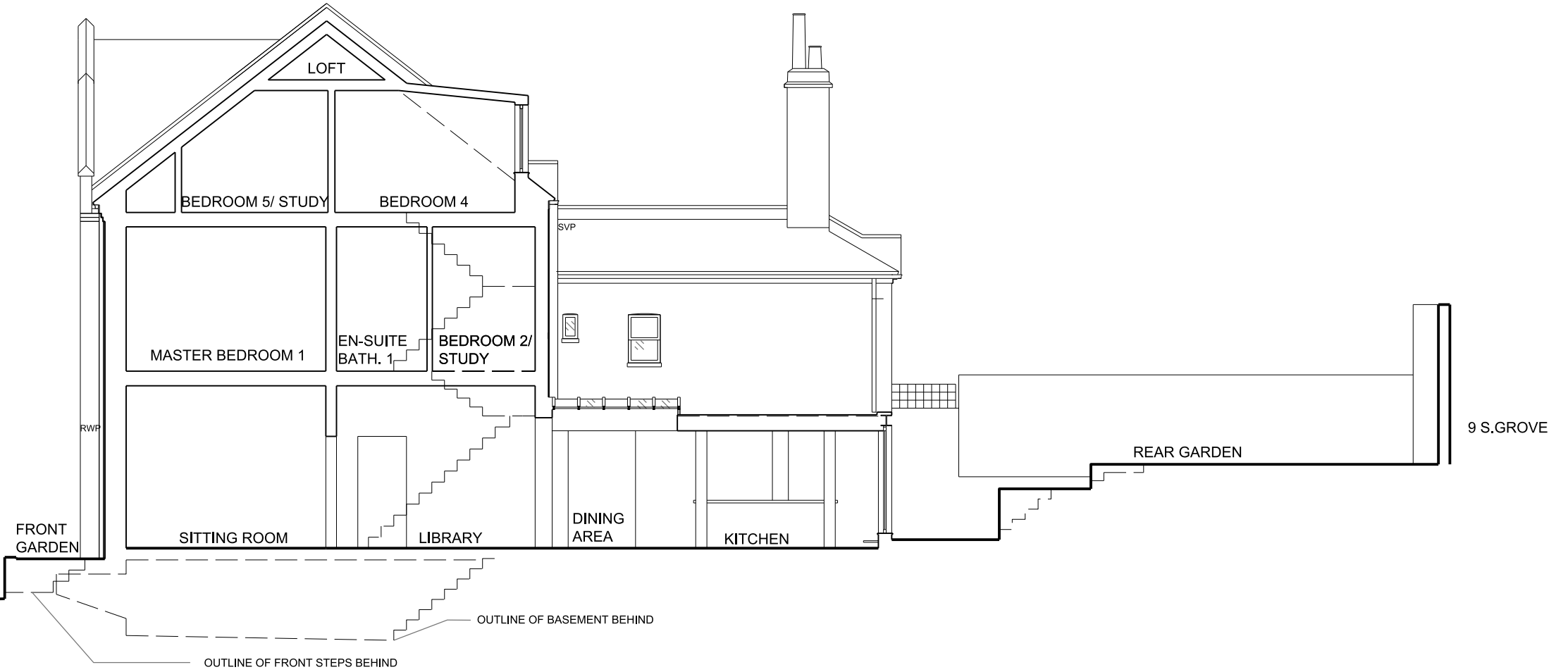
PICARDI ARCHITECTS 119 OXFORD GARDENS LONDON W10 6NE TEL. 020 89600383

1. ALL DIMENSIONS TO BE CHECKED ON SITE
2. THIS DRAWING IS COPYRIGHT OF PICARDI ARCHITECTS
3. THIS DRAWING DOES NOT FORM PART OF A STRUCTURAL SURVEY

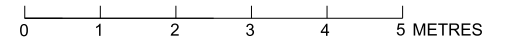
**TITLE**  
19 BISHAM GARDENS, LONDON N6  
PROPOSED REFURBISHMENT AND EXTENSION  
BASEMENT & GROUND FLOOR PLAN AS EXISTING

**JOB NO** BG13  
**DRG NO** 01 REV  
**DATE** AUG 13  
**SCALE** 1:100 @ A3

05 SECTION CC AS EXISTING

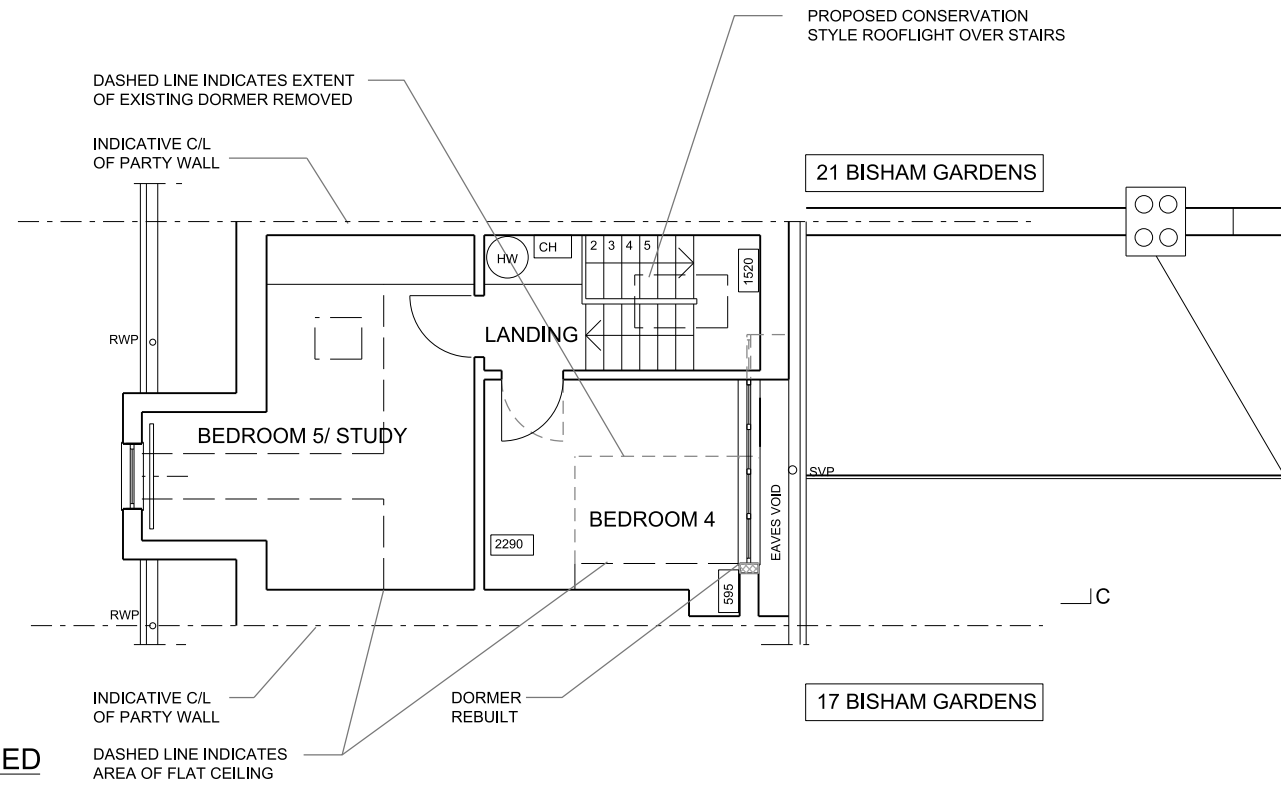


<b>KEY</b>	— — HIDDEN LINE OVER/BEHIND	SVP = SOIL VENT PIPE
		RWP = RAINWATER PIPE

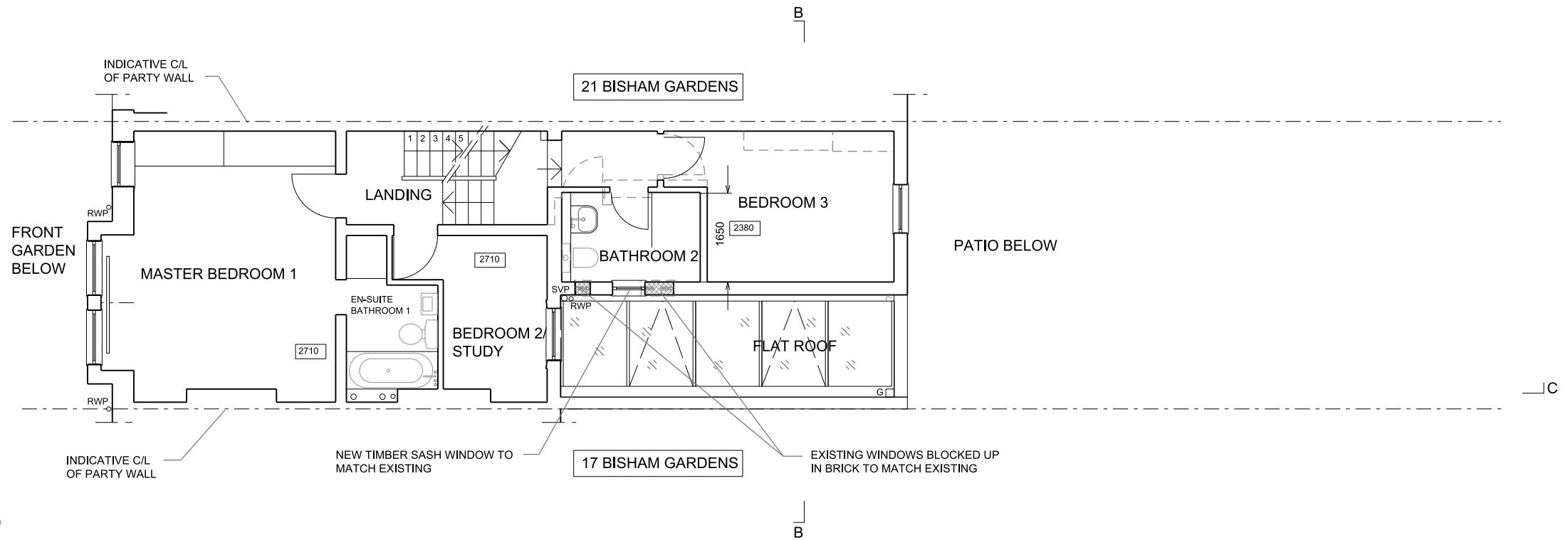


<b>REVISIONS</b>	<b>NOTES</b>
	1. ALL DIMENSIONS TO BE CHECKED ON SITE
	2. THIS DRAWING IS COPYRIGHT OF PICARDI ARCHITECTS
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PICARDI ARCHITECTS 119 OXFORD GARDENS LONDON W10 6NE TEL. 020 89600383	
<b>TITLE</b>	<b>JOB NO</b> BG13
19 BISHAM GARDENS, LONDON N6	<b>DRG NO</b> 05 REV
PROPOSED REFURBISHMENT AND EXTENSION	<b>DATE</b> AUG 13
SECTIONS CC AS EXISTING	<b>SCALE</b> 1:100 @ A3



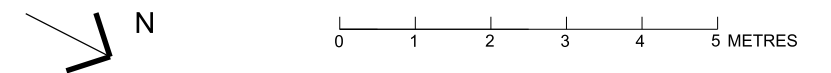
**12** SECOND FLOOR PLAN AS PROPOSED  
**B**



**12** FIRST FLOOR PLAN AS PROPOSED  
**A**

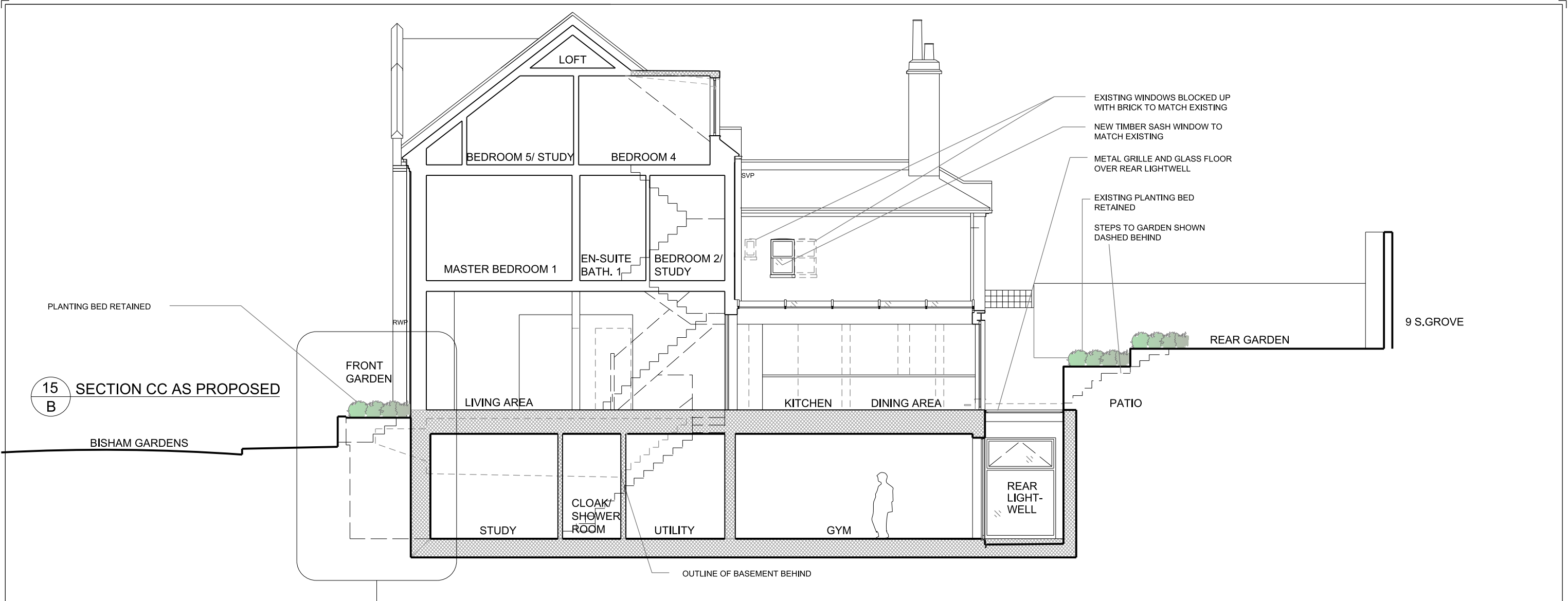
<b>KEY</b>	— — HIDDEN LINE OVER/BEHIND	SVP = SOIL VENT PIPE	[2600] FLOOR TO CEILING HEIGHT
	- - - - REMOVED/DEMOLISHED	RWP = RAINWATER PIPE	[Hatched] NEW CONSTRUCTION

APPROXIMATE FLOOR AREAS:  
MEASURED TO INSIDE OF EXTERNAL WALLS  
FIRST FLOOR= 56.9m<sup>2</sup>  
SECOND FLOOR= 32.9m<sup>2</sup>

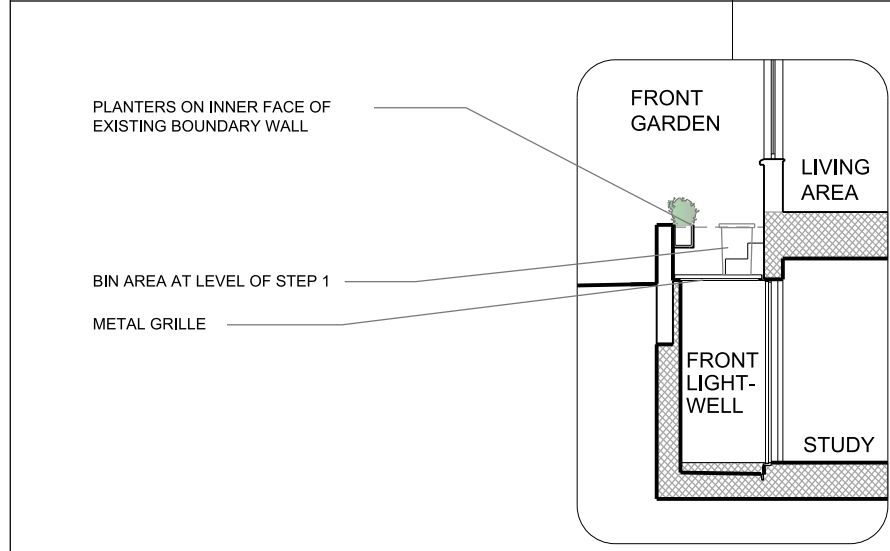


<b>REVISIONS</b>	<b>NOTES</b>
	1. ALL DIMENSIONS TO BE CHECKED ON SITE
	2. THIS DRAWING IS COPYRIGHT OF PICARDI ARCHITECTS
	3. THIS DRAWING DOES NOT FORM PART OF A STRUCTURAL SURVEY


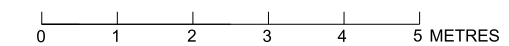
PICARDI ARCHITECTS 119 OXFORD GARDENS LONDON W10 6NE TEL. 020 89600383	
<b>TITLE</b>	<b>JOB NO</b>
19 BISHAM GARDENS, LONDON N6	BG13
<b>PROPOSED REFURBISHMENT AND EXTENSION</b>	<b>DRG NO</b>
<b>FIRST &amp; SECOND FLOOR PLAN AS PROPOSED</b>	12 REV
	<b>DATE</b>
	AUG 13
	<b>SCALE</b>
	1:100 @ A3



15 SECTION CC AS PROPOSED  
B



15 INSET: SECTION DD AS PROPOSED  
A

<b>KEY</b> - - - HIDDEN LINE OVER/BEHIND - - - REMOVED/DEMOLISHED SVP = SOIL VENT PIPE RWP = RAINWATER PIPE  NEW CONSTRUCTION		
<b>REVISIONS</b>  	<b>NOTES</b> 1. ALL DIMENSIONS TO BE CHECKED ON SITE 2. THIS DRAWING IS COPYRIGHT OF PICARDI ARCHITECTS 3. THIS DRAWING DOES NOT FORM PART OF A STRUCTURAL SURVEY	PICARDI ARCHITECTS 119 OXFORD GARDENS LONDON W10 6NE TEL. 020 89600383 <b>TITLE</b> 19 BISHAM GARDENS, LONDON N6 PROPOSED REFURBISHMENT AND EXTENSION SECTIONS CC AND DD AS PROPOSED <b>JOB NO</b> BG13 <b>DRG NO</b> 15 REV <b>DATE</b> AUG 13 <b>SCALE</b> 1:100 @ A3



**APPENDIX H**

**EVANS RIVERS AND COASTAL SURFACE WATER AND  
FLOODING SCREENING**

101 Knowsley Road, Norwich, Norfolk, NR3 4PT  
 Telephone: 01603 611923  
 Email: enquiries@evansriversandcoastal.co.uk

Our Ref: 1377/RE/01

10<sup>th</sup> December 2014

Mr M Rush  
**FASTRACK™ SITE INVESTIGATIONS LTD**  
 Tyndales Farm,  
 Southend Road,  
 Woodham Mortimer,  
 Essex  
 CM9 6TQ

Dear Martin,

**PROPOSED BASEMENT WORKS AT NUMBER 19 BISHAM GARDENS, LONDON, N6 6DJ  
 SURFACE FLOW AND FLOODING SCREENING**

Please find below (continued overleaf) the completed Surface Flow and Flooding screening table in accordance with the requirements of the London Borough of Camden Planning Guidance CPG4 "Basements and Lightwells" and Arup's "Geological, Hydrogeological and Hydrological Study, Guidance for Subterranean Development".

Question	Response for 19 Bisham Gardens
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Figure 14 of the Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010, confirms that the site is not located within this catchment area.
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	<p>No. There will not be an increase in impermeable area across the ground surface above the basement.</p> <p>There will be no surface expression of the basement development, so the surface water flow regime will be unchanged.</p> <p>Although the basement will mainly be located under the dwelling, it is proposed that the basement will also extend below ground into the garden area somewhat. The ground surface above the basement will not change and will remain as hardstanding. This will ensure no increase in runoff rate or volume as a result of the proposed basement construction.</p> <p>The basement will largely be beneath the footprint of the dwelling therefore the 1m distance between the roof of the basement and ground surface as recommended by the <i>Camden geological, hydrogeological and hydrological study – Guidance for subterranean development</i> dated 2010, does not generally apply. However, where the basement extends into the rear garden, there will be a small section which has less than 1m distance between the roof of the basement and ground surface and it is unlikely that this will impact the infiltration capacity and runoff regime as the ground surface above the basement is currently paved and therefore already has a low permeability and infiltration capacity.</p>

<p>3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?</p>	<p>No. There will not be an increase in impermeable area across the ground surface above the basement.</p> <p>There will be no surface expression of the basement development.</p>
<p>4. Will the proposed basement development result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?</p>	<p>No. There will not be an increase in impermeable area across the ground surface above the basement.</p> <p>There will be no surface expression of the basement development, so the surface water flow regime will be unchanged.</p> <p>The basement will largely be beneath the footprint of the dwelling therefore the 1m distance between the roof of the basement and ground surface as recommended by the <i>Camden geological, hydrogeological and hydrological study – Guidance for subterranean development</i> dated 2010, does not generally apply. However, where the basement extends into the rear garden, there will be a small section which has less than 1m distance between the roof of the basement and ground surface and it is unlikely that this will impact the infiltration capacity and runoff regime as the ground surface above the basement is currently paved and therefore already has a low permeability and infiltration capacity.</p>
<p>5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?</p>	<p>No. There will be no surface expression of the basement development, so the surface water flow regime will be unchanged.</p> <p>There will not be an increase in impermeable area and therefore no increased quantity of surface water being discharged from the site.</p> <p>The basement will largely be beneath the footprint of the dwelling therefore the 1m distance between the roof of the basement and ground surface as recommended by the <i>Camden geological, hydrogeological and hydrological study – Guidance for subterranean development</i> dated 2010, does not generally apply. However, where the basement extends into the rear garden, there will be a small section which has less than 1m distance between the roof of the basement and ground surface and it is unlikely that this will impact the infiltration capacity and runoff regime as the ground surface above the basement is currently paved and therefore already has a low permeability and infiltration capacity.</p>
<p>6. Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk of flooding because the proposed basement is below the static water level of a nearby surface water feature?</p>	<p>No. The Camden Flood Risk Management Strategy dated 2013, North London Strategic Flood Risk Assessment dated 2008, and Environment Agency online flood maps show that the site has a low flooding risk from surface water, sewers, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses.</p> <p>The site is located within the Critical Drainage Area number GROUP3-001 as identified in the Camden SWMP.</p>

Yours sincerely



Rupert Evans MSc CEnv C.WEM MCIWEM AIEMA  
Director and Chartered Environmentalist

**APPENDIX I**

**GROUND AND PROJECT CONSULTANTS LTD:**

**BIA ASSESSMENT: LAND STABILITY**

**Ground and Project Consultants Ltd**



**19 BISHAM GARDENS, LONDON, N6 6DJ**

**Basement Impact Assessment:**

**Land Stability**

**February 2015**



**Client:**

**Green Structural Engineering,  
Unit 4 Marvic House,  
Bishops Rd,  
London SW6 7AD**

# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

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The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Ground and Project Consultants Ltd at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

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# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

### 1. Introduction

Ground and Project Consultants Ltd have been instructed by Green Structural Engineering Ltd (GSE) to undertake the land stability element of a Basement Impact Assessment compliant with CPG4, for 19 Bisham Gardens, London, N6 6DJ. The location of the property is indicated on Figure 1.



Figure 1: Site Location

Ordnance Survey Data © Crown copyright and database right 2015

# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

### 2. Scope and Objective

The scope of this report and approach is as follows:

- A review the existing data supplied by GSE has been carried out, including the BIA produced to date, Ground Investigation data (two reports) and the proposed and existing drawings/ photos for the building and the background data available through LB Camden's website and other freely available data such as BGS.
- In line with the CPG4 guidance:
  - A detailed assessment of the published and encountered geology
  - Development of a ground model including an assessment of geotechnical properties
  - An engineering interpretation including an assessment of slope stability and ground movements.
- Recommendations for additional work/ monitoring and observation have been provided.

This report and the work to support it has been carried out by Jon Smithson who is a Director of Ground and Project Consultants Ltd and is a Chartered Geologist with 30 years' experience.



# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

### 3. Site Information

#### 3.1 Existing Property and Basement Proposals

The property at 19 Bisham Gardens, London N6 6DJ is located on the north side of the street, which is itself located immediately to the north of Waterlow Park and to the NNE of Highgate Cemetery. The property is a terraced three storey house with a small basement. It is brick built with timber floors and roof construction. No buildings in the terrace are heritage listed.

The house has a footprint of around 105m<sup>2</sup> with an overall plot size of approximately 161m<sup>2</sup>. The existing basement extends below the front half of the house only and its depth is approximately 1.7m below the existing ground floor and its floor is around 0.6m below the street level.

It is understood that the house next door, No. 21, had a basement constructed in around 2001 (Camden application number: PEX0100287).

The BIA produced by GSE (Ref 4) states that:

*'The property is in a sound condition structurally with no sign of movement associated with the previous basement to No21 evident during visual inspection. The adjoining properties are of similar construction and look to be in sound condition from an external non-intrusive visual examination.'*

The basement proposals are for a study, cloak/shower room, utility room, gym, a second shower room and storage space. The basement will extend beneath the entire footprint of the house and will include a large rear light-well and a smaller light-well at the front. The base of the basement slab will be around 3.7m below the existing ground floor and 2.6m below street level.

#### 3.2 Topography

The property is located close to the top of a gentle hill at Highgate. Its elevation can be estimated from OS mapping at around 124mAOD. This is confirmed by the survey for a borehole drilled in the rear garden at 123.46mAOD. The OS map shows that the ground surface falls relatively gently to the SSE over a gradient of around 1 in 10 (i.e. around 6°). To the west the land rises slightly and then falls gently away towards Highgate ponds. See Figure 1.

#### 3.3 Geology

The available geological mapping (Ref 1.) indicates that the site is underlain by the Bagshot Formation, which overlies Claygate beds. This in turn overlies London Clay which is extensive across much of the London area. The Bagshot Formation and Claygate beds form the high ground in the area. Comparing the geological map and topographical maps it is estimated that the surface of the London Clay beneath the property is at around 95mAOD, around 29m below ground level. The surface of the Claygate beds are estimated to be around 115mAOD, i.e. about 8m below ground level.

The Bagshot Formation and Claygate beds are described in the Arup report (Ref 2.) as follows:

*'The Bagshot Formation comprises cross-laminated yellow, orange brown and brown fine grained sands. In Hampstead Heath the Bagshot Formation has a basal bed of coarse grit and sub-rounded flint pebbles. The Claygate Member consists of alternating beds of clayey silt, very silty clay, sandy silt and silty fine sand. The Claygate Member and the Bagshot Formation were both deposited in marine conditions shallow enough to be influenced by tidal sequences,*

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## 19 Bisham Gardens, BIA: Land Stability Report

although the supply of sediment during the deposition of the Bagshot Formation is thought to have been higher than in the Claygate Member deposition.'

### 3.4 Hydrology and Hydrogeology

The OS Map indicates that there are three surface water bodies within Waterlow Park, around 150, 290 and 390m south-east of the property. There are no other surface water features within 250 m of the site, and no detailed River Network entries within 500 m of the site. There are no springs shown on OS mapping but the local geological boundaries between the Bagshot and Claygate, and Claygate and London Clay (approx. 100m and 300m from the site respectively), may give rise to springs/groundwater emergence. There are no groundwater abstraction licenses within 2 km of the site and no source protection zones within 500 m of the site. (Ref 3. Groundsure appendix).

The Bagshot Formation is classified by the Environment Agency as a Secondary A aquifer (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).

### 4. Ground Investigation

Two phases of ground investigation have been carried out by Fastrack Ltd and results of these have been made available by GSE. The first GI was carried out in 2013 and reported in November of that year. The work included a desk study and much of the data is summarised above. The section on natural (ground) hazards is quoted below:

“There is a negligible shrink swell hazard as the ground conditions are predominantly non plastic. There landslide risk is very low; Slope instability problems are unlikely to be present. The soluble rock hazard is null/negligible as soluble rocks are not present within the site area. There is negligible risk from compressible ground, No indicators for compressible deposits identified. The collapsible rocks hazard is very low; Deposits with potential to collapse when loaded and saturated are unlikely to be present. The running sand hazard is low; there is possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. The site does not lie with an area affected by mining”.

Our review of the Groundsure data confirms that this is an accurate assessment but some aspects are considered further in the screening exercise and impact assessment.

One trial pit was excavated in the front left (i.e. SW) corner of the basement. This revealed a brick foundation founded on medium dense (estimated by logger) Sand at 0.215m below the basement floor. The foundation consists of 3 brick step outs. A borehole was drilled by hand auger in the front garden of the property elevated about 0.8m above street level. This encountered 0.5m of Made Ground, overlying a 'mid brown sand and gravel'. Fastrack note that the Sand and Gravel was noted to be loose at 0.50m increasing in density to medium dense between 1.00m and 2.00m (Fastrack have estimated relative density from Mackintosh probe blow counts which is usually assessed from the Standard Penetration Test (SPT)).

An additional borehole was drilled in the second phase to 10m in the rear garden of the property. This encountered the following sequence:

# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

Top/Bottom mbgl	Description	Likely Designation
0.0/1.2	Dark brown sandy clayey MADE GROUND containing brick and gravel	Made Ground
1.2/2.5	Dense dark brown clayey sandy GRAVEL	Bagshot Formation
2.5/9.3	Dense yellow clayey SAND	Bagshot Formation
9.3/Not proven	Orange silty sandy gravelly CLAY	Claygate Member

Table 1: Strata at site

The depth and reduced level of 114.16mAOD correlates very well with the estimated surface of the Claygate member at 115mAOD. The change in the nature of the strata from granular to cohesive also correlates with the expected descriptions of the respective strata. Again it should be noted that the assessments of 'Dense' for relative density (normally measured using the Standard Penetration Test (SPT)) have been carried out using Mackintosh probe correlations. It is assumed from the borehole records that the probe tests were undertaken in 75mm drives and that Fastrack have extrapolated these results.

Groundwater was encountered in the borehole at 9.75mbgl (113.71mAOD).

Laboratory tests were carried out on the samples collected from the borehole. Moisture contents were derived at regular intervals. These are of limited value due to the potential addition of water or drainage of (permeable) sand and gravel samples in the drilling and sampling process. It is noted that the description for the sample at 10m does not conform to that in the borehole log.

Particle size distribution tests were carried out on 4 samples which correlated well to the descriptions in the logs and percentages of clay/silt, sand and gravel have been estimated from the results and are summarised as follows:

Depth (m)	Clay/Silt %	Sand %	Gravel%
2.0	2	8	90
6.0	17	80	3
8.0	10	90	0
10.0	19	70	11

Table 2: Summary of Grading analyses

Although the lower sample, described as a clay, has a relatively low fines content of 19%, the influence of the finer fraction will be disproportionate in its engineering properties and is likely to behave as a clay.

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## 19 Bisham Gardens, BIA: Land Stability Report

### 5. Conceptual Ground Model

From the above a conceptual Ground model has been developed and is presented in tabular form below:

Strata	Typical Description	Depth at Property	Geotechnical Properties – Tentative Characteristic Values*	Other
Made Ground	Dark brown sandy clayey MADE GROUND containing brick and gravel	Ground level to 1.2m	N/A	Made Ground is unlikely to be encountered in significant quantities or locations. It should not be relied upon as a bearing strata.
Bagshot Formation	Dense dark brown clayey sandy GRAVEL or Dense yellow clayey SAND	1.2m to 9.3m	$c' = 0$ , $\Phi' = 28^\circ$ Bulk Density = $19.5 \text{ Mg/m}^3$	Variable gravel and sand content
Claygate Member	Orange silty sandy gravelly CLAY	9.3m to c 29m	$c' = 0$ , $\Phi' = 22^\circ$ Bulk Density = $19.5 \text{ Mg/m}^3$	
London Clay	Not available	c. 29m and below	N/A	Not encountered
Groundwater		9.75m		May exhibit significant vary seasonally or after prolonged wet or dry periods.

Table 3: Summary of Strata Characteristics

\*The determination of parameters is tentative due to the lack of test data.

# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

### 6. BIA Screening for Slope/Land Stability

A screening exercise has been carried out as per the guidance in CPG4 as follows:

Question	Answer	Action/ Comment
Question 1: Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)	No. The gradients in the area assessed from OS data suggest slopes of around 6° (in Waterlow Park) and locally lesser gradients in the street of around 4 ½°. (Ref 4). Reference to figure 16 in the Arup report suggests some localised exceedances of 7° degrees. It is likely that this is due to localised changes in level arising from the presence of steps up to properties. London Clay is at significant depth below the site.	None
Question 2: Will the proposed reprofiling of landscaping at site change slopes at the property boundary to more than 7deg? (approximately 1 in 8)	No. There are no changes in surface profile planned.	None
Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7deg? (approximately 1 in 8)	No.	None
Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7degrees? (approximately 1 in 8)	No, the slope in the area is around 1 in 10 (6°) based on Ordnance Survey data. It is understood that there is a cross fall towards the south of approximately 4 ½° degrees across the street.	
Question 5: Is the London Clay the shallowest strata at the site?	No, the proposed works will be entirely carried out within the Bagshot Formation. The surface of the London Clay is some 29 to 30m below the surface at the site.	None
Question 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? (Note that consent is required from LB	No.	None

# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

Camden to undertake work to any tree/s protected by a Tree Protection Order or to tree/s in a Conservation Area if the tree is over certain dimensions).		
Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	None known. Unlikely as the near surface soils appear to be generally granular in nature.	None
Question 8: Is the site within 100m of a watercourse or a potential spring line?	No.	None
Question 9: Is the site within an area of previously worked ground?	No.	None
Question 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. The site is located on the Bagshot Formation which is a Secondary A aquifer. Groundwater was encountered at some depth well below the influence of the proposed works. It is therefore unlikely that there will be any requirement for significant dewatering.	If significant groundwater is encountered then adjustments to working methods will be required to minimise the potential for settlement. This is further discussed in the Impact Assessment.
Question 11: Is the site within 50m of the Hampstead Heath ponds?	No.	None
Question 12: Is the site within 5m of a highway or pedestrian right of way?	Yes.	Health Safety and environmental measures will be required to be integrated into the building contractors methods of working
Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes, the basement extend the depth by 2.0m where there is an existing facility and by around 3.5m elsewhere. The Structural BIA report discusses the construction sequence and mitigation in some detail. This is also further discussed in detail in the Impact Assessment of this report.	This is also further discussed in detail in the Impact Assessment of this report.
Question 14: Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No.	None

## 7. Impact Assessment

There are no major issues which should seriously affect the viability of the construction of the new basement. However the assessment of the geo-environment of 19 Bisham Gardens and the screening exercise indicate some areas for further discussion in this report with suggested mitigation where appropriate.

- 7.1 **Groundwater:** The ground investigation encountered groundwater at depth, some 9.75m bgl. However this is based on two readings in September 2014 at the end of a relatively dry summer. Groundwater levels can vary significantly on a seasonal basis or after prolonged wet weather. There is limited recharge potential at the site as it is close the top of a hill, so it will be reasonable to assume that levels will not vary significantly. Should significant flows be encountered during construction, open exposures of the sands and gravels should be further limited in size and time and measures taken to prevent wash out of fines. Settlement from dewatering itself (i.e. if loss of fines is prevented) is likely to be of low magnitude. It is recommended that monitoring of groundwater is undertaken before during and after the works.
- 7.2 **Basement Depth:** The basement is proposed to be constructed involving an excavation to 3.7m below the existing ground floor and 2.6m below street level. Basement construction is understood to have taken place next door at no.21 with, it is understood, no adverse effects on it or adjacent properties, including no.19. It is presumed that no.17 has only a small basement similar to that existing at 19 and therefore the depth of the proposed basement has some significance. It is understood that the proposals to construct the basement involves a 'hit and miss' approach in 5 stages so each 'panel' is separated by 4 others from the next open one. It will be important that the building contractor is closely supervised and is experienced in this type of construction. It will be critical to prevent exposed faces from collapse or significant ground loss into the new excavation and temporary face support should be maintained where practicable. Regular and baseline monitoring of the building and its immediate neighbours for settlement and movement/distress is highly recommended during building works and for a short period after completion.

# Ground and Project Consultants Ltd

## 19 Bisham Gardens, BIA: Land Stability Report

### 8. Conclusions

The methodology and approach of CPG4 has been followed in developing this BIA with respect to Land stability. It is concluded that with the construction of the new basement at 19 Bisham Gardens should not have significant impacts on land stability provided that:

- Groundwater inflow, if encountered is reduced to a minimum and properly controlled such that there is no significant wash out of fine material. Groundwater levels should be monitored before, during and after construction.
- The construction of the basement is carried out by a competent and experienced building contractor and precautions are taken to maintain the stability of the excavations.
- Monitoring of the structures is carried out before, during and after construction. The exact nature of this monitoring should be determined by the structural engineer.



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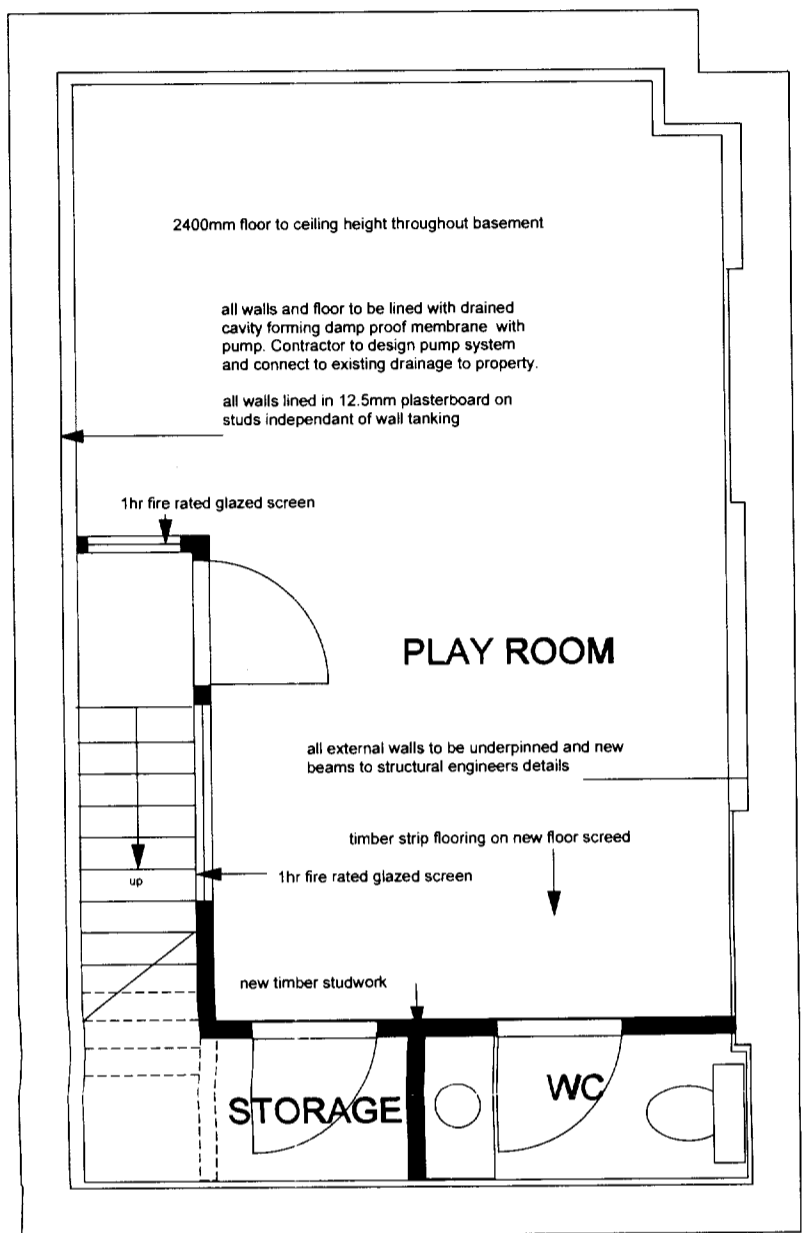
## 19 Bisham Gardens, BIA: Land Stability Report

### 9. References

1. BGS open source mapping: <http://mapapps2.bgs.ac.uk/geoindex/home.html>
2. Arup: Camden Geological, Hydrogeological and Hydrological Study
3. Fastrack: Geotechnical Survey Reports 8328 and 8328a
4. Green Structural Engineering: 19 Bisham Gardens, London, N6 6DJ, Basement Impact Assessment, December 2013

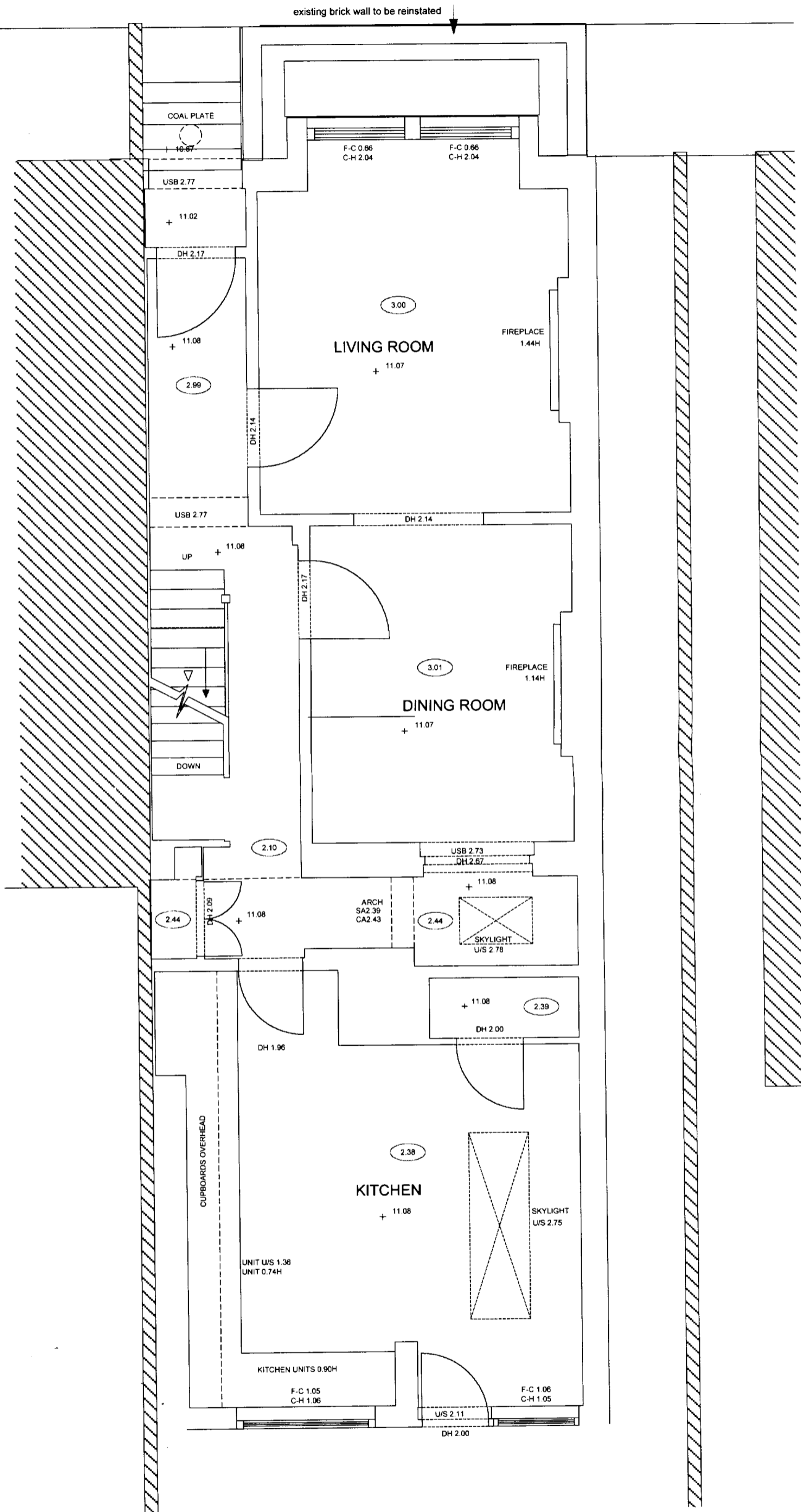
**APPENDIX J**

**NO21 PLANNING DRAWINGS FOR EXISTING BASEMENT**



**BASEMENT FLOOR PLAN**

PEX0100287R1  
 B10/9/15



**GROUND FLOOR PLAN**

**GREGORY PHILLIPS ARCHITECTS**

66 GREAT CLIMBERLAND PLACE, LONDON W1H 7FD. TELEPHONE: 020 7724 3040. FACSIMILE: 020 7724 3020

CLIENT: Michael Rosehill  
 PROJECT: 21 Bisham Gardens  
 DRAWING TITLE: Plans/Elevation  
 SCALE: 1:50 @ A3  
 DATE: March 2001

090/001

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FLOWERBED

EXISTING ELEVATION FROM STREET



FLOWERBED AS EXISTING

PROPOSED ELEVATION FROM STREET  
= EXISTING ELEVATION

PE X0100287R1  
 B10/9/15

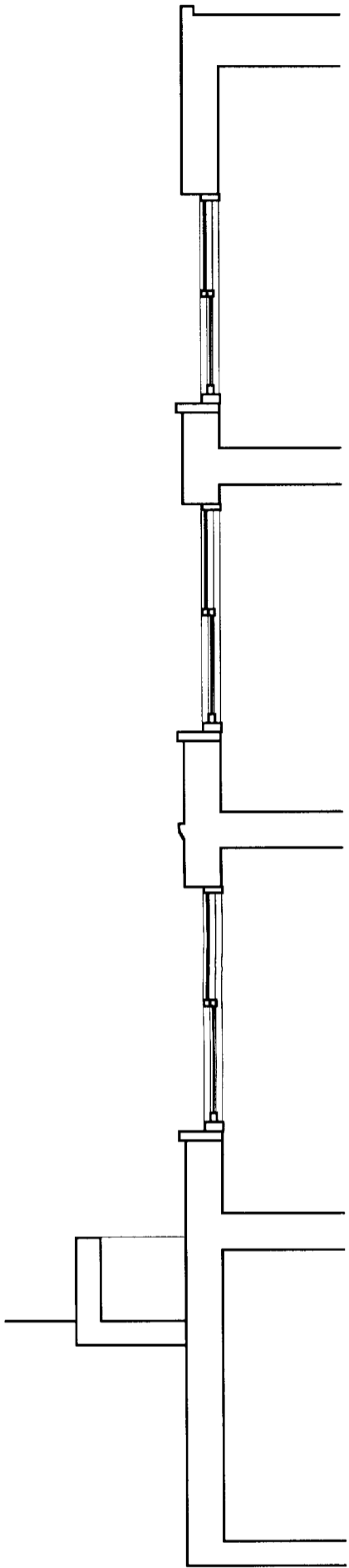
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65 GREAT CLIFTON PLACE LONDON W1H 7FD TELEPHONE 020 7724 3040 FACSIMILE 020 7724 3020

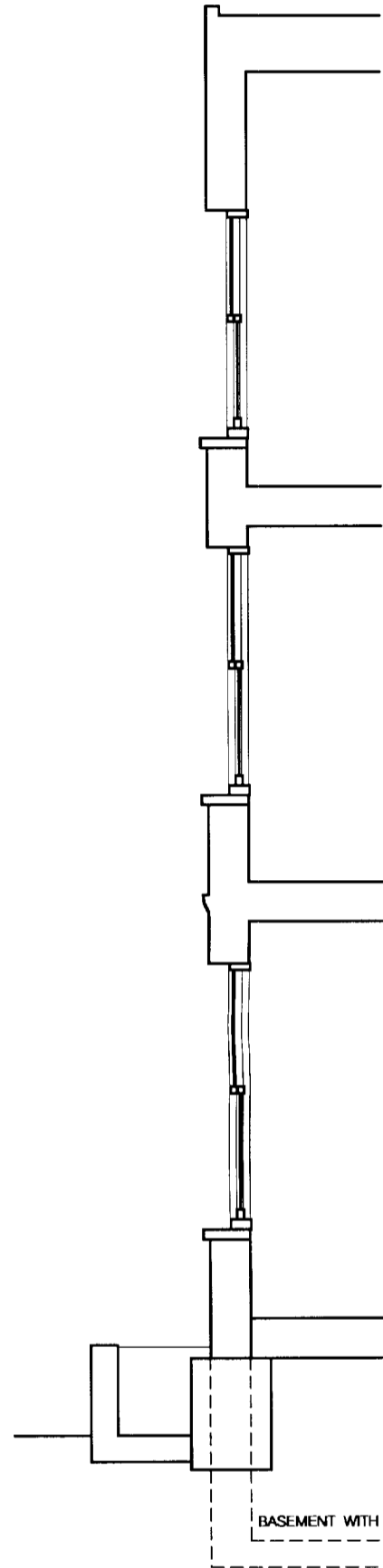
CLIENT Michael Rosehill  
 PROJECT 21 Bisham Gardens  
 DRAWING TITLE Elevation, existing and proposed  
 SCALE 1:50 @ A3  
 DATE March 2001

DRAWING NO.	090/002	REV	01
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REVISIONS  
B10/d/s  
2/10/01



SECTION THROUGH FACADE TOWARDS STREET



SECTION THROUGH STREETFACADE AS EXISTING

GREGORY PHILLIPS ARCHITECTS

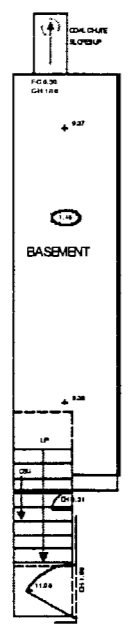
88 GREAT CLIMBERLAND PLACE LONDON W1H 7TD TELEPHONE 020 7724 3040 FACSIMILE 020 7724 3020

CLIENT Michael Rosehill  
PROJECT 21 Bisham Gardens  
DRAWING TITLE Sections  
SCALE 1:50 @ A3  
DATE March 2001

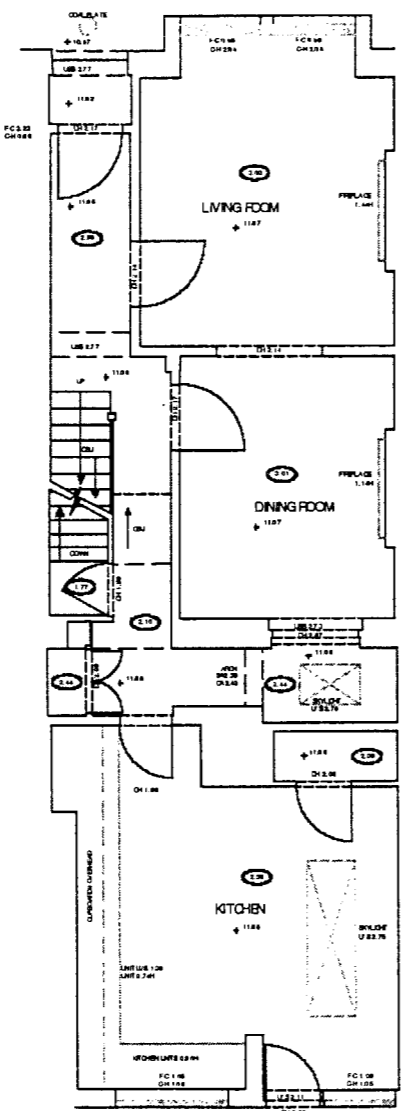
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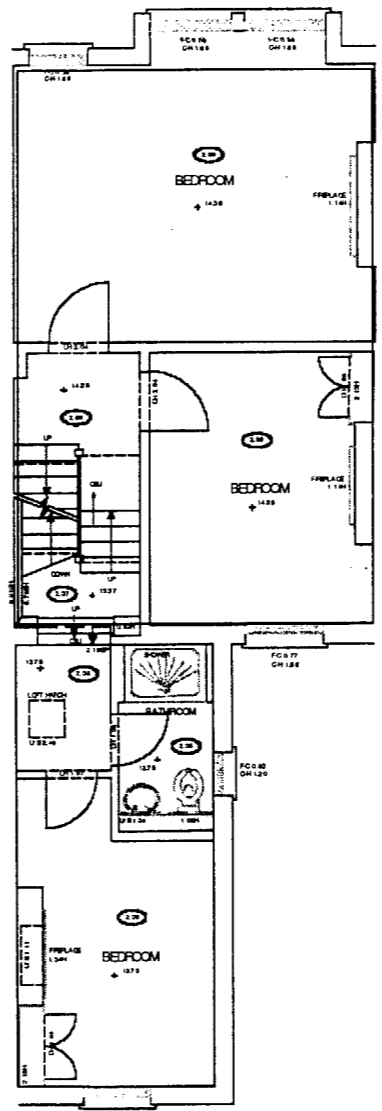
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B 1 0 / 9 / 1 5



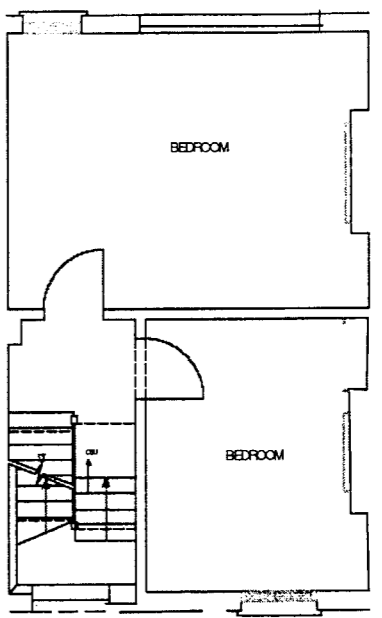
BASEMENT PLAN



GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN  
APPREX

<b>XYZ LAND SURVEYS</b>		LEVELS RELATE TO -- TBM WITH AN ARBITRARY VALUE OF 10.00m.	
<b>LAND &amp; BUILDING SURVEYORS</b>			
<small>SURVEYS TAKEN IN ACCORDANCE WITH SURVEY ACT 1980          TRANSFORMATION &amp; REVISIONS TO BE MADE BY SURVEYORS ONLY          16, 18 &amp; 20, BISHAM GARDENS, LONDON, N6          CONTACT: SURVEYORS@XYZSURVEYS.CO.UK</small>			
SITE <b>21 BISHAM GARDENS</b> LONDON N6		ORIGINAL SURVEY 1. SURVEY OF THE BUILDING 2. SURVEY OF THE SITE 3. SURVEY OF THE ADJACENT PLOTS 4. SURVEY OF THE ADJACENT STREETS 5. SURVEY OF THE ADJACENT PARKS 6. SURVEY OF THE ADJACENT RIVERS 7. SURVEY OF THE ADJACENT CANALS 8. SURVEY OF THE ADJACENT BRIDGES 9. SURVEY OF THE ADJACENT TUNNELS 10. SURVEY OF THE ADJACENT TOWERS 11. SURVEY OF THE ADJACENT CASTLES 12. SURVEY OF THE ADJACENT CASTLES 13. SURVEY OF THE ADJACENT CASTLES 14. SURVEY OF THE ADJACENT CASTLES 15. SURVEY OF THE ADJACENT CASTLES 16. SURVEY OF THE ADJACENT CASTLES 17. SURVEY OF THE ADJACENT CASTLES 18. SURVEY OF THE ADJACENT CASTLES 19. SURVEY OF THE ADJACENT CASTLES 20. SURVEY OF THE ADJACENT CASTLES	
DRAWING			
FLOOR PLANS			
DATE	150	DATE	20/1/2001
BY	MEL/ET	CHECKED	01
<b>GREGORY PHILLIPS ARCHITECTS</b>			

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CLIENT: Michael Rosehill  
 PROJECT: 21 Bisham Gardens  
 DRAWING TITLE: Survey of Existing  
 SCALE: 1:123 @ A3  
 DATE: March 2001

THUMBING NO.	090/006	REV.	00
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