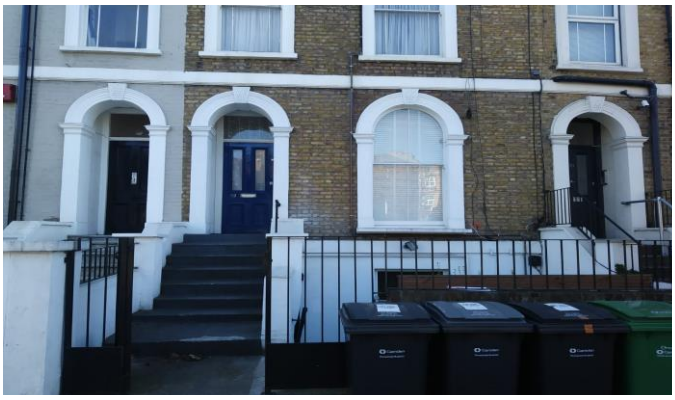
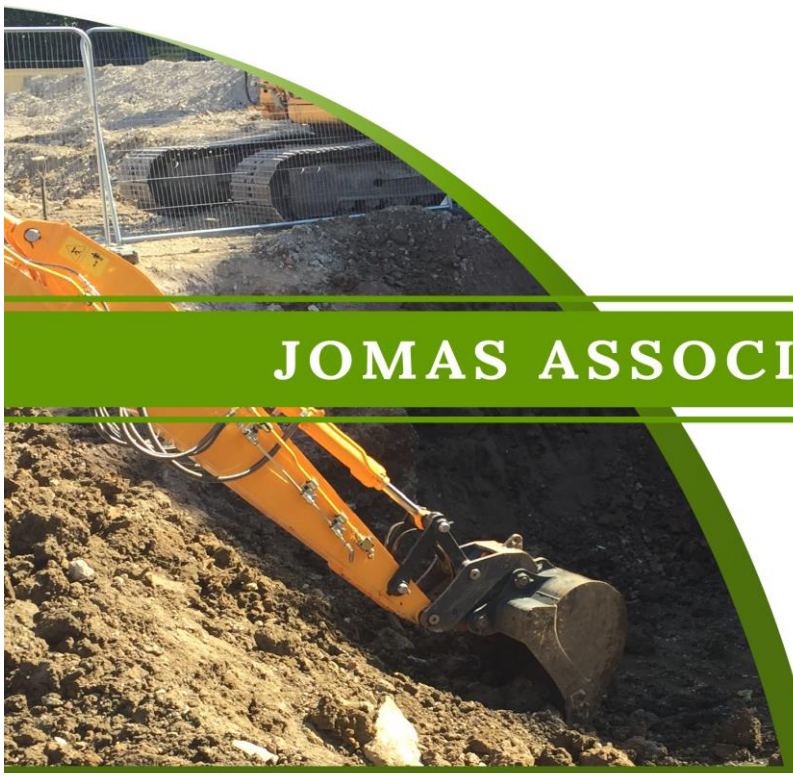
DESK STUDY &
PRELIMINARY BASEMENT IMPACT ASSESSMENT (SCREENING & SCOPING) REPORT

FOR

FLAT A
19 CAMDEN PARK ROAD
LONDON
NW1 9AX





JOMAS ASSOCIATES LTD

SITE INVESTIGATION & SURVEYS
LAND DEVELOPMENT SUPPORT

Tel: 0843-289-2187

Report Title: **Desk Study & Basement Impact Assessment (Screening & Scoping) for Flat A, Camden Park Road, London, NW1 9AX.**

Report Status: **Final v1.0**

Job No: **P1675J1537/SRC**

Date: **07 November 2018**

QUALITY CONTROL - REVISIONS

Version	*Date*	*Issued By*
v1.1	15 November 2019	SRC

Prepared by: JOMAS ASSOCIATES LTD **For: JAMES OZKAN**

Prepared by
Alex Marcelo BSc (Hons)
Geotechnical Engineer

Reviewed by
Peter Swettenham BSc (Hons) MSc PgCert CEnv MIEnvSc
Principal Geotechnical Engineer

Approved by
Roni Savage BEng (Hons), MSc, SiLC, CGeol, MCIWM, FGS
Technical Director

Shaw Carter BSc (Hons), FGS
Geotechnical Engineer

Suneel Law BSc (Hons) MSc FGS
Principal Geo-environmental Engineer

James Field, BSc (Hons), CGeol, FGS, RoGEP
Principal Engineer

Should you have any queries relating to this report, please contact

Jomas Associates Ltd

www.jomasassociates.com

☎ 0843 289 2187

✉ info@jomasassociates.com

CONTENTS

Page

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS

EXECUTIVE SUMMARY

James Ozkan ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Basement Impact Assessment for a site located at Flat A, 19 Camden Park Road, London, NW1 9AX.

The aim of this report is to assess whether the ground conditions within the local area represent an impediment to the proposed development. A preliminary risk assessment is also undertaken to establish if possible contaminant linkages exist, which require further investigation in accordance with the Environment Agency (EA) report R&D CLR11 and relevant guidance within the National Planning Policy Framework (NPPF).

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Desk Study	
Current Site Use	The site currently comprises a three-storey residential building with lower ground floor.
Proposed Site Use	The proposed development for this site is understood to comprise the lateral extension of the existing lower ground floor into the existing garden area towards the south west. The lateral extent of the proposed development is undecided at the time of writing this report, numerous options are available. Private gardens are anticipated as part of this proposed development.
Site History	On the earliest available map (1867), the site is shown to consist of a residential style terraced building development with a private garden towards the south west. No significant changes are noted from this date to the present-day configuration of site. The site vicinity on the earliest available plan comprised predominately residential style buildings. A reservoir is located towards the north of site on the earliest available plan, this area is redeveloped by 1938. The site vicinity shows consistent building development with no significant changes noted within the immediate vicinity of site.
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation, classified as an Unproductive aquifer. No superficial or artificial deposits are reported on site. A review of the EnviroInsight Report indicates that there are no Environment Agency Zone 2 or Zone 3 flood zones within 250m of the site. The site is not located within an environment agency source protection zone. There are 13No groundwater, 5No surface water and 4No potable water abstractions reported within 2km of the site. There are no detailed river entries or surface water features reported within 250m of the site.
Potential Sources	• Potential for Made Ground associated with previous development operations – on site (S1) • Possible infilled reservoir 50m north (S2)
Potential Receptors	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)

Preliminary Risk Assessment	The risk estimation matrix indicates a moderate risk. It is possible that the reservoir located north of site was potentially infilled. However, with reference to the historical maps, the reservoir was constructed within raised embankments, and the site subsequently redeveloped with residential housing post WWII. From online mapping, the residential development is constructed at ground level, and therefore it is considered likely that any infilling of the former reservoir would be of insignificant thickness. In addition, given the underlying London Clay in the vicinity of the site, pathways for ground gas migration will be restricted by the presence of low permeability clay. Therefore, a pollutant linkage is not considered to exist with regards ground gases from this potential off-site source. If a significant thickness of Made Ground is encountered on site or evidence of putrescible materials is recorded then a programme of soil gas monitoring may be required. Groundwater monitoring should be undertaken to confirm the presence and depth of groundwater strike beneath the site. Given the lack of sources of potentially mobile contaminants on site, risks to controlled waters are considered to be low. A watching brief should be maintained for visual and olfactory evidence of possible contamination (including any significant quantities of demolition materials) during groundworks and investigations for geotechnical purposes. Should any such evidence be encountered, chemical testing of soil samples would be recommended. It is also recommended that testing is undertaken to help categorise the material that will be excavated for waste disposal purposes.
Potential Geological Hazards	The Groundsure data identifies moderate to negligible risks for the potential hazards assessed. For full details refer to Section 3.4
UXO	Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site. The data indicates there is a moderate risk. This does not constitute a formal UXO risk assessment.

Screening and Scoping (Basement Impact Assessment)	
Subterranean (Groundwater) Flow	An investigation should confirm the ground conditions and groundwater levels (if any) beneath the site. This can then confirm the relative depths of the basement to the groundwater levels.
Land Stability	The site, as with the surrounding area, is generally flat. The Groundsure report has noted that there is a “very low” risk of land instability issues for the site. The investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground and/or clay. Atterberg Limits of the underlying clay should be determined by a ground investigation.
Surface Flow and Flooding	The position of the proposed basement is within the rear garden area. The rear garden area is assumed to comprise a mixture of soft landscaping and hardstanding paving. Consequently, the new extension is likely to be similar area to the current hardstanding. In addition, the underlying London Clay is generally impermeable that hardstanding is expected to make very limited difference. SuDs will be required, these are likely to consist of attenuation as the low permeability of the underlying geology is likely to preclude the use of infiltration drainage.

Basement Impact Assessment	
Impact Assessment	The overall assessment of the site is that the creation of a basement for the existing development should not adversely impact the site or its immediate environs, providing measures are taken to protect surrounding land and properties during construction. The proposed basement excavation will be within 5m laterally of neighbouring properties. Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground and any associated services. During the construction phase careful and regular monitoring will need to be undertaken to ensure that the property above, and adjacent pavement is not adversely affected. This may mean that the property needs to be suitably propped and supported. From the studies that have been undertaken so far, and subject to the findings of an intrusive investigation, it is concluded that the construction of the building should not present a problem for groundwater. SuDs will be required, these are likely to consist of attenuation as the low permeability of the underlying geology is likely to preclude the use of infiltration drainage.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 James Ozkan ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Desk Study and a Basement Impact Assessment (Screening & Scoping) at a site located at Flat A, 19 Camden Park Road, London, NW1 9AX.

1.1.2 Jomas' work has been undertaken in accordance with our proposal dated 09th October 2018.

1.2 Proposed Development

1.2.1 The proposed development for this site is understood to comprise the lateral extension of the existing lower ground floor into the existing garden area towards the south west. Private gardens are anticipated as part of this proposed development.

Plan of the proposed development are included as Figures 4 and 6 in Appendix 1.

1.2.2 For the purposes of the contamination risk assessment, the proposed development is classified as 'Residential with plant uptake'.

1.2.3 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1. GC 2 projects are defined as involving:

- Conventional structures.
- Quantitative investigation and analysis.
- Normal risk.
- No difficult soil and site conditions.
- No difficult loading conditions.
- Routine design and construction methods.

1.2.4 This will be reviewed at each stage of the project.

1.3 Objectives

1.3.1 The objectives of Jomas' investigation was as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;
- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas;
- To assess the potential impacts that the proposal may have on ground stability, the hydrogeology and hydrology on the site and its environs;

1.3.2 Version 1.0 of this report dated 07 November 2018 was submitted to London Borough of Camden. Table 1.1 presents the comments made by the council where these comments have been addressed. These comments have been incorporated into this updated version of the report.

Table 1.1: London Borough of Camden comments regarding v1.0 of Jomas' report dated 7th November 2018

LBC Comment	Response
Retaining walls at the rear - will they be underpinning the Party Walls?	Details provided in the CMS document produced by MiNT Structures (ref M19128/LS).
What level are the neighbouring properties / neighbouring gardens?	A topographic survey has been undertaken which shows the levels of neighbouring properties and gardens. Undertaken by BGG Survey drawing references 190031 01 & 02. There are no significant differences in levels between 19 Camden Park Road and the adjacent neighbouring sites.
Do neighbouring properties have basements?	A survey undertaken and shows that neighbouring properties do not have basements but have lower ground floors similar to that of the study site at 19 Camden Park Road. The survey found that the neighbouring buildings have a lower ground floor similar to that present at 19 Camden Park Road
Current and proposed levels at the site (relative dimensions are shown in the current drawings, so this is clear enough)	Architect drawings ref 1803- A201, A202, A203, A301, A302 and A303 show existing and proposed elevations. This should be read in conjunction with the topographic survey drawings ref 190031 01 & 02.
Current levels of adjacent structures / gardens (these are unclear)	A topographic survey has been undertaken which shows the levels of neighbouring properties and gardens. Undertaken by BGG Survey drawing references 190031 01 & 02. There are no significant differences in levels between 19 Camden Park Road and the adjacent neighbouring sites.
Change in impermeable site area (existing to proposed, unclear)	The development will result in an increase to impermeable areas by approximately 27m^2. Further details and affects are provided in Table 4.2 and Sections 4.4 and 5 of this report.

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- A walkover survey of the site;
- A desk study, which included the review of a database search report (GeoInsight Report, attached in Appendix 2) and historical Ordnance Survey maps (attached in Appendix 3);
- A basement impact assessment;
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.5 Scope of Basement Impact Assessment

1.5.1 The study site lies within the London Borough of Camden. Jomas has based the methodology of the BIA on the guidance given in the London Borough of Camden document "Camden Planning Guidance Basements" (CPGB) (March 2018).

1.5.2 The CPGB differentiates between lower ground floors and basements. Noting that storeys built partially below ground are common around London and especially in Camden, in particular in historic buildings. To be considered a lower ground floor and not a basement the storey must typically:

- Have a significant proportion above the prevailing ground level;
- Be accessible from the outside of the building at the front and rear of the property;
- Form part of the original fabric of a building, and form part of the character of the area.

1.5.3 The proposed development does not "have a significant proportion above the prevailing ground level" and so would therefore be deemed a basement and require a BIA.

1.5.4 Jomas' BIA covers most items required under CPGB, with the exception of;

- Plans and sections to show foundation details of adjacent structures – no access to adjacent properties was possible
- Programme for enabling works, construction and restoration
- Evidence of consultation with neighbours
- Ground Movement Assessment (GMA), to include assessment of significant adverse impacts and Specific mitigation measures required, as well as confirmatory and reasoned statement identifying likely damage to nearby properties according to Burland Scale
- Construction Sequence Methodology
- Proposals for monitoring during construction.
- Drainage assessment

1.5.5 Some of the above points are addressed by the CMS produced by MiNT Structures (ref M19128/LS).

1.5.6 This BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided.

1.5.7 A number of the requirements set out in the London Borough of Camden document CPGB will need to be addressed in a construction management plan, this stage is not within the scope of work that Jomas Associates have been commissioned.

1.6 Limitations

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of James Ozkan in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of

Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas has actual knowledge to the contrary, information obtained from public sources or provided to Jomas by site personnel and other information sources, have been assumed to be correct. Jomas does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.

1.6.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.

2 SITE SETTING & HISTORICAL INFORMATION

2.1 Site Information

2.1.1 The site location plan is appended to this report in Figure 1, Appendix 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	Flat A 19 Camden Park Road London NW1 9AX
Approx. National Grid Ref.	529909 184693
Site Area (Approx)	0.02 hectares
Site Occupation	Residential
Local Authority	London Borough of Camden
Proposed Site Use	Residential with a lower ground floor extension located within the garden area to the rear of the main building

2.2 Walkover Survey

2.2.1 The site was visited by a Jomas Engineer on 22 October 2018. The following information was noted while on site.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	Site consists of a three-storey terraced house with a lower ground floor. The rear garden and main building were not accessible at the time of the Jomas walkover. It is assumed that the garden area comprises a mixture of soft landscaping and hardstanding (path, patio etc.).
	Evidence of historic uses:	No evidence of historic uses observed on site.
	Surfaces:	Surfaces on site comprise hardstanding and soft landscaped areas. Hardstanding consists of the footprint of the main building. It is assumed there is a small area of hardstanding patio within the rear garden.
	Vegetation:	No extensive vegetation was observed at the front of the main building. The rear garden area was inaccessible at the time of the walkover.
	Topography / Slope Stability:	The site is assumed to be generally flat.

Area	Item	Details
	Drainage:	Site appears to be connected to normal drainage facilities.
	Services:	Site appears to be connected to normal electrical and water services which are in use. The site is also assumed to be connected to communication services.
	Controlled waters:	No controlled waters were observed at the front of site. The rear garden area was not accessible at the time of the walkover.
	Tanks:	No tanks were observed at the front of site. The rear garden area and main building was not accessible at the time of the walkover.
Neighbouring land:	**North:**	Residential
	East:	Residential
	South:	Residential
	West:	Residential

2.2.2 Although access to the main building and the rear garden was not possible at the time of the walkover, a review of readily available aerial photographs confirms that some trees and bushes appear to be present in the rear garden and no evidence of surface waters is observed.

2.2.3 In addition, since Jomas' site visit, the client has provided a topographical survey of the study site and adjacent neighbouring properties (included as Figures 7 and 8 in Appendix 1).

2.2.4 Photos taken during the site visit are provided in Figure 2, Appendix 1.

2.3 Historical Mapping Information

2.3.1 The historical development of the site and its surrounding areas was evaluated following the review of a number of Ordnance Survey historic maps, procured from GroundSure, and provided in Appendix 3 of this report.

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 below. Distances are taken from the site boundary.

Table 2.3: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	**Off Site**
1874 1:1,056	Site consists of a terraced house development with a private garden towards the south west. This development appears to represent the present-day configuration of the study site.	The site vicinity consists predominately of terraced residential style buildings within 150m. A **reservoir** is located 50m north west of site, identified as 'New River Company's **Water Works**'.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1879/82 1:2,500 1:10,560	No significant changes.	The site vicinity within 500m consists predominately of residential style buildings within the area of Finsbury. The 'Metropolitan Cattle Market' is located 100m east of site consists of numerous housing pens for livestock. A **coal depot** is located 400m towards the south adjacent to a **large rail network** orientated east to west.
1894/96 1:10,560 1:1,056 1:2,500	No significant changes.	No significant changes noted within 500m of site.
1916/20 1:2,500 1:10,560	No significant changes.	An '**Organ Works**' and **Laundry** is located 150m north and 200m south east of site respectively. No other significant land uses noted within 250m of site.
1938 1:10,560	No significant changes.	The **reservoir** towards the north of site has been replaced by a new building development. No other significant changes noted within 500m of site.
1952 1:10,560 1:2,500	No significant changes.	The building development located in the area of the former **reservoir** comprises numerous buildings and is identified as 'Camelot House'. Numerous areas within 250m of site are identified as **ruins**, this feature could potentially be linked with **WWII bombing activity**. No other significant changes noted within 250m of site.
1960/62 1:1,250 1:10,560	No significant changes.	No significant changes noted within 500m of site.
1968/71 1:10,560 1:1,250	No significant changes.	No significant changes noted within 500m of site.
1983 1:1,250	No significant changes.	No significant changes noted within 250m of site.
1994 1:10,000	No significant changes.	No significant changes noted within 500m of site.
2002/10/14 1:10,000	No significant changes.	No significant changes noted. The site vicinity within 500m consists predominately of residential style terraced buildings.

2.3.3 An aerial photograph supplied as part of the GroundSure EnviroInsight report and taken in June 2015 generally shows that the site vicinity consists of terraced residential style buildings with private gardens. This information coincides with the most recent historical maps.

2.4 Historical Industrial Sites

2.4.1 Groundsure have provided some information on historical industrial sites on and in the vicinity of the site. Table 2.4 below, summarises the information provided, which is presented in further detail in the Enviroinsight in Appendix 2. Where the identified features have appeared on more than one map they have been counted multiple times and therefore the reported numbers are higher than the actual count.

Table 2.4: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Potentially Contaminative Uses identified from 1:10,000 scale mapping	None reported	99 No reported; nearest entry, unspecified works located 168m south east.	X
Additional Information - Historical Tank Database	None reported	20No reported; all entries identified as unspecified tanks, nearest located 132m north.	X
Historical Energy Features Database	None reported	131No reported; nearest entry, electricity substation located 62m north.	X
Historical Petrol & Fuel Site Database	None reported	None reported	X
Historical Garage & Motor Vehicle Repair Database	None reported	27No reported; nearest entry, garage located 323m west.	X
Potentially infilled land	None reported	30No reported; nearest entry, pond located 50m north. This is considered to represent the reservoir noted within the historical maps.	✓
Tunnels	None reported	None reported within 250m of site.	X

2.5 Industrial and Statutory Consents

2.5.1 The Groundsure EnviroInsight Report also provides information on various statutory and industrial consents on and in the vicinity of the site. The following section summarises the information collected from the available sources.

Table 2.5: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Discharge Consents	None reported	None reported	X
Water Industry Act Referrals	None reported	None reported	X
Red List Discharges	None reported	None reported	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
List 1 and List 2 Dangerous Substances	None reported	None reported	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites	None reported	None reported	X
Planning Hazardous Substance Consents	None reported	None reported	X
Category 3 or 4 Radioactive substances Authorisations	None reported	None reported	X
Pollution Incidents (List 2)	None reported	1No reported; atmospheric pollutants and effects air impact category 3 (minor), dated July 2001. Water and land impact category 4 (no impact).	X
Pollution Incidents (List 1)	None reported	None reported	X
Contaminated Land Register Entries and Notices	None reported	None reported	X
Registered Landfill Sites	None reported	None reported	X
Waste Treatment and/or Transfer Sites	None reported	None reported	X
Fuel Station Entries	None reported	3No reported, nearest entry located 53m east.	X
Current Industrial Site Data	None reported	9No reported; nearest entry, petrol and fuel stations located 53m east.	X

***** *From a land contamination perspective*

2.6 Previous Site Investigations

2.6.1 No previous site investigation reports were provided to Jomas at the time of writing this report.

2.7 Unexploded Ordnance

2.7.1 Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site.

2.7.2 The initial data indicates that there is a moderate risk.

2.7.3 Moderate-risk regions are those that show a bomb density of up to 10 bombs per 1km^2 and that may contain potential WWII targets.

2.7.4 This does not comprise a full UXO risk assessment.

2.8 Sensitive Land Uses

2.8.1 No sensitive land use was identified within 1km of the site.

2.9 Radon

2.9.1 The site is reported not to lie within a Radon affected area, as less than 1% of properties are above the action level.

2.9.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2007).

3 GEOLOGICAL SETTING & HAZARD REVIEW

3.1.1 The following section summarises the principal environmental resources (geological, hydrogeological and hydrological) of the site and its surroundings.

3.1.2 The data discussed herein is generally based on the information given within the EnviroInsight Report and published information provided by the Environment Agency and British Geological Survey.

3.2 Solid and Drift Geology

3.2.1 The British Geological Survey (BGS) indicates that the site is directly underlain by solid deposits of the London Clay Formation. No superficial or artificial deposits are reported on site.

3.2.2 The BGS describes the London Clay Formation as consisting of

> *"bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels."*

3.2.3 No superficial deposits are reported within 500m of the study site.

3.2.4 No artificial deposits are reported on site but given the sites identified history, a depth of Made Ground should be expected.

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were obtained and reviewed from the surrounding area. The local records obtained are presented in Appendix 5.

3.3.2 A historic borehole record was identified 235m north of site, completed in September 1968.

3.3.3 This showed the underlying ground conditions to comprise 'Made Ground' to a depth of around 0.60m bgl.

3.3.4 This was reported to be underlain by 'Brown fissured clay' to the terminal depth of the borehole at around 9.14m bgl. This material is considered to represent deposits of the London Clay Formation.

3.3.5 No information regarding in-situ testing such as SPTs or strength assessments are included.

3.3.6 During drilling of the borehole no groundwater strike was reported.

3.3.7 Based on the information provided from the historical borehole log; the site is expected to be underlain by some Made Ground, underlain by the London Clay Formation.

3.3.8 All depths and measurements should be viewed as approximate, due to the age of the borehole and corresponding use of imperial measurements.

3.4 Geological Hazards

3.4.1 The following are brief findings extracted from the GroundSure GeoInsight Report, that relate to factors that may have a potential impact upon the engineering of the proposed development.

Table 3.1: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell	Moderate	Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE).	Yes
Landslides	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks.	No
Compressible deposits	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits.	No
Collapsible Rock	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	No
Running sand	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required.	No
Coal mining	No	There are no coal mining areas identified within 1km of the site boundary.	No
Non-coal mining	No	There are no non-coal mining areas identified within 1km of the site boundary.	No
Brine affected areas	No	There are no brine affected areas identified within 1km of the site boundary.	No

3.4.2 In addition, the GeoInsight report notes the following:

- 3No historical surface ground working feature is reported within 250m of the site. Nearest entry is located 50m north, identified as a pond dated 1894.

- 28No historical underground working features are reported within 1km of the site. All entries identified as tunnels, nearest located 331m south west.

- 3No BGS Current Ground Working Features are reported within 1km of the site. Nearest entry is located 888m south, identified as Kings Cross Rail Depot.

3.4.3 The clearance of the site, including removal or diversion of services is likely to increase the depth of Made Ground on the site.

3.4.4 Foundations should not be formed within Made Ground or organic rich materials (i.e. Topsoil) due to the unacceptable risk of total and differential settlement.

3.4.5 The presence of Made Ground derived from demolition material may be a source of elevated sulphate results associated with plaster from the previous structures. The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate. If such levels are noted then sulphate resistant concrete may be required.

3.4.6 Given the anticipated ground conditions on site a shallow groundwater table is unlikely to be present, although perched groundwater may be present.

3.4.7 However, the potential impacts of shallow or perched groundwater should be considered during foundation design. The affects that this may have include (but are not limited to):

- Permanent excavations – i.e. for items such as basements and drainage. This is likely to need waterproofing / tanking and may have flotation issues.

- Temporary excavations – likely to affect side stability especially where the excavations are formed in granular materials.

- Soakaways – likely to affect the permeability and therefore the effective use of soak-away drainage. Although the expected geology suggests that infiltration drainage would not be feasible.

- Concrete classification on the site (in accordance with BRE SD-1) due to the potential for a mobile groundwater table and the dissolution of the disseminated pyrite.

- May require dewatering or groundwater exclusion techniques to be used.

- Foundation design – likely to reduce the allowable bearing capacity that could be achieved in the superficial deposits.

3.4.8 It is recommended that a geotechnical ground investigation is undertaken to inform design and assess the shrink swell moderate hazard.

4 HYDROGEOLOGY, HYDROLOGY AND FLOOD RISK REVIEW

4.1 Hydrogeology & Hydrology

4.1.1 General information about the hydrogeology of the site was obtained from the Environment Agency website.

Groundwater Vulnerability

4.1.2 Since 1 April 2010, the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. This comprises;

- **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;
- **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Principal Aquifer** – this is a formation with a high primary permeability, supplying large quantities of water for public supply abstraction.
- **Unproductive Strata** - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Source Protection Zones (SPZ)

4.1.3 In terms of aquifer protection, the EA generally adopts a three-fold classification of SPZs for public water supply abstraction wells.

- Zone I - or 'Inner Protection Zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source.
- Zone II - or 'Outer Protection Zone' is defined by a 400-day travel time to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants.
- Zone III - or 'Total Catchment' is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

Hydrogeology

4.1.4 The baseline hydrogeology of the site is based on available hydrogeological mapping, including the BGS online mapping, and generic information obtained from the Groundsure Report.

4.1.5 The available data indicates that the geology of the area consists of the London Clay Formation with no superficial deposits reported within 500m of the site. It would be expected that a groundwater table would not exist within influencing distance of the site.

Hydrology

4.1.6 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.

4.1.7 The Environment Agency defines a floodplain as the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.

4.1.8 There are two different kinds of area shown on the Flood Map for Planning. They can be described as follows:

Areas that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year;
- or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

(For planning and development purposes, this is the same as Flood Zone 3, in England only.)

- The additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

(For planning and development purposes, this is the same as Flood Zone 2, in England only.)

4.1.9 These two areas show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

4.1.10 Outside of these areas flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. (For planning and development purposes, this is the same as Flood Zone 1, in England only.)

4.1.11 Some areas benefit from flood defences and these are detailed on Environment Agency mapping.

4.1.12 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

Table 4.1: Summary of Hydrogeological & Hydrology

Feature		On Site	Off Site	Potential Receptor?
Aquifer	**Superficial:**	None reported	None reported within 500m of site.	**X**
	Solid:	Unproductive	Unproductive within 500m of site.	**X**
Source Protection Zone		None reported	None reported within 500m of site.	**X**
Abstractions	**Groundwater**	None reported	13No reported; nearest entry, Kings Cross Concrete Plant Borehole, located 640m south identified as active.	**X**
	Surface water	None reported	5No reported; nearest entry, Grand Union Canal located 1090m south identified as historical.	**X**
	Potable water	None reported	4No reported; nearest entry, Kentish Town Sports Centre located 1097m west identified as historical.	**X**
Surface Water Features		None reported	No surface water features within 250m of site. No detailed river networks within 500m of site.	**X**
Flood Risk	**EA Flood Zone 2**	None	-	-
	EA Flood Zone 3	None	-	-
	RoFRaS	Very low	-	-
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site.		-
	BGS	The BGS has not provided a confidence level for the potential of flooding at the study site.		-

4.2 Flood Risk Review

4.2.1 In accordance with the NPPF Guidance, below is a review of flood risks posed to and from the development and recommendations for appropriate design mitigation where necessary. Specific areas considered are based on the requirements laid out in the "Camden Guidance for Subterranean Development".

Table 4.2: Flood Risk Review

Flood Sources	Site Status	Comment on flood risk posed to / from the development
Fluvial / Tidal	Site is not within 250m of an Environment Agency Zone 2 or Zone 3 floodplain. Risk of flooding from rivers and the sea (RoFRaS) rating very low.	The proposed basement is located within the existing rear garden area. As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of fluvial flooding.
Groundwater	The BGS has not provided a confidence rating for the potential of flooding at the study site.	Basement will be fully waterproofed as appropriate to industry standard. As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of groundwater flooding. Low Risk
Artificial Sources	No surface water features within 250m of site.	Low Risk
Surface Water / Sewer Flooding	No surface water features within 250m of site. Condition, depth and location of surrounding infrastructure uncertain.	Development will utilise existing connection to sewers, gravity drainage and non-return valves. As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to include attenuation before releasing to the existing sewer network. If permeable paving is used this would likely reduce the risk of surface water flooding. Combined, these are likely to reduce the risk of both surface and sewer flooding to both the site and surrounding properties. Development unlikely to significantly increase the volume of discharge from the site and the use of SUDS is likely to reduce the peak flow. No further drainage assessment required. Low Risk
Climate Change	Included in the flood modelling extents. Site not within climate change flood extent area.	Development will not significantly increase the peak flow and volume of discharge from the site Low risk posed to and from the development

4.2.2 Based on the available data, the site is considered to be at low risk from identified potential sources of flooding. The basement can be constructed and operated safely in

flood risk terms without increasing flood risk elsewhere and is therefore considered NPPF compliant.

4.3 Surface Water Flood Risk Review

4.3.1 The study site lies within a Flood Zone 1. Based on EA mapping, the site and highways surrounding the site are not within an area identified as a high risk for surface water flooding potential; site itself not likely to be inundated.

4.4 Increase in Impermeable Areas

4.4.1 It is anticipated that there will be an increase in impermeable area by approximately 27m^2.

4.4.2 The expected underlying geology is the practically impermeable London Clay Formation. This increase in impermeable area is therefore unlikely to significantly alter the amount of groundwater that would infiltrate into the ground.

4.4.3 In accordance with the NPPF, PPG and LLFA policy requirements, sustainable drainage systems (SUDS) should be incorporated wherever possible to reduce positive surface water run-off and flood risk to other areas.

4.4.4 Given the expected underlying ground and hydrogeological conditions it is considered that infiltration drainage would likely be impracticable.

4.4.5 It is likely that SUDS would be restricted by the small size of the site and proximity to buildings and boundary walls. However, it may include the replacement of hard cover with permeable hardstanding and surface / above-ground attenuation prior to discharge to storm sewers.

4.4.6 A critical drainage area is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006, a Critical Drainage Area is “an area within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency”.

4.4.7 These areas are where man made drainage infrastructure has been identified as at critical risk of failure, resulting in flooding. Such areas can be completely different or similar, to the areas identified by the Environment Agency as at risk of natural watercourse, river and sea flooding.

4.4.8 3No Critical Drainage Areas (CDA) are located within the Camden Surface Water Management Plan (SWMP). This study site is located one of the identified areas however the SWMP notes that the majority of the CDA is located within a Flood Zone 1, including the study site.

4.4.9 2No Local Flood Risk Zones (LFRZ) are located within the CDA, these are identified as Gospel Oak and Primrose Hill. The study site is not located within 500m of these two areas.

4.4.10 The Camden SWMP reports historic sewer flooding events, the study site is located within a postcode shown to have 104No properties affected in the past decade. This is less than the average for areas at highest risk (greater than 51 recorded incidents) within the Borough.

4.4.11 The Camden SWMP comments that overall groundwater flooding is considered to be a relatively low risk in the London Borough of Camden.

4.5 Sequential and Exception Tests

4.5.1 The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

Sequential Test: within FZ1 and no additional dwelling hence pass by default.

4.5.2 Paragraph 19 of PPS25 recognizes the fact that wider sustainable development criteria may require the development of some land that cannot be delivered through the sequential test. In these circumstances, the Exception Test can be applied to some developments depending on their vulnerability classification (Table D.2 of PPS25). The Exception Test provides a method of managing flood risk while still allowing necessary development to occur.

Exception Test: FZ1 hence pass by default and low risk posed to and from other sources

4.6 Flood Resilience

4.6.1 In accordance with general basement flood policy and basement design, the proposed development will utilize the flood resilient techniques recommended in the NPPF Technical Guidance where appropriate and also the recommendations that have previously been issued by various councils.

4.6.2 These techniques include the following:

- Basement to be fully waterproofed (tanked) and waterproofing to be tied in to the ground floor slab as appropriate: to reduce the turnaround time for returning the property to full operation after a flood event.
- Plasterboards will be installed in horizontal sheets rather than conventional vertical installation methods to minimise the amount of plasterboard that could be damaged in a flood event.
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property.
- Any wood fixings on basement / ground floor will be robust and/or protected by suitable coatings in order to minimise damage during a flood event.
- The basement waterproofing where feasible will be extended to an appropriate level above existing ground levels.
- The concrete sub floor as standard will likely be laid to fall to drains or gullies which will remove any build-up of ground water to a sump pump where it will be pumped into the mains sewer. This pump will be fitted with a non-return valve to prevent water backing up into the property should the mains sewer become full.
- Insulation to the external walls will be specified as rigid board which has impermeable foil facings that are resistant to the passage of water vapour and double the thermal resistance of the cavity.

5 SCREENING AND SCOPING ASSESSMENT

5.1 Screening Assessment

5.1.1 Screening is the process of determining whether or not there are areas of concern which require a BIA for a particular project. This was undertaken in previous sections by the site characterisation. Scoping is the process of producing a statement which defines further matters of concern identified in the screening stage. This definition is in terms of ground processes in order that a site-specific BIA can be designed and executed by deciding what aspects identified in the screening stage require further investigation by desk research or intrusive drilling and monitoring or other work.

5.1.2 The scoping stage highlights areas of concern where further investigation, intrusive soil and water testing and groundwater monitoring may be required.

5.1.3 This Jomas BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided. Within the pro forma a series of tables have been used to identify what issues are relevant to the site.

5.1.4 Each question posed in the tables is completed by answering “Yes”, “No” or “Unknown”. Any question answered with “Yes” or “Unknown” is then subsequently carried forward to the scoping phase of the assessment.

5.1.5 The results of the screening process for the site are provided in Table 5.1 below. Where further discussion is required the items have been carried forward to scoping.

5.1.6 The numbering within the questions refers the reader to the appropriate question / section in the London Borough of Camden BIA pro forma.

5.1.7 It should be noted that the pro forma is mainly concerned with the pond chain on Hampstead Heath, if other ponds / waterbodies may similarly affect the development Jomas will indicate this.

5.1.8 A Site Investigation undertaken where necessary will be required to establish base conditions and the impact assessment determines the impact of the proposed basement on the baseline conditions, considering any mitigating measures proposed.

Table 5.1: Screening Assessment

Query	Y / N	Comment
Subterranean (Groundwater) Flow (see London Borough of Camden BIA Pro Forma Section 4.1.1)		
1a) Is the site located directly above an aquifer?	No	The site is directly underlain by the London Clay Formation, identified as unproductive strata.
1b) Will the proposed basement extend below the surface of the water table?	Unknown	Due to the unproductive, very low permeability strata of the London Clay Formation, it is unlikely that groundwater will be encountered beneath the study site. This may be confirmed with a ground investigation.

Query	Y / N	Comment
2) Is the site within 100m of a watercourse, well (disused or used) or a potential spring line?	No	No surface water features within 250m of site. No detailed river networks within 500m of site.
3) Is the site within the catchment of any surface water features?	No	No surface water features within 250m of site. No detailed river networks within 500m of site.
4) Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	Yes	Proposed basement will be formed within the rear garden area that is assumed to consist of paving and soft landscaping. An increase in impermeable area of approximately 27m^2 is therefore expected As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to include attenuation and / or permeable paving.
5) As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	Yes	Proposed basement will be formed within the rear garden area that is assumed to consist of paving and soft landscaping. An increase in impermeable area of approximately 27m^2 is therefore expected As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to include attenuation and / or permeable paving.
6) Is the lowest point of the proposed excavation (allowing of any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath or spring line?	No	No surface water features within 250m of site.
Slope Stability (see London Borough of Camden BIA Pro Forma Section 4.2)		
1) Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)	No	The site is flat and level with the main road.
2) Will the proposed re-profiling of landscaping change slopes at the property to more than 7 degrees? (approximately 1 in 8)	No	Re-profiling or change of slopes is not anticipated as part of the proposed development.
3) Does the developments' neighbouring land include railway cuttings and the like, with a slope greater than 7 degrees? (approximately 1 in 8)	No	Nearest entry of a railway line is 357m south west. Other land uses neighbouring site are residential.
4) Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approximately 1 in 8)	No	Surrounding area is generally flat.
5) Is the London Clay the shallowest strata at the site?	Yes	The site is reported to be underlain by solid deposits of the London Clay Formation. This should be confirmed with a ground investigation.

Query	Y / N	Comment
6) Will any trees 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?	Unknown	As the garden area was not accessed during the walkover the presence of mature trees has only been assessed using aerial photography. It is unknown if any mature trees are to be felled as part of the proposed development.
7) Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Unknown	No evidence of structural distress caused by seasonal shrink / swell was noted during the external walkover.
8) Is the site within 100m of a watercourse or a spring line?	No	No surface water features within 250m of site. No detailed river networks within 500m of site.
9) Is the site within an area of previously worked ground?	No	Site has only had the current development in place.
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?	Unknown	The site is directly underlain by unproductive London Clay Formation. Groundwater level may be assessed by a ground investigation
11) Is the site within 50m of the Hampstead Heath ponds (or other waterbody)?	No	
12) Is the site within 5m of a highway or pedestrian 'right of way'?	Yes	The site faces onto a pavement and road to the north.
13) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	The proposed development comprises a lateral extension of the existing lower ground floor and will not be an increase in depth of foundations compared those already in place for the structure. A topographic survey of the study site and neighbouring properties indicates that the adjacent structures are of similar layout to the study site and it is unlikely that the neighbouring foundations will be different.
14) Is the site over (or within the exclusion of) any tunnels e.g. railway lines?	No	No tunnels are reported within 250m of the study site.
Surface Flow and Flooding (see London Borough of Camden BIA Pro Forma Section 4.3)		
1) Is the site within the catchment of the pond chains on Hampstead Heath?	No	No surface water features within 250m of site.
2) As part of the site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially different from the existing route?	Yes	Proposed basement will be formed within the rear garden area that is assumed to consist of paving and soft landscaping. An increase in hardstanding areas is expected, however as the underlying ground is London Clay Formation it is considered that these materials would be very impermeable and therefore the increase in hardstanding would not make a significant difference to the infiltration.

Query	Y / N	Comment
		Consequently, a significant increase in surface water discharge is considered unlikely. SuDS will be required and are likely to consist of attenuation and / or permeable paving.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	An increase in impermeable area of approximately 27m^2 is expected and SuDS will be required and are likely to consist of attenuation and / or permeable paving.
4) Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	No	No surface waters in the area to be impacted.
5) Will the proposed basement result in changes to the quality of surface waters being received by adjacent properties or downstream watercourses?	No	No surface waters in the area to be impacted.
6) Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	No	No nearby surface water features and not within an EA flood zone.

5.2 Scoping

5.2.1 Scoping is the activity of defining in further detail the matters to be investigated as part of the BIA process. Scoping comprises of the definition of the required investigation needed in order to determine in detail the nature and significance of the potential impacts identified during screening.

5.2.2 The potential impacts for each of the matters highlighted in Table 5.1 above are discussed in further detail below together with the requirements for further investigations. Detailed assessment of the potential impacts and recommendations are provided where possible.

Subterranean (Groundwater) Flow

5.2.3 A ground investigation would confirm the ground conditions and groundwater levels (if any) beneath the site. This would be able to confirm the relative depths of the basement to the groundwater levels.

Land Stability

5.2.4 The site, as with the surrounding area, is generally flat. The Groundsure report has noted that there is a “very low” risk of land instability issues for the site.

5.2.5 A ground investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground and/or clay. Atterberg Limits of the underlying clay should be determined by the ground investigation.

5.2.6 It is noted that the London Borough of Camden's guidance documents requires a Ground Movement Assessment to be undertaken as part of the Basement Impact Assessment.

5.2.7 Due to the very limited extent of the extension and the fact that it basically forms an infilled area on an existing patio, it is considered unlikely that significant movement would occur. Support supplied during construction to protect the existing structure would also protect the adjacent properties.

Surface Flow and Flooding

5.2.8 The rear garden area was not accessible during the Jomas walkover. It is assumed that the rear garden comprises soft landscaped lawn cover and a hardstanding patio area. The proposed basement will is located within the rear garden. A significant change in surface water run-off is not expected, partly due to the expected patio and partly due to the very low permeability London Clay Formation expected at the surface.

5.2.9 The presence of the very low permeability London Clay Formation at the surface should be confirmed by the ground investigation.

5.2.10 As SUDS will be required by NPPF, PPG and LLFA policy requirements, this is likely to be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of groundwater flooding.

6 PRELIMINARY BASEMENT IMPACT ASSESSMENT

6.1 Proposed Changes to Areas of External Hardstanding

6.1.1 Existing areas of hardstanding include the existing buildings on site and areas within the front and rear garden. The proposed development will comprise a basement within the rear garden area. The rear garden area was not accessible during the Jomas walkover. It is assumed that the rear garden comprises soft landscaped lawn cover and a hardstanding patio area.

6.1.2 There will be an increase in impermeable area by approximately 27m^2. As SUDS will be required by NPPF, PPG and LLFA policy requirements, where practicable, the remaining hard surfaces will likely be replaced with permeable paving combined with attenuation.

6.2 Past Flooding

6.2.1 The National Planning Policy Framework sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.

6.2.2 When assessing the site-specific flood risk and the potential for historic flooding to reoccur the above guidance recommends that, historic flooding records and any other relevant and available information including flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired are assessed.

6.2.3 The Camden SWMP reports historic sewer flooding events, the study site is located within a postcode shown to have 104No properties affected in the past decade. This is less than the average for areas at highest risk (greater than 51 recorded incidents) within the Borough.

6.2.4 The Camden SWMP comments that overall groundwater flooding is considered to be a relatively low risk in the London Borough of Camden.

6.2.5 The site is therefore considered to be at low risk of flooding based on historic flooding.

6.3 Geological Impact

6.3.1 The published geological maps indicate that the site is directly underlain by solid deposits of the London Clay Formation. This should be confirmed by an intrusive investigation.

6.3.2 Due to the relative impermeable nature of the London Clay Formation a shallow groundwater table in not anticipated. There is the potential for perched groundwater table to be encountered on site at the interface between the Made Ground or Topsoil and the very low permeability London Clay Formation. However significant quantities of water are not anticipated.

6.4 Hydrology and Hydrogeology Impact

6.4.1 Based on all the information available at the time of writing, the risk of flooding from groundwater is considered to be low. The proposed basement is unlikely to have a detectable impact on the local groundwater regime. Appropriate water proofing measures should be included within the whole of the proposed basement wall/floor design as a precaution.

6.4.2 The proposed development will lie outside of flood risk zones and is therefore assessed as being at a low probability of fluvial flooding.

6.4.3 There are no surface water features on or within 250m of the site. It is therefore not anticipated that the site will make any impact upon the hydrology of the area.

6.4.4 3No Critical Drainage Areas (CDA) are located within the Camden Surface Water Management Plan (SWMP). This study site is located one of the identified areas however the SWMP notes that the majority of the CDA is located within a Flood Zone 1, including the study site.

6.4.5 2No Local Flood Risk Zones (LFRZ) are located within the CDA, these are identified as Gospel Oak and Primrose Hill. The study site is not located within 500m of these two areas.

6.4.6 The Camden SWMP reports historic sewer flooding events, the study site is located within a postcode shown to have 104No properties affected in the past decade. This is less than the average for areas at highest risk (greater than 51 recorded incidents) within the Borough.

6.4.7 The Camden SWMP comments that overall groundwater flooding is considered to be a relatively low risk in the London Borough of Camden.

6.4.8 The information available suggests that the site lies in an area that is at low risk of surface water flooding.

6.5 Impacts of Basement on Adjacent Properties and Pavement

6.5.1 The proposed basement excavation will not be located within 5m of a public pavement. It is however within 5m of neighbouring properties.

6.5.2 Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground, any associated services and structures.

6.5.3 It is recommended that the site is supported by suitably designed temporary support with a basement box construction. This will ensure that the adjacent land is adequately supported in the temporary and permanent construction. Alternatively, the excavation should proceed in a manner that maintains the integrity of the ground on all sides.

6.5.4 Careful and regular monitoring of the structure will need to be undertaken during the construction phase to ensure that vertical movements do not adversely affect the property. If necessary, the works may have to be carried out in stages with the above structure suitably propped and supported.

6.5.5 It will be necessary to ensure that the basements are designed in accordance with the NHBC Standards and take due cognisance of the potential impacts highlighted above. This may be achieved by ensuring best practice engineering and design of the proposed scheme by competent persons and in full accordance with the Construction (Design and Management) Regulations. This will include:

- Establishment of the likely ground movements arising from the temporary and permanent works and the mitigation of excessive movements;

- Assessment of the impact on any adjacent structures (including adjacent properties and the adjacent pavement with potential services);
- Determination of the most appropriate methods of construction of the proposed basements;
- Undertake pre-condition surveys of adjacent structures;
- Monitor any movements and pre-existing cracks during construction;
- Establishment of contingencies to deal with adverse performance;
- Ensuring quality of workmanship by competent persons.

6.5.6 Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement should be submitted by the Developer to the London Borough of Camden.

6.6 Size of Basement

6.6.1 The London Borough of Camden document "Camden Planning Guidance Basements" (March 2018) outlines how Local Plan Policy A5 on basements limits the size of basement developments.

Table 6.1: Screening Assessment

Criterion from LBC Policy A5	Jomas Comments on the Proposed Development in relation to LBC Policy A5
f. not comprise of more than one storey;	The proposed basement is only a single storey.
g. not be built under an existing basement;	The proposed basement is under an area of paved and/or soft landscaped garden and not beneath an existing basement.
h. not exceed 50% of each garden within the property;	The Camden guidance notes that this applies to the front garden, the rear garden and gardens to the side of the property individually, rather than calculated as an aggregated garden area for the whole property. The proposed development will not exceed 50% of garden space.
i. be less than 1.5 times the footprint of the host building in area;	The existing main building is approximately 72m^2. The proposed development will increase the total footprint area by approximately 27m^2 and therefore does not exceed this.
j. extend into the garden no further than 50% of the depth of the host building	The existing building width is approximately 11.7m. The proposed development will not extend this by more than 50%.

Criterion from LBC Policy A5	Jomas Comments on the Proposed Development in relation to LBC Policy A5
measured from the principal rear elevation;	
k. not extend into or underneath the garden further than 50% of the depth of the garden;	The proposed development will not extend underneath the garden nor into the garden by greater than 50% of the gardens depth.
l. be set back from neighbouring property boundaries where it extends beyond the footprint of the host building;	The neighbouring properties and their respective gardens have been surveyed. The proposed development will extend the footprint of the host-building and set back from neighbouring properties.
m. avoid the loss of garden space or trees of townscape or amenity value	The proposed development is located within the rear garden to the existing property.

7 QUALITATIVE RISK ASSESSMENT

7.1 Legislative Framework

7.1.1 A qualitative risk assessment has been prepared for the site, based on the information collated. This highlights the potential sources, pathways and receptors. Intrusive investigations will be required to confirm the actual site conditions and risks.

7.1.2 Under Part IIA of the Environmental Protection Act 1990, the statutory definition of contaminated land is:

"*land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) pollution of controlled waters is being, or is likely to be, caused."

7.1.3 The Statutory Guidance provided in the DEFRA Circular 01/2006 lists the following categories of significant harm:

- death, disease, serious injury, genetic mutation, birth defects or the impairment of reproduction functions in human beings;
- irreversible adverse change, or threat to endangered species, affecting an ecosystem in a protected area (i.e. site of special scientific interest);
- death, serious disease or serious physical damage to pets, livestock, game animals or fish;
- a substantial loss in yield or value of crops, timber or produce; and
- structural failure, substantial damage or substantial interference with right of occupation to any building.

7.1.4 Contaminated land will only be identified when a 'pollutant linkage' has been established.

7.1.5 A 'pollutant linkage' is defined in Part IIA as:

"A linkage between a contaminant Source and a Receptor by means of a Pathway".

7.1.6 Therefore, this report presents an assessment of the potential pollutant linkages that may be associated with the site, in order to determine whether additional investigations are required to assess their significance.

7.1.7 In accordance with the National Planning Policy Framework, where development is proposed, the developer is responsible for ensuring that the development is safe and suitable for use for the purpose for which it is intended, or can be made so by remedial action. In particular, the developer should carry out an adequate investigation to inform a risk assessment to determine:

- whether the land in question is already affected by contamination through source – pathway – receptor pollutant linkages and how those linkages are represented in a conceptual model;
- whether the development proposed will create new linkages, e.g. new pathways by which existing contaminants might reach existing or proposed receptors and whether it will introduce new vulnerable receptors; and

- what action is needed to break those linkages and avoid new ones, deal with any unacceptable risks and enable development and future occupancy of the site and neighbouring land.

7.1.8 A potential developer will need to satisfy the Local Authority that unacceptable risk from contamination will be successfully addressed through remediation without undue environmental impact during and following the development.

7.2 Conceptual Site Model

7.2.1 On the basis of the information summarised above, a conceptual site model (CSM) has been developed for the site. The CSM is used to guide the investigation activities at the site and identifies potential contamination sources, receptors (both on and off-site) and exposure pathways that may be present. The identification of such potential "pollutant linkages" is a key aspect of the evaluation of potentially contaminated land.

7.2.2 The site investigation is then undertaken in order to prove or disprove the presence of these potential source-pathway-receptor linkages. Under current legislation an environmental risk is only deemed to exist if there are proven linkages between all three elements (source, pathway and receptor).

7.2.3 This part of the report lists the potential sources, pathways and receptors at the site, and assesses based on current and future land use, whether pollution linkages are possible.

7.2.4 Potential pollutant linkages identified at the site are detailed below:

Table 7.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
• Potential for Made Ground associated with previous development operations – on site (S1) • Possible infilled reservoir 50m north (S2)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hard standing or via service pipe/corridors and surface water runoff. (P3) • Horizontal and vertical migration of contaminants within groundwater (P4) • Accumulation and Migration of Soil Gases (P5) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)

7.3 Qualitative Risk Estimation

7.3.1 Based on information previously presented in this report, a qualitative risk estimation was undertaken.

7.3.2 For each potential pollutant linkage identified in the conceptual model, the potential risk can be evaluated, based on the following principle:

Overall contamination risk = Probability of event occurring x Consequence of event occurring

7.3.3 In accordance with CIRIA C552, the consequence of a risk occurring has been classified into the following categories:

- Severe
- Medium
- Mild
- Minor

7.3.4 The probability of a risk occurring has been classified into the following categories:

- High Likelihood
- Likely
- Low Likelihood
- Unlikely

7.3.5 This relationship can be represented graphically as a matrix (Table 7.2).

Table 7.2: Overall Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Low Risk
	Likely	High Risk	Moderate Risk	Moderate Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate Risk	Low Risk	Very Low Risk
	Unlikely	Low Risk	Low Risk	Very Low Risk	Very Low Risk

7.3.6 The risk assessment process is based on guidance provided in CIRIA C552 (2001) *Contaminated Land Risk Assessment – A Guide to Good Practice*. Further information including definitions of descriptive terms used in the risk assessment process is included in Appendix 4.

7.3.7 The degree of risk is based on a combination of the potential sources and the sensitivity of the environment. The risk classifications can be cross checked with reference to Table A4.4 in Appendix 4.

7.3.8 Hazard assessment was also carried out, the outcome of which could be:

- Urgent Action (UA) required to break existing source-pathway-receptor link.
- Ground Investigation (GI) required to gather more information.
- Watching Brief there is no evidence of potential contamination but the possibility of it exists and so the site should be monitored for local and olfactory evidence of contamination.
- No action required (NA)

7.3.9 The preliminary risk assessment for the site is presented in Table 7.3 overleaf.

Table 7.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
• Potential for Made Ground associated with previous development operations – on site (S1) • Possible infilled reservoir 50m north (S2)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Unlikely	Low	Watching brief
			Severe for Asbestos	Unlikely for Asbestos	Low for Asbestos	
	• Accumulation and migration of soil gases (P5)		Severe	Unlikely	Low	
	• Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) • Horizontal and vertical migration of contaminants within groundwater (P4)	• Neighbouring site users (R3) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Unlikely	Low	

7.3.10 It should be noted that the identification of potential pollutant linkages does not necessarily signify that the site is unsuitable for its current or proposed land use. It does however act as a way of focussing data collection at the site in accordance with regulatory guidance in CLR 11.

7.4 Outcome of Risk Assessment

7.4.1 The proposed development is understood to comprise the lateral extension of the existing lower ground floor into the existing garden area towards the south west. The lateral extent of the proposed development is undecided at the time of writing this report, numerous options are available. Private gardens are anticipated as part of this proposed development.

7.4.2 The risk estimation matrix indicates a low risk as defined above.

7.4.3 On the earliest available map (1867), the site is shown to consist of a residential style terraced building development with a private garden towards the south west. No significant changes are noted from this date to the present day configuration of site.

7.4.4 The site vicinity on the earliest available plan comprised predominately residential style buildings. A reservoir is located towards the north of site on the earliest available plan, this area is redeveloped by 1938. The site vicinity shows consistent building development with no significant changes noted within the immediate vicinity of site.

7.4.1 It is possible that the reservoir located north of site was potentially infilled. However, with reference to the historical maps, the reservoir was constructed within raised embankments, and the site subsequently redeveloped with residential housing post WWII. From online mapping, the residential development is constructed at ground level, and therefore it is considered likely that any infilling of the former reservoir would be of insignificant thickness. In addition, given the underlying London Clay in the vicinity of the site, pathways for ground gas migration will be restricted by the presence of low permeability clay. Therefore, a pollutant linkage is not considered to exist with regards ground gases from this potential off-site source.

7.4.2 If a significant thickness of Made Ground is encountered on site or evidence of putrescible materials is recorded then a programme of soil gas monitoring may be required. Groundwater monitoring should be undertaken to confirm the presence and depth of groundwater strike beneath the site.

7.4.1 Given the lack of sources of potentially mobile contaminants on site, risks to controlled waters are considered to be low.

7.4.1 A watching brief should be maintained for visual and olfactory evidence of possible contamination (including any significant quantities of demolition materials) during groundworks and investigations for geotechnical purposes. Should any such evidence be encountered, chemical testing of soil samples would be recommended.

7.4.2 It is also recommended that testing is undertaken to help categorise the material that will be excavated for waste disposal purposes.

7.5 List of Key Contaminants

7.5.1 The possible contamination implications for both on-site and off-site sources have been assessed based on the information presented in the report. This has been achieved using guidance publications by the Environment Agency, together with other sources.

7.5.2 In the case of the site uses identified as part of the desk study research, reference to DoE industry profiles would not indicate a specific use reference, although reference has been made to the miscellaneous industries profile

7.5.3 Based on recommendations within the guidance publications, an initial soil and water chemical testing suite would need to consider a range of contaminants as follows:

- *Metals*: cadmium, chromium, copper, lead, mercury, nickel, zinc;
- *Semi-metals and non-metals*: arsenic, boron, sulphur;
- *Inorganic chemicals*: cyanide, nitrate, sulphate and sulphide;
- *Organic chemicals*: aromatic hydrocarbons, aliphatic hydrocarbons, petroleum hydrocarbons, phenol, polyaromatic hydrocarbon;
- *Others*: pH, Asbestos

8 REFERENCES

Groundsure EnviroInsight Report Ref HMD-377- 5556346 October 2018

Groundsure GeoInsight Report Ref HMD-377- 5556347 October 2018

Environment Agency (2004) *Model procedures for the management of land contamination*. CLR11. Bristol: Environment Agency

National Planning Policy Framework. Department for Communities and Local Government, March 2012

Code of Practice for Site Investigations BS5930: 2015

Investigation of Potentially Contaminated Sites – Code of Practice BS10175: 2011

BRE Report BR211; Radon: Protective measures for new dwellings, 2007

British Standards Institution (2015) BS 5930:2015 *Code of practice for site investigations*. Milton Keynes: BSI

CIRIA C580, Embedded retaining walls – guidance for economic design

Department of Environment Industry Profiles (1996) - Miscellaneous Land ISBN 1 85112 313 X

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS