BASEMENT IMPACT ASSESSMENT SCREENING AND SCOPING

AT

59 GOLDHURST TERRACE
CAMDEN, LONDON, NW6 3HB

FOR

Mr R Ambrose

REPORT REF: RA 3324

Engineering Geologists and Environmental Scientists

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JANUARY 2018

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Ashton Bennett

CONTENTS

APPENDICES

FIGURES

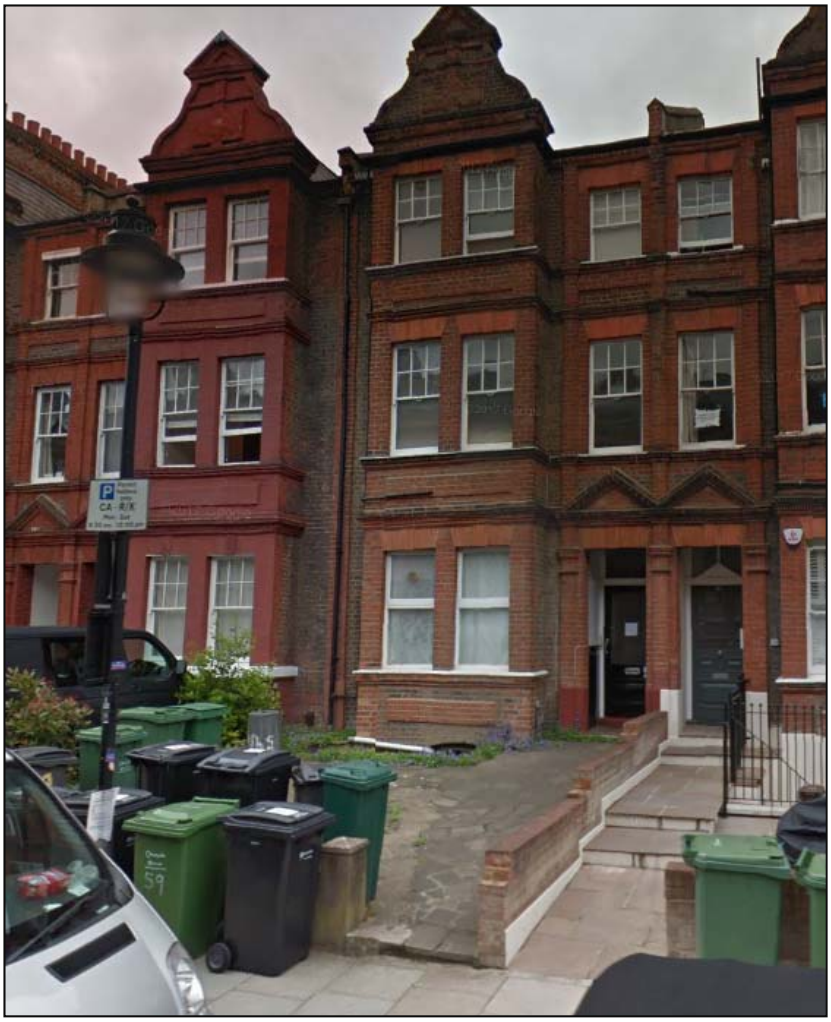
QUALITY MANAGEMENT FOR REPORT

Project	59 Goldhurst Terrace, London, NW6 3HB		
Client	Mr R Ambrose		
Date	January 2018		
Version	Issue 1		
Prepared by	Frances A Bennett	BSc (Hons), CGeol, FGS, FIMMM, C.WEM, MCIWEM, CEnv, AIEMA, MIEnvSci	Director Ashton Bennett Ltd
	Tristan Bennett	BSc (Hons)	Engineer

EXECUTIVE SUMMARY

Site Location	59 Goldhurst Terrace, London, NW6 3HB.
Site Description	Terraced 4 storey house.
Historical Land Use	Open land and house of 59 constructed by 1894. Local industries include food factory, garages and printing works at >90m distance from site.
Current Land Use	Residential house.
Potential Contamination	Low Risk due to distance of local industries. Tests should be undertaken for heavy metals, hydrocarbons and asbestos for Health and Safety.
Archaeological Potential	Low Risk.
Hydrogeology	Non productive strata of the London Clay.
Groundwater	Local historic boreholes indicate dry ground conditions, with groundwater at 90m bgl. Perched groundwater may be present within siltstone bands in the London Clay. Groundwater monitoring is recommended.
Flooding from Groundwater	Low Risk as no water bearing superficial deposits present on London Clay.
Hydrology and Flooding	Low risk of flooding from rivers and seas and from canals, reservoirs and sewers.
Underground lost rivers	None that could affect the basement or be affected by the basement.
Critical Drainage Areas	Within a CDA, not within Local Flood Risk Zone. Road Flooded in 1975 and 2002. Site Specific Flood Risk Assessment required.
Flooding from Surface Water	Low Risk.
Flooding Incidents	2 recorded in Goldhurst Terrace.
SUDS	Ground not suitable for soakaways.
Geology	London Clay weathering to silty clay.
Landfill gas potential	No landfill within 250m, infilled ground and tunnels within 250m. Methane monitoring required. Radon gas protection is not required.
Geotechnical	London Clay has good bearing strength where unweathered for low rise

Properties	housing and may have high plasticity.
Extra hard cover	Extra hard cover will be 8m^2 in the rear garden.
Concrete	Underground concrete should be designed to DS-2 due to selenite content of London Clay. Soluble sulphate tests required to confirm.
Ground Movement	Calculations to CIRIA 580 indicate a very slight Damage Category to neighbouring properties.
Monitoring Strategy	Party Wall Surveyor should undertake structural survey of adjacent properties and monitoring.
Waste Disposal	Waste disposal is responsibility of owner to ensure it is disposed appropriately to landfill. Likely to go as inert waste and WACS tests will be required to confirm.
Tunnels	None recorded within 150m.
Structural Design	The basement and lightwells will be underpinned in sequence to similar depth of adjacent basement.
Conceptual Model	A Conceptual Model is presented in Appendix D.



1. INTRODUCTION

This report describes the results of the screening and scoping for a Basement Impact Assessment (Geology, Hydrogeology and Hydrology) undertaken for the development of a residential basement at 59 Goldhurst Terrace, London, NW6 3HB. The work was undertaken on behalf of the client Mr R Ambrose and was carried out by the Ashton Bennett Consultancy. Plans of the proposed development are provided in Appendix A.

The purpose of this Report is to ascertain the potential impacts that the proposed basement and lightwells may have on the ground stability, the hydrogeology and the hydrology in the vicinity of the site and to assess any potential ground movement that could detrimentally affect neighbouring properties.

The site lies within the London Borough of Camden. The assessments were carried out in general accordance with the London Borough of Camden Development Policy 27 “Basements and Lightwells” and Camden Planning Guidance 1 “Design Note prepared by London Borough of Camden for New Basement Development and Extensions to Existing Basement Accommodation” (LBC, 2010).

As stated in Camden Development Policy DP27 paragraph 27.1, LB Camden “will only permit (basement and other underground development) that does not cause harm to the

built and natural environment and local amenity and does not result in flooding or ground instability".

The approach followed in this report was initially to undertake screening of the site and provide a full site characterisation by a desk study of available geological, hydrological, hydrogeological, environmental and historical and topographic information together with a site visit. The results of the screening has enabled scoping of the further reporting and intrusive ground investigations required to complete the Basement Impact Assessment. The screening and scoping has been undertaken in general accordance with the recommended methodologies highlighted in Arup document "Guidance for Subterranean Development", prepared for the London Borough of Camden and the URS Report 'Strategic Flood Risk Assessment', (2014) for LBC.

The project brief comprises of:

- Screening – Identification of matters of concern using checklists.
- Scoping – Definition of the matters of concern identified and design of BIA.
- Impact Assessment – Determination of the potential impact of the proposed basement and lightwells on the projected baseline conditions.
- Recommendations and mitigating measures

This report comprises the screening and scoping and was prepared by Frances A Bennett an engineering geologist with 45 years' experience, who is a Chartered Geologist CGeol, Chartered Environmentalist CEnv and Chartered Water and Environmental Manager C.WEM.

2. THE SITE

2.1 Site Description

The site is located at number 59 Goldhurst Terrace, which lies north of Camden Town in the London Borough of Camden. A site walkover was undertaken on Tuesday January 16th 2018 in order assess the property.

No. 59 Goldhurst Terrace is a private terraced residential house and garden of 0.03 hectares. The house is attached on the north side by house no 57 and on the south side by house no 61. There is no side entrance to the rear garden.

Access to the site is to the immediate east off Goldhurst Terrace.

It is proposed to construct a basement and associated lightwells beneath the front and rear of the house and beneath a small area of the garden.

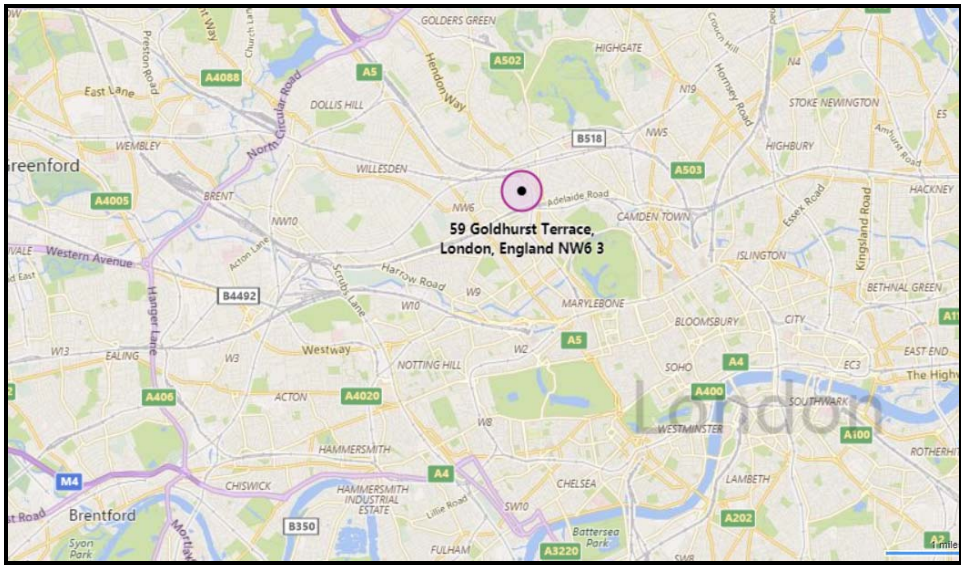


Figure 1 Site Location Plan

The site has hard cover at the front of the property leading onto Goldhurst Terrace and garden area to the rear of the property. The building itself is a three story terraced property currently in use as residential flats. A three storey extension exists on the east face of the building fronting onto the garden and a second single storey extension continues into the rear garden area. A narrow tunnel currently navigates under the property allowing access from the front to the rear.

The site is bounded to the north by 57 Goldhurst Terrace with 55 Goldhurst Terrace beyond. The site is bounded to the south by 61 Goldhurst Terrace with 63 Goldhurst Terrace beyond. The site is bounded to the west by Goldhurst Terrace with residential terraced properties beyond and residential gardens and houses beyond that. The site is bounded to the east by a high brick wall with residential gardens and houses beyond. The rear garden area is bounded to the north and south by high wooden fencing with residential gardens beyond.

A site visit was undertaken on Tuesday January 16th 2018.

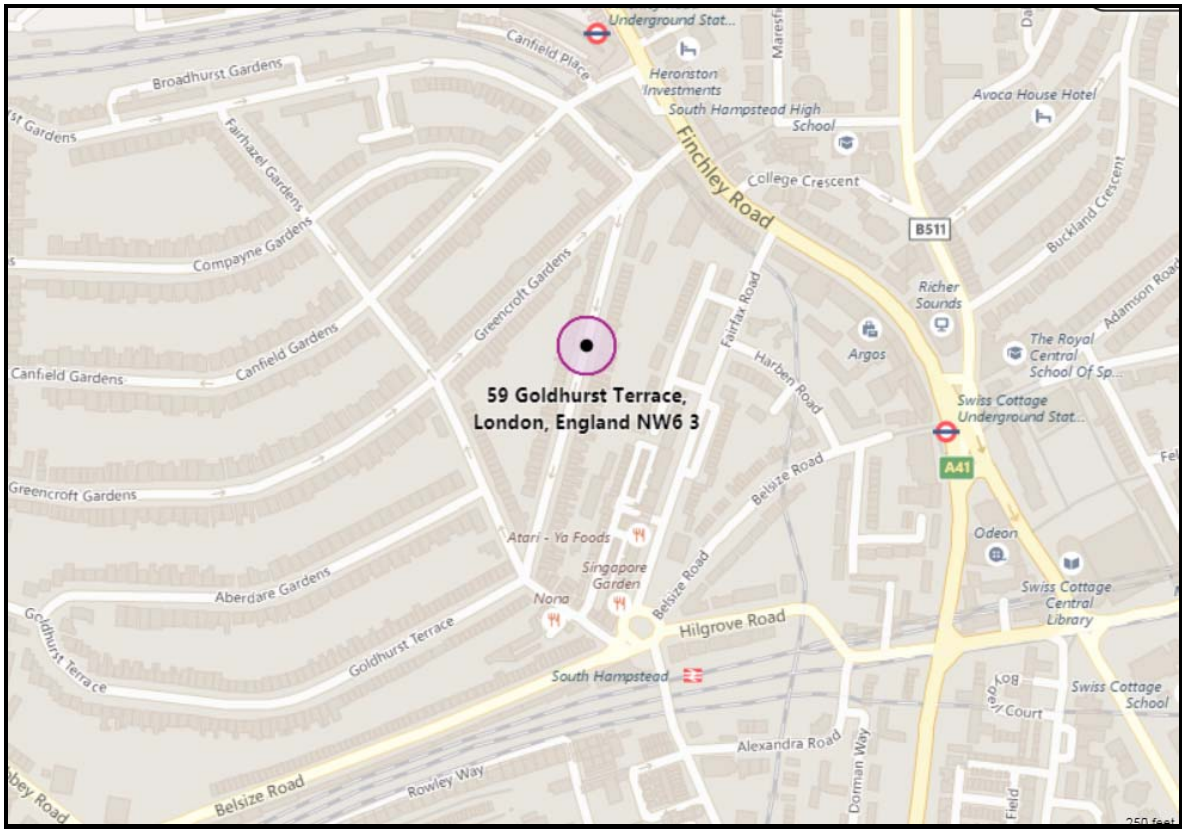


Figure 2 Detailed Site Location Plan

Figure 3 Site Plan

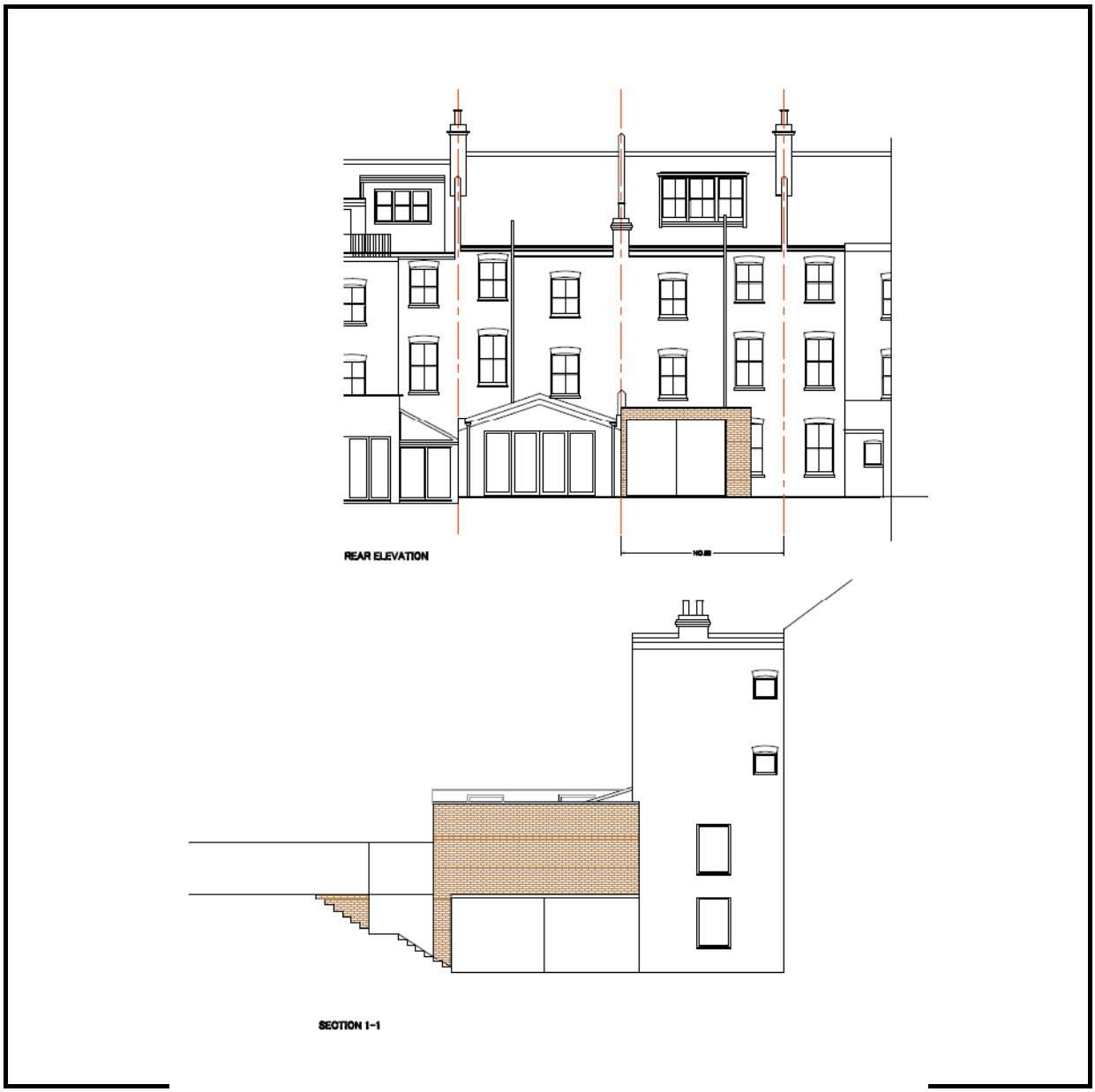


Figure 4 Proposed Rear Elevation and Section

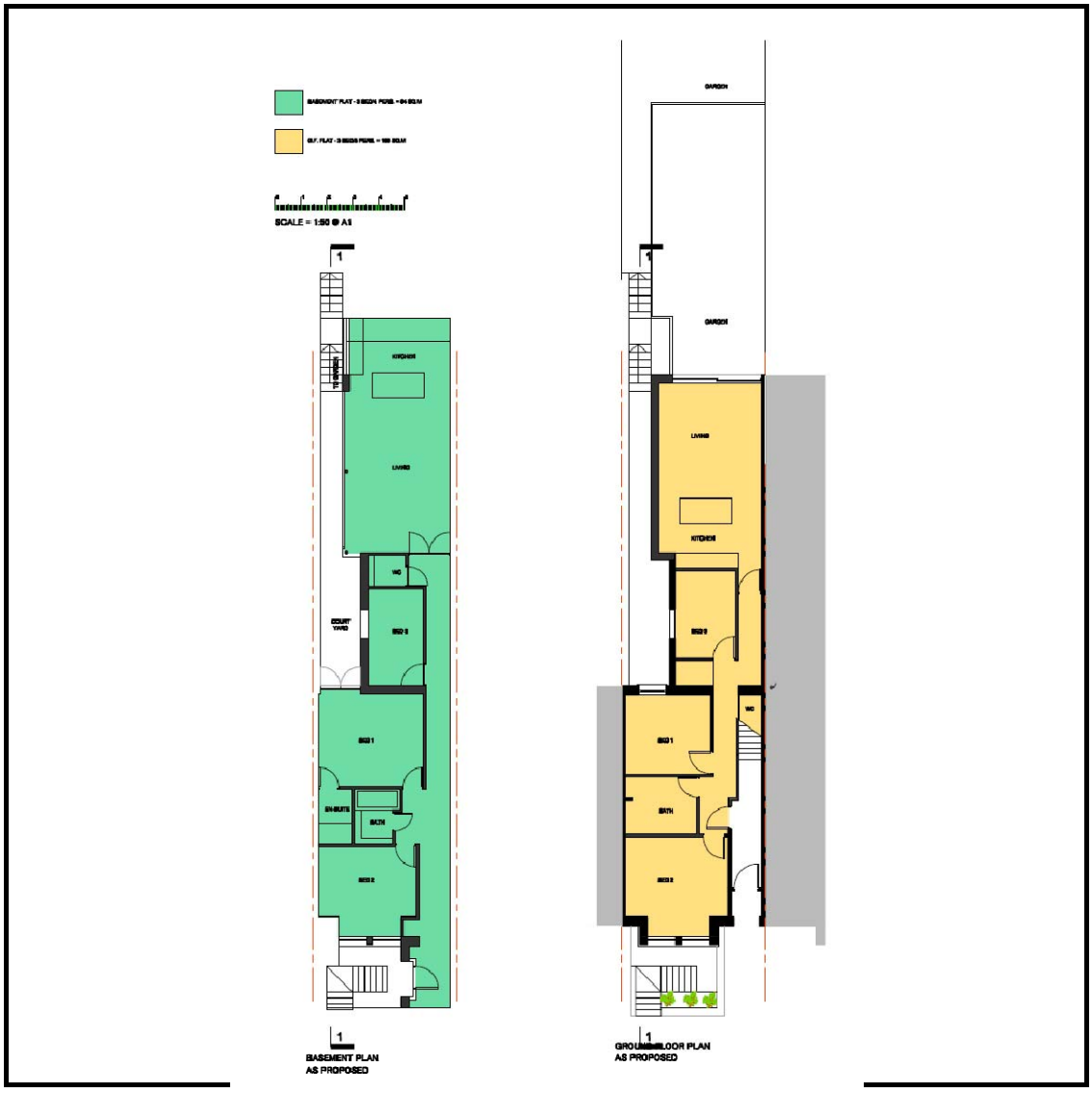


Figure 5 Proposed Basement and Ground Floor Plans

The site lies around National Grid Reference 526301^{E} 184369^{N} at a height of around 136m above Ordnance Datum. A Site Location Plan is presented as Figure 1 and a Detailed Site Location Plan is presented as Figure 2. A Site Plan is presented as Figure 3. A Rear Elevation and Section is presented as Figure 4. The Proposed Basement and Ground Floor Plans are presented as Figure 5. Historic Land use is presented as Figure 6 and Current Land Use as Figure 7.

A Superficial Deposits Geological Plan as Figure 8. A Bedrock Geological Plan is presented as Figure 9. The BGS Landslip Risk is presented as Figure 10. A Local Borehole Plan is presented as Figure 11. Hydrogeology Plan of Bedrock is presented as Figure 12. A Source Protection Zone is presented as Figure 13. The Detailed River Network is presented as Figure 14 and Lost Rivers in Camden as Figure 15. The Critical Drainage Areas and Flood Risk Zones is presented as Figure 16. The Environment Agency Flood Risk form Surface Water presented as Figure 17. The Flooded Roads 1975 and 2002 is presented as Figure 18. Risk of Flooding and Flood Defences is presented as Figure 19. Flood Risk from Rivers and Seas is presented as Figure 20 and Camden SFRA 1 in 1000 Year Flood Event as

Figure 21, and Flood Risk from Reservoirs is presented as Figure 22. Flood Risk from Sewers is presented as Figure 23. Local Landfill sites are presented as Figure 24 and Local Infrastructure as Figure 25.

Drawings of site proposals are presented in Appendix A and archival maps are presented in Appendix B. The Ground Movement Methodology and Monitoring Strategy are presented in Appendix C and a Conceptual Model is presented in Appendix D.

3 SITE HISTORY, HISTORIC and CURRENT LAND USE

3.1 Historic Mapping

The following maps and plans were inspected to assess the history of the site and its past environments. The archival Ordnance Survey maps are presented in Appendix B.

TABLE 1
Historical Maps Inspected

DATE	SCALE	DESCRIPTION	
		SITE	SURROUNDING AREA
1871 & 1872 & 1873-4	1:1,056 & 1:2,060 & 1:10,560	The site at these dates is open land forming part of a field with a field boundary and small pond to the north.	The east end of the site lies adjacent to the rear gardens of houses facing onto Victoria Road. There are no industries annotated within 250m.
1894 & 1896	1:10,560 & 1:1,056 & 1:2,500	Goldhurst Terrace is constructed with houses to the west and east including No 59.	Further housing is annotated on all sides of Goldhurst Terrace, with the exception of the south west where roads are shown but no development. No industries are shown within 250m of the site. Hampstead Baths are shown at the north end of Goldhurst Terrace.
1915 & 1920	1: 2,500 & 1:10,560	No change to the site area.	Housing development is shown on all sides of the site. Public Baths are shown to the north and a school, is shown to the south of the site. Two air shafts and an Athletic Ground are shown to the east of the site. There are no industries shown within 250m of the site.
1935	1:2,500	No significant change to the site area.	No significant change to the surrounding area.
1951 & 1953 & 1955 & 1957-8	1:10,560 & 1:2,500 1:2,500 1:10,560	No significant change to the site area.	There is no significant change to the area surrounding the site. A Food Factory is annotated at 90m south of the site and Garages and a Printing Works are annotated between 100m and 250m south of the site.
1960-62 & 1965-68 & 1967-71	1:2,500 & 1:10,560 1:1,250	No significant change to the site area.	There is no significant change to the area surrounding the site. The Printing Works is annotated as a Warehouse, the Garages are annotated, and the Food Factory is annotated as Factory. There are no additional industries shown within 250m of the site.
1973-74 & 1979-1983 1989	1:10,000 & 1:1,250 1:10,000	No significant change to the site area.	There is no significant change to the surrounding area.
1991	1:1,250	No significant change to the site area.	The surrounding area remains largely unchanged during this time. The factory and warehouse have been replaced by housing and the two Garages are still annotated. No other industries are shown within 250m of the site.
2002	1:10,000	No significant change to the site area.	No significant change to the surrounding area.

DATE	SCALE	DESCRIPTION	
		SITE	SURROUNDING AREA
2010 & 2014	1:10,000 & 1:10,000	No significant change to the site area.	No significant change to the surrounding area.

In summary, the site, based on the Ordnance Survey maps, has been occupied by 59 Goldhurst Avenue since 1894 and has remained unchanged to date. The surrounding area is mainly residential although a food factory, printing works and two garages have existed at >90m and within 250m of the site.

3.2 Historic Land Use

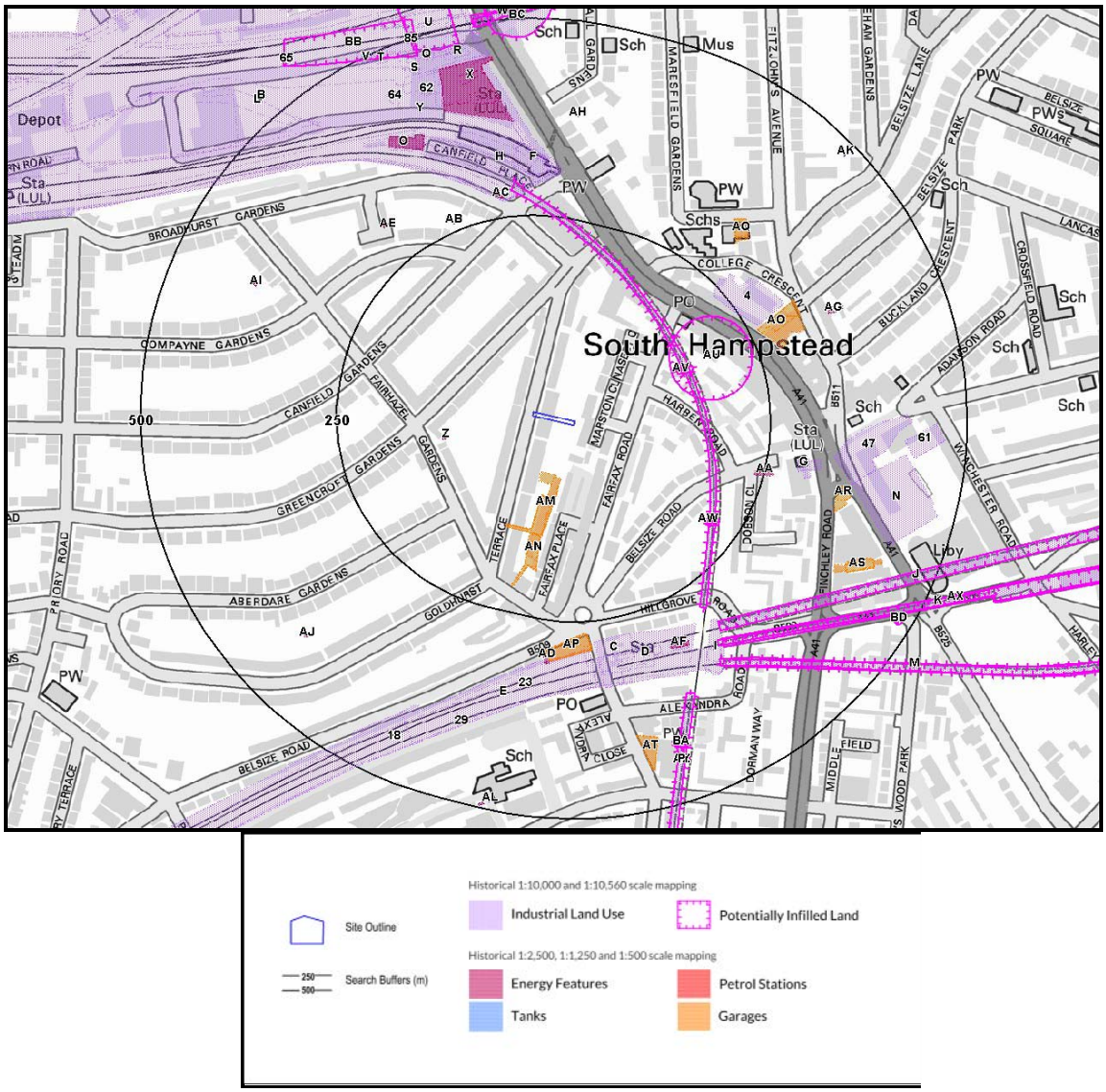


Figure 6 Historic Land Use

Historic Land Use indicates the presence of infilled land within 154m of the site regarding an underground railway line. Air shafts are also present within 139m associated with the underground line. It would be prudent therefore to test for toxic gases which can emanate from infilled ground, during the ground investigation. Due to the historic presence of garages and a printing works, it would be prudent to screen test for hydrocarbons, heavy metals and asbestos.

3.3 Current Land Use

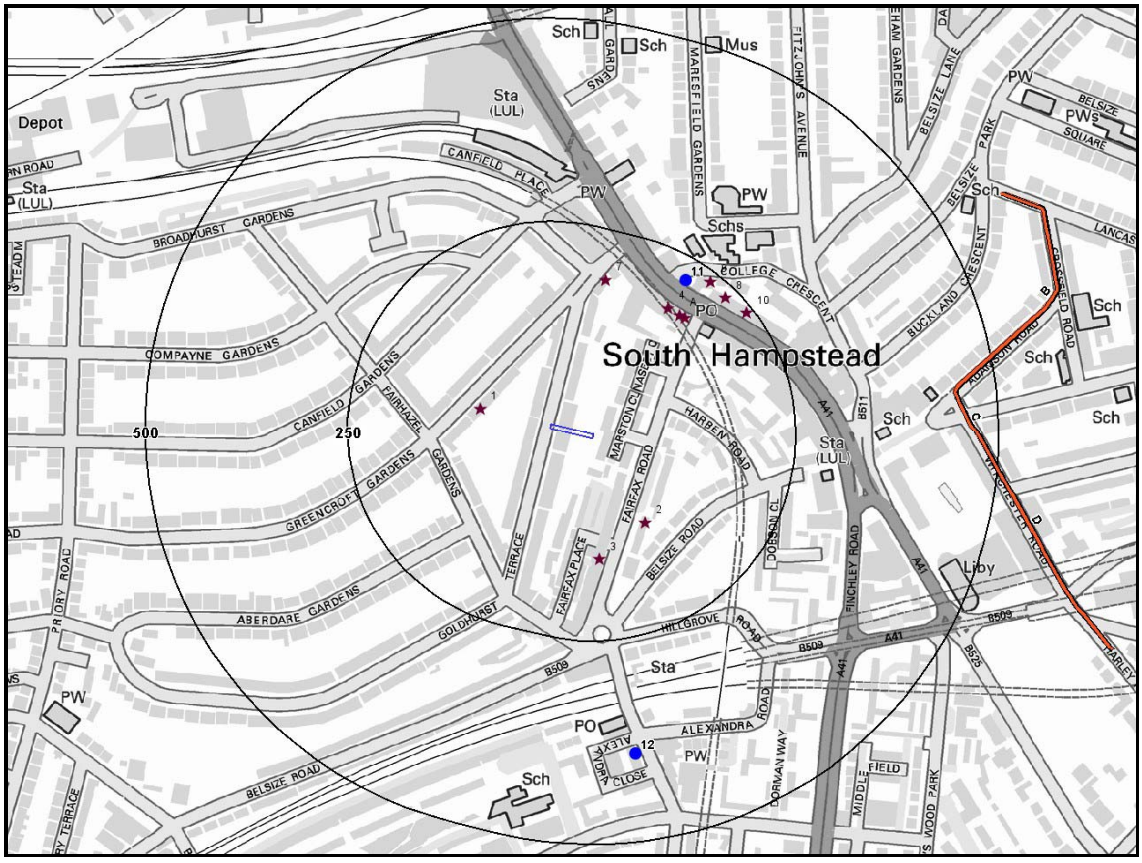


Figure 7 Current Land Use

Current Land Use within 250m of the site includes a radar and telecommunications company, furniture makers, wooden floor company, disability and mobility equipment, beds and bedding shop, baking and confectionary and published goods, with one petrol station at 238m NE of the site. Due to distance of >90m to 242m, these sites are unlikely to contaminate or to detrimentally affect the land beneath 59 Goldhurst Terrace.

4. POTENTIAL CONTAMINATION

The historical map search has not identified any potential sources of contamination that could be present on the site.

A search of environmental databases via an EnviroInsight report (provided by Centremaps) did not reveal any offsite sources of contamination that are considered likely to pose a risk to the site and the proposed development. The former food factory, garages and former printing works lie >90m from the site and are therefore unlikely to have detrimentally affected

the site in the past or present. It will be necessary to undertake screen tests for contamination for Health and Safety for workmen.

5. ARCHAEOLOGY AND SENSITIVE SITES

5.1 Archaeology

The archival maps have not identified any potential for archaeological features that could be present on the site.

5.2 Sensitive Sites

The site does not lie within 2000m of a Site of Special Scientific Interest, within 2000m of a National Nature Reserve, a Special Area of Conservation, a Special Protection Area, a Ramsar Site, Ancient Woodland or World Heritage Site. The site does not lie within 2000m of an Environmentally Sensitive Area, an Area of Outstanding Natural Beauty, a National Park, Nitrate Sensitive Area or Green Belt. The site does not lie within a Nitrate Vulnerable Zone.

The site lies within 1440m of a Local Nature Reserve of Belsize Wood to the north east of the site.

The development of the basement will not detrimentally affect any local sensitive sites.

6. SITE GEOLOGY

6.1 Geology

The published 1:50,000 scale British Geological Survey (BGS) geological map of the area (Sheet 270 “South London”) shows the site to be underlain by bedrock of the London Clay Formation (up to 85m thick in this area) of the Eocene geological epoch.

There are no superficial deposits underlying the site. An extract of the BGS Geological Map is provided in Figures 8 and 9 below.

The underlying London Clay is generally of medium strength silty often sandy with selenite crystals and very thin bands of siltstone.

Given the historical development of the site and surrounding areas, there may be made ground present on the site.

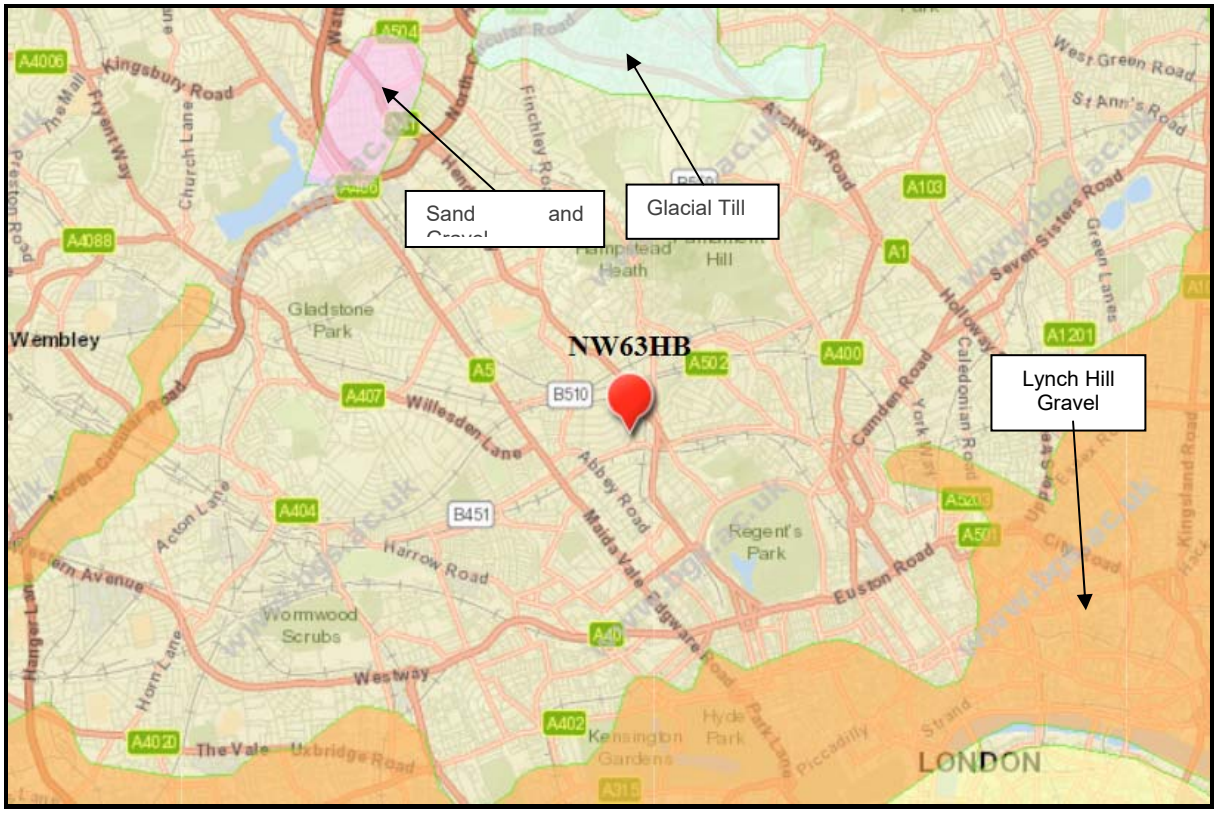


Figure 8 Superficial Deposits Geological Plan

It is recommended that boreholes should be sunk on the site to determine the sequence of strata and the thickness and strength of the strata in order to enable design of depth of foundations and floor slabs for the proposed development.

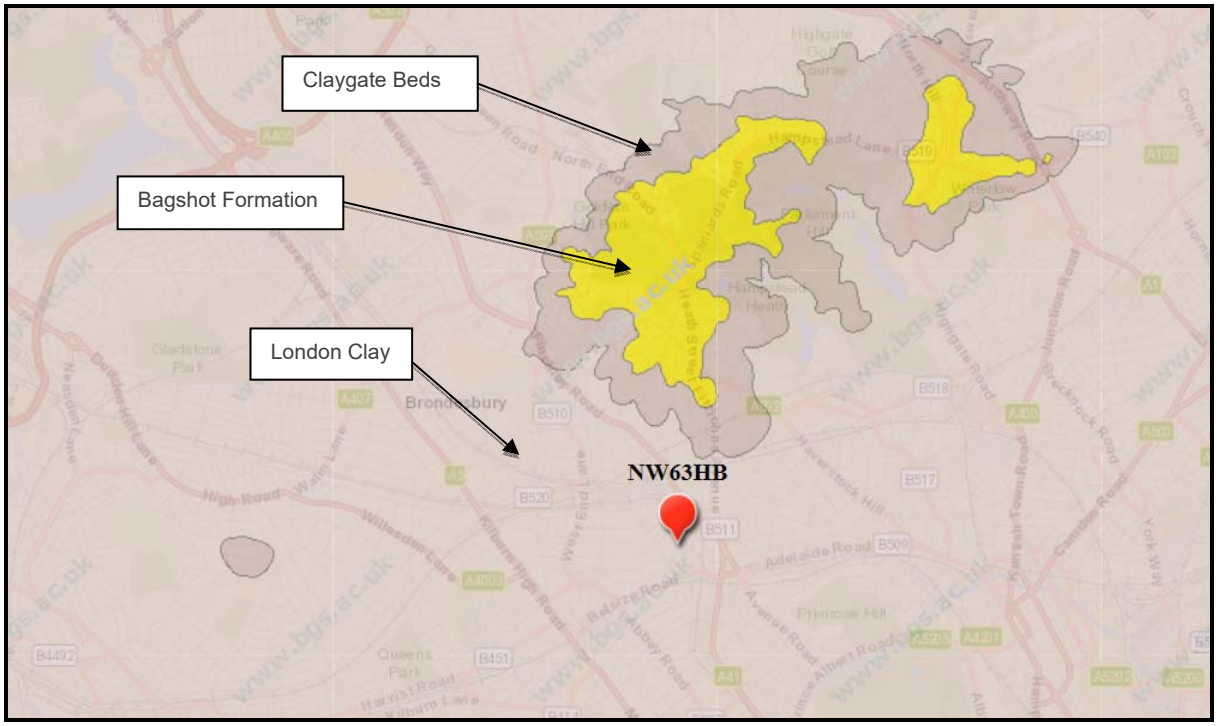


Figure 9 Bedrock Geological Plan

No geological faults are shown to be present within close proximity to the site.

6.2 Mining

There is no evidence of past or present mining or quarrying activity in the vicinity of the site. The site does not lie in a mining area for coal, tin, gypsum, stone or other recorded mineral works.

6.3 Landslips

The site is designated by the British Geological Survey as at negligible risk of a landslide as shown on Figure 10. There are no railway embankments or cuttings nearby which could cause instability of the ground. The ground slopes at less than 7degrees to the horizontal.

Land stability will be further assessed by an Engineer with CEng, MICE qualifications during the next stage of the Basement Impact Assessment.

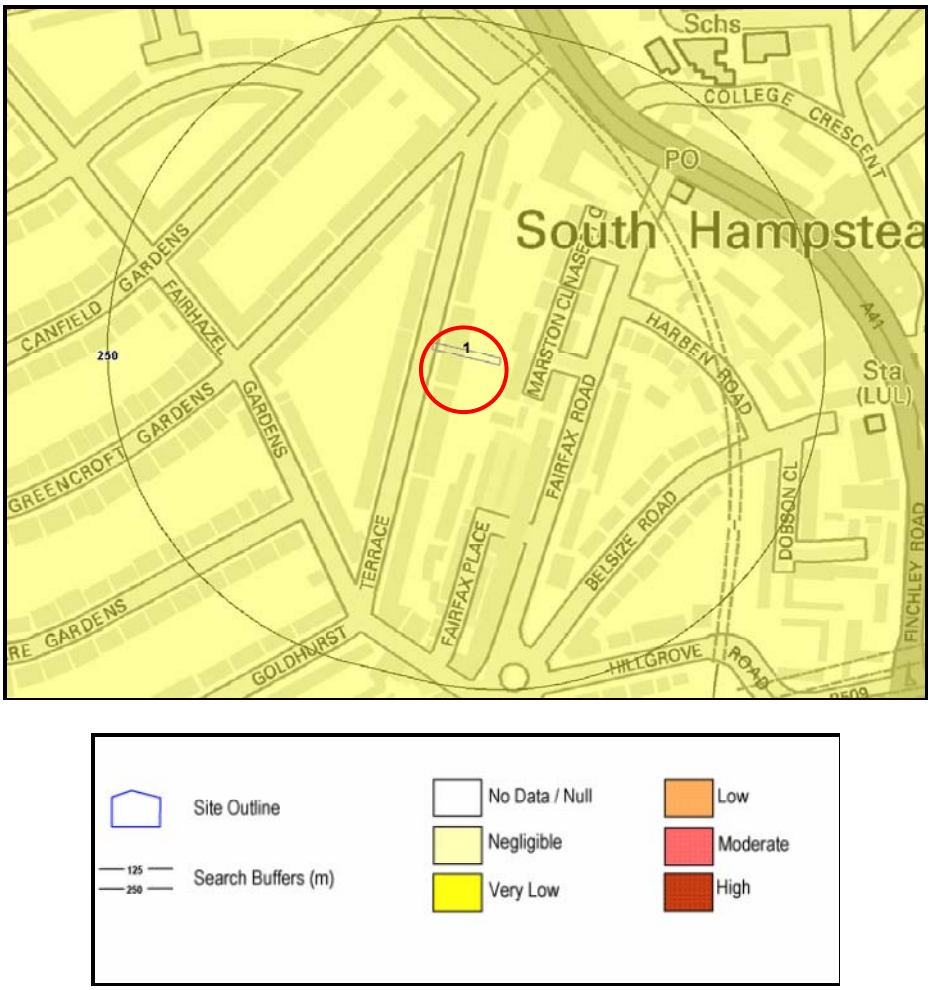


Figure 10 BGS Landslip Risk

6.4 Local Boreholes

A number of relevant available historic borehole logs have been obtained from the BGS website and are summarised in Table 2 below. A plan showing the available local borehole locations is presented in Figure 11.

TABLE 2
Summary of Historical Borehole Logs

BGS Reference	Depth bgl in m	Brief Summary of Ground Conditions	Water Level
TQ28SE1769	159m	GL-1.2m Made Ground 1.2-84.2m London Clay 84.2-96.2m Woolwich and Reading Beds 96.2-100.4m Thanet Sand 100.4-112.6m Putty Chalk 112.6-159.6m Upper Chalk	90m bgl
TQ28SE488A	15.2m	GL – 0.50m Made Ground 0.50 – 15.20m Clay	DRY
TQ28SE895	12.19m	Made Ground overlying clay to 12.19m bgl	DRY

These boreholes confirm the geology of the area surrounding the site to be London Clay with groundwater at >90m bgl.

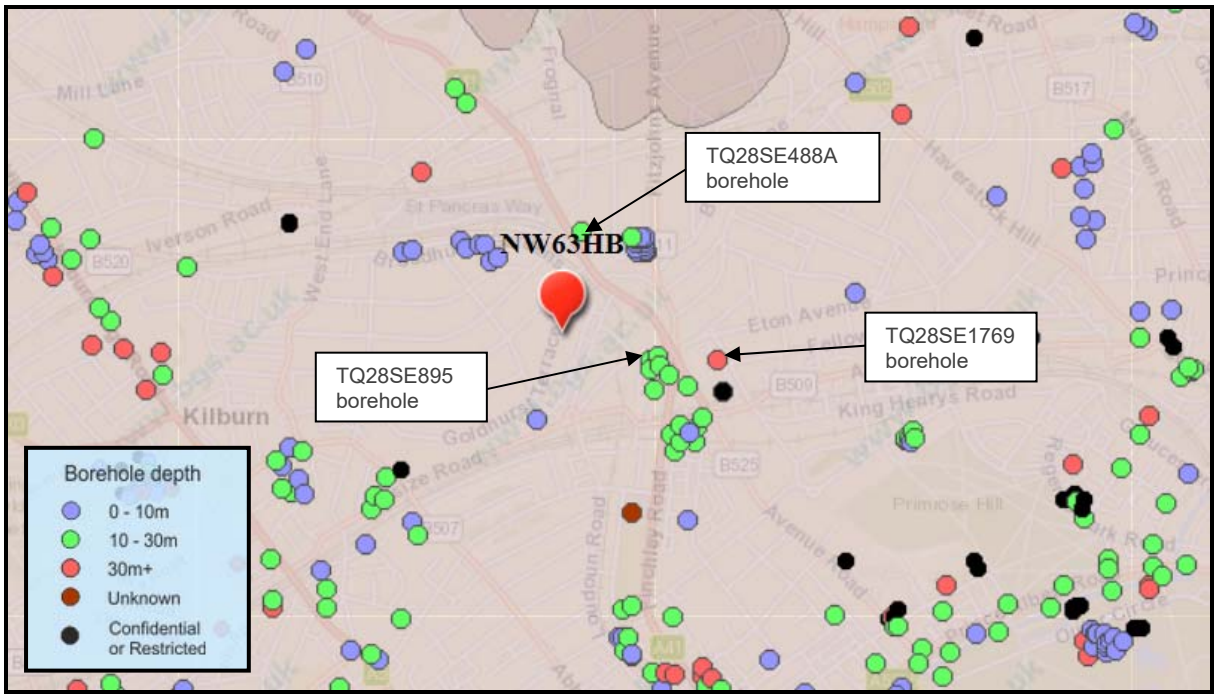


Figure 11 Local Borehole Plan

7. HYDROGEOLOGY

7.1 Aquifers

The above referenced geological map indicates the site to be underlain by London Clay Formation, which is relatively impermeable and classified as unproductive. Superficial deposits do not underlie the site.

The Environment Agency have designated the London Clay Formation beneath the site as "Unproductive" which means the strata have a low permeability and negligible significance to water supply or base flow to rivers. Permeability of the London Clay varies from 5 $x10^{-6}$ to 1 $x10^{-10}$m/sec. (BS 8004, 1986). The site does not lie on a Groundwater Vulnerability Zone.

The natural soils underlying the site are likely to comprise a superficial covering of made ground (potentially absent) overlying the London Clay (clay soils). The London Clay has very low permeability and does not readily permit the downwards transfer of surface water or percolating groundwater.

It is recommended that standpipes are installed in boreholes in order to determine the water levels beneath the site to establish any perched groundwater and the requirement for sump pumping or dewatering during construction.

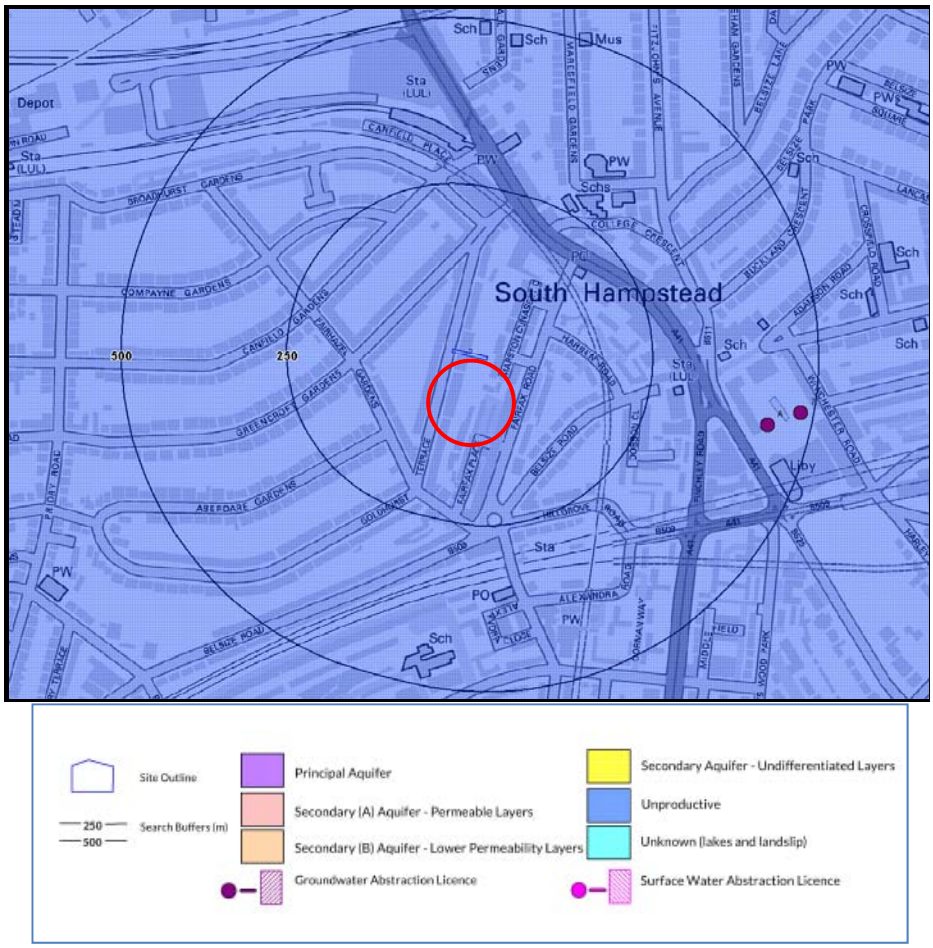


Figure 12 Hydrogeology Plan of Bedrock

7.2 Groundwater Depth and Flow

The development of a basement is unlikely to detrimentally affect any groundwater which lies >90m bgl in the Thanet Sands and Woolwich and Reading Beds or underlying Chalk Aquifer and is protected by the relatively impermeable London Clay.

Water levels were not encountered above 90m bgl in local boreholes researched. The boreholes were sunk some years ago and water levels now may be different. Siltstone bands within the London Clay may be water bearing. Sump pumping or dewatering may be required for construction. Groundwater should be taken as ground level for structural design as recommended by Eurocode 7.

Perched groundwater within the London Clay is generally contained in isolated thin bands of siltstone of limited extent. It would be prudent to waterproof the basement and take into

consideration the potential uplift pressures in structural design in accordance with Eurocode 7.

Due to the small footprint of the basement, and lack of a phreatic surface in the London Clay, there is a low risk of a cumulative effect on groundwater flow from the construction of the basement.

7.3 Groundwater Abstraction Wells, Wells and Springs

There are two groundwater water abstraction licences within 500m of the site. At 435m east there is an active licence from groundwater and lake and pond for general washing and for spray irrigation for London Borough of Camden. At 480m east there is an historic licence for spray irrigation for London Borough of Camden. Other groundwater abstraction licences lie >1468m south east of the site for water supply for Thames Water Utilities Ltd.

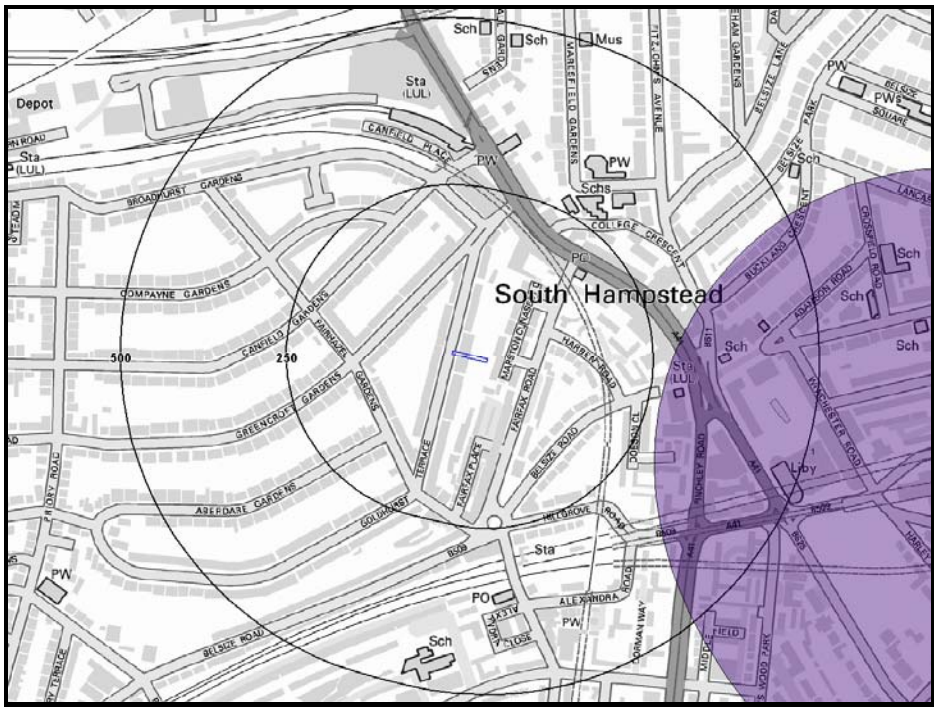
There is one active licence for potable water within 1468m SE of the site for Thames Water Utilities Ltd at Barrow Hill. The site lies within 500m of a Source Protection Zone 2 Outer Catchment for a potable water supply.

Other unrecorded or unlicensed wells may be present close to the site. There are no springs recorded on the OS maps in the local vicinity. The development is unlikely to detrimentally affect groundwater abstraction wells, wells or springs.

7.4 Summary of Hydrogeology

The site is underlain by relatively impermeable London Clay, although some perched water may be present in thin siltstone bands. The site is unlikely to detrimentally affect the groundwater which lies >90m bgl. or potable water abstractions due to distance and the protection of the groundwater by the London Clay.

The site is unlikely to detrimentally affect groundwater quality or to displace groundwater such that it causes a nuisance to neighbouring properties.



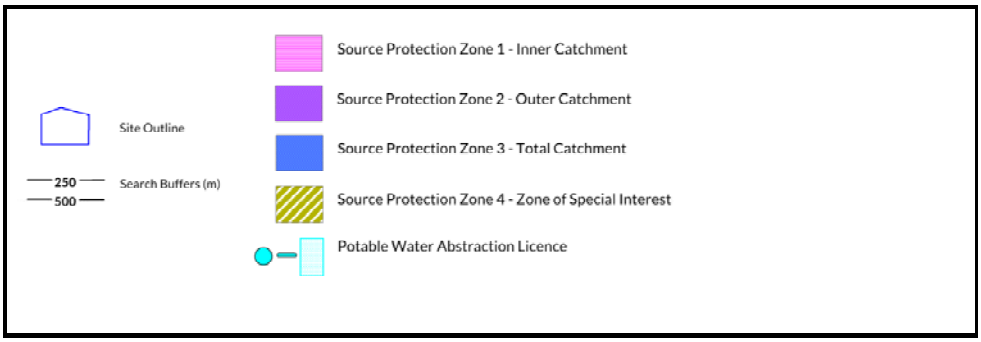


Figure 13 Source Protection Zone

8. HYDROLOGY

8.1 Surface Water Drainage

Prior to the commencement of the redevelopment of the site, the rainfall over the area of the site drains to ground and to public drains.

Surface water from the rear roof drains into the drainage system via underground pipes leading to the front of the site. Surface water from the front roof drains into the drainage system that runs under the front area and to the east of the site. Surface water on the rear garden drains into the ground.

On completion of redevelopment the rainfall will drain in the same manner to public drains. There will be no change in the existing drainage level to public drains. There will be a change in the area of hard cover of an extra 8m2. The extra surface water run off could be partly alleviated by pot planting or creation of flower beds in the presently hard covered front garden.

8.2 Local Rivers, Canals and Surface Water Features

There are no rivers or canals, or surface water features recorded within 500m of the site.

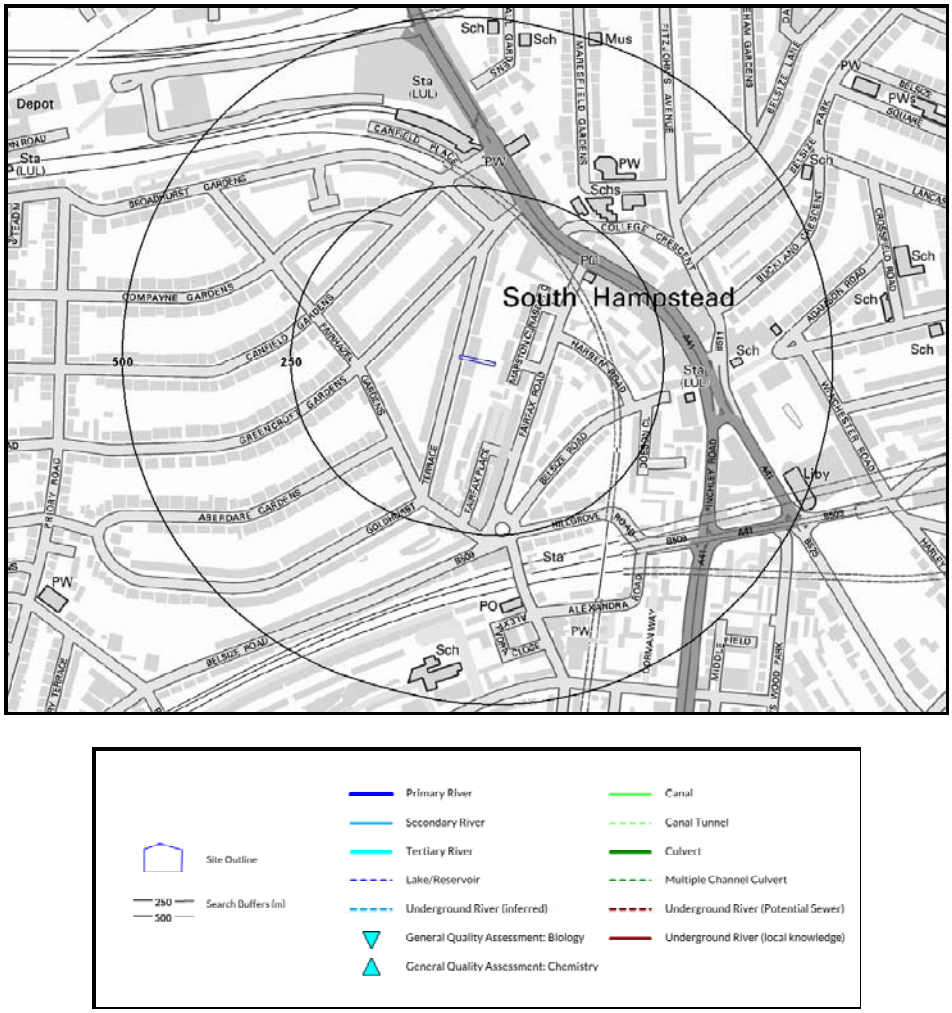


Figure 14 Detailed River Network

The site is unlikely to be affected by or to affect any rivers, canals or surface water features.

8.3 Lost Rivers

The upper reaches of the River Westbourne known historically as the ‘cyna-burna’or kilburn is recorded as flowing to the west of the site in the past and crossing Maida Vale Road at Kilburn from where it derived its name. The lost river runs north to south and is 160m west at its closest point to the site. and is unlikely therefore to detrimentally affect the site.

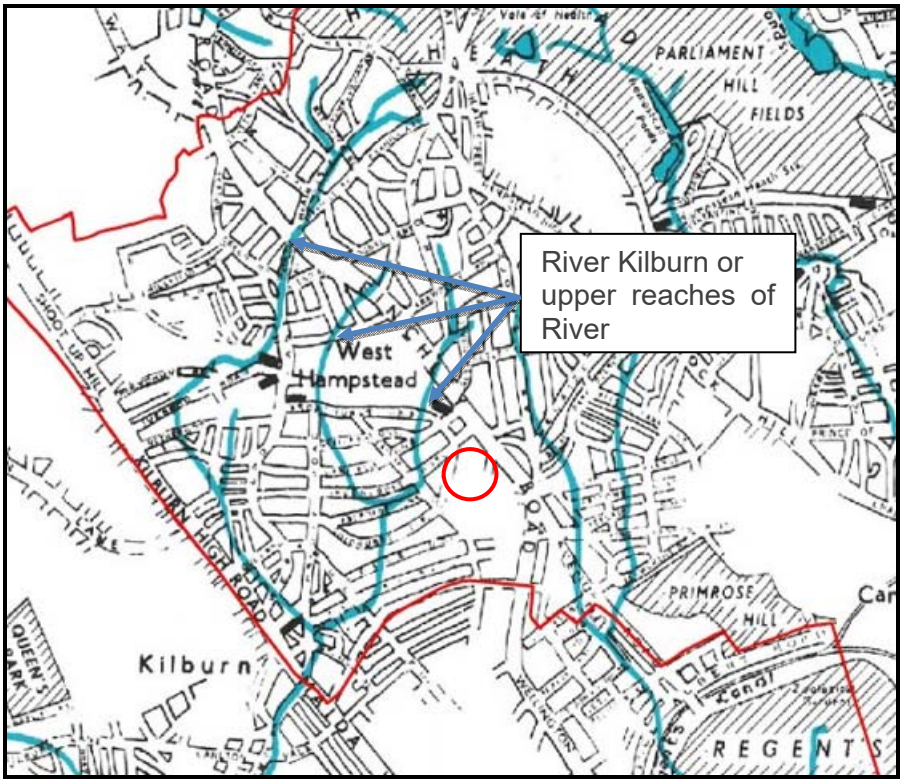


Figure 15 Lost Rivers in Camden

8.4 Surface Water Abstractions

There are no surface water abstraction licenses within 2000m of the site that could be detrimentally affected by or detrimentally affect the site.

8.5 Summary of Hydrology

There are no rivers, lost rivers, canals or surface water features that could affect or be affected by the development of a basement.

9. FLOOD RISK

9.1 Flood Risk from Surface Water

Camden is at risk from surface water runoff (i.e. rainwater that is on the surface of the ground and has not entered a watercourse, drainage system or public sewer), because pipes have burst or gone beyond capacity due to heavy rainfall. These situations are only likely to occur in extreme rainfall events such as in 1975 and 2002 when floods occurred in Camden.

The site does lie in a Critical Drainage Area 3_010, but does not lie in a Local Flood Risk Zone as shown on Figure 16.

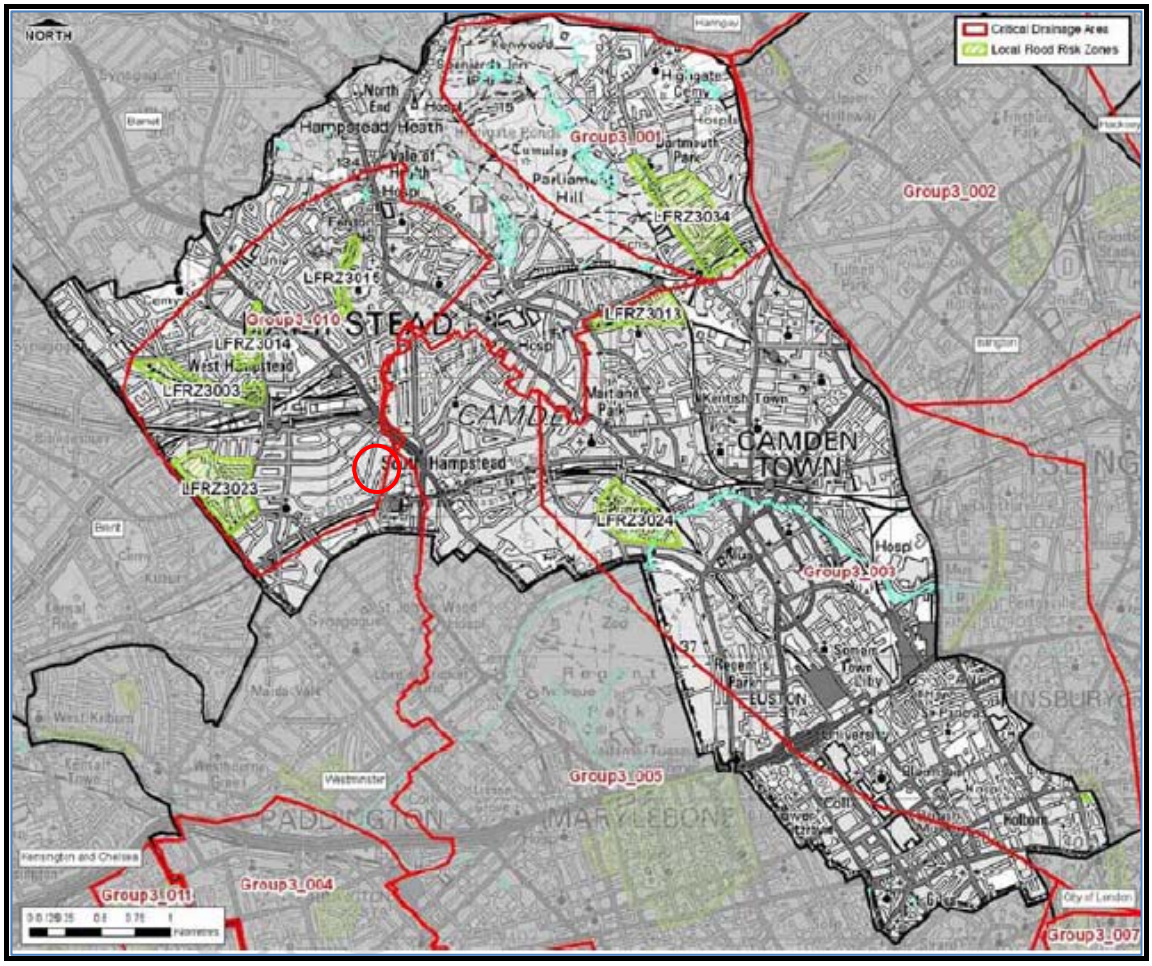


Figure 16 Critical Drainage Areas and Flood Risk Zones

Camden are, since publishing the Scrutiny Task Group Report on surface water flooding, aiming to increase clearage of gullies and drains to enable better discharge of water in times of heavy rain fall.

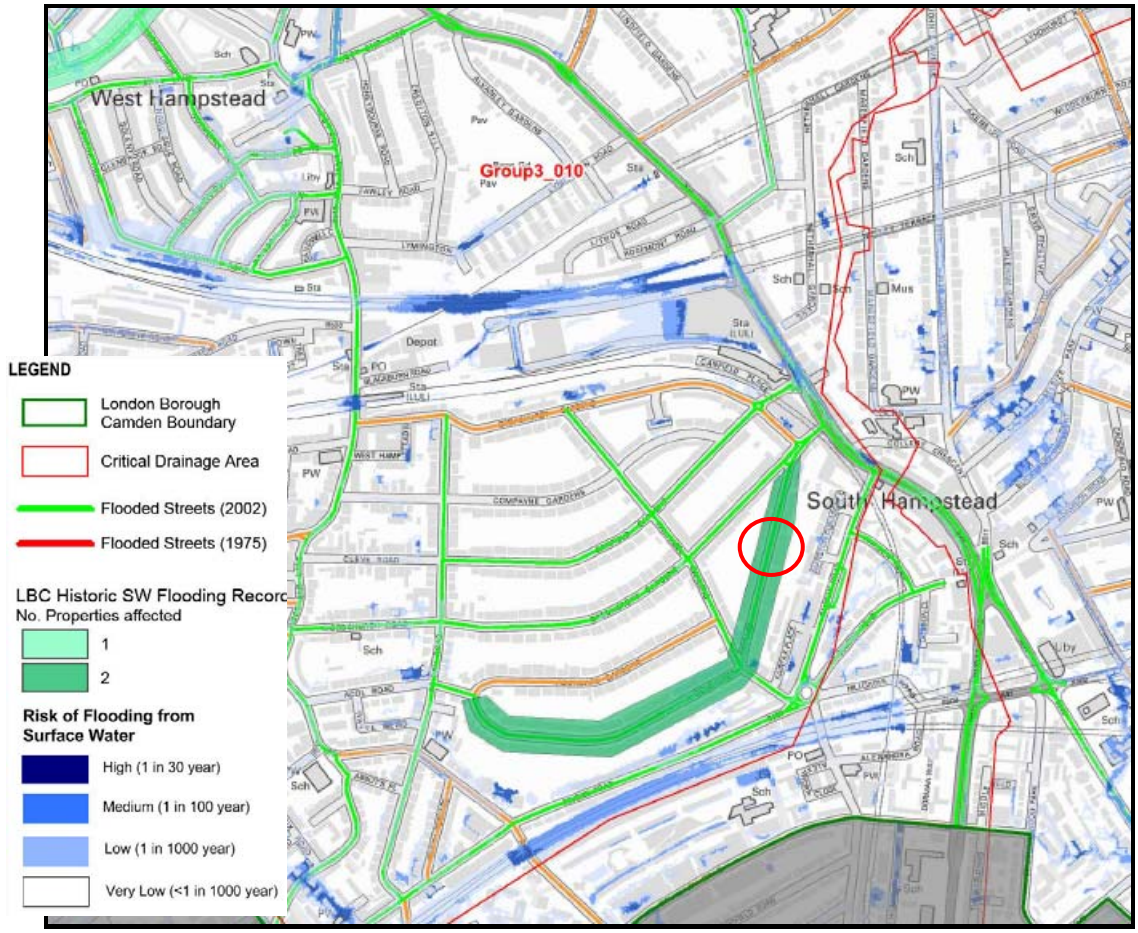


Figure 17 Environment Agency Flood Risk from Surface Water

The site is recorded by the Environment Agency in Figure 17 as having flooded in 2002 with 2 properties affected. Figure 17 indicates a very low risk of surface water flooding for the site.

Figure 18, from Camden Floods Scrutiny Panel indicates that Goldhurst Terrace was flooded in 1975 and 2002.

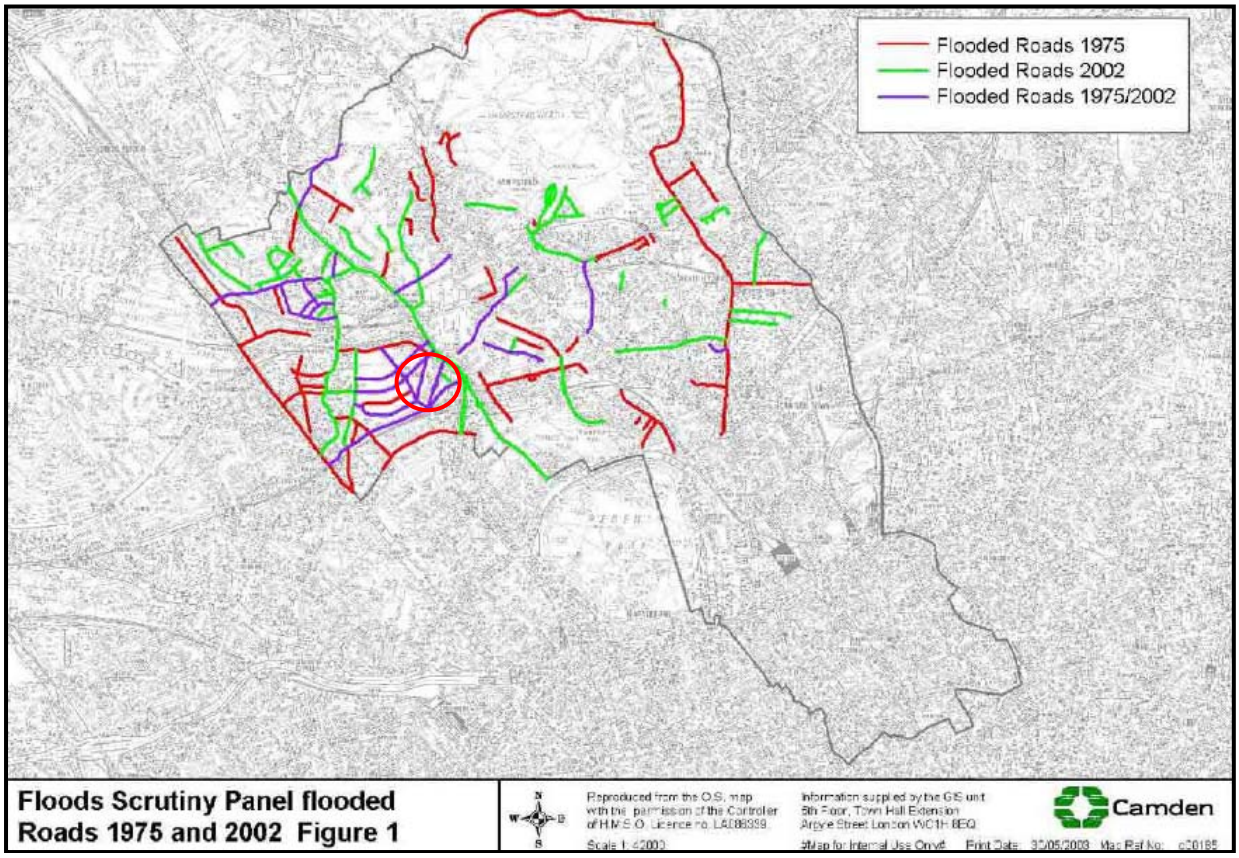


Figure 18 Flooded Roads 1975 and 2002

9.2 Flood Risk From Rivers and Seas

The site is shown by the Environment Agency (EA) to not lie within/on the boundary of an area at risk of flooding. The EA indicate a very low risk of flooding from rivers and the sea.

The Flood Zone maps produced by the Environment Agency provide an initial assessment of flood risk. The Flood Zones are divided into four categories of flood probability and do not take into account any flood defences. PPS25 defines the flood zones as:

Zone 1: Low Probability-This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

Zone 2: Medium Probability-This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% to 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% to 0.1%) in any year.

Zone 3: High Probability- This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Zone 3B 'The Functional Floodplain' – This zone comprises land where water has to flow or be stored in times of flood.

The site does not lie within a Flood Zone.

The site does not benefit from flood defences as detailed on Figure 19.

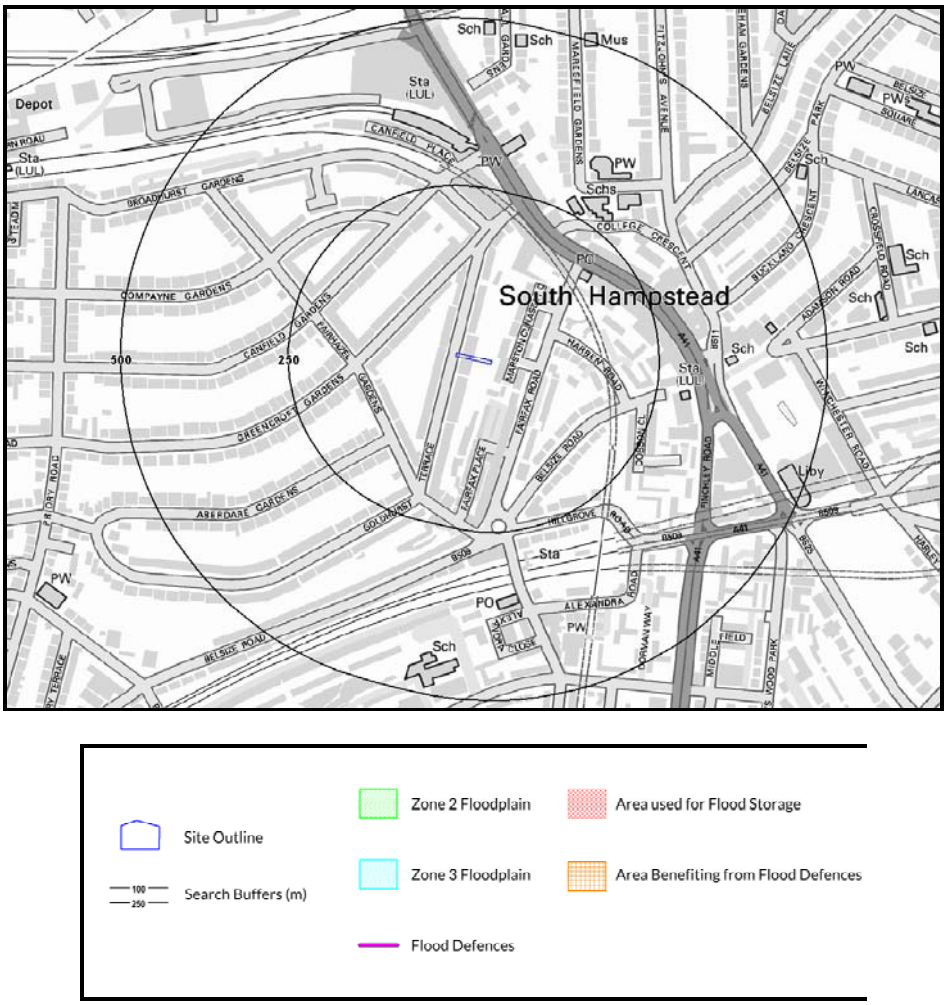


Figure 19 Risk of Flooding and Flood Defences

The risk of flooding from rivers and seas(RoFRaS) rating for the site is not a risk as detailed in Figures 20 and 21.

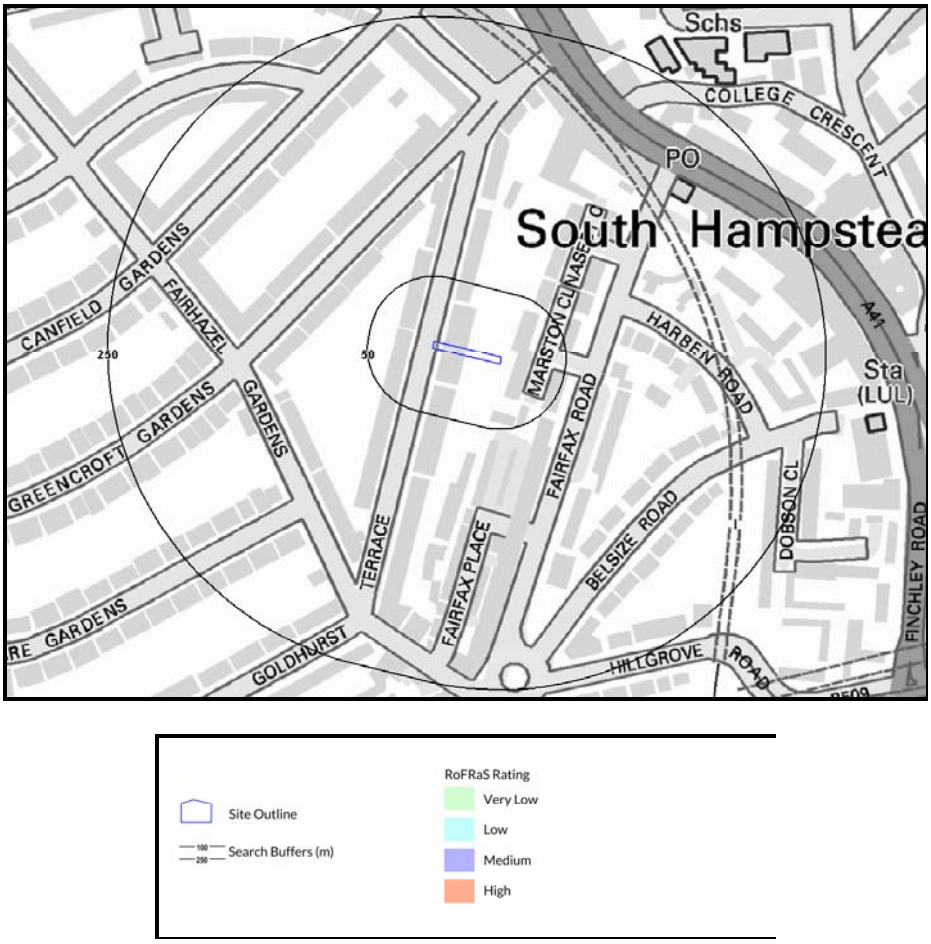


Figure 20 Flood Risk RoFRaS Plan

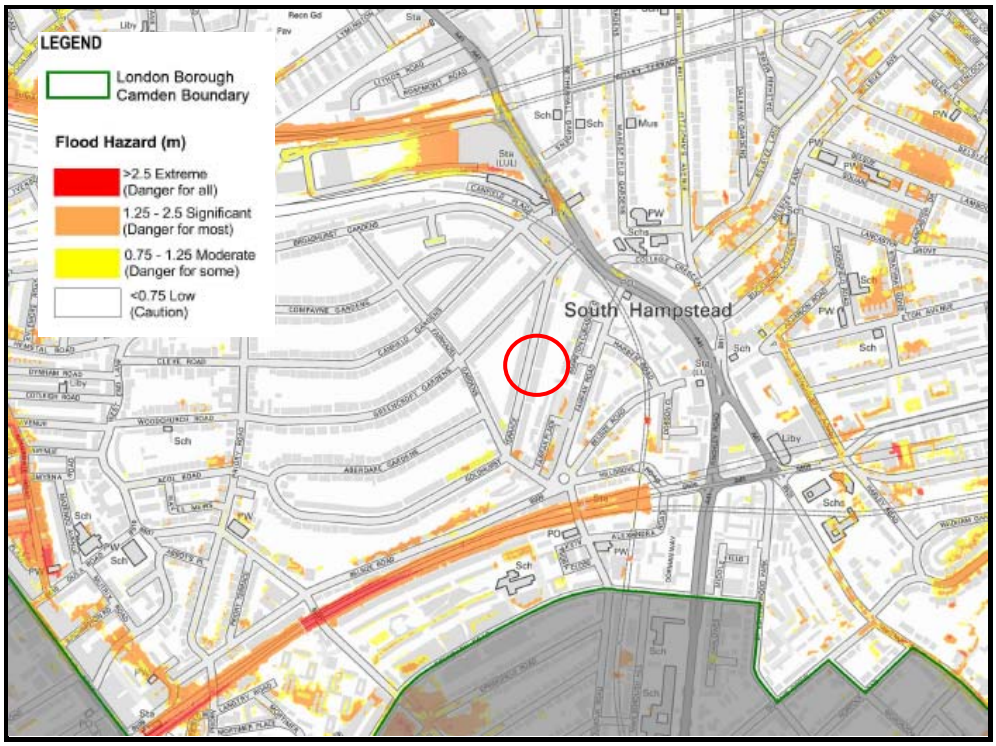


Figure 21 Camden SFRA 1 in 1000 Year Flood Event

9.3 Flood Risk From Reservoirs

The Environment Agency are the enforcement authority for the Reservoirs Act (1975) and all large reservoirs are inspected and monitored by reservoir panel engineers. The risk of flooding from reservoirs is therefore very low. The Environment Agency Reservoir Flood Risk Maps for large reservoirs (>25,000m3) for this area indicate the site is at very low risk of flooding from reservoirs.

Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly, and essential safety work is carried out.

Figure 22 indicates the site is not at risk of flooding from reservoirs.

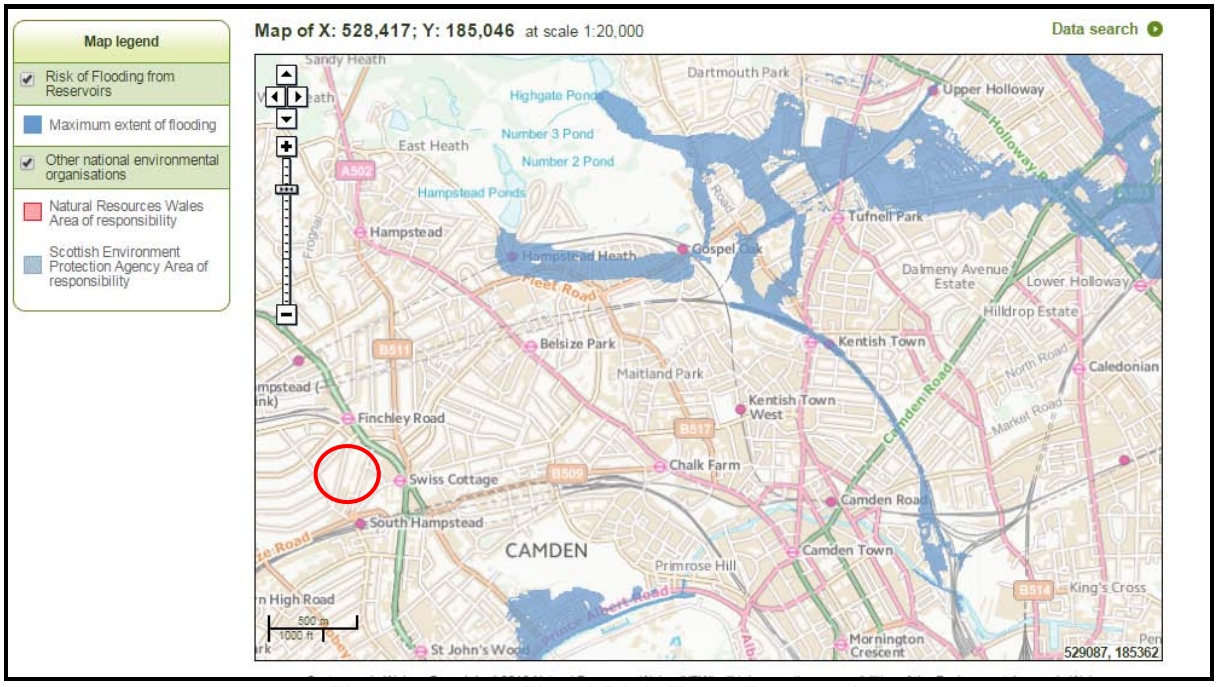


Figure 22 Flood Risk From Reservoirs

9.4 Flood Risk From Groundwater

According to the BGS there are no groundwater flood susceptibility areas within 50m of the site. There is according to the BGS a negligible risk of groundwater flooding based on the underlying geology. Groundwater flooding occurs as a result of water rising up from an underlying shallow aquifer or from water flowing from springs. It mostly occurs following heavy rainfall within aquifers and may detrimentally affect basements.

As the site is not underlain by a shallow aquifer there is a low risk of groundwater flooding.

There is a future susceptibility for increased groundwater flooding due to climate change bringing longer periods of rainfall and due to the use of SUDS increasing water held in the aquifer and reducing the unsaturated zone in the strata. However due to the impermeable nature of the London Clay there are unlikely to be soakaways that increase groundwater levels in this area.

The site lies in an area that is potentially unsuitable for SUDS due to the variable very low permeability of the London Clay.

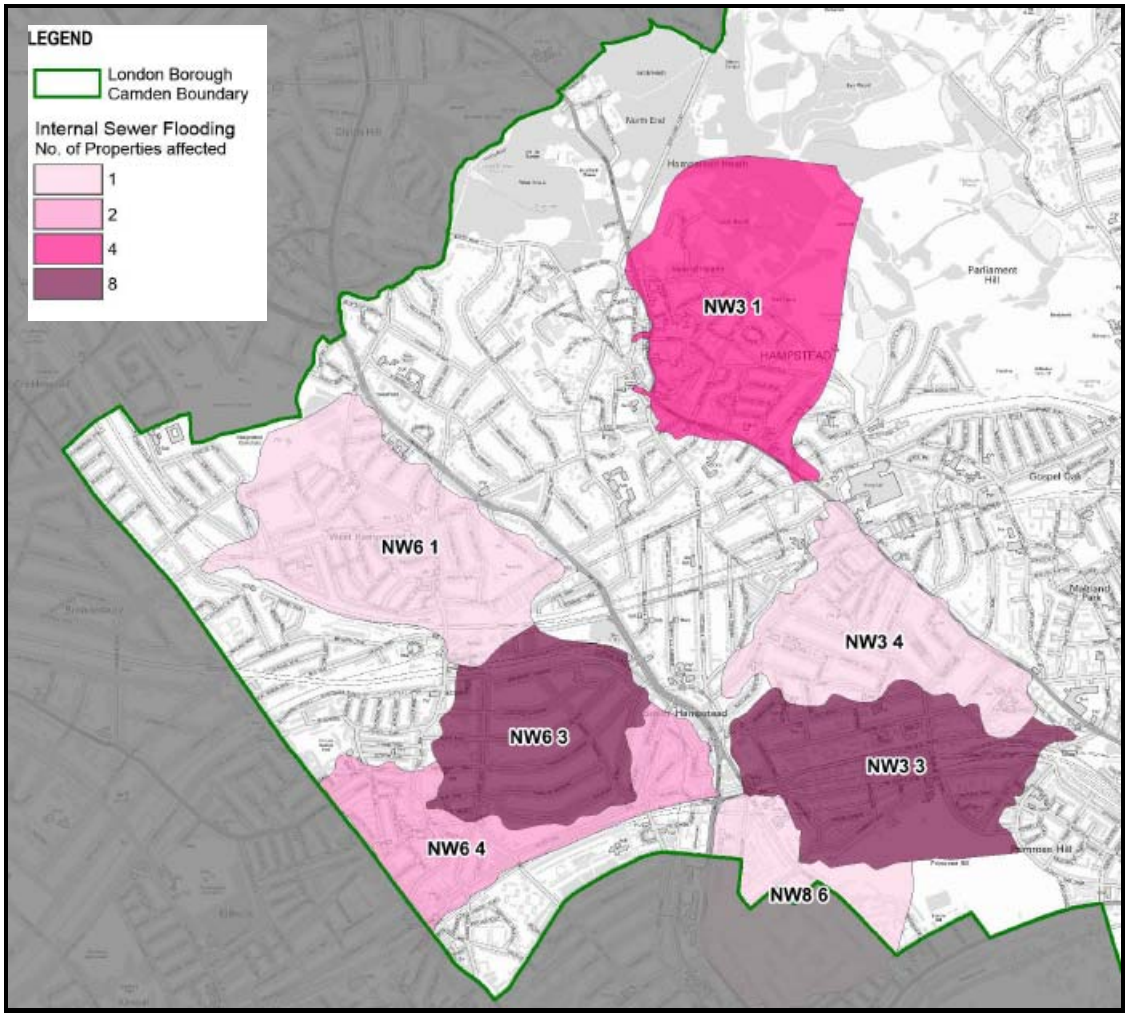


Figure 23 Flood Risk From Sewers

9.5 Flood Risk from Sewers

The area of NW6 is shown to have 8 properties that have suffered from internal sewer flooding.

9.6 Summary of Flood Risk

Although Goldhurst Terrace was flooded in 1975 and 2002, the Environment Agency indicate a low risk of flooding by surface water, rivers and seas, groundwater and reservoir water. Several properties have suffered from internal flooding from sewers.

10. LANDFILL AND RADON

10.1 Landfill

According to the Environment Agency there are no landfill sites within 250m of the site.

The nearest recorded landfill site is 400m from the site. Gases emitting from landfill sites rarely travel more than 250m in the strata and therefore there is considered a low risk from toxic gases from this landfill detrimentally affecting the site.

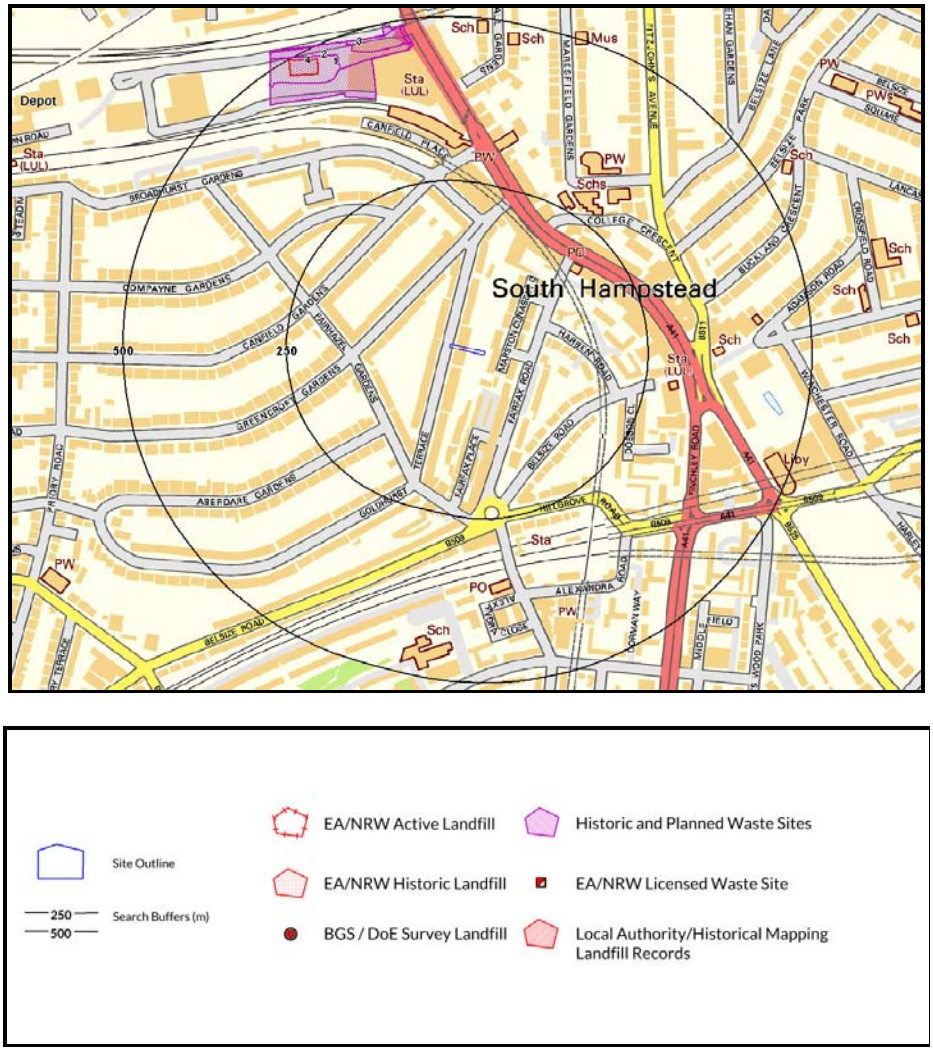


Figure 24 Local Landfill Sites

10.2 Radon Gas

There is, according to BGS/Public Health England, a very low risk that the site is affected by radon gas and as such, radon protection measures in accordance with BR211 will not be required in the basement as part of the proposed development.

11. REGULATED INDUSTRIES AND INFRASTRUCTURE

11.1 Regulated Industries

Results of searches for regulated industries are presented in Table 3.

TABLE 3
Authorisations, Incidents and Registers

Regulated Industry	On SITE	Within 250m	DETAILS
Historic IPC Authorisations	None	None	-
Part A(1) and IPPC Authorised Activities	None	None	-
Water Industry Referrals	None	None	-
Records of Red List Discharge Consents	None	None	-
Records of List 1 Dangerous Substances Inventory Sites	None	None	-
Records of List 2 Dangerous Substances Inventory Sites	None	None	-
Records of Part A(2) and Part B activities and enforcements	None	1	237m NE of site, Incident, unloading of petrol into storage at service stations, no enforcement. Current Permit Type B. 239m Squeaky Clean Dry Cleaners, 13 Fairhazel Gardens, Dry Cleaning, Historic Permit Type B. 239m Swiss Dry Cleaners, 13 Fairhazel Gardens, Dry Cleaning, Current Permit Type B. 248m Connoisseur Dry Cleaners 3-5 Fairhazel Gardens, Swiss Cottage, Dry Cleaning, Historical Permit, Type B.
Records of Category 3 or 4 Radioactive Consents	None	None	-
Records of Licensed Discharge Consents	None	None	-
Records of Planning Hazardous Substance Consents and Enforcements	None	None	-
Records of COMAH and NIHHS sites	None	None	-
Records of National Incidents Recording System List 2	None	None	-
Records of National Incidents Recording System List 1	None	None	-
Records of sites determined as contaminated land under Section 78R of EPA 1990	None	None	-
Records of Made Ground	None	None	-
Records from EA landfill Data	None	None	-
Records of Operational Landfill Sites	None	None	-
Records of EA historic landfill sites	None	None	-
Records of non operational landfill sites	None	None	-
Records of local authority landfill sites	None	None	-
Records of operational waste treatment, transfer or disposal sites	None	None	-
Records of non operational waste treatment, transfer or disposal sites	None	None	-
Records of EA licensed waste sites	None	None	-
Current Industrial Land Use	None	10	90m W Easaphone Services, telecommunications, 122m SE Anthony Rau furniture, 148m S Wooden Floors, 182m NE Spacesavers Hearcare Disability Equipment, 182m NE Taurus Beds, 190m N Lanka, baking and confectionary, 235m NE Chimney Cake Bakers, 238m NE Hampstead Connect Petrol and Fuel Station, 242m NE Artltst, published goods.

Petrol and Fuel Sites	None	1	238m NE Hampstead Connect Petrol and Fuel Station.
Underground High Pressure Oil and Gas Pipelines	None	None	-
NG High Voltage underground Electricity Transmission Cables	None	None	-
Residential Property (within 250m)	Yes	Yes	Residential to the west north and east
Radon Protection Required	No	-	The property is not in a Radon Affected Area, as <1% of properties lie above action level.

Results of searches for regulated industries, pollution incidents or registered authorisations are presented in Table 3 above and indicate that potentially contaminative land uses are not present on and within close vicinity to the site and there are no records of an environmentally sensitive nature which could be detrimentally affected by the construction of the basement lightwell.

11.2 Infrastructure

There is no known infrastructure beneath the site. The underground railway runs at >150m to the east of the site.

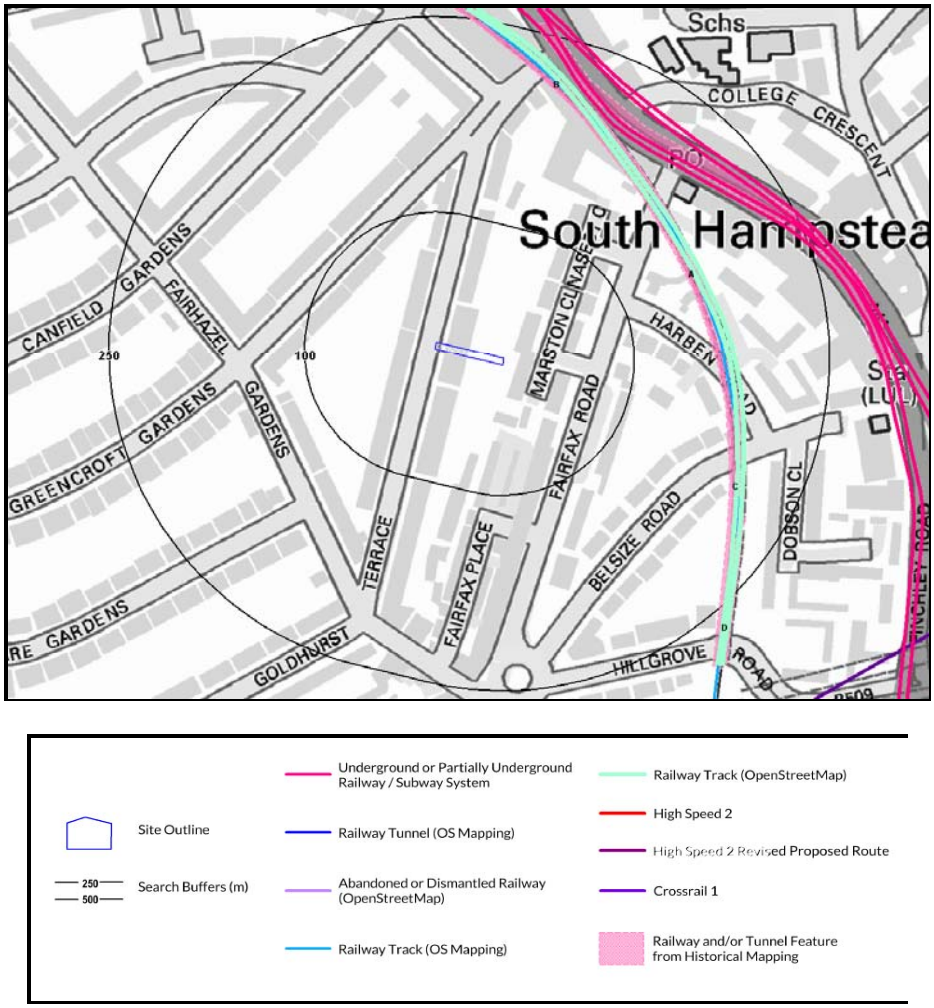


Figure 25 Local Infrastructure

12. SCREENING AND SCOPING

12.1 Screening

Screening is the process of determining whether or not there are areas of concern which require further consideration and / or investigation for a particular project. In order to undertake screening a site characterisation was undertaken in the previous sections. Scoping is the process of producing a statement which defines further matters of concern identified in the screening stage. This defining 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.

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

A series of flowcharts have been used in the screening process to identify what issues are relevant to the site. Each question posed in the flowcharts 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.

The results of the screening process for the site are provided in Table 4 below. Where further discussion is required the items have been carried forward to scoping.

Scoping often indicates that a ground investigation is required to establish more fully the base conditions. The Basement Impact Assessment determines the potential impacts of the proposed basement on the baseline conditions, taking into account any mitigating measures proposed.

Table 4
Screening For Basement Impact Assessment

Ref	Question	Response	Details
	Surface Flow and Flooding		
1	Is the site within the catchment of the pond chains of Hampstead Heath	No	Refer to Maps in Appendix B
2	As part of the site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	Drainage arrangements will be unchanged and volume of water to drains unchanged.
3	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	Increase in hard cover of 8m^2. Carried forward to scoping
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	Surface water originating from the site is not received by adjacent properties or downstream watercourses (other than run-off to sewers).
5	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	Surface water originating from the site is not received by adjacent properties or downstream watercourses (other than run-off to sewers).

Table 4
Screening For Basement Impact Assessment

Ref	Question	Response	Details
6	Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk of flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	Yes	The site does not lie below the water level of any surface water feature. The road was flooded in 1975 and 2002. Carried forward to scoping
	Does site lie within Critical Drainage Area?	Yes	The site does lie within a CDA, 3-010. Carried forward to scoping
	Does the site lie within a Local Flood Risk Zone	No	The site does not lie within a Local Flood Risk Zone
	Subterranean (groundwater) Flow		
1	Is the site located directly above an aquifer?	No	The site lies above the aquiclude of the London Clay
1b	Will the proposed basement extend beneath the water table surface?	No	The water table lies within permeable strata beneath the London Clay
2	Is the site within 100m of a watercourse, well (disused / used) or a potential spring line?	No	The site lies >160m from culverted River Kilburn/Westbourne and the basement is unlikely to be affected by the river. The site lies >500m from existing watercourses/rivers/canals/springs.
3	Is the site within the catchment of the pond chains of on Hampstead Heath	No	Refer to Appendix A
4	Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	Yes	Refer to Appendix A drawings. Rear garden will lose 8m2 of garden. The front garden is presently hard covered. Carried forward to scoping
5	As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	Refer to Appendix A. Soakaways unsuitable in London Clay discharge will be to public sewer.
6	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No	No surface water feature within 500m of the site.
	Ground Stability		
1	Does the existing site include slopes, natural or manmade, greater than 7°? (approx. 1 in 8)	No	Refer to site description.
2	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7°? (approx. 1 in 8)	No	Refer to Appendix B
3	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°? (approx. 1 in 8)	No	Refer to site description.
4	Is the site within a wider hillside setting in	No	Refer to site description

Table 4
Screening For Basement Impact Assessment

Ref	Question	Response	Details
	which the general slope is >7° ?(approx. 1 in 8)		
5	Is the London Clay the shallowest strata at the site?	Yes	London Clay is shallowest strata Carried forward to scoping
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?	No	No trees to be felled as part of 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?	Yes	History of shrink and swell in London Clay. London Clay should be tested for plasticity. Carried forward to scoping
8	Is the site within 100m of a watercourse or a potential spring line?	No	Refer maps in Appendix B
9	Is the site within an area of previously worked ground?	No	Unlikely. House constructed before 1894
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?	No	Site underlain by impermeable London Clay. Aquifer is >90m bgl.
11	Is the site within 50m of the Hampstead Heath ponds?	No	Refer to maps in Appendix B
12	Is the site within 5m of a pedestrian right of way?	Yes	Goldhurst Terrace lies <5m from the basement lightwell Carried forward to Scoping
13	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	House no 61 has a basement. Foundations for the proposed basement will be below those of No 61 and not add weight to existing foundations. Carried forward to Scoping
14	Is the site over (or within the exclusion of) any tunnels, e.g. railway lines?	No	Site is not located over any railway tunnels.

In summary the issues carried forward to scoping include those associated with the plasticity of the London Clay, the flood risk and the impact of the basement on the ground and on the ground supporting adjacent properties.

12.2 Scoping

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.

The potential impacts for each of the matters highlighted in Table 4 above are discussed in further detail below in Table 5 together with the requirements for further research and / or investigations. Detailed assessment of the potential impacts and recommendations are provided where possible.

Table 5
Scoping for Basement Impact Assessment

Reference	Issue	Potential Impact and Action
	Surface Flow and Flooding	
3	Additional 8m^2 of hard cover	**Impact:** Extra surface water runoff **Action:** Mitigating measures, extra planting.
6	Road was flooded in 1975 and 2002 Environment Agency indicate it is at low risk of flooding from surface water	**Impact:** Possible flooding **Action:** Mitigating measures to protect lightwells and basement. Flood Risk Assessment.
	Subterreanean Flow	
4	The proposed basement development will result in a change in the proportion of hard surfaced/paved areas of 8m^2.	**Impact:** Extra surface water runoff. **Action:** Add green roof to extension or pot planters in front hard covered garden.
	Ground Stability	
5	The site is underlain by London Clay	**Impact:** **Action:**
7	Shrink and swelling of London Clay	**Impact:** Ground Movement **Action:** Undertake Atterberg Limit tests to design foundations for basement construction
12	The basement lightwell lies <5m from the pavement	**Impact:** Damage of services in pavement **Action:** Collect service drawings for pavement
13	Adjacent property has a basement at similar level.	**Impact:** None, foundations will be same as or below existing foundations. **Action:** Check Damage Category

The screening and scoping stage of the BIA indicated the requirement for a ground investigation. In addition, there is a requirement for a Structural Method Statement and Construction Method Statement and Ground Movement Calculations and a Flood Risk Assessment and Construction Transport Management Plan.

The ground investigation should comprise:

1. Two boreholes
2. In situ shear strength tests in strata
3. Collection of soil samples
4. Installation of standpipes
5. Monitoring of groundwater levels
6. Contamination testing on soil samples
7. Geotechnical testing of soil samples
8. Excavation of trial pits to establish existing foundation depths.

13. IMPACT ASSESSMENT AND CONCEPTUAL MODEL

13.1 Introduction

The BIA has been undertaken for the proposed construction of a new basement and lightwells. The depth of the basement is anticipated to be 3.00m bgl to the underside of the floor. The anticipated bearing pressure of the new structure has not been provided.

The comprehensive desk based assessment together with the site inspection and ground movement calculations have been sufficient to allow the potential impacts of the issues identified during the screening and scoping stage to be assessed and a Conceptual Model drawn.

This section of the report provides an interpretation of the findings of the Desk Study and in the form of a ground model, and provides advice and recommendations with respect to temporary and permanent works and foundation options. A Conceptual Model is presented in Appendix D.

13.2 Geological and Hydrogeological Setting

The site is underlain by London Clay with no overlying superficial deposits. Laboratory tests should be undertaken for plasticity on the clay to assess its potential to swell and shrink under varying moisture conditions.

There are no recorded abstraction licences which could be detrimentally affected by the basement development. The underlying London Clay is an aquiclude and protects the underlying major chalk aquifer.

Perched water may be present in thin siltstone bands in the London Clay and groundwater levels should be monitored to assess any necessary sump pumping or dewatering for construction.

The construction of the basement is unlikely to have any detrimental effect on groundwater levels or flow as groundwater lies at >90m bgl.

13.3 Hydrology and Flood Risk

There is no risk of flooding from rivers and seas, sewers, reservoirs or groundwater.

However, the screening indicated a Flood Risk Assessment may be required due to the site lying within a CDA and being flooded from surface water in 1975 and 2002. Mitigating measures may include waterproofing and tanking the basement, with non return valves on the drains and an emergency pump incorporated. A site specific Flood Risk Assessment should be undertaken.

13.4 Contamination

Ordnance Survey maps inspected indicated the site had the house constructed before 1894. As such there is a low risk of contamination being present on the site.

Historic local industries include food factory, printing works and garages. These lie in excess of 90m from the site and are unlikely therefore to have detrimentally affected the site.

As a Health and Safety precaution screen tests for contamination, including heavy metals, hydrocarbons and asbestos should be undertaken during the ground investigation. All builders should also use gloves when handling soil for Health and Safety and work in accordance with HSE and CIRIA guidelines.

13.5 Basement and Lightwell Excavations

The excavation for the basement will be circa 3.00m below existing ground level. The floor formation level will be on the London Clay.

Excavation in any made ground and London Clay could be achieved by mechanical excavator. All excavations will require temporary support for construction.

Groundwater may be encountered especially during and after heavy rainfall. If rainwater falls into the excavation, during temporary works, it may be easily be dealt with by sump pumping. If this occurs the softened surface of the clay strata should be removed prior to any pouring of concrete for the underpins or the floor.

In accordance with Eurocode 7 (BSEN 1997-1) groundwater should be taken at ground level for short and long term design. Such design must resist the buoyant uplift pressures generated by groundwater at ground level.

Excavations for the proposed structure will require temporary support in all strata to maintain stability of the surrounding structures and to prevent any excessive horizontal ground movements.

Formation level for the proposed development will be the clay beneath any topsoil or made ground, which are unsuitable bearing strata. The clay should provide a suitable bearing stratum for foundations, provided the bearing pressure is low, ie less than 150kN/m^2.

The support for the temporary and permanent conditions must take account of maintaining the stability of the excavation and the stability of the adjacent properties and surrounding structures. Design of the walls may be decided as to whether the temporary support is also incorporated into the permanent solution. A Structural Method Statement will be required to detail the structural proposals and describe the proposed construction methodology.

If plasticity tests of the clay indicate intermediate or high plasticity, it is possible that ground heave will occur on excavation. It is recommended that compressible material is laid beneath the floor slab or a void is created to accommodate any heave.

13.6 Foundation Design

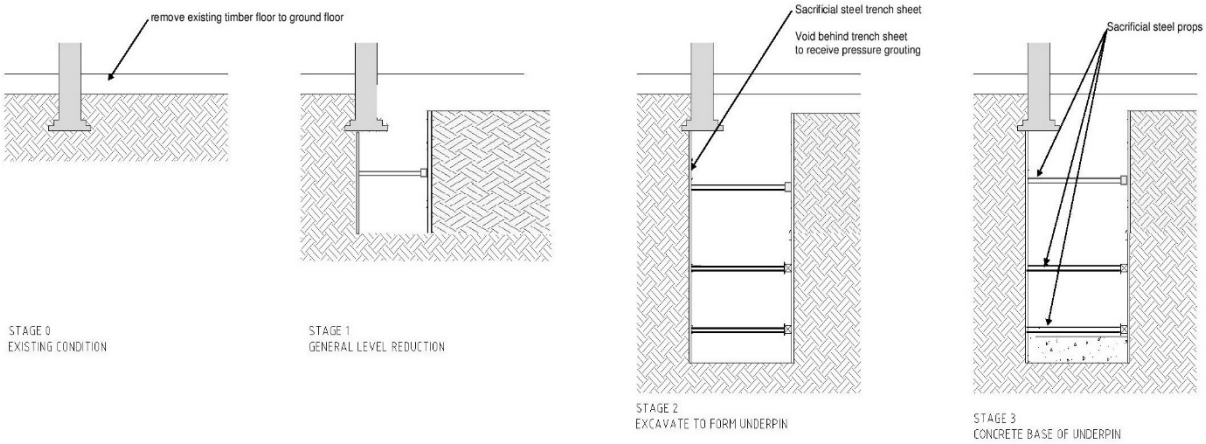
Foundations should be extended to suitable bearing strata by reinforced concrete underpins which should be constructed on an alternate sequence to maintain stability of the existing and neighbouring properties.

The clay should provide a suitable bearing stratum for underpinned foundations, provided the allowable bearing pressure is low, ie less than 150kN/m^2. Bulk Density should be taken as 1900kg/m^3, effective cohesion as zero and effective friction angle as 25 degrees.

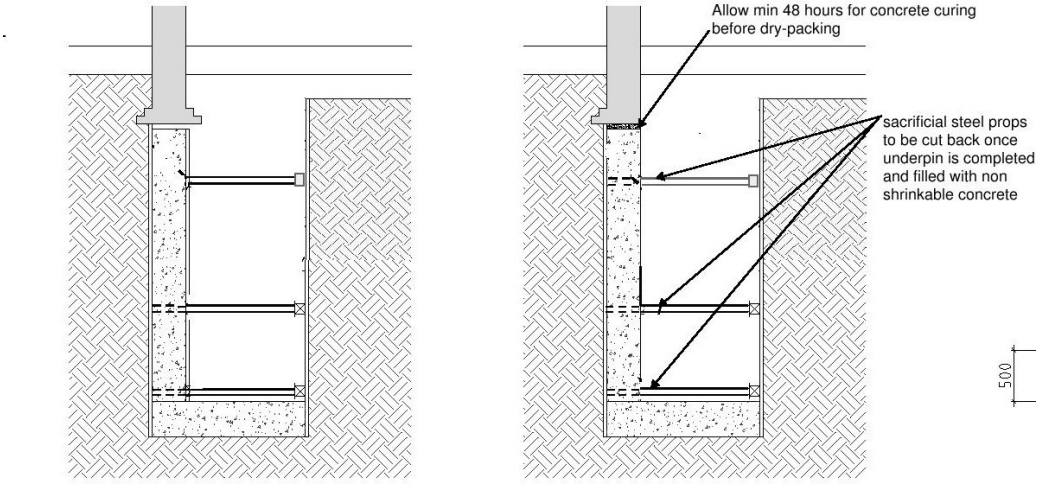
A full Structural Method Statement will be presented following the ground investigation. The drawings below illustrate the temporary works for underpinning.

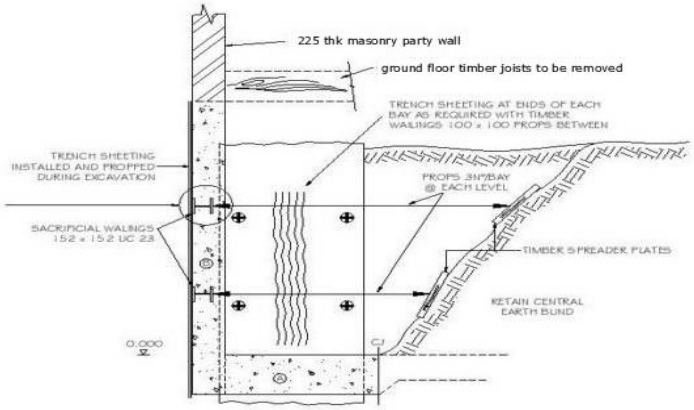
General underpinning temporary works:

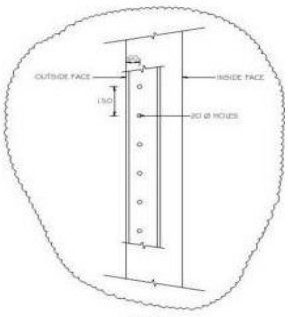
- Carry out soft strip and prop upper floor as required.
- Install conveyor belt with appropriate boxing in to the front of the property to provide safe usage.
- Follow proposed sequence of underpinning as per drawing by structural engineer - dig down to half depth while progressively installing temporary sacrificial propping, complete toe of underpin.



- Install underpin –Allow a minimum curing duration of 24 hours between casting underpins and dry packing and a minimum of 48 hours curing period between dry packing and excavation of next underpin.
- Waling beams may be used with individual underpins as well as retaining wall sections, as per the indicative drawing below.
- On completion of each underpin sacrificial jacks/props can be cut back and the newly cast underpin propped against the middle earth with type 1 acrows or jacks at low, mid and high level until all RC walls are completed and excavation of middle earth is started.
- Once underpinning is completed including RC walls, dig out of middle earth is undertaken. After removing 1 meter of earth, super slim soldier props can be installed across the basement. Installation of soldier beams can be done progressively with the excavation.
- Install reinforcement and cast basement slab.







Calculations for heave and bearing capacity will be presented following the ground investigation.

13.7 Adjacent Structures

The development of the basement and lightwells is unlikely to impact on adjacent properties provided mitigating measures and appropriate temporary and permanent design are undertaken.

The Party Wall Surveyor should be appointed to undertake a structural condition survey of adjacent properties on both sides of No 59 before work commences.

The proposed basement and lightwells will lie within 5m of the pavement of Goldhurst Terrace. Lateral movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of any adjacent structures.

Ground movement calculations undertaken in accordance with CIRIA 580 indicate very slight Damage Category according to Burland and Boscadin Scale of damage. Calculations are presented in Appendix C together with the Monitoring Strategy for adjacent structures.

13.8 Underground Concrete

Due to the selenite content of the London Clay, it is recommended that tests are undertaken on the clay for soluble sulphate in order to design the underground concrete.

13.9 Service Excavations

Shallow excavations for services and the like are unlikely to be stable in the made or clay in the short or long term and will require substantial support. Some sump pumping may be required to keep the trenches dry.

13.10 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip in accordance with the EP (Duty of Care) Regs 1991 and Landfill (England and Wales) Regulations (2002) amended. Under the European Waste Directive landfills are classified as accepting inert non-hazardous or hazardous wastes in accordance with the EU

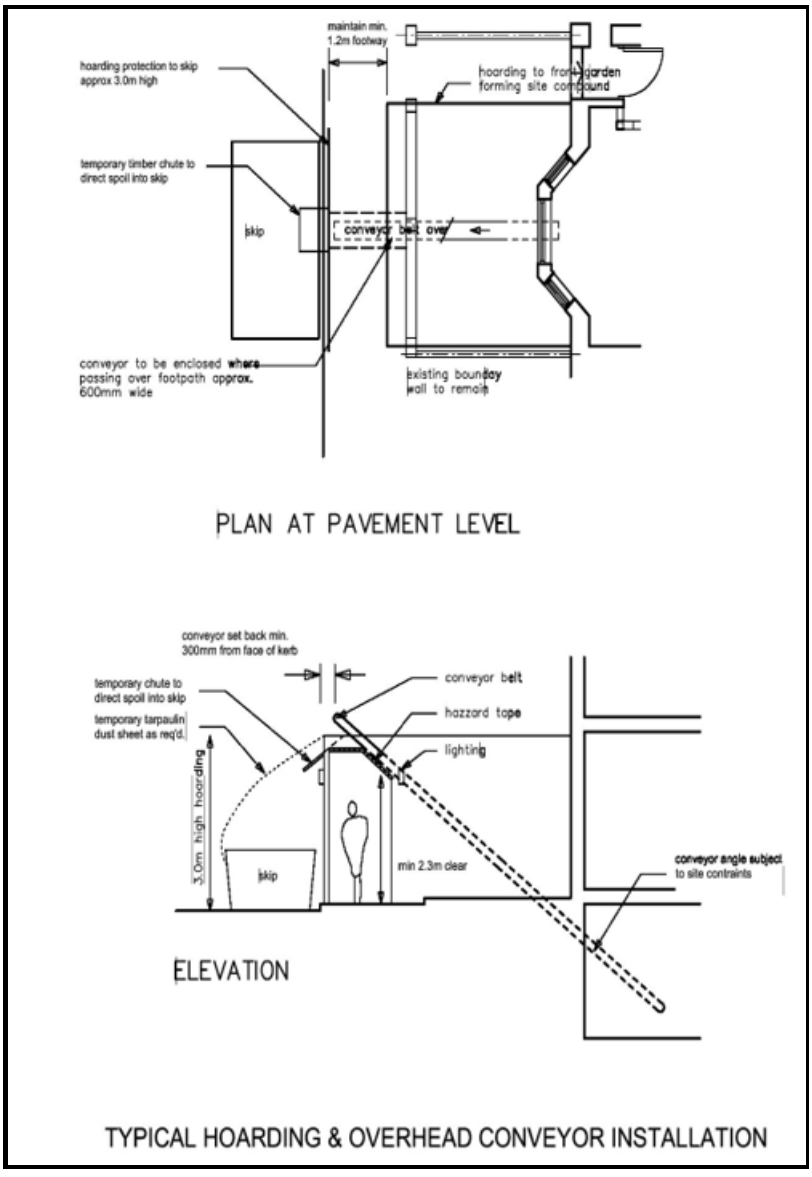
Waste Directive. Based on the technical guidance provided by the Environment Agency it is considered likely that the soil from this site, would be classified as inert waste

The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material if provided with the results of the environmental and Waste Acceptance Criteria Tests (WACS).

13.11 Construction Methodology and Transport Management

A Construction Methodology and Transport Management Plan will be required to ensure that the construction and transport of materials are undertaken with due care and to ensure minimal disruption to the neighbours.

The drawing below illustrates typical pavement and overhead conveyor belt design.



13.12 Recommendations

The development of the basement and lightwells is unlikely to impact on geology, hydrogeology, groundwater or surface water abstractions, groundwater flow and quality or flooding. There will be 8m^2 reduction in grassed area which can be mitigated by providing other areas of infiltration for rainwater.

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.

Recommendations and mitigating measures are:

1. Undertake Flood Risk Assessment
2. Undertake ground investigation
3. Undertake monitoring for groundwater and gas
4. Provide Structural Method Statement
5. Provide foundation design drawings
6. Provide calculations for bearing capacity and heave
7. Check for contamination and WACS test for waste soil
8. Undertake geotechnical tests including for soluble sulphate
9. Foundations to be extended by reinforced concrete underpins
10. Provide Works programme
11. Party Wall Surveyor to assess structural stability of adjacent properties
12. Monitoring of adjacent properties to ensure movement predictions are of right order
13. Provide Construction Transport Management Plan

Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement and works programme will be presented following the ground investigation.

14. GENERAL REMARKS

This report truly reflects the conditions found during the desk study. Whilst the desk study was undertaken in a professional manner taking due regard of additional information which became available as a result of ongoing research, the results portrayed only pertain to the information attained, and it is possible that other undetected information and undetected ground and gas conditions, undetected mining conditions and undetected contamination may exist. The desk study was only undertaken within the site boundaries and should not be used for interpretation purposes elsewhere. These conclusions are only a brief summary of the report, and it is recommended that the report is read in full to ensure that all recommendations have been understood.

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