Document Control

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a desk study and basement impact assessment (BIA) carried out by Geotechnical and Environmental Associates (GEA) on the instructions of Price & Myers on behalf of Ian Brungs. The purpose of the work has been to determine the history of the site, to assess the potential for contamination, and to provide preliminary information on the expected ground conditions, with respect to the reconstruction of the existing three-storey rear extension to the property, combined with localised underpinning to the adjoining properties to facilitate lowering the level of the rear garden, and the rear part of the internal ground floor level. The report also includes the screening and scoping elements of a Basement Impact Assessment (BIA) in accordance with London Borough of Camden guidance.

DESK STUDY FINDINGS

The 1871 map shows the site to have already been developed, with an end of terrace house with a different footprint to the existing No 49 Flask. The next available map, dated 1879, shows the property in this same configuration, but between this map, and the subsequent map, dated 1895, the property appears to have been demolished, and the site redeveloped into its current layout. To the rear of the site, No 4 Lutton Terrace was also built during this time, and the area immediately to the north-east of Lutton Terrace was redeveloped with new terraced houses. The 1895 map also shows a rear projection / extension to the rear of No 49 Flask Walk.

The 1954 map shows a garage and radiator works roughly 20 m to the west of the site, with access to the businesses from Flask Way having been made possible through the apparent clearing of two of the terraced houses that fronted onto Flask Walk. This clearing was later annotated as a road named Lakis Close on the 1974 map. The site and surrounding area have since remained largely unchanged, with the exception of the rear projection / extension, which is now smaller in footprint than shown on the 1991 map.

The site is expected to be underlain by the Claygate Member, over the London Clay Formation.

CONCLUSIONS

On the basis of the findings of the research carried out there is considered to be a LOW risk of contamination at this site and a risk from soil gas is not envisaged.

The BIA has indicated that the impacts identified can be mitigated by appropriate design and standard construction practice. It would be prudent to carry out a limited ground investigation prior to commencement, which should include groundwater monitoring to determine the water level beneath the site. Providing there is an absence of persistent / laterally continuous sand layers beneath the site, any inflows from within the Claygate Member would be expected to be at a very slow rate which could be suitably controlled by sump pumping. As a result, the proposed works are not considered likely to have any detrimental effect on the local groundwater regime.

Providing the construction work is carried out in accordance with best practice, resulting ground movements should be within normal tolerable limits, and the proposed structure should not have a significant impact on the overall stability of the slope.

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Price & Myers on behalf of Ian Brungs, to carry out a desk study and basement impact assessment for 49 lask Walk, London NW3 1HH.

This report also forms part of a Basement Impact Assessment (BIA), which has been carried out in accordance with guidelines from the London Borough of Camden (LBC) in support of a planning application, the details of which are described below.

1.1 Proposed Development

A planning application (Ref: 2019/1309/P) has been submitted to the London Borough of Camden for the "*Reconstruction & alteration of existing three storey rear extension. Alterations to rear fenestration. Ground floor rear infill extension and new rear bay window. Mansard roof extension and terrace. New bin store below front garden.*". The finished floor level of the proposed rear extension will be 1.20 m below the existing level in the rear garden, and beyond the extension, it is proposed to lower the level of the rear garden by 0.50 m. It is also proposed to lower the rear part of the ground floor by 0.20 m.

This report is specific to the proposed development and the advice herein should be reviewed once the development proposals have been finalised.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to determine the history of the site and surrounding area, particularly with respect to any previous or present potentially contaminative uses;
- to research the geology and hydrogeology of the site;
- to check records of data on groundwater, surface water and other publicly available environmental data; and
- to use the information obtained in the above searches to carry out a qualitative risk assessment with respect to subsurface contamination.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, comprising, in summary, the following activities:

- a review of readily available geological maps;
- a review of publicly available environmental data sourced from the Envirocheck database;
- a review of historical Ordnance Survey (OS) maps supplied by Envirocheck;
- a review of nearby GEA archive projects;
- a site walkover survey carried out on 12 February 2020; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11 and involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment, with the first two stages presented in this report.

1.3.1 Basement Impact Assessment

The work carried out also includes a Hydrological and Hydrogeological Assessment and Land Stability Assessment (also referred to as Slope Stability Assessment), all of which form part of the BIA procedure specified in the London Borough of Camden (LBC) Planning Guidance CPG[1] and their Guidance for Subterranean Development[2] prepared by Arup. The aim of the work is to provide information on surface water, land stability and groundwater and in particular to assess whether the development will affect neighbouring properties or groundwater movements and whether any identified impacts can be appropriately mitigated by the design of the development.

1.3.2 Qualifications

The land stability element of the Basement Impact Assessment (BIA) has been carried out by Martin Cooper, a BEng in Civil Engineering, a chartered engineer (CEng), member of the Institution of Civil Engineers (MICE), and Fellow of the Geological Society (FGS) who has over 20 years' specialist experience in ground engineering. The subterranean (groundwater) flow assessment has been carried out by John Evans, MSc in Hydrogeology, Chartered Geologist (CGeol) and Fellow of the Geological Society of London (FGS). The surface water and flooding assessment has been carried out by Rupert Evans, a hydrologist with more than ten years consultancy experience in flood risk assessment, surface water drainage schemes and hydrology / hydraulic modelling. Rupert Evans is a Chartered Environmentalist, Chartered Water and Environmental Manager and a Member of CIWEM.

The assessments have been made in conjunction with Steve Branch, a BSc in Engineering Geology and Geotechnics, MSc in Geotechnical Engineering, a chartered geologist (CGeol) and Fellow of the Geological Society (FGS) with some 30 years' experience in geotechnical engineering and engineering geology.

All assessors meet the qualification requirements of the Council guidance.

1.4 Limitations

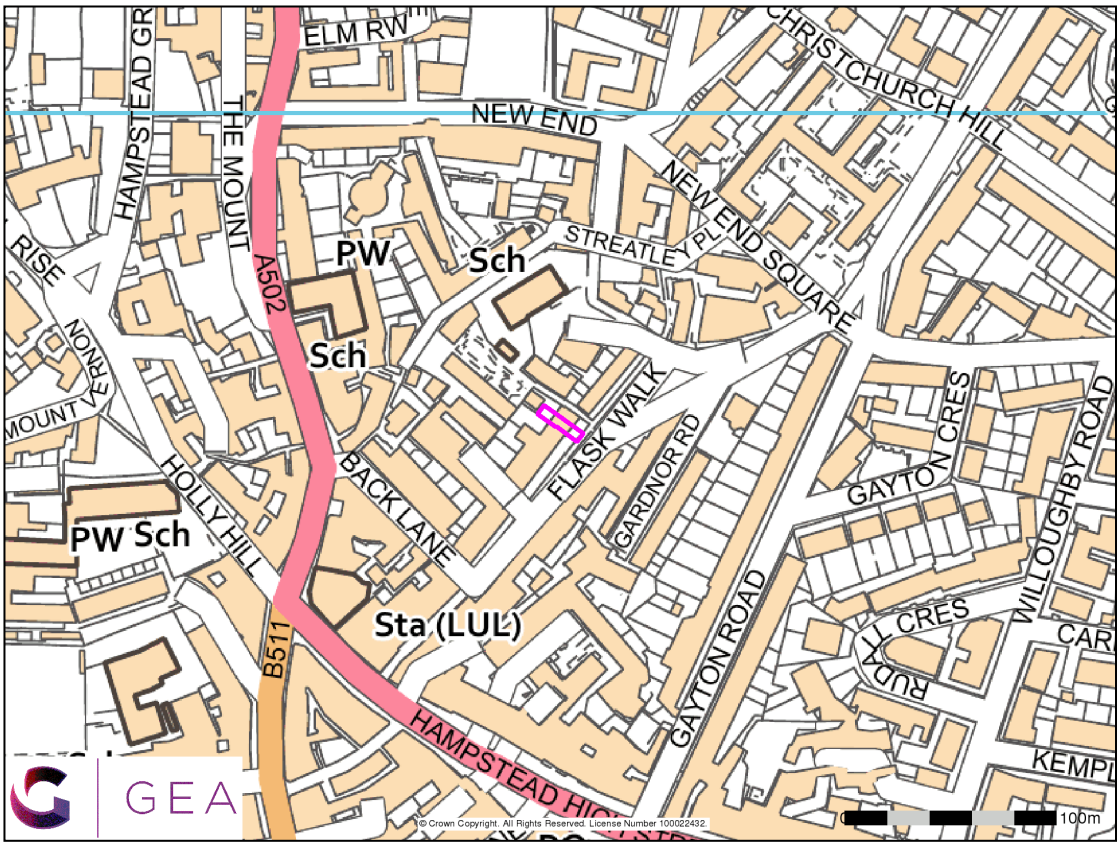
The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted and the number of locations where the ground was sampled. No liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

1 London Borough of Camden Draft Planning Guidance CPG (March 2018) *Basements and lightwells*
2 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

2.0 THE SITE

2.1 Site Description

The site is located in the London Borough of Camden, approximately 140 m northeast of Hampstead London Underground station and 420 m southwest of Hampstead Heath. The site is bounded by Flask Walk to the southeast, adjacent houses and their associated private front and rear gardens to the southwest and northeast, and by No 4 Lutton Terrace to the northwest, which is accessed via the Lutton Terrace footpath from Flask Walk. The site may be additionally located by National Grid Reference 526500, 185850 and is shown on the map extract below.



A walkover of the site was carried out by a geotechnical engineer from GEA on 12 February 2020. The site covers a roughly rectangular area measuring approximately 23 m northwest-southeast by 5.5 m southwest-northeast. It is currently occupied by a three-storey terraced house with a three-storey rear projection/extension, the rearmost part of which is slightly lower in height, and is understood to have been built in the 1950s. Along the southwestern side of the site, at ground floor level, is a flying freehold passageway to the neighbouring No 47 Flask Walk, which extends beneath the first and second floor level of No 49 Flask walk.

At the front of the property is a steep set of steps which leads from the Flask Walk footway up to the front entrance at ground floor level, and a small front garden area at ground floor level, which is supported by a rendered retaining wall where it bounds these steps and the Flask Walk footway. A paved patio area is located at the rear of the property, alongside the rear projection/extension at ground floor level, with a short set of steps leading up to the upper part of the rear garden, which extends from the rear wall of the rear extension, up to No 4 Lutton Terrace. This upper part of the rear garden is around 1.20 m higher than ground

floor level, and is predominantly paved, with perimeter planting areas which include small shrubs.

There are no trees on site, but small trees are present outside of the site boundary within the rear garden of the adjoining No 47 Flask Walk, and at the front of the property, mature trees line Flask Walk on the opposite side of the footway.

2.2 Site History

The site history has been researched by reference to internet sources and historical Ordnance Survey (OS) maps obtained from the Envirocheck database.

The earliest map studied, dated 1850, shows Flask Walk in its present-day orientation, although it is unclear if the site had been developed at that time. The next map, published in 1871, shows the site to have been developed, but not in its present-day orientation, with an end of terrace house with a different footprint to the existing No 49 Flask Walk occupying the site. The front wall of this house is shown as in line with the adjoining No 47, not set forward in its current position, and neither the adjoining No 51 Flask Walk or No 4 Lutton Terrace to the rear had been built yet.

The next available map, dated 1879, shows the property in this same configuration, however between this map, and the subsequent map, dated 1895, the property appears to have been demolished, and the site redeveloped into its current layout, with No 49 and No 51 Flask Walk set further forward than the adjoining No 47, and a passageway shown along the boundary between No 47 and No 49 Flask Walk. To the rear of the site, No 4 Lutton Terrace was also build during this time, and the area immediately to the north-east of Lutton Terrace was redeveloped with new terraced houses. The 1895 map also indicates that No 49 Flask Walk had a rear projection / extension, the rear wall of which is shown roughly in line with the rear wall of the adjoining No 47's rear extension. The 1898 Charles Booth poverty map of London indicates the site to have been occupied by a mixed class of resident.

A review of the bomb damage map of the area[3] indicates that no bombs fell on or close to the site during World War II. The 1954 map annotates the building on the site as No 49 Flask Walk and a garage and radiator works are shown to have been present roughly 20 m to the west of the site, with access to the businesses from Flask Way having been made possible through the apparent clearing of two of the terraced houses that fronted onto Flask Walk approximately 35 m to the southwest. This clearing was later annotated as a road named Lakis Close in the 1974 map. The site and surrounding area have since remained largely unchanged, with the exception of the rear extension, which is now smaller in footprint than shown on the 1991 map.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and relevant extracts from the search are appended. Full results of the search can be provided if required.

The Envirocheck report has indicated no historical landfill, waste transfer or waste management sites within 250 m of the site. The nearest area of potentially infilled land is 344 m to the northeast of the site, and relates to an area which was previously filled with water.

3 Laurence Ward, 2015, *The London County Council Bomb Damage Maps 1939-1945*, Thames & Hudson

No pollution incidents to controlled waters have been recorded within 1 km of the site and there are no fuel stations within 500 m of the site. The nearest Local Authority Pollution Prevention and Control Point is located 176 m to the southwest of the site, and relates to a dry cleaning service.

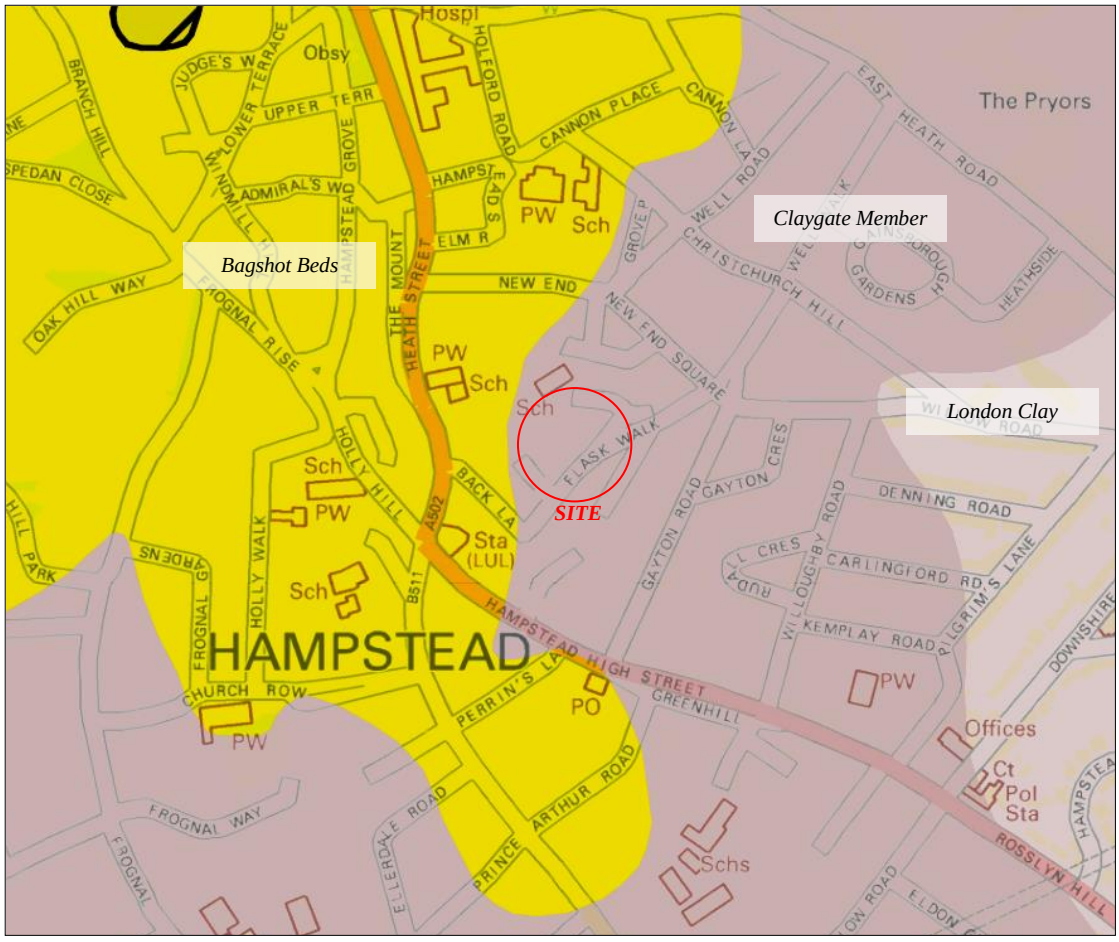
The site is not within an area shown by the Environment Agency to be at risk from flooding from rivers or the sea and does not lie within any known areas of sensitive land use.

There are three contemporary trade directory entries within 100 m of the site and these include two domestic cleaning services and a leather garments and products company, all of which are located to the west or southwest of the site.

Reference to records compiled by the Health Protection Agency (formerly the National Radiological Protection Board) indicates that the site falls within an area where less than 1% of homes are affected by radon emissions and therefore radon protective measures will not be necessary.

2.4 Geology

The British Geological Survey (BGS) map (Sheet 256) of the area indicates that the site is underlain by the Claygate Member overlying the London Clay Formation.



GEA has previously completed a basement impact assessment at No 45 Flask Walk, which has obtained planning consent, with associated documents available on the Camden planning portal. As part of that work, a ground investigation was carried out at in December 2015, by

Ashdown Site Investigations, and comprised a series of four shallow boreholes, advanced by means of window sampling equipment in the front and rear gardens, to depths of between 2.0 m and 5.0˚m, and eight hand dug trial pits. The investigation generally confirmed the expected ground conditions in that, below a moderate to significant thickness of made ground, the Claygate Member was encountered to the full depth of the investigation, of 5.00 m.

The made ground was described as comprising dark brown slightly sandy gravelly clay with fine to coarse brick fragments and extended to depths of 0.60 m and 1.70 m. The Claygate Member generally comprised stiff orange-brown grey mottled slightly gravelly clay and very silty sandy clay with gravel of siltstone to the maximum depth investigated, of 5.00 m. In a borehole in the front garden, the Claygate Member became orange-brown clayey fine sand becoming fine and medium sand and very sandy clay, to the full depth of the borehole, of 5.00 m.

A borehole drilled by the BGS on Hampstead Lane, generally referred to as the Hampstead Heath borehole, to a depth of 66.74 m (61.97 m OD), about 1.0 km to the northeast of the site at National Grid Reference 526455, 186890, found the Bagshot Formation to extend to a level of 109.71 m OD and penetrated the full thickness of the Claygate Member. This borehole found the Claygate Member to extend to a level of 93.71 m OD and in the lower 5 m to 10 m of the Claygate Member, which is where the site is located geologically, it encountered yellowish brown silt interbedded with occasional sand and clay with varying quantities of silt, sand and clay. A band of limestone was encountered between 97.06 m OD and 96.76 m OD.

The geology in this area is generally horizontally bedded such that the boundary between the geological formations roughly follows the ground surface contour lines. The boundary between the Claygate Member and the overlying Bagshot Formation is present roughly 50 m to the west of the site, at a level of between approximately 105 m OD and 110 m OD, approximately 5 m to 10 m above the level of the area of investigation. The boundary between the Claygate Member and London Clay is located roughly 260 m to the east of the site, at levels of between approximately 95 m OD to 85 m OD, around 5 m to 15 m below the level of the site.

According to the British Geological Society memoir, the Claygate Member comprises alternating beds of clayey silt, very silty clay, sandy silt and glauconitic silty fine sand. The lower part of the Claygate Member is generally more bioturbated. A bed of calcareous concretions is present near the base in many places.

2.5 Hydrology and Hydrogeology

The Claygate Member is classified as a Secondary ‘A’ Aquifer, which refers to 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. The underlying London Clay is classified as an Unproductive Stratum, which refers to rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Groundwater was not encountered during the fieldwork carried out at No 45 Flask Walk and a groundwater data logger was installed in one of the boreholes on 13 January 2016 and monitored until 25 January 2016. During this time, the borehole was found to remain dry with the exception of readings for four days during the monitoring period in January, where the groundwater was measured at depths of between 4.60 m and 4.75 m. According to the report, the monitoring was carried out during a particularly wet period. Groundwater was noted in one of the trial pits, but probably represented perched water trapped around the foundations.

The nearest surface water feature to the site is located 464 m to the northwest and appears to be the Whitestone Pond in the southwest of Hampstead Heath. The site is not within an area at risk from flooding as defined by the EA or in an area at risk of flooding from surface water, nor is the site within a source protection zone.

Historically[4] tributaries of three of London's "lost" rivers; the Westbourne, the Tyburn and the Fleet originated within approximately 450 m to 500 m of the site. Two tributaries of the Westbourne originated to the west and southwest of the site and flowed in a southwesterly direction away from the site. The Fleet originated close to the Vale of Health in the southwest of Hampstead Heath, and flowed in a southeasterly direction towards Hampstead Heath station and Camden Town beyond. The tributary of the Tyburn was located to the south and flowed away from the site in a southerly direction.

Groundwater may be present within the Claygate Member, and other investigations carried out around the area of Hampstead Heath indicate that spring lines, reflecting the presence of perched groundwater, are present at the interface of the Bagshot Beds and the Claygate Member, and at a lower level at the boundary between the Claygate Member and the underlying essentially impermeable London Clay.

Groundwater within the silty sandy clays of the Claygate Member is considered to be dominated by fissure flow. The absence of any significant sand bed horizons reduces the water-bearing potential of the Claygate Member to that similar to the underlying London Clay. Due to the very low permeability of the London Clay, any groundwater flow will be at very low rates. Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1 x 10^{-}10 m/s and 1 x 10^{-}8 m/s, with an even lower vertical permeability. However, the Claygate Member is sandier in composition and permeability could be expected to be higher.

The site lies outside the catchment of the Hampstead Heath chain of ponds. If continuous saturated sand layers are present within the Claygate Member beneath the site, the direction of groundwater flow is likely to be controlled by the local topography and therefore in a south and southwesterly direction.

The site is not at risk of flooding from rivers or sea, as defined by the Environment Agency; Flask Walk has not been identified as a street at risk of surface water flooding, specified in the London Borough of Camden (LBC) Planning Guidance CPG and therefore a flood risk assessment will not be required.

The site is largely covered by the existing building and areas of hardstanding and therefore infiltration of rainwater into the ground beneath the site is limited to the areas of soft landscaping in the rear and front gardens. The run-off of groundwater is likely to be high due to the predominantly clay nature of the underlying soils and the majority of surface runoff is likely to drain into combined sewers in the road.

[4] Nicholas Barton and Stephen Myers (2016) *London's Lost Rivers. Revised Edition.* Historical Publications Ltd

3.0 SCREENING

The Camden planning guidance suggests that the development proposal should be screened to determine whether or not a full Basement Impact Assessment (BIA) is required.

3.1 Screening Assessment

A number of screening tools are included in the Arup document and for the purposes of this report reference has been made to Appendix E which includes a series of questions within a screening flowchart for three categories; groundwater flow; land stability; and surface water flow. Responses to the questions are tabulated on the following page.

3.1.1 Subterranean (groundwater) Screening Assessment

Question	Response for 49 Flask Walk
1a. Is the site located directly above an aquifer?	*Yes. The Site is underlain by the Claygate Member of the London Clay Formation which is designated as Secondary Aquifer by the Environment Agency, capable of supplying local water supplies and supporting small watercourses.*
1b. Will the proposed basement extend beneath the water table surface?	No. Groundwater was measured at a shallowest depth of 4.60˚m at No.45 Flask Walk, within a layer of clayey fine to medium sand of the Claygate Member. The proposed development formation level at No.49 would locally extend to a maximum depth of approximately 2.0 m (including an allowance of 0.8 m for the floor structure and finishes) below the existing ground level in the upper part of the rear garden, thus, it will not extend beneath the water surface.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	No. The site is not located within 100 m of a known spring line, and the nearest surface water feature to the site is located 464 m to the northwest and appears to be the Whitestone Pond in the southwest of Hampstead Heath.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Figure 14 of the Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010, confirms that the site is not located within this catchment area.
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No. There will not be an increase in impermeable area across the ground surface as the extension will extend over existing patio areas.
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. As a result of the development there is likely to be a small increase in the volume of surface water captured, although the typically very low permeability of the Claygate Member strata is likely to be unsuitable for receiving discharge to the ground.
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 or spring line?	No. There are no local ponds or spring lines.

The above assessment has identified the following potential issues that need to be assessed:

Q1a. The site is located directly above an aquifer.

The potential issues that need to be assessed, along with the possible effects of the proposed works on the local hydrology and hydrogeology and are discussed further in Section 5 of this report.

3.1.2 Stability Screening Assessment

Question	Response for 49 Flask Walk
1. Does the existing site include slopes, natural or manmade, greater than 7°?	*Yes. The distance from the road level to front elevation of the house is roughly 7.5 m, with an associated drop in level towards the road of around 3.0 m, equating in a slope angle of roughly 22°.*
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No. The site is not to be significantly re-profiled as part of the development.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No. The neighbouring sites to the northeast and southwest are of a similar stepped topography to that of the site. The majority of the step in level owing to a slope angle of 22° occurs within the site boundary.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No. Although there is a notable difference in level across the site, the site is not indicated as being located in an area with a wider hillside setting where the general slope is greater than 7°, according to Figure 16 of the Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010.
5. Is the London Clay the shallowest strata at the site?	No. The Claygate Member is the shallowest stratum at the site.
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. There are no trees at the site.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	*Possibly, the Claygate Member has some potential for shrink-swell.*
8. Is the site within 100 m of a watercourse or potential spring line?	No, the site is located roughly 450 m to 500 m away from any tributary of a historical 'Lost' river. Similarly, the nearest surface water feature to the site is located 464 m to the northwest and appears to be the Whitestone Pond in the southwest of Hampstead Heath.
9. Is the site within an area of previously worked ground?	No.
10a. Is the site within an aquifer?	*Yes. The site is underlain by the Claygate Member of the London Clay Formation which is designated a Secondary Aquifer by the Environment Agency, capable of supporting base flow to watercourses.*
10b. Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No. Groundwater was measured at a shallowest depth of 4.60˚m at No.45 Flask Walk, whereas the proposed formation level at No.49 will only extend to a depth of approximately 2.0 m below the existing level in the upper part of the rear garden, and just 1.0 m below the existing internal ground floor level .
11. Is the site within 50 m of Hampstead Heath ponds?	No.
12. Is the site within 5 m of a highway or pedestrian right of way?	*Yes. The site is adjoined by the raised footpath of Flask Walk at the southeastern boundary, although the area of proposed ground level lowering is at the rear of the property, and is not within 5.0 m.*

Question	Response for 49 Flask Walk
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No. The proposed underpinning to the 49/51 boundary wall is very unlikely to extend beneath the existing 0.90 m deep concrete strip foundations to No.51, thus will not significantly increase the differential depth of foundations in this area. Due to the limited depth of excavation of approximately 1.0 m beneath the existing ground floor level to No 49, the proposed underpinning to No 47 is also unlikely to significantly increase the differential depth of foundations.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No. The nearest London underground tunnel is located at least 100 m to the southwest of the site.

The above assessment has identified the following potential issues that need to be assessed:

Q1. The existing site has a slope that is greater than 7°.
Q7. The site is underlain by the Claygate Member, which has some potential for seasonal shrink-swell subsidence.
Q10a. The Site is underlain by the Claygate Member of the London Clay Formation which is designated a Secondary Aquifer.
Q12. The site is within 5 m of a public footpath and highway.

The potential issues that need to be assessed, along with the possible effects of the basement construction on the local hydrology and hydrogeology and are discussed further in Section 5 of this report.

3.1.3 Surface Flow and Flooding Screening Assessment

Question	Response for 49 Flask Walk
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Figure 14 of Arup report confirms that the site is not located within this catchment area.
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No. There will not be an increase in impermeable area across the ground surface, so the surface water flow regime will be unchanged. A green roof is proposed above part of the new extension which will reduce runoff rates and volumes.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No. There will not be an increase in impermeable area across the ground surface as the extension will extend over existing patio areas.
4. Will the proposed basement development result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	No. There will not be an increase in impermeable area across the ground surface, so the surface water flow regime will be unchanged. A green roof is proposed above part of the new extension which will reduce runoff rates and volumes.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No. The proposals are very unlikely to result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses as the surface water drainage regime will be unchanged and the land uses will remain the same.
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 nearby surface water feature?	No. The findings of this BIA together with the Camden Flood Risk Management Strategy dated 2013 and Figures 3iii, 4e, 5a and 5b of the SFRA dated 2014, in addition to the Environment Agency online flood maps show that the site has a very low flooding risk from surface water, sewers, and reservoirs (and other artificial sources), and fluvial/tidal watercourses.

The above assessment has not identified any potential issues in relation to surface flow and flooding that need to be assessed further.

4.0 SCOPING

The purpose of scoping is to assess in more detail the factors to be investigated in the impact assessment. Potential impacts are assessed for each of the identified potential impact factors.

4.1 Potential Impacts

The following potential impacts have been identified by the screening process.

Potential Impact	Consequence
The site is located above a Secondary 'A' Aquifer	This may affect the groundwater flow regime
The existing site has a slope that is greater than 7°	The construction of the proposed basement may lead to instability of the slope
The site is underlain by the Claygate Member, which has some potential for seasonal shrink-swell subsidence.	If a new basement is not dug to below the depth likely to be affected by tree roots this could lead to damaging differential movement between the subject site and adjoining properties, however new trees do not form part of the proposed development.
The site is within 5 m of a highway or pedestrian right of way.	Excavation of a basement may result in structural damage to the road or footway.

5.0 BASEMENT IMPACT ASSESMENT

The screening and scoping identified a number of potential impacts. The desk study information has been used below to review the potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation

The site is located above a Secondary 'A' Aquifer

The Claygate Member beneath the site is classified by the environment agency as a Secondary 'A' Aquifer. Based on the results of nearby ground investigations, it is likely to comprise predominantly silty sandy clay with some clayey sand. Providing there is an absence of persistent / laterally continuous sand layers beneath the site, the Claygate Member would be expected to exhibit the hydraulic characteristics of Non Productive strata, similar to the London Clay.

The existing site has a slope that is greater than 7°.

The distance from the road level to the front elevation of the house is roughly 7.5 m, with an associated drop in level towards the road of around 3.0 m, equating in a slope angle of roughly 22°. The majority of the proposed works are at the rear of the property, thus will not impact this slope at the front of the property.

The proposed new bin store beneath the front garden will involve cutting into a section of this slope. Retaining walls will be required to form the walls of this bin store. Providing the construction work is carried out in accordance with best practice, resulting ground movements

should be within normal tolerable limits, and the proposed structure should not have a significant impact on the overall stability of the slope.

The site is underlain by the Claygate Member, which has some potential for seasonal shrink-swell subsidence

New foundations will need to be designed in accordance with NHBC guidelines to protect from future shrinking and swelling associated with tree removal / growth. .

The site is located within 5 m of a public highway

The majority of the proposed works will be at the rear of the property, thus will be more than 5.0 m away from the adjacent public footway at the front of the site. As a result, the excavations are not considered to pose a risk to the slope at the front of the property, or the adjoining public footway.

Structural movement of the retaining wall along the boundary with the Flask Walk footpath was noted during the site walkover survey. The proposed new bin store at the front of the property will be located directly alongside the Flask Walk footway, however the floor level of this storage area will be at a similar level to the footway, thus excavations below this level are not anticipated. Providing the construction work is carried out in accordance with best practice, the proposed bin store is likely to prove beneficial to the stability of the slope adjoining the Flask Walk footway, since it will involve the replacement of the existing retaining walls.

6.0 RISK ASSESSMENT

A planning application (Ref: 2019/1309/P) has been submitted to the London Borough of Camden for the "*Reconstruction & alteration of existing three storey rear extension. Alterations to rear fenestration. Ground floor rear infill extension and new rear bay window. Mansard roof extension and terrace. New bin store below front garden.*". The finished floor level of the proposed rear extension will be 0.20 m below the existing ground floor level and 1.20 m below the existing level in the rear garden. Beyond the extension, it is proposed to lower the level of the rear garden by 0.50 m. As a result, underpinning will be required beneath both of the adjoining properties.

6.1 Environmental Risks

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. As part of the regime, local authorities are required to carry out inspections of their area to identify sites that may be contaminated.

The determination of contaminated sites is based on a "suitable for use" approach, which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of establishing one or more "pollution linkages"; a pollution linkage requires a source of contamination, a sensitive target or receptor that is at risk from the contamination and a pathway by which the contamination can travel from the source to the target.

6.1.1 Source

The findings of the desk study indicate that the site does not have a potentially contaminative history, as it has never been developed and the surrounding area has only been developed with housing. No landfills have been identified within the vicinity of the site and on this basis, there are no potential sources of soil gas.

6.1.2 Receptor

The site will continue to be used for residential purposes, so will result in the end users representing relatively high sensitivity receptors. As the site is underlain by the Claygate Member of the London Clay, classified as a Secondary A Aquifer, groundwater is also considered to be a highly sensitive receptor. Buried services are likely to come into contact with any contaminants present within the soils through which they pass, and site workers are likely to come into direct contact with any contaminants present in the soil during excavation and construction.

Neighbouring sites, buried concrete and services and construction workers are also considered to be receptors.

6.1.3 Pathway

The footprint of the building will effectively form a barrier between end users and any potential contaminants within the underlying soil. The development proposals include paving over the existing perimeter planting areas within the rear garden, and the addition of new small raised planters. The front garden includes limited areas of soft landscaping, which it is assumed will remain. A viable pathway by which end users could come into contact with potentially contaminated soils could therefore exist in these areas.

The building and hardstanding coverage also prevent infiltration of potentially contaminated surface water into the underlying soil. The majority of surface runoff is therefore likely to drain into combined sewers and into the main road. Where gaps or cracks are present in the hardstanding, such that surface water can infiltrate, the underlying predominantly cohesive soil means that the water will be held in place in localised pockets and will not be able to migrate to adjacent sites.

Migration of potentially contaminated groundwater is likely to only be possible through drain runs at the site and where drain runs are damaged, there is the potential for contaminated groundwater to enter the soil. This is again only likely to form a pocket rather than flow to adjacent sites. The majority of potentially contaminated water or contaminants entering the drains directly is however likely to drain into combined sewers in the main road.

Buried services and concrete will come into direct contact with any contaminants present in the soils through which they pass, and site workers will come into direct contact with any contaminants present in the soils handled during demolition and construction works.

There is thus considered to be low potential for a contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

6.1.4 Preliminary Risk Appraisal

In accordance with the guidelines provided by CIRIA[5], the following table comprises the conceptual site model and summarises possible pollution linkages for the site.

SOURCE	RECEPTOR	PATHWAY	PROBABILITY	CONSEQUENCE
Unknown contaminants resulting from former use of site	End users	Ingestion of contaminated soil, dust or water through skin contact or inhalation	Unlikely	Medium
		Vapours	Unlikely	Medium
	Groundwater	Percolation and leaching of surface/agricultural run-off	Unlikely	Medium
	Adjacent sites	Shallow perched water or drain runs	Unlikely	Mild
	Site workers	Direct contact, inhalation of dust	Low Likelihood	Mild
	Surface water	Mobilisation of soluble contaminants	Unlikely	Mild

This method of risk evaluation involves classification of the magnitude of the potential consequence (severity) and probability (likelihood) of the risk. The method by which these factors are classified is detailed in the Appendix. On the basis of the consequence and probability the site can be attributed a level of risk, ranging from very low to very high and the procedure for making this assessment is shown in the Appendix, together with a description of each level of assessed risk and the actions that may be required to mitigate the risk.

On the basis of the above, it is considered that there is a LOW RISK of there being a significant contaminant linkage at this site which would result in the requirement for any remediation work. This is because the site has not had a potentially contaminative history, and the proposals for the site are such that most of the site will be covered by the building and hardstanding, however, the front and rear gardens are likely to contain limited areas of soft landscaping which will create a viable pathway to end users. The site is underlain by a Secondary A aquifer and as such groundwater is considered to be a highly sensitive receptor.

7.0 CONCLUSIONS

On the basis of the findings of the research carried out there is considered to be a LOW RISK of there being a significant contamination linkage at this site, and it is not anticipated that remedial works will be required.

The BIA has indicated that the reconstruction of the existing three storey rear extension to the property, combined with localised underpinning to the adjoining properties to facilitate lowering the level of the rear garden, and slightly lowering the internal ground floor level, should not have any impact. A limited ground investigation would be prudent prior to commencement, but it is anticipated that it should be possible to make this a condition of planning in view of the small scale of the proposal.

[5] Rudland, DJ, Lancefield, RM and Mayell, PN (2001) *Contaminated land risk assessment. A guide to good practice. CIRIA C552*

APPENDIX

Envirocheck Report

Historical Maps

Risk Assessment Classification

Risk Assessment Description