GROUND INVESTIGATION AND BASEMENT IMPACT ASSESSMENT REPORT

Jack Straws Castle PH
North End Way
London NW3

Client: Albany Homes Developments Limited

Engineer: Richard Tant Associates

J16284

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GEA Geotechnical & Environmental Associates

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	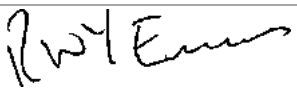		
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This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

CONTENTS

Part 3: GROUND MOVEMENT ASSESSMENT

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 site investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Richard Tant Associates, on behalf of Albany Homes Developments Ltd, with respect to the construction of two three-storey dwellings with single level basement that will extend to a depth of approximately 3.5 m. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground conditions and hydrogeology, to assess the extent of any contamination and to provide information to assist with the design of the basement structure and suitable shallow foundations. The report also includes information required to comply with London Borough of Camden (LBC) Planning Guidance CPG4, relating to the requirement for a Basement Impact Assessment (BIA).

DESK STUDY FINDINGS

The earliest map studied, dated 1850, shows the site to have comprised open fields, whilst North End Road, Spaniards Road and Heath Brow are shown in their existing locations. The next map studied, dated 1879, shows the site to have comprised the grounds associated with Jack Straw's Castle Hotel, the predecessor of the existing building. Directly to the southwest of the site, where the existing public car park is located, a number of buildings are shown to have been present, presumably associated with the hotel and a sand pit was present 200 m to the southwest. The site and surrounding area remained largely unchanged until the 1915 map, although the sand pit to the southwest is not shown on the map dated 1896 and had presumably been backfilled. Sometime before 1954, the majority of the buildings directly to the southwest had been cleared, and a single footprint of a building marked 'ruin' is shown. Internet research has indicated that the buildings had been severely damaged in 1941 by bombing and subsequently cleared. The existing hotel was then rebuilt by 1963. The next map studied, dated 1973, shows the site and surrounding area in their existing condition with the existing car park having been laid. The site has since remained essentially unchanged.

GROUND CONDITIONS

The investigation has generally encountered the expected ground conditions in that, beneath a limited thickness of made ground, the Bagshot Formation was encountered to the full depth of the investigation, of 8.70 m (125.8 m OD). Beneath a 50 mm thickness of tarmac, the made ground comprised a dark brown to brown silty sand with fragments of flint, brick, pottery, concrete, tarmac, glass, plastic and metal and extended to a depth of 1.8 m (132.7 m OD). The Bagshot Formation comprises medium dense orange-brown slightly clayey gravelly fine to coarse grained sand with occasional cobbles of flint. Blow counts recorded during continuous dynamic probing through the base of the borehole suggest that the Bagshot formation extends to at least 8.7 m depth, where the investigation was completed. Groundwater was not encountered during drilling. A single monitoring standpipe was installed to a depth of 6.0 m (128.5 m OD) and has been monitored on a single occasion and found to be dry. The contamination testing has not measured any elevated concentrations above the screening values for a residential end use with plant uptake.

RECOMMENDATIONS

Formation level of the basement will be within the medium dense silty sand of the Bagshot Formation. Groundwater monitoring suggests that groundwater will not be encountered within the basement excavation. Therefore it should be possible to form the southern retaining wall by means of conventional concrete underpinning using a standard 'hit and miss' approach. A contiguous bored pile wall should be appropriate for the remaining retaining walls. Spread foundations, excavated from the basement formation level may be designed to apply a net allowable bearing pressure of 175 kN/m^2 in the medium dense silty sand of the Bagshot Formation.

BASEMENT IMPACT ASSESSMENT

The BIA Screening and Scoping has not indicated any concerns with regard to the effects of the proposed basement on the site and surrounding area. A ground movement analysis and building damage assessment has predicted ground movements resulting in damage category of 0 (Negligible) which is within acceptable limits. It has been concluded that the impacts identified in the Screening and Scoping process can be mitigated by appropriate design and standard construction practice.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2 and an assessment of the ground movements associated with the basement excavation are included in Part 3.

1.0 INTRODUCTION

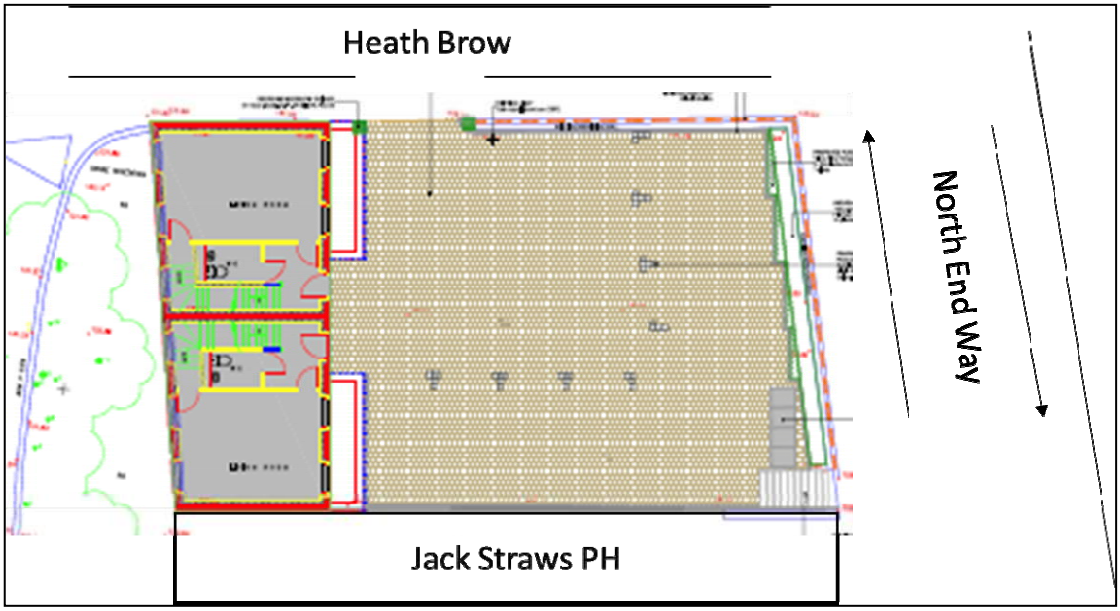
Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Albany Homes Developments Ltd, on the instructions of Richard Tant Associates, to carry out a desk study and ground investigation at Jack Straw's Castle, London, NW3 7ES. This report also forms part of a Basement Impact Assessment (BIA), which has been carried out in accordance with guidelines from the London Borough of Camden (LBC) in support of a planning application.

Following further instructions from the client, the report has been updated to include a ground movement assessment.

1.1 Proposed Development

It is understood that it is proposed to construct two new three-storey dwellings with a single level basement to a depth of approximately 3.5 m. The proposed development is shown on the plan below.

Proposed site plan:



This report is specific to the proposed development and the advice herein should be reviewed if the proposals are amended.

1.2 Purpose of Work

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

- to check the history of the site with respect to previous contaminative uses;
- to provide an assessment of the risk of Unexploded Ordnance (UXO);
- to determine the ground conditions and their engineering properties;
- to provide advice and information with respect to the design of suitable foundations and retaining walls;
- to assess the impact of the proposed basement on the local hydrogeology, hydrology and stability of the surrounding natural and build environment;
- to provide an indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database;
- a review of readily available geology maps;
- a walkover survey of the site carried out in conjunction with the fieldwork;
- commissioning of a preliminary UXO risk assessment from 1st Line Defence;

In light of this desk study an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- a single percussion open-drive sampler borehole advanced to a depth of 6.0 m, with continuous dynamic probe follow on to 8.7 m depth, by means of a terrier rig;
- standard penetration tests (SPTs), carried out at regular intervals in the open-drive borehole to provide quantitative data on the strength of the soils;
- installation of a groundwater monitoring standpipe, to a depth of 6.0 m;
- a single hand excavated trial pit to a maximum depth of 1.4 m;
- supervision and magnetometer surveying by a 1st Line Defence UXO engineer;
- testing of selected soil samples for contamination and geotechnical purposes;
- 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[1] 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.

The exploratory methods adopted in this investigation have been selected on the basis of the constraints of the site including but not limited to access and space limitations, together with any budgetary or timing constraints. Where it has not been possible to reasonably use an EC7 compliant investigation technique a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

1.3.1 Basement Impact Assessment

The work carried out 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 CPG4[2] and their Guidance for Subterranean Development[3] prepared by Arup ('the Arup Report'). The aim of the work is to provide information on surface water, groundwater and land stability 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 *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004
2 London Borough of Camden Planning Guidance CPG4 *Basements and lightwells*
3 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

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, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; 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.

2.0 THE SITE

2.1 Site Description

The site is located in the London Borough of Camden, roughly 700 m north of Hampstead Underground Station and adjacent to the southern side of Hampstead Heath. It is rectangular in shape, measuring approximately 30 m east-west by 15 m north-south. The site is bounded by North End Way to the east and Heath Brow to the north. It is bounded to the south by Jack Straw's Castle, which is a three-storey to four-storey former Grade II Listed public house, which has been converted into a gymnasium and apartment building, and to the west by a raised planting area and gravel surfaced public car park. The site may additionally be located by National Grid Reference 526230, 186460 and is shown on the map extract below.

The site is occupied by a hard surfaced car park, currently used by the residents of Jack Straw's Castle. The car park is relatively level but the surrounding topography falls gently to the west. A small retaining wall bounds the perimeter of the site on its northern and eastern flanks, retaining a height of 1.6 m in the southeastern corner, reducing to 1.1 m on the northeastern corner and reducing further to 0.2 m height in the north at the site entrance. A 2.2 m high retaining wall separates the car park from the raised planting bed bounding the west of the site. These walls are shown as the blue lines in the plan above. Street level is shown on OS maps to be around 134.5 m OD.

During a site walkover carried out in conjunction with the fieldwork, no signs of contamination were observed.

2.2 Site History

The history of the site and surrounding area has been researched by reference to archive historical maps and Ordnance Survey (OS) maps sourced from the Envirocheck database.

The earliest map studied, dated 1850, shows the site to have comprised open fields, whilst North End Road, Spaniards Road and Heath Brow are shown in their existing locations. The next map studied, dated 1879, shows the site to have comprised the grounds associated with Jack Straw's Castle Hotel, the predecessor of the existing building. Directly to the southwest of the site, where the existing public car park is located, a number of buildings are shown to have been present, presumably associated with the hotel. The surrounding area comprised mainly open grass and woodland, with the occasional detached residential house and a sand pit is shown approximately 200 m to the southwest of the site. The site and surrounding area remained largely unchanged until the 1915 map, which shows a detached building in roughly the same footprint as the existing car park. The sand pit to the southwest is not shown on the map dated 1896 and had presumably been backfilled.

The next significant change to the site and surrounding area is recorded on the 1954 map, which shows the majority of the buildings directly to the southwest to have been cleared, and a single footprint of a building marked 'ruin' is shown. Internet research has indicated that the buildings had been severely damaged in 1941 by bombing and subsequently cleared. The existing hotel was then rebuilt by 1963.

The next map studied, dated 1973, shows the site and surrounding area in their existing condition with the existing car park having been laid. The site has since remained essentially unchanged, although in 1991 the former hotel was sold to a property developer and subsequently converted into the existing apartments and gym.

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 search has revealed that there are no landfills, waste management, transfer, treatment or disposal sites within 500 m of the site. There have been no pollution incidents to controlled waters within 250 m of the site.

The search has indicated that the site is located in an area where less than 1% of homes are affected by radon emissions; which is the lowest classification given by the Health Protection Agency (HPA) and therefore no radon protective measures will be necessary.

The Envirocheck report indicates a very low risk of potential landslide instability on site.

The site is not located within a nitrate vulnerable zone or any other sensitive land use.

The results of a search of the London Borough of Camden Planning Portal for planning applications relating to the properties surrounding the site suggest that none of the surrounding properties have basement levels. However, it is known that Heath House, which is opposite the site, has a basement level that extends approximately 3.0 m below the ground level of our site. Drawings supplied by the consulting structural engineer show the basement level of Jack Straw's Castle to be roughly level with the existing car park level.

There are no London Underground or Network Rail Tunnels within 50 m of the site.

2.4 Geology

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

GEA has previously carried out a ground investigation at Heath House, which is located on the opposite side of North End Way; the investigation supplemented an earlier investigation carried out by STATS. It encountered the expected ground conditions in that, beneath a layer of made ground the Bagshot Sands were encountered to the maximum depth investigated of 12.45 m (121.55 m OD). The Bagshot Formation initially comprised very dense brown sand and gravel that extended to depths of 3.10 m (132.40 m OD) and 3.30 m (130.70 m OD) in Borehole Nos 101 and 102, respectively, and may possibly represent soils of the Stanmore Gravel. This horizon is, in turn, underlain by orange-brown or yellowish brown fine and medium sand. Rare flint gravel was noted to depths of 6.00 m (129.50 m OD) and 4.50 m (129.50 m OD). This material was underlain by brown becoming greenish grey mottled orange-brown silty fine sand that was proved to the maximum depth investigated by GEA of 12.45 m (123.05 m OD and 121.55 m OD).

A borehole drilled by the BGS on Hampstead Lane to the north of the site, generally referred to as the 'Hampstead Heath borehole', was advanced to a depth of 66.74 m (61.97 m OD) at National Grid Reference 526455, 186890. The borehole record indicates that the Bagshot Formation extended to a depth of 19.0 m (109.71 m OD) and penetrated the full thickness of the Claygate Member, which was found to extend to a depth of 35.0 m (93.71 m OD).

2.5 Hydrology and Hydrogeology

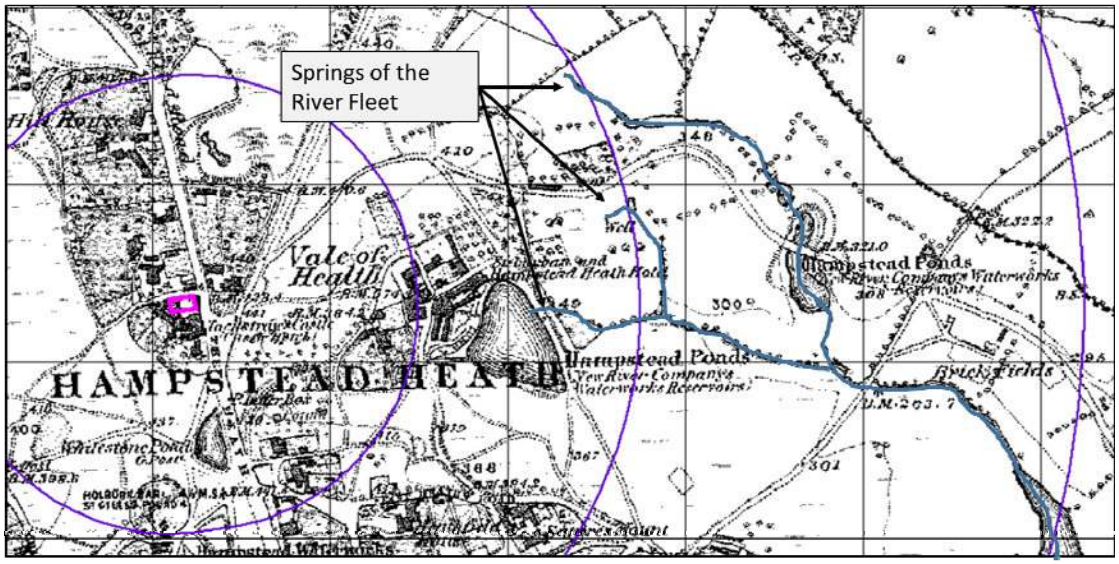
Both the Bagshot Formation and Claygate Member are classified by the Environment Agency (EA) as a Secondary 'A' Aquifer, which refers to permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. In the absence of significant sand horizons the Claygate Member is not capable of storing and transmitting water in usable amounts and receives very low levels of annual recharge due to very low permeability.

The underlying London Clay Formation is classified by the EA as an Unproductive Stratum, referring to rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

There are no EA designated Source Protection Zones (SPZs) on the site. The Envirocheck report indicates that Whitestone Pond, which is the nearest surface water feature, is 122 m south of the site. The site is not located in an area at risk of flooding from rivers or sea and surface water, as defined by the EA.

Reference to the Lost Rivers of London[4] and historical mapping of the area indicates that a number of sources of the River Fleet rose on Hampstead Heath, with three shown approximately 400 m to the east of the site as shown on the 1873 map extract overleaf. The spring lines originated from the Bagshot Sand Formation at a much lower level than site, at around 100 m OD. Today the Fleet is mainly culverted and hidden from view.

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



Groundwater monitoring standpipes were installed in both the STATS and GEA investigations at the Heath House Site. Neither investigation encountered groundwater during drilling but groundwater was subsequently measured at depths of between 9.50 m (124.73 m OD) and 10.68 m (123.55 m OD). However it was concluded that these water levels did not represent a groundwater table. The monitoring standpipes installed by GEA were recorded as dry on three occasions before water was recorded and the standpipe was noted to be blocked and the water column to be 30 mm deep, suggesting some sort of filling of the standpipe.

2.6 Preliminary Risk Assessment

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. 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 a source-pathway-receptor approach.

2.6.1 Source

The desk study research has indicated that the site has only been used as a hotel or small carpark for its entire developed history and is therefore not considered to have had a contaminative history. No sources of soil gas have been identified on site or in the surrounding area. . It is possible that small-scale fuel and oil spillages from vehicles may have occurred, although there was no evidence to suggest this on site.

2.6.2 Receptor

The proposed residential redevelopment will result in future end users representing relatively high sensitivity receptors and as the site is underlain by a Secondary 'A' Aquifer, adjacent sites are considered to be a moderately sensitive receptors. Shallow groundwater is also considered to be a moderately sensitive receptor, while the chalk aquifer at depth is considered to be a particularly 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 contact with any contaminants present in the soils during construction works.

2.6.3 Pathway

The permeable Bagshot Formation could allow the migration of contaminated groundwater through the shallow soils to surrounding sites, although the impermeable layers in the Claygate Member and impermeable London Clay create a barrier to the major Chalk aquifer. End users will be isolated from direct contact with any contaminants present within the made ground by the presence of the hardstanding and building. Buried services may be exposed to any contaminants present within the soil through direct contact and site workers will come into contact with the soils during construction works. There is thus considered to be a low potential for a contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

2.6.4 Preliminary Risk Appraisal

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 a requirement for major remediation work. The historical map dated 1879 shows the presence of a sand pit located around 200 m to the southwest of the site, which was infilled by 1896. Although the infill material of the pit is unknown, given that it was infilled by 1896, it is considered that any biodegradable material within the fill would have decomposed. CIRIA 152[5] suggests that if a water content of dry or standard is assumed and a slow to medium biodegradability of say, 20, the % total generatable volume remaining within the soil will be low. On this basis and considering the apparent age of the pit, it is deemed unlikely that any organic material is still present within any fill materials that is still capable of breaking down and producing hazardous gas. The former sand pit is therefore not considered to be a source of hazardous soil gas.

2.7 UXO Risk Assessment

The appended UXO report, produced by 1st Line Defence, cited multiple records revealing that at least a single bomb fell immediately adjacent to the site during WWII and the site received severe damage. Due to the extent of the damage and the fact that these areas were rarely visited after sustaining severe damage, the chance that a UXO could have fallen unnoticed and unrecorded could not be discounted. It was therefore concluded that a detailed UXO risk assessment should be carried out in due course, but in light of the restricted timescale leading up to site work, on-site supervision and magnetometer surveying was commissioned.

3.0 SCREENING

The LBC guidance suggests that any development proposal that includes a basement should be screened to determine whether or not a full 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 Appendices E1, E2 and E3 which include a series of questions within screening flowcharts for surface flow and flooding, subterranean (groundwater) flow and land stability. The flowchart questions and responses to these questions are tabulated below.

5 CIRIA 152 (1995) *Risk Assessment for methane and other gases from the ground* Construction Industry Research and Information Association

3.1.1 Subterranean (groundwater) Screening Assessment

Question	Response for Jack Straw's Castle
1a. Is the site located directly above an aquifer?	*Yes. The site is underlain by the Bagshot Formation sands which are designated a Secondary Aquifer by the Environment Agency, capable of supporting flow to watercourses and private abstractions. Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 4 and 8 of the Arup report confirm this.*
1b. Will the proposed basement extend beneath the water table surface?	Unlikely. The proposed basement will extend to a depth of 3.5 m below ground level. Given the site's elevation on the top of the Heath, groundwater is likely to percolate down through the Bagshot Sands and rest at the top of the relatively impermeable Claygate Member. Also, nearby site investigations suggest the groundwater table to be at least 12.45 m below ground level.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	No. Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report confirm this.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	*Yes. The proposed basement development is within the Hampstead pond chain catchment as shown on Figure 14 of the Arup report.*
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No. The existing car park area is completely hardstanding.
5. As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No. The details of the proposed development do not indicate the use of soakaway drainage. Plans also confirm that the proportion of hardstanding will not increase and therefore surface water runoff rate should be unchanged.
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. Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report confirm this.

The above assessment has not identified any potential issues that need to be further assessed:

Q1 The site is underlain by the Bagshot Formation which is classified a Secondary 'A' Aquifer.
Q3 The site lies within the catchment of Hampstead chain catchment.

3.1.2 Stability Screening Assessment

Question	Response for Jack Straw's Castle
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No. Fig 16 of the Arup report does not show the site to be in an area with slopes greater than 7°.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No, not according to proposed drawings supplied by the consulting engineer.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No. Not according to Figure 16 of the Arup report.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	*No the site is not within a hillside setting with a general slope less than 7° according to Figure 16 of the Arup report.*
5. Is the London Clay the shallowest strata at the site?	No. Not according to Figure 2 of the Arup report or the BGS map of the area.
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. Not according to plans supplied by the consulting engineer.

Question	Response for Jack Straw's Castle
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	No. The Bagshot Sands are predominantly granular and are not capable of shrink swell. Also, information derived from the Envirocheck report indicates the site is not in an area susceptible to ground shrink swell stability hazards.
8. Is the site within 100 m of a watercourse or potential spring line?	No. Not according to Figure 12 of the Arup report, extracts from the Envirocheck report and Ordnance Survey maps.
9. Is the site within an area of previously worked ground?	No. Not according to Figure 3 of the Arup report.
10. Is the site within an aquifer?	*Yes. The site is underlain by the Bagshot Formation which is classified as a Secondary 'A' Aquifer by the Environment Agency (EA).*
11. Is the site within 50 m of Hampstead Heath ponds?	No. Not according to Figure 14 of the Arup Report.
12. Is the site within 5 m of a highway or pedestrian right of way?	*Yes. The site boundary is within 5 m of a North End Road and Heath Brow.*
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	*Possibly. According to the Camden Planning Portal, neighbouring properties do not have basement levels. However, it is known that Heath House nearby does have a 3.0 m deep basement. Furthermore, drawings and sections of Jack Straw's Castle show a basement level roughly level with the existing car park, with foundations appearing to be bearing around 1.0 m below car park level. Therefore, and with no confirmed founding levels, it has been assumed the proposed scheme will deepen foundations relative to neighbouring properties.*
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No. Not according to Figure 18 of the Arup report.

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

Q10 The site is underlain by a Secondary 'A' Aquifer, as defined by the EA.
Q12 The site boundary is within 5 m of a highway or pedestrian right of way.
Q13 The proposed development will extend foundations deeper relative to neighbouring properties.

3.1.3 Surface Flow and Flooding Screening Assessment

Question	Response for Jack Straw's Castle
1. Is the site within the catchment of the pond chains on Hampstead Heath?	*Yes. The proposed basement development is within the Hampstead pond chain catchment as shown on Figure 14 of the Arup report.*
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 above the basement, so the surface water flow regime will be unchanged. The basement will be beneath the area of the existing hardstanding, therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report and para 2.16 of the CPG4 does not apply.
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 above the basement.
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 above the basement, so the surface water flow regime will be unchanged. The basement will be beneath the area of the existing hardstanding, therefore the 1m distance between the roof of the basement and ground surface as recommended by the Arup report and para 2.16 of the CPG4 does not apply across these areas.

Question	Response for Jack Straw's Castle
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No. The proposed basement is 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 similar.
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, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses. In accordance with paragraph 5.11 of the CPG a positive pumped device will be installed in the basement in order to further protect the site from sewer flooding. The site is located within the Critical Drainage Area Group3_010, but not in a Local Flood Risk Zone as identified in the Camden SWMP and Updated SFRA Figure 6/Rev 2.

Q1 The site lies within the catchment of Hampstead chain catchment.

The above assessment has identified no potential issues that need to be assessed.

4.0 SCOPING AND SITE INVESTIGATION

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 underlain by a Secondary 'A' Aquifer, as defined by the EA	Groundwater present within the aquifer may enter the proposed excavation and cause structural instability and damage. There is potential for the contamination of groundwater. There is also potential for the proposed basement to impact on groundwater flow beneath the site.
The site is within 50 m of the Hampstead Chain Catchment	Groundwater ingress my cause instability of proposed development. The development may create a cut off and hinder groundwater flow toward the pond.
The proposed basement will significantly increase differential depth of foundations to neighbouring properties	Ground movements associated with significantly changing the differential depth of foundations to neighbouring properties could result in structural damage.
The site is within 5 m of a highway or pedestrian right of way	Ground movements generated by the construction of the proposed development may cause instability and structural damage to the nearby roads, pathways and underground services.

These potential impacts have been investigated through the site investigation, as detailed in Section 10.0.

4.2 Exploratory Work

In order to meet the objectives described in Section 1.2, a single open-drive sampler borehole was advanced to a depth of 6.0 m, with continuous dynamic probing to 8.7 m depth, by means of a Terrier rig. Standard Penetration Tests were carried out in the borehole at regular intervals and disturbed samples were recovered for subsequent laboratory examination and testing.

A single groundwater monitoring standpipe was installed to 6.0 m depth and has been monitored once to date.

A single trial pit was excavated to 1.4 m depth in order to determine the configuration of foundations on the northern elevation of Jack Straw's Castle.

A selection of the disturbed samples recovered from the boreholes was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

All of the work was carried out under the supervision of a geotechnical engineer from GEA. The borehole records are appended, together with the results of the laboratory testing and a site plan indicating the borehole locations.

4.3 Sampling Strategy

The boreholes and trial pits were positioned on site by an engineer from GEA in accessible areas, with due regard to the proposed development and the locations of known buried services.

Two samples of the shallow soil and were subjected to analysis for a range of common industrial contaminants and contamination indicative parameters. For this investigation the analytical suite for the soil and water included a range of metals, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols.

During drilling and excavation of the trial pit, a photo ionisation detector (PID) was used to detect if volatile organic compounds (VOCs) were present in addition to some headspace testing on samples of the made ground.

The soil samples were selected to provide a general view of the chemical conditions of the soils that are likely to be involved in a human exposure or groundwater pathway and to provide advice in respect of re-use or for waste disposal classification. The contamination analyses were carried out at a MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards.

A number of the disturbed samples of natural soil were submitted to a geotechnical testing laboratory and were subject to a number of material property tests, including four point Atterberg Limit, moisture content tests and particle size distribution tests (PSD).

5.0 GROUND CONDITIONS

The investigation has confirmed the expected ground conditions in that, below a limited thickness of made ground, the Bagshot Formation was encountered to the full depth of the investigation.

5.1 Made Ground

Beneath a 50 mm thickness of tarmac, the made ground comprised a dark brown to brown silty sand with fragments of flint, brick, pottery, concrete, tarmac, glass, plastic and metal that extended to 1.8 m depth. In Borehole No 1 a slight hydrocarbon odour was noted on a parting of black staining at 0.5 m depth, although PID monitoring did not record any vapours.

No evidence of significant contamination was identified during the fieldwork. As a precaution a total of two samples of the made ground were tested for the presence of contamination and the results are presented in Section 6.5.

5.2 Bagshot Formation

The Bagshot Formation comprised medium dense orange-brown slightly clayey gravelly fine to coarse grained sand with occasional cobbles of flint. Blow counts recorded during continuous dynamic probing through the base of the borehole suggests the Bagshot Formation extends to at least 8.7 m depth (125.8 m OD), where the investigation was terminated.

No evidence of contamination was noted in these soils.

5.3 Groundwater

Groundwater was not encountered during drilling and a monitoring standpipe was installed to 6.0 m depth. The standpipe has been monitored on a single occasion and was found to be dry.

5.4 Soil Contamination

The table below sets out the values measured within two samples of made ground; all concentrations are in mg/kg unless otherwise stated.

Determinant	BH1 – 0.3 m	BH1 – 1.00 m
pH	8.2	7.2
Arsenic	11	9.3
Cadmium	<0.2	<0.2
Chromium	14	9.9
Copper	22	37
Mercury	0.4	0.6
Nickel	5.8	5.9
Lead	100	140
Selenium	<1.0	<1.0
Zinc	38	37

Determinant	BH1 – 0.3 m	BH1 – 1.00 m
Total Cyanide	<1	<1
Total Phenols	<1.0	<1.0
Sulphide	18	<1.0
Total TPH	270	51
Naphthalene	1.5	<0.05
Benzo(a)pyrene	1.7	0.59
Total PAH	26.3	4.34
Total organic carbon %	0.6	1.2

The contamination testing has indicated no elevated concentrations contaminants within the samples of made ground tested and the significance of which is discussed further in Part 2.

5.4.1 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[6] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Version 1.06 software assuming a residential without plant uptake end use. The key generic assumptions for this end use are as follows:

- that groundwater is not a critical risk receptor;
- that the critical receptor for human health is a young female child (aged zero to six years old);
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include;

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;

6 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.

- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

The results are discussed in detail in Section 2 of this report.

5.5 Existing Foundations

The findings of the trial pit are summarised in the table below. Sketches and photographs of each pit are included in the Appendix.

Trial Pit No	Structure	Foundation detail	Bearing Stratum
1	Northern perimeter wall of Jack Straw's Castle	Concrete footing Top: 900 mm Base: 1300 mm Lateral projection 200 mm	Orange-brown yellowish silty fine grained sand (Bagshot Formation)

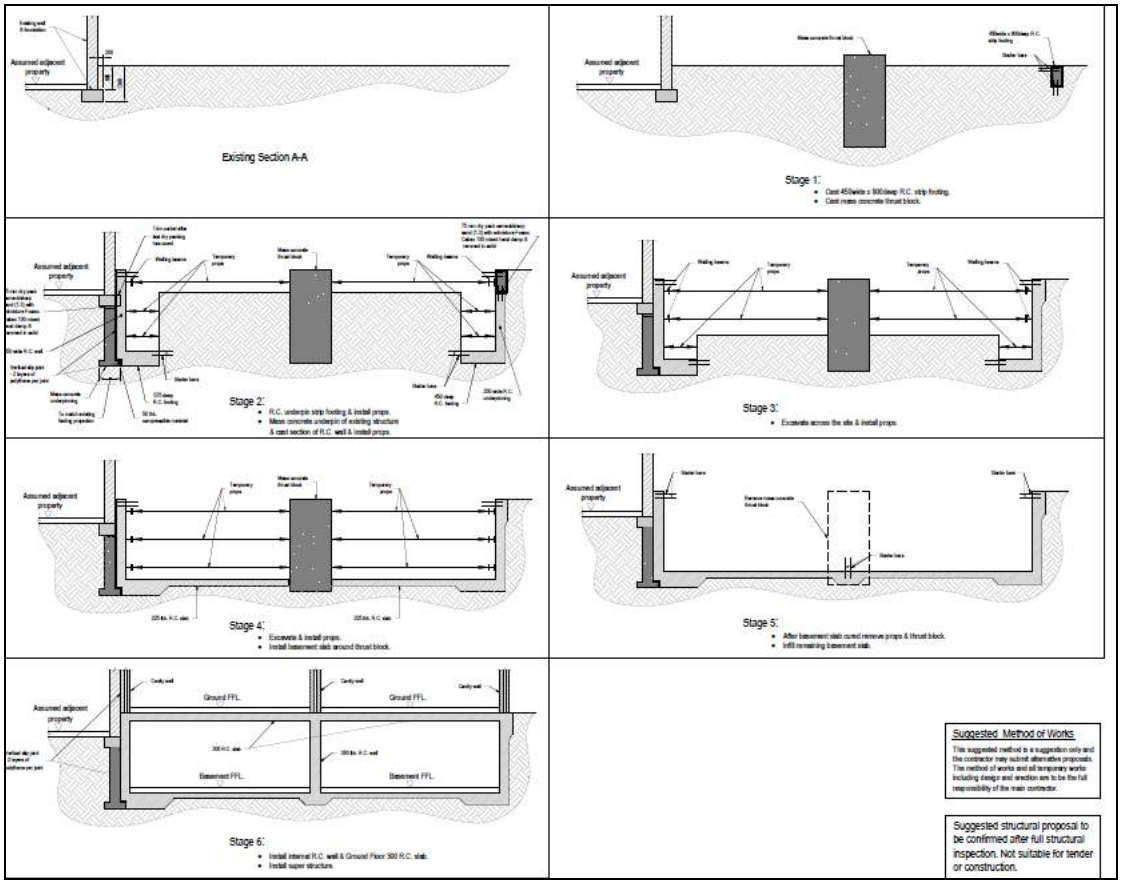
Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to foundation options and contamination issues.

6.0 INTRODUCTION

It is understood that it is proposed to construct two three-storey dwellings with a single level basement, approximately 3.5 m deep.

It is understood that the new structure will be supported on a combination of new underpins and strip footings as shown on the preliminary construction plan below. Line loading onto the strip footings and underpins is thought to be around 175 kN/m run.



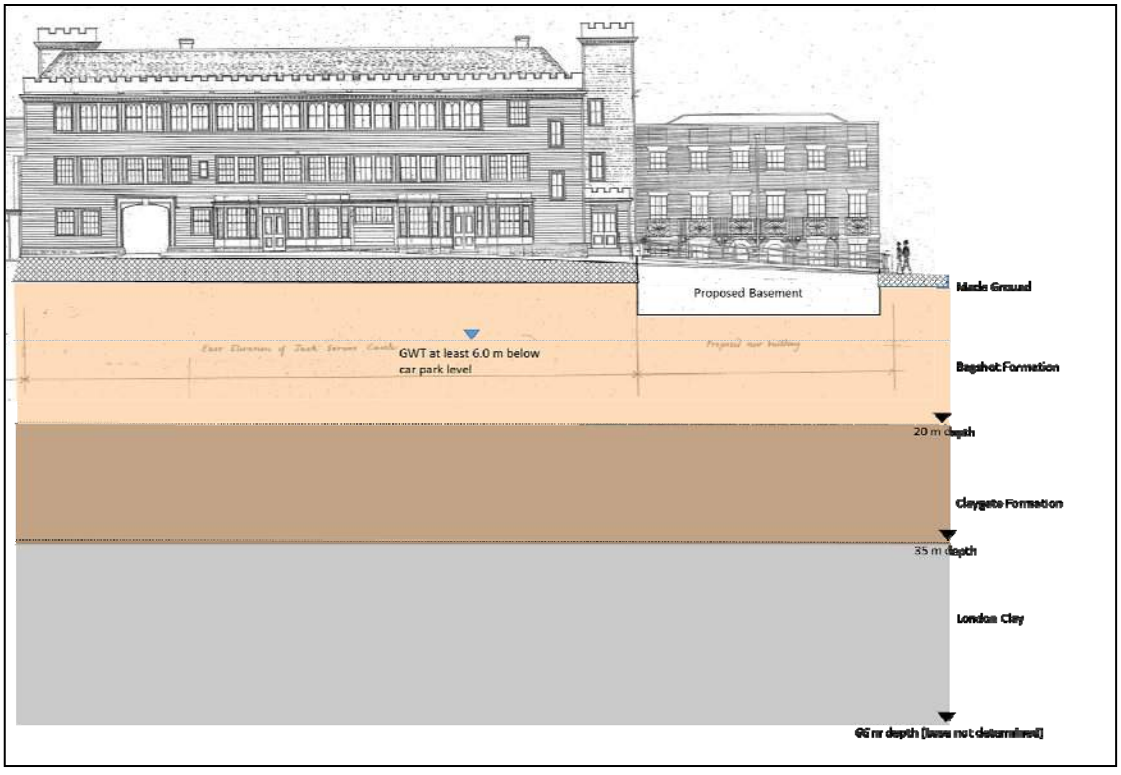
7.0 GROUND MODEL

The desk study research has indicated that the site does not have a potentially contaminative history, having been used as a hotel or car park for its entire developed history. On the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- below a limited thickness of made ground, the Bagshot Formation is present and was proved to the maximum depth investigated of 8.7 m;
- the made ground comprises a dark brown to brown silty sand with variable amounts of extraneous material and extends to 1.8 m depth;
- a slight hydrocarbon odour was noted in Borehole No 1 at 0.5 m depth but PID sampling did not record any hydrocarbon vapours;
- the Bagshot Formation comprises slightly clayey gravely fine to coarse grained sand with occasional cobbles of flint. Blow counts recorded through the base of the 6.0 m deep borehole suggest the Bagshot Formation to extend to at least 8.7 m depth.
- groundwater was not encountered during drilling and the standpipe installed in Borehole No 1 has been monitored as dry on a single occasion; and
- the contamination testing has measured no elevated concentrations of contaminants within the samples of the made ground tested.

7.1 Conceptual site model

Using the information gathered at desk study phase and by the investigation the following conceptual site model of the proposed development has been derived.



8.0 ADVICE AND RECOMMENDATIONS

The new basement is proposed to extend to a depth of approximately 3.5 m. Formation level for the proposed basement will therefore be within the medium dense slightly clayey slightly gravelly fine to coarse grained sand of the Bagshot Formation. On the basis of the field work and a subsequent monitoring visit, groundwater is unlikely to be encountered within the basement excavation.

The proposed basement will extend to a significant depth relative to the existing foundations of the neighbouring property and it is understood that the loads from the boundary walls will be supported by the new retaining walls.

8.1 Basement Excavation

8.1.1 Basement Construction

The previous GEA investigation carried out on the Heath House site opposite Jack Straws Castle did not encounter a groundwater table to a depth of 12.45 m (121.55 m OD. The groundwater table is probably close to the boundary with the underlying Claygate Beds, which according to the BGS Hampstead Heath Borehole is at approximately 109.71 m OD. The investigation has indicated that groundwater should not be encountered in the basement excavation, although this should be confirmed by continued groundwater monitoring.

There are a number of methods by which the sides of the basement excavation could be supported in the temporary and permanent conditions. The choice of wall will be governed, to a large extent, by whether it is to be incorporated into the permanent works and have a load bearing function and also by the limited available access. The final choice will depend on a number of factors, including the need to protect nearby structures from movements, the required overall stiffness of the support system and the potential need to control groundwater movement through the wall in the temporary condition. In this respect the stability of the adjacent buildings will be paramount.

On this site it is likely that the southern retaining wall will be able to be formed by means of conventional concrete underpinning using a standard 'hit and miss' approach. Careful workmanship will be required to ensure that movement of the surrounding structures does not arise. The contractor should, however, be required to provide details of how they intend to control groundwater and instability of excavations, should it arise.

In areas where underpins cannot be adopted and on the basis of the monitoring to date, the use of contiguous bored pile walls is feasible. A contiguous bored piled wall would have the disadvantage of reducing usable space in the basement, and in this respect the secant or sheet piled walls may be preferable as it would overcome the requirement for any secondary groundwater protection in the permanent works and maximise the basement area.

The ground movements associated with the basement excavation will depend on the method of excavation and support and the overall stiffness of the basement structure in the temporary condition. Thus, a suitable amount of propping will be required to provide the necessary rigidity. In this respect the timing of the provision of support to the wall will have an important effect on movements. The stability of the adjacent foundations will need to be ensured at all times and the existing foundations will need to be underpinned prior to construction of the proposed new basement or will need to be supported by new retaining walls. A Ground Movement Analysis will be required in accordance to the requirements of CPG4.

8.1.2 Retaining Walls

The following parameters are suggested for the design of the permanent basement retaining walls.

Stratum	Bulk Density (kg/m^3)	Effective Cohesion (c' – kN/m^2)	Effective Friction Angle (Φ' – degrees)
Made Ground	1700	Zero	20
Bagshot Formation (Sands)	1900	Zero	34

At this stage, it is recommended that for the design of the retaining walls, groundwater level can be assumed to be below the depth of the basement, as indicated by the investigation carried out to date. The advice in BS8102:2009[7] should be followed in the design of the basement retaining walls and with regard to waterproofing requirements.

8.1.3 Basement Heave

The 3.5 m deep basement excavation will result in a net unloading of up to approximately 65 kN/m². The proposed excavations will result in a limited amount of elastic heave and long term swelling of the cohesive content within the Bagshot Formation, although this is expected to be minimal. The effects of the longer term swelling movement will to a certain extent be counteracted by the applied loads from the development and will in any case be expected to be minimal on the basis of the granular nature of the Baghsot Formation.

8.2 Spread Foundations

It should be possible to adopt spread foundations on the basis of the anticipated light loading. Given the basement excavation of 3.5 m all new foundations should bypass any potentially desiccated soils and there should not be a need for further deepening to take account for the presence of possible tree root effects.

Spread foundations, including underpinned foundations, bearing beneath basement formation level in the medium dense slightly clayey slightly gravelly sand of the Bagshot Formation may be designed to apply a net allowable bearing pressure of 175 kN/m².

The requirement for compressible material alongside foundations should be determined by reference to the NHBC guidelines.

If the proposed loads are too high or the required founding depths become uneconomic piled foundations would provide a suitable alternative foundation option. A deep borehole will be required in order to determine soil parameters for a pile design.

8.3 Basement Floor Slabs

Following the excavation of the single level basement and on the basis the Bagshot Formation is largely granular in composition, the Baghsot Formation should be suitable for the adoption of ground bearing floor slab. It is recommended that a proof rolling exercise be conducted at formation level and any soft spots replaced with suitably compacted granular fill. This should be reviewed once the levels and loads are known.

8.4 Shallow Excavations

On the basis of the borehole findings it is considered that shallow excavations for foundations and services that extend through the made ground should remain generally stable in the short

7 BS8102 (2009) *Code of practice for protection of below ground structures against water from the ground*

term, although some instability may occur. Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides considered in order to comply with normal safety requirements.

Significant inflows of groundwater into shallow excavations are not generally anticipated, although seepages may be encountered from localised perched water tables within the made ground or from within more silty and sandy horizons from within the Bagshot Formation, although such inflows should be suitably controlled by sump pumping.

If deeper excavations are considered it is recommended that provision be made for lateral support or battering of the excavation sides be considered in order to comply with normal safety requirements.

8.5 Effect of Sulphates

Chemical analyses of selected samples of the Made Ground and Bagshot Formation have revealed low concentrations of soluble sulphate but high alkaline content, corresponding to Class DS-1 and ACEC AC-1 of Table C2 of BRE Special Digest 1 Part C (2005), assuming a mobile groundwater condition.

The guidelines contained in the above digest should be followed in the design of foundation concrete.

8.6 Site Specific Risk Assessment

The desk study did not indicate that the site has a contaminative history and contamination testing has not measured any elevated concentrations of contaminants within the samples of the made ground tested and thus no further remediation work is considered to be necessary.

8.6.1 Protection of Site Workers

A programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE[8] and CIRIA[9] and the requirements of the Local Authority Environmental Health Officer.

A watching brief should be maintained during the site works and if any suspicious soil is encountered, it should be inspected by a suitably qualified engineer and further testing carried out if required.

8.6.2 Protection of Buried Services

It is unlikely that services are at risk from the contamination noted in the made ground, however, details of any proposed protection measures for buried plastic services will in any case need to be approved by the EHO and the relevant service authority prior to the adoption of any scheme.

8.7 Waste Disposal

Under the European Waste Directive, waste is classified as being either Hazardous or Non-Hazardous and landfills receiving waste are classified as accepting hazardous or non-hazardous wastes or the non-hazardous sub-category of inert waste in accordance with the Waste Directive. Waste classification is a staged process and this investigation represents the

8 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO

9 CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association

preliminary sampling exercise of that process. Once the extent and location of the waste that is to be removed has been defined, further sampling and testing may be necessary. The results from this ground investigation should be used to help define the sampling plan for such further testing, which could include WAC leaching tests where the totals analysis indicates the soil to be a hazardous waste or inert waste from a contaminated site. It should however be noted that the Environment Agency guidance WM3[10] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[11] guidance, will need to be disposed of to a licensed tip. Waste going to landfill is subject to landfill tax at either the standard rate of £86.10 per tonne (about £150 per m^3) or at the lower rate of £2.70 per tonne (roughly £5 per m^3). However, the classifications for tax purposes and disposal purposes differ and currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring soil and stones, which are accurately described as such in terms of the 2011 Order, would qualify for the 'lower rate' of landfill tax.

Based upon on the technical guidance provided by the Environment Agency it is considered likely that the soils encountered during this ground investigation, as represented by the four chemical analyses carried out, would be generally classified as follows;

Soil Type	Waste Classification (Waste Code)	WAC Testing Required Prior to Landfill Disposal?	Comments
Made Ground	Non - hazardous (17 05 04)	No	-
Natural Soils	Inert (17 05 04)	No	Requires confirmation from receiving landfill

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[12] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified.

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 but may require further testing.

10 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition
11 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2
12 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

Part 3: GROUND MOVEMENT ASSESSMENT

This section of the report comprises an analysis of the ground movements arising from the proposed basement and foundation scheme discussed in Part 2 and the information obtained from the investigation, presented in Part 1 of the report.

9.0 INTRODUCTION

The sides of an excavation will move to some extent regardless of how they are supported. The movement will typically be both horizontal and vertical and will be influenced by the engineering properties of the ground, groundwater level and flow, the efficiency of the various support systems employed during underpinning and the efficiency or stiffness of any support structures used.

An analysis has been carried out of the likely movements arising from the proposed excavation and the results of this analysis have been used to predict the effect of these movements on surrounding structures.

9.1 Construction Sequence

The following sequence of operations has been assumed to enable analysis of the ground movements around the basement both during and after construction.

In general, the sequence of works for basement construction will comprise the following stages. A more detailed specification is presented in drawings 4423-SM01 and SM02, as supplied by the consulting structural engineers.

1. Install mass concrete thrust block and construct retaining walls to all boundaries, including underpins beneath the party walls with Jack Straw's Castle. These are commonly formed in a 'hit and miss' sequence using a trench box excavation, commonly sheet lined, shored and strutted; all temporary shoring and propping to be inspected by a suitably qualified person;

2. Excavate across site and install propping. Install basement slab around thrust block. Once basement slab has cured remove props and thrust block. Then, install reinforced concrete internal walls and ground floor slab.

The underpins should be adequately laterally propped and sufficiently dowelled together, with the concrete cast and adequately cured prior to excavation of the basement and removal of the formwork and supports.

When the final excavation depths have been reached the permanent works will be formed, which are likely to comprise reinforced concrete walls with a drained cavity lining the inside of the underpinned walls.

The detail of the support provided to adjacent walls is beyond the scope of this report at this stage and the structural engineer will be best placed to agree a methodology with the underpinning contractors once appointed.

10.0 GROUND MOVEMENTS

The assessment of ground movements within and surrounding the excavation has been undertaken using the P-Disp Version 19.3 – Build 12 package licensed from the OASYS suite of geotechnical modelling software from Arup. This program is commonly used within the ground engineering industry and is considered to be an appropriate tool for the analysis of an underpinned retained wall.

Published data for ground movements associated with underpinned retaining walls and subsequent excavation of a new basement is limited compared to other types of retaining wall. It is possible to use the well-documented predictions and movement curves for embedded retaining walls contained within CIRIA C760[13]. However, this approach is considered to be unnecessarily conservative as underpinned walls are unlikely to move horizontally to any significant degree as they are subject to a continued vertical loading from the structure above. A manual approach has therefore been adopted in conjunction with the results of a P-Disp analysis to assess the effects of construction of the proposed underpinned retaining walls and the subsequent excavation of the new basement in granular soils.

10.1 P-Disp Model

Unloading of the Bagshot Formation and limited unloading of the underlying Claygate Formation will take place as a result of the installation of the proposed underpinned retaining walls and excavation of the new basement. Although the Bagshot Formation is largely granular the reduction in vertical stress in the short term will cause a degree of heave to take place within the small percentage of cohesive material. Undrained soil parameters have been used to estimate the potential short term movements, which include the "immediate" or elastic movements as a result of the basement excavation. The model is based on the assumption that the soils behave elastically, which provides a reasonable approximation to soil behaviour at small strains. Drained parameters have been used to provide an estimate of the total movement, which includes long term swelling that will continue for a number of years.

The elastic analysis requires values of soil stiffness at various levels to calculate displacements. Values of stiffness for the soils at this site are readily available from published data and we have used a well-established method to provide our estimates. This relates values of E' and E_u, the drained and undrained stiffness respectively, to values of undrained cohesion, as described by Padfield and Sharrock[14] and Butler[15] and more recently by O'Brien and Sharp[16]. Relationships of $E_u = 500\ C_u$ and $E' = 300\ C_u$ for the cohesive soils have been used to obtain values of Young's modulus. More recent published data[17] indicates stiffness values of 750 x Cu for the London Clay and a ratio of E' to Eu of 0.75, and it is considered that the use of the more conservative values provides a sensible approach for this stage in the design. For the granular material relationships of 2000 x N have been assumed[18].

The soil parameters used in this assessment are tabulated below:

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13 Gaba, A, Hardy, S, Powrie, W, Doughty, L and Selemetas, D (2017) *Embedded retaining walls – guidance for economic design* CIRIA Report C760

14 Padfield CJ and Sharrock MJ (1983) *Settlement of structures on clay soils*. CIRIA Special Publication 27

15 Butler FG (1974) *Heavily overconsolidated clays: a state of the art review*. Proc Conf Settlement of Structures, Cambridge, 531-578, Pentech Press, Lond

16 O'Brien AS and Sharp P (2001) *Settlement and heave of overconsolidated clays - a simplified non-linear method.* Part Two, Ground Engineering, Nov 2001, 48-53

17 Burland JB, Standing, JR, and Jardine, FM (2001) *Building response to tunnelling, case studies from construction of the Jubilee Line Extension* CIRIA Special Publication 200

18 Gaba, A (1989) *Instrumented driven steel tube piles at Canary Wharf, London.* Piling and deep foundations. Burland and Mitchell.

Stratum	Depth (m)	Eu (MPa)	E' (MPa)
Made ground	GL to 2.0	3 to 12	5 to 20
Bagshot Formation (granular)	2.0 to 20.0	20 to 50	20 to 50
Claygate Formation	20.0 to 35.0	30 to 52.5	50 to 87.5
London Clay	35.0 to 66.0	75 to 150	125 to 250

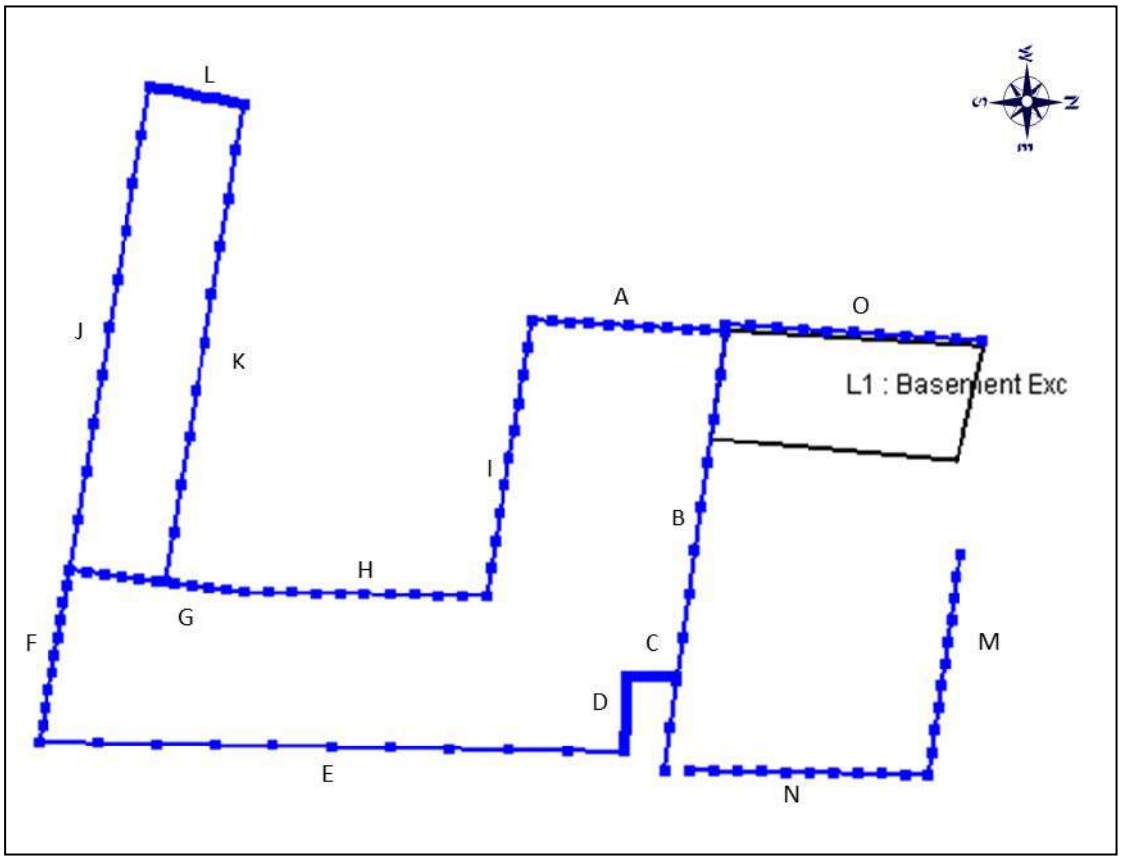
A rigid boundary for the analysis has been set at a depth of 66 m below existing ground level, where the nearby Hampstead Heath Borehole was terminated within the London Clay. As limited on site information was available, strength parameters for the Claygate Formation and London Clay have been assumed from GEA in house records and published papers.

As a conservative approach, all existing loads have been ignored. The proposed loads have been included in the assessment as provided by the consulting structural engineer.

The proposed construction of the new basement will result in a net unloading of roughly 65 kN/m², assuming a unit weight of overburden soil of 19 kN/m^3.

For the purpose of this analysis, the corners have been defined by x and y coordinates, with the x-direction parallel with the orientation east-west, whilst the y-direction is parallel with the orientation of north-south. Vertical movement is in the z-direction. Wall lengths of less than 10 m have been modelled as 1 m long structural elements, while walls greater than 10 m in length have been modelled as 2 m elements to reflect their greater stiffness. The full outputs of all the analyses and P-Disp movement contour plots are included within the appendix.

The diagram overleaf details the sensitive structures in relation to the proposed excavation. The sensitive structures were located using a drawing (ref: 385/3/R2, issued February 1962) issued by the consulting architect, Quinlan & Francis Terry LLP. The basement footprint was overlaid using drawings provided by the structural engineer.



Sectional drawings through Jack Straw's Castle show the basement level to be roughly equivalent to the existing car park. The elevation that is to be underpinned was investigated and found to be bearing a depth of 1.3 m. Given that no other information has been made available it has been assumed that the remainder of Jack Straw's Castle is founded at the same depth. The small retaining walls bounding the car park (elevations M and O) were not investigated and have been assumed to be founded at a depth of 0.5 m.

The proposed basement has been modelled to extend to a depth of 3.5 m.

The modelled building heights from depth of foundations to eaves level were derived from on site observations and drawing 1370 – PLANS 15-08-2017 as supplied by the architect and are detailed below.

Sensitive Structure	Sensitive Structure Elevation	Height of Building from foundation to eaves level (m)
Jack Straws Castle	A to I	12
Jack Straws Castle (single storey)	J to L	4
Car park retaining wall	M	0.2 to 1.1 (0.65 m assumed)
Car park retaining wall	N	1.1 to 1.6 (1.35 m assumed)
Car park retaining wall	O	2.2

Limitations within the analyses did not allow for the wall height of sensitive structure M and N to differ across their length, therefore an average has been assumed.

10.2 Ground Movements – Surrounding the Basement

10.2.1 Wall Installation

As noted previously, predictions of the vertical and horizontal ground movements behind the wall, as a result of wall installation, can be based on case study information from CIRIA 760 for a planar diaphragm wall installed into stiff clay. There are no data sets available for the installation of an underpinned wall in granular material and the predicted movements for a wall in clay are considered to be a conservative approach.

As mentioned previously, underpinned walls are unlikely to move horizontally to any significant degree as they are subject to a continued vertical loading from the structure above. The use of datasets derived from case studies of embedded retaining walls will therefore be expected to overestimate horizontal movements for these walls, but will provide an indication of the pattern of possible horizontal and vertical movements.

In order to achieve an approximation of vertical and horizontal movements Table 6.3 of CIRIA C760 indicates that for a planar diaphragm wall installed into stiff clay, predicted vertical and horizontal movements behind the wall will be in the region of 1.5 times the retained height and for a 3.5 m wall this equates to a zone of influence of 5.25 m. A total of three walls of the adjacent structures fall within this 5.25 m distance and Table 6.3 also indicates that maximum horizontal and vertical movements of 0.05 % of the retained height may arise immediately behind the wall, which for a 3.5 m deep basement gives a movement of about 2 mm. However as mentioned above, whilst this is considered to be a conservative approximation of the likely movement, the horizontal and vertical movements are likely to be most sensitive to the quality of workmanship and appropriate sequencing during the underpin construction.

10.2.2 Following Excavation

Settlement of the soil behind the new retaining wall is likely to be limited due to the existing building effectively acting as additional support at ground level. The magnitude of the settlement will be controlled to a large extent by the quality of workmanship of the underpins and by the existing building that is likely to provide additional rigidity. For this first assessment, the settlement of the ground behind the wall as a result of the proposed excavation is assumed to be zero.

P-Disp has been used to predict the effect of potential ground movements at the foundation depth of nearby sensitive structures, as a result of the loading of the underlying soils following the installation of the underpins and unloading of the underlying soils following the proposed basement excavation. In order to assess which structures are likely to be affected by the excavation, reference has been made to CIRIA C760, which indicates that for a high support stiffness embedded retaining wall constructed within a high stiffness clay, vertical and horizontal ground surface movements following the basement excavation are likely to be negligible beyond 3.5 and 4 times the retained height respectfully, which for this assessment is 12.25 m and 14.0 m for vertical and horizontal movements respectively. An initial assessment indicates that all sensitive structures modelled are likely to experience some degree of movement.

10.3 Ground Movements within the Excavation

The P-Disp analysis indicates that, by the time the basement construction is complete, up to 8 mm of heave is likely to have taken place at the centre of the proposed excavation, reducing to between 1 mm and 2 mm beneath the retaining walls.

In the long term, following completion of the basement construction, a further 4 mm of heave is predicted in the centre of the excavation, whilst a further 1 mm to 2 mm is predicted to occur beneath the retaining walls.

11.0 BUILDING DAMAGE ASSESSMENT

In addition to the above assessment of the likely movements that will result from the proposed development, the neighbouring buildings are considered to be sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 6.4 of C760.

The results above have been used to manually predict the building damage category for selected worst case sensitive structures, on the basis of their location within the inclusion zone described above and their position / alignment with the basement and resulting movement contours. The results of the building damage assessment are presented in Section 6.1 below and a summary page showing the individual results for the selected sensitive structures is appended.

All structures are shown on the plan in Section 11.1

11.1 Damage to Neighbouring Structures

P-Disp has been used to estimate the differential movement along the length of each sensitive structure and the results have been used in a manual assessment to predict the building damage category for each sensitive structure. The results of the building damage assessment are shown in the table below.

The plot for horizontal wall movements as a result of the excavation in front of a wall in stiff clay in CIRIA C760 (Fig 6.16) has been adapted to reflect a trend line that assumes a movement of 5 mm immediately behind the wall. The trend line is set such that the predicted movement diminishes with distance from the wall according to the trend line set by a wall within a high stiffness clay. The results of the assessment are derived from the overall term condition, which is considered to represent the worst case in view of the slightly higher expected heave movements.

The building damage reports for the selected sensitive structures predict that the damage to the adjoining structures would generally be Category 0 (Negligible). Ground movements affecting sensitive structure B, which is the façade of Jack Straw's Castle to be underpinned, resulted in differential movements creating both 'sagging' and 'hogging' damage. In order to remain conservative these sections were analysed individually and both resulted in Category 0 (Negligible) damage, both summary sheets are presented in the appendix.

11.2 Monitoring of Ground Movements

CPG4 states that "The Council therefore will expect BIAs to provide mitigation measures where any risk of damage is identified of Burland Category 1 'very slight' or higher. Following inclusion of mitigation measures into the proposed scheme the changes in attributes are to be re-evaluated and new net consequences determined". The predictions of ground movement based on the ground movement analysis should not therefore result in a monitoring scheme being required.

12.0 CONCLUSIONS

The analysis has concluded that the predicted damage to the neighbouring properties would generally be 'Negligible' and therefore does not require a monitoring regime.

13.0 BASEMENT IMPACT ASSESSMENT

The screening identified a number of potential impacts. The desk study and ground investigation 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 table below summarises the previously identified potential impacts and the additional information that is now available from the site investigation in consideration of each impact.

The site is located to the west of an area of hillside setting ranging from 7° to 10°
Given the relatively small size of the development and the fact that appropriate propping and piled walls are recommended for construction, which will support the basement excavation, it is deemed the proposed development will not have any effect on the slope stability of the surrounding area.

The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties
The investigation recorded the northern perimeter wall of Jack Straw's Castle to be founding at 1.3 m depth which confirmed a search of the Camden Planning portal suggesting the neighbouring properties do not have basements. It is expected that the proposed scheme will result in foundations extending a significantly greater depth relative to the existing foundations of the neighbouring properties.

A Ground Movement Analysis has been carried out and predicts that movements will remain within acceptable limits.

The site is located within 50 m of the catchment area of the Hampstead Pond Chain and the site is underlain by a Secondary 'A' Aquifer, as defined by the EA
There is a potential for groundwater to be present within the Secondary 'A' Aquifer beneath the site. Groundwater levels have been shown to be greater than 6.0 m below ground level and therefore are at least 2.0 m below the depth of the proposed basement structure. It is therefore deemed that the proposed basement will not have any effect on groundwater flow, and that no significant perched groundwater inflows will be encountered that cannot be dealt with by standard sump pumping,.

The site is within 5 m of a highway or pedestrian right of way
The basement excavation will extend to within 5.0 m from the pathways and highways to the east and therefore the basement excavation may affect the highway. A retention system will need to be adopted that maintains the stability of the excavation at all times.

13.1 BIA Conclusion

A Basement Impact Assessment has been carried out following the information and guidance published by the London Borough of Camden.

It is concluded that the proposed development is unlikely to result in any specific land or slope stability issues.

13.2 Non-Technical Summary of Evidence

This section provides a short summary of the evidence acquired and used to form the conclusions made within the BIA.

13.2.1 Screening

The following table provides the evidence used to answer the surface water flow and flooding screening questions.

Question	Evidence
1. Is the site within the catchment of the pond chains on Hampstead Heath?	Figures 12 and 14 of the Arup report.
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?	A site walkover and existing plans of the site have confirmed that the proposed basement scheme will not increase the amount of hardstanding.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved 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?	As above.
5. Will the proposed basement result in changes to the quantity of surface water being received by adjacent properties or downstream watercourses?	
6. Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk of flooding because the proposed basement is below the static water level of a nearby surface water feature?	Flood risk maps acquired from the Environment Agency as part of the desk study, Figure 15 of the Arup report, the Camden Flood Risk Management Strategy dated 2013 and SFRA dated 2014.

The following table provides the evidence used to answer the subterranean (groundwater flow) screening questions.

Question	Evidence
1a. Is the site located directly above an aquifer?	Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 5 and 8 of the Arup report.
1b. Will the proposed basement extend beneath the water table surface?	Site investigation.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	Historical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	Figures 12 and 14 of the Arup report.
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	A site walkover and existing plans of the site have confirmed that the basement development will only replace existing hardstanding 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)?	The details of the proposed development do not indicate the use soakaway drainage.
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?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report.

The following table provides the evidence used to answer the slope stability screening questions.

Question	Evidence
1. Does the existing site include slopes, natural or manmade, greater than 7°?	Figures 16 and 17 of the Arup report and confirmed during a site walkover.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	The details of the proposed development provided do not include the re-profiling of the site to create new slopes.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	Topographical maps and Figures 16 and 17 of the Arup report and confirmed during a site walkover.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	
5. Is the London Clay the shallowest strata at the site?	Geological maps and Figures 3, 5 and 8 of the Arup report.
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?	There are no known plans to remove any trees and an arboriculturist should be consulted to ensure no damage to tree roots and if trees are to be removed.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	Knowledge on the ground conditions of the area and reference to NHBC guidelines were used to make an assessment of this, in addition to a visual inspection of the buildings carried out during the site walkover.
8. Is the site within 100 m of a watercourse or potential spring line?	Topographical maps acquired as part of the desk study and Figures 11 and 12 of the Arup report and the Lost Rivers of London book.
9. Is the site within an area of previously worked ground?	Geological maps and Figures 3, 5 and 8 of the Arup report.
10. Is the site within an aquifer?	Aquifer designation maps acquired from the Environment Agency as part of the desk study and Figures 3, 5 and 8 of the Arup report.
11. Is the site within 50 m of Hampstead Heath ponds?	Topographical maps acquired as part of the desk study and Figures 12 and 14 of the Arup report.
12. Is the site within 5 m of a highway or pedestrian right of way?	Site plans and the site walkover.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Camden planning portal and the site walkover confirmed the position of the proposed basement relative the neighbouring properties.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	Maps and plans of infrastructure tunnels were reviewed.

13.2.2 Scoping and Site Investigation

The questions in the screening stage that there were answered 'yes', were taken forward to a scoping stage and the potential impacts discussed in Section 4.0 of this report, with reference to the possible impacts outlined in the Arup report.

A ground investigation has been carried out, which has allowed an assessment of the potential impacts of the basement development on the various receptors identified from the screening and scoping stages. Principally the investigation aimed to establish the ground conditions, including the groundwater level and the engineering properties of the underlying soils to enable suitable design of the basement development. The findings of the investigation are discussed in Part 2 of this report and summarised in the Executive Summary. The findings of the Ground Movement Assessment and Building Damage Assessment can be found in Part 3 of this report.

13.2.3 Impact Assessment

Section 10.0 of this report summarises whether or not, on the basis of the findings of the investigation, the potential impacts still need to be given consideration and identifies ongoing risks that will require suitable engineering mitigation. Section 9.0 of this report also provides recommendations for the design of the proposed development.

A ground movement analysis and building damage assessment has predicted ground movements to remain within acceptable limits.

14.0 OUTSTANDING RISKS AND ISSUES

This section of the report aims to highlight areas where further work is required as a result of limitations on the scope of this investigation, or where issues have been identified by this investigation that warrant further consideration. The scope of risks and issues discussed in this section is by no means exhaustive, but covers the main areas where additional work may be required.

The ground is a heterogeneous natural material and variations will inevitably arise between the locations at which it is investigated. This report provides an assessment of the ground conditions based on the discrete points at which the ground was sampled, but the ground conditions should be subject to review as the work proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

It would be prudent, once access is available, to carry out a number of trial excavations, to depths as close to the full basement depth as possible, to provide an indication of the likely groundwater conditions. Continued monitoring of the standpipes to establish any seasonal fluctuations and a groundwater design line is also recommended.

APPENDIX

Borehole Records

Laboratory Geotechnical Results

Contamination Results

Generic Risk Based Screening Values

Preliminary UXO Risk Assessment

Envirocheck Report Extracts

Historical Maps

Site Plan

Utility Plans

APPENDIX B

P-DISP ANALYSIS

Short Term Movement Contour Plots

Total Movement Contour Plots

Critical BDA Sheets

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Jack Straw's Castle, London NW3 7ES	**Number** **BH1**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Percussive Opendrive Sampler			Albany Homes	J16284
	Location	**Dates** 20/12/2016	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D1				(0.50) 0.50	MADE GROUND (dark brown silty sand with flint, fragments of brick and concrete, tarmac, glass, plastic and metal)		
1.00-1.45 1.00	SPT N=6 D2		1,1/2,1,1,2		(1.30) 1.80	MADE GROUND (brown silty sand with flint, fragmetns of brick and concrete, pottery fragments and plastic)		
1.90 2.00-2.45	D3 SPT N=6		1,1/1,1,2,2		(0.50) 2.30	Yellowish and orange-brown clayey fine SAND		
2.40	D4				(0.40) 2.70	Orange-brown slightly clayey gravelly fine to coarse SAND with occasional cobbles of flint. Gravel is subrounded to subangular		
3.00-3.45	SPT N=15		2,3/3,4,4,4		(1.30)	Orange-brown very silty fine SAND becoming grey mottled orange-brown from 3.5 m depth		
3.50	D5							
4.00-4.45	SPT N=27		2,5/6,7,7,7		4.00 (0.20) 4.20	Brown slightly clayey gravelly fine to coarse SAND		
4.50	D6					Orange-brown mottled light grey silty fine SAND		
5.00-5.45	SPT N=25		3,5/5,6,7,7		(1.80)			
5.50	D7							
					6.00	Complete at 6.00m		

Remarks
Groundwater not encountered
Slight hydrocarbon odour noted within made ground at a depth of approximately 0.5 m
A continuous probe was carried out from the base of the borehole to a depth of 8.7 m and the results are shown on a separate record.

Scale (approx)	**Logged By**
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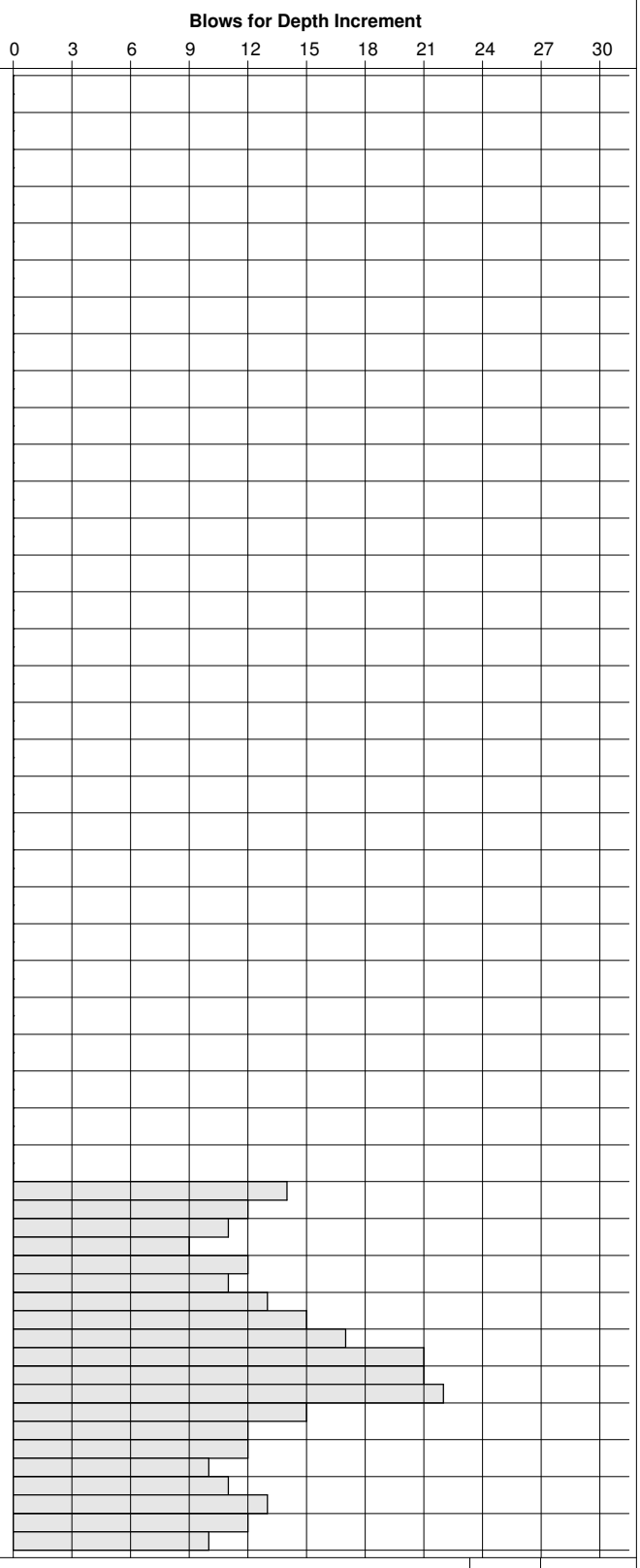
Figure No.
J16284.BH1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Jack Straw's Castle, London NW3 7ES	**Probe Number** **DP1**

Method	**Cone Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Dynamic Probe		133.50	Albany Homes	J16284
	Location	**Dates**	**Engineer**	**Sheet**
		20/12/2016	Richard Tant Associates	1/2

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		133.50	0.00
0.10-0.20	0			
0.20-0.30	0			
0.30-0.40	0			
0.40-0.50	0			
0.50-0.60	0		133.00	0.50
0.60-0.70	0			
0.70-0.80	0			
0.80-0.90	0			
0.90-1.00	0			
1.00-1.10	0		132.50	1.00
1.10-1.20	0			
1.20-1.30	0			
1.30-1.40	0			
1.40-1.50	0			
1.50-1.60	0		132.00	1.50
1.60-1.70	0			
1.70-1.80	0			
1.80-1.90	0			
1.90-2.00	0			
2.00-2.10	0		131.50	2.00
2.10-2.20	0			
2.20-2.30	0			
2.30-2.40	0			
2.40-2.50	0			
2.50-2.60	0		131.00	2.50
2.60-2.70	0			
2.70-2.80	0			
2.80-2.90	0			
2.90-3.00	0			
3.00-3.10	0		130.50	3.00
3.10-3.20	0			
3.20-3.30	0			
3.30-3.40	0			
3.40-3.50	0			
3.50-3.60	0		130.00	3.50
3.60-3.70	0			
3.70-3.80	0			
3.80-3.90	0			
3.90-4.00	0			
4.00-4.10	0		129.50	4.00
4.10-4.20	0			
4.20-4.30	0			
4.30-4.40	0			
4.40-4.50	0			
4.50-4.60	0		129.00	4.50
4.60-4.70	0			
4.70-4.80	0			
4.80-4.90	0			
4.90-5.00	0			
5.00-5.10	0		128.50	5.00
5.10-5.20	0			
5.20-5.30	0			
5.30-5.40	0			
5.40-5.50	0			
5.50-5.60	0		128.00	5.50
5.60-5.70	0			
5.70-5.80	0			
5.80-5.90	0			
5.90-6.00	0			
6.00-6.10	14		127.50	6.00
6.10-6.20	12			
6.20-6.30	11			
6.30-6.40	9			
6.40-6.50	12			
6.50-6.60	11		127.00	6.50
6.60-6.70	13			
6.70-6.80	15			
6.80-6.90	17			
6.90-7.00	21			
7.00-7.10	21		126.50	7.00
7.10-7.20	22			
7.20-7.30	15			
7.30-7.40	12			
7.40-7.50	12			
7.50-7.60	10		126.00	7.50
7.60-7.70	11			
7.70-7.80	13			
7.80-7.90	12			
7.90-8.00	10		125.50	8.00



Remarks

Scale (approx)	**Logged By**
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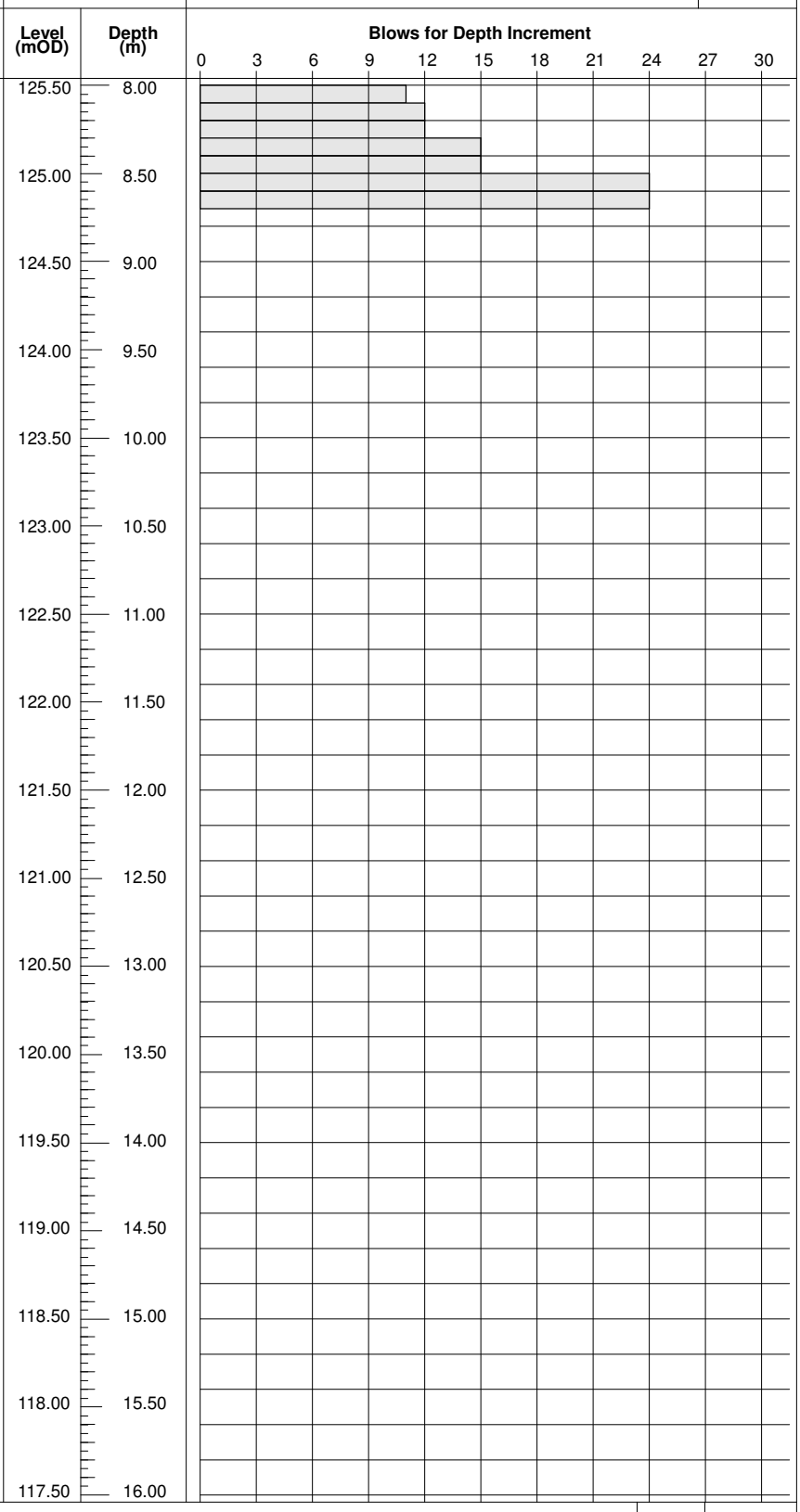
Figure No.
J16284.DP1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Jack Straw's Castle, London NW3 7ES	**Probe Number** **DP1**

Method	**Cone Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Dynamic Probe		133.50	Albany Homes	J16284
	Location	**Dates**	**Engineer**	**Sheet**
		20/12/2016	Richard Tant Associates	2/2

Depth (m)	Blows for Depth Increment	Field Records
8.00-8.10	11	
8.10-8.20	12	
8.20-8.30	12	
8.30-8.40	15	
8.40-8.50	15	
8.50-8.60	24	
8.60-8.70	24	



Remarks

Scale (approx)	**Logged By**
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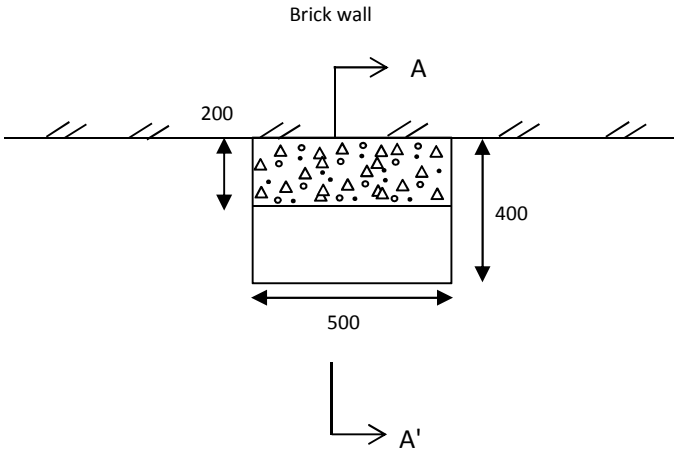
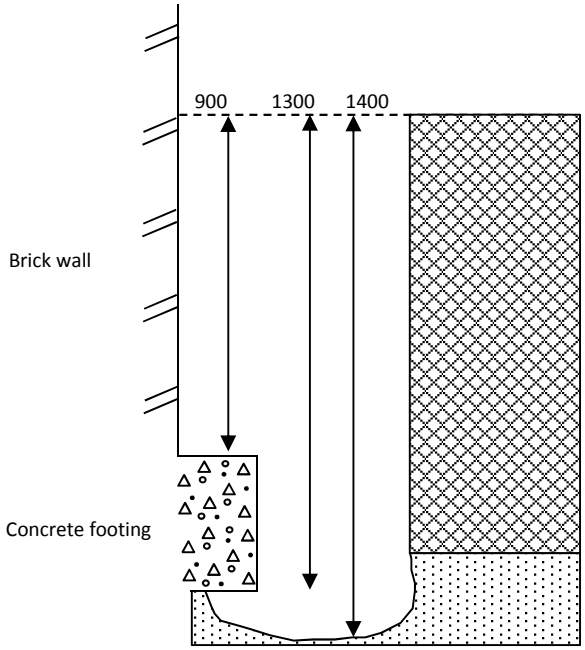
Figure No.
J16284.DP1

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware Herts SG12 7QE			**Site** Jack Straws Castle, London, NW3 7ES	**Trial Pit Number** 1
Excavation Method Manual	**Dimensions** 400 x 500 x 1400	**Ground Level (mOD)**	**Client** Albany Homes Developments Ltd	**Job Number** J16284
	Location	**Dates** 19/12/2016	**Engineer** Richard Tant	**Sheet** 1/1

Plan



Section A - A'



GL to 1.2 m: Made ground (100 mm tarmac over grey sandy clay with fragments of flint, concrete, brick, and tarmac).

1.2 m to 1.4 m: Yellowish orange - brown silty fine grained SAND.

Remarks: All dimensions in millimetres Sides of trial pit remained stable during excavation Groundwater: Not encountered	Base of footing proven with hand tool	Scale: 1:20 Logged by: JD

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH1	D3	1.90	D	Orange fine to medium SAND														Particle Size Distribution
BH1	D5	3.50	D	Light brown and rare light grey silty fine SAND											7.2	<0.01		Particle Size Distribution
BH1	D7	5.50	D	Light brown and rare light grey silty fine SAND											7.4	0.02		Particle Size Distribution

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke

S Burke - Senior Technician
01/02/2017

Project Number:

GEO / 25311

Project Name:

JACK STRAW'S CASTLE, LONDON, NW3 7ES
J16284

GEOLABS®

BS1377 : Part 2 : Clause 9 : 1990

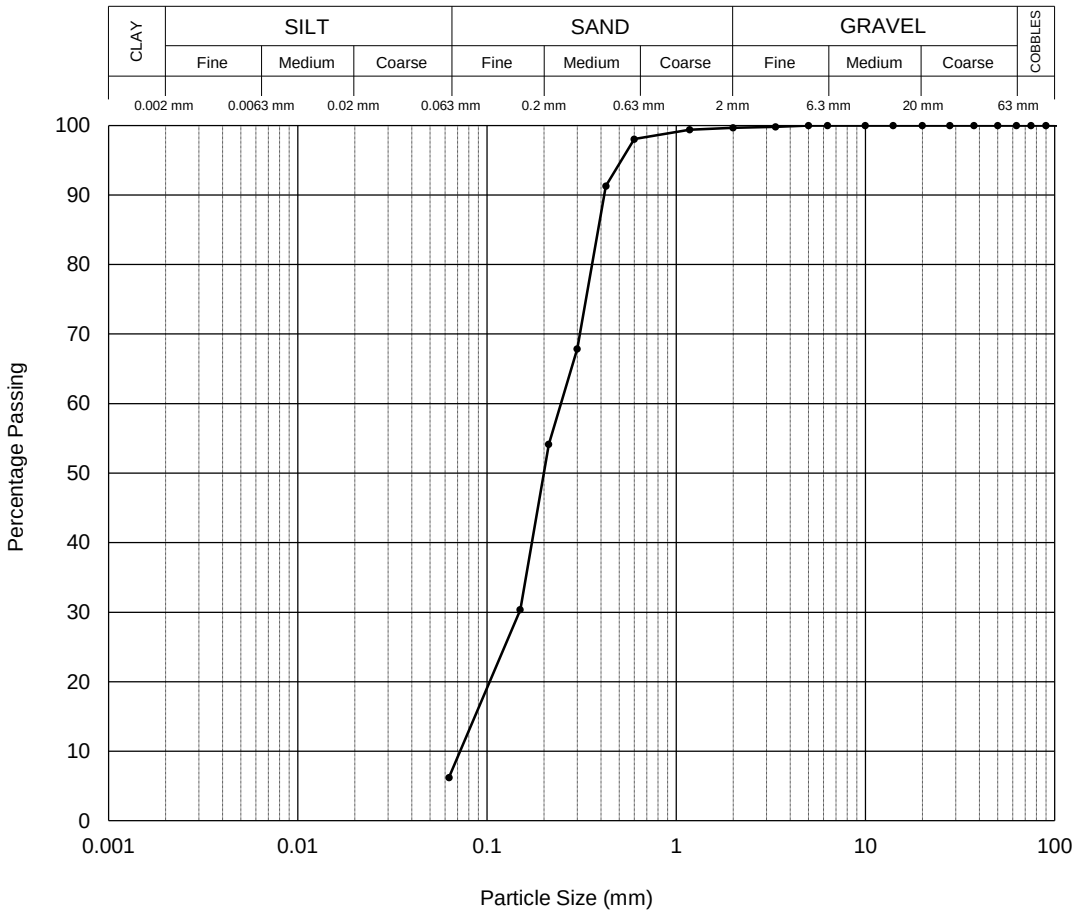
PARTICLE SIZE DISTRIBUTION

BH/TP No:	BH1
Sample Ref.	D3
Depth (m):	1.90
Sample Type	D

Description:
Orange fine to medium SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	100
5	100
3.35	100
2	100
1.18	99
0.6	98
0.425	91
0.3	68
0.212	54
0.15	30
0.063	6



Particle Proportions	
Cobbles	0.0 %
Gravel	0.3 %
Sand	93.5 %
Silt & Clay	6.2 %

Checked and Approved by

S Burke

S Burke - Senior Technician
01/02/2017

Project Number:

GEO / 25311

Project Name:

JACK STRAW'S CASTLE, LONDON, NW3 7ES
J16284

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : Clause 9 : 1990

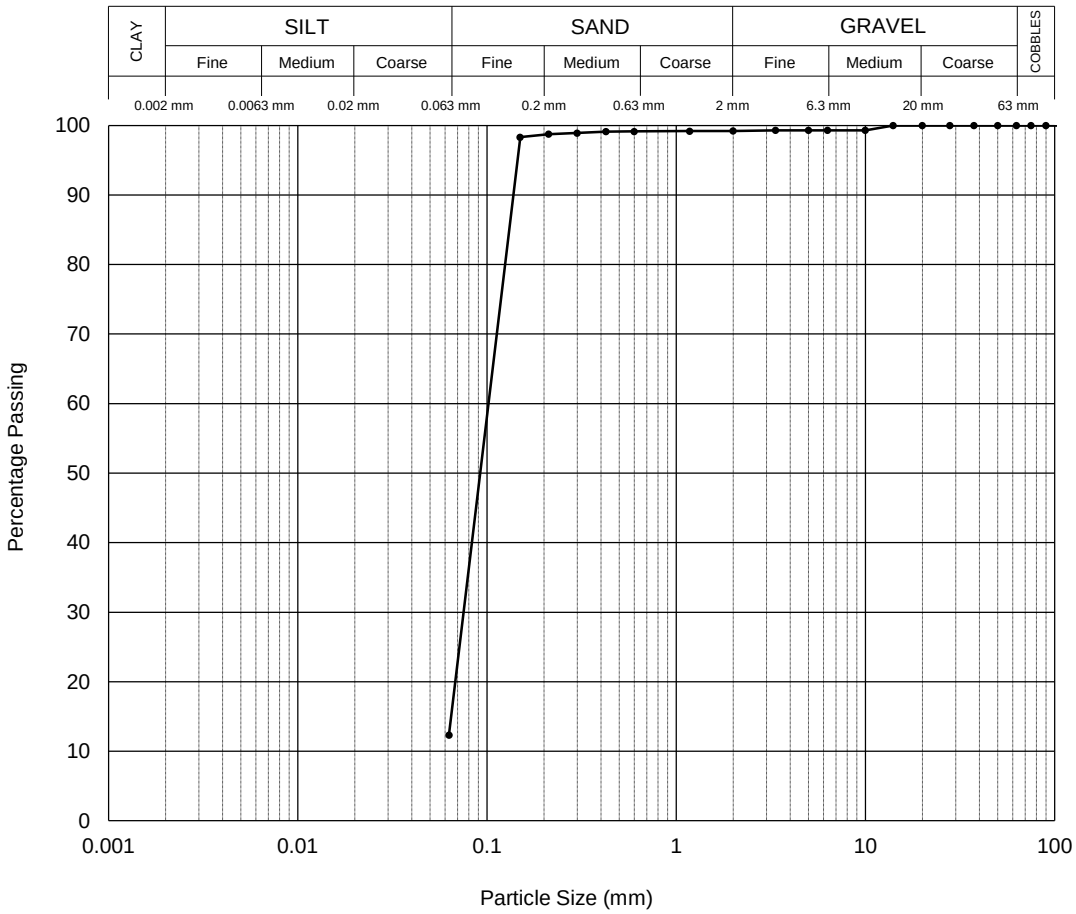
PARTICLE SIZE DISTRIBUTION

BH/TP No:	BH1
Sample Ref.	D5
Depth (m):	3.50
Sample Type	D

Description:
Light brown and rare light grey silty fine SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	99
6.3	99
5	99
3.35	99
2	99
1.18	99
0.6	99
0.425	99
0.3	99
0.212	99
0.15	98
0.063	12



Particle Proportions	
Cobbles	0.0 %
Gravel	0.8 %
Sand	86.9 %
Silt & Clay	12.3 %

Checked and Approved by

S Burke

S Burke - Senior Technician
01/02/2017

Project Number:

GEO / 25311

Project Name:

JACK STRAW'S CASTLE, LONDON, NW3 7ES
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GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : Clause 9 : 1990

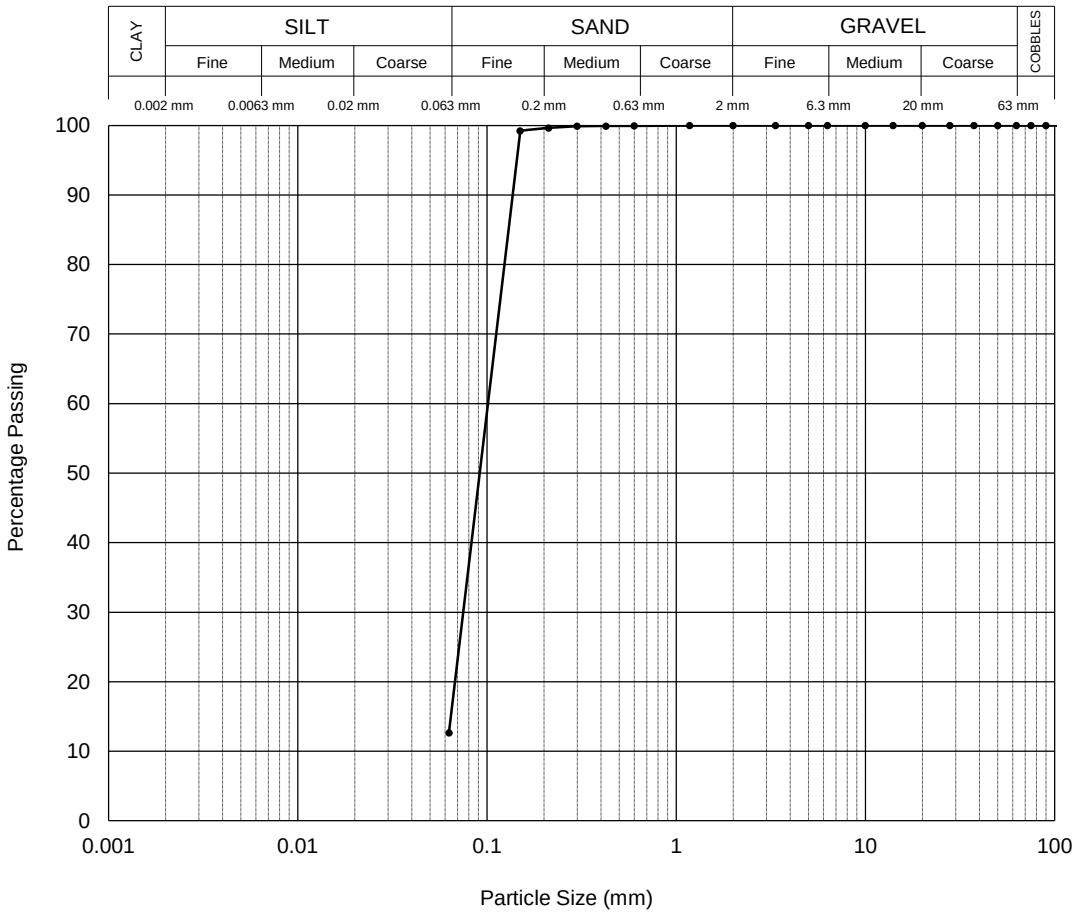
PARTICLE SIZE DISTRIBUTION

BH/TP No:	BH1
Sample Ref.	D7
Depth (m):	5.50
Sample Type	D

Description:
Light brown and rare light grey silty fine SAND

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	100
5	100
3.35	100
2	100
1.18	100
0.6	100
0.425	100
0.3	100
0.212	100
0.15	99
0.063	13



Particle Proportions	
Cobbles	0.0 %
Gravel	0.0 %
Sand	87.3 %
Silt & Clay	12.7 %

Checked and Approved by

S Burke

S Burke - Senior Technician
01/02/2017

Project Number:

GEO / 25311

Project Name:

JACK STRAW'S CASTLE, LONDON, NW3 7ES
J16284

GEOLABS

UKAS TESTING 1982

Caroline Anderson
Geotechnical & Environmental Associates
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Widbury Hill
Ware
Hertfordshire
SG127QE

e: caroline@gea-ltd.co.uk

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t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 16-36171

Project / Site name:	Jack Straw's Castle, London NW3 7ES	**Samples received on:**	21/12/2016
Your job number:	J16284	**Samples instructed on:**	21/12/2016
Your order number:	J16284	**Analysis completed by:**	30/12/2016
Report Issue Number:	1	**Report issued on:**	30/12/2016
Samples Analysed:	2 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 16-36171

Project / Site name: Jack Straw's Castle, London NW3 7ES
Your Order No: J16284

Lab Sample Number				678258	678259			
Sample Reference				BH1	BH1			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.30	1.00			
Date Sampled				20/12/2016	20/12/2016			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	18	22			
Moisture Content	%	N/A	NONE	7.4	6.1			
Total mass of sample received	kg	0.001	NONE	1.4	1.2			
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.2	7.2			
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1			
Total Sulphate as SO_4	mg/kg	50	MCERTS	290	320			
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.068	0.020			
Sulphide	mg/kg	1	MCERTS	18	< 1.0			
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	25	21			
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.6	1.2			
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	1.5	< 0.05			
Acenaphthylene	mg/kg	0.1	MCERTS	0.14	< 0.10			
Acenaphthene	mg/kg	0.1	MCERTS	0.35	< 0.10			
Fluorene	mg/kg	0.1	MCERTS	0.74	< 0.10			
Phenanthrene	mg/kg	0.1	MCERTS	4.2	< 0.10			
Anthracene	mg/kg	0.1	MCERTS	0.91	< 0.10			
Fluoranthene	mg/kg	0.1	MCERTS	4.8	0.49			
Pyrene	mg/kg	0.1	MCERTS	4.3	0.66			
Benzo(a)anthracene	mg/kg	0.1	MCERTS	1.7	0.47			
Chrysene	mg/kg	0.05	MCERTS	1.8	0.52			
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	1.2	0.50			
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	1.4	0.51			
Benzo(a)pyrene	mg/kg	0.1	MCERTS	1.7	0.59			
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.61	0.24			
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	0.16	< 0.10			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.95	0.36			
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	26.3	4.34			
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	9.3			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	9.9			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	22	37			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	140			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	0.6			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	5.8	5.9			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	38	37			
Petroleum Hydrocarbons								
TPH C10 - C40	mg/kg	10	MCERTS	270	51			
TPH (C8 - C10)	mg/kg	0.1	NONE	< 0.1	< 0.1			
TPH (C10 - C12)	mg/kg	2	ISO 17025	4.0	< 2.0			
TPH (C12 - C16)	mg/kg	4	ISO 17025	24	5.5			
TPH (C16 - C21)	mg/kg	1	ISO 17025	69	7.8			
TPH (C21 - C35)	mg/kg	1	ISO 17025	150	28			

Analytical Report Number : 16-36171

Project / Site name: Jack Straw's Castle, London NW3 7ES

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
678258	BH1	None Supplied	0.30	Brown sandy loam with stones.
678259	BH1	None Supplied	1.00	Brown sandy loam with stones.

Analytical Report Number : 16-36171

Project / Site name: Jack Straw's Castle, London NW3 7ES

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding.	L076-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

GEA Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
Ware
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Generic Risk-Based Soil Screening Values

Site	Jack Straw's Castle, London, NW3 7ES	**Job Number** J16284
Client	Albany Home Development Ltd	**Sheet** 1 / 2
Engineer	Richard Tant Associates	

Proposed End Use Residential without plant uptake

Soil pH 8

Soil Organic Matter content % 1.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	40	C4SL
Cadmium	149	C4SL
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	21	C4SL
Copper	2,330	LQM/CIEH
Lead	310	C4SL
Elemental Mercury	1.02	SGV
Inorganic Mercury	235	SGV
Nickel	99	LQM/CIEH
Selenium	595	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.89	C4SL
Toluene	120	SGV
Ethyl Benzene	65	SGV
Xylene	42	SGV
Aliphatic C5-C6	30	LQM/CIEH
Aliphatic C6-C8	73	LQM/CIEH
Aliphatic C8-C10	19	LQM/CIEH
Aliphatic C10-C12	93	LQM/CIEH
Aliphatic C12-C16	740	LQM/CIEH
Aliphatic C16-C35	45,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	27	LQM/CIEH
Aromatic C10-C12	69	LQM/CIEH
Aromatic C12-C16	140	LQM/CIEH
Aromatic C16-C21	250	LQM/CIEH
Aromatic C21-C35	890	LQM/CIEH
PRO (C_5 –C_{10})	270	Calc
DRO (C_{12} –C_{28})	46,130	Calc
Lube Oil (C_{28} –C_{44})	45,890	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	310	SGV
PAH		
Naphthalene	2.33	C4SL exp & LQM/CIEH
Acenaphthylene	1,950	LQM/CIEH
Acenaphthene	2,020	LQM/CIEH
Fluorene	1,850	LQM/CIEH
Phenanthrene	837	LQM/CIEH
Anthracene	19,800	LQM/CIEH
Fluoranthene	972	LQM/CIEH
Pyrene	2,330	LQM/CIEH
Benzo(a) Anthracene	5.5	C4SL exp & LQM/CIEH
Chrysene	13	C4SL exp & LQM/CIEH
Benzo(b) Fluoranthene	10.6	C4SL exp & LQM/CIEH
Benzo(k) Fluoranthene	15.2	C4SL exp & LQM/CIEH
Benzo(a) pyrene	4.65	C4SL
Indeno(1 2 3 cd) Pyrene	6.3	C4SL exp & LQM/CIEH
Dibenzo(a h) Anthracene	1.31	C4SL exp & LQM/CIEH
Benzo (g h i) Perylene	71	C4SL exp & LQM/CIEH
Screening value for PAH	**66.4**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	12.9	LQM/CIEH
tetrachloroethane (PCA)	3.6	LQM/CIEH
tetrachloroethene (PCE)	1.46	LQM/CIEH
trichloroethene (TCE)	0.15	LQM/CIEH
1,2-dichloroethane (DCA)	0.00646	LQM/CIEH
vinyl chloride (Chloroethene)	0.00129	LQM/CIEH
tetrachloromethane (Carbon tetra	0.0362	LQM/CIEH
trichloromethane (Chloroform)	1.72	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these valuesindicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health croiteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

Geotechnical & Environmental Associates
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Generic Risk-Based Soil Screening Values

Site	Jack Straw's Castle, London, NW3 7ES
Client	Albany Home Development Ltd
Engineer	Richard Tant Associates

Job Number J16284

Sheet 2 / 2

Proposed End Use **Residential without plant uptake**

The key generic assumptions for this end use are as follows;

- ❑ that groundwater will not be a critical risk receptor;
- ❑ that the critical receptor for human health will be a young female aged 0 to 6 years old;
- ❑ that the exposure duration will be six years;
- ❑ that the building type equates to a terraced house.
- ❑ that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and dust, and inhalation of dust and vapours;

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of the generic screening value there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- ❑ additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- ❑ site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- ❑ soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

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Express Preliminary UXO Risk Assessment

Client	GEA
Project	Jack Straw's Castle
Site Address	North End Way, London, NW3 7ES
Report Reference	EP4216-00
Date	02/12/16
Originator	PS
Doc Code	16-2-1F-Ed02-Sept16

Assessment Objective

This preliminary risk assessment is a qualitative screening exercise to assess the likely potential of encountering unexploded ordnance (UXO) at the Jack Straw's Castle site. The assessment involves the consideration of the basic factors that affect the potential for UXO to be present at a site as outlined in Stage One of the UXO risk management process.

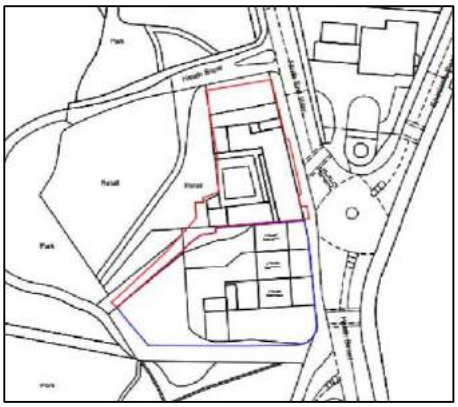
Background

This assessment uses the sources of information available in-house to 1st Line Defence Limited to enable the placement of a development site in context with events that may have led to the presence of German air-delivered or Allied military UXO. The report will identify any immediate necessity for risk mitigation or additional research in the form of a Detailed UXO Risk Assessment. It makes use of 1st Line Defence's extensive historical archives, library and unique geo-databases as well as internet resources, and is researched and compiled by UXO specialists and graduate researchers.

The assessment directly follows CIRIA C681 guidelines "Unexploded Ordnance, a Guide for the Construction Industry". The document will therefore assess the following factors:

- Basic Site Data
- Previous Military Use
- Indicators of potential aerial delivered UXO threat
- Consideration of any Mitigating Factors
- Extent of Proposed Intrusive Works
- Any requirement for Further Work

It should be noted that the vast majority of construction sites in the UK will have a low or negligible risk of encountering UXO and should be able to be screened out at this preliminary stage. The report is meant as a common sense 'first step' in the UXO risk management process. The content of the report and conclusions drawn are based on basic, preliminary research using the information available to 1st Line Defence at the time this report was produced.

Risk Assessment Considerations	
Site location and description/current use	The site is located within Hampstead Heath, in the London Borough of Camden. The site is occupied by the Jack Straw's Castle, a Grade II listed building and former public house; as well as an accompanying hard-standing courtyard and a narrow accessway. The site is surrounded on all sides by undeveloped woodland within Hampstead Heath. The site is bordered to the north by Heath Brow, to the east by the A502 North End Way and to the south by Whitestone Walk. The site is centred on the approximate OS grid reference: **TQ 2623286435** 
Are there any indicators of current/historical military activity on/close to the site?	Though there is no clear evidence of military activity within the site area or its immediate area, there is evidence of military training activities on Hampstead Heath throughout WWII, such as mock gas attack exercises. It is not thought that these exercises would increase the risk from Allied military ordnance within the site area.
What was the pre- and post-WWII history of the site?	Historical OS mapping indicates that the site area was occupied by the Jack Straw's Castle tavern until after the war, when mapping shows the area to be cleared. Reconstruction of Jack Straw's Castle public house is shown to have occurred occurring on the site by 1955 mapping. This structure changes shape by 1973 and has remained fundamentally unchanged to this day.
Was the area subject to bombing during WWII?	The proposed site was situated within the Metropolitan Borough of Hampstead during WWII. Hampstead sustained a moderate-high density of bombing with 166 items of ordnance recorded per 1,000 acres. This included 321 High Explosive Bombs, 6 Parachute Mines, 31 Oil Bombs, 5 Phosphorus Bombs, 10 Pilotless Aircraft (V1s), and 3 Long Range Rocket Bombs (V2). Bomb census mapping does not record any bomb strikes directly within the proposed site area. There were however multiple strikes in the immediate vicinity of the site, with a bomb strike plotted on consolidated mapping immediately adjacent to the site and an Incendiary bomb 'shower' recorded over the general site area. An oil bomb is also recorded adjacent to the site on weekly mapping that may relate to the previously referenced strike plotted on consolidated mapping.
Is there any evidence of bomb damage on/close to the site?	The tavern on the site area is marked as damaged beyond repair on LCC bomb damage mapping and is shown to be cleared immediately post-WWII, apparently as the result of this severe damage.
To what degree would the site have been subject to access?	If the area of the site occupied by the tavern was damaged through the majority of the war, access to the site would have been lower in this period and it is unlikely that signs of UXBs would have been noticed or recorded. It is not clear at what stage in the war the tavern on site was damaged or to what extent at this stage.

To what degree has the site been developed post-WWII?	Post-WWII the structure of the current Jack Straw's Castle public house was constructed over the cleared ground of the previous tavern. The risk of encountering items of UXO would be mitigated down to the depths of the excavations of this building.
What is the nature and extent of the intrusive works proposed?	The scope of intrusive works are unknown to 1st Line Defence at the time of writing this report.

Summary and Conclusions

The site was situated within the Metropolitan Borough of Hampstead during WWII, which received a moderate-high density of bombing at 166 bombs per 1000 acres. Multiple records suggest that at least a single bomb fell immediately adjacent to the site during WWII. LCC Bomb Damage Mapping indicates that the site received severe damage. Access to severely damaged structures during WWII is likely to have been irregular and the chance that items of UXO could have fallen unnoticed and unrecorded within such areas cannot be discounted at this preliminary stage.

Recommendations

It is recommended that further research is carried out in the form of a **Detailed UXO Risk Assessment** in order to ascertain more information about the exact wartime condition of the former public house on site; as well as to ascertain the exact date and extent of the damage it sustained. This would involve obtaining local historical records for the site area, ARP written records and high resolution WWII-era aerial photography. The level of damage present at the site area would have greatly affected the regularity of access and the possibility that items of UXO fell unnoticed and unrecorded. The acquisition of such information could lower the risk of encountering UXO across a portion of the site, depending on its quality.

If the client has any anecdotal or empirical evidence of UXO risk on site, please contact 1st Line Defence.

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
113083364_1_1

Customer Reference:
J16284

National Grid Reference:
526230, 186460

Slice:
A

Site Area (Ha):
0.04

Search Buffer (m):
1000

Site Details:

Jack Straws Castle, 12
North End Way
LONDON
NW3 7ES

Client Details:

Mr S Branch
GEA Ltd
Widbury Barn
Widbury Hill
Ware
Herts
SG12 7QE

Contents

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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Natural England Copyright Notice

Ove Arup Copyright Notice

Peter Brett Associates Copyright Notice

Radon Potential dataset Copyright Notice

Report Version v50.0

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility	pg 1	Yes			n/a
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 1			1	1
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 1				1
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 1		Yes		
Pollution Incidents to Controlled Waters	pg 1				4
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances					
River Quality					
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register					
Water Abstractions					
Water Industry Act Referrals					
Groundwater Vulnerability	pg 2	Yes	n/a	n/a	n/a
Drift Deposits			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 2	Yes	n/a	n/a	n/a
Superficial Aquifer Designations			n/a	n/a	n/a
Source Protection Zones					
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
Detailed River Network Lines	pg 2			Yes	n/a
Detailed River Network Offline Drainage					n/a

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites					
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)					
Local Authority Landfill Coverage		1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)	pg 4				2
Potentially Infilled Land (Water)	pg 4				3
Registered Landfill Sites					
Registered Waste Transfer Sites					
Registered Waste Treatment or Disposal Sites					
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Geological					
BGS 1:625,000 Solid Geology	pg 5	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry					
BGS Recorded Mineral Sites					
BGS Urban Soil Chemistry	pg 5		Yes	Yes	Yes
BGS Urban Soil Chemistry Averages	pg 8	Yes			
CBSCB Compensation District			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities					
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 8	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards				n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 8	Yes		n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 8	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 9		Yes	n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a
Industrial Land Use					
Contemporary Trade Directory Entries	pg 10				45
Fuel Station Entries					
Points of Interest - Commercial Services	pg 13				4
Points of Interest - Education and Health	pg 14			3	
Points of Interest - Manufacturing and Production					
Points of Interest - Public Infrastructure	pg 14				5
Points of Interest - Recreational and Environmental	pg 14				1
Gas Pipelines					
Underground Electrical Cables	pg 14			4	8

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Sensitive Land Use					
Ancient Woodland	pg 17		1		2
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves					
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones					
Ramsar Sites					
Sites of Special Scientific Interest	pg 17				1
Special Areas of Conservation					
Special Protection Areas					
World Heritage Sites					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13SW (S)	0	2	526234 186464
1	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: WTW/WATER COLLECTION/TREATMENT/SUPPLY Location: Hampstead Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.0140 Permit Version: 1 Effective Date: 15th September 1989 Issued Date: 15th September 1989 Revocation Date: 5th October 2000 Discharge Type: Trade Effluent Discharge Environment: Freshwater Stream/River Receiving Water: River Thames **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A8NW (S)	357	3	526200 186100
2	**Discharge Consents** Operator: Thames Water Utilities Ltd Property Type: WTW/WATER COLLECTION/TREATMENT/SUPPLY Location: Kidderpore Authority: Environment Agency, Thames Region Catchment Area: Not Supplied Reference: Temp.0165 Permit Version: 1 Effective Date: 15th September 1989 Issued Date: 15th September 1989 Revocation Date: 5th October 2000 Discharge Type: Trade Effluent Discharge Environment: Freshwater Stream/River Receiving Water: River Thames **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A7NW (SW)	992	3	525400 185900
3	**Local Authority Pollution Prevention and Controls** Name: Perkins Dry Cleaners Location: 40 Heath Street, London, Nw3 6te Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC9 Dated: 12th January 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Located by supplier to within 10m	A8SE (S)	746	4	526374 185724
	Nearest Surface Water Feature	A13SE (S)	122	-	526263 186338
4	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: HAMPSTEAD HEATH Authority: Environment Agency, Thames Region Pollutant: Unknown Sewage Note: Confirmed incident Incident Date: 2nd June 1999 Incident Reference: THNE1999043207 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 10m	A18SW (NW)	575	3	526000 187000
5	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Northend Road, GOLDERS GREEN Authority: Environment Agency, Thames Region Pollutant: Oils - Unknown Note: Not Supplied Incident Date: 18th June 1996 Incident Reference: N1960311 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A17NE (NW)	907	3	525750 187245

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
5	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Northend Road, GOLDERS GREEN Authority: Environment Agency, Thames Region Pollutant: Miscellaneous - Other Note: Not Supplied Incident Date: 10th September 1996 Incident Reference: N1960475 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A17NE (NW)	911	3	525750 187250
6	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Turners Wood, HAMPSTEAD Authority: Environment Agency, Thames Region Pollutant: Storm Sewage Note: Not Supplied Incident Date: 12th November 1997 Incident Reference: THN11997030884 Catchment Area: Not Given Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18NE (N)	940	3	526400 187400
	Groundwater Vulnerability Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise Map Sheet: Sheet 39 West London Scale: 1:100,000	A13SW (SW)	0	3	526229 186460
	Groundwater Vulnerability Soil Classification: Soils of Intermediate Leaching Potential (I1) - Soils which can possibly transmit a wide range of pollutants Map Sheet: Sheet 39 West London Scale: 1:100,000	A13SW (S)	0	3	526234 186464
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Secondary Aquifer - A	A13SW (S)	0	2	526234 186464
	Superficial Aquifer Designations No Data Available				
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
7	**Detailed River Network Lines** River Type: Tertiary River River Name: Not Supplied Hydrographic Area: B06 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk Management Status: Other Rivers Water Course Name: Not Supplied Water Course Reference: Not Supplied	A13NW (W)	293	3	525933 186531

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Detailed River Network Lines** River Type: Tertiary River River Name: Not Supplied Hydrographic Area: B06 River Flow Type: Primary Flow Path River Surface Level: Surface Drain Feature: Not a Drain Flood Risk Management Status: Other Rivers Water Course Name: Not Supplied Water Course Reference: Not Supplied	A14SW (E)	468	3	526715 186428
	Detailed River Network Offline Drainage None				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: London Borough of Camden - Has no landfill data to supply		0	5	526234 186464
	Local Authority Landfill Coverage Name: London Borough of Barnet - Has supplied landfill data		549	6	525978 186962
9	**Potentially Infilled Land (Non-Water)** Bearing Ref: E Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A14SE (E)	780	8	527023 186376
10	**Potentially Infilled Land (Non-Water)** Bearing Ref: W Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A7NW (W)	990	8	525300 186096
11	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A9NW (SE)	724	8	526813 186007
12	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A17SW (NW)	823	8	525492 186852
13	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1896	A7SE (SW)	976	8	525731 185613

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Bracklesham Group And Barton Group (Undifferentiated)	A13SW (S)	0	2	526234 186464
	BGS Estimated Soil Chemistry No data available				
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526219, 186357 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 15.20 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 91.10 mg/kg Lead Measured Concentration: 269.20 mg/kg Nickel Measured Concentration: 15.80 mg/kg	A13SW (S)	99	2	526219 186357
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526370, 186775 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 17.40 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 211.10 mg/kg Lead Measured Concentration: 184.00 mg/kg Nickel Measured Concentration: 12.90 mg/kg	A13NE (NE)	327	2	526370 186775
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525880, 186665 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 8.50 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 98.60 mg/kg Lead Measured Concentration: 99.90 mg/kg Nickel Measured Concentration: 7.00 mg/kg	A12NE (NW)	392	2	525880 186665
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526737, 186262 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 11.40 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 155.00 mg/kg Lead Measured Concentration: 104.40 mg/kg Nickel Measured Concentration: 7.80 mg/kg	A14SW (E)	527	2	526737 186262

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526716, 186777 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 18.90 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 130.80 mg/kg Lead Measured Concentration: 223.30 mg/kg Nickel Measured Concentration: 10.00 mg/kg	A14NW (NE)	560	2	526716 186777
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525663, 186188 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 15.70 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 156.80 mg/kg Lead Measured Concentration: 1130.60 mg/kg Nickel Measured Concentration: 23.00 mg/kg	A12SE (SW)	620	2	525663 186188
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526771, 186829 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 23.40 mg/kg Cadmium Measured Concentration: 0.80 mg/kg Chromium Measured Concentration: 74.50 mg/kg Lead Measured Concentration: 586.60 mg/kg Nickel Measured Concentration: 44.00 mg/kg	A19SW (NE)	635	2	526771 186829
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526248, 187271 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 13.90 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 118.10 mg/kg Lead Measured Concentration: 288.50 mg/kg Nickel Measured Concentration: 12.90 mg/kg	A18NE (N)	798	2	526248 187271
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526223, 185630 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 19.70 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 127.10 mg/kg Lead Measured Concentration: 514.80 mg/kg Nickel Measured Concentration: 23.20 mg/kg	A8SW (S)	826	2	526223 185630

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525393, 186257 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 11.90 mg/kg Cadmium Measured Concentration: 1.50 mg/kg Chromium Measured Concentration: 51.30 mg/kg Lead Measured Concentration: 269.20 mg/kg Nickel Measured Concentration: 21.40 mg/kg	A12SW (W)	853	2	525393 186257
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526862, 187134 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 9.90 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 103.50 mg/kg Lead Measured Concentration: 174.50 mg/kg Nickel Measured Concentration: 11.50 mg/kg	A19SW (NE)	904	2	526862 187134
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526732, 185657 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 40.30 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 97.40 mg/kg Lead Measured Concentration: 660.40 mg/kg Nickel Measured Concentration: 34.00 mg/kg	A9SW (SE)	937	2	526732 185657
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525769, 187291 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 46.20 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 67.70 mg/kg Lead Measured Concentration: 214.40 mg/kg Nickel Measured Concentration: 46.60 mg/kg	A17NE (NW)	938	2	525769 187291
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525676, 185669 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 13.90 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 116.40 mg/kg Lead Measured Concentration: 247.30 mg/kg Nickel Measured Concentration: 22.60 mg/kg	A7SE (SW)	958	2	525676 185669

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 525271, 186726 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 16.80 mg/kg Cadmium Measured Concentration: 0.40 mg/kg Chromium Measured Concentration: 184.30 mg/kg Lead Measured Concentration: 166.50 mg/kg Nickel Measured Concentration: 14.50 mg/kg	A12NW (W)	983	2	525271 186726
	BGS Urban Soil Chemistry Averages Source: British Geological Survey, National Geoscience Information Service Sample Area: London Count Id: 7209 Arsenic Minimum Concentration: 1.00 mg/kg Arsenic Average Concentration: 17.00 mg/kg Arsenic Maximum Concentration: 161.00 mg/kg Cadmium Minimum Concentration: 0.10 mg/kg Cadmium Average Concentration: 0.90 mg/kg Cadmium Maximum Concentration: 165.20 mg/kg Chromium Minimum Concentration: 13.00 mg/kg Chromium Average Concentration: 79.00 mg/kg Chromium Maximum Concentration: 2094.00 mg/kg Lead Minimum Concentration: 11.00 mg/kg Lead Average Concentration: 280.00 mg/kg Lead Maximum Concentration: 10000.00 mg/kg Nickel Minimum Concentration: 2.00 mg/kg Nickel Average Concentration: 28.00 mg/kg Nickel Maximum Concentration: 506.00 mg/kg	A13SW (S)	0	2	526234 186464
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	143	2	526383 186411

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	143	2	526383 186411
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	0	2	526234 186464

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
14	**Contemporary Trade Directory Entries** Name: Emily Jane Ltd Location: 2, The Village, North End Way, London, NW3 7HA Classification: Children & Babywear - Manufacturers & Wholesalers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SW (NW)	555	-	526010 186982
14	**Contemporary Trade Directory Entries** Name: Elias Cleaners Location: 1, The Village, North End Way, London, NW3 7HA Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A18SW (NW)	565	-	526004 186991
14	**Contemporary Trade Directory Entries** Name: Elias Cleaners Location: 1, The Village, North End Way, London, NW3 7HA Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A18SW (NW)	565	-	526004 186991
14	**Contemporary Trade Directory Entries** Name: Atlantic Hire Services Location: London, NW3 7HG Classification: Sound Equipment Systems Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SW (N)	566	-	526028 187001
15	**Contemporary Trade Directory Entries** Name: Vape Emporium Location: 87, Heath Street, London, NW3 6UG Classification: Tobacco Products - Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NE (S)	596	-	526367 185876
16	**Contemporary Trade Directory Entries** Name: Simply For You Ltd Location: 49, Mountview Close, London, NW11 7HG Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SW (N)	652	-	526028 187092
17	**Contemporary Trade Directory Entries** Name: Soul Revolver Location: 9, Back Lane, London, NW3 1HL Classification: Leather Garments & Products **Status: Active** Positional Accuracy: Automatically positioned to the address	A8NE (S)	657	-	526425 185827
18	**Contemporary Trade Directory Entries** Name: Spotless Cleaning Location: 35, Flask Walk, London, NW3 1HH Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NE (S)	674	-	526476 185825
18	**Contemporary Trade Directory Entries** Name: Hampstead Cleaners Location: 35, Flask Walk, London, NW3 1HH Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A8NE (S)	674	-	526476 185825
19	**Contemporary Trade Directory Entries** Name: Scrap Yard In Hampstead Htt Location: Hampstead Station, Hampstead High Street, London, NW3 1QG Classification: Car Breakers & Dismantlers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	695	-	526393 185780
19	**Contemporary Trade Directory Entries** Name: Bubbles & Light Ltd Location: 9a, Flask Walk, London, NW3 1HJ Classification: Candle Manufacturers & Suppliers **Status: Active** Positional Accuracy: Automatically positioned to the address	A8SE (S)	719	-	526436 185766
19	**Contemporary Trade Directory Entries** Name: Hampstead Cleaners Location: 5, Flask Walk, London, NW3 1HJ Classification: Carpet, Curtain & Upholstery Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	723	-	526429 185760

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
20	**Contemporary Trade Directory Entries** Name: Perkins Dry Cleaners Location: 6, Holly Bush Vale, London, NW3 6TX Classification: Dry Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A8SE (S)	699	-	526343 185767
20	**Contemporary Trade Directory Entries** Name: Perkins Dry Cleaners Location: 6, Holly Bush Vale, London, NW3 6TX Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	699	-	526343 185767
21	**Contemporary Trade Directory Entries** Name: American Dry Cleaning Location: 47, Hampstead High Street, London, NW3 1QG Classification: Dry Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A8SE (S)	717	-	526400 185759
21	**Contemporary Trade Directory Entries** Name: Perkins Group Location: 40, Heath Street, London, NW3 6TE Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	747	-	526374 185724
22	**Contemporary Trade Directory Entries** Name: Xyz Location: 10, Flask Walk, London, NW3 1HE Classification: Ceramic Manufacturers, Supplies & Services **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A8SE (S)	731	-	526445 185756
22	**Contemporary Trade Directory Entries** Name: Hillsdown Holdings Ltd Location: 32, Hampstead High Street, London, NW3 1QD Classification: Food Products - Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	776	-	526475 185717
23	**Contemporary Trade Directory Entries** Name: Skipwith Consulting Location: 37, Willow Road, London, NW3 1TN Classification: Commercial Cleaning Services **Status: Active** Positional Accuracy: Automatically positioned to the address	A9NW (SE)	763	-	526726 185866
24	**Contemporary Trade Directory Entries** Name: Ravtex Uk Ltd Location: 95 Platts Lane, London, NW3 7NH Classification: Packaging Materials Manufacturers & Suppliers **Status: Active** Positional Accuracy: Manually positioned to the address or location	A12SW (W)	771	-	525464 186318
25	**Contemporary Trade Directory Entries** Name: Crabtree & Evelyn Location: 65, Hampstead High Street, London, NW3 1QP Classification: Toiletries **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	776	-	526422 185704
26	**Contemporary Trade Directory Entries** Name: Andrews Location: 22, Heath Street, London, NW3 6TE Classification: Hardware **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	804	-	526381 185666
26	**Contemporary Trade Directory Entries** Name: Destination Skin Location: 12, Heath Street, London, NW3 6TE Classification: Electrolysis **Status: Active** Positional Accuracy: Automatically positioned to the address	A8SE (S)	818	-	526396 185655
27	**Contemporary Trade Directory Entries** Name: All Rubbish Cleared Location: Redington Rd, London, NW3 7QX Classification: Rubbish Clearance **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A8SW (S)	820	-	525919 185694

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
28	**Contemporary Trade Directory Entries** Name: Rubbish Collection Location: Heath St, London, NW3 6TP Classification: Waste Disposal Services **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A8SE (S)	829	-	526372 185640
28	**Contemporary Trade Directory Entries** Name: Jeeves Of Belgravia Location: 11, Heath Street, London, NW3 6TP Classification: Dry Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A8SE (S)	842	-	526365 185625
28	**Contemporary Trade Directory Entries** Name: Jeeves Of Belgravia Location: 11, Heath Street, London, NW3 6TP Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	842	-	526365 185625
28	**Contemporary Trade Directory Entries** Name: Office Cleaning Services Location: 3, Heath Street, London, NW3 6TP Classification: Commercial Cleaning Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	861	-	526373 185608
28	**Contemporary Trade Directory Entries** Name: Hampstead Autos Location: 28, Perrins Walk, London, NW3 6TH Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	865	-	526365 185603
29	**Contemporary Trade Directory Entries** Name: Cleaners Of Hampstead Location: 15, Hampstead High Street, London, NW3 1PX Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	857	-	526573 185667
29	**Contemporary Trade Directory Entries** Name: Cleaners Of Hampstead Location: 15, Hampstead High Street, London, NW3 1PX Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	857	-	526573 185667
30	**Contemporary Trade Directory Entries** Name: Woodstock Motors Location: 143, North End Road, London, NW11 7HT Classification: Car Dealers **Status: Active** Positional Accuracy: Automatically positioned to the address	A17NE (NW)	859	-	525832 187236
31	**Contemporary Trade Directory Entries** Name: Cleaners Hampstead Location: 8, Hampstead High Street, London, NW3 1PR Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	883	-	526614 185656
31	**Contemporary Trade Directory Entries** Name: Radici Plastics Uk Location: 6a, Hampstead High Street, London, NW3 1PR Classification: Plaster Manufacturers & Suppliers **Status: Active** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	890	-	526626 185654
32	**Contemporary Trade Directory Entries** Name: Chauffeurs Of London Location: Business Centre, 120 West Heath Road, London, NW3 7TU Classification: Car Engine Tuning & Diagnostic Services **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A17SW (NW)	903	-	525391 186827
32	**Contemporary Trade Directory Entries** Name: Acell Location: Suite 14, Business Centre, 120, West Heath Road, London, NW3 7TU Classification: Building Block Manufacturers & Distributors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A17SW (NW)	903	-	525391 186827

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
32	**Contemporary Trade Directory Entries** Name: Chamber Engineering Ltd Location: Suite 2,5,Business Centre,120 West Heath Rd, London, NW3 7TU Classification: Metal Products - Fabricated **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A17SW (NW)	903	-	525391 186827
32	**Contemporary Trade Directory Entries** Name: Contec Global Location: The Chase Centre, 114, West Heath Road, London, NW3 7TX Classification: Energy Efficient Products and Services **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A17SW (W)	921	-	525363 186807
33	**Contemporary Trade Directory Entries** Name: Grand Products Ltd Location: A, 20, Hollycroft Avenue, London, NW3 7QL Classification: Furniture Manufacturers - Home & Office **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A7NW (SW)	911	-	525381 186106
34	**Contemporary Trade Directory Entries** Name: Snappy Snaps Location: 80, Rosslyn Hill, London, NW3 1ND Classification: Photographic Processors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	942	-	526685 185626
34	**Contemporary Trade Directory Entries** Name: Fast Cash 4 Scrap Cars London Aeg Location: 64, Rosslyn Hill, London, NW3 1ND Classification: Car Breakers & Dismantlers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	958	-	526708 185619
34	**Contemporary Trade Directory Entries** Name: Cleaning Services Hampstead Location: 58a, Rosslyn Hill, London, NW3 1ND Classification: Carpet, Curtain & Upholstery Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	970	-	526723 185614
34	**Contemporary Trade Directory Entries** Name: Farrow & Ball Ltd Location: 58, Rosslyn Hill, London, NW3 1ND Classification: Wallpapers & Wall Coverings **Status: Active** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	970	-	526723 185614
35	**Contemporary Trade Directory Entries** Name: Hampstead Waste Location: Flat 68, Henderson Court, 102, Fitzjohns Avenue, London, NW3 6NR Classification: Medical Waste Disposal **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	992	-	526493 185498
36	**Contemporary Trade Directory Entries** Name: Lily'S Kitchen Location: 6, Rosslyn Mews, London, NW3 1NN Classification: Pet Foods & Animal Feeds **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	996	-	526769 185611
37	**Points of Interest - Commercial Services** Name: Carspa Location: 49 Mountview Close, London, NW11 7HG Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A18SW (N)	652	7	526028 187092
38	**Points of Interest - Commercial Services** Name: Av Auto Locksmiths Location: 38 Willow Road, London, NW3 1TN Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A9NW (SE)	761	7	526722 185864
39	**Points of Interest - Commercial Services** Name: Woodstock Car Wash Location: 143 North End Road, London, NW11 7HT Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A17NE (NW)	859	7	525832 187236

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
39	**Points of Interest - Commercial Services** Name: Woodstock Car Wash Location: 143 North End Road, London, NW11 7HT Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A17NE (NW)	859	7	525832 187236
40	**Points of Interest - Education and Health** Name: Queen Marys House Location: 23 East Heath Road, London, NW3 1DU Category: Health Practitioners and Establishments Class Code: Hospitals Positional Accuracy: Positioned to address or location	A13SE (SE)	257	7	526353 186225
40	**Points of Interest - Education and Health** Name: Piercey Day Hospital Location: 23 East Heath Road, London, NW3 1DU Category: Health Practitioners and Establishments Class Code: Hospitals Positional Accuracy: Positioned to address or location	A13SE (SE)	270	7	526380 186224
41	**Points of Interest - Education and Health** Name: The Royal Free Hospital Location: 30 Spedan Close, London, NW3 7XF Category: Health Practitioners and Establishments Class Code: Hospitals Positional Accuracy: Positioned to address or location	A8NW (SW)	497	7	525961 186033
42	**Points of Interest - Public Infrastructure** Name: Sluice Location: NW3 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A14SE (E)	687	7	526935 186450
43	**Points of Interest - Public Infrastructure** Name: Graveyard Location: Not Supplied Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A8SE (S)	755	7	526249 185702
43	**Points of Interest - Public Infrastructure** Name: Grave Yard Location: NW3 Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A8SE (S)	755	7	526241 185701
44	**Points of Interest - Public Infrastructure** Name: Sluice Location: NW3 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A14SE (E)	880	7	527121 186344
45	**Points of Interest - Public Infrastructure** Name: Sluice Location: NW3 Category: Water Class Code: Weirs, Sluices and Dams Positional Accuracy: Positioned to an adjacent address or location	A17SW (NW)	963	7	525372 186926
46	**Points of Interest - Recreational and Environmental** Name: Playing Area Location: Elm Walk, NW3 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A12NE (NW)	728	7	525569 186795
47	**Underground Electrical Cables** Unique Feature Identifier: 265529 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A13NE (NE)	278	8	526409 186698

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
48	**Underground Electrical Cables** Unique Feature Identifier: 265407 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A13NE (NE)	280	8	526410 186699
49	**Underground Electrical Cables** Unique Feature Identifier: 265528 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A14NW (E)	365	8	526612 186487
50	**Underground Electrical Cables** Unique Feature Identifier: 265404 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A14NW (E)	370	8	526618 186482
51	**Underground Electrical Cables** Unique Feature Identifier: 265408 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A18SE (NE)	564	8	526523 186963
52	**Underground Electrical Cables** Unique Feature Identifier: 265527 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A18SE (NE)	570	8	526524 186970
53	**Underground Electrical Cables** Unique Feature Identifier: 265526 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A9NW (SE)	651	8	526674 185967
54	**Underground Electrical Cables** Unique Feature Identifier: 265406 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A9NW (SE)	654	8	526671 185961
55	**Underground Electrical Cables** Unique Feature Identifier: 264445 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A18NE (N)	887	8	526280 187359
56	**Underground Electrical Cables** Unique Feature Identifier: 264472 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A18NE (N)	890	8	526273 187363
57	**Underground Electrical Cables** Unique Feature Identifier: 265547 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A9SW (SE)	975	8	526708 185599

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
58	**Underground Electrical Cables** Unique Feature Identifier: 265405 Cable Status: Commissioned Cable Type: Pilot (Communication) Record Last Updated: 4th June 2013	A9SW (SE)	980	8	526715 185598

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
59	**Ancient Woodland** Name: Bishops Wood Reference: 1495665 Area(m²): 146178.49 Type: Ancient and Semi-Natural Woodland	A13NE (N)	141	9	526252 186614
60	**Ancient Woodland** Name: Ken Wood Reference: 1495724 Area(m²): 94873.72 Type: Ancient and Semi-Natural Woodland	A14NE (NE)	768	9	526950 186779
61	**Ancient Woodland** Name: Not Supplied Reference: 1495650 Area(m²): 26918.69 Type: Ancient and Semi-Natural Woodland	A18NE (N)	953	9	526349 187421
62	**Sites of Special Scientific Interest** Name: Hampstead Heath Woods Multiple Areas: Y Total Area (m2): 161715.26 Source: Natural England Reference: 1003451 Designation Details: Site Of Special Scientific Interest Designation Date: 18th April 1990 Date Type: Notified	A19SW (NE)	729	9	526884 186823

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices		
London Borough of Hackney - Environmental Health Department	April 2015	Annual Rolling Update
London Borough of Islington - Public Protection	August 2013	Annual Rolling Update
London Borough of Barnet - Environmental Health Department	January 2015	Annual Rolling Update
London Borough of Camden - Pollution Projects Team	March 2013	Annual Rolling Update
Royal Borough of Kensington And Chelsea - Environmental Services	May 2014	Annual Rolling Update
London Borough of Haringey - Planning and Environmental Health	October 2014	Annual Rolling Update
Westminster City Council - Environmental Health Department	October 2014	Annual Rolling Update
London Borough of Hammersmith And Fulham - Environmental Health Department	September 2013	Annual Rolling Update
London Borough of Brent - Environmental Health Department	September 2014	Annual Rolling Update
Discharge Consents		
Environment Agency - Thames Region	October 2016	Quarterly
Enforcement and Prohibition Notices		
Environment Agency - Thames Region	March 2013	As notified
Integrated Pollution Controls		
Environment Agency - Thames Region	October 2008	Not Applicable
Integrated Pollution Prevention And Control		
Environment Agency - Thames Region	October 2016	Quarterly
Local Authority Integrated Pollution Prevention And Control		
London Borough of Barnet - Environmental Health Department	April 2013	Annual Rolling Update
London Borough of Islington - Environmental Health Department	January 2015	Annual Rolling Update
London Borough of Haringey - Planning and Environmental Health	June 2014	Annual Rolling Update
London Borough of Hammersmith And Fulham - Environmental Health Department	March 2014	Annual Rolling Update
London Borough of Hackney - Environmental Health Department	March 2015	Annual Rolling Update
London Borough of Brent - Environmental Health Department	March 2016	Annual Rolling Update
Westminster City Council - Environmental Health Department	November 2015	Annual Rolling Update
London Borough of Camden - Pollution Projects Team	October 2014	Annual Rolling Update
Royal Borough of Kensington And Chelsea - Environmental Health Department	September 2014	Annual Rolling Update
Local Authority Pollution Prevention and Controls		
London Borough of Barnet - Environmental Health Department	December 2014	Annual Rolling Update
London Borough of Islington - Environmental Health Department	January 2015	Annual Rolling Update
London Borough of Haringey - Planning and Environmental Health	June 2014	Annual Rolling Update
London Borough of Hammersmith And Fulham - Environmental Health Department	March 2014	Annual Rolling Update
London Borough of Hackney - Environmental Health Department	March 2015	Annual Rolling Update
London Borough of Brent - Environmental Health Department	March 2016	Annual Rolling Update
Westminster City Council - Environmental Health Department	November 2015	Annual Rolling Update
London Borough of Camden - Pollution Projects Team	October 2014	Annual Rolling Update
Royal Borough of Kensington And Chelsea - Environmental Health Department	September 2014	Annual Rolling Update
Local Authority Pollution Prevention and Control Enforcements		
London Borough of Barnet - Environmental Health Department	December 2014	Annual Rolling Update
London Borough of Islington - Environmental Health Department	January 2015	Annual Rolling Update
London Borough of Haringey - Planning and Environmental Health	June 2014	Annual Rolling Update
London Borough of Hammersmith And Fulham - Environmental Health Department	March 2014	Annual Rolling Update
London Borough of Hackney - Environmental Health Department	March 2015	Annual Rolling Update
London Borough of Brent - Environmental Health Department	March 2016	Annual Rolling Update
Westminster City Council - Environmental Health Department	November 2015	Annual Rolling Update
London Borough of Camden - Pollution Projects Team	October 2014	Annual Rolling Update
Royal Borough of Kensington And Chelsea - Environmental Health Department	September 2014	Annual Rolling Update
Nearest Surface Water Feature		
Ordnance Survey	July 2012	Quarterly
Pollution Incidents to Controlled Waters		
Environment Agency - Thames Region	September 1999	Not Applicable
Prosecutions Relating to Authorised Processes		
Environment Agency - Thames Region	March 2013	As notified

Agency & Hydrological	Version	Update Cycle
Prosecutions Relating to Controlled Waters Environment Agency - Thames Region	March 2013	As notified
River Quality Environment Agency - Head Office	November 2001	Not Applicable
River Quality Biology Sampling Points Environment Agency - Head Office	July 2012	Annually
River Quality Chemistry Sampling Points Environment Agency - Head Office	July 2012	Annually
Substantiated Pollution Incident Register Environment Agency - Thames Region - North East Area	October 2016	Quarterly
Water Abstractions Environment Agency - Thames Region	October 2016	Quarterly
Water Industry Act Referrals Environment Agency - Thames Region	October 2016	Quarterly
Groundwater Vulnerability Environment Agency - Head Office	April 2015	Not Applicable
Drift Deposits Environment Agency - Head Office	January 1999	Not Applicable
Bedrock Aquifer Designations British Geological Survey - National Geoscience Information Service	August 2015	As notified
Superficial Aquifer Designations British Geological Survey - National Geoscience Information Service	August 2015	As notified
Source Protection Zones Environment Agency - Head Office	October 2016	Quarterly
Extreme Flooding from Rivers or Sea without Defences Environment Agency - Head Office	November 2016	Quarterly
Flooding from Rivers or Sea without Defences Environment Agency - Head Office	November 2016	Quarterly
Areas Benefiting from Flood Defences Environment Agency - Head Office	November 2016	Quarterly
Flood Water Storage Areas Environment Agency - Head Office	November 2016	Quarterly
Flood Defences Environment Agency - Head Office	November 2016	Quarterly
Detailed River Network Lines Environment Agency - Head Office	September 2014	Annually
Detailed River Network Offline Drainage Environment Agency - Head Office	March 2012	Annually
Surface Water 1 in 30 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water Suitability Environment Agency - Head Office	October 2013	As notified
BGS Groundwater Flooding Susceptibility British Geological Survey - National Geoscience Information Service	May 2013	Annually

Waste	Version	Update Cycle
BGS Recorded Landfill Sites		
British Geological Survey - National Geoscience Information Service	June 1996	Not Applicable
Integrated Pollution Control Registered Waste Sites		
Environment Agency - Thames Region	October 2008	Not Applicable
Licensed Waste Management Facilities (Landfill Boundaries)		
Environment Agency - Thames Region - North East Area	August 2016	Quarterly
Licensed Waste Management Facilities (Locations)		
Environment Agency - Thames Region - North East Area	October 2016	Quarterly
Local Authority Landfill Coverage		
London Borough of Barnet	May 2000	Not Applicable
London Borough of Brent - Environmental Health Department	May 2000	Not Applicable
London Borough of Camden	May 2000	Not Applicable
London Borough of Hackney	May 2000	Not Applicable
London Borough of Hammersmith And Fulham - Environmental Health Department	May 2000	Not Applicable
London Borough of Haringey - Planning Department	May 2000	Not Applicable
London Borough of Islington - Environmental Health Department	May 2000	Not Applicable
Royal Borough of Kensington And Chelsea	May 2000	Not Applicable
Westminster City Council - Environmental Health Department	May 2000	Not Applicable
Local Authority Recorded Landfill Sites		
London Borough of Barnet	May 2000	Not Applicable
London Borough of Brent - Environmental Health Department	May 2000	Not Applicable
London Borough of Camden	May 2000	Not Applicable
London Borough of Hackney	May 2000	Not Applicable
London Borough of Hammersmith And Fulham - Environmental Health Department	May 2000	Not Applicable
London Borough of Haringey - Planning Department	May 2000	Not Applicable
London Borough of Islington - Environmental Health Department	May 2000	Not Applicable
Royal Borough of Kensington And Chelsea	May 2000	Not Applicable
Westminster City Council - Environmental Health Department	May 2000	Not Applicable
Potentially Infilled Land (Non-Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Potentially Infilled Land (Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Registered Landfill Sites		
Environment Agency - Thames Region - North East Area	March 2003	Not Applicable
Registered Waste Transfer Sites		
Environment Agency - Thames Region - North East Area	March 2003	Not Applicable
Registered Waste Treatment or Disposal Sites		
Environment Agency - Thames Region - North East Area	June 2015	Not Applicable

Hazardous Substances	Version	Update Cycle
Control of Major Accident Hazards Sites (COMAH)		
Health and Safety Executive	July 2016	Bi-Annually
Explosive Sites		
Health and Safety Executive	September 2016	Bi-Annually
Notification of Installations Handling Hazardous Substances (NIHHS)		
Health and Safety Executive	November 2000	Not Applicable
Planning Hazardous Substance Enforcements		
London Borough of Barnet	February 2016	Annual Rolling Update
London Borough of Camden	February 2016	Annual Rolling Update
London Borough of Hackney	February 2016	Annual Rolling Update
London Borough of Haringey	February 2016	Annual Rolling Update
Royal Borough of Kensington And Chelsea	February 2016	Annual Rolling Update
Westminster City Council	February 2016	Annual Rolling Update
London Borough of Brent	January 2016	Annual Rolling Update
London Borough of Islington	October 2015	Annual Rolling Update
London Borough of Hammersmith And Fulham - Environmental Protection	September 2014	Annual Rolling Update
Planning Hazardous Substance Consents		
London Borough of Hammersmith And Fulham - Environmental Protection	August 2015	Annual Rolling Update
London Borough of Barnet	February 2016	Annual Rolling Update
London Borough of Camden	February 2016	Annual Rolling Update
London Borough of Hackney	February 2016	Annual Rolling Update
London Borough of Haringey	February 2016	Annual Rolling Update
Royal Borough of Kensington And Chelsea	February 2016	Annual Rolling Update
Westminster City Council	February 2016	Annual Rolling Update
London Borough of Brent	January 2016	Annual Rolling Update
London Borough of Islington	October 2015	Annual Rolling Update

Geological	Version	Update Cycle
BGS 1:625,000 Solid Geology British Geological Survey - National Geoscience Information Service	January 2009	Not Applicable
BGS Estimated Soil Chemistry British Geological Survey - National Geoscience Information Service	October 2015	As notified
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	October 2016	Bi-Annually
BGS Urban Soil Chemistry British Geological Survey - National Geoscience Information Service	October 2015	As notified
BGS Urban Soil Chemistry Averages British Geological Survey - National Geoscience Information Service	October 2015	As notified
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	As notified
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	Annually
Radon Potential - Radon Affected Areas British Geological Survey - National Geoscience Information Service	July 2011	As notified
Radon Potential - Radon Protection Measures British Geological Survey - National Geoscience Information Service	July 2011	As notified

Industrial Land Use	Version	Update Cycle
Contemporary Trade Directory Entries Thomson Directories	November 2016	Quarterly
Fuel Station Entries Catalist Ltd - Experian	November 2016	Quarterly
Gas Pipelines National Grid	July 2014	Quarterly
Points of Interest - Commercial Services PointX	December 2016	Quarterly
Points of Interest - Education and Health PointX	December 2016	Quarterly
Points of Interest - Manufacturing and Production PointX	December 2016	Quarterly
Points of Interest - Public Infrastructure PointX	December 2016	Quarterly
Points of Interest - Recreational and Environmental PointX	December 2016	Quarterly
Underground Electrical Cables National Grid	December 2015	Bi-Annually

Sensitive Land Use	Version	Update Cycle
Ancient Woodland Natural England	August 2016	Bi-Annually
Areas of Adopted Green Belt London Borough of Barnet London Borough of Haringey	November 2016 November 2016	As notified As notified
Areas of Unadopted Green Belt London Borough of Barnet London Borough of Haringey	November 2016 November 2016	As notified As notified
Areas of Outstanding Natural Beauty Natural England	January 2017	Bi-Annually
Environmentally Sensitive Areas Natural England	January 2017	Annually
Forest Parks Forestry Commission	April 1997	Not Applicable
Local Nature Reserves Natural England	January 2017	Bi-Annually
Marine Nature Reserves Natural England	January 2017	Bi-Annually
National Nature Reserves Natural England	January 2017	Bi-Annually
National Parks Natural England	August 2016	Bi-Annually
Nitrate Sensitive Areas Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	April 2016	Not Applicable
Nitrate Vulnerable Zones Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	October 2015	Annually
Ramsar Sites Natural England	January 2017	Bi-Annually
Sites of Special Scientific Interest Natural England	April 2016	Bi-Annually
Special Areas of Conservation Natural England	January 2017	Bi-Annually
Special Protection Areas Natural England	January 2017	Bi-Annually
World Heritage Sites English Heritage - National Monument Record Centre	September 2015	Bi-Annually

Data Suppliers

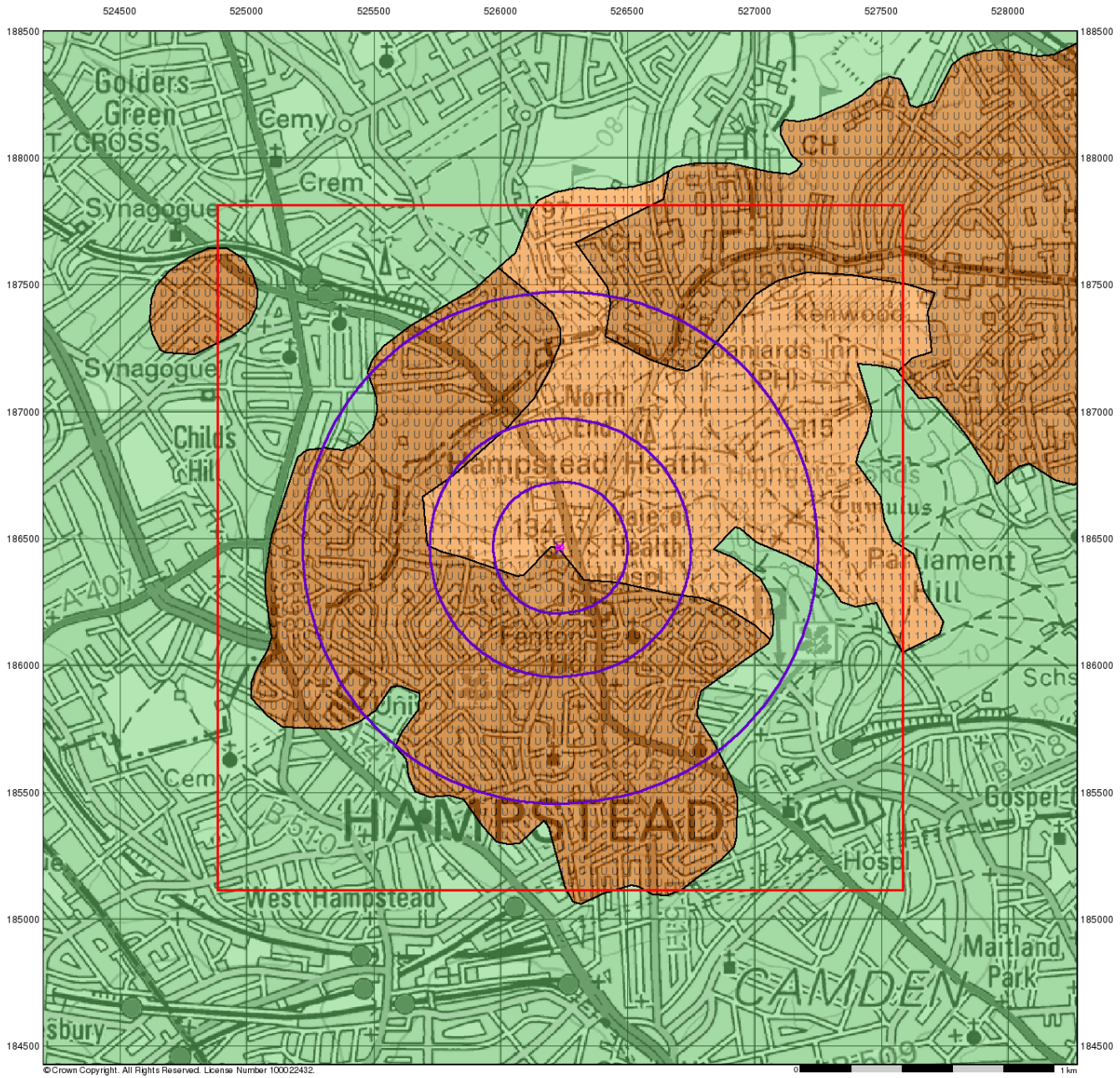
A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Scottish Environment Protection Agency	
The Coal Authority	
British Geological Survey	
Centre for Ecology and Hydrology	
Natural Resources Wales	
Scottish Natural Heritage	
Natural England	
Public Health England	
Ove Arup	
Peter Brett Associates	

Useful Contacts

Contact	Name and Address	Contact Details
2	**British Geological Survey - Enquiry Service** British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
3	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
4	**London Borough of Camden - Pollution Projects Team** Seventh Floor, Town Hall Extension, Argyle Street, London, WC1H 8EQ	Telephone: 020 7278 4444 Fax: 020 7860 5713 Website: www.camden.gov.uk
5	**London Borough of Camden** Town Hall, Judd Street, London, WC1H 9JE	Telephone: 020 7974 4444 Fax: 020 7974 6866 Email: info@camden.gov.uk Website: www.camden.gov.uk
6	**London Borough of Barnet - Land Charges** The Town Hall, The Burroughs, Hendon, LONDON, NW4 4BQ	Telephone: 0208 3592482 Fax: 0208 3592493 Website: www.barnet.gov.uk
7	**PointX** 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
8	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9966 Fax: 0844 844 9951 Email: helpdesk@landmark.co.uk Website: www.landmark.co.uk
9	**Natural England** County Hall, Spetchley Road, Worcester, WR5 2NP	Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk Website: www.naturalengland.org.uk
10	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



GEA Geotechnical & Environmental Associates

Groundwater Vulnerability

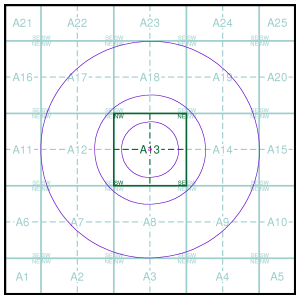
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes	Soil Classes
Major Aquifer (Highly Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Minor Aquifer (Variably Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Non Aquifer (Negligibly Permeable)	
Water or Sea	
Drift Deposit	

Site Sensitivity Context Map - Slice A

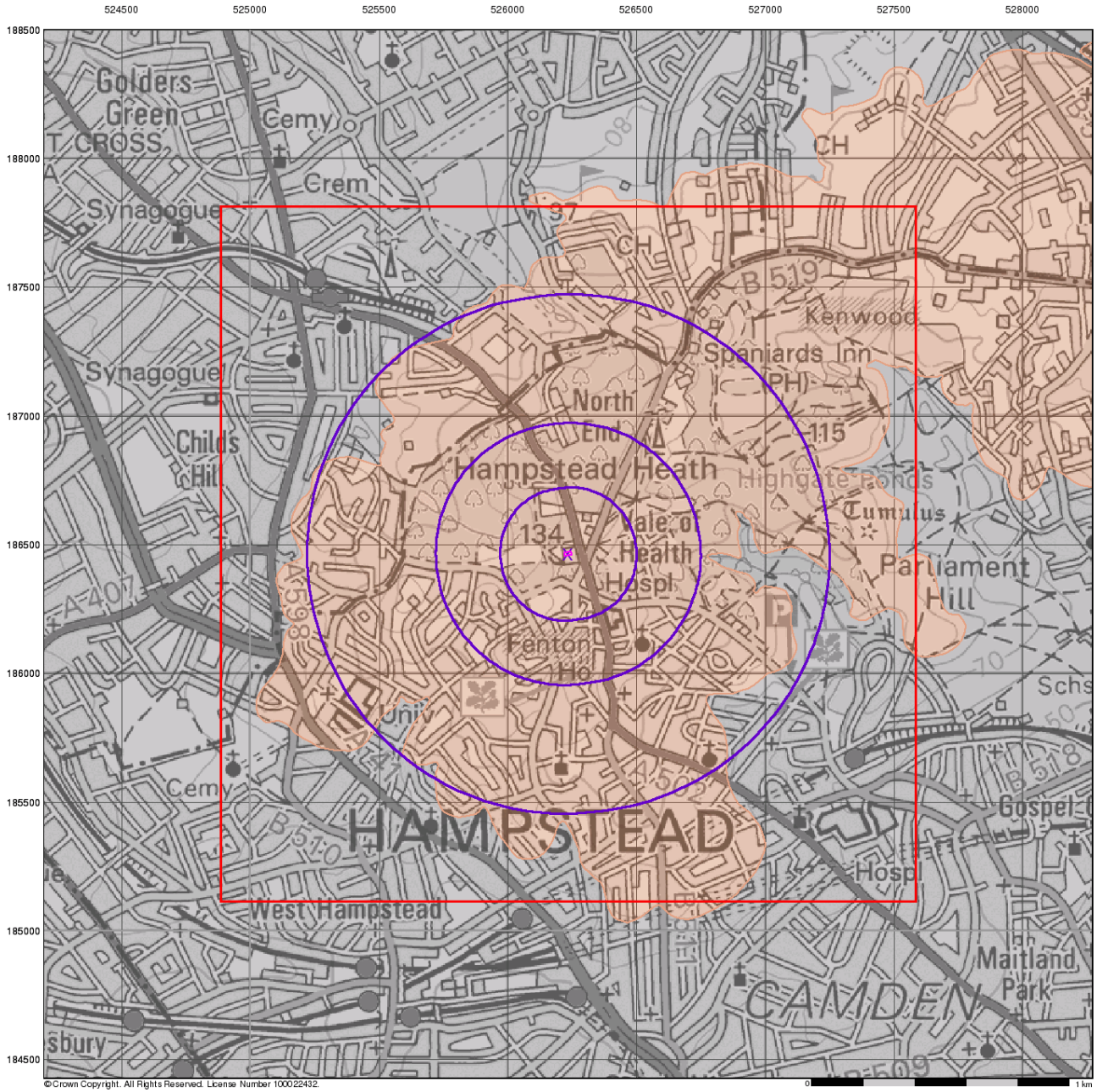


Order Details

Order Number:	113083364_1_1
Customer Ref:	J16284
National Grid Reference:	526230, 186460
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES



GEA Geotechnical & Environmental Associates

Bedrock Aquifer Designation

General

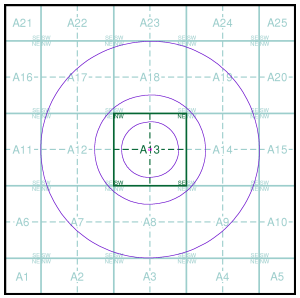
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

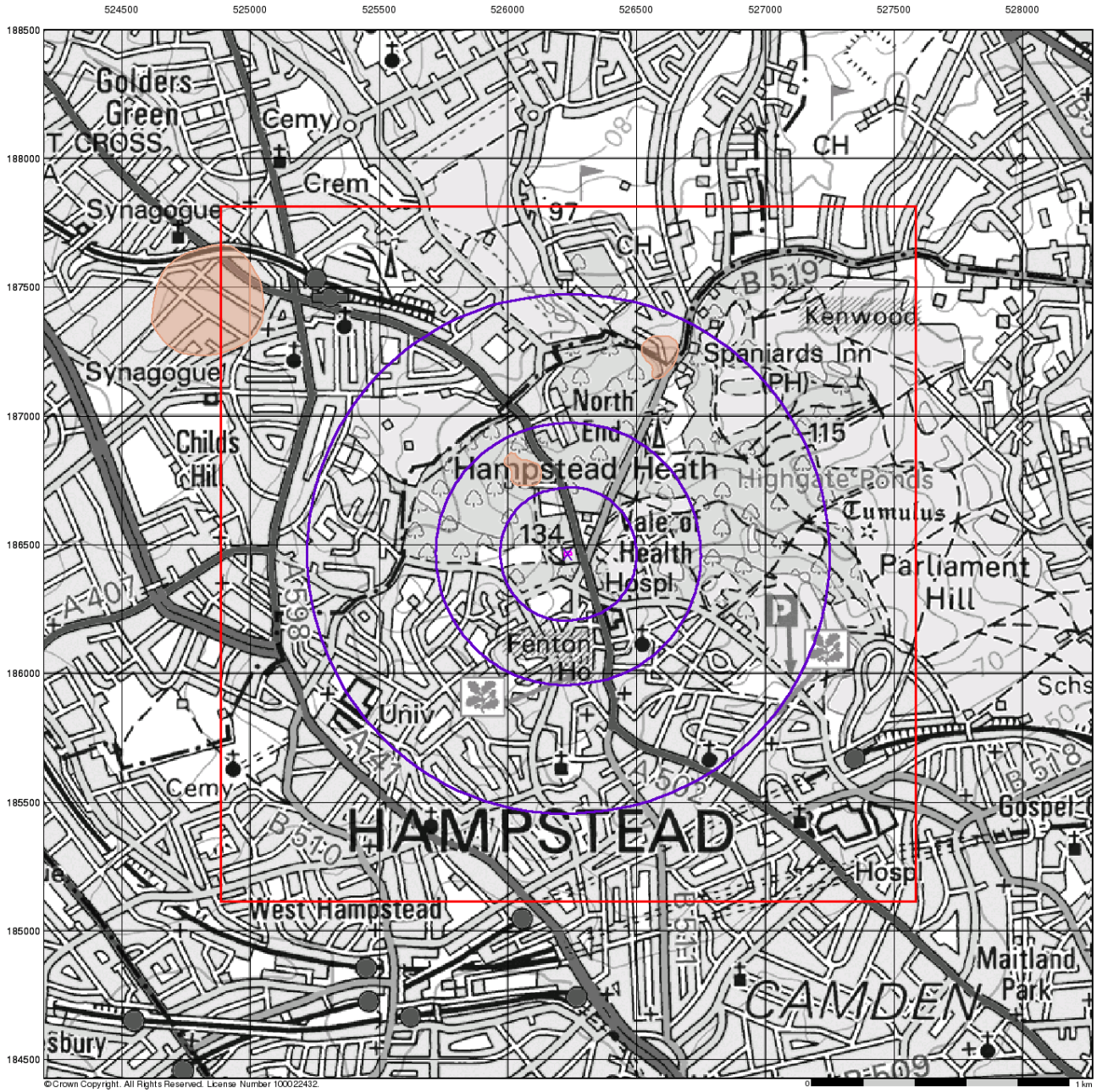


Order Details

Order Number:	113083364_1_1
Customer Ref:	J16284
National Grid Reference:	526230, 186460
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES



GEA Geotechnical & Environmental Associates

Superficial Aquifer Designation

General

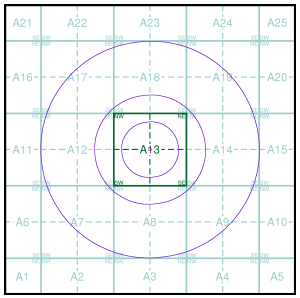
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

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National Grid Reference:	526230, 186460
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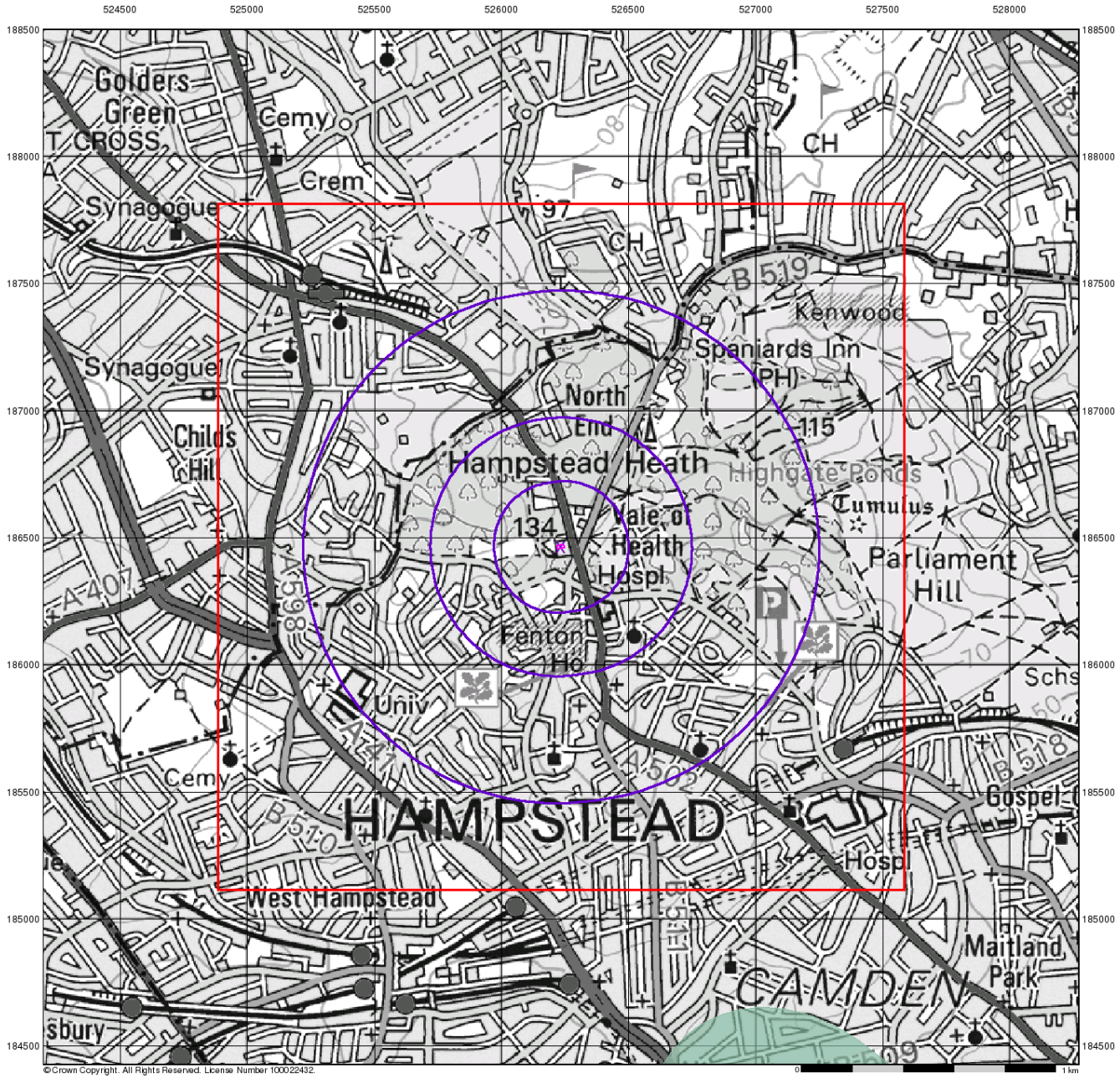
Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES



GEA Geotechnical & Environmental Associates

Source Protection Zones

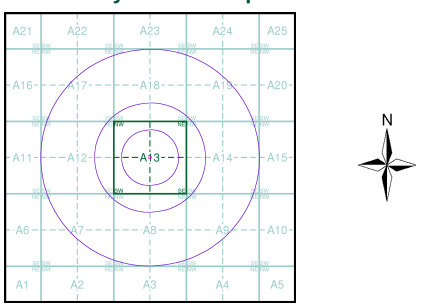
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)
- Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A



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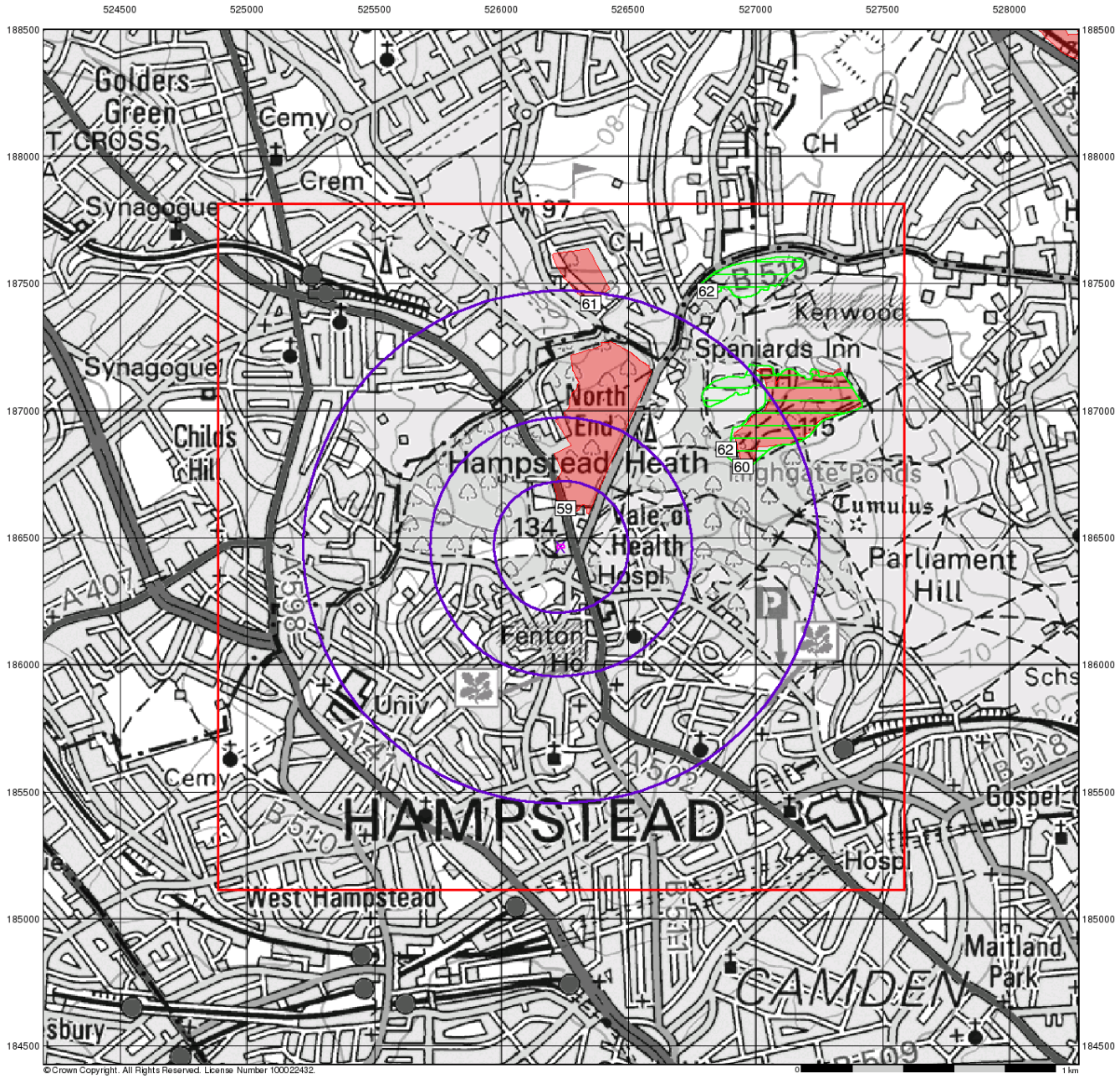
Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES



GEA Geotechnical & Environmental Associates

Sensitive Land Uses

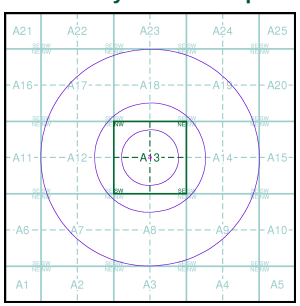
General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A

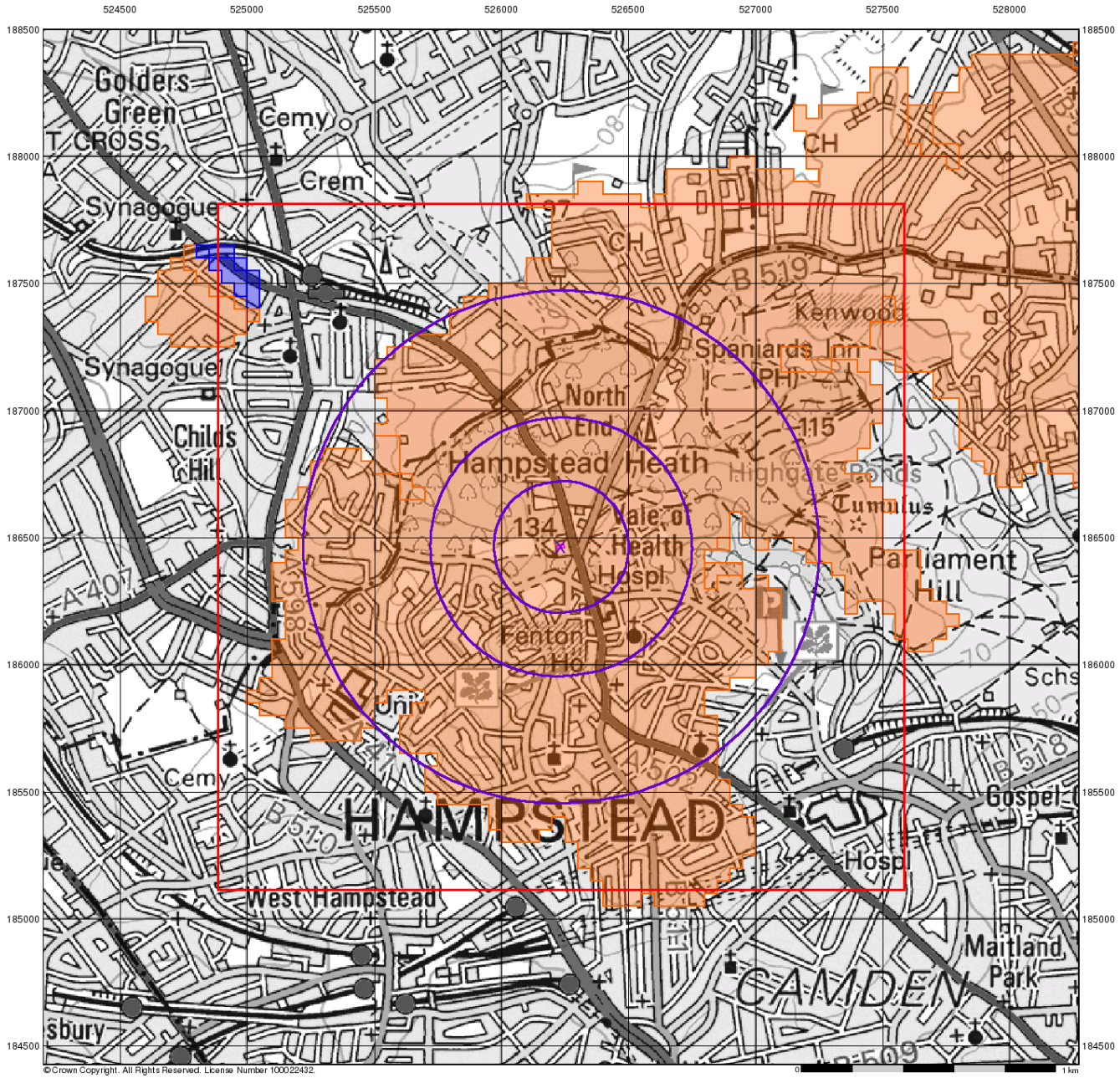


Order Details

Order Number:	113083364_1_1
Customer Ref:	J16284
National Grid Reference:	526230, 186460
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES



GEA Geotechnical & Environmental Associates

BGS Flood GFS Data

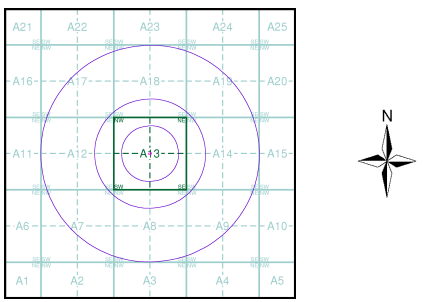
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

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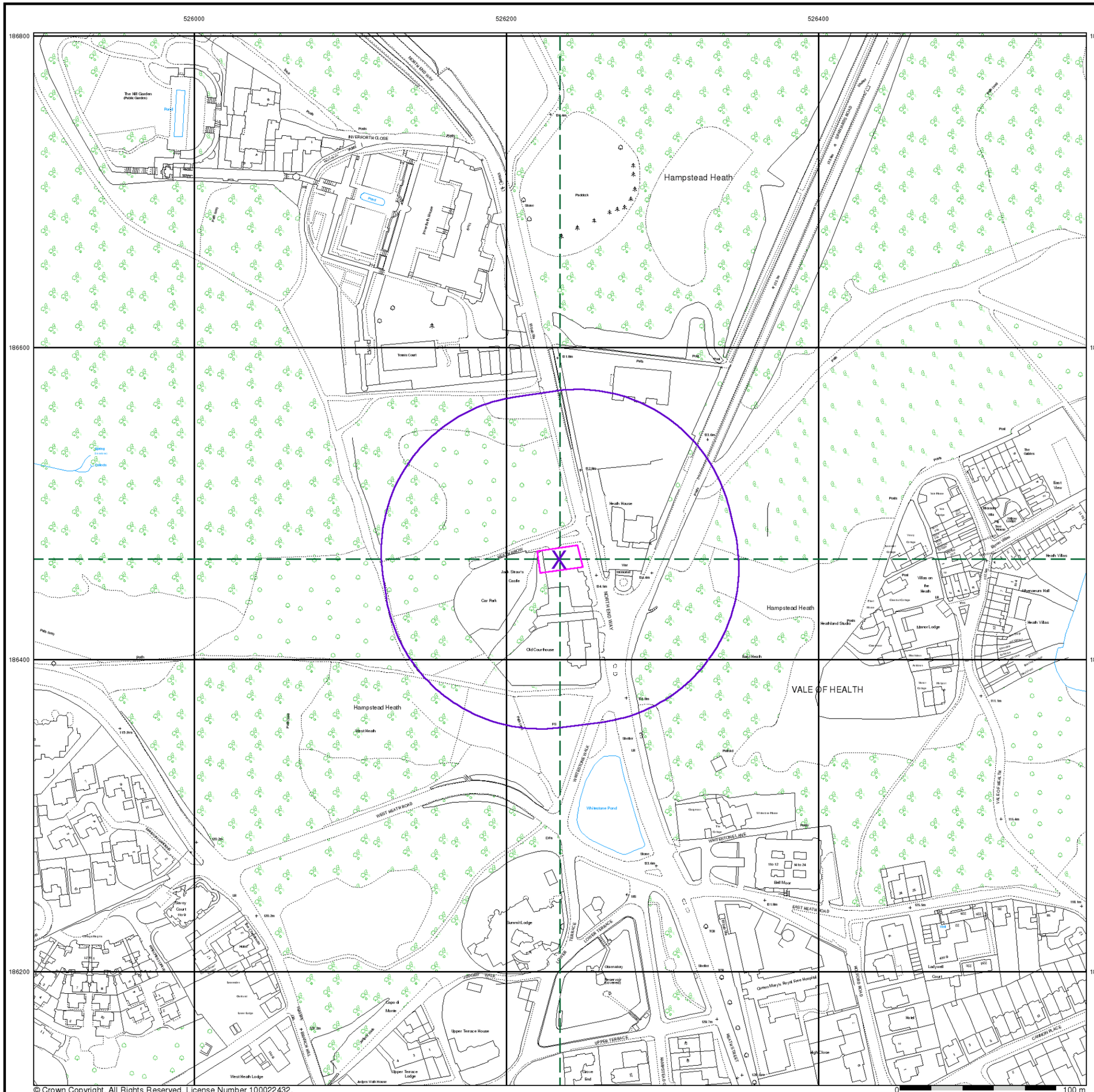
National Grid Reference:	526230, 186460
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES



GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

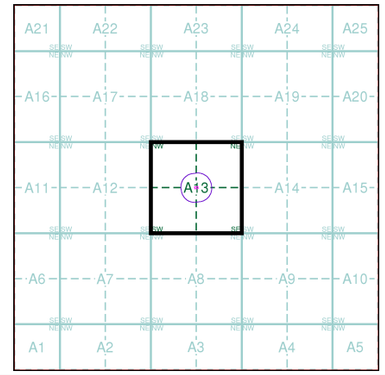
Geological

- BGS Recorded Mineral Site

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Segment A13



Order Details

Order Number:	113083364_1_1
Customer Ref:	J16284
National Grid Reference:	526230, 186460
Slice:	A
Site Area (Ha):	0.04
Plot Buffer (m):	100

Site Details

Jack Straws Castle, 12, North End Way, LONDON, NW3 7ES

Landmark INFORMATION GROUP

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