16 Pilgrim's Lane
London
NW3 1SN

Site Investigation &
Basement Impact Assessment

Mr Andrew Lavery

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Executive summary

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

Brief

This report describes the findings of a ground investigation, basement impact assessment and ground movement analysis carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Wolf Architects, on behalf of Mr Andrew Lavery, with respect to the extension of the existing lower ground floor level beneath the full footprint of the house, and the construction of a new rear extension and terrace, as part of alterations to the house. Formation level for the proposed lower ground floor level is understood to be approximately 3.60 m below the existing ground floor level. The purpose of the investigation has been to determine the ground conditions and hydrogeology, to assess the extent of any contamination and to provide information to assist with the design of suitable foundations. The report also includes information required to comply with London Borough of Camden Planning Guidance, with respect to the requirement for a Basement Impact Assessment (BIA).

Desk Study & BIA Findings

The earliest available Ordnance Survey (OS) map studied, dated 1875, shows the site within an area of landscaped gardens. The southwestern end of Pilgrims Lane had already been established by this time, along with much of the surrounding road network and residential properties to the south and east of the site, but the area to the north is shown as undeveloped, comprising open fields. By 1896, the area to the north of the site had been developed with the existing road network and residential properties, and the rest of Pilgrims Lane had been established, though at this time the north-eastern end of the road was named Worsley Road. The 1896 map also shows that the majority of the houses fronting onto what is now named Pilgrims Lane had already been constructed, with the exception of No 16 and the neighbouring properties to the southwest and northeast. This area remained undeveloped until between 1915 and 1934, when the existing property was constructed, and the neighbouring sites to the southwest and northeast were also similarly developed. Few significant changes have subsequently been made within the site and immediately surrounding area, but it is noted that the site is labelled as a surgery on the 1966 and 1970 OS maps.

A search of public registers and databases has revealed that there are no historic or existing landfill sites within 1 km of the site, and no records of potentially infilled land within 250 m.

Ground conditions

The investigation generally confirmed the expected ground conditions in that, below a limited to moderate thickness of made ground, London Clay was encountered to the maximum depth investigated, of 10.00 m. The made ground typically comprised brown sandy silty clay with frequent fine to coarse gravel sized fragments of brick, flint, mortar and occasionally charcoal, and generally extended to depths of between 0.40 m and 1.30 m, but at the location of Trial Pit No 2, made ground comprising greyish brown slightly sandy silty clay with occasional partings of reddish brown sand, and rare fine fragments of brick and flint was encountered to the base of the trial pit at a depth of 1.39 m. Beneath the front garden / amenity area within the northwest of the site, the London Clay comprised an initial horizon of soft becoming firm then stiff with depth, brown sandy silty clay, to a depth of 6.50 m, whereupon very stiff fissured dark grey silty sandy clay was encountered, to the maximum depth investigated of 10.00 m. Beneath the rear garden within the southeast of the site, the London Clay generally comprised soft becoming firm then stiff with depth fissured brown mottled grey silty clay with partings of sand and occasional selenite, and was recorded to the maximum depth investigated in this area, of 3.70 m.

A slight groundwater seepage was recorded in Borehole Nos 2 and 3 within the rear garden, at a depth of around 3.0 m, and perched water was encountered within one of the trial pits. Contamination testing has revealed the presence of elevated concentrations of arsenic, lead, a single PAH compound (naphthalene) and asbestos contamination within the made ground.

Recommendations

Formation level of the proposed lower ground floor will be within the stiff silty clay of the London Clay. Excavations for the proposed lower ground floor structure will require temporary support to maintain stability and to prevent any excessive ground movements. The proposed use of reinforced concrete underpinning to form the proposed lower ground floor and support the existing building should be suitable. Significant groundwater flows are not anticipated within the excavation, although localised inflows are likely to be encountered within the made ground, as well as from partings of silt and sand in the London Clay. Site workers should adopt suitable precautions when handling soil and areas of new soft landscaping will need to be formed with a clean cover system.

Basement Impact Assessment

The BIA has not indicated any concerns with regard to the effects of the proposed lower ground floor level on the site and surrounding area. It has been concluded that the impacts identified can be mitigated by appropriate design and standard construction practice.

Ground Movement Analysis Conclusions

The analysis has concluded that the predicted damage to the neighbouring properties from the construction of the proposed lower ground floor would be 'Negligible' to 'Very Slight'. On this basis, the damage that has been predicted to occur as a result of the construction the proposed lower ground floor falls within the limits acceptable to the London Borough of Camden, assuming that the careful control is taken during construction of the proposed excavations, and monitoring will be required to ensure that no excessive movements occur that would lead to damage in excess of these limits. The lower ground floor slab will need to be suspended, unless it can be suitably reinforced to cope with anticipated heave movements.

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.

1.0 Introduction

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Wolff Architects, on behalf of Mr Andrew Lavery, to carry out a desk study, ground investigation and ground movement analysis at 16 Pilgrims Lane, London NW3 1SN.

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.

1.1 Proposed Development

Proposed Section AA
1 : 100

It is understood that it is proposed to extend the existing lower ground floor level beneath the full footprint of the house, and construct a new rear extension and terrace, as part of alterations to the house. Formation level for the proposed lower ground floor level is understood to be approximately 3.60 m below the existing ground floor level, which is around 1.00 m below the existing lower ground floor level.

This report is specific to the proposed development and the advice herein should be reviewed if the development 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 encountering unexploded ordnance (UXO);
- to determine the ground conditions and their engineering properties;
- to use the above information to provide recommendations with respect to the design of suitable foundations and retaining walls;
- to assess the impact of the proposed lower ground floor 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 preliminary UXO risk assessment; and
- a walkover survey of the site carried out in conjunction with the fieldwork.

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

- a single borehole advanced to a depth of 10.00 m using a combination of rotary augering and percussive sampling techniques, with standard penetration tests (SPTs) carried out at regular intervals to provide quantitative data on the strength of the soils;
- two window sampler boreholes advanced to depths of 3.60 m and 3.70 m;
- three foundation inspection trial pits, hand excavated to depths of between 0.75 m and 1.40 m;
- installation of three gas and groundwater monitoring standpipes and two monitoring visits carried out to date;
- testing of selected soil samples for contamination and geotechnical purposes; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

This report includes a contaminated land assessment which has been undertaken by a suitably qualified and competent professional in accordance with the methodology presented by the Environment Agency in their Land contamination risk assessment (LCRM)[1] published 19 April 2021, This 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. Risk management is divided into three stages; Risk Assessment, Options Appraisal and Remediation, and each stage comprises three tiers. The Risk Assessment stage includes preliminary risk assessment (PRA), generic quantitative risk assessment (GQRA) and detailed quantitative risk assessment (DQRA) and this report includes the PRA and GQRA.

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). These assessments form part of the BIA procedure specified in the London Borough of Camden (LBC) Planning Guidance CPG[2] and their Guidance for Subterranean Development[3] prepared by Arup (the "Arup report") in accordance with Policy A5 of the Camden Local Plan 2017. 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 Nick Mannix, 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.

1 https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm
2 London Borough of Camden Planning Guidance CPG (January 2021) *Basements*
3 Ove Arup & Partners (2010) *Camden geological, hydrogeological and hydrological study. Guidance for Subterranean Development.* For London Borough of Camden November 2010

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

All assessors meet the qualification requirements of the Council guidance.

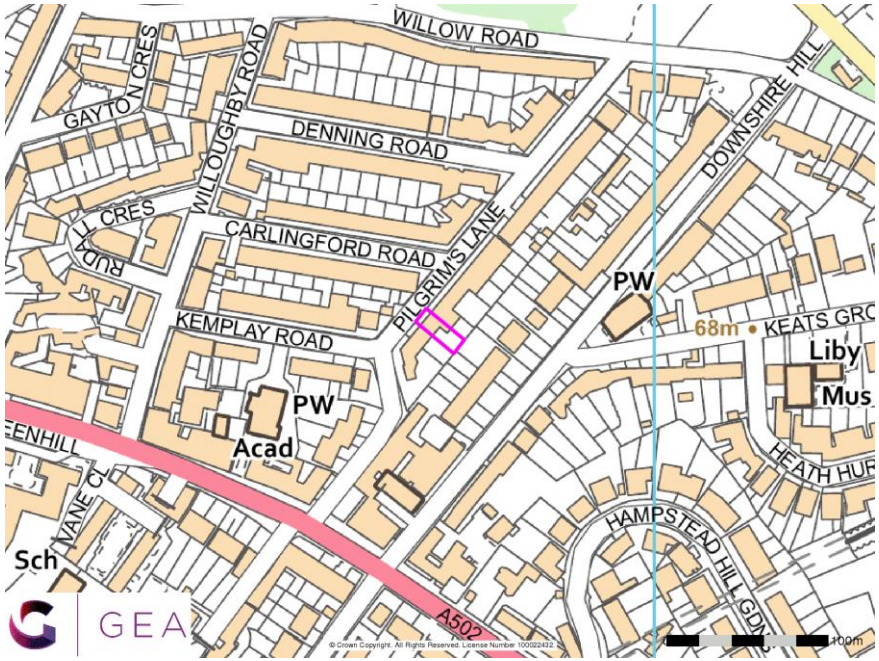
1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or ground water 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 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 Hampstead within the London Borough of Camden, approximately 470 m to the east of Hampstead London Underground station and 380 m west of Hampstead Heath railway station. It fronts onto Pilgrims Lane to the northwest, is bounded to the southeast by the rear gardens of properties on the northwest side of Downshire Hill, and by the adjoining Nos 14 and 18 Pilgrims Lane to the southwest and northeast respectively. The site may additionally be located by National Grid Reference 526850, 185660 and is shown on the map extract below.



A walkover of the site was carried out by a geotechnical engineer from GEA during the site work. It is rectangular in shape, measuring roughly 31.0 m northwest to southeast by 10.5 m northeast to southwest at its maximum extent. The site is occupied by 16 Pilgrims Lane, a split level two/three-storey house, with a paved front garden and soft landscaped

rear garden. The rear garden includes various shrubs and bushes, but the nearest mature and semi-mature trees are located within the adjoining rear gardens to the south and east. There is also a mature (Ash?) tree located within the adjoining Pilgrims Lane footway at the front of the property.

2.2 Site History

The earliest available Ordnance Survey (OS) map studied, dated 1875, shows the site within an area of landscaped gardens. The southwestern end of Pilgrims Lane had already been established by this time, along with much of the surrounding road network and residential properties to the south and east of the site, but the area to the north is shown as undeveloped, comprising open fields.

By 1896, the area to the north of the site had been developed with the existing road network and residential properties, and the rest of Pilgrims Lane had been established, though at this time the north-eastern end of the road was named Worsley Road. The 1896 map also shows that the majority of the houses fronting onto what is now named Pilgrims Lane had already been constructed, with the exception of No 16 and the neighbouring properties to the southwest and northeast. This area remained undeveloped until between 1915 and 1934, when the site was developed with the existing property, and the neighbouring sites to the southwest and northeast were also similarly developed.

Few significant changes have subsequently been made within the site and immediately surrounding area, but it is noted that the site is labelled as a surgery on the 1966 and 1970 OS maps.

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.

There are no historic or existing landfill sites within 1km of the site, and no records of potentially infilled land within 250 m of the site.

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

There are no recorded pollution incidents to controlled waters or local authority pollution prevention and control authorisations within 250 m of the site. The site is not located within a nitrate vulnerable zone or any other area of sensitive land use.

The nearest contemporary trade directory entry is located 79 m to the east of the site, and pertains to wallpapers & wall coverings. The status of this entry is recorded as inactive. No records were found relating to a surgery at No 16 Pilgrims Lane, despite the labels shown on the historic OS maps dated 1966 and 1970.

The site is not located in an area liable to flooding from rivers or the sea without defences, as defined by the Environment Agency.

2.4 Preliminary UXO Risk Assessment

A Preliminary UXO Risk Assessment report was completed by 1st Line Defence for the nearby site at No 12 Pilgrims Lane in 2021. The report concluded that the site would have been subject to regular access during the war, thus a low / minimal risk of encountering unexploded ordnance was identified, and no further action was recommended in this respect. Based on the proximity of No.12 to No.16, and the very similar site history, the same level of risk of encountering unexploded ordnance was applied to No.16, and no further action with respect to UXO was considered necessary.

2.5 Geology

The Geological Survey map of the area (BGS sheet 256) indicates that the site is located immediately to the east of the boundary between the Claygate Member, and the underlying London Clay Formation. The Bagshot Formation, which overlies the Claygate Member, is recorded at surface further upslope to the northwest of the site.

The geology in this area is generally horizontally bedded such that the boundary between the geological formations roughly follows the ground surface contour lines. 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 19.00 m (109.71 m OD) and penetrated the full thickness of the Claygate Member, which was found to extend to a depth of 35.00 m (93.71 m OD), below which the London Clay Formation was encountered.

According to the BGS memoir, the Claygate Member comprises alternating beds of clayey silt, very silty clay, sandy silt and glauconitic silty fine sand. The lower part of the Claygate Member is generally more bioturbated. A bed of calcareous concretions is present near the base in many places. The underlying London Clay Formation is homogenous, slightly calcareous silty clay to very silty clay, with some beds of clayey silt grading to silty fine-grained sand. The boundary between the Claygate Member and London Clay is transitional, and often difficult to distinguish.

GEA has previously carried out a ground investigation at 12 Pilgrims Lane in 2021, located approximately 10 m to the southwest of the site. The investigation generally encountered the expected ground conditions in that below a nominal thickness of made ground, London Clay was encountered to the maximum depth of the investigation, of 8.00 m. The made ground generally comprised brown sandy silty clay with frequent fine to coarse gravel sized fragments of brick flint and rare charcoal, and extended to depths of between 0.60 m and 2.00 m. Beneath the front garden, the London Clay comprised an initial horizon of stiff becoming firm with depth, slightly desiccated brown sandy silty clay, to a depth of 1.50 m in both Borehole Nos 1 and 2, whereupon firm becoming stiff with depth, fissured slightly sandy silty clay with frequent partings of sand and silt was encountered to a depth of 6.30 m in both boreholes. Below a depth of 6.30 m, Borehole Nos 1 and 2 both encountered stiff becoming very stiff with depth fissured brownish grey silty clay to the maximum depth investigated.

Within the rear garden of No 12, directly beneath the made ground, both Borehole Nos 3 and 4 generally encountered firm becoming stiff with depth fissured brown silty clay with partings of sand and silt and occasional selenite, which was proved to the base of the boreholes at depths of 4.00 m.

2.6 Hydrology and Hydrogeology

The Claygate Member is classified by the Environment Agency as a Secondary 'A' Aquifer, defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The Claygate Member is predominantly cohesive in nature and therefore groundwater flow is likely to be relatively slow, although horizons of sandier soils do occur in this stratum, resulting in the permeability ranging from "very low" to "high". The Claygate Member is only designated as a Secondary Aquifer because it contains sand horizons, which provide more permeable layers for the storage of groundwater. Where saturated and continuous sand beds are not present, the Claygate Member behaves hydraulically more like the underlying London Clay, exhibiting poor aquifer properties which accounts for the variable permeability described above. In this case it is not capable of storing and transmitting water in usable amounts and receives very low levels of annual recharge due to very low permeability.

Under the same classification system, the London Clay is designated as Unproductive Strata, which refers to deposits that have low permeability and negligible significance for water supply or river base flow. The London Clay is not capable of supporting a groundwater table, although pockets of perched groundwater do occur within fissures and silt and sand partings. Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1×10^{-10} m/s and 1×10^{-8} m/s, with an even lower vertical permeability.

To the northeast of the site (up topographic and hydraulic gradient), in Hampstead Heath and Parliament Hill, is a series of spring lines and ponds, which drain in a southerly direction down the valley, towards both the Highgate and Hampstead Ponds. The positions of these springs are likely to mark the boundary between the Bagshot Formation and the Claygate Member. The springs have been the source of a number of London's "lost" rivers, notably the Fleet, Westbourne and Tyburn. A tributary of the former River Fleet flowed around 330 m to the east of the site at its closest point, flowing southwards away from the site.

The nearest surface water feature is the Hampstead No 1 Pond, located 355 m to the northeast, and the site does not lie within any of the catchment areas of the Hampstead Heath pond chains. The site is not within an area shown by the Environment Agency to be at risk from flooding from rivers or the sea, and it is not shown on the EA surface water flood maps as being in an area with a potential risk from surface water flooding. It is also not within a Groundwater Source Protection Zone as defined by the Environment Agency.

An area of soft landscaping is present within the rear garden, but the site is predominantly covered by the existing building and areas of hardstanding. Infiltration rates are likely to be limited by the presence of the cohesive London Clay beneath the site, such that the majority of surface runoff is likely to drain into combined sewers in the road.

Although the new lower ground floor level will be entirely beneath the footprint of the existing property, the new rear extension and terrace area will result in a slight increase in the proportion of hard surfaced area, as they will replace a small section of the existing soft landscaping within the rear garden.

2.7 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. As part of the new regime local authorities are required to carry out inspections of their area to identify sites that may be contaminated. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of establishing one or more "pollution linkages"; a pollution linkage requires a source of contamination, a sensitive target or receptor that is at risk from the contamination and a pathway by which the contamination can travel from the source to the target.

A risk assessment should be carried out for consideration by the Local Planning Authority (LPA) before the planning application is determined. Where unacceptable risks are identified proposals will need to be made to address these risks as part of the development process. The guidance recognises the benefits of a phased approach, and the desk study is the first phase in the process of investigating and identifying contamination to assist in the determination of a planning application.

Source

The desk study findings indicate that the site does not have a potentially contaminative history as it has apparently been developed with the existing house since some time between 1915 and 1935.

The site is labelled as a surgery on the 1966 and 1970 OS maps. The exact nature of this surgery is unknown, but given its location within a residential area, it is not considered to represent a potential source of contamination.

No potential sources of ground gas have been identified.

Receptor

The site will continue to have a residential end use, such that end users will represent high sensitivity receptors, as at present. 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 during construction works.

Perched water may be present in the made ground, particularly in the vicinity of existing foundations, although such pockets of water are likely to be localised and unlikely to form part of a general water table, thus shallow groundwater is not considered to represent a sensitive receptor. The presence of the London Clay beneath the site means that the chalk aquifer at depth represents a relatively low sensitivity receptor.

Pathway

Within the site, end users will be isolated from direct contact with any contaminants present within the made ground by the new building and surrounding hard surfacing, such that a pathway whereby end users could come into direct contact with potentially contaminated soils will not exist in these areas. Only in areas of soft landscaping will end users potentially come into contact with contaminants, though such pathways are already in existence.

Any soluble contaminants within the made ground could potentially migrate onto adjacent sites as a result of infiltration of surface run-off, although this pathway is also already in existence. The London Clay Formation is classed as Unproductive Strata, thus will protect the underlying aquifers from downward percolation of contaminants in groundwater.

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 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.

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.

3.0 Screening and Scoping Assessment

The Camden guidance suggests that any development proposal that includes a basement should be screened to determine whether a full BIA is required. A number of screening tools are included in the Arup report 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.

3.1 Subterranean (Groundwater) Screening Assessment

Question	Response for 16 Pilgrims Lane
1a. Is the site located directly above an aquifer?	No. The underlying London Clay is classified as an Unproductive Stratum.
1b. Will the proposed basement extend beneath the water table surface?	No. The London Clay is classified as an unproductive stratum and cannot support a continuous water table although isolated pockets of perched groundwater can occur within fissures and silt and sand partings.
2. Is the site within 100 m of a watercourse, well (used/ disused) or potential spring line?	No. There are no local ponds, wells, watercourses or spring lines within 100 m
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Figure 14 of the Arup report confirms that the site is not located within these catchment areas.
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	*Yes. The new rear extension and terrace area will result in a slight increase in the proportion of hard surfaced area, as they will replace a small section of the existing soft landscaping within the rear garden.*
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 London Clay is not considered suitable for the use of soakaways, and as a result provision will need to be made for surface water drainage through the existing infrastructure.
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than, the mean water level in any local pond or spring line?	No. There are no local ponds or spring lines.

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

Q4 The proposed development will result in a slight increase in the proportion of hard surfaced areas

3.2 Land Stability Screening Assessment

Question	Response for 16 Pilgrims Lane
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No. The site will not be significantly re-profiled as part of the development.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No. As indicated on the Slope Angle Map Fig 16 of the Arup report.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No. Reference to Figure 16 of the Arup report indicates that the site is not in an area where slopes are generally greater than 7˚.
5. Is the London Clay the shallowest strata at the site?	*Yes. As indicated on the geological map and Figures 3 and 5 of the Arup report, at least part of the site is underlain by the London Clay.*
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?	*Yes. Based on Marcus Foster Ltd's 'Tree Protection Plan' (Drg ref: AIA/MF/0193/22 T003, dated December 2022), a small section of the proposed rear extension will extend into the Root Protection Area (RPA) of a nearby tree.*
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	*Yes. The area is prone to these effects as a result of the presence of shrinkable London Clay.*
8. Is the site within 100 m of a watercourse or potential spring line?	No. There are no watercourses or potential spring lines within 100 m of the site.
9. Is the site within an area of previously worked ground?	No. Not according to BGS mapping and Figure 3 of the Arup report.
10a. Is the site within an aquifer?	No. The underlying London Clay is classified as an Unproductive Stratum.
10b. Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No. The London Clay is classified as an unproductive stratum and cannot support a continuous water table although isolated pockets of perched groundwater can occur within fissures and silt and sand partings.

Question	Response for 16 Pilgrims Lane
11. Is the site within 50 m of Hampstead Heath ponds?	No. Figure 14 of the Arup report confirms that the site is not located within this catchment area.
12. Is the site within 5 m of a highway or pedestrian right of way?	*Yes. The development is bounded to the northwest by Pilgrims Lane.*
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	*Yes. The proposed lower ground floor will require deeper foundations, such that the development will increase the foundation depths relative to the neighbouring properties.*
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No. An online search for London Underground Tunnels and railway tunnels did not indicate any in the proximity of the site. This is confirmed with reference to ARUPs Transport Infrastructure map, Figure 18. Thames Water has been contacted and their plans indicate no deep sewers or tunnels under or in close proximity of the site.

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

Q5. The London Clay is the shallowest strata across much of the site.
Q6 Part of the proposed development will extend into the RPA of a nearby tree.
Q7. The site is in an area likely to be affected by seasonal shrink-swell.
Q12. The development is within 5 m of Pilgrims Lane.
Q13. The lower ground floor will increase the foundation depths relative to the neighbouring properties.

3.3 Surface Flow and Flooding Screening Assessment

Question	Response for 16 Pilgrims Lane
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No. Figure 14 of Arup report confirms that the site is not located within this catchment area.
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No. Any additional surface water from the increase in hardstanding area will be attenuated and discharged into the Thames Water sewers to ensure the surface water flow regime will be unchanged. The new lower ground floor level will be beneath the footprint of the building, therefore the 1 m distance between the roof of the basement and ground surface as recommended by the Arup report and para 3.2 of the CPG (2021) does not apply across these areas.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	*Yes. The new rear extension and terrace area will result in a slight increase in the proportion of hard surfaced area, as they will replace a small section of the existing soft landscaping within the rear garden.*
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. Any additional surface water from the increase in hardstanding area will be attenuated and discharged into the Thames Water sewers to ensure the surface water flow regime will be unchanged. The lower ground floor will be beneath the footprint of the building, therefore the 1 m distance between the roof of the lower ground floor and ground surface as recommended by the Arup report and para 3.2 of the CPG (2021) does not apply across these areas.
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 lower ground floor 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 the same.
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk of flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	No. The findings of this BIA together with the Camden Flood Risk Management Strategy dated 2013 and Figures 3iii, 4e, 5a and 5b of the SFRA dated 2014, in addition to the Environment Agency online flood maps show that the site has a very low flooding risk from surface water, sewers, reservoirs (and other artificial sources), groundwater and fluvial/tidal watercourses. It is possible that the lower ground floor will be constructed within pockets of perched water and the recommendations outlined in the BIA with regards to water-proofing and tanking of the lower ground floor will reduce the risk to acceptable levels. In accordance with paragraph 5.11 of the CPG, a positive pumped device will be installed in the lower ground floor in order to further protect the site from sewer flooding.

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

Q3 The proposed development will result in a slight increase in the proportion of hard surfaced areas.

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
London Clay is the shallowest strata at the site. There is a moderate potential of seasonal shrink-swell subsidence in the local area	The London Clay is prone to seasonal shrink-swell (subsidence and heave). If a new basement is not dug to below the depth likely to be affected by tree roots this could lead to damaging differential movement between the subject site and adjoining properties.
The site is within 5 m of a highway or pedestrian right of way.	Excavation of a basement may result in structural damage to the road or footway.
Part of the proposed development will extend into the Root Protection Area (RPA) of a nearby tree	Excavations within the RPA could cause damage to the tree if not carried out carefully.
The proposed development will result in an increase in differential depth relative to neighbouring properties.	The stability of all surrounding structures will need to be ensured at all times. An analysis of the predicted ground movements will be completed once the scheme is finalised, to assess the impact on neighbouring buildings.
A change in the in proportion of hard surfaced or paved areas of a property will affect the way in which rainfall and surface water are transmitted away from a property.	Changes to the surface water received by the adjacent properties and nearby watercourses. The sealing off of the ground surface by pavements and buildings to rainfall may result in decreased recharge to the underlying ground.

These potential impacts have been investigated through the site investigation, as detailed in Section 13.0.

4.2 Exploratory Work

In order to meet the objectives described in Section 1.2, a single borehole was advanced to a depth of 10.00 m using a combination of rotary augering and percussive sampling techniques, and two window sampler boreholes were advanced to depths of 3.60 m and 3.70 m. Three trial pits were also manually excavated to provide access to the foundations of the existing structures on the site.

During boring, undisturbed and disturbed samples were obtained from the boreholes for subsequent laboratory examination and testing. Standard Penetration Tests (SPTs) were also carried out at regular intervals in the rotary augered boreholes to provide additional quantitative data on the strength of soils encountered.

Gas and groundwater monitoring standpipes were installed in three of the boreholes, to a maximum depth of 6.00 m, which have been subsequently monitored on two occasions to date.

A selection of disturbed and undisturbed 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.

The above work was carried out under the supervision of a geotechnical engineer from GEA. The borehole and trial pit records are appended, together with the results of the laboratory testing and a site plan indicating the borehole and trial pit locations. The levels on the borehole and trial pit records have been interpolated from the floor levels shown on Wolf Architects' 'Proposed Section AA' (drawing ref: 2219-PL-310, dated November 2021), which are understood to be relative to Ordnance Datum (OD).

4.3 Sampling Strategy

The general borehole and trial pit positions were agreed with the client and consulting engineers and positioned on site by GEA with due regard to the proposed development, whilst avoiding areas of known services.

A total of four samples of the shallow soil were subjected for analysis for a range of common industrial contaminants and contamination indicative parameters. For this investigation, the analytical suite for the soil included a range of metals, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The same six samples were also screened for asbestos. The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

5.0 Ground Conditions

The investigation generally encountered the expected ground conditions, in that beneath a generally limited to moderate thickness of made ground, the London Clay Formation was encountered, and proved to the full depth of the investigation, of 10.00 m (72.65 m OD).

5.1 Made Ground

The made ground typically comprised brown sandy silty clay with frequent fine to coarse gravel sized fragments of brick flint mortar and rare charcoal, and generally extended to depths of between 0.40 m and 1.30 m. In Trial Pit No 2 only, made ground comprising greyish brown slightly sandy silty clay with occasional partings of reddish brown sand, and rare fine fragments of brick and flint was recorded to the base of the trial pit, at a depth of 1.39 m.

Apart from the presence of fragments of extraneous material noted above, no other visual or olfactory evidence of contamination was observed during the fieldwork. Four samples of the made ground have however been analysed for a range of contaminants as a precautionary measure, and the same four samples of the made ground have also been screened for the presence of asbestos, the results of which are detailed within Section 5.4.

5.2 London Clay

Beneath the front garden / amenity area within the northwest of the site, the London Clay comprised an initial horizon of soft becoming firm then stiff with depth, brown sandy silty clay, to a depth of 6.50 m, whereupon very stiff fissured dark grey silty sandy clay was encountered, and recorded to the maximum depth investigated.

Beneath the rear garden in the southeast, directly beneath the made ground, both Borehole Nos 2 and 3 generally encountered soft becoming firm then stiff with depth fissured brown mottled grey silty clay with partings of sand and occasional selenite, which was proved to the base of the boreholes at depths of 3.70 m and 3.60 m.

Laboratory plasticity index tests indicate the clay to generally be of high to very high plasticity and high volume change potential. The results of the undrained triaxial tests indicate the clay to be of medium strength, becoming high then very high strength with depth.

5.3 Groundwater

A slight groundwater seepage was recorded in Borehole Nos 2 and 3 within the rear garden, at a depth of around 3.0 m, and perched water was encountered within one of trial pits excavated alongside the rear of the property. Two return monitoring visit has been carried out to date, the results of which are presented in the table below.

Date	Borehole No	Depth to water (m) [Level (m OD)]
06/01/2023	1	1.65 (81.00)
	2	0.34 (79.66)
	3	0.37 (79.63)
02/02/2023	1	2.24 (80.41)
	2	0.64 (79.36)
	3	0.70 (79.30)

5.4 Soil Contamination

The table below sets out the values measured within the four samples analysed and the generic risk based screening values for a residential end use with plant uptake; all concentrations are in mg/kg unless otherwise stated.

Determinant	BH1 0.40 m	BH2 0.30 m	BH3 0.30 m	TP2 0.80 m
pH	7.3	7.6	8.3	10.6
Arsenic	26	25	**38**	26
Cadmium	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	37	37	33	23
Lead	**340**	**710**	**880**	34
Mercury	0.6	0.9	1.5	< 0.3
Selenium	< 1.0	< 1.0	< 1.0	< 1.0
Copper	42	77	120	17
Nickel	28	29	35	13
Zinc	140	370	380	79
Total Cyanide	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	< 1.0	< 1.0	< 1.0	< 1.0
Total PAH	16.3	22.1	19.2	12.9
Sulphide	3.7	< 1.0	5.1	< 1.0
Benzo(b)fluoranthene	1.7	2.1	1.6	1.6
Benzo(a)pyrene	1.4	1.7	1.4	1.3
Dibenz(a,h)anthracene	0.18	0.17	0.14	0.15
Naphthalene	0.1	**4.1**	**4.4**	1.9
TPH	< 10	28	47	41
Total Organic Carbon %	1.1	2.8	2.9	1.9

In addition, the same four sample of the made ground, have been screened for the presence of asbestos and the results are shown in the table below.

BH/TP ref	Sample depth (m)	Asbestos detected	Quantification; total asbestos in sample (%)
BH1	0.40	None	-
BH2	0.30	None	-
BH3	0.30	None	-
TP2	0.80	**Chrysotile**	< 0.001

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. Contaminants of concern are those that have values in excess of generic human health risk-based guideline values, which are either the CLEA[4] Soil Guideline Values where available, the Suitable 4 Use Values[5] (S4UL) produced by LQM/CIEH calculated using the CLEA UK Version 1.07[6] software, or the DEFRA Category 4 Screening values[7], assuming a residential end use with 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 young female children aged less than six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of homegrown produce, consumption of soil adhering to home grown produce, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a two-storey terraced house.

It is considered that these assumptions are suitable for this generic first 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;
- 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 table below indicates contaminants of concern and the locations of the samples where the elevated concentrations were measured.

Contaminant of Concern	Maximum concentration recorded (mg/kg)	Generic Risk-Based Screening Value	Location of elevated concentrations
Arsenic	38	37	BH3
Lead	880	200	BH1, BH2 & BH3
Naphthalene	4.4	2.3	BH2 & BH3
Asbestos (Chrysotile)	<0.001%	N/A	TP2

In addition, all samples of the made ground have been screened for the presence of asbestos. Only one of the samples was found to contain asbestos, in the form of Chrysotile, at a concentration of < 0.001 %. The significance of these results is considered further in Part 2 of the report.

4 *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.
5 *The LQM/CIEH S4Uls for Human Health Risk Assessment* S4UL3065 November 2014
6 Contaminated Land Exposure Assessment (CL|EA) Software Version 1.071 Environment Agency 2015
7 CL:AIRE (2013) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Final Project Report SP1010 and DEFRA (2014) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Policy Companion Document SP1010

5.5 Existing Foundations

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

Trial Pit No	Structure	Foundation detail	Bearing Stratum
1	Rear wall of rear projection	Brickwork over concrete strip / trench fill foundation Top: 0.20 m Base: 0.66 m Lateral projection: 120 mm	UNKNOWN (perched water in trial pit preventing detailed examination)
2	Flank wall of 18 Pilgrims Lane	Base of foundation not found within 1.39 m depth of pit.	UNKNOWN.
3	Front Wall	Brickwork over concrete strip / trench fill foundation Top: 0.44 m Base: 0.79 m Lateral projection: 180 mm	Brown mottled grey silty CLAY with blue grey veining and occasional roots (< 3 mm)

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 the proposed development.

6.0 Introduction

It is understood that it is proposed to extend the existing lower ground floor level beneath the full footprint of the house, and construct a new rear extension and terrace, as part of alterations to the house. Formation level for the proposed lower ground floor level is understood to be approximately 3.60 m below the existing ground floor level, which is around 1.00 m below the existing lower ground floor level, at roughly 79.00 m above Ordnance Datum (OD).

Proposed Section AA
1 : 100

7.0 Ground Model

The desk study findings indicate that the site does not have a potentially contaminative history as it has apparently been developed with the existing house since some time between 1915 and 1935. On the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- beneath a limited to moderate thickness of made ground, the London Clay Formation is present, and extends to the maximum depth investigated, of 10.00 m (72.65 m OD);
- the made ground typically comprises brown sandy silty clay with frequent fine to coarse gravel sized fragments of brick flint mortar and rare charcoal, and generally extended to depths of between 0.40 m and 1.30 m;
- at the location of Trial Pit No 2, made ground comprising greyish brown slightly sandy silty clay with occasional partings of reddish brown sand, and rare fine fragments of brick and flint is present, to the base of the trial pit at a depth of 1.39 m;
- beneath the front garden / amenity area within the northwest of the site, the London Clay comprises an initial horizon of soft becoming firm then stiff with depth, brown sandy silty clay, to a depth of 6.50 m, whereupon very stiff fissured dark grey silty sandy clay is present, to the maximum depth investigated of 10.00 m;
- beneath the rear garden within the southeast of the site, the London Clay generally consist of soft becoming firm then stiff with depth fissured brown mottled grey silty clay with partings of sand and occasional selenite, to the maximum depth investigated in this area, of 3.70 m;
- a slight groundwater seepage was recorded in Borehole Nos 2 and 3 within the rear garden, at a depth of around 3.0 m, and perched water was encountered within one of the trial pits. Groundwater has been measured at a shallowest depth of 0.34 m during the two groundwater monitoring visits completed to date; and
- contamination testing has revealed the presence of elevated concentrations of arsenic, lead, a single PAH compound (naphthalene) and asbestos contamination within the made ground;

8.0 Advice & Recommendations

Excavations for the proposed lower ground floor will require temporary support to maintain stability and to prevent any excessive ground movements.

Formation level for the proposed lower ground floor will be within the London Clay at a depth of around 3.60 m below the existing ground floor level, which is around 1.00 m below the existing lower ground floor level, at roughly 79.00 m OD.

The proposed use of reinforced concrete underpinning to form the proposed lower ground floor and support the existing building should be suitable. Perched water is likely be encountered within the made ground, but significant groundwater inflows during the excavation are not anticipated.

8.1 Lower Ground Floor Construction

The formation level of the proposed lower ground floor level is anticipated to extend to a depth of approximately 3.60 m below the existing ground floor level, at roughly 79.00 m OD. Formation level is therefore expected to be within the stiff clays of the London Clay. Within the footprint of the existing lower ground floor level at the rear of the property, an excavation depth of around 1.00 m is anticipated to be required, to reach the proposed formation level.

A slight groundwater seepage was recorded in Borehole Nos 2 and 3, at a depth around 2.00 m below the proposed formation level, and prolonged inflows are not generally encountered within the London Clay, as they are generally attributable to localised partings of silt and sand and are therefore of limited volume. Shallow inflows of perched water may be encountered from within the made ground, particularly within the vicinity of existing foundations, and were encountered within one of the trial pits during the investigation. Ideally a number of trial excavations should be carried out, to depths as close to the full lower ground floor depth as possible, to provide an indication of stability and the extent to which the excavation may be affected by groundwater inflows.

Due to the cohesive nature of the London Clay, it is likely that the rate of any inflow will be relatively slow, such that any potential inflows are unlikely to be significant and should be adequately dealt with through sump pumping. The selected contractor should have a contingency plan in place to deal with more significant or prolonger inflows as a precautionary measure if a watertight retention scheme is not adopted.

The design of lower ground floor support in the temporary and permanent conditions needs to take account of the necessity to maintain the stability of the excavation and the surrounding structures and to protect against potential groundwater inflows. There are a number of methods by which the sides of the lower ground floor excavation could be supported in the temporary and permanent conditions. The choice of wall may be governed to a large extent by whether it is to be incorporated into the permanent works and have a load bearing function.

Provided that groundwater inflows can be controlled it should be possible to form the retaining walls by means of concrete underpinning using a traditional ‘hit and miss’ approach. Careful workmanship will be required to ensure that movement of the surrounding structures is restricted but this method will have the benefit of minimising the plant required and maximising usable space in the new lower ground floor. Consideration should be given to the stability of excavations to form the underpins and the contractor should have measures in place to deal with groundwater inflows such as sump pumping or localised grouting.

Alternatively, for the ground conditions at this site a bored pile wall could be utilised to support the lower ground floor excavation and could be incorporated into the permanent works to provide support for structural loads. In view of the limited potential for groundwater inflows a contiguous bored pile wall may be adopted.

The ground movements associated with the lower ground floor excavation will depend on the method of excavation and support and the overall stiffness of the lower ground floor 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. Consideration will also need to be given to a retention system that maintains the stability at all times of the existing building, neighbouring properties and structures. The existing foundations will need to be underpinned prior to excavation of the lower ground floor or will need to be supported by new retaining walls. A Ground Movement Analysis has been carried out and is presented in Part 3 below.

8.1.1 lower Ground Floor 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	27
London Clay	1950	Zero	23

On the basis of the groundwater observations made to date and low permeability of the London Clay, significant groundwater inflows are unlikely to be encountered within the proposed excavations. However, consideration will need to be given to the risk of surface water building up behind the retaining walls and unless adequate drainage can be incorporated to prevent such build-up, it is recommended that the lower ground floor is designed with a water level assumed to be 1.0 m below ground level.

The advice in BS8102:2009[8] should be followed in this respect and with regard to the provision of suitable waterproofing.

8.1.2 Lower Ground Floor Heave

The anticipated excavation depth of around 3.60 m will result in a net unloading of around 68 kN/m^2, resulting in heave of the underlying London Clay. This will comprise immediate elastic movement, which will account for approximately 40 % of the total movement and be expected to be complete during the construction period, and long-term movements, which will theoretically take many years to complete. These movements will, to some extent, be mitigated by the loads applied by the proposed development, and are considered in more detail in Part 3 of this report.

Within the footprint of the existing lower ground floor level at the rear of the property, an excavation depth of around 1.00 m is anticipated, which will result in a slight net unloading of around 19 kN/m^2, and differential heave of the underlying London Clay.

Further consideration is given to ground movements in Part 3.0 of this report.

8.2 Spread Foundations

Spread foundations bearing beneath the proposed lower ground floor level in the stiff silty clay of the London Clay may be designed to apply a net allowable bearing pressure of 125 kN/m^2. This value incorporates an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

The intrusive investigation did not find evidence of desiccation on site, and the depth of the lower ground floor excavation is such that foundations will be placed below the likely depth of any potential desiccation. However, it would be prudent to have the formation level inspected for signs of tree root growth.

8.3 Shallow Excavations

On the basis of the borehole findings, it is considered that it will be generally feasible to form relatively shallow excavations terminating within the made ground or London Clay without the requirement for lateral support, although localised instabilities are likely to occur if more granular material or groundwater is encountered.

Significant inflows of groundwater into shallow excavations are not generally anticipated, although seepages are likely be encountered from perched water tables within the made ground, particularly within the vicinity of existing foundations, although such inflows should be suitably controlled by sump pumping. Rising head tests could be carried out on the existing standpipes to provide an indication of the rates of inflow that could be expected. Ideally, trial excavations extending to as close to proposed formation level as possible should be carried out to provide an indication of the likely stability and presence of inflows.

If deeper excavations are considered or if excavations are to remain open for prolonged periods it is recommended that provision be made for battered side slopes or lateral support. 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.

8.4 Lower Ground Floor Slab

Following excavation of the lower ground floor, it is likely that the floor slab for the proposed lower ground floor level will need to be suspended over a void or a layer of compressible material to accommodate the anticipated heave and any potential uplift

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

forces from groundwater pressures, unless the slab can be suitably reinforced to cope with these movements.

Further consideration is given to ground movements in Part 3.0 of this report.

8.5 Effect of Sulphates

Chemical analyses have generally revealed relatively low concentrations of soluble sulphate and near-neutral pH in the samples of made ground tested, in accordance with Class DS-1 conditions of Table C2 of BRE Special Digest 1:SD Third Edition (2005), but moderate concentrations of soluble sulphate were recorded in the samples of natural soil, in accordance with Classes DS-2 to DS-3.

The measured pH values of the samples show that an ACEC class of up to AC-2s would be appropriate for the site, for concrete placed within the natural soils, assuming a static water condition. For concrete placed entirely within the made ground, an ACEC class of AC-1s would be appropriate, also assuming a mobile groundwater condition.

8.6 Contamination Risk Assessment

The desk study findings indicate that the site does not have a potentially contaminative history as it has apparently been developed with the existing house since some time between 1915 and 1935. No significant on-site or off-site potential sources of contamination have been identified, including existing or historical landfill sites, thus the site is not considered to have had a particularly contaminative history. However, the results of the chemical analyses carried out on samples of the made ground have indicated elevated concentrations of arsenic within one of the samples tested, lead within three of the samples tested, and naphthalene (a PAH species) within two of the samples tested, although total PAH is not elevated. Additionally, chrysotile asbestos has been identified in one of the samples of made ground analysed, at a concentration of < 0.001 %.

The source of the arsenic and lead contamination is not known but the made ground was noted as containing variable amounts of extraneous material, and it is therefore likely that a fragment of such material was present within the samples tested, accounting for the elevated concentrations. Information on Urban Soil Chemistry provided by the BGS also indicates that background concentrations for arsenic in the vicinity of the site are between 35 mg/kg and 40 mg/kg, and that background concentrations for lead in the vicinity of the site are between 600 mg/kg and 900 mg/kg, such that a significant proportion of the measured concentrations could be the result of residual airborne sources, particularly from historical use of leaded petrol.

Lead and arsenic compounds are relatively immobile, unlikely to be in a soluble form and are considered to be non-volatile or of a low volatility. The lead and arsenic contamination does not therefore present a significant vapour risk or a significant risk of leaching and migration within any perched groundwater within the made ground. As the site is underlain by London Clay, which cannot support a continuous groundwater table, a risk to groundwater is also not identified.

Statistical analysis of the specific PAH species identified in the elevated samples recovered from Borehole Nos 2 and 3 has found the concentration to be of a pyrogenic origin, i.e. it originates form the partial combustion of hydrocarbons. Although the specific source is unknown, fragments of extraneous material including charcoal were noted within the made ground, so it is likely that this has resulted in the elevated concentration of the specific PAH species Naphthalene. As such, the contamination is not considered likely to be soluble and should not, therefore pose a risk of vapours or to adjacent sites or groundwater.

As asbestos is insoluble, it is not considered to pose any meaningful risk to groundwater, the development, or to neighbouring sites through migration in the ground. It is however potentially hazardous to human health as airborne fibres and could thus pose a risk through inhalation, According to the HSE[9] , there is now significant monitoring evidence available within the ground investigation and remediation industry to suggest that significant visible quantities of bound asbestos-containing materials (ACMs) will need to be present to give rise to exposures above 0.01 f/ml, equivalent to one tenth of the control limit, unless they are being subject to highly energetic processes (e.g. crushing, power screening and grading of demolition waste and made ground or soil).

No new areas of soft landscaping will be created as part of the proposals, but areas of soft landscaping will remain in the front and rear garden areas such that the risk to end users will be no greater than currently present. The measured contaminants in the made ground will nevertheless pose a risk to site workers during the ground works. These risks are further assessed below.

9 HSE (2016) *Asbestos: The analysts' guide for sampling, analysis and clearance procedures* HSG248. Second Edition 2016. In preparation.

8.6.1 Protection of Site Workers

Site workers should be made aware of the potential contamination and 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[10] and CIRIA[11] 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.

Due to the asbestos contamination recorded in parts of the made ground, the construction works fall under the Control of Asbestos Regulations 2012, but are unlikely to comprise notifiable or licensed work, provided that the control limit of 0.1 fibres per cubic centimetre is not exceeded during the construction works[12].

8.6.2 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 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[13] 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[14] 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 £98.60 per tonne (about £185 per m^3) or at the lower rate of £3.15 per tonne (roughly £5.85 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 on the technical guidance provided by the EA it is considered likely that the soils encountered during this ground investigation, as represented by the chemical analyses carried out, would be generally classified as follows.

Soil Type	Waste Classification (Waste Code)	WAC Testing Required Prior to Landfill Disposal?	Current applicable rate of Landfill Tax
Made ground	Non-hazardous (17 05 04)	Should not be required but confirm with receiving landfill	£98.60/tonne (Standard rate)
London Clay	Assumed to be Inert (17 05 04)	Should not be required but confirm with receiving landfill	£3.15 / tonne (Reduced rate for uncontaminated naturally occurring rocks and soils)

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[15] 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 in-situ prior to excavation.

10 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO
11 CIRIA (1996) *A guide for safe working on contaminated sites.* Report 132, Construction Industry. Research and Information Association
12 HSE (2016) *Asbestos: The analysts' guide for sampling, analysis and clearance procedures* HSG248. Second Edition 2016. In preparation.
13 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition
14 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2
15 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

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.

Part 3: Ground Movement Analysis

This section of the report comprises an analysis of the ground movements arising from the proposed lower ground floor 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 and the efficiency or stiffness of any support structures used. An analysis has been carried out of the likely movements arising from the proposed lower ground floor excavation and the results of this analysis have been used to predict the effect of these movements on surrounding structures.

9.1 Nearby Sensitive Structures

Nearby sensitive structures comprise the adjoining 18 and 20 Pilgrims Lane to the northeast and the adjoining 14 and 12 Pilgrims Lane to the southwest, as shown on the plan below.

The heights of the buildings have been estimated from observations, and from drawings provided by the consulting engineers. The underside of the foundations of 12 and 14 Pilgrims Lane have been determined based on the trial pitting completed at 12 Pilgrims Lane, the findings of which were found during a recent search of planning records held by Camden Council, and the foundations of 18 and 20 Pilgrims Lane have been assumed to be the same. Trial Pit No 2, excavated alongside the southeast flank wall of 18 Pilgrims Lane did not reveal the base of the foundation to this wall within the 1.39 m depth excavated, but the foundations to 18 Pilgrims Lane have been conservatively modelled at a depth of 0.70 m, as per 12, 14 and 20 Pilgrims Lane. The heights and underside of foundations are summarised in the table below.

Sensitive structure	Height of building above foundation level (m)	Underside of foundation, depth (m) [m ASD)
12 Pilgrims Lane	6.5	0.70 [81.90]
14 Pilgrims Lane	3.7 to 6.5	0.70 [81.90]
18 Pilgrims Lane	3.7 to 6.5	0.70 [81.90]
20 Pilgrims Lane	6.5	0.70 [81.90]

During the site walkover, no evidence was seen to indicate that 14, 18 or 20 Pilgrims Lane have existing basement levels and no planning applications were found relating to proposed basements beneath these properties during a search of planning records held by Camden Council. No 12 Pilgrims Lane is known to have an existing lower ground floor level, and planning permission has been granted for the extension of the lower ground floor level beneath almost the full footprint of the property, and the construction of a swimming pool. Since the proposed new lower ground floor level at No 12 has not yet been constructed, it has been omitted from the following analyses. The existing partial lower ground floor level has also been conservatively omitted from the following analyses. The locations of the neighbouring buildings have been input into the model based on dimensions calculated from scaled drawings.

9.2 Construction Sequence

It is currently proposed to form the new lower ground floor level by means of reinforced concrete underpinning. Based on information provided by the consulting engineer, Green

Structural Engineering Limited (GSE), the loading on the proposed underpinning is anticipated to vary from around 30 kN/m to 105 kN/m.

The following sequence of operations has been derived to enable analysis of the ground movements around the lower ground floor, both during and after construction.

1. construction of underpins to the existing perimeter walls in hit and miss sequence;
2. installation of props and excavation of lower ground floor to formation level;
3. installation of lower ground floor slab; and
4. casting of ground floor slab and removal of temporary props once concrete has sufficiently cured.

It is understood that underpinning of the existing perimeter walls will take place in a 'hit and miss' sequence, in stages to be agreed with the temporary works engineer and under party wall agreement. Underpinning should generally be undertaken in short sections not exceeding 1.00 m to 1.20 m in length, with no adjacent pin to be excavated until a minimum of 48 hours after the adjacent pin has been cast and dry-packed placed, with the sides of the excavation adequately shored and propped.

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 basement contractors once appointed.

The individual panel widths of the liner wall will need to be adequately laterally propped and sufficiently dowelled together, and the concrete will need to be cast and adequately cured prior to excavation of the lower ground floor and removal of the formwork and supports. It is assumed that the corners of the excavation will be locally stiffened by cross-bracing or similar and that the new retaining walls will not be cantilevered at any stage during the construction process. It is assumed that adequate temporary propping of the new retaining walls, particularly at the top level, will occur at all times prior to the construction of permanent concrete floor slabs.

10.0 Ground Movements

An assessment of ground movements within and surrounding the excavation has been undertaken using the P-Disp and X-Disp computer programs licensed from the OASYS suite of geotechnical modelling software from Arup.

The X-Disp and P-Disp programs have been used to predict ground movements likely to arise from the excavation and construction of the proposed lower ground floor. This includes the heave / settlement of the ground (vertical movement) and the lateral movement of soil behind the proposed retaining walls (horizontal movement). Both the P-Disp and X-Disp programs are commonly used within the ground engineering industry and are considered to be appropriate tools for the purpose of this analysis.

The lower ground floor has been modelled based on scaled dimensions from plan drawings provided by the consulting engineers and the corners of the lower ground floor are defined by x and y coordinates. As such, for the purpose of these analyses, the x direction is orientated approximately east-west, and the y direction is orientated approximately north-south, roughly parallel with the front elevation of the building. Vertical movement is in the z-direction.

The lower ground floor structure has been modelled as a simplified polygon with maximum dimensions of around 21.35 m by 9.75 m, and a founding depth of around 79.00 m OD. The proposed lower ground floor will be formed through underpinning of the existing foundations, and a new floor slab.

It is assumed that suitable propping will be provided during the construction of the lower ground floor and in the permanent condition, such that the walls can be considered to be stiff for the purpose of the ground movement modelling.

The full outputs of all the analyses can be provided on request but samples of the output movement contour plots are included within the appendix.

10.1 Ground Movements – Surrounding the Lower Ground Floor

10.1.1 Model Used

For the X-Disp analysis, the soil movement relationships used for the embedded retaining walls are the default values within CIRIA report C760[16], which were derived from a number of historic case studies.

Installation of underpins:

Predictions of the vertical and horizontal ground movements behind the walls, as a result of underpinning, can be based on case study information within CIRIA C760[17] for a planar diaphragm wall installed into stiff clay, which is considered to be a conservative approach. Whilst this is considered to be a conservative approach, Campbell Reith, who audit basement impact assessments for Camden, have requested that total vertical and horizontal movements should be assumed to fall within the range of 5 mm to 10 mm, for a single stage of underpinning. As a result, modified curves for a planar diaphragm wall installed into stiff clay have been adopted, with the movements slightly adjusted so that when combined with the excavation movements, the total vertical and horizontal movements reflect the lower range of the above movements provided by Campbell Reith. The lower range of above movements has been adopted based on the findings of the ground investigation, and the proposed propping.

Excavation Phase:

Suitable propping will be provided during the construction of the lower ground floor and in the permanent condition, such that the walls can be considered to be stiff for the purpose of the ground movement modelling. Thus, the horizontal ground movement curve for 'excavations in front of high stiffness wall in stiff clay' has been adopted for the subsequent excavation required to form the proposed lower ground floor.

For the XDisp analysis, a maximum depth of 3.60 m has been adopted for the excavation based on a ground level of around 82.60 m OD and a formation level of 79.00 m OD. Within the footprint of the existing lower ground floor and rear garden, an excavation depth of around 1.00 m is anticipated. For the X-Disp analysis, the maximum excavation depth of 3.60 m has been conservatively adopted throughout.

10.1.2 Results

The movements predicted by X-Disp surrounding the lower ground floor are summarised in the table below; the results are presented below and in subsequent tables to the degree of accuracy required to allow predicted variations in ground movements around the structure to be illustrated but may not reflect the anticipated accuracy of the predictions.

Phase of Works	Wall Movement (mm)	
	Vertical Settlement	Horizontal Movement
Installation of underpinned wall	2 to 3	1 to 2
Combined Installation and Excavation Movements	4 to 5	5 to 6

The analysis has indicated that the vertical settlements that will result from wall installation are anticipated to be up to around 3 mm, with movements increasing to between 4 mm and 5 mm of vertical settlement, from the combined wall installation and excavation phases.

The analysis also indicates that maximum horizontal movements that will result from wall installation are anticipated to be up to around 2 mm, with movements increasing to around 5 mm to 6 mm as a result of the combined wall installation and excavation phases.

The movements set out in the table and discussed above are the maximum movements and the analysis has indicated that they occur immediately or just outside the line of the retaining walls, and also account for the likely overprediction of movements within re-entrant corners included within the model.

10.2 Ground Movements – Resulting from Excavation

10.2.1 Model Used

Unloading of the London Clay will take place as a result of the excavation of the proposed lower ground floor and the reduction in vertical stress will cause heave to take place. 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 lower

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

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

ground floor excavation. Drained parameters have been used to provide an estimate of the total long-term movement.

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 Eu and E', the undrained and drained stiffness respectively, to values of undrained cohesion, as described by Padfield and Sharrock[18] and Butler[19] and more recently by O'Brien and Sharp[20]. Whilst values of Eu can be taken as 750 x Cu for the London Clay and a ratio of E' to Cu of 0.75 considered appropriate and in line with more recent published data, more conservative values of 500 x Cu for Eu and a ratio of E' to Cu of 0.60 have been adopted at this stage.

Based on information provided by the consulting engineer, Green Structural Engineering Limited (GSE), the loading on the proposed underpinning is anticipated to vary from around 30 kN/m to 105 kN/m. When the unloading due to the proposed excavation is taken into account, the net pressure beneath the underpins is estimated to range from approximately -38 kN/m^2 to 50 kN/m^2.

The soil parameters used in this analysis and tabulated below have been primarily derived from the onsite investigation and extrapolation of data for the London Clay at depth. A rigid boundary for the analysis has been set at around 39.00 m below formation level (40 m OD) within the London Clay, as below this depth the clay soils of the London Clay are considered to be essentially incompressible. An initial strength of 35 kN/m^2 and a subsequent increase in cohesion of 7.5 kN/m^2 for each metre of depth has been adopted to provide a conservative estimate of the likely strength profile within the London Clay beneath the site.

Stratum	Depth Range (m) (m OD)	Bulk Density (Kg/m^3)	Eu (KN/m^2)	E'(KN/m^2)
Made Ground	GL to 1.00 (82.60 to 81.60)	1700	10,000	10,000
London Clay	1.00 to 39.00 (81.60 to 40.00)	1950	17,500 to 160,000	10,500 to 96,000

10.2.2 Results

The predicted movements are summarised in the table below; the results are presented below and in subsequent tables to the degree of accuracy required to allow predicted variations in ground movements around the structure(s) to be illustrated, but may not reflect the anticipated accuracy of the predictions. In the table below, heave movements are shown as negative, and settlement movements are shown as positive.

Location	Short term movement (mm)	Total movement (mm)
Maximum movement - towards the centre of proposed lower ground floor	-10	-16
Along lower ground floor	-4 to 2	-10 to 3
Note: -ve values denote heave, and +ve values denote settlement		

The P-Disp analysis indicates that, by the time construction is complete, up to 10 mm of heave is likely to have taken place beneath the area of the lower ground floor, and between around 4 mm heave and 2 mm of settlement is likely to have taken place beneath the underpins and rear extension. The analysis using drained parameters has indicated that total heave at the centre of the excavation can be expected to increase by around 6 mm to a maximum of between 16 mm, and that settlement movements beneath the rear extension can be expected to increase by around 1 mm to a maximum of 3 mm. The analysis has indicated that immediately outside of the excavation, heave movements of less than 6 mm can be expected.

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

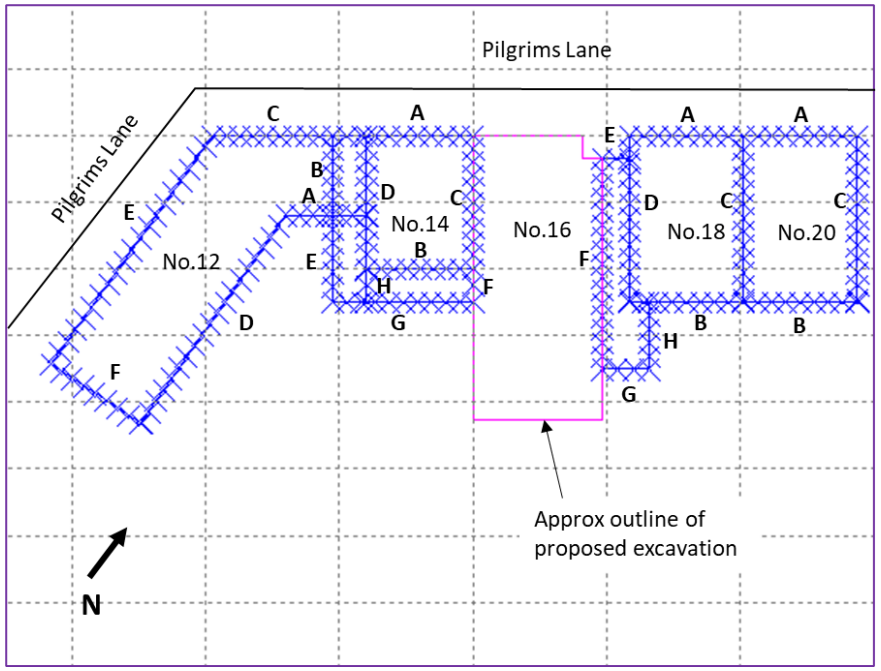
[19] Butler FG (1974) *Heavily overconsolidated clays: a state of the art review*. Proc Conf Settlement of Structures, Cambridge, 531-578, Pentech Press, Lond

[20] 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

11.0 Damage Assessment

In addition to the above assessment of the likely movements that will result from the proposed development, any neighbouring buildings within the zone of influence of the excavations are considered to be sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 6.4 of CIRIA report C760[21].

The sensitive structures outlined previously have been modelled as displacement lines in the analysis along which the damage assessment has been undertaken. The labelling adopted is shown on the diagram below.



Plan view of neighbouring structures and the labelling of each wall

11.1 Damage to Neighbouring Structures

The ground movements resulting from the underpinning and lower ground floor excavation phases have been calculated using X-Disp modelling software to carry out an assessment of the likely damage to adjacent properties and the results are discussed below. The building damage reports for sensitive structures highlighted above are included in the appendix and indicate that predominantly the damage to the adjoining and nearby structures due to the construction of the proposed lower ground floor would be either 'Negligible (0)' or 'Very Slight (1)'. A summary of the structures indicated as affected is included below.

Structure	Elevation Reference	Category of Damage*
12 Pilgrims Lane	Walls A to C	Negligible (0)
	Walls D to F	Below limit of detection
14 Pilgrims Lane	Walls A, B & G	Very Slight (1)
	Walls C to F & H	Negligible (0)
18 Pilgrims Lane	Walls A, B, E & G	Very Slight (1)
	Walls C, D, F & H	Negligible (0)
20 Pilgrims Lane	Walls A & B	Negligible (0)
	Wall C	Below limit of detection

*From Table 6.4 of C760: Classification of visible damage to walls.
** All vertical displacements are less than the limit sensitivity.

Building damage categories Negligible to Very Slight are widely considered to cause only aesthetic damage to buildings such that structural instability is highly unlikely to occur. All sensitive structures have been assessed to have a damage category of 'Negligible' to 'Very Slight', such that all sensitive structures are considered to fall within acceptable limits.

The results discussed above are based on individual building lines, or walls, that in some instances, have been further divided up within the analysis into a series of segments that are assumed to be able to move independently of one another, with the most critical segment determining the result for the entire wall. In reality, this is unlikely to be the case

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

as the walls will behave as single stiff elements that are also joined continuously with the rest of the structure.

The results therefore provide a conservative estimate of the behaviour of each of the sensitive structures and overestimate the degree of damage, although they provide a useful indication of the most critical structures within the adjoining properties that may require further assessment, as detailed below.

11.2 Monitoring of Ground Movements

The predictions of ground movement based on the ground movement analysis should be checked by monitoring of the adjacent properties and structures. The structures to be monitored during the construction stages should include the existing property and the neighbouring structure assessed above. Condition surveys of the above existing structures should be carried out before and after the proposed works.

The precise monitoring strategy will be developed at a later stage, and it will be subject to discussions and agreements with the owners of the adjacent properties and structures. Contingency measures will be implemented if movements of the adjacent structures exceed predefined trigger levels. Both contingency measures and trigger levels will need to be developed within a future monitoring specification for the works.

12.0 GMA Conclusions

The analysis has concluded that the predicted damage to the neighbouring properties from the construction of the proposed lower ground floor would be 'Negligible' to 'Very Slight '.

On this basis, the damage that has been predicted to occur as a result of the construction the proposed lower ground floor falls within the limits acceptable to the London Borough of Camden assuming that the careful control is taken during construction of the proposed excavations, and monitoring will be required to ensure that no excessive movements occur that would lead to damage in excess of these limits.

The separate phases of work, including piling and subsequent excavation of the proposed lower ground floor, will in practice be separated by a number of weeks. This will provide an opportunity for the ground movements during and immediately after installation of the retaining walls to be measured and the data acquired can be fed back into the design and compared with the predicted values. Such a comparison will allow the ground model to be reviewed and the predicted wall movements to be reassessed prior to the main excavation taking place so that propping arrangements can be adjusted if required.

Part 4: Basement Impact Assessment

This section of the report evaluates the direct and indirect implications of the proposed project, based on the findings of the previous screening and scoping, site investigation and ground movement assessment.

13.0 Introduction

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.

13.1 Potential Impacts

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

Potential Impact	Consequence
London Clay is the shallowest strata at the site. There is a moderate potential of seasonal shrink-swell subsidence in the local area.	Multiple potential impacts depending on the specific setting of the basement development. For example, in terraced properties, the implications of a deepened basement/foundation system on neighbouring properties should be considered.
The development is located within 5 m of a highway or pedestrian right of way.	Should the design of retaining walls and foundations not take into account the presence of nearby infrastructure, it may lead to the structural damage of footways, highways and associated buried services.
Part of the proposed development will extend into the Root Protection Area (RPA) of a nearby tree	Excavations within the RPA could cause damage to the tree if not carried out carefully.
The proposed development will result in an increase in differential depth relative to neighbouring properties	The stability of neighbouring structures will need to be ensured throughout the development. A ground movement analysis and building damage assessment has been carried out and reported in Part 3 of this report.
A change in the in proportion of hard surfaced or paved areas of a property will affect the way in which rainfall and surface water are transmitted away from a property.	Changes to the surface water received by the adjacent properties and nearby watercourses. The sealing off of the ground surface by pavements and buildings to rainfall may result in decreased recharge to the underlying ground.

The results of the site investigation have therefore been used below to review the remaining potential impacts, to assess the likelihood of them occurring and the scope for reasonable engineering mitigation.

The site is underlain by London Clay which would be subject to seasonal shrink-swell

Shrinkable clay is present within a depth that can be affected by tree roots. Numerous trees are present adjacent to the site, both to the front and rear, but the intrusive investigation did not find evidence of desiccation. In addition, the proposed lower ground floor will extend to a depth such that new foundations should bypass any desiccated soils.

Subject to inspection of excavations in the normal way to ensure that there is not significant unexpectedly deep root growth, it is not considered that the occurrence of shrink-swell issues in the local area has any bearing on the proposed development.

Location of public highway

The lower ground floor excavation will extend to within 5.00 m from Pilgrims Lane and therefore the excavation may affect the highway. The proposed development will include retaining walls that will be designed to maintain the stability of the surrounding ground, thus protecting the adjacent road and associated infrastructure beyond.

There is nothing unusual or exceptional in the proposed development or the findings of the previous investigation that give rise to any concerns with regard to stability over and above any development of this nature, although this will be confirmed through further site investigation.

The proposed development will extend into the Root Protection Area (RPA) of a nearby tree

Based on Marcus Foster Ltd's 'Tree Protection Plan' (Drg ref: AIA/MF/0193/22 T003, dated December 2022), a small section of the proposed rear extension will extend into the Root Protection Area (RPA) of a nearby tree. The drawing indicates that only 1 % of the RPA will be affected, and that hand tools must be used in this area, with hessian used to protect exposed roots.

New foundations will need to be deepened in the vicinity of existing and proposed trees and National House Building Council (NHBC) guidelines should be followed in this respect. The intrusive investigation did not find evidence of desiccation on site, however, it would be prudent to have the formation level inspected for signs of tree root growth. Notwithstanding NHBC guidelines, all foundations should extend beyond the zone of desiccation.

Differential founding depths / Neighbouring structures

The proposed lower ground floor is expected to extend to a maximum depth of approximately 3.6 m, such that ground movements as a result of the proposed excavations would be expected to reduce to zero at a distance of approximately 14.4 m, corresponding to four times the retained height, based on the CIRIA ground movement curve for an 'excavation in front of a stiff wall in stiff clay' (Fig 6.15a of CIRIA C760). As the adjoining 14 & 12 Pilgrims Lane to the southeast, as well as the adjacent 18 & 20 Pilgrims Lane to the northeast of the site are within this zone, the stability of the structures has been considered as part of a ground movement analysis and building damage assessment reported in Part 3. The analysis found that movements are anticipated to be negligible (Category 0) to very slight (Category 1) and as such, the proposed lower ground floor construction and excavation are unlikely to impact the adjacent structures.

Increase in proportion of hardstanding across the site

The proposed new rear terrace will be partially within an area that currently comprises soft landscaping, thus there will be a slight increase in the proportion of hardstanding.

The sealing of the ground surface to rainfall, by increasing the building area, would result in decreased recharge to the underlying ground, although the low permeability of the underlying London Clay would result in a low recharge in any case and consequently there would be little or no effect on groundwater.

It is anticipated that all surface water will be discharged to the sewer network through existing connections and the volumes of surface water run-off from the site are not anticipated in increase significantly. The effects of attenuation due to the construction of the lower ground floor are likely to be minimal given the low permeability of the shallow soils and that surface water will be discharged to the sewer network through existing connections. On this basis of this impact assessment, the proposed development will not have a significant detrimental effect on surface water flow.

13.2 BIA Conclusions

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.

13.3 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.

13.3.1 Screening

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

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°?	Topographical maps and 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
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?	The details of the proposed development including architectural drawings.
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
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

Question	Evidence
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 lower ground floor relative to 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.

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?	Topographical maps acquired as part of the desk study and 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?	
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?	A site walkover confirmed the current site conditions. Details provided on the proposed development.
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 the North London Strategic Flood Risk Assessment dated 2008.

13.3.2 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, the engineering properties of the underlying soils to enable suitable design of the basement development and the configuration of existing party wall foundations. The findings of the investigation are discussed in Section 5.0 of this report and summarized in both Section 7.0 and the Executive Summary.

13.3.3 Impact Assessment

Section 13.0 of this report summarises whether, 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 been carried out and its findings are presented in Part 3.

14.0 Outstanding Risks & 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.

As discussed throughout the report, perched water is likely to be encountered during the lower ground floor excavation, although the findings of the investigation indicate that potential inflows are unlikely to be significant and should be adequately dealt with through sump pumping. However, groundwater monitoring should be continued for as long as possible prior to construction, and trial excavations should be considered to assess the extent of inflows to be expected within the proposed lower ground floor level excavations.

If during ground works any visual or olfactory evidence of contamination is identified it is recommended that further investigation be carried out and that the risk assessment is reviewed.

These areas of doubt should be drawn to the attention of prospective contractors and further investigation will be required or sufficient contingency should be provided to cover the outstanding risk.

Appendix

a. Field Work

Site Plan
Borehole Records
Trial Pit Records

b. Lab Testing

Geotechnical Test Results
SPT & Cohesion/Depth Graph
Chemical Test Results
Generic Risk Based Screening Values

c. Desk Study

Envirocheck Extracts
Historical Maps
Risk Assessment Tables

d. Ground Movement Analysis

PDisp Analysis – Short Term Movements
PDisp Analysis – Total Movements
XDisp Analysis – Vertical movements - Installation
XDisp Analysis – Horizontal movements - Installation
XDisp Analysis – Vertical movements - Installation and Excavation
XDisp Analysis - Horizontal movements - Installation and Excavation
XDisp Analysis – Tabular output - Installation
XDisp Analysis – Tabular output - Installation and Excavation

appendix a

Field Work

Site Plan
Borehole Records
Trial Pit Records

GEA

Geotechnical & Environmental Associates

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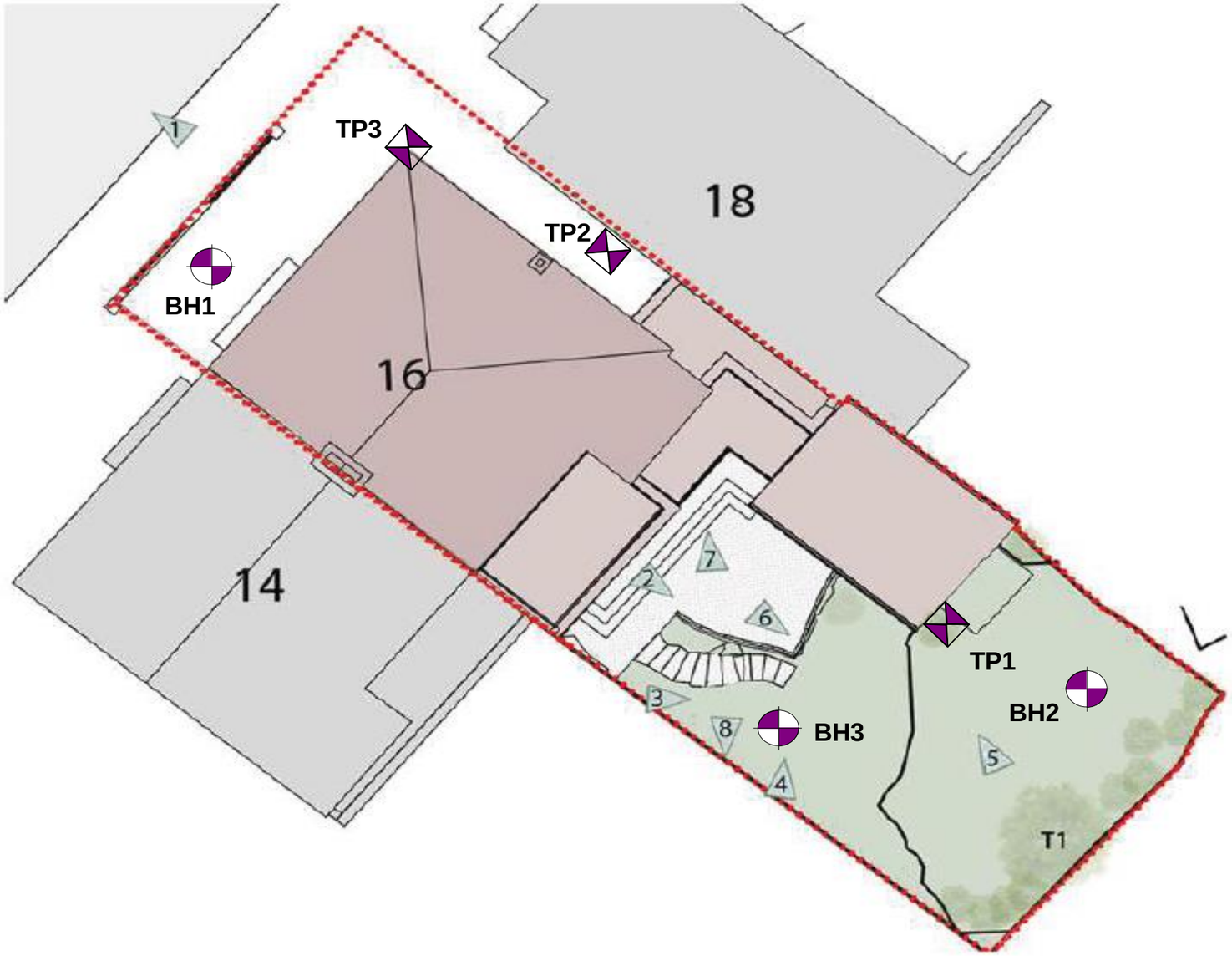
Site Plan

Site	16 Pilgrims Lane, London NW13 1SN
Client	Mr Andrew Lavery
Engineer	GSE

Job Number J22352

Sheet 1 / 1

N



GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
16 Pilgrims Lane, London NW13 1SN				**BH1**
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J22352	16-11-22 16-11-22	82.65		
Client		Engineer		Sheet
Mr Andrew Lavery		GSE		1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
				82.50		0.15	Paving slab over concrete	
0.25	D						MADE GROUND (Loose brick rubble hardcore over clayey brick, mortar and concrete gravel)	
0.40	ES			82.05		0.60		
0.50	D						MADE GROUND (Brown sandy silty clay with frequent fine to coarse fragments of brick, mortar and rare charcoal)	
0.75	D					(0.70)		
1.00	D			81.35		1.30		
1.20-1.65	D	1,1/1,2,1,2 N60 = 8					Soft becoming firm then stiff with depth brown mottled grey very sandy silty CLAY with pockets and partings of orange-brown silt and fine sand	
1.85	D							
2.00-2.45	U100							
2.75	D							
3.00-3.45	D	1,2/2,3,3,3 N60 = 15						
3.75	D					(5.20)		
4.00-4.45	U100							
4.75	D							
5.00-5.45	D	2,3/4,4,4,4 N60 = 22						
6.00	D							
				76.15		6.50		
6.50-6.95	U100						Very stiff fissured dark grey silty CLAY with occasional pockets and partings of grey silt and fine sand	
7.50	D							
8.00-8.45	D	2,3/4,5,5,6 N60 = 27				(3.50)		
9.00	D							
9.50-9.95	U100							
				72.65		10.00		
10.00	D							

Boring Progress and Water Observations

Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Services pit excavated to depth of 1.20 m
Groundwater not encountered
Borehole complete at 10.0 m
Standpipe installed to depth of 6.0 m on completion

All dimensions in metres Scale 1:65.625	Method/ Plant Used rotary percussive sampler	Logged By AG

Report ID: CABLE PERCUSSION || Project: J22352 - 16 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 10 February 2023

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
16 Pilgrims Lane, London NW13 1SN				**BH2**
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J22352	28-11-22 28-11-22	80.00		
Client		Engineer		Sheet
Mr Andrew Lavery		GSE		1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
				79.60		0.40	MADE GROUND (Dark brownish grey organic gravelly silty clay. Gravel comprises fine to coarse fragments of brick with occasional charcoal, concrete, flint and ceramic. Common roots)	
0.30	ES							
0.40	D							
0.80	D						Soft becoming firm then stiff with depth fissured brown mottled grey silty CLAY, with occasional partings of orange brown clayey sand, roots and rare flint gravel.	
1.20	D							
1.50	D							
1.80	D					(3.30)		
2.20	D							
2.50	D						2.50 Occasional pockets of selenite crystals and blue grey veining with decaying roots below 2.50 m	
2.80	D							
3.20	D							
3.50	D			76.30		3.70		

Boring Progress and Water Observations

Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Services pit excavated to depth of 1.20 m
Groundwater not encountered
Borehole aborted at 3.70 m due to very stiff ground conditions
Standpipe installed to depth of 3.70 m on completion

All dimensions in metres Scale 1:65.625	Method/ Plant Used hand held window sampler	Logged By AG

Report ID: CABLE PERCUSSION || Project: J22352 - 16 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 10 February 2023

GEA

Geotechnical & Environmental Associates

Project				BOREHOLE No
16 Pilgrims Lane, London NW13 1SN				**BH3**
Job No	Date	Ground Level (m OD)	Co-Ordinates ()	
J22352	28-11-22 28-11-22	80.00		
Client		Engineer		Sheet
Mr Andrew Lavery		GSE		1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.30	ES			79.60		0.40	MADE GROUND (Dark brownish grey organic gravelly silty clay. Gravel comprises fine to coarse fragments of brick with occasional charcoal, concrete, flint and ceramic. Common roots)	
0.80	D						Soft becoming firm then stiff with depth fissured brown mottled grey silty CLAY, with occasional partings of orange brown clayey sand, roots and rare flint gravel.	
1.20	D							
1.50	D							
1.80	D					(3.20)		
2.20	D						2.00 Occasional pockets of selenite crystals below 2.00 m	
2.50	D							
2.80	D							
3.20	D							
3.50	D			76.40		3.60		

Boring Progress and Water Observations					
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth

GENERAL REMARKS

Services pit excavated to depth of 1.20 m
Groundwater not encountered
Borehole aborted at 3.60 m due to very stiff ground conditions
Standpipe installed to depth of 3.60 m on completion

All dimensions in metres Scale 1:65.625	Method/ Plant Used hand held window sampler	Logged By AG

Report ID: CABLE PERCUSSION || Project: J22352 - 16 PILGRIMS LANE.GPJ || Library: GEA LIBRARY.GLB || Date: 10 February 2023

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Herts | 01727 824666 Notts | 01509 674888

Trial Pit No 1

Site 16 Pilgrims Lane, London NW13 1SN

Client Mr Andrew Lavery

Engineer GSE

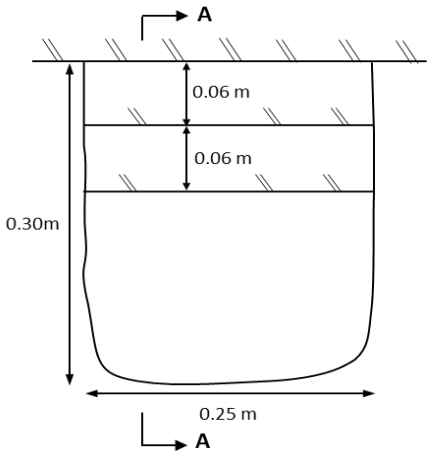
Job Number J22352

Sheet 1/3

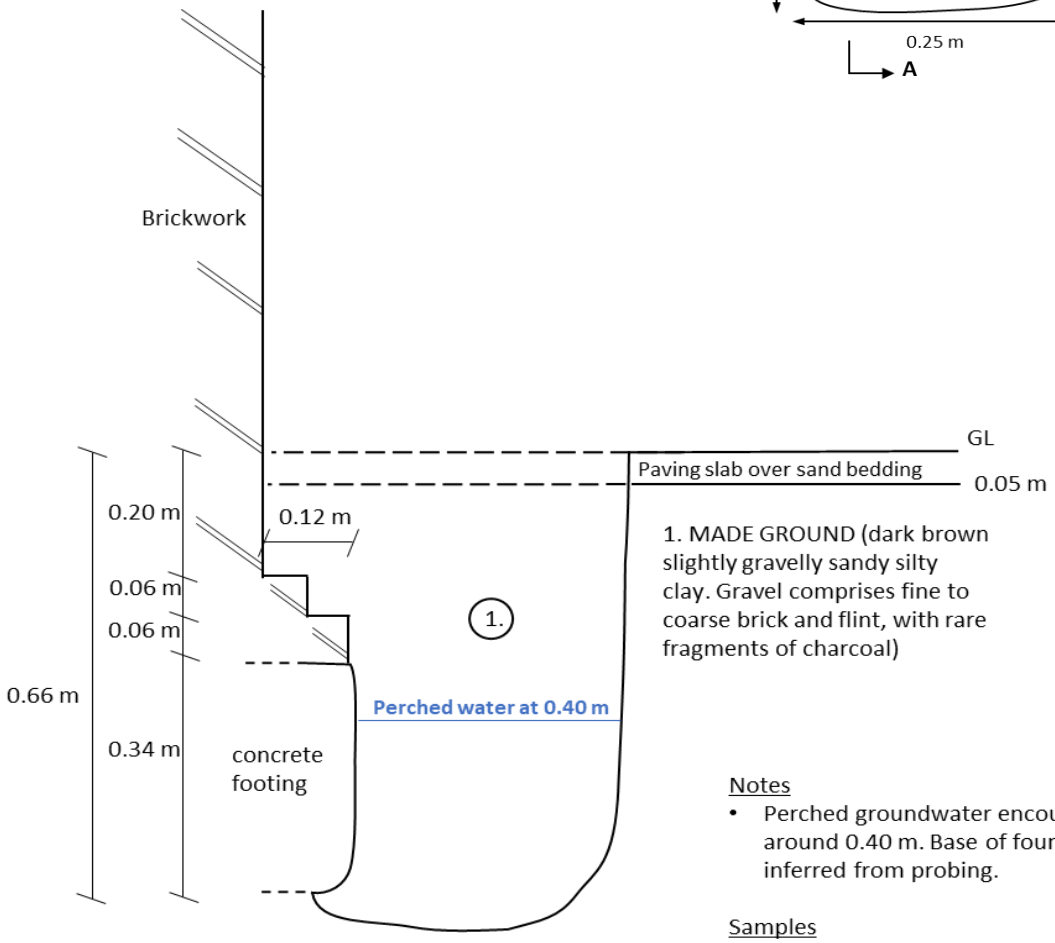
Dates 28/11/2022

Excavation Method	Dimensions (m)	Ground Level (m OD)	Location
Hand dug	see plan	80.00	see plan

Plan:



TP1: Section A-A



Notes

- Perched groundwater encountered at around 0.40 m. Base of foundation inferred from probing.

Samples

D@ 0.30 m

Remarks:

All dimensions in metres

Scale: NTS

Logged by: AG

GEA

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Herts | 01727 824666 Notts | 01509 674888

Trial Pit No 2

Site 16 Pilgrims Lane, London NW13 1SN

Client Mr Andrew Lavery

Engineer GSE

Job Number J22352

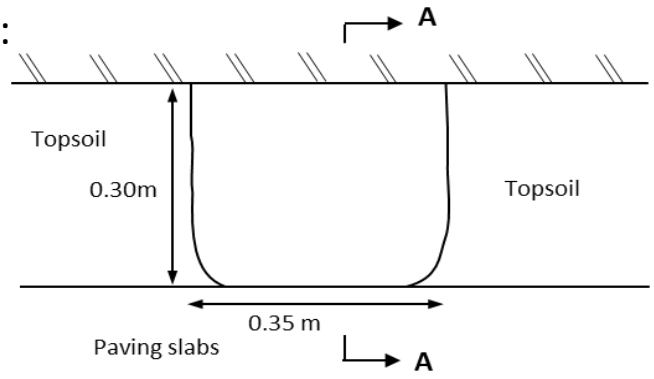
Sheet 2/3

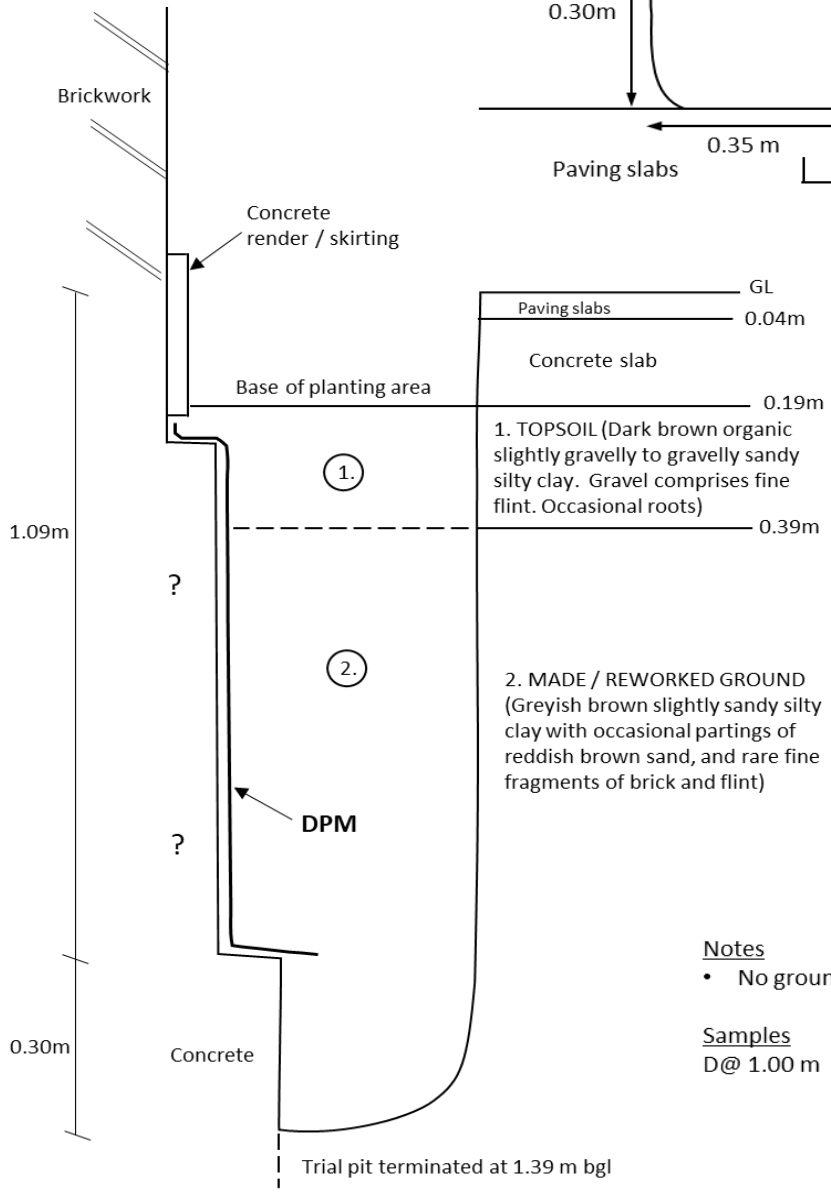
Dates 28/11/2022

Excavation Method	Dimensions (m)	Ground Level (m OD)	Location
Hand dug	see plan	82.65	see plan

TP2: Section A-A

Plan:





Notes

- No groundwater encountered

Samples

D@ 1.00 m

Remarks:

All dimensions in metres

Scale: NTS

Logged by: AG

GEA

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Herts | 01727 824666 Notts | 01509 674888

Trial Pit No 3

Site 16 Pilgrims Lane, London NW13 1SN

Client Mr Andrew Lavery

Engineer GSE

Job Number J22352

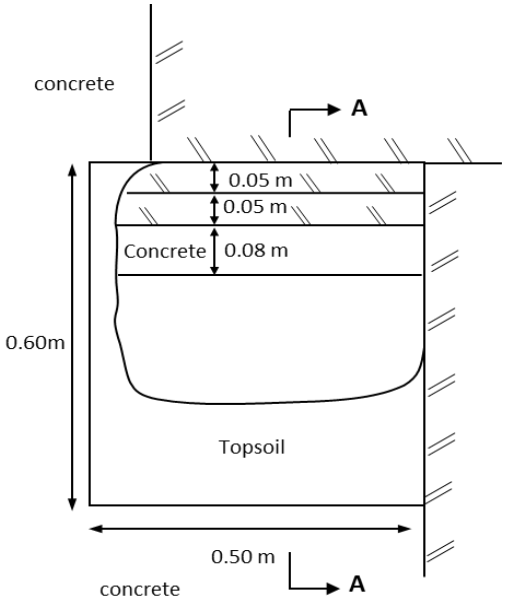
Sheet 3/3

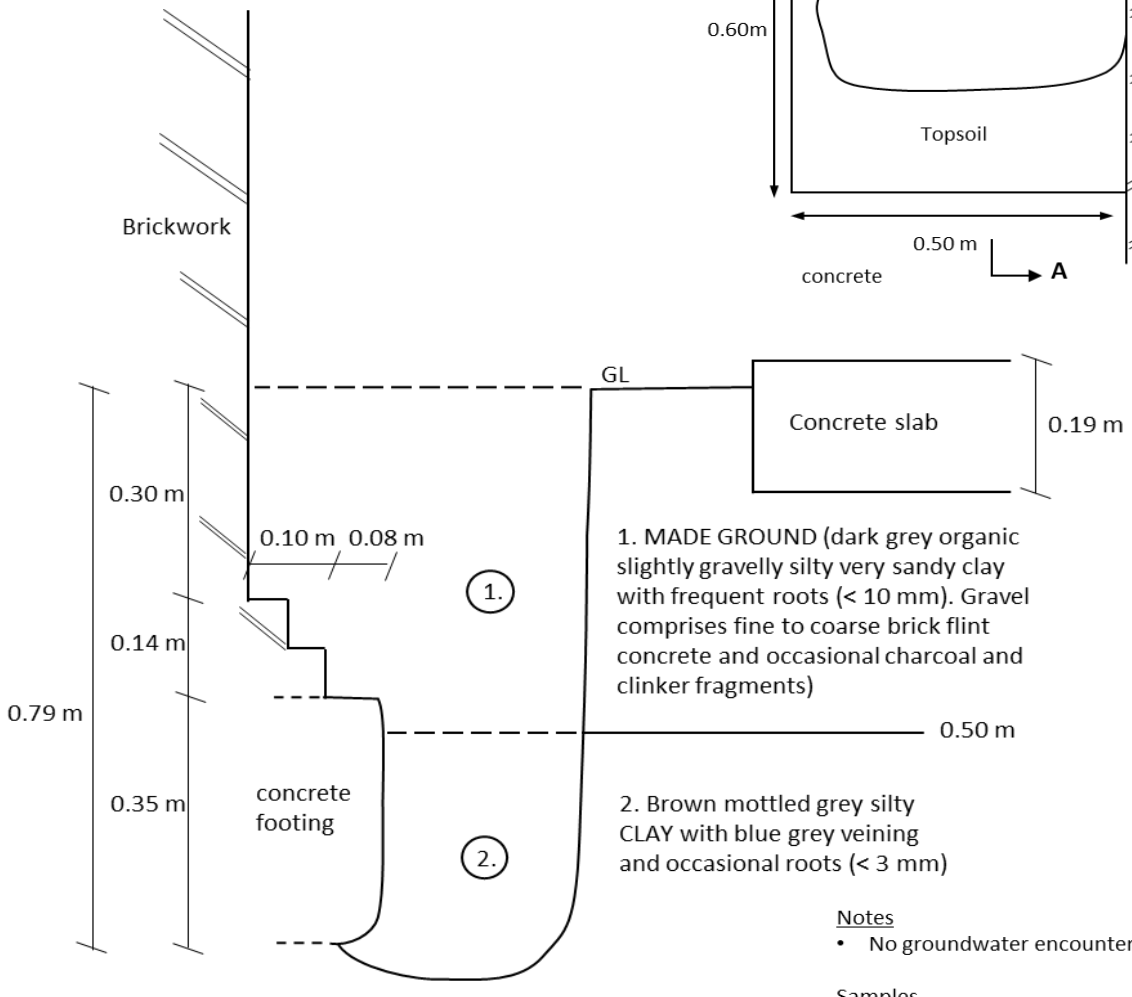
Dates 28/11/2022

Excavation Method	Dimensions (m)	Ground Level (m OD)	Location
Hand dug	see plan	82.65	see plan

TP3: Section A-A

Plan:





1. MADE GROUND (dark grey organic slightly gravelly silty very sandy clay with frequent roots (< 10 mm). Gravel comprises fine to coarse brick flint concrete and occasional charcoal and clinker fragments)

2. Brown mottled grey silty CLAY with blue grey veining and occasional roots (< 3 mm)

Trial pit terminated at 0.85 m bgl

Notes
- No groundwater encountered

Samples
D@ 0.75 m
ES @ 0.40 m

Remarks:

All dimensions in metres

Scale: NTS

Logged by: AG

appendix b

Lab Testing

Geotechnical Test Results
SPT & Cohesion/Depth Graph
Chemical Test Results
Generic Risk Based Screening Values

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
32734	16 Pilgrims Lane	Samples received	28/11/2022
		Schedule received	05/12/2022
Project No.	Client	Project started	05/12/2022
J22352	GEA	Testing Started	20/12/2022

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH1	-	1.85	-	D	Orangish brown slightly mottled grey slightly sandy slightly gravelly silty CLAY (gravel is fm and sub-angular to rounded)	26	94	47	23	24	
BH1	-	2.00	2.45	U	Medium strength orangish brown mottled brown slightly gravelly slightly sandy silty CLAY with occasional fine rootlets (gravel is fm and sub-angular)	33					
BH1	-	2.75	-	D	Orangish brown slightly mottled grey silty CLAY	28	100	73	28	45	
BH1	-	3.00	3.45	D	Orangish brown slightly mottled grey silty CLAY with scattered selenite crystals	27					
BH1	-	3.75	-	D	Orangish brown slightly mottled bluish grey silty CLAY with scattered selenite crystals	30	100	75	29	46	
BH1	-	4.00	4.45	U	High strength brown slightly mottled orangish brown gleying grey silty CLAY with occasional pockets of fm pyrite crystals	31					
BH1	-	4.75	-	D	Orangish brown and occasional grey silty CLAY	28					
BH1	-	5.00	5.45	D	Brown and occasional bluish grey silty CLAY with scattered selenite crystals	30	100	72	30	42	
BH1	-	6.00	-	D	Brown and occasional grey silty CLAY with scattered selenite crystals	31					
BH1	-	6.50	6.95	U	High strength dark brown slightly gleying orangish brown silty CLAY	34					
BH1	-	7.50	-	D	Dark grey silty CLAY	27					
BH1	-	8.00	8.45	D	Dark grey silty CLAY	25	100	73	29	44	

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Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
Initials **J.P**
Date: 22/12/2022

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
32734	16 Pilgrims Lane	Samples received	28/11/2022
		Schedule received	05/12/2022
Project No.	Client	Project started	05/12/2022
J22352	GEA	Testing Started	20/12/2022

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH1	-	9.00	-	D	Dark grey slightly fine sandy silty CLAY	23					
BH1	-	9.50	9.95	U	Very high strength dark grey slightly fine sandy silty CLAY with occasional fmc pyrite nodules	24					
BH2	-	1.20	-	D	Dark grey slightly mottled orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)	39	88	61	27	34	
BH2	-	1.80	-	D	Orangish brown slightly mottled grey silty CLAY	32					
BH2	-	2.20	-	D	Orangish brown slightly mottled grey silty CLAY	30					
BH2	-	2.80	-	D	Orangish brown slightly mottled bluish grey silty CLAY	30	100	78	30	48	
BH2	-	3.20	-	D	Orangish brown and occasional bluish grey silty CLAY	33					
BH3	-	1.50	-	D	Orangish brown mottled grey silty CLAY with rare fine gravel	36	99	83	31	52	
BH3	-	2.50	-	D	Brown slightly mottled grey silty CLAY with rare fine gravel	25	99	65	25	40	
BH3	-	3.50	-	D	Orangish brown slightly mottled grey silty CLAY	31					
TP3	-	0.75	-	D	Brown slightly mottled dark grey and bluish grey slightly gravelly silty CLAY (gravel is fm and angular to sub-angular)	32	95	71	29	42	

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Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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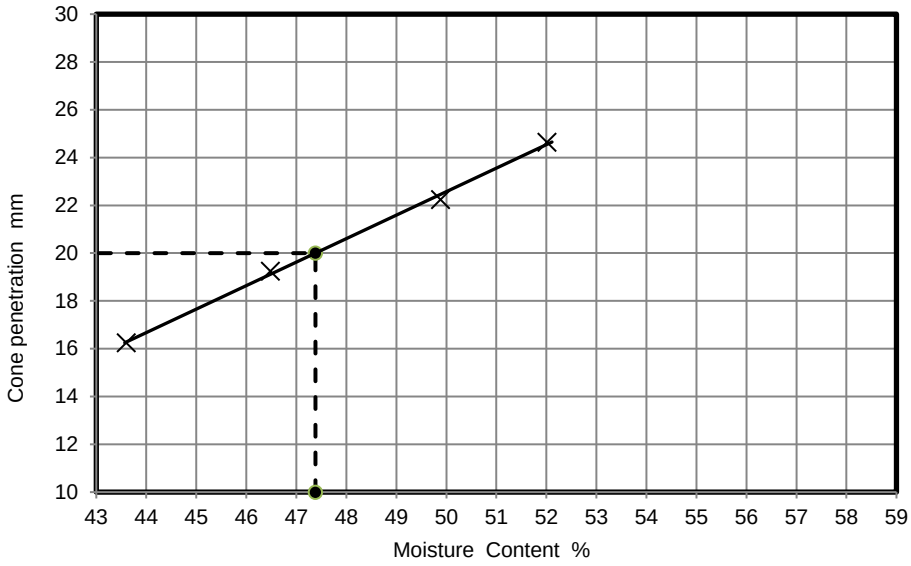
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

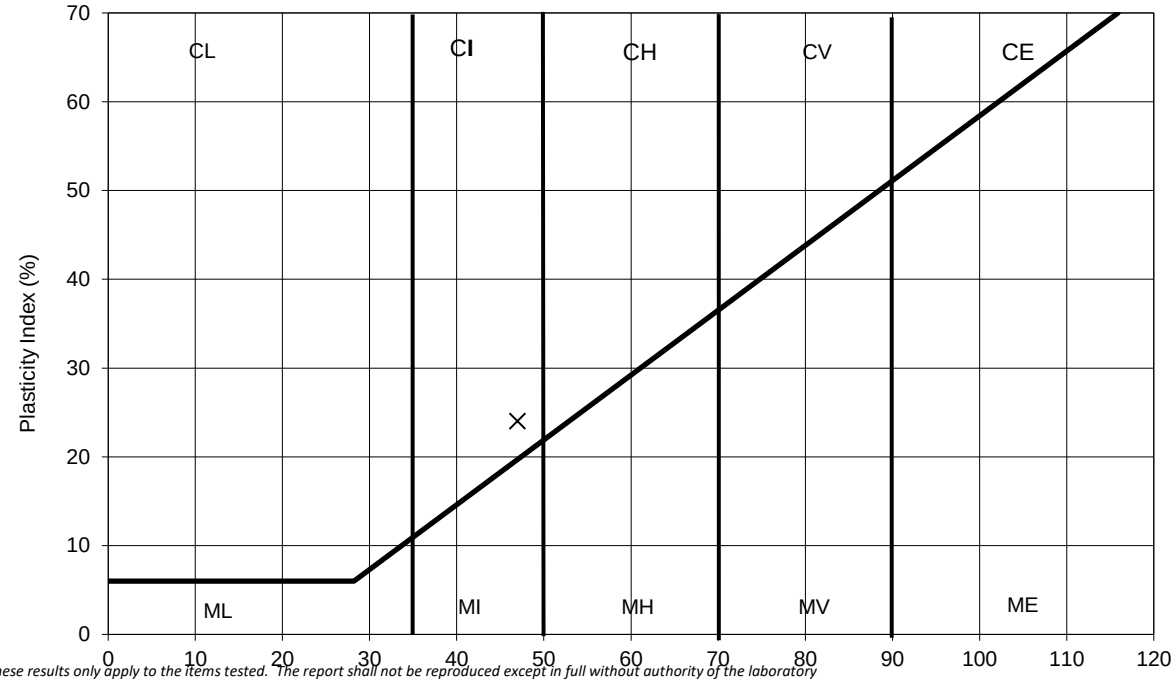
				Job No.	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	1.85 m
Soil Description	Orangish brown slightly mottled grey slightly sandy slightly gravelly silty CLAY (gravel is fm and sub-angular to rounded)			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**26**	**%**
% PASSING 425µm SIEVE	**94**	**%**
LIQUID LIMIT	**47**	**%**
PLASTIC LIMIT	**23**	**%**
PLASTICITY INDEX	**24**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
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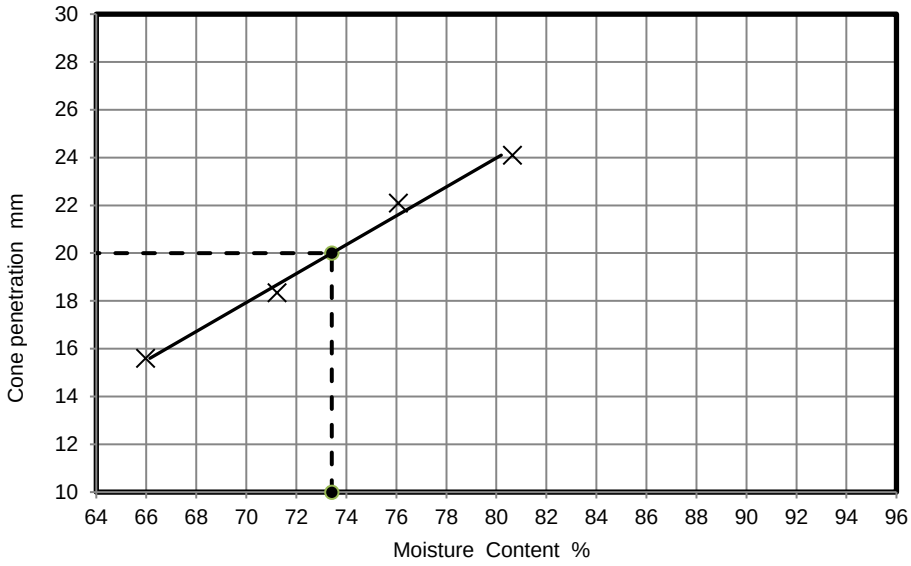
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

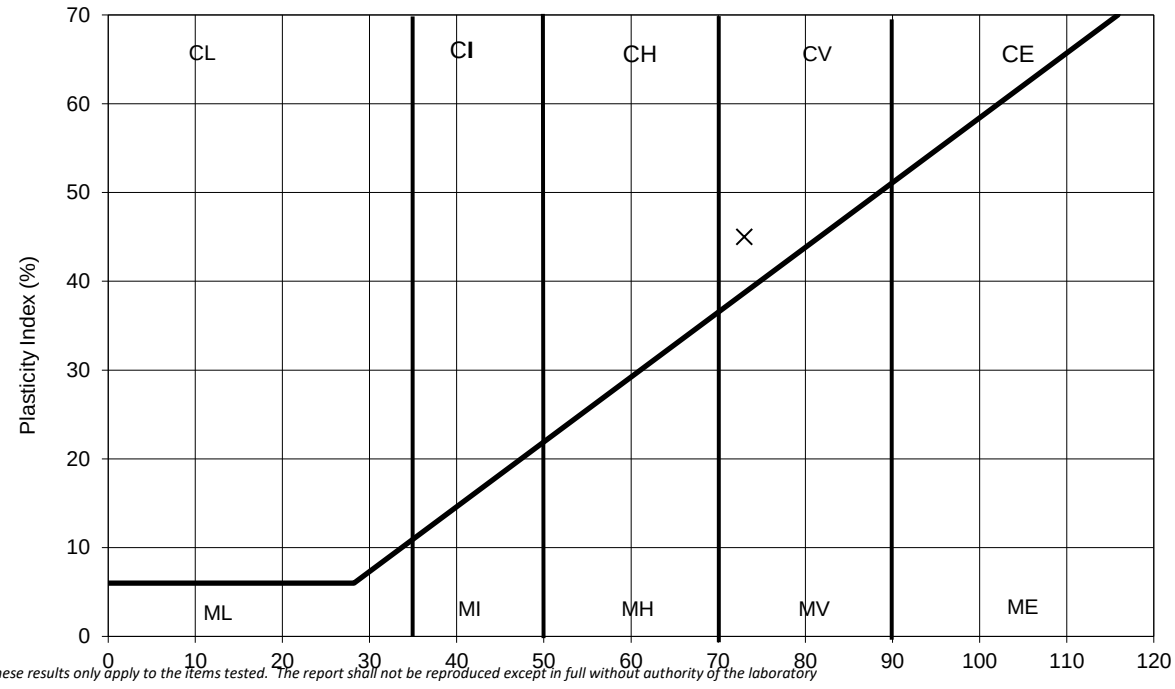
				Job No.	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	2.75 m
Soil Description	Orangish brown slightly mottled grey silty CLAY			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**73**	**%**
PLASTIC LIMIT	**28**	**%**
PLASTICITY INDEX	**45**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 22/12/2022

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Tel: 01923 711 288 Email: James@k4soils.com

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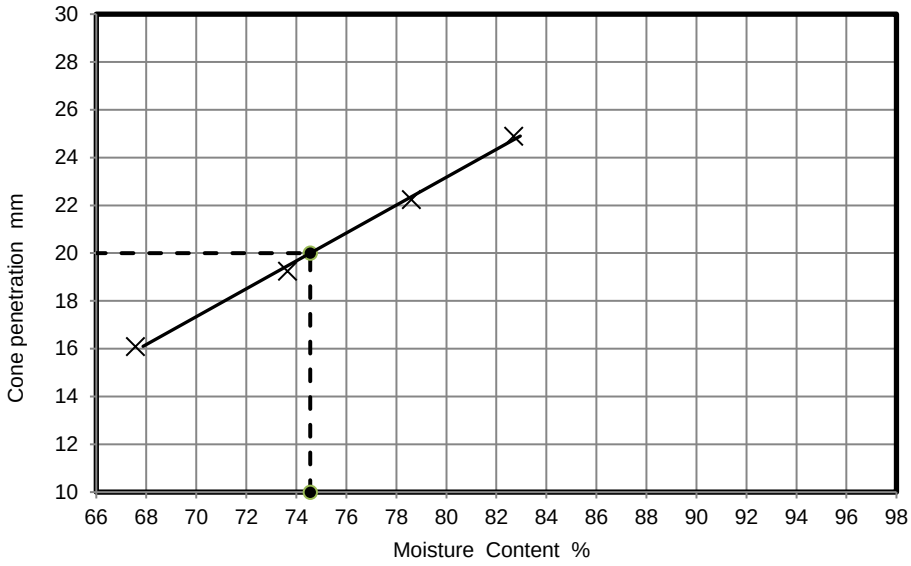
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	3.75 m
Soil Description	Orangish brown slightly mottled bluish grey silty CLAY with scattered selenite crystals			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022

Job No. 32734

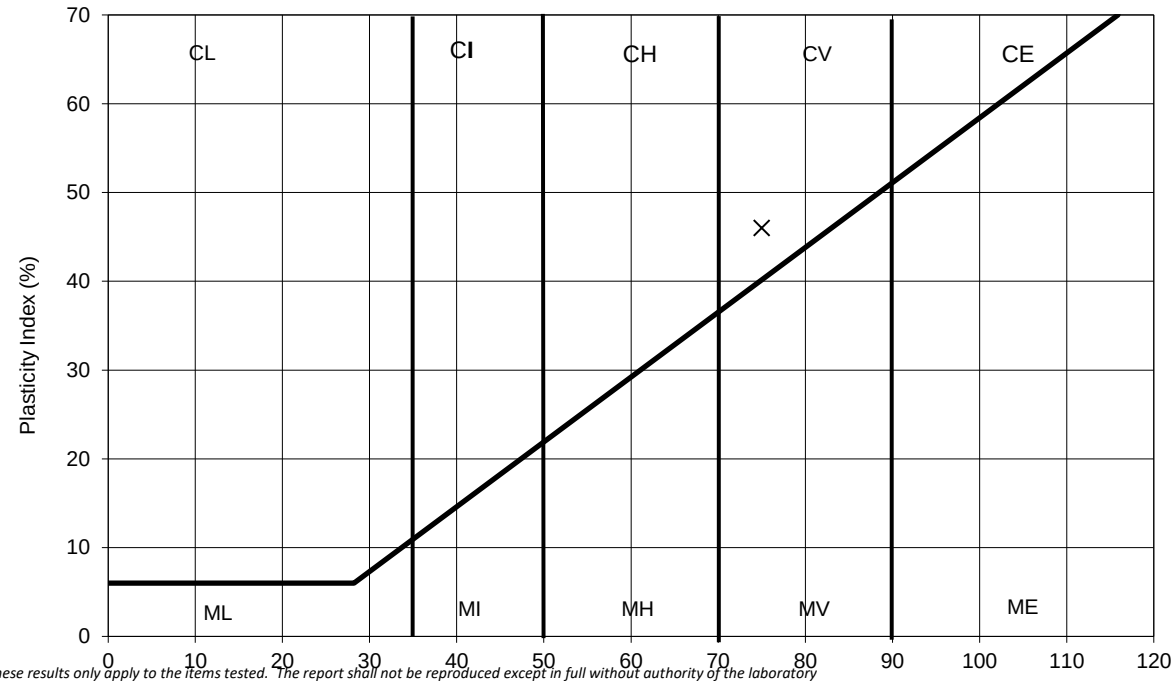
Borehole/Pit No. BH1



NATURAL MOISTURE CONTENT	**30**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**75**	**%**
PLASTIC LIMIT	**29**	**%**
PLASTICITY INDEX	**46**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 22/12/2022

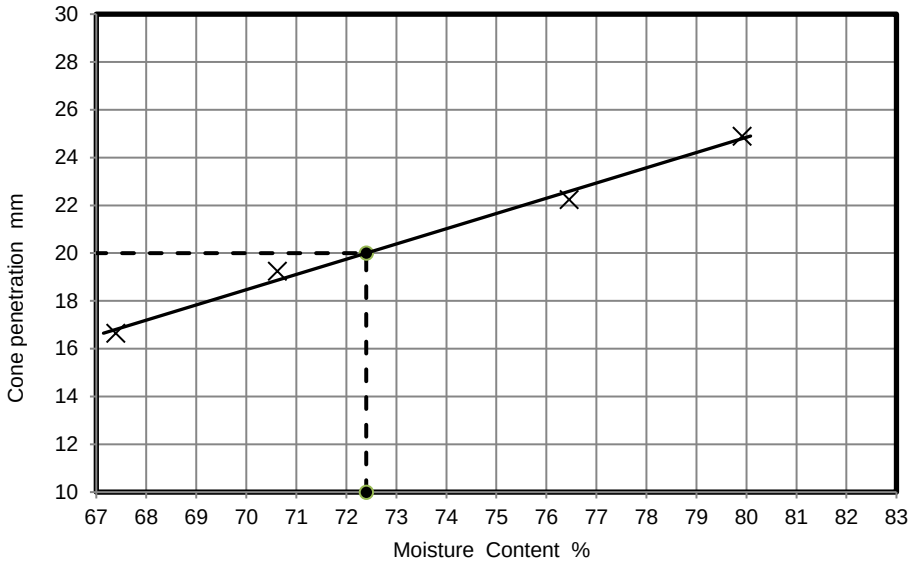
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

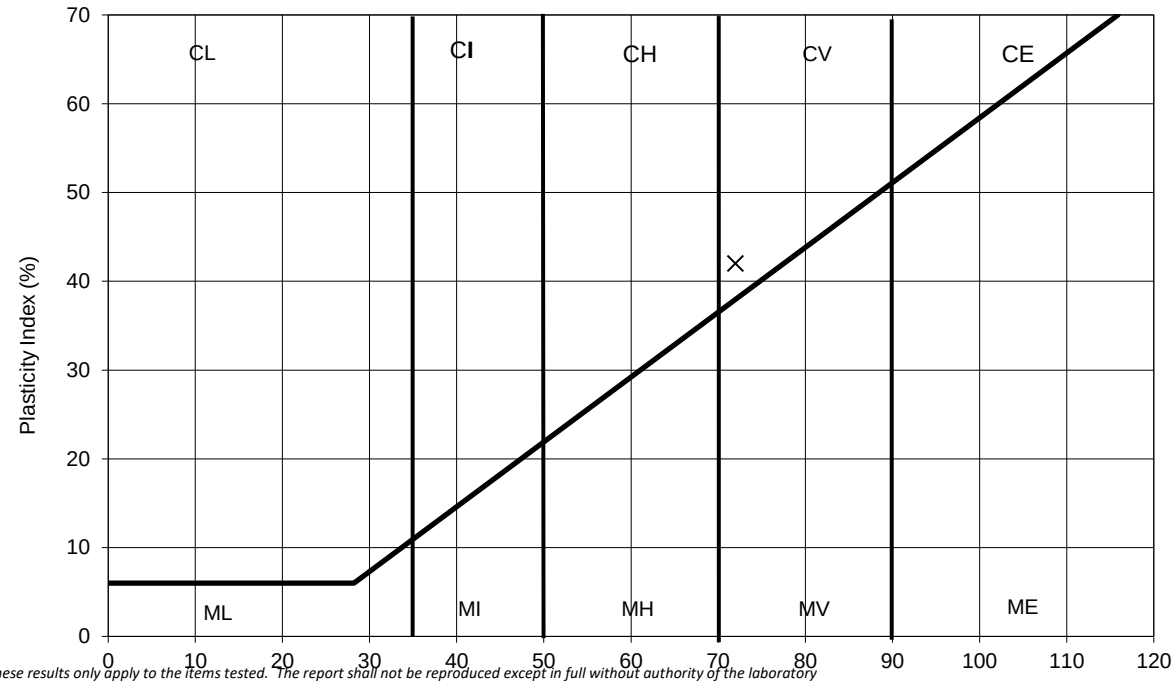
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	5.00 m
Soil Description	Brown and occasional bluish grey silty CLAY with scattered selenite crystals			Depth Base	5.45 m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**30**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**72**	**%**
PLASTIC LIMIT	**30**	**%**
PLASTICITY INDEX	**42**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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Tel: 01923 711 288 Email: James@k4soils.com

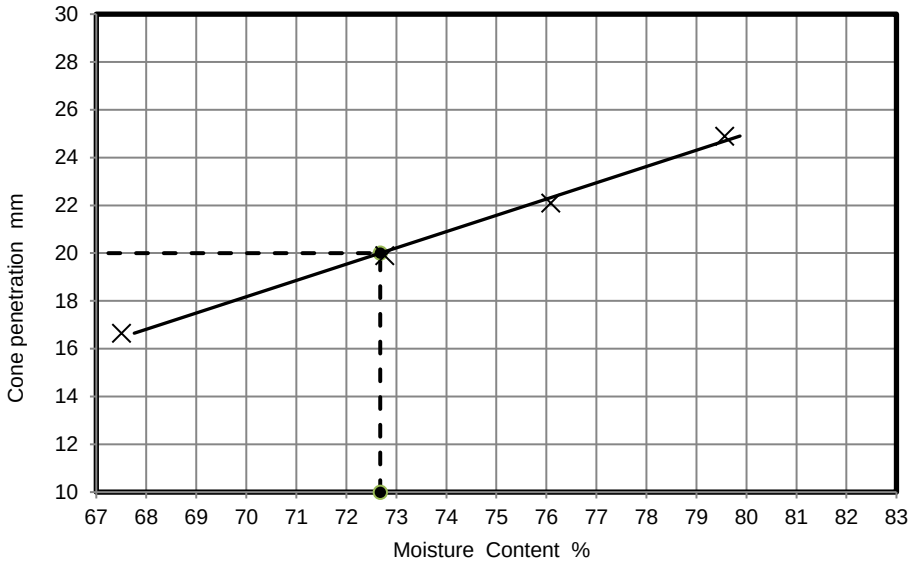
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

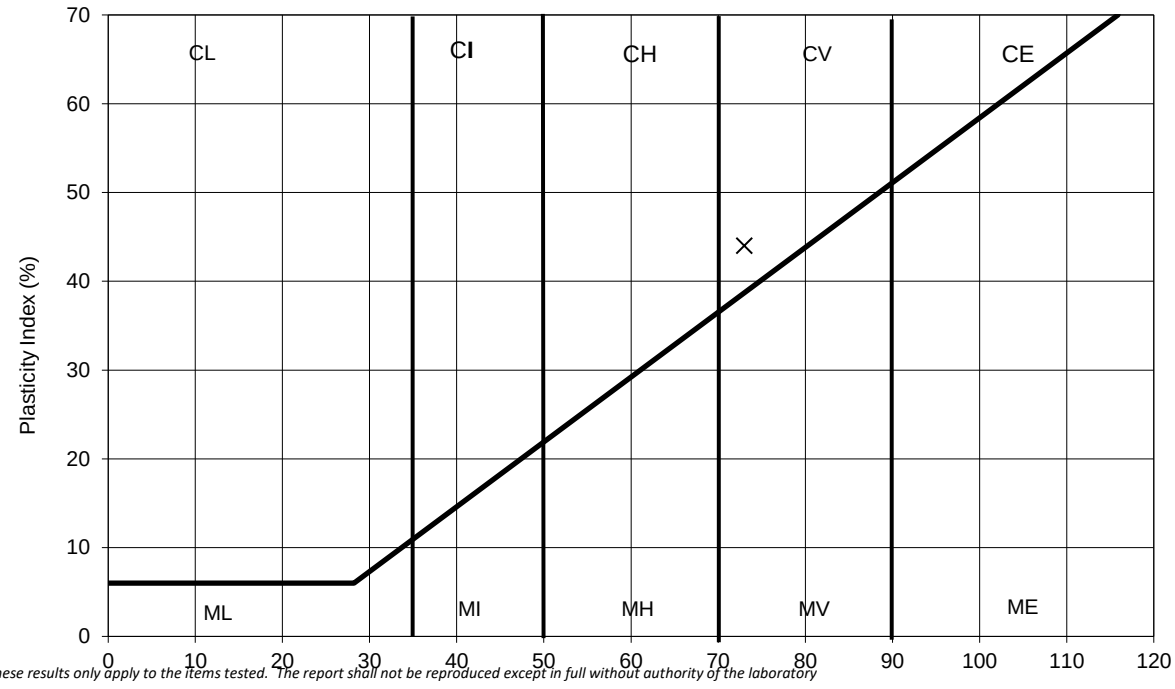
				Job No.	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	8.00 m
Soil Description	Dark grey silty CLAY			Depth Base	8.45 m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**25**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**73**	**%**
PLASTIC LIMIT	**29**	**%**
PLASTICITY INDEX	**44**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 22/12/2022

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

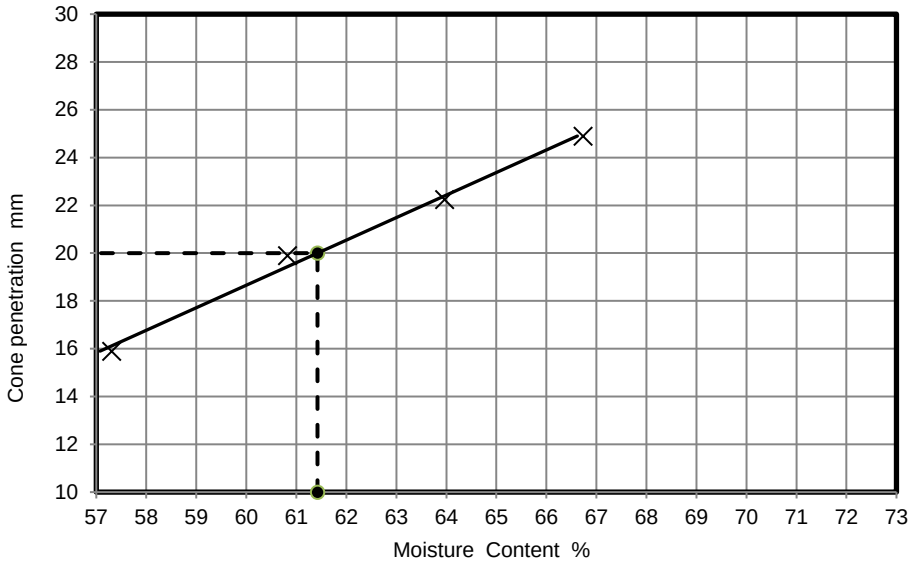
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

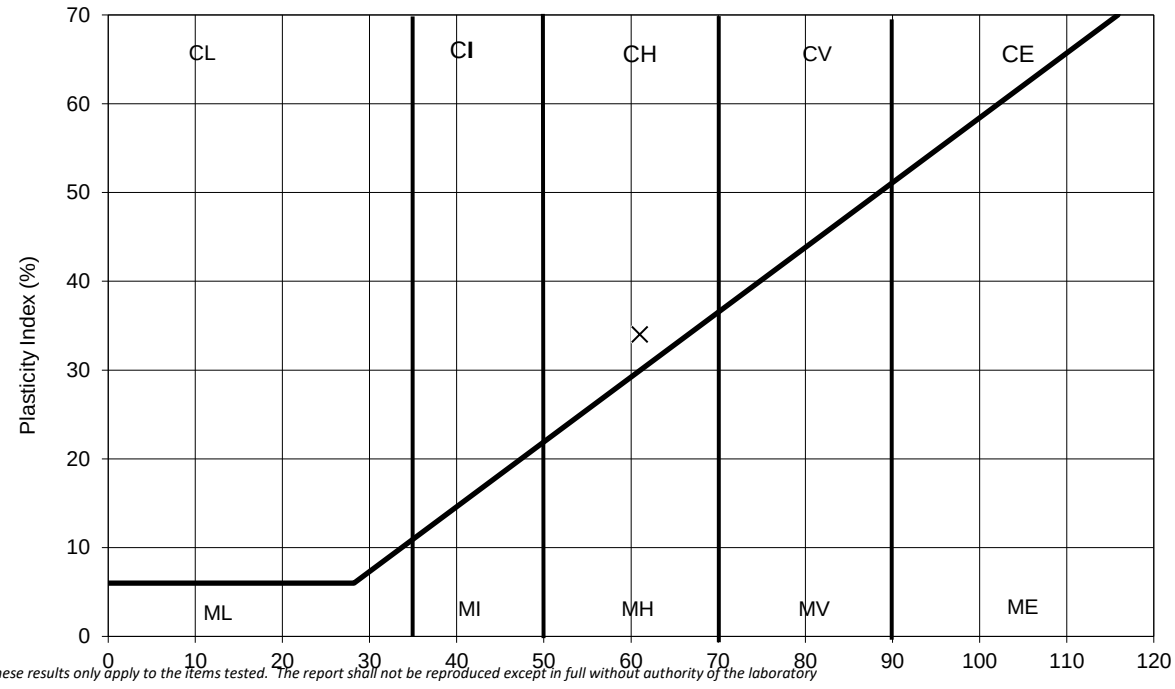
				Job No.	32734
				Borehole/Pit No.	BH2
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	1.20 m
Soil Description	Dark grey slightly mottled orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to rounded)			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**39**	**%**
% PASSING 425µm SIEVE	**88**	**%**
LIQUID LIMIT	**61**	**%**
PLASTIC LIMIT	**27**	**%**
PLASTICITY INDEX	**34**	**%**

Remarks

PLASTICITY INDEX



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Checked and Approved

Initials: J.P
Date: 22/12/2022

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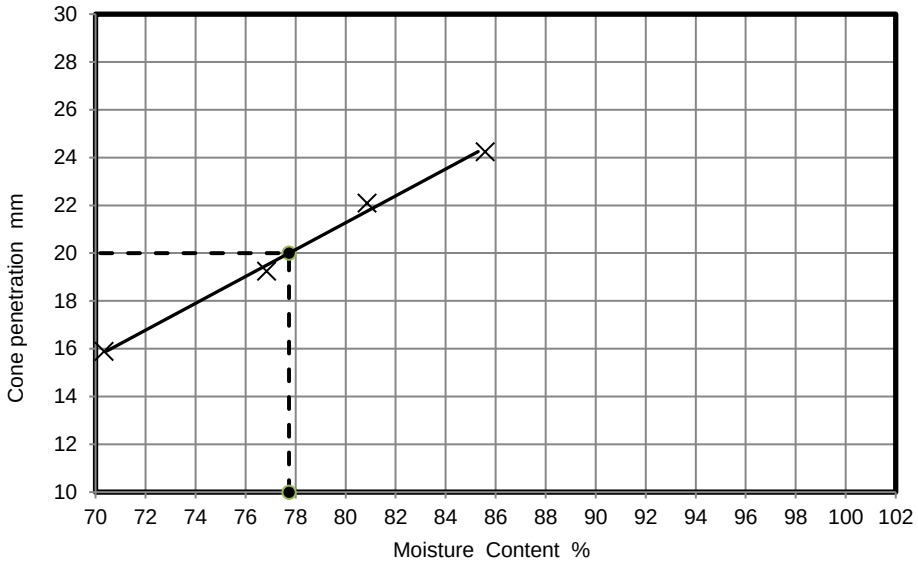
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

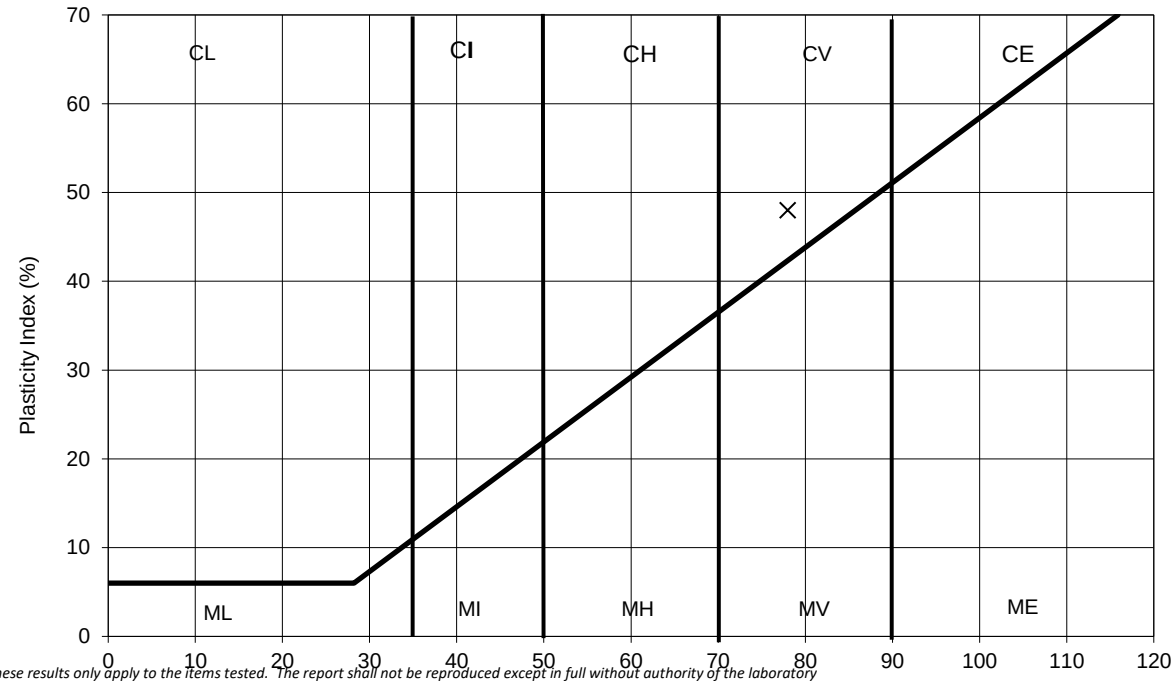
				Job No.	32734
				Borehole/Pit No.	BH2
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	2.80 m
Soil Description	Orangish brown slightly mottled bluish grey silty CLAY			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**30**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**78**	**%**
PLASTIC LIMIT	**30**	**%**
PLASTICITY INDEX	**48**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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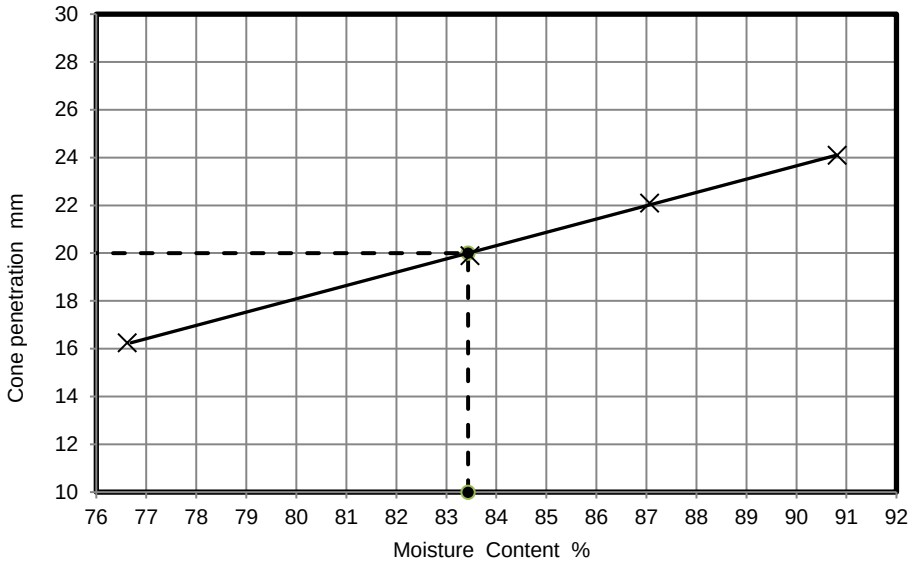
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

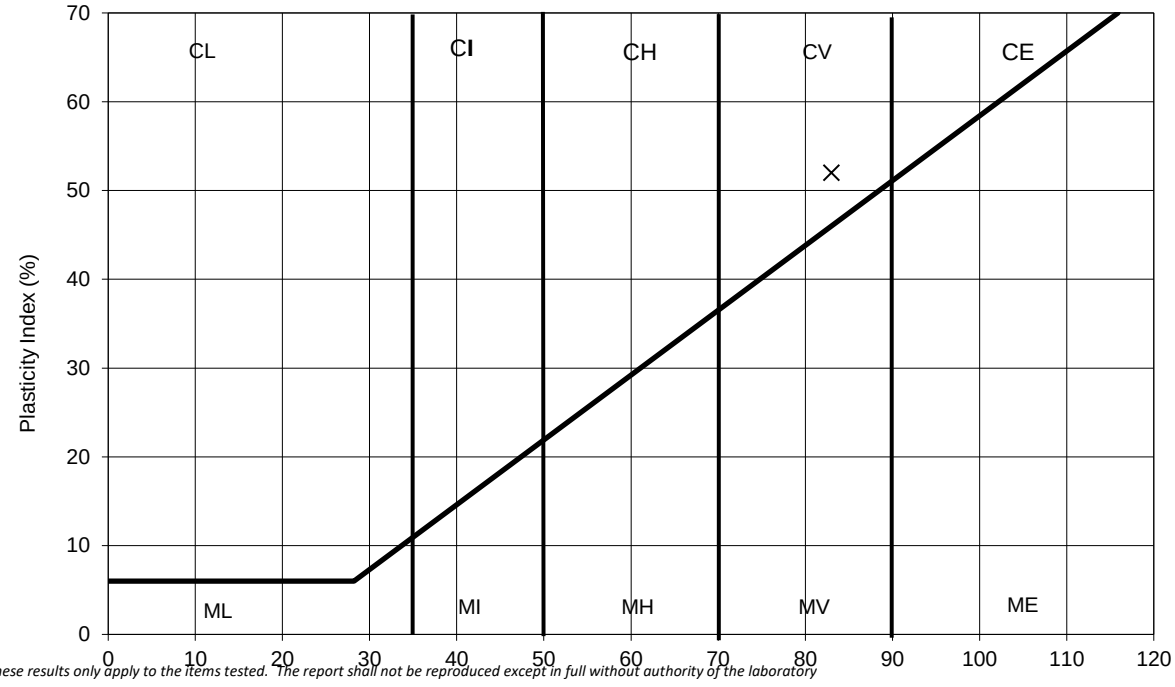
				Job No.	32734
				Borehole/Pit No.	BH3
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	1.50 m
Soil Description	Orangish brown mottled grey silty CLAY with rare fine gravel			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**36**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**83**	**%**
PLASTIC LIMIT	**31**	**%**
PLASTICITY INDEX	**52**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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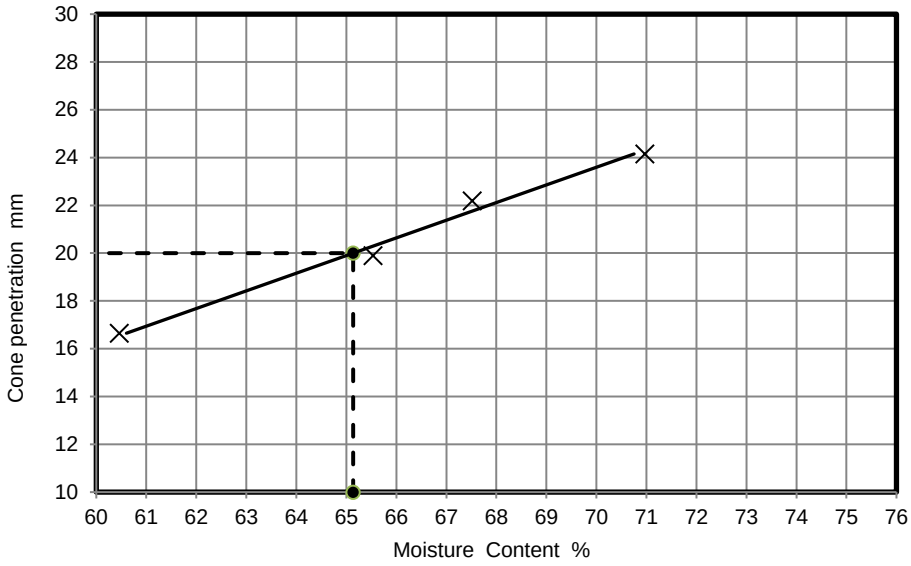
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

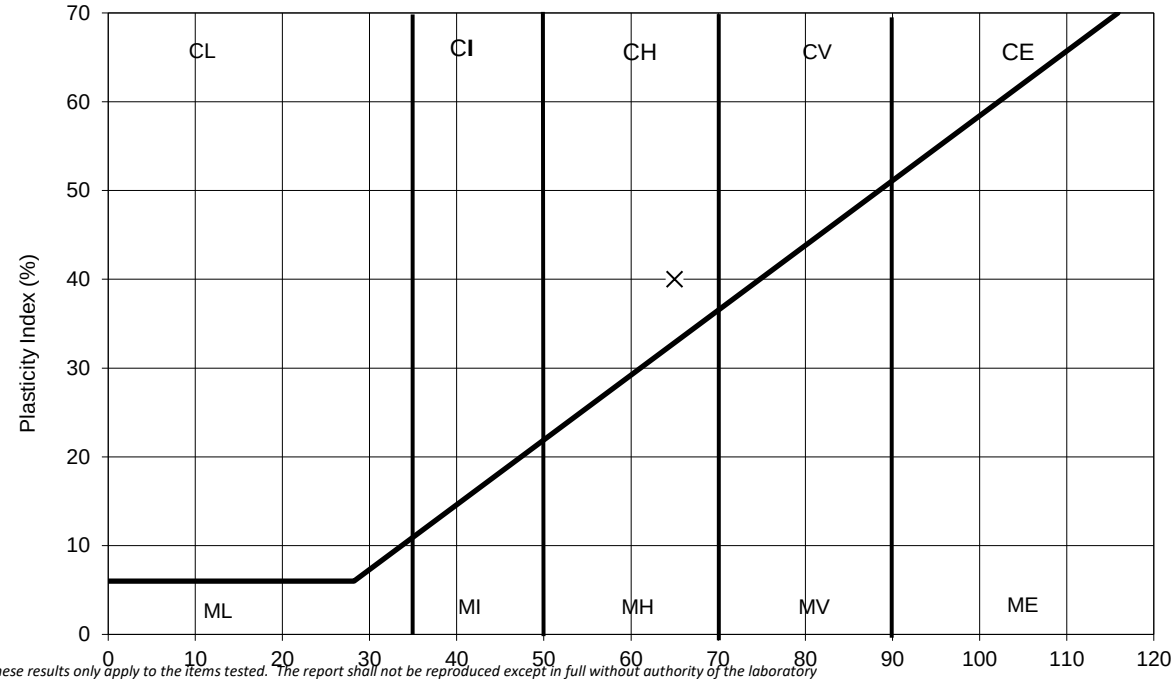
				Job No.	32734
				Borehole/Pit No.	BH3
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	2.50 m
Soil Description	Brown slightly mottled grey silty CLAY with rare fine gravel			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**25**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**65**	**%**
PLASTIC LIMIT	**25**	**%**
PLASTICITY INDEX	**40**	**%**

Remarks

PLASTICITY INDEX



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Checked and Approved

Initials: J.P
Date: 22/12/2022

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
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UKAS TESTING

2519

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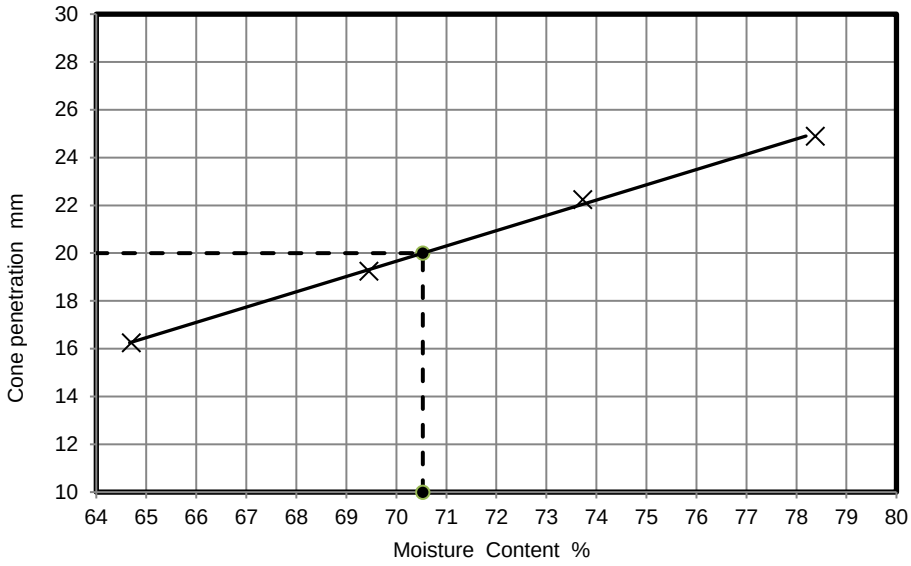
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

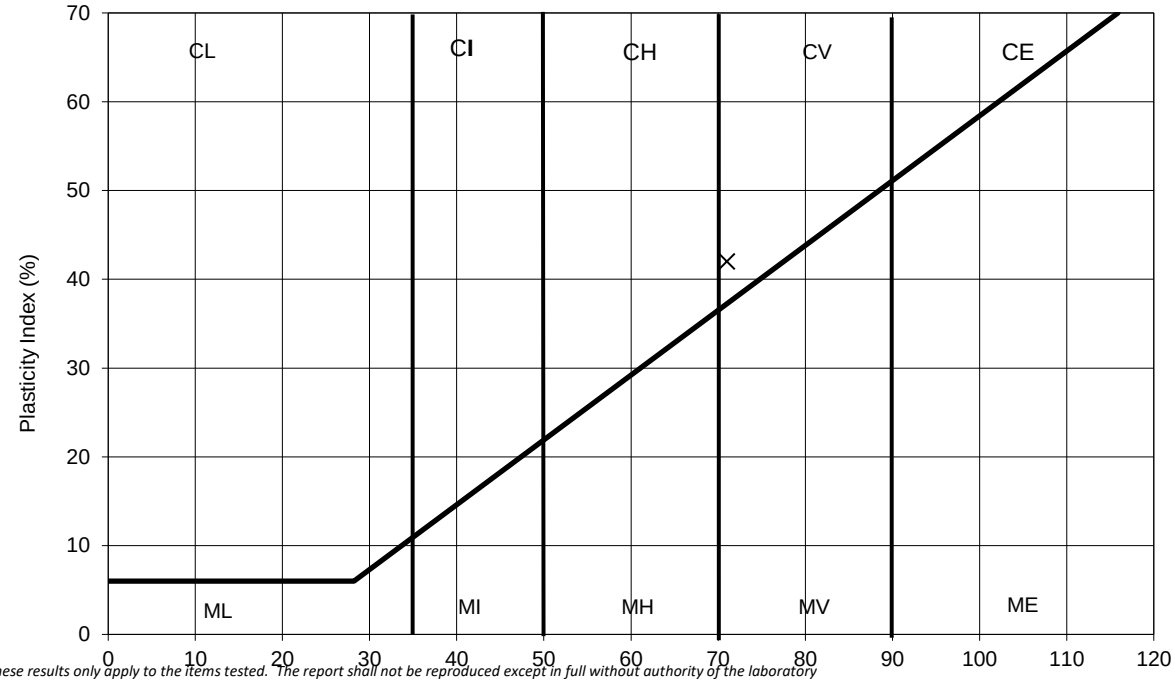
				Job No.	32734
				Borehole/Pit No.	TP3
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	0.75 m
Soil Description	Brown slightly mottled dark grey and bluish grey slightly gravelly silty CLAY (gravel is fm and angular to sub-angular)			Depth Base	- m
				Sample Type	D
				Samples received	28/11/2022
				Schedules received	05/12/2022
				Project Started	05/12/2022
				Date Tested	20/12/2022



NATURAL MOISTURE CONTENT	**32**	**%**
% PASSING 425µm SIEVE	**95**	**%**
LIQUID LIMIT	**71**	**%**
PLASTIC LIMIT	**29**	**%**
PLASTICITY INDEX	**42**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

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Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
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UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

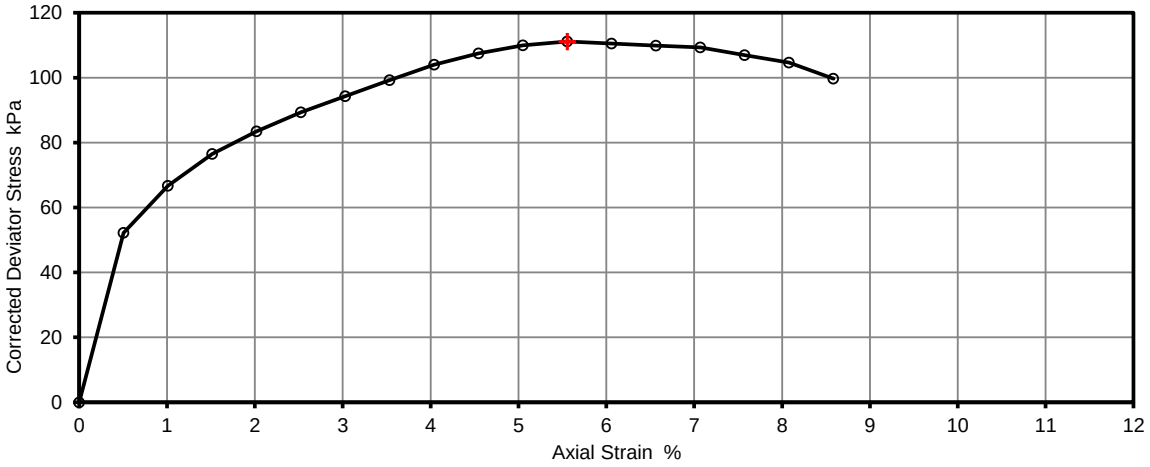
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	2.00 m
Soil Description	Medium strength orangish brown mottled brown slightly gravelly slightly sandy silty CLAY with occasional fine rootlets (gravel is fm and sub-angular)			Depth Base	2.45 m
				Sample Type	U
				Samples received	28/11/2022
				Schedules received	05/12/2022
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	08/12/2022

Remarks

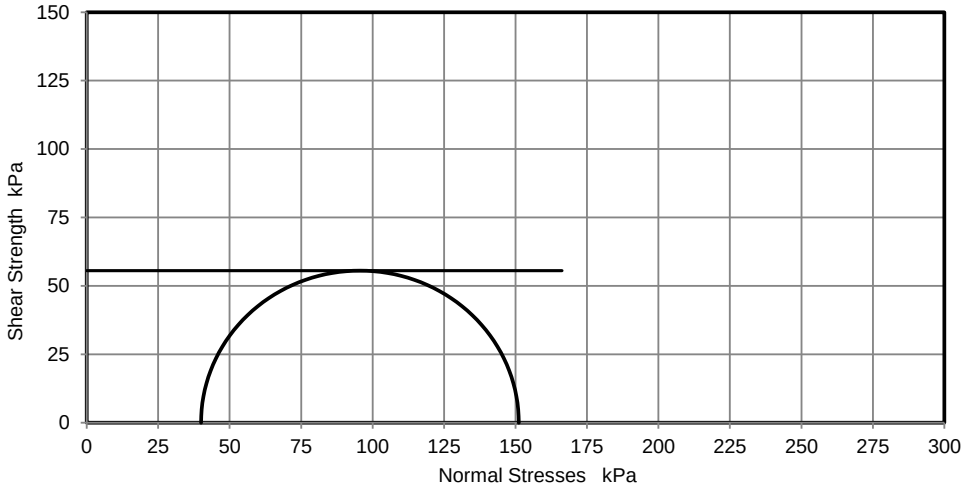
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	103.0	mm
Bulk Density	1.80	Mg/m3
Moisture Content	33	%
Dry Density	1.35	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	40	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	111	kPa
Undrained Shear Strength, cu	56	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 22/12/2022

2519 *Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)* MSF-5 R7

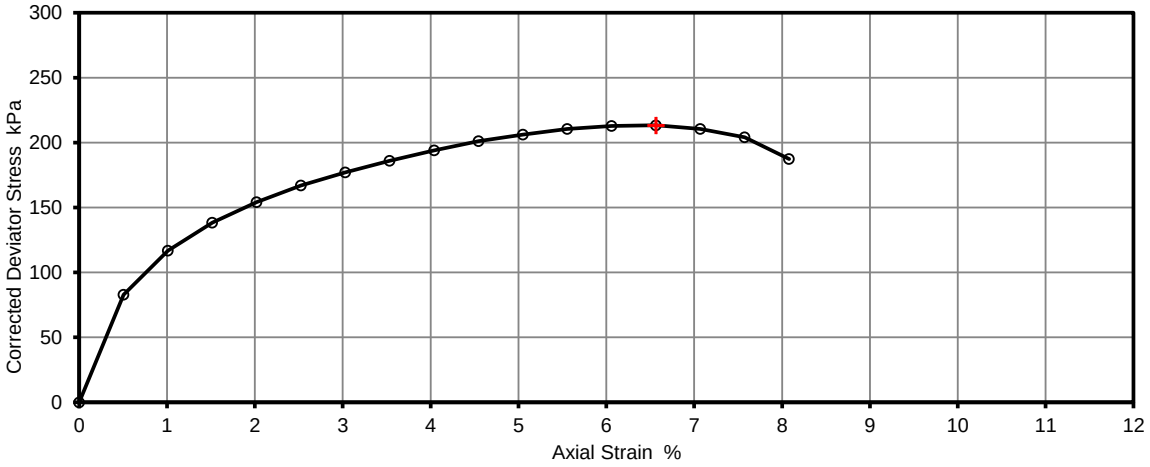
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	4.00 m
Soil Description	High strength brown slightly mottled orangish brown gleying grey silty CLAY with occasional pockets of fm pyrite crystals			Depth Base	4.45 m
				Sample Type	U
				Samples received	28/11/2022
				Schedules received	05/12/2022
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	08/12/2022

Remarks

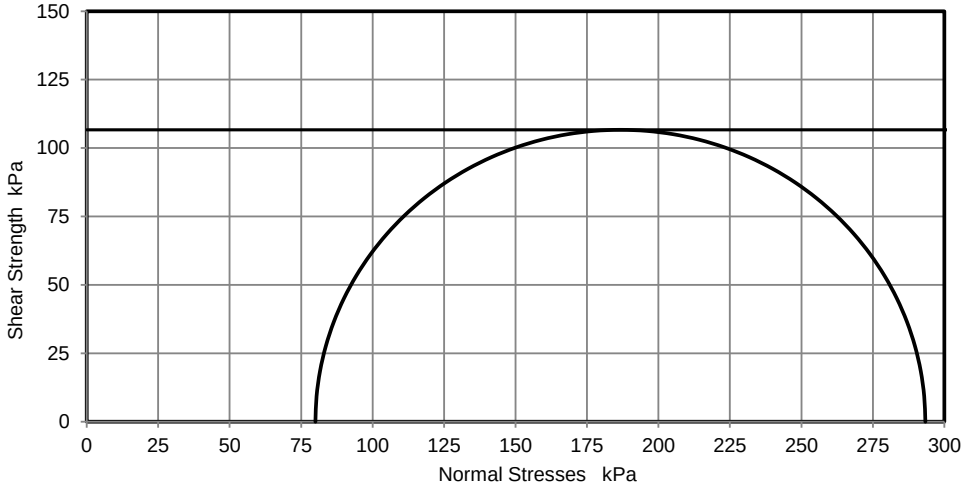
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	103.0	mm
Bulk Density	1.89	Mg/m3
Moisture Content	31	%
Dry Density	1.44	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	80	kPa
Axial Strain	6.6	%
Deviator Stress, (σ1 - σ3)f	213	kPa
Undrained Shear Strength, cu	107	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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UKAS TESTING 2519

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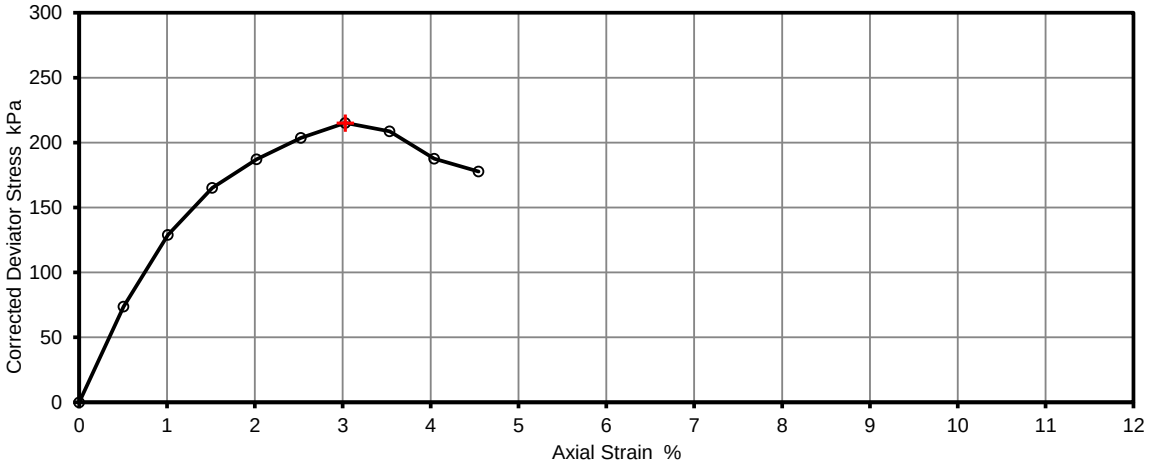
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	6.50 m
Soil Description	High strength dark brown slightly gleying orangish brown silty CLAY			Depth Base	6.95 m
				Sample Type	U
				Samples received	28/11/2022
				Schedules received	05/12/2022
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	08/12/2022

Remarks

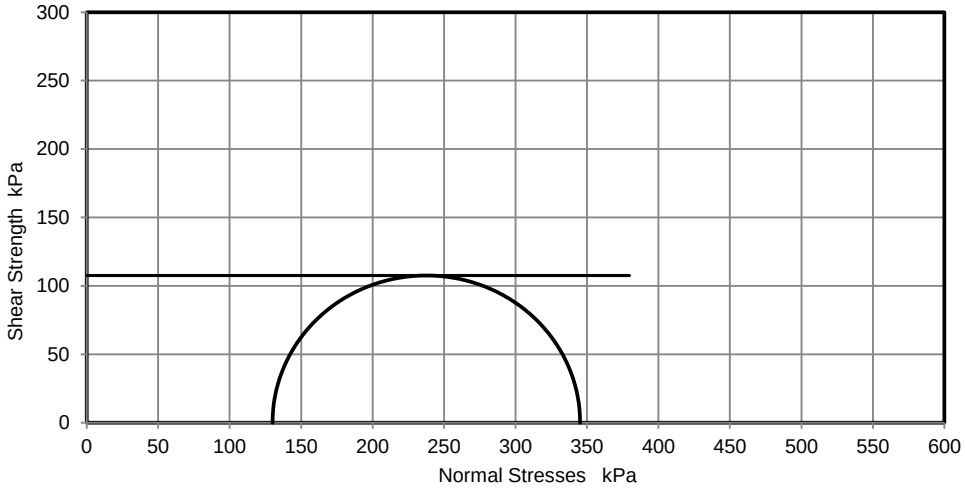
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	103.0	mm
Bulk Density	1.85	Mg/m3
Moisture Content	34	%
Dry Density	1.38	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	130	kPa
Axial Strain	3.0	%
Deviator Stress, (σ1 - σ3)f	215	kPa
Undrained Shear Strength, cu	108	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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Initials: J.P
Date 22/12/2022

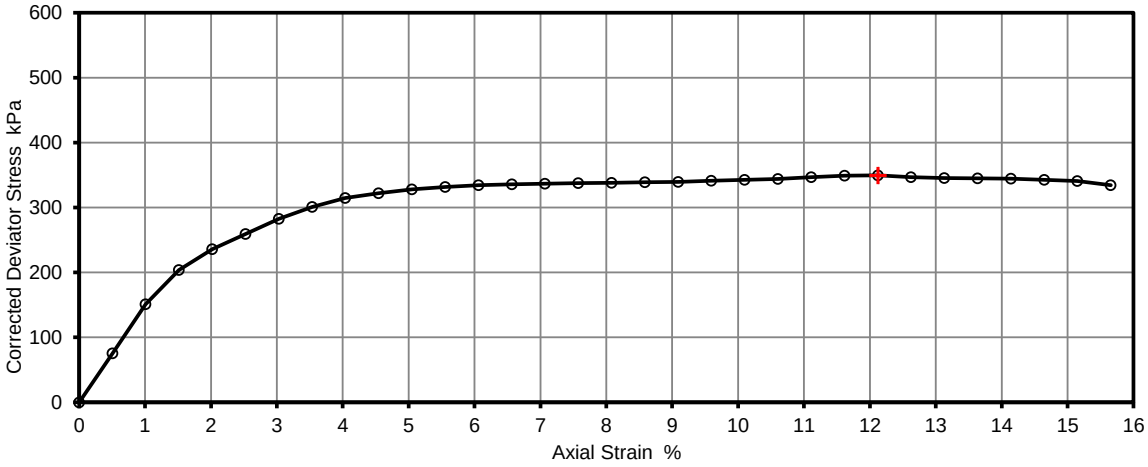
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	32734
				Borehole/Pit No.	BH1
Site Name	16 Pilgrims Lane			Sample No.	-
Project No.	J22352	Client	GEA	Depth Top	9.50 m
Soil Description	Very high strength dark grey slightly fine sandy silty CLAY with occasional fmc pyrite nodules			Depth Base	9.95 m
				Sample Type	U
				Samples received	28/11/2022
				Schedules received	05/12/2022
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	08/12/2022

Remarks

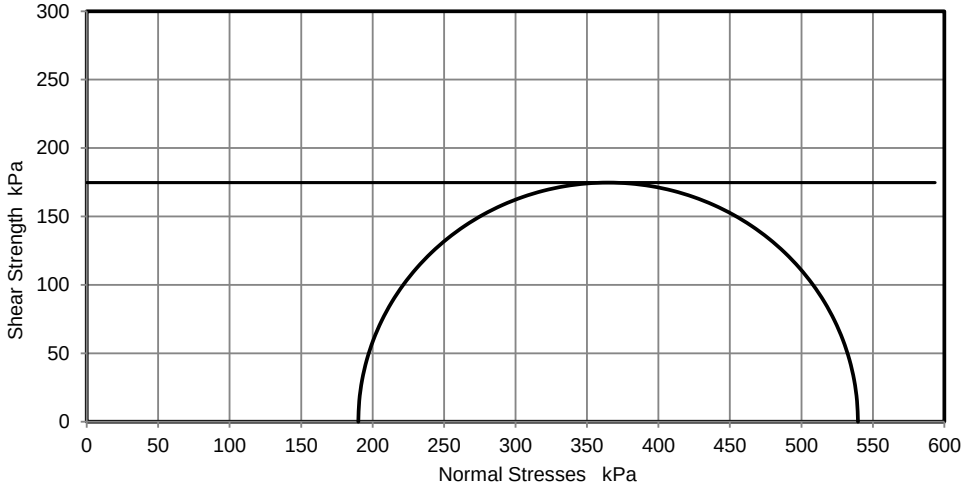
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	103.0	mm
Bulk Density	2.02	Mg/m3
Moisture Content	24	%
Dry Density	1.63	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	190	kPa
Axial Strain	12	%
Deviator Stress, (σ1 - σ3)f	350	kPa
Undrained Shear Strength, cu	175	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



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Initials: J.P
Date 22/12/2022

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
32734	16 Pilgrims Lane	Samples received	28/11/2022
		Schedule received	05/12/2022
Project No.	Client	Project started	05/12/2022
J22352	GEA	Testing Started	08/12/2022

Hole No.	Sample Ref	Top m	Base m	Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure: Axial strain %	At failure: σ1 - σ3 kPa	At failure: cu kPa	At failure: Mode	Remarks
BH1	-	2.00	2.45	U	Medium strength orangish brown mottled brown slightly gravelly slightly sandy silty CLAY with occasional fine rootlets (gravel is fm and sub-angular)	UU	1.80	1.35	33	198	103	40	5.6	111	56	B	
BH1	-	4.00	4.45	U	High strength brown slightly mottled orangish brown gleying grey silty CLAY with occasional pockets of fm pyrite crystals	UU	1.89	1.44	31	198	103	80	6.6	213	107	B	
BH1	-	6.50	6.95	U	High strength dark brown slightly gleying orangish brown silty CLAY	UU	1.85	1.38	34	198	103	130	3.0	215	108	B	
BH1	-	9.50	9.95	U	Very high strength dark grey slightly fine sandy silty CLAY with occasional fmc pyrite nodules	UU	2.02	1.63	24	198	103	190	12	350	175	C	

Legend
UU - single stage test (single and multiple specimens) σ3 Cell pressure Mode of failure ; B - Brittle
UUM - Multistage test on a single specimen σ1 - σ3 Maximum corrected deviator stress P - Plastic
suffix R - remoulded or recompacted cu Undrained shear strength, ½ (σ1 - σ3) C - Compound

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Checked and Approved

Initials: J.P

Date: 22/12/2022

Sulphate Content (Gravimetric Method) for 2:1 Soil: Water Extract and pH Value - Summary of Results

Tested in accordance with BS1377 : Part 3 : 2018, Clause 7.6 & Clause 12

Job No.	Project Name	Programme	
32734	16 Pilgrims Lane	Samples received	28/11/2022
		Schedule received	05/12/2022
Project No.	Client	Project started	05/12/2022
J22352	GEA	Testing Started	12/12/2022

Hole No.	Sample Ref	Top m	Base m	Type	Soil description	Dry Mass passing 2mm %	SO4 Content mg/l	pH	Remarks
BH1	-	0.50	-	D	Dark brown sandy clayey GRAVEL/clayey very gravelly SAND with brick and concrete fragments (gravel is fm and sub-angular)	40	480	7.6	
BH1	-	1.85	-	D	Orangish brown slightly mottled grey slightly sandy slightly gravelly silty CLAY (gravel is fm and sub-angular to rounded)	98	400	7.7	
BH1	-	3.75	-	D	Orangish brown slightly mottled bluish grey silty CLAY with scattered selenite crystals	100	790	7.7	
BH2	-	3.50	-	D	Brown slightly mottled grey silty CLAY with occasional scattered decomposed selenite crystals	100	2500	7.5	

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

These results only apply to the items tested

Checked and Approved

Initials J.P

Date: 22/12/2022

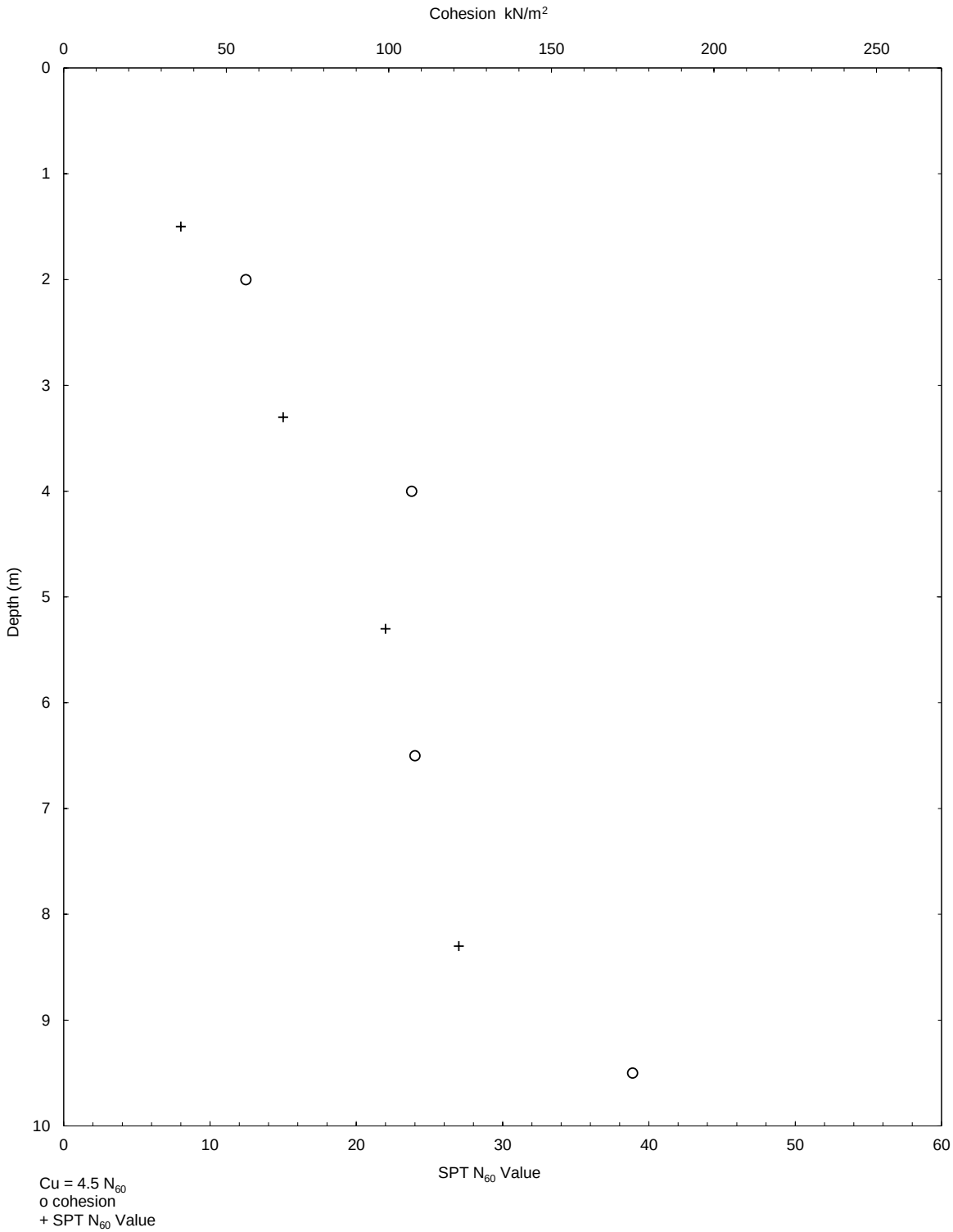
GEA
www.gea-ltd.co.uk
Herts | 01727 824666 Notts | 01509 674888

SPT & Cohesion / Depth Graph

Site	16 Pilgrims Lane, London NW13 1SN
Client	Mr Andrew Lavery
Engineer	GSE Ltd

Job Number J22352

Sheet 1 / 1



Cu = 4.5 N_{60}
o cohesion
+ SPT N_{60} Value

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Analytical Report Number : 22-98775

Project / Site name:	16 Pilgrims Lane	**Samples received on:**	23/11/2022
Your job number:	J22314	**Samples instructed on/ Analysis started on:**	24/11/2022
Your order number:		**Analysis completed by:**	02/12/2022
Report Issue Number:	1	**Report issued on:**	05/12/2022
Samples Analysed:	1 soil sample		

Signed:

Adam Fenwick
Technical Reviewer
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-98775
Project / Site name: 16 Pilgrims Lane

Lab Sample Number				2510891
Sample Reference				BH1
Sample Number				None Supplied
Depth (m)				0.40
Date Sampled				16/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	10
Total mass of sample received	kg	0.001	NONE	0.6

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001
Asbestos Analyst ID	N/A	N/A	N/A	ASE

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1700
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.24
Sulphide	mg/kg	1	NONE	3.7
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	130
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	0.1
Acenaphthylene	mg/kg	0.05	NONE	0.08
Acenaphthene	mg/kg	0.05	NONE	0.05
Fluorene	mg/kg	0.05	NONE	0.05
Phenanthrene	mg/kg	0.05	NONE	1.2
Anthracene	mg/kg	0.05	NONE	0.24
Fluoranthene	mg/kg	0.05	NONE	3
Pyrene	mg/kg	0.05	NONE	2.7
Benzo(a)anthracene	mg/kg	0.05	NONE	1.6
Chrysene	mg/kg	0.05	NONE	1.6
Benzo(b)fluoranthene	mg/kg	0.05	NONE	1.7
Benzo(k)fluoranthene	mg/kg	0.05	NONE	0.81
Benzo(a)pyrene	mg/kg	0.05	NONE	1.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.81
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.18
Benzo(ghi)perylene	mg/kg	0.05	NONE	0.89

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	16.3

Analytical Report Number: 22-98775
Project / Site name: 16 Pilgrims Lane

Lab Sample Number				2510891
Sample Reference				BH1
Sample Number				None Supplied
Depth (m)				0.40
Date Sampled				16/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	26
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42
Lead (aqua regia extractable)	mg/kg	1	MCERTS	340
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140
Petroleum Hydrocarbons				
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	NONE	< 10
TPH (C8 - C10) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1
TPH (C10 - C12) EH_CU_1D_TOTAL	mg/kg	2	NONE	< 2.0
TPH (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	NONE	< 4.0
TPH (C16 - C21) EH_CU_1D_TOTAL	mg/kg	1	NONE	< 1.0
TPH (C21 - C35) EH_CU_1D_TOTAL	mg/kg	1	NONE	< 1.0
TPH Total C8 - C35 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-98775
Project / Site name: 16 Pilgrims Lane

* 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 *
2510891	BH1	None Supplied	0.4	Brown loam and sand with gravel and rubble.

Analytical Report Number : 22-98775
Project / Site name: 16 Pilgrims Lane

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	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
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	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-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	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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
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 (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

Analytical Report Number : 22-98775
Project / Site name: 16 Pilgrims Lane

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' 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
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report

Analytical Report Number : 22-98775
Project / Site name: 16 Pilgrims Lane

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH1	None Supplied	S	2510891	c	Sulphide in soil	L010-PL	c
BH1	None Supplied	S	2510891	c	Total cyanide in soil	L080-PL	c

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Analytical Report Number : 22-11317

Project / Site name:	16 Pilgrims Lane	**Samples received on:**	02/12/2022
Your job number:	J22352	**Samples instructed on/ Analysis started on:**	05/12/2022
Your order number:		**Analysis completed by:**	14/12/2022
Report Issue Number:	1	**Report issued on:**	14/12/2022
Samples Analysed:	3 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
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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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-11317
Project / Site name: 16 Pilgrims Lane

Lab Sample Number				2521573	2521574	2521575
Sample Reference				BH2	BH3	TP2
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.30	0.80
Date Sampled				28/11/2022	28/11/2022	28/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	18	19
Total mass of sample received	kg	0.001	NONE	0.8	0.5	0.5
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SSZ	SSZ	SSZ
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	7.3	7.6	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	750	710	470
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.021	0.022	0.017
Sulphide	mg/kg	1	MCERTS	< 1.0	5.1	< 1.0
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	11	9.5	8.5
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.8	2.9	1.9
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	4.1	4.4	1.9
Acenaphthylene	mg/kg	0.05	MCERTS	0.09	0.18	0.09
Acenaphthene	mg/kg	0.05	NONE	0.36*	0.3*	0.15*
Fluorene	mg/kg	0.05	NONE	0.18*	0.23*	0.08*
Phenanthrene	mg/kg	0.05	MCERTS	1.2	1.4	0.39
Anthracene	mg/kg	0.05	MCERTS	0.23	0.28	0.12
Fluoranthene	mg/kg	0.05	MCERTS	3.5	2.6	1.5
Pyrene	mg/kg	0.05	MCERTS	3	2.3	1.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.6	1.3	0.89
Chrysene	mg/kg	0.05	MCERTS	1.7	1.3	0.9
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	2.1*	1.6*	1.6*
Benzo(k)fluoranthene	mg/kg	0.05	NONE	0.74*	0.53*	0.5*
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.7	1.4	1.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.76*	0.6*	0.78*
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.17	0.14	0.15
Benzo(ghi)perylene	mg/kg	0.05	NONE	0.79*	0.7*	1*
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	22.1	19.2	12.9
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	25	38	26
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37	33	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	77	120	17
Lead (aqua regia extractable)	mg/kg	1	MCERTS	710	880	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	1.5	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	29	35	13
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	370	380	79

Analytical Report Number: 22-11317
Project / Site name: 16 Pilgrims Lane

Lab Sample Number				2521573	2521574	2521575
Sample Reference				BH2	BH3	TP2
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.30	0.80
Date Sampled				28/11/2022	28/11/2022	28/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Petroleum Hydrocarbons						
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	MCERTS	28	47	41
TPH (C8 - C10) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_1D_TOTAL	mg/kg	2	MCERTS	3.1	4	2.5
TPH (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	MCERTS	< 4.0	7.5	4.2
TPH (C16 - C21) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	5.9	12	6.6
TPH (C21 - C35) EH_CU_1D_TOTAL	mg/kg	1	MCERTS	16	24	23
TPH Total C8 - C35 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	25	47	36

U/S = Unsuitable Sample I/S = Insufficient Sample
*Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted and the failure justified as having no significant impact on sample data reported.

Analytical Report Number : 22-11317
Project / Site name: 16 Pilgrims Lane

* 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 *
2521573	BH2	None Supplied	0.3	Brown clay and sand with gravel and vegetation.
2521574	BH3	None Supplied	0.3	Brown clay and sand with gravel and vegetation.
2521575	TP2	None Supplied	0.8	Brown clay and sand with gravel.

Analytical Report Number : 22-11317
Project / Site name: 16 Pilgrims Lane

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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.	L038-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
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	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
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-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 sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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
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 (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-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 and silica gel split/cleanup.	L076-PL	D	MCERTS

Analytical Report Number : 22-11317
Project / Site name: 16 Pilgrims Lane

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' 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.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report

Analytical Report Number : 22-11317
Project / Site name: 16 Pilgrims Lane

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH2	None Supplied	S	2521573	c	Sulphide in soil	L010-PL	c
BH2	None Supplied	S	2521573	c	Total cyanide in soil	L080-PL	c
BH3	None Supplied	S	2521574	c	Sulphide in soil	L010-PL	c
BH3	None Supplied	S	2521574	c	Total cyanide in soil	L080-PL	c
TP2	None Supplied	S	2521575	c	Sulphide in soil	L010-PL	c
TP2	None Supplied	S	2521575	c	Total cyanide in soil	L080-PL	c

GEA

Widbury Barn
Widbury Hill
Ware
SG12 7QE

Generic Risk-Based Soil Screening Values

Site	16 Pilgrims Lane, London NW13 1SN	**Job Number** J22352
Client	Mr Andrew Lavery	**Sheet** 1 / 1
Engineer	GSE Ltd	

Proposed End Use Residential with plant uptake

Soil Organic Matter content % 1.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	37	C4SL
Cadmium	22	C4SL
Chromium (III)	910	S4UL
Chromium (VI)	21	C4SL
Copper	2,400	S4UL
Lead	200	C4SL
Elemental Mercury	1.2	S4UL
Inorganic Mercury	40	S4UL
Nickel	130	S4UL
Selenium	350	SGV
Zinc	3,700	S4UL
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	184	SGV
PAH		
Naphthalene	2.30	S4UL
Acenaphthylene	170	S4UL
Acenaphthene	210	S4UL
Fluorene	170	S4UL
Phenanthrene	95	S4UL
Anthracene	2,400	S4UL
Fluoranthene	280	S4UL
Pyrene	620	S4UL
Benzo(a)anthracene	7.2	S4UL
Chrysene	15	S4UL
Benzo(b)fluoranthene	2.6	S4UL
Benzo(k)fluoranthene	77.0	S4UL
Benzo(a)pyrene	4.35	C4SL
Indeno(1 2 3 cd)pyrene	27.0	S4UL
Dibenz(a h)anthracene	0.24	S4UL
Benzo (g h i)perylene	320	S4UL
Total PAH Screen	**62.1**	B(a)P / 0.15

Contaminant	Screening Value mg/kg	Data Source
Hydrocarbons		
Banded TPH (8-10)	52	Calc1
Banded TPH (10-12)	114	Calc1
Banded TPH (12-16)	215	Calc1
Banded TPH (16-21)	400	Calc1
Banded TPH (21-35)	1692	Calc1
Benzene	0.2	C4SL
Toluene	120	SGV
Ethyl Benzene	65	SGV
Xylene	42	SGV
Aliphatic C5-C6	42	S4UL
Aliphatic C6-C8	100	S4UL
Aliphatic C8-C10	27	S4UL
Aliphatic C10-C12	130	S4UL
Aliphatic C12-C16	1100	S4UL
Aliphatic C16-C35	65,000	S4UL
Aromatic C6-C7	See Benzene	S4UL
Aromatic C7-C8	See Toluene	S4UL
Aromatic C8-C10	34	S4UL
Aromatic C10-C12	74	S4UL
Aromatic C12-C16	140	S4UL
Aromatic C16-C21	260	S4UL
Aromatic C21-C35	1100	S4UL
PRO (C_5 –C_{10})	323	Calc2
DRO (C_{12} –C_{28})	66,500	Calc2
Lube Oil (C_{28} –C_{44})	66,100	Calc2
TPH	**750**	Trigger to consider speciated testing
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	8.8	S4UL
tetrachloroethane (PCA)	1.2	S4UL
tetrachloroethene (PCE)	0.18	S4UL
trichloroethene (TCE)	0.016	S4UL
1,2-dichloroethane (DCA)	0.0071	S4UL
vinyl chloride (Chloroethene)	0.00064	S4UL
tetrachloromethane (Carbon tetra	0.026	S4UL
trichloromethane (Chloroform)	0.91	S4UL

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

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

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009 - where not superseded by C4SL

S4UL - LQM/CIEH Suitable for use Level (2015) based on 'minimal' level of risk

Calc1 - sum of thresholds for Ali & Aro fractions - assuming a 35% Aro:65% Ali ratio as is commonly encountered in the soil

Calc2 - sum of nearest available carbon range specified including BTEX for PRO fraction

Total PAH based on B(a)P / 0.15 - GEA experience indicates that Benzo(a) pyrene rarely exceeds 15% of the total PAH concentration

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Widbury Barn
Widbury Hill
Ware
SG12 7QE

Generic Risk-Based Soil Screening Values

Site	16 Pilgrims Lane, London NW13 1SN
Client	Mr Andrew Lavery
Engineer	GSE Ltd

Job Number J22352

Sheet 2 / 2

Proposed End Use **Residential with 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, consumption of home grown produce, consumption of soil adhering to home grown produce, 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.

appendix c

Desk Study

Envirocheck Extracts
Historical Maps
Risk Assessment Tables

appendix c

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
305378389_1_1

Customer Reference:
J22352

National Grid Reference:
526870, 185690

Slice:
A

Site Area (Ha):
0.04

Search Buffer (m):
1000

Site Details:

16, Pilgrims Lane
LONDON
NW3 1SN

Client Details:

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

GEA

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

Report Version v53.0

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
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			2	5
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 2			Yes	
Pollution Incidents to Controlled Waters					
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances	pg 2			28	12
River Quality					
River Quality Biology Sampling Points					
Substantiated Pollution Incident Register	pg 8				1
River Quality Chemistry Sampling Points					
Water Abstractions	pg 9				(*4)
Water Industry Act Referrals					
Groundwater Vulnerability Map	pg 10	Yes	n/a	n/a	n/a
Groundwater Vulnerability - Soluble Rock Risk			n/a	n/a	n/a
Groundwater Vulnerability - Local Information			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 10	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
OS Water Network Lines	pg 10			3	19

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	pg 13	1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)	pg 13			1	6
Potentially Infilled Land (Water)	pg 13			2	
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					

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 14	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry					
BGS Recorded Mineral Sites					
BGS Urban Soil Chemistry	pg 14		Yes	Yes	Yes
BGS Urban Soil Chemistry Averages	pg 17	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 17	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 17	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 17	Yes		n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 17	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 18		14	35	77
Fuel Station Entries	pg 28				1
Points of Interest - Commercial Services	pg 28		1		16
Points of Interest - Education and Health	pg 30			5	4
Points of Interest - Manufacturing and Production	pg 30			2	12
Points of Interest - Public Infrastructure	pg 32		2	4	11
Points of Interest - Recreational and Environmental	pg 33			3	4
Gas Pipelines					
Underground Electrical Cables	pg 34		4	4	4

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Sensitive Land Use					
Ancient Woodland					
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves	pg 36				1
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones					
Ramsar Sites					
Sites of Special Scientific Interest					
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	A13NW (W)	3	1	526850 185690
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 revoked** Positional Accuracy: Located by supplier to within 100m	A17SE (NW)	768	2	526200 186100
2	**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	A12NE (W)	480	3	526374 185724
3	**Local Authority Pollution Prevention and Controls** Name: The Royal Free Hospital Location: Pond Street, LONDON, NW3 2QG Authority: London Borough of Camden, Pollution Projects Team Permit Reference: Not Given Dated: 24th July 1992 Process Type: Local Authority Air Pollution Control Description: PG5/1Clinical waste incineration processes under 1 tonne an hour **Status:** **Authorisation revoked** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	496	3	527296 185410
4	**Local Authority Pollution Prevention and Controls** Name: Belsize Park Service Station Location: 215 Haverstock Hill, LONDON, NW3 4RE Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC21 Dated: 2nd January 1999 Process Type: Local Authority Pollution Prevention and Control Description: PG1/14 Petrol filling station **Status:** **Permitted** Positional Accuracy: Automatically positioned to the address	A8NE (SE)	546	3	527187 185227
5	**Local Authority Pollution Prevention and Controls** Name: Top Choice Dry Cleaners Location: 96 Fleet Road, London, Nw3 2qx Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC13 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	A14SW (E)	681	3	527529 185471
6	**Local Authority Pollution Prevention and Controls** Name: Pyramid Cleaners Location: 52 Besize Lane, London, Nw3 5ar Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC8 Dated: 1st 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)	691	3	526872 184985

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
7	**Local Authority Pollution Prevention and Controls** Name: Perkins Dry Cleaners Location: 171 Haverstock Hill, London, Nw3 4qs Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC7 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	A9NW (SE)	777	3	527342 185055
7	**Local Authority Pollution Prevention and Controls** Name: Swan Dry Cleaners Location: 163 Haverstock Hill, London, Nw3 4qt Authority: London Borough of Camden, Pollution Projects Team Permit Reference: PPC/DC42 Dated: 24th 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	A9NW (SE)	812	3	527371 185032
	Nearest Surface Water Feature	A13NE (NE)	355	-	527195 185851
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AR0446 Dated: 12th July 1995 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	493	2	527292 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AT8398 Dated: 17th January 1996 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	496	2	527292 185405
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: CD3170 Dated: 13th July 2009 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Application has been authorised and any conditions apply to the operator** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: CB2954 Dated: 20th July 2007 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to an authorisation under S13 or S14 RSA in respect of a registration under S7 when Technetium 99M is used being =< 10 gigabecquerels **Status: Authorisation either revoked or cancelled** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Ca2592 Dated: 13th April 2006 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bz9162 Dated: 9th December 2005 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bz1617 Dated: 9th September 2005 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Anthony Nolan Trust (Ant) Location: Royal Free Hospital, Pond Street, Hampstead, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bz0777 Dated: 14th July 2005 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185411
8	**Registered Radioactive Substances** Name: Anthony Nolan Trust (Ant) Location: Medical Physics Department Royal Free Hospital, Pond Street, Hampstead, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bz0831 Dated: 14th July 2005 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Minor variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: By5714 Dated: 6th December 2004 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: By5706 Dated: 22nd November 2004 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Discretionary registration under the Act of an open source which is also the subject of an authorisation **Status: Application has been authorised and any conditions apply to the operator** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bw6841 Dated: 1st December 2003 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Anthony Nolan Trust (Ant) Location: Royal Free Hospital, Pond Street, Hampstead, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bw7643 Dated: 1st December 2003 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185411
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bt8759 Dated: 12th May 2003 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bs4863 Dated: 25th July 2002 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Minor variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Anthony Nolan Trust (Ant) Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Br6392 Dated: 29th April 2002 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, HAMPSTEAD, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Br6406 Dated: 29th April 2002 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Substantial variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free And University College Medical School Of University College London Location: Medical Physics Department, Royal Free Hospital, Pond Street, London, Greater London, NW3 2PF Authority: Environment Agency, Thames Region Permit Reference: Bm0214 Dated: 28th November 2001 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Substantial variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bj5708 Dated: 14th February 2001 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Polymasc Pharmaceuticals Plc Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bj5678 Dated: 14th February 2001 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation either revoked or cancelled** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Anthony Nolan Trust (Ant) Location: Royal Free Hospital, Pond Street, Hampstead, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bj5716 Dated: 14th February 2001 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185411
8	**Registered Radioactive Substances** Name: Royal Free And University College Medical School Of University College London Location: Medical Physics Department, Royal Free Hospital, Pond Street, London, Greater London, NW3 2PF Authority: Environment Agency, Thames Region Permit Reference: BB6254 Dated: 27th October 1998 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Minor variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AV1327 Dated: 11th August 1997 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free And University College Medical School Of University College London Location: Medical Physics Department, Royal Free Hospital, Pond Street, London, Greater London, NW3 2PF Authority: Environment Agency, Thames Region Permit Reference: AR0403 Dated: 12th July 1995 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital,Pond Street,Hampstead, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AH9987 Dated: 21st June 1994 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, LONDON, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AB4095 Dated: 31st March 1991 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free London Nhs Foundation Trust Location: The Royal Free Hospital, Pond Street, Hampstead, Nw3 2qg Authority: Environment Agency, Thames Region Permit Reference: UB3935DG Dated: Not Supplied Process Type: Not Supplied Description: Not Supplied **Status: Application has been determined by the EA** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	497	2	527297 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead NHS Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AV8011 Dated: 25th October 1996 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	499	2	527292 185400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Registered Radioactive Substances** Name: Royal Free Hampstead NHS Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AR0373 Dated: 11th July 1995 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Minor variation to a registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	501	2	527302 185410
8	**Registered Radioactive Substances** Name: Royal Free Hampstead Nhs Trust Location: Royal Free Hospital, Pond Street, Hampstead, LONDON, Greater London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: AE8658 Dated: 24th March 1992 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of multiple open sources which are also the subject of authorisations **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	504	2	527302 185405
8	**Registered Radioactive Substances** Name: University College London Location: Royal Free Campus, Rowland Hill Street, London, Nw3 2pf Authority: Environment Agency, Thames Region Permit Reference: By6001 Dated: 7th May 2015 Process Type: Not Supplied Description: Not Supplied **Status: Replaced** Positional Accuracy: Located by supplier to within 100m	A14SW (SE)	505	2	527300 185400
8	**Registered Radioactive Substances** Name: University College London Location: Royal Free Campus, Rowland Hill Street, London, Nw3 2pf Authority: Environment Agency, Thames Region Permit Reference: Bz9758 Dated: 7th May 2015 Process Type: Not Supplied Description: Not Supplied **Status: Replaced** Positional Accuracy: Located by supplier to within 100m	A14SW (SE)	505	2	527300 185400
8	**Registered Radioactive Substances** Name: Royal Free And University College Medical School Of University College London Location: Royal Free Hospital, Pond Street, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: By6010 Dated: 3rd August 2005 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Substantial variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	505	2	527299 185399
8	**Registered Radioactive Substances** Name: Royal Free And University College Medical School Of University College London Location: Royal Free Hospital, Pond Street, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bw7635 Dated: 1st December 2003 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Minor variation to authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	505	2	527299 185399

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
8	**Registered Radioactive Substances** Name: Royal Free And University College Medical School Of University College London Location: Royal Free Hospital, Pond Street, London, NW3 2QG Authority: Environment Agency, Thames Region Permit Reference: Bj5694 Dated: 14th February 2001 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7) Description: Authorisation under RSA **Status: Authorisation superseded by a substantial or non substantial variation** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	505	2	527299 185399
8	**Registered Radioactive Substances** Name: University College London Location: Royal Free Campus, Rowland Hill Street, London, Nw3 2pf Authority: Environment Agency, Thames Region Permit Reference: SB3598DT Dated: Not Supplied Process Type: Not Supplied Description: Not Supplied **Status: Application has been determined by the EA** Positional Accuracy: Located by supplier to within 100m	A14SW (SE)	505	2	527300 185400
9	**Registered Radioactive Substances** Name: Anthony Nolan Trust Location: Anthony Nolan Histocompatibility Laboratories, 77b Fleet Road, Hampstead, London, Nw3 2qr Authority: Environment Agency, Thames Region Permit Reference: CB1915 Dated: 21st January 2016 Process Type: Not Supplied Description: Not Supplied **Status: Replaced** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	626	2	527442 185404
9	**Registered Radioactive Substances** Name: Anthony Nolan Trust Location: Anthony Nolan Histocompatibility Laboratories, 77b Fleet Road, Hampstead, London, Nw3 2qr Authority: Environment Agency, Thames Region Permit Reference: CB5171 Dated: 21st January 2016 Process Type: Not Supplied Description: Not Supplied **Status: Replaced** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	626	2	527442 185404
9	**Registered Radioactive Substances** Name: Polymasc Pharmaceuticals Plc Location: Anthony Nolan Building, Royal Free Hospital Site, Fleet Road; Hampstead, LONDON, Greater London, NW3 2EZ Authority: Environment Agency, Thames Region Permit Reference: AU4924 Dated: 20th February 1996 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under the Act of an open source which is also the subject of an authorisation **Status: Authorisation either revoked or cancelled** Positional Accuracy: Manually positioned to the address or location	A14SW (SE)	626	2	527442 185404
9	**Registered Radioactive Substances** Name: Anthony Nolan Trust Location: Anthony Nolan Histocompatibility Laboratories, 77b Fleet Road, Hampstead, London, Nw3 2qr Authority: Environment Agency, Thames Region Permit Reference: AB3298DT Dated: Not Supplied Process Type: Not Supplied Description: Not Supplied **Status: Application has been determined by the EA** Positional Accuracy: Automatically positioned to the address	A14SW (SE)	626	2	527442 185404
10	**Substantiated Pollution Incident Register** Authority: Environment Agency - Thames Region, North East Area Incident Date: 23rd September 2003 Incident Reference: 191922 Water Impact: Category 2 - Significant Incident Air Impact: Category 4 - No Impact Land Impact: Category 4 - No Impact Positional Accuracy: Located by supplier to within 10m Pollutant: Pollutant Not Identified: Not Identified	A19SW (NE)	559	2	527254 186101

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: London Borough Of Camden Licence Number: 28/39/39/0219 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London. Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3SW (S)	1398	2	526800 184280
	Water Abstractions Operator: London Borough Of Camden Licence Number: Th/039/0039/087 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 5th December 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3SW (S)	1421	2	526750 184261
	Water Abstractions Operator: London Borough Of Camden Licence Number: Th/039/0039/087 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: General Washing/Process Washing Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 5th December 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3SW (S)	1421	2	526750 184261
	Water Abstractions Operator: London Borough Of Camden Licence Number: Th/039/0039/087 Permit Version: 1 Location: Swiss Cottage Open Space- Borehole Authority: Environment Agency, Thames Region Abstraction: Municipal Grounds: Lake And Pond Throughflow Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Swiss Cottage Open Space, Winchester Road, London Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 5th December 2013 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A3SW (S)	1421	2	526750 184261

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Groundwater Vulnerability Map Combined Classification: Unproductive Aquifer (may have productive aquifer beneath) Combined Vulnerability: Unproductive Combined Aquifer: Unproductive Bedrock Aquifer, No Superficial Aquifer Pollutant Speed: Intermediate Bedrock Flow: Mixed Dilution: 300-550 mm/year Baseflow Index: 40-70% Superficial Patchiness: <90% Superficial Thickness: <3m Superficial Recharge: No Data	A13NE (SW)	0	4	526867 185690
	Groundwater Vulnerability - Soluble Rock Risk None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13NE (SW)	0	4	526867 185690
	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				
11	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 5204.1 Watercourse Level: Underground Permanent: True Watercourse Name: The Fountains Catchment Name: Thames Primacy: 1	A14SW (E)	346	5	527228 185677
12	**OS Water Network Lines** Watercourse Form: Lake Watercourse Length: 172.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Hampstead Ponds Catchment Name: Thames Primacy: 1	A14NW (E)	377	5	527233 185821
13	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 13.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A14SW (E)	434	5	527315 185663
14	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 18.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A14NW (NE)	505	5	527289 185984

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
15	**OS Water Network Lines** Watercourse Form: Lake Watercourse Length: 118.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Hampstead Ponds Catchment Name: Thames Primacy: 1	A14NW (NE)	514	5	527285 186003
16	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 11.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A19SW (NE)	567	5	527249 186116
17	**OS Water Network Lines** Watercourse Form: Lake Watercourse Length: 178.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Hampstead Ponds Catchment Name: Thames Primacy: 1	A19SW (NE)	573	5	527245 186127
18	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 71.1 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18SE (NE)	657	5	527163 186285
19	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 131.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NE (N)	679	5	526987 186369
20	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 214.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NE (N)	688	5	526930 186387
21	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 68.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NE (N)	688	5	526954 186384
22	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 10.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18SE (N)	695	5	527125 186345
23	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 40.8 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18SE (N)	696	5	527116 186349

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
24	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 62.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NW (N)	739	5	526715 186428
25	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 124.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NW (N)	748	5	526771 186446
26	**OS Water Network Lines** Watercourse Form: Lake Watercourse Length: 117.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Hampstead Ponds Catchment Name: Thames Primacy: 1	A18NE (N)	752	5	526937 186451
27	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 164.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NE (N)	865	5	526922 186565
28	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 17.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A19NW (NE)	927	5	527476 186396
29	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 5.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A19NW (NE)	943	5	527483 186411
30	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 184.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A19NW (NE)	944	5	527488 186408
31	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 37.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NW (N)	969	5	526820 186671
32	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 9.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Thames Primacy: 1	A18NW (N)	969	5	526820 186671

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	6	526867 185690
33	**Potentially Infilled Land (Non-Water)** Bearing Ref: SW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A8NW (SW)	461	8	526616 185296
34	**Potentially Infilled Land (Non-Water)** Bearing Ref: SE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A9NW (SE)	606	8	527284 185228
35	**Potentially Infilled Land (Non-Water)** Bearing Ref: S Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A8NW (S)	657	8	526763 185029
36	**Potentially Infilled Land (Non-Water)** Bearing Ref: NE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A19SW (NE)	658	8	527250 186231
37	**Potentially Infilled Land (Non-Water)** Bearing Ref: SE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A9NW (SE)	678	8	527347 185189
38	**Potentially Infilled Land (Non-Water)** Bearing Ref: SE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1996	A9NW (SE)	727	8	527473 185261
39	**Potentially Infilled Land (Non-Water)** Bearing Ref: SW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1991	A7SE (SW)	791	8	526467 184999
40	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A13NW (N)	308	8	526813 186007
41	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A14NW (E)	347	8	527228 185721

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Thames Group	A13NE (SW)	0	1	526867 185690
	BGS Estimated Soil Chemistry No data available				
	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	A13SW (W)	127	1	526732 185657
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527233, 185694 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 31.90 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 126.40 mg/kg Lead Measured Concentration: 478.50 mg/kg Nickel Measured Concentration: 45.60 mg/kg	A14NW (E)	351	1	527233 185694
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527216, 185357 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 19.70 mg/kg Cadmium Measured Concentration: 0.80 mg/kg Chromium Measured Concentration: 96.90 mg/kg Lead Measured Concentration: 626.10 mg/kg Nickel Measured Concentration: 27.60 mg/kg	A14SW (SE)	466	1	527216 185357
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526763, 185153 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 17.60 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 55.10 mg/kg Lead Measured Concentration: 617.70 mg/kg Nickel Measured Concentration: 22.30 mg/kg	A8NW (S)	535	1	526763 185153

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: 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	A18SW (N)	572	1	526737 186262
	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	A12SE (W)	633	1	526223 185630
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526278, 185352 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 25.30 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 122.20 mg/kg Lead Measured Concentration: 273.70 mg/kg Nickel Measured Concentration: 19.50 mg/kg	A7NE (SW)	670	1	526278 185352
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527297, 186229 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 21.10 mg/kg Cadmium Measured Concentration: 0.30 mg/kg Chromium Measured Concentration: 115.30 mg/kg Lead Measured Concentration: 367.50 mg/kg Nickel Measured Concentration: 18.70 mg/kg	A19SW (NE)	685	1	527297 186229
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527766, 185717 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 14.80 mg/kg Cadmium Measured Concentration: 0.50 mg/kg Chromium Measured Concentration: 62.40 mg/kg Lead Measured Concentration: 150.60 mg/kg Nickel Measured Concentration: 19.50 mg/kg	A14NE (E)	884	1	527766 185717

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: 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	A17SE (NW)	915	1	526219 186357
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527169, 184808 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 20.70 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 83.40 mg/kg Lead Measured Concentration: 2153.80 mg/kg Nickel Measured Concentration: 34.90 mg/kg	A8SE (S)	916	1	527169 184808
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 527669, 185211 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 18.20 mg/kg Cadmium Measured Concentration: 0.60 mg/kg Chromium Measured Concentration: 99.60 mg/kg Lead Measured Concentration: 936.90 mg/kg Nickel Measured Concentration: 25.60 mg/kg	A9NE (SE)	918	1	527669 185211
	BGS Measured Urban Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Grid: 526703, 184701 Soil Sample Type: Topsoil Sample Area: London Arsenic Measured Concentration: 32.80 mg/kg Cadmium Measured Concentration: 0.70 mg/kg Chromium Measured Concentration: 79.00 mg/kg Lead Measured Concentration: 770.10 mg/kg Nickel Measured Concentration: 44.30 mg/kg	A8SW (S)	990	1	526703 184701

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	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	A13NE (SW)	0	1	526867 185690
	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	A13NE (SW)	0	1	526867 185690
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (SW)	0	1	526867 185690
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (SW)	0	1	526867 185690
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (SW)	0	1	526867 185690
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (E)	72	1	526951 185705
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	145	1	526983 185578
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (SW)	0	1	526867 185690
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NE (SW)	0	1	526867 185690
	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	A13NE (SW)	0	1	526867 185690
	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	A13NE (SW)	0	1	526867 185690

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
42	**Contemporary Trade Directory Entries** Name: Interior Couture Location: 14a, Downshire Hill, LONDON, NW3 1NR Classification: Wallpapers & Wall Coverings **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (E)	79	-	526950 185723
43	**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	A13SW (SW)	119	-	526769 185611
43	**Contemporary Trade Directory Entries** Name: Bang & Olufsen Location: 44, Rosslyn Hill, London, NW3 1NH Classification: Electrical Goods Sales, Manufacturers & Wholesalers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	132	-	526764 185598
43	**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	A13SW (SW)	153	-	526723 185614
43	**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	A13SW (SW)	153	-	526723 185614
44	**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	A13SW (SW)	164	-	526708 185619
44	**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	A13SW (W)	181	-	526685 185626
45	**Contemporary Trade Directory Entries** Name: Hampstead Cleaners Location: 63, Rosslyn Hill, London, NW3 5UQ Classification: Carpet, Curtain & Upholstery Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	186	-	526714 185571
46	**Contemporary Trade Directory Entries** Name: Oven Cleaning (Hampstead) Location: 32, Downshire Hill, London, NW3 1NT Classification: Oven cleaning **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NE (NE)	198	-	527034 185812
47	**Contemporary Trade Directory Entries** Name: Tenancy Cleaners London Location: 4, Shepherds Walk, London, NW3 5UE Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	210	-	526744 185512
48	**Contemporary Trade Directory Entries** Name: Skipwith Consulting Location: 37, Willow Road, London, NW3 1TN Classification: Commercial Cleaning Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NW (NW)	210	-	526726 185866
48	**Contemporary Trade Directory Entries** Name: Belsize Park Carpet Cleaners Location: 12 Gayton Crescent, Camden, London, NW3 1TT Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A13NW (NW)	213	-	526693 185837

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
49	**Contemporary Trade Directory Entries** Name: Radici Plastics Uk Location: 6a, Hampstead High Street, London, NW3 1PR Classification: Plaster Manufacturers & Suppliers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (W)	230	-	526626 185654
49	**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	A13SW (W)	242	-	526614 185656
50	**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	A13SW (W)	281	-	526573 185667
50	**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	A13SW (W)	281	-	526573 185667
51	**Contemporary Trade Directory Entries** Name: Bri-Clean Laundries Location: 57, South End Road, London, NW3 2QB Classification: Laundries & Launderettes **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (E)	305	-	527188 185678
51	**Contemporary Trade Directory Entries** Name: Padma Location: Davu House, 2b, Heath Hurst Road, LONDON, NW3 2RX Classification: Textile Manufacturing **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (E)	325	-	527204 185637
52	**Contemporary Trade Directory Entries** Name: American Dry Cleaning Location: 29, South End Road, London, NW3 2PT Classification: Dry Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A14SW (E)	368	-	527235 185581
52	**Contemporary Trade Directory Entries** Name: House Of Mistry Location: 15, South End Road, LONDON, NW3 2PT Classification: Pharmaceutical Manufacturers & Distributors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A14SW (E)	393	-	527251 185547
52	**Contemporary Trade Directory Entries** Name: Bevan Scaffolding Location: 14, SOUTH END ROAD, LONDON, NW3 2QE Classification: Scaffolding & Work Platforms **Status: Active** Positional Accuracy: Automatically positioned to the address	A14SW (E)	409	-	527275 185569
53	**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	A12NE (W)	379	-	526475 185717
53	**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	A12NE (W)	412	-	526445 185756
54	**Contemporary Trade Directory Entries** Name: Kronus (Uk) Ltd Location: 6, Park End, London, NW3 2SE Classification: Catering Equipment **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A14NW (E)	387	-	527263 185752

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
97	**Contemporary Trade Directory Entries** Name: Timberwise Uk Ltd Location: 176, Finchley Road, London, NW3 6BT Classification: Damp & Dry Rot Control **Status: Active** Positional Accuracy: Automatically positioned to the address	A7SW (SW)	968	-	526169 185011
97	**Contemporary Trade Directory Entries** Name: Posh Clean Uk Location: 176, Finchley Road, London, NW3 6BT Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A7SW (SW)	968	-	526169 185011
97	**Contemporary Trade Directory Entries** Name: London Scrap Yards Hampstead Location: 176, Finchley Road, London, NW3 6BT Classification: Car Breakers & Dismantlers **Status: Active** Positional Accuracy: Automatically positioned to the address	A7SW (SW)	968	-	526169 185011
97	**Contemporary Trade Directory Entries** Name: Online Plumbing Location: 176, Finchley Road, London, NW3 6BT Classification: Boilers - Servicing, Replacements & Repairs **Status: Inactive** Positional Accuracy: Manually positioned to the address or location	A7SW (SW)	968	-	526169 185011
98	**Contemporary Trade Directory Entries** Name: The Belsize Plumbing Co Ltd Location: 24, Belsize Grove, London, NW3 4TR Classification: Boilers - Servicing, Replacements & Repairs **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	972	-	527399 184857
99	**Contemporary Trade Directory Entries** Name: Chalcot House Services Location: Flat 1, 51, Belsize Park Gardens, London, NW3 4JL Classification: Commercial Cleaning Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	994	-	527202 184737
100	**Contemporary Trade Directory Entries** Name: American Wheels Location: 16, Frognal Parade, London, NW3 5HH Classification: Car Customisation & Conversion Specialists **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A7SE (SW)	995	-	526207 184939
101	**Fuel Station Entries** Name: Belsize Park Service Station Location: 215, Haverstock Hill , Belsize Park , London, Inner London, NW3 4QE Brand: BP Premises Type: Petrol Station **Status: Open** Positional Accuracy: Automatically positioned to the address	A8NE (SE)	547	-	527188 185227
102	**Points of Interest - Commercial Services** Name: A V 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	A13NW (NW)	212	7	526722 185864
103	**Points of Interest - Commercial Services** Name: Car Wash Location: Belzier Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A8NE (SE)	546	7	527187 185227
103	**Points of Interest - Commercial Services** Name: B P Car Wash Location: Belsize Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A8NE (SE)	547	7	527188 185227
104	**Points of Interest - Commercial Services** Name: Targus Seatrade Location: 201 Haverstock Hill, London, NW3 4QG Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A9NW (SE)	682	7	527272 185121

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
123	**Points of Interest - Public Infrastructure** Name: Metropolitan Police Service Hampstead Location: Hampstead Police Station 26, Rosslyn Hill, London, NW3 1PD Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13SW (S)	136	7	526866 185540
123	**Points of Interest - Public Infrastructure** Name: Hampstead Police Station Location: Hampstead Police Station 26, Rosslyn Hill, London, NW3 1PD Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13SE (S)	137	7	526883 185539
124	**Points of Interest - Public Infrastructure** Name: Hampstead Heath Rail Station Location: South End Road, NW3 Category: Public Transport, Stations and Infrastructure Class Code: Railway Stations, Junctions and Halts Positional Accuracy: Positioned to address or location	A14SW (E)	371	7	527250 185634
124	**Points of Interest - Public Infrastructure** Name: Hampstead Heath Station Location: South End Road, NW3 Category: Public Transport, Stations and Infrastructure Class Code: Railway Stations, Junctions and Halts Positional Accuracy: Positioned to address or location	A14SW (E)	371	7	527250 185634
125	**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	A14NW (NE)	466	7	527231 185992
125	**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	A14NW (NE)	469	7	527235 185993
126	**Points of Interest - Public Infrastructure** Name: BP Service Station Belsize Park Self Serve Location: Belzier Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A8NE (SE)	546	7	527187 185227
126	**Points of Interest - Public Infrastructure** Name: Belzier Park Service Station Location: Belzier Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A8NE (SE)	546	7	527187 185227
126	**Points of Interest - Public Infrastructure** Name: Belsize Park Self Serve Location: Belzier Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A8NE (SE)	546	7	527187 185227
126	**Points of Interest - Public Infrastructure** Name: BP Service Station Location: Belsize Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A8NE (SE)	547	7	527188 185227
126	**Points of Interest - Public Infrastructure** Name: Belsize Park Self Serve Location: Belzier Park Service Station 215, Haverstock Hill, London, NW3 4QE Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A8NE (SE)	547	7	527188 185227
127	**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	A12NE (W)	604	7	526249 185702

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
136	**Underground Electrical Cables** Unique Feature Identifier: 10006073 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A13SW (SW)	142	8	526792 185561
137	**Underground Electrical Cables** Unique Feature Identifier: 10005912 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A13SW (SW)	142	8	526791 185561
138	**Underground Electrical Cables** Unique Feature Identifier: 10006070 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A13NW (W)	146	8	526717 185750
139	**Underground Electrical Cables** Unique Feature Identifier: 10005913 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A13NW (W)	147	8	526717 185750
140	**Underground Electrical Cables** Unique Feature Identifier: 10006072 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A13NW (NW)	320	8	526673 185963
141	**Underground Electrical Cables** Unique Feature Identifier: 10005915 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A13NW (NW)	321	8	526672 185963
142	**Underground Electrical Cables** Unique Feature Identifier: 10005743 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A8NW (SW)	479	8	526658 185250
143	**Underground Electrical Cables** Unique Feature Identifier: 10007954 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A8NW (SW)	479	8	526658 185250
144	**Underground Electrical Cables** Unique Feature Identifier: 10005919 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A8SE (S)	744	8	526891 184932
145	**Underground Electrical Cables** Unique Feature Identifier: 10006131 Cable Status: Electrically Decommissioned Cable Type: Alternating Current Record Last Updated: 27th October 2017	A8SE (S)	744	8	526891 184932

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
148	**Local Nature Reserves** Name: Belsize Wood Multiple Area: N Area (m2): 2723 Source: Natural England Designation Date: 1st October 2004	A9NW (SE)	712	9	527487 185309

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	
Stantec UK Ltd	

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
3	**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
4	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
5	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
6	**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
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
-	**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.

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WGR	Worked Ground (Undivided)	Void	Not Supplied - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	DHGR	Dollis Hill Gravel Member	Sand and Gravel	Not Supplied - Cromerian
	STGR	Stanmore Gravel Formation	Sand and Gravel	Not Supplied - Pleistocene

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	LC	London Clay Formation	Clay, Silt and Sand	Not Supplied - Ypresian
	CLGB	Claygate Member	Clay, Silt and Sand	Not Supplied - Ypresian
	BGS	Bagshot Formation	Sand	Not Supplied - Ypresian

GEA

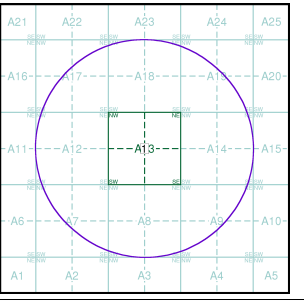
Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	**1**
Map Sheet No:	**256**
Map Name:	**North London**
Map Date:	**2006**
Bedrock Geology:	**Available**
Superficial Geology:	**Available**
Artificial Geology:	**Available**
Faults:	**Not Supplied**
Landslip:	**Available**
Rock Segments:	**Not Supplied**

Geology 1:50,000 Maps - Slice A

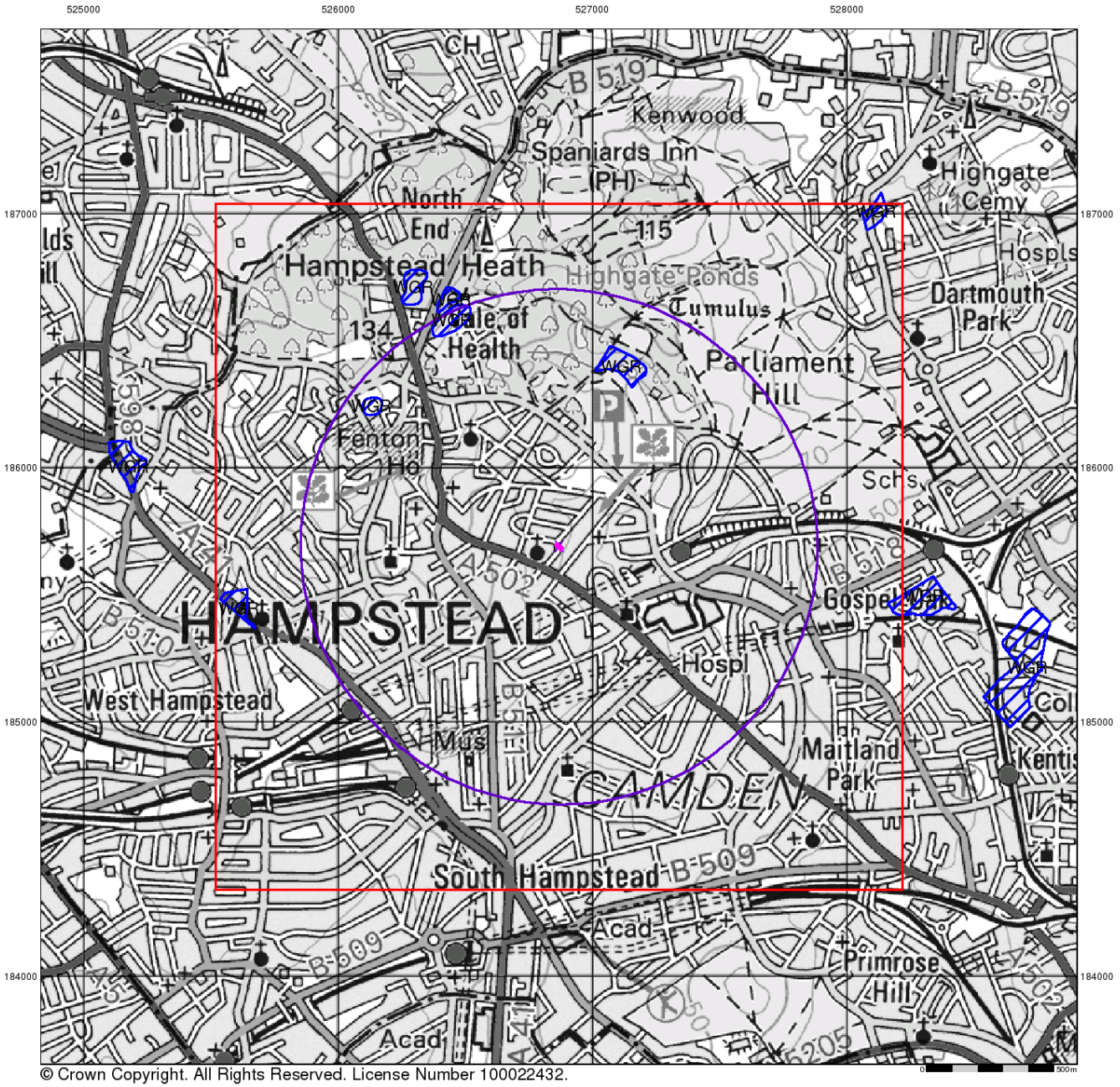


Order Details:

Order Number:	305378389_1_1
Customer Reference:	J22352
National Grid Reference:	526870, 185690
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details:

16, Pilgrims Lane, LONDON, NW3 1SN



GEA

Artificial Ground and Landslip

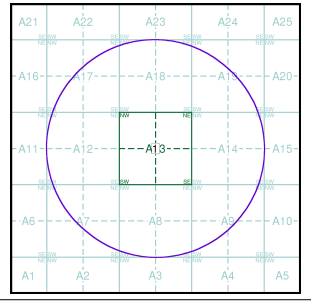
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



Order Details:

Order Number:	305378389_1_1
Customer Reference:	J22352
National Grid Reference:	526870, 185690
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details:

16, Pilgrims Lane, LONDON, NW3 1SN

Landmark INFORMATION GROUP
Tel: 0844 844 9952
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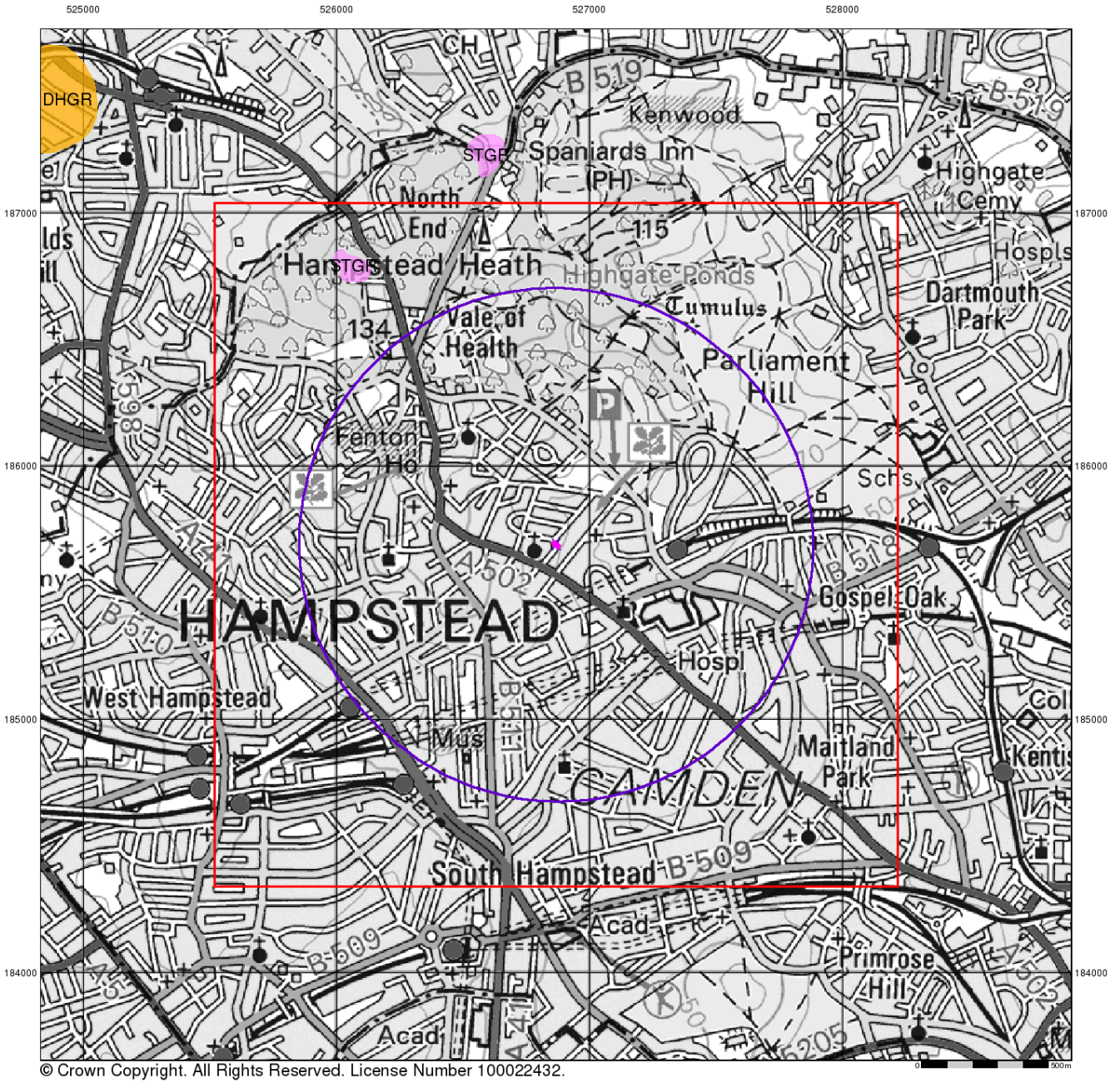
Web: www.envirocheck.co.uk



GEA

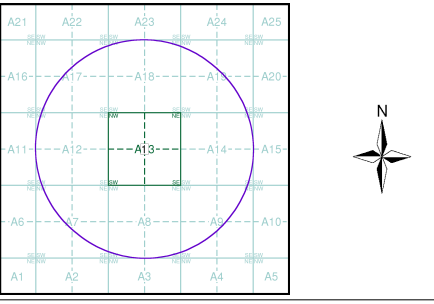
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



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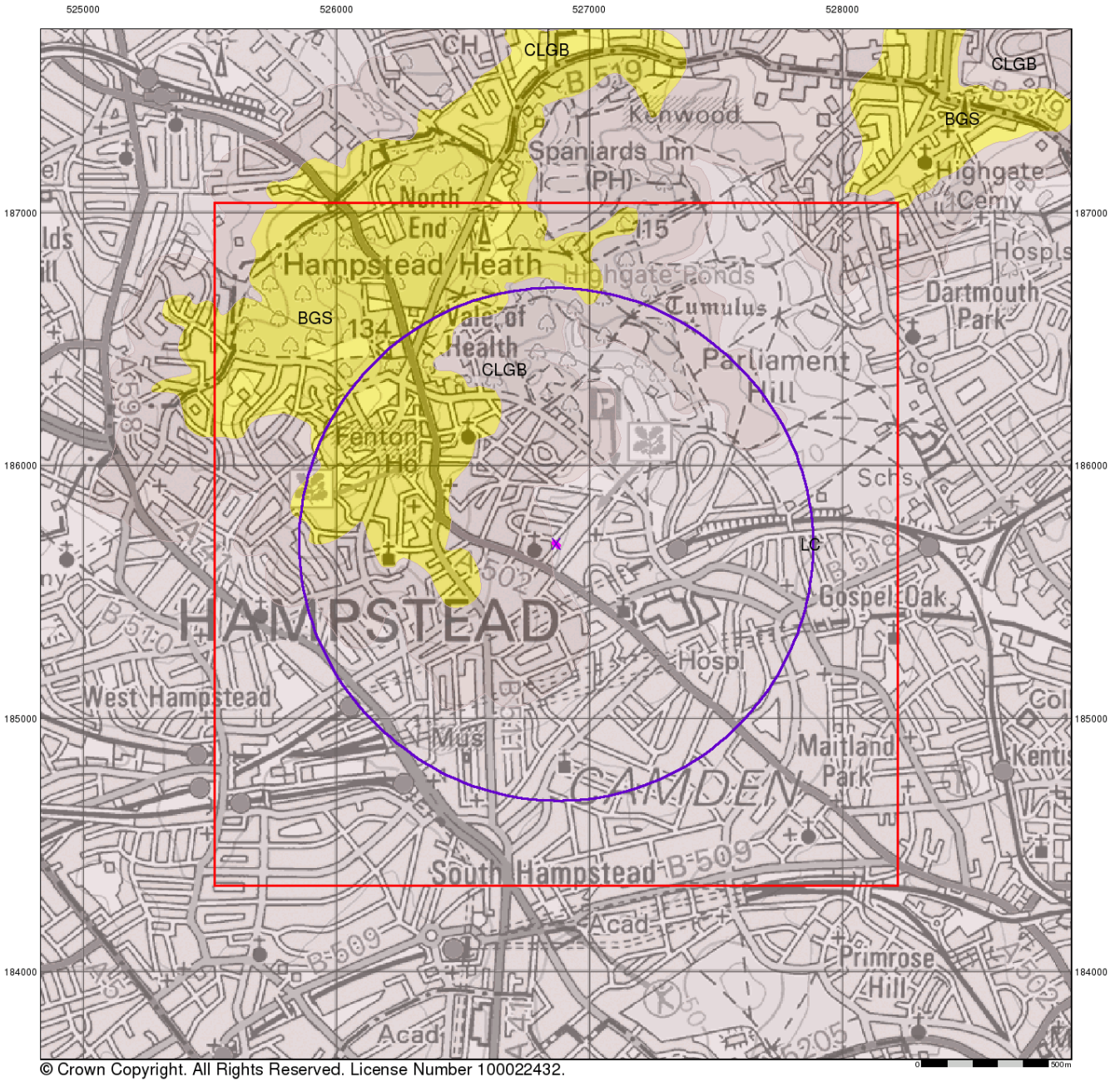


GEA

Bedrock and Faults

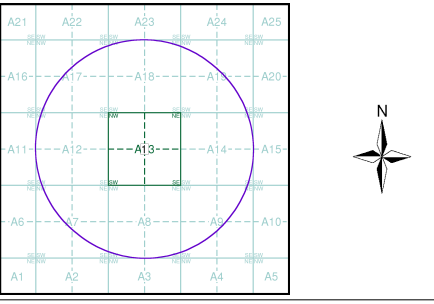
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



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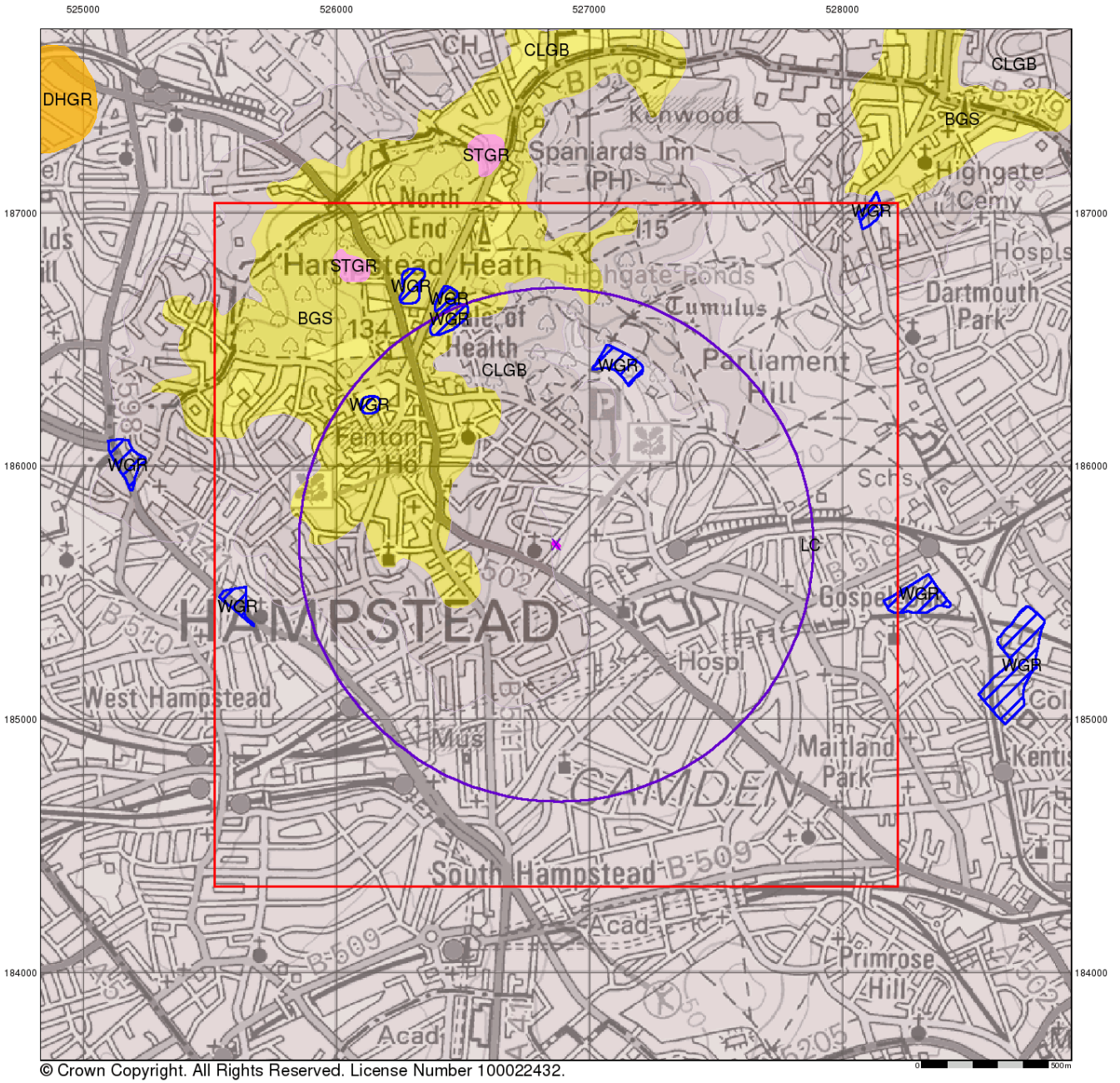

GEA

Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

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Kingsley Dunham Centre
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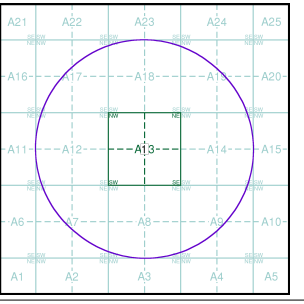
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



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Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

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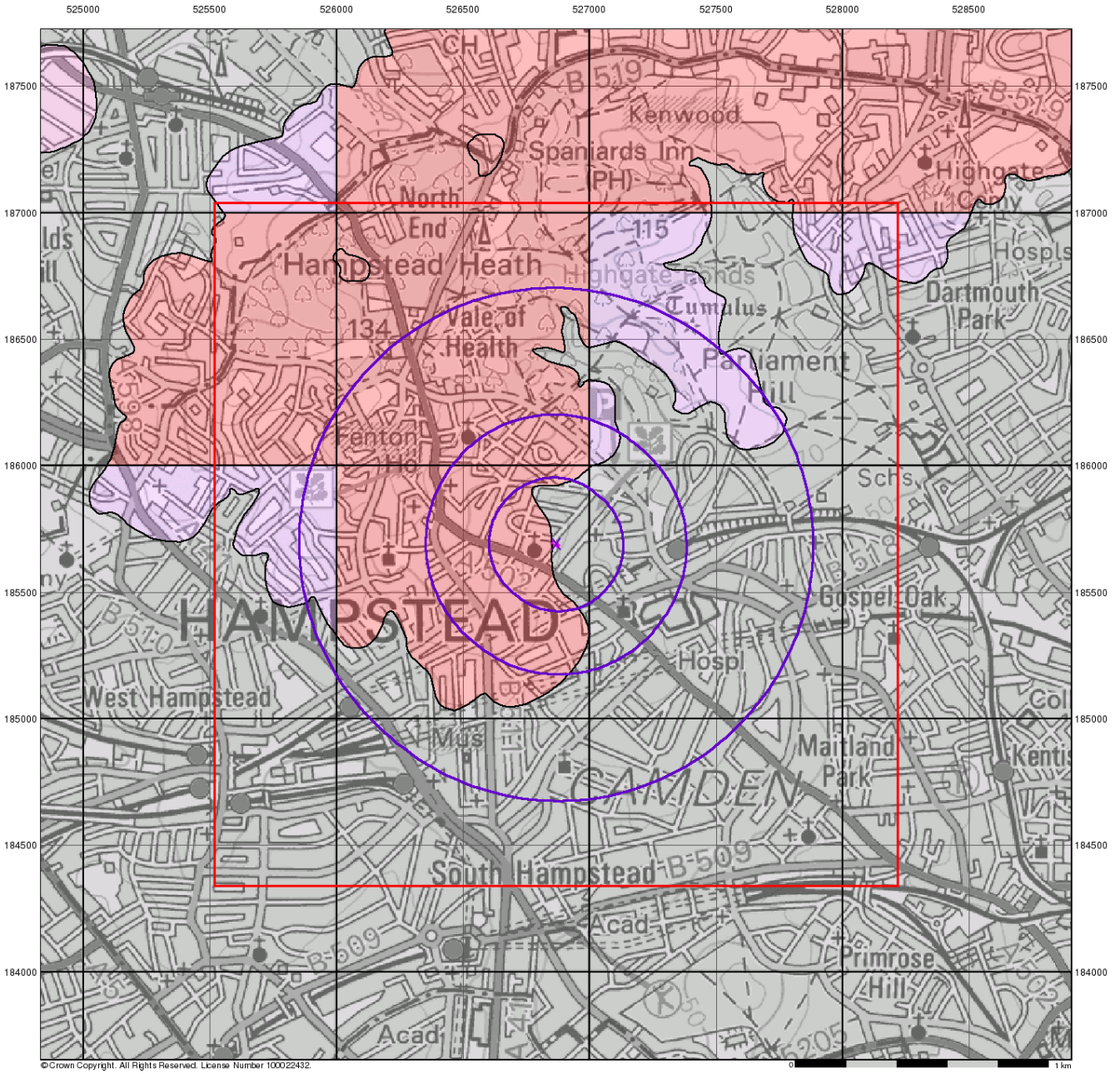


GEA

Groundwater Vulnerability

General

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

Slice | Map ID

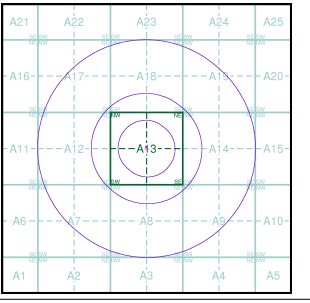
Agency and Hydrological

Bedrock Aquifers	Superficial Aquifers
High Vulnerability, Principal Aquifer	High Vulnerability, Principal Aquifer
High Vulnerability, Secondary Aquifer	High Vulnerability, Secondary Aquifer
Medium Vulnerability, Principal Aquifer	Medium Vulnerability, Principal Aquifer
Medium Vulnerability, Secondary Aquifer	Medium Vulnerability, Secondary Aquifer
Low Vulnerability, Principal Aquifer	Low Vulnerability, Principal Aquifer
Low Vulnerability, Secondary Aquifer	Low Vulnerability, Secondary Aquifer

Unproductive Aquifer

Soluble Rock

Site Sensitivity Context Map - Slice A



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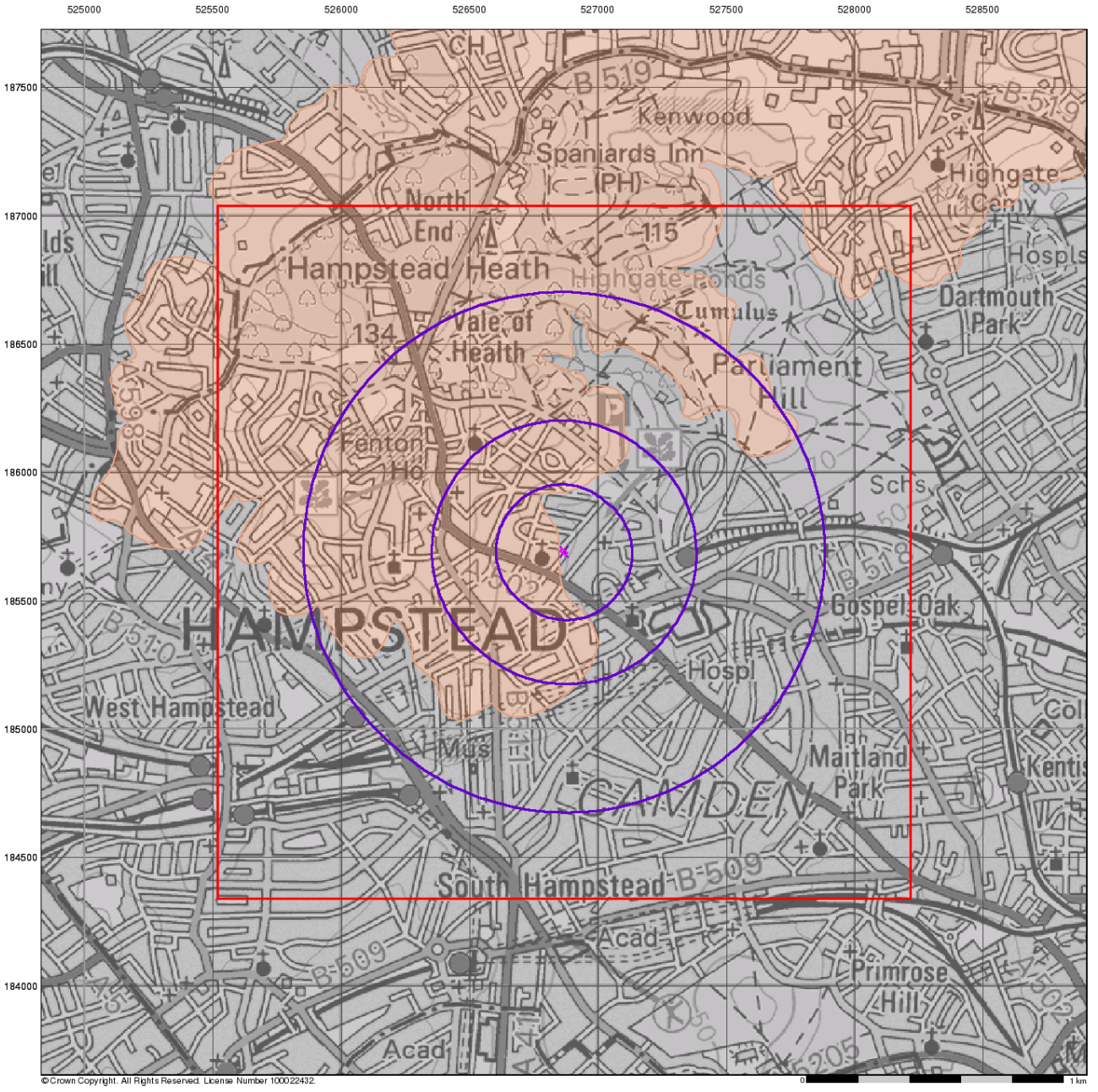


GEA

Bedrock Aquifer Designation

General

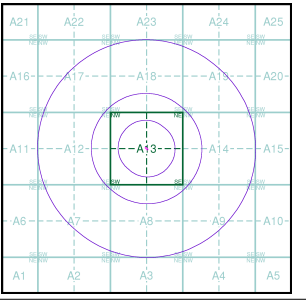
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

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

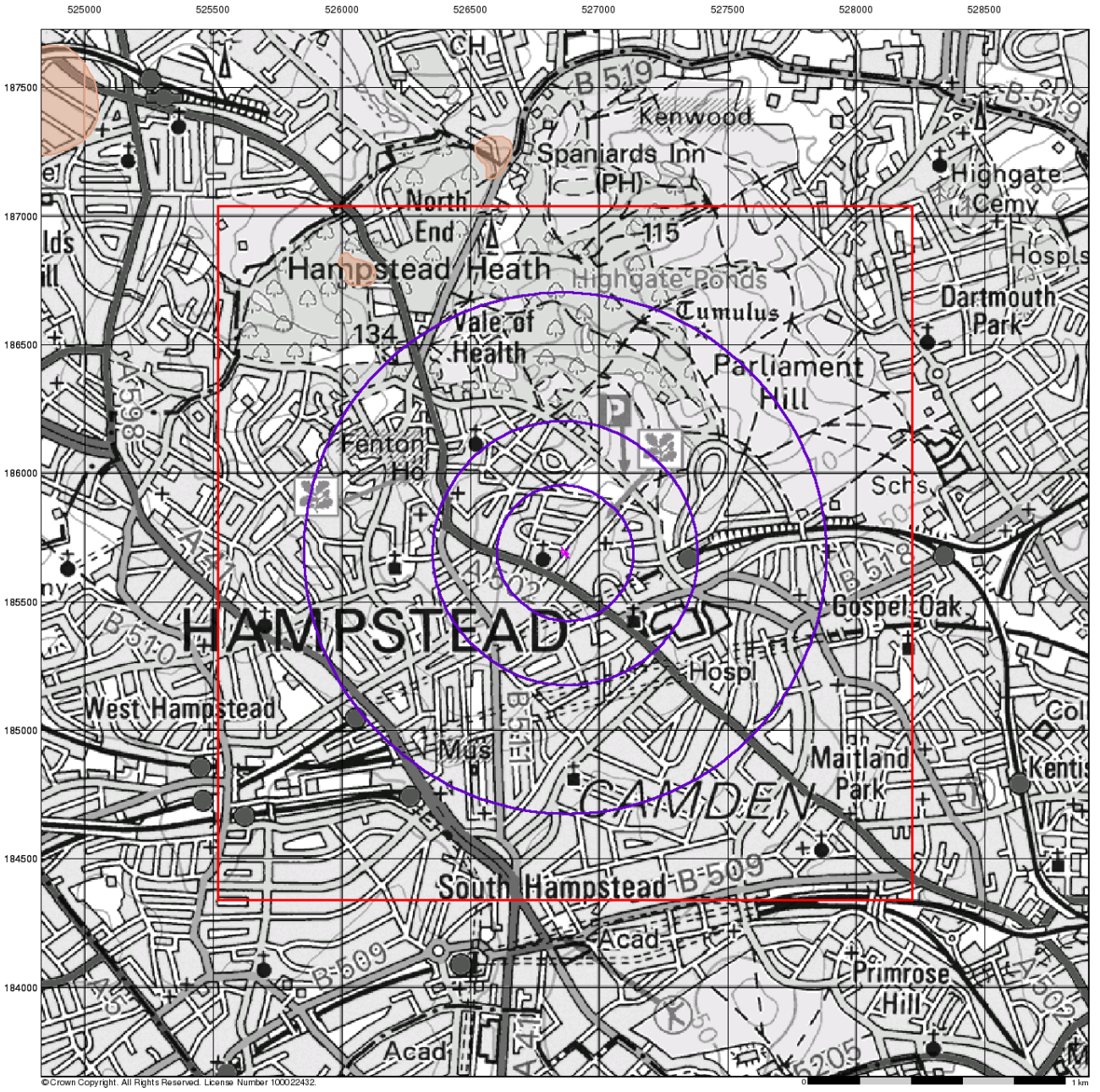


Order Details

Order Number:	305378389_1_1
Customer Ref:	J22352
National Grid Reference:	526870, 185690
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

16, Pilgrims Lane, LONDON, NW3 1SN



GEA

Superficial Aquifer Designation

General

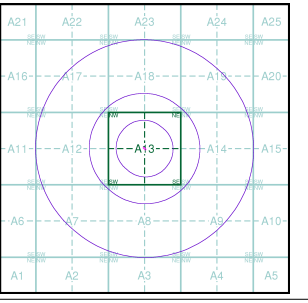
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

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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Customer Ref:	J22352
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Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

16, Pilgrims Lane, LONDON, NW3 1SN

GEA

Source Protection Zones

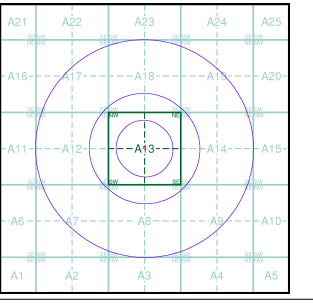
General

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)

Site Sensitivity Context Map - Slice A



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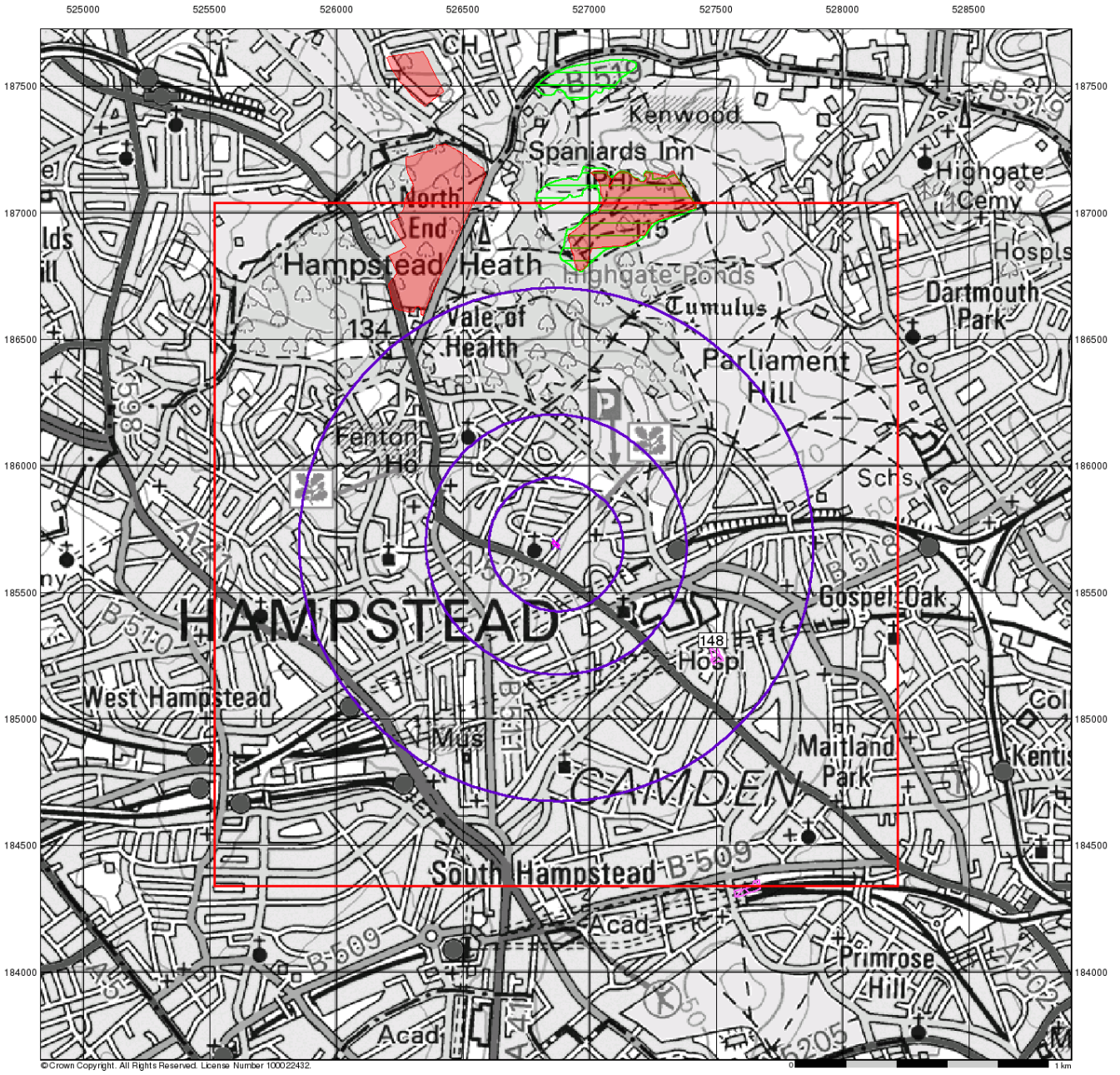


GEA

Sensitive Land Uses

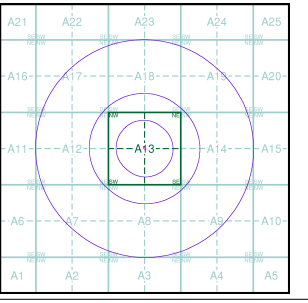
General

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:	305378389_1_1
Customer Ref:	J22352
National Grid Reference:	526870, 185690
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

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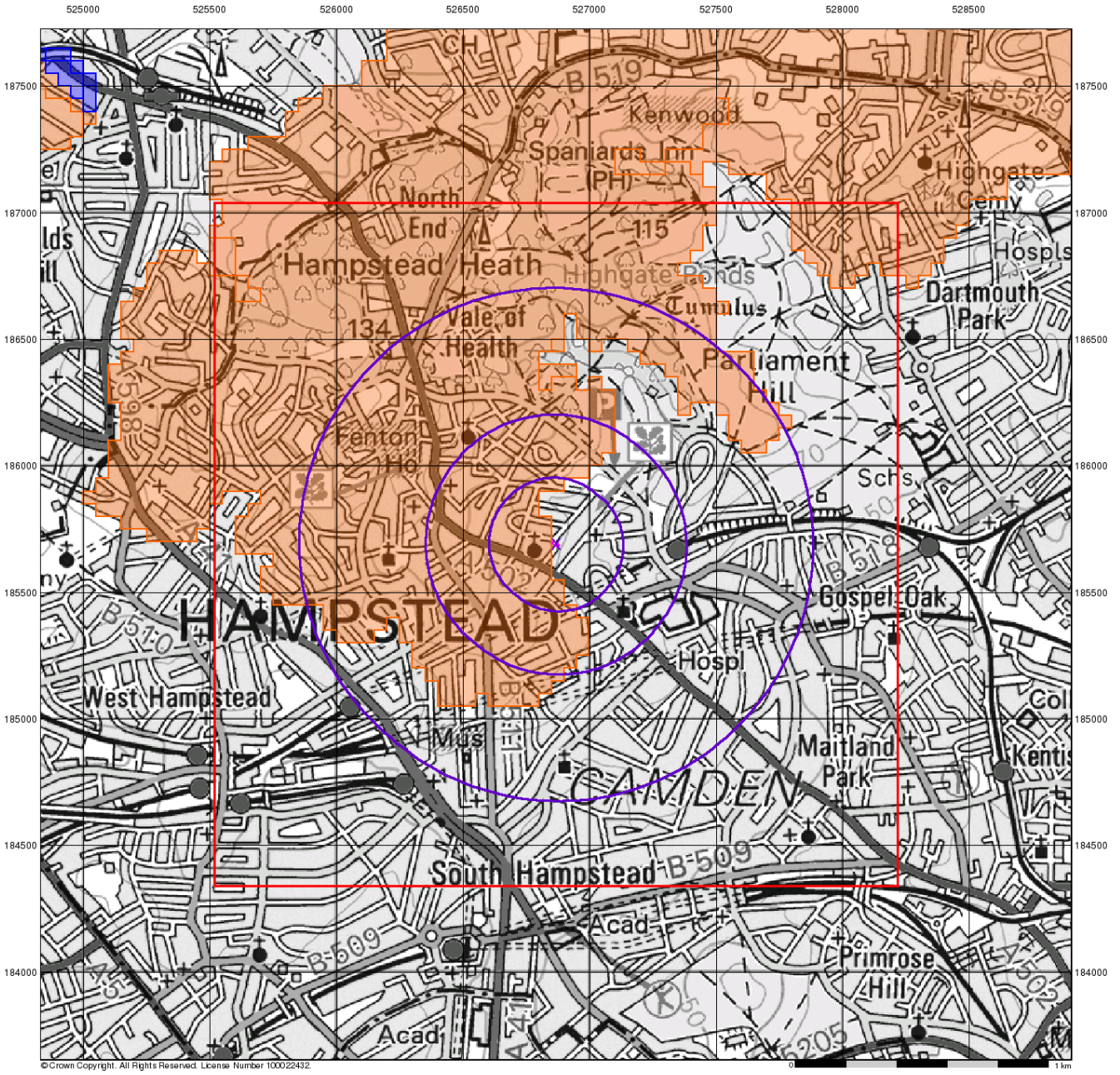


GEA

BGS Flood GFS Data

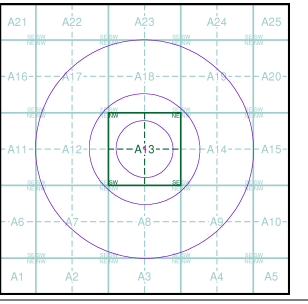
General

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

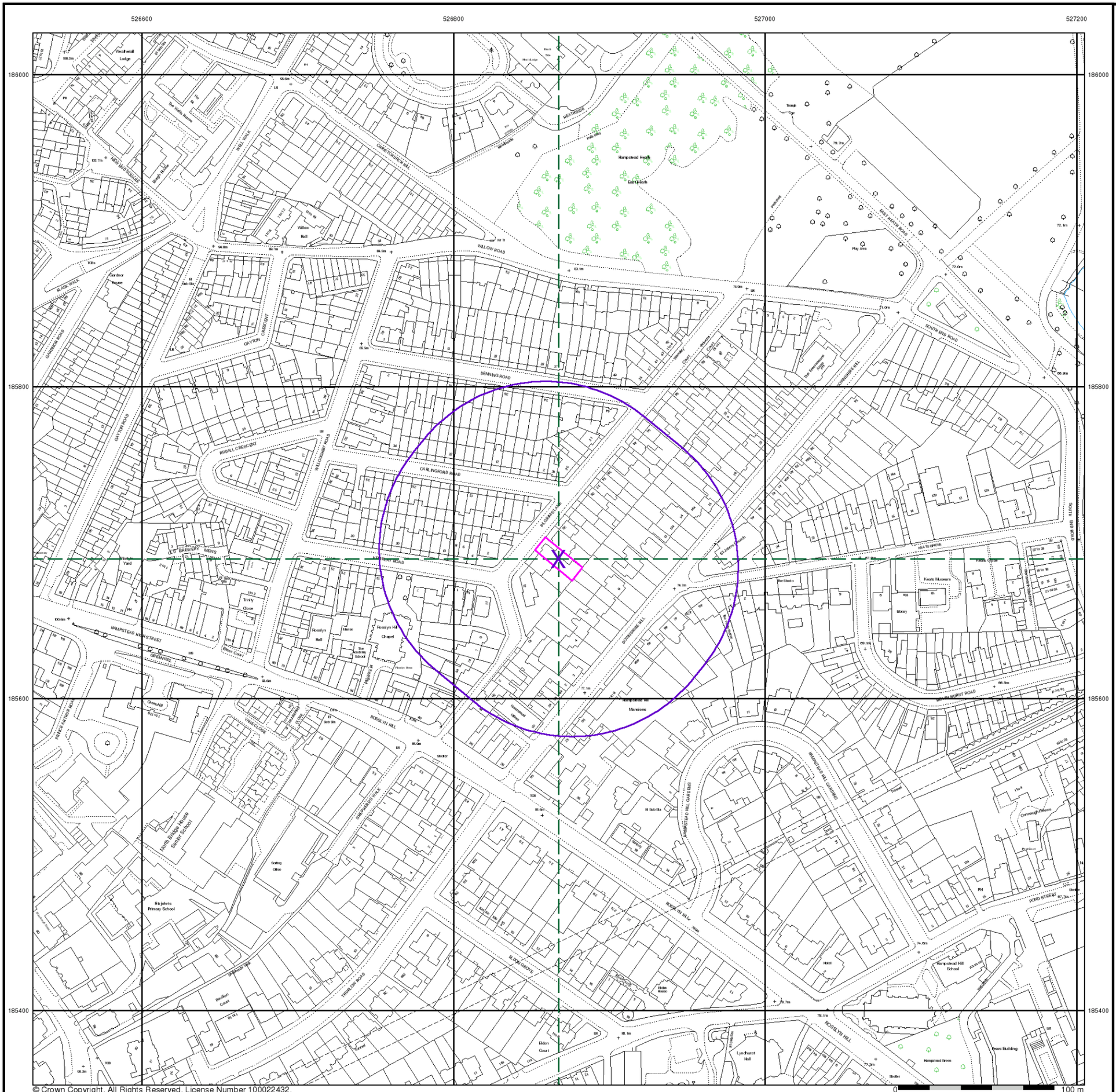


Order Details

Order Number:	305378389_1_1
Customer Ref:	J22352
National Grid Reference:	526870, 185690
Slice:	A
Site Area (Ha):	0.04
Search Buffer (m):	1000

Site Details

16, Pilgrims Lane, LONDON, NW3 1SN



GEA

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

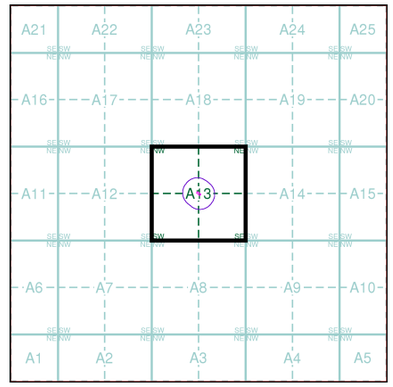
Geological

- 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:	305378389_1_1
Customer Ref:	J22352
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Slice:	A
Site Area (Ha):	0.04
Plot Buffer (m):	100

Site Details

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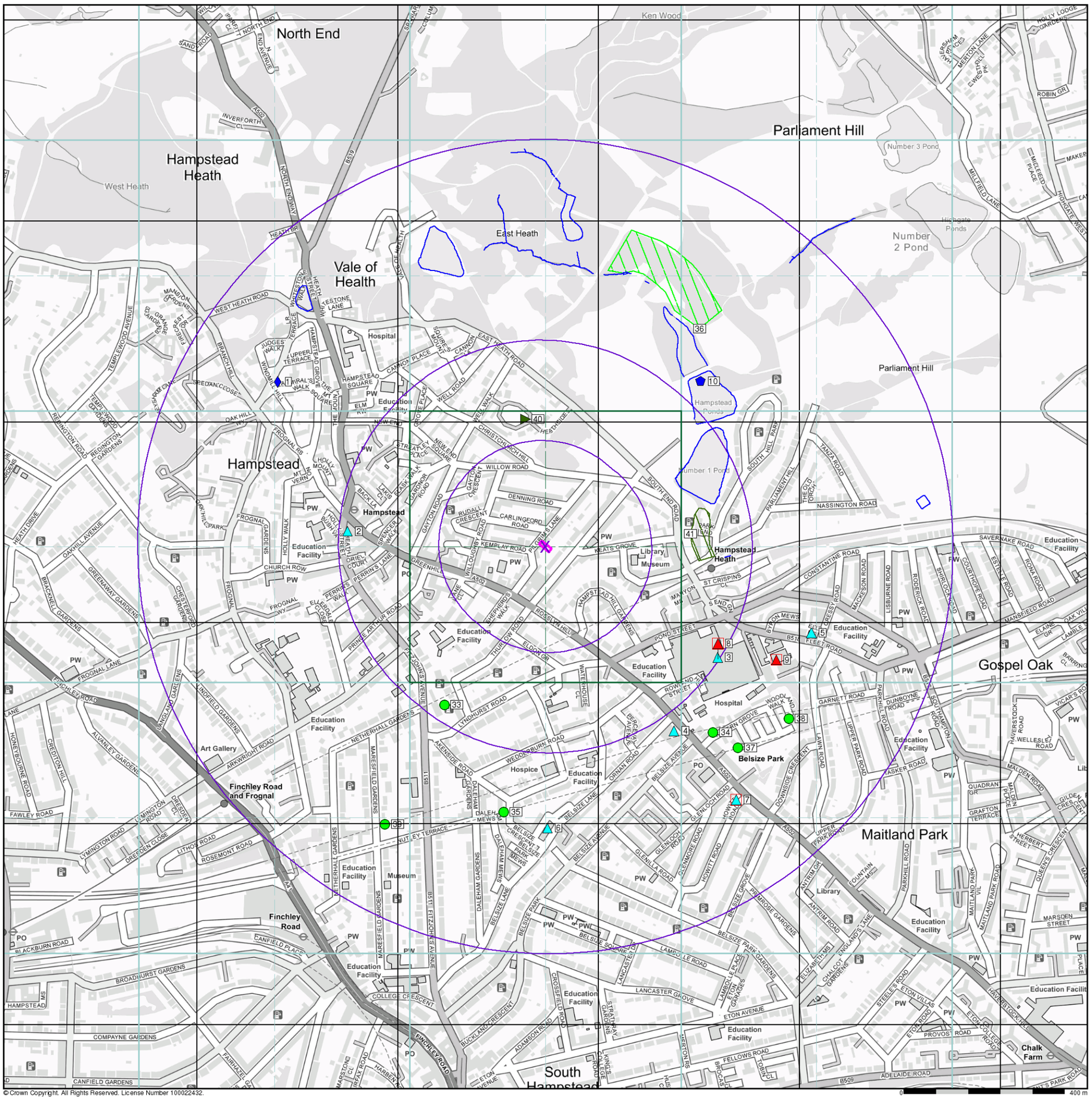

GEA

General

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

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
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- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

- COMAH Site
- Explosive Site
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- Planning Hazardous Substance Consent
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Geological

- BGS Recorded Mineral Site

Waste

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- Potentially Infilled Land (Water)
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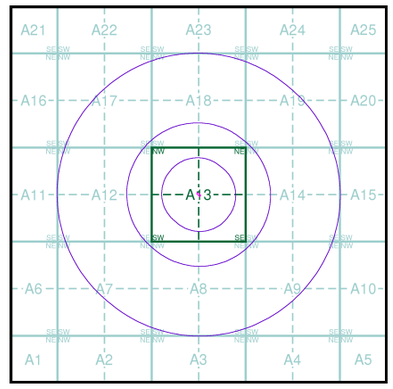
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Slice A



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