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13 FERNCROFT AVENUE

LONDON

NW3 7PG

BASEMENT IMPACT ASSESSMENT (BIA) & SITE INVESTIGATION REPORT

32655/R/001/RJM

December 2014

APPROVAL SHEET AND FOREWORD

13 FERNCROFT AVENUE

LONDON

NW3 7PG

BASEMENT IMPACT ASSESSMENT (BIA)

Report Ref: 32655/R/001/RJM

Report Status: draft		Date of Issue: October 2014
		Signature
Author	**R J Moore (CGeol.)**	
Reviewed	**J Sturman (MICE CEng.)**	
Checked and Approved	**P G Hicks** pp	

This report has been prepared with all reasonable skill, care and diligence within the terms of the contract with the Client and within reasonable limitations of the resources devoted to it by agreement with the Client.

This report is confidential to the Client and Knapp Hicks & Partners Limited accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

This report shall not be used for engineering or contractual purposes unless signed by the author and the approver and on behalf of Knapp Hicks & Partners Limited, and unless the report status is "Final".

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APPENDICES

13 FERNCROFT AVENUE
LONDON, NW3 7PG
BASEMENT IMPACT ASSESSMENT (BIA) REPORT

1 INTRODUCTION

This BIA has been prepared by Richard Moore, a Technical Director at Knapp Hicks and Partners Limited (KHPL), a Fellow of the Geological Society (FGS), and a Chartered Geologist (CGeol) with 25 years experience of geotechnical projects including hydrogeological assessment, slope stability, foundations and site investigation.

Richard Moore has been assisted in the preparation of the BIA by KHPL colleagues Jennifer Sturman, Chartered Civil Engineer (CEng) and Member of the Institution of the Civil Engineers (MICE), who has over 25 years experience of civils and drainage design, and flood risk assessment and her carrer to date has included experience with Local Authority, contractors and consultants. Jennifer has contributed to both the Land Stability and the Surface Water & Flooding stages of our assessment.

This document fulfils the requirements for BIA Stages 1 to 3. Stage 4 discusses the impacts and some additional work is recommended to conclude the impact assessment.

Should further analysis be required to compliment the structural design of the basement and to assess the impacts in greater detail, we are also pleased to confirm that we can call upon the services of a CGeol, FGS, RoGEP geotechnical specialist to assist with the calculation of predicted ground movements and structural impact, and by an FGS CGeol qualified hydrogeologist to model the groundwater in greater detail.

We can also confirm that one of our structural engineers will also review the completed document.

Knapp Hicks and Partners Limited (KHPL) have been instructed to prepare a Basement Impact Assessment (BIA) for 13 Ferncroft Avenue, London NW3, to be prepared in accordance with London Borough of Camden guidance document CPG4 (September 2013) and subsequent revisions. A site investigation was also undertaken to complement the BIA, and the findings are included and assessed in this report to assist with Stages 2 and 3 of the BIA process.

Due diligence and care has been used in the preparation of this report, however the contents should be read with due regard to the time and financial resource made available to compile this report.

Whilst every effort has been made to ensure the accuracy of the data supplied and any analysis derived from it, there may be conditions at the site that have not been disclosed by the available records and could not therefore be taken into account. In particular, it should be noted that groundwater conditions vary due to seasonal and other effects and may at times be significantly different from those measured by intrusive investigations. No liability can be accepted for any such variations in these conditions.

In addition, any recommendations made are specific to the development as detailed in this report, and no liability will be accepted should they be used for the design of alternative schemes without prior consultation with KHPL.

Site Description

The site is located at 13 Ferncroft Avenue, London NW3 at approximate grid reference TQ253859. At this location, Ferncroft Avenue is orientated NW-SE and the ground level falls

gradually towards the south east. A number of photographs are provided as attachments with this report.

No13 is a semi-detached 3-storey house with a cellar. The cellar access is from the northern side and the cellar extends to the full footprint of the main house. No 15 is adjoining to the south. The floor level to No 15 is slightly higher than No13 as they are stepped to follow the profile of Ferncroft Avenue which slopes down to the north west at around 1V(Vertical) on 18H(Horizontal), although there appears to be an overall fall of the surrounding topography from east to west. The front garden is paved with York Stone with planted borders surrounding, and is used for parking. There are no lightwells. There is a paved terrace behind the northern half of the house. To the rear there is a lawn with trees and walls along the borders with the adjacent properties. Beyond the rear garden there is a Thames Water reservoir facility.

Mature trees along the boundaries are located in neighbouring properties. The detail of these trees is not known.

The ground level falls slightly from front to rear.

A pathway extends along the northern side of the house and is relatively level along its length. The pathway is approximately 1.00m wide, including the vegetated border running alongside.

The houses to both sides appear to be of similar construction. We are not aware of either having a basement extension.

The overall site is rectangular in shape with approximately 10.5m length frontage onto the western side of Ferncroft Avenue. The footway at this location has mature London Plane trees present at regular intervals along the length of Ferncroft Avenue, and one is located close to the boundary of No13 and No11.

Based on the Thames Water service records, the existing ground level at 13 Ferncroft Avenue is approximately 64.0mAOD but a datum has been created in Ferncroft Avenue and given an arbitrary value of 50.00m. Therefore, for the purposes of this report and to avoid confusion with the drawings, levels are quoted relative to site datum SD, which is approximately 14.0m lower than Ordnance Datum.

Proposed Development

A set of plans and sections for the existing house layout and the proposed development is appended to this report.

It is proposed to deepen the existing cellar to facilitate its conversion to provide an extra floor of living space below the existing house footprint. The ground floor will remain the same size as existing.

Lightwells and associated access steps are proposed along the rear elevation, along the side passage between No13 and No11, and to the front of the existing bay window at the front.

The basement will be split level with different floor levels for the front and rear portions of the basement (see annotated plan of porposed basement provided in Appendix A). The lightwells will not be as deep as the basement. The changes in level relative to existing levels are summarised below and should be read alongside the attached site plans:

Area	Proposed reduction in level (mAOD)
Front	1.42m below existing cellar level (48.05mAOD)
Rear	2.16m below existing cellar level (47.31mAOD) (47.30mAOD i.e. approx. 2.2m below rear garden level)
Front Light Well	0.64m below existing cellar level (48.83mAOD)
Side Light Well	0.87m below existing cellar level (48.60mbgl)
Rear Light Well	2.16m below existing cellar level (47.31mAOD)

Apart from lightwells, the proposed basement will not extend further into either the front or rear gardens.

It is not anticipated that any trees will affect or be affected by the proposed scheme but it is recommended that the mature trees located in the neighbouring gardens and along the road are assessed by a suitably qualified arboriculturalist prior to commencement of construction so that Root Protection Areas etc are confirmed and may be clearly marked out.

At the outset, it is proposed to construct the basement using traditional 'hit and miss' underpinning methods, and the feasibility of this in relation to the prevailing ground and groundwater conditions is assessed and discussed later in this report.

Geology & Other Relevant Information

The 1:50,000 Geological Map (Sheet No. 256: North London) and the Groundsure Report indicates the site to be underlain by Claygate Member strata ('Claygate Beds') which is typically a mix of clays silts and sands. London Clay will be present at greater depth. Bagshot Formation sands are found on top of the Claygate Beds in this area of London and are shown on the geological maps approximately 139m further NE.

The geological map shows no superficial deposits, however, given the history of development on the site and surrounding area, a thin layer of made ground is expected.

The above geology has been confirmed on site in boreholes which are described later in this report (See attached borehole records in Appendix C).

The findings of a Groundsure Report and a review of historic maps of the area surrounding the site are summarised in Section 3 of this report.

2. SITE INVESTIGATIONS UNDERTAKEN

Scope of Investigation

We are not aware of any previous site investigation records for this site.

A site investigation was carried out under the supervision of a CGeol qualified engineering geologist in October 2014 and consisted of 2No window sampler boreholes, and 2No hand dug trial pits to confirm the existing foundation details. At the time of the investigations the weather was warm and dry and had been relatively settled for a period of some weeks.

Standpipes were installed in both boreholes and groundwater levels were measured 1 week after their installation and on 2 further occasions in November and December, following the onset of some more prolonged wet weather.

3. STAGE 1 – SCREENING

The London Borough of Camden has ruled that all new basement developments within the Borough are subject to the assessment process described in CPG4 Basements and Lightwells, adopted April 2011, and revised and updated September 2013. This policy has been developed to ensure that permission will only be granted for new basements which do not:

- Cause harm to the built and natural environment and local amenity;
- Result in flooding; or
- Lead to ground instability

The proposed scheme is an extension of an existing basement space which is currently only part-used and has low headroom throughout. It will occupy the full width of the semi-detached property but will not extend significantly beyond the existing building footprint and existing terrace to the rear of the house.

It is proposed to install additional living space including a storage and utility space, a guest bedroom, and leisure/recreation space.

The Basement Impact Assessment contains five stages in total:

- Stage 1 – Screening
- Stage 2 – Scoping
- Stage 3 – Site investigation
- Stage 4 – Impact assessment; and
- Stage 5 – Review and decision making

This section addresses the first stage in the process i.e. screening of the proposal and is supplemented by the findings of recent investigations of the existing structure (i.e. Stage 3) and recommendations in respect of potential impacts arising from the proposed basement and construction methodology (i.e. Stage 4). At this stage, the guidance requires any proposed application to make an assessment on the impact of the development on (a) surface water flows, (b) groundwater flow, and (c) land stability.

The screening process is described in Appendix E of CPG4 and includes 3 flowcharts as follows:

- Surface flow and flooding
- Subterranean (groundwater) flow
- Slope Stability

Potential impacts linked to the screening flowcharts are presented in Appendix F LB Camden document 'Camden geological, hydrogeological and hydrological study: Guidance for subterranean development', prepared by Ove Arup & Partners Ltd, November 2010.

Each of the above flow charts and responses to the questions asked are presented on the following pages of this report.

By way of an introduction to the site and to provide a review of the site setting in relation to the surrounding environment, we have reviewed a Groundsure Report for the area in which the site is located. The findings of this review are summarised in Section 5 and are intended to compliment the CPG4 flowcharts which follow:

A. Surface flow and flooding screening flowchart

Question		Yes (Y), No (N), Unknown (U) (see also notes provided at base of table)
1.	Is the site within the catchment of the pond chains on Hampstead Heath?	N
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?	N
3.	Will the proposed basement result in a change in the proportion of hard surfaced / paved external areas?	N
4.	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	N
5.	Will the proposed basement result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses?	N
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 from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	N

Notes

Q1 - By inspection of Figure 14 of CPG4,

Q2, Q3 & Q4 – The footprint of the proposed development has been calculated to be the same or slightly less than the existing area occupied by roof or hardstandings. Therefore only minor change to the impermeable/permeable area ratio is suggested for the site, and consists of a net reduction in impermeable areas.

Q4 – Note: On CPG4, Figure 15, and on the table provided in CPG4, Ferncroft Avenue is shown as having flooded during the flooding events of 1975, but not in 2002.

Q5 – No change in quality will occur.

B. Subterranean (groundwater) flow screening flowchart

Question		Yes (Y), No (N), Unknown (U) (see also notes provided at base of table)
1a.	Is the site located directly above an aquifer?	Y
1b.	Will the proposed basement extend beneath the water table surface?	Y
2.	Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	N
3.	Is the site within the catchment of the pond chains on Hampstead Heath?	N
4.	Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	N
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)?	N
6.	Is the lowest point of the excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	N

Notes

Q1a – The site is located on Claygate Member which is a Secondary A Aquifer, i.e. with permeable layers capable of supporting water supplies at local rather than strategic scale. Such strata can form an important source of base flow to rivers. Secondary Aquifers were generally formerly classified as minor aquifers.

Q1b – Groundwater was not encountered above the proposed depth of the basement in recent site investigation holes. However, subsequent monitoring installations have recorded groundwater levels which have risen to deepest FFL (i.e. the rear half of the proposed basement) +/-100mm. This is discussed later in this report.

Q2 - There are no records of existing water courses beneath the site.

Q3 – By inspection of Figure 14 CPG4.

Q4 – The footprint of the proposed development has been calculated to be the same or slightly less than the existing area occupied by roof or hardstandings. Therefore only minor change to the impermeable/permeable area ratio is suggested for the site, and consists of a net reduction in impermeable areas.

Q5 – There will be no significant change to the drainage arrangements for the site

Q6 – There are no surface water features in the vicinity of the site.

C. Slope stability screening flowchart

Question		Yes(Y),No(N), Unknown (U) (see also notes provided at base of table)
1.	Does the existing site include slopes, natural or manmade greater than 7deg. (approx. 1V in 8H)?	N
2.	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7deg.?	N
3.	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7deg.?	N
4.	Is the site within a wider hillside setting in which the general slope is greater than 7deg.?	N
5.	Is the London Clay the shallowest strata at the site?	N
6.	Will any trees be felled as part of the proposed development? Are any works proposed within any tree protection zones?	N
7.	Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	U
8.	Is the site within 100m of a watercourse or a potential spring line?	N
9.	Is the site within an area of previously worked ground?	N
10.	Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Y Y
11.	Is the site within 50m of the Hampstead Heath ponds?	N
12.	Is the site within 5m of a highway or pedestrian right of way?	N
13.	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Y
14.	Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	N

Notes

Q1 – See site plans provided with this report. The topography surrounding the site is gently sloping towards north west. The existing cellar level of the existing house is approximately 0.3m to 0.4m below road level.

Q2 – There will be no changes to the surrounding topography.

Q6 – Some mature trees are present in the gardens to the rear of the site. Root Protection Areas (as derived using BS5837:2005, Trees in relation to construction) will be confirmed in due course but the proposed scheme is not expected to impinge significantly upon them.

Q7 – We are unaware of any shrink-swell subsidence or evidence thereof on site or in the area of the site and information for any shrink-swell damage to neighbouring properties is not available to us. However, the soils have been classified as typically medium to high shrinkage potential and so it is possible that property on Ferncroft Avenue may have been affected by shrink-swell subsidence.

Q8 – There are no Environment Agency flood plains, river network entries or surface water features in the vicinity of the site.

Q9 No previous workings are reported on or near the site that would affect the proposed development.

Q10 - Groundwater was encountered as seepages in site investigation holes undertaken to the front and rear of the property. The seepages occur from sandier strata at depth in the Claygate Member. Groundwater levels obtained by monitoring wells installed in boreholes are provided in later sections of this report.

Q12 – The existing house is approximately 8m to 9m from the public footway alongside Ferncroft Avenue.

Q13 – The basement will increase the differential depth of foundations by 2m to 3m.

4. STAGE 2 - SCOPING

4.1 Impacts identified by Stage 1 Screening

The basement has been assessed in accordance with the three flow charts detailed in Appendix E of London Borough of Camden document CPG4 Basement and Lightwells.

Part A which considers surface water and flooding issues has raised no issues with regard to the development.

Part B which covers subterranean (groundwater) flow has returned one potential issue with regard to the development: Question 1: The site is located above a Secondary A aquifer and the groundwater level has been monitored in recent site investigation holes which has confirmed that depending on the prevailing weather, the groundwater level fluctuates above and below the proposed formation and Finished Floor Level of the basement. Based on the 2No boreholes, the groundwater level appears to be relatively consistent across the site in terms of reduced level (mASD), but may be affected locally by sewer runs, foundations, and localised variations in the geology.

The grading of the permeable strata at basement formation level has been confirmed in particle size distribution gradings as a clayey or silty fine SAND of very (fine) sandy SILT/CLAY. Careful consideration is required for construction of the basement walls and floor in these strata below the water table and this is discussed at greater length later in this report (Refer Section 5.3).

Part C covers slope stability. The screening flowchart has returned affirmative answers as follows: (1) Question 10 concerning the aquifer and groundwater level relative the proposed basement is the same as Question 1 in Part B (see above), and (2) the basement will increase the differential depth of foundations relative to neighbouring property.

Also, Q7, shrink swell subsidence: We are unaware of any shrink-swell subsidence or evidence thereof on site or in the area of the site and information for any shrink-swell damage to neighbouring properties is not available to us. However, the soils have been classified as typically medium to high shrinkage potential and so it is possible that property on Ferncroft Avenue may have been affected by shrink-swell subsidence.

The issues are discussed at greater length in Stage 4 - Impact Assessment

4.2 Conceptual Site Model

A sketch section is provided to illustrate the main issues raised by the screening and/or identified by the site investigations, and which need to be considered in terms of impacts by the prevailing conditions on construction of the basement and the impact of the basement on those conditions.

The issues and their impacts are discussed in Stage 4 – Impact Assessment.

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Project: 13 FERNCROFT AVE – CONCEPTUAL SITE MODEL	Job Ref: 32655	Page No. 1
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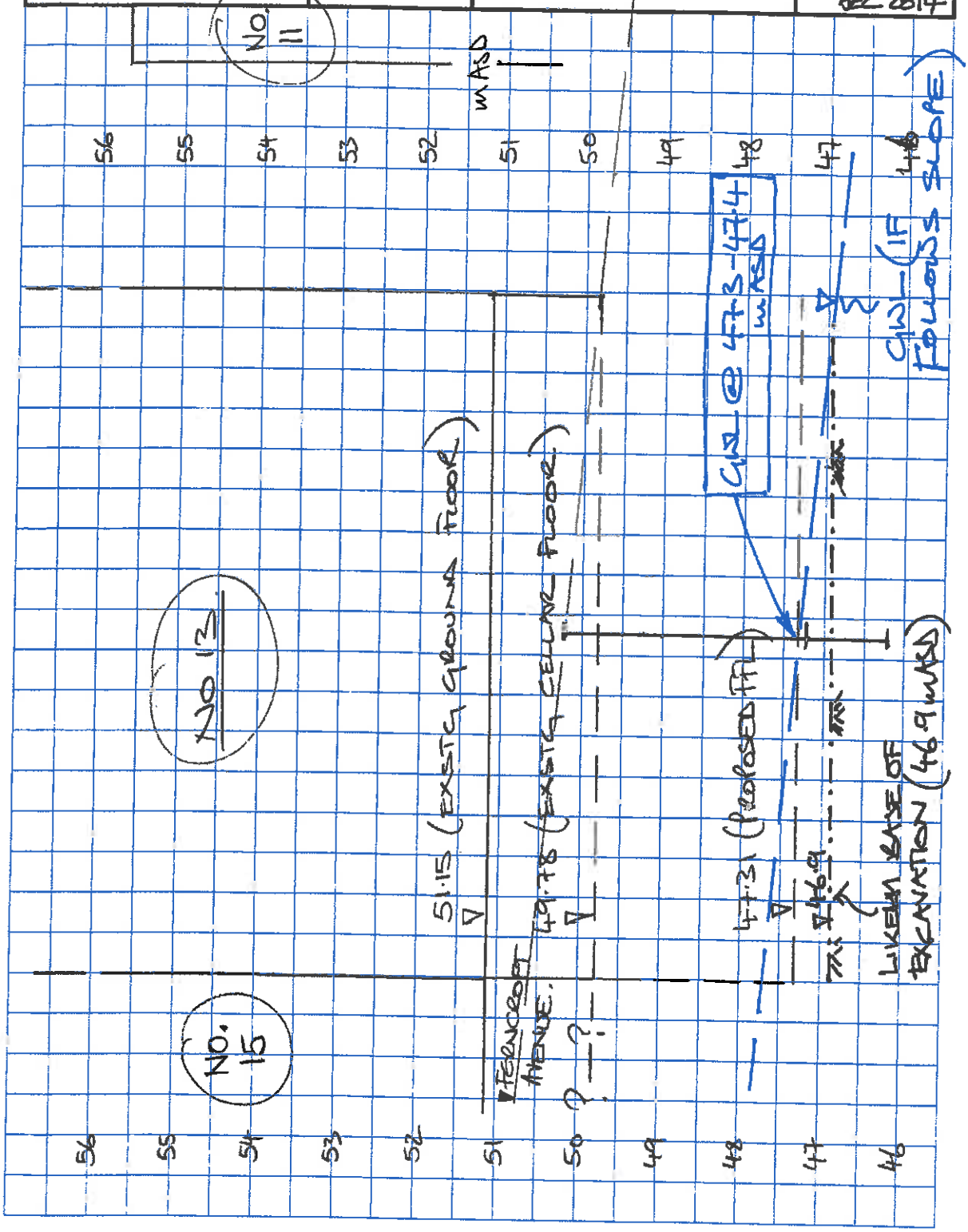
		Date: DEC 2014



5. STAGE 3 - SITE INVESTIGATION & STUDY

5.1 Desk Study

Review of GroundSure Report Reference EMS-235188_312764, dated 27 Jan 2014

- No records of artificial / made ground on site. A large outcrop of worked ground is indicated immediately beyond the end of the rear garden and a covered reservoir is present in land to the south east of the site. A further larger area of worked ground exists to the west side of Platts Lane, believed to be a former brickworks,.
- No records of landslips on or near the site.
- No Radon Protection Measures are required.
- Northern Line tunnels pass underground close to the site but we understand these are deep lines and are likely to be located well below the depth of influence of the proposed basement.
- Moderate risk of shrink-swell clays and natural ground subsidence.
- Geology is confirmed as Claygate Member strata. The overlying Bagshot Beds are indicated further uphill from the site and are shown outcropping at ground level 139m NE. the underlying London Clay is shown outcropping further downhill, around 210m SE from the site.
- Claygate Member is a Secondary A Aquifer, i.e. with permeable layers capable of supporting water supplies at local rather than strategic scale. Such strata can form an important source of base flow to rivers. Secondary Aquifers were generally formerly classified as minor aquifers.
- There are no records of Environmental Permits, Incidents or Registers within 50m
- There are no records of landfills, waste sites or other landuse within 50m
- There are no records of abstraction licences or Source Protection Zones which will affect the site
- There is no Groundwater Vulnerability and Soil Leaching Potential on site.
- There are no EA recorded river entries or surface water features within 250m of site
- There are no EA Zone 2 or Zone 3 floodplains within 250m of site
- BGS have assessed there is limited potential for groundwater flooding risk, and the assessed confidence rating for this is low.
- There are no Environmentally Sensitive Sites within 250m of site

Review of Historic Maps (1:2,500 to 1:10,000)

1866-70	Site is shown within an open field with a field boundary indicated to the rear (south west) and a boundary fence to a detached house shown a few metres beyond the western boundary of the plot. The garden to the house and the field boundary may be part occupied by trees. Further to the south is Kidderpore Hall, a large detached residence with extensive landscaped gardens. Some pumps are indicated at the Hall and associated outbuildings. Platt Lane is present further to the west and beyond this a brick field is shown.
1893, 1896,	The site is unchanged although it is now contained in a larger square fenced area. The land to the southern side of the rear boundary fence is now occupied by a covered reservoir and embankment earthworks are shown to either side of the reservoir. Kidderpore Hall is now labelled Westfield College.
1915	The site is now occupied by 13 Ferncroft Avenue, and all of the surrounding area has become developed with similar semi-detached housing. However, the Reservoir to the rear remains as shown previously.
1953 -	Similar to 1915 and layout of site and surrounding area more-or-less remains the same to present day. To the rear of

Present	the site, the banked areas to either side of the reservoir are now occupied by tennis courts but the reservoir remains in place.

5.2 Site Investigation (2014)

Introduction & Scope

We are not aware of any previous site investigation records for this site.

A site investigation was carried out by Knapp Hicks & Partners, under the supervision of a CGeol qualified engineering geologist, in October 2014 and consisted of 2No window sampler boreholes, and 2No hand dug trial pits to confirm the existing foundation details. At the time of the investigations the weather was warm and dry and had been relatively settled for a period of some weeks.

Standpipes were installed in both boreholes and groundwater levels were measured 1 week after their installation and on 2 further occasions in November and December, following the onset of some more prolonged wet weather.

Window sampler borehole WS1 was located in the pathway along the rear of the house and was extended to a depth of 4.00m. Borehole WS2 was carried out within the paved area at the front of the house and also extended to 4.00mbgl. A paving slab was lifted to facilitate this. Ground level at WS2 (50.17mASD) is estimated to be around 830mm above the ground level at BH1 (49.34mASD).

All samples were logged by a BSc CGeol. Qualified geotechnical engineer / engineering geologist as the boreholes were advanced, and pocket penetrometer determinations of undrained shear strength were recorded at regular depth intervals.

Geotechnical laboratory testing consisting of natural moisture content determinations, soil index property tests and particle size distribution gradings were undertaken on representative samples obtained from the boreholes and these have been assessed in relation to the proposed scheme.

Borehole logs are provided in Appendix C along with laboratory test results and graphs of the pocket penetrometer and moisture contents plotted against depth.

Existing Foundations

At the front of the house, the foundation was comprised of a 3 layer brick corbel (from 0.90mbgl to 1.14mbgl) resting on a 300mm thickness of compacted ash and clinker (1.14mbgl to 1.44mbgl), which is a typical foundation arrangement for similar houses of this age in the Hampstead area. No groundwater was encountered and the excavation was dry. Ground level was 200mm below the air brick.

The trial pit in the side passage, towards the rear of the property, was excavated at the junction of the main house and the 2-storey rear extension which has a pitched roof shedding towards the rear garden. A 2-brick corbel was present from 0.70mbgl to 0.84mbgl, and a 300mm compacted ash and clinker footing was proved from 0.84mbgl to 1.14mbgl. The excavation was restricted due to foul sewer pipes running along the side passage (refer attached sketch). In the side passage, the ground level was approximately 350mm below the nearest air brick.

Ground Conditions

The boreholes confirmed the expected geology of topsoil and clayey made ground resting on silty CLAY overlying very sandy CLAY/SILT deposits.

The Made Ground typically extends to around 0.80mbgl and is a mix of topsoil.

Below the Made ground the underlying natural strata are mainly clayey to 2.00mbgl in BH1 (rear) and 1.75m in BH2 (front).

Below the clay, the soil is a mix of silty and or clayey fine SAND, sometimes with interlaminations of silty and/or sandy clay, which become more damp with depth.

The sandier strata were submitted for grading analysis to help with the assessment of permeability and stability. The sand fraction is well graded fine sand, being uniformly distributed from 0.06mm to 0.2mm.

The groundwater strikes and responses in the boreholes are described in greater detail below.

Roots and rootlets were noted in the boreholes to 2.00m (BH1 (rear) and 1.45m in BH2 (front).

Index tests on the clayey strata gave plasticity index values of 31% to 51% which indicates medium to high shrinkage potential. None of the natural moisture content values indicates significant desiccation when compared against commonly used indicators of desiccation such as Plastic Limit Value + 2% or Liquid limit x 0.4.

However, we would recommend that the structural designer review the tree species and heightsalong the site boundary and ensure that potential heave / shrinkage is taken into consideration.

Groundwater & Monitoring

Groundwater was encountered in both of the boreholes and following termination of the boreholes, the groundwater level was monitored to confirm how quickly it rises in the borehole and the level at which it would settle. To assist with confirmation of the standing water level, standpipes were installed in both boreholes and both were monitored approximately 1 week after completion of the site works, and on 2 separate occasions in November and December following wetter weather.

In WS1, groundwater was encountered as the sampling tube was driven from 2.0m to 3.0m and the holes was terminated at 4.00mbgl because the sides were unstable below 3.00mbgl.

No groundwater was encountered in the hand dug trial pits or the inspection pits for the boreholes.

Standpipes were installed as follows:

BH1 – 1No to 2.93mbgl

BH2 – 1No to 3.60mbgl.

A monitoring visit was carried out on 29/9/2014, and further monitoring visits were carried out. The following table reports the monitored groundwater levels in both mbgl and mASD.

Borehole	Ground Level metres above site datum (mASD)	Depth of standpipe (mbgl)	Groundwater Level mbgl (mASD)		
			29/9/2014	21/11/2014	5/12/2014
WS1 (Back)	49.34mASD	2.93m	2.40m (46.94mASD)	1.95m (47.39mASD)	2.02m (47.32mASD)
WS2 (Front)	50.17mASD	3.60m	3.26m (46.57mASD)	2.97m (47.20mASD)	3.005m (47.165mASD)

Based on the above information it is expected that, depending on the season and prevailing weather, the standing groundwater level is expected to be encountered at between 0.78m below, and 0.08m above the lowest Finished Floor Level (FFL) of the new basement (47.31mASD). It should be noted that the lower basement level only applies to the rear 'half' of the basement. The front half of the basement will be have FFL at 48.05mASD, which will ensure the front part of the basement will be above the groundwater level.

Appropriate further investigations and design options to mitigate against the groundwater and consider the impact of the basement on the groundwater are discussed at greater length in later sections of this report.

Classification for Buried Concrete

Tests on representative samples recovered from the boreholes indicate that ground conditions are suitable for a Design sulphate class of DS-1 and an aggressive concrete classification of AC-1.

5.3 Ground Engineering & Impacts based on the Site Investigation findings

The ground conditions generally consist of firm becoming stiff clayey strata to 1.75m to 2.00m below existing ground level (mbgl), becoming a clayey or silty fine sand below these depths. The sands appear moderately compact, with occasional layers of siltstone. The sands are interlayered with silty clays which are firm. It is considered that a bearing capacity of 75KN/m2 for spread foundations placed at approximately 3.0mbgl will be appropriate although this should be revised following a review, with specialist contractors, of options to deal with groundwater in excavations as described below.

Groundwater was encountered at 2.97mbgl to 3.26mbgl to the front and 1.95mbgl to 2.40mbgl at the rear. Giving a range of groundwater level of 46.57mASD to 47.39mASD according to location and seasonal influence.

It is anticipated that the groundwater level will to some degree follow the overall slope profile i.e. east to west, but this will be affected by local differences in the geology and the effects of services and other earthworks which have been introduced over the years.

However, the impact on the proposed basement construction is that the proposed basement floor below the rear half of the property is effectively below the water table. At certain times of the year, the water table will fall below this level (as indicated by the first set of monitoring readings).

The water bearing soils are a mix of thinly interbedded fine sands, silts and clays. Where excavations in these strata penetrate below these strata, the soils will be prone to instability, and we do not anticipate that it will be possible to control the groundwater through the use of standard pumping methods, i.e. pumping groundwater from a sump as the works proceed as this could lead to the removal or migration of fine material from the ground.

Therefore consideration needs to be given to how these soils can be stabilised to maintain stability of No13 and adjacent properties as the works proceed.

A number of techniques have been developed for the construction of basements below the water table: (a) local lowering of the groundwater table; (b) construction of a perimeter barrier (piling) to control water ingress; and (c) soil stabilisation by grouting.

Based on the site constraints, it is considered that all three of the above methods may be feasible, subject to consultation with specialists. It is important to note that all of these options should be designed by specialist contractors, preferably with experience of similar schemes in water bearing Claygate Beds and ASUC (Association of Specialist Underpinning Contractors)

accreditation. However, we consider that the construction of a perimeter barrier (i.e. piling) may be the least feasible due to the expected depth which would be required to prove an impermeable layer at depth to seal off the groundwater.

Lowering of the groundwater table using a well point/ejector dewatering system to reduce the water level for the duration of the groundworks may be feasible, but the design is critical and must be based on the soil grading and expected permeability. Upon completion the pumping would cease and the groundwater level would return to its original level.

Our preferred option for this site would be the use of cementitious or chemical grouting to bind the soils together to reduce permeability and increase stability of the ground during excavation and construction. Injection of grout is via lances to form overlapping bulbs of stabilised ground around the perimeter of the basement and in the ground below the basement floor. An alternative method would be to use jet grouting to form overlapping columns of treated ground which would also fulfil the purpose of underpins. Soil stabilisation by grouting is often considered o be the most expensive solution for construction below the water table but in this case, given the relatively shallow depth to which treatment would be required, it is our opinion that specialist grouting could provide the optimum solution.

We suggest that the construction method could consist of traditional underpinning within the upper clayey strata to increase the available headroom in the existing basement space, then mobilise the specialist grouting equipment and crew to treat the water bearing fine sandy strata below the rear half of the basement before excavating below the groundwater table.

All temporary and permanent works would be designed and approved in advance in accordance with recognised ASUC procedures.

6. STAGE 4 – IMPACT ASSESSMENT

6.1 Surface Water and Flooding

1.	Is the site within the catchment of the pond chains on Hampstead Heath?	N
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?	N
3.	Will the proposed basement result in a change in the proportion of hard surfaced / paved external areas?	N
4.	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	N
5.	Will the proposed basement result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses?	N
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 from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	N

No impacts are identified in terms of surface water and flooding but we have the following qualifying comments.

Q1 - By inspection of Figure 14 of CPG4

Q2, Q3 & Q4 – The footprint of the proposed development has been calculated to be the same or slightly less than the existing area occupied by roof or hardstandings. Therefore only minor change to the impermeable/permeable area ratio is suggested for the site, and consists of a net reduction in impermeable areas.

Q4 – Note: On CPG4, Figure 15, and on the table provided in CPG4, Ferncroft Avenue is shown as having flooded during the flooding events of 1975, but not in 2002.

6.2 Groundwater Flow

1a.	Is the site located directly above an aquifer?	Y
1b.	Will the proposed basement extend beneath the water table surface?	Y
2.	Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	N
3.	Is the site within the catchment of the pond chains on Hampstead Heath?	N
4.	Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	N
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)?	N
6.	Is the lowest point of the excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	N

The presence of the aquifer and elevated groundwater table relative to the proposed basement is the only issue are identified in terms of groundwater flow but we have the following qualifying comments.

Q1a – The site is located on Claygate Member which is a Secondary A Aquifer, i.e. with permeable layers capable of supporting water supplies at local rather than strategic scale. Such strata can form an important source of base flow to rivers. Secondary Aquifers were generally formerly classified as minor aquifers.

Q1b – Groundwater was not encountered above the proposed depth of the basement in recent site investigation holes. However, subsequent monitoring installations have recorded groundwater levels which have risen to FFL+/-100mm.

Q2 - There are no records of existing water courses beneath the site.

Q3 – By inspection of Figure 14 CPG4.

Q4 – The footprint of the proposed development has been calculated to be the same or slightly less than the existing area occupied by roof or hardstandings. Therefore only minor change to the impermeable/permeable area ratio is suggested for the site, and consists of a net reduction in impermeable areas.

Q5 – There will be no significant change to the drainage arrangements for the site

Q6 – There are no surface water features in the vicinity of the site.

GROUNDWATER FLOW IMPACT ASSESSMENT

It is considered that the basement excvations and associated ground treatment will penetrate below the groundwater by approximately 1m to 1.5m, i.e. to approximately 45.5mASD to 46.0mASD. Note: this will only affect the rear half of the basement as we expect that it wil be possible to construct the front half of the basement by conventional hit and miss underpinning.

The affected strata will be permeable and therefore it is considered that the groundwater will be able to flow around the ground affected by the basement where it intersects the water table, i.e. the rear half of the basement.

Groundwater monitoring will be carried out inside the basement and at points along the basement externally, and upon completion of the grouting it will be possible to reduce the groundwater level within the basement to facilitate construction. Monitoring of the groundwater level external to the basement will detect if groundwater is continuing to enter the basement, in which case further grouting will be carried out until dewatering of the basement can be demonstrated to be having no effect on the external groundwater level.

It is considered that, subject to ongoing monitoring and the preparation and approval of a detailed methodology for the construction, the basement will have a negligible impact upon the groundwater flow regime in this area, especially as the site layout, and the proposed scheme itself, will not lead to construction of further basement development to either side, thus maintaining short flow paths for groundwater flow to pass the basement.

Furthermore, the groundwater in this area does not support flow to any local ponds or surface watercourses and therefore there should be no impact on groundwater beyond the site. More detailed assessment of the impacts on groundwater can be arranged with a hydrogeologist on request.

6.3 Slope Stability

1.	Does the existing site include slopes, natural or manmade greater than 7deg. (approx. 1V in 8H)?	N
2.	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7deg.?	N
3.	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7deg.?	N
4.	Is the site within a wider hillside setting in which the general slope is greater than 7deg.?	N
5.	Is the London Clay the shallowest strata at the site?	N
6.	Will any trees be felled as part of the proposed development? Are any works proposed within any tree protection zones?	N
7.	Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	U (Moderate Risk)
8.	Is the site within 100m of a watercourse or a potential spring line?	N
9.	Is the site within an area of previously worked ground?	N
10.	Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Y Y
11.	Is the site within 50m of the Hampstead Heath ponds?	N
12.	Is the site within 5m of a highway or pedestrian right of way?	N (Approx 6.5m)
13.	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Y
14.	Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	N

The main potential impacts caused by the basement are in relation to groundwater. However, our comments in relation to all potential impacts are discussed below:

Q1 – See site plans provided with this report. The topography surrounding the site is gently sloping towards north west. The existing cellar level of the existing house is approximately 0.3m to 0.4m below road level.

Q2 – There will be no changes to the surrounding topography.

Q4 – The topography slopes at approximately 1V on 11H (5.1deg.).

Q6 – Some mature trees are present in the gardens to the rear of the site. Root Protection Areas (as derived using BS5837:2005, Trees in relation to construction) will be confirmed in due course but the proposed scheme is not expected to impinge significantly upon them.

Q7 – We are unaware of any shrink-swell subsidence or evidence thereof on site or in the area of the site and information for any shrink-swell damage to neighbouring properties is not available to us. However, the soils have been classified as typically medium to high shrinkage potential and so it is possible that property on Ferncroft Avenue may have been affected by shrink-swell subsidence.

Q8 – There are no Environment Agency flood plains, river network entries or surface water features in the vicinity of the site.

Q9 No previous workings are reported on or near the site that would affect the proposed development.

Q10 - Groundwater was encountered as seepages in site investigation holes undertaken to the front and rear of the property. The seepages occur from sandier strata at depth in the Claygate Member. Groundwater levels obtained by monitoring wells installed in boreholes are provided in later sections of this report.

See Impact Assessment below for proposals to deal with groundwater.

Q12 – The site is approximately 6.5m from the public footway alongside Ferncroft Avenue. Subject to the findings of a trial hand-dig, it is anticipated the basement will be excavated in a minimum of 2 stages, i.e. excavate to a pre-arranged depth and form that section of wall before commencing excavation to greater depth. It is considered that this method of construction will be sufficient to allow the construction of the scheme, and for maintenance of the highway and footway alongside.

Q13 – The basement will increase the differential depth of foundations by 2m to 3m.

Q14 – The site is not located close to the alignments of any tunnels.

SLOPE / LAND STABILITY IMPACT ASSESSMENT

We understand that basements of similar extent have been approved and constructed at similar properties nearby and the proposed scheme is expected to have minimal impact upon neighbouring properties on condition that the Construction Method Statement is prepared by a competent individual and strictly adhered to during construction, in particular with respect to stability of soils below the groundwater table, groundwater flow and monitoring thereof.

It will be necessary to undertake some underpinning of the shared wall with No15 prior to commencement of construction of the proposed basement at No13. Underpinning of No11 should not be required but a party wall investigation is recommended to confirm the detail and depth of foundations to No11.

Knapp Hicks consider that it is feasible that the proposed scheme can be constructed by a competent contractor without causing damage to adjacent properties and infrastructure. However, this is conditional on the Basement Contractor, and their structural engineers, giving full consideration in their design and construction methodology to the location of the site, and all neighbouring properties and infrastructure, in relation to their proposed method of basement construction, the form of construction of all affected or potentially affected structures and infrastructure, and all appertaining ground and groundwater conditions.

It is the responsibility of the basement contractor to develop appropriate techniques to avoid all adverse effects to neighbouring property. This concurs with the recommendations and advice

provided in Camden Planning Guidance Document CPG4: Basements & Lightwells, all related guidance, and the recommendations made in this BIA Report.

Notwithstanding the above statements, this BIA document includes the findings of site investigations undertaken at the time of BIA preparation to help identify the critical issues which might affect the basement construction. The attached cross-sections through the property serve as a Conceptual Model for the scheme and illustrates the following factors which must be taken into consideration:

- 13 Ferncroft Avenue shares an adjoining party wall with 15 Ferncroft Avenue which is effectively a similar property.
- The boundary with 11 Ferncroft Avenue is occupied by a passageway serving the rear of No13. The 2 properties are separated by a hedge of mixed species.
- The geology below the site is described in Section 5
- Groundwater was encountered in the investigations and the level fluctuates according to prevailing seasonal weather. The groundwater is known to rise up to 100mm above proposed basement Finished Floor Level

It is recommended that specialist advice be sought as required to confirm appropriate groundwater control measures both for the temporary and the permanent works. Knapp Hicks recommend grouting to control groundwater during construction, in particular around and underneath the rear half of the proposed basement to ensure stability throughout the works.

The detailed method of construction will be prepared in due course by a structural engineer on behalf of a basement contractor but, subject to the findings in 1 to 2 trial excavations to the depth of the basement, we would anticipate that the preferred method of construction will be a 2-stage excavation, with the existing walls being underpinned following a pre-determined sequence of underpins (i.e. Hit and miss as described in the industry standard reference document: Design and construction of deep basements including cut-and-cover structures, Institution of Structural Engineers, 2004).

Following the above method, the first stage of excavation would be carried out to increase the headroom in the basement which will facilitate grouting of the sandy water bearing layers to improve stability and reduce permeability.

The construction methodology proposed above will ensure that settlement of adjacent and nearby structures is within tolerable limits as defined by the Burland Damage Category Chart (CIRIA C580), as reproduced in CPG4, i.e. Category 2 (Slight) or lower. Assessment of potential movement associated with the proposed methodology should be carried out by the specialist grouting contractor. Movement assessment should also consider the effects of the construction along the change in levels between front and back of the basement.

Measures to ensure the scheme is executed to satisfy Damage Category 2 or Lower must include the following:

(a) Undertake pre-construction Condition Surveys on potentially affected properties and infrastructure, to include trial pits to confirm details of the foundations to 11 and 15 Ferncroft Avenue.
(b) Incorporation of a scheme of movement monitoring of adjacent property and ground levels, with pre-determined checks and controls.
(c) Design the basement to be water resisting.
(d) Design the basement to resist uplift from a water table 0.5m below the existing ground level.

(e) Prior to commencement of construction, it is recommended that trial excavations are dug down to formation level to confirm the rate of inflow to open excavations and to assist with selection and design of appropriate temporary works and long term waterproofing measures to control the groundwater.

(f) Based on the findings of (e), consider incorporation a scheme of groundwater investigation and monitoring to identify potential higher permeability water bearing layers along the perimeter of the proposed scheme.

(g) Incorporate groundwater control measures to address the potential temporary works issues associated with potential water bearing strata. Subject to the findings of (e) and (f), possible options include permeation grouting using cementitious injection or secant piling to create a cut-off around the perimeter of the basement during the underpinning and excavation procedures. As described above, the reinforced concrete underpins and raft floor slab shall be designed to resist water pressure. As previously stated, the effectiveness of this approach should be tested by trials in advance of construction.

7. CONCLUSIONS AND RECOMMENDATIONS

The groundwater level has been shown to be subject to seasonal and other changes. The basement formation is expected to extend below the water table below the rear half of the property, i.e. within water bearing fine sandy Claygate Beds strata. However, Knapp Hicks propose that, subject to consultation with a reputable basement contractor and the additional measures described in this report, the groundwater and any related ground stability issues may be satisfactorily dealt with by the adoption of appropriate construction methods and adherence to a Construction Method prepared by a competent structural engineer and based on good industry practice (Refer ASUC Guidelines on safe and efficient basement construction) for the construction of basements.

The scheme is not expected to make a significant impact on the local groundwater level and flow pattern because the affected area is of limited extent, consisting of approximately half the basement footprint. The Claygate Beds strata become more permeable with depth and therefore the groundwater can continue to flowe past and beneath thebuilding footprint as before.

The designer of the basement should make allowance for tree species and heights close to the basement, in particular along the boundary with No11.

It is recommended that the structural designer and basement contractor engage a specialist grouting contractor to assess the most appropriate method of grouting to stabilise the ground and reduce the permeability to facilitate the basement construction. Carefully controlled and monitored grouting along the party walls by an ASUC approved contractor will ensure that ground movement is maintained at acceptable levels as determined by the Burland classification.

The designer will ensure that appropriate temporary works and control measures are in place to ensure that any movement is detected as it occurs and no party walls with adjacent properties are undermined during the project.

REFERENCES

1. Camden Planning Guidance: Basements and Lightwells, CPG4
2. Groundsure Report, dated 12th September 2014

APPENDIX A

Site Plans
&
Cross Sections
(Existing & Proposed)

- Site & Borehole Location Plan
- Existing Plans & Elevations
- Proposed Plans & Elevations

- **Site & Borehole Location Plan**

1 LOCATION PLAN
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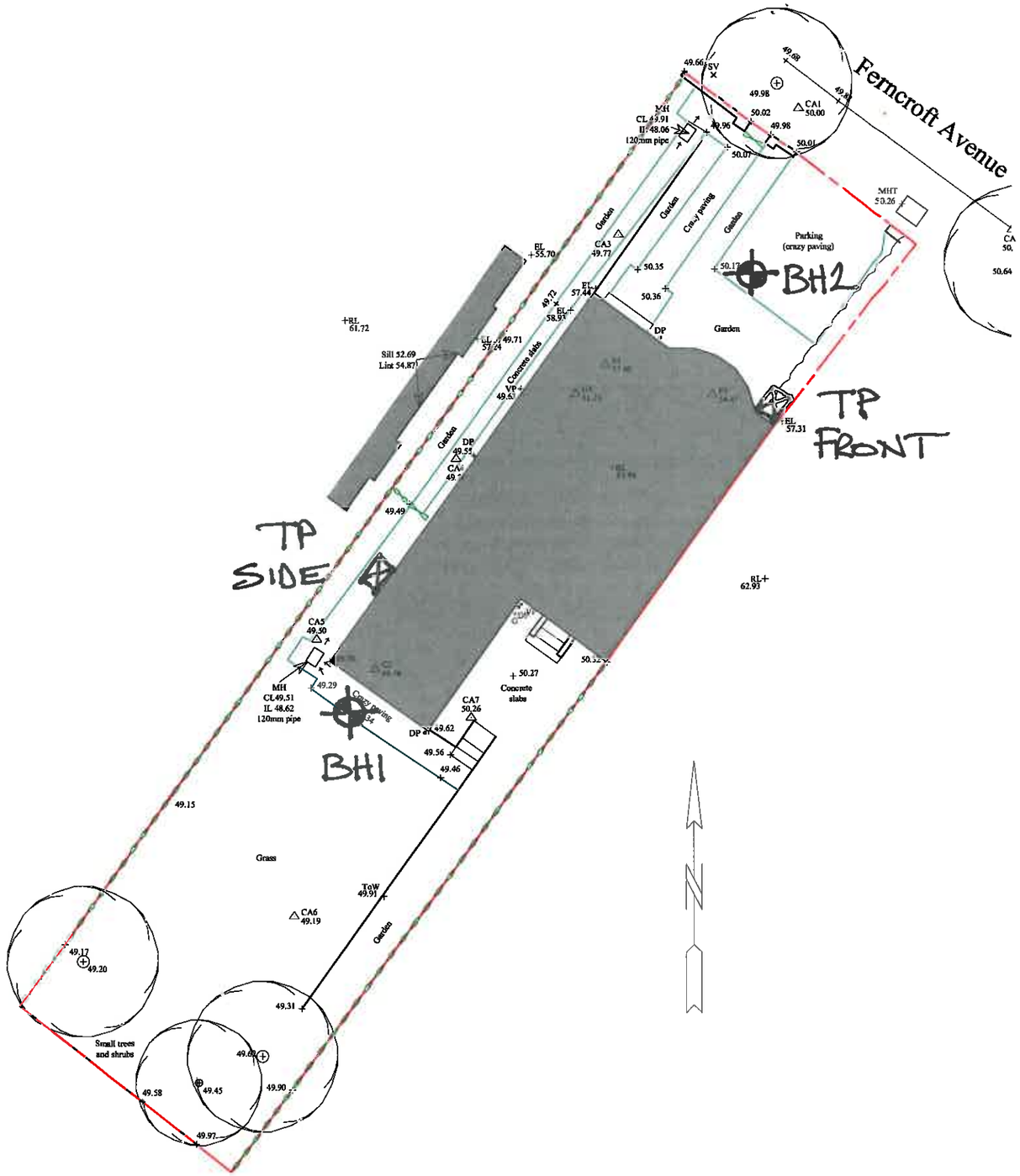

2 EXISTING SITE PLAN
1 : 200

0 1 5 10

B chitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
EXISTING LOCATION PLAN & SITE PLAN

DATE
SEPT 2014

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JOB NO
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DWG NO/REV
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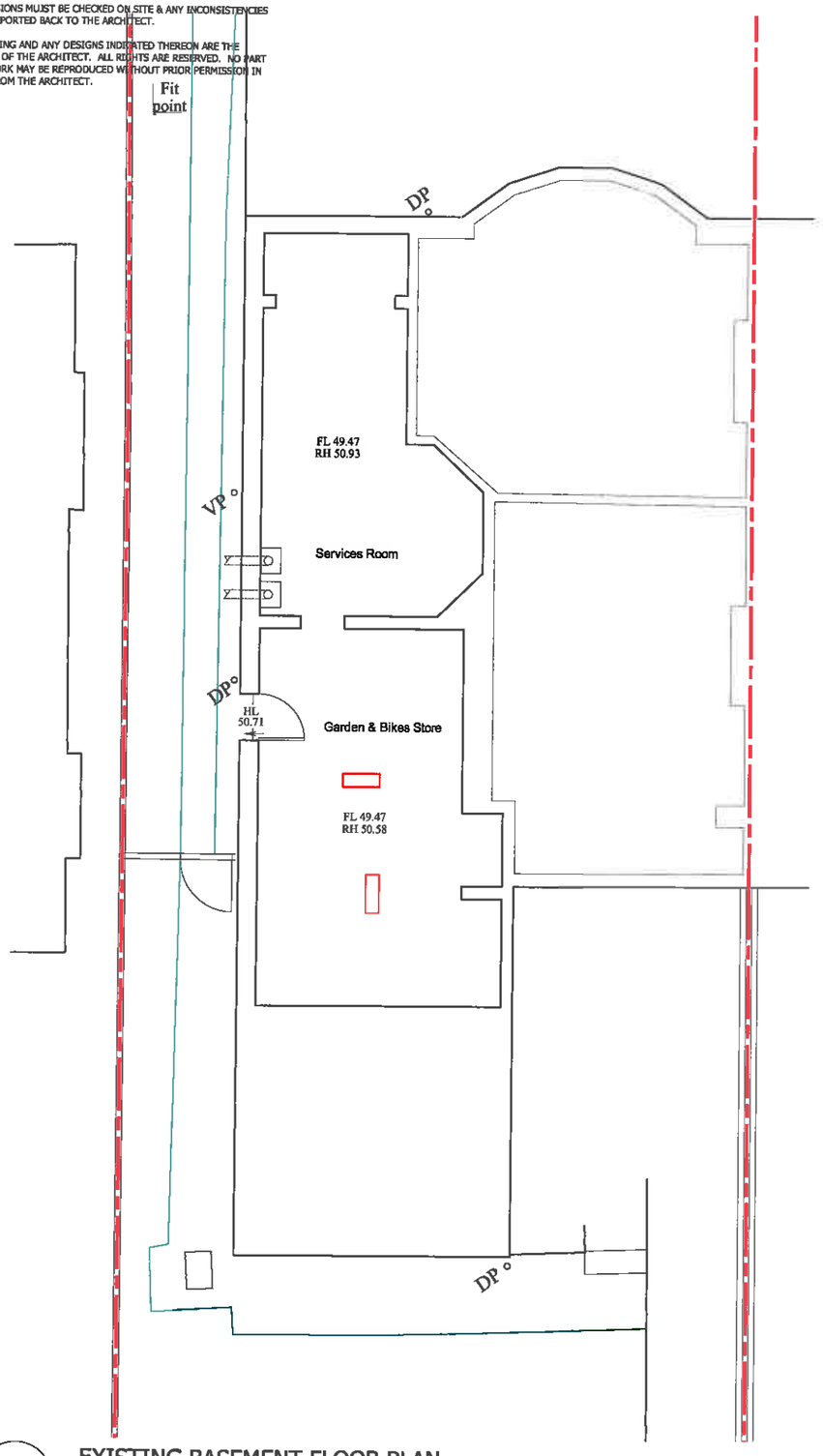
- **Existing Plans & Elevations**



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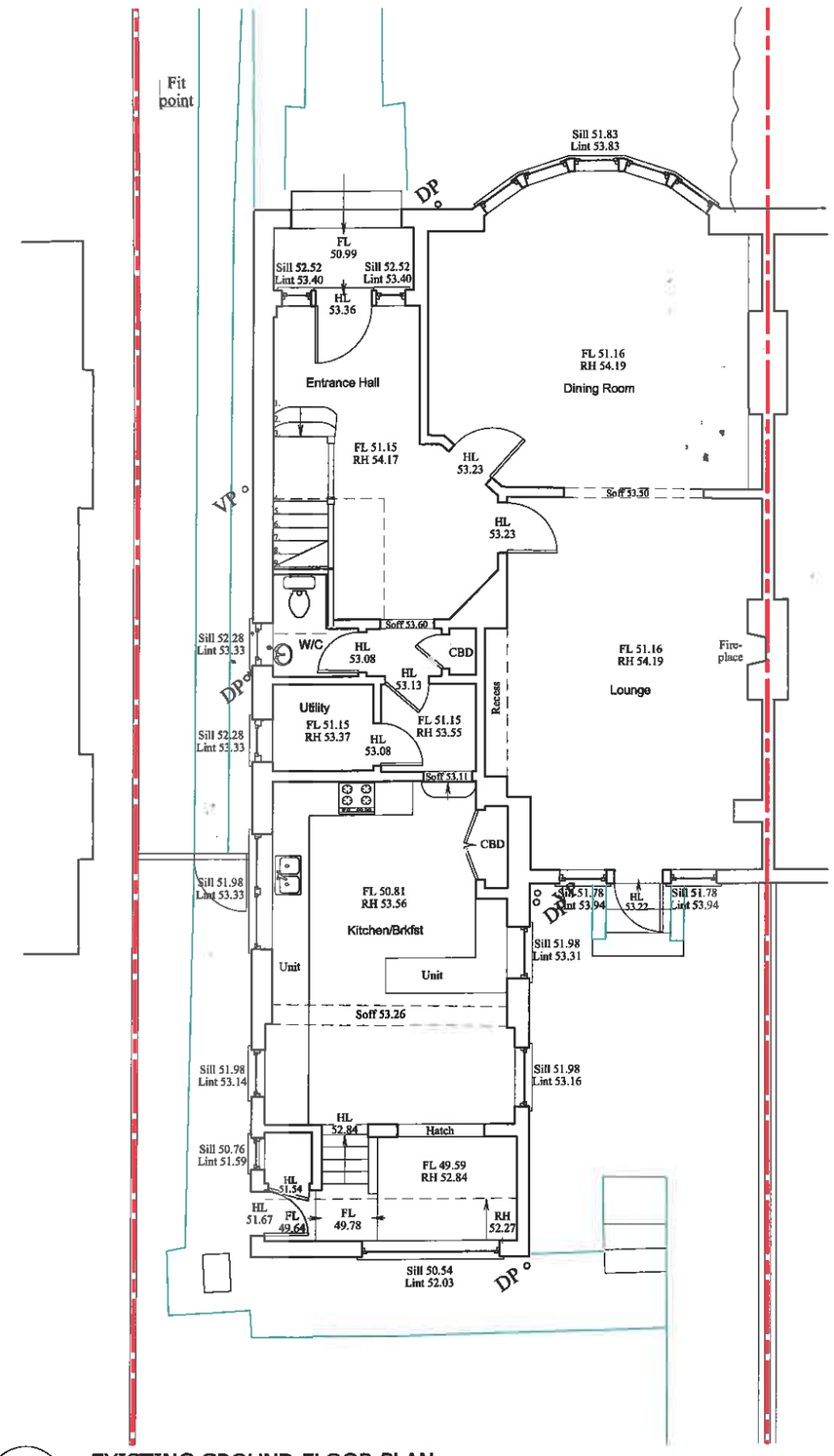

2 EXISTING GROUND FLOOR PLAN
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0 1000 2000 5000

Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

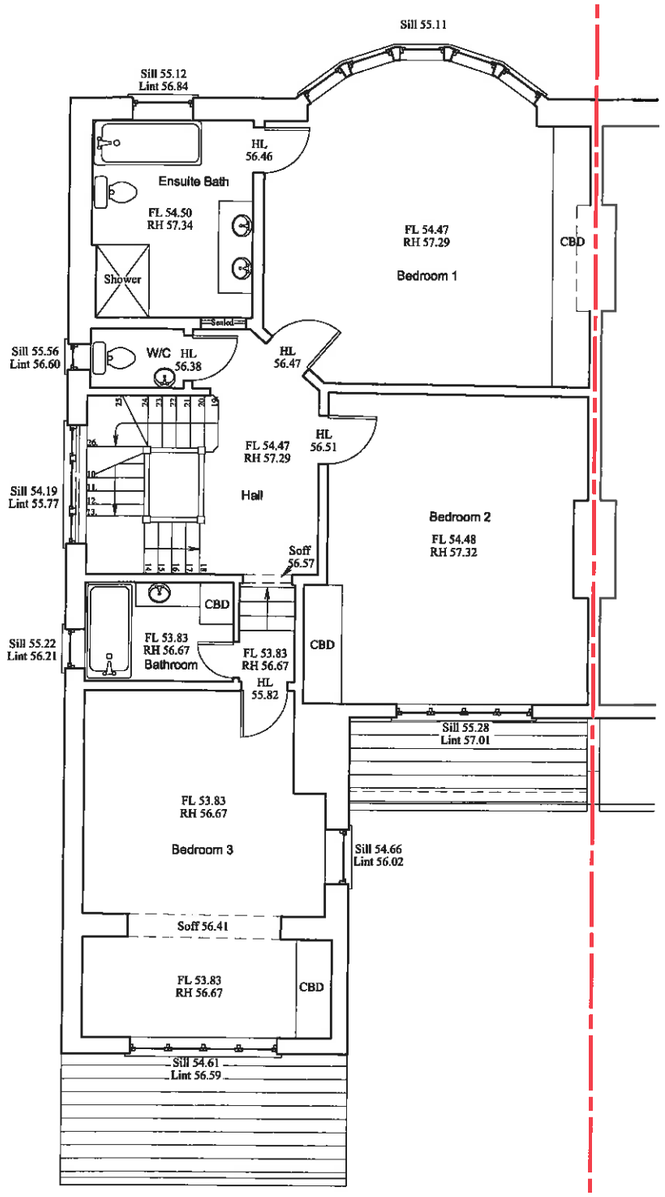
DRAWING TITLE
EXISTING BASEMENT & GROUND FLOOR PLANS

DATE
SEPT 2014

SCALE
1:100 @A3

JOB NO
1406

DWG NO/REV
102/-



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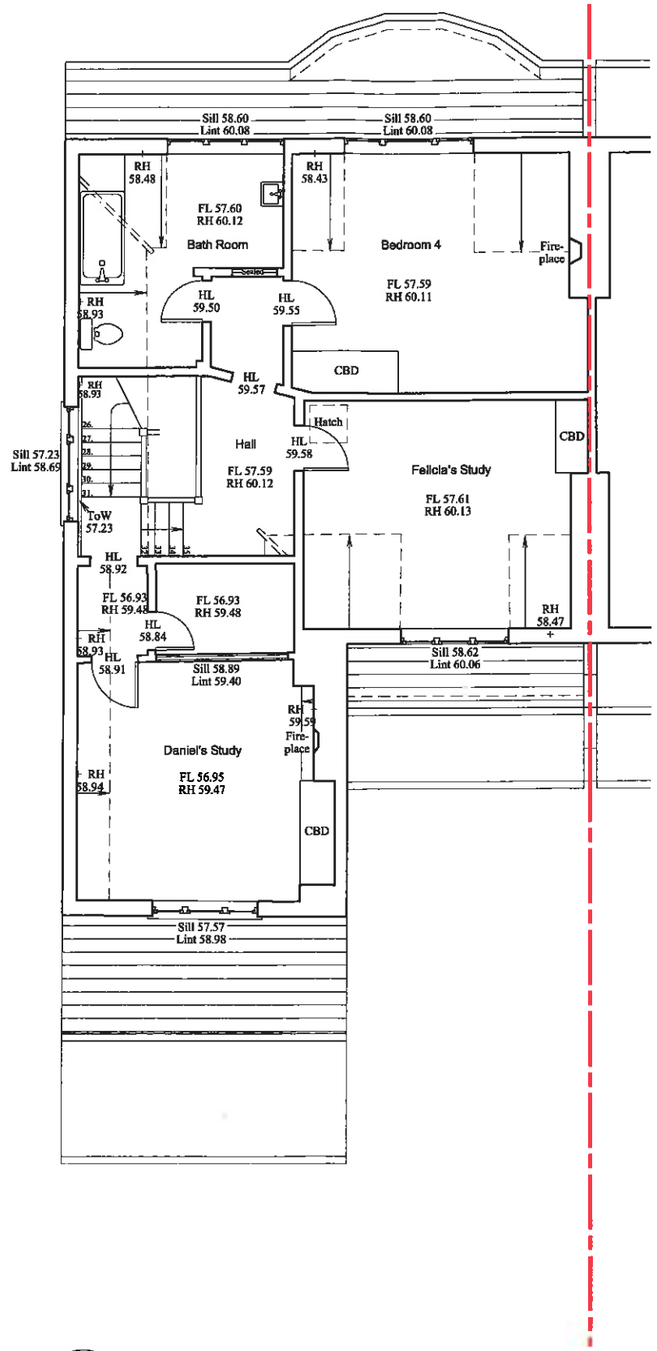

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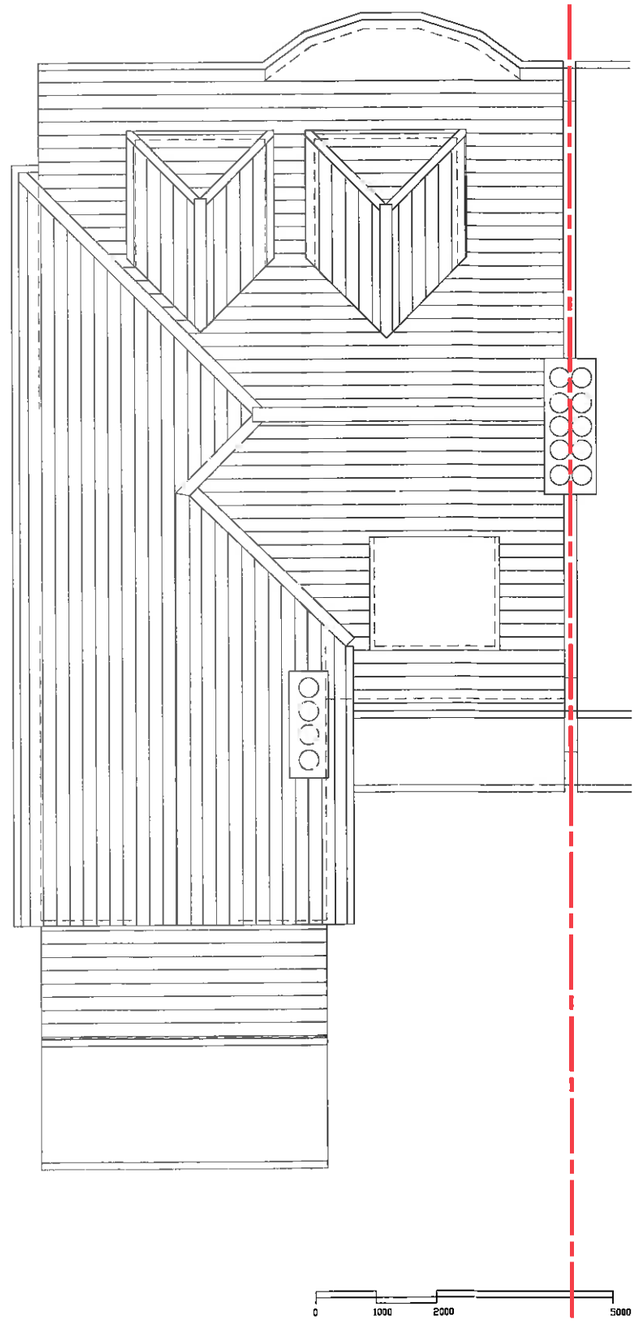

3 EXISTING ROOF PLAN
1 : 100

Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
EXISTING FIRST, SECOND & ROOF PLANS

DATE
SEPT 2014

SCALE
1:100 @A3

JOB NO
1406

DWG NO/REV
103/-

1 EXISTING FRONT ELEVATION
1 : 100

2 EXISTING REAL ELEVATION
1 : 100

0 1000 2000 5000

Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
EXISTING ELEVATIONS

DATE
SEPT 2014

SCALE
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JOB NO
1406

DWG NO/REV
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1 EXISTING SIDE ELEVATION
1 : 100

0 1000 2000 5000

B chitecture
11A Beresford Road London N2 8AT
t 07932 736 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
EXISTING ELEVATION

DATE
SEPT 2014

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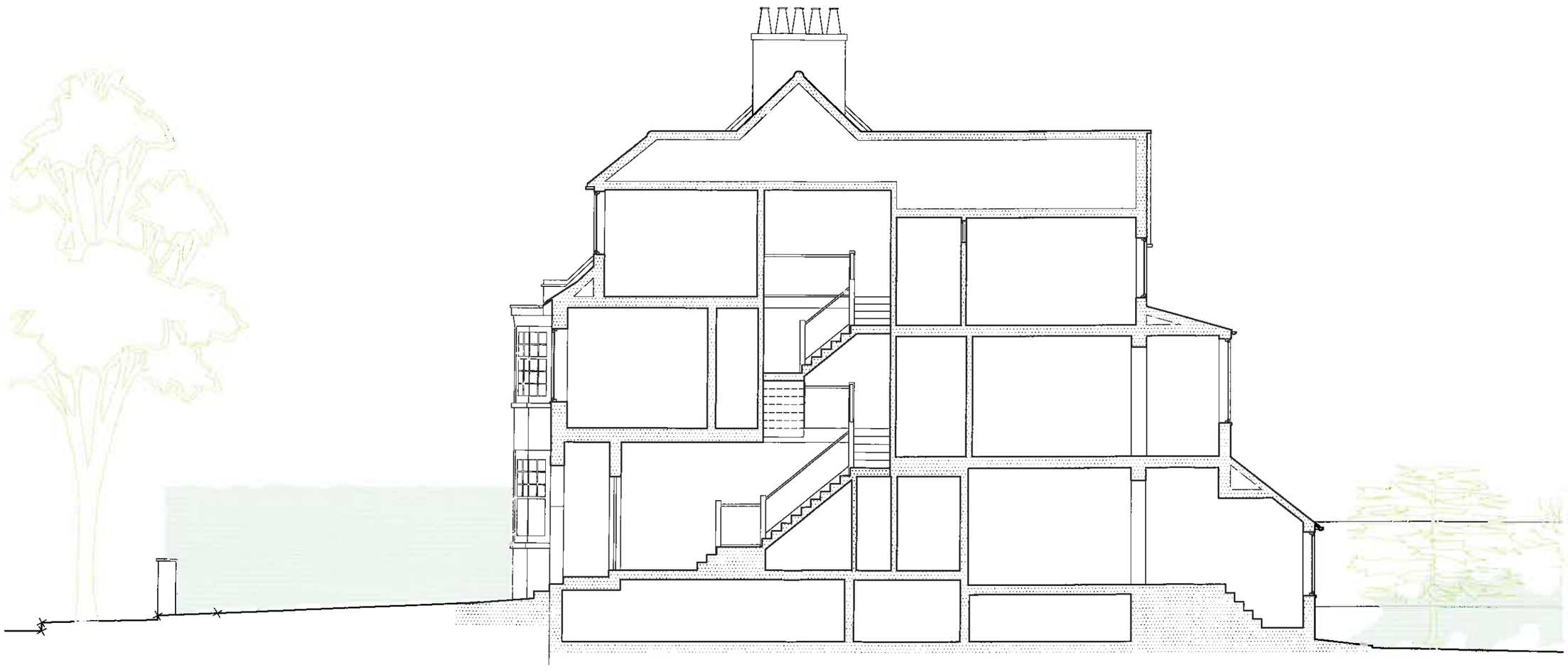

1 EXISTING SECTION AA
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0 1000 2000 5000

B chitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LIMITATION

13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
EXISTING SECTIONS
AA & BB

DATE
SEPT 2014

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@A3

JOB NO
1406

DWG NO/REV
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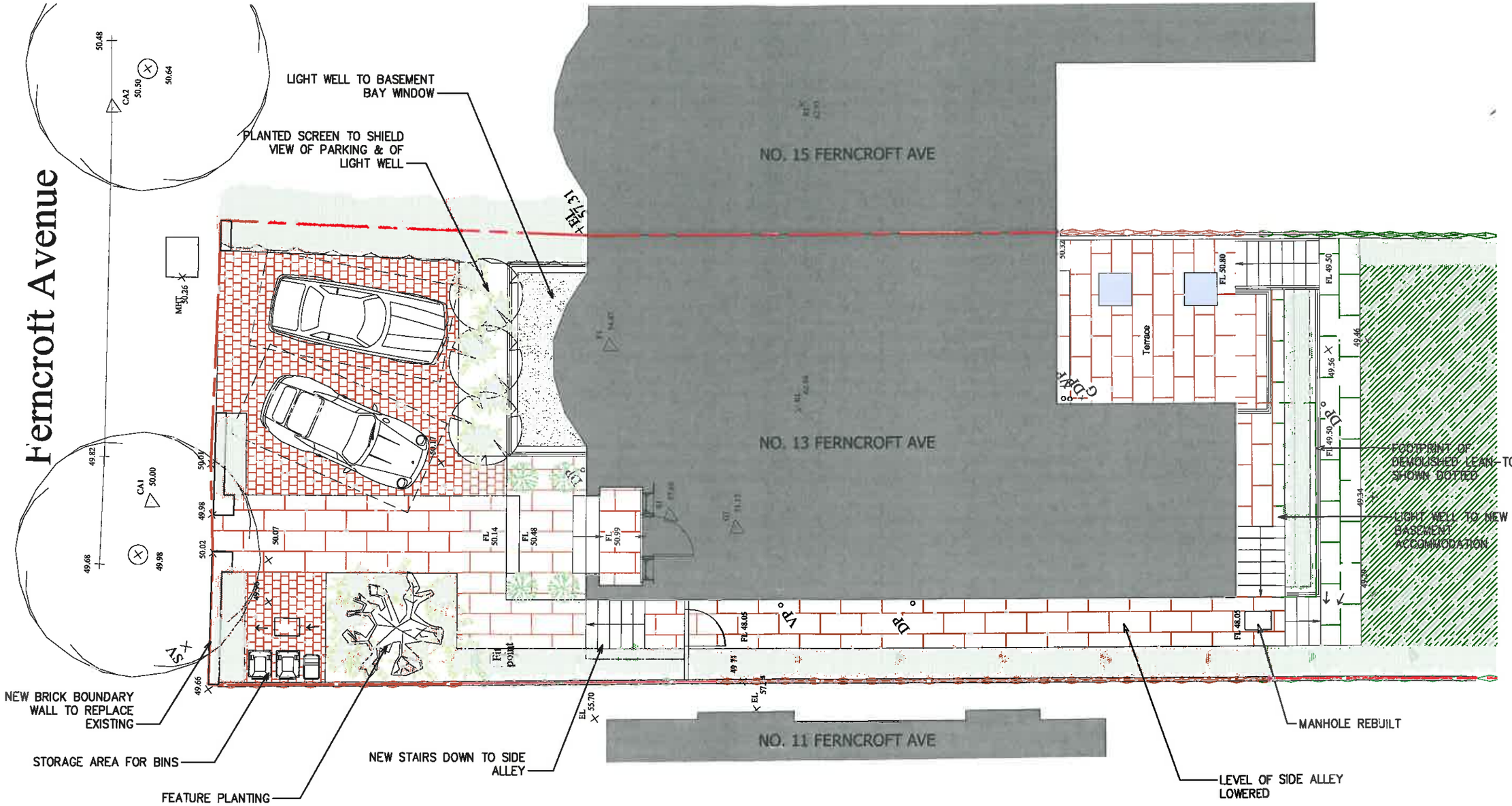
- **Proposed Plans & Elevations**



1 PROPOSED SITE PLAN
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B chitecture
11A Beresford Road London N2 8AT
t 07332 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
PROPOSED SITE PLAN

DATE
SEPT 2014

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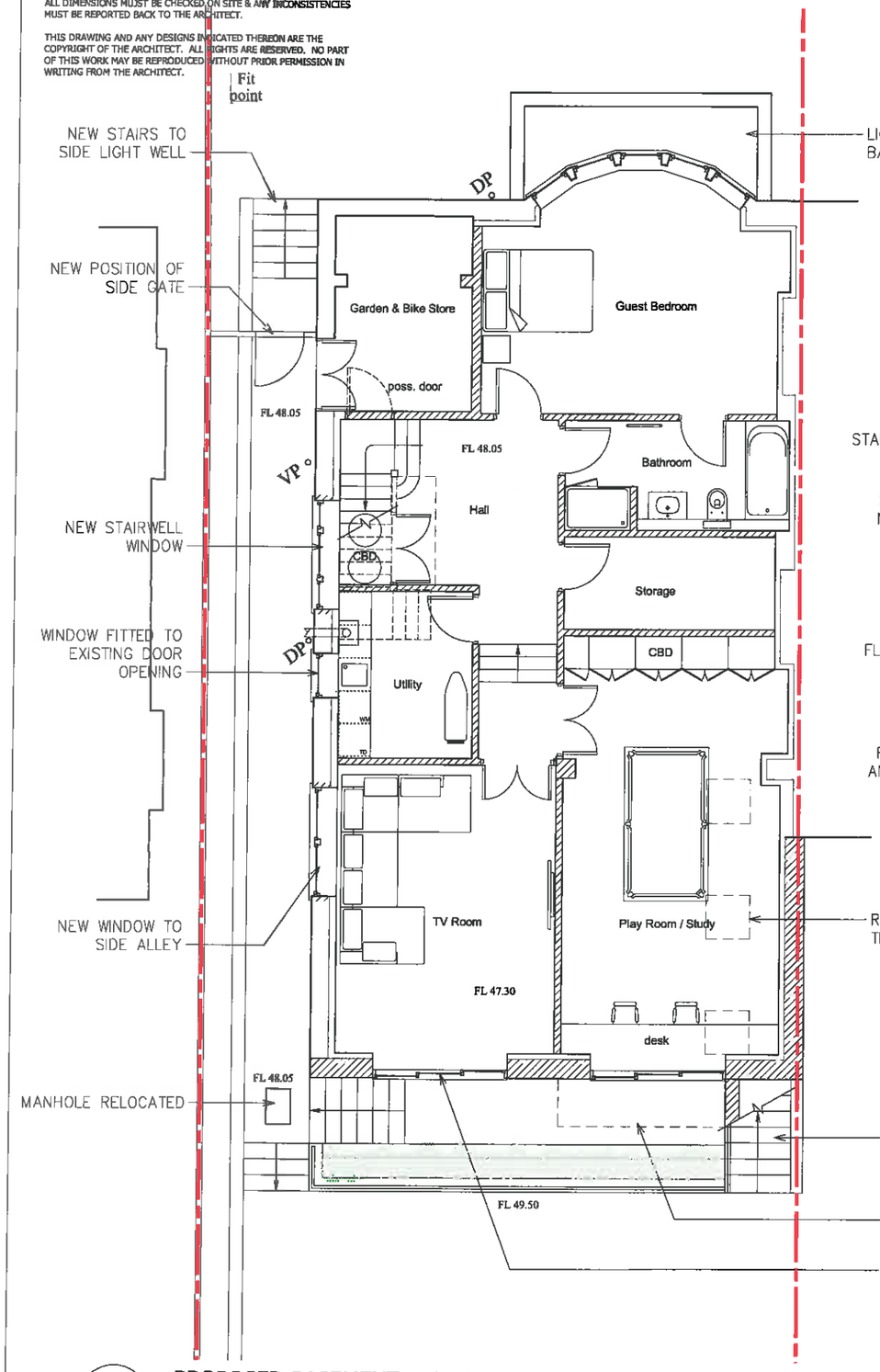

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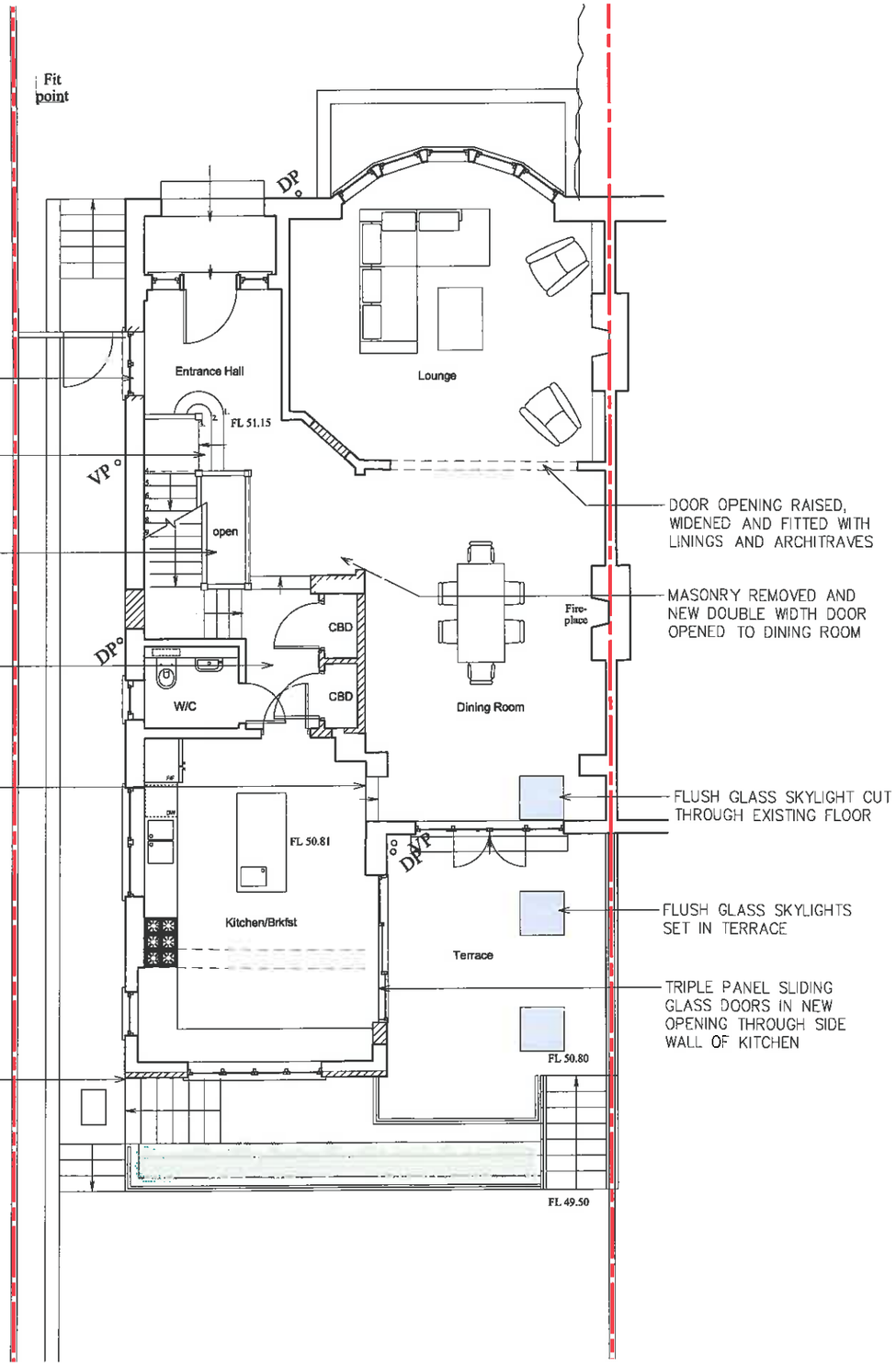

2 PROPOSED GROUND FLOOR PLAN
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Architecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
PROPOSED BASEMENT & GROUND FLOOR PLANS

DATE
SEPT 2014

SCALE
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DWG NO/REV
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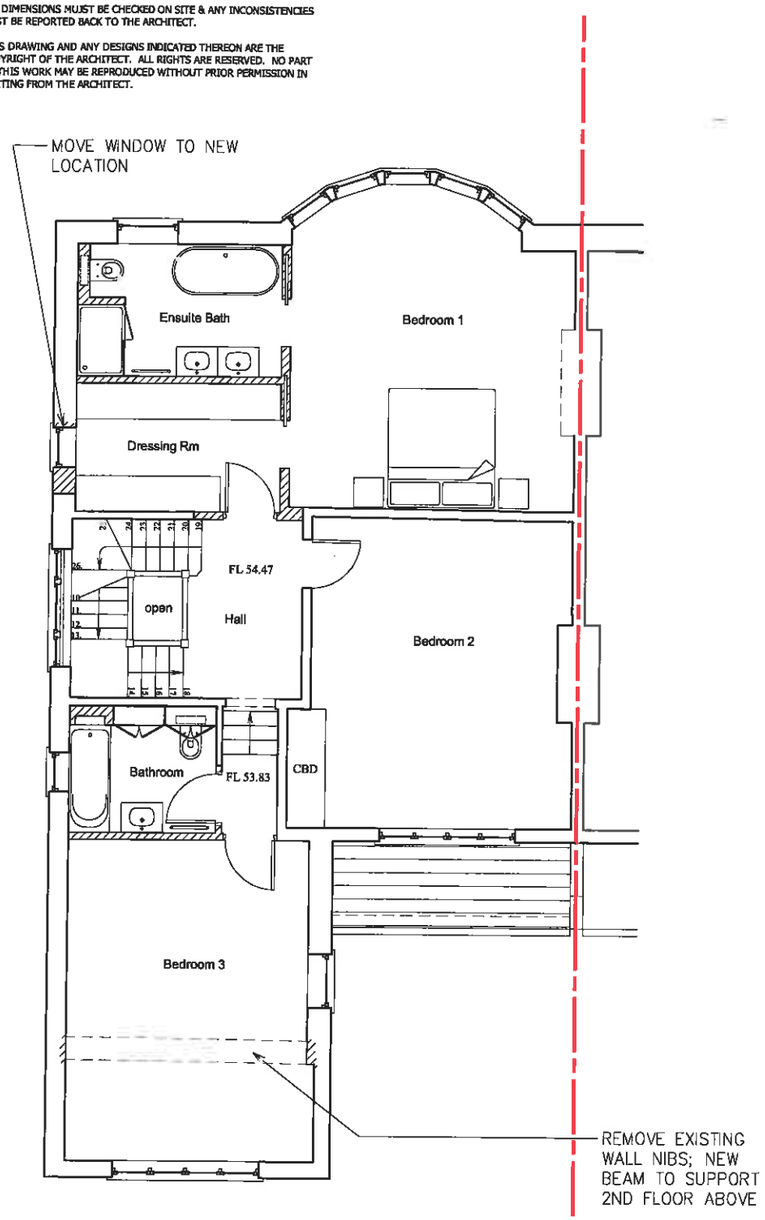

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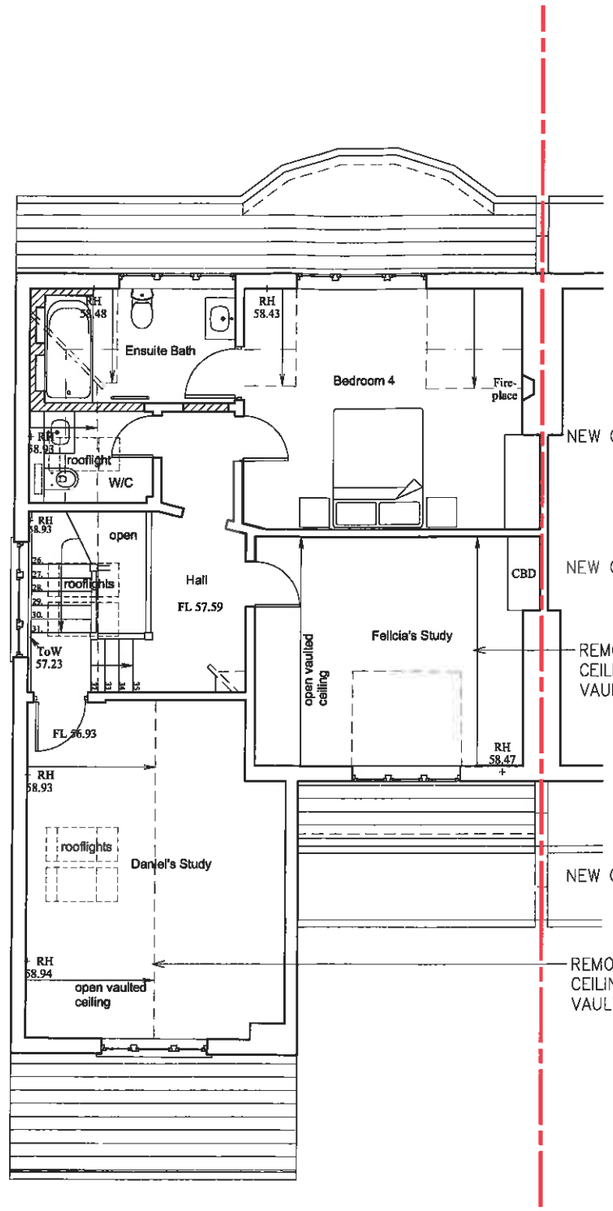

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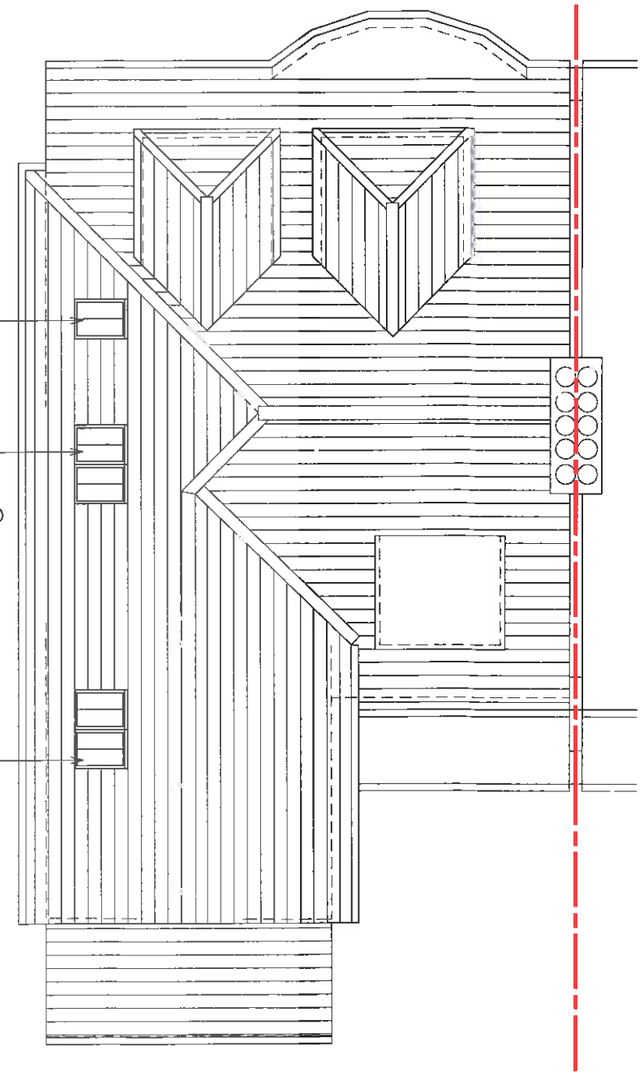

3 PROPOSED ROOF PLAN
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Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE

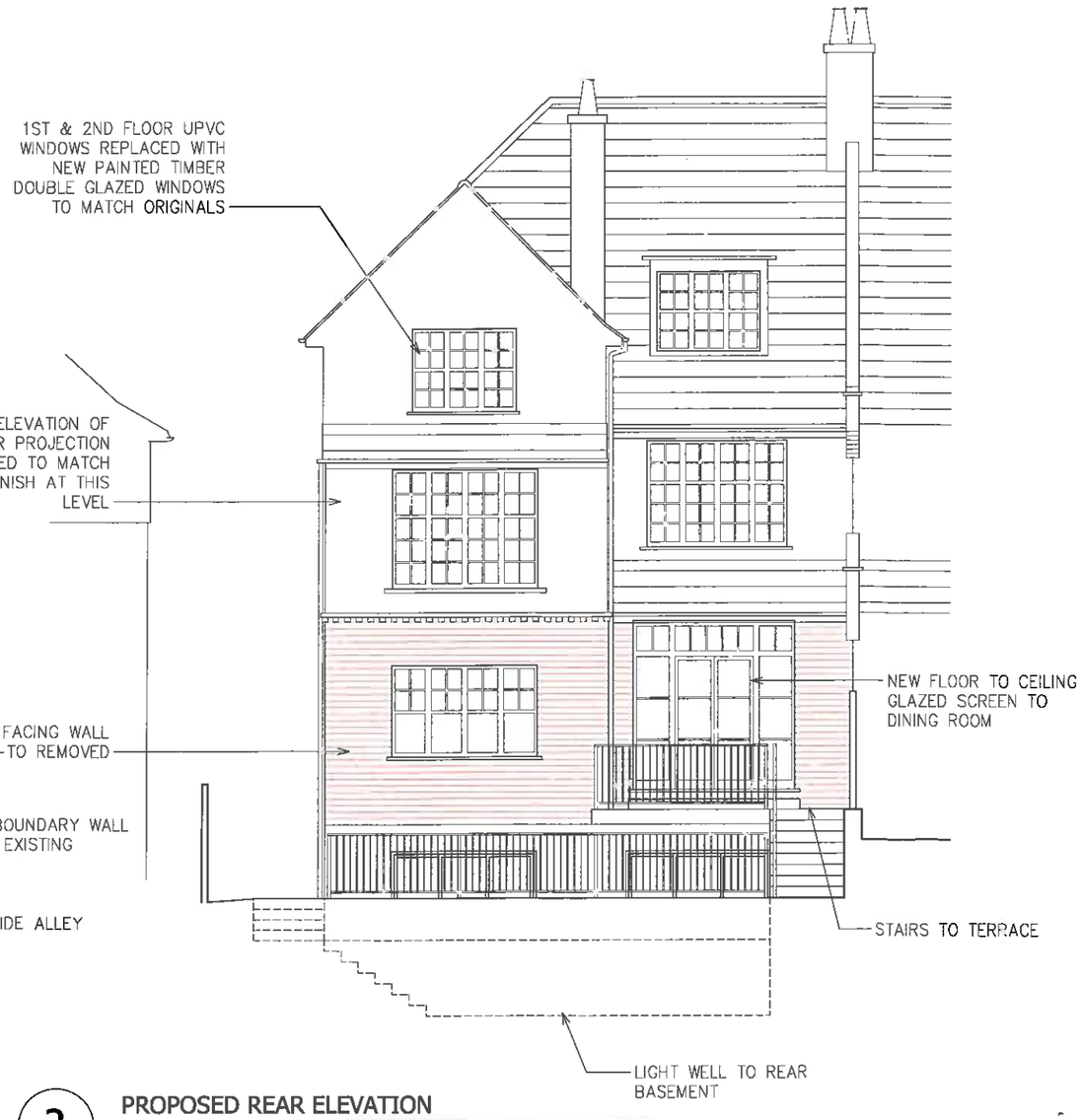
DATE
SEPT 2014

SCALE
1:100 @A3

JOB NO
1406

DWG NO/REV
112/-

1 PROPOSED FRONT ELEVATION
1 : 100



2 PROPOSED REAR ELEVATION
1 : 100

Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
PROPOSED ELEVATIONS

DATE
SEPT 2014

SCALE
1:100 @A3

JOB NO
1406

DWG NO/REV
113/-

1 PROPOSED SECTION AA
1 : 100

Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
PROPOSED SECTIONS
AA & BB

DATE
SEPT 2014

SCALE
1:100
@A3

JOB NO
1406

DWG NO/REV
115/-

1 **PROPOSED SIDE ELEVATION**
1 : 100

Bchitecture
11A Beresford Road London N2 8AT
t 07932 796 407 e Bchitecture@gmail.com

LOCATION
13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE
PROPOSED ELEVATION

DATE
SEPT 2014

SCALE
1:100 @A3

JOB NO
1406

DWG NO/REV
114/-

FRONT LIGHT WELL
-0.64

Fit point

NEW STAIRS TO SIDE LIGHT WELL

NEW POSITION OF SIDE GATE

NEW STAIRWELL WINDOW

WINDOW FITTED TO EXISTING DOOR OPENING

SIDE LIGHT WELL
-0.87

NEW WINDOW TO SIDE ALLEY

MANHOLE RELOCATED

REAR LIGHT WELL
-2.16

-0.87

Garden & Bike Store

poss. door

Guest Bedroom

-1.42M

Bathroom

Hall

Storage

Utility

CBD

TV Room

Play Room / Study

-2.16M

desk

FL 48.05

FL 47.30

FL 49.50

LIGHT WELL TO FRONT OF BAY WINDOW

NEW WINDOW OPENED TO ENTRANCE

STAIR MODIFIED TO TURN AT RIGHT ANGLE

STAIR WELL OPENED AND NEW STAIR INSTALLED TO BASEMENT TO MATCH EXISTING

FLOOR LEVEL LOWERED TO MATCH KITCHEN

REMOVE CHIMNEY BREAST AND CUT IN NEW DOOR TO DINING ROOM

ROOFLIGHTS SET IN TERRACE ABOVE

EXISTING LEAN-TO DEMOLISHED AND REAR FACADE REBUILT IN LINE WITH FIRST FLOOR

STAIRS TO TERRACE

OVERHANGING TERRACE BALCONY

TRIPLE PANEL SLIDING GLASS DOORS

1 PROPOSED BASEMENT FLOOR PLAN
1 : 100

Fit point

Entrance Hall

FL 51.15

Lounge

open

DOOR OPENING RAISED, WIDENED AND FITTED WITH LININGS AND ARCHITRAVES

MASONRY REMOVED AND NEW DOUBLE WIDTH DOOR OPENED TO DINING ROOM

Fire-place

CBD

W/C

CBD

Dining Room

FLUSH GLASS SKYLIGHT CUT THROUGH EXISTING FLOOR

FL 50.81

Kitchen/Brkfst

Terrace

FLUSH GLASS SKYLIGHTS SET IN TERRACE

TRIPLE PANEL SLIDING GLASS DOORS IN NEW OPENING THROUGH SIDE WALL OF KITCHEN

FL 50.90

FL 49.50

2 PROPOSED GROUND FLOOR PLAN
1 : 100

0 1000 2000 5000

Architecture

13 Ferncroft Avenue
London NW3 7PG

DRAWING TITLE: PROPOSED BASEMENT & GROUND FLOOR PLANS

DATE: SEPT 2014

SCALE: 1:100 @A3

JOB NO: 1406

DRG NO/REV: 111/-

* ALL DIMENSIONS ARE FOR FINISHED BASEMENT FLOOR LEVELS RELATIVE TO EXISTING CELLAR LEVEL

APPENDIX B

Photographs – Existing Site

Photo 1 – General View of front of house (centre frame) from Ferncroft Avenue. Note general slope of Ferncroft Avenue from left to right, towards NNW.

Photo 2 – View along side passage between No13 (left) and No11 Ferncroft Avenue

Photo 3 - Detailed view of access gate to site.
Note mature tree in public footway adjacent to site.

Photo 4 – View of existing cellar (1).

Photo 5 – View of existing cellar (2)

Photo 6 – View of existing cellar (3)

Photo 7 – Trial pit along side access passage

Photo 8 - View of rear of house

Photo 9 – View of BH1 location to rear of house.

Photo 10 – BH1 location to rear of house and view of equipment used.

Photo 11 – View of reduced height access door to existing cellar.

Photo 12 – View of trial pit at front of property.
Note the dark edge indicating how the loose fill above foundation level tended to 'bell' out as the hole was excavated.

Photo 13 – General view of 13 Ferncroft Avenue including mature trees in the public footway

Photo 14 - View of trial pit along side passage.

APPENDIX C
Ground Investigation Records

1. Knapp Hicks Window Sampler Borehole logs (Oct 2014)
2. Hand dug trial pits
3. Geotechnical Laboratory Test Results

WINDOW SAMPLER BOREHOLE LOGS

Borehole BH1	Located in pathway to rear of existing house Approx. reduced ground level: 49.34mASD (SD = 50.00m Site Datum on public footway to front of property)
Ground Level – 0.05m	PAVING
0.05m – 0.25m	Brown silty clayey TOPSOIL with occasional fragments of brick and salt glazed sewer pipe.
0.25m – 0.40m	MADE GROUND: Firm mid brown fine sandy silt mixed with brown topsoil and traces of chalk, ash etc
0.40m – 0.75m	Grading to: MADE GROUND: Firm to stiff light brown clay with fine gravel of crockery and brick.
0.75m – 1.55m	Stiff orange brown silty CLAY with live rootlets to 2mm diameter and old decayed roots to 5mm diameter. 1.45m to 1.55m: Concentration of live rootlets at this depth.
1.55m – 2.00m	Stiff orange brown silty CLAY with increasing proportion of sandy partings and greyish orange sandy clay interlaminations. With roots and root hairs.
2.00m – 4.00m	Moderately compact silty fine SAND with clayey partings 2.10m-2.20m & 2.80m-3.00m: Samples recovered as wet 2.30m-2.75m: Interlaminated brown silty CLAY, fine SAND and sandy CLAY.
4.00m	*End of Borehole*

Additional Notes

- Upon completion the groundwater level in the borehole was 2.45mbgl. Groundwater level was monitored for 30minutes at which time the water level had risen to 2.38mbgl. The base of the hole did not remain open and collapsed to approximately 3.00mbgl.
- A standpipe was installed to 2.93mbgl and on a return visit 10 days after completion of the borehole, the groundwater level had settled at 2.40mbgl (approx. 46.94mASD). Further monitoring results are presented in the attached report.
- Roots and rootlets noted to approximately 2.00mbgl.

Borehole BH2	Located in paved parking area to front of existing house. Approx. reduced ground level: 50.17mASD (SD = 50.00m Site Datum on public footway to front of property)
Ground Level – 0.05m	PAVING
0.05m – 0.20m	CONCRETE bedding below paving.
0.20m – 0.80m	MADE GROUND: Brown silty clayey TOPSOIL with occasional fragments of brick and lumps of orange clay.
0.80m – 1.45m	Stiff orange brown silty CLAY. Dry with rootlets.
1.45m – 1.75m	Firm to stiff silty CLAY with increasing proportion of sandy clay and fine sand partings.
1.75m – 2.00m	Moderately compact fine SAND with pockets and partings of silty clay. Recovered wet at base.
2.00m – 3.80m	Moderately compact silty fine SAND interlaminated with brown silty CLAY and sandy CLAY. Damp 2.90m – 3.00m: Layer of dark red brown SILTSTONE, moderately weak.
3.80m – 4.00m	Moderately compact silty fine SAND with partings and pockets of firm clay. Wet.
4.00m	*End of Borehole*

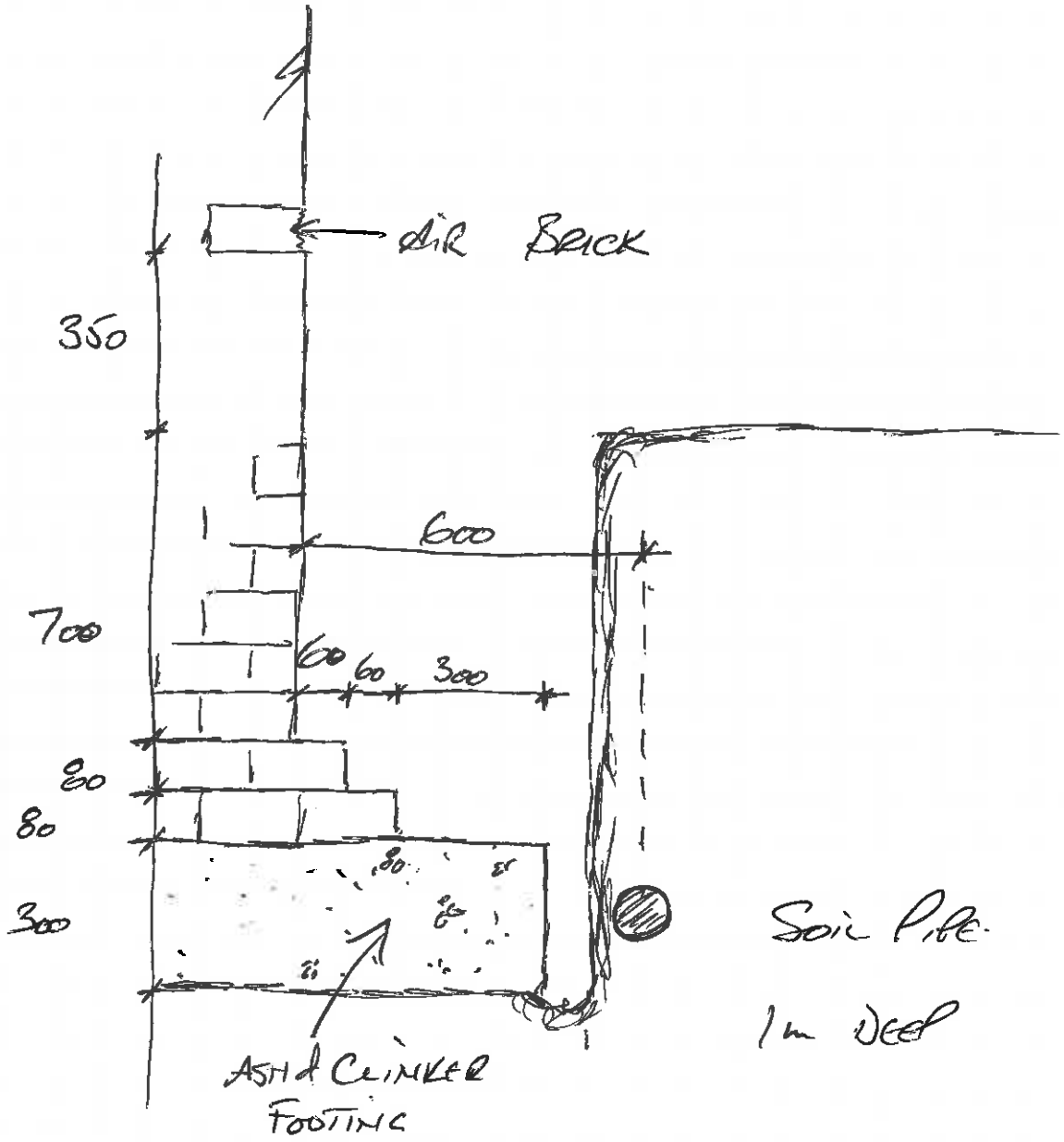
Additional Notes

- Upon completion the groundwater level in the borehole was 3.45mbgl. Groundwater level was monitored for 40minutes at which time the water level had risen to 3.32mbgl. The base of the hole did not remain open and collapsed to approximately 3.60mbgl.
- A standpipe was installed to 3.60mbgl and on a return visit 10 days after completion of the borehole, the groundwater level had settled at 3.26mbgl (Approx. 46.91mASD). Further monitoring results are provided in the report.
- Roots and rootlets noted to approximately 1.45mbgl.

COMPLIANCE DRILLING SERVICES

76 Sedgewick Avenue
Hillingdon Middlesex UB10 9DG
Tel / Fax: 01895 904806 Mobile: 07808 295526

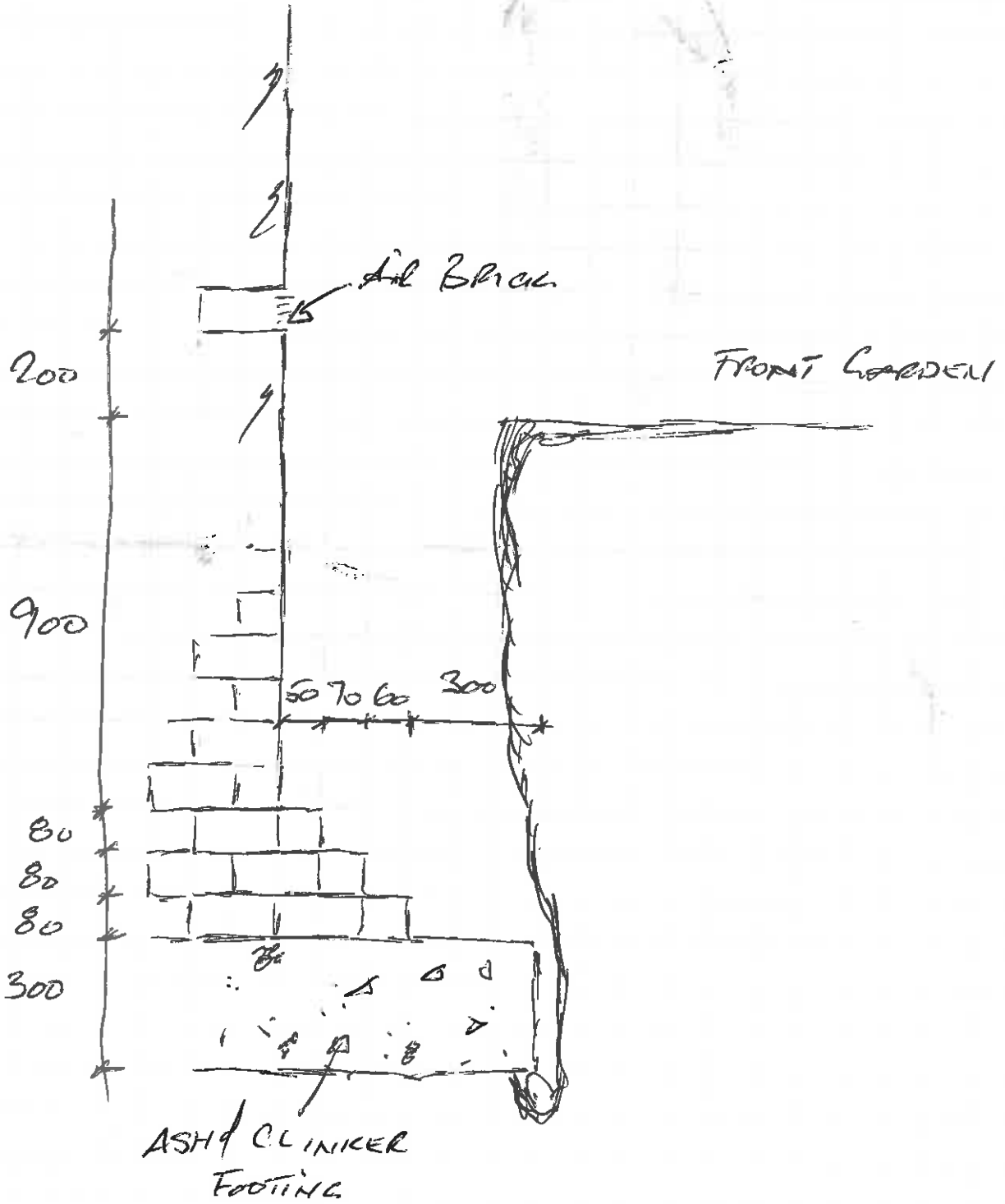
CLIENT KHP	PROJECT 13 FERNCROFT AVENUE		LOCATION SIDE
DATE	JOB REF	TECHNICIAN	SHEET No.



OMPLIANCE DRILLING SERVICES

76 Sedgewick Avenue
Hillingdon Middlesex UB10 9DG
Tel / Fax: 01895 904806 Mobile: 07808 295526

CLIENT KHP	PROJECT 13 FERNCLOFT AVENUE		LOCATION FRONT
DATE 16.09.2014.	JOB REF TBC	TECHNICIAN	SHEET No. 1



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E info@peterbaxterassociates.co.uk
T +44 (0) 1634 234332 / 717974

Client: Knapp Hicks & Partners Ltd

Address: Prospect House
1 Highpoint Business Village
Henwood, Ashford
Kent
TN24 8DH

Report No: 0595/25/MC1

Your Ref: 32655

Report Date: 03/10/2014

Client Contact: Mr Richard Moore
Site: Ferncroft Avenue

Test Requested: Determination of Moisture Content, Liquid, Plastic Limits & Plasticity Index
Test Method: BS 1377-2: 1990, Test Nos. 3.2; 4.4 (1 point LL); 5.3; & 5.4

Sample Details:

Sampled and submitted by:	Client
Date Sampled:	16/09/2014
Date Received:	18/09/2014
Date Tested:	26/09/2014

TEST RESULTS:

Laboratory Reference	Client Reference	MC (%)	L.L (%)	P.L (%)	P.I (%)	% Retained on 425µm sieve	Condition of Test	Sample Type
0595/25/01	BH1 @ 0.9-1.1m	32	68	23	45	0	Natural	Disturbed
0595/25/02	BH1 @ 1.4-1.5m	34	-	-	-	-	Natural	Disturbed
0595/25/03	BH1 @ 1.9-2.0m	27	51	20	31	0	Natural	Disturbed
0595/25/04	BH1 @ 2.1-2.2m	30	-	-	-	-	Natural	Disturbed
0595/25/05	BH1 @ 2.4-2.6m	27	-	-	-	-	Natural	Disturbed
0595/25/06	BH1 @ 3.4-3.7m	28	-	-	-	-	Natural	Disturbed
0595/25/07	BH2 @ 0.8-1.1m	34	75	24	51	0	Natural	Disturbed
0595/25/08	BH2 @ 1.30m	30	-	-	-	-	Natural	Disturbed
0595/25/09	BH2 @ 1.50m	28	57	22	35	0	Natural	Disturbed
0595/25/10	BH2 @1.8-2.0m	24	-	-	-	-	Natural	Disturbed

Visual Descriptions:

Laboratory Reference	Client Reference	Description
0595/25/01	BH1 @ 0.9-1.1m	Orange grey CLAY with rootlets
0595/25/02	BH1 @ 1.4-1.5m	Orange grey CLAY
0595/25/03	BH1 @ 1.9-2.0m	Orange grey slightly sandy CLAY
0595/25/04	BH1 @ 2.1-2.2m	Orange grey very sandy CLAY
0595/25/05	BH1 @ 2.4-2.6m	Orange grey sandy CLAY
0595/25/06	BH1 @ 3.4-3.7m	Orange grey sandy CLAY
0595/25/07	BH2 @ 0.8-1.1m	Orange grey CLAY
0595/25/08	BH2 @ 1.30m	Orange grey CLAY
0595/25/09	BH2 @ 1.50m	Orange grey slightly sandy CLAY
0595/25/10	BH2 @1.8-2.0m	Orange grey slightly sandy CLAY

.....END OF TEST REPORT.....

Signed: _____ Kwaku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

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Client:	Knapp Hicks & Partners Ltd	**Report No:**	0595/25/MC1
Address:	Prospect House 1 Highpoint Business Village Henwood, Ashford Kent TN24 8DH	**Your Ref:**	32855
		Report Date:	03/10/2014
Client Contact:	Mr Richard Moore		
Site:	Ferncroft Avenue		

Test Requested: Determination of Moisture Content, Liquid, Plastic Limits & Plasticity Index
Test Method: BS 1377-2: 1990, Test Nos. 3.2; 4.4 (1 point LL); 5.3; & 5.4

Sample Details:

Sampled and submitted by:	Client
Date Sampled:	16/09/2014
Date Received:	18/09/2014
Date Tested:	26/09/2014

TEST RESULTS:

Laboratory Reference	Client Reference	MC (%)	L.L (%)	P.L (%)	P.I (%)	% Retained on 425µm sieve	Condition of Test	Sample Type
0595/25/11	BH2 @ 2.4-2.6m	25	-	-	-	-	Natural	Disturbed
0595/25/12	BH2 @ 3.4-3.6m	26	-	-	-	-	Natural	Disturbed

Visual Descriptions:

Laboratory Reference	Client Reference	Description
0595/25/11	BH2 @ 2.4-2.6m	Orange very sandy CLAY
0595/25/12	BH2 @ 3.4-3.6m	Orange very sandy CLAY

.....END OF TEST REPORT.....

Signed: _____ Kweku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

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Client: Knapp Hicks & Partners Ltd

Address: Prospect House
1 Highpoint Business Village
Henwood, Ashford
Kent
TN24 8DH

Report No: 0595/25/CH1

Your Ref: 32655

Report Date: 03/10/2014

Client Contact: Mr Richard Moore
Site: Ferncroft Avenue

Test Requested: Determination of pH Value and Sulphate Content
Test Method: BS 1377-3: 1990, Clauses 5.5 & 9.5

Sample Details:

Sampled and submitted by:	Client
Date Sampled:	16/09/2014
Date Received:	18/09/2014
Date Tested:	30/09/2014

TEST RESULTS:

Laboratory Reference	Client Reference	Soil Sulphates as SO_4		Water Sulphates as SO4	pH	CLASS*	Dry Mass Passing 2mm test sieve	Description
		Total (%)	Water Soluble (g/L)	(g/L)			(%)	
0595/25/02	BH1 @ 1.4-1.5m	-	0.1	-	4.5	DS-1	100	Orange grey CLAY
0595/25/05	BH1 @ 2.4-2.6m	-	0.1	-	4.3	DS-1	100	Orange grey sandy CLAY

* Classification based on Tables C1 & C2: BRE Special Digest 1:2005

.....END OF TEST REPORT.....

Signed: _____ Kwaku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

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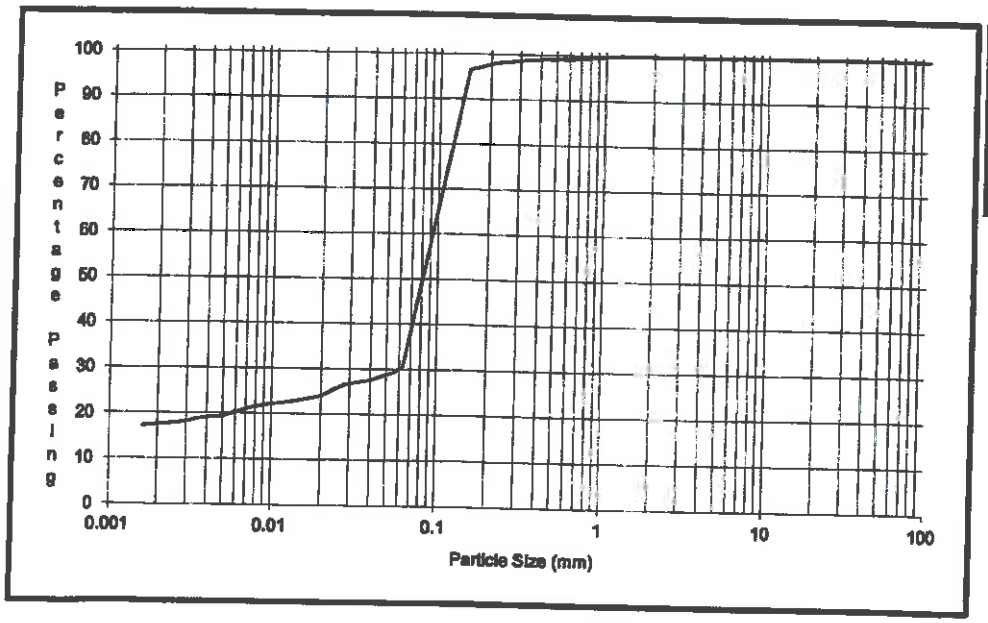
Client:	Knapp Hicks & Partners	**Report No:**	0595/25/04
Address:	Prospect House 1 Highpoint Business Village Henwood, Ashford Kent TN24 8DH	**Your Ref:**	32655
		Report Date:	03/10/2014
Client Contact:	Mr Richard Moore		
Site:	**Femcroft Avenue**		
Test Requested:	**Particle Size Distribution**		
Test Method:	BS 1377-2 : 1990 : Clauses 9.2 & 9.5		

Sample Details:

Sampled and submitted by:	Client	Date Tested:	01-02/10/2014
Client Ref:	BH1 @ 2.1-2.2m	Date Sampled:	16/09/2014
Laboratory Ref:	0595/25/04	Type of Sample:	Bulk
Date Received:	18/09/2014		

Visual Description: Orange grey very sandy CLAY

Preparation Method : In accordance with BS 1377-1:1990
Assumed Particle Density: 2.68 Mg/m³



Material Type	Percentage Passing
Cobbles	
Gravel	
Sand	69
Silt	13
Clay	18

Comments :

Signed : _____ Kwaku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

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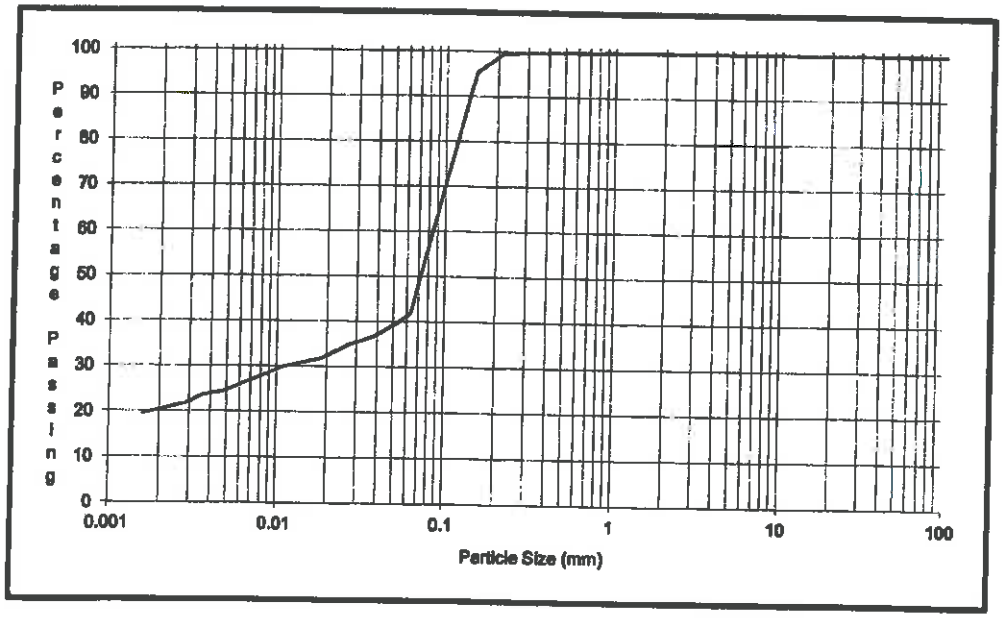
Client:	Knapp Hicks & Partners	**Report No:**	0595/25/05
Address:	Prospect House 1 Highpoint Business Village Henwood, Ashford Kent TN24 8DH	**Your Ref:**	32655
		Report Date:	03/10/2014
Client Contact:	Mr Richard Moore		
Site:	**Ferncroft Avenue**		
Test Requested:	**Particle Size Distribution**		
Test Method:	BS 1377-2 : 1990 : Clauses 9.2 & 9.5		

Sample Details:

Sampled and submitted by:	Client	Date Tested:	01-02/10/2014
Client Ref:	BH1 @ 2.4-2.6m	Date Sampled:	16/09/2014
Laboratory Ref:	0595/25/05	Type of Sample:	Bulk
Date Received:	18/09/2014		

Visual Description: Orange grey sandy CLAY

Preparation Method : In accordance with BS 1377-1:1990
Assumed Particle Density: 2.68 Mg/m³



Material Type	Percentage Passing
Cobbles	
Gravel	
Sand	58
Silt	21
Clay	21

Comments :

Signed : _____ Kwaku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

Form:R6A

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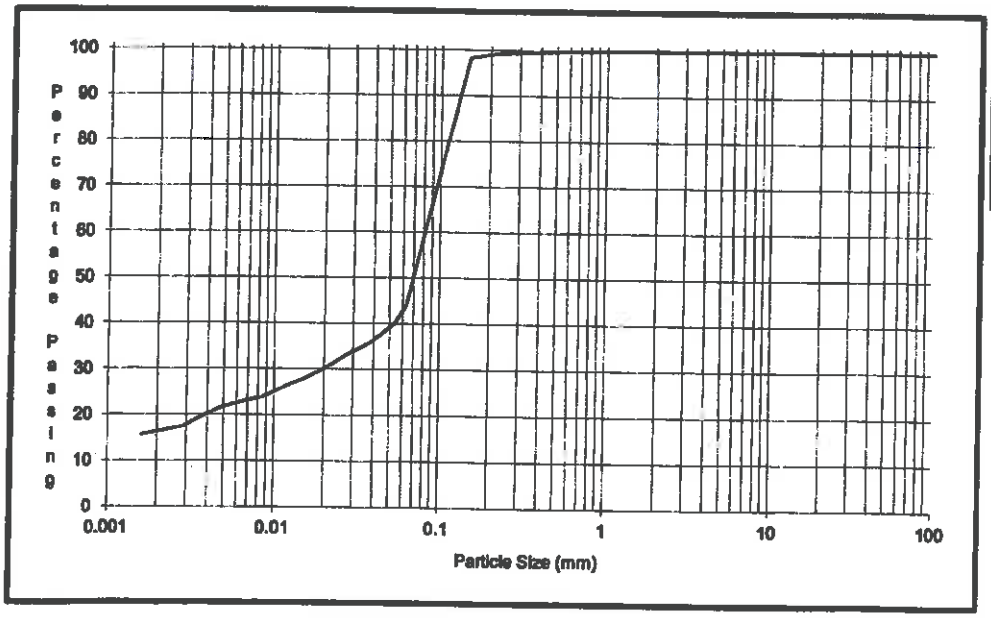
Client:	Knapp Hicks & Partners	**Report No:**	0595/25/06
Address:	Prospect House 1 Highpoint Business Village Henwood, Ashford Kent TN24 8DH	**Your Ref:**	32655
		Report Date:	03/10/2014
Client Contact:	Mr Richard Moore		
Site:	**Ferncroft Avenue**		
Test Requested:	**Particle Size Distribution**		
Test Method:	BS 1377-2 : 1990 : Clauses 9.2 & 9.5		

Sample Details:

Sampled & submitted by:	Client	Date Tested:	01-02/10/2014
Client Ref:	BH1 @ 3.4-3.7m	Date Sampled:	16/09/2014
Laboratory Ref:	0595/25/06	Type of Sample:	Bulk
Date Received:	18/09/2014		

Visual Description: Orange grey sandy CLAY

Preparation Method : In accordance with BS 1377-1:1990
Assumed Particle Density: 2.68 Mg/m³



Material Type	Percentage Passing
Cobbles	
Gravel	
Sand	56
Silt	27
Clay	17

Comments :

Signed : _____ Kwaku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

Form:R6A

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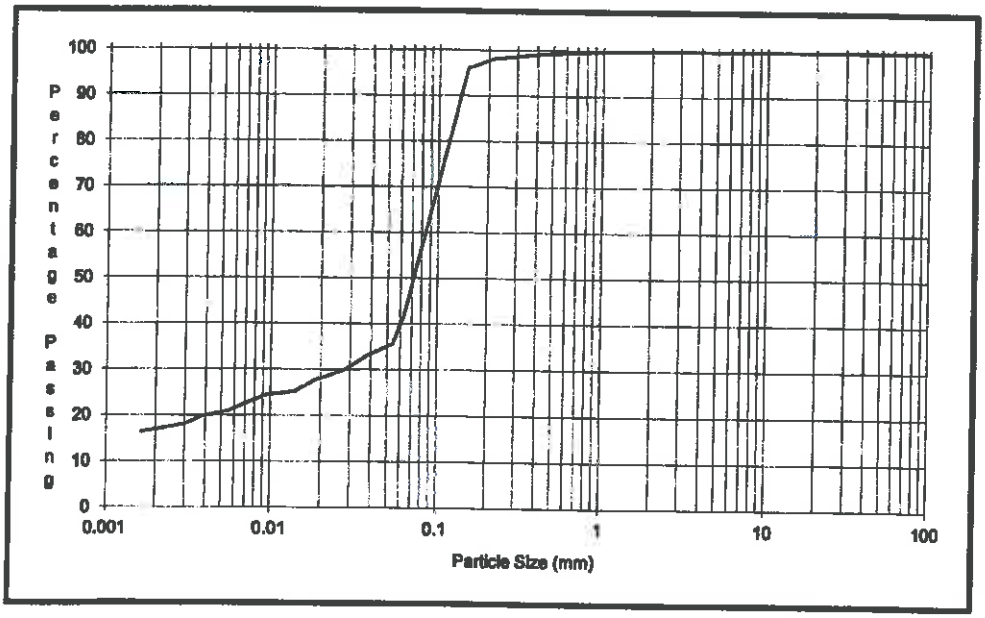
Client:	Knapp Hicks & Partners	**Report No:**	0595/25/12
Address:	Prospect House 1 Highpoint Business Village Henwood, Ashford Kent TN24 8DH	**Your Ref:**	32655
		Report Date:	03/10/2014
Client Contact:	Mr Richard Moore		
Site:	**Ferncroft Avenue**		
Test Requested:	**Particle Size Distribution**		
Test Method:	BS 1377-2 : 1990 : Clauses 9.2 & 9.5		

Sample Details:

Sampled and submitted by:	Client	Date Tested:	01-02/10/2014
Client Ref:	BH2 @ 3.4-3.6m	Date Sampled:	16/09/2014
Laboratory Ref:	0595/25/12	Type of Sample:	Bulk
Date Received:	18/09/2014		

Visual Description: Orange grey sandy CLAY

Preparation Method : In accordance with BS 1377-1:1990
Assumed Particle Density: 2.68 Mg/m³



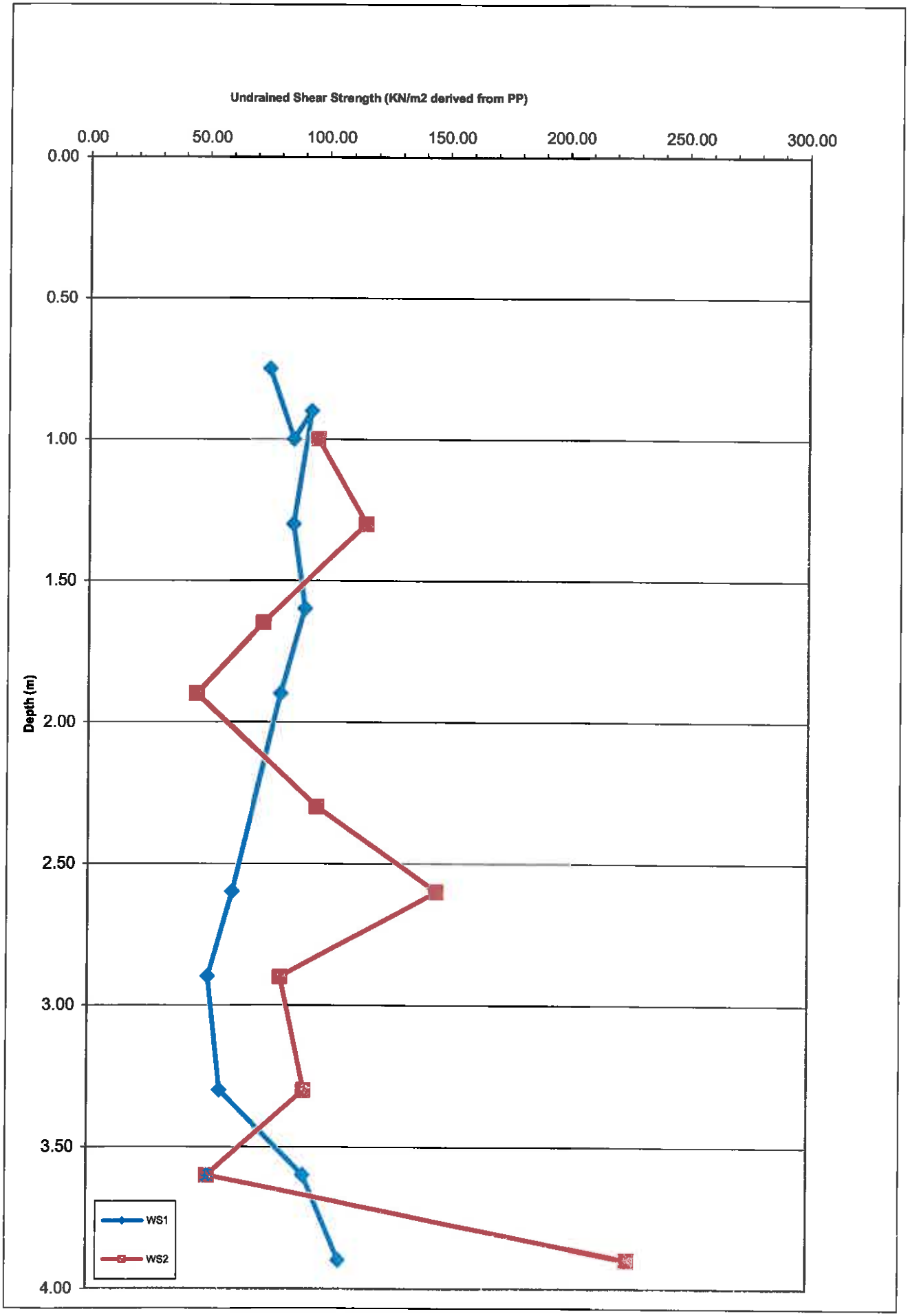
Material Type	Percentage Passing
Cobbles	
Gravel	
Sand	58
Silt	25
Clay	17

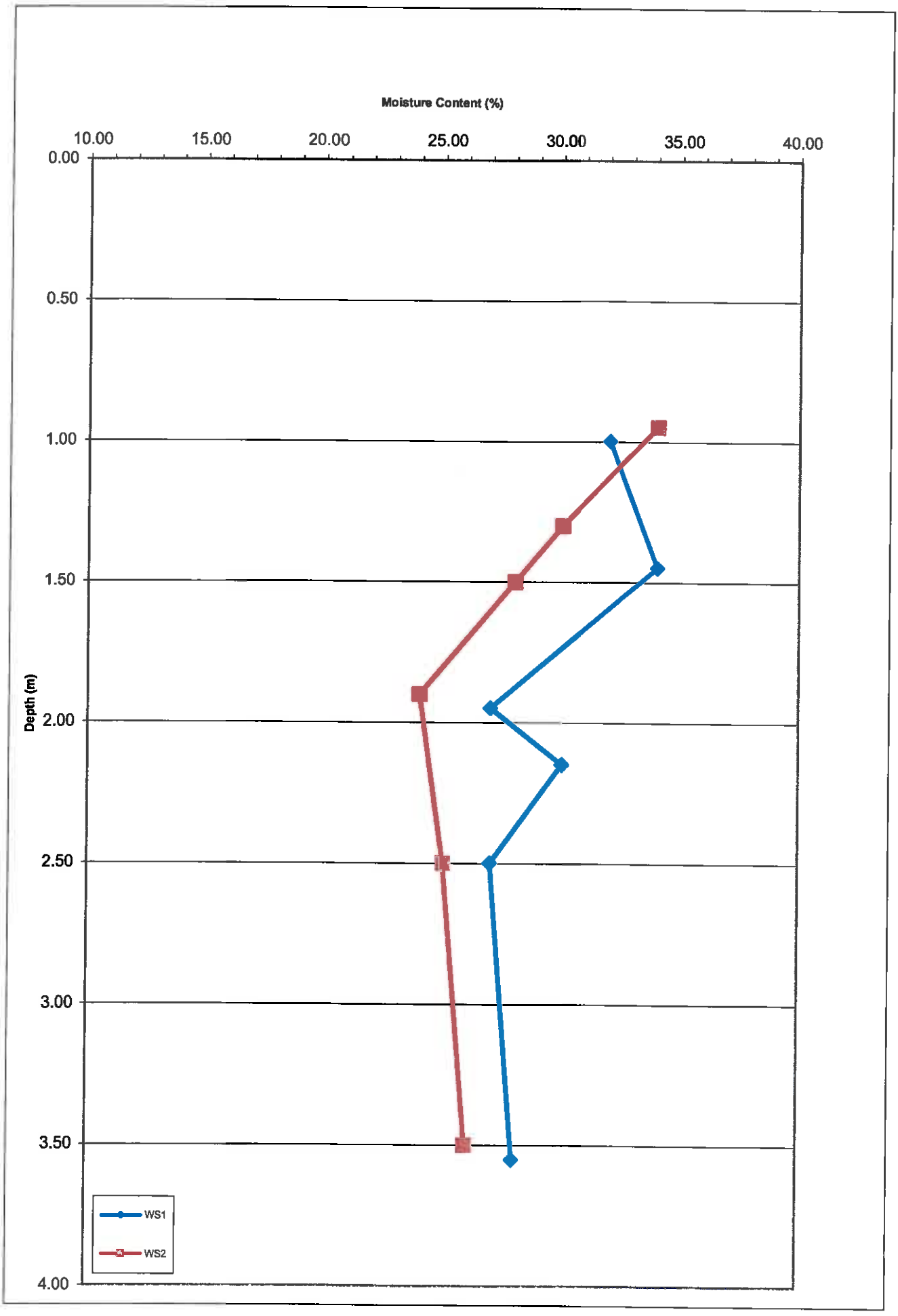
Comments :

Signed : _____ Kwaku Baah - Laboratory Manager

For and on behalf of PBA Laboratories

Form:R6A


Undrained Shear Strength (KN/m2 derived from PP)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Depth (m)
WS1
WS2


Moisture Content (%)
10.00
15.00
20.00
25.00
30.00
35.00
40.00
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
WS1
WS2

APPENDIX D

THAMES WATER SEWER RECORDS

APPENDIX D

THAMES WATER SEWER RECORDS

Asset Location Search

Jennifer Sturman
Knapp Hicks & Partners Ltd
Kingston House
The Long Barrow
ASHFORD
TN24 0GP

Search address supplied 13
Ferncroft Avenue
London
NW3 7PG

Your reference N/A

Our reference ALS/ALS Standard/2014_2864768

Search date 16 September 2014

You are now able to order your Asset Location Search requests online by visiting
www.thameswater-propertysearches.co.uk

searchcode

Asset Location Search

Search address supplied: 13, Ferncroft Avenue, London, NW3 7PG

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset Location Search

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and

pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

An invoice is enclosed. Please send remittance to Thames Water Utilities Ltd., PO Box 3189, Slough, SL1 4WW.

Asset Location Search

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2014_2864768

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 525366,186014

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
581C	n/a	n/a
5001	102.82	97.96
5801	89.6	86.83
5902	98.97	95.43
591B	n/a	n/a
591A	n/a	n/a
5810	90.28	83.69
591C	n/a	n/a
501A	n/a	n/a
581A	n/a	n/a
501B	n/a	n/a
581B	n/a	n/a
501C	n/a	n/a
3701	93.89	90.71
301A	98.72	97.78
401A	100.57	99.6
4902	100.08	95.55
40BF	n/a	n/a
491A	n/a	n/a
481A	n/a	n/a
4001	103.98	100.27
481B	n/a	n/a
49AE	0	0
4703	87.94	85.04
40AE	n/a	n/a
40AG	n/a	n/a
40AF	n/a	n/a
5901	95.47	89.09
21CJ	n/a	n/a
211B	n/a	n/a
211A	n/a	n/a
211C	n/a	n/a
2103	n/a	n/a
3201A	93.5	87.21
3101	99.21	95.31
4208	n/a	n/a
4103	108.24	104.56
4106	n/a	n/a
4105	n/a	n/a
5101	n/a	n/a
17AF	n/a	n/a
17AG	n/a	n/a
17AH	n/a	n/a
17AI	n/a	n/a
1206	.01	n/a
1203	83.69	n/a
1204	83.69	82.72
1104	84.33	81.91
1103	85.9	82.65
1202	87.24	n/a
1205	87.66	n/a
2203	91.15	n/a
2201B	.01	n/a
191A	n/a	n/a
171A	n/a	n/a
1901	87.13	n/a
11BC	n/a	78.33
11BD	n/a	n/a
1802	85.86	n/a
18CI	n/a	77.69
1102	86.5	n/a
1001	88.54	n/a
1101	86.71	82.76
1801	n/a	83.3
2901	89.17	n/a
2002	90.06	n/a
2102	88.23	82.41
2003	91.21	85.23
2004	90.99	83.02
3802	97.58	83.32
3002	96.05	93.12
		91.51

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

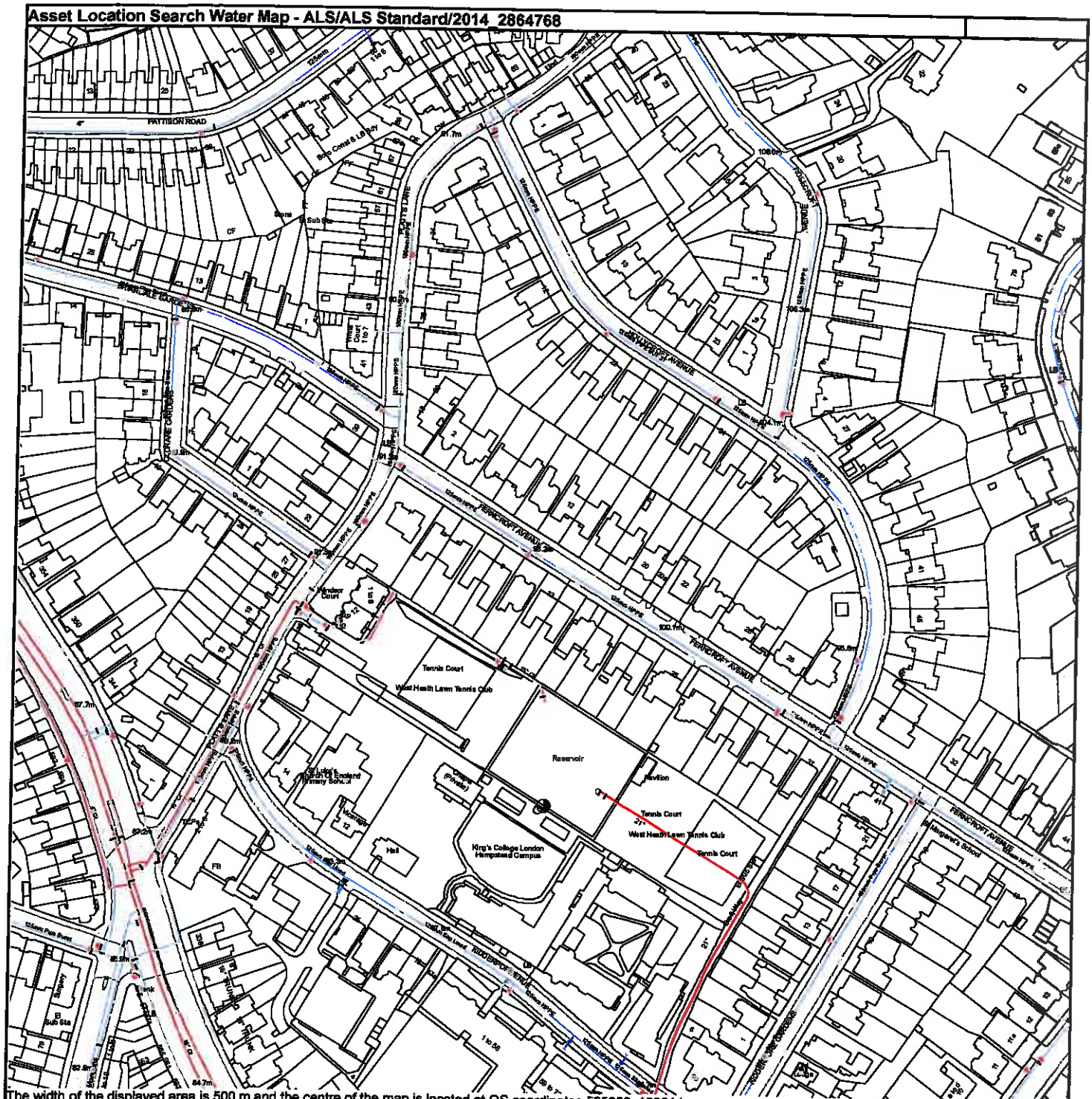
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2014_2864768



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 525366, 186014.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

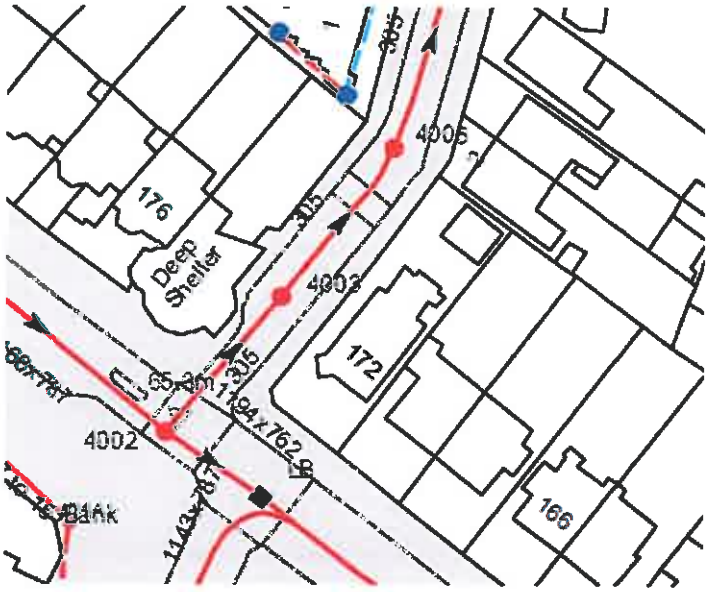
- Data Logger

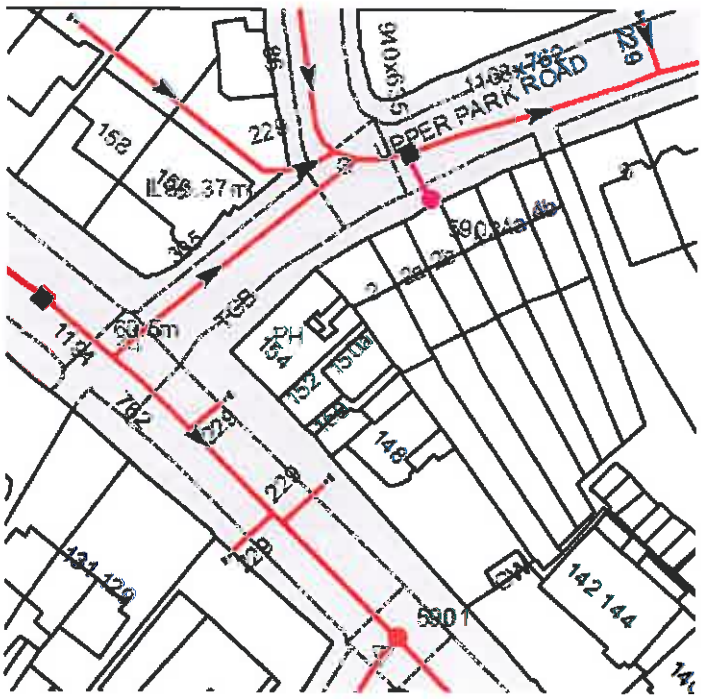
PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

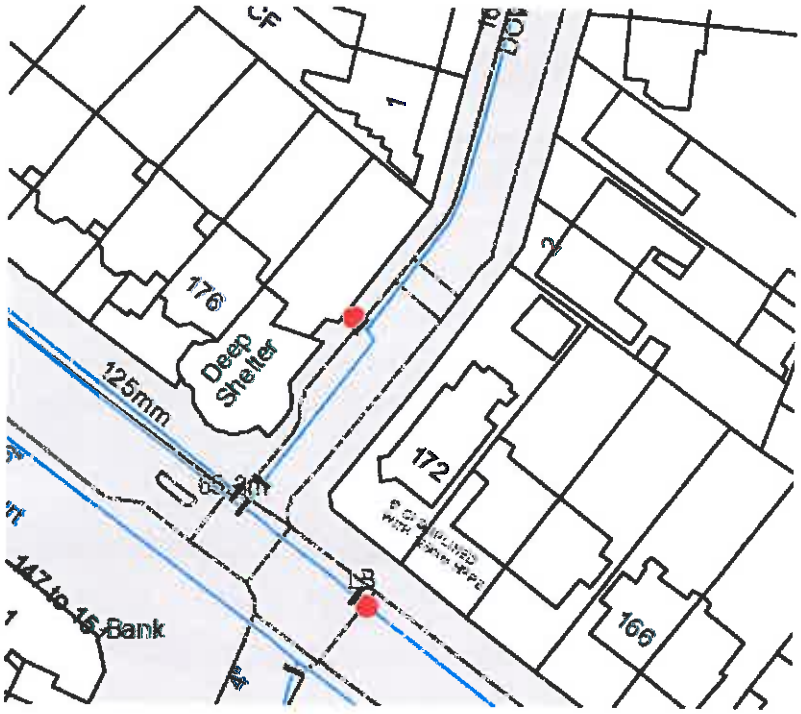
Other Water Pipes (Not Operated or Maintained by Thames Water)

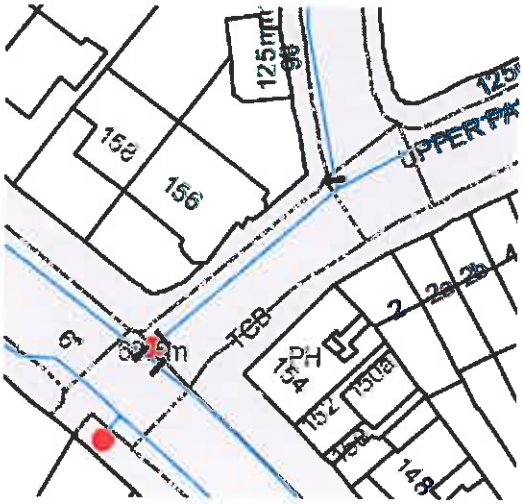
Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.


4005
176
Deep Shelter
4003
172
4002
166
Bank


UPPER PARK ROAD
152
148
142 144
5901


176
Deep Shelter
125mm
172
166
147 to 15 Bank


125mm
158
156
UPPER PK
TCB
PH
154
152
150a
148