Geotechnical & Environmental Associates

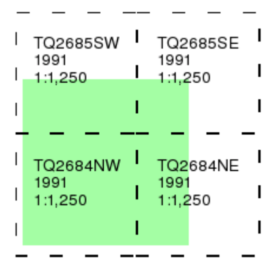
Large-Scale National Grid Data

Published 1991

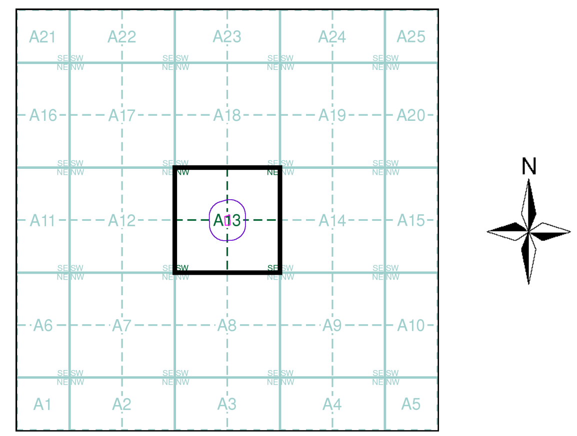
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

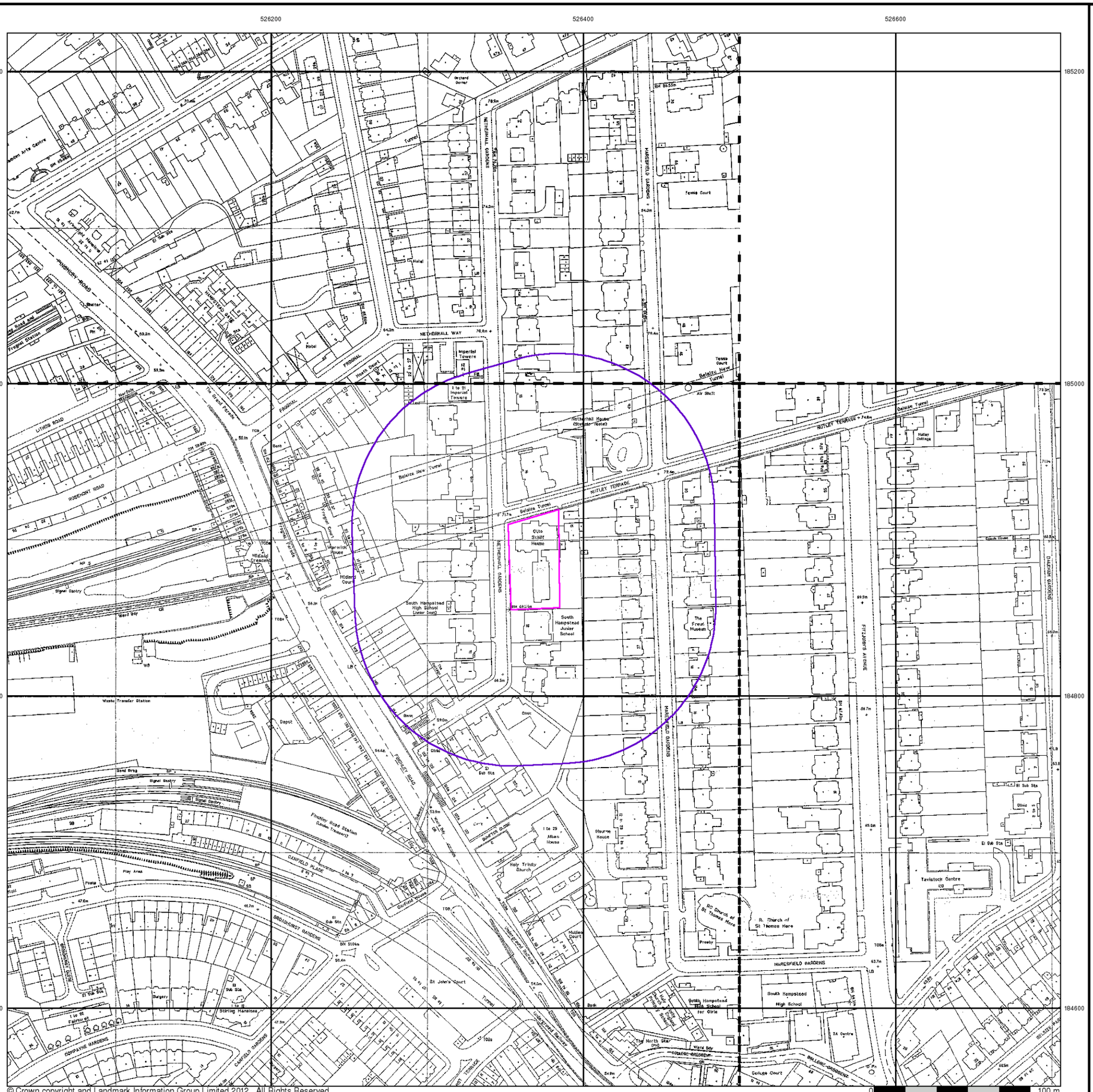
Order Number:	37369747_1_1
Customer Ref:	J12015
National Grid Reference:	526370, 184890
Slice:	A
Site Area (Ha):	0.19
Search Buffer (m):	100

Site Details

14 Netherhall Gardens, LONDON, NW3 5TQ

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA Geotechnical & Environmental Associates

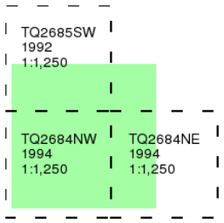
Large-Scale National Grid Data

Published 1992 - 1994

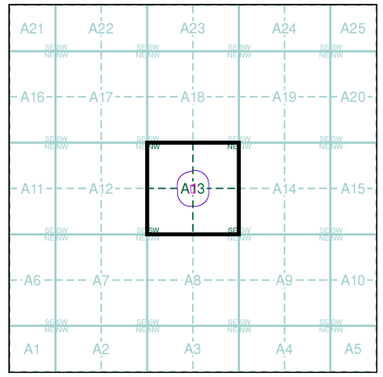
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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GEA Geotechnical & Environmental Associates

10k Raster Mapping

Published 1999

Source map scale - 1:10,000

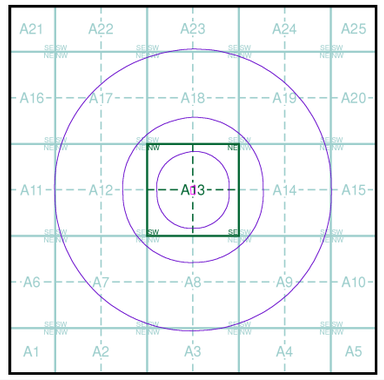
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TQ28NE 1999 1:10,000

TQ28SE 1999 1:10,000

Historical Map - Slice A



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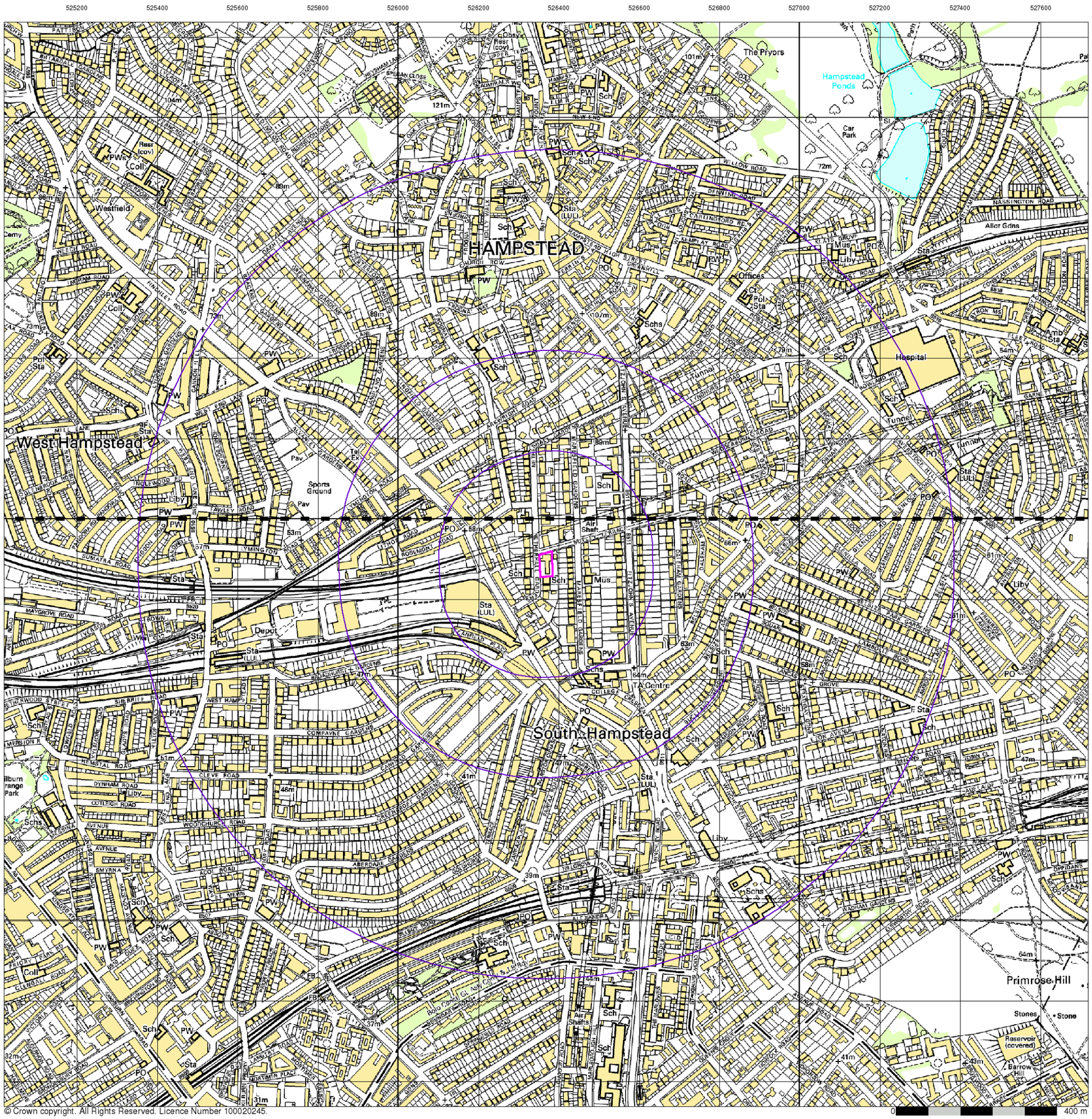


GEA Geotechnical & Environmental Associates

10k Raster Mapping

Published 2006

Source map scale - 1:10,000

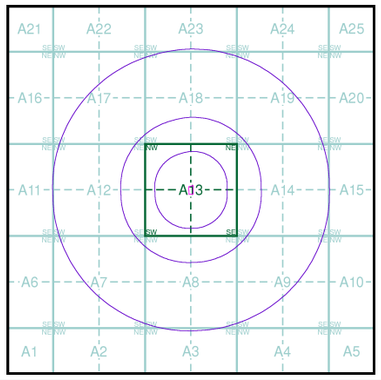
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TQ28NE 2006 1:10,000

TQ28SE 2006 1:10,000

Historical Map - Slice A



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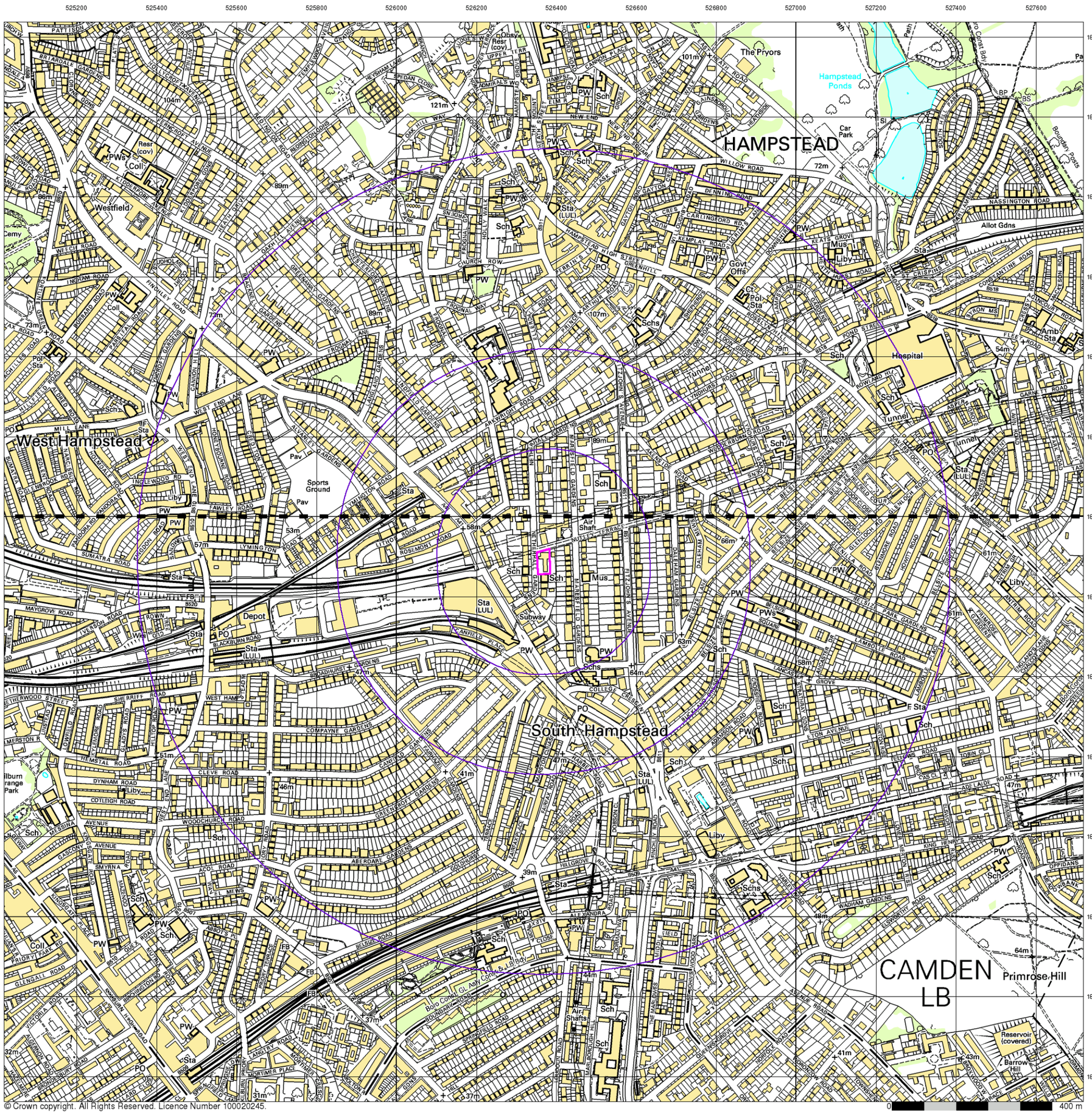


GEA Geotechnical & Environmental Associates

10k Raster Mapping

Published 2011

Source map scale - 1:10,000

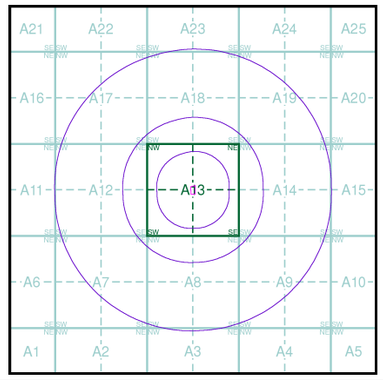
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TQ28NE
2011
1:10,000

TQ28SE
2011
1:10,000

Historical Map - Slice A



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Ground Investigation

Soils LIMITED

Geotechnical & Environmental Consultants

Report On A Ground Investigation

At

Otto Schiff House, 14 Netherhall Gardens, Hampstead, London, NW3 5TQ

For

Vkhp Consulting Ltd (Dorking)

REPORT J12146/SI

Soils Limited
Newton House
Cross Road
Tadworth
Surrey KT20 5SR
☎ 01737 814221
01737 812557

Ground Investigation Report

Job Title: Otto Schiff House, 14 Netherhall Gardens, Hampstead, London, NW3 5TQ

Client: Vkhp Consulting Ltd (Dorking)

CONTROL DOCUMENT

SOILS LIMITED DOCUMENT REFERENCE NUMBER:
J12146

DOCUMENT TYPE:
GROUND INVESTIGATION REPORT

DOCUMENT STATUS: FINAL Revision: 1.00 DATE: January 2011

Note: This is not a valid document for use in the design of the project unless it is titled **Final** in the Document Status box.

	Name	Signature
Prepared by:	Nikos Sidiropoulos	
Checked by:	R B Higginson	
	N J Lambert	

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

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soils LIMITED
Geotechnical & Environmental Consultants

Report On A Ground Investigation

At

Otto Schiff House, 14 Netherhall Gardens, Hampstead, London, NW3 5TQ

For

Vkhp Consulting Ltd (Dorking)

Commission

An invitation to tender for the investigation was received from Vkhp Consulting Ltd (Dorking) and the scope of the investigation was as outlined in Soils Limited subsequent quotation reference Q12551 dated 17th November 2010.

This report comprises the intrusive phase of the investigation and incorporates the results, discussion and conclusions to the Intrusive Investigation.

No Desk Study, investigation, analysis or recommendations in respect of contamination are made in this report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

The following sections make up the report made on the investigation and comprise:

Section 1
Introduction

- Objective of the Investigation;
- Location;
- Proposed Redevelopment;
- Limitations and Disclaimers.

Section 2
Site Works

- Proposed Works;
- Anticipated Geology;
- Ground Conditions;
- Roots;

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January, 2011
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- Groundwater;
- Site Walkover.

Section 3
Discussion of Geotechnical In-Situ and Laboratory Testing

- Standard Penetration Tests (S.P.T.);
- Quick Unconsolidated Undrained Triaxial Tests;
- Atterberg Limit Tests;
- Sulphate and pH Tests.

Section 4
Foundation Design

- General;
- Foundation Scheme;
- Subsurface Concrete;
- Duty of Care;
- Excavated Material;
- Imported Material;
- Discovery Strategy.

Appendices

- Appendix A: A description of the fieldwork and the borehole logs;
- Appendix B: The results of geotechnical laboratory tests carried out on soil samples obtained from the boreholes.

The site works were performed in accordance with the methods given in BS 5930+A2:2010 and BS 1377:1990 Part 9.

The geotechnical laboratory testing was performed by K4 Soils Laboratories in accordance with methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accreditation.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

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Section 1
Introduction

1.1 Objective of the Investigation

The investigation was to provide parameters for the design of piled foundations by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the boreholes.

This report comprises the intrusive report of the investigation and incorporates the results, discussion and conclusions to the Intrusive Investigation. No Desk Study, investigation, analysis or recommendations in respect of contamination are made in this report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

1.2 Location

The approximate O.S. National Grid Reference at the centre of the site was TQ 263 848. The general layout is presented on Figure 1.

1.3 Proposed Redevelopment

Following discussions with the client, the proposed redevelopment was to comprise the construction of a piled raft to an existing residential property that the client has been monitoring for subsidence.

1.4 Limitations and Disclaimers

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The conclusions and recommendations relate to land at Otto Schiff House, 14 Netherhall Gardens, Hampstead, London, NW3 5TQ.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation prior to the construction of foundations.

Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets remains with Soils Limited. The license is for the sole use of the client but may be assigned on subject to agreement with Soils Limited which would not be unreasonably withheld.

Section 2
Site Works

2.1 Proposed Works
The works to be undertaken on the site comprised the following items:

- Drilling of two cable percussion boreholes within the site to a depth of 10.0 metres bgl;
- Installation of a well in one of the boreholes and to allow subsequent long term groundwater monitoring upon request;
- Logging, sampling and *in-situ* testing as appropriate to the ground conditions encountered in the boreholes.

2.2 Anticipated Geology
The 1:50 000 Geological Survey of Great Britain (England and Wales) sheet number 256 of the North London area, showed the site to be located on the London Clay Formation.

2.2.1 London Clay Formation
The London Clay Formation comprises stiff grey fissured clay, weathering to brown near surface. Concretions of argillaceous limestone in nodular form (Claystones) occur throughout the formation. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay Formation, and precautions against sulphate attack to concrete are sometimes required.

The lowest part of the formation is a sandy beds with black rounded gravel and occasional layers of sandstone and is known as the Basement Bed.

In the north London area the upper part of the London Clay Formation has been disturbed by glacial action and may contain pockets of sand and gravel.

2.3 Ground Conditions
Between 15th and 16th December 2010, two cable percussion boreholes (BH1-BH2) were drilled to a depth of 10.0 metres below ground level (bgl) at locations agreed with the client on site, where access could be gained and no live services were present.

A well was installed in BH1 to a depth of 10.0 metres to allow long term groundwater level monitoring following installation, upon request.

The approximate location of the boreholes is presented on Figure 2.

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level directly adjacent to the individual trial hole.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots, or has been identified as part of the *in-situ* weathering profile, it has been described as Topsoil both on the logs and within this report. Where the soil has, in general, been found to have the same composition as the 'Topsoil' but also incorporated a minor constituent, e.g. less than an estimated 5%, of possibly non-naturally occurring material, or is of uncertain origin, the soil has been described as Topsoil/Made Ground both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion the succession of conditions encountered in the trial holes in descending order can be summarised as follows below:

Made Ground
London Clay Formation

2.3.1 Made Ground

Made Ground was found from surface in both boreholes and comprised dark brown sandy clay with occasional to abundant brick fragments to depths ranging between 0.45 metre bgl in BH1 and 0.65 metre bgl in BH2.

2.3.2 London Clay Formation

The soils of the London Clay Formation were encountered directly beneath the Made Ground and comprised firm to stiff dark brown to grey occasionally fissured silty CLAY with occasional partings of fine sand and scattered traces of selenite and occasional roots and rootlets. The soils of the London Clay Formation were found for the full depth of the boreholes to 10.0 metres bgl.

2.4 Roots

Records of the depth of roots observed during the drilling of the boreholes are given in the table overpage.

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Root Records	
Borehole	**Root Depth (m bgl)**
BH1	Roots observed to 0.5m
BH2	Rootlets observed to 3.0m

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low, thus a direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

Roots may be found to greater depths at other locations on the site, particularly close to trees and/or trees that have been removed both within the site and its close environs.

The description of roots was based solely on visual observation and is not definitive.

2.5 Groundwater

Groundwater equilibrium conditions may only be conclusively established by means of a series of measurements made in a standpipe, or piezometer installed in the ground after completion of site works.

A groundwater monitoring well was installed in the borehole at 10.0 metres below existing ground level, to allow long term groundwater level monitoring upon request. Short-term groundwater levels recorded during the site investigation are presented in tabular form below.

Groundwater Records		
Borehole	**Groundwater Depth (m bgl)**	**Comment**
BH1	No groundwater encountered	Reading taken on 15.12.2010
BH2	No groundwater encountered	Reading taken on 16.12.2010

Changes in groundwater level do occur for a number of reasons including seasonal effects and variations in drainage. The site investigation was conducted in December 2010, when groundwater levels should typically rising from their annual minimum (i.e. lowest) elevation.

Any groundwater or surface water ingress **must** be prevented from entering foundation trenches. The possible effect of groundwater on the proposed redevelopment and the foundations will be discussed later in the report.

2.6 Site Walkover

At the time of the site investigation, in November 2010, the site comprised an approximately rectangular shaped plot of generally flat and level land with a very

gentle fall towards the south. The site elevation was estimated at approximately 72 metres Above Ordnance Datum (AOD).

A 3-storey brick built block of flats was noted to occupy most of the site with its long axis orientated in a north-south direction.

The area to the immediate west and east was grass covered with mature and semi-mature trees noted beyond and Netherhall Gardens further to the west. To the north there was a 2/3-storey brick built house with Nutley Terrace beyond and with a school to the immediate south.

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Section 3
Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Standard Penetration Tests (S.P.T.)

Standard Penetration Tests (S.P.T.) were undertaken during the drilling of the cable percussion boreholes in the soils of the London Clay Formation.

The cohesive deposits of the London Clay Formation have been classified based on the relationship given below.

The inferred cohesion in the cohesive soils based on the S.P.T. "N" blow counts given in the table below is based on the relationship suggested by Stroud (1974). *(ref: Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).*

Classification	Undrained Cohesive Strength (KPa)
Very Soft	0 – 20
Soft	20 – 40
Firm	40 – 75
Stiff	75 – 150
Very Stiff	150 – 300
Hard	> 300

(Ref: Table 13 – Identification and Description of Soils – BS5930:1999.)

An interpretation of the S.P.T. "N" blow counts is given in the following table below.

Interpretation Of S.P.T."N" Blow Counts				
Strata	"N" blow Range (uncorrected)	Soil Type		Borehole
		Cohesive	Granular	
London Clay Formation	9 - 21	Firm to stiff	-	BH1-BH2

(The Standard Penetration Tests were made in accordance with B.S. 1377:Part 9:1990 Test 3.3.)

The test results are presented on the borehole logs, Appendix A.

3.2 Quick Unconsolidated Undrained Triaxial Tests

QUU Triaxial Tests were made on undisturbed soil samples of the London Clay Formation and a summary of the results is presented overpage.

QUU Triaxial Test Results Summary		
Moisture Content Range (%)	**Undrained Cohesion Range (kN/m^2)**	**Soil Strength Range**
29-35	49-126	Firm to stiff

(The QUU Triaxial Tests were made in accordance with B.S. 1377:Part 7:1990 Test 9.0)

The test results are presented in Appendix B.

3.3 Atterberg Limit Tests

A summary of the results of the Atterberg Limit Tests made on samples of the London Clay Formation is given in the table below.

Atterberg Limit Test Results Summary					
Moisture Content Range (%)	**Passing 425 µm sieve Range (%)**	**PI Range (%)**	**Soil Class Range**	**Volume Change Potential Range**	
				BRE	**NHBC**
31-35	100	48-50	CV	High	High

NB: BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results). NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2 (based on Atterberg results) Soil Classification based on British Soil Classification System.

The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.

(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Tests 4 and 5).

The test results are given in Appendix B.

3.4 Sulphate and pH Tests

The significance of the Sulphate and pH Test results are discussed within Section 4.3.

(The Sulphate and pH Tests were undertaken made in accordance with BS 1377:Part 3:1990 Clause 5).

The test results are given in Appendix B.

Section 4
Foundation Design

4.1 General

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented below and overpage.

4.1.1 Topsoil or Made Ground

The terms *Fill* and *Made Ground* are used to describe material, which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:1986, Clause 2.2.2.3.5 Made Ground and Fill, includes the caveat that *'all made ground should be treated as suspect, because of the likelihood of extreme variability'.*

A result of the inherent variability, particularly of uncontrolled Fill and/or Made Ground, is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Fill and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Made Ground was found from surface in both boreholes and comprised dark brown sandy clay with occasional to abundant brick fragments to depths ranging between 0.45 metre bgl in BH1 and 0.65 metre bgl in BH2.

Made Ground might be present to similar or greater depths elsewhere on the site including service trenches, infilled ground, basements and the like.

4.1.2 London Clay Formation

The soils of the London Clay Formation were encountered directly beneath the Made Ground and comprised firm to stiff dark brown to grey occasionally fissured silty CLAY with occasional partings of fine sand and scattered traces of selenite and occasional roots and rootlets. The soils of the London Clay Formation were found for the full depth of the boreholes to 10.0 metres bgl.

The results of the Atterberg Limit testing indicated that the soils of the London Clay Formation fell into the BRE Digest 240 and the NHBC Standards Chapter 4.2 ***high volume change potential*** classification.

The soils of the London Clay Formation are overconsolidated soils and as such generally have moderate bearing and settlement characteristics and could be considered suitable as a founding stratum for the proposed redevelopment.

4.2 Foundation Scheme

Following discussions with the client, the proposed redevelopment was to comprise the construction of a piled raft to an existing residential property that the client has been monitoring for subsidence.

4.2.1 Guidance on Shrinkable Soils

The Building Research Establishment (BRE) Digests 240, 241 and 242 provide guidance on 'best practice' for the design and construction of foundations on shrinkable soils.

The BRE Digest 241 states: *"An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used".*

The stated intention of the NHBC is to ensure that shrinkage and swelling of plastic soils does not adversely affect the structural integrity of foundations to such a degree that remedial works would be required to restore the serviceability of the building.

It must be borne in mind that adherence to the NHBC tables and design recommendations may not, in all cases, totally prevent foundation movement and cracking of brickwork might occur.

The BRE Digest 240 sets out best practise in respect of the design of foundations taken into shrinkable soils and advises that a piled foundation must be used if there is any doubt regarding completion of soil moisture content following any tree removal. In predominantly clayey soils, moisture content recovery can take in excess of 20 years to complete.

Any slabs or beams **must** be designed in accordance with the ***high volume change potential*** classification of the NHBC Standards Chapter 4.2 and taking into account the planting schedule for the site.

4.2.2 Conclusions and Recommendations

The foundation design must be suitable for the conditions present at the site. As discussed with the client, the investigation was to provide parameters for the design of the proposed piled raft by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the boreholes.

The piled foundations should be taken through any Made Ground, below any roots and desiccated or disturbed ground and into the soils of the London Clay Formation, such that sufficient bearing capacity was achieved.

In the table overpage, preliminary load capacities calculated for varying diameters and lengths of vertically loaded piles taken into the soils of the London Clay Formation are given. These values have been calculated for the ground conditions found in the boreholes and should be used for preliminary design purposes only as the actual working load is dependent on the type of pile and the method of installation.

The pile working loads incorporate a factor of safety of 3 on the ultimate skin bearing value and 3 on the ultimate end bearing value.

The values given in the table overpage incorporate an end bearing value (N_c) of 9 and a skin friction coefficient (alpha) of 0.45.

The results were based on both the inferred cohesion based on the SPT 'N' Blow count values and the results of the Quick Unconsolidated Undrained Triaxial Tests in the soils of the London Clay Formation.

The upper three metres of the shaft of the pile have been ignored in the preliminary pile design given.

Temporary casing will be required where the upper portion of the pile passes through the Made Ground, London Clay Formation, particularly below the groundwater table, if encountered, to prevent necking of the green concrete.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

The pile bearing values given in the table overpage are applicable to single piles. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Possible uplift forces and lateral movements due to the **high** volume change potential or desiccation of the soils of the London Clay Formation

must be taken into account. Void formers and/or compressible layers to ground beam and slabs as well as heavesleeves and tensile reinforcement of the piles should be adopted in order to accommodate possible heave/swelling in accordance with the BRE 250.

Preliminary Pile Working Loads (Single Pile Vertically Loaded)			
Depth BGL (m)	**Pile Diameter (m)**		
	0.30	0.45	0.60
6	20 20 40	40 30 70	80 50 130
8	20 50 70	50 70 120	90 110 200
10	20 80 100	50 120 170	90 170 260
Note: End Working Load (kN) Skin Working Load (kN) Total Pile Working Load (kN)		90 170 260	

Guidance on the design of a working platform for piling rigs can be provided by Soils Limited in accordance with the BRE "Working platform for tracked plant, 2004" documentation.

4.3 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts fell into Class DS-2 of the BRE Special Digest 1, 2005, *'Concrete in Aggressive Ground'.* Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) site classification of AC-1s. For the classification given, the "static" case was adopted, as no groundwater was recorded during the site investigation. The pH of the soil was ranging between 7.0 and 7.2.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1, 2005, *'Concrete in Aggressive Ground'* taking into account the pH of the soils.

4.4 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust were generated as a result of construction activities. The site should be securely fenced at all times to prevent unauthorised access.

Washing facilities should be provided and eating restricted to mess huts.

4.5 Excavated Material

Excavated material must be classified with the Environment Agency for disposal at an appropriately licensed disposal facility. The requirements of Duty of Care and Health and Safety Guidance must be complied with.

Both Producers and Waste Management companies must ensure compliance with the new Waste Acceptance Criteria (WAC) prior to landfill in Hazardous, stable non-reactive cells and inert sites. These regulations govern the operation of landfill in England and Wales. Basic characterisation is the responsibility of the waste producer and compliance checking is generally the responsibility of the landfill operator. Therefore landfill operators will be unlikely to accept waste that does not meet the Waste Acceptance Criteria for their class of site.

From October 30th 2007 there is an obligation to 'treat' all soils destined for landfill, including non-hazardous waste. This treatment must now be documented and presented to the landfill operator or waste may be refused entry. Note that all liquids are banned from landfill from 30th October. For the purposes of legal compliance, 'treatment' must comprise three things (the 'three-point test') presented below:

1. It must be a physical, thermal, chemical or biological process.
2. It must change the characteristics of the waste.
3. It must do so in order to:

    (a) reduce its volume, or
    (b) reduce its hazardous nature, or
    (c) facilitate its handling, or enhance its recovery.

4.6 Imported Material

Any soil which is to be imported onto the site must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

4.7 Discovery Strategy

There may be areas of contamination that have not been identified during the course of the intrusive investigation. For instance, there may have been underground storage tanks (UST's) not identified during the Ground Investigation for which there is no historical or contemporary evidence. Such occurrences may be discovered during the demolition and construction phases for the redevelopment of the site.

Groundworkers should be instructed to report to the Site Manager any evidence for such contamination, this may comprise visual indicators, such as fibrous materials within the soil, discolouration, or odours and emission. Upon discovery advice must be taken from a suitably qualified person before proceeding, such that appropriate remedial measures and health and safety protection may be applied.

Should a new source of contamination be suspected or identified then works should be suspended in this area of the site and the Local Authority will be informed.

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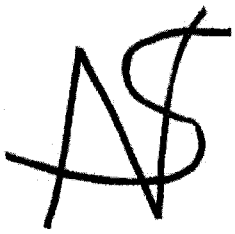
The following figures and appendices complete this report:

Figure 1	Site Location Map
Figure 2	Trial Hole Location Plan
Appendix A	Field Work
Appendix B	Geotechnical Laboratory Analysis



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Appendix A
Field Work

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Borehole No **BH 1**
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Otto Schiff House	12146		Cable
Location: Otto Schiff House, 14 Netherhall Gardens, NW3 5TQ		Level: -	Scale 1:50
Client: vkhp Consulting Ltd		Dates: 16/12/2010	Logged By SW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.25	D		0.28			MADE GROUND Dark brown sandy clay with occasional brick fragments
		0.50	B		0.45			MADE GROUND Dark brown sandy clay in a matrix of brick rubble
		1.00	SPT	N=10				LONDON CLAY FORMATION Firm to stiff dark brown grey silty occasionally fissured CLAY with occasional partings of grey fine sand and scattered traces of selenite and occasional roots and rootlets
		1.00	D	N=10 (1,2,2,3,2,3)				
		2.00-2.45	U	26				
		2.50	D					
		3.00	SPT	N=10				
		3.00	D	N=10 (1,2,2,2,3,3)				
		3.50	D					
		4.00-4.45	U	40				
		4.50	D					
		5.00	SPT	N=13				
		5.00	D	N=13 (2,2,2,3,4,4)				
		5.50	D					
		6.00-6.45	U	40				
		6.50	D					
		7.00	SPT	N=19				
		7.00	D	N=19 (2,2,4,4,5,6)				
		7.50	D					
		8.00-8.45	U	80				
		8.50	D					
		9.00	SPT	N=21				
		9.00	D	N=21 (2,3,4,5,6,6)				
		9.50-9.95	U	72				
		Type		Results				End of Borehole at 10.00 m

Remarks: 1 Hour hand digging pit to 1.0m, 3/4 hour bagging spoil and taking to front of house.
Well installed to 10.0m. No groundwater encountered.

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Borehole No **BH 2**

Project Name	Project No.	Co-ords: -	Hole Type
Otto Schiff House	12146		Cable
Location: Otto Schiff House, 14 Netherhall Gardens, NW3 5TQ		Level: -	Scale 1:50
Client: vkhp Consulting Ltd		Dates: 16/12/2010	Logged By SW

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.25	D		0.30			MADE GROUND Dark brown sandy clay with occasional brick fragments
		0.50	B		0.65			MADE GROUND Dark brown sandy clay in a matrix of brick rubble
								LONDON CLAY FORMATION Firm to stiff dark brown grey silty occasionally fissured CLAY with occasional partings of grey fine sand and scattered traces of selenite and occasional roots and rootlets
		1.00-1.45	U	28				
		1.50	D					
		2.00	SPT	N=9				
		2.00	D	N=9 (1,2,2,2,2,3)				
		2.50	D					
		3.00-3.45	U	32				
		3.50	D					
		4.00	SPT	N=12				
		4.00	D	N=12 (2,2,2,3,3,4)				
		4.50	D					
		5.00-5.45	U	50				
		5.50	D					
		6.00	SPT	N=15				
		6.00	D	N=15 (2,2,3,3,4,5)				
		6.50	D					
		7.00-7.45	U	62				
		8.00	SPT	N=19				
		8.00	D	N=19 (2,3,4,4,5,6)				
		8.50	D					
		9.00-9.45	U	82				
		9.50	SPT	N=21				
		9.50	D	N=21 (2,4,4,5,6,6)				
			Type	Results				End of Borehole at 10.00 m

Remarks: 1 Hour hand digging pit to 1.0m. No groundwater encountered.

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Appendix B
Geotechnical Laboratory Analysis

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Project Name:	Hampstead	**Samples Received:**	21/12/2010
		Project Started:	04/01/2011
Client:	Soils Ltd	**Testing Started:**	12/01/2011
Project No:	J12146 **Our job/report no:** 10391	**Date Reported:**	14/01/2011

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Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH1		0.50	Brown CLAY with roots	31	75	27	48	100	CV
BH2	7	3.00 - 3.45	Firm grey brown CLAY with traces of blue grey staining and scattered traces of selenite and very occasional rootlets	35	79	29	50	100	CV

UKAS TESTING 2519

Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.
BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

Checked and Approved
Initials: K.P
Date: 14/01/2011

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

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Client :	Soils Ltd	Our Job/report no:	10391	Samples Rec :	21/12/2010	Testing Started:	13/01/2011
Project name:	Hampstead	Project No:	J12146	Project Started:	-	Date reported:	14/01/2011

BH / TP No	Sample no / ref	Sample depth (m)	Description	Moisture content (%)	Bulk Density (Mg/m3)	Dry density (Mg/m3)	Cell Pressure (kPa)	Strain at failure (%)	Max Deviator Stress (kPa)	Mode of failure	Shear Strength (kPa)	Phi (deg)
BH1	9	4.00 - 4.45	Stiff grey brown CLAY with scattered traces of selenite crystals and occasional partings of brown fine sand	30	1.95	1.50	85	10.6	174	Compound	87	NA
BH1	13	6.00 - 6.45	Stiff fissured dark grey brown CLAY with scattered traces of selenite	31	1.95	1.49	125	8.5	207	Compound	104	NA
BH1	17	8.00 - 8.45	Stiff fissured dark grey brown CLAY with traces of brown staining and scattered traces of selenite	31	1.95	1.49	165	4.5	251	Brittle	126	NA
BH1	20	9.50 - 9.95	Stiff fissured dark grey CLAY with scattered traces of selenite	29	1.96	1.52	195	3.5	223	Brittle	112	NA
BH2	7	3.00 - 3.45	Firm grey brown CLAY with traces of blue grey staining and scattered traces of selenite and very occasional rootlets	35	1.90	1.41	65	11.1	98	Compound	49	NA
BH2	11	5.00 - 5.45	Stiff fissured grey brown CLAY	29	1.96	1.52	105	8	196	Compound	98	NA
BH2	15	7.00 - 7.45	Stiff slightly fissured grey brown CLAY with traces of brown staining and scattered traces of selenite	30	1.98	1.52	145	5	211	Brittle	106	NA
BH2	19	9.00 - 9.45	Stiff fissured dark grey brown CLAY with traces of brown staining and scattered traces of selenite	31	1.95	1.49	185	6	238	Brittle	119	NA

K4 SOILS

Summary of Undrained Triaxial Compression Testing

BS 1377 : Part 7 : Clause 8 : 1990

Checked and approved

Initials kp

UKAS TESTING 2519

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford WD18 9RU Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)