Basement impact assessment, screening and scoping report: hydrology and hydrogeology. 3 Trinity Close, London Borough of Camden.

ESI Report Reference 61815R1D1

Basement impact assessment, screening and scoping report: hydrology and hydrogeology. 3 Trinity Close, London Borough of Camden.

Prepared for

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Building Doctors Ltd.
96 Farringdon Road,
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Report reference: 61815R1D1 October 2013
Report status: Draft Report for client review

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Basement impact assessment, screening and scoping report: hydrology and hydrogeology. 3 Trinity Close, London Borough of Camden.

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REPORT SUMMARY

The assessment findings are summarised as follows:

1. Risk of basement impact on surface water flows	High	
	Med	
	Low	
2. Risk of basement impact on groundwater levels and flows	High	
	Med	
	Low	
3. Risk of flooding at the site	High	
	Med	
	Low	

Key:

High		*There is a high potential risk*
Med		*There is medium potential risk*
Low		*There is a low potential risk*

RECOMMENDATIONS

The development described in this report will not involve any increase in the impermeable surface area at the site, and therefore it will produce no changes to the rates of runoff from the site. The development will have no impact on surface water bodies in the area.

The site is not at risk of fluvial, tidal or surface water flooding. The site has no history of groundwater or sewer flooding.

The site occurs over the Claygate Member, a Secondary A aquifer. The proposed basement will intercept the water table in this formation, but will maintain sufficient flow paths beneath it and around it, such that the resulting impact on groundwater flows and levels will be negligible. The absence of any other basements at the same depth in the vicinity of the site will further ensure relatively undisturbed groundwater flows in the area.

Appropriate waterproofing of the basement structure is needed to minimise the impact of the permanent sump pump on groundwater levels in the vicinity of the site.

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1 INTRODUCTION

1.1 This Document

ESI Ltd. (ESI) was commissioned in September 2013 to undertake a Basement Impact Assessment for a basement development at 3 Trinity Close, NW3 1SD ("the site"), in the London Borough of Camden, at approximate grid reference TQ 26680 85670 (Figure 1).

This document is a desk study which considers the potential impact of the proposed development on surface water and groundwater flows, as well as its vulnerability to flooding, and complies with the Camden Development Policy DP27 and the Camden Planning Guidance CPG4 for basements and lightwells (Camden Council, 2013).

1.2 Scope of Works

The following scope of works was requested: an assessment of the impacts of the proposed basement on groundwater and surface water, its vulnerability to flooding from these sources, as well as its impact on ground stability, as specified in the guidance issued by Camden Council (2013). This report comprises the groundwater and surface water assessments. The ground stability assessment was completed by Soil Consultants Ltd., and is included in a separate report (Report Reference 9481/OT/AW, Soil Consultants Ltd., 2013).

An analysis of key hydrological and hydrogeological issues was undertaken, following the requirements in Camden Council's planning guidance on basements and light wells (Camden Council 2013). The Arup study on which this guidance is based was also consulted in the preparation of this report, as it provides important information on hydrological and geological conditions in the borough (Arup 2010).

The report has been set out with an initial screening assessment followed by a more detailed scoping assessment of specific items.

1.3 Proposed Basement Works

The proposed development involves excavating to a depth of 4 metres below ground level (mbgl), to construct a basement with an area of approximately 80 m^2 below the existing footprint of the property. A drained/pumped cavity around the perimeter of the basement is proposed for maintaining a dry structure (Site Plans included in Appendix A). It is assumed that the permanent sump pump will be sized based on the inflow volumes encountered during construction.

1.4 Site Description and Conceptual Model

The site occurs at an elevation of approximately 94 mAOD, on land sloping to the east, as shown on the Ordnance Survey (OS) 1:25,000 scale map presented in Figure 1. The site is within the catchment of the 'lost' river Fleet, which now flows through manmade culverts in a south-easterly direction at a distance just over 500 m to the east of the site. Natural surface runoff from the site is downslope, in an easterly direction, originally discharging into the river Fleet.

A borehole drilled by Herts & Essex Site Investigations on the 4th of June 2013, at a distance of approximately 9 m from the southern boundary of the proposed basement (Appendix B), shows made ground to a depth of 0.65 mbgl, followed by sandy clay to the base of the borehole, at a depth of 10 mbgl. Trial pits dug around the perimeter of the proposed basement by Site Analytical Services Ltd. in June 2012 to a maximum depth of 1.2 mbgl revealed made ground overlying very sandy silty clay (Appendix C).

Reference to the British Geological Survey (BGS) 1:50,000 scale geology map for the area (Figure 2), establishes the sandy clay and very sandy silty clay strata as part of the Claygate Member, which is constituted of interbedded clay, sand and silt layers. This formation is classified as a Secondary A aquifer by the Environment Agency (Arup 2010; Environment Agency, 2013). Flow in this formation occurs predominantly through the sandy layers, which

are expected to be in hydraulic continuity with the upgradient Bagshot sands and may also be hydraulically connected to the culverted river Fleet.

London Clay bedrock underlies the Claygate to a depth of at least 100 mbgl, according to a borehole drilled 40 m to the south-west of the site (Borehole TQ28/NE304, drilled in 1878, BGS Borehole Scans 2013). The London Clay has low permeability and effectively isolates the Lower aquifer, constituted of the Lambeth Group, Thanet Sands and Chalk formations (Arup, 2010).

The thickness of the Claygate Member below the site is unknown. The Herts & Essex borehole indicates a transition from orange brown sandy clay to dark grey sandy clay at a depth of 4.3 mbgl, which may represent the upper boundary of the London Clay Formation. However, this cannot be confirmed from available data and samples indicate a decrease in plasticity, and therefore a potential increase in permeability, across that boundary. Boreholes drilled 200 m to the south-west of the site (Boreholes TQ28/NE44, drilled in 1963, BGS Borehole Scans 2013) show the Claygate formation to extend to a depth of at least 12 mbgl.

The water level in the Herts & Essex borehole near the site was measured on three occasions, as detailed in the table below:

Date	**Groundwater level**	**Measured by**
7 June 2013	3.10 mbgl	Herts & Essex Site Investigations
10 June 2013	2.89 mbgl	Herts & Essex Site Investigations
2 October 2013	2.05 mbgl	Soil Consultants Ltd. (subcontracted to undertake a site visit and groundwater level measurement on behalf of ESI Ltd.)

These measurements show that a shallow groundwater system occurs within the Claygate formation below the site. The water table appears to exhibit significant seasonal fluctuations in the order of at least a metre (this estimate is based on the measurements presented above; additional groundwater level measurements would be needed to establish the range of groundwater levels in this system if required). Large water table variations over short time scales are characteristic of a thin perched aquifer (the Claygate) overlying an impermeable formation (the London Clay).

Buildings in the vicinity of the site predominately have lower ground floors, which extend no more than a couple metres below street level. One possible exception is the development in the vacant site near 2 Willoughby Road, for which works are currently on-going, and which is located at a distance of approximate 25 m south-east of the site. This development may include a full basement, with depth comparable to that proposed at 3 Trinity Close, though this information could not be verified from available documents on the Camden Council's website.

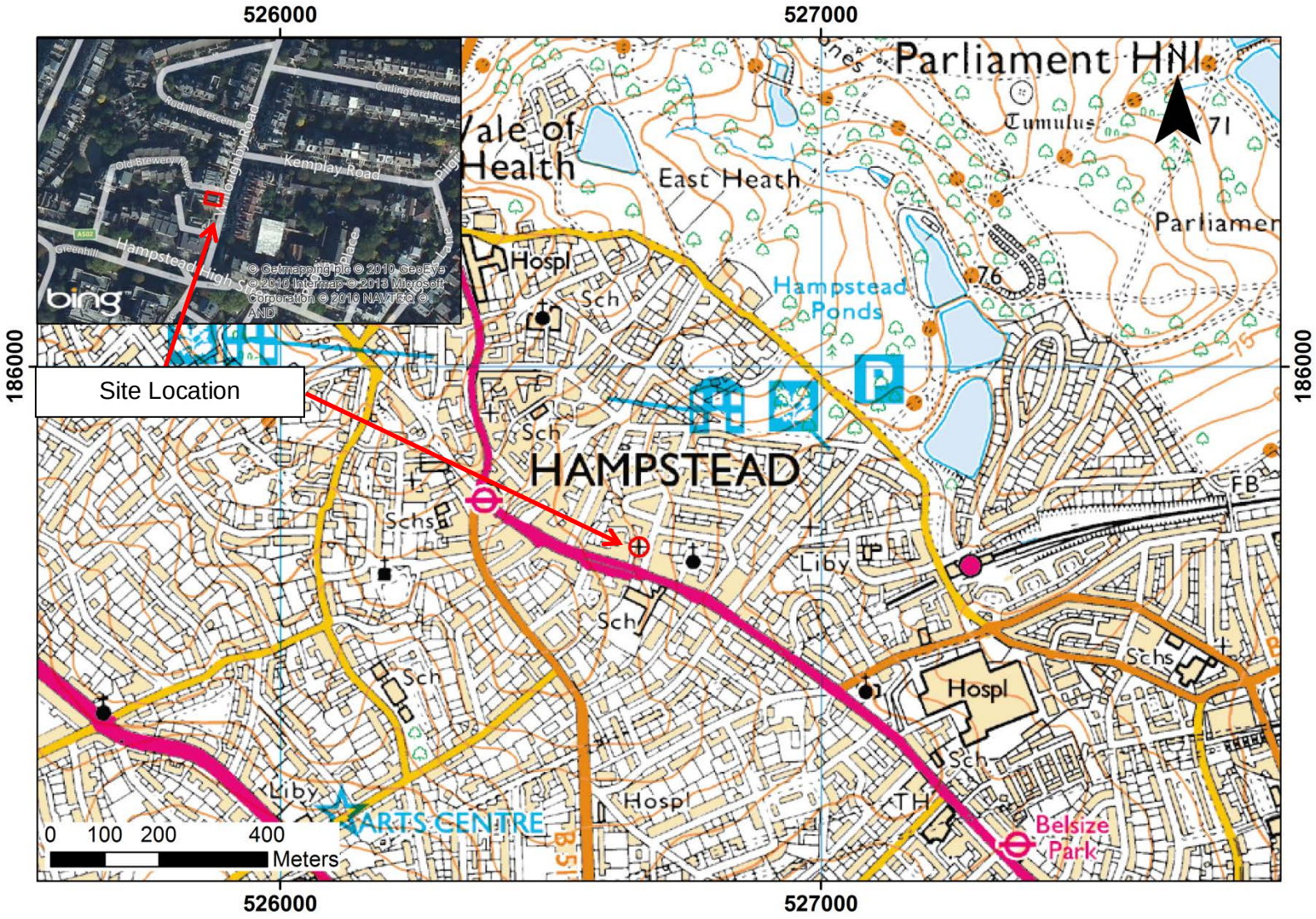

Figure 1 Site location.

Contains Ordnance Survey Data © Crown copyright and database rights 2013

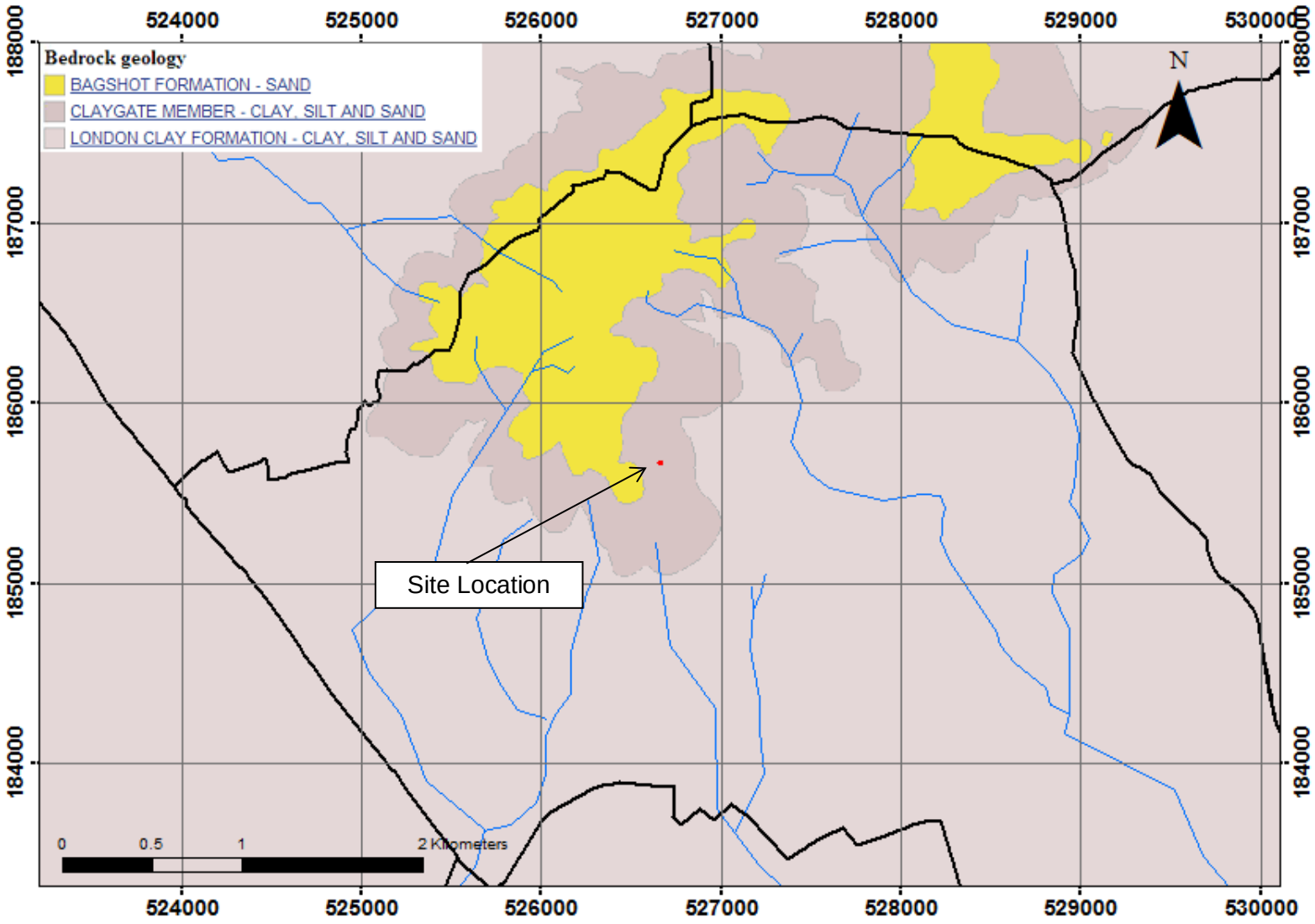

Figure 2 Site Geology

Contains British Geological Survey materials © NERC 2013.

2 SCREENING

The screening stage for Impact Assessment has been considered as set out in CPG4 (Camden Council, 2013) and the results have been tabulated below.

2.1 SURFACE WATER (Surface flow and flooding screening flowchart (Figure 3, CPG4 (Camden Council, 2013))

Impact question	Answer	Justification	Reference
1) Is the site within the catchment of the pond chains on Hampstead Heath?	**No**	The site is not within the catchment of the ponds on Hampstead Heath (Figure 14 of Arup (2010) report, reproduced and annotated in Appendix C)	Arup, 2010
2) As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	**No**	Given that the basement will be built below the footprint of the existing property, no significant alterations to surface flows are expected. Discharge of water from the permanent sump pump to the sewer system can be minimised by appropriate waterproofing of the basement structure.	Site Plans (Appendix A).
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**No**	The proposed basement is built under existing impermeable surfaces, predominantly below the footprint of the existing building. Therefore, there will be no change to the proportion of hard surfaced / paved external areas.	Site plans (Appendix A).
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?	**No**	The site is about 500 m west and upstream of the culverted river Fleet (Figure 2). Surface run-off from the site may discharge into this river via the surface drainage system. Given that the development will not change surface runoff from the site, the profile of surface water inflows to the river will be unchanged. Surface water features in the vicinity of the site are shown in Figure 12 of the Arup 2010 report (reproduced and annotated in Appendix C). This figure shows that the site is about 550 m west of the southernmost pond of the Hampstead Ponds chain. However, inspection of the area's topography, as well as reference to the Arup 2010 report (Figure 14, reproduced in Appendix C), shows that surface run-off from the site does not drain to this pond. Other water features within 1 km of the site similarly do not occur along the drainage pathway of surface runoff from the site.	Barton, 1992. Arup, 2010. Ordnance Survey Mapping.
5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**No**	Given that the proposed basement will not change surface water inflows to nearby water bodies, it will have no impact on the water quality of these features.	Barton, 1992. Ordnance Survey Mapping. Arup, 2010.

Impact question	Answer	Justification	Reference
6) Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	**No**	The site is not in a location susceptible to surface water flooding, as identified in the Arup 2010 report (Figure 15 of the Arup report, reproduced and annotated in Appendix C). The Site is not located in an area at risk from tidal flooding or reservoir failure according the Environmental Agency flood zone maps. The Site has no history of sewer flooding (Appendix D). The ground elevation at the site is at least 25 m above that of the culverted river Fleet, which is about 500 m from the site at its closest point. The site is similarly at least 10 m above the elevation of the Hampstead Ponds (Figure 1). Two ponds occur about 700 m north of the site, at a higher ground elevation (OS 1:25,000 map and Figure 12 of the Arup 2010 report, reproduced and annotated in Appendix C). However, inspection of the area's topography shows that they are not directly upstream of the site, and therefore could not flood it via surface flow pathways. Furthermore, given their small catchments and distance from the site, they have no potential to flood the site via groundwater pathways.	Environment Agency, 2013. Thames Water, 2013. Arup, 2010 Ordnance Survey Mapping.

2.2 GROUND WATER (Subterranean (ground water) flow screening chart (Figure 1, CPG4 (Camden Council, 2013))			
Impact question	**Answer**	**Justification**	**Reference**
1a) Is the site located directly above an aquifer?	**Yes**	The site is located on the Claygate Member (Figure 2), which is classified as a Secondary A aquifer by the Environment Agency. This means it is formed of permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Groundwater flow in the Claygate occurs primarily in its sand-dominated layers which have relatively high permeability (Arup 2010). It is uncertain whether the proposed basement will intercept such high-permeability layers. Ground investigations to date did not identify such layers, but indicate some variability in geological conditions around the site: The Herts & Essex borehole drilled approximately 10 m from the proposed basement showed high/intermediate plasticity sandy clay to a depth of 10 mbgl, whereas the trial pits dug by Site Analytical Services around the perimeter of the proposed basement intercepted intermediate/low plasticity, very sandy silty clay (these pits were dug to maximum depth of 1.2 mbgl).	Environment Agency, 2013. Arup 2010. Herts & Essex Site Investigation Report (Appendix B)
1b) Will the proposed basement extend beneath the water table surface?	**Yes**	Water level measurements taken in the Herts & Essex borehole, on three occasions in June and October 2013, show that the basement does intercept the water table in the Claygate, with its foundations extending to about 2 m below the water table.	Herts & Essex Site Investigation Report (Appendix B)
2) Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	**No**	There are no active wells, watercourses or spring lines known to exist within 100 m of the site. There is an abandoned well drilled in 1878 to a depth of 180 mbgl at the site of the old Hampstead Brewery, at a distance of 40 m south-west of the proposed basement. The well was abandoned and covered in 1932 (Borehole TQ28NE304, BGS Borehole Scans)	Barton, 1992 Arup 2010 Ordnance Survey Mapping British Geological Survey, 2013.
3) Is the site within the catchment of the pond chains on Hampstead Heath?	**No**	The site is not within the catchment of the ponds on Hampstead Heath, as demonstrated in section 2.1.	Arup, 2010
4) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**No**	The proposed basement would be sited beneath the footprint of the existing construction. This would result in no change in impermeable surfaces across the site.	Site Plans (Appendix A)

5) As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	**No**	No soakaways or other SUDS systems are planned for the development.	Site Plans (Appendix A)
6) Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring line.	**No**	As explained in question 6 of section 2.1, the only water features that occur at a higher elevation than the proposed basement are 700 m away and have small catchments. Therefore, they do not constitute a flood risk to the development.	Ordnance Survey Mapping Arup 2010.

3 SCOPING AND IMPACT ASSESSMENT

3.1 Surface water

The screening assessment has shown that the development is unlikely to impact surface water flows.

3.2 Groundwater

The proposed basement foundations will extend to a depth of 4 mbgl, about 2 m below the water table based on the available monitoring, and potentially more accounting for seasonal variation. However, the basement will have no significant impact on groundwater flows and levels in the area, as groundwater flows will be diverted beneath it and around it. This is supported by the following evidence:

- The Herts & Essex borehole does not intercept a distinct impermeable horizon, and instead indicates a potential increase in permeability associated with the transition from orange brown sandy clay to dark grey sandy clay at 4.3 mbgl. Therefore, groundwater flow paths should be maintained below the basement foundations to a depth of at least 10 mbgl (maximum depth of the borehole), beyond which geological conditions remain unknown.
- Minimal impact on groundwater flows is further supported by the small footprint of the basement (approximately 8m x 10m), and the absence of other basements of comparable depth within a 20 m radius of the site.

If required, construction dewatering at the site may temporarily lower groundwater levels in its vicinity. Operation of the permanent sump pump within the basement may also depress local water levels in the longer term, although suitable waterproofing of the basement should limit the extent of this.

Any effects of the basement on groundwater levels are likely to be negligible compared to the seasonal variation of the water table indicated by measurements taken in the Herts & Essex borehole drilled in the vicinity of the site, although more long term monitoring would be needed to confirm this, if required.

Construction will take place beneath the water table within the Claygate Member, a secondary aquifer comprising interbedded sand and clay layers. Appropriate measures should be taken to permit construction (and dewatering if required) should permeable horizons be encountered during the excavation.

4 CONCLUSIONS

Potential impacts of the proposed basement development at the site have been considered as set out in the scope of works. The following summary conclusions are made:

- The site is not at risk of fluvial or tidal flooding or flooding due to reservoir failure. The site is also at negligible risk of surface water flooding.
- The proposed basement development produces no changes to surface runoff at the site, and no impact on surface flows to adjacent properties or downstream water bodies.
- The basement will have no impact on ponds, springs, active wells or other water features.
- Based on the information available, the proposed basement is unlikely to change groundwater levels or flows significantly.
- Appropriate waterproofing of the basement structure is needed to minimize the impact of the permanent sump pump on groundwater levels in the vicinity of the site.
- Appropriate measures should be taken to permit construction (and dewatering if required) should permeable horizons be encountered during the excavation.

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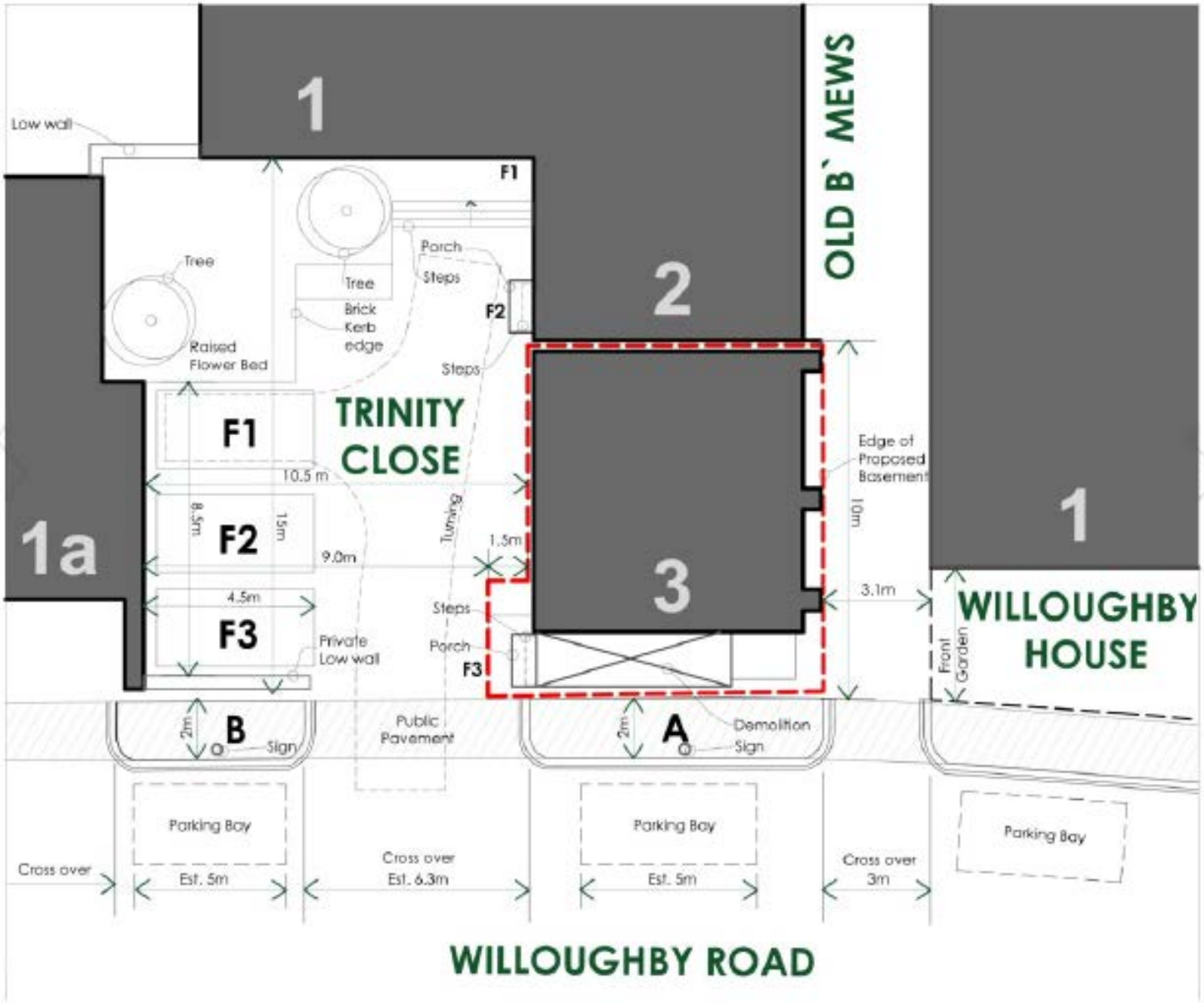
Ordnance survey mapping, 1:25,000. © Crown copyright. All rights reserved. Licence number AL 100015683

Thames Water, (2013). Sewer Flooding History Enquiry – 3 Trinity Close

APPENDICES

APPENDIX A

Site Plans



RIBA
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Disclaimer

Pls. read this drawing alongside the engineer info. & let us know if there's any difference between this & other tender information. It's best to use dimensions shown, as it's not advised to scale from this drawing. All contractors and suppliers should take their own site dims before final manufacture.

date	revision	auth
11.03.2013		MK

client
Mr S. Bradbury
3, Trinity Cl, Willoughby Road, Hampstead

project
3 Trinity Close
NW3 1SD

title
Existing Block Plan with Parking

[X] Draft [X] Planning [ ] B. Control
[ ] Tender [ ] Constr. [ ] Other

Stage A

no. & rev.
622-EP04

A3

This drawing must be read in conjunction with the specification and all other relevant drawings. Do not scale from this drawing.

SCHEME DESIGN ONLY: FINAL DESIGN SUBJECT TO FURTHER INVESTIGATIONS & TEMPORARY WORKS BY CONTRACTOR

MIN. 2No TRANSITION UNDERPINS

MIN 300 thk R.C UNDERPINNED RETAINING WALL FOOTING WIDTH ≥ EXISTING.

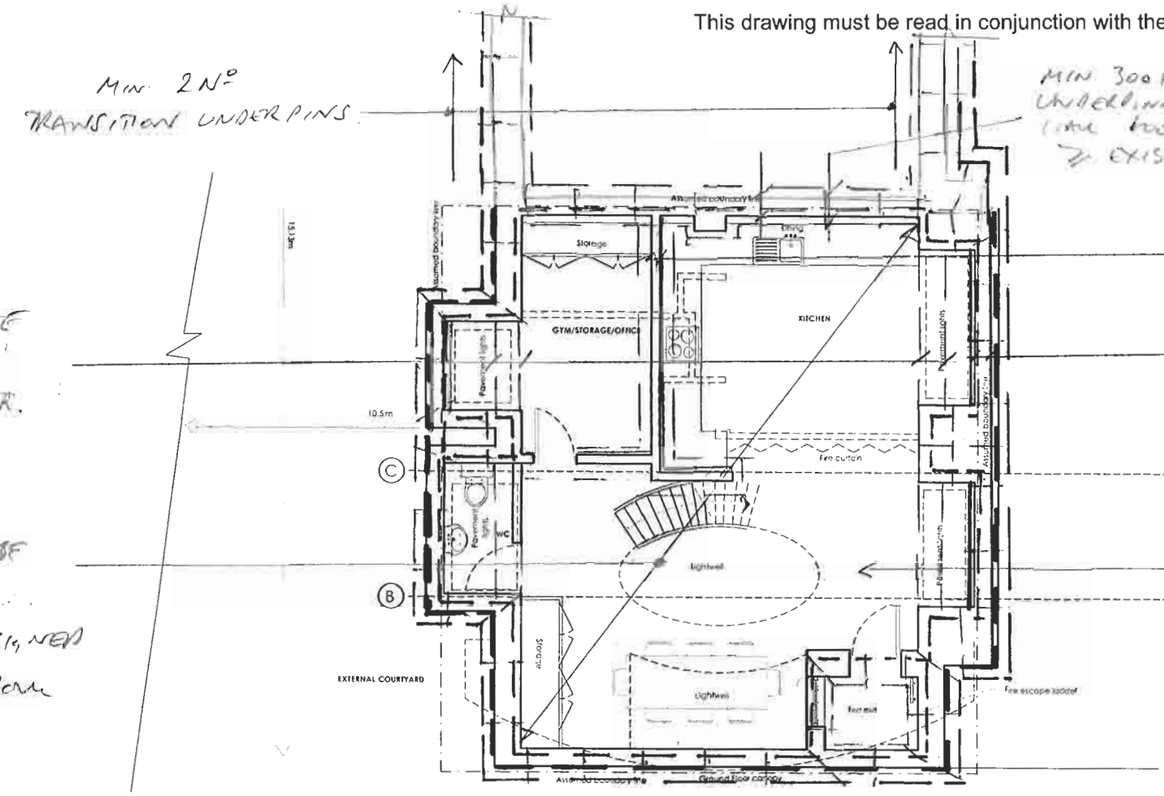
LOAD BEARING INTERNAL PARTITIONS 150mm THICK R.C. WALLS ON SLAB THICKENINGS

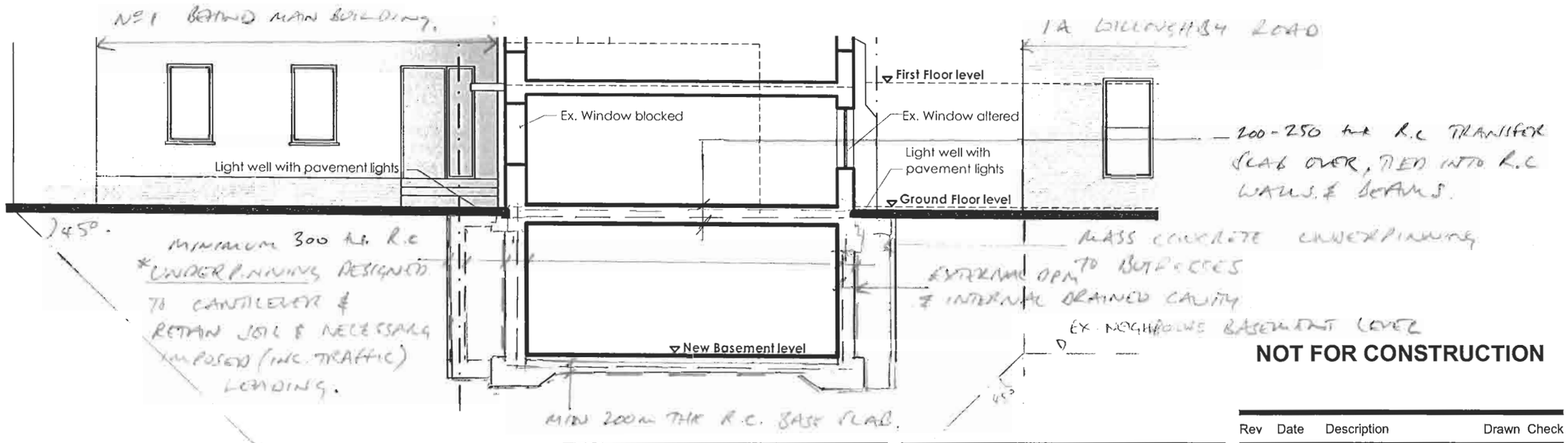
MIN 300 thk REINFORCED UNDERPINNING / RETAINING WALL

REINFORCED CONCRETE BEAMS / CONCRETE ENCASED STEELS OVER.

MIN 200 thk R.C. BASE SLAB TIED INTO R.C. RETAINING WALLS DESIGNED TO RESIST PRESSURE FROM LONDON CLAY.

REINFORCED CONCRETE SLAB OVER SUPPORTS STRUCTURE ABOVE & TIES GROUND FLOOR BASE OF WALL TOGETHER DURING CONSTRUCTION & IN PERMANENT CONDITION.





* STAGED CONSTRUCTION PROCESS IN MAX. 1000 mm SECTIONS TO AVOID UNDERMINING EXISTING CONSTRUCTION & SURROUNDING TRAFFICKED AREAS

NOT FOR CONSTRUCTION

conisbee
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Consulting Civil Engineers

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Project
3 TRINITY CLOSE

Title
STRUCTURAL SCHEME
BASEMENT PLAN & SECTION S'TH-N'TH

Rev	Date	Description	Drawn	Check

Drawing Status: PRELIMINARY			Project No: 120445
Date: JUNE 2012	Drawn: HH		Drawing No: S100
Scale: 1:100@A3	Engineer: HH		Revision: P1

APPENDIX B

Site Investigation Report by Herts & Essex Site Investigations

June 2013

HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon,
Ware, Herts, SG11 1NJ

Telephone : Ware (01920) 822233
Fax: Ware (01920) 822200

17th June 2013

Our Ref : MRS/11500

Ms S.Bradbury
3 Trinity Close
Willoughby Road
London
NW3 1SD

Dear Sirs,

Re: 3 Trinity Close, Willoughby Road, London NW3 1SD : Site Investigation

1.0 Introduction

1.01 In accordance with your instructions, we visited the above site during June 2013.

1.02 The purpose of our visit was to carry out an investigation into the subsoil conditions with a view to foundation design.

1.03 The comments and opinions expressed are based purely on the conditions encountered and the subsequent laboratory testing.

1.04 Therefore, it is possible that some special conditions prevailing on site have not been encountered or taken into account.

1.05 All ground water recordings or their absence relate to short term observations and do not allow for fluctuations due to seasonal or other effects.

2.0 Description of Site

2.01 The site is situated at 3 Trinity Close, Willoughby Road, London NW3 1SD.

2.02 At the time of our visit the site was generally flat.

3.0 Fieldwork

3.01 One borehole was sunk to a maximum depth of 10.00m by means of a window sampler drilling rig.

3.02 The location of the works is indicated on the site plan forming appendix one.

3.03 The various strata and details encountered were noted and are recorded on the borehole logs forming appendix two.

3.04 Insitu strength tests were carried out in the boreholes, the results of which can be seen on the aforementioned logs.

3.05 A full range of samples were recovered as noted and retained for subsequent laboratory testing.

3.06 The location, type and height of any trees should be taken from a survey for later use with NHBC Chapter 4.20, if required.

4.0 Laboratory Testing

4.01 All samples were tested in accordance with BS:1377:1990 Methods of Test for Soils for Civil Engineering purposes.

4.02 Selected samples were tested to determine their atterberg limits, triaxial strength, soluble sulphate content and pH value.

4.03 The results of all laboratory testing are summarised in appendix three.

5.0 Conclusions and Recommendations

5.01 By inspection of the borehole log it can be seen that the subsoil consists of a Granite Cobble Over Concrete to 0.25m where a Soft To Firm Brown Sandy Clay Ash Brick FILL is present to 0.65m above Soft To Firm Becomming Stiffer With Depth Orange Brown to Dark Grey Sandy CLAYS, which are encountered and present to the close of the borehole.

5.02 Water was encountered upon excavation of the boreholes as described on the borehole logs, standing water at 5.67m a standpipe was installed at 6m deep.
Water Levels
3.10m 7/6/13
2.89m 10/6/13

5.03 No significant roots were encountered in the boreholes beyond 0.60m.

5.04 Laboratory testing proved the clays to be of Intermediate to high plasticity (PI=28 - 38%) which indicates a moderate susceptibility to movement associated with moisture content change.

5.05 Triaxial testing proved the CLAYS to have cohesion values between 22 - 101 Kn/m² these values are generally seen to increase with depth.

5.06 Therefore when considering the information available we are of the opinion that a the basement can take the form of a reinforced raft with walls designed to take the pressure of the retained soil.

5.07 Further investigation may be required in order to locate existing foundations within the area of the site which may restrict any future works.

5.08 As the site contains less than 0.50g/L of soluble sulphate it can be categorised as a class 1 site in accordance with BRE Digest, and as such any concrete in contact with the subsoil needs no special precautions.

5.09 Chemical testing is enclosed and the two samples tested are seen to be clean and uncontaminated hence the site can be developed in the conventional manor.

We hope that this is satisfactory, however if you should require any further information, please do not hesitate to contact us.

Yours faithfully,

M. R. Smith M.Sc
Principal Engineer

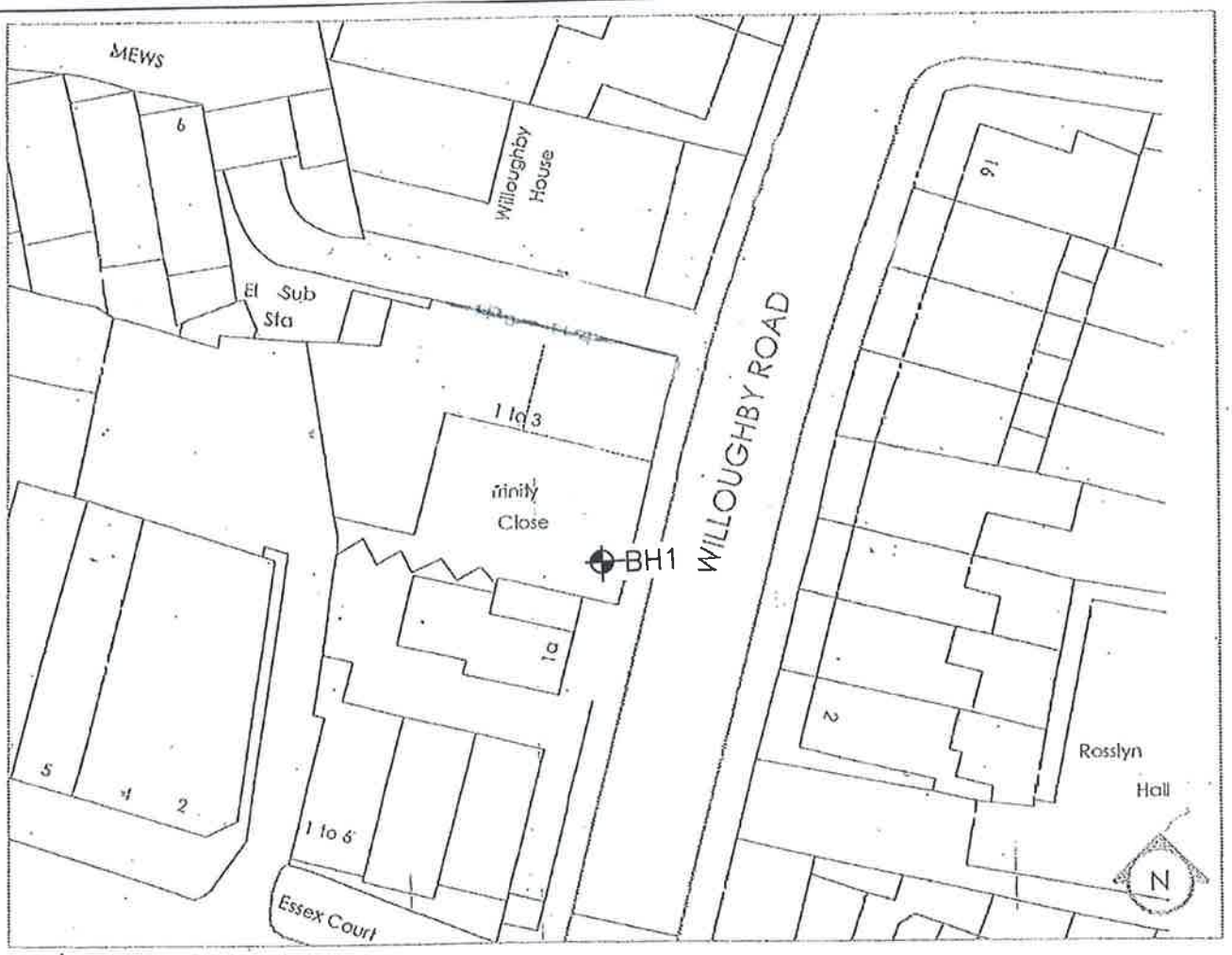
HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon, Ware, Herts SG11 1NJ
Telephone: Ware (01920) 822233
Fax: Ware (01920) 822200

Appendix No.	1
Sheet No.	1
Job No.	11500
Date	June 2013

3 Trinity Close, Willoughby Road, Hampstead NW3 1RP

Site Plan



3 TrinityClose Hampstead OS Map 1:1250

HERTS & ESSEX SITE INVESTIGATIONS

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Appendix No. 2
Sheet No. 1
Job No. 11500
Date June 2013

3 Trinity Close, Willoughby Road, Hamstead, NW3 1RP

Borehole One

Description of Strata	Depth	Reduced Level	Legend	Thickness (m)	Water Level	Samples No.	Samples Type	Samples Depth (m)	S.P.T N-Value or Vane Strength	Casing Depth (m)
Granite Cobble	0.10			0.10	Standing Water at 5.67m	1	U	0.00		
Concrete	0.25			0.15						
Soft To Firm Brown Sandy Clay Ash Brick FILL	0.65			0.40						
Soft To Firm Becomming Firm Orange Brown Sandy CLAY	4.30			3.65		2	U	1.00		1.00
						3	U	2.00		
						4	U	3.00		
						5	U	4.00		
Firm To Stiff Dark Grey Sandy CLAY	5.70			1.40		6	U	5.00		
Stiff Dark Grey Sandy CLAY						7	U	6.00		
						8	U	7.00		
						9	U	8.00		
				4.30		10	U	9.00		
Borehole Complete At 10.00 M	10.00									

Remarks:
Standpipe Installed at 6.00m

Scale 1:50

Key : U–Undisturbed Sample (100mm diameter) B –Bulk Sample ▼ –Water Struck D –Disturbed Sample ▽ –Water Standing W–Water Sample P–Piston Sample N–S.P.T. N–Value V–Vane Strength (kN/m²)

HERTS & ESSEX SITE INVESTIGATIONS

Warren House, Bells Hill, Bishop's Stortford, Herts. CM23 2NN
Telephone: Bishops Stortford (01279) 506725
Fax: Bishops Stortford (01279) 506724

Appendix No. 3
Sheet No. 1
Job No. 11500
Date June 2013

LOCATION 3 Trinity Close, Willoughby Road, Hampstead

LIQUID AND PLASTIC LIMIT TEST RESULTS

Borehole	Depth (m)	Sample	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Group Symbol	Desiccation Profile	Percentage Retained 425 Micron Sieve (%)
1	1.00	U	30	57	19	38	CH		0
1	3.00	U	32	53	19	34	CH		0
1	5.00	D	29	40	11	29	CI		0
1	8.00	U	23	39	11	28	CI		0

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Appendix No. 3
Sheet No. 2
Job No. 11500
Date June 2013

LOCATION 3 Trinity Close, Willoughby Road, Hampstead

UNDRAINED COMPRESSION TEST RESULTS

Borehole	Depth (m)	Sample	Natural Moisture Content (%)	Bulk Density (Mg/m^3)	Lateral Pressure (kN/m^2)	Deviator Stress (kN/m^2)	Apparent Cohesion (kN/m^2)	Angle of Shearing Resistance	Remarks
1	1.00	U	30	1.94	20	44	22		
1	2.00	U	32	1.96	40	64	32		
1	3.00	U	32	1.98	60	88	44		
1	4.00	U	28	2.01	80	89	45		
1	5.00	U	29	2.00	100	108	54		
1	6.00	U	29	2.01	120	114	57		
1	7.00	U	25	2.03	140	166	83		
1	8.00	U	23	2.02	160	173	87		
1	9.00	U	26	2.04	180	202	101		

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Appendix No. 3
Sheet No. 3
Job No. 11500
Date June 2013

LOCATION 3 Trinity Close, Willoughby Road, Hampstead

SULPHATE ANALYSIS TEST RESULTS

Borehole	Depth (m)	Sample	Concentrations of Soluble Sulphate			Classification	pH
			Soil		Groundwater		
			Total SO_4 (%)	SO_4 in 2:1 water:soil (g/l)			
1	1.00	U		0.18			7.28
1	3.00	U		0.17			7.56
1	8.00	U		0.08			7.82

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Newmarket
CB8 0AL
Tel: 01638 606070

Herts & Essex Site Investigations
The Old Post Office
Wellpond Green, Standon
Ware, Hertfordshire
SG11 1NJ

FAO Martyn Smith
17 June 2013

Dear Martyn Smith

Test Report Number **232055**
Your Project Reference **11500 - 3 Trinity Close, Willoughby Road, Hempstead**

Please find enclosed the results of analysis for the samples received 11 June 2013.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Phil Hellier, Director

2183

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are outside of the scope of UKAS accreditation*
- *The results relate only to the items tested*
- *Stones represent the quantity of material removed prior to analysis*
- *All results are expressed on a dry weight basis*
- *The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, phenols*
- *For all other tests the samples were dried at < 37°C prior to analysis*
- *Uncertainties of measurement for the determinands tested are available upon request*
- *Soil descriptions, including colour and texture, are beyond the scope of MCertS accreditation*
- *None of the test results included in this report have been recovery corrected*

Herts & Essex Site Investigations
The Old Post Office
Wellpond Green, Standon
Ware, Hertfordshire
SG11 1NJ

FAO Martyn Smith

LABORATORY TEST REPORT

Results of analysis of 2 samples received 11 June 2013

11500 - 3 Trinity Close, Willoughby Road, Hempstead

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Report Date
17 June 2013

Login Batch No					232055	
	Chemtest LIMS ID				AI80545	AI80546
	Sample ID				WS1	WS1
	Sample No				U	U
	Sampling Date				6/6/2013	6/6/2013
	Depth				0.50m	1.20m
	Matrix				*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*		
2030	Moisture		%	n/a	21	20
	Stones content (>50mm)		%	n/a	<0.02	<0.02
2040	Soil colour			M	brown	brown
	Soil texture			M	clay	clay
	Other material			M	stones	none
2010	pH			M	9.0	8.3
2020	Electrical Conductivity (2:1)	EC	µS cm-¹	N	300	250
2300	Cyanide (free)	57125	mg kg-¹	M	<0.5	<0.5
	Cyanide (total)	57125	mg kg-¹	M	<0.5	<0.5
2625	Organic matter		%	M	1.3	0.53
2120	Boron (hot water soluble)	7440428	mg kg-¹	M	0.4	<0.4
	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	<0.01	<0.01
2490	Chromium (hexavalent)	18540299	mg kg-¹	N	<0.5	<0.5
2430	Sulfate (total) as SO4	14808798	%	M	0.07	<0.01
2450	Arsenic	7440382	mg kg-¹	M	22	12
	Cadmium	7440439	mg kg-¹	M	<0.10	<0.10
	Chromium	7440473	mg kg-¹	M	35	34
	Copper	7440508	mg kg-¹	M	35	13
	Mercury	7439976	mg kg-¹	M	0.44	<0.10
	Nickel	7440020	mg kg-¹	M	15	16
	Lead	7439921	mg kg-¹	M	88	25
	Zinc	7440666	mg kg-¹	M	45	41
2700	Naphthalene	91203	mg kg-¹	M	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-¹	M	< 0.1	< 0.1

All tests undertaken between 11/06/2013 and 17/06/2013

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Herts & Essex Site Investigations
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Wellpond Green, Standon
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FAO Martyn Smith

LABORATORY TEST REPORT

Results of analysis of 2 samples received 11 June 2013

11500 - 3 Trinity Close, Willoughby Road, Hempstead

Chemtest
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Report Date
17 June 2013

					232055	
					AI80545	AI80546
					WS1	WS1
					U	U
					6/6/2013	6/6/2013
					0.50m	1.20m
					SOIL	*SOIL*
2700	Acenaphthene	83329	mg kg^{-1}	M	< 0.1	< 0.1
	Fluorene	86737	mg kg^{-1}	M	< 0.1	< 0.1
	Phenanthrene	85018	mg kg^{-1}	M	0.25	< 0.1
	Anthracene	120127	mg kg^{-1}	M	0.16	< 0.1
	Fluoranthene	206440	mg kg^{-1}	M	0.25	< 0.1
	Pyrene	129000	mg kg^{-1}	M	0.17	< 0.1
	Benzo[a]anthracene	56553	mg kg^{-1}	M	< 0.1	< 0.1
	Chrysene	218019	mg kg^{-1}	M	< 0.1	< 0.1
	Benzo[b]fluoranthene	205992	mg kg^{-1}	M	< 0.1	< 0.1
	Benzo[k]fluoranthene	207089	mg kg^{-1}	M	< 0.1	< 0.1
	Benzo[a]pyrene	50328	mg kg^{-1}	M	< 0.1	< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg^{-1}	M	< 0.1	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg^{-1}	M	< 0.1	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg^{-1}	M	< 0.1	< 0.1
	Total (of 16) PAHs		mg kg^{-1}	M	< 2	< 2
2920	Phenols (total)		mg kg^{-1}	N	<0.3	<0.3

All tests undertaken between 11/06/2013 and 17/06/2013

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SG11 1NJ

FAO Martyn Smith
17 June 2013

Dear Martyn Smith

Test Report Number **232055**
Your Project Reference **11500 - 3 Trinity Close, Willoughby Road, Hempstead**

Please find enclosed the results of analysis for the samples received 11 June 2013.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Phil Hellier, Director

UKAS TESTING
2183

ISO 14001 sira UKAS ENVIRONMENTAL MANAGEMENT 011

Notes to accompany report:

- *The in-house procedure is employed to identify materials and fibres in soils*
- *The sample is examined by stereo-binocular and polarised light microscopy*
- *Sample size is reduced by coning and quartering to obtain a representative sub-sample if necessary*
- *The bulk identification is in accordance with the requirements of the analyst guide (HSG 248)*
- *Samples associated with asbestos are retained for six months*
- *The results relate only to the items tested as supplied by the client*
- *Comments or interpretations are beyond the scope of UKAS accreditation*

Herts & Essex Site Investigations
The Old Post Office
Wellpond Green, Standon
Ware, Hertfordshire
SG11 1NJ

FAO Martyn Smith

LABORATORY TEST REPORT
Asbestos in Soils

Chemtest

Results of analysis of 2 samples
received 11 June 2013
11500 - 3 Trinity Close, Willoughby Road, Hempstead

Report Date
17 June 2013

Login Batch No: 232055

Qualitative Results

				SOP 2190	
				ACM Type	Asbestos Identification
Chemtest ID	Sample ID	Sample Desc	Depth (m)		
AI80545	WS1	U	0.50	-	No Asbestos Detected
AI80546	WS1	U	1.20	-	No Asbestos Detected

The detection limit for this method is 0.001%

Signed

Albert Vella
Senior Environmental Surveyor

All tests undertaken between 17-Jun-2013 and 17-Jun-2013