BIA Addendum

Information for Submission to Camden Council for discharge of Conditions 7a & 7c of Planning Permission 2012/4744/P

in relation to development at

12 Elsworthy Road

London

NW3 3DJ

for

Jonathan Hilliard QC

LBH4411 Ver 1.1

August 2016

LBH WEMBLEY

Geotechnical & Environmental

Project No: LBH4411

Report Ref: LBH4411 Ver 1.1

Date: 9th August 2016

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Foreword-Guidance Notes

GENERAL

This report has been prepared for a specific client and to meet a specific brief. The preparation of this report may have been affected by limitations of scope, resources or time scale required by the client. Should any part of this report be relied on by a third party, that party does so wholly at its own risk and LBH WEMBLEY Geotechnical & Environmental disclaims any liability to such parties. The data given within the Appendix should not be reproduced without the accompanying text that constitutes an interpretation of that data. LBH WEMBLEY Geotechnical & Environmental will not be responsible for any other interpretation of the data.

The observations and conclusions described in this report are based solely upon the agreed scope of work. LBH WEMBLEY Geotechnical & Environmental has not performed any observations, investigations, studies or testing not specifically set out in the agreed scope of work and cannot accept any liability for the existence of any condition, the discovery of which would require performance of services beyond the agreed scope of work.

VALIDITY

Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in the future and any such reliance on the report in the future shall again be at the client's own and sole risk. LBH WEMBLEY Geotechnical & Environmental should in all such altered circumstances be commissioned to review and update this report accordingly.

CONTAMINATION

Unless detailed in the report, no contamination investigation has been undertaken and no consideration has been given to any special measures that may be necessary in connection with possible contamination. Unless specifically commented upon, no approach has been made to the Local Authority or Environment Agency in order to establish any further information or requirements that may affect this site.

THIRD PARTY INFORMATION

The report may present an opinion on the disposition, configuration and composition of soils, strata and any contamination within or near the site based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

DRAWINGS

Any plans or drawings provided in this report are not meant to be an accurate base plan, but are used to present the general relative locations of features on, and surrounding, the site.

1. Introduction

1.1 Background

Planning was granted in August 2013 by London Borough of Camden for the enlargement of the existing cellar to create a new basement storey, including creation of a front lightwell and sunken courtyard to the rear, under planning reference 2012/4744/P.

The following condition was imposed:

7) Prior to commencement of works on site the following information shall be submitted to and approved by the Council.

a) The results of the proposed site investigation and laboratory testing to check for desiccation and the estimation of possible movements based thereon;

b) The final engineering design drawings, including any resultant changes;

c) The ground movement/heave analysis; and

d) Temporary works design drawings and details.

The relevant part of the works shall be carried out in accordance with the details thus approved.

Reason: To protect the structural stability of the host building and neighbouring buildings, in accordance with policies CS5 and CS14 of the London Borough of Camden Local Development Framework Core Strategy and policies DP24, DP25, DP26 and DP27 of the London Borough of Camden Local Development Framework Development Policies.

1.2 Brief

LBH WEMBLEY Geotechnical & Environmental have been appointed by Mr. Jonathan Hilliard as geotechnical consultants to this project in order provide information to assist the discharge of sections 7a & 7c.

1.3 Existing Reports and Drawings

The following documents have been taken into account:

- Site Investigation and Basement Impact Assessment Report, prepared by GEA, dated June 2013 (ref J12192)
- Independent Assessment of Basement Excavation, prepared by Chelmer Consultancy Services, dated April 2013 (ref BIA/3685)
- Construction Method Statement, prepared by Structural Engineering Services (SES), dated May 2016 (ref SES/2015/PB/20)
- Calculation Package, prepared by SES, dated April 2016 (ref SES/2015/PB/20)
- Structural engineering drawings prepared by SES, dated March 2016 (ref SES/2016/PB/20/01 to 05)
- Arboricultural Impact Assessment, prepared by Arbtech Environmental Services, dated August 2012

1.4 Additional Investigation

A further ground investigation has been undertaken in order to assess whether the Robinia tree (removed in May 2013, under planning application 2013/2693/T) has caused desiccation beneath the rear walls of Nos 10 & 12.

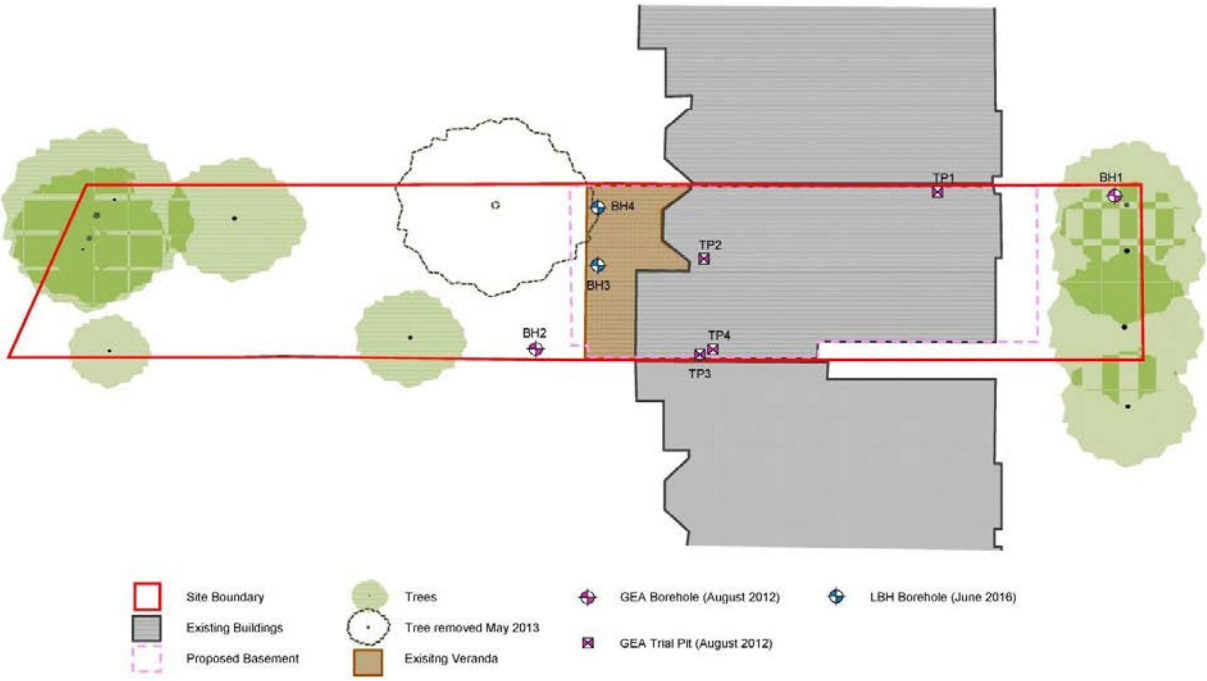
1.5 Ground Movement Assessment

In addition to the supplementary ground investigation a quantitative assessment of possible heave caused by both the removal of the above tree and the unloading of the London Clay is presented.

2. Additional Investigation

2.1 Additional Ground Investigation

Two 7m additional handheld window sampler boreholes have now been constructed through the existing veranda close to the existing buildings rear wall. The borehole records, together with the results of geotechnical laboratory tests carried out on selected soil samples are appended.



2.2 Desiccation

The London Clay was found to be present in the additional boreholes at less than 1m depth below garden level (+48.5 mOD). The clay initially comprises weathered firm to stiff, orange-brown and mottled grey silty clay, becoming very stiff from around 4m depth (+44.5m OD). The clay soils encountered showed no visual signs of desiccation.

The results of laboratory plasticity index testing have confirmed the London Clay to be of high shrinkability, but to have not been affected by desiccation.

3. Ground Movement Assessment

The completed basement will potentially be subjected to net uplift forces unless the mass of the structure is greater than the weight of soil removed. An analysis of ground movement has been carried for the envisaged various phases of excavation and construction.

3.1 Ground Model

The follwoing soil model has been devised for the site based upon published information on the London Clay, results of the ground investigations and results from previous investigations at nearby sites. An average undrained shear strength (Cu) is taken to be 50 kN/m^2 at the surface of the Clay increasing at approximately 8kN/m^2 per m depth.

Analysis Layer:	Upper Boundary (m OD)	Thickness (m)	Average C_u (kN/m^2)	Soil Stiffness (kN/m^2)	
				E_u	E'
London Clay	+46.5	3	50	22500	12500
London Clay	+43.5	3	74	33300	18500
London Clay	+40.5	3	98	44100	24500
London Clay	+37.5	3	122	54900	30500
London Clay	+34.5	4	154	69300	38500
London Clay	+30.5	4	186	83700	46500
London Clay	+26.5	4	218	98100	54500
London Clay	+22.5	6	266	119700	66500
Assumed Rigid	+16.5				

The Undrained Modulus of Elasticity (Eu) for the underlying clay has been based upon an empirical relationship of Eu = 450 x Cu, and the Drained Modulus of Elasticity (E') has been based upon an empirical relationship of 250 x Cu.

Poisson's Ratios of 0.5 and 0.1 have been used for short term (undrained) and long term (drained) conditions respectively.

The analysis, undertaken using the SAPPER programme, uses classic modified Boussinesq elasticity theory, assuming uniform (fully flexible) loading/unloading of rectangular areas applied to a semi-infinite elastic half-space, using the above parameters for stratified homogeneity and with the introduction of an assumed rigid boundary at approximately 30m depth.

The analysis calculates the theoretical Boussinesq elastic stress decrease due to the applied net unloadings (over the given unloaded areas) at the mid-level of a number of discrete soil layers.

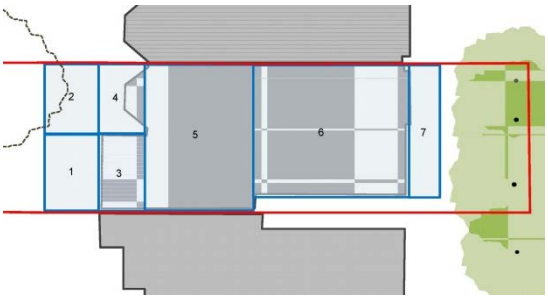
Short-term and long-term heave movements are then calculated at each layer, using the given values of Stiffness Moduli and Poisson's Ratio over the whole area of the site on a 1m by 1m grid.

3.2 Neighbouring Structures

The site is semi-detached, and shares a party wall with No. 10 Elsworthy Road, located along the sites north-eastern boundary. This property built at the same time as No. 12, this property is also three storeys and is thought to have a semi-basement and founds at the same depth.

No.14 Elsworthy Road, bounds the site to the southwest, and is also three storeys, assumed to have a semi-basement and founded at similar depths to No.12. There was previously an access route to the rear garden running adjacent to the existing garden wall. Over time, both No.12 and No.14 have partially closed this access way, now sharing the garden wall, and utilising it as an external wall. Trial pits have indicated that this garden wall sits at a higher founding level, than the foundations for both No.12 and No.14.

3.3 Short Term Heave Movements due to Excavation



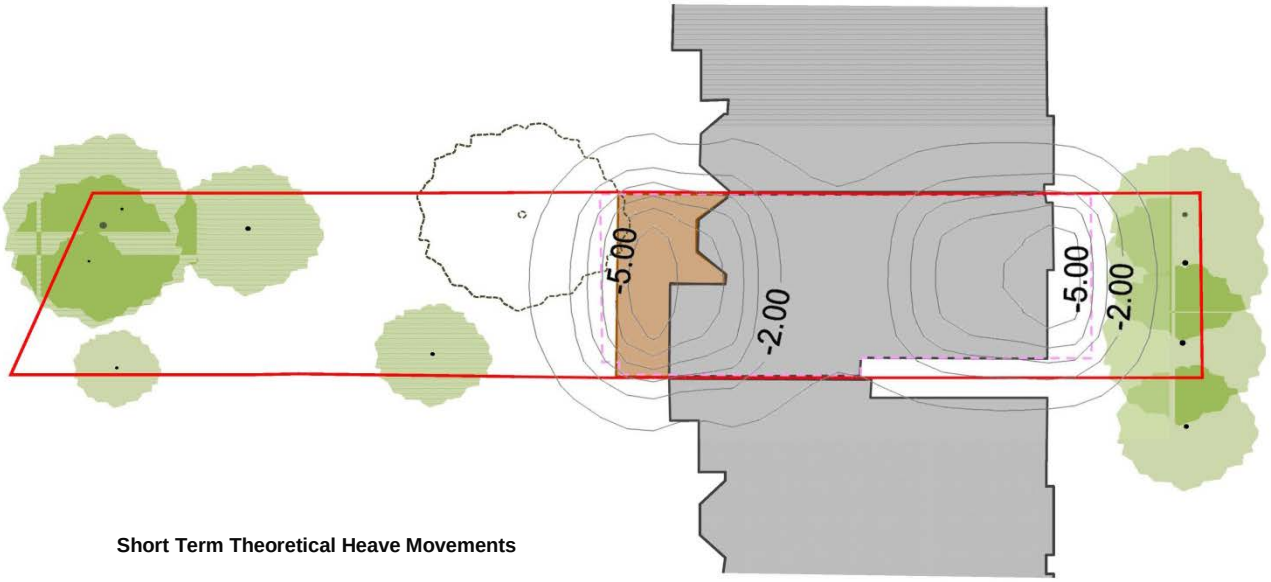
Areas	X1	Y1	X2	Y2	Loading (kN/m^2)
1	24.5	10	27	14	-38
2	24.5	14	27	17.5	-38
3	27	10	29.5	14	-38
4	27	14	29.5	17.5	-38
5	29.5	10	26.5	17.5	-29
6	36.5	10.5	42	17.5	-29
7	42	10.5	43.5	17.5	-58

Loaded Areas Input Details

Due to the varied excavation depths required for the proposed basement, a number of rectangular load areas have been modelled.

The maximum potential effect of the planned basement excavations is estimated to be -58kN/m^2, reducing to a minimum potential effect of -29KN/m^2.

Based on the short term situation the analysis suggests that, by the time basement excavation is complete, less than 5mm of theoretical heave is generally likely to have taken place within the excavation.



Short Term Theoretical Heave Movements

3.4 Short Term Movements due to Tree Removal

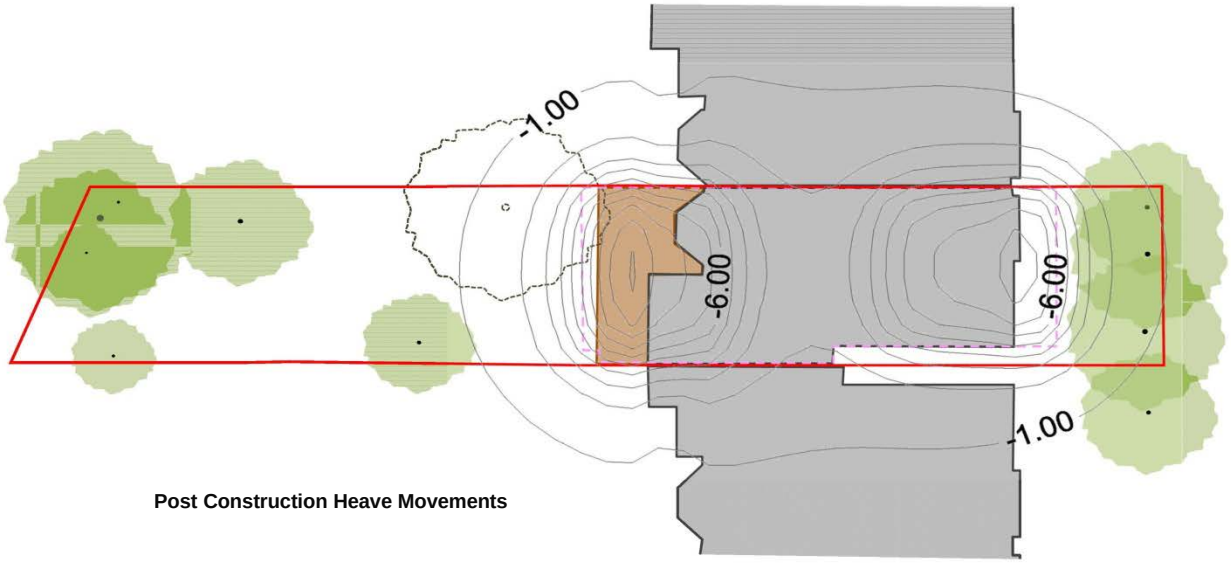
In view of the fact that the soils close to the existing building showed no signs of being affected by desiccation, it is envisaged that the removal of the Robinia Tree will not lead to any heave movements affecting either No. 10 or No.12 Elsworthy Road.

3.5 Long Term Heave Movements

Following excavation, loading will be applied to the soil as a result of the proposed basement structure. This loading will be transferred to the London Clay by means of underpinning.

However, it is evident that there is a mismatch between the weight of soil that is to be removed during the basement excavation and the weight of the new structure that is to replace this. In this situation there will inevitably be a component of long term heave movement that could proceed for several decades.

On a worst-case assumption that no loading was to be re-applied to the area of excavation, a post construction theoretical heave of approximately 10mm is indicated within the new basement area.



Post Construction Heave Movements

However, given the intended construction and the weight of the new buildings predicted theoretical post construction movements are again indicated to be less than about 5mm.

3.6 Impact on neighbouring structures

The Camden Planning Guidance (CPG4) states that "*the design and construction methodology should aim to limit damage to the existing building on the site and to all adjoining buildings to Category 1 … and should never be more than Category 2"*.

In view of the potential party wall movements described above, regardless of actual movements of the surrounding ground, the expectation of vertical movements affecting the party walls could potentially be 5mm.

The ground settlements behind a conventionally underpinned wall cannot be modelled. However, it can be stated that, provided horizontal movements can be adequately limited by good workmanship and temporary propping, the scale of damage will be minimised.

Broadly speaking, it is assessed that if overall lateral ground movements can be limited to less than 5mm, Burland scale Category 1 (Very Slight) damage to No. 10 and No.12 Elsworthy Road can be expected for the situation at this site.

APPENDIX

SITE PLAN SHOWING EXPLORATORY POSITIONS

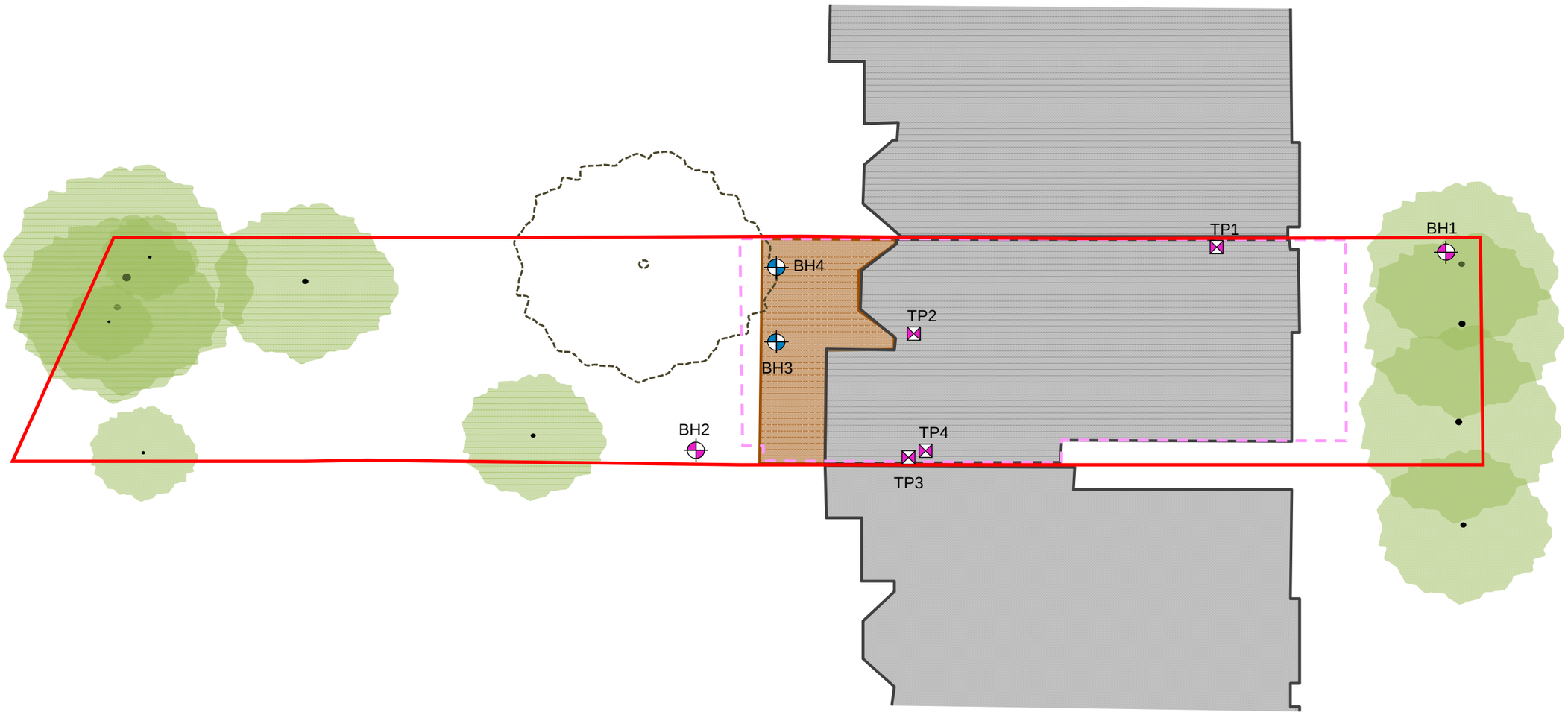
EXPLORATORY BOREHOLE RECORDS

GEOTECHNICAL TEST RESULTS

PROJECT: 12 Elsworthy Road
CLIENT: Jonathan Hilliard

LBH4411

SITE PLAN



LBH WEMBLEY Geotechnical & Environmental

PROJECT: 12 Elsworthy Road, London, NW3 LBH4411

CLIENT: Mr J Hilliard

BOREHOLE WS1

BORING METHOD: Handheld Dynamic Window Sampler

Date: 09/06/16

GROUND WATER: Perched water encountered at base of made ground 0.9m

REMARKS:

G.L +48.5 m OD

Samples No	Samples Type	Depth m	Tests	Legend	Depth m	Description
					0.50	MADE GROUND (100mm concrete over dirty brown clayey sandy fill, with scattered concrete and brick fragments)
1	D	0.50			0.90	MADE GROUND (reworked orange-brown clay with scattered concrete fragments)
2	D	1.00				Firm to stiff orange-brown mottled grey sily CLAY
3	D	1.50				
4	D	2.00				
5	D	2.50				
6	D	3.00				
7	D	3.50				
8	D	4.00				….becoming v.stiff
9	D	4.50				
10	D	5.00				

U=Undisturbed
B= Bulk
D=Disturbed
W=Water

Sheet No:

PROJECT: 12 Elsworthy Road, London, NW3 LBH4411

CLIENT: Mr J Hilliard

BOREHOLE WS1

BORING METHOD: Handheld Dynamic Window Sampler

Date: 09/06/16

GROUND WATER: Perched water encountered at base of made ground 0.9m

REMARKS:

Samples No	Samples Type	Depth m	Tests	Legend	Depth m	Description
11	D	5.50				V.stiff orange-brown mottled grey silty CLAY
12	D	6.00			6.00	

U=Undisturbed
B= Bulk
D=Disturbed
W=Water

Sheet No:

PROJECT: 12 Elsworthy Road, London, NW3 LBH4411

CLIENT: Mr J Hilliard

BOREHOLE WS2

BORING METHOD: Handheld Dynamic Window Sampler

Date: 09/06/16

GROUND WATER: Perched water encountered at base of made ground 1.0m

REMARKS:

G.L +48.5 m OD

Samples No	Samples Type	Depth m	Tests	Legend	Depth m	Description
					0.50	MADE GROUND (100mm concrete over dirty brown clayey sandy fill, with scattered concrete and brick fragments)
1	D	0.50				MADE GROUND (reworked orange-brown clay with scattered concrete fragments)
2	D	1.00			1.00	
3	D	1.50				Firm to stiff orange-brown mottled grey sily CLAY
4	D	2.00				
5	D	2.50				
6	D	3.00				
7	D	3.50				
8	D	4.00				….becoming v.stiff
9	D	4.50				
10	D	5.00				

U=Undisturbed
B= Bulk
D=Disturbed
W=Water

Sheet No:

PROJECT: 12 Elsworthy Road, London, NW3 LBH4411

CLIENT: Mr J Hilliard

BOREHOLE WS2

BORING METHOD: Handheld Dynamic Window Sampler

Date: 09/06/16

GROUND WATER: Perched water encountered at base of made ground 1.0m

REMARKS:

Samples No	Samples Type	Depth m	Tests	Legend	Depth m	Description
11	D	5.50				V.stiff orange-brown mottled grey silty CLAY
12	D	6.00			6.00	

U=Undisturbed
B= Bulk
D=Disturbed
W=Water

Sheet No:

GroundTech Laboratories

Geotechnical Testing Facility

Slapton Hill Barn, Blakesley Road, Slapton, Towcester, Northants. NN12 8QD
Telephone: 01327 860947/860060 Fax: 01327 860430 Email: groundtech@listersgeotechnics.co.uk

Quality Assured to ISO 9001

SAMPLES				CLASSIFICATION TESTS							CLASSIFICATION TESTS							STRENGTH TESTS					CHEMICAL TESTS	
Test Location	Sample Type	Sample Depth -m	Test Type	MC %	LL %	PL %	PI %	Passing 425 µm %	Modified PI %	Class	Passing 63 µm %	MC/ LL	PL+ 2%	Liquidity Index	Loss on Ignition %	Soil Suction kPa	Bulk Density Mg/m3	Test Type	Cell Pressure kN/m2	Deviator Stress kN/m2	Apparent Cohesion kN/m2	ϕ	pH Value	Soluble Sulphate Content SO4 g/l
WS 1	D	0.50	PI/63	34	54	23	31	97	30	CH	87	0.63	25	0.35										
	D	1.00	PI/63	29	44	20	24	99	24	CI	87	0.66	22	0.38										
	D	1.50	PI/63	30	58	22	36	97	35	CH	87	0.52	24	0.22										
	D	2.00	PI/63	38	78	25	53	100	53	CV	99	0.49	27	0.25										
	D	2.50	PI/63	35	68	24	44	100	44	CH	97	0.51	26	0.25										
	D	3.00	PI/63	34	66	25	41	100	41	CH	94	0.52	27	0.22										
	D	3.50	PI/63	34	74	26	48	100	48	CV	97	0.46	28	0.17										
	D	4.00	PI/63	36	78	27	51	100	51	CV	99	0.46	29	0.18										
	D	4.50	PI/63	36	78	25	53	100	53	CV	98	0.46	27	0.21										
	D	5.00	PI/63	32	74	24	50	99	49	CV	94	0.43	26	0.16										
	D	5.50	PI/63	34	79	26	53	100	53	CV	97	0.43	28	0.15										
	D	6.00	PI/63	33	76	26	50	100	50	CV	98	0.43	28	0.14										
WS 2	D	0.50	PI/63	29	43	20	23	98	23	CI	89	0.67	22	0.39										
	D	1.00	PI/63	30	50	20	30	99	30	CI	88	0.60	22	0.33										
	D	1.50	PI/63	41	70	26	44	100	44	CH	98	0.59	28	0.34										
	D	2.00	PI/63	38	72	27	45	100	45	CV	99	0.53	29	0.24										
	D	2.50	PI/63	34	71	24	47	99	47	CV	97	0.48	26	0.21										
	D	3.00	PI/63	37	73	24	49	100	49	CV	99	0.51	26	0.27										
	D	3.50	PI/63	32	73	25	48	98	47	CV	94	0.44	27	0.15										
	D	4.00	PI/63	34	70	24	46	100	46	CH	96	0.49	26	0.22										
	D	4.50	PI/63	33	71	24	47	100	47	CV	96	0.46	26	0.19										
	D	5.00	PI/63	33	72	25	47	100	47	CV	96	0.46	27	0.17										
	D	5.50	PI/63	31	72	25	47	100	47	CV	96	0.43	27	0.13										

Symbols:

U	Undisturbed Sample	R	Remoulded	PI	Plasticity Index	T	Triaxial Undrained	L	100mm specimen
D	Disturbed Sample	63	Passing 63µm	F	Filter Paper Suction Tests	M	Multistage Triaxial	S	38mm specimen
B	Bulk Sample	H	Hydrometer	CC	Continuous Core	HP	Hand Penetrometer		
W	Water Sample	PSD	Wet Sieving			V	Vane Test		

LABORATORY TEST RESULTS

Project Reference
16.06.013

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Quality Assured to ISO 9001

SAMPLES				CLASSIFICATION TESTS							CLASSIFICATION TESTS							STRENGTH TESTS					CHEMICAL TESTS	
Test Location	Sample Type	Sample Depth -m	Test Type	MC %	LL %	PL %	PI %	Passing 425 µm %	Modified PI %	Class	Passing 63 µm %	MC/ LL	PL+ 2%	Liquidity Index	Loss on Ignition %	Soil Suction kPa	Bulk Density Mg/m3	Test Type	Cell Pressure kN/m2	Deviator Stress kN/m2	Apparent Cohesion kN/m2	ϕ	pH Value	Soluble Sulphate Content SO4 g/l
WS 2	D	6.00	PI/63	33	73	26	47	100	47	CV	98	0.45	28	0.15										

Symbols:

U	Undisturbed Sample	R	Remoulded	PI	Plasticity Index	T	Triaxial Undrained	L	100mm specimen
D	Disturbed Sample	63	Passing 63µm	F	Filter Paper Suction Tests	M	Multistage Triaxial	S	38mm specimen
B	Bulk Sample	H	Hydrometer	CC	Continuous Core	HP	Hand Penetrometer		
W	Water Sample	PSD	Wet Sieving			V	Vane Test		

LABORATORY TEST RESULTS

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