Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Tel: 020 8594 8134
Fax: 020 8594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons). MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref: **14/22242-1**
April 2015

4a WADHAM GARDENS,

LONDON, NW3 3DP

REVISED REPORT ON A PHASE 2 GROUND INVESTIGATION

Prepared for

Elliott Wood Partnership LLP

Acting on behalf of

Mr Lawrence Brown

Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Tel: 020 8594 8134
Fax: 020 8594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons). MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref: **Ref: 14/22242-1**
April 2015

Report on a Phase 2 Ground Investigation

At

4a Wadham Gardens, London, NW3 3DP

For

Mr Lawrence Brown

Original Document issued July 2014

Re-issued with amendments April 2015

CONTENTS

1.0 INTRODUCTION

1.1 Outline and Limitations of Report

At the request of Mr Lawrence Brown, a ground investigation was carried out in connection with a proposed ground floor and basement extension at the above property. A Phase 1 Preliminary Risk Assessment (Desk Study) is presented under separate cover in Site Analytical Services Limited Report Reference 14/22242-1 dated July 2014.

The information was required for the design and construction of foundations and infrastructure for the proposed development.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory holes locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 SITE DETAILS

(National Grid Reference: TQ271840)

2.1 Site Location

The site comprises of a single storey building, formerly an annex of the adjacent property. Located in the Wadham Gardens area in the London borough of Camden. The site address is 4a Wadham Gardens, NW3 3DP.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain by the London Clay formation.

2.3 Previous Investigations

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 14/22242-1 dated July 2014) and Basement Impact Assessment (SAS Report Ref: 14/22242-2) were undertaken across the site by Site Analytical Services Limited. The Phase 1 PRA should be read in full in conjunction with this Phase 2 report.

2.4 Proposed development

It is proposed to extend the basement and ground floor front of the property.

3.0 SCOPE OF WORK

3.1 Site Works

The proposed scope of works was agreed by the client prior to the commencement of the investigations. To achieve this, the following works were undertaken:-

- The drilling of one rotary percussive borehole to a depth of 15m below ground level (Borehole 1).
- The drilling of one continuous flight auger borehole to a depth of 15m below ground level (Borehole 2)
- Excavation of one hand dug trial pit to 1.5m depth below ground level
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the boreholes and trial pit.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.
- Interpretative reporting on foundation options for the proposed building and infrastructure.
- A study into the possibility of the presence of toxic substances in the soil was outside the scope of the investigation.

3.2 Ground Conditions

The locations of the exploratory holes are shown on the site sketch plan, Figure 1.

The boreholes and trial pit revealed ground conditions that were concordant with the geological records and known history of the area. The ground comprised of Made Ground up to 1.70m in thickness resting on the London Clay formation.

For detailed information on the ground conditions encountered in the boreholes and trial pit, reference should be made to the exploratory hole records presented in Appendix A.

The Made Ground extended to respective depths of 1.00m and 1.70m in Boreholes 1 and 2 and to the full depth of investigation of 1.50m below ground level in Trial Pit 1 and comprised a surface cover of flower beds overlying a combination of loose clayey silty sand, fine to medium gravel and firm and stiff clay with brick and concrete fragments and roots above 1.00m depth.

Weathered London Clay was encountered below the Made Ground and consisted of firm mottled silty clay with occasional pockets and partings of silty fine sand. The weathered London Clay extended down to a depth of 10.50m below ground level in Borehole 1 and 10.80m below ground level in Borehole 2.

The weathered clay was underlain by more competent London Clay comprising of stiff becoming very stiff fissured silty clay with occasional partings of silty fine sand and scattered small gypsum crystals. These deposits extended down to the full depth of investigation of 15.00m below ground level in Boreholes 1 and 2.

3.3 Groundwater

Groundwater was not encountered during the excavation and drilling and the soils remained essentially dry throughout.

It must be noted that the speed of excavation is such that there may well be insufficient time for further light seepages of groundwater to enter the boreholes and trial pit and hence be detected, particularly within more cohesive soils.

Isolated pockets of groundwater may also be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

Groundwater was subsequently found to have stabilised at a depth of 1.76m below ground level in the monitoring standpipe placed in Borehole 2 after a period of approximately four weeks. Groundwater was not encountered in the standpipe placed in Borehole 1 after the same monitoring period.

Groundwater is by its nature, hidden from view and unforeseen ground conditions can occur. It is therefore recommended that the water levels in the monitoring boreholes be periodically measured immediately prior to, and during construction. Should groundwater levels rise to within the excavation volume, or should significant groundwater inflow be observed during excavation, professional advice should be sought.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (June and July 2014) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

3.4 Existing Foundations and services

Trial Pit 1 was made adjacent to the existing building at the site at the position shown on the site sketch plan (Figure 1) in order to expose the foundations supporting the structure. A sketch of the foundations exposed in the trial pit is presented as Figure 2.

4.0 IN-SITU AND LABORATORY TESTS

4.1 Standard Penetration Tests

The results of the Standard Penetration Tests carried out in the natural soils are shown on the exploratory hole records in Appendix A. SPT 'N' values for Borehole 1 ranged between 16 and 56.

The results of the Standard Penetration Tests carried out in the natural silty sandy clay deposits indicate a firm, stiff and very stiff clay with increasing depth below ground level based on the methods outlined by Stroud and Butler. The correlation between SPT 'N' value and measured cohesion is generally taken as a multiplier of between 4.5 and 5 on the SPT 'N' value according to Stroud and Butler and has generally proved to be reliable.

The results of the tests are shown on the appropriate borehole records and summary sheets presented in Appendix A.

4.2 In-Situ Shear Vane Tests

In the essentially cohesive soils encountered, in-situ shear vane tests were conducted in borehole 2. The strength of the material corresponded very well with SPT N values recorded in Borehole 1. Strengths according to BS5930 ranged from a firm to stiff becoming very stiff clay.

The results of the in-situ tests are shown on the appropriate exploratory borehole records contained in Appendix A.

4.3 Undrained Triaxial Compression Test Results

Quick Undrained Triaxial Compression tests were made on five selected undisturbed 100mm diameter samples taken from Borehole 1. The results show the samples to be of a stiff to very stiff consistency.

The results of the tests are presented on Table 1, contained in Appendix B.

4.4 Classification Tests

Atterberg Limit tests were conducted on four selected samples taken from the upper cohesive portion of the natural soils in Boreholes 1 and 2 and showed the samples tested to fall into Classes CH/CV and CV according to the British Soil Classification System.

These are fine grained silty clay soils of high to very high plasticity and as such generally have a low permeability and a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values between 48% and 57%, with all of the samples being above the 40% boundary between soils assessed as being of medium swelling and shrinkage potential and those assessed as being of high swelling and shrinkage potential.

The test results are given in Table 2, contained in Appendix B.

4.5 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on seven soil samples selected to give a range of depth are presented on Table 3. The results presented on Table 3 show the soil samples to have water soluble sulphate contents of up to 2.48g/l associated with near neutral to slightly acidic pH values.

5.0 FOUNDATION DESIGN

5.1 General

It is proposed to extend the basement and ground floor front of the property. It is understood that parts of the existing building are to be retained, but during construction the front wall, the internal structure and the roof will be removed. The basement is to be constructed beneath the full building footprint, and to extend a maximum of approximately 6.6m out beneath the front drive of the property, this forward section to include the car lift.

5.2 Site Preparation Works

The CDM Co-ordinator should be informed of the site conditions and risk assessment undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions. It is recommended that extensive searches of existing man made services are undertaken over the site prior to final design works.

5.3 Conventional Spread Foundations

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

Based on the ground and groundwater conditions encountered in the boreholes and trial pit, it should be possible to support the proposed new development on conventional strip or basement raft foundations taken down below the Made Ground and any weak superficial soils and placed in the natural stiff clay deposits which were encountered at a depth of about 2.00m below ground level across the site.

Using theory from Terzaghi (1943), strip foundations placed within natural soils may be designed to allowable net bearing pressures of approximately 240kN/m^2 at 2.00m below ground level increasing to 290kN/m^2 at 6.00m in order to allow for a factor of safety of 2.5 against general shear failure and should be sufficiently low to ensure that overstressing of the underlying soils does not occur. The actual allowable bearing pressure applicable will depend on the form of foundation, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from "Foundation Design and Construction", Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing and recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, "Building near Trees" and it is considered that this document is relevant in this situation.

5.4 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

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

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.

5.5 Basement Retaining Walls

5.5.1 General

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

The full design of temporary and permanent retaining structures is beyond the scope of this report. However the following design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table C below to assist the design of these structures.

Stratum	Depth to top (m)	Bulk Density (Mg/m3) (γ)	Effective Angle of Internal Friction (Φ)
London Clay Formation	7.00	2.00	21

Table A. Retaining Wall Design Parameters

The designer should use these parameters to derive the active and passive earth pressure coefficients ka and kp. The determination of appropriate earth pressure coefficients, together with factors such as the pattern of the earth pressure distribution, will depend upon the type/geometry of the wall and overall design factors.

5.5.2 Ground Movement

The upward movement of the base of an excavation occurs as a result of unloading and may be considered as consisting of two parts:

1. A short term movement called heave which occurs as a result of elastic rebound and may typically occur during the construction period

2. A long term movement called swell which occurs as a result of the absorption of water into the pores of the soils as the ground adjusts to new stress conditions.

The site lies above the London Clay Formation recorded in this investigation to have a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2 (2010).

Excavations below at the site will encounter London Clay and the main contractor should account for any upward ground movements using a suspended concrete slab over the compressible material at basement level (for example Claymaster or similar).

The actual amount of movement will depend upon a number of factors including the construction timetable, ultimate loads and critically, the depth of the final excavation.

5.6 Basement Floor Slabs

Due to the presence of soils assessed to be of high swelling and shrinkage potential below, it is recommended that ground slabs should be fully suspended.

5.7 Excavations

Shallow excavations for foundations and services are likely to require nominal side support in the short term and groundwater is unlikely to be encountered in significant quantities once any accumulated surface water has been removed. Deeper and longer excavations below approximately 1.0m below existing ground level will require close side support and some seepages of groundwater could be encountered.

No particular difficulties are envisaged in removing such water by conventional internal pumping methods from open sumps.

Normal safety precautions should be taken if excavations are to be entered.

5.8 Chemical Attack on Buried Concrete

The results presented on Table 3 show the soil samples to have water soluble sulphate contents of up to 2.48g/litre associated with near neutral to slightly acidic pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack may occur unless precautions are taken. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-3 conditions.

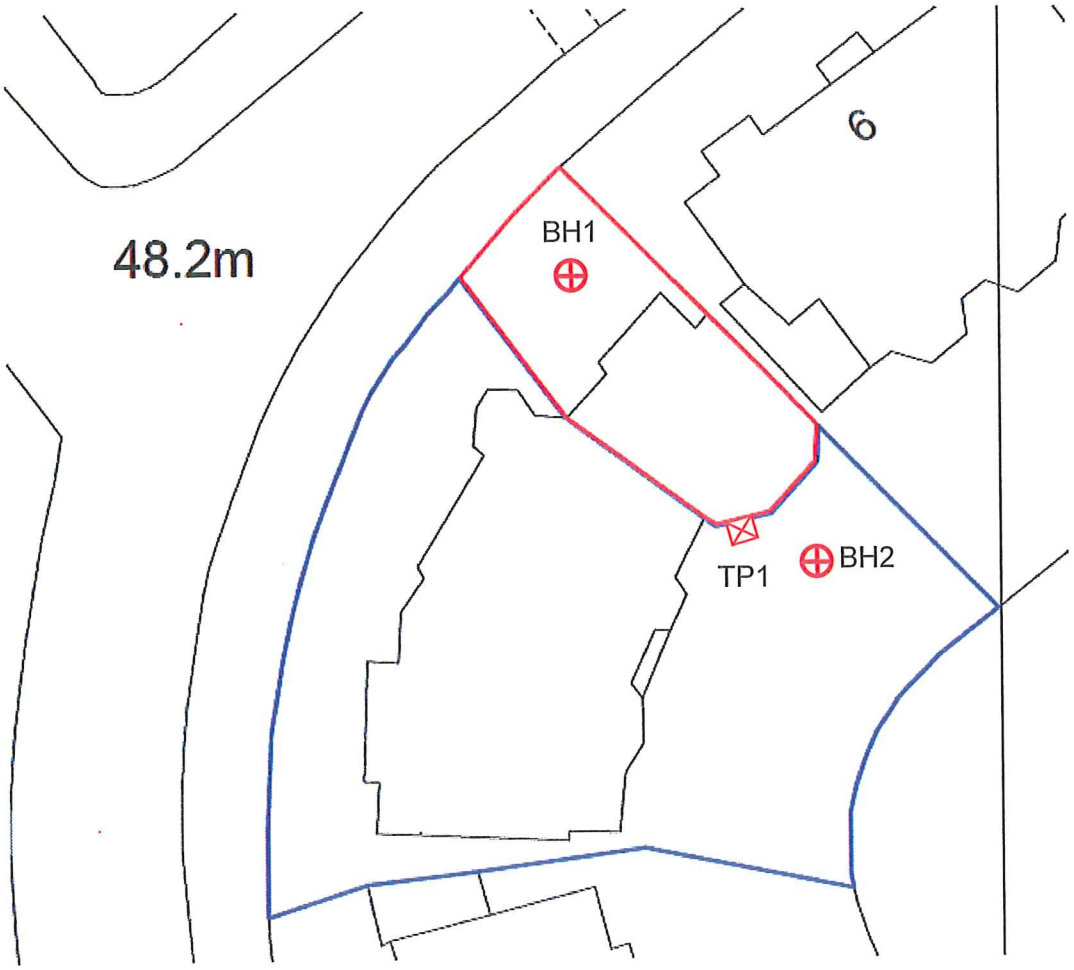
In addition, segregations of gypsum were noted within the London Clay and scattered small gypsum crystals were also noted at depth. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such deep buried concrete in accordance with full Class DS-3

p.p. SITE ANALYTICAL SERVICES LIMITED

A P Smith BSc (Hons) FGS MCIWEM
Senior Geologist

A M Davidson BSc (Hons) MSc DIC
Environmental Engineer

Site Analytical Services Ltd.				REF: 14/22242-1
LOCATION:	4a Wadham Gardens, London, NW3 3DP			FIG: 1
TITLE:	Site Sketch Plan	DATE:	April 2015	SCALE: NTS



APPENDIX `A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site	Borehole Number
4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m		MR LAWRENCE BROWN	1422242
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 271 840	04/06/2014	ELLIOTT WOOD PARTNERSHIP LLP	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20) 0.20	MADE GROUND - compost flower bed (120mm), lean mix concrete (30mm) and dark brown clayey topsoil (50mm)		
0.25-0.35	D1								
0.50-0.60	D2					(0.80)	MADE GROUND - loose to medium dense grey brown clayey silty sand, brick rubble and crushed brick and concrete fragments		
0.75-0.85	D3					1.00			
1.00-1.45	CPT N=16		DRY	2,3/4,4,4,4			Stiff becoming stiff to very stiff brown and mottled orange brown and veined blue grey silty CLAY with occasional partings of light brown silty fine sand., occasional weak claystone nodules and scattered small gypsum crystals		
1.00-1.45	D4								
1.75-1.85	D5								
2.00-2.45	U1		DRY	55 blows					
2.75-2.85	D6								
3.00-3.45	SPT N=25		DRY	4,5/6,6,6,7					
3.00-3.45	D7								
3.75-3.85	D8								
4.00-4.45	U2		DRY	80 blows					
4.75-4.85	D9								
5.00-5.45	SPT N=23		DRY	3,4/5,5,6,7					
5.00-5.45	D10					(9.00)			
6.00-6.10	D11								
6.50-6.95	U3		DRY	90 blows					
7.50-7.60	D12								
8.00-8.45	SPT N=34		DRY	7,8/8,8,9,9					
8.00-8.45	D13						Weak grey CLAYSTONE nodules between 8.60m and 9.00m depth		
9.00-9.10	D14								
9.50-9.95	U4		DRY	120 blows		10.00			

Remarks
Removing rose bushes and replanting to enable borehole to be made away from the cobble stone driveway
Groundwater was not encountered during boring
D = Disturbed Sample
C = Dynamic Cone Penetration Test, S = Standard Penetration Test
U = Undisturbed 100mm Diameter Sample
Excavating from 0.00m to 1.00m for 1.0 hour.

Scale (approx)	Logged By
1:50	JIP

Figure No.
1422242.BH1

Site Analytical Services Ltd.

Site	Borehole Number
4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m		MR LAWRENCE BROWN	1422242
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 271 840	04/06/2014	ELLIOTT WOOD PARTNERSHIP LLP	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.50)	SEE PREVIOUS SHEET		
						10.50			
10.50-10.60	D15						Very stiff dark grey brown fissured silty CLAY with occasional partings of light brown silty fine sand and scattered small gypsum crystals		
11.00-11.45	SPT N=49		DRY	9,11/12,12,12,13					
11.00-11.45	D16								
12.00-12.10	D17								
12.50-12.95	U5		DRY	140 blows		(4.50)			
13.75-13.85	D18								
14.55-15.00	SPT N=56		DRY	11,13/12,14,15,15					
14.55-15.00	D19								
				04/06/2014:DRY		15.00	Complete at 15.00m		

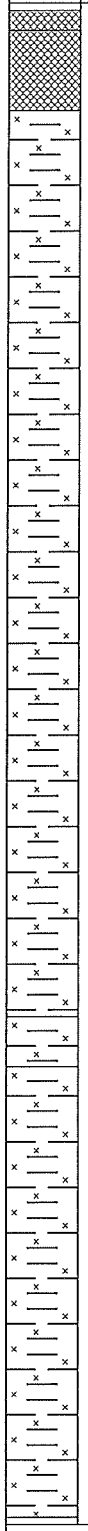
Remarks

Scale (approx)	Logged By
1:50	JIP

Figure No. 1422242.BH1

Site Analytical Services Ltd.

	Site: 4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP	Borehole Number: BH1
Installation Type: MONITORING STANDPIPE Dimensions: Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 128 mm	Client: MR LAWRENCE BROWN	Job Number: 1422242
Location: TQ 271 840	Ground Level (mOD):	Engineer: ELLIOTT WOOD PARTNERSHIP LLP Sheet: 1/1



Depth (m)	Description
	Bentonite Seal
1.00	
	Slotted Standpipe
5.00	
	Bentonite Seal
6.00	
	General Backfill
15.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
04/06/14				DRY			15.00		DRY	

Instrument Groundwater Observations

Inst. [A] Type : SINGLE STANDPIPE

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

Remarks
Lockable cover set in concrete
Gas valve fitted

Site Analytical Services Ltd.

Standard Penetration Test Results

Site : 4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP

Client : MR LAWRENCE BROWN

Engineer: ELLIOTT WOOD PARTNERSHIP LLP

Job Number 1422242

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.00	1.15	1.45	CPT	2	3	4	4	4	4	N=16	
BH1	3.00	3.15	3.45	SPT	4	5	6	6	6	7	N=25	
BH1	5.00	5.15	5.45	SPT	3	4	5	5	6	7	N=23	
BH1	8.00	8.15	8.45	SPT	7	8	8	8	9	9	N=34	
BH1	11.00	11.15	11.45	SPT	9	11	12	12	12	13	N=49	
BH1	14.55	14.70	15.00	SPT	11	13	12	14	15	15	N=56	

Site Analytical Services Ltd.

Site	Borehole Number
4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MR LAWRENCE BROWN	1422242
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 271 840	04/06/2014	ELLIOTT WOOD PARTNERSHIP LLP	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.10) 0.10	MADE GROUND - compost flower bed		
0.25	D1					(0.50)	MADE GROUND - loose grey brown clayey silty sand, fine to medium gravel, brick and concrete fragments		
0.50	D2					0.60			
0.75	D3						MADE GROUND - firm becoming stiff dark brown sandy silty clay with brick fragments		
1.00	D4								
1.00	V1 72					(1.10)			
1.50	D5								
1.50	V2 83					1.70			
2.00	D6						Stiff becoming stiff to very stiff brown and mottled orange brown and veined blue grey silty CLAY with occasional partings of light brown silty fine sand., occasional weak claystone nodules and scattered small gypsum crystals		
2.00	V3 114								
2.50	D7								
2.50	V5 127								
3.00	V5 133								
3.00	D8								
3.50	D9								
3.50	V6 138								
4.00	D10								
4.00	V7 140								
4.50	D11								
4.50	V8 140+								
5.00	V9 140+								
5.00	D12								
						(8.30)			
6.00	D13								
6.00	V10 140+								
7.00	D14								
7.00	V11 140+								
8.00	D15								
8.00	V12 140+								
9.00	D16								
9.00	V13 140+								
						10.00			

Remarks
V = Vane Test - Result in kPa
D = Disturbed Sample
Groundwater was not encountered during boring
Water added from 7.00m to 8.00m. Excavating from 0.00m to 1.00m for 1.0 hour.

Scale (approx)	Logged By
1:50	JIP

Figure No.
1422242.BH2

Site Analytical Services Ltd.

Site	Borehole Number
4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		MR LAWRENCE BROWN	1422242
	Location TQ 271 840	**Dates** 04/06/2014	**Engineer** ELLIOTT WOOD PARTNERSHIP LLP	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00 10.00	D17 V14 140+					(0.80)	SEE PREVIOUS SHEET		
						10.80	Very stiff dark grey brown fissured silty CLAY with occasional partings of light brown silty fine sand and scattered small gypsum crystals		
11.00 11.00	V15 140+ D18								
12.00 12.00	D19 V16 140+								
						(4.20)			
13.00 13.00	D18 V17 140+								
14.00 14.00	D19 V18 140+								
15.00 15.00	D20 V19 140+			04/06/2014:DRY		15.00	Complete at 15.00m		

Remarks	Scale (approx)	Logged By
	1:50	JIP
	Figure No. 1422242.BH2	

Site Analytical Services Ltd.

Site	Borehole Number
4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP	BH2

Installation Type	Dimensions	Client	Job Number
MONITORING STANDPIPE	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 100 mm	MR LAWRENCE BROWN	1422242

Location	Ground Level (mOD)	Engineer	Sheet
TQ 271 840		ELLIOTT WOOD PARTNERSHIP LLP	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Bentonite Seal
				1.00	
					Slotted Standpipe
				5.00	
					Bentonite Seal
				6.00	
					General Backfill
				15.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
04/06/14				DRY			15.00		DRY	

Instrument Groundwater Observations

Inst. [A] Type : SINGLE STANDPIPE

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks

Lockable cover set in concrete
Gas valve fitted

Site Analytical Services Ltd.

Site: 4A WADHAM GARDENS, PRIMROSE HILL, LONDON, NW3 3DP			Trial Pit Number: TP1
Excavation Method: HAND EXCAVATION	Dimensions: 500 X 500	Ground Level (mOD):	Client: MR LAWRENCE BROWN	Job Number: 1422242
	Location: TQ 271 840	Dates: 16/06/2014	Engineer: ELLIOTT WOOD PARTNERSHIP LLP	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.25	D1				(1.50)	MADE GROUND - loose to medium dense grey brown clayey silty sand, scattered fine to medium flint gravel and crushed brick fragments; roots noted above 1.00m depth		
0.50	D2							
0.75	D3							
1.00	D4							
1.50	D5		16/06/2014:DRY		1.50	Complete at 1.50m		

Plan

Remarks

For details of foundations exposed see sketch
D = Disturbed Sample
Groundwater was not encountered during excavation

Scale (approx)	Logged By	Figure No.
1:25	JIP	1422242.TP1

APPENDIX `B'

Laboratory Test and Groundwater Monitoring Data

Site Analytical Services Ltd.

Ref: 14/22242-1

UNDRAINED TRIAXIAL COMPRESSION TEST

LOCATION 4a Wadham Gardens, London, NW3 3DP

BH/TP No.	MOISTURE CONTENT	BULK DENSITY	LATERAL PRESSURE	COMPRESSIVE STRENGTH	COHESION	ANGLE OF SHEARING RESISTANCE	DEPTH
	%	Mg/m^3	kN/m^2	kN/m^2	kN/m^2	degrees	m
BH1	23	2.03	50	236	118		2.25
	24	1.99	80	284	142		4.25
	28	1.96	130	342	171		6.75
	28	1.99	190	364	182		9.75
	27	2.01	250	393	197		12.75

Table 1

Site Analytical Services Ltd.

Ref: 14/22242-1

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 4a Wadham Gardens, London, NW3 3DP

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Class
BH1	3.00	23	78	24	54	100	CV
	3.75	25	81	24	57	100	CV
BH2	2.00	31	72	21	51	100	CV
	4.00	26	70	22	48	100	CH/CV

Table 2

Site Analytical Services Ltd.

Ref: 14/22242-1

SULPHATE & pH DETERMINATIONS

LOCATION 4a Wadham Gardens, London, NW3 3DP

BH/TP No.	DEPTH BELOW GL m	SOIL SULPHATES AS SO_4 TOTAL %	SOIL SULPHATES AS SO_4 WATER SOL g/l	WATER SULPHATES AS SO_4 g/l	pH	CLASS	SOIL - 2mm %
BH1	2.75		0.33		5.9	DS-1	100
	7.50		1.99		5.7	DS-3	100
	11.00		0.62		6.4	DS-2	100
	14.55		0.45		6.5	DS-1	100
BH2	6.00		2.48		5.9	DS-3	100
	9.00		2.34		5.7	DS-3	100
	13.00		0.90		6.5	DS-2	100

Classification – Tables C1 and C2 : BRE Special Digest 1 : 2005

Site Analytical Services Ltd.

Ref: 14/22242-1

GROUNDWATER MONITORING

LOCATION 4a Wadham Gardens, London, NW3 3DP

MONITORING DATE 16th June 2014

BOREHOLE REF:		**BH1**	**BH2**
Water Level	(m.bgl)	Dry	1.68
Base of Well	(m.bgl)	5.03	5.08

Table 4

Site Analytical Services Ltd.

Ref: 14/22242-1

GROUNDWATER MONITORING

LOCATION 4a Wadham Gardens, London, NW3 3DP

MONITORING DATE 3rd July 2014

BOREHOLE REF:		**BH1**	**BH2**
Water Level	(m.bgl)	Dry	1.76
Base of Well	(m.bgl)	5.03	5.08

Table 4a

6.0 REFERENCES

1. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

2. British Standards Institution, 1990. Methods for test for soils for civil engineering purposes, BS1377, BSI, London

3. British Standards Institution, 1994. Code of practice for earth retaining structures, BS8002, BSI, London

4. British Standards Institution, 2007. Code of Practice for Site Investigations, BS EN 1997-2, BSI, London

5. British Standards Institution, 2004. Geotechnical Design, BS EN 1997-1 BSI, London

6. Building Research Establishment Special Digest 1, 2005, "Concrete in Aggressive Ground – Third Edition."

7. Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107

8. Environment Agency, 2000b. Technical aspects of site investigation, Volumes 1 and 2. R&D Technical Report P5-065/TR. Bristol: Environment Agency.

9. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London

10. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

11. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

12. Stroud M.A. and Butler F.G. (1975) Symposium on the Engineering Behaviour of Glacial Materials; the Midland Soil Mechanics and Foundation Engineering Society; pgs 124 et seq.

13. Tomlinson, M J, 2001. "Foundation Design and Construction", Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).