REPORT ON
GROUND INVESTIGATION
AT
4 FROGNAL RISE
HAMPSTEAD, NW3 6RD

CLIENT: **ELLIOTT WOOD PARTNERSHIP**

DATE: 12 MARCH 2015 **REF:** G/011506/001

K F GEOTECHNICAL

CONSULTING GEOTECHNICAL ENGINEERS

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CONTENTS

APPENDICES

1. INTRODUCTION

1.1 We were instructed by Elliott Wood Partnership and Steven Brandes Architects, acting on behalf of the owner of the site, to carry out a ground investigation by means of trial pits and boreholes at 4 Frognal Rise, Hampstead, NW3 6RD.

1.2 The purpose of the investigation was to determine the ground conditions to assist in the design of additions and alterations to the property including, the construction of a basement.

1.3 The site work took place on the 19 December 2014 for the deeper shell and auger borehole at the lower level and 7 January 2015 for borehole 2 in the rear garden at a higher level and three trial pits.

1.4 Trial pit 2 could not be carried out as a wall was obstructing the indicated location.

2. THE SITE

2.1 Frognal Rise is residential street lying to the north of Hampstead centre and to the south and west of Hampstead Heath. No. 4 lies on the northeast side of the road and is accessed both from Frognal Rise at the front of the property and Windmill Hill slightly further to the east. Windmill Hill forms a fork with Frognal Rise nearby to the south.

2.2 The natural slope of the ground is upwards from west to east and from south to north. Because of this the driveway to the immediate left of the main house and accessed from Frognal Rise is basically level but there are steep steps leading up from the driveway to the rear garden. There is also another access to the rear garden but this also involves a series of steps.

2.3 The boundaries are marked by mature hedging and there are medium to large trees at the south eastern end of the site and close to the northwest corner.

2.4 The Geological Survey Sheet for the area indicates that the naturally occurring subsoil is Bagshot Beds over Claygate Beds over London Clay.

3. SITE WORK

3.1 The layout of the site and the location of our trial pits and boreholes is indicated on our Location Plan G/011506/101. The logs of the boreholes and the trial pits are appended at the rear of this report.

3.2 Borehole 1, at the front of the property through the driveway, revealed slate and concrete to 200mm over fill material consisting of a medium dense brown gravelly sandy clayey silt with brick fragments. This overlies at 2.0m a medium dense clayey silty sand, changing at 2.0m to a medium dense brown silty sand with clay bands and this overlies at 11.5m a stiff grey sandy silty clay which was proved to the base of the borehole at 15.0m.

3.3 Disturbed samples were taken at regular depths and these were bagged and labelled and sent to the laboratories for appropriate geotechnical analysis. A single U100 sample was taken at a depth of 12.5m and this was sealed and sent to the laboratories for appropriate analysis.

3.4 CPTs and SPTs were carried out at regular depths and the results are indicated on the log.

3.5 There was a water strike at 9.0m which rose to 7.0m after five minutes. This was sealed out in the clay at 11.5m.

3.6 A standpipe was installed to a depth of 9.0m and the water depth was measured at 7.0m from ground level on completion.

3.7 Borehole 2, at the rear, was put down by mechanical flight auger and this revealed Yorkstone slabs and concrete overlying made ground which is initially a loose topsoil type material with brick and clinker rubble, overlying at 1.2m a firm sandy silty clay with numerous brick fragments. This overlies at 2.2m further fill material consisting of a medium compact gravelly silty sand once more with numerous brick fragments.

3.8 The natural ground was encountered at 2.7m and consisted initially of a medium dense brown clayey silty sand. This changes at 3.6m to a stiff very sandy silty clay that was proved to a depth of 6.3m. Below this is medium dense silty sand becoming clayey below 7.2m. The undisturbed unweathered London Clay was encountered at 11.4m and proved to the base of the borehole at 12.0m. Roots of live appearance were encountered to 4.2m. There was water seepage at 3.0m and a water strike at 11.3m. The borehole was collapsing from 6.4m and a standpipe was installed to this depth.

3.9 Trial pit 1 was put down at the front of the garage and revealed foundations to the garage and the boundary wall consisting of substructural brickwork extending to 1.04m. The top of the footing was encountered at this depth but the underside of the footing could not be proved due to the pit collapsing. To this depth was a medium compact gravelly sand with large pieces of concrete and brick rubble.

3.10 Trial pit 3 was put down against the right side of the house and this revealed a 400mm deep concrete strip footing supporting three courses of corbelled brickwork and founded at 1.02m below ground level within a medium dense clayey silty sand.

3.11 Trial pit 4 was put down against the right wall close to the front right corner of the property and this revealed a 200mm deep concrete strip footing supporting one course of corbelled brickwork and founded at 740mm below ground level at this point and founded within a medium dense clayey silty sand.

3.12 In-situ testing by Mackintosh Probe was carried out at the underside of the footing in trial pits 3 and 4, and the results are indicated on the individual log.

3.13 Disturbed samples were taken from the underside of the footings and these were bagged and labelled and sent to our laboratories for appropriate geotechnical analysis.

4. LABORATORY WORK

4.1 Geotechnical Analysis

4.1.1 Moisture contents were determined on all samples with liquid and plastic limits being determined on the sample taken from 4.0m and 5.0m in borehole 2. No further testing has been carried out on borehole 1 as the subsoil is granular consisting predominantly of a clayey sand. The moisture contents confirm this.

4.2 Contamination Analysis

4.2.1 Two samples were taken from 1.0m in borehole 2 and at 1.0m in trial pit 3. These were sent to our specialist laboratories, Chemtest, for Waste Acceptance Criteria (WAC) analysis. The results are appended.

4.2.2 The results indicate no undue concentrations of any of the determinands for inert waste which means that all soil taken off this site can removed to a landfill site as inert.

5. DISCUSSION

5.1 Geotechnical Aspects

5.1.1 The ground investigation revealed the anticipated geology with the subsoil being typical of Bagshot Beds. There is however up to 2.7m of fill material across the site which is probably a function of the natural slope and the fact that the property has been terraced into the slope.

5.1.2 We understand that the intention is to provide a basement under the footprint of the existing property formed by underpinning of the external walls. Based on plans forwarded to us, the provision of the basement will effectively have the rear wall of the basement at approximately 5.0m to 6.0m below ground level at the rear and 2.0m to 3.0m below the level of Frognal Rise at the front.

5.1.3 It is interesting to note from our ground investigation that the depth to the clay is at approximately at the same depth in each of the boreholes which indicates that the natural ground follows the natural slope.

5.1.4 We assume that the basement formation level will be at approximately 3.5m below current ground level at the front of the property and this will be founded within a medium dense silty sand with clayey bands.

5.1.5 The SPT results at this depth give an 'N' value of 20 which would equate to a safe bearing capacity in the region of 200kPa and we would recommend this figure for design purposes and which should be more than sufficient to take the anticipated loads.

5.1.6 Relative to borehole 2 at the rear, the formation level will be approximately at a depth of between 6.0m to 6.5m which should put it below the level of the more clayey material and once more within the sand with clayey bands.

5.1.7 There was water seepage at 3.0m at the rear in borehole 2 which would appear to equate to the change in strata between clayey sand and a sandy clay. There was a further water strike at 11.3m at the top of the London Clay. In the lower borehole, there was a water strike at 9.0m which probably relates to water flowing along the line of one of the clayey bands through the sand which is fairly typical of Bagshot Beds.

5.1.8 We give below parameters for basement wall design based firstly on the excavation being through a clayey silty sand and secondly, if the excavation is predominantly through a sandy silty clay:

Clayey Silty Sand

Moist bulk density (γm) - 18kN/m^3
Effective angle of shearing resistance (ϕ') crit - 34°.

Sandy Silty Clay

Moist bulk density (γm) - 18kN/m^3
Critical state angle of shearing resistance (ϕ') crit - 27°
Effective cohesion (c') - 0.

5.1.9 Based on the results of the boreholes the excavations should be largely dry but this will depend to a certain extent on prevailing weather conditions. We would recommend, however, making provision for short-term pumping or bailing during the course of the work.

5.1.10 Also, the excavations for the underpinning pins should remain stable long enough to allow for construction assuming that the underpinning is carried out in short lengths. However, some provision should be made for shoring should it be required.

5.1.11 Although the excavations may be dry some provision should be made for hydrostatic pressure in the design of the basement walls mainly to allow for any short-term conditions.

5.1.12 As the formation of the excavation is likely to be within a sand there is unlikely to be any net uplift of the base of the excavation due to removal of overburden pressure.

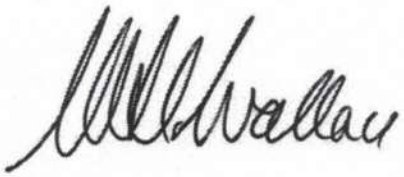
5.1.13 At the time of writing this report we have not carried out any ongoing measurements of the water levels in the standpipes. The water encountered will be perched water and the more significant water strike will relate to the change in soil from granular to more cohesive material ie at the junction of the Bagshot Beds and London Clay. If the London Clay follows the natural slope of the ground then there is likely to be some flow of water through the site. However, this will be below the proposed formation level of the basement and we can see no reason why the construction of this basement should form any impediment to natural groundwater flow.

5.1.14 The site lies away from the natural water courses feeding from Highgate Ponds and there will, therefore, be no interference with natural water courses.

5.1.15 We are not clear as to whether there will be any underpinning to party walls. If there is, we can see no reason why there should be any measureable movement to such walls during the underpinning process. There should be no significant water ingress and no loss of fines and if the underpinning is carried out in short staggered lengths in a properly designed and workmanlike manner there should be no problems.

5.2 Contamination Aspects

5.2.1 The WAC testing indicates that all subsoil taken off this site can be removed to a landfill site as inert.



W J C Wallace

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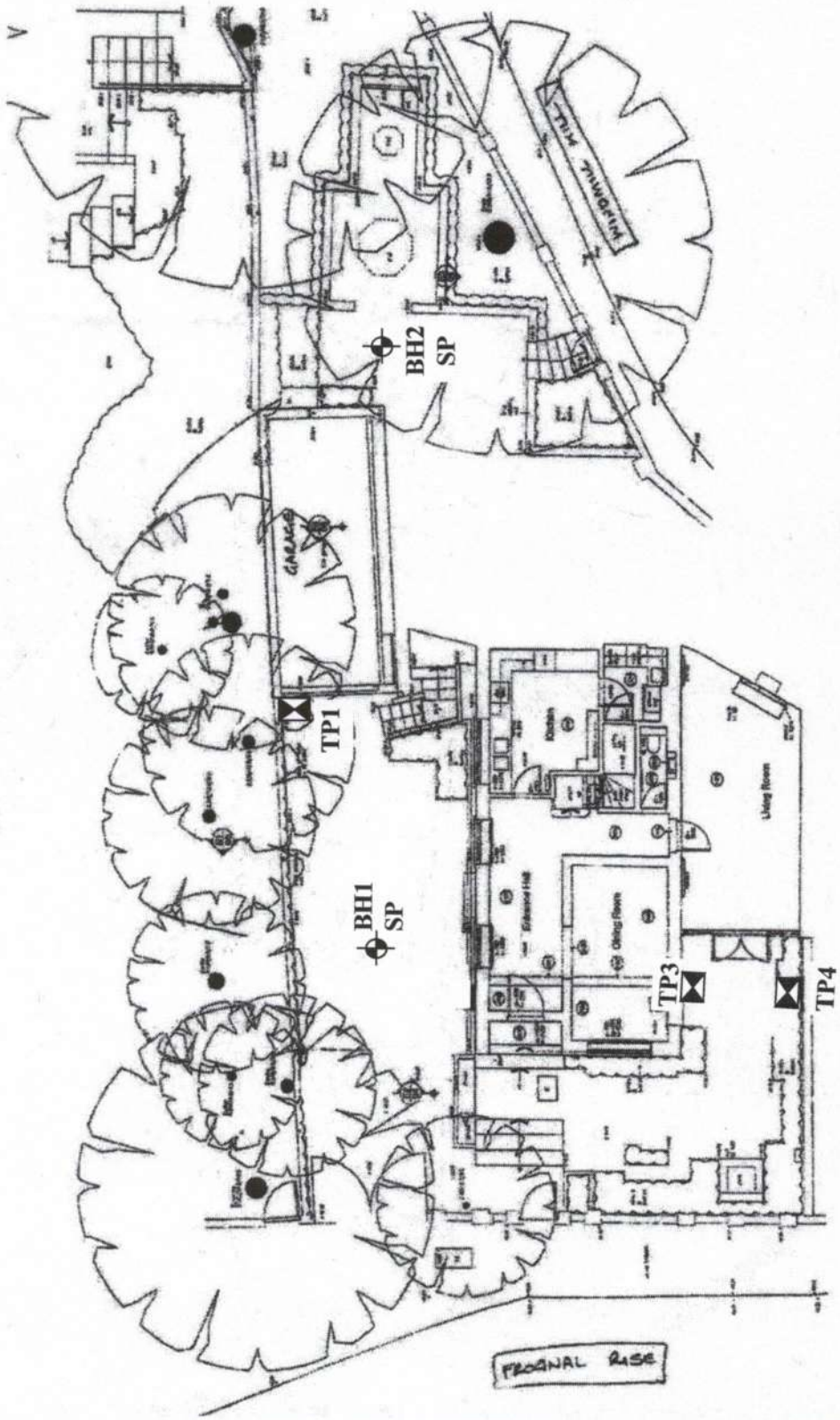
SITE LOCATION PLAN

Ref: G/011506/101

Sheet:	Scale:	Date:
1 of 1	N/A	7 January 2015

Client: Elliott Wood Partnership

Location: **4 FROGNAL RISE, HAMPSTEAD, NW3 6RD**



Remarks:

Key:

⊕	Borehole (BH)	SP	Stand Pipe	MH	Manhole
⋈	Trial pit (TP)	RWP	Rainwater Pipe	G	Gully
●	Sample (S)	⊠	Soakaway (SW)	◇	Tree/Bush (approx. ht in m)

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Borehole 1		Ref: G011506
Sheet: 1	Scale: 1:50	Date: 19/12/14
Client: ELLIOTT WOOD PARTNERSHIP		
Equipment & Method : Shell & Auger	Location: 4 FROGNAL RISE, HAMPSTEAD	

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
Slate slabs and concrete (0.10)	-0.10		0.10					
Concrete (0.10)	-0.20		0.20					
MADE GROUND: medium dense brown gravelly silty clayey sand with brick (1.80)				D	0.40			
				D	0.70			
				B	1.00	C	N=21	
	-2.00		2.00	D	2.00	S	N=15	
Medium dense brown clayey silty SAND (1.00)								
	-3.00		3.00	D	3.00	S	N=19	
Medium dense brown silty SAND with bands of clay (8.50)				D	4.00	S	N=21	
				D	5.00	S	N=23	
				D	6.40	S	N=25	
				D	8.00	S	N=24	
								Water strike at 9m. Rose to 7m after 5min. Sealed out at 11.5m
				D	9.50	S	N=24	
				W	10.00			

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks

Water standing at 7m on completion
Standpipe installed to 9m
Water added from 4m to 9m (300 litres)
Water added from 10m to 11.5m (25 litres)

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Borehole 1			Ref: G011506
Sheet: 2	Scale: 1:50		Date: 19/12/14
Client: ELLIOTT WOOD PARTNERSHIP			
Equipment & Method : Shell & Auger	Location: 4 FROGNAL RISE, HAMPSTEAD		

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
(Continued) Medium dense brown silty SAND with bands of clay (8.50)				D	11.00	S	N=23	
	-11.50		11.50					
Stiff grey silty sandy CLAY (3.50)				U	12.50		57 BLOWS	
				D	12.95			
				D	14.00	S	N=27	
Base of Borehole	-15.00		15.00					

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks

Water standing at 7m on completion
Standpipe installed to 9m
Water added from 4m to 9m (300 litres)
Water added from 10m to 11.5m (25 litres)

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Borehole 2		Ref: G011506
Sheet: 1	Scale: 1:50	Date: 7/1/15
Client: ELLIOTT WOOD PARTNERSHIP		
Equipment & Method : Flight Auger	Location: 4 FROGNAL RISE, HAMPSTEAD	

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
Yorkstone slabs over concrete (0.15)								
	-0.15		0.15					
MADE GROUND: loose dark brown gravelly clayey silty sand with brick and concrete rubble (1.05)				D	1.00	M	2,3,3,4	
	-1.20		1.20					
MADE GROUND: firm light grey sandy silty clay with brick fragments (1.00)				D	1.50			
				D	2.00	V	62	
	-2.20		2.20					
MADE GROUND: medium compact brown gravelly silty sand with brick fragments (0.50)				D	2.50			
	-2.70		2.70					
Medium dense brown clayey silty SAND (0.90)				D	3.00	M	17,33,40,47	
	-3.60		3.60					
Stiff light brown/orange sandy silty CLAY (2.70)				D	4.00	V	122	Roots of live appearance to 4.2m Water seepage at 3m
				D	5.00	V	132	
				D	6.00	V	138	
	-6.30		6.30					
Medium dense brown/orange silty clayey SAND (5.10)				D	8.00	M	40,43,50,50	
				D	10.00	M	39,50,50,50+	

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks

Borehole collapsing from 6.4m
Standpipe installed

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Borehole 2		Ref: G011506
Sheet: 2	Scale: 1:50	Date: 7/1/15
Client: ELLIOTT WOOD PARTNERSHIP		
Equipment & Method : Flight Auger	Location: 4 FROGNAL RISE, HAMPSTEAD	

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
(Continued) Medium dense brown/orange silty clayey SAND (5.10)								
								Water strike at 11.3m
Very stiff brown/grey sandy silty CLAY (0.60)	-11.40		11.40					
Base of Borehole	-12.00		12.00	D	12.00	V	140+	

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks

Borehole collapsing from 6.4m
Standpipe installed

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Trial Pit 1		Ref: G011506
Sheet: 1	Scale: 1:10	Date: 7/1/15
Client: ELLIOTT WOOD PARTNERSHIP		
Equipment & Method : Trial Pit	Location: 4 FROGNAL RISE, HAMPSTEAD	

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
SLAB [0.16]	-0.16		0.16					
GRAVELLY SAND WITH BRICK AND CONCRETE RUBBLE [0.94]	-1.10		1.10					Roots of live appearance to 1.1m
CONC. FOOTING.								

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks
Trial pit collapsing from 0.8m

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Trial Pit 3			Ref: G011506
Sheet: 1	Scale: 1:10		Date: 7/1/15
Client: ELLIOTT WOOD PARTNERSHIP			
Equipment & Method : Trial Pit	Location: 4 FROGNAL RISE, HAMPSTEAD		

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
SLAB. CONC	-0.12		0.12					
LOOSE GRAVELLY CLAYEY SILTY SAND WITH BRICK RUBBLE 170 (NTS)	-0.37		0.37					
FIRM GRAVELLY SANDY SILTY CLAY + BRICK 210 180 -0.62	-0.67		0.67					
CONC AS BELOW								
Medium dense brown/orange clayey silty SAND (0.08)	-1.02		1.02	D	1.02	M	10,19,23,33	
Base of Trial Pit	-1.10		1.10					Roots of live appearance to 1.1m

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks
Trial pit dry and open on completon

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Trial Pit 4			Ref: G011506
Sheet: 1	Scale: 1:10		Date: 7/1/15
Client: ELLIOTT WOOD PARTNERSHIP			
Equipment & Method : Trial Pit	Location: 4 FROGNAL RISE, HAMPSTEAD		

Description of Strata [thickness]	Reduced Level	Legend	Depth	Samples Type	Samples Depth	Tests Type	Tests Value	Field Notes
U SLABS CONC								
LOOSE GRAVELLY SILT/CLAY & SAND + BRICK	-0.11		0.11					
80 GO -0.54 CONC AS BELOW	-0.51		0.51					
Medium dense brown/orange clayey silty SAND (0.06)	-0.74		0.74	D	0.74	M	16,19,22,24	
Base of Trial Pit	-0.80		0.80					Roots of live appearance to 0.8m

Where 0.3m penetration has not been achieved, the number of blows for the quoted penetration is given. (Not the N value)
All depths and reduced levels are in metres.
Water level observations during boring are given on the last sheet of the log.

U Undisturbed Sample
D Disturbed Sample
B Bulk Sample
W Water Sample
S Standard Penetration Test
V Vane Test
MP Mackintosh Probe

Remarks
Trial pit dry and open on completon

Trentside Geotechnical Testing

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Geotechnical Testing

Client : KFG

Site Name : 4 Frognal Rise

Client Reference : n/a

Laboratory Reference : TGT1128

Date of Completion : 26-Jan

Content Summary

Lab Reference : TGT1128

Client Reference : n/a

For the attention of : Bill Wallace

This report comprises of the following : 3 Pages of Results

1 Moisture/Shear Strength Chart

1 Plasticity Chart

Notes :

General

Please refer to report summary notes for details pertaining to methods undertaken and their subsequent accreditations

Samples were supplied by Customer

All tests performed in-house unless otherwise stated

Deviant Samples

Samples were received in suitable containers	Yes
A date and time of sampling was provided	Yes
Arrived damage/denaturing free	Yes

Laboratory Testing Results

BS 1377 : 1990

[redacted]

Job Number : TGT1128
Client : KFG
Client Reference : n/a
Site Name : 4 Frognal Rise

Date Received : 09/01/2015
Date Testing Started : 23/01/2015
Date Testing Completed : 26/01/2015
Laboratory Used : Trentside Geotechnical, CO9 4HS

Sample Ref			Sample Type	Moisture Content (%) [1]	Soil Faction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index (%) [5]	Modified Plasticity Index (%) [6]	Soil Class [7]	Filter Paper Contact Time (h) [8]	Soil Sample Suction (kPa)	Insitu Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	pH Value [11]	Sulphate Content		
BH/TP/WS	Depth (m)	UID															SO_3 [12]	SO_4 [13]	Class [14]
BH2	1.0	15-0149	D	24	34														
BH2	1.5	15-0150	D	33	9														
BH2	2.0	15-0151	D	30	7	33	20	13	0.76	12	CL					8.3	0.77	0.92	DS-2
BH2	2.5	15-0152	D	18	14														
BH2	3.0	15-0153	D	28	<5											8.0	0.13	0.16	DS-1
BH2	4.0	15-0154	D	36	<5	39	21	18	0.85	18	CI								
BH2	5.0	15-0155	D	31	<5														
BH2	6.0	15-0156	D	35	<5	35	19	15	1.00	15	CL								
BH2	8.0	15-0157	D	36	<5														

Notes :-

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method 59a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

D	Disturbed sample
B	Bulk sample
U	U100 (undisturbed sample)
W	Water sample
ENP	Essentially Non-Plastic
U/S	Underside Foundation

Comments :-

Technician :- JW
Checked By :- GW
Date Checked :- 26-Jan-15

Laboratory Testing Results

BS 1377 : 1990

Job Number : TGT1128
Client : KFG
Client Reference : n/a
Site Name : 4 Frognal Rise

Date Received : 09/01/2015
Date Testing Started : 23/01/2015
Date Testing Completed : 26/01/2015
Laboratory Used : Trentside Geotechnical, CO9 4HS

Sample Ref			Sample Type	Moisture Content (%) [1]	Soil Faction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index (%) [5]	Modified Plasticity Index (%) [6]	Soil Class [7]	Filter Paper Contact Time (h) [8]	Soil Sample Suction (kPa)	Insitu Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	pH Value [11]	Sulphate Content		
BH/TP/WS	Depth (m)	UID															SO_3 [12]	SO_4 [13]	Class [14]
TP3	1.0	15-0158	D	34	9														

Notes :-

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method 59a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

D	Disturbed sample
B	Bulk sample
U	U100 (undisturbed sample)
W	Water sample
ENP	Essentially Non-Plastic
U/S	Underside Foundation

Comments :-

Technician :- JW
Checked By :- GW
Date Checked :- 26-Jan-15

Laboratory Testing Results

BS 1377 : 1990

Job Number : TGT1128
Client : KFG
Client Reference : n/a
Site Name : 4 Frognal Rise

Date Received : 09/01/2015
Date Testing Started : 23/01/2015
Date Testing Completed : 26/01/2015
Laboratory Used : Trentside Geotechnical, CO9 4HS

Sample Ref			Sample Type	Moisture Content (%) [1]	Soil Faction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index (%) [5]	Modified Plasticity Index (%) [6]	Soil Class [7]	Filter Paper Contact Time (h) [8]	Soil Sample Suction (kPa)	Insitu Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	pH Value [11]	Sulphate Content		
BH/TP/WS	Depth	UID															SO_3 [12]	SO_4 [13]	Class [14]
TP4	1.0	15-0159	D	36	13														

Notes :-

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method S9a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

D	Disturbed sample
B	Bulk sample
U	U100 (undisturbed sample)
W	Water sample
ENP	Essentially Non-Plastic
U/S	Underside Foundation

Comments :-

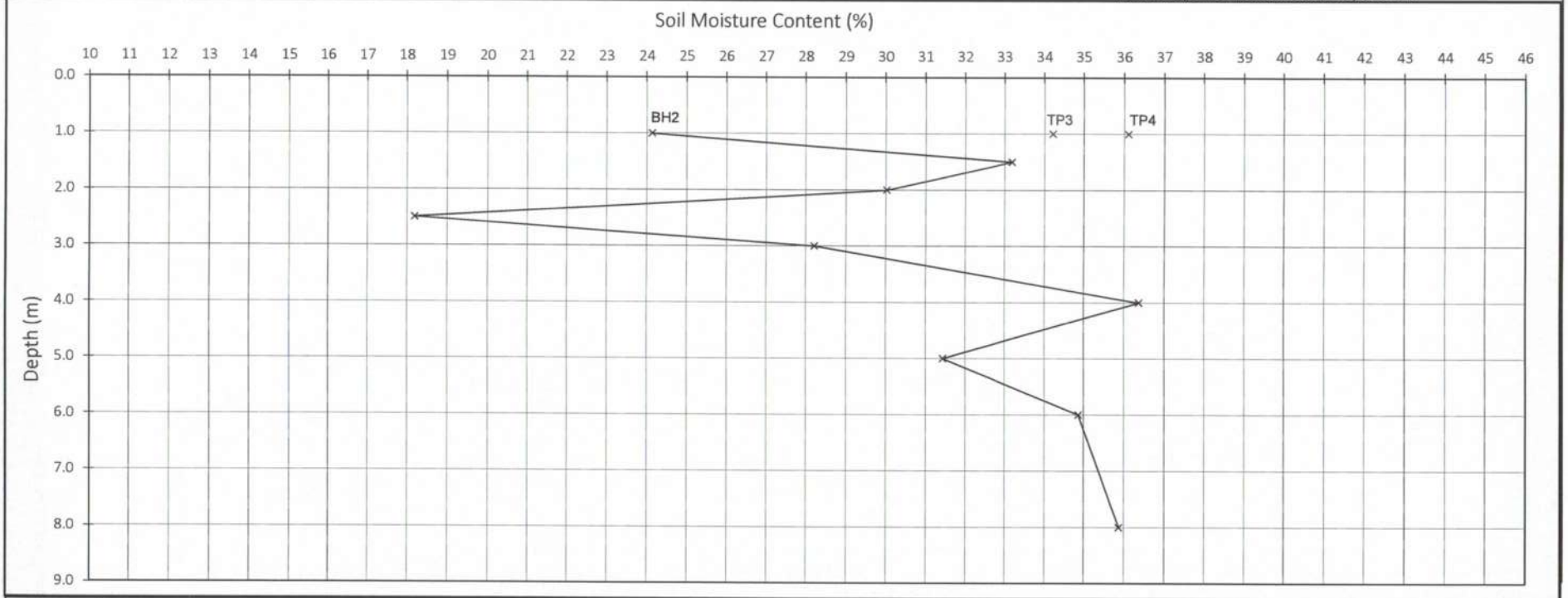
Technician :- JW
Checked By :- GW
Date Checked :- 26-Jan-15

Laboratory Testing Results

Moisture Content/Shear Strength Profile

Job Number : TGT1128
Client : KFG
Client Reference : n/a
Site Name : 4 Frognal Rise

Date Received : 09/01/2015
Date Testing Started : 23/01/2015
Date Testing Completed : 26/01/2015
Laboratory : Trentside Geotechnical, CO9 4HS



Notes :-

1. If the Soil Fraction > 0.425mm exceeds 5% the Equivalent Moisture Content of the remainder (calculated in accordance with BS 1377: Part 2 : 1990, cl.3.2.4 note 1) is also plotted and the alternative profile additionally shown as an appropriately coloured broken line.
2. If plotted, 0.4 LL and PL+2 (after Driscoll, 1983) should only be applied to London Clay (and similarly over consolidated clays) at shallow depths.

Unless otherwise stated, values of Shear Strength were determined in situ by using a Pilcon Hand Vane the calibration of which is limited to a maximum reading of 140 kPa.

Comments :-

Checked By :- GW

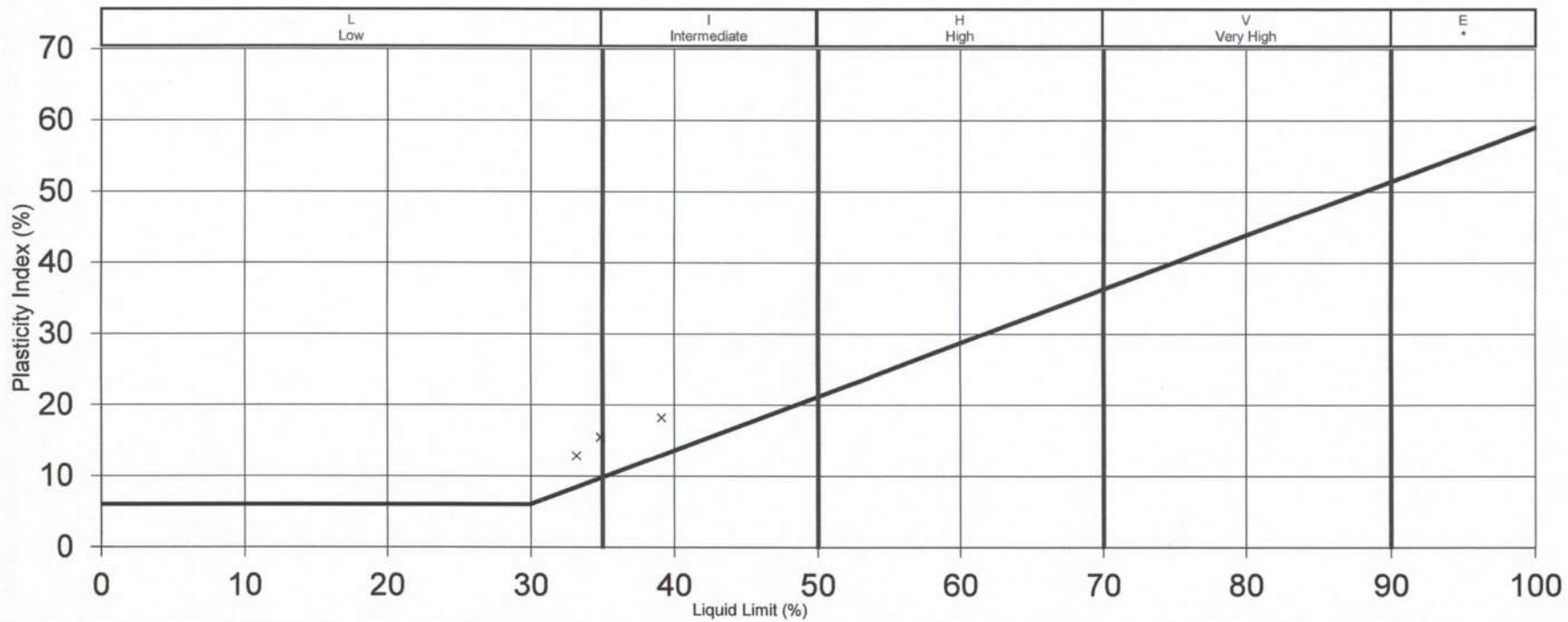
Date Checked :- 26-Jan-15

Laboratory Testing Results

Plasticity Chart for the classification of fine soils and the finer part of coarse soils
In Compliance with BS5930 : 1999

Job Number : TGT1128
Client : KFG
Client Reference : n/a
Site Name : 4 Frognal Rise

Date Received : 09/01/2015
Date Testing Started : 23/01/2015
Date Testing Completed : 26/01/2015
Laboratory : Trentside Geotechnical CO9 4HS



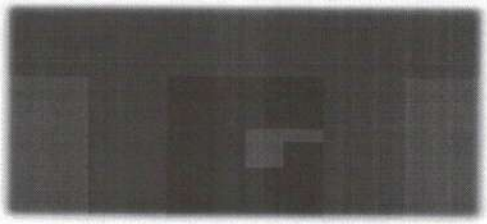
Notes :-
SILT (M-SOIL), M, plots below A-Line
CLAY, C, plots above A-Line)M and C may be combined as FINE SOIL, F.

Key :- BH2
TP3
TP4

Comments :-

Checked By :- GW

Date Checked :- 26-Jan-15



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This report shall not be reproduced, except in full, without the written approval of the testing laboratory.

Where our involvement consists exclusively of testing samples, the results and comments (if provided) relate only to the samples tested.

Any samples that are deemed to be subject to deviation will be recorded as such within the test summary.

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report Number:	15-03203 Issue-1
Initial Date of Issue:	20-Feb-2015
Client:	KF Geotechnical
Client Address:	70a Lysons Road Aldershot Hampshire GU11 EED
Contact(s):	Bill Wallace
Project:	4 Frognal Rise
Quotation No.:	
Order No.:	
No. of Samples:	2
Turnaround: (Wkdays)	5
Date Approved:	20-Feb-2015
Approved By:	
Details:	Darrell Hall, Laboratory Director

Date Received:	13-Feb-2015
Date Instructed:	16-Feb-2015
Results Due Date:	20-Feb-2015

Chemtest
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Results Summary - 2 Stage WAC

Project: 4 Frognal Rise

Chemtest Job No: 15-03203 Chemtest Sample ID: 101998 Sample Ref: Sample ID: BH2 Top Depth(m): 1.0 Bottom Depth(m): Sampling Date:							Landfill Waste Acceptance Criteria Limits		
							Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	U	%			0.89	3	5	6
Loss on Ignition	2610	U	%			5	--	--	10
Total BTEX	2760	U	mg/kg			A < 0.01	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			A < 10	500	--	--
Total (of 17) PAHs	2700	N	mg/kg			< 2.0	100	--	--
pH	2010	U				8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.045	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.02	0.004	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.0001	< 0.0001	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.0005	< 0.0005	< 0.001	< 0.005	0.01	0.2	2
Molybdenum	1450	U	0.001	< 0.001	< 0.050	< 0.050	0.5	10	30
Nickel	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.005	0.003	< 0.010	0.035	0.5	10	50
Antimony	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.001	< 0.001	< 0.50	< 0.50	4	50	200
Chloride	1220	U	18	2.5	35	35	800	15000	25000
Fluoride	1220	U	0.56	0.35	1.1	3.6	10	150	500
Sulphate	1220	U	26	1.9	50	34	1000	20000	50000
Total Dissolved Solids	1020	N	250	50	480	620	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	N	67	7.4	130	110	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	25

Leachate Test Information	
Leachant volume 1st extract/l	0.293
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.112

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Results Summary - 2 Stage WAC

Project: 4 Frognal Rise

Chemtest Job No: 15-03203 Chemtest Sample ID: 101999 Sample Ref: U/S Footings Sample ID: TP3 Top Depth(m): Bottom Depth(m): Sampling Date:							Landfill Waste Acceptance Criteria Limits		
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable Non-reactive Hazardous waste in non-hazardous**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%			1.3	3	5	6
Loss on Ignition	2610	U	%			5	--	--	10
Total BTEX	2760	U	mg/kg			A < 0.01	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			A < 10	500	--	--
Total (of 17) PAHs	2700	N	mg/kg			< 2.0	100	--	--
pH	2010	U				7.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.034	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.001	0.001	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.015	0.005	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	0.0002	0.0001	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.003	0.002	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.0005	< 0.0005	< 0.001	< 0.005	0.01	0.2	2
Molybdenum	1450	U	0.022	0.005	< 0.050	0.067	0.5	10	30
Nickel	1450	U	0.001	0.001	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	< 0.001	0.003	< 0.010	0.024	0.5	10	50
Antimony	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.001	< 0.001	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.054	0.065	< 0.50	0.64	4	50	200
Chloride	1220	U	31	< 1.0	60	27	800	15000	25000
Fluoride	1220	U	0.72	0.32	1.4	3.5	10	150	500
Sulphate	1220	U	33	2.5	64	51	1000	20000	50000
Total Dissolved Solids	1020	N	160	45	310	550	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	N	94	14	180	210	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	21

Leachate Test Information	
Leachant volume 1st extract/l	0.303
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.151

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Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Chemtest Sample ID:	Sample Ref:	Sample ID:	Sampled Date:	Containers Received:	Deviation Code(s):
101998		BH2	None Supplied	Amber Glass 250ml	A
101998		BH2	None Supplied	Plastic Tub 500g	A
101999	U/S Footings	TP3	None Supplied	Amber Glass 250ml	A
101999	U/S Footings	TP3	None Supplied	Plastic Tub 500g	A

Chemtest
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Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
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, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk