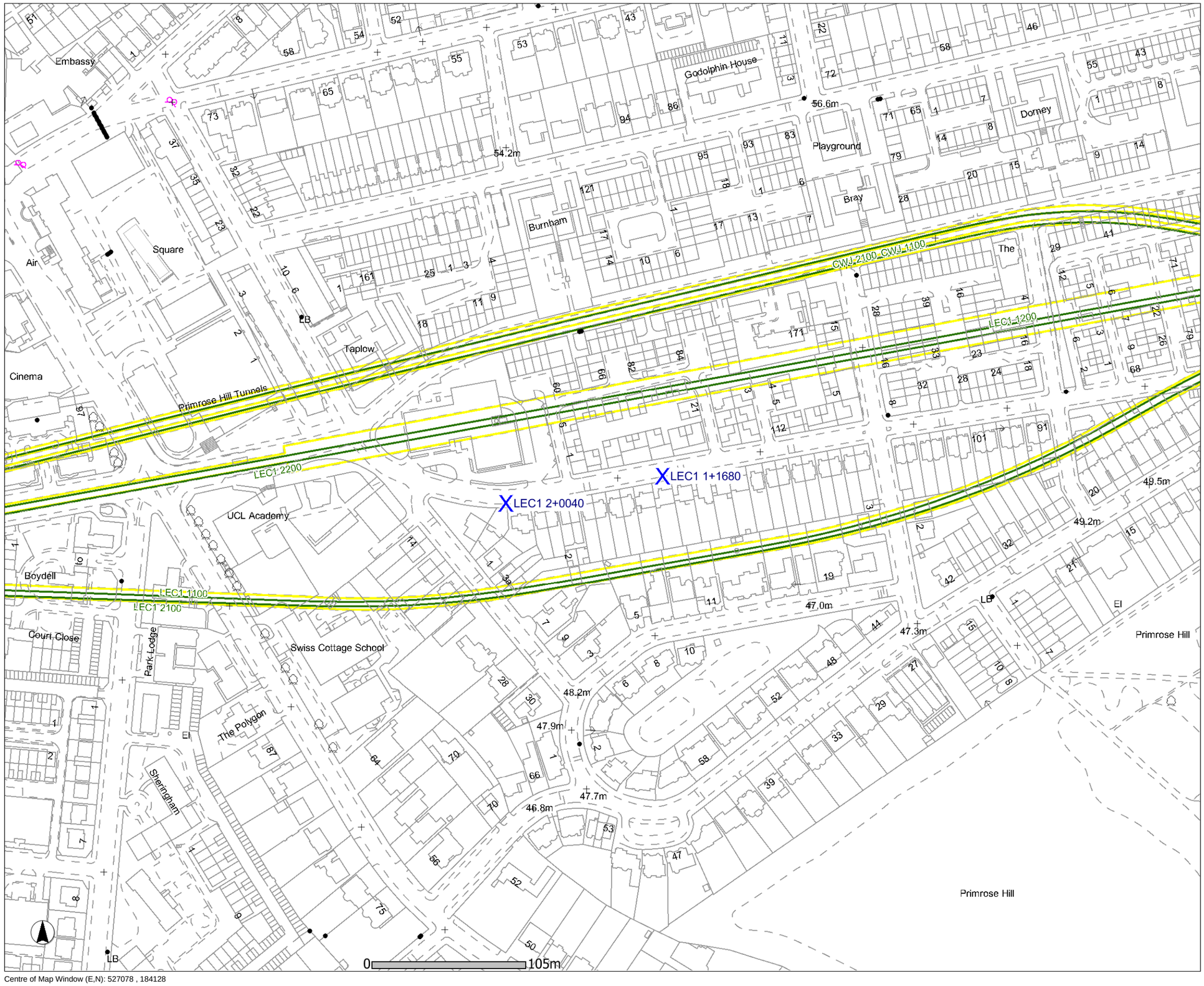

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Company Ownership

- Bridge (Rail over River)
- Bridge (Rail over Road)
- Bridge (Road over Rail)
- Bridge (Rail over Rail)
- Level Crossing
- Tunnel
- Contracted for Sale
- Leasehold Ownership
- Freehold Ownership
- Prohibitive Interest

Annotation

Points

- Bench Mark
- Boundary Post or Stone
- Historic Site
- Disused Feature
- General Feature
- Positioned Boulder
- Positioned Coniferous Tree
- Positioned Nonconiferous Tree
- Railway Structure
- Roadside
- Spot Height
- Tidal Water
- Inland Water
- Inland Water

Symbols

- Bench Mark
- Boundary Half Mereing
- Direction of Flow
- Switch
- Road Related Flow

Line Features

- Building
- Building
- Building Overhead
- General Feature Edge
- General Feature
- General Feature Underground
- Top of Slope
- Top of Slope
- Bottom of Slope
- Bottom of Slope
- Narrow Gauge Railway
- Standard Gauge Railway
- Overhead Construction
- validate General Feature
- Mean High Water
- Mean High Water
- Mean Low Water
- Mean Low Water
- Historic Cable Route

Miscellaneous

- Business Space
- Miscellaneous Asset Portfolio
- Easements Wayleaves Telecoms

Utilities

- Business Space
- Miscellaneous Asset Portfolio
- Easements Wayleaves Telecoms
- Track Link

LNW137638
9 Harley Road, London

Plot Scale	1:2500
Plot Date	29/7/2015

Network Rail

Centre of Map Window (E,N): 527078 , 184128

Output Created from the GI Portal – A3 Landscape

National Hazard Directory

Terms and Conditions

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National Hazard Directory

Customised Report

Search Criteria: ELR(s) = LEC1; Mileage From = 1.1680; Mileage To = 2.0040
Date: 28/07/2015

17 Hazards found.

ELR	ELR Name	Mileage From	Mileage To	Hazard Code	Hazard Description	Local Name	Track ID	Free Text
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	0.0000	6.0440	HC	Hazard-Clearance	Restricted Warning Times		ZIAR Ref No_272501_ Interim Reference No_HZ_11019 _Notes: Sourced from Issue 1. Dated 25/3/97. of the Hazards Directory
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	0.0000	83.0374	EKR	Road/Rail Noise	Beware of Noise		ZIAR Ref No_272493_ Interim Reference No_HZ_11011 _Notes: Noise from Wind, Road Traffic and Low Flying Aircraft. Sourced from Issue 1. Dated 25/3/97. of the Hazards Directory
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	0.0000	83.0374	HEO	25Kv Overhead Electrification	25 KV Overhead Line Equipment		Sourced from Issue 1. Dated 25/3/97. of the Hazards Directory
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.0888	2.0597	HCR	No Refuges	Down DC Electric and Down NL DC Electric	Unknown	Lockout Area 4046: Down DC Eectric Line and Down NL DC Electric Line through South Hampstead Tunnel, from the entrance to the tunnel on the Down Slow near 2100 Points and where the retaining walls start for the tunnel entrance on the Down NL DC Electric n
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.0888	2.0597	HCC	Restricted Clearance	Down DC Electric and Down NL DC Electric	Unknown	Lockout Area 4046: Down DC Electric Line and Down NL DC Electric Line through S Hampstead Tunnel, from the entrance to tunnel on the Dn Slow near 2100 Pts where retaining walls start for tunnel on the Dn NL DC Electric.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1037	2.0597	HCR	No Refuges	Up DC Electric and Up NL DC Electric	Unknown	Lockout Area 4047: Up DC Eectric and NL DC Electric Lines through South Hampstead Tunnel, between signal WM900 on the Up DC Electric line,signal WM800 on the Up NL DC Electric line and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1037	2.0597	HCC	Restricted Clearance	Up DC Electric and Up NL DC Electric	Unknown	Lockout Area 4047: Up DC Eectric and NL DC Electric Lines through South Hampstead Tunnel, between signal WM900 on the Up DC Electric line,signal WM800 on the Up NL DC Electric line and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1133	2.0603	HCR	No Refuges	Up Fast inside Primrose Hill Tunnel	Unknown	Lockout Area 4043: Up Fast line through Primrose Hill Tunnel, between signal WM110 and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1133	2.0603	HCC	Restricted Clearance	Up Fast inside Primrose Hill Tunnel	Up Main/Fast	Lockout Area 4043: Up Fast line through Primrose Hill Tunnel, between signal WM110 and the north end tunnel portal.
LEC1	LONDON EUSTON -	1.1133	2.0605	HCR	No Refuges	Down Slow inside	Unknown	Lockout Area 4044: Down Slow line through Primrose Hill Tunnel,

ELR	ELR Name	Mileage From	Mileage To	Hazard Code	Hazard Description	Local Name	Track ID	Free Text
	RUGBY TRENT VALLEY JCN					Primrose Hill Tunnel		between signal WM317 and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1133	2.0605	HCC	Restricted Clearance	Down Slow inside Primrose Hill Tunnel	Down Slow	Lockout Area 4044: Down Slow line through Primrose Hill Tunnel, between signal WM317 and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1162	2.0603	HCR	No Refuges	Down Fast inside Primrose Hill Tunnel	Unknown	Lockout Area 4042: Down Fast line through Primrose Hill Tunnel, between signal WM113 and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1162	2.0603	HCC	Restricted Clearance	Down Fast inside Primrose Hill Tunnel	Down Main/Fast	Lockout Area 4042: Down Fast line through Primrose Hill Tunnel, between signal WM113 and the north end tunnel portal.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1173	2.0605	HCR	No Refuges	Up Slow inside Primrose Hill Tunnel	Unknown	Lockout Area 4045: Up Slow line through Primrose Hill Tunnel, between the tunnel portals.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1173	2.0605	HCC	Restricted Clearance	Up Slow inside Primrose Hill Tunnel	Up Slow	Lockout Area 4045: Up Slow line through Primrose Hill Tunnel, between the tunnel portals.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1188	2.0594	HCC	Restricted Clearance	Primrose Hill Tunnel	Unknown	Limited Clearance and TOWS must be in Operation.
LEC1	LONDON EUSTON - RUGBY TRENT VALLEY JCN	1.1188	2.0616	HCR	No Refuges	Primrose Hill Tunnels All lines	All/Multiple Tracks	RED ZONE Working Prohibited. Clearance. Cabinets in refuges.

Adams Mandy

From: Mole Simon
Sent: 23 July 2015 09:09
To: BS_Transmittals
Subject: Underground Services search: NRS **OP** 9 Harley Road, London (LNW137638)

Action taken by NRG:

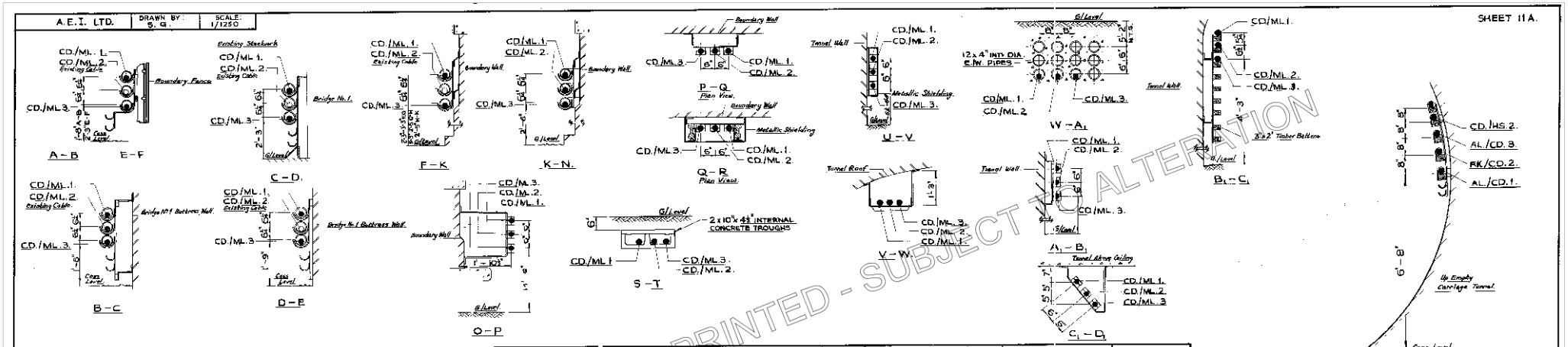
Records sent via email

NST Ref: LNW137638

National Records Group

A.E.I. LTD.	DRAWN BY: S. G.	SCALE: 1/1250

SHEET 11A.



SECTION	TYPE OF ROUTE	LENGTH	DISTANCE FROM MAIN R/RAIL EMBANKMENT WALL OR BOUNDARY WALL.	REMARKS	LOCATION
A — B	SPLIT TUBES ON BRACKETS	7'–6"	2'–0" — 5'–0"	BRACKETS CLIPPED TO TOE IRONS	MP. B. 5+1327–6"
B — C	" " " "	6'–0"	5'–0" — 3'–3"	BRACKETS BOLTED TO BRIDGE BUTTRESS	MP. C. 5+1339'–6"
C — D	" " " "	150'–0"	3'–3" — 3'–0"	BRACKETS BOLTED TO EXISTING RETAINING WALL ON SLOPING EMT.	MP. D. 5+1484'
D — E	" " " "	7'–0"	3'–0" — 3'–3"	BRACKETS BOLTED TO BRIDGE BUTTRESS	MP. E. 5+1491'
E — F	" " " "	45'–0"	3'–3" — 5'–0"	BRACKETS BOLTED BOUNDARY WALL	MP. F. 5+1537'
F — G	" " " "	9'–6"	5'–0" — 6" B/WALL.	" " "	MP. G. 5+1546'
G — H	" " " "	6'–6"	6" B./WALL.	" " "	MP. H. 5+1552'
H — J	" " " "	139'–0"	6" B./WALL.	J = JOINT BAY CD./ML. 3	MP. J. 5+1698'
J — K	" " " "	4'–3"	6" B./WALL.	K = JOINT BAY CD./ML. 2	MP. K. 5+1702'–6"
K — L	" " " "	7'–3"	6" B./WALL.	L = JOINT BAY CD./ML. 1.	MP. L. 5+1710'
L — M	" " " "	3'–0"	6" B./WALL. – 9" B./WALL.	BRACKETS BOLTED TO BOUNDARY WALL	MP. M. 5+1746'
M — N	" " " "	1'–0"	9" B./WALL. – B./WALL.	" " " "	MP. N. 5+1746'–6"
N — O	SPLIT TUBES IN CONCRETE	1'–6"		THROUGH BOUNDARY WALL	MP. O. 5+1747'–6"
O — P	CLEATED ON BRACKETS	6'–0"		BRACKETS BOLTED TO BOUNDARY WALL	MP. P. 5+1753'
P — Q	" " "	15'–0"		" " " "	
Q — R	" " "	6'–0"		" " " "	
R — S	SPLIT TUBES IN CONCRETE	4'–0"			
S — T	BURIED CONCRETE TROUGHS	236'–0"			
T — U	SPLIT TUBES IN CONCRETE	3'–0"			
U — V	CLEATED ON BRACKETS	20'–0"		BRACKETS BOLTED TO WALL OF TUNNEL	
V — W	" " "	12'–0"		BRACKETS BOLTED TO ROOF OF TUNNEL	
W — X	E/W. PIPES IN CONCRETE	19'–0"		DUCTS UNDER GOODS YD.	
X — Y	" " "	145'–0"		" " " "	
Y — Z	" " "	172'–0"		" " " "	
Z — A1	" " "	21'–0"		" " " "	

SECTION	TYPE OF ROUTE	LENGTH	DISTANCE FROM MAIN R/RAIL EMBANKMENT WALL OR BOUNDARY WALL.	REMARKS	LOCATION
A_1 — B_1	CLEATED ON BRACKETS	5'–6"		BRACKETS BOLTED TO WALL OF TUNNEL	
B_1 — C_1	TIMBER BATTENS ON BRACKETS	152'–6"		" " " "	
C_1 — D_1	CLEATED ON BRACKETS	8'–0"		BRACKETS BOLTED TO ROOF OF TUNNEL	
D_1 — E_1	ASBESTOS PIPES IN CONCRETE	60'–0"		DUCTS RISING FROM HORSE TUNNEL TO TRACK	
E_1 — F_1	SURFACE CONCRETE TROUGHS	62'–0"	14'–6"		
F_1 — G_1	" " "	42'–0"	21'–0" S/S WALL 16'–6" S/S WALL		
G_1 — H_1	CAST CABLE CHASE	48'–0"	3'–6" S/S WALL		
H_1 — J_1	" " "	9'–3"	3'–6" S/S WALL		
J_1 — K_1	" " "	15'–9"	3'–6" S/S WALL		
A_2 — B_2	CAST CABLE CHASE	18'–6"	1'–6" S/S WALL		MP B_1 + 0221'
B_2 — C_2	" " "	9'–3"	1'–6" S/S WALL		MP C_1 + 0230'–3"
C_2 — D_2	" " "	2'–3"	1'–6" S/S WALL		MP D_1 + 0232'–6"
D_2 — E_2	" " "	42'–6"	1'–6" S/S WALL – 17'–9" S/S WALL		MP E_2 + 0275'
E_2 — F_2	SURFACE CONCRETE TROUGHS	34'–0"	17'–9" S/S WALL – 22'–3" S/S WALL		MP F_2 + 0279'–6"
F_2 — G_2	ASBESTOS PIPES IN CONCRETE	8'–0"	22'–3" S/S WALL – 12'–6" MAIN R/R.		MP G_2 + 0279'–6"
G_2 — H_2	" " "	60'–6"	12'–6"		MP H_2 + 0339'–6"
H_2 — J_2	" " "	63'–0"		DUCTS LEADING DOWN INTO HORSE TUNNEL FROM TRACK	
J_2 — K_2	SURFACE CONCRETE TROUGHS	11'–0"			
K_2 — L_2	" " "	10'–6"		L_2 = JOINT BAY FROM CD./ML. 2 & AL./CD. 3	
L_2 — M_2	" " "	7'–0"		M_2 = JOINT BAY AL./CD. 1 & CD./ML. 2	
M_2 — N_2	" " "	61'–0"			
N_2 — O_2	CLEATED ON BRACKETS	12'–0"			
O_2 — P_2	" " "	30'–0"		CABLE SHAFT LEADING TO UP SAFETY CARRIAGE TUNNEL	MP P_2 + 0425
P_2 — Q_2	TIMBER BATTENS ON BRACKETS	908'–0"	5'–6"		MP Q_2 + 1320

NOTE:– AT POINT 'K' CD./ML. 2. NEW SECTIONAL LENGTH IS JOINTED TO EXISTING CABLE

REVISION 1
AL/CD-1 WAS SP/CD-1 AL/CD-2 WAS SP/CD-2 AL/CD-3 WAS SP/CD-3
REVISION 2
AL/CD-2 AMENDED TO FK/CD-2 11/74

CB 9/11/67

BRITISH RAILWAYS. L.M. REGION.
C.M. & E.E. (ELECTRICAL). STONEBRIDGE PK.

LONDON ELECTRIFIED LINES
E.H.V. CABLE RENEWAL STAGE 4.
ROUTE DETAILS
M.P. 5¼ TO CAMDEN S/S. TO M.P. 1¾

SCALE: 1/1250. DATE: 12-6-64

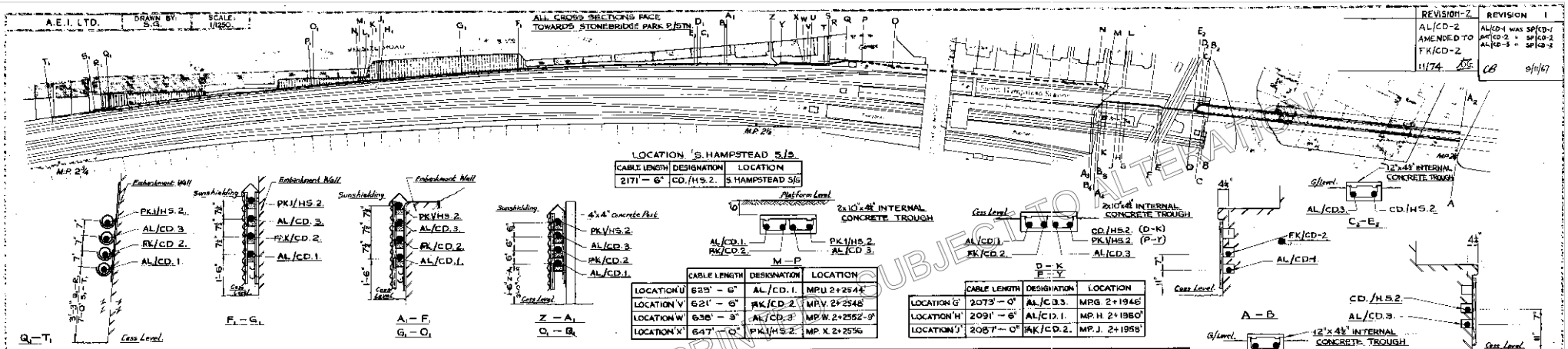
E.2/D. 41/64/2

DRAWN BY. S.G. CHECKED BY. APPROVED BY.

A.E.I. LTD. | DRAWN BY: S.G. | SCALE: 1/1250

ALL CROSS SECTIONS FACE TOWARDS STONEBRIDGE PARK P/STN.

REVISION-Z	REVISION 1
AL/CD-2 AMENDED TO FK/CD-2 11/74	AL/CD-1 WAS SP/CD-1, AL/CD-2 = SP/CD-2, AL/CD-3 = SP/CD-3 CB 9/11/67



LOCATION 'S. HAMPSTEAD S/S.

CABLE LENGTH	DESIGNATION	LOCATION
2171'—6"	CD./HS.2.	S. HAMPSTEAD S/S

	CABLE LENGTH	DESIGNATION	LOCATION
LOCATION 'U'	623'—6"	AL/CD.1.	MP.U 2+2544'
LOCATION 'V'	621'—6"	FK/CD.2.	MP.V. 2+2548'
LOCATION 'W'	638'—3"	AL/CD.3.	MP.W. 2+2552-9"
LOCATION 'X'	647'—0"	PK.1/HS.2.	MP. X. 2+2556

	CABLE LENGTH	DESIGNATION	LOCATION
LOCATION 'G'	2073'—0"	AL/C.D.3.	MP.G. 2+1946'
LOCATION 'H'	2091'—6"	AL/CD.1.	MP.H. 2+1960'
LOCATION 'J'	2087'—0"	FK/C.D.2.	MP.J. 2+1958'

SECTION	TYPE OF ROUTE	LENGTH	DISTANCE FROM MAIN R/RAIL, EMBANKMENT WALL OR SOUNDARY WALL	REMARKS	LOCATION
A — B	CABLE CHASES	474'—0"	2'—9"	IN PLATFORM WALL OF PRIMROSE HILL DOWN ELECTRIC TUNNEL	MP.B 2+1794'
B — C	ASBESTOS TUBES IN CONCRETE	3'—0"	2'—9" — 4'—6"		MP.C. 2+1797'
C — D	SURFACE CONCRETE TROUGHS	21'—0"	4'—6" — 4'—0"		MP.D. 2+1818'
D — E	" " "	57'—0"	4'—0" — 4'—6"		MP.E. 2+1875'
E — F	" " "	7'—0"	4'—6" — 6'—6"		MP.F. 2+1881'
F — G	" " "	65'—0"	6'—0"	G=JOINT BAY AL/CD.3	MP.G. 2+1946'
G — H	" " "	4'—0"	6'—6"	H=JOINT BAY AL/CD.1.	MP.H. 2+1950'
H — J	" " "	8'—0"	7'—3"	J=JOINT BAY FK/CD.2.	MP.J. 2+1958'
J — K	" " "	22'—6"	6'—9"		MP.K. 2+1980'-6
K — L	BURIED CONCRETE TROUGHS	7'—6"	6'—9"		MP.L. 2+1987'-6
L — M	ASBESTOS TUBES DUCTS	30'—0"		TRACK CROSSING	MP.M. 2+1987'-6
M — N	BURIED CONCRETE TROUGHS	17'—0"	3'—3" B/WALL	S. HAMPSTEAD STN. PLATFORM	MP.N. 2+2007'
N — O	" " "	390'—0"	3'—3" B/WALL		MP.O. 2+2400'
O — P	" " "	50'—8'	3'—3" — 1'—3" B/WALL		MP.P. 2+2449'
P — Q	SURFACE CONCRETE TROUGHS	92'—0"	17'—6" — 18'—9"		MP.Q. 2+2481'
Q — R	BURIED CONCRETE TROUGHS	31'—0"	18'—9" — 13'—0"		MP.R. 2+2510'-6
R — S	SURFACE CONCRETE TROUGHS	2'—0"	13'—0"		MP.S. 2+2512'-6
S — T	" " "	8'—6"	13'—0" — 9'—3"		MP.T. 2+2519'-9
T — U	" " "	26'—6"	9'—6"	U=JOINT BAY AL/CD.1.	MP.U 2+2544'
U — V	" " "	4'—0"	9'—0"	V=JOINT BAY FK/CD.2.	MP.V. 2+2548'
V — W	" " "	4'—9"	9'—6"	W=JOINT BAY AL/CD.3.	MP.W. 2+2552'-9
W — X	" " "	3'—3"	10'—0"	X=JOINT BAY PK.1/HS.2.	MP.X. 2+2556'
X — Y	" " "	42'—0"	9'—3" — 8'—6"		MP.Y. 2+2598'
Y — Z	SPLIT TUBE ON BRACKET	7'—0"	8'—6" — 9'—0"	RAMP UP TO POSIT. ROUTE	MP.Z. 2+2604'
Z — A1	TIMBER BATTENS ON BRACKETS	96'—0"	5'—0" — 5'—6"	CONCRETE POST 8'-0" CTRS.	MP.A1 2+2696'

SECTION	TYPE OF ROUTE	LENGTH	DISTANCE FROM MAIN R/RAIL, EMBANKMENT WALL OR BOUNDARY WALL	REMARKS	LOCATION
A1 — B1	TIMBER BATTENS ON BRACKETS	6'—0"	5'—6"	FIXED TO EMBANKMENT WALL	MP.B1 2+2708'
B1 — C1	" " "	49'—0"	5'—6" — 5'—9"	" " "	MP.C1 2+2750'-6
C1 — D1	" " "	6'—0"	5'—9" — 5'—0"	" " "	MP.D1 2+2756'-6
D1 — E1	" " "	6'—0"	5'—0" — 5'—9"	" " "	MP.E1 2+2762'
E1 — F1	" " "	385'—0"	5'—9" — 6'—0"	" " "	MP.F1 2+3094'
F1 — G1	" " "	105'—6"	6'—0"	" " "	MP.G1 2+3201'
G1 — H1	" " "	153'—0"	6'—0"	" " "	MP.H1 2+3350'
H1 — J1	" " "	3'—6"	6'—0"	" " "	MP.J1 2+3353'
J1 — K1	" " "	23'—0"	6'—0"	" " "	MP.K1 2+3374'
K1 — L1	" " "	4'—6"	6'—0" — 5'—3"	" " "	MP.L1 2+3378'
L1 — M1	" " "	4'—0"	5'—3"	" " "	MP.M1 2+3382'
M1 — N1	" " "	4'—6"	5'—3" — 6'—0"	" " "	MP.N1 2+3386'
N1 — O1	" " "	85'—0"	6'—0"	" " "	MP.O1 2+3449'
O1 — P1	" " "	3'—0"	6'—0" — 5'—6"	" " "	MP.P1 2+3472'
P1 — Q1	" " "	390'—0"	5'—6" — 6'—0"	CONCRETE POST 8'-0" CENTRES	MP.Q1 2+3852'
Q1 — R1	SPLIT TUBES ON BRACKETS	12'—0"	6'—0" — 6'—6"	FIXED TO EMBANKMENT WALL	MP.R1 2+3864'
R1 — S1	" " "	14'—0"	6'—6"	" " "	MP.S1 2+3877'
S1 — T1	" " "	86'—0"	6'—6" — 6'—0"	" " "	MP.T1 2+3960'
A2 — B2	CABLE CHASES	479'—0"	2'—9"	IN PLATFORM WALL OF PRIMROSE HILL UP ELECTRIC TUNNEL	MP.A2 2+1799'
B2 — C2	ASBESTOS TUBES IN CONCRETE	3'—0"	2'—9" — 4'—3"		MP.B2 2+1802'
C2 — D2	SURFACE CONCRETE TROUGHS	7'—0"	4'—3"		MP.C2 2+1809'
D2 — E2	" " "	18'—0"	4 — 3"UP LINE — 4'—0" DOWN LINE		MP.D2 2+1818'
A3 — B3	ASBESTOS TUBES DUCTS	23'—6"		TRACK CROSSING	MP.B3 2+1987'-6
A4 — B4	ASBESTOS TUBES DUCTS	23'—6"		TRACK CROSSING	MP.B4 2+1987'-6

$A_2 - B_2$

- CABLE CHASES IN PLATFORM WALL
- SURFACE CONCRETE TROUGHS
- BURIED CONCRETE TROUGHS
- SPLIT TUBES ON BRACKETS
- TIMBER BATTENS ON BRACKETS
- ASBESTOS TUBES IN CONCRETE

BRITISH RAILWAYS. L.M. REGION.
C.M.& E.E. (ELECTRICAL.). STONEBRIDGE PK.
LONDON ELECTRIFIED LINES.
E.H.V. CABLE RENEWAL. STAGE 4.
ROUTE MAP.
M.P. 2¼ TO M.P. 2¾.

SCALE: 1/1250. DATE: 12-6-64

E.2/D. 44/64/2

DRAWN BY. S.G. CHECKED BY. APPROVED BY.

Transport for London
London Streets

Your ref: 16378DM
Our ref: AD/NRSWA/ENQ/TFL: 37076

18 August 2015

Dear Sir / Madam

PLANT ENQUIRY: 9 Harley Road, London, NW3 3BX

Thank you for your email dated 13 August 2015.
Our records show no traffic control equipment within the sites of your anticipated works.

Should you vary the location of the works please inform us so that further checks can be made.

The information relates to traffic control equipment owned by Transport for London, and is believed to be correct.

Yours faithfully

Miss Sabihah Qureshi
RSM Operations ,Planned Interventions,
Surface Transport, Transport for London
Email: plantenquiries@tfl.gov.uk
Direct line: (020) 3054 4872

Debbie Miller

From: Rachael Katz <RachaelKatz@crossrail.co.uk> on behalf of Safeguarding <Safeguarding@crossrail.co.uk>
Sent: 17 July 2015 09:11
To: Debbie Miller
Subject: CRL-00-140914 Ref: 16378DM - Site : 9 Harley Road, London, NW3 3BX

Dear Debbie Miller

Crossrail Ref: CRL-00-140914

Ref: 16378DM - Site : 9 Harley Road, London, NW3 3BX

Thank you for your letter dated 17 July 2015, requesting the views of the Crossrail Project Team on the above.

The area in question is outside the limits of consultation shown in the Safeguarding Direction issued by the Secretary of State for Transport on 24 January 2008.

The implications arising from Crossrail have been considered, and we do not wish to make any comments.

The Crossrail Bill which was introduced into Parliament by the Secretary of State for Transport in February 2005 was enacted as the Crossrail Act on the 22nd July 2008. The first stage of Crossrail preparatory construction works began in early 2009. Main construction works have started with works to the central tunnel section to finish in 2018, to be followed by a phased opening of services.

In addition, the latest project developments can be found on the Crossrail website www.crossrail.co.uk/safeguarding, which is updated on a regular basis.

I hope this information is helpful, but if you require any further assistance then please feel free to contact a member of the Safeguarding Team on 0345 602 3813, or by email to safeguarding@crossrail.co.uk

Yours sincerely

Rachael Katz | Community Relations Assistant
Crossrail | 25 Canada Square, Canary Wharf, London E14 5LQ
Helpdesk (24hr) 0345 602 3813
helpdesk@crossrail.co.uk | www.crossrail.co.uk

MOVING LONDON FORWARD

Appendix B. Ground Investigation Factual Report

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: 0208 594 8134
Fax: 0208 594 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: 15/23973**
December 2015

9 HARLEY ROAD, ST JOHNS WOOD,

LONDON, NW3 3BX

FACTUAL REPORT ON A GROUND INVESTIGATION

Prepared for

engineersHRW

Acting on behalf of

Antigone and George Polychronopoulos

CONTENTS

1.0INTRODUCTION

1.1 Outline and Limitations of Report

At the request of engineersHRW, working on behalf of Antigone & George Polychronopoulos, a ground investigation was carried out in connection with a proposed residential basement development at the above site. A Phase 1 Preliminary Risk Assessment (Desk Study) is presented under separate cover in Site Analytical Services Limited Report Reference 15/23973-1.

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

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 hole 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: TQ 270 840)

2.1 Site Location

The site is located to the north-east of Harley Road in Hampstead, North London, NW3 3BX and comprises a two storey residential property including rooms at roof level with front and rear garden areas. The site covers an area of approximately 0.1 hectares and the general area is under the authority of the London Borough of Camden.

The site is bound by Harley Road to the immediate south-west, with residential properties to the north-east, north-west and south-east.

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.

The British Geological Survey's (BGS) online records indicate there are no historic boreholes within 250m of the site.

2.3 Previous Investigations

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 15/23973-1 dated December 2015) has been undertaken across the site by Site Analytical Services Limited.

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 two rotary percussive boreholes to a depth of 15.00m below ground level (Boreholes 1 and 2).
- The excavation of one trial pit to 1.50m maximum depth to expose existing foundations at the site (Trial Pit 1).
- 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.
- Factual reporting on the results of the investigation.

3.2 Ground Conditions

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

The boreholes revealed ground conditions that were consistent with the geological records and known history of the area and comprised Made Ground up to 1.00m in thickness resting on deposits of the London Clay Formation.

These ground conditions are summarised in the following table. For detailed information on the ground conditions encountered in the boreholes, reference should be made to the exploratory hole records presented in Appendix A.

Strata	Depth to top of strata (mbgl)	Level to top of strata (mOD)	Depth to base of strata (mbgl)	Level to base of strata (mOD)	Description
Made Ground	0.00		0.30 to 1.00	48.56 to 48.08	Grass surface over silty slightly gravelly sandy clay with brick fragments.
London Clay Formation	0.30 to 1.00	48.56 to 48.08	15.00 (base of BH's 1 & 2)	34.16 to 33.64	Firm then stiff becoming very stiff silty sandy clay with gypsum crystals

Table A: Summary of Ground Conditions in Exploratory Holes

3.3 Groundwater

Groundwater was not encountered within Boreholes 1 and 2 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 not subsequently encountered within the monitoring standpipes after a period of approximately four weeks.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (October and November 2015) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

4.0 IN-SITU TESTING 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.

4.2 Undrained Triaxial Compression Test Results

Undrained Triaxial Compression tests were carried out on ten undisturbed 100mm diameter samples taken from within Boreholes 1 and 2.

The results of the tests are given within the K4 Soils reports, contained in Appendix B

4.3 Classification Tests

Atterberg Limit tests were conducted on four samples taken at depth in Boreholes 1 and 2 and showed the samples tested to fall into Class CH according to the British Soil Classification System.

The test results are given in Table 1, contained in Appendix B.

4.4 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on four samples are presented on Table 2, contained in Appendix B.

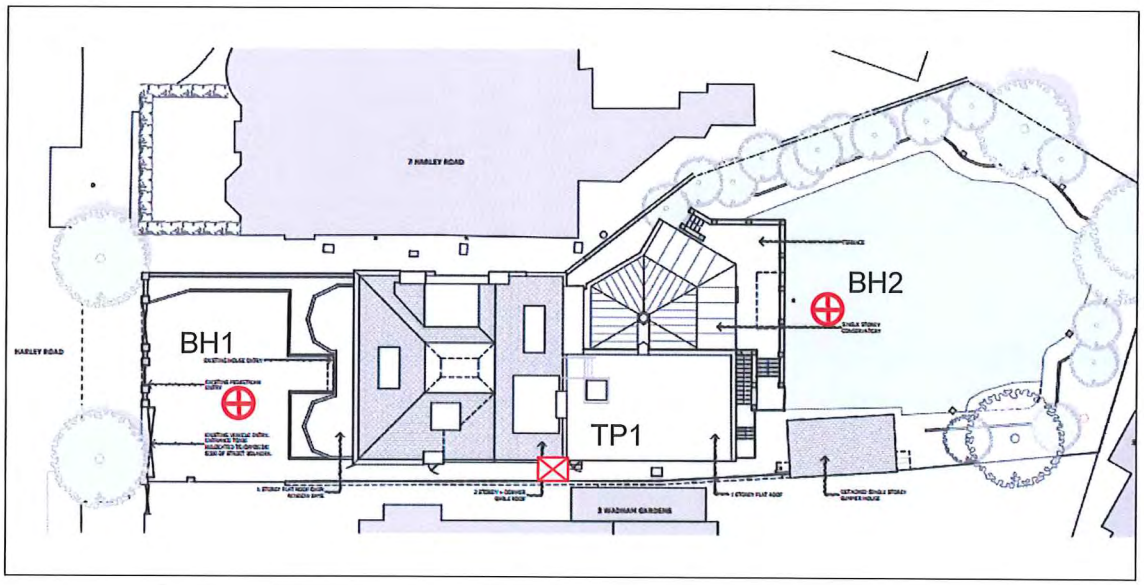
p.p. SITE ANALYTICAL SERVICES LIMITED

T P Murray MSc BSc (Hons) FGS
Geotechnical Engineer

5.0 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, 20. Code of Practice for Site Investigations, BS5930: 2015, 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. Eurocode 1: Actions on structures – BS EN 1991-1-1:2002: General actions – Densities, self weight and imposed loads, BSI, London
9. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.
10. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.
11. 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.
12. Tomlinson, M J, 2001. "Foundation Design and Construction", Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

	Site Analytical Services Ltd.	REF: 15/23973
	LOCATION: 9 Harley Road, London, NW3 3BX	FIG: 1
	TITLE: Site Sketch Plan DATE: Dec' 2015	SCALE: NTS



APPENDIX `A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site	Borehole Number
9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE		49.16	ANTIGONE & GEORGE POLYCHRONOPOULOS	1523973
	Location TQ270840	**Dates** 05/10/2015	**Engineer** ENGINEERSHRW	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					49.06	0.10 (0.20)	MADE GROUND: Grass surface over silty sandy topsoil.		
0.25	D1				48.86	0.30	MADE GROUND: Brown clay containing brick fragments and ashes.		
0.50	D2						Soft mottled brown silty sandy CLAY containing partings of silty fine sand.		
0.75	D3								
1.00-1.45 1.00	SPT(C) N=7 D4		DRY	1,2/1,2,2,2					
						(2.70)			
1.75	D5								
2.00-2.45	U1			50 blows					
2.75	D6								
3.00-3.45 3.00	SPT N=14 D7		DRY	2,3/3,3,4,4	46.16	3.00	Firm becoming stiff mottled brown silty sandy CLAY containing partings of silty fine sand and occasional gypsum crystals.		
3.75	D8								
4.00-4.45	U2			90 blows					
4.75	D9								
5.00-5.45 5.00	SPT N=21 D10		DRY	3,4/5,4,6,6					
						(5.80)			
6.00	D11								
6.50-6.95	U3			100 blows					
7.50	D12								
8.00-8.45 8.00	SPT N=31 D13		DRY	6,6/7,8,8,8					
					40.36	8.80	Very stiff dark grey brown blue silty sandy fissured CLAY containing partings of silty fine sand, gypsum crystals and claystones.		
9.00	D14								
						(1.20)			
9.50-9.95	U4			120 blows					

Remarks
D = Disturbed sample
SPT(C) = Standard Penetration Test (Cone)
U = Undisturbed 100mm diameter sample
SPT = Standard Penetration Test
Groundwater was not encountered during drilling.
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	TM

Figure No. 1523973.BH1

Site Analytical Services Ltd.

Site	Borehole Number
9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE		49.16	ANTIGONE & GEORGE POLYCHRONOPOULOS	1523973
	Location TQ270840	**Dates** 05/10/2015	**Engineer** ENGINEERSHRW	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					39.16	10.00	AS PREVIOUS STRATA		
10.50	D15								
11.00-11.45 11.00	SPT N=47 D16		DRY	6,10/10,11,13,13					
12.00	D17								
12.50-12.95	U5			150 blows		(5.00)			
13.75	D18								
14.55-15.00 14.55	SPT N=58 D19		DRY	7,12/13,14,15,16					
				05/10/2015:DRY	34.16	15.00	Complete at 15.00m		

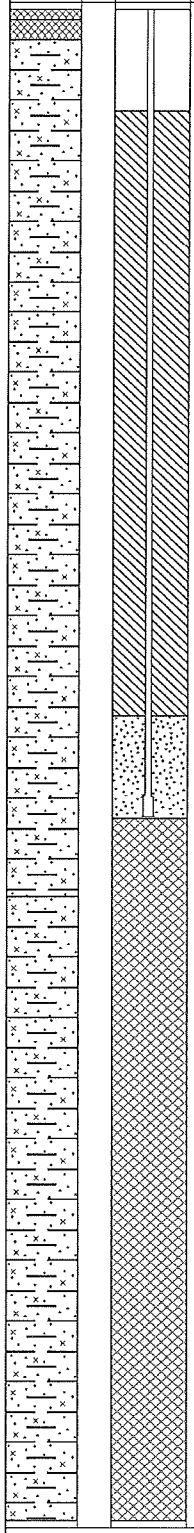
Remarks
D = Disturbed sample
SPT(C) = Standard Penetration Test (Cone)
U = Undisturbed 100mm diameter sample
SPT = Standard Penetration Test
Groundwater was not encountered during drilling.

Scale (approx)	Logged By
1:50	TM

Figure No. 1523973.BH1

Site Analytical Services Ltd.

Site 9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX			**Borehole Number** BH1
Installation Type Single Installation	**Dimensions** Internal Diameter of Tube [A] = 19 mm Diameter of Filter Zone = 128 mm	**Client** ANTIGONE & GEORGE POLYCHRONOPOULOS	**Job Number** 1523973
	Location TQ270840	**Ground Level (mOD)** 49.16	**Engineer** ENGINEERSHRW	**Sheet** 1/1



Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			48.16	1.00	Bentonite Seal
			42.16	7.00	Cement/Bentonite Grout
			41.36	7.80	Sand Filter
			41.16	8.00	Piezometer Tip
			34.16	15.00	General Backfill

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)
05/10/15				DRY			15.00		DRY	

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

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

Remarks
Lockable cover set in concrete.

Site Analytical Services Ltd.

Site	Borehole Number
9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m	48.64	ANTIGONE & GEORGE POLYCHRONOPOULOS	1523973
	Location	**Dates**	**Engineer**	**Sheet**
	TQ270840	06/10/2015	ENGINEERSHRW	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.40)	MADE GROUND: Grass surface over clayey silty topsoil.		
0.25	D1				48.24	0.40			
0.50	D2						Soft mottled brown silty sandy CLAY containing partings of silty fine sand.		
0.75	D3								
1.00-1.45 1.00	SPT(C) N=7 D4		DRY	1,2/1,2,2,2					
						(2.60)			
1.75	D5								
2.00-2.45	U1			50 blows					
2.75	D6								
3.00-3.45 3.00	SPT N=16 D7		DRY	3,3/4,4,4,4	45.64	3.00	Firm becoming stiff mottled brown silty sandy CLAY containing partings of silty fine sand and occasional gypsum crystals.		
3.75	D8								
4.00-4.45	U2			70 blows					
4.75	D9								
5.00-5.45 5.00	SPT N=19 D10		DRY	3,4/5,5,4,5					
6.00	D11								
						(6.60)			
6.50-6.95	U3			100 blows					
7.50	D12								
8.00-8.45 8.00	SPT N=29 D13		DRY	5,5/6,7,8,8					
9.00	D14								
9.50-9.95	U4			120 blows	39.04	9.60			
						(0.40)	Very stiff dark grey brown blue silty sandy fissured CLAY containing partings of silty fine sand, gypsum crystals and claystones.		

Remarks
D = Disturbed sample
SPT(C) = Standard Penetration Test (Cone)
U = Undisturbed 100mm diameter sample
SPT = Standard Penetration Test
Groundwater was not encountered during drilling.
Excavating from 0.00m to 1.00m for 1 hour.

Scale (approx)	Logged By
1:50	TM

Figure No. 1523973.BH2

Site Analytical Services Ltd.

Site	Borehole Number
9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSIVE	128mm cased to 0.00m	48.64	ANTIGONE & GEORGE POLYCHRONOPOULOS	1523973
	Location	**Dates**	**Engineer**	**Sheet**
	TQ270840	06/10/2015	ENGINEERSHRW	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					38.64	10.00	AS PREVIOUS STRATA		
10.50	D15								
11.00-11.45 11.00	SPT N=49 D16		DRY	7,11/12,12,12,13					
12.00	D17								
12.50-12.95	U5			150 blows		(5.00)			
13.75	D18								
14.55-15.00 14.55	SPT N=55 D19		DRY	9,10/13,14,13,15					
				06/10/2015:DRY	33.64	15.00	Complete at 15.00m		

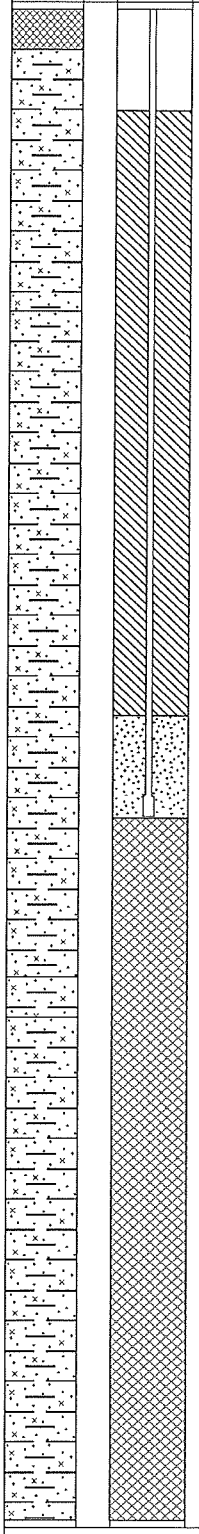
Remarks
D = Disturbed sample
SPT(C) = Standard Penetration Test (Cone)
U = Undisturbed 100mm diameter sample
SPT = Standard Penetration Test
Groundwater was not encountered during drilling.

Scale (approx)	Logged By
1:50	TM

Figure No.
1523973.BH2

Site Analytical Services Ltd.

Site 9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX			**Borehole Number** BH2
Installation Type Single Installation	**Dimensions** Internal Diameter of Tube [A] = 19 mm Diameter of Filter Zone = 128 mm	**Client** ANTIGONE & GEORGE POLYCHRONOPOULOS	**Job Number** 1523973
	Location TQ270840	**Ground Level (mOD)** 48.64	**Engineer** ENGINEERSHRW	**Sheet** 1/1



Level (mOD)	Depth (m)	Description
47.64	1.00	Bentonite Seal
		Cement/Bentonite Grout
41.64	7.00	Sand Filter
40.84	7.80	Piezometer Tip
40.64	8.00	
		General Backfill
33.64	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)
06/10/15				DRY			15.00		DRY	

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

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

Remarks
Lockable cover set in concrete.

Site Analytical Services Ltd.

Standard Penetration Test Results

Site : 9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX

Client : ANTIGONE & GEORGE POLYCHRONOPOULOS

Engineer: ENGINEERSHRW

Job Number 1523973

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	1	2	1	2	2	2	N=7	
BH1	3.00	3.15	3.45	SPT	2	3	3	3	4	4	N=14	
BH1	5.00	5.15	5.45	SPT	3	4	5	4	6	6	N=21	
BH1	8.00	8.15	8.45	SPT	6	6	7	8	8	8	N=31	
BH1	11.00	11.15	11.45	SPT	6	10	10	11	13	13	N=47	
BH1	14.55	14.70	15.00	SPT	7	12	13	14	15	16	N=58	
BH2	1.00	1.15	1.45	CPT	1	2	1	2	2	2	N=7	
BH2	3.00	3.15	3.45	SPT	3	3	4	4	4	4	N=16	
BH2	5.00	5.15	5.45	SPT	3	4	5	5	4	5	N=19	
BH2	8.00	8.15	8.45	SPT	5	5	6	7	8	8	N=29	
BH2	11.00	11.15	11.45	SPT	7	11	12	12	12	13	N=49	
BH2	14.55	14.70	15.00	SPT	9	10	13	14	13	15	N=55	

Site Analytical Services Ltd.

Site 9 HARLEY ROAD, ST JOHNS WOOD, LONDON, NW3 3BX				**Trial Pit Number** TP1
Excavation Method HAND EXCAVATION	**Dimensions** 300mm x 300mm	**Ground Level (mOD)** 49.08	**Client** ANTIGONE & GEORGE POLYCHRONOPOULOS	**Job Number** 1523973
	Location	**Dates** 05/10/2015	**Engineer** ENGINEERSHRW	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				49.03	0.05	MADE GROUND: Brick paving.		
0.25	D1				(0.95)	MADE GROUND: Silty sandy slightly gravelly clay containing brick fragments and concrete cobbles.		
0.50	D2							
0.75	D3							
1.00	D4			48.08	1.00 (0.30)	Mottled brown silty sandy CLAY containing partings of silty fine sand.		
1.20	D5		05/10/2015:DRY	47.78	1.30	Complete at 1.30m		

Plan

Remarks

D = Distubed sample
Groundwater was not encountered during the excavation.

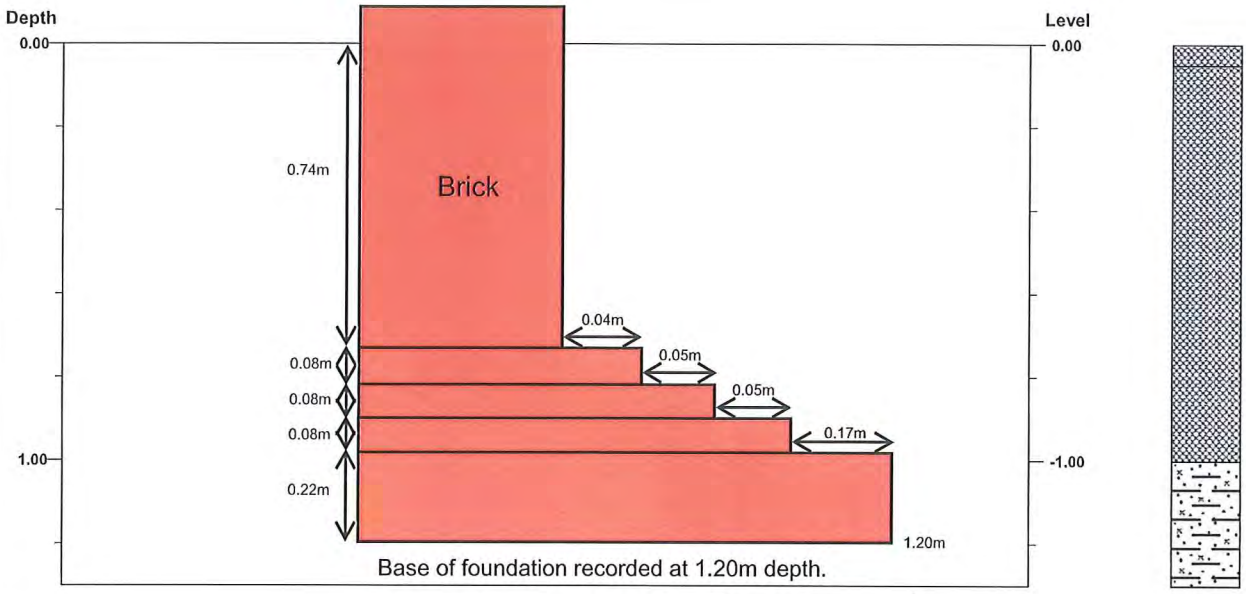
Scale (approx)	Logged By	Figure No.
1:50	TM	1523973.TP1

Site Analytical Services Ltd.

Site	Trial Pit Number
9 HARLEY ROAD, LONDON, NW3 3BX	TP1

Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	300mm x 300mm		ANTIGONE & GEORGE POLYCHRONOPOULOS	1523973

Orientation	Location	Dates	Engineer	Sheet
A / D / B / C		05/10/2015	ENGINEERSHRW	1/1



Strata

Depth (m)	No.	Description
0.00-0.05	1	MADE GROUND: Brick paving.
0.05-1.00	2	MADE GROUND: Silty sandy slightly gravelly clay containing brick fragments and concrete cobbles.
1.00-1.30	3	Mottled brown silty sandy CLAY containing partings of silty fine sand.

Samples and Tests

Depth (m)	Type	Field Records
0.25	D1	
0.50	D2	
0.75	D3	
1.00	D4	
1.20	D5	

Excavation Method:
HAND EXCAVATION

Shoring / Support:
N/A

Stability:
Good

Backfill:
Arisings

Remarks
D = Distubed sample
Groundwater was not encountered during the excavation.

Logged By	: TM
Checked By	: JW
Figure No.	: 1523973.TP1

APPENDIX `B'

Laboratory Test and Groundwater Monitoring Data

Site Analytical Services Ltd.

Ref: 15/23973

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 9 Harley Road, St Johns Wood, London, NW3 3BX

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Class
BH1	2.75	30	62	26	36	100	CH
	3.75	29	62	26	36	100	CH
BH2	3.00	32	64	29	35	100	CH
	3.75	30	66	28	38	100	CH

Table 1

Site Analytical Services Ltd.

Ref: 15/23973

SULPHATE & pH DETERMINATIONS

LOCATION 9 Harley Road, St Johns Wood, London, NW3 3BX

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	4.75		2.16		5.5	DS-3	100
	8.00		2.06		5.5	DS-3	100
BH2	6.00		2.57		5.5	DS-3	100
	10.50		0.83		6.3	DS-2	100

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

Site Analytical Services Ltd.

Ref: 15/23973

GROUNDWATER MONITORING

LOCATION 9 Harley Road, St Johns Wood, London, NW3 3BX

GROUNDWATER MONITORING RECORD			
Date	**Weather Conditions**	**Ground Conditions**	**Temperature (°C)**
16/10/2015	Overcast	Dry	13.3
Monitoring Point Location	**Depth to water (mBGL)**		**Depth to Base of well (mBGL)**
BH1	Dry		8.30
BH2	Dry		8.16

Table 3

Site Analytical Services Ltd.

Ref: 15/23973

GROUNDWATER MONITORING

LOCATION 9 Harley Road, St Johns Wood, London, NW3 3BX

GROUNDWATER MONITORING RECORD			
Date	**Weather Conditions**	**Ground Conditions**	**Temperature (°C)**
04/11/2015	Cloudy with showers	Dry	14.0
Monitoring Point Location	**Depth to water (mBGL)**		**Depth to Base of well (mBGL)**
BH1	Dry		8.31
BH2	Dry		8.30

Table 3a

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
19670	9 Harley Road, London NW3 3BX	Samples received	14/10/2015
		Schedule received	14/10/2015
Project No.	Client	Project started	15/10/2015
15/23973	SAS	Testing Started	15/10/2015

Hole No.	Sample				Soil Description	Test Type	Density		w	Length	Diameter	σ3	At failure				Remarks
	Ref	Top	Base	Type			bulk	dry					Axial strain	σ1 - σ3	cu	Mode	
							Mg/m3		%	mm	mm	kPa	%	kPa	kPa		
BH1		2.00		U	High strength fissured brown and blue grey mottled slightly silty CLAY with rare selenite crystals	UU	1.91	1.47	30	205	105	40	14	173	87	C	
BH1		4.00		U	High strength fissured brown and blue grey mottled CLAY with rare selenite crystals	UU	1.89	1.47	29	205	105	80	6.8	209	104	B	
BH1		6.50		U	High strength fissured brown CLAY with rare selenite crystals	UU	1.86	1.42	31	205	105	130	4.9	254	127	B	
BH1		9.50		U	High strength fissured dark brown CLAY	UU	1.91	1.48	29	205	105	190	5.9	287	143	B	
BH1		12.50		U	Very high strength fissured dark brown CLAY	UU	1.94	1.51	28	205	105	250	5.4	309	155	B	
BH2		2.00		U	High strength fissured brown CLAY with selenite crystals	UU	1.94	1.48	31	205	105	40	6.3	226	113	B	
BH2		4.00		U	Medium strength fissured brown and blue grey mottled CLAY with selenite crystals	UU	1.89	1.44	31	205	105	80	9.3	122	61	B	
BH2		6.50		U	High strength fissured dark brown CLAY with rare selenite crystals	UU	1.90	1.49	28	205	105	130	6.8	270	135	B	
BH2		9.50		U	High strength fissured dark grey CLAY	UU	1.93	1.51	28	205	105	190	4.9	276	138	B	
BH2		12.50		U	High strength fissured dark grey CLAY	UU	1.92	1.51	27	205	105	250	4.9	280	140	B	

Legend
UU - single stage test (single and multiple specimens) σ3 Cell pressure Mode of failure ; B - Brittle
UUM - Multistage test on a single specimen σ1 - σ3 Maximum corrected deviator stress P - Plastic
suffix R - remoulded or recompacted cu Undrained shear strength, ½ (σ1 - σ3) C - Compound

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: james@k4soils.com

Checked and Approved
Initials: J.P
Date: 16/10/2015

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R7b (Rev. 0)

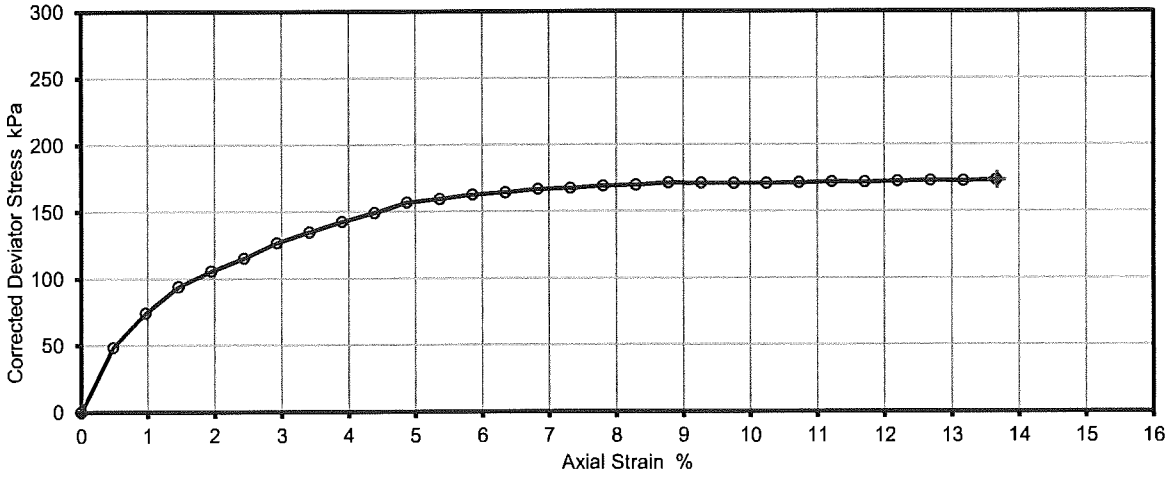
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670
				Borehole/Pit No.	BH1
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-
Project No.	15/23973	Client	SAS	Depth	2.00 m
Soil Description	High strength fissured brown and blue grey mottled slightly silty CLAY with rare selenite crystals			Sample Type	U
				Samples received	14/10/2015
				Schedules received	14/10/2015
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015

Remarks

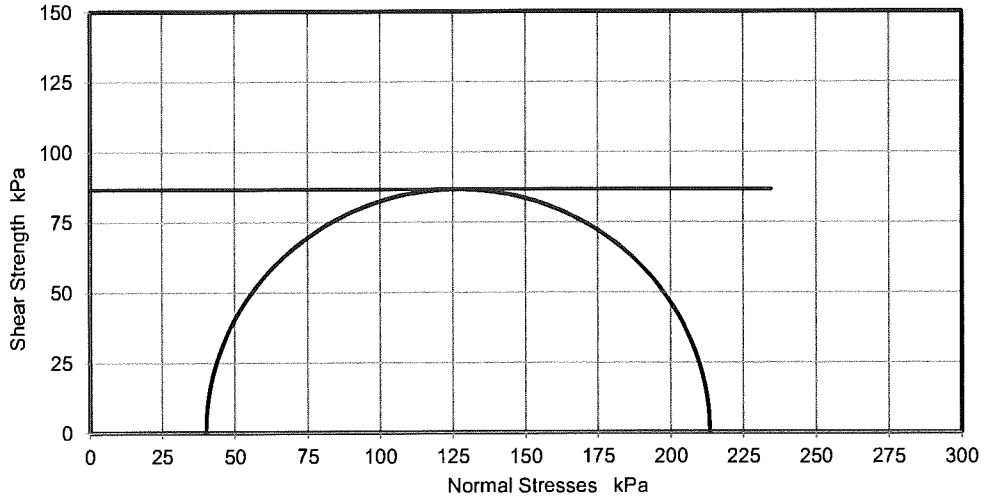
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.91	Mg/m3
Moisture Content	30	%
Dry Density	1.47	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	40	kPa
Axial Strain	14	%
Deviator Stress, (σ1 - σ3)f	173	kPa
Undrained Shear Strength, cu	87	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
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Date 16/10/2015

UKAS TESTING 2519

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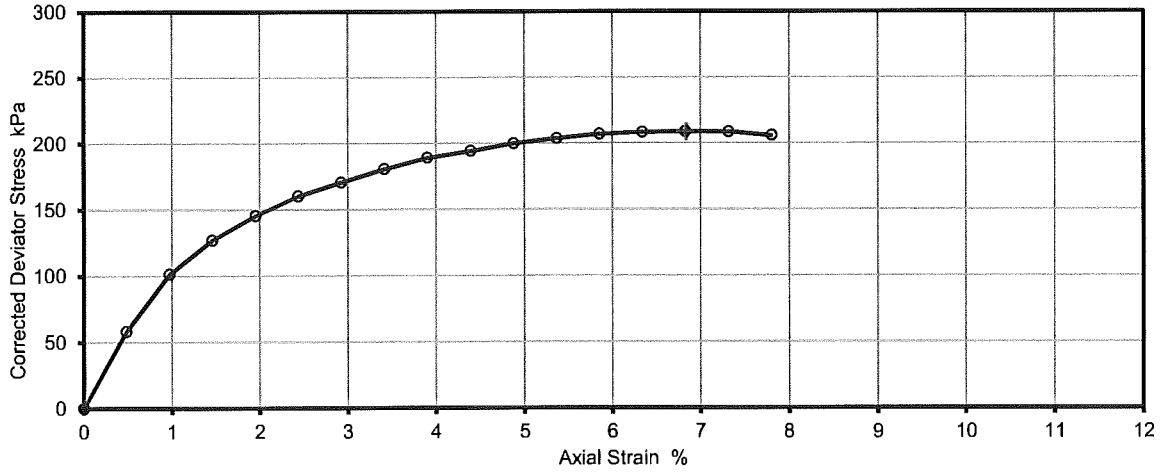
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH1	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	4.00	m
Soil Description	High strength fissured brown and blue grey mottled CLAY with rare selenite crystals			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.89	Mg/m3
Moisture Content	29	%
Dry Density	1.47	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	80	kPa
Axial Strain	6.8	%
Deviator Stress, (σ1 - σ3)f	209	kPa
Undrained Shear Strength, cu	104	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Position within sample

Deviator Stress v Axial Strain



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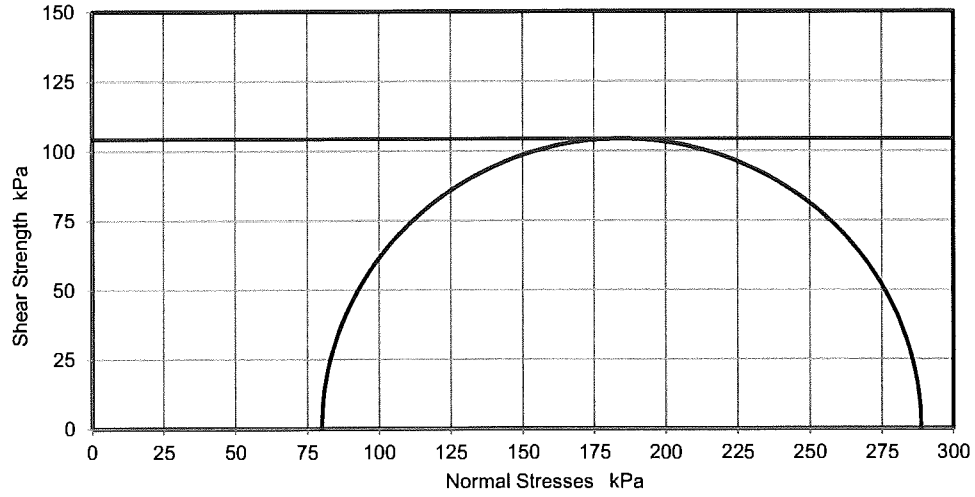

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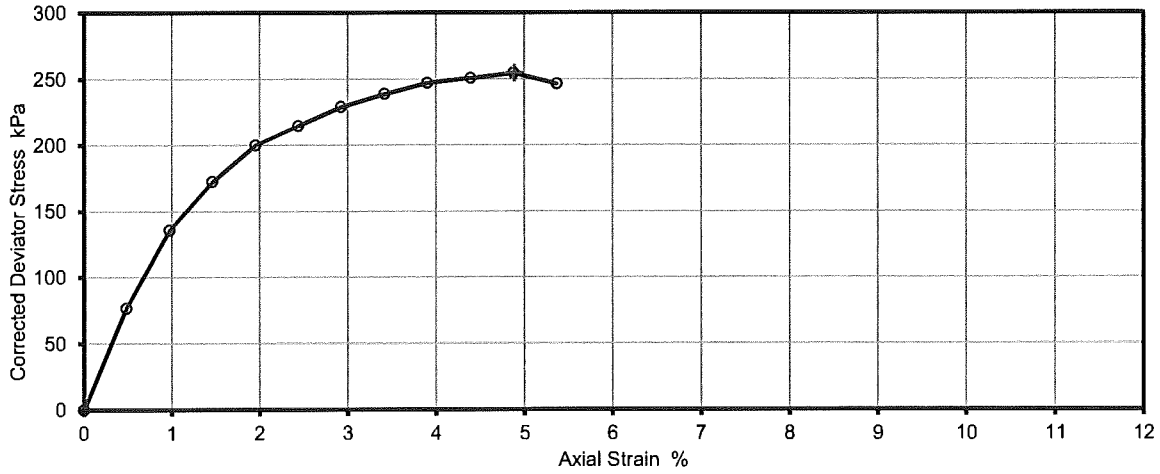
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH1	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	6.50	m
Soil Description	High strength fissured brown CLAY with rare selenite crystals			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

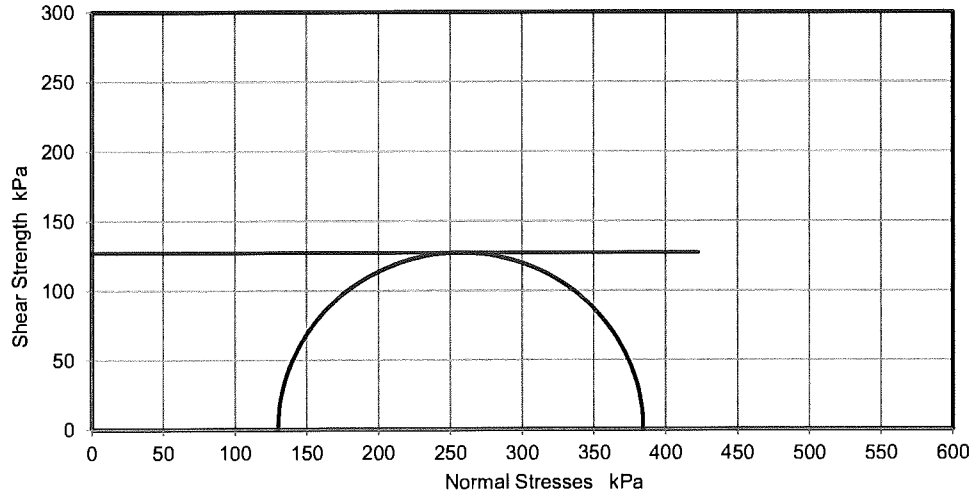
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.86	Mg/m3
Moisture Content	31	%
Dry Density	1.42	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	130	kPa
Axial Strain	4.9	%
Deviator Stress, (σ1 - σ3)f	254	kPa
Undrained Shear Strength, cu	127	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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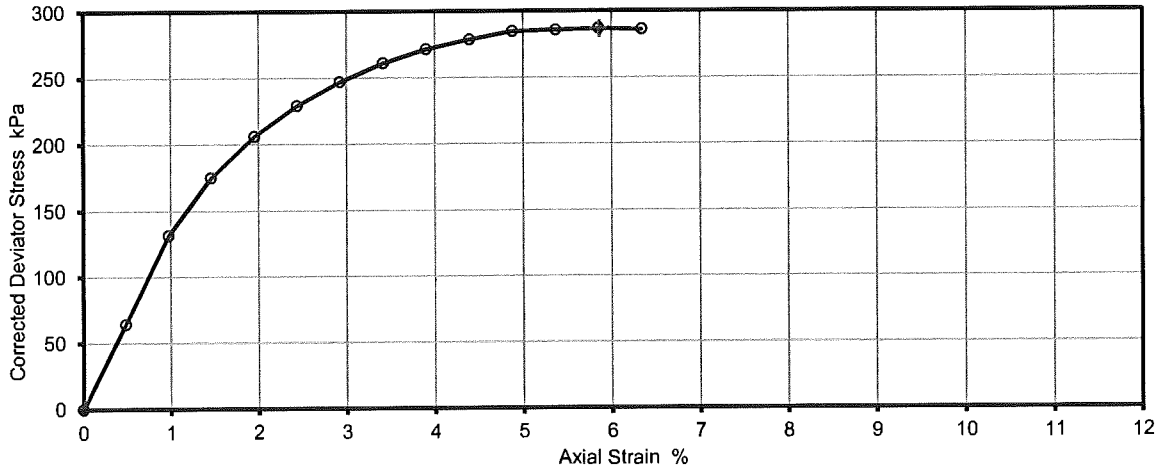
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH1	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	9.50	m
Soil Description	High strength fissured dark brown CLAY			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

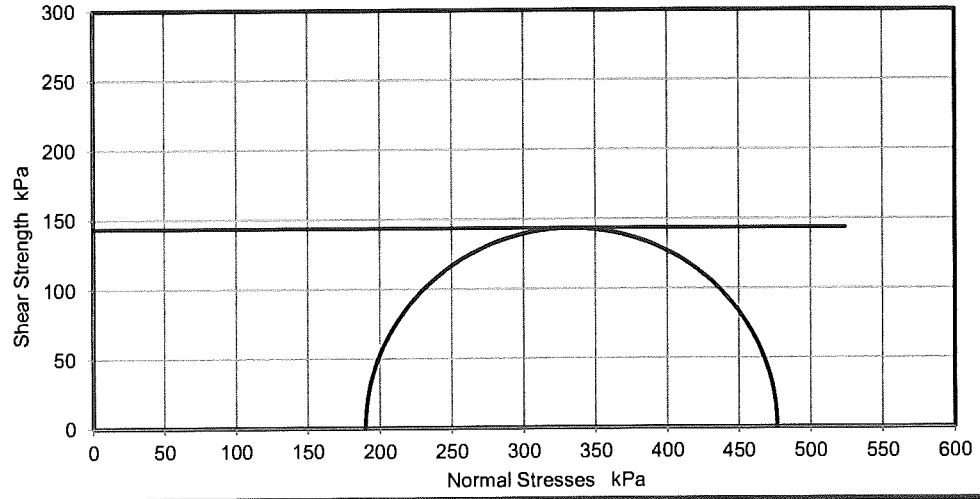
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.91	Mg/m3
Moisture Content	29	%
Dry Density	1.48	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	190	kPa
Axial Strain	5.9	%
Deviator Stress, (σ1 - σ3)f	287	kPa
Undrained Shear Strength, cu	143	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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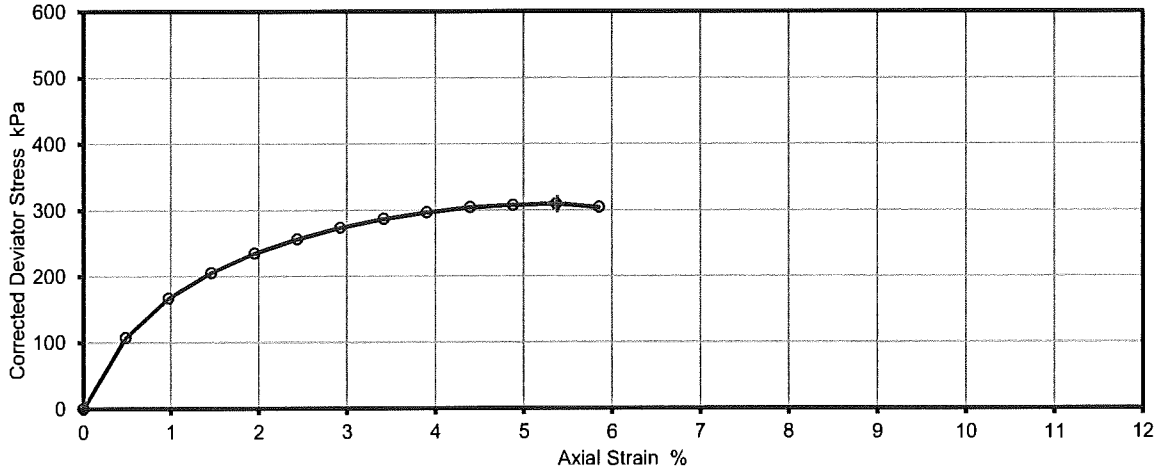
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH1	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	12.50	m
Soil Description	Very high strength fissured dark brown CLAY			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.94	Mg/m3
Moisture Content	28	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	250	kPa
Axial Strain	5.4	%
Deviator Stress, (σ1 - σ3)f	309	kPa
Undrained Shear Strength, cu	155	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



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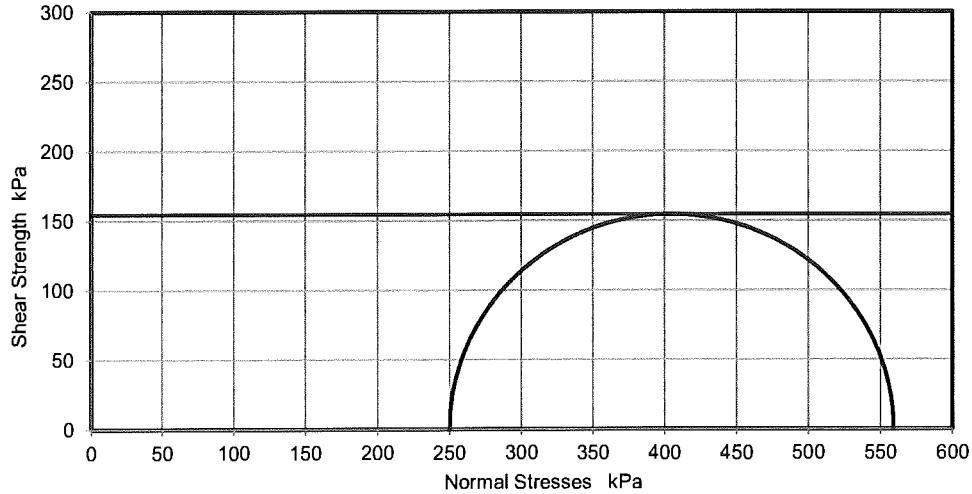

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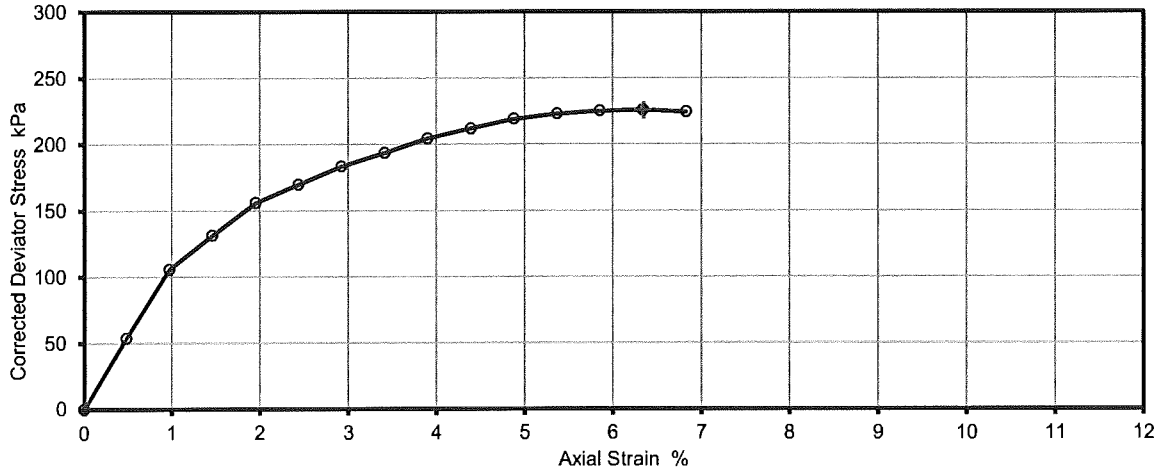
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH2	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	2.00	m
Soil Description	High strength fissured brown CLAY with selenite crystals			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

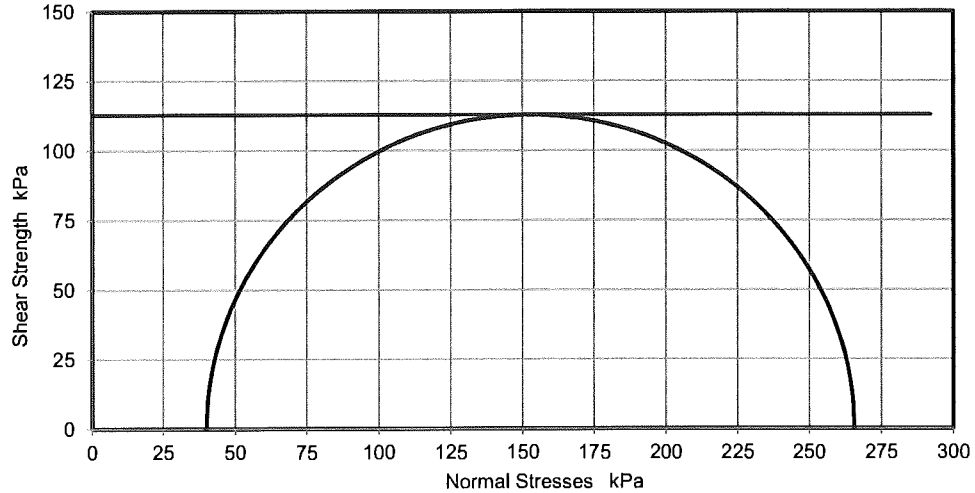
Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.94	Mg/m3
Moisture Content	30	%
Dry Density	1.48	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	40	kPa
Axial Strain	6.3	%
Deviator Stress, (σ1 - σ3)f	226	kPa
Undrained Shear Strength, cu	113	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



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Tel: 01923 711 288
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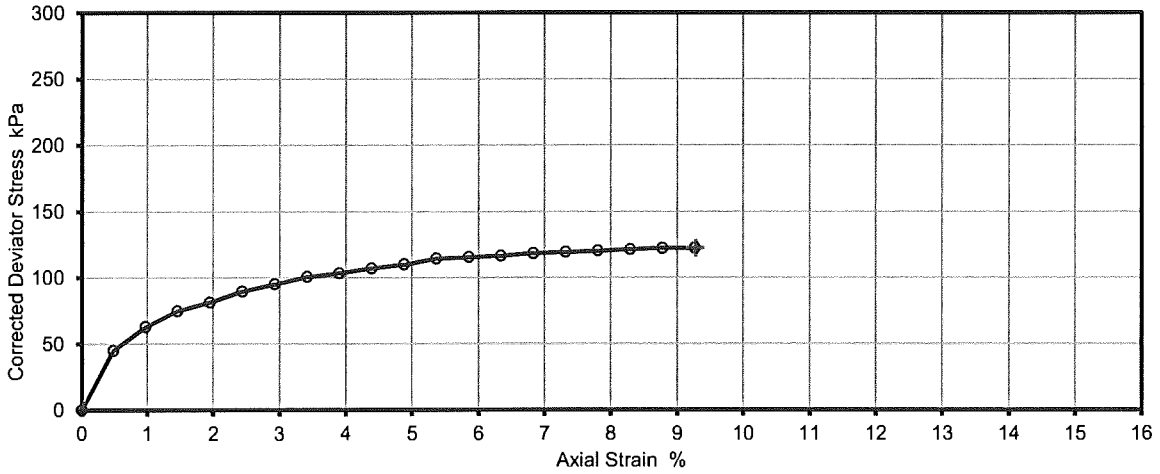
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670
				Borehole/Pit No.	BH2
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-
Project No.	15/23973	Client	SAS	Depth	4.00 m
Soil Description	Medium strength fissured brown and blue grey mottled CLAY with selenite crystals			Sample Type	U
				Samples received	14/10/2015
				Schedules received	14/10/2015
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015

Remarks

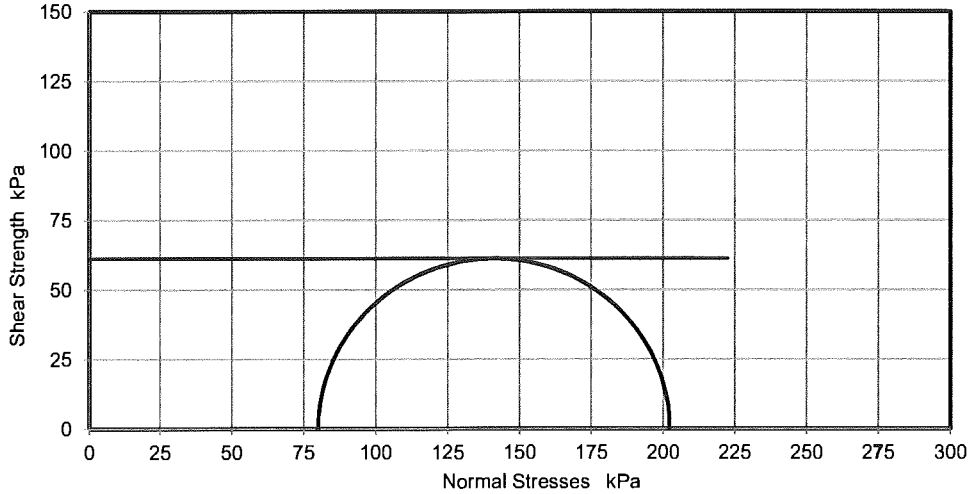
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.89	Mg/m3
Moisture Content	31	%
Dry Density	1.44	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	80	kPa
Axial Strain	9.3	%
Deviator Stress, (σ1 - σ3)f	122	kPa
Undrained Shear Strength, cu	61	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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Tel: 01923 711 288
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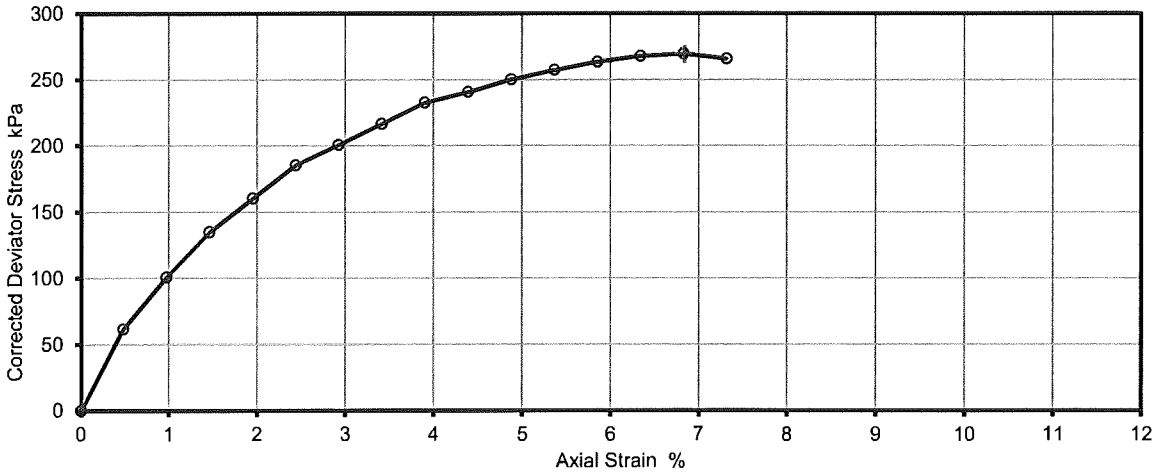
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH2	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	6.50	m
Soil Description	High strength fissured dark brown CLAY with rare selenite crystals			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

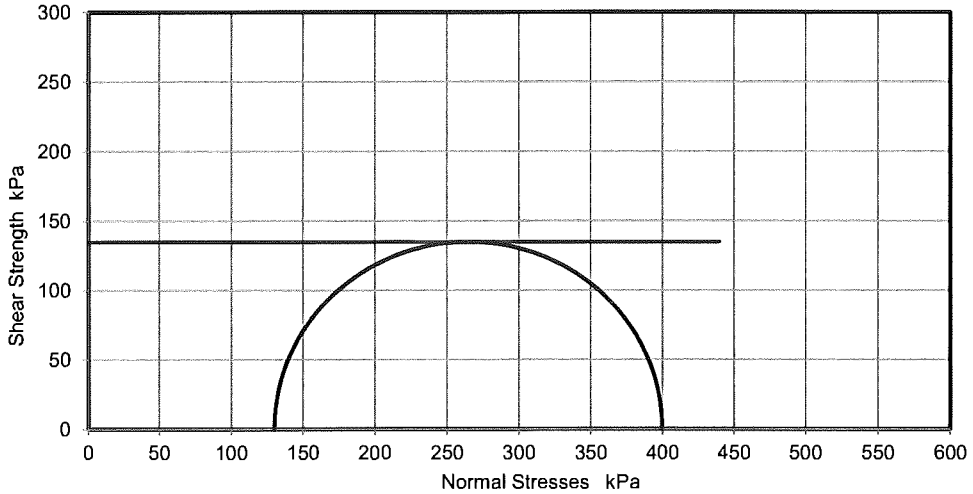
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.90	Mg/m3
Moisture Content	28	%
Dry Density	1.49	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	130	kPa
Axial Strain	6.8	%
Deviator Stress, (σ1 - σ3)f	270	kPa
Undrained Shear Strength, cu	135	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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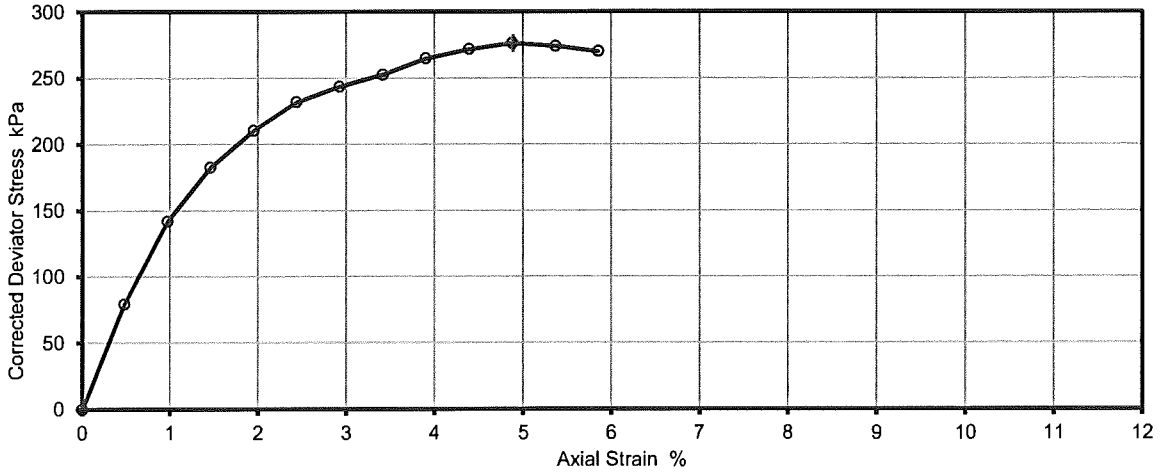
				Borehole/Pit No.	BH2	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	9.50	m
Soil Description	High strength fissured dark grey CLAY			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

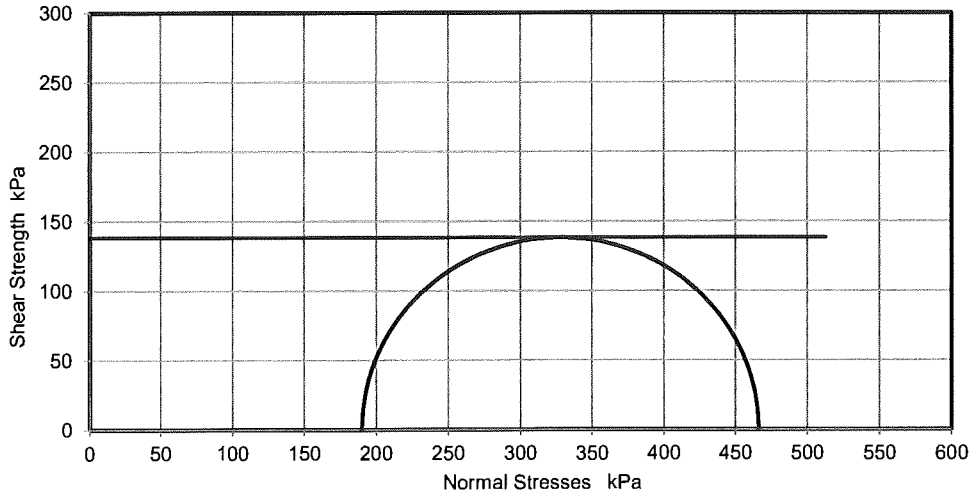
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.93	Mg/m3
Moisture Content	28	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	190	kPa
Axial Strain	4.9	%
Deviator Stress, (σ1 - σ3)f	276	kPa
Undrained Shear Strength, cu	138	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 16/10/2015

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

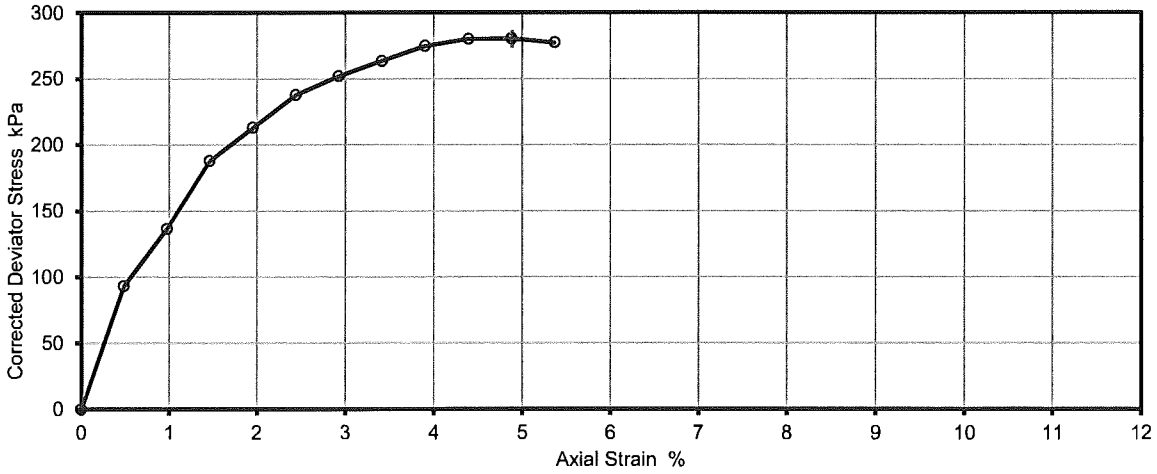
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	19670	
				Borehole/Pit No.	BH2	
Site Name	9 Harley Road, London NW3 3BX			Sample No.	-	
Project No.	15/23973	Client	SAS	Depth	12.50	m
Soil Description	High strength fissured dark grey CLAY			Sample Type	U	
				Samples received	14/10/2015	
				Schedules received	14/10/2015	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	15/10/2015	

Remarks

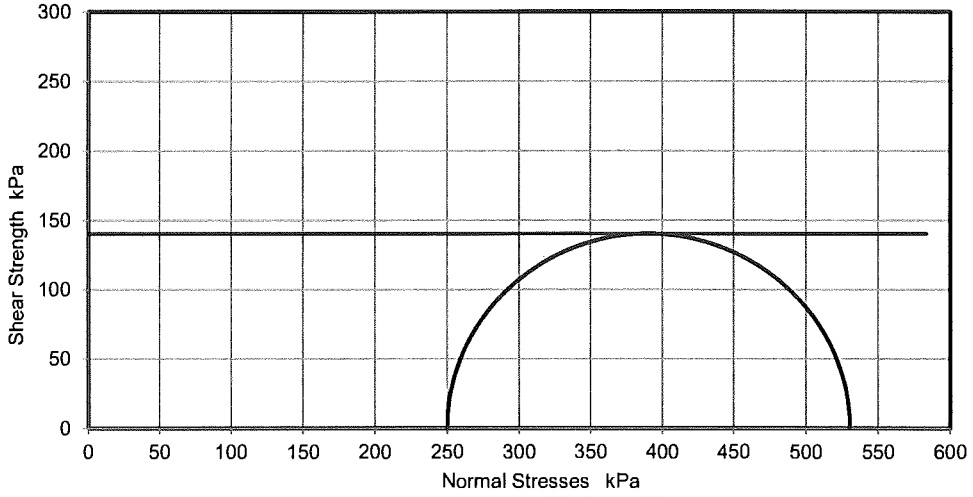
Position within sample

Test Number	1	
Length	205.0	mm
Diameter	105.0	mm
Bulk Density	1.92	Mg/m3
Moisture Content	27	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	250	kPa
Axial Strain	4.9	%
Deviator Stress, (σ1 - σ3)f	280	kPa
Undrained Shear Strength, cu	140	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

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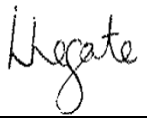
Appendix C. Ground Movement Assessment

Geo-Environmental

BUILDING DAMAGE ASSESSMENT
for the site at
9 HARLEY ROAD
LONDON
NW3 3BX
on behalf of
SITE ANALYTICAL SERVICES LTD

Report:	**BUILDING DAMAGE ASSESSMENT**
Site:	**9 HARLEY ROAD LONDON NW3 3BX**
Client:	**SITE ANALYTICAL SERVICES LTD**
Date:	**DECEMBER 2015**
Reference:	**GE15167 – BDAv1JT151202**
Version:	**1.0**
Prepared by:	
	Jonathan Tingley CEnv, BEng (Hons), MSc, FGS, MIEnvSc **Technical Director**
Reviewed by:	
	Laura Legate CGeol, CSci, BSc (Hons), MSc, FGS **Senior Consulting Engineer**

Geo-Environmental Services Ltd
Unit 7, Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex, BN6 9GL
T: 01273 832 972 E: mail@gesl.net W: www.gesl.net

CONTENTS

FIGURES

1.0 INTRODUCTION

1.1 General

Geo-Environmental Services Limited (Geo-Environmental) was instructed by Site Analytical Services Limited to prepare a building damage assessment for a proposed new basement at 9 Harley Road, London NW3 3BX.

The report was to provide information on the effect the new excavation would have on the neighbouring properties; No.7 Harley Road and No.3 Wadham Gardens. When viewed from Harley Road, No.7 was located on the left hand side (north-west) and 3 Wadham Gardens was to the right (south-east) of the property. The layout of the buildings is shown in Figure 1. It was understood that 3 Wadham Gardens already had a substantial basement which extended to within several metres of the site boundary.

It was understood that it was intended to demolish the rear extension to the existing property, which included a partial basement and construct a new basement and single storey structure. The basement was to be formed by a contiguous bored pile wall and conventional underpinning (see Figure 2).

No.9 Harley Road comprised a substantial detached two storey masonry property with living space in the roof void. The topographic survey provided indicated that the ground level on the western side of the property was c.49.30mOD falling to c.48.55 at the rear of the proposed basement.

1.2 Information Provided

Geo-Environmental was provided with the following information:

1. SAS Borehole & Trial Pit logs dated 05/10/2015
2. Geotechnical test results
3. SHH Sketches indicating current and proposed loadings
4. SHH dimensioned drawings and sections of the proposed basement

1.3 Conditions

Information contained in this report is intended for the use of the Client, and Geo-Environmental can take no responsibility for the use of this information by any party for uses other than that described in this report. Geo-Environmental makes no warranty or representation whatsoever express or implied with respect to the use of this information by any third party. Geo-Environmental does not indemnify the Client or any third parties against any dispute or claim arising from any finding or other result of this investigation report or any consequential losses.

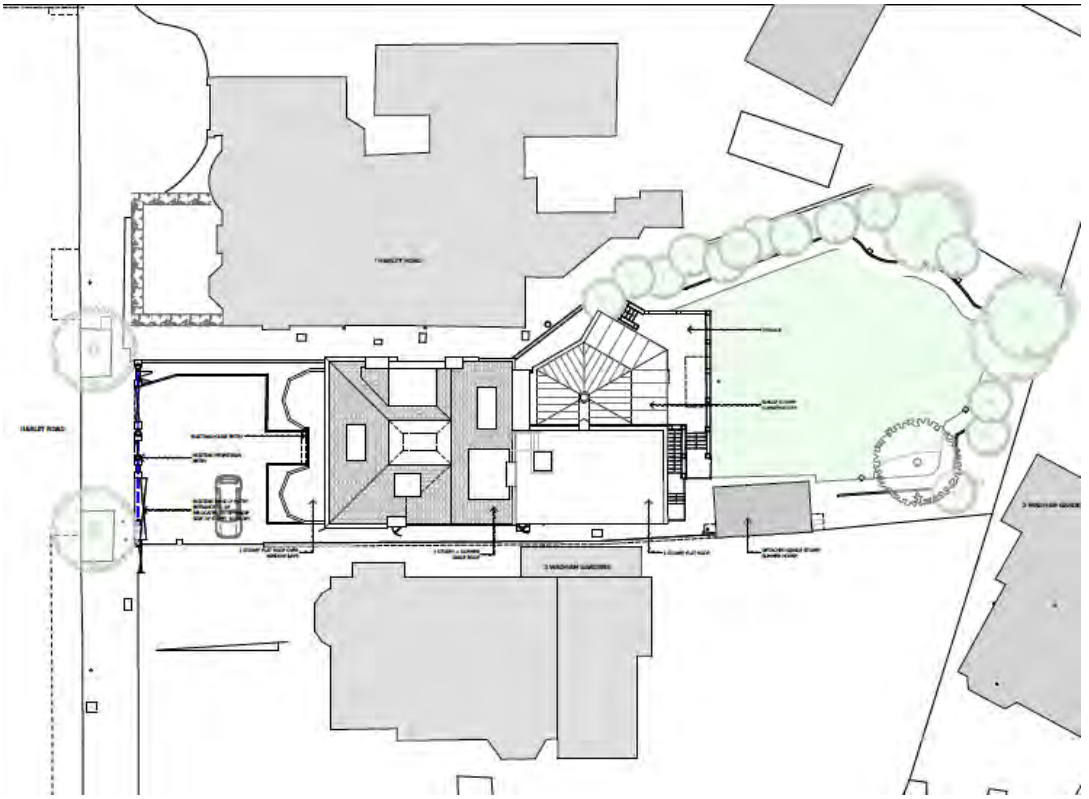


Figure 1- Site Location (Extract from SHH Drawing (680)002_PL01

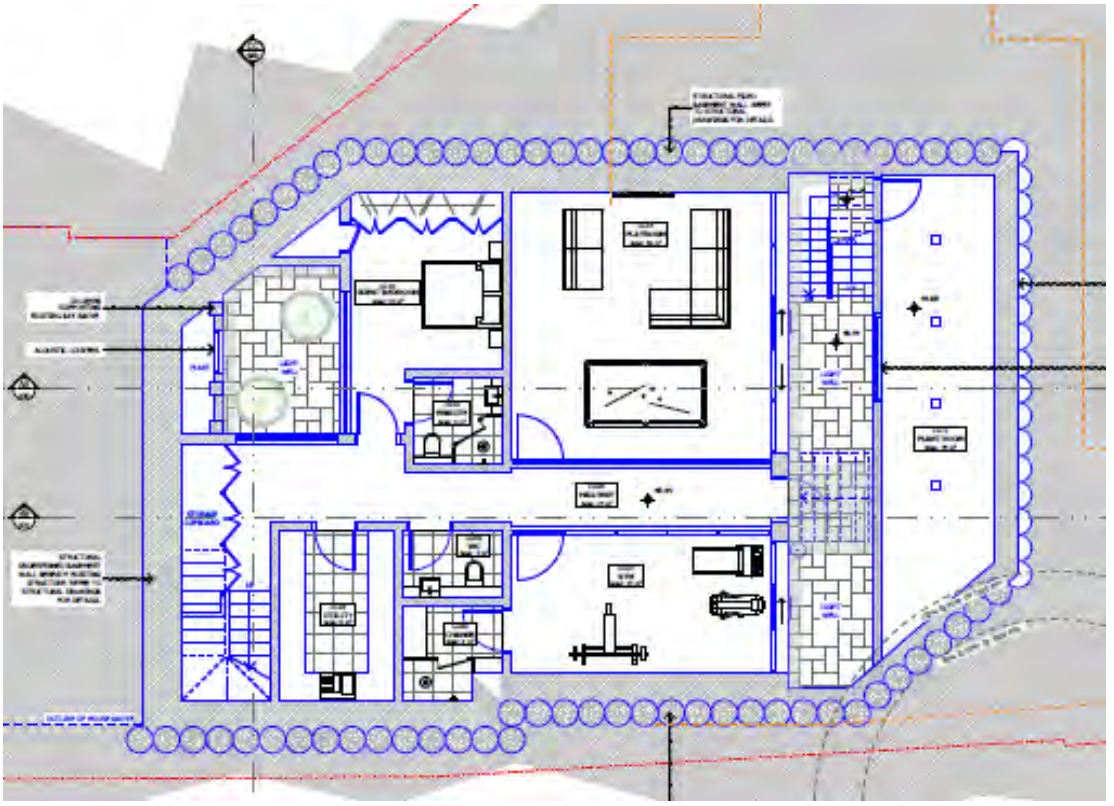


Figure 2 Proposed Lower Ground Floor (extract from SHH Dwg (680)020_PL01)

2.0 ENCOUNTERED CONDITIONS

A factual record of the conditions encountered during the physical investigation of the site is presented in the following sections.

2.1 Ground Conditions

According to published information the anticipated geological succession beneath the site was indicated to comprise the London Clay Formation. The investigation undertaken by SAS in October 2015 encountered the London Clay Formation beneath a thin mantle of Made Ground in all locations. A summary of the encountered soil conditions is presented in Table 2.1

Top (m bgl)	Base (m bgl)	Description	Position
0.00	0.30 – 0.40	MADE GROUND: Brown clay containing brick fragments	BH1 & BH2
0.30-0.40	3.00	LONDON CLAY: Soft mottled brown silty sandy CLAY containing partings of silty fine sand.	BH1 & BH2
3.00	8.80-9.60	LONDON CLAY: Firm becoming stiff mottled brown silty sandy CLAY containing partings of silty fine sand and occasional gypsum crystals.	BH1 & BH2
8.80-9.60	15.00	Very stiff dark grey brown blue silty sandy fissured CLAY with partings of silty fine sand, gypsum crystals and claystones.	BH1 & BH2

Table 2.1: Summary of Ground Conditions

For further details of the ground conditions encountered, reference should be made to the borehole logs appended to the BIA.

2.2 Groundwater

Groundwater was not encountered in the boreholes during the intrusive investigation.

However, changes in groundwater levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a standpipe or piezometer.

2.3 Foundations

A hand pit excavated on south-eastern side of No.9 Harley Road indicated the foundations to be of corbelled brick construction and bearing within the London Clay at a depth of 1.20mbgl.

2.4 Geotechnical Laboratory Results

Atterberg Limit tests were undertaken on four samples of the London Clay Formation, with the results indicating Plasticity Indices ranging between 35 and 38. The corresponding Moisture Content analyses indicated moisture contents ranging between 29% and 32%.

Quick undrained triaxial tests were carried out on ten samples of the London Clay with measured undrained strengths ranging between 61kPa and 155kPa with a general trend of increasing undrained strength with depth.

In Situ Standard Penetration Tests (SPT's) were undertaken within the boreholes, in order to assess the relative consistency of the materials encountered. The results ranged between equivalent SPT'N' values of N=7 to N=58 with an overall trend of increasing results with depth.

Following the relationship proposed by Stroud and Butler 1975, where undrained shear strength (Cu) is related to SPT 'N' value by Cu=4.5x'N', the consistency of the London Clay ranged between soft to very stiff, with a general trend of increasing undrained shear strength with depth. The SPT values converted to undrained strength have been plotted with the results of the undrained triaxial tests in Figure 3.

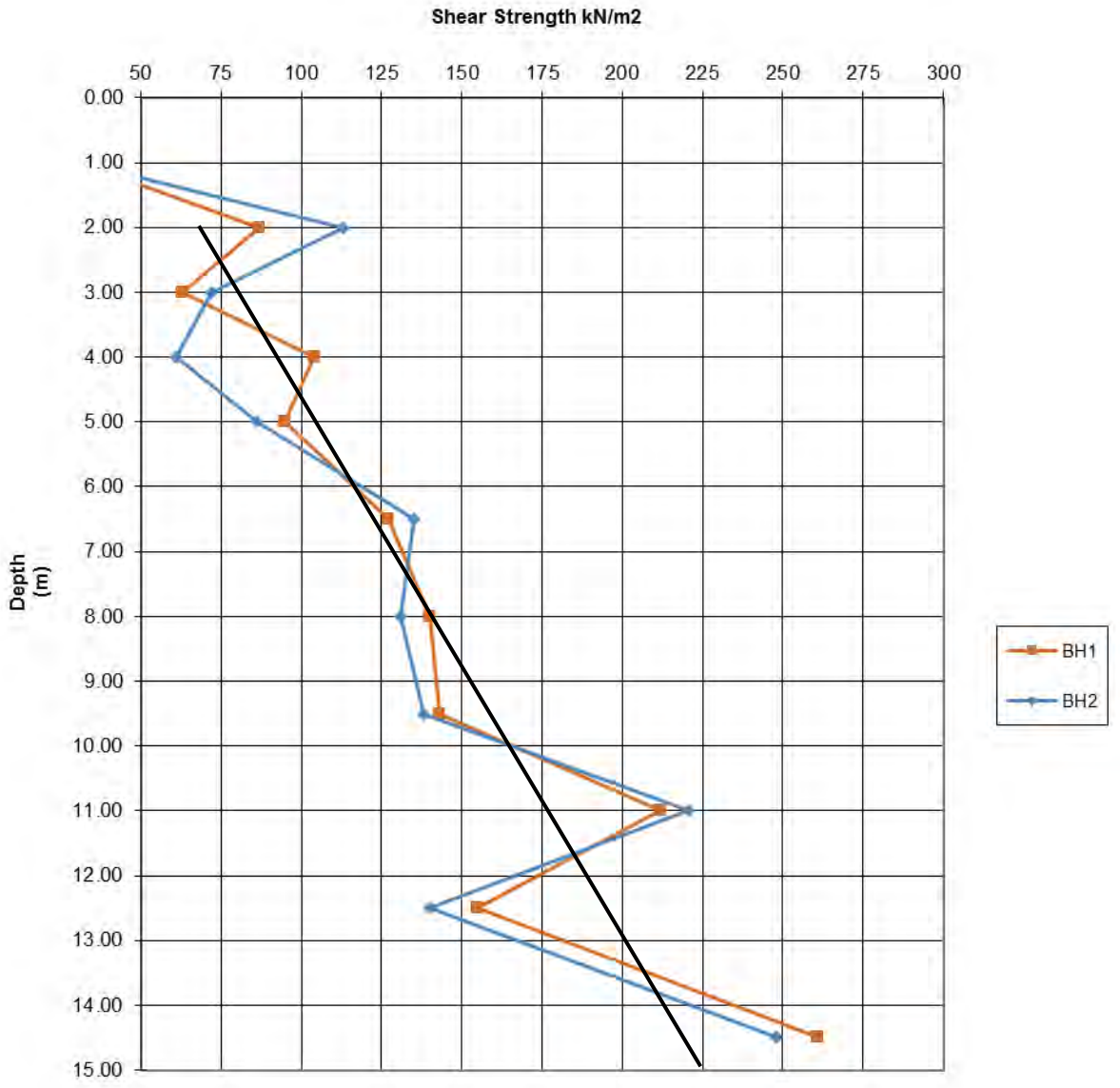


Figure 3 Cu & N.Cu vs Depth

2.5 Geotechnical Design Parameters

Geotechnical design parameters for the proposed development are summarised in Tables 2.2 and 2.3 below, they are based on the results of laboratory and in-situ testing and published data for the well-studied London Geology.

Strata	Level at top (mbgl)	Young's Modulus (kPa)		Poisson's ratio
		Top	Bottom	
Made Ground	0	20,000	20,000	0.2
London Clay	0.6	35,000	100,000	0.5
London Clay	15	100000	275,000	0.5

Rigid boundary taken as -80.0mbgl, inferred base of London Clay.
Table 2.2: Undrained Parameters

Strata	Level at top (mbgl)	Young's Modulus (kPa)		Poisson's ratio
		Top	Bottom	
Made Ground	0	15,000	15,000	0.13
London Clay	0.6	26,250	75,000	0.20
London Clay	15	75,000	206,250	0.20

Rigid boundary taken as -80.0mbgl, inferred base of London Clay.
Table 2.3: Drained Parameters

3.0 STRUCTURAL LOADS

The estimated building loads, which were taken as Dead Load + Live Load/2 for the purposes of this assessment are summarised below:

- Existing line loads along walls range from 11kN/m^2 and 56kN/m^2
- Proposed line loads at basement level range between 35kN/m^2 and 142kN/m^2
- Proposed internal column loads 114kN/m^2 and 154kN/m^2
- Uniformly distributed raft bearing pressure of between 13.5kN/m^2 (plant room) and 120kN/m^2 (main basement).

It is understood that the majority of the perimeter line loads will bear onto piles whilst those at the rear of the existing building will bear upon underpins.

Based on the drawings, the excavation will vary between 3.10m and c.3.70m and the load reduction due to excavation has been based on a bulk unit weight of 20kN/m^3.

4.0 GROUND MOVEMENTS

There is the potential for ground movements due to the proposed development, from the excavation process, including formation of bored piles or underpins, and from the changes in vertical stress within the soil resulting from the changes in loading from the development.

The effect of excavating soil is to cause a reduction in stress at the new formation level, due to the weight of the overburden removed. Since typically, construction follows on shortly after excavation, this unloading of the ground is normally modelled as producing a short term (undrained) response. However, if there is a delay in the construction phase, a fully drained response to the unloading may develop. In the case of the proposed development, it is assumed that basement excavation will be quickly followed by construction and hence modelling an undrained response is applicable.

The loading that results from the new construction will apply in the long term, over the structure's lifetime. Hence there will be both a short term and long term response. Generally, the long term behaviour results in larger movements. The overall movement of the ground following construction is, however, driven by the total changes in loading that have occurred; thus it is a combination of the unloading caused by demolition and excavation of soil and the imposed loading from the new structure.

The ground response to stress changes have therefore been modelled in the short term for the unloading caused by excavation and removal of overburden pressure. The long term response has been modelled for the net stress change caused by the combination of demolition, the excavation and new loading.

Three stages have been modelled:

1. Unloading of ground due to the demolition of existing structures and removal of overburden from excavation across the footprint of the basement.
2. End of construction, assumed 120kN/m^2 uniformly distributed raft bearing pressure (based on SHH Drawing No. (680)020_PL01).
3. Long term drained condition when the underlying ground is consolidating/heaving under the new loadings.

The OASYS Software PDISP (V19.3) has been used to model the ground movements associated with the changes in stress calculated for the basement excavation and subsequent development. PDISP assumes a linear elastic behaviour of the soil and a flexible structure. In reality, the stiffness of the structures will tend to redistribute the movements, when compared to those predicted by PDISP. The movement calculations therefore represent free field movements unaffected by the stiffness of the structures and are likely to be conservative (i.e. the distortions of the structure would be less than those obtained from the predicted movements).

It is understood that tension piles may be installed within the basement. These are likely to reduce overall movements within the basements, but would have limited impact on movements beyond the excavation. The effect of these piles has not been modelled in the analysis.

The assessments were undertaken using soil parameters (undrained and drained) derived from the ground investigation to model the stiffness behaviour. A rigid base for the analysis was taken as -80mbgl, which was the inferred depth to the geological boundary with the Lambeth Group beneath the London Clay.

The PDisp outputs denote upward movements (heave) with number prefixed by a minus sign. Results without any prefix denote downward movements (settlement).

4.1 Stage 1 - Short Term Vertical Movements Due to Excavation

It was estimated that the stress relief due to unloading would range between 50kPa to 82kPa. The differences in stress relief across the basement are due to the variations in basement depth (deeper excavation for the plant room) and the stress relief in the area of the former basement. Based on the shape of the excavation (see Figure 2), the stage 1 short term analysis estimated a maximum short term heave of about 9mm occurring within the centre of the excavation (see Figure 4). Predicted heave movements beneath the party walls ranged between a minimum of 2mm at the corners to a maximum of 4mm at the midpoint of the excavation.

It should be noted that the values of heave given at the party walls do not take into account any restraining effect the proposed underpins would have on vertical movements. Neither do they take account of any structures, such as pre-existing basement, which would serve to significantly reduce any movements.

In practice, the heave movements that develop from unloading the soil do not occur in isolation from other ground movements (settlements) associated with basement construction so it is unlikely the magnitudes of movement calculated around the perimeter of the excavation would be realised.

4.2 Stage 2 - Short Term Vertical Movements Post Construction

Post construction it was estimated that the net bearing pressure beneath the main basement and former basement areas would be 66kPa and 38kPa respectively. Beneath the plant room the net bearing pressure was calculated to be -38kPa (resulting in heave). Based on the shape of the excavation the stage 2 short term analysis estimated settlements of between 3-6mm beneath the main excavation and a heave of 1mm beneath the plant room (see Figure 5). Predicted settlements beneath the party walls ranged between a minimum of 1mm at the corners to a maximum of 2mm at the midpoint of the excavation.

4.3 Stage 3 - Long Term Vertical Movements Post Construction

The movements of the ground following construction were also analysed for the long term (drained) case after the completion of the structure. The PDisp analyses estimated long term settlements of between 5mm and 10mm beneath the main basement level and a heave of up to 2.5mm beneath the plant room (see Figure 6) i.e. the long term settlement beneath the basement between stage 2 and stage 3 is 2-4mm.

However, it should be reiterated that in practice, the heave movements that develop from unloading the soil do not occur in isolation from other ground movements (settlements) associated with basement construction so it is unlikely the magnitudes of movement calculated within and around the perimeter of the excavation would be realised.

4.4 Movements due to pile installation, underpin construction and basement excavation.

In addition to the movements due to the changes in vertical stress which have been modelled using Pdisp, the ground movements around the excavation have also been modelled using OASYS Xdisp. Each wall around an excavation is assigned a horizontal and vertical ground movement curve that are used to calculate the displacements at various distances from the excavation.

The assessment of the ground movements due to the construction of the contiguous bored pile wall/underpins and subsequent excavation has been undertaken in accordance with methodology provided in CIRIA guide C580, "Embedded retaining walls – guidance for economic design". This provides guidance on the horizontal and vertical movements at the soil surface adjacent to an embedded retaining wall as a result of pile installation and of excavation in front of the wall. The guidance is based on numerous case histories, and based on the construction methodology proposed in this case a high stiffness (propped) retaining wall has been assumed. The guidance states that few walls are constructed entirely in stiff over consolidated fine-grained soils. Although walls may be embedded into such soils, it is likely that they will also retain other soils such as Made Ground, River Terrace Deposits and other alluvial soils. The guidance and principles presented in the guidance also apply to these ground conditions. It is therefore considered a suitable methodology for the ground conditions encountered at 9 Harley Road.

The majority of the basement is to be formed by a contiguous bored pile wall. However, the existing rear elevation of the property will be underpinned, rather than piled. It is assumed that the underpins will be constructed following a typical underpin 'hit-and-miss' sequence. It is expected that the underpins will be constructed to full depth in a single stage of pin construction and it has been assumed that a high stiffness support system will be applied to the underpins when the main excavation works are undertaken.

Ground movement guidance in C580 is divided into movements resulting from pile installation and from the mass excavation in front of the wall.

Based on the proposed excavation depth of c.3.5m the Xdisp analyses indicates settlements around the perimeter of the excavation (at ground level) of 5mm. Settlements are likely to become negligible (<1mm) at a distance of 10m from the excavation. A contour plot of the settlements is presented in Figure 7.

The movements given by CIRIA are for excavations with straight walls; corners tend to restrict movements, such that horizontal deflections towards an excavation in the vicinity of a corner to the excavation are typical reduced to about half that predicted from 'plane strain' movements, though this does not apply for re-entrant corners. The effect of the corner stiffening is calculated in Xdisp in accordance with the methodology derived by Fuentes R. and Devriendt M. (2010).

Horizontal movements in towards the excavation have also been analysed using Xdisp and are likely to be in the order of 6mm at the perimeter of the excavation, becoming negligible at 10-12m from the excavation. As stated above the Xdisp analyses has considered corner stiffening which serve to restrict movements at the corners of excavations. A contour plot of the settlements is presented in Figure 8.

The movements derived from Xdisp is based on the surface ground movement curves presented in the CIRIA guidance which are based on empirical data. As such, it is assumed that they include any short-term element of ground movement due to vertical stress change. However, it is unlikely that the C580 data includes the long term movements resulting from stress changes. Total ground movements resulting from the proposed development are therefore taken as the sum of the predicted ground movements using C580, plus the difference in movement between short and long term (stage 2 and stage 3). These movements have been included in the analyses by exporting the displacement data of stage 2 and stage 3 from Pdisp and subtracting the stage 2 movements from the stage 3 movements. The resultant movement was then imported into Xdisp and included in the analyses.

4.5 Building Damage Assessment.

The adjoining structures have been modelled in Xdisp in order to assess the potential category of

damage in accordance with the criteria derived by Burland (1997) presented below:

Building / Structure Damage Risk Classification (Burland (1997))

Damage Category	Category of damage	Description of typical damage* (Ease of repair is underlined)	Approx. crack width* (mm)	Limiting tensile strain (%)
0	Negligible	Hairline cracks	< 0.1	< 0.05
1	Very Slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in buildings. Cracks in external brickwork visible on inspection.	< 1	0.05 - 0.075
2	Slight	Cracks easily filled. Redecorating probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weather tightness. Doors and windows may stick slightly.	< 5	0.075 - 0.15
3	Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather tightness often impaired.	5 - 15 or a number of cracks > 3	0.15 – 0.3
4	Severe	Extensive repair work involving breaking out and replacing sections of walls, especially over doors and windows. Windows and door frames distorted, floor sloping noticeably. Walls leaning and bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15 - 25 but also depends on number of cracks	> 0.3
5	Very Severe	This requires a major repair job involving partial or complete rebuilding. Beams lose bearing, walls lean badly and require shoring. Windows broken due to distortion. Danger of instability.	Usually > 25 but depends on number of cracks.	-

The building damage assessment has focused on parts of the adjoining structures likely to be most sensitive to building damage. Table 4.1 summarises the walls assessed and the worst case category of damage calculated.

Property	Structure	Predicted Peak Settlement (mm)	Predicted Peak Horizontal Movement (mm)	Category of Damage	Figure No.
3 Wadham Gardens	Single storey party wall	2.3	4.8	Negligible	9
3 Wadham Gardens	Single storey perpendicular wall	2.5	4.8	Negligible	10
3 Wadham Gardens	Main party wall	2.5	4.1	Negligible	11
7 Harley Road	Perpendicular party wall	2.5	3.7	Negligible	12
7 Harley Road	Main party wall	2.4	3.7	Negligible	13

Table 4.1 Damage category summary

In summary, the analysis indicates that the predicted ground movements in response to the basement excavation would cause negligible damage to the adjoining structures. It is anticipated that where necessary cross-propping of the excavation will be introduced early in the works, providing a very stiff

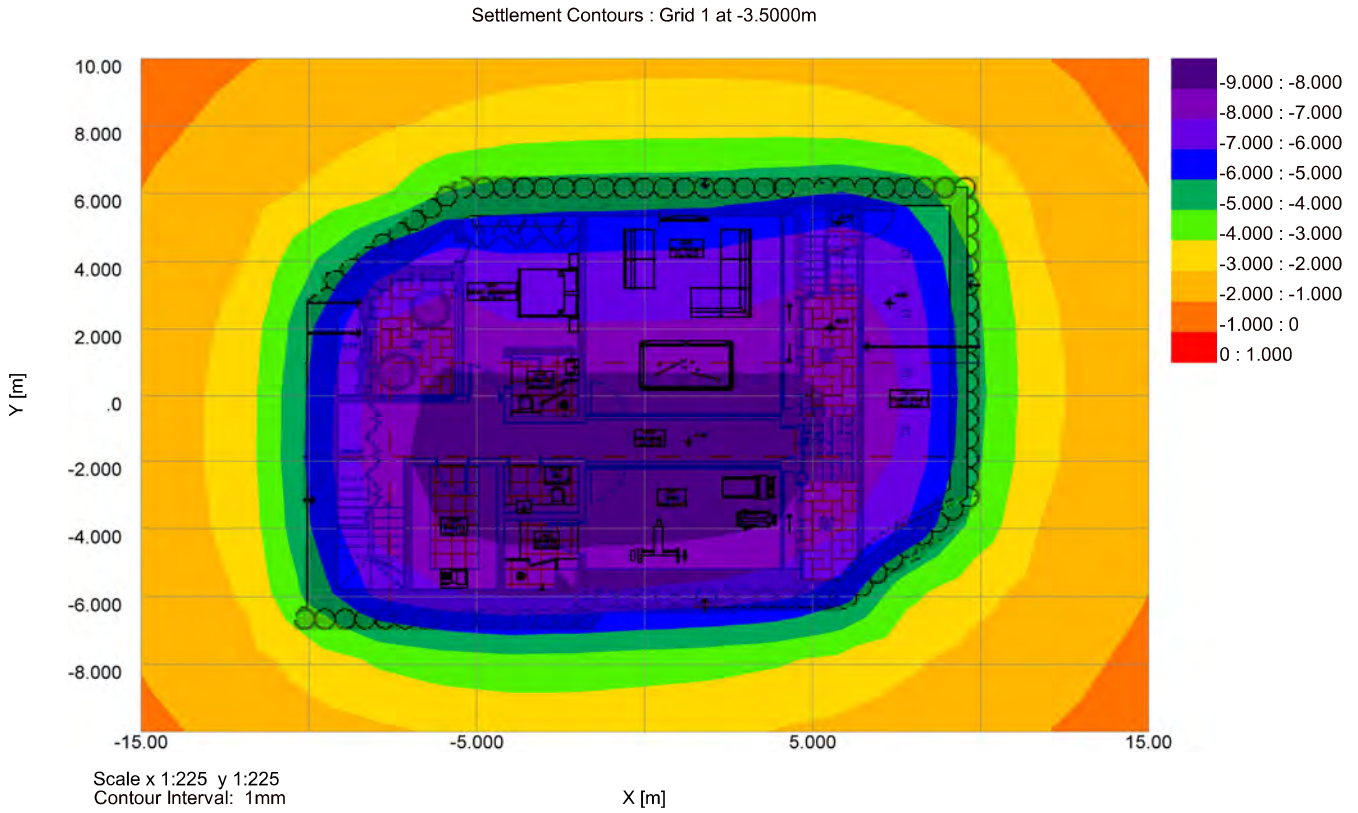
support system to the walls. Furthermore, it has been assumed that where required the underpinning will be undertaken to a high standard of workmanship and measures are taken to avoid instability of excavations and keep ground loss to a minimum.

Full details of the Xdisp results are available on request.

4.6 Monitoring

The results of the Xdisp analyses indicate that with good construction control, damage to adjacent structures generated by the assumed construction methods and sequence are likely to be (within Category 0) 'Negligible'. A formal monitoring strategy is recommended in order to observe and control ground movements during construction. This should ensure movement do not start to fall outside of that predicted.

It is recommended that the monitoring system be designed and operated broadly in accordance with the 'Observational Method' as defined in CIRIA Report 185. Regular monitoring of positions will determine if any horizontal translation, tilt or differential settlement of the neighboring structures is occurring as the construction progresses. Monitoring data should be checked against predefined trigger limits and should also be further analysed to assess and manage the damage category of the adjacent building as construction progresses.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6.000
4.000
2.000
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-2.000
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-5.000
5.000
15.00
X [m]
-9.000 : -8.000
-8.000 : -7.000
-7.000 : -6.000
-6.000 : -5.000
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-1.000 : 0
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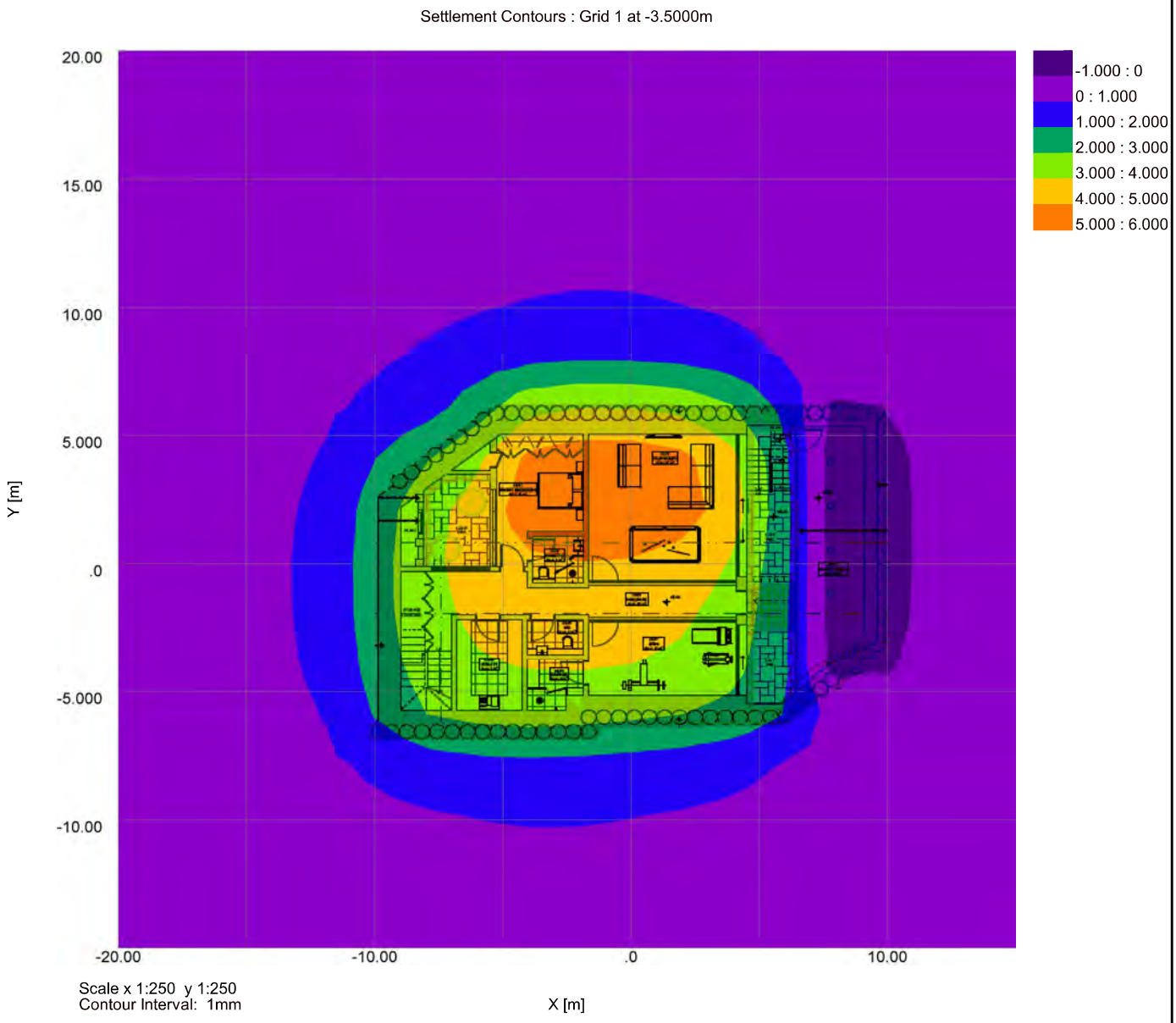
Contour Interval: 1mm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2.000 : 3.000
3.000 : 4.000
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5.000 : 6.000
20.00
15.00
10.00
5.000
.0
-5.000
-10.00
Y [m]
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10.00
X [m]
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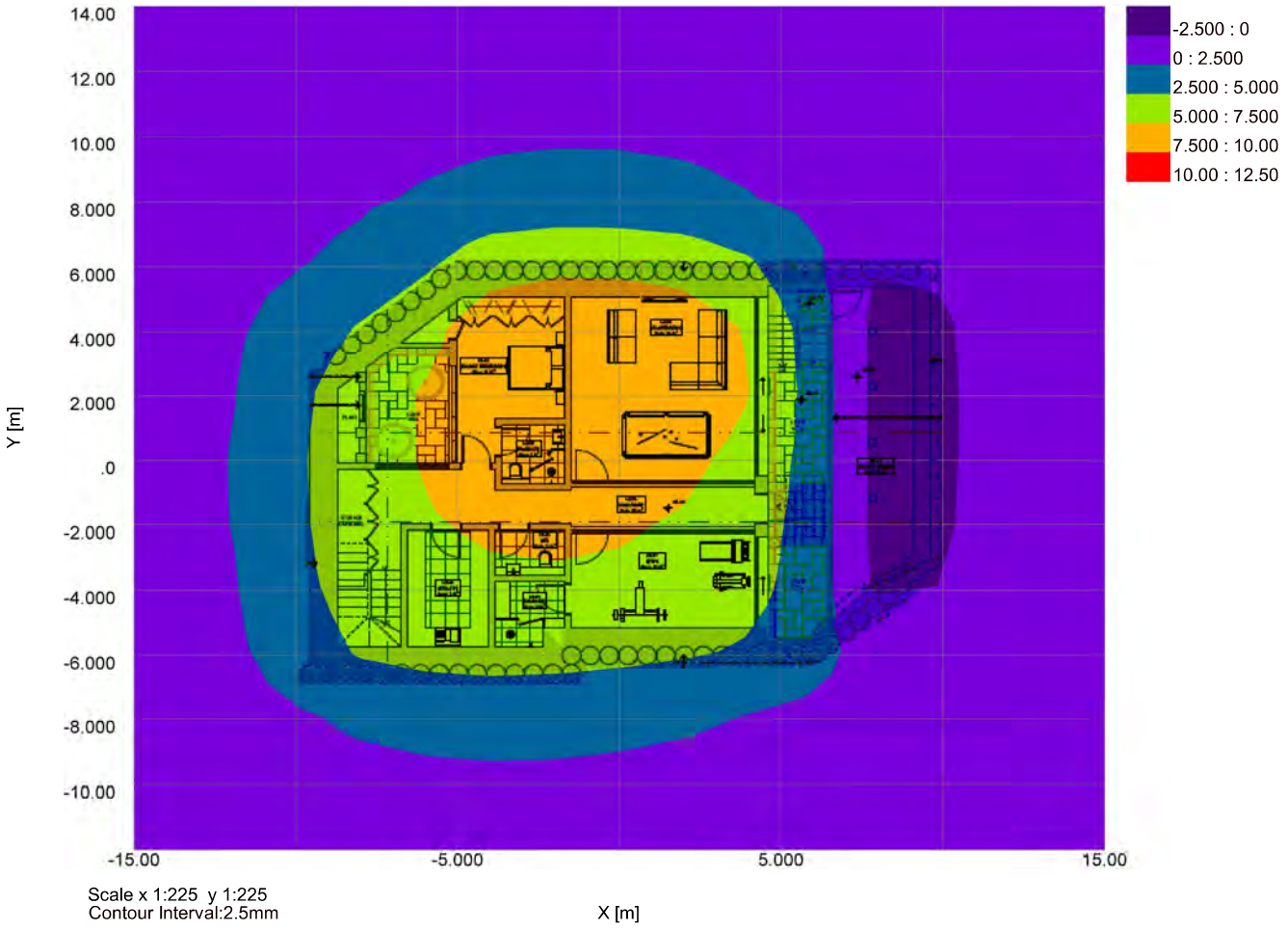
Contour Interval: 1mm

Settlement Contours : Grid 1 at -3.5000m



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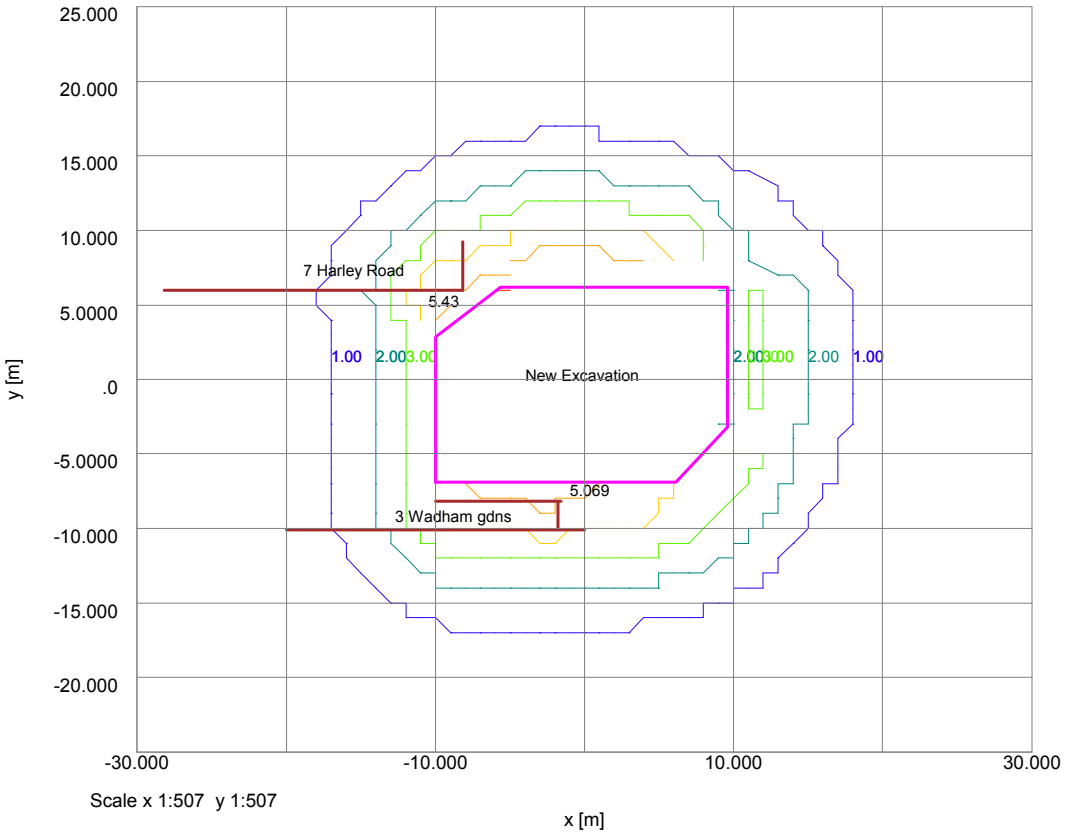
Vertical Settlement Contours: Grid 1 (level 0.000m) (Interval 1mm)



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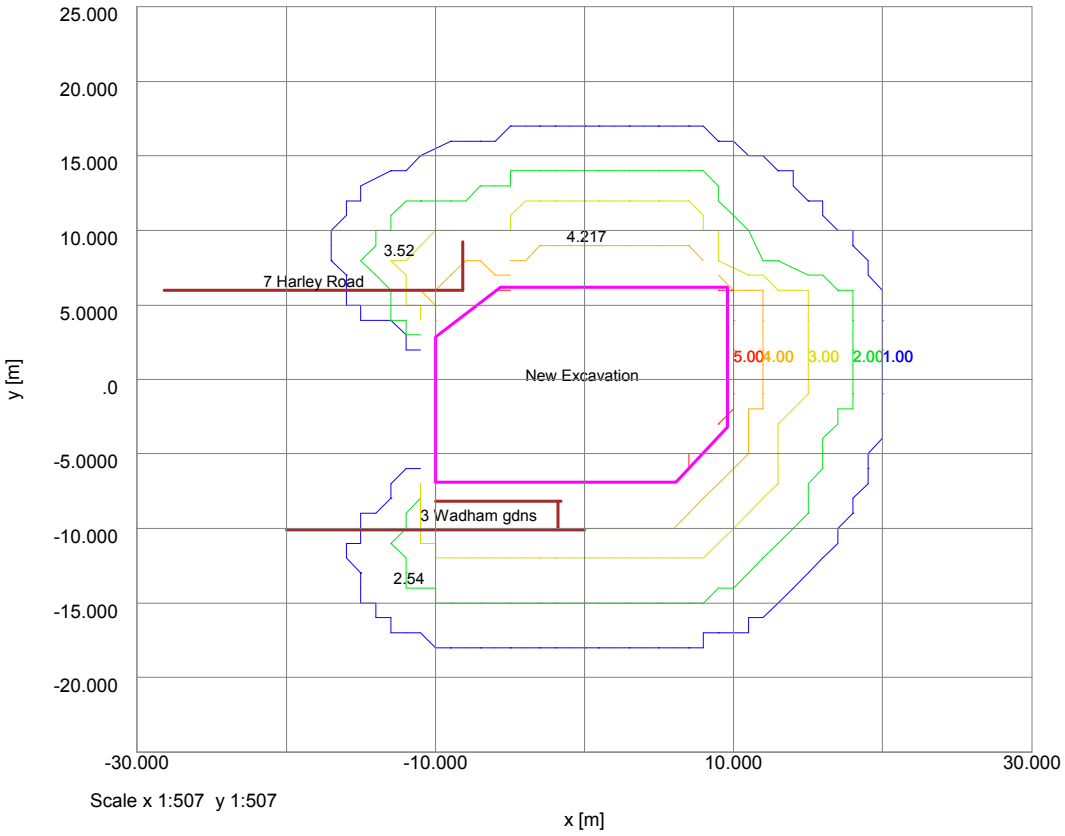
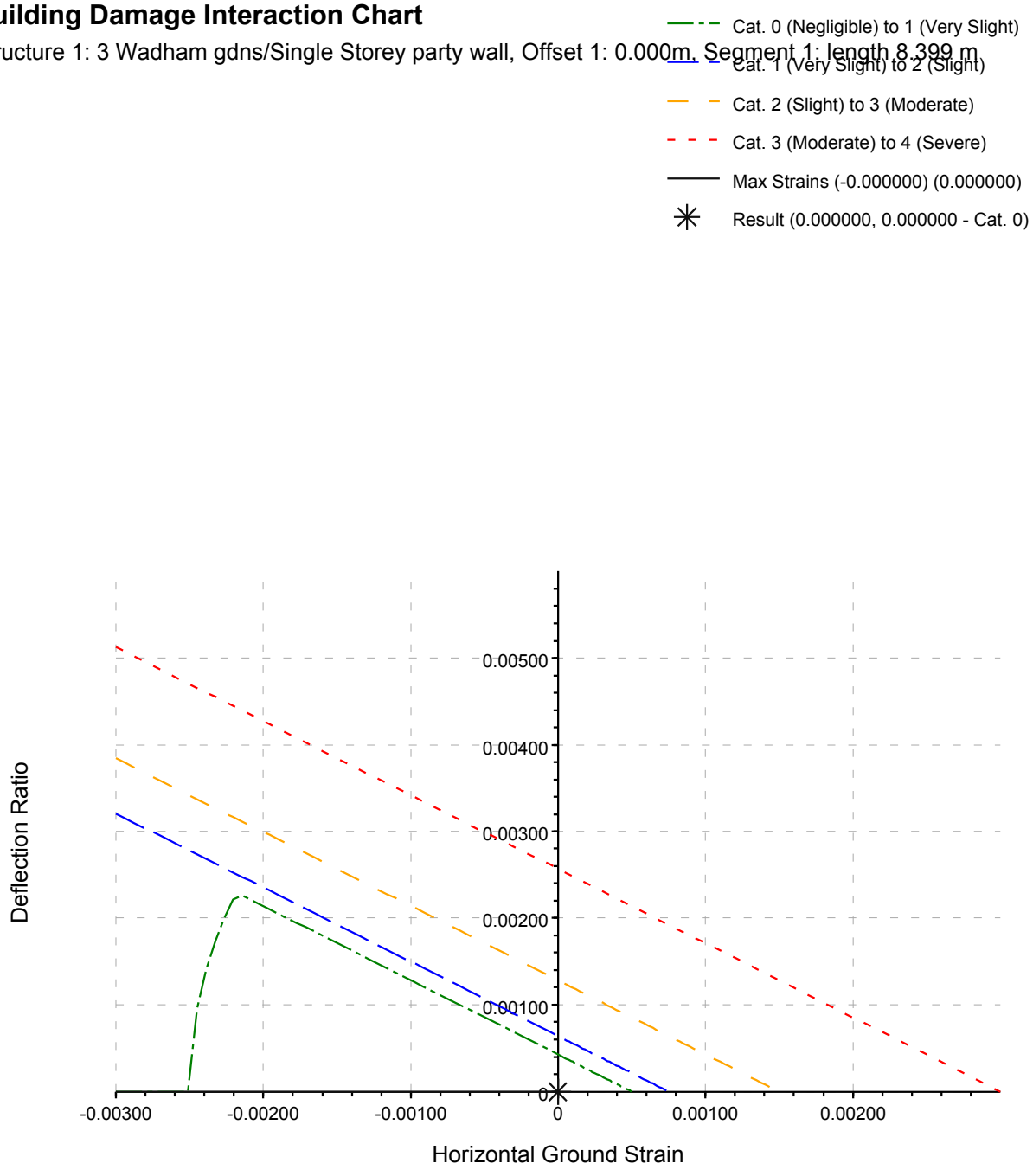
Horizontal Displacement Contours: Grid 1 (level 0.000m) Interval 1mm



Scale x 1:507 y 1:507

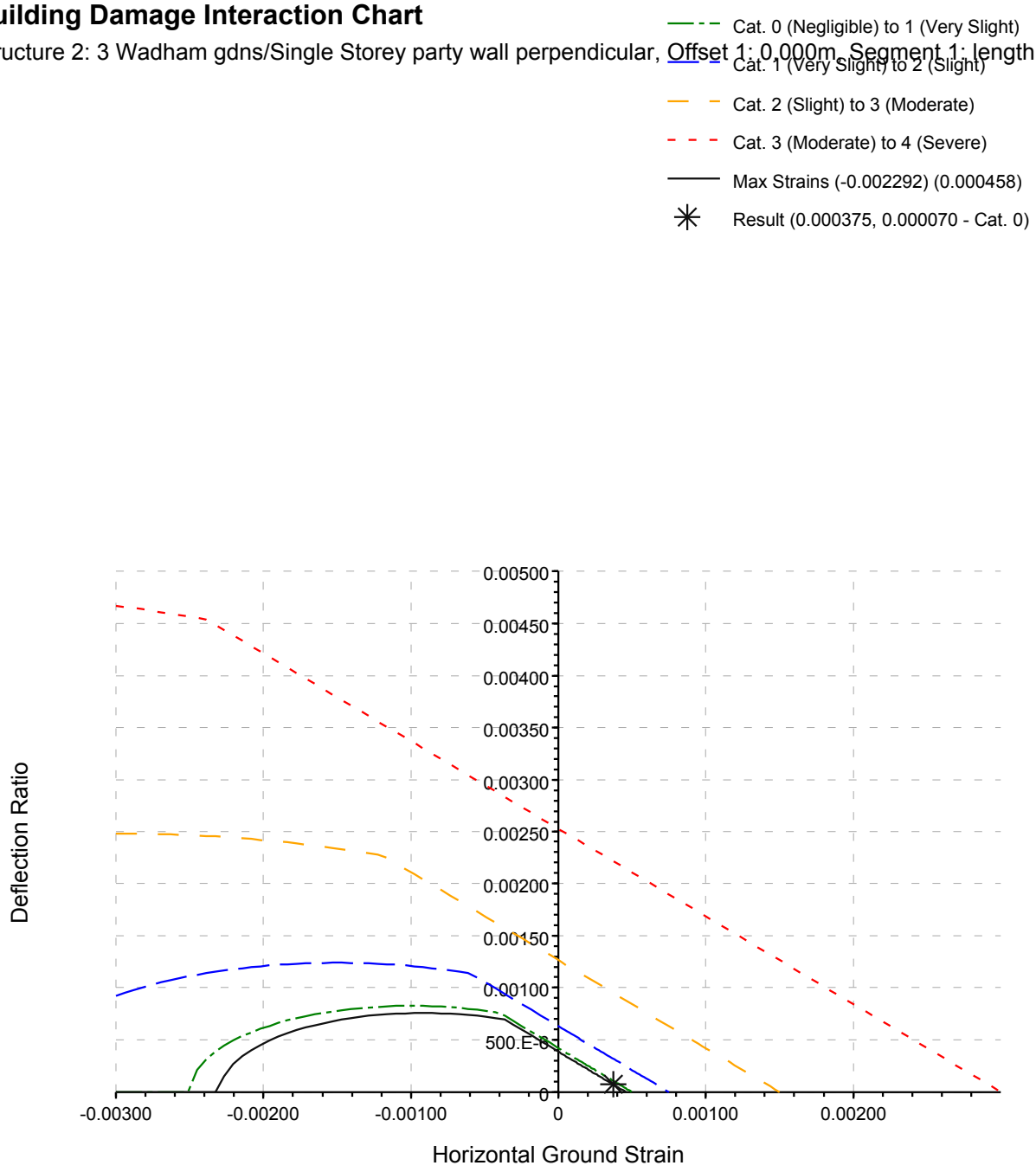
Building Damage Interaction Chart

Structure 1: 3 Wadham gdns/Single Storey party wall, Offset 1: 0.000m, Segment 1: length 8.399 m



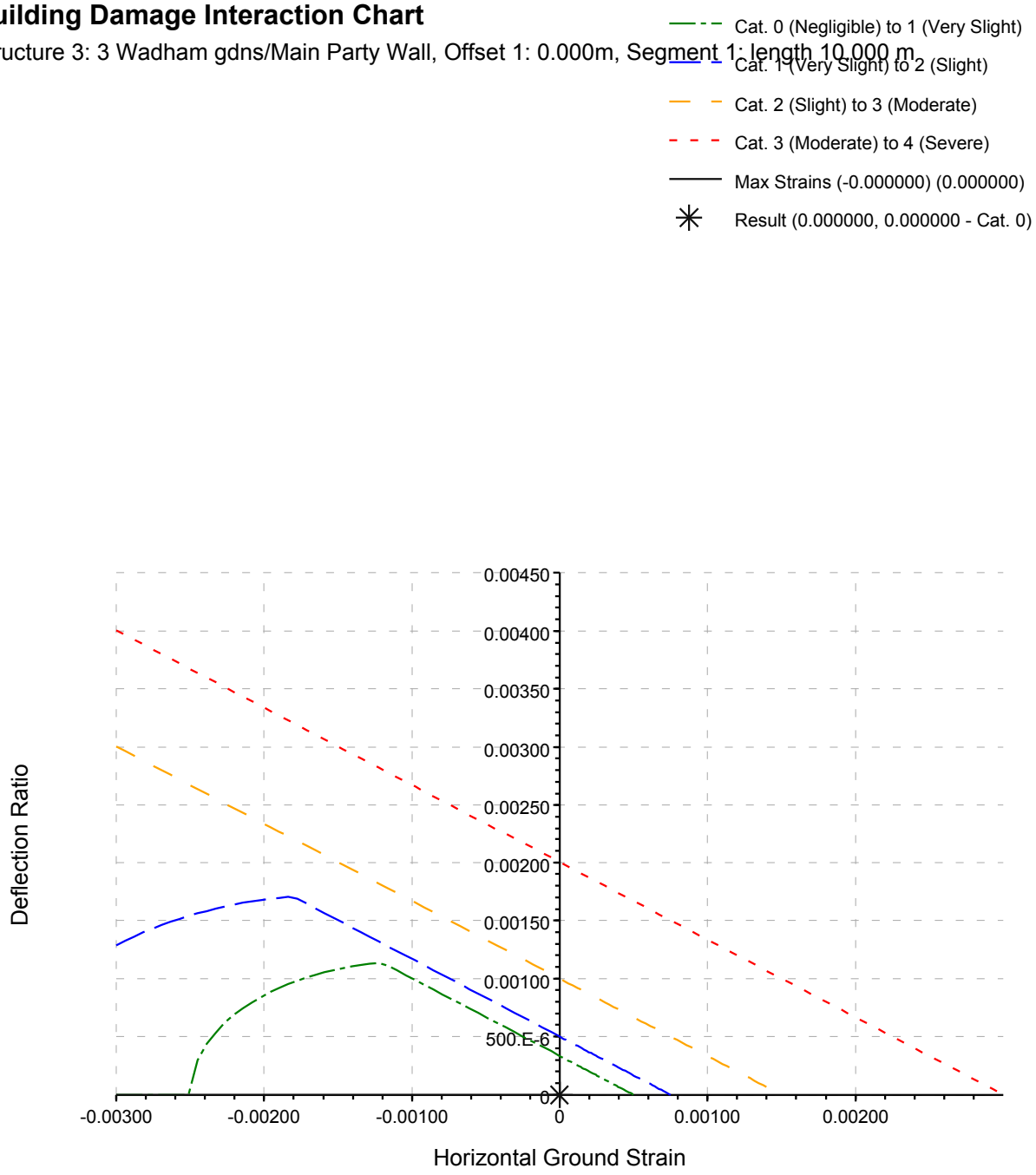
Building Damage Interaction Chart

Structure 2: 3 Wadham gdns/Single Storey party wall perpendicular, Offset 1: 0.000m, Segment 1: length 1.899 m



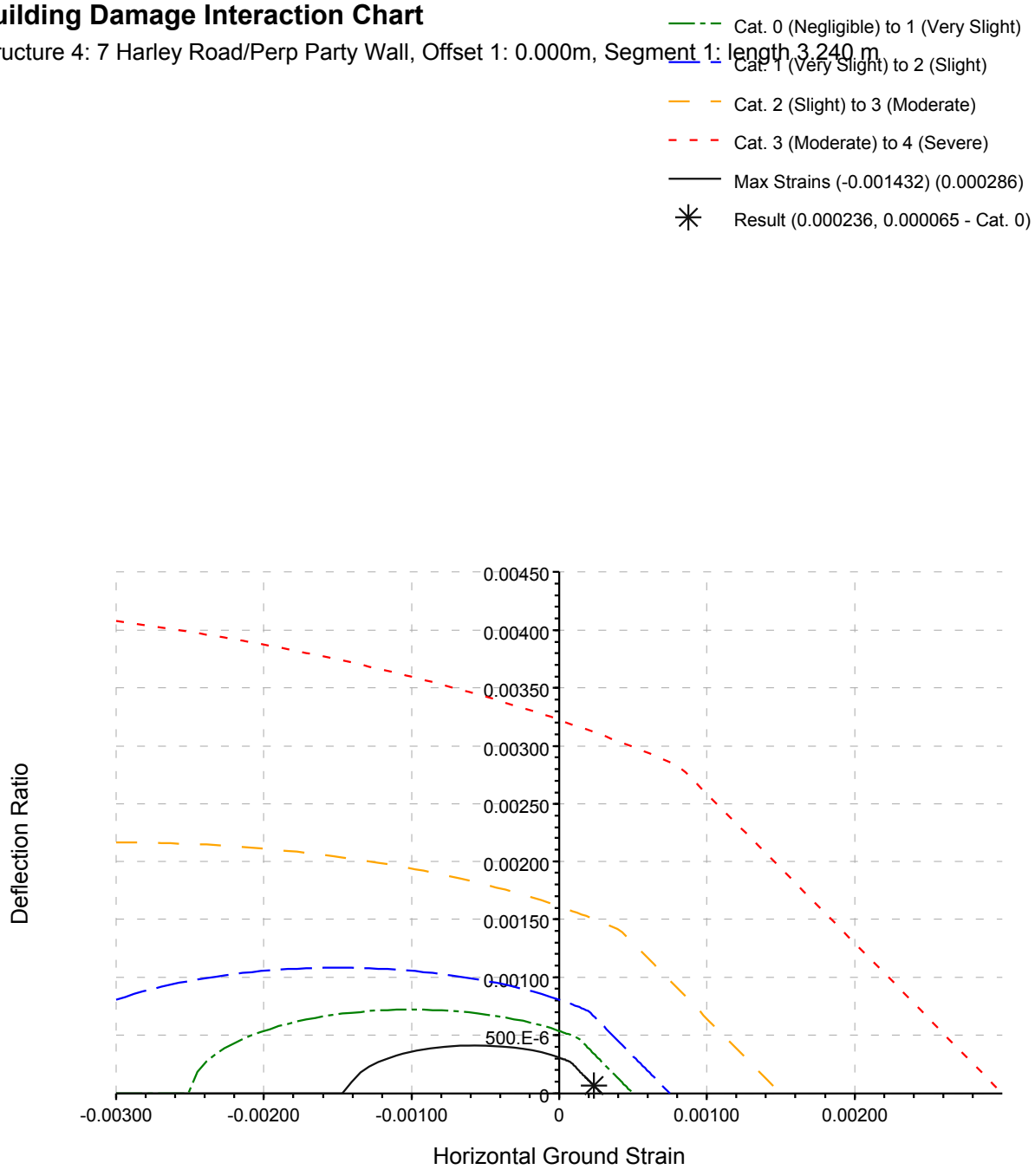
Building Damage Interaction Chart

Structure 3: 3 Wadham gdns/Main Party Wall, Offset 1: 0.000m, Segment 1: length 10.000 m



Building Damage Interaction Chart

Structure 4: 7 Harley Road/Perp Party Wall, Offset 1: 0.000m, Segment 1: length 3.240 m



Building Damage Interaction Chart

Structure 5: 7 Harley Road/Main Party Wall, Offset 1: 0.000m, Segment 1: length 7.003 m