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APPENDIX – PART 1B

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GEA Geotechnical & Environmental Associates

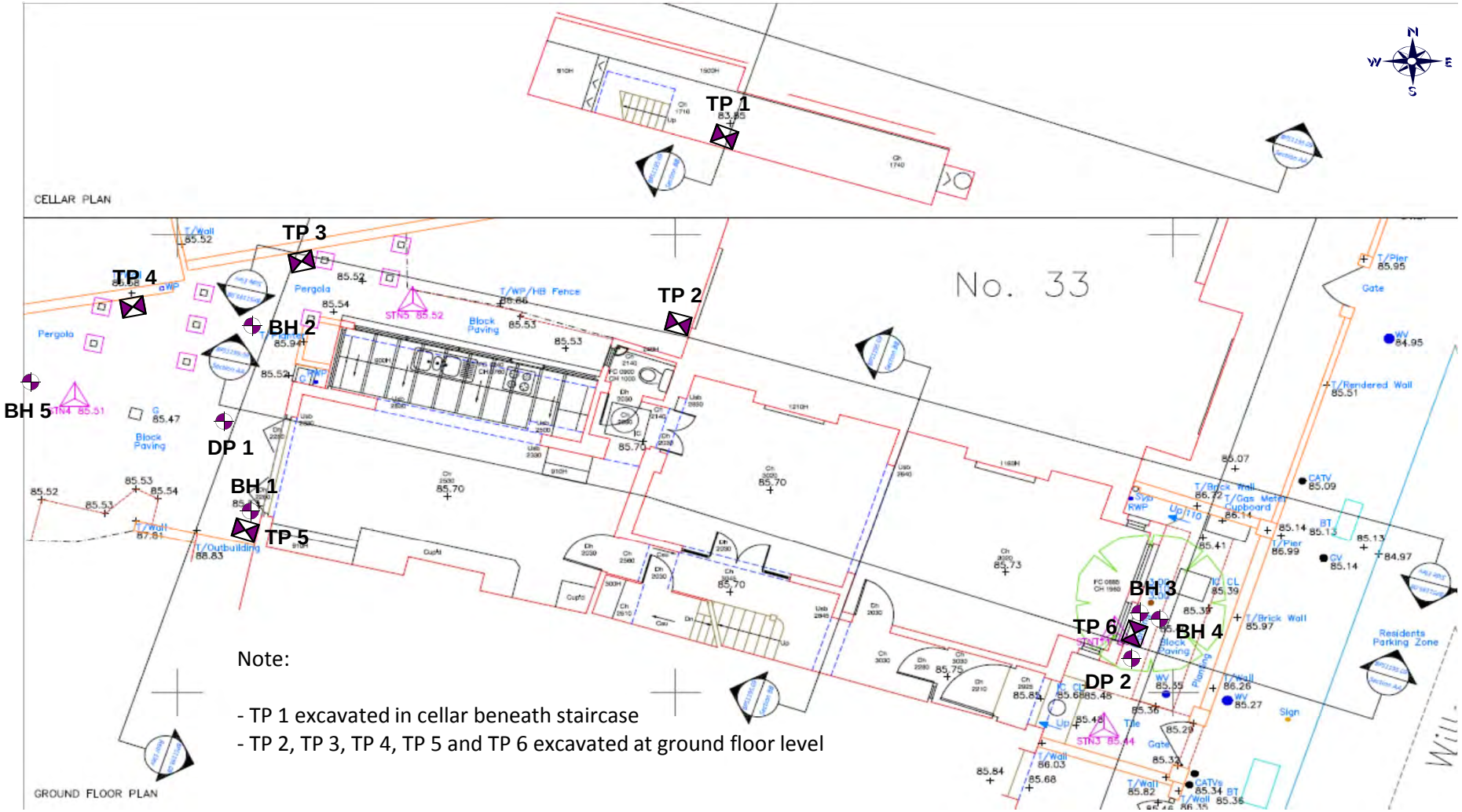
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Site Plan

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1



GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Number** **BH1**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		85.55	Manuela Eleuteri	J15315
	Location	**Dates** 13/01/2016	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				85.45	0.10	Brick Paving		
				85.40	(0.15)			
				85.25	0.30	Made Ground (yellowish brown sand with gravel)		
						Concrete		
					(1.10)	Made Ground (brown to dark brown silty sandy clay with gravel and occasional brick fragments)		
1.20	D1			84.15	1.40			
1.50	D2					Made Ground (pale greenish grey and orange-brown slightly sandy silty clay with occasional gravel, carbonaceous material and brick fragments)		
					(0.70)			
1.90	D3			83.45	2.10			
2.25	D4					Made Ground (orange-brown slightly sandy silty clay with gravel; dark grey between 2.7-2.8m)		
					(1.00)			
2.75	D5							▽1
			Slow Inflow(1) at 3.00m, not sealed.	82.45	3.10	Firm becoming stiff brown becoming brownish grey silty CLAY		
3.50	D6				(0.90)			
				81.55	4.00			
						Terminated at 4.00m		

Remarks
Groundwater monitoring standpipe installed to 3.1m
Borehole completed from base of Trial Pit No 5

Scale (approx)	**Logged By**
1:50	JS

Figure No.
J15315.BH1

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Number** **BH2**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		85.50	Manuela Eleuteri	J15315
	Location	**Dates** 13/01/2016	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				85.40	0.10	Brick Paving		
				85.35	0.15	Made Ground (yellowish brown sand with gravel)		
				85.30	0.20	Concrete		
0.50	D1					Made Ground (brown, orange-brown and greenish grey silty sandy clay with gravel, rootlets and brick fragments)		
1.50	D2				(3.00)			
2.50	D3							
			Slow Inflow(1) at 3.00m, not sealed.					▽1
				82.30	3.20	Firm greenish grey to orange-brown & dark grey slightly silty CLAY with gravel and carbonaceous material		
3.35	D4				(0.30)			
				82.00	3.50	Firm mottled pale grey to bluish & orange-brown slightly silty CLAY with occasional gravel		
				81.80	3.70	Firm becoming stiff brown becoming brownish grey silty CLAY		
					(1.30)			
4.50	D5							
				80.50	5.00	Terminated at 5.00m		

Remarks
Groundwater monitoring standpipe installed to 4.0 m

Scale (approx)	**Logged By**
1:50	JS

Figure No.
J15315.BH2

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Number** **BH3**
Excavation Method Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)** 85.40	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Dates** 13/01/2016	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(1.70)	Made Ground (brown to dark brown sandy silty clay with gravel, ash, charcoal, rootlets and brick fragments)		
				83.70	1.70			
2.00	D1				(0.70)	Made Ground (orange-brown & grey mottled slightly silty clay with rare brick fragments)		
				83.00	2.40			
3.00	D2				(1.35)	Firm greenish grey and orange-brown slightly silty CLAY with carbonaceous material and gravel		
				81.65	3.75			
4.00-4.50	D3				(0.75)	Firm becoming stiff pale orange-brown becoming brownish grey slightly silty CLAY		
				80.90	4.50			
						Terminated at 4.50m		

Remarks
Taken from base of TP6
Groundwater not encountered
Groundwater monitoring standpipe installed at 3.0m

Scale (approx)	**Logged By**
1:50	JS

Figure No.
J15315.BH3

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Number** **BH4**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Opendrive lined percussive sampler	110mm to 1.00m	85.40	Manuela Eleuteri	J15315
	Location	**Dates** 20/01/2016	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				85.35	(0.05)			
				85.30	0.05	Paving Stone		
				85.25	(0.05)	Made Ground (orange-brown sand)		
					0.10			
					(0.05)	Concrete		
					0.15			
1.00-1.45	SPT N=7		1,2/2,1,2,2		(1.55)	Made Ground (brown to orange brown mottled grey sandy silty clay with gravel, brick fragments, charcoal, ash and roots)		
				83.70	1.70			
2.00-2.45	SPT N=6		0,0/1,2,1,2		(0.80)	Made Ground (grey and orange-brown mottled slightly silty clay with rare brick fragments and rootlets)		
				82.90	2.50			
3.00-3.45	SPT N=7		0,0/1,2,2,2		(1.00)	Firm pale orange-brown and greenish grey silty CLAY with occasional gravel and carbonaceous material; dark grey carbonaceous layers at 2.8 m to 3.0 m and 3.3 m to 3.4 m)		
3.00	D1		Slow Inflow(1) at 3.30m, not sealed.					▽1
				81.90	3.50			
				81.70	(0.20) 3.70	Firm pale orange-brown mottled grey slightly silty CLAY		
4.00-4.45	SPT N=7		2,1/2,1,2,2			Firm becoming stiff pale orange-brown becoming brownish grey slightly silty CLAY with rare selenite crystals and occasional partings of silt and sand		
4.00	D2				(1.30)			
4.50	D3							
				80.40	5.00			
5.00-5.45	SPT N=10		2,1/2,2,3,3			Stiff dark brownish grey slightly silty CLAY with occasional partings of silt and sand; claystone encountered at 6.5 m to 6.7 m		
5.50	D4							
6.00-6.45	SPT N=14		2,2/2,2,3,7					
6.50	D5							
7.00-7.45	SPT N=13		2,3/2,3,4,4					
7.50	D6				(5.00)			
8.00-8.45	SPT N=13		2,2/3,3,3,4					
8.50	D7							
9.00-9.45	SPT N=13		2,3/3,3,4,3					
9.50	D8							
10.00-10.45	SPT N=11		2,2/1,3,3,4	75.40	10.00			

Remarks
Groundwater monitoring standpipe installed at 5.0m.
SPT N results potentially impacted by proximity to BH3 and the potential effects of water softening in the base of the borehole, such that the results are not considered to represent the true in-situ strength.
The assessment of the strength for the natural soils is therefore based on a combination of the test results together with the field observations, which indicated a firm becoming stiff consitency, and not just the SPT 'N' results alone.

Scale (approx)	**Logged By**
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Figure No.
J15315.BH4

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Number** **BH5**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Opendrive percussive lined sampler	110mm to 1.00m	85.50	Manuela Eleuteri	J15315
	Location	**Dates** 11/07/2017	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				85.40	0.10	Brick Paving		
				85.35	0.15	Made Ground (yellowish brown sand)		
				85.30	0.20	Concrete		
						Made Ground (brown silty slightly sandy clay with occasional gravel, ash and small brick fragments)		
1.00-1.45	SPT(C) N=9	DRY	0,1/2,2,2,3		(2.00)			
2.00-2.45	SPT(C) N=8	DRY	1,1/2,2,2,2	83.30	2.20	Made Ground (brown silty clay with rare brick fragments)		
					(0.75)			
3.00-3.45	SPT(C) N=8	DRY	0,0/0,3,2,3	82.55	2.95	Made Ground (greenish brown silty clay with very rare brick fragments)		
					(0.45)			
4.00-4.45	SPT N=12	DRY	2,2/3,3,3,3	82.10	3.40	Firm becoming stiff brownish grey silty CLAY with relic root traces		
					(2.05)			
5.00-5.45	SPT N=16	DRY	2,2/3,4,5,4					
				80.05	5.45	Complete at 5.45m		

Remarks
Groundwater not encountered during drilling and borehole remained dry throughout an observation period of approximatley 4 hours.

Scale (approx)	**Logged By**
1:50	MP

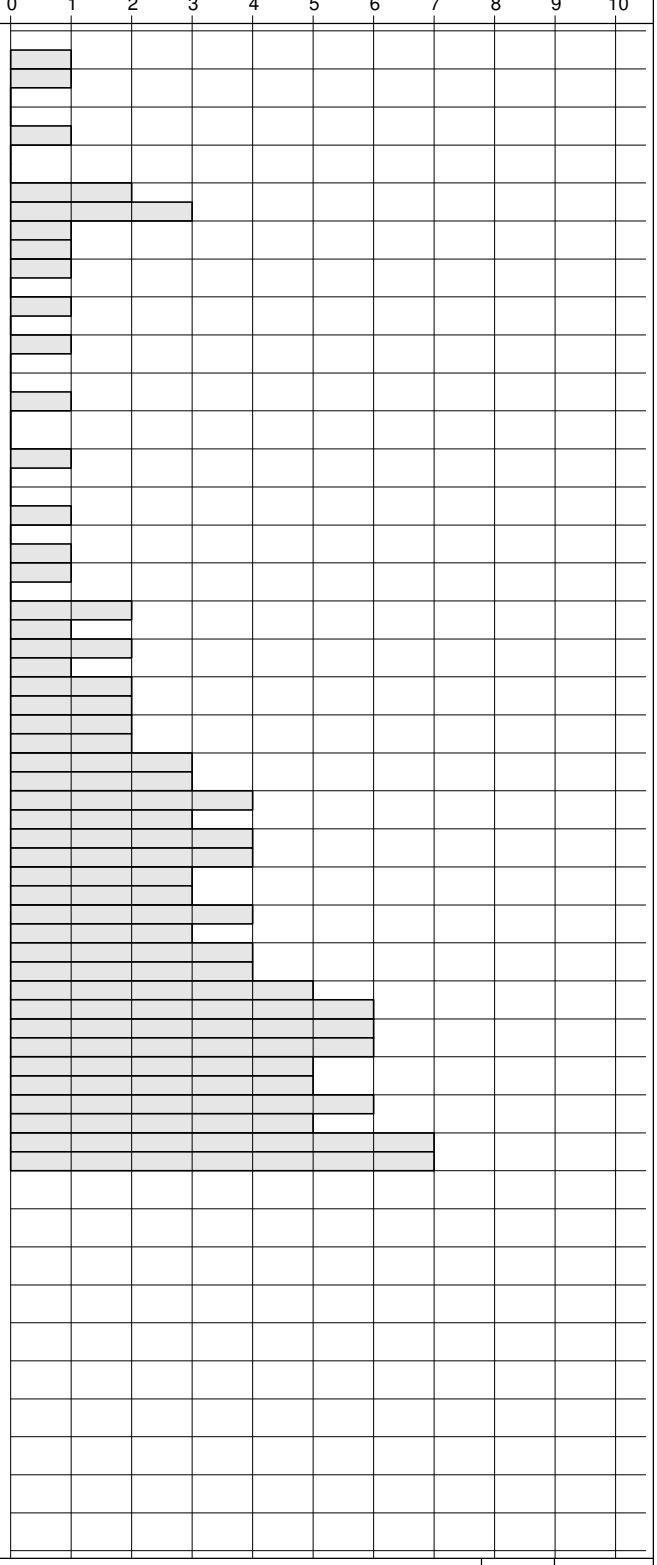
Figure No.
j15315.BH5

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Probe Number** **DP1**

Method DPSH	**Cone Dimensions**	**Ground Level (mOD)** 85.50	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Dates** 11/07/2017	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records
0.10-0.20	1	
0.20-0.30	1	
0.30-0.40	0	
0.40-0.50	0	
0.50-0.60	1	
0.60-0.70	0	
0.70-0.80	0	
0.80-0.90	2	
0.90-1.00	3	
1.00-1.10	1	
1.10-1.20	1	
1.20-1.30	1	
1.30-1.40	0	
1.40-1.50	1	
1.50-1.60	0	
1.60-1.70	1	
1.70-1.80	0	
1.80-1.90	0	
1.90-2.00	1	
2.00-2.10	0	
2.10-2.20	0	
2.20-2.30	1	
2.30-2.40	0	
2.40-2.50	0	
2.50-2.60	1	
2.60-2.70	0	
2.70-2.80	1	
2.80-2.90	1	
2.90-3.00	0	
3.00-3.10	2	
3.10-3.20	1	
3.20-3.30	2	
3.30-3.40	1	
3.40-3.50	2	
3.50-3.60	2	
3.60-3.70	2	
3.70-3.80	2	
3.80-3.90	3	
3.90-4.00	3	
4.00-4.10	4	
4.10-4.20	3	
4.20-4.30	4	
4.30-4.40	4	
4.40-4.50	3	
4.50-4.60	3	
4.60-4.70	4	
4.70-4.80	3	
4.80-4.90	4	
4.90-5.00	4	
5.00-5.10	5	
5.10-5.20	6	
5.20-5.30	6	
5.30-5.40	6	
5.40-5.50	5	
5.50-5.60	5	
5.60-5.70	6	
5.70-5.80	5	
5.80-5.90	7	
5.90-6.00	7	

Level (mOD)	Depth (m)
85.50	0.00
85.00	0.50
84.50	1.00
84.00	1.50
83.50	2.00
83.00	2.50
82.50	3.00
82.00	3.50
81.50	4.00
81.00	4.50
80.50	5.00
80.00	5.50
79.50	6.00
79.00	6.50
78.50	7.00
78.00	7.50
77.50	8.00



Remarks
Groundwater not encountered
Classification after Huntley (1990): Very Soft = <1; Soft = 1 to 2; Firm: 3 to 4; Stiff = 5 to 8; Very stiff = > 8

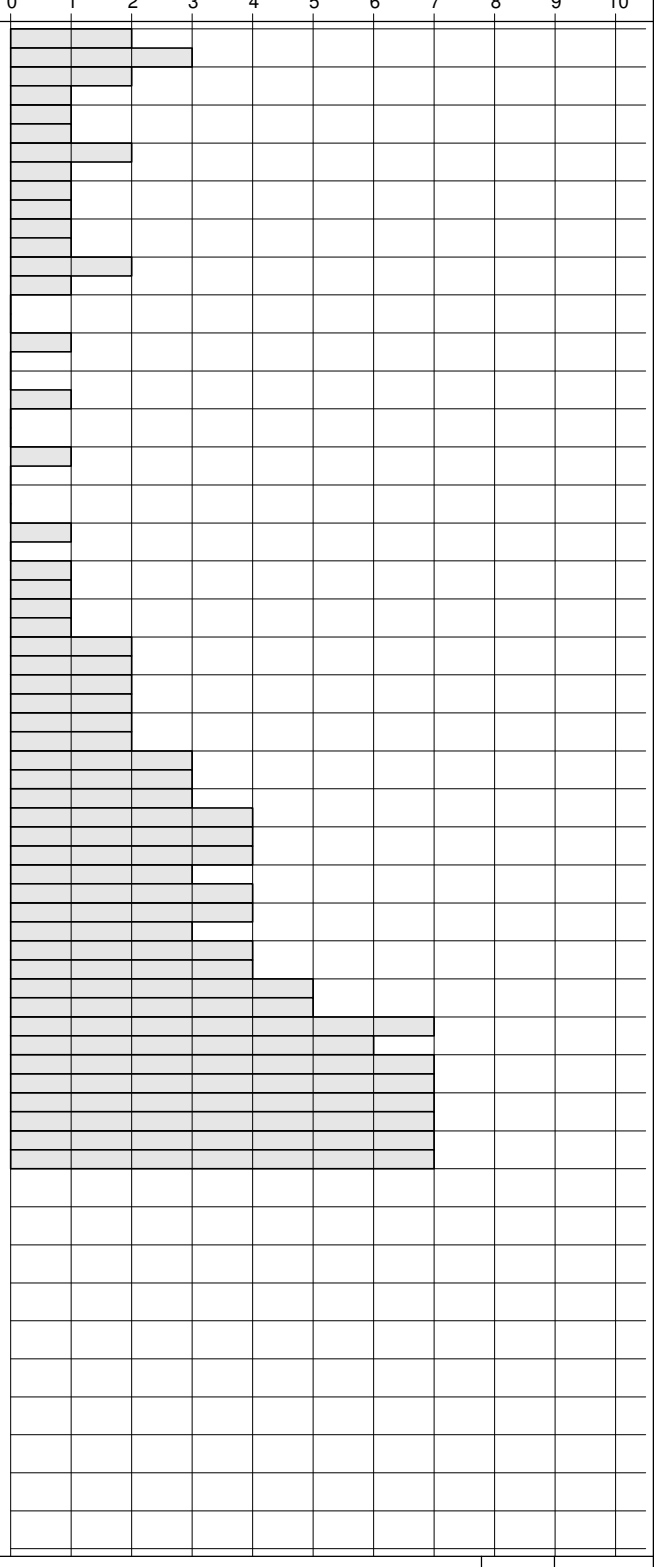
Scale (approx)	**Logged By**
1:40	MJD

Figure No.
J15315.DP1

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Probe Number** **DP2**

Method Super Heavy Dynamic Probe (DPSH)	**Cone Dimensions**	**Ground Level (mOD)** 85.40	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Dates** 11/07/2017	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		85.40	0.00
0.10-0.20	3			
0.20-0.30	2			
0.30-0.40	1			
0.40-0.50	1			
0.50-0.60	1		84.90	0.50
0.60-0.70	2			
0.70-0.80	1			
0.80-0.90	1			
0.90-1.00	1			
1.00-1.10	1		84.40	1.00
1.10-1.20	1			
1.20-1.30	2			
1.30-1.40	1			
1.40-1.50	0			
1.50-1.60	0		83.90	1.50
1.60-1.70	1			
1.70-1.80	0			
1.80-1.90	0			
1.90-2.00	1			
2.00-2.10	0		83.40	2.00
2.10-2.20	0			
2.20-2.30	1			
2.30-2.40	0			
2.40-2.50	0			
2.50-2.60	0		82.90	2.50
2.60-2.70	1			
2.70-2.80	0			
2.80-2.90	1			
2.90-3.00	1			
3.00-3.10	1		82.40	3.00
3.10-3.20	1			
3.20-3.30	2			
3.30-3.40	2			
3.40-3.50	2			
3.50-3.60	2		81.90	3.50
3.60-3.70	2			
3.70-3.80	2			
3.80-3.90	3			
3.90-4.00	3			
4.00-4.10	3		81.40	4.00
4.10-4.20	4			
4.20-4.30	4			
4.30-4.40	4			
4.40-4.50	3			
4.50-4.60	4		80.90	4.50
4.60-4.70	4			
4.70-4.80	3			
4.80-4.90	4			
4.90-5.00	4			
5.00-5.10	5		80.40	5.00
5.10-5.20	5			
5.20-5.30	7			
5.30-5.40	6			
5.40-5.50	7			
5.50-5.60	7		79.90	5.50
5.60-5.70	7			
5.70-5.80	7			
5.80-5.90	7			
5.90-6.00	7			
			79.40	6.00
			78.90	6.50
			78.40	7.00
			77.90	7.50
			77.40	8.00



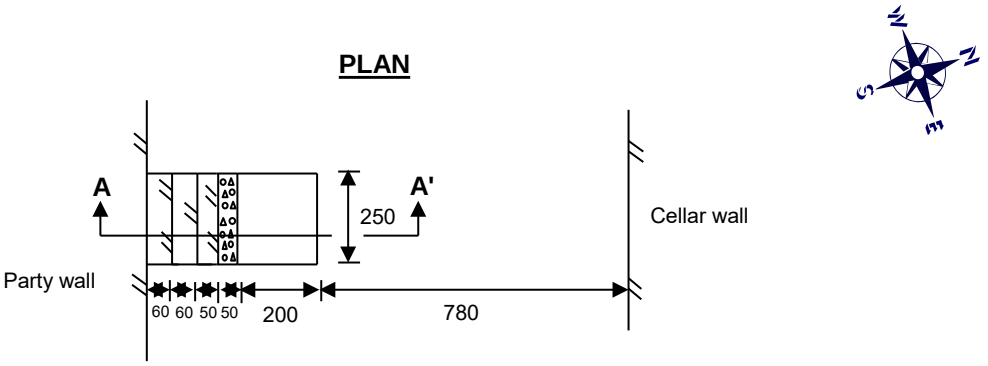
Remarks
Groundwater not encountered
Classification after Huntley (1990): Very Soft = <1; Soft = 1 to 2; Firm: 3 to 4; Stiff = 5 to 8; Very stiff = > 8

Scale (approx)	**Logged By**
1:40	MJD

Figure No.
J15315.DP2

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** 1
Excavation Method Manual	**Dimensions** 250 x 420 x 500	**Ground Level (mOD)** 83.85	**Client** Manuela Eleuteri	**Job Number** J15315
	Location Ground Level	**Dates** 12/01/16 to 13/01/16	**Engineer** Richard Tant Associates	**Sheet** 1/1

PLAN



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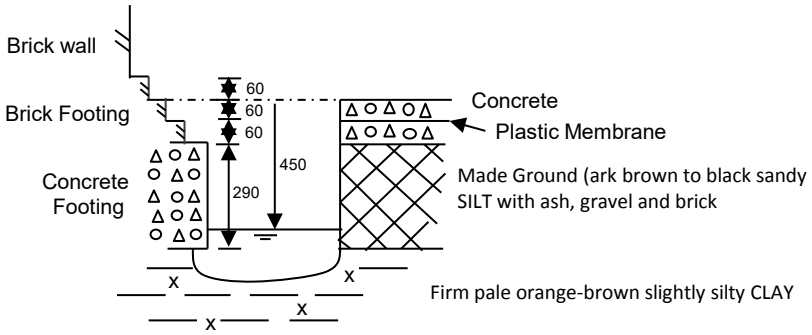
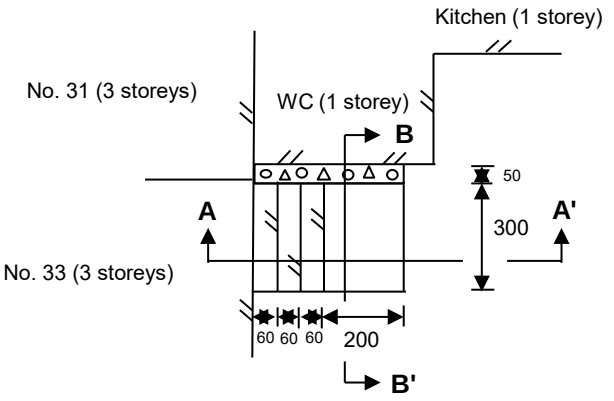


Remarks: All dimensions in millimetres Trial pit sides remained stable during excavation Groundwater encountered at a depth of 0.45 m	Scale: 1:20 Logged by: JS

GEA Geotechnical & Environmental Associates	Widbury Barns Widbury Hill Ware Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** **2**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Manual	350 x 380 x 1600	85.50	Manuela Eleuteri	J15315
	Location	**Dates**	**Engineer**	**Sheet**
	Ground Level	12/01/16 to 13/01/16	Richard Tant Associates	1/2

PLAN



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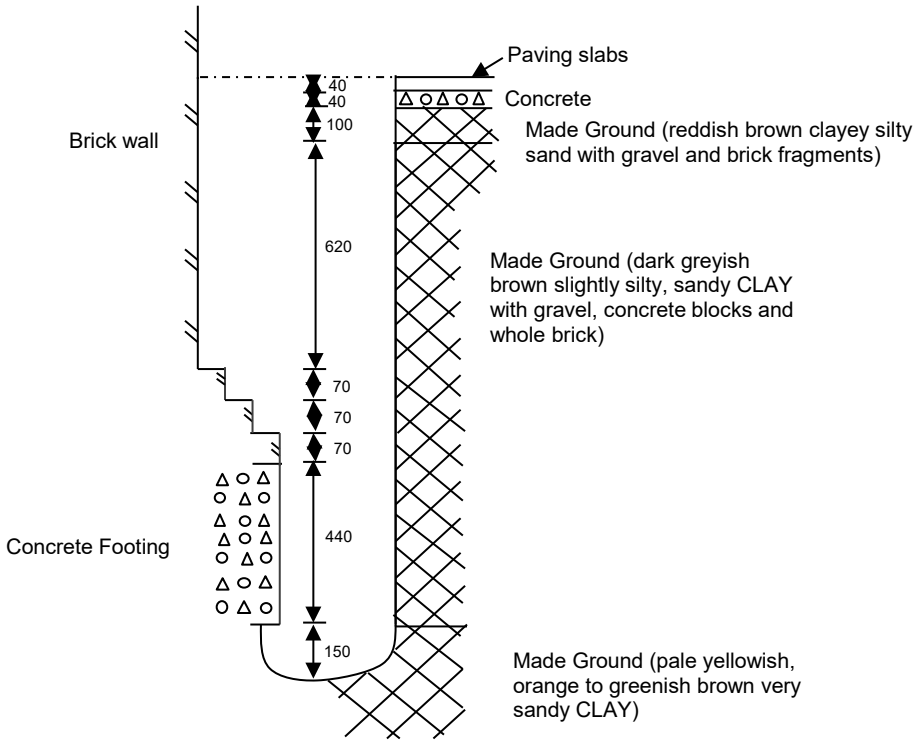
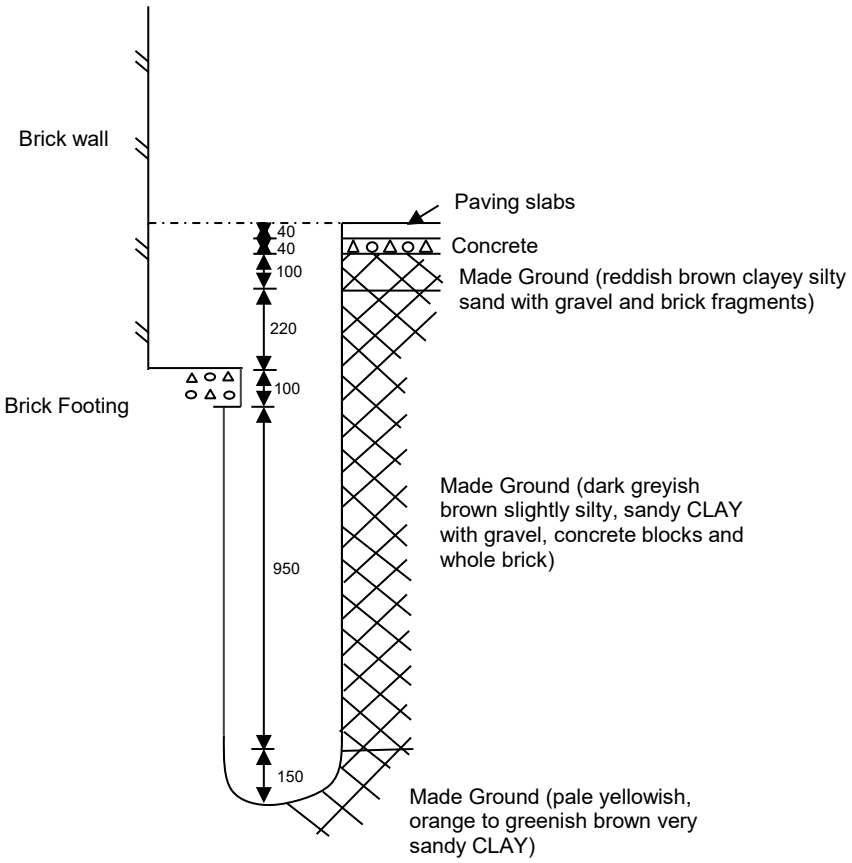


Remarks:	Scale:
All dimensions in millimetres	1:20
Trial pit sides remained stable during excavation	Logged by:
Groundwater not encountered	JS

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** **2**
Excavation Method Manual	**Dimensions** 350 x 380 x 1600	**Ground Level (mOD)** 85.50	**Client** Manuela Eleuteri	**Job Number** J15315
	Location Ground Level	**Dates** 12/01/16 to 13/01/16	**Engineer** Richard Tant Associates	**Sheet** 2/2

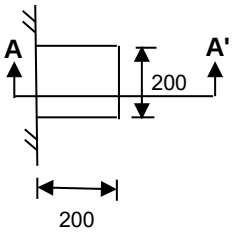
SECTION B - B'



Remarks: All dimensions in millimetres Trial pit sides remained stable during excavation Groundwater not encountered	Scale: 1:20 Logged by: JS

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** 3
Excavation Method Manual	**Dimensions** 200 x 200 x 500	**Ground Level (mOD)** 85.50	**Client** Manuela Eleuteri	**Job Number** J15315
	Location Ground Level	**Dates** 12/01/16 to 13/01/16	**Engineer** Richard Tant Associates	**Sheet** 1/1

PLAN



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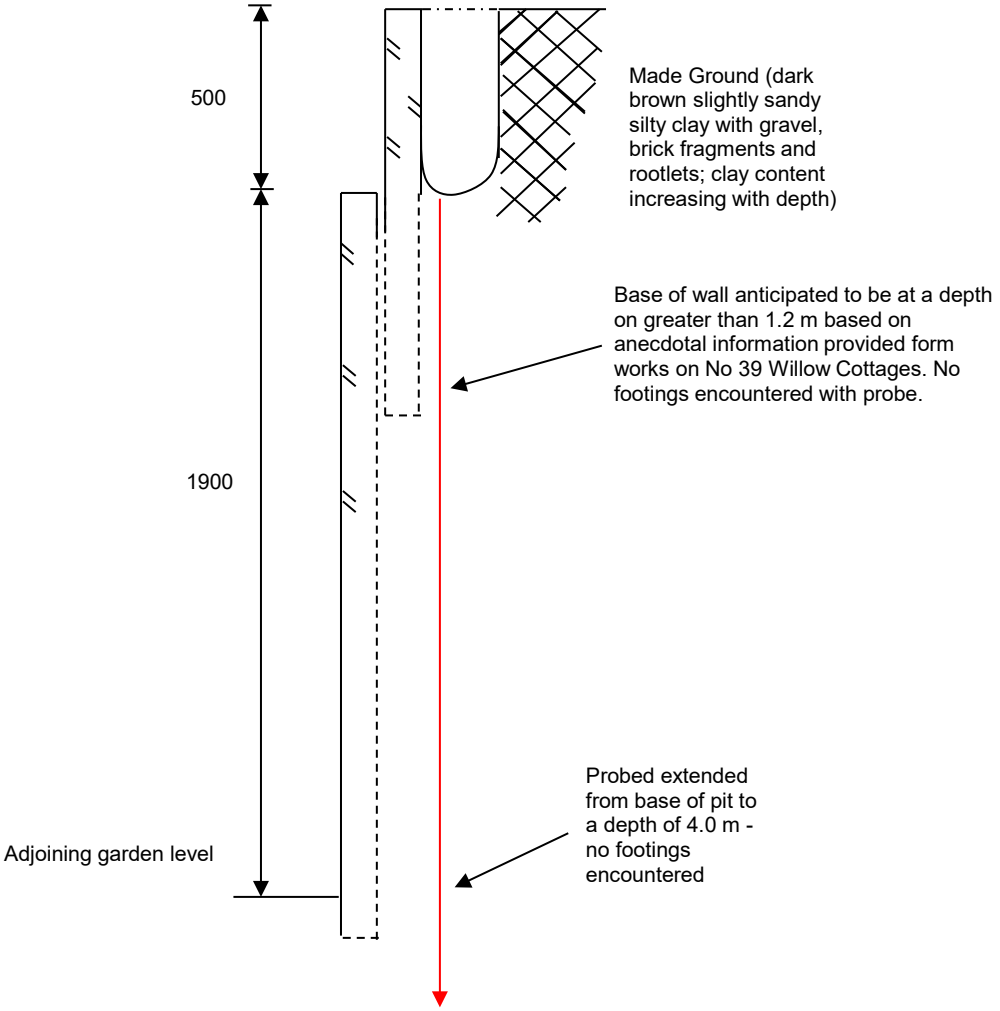
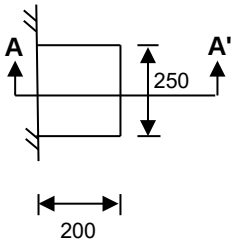


Remarks: All dimensions in millimetres Trial pit sides remained stable during excavation Groundwater not encountered	Scale: 1:20 Logged by: JS

GEA Geotechnical & Environmental Associates Widbury Barns Widbury Hill Ware Herts SG12 7QE			**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** 4
Excavation Method Manual	**Dimensions** 200 x 250 x 600	**Ground Level (mOD)** 85.50	**Client** Manuela Eleuteri	**Job Number** J15315
	Location Ground Level	**Dates** 12/01/16 to 13/01/16	**Engineer** Richard Tant Associates	**Sheet** 1/1

PLAN



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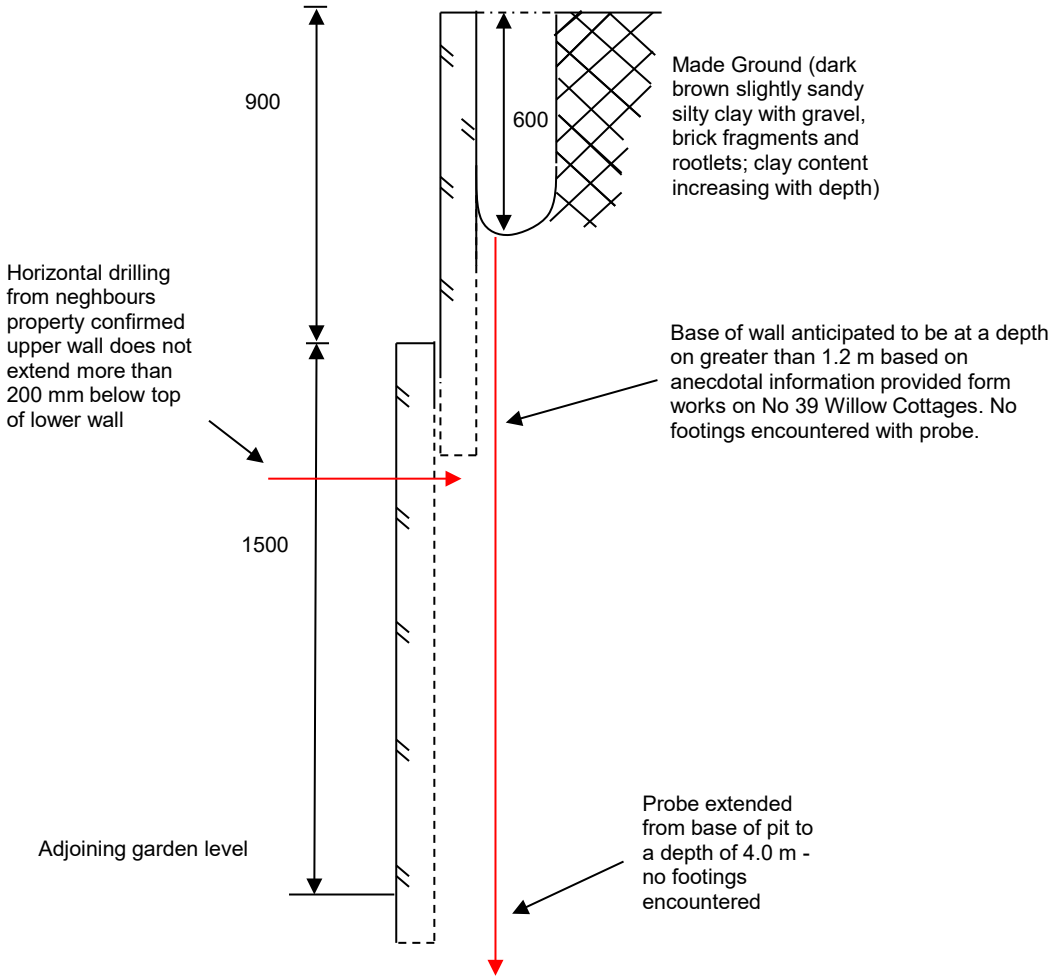
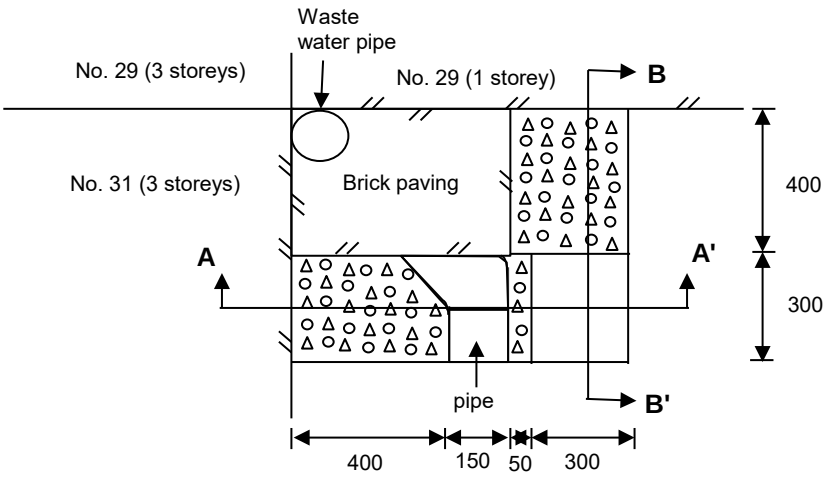


Remarks: All dimensions in millimetres Trial pit sides remained stable during excavation Groundwater not encountered	Scale: 1:20 Logged by: JS

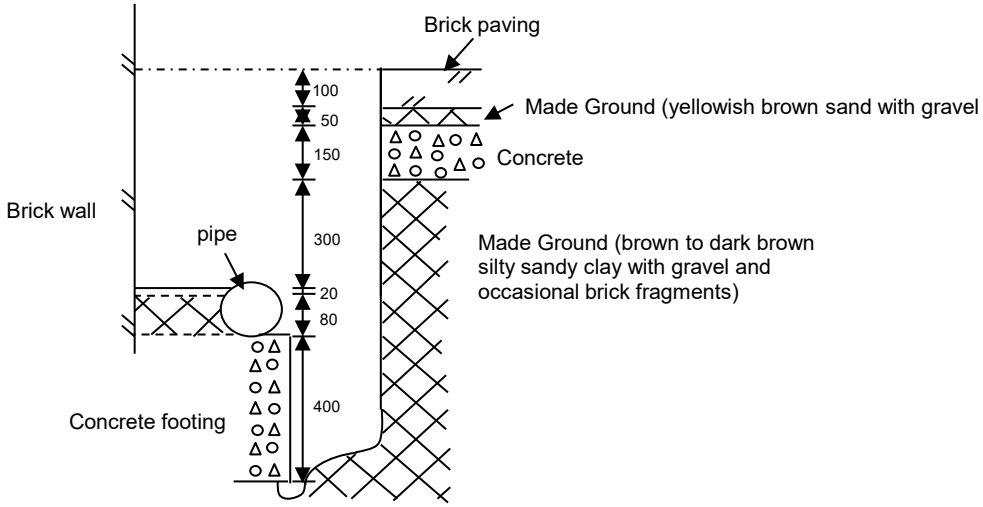
GEA Geotechnical & Environmental Associates	Widbury Barns Widbury Hill Ware Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** 5

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Manual	700 x 900 x 1200	85.50	Manuela Eleuteri	J15315
	Location	**Dates**	**Engineer**	**Sheet**
	Ground Level	12/01/16 to 13/01/16	Richard Tant Associates	1/2

PLAN



SECTION A - A'

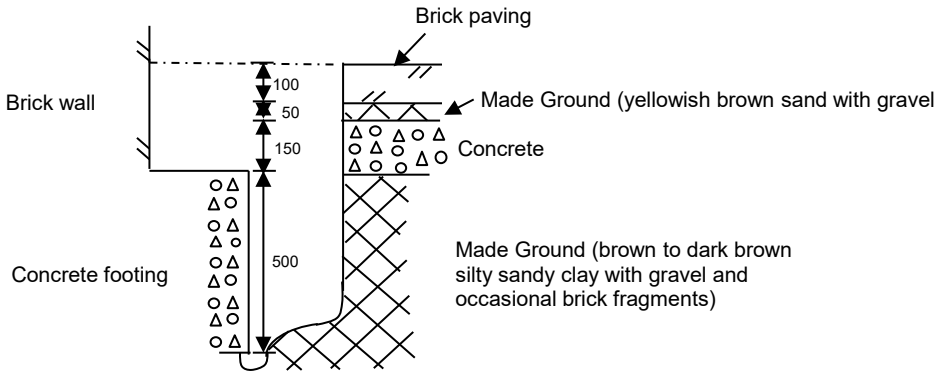


Remarks:	Scale:
All dimensions in millimetres	1:20
Trial pit sides remained stable during excavation	Logged by:
Groundwater not encountered	JS

GEA Geotechnical & Environmental Associates	Widbury Barns Widbury Hill Ware Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** **5**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Manual	700 x 900 x 1200	85.50	Manuela Eleuteri	J15315
	Location	**Dates**	**Engineer**	**Sheet**
	Ground Level	12/01/16 to 13/01/16	Richard Tant Associates	2/2

SECTION B - B'

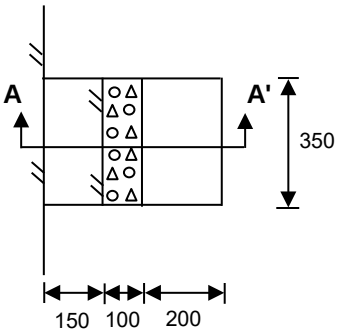


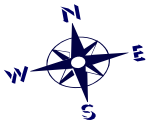
Remarks:	Scale:
All dimensions in millimetres	1:20
Trial pit sides remained stable during excavation	Logged by:
Groundwater not encountered	JS

GEA Geotechnical & Environmental Associates	Widbury Barns Widbury Hill Ware Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Trial Pit Number** **6**

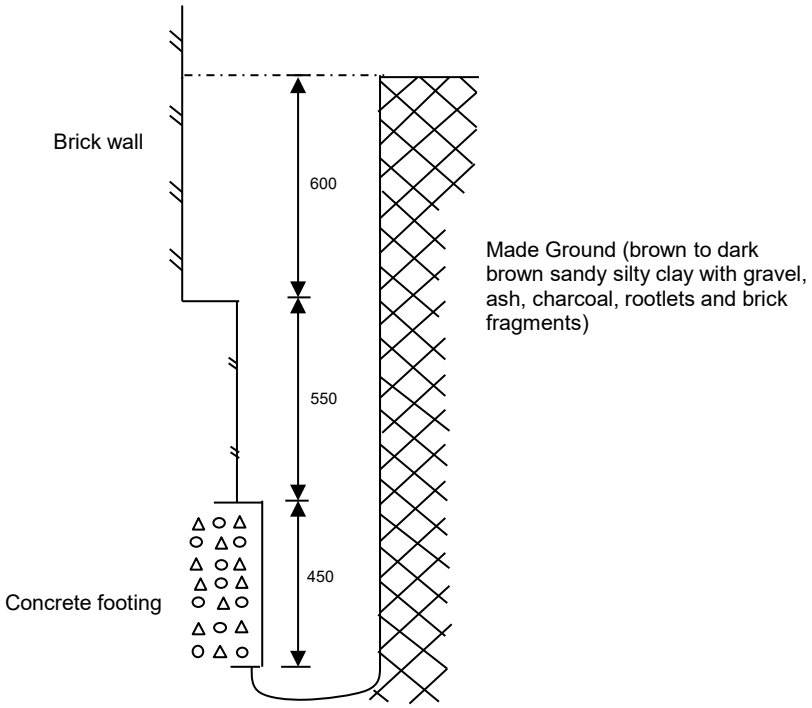
Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Manual	350 x 450 x 1800	85.40	Manuela Eleuteri	J15315
	Location	**Dates**	**Engineer**	**Sheet**
	Ground Level	12/01/16 to 13/01/16	Richard Tant Associates	1/1

PLAN





SECTION A - A'



Remarks:	Scale:
All dimensions in millimetres	1:20
Trial pit sides remained stable during excavation	Logged by:
Groundwater not encountered	JS

Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
SG12 7QE

Trial Pit No 1

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1

View of TP1 - looking southeast

View into TP1 - looking southeast

GEA Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
SG12 7QE

Trial Pit No 2

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1

View of TP2 - looking southeast

View into TP2 - looking southeast

Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
SG12 7QE

Trial Pit No 3

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1

View of TP3 - looking northeast

View into TP3 - looking north

Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
SG12 7QE

Trial Pit No 4

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1

View of TP4 - looking northwest

Plan view of TP4 - looking northwest

GEA Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
SG12 7QE

Trial Pit No 5

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1

View of TP5 - looking southeast

View into TP5 - looking east

Geotechnical & Environmental Associates

Widbury Barns
Widbury Hill
Ware
SG12 7QE

Trial Pit No 6

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1

View of TP6 - looking northwest

View into TP6 - looking northeast

Summary of Test Results

Job No.	Project Name	Programme	
20228	31 Willoughby Road	Samples received	21/01/2016
		Schedule received	21/01/2016
Project No.	Client	Project started	22/01/2016
J15315	GEA	Testing Started	02/02/2016

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top	Base	Type		%	%	%	%	%	
BH1	6	3.50		D	Brown and occasional blue grey silty CLAY	33	100	63	23	40	
BH2	5	4.50		D	Brown and occasional blue grey silty CLAY with rare fine gravel	32	99	64	26	38	
BH4	1	3.00		D	Dark grey slightly fine sandy slightly gravelly silty CLAY (gravel is fine)	30	97	48	24	24	
BH4	3	4.50		D	Brown and occasional blue grey silty CLAY with rare fine gravel	31	99	69	25	44	
BH4	5	6.50		D	Dark brown silty CLAY with rare fine gravel	32	99	70	24	46	
BH4	7	8.50		D	Dark blue grey silty CLAY with rare fine gravel	29	99	67	25	42	

UKAS TESTING
2519

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3 and 5.0

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: 03/02/2016

Loss On Ignition - Summary of Results

Job No.	Project Name	Programme	
20228	31 Willoughby Road	Samples received	21/01/2016
		Schedule received	21/01/2016
Project No.	Client	Project Started	22/01/2016
J15315	GEA	Testing Started	02/02/2016

Hole No.	Sample				Description	Passing 2mm %	Loss on Ignition %	Remarks
	Ref	Top	Base	Type				
BH4	1	3.00		D	Dark grey slightly fine sandy slightly gravelly silty CLAY (gravel is fine)	100	**6.2**	

Test Methods: BS1377: Part 3: 1990:
Mass Loss on Ignition : clause 4.0

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: 03/02/2016

2519

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

Sulphate Content (Gravimetric Method) for 2:1 Soil: Water Extract and pH Value - Summary of Results

Tested in accordance with BS1377 : Part 3 : 1990, clause 5.3 and clause 9

Job No.	Project Name	Programme	
20228	31 Willoughby Road	Samples received	21/01/2016
		Schedule received	21/01/2016
Project No.	Client	Project started	22/01/2016
J15315	GEA	Testing Started	01/02/2016

Hole No.	Sample				Soil description	Dry Mass passing 2mm	SO3 Content	SO4 Content	pH	Remarks
	Ref	Top	Base	Type		%	g/l	g/l		
BH1	6	3.50		D	Brown and occasional blue grey silty CLAY	100	0.30	0.36	7.80	
BH2	5	4.50		D	Brown and occasional blue grey silty CLAY with rare fine gravel	100	0.87	1.04	7.82	
BH4	1	3.00		D	Dark grey slightly fine sandy slightly gravelly silty CLAY (gravel is fine)	100	0.38	0.46	7.48	
BH4	5	6.50		D	Dark brown silty CLAY with rare fine gravel	100	0.74	0.89	7.90	

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: 03/02/2016

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618
Facsimile: (01424) 729911
info@elab-uk.co.uk

UKAS TESTING 2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	16-05425
Issue:	1
Date of Issue:	29/01/2016
Contact:	James Phaure
Customer Details:	K4 Soils Laboratory Ltd Unit 8 Watford HertfordshireWD18 9RU
Quotation No:	Q15-00248
Order No:	20228
Customer Reference:	J15315
Date Received:	27/01/2016
Date Approved:	29/01/2016
Details:	31 Willoughby Way
Approved by:	

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683

Sample Summary

Report No.: 16-05425

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
51816	BH4 D1 3.00	Not Provided	27/01/2016	Silty loam	a

Results Summary

2683

Report No.: 16-05425

ELAB Reference	51816
Customer Reference	D1
Sample ID	
Sample Type	SOIL
Sample Location	BH4
Sample Depth (m)	3.00
Sampling Date	

Determinand	Codes	Units	LOD	
Miscellaneous				
Soil Organic Matter	U	%	0.1	3.3

2683

Method Summary

Report No.: 16-05425

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Soil organic matter	U	Air dried sample	29/01/2016	BS1377:P3	Titrimetry

2683

Report Information

Report No.: 16-05425

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis
Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

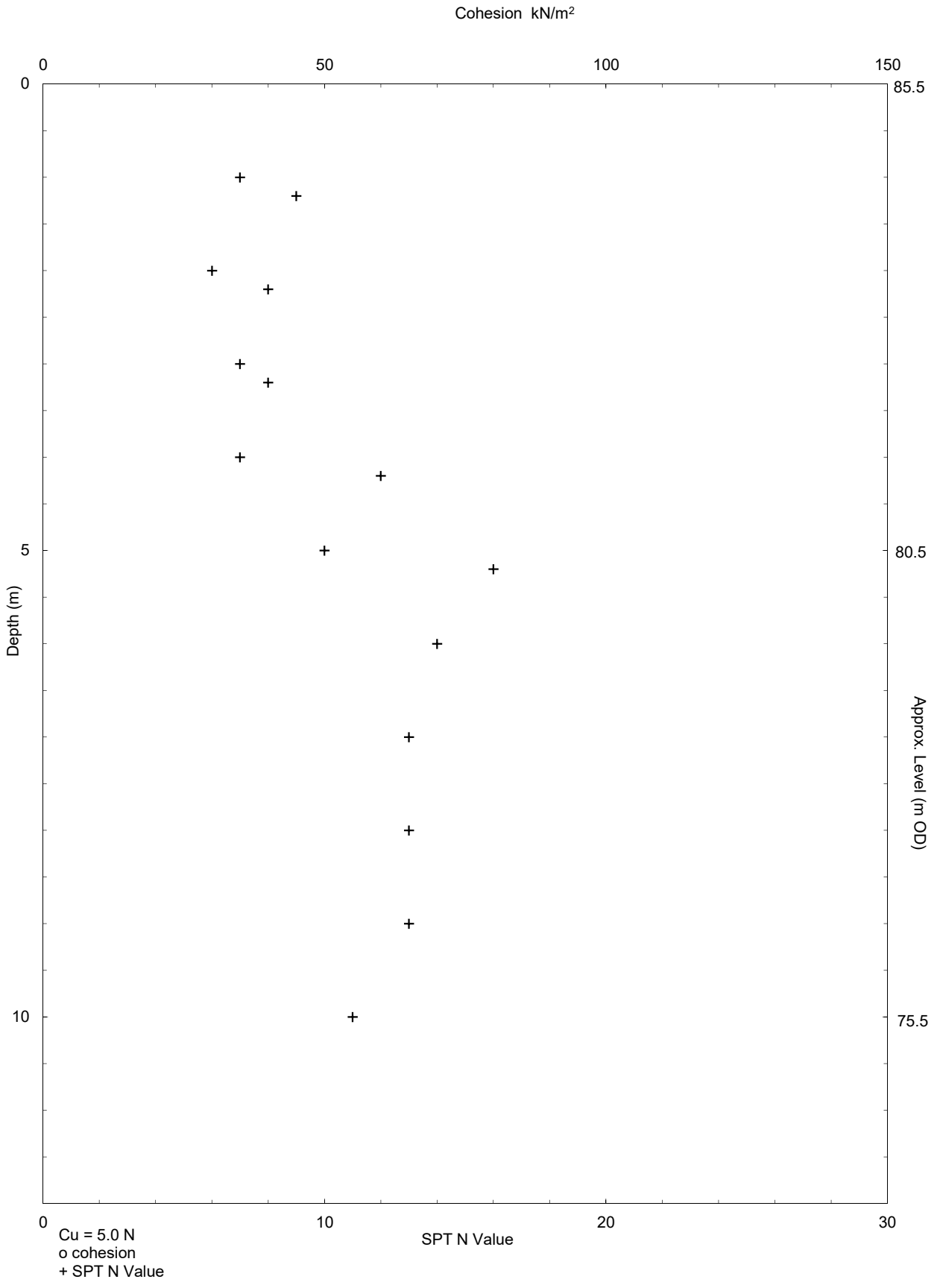
Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

SPT / Depth & Level Graph

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1 / 1



Chemtest
The right chemistry to deliver results

Results - Soil

Project: J15315 - 31 Willoughby Road, London, NW3 1RT

Client: GEA					**Chemtest Job No.:**	16-00910	16-00910	16-00910	16-00910
Quotation No.:					**Chemtest Sample ID.:**	241134	241135	241136	241139
Order No.:					Client Sample Ref.:	BH1	BH2	TP1	TP6
					Client Sample ID.:	1	1	1	1
					Sample Type:	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	2.25	0.50	0.40	0.50
					Bottom Depth (m):				1.00
					Date Sampled:	13-Jan-2016	13-Jan-2016	13-Jan-2016	13-Jan-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020		23	21	27	16
Stones	N	2030	%	0.020		< 0.020	< 0.020	< 0.020	< 0.020
Soil Colour	N	2040		N/A		Brown	Brown	Brown	Brown
Other Material	N	2040		N/A		Stones	Stones	Stones	Stones, Brick
Soil Texture	N	2040		N/A		Clay	Clay	Clay	Clay
pH	M	2010		N/A		7.3	8.1	8.2	8.2
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010		0.058	< 0.010	0.16	0.011
Chloride (Extractable)	M	2220	g/l	0.010		0.023	< 0.010	0.019	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.50		2.1	1.6	6.8	1.9
Sulphate (Total)	M	2430	mg/kg	100		1300	850	3000	1100
Arsenic	M	2450	mg/kg	1.0		9.8	17	47	19
Cadmium	M	2450	mg/kg	0.10		0.10	< 0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0		39	40	52	34
Copper	M	2450	mg/kg	0.50		16	33	270	50
Mercury	M	2450	mg/kg	0.10		< 0.10	0.80	0.13	0.66
Nickel	M	2450	mg/kg	0.50		43	25	53	25
Lead	M	2450	mg/kg	0.50		37	330	670	350
Selenium	M	2450	mg/kg	0.20		0.28	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50		58	81	180	120
Total Organic Carbon	M	2625	%	0.20		0.41	0.67	5.8	1.1
TPH >C5-C6	N	2670	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C6-C7	N	2670	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C7-C8	N	2670	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C12-C16	N	2670	mg/kg	1.0		< 1.0	< 1.0	< 1.0	4.7
TPH >C16-C21	N	2670	mg/kg	1.0		< 1.0	2.7	< 1.0	31
TPH >C21-C35	N	2670	mg/kg	1.0		< 1.0	5.3	< 1.0	38
Total TPH >C5-C35	N	2670	mg/kg	10		< 10	< 10	< 10	74
Naphthalene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	2.6
Acenaphthylene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	0.20
Acenaphthene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	1.5
Fluorene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	1.5
Phenanthrene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	19
Anthracene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	2.2
Fluoranthene	M	2700	mg/kg	0.10		< 0.10	0.76	0.45	21
Pyrene	M	2700	mg/kg	0.10		< 0.10	0.71	0.47	19

Chemtest
The right chemistry to deliver results

Results - Soil

Project: J15315 - 31 Willoughby Road, London, NW3 1RT

Client: GEA			**Chemtest Job No.:**		16-00910	16-00910	16-00910	16-00910
Quotation No.:			**Chemtest Sample ID.:**		241134	241135	241136	241139
Order No.:			Client Sample Ref.:		BH1	BH2	TP1	TP6
			Client Sample ID.:		1	1	1	1
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		2.25	0.50	0.40	0.50
			Bottom Depth (m):					1.00
			Date Sampled:		13-Jan-2016	13-Jan-2016	13-Jan-2016	13-Jan-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	9.3
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	9.7
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	11
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	4.5
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	7.6
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	5.2
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.3
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	4.1
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	120
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

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, SVOCs, 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

GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	31 Willoughby Road, London, NW3 1RT	**Job Number** J15315
Client	Manuela Eleuteri	**Sheet** 1 / 2
Engineer	Richard Tant Associates	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 6.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	37	C4SL
Cadmium	26	C4SL
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	21	C4SL
Copper	2,330	LQM/CIEH
Lead	200	C4SL
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	97	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.87	C4SL
Toluene	610	SGV
Ethyl Benzene	350	SGV
Xylene	230	SGV
Aliphatic C5-C6	110	LQM/CIEH
Aliphatic C6-C8	370	LQM/CIEH
Aliphatic C8-C10	110	LQM/CIEH
Aliphatic C10-C12	540	LQM/CIEH
Aliphatic C12-C16	3000	LQM/CIEH
Aliphatic C16-C35	76,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	151	LQM/CIEH
Aromatic C10-C12	346	LQM/CIEH
Aromatic C12-C16	593	LQM/CIEH
Aromatic C16-C21	770	LQM/CIEH
Aromatic C21-C35	1230	LQM/CIEH
PRO (C_5 –C_{10})	1352	Calc
DRO (C_{12} –C_{28})	80,363	Calc
Lube Oil (C_{28} –C_{44})	77,230	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	420	SGV
PAH		
Naphthalene	12.40	C4SL exp & LQM/CIEH
Acenaphthylene	850	LQM/CIEH
Acenaphthene	1,000	LQM/CIEH
Fluorene	780	LQM/CIEH
Phenanthrene	380	LQM/CIEH
Anthracene	9,200	LQM/CIEH
Fluoranthene	670	LQM/CIEH
Pyrene	1,600	LQM/CIEH
Benzo(a) Anthracene	8.7	C4SL exp & LQM/CIEH
Chrysene	14	C4SL exp & LQM/CIEH
Benzo(b) Fluoranthene	10.5	C4SL exp & LQM/CIEH
Benzo(k) Fluoranthene	15.0	C4SL exp & LQM/CIEH
Benzo(a) pyrene	5.00	C4SL
Indeno(1 2 3 cd) Pyrene	6.2	C4SL exp & LQM/CIEH
Dibenzo(a h) Anthracene	1.35	C4SL exp & LQM/CIEH
Benzo (g h i) Perylene	71	C4SL exp & LQM/CIEH
Screening value for PAH	**71.4**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	53.1	LQM/CIEH
tetrachloroethane (PCA)	2.4	LQM/CIEH
tetrachloroethene (PCE)	4.5	LQM/CIEH
trichloroethene (TCE)	0.598	LQM/CIEH
1,2-dichloroethane (DCA)	0.014	LQM/CIEH
vinyl chloride (Chloroethene)	0.00329	LQM/CIEH
tetrachloromethane (Carbon tetra	0.089	LQM/CIEH
trichloromethane (Chloroform)	3.86	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these valuesindicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health croiteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

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Generic Risk-Based Soil Screening Values

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 2 / 2

Proposed End Use **Residential with plant uptake**

The key generic assumptions for this end use are as follows;

- ❑ that groundwater will not be a critical risk receptor;
- ❑ that the critical receptor for human health will be a young female aged 0 to 6 years old;
- ❑ that the exposure duration will be six years;
- ❑ that the building type equates to a terraced house.
- ❑ that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of home grown produce, consumption of soil adhering to home grown produce, skin contact with soils and dust, and inhalation of dust and vapours

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of the generic screening value there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- ❑ additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- ❑ site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- ❑ soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Borehole Number** **BH1**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 30 mm Diameter of Filter Zone = 60 mm	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Ground Level (mOD)** 85.55	**Engineer** Richard Tant Associates	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Bentonite Seal
			84.55	1.00	
					Slotted Standpipe
	▽1		82.45	3.10	
					General Backfill
			81.55	4.00	

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)
13/01/16		3.00		Slow Inflow					NOT

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)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
02/02/16		2.55	83.00	
23/02/16		2.34	83.21	
05/07/17		2.46	83.09	
11/07/17		3.00	82.55	

Remarks

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Borehole Number** **BH2**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 30 mm Diameter of Filter Zone = 60 mm	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Ground Level (mOD)** 85.50	**Engineer** Richard Tant Associates	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			84.50	1.00	Bentonite Seal
	▽1				Slotted Standpipe
			81.50	4.00	General Backfill
			80.50	5.00	

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)
13/01/16		3.00		Slow Inflow					NOT

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)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
02/02/16		3.00	82.50	
23/02/16		3.04	82.46	
05/07/17		3.17	82.33	
11/07/17		3.20	82.30	

Remarks

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Borehole Number** **BH3**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 30 mm Diameter of Filter Zone = 60 mm	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Ground Level (mOD)** 85.40	**Engineer** Richard Tant Associates	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Bentonite Seal
			84.40	1.00	
					Slotted Standpipe
			82.40	3.00	
					General Backfill
			80.90	4.50	

Groundwater Strikes During Drilling

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

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	
02/02/16		2.75	82.65	
23/02/16		2.70	82.70	
14/12/16		2.75	82.65	
05/07/17		2.85	82.55	
11/07/17		2.80	82.60	

Remarks

Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** 31 Willoughby Road, London, NW3 1RT	**Borehole Number** **BH4**
Installation Type Standpipe	**Dimensions** Internal Diameter of Tube [A] = 30 mm Diameter of Filter Zone = 60 mm	**Client** Manuela Eleuteri	**Job Number** J15315
	Location	**Ground Level (mOD)** 85.40	**Engineer** Richard Tant Associates	**Sheet** 1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			84.40	1.00	Bentonite Seal
	▽1				Slotted Standpipe
			80.40	5.00	
					General Backfill
			75.40	10.00	

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)
20/01/16		3.30	1.00	Slow Inflow					NOT

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)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
02/02/16		2.75	82.65	
23/02/16		2.76	82.64	
13/12/16		2.75	82.65	
05/07/17		2.88	82.52	
11/07/17		2.89	82.51	

Remarks

GEA Geotechnical & Environmental Associates
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Herts SG12 7QE

Borehole Soakage Test

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1/1

Date: 05 July 2017

Borehole No: 1

Test No: 1

Test Data

Before start of test:

Standpipe depth (m): 3.28
Screen depth (m): 1.00
Water level (m): 2.46

Time (mins)	Depth to Water (m)	Depth of Water (m)
0.0	3.12	0.16
1.0	3.12	0.16
3.0	3.12	0.16
5.0	3.11	0.17
10.0	3.11	0.17
15.0	3.11	0.17
20.0	3.11	0.17
30.0	3.11	0.17
45.0	3.11	0.17
60.0	3.10	0.18
90.0	3.10	0.18
120.0	3.10	0.18

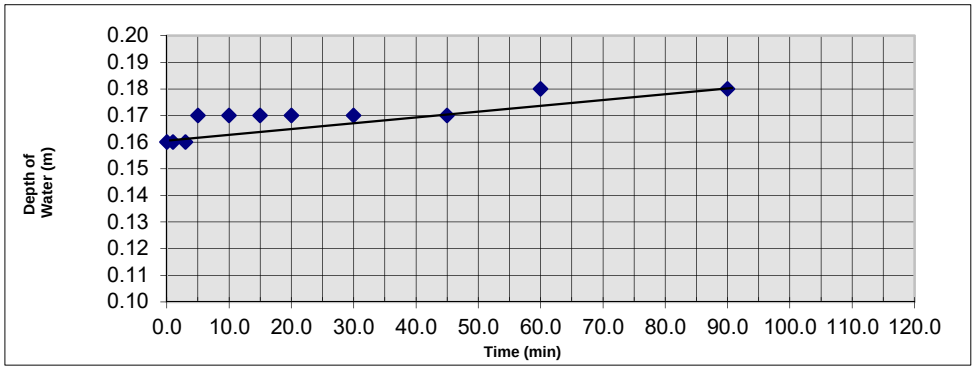
Soakage Calculation

Borehole Diameter (m)		0.0600
Borehole Area (m)		0.0028
Borehole Perimeter (m)		0.188
From Plot:	D1 (m)	3.12
	D2 (m)	3.10
	T1 (min)	0
	T2 (min)	120
Soakage Volume (m^3)		0.000
Soakage Area (m^2)		0.43
Time (min)		120

Soakage rate (m/sec)	1.81554E-08
Soakage rate (m/day)	0.001568627

At end of test:

Standpipe depth (m): 3.28
Screen depth (m): 1.00
Water level (m): 3.10



Remarks: Bailing at this position to reduce the water level, had no measureable effect on the water level in the nearby standpipe within BH2

Geotechnical & Environmental Associates
Widbury Barn
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Ware
Herts SG12 7QE

Borehole Soakage Test

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1/1

Date: 05 July 2017

Borehole No: 2

Test No: 1

Test Data

Before start of test:

Standpipe depth (m): 3.82
Screen depth (m): 1.00
Water level (m): 3.17

Time (mins)	Depth to Water (m)	Depth of Water (m)
0.0	3.48	0.34
1.0	3.47	0.35
3.0	3.46	0.36
5.0	3.43	0.39
10.0	3.40	0.42
15.0	3.38	0.44
20.0	3.35	0.47
30.0	3.32	0.50
45.0	3.29	0.53
60.0	3.26	0.56
90.0	3.23	0.59
120.0	3.21	0.61

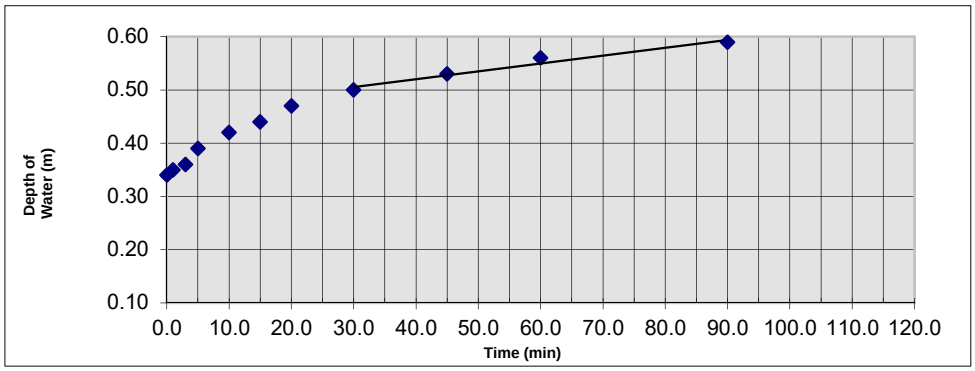
Soakage Calculation

Borehole Diameter (m)		0.0600
Borehole Area (m)		0.0028
Borehole Perimeter (m)		0.188
From Plot:	D1 (m)	3.32
	D2 (m)	3.21
	T1 (min)	30
	T2 (min)	120
Soakage Volume (m^3)		0.000
Soakage Area (m^2)		0.53
Time (min)		90

Soakage rate (m/sec)	1.0778E-07
Soakage rate (m/day)	0.009312169

At end of test:

Standpipe depth (m): 3.82
Screen depth (m): 1.00
Water level (m): 3.21



Remarks: Bailing at this position to reduce the water level, had no measureable effect on the water level in the nearby standpipe within BH1

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Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Borehole Soakage Test

Site	31 Willoughby Road, London, NW3 1RT
Client	Manuela Eleuteri
Engineer	Richard Tant Associates

Job Number J15315

Sheet 1/1

Date: 05 July 2017

Borehole No: 4

Test No: 1

Test Data

Before start of test:

Standpipe depth (m): 4.80
Screen depth (m): 1.00
Water level (m): 2.88

Time (mins)	Depth to Water (m)	Depth of Water (m)
0.0	4.80	0.00
1.0	4.80	0.00
3.0	4.79	0.01
5.0	4.79	0.01
10.0	4.77	0.03
15.0	4.76	0.04
20.0	4.75	0.05
30.0	4.73	0.07
45.0	4.71	0.09
60.0	4.68	0.12
90.0	4.64	0.16
120.0	4.62	0.18

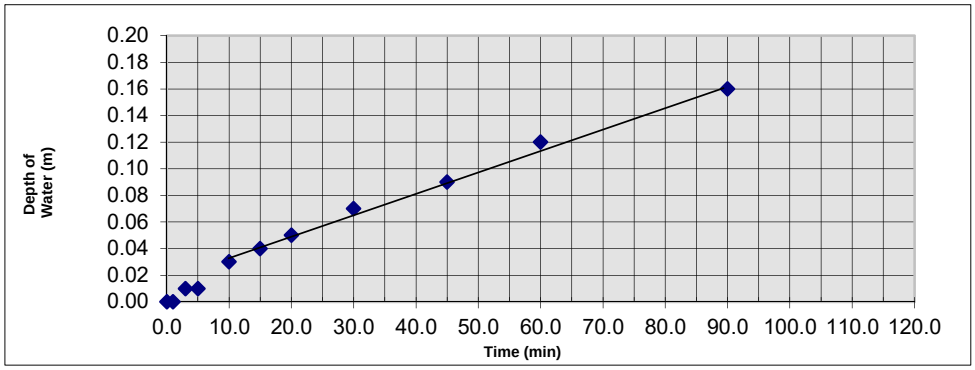
Soakage Calculation

Borehole Diameter (m)		0.1000
Borehole Area (m)		0.0079
Borehole Perimeter (m)		0.314
From Plot:	D1 (m)	4.77
	D2 (m)	4.62
	T1 (min)	10
	T2 (min)	120
Soakage Volume (m^3)		0.001
Soakage Area (m^2)		1.20
Time (min)		110

Soakage rate (m/sec)	1.48544E-07
Soakage rate (m/day)	0.012834225

At end of test:

Standpipe depth (m): 4.80
Screen depth (m): 1.00
Water level (m): 4.62



Remarks: Monitoring of the adjacent standpipe within BH3 showed no change in the observed water level (2.85 m) during bailing out of BH4 and throughout the subsequent test.

PROPOSED BASEMENT AT 31 WILLOUGHBY ROAD, LONDON, NW3 1RT

FLOOD RISK ASSESSMENT

JANUARY 2016

REF: 1542/RE/12-15/01 REVISION A

Evans Rivers and Coastal Ltd
T: 07896 328220
E: Enquiries@evansriversandcoastal.co.uk
W: www.evansriversandcoastal.co.uk

CONTRACT

Evans Rivers and Coastal Ltd has been commissioned by Geotechnical and Environmental Associates to carry out a Flood Risk Assessment for a proposed basement at number 31 Willoughby Road, London, NW3 1RT.

QUALITY ASSURANCE, ENVIRONMENT AND HEALTH AND SAFETY

Evans Rivers and Coastal Ltd operates a Quality Assurance, Environmental, and Health and Safety Policy.

This project comprises various stages including data collection; hydrological and hydrogeological assessments; surface water drainage designs; and reporting. Quality will be maintained throughout the project by producing specific methodologies for each work stage. Quality will also be maintained by initiating internal quality procedures including the validation of third party deliverables; creation of an audit trail to record any changes made; and document control using a database and correspondence log file system.

To adhere to the Environmental Policy, data will be obtained and issued in electronic format and alternatively by post. Paper use will also be minimised by communicating via email or telephone where possible. Documents and drawings will be transferred in electronic format where possible and all waste paper will be recycled. Meetings away from the office of Evans Rivers and Coastal Ltd will be minimised to prevent unnecessary travel, however for those meetings deemed essential, public transport will be used in preference to car journeys.

The project will follow the commitment and objectives outlined in the Health and Safety Policy operated by Evans Rivers and Coastal Ltd. All employees will be equipped with suitable personal protective equipment prior to any site visits and a risk assessment will be completed and checked before any site visit. Other factors which have been taken into consideration are the wider safety of the public whilst operating on site, and the importance of safety when working close to a water source and highway. Any designs resulting from this project and directly created by Evans Rivers and Coastal Ltd will also take into account safety measures within a “designers risk assessment”.

Report carried out by:

…….
Rupert Evans, BSc (Hons), MSc, CEnv, C.WEM, MCIWEM, AIEMA

DISCLAIMER

This report has been written and produced for Geotechnical and Environmental Associates. No responsibility is accepted to other parties for all or any part of this report. Any other parties relying upon this report without the written authorisation of Evans Rivers and Coastal Ltd do so at their own risk.

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CONTENTS

1. INTRODUCTION

1.1 Project Scope

1.1.1 Evans Rivers and Coastal Ltd has been commissioned by Geotechnical and Environmental Associates to carry out a Flood Risk Assessment for a proposed basement at number 31 Willoughby Road, London, NW3 1RT.

1.1.2 Specifically, this assessment intends to:

1) Carry out an appraisal of flood risk from all sources such as fluvial/tidal, groundwater, surface water/sewers, artificial sources in accordance with NPPF and other documents such as the SFRA and SWMP;

2) Recommend mitigation measures where appropriate;

3) Report findings and recommendations.

1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) dated March 2012. Other documents which have been consulted include:

- DEFRA/EA document entitled *Framework and guidance for assessing and managing flood risk for new development Phase 2 (FD2320/TR2)*, 2005;
- DEFRA/Jacobs 2006. *Groundwater flooding records collation, monitoring and risk assessment (ref HA5)*.
- National Planning Practice Guidance – Flood Risk and Coastal Change.
- London Borough of Camden Preliminary Flood Risk Assessment (PFRA) Version 0.2 dated 2011.
- London Borough of Camden Strategic Flood Risk Assessment (SFRA) dated 2014.
- London Borough of Camden Surface Water Management Plan (SWMP) Version 1 dated 2011.
- London Borough of Camden flood risk management strategy (FRMS) dated 2013.
- London Borough of Camden, Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010.
- London Borough of Camden, Camden Planning Guidance – Basements and Lightwells (CPG 4) dated July 2015.
- Woods-Ballard., et al. 2015. *The SUDS Manual, Report C753*. London: CIRIA.
- National SUDS Working Group. 2004. *Interim Code of Practice for Sustainable Drainage Systems*.

2. DATA COLLECTION

2.1 To assist with this report, the data collected included:

- 1:250,000 *Soil Map of South East England* (Sheet 6) published by Cranfield University and Soil Survey of England and Wales 1983.
- 1:625,000 *Hydrogeological Map of England and Wales*, published in 1977 by the Institute of Geological Sciences (now the British Geological Survey).
- Local borehole data extracted from the *BGS Online Geology Viewer.*
- *Summary of ground investigation preliminary findings* produced by Geotechnical and Environmental Associates in January 2016 (excerpts in Appendix A).
- Information and data from:
    - London Borough of Camden Preliminary Flood Risk Assessment (PFRA) Version 0.2 dated 2011.
    - London Borough of Camden Strategic Flood Risk Assessment (SFRA) dated 2014.
    - London Borough of Camden Surface Water Management Plan (SWMP) Version 1 dated 2011.
    - London Borough of Camden Flood Risk Management Strategy (FRMS) dated 2013.
    - London Borough of Camden, Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010.

2.2 All third party data used in this study has been checked and verified prior to use in accordance with Evans Rivers and Coastal Ltd Quality Assurance procedures.

3. SITE CHARACTERISTICS

3.1 Existing Site Characteristics and Location

3.1.1 The site is located at number 31 Willoughby Road, London, NW3 1RT. The approximate Ordnance Survey (OS) grid reference for the site is 526727 185854 and the location of the site is shown on Figure 1.

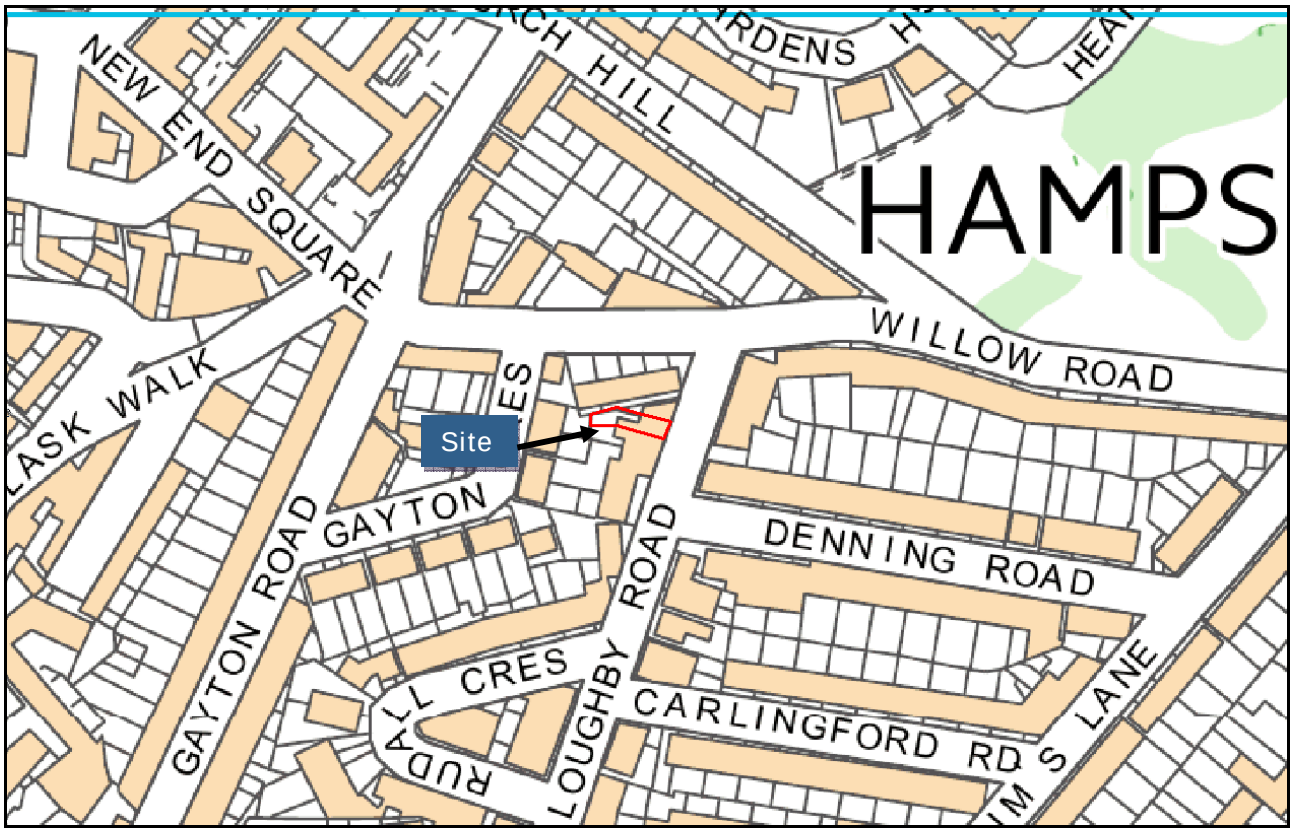


Figure 1: Site location plan (Source: Ordnance Survey, 2015)

3.1.2 The site is located within a residential area and comprises a four-storey building which is accessed from Willoughby Road adjacent to the eastern frontage of the site. There are front and rear garden areas which are largely covered by block paving apart from a small area of the front garden which remains vegetated (i.e. bedding plants).

3.1.3 The topographical survey/existing layout can be seen on Drawing Number BPS1195.02 and shows that ground levels across the site do not vary significantly and that the dwelling is set approximately 300mm higher than existing ground levels.

3.2 Site Proposals

3.2.1 It is understood that the development will comprise the construction of a single level basement beneath the existing property, which will extend beneath part of rear garden and beyond the existing front footprint to create a lightwell space. The proposed basement is understood to extend to a depth of approximately 3m, such that formation level is expected to be within the London Clay.

3.2.2 It is understood that this Flood Risk Assessment needs to assess the flood risk to the basement level only. The site proposals can be seen on Drawing Number 4186/SM01.

4. SOURCES OF FLOODING

4.1 Fluvial / Tidal

4.1.1 The Environment Agency Flood Map shows that the site is located within the NPPF Flood Zone 1, 'Low Probability' which comprises land as having less than a 1 in 1000 year annual probability of fluvial or tidal flooding (i.e. an event more severe than the extreme 1 in 1000 year event). NPPF states that all uses of land, including basements, are appropriate in this zone.

4.1.2 The SFRA also states that there has been no historical flooding within the Borough from fluvial or tidal sources. Furthermore, the SWMP confirms that the Borough does not fall within the Environment Agency's flood zones and therefore is not at significant risk from fluvial or tidal flooding.

4.1.3 The SFRA and SWMP states that all main rivers historically located within the Borough are now culverted and incorporated into the sewer network. The SWMP discusses the River Fleet which is one of London's "lost rivers" and which historically originates from springs on Hampstead Heath and drains to the Thames through the Borough. The Fleet is entirely incorporated within the sewer network.

4.1.4 The SFRA continues to discuss the Borough's historic rivers and in addition to the Fleet, the Tyburn, Kilburn and Brent were also located in the area of Hampstead Heath. All of these "lost rivers" are also now incorporated into the local sewer system maintained by Thames Water. It is for these reasons that the Borough is located entirely within Flood Zone 1.

4.2 Critical Drainage Areas (CDA)

4.2.1 Despite the site being located within Flood Zone 1, it is understood from Figure 6/Rev 2 of the SFRA and Figure 3.1 of the SWMP, that the site is located within the Group3-010 Critical Drainage Area (CDA).

4.2.2 The SWMP defines the CDA as:

"A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure."

4.3 Groundwater Flooding

4.3.1 In addition to the information provided in the SFRA and SWMP, in order to assess the potential for groundwater flooding, the Jacobs/DEFRA report entitled *Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study*, published in May 2004, was consulted, together with the guidance offered within the document entitled *Groundwater flooding records collation, monitoring and risk assessment (ref HA5)*, commissioned by DEFRA and carried out by Jacobs in 2006.

4.3.2 The *Summary of ground investigation preliminary findings* produced by Geotechnical and Environmental Associates in January 2016, indicates that the soils beneath the site comprise Made Ground (sandy clay) overlying London Clay. Groundwater seepages were encountered during the investigation and within the London Clay at 3m bgl.

4.3.3 Paragraphs 2.10.4 and 2.10.6 of the SFRA states that the London Clay has a low permeability but is likely to permit moderate infiltration. Paragraph 6.4.8 of the SFRA suggests that there could be perched water within sand pockets of the London Clay.

4.3.4 Figure 4e/Rev 1 of the SFRA shows that the site has not been affected in the past from groundwater flooding incidents and that the site is not located within an area of increased susceptibility to elevated groundwater and is therefore expected to remain at depth. Figure 4a/Rev 1 of the SFRA also shows that the site is not located across an area with superficial (and more permeable) deposits beneath the surface.

4.3.5 The BGS Groundwater Susceptibility Map also indicates that there is "Limited Potential for Groundwater Flooding to Occur" at the site.

4.3.6 The results from the intrusive testing indicate that groundwater is likely to be encountered below the site to a depth of 3m and therefore equal to or higher than the proposed basement floor.

4.3.7 The potential for groundwater to rise significantly is low considering the low permeable soil types, however, it is recommended that the basement is designed to achieve a Grade 3 level of waterproofing protection as outlined in BS8102:2009. A new reinforced concrete lining wall and ground-bearing concrete slab could be constructed using water resistant concrete to form the primary barrier. An internal drained cavity system will act as a secondary barrier against water ingress.

4.3.8 The evidence suggests that it is unlikely that the water table has the potential to breach the ground surface and flow into the building and basement via the ground floor.

4.3.9 The groundwater flooding risk to the property and basement is considered to be overall low and the risk reduced further by the appropriate mitigation measures stated within this section.

4.4 Surface Water Flooding and Sewer Flooding

4.4.1 Surface water and sewer flooding across urban areas is often a result of high intensity storm events which exceed the capacity of the sewer thus causing it to surcharge and flood. Poorly maintained sewer networks and blockages can also exacerbate the potential for sewer flooding.

Surface Water Flooding

4.4.2 It has been established that the site lies within the Group3-010 Critical Drainage Area. The SFRA notes that the surface water mapping indicates that the surface water flood extent broadly follows the natural topography of the borough and man-made features such as roads and rail lines. During extreme modelling scenarios, the SFRA states that there is increased ponding in areas of properties. For example, the SWMP indicates that the modelling shows deep flooding at Gospel Park, affecting Oak Village, Lamble St, Grafton Road and Kiln Place, caused by railway embankments creating a "basin" into which surface water collects.

4.4.3 The SFRA discusses the two large surface water flooding events in the Borough, which occurred in 1975 and 2002 and caused widespread damage. It is understood that during these events the sewers reached maximum capacity, however, Figure 3ii/Rev 1 of the SFRA shows that the site and the adjacent highway of Willoughby Road were not affected during these events.

4.4.4 Figure 3ii/Rev 1 of the SFRA (Figure 2 below) also shows that the site and the adjacent highway of Willoughby Road are not at risk from surface water flooding during events up to and including the 1 in 1000 year event. In fact, the site is located across an area with a less than 1 in 1000 year return period of surface water flooding.

4.4.5 It is considered that the site is not at risk of surface water flooding as indicated by the maps.

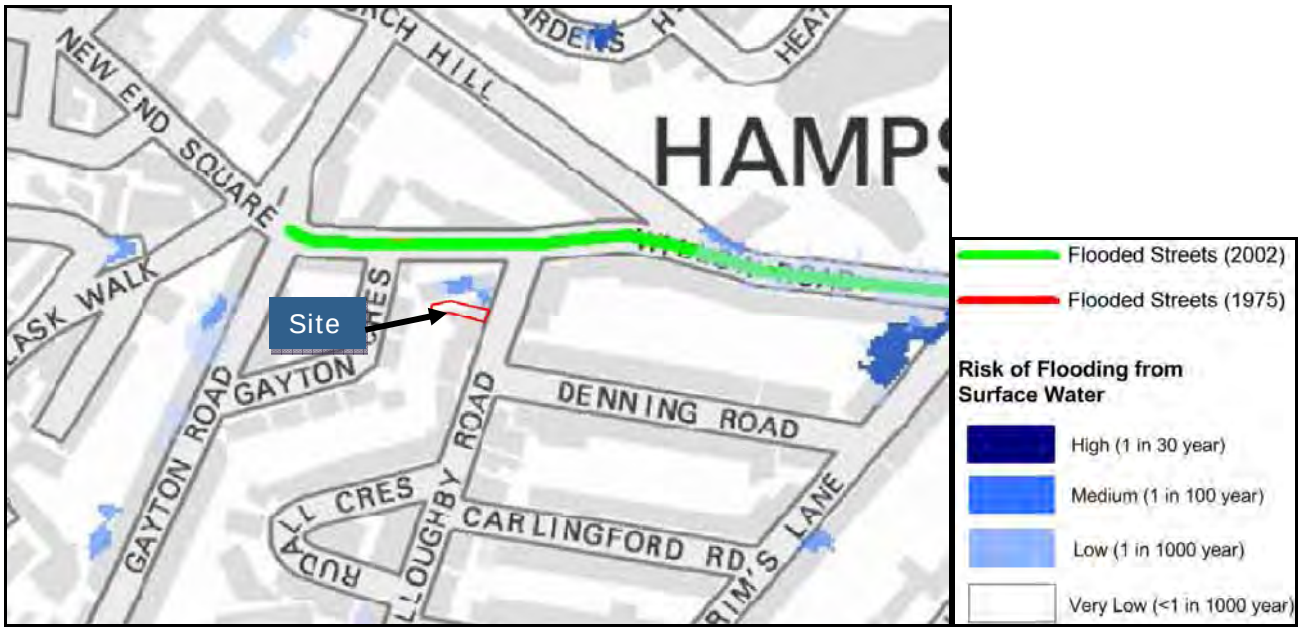


Figure 2: Location of site in relation to surface water flood extent (Source: taken from Figure 3ii/Rev 1 of the SFRA)

Sewer Flooding

4.4.6 The SFRA states that the majority of the Borough is served by a combined surface and foul water system which is designed to accommodate rainfall events of up to 1 in 30 years return period.

4.4.7 The combined sewer network outfalls into the River Thames during intense rainfall events when the sewer network reaches capacity. The evidence suggests that as the sewer capacity becomes exceeded this results in surcharging of the network prior to sufficient discharge into the Thames.

4.4.8 Figure 5a/Rev 1 of the SFRA indicates that the site is located across an area which has had 4 recorded internal sewer flooding incidents. Figure 5b/Rev 1 of the SFRA that the site is located across an area which has had 1 external sewer flooding incidents.

4.4.9 It is likely that foul water from the basement level will be drained to a submersible packaged pumping station and pumped to ground level where it will flow into the surrounding sewer system via gravity. It is understood that a non-return valve (e.g. http://www.forgevalves.co.uk/) will be installed so that the basement (and upper floors) will be protected further from sewer flooding.

4.4.10 This approach also complies with paragraph 5.11 of the Camden Planning Guidance CPG4 dated 2015. Therefore, if the sewer in the road becomes completely full during a heavy storm, foul water does not backflow into the property.

4.5 Reservoirs, Canals And Other Artificial Sources

4.5.1 The failure of man-made infrastructure such as flood defences and other structures can result in unexpected flooding. Flooding from artificial sources such as reservoirs, canals and lakes can also occur suddenly and without warning, leading to high depths and velocities of flood water which pose a safety risk to people and property.

4.5.2 The Environment Agency's "Risk of flooding from reservoirs" map suggests that the site is not at risk from reservoir flooding. This supported by the SFRA which also states that the risk of flooding from the Regent's Canal is low.

5. SURFACE WATER DRAINAGE

5.1 Policy 5.13 in Chapter 5 of the London Plan dated March 2015, requires sustainable drainage systems (SUDS) to be installed where appropriate and in line with the drainage hierarchy in order for runoff to be managed as close to its source as possible.

5.2 The London Plan states that SUDS should be utilised unless there are practical reasons for not doing so. The less permeable soils beneath the site are unlikely to possess sufficient infiltration capacity for the practical use of infiltration devices.

5.3 Despite a small increase in impermeable area at the front of the property as a result of the basement development, there is a lack of available space and little opportunity to reduce runoff rates from the site via attenuation or rainwater harvesting.

5.4 If an attenuation tank was included at the site, it would need to be located in the rear garden area and therefore it may be difficult to direct flows from this device through the house and into the sewer beneath Willoughby Road. It is likely that in this instance, surface water from the tank would be directed to the foul water pump at basement level in order to maintain a discharge into the sewer. There is uncertainty about the viability of this approach, especially when considering the positions of existing downpipes and the reliability of the pump to accommodate surface water flows as well as foul water flows.

5.5 Despite this, other SUDS measures should be considered such as rain gardens (i.e. vegetated depressions which hold back water) and pervious surfaces (i.e. possibly permeable paving which could temporarily retain surface water).

6. CONCLUSIONS

- A review of the relevant guidance documents and various types of data collected at the site has enabled a full assessment of the flood risks to be quantified.

- The site is located within the Flood Zone 1 therefore all uses of land are appropriate in this zone.

- This assessment has investigated the possibility of groundwater flooding and flooding from other sources at the site. It is considered that there will be low risk of groundwater flooding and surface water flooding across the site.

- There is a low to moderate risk of flooding from sewers, however, as a precaution; the risk from sewer flooding should be mitigated further by introducing a non-return valve to the pumped system.

7. BIBLIOGRAPHY

i. Communities and Local Government 2012. *National Planning Policy Framework.*

ii. DEFRA/EA 2005. *Framework and guidance for assessing and managing flood risk for new development, Phase 2, Flood and Coastal Defence R&D Programme, R&D Technical Report FD2320/TR2*. Water Research Council.

iii. DEFRA/Jacobs 2004. *Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study (LDS), Final Report, Volumes 1 and 2*.

iv. Geological Society of London 2006. *Groundwater and Climate Change.* Geoscientist magazine, Volume 16, No 3.

v. Institute of Geological Sciences 1977. *Hydrogeological Map of England and Wales,* 1:625,000. NERC.

vi. London Borough of Camden Preliminary Flood Risk Assessment (PFRA) Version 0.2 dated 2011.

vii. London Borough of Camden 2014. *Strategic Flood Risk Assessment*.

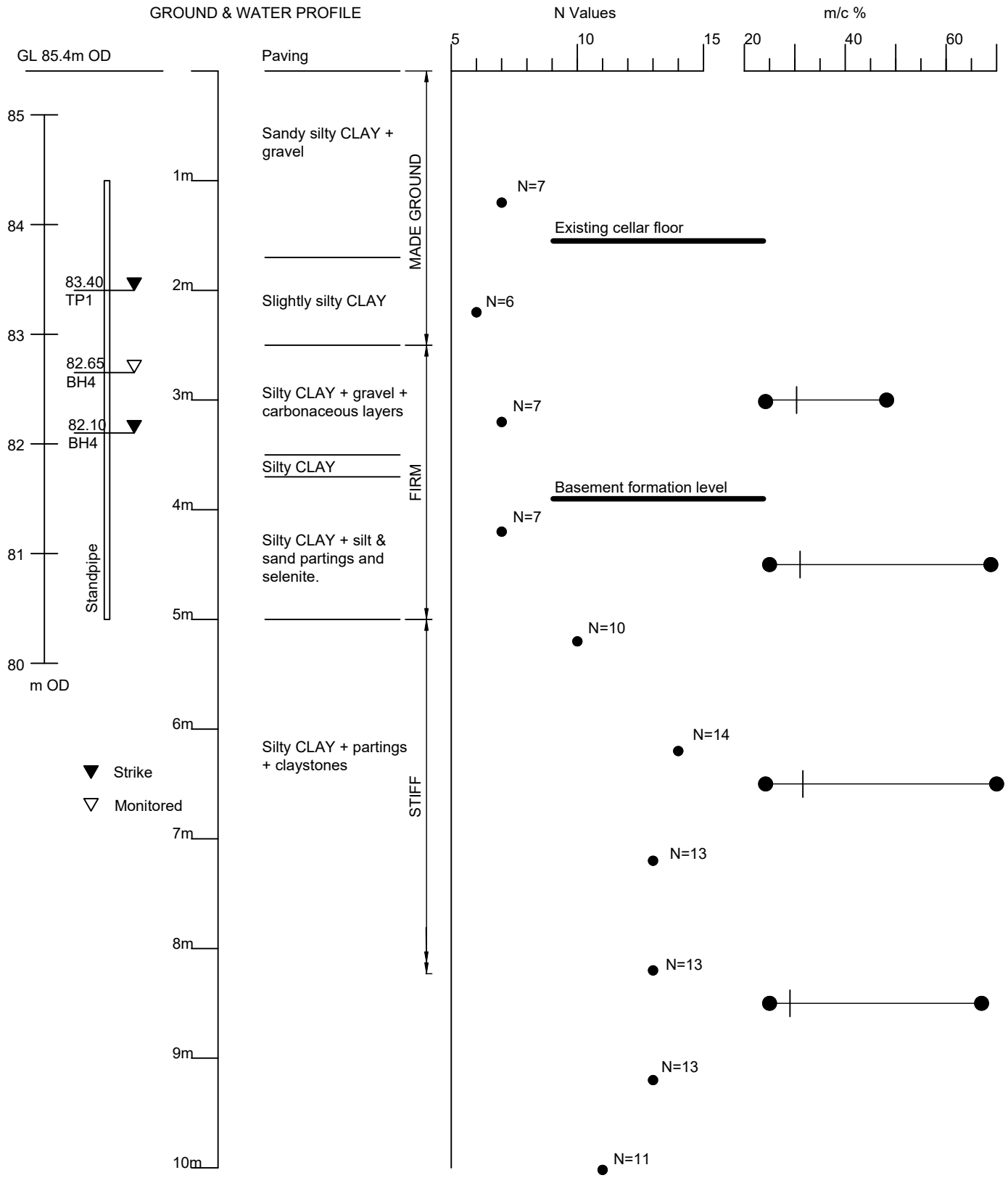
viii. London Borough of Camden 2013a. *CPG4 Basement and Lightwells.*

ix. London Borough of Camden 2013b. *Flood risk management strategy*.

x. London Borough of Camden 2011. *Surface Water Management Plan* Version 1.

xi. London Borough of Camden 2010. *Camden geological, hydrogeological and hydrological study – Guidance for subterranean development*.

xii. Water UK 2012. *Sewers for Adoption 7th Edition, A design and construction guide for developers*. Water Research Council.



31 WILLOUGHBY ROAD NW3 1RT

GEA BOREHOLE 4 DATA COLLATED

G1808-RP-01-E1	Figure	2

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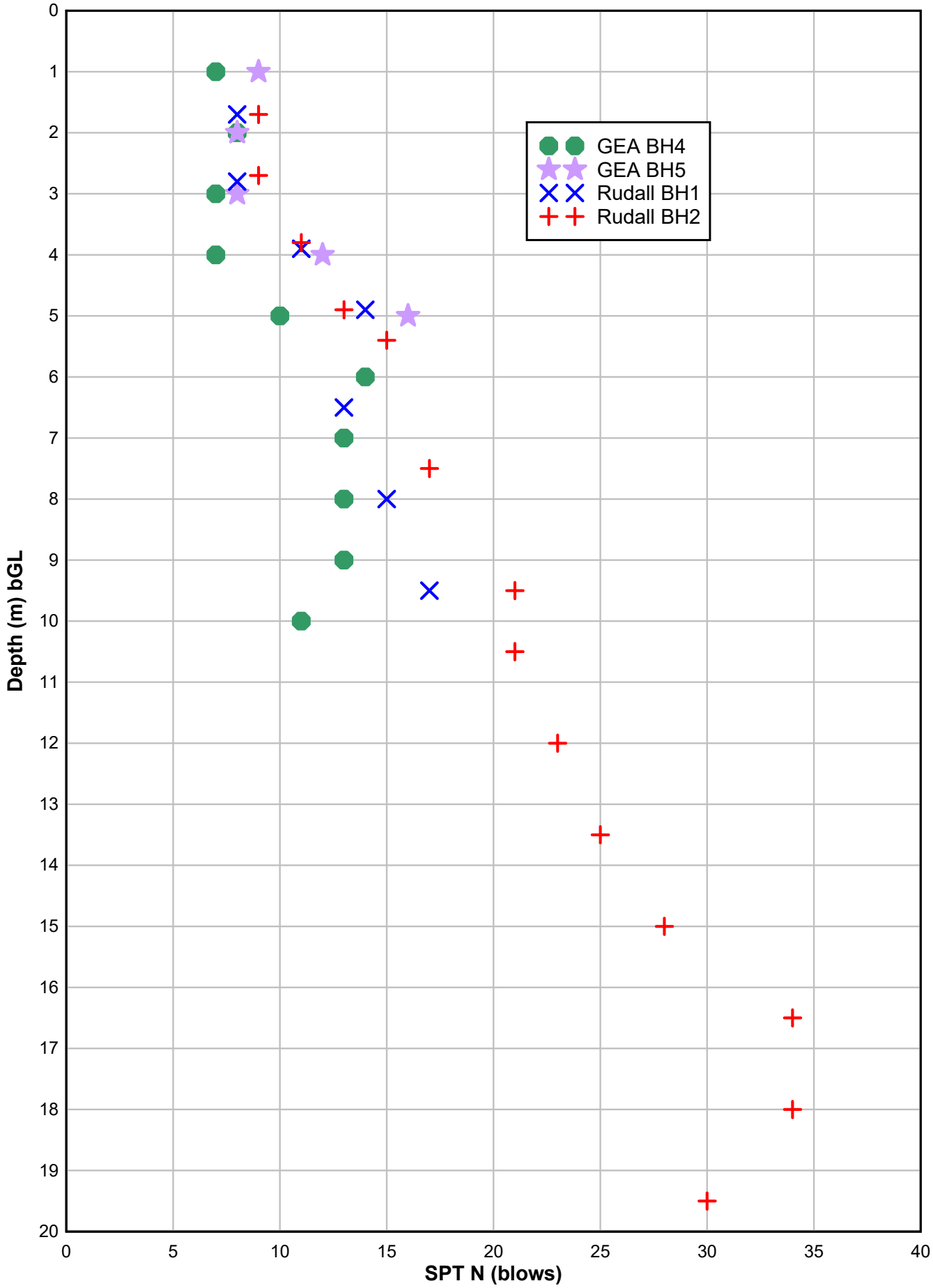
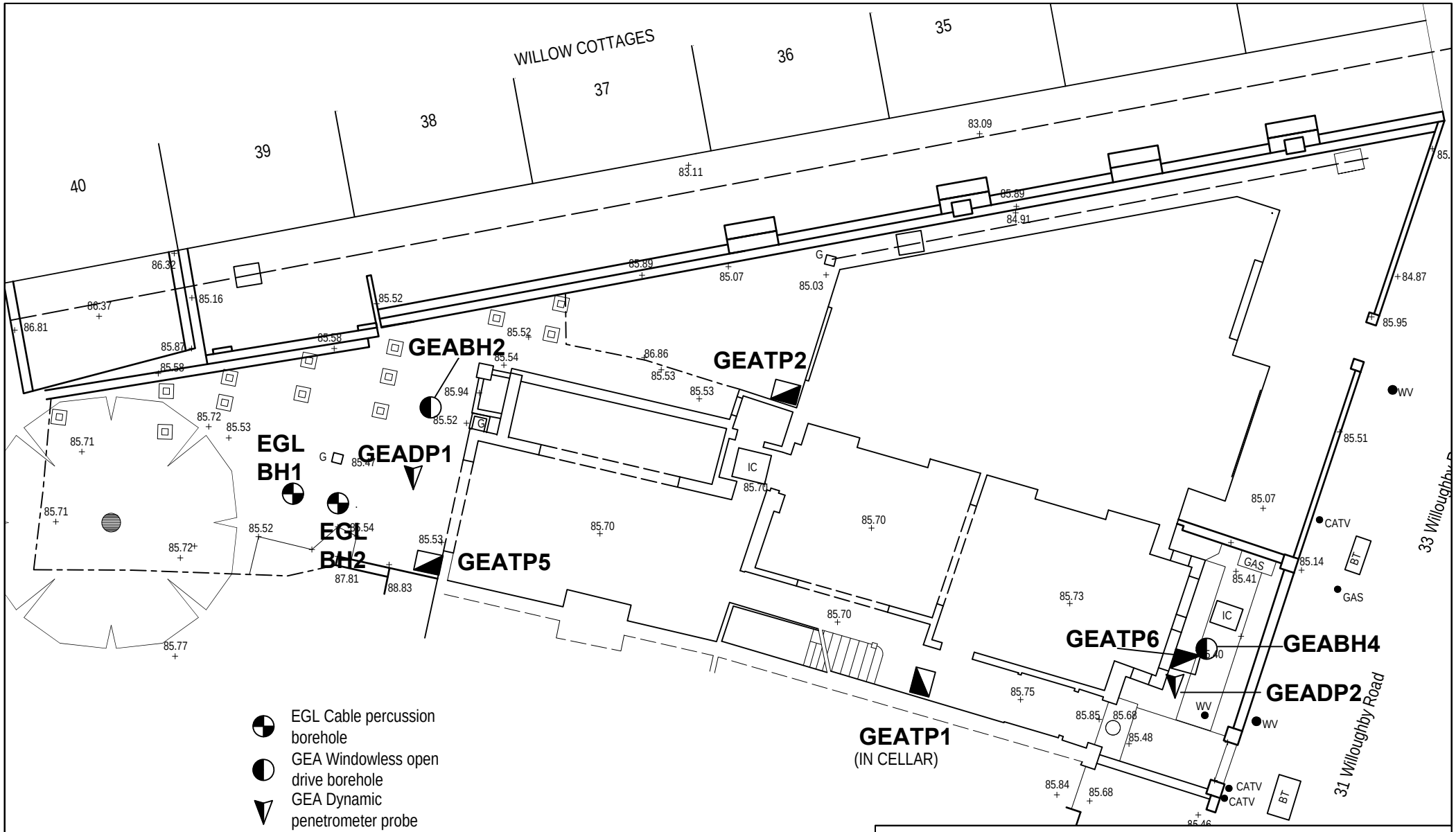
G1808 31 WILLOUGHBY ROADNW3 1RT - Proposed Basement

SPT Profiles GEA BH4, BH5 & 37-39 Rudall Crescent BH1, BH2



Appendix C Contents



31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

EXISTING & PROPOSED CROSS SECTION SKETCHES - REAR

eldreds
ELDRED GEOTECHNICS LTD

Report:G1808-RP-01-E1

Scale as shown

Figure 4

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Email: mail@eldreds-geo.co.uk

CABLE PERCUSSION BOREHOLE RECORD

Project				BH1
31 WILLOUGHBY ROAD NW3 1RT - BASEMENT				
Job No	Date	Ground Level (m ODN)	Co-Ordinates (OSGB36)	
G1808	13-08-18 14-08-18	85,50	E 526.718,0 N 185.855,0	
Method				Sheet
Demountable cable percussion rig; borehole 200dia. to 5m, 150dia. 5m to EOB				1 of 3

SAMPLES & TESTS			Water	EXCAVATION RECORD				
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	MATERIAL DESCRIPTION Main Description	Strata Notes
0,50-0,95	B1					(1,30)	0,0- 0,2 Brick pavours on sharp sand 0,2- 0,3 Concrete 0,3- 0,5 Crushed brick 0,5- 1,3 Soft grey/green clay sand & brick; (cutting tool drove brick to 2m bGL) (MADE GROUND)	
1,00-1,95 1,00	B3 C	N7 1/2/1/2/2/2		84,20		1,30		
1,50-1,95 1,50	B4 C	N8 2/1/1/2/3/2				(2,20)	Soft low strength brown sandy and silty CLAY with rare rounded flint gravel and 5mm angular brick fragments (driven from above?) (MADE GROUND)	
2,00-2,45	U5	12 blows						
2,50 2,50 2,80	S6 SPT	N7 1/1/2/2/1/2	1					
3,00-3,45	U7	16 blows NR						
3,00-3,45	B8			82,00		3,50		
3,50 3,50	S9 SPT	N10 1/2/2/2/3/3				(0,50)	Firm medium strength brown slightly sandy silty CLAY with rare m.f. rounded flint gravel. (HEAD)	
4,00-4,45	U10	25 blows		81,50		4,00		
4,50 4,50	S11 SPT	N15 1/2/3/3/4/5					Firm becoming stiff, medium strength brown fragmented and thinly laminated silty CLAY disturbed by freeze/thaw, possibly with zones of concentrated mobilization. Occasional fine roots. (LONDON CLAY - Disturbed)	
5,00-5,45	U12	30 blows				(2,00)		

Groundwater Observations During Drilling				
Date &Time	Obs. (min)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
13/08 00:00	Wet	2,80	2,00	2,80
13/08 00:00	Dry	4,00	4,00	

Groundwater Strikes During Drilling						
Date &Time	Obs. (min)	Strike Depth (m)	Casing Depth (m)	Inflow Rate	Rise to depth	Depth Sealed (m).
13/08 00:00	30	2.8	2,00	Seep		

Chiselling		
From (m).	To (m)	Time (hhmm)

All dimensions in metres Scale 1:34.375	Contractor P J Drilling Ltd	Plant Used Dando 100 modular rig.	Logged By MdF/MLE

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CABLE PERCUSSION BOREHOLE RECORD

Project				BH1
31 WILLOUGHBY ROAD NW3 1RT - BASEMENT				
Job No	Date	Ground Level (m ODN)	Co-Ordinates (OSGB36)	
G1808	13-08-18 14-08-18	85,50	E 526.718,0 N 185.855,0	
Method				Sheet
Demountable cable percussion rig; borehole 200dia. to 5m, 150dia. 5m to EOB				2 of 3

SAMPLES & TESTS			Water	EXCAVATION RECORD				
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	MATERIAL DESCRIPTION Main Description	Strata Notes
5,50	S13							
5,50	SPT	N17 3/2/3/4/5/5						
				79,50		6,00		
6,00-6,45	U14	25 blows					Stiff medium to high strength grey slightly silty thinly laminated and very closely fissured (fissures are horizontal) CLAY; (LONDON CLAY)	
6,50	S15							
6,50	SPT	N17 1/2/4/4/4/5						
7,00-7,45	U16	35 blows				(2,50)		
7,50	S17							
7,50	SPT	N18 2/3/4/4/5/5						
8,00-8,45	U18	40 blows						10mm thick bands of broken shells at circa 8.0m
				77,00		8,50		
8,50	S19						Stiff high strength grey silty thinly laminated and very to extremely closely fissured (fissures are horizontal to sub horizontal) CLAY. (LONDON CLAY)	
8,50	SPT	N17 1/2/3/4/5/5						
9,00-9,45	U20	40 blows						
9,45	D21							
9,50	S22							
9,50	SPT	N21 2/3/4/4/5/8						
10,00-10,45	U23	40 blows						
10,45	D24							
10,50	S25							
10,50	SPT	N24 3/4/5/5/7/7						

Groundwater Observations During Drilling

Date &Time	Obs. (min)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
13/08 00:00	Dry	6,10	4,50	

Groundwater Strikes During Drilling

Date &Time	Obs. (min)	Strike Depth (m)	Casing Depth (m)	Inflow Rate	Rise to depth	Depth Sealed (m).

Chiselling

From (m).	To (m)	Time (hhmm)

All dimensions in metres Scale 1:34.375	Contractor P J Drilling Ltd	Plant Used Dando 100 modular rig.	Logged By MdF/MLE

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CABLE PERCUSSION BOREHOLE RECORD

Project				BH1
31 WILLOUGHBY ROAD NW3 1RT - BASEMENT				
Job No	Date	Ground Level (m ODN)	Co-Ordinates (OSGB36)	
G1808	13-08-18 14-08-18	85,50	E 526.718,0 N 185.855,0	
Method				Sheet
Demountable cable percussion rig; borehole 200dia. to 5m, 150dia. 5m to EOB				3 of 3

SAMPLES & TESTS			Water	EXCAVATION RECORD				
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	MATERIAL DESCRIPTION Main Description	Strata Notes
11,00- 11,45	U26	45 blows					Stiff high strength grey silty thinly laminated and very to extremely closely fissured (fissures are horizontal to sub horizontal) CLAY. (LONDON CLAY) *(continued)*	
11,45	D27							
11,50	S28							
11,50	SPT	N28 2/7/7/7/7/7				(6,50)		
12,00- 12,45	U29	45 blows						
12,45	D30							
12,50	S31							
12,50	SPT	N29 3/6/7/7/7/8						
13,00- 13,45	U32	48 blows						
13,45	D33							
13,50	S34							
13,50	SPT	N34 4/6/7/8/9/10						
14,00- 14,45	U35	48 blows						Consistency is locally firm at circa 14.0m
14,45	D36							
14,55- 15,00	S37							
14,55	SPT	N35 7/7/8/8/9/10		70,50		15,00		
							Borehole ends	

Groundwater Observations During Drilling				
Date &Time	Obs. (min)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
14/08 00:00	Wet	13,00	4,50	13,00
14/08 00:00	Dry	15,00	4,50	

Groundwater Strikes During Drilling						
Date &Time	Obs. (min)	Strike Depth (m)	Casing Depth (m)	Inflow Rate	Rise to depth	Depth Sealed (m).
14/08 00:00	30	13	4,50	Seep		

Chiselling		
From (m).	To (m)	Time (hhmm)

All dimensions in metres Scale 1:34.375	Contractor P J Drilling Ltd	Plant Used Dando 100 modular rig.	Logged By MdF/MLE

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CABLE PERCUSSION BOREHOLE RECORD

Project				BH2
31 WILLOUGHBY ROAD NW3 1RT - BASEMENT				
Job No	Date	Ground Level (m ODN)	Co-Ordinates (OSGB36)	
G1808	15-08-18 15-08-18	85,50	E 526.719,0 N 185.855,0	
Method: Demountable cable percussion rig; borehole 200dia.				Sheet: 1 of 1

SAMPLES & TESTS			Water	EXCAVATION RECORD				
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	MATERIAL DESCRIPTION: Main Description	MATERIAL DESCRIPTION: Strata Notes
				85,00		(0,50) 0,50	Brick paviours on sand to 0.15m on 100mm thick concrete on soft dark grey/brown clay with brick. (MADE GROUND)	
0,50-0,95	B1	NR					Soft low strength dark grey/brown becoming brown mottled green silty sandy and slightly gravelly CLAY. Gravel is m.f rounded flint with rare crushed brick. Occasional fine roots. (MADE GROUND) .	
1,00-1,45	B3							
1,00	SPT	N4 1/2/1/1/1/1						
1,50-1,95	U4	11 blows				(2,50)		
1,95	D5							
2,00	S6							
2,00-2,45	B7							
2,00	SPT	N4 2/1/1/1/1/1						
2,50-2,95	U8	11 blows						15mm layer of organic material; possibly from stream bed. circa 2.5m
				82,50		3,00		
2,95	D9						Soft medium strength brown silty, slightly sandy CLAY. Occasional fine roots. (HEAD)	
3,00	S10							
3,00-3,45	B11							
3,00	SPT	N7 1/1/1/2/2/2						
3,45	D12							
3,50-3,95	U11	15 blows				(1,50)		
3,95	D12							
4,00	S13							
4,00	SPT	N12 1/1/2/3/3/4						
				81,00		4,50		
4,50-4,95	U14						Firm medium strength thinly laminated brown silty CLAY. Occasional fine roots. (DISTURBED LONDON CLAY)	
				80,50		(0,50) 5,00		
4,95	D15						Borehole ends	

Groundwater Observations During Drilling					Groundwater Strikes During Drilling							Chiselling		
Date &Time	Obs. (min)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Date &Time	Obs. (min)	Strike Depth (m)	Casing Depth (m)	Inflow Rate	Rise to depth	Depth Sealed (m).	From (m).	To (m)	Time (hhmm)
		1,35 3,00 3,50 5,00	 2,00 3,00 3,00	Dry Dry Dry Dry										

All dimensions in metres Scale 1:34.375	Contractor P J Drilling Ltd	Plant Used Dando 100 modular rig.	Logged By MdF/MLE

Descriptions of samples from 31 Willoughby Road recovered 13th to 15th August 2018 Logged by M.H. de Freitas

Bulk(B), SPT(S), Cutting shoe (CS) samples logged 13th-15th August

U(UUTxl) extruded & tested 15th November; logged 26th November 2018

Vocabulary of spacing:

Fissuring. Very close = 20 – 60mm. Extremely close = <20mm.

Thinly laminated = < 6mm

Loc'n	Depth	Type	Description	Geology
BH1	0.5	B		
	1.0-1.45	B		
	1.5-1.95	B		
	2.0-2.45	U	Soft brown clay @PL comprising angular fragments of clay mixed with ~ 0.5cm lenses silt which together exhibit a crude stratification, plus occasional 0.5cm angular fragment of red brick. Fine rootlets present. .	Made Ground
	2.5-2.95	S	Soft brown damp clay with possibly slightly silt/fine sand content with rounded flint fragment medium gravel size. @ PL or just wet of.	Made Ground
	3.0-3.45	B	Soft, brown, moist to almost wet clay matrix supporting isolated medium to fine (and suspect smaller) size angular fragments of brick and stone. Brown colouration in clay contains patches of different hues. Wet of PL	
	3.5-3.95	S	Firm brown damp mosaic of angular clasts ~ 7mm side length of London Clay some being litho-relics, with veins and blotches of blue. Rounded flints of medium and fine grained gravel size. @PL or just wet of	London Clay
	4.0-4.45	U	Soft to firm brown horizontally thinly laminated brown clay @ PL comprised of angular but rounded fragments of laminated clay up to 4cm across often with smooth surfaces, closely packed and mainly outlined by light brown 1mm rim of light brown clay; occasional 1mm rim of soft light blue clay. (Disturbed by freeze-thaw).	London Clay
	4.5-4.95	S	Stiff brown damp mosaic of angular lithorelics of thinly laminated London Clay ~ 7mm side length, bounded by veins of blue clay <1mm thick. @PL	London Clay

Descriptions of samples from 31 Willoughby Road recovered 13th to 15th August 2018 Logged by M.H. de Freitas

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Vocabulary of spacing:

Fissuring. Very close = 20 – 60mm. Extremely close = <20mm.

Thinly laminated = < 6mm

Loc'n	Depth	Type	Description	Geology
BH1	5.0-5.45	U	Firm grey very closely fissured clay going brown on the fissures. Fissures producing blocks 5cm -6cm across; clay in blocks @ PL. Between these blocks is soft grey clay on wet side of PL consisting of 1cm angular fragments forming a clay clast supported fabric in a soft clay matrix. Some of the boundaries between this soft clay and the blocks bounded by fissures are striated surfaces that are sub-horizontal and at 45°. Fine lace-like network of black fibrous rootlets on some planar surfaces. (Disturbed with what appear to be zones of concentrated mobilization; slope instability, valley bulge?).	London Clay
	5.5-5.95	S	Stiff brown damp mosaic of angular fragments larger than those above ~10mm+ very well thinly laminated; appears to be undisturbed. @PL.	London Clay
	6.0-6.45	U	Stiff horizontally very closely fissured grey thinly laminated clay that has a dry silty appearance, just turning brown on fissure surfaces; on dry side of PL. Horizontal fissures smooth, undulating and extremely closely spaced	London Clay
	6.5-6.95	S	Stiff grey damp very well & thinly laminated clay. @PL	London Clay
	7.0-7.45	U	Stiff grey thinly laminated clay that glistens suggesting a visible silt content. On dry side of PL. Horizontal smooth undulating fissures just discernible. Small gastropods occasionally present	London Clay
	7.5-7.95	S	Stiff grey damp very well & thinly laminated clay. @PL	London Clay
	8.0-8.45	U	Firm grey thinly laminated clay just wet of PL. Bands of broken shells 1cm thick at 40° subparallel to laminations. Weakly developed	London Clay

Descriptions of samples from 31 Willoughby Road recovered 13th to 15th August 2018 Logged by M.H. de Freitas

Bulk(B), SPT(S), Cutting shoe (CS) samples logged 13th-15th August

U(UUTxl) extruded & tested 15th November; logged 26th November 2018

Vocabulary of spacing:

Fissuring. Very close = 20 – 60mm. Extremely close = <20mm.

Thinly laminated = < 6mm

Loc'n	Depth	Type	Description	Geology
BH1			horizontal and sub-vertical fissuring. Although it looks disturbed (40° dips) no striated surfaces were found.	
	8.5-8.95	S	Stiff grey damp very well & thinly laminated clay. @PL	London Clay
	9.0-9.45	U	Stiff grey thinly laminated very closely fissured clay on dry side of PL, possibly silty. Fissures smooth and planar to undulating. No striations. (Undisturbed)	London Clay
	9.45	CS	Firm to stiff thinly laminated extremely closely fissured damp grey clay. Dry of PL	London Clay
	9.5-9.95	S	Stiff grey damp very well & thinly laminated clay. @PL	London Clay
	10.0-10.45	U		
	10.5	CS	Stiff thinly laminated extremely closely fissured damp grey clay. @ PL	London Clay
	10.5-10.95	S	Stiff grey damp very well & thinly laminated clay. @PL or just below	London Clay
	11.0-11.45	U		
	11.5-11.95	S	Stiff grey damp very well thinly laminated clay that breaks more easily and could contain more silt than above. Dry of PL	London Clay
	12.0-12.45	U	Stiff grey thinly laminated clay on dry side of PL, possibly silty. Very closely fissured.	London Clay
	12.5-12.95	S	Stiff to Very Stiff grey damp very well thinly laminated clay that breaks more easily and could contain more silt than that to 11.5m. Dry of PL	London Clay
	13.0-13.45	U		
	13.5-13.95	S	Stiff to Very Stiff grey damp very well thinly laminated clay that breaks more easily and could contain more silt than that to 11.5m. Dry of PL	London Clay

Descriptions of samples from 31 Willoughby Road recovered 13th to 15th August 2018 Logged by M.H. de Freitas

Bulk(B), SPT(S), Cutting shoe (CS) samples logged 13th-15th August

U(UUTxl) extruded & tested 15th November; logged 26th November 2018

Vocabulary of spacing:

Fissuring. Very close = 20 – 60mm. Extremely close = <20mm.

Thinly laminated = < 6mm

Loc'n	Depth	Type	Description	Geology
BH1	14.0-14.45	U	Firm grey thinly laminated very closely fissured clay with m/c close to PL; possibly silty. Occasional light brown 1mm thick bands of silt to fine sand	London Clay
	14.45	CS	Stiff thinly laminated extremely closely fissured damp grey clay. Occasional fragments of shell. More easily split than that at 190.5 and may contain more silt. Appears to be unfissured. Dry of PL	London Clay
	14.5-14.95	S	Stiff to Very Stiff grey extremely closely fissured damp thinly laminated clay that breaks more easily and could contain more silt than that to 11.5m. Fissures are fine and delicate in nature. No sign of polishing on them. Dry of PL	London Clay
BH2	0.5	B		
	1.0-1.45	B		
	1.5-1.95	U	Brown mottled green clay peds 2cm – 3cm just wet of PL, intermixed with lenticles of green silt/sand separated by a sharp horizontal boundary from structureless brown clay wet of PL with included angular fine gravel size fragments of red brick..	Made ground
	2.0	CS	Soft brown structureless clay matrix with sand and silt content supporting fragments of brick and stone fine gravel to medium sand in size. Rootlets and @ just dry of PL. Crumbles on remoulding	

Descriptions of samples from 31 Willoughby Road recovered 13th to 15th August 2018 Logged by M.H. de Freitas

Bulk(B), SPT(S), Cutting shoe (CS) samples logged 13th-15th August

U(UUTxl) extruded & tested 15th November; logged 26th November 2018

Vocabulary of spacing:

Fissuring. Very close = 20 – 60mm. Extremely close = <20mm.

Thinly laminated = < 6mm

Loc'n	Depth	Type	Description	Geology
BH2	2.0-2.45	S	Soft brown structureless clay matrix supporting fragments of brick and stone fine gravel to medium sand in size. Rootlets and @ PL or just wet of.	Made Ground
	2.5-2.95	B	Stiff light brown/orange structureless clay on wet side of PL containing rootlets and occasional rounded flint of fine/medium size gravel, and 1.5cm sub-horizontal layer of structureless black clay containing soft elongate fragments of wood (10mm long x 2mm across) and possibly peat.	Made Ground
	2.5-2.95	U	No recovery	
	2.95	CS	Soft brown clay with silt and occasional rounded flint med to coarse gravel size. Light brown 1mm peds of soil surrounded by darker mottled brown with light and dark hues clay matrix forming agglomerates ~ 1cm in diameter with an elliptical shape that has its long axis approx. sub-horizontal. Separates along the boundaries of the aggregates which often have blue veining and staining and sometimes rootlets. Overall @ PL.	Transported
	3.0-3.45	B	Soft brown clay with silt. Light brown 1mm peds of soil surrounded by darker clay matrix forming agglomerates ~ 1cm in diameter with an elliptical shape that has its long axis approx. sub-horizontal. Separates along the boundaries of the aggregates which often have blue veining and staining and sometimes rootlets. Overall @ PL.	Transported
	3.45	CS	Soft brown clay with silt. Light brown 1mm peds of soil surrounded by darker clay matrix forming agglomerates ~ 1cm in diameter with an elliptical shape that has its long axis approx. sub-horizontal. Separates along the boundaries	Transported

Descriptions of samples from 31 Willoughby Road recovered 13th to 15th August 2018 Logged by M.H. de Freitas

Bulk(B), SPT(S), Cutting shoe (CS) samples logged 13th-15th August

U(UUTxl) extruded & tested 15th November; logged 26th November 2018

Vocabulary of spacing:

Fissuring. Very close = 20 – 60mm. Extremely close = <20mm.

Thinly laminated = < 6mm

Loc'n	Depth	Type	Description	Geology
BH2			of the aggregates which often have blue veining and staining and sometimes rootlets. Overall @ PL.	
	3.5-3.95	U	Accumulation of stiff/firm brown thinly laminated clay peds at PL, clast supported but exhibiting extremely closely fissuring with green gleying 1mm on occasional sub-vertical surfaces.	Transported
	3.95	CS	Soft and highly remoulded sample on wet side of PL. Of dubious representativeness.	
	4.0-4.45	S	Soft to firm brown thinly laminated clay with blue staining on some laminae. @ PL (in situ).	London Clay
	4.5-4.95	U	Firm brown thinly laminated clay comprising of angular but rounded fragments of the clay 1cm – 2cm across at around PL, with much green gleying on sub-horizontal and 45° pervasive surfaces; no striations or polishing. 1cm thick orange brown lens of fine-medium sand that thins to nothing across the diameter of the core and containing fine network of black rootlets.	Disturbed
	4.95	CS	Firm brown thinly laminated London Clay just on dry side of PL and appears to be silty with blue staining on some laminae and blue veining on some fissures. Occasional rootlets penetrating fissures.	

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
25366	31 Willoughby Road, London NW3 1RT	Samples received	17/08/2018
		Schedule received	22/10/2018
Project No.	Client	Project started	23/10/2018
G1808	Eldred Geotechnics Ltd	Testing Started	01/11/2018

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH1	4	1.50	1.95	B	Green silty clayey SAND with numerous brown slightly sandy silty clay lumps and rare fm sub-angular to sub-rounded gravel	21	91	43	17	26	
BH1	5	2.00	2.45	U	High strength brown mottled orangish brown clayey gravelly silty SAND with rare fine brick fragments (gravel is fmc and rounded to sub-angular)	17	80	41	17	24	
BH1	8	3.00	3.45	B	Brown and occasional greenish grey slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to sub-rounded)	28	94	42	18	24	
BH1	10	4.00	4.45	U	Medium strength brown slightly mottled grey silty CLAY with rare pockets of orange fine sand / silt and traces of selenite crystals and rootlets	33	99	66	23	43	
BH1	12	5.00	5.45	U	High strength brown silty CLAY with rare pockets of orange fine sand / silt	32	100	68	27	41	
BH1	14	6.00	6.45	U	High strength dark brown slightly mottled orangish brown silty CLAY with occasional pockets of fine sand / silt	28	99	67	25	42	
BH1	16	7.00	7.45	U	High strength dark grey silty CLAY with rare pockets of fine sand	28	100	68	24	44	
BH1	18	8.00	8.45	U	High strength dark grey silty CLAY	29	100	66	25	41	
BH2	3	1.00	1.45	B	Greenish grey and occasional dark grey gravelly clayey very silty SAND with rare cobbles (gravel is fmc and sub-angular to sub-rounded)	20	87	36	18	18	
BH2	4	1.50	1.95	U	High strength brown and orangish brown mottled slightly gravelly sandy silty CLAY with rare brick fragments and traces of carbonaceous deposits (gravel is fm and sub-angular)	21	87	33	15	18	
BH2	8	2.50	2.95	U	Medium strength grey, brown and orangish brown mottled slightly gravelly sandy silty CLAY (gravel is fm and rounded to sub-angular)	27	74	42	20	22	
BH2	11	3.00	3.45	B	Brown slightly mottled grey slightly sandy silty CLAY	33	99	62	22	40	

UKAS TESTING
2519

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

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: 06/11/2018

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

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
25366	31 Willoughby Road, London NW3 1RT	Samples received	17/08/2018
		Schedule received	22/10/2018
Project No.	Client	Project started	23/10/2018
G1808	Eldred Geotechnics Ltd	Testing Started	01/11/2018

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH2	11	3.50	3.95	U	High strength brown and orangish brown mottled silty CLAY with occasional pockets of fine sand and rare fine gravel	31	99	68	24	44	
BH2	14	4.50	4.95	U	High strength slightly mottled orangish brown and grey silty CLAY with occasional pockets of fine sand	34	100	72	24	48	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0

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UKAS TESTING 2519

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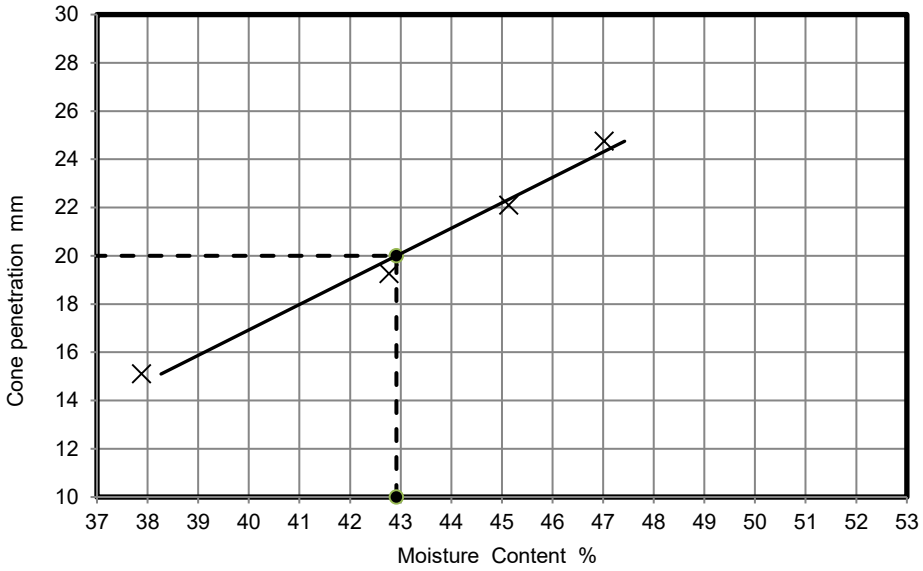
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

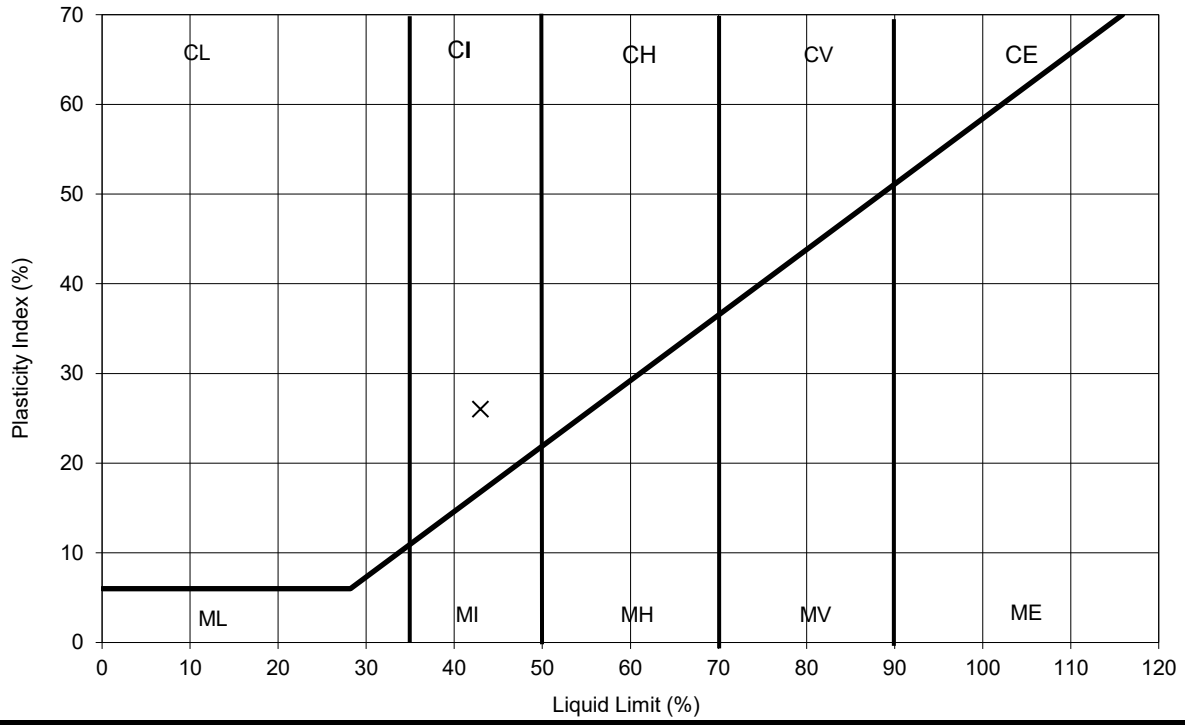
				Job No.	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	4
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	1.50 m
Soil Description	Green silty clayey SAND with numerous brown slightly sandy silty clay lumps and rare fm sub-angular to sub-rounded gravel			Depth Base	1.95 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**21**	**%**
% PASSING 425µm SIEVE	**91**	**%**
LIQUID LIMIT	**43**	**%**
PLASTIC LIMIT	**17**	**%**
PLASTICITY INDEX	**26**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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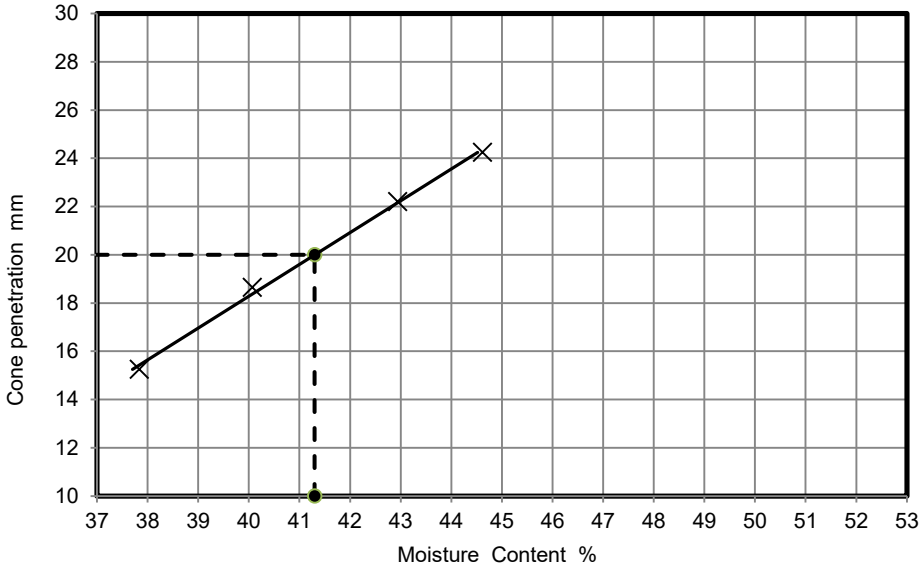
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	5
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	2.00 m
Soil Description	High strength brown mottled orangish brown clayey gravelly silty SAND with rare fine brick fragments (gravel is fmc and rounded to sub-angular)			Depth Base	2.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018

Job No. 25366

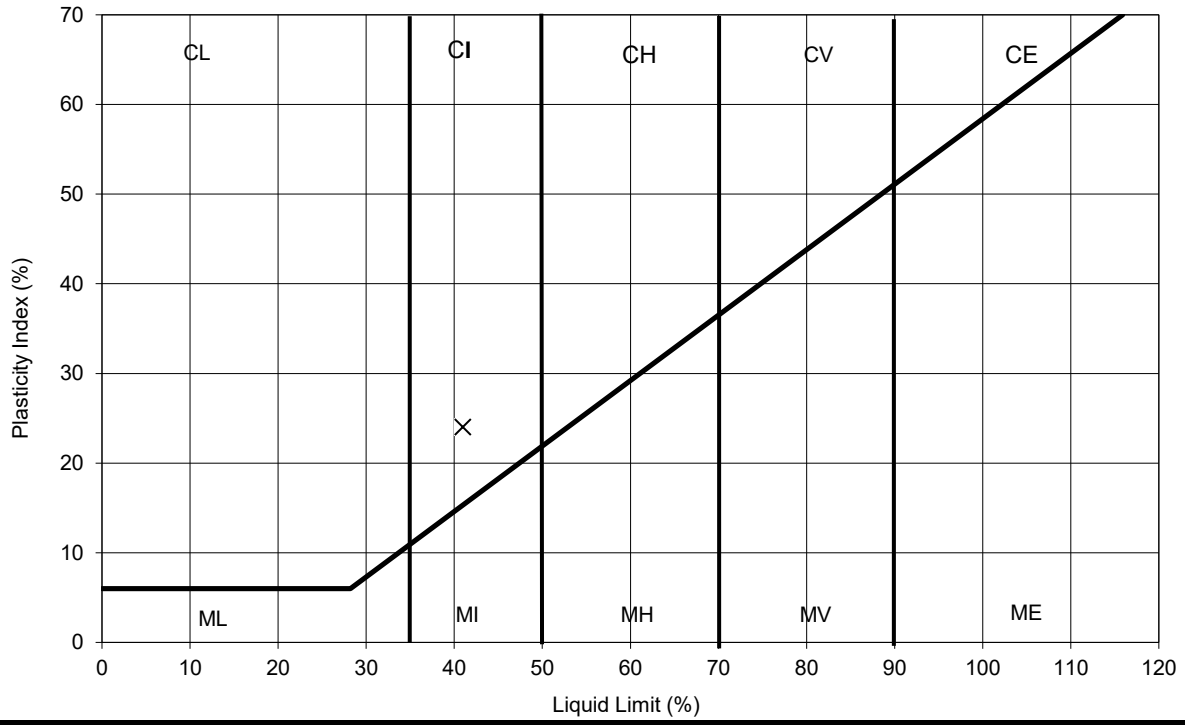
Borehole/Pit No. BH1



NATURAL MOISTURE CONTENT	**17**	**%**
% PASSING 425µm SIEVE	**80**	**%**
LIQUID LIMIT	**41**	**%**
PLASTIC LIMIT	**17**	**%**
PLASTICITY INDEX	**24**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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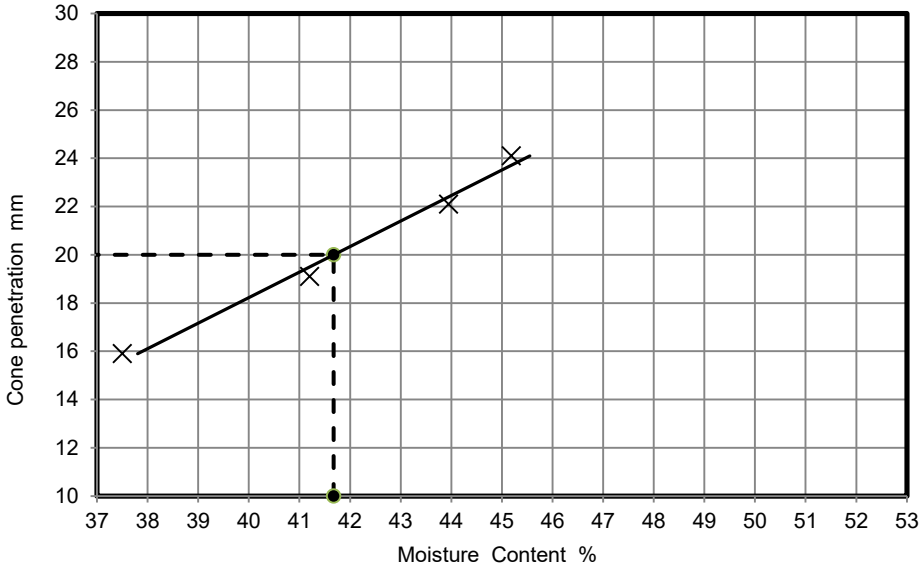
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	8
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	3.00 m
Soil Description	Brown and occasional greenish grey slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to sub-rounded)			Depth Base	3.45 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018

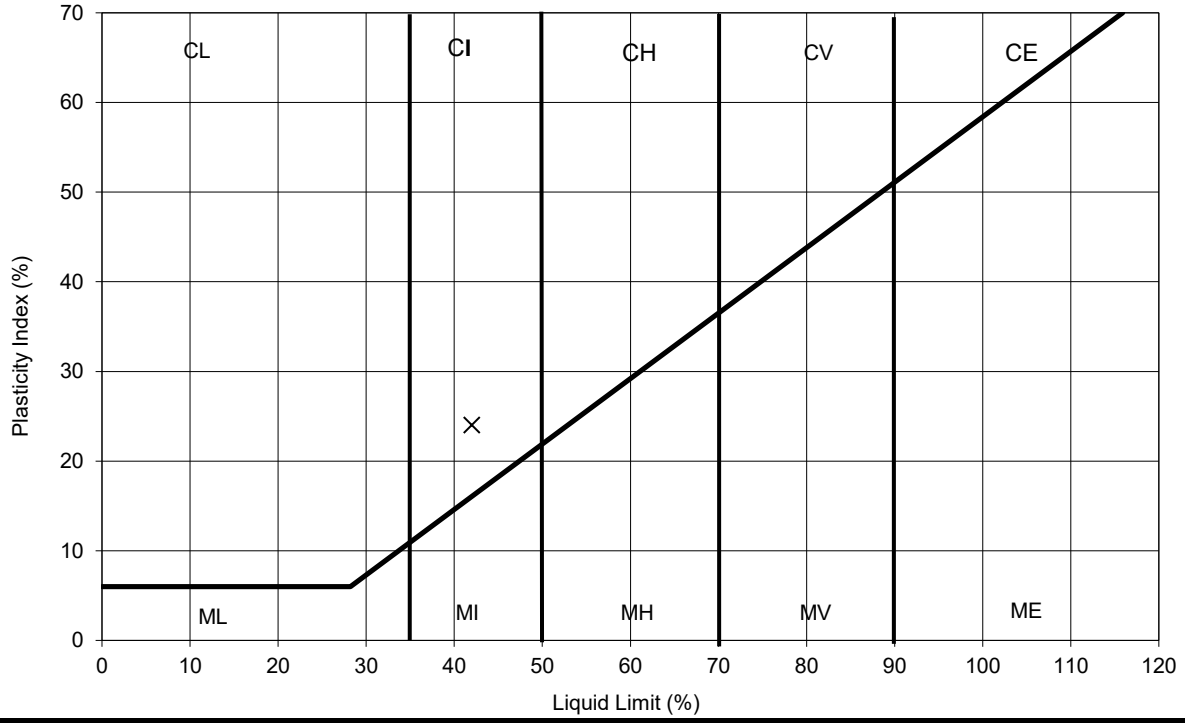
Job No.	25366
Borehole/Pit No.	BH1



NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**94**	**%**
LIQUID LIMIT	**42**	**%**
PLASTIC LIMIT	**18**	**%**
PLASTICITY INDEX	**24**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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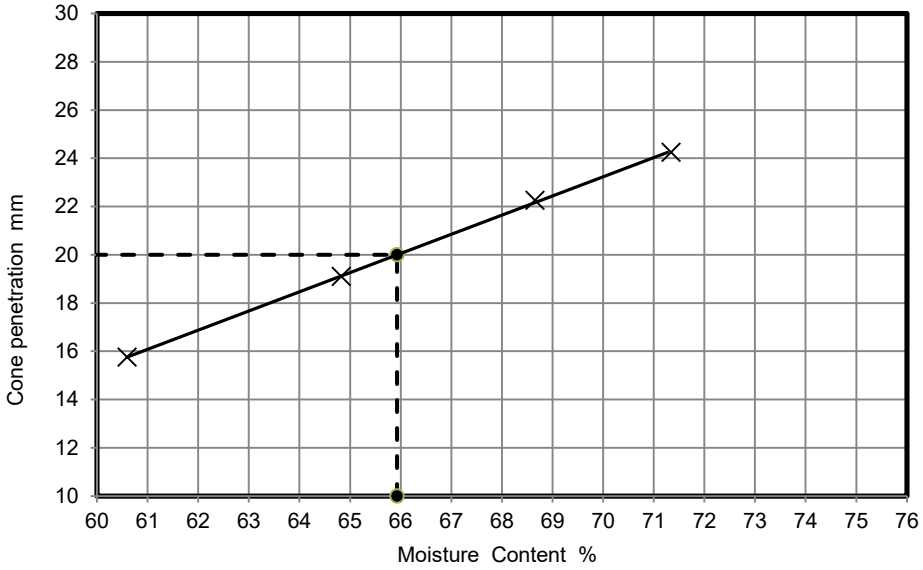
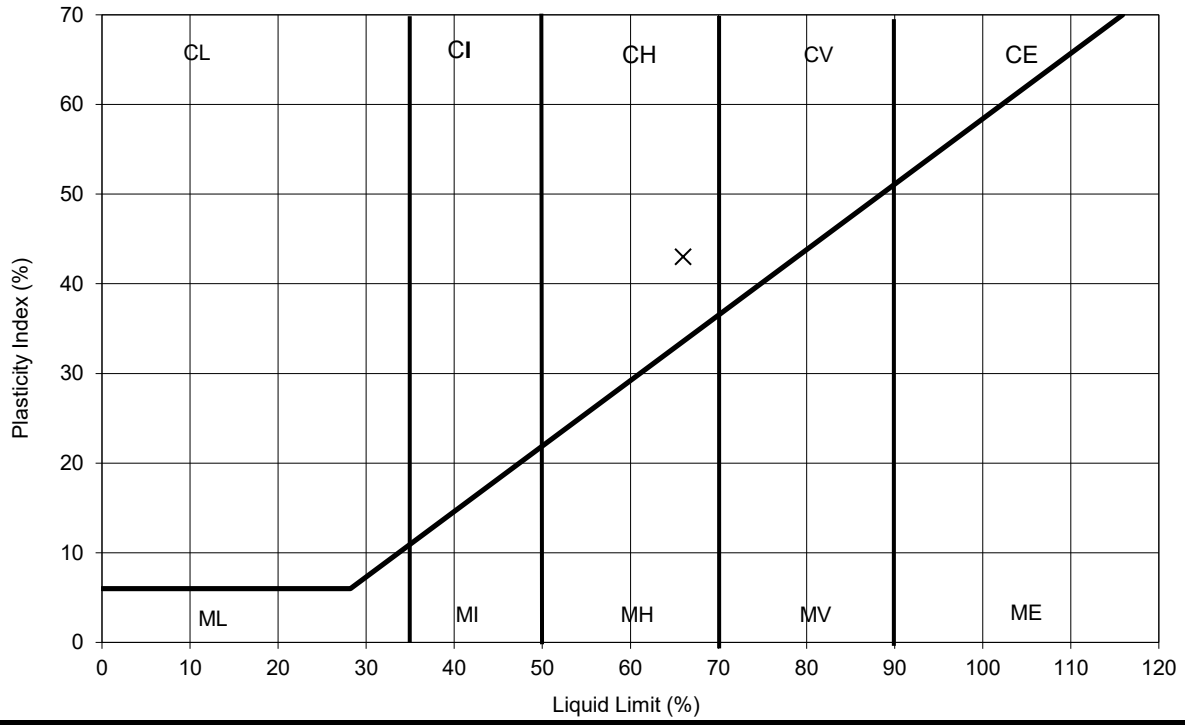
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	10
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	4.00 m
Soil Description	Medium strength brown slightly mottled grey silty CLAY with rare pockets of orange fine sand / silt and traces of selenite crystals and rootlets			Depth Base	4.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**33**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**66**	**%**
PLASTIC LIMIT	**23**	**%**
PLASTICITY INDEX	**43**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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UKAS TESTING 2519

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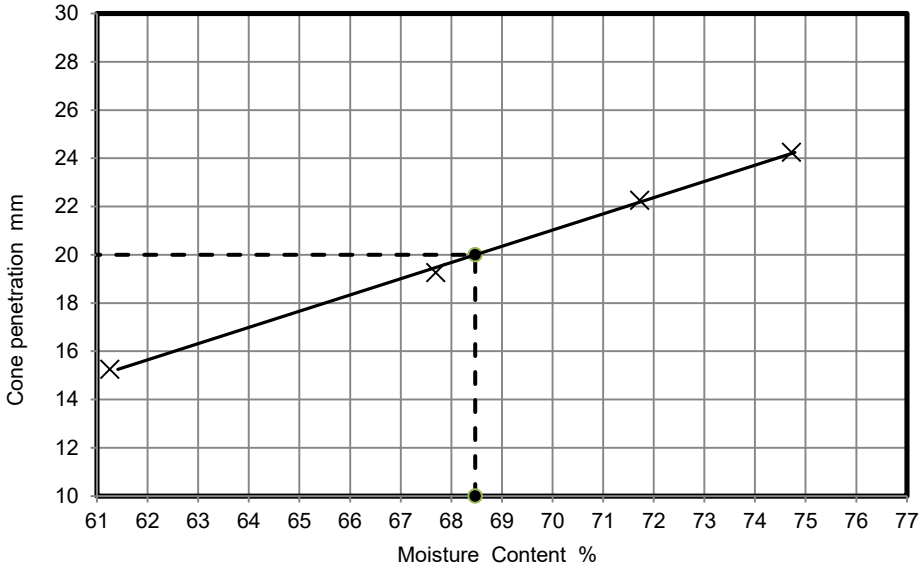
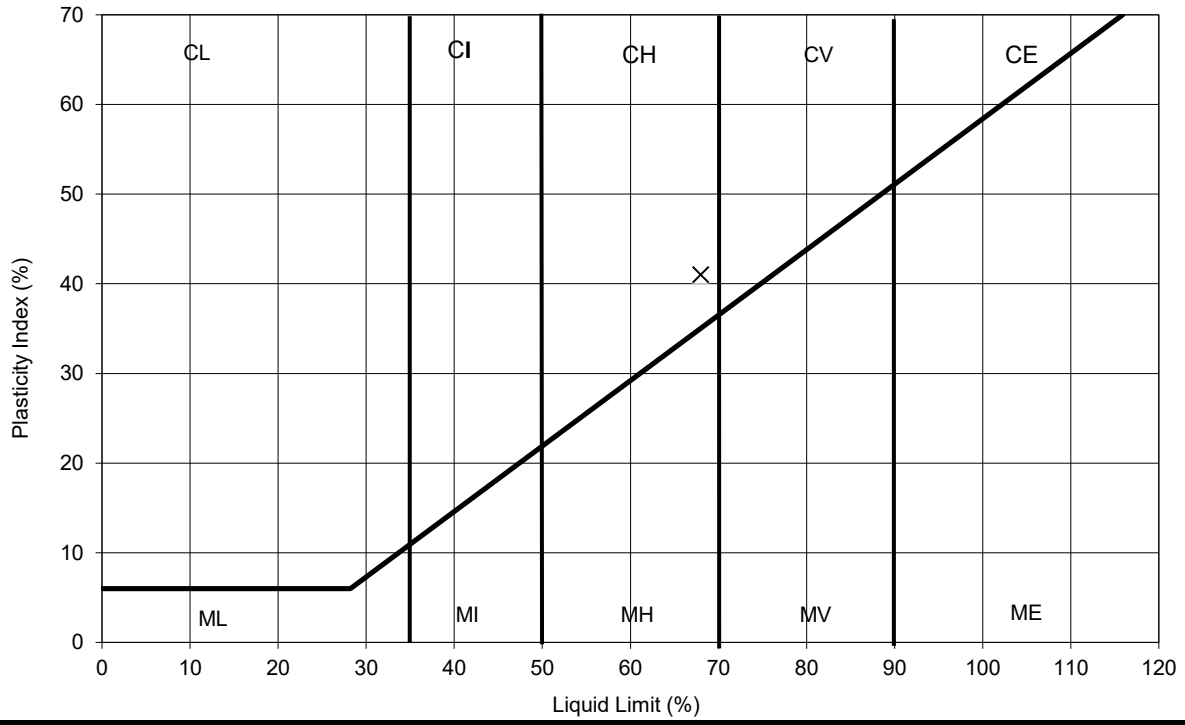
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	12
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	5.00 m
Soil Description	High strength brown silty CLAY with rare pockets of orange fine sand / silt			Depth Base	5.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**32**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**68**	**%**
PLASTIC LIMIT	**27**	**%**
PLASTICITY INDEX	**41**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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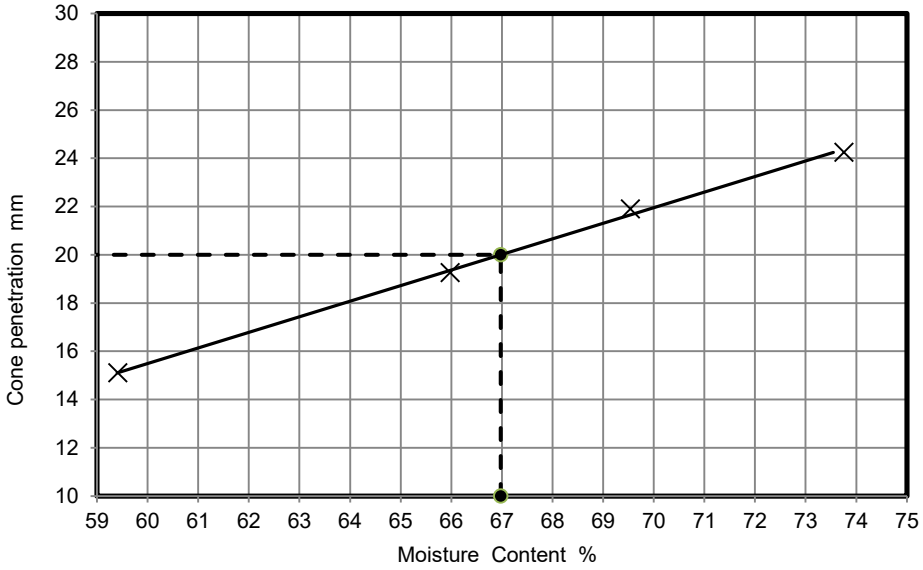
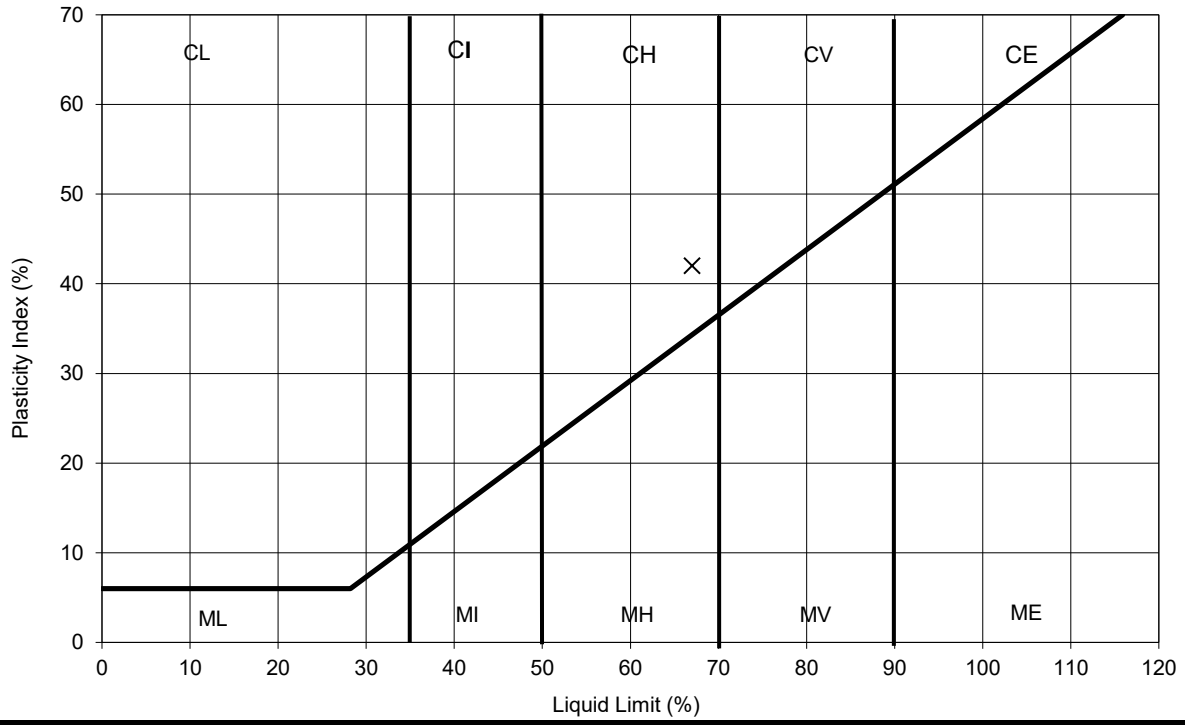
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	14
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	6.00 m
Soil Description	High strength dark brown slightly mottled orangish brown silty CLAY with occasional pockets of fine sand / silt			Depth Base	6.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**67**	**%**
PLASTIC LIMIT	**25**	**%**
PLASTICITY INDEX	**42**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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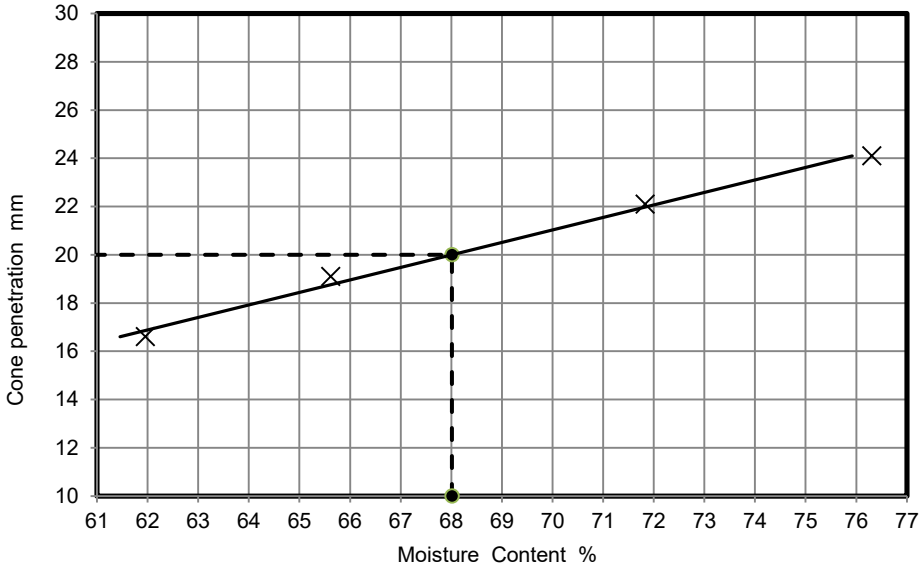
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

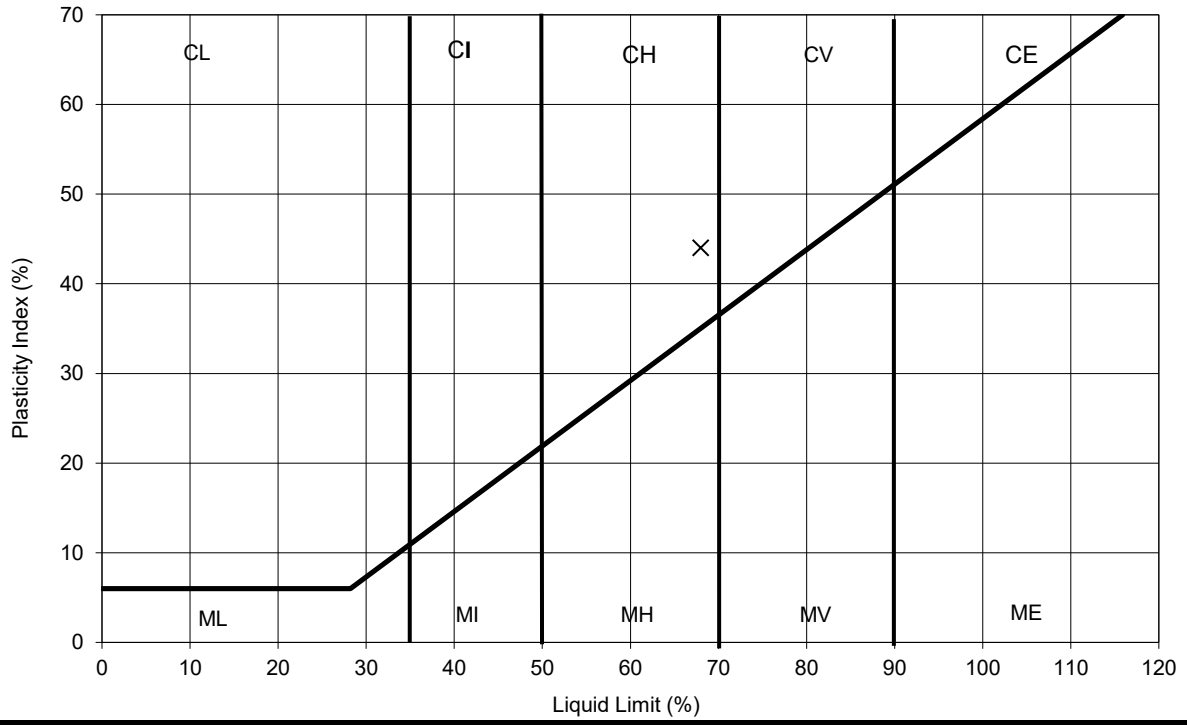
Job No.	25366				
Borehole/Pit No.	BH1				
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	16
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	7.00 m
Soil Description	High strength dark grey silty CLAY with rare pockets of fine sand			Depth Base	7.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**68**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**44**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
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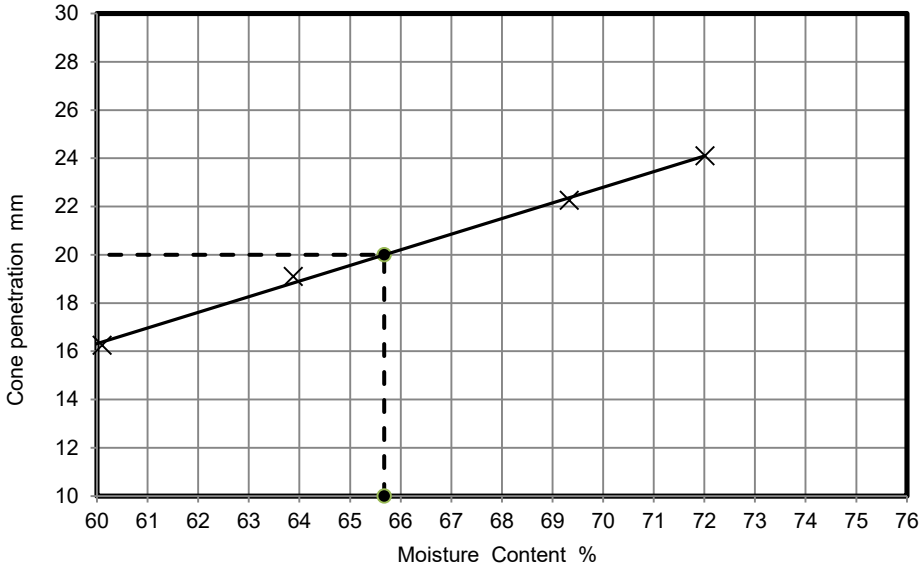
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	18
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	8.00 m
Soil Description	High strength dark grey silty CLAY			Depth Base	8.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018

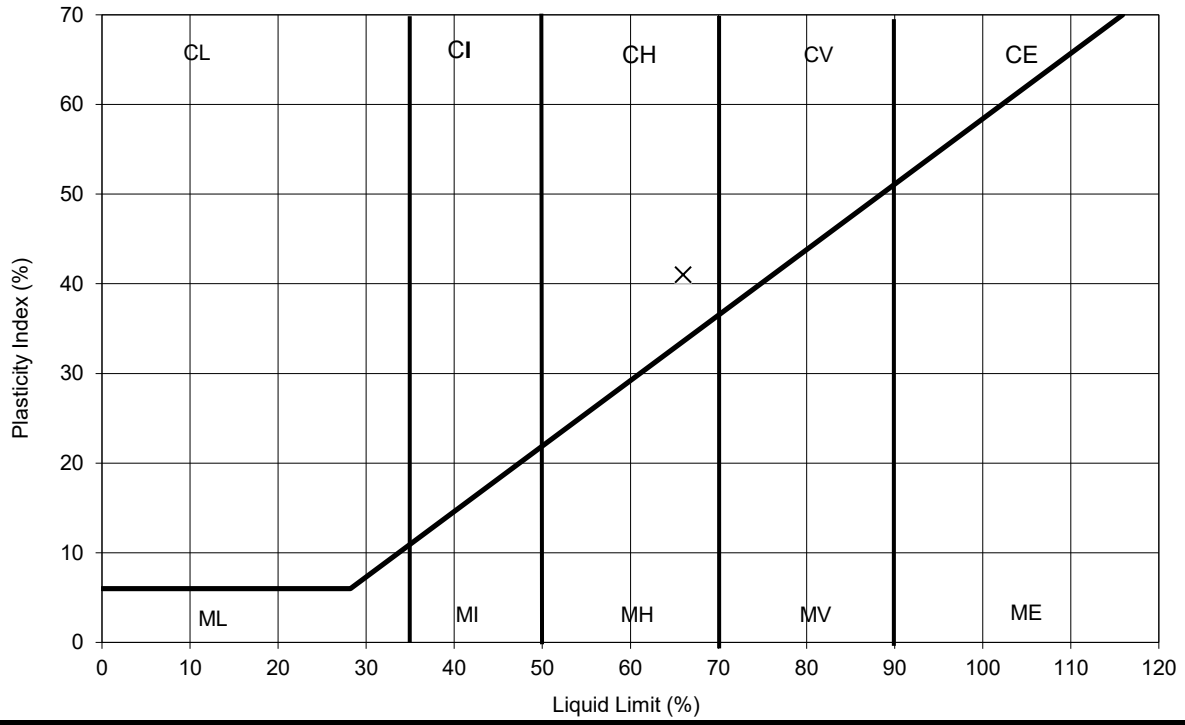
Job No.	25366
Borehole/Pit No.	BH1



NATURAL MOISTURE CONTENT	**29**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**66**	**%**
PLASTIC LIMIT	**25**	**%**
PLASTICITY INDEX	**41**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 06/11/2018

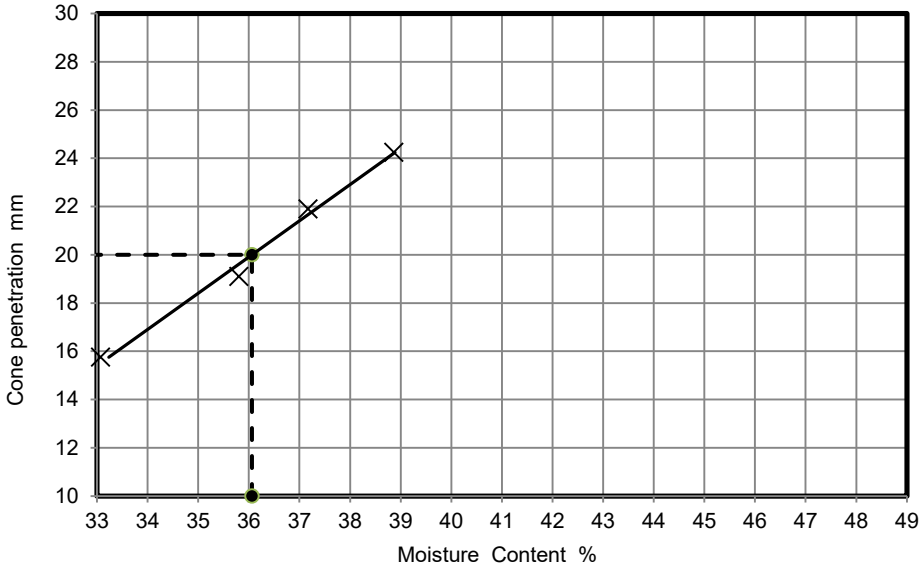
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

2519

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

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

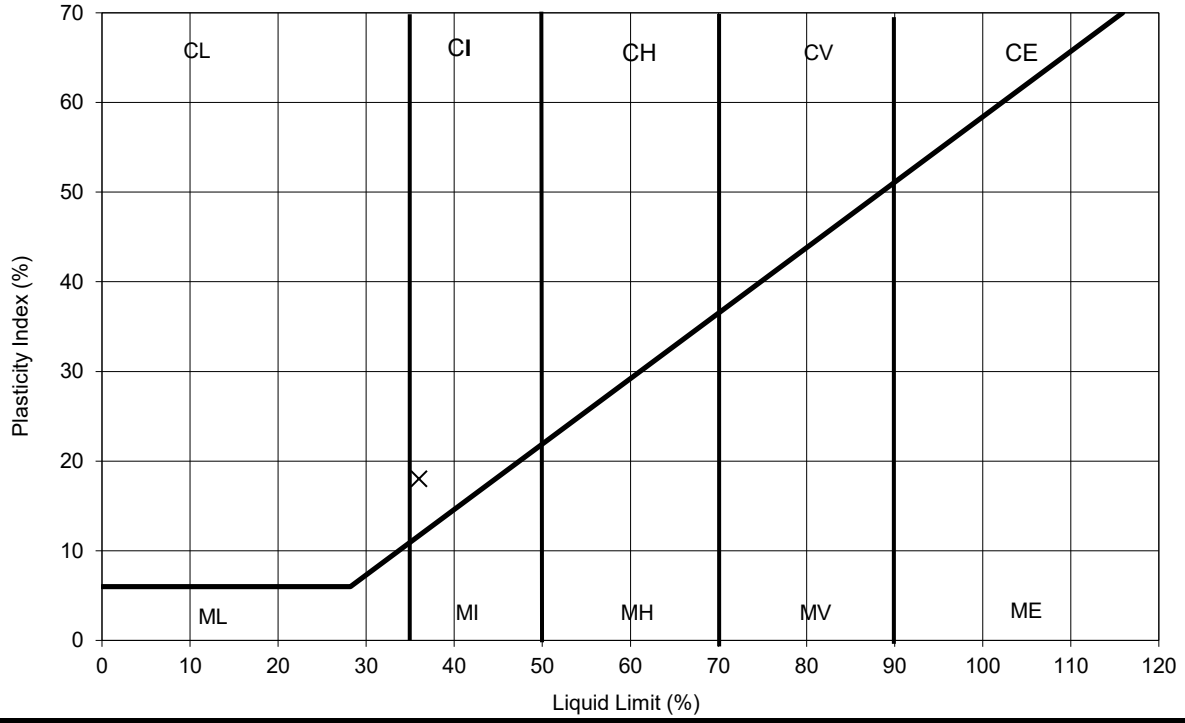
				Job No.	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	3
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	1.00 m
Soil Description	Greenish grey and occasional dark grey gravelly clayey very silty SAND with rare cobbles (gravel is fmc and sub-angular to sub-rounded)			Depth Base	1.45 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**20**	**%**
% PASSING 425µm SIEVE	**87**	**%**
LIQUID LIMIT	**36**	**%**
PLASTIC LIMIT	**18**	**%**
PLASTICITY INDEX	**18**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 06/11/2018

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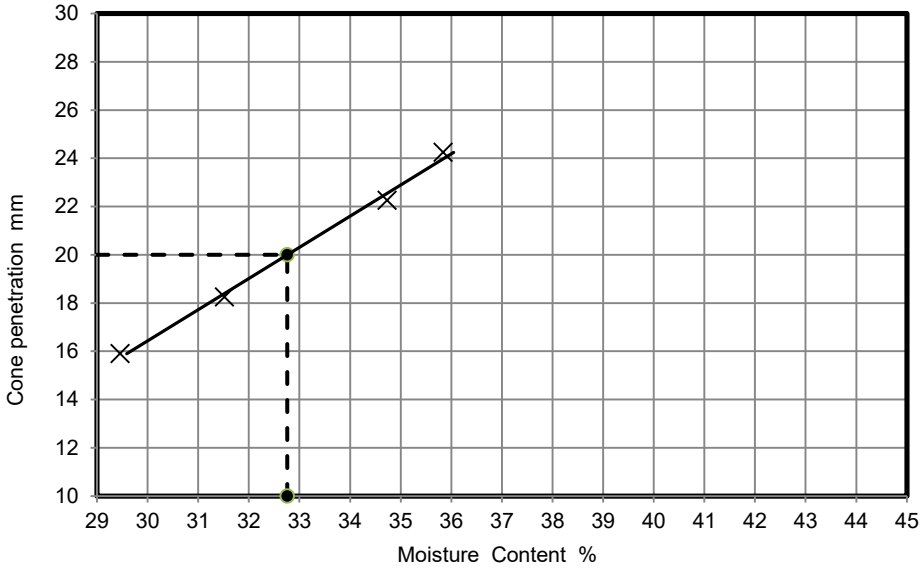
2519

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

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

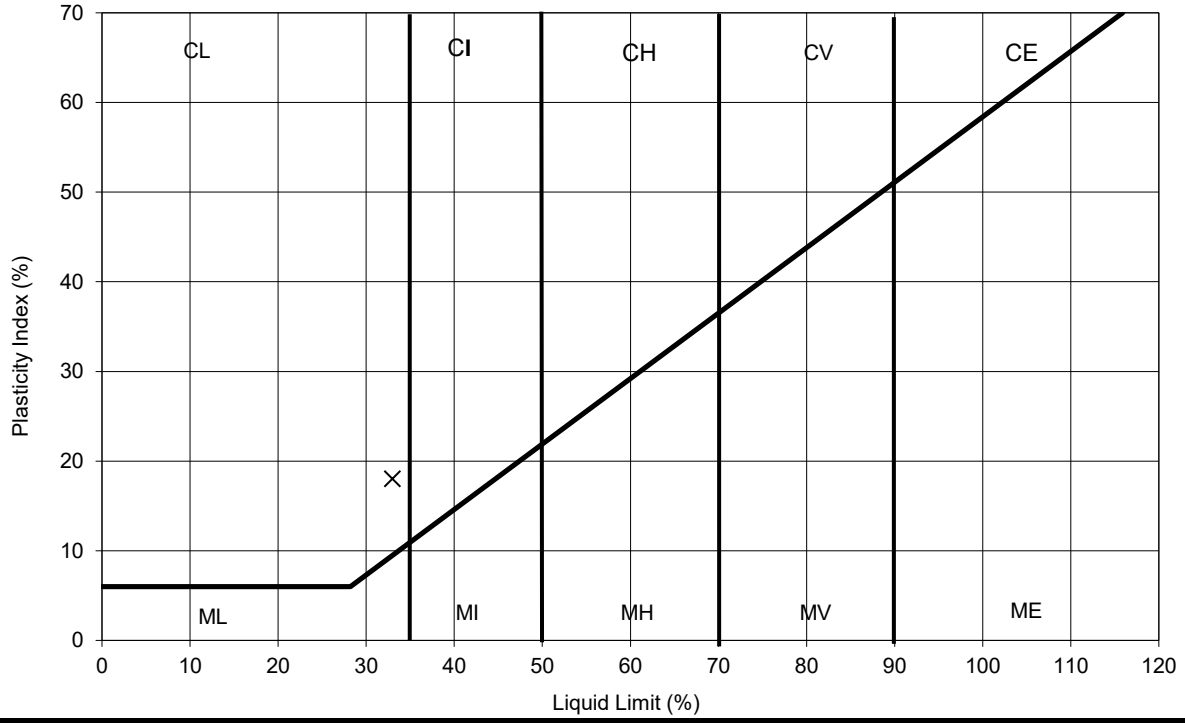
				Job No.	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	4
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	1.50 m
Soil Description	High strength brown and orangish brown mottled slightly gravelly sandy silty CLAY with rare brick fragments and traces of carbonaceous deposits (gravel is fm and sub-angular)			Depth Base	1.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**21**	**%**
% PASSING 425µm SIEVE	**87**	**%**
LIQUID LIMIT	**33**	**%**
PLASTIC LIMIT	**15**	**%**
PLASTICITY INDEX	**18**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
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Initials: J.P
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UKAS TESTING 2519

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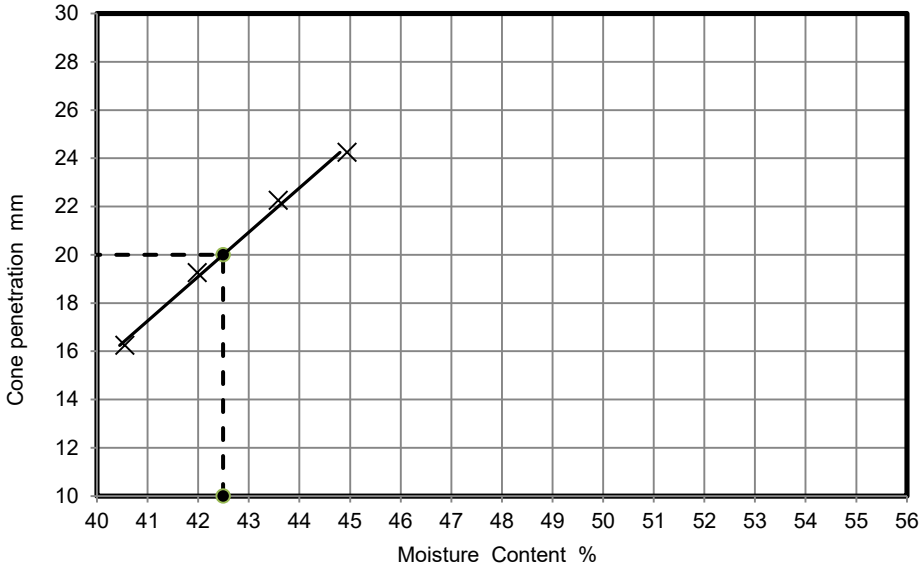
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

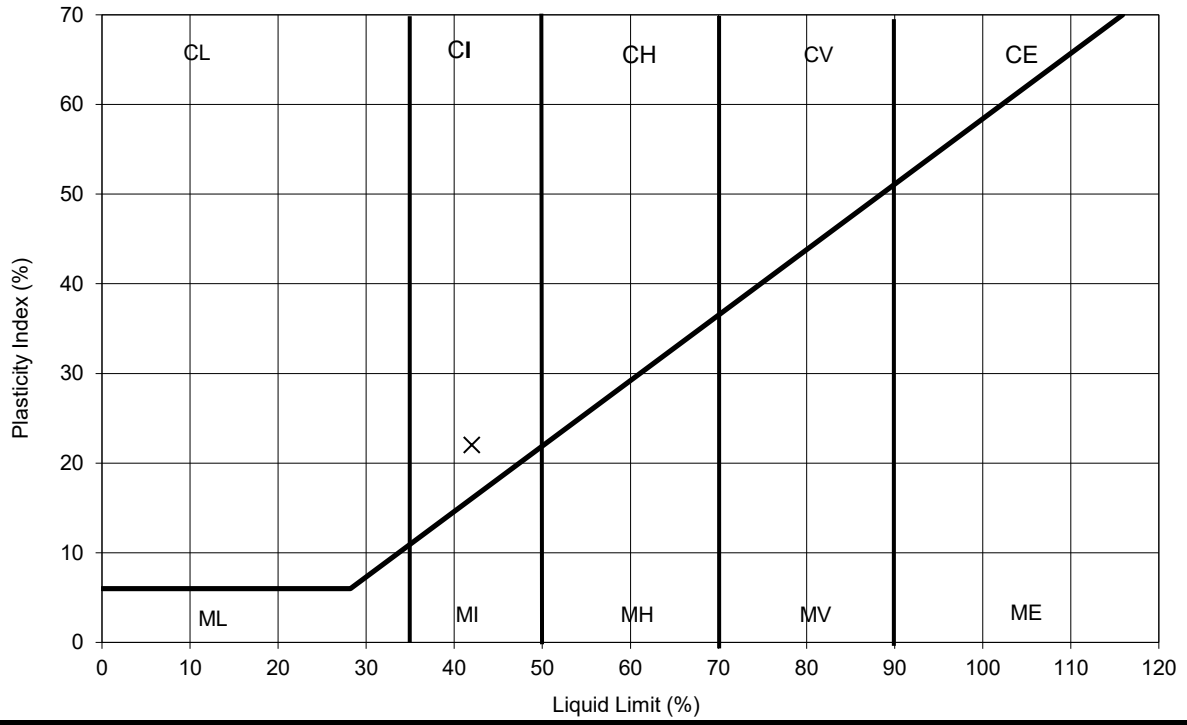
				Job No.	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	8
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	2.50 m
Soil Description	Medium strength grey, brown and orangish brown mottled slightly gravelly sandy silty CLAY (gravel is fm and rounded to sub-angular)			Depth Base	2.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**27**	**%**
% PASSING 425µm SIEVE	**74**	**%**
LIQUID LIMIT	**42**	**%**
PLASTIC LIMIT	**20**	**%**
PLASTICITY INDEX	**22**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
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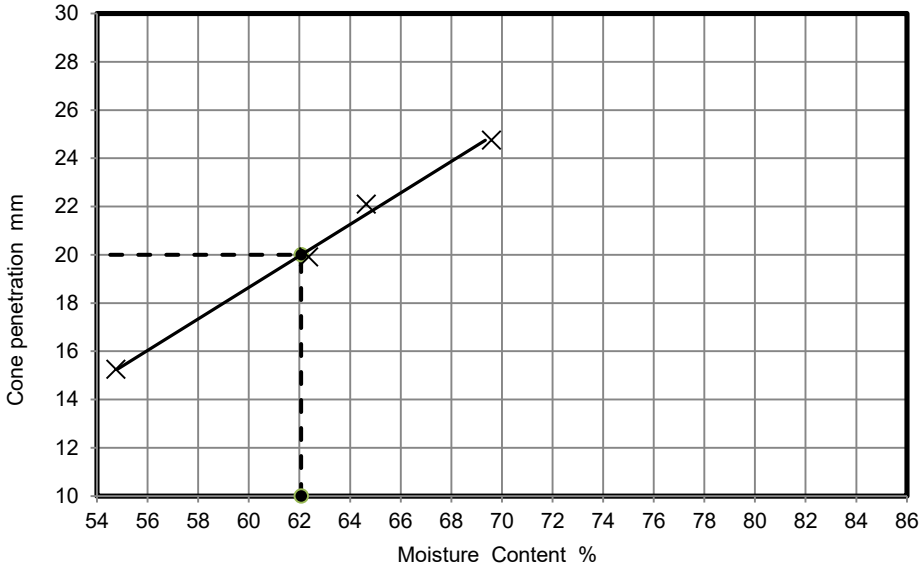
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

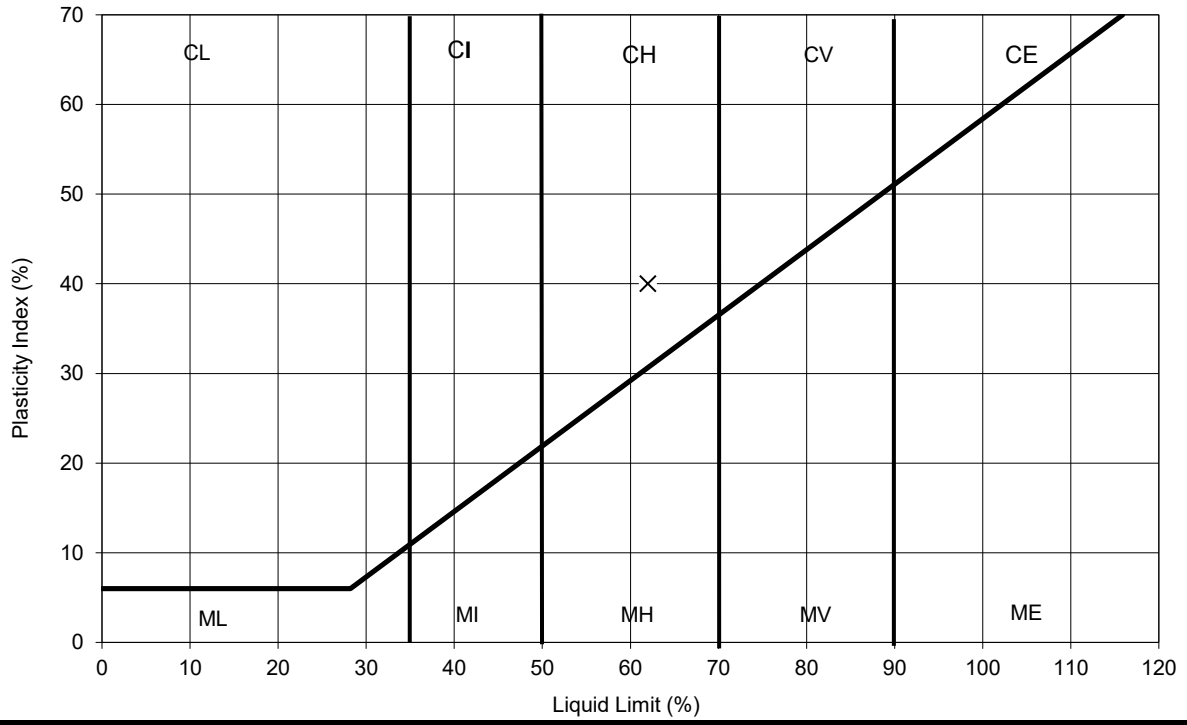
				Job No.	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	11
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	3.00 m
Soil Description	Brown slightly mottled grey slightly sandy silty CLAY			Depth Base	3.45 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**33**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**62**	**%**
PLASTIC LIMIT	**22**	**%**
PLASTICITY INDEX	**40**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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Date: 06/11/2018

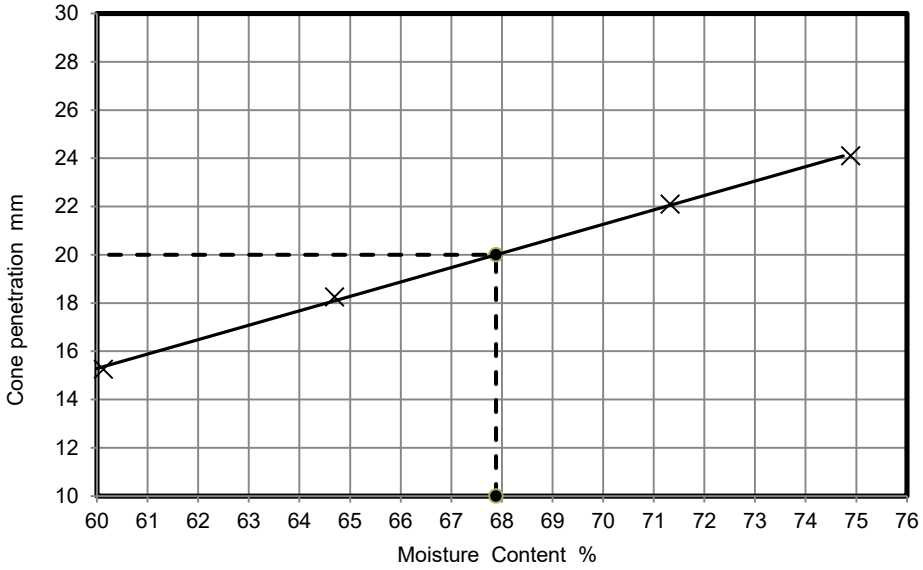
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

UKAS TESTING 2519

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

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

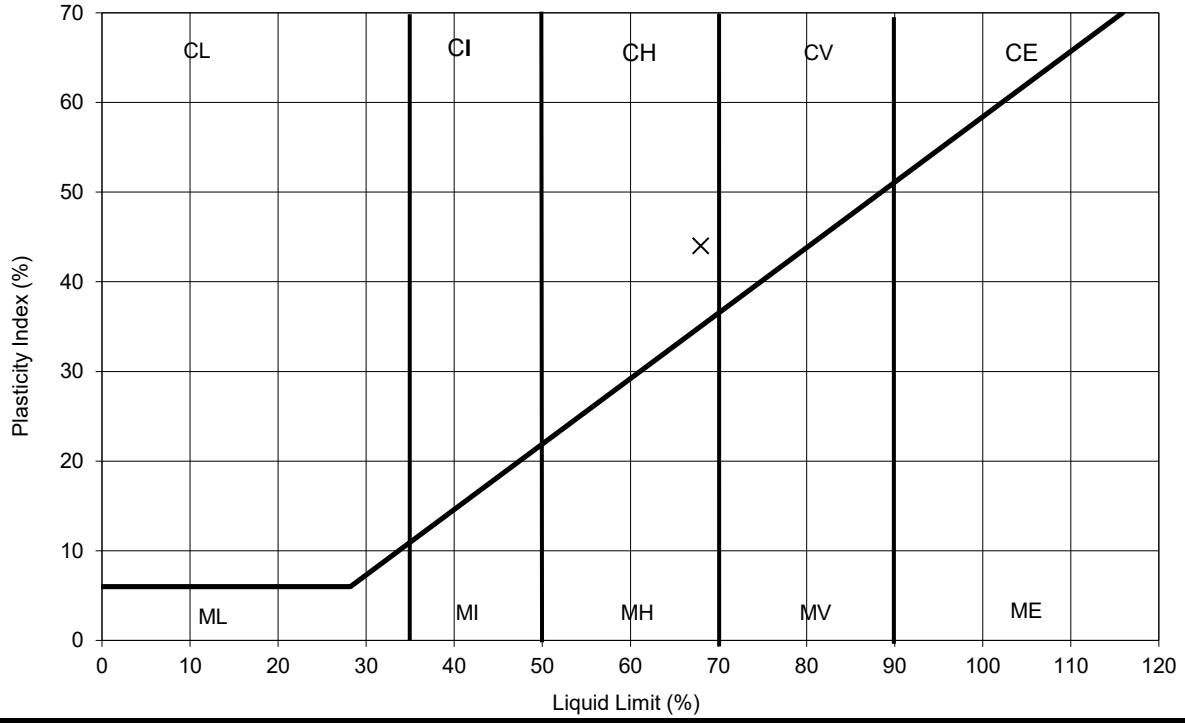
				Job No.	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	11
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	3.50 m
Soil Description	High strength brown and orangish brown mottled silty CLAY with occasional pockets of fine sand and rare fine gravel			Depth Base	3.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**31**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**68**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**44**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
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UKAS TESTING 2519

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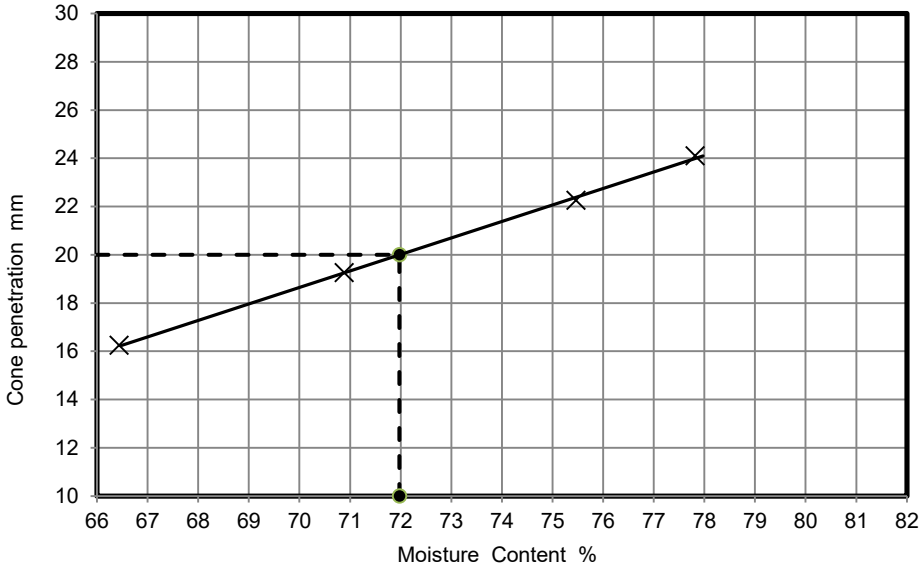
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

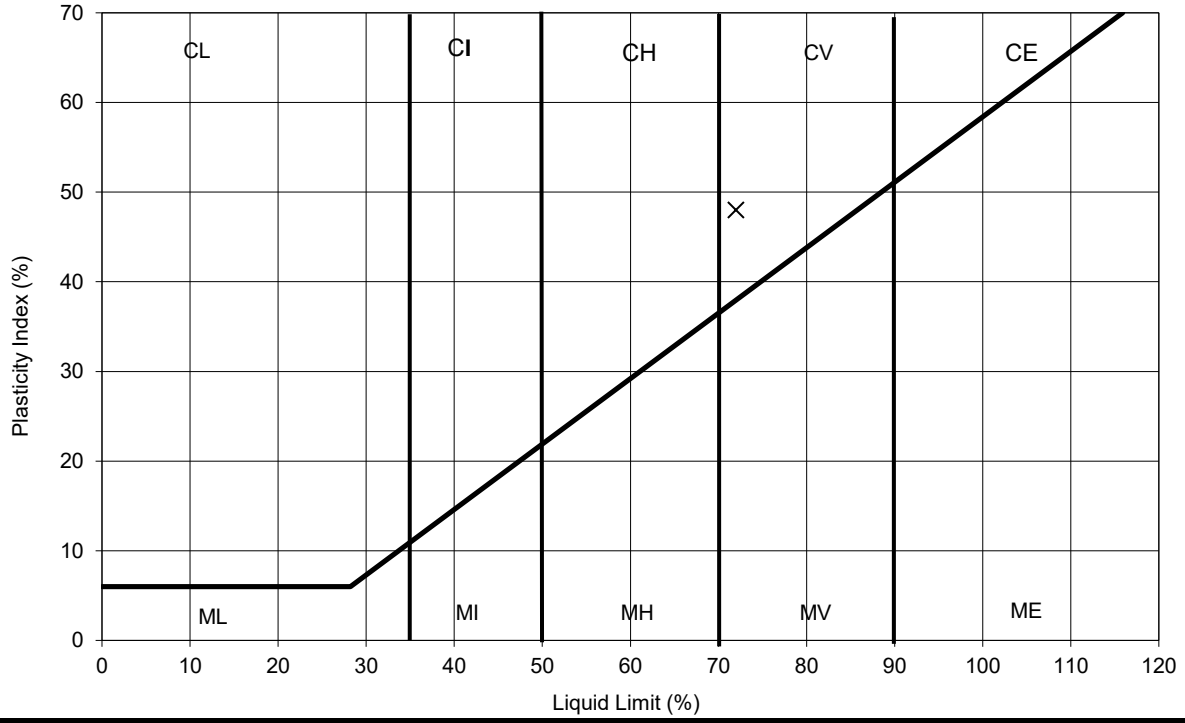
				Job No.	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	14
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	4.50 m
Soil Description	High strength slightly mottled orangish brown and grey silty CLAY with occasional pockets of fine sand			Depth Base	4.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
				Project Started	23/10/2018
				Date Tested	01/11/2018



NATURAL MOISTURE CONTENT	**34**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**72**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**48**	**%**

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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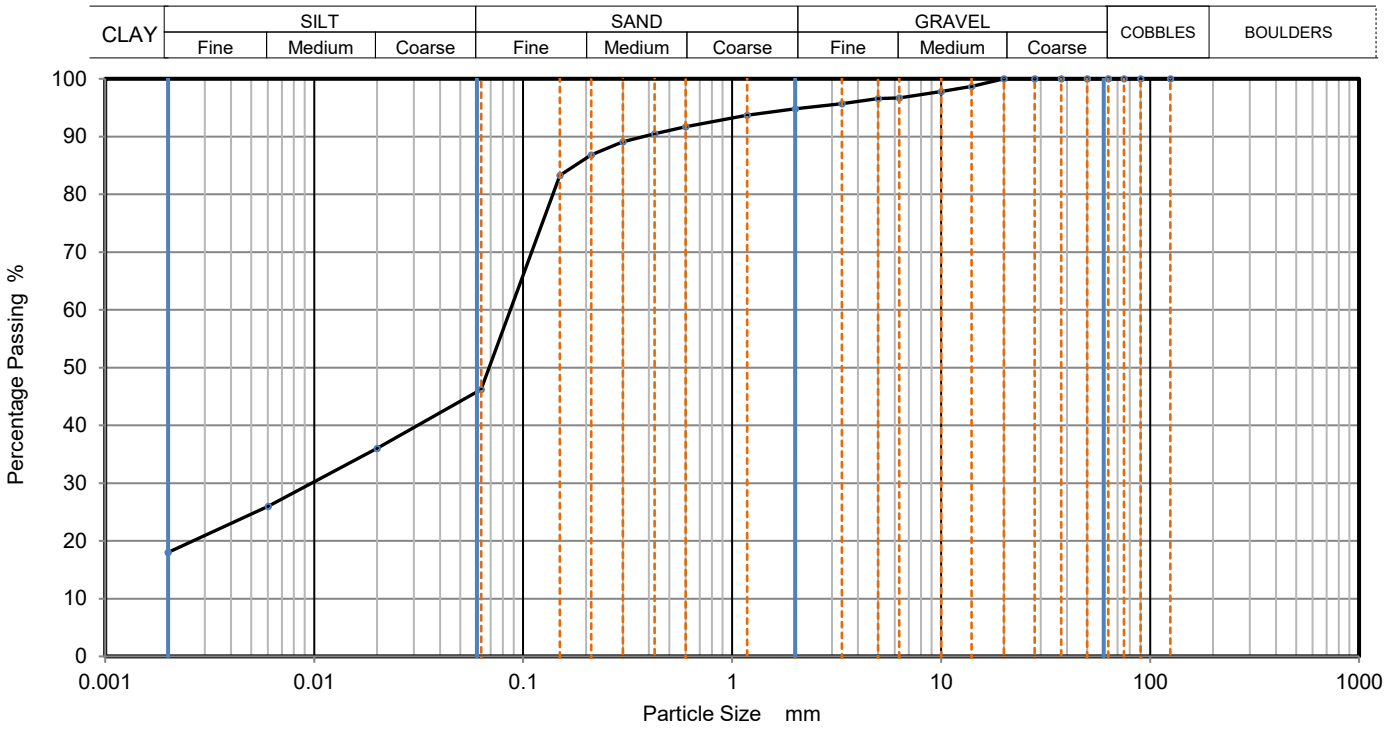
2519

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

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH1
Project No.	G1808	Client	Eldred Geotechnics Ltd	Sample No.	4
				Depth Top	1.50 m
Soil Description	Green silty clayey SAND with numerous brown slightly sandy silty clay lumps and rare fm sub-angular to sub-rounded gravel			Depth Base	1.95 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	01/11/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	36
90	100	0.0060	26
75	100	0.0020	18
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	98		
6.3	97		
5	97		
3.35	96		
2	95		
1.18	94		
0.6	92	Particle density (assumed)	
0.425	91	2.70	Mg/m3
0.3	89		
0.212	87		
0.15	83		
0.063	46		

Dry Mass of sample, g	333

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	5.2
Sand	48.5
Silt	27.9
Clay	18.4

Grading Analysis		
D100	mm	
D60	mm	0.087
D30	mm	0.01
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: **J.P**

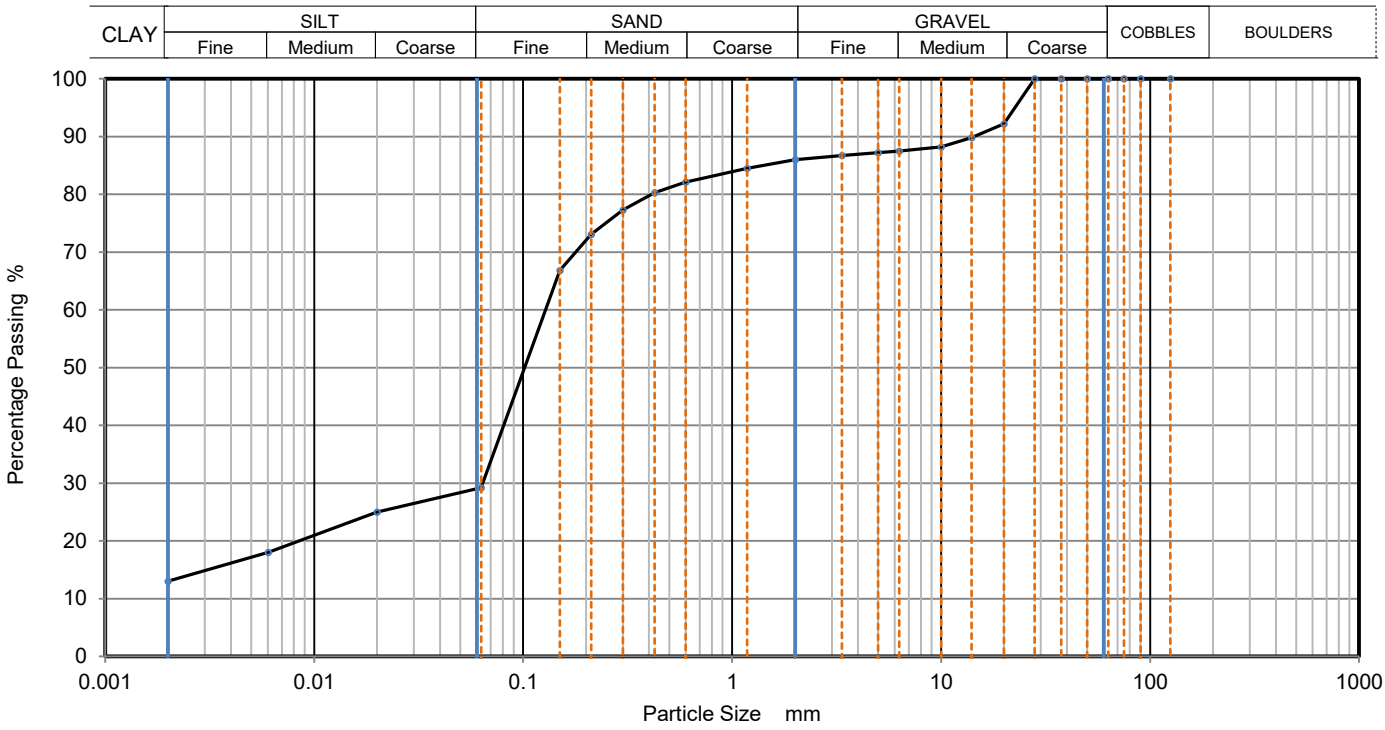
Date: 06/11/2018

UKAS TESTING 2519

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

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH1
				Sample No.	5
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	2.00 m
Soil Description	High strength brown mottled orangish brown clayey gravelly silty SAND with rare fine brick fragments (gravel is fmc and rounded to sub-angular)			Depth Base	2.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	25
90	100	0.0060	18
75	100	0.0020	13
63	100		
50	100		
37.5	100		
28	100		
20	92		
14	90		
10	88		
6.3	88		
5	87		
3.35	87		
2	86		
1.18	85		
0.6	82	Particle density (assumed)	
0.425	80	2.70	Mg/m3
0.3	77		
0.212	73		
0.15	67		
0.063	29		

Dry Mass of sample, g	189

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	14.0
Sand	56.8
Silt	16.5
Clay	12.7

Grading Analysis		
D100	mm	
D60	mm	0.128
D30	mm	0.0642
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Initials: **J.P**

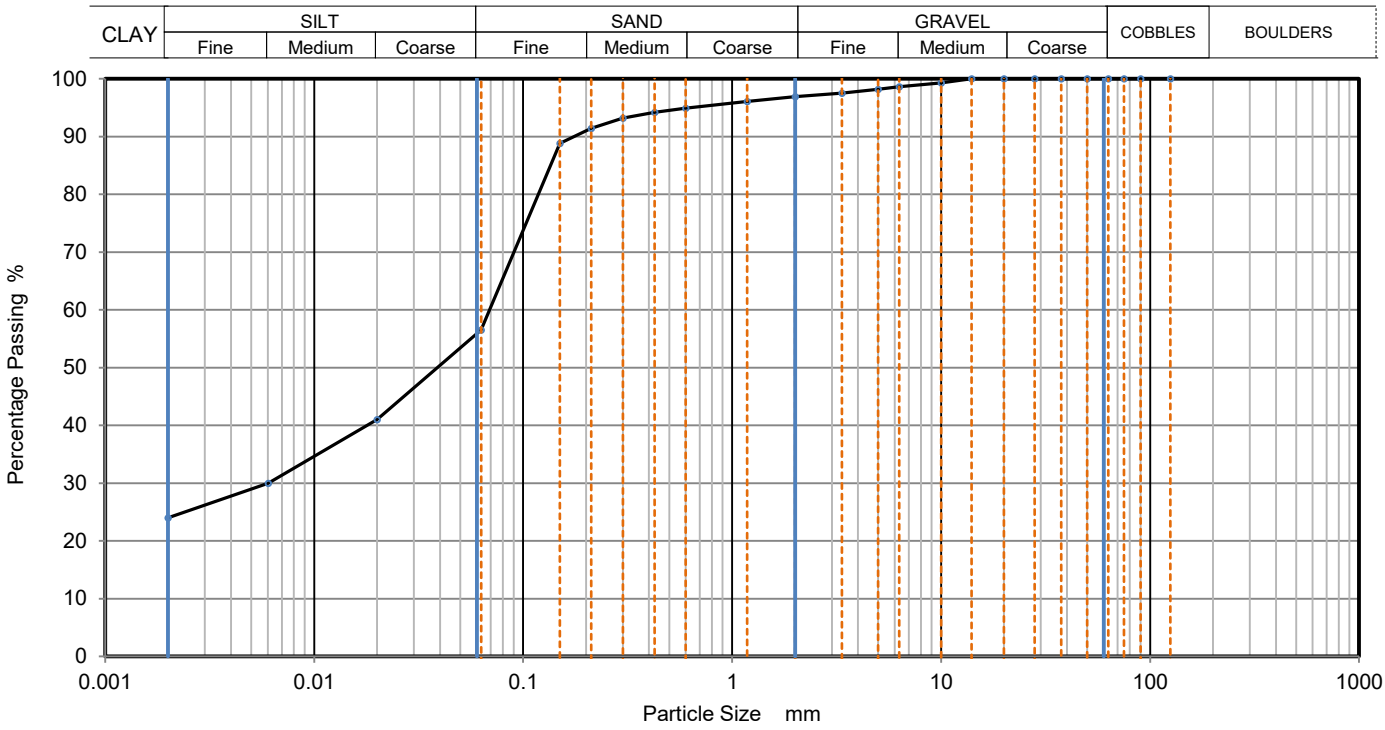
Date: 06/11/2018

UKAS TESTING 2519

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

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH1
Project No.	G1808	Client	Eldred Geotechnics Ltd	Sample No.	8
				Depth Top	3.00 m
Soil Description	Brown and occasional greenish grey slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to sub-rounded)			Depth Base	3.45 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	01/11/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	41
90	100	0.0060	30
75	100	0.0020	24
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5	98		
3.35	98		
2	97		
1.18	96		
0.6	95	Particle density (assumed)	
0.425	94	2.70	Mg/m3
0.3	93		
0.212	91		
0.15	89		
0.063	57		

Dry Mass of sample, g: 349

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	3.1
Sand	40.4
Silt	32.7
Clay	23.8

Grading Analysis		
D100	mm	
D60	mm	0.0692
D30	mm	0.0057
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Tel: 01923 711288

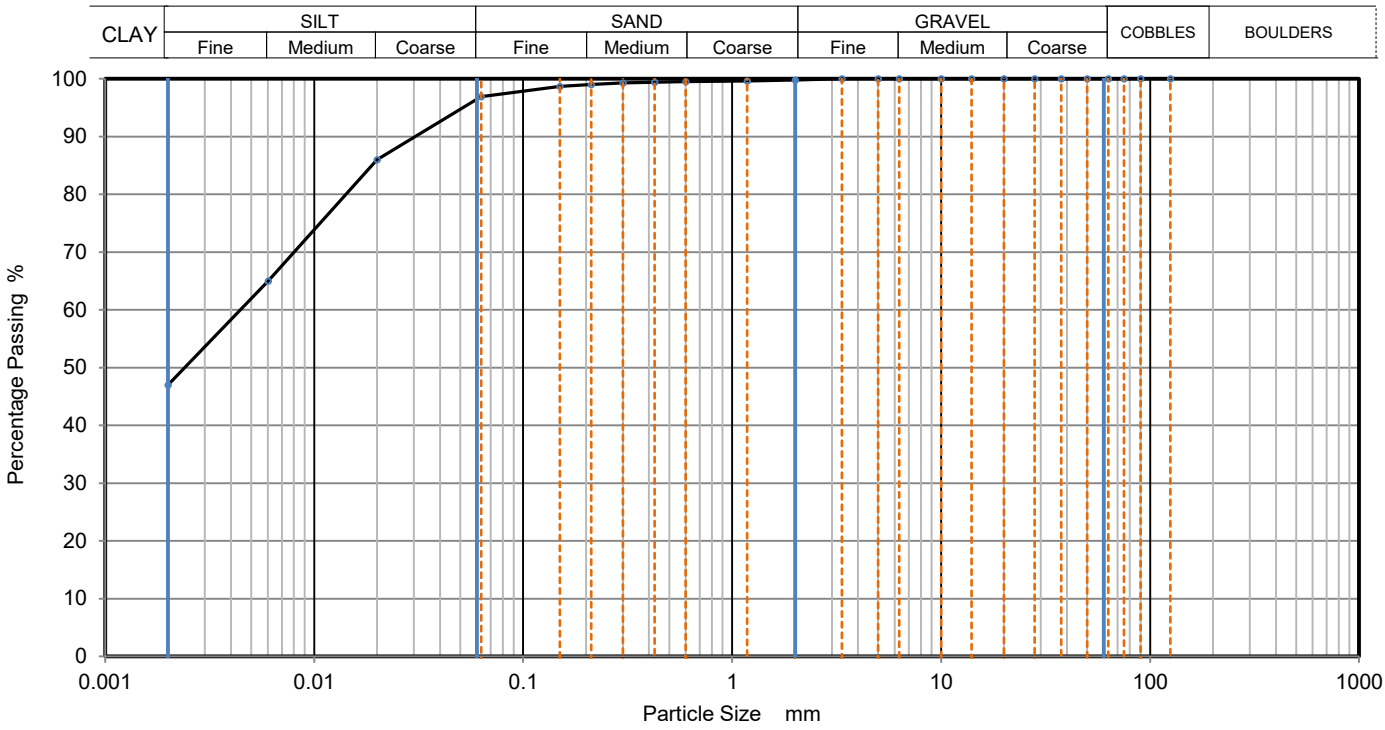
Checked and Approved

Initials: **J.P**

Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH1
				Sample No.	10
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	4.00 m
Soil Description	Medium strength brown slightly mottled grey silty CLAY with rare pockets of orange fine sand / silt and traces of selenite crystals and rootlets			Depth Base	4.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	86
90	100	0.0060	65
75	100	0.0020	47
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	99	2.70	Mg/m3
0.3	99		
0.212	99		
0.15	99		
0.063	97		

Dry Mass of sample, g: 4

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.2
Sand	2.9
Silt	50.0
Clay	46.9

Grading Analysis		
D100	mm	
D60	mm	0.00447
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Email: james@k4soils.com

Tel: 01923 711288

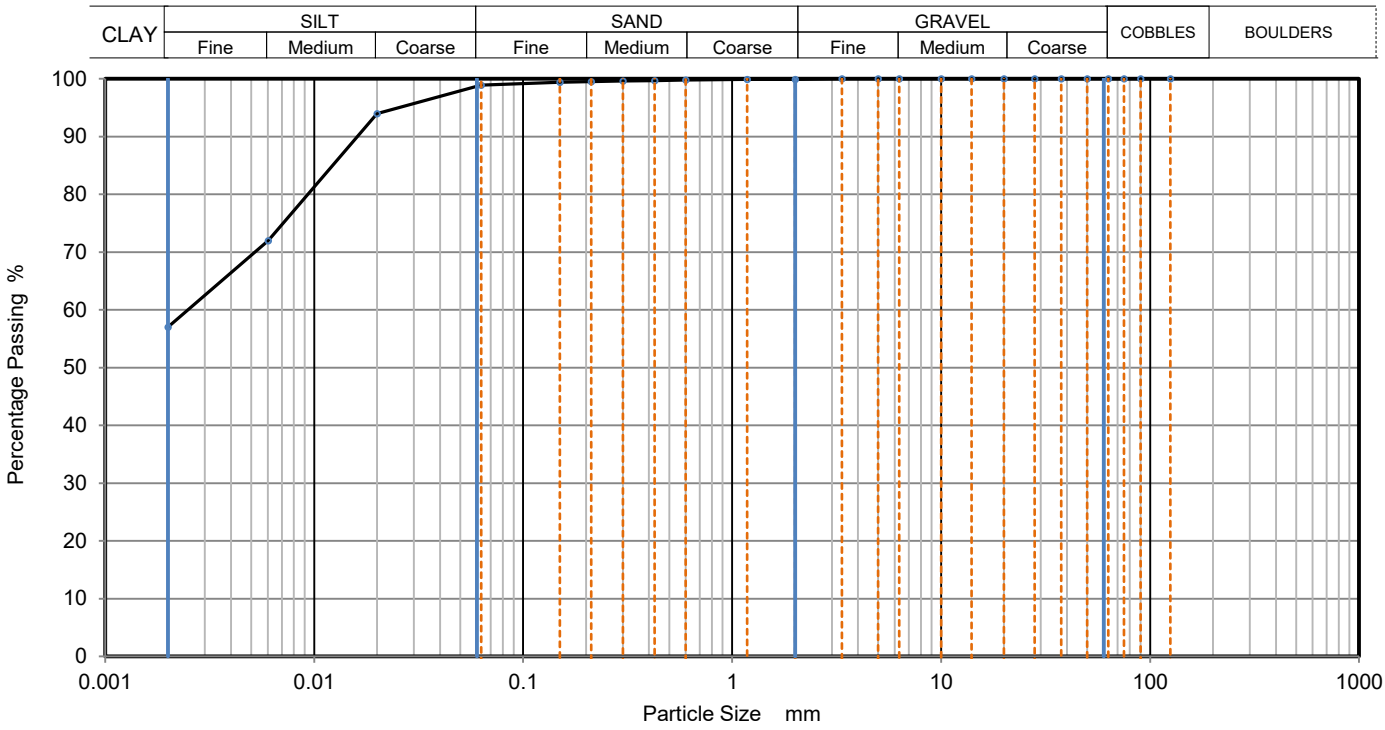
Checked and Approved

Initials: **J.P**

Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

				Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	12
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	5.00 m
Soil Description	High strength brown silty CLAY with rare pockets of orange fine sand / silt			Depth Base	5.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	94
90	100	0.0060	72
75	100	0.0020	57
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.70	Mg/m3
0.3	100		
0.212	100		
0.15	99		
0.063	99		

Dry Mass of sample, g: 3

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.1
Sand	1.1
Silt	42.2
Clay	56.6

Grading Analysis		
D100	mm	
D60	mm	0.00255
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

Checked and Approved

Initials: **J.P**

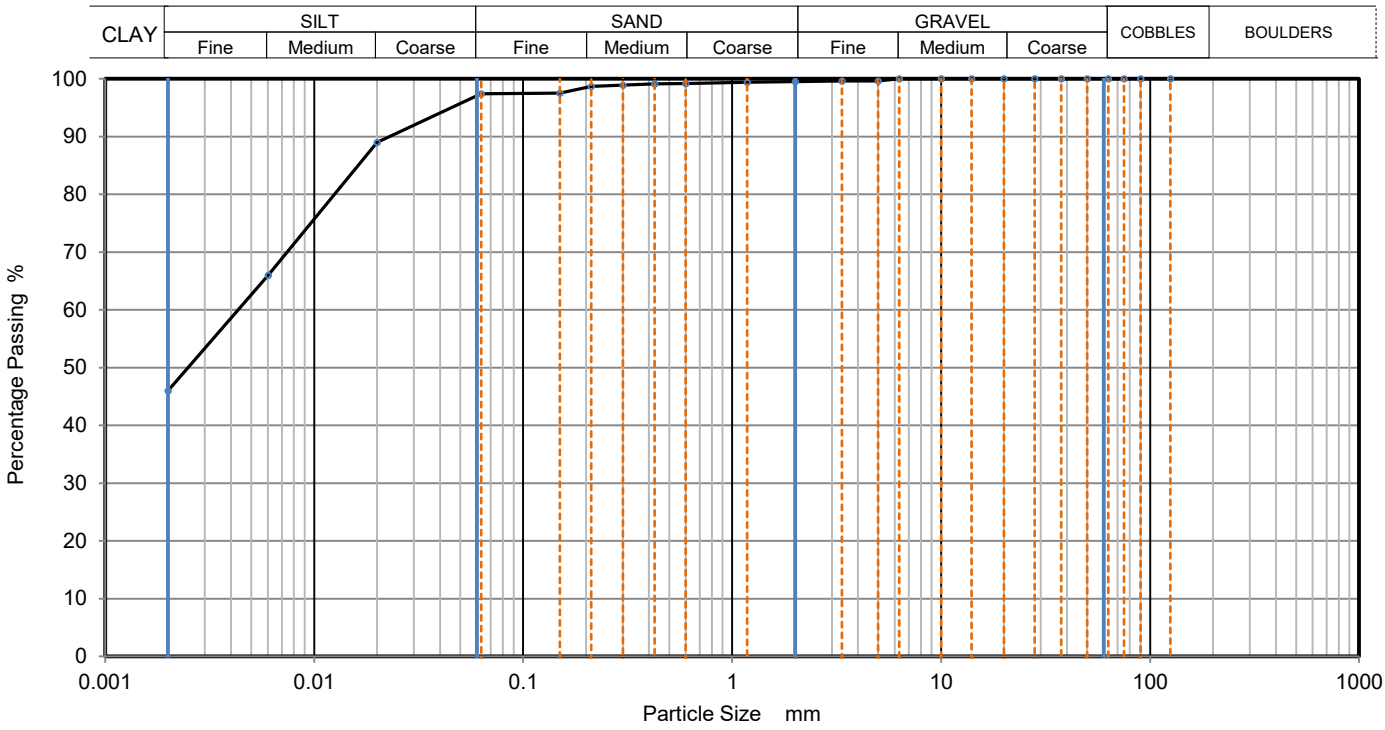
Date: 06/11/2018

UKAS TESTING 2519

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

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH1
Project No.	G1808	Client	Eldred Geotechnics Ltd	Sample No.	14
				Depth Top	6.00 m
Soil Description	High strength dark brown slightly mottled orangish brown silty CLAY with occasional pockets of fine sand / silt			Depth Base	6.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	89
90	100	0.0060	66
75	100	0.0020	46
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density (assumed)	
0.425	99	2.70	Mg/m3
0.3	99		
0.212	99		
0.15	98		
0.063	97		

Dry Mass of sample, g	4

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.5
Sand	2.1
Silt	51.6
Clay	45.8

Grading Analysis		
D100	mm	
D60	mm	0.00439
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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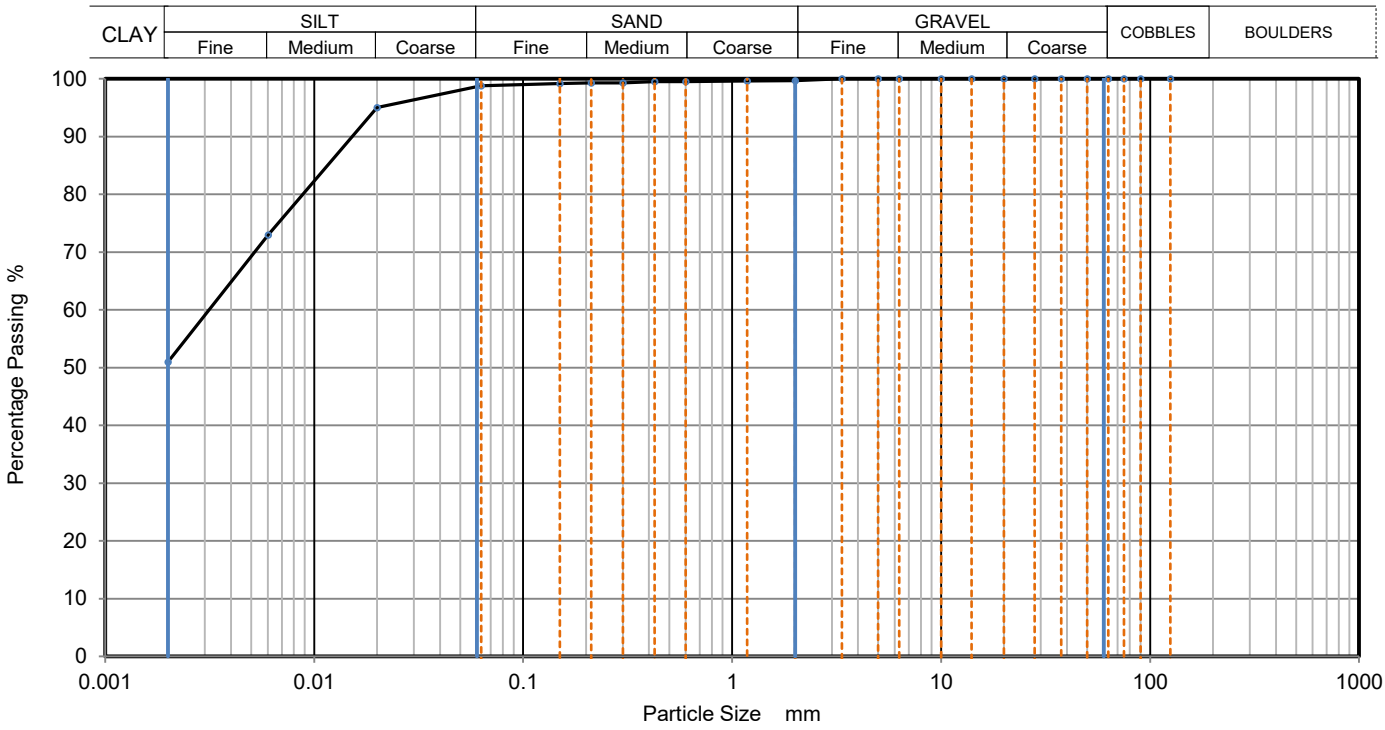
Initials: **J.P**

Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH1
Project No.	G1808	Client	Eldred Geotechnics Ltd	Sample No.	16
				Depth Top	7.00 m
Soil Description	High strength dark grey silty CLAY with rare pockets of fine sand			Depth Base	7.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	95
90	100	0.0060	73
75	100	0.0020	51
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.70	Mg/m3
0.3	99		
0.212	99		
0.15	99		
0.063	99		

Dry Mass of sample, g: 1

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.3
Sand	1.0
Silt	47.3
Clay	51.4

Grading Analysis		
D100	mm	
D60	mm	0.00312
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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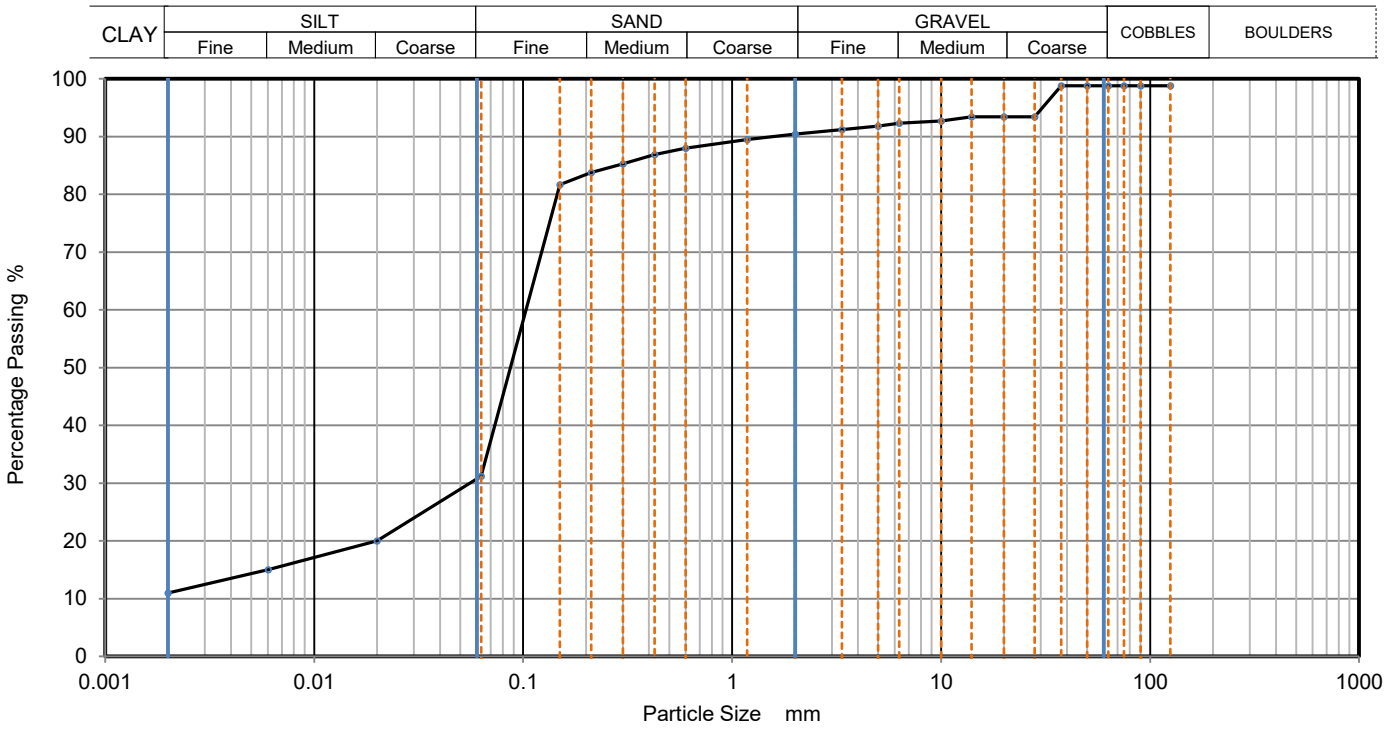
Initials: **J.P**

Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

				Job Ref	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	3
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	1.00 m
Soil Description	Greenish grey and occasional dark grey gravelly clayey very silty SAND with rare cobbles (gravel is fmc and sub-angular to sub-rounded)			Depth Base	1.45 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	01/11/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	99	0.0200	20
90	99	0.0060	15
75	99	0.0020	11
63	99		
50	99		
37.5	99		
28	93		
20	93		
14	93		
10	93		
6.3	92		
5	92		
3.35	91		
2	90		
1.18	90		
0.6	88	Particle density (assumed)	
0.425	87	2.70	Mg/m3
0.3	85		
0.212	84		
0.15	82		
0.063	31		

Dry Mass of sample, g: 601

Sample Proportions	% dry mass
Very coarse	1.2
Gravel	8.4
Sand	59.2
Silt	20.1
Clay	11.1

Grading Analysis		
D100	mm	
D60	mm	0.103
D30	mm	0.0557
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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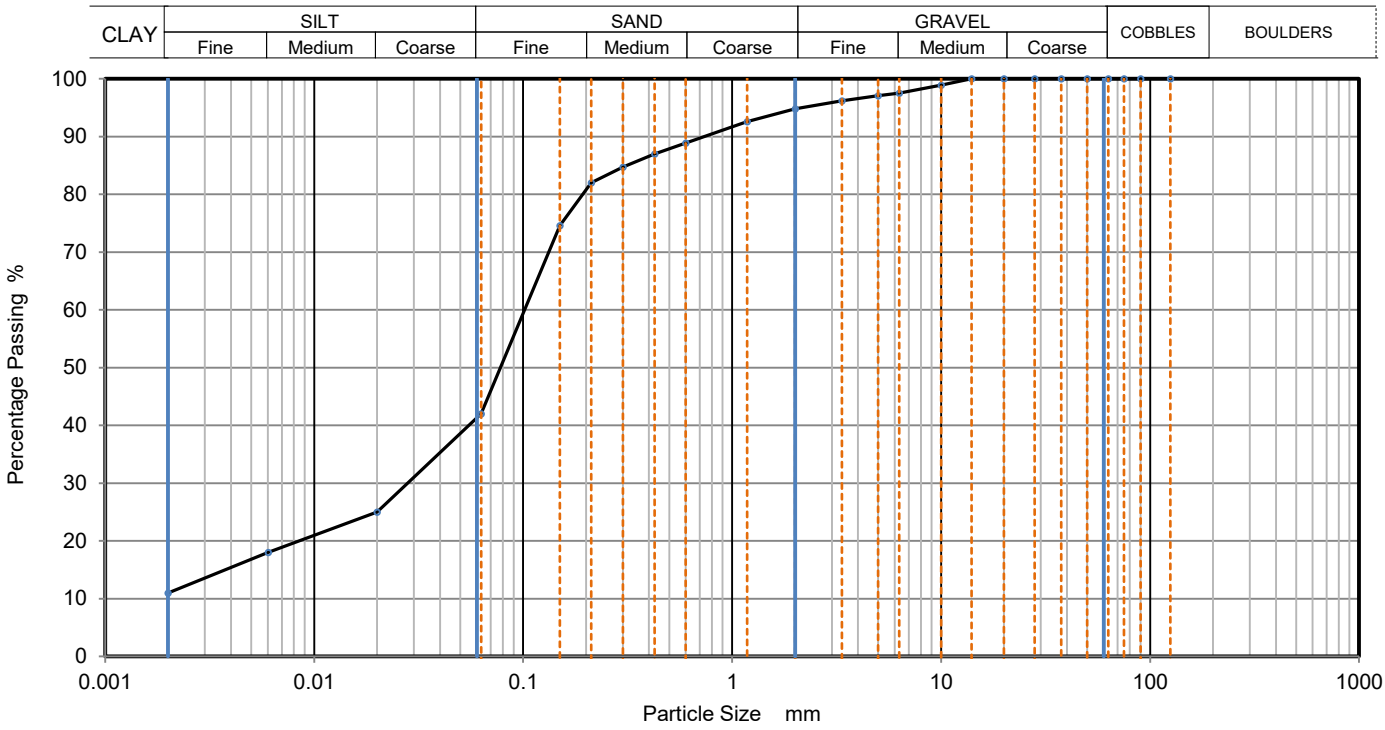
Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH2
				Sample No.	4
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	1.50 m
Soil Description	High strength brown and orangish brown mottled slightly gravelly sandy silty CLAY with rare brick fragments and traces of carbonaceous deposits (gravel is fm and sub-angular)			Depth Base	1.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	25
90	100	0.0060	18
75	100	0.0020	11
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5	97		
3.35	96		
2	95		
1.18	93		
0.6	89	Particle density (assumed)	
0.425	87	2.70	Mg/m3
0.3	85		
0.212	82		
0.15	75		
0.063	42		

Dry Mass of sample, g	312

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	5.2
Sand	52.8
Silt	30.7
Clay	11.3

Grading Analysis		
D100	mm	
D60	mm	0.102
D30	mm	0.0286
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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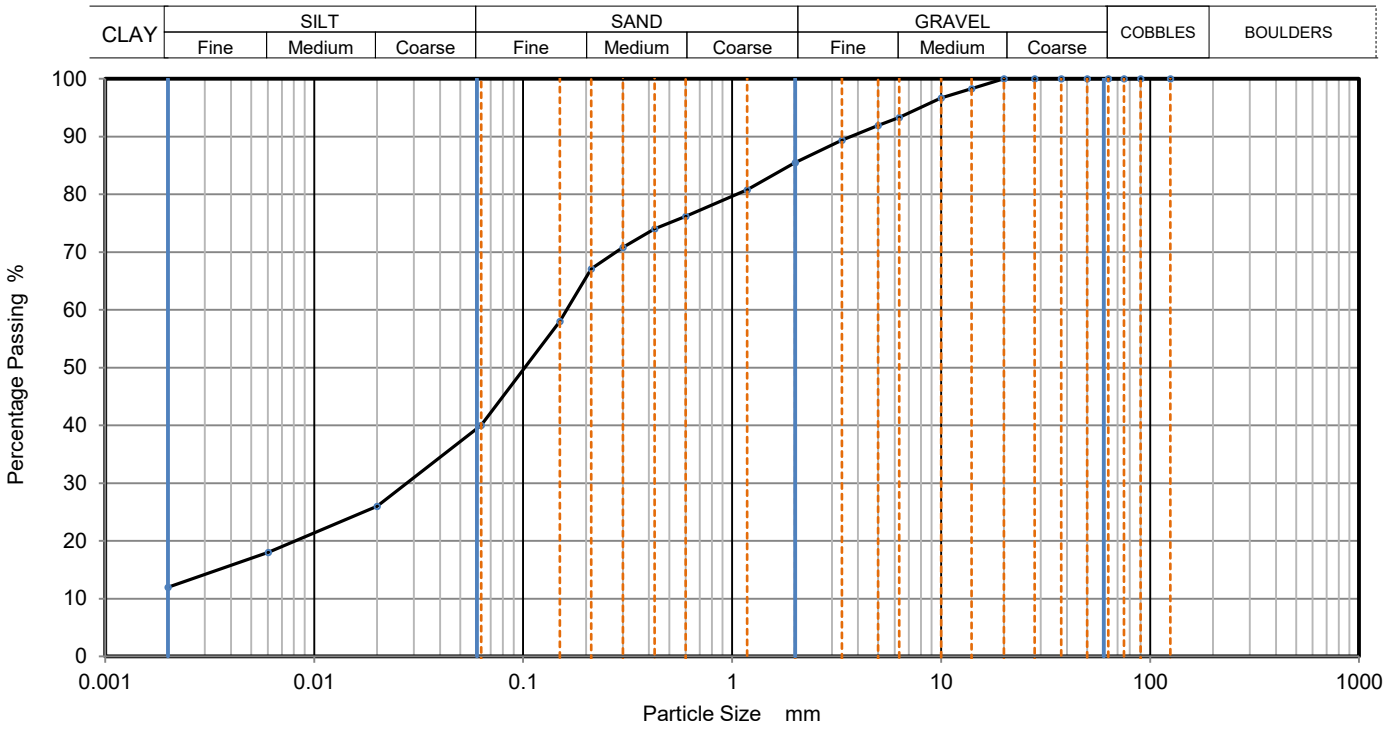
Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	8
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	2.50 m
Soil Description	Medium strength grey, brown and orangish brown mottled slightly gravelly sandy silty CLAY (gravel is fm and rounded to sub-angular)			Depth Base	2.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018

Job Ref: 25366
Borehole/Pit No.: BH2



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	26
90	100	0.0060	18
75	100	0.0020	12
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	97		
6.3	93		
5	92		
3.35	89		
2	86		
1.18	81		
0.6	76	Particle density (assumed)	
0.425	74	2.70	Mg/m3
0.3	71		
0.212	67		
0.15	58		
0.063	40		

Dry Mass of sample, g: 188

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	14.5
Sand	45.5
Silt	27.5
Clay	12.5

Grading Analysis		
D100	mm	
D60	mm	0.162
D30	mm	0.0275
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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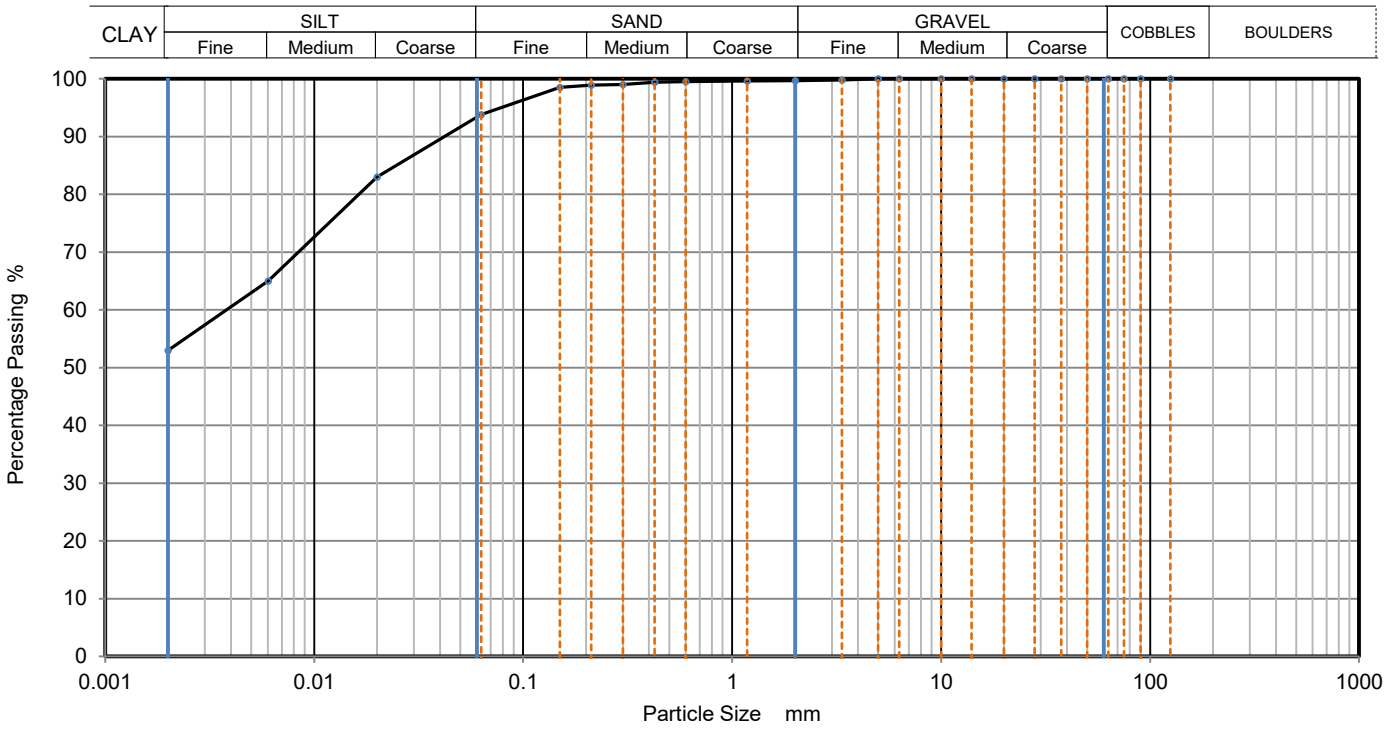
Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH2
Project No.	G1808	Client	Eldred Geotechnics Ltd	Sample No.	11
				Depth Top	3.00 m
Soil Description	Brown slightly mottled grey slightly sandy silty CLAY			Depth Base	3.45 m
				Sample Type	B
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	01/11/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	83
90	100	0.0060	65
75	100	0.0020	53
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	99	2.70	Mg/m3
0.3	99		
0.212	99		
0.15	99		
0.063	94		

Dry Mass of sample, g: 14

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.3
Sand	5.9
Silt	40.8
Clay	53.0

Grading Analysis		
D100	mm	
D60	mm	0.00378
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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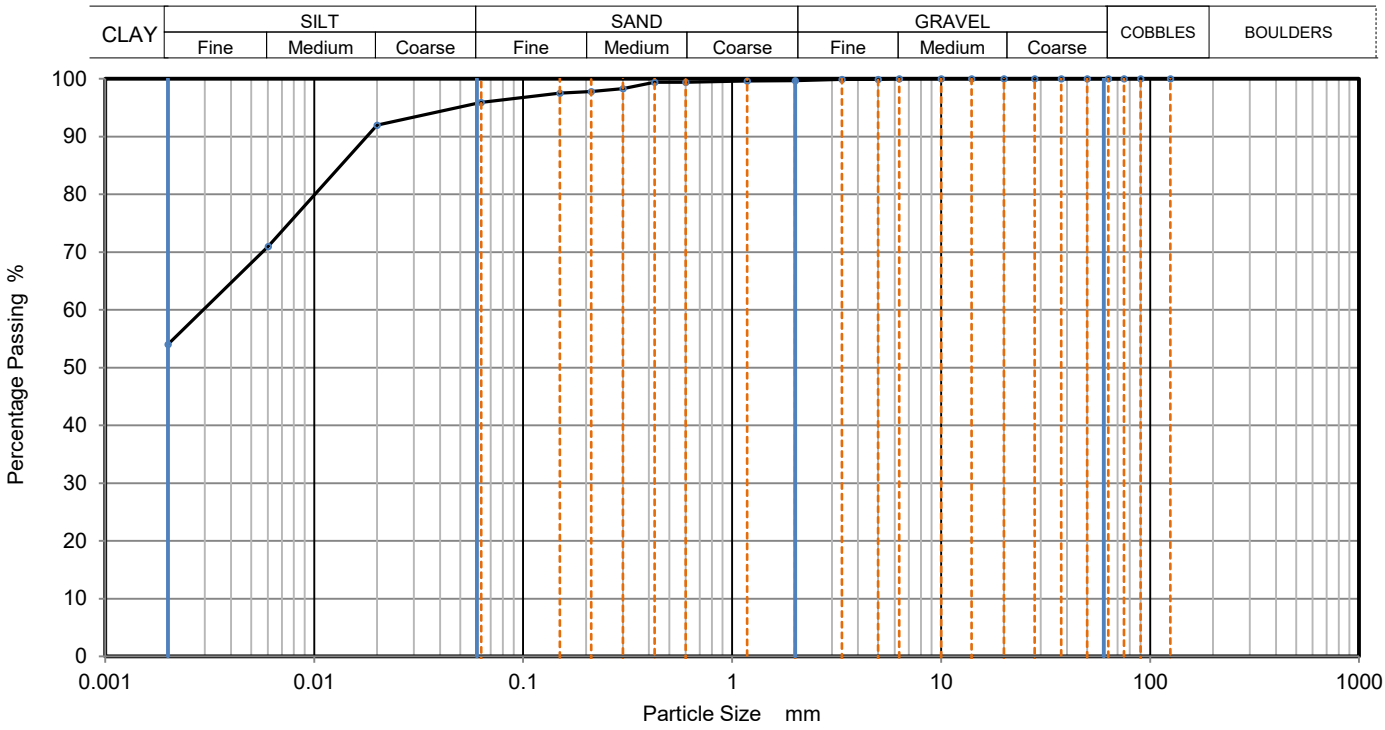
Date: 06/11/2018

PARTICLE SIZE DISTRIBUTION

Job Ref	25366				
Borehole/Pit No.	BH2				
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	11
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	3.50 m
Soil Description	High strength brown and orangish brown mottled silty CLAY with occasional pockets of fine sand and rare fine gravel			Depth Base	3.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	92
90	100	0.0060	71
75	100	0.0020	54
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99	Particle density (assumed)	
0.425	99	2.70	Mg/m3
0.3	98		
0.212	98		
0.15	98		
0.063	96		

Dry Mass of sample, g: 4

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.3
Sand	3.8
Silt	41.9
Clay	54.0

Grading Analysis		
D100	mm	
D60	mm	0.00293
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Checked and Approved

Initials: **J.P**

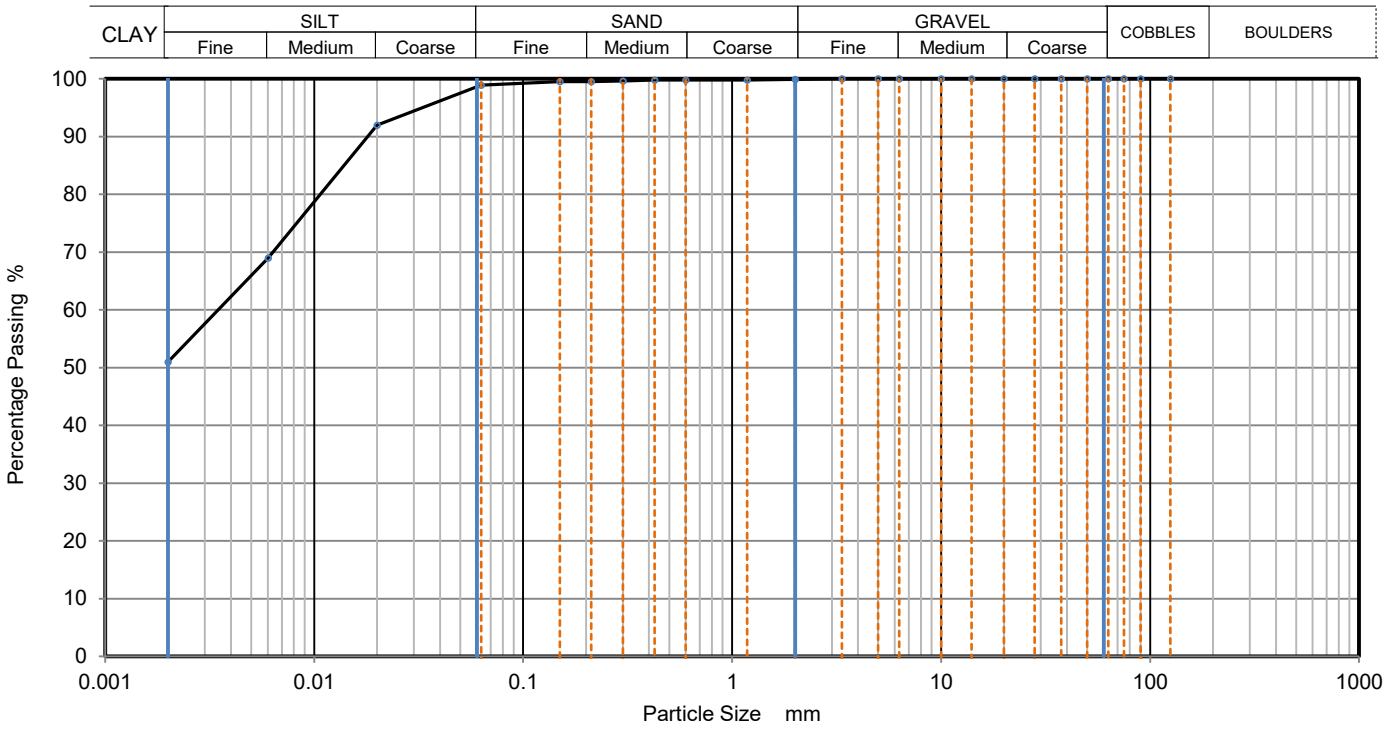
Date: 06/11/2018

UKAS TESTING 2519

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

PARTICLE SIZE DISTRIBUTION

Site Name	31 Willoughby Road, London NW3 1RT			Job Ref	25366
				Borehole/Pit No.	BH2
				Sample No.	14
Project No.	G1808	Client	Eldred Geotechnics Ltd	Depth Top	4.50 m
Soil Description	High strength slightly mottled orangish brown and grey silty CLAY with occasional pockets of fine sand			Depth Base	4.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	23/10/2018
				Date tested	31/10/2018



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	92
90	100	0.0060	69
75	100	0.0020	51
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.70	Mg/m3
0.3	100		
0.212	100		
0.15	100		
0.063	99		

Dry Mass of sample, g: 2

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.1
Sand	1.0
Silt	47.8
Clay	51.1

Grading Analysis		
D100	mm	
D60	mm	0.00345
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Date: 06/11/2018

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	
25366	31 Willoughby Road, London NW3 1RT	Samples received	17/08/2018
		Schedule received	22/10/2018
Project No.	Client	Project started	23/10/2018
G1808	Eldreds	Testing Started	29/10/2018

Hole No.	Sample Ref	Top m	Base m	Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure: Axial strain %	At failure: σ1 - σ3 kPa	At failure: cu kPa	At failure: Mode	Remarks
BH1	5	2.00	2.45	U	High strength brown mottled orangish brown clayey gravelly silty SAND with rare fine brick fragments (gravel is fmc and rounded to sub-angular)	UU	1.83	1.48	23	198	102	50	5.6	170	85	B	
BH1	10	4.00	4.45	U	Medium strength brown slightly mottled grey silty CLAY with rare pockets of orange fine sand / silt and traces of selenite crystals and rootlets	UU	1.93	1.45	33	198	102	70	7.1	140	70	B	
BH1	12	5.00	5.45	U	High strength brown silty CLAY with rare pockets of orange fine sand / silt	UU	1.88	1.42	33	198	102	100	7.6	202	101	B	
BH1	14	6.00	6.45	U	High strength dark brown slightly mottled orangish brown silty CLAY with occasional pockets of fine sand / silt	UU	1.94	1.50	29	198	102	120	5.1	255	127	B	
BH1	16	7.00	7.45	U	High strength dark grey silty CLAY with rare pockets of fine sand	UU	1.99	1.52	30	198	102	140	7.6	204	102	B	
BH1	18	8.00	8.45	U	High strength dark grey silty CLAY	UU	2.03	1.57	29	198	102	160	11	190	95	C	
BH1	23	10.00	10.45	U	Very high strength dark grey silty CLAY with occasional pockets of fine sand	UU	2.03	1.59	28	198	102	200	5.1	360	180	B	
BH1	29	12.00	12.45	U	Very high strength dark grey silty CLAY with occasional pockets of fine sand	UU	2.02	1.63	24	198	102	240	2.5	340	170	B	Disturbed
BH1	35	14.00	14.45	U	Very high strength dark grey silty CLAY with frequent pockets of fine sand and rare decayed shell deposits	UU	2.11	1.69	25	198	102	280	19	335	168	C	
BH2	4	1.50	1.95	U	High strength brown and orangish brown mottled slightly gravelly sandy silty CLAY with rare brick fragments and traces of carbonaceous deposits (gravel is fm and sub-angular)	UU	2.05	1.62	27	198	102	50	17	172	86	C	
BH2	8	2.50	2.95	U	Medium strength grey, brown and orangish brown mottled slightly gravelly sandy silty CLAY (gravel is fm and rounded to sub-angular)	UU	2.04	1.66	23	198	102	50	20	83	41	P	
BH2	11	3.50	3.95	U	High strength brown and orangish brown mottled silty CLAY with occasional pockets of fine sand and rare fine gravel	UU	1.99	1.50	33	198	102	60	6.1	175	87	B	
BH2	14	4.50	4.95	U	High strength slightly mottled orangish brown and grey silty CLAY with occasional pockets of fine sand	UU	2.01	1.51	33	198	102	75	8.1	171	86	C	

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: 15/11/2018

2519

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

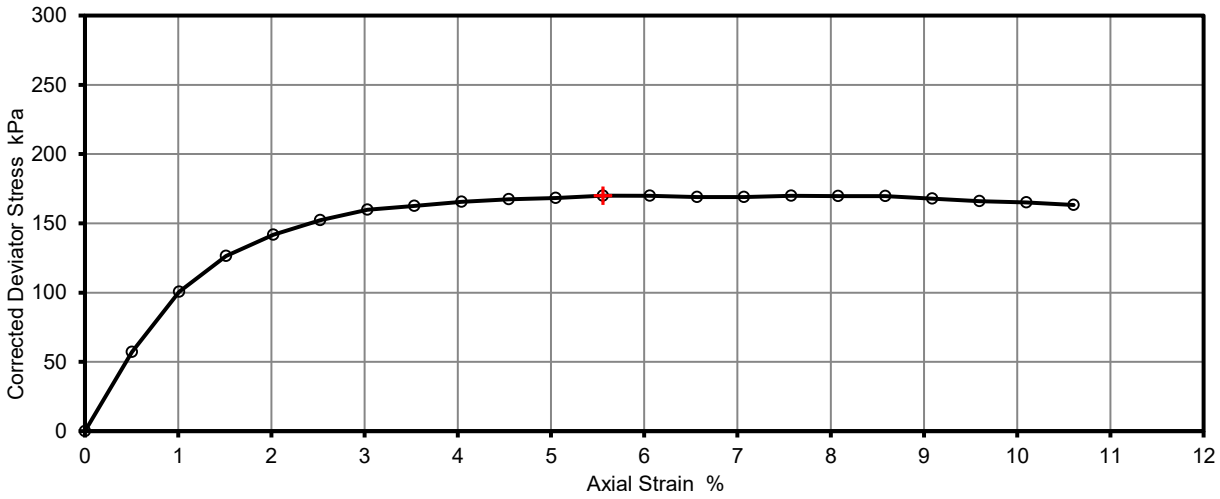
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	5
Project No.	G1808	Client	Eldreds	Depth Top	2.00 m
Soil Description	High strength brown mottled orangish brown clayey gravelly silty SAND with rare fine brick fragments (gravel is fmc and rounded to sub-angular)			Depth Base	2.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

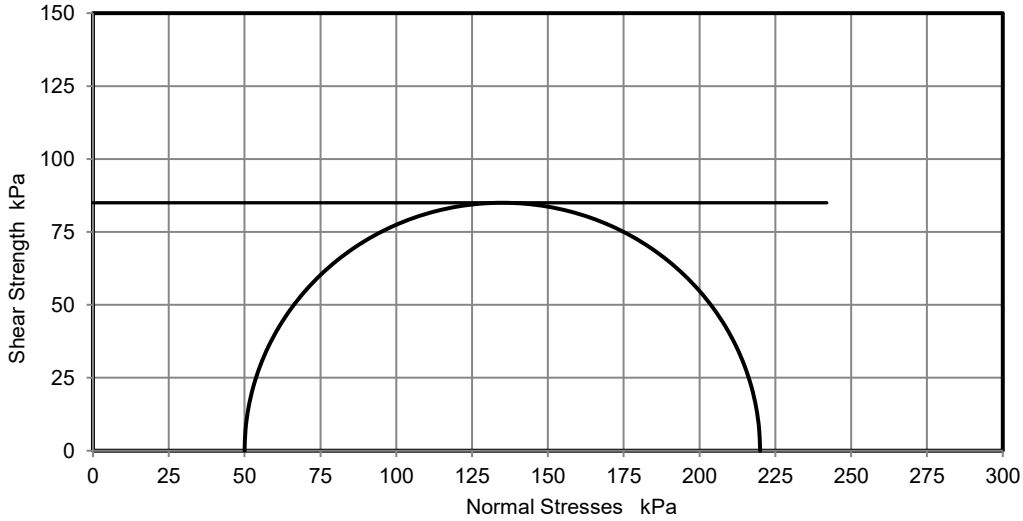
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.83	Mg/m3
Moisture Content	23	%
Dry Density	1.48	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	50	kPa
Axial Strain	5.6	%
Deviator Stress, (σ1 - σ3)f	170	kPa
Undrained Shear Strength, cu	85	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
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Email: James@k4soils.com

Checked and Approved
Initials: J.P
Date 15/11/2018

UKAS TESTING 2519

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

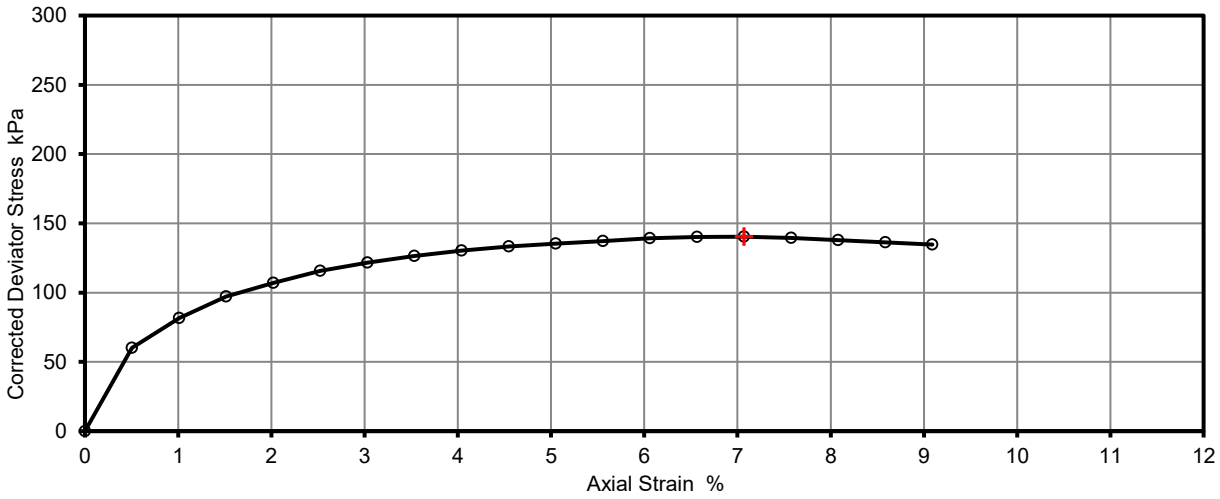
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	10
Project No.	G1808	Client	Eldreds	Depth Top	4.00 m
Soil Description	Medium strength brown slightly mottled grey silty CLAY with rare pockets of orange fine sand / silt and traces of selenite crystals and rootlets			Depth Base	4.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	28/10/2018

Remarks

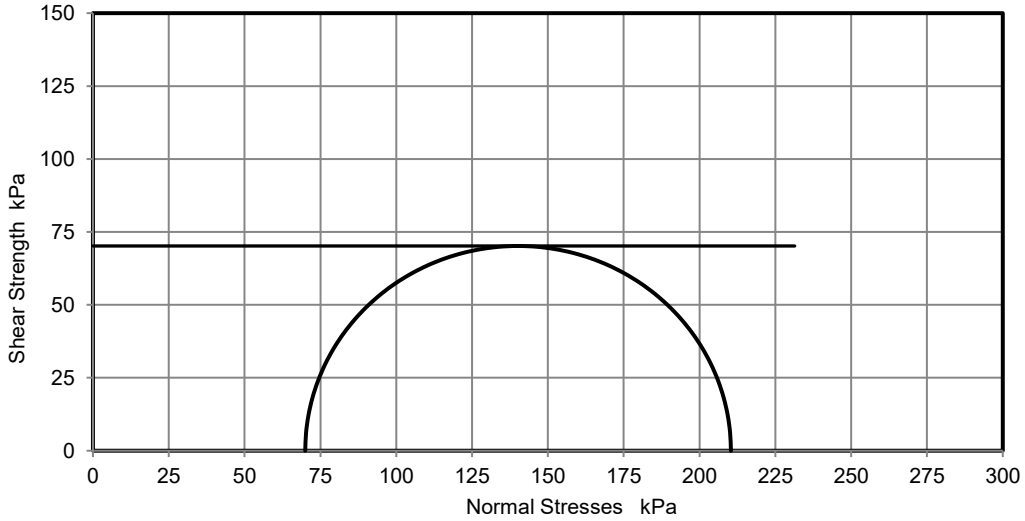
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.93	Mg/m3
Moisture Content	33	%
Dry Density	1.45	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	70	kPa
Axial Strain	7.1	%
Deviator Stress, (σ1 - σ3)f	140	kPa
Undrained Shear Strength, cu	70	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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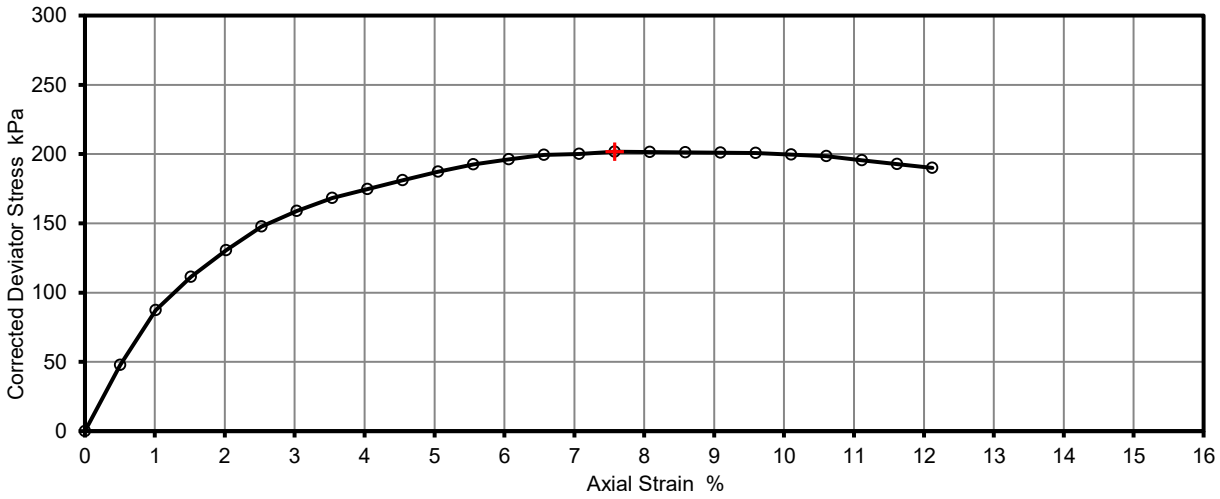
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	12
Project No.	G1808	Client	Eldreds	Depth Top	5.00 m
Soil Description	High strength brown silty CLAY with rare pockets of orange fine sand / silt			Depth Base	5.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

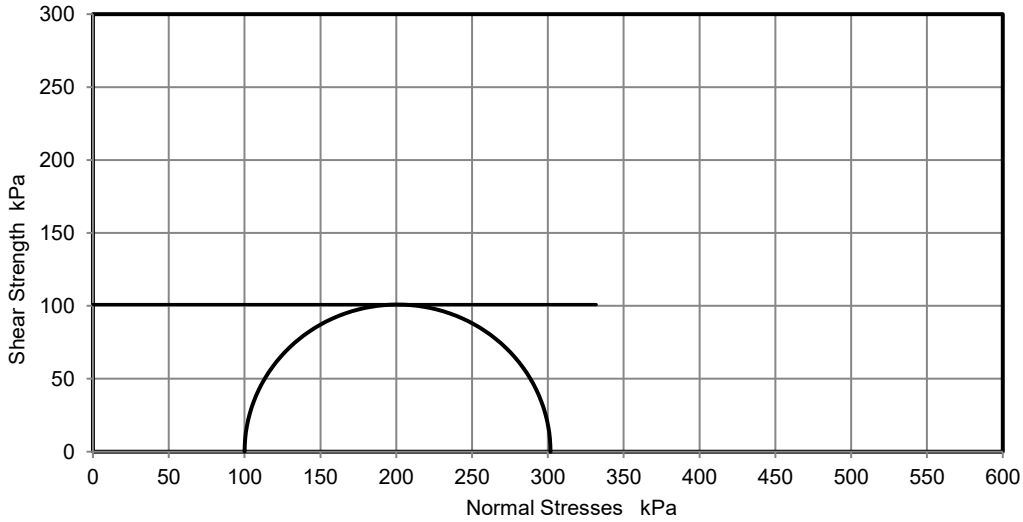
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.88	Mg/m3
Moisture Content	33	%
Dry Density	1.42	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	100	kPa
Axial Strain	7.6	%
Deviator Stress, (σ1 - σ3)f	202	kPa
Undrained Shear Strength, cu	101	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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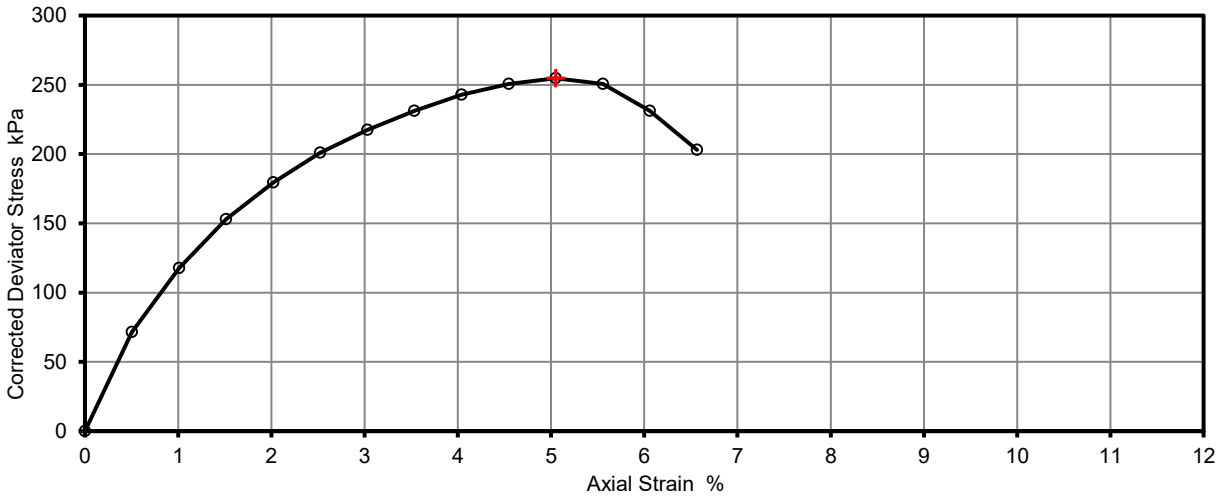
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	14
Project No.	G1808	Client	Eldreds	Depth Top	6.00 m
Soil Description	High strength dark brown slightly mottled orangish brown silty CLAY with occasional pockets of fine sand / silt			Depth Base	6.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

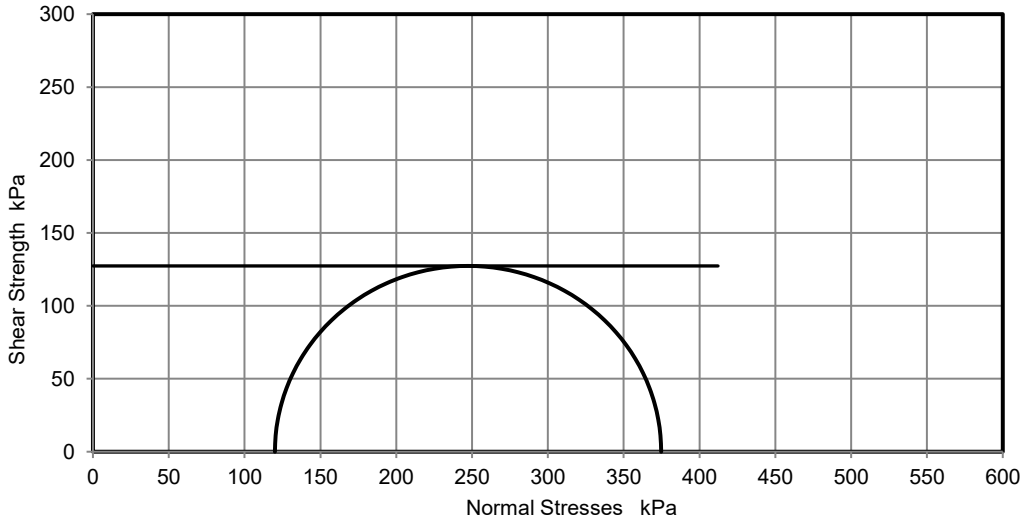
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.94	Mg/m3
Moisture Content	29	%
Dry Density	1.50	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	120	kPa
Axial Strain	5.1	%
Deviator Stress, (σ1 - σ3)f	255	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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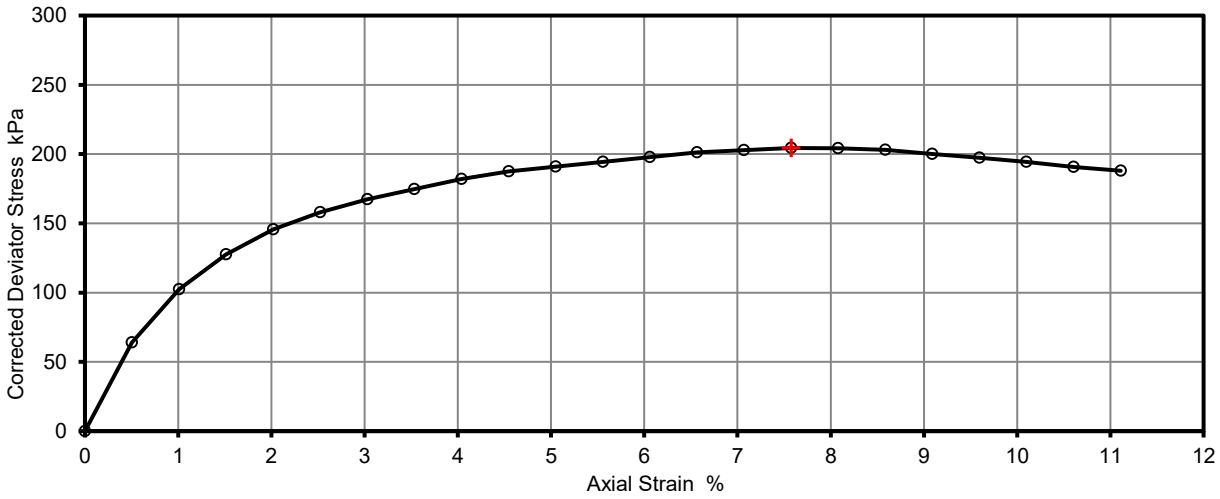
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	16
Project No.	G1808	Client	Eldreds	Depth Top	7.00 m
Soil Description	High strength dark grey silty CLAY with rare pockets of fine sand			Depth Base	7.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

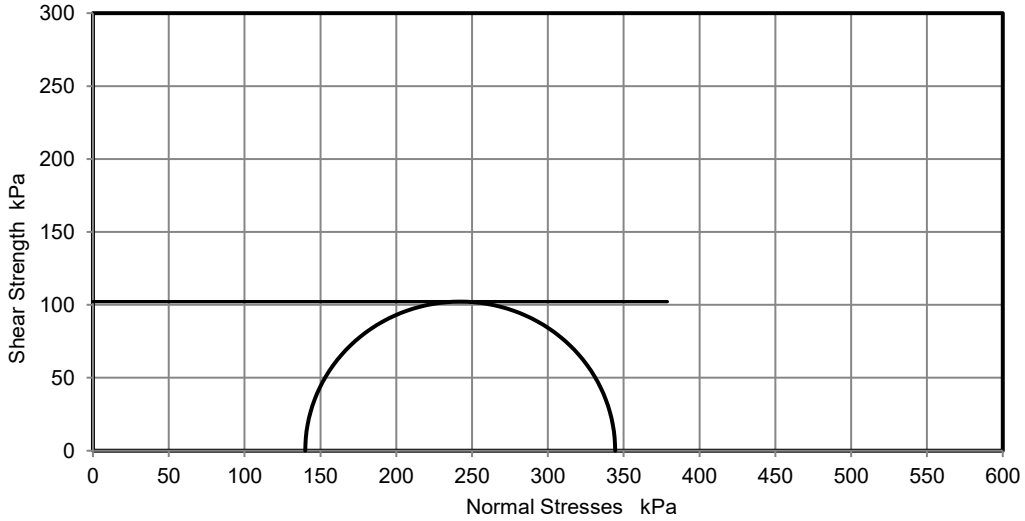
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.99	Mg/m3
Moisture Content	30	%
Dry Density	1.52	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	140	kPa
Axial Strain	7.6	%
Deviator Stress, (σ1 - σ3)f	204	kPa
Undrained Shear Strength, cu	102	kPa ½(σ1 - σ3)f
Mode of Failure	Brittle	

Deviator Stress v Axial Strain



Mohr Circles



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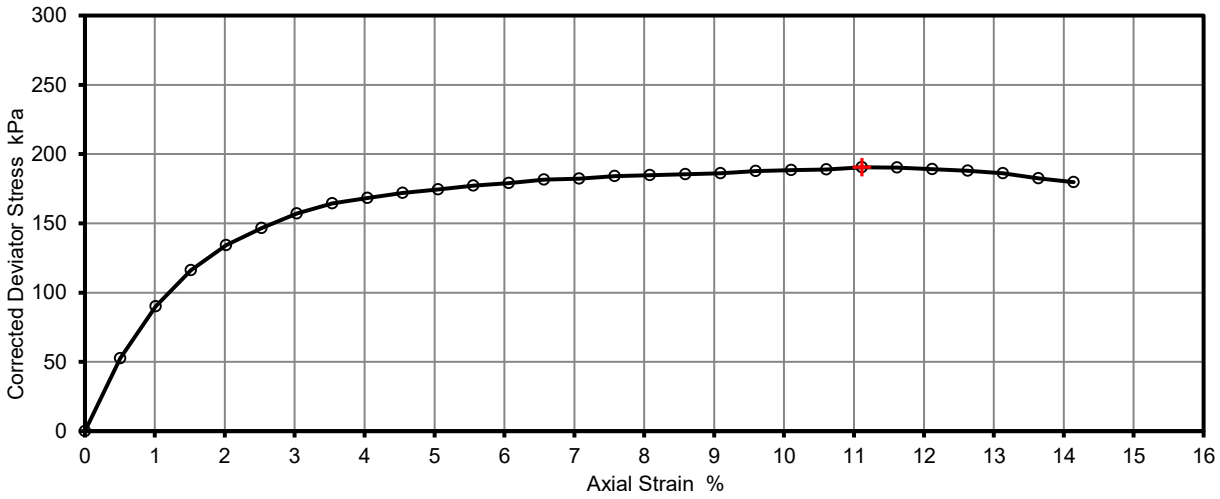
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	18
Project No.	G1808	Client	Eldreds	Depth Top	8.00 m
Soil Description	High strength dark grey silty CLAY			Depth Base	8.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

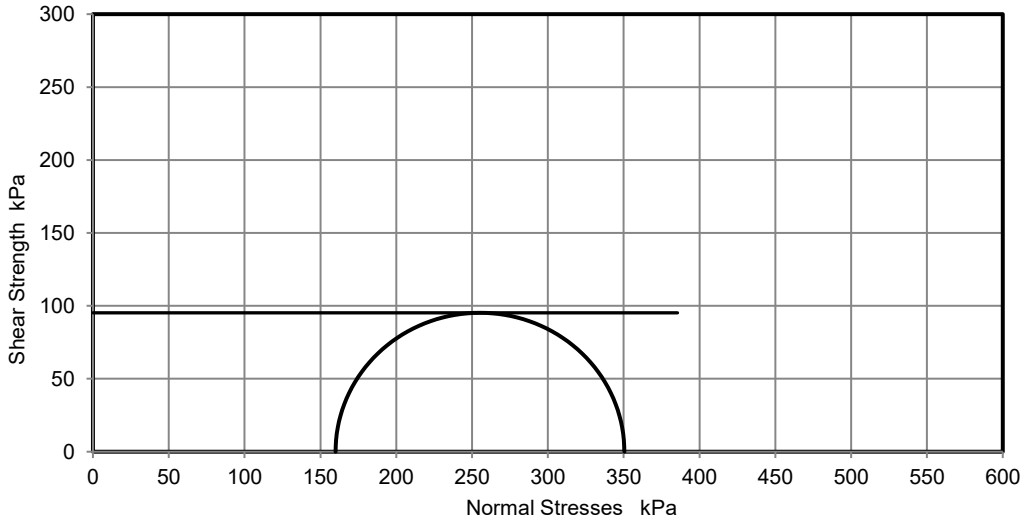
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.03	Mg/m3
Moisture Content	29	%
Dry Density	1.57	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	160	kPa
Axial Strain	11	%
Deviator Stress, (σ1 - σ3)f	190	kPa
Undrained Shear Strength, cu	95	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



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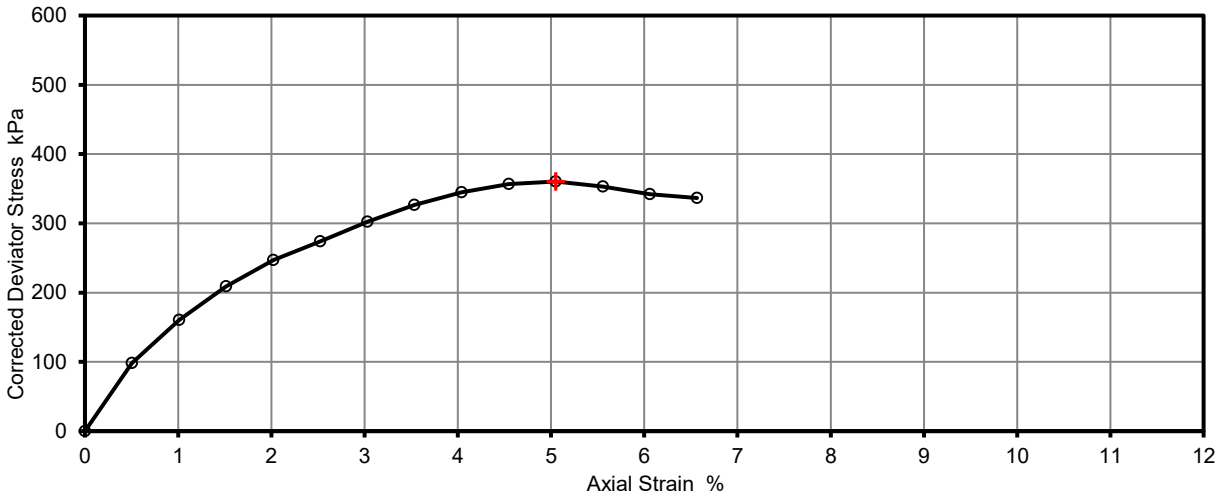
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	23
Project No.	G1808	Client	Eldreds	Depth Top	10.00 m
Soil Description	Very high strength dark grey silty CLAY with occasional pockets of fine sand			Depth Base	10.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	13/11/2018

Remarks

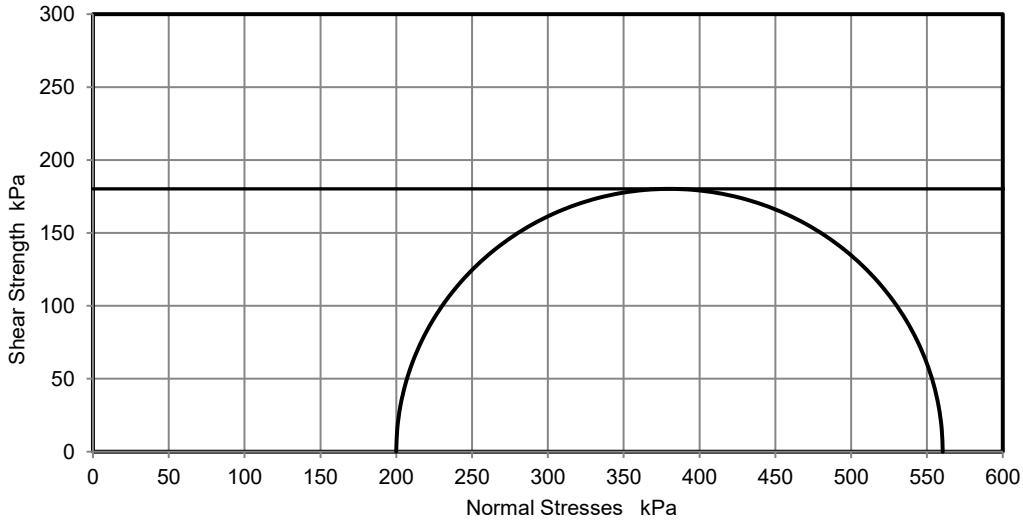
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.03	Mg/m3
Moisture Content	28	%
Dry Density	1.59	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	200	kPa
Axial Strain	5.1	%
Deviator Stress, (σ1 - σ3)f	360	kPa
Undrained Shear Strength, cu	180	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

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	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	29
Project No.	G1808	Client	Eldreds	Depth Top	12.00 m
Soil Description	Very high strength dark grey silty CLAY with occasional pockets of fine sand			Depth Base	12.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	13/11/2018

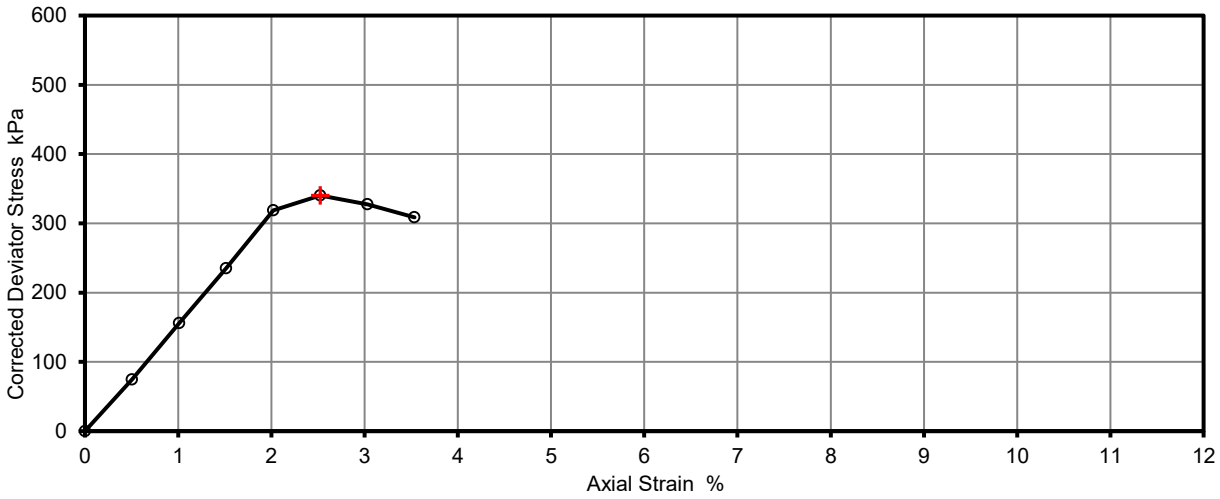
Remarks

Disturbed

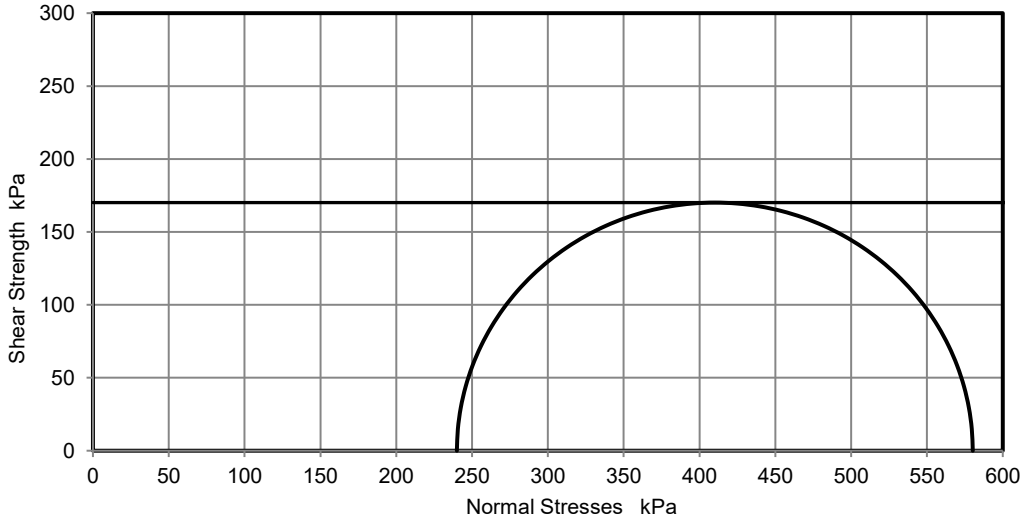
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.02	Mg/m3
Moisture Content	24	%
Dry Density	1.63	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	240	kPa
Axial Strain	2.5	%
Deviator Stress, (σ1 - σ3)f	340	kPa
Undrained Shear Strength, cu	170	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

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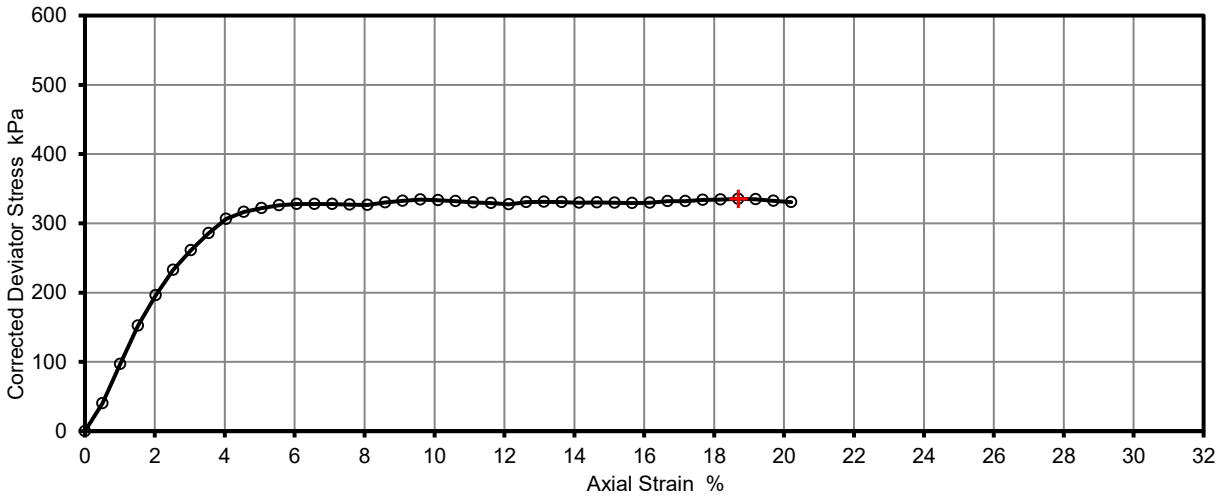
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH1
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	35
Project No.	G1808	Client	Eldreds	Depth Top	14.00 m
Soil Description	Very high strength dark grey silty CLAY with frequent pockets of fine sand and rare decayed shell deposits			Depth Base	14.45 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	13/11/2018

Remarks

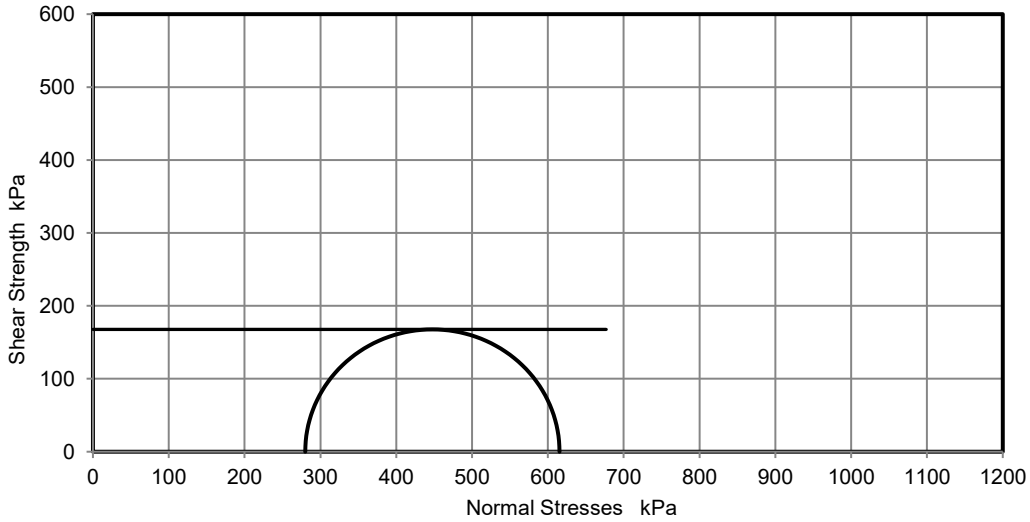
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.11	Mg/m3
Moisture Content	25	%
Dry Density	1.69	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	280	kPa
Axial Strain	19	%
Deviator Stress, (σ1 - σ3)f	335	kPa
Undrained Shear Strength, cu	168	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



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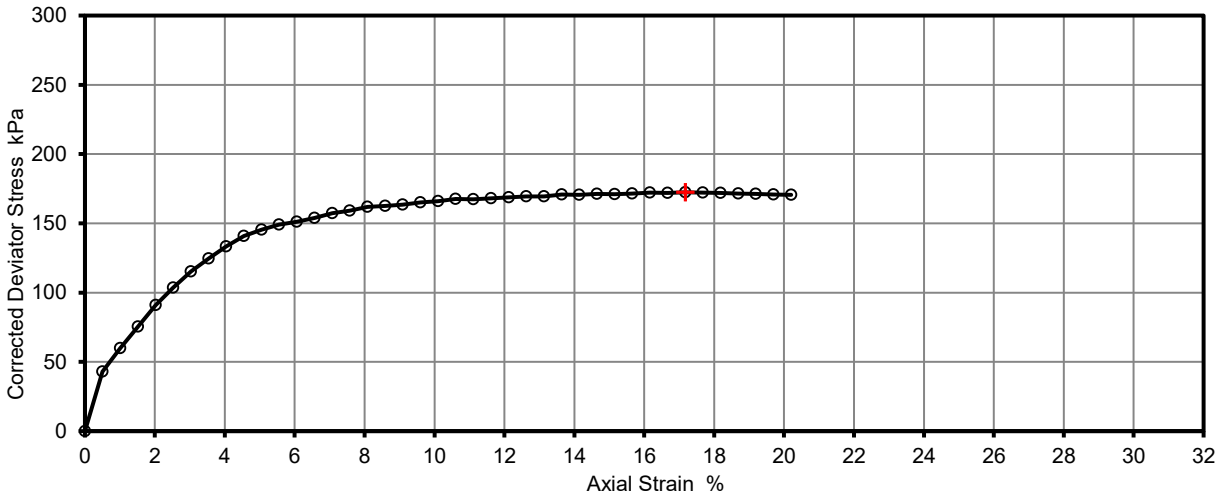
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	4
Project No.	G1808	Client	Eldreds	Depth Top	1.50 m
Soil Description	High strength brown and orangish brown mottled slightly gravelly sandy silty CLAY with rare brick fragments and traces of carbonaceous deposits (gravel is fm and sub-angular)			Depth Base	1.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

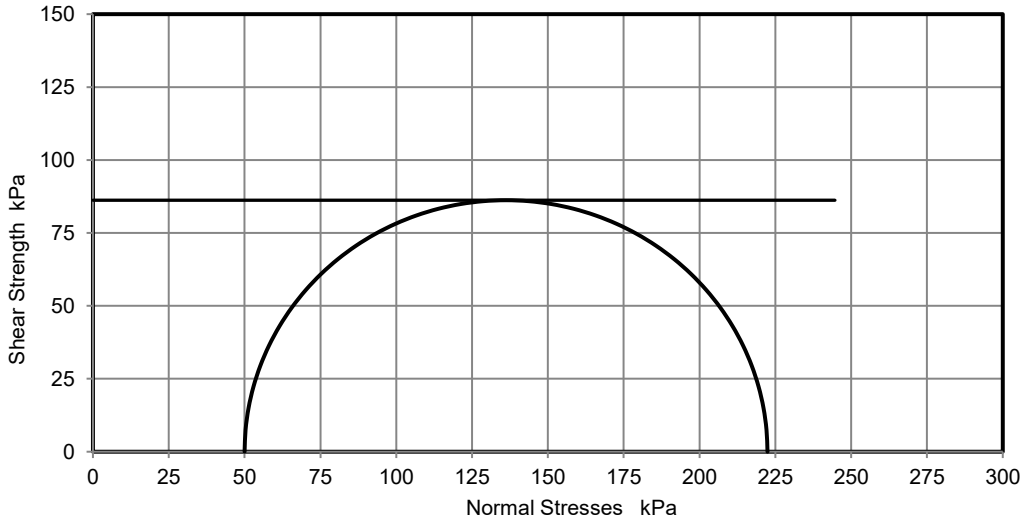
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.05	Mg/m3
Moisture Content	27	%
Dry Density	1.62	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	50	kPa
Axial Strain	17	%
Deviator Stress, (σ1 - σ3)f	172	kPa
Undrained Shear Strength, cu	86	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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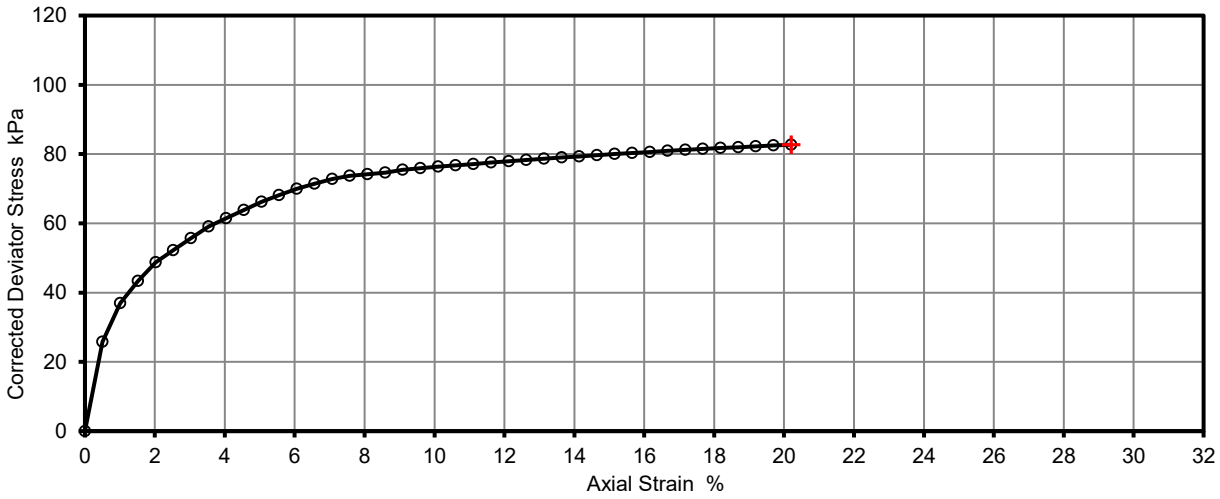
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	8
Project No.	G1808	Client	Eldreds	Depth Top	2.50 m
Soil Description	Medium strength grey, brown and orangish brown mottled slightly gravelly sandy silty CLAY (gravel is fm and rounded to sub-angular)			Depth Base	2.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

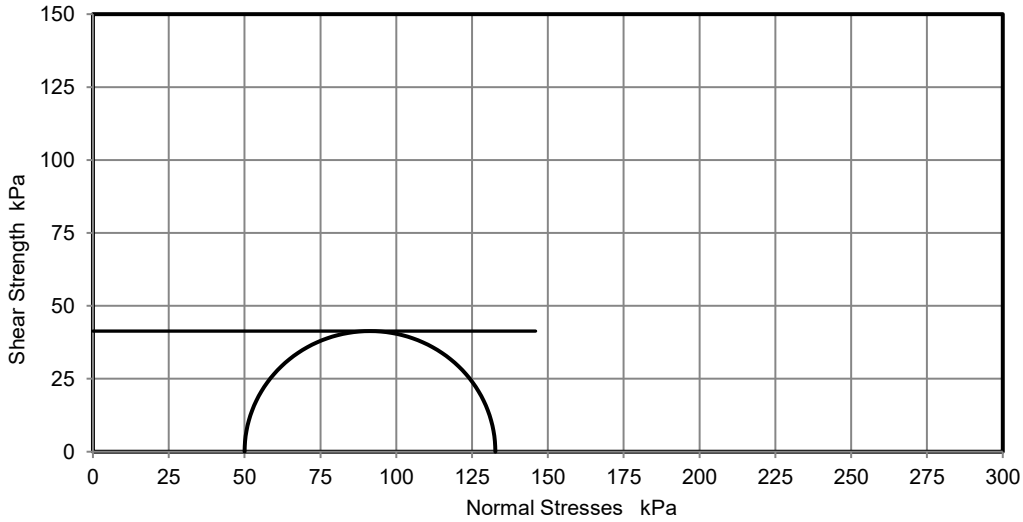
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.04	Mg/m3
Moisture Content	23	%
Dry Density	1.66	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	50	kPa
Axial Strain	20	%
Deviator Stress, (σ1 - σ3)f	83	kPa
Undrained Shear Strength, cu	41	kPa ½(σ1 - σ3)f
Mode of Failure	Plastic	

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 15/11/2018

UKAS TESTING 2519

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

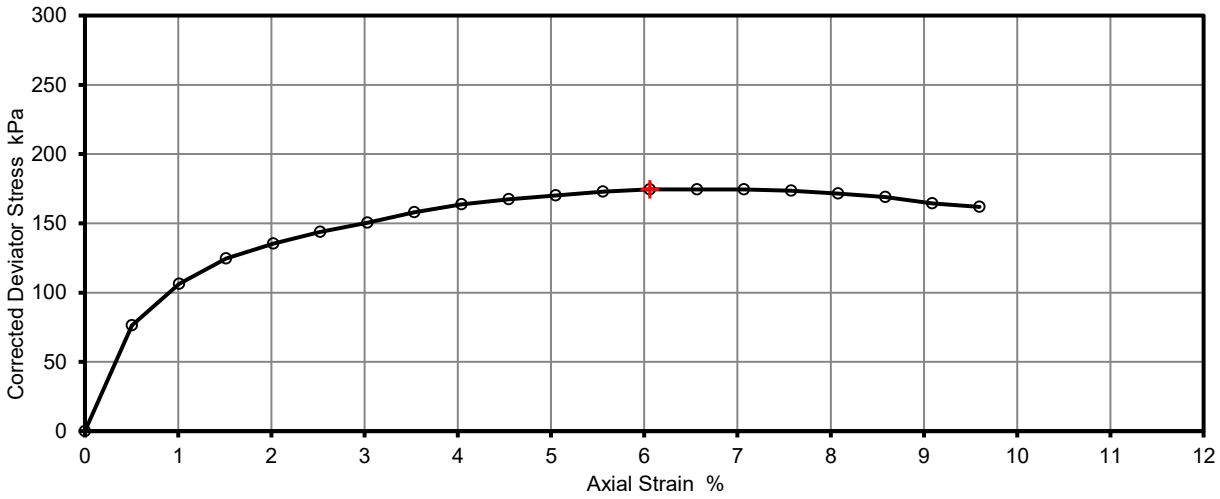
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	11
Project No.	G1808	Client	Eldreds	Depth Top	3.50 m
Soil Description	High strength brown and orangish brown mottled silty CLAY with occasional pockets of fine sand and rare fine gravel			Depth Base	3.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

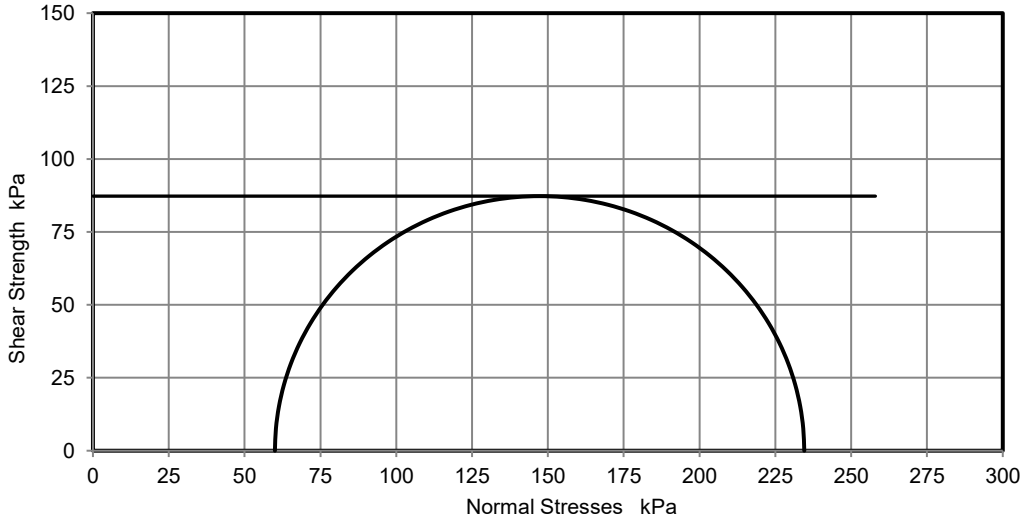
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	1.99	Mg/m3
Moisture Content	32	%
Dry Density	1.50	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	60	kPa
Axial Strain	6.1	%
Deviator Stress, (σ1 - σ3)f	175	kPa
Undrained Shear Strength, cu	87	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

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Checked and Approved
Initials: J.P
Date 15/11/2018

2519

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

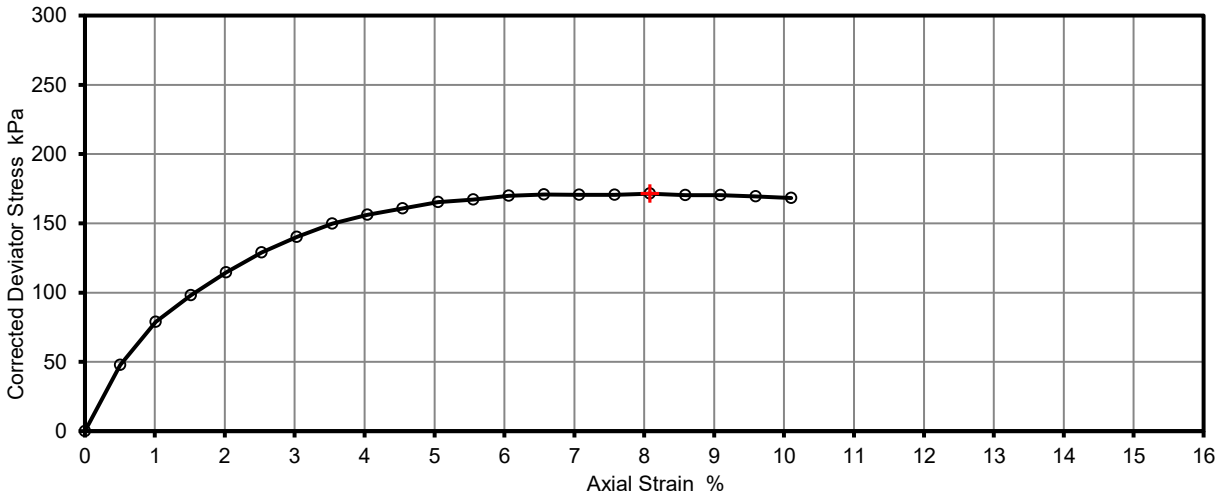
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	25366
				Borehole/Pit No.	BH2
Site Name	31 Willoughby Road, London NW3 1RT			Sample No.	14
Project No.	G1808	Client	Eldreds	Depth Top	4.50 m
Soil Description	High strength slightly mottled orangish brown and grey silty CLAY with occasional pockets of fine sand			Depth Base	4.95 m
				Sample Type	U
				Samples received	17/08/2018
				Schedules received	22/10/2018
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	29/10/2018

Remarks

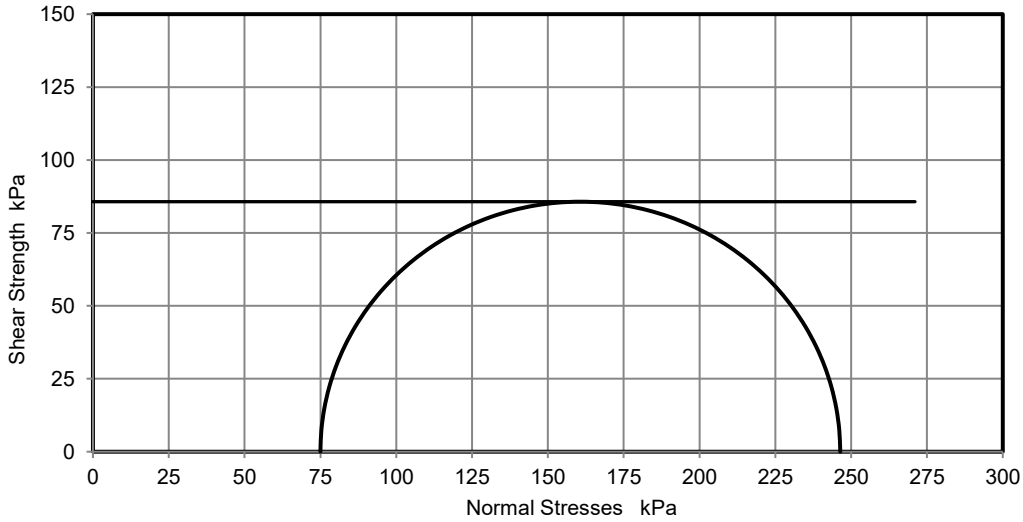
Position within sample

Test Number	1	
Length	198.0	mm
Diameter	102.0	mm
Bulk Density	2.01	Mg/m3
Moisture Content	33	%
Dry Density	1.51	Mg/m3
Rate of Strain	2.0	%/min
Cell Pressure	75	kPa
Axial Strain	8.1	%
Deviator Stress, (σ1 - σ3)f	171	kPa
Undrained Shear Strength, cu	86	kPa ½(σ1 - σ3)f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



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Date 15/11/2018

UKAS TESTING 2519

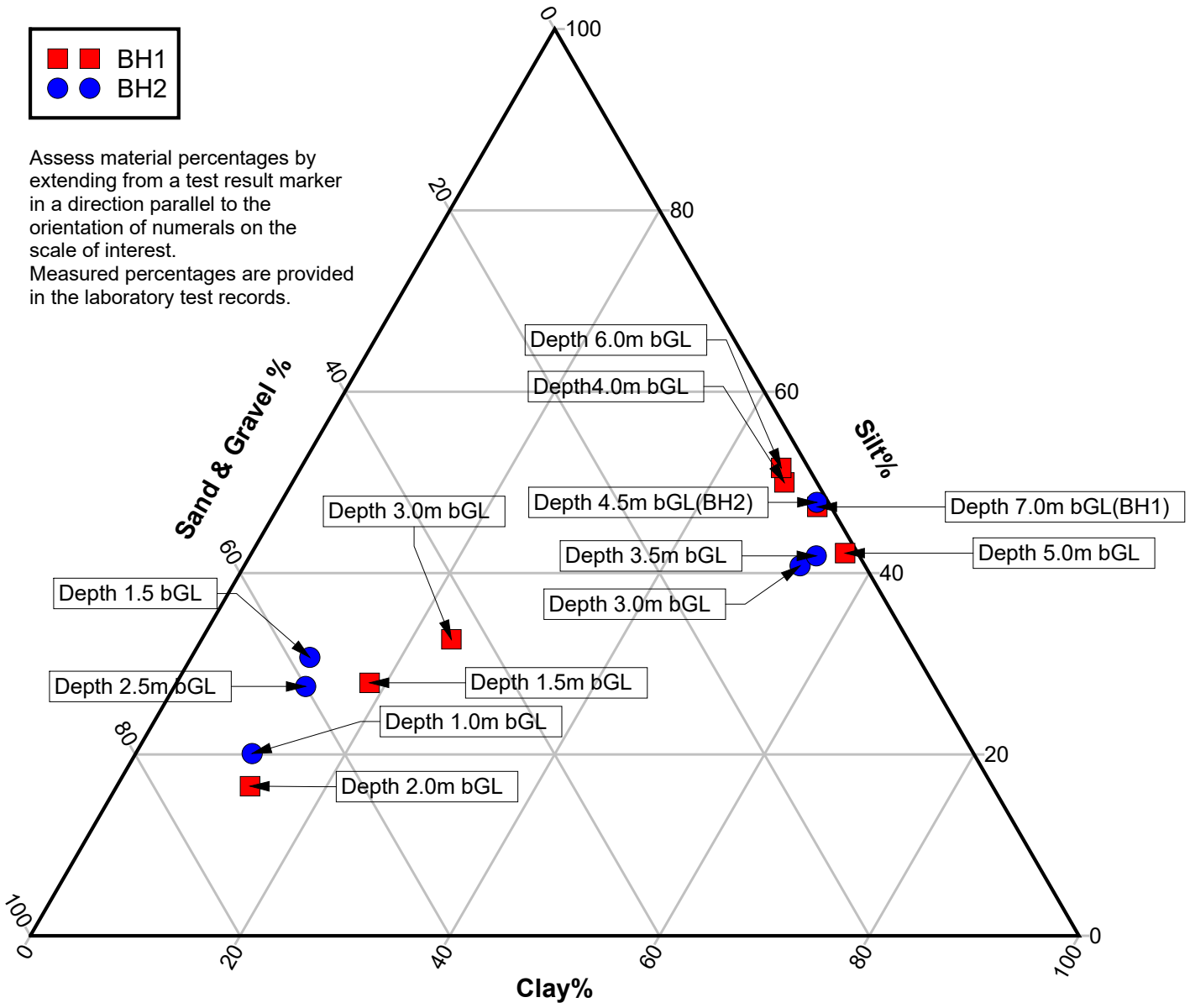
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Groundwater instrumentation

Borehole	GEA BH2 (rear)	GEA BH4 (front)	EGL BH1 W1	EGL BH1 W2	EGL BH2 W1	EGL BH2 W2
Transducerr ref.	B12690	B12691	B12692	B12701	B12703	B12698
Well depth mbGL	3.75	4.00	7.79	4.00	5.10	3.16
Ground level mOD	85.50	85.40	85.50	85.50	85.50	85.50
Datum level mOD	85.50	85.40	85.61	85.70	85.65	85.64
Well base level mOD	81.75	81.40	77.71	81.50	80.40	82.34
Depth Datum to transducer m.	3.50	3.52	7.50	4.15	5.10	2.80
Transducer level mOD	82.00	81.88	78.11	81.55	80.55	82.84
Slots top level mOD	84.50	84.40	78.71	82.50	81.40	83.34
Slots btm level mOD	81.50	81.40	77.71	81.50	80.40	82.34
Filter top level mOD	84.50	84.40	78.71	82.50	81.40	83.34
Filter base level mOD	81.50	81.40	77.71	81.50	80.40	82.34
BH dia. at filter mm.	60	60	150	200	200	200
Well ID mm	30	30	50	50	50	50
Well OD mm	36	36	60	60	60	60

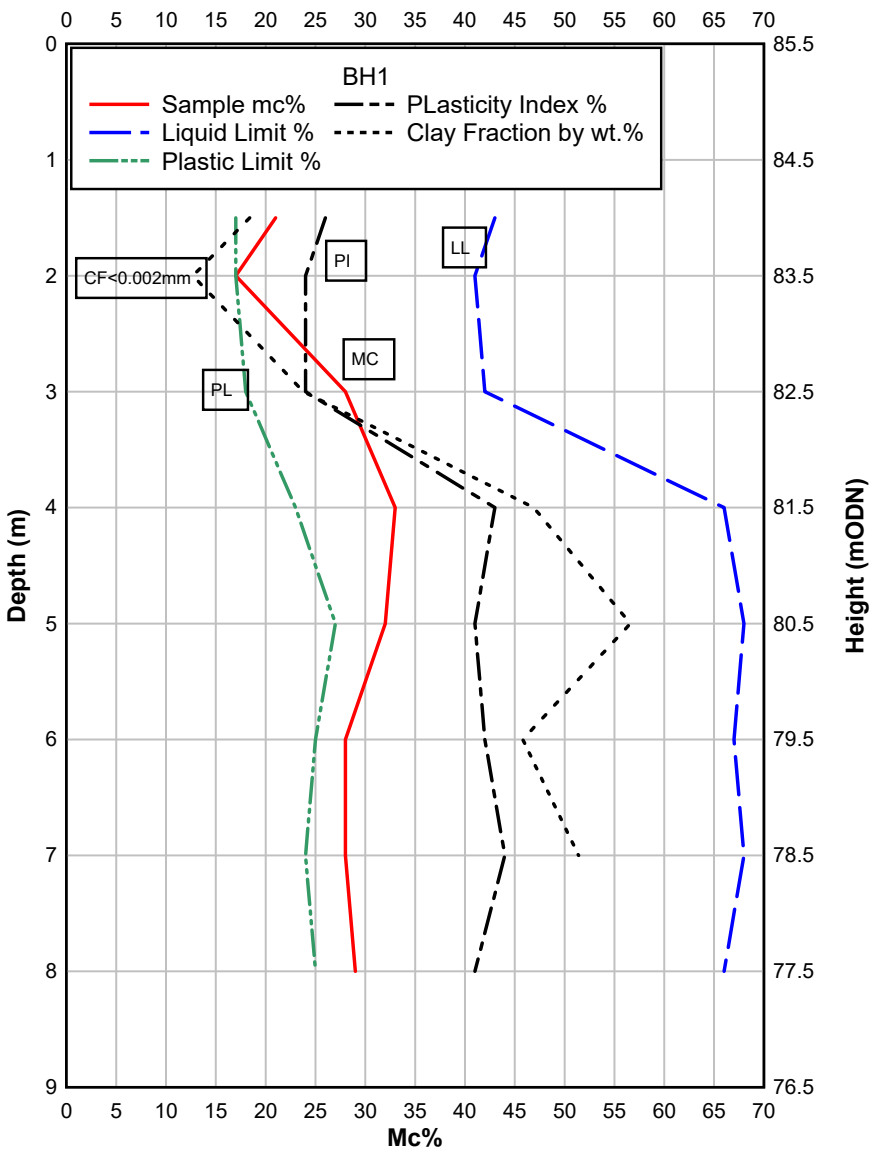
G1808 31 Willoughby Road NW3 1RT - Proposed Basement

Sample Depths and Results of Particle Size Distribution Tests



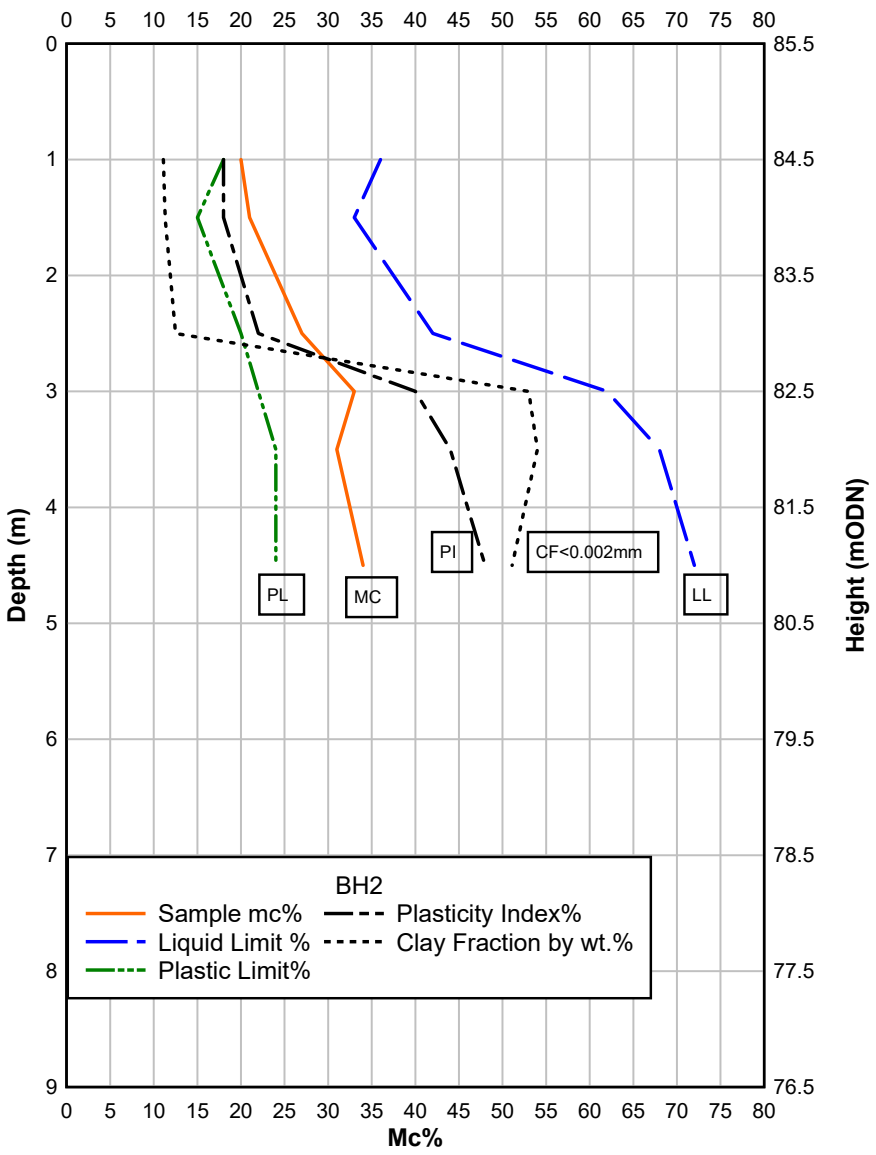
G1808 31 Willoughby Road NW3 1RT - Proposed Basement

BH1 Moisture Content & Atterberg Limits vs Depth & ODN Height



G1808 31 Willoughby Road NW3 1RT - Proposed Basement

BH2 Moisture Content & Atterberg Limits vs Depth & ODN Height



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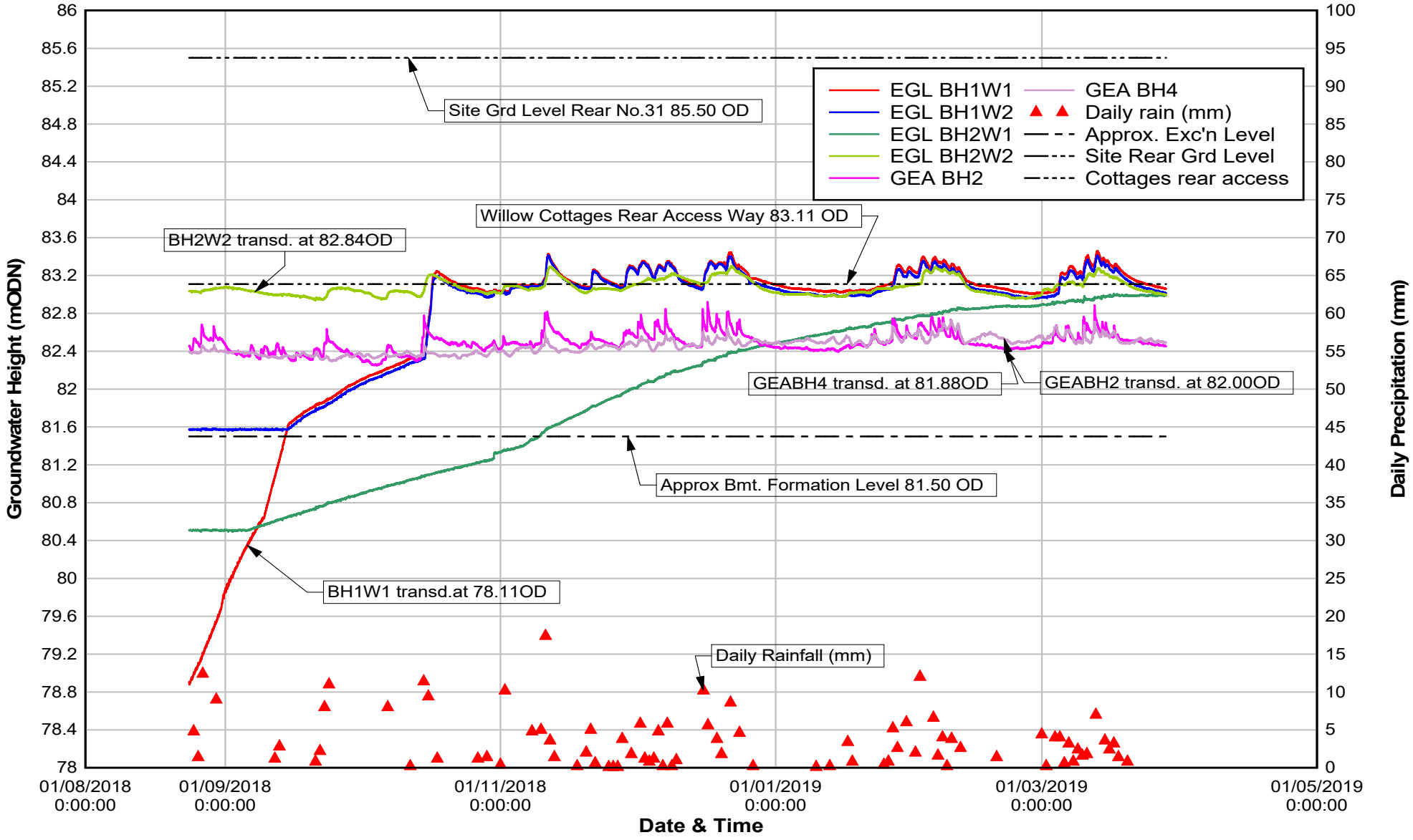
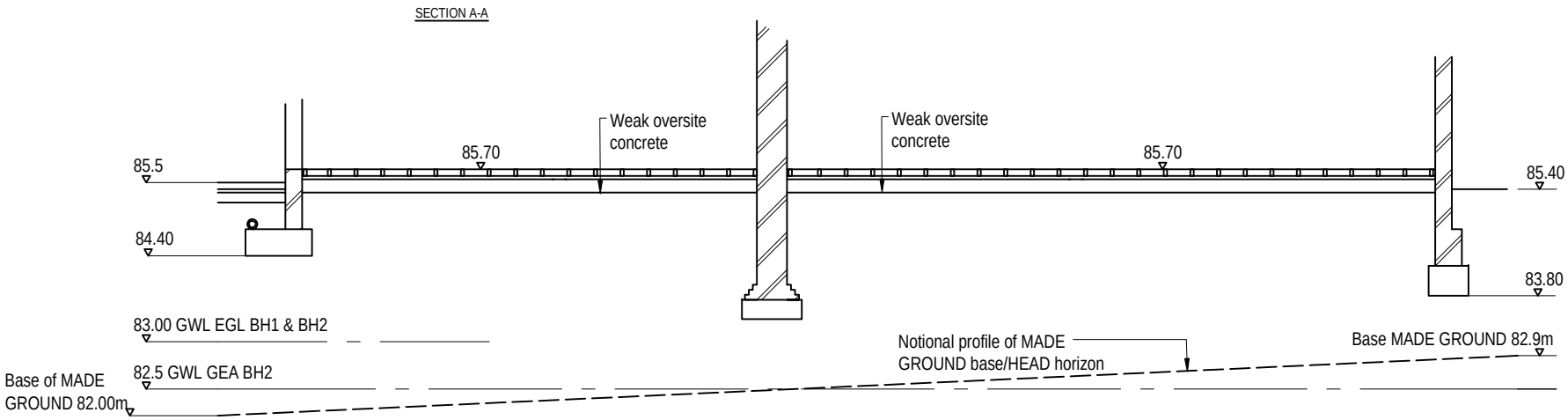
G1808 31 Willoughby Road NW3 1RT - Proposed Basement

Groundwater Height (mODN) in Borehole Piezometers & Daily Rainfall

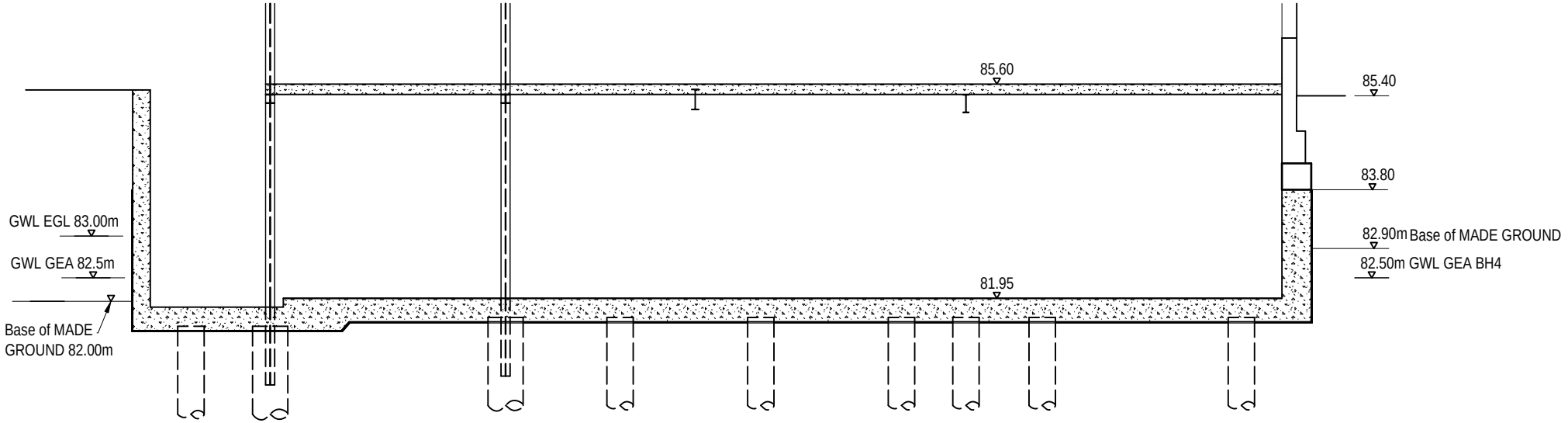


Report:: G1808-RP-01-E1

Figure No.8



LONG SECTION EXISTING



LONG SECTION PROPOSED

0m 1m 2m 3m 4m 5m

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

EXISTING & PROPOSED LONG SECTION SKETCHES

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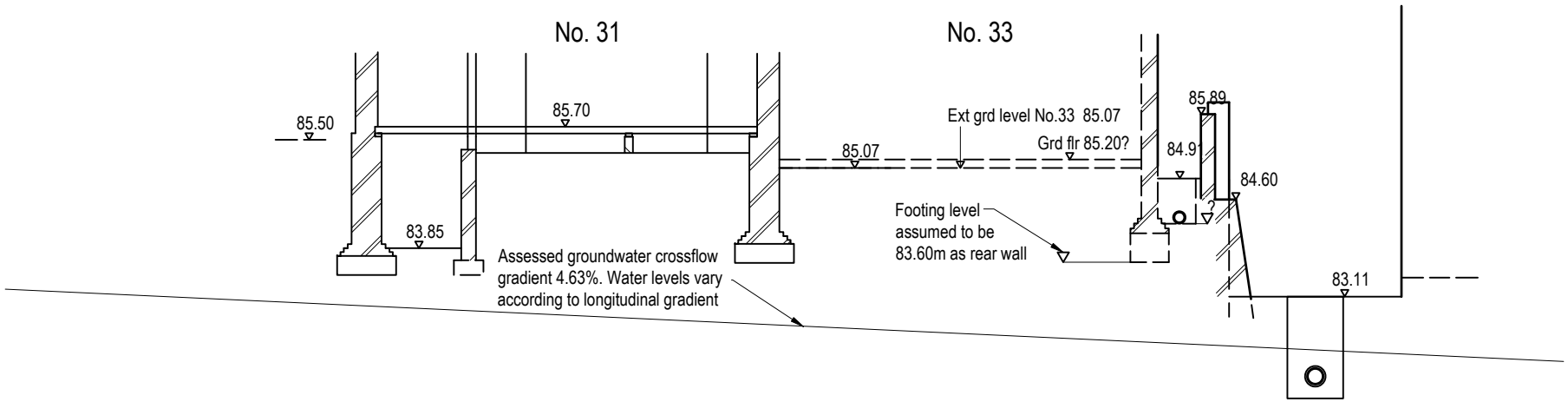
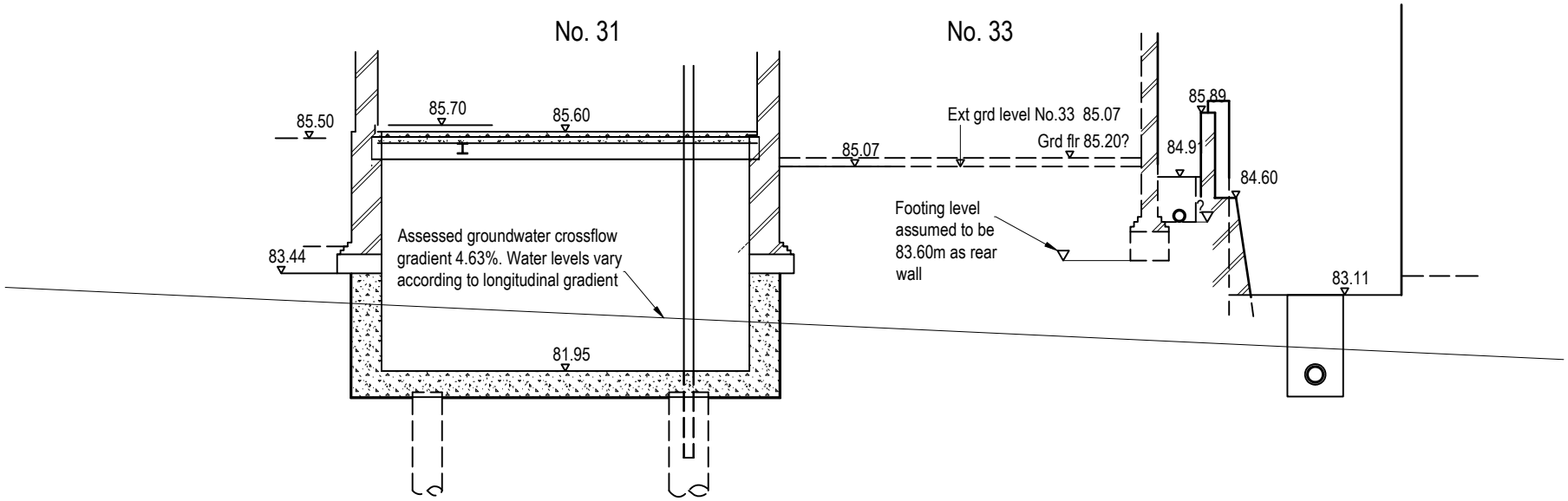
Report:G1808-RP-01-E1

Scale as shown

Figure 9.



EXISTING CROSS SECTION
FRONT OF HOUSE



PROPOSED CROSS SECTION
FRONT OF HOUSE

0m 1m 2m 3m 4m 5m

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

EXISTING & PROPOSED CROSS SECTION SKETCHES - FRONT

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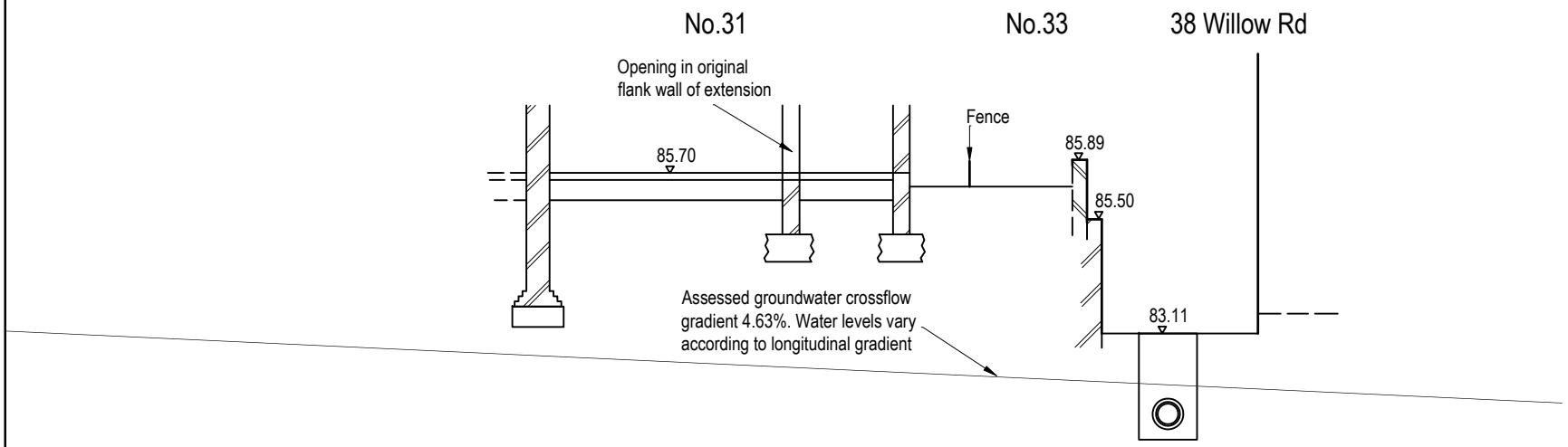
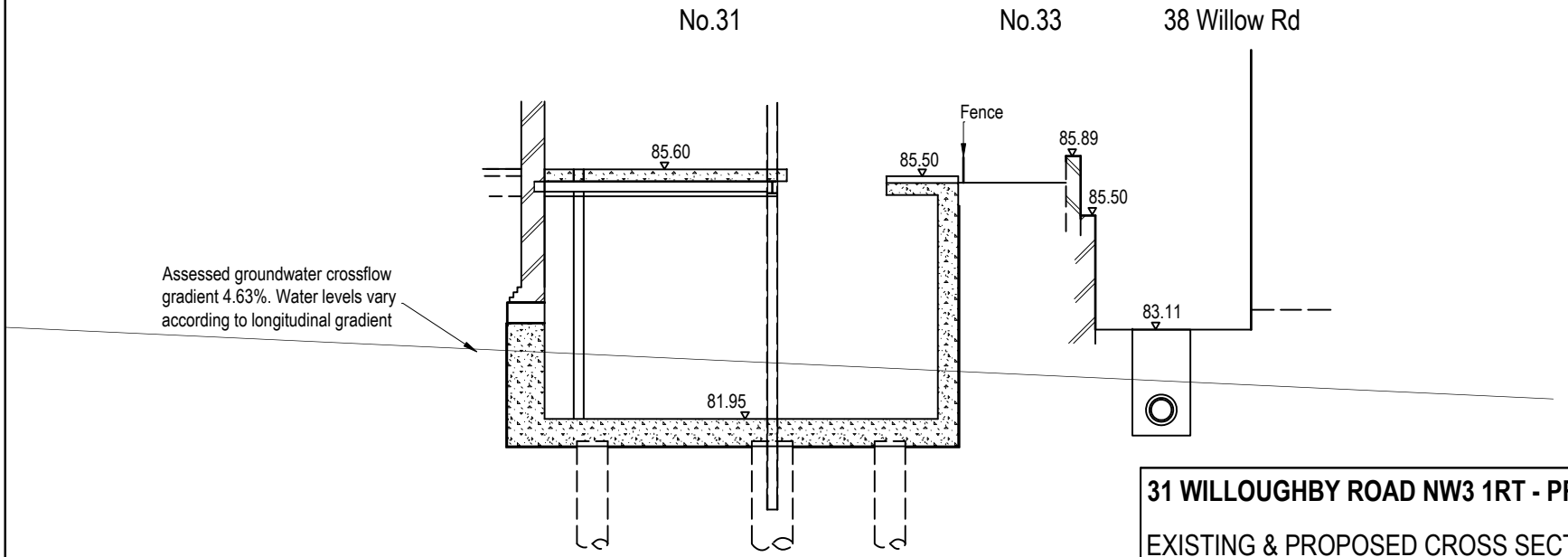
Report:G1808-RP-01-E1

Scale as shown

Figure 10



EXISTING CROSS SECTION
REAR EXTENSION



PROPOSED CROSS SECTION
REAR EXTENSION

0m 1m 2m 3m 4m 5m

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

EXISTING & PROPOSED CROSS SECTION SKETCHES - REAR

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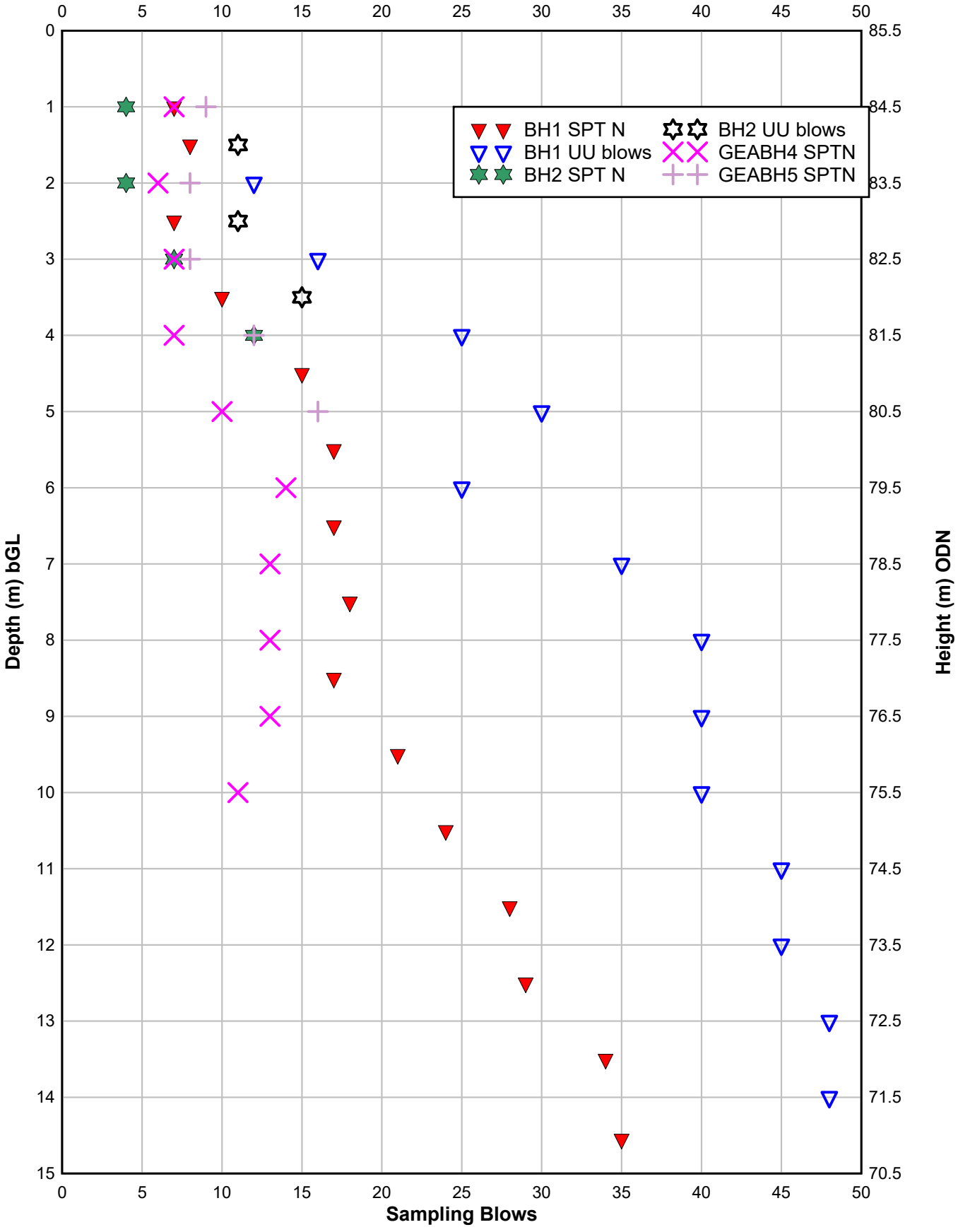
Report:G1808-RP-01-E1

Scale as shown

Figure 11

G1808 31 Willoughby Road NW3 1RT - Proposed Basement

Sampling Blow Counts vs Depth & ODN Height



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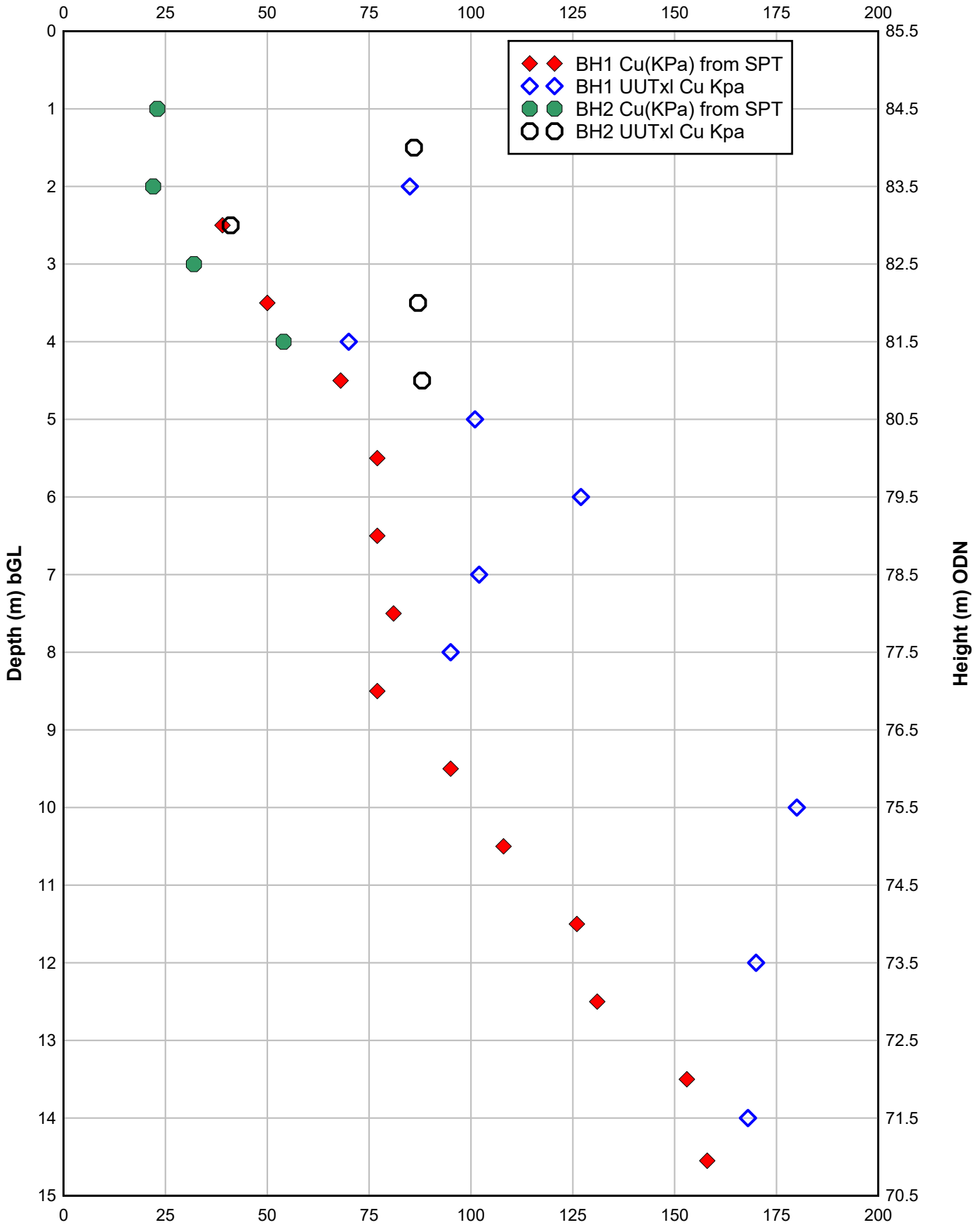
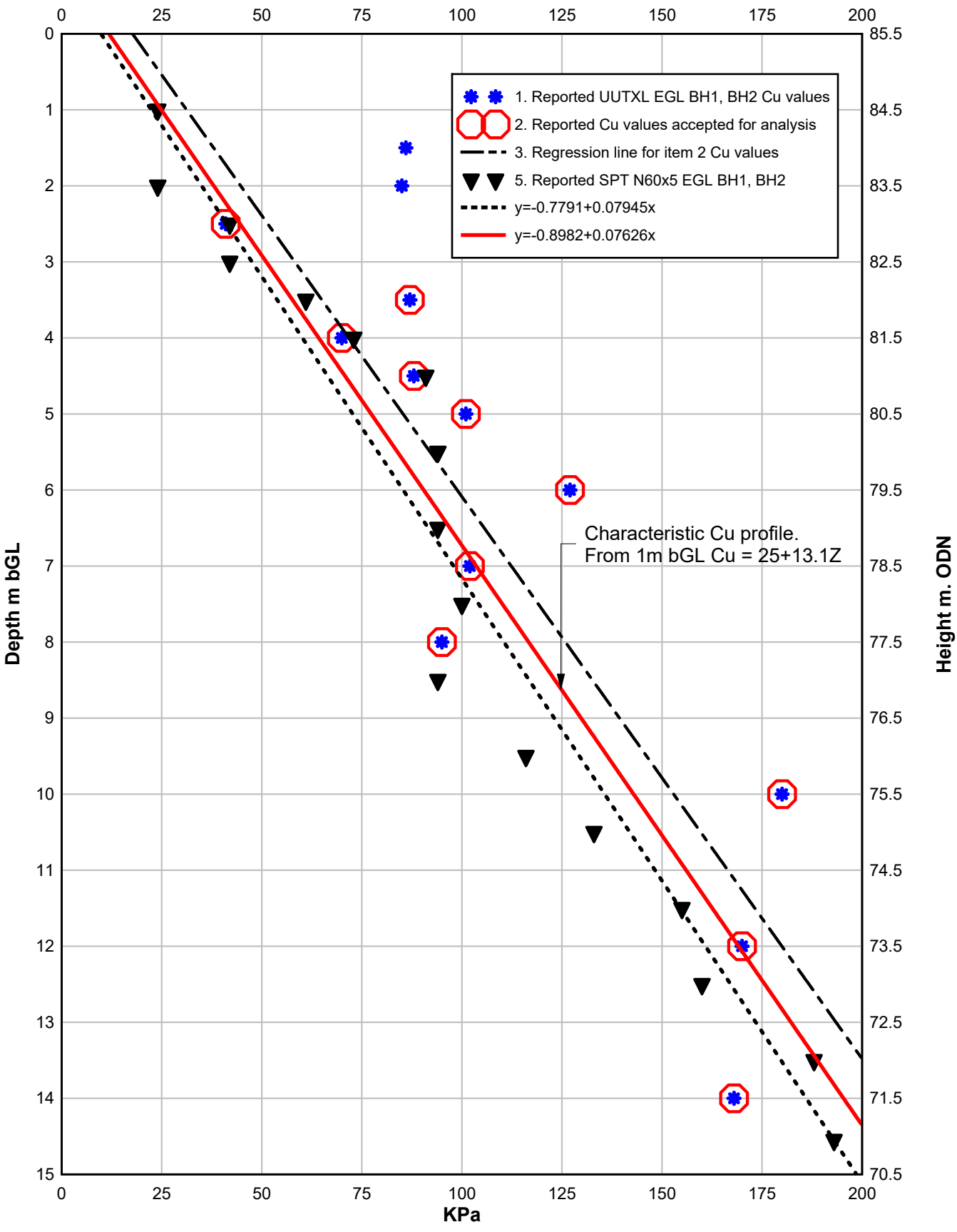
G1808 31 Willoughby Road NW3 1RT - Proposed Basement

Undrained Shear Strength vs Depth & ODN Height



G1808 31 Willoughby Road NW3 1RT - Proposed Basement

Assessed Characteristic Profile of Undrained Shear strength vs Depth



Appendix D Contents

Eldred Geotechnics
66 Warren Road, Chislsfield, Orpington
Kent BR6 6HY, UK

Outline structural design report G1808-ST-01-E1
for basement extension of 31 Willoughby Road NW3 1RT

1 Criteria references

1. BS EN 1990 Basis of structural design
2. BS EN 1991 Actions on structures
3. BS EN 1992 Design of concrete structures
4. BS EN 1993 Design of steel structures
5. BS EN 1995 Design of timber structures
6. BS EN 1996 Design of masonry structures

2 Overview

7. Structural alterations are required as part of a scheme to provide a single storey basement below the property. The structural proposal is for a steel framed solution which will be inserted as work proceeds to provide maximum working space for the basement and ground floor works. Refer to the engineering design illustrated by Eldreds' accompanying drawings and method statement.

3 Software

8. STRAP (STRuctural Analysis Programs) 2018 version by Atir Engineering Software Ltd has been used for analysis of the structure. At this preliminary stage no attempt has been made to model staged construction sequences or stress reversals that installation and removal of temporary supports will cause as the frame develops: the analysis allows for what are judged to be the worst conditions likely to occur.

Eldred Geotechnics
66 Warren Road, Cheslsfield, Orpington
Kent BR6 6HY, UK

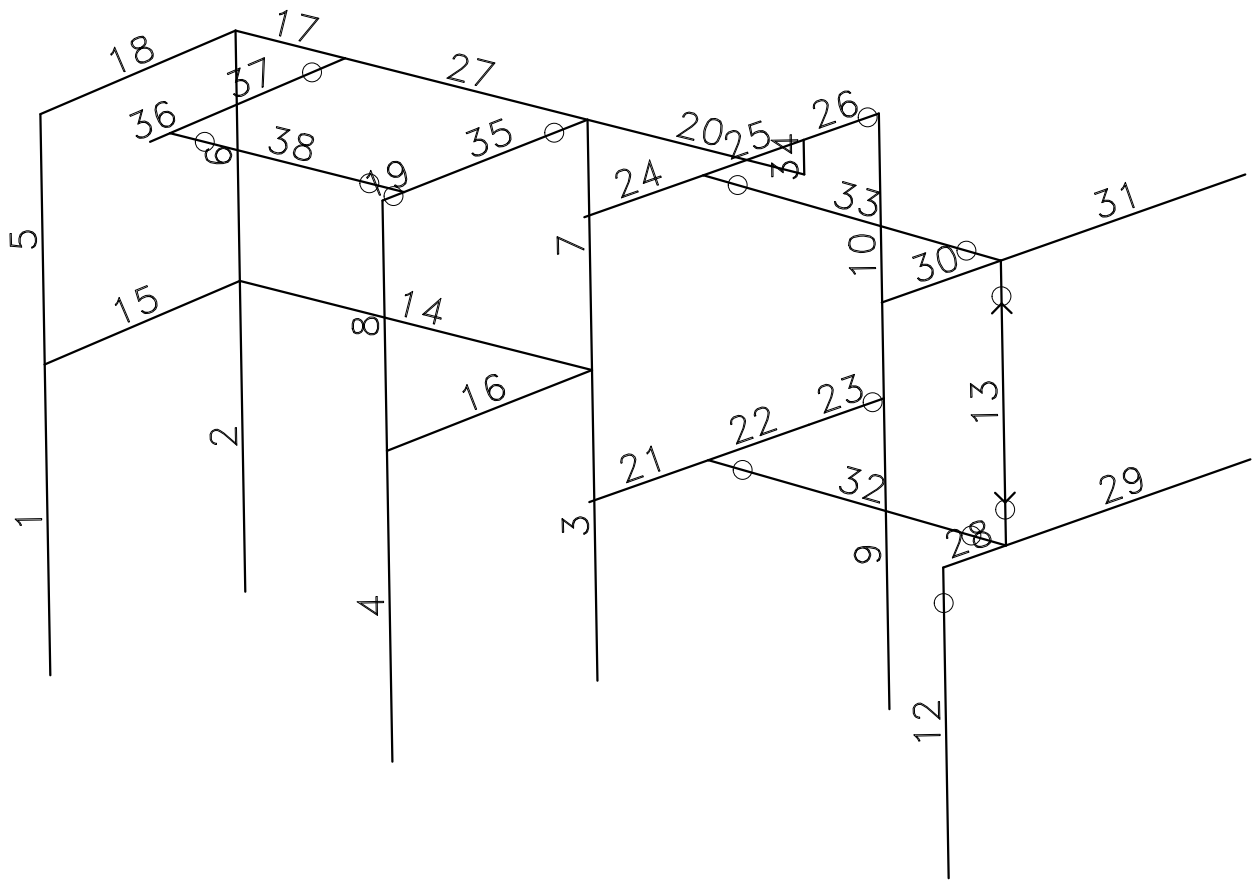
4 Frame arrangement

31 WILLOUGHBY ROAD NW3 1RT – BASEMENT

Steel frame isometric – STRAP beam Nos.

X3
X2
X1

SCALE = 1:83 DATE:14/07/19



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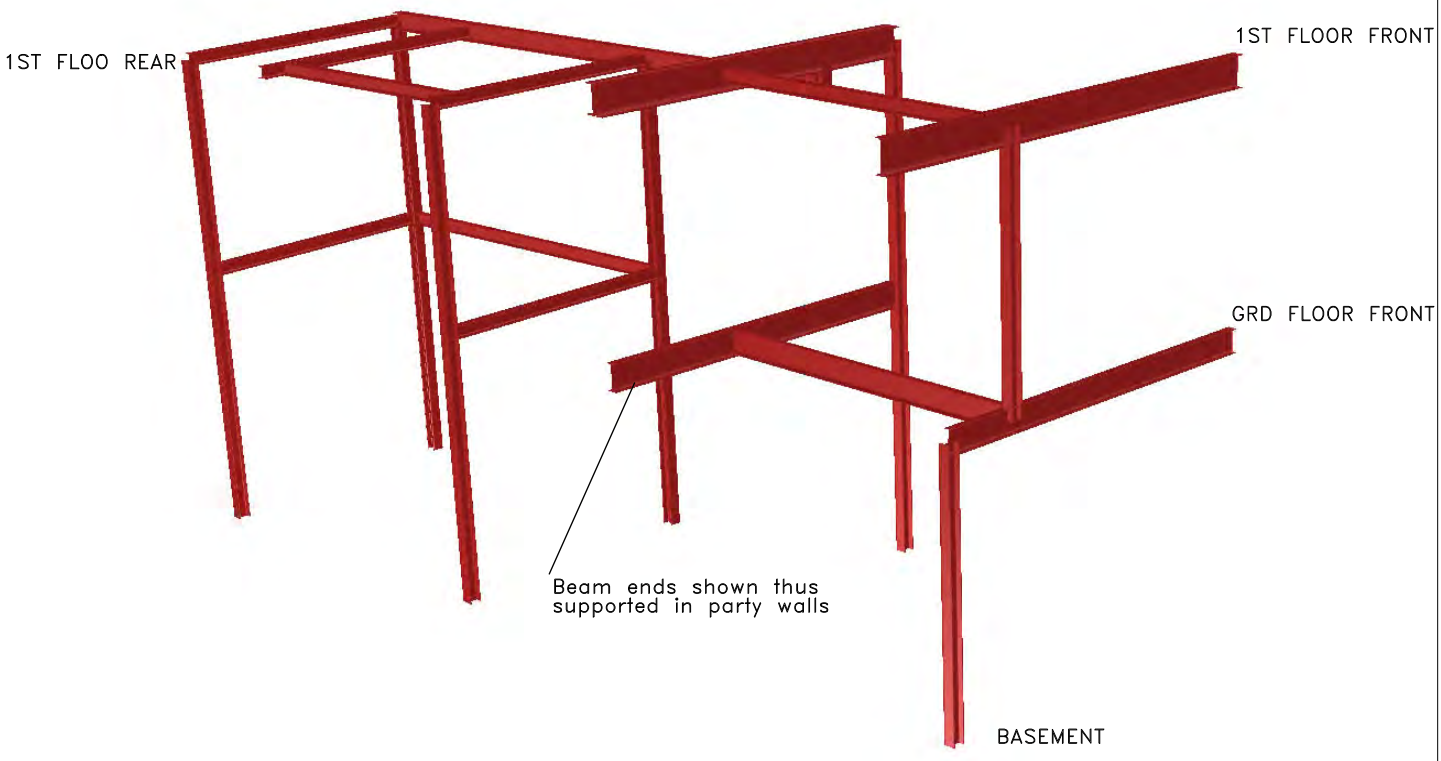
Kent BR6 6HY, UK

31 WILLOUGHBY ROAD NW3 1RT – BASEMENT

Steel frame isometric rendered

X3
X2
X1

DATE:14/07/19

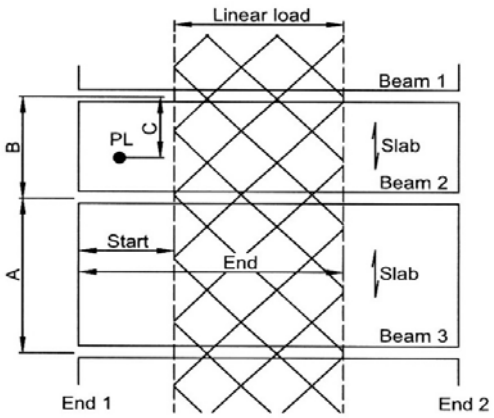


Eldred Geotechnics
66 Warren Road, Cheslsfield, Orpington
Kent BR6 6HY, UK

5 Loads

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Key to Excel tables used to calculate actions on structure	4/19	G1808	1	

Item	Table Column	Description
1	Member	Element of construction identified as receiving load
2	Action source	Element of construction or externally applied action causing load upon the member
3	Type	Load type: U = unformly distributed (KN/m2); L = linearly distributed over a certain distance (KN/m); P = point load (KN)
4	Unit action	Characteristic force (KN), force/unit length or area (KN/m or KN/m2), or material density (KN/m3)
5	Factor	Factor converting the source action to the corresponding effective action upon the member; e.g. in the simplest case, if the member spreads a source point load to cause a uniformly distributed load of length X at the level considered, the effect at that level is given by a factor of 1/X. The converse, situation w ould require a factor of X.
6	Width or Ht.	Refer to diagram. Considering load on Beam 2, the w idth of the slab load and of the linear load is A+B. For the point load, the w idth is entered as 1 to preserve the calculation logic. Height is entered for vertical elements such as w alls, w hen unit loads are given /unit area on elevation.. To preserve calculation logic, height is given as 1 for unit loads /m run.
7	Proportion	Proportion of load w idth or height attracted to the member considered. If slabs in the diagram are simply supported, the proportion of the slab and linear loads on Beam 2 is 0.5 and the proportion of the point load is C/B.
8	Perm. & Var.	End values of permanent and variable actions are the product of items 3, 4, 5 and 6



Eldred Geotechnics
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Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Limit state factors	4/19	G1808	2	

Combination case		Persistent and transient design situations	Permanent actions ($_1$G)		Leading variable action ($_2$Q) [0 if favourable]	Accompanying variable action ($_1$Q) [0 if favourable]	
			Unfavourable	Favourable		Main (if any)	Others
1	EQU SetA	Eqn 6.10	1.10	0.90	1.50	N/A	1.5E_{β}
2	STR/GEO Set B	Eqn 6.10	1.35	1.00	1.50	N/A	1.5N_1
2a		Eqn 6.10a	1.35	1.00	N/A	1.5X_X	1.5$1_1$
2b		Eqn 6.10b	1.25	1.00	1.50	N/A	1.5N_N
3	STR/GEO Set C	Eqn 6.10	1.00	1.00	1.30	N/A	1.3X_1
4	ACCIDENT-AL	Eqn 6.11a/b	1.00	1.00	1.00	1_1	1_N
5	SERVICE-ABILITY	Characteristic	1.00	1.00	1.00	N/A	X_N
5a		Frequent	1.00	1.00	5_1	N/A	2_N
5b		Quasi-permanent	1.00	1.00	N/A	1_{Σ}	X_N

Proposed Use Category	X_5	5_5	5_5	Design combination cases for actions		Comment
A: Residential	0.70	0.50	0.30	ULS	1, 2	
				SLS	5	Alterations; Q/G small; deflection limit L/360 for Q+G

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PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Construction notes and Characteristic Unit Loads	4/19	G1808	3	

EXISTING BUILDINGS: Refer to current editions of drawings G1808-GA-001 to 007

Pitched roofs Nos 29 & 31			
Permanent	Slate	0.25	
	Battens	0.04	
	Rafters	0.10	
	Ceiling (P/Bd & skim)	0.17	
	Total	0.56	Kpa
	30 deg. Pitch factor	1.15	
	Total on plan	0.64	KPa
Variable		0.60	KPa
Floors Nos 29-33			
Permanent	12mm HW overlay	0.09	
	Boards Joists, ceiling	0.50	
		0.59	Kpa
Variable	No 31 upper	0.90	Kpa
	All floors occupied	1.50	Kpa
Patio roofs	Concrete tiles	0.38	
	50mm screed	1.15	
	Asphalt	0.42	
	Boards Joists, ceiling	0.50	
		2.45	Kpa
Variable		1.50	KPa

Eldred Geotechnics
66 Warren Road, Cheslsfield, Orpington
Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Construction notes and Characteristic Unit Loads	4/19	G1808	4	

EXISTING BUILDINGS: Refer to current editions of drawings G1808-GA-001 to 007

Flat roof No.33				
Permanent	Lead, code 5, underlay, paper		0.30	
	Boards Joists, ceiling		0.50	
			0.80	Kpa
Variable			0.60	KPa
Tiled roof No.33				
Permanent	Clay tiles plain		0.65	
	Battens		0.04	
	Rafters		0.10	
	Ceiling (P/Bd & skim)		0.17	
	Total		0.96	Kpa
	30 deg. Pitch factor		1.15	
	Total on plan		1.10	KPa
Variable			0.60	KPa
Walls				
Permanent	Brick medium dense	21.53 KN.m3		
	Thickness (mm)	450	9.69	Kpa
		340	7.32	Kpa
		225	4.84	Kpa
		112	2.41	KPa
	Plaster/render per side		0.25	KPa

Eldred Geotechnics
66 Warren Road, Chesisfield, Orpington
Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Construction notes and Characteristic Unit Loads	4/19	G1808	5	

EXISTING BUILDINGS: Refer to current editions of drawings G1808-GA-001 to 007

Walls (contd)

Partitions 1st flr & above, Nos.29,31

Permanent	SW studwork	0.10	
	Lathing 2 sides	0.12	
	Plaster 2 sides 3 coats	1.00	
		1.22	Kpa

Partitions 1st flr & above, No.33

Permanent	SW studwork	0.10	
	P/Bd & skim 2 sides	0.40	
		0.50	Kpa

Sash windows based on 1.8x1m frame 0.30 Kpa

Rear Chimney Breast: notional load on 1st floor

Permanent	340mm brick work 1.5m high	10.98	KN/m

Eldred Geotechnics
66 Warren Road, Chesisfield, Orpington
Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Characteristic Member Actions	4/19	G1808	6	

Member/Case	Action source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Ridge Beam No.31. No.29 beam similar											
Permanent	Pitched roof	U	0.64	1.00	9.00	9.00	0.50	2.90	2.90		
Variable		U	0.60	1.00	9.00	9.00	0.50	2.70	2.70		
Party Wall Nos 29/31 Front Section											
Roof to Grd											
Permanent	Ridge beams	U	2.90	0.22	6.00	6.00	0.50	1.93	1.93		
	225 Wall roof to 3rd (ave	U	5.34	1.00	1.75	1.75	1.00	9.35	9.35		
	340 wall 3rd-1st	U	7.82	1.00	6.20	6.20	1.00	48.49	48.49		
	450 wall 1st-grd	U	10.19	1.00	3.35	3.35	1.00	34.13	34.13		
	2nd-grd stair well strips	U	0.59	6.00	2.00	2.00	0.50	3.54	3.54		
	Total at grd (KN/m)							97.44	97.44		
Variable	Ridge beams	U	0.60	0.22	6.00	6.00	0.50	0.40	0.40		
	2nd-grd stair well strips	U	1.50	6.00	2.00	2.00	0.50	9.00	9.00		
	Total at grd (KN/m)							9.40	9.40		
450mm Party wall Grd-Ftg.											
Permanent	Wall	U	9.69	1.00	2.00	2.00	1.00	19.38	19.38		
	Ftg spread	U	21.53	0.23	0.63	0.63	1.00	3.03	3.03		
	Concrete	U	23.00	0.30	0.90	0.90	1.00	6.21	6.21		
	Total (KN/m)							28.61	28.61		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Party/Ext Wall Nos 31/33											
Front & back sections 2.5m long, Roof- Grd											
Permanent	Ridge beam No.31	U	2.90	0.11	6.00	6.00	0.50	0.97	0.97		
	225 Wall roof - 3rd (ave ht)	U	5.34	1.00	1.75	1.75	1.00	9.35	9.35		
	Stack 0.3m2 net	U	21.53	0.06	3.75	3.75	1.00	4.84	4.84	Stack 50% void	
	340 wall 3rd-1st	U	7.82	1.00	6.20	6.20	1.00	48.49	48.49		
	450 wall 1st-grd	U	10.19	1.00	3.35	3.35	1.00	34.13	34.13		
	Stack 0.5m2 net	U	21.53	0.10	9.55	9.55	1.00	20.56	20.56	Stack 50% void	
	No.33 flat roof	U	0.80	1.00	3.50	3.50	0.50	1.40	1.40		
	No.33 1st &2nd flrs	U	0.59	1.00	4.00	4.00	0.50	1.18	1.18		
	Total at Grd (KN/m)							120.92	120.92		
Variable	Ridge beam No.31	U	2.70	0.11	6.00	6.00	0.50	0.90	0.90		
	No.33 flat roof	U	0.60	1.00	3.50	3.50	0.50	1.05	1.05		
	No.33 1st &2nd flrs	U	1.50	1.00	4.00	4.00	0.50	3.00	3.00		
	Total at Grd (KN/m)							4.95	4.95		
Middle section 4.5m long, Roof- Grd											
Permanent	Ridge beam No.31	U	2.90	0.11	6.00	6.00	0.50	0.97	0.97		
	225 Wall roof - 3rd (ave ht)	U	5.34	1.00	1.75	1.75	1.00	9.35	9.35		
	Stack 0.3m2 net	U	21.53	0.07	3.75	3.75	1.00	5.38	5.38	Stack 50% void	
	340 wall 3rd-1st	U	7.82	1.00	6.20	6.20	1.00	48.49	48.49		
	450 wall 1st-grd	U	10.19	1.00	3.35	3.35	1.00	34.13	34.13		
	Stack 0.5m2 net	U	21.53	0.11	9.55	9.55	1.00	22.85	22.85	Stack 50% void	
	No.33 flat roof	U	0.80	1.00	3.50	3.50	0.50	1.40	1.40		
	No.33 1st &2nd flrs	U	0.59	1.00	4.00	4.00	0.50	1.18	1.18		
	Total at Grd (KN/m)							123.74	123.74		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Party/Ext Wall Nos 31/33 Contd											
Middle section 4.5m long, Roof- Grd Contd											
Variable	Ridge beam No.31	U	2.70	0.11	6.00	6.00	0.50	0.90	0.90		
	No.33 flat roof	U	0.60	1.00	3.50	3.50	0.50	1.05	1.05		
	No.33 1st &2nd flrs	U	1.50	1.00	4.00	4.00	0.50	3.00	3.00		
	Total at Grd (KN/m)							4.95	4.95		
450mm Party wall Grd-Ftg. (2.5m deep)											
Permanent	Wall	U	9.69	1.00	2.00	2.00	1.00	19.38	19.38		
	Ftg spread	U	3.03	1.00	1.00	1.00	1.00	3.03	3.03		
	Conccrete	U	6.90	1.00	0.90	0.90	1.00	6.21	6.21		
	Total							28.61	28.61		
Party Wall Nos 29/31 Rear Section											
Roof to Grd Flr.											
Permanent	Patio roof	U	2.45	2.00	3.50	3.50	0.50	8.58	8.58		
	Stack above r'f 0.4m2 net	U	21.53	0.07	4.00	4.00	1.00	5.74	5.74		
	225 wall roof-1st	U	5.34	1.00	3.25	3.25	1.00	17.37	17.37		
	Stack r'f-grd 0.6m2 net	U	21.53	0.10	5.80	5.80	1.00	12.49	12.49		
	340 wall 1st-grd	U	7.82	1.00	2.84	2.84	1.00	22.21	22.21		
	1st flr	U	0.59	2.00	3.50	3.50	0.50	2.07	2.07		
	Total at Grd (KN/m)							68.45	68.45		
Variable	Patio roof	U	1.50	2.00	3.50	3.50	0.50	5.25	5.25		
	1st Flr.	U	1.50	2.00	3.50	3.50	0.50	5.25	5.25		
	Total at Grd (KN/m)							10.50	10.50		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Party Wall Nos 29/31 Rear Section Contd											
340mm Party wall Grd-Ftg (1.5m deep)											
Permanent	Wall	U	7.32	1.00	1.00	1.00	1.00	7.32	7.32		
	Stack 1.2m2	U	21.53	0.30	1.00	1.00	1.00	6.46	6.46		
	Ftg spread	U	21.53	0.23	0.63	0.63	1.00	3.03	3.03		
	Concrete	U	23.00	0.30	0.90	0.90	1.00	6.21	6.21		
	Total (KN/m)							23.02	23.02		
Front Bay wall											
Roof-grd											
Permanent	Tiled roof	U	1.10	1.00	1.00	1.00	0.50	0.55	0.55		
	1st flr	U	0.59	1.00	1.00	1.00	0.50	0.30	0.30		
	225 brick	U	5.09	1.00	6.80	6.80	1.00	34.64	34.64		
	omit net of fenest'n 7m2	U	-4.54	7.00	0.29	0.29	1.00	-9.07	-9.07		
	Total (KN/m)							26.42	26.42		
Variable	Tiled roof	U	0.60	1.00	1.00	1.00	0.50	0.30	0.30		
	1st flr	U	1.50	1.00	1.00	1.00	0.50	0.75	0.75		
	Total (KN/m)							1.05	1.05		
Grd-Ftg											
Permanent	225mm brick	U	4.84	1.00	1.00	1.00	1.00	4.84	4.84		
	340mm brick	U	7.32	1.00	1.00	1.00	1.00	7.32	7.32		
	Concrete	U	5.52	1.00	1.00	1.00	1.00	5.52	5.52		
	Total (KN/m)							17.68	17.68		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Eaves partitions at 3rd floor(unit load)											
Permanent	Roof	U	0.64	1.00	4.50	4.50	0.50	1.45	1.45		
	Self wt	U	1.22	1.00	1.00	1.00	1.00	1.22	1.22		
	Total							2.67	2.67		
Variable	Roof	U	0.60	1.00	4.50	4.50	0.50	1.35	1.35		
Internal crosswall at Grd. Flr. (1m & 0.75m long wing walls 1st-Grd.)											
Permanent	Eaves partn	U	2.67	5.14	1.00	1.00	0.39	5.34	5.34		
	3rd-1st . Flrs	U	0.59	7.71	9.00	9.00	0.50	20.48	20.48		
	1st flr partn.	U	1.22	2.57	3.30	3.30	0.67	6.90	6.90		
	Self wt stud 3rd-1st	U	1.22	2.57	6.20	6.20	1.00	19.45	19.45		
	SW brick wall grd flr	U	2.91	1.00	3.35	3.35	1.00	9.75	9.75		
	Total at grd (K							52.17	52.17		
Variable	Eaves partn	U	1.35	5.14	1.00	1.00	0.39	2.70	2.70		
	3rd-1st floors	U	1.50	7.71	9.00	9.00	0.50	52.07	52.07		
	Total at grd (KN/m)							54.77	54.77		
Internal crosswall to 1st & 1st. Flr.											
Permanent	Eaves partn	U	2.67	2.00	1.00	1.00	0.39	2.08	2.08		
	3rd-1st . Flrs	U	0.59	3.00	9.00	9.00	0.50	7.97	7.97		
	1st flr partn.	U	1.22	1.00	3.30	3.30	0.67	2.68	2.68		
	Self wt stud 3rd-1st	U	1.22	1.00	6.20	6.20	1.00	7.56	7.56		
	Total at 1st flr soffit (KN/m)							20.29	20.29		
Variable	Eaves partn	U	1.35	2.00	1.00	1.00	0.39	1.05	1.05		
	3rd-1st floors	U	1.50	3.00	9.00	9.00	0.50	20.25	20.25		
	Total at 1st flr soffit (KN/m)							21.30	21.30		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Main front wall											
1m wide left section bearing on 29/31 party wall above entrance											
Permanent	Roof	U	0.64	1.00	1.50		0.50	0.48			
	Eaves partns	U	2.67	1.00	1.00		0.67	1.78			
	3rd flr	U	0.59	1.00	4.50		0.50	1.33			
	2nd flr	U	0.59	1.00	4.50		0.50	1.33			
	1st flr	U	0.59	1.00	4.50		0.50	1.33			
	Wall roof-2nd	U	5.09	1.00	2.90		1.00	14.77			
	Ddt windows 0.8m2	U	-4.79	0.80	1.00		1.00	-3.84			
	Wall 2nd-1st	U	7.57	1.00	3.30		1.00	24.98			
	Ddt windows 1.8m2	U	-7.27	1.00	1.00		1.00	-7.27			
	Total (KN/m)							34.89			
Variable	Roof	U	0.60	1.00	1.50		0.50	0.45			
	Eaves partns	U	1.35	1.00	1.00		0.67	0.90			
	3rd-1st floors	U	1.50	3.00	4.50		0.50	10.13			
	Total (KN/m)							11.48			
340mm wall Grd-Ftg (2.5m deep)											
Permanent	Wall	U	7.32	1.00	2.00	2.00	1.00	14.64	14.64		
	Ftg spread	U	21.53	0.23	0.63	0.63	1.00	3.03	3.03		
	Concrete	U	23.00	0.30	0.90	0.90	1.00	6.21	6.21		
	Total (KN/m)							23.88	23.88		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Main front wall Contd.											
Left side of bay, 1m long at Grd Flr											
Permanent	Roof	U	0.64	2.50	1.50	1.50	0.50	1.21	1.21		
	Eaves partns	U	2.67	2.50	1.00	1.00	1.00	6.67	6.67		
	3rd-1st floors	U	0.59	7.50	4.50	4.50	0.50	9.96	9.96		
	Wall 3rd-2nd	U	5.09	2.50	2.90	2.90	1.00	36.93	36.93		
	Ddt windows 2.4m2	U	-4.79	2.40	1.00	1.00	1.00	-11.51	-11.51		
	Wall 2nd-1st	U	7.57	1.50	3.30	3.30	1.00	37.47	37.47		
	Ddt windows 1m2	U	-7.27	1.00	1.00	1.00	1.00	-7.27	-7.27		
	Wall 1st-Grd	U	7.57	1.00	3.35	3.35	1.00	25.36	25.36		
	Total (KN/m)							98.83	98.83		
Variable	Roof	U	0.60	2.50	1.50	1.50	0.50	1.13	1.13		
	Eaves partns	U	1.35	2.50	1.00	1.00	1.00	3.38	3.38		
	3rd-1st floors	U	1.50	7.50	4.50	4.50	0.50	25.31	25.31		
	Total (KN/m)							29.81	29.81		
Right (No.33) side of bay, 1m long at Grd Flr											
Permanent	Roof	U	0.64	2.00	1.50	1.50	0.50	0.97	0.97		
	Eaves partns	U	2.67	2.00	1.00	1.00	1.00	5.34	5.34		
	3rd-1st floors	U	0.59	6.00	4.50	4.50	0.50	7.97	7.97		
	Wall 3rd-2nd	U	5.09	2.00	2.90	2.90	1.00	29.55	29.55		
	Ddt windows 1.6m2	U	-4.79	1.60	1.00	1.00	1.00	-7.67	-7.67		
	Wall 2nd-Grd	U	7.57	1.00	6.35	6.35	1.00	48.07	48.07		
	Total (KN/m)							84.22	84.22		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Main front wall Contd.											
Right (No.33) side of bay, 0.8m long at Grd Flr Contd											
Variable	Roof	U	0.60	3.13	1.50	1.50	0.50	1.41	1.41		
	Eaves partns	U	1.35	3.13	1.00	1.00	1.00	4.22	4.22		
	3rd-1st floors	U	1.50	9.38	4.50	4.50	0.50	31.64	31.64		
	Total (KN/m)							37.27	37.27		
Main rear wall											
Left(No.33) side of bay, 0.7m long at Grd Flr											
Permanent	Roof	U	0.64	1.79	1.50	1.50	0.50	0.86	0.86		
	Eaves partns	U	2.67	1.79	1.00	1.00	1.00	14.30	14.30		
	3rd-1st floors	U	0.59	5.36	4.50	4.50	0.50	7.11	7.11		
	Wall 3rd-2nd	U	5.09	1.79	2.90	2.90	1.00	26.38	26.38		
	Ddt windows 0.8m2	U	-4.79	1.14	1.00	1.00	1.00	-5.48	-5.48		
	Wall 2nd-1st	U	7.57	1.79	3.30	3.30	1.00	44.61	44.61		
	Ddt windows 1m2	U	-7.27	1.43	1.00	1.00	1.00	-10.39	-10.39		
	Wall 1st-Grd	U	7.57	1.43	3.35	3.35	1.00	36.23	36.23		
	Total (KN/m)							113.63	113.63		
Variable	Roof	U	0.60	1.79	1.50	1.50	0.50	0.80	0.80		
	Eaves partns	U	1.35	1.79	1.00	1.00	1.00	2.41	2.41		
	3rd-1st floors	U	1.50	5.36	4.50	4.50	0.50	18.08	18.08		
	Total (KN/m)							21.29	21.29		
Left(No.33) side of bay, 0.7m long at soffit 1st Flr											
Permanent	As above							113.63	113.63		
	Deduct wall 1s							-36.23	-36.23		
	Total (KN/m)							77.40	77.40		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Main rear wall Contd											
Mid section of wall 2m long at Grd Flr											
Permanent	Roof	U	0.56	1.75	1.50	1.50	0.50	0.74	0.74		
	Eaves partns	U	2.67	1.75	1.00	1.00	1.00	4.67	4.67		
	3rd-1st	U	0.59	5.25	4.50	4.50	0.50	6.97	6.97		
	Wall 3rd-2nd	U	5.09	1.75	2.90	2.90	1.00	25.85	25.85		
	Ddt windows 2m2	U	-4.79	1.00	1.00	1.00	1.00	-4.79	-4.79		
	Wall 2nd-Grd	U	7.57	1.25	6.35	6.35	1.00	60.09	60.09		
	Ddt windows 2.25m2	U	-7.27	1.13	1.00	1.00	1.00	-8.18	-8.18		
	Total (KN/m)							85.34	85.34		
	Total at 1st flr soffit(KN/m)							65.31	65.31		
Variable	Roof	U	0.60	1.75	1.50	1.50	0.50	0.79	0.79		
	Eaves partns	U	1.35	1.75	1.00	1.00	1.00	2.36	2.36		
	3rd-1st floors	U	1.50	5.25	4.50	4.50	0.50	17.72	17.72		
	Total (KN/m)							20.87	20.87		
Right(No.29) side, 1m long supported at 2nd flr.											
Permanent	Roof	U	0.56	1.00	1.50	1.50	0.50	0.42	0.42		
	Eaves partns	U	2.67	1.00	1.00	1.00	1.00	2.67	2.67		
	3rd-2nd flrs	U	0.59	1.00	4.50	4.50	0.50	1.33	1.33		
	Wall 3rd-2nd	U	5.09	1.00	3.70	3.70	1.00	18.85	18.85		
	Ddt windows 1.25m2	U	-4.79	1.25	1.00	1.00	1.00	-5.99	-5.99		
	Total(KN/m) on beam							17.27	17.27		
Variable	Roof	U	0.60	1.75	1.50	1.50	0.50	0.79	0.79		
	Eaves partns	U	1.35	1.75	1.00	1.00	1.00	2.36	2.36		
	3rd-1st floors	U	1.50	5.25	4.50	4.50	0.50	17.72	17.72		
	Total(KN/m) on beam							20.87	20.87		

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Member/Case	Load source	Type	Unit load	Factor	Width/height		Prop'n	Value		(m) from End 1	
					Start	End		Start	End	Start	End
Rear extension flank & rear walls											
Flank wall at 1st floor											
Permanent	Patio roof	U	2.45	1.00	3.50	3.50	0.50	4.29	4.29		
	1st Floor	U	0.59	1.00	3.50	3.50	0.50	1.03	1.03		
	Wall roof-1st	U	5.09	1.00	3.75	3.75	1.00	19.10	19.10		
	Total (KN/m)							24.42	24.42		
Variable	Roof	U	1.50	1.75	3.50	3.50	0.50	4.59	4.59		
	1st Floor	U	1.50	1.75	3.50	3.50	0.50	4.59	4.59		
	Total (KN/m)							9.19	9.19		
Rear wall at 1st floor											
Permanent	Wall roof-1st	U	5.09	1.00	3.75	3.75	1.00	19.10	19.10		
Longitudinal wall adj stair											
3rd-1st flr											
Permanent	Stud wall	U	1.22	1.00	7.70	7.70	1.00	9.39	9.39		
	Floors	U	0.59	3.00	2.00	2.00	0.50	1.77	1.77		
	Total (KN/m)							11.16	11.16		
Variable	Floors	U	1.50	3.00	2.00	2.00	0.50	4.50	4.50		
1st-Grd floor brick 2.4m	Wall	U	2.91	1.88	3.35	3.35	1.00	18.29	18.29		

Eldred Geotechnics
66 Warren Road, Chesisfield, Orpington
Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Load Summaries	4/19	G1808	16	

EXISTING BUILDINGS: Refer to current editions of drawings G1808-GA-001 to 007

Front Bay	Perm.	Var.		Page
Total to Grd	26.42	1.05		B4
Grd-Ftg	17.68			B4
Total to Ftg	44.11	1.05	KN/m	

Front Wall adj PW 29	Perm.	Var.		Page
Total-Grd	34.89	11.48		B6
Grd-Ftg	23.88			B4
Total at Ftg	58.77	11.48	KN/m	

Front Wall LHS Bay	Perm.	Var.		Page
Total at Grd	98.83	29.81		B7
Grd-Ftg	23.88			B4
	122.70	29.81	KN/m	

Front Wall adj PW33	Perm.	Var.		Page
Total at Grd	84.22	37.27		B7/8
Grd-Ftg	23.88			B4
	108.09	37.27	KN/m	

Internal cross wall	Perm.	Var.		Page
UDL in	52.17	54.77	KN/m	B5

Main rear wall adj PW33	Perm.	Var.		Page
Total-Grd	113.63	21.29	KN/m	B8
Grd-Ftg	23.88			B4
Total at Ftg	137.51	21.29	KN/m	

Main rear wall mid section	Perm.	Var.		Page
Total-Grd	85.34	20.87		B9
Grd-Ftg	23.88			B4
Total at Ftg	109.22	20.87	KN/m	

Main rear wall adj PW29	Perm.	Var.		Page
Total on beam	17.27	20.87	KN/m	B9

Rear wall back extn	Perm.	Var.		Page
Total at 1st	19.10		KN/m	B10

Flank wal back extn	Perm.	Var.		Page
Total on beam at 1st	24.42	9.19	KN/m	B10

Party Wall 33	Perm.	Var.		Page
Total at Grd	123.74	4.95		B2/3
Grd-Ftg	28.61			B3
	152.36	4.95	KN/m	

Eldred Geotechnics
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Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Load Summaries	4/19	G1808	17	

EXISTING BUILDINGS: Refer to current editions of drawings G1808-GA-001 to 007

Wall adj stair to grd	Perm.	Var.		Page
Total to 1st	11.16	4.50		B10
1st-grd brick 2.4m long	18.29			B10
Total to Grd	29.45	4.50	KN/m	

PW 29 front	Perm.	Var.		Page
Total to grd	97.44	9.40		B1
Grd-ftg	28.61			B1
Toptal to Ftg	126.06	9.40	KN/m	

PW 29 rear	Perm.	Var.		Page
Total to grd	68.45	10.50		B3
Grd-ftg	23.02			B4
Toptal to Ftg	91.46	10.50	KN/m	

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66 Warren Road, Chislsfield, Orpington
Kent BR6 6HY, UK

PROJECT	SUBJECT	DATE	JOB REF.	SHEET	REVISION
31 Willoughby Road NW3 1RT Proposed Basement Extension	Load Summaries	4/19	G1808	18	

EXISTING BUILDINGS: Refer to current editions of drawings G1808-GA-001 to 007

Total existing footing loads

Wall	Perm.	Var.	Length	Total Perm.	Total Var.
Front Bay	44.11	1.05	5.00	220.53	5.25
Front Wall adj PW 29	58.77	11.48	2.00	117.54	22.96
Front Wall LHS Bay	122.70	29.81	1.00	122.70	29.81
Front Wall adj PW33	108.09	37.27	1.00	108.09	37.27
Internal cross wall	52.17	54.77	5.50	286.94	301.24
Main rear wall adj PW33	137.51	21.29	1.00	137.51	21.29
Main rear wall mid section	109.22	20.87	2.00	218.44	41.74
Main rear wall adj PW29	17.27	20.87	1.70	29.36	35.48
Rear wall back extn	19.10		3.50	66.86	0.00
Flank wal back extn	24.42	9.19	7.50	183.18	68.91
Party Wall 33	152.36	4.95	9.50	1447.40	47.03
Wall adj stair to grd	29.45	4.50	4.50	132.53	20.25
PW 29 front	126.06	9.40	9.50	1197.53	89.30
PW 29 rear	91.46	10.50	7.00	640.25	73.50
				4908.87	794.02

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STRAP LOADS INPUT

Load no. 1: Permanent SLS (units - kN meter)

```
/ BEAM LOADS
SELF  X3 -1. B 1 TO 10 12 TO 35
DIST GL FX3 -20.39 B 31 30
/ BEAM LOADS
DIST GL FX3 -19.1 B 18
DIST GL FX3 -24.42 B 17 20 27
DIST GL FX3 -11.16 B 33
DIST GL FX3 -18.29 B 32
DIST GL FX3 -63.88 B 25
DIST GL FX3 -7.08 B 15 14
DIST GL FX3 -18.76 B 16
DIST GL FX3 -20.36 B 21 TO 23
DIST GL FX3 -24.43 B 28 29
/ BEAM LOADS
SELF  X3 -1. B 38 37 36
DIST GL FX3 -10.98 B 38
/ END

F O R C E   S U M M A T I O N

FX1=0. kN
FX2=0. kN
FX3=-1029.2 kN
*** PDELTA EFFECT WILL BE COMPUTED ***
```

Load no. 2: Variable SLS (units - kN meter)

```
/ BEAM LOADS
DIST GL FX3 -21.3 B 31 30
DIST GL FX3 -4.5 B 33
DIST GL FX3 -20.87 B 25
DIST GL FX3 -20.87 B 24
DIST GL FX3 -20.87 B 26
DIST GL FX3 -9.19 B 17 20 27
DIST GL FX3 -1.8 B 15 14
DIST GL FX3 -4.8 B 16
DIST GL FX3 -5.17 B 21 TO 23
DIST GL FX3 -6.2 B 28 29
/ END

F O R C E   S U M M A T I O N

FX1=0. kN
FX2=0. kN
FX3=-403.75 kN
*** PDELTA EFFECT WILL BE COMPUTED ***
```

Load no. 3: Wind +X2 (units - kN meter)

```
/ GLOBAL LOADS
* WIND NAME Panel no. 1
* WIND PARAM EC1BS HEI X3 0. DIR +X2  TABLE 3
* WIND VAL B 30. CT 1. QREF 308.17 SEA 100. TOWN 1.
* WIND CP 1.15 ALL
* WIND ON BEAM -8.15 3.02 6.5 -3.105 3.317 6.5 -3.105 3.317 3.6 0. C
* WIND ON 2.9 E
DIST 0.6336 PLANE -8.15 3.02 6.5   -3.105 3.317 6.5   -3.105 3.317
3.6  P 0. 2.9 BEAMS
* WIND END
* WIND NAME Panel no. 2
* WIND PARAM EC1BS HEI X3 0. DIR +X2  TABLE 3
* WIND VAL B 30. CT 1. QREF 308.17 SEA 100. TOWN 1.
* WIND CP -1. ALL
* WIND ON BEAM -7.8 -0.46 3.6 -7.8 -0.46 6.5 -8.15 3.02 6.5 0. 3.4976 E
```

Load no. 3: Wind +X2 (units - kN meter)

DIST 0.551 PLANE -7.8 -0.46 3.6 -7.8 -0.46 6.5 -8.15 3.02 6.5
P 0. 3.4976 BEAMS
* WIND END
/ END STATIC

F O R C E S U M M A T I O N

FX1=-6.1064 kN
FX2=8.7107 kN
FX3=0. kN
*** PDELTA EFFECT WILL BE COMPUTED ***

:

6 Steel Member check

6.1 Member references: STRAP correlated to Eldreds drawings

EGL	STRAP	EGL	STRAP	EGL	STRAP
B1	30,31	B10	21,22,23	C6	1
B2	24,25,26	B11	16	C7	13
B3	33	B12	15	C8	10
B4	17,27,20	B13	14	C9	7
B5	18	C1	12	C10	6
B6	37	C2	9	C11	8
B7	35	C3	3	C12	5
B8	38	C4	4		
B9	28,29	C5	2		

Results Summary Table

Beam	Section	Com	Defl L/	Slen	Nsd / Npl	Dir	Vsd / Vpl	M / Mc	M / Mb	Combined Axial+Mom Loc.	Combined Axial+Mom Over.
1	UC 152x152x23	1	9999	97	-0.14	MJ	0.00	0.02	0.02	0.09	0.16
2	UC 152x152x23	1	1861	97	-0.38	MJ	0.01	0.13	0.13	0.34	0.53
						MI	0.00	0.03	0.00		
3	UC 152x152x23	1	876	97	-0.63	MJ	0.00	0.01	0.01	0.60	0.88
						MI	0.00	0.29	0.00		
4	UC 152x152x23	1	1204	97	-0.17	MJ	0.02	0.21	0.21	0.29	0.37
5	UC 152x152x23	1	1687	78	-0.08	MJ	0.05	0.35	0.35	0.42	0.43
						MI	0.00	0.02	0.00		
6	UC 152x152x30	1	987	76	-0.17	MJ	0.07	0.37	0.37	0.39	0.62
						MI	0.01	0.26	0.00		
7	UC 152x152x30	1	932	76	-0.27	MJ	0.07	0.26	0.26	0.36	0.68
						MI	0.01	0.28	0.00		
8	UC 152x152x23	1	1210	78	-0.04	MJ	0.03	0.26	0.26	0.28	0.29
9	UC 152x152x23	1	9999	97	-0.59	MI	0.00	0.00	0.00	0.28	0.60
10	UC 152x152x23	1	9999	89	-0.35	MI	0.00	0.00	0.00	0.19	0.35
12	UC 152x152x23	1	9999	97	-0.29	MI	0.00	0.00	0.00	0.14	0.29
13	UC 152x152x23	1	9999	89	0.00	MI	0.00	0.00	0.00	0.00	0.00
14	UB 178x102x19	1	507	0	0.02	MJ	0.15	0.38	0.00	0.29	0.00
						MI	0.01	0.15	0.00		
15	UC 152x152x23	1	1825	0	0.01	MJ	0.11	0.22	0.00	0.32	0.00
						MI	0.00	0.09	0.00		

Eldred Geotechnics
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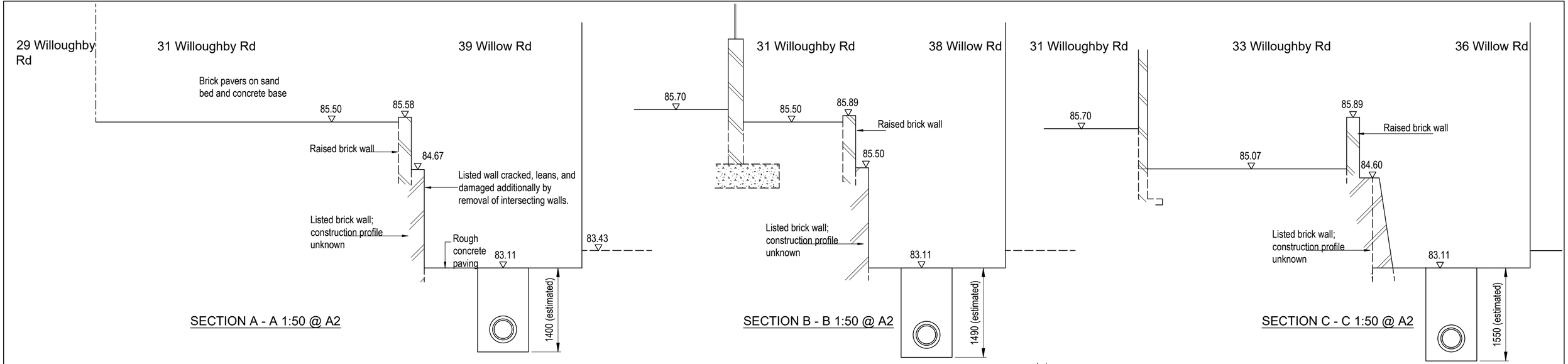
Results Summary Table

Beam	Section	Com	Defl L/	Slen	Nsd / Npl	Dir	Vsd / Vpl	M / Mc	M / Mb	Combined Axial+Mom Loc.	Combined Axial+Mom Over.
16	UC 152x152x23	1	428	0	0.00	MJ	0.28	0.47	0.00	0.59	0.00
						MI	0.00	0.11	0.00		
17	UB 305x102x28	1	811	167	-0.05	MJ	0.32	0.80	0.95	0.69	0.98
						MI	0.01	0.05	0.00		
18	UC 152x152x23	1	493	94	-0.01	MJ	0.23	0.38	0.39	0.43	0.44
						MI	0.00	0.05	0.00		
19	UC 152x152x23	1	1558	84	0.00	MJ	0.11	0.14	0.14	0.14	0.14
21	UB 356x127x33	1	396	0	0.00	MJ	0.23	0.78	0.00	0.60	0.00
23	UB 305x102x25	1	1490	0	0.00	MJ	0.26	0.79	0.00	0.63	0.00
24	][CHANNELS381x10	1	608	33	0.00	MJ	0.12	0.41	0.41	0.41	0.41
						MI	0.00	0.01	0.00		
28	UB 406x140x39	1	436	0	0.00	MJ	0.25	0.58	0.00	0.33	0.00
30	UB 457x152x60	1	407	121	0.00	MJ	0.23	0.60	0.71	0.36	0.71
32	UB 305x102x25	1	425	0	0.00	MJ	0.14	0.50	0.00	0.25	0.00
33	UC 203x203x46	1	504	88	0.00	MJ	0.13	0.30	0.32	0.09	0.32
34	UC 152x152x23	1	9999	11	0.04	MJ	0.01	0.01	0.01	0.06	0.01
						MI	0.00	0.01	0.00		
36	UC 152x152x23	1	1584	85	0.00	MJ	0.11	0.14	0.14	0.14	0.14
38	UC 152x152x23	1	478	91	0.00	MJ	0.12	0.35	0.37	0.35	0.37



Rev.	Date	Details
E2	09/20	Willow Cottages: detail updated to 2020 survey; drainage updated to show N.A. archive information and estimated trench depths

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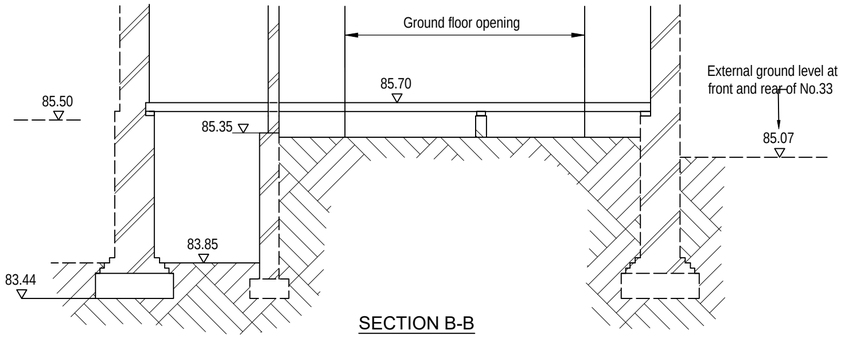
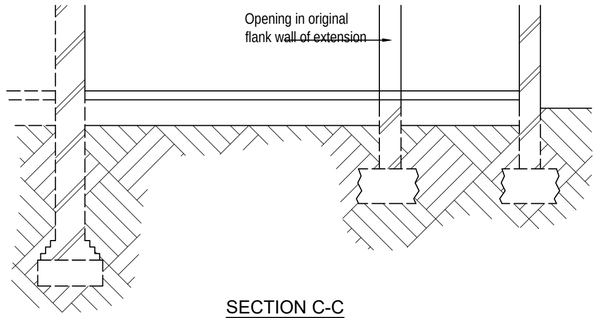
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

EXISTING SITE PLAN AND SECTIONS

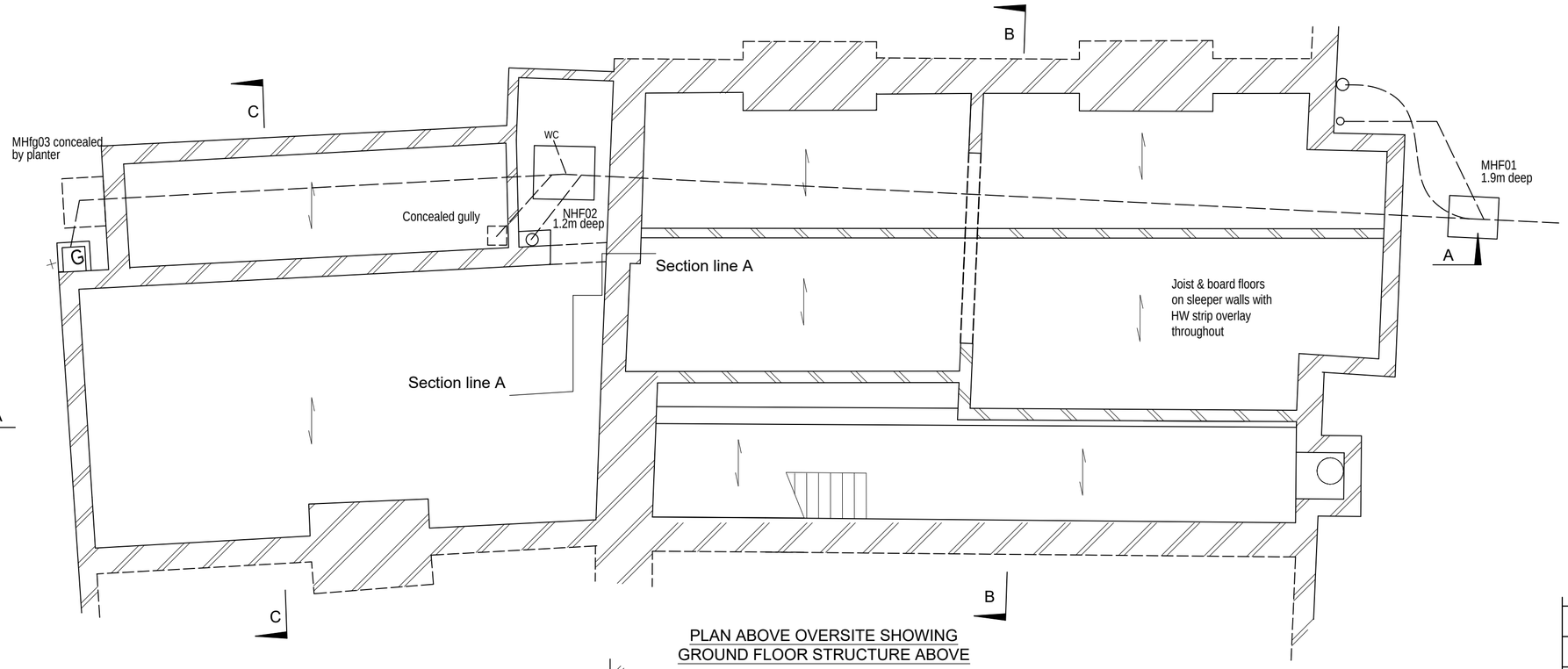
Scale.	Date	Drawing ref.
1:100, 1:50	03/19	G1808-PA-001-E2
Scale refers to paper size: A2		



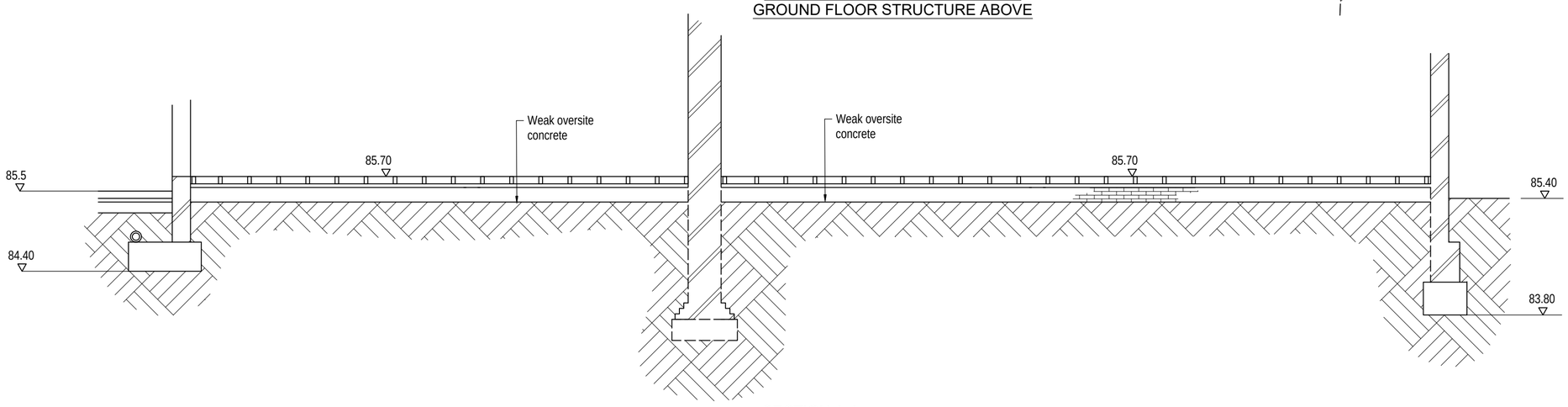
SECTION B-B



SECTION C-C



PLAN ABOVE OVERSITE SHOWING
GROUND FLOOR STRUCTURE ABOVE



SECTION A-A

GENERAL NOTES

1 This drawing is based upon a topographical survey made by Blueprint Surveys Ltd in 2014 and referenced BPS1195, and site inspection. Broken lines indicate what are considered to be the probable outlines of construction features not visible during survey or inspection.

2 Foundation depths have been taken from trial pit records or have been assessed provisionally by reference to the geotechnical investigation records. Where the party wall and external wall thicknesses are not evident from the survey or currently measurable they, together with dimensions of spread footings, have been determined by reference to the 1894 London Building Act.

Rev.	Date	Details

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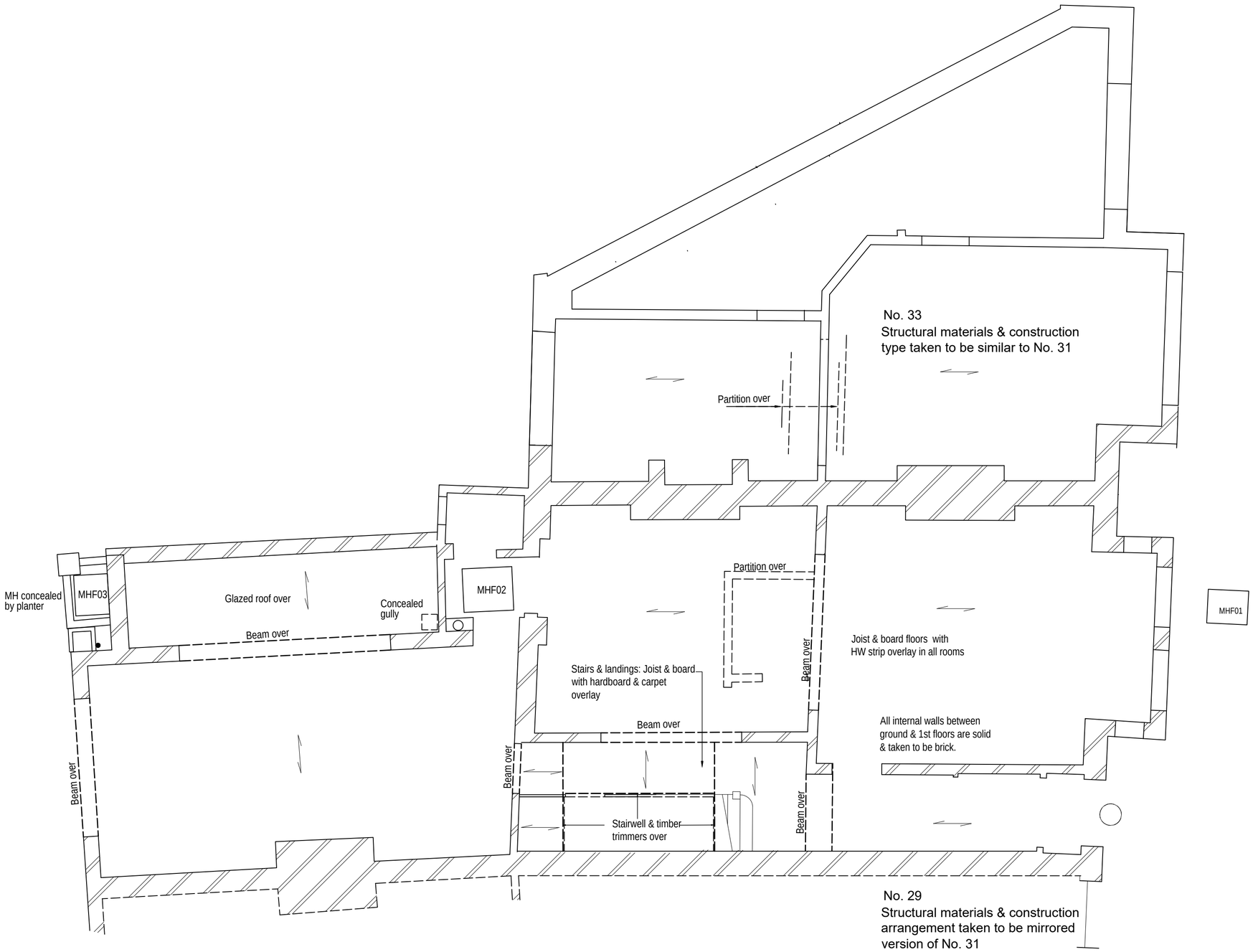
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

EXISTING SUB GROUND FLOOR PLAN
AND SECTIONS

Scale.	Date	Drawing ref.
1:50	03/19	G1808-PA-002-E1
Scale refers to paper size: A2		

GENERAL NOTES

1 This drawing is based upon a topographical survey made by Blueprint Surveys Ltd in 2014 and referenced BPS1195 and site inspection. Broken lines indicate what are considered to be the probable outlines of construction features not visible during survey or inspection.



GROUND FLOOR PLAN SHOWING
FIRST FLOOR STRUCTURE ABOVE

0m 1m 2m 3m 4m 5m

Rev.	Date	Details

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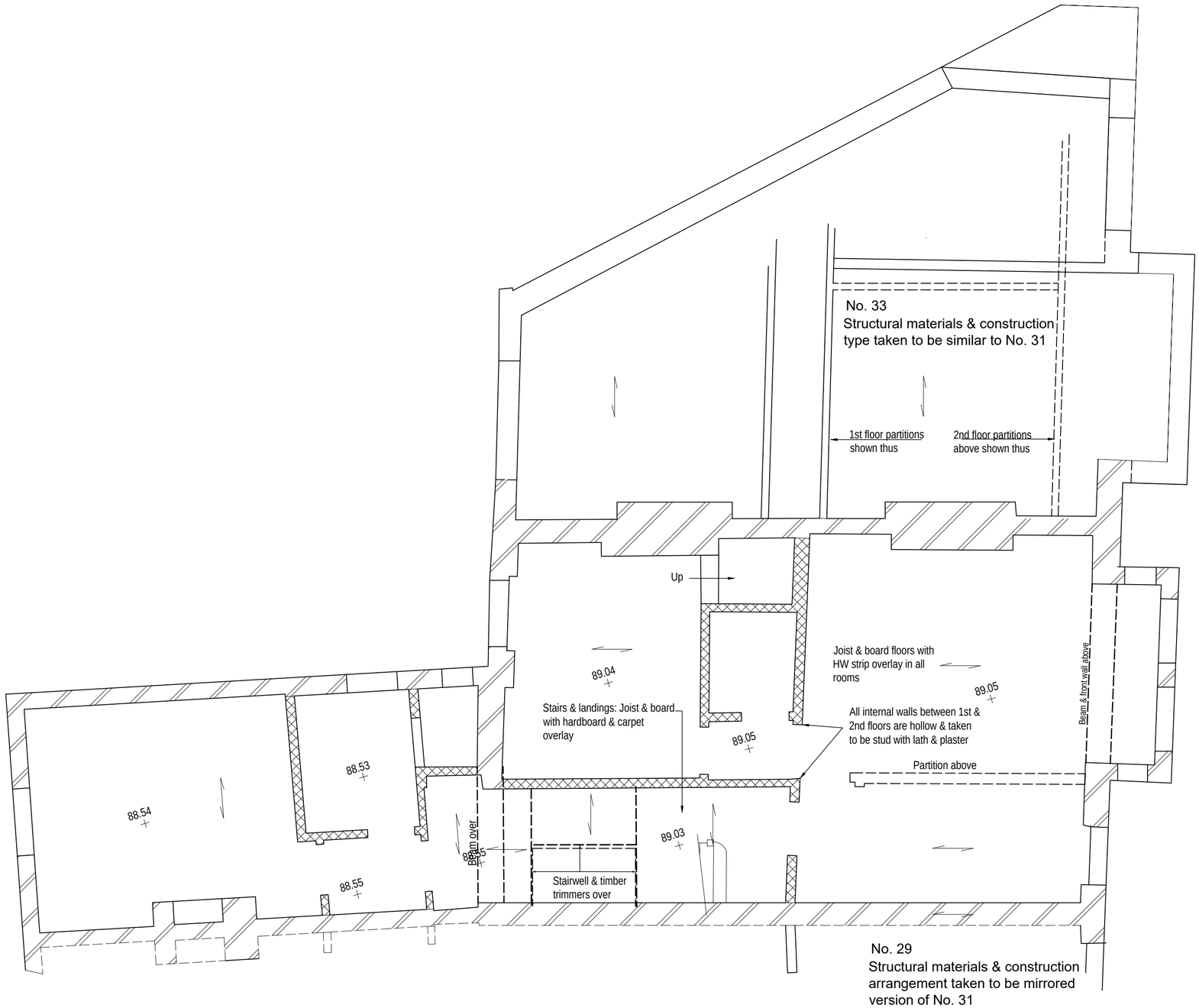
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

EXISTING GROUND FLOOR PLAN SHOWING FIRST FLOOR STRUCTURE ABOVE

Scale.	Date	Drawing ref.
1:50	03/19	G1808-PA-003-E1
Scale refers to paper size: A2		

GENERAL NOTES

1 This drawing is based upon a topographical survey made by Blueprint Surveys Ltd in 2014 and referenced BPS1195 and site inspection. Broken lines indicate what are considered to be the probable outlines of construction features not visible during survey or inspection.



FIRST FLOOR PLAN SHOWING
SECOND FLOOR STRUCTURE ABOVE

0m 1m 2m 3m 4m 5m

Rev.	Date	Details

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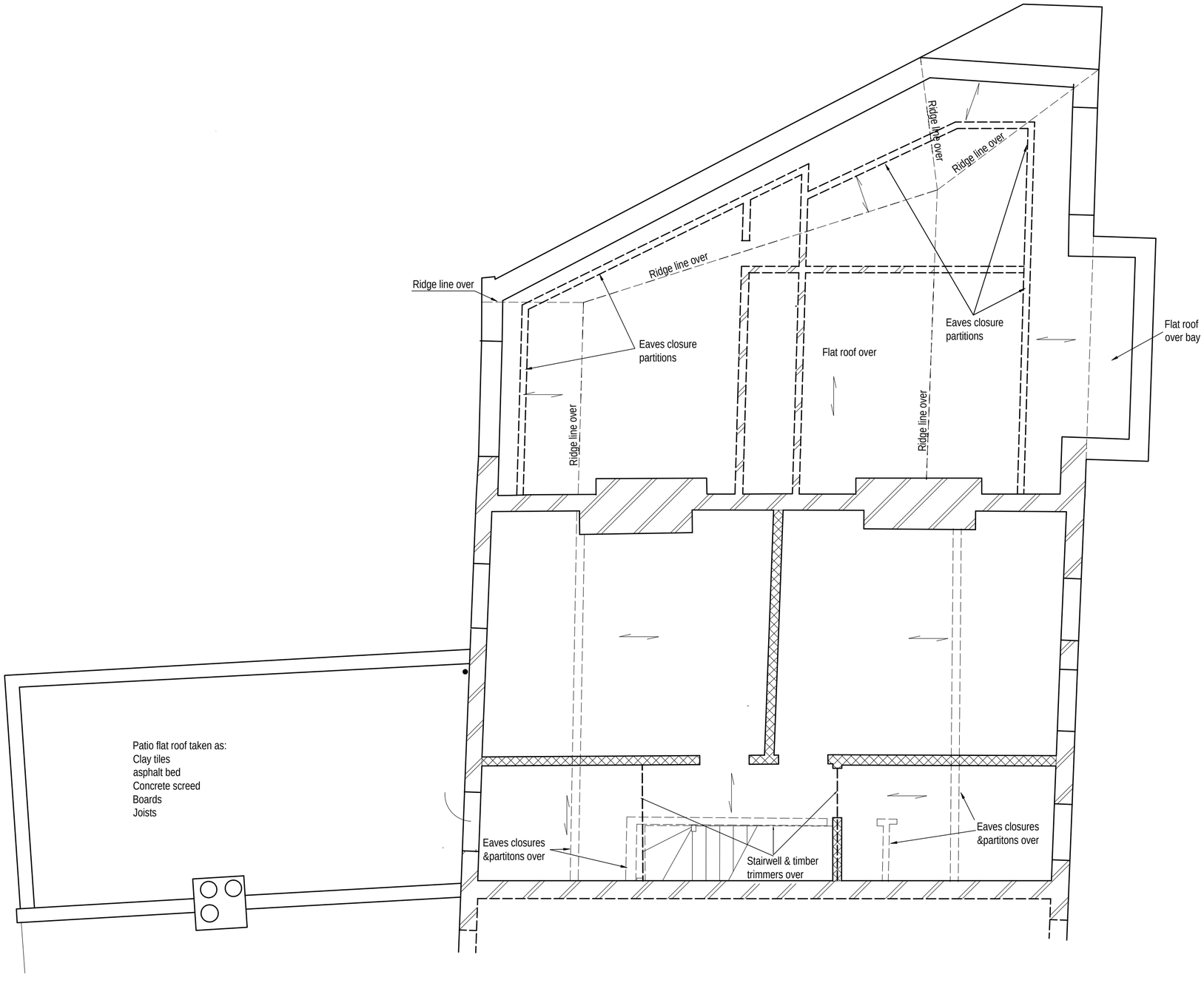
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

EXISTING FIRST FLOOR PLAN SHOWING SECOND FLOOR STRUCTURE ABOVE

Scale.	Date	Drawing ref.
1:100, 1:50	03/19	G1808-PA-004-E1
Scale refers to paper size: A2		

GENERAL NOTES

1 This drawing is based upon a topographical survey made by Blueprint Surveys Ltd in 2014 and referenced BPS1195 and site inspection. Broken lines indicate what are considered to be the probable outlines of construction features not visible during survey or inspection.



0m 1m 2m 3m 4m 5m

Rev.	Date	Details

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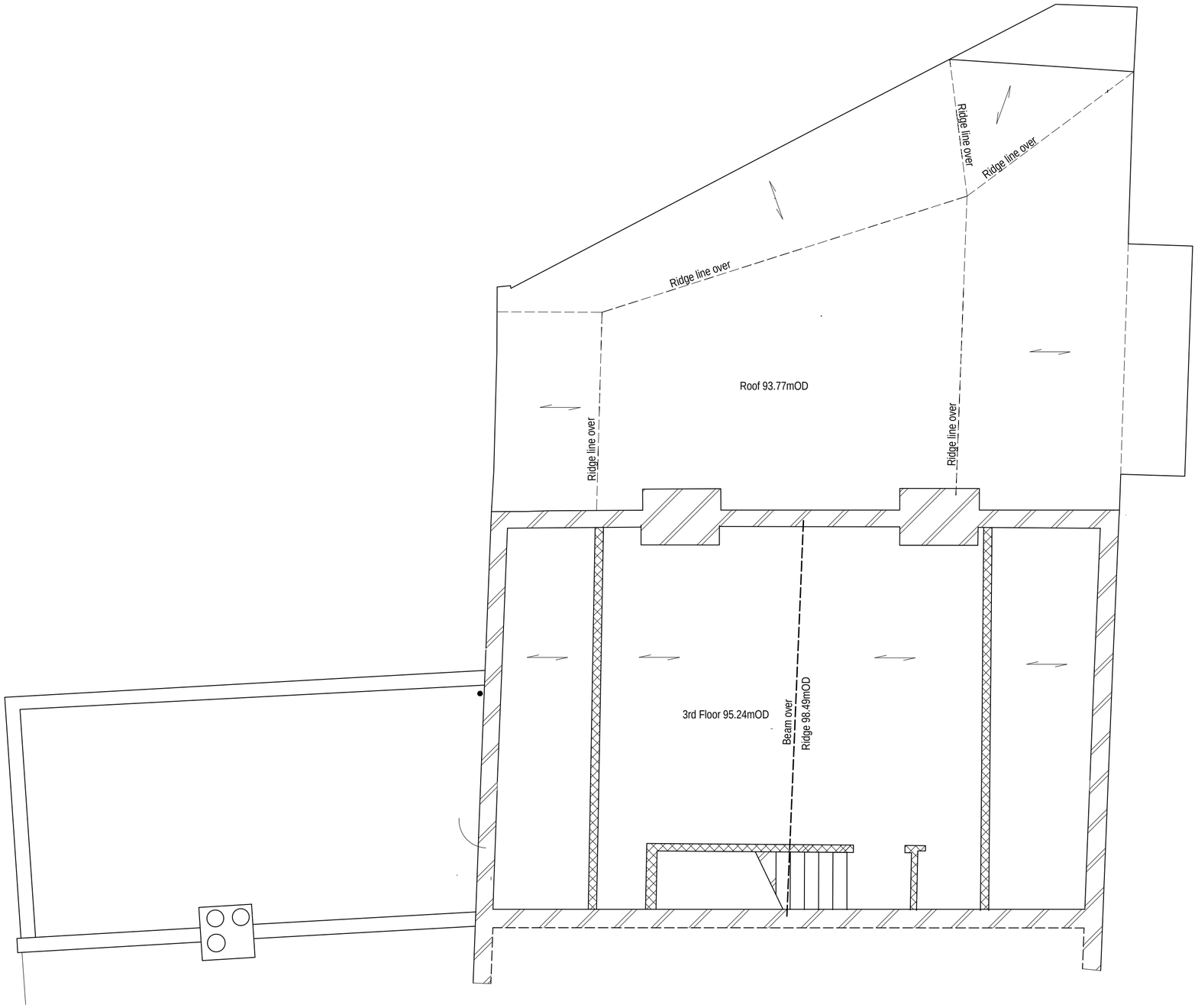
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

EXISTING SECOND FLOOR PLAN SHOWING STUDY FLOOR STRUCTURE ABOVE

Scale.	Date	Drawing ref.
1:100, 1:50	03/19	G1808-PA-005-E1
Scale refers to paper size: A2		

GENERAL NOTES

1 This drawing is based upon a topographical survey made by Blueprint Surveys Ltd in 2014 and referenced BPS1195 and site inspection. Broken lines indicate what are considered to be the probable outlines of construction features not visible during survey or inspection.



0m 1m 2m 3m 4m 5m

Rev.	Date	Details

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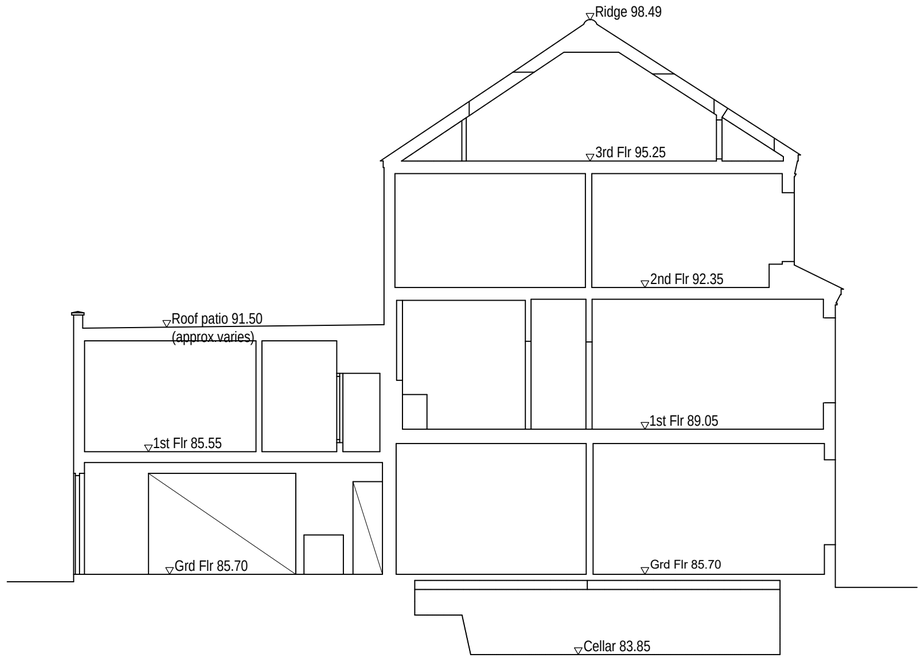
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

EXISTING THIRD FLOOR PLAN SHOWING ROOF STRUCTURE ABOVE

Scale.	Date	Drawing ref.
1:100, 1:50	03/19	G1808-PA-006-E1
Scale refers to paper size: A2		

GENERAL NOTES

1 This drawing is based upon a topographical survey made by Blueprint Surveys Ltd in 2014 and referenced BPS1195 and site inspection.



SECTION 1 - 1
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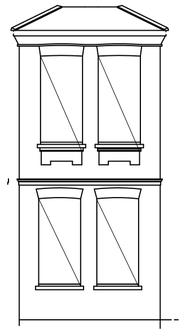

ELEVATION 2 - 2
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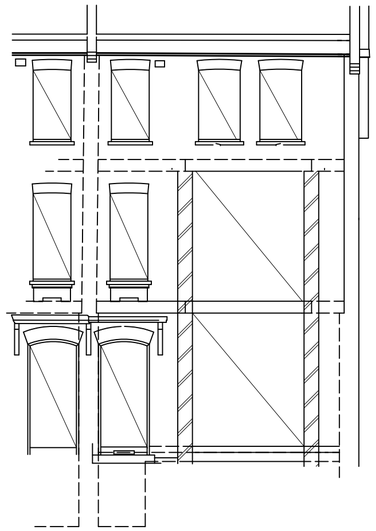

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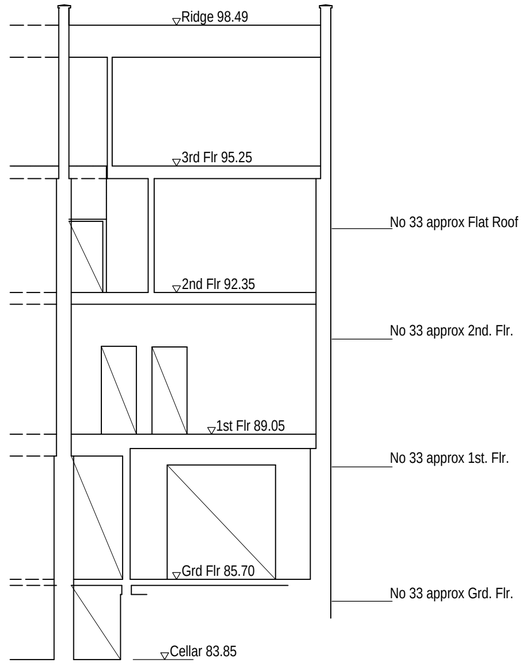

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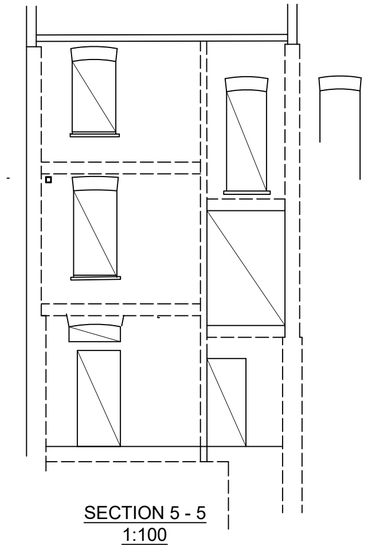

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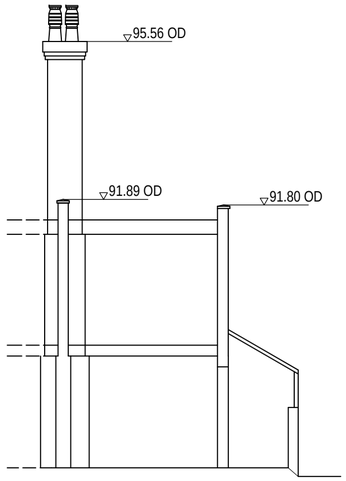
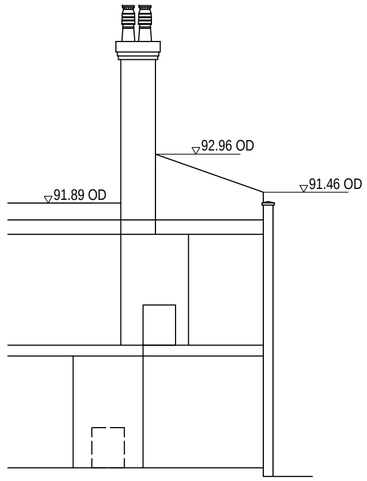
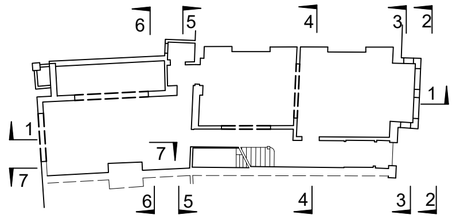


SECTION 6 - 6
1:100



SECTION 7 - 7
1:100



KEY PLAN
Scale 1:200
0m 5m

0m 1m 2m 3m 4m 5m

Rev.	Date	Details

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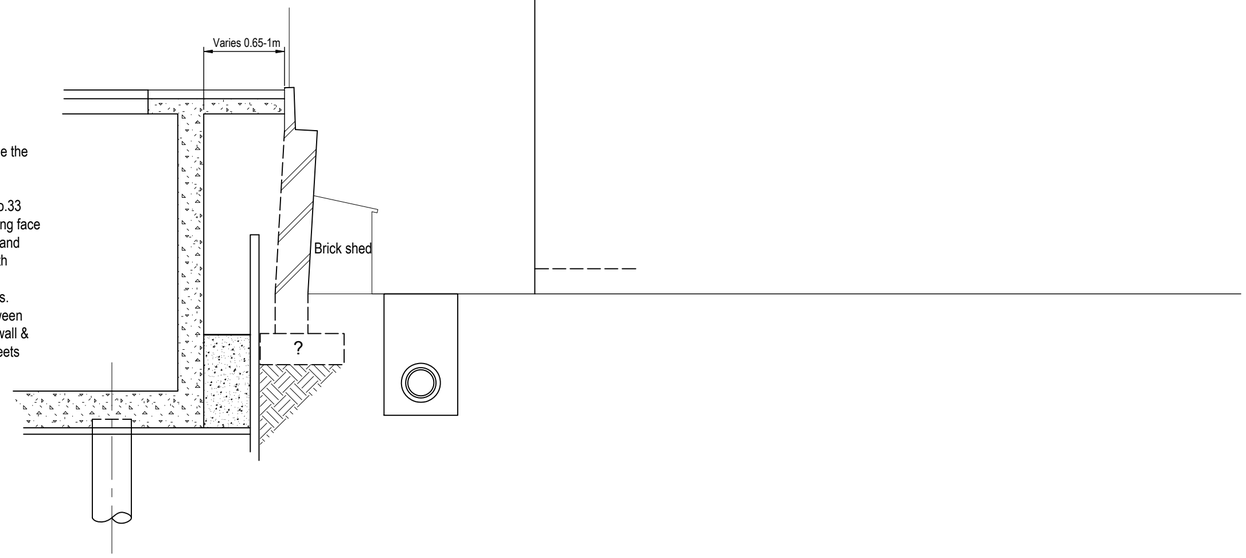
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

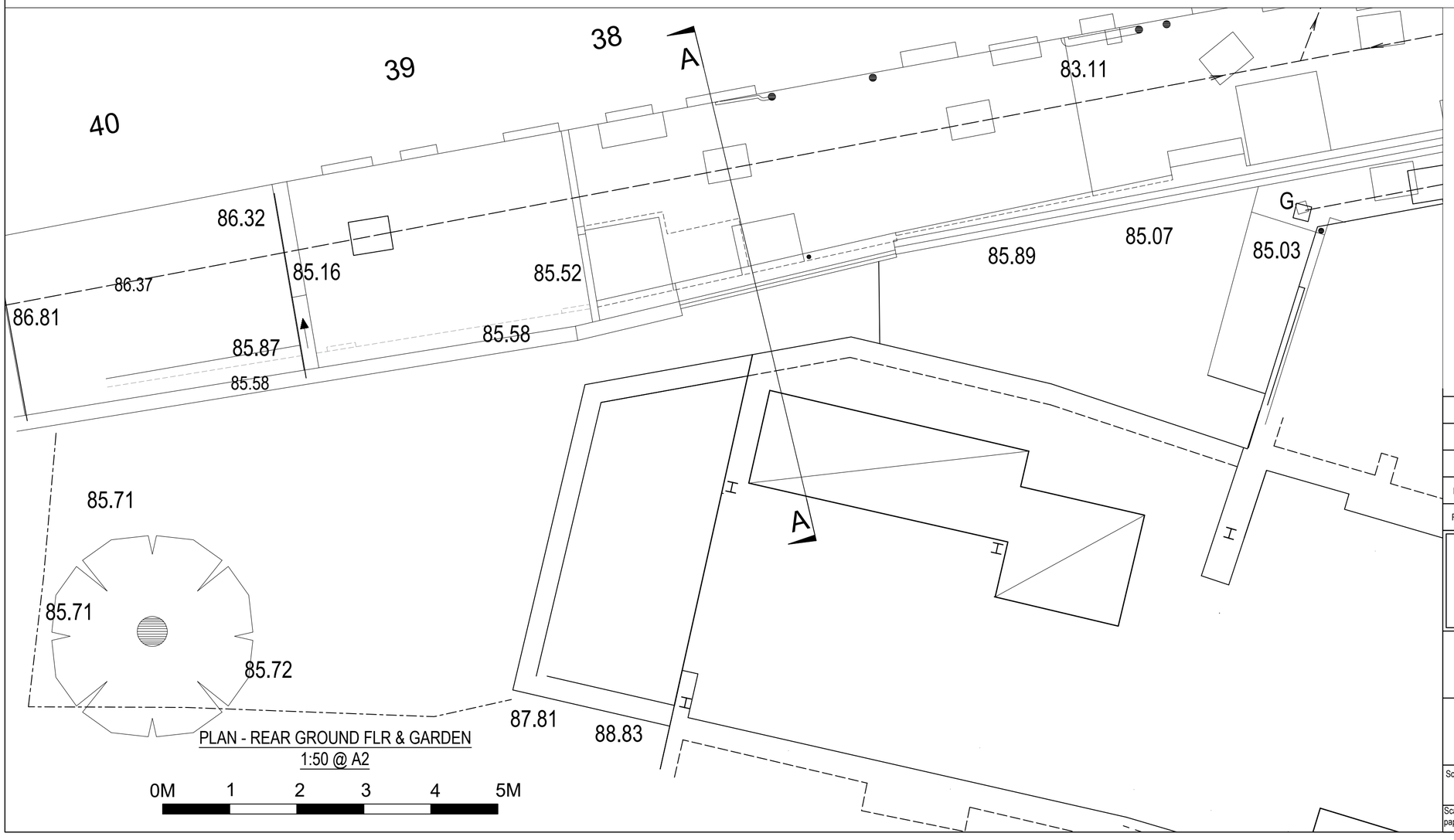
EXISTING BUILDING SECTIONS & ELEVATIONS

Scale.	Date	Drawing ref.
1:100 & 1:200	03/19	G1808-PA-007-E1
Scale refers to paper size: A2		

BEFORE CONSTRUCTION:
A trial pit is to be hand excavated to determine the existing wall profile and footing details.
CONSTRUCTION:
Following construction of rear lightwell and No.33 boundary walls: Re-excavate to expose existing face of brick wall. Brace wall as required & retain and support ground below existing wall footing with sacrificial trench sheets supportedby waling supported behind previously constructed walls. Construct new wall as free standing infill between existing RC walls. fill concrete between new wall & trench sheets. Remove waling, cut trench sheets down and backfill with lightly compacted soil



SECTION A - A 1:50 @ A2



PLAN - REAR GROUND FLR & GARDEN
1:50 @ A2

Rev.	Date	Details
E2.	10/20	Basement profile and detail adjacent to existing wall altered

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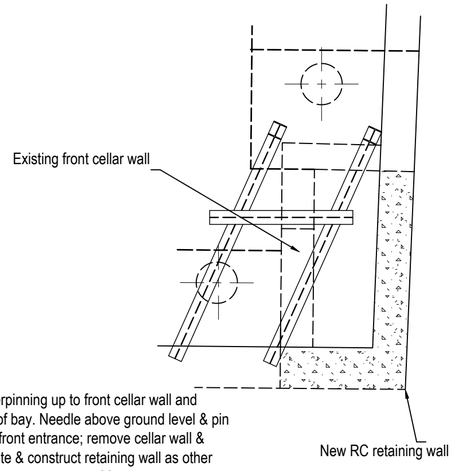
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

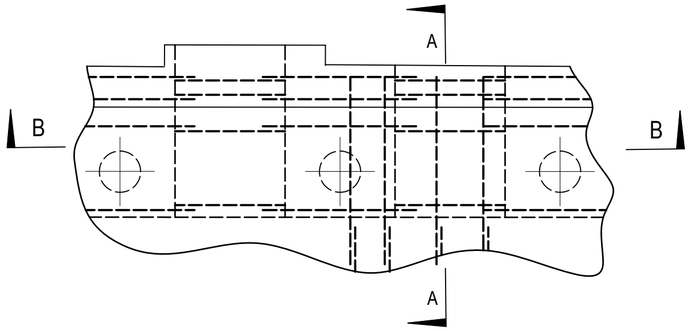
PROPOSED RELATIONSHIP OF REAR BASEMENT TO EXISTING BOUNDARY RETAINING WALLS

Scale.	Date	Drawing ref.
1:50	03/19	G1808-PA-101-E2
Scale refers to paper size: A2		

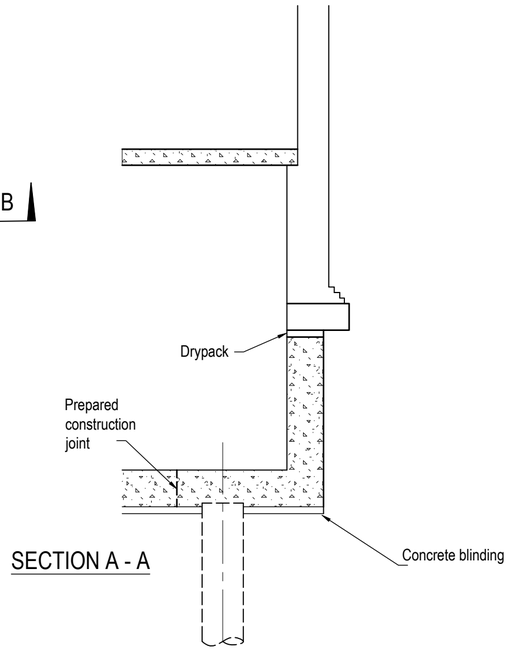


Complete underpinning up to front cellar wall and below sie wall of bay. Needle above ground level & pin up wall beside front entrance; remove cellar wall & footing; excavate & construct retaining wall as other underpins. Permanent support of front entrance and side wall to be by ground floor slab.

DETAIL 1



Underpinning to be carried out in 1m lengths. Type 1 pins with bases supported by piles are to be constructed first (note requirement for pile heads to be cut down without vibration) and intervening Type 2 pins are to be cast against prepared Type 1 faces. Reinforcing bars are to be lapped or to be fitted with connectors to provide a structurally continuous wall and basement floor.



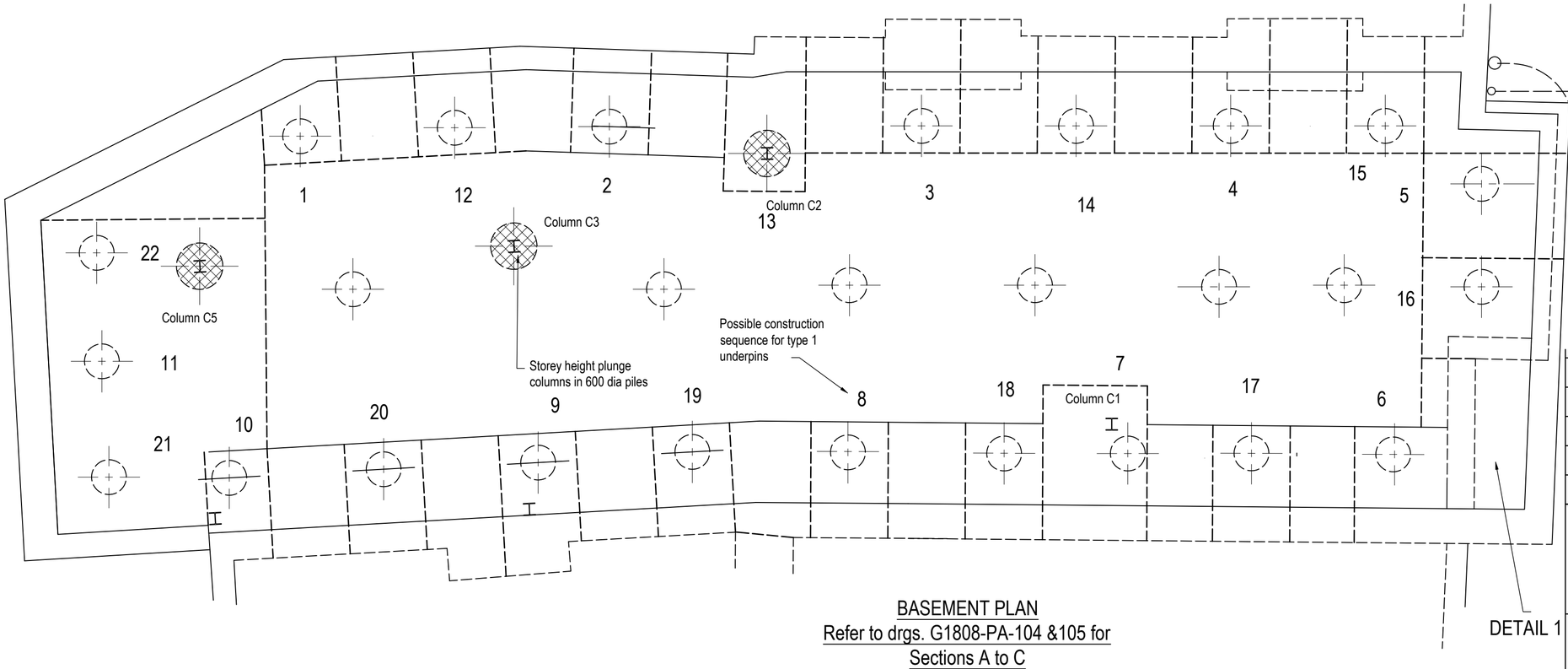
SECTION A - A

PILE INSTALLATION

1 All piles to be installed from mat at ground floor level; cut off level for all piles to be 0.5m minimum above soffit of basement floor slab. Steel plunge columns to be installed with guide frame, to terminate 200mm above pile mat level and to be protected.

2 All piles to be tested for integrity after installation and open bores to be backfilled with granular material.

3 Following completion of underpinning and excavation of dumpling, pile heads to be cut down using non-vibratory method.



BASEMENT PLAN
Refer to drgs. G1808-PA-104 &105 for Sections A to C

0m 1m 2m 3m 4m 5m

Rev.	Date	Details
E2.	10/20	Basement profile amended, geocomposite omitted, possible underpin sequence added

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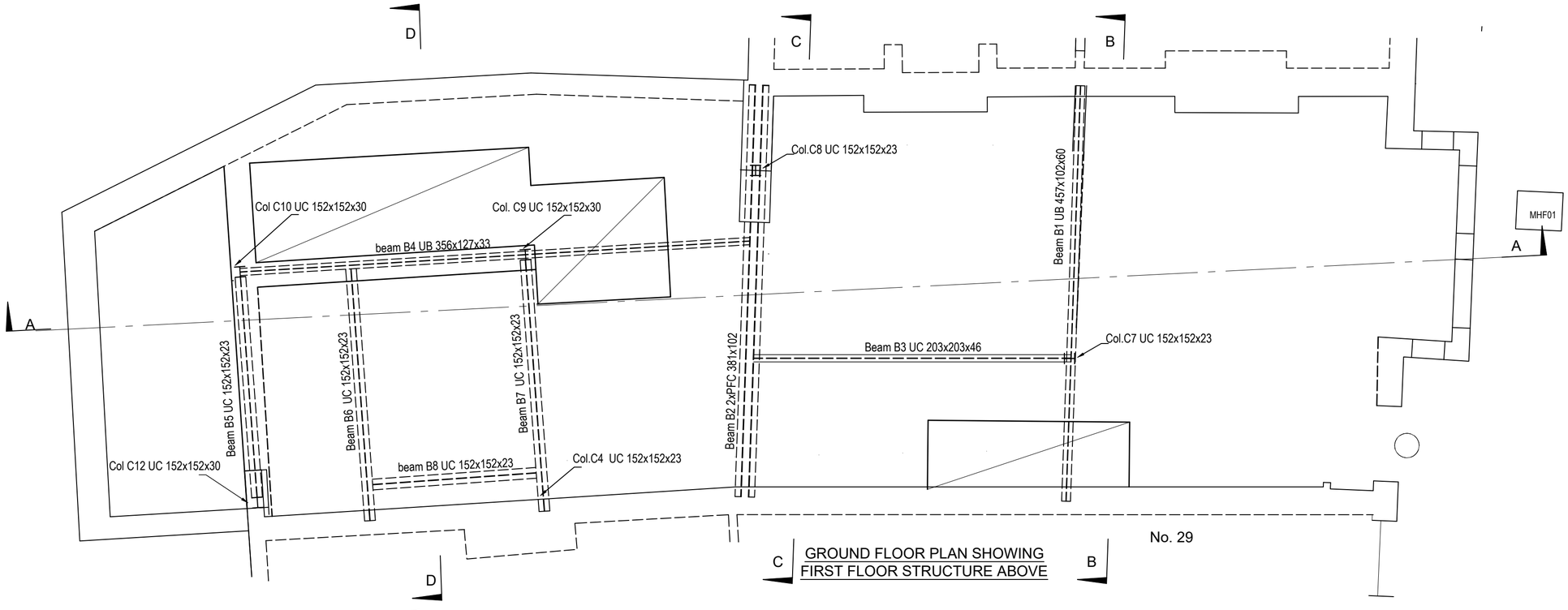
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

PROPOSED BASEMENT PLAN AND SECTIONS

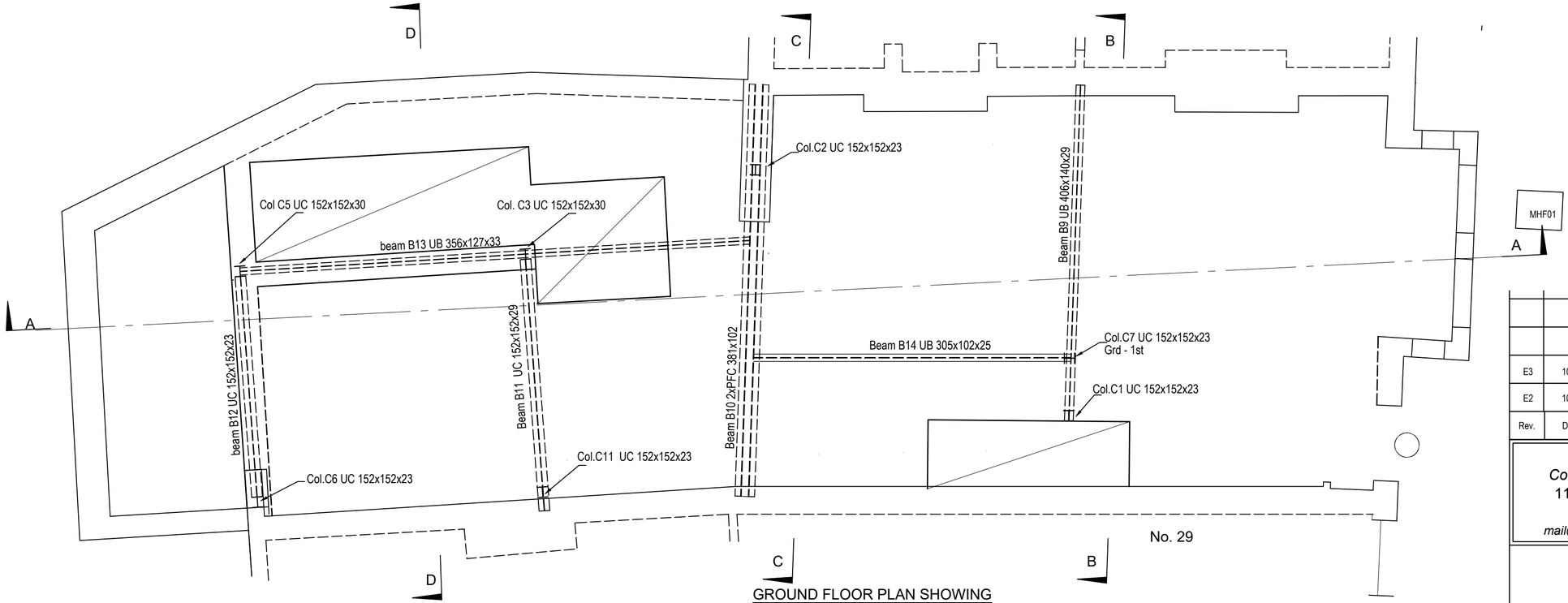
Scale.	Date	Drawing ref.
1:50	03/19	G1808-PA-102-E2
Scale refers to paper size: A2		

GENERAL NOTES

1 For sections refer to drawings G1808-PA-104 & 105



C GROUND FLOOR PLAN SHOWING FIRST FLOOR STRUCTURE ABOVE B



C GROUND FLOOR PLAN SHOWING GROUND FLOOR STEEL BELOW B

0m 1m 2m 3m 4m 5m

Rev.	Date	Details
E3	10/20	Beam & Column references amended to match calc sheets
E2	10/20	Basement profile amended

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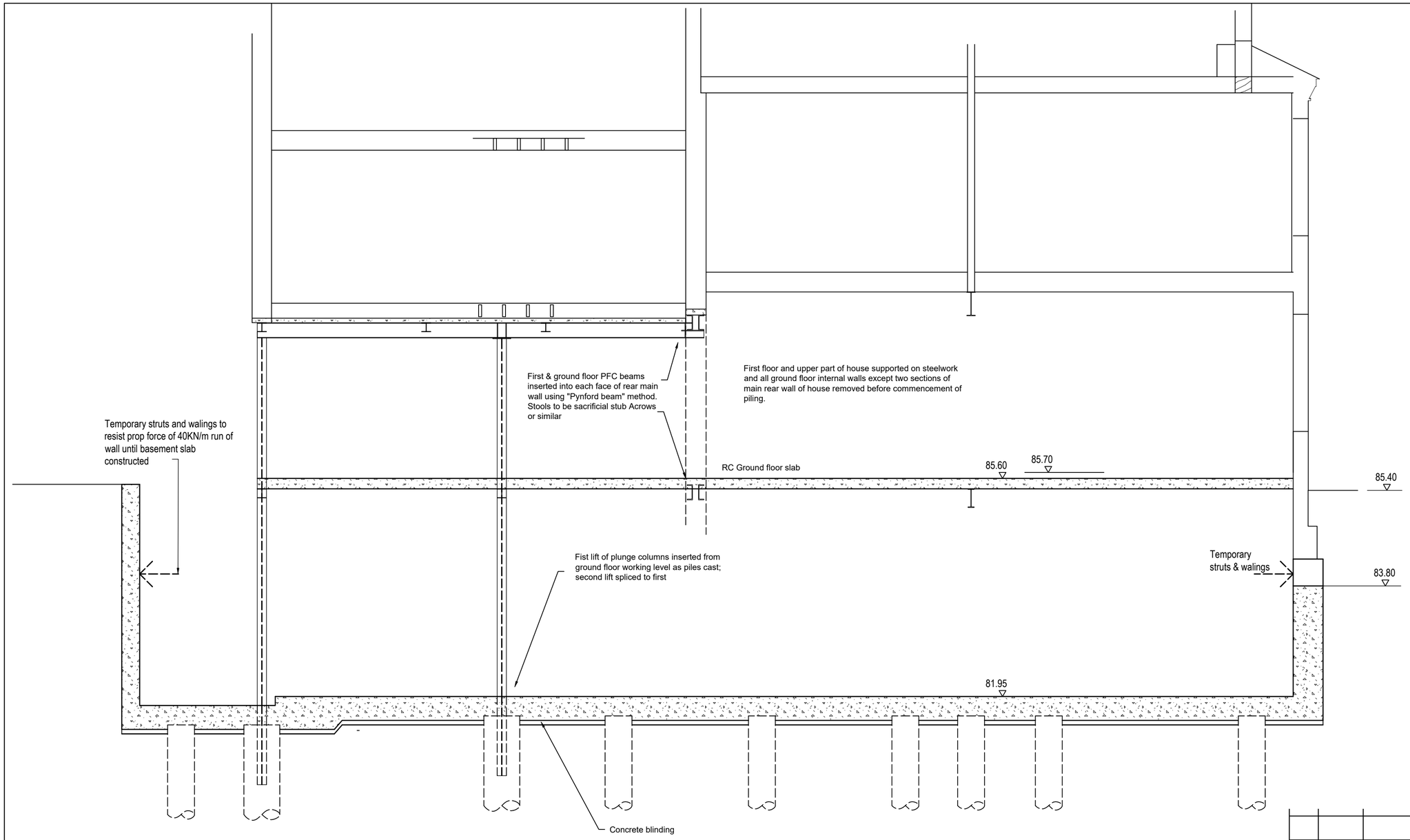
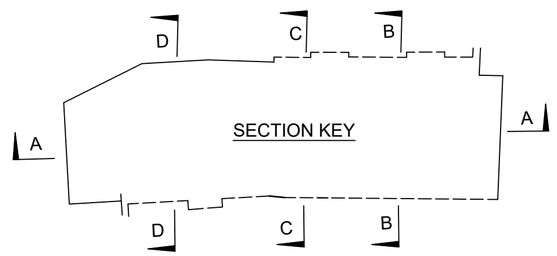
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

GROUND FLOOR PLANS
SHOWING GROUND AND FIRST FLOOR STRUCTURE

Scale.	Date	Drawing ref.
1:100, 1:50	03/19	G1808-PA-103-E3
Scale refers to paper size: A2		



SECTION A-A



0m 1m 2m 3m 4m 5m

E2.	10/02	Geocomposite omitted, basement profile amended

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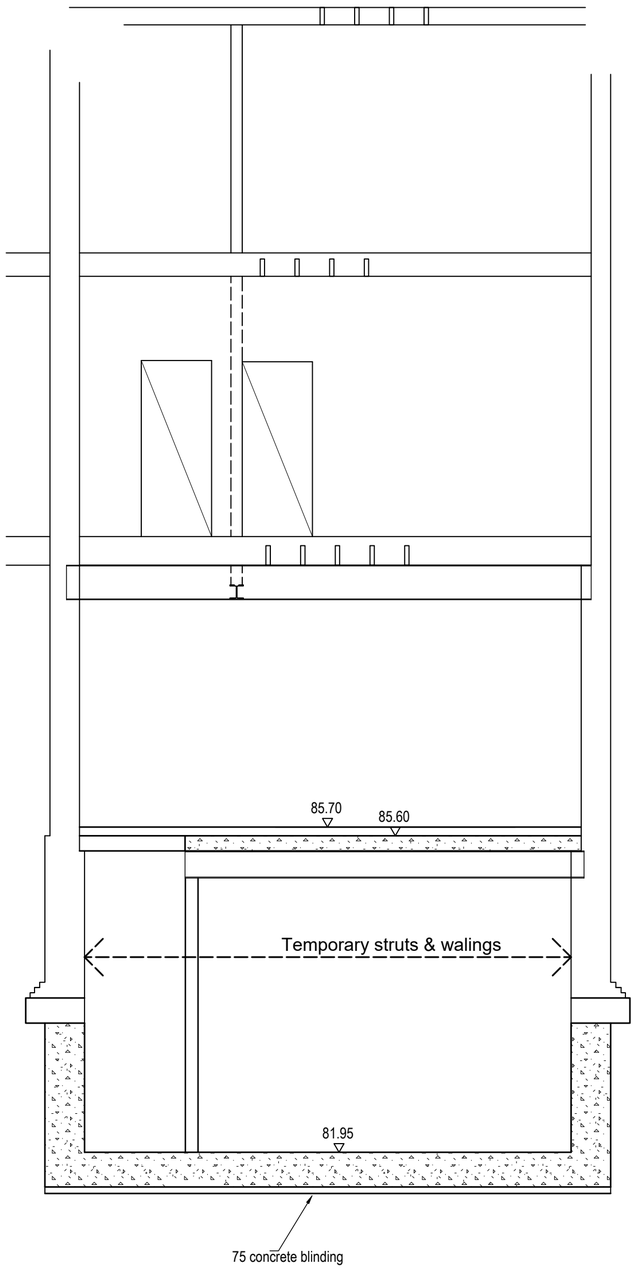
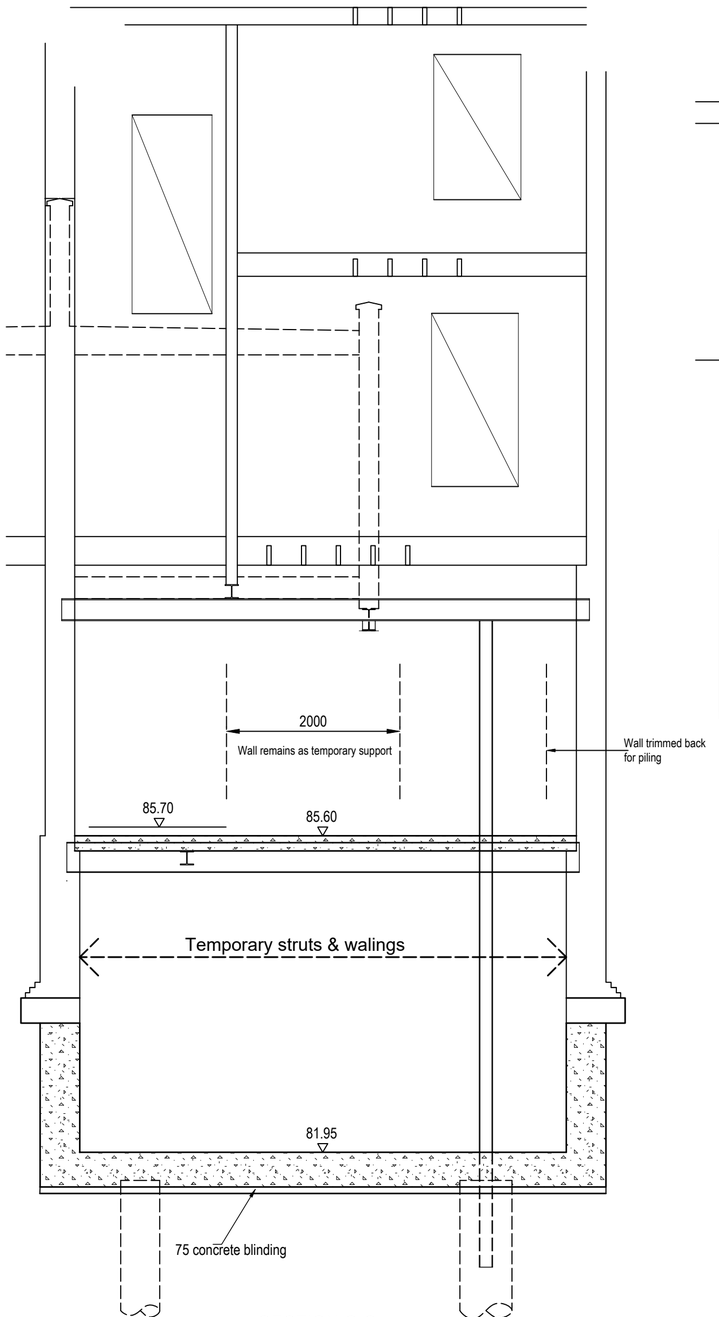
31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

PROPOSED GENERAL SECTION A - A

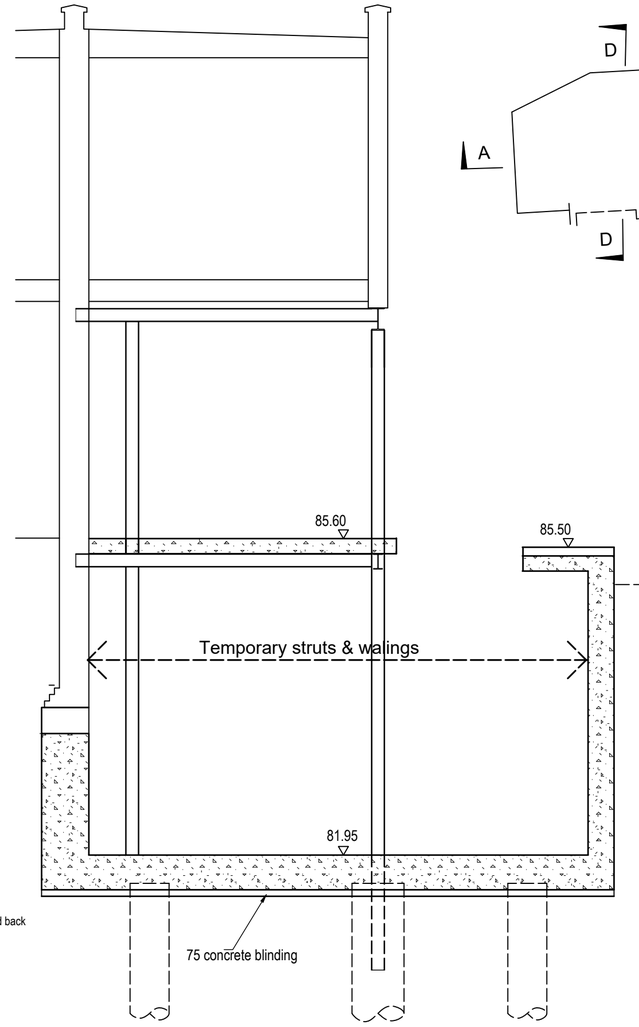
Scale.	Date	Drawing ref.
1:50	03/19	G1808-PA-104-E2
Scale refers to paper size: A2		



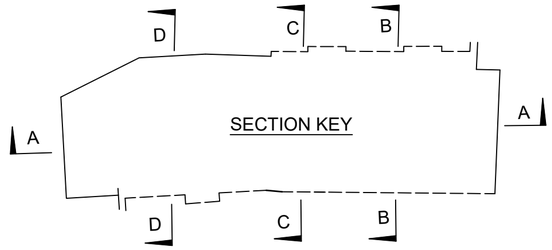
SECTION B-B



SECTION C-C



SECTION D - D



0m 1m 2m 3m 4m 5m

Rev.	Date	Details
E2	10/02	Basement profile amended geocomposite deleted

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31 WILLOUGHBY ROAD LONDON NW3 1RT
PROPOSED BASEMENT EXTENSION

PROPOSED GENERAL CROSS SECTIONS

Scale.	Date	Drawing ref.
1:50	03/19	G1808-PA-105-E2
Scale refers to paper size: A2		

Appendix E Contents

PROPOSED BUILDINGS: Refer to current editions of drawings G1808-GA-102 to 105

Front part of basement; preliminary estimate of unfactored loads imposed at basement floor soffit level (81.50 OD)

Item	Permanent	Variable	
Existing: No.29 party wall	126.06	9.40	
Existing: No.33 party wall	152.36	4.95	
New; 2 No.300 RC party walls 1.5m high	21.60		
New; 450mm basement floor slab 6.5m wide	70.20		
New; basement floor finish	8.85		
New; basement floor variable		8.85	
New 175mm ground floor slab	24.78		
New; ground floor fininsh	8.85		
New; ground floor variable		8.85	
Total unfactored loads/m length of basement	412.69	32.05	KN/m
For preliminary purposes assume all load carried by piles close to external walls; piles @ 2m c/c			
SLS Loads/pile	412.69	32.05	KN/m
DA1 Comb A1	557.14	48.08	KN/m
DA1 Comb A2	412.69	41.67	KN/m

Rear part of basement; unfactored loads imposed at basement floor soffit level (81.50 OD)

Item	Permanent	Variable	
Existing: No.29 party wall	91.46	10.50	KN/m
Other loads as front/2	67.14	8.85	KN/m
Total unfactored loads/m length of basement	158.60	19.35	KN/m
For preliminary purposes assume all load carried by piles close to external walls; piles @ 2m c/c			
SLS Loads/pile	158.60	19.35	KN/m
DA1 Comb A1	214.11	29.03	KN/m
DA1 Comb A2	158.60	25.16	KN/m

Preliminary assessment of Pile Capacity

11m pile below basement soffit. 450 dia. Front. Refer to Cu profile Figure 14

Load DA1 Comb. 2 = Comp 454 KN Tension 247 KN

		Pile dia m.	Perimeter m.	α	Section length m	Cu	γ_{Cu}	Resistance	
Shaft		0.45	1.41	0.50	11.00	129.00	1.40	716.54	KN
End	CSA	0.16		9.00		196.00	1.40	201.60	KN
							Total	918.14	KN

Resitance factors R4 Comp 2.02 R4 Tens 2.90 >2 Adequate

DA1 Comb. 1 = 605 KN Tension 333 KN

		Pile dia m.	Perimeter m.	α	Section length m	Cu	γ_{Cu}	Resistance	
Shaft		0.45	1.41	0.50	11.00	129.00	1.00	1003.16	KN
End	CSA	0.16		9.00		196.00	1.00	282.24	KN
								1285.40	KN

Resitance factors R1 Comp 2.12 R1 Tens 3.01 >1 Adequate

11m pile below basement soffit. 300 dia. Rear. Refer to Cu profile Figure 14

DA1 Comb. 2 = 184 KN Tension 247 KN

		Pile dia m.	Perimeter m.	α	Section length m	Cu	γ_{Cu}	Resistance	
Shaft		0.30	0.94	0.50	11.00	129.00	1.40	477.70	KN
End	CSA	0.07		9.00		196.00	1.40	88.20	KN
								565.90	KN

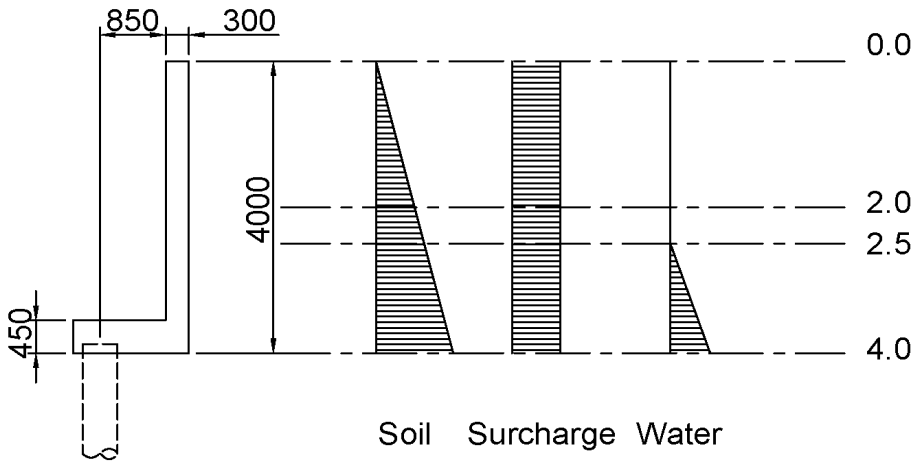
Resitance factors R4 Comp 3.08 R4 Tens 1.93 >=2 Adequate

DA1 Comb. 1 = 243 KN Tension 333 KN

		Pile dia m.	Perimeter m.	α	Section length m	Cu	γ_{Cu}	Resistance	
Shaft		0.30	0.94	0.50	11.00	129.00	1.00	668.77	KN
End	CSA	0.07		9.00		196.00	1.00	123.48	KN
								792.25	KN

Resitance factors R1 Comp 3.26 R1 Tens 2.01 >1 Adequate

Preliminary check on stability of cantilever retaining wall in rear extension - short term condition



Soil	γ_{sat}	18.00	KN/m^3
Conc.	γ	24.00	KN/m^3

< int. friction	ϕ'	25.00	deg.
Cohes.	c'	0.00	Kpa

Ka	0.41	frac'n

DA1	Char.	A1	A2		A1	A2	A1	A2
Action	Pv	Pah	Pah	Arm	M O/T	M O/T	MR	MR
Soil	72.00	40	30	1.33	53	39		
Surch	10.00	25	21	2.00	49	43		
Water	7.50	10	8	0.50	5	4		
Stem	28.80			1.00			28.80	28.80
Base	9.18			0.43			3.90	3.90
					107.27	85.65	32.70	32.70

Resistance factors R1/A1 0.30 R1/A2 0.38 Inadequate.

Provide struts 1.5m from top of wall ULS force/m run = (107.27-32.7)/2.5 = 29.83 KN/m

Preliminary EC2 check on Section F3 wall at junction of Nos. 31 &33

SLS actions from analysis (31/33 party wall)

M = 37 kNm/m ; V = 108 kN/m

ULS say: 37 x 1.5 = 56 kNm 108 x 1.5 = 162 kN.

Allow for 400mm wall (d = 350) + 500 base (d = 450)

Concrete: C35/45

At age t = 7 days s = 0.2 $\beta_{cc}(t) = 0.819$

$f_{ck}(t) = 28\ N/mm^2$.

$K = \frac{56E3}{450^2 \times 28} = 0.01$ $z = 0.95d$.

Wall: $A_{st} = \frac{56E6 \times 1.15}{500 \times 0.95 \times 356} = 390\ mm^2/m$

$min\ \% = 0.14\% = 466$ T12@200 (565)

Base: Shear stress $= \frac{162 \times 10^3}{450 \times 0.95 \times 10^3} = 0.378\ N/mm^2$

V_{Rdc} with 0.25% $A_{st} = 410\ N/mm^2$

$A_{st} = 1068\ mm^2/m$. T20@200 (1571)

400 wall + 500 base local to wall adequate

FLAC Analysis -primary input values. Figures 15 to 23 show groundwater flow direction and model geometry together with tabled critical results extracted from output data.

Units are Mg - m - sec. Stress is expressed in Kpa.

For soils, FLAC does not accept input in terms of Youngs Modulus, which is replaced by drained bulk modulus K' of the solid matrix and shear modulus G. E'= 3K'(1-2v') = 2G(1+v). The undrained bulk modulus is
K = K'+Kw/n: Kw is the bulk modulus of water (2E+9 GPa), n is porosity.
The permeability k used is not the hydraulic conductivity (m/sec) but the mobility coefficient (m^2/KPa.sec). The numerical conversion is k(m^2/KPa.sec) = k(m/s)/10.
Properties of structural members are input in convential form.

Soil Properties:		γ dry	ν	E'	Bulk K'	Shear G	Cu	C'	ϕ'
		Mg/m3		Kpa	Kpa	Kpa	Kpa	Kpa	Deg.
Soil 1	0 - 4m bGL	1.5	0.20	2.43E+04	1.35E+02	1.01E+04	38.0	2.0	25.0
Soil 2	4 - 6m bGL	1.5	0.20	5.24E+04	2.91E+04	2.18E+04	77.0	2.0	25.0
Soil 3	6 - 8m bGL	1.6	0.20	6.66E+04	3.70E+04	2.78E+04	104.0	2.0	25.0
Soil 4	8 - 15m bGL	1.3	0.20	1.04E+05	5.78E+04	4.33E+04	163.0	2.0	25.0
Soil 5	15 - 30m bGL	1.7	0.20	1.97E+05	1.09E+05	8.21E+04	307.0	2.0	25.0

Structural elements	Density	Dia or Thickn'	E	Rot'n stiffness KNm^2	Pitch m
Concrete piles 10m long	2.4	0.45	2.60E+07	not used	2.00
Concrete walls	2.4	0.40	2.60E+07	not used	Cont.
UC 152x152x23	7.85		2.10E+08	not used	3.00
Floor slabs	2.4	0.4*	2.60E+07	not used	Cont.

*increased to 0.5m below perimeter walls

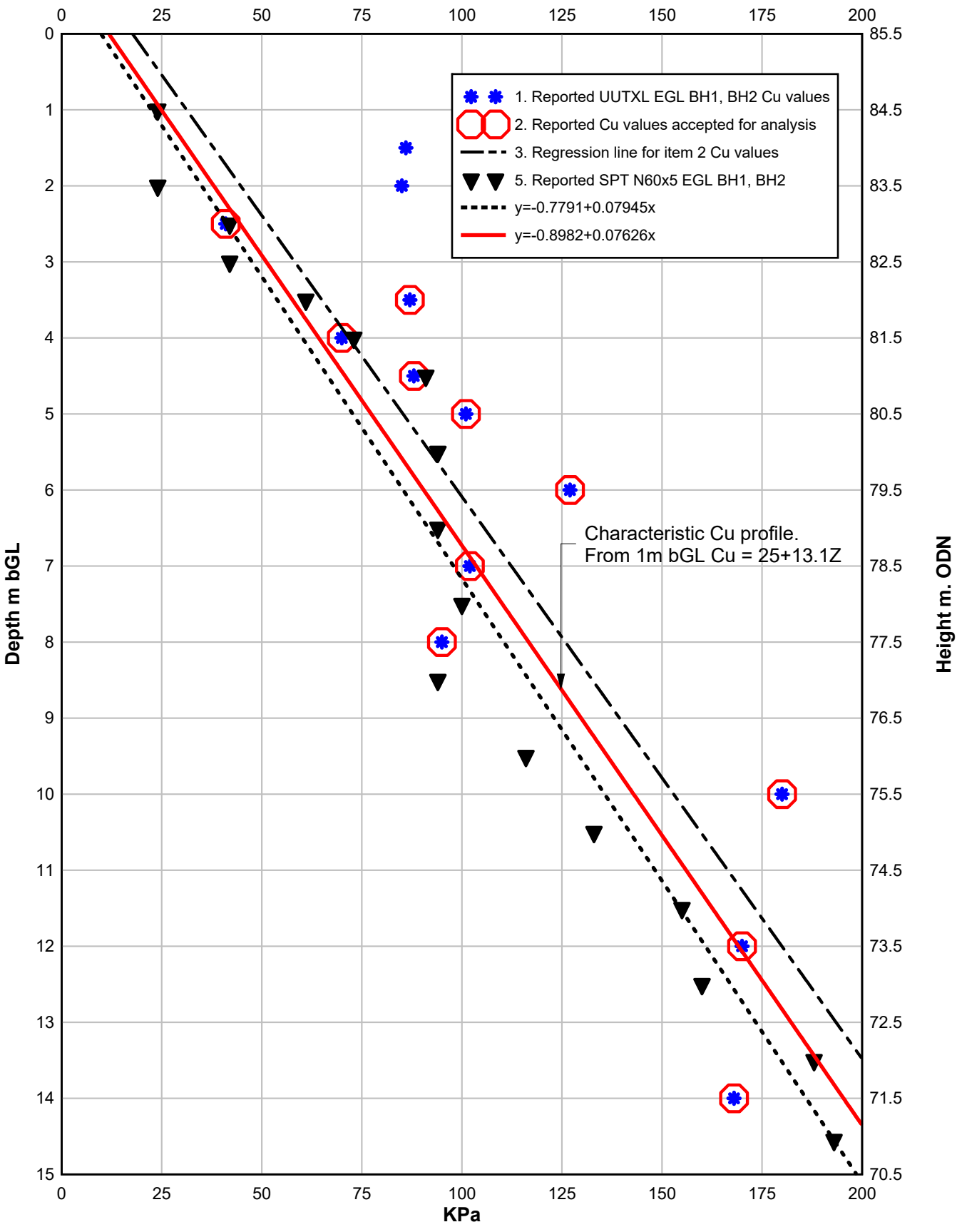
Interfaces	Normal spring stiffness Kpa/m	Shear spring stiffness Kpa/m	Cohesion Kpa	Friction Deg.
Piles	6.30E+05	6.30E+05	2.00	16.5
Walls	5.38E+05	5.38E+05	2.00	16.5
Wall bases	5.38E+05	5.38E+05	2.00	16.5

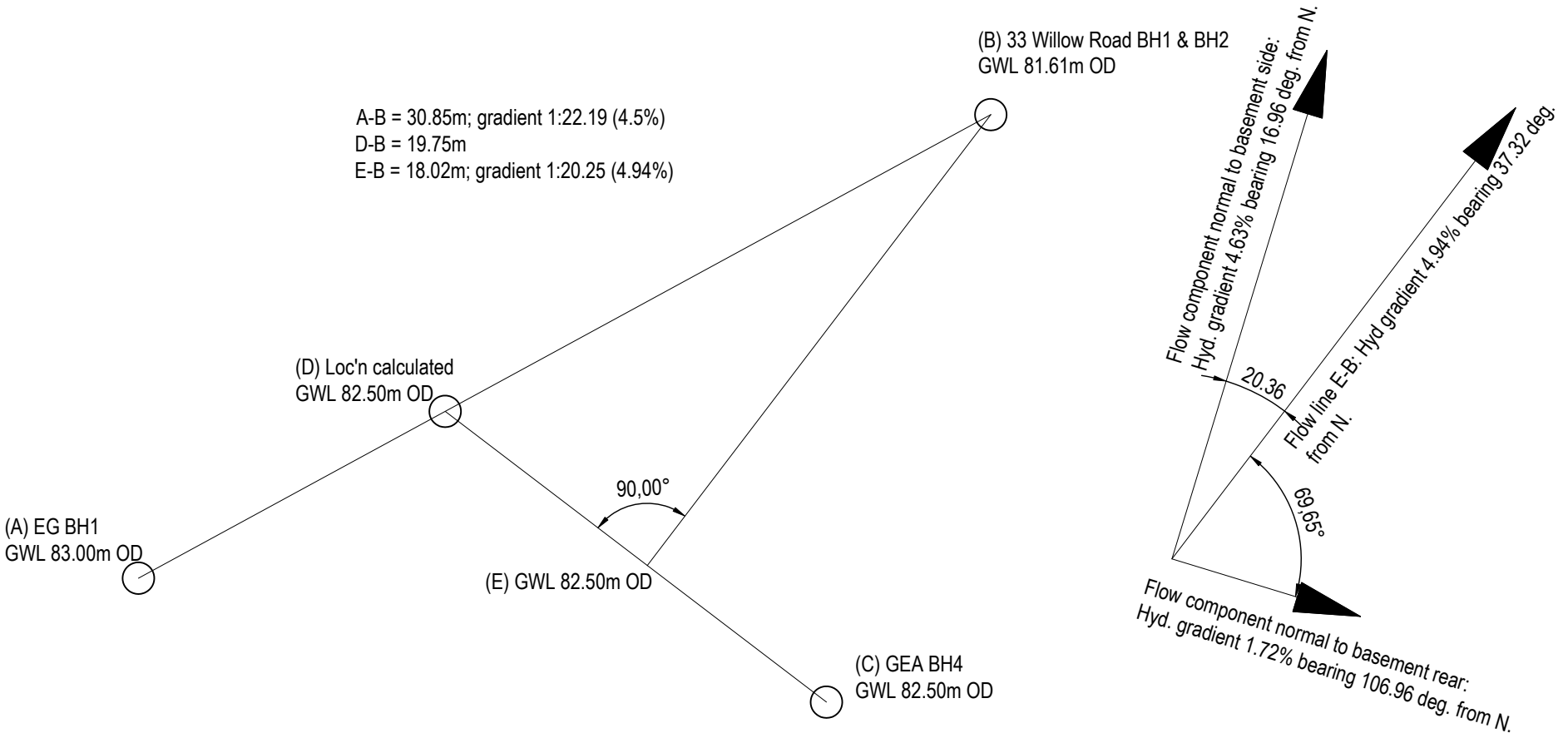
Porosity & Permeability (see note)

	n	k
Soil 1	0.5	1.00E-09
Soil 2	0.6	1.00E-09
Soil 3	0.50	1.00E-10
Soil 4	0.50	1.00E-10
Soil 5	0.50	1.00E-10

G1808 31 Willoughby Road NW3 1RT - Proposed Basement

Assessed Characteristic Profile of Undrained Shear strength vs Depth





31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

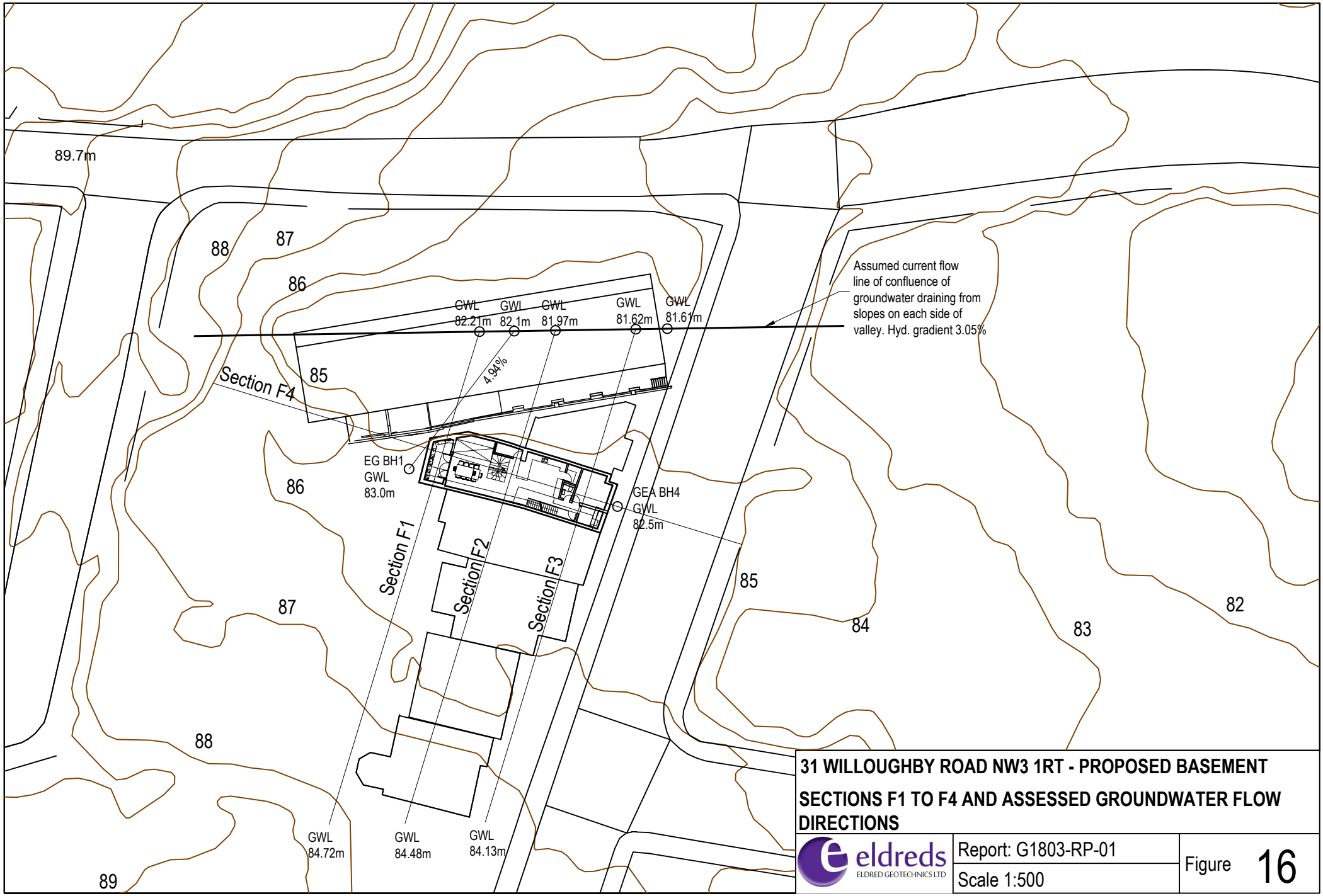
ASSESSED GROUNDWATER FLOW DIRECTION AND COMPONENTS FOR ANALYSES

eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale as indicated

Figure 15



31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

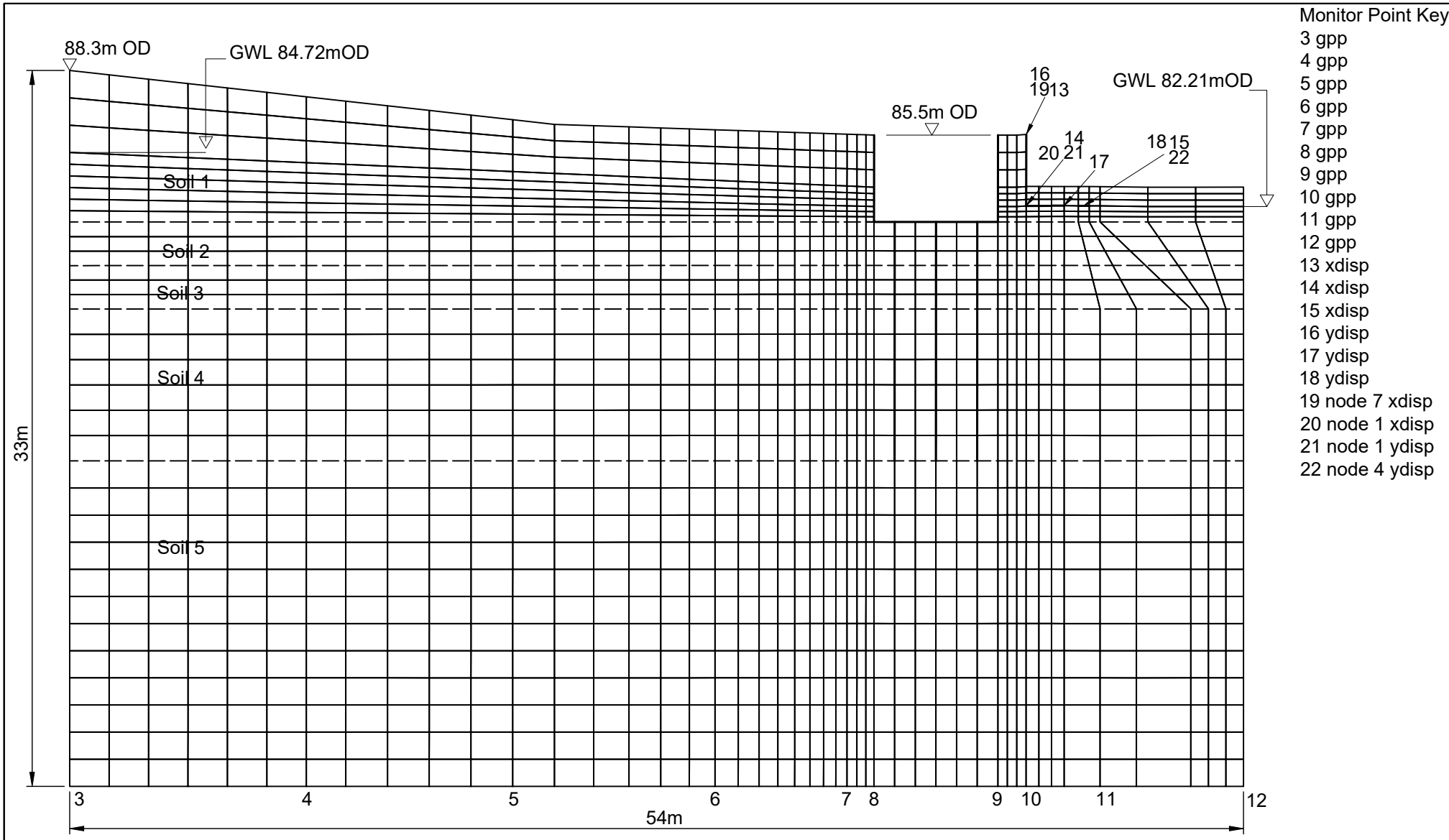
SECTIONS F1 TO F4 AND ASSESSED GROUNDWATER FLOW DIRECTIONS

eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale 1:500

Figure 16



Monitor Point Key
3 gpp
4 gpp
5 gpp
6 gpp
7 gpp
8 gpp
9 gpp
10 gpp
11 gpp
12 gpp
13 xdisp
14 xdisp
15 xdisp
16 ydisp
17 ydisp
18 ydisp
19 node 7 xdisp
20 node 1 xdisp
21 node 1 ydisp
22 node 4 ydisp

0m 5m 10m 20m
Horizontal & Vertical Scale

Legend
gpp grid point pore water pressure
xdisp grid displacement
ydisp grid displacement
node structural node, No., dispm'nt directions +ve towards right & top

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

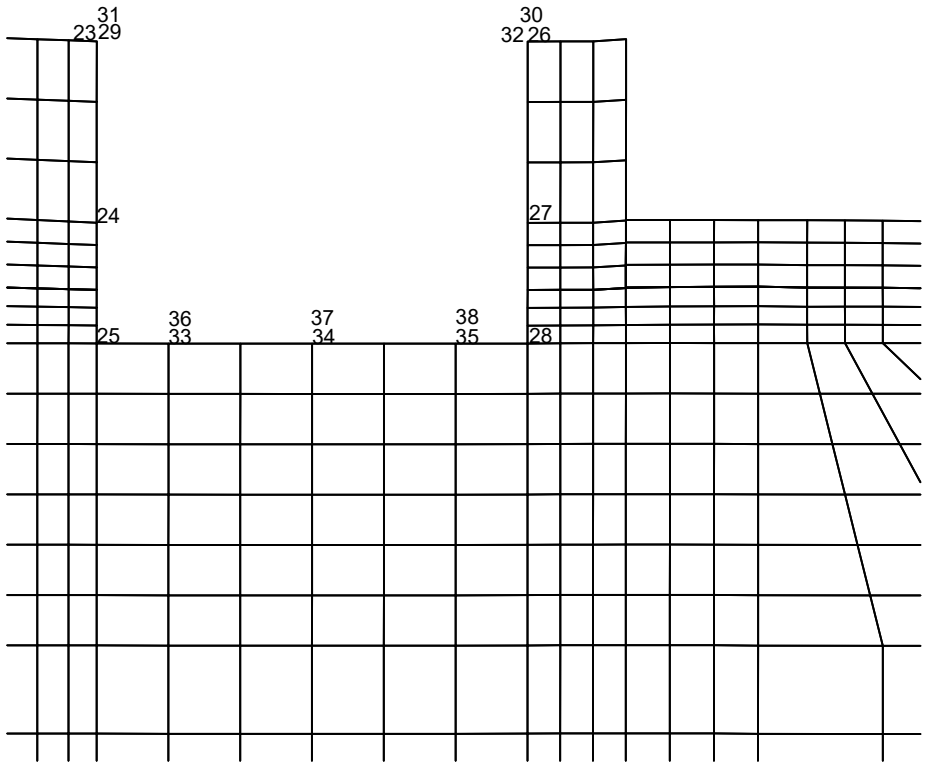
FLAC SECTION F1 MODEL ARRANGEMENT & MONITOR POINTS

eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale as shown

Figure 17



31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

FLAC SECTION F1 MODEL ARRANGEMENT & MONITOR POINTS AT BASEMENT

eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale 1:100 approx

Figure 18

GROUNDWATER MONITORING DATA

Condition/ Monitor points	**MP3pp**	**MP3pp**	**MP5pp**	**MP6pp**	**MP7pp**	**MP8pp**	**MP9pp**	**MP10pp**	**MP11pp**
1. Predevelopment c19 Kpa	2.92E+02	2.85E+02	2.80E+02	2.76E+02	2.73E+02	2.73E+02	2.70E+02	2.70E+02	2.69E+02
2. Existing state Kpa	2.92E+02	2.85E+02	2.80E+02	2.76E+02	2.73E+02	2.72E+02	2.70E+02	2.70E+02	2.68E+02
3. GWL change stages 1 to 2 (mm)	**0.00**	**-19.92**	**-22.91**	**-22.31**	**-20.76**	**-20.30**	**-17.38**	**-16.44**	**-13.27**
4. Basement exc. & dewatered Kpa	2.92E+02	2.82E+02	2.75E+02	2.69E+02	2.67E+02	2.67E+02	2.66E+02	2.65E+02	2.66E+02
5. GWL change stages 2 to 4 (mm)	**0.00**	**-287.37**	**-503.75**	**-621.64**	**-603.02**	**-587.12**	**-458.73**	**-417.36**	**-291.26**
6. Final state Kpa	2.92E+02	2.85E+02	2.80E+02	2.76E+02	2.73E+02	2.73E+02	2.70E+02	2.70E+02	2.69E+02
7. GWL change stages 4 to 6 (mm)	**0.00**	**299.60**	**524.10**	**643.70**	**621.87**	**604.96**	**471.08**	**428.36**	**298.73**
8.GWL change stages 2 to 6 (mm)	**0.00**	**12.23**	**20.35**	**22.06**	**18.85**	**17.84**	**12.35**	**11.01**	**7.47**

Condition/ Monitor points	**MP12pp**
1. Predevelopment c19 Kpa	2.67E+02
2. Existing state Kpa	2.67E+02
3. GWL change stages 1 to 2 (mm)	**0.00**
4. Basement exc. & dewatered Kpa	2.67E+02
5. GWL change stages 2 to 4 (mm)	**0.00**
6. Final state Kpa	2.67E+02
7. GWL change stages 4 to 6 (mm)	**0.00**
8.GWL change stages 2 to 6 (mm)	**0.00**

MECHANICAL MONITORING DATA

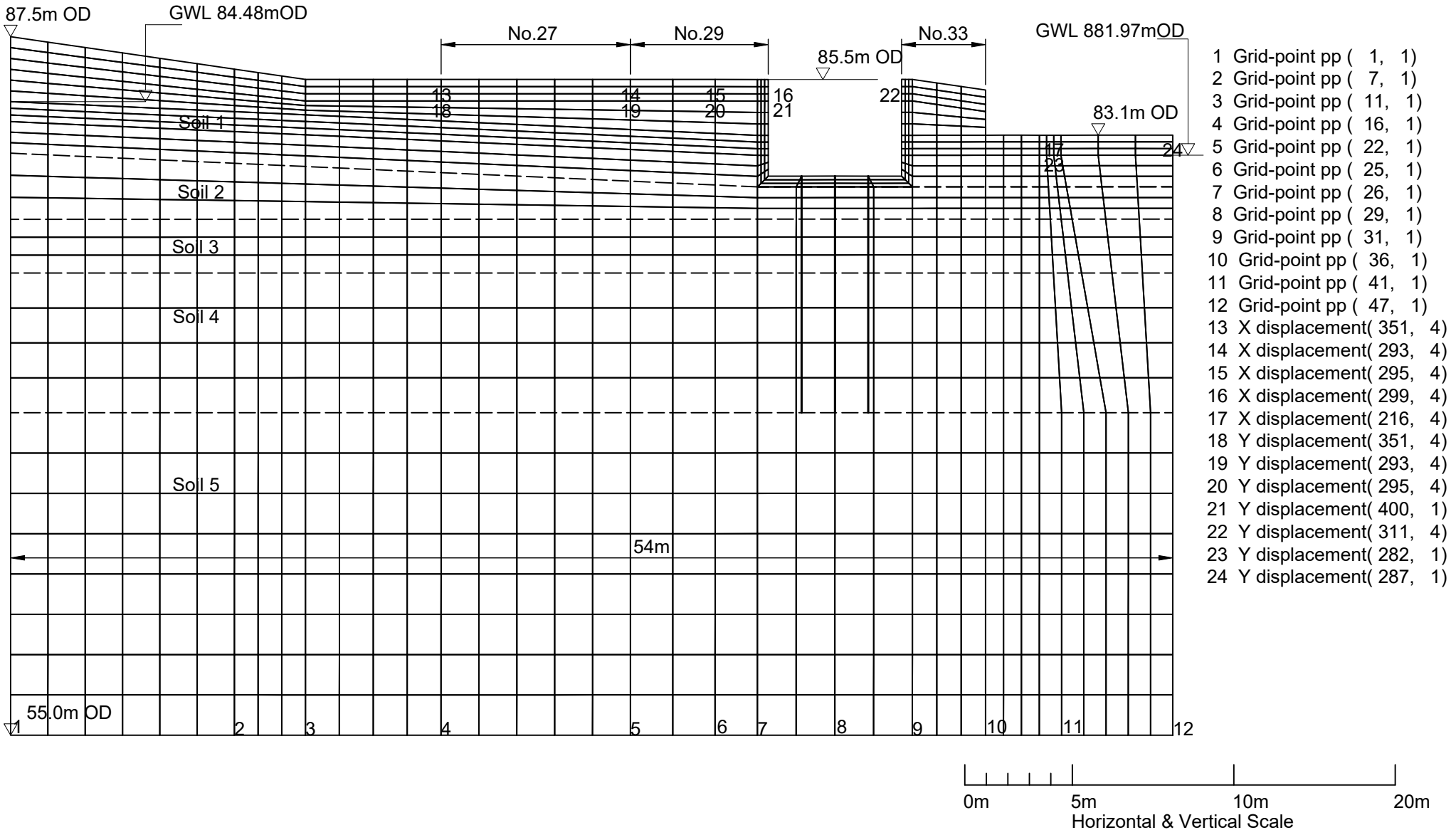
Condition/ Monitor points	**MP13X**	**MP14X**	**MP15X**	**MP16Y**	**MP17Y**	**MP18Y**	**MP19NX**	**MP20NX**	**MP21NY**
1. Predevelopment c19 (m)	4.11E-03	1.14E-03	1.34E-04	-1.11E-02	-4.86E-03	-6.51E-03	4.07E-03	1.05E-03	-3.21E-03
2. Existing state (m)	7.01E-03	2.89E-03	5.53E-04	-8.17E-03	-1.87E-03	-4.87E-03	7.36E-03	3.01E-03	-2.14E-04
3. Disp. change stages 1 to 2 (mm)	**2.91**	**1.75**	**0.42**	**2.93**	**2.99**	**1.63**	**3.29**	**1.96**	**2.99**
4. Basement exc. & dewatered (m)	7.28E-03	2.68E-03	2.04E-04	-8.43E-03	-2.35E-03	-5.32E-03	7.57E-03	2.81E-03	-4.87E-04
5. Disp. change stages 2 to 4 (mm)	**0.26**	**-0.20**	**-0.35**	**-0.26**	**-0.48**	**-0.45**	**0.21**	**-0.20**	**-0.27**
6. Final state (m)	7.19E-03	2.87E-03	5.51E-04	-8.27E-03	-1.92E-03	-4.93E-03	7.41E-03	3.06E-03	-2.82E-04
7. Disp. change stages 4 to 6 (mm)	**-0.08**	**0.19**	**0.35**	**0.17**	**0.42**	**0.40**	**-0.16**	**0.25**	**0.21**
8 .Disp. change stages 2 to 6 (mm)	**0.18**	**-0.01**	**0.00**	**-0.10**	**-0.06**	**-0.05**	**0.05**	**0.05**	**-0.07**

Condition/ Monitor points	**MP22NY**
1. Predevelopment c19 (m)	-6.63E-03
2. Existing state (m)	-5.02E-03
3. Disp. change stages 1 to 2 (mm)	**1.61**
4. Basement exc. & dewatered (m)	-5.47E-03
5. Disp. change stages 2 to 4 (mm)	**-0.45**
6. Final state (m)	-5.07E-03
7. Disp. change stages 4 to 6 (mm)	**0.39**
8 .Disp. change stages 2 to 6 (mm)	**-0.05**

MECHANICAL MONITORING DATA

Condition/ Monitor points	**MP23X**	**MP24X**	**MP25X**	**MP26X**	**MP27X**	**MP28X**	**MP29Y**	**MP30Y**	**MPN31X**
1. Predevelopment c19 (m)									
2. Existing state (m)	5.62E-03	4.84E-03	4.08E-03	5.22E-03	3.70E-03	3.27E-03	-3.79E-02	-3.96E-02	0.00E+00
3. Disp. change stages 1 to 2 (mm)									
4. Basement exc. & dewatered (m)	5.62E-03	4.84E-03	4.08E-03	5.21E-03	3.70E-03	3.27E-03	-3.79E-02	-3.95E-02	-1.06E-03
5. Disp. change stages 2 to 4 (mm)	**-0.0025**	**-0.0048**	**-0.0033**	**-0.0023**	**0.0007**	**0.0000**	**0.0065**	**0.0047**	**-1.0593**
6. Final state (m)	5.62E-03	4.83E-03	4.08E-03	5.21E-03	3.70E-03	3.27E-03	-3.79E-02	-3.95E-02	-1.07E-03
7. Disp. change stages 4 to 6 (mm)	**-0.0015**	**-0.0029**	**-0.0020**	**-0.0014**	**0.0004**	**0.0000**	**0.0039**	**0.0028**	**-0.0086**
8 .Disp. change stages 2 to 6 (mm)	**-0.0040**	**-0.0076**	**-0.0053**	**-0.0037**	**0.0011**	**0.0000**	**0.0104**	**0.0075**	**-1.0679**

Condition/ Monitor points	**MPN31X**	**MPN32X**	**MPN33X**	**MPN34X**	**MPN35X**	**MPN36Y**	**MPN37Y**	**MPN38Y**
1. Predevelopment c19 (m)								
2. Existing state (m)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Disp. change stages 1 to 2 (mm)								
4. Basement exc. & dewatered (m)	-1.06E-03	4.41E-05	-5.59E-06	-1.80E-04	-7.71E-06	-7.40E-05	-9.94E-06	-8.71E-05
5. Disp. change stages 2 to 4 (mm)	**-1.0593**	**0.0441**	**-0.0056**	**-0.1801**	**-0.0077**	**-0.0740**	**-0.0099**	**-0.0871**
6. Final state (m)	-1.07E-03	4.01E-05	-5.99E-06	-1.80E-04	-7.84E-06	-8.33E-05	-1.31E-05	-9.27E-05
7. Disp. change stages 4 to 6 (mm)	**-0.0086**	**-0.0040**	**-0.0004**	**-0.0003**	**-0.0001**	**-0.0092**	**-0.0032**	**-0.0056**
8 .Disp. change stages 2 to 6 (mm)	**-1.0679**	**0.0401**	**-0.0060**	**-0.1804**	**-0.0078**	**-0.0833**	**-0.0131**	**-0.0927**



31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

FLAC SECTION F2 MODEL ARRANGEMENT & MONITOR POINTS

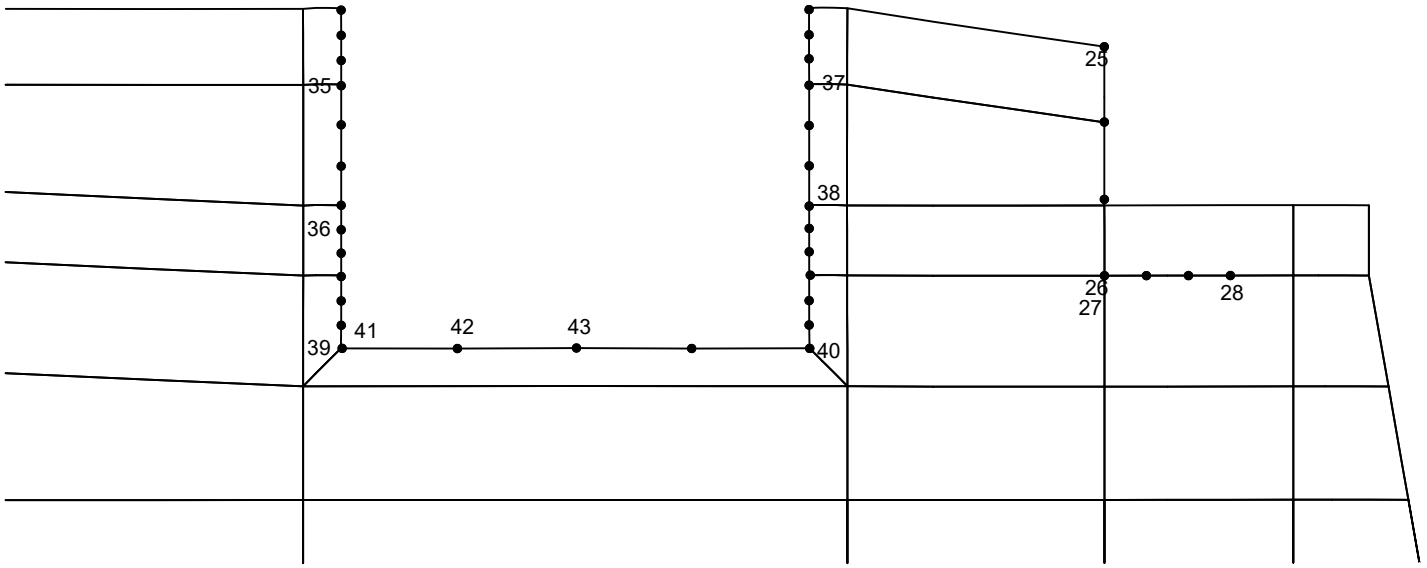
eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale as shown

Figure 19

Pt.	Direction	Node
25	X Displacement (Nd	1)
26	X Displacement (Nd	2)
27	Y Displacement (Nd	2)
28	Y Displacement (Nd	3)
35	X Displacement (Nd	11)
36	X Displacement (Nd	15)
37	X Displacement (Nd	25)
38	X Displacement (Nd	29)
39	X Displacement (Nd	20)
40	X Displacement (Nd	34)
41	Y Displacement (Nd	20)
42	Y Displacement (Nd	21)
43	Y Displacement (Nd	37)



31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

FLAC SECTION F2 MODEL ARRANGEMENT & STRUCTURAL MONITOR POINTS

eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale as shown

Figure 20

GROUNDWATER MONITORING DATA

Condition/ Monitor points	**MP1pp**	**MP2pp**	**MP3pp**	**MP4pp**	**MP5pp**	**MP6pp**	**MP7pp**	**MP8pp**	**MP9pp**
1. Predevelopment c19 Kpa	2.95E+02	2.88E+02	2.86E+02	2.83E+02	2.79E+02	2.77E+02	2.76E+02	2.75E+02	2.73E+02
2. Existing state Kpa	2.95E+02	2.88E+02	2.86E+02	2.83E+02	2.79E+02	2.77E+02	2.76E+02	2.75E+02	2.73E+02
3. GWL change stages 1 to 2 (mm)	**0.00**	**-0.13**	**-0.13**	**-0.13**	**-0.13**	**-0.13**	**-0.13**	**-0.14**	**-0.13**
4. Basement exc. & dewatered Kpa	2.95E+02	2.84E+02	2.81E+02	2.76E+02	2.70E+02	2.68E+02	2.68E+02	2.67E+02	2.67E+02
5. GWL change stages 2 to 4 (mm)	**0.00**	**-395.02**	**-509.34**	**-701.72**	**-863.22**	**-868.96**	**-851.75**	**-782.45**	**-664.13**
6. Final state Kpa	2.95E+02	2.88E+02	2.86E+02	2.83E+02	2.79E+02	2.77E+02	2.76E+02	2.75E+02	2.73E+02
7. GWL change stages 4 to 6 (mm)	0.00	395.73	513.00	710.40	873.40	877.04	858.25	785.55	663.81
8.GWL change stages 2 to 6 (mm)	**0.00**	**0.71**	**3.66**	**8.68**	**10.18**	**8.08**	**6.50**	**3.10**	**-0.32**

Condition/ Monitor points	**MP10pp**	**MP11pp**	**MP12pp**
1. Predevelopment c19 Kpa	2.72E+02	2.71E+02	2.70E+02
2. Existing state Kpa	2.72E+02	2.71E+02	2.70E+02
3. GWL change stages 1 to 2 (mm)	**-0.13**	**-0.13**	**0.00**
4. Basement exc. & dewatered Kpa	2.67E+02	2.68E+02	2.70E+02
5. GWL change stages 2 to 4 (mm)	**-511.64**	**-319.67**	**0.00**
6. Final state Kpa	2.72E+02	2.71E+02	2.70E+02
7. GWL change stages 4 to 6 (mm)	508.83	315.71	0.00
8.GWL change stages 2 to 6 (mm)	**-2.81**	**-3.96**	**0.00**

MECHANICAL MONITORING DATA

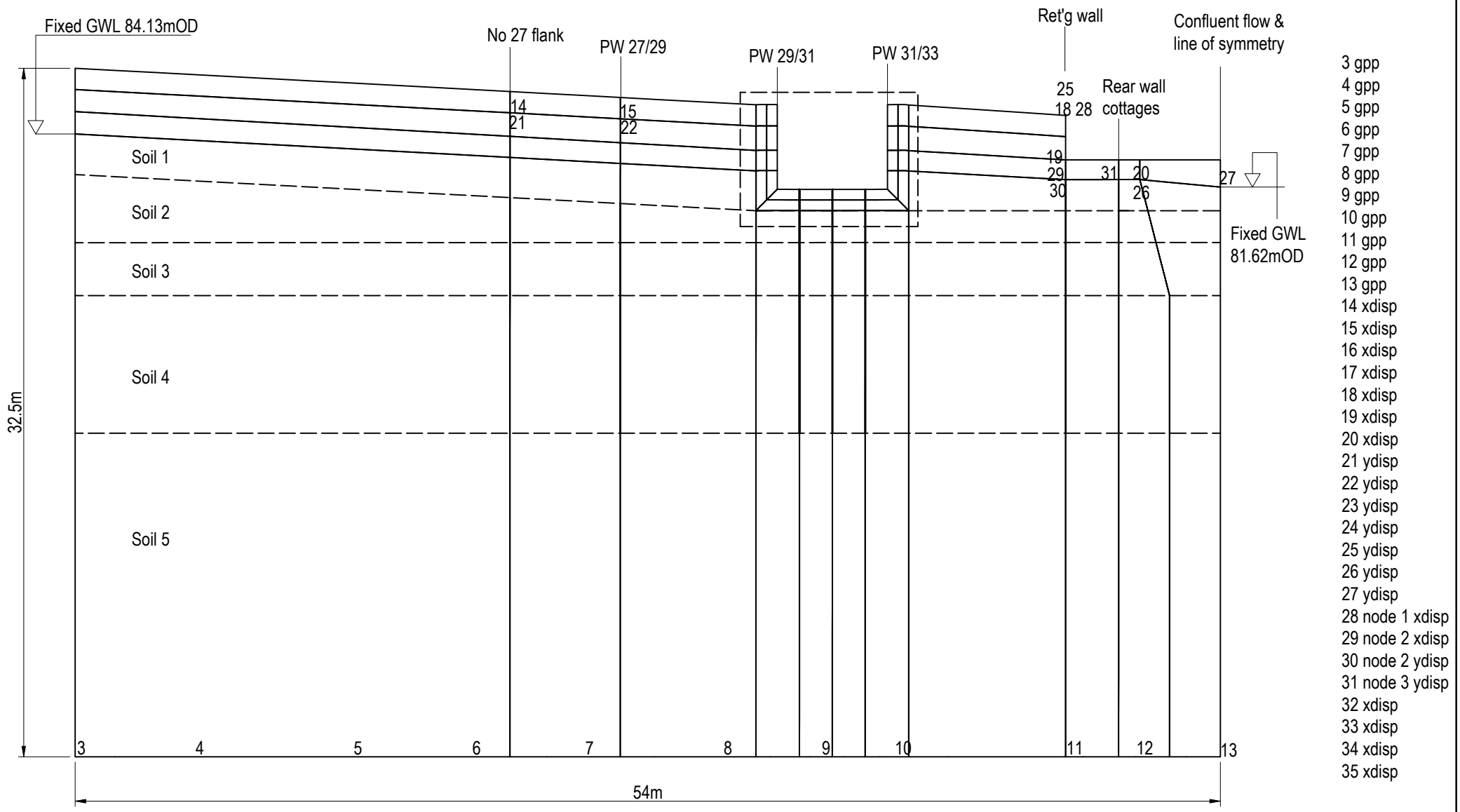
Condition/ Monitor points	**MP13X**	**MP14X**	**MP15X**	**MP16X**	**MP17X**	**MP18Y**	**MP19Y**	**MP20Y**	**MP21Y**
1. Predevelopment c19 (m)	3.06E-03	3.02E-03	2.15E-03	3.00E-03	1.65E-03	-2.79E-02	-3.56E-02	-3.68E-02	-2.43E-02
2. Existing state (m)	3.13E-03	3.09E-03	2.20E-03	3.27E-03	1.77E-03	-2.80E-02	-3.60E-02	-3.81E-02	-3.01E-02
3. Disp. change stages 1 to 2 (mm)	**0.07**	**0.07**	**0.05**	**0.28**	**0.12**	**-0.10**	**-0.41**	**-1.32**	**-5.81**
4. Basement exc. & dewatered (m)	4.44E-03	4.28E-03	3.64E-03	6.60E-03	6.59E-04	-2.89E-02	-3.67E-02	-3.87E-02	-3.10E-02
5. Disp. change stages 2 to 4 (mm)	**1.31**	**1.19**	**1.44**	**3.32**	**-1.11**	**-0.95**	**-0.70**	**-0.55**	**-0.85**
6. Final state (m)	3.66E-03	4.04E-03	3.85E-03	7.00E-03	1.39E-03	-2.78E-02	-3.55E-02	-3.80E-02	-3.11E-02
7. Disp. change stages 4 to 6 (mm)	**-0.78**	**-0.24**	**0.21**	**0.40**	**0.73**	**1.17**	**1.28**	**0.62**	**-0.14**
8 .Disp. change stages 2 to 6 (mm)	**0.53**	**0.95**	**1.65**	**3.73**	**-0.39**	**0.22**	**0.58**	**0.07**	**-0.99**

Condition/ Monitor points	**MP22Y**	**MP23Y**	**MP24Y**
1. Predevelopment c19 (m)	-2.47E-02	-2.99E-02	-3.59E-02
2. Existing state (m)	-2.59E-02	-2.88E-02	-3.08E-02
3. Disp. change stages 1 to 2 (mm)	**-1.17**	**1.18**	**5.08**
4. Basement exc. & dewatered (m)	-2.78E-02	-2.85E-02	-3.03E-02
5. Disp. change stages 2 to 4 (mm)	**-1.96**	**0.25**	**0.43**
6. Final state (m)	-2.77E-02	-2.80E-02	-3.02E-02
7. Disp. change stages 4 to 6 (mm)	**0.12**	**0.50**	**0.15**
8 .Disp. change stages 2 to 6 (mm)	**-1.84**	**0.76**	**0.58**

MECHANICAL MONITORING DATA

Condition/ Monitor points	**MP25NX**	**MP26NX**	**MP27NX**	**MP28NX**	**MP35NX**	**MP36NX**	**MP37NX**	**MP39NX**	**MP40NY**
1. Predevelopment c19 (m)	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
2. Existing state (m)	6.63E-04	7.11E-04	6.34E-04	1.08E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Disp. change stages 1 to 2 (mm)	**0.66**	**0.71**	**0.63**	**1.08**					
4. Basement exc. & dewatered (m)	-9.35E-04	-6.05E-04	9.27E-04	1.48E-03	5.24E-04	9.73E-04	-8.44E-04	-1.57E-03	-1.68E-03
5. Disp. change stages 2 to 4 (mm)	**-1.60**	**-1.32**	**0.29**	**0.40**	**0.52**	**0.97**	**-0.84**	**-1.57**	**-1.68**
6. Final state (m)	-4.79E-04	1.71E-04	1.51E-03	2.15E-03	9.23E-04	1.43E-03	-5.35E-04	-1.25E-03	-1.22E-03
7. Disp. change stages 4 to 6 (mm)	**0.46**	**0.78**	**0.58**	**0.68**	**0.40**	**0.46**	**0.31**	**0.31**	**0.46**
8 .Disp. change stages 2 to 6 (mm)	**-1.14**	**-0.54**	**0.87**	**1.08**	**0.92**	**1.43**	**-0.54**	**-1.25**	**-1.22**

Condition/ Monitor points	**MP41NY**	**MP42NY**	**MP43NY**
1. Predevelopment c19 (m)			
2. Existing state (m)	0.00E+00	0.00E+00	0.00E+00
3. Disp. change stages 1 to 2 (mm)			
4. Basement exc. & dewatered (m)	-2.70E-04	7.53E-04	8.08E-04
5. Disp. change stages 2 to 4 (mm)	**-0.27**	**0.75**	**0.81**
6. Final state (m)	-4.28E-04	6.06E-04	7.06E-04
7. Disp. change stages 4 to 6 (mm)	**-0.16**	**-0.15**	**-0.10**
8 .Disp. change stages 2 to 6 (mm)	**-0.43**	**0.61**	**0.71**



0m 5m 10m 20m
Horizontal & Vertical Scale

Legend
gpp grid point pore water pressure
xdisp grid displacement
ydisp grid displacement
node structural node, No., dispm'nt
directions +ve towards right & top

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

FLAC SECTION F3 MODEL ARRANGEMENT & MONITOR POINTS

eldreds ELDRED GEOTECHNICS LTD

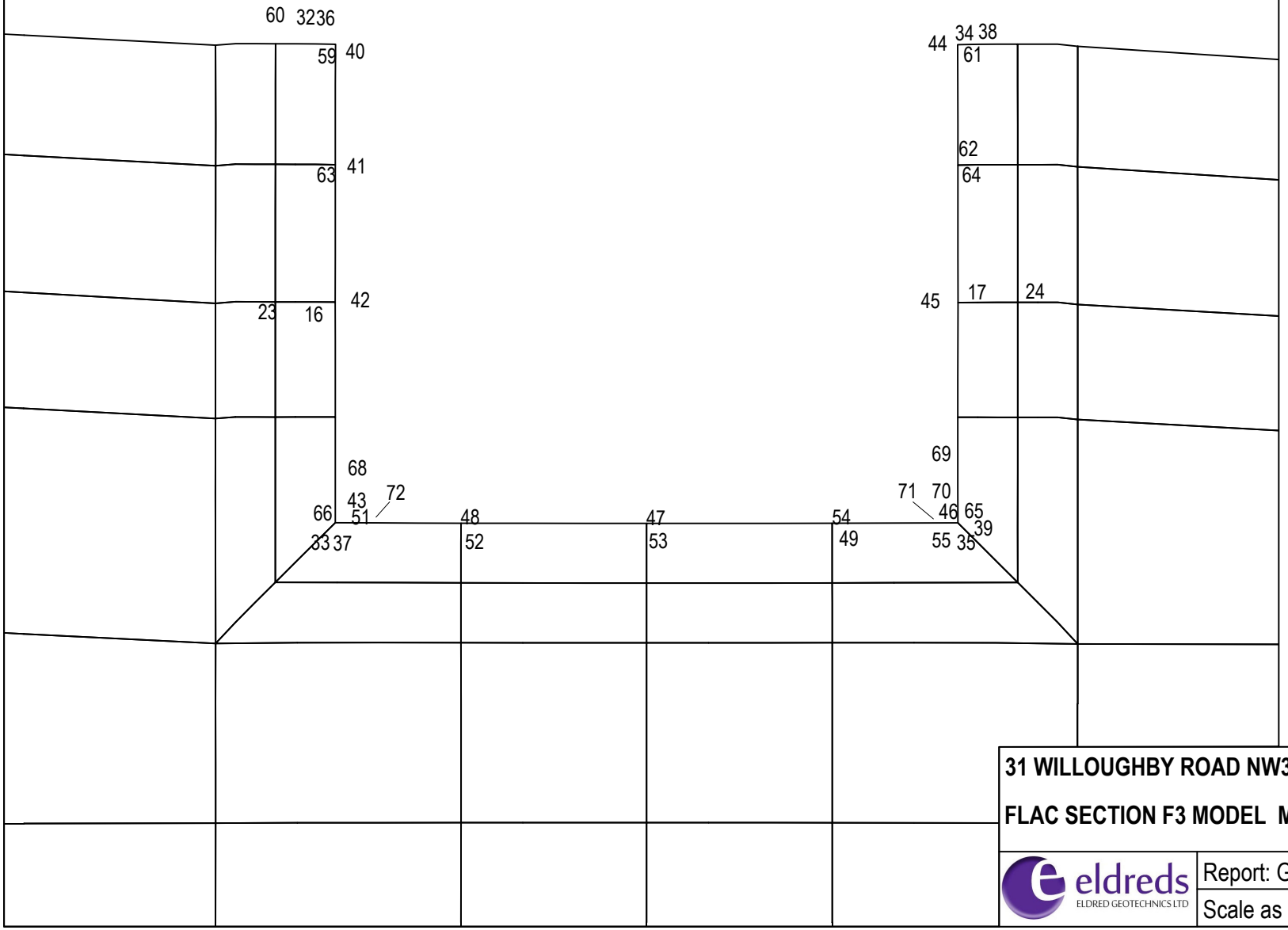
Report: G1803-RP-01

Scale as shown

Figure 21

Legend
gpp grid point pore water pressure
xdisp grid displacement
ydisp grid displacement
node structural node, No., dispm'nt
directions +ve towards right & top

0` 0.5 1.0 2.0m
Horizontal & Vertical Scale



16 xdisp 150 from wall
17 xdisp 150 from wall
23 ydisp 500 from wall
24 ydisp 500 from wall
32 xdisp 150 from wall
33 xdisp 150 from wall left & below
34 xdisp 150 from wall
35 xdisp 150 from wall right & below
36 ydisp 150 from wall
37 ydisp 150 from wall left & below
38 ydisp 150 from wall
39 ydisp 150 from wall right & below
40 node 8 xdisp
41 node 11 xdisp
42 node 15 xdisp
43 node 20 xdisp
44 node 25 xdisp
45 node 32 xdisp
46 node 37 xdisp
47 node 43 xdisp
48 node 23 xdisp
49 node 40 xdisp
50 node 75 ydisp
51 node 20 ydisp
52 node 23 ydisp
53 node 43 ydisp
54 node 40 ydisp
55 node 37 ydisp
56 node 42 ydisp
57 node 44 ydisp
58 node 45 ydisp
Structure nodes
59 xdisp at wall
60 xdisp at wall
61 xdisp at wall
62 xdisp at wall
63 ydisp at wall
64 ydisp at wall
65 ydisp at wall
66 ydisp at wall
68 element 18 moment end 2
69 element 33 momwent end1
70 element 34 moment end 2
71 element 35 shear
72 element 19 shear

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

FLAC SECTION F3 MODEL MONITOR POINTS AT BASEMENT

eldreds
ELDRED GEOTECHNICS LTD

Report: G1808-RP-01
Scale as shown

Figure 22

GROUNDWATER MONITORING DATA

Condition/ Monitor points	MP3PP	MP4PP	MP5PP	MP6PP	MP7PP	MP8PP	MP9PP	MP10PP	MP11PP
1. Predevelopment c19 Kpa	2.89E+02	2.86E+02	2.83E+02	2.81E+02	2.78E+02	2.75E+02	2.73E+02	2.72E+02	2.68E+02
2. Existing state Kpa	2.89E+02	2.86E+02	2.83E+02	2.81E+02	2.78E+02	2.75E+02	2.73E+02	2.72E+02	2.68E+02
3. GWL change stages 1 to 2 (mm)	**0.00**	**-0.87**	**-0.89**	**-0.91**	**-0.92**	**-0.86**	**-0.75**	**-0.81**	**-0.90**
4. Basement exc. & dewatered Kpa	2.89E+02	2.84E+02	2.79E+02	2.75E+02	2.71E+02	2.68E+02	2.66E+02	2.65E+02	2.64E+02
5. GWL change stages 2 to 4 (mm)	**0.00**	**-191.74**	**-425.87**	**-576.05**	**-682.95**	**-736.70**	**-704.49**	**-638.57**	**-355.45**
6. Final state Kpa	2.89E+02	2.86E+02	2.83E+02	2.81E+02	2.78E+02	2.75E+02	2.73E+02	2.71E+02	2.68E+02
7. GWL change stages 4 to 6 (mm)	0.00	181.85	412.08	561.53	668.10	721.14	688.40	622.67	343.29
8.GWL change stages 2 to 6 (mm)	**0.00**	**-9.88**	**-13.79**	**-14.52**	**-14.85**	**-15.56**	**-16.08**	**-15.90**	**-12.16**

Condition/ Monitor points	MP12PP	MP13PP
1. Predevelopment c19 Kpa	2.66E+02	2.64E+02
2. Existing state Kpa	2.66E+02	2.64E+02
3. GWL change stages 1 to 2 (mm)	**-0.87**	**0.00**
4. Basement exc. & dewatered Kpa	2.64E+02	2.64E+02
5. GWL change stages 2 to 4 (mm)	**-202.07**	**0.00**
6. Final state Kpa	2.66E+02	2.64E+02
7. GWL change stages 4 to 6 (mm)	193.72	0.00
8.GWL change stages 2 to 6 (mm)	**-8.35**	**0.00**

MECHANICAL MONITORING DATA

Condition/ Monitor points	**MP14X**	**MP15X**	**MP16X**	**MP17X**	**MP18X**	**MP19X**	**MP20X**	**MP21Y**	**MP22Y**
1. Predevelopment c19 (m)	5.17E-03	5.39E-03	3.70E-03	2.01E-03	-3.44E-04	9.65E-04	9.09E-04	-3.78E-02	-4.01E-02
2. Existing state (m)	5.61E-03	6.02E-03	3.30E-03	2.61E-03	-1.98E-04	1.08E-03	9.64E-04	-3.82E-02	-4.10E-02
3. Disp. change stages 1 to 2 (mm)	**0.44**	**0.63**	**-0.40**	**0.60**	**0.15**	**0.11**	**0.06**	**-0.37**	**-0.87**
4. Basement exc. & dewatered (m)	6.37E-03	6.31E-03	3.16E-03	2.86E-03	-1.09E-04	1.14E-03	9.95E-04	-3.92E-02	-4.17E-02
5. Disp. change stages 2 to 4 (mm)	**0.76**	**0.29**	**-0.15**	**0.25**	**0.09**	**0.07**	**0.03**	**-0.96**	**-0.73**
6. Final state (m)	5.81E-03	5.93E-03	3.14E-03	2.87E-03	-9.72E-05	1.15E-03	1.00E-03	-3.82E-02	-4.09E-02
7. Disp. change stages 4 to 6 (mm)	**-0.56**	**-0.38**	**-0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.92**	**0.81**
8 .Disp. change stages 2 to 6 (mm)	**0.20**	**-0.09**	**-0.16**	**0.26**	**0.10**	**0.08**	**0.04**	**-0.05**	**0.08**

Condition/ Monitor points	**MP23Y**	**MP24Y**	**MP25Y**	**MP26Y**	**MP27Y**	**MP28NX**	**MP29NX**	**MP30NY**	**MP31NY**
1. Predevelopment c19 (m)	-2.25E-02	-2.28E-02	-4.05E-02	-3.52E-02	-3.77E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Existing state (m)	-3.22E-02	-3.60E-02	-4.05E-02	-3.53E-02	-3.78E-02	1.46E-04	1.33E-04	-3.59E-05	-1.81E-04
3. Disp. change stages 1 to 2 (mm)	**-9.72**	**-13.18**	**-0.03**	**-0.02**	**-0.06**	**0.15**	**0.13**	**-0.04**	**-0.18**
4. Basement exc. & dewatered (m)	-3.07E-02	-3.36E-02	-4.05E-02	-3.53E-02	-3.78E-02	2.35E-04	1.24E-04	-5.12E-05	-2.53E-04
5. Disp. change stages 2 to 4 (mm)	**1.50**	**2.36**	**-0.02**	**-0.01**	**-0.03**	**0.09**	**-0.01**	**-0.02**	**-0.07**
6. Final state (m)	-3.04E-02	-3.35E-02	-4.05E-02	-3.53E-02	-3.78E-02	2.47E-04	1.95E-04	-5.26E-05	-1.93E-04
7. Disp. change stages 4 to 6 (mm)	**0.30**	**0.16**	**0.00**	**0.00**	**0.03**	**0.01**	**0.07**	**0.00**	**0.06**
8 .Disp. change stages 2 to 6 (mm)	**1.80**	**2.51**	**-0.02**	**-0.01**	**0.00**	**0.10**	**0.06**	**-0.02**	**-0.01**

MECHANICAL MONITORING DATA

Condition/ Monitor points	**MP32X**	**MP33X**	**MP34X**	**MP35X**	**MP36Y**	**MP37Y**	**MP38Y**	**MP39Y**	**MN40NX**
1. Predevelopment c19 (m)									
2. Existing state (m)	5.30E-03	3.65E-03	9.93E-04	1.55E-03	-2.91E-02	-2.41E-02	-3.23E-02	-2.52E-02	0.00E+00
3. Disp. change stages 1 to 2 (mm)									
4. Basement exc. & dewatered (m)	5.40E-03	3.73E-03	8.78E-04	1.52E-03	-2.32E-02	-2.40E-02	-2.48E-02	-2.50E-02	7.44E-04
5. Disp. change stages 2 to 4 (mm)	**0.10**	**0.08**	**-0.12**	**-0.03**	**5.97**	**0.06**	**7.49**	**0.17**	**0.74**
6. Final state (m)	5.42E-03	3.63E-03	8.84E-04	1.64E-03	-2.28E-02	-2.39E-02	-2.46E-02	-2.49E-02	7.37E-04
7. Disp. change stages 4 to 6 (mm)	**0.01**	**-0.10**	**0.01**	**0.12**	**0.34**	**0.11**	**0.19**	**0.11**	**-0.01**
8 .Disp. change stages 2 to 6 (mm)	**0.12**	**-0.01**	**-0.11**	**0.10**	**6.31**	**0.18**	**7.68**	**0.27**	**0.74**

Condition/ Monitor points	**MP41NX**	**MP42NX**	**MP43NX**	**MP44NX**	**MP45NX**	**MP46NX**	**MP47NX**	**MP48NX**	**MP49NX**
1. Predevelopment c19 (m)									
2. Existing state (m)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Disp. change stages 1 to 2 (mm)									
4. Basement exc. & dewatered (m)	4.65E-04	1.05E-04	2.93E-05	8.89E-04	5.41E-04	6.72E-06	1.05E-05	2.84E-05	8.51E-06
5. Disp. change stages 2 to 4 (mm)	**0.47**	**0.11**	**0.03**	**0.89**	**0.54**	**0.01**	**0.01**	**0.03**	**0.01**
6. Final state (m)	4.64E-04	1.11E-04	2.70E-05	8.70E-04	5.29E-04	1.67E-05	1.47E-05	2.61E-05	1.86E-05
7. Disp. change stages 4 to 6 (mm)	**0.00**	**0.01**	**0.00**	**-0.02**	**-0.01**	**0.01**	**0.00**	**0.00**	**0.01**
8 .Disp. change stages 2 to 6 (mm)	**0.46**	**0.11**	**0.03**	**0.87**	**0.53**	**0.02**	**0.01**	**0.03**	**0.02**

MECHANICAL MONITORING DATA

Condition/ Monitor points	**MP50Y**	**MP51Y**	**MP52Y**	**MP53Y**	**MP54Y**	**MP55Y**	**MP56Y**	**MP57Y**	**MP58Y**
1. Predevelopment c19 (m)									
2. Existing state (m)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Disp. change stages 1 to 2 (mm)									
4. Basement exc. & dewatered (m)	-1.15E-03	-2.29E-04	-4.00E-05	-7.40E-06	-6.35E-07	-5.68E-04	-1.09E-05	1.73E-06	3.69E-05
5. Disp. change stages 2 to 4 (mm)	**-1.15**	**-0.23**	**-0.04**	**-0.01**	**0.00**	**-0.57**	**-0.01**	**0.00**	**0.04**
6. Final state (m)	-1.15E-03	-2.28E-04	-6.02E-05	-7.97E-05	-2.78E-05	-5.64E-04	-7.23E-05	-8.06E-05	-4.52E-05
7. Disp. change stages 4 to 6 (mm)	**0.00**	**0.00**	**-0.02**	**-0.07**	**-0.03**	**0.00**	**-0.06**	**-0.08**	**-0.08**
8 .Disp. change stages 2 to 6 (mm)	**-1.15**	**-0.23**	**-0.06**	**-0.08**	**-0.03**	**-0.56**	**-0.07**	**-0.08**	**-0.05**

Condition/ Monitor points	**MP59X**	**MP60X**	**MP61X**	**MP62X**	**MP63Y**	**MP64Y**	**MP65Y**	**MP66Y**	**MP67M1**
1. Predevelopment c19 (m)									
2. Existing state (m)	6.74E-03	4.28E-03	-4.55E-04	1.90E-03	-3.62E-02	-3.95E-02	-2.61E-02	-2.50E-02	0.00E+00
3. Disp. change stages 1 to 2 (mm)									
4. Basement exc. & dewatered (m)	6.75E-03	4.30E-03	-4.31E-04	1.92E-03	-3.62E-02	-3.95E-02	-2.61E-02	-2.50E-02	3.29E+01
5. Disp. change stages 2 to 4 (mm)	**0.01**	**0.01**	**0.02**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**32.86**
6. Final state (m)	6.75E-03	4.30E-03	-4.27E-04	1.92E-03	-3.62E-02	-3.95E-02	-2.61E-02	-2.50E-02	3.11E+01
7. Disp. change stages 4 to 6 (mm)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**-1.71**
8 .Disp. change stages 2 to 6 (mm)	**0.02**	**0.02**	**0.03**	**0.03**	**0.00**	**0.00**	**0.00**	**0.00**	**31.14**

MECHANICAL MONITORING DATA

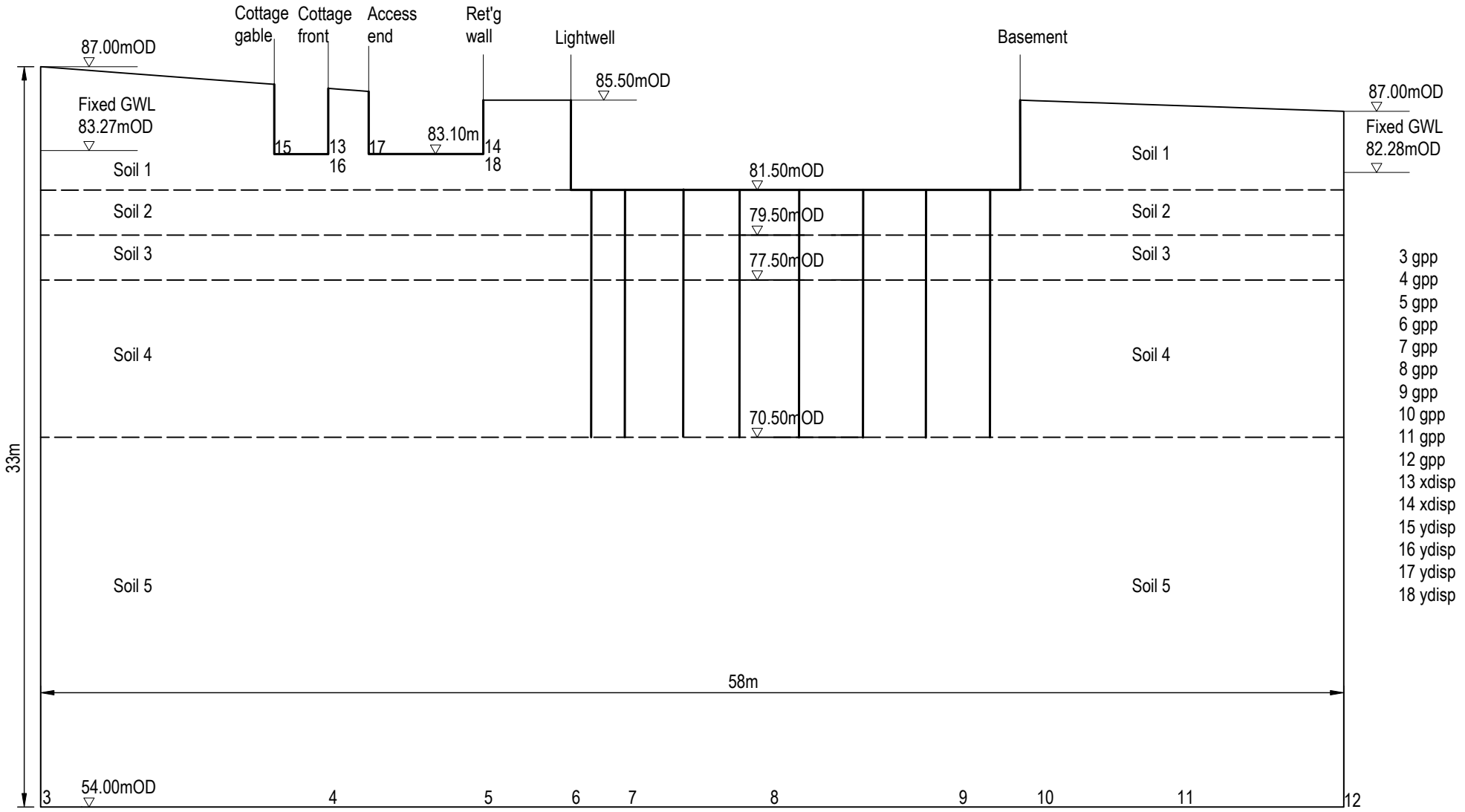
Condition/ Monitor points	**MP68M2**	**MP69M1**	**MP70M2**	**MP71S**	**MP72S**
1. Predevelopment c19 (m)					
2. Existing state (m)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Disp. change stages 1 to 2 (mm)					
4. Basement exc. & dewatered (m)	3.65E+01	-3.3E+01	-3.6E+01	1.08E+02	-6.44E+01
5. Disp. change stages 2 to 4 (mm)	**36.46**	**-32.86**	**-36.38**	**107.58**	**-64.38**
6. Final state (m)	3.46E+01	-3.1E+01	-3.4E+01	1.08E+02	-6.45E+01
7. Disp. change stages 4 to 6 (mm)	**-1.87**	**1.71**	**1.90**	**0.35**	**-0.08**
8 .Disp. change stages 2 to 6 (mm)	**34.59**	**-31.14**	**-34.48**	**107.93**	**-64.46**

Condition/ Monitor points

1. Predevelopment c19 (m)
2. Existing state (m)
3. Disp. change stages 1 to 2 (mm)

4. Basement exc. & dewatered (m)
5. Disp. change stages 2 to 4 (mm)

6. Final state (m)
7. Disp. change stages 4 to 6 (mm)
8 .Disp. change stages 2 to 6 (mm)



0m 5m 10m 20m
Horizontal & Vertical Scale

Legend
gpp grid point pore water pressure
xdisp grid displacement
ydisp grid displacement
node structural node, No., dispm'nt
directions +ve towards right & top

31 WILLOUGHBY ROAD NW3 1RT - PROPOSED BASEMENT

FLAC SECTION F4 MODEL ARRANGEMENT & MONITOR POINTS

eldreds
ELDRED GEOTECHNICS LTD

Report: G1803-RP-01

Scale as shown

Figure 23

GROUNDWATER MONITORING DATA

Condition/ Monitor points	**MP3pp**	**MP4pp**	**MP5pp**	**MP6pp**	**MP7pp**	**MP8pp**	**MP9pp**	**MP10pp**	**MP11pp**
1. Predevelopment c19 Kpa	2.89E+02	2.85E+02	2.84E+02	2.83E+02	2.83E+02	2.81E+02	2.80E+02	2.79E+02	2.78E+02
2. Existing state Kpa	2.89E+02	2.85E+02	2.84E+02	2.83E+02	2.82E+02	2.81E+02	2.80E+02	2.79E+02	2.78E+02
3. GWL change stages 1 to 2 (mm)	**0.00**	**-20.70**	**-23.10**	**-23.50**	**-23.50**	**-23.00**	**-20.70**	**-19.00**	**-14.20**
4. Basement exc. & dewatered Kpa	2.89E+02	2.79E+02	2.75E+02	2.73E+02	2.72E+02	2.71E+02	2.71E+02	2.72E+02	2.74E+02
5. GWL change stages 2 to 4 (mm)	**0.00**	**-599.40**	**-854.80**	**-956.70**	**-1000.70**	**-1025.30**	**-854.60**	**-722.20**	**-424.10**
6. Final state Kpa	2.89E+02	2.85E+02	2.84E+02	2.83E+02	2.82E+02	2.81E+02	2.80E+02	2.79E+02	2.78E+02
7. GWL change stages 4 to 6 (mm)	**0.00**	**601.90**	**857.20**	**958.30**	**1001.60**	**1024.00**	**851.00**	**718.40**	**421.70**
8.GWL change stages 2 to 6 (mm)	**0.00**	**2.50**	**2.40**	**1.60**	**0.90**	**-1.30**	**-3.60**	**-3.80**	**-2.40**

Condition/ Monitor points	**MP12pp**
1. Predevelopment c19 Kpa	2.77E+02
2. Existing state Kpa	2.77E+02
3. GWL change stages 1 to 2 (mm)	**0.00**
4. Basement exc. & dewatered Kpa	2.77E+02
5. GWL change stages 2 to 4 (mm)	**0.00**
6. Final state Kpa	2.77E+02
7. GWL change stages 4 to 6 (mm)	**0.00**
8.GWL change stages 2 to 6 (mm)	**0.00**

MECHANICAL MONITORING DATA

Condition/ Monitor points	MP13 X di	MP14 X dis	MP15Ydis	MP16 Y di	MP17Y di	MP18Y disp
1. Predevelopment c19 (m)	4.02E-04	8.63E-04	-4.62E-02	-4.31E-02	-4.18E-02	-4.08E-02
2. Existing state (m)	6.28E-04	1.15E-03	-4.66E-02	-4.41E-02	-4.23E-02	-4.15E-02
3. Disp. change stages 1 to 2 (mm)	**0.23**	**0.29**	**-0.46**	**-0.94**	**-0.46**	**-0.74**
4. Basement exc. & dewatered (m)	7.52E-04	1.31E-03	-4.69E-02	-4.46E-02	-4.25E-02	-4.08E-02
5. Disp. change stages 2 to 4 (mm)	**0.12**	**0.16**	**-0.25**	**-0.51**	**-0.25**	**0.74**
6. Final state (m)	8.53E-04	1.44E-03	-4.71E-02	-4.50E-02	-4.28E-02	-4.22E-02
7. Disp. change stages 4 to 6 (mm)	**0.10**	**0.13**	**-0.21**	**-0.42**	**-0.21**	**-1.49**
8 .Disp. change stages 2 to 6 (mm)	**0.22**	**0.29**	**-0.46**	**-0.93**	**-0.46**	**-0.75**

Condition/ Monitor points

1. Predevelopment c19 (m)
2. Existing state (m)
3. Disp. change stages 1 to 2 (mm)

4. Basement exc. & dewatered (m)
5. Disp. change stages 2 to 4 (mm)

6. Final state (m)
7. Disp. change stages 4 to 6 (mm)
8 .Disp. change stages 2 to 6 (mm)

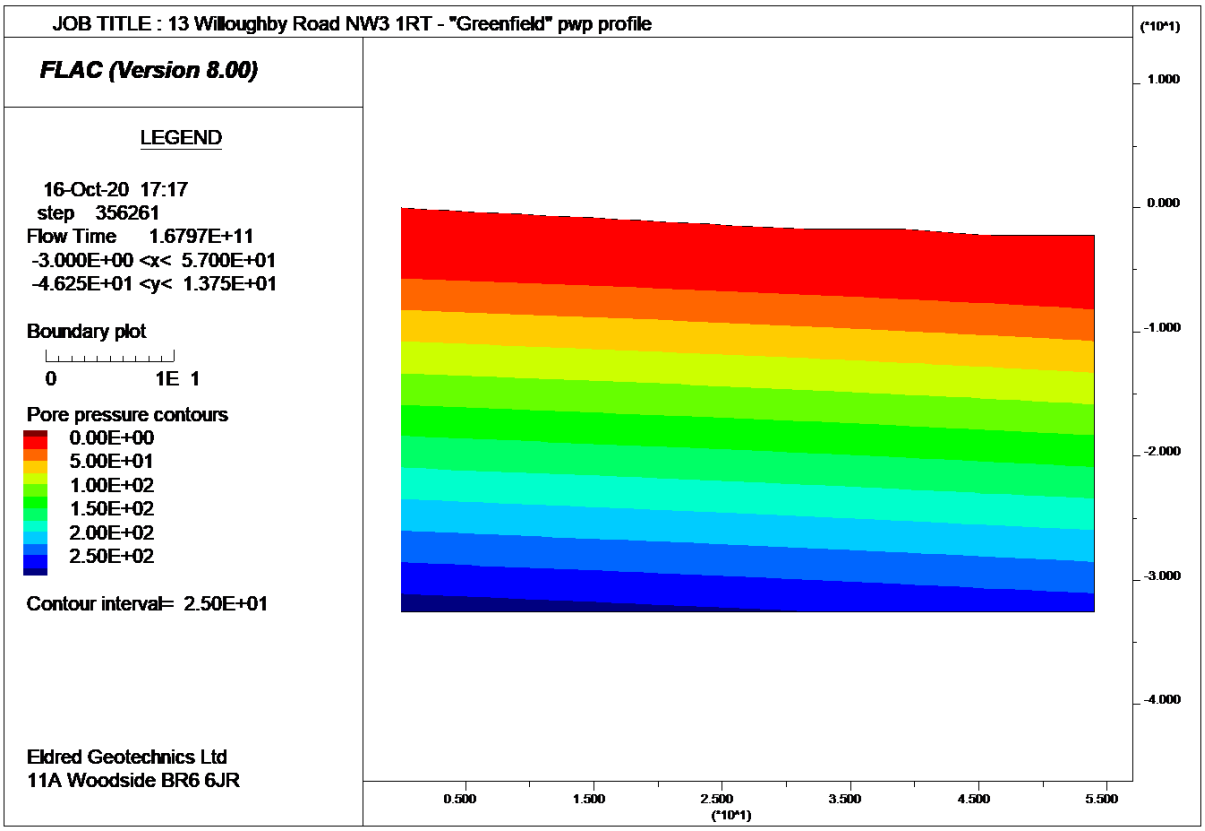


Figure 24 - Section F3 Green field PWP Contours

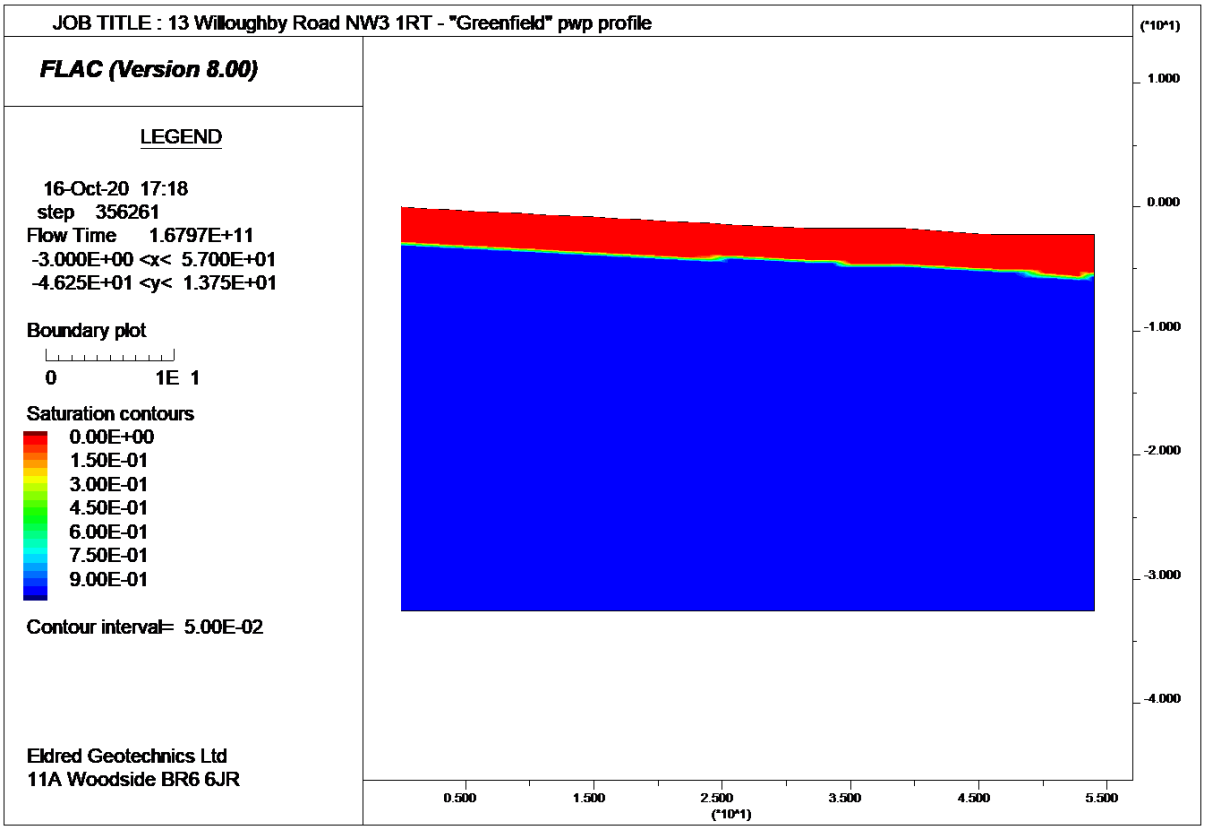


Figure 25 - Section F3 Green field Saturation Contours

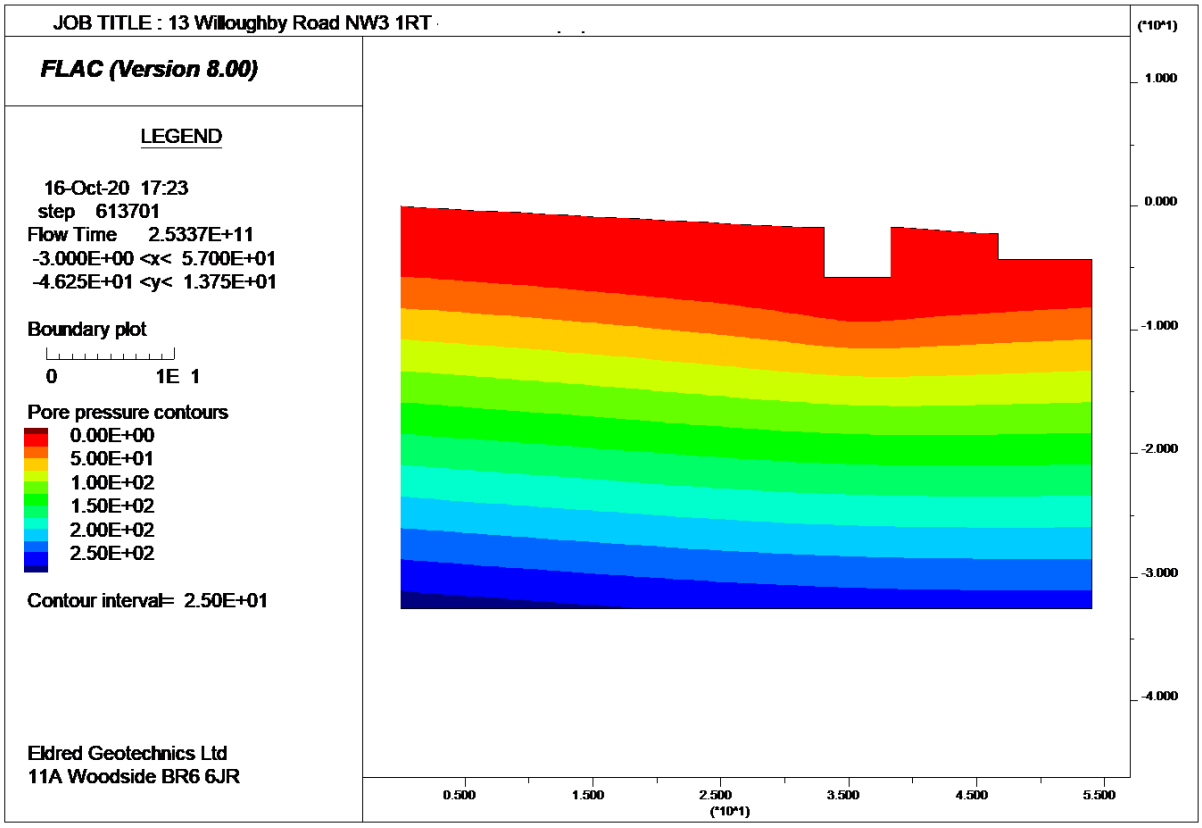


Figure 28 - Section F3 Steady state Drawdown PWP Contours

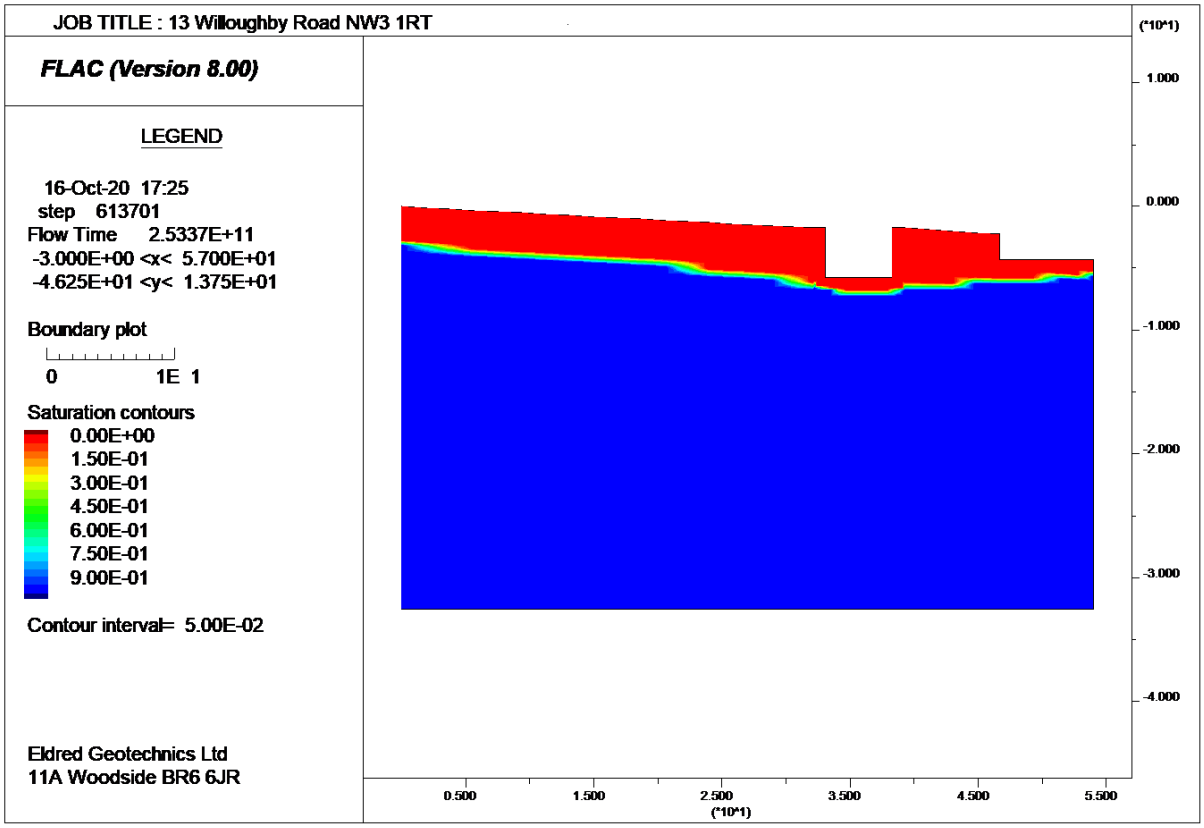


Figure 29 - Section F3 Steady state Drawdown Saturation Contours

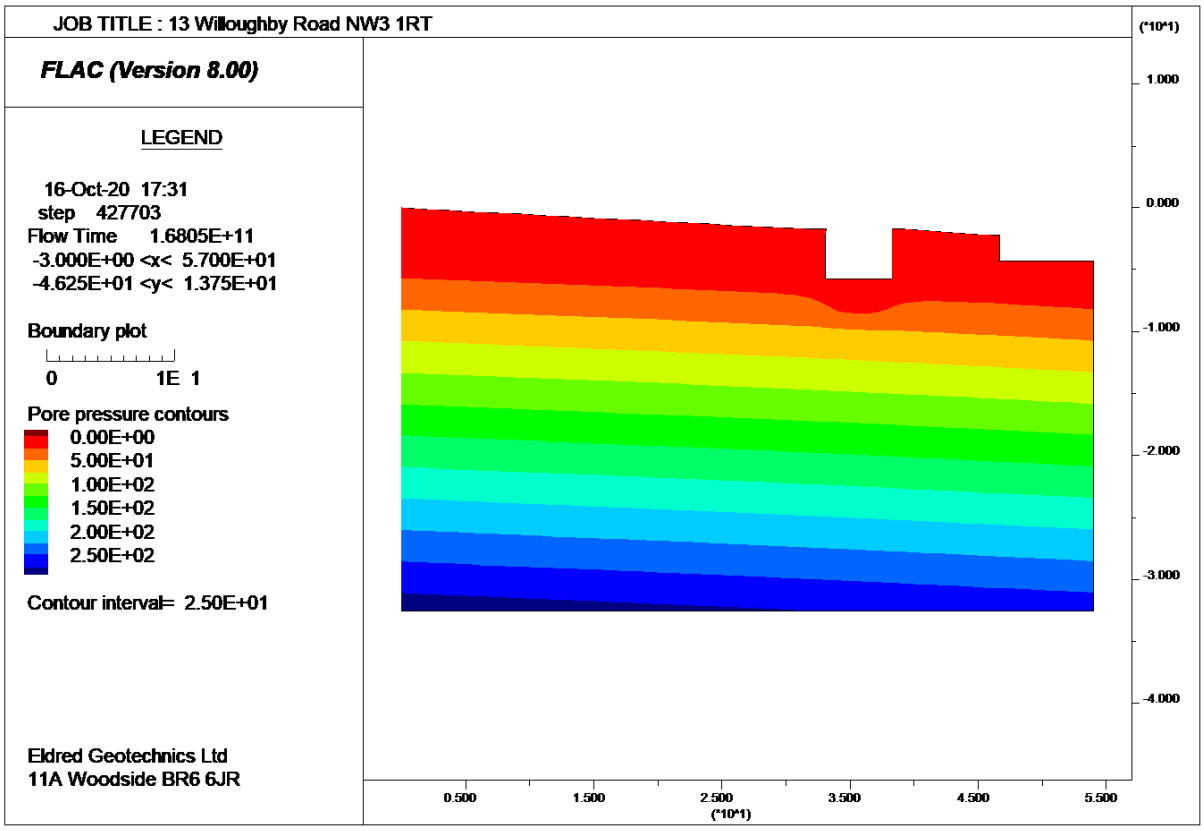


Figure 30 - Section F3 One Year Drawdown PWP Contours

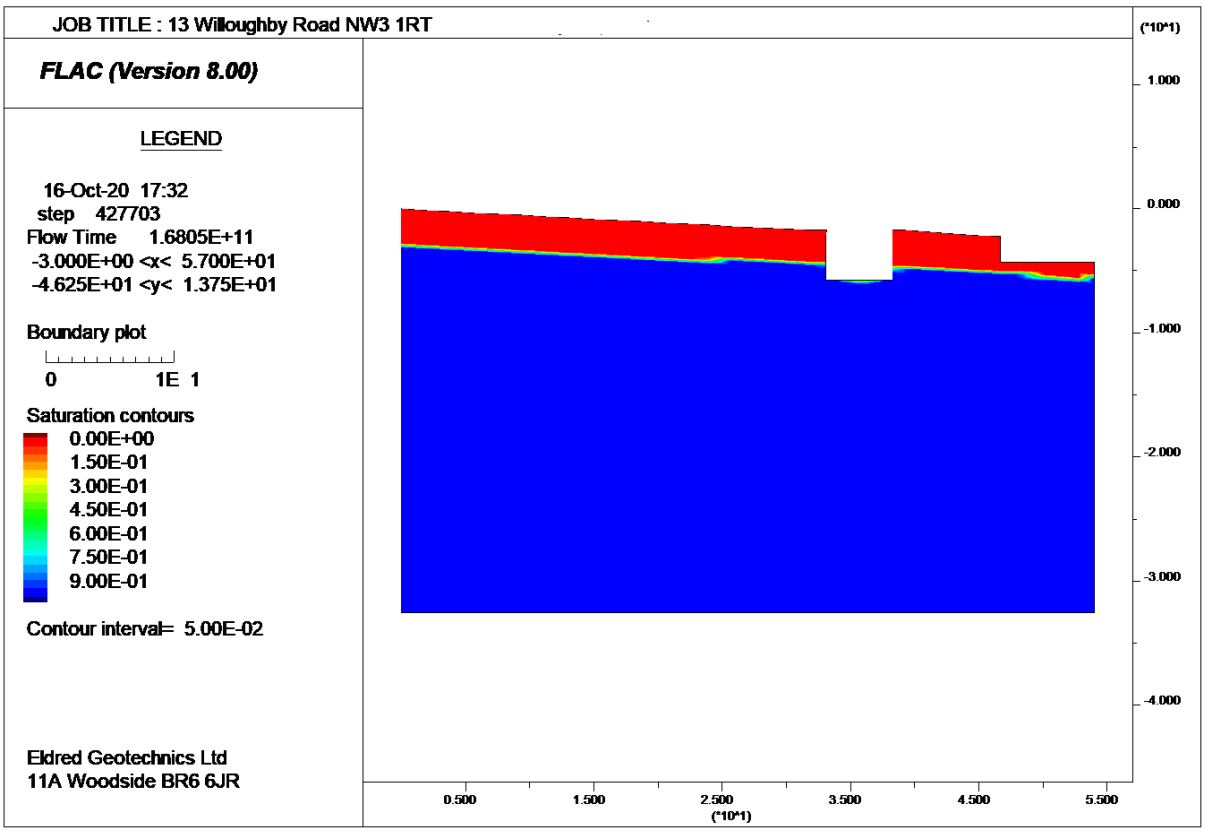


Figure 31 - Section F3 One Year Drawdown Saturation Contours

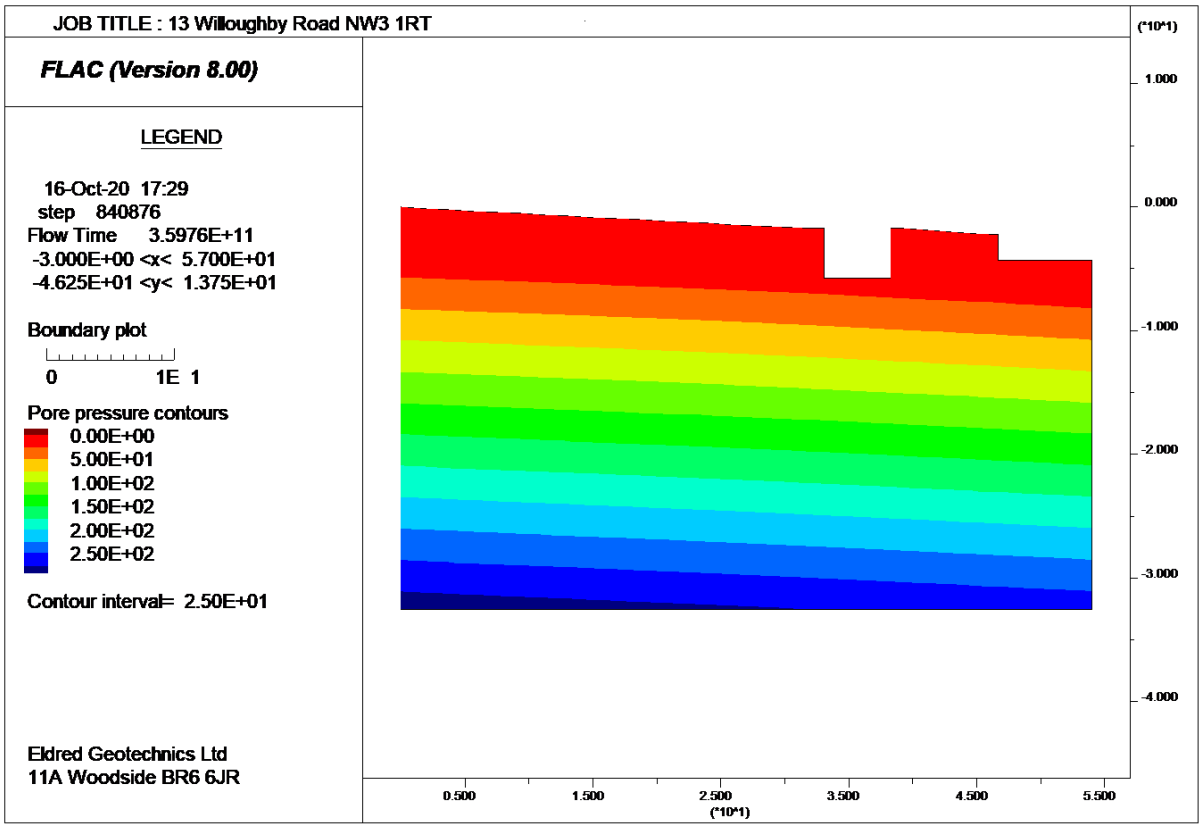


Figure 32 - Section F3 Final State PWP Contours

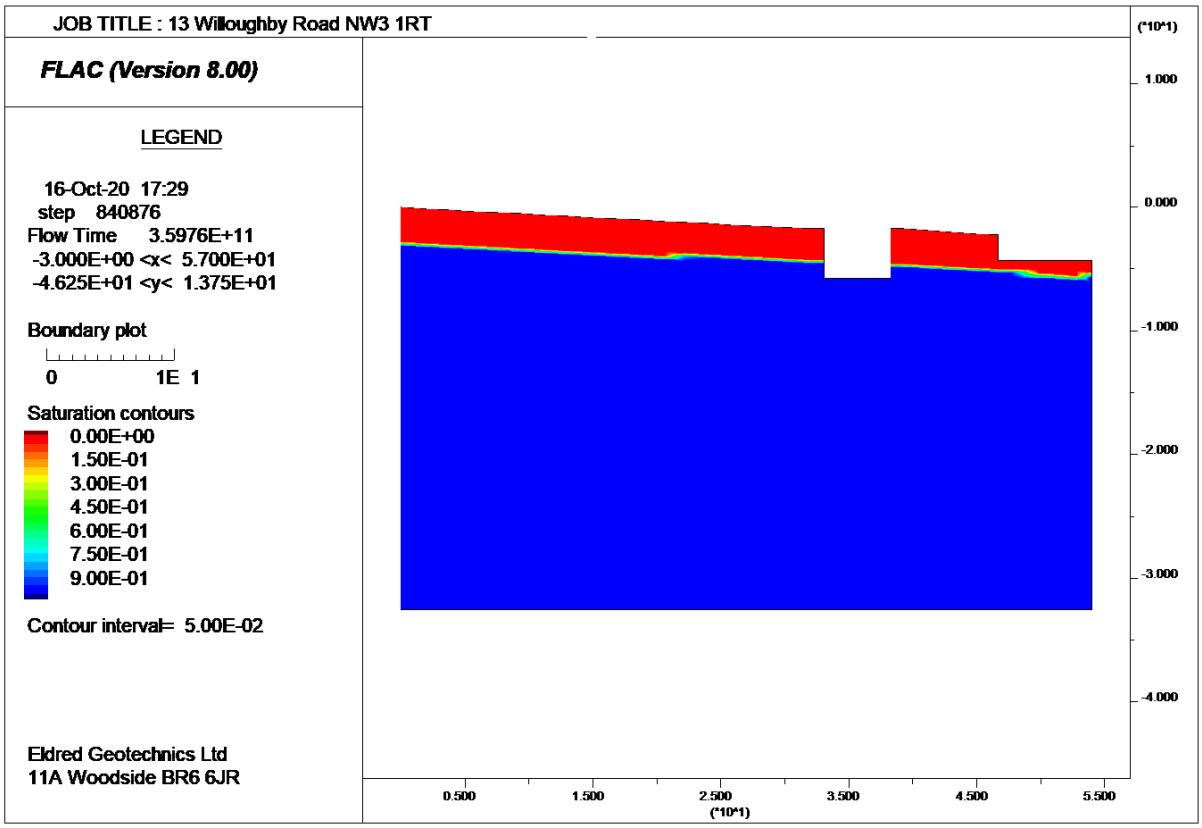


Figure 33 - Section F3 Final State Saturation Contours

Section	Property(s)	Element	Strain type	Location	Value mm	Eff. length	% disp.	Damage Cat'y
F1	Willow Cotts.	Rear wall-Bound'y	lateral	Notional excn face	-5	11000	-0.045	
			lateral	MP15X	0	7000	0.000	
			Net total				-0.045	Cat 0
			angular	MP22Ny	-0.05	7000	-0.001	
F2	Willow Cotts	Rear wall-Bound'y	lateral	Notional excn face	5	12000	0.042	
			lateral	MP17X	0.39	7000	0.006	
			Net total				0.028	Cat 0
			angular	MP23Y	0.76	5500	0.014	
				MP24Y	0.58	5500	0.011	
			Net total				-0.020	
	No.29	Width	lateral	Notional excn face	5	15000	0.033	
			lateral	MP35NX	0.92	6400	0.014	
				MP14X	0.98	6400	0.015	
			Net total				0.034	Cat 0
			angular	MPN41Y	-0.43			
				MP20Y	0.58			
				MP19Y	0.07			
			Net total (hog)		0.33	6400	0.005	
	No.27	Width	lateral	Notional excn face	5	15000	0.033	
			lateral	MP13X	0.53	8800	0.006	
				MP14X	0.98	8800	0.011	
							0.050	Cat 0-1
			ang. + No.29	MPN41Y	-0.43			
				MP19Y	0.07			
				MP18Y	0.22			
			Net total (hog)		0.175	15000	0.001	

Section	Property(s)	Element	Strain type	Location	Value mm	Eff. length	% disp.	Damage Cat'y
F3	No.33	Width	lateral	Notional excn face	-5	7900	-0.063	
			lateral	MP44NX	0.87	7900	0.011	
			Net total	MP15X	0.1	7900	-0.056	
								Cat 1
			angular	MP55NY	-0.56	7900	-0.007	
				MP25Y	-0.02	7900	0.000	
			Net total				-0.007	
	No.29	Width	lateral	Notional excn face	5	15000	0.033	
			lateral	MP40NX	0.74	6400	0.012	
				MP14X	-0.09	6400	-0.001	
			Net total				0.020	
								Cat 0
			angular	MP51NY	-0.23	6400	-0.004	
				MP22Y	0.08	6400	0.001	
			Net total				0.005	
	No.27	Width	lateral	Notional excn face	5	15000	0.033	
			lateral	MP14X	0.2	8800	0.002	
				MP15X	-0.09	8800	-0.001	
							0.035	
								Cat 0-1
			ang. + No.29	MPN51Y	-0.43			
				MP22Y	0.08			
				MP21Y	-0.05			
			Net total (sag)		0.32	15000	0.002	
All	Willow Cotts rear wall	F1 to F3	angular	F1 MP22Y	-0.05			
				F2 MP23Y	0.76			Cat 0
				F3 MP26Y	-0.01			
			Net total (hog)		0.79	17400	0.005	