



Franki Foundations

Contract Reference:

F15923

Site Address:

**Residential Development
8 New Lane
Havant
Hampshire
PO9 2JJ**

Client:

**Days Estates Limited
c/o Hamill Davies Limited Consulting Engineers**

Design Element:

Preliminary Issue Bearing Pile Design Calculations

Issue	Date	By	Checked	Comments
1	7/7/2017	Jonathan Chaloner	Alistair Macdonald	First Issue

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1.0 DESIGN BRIEF

Franki Foundations has been instructed to provide preliminary issue design calculations for the proposed piling works to the residential development at New Lane, Havant.

We have prepared these calculations for submission to the Structural Engineer for their further consideration in foundation design development and to assist with devising pile layouts. This preliminary design document will provide Safe Working Load pile capacities for various diameters at depths of up to 18.0 metres.

Overall design considers a Safety Factor of 3.0 with an additional check against shaft friction only, this will in some instances dictate pile SWL. For further details please refer to Section 6.0.

Diameters Considered for CFA Piles are 350mm, 400mm & 450mm.

A piling platform level of existing borehole level has been assumed for this design in the absence of confirmed levels.

2.0 DESIGN DOCUMENTS

Specifications: In accordance with ICE SPERW, 2nd Edition

Site Investigation: By Omnia Environmental Consulting Limited
Report Ref: A10708/1.1
Dated: November 2016

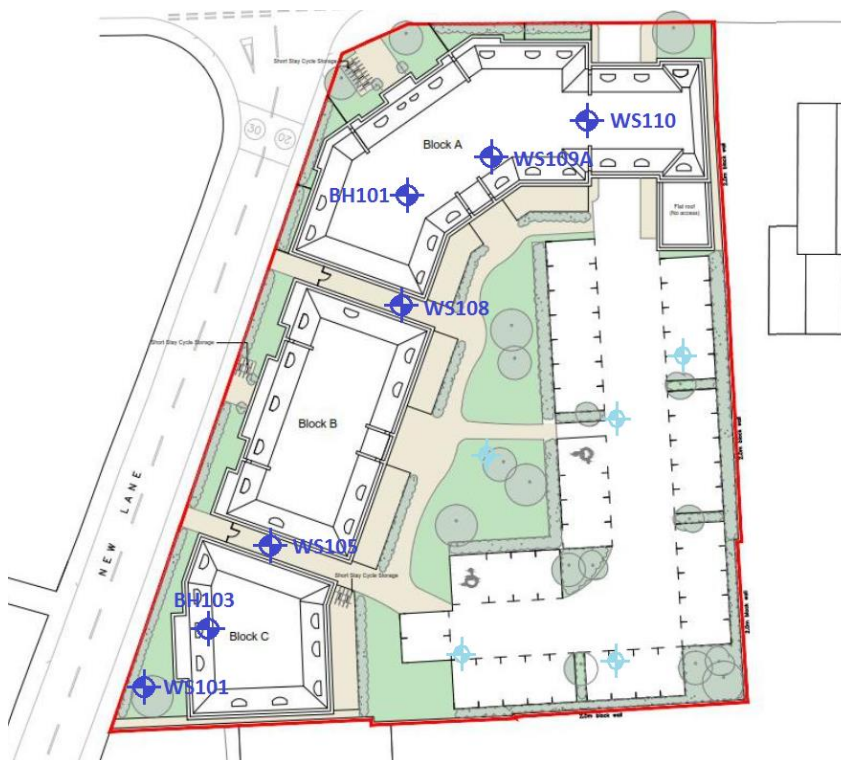
Drawings Used: Hamill Davies Limited Consulting Civil and Structural Engineers

Substructure Standard Notes	16-2730-100 Rev P2
Block A – Sheet 1 of 2 Piling Layout	16-2730-101A Rev P2
Block A – Sheet 2 of 2 Piling Layout	16-2730-101B Rev P2
Block B – Piling Layout	16-2730-102 Rev P2
Block C – Piling Layout	16-2730-103 Rev P2
Substructure Section/Details – Sheet 1	16-2730-151 Rev P2

Reference Documents: BRE Special Digest 1 Concrete in Aggressive Ground - 3rd edition 2005
BS 8004 – Foundations : 2015
BS 8110 - Structural Use of Concrete : Part 1 : 1997
BS 8500 – Concrete : 2002
BS 8666 – Reinforcement for Concrete : 2005
BS EN 206 – Concrete : 2000
BS EN 1536 – Execution of geotechnical work – Bored piles : 2010+A1

3.0 GEOTECHNICAL REVIEW

The design uses the ground strata profile outlined below, based on the findings within the site investigation and the soil strength profile (Appendix A). We have assumed that the site investigation is an accurate representation of the ground conditions based on footprint of the proposed Blocks A – C. It should be noted that we have discounted boreholes and window samplers which do not represent the ground conditions beneath the Blocks. We have therefore considered the following boreholes for design as illustrated below:-



Groundwater was generally recorded within the London Clay Formation between 7.6 - 10.5mbgl however perched water was noted within the Trial Pits and Window Samplers though this is not considered to represent a continuous water body across the site. We have therefore modelled a water level of 2.5mbgl for design purposes.

From (mBGL)		To (mBGL)	Stratum
0.00	-	1.50	Made Ground (<i>Ignored</i>)
1.50	-	2.50	River Terrace Deposits (<i>Ignored</i>)
2.50	-	5.00	River Terrace Deposits (Granular)
5.00	-	8.00	London Clay (Cohesive)
8.00	-	14.00 <i>Proven</i>	Bognor Sand Member (Granular)

Soil parameters have been established from the test data where relevant tests have been carried out within the geotechnical investigation works. A profile of the soil strength to depth is shown in Appendix A.

Soil	γ (kN/m ³)	Cu (kPa)	Cu Inc (kPa/m)	ϕ (°)
'Discounted Soils' Made Ground > River Terrace Deposits (ignored)	18.0	-	-	-
River Terrace Deposits	18.0	-	-	30
London Clay	19.0	60	11.67	-
Bognor Sand Member	19.0	-	-	42

4.0 CONCRETE ASSESSMENT

The site investigation (section 6.2.3) findings show a design sulphate class as DS-2 and ACEC class AC-2. We note however Hamill Davies Notes drawing (drawing 100) section B3 calls for a DC-3. We therefore propose to use a design chemical class of DC-3.

5.0 PILE SELECTION

The general site and ground conditions found on this project lend itself to CFA bearing piles. The presence of Sandstone/ Very Dense Gravels is noted and this will require further consideration with the appropriate choice of boring tool on lead flight auger.

6.0 GEOTECHNICAL PILE CAPACITY (BEARING)

The axial capacity of circular concrete piles is determined using the ground profile and geotechnical soil parameters found in Appendix and the following formula:

Ultimate pile capacity, $Q_u = Q_{su} + Q_{bu} = t_{su} \cdot A_s + \sigma_{bu} \cdot A_b$

Where, t_{su} = Ultimate unit shaft resistance

σ_{bu} = Ultimate unit base resistance

A_s = Pile shaft Area in contact with the ground strata

A_b = Pile Base Area

The pile lengths have been calculated using a FOS of 3.0, with a minimum FOS of 1.3 on the pile shaft. This should negate the need for any static load verification testing, but will need to be confirmed by the approving bodies.

It has been assumed that all piles will be spaced at a minimum of 3.0 x pile diameter, and as such no group analysis is required.

The pile capacity output is outlined in Appendix B for the selected pile diameters.

7.0 STRUCTURAL PILE CAPACITY

The maximum pile compression load has been limited to that which induces stress in the pile section of $0.25 f_{cu}$, summarised below:

Concrete Grade	Pile Dia. (mm)	Max Compression (kN)
C32/40	350	960
	400	1026
	450	1590

7.1 MINIMUM REINFORCEMENT

Reinforcement cage to consist of main bars equivalent to a minimum of 0.5% A_c , in accordance with BS EN 1536.

- For 350mm diameter piles 481mm^2 – propose 4 x H 16 (804mm^2)
- For 400mm diameter piles 628mm^2 – propose 4 x H 16 (804mm^2)
- For 450mm diameter piles 795mm^2 – propose 4 x H 16 (804mm^2)

7.2 SHEAR ANALYSIS

No horizontal loads are specified currently however we would note that the various diameters will each have their own maximum horizontal capacity. Typically the limits for horizontal loads can be considered as 7.5 – 10% of the pile diameter though this can be greater however, this will depend on the ground conditions and whether the piles can be modelled as ‘fixed’ in pile caps.

7.3 TENSION

Potential tensile forces due to clay heave have been analysed below:

- Zone of influence: 0.5 – 2.5mBGL (taking in to account ground beam depth)

The required area of steel to accommodate the tension force is calculated as;

$$A_s = F_v \gamma_f \gamma_m / f_y$$

Where;

F_v = Tensile Force

$\gamma_f = 1.4$

$\gamma_m = 1.15$

$f_y = 500\text{N/mm}^2$

Average Cohesion over zone of influence = 80kN/m^2

Adhesion Factor Considered = 0.5

Check for 350mm diameter Piles:

Tensile force acting on 350mm dia pile, $F_v = (80 \times \alpha)(.35 \times \pi \times 2.0\text{m}) = 88\text{kN}$

Required Steel, $A_s = 88 \times 1.4 \times 10^3 \times 1.15 / 500 = 283\text{mm}^2$, proposed 4 H16 (804mm^2)

From Appendix C take Q_s at 8.0m = 175kN

FOS against Heave $175 / 88 = 2.0$

Check for 400mm diameter Piles:

Tensile force acting on 400mm dia pile, $F_v = (80 \times \alpha)(.4 \times \pi \times 2.0\text{m}) = 100\text{kN}$

Required Steel, $A_s = 100 \times 1.4 \times 10^3 \times 1.15 / 500 = 322\text{mm}^2$, proposed 4 H16 (804mm^2)

From Appendix C take Q_s at 8.0m = 200kN

FOS against Heave $200 / 100 = 2.0$

Check for 450mm diameter Piles:

Tensile force acting on 450mm dia pile, $F_v = (80 \times \alpha)(.45 \times \pi \times 2.0\text{m}) = 113\text{kN}$

Required Steel, $A_s = 113 \times 1.4 \times 10^3 \times 1.15 / 500 = 364\text{mm}^2$, proposed 4 H16 (804mm^2)

From Appendix C take Q_s at 8.0m = 225kN

FOS against Heave $225 / 113 = 2.0$

For all cases propose 4 H16 x 8.0m pile cages

7.4 REBAR ANCHORAGE

BS8110 Table 3.27 – Longitudinal pile steel shall be carried into the pile cap a minimum distance of 38 bar diameters. For typical concrete strength class 28/35 and deformed type 2 reinforcement, the following tension anchorage/lap length is required;

H16 = 608mm

The engineers sub-structure needs to have sufficient depth to cater for the required anchorage.

Lastly, we would suggest the use of de-bonding foam to aid pile trimming.

8.0 CONSTRUCTION DETAILS

Construct the piles in accordance with the pile schedule, issued separately.

All piles to be 350mm / 400mm / 450mm diameter

Pile Cage Reinforcement (regardless of diameter) = 4 H16 w/ H8 @ 200mm c/c x 8.0m.

Adopt Grade C32/40 concrete to class DC-3, BRE SD1 (2005)

9.0 CLIENT ACTIONS FOR DESIGN RELISATION

Borehole information for site shows maximum investigated depths of 14.0m. Proposed piles and design considers up to 18.0m piles. Additional Site Investigation may be required to satisfy NHBC / Building Control conditions. This is to be checked and reviewed by Client.

Acceptance of the design and its associated qualifications

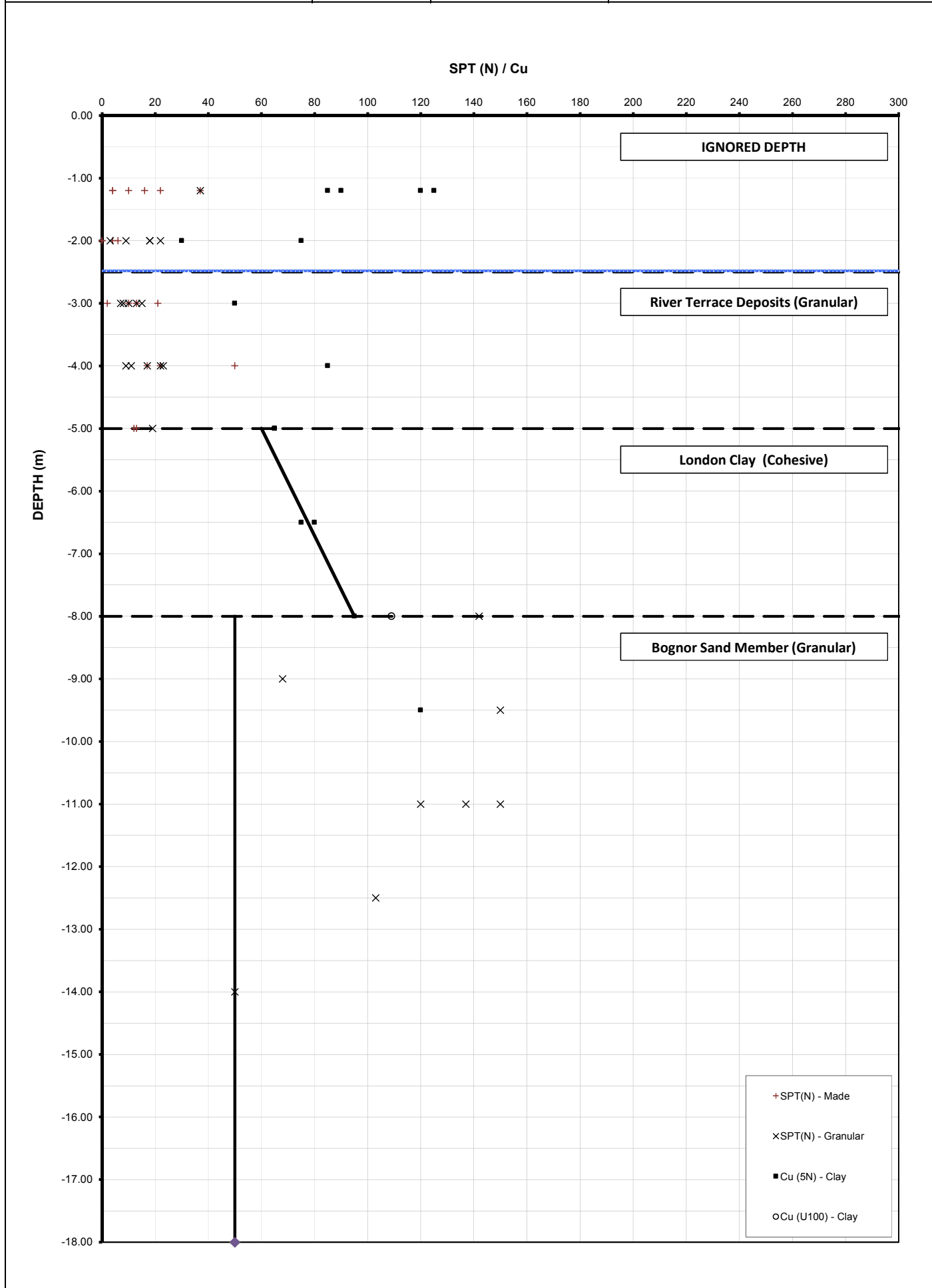
Provide attendance items and Working Platform in accordance with the FPS schedule of attendances

Provide Construction Issue Drawings

Forward calculations to necessary parties for review and acceptance

APPENDIX A – SOIL PROFILE & GEOTECHNICAL PARAMETERS

Contract Title:		8 New Lane, Havant, PO9 2JJ		 Franki Foundations	
Element:		Shear Strength / N Value vs. Depth Plot			
Contract No:	F15923	By:	JOC		Date:



APPENDIX B – GEOTECHNICAL PILE CAPACITY

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Analysis Options

Design method	Working load
Are compression calculations enabled?	Yes
Is global FoS criterion for compression active?	Yes
Global factor on ultimate bearing capacity Fg	3.000
Is partial FoS criterion for compression active?	No
Is shaft FoS criterion for compression active?	Yes
Factor applied to ultimate skin friction Fs2	1.300
Is pile limiting stress criterion for compression active?	Yes
Limiting pile material stress at working load	8750. kPa
Are tension calculations enabled?	No
Datum type	Depth based
Effective stress profile	Calculated

Pile Properties

Pile type	Solid
Pile cross-section	Circular
Under-ream	No
Calculation profile	Range
Minimum pile length	11.50 m
Maximum pile length	18.00 m
Increment size	0.5000

Cross-section	Number of cross sections	Top Diameter	Second Diameter location	Second Diameter	Third Diameter location	Third Diameter
		[m]	[m]	[m]	[m]	[m]
Cross-section 1	1	0.3500				
Cross-section 2	1	0.4000				
Cross-section 3	1	0.4500				

Undrained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Cu material factor	Top Cu [kPa]	Base Cu [kPa]
1	London Clay	19.00	NA	60.00	95.00

Undrained Materials - Skin Friction Data

No.	Material description	Skin friction computation	Alpha	qs Top [kPa]	qs,lim Base Spec. Value [kPa]
1	London Clay	Alpha specified	0.5000	NA	NA No NA

Undrained Materials - End Bearing Data

No.	Material description	End bearing computation	Nc	qb Top [kPa]	qb,lim Base Spec. Value [kPa]
1	London Clay	Nc specified	9.000	NA	NA No NA

Drained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Tan(δ) material factor
1	Discounted Soils	18.00	NA
2	River Terrace Deposits	18.00	NA
3	Bognor Sand Member	19.00	NA

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No. Material Bulk Tan(δ)
description unit material
weight factor
[kN/m³]

Drained Materials - Friction Data

No.	Material description	Skin friction computation	Beta	Delta (δ) [deg]	Coefficient of earth pressure K	q_s Top [kPa]	$q_{s,lim}$ Base [kPa]	Spec. Value
1	Discounted Soils	q_s specified	NA	NA	NA	0.0	0.0	No NA
2	River Terrace Deposits	Earth pressure	NA	30.00	0.8000	NA	NA	No NA
3	Bognor Sand Member	Earth pressure	NA	42.00	0.8000	NA	NA	No NA

Drained Materials - End Bearing Data

No.	Material description	End bearing computation	N_q	Φ [deg]	Φ D [deg]	Φ cv [deg]	I_r	q_b Top [kPa]	$q_{b,lim}$ Base [kPa]	Spec. Value	N_q - Φ curves
1	Discounted Soils	q_b specified	NA	NA	NA	NA	NA	0.0	0.0	No	NA NA
2	River Terrace Deposits	q_b specified	NA	NA	NA	NA	NA	0.0	0.0	No	NA NA
3	Bognor Sand Member	Berezantzev	*	40.00	40.00	NA	NA	NA	NA	Yes	10000. Standard

* - Will be calculated by the program.

STAGE SPECIFIC DATA**Stage 0 : Initial Stage****Groundwater**

No.	Level [m]	Pressure [kPa]	Unit weight of water [kN/m ³]
1	2.500	0.0	9.810

Soil Profiles**Soil Profile 1: Soil Profile 1**

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Air/Void	No
2	1.000	Discounted Soils	No
3	2.500	River Terrace Deposits	No
4	5.000	London Clay	No
5	8.000	Bognor Sand Member	No

Soil Profile - Groundwater Map

No.	Soil Profile	Groundwater
1	Soil Profile 1	Groundwater Profile 1

Stage specific warnings

1 Stage 1 Soil profile 1[Soil Profile 1]: This soil profile has some

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No. Soil Profile Groundwater

layers using Berezantzev/Bolton methods. In calculating N_q by Berezantzev method, the program uses the Φ_{iD} value for the layer at the location of pile toe depth as the equivalent Φ_{iD} for the overburden soil surrounding the pile shaft.

CAPACITY RESULTS

Stress Profiles

Soil Profile 1: Soil Profile 1

Depth	Density	Undrained Cohesion	N_q	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*
[m]	[kN/m ³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa] [kN/m]
0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA 0.0
1.000	0.0	0.0	0.0	0.0	0.0	0.0	NA 0.0
1.000	18.00	0.0	N.A.	0.0	0.0	0.0	NA 0.0
2.500	18.00	0.0	N.A.	27.00	0.0	27.00	NA 0.0
2.500	18.00	0.0	N.A.	27.00	0.0	27.00	21.60 0.0
5.000	18.00	0.0	N.A.	72.00	24.52	47.47	37.98 0.0
5.000	19.00	60.00	N.A.	72.00	24.52	47.47	NA 0.0
8.000	19.00	95.00	N.A.	129.0	53.96	75.04	NA 0.0
8.000	19.00	0.0	N.A.	129.0	53.96	75.04	60.04 0.0
11.50	19.00	0.0	N.A.	195.5	88.29	107.2	85.77 0.0
12.00	19.00	0.0	N.A.	205.0	93.19	111.8	89.44 0.0
12.50	19.00	0.0	N.A.	214.5	98.10	116.4	93.12 0.0
13.00	19.00	0.0	N.A.	224.0	103.0	121.0	96.80 0.0
13.50	19.00	0.0	N.A.	233.5	107.9	125.6	100.5 0.0
14.00	19.00	0.0	N.A.	243.0	112.8	130.2	104.1 0.0
14.50	19.00	0.0	N.A.	252.5	117.7	134.8	107.8 0.0
15.00	19.00	0.0	N.A.	262.0	122.6	139.4	111.5 0.0
15.50	19.00	0.0	N.A.	271.5	127.5	144.0	115.2 0.0
16.00	19.00	0.0	N.A.	281.0	132.4	148.6	118.9 0.0
16.50	19.00	0.0	N.A.	290.5	137.3	153.2	122.5 0.0
17.00	19.00	0.0	N.A.	300.0	142.2	157.8	126.2 0.0
17.50	19.00	0.0	N.A.	309.5	147.1	162.4	129.9 0.0
18.00	19.00	0.0	N.A.	319.0	152.1	166.9	133.6 0.0

* Effective horizontal stress not calculated for "Total Stress" materials and for Beta Method.

Cross-section 1 results:

Uniform pile with top shaft diameter = 0.35 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Negative skin friction	Ultimate capacity	Allowable capacity	Limiting criterion
		(Q_b)	(Q_s)	(Q_{nsf})			#
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]	
11.50	11.50	962.1	427.7	0.0	1390.	329.0	3
12.00	12.00	962.1	471.1	0.0	1433.	362.4	3
12.50	12.50	962.1	516.3	0.0	1478.	397.1	3
13.00	13.00	962.1	563.3	0.0	1525.	433.3	3
13.50	13.50	962.1	612.1	0.0	1574.	470.9	3
14.00	14.00	962.1	662.8	0.0	1625.	509.8	3
14.50	14.50	962.1	715.2	0.0	1677.	550.2	3
15.00	15.00	962.1	769.5	0.0	1732.	577.2	1
15.50	15.50	962.1	825.6	0.0	1788.	595.9	1
16.00	16.00	962.1	883.5	0.0	1846.	615.2	1
16.50	16.50	962.1	943.3	0.0	1905.	635.1	1
17.00	17.00	962.1	1005.	0.0	1967.	655.7	1
17.50	17.50	962.1	1068.	0.0	2030.	676.8	1
18.00	18.00	962.1	1133.	0.0	2096.	698.5	1

~ Pile embedment into drained material from undrained material is less than twice the pile diameter.

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Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Negative skin friction	Ultimate capacity	Allowable capacity	Limiting criterion
		(Q _b)	(Q _s)	(Q _{nsf})			#

Hence, contribution from this drained layer near toe is ignored.

Limiting criteria :

- 1: Global factor of safety
- 2: Shaft and base factors of safety
- 3: Shaft factor of safety
- 4: Pile material limiting stress [Compression]

Nq Calculation Details

Soil Profile 1: Soil Profile 1

Depth	Pile length	N _q	α _T	A _k	B _k
[m]	[m]				
11.50	11.50	136.9	0.7279	104.0	183.8
12.00	12.00	136.5	0.7264	104.0	183.8
12.50	12.50	136.1	0.7251	104.0	183.8
13.00	13.00	135.8	0.7239	104.0	183.8
13.50	13.50	135.5	0.7228	104.0	183.8
14.00	14.00	135.2	0.7217	104.0	183.8
14.50	14.50	134.9	0.7207	104.0	183.8
15.00	15.00	134.7	0.7198	104.0	183.8
15.50	15.50	134.4	0.7189	104.0	183.8
16.00	16.00	134.2	0.7181	104.0	183.8
16.50	16.50	134.0	0.7173	104.0	183.8
17.00	17.00	133.8	0.7165	104.0	183.8
17.50	17.50	133.6	0.7158	104.0	183.8
18.00	18.00	133.4	0.7152	104.0	183.8

Cross-section 2 results:

Uniform pile with top shaft diameter = 0.40 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Negative skin friction	Ultimate capacity	Allowable capacity	Limiting criterion
		(Q _b)	(Q _s)	(Q _{nsf})			#
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]	
11.50	11.50	1257.	488.8	0.0	1745.	376.0	3
12.00	12.00	1257.	538.4	0.0	1795.	414.1	3
12.50	12.50	1257.	590.0	0.0	1847.	453.9	3
13.00	13.00	1257.	643.7	0.0	1900.	495.2	3
13.50	13.50	1257.	699.5	0.0	1956.	538.1	3
14.00	14.00	1257.	757.4	0.0	2014.	582.6	3
14.50	14.50	1257.	817.4	0.0	2074.	628.8	3
15.00	15.00	1257.	879.4	0.0	2136.	676.5	3
15.50	15.50	1257.	943.6	0.0	2200.	725.8	3
16.00	16.00	1257.	1010.	0.0	2266.	755.5	1
16.50	16.50	1257.	1078.	0.0	2335.	778.2	1
17.00	17.00	1257.	1148.	0.0	2405.	801.7	1
17.50	17.50	1257.	1221.	0.0	2477.	825.8	1
18.00	18.00	1257.	1295.	0.0	2552.	850.7	1

~ Pile embedment into drained material from undrained material is less than twice the pile diameter.
Hence, contribution from this drained layer near toe is ignored.

Limiting criteria :

- 1: Global factor of safety
- 2: Shaft and base factors of safety
- 3: Shaft factor of safety
- 4: Pile material limiting stress [Compression]

Nq Calculation Details

Soil Profile 1: Soil Profile 1

Depth	Pile length	N _q	α _T	A _k	B _k
[m]	[m]				

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Depth [m]	Pile length [m]	Nq	α_T	A _k	B _k
11.50	11.50	138.2	0.7326	104.0	183.8
12.00	12.00	137.8	0.7311	104.0	183.8
12.50	12.50	137.4	0.7296	104.0	183.8
13.00	13.00	137.0	0.7282	104.0	183.8
13.50	13.50	136.6	0.7270	104.0	183.8
14.00	14.00	136.3	0.7258	104.0	183.8
14.50	14.50	136.0	0.7247	104.0	183.8
15.00	15.00	135.7	0.7236	104.0	183.8
15.50	15.50	135.5	0.7226	104.0	183.8
16.00	16.00	135.2	0.7217	104.0	183.8
16.50	16.50	135.0	0.7208	104.0	183.8
17.00	17.00	134.7	0.7200	104.0	183.8
17.50	17.50	134.5	0.7192	104.0	183.8
18.00	18.00	134.3	0.7185	104.0	183.8

Cross-section 3 results:

Uniform pile with top shaft diameter = 0.45 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity (Q _b)	Cumulative external Friction (Q _s)	Negative skin friction (Q _{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]	
11.50	11.50	1590.	549.9	0.0	2140.	423.0	3
12.00	12.00	1590.	605.7	0.0	2196.	465.9	3
12.50	12.50	1590.	663.8	0.0	2254.	510.6	3
13.00	13.00	1590.	724.2	0.0	2315.	557.1	3
13.50	13.50	1590.	787.0	0.0	2377.	605.4	3
14.00	14.00	1590.	852.1	0.0	2443.	655.5	3
14.50	14.50	1590.	919.6	0.0	2510.	707.4	3
15.00	15.00	1590.	989.4	0.0	2580.	761.0	3
15.50	15.50	1590.	1061.	0.0	2652.	816.5	3
16.00	16.00	1590.	1136.	0.0	2726.	873.8	3
16.50	16.50	1590.	1213.	0.0	2803.	932.9	3
17.00	17.00	1590.	1292.	0.0	2882.	960.8	1
17.50	17.50	1590.	1373.	0.0	2964.	988.0	1
18.00	18.00	1590.	1457.	0.0	3048.	1016.	1

~ Pile embedment into drained material from undrained material is less than twice the pile diameter. Hence, contribution from this drained layer near toe is ignored.

Limiting criteria :

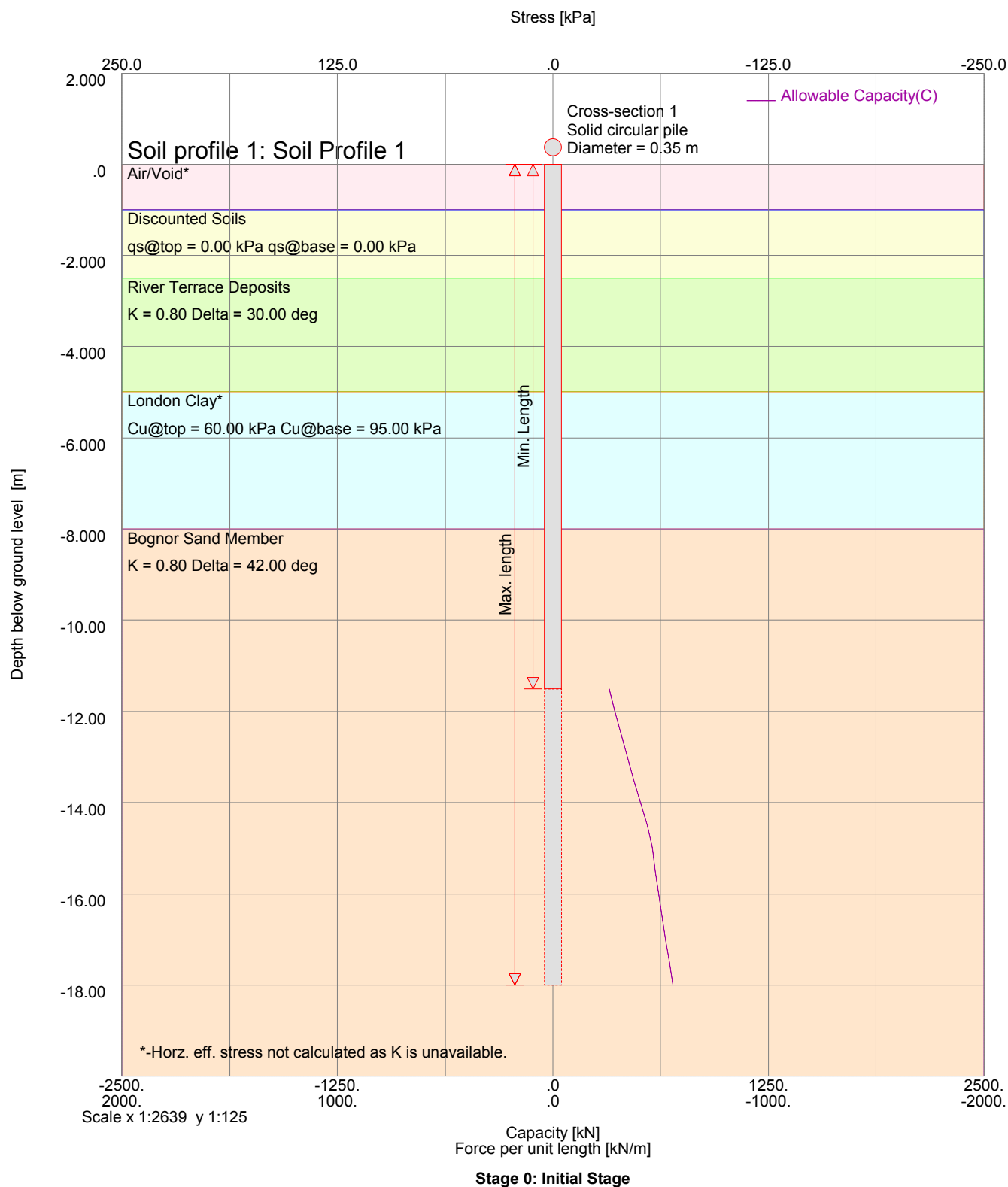
- 1: Global factor of safety
- 2: Shaft and base factors of safety
- 3: Shaft factor of safety
- 4: Pile material limiting stress [Compression]

Nq Calculation Details

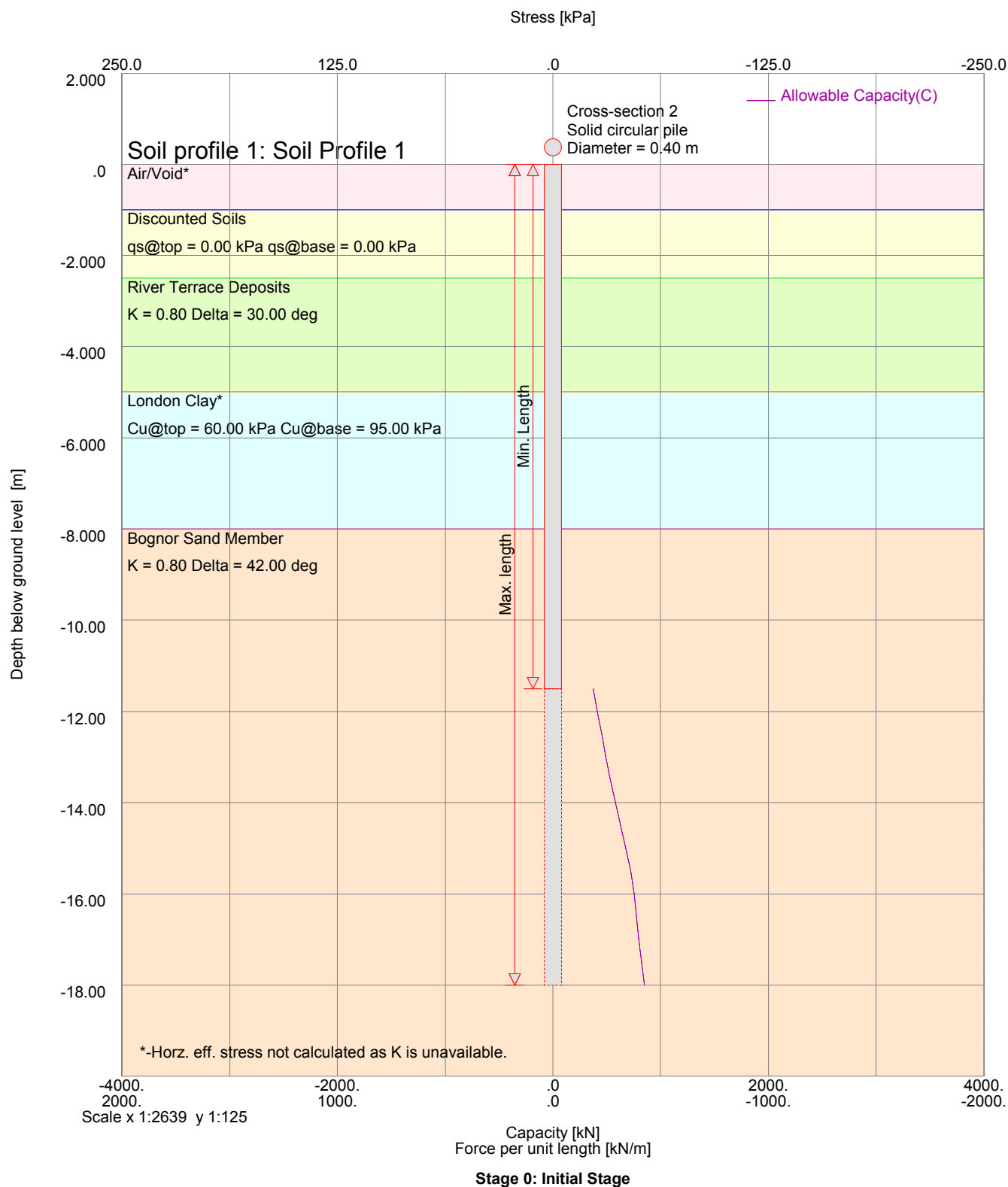
Soil Profile 1: Soil Profile 1

Depth	Pile length	Nq	α_T	A _k	B _k
[m]	[m]				
11.50	11.50	139.5	0.7373	104.0	183.8
12.00	12.00	139.0	0.7356	104.0	183.8
12.50	12.50	138.6	0.7340	104.0	183.8
13.00	13.00	138.2	0.7325	104.0	183.8
13.50	13.50	137.8	0.7311	104.0	183.8
14.00	14.00	137.4	0.7298	104.0	183.8
14.50	14.50	137.1	0.7285	104.0	183.8
15.00	15.00	136.8	0.7274	104.0	183.8
15.50	15.50	136.5	0.7263	104.0	183.8
16.00	16.00	136.2	0.7253	104.0	183.8
16.50	16.50	135.9	0.7243	104.0	183.8
17.00	17.00	135.7	0.7234	104.0	183.8
17.50	17.50	135.4	0.7225	104.0	183.8
18.00	18.00	135.2	0.7217	104.0	183.8

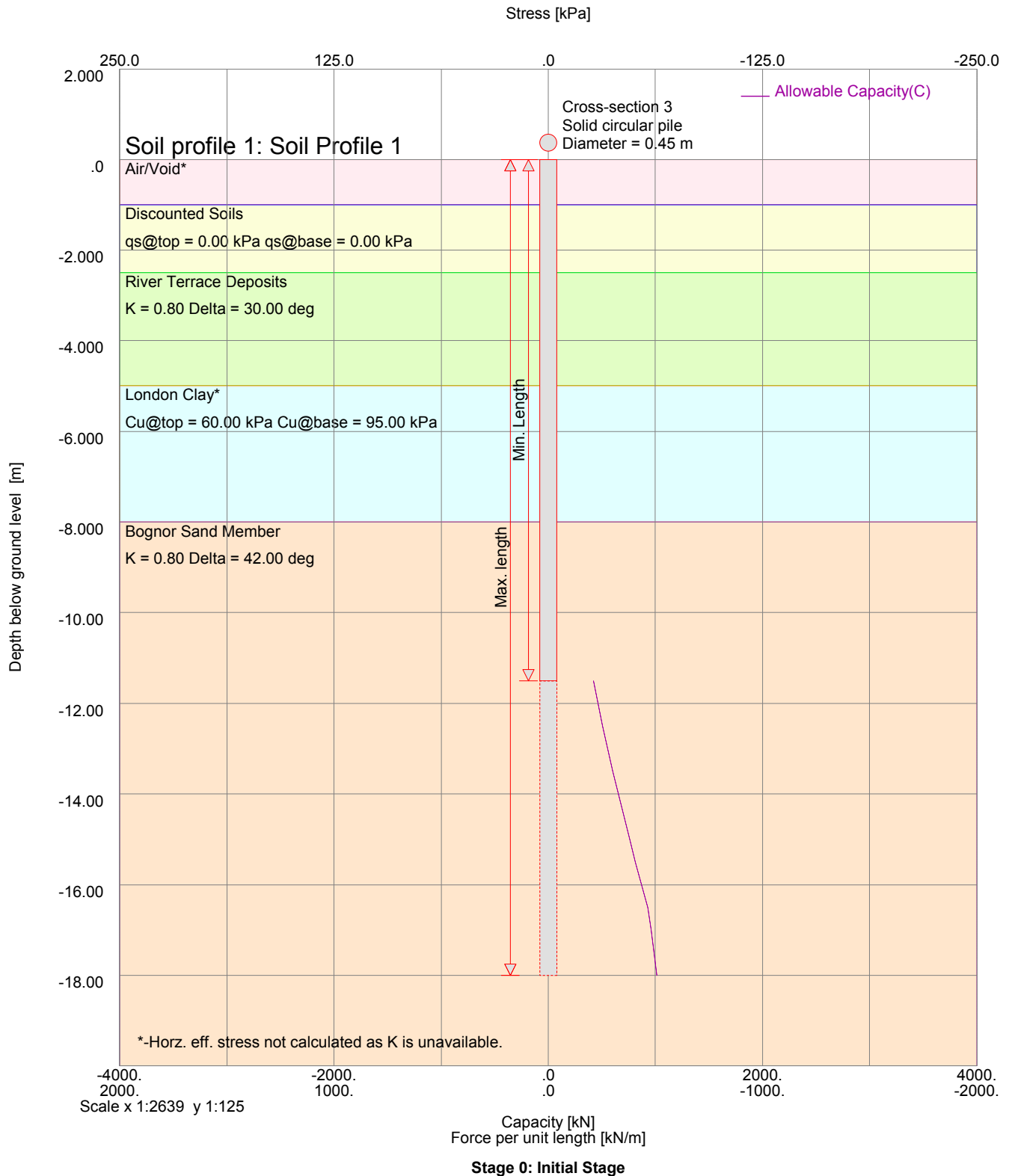
Job No.	Sheet No.	Rev.
F15923		
Drg. Ref.		
Made by	Date	Checked
JC		



Job No.	Sheet No.	Rev.
F15923		
Drg. Ref.		
Made by JC	Date	Checked



Job No.	Sheet No.	Rev.
F15923		
Drg. Ref.		
Made by	Date	Checked
JC		



Pile Load Capacities (Summarised from Oasys Pile Sheets)

	SWL based on FOS = 3.0		
Depth (mbgl)	350mm Dia. SWL (kN)	400mm Dia. SWL (kN)	450mm Dia. SWL (kN)
11.5	329	376	423
12.0	362	414	466
12.5	397	454	511
13.0	433	495	557
13.5	471	538	605
14.0	510	583	656
14.5	550	629	707
15.0	577	677	761
15.5	596	726	817
16.0	615	756	874
16.5	635	778	933
17.0	656	802	961
17.5	677	826	988
18.0	699	851	1016