



Lancaster Lane, Brockholes

305 x 305 x 198mm Bar 7.50m Length

Job No. Sheet No. Rev.

3067

Drg. Ref.

Made by Date
PW 11-Mar-2024

Checked Date

Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
14	-6.50000	-1.04347	0.00000	0.00000	56.76170	0.00000	65.72153
15	-7.00000	-0.66472	0.00000	0.00000	23.06782	0.00000	56.76170
16	-7.50000	-0.34405	0.00000	-0.00000	0.00000	0.00000	0.00000
17	-8.00000	-0.28023	0.00000	-0.00000	0.00000	0.00000	0.00000
18	-8.50000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000



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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Ground level [m] LEFT: 0.00 RIGHT: 0.00 Soil zones changed

Water data on LEFT side

No.	Level	Pressure	Unit wt.	
		[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000	

Water data on RIGHT side

No.	Level	Pressure	Unit wt.	
		[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000	

Analysis details

SAFE model with redistribution



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Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
14	-6.62500	-1.25256	0.00000	0.00000	53.66568	0.00000	54.04916
15	-7.25000	-0.93801	0.00000	0.00000	22.74017	0.00000	38.49041
16	-7.87500	-0.71492	0.00000	0.00000	5.55267	0.00000	18.19213
17	-8.50000	-0.51922	0.00000	0.00000	0.00000	-0.00000	0.00000
18	-9.00000	-0.32275	0.00000	0.00000	0.00000	-0.00000	0.00000
19	-9.50000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000



Lancaster Lane, Brockholes
305 x 305 x 198mm Bar 9.50m Length

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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil Left Right	Boundary Left Right	EI below node [kNm ² /m]
1	0.00000	1	1	50.00000
2	-0.61111	1	1	50.00000
3	-1.22222	1	1	50.00000
4	-1.77778	2	2	50.00000
5	-2.33333	2	2	50.00000
6	-2.66667	3	3	50.00000
7	-3.27778	3	3	50.00000
8	-3.88889	3	3	50.00000
9	-4.50000	3	3	50.00000
10	-4.91667	3	3	50.00000
11	-5.33333	3	3	50.00000
12	-5.66667	3	3	50.00000
13	-6.00000	3	3	50.00000



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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
14	-6.58333	3	3	50.00000	50.00000	81270
15	-7.16667	3	3	50.00000	50.00000	81270
16	-7.75000	3	3	50.00000	50.00000	81270
17	-8.33333	3	3	50.00000	50.00000	81270
18	-8.91667	3	3	50.00000	50.00000	81270
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

Water data on LEFT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress		Pt [kN/m ²]	Pe [kN/m ²]	Pore Pressure [kN/m ²]	Soil		Vt [kN/m ²]	Ve [kN/m ²]
			Vt BM [kN/m ²]	Ve SF [kN/m ²]				Left	Right		
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000							
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
6.31889	6.31889	0.00000	0.00000	0.00000							
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
12.63778	12.63778	0.00000	0.00000	0.00000							
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
19.27778	19.27778	0.00000	0.00000	0.00000							
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
24.83333	24.83333	0.00000	0.00000	0.00000							
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
28.41667	28.41667	0.00000	0.00000	0.00000							
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
35.44444	35.44444	0.00000	0.00000	0.00000							
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
42.47222	42.47222	0.00000	0.00000	0.00000							
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000



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Stress					Pore					Stress	
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	
Pt	Pe	Pressure	BM	SF							
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000					
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000					
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000					
13	-6.00000	0.00000	132.58960	132.58960	66.29480	66.29480	0.00000	3	3	132.58960	132.58960
66.29480	66.29480	0.00000	0.00000	0.00000	0.00000	0.00000					
14	-6.58333	0.00000	146.91667	141.19417	76.31959	70.59708	5.72250	3	3	146.91667	141.19417
76.31959	70.59708	5.72250	0.00000	0.00000	0.00000	0.00000					
15	-7.16667	0.00000	160.33333	148.88833	85.88916	74.44417	11.44500	3	3	160.33333	148.88833
85.88916	74.44417	11.44500	0.00000	0.00000	0.00000	0.00000					
16	-7.75000	0.00000	173.75000	156.58250	95.45875	78.29125	17.16750	3	3	173.75000	156.58250
95.45875	78.29125	17.16750	0.00000	0.00000	0.00000	0.00000					
17	-8.33333	0.00000	187.16666	164.27666	105.02833	82.13833	22.89000	3	3	187.16666	164.27666
105.02833	82.13833	22.89000	0.00000	0.00000	0.00000	0.00000					
18	-8.91667	0.00000	200.58334	171.97084	114.59792	85.98542	28.61250	3	3	200.58334	171.97084
114.59792	85.98542	28.61250	0.00000	0.00000	0.00000	0.00000					
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500
124.16750	89.83250	34.33500	0.00000	0.00000	0.00000	0.00000					
20	-10.00000	0.00000	225.50000	186.26000	132.37000	93.13000	39.24000	3	3	225.50000	186.26000
132.37000	93.13000	39.24000	0.00000	0.00000	0.00000	0.00000					
21	-10.50000	0.00000	237.00000	192.85500	140.57250	96.42750	44.14500	3	3	237.00000	192.85500
140.57250	96.42750	44.14500	0.00000	0.00000	0.00000	0.00000					

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	81270
2	-0.61111	1	1	50.00000	50.00000	81270
3	-1.22222	1	1	50.00000	50.00000	81270
4	-1.77778	2	2	50.00000	50.00000	81270
5	-2.33333	2	2	50.00000	50.00000	81270
6	-2.66667	3	3	50.00000	50.00000	81270
7	-3.27778	3	3	50.00000	50.00000	81270
8	-3.88889	3	3	50.00000	50.00000	81270
9	-4.50000	3	3	50.00000	50.00000	81270
10	-4.91667	3	3	50.00000	50.00000	81270
11	-5.33333	3	3	50.00000	50.00000	81270
12	-5.66667	3	3	50.00000	50.00000	81270
13	-6.00000	3	3	50.00000	50.00000	81270
14	-6.58333	3	3	50.00000	50.00000	81270
15	-7.16667	3	3	50.00000	50.00000	81270
16	-7.75000	3	3	50.00000	50.00000	81270
17	-8.33333	3	3	50.00000	50.00000	81270
18	-8.91667	3	3	50.00000	50.00000	81270
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 21883. E at bottom node = 240740. kN/m²



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Node	Level	Soil	Boundary		EI below node
	[m]	Left Right	Left	Right	[kNm ² /m]

On the RIGHT: E at ground level = 21883. E at bottom node = 240740. kN/m²

Iter no.	Inc max displ	Node no.	Disp error.	Node no.	Press error.	Node no.
	[mm]		[mm]		[kN/m ²]	
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress		Pt [kN/m ²]	Pore Pressure		Soil		Stress	
			Vt [kN/m ²]	Ve [kN/m ²]		Pe [kN/m ²]	Pressure [kN/m ²]	Left	Right	Vt [kN/m ²]	Ve [kN/m ²]
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333
13	-6.00000	0.00000	132.58960	132.58960	66.29480	66.29480	0.00000	3	3	132.58960	132.58960
14	-6.58333	0.00000	146.91667	141.19417	76.31959	70.59708	5.72250	3	3	146.91667	141.19417
15	-7.16667	0.00000	160.33333	148.88833	85.88916	74.44417	11.44500	3	3	160.33333	148.88833
16	-7.75000	0.00000	173.75000	156.58250	95.45875	78.29125	17.16750	3	3	173.75000	156.58250
17	-8.33333	0.00000	187.16666	164.27666	105.02833	82.13833	22.89000	3	3	187.16666	164.27666
18	-8.91667	0.00000	200.58334	171.97084	114.59792	85.98542	28.61250	3	3	200.58334	171.97084
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500
20	-10.00000	0.00000	225.50000	186.26000	132.37000	93.13000	39.24000	3	3	225.50000	186.26000
21	-10.50000	0.00000	237.00000	192.85500	140.57250	96.42750	44.14500	3	3	237.00000	192.85500

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -9.50



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Stress				Pore				Stress			
Pore	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	
Pt	Pe	Pressure	BM	SF							
EXTREME values so far											
Displacements [mm]			Moments [kNm/m]		Shears [kN/m]						
Min	Max	Min	Max	Min	Max						
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000						
Surcharge 1 present in this stage											

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	106890
2	-0.61111	0	1	50.00000	50.00000	106890
3	-1.22222	0	1	50.00000	50.00000	106890
4	-1.77778	0	2	50.00000	50.00000	106890
5	-2.33333	0	2	50.00000	50.00000	106890
6	-2.66667	0	3	50.00000	50.00000	106890
7	-3.27778	0	3	50.00000	50.00000	106890
8	-3.88889	0	3	50.00000	50.00000	106890
9	-4.50000	0	3	50.00000	50.00000	106890
10	-4.91667	0	3	50.00000	50.00000	106890
11	-5.33333	0	3	50.00000	50.00000	106890
12	-5.66667	3	3	50.00000	50.00000	106890
13	-6.00000	3	3	50.00000	50.00000	106890
14	-6.58333	3	3	50.00000	50.00000	106890
15	-7.16667	3	3	50.00000	50.00000	106890
16	-7.75000	3	3	50.00000	50.00000	106890
17	-8.33333	3	3	50.00000	50.00000	106890
18	-8.91667	3	3	50.00000	50.00000	106890
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²
On the RIGHT: E at ground level = 21883. E at bottom node = 240740. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error.	Node no.
displ		[mm]		[kN/m ²]		
1	0.0	1	3.0563	1	10.28	12
2	3.1	1	0.4749	1	12.04	7
3	3.5	1	0.4633	1	82.80	12
4	4.0	1	0.4413	1	9.72	6
5	4.4	1	0.4255	1	10.88	6
10	6.4	1	0.3526	1	10.65	6
15	8.1	1	0.2954	1	8.47	6
20	9.4	1	0.2482	1	7.06	8
30	11.6	1	0.1809	1	5.18	8
40	13.2	1	0.1358	1	3.94	8
50	14.4	1	0.1018	1	2.95	8
60	15.3	1	0.0763	1	2.21	8
70	16.0	1	0.0572	1	1.65	8
80	16.5	1	0.0436	1	1.29	8
90	16.9	1	0.0339	1	1.00	8
100	17.2	1	0.0262	1	0.78	8
120	17.6	1	0.0157	1	0.46	8
140	17.8	1	0.0094	1	0.28	8
150	17.9	1	0.0073	1	0.22	8
160	18.0	1	0.0057	1	0.17	8
180	18.1	1	0.0034	1	0.10	8
181	18.1	1	0.0033	1	0.10	8



Lancaster Lane, Brockholes
305 x 305 x 198mm Bar 9.50m Length

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Iter Inc Node Disp Node Press Node
no. max no. error. no. error no.
displ
[mm] [mm] [kN/m²]

Ground level left = -5.50 Ground level right = 0.00

Stress			Pore			Stress			Pore			
Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF				Left	Right			
[kN/m ²]	[m]	[mm]	[kN/m ²]									
1	0.00000	-18.07055	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.15692	1.15692	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-16.09193	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
4.66921	4.66921	0.00000	0.21603	-1.78021	0.00000	0.00000	0.00000	0	1	a	38.55556	38.55556
3	-1.22222	-14.11507	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667
9.35314	9.35314	0.00000	2.17581	-5.93491	0.00000	0.00000	0.00000	0	2	a	56.83334	56.83334
4	-1.77778	-12.32580	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
14.98362	14.98362	0.00000	6.98854	-12.82503	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
5	-2.33333	-10.55893	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
19.30729	19.30729	0.00000	16.42584	-21.27765	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
6	-2.66667	-9.52033	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667
-0.08853	-0.08853	0.00000	24.94856	-25.54726	0.00000	0.00000	0.00000	0	3	a	125.83333	125.83333
7	-3.27778	-7.68996	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	132.58960	132.58960
-0.08821	-0.08821	0.00000	40.54799	-25.49940	0.00000	0.00000	0.00000	0	3	a	146.91667	146.91667
8	-3.88889	-6.00124	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	160.33333	160.33333
-0.09530	-0.09530	0.00000	56.11449	-25.44333	0.00000	0.00000	0.00000	0	3	a	173.75000	173.75000
9	-4.50000	-4.50855	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	187.16666	187.16666
-0.08586	-0.08586	0.00000	71.64540	-25.39215	0.00000	0.00000	0.00000	0	3	a	200.58334	200.58334
10	-4.91667	-3.63102	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	214.00000	214.00000
-0.09269	-0.09269	0.00000	82.21626	-25.35077	0.00000	0.00000	0.00000	0	3	a	225.50000	225.50000
11	-5.33333	-2.88703	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	237.00000	237.00000
-0.07461	-0.07461	0.00000	92.77105	-25.31747	0.00000	0.00000	0.00000	0	3	a	250.00000	250.00000
12	-5.66667	-2.39950	3.83333	3.83333	174.61966	174.61966	0.00000	3	3	a	264.00000	264.00000
-0.06725	-0.06725	0.00000	101.20553	3.81100	53.38775	53.38775	0.00000	3	3	a	279.00000	279.00000
13	-6.00000	-2.01380	10.58960	10.58960	32.89230	32.89230	27.16980	5.72250	3	3	146.91667	141.19417
-0.04860	-0.04860	0.00000	90.23037	45.17131	27.16980	27.16980	5.72250	3	3	160.33333	148.88833	
14	-6.58333	-1.55009	24.91667	19.19417	32.89230	32.89230	27.16980	5.72250	3	3	173.75000	156.58250
43.65154	37.92904	5.72250	56.73703	54.27903	33.36807	33.36807	21.92307	11.44500	3	3	187.16666	164.27666
15	-7.16667	-1.26894	38.33333	26.88833	33.36807	33.36807	21.92307	11.44500	3	3	200.58334	171.97084
65.91841	54.47342	11.44500	26.90484	41.64707	34.47580	34.47580	22.89000	39.24000	3	3	214.00000	179.66500
16	-7.75000	-1.07931	51.75000	34.58250	44.73483	44.73483	27.56733	17.16750	3	3	225.50000	186.26000
72.83841	55.67091	17.16750	8.14879	23.95634	57.36580	57.36580	34.47580	22.89000	3	3	237.00000	192.85500
17	-8.33333	-0.92070	65.16666	42.27666	57.36580	57.36580	34.47580	22.89000	3	3	250.00000	206.00000
78.49405	55.60405	22.89000	-1.04423	9.59706	59.01776	59.01776	44.14500	103.16276	3	3	264.00000	220.00000
18	-8.91667	-0.76258	78.58334	49.97084	69.83873	69.83873	41.22623	28.61250	3	3	279.00000	234.00000
84.68342	56.07092	28.61250	-3.04777	-0.89506	91.44234	91.44234	57.10734	34.33500	3	3	293.00000	248.00000
*19	-9.50000	-0.59744	92.00000	57.66500	91.44234	91.44234	57.10734	34.33500	3	3	307.00000	262.00000
81.79664	47.46163	34.33500	-0.00000	0.00000	94.16228	94.16228	54.92228	39.24000	3	3	321.00000	276.00000
20	-10.00000	-0.34819	103.50000	64.26000	94.16228	94.16228	54.92228	39.24000	3	3	335.00000	290.00000
94.16228	54.92228	39.24000	-0.00000	0.00000	103.16276	103.16276	59.01776	44.14500	3	3	349.00000	304.00000
21	-10.50000	0.00000	115.00000	70.85500	103.16276	103.16276	59.01776	44.14500	3	3	363.00000	318.00000
103.16276	59.01776	44.14500	-0.00000	0.00000								

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -9.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-18.07055	0.00000	-3.04777	101.20553	-25.54726	54.27903

Surcharge 1 present in this stage

Results Envelope

Node	Level	Displacements [mm]	Moments [kNm/m]	Shears [kN/m]
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	[m]	Min	Max	Min	Max	Min	Max
1	0.00000	-18.07055	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-16.09193	0.00000	0.00000	0.21603	-1.78021	0.00000
3	-1.22222	-14.11507	0.00000	0.00000	2.17581	-5.93491	0.00000
4	-1.77778	-12.32580	0.00000	0.00000	6.98854	-12.82503	0.00000
5	-2.33333	-10.55893	0.00000	0.00000	16.42584	-21.27765	0.00000
6	-2.66667	-9.52033	0.00000	0.00000	24.94856	-25.54726	0.00000
7	-3.27778	-7.68996	0.00000	0.00000	40.54799	-25.49940	0.00000
8	-3.88889	-6.00124	0.00000	0.00000	56.11449	-25.44333	0.00000
9	-4.50000	-4.50855	0.00000	0.00000	71.64540	-25.39215	0.00000
10	-4.91667	-3.63102	0.00000	0.00000	82.21626	-25.35077	0.00000
11	-5.33333	-2.88703	0.00000	0.00000	92.77105	-25.31747	0.00000
12	-5.66667	-2.39950	0.00000	0.00000	101.20553	0.00000	3.81100
13	-6.00000	-2.01380	0.00000	0.00000	90.23037	0.00000	45.17131
14	-6.58333	-1.55009	0.00000	0.00000	56.73703	0.00000	54.27903
15	-7.16667	-1.26894	0.00000	0.00000	26.90484	0.00000	41.64707
16	-7.75000	-1.07931	0.00000	0.00000	8.14879	0.00000	23.95634
17	-8.33333	-0.92070	0.00000	-1.04423	0.00000	0.00000	9.59706
18	-8.91667	-0.76258	0.00000	-3.04777	0.00000	-0.89506	0.00000
19	-9.50000	-0.59744	0.00000	-0.00000	0.00000	0.00000	0.00000
20	-10.00000	-0.34819	0.00000	-0.00000	0.00000	0.00000	0.00000
21	-10.50000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 6.50m Length

Job No.	Sheet No.	Rev.
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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil	Boundary		EI below node [kNm ² /m]	
		Left	Right	Left	Right	
1	0.00000	1	1	50.00000	50.00000	134820
2	-0.61111	1	1	50.00000	50.00000	134820
3	-1.22222	1	1	50.00000	50.00000	134820
4	-1.77778	2	2	50.00000	50.00000	134820
5	-2.33333	2	2	50.00000	50.00000	134820
6	-2.66667	3	3	50.00000	50.00000	134820
7	-3.27778	3	3	50.00000	50.00000	134820
8	-3.88889	3	3	50.00000	50.00000	134820
9	-4.50000	3	3	50.00000	50.00000	134820
10	-4.91667	3	3	50.00000	50.00000	134820
11	-5.33333	3	3	50.00000	50.00000	134820
12	-5.66667	3	3	50.00000	50.00000	134820
13	-6.00000	3	3	50.00000	50.00000	134820



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 6.50m Length

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Node	Level	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
* 14	-6.50000	3	3	50.00000	50.00000	0.0
15	-7.00000	3	3	50.00000	50.00000	0.0
16	-7.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -6.50

Water data on LEFT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node	Stress					Pore		Soil		Stress	
	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Left	Right	Vt	Ve
Pt	Pe	Pressure	BM	SF	[kN/m ²]						
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				



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Stress							Pore		Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF								
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3 3	125.83333	125.83333		
62.91666	62.91666	0.00000	0.00000	0.00000								
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3 3	132.76425	132.76425		
66.38213	66.38213	0.00000	0.00000	0.00000								
14	-6.50000	0.00000	145.00000	145.00000	74.95250	74.95250	4.90500	3 3	145.00000	140.09500		
74.95250	70.04750	4.90500	0.00000	0.00000								
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3 3	156.50000	146.69000		
83.15500	73.34500	9.81000	0.00000	0.00000								
16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3 3	168.00000	153.28500		
91.35750	76.64250	14.71500	0.00000	0.00000								

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	134820
2	-0.61111	1	1	50.00000	50.00000	134820
3	-1.22222	1	1	50.00000	50.00000	134820
4	-1.77778	2	2	50.00000	50.00000	134820
5	-2.33333	2	2	50.00000	50.00000	134820
6	-2.66667	3	3	50.00000	50.00000	134820
7	-3.27778	3	3	50.00000	50.00000	134820
8	-3.88889	3	3	50.00000	50.00000	134820
9	-4.50000	3	3	50.00000	50.00000	134820
10	-4.91667	3	3	50.00000	50.00000	134820
11	-5.33333	3	3	50.00000	50.00000	134820
12	-5.66667	3	3	50.00000	50.00000	134820
13	-6.00000	3	3	50.00000	50.00000	134820
* 14	-6.50000	3	3	50.00000	50.00000	0.0
15	-7.00000	3	3	50.00000	50.00000	0.0
16	-7.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -6.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 10200. E at bottom node = 232770. kN/m²

On the RIGHT: E at ground level = 10200. E at bottom node = 232770. kN/m²

Iter no.	Inc max	Node no.	Disp error	Node no.	Press error	Node no.
displ						
		[mm]	[mm]	[kN/m ²]		
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00

Stress							Pore		Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF								
	[m]	[mm]	[kN/m ²]	Left Right	[kN/m ²]	[kN/m ²]						
[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m]								



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Stress							Pore			Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve			
Pt	Pe	Pressure	BM	SF									
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111		
1.57972	1.57972	0.00000	0.00000	0.00000									
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444		
6.31889	6.31889	0.00000	0.00000	0.00000									
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889		
12.63778	12.63778	0.00000	0.00000	0.00000									
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556		
19.27778	19.27778	0.00000	0.00000	0.00000									
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667		
24.83333	24.83333	0.00000	0.00000	0.00000									
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334		
28.41667	28.41667	0.00000	0.00000	0.00000									
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889		
35.44444	35.44444	0.00000	0.00000	0.00000									
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444		
42.47222	42.47222	0.00000	0.00000	0.00000									
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000		
49.50000	49.50000	0.00000	0.00000	0.00000									
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333		
54.29166	54.29166	0.00000	0.00000	0.00000									
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667		
59.08334	59.08334	0.00000	0.00000	0.00000									
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333		
62.91666	62.91666	0.00000	0.00000	0.00000									
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425		
66.38213	66.38213	0.00000	0.00000	0.00000									
*14	-6.50000	0.00000	145.00000	140.09500	74.95250	70.04750	4.90500	3	3	145.00000	140.09500		
74.95250	70.04750	4.90500	0.00000	0.00000									
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000		
83.15500	73.34500	9.81000	0.00000	0.00000									
16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500		
91.35750	76.64250	14.71500	0.00000	0.00000									

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -6.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Surcharge 1 present in this stage

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	134820
2	-0.61111	0	1	50.00000	50.00000	134820
3	-1.22222	0	1	50.00000	50.00000	134820
4	-1.77778	0	2	50.00000	50.00000	134820
5	-2.33333	0	2	50.00000	50.00000	134820
6	-2.66667	0	3	50.00000	50.00000	134820
7	-3.27778	0	3	50.00000	50.00000	134820
8	-3.88889	0	3	50.00000	50.00000	134820
9	-4.50000	0	3	50.00000	50.00000	134820
10	-4.91667	0	3	50.00000	50.00000	134820
11	-5.33333	0	3	50.00000	50.00000	134820
12	-5.66667	3	3	50.00000	50.00000	134820
13	-6.00000	3	3	50.00000	50.00000	134820
* 14	-6.50000	3	3	50.00000	50.00000	0.0
15	-7.00000	3	3	50.00000	50.00000	0.0
16	-7.50000	3	3	50.00000	50.00000	0.0



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Node	Level	Soil	Boundary	EI below node
	[m]	Left Right	Left Right	[kNm ² /m]

* Wall toe level: -6.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²
On the RIGHT: E at ground level = 10200. E at bottom node = 232770. kN/m²

Iter no.	Inc max displ	Node no.	Disp error.	Node no.	Press error	Node no.
	[mm]		[mm]		[kN/m ²]	
1	0.0	1	2.6154	1	10.28	12
2	2.6	1	0.5428	1	13.17	7
3	3.2	1	0.5018	1	77.89	12
4	3.7	1	0.4679	1	12.39	6
5	4.1	1	0.4427	1	13.35	6
10	6.2	1	0.3569	1	11.30	6
15	7.8	1	0.3033	1	9.93	8
20	9.3	1	0.2688	1	8.97	8
30	11.7	1	0.2257	1	7.64	8
40	13.8	1	0.1933	1	6.53	8
50	15.7	1	0.1685	1	5.97	10
60	17.3	1	0.1501	1	5.33	10
70	18.7	1	0.1337	1	4.74	10
80	20.0	1	0.1190	1	4.22	10
90	21.1	1	0.1060	1	3.76	10
100	22.1	1	0.0943	1	3.35	10
120	23.8	1	0.0748	1	2.65	10
140	25.1	1	0.0593	1	2.10	10
150	25.7	1	0.0528	1	1.87	10
160	26.2	1	0.0470	1	1.67	10
180	27.0	1	0.0373	1	1.32	10
200	27.7	1	0.0295	1	1.05	10
250	28.8	1	0.0165	1	0.59	10
300	29.5	1	0.0092	1	0.33	10
350	29.8	1	0.0052	1	0.18	10
400	30.0	1	0.0029	1	0.10	10
403	30.0	1	0.0028	1	0.10	10

Ground level left = -5.50 Ground level right = 0.00

Pore Node	Level	Disp	Stress			Pore			Soil		Stress			
			Vt	Ve	Pt	Pe	Pressure	Left	Right	Vt	Ve			
Pt	Pe Pressure	Displ	BM	SF										
[kN/m ²]	[kN/m ²]	[mm]	[kN/m ²]		[kN/m ²]	[kN/m ²]								
1	0.00000	-30.01831	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.16245	1.16245	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-26.81714	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
4.67634	4.67634	0.00000	0.21706	-1.78408	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	38.55556	38.55556
3	-1.22222	-23.61738	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667
9.36051	9.36051	0.00000	2.18054	-5.94311	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	56.83334	56.83334
4	-1.77778	-20.71477	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
14.99153	14.99153	0.00000	6.99901	-12.83757	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
5	-2.33333	-17.82994	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
19.31325	19.31325	0.00000	16.44450	-21.29372	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
6	-2.66667	-16.11612	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
-0.08033	-0.08033	0.00000	24.97302	-25.56658	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
7	-3.27778	-13.03264	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
-0.08479	-0.08479	0.00000	40.58545	-25.52171	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
8	-3.88889	-10.06156	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
-0.09514	-0.09514	0.00000	56.16621	-25.46673	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
9	-4.50000	-7.24605	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
-0.08855	-0.08855	0.00000	71.71145	-25.41491	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
10	-4.91667	-5.43766	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		



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Stress						Pore				Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve			
Pt	Pe	Pressure	BM	SF									
-0.09790	-0.09790	0.00000	82.29151	-25.37176									
11	-5.33333	-3.73522	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667	
-0.07907	-0.07907	0.00000	92.85459	-25.33654									
12	-5.66667	-2.45872	3.83333	3.83333	377.47914	377.47914	0.00000	3	3	a	125.83333	125.83333	
-0.06831	-0.06831	0.00000	101.29515	37.60285									
13	-6.00000	-1.25993	10.76425	10.76425	84.06431	84.06431	0.00000	3	3	a	132.76425	132.76425	
-0.04268	-0.04268	0.00000	67.78599	118.04970									
*14	-6.50000	0.44755	23.00000	18.09500	4.86426	-0.04074	4.90500	a	3	3	145.00000	140.09500	
276.00824	271.10324	4.90500	0.00000	-0.00000									
15	-7.00000	-0.23137	34.50000	24.69000	9.80027	-0.00973	9.81000	a	3	3	a	156.50000	146.69000
9.80027	-0.00973	9.81000	0.00000	-0.00000									
16	-7.50000	0.00000	46.00000	31.28500	53.55256	38.83756	14.71500		3	3	168.00000	153.28500	
53.55256	38.83756	14.71500	0.00000	-0.00000									

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -6.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-30.01831	0.44755	0.00000	101.29515	-25.56658	118.04970

Surcharge 1 present in this stage

Results Envelope

Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-30.01831	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-26.81714	0.00000	0.00000	0.21706	-1.78407	0.00000
3	-1.22222	-23.61738	0.00000	0.00000	2.18054	-5.94310	0.00000
4	-1.77778	-20.71477	0.00000	0.00000	6.99901	-12.83757	0.00000
5	-2.33333	-17.82994	0.00000	0.00000	16.44450	-21.29371	0.00000
6	-2.66667	-16.11612	0.00000	0.00000	24.97302	-25.56658	0.00000
7	-3.27778	-13.03264	0.00000	0.00000	40.58545	-25.52171	0.00000
8	-3.88889	-10.06156	0.00000	0.00000	56.16621	-25.46673	0.00000
9	-4.50000	-7.24605	0.00000	0.00000	71.71145	-25.41491	0.00000
10	-4.91667	-5.43766	0.00000	0.00000	82.29151	-25.37176	0.00000
11	-5.33333	-3.73522	0.00000	0.00000	92.85459	-25.33654	0.00000
12	-5.66667	-2.45872	0.00000	0.00000	101.29515	0.00000	37.60285
13	-6.00000	-1.25993	0.00000	0.00000	67.78599	0.00000	118.04970
14	-6.50000	0.00000	0.44755	0.00000	0.00000	-0.00000	0.00000
15	-7.00000	-0.23137	0.00000	0.00000	0.00000	-0.00000	0.00000
16	-7.50000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000



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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil	Boundary		EI below node [kNm ² /m]	
		Left	Right	Left	Right	
1	0.00000	1	1	50.00000	50.00000	81270
2	-0.61111	1	1	50.00000	50.00000	81270
3	-1.22222	1	1	50.00000	50.00000	81270
4	-1.77778	2	2	50.00000	50.00000	81270
5	-2.33333	2	2	50.00000	50.00000	81270
6	-2.66667	3	3	50.00000	50.00000	81270
7	-3.27778	3	3	50.00000	50.00000	81270
8	-3.88889	3	3	50.00000	50.00000	81270
9	-4.50000	3	3	50.00000	50.00000	81270
10	-4.91667	3	3	50.00000	50.00000	81270
11	-5.33333	3	3	50.00000	50.00000	81270
12	-5.66667	3	3	50.00000	50.00000	81270
13	-6.00000	3	3	50.00000	50.00000	81270



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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
14	-6.50000	3	3	50.00000	50.00000	81270
15	-7.00000	3	3	50.00000	50.00000	81270
* 16	-7.50000	3	3	50.00000	50.00000	0.0
17	-8.00000	3	3	50.00000	50.00000	0.0
18	-8.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -7.50

Water data on LEFT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress			Pore			Soil		Stress	
			Vt BM	Ve SF	Pt	Pe Pressure	Pressure	Left	Right	Vt	Ve	
			[kN/m ²]	Left	Right	[kN/m ²]	[kN/m ²]					
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000		1	1	3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000								
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000		1	1	13.44444	13.44444
6.31889	6.31889	0.00000	0.00000	0.00000								
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000		1	1	26.88889	26.88889
12.63778	12.63778	0.00000	0.00000	0.00000								
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000		2	2	38.55556	38.55556
19.27778	19.27778	0.00000	0.00000	0.00000								
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000		2	2	49.66667	49.66667
24.83333	24.83333	0.00000	0.00000	0.00000								
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000		3	3	56.83334	56.83334
28.41667	28.41667	0.00000	0.00000	0.00000								
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000		3	3	70.88889	70.88889
35.44444	35.44444	0.00000	0.00000	0.00000								
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000		3	3	84.94444	84.94444
42.47222	42.47222	0.00000	0.00000	0.00000								
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000		3	3	99.00000	99.00000
49.50000	49.50000	0.00000	0.00000	0.00000								
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000		3	3	108.58333	108.58333
54.29166	54.29166	0.00000	0.00000	0.00000								



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 7.50m Length

Job No.	Sheet No.	Rev.
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Stress					Pore					Stress				
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve			
Pt	Pe	Pressure	BM	SF										
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667			
59.08334	59.08334	0.00000	0.00000	0.00000										
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333			
62.91666	62.91666	0.00000	0.00000	0.00000										
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425			
66.38213	66.38213	0.00000	0.00000	0.00000										
14	-6.50000	0.00000	145.00000	140.09500	74.95250	70.04750	4.90500	3	3	145.00000	140.09500			
74.95250	70.04750	4.90500	0.00000	0.00000										
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000			
83.15500	73.34500	9.81000	0.00000	0.00000										
16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500			
91.35750	76.64250	14.71500	0.00000	0.00000										
17	-8.00000	0.00000	179.50000	159.88000	99.56000	79.94000	19.62000	3	3	179.50000	159.88000			
99.56000	79.94000	19.62000	0.00000	0.00000										
18	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500			
107.76250	83.23750	24.52500	0.00000	0.00000										

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil	Boundary		EI below node	
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	81270
2	-0.61111	1	1	50.00000	50.00000	81270
3	-1.22222	1	1	50.00000	50.00000	81270
4	-1.77778	2	2	50.00000	50.00000	81270
5	-2.33333	2	2	50.00000	50.00000	81270
6	-2.66667	3	3	50.00000	50.00000	81270
7	-3.27778	3	3	50.00000	50.00000	81270
8	-3.88889	3	3	50.00000	50.00000	81270
9	-4.50000	3	3	50.00000	50.00000	81270
10	-4.91667	3	3	50.00000	50.00000	81270
11	-5.33333	3	3	50.00000	50.00000	81270
12	-5.66667	3	3	50.00000	50.00000	81270
13	-6.00000	3	3	50.00000	50.00000	81270
14	-6.50000	3	3	50.00000	50.00000	81270
15	-7.00000	3	3	50.00000	50.00000	81270
* 16	-7.50000	3	3	50.00000	50.00000	0.0
17	-8.00000	3	3	50.00000	50.00000	0.0
18	-8.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -7.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 10200. E at bottom node = 238410. kN/m²
On the RIGHT: E at ground level = 10200. E at bottom node = 238410. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error	Node no.
displ		[mm]		[kN/m ²]		
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 7.50m Length

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Iter no.	Inc max	Node no.	Disp error	Node no.	Press error	Node no.	Stress		Pore		Stress	
displ			[mm]			[kN/m ²]			Pore		Soil	
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF			Pressure	Left	Right			
[kN/m ²]	[m]	[kN/m ²]	[kNm/m]	[kN/m]	[kN/m ²]							
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111	
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444	
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889	
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556	
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667	
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334	
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889	
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444	
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000	
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333	
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667	
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333	
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425	
66.38213	66.38213	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
14	-6.50000	0.00000	145.00000	140.09500	74.95250	70.04750	4.90500	3	3	145.00000	140.09500	
74.95250	70.04750	4.90500	0.00000	0.00000	0.00000	0.00000	0.00000					
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000	
83.15500	73.34500	9.81000	0.00000	0.00000	0.00000	0.00000	0.00000					
*16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500	
91.35750	76.64250	14.71500	0.00000	0.00000	0.00000	0.00000	0.00000					
17	-8.00000	0.00000	179.50000	159.88000	99.56000	79.94000	19.62000	3	3	179.50000	159.88000	
99.56000	79.94000	19.62000	0.00000	0.00000	0.00000	0.00000	0.00000					
18	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500	
107.76250	83.23750	24.52500	0.00000	0.00000	0.00000	0.00000	0.00000					

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -7.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Surcharge 1 present in this stage

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	134820
2	-0.61111	0	1	50.00000	50.00000	134820
3	-1.22222	0	1	50.00000	50.00000	134820
4	-1.77778	0	2	50.00000	50.00000	134820
5	-2.33333	0	2	50.00000	50.00000	134820



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305 x 305 x 240mm Bar 7.50m Length

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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
6	-2.66667	0	3	50.00000	50.00000	134820
7	-3.27778	0	3	50.00000	50.00000	134820
8	-3.88889	0	3	50.00000	50.00000	134820
9	-4.50000	0	3	50.00000	50.00000	134820
10	-4.91667	0	3	50.00000	50.00000	134820
11	-5.33333	0	3	50.00000	50.00000	134820
12	-5.66667	3	3	50.00000	50.00000	134820
13	-6.00000	3	3	50.00000	50.00000	134820
14	-6.50000	3	3	50.00000	50.00000	134820
15	-7.00000	3	3	50.00000	50.00000	134820
* 16	-7.50000	3	3	50.00000	50.00000	0.0
17	-8.00000	3	3	50.00000	50.00000	0.0
18	-8.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -7.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²

On the RIGHT: E at ground level = 10200. E at bottom node = 238410. kN/m²

Iter no. Inc max no. Node error. Disp no. Node error. Press no. Node error.

Iter no.	Inc max	Node error.	Disp no.	Node error.	Press no.	Node error.
displ		[mm]		[kN/m ²]		
1	0.0	1	2.7518	1	10.28	12
2	2.8	1	0.5235	1	13.01	7
3	3.3	1	0.4865	1	80.57	12
4	3.8	1	0.4527	1	11.72	6
5	4.2	1	0.4277	1	12.70	6
10	6.2	1	0.3355	1	10.62	6
15	7.7	1	0.2718	1	8.40	8
20	9.0	1	0.2244	1	7.08	8
30	10.9	1	0.1580	1	5.06	8
40	12.3	1	0.1150	1	3.68	8
50	13.3	1	0.0832	1	2.67	8
60	14.0	1	0.0629	1	2.13	10
70	14.5	1	0.0479	1	1.62	10
80	15.0	1	0.0369	1	1.24	10
90	15.3	1	0.0285	1	0.96	10
100	15.6	1	0.0220	1	0.74	10
120	15.9	1	0.0131	1	0.44	10
140	16.1	1	0.0078	1	0.26	10
150	16.2	1	0.0060	1	0.20	10
160	16.2	1	0.0046	1	0.16	10
178	16.3	1	0.0029	1	0.10	10

Ground level left = -5.50 Ground level right = 0.00

Pore Node	Stress					Pore			Stress			
	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe Pressure	BM	SF					Left	Right			
[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m ²]	[kN/m ²]	[kN/m ²]	[kN/m ²]			[kN/m ²]	[kN/m ²]	
1	0.00000	-16.30262	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.16170	1.16170	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-14.52772	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
4.67539	4.67539	0.00000	0.21692	-1.78355				0	1	a	38.55556	38.55556
3	-1.22222	-12.75422	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667
9.35924	9.35924	0.00000	2.17990	-5.94192				0	3	a	56.83334	56.83334
4	-1.77778	-11.14821	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	24.96911	-25.56319
14.98986	14.98986	0.00000	6.99751	-12.83555				0	3	a		
5	-2.33333	-9.55999	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
19.31191	19.31191	0.00000	16.44162	-21.29093				0	3	a		
6	-2.66667	-8.62412	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
-0.08165	-0.08165	0.00000	24.96911	-25.56319				0	3	a		



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Stress						Pore				Stress		
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF								
7	-3.27778	-6.96689	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
-0.08424	-0.08424	0.00000	40.57927	-25.51817								
8	-3.88889	-5.42204	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
-0.09296	-0.09296	0.00000	56.15798	-25.46403								
9	-4.50000	-4.03274	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
-0.08588	-0.08588	0.00000	71.70198	-25.41356								
10	-4.91667	-3.19674	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.09579	-0.09579	0.00000	82.28176	-25.37153								
11	-5.33333	-2.46670	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667
-0.07863	-0.07863	0.00000	92.84492	-25.33683								
12	-5.66667	-1.96809	3.83333	3.83333	179.61720	179.61720	0.00000	3	3	a	125.83333	125.83333
-0.07179	-0.07179	0.00000	101.28561	4.62607								
13	-6.00000	-1.55021	10.76425	10.76425	66.71525	66.71525	0.00000	3	3	a	132.76425	132.76425
-0.05445	-0.05445	0.00000	89.76087	48.48458								
14	-6.50000	-1.05483	23.00000	18.09500	37.89371	32.98871	4.90500	3	3		145.00000	140.09500
25.43899	20.53399	4.90500	58.56339	65.50862								
15	-7.00000	-0.66709	34.50000	24.69000	25.83411	16.02410	9.81000	3	3		156.50000	146.69000
66.06973	56.25973	9.81000	24.25224	58.56340								
*16	-7.50000	-0.32743	46.00000	31.28500	14.68386	-0.03114	14.71500	a	3	3	168.00000	153.28500
111.69284	96.97784	14.71500	0.00000	-0.00000								
17	-8.00000	-0.27864	57.50000	37.88000	57.58810	37.96810	19.62000	3	3		179.50000	159.88000
57.58810	37.96810	19.62000	0.00000	-0.00000								
18	-8.50000	0.00000	69.00000	44.47500	70.10224	45.57724	24.52500	3	3		191.00000	166.47500
70.10224	45.57724	24.52500	0.00000	-0.00000								

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -7.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-16.30262	0.00000	0.00000	101.28561	-25.56319	65.50862

Surcharge 1 present in this stage

Results Envelope

Node	Level	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-16.30262	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-14.52772	0.00000	0.00000	0.21692	-1.78355	0.00000
3	-1.22222	-12.75422	0.00000	0.00000	2.17990	-5.94192	0.00000
4	-1.77778	-11.14821	0.00000	0.00000	6.99751	-12.83555	0.00000
5	-2.33333	-9.55999	0.00000	0.00000	16.44162	-21.29093	0.00000
6	-2.66667	-8.62412	0.00000	0.00000	24.96911	-25.56319	0.00000
7	-3.27778	-6.96689	0.00000	0.00000	40.57927	-25.51817	0.00000
8	-3.88889	-5.42204	0.00000	0.00000	56.15798	-25.46403	0.00000
9	-4.50000	-4.03274	0.00000	0.00000	71.70198	-25.41355	0.00000
10	-4.91667	-3.19674	0.00000	0.00000	82.28176	-25.37153	0.00000
11	-5.33333	-2.46670	0.00000	0.00000	92.84492	-25.33683	0.00000
12	-5.66667	-1.96809	0.00000	0.00000	101.28561	0.00000	4.62607
13	-6.00000	-1.55021	0.00000	0.00000	89.76087	0.00000	48.48458
14	-6.50000	-1.05483	0.00000	0.00000	58.56339	0.00000	65.50862
15	-7.00000	-0.66709	0.00000	0.00000	24.25224	0.00000	58.56339
16	-7.50000	-0.32743	0.00000	0.00000	0.00000	-0.00000	0.00000
17	-8.00000	-0.27864	0.00000	0.00000	0.00000	-0.00000	0.00000
18	-8.50000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000



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305 x 305 x 240mm Bar 8.50m Length

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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil	Boundary		EI below node [kNm ² /m]	
		Left	Right	Left	Right	
1	0.00000	1	1	50.00000	50.00000	81270
2	-0.61111	1	1	50.00000	50.00000	81270
3	-1.22222	1	1	50.00000	50.00000	81270
4	-1.77778	2	2	50.00000	50.00000	81270
5	-2.33333	2	2	50.00000	50.00000	81270
6	-2.66667	3	3	50.00000	50.00000	81270
7	-3.27778	3	3	50.00000	50.00000	81270
8	-3.88889	3	3	50.00000	50.00000	81270
9	-4.50000	3	3	50.00000	50.00000	81270
10	-4.91667	3	3	50.00000	50.00000	81270
11	-5.33333	3	3	50.00000	50.00000	81270
12	-5.66667	3	3	50.00000	50.00000	81270
13	-6.00000	3	3	50.00000	50.00000	81270



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Node	Level	Soil		Boundary		EI below node
		Left	Right	Left	Right	
	[m]					[kNm ² /m]
14	-6.62500	3	3	50.00000	50.00000	81270
15	-7.25000	3	3	50.00000	50.00000	81270
16	-7.87500	3	3	50.00000	50.00000	81270
* 17	-8.50000	3	3	50.00000	50.00000	0.0
18	-9.00000	3	3	50.00000	50.00000	0.0
19	-9.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -8.50

Water data on LEFT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node	Level	Disp	Stress			Pore			Soil		Stress	
			Pt	Pe	Pressure	Pt	Pe	Pressure	Left	Right	Vt	Ve
	[m]	[mm]	[kN/m ²]			[kN/m ²]	[kN/m ²]					
	[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m]							
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000		1		3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000		1	1	13.44444	13.44444
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000		1	1	26.88889	26.88889
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000		2	2	38.55556	38.55556
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000		2	2	49.66667	49.66667
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000		3	3	56.83334	56.83334
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000		3	3	70.88889	70.88889
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000		3	3	84.94444	84.94444
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000		3	3	99.00000	99.00000
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000		3	3	108.58333	108.58333



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Stress						Pore				Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve		
Pt	Pe	Pressure	BM	SF									
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000							
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667		
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000								
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333		
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000								
13	-6.00000	0.00000	132.50034	132.50034	66.25017	66.25017	0.00000	3	3	132.50034	132.50034		
66.25017	66.25017	0.00000	0.00000	0.00000	0.00000								
14	-6.62500	0.00000	147.87500	147.87500	77.00313	77.00313	6.13125	3	3	147.87500	141.74375		
77.00313	70.87187	6.13125	0.00000	0.00000									
15	-7.25000	0.00000	162.25000	149.98750	87.25625	74.99375	12.26250	3	3	162.25000	149.98750		
87.25625	74.99375	12.26250	0.00000	0.00000									
16	-7.87500	0.00000	176.62500	158.23125	97.50938	79.11562	18.39375	3	3	176.62500	158.23125		
97.50938	79.11562	18.39375	0.00000	0.00000									
17	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500		
107.76250	83.23750	24.52500	0.00000	0.00000									
18	-9.00000	0.00000	202.50000	173.07000	115.96500	86.53500	29.43000	3	3	202.50000	173.07000		
115.96500	86.53500	29.43000	0.00000	0.00000									
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500		
124.16750	89.83250	34.33500	0.00000	0.00000									

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil	Boundary		EI below node	
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	81270
2	-0.61111	1	1	50.00000	50.00000	81270
3	-1.22222	1	1	50.00000	50.00000	81270
4	-1.77778	2	2	50.00000	50.00000	81270
5	-2.33333	2	2	50.00000	50.00000	81270
6	-2.66667	3	3	50.00000	50.00000	81270
7	-3.27778	3	3	50.00000	50.00000	81270
8	-3.88889	3	3	50.00000	50.00000	81270
9	-4.50000	3	3	50.00000	50.00000	81270
10	-4.91667	3	3	50.00000	50.00000	81270
11	-5.33333	3	3	50.00000	50.00000	81270
12	-5.66667	3	3	50.00000	50.00000	81270
13	-6.00000	3	3	50.00000	50.00000	81270
14	-6.62500	3	3	50.00000	50.00000	81270
15	-7.25000	3	3	50.00000	50.00000	81270
16	-7.87500	3	3	50.00000	50.00000	81270
* 17	-8.50000	3	3	50.00000	50.00000	0.0
18	-9.00000	3	3	50.00000	50.00000	0.0
19	-9.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -8.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 14535. E at bottom node = 240710. kN/m²
On the RIGHT: E at ground level = 14535. E at bottom node = 240710. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error.	Node no.
displ		[mm]		[kN/m ²]		
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1



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Iter Inc Node Disp Node Press Node
no. max no. error. no. error no.
displ
[mm] [mm] [kN/m²]

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Stress					Pore			Soil		Stress	
	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Left	Right	Vt	Ve	
[kN/m ²]	[m]	[mm]	[kN/m ²]			[kN/m ²]	[kN/m ²]					
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111	
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444	
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889	
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556	
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667	
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334	
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889	
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444	
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000	
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333	
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667	
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333	
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
13	-6.00000	0.00000	132.50034	132.50034	66.25017	66.25017	0.00000	3	3	132.50034	132.50034	
66.25017	66.25017	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
14	-6.62500	0.00000	147.87500	141.74375	77.00313	70.87187	6.13125	3	3	147.87500	141.74375	
77.00313	70.87187	6.13125	0.00000	0.00000	0.00000	0.00000	0.00000					
15	-7.25000	0.00000	162.25000	149.98750	87.25625	74.99375	12.26250	3	3	162.25000	149.98750	
87.25625	74.99375	12.26250	0.00000	0.00000	0.00000	0.00000	0.00000					
16	-7.87500	0.00000	176.62500	158.23125	97.50938	79.11562	18.39375	3	3	176.62500	158.23125	
97.50938	79.11562	18.39375	0.00000	0.00000	0.00000	0.00000	0.00000					
*17	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500	
107.76250	83.23750	24.52500	0.00000	0.00000	0.00000	0.00000	0.00000					
18	-9.00000	0.00000	202.50000	173.07000	115.96500	86.53500	29.43000	3	3	202.50000	173.07000	
115.96500	86.53500	29.43000	0.00000	0.00000	0.00000	0.00000	0.00000					
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500	
124.16750	89.83250	34.33500	0.00000	0.00000	0.00000	0.00000	0.00000					

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -8.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Surcharge 1 present in this stage

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil	Boundary	EI below node
------	-------	------	----------	---------------



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[m]	Left	Right	Left	Right	[kNm2/m]
1	0.00000	0	1 50.00000	50.00000	134820
2	-0.61111	0	1 50.00000	50.00000	134820
3	-1.22222	0	1 50.00000	50.00000	134820
4	-1.77778	0	2 50.00000	50.00000	134820
5	-2.33333	0	2 50.00000	50.00000	134820
6	-2.66667	0	3 50.00000	50.00000	134820
7	-3.27778	0	3 50.00000	50.00000	134820
8	-3.88889	0	3 50.00000	50.00000	134820
9	-4.50000	0	3 50.00000	50.00000	134820
10	-4.91667	0	3 50.00000	50.00000	134820
11	-5.33333	0	3 50.00000	50.00000	134820
12	-5.66667	3	3 50.00000	50.00000	134820
13	-6.00000	3	3 50.00000	50.00000	134820
14	-6.62500	3	3 50.00000	50.00000	134820
15	-7.25000	3	3 50.00000	50.00000	134820
16	-7.87500	3	3 50.00000	50.00000	134820
* 17	-8.50000	3	3 50.00000	50.00000	0.0
18	-9.00000	3	3 50.00000	50.00000	0.0
19	-9.50000	3	3 50.00000	50.00000	0.0

* Wall toe level: -8.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²

On the RIGHT: E at ground level = 14535. E at bottom node = 240710. kN/m²

Iter no. Inc max no. Node error. Disp no. Node error. Press no. Node error.

Iter no.	Inc max no.	Node error.	Disp no.	Node error.	Press no.	Node error.
displ		[mm]	[mm]	[kN/m ²]		
1	0.0	1 2.8994	1	10.28	12	
2	2.9	1 0.4916	1	12.70	7	
3	3.4	1 0.4658	1	81.98	12	
4	3.9	1 0.4367	1	10.75	6	
5	4.3	1 0.4158	1	11.81	6	
10	6.2	1 0.3307	1	10.38	6	
15	7.7	1 0.2683	1	8.00	8	
20	9.0	1 0.2201	1	6.68	8	
30	10.8	1 0.1520	1	4.66	8	
40	12.1	1 0.1084	1	3.32	8	
50	13.1	1 0.0769	1	2.35	8	
60	13.7	1 0.0546	1	1.67	8	
70	14.2	1 0.0388	1	1.22	10	
80	14.5	1 0.0290	1	0.92	10	
90	14.8	1 0.0215	1	0.68	10	
100	15.0	1 0.0160	1	0.51	10	
120	15.2	1 0.0088	1	0.28	10	
140	15.4	1 0.0049	1	0.15	10	
150	15.4	1 0.0036	1	0.11	10	
155	15.4	1 0.0031	1	0.10	10	

Ground level left = -5.50 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress			Pore		Soil		Stress			
			Vt	Ve	Pt	Pe	Pressure	Left	Right	Vt	Ve		
			BM [kN/m ²]	SF [kN/m ²]	[kN/m ²]	[kN/m ²]	[kN/m ²]			[kN/m ²]	[kN/m ²]		
1	0.00000	-15.43173	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.15940	1.15940	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-13.76615	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
3	-1.22222	-12.10198	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
9.35668	9.35668	0.00000	2.17809	-5.93891									



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Stress						Pore			Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF								
4	-1.77778	-10.59535	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	38.55556	38.55556
14.98687	14.98687	0.00000	6.99361	-12.83096								
5	-2.33333	-9.10649	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667
19.30955	19.30955	0.00000	16.43471	-21.28500								
6	-2.66667	-8.23025	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	56.83334	56.83334
-0.08521	-0.08521	0.00000	24.96005	-25.55589								
7	-3.27778	-6.68228	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
-0.08635	-0.08635	0.00000	40.56524	-25.50938								
8	-3.88889	-5.24667	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
-0.09451	-0.09451	0.00000	56.13818	-25.45412								
9	-4.50000	-3.96654	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
-0.08650	-0.08650	0.00000	71.67584	-25.40302								
10	-4.91667	-3.20495	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.09555	-0.09555	0.00000	82.25116	-25.36089								
11	-5.33333	-2.54926	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667
-0.07831	-0.07831	0.00000	92.80991	-25.32630								
12	-5.66667	-2.11011	3.83333	3.83333	162.36433	162.36433	0.00000	3	3	a	125.83333	125.83333
-0.07154	-0.07154	0.00000	101.24711	1.76103								
13	-6.00000	-1.75192	10.50034	10.50034	55.77962	55.77962	0.00000	3	3	a	132.50034	132.50034
-0.05259	-0.05259	0.00000	91.63588	42.21013								
14	-6.62500	-1.26957	25.87500	19.74375	35.20137	29.07012	6.13125	3	3		147.87500	141.74375
44.75709	38.62584	6.13125	56.89425	52.60044								
15	-7.25000	-0.95386	40.25000	27.98750	35.18868	22.92618	12.26250	3	3		162.25000	149.98750
66.71627	54.45377	12.26250	25.88533	39.76191								
16	-7.87500	-0.71911	54.62500	36.23125	45.84628	27.45253	18.39375	3	3		176.62500	158.23125
75.29034	56.89659	18.39375	7.19187	20.70827								
*17	-8.50000	-0.51074	69.00000	44.47500	60.48907	35.96407	24.52500	3	3		191.00000	166.47500
80.94596	56.42096	24.52500	-0.00000	0.00000								
18	-9.00000	-0.32056	80.50000	51.07000	77.42718	47.99718	29.43000	3	3		202.50000	173.07000
77.42718	47.99718	29.43000	-0.00000	0.00000								
19	-9.50000	0.00000	92.00000	57.66500	86.63956	52.30456	34.33500	3	3		214.00000	179.66500
86.63956	52.30456	34.33500	-0.00000	0.00000								

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -8.50

EXTREME values so far

Displacements [mm]	Moments [kNm/m]	Shears [kN/m]			
Min	Max	Min	Max	Min	Max
-15.43173	0.00000	-0.00000	101.24711	-25.55589	52.60044

Surcharge 1 present in this stage

Results Envelope

Node	Level [m]	Displacements [mm]	Moments [kNm/m]	Shears [kN/m]	
		Min	Max	Min	Max
1	0.00000	-15.43173	0.00000	0.00000	0.00000
2	-0.61111	-13.76615	0.00000	0.00000	0.21649
3	-1.22222	-12.10198	0.00000	0.00000	-5.93891
4	-1.77778	-10.59535	0.00000	0.00000	6.99361
5	-2.33333	-9.10649	0.00000	0.00000	-21.28500
6	-2.66667	-8.23025	0.00000	0.00000	-25.55589
7	-3.27778	-6.68228	0.00000	0.00000	-25.50938
8	-3.88889	-5.24667	0.00000	0.00000	-25.45412
9	-4.50000	-3.96654	0.00000	0.00000	-25.40302
10	-4.91667	-3.20495	0.00000	0.00000	-25.36088
11	-5.33333	-2.54926	0.00000	0.00000	-25.32630
12	-5.66667	-2.11011	0.00000	0.00000	101.24711
13	-6.00000	-1.75192	0.00000	0.00000	0.00000
14	-6.62500	-1.26957	0.00000	0.00000	56.89425
15	-7.25000	-0.95386	0.00000	0.00000	0.00000
16	-7.87500	-0.71911	0.00000	0.00000	7.19187
17	-8.50000	-0.51074	0.00000	-0.00000	0.00000
18	-9.00000	-0.32056	0.00000	-0.00000	0.00000
19	-9.50000	0.00000	0.00000	-0.00000	0.00000



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 9.50m Length

Job No.	Sheet No.	Rev.
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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil Left Right	Boundary Left Right	EI below node [kNm ² /m]
1	0.00000	1 1	50.00000 50.00000	81270
2	-0.61111	1 1	50.00000 50.00000	81270
3	-1.22222	1 1	50.00000 50.00000	81270
4	-1.77778	2 2	50.00000 50.00000	81270
5	-2.33333	2 2	50.00000 50.00000	81270
6	-2.66667	3 3	50.00000 50.00000	81270
7	-3.27778	3 3	50.00000 50.00000	81270
8	-3.88889	3 3	50.00000 50.00000	81270
9	-4.50000	3 3	50.00000 50.00000	81270
10	-4.91667	3 3	50.00000 50.00000	81270
11	-5.33333	3 3	50.00000 50.00000	81270
12	-5.66667	3 3	50.00000 50.00000	81270
13	-6.00000	3 3	50.00000 50.00000	81270



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305 x 305 x 240mm Bar 9.50m Length

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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
14	-6.58333	3	3	50.00000	50.00000	81270
15	-7.16667	3	3	50.00000	50.00000	81270
16	-7.75000	3	3	50.00000	50.00000	81270
17	-8.33333	3	3	50.00000	50.00000	81270
18	-8.91667	3	3	50.00000	50.00000	81270
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

Water data on LEFT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress		Pt [kN/m ²]	Pe [kN/m ²]	Pore Pressure [kN/m ²]	Soil		Vt [kN/m ²]	Ve [kN/m ²]
			Vt BM [kN/m ²]	Ve SF [kN/m ²]				Left	Right		
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 9.50m Length

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Stress					Pore					Stress	
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	
Pt	Pe	Pressure	BM	SF							
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333 108.58333	
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000					
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667 118.16667	
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000					
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333 125.83333	
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000					
13	-6.00000	0.00000	132.58960	132.58960	66.29480	66.29480	0.00000	3	3	132.58960 132.58960	
66.29480	66.29480	0.00000	0.00000	0.00000	0.00000	0.00000					
14	-6.58333	0.00000	146.91667	141.19417	76.31959	70.59708	5.72250	3	3	146.91667 141.19417	
76.31959	70.59708	5.72250	0.00000	0.00000	0.00000	0.00000					
15	-7.16667	0.00000	160.33333	148.88833	85.88916	74.44417	11.44500	3	3	160.33333 148.88833	
85.88916	74.44417	11.44500	0.00000	0.00000	0.00000	0.00000					
16	-7.75000	0.00000	173.75000	156.58250	95.45875	78.29125	17.16750	3	3	173.75000 156.58250	
95.45875	78.29125	17.16750	0.00000	0.00000	0.00000	0.00000					
17	-8.33333	0.00000	187.16666	164.27666	105.02833	82.13833	22.89000	3	3	187.16666 164.27666	
105.02833	82.13833	22.89000	0.00000	0.00000	0.00000	0.00000					
18	-8.91667	0.00000	200.58334	171.97084	114.59792	85.98542	28.61250	3	3	200.58334 171.97084	
114.59792	85.98542	28.61250	0.00000	0.00000	0.00000	0.00000					
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000 179.66500	
124.16750	89.83250	34.33500	0.00000	0.00000	0.00000	0.00000					
20	-10.00000	0.00000	225.50000	186.26000	132.37000	93.13000	39.24000	3	3	225.50000 186.26000	
132.37000	93.13000	39.24000	0.00000	0.00000	0.00000	0.00000					
21	-10.50000	0.00000	237.00000	192.85500	140.57250	96.42750	44.14500	3	3	237.00000 192.85500	
140.57250	96.42750	44.14500	0.00000	0.00000	0.00000	0.00000					

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	81270
2	-0.61111	1	1	50.00000	50.00000	81270
3	-1.22222	1	1	50.00000	50.00000	81270
4	-1.77778	2	2	50.00000	50.00000	81270
5	-2.33333	2	2	50.00000	50.00000	81270
6	-2.66667	3	3	50.00000	50.00000	81270
7	-3.27778	3	3	50.00000	50.00000	81270
8	-3.88889	3	3	50.00000	50.00000	81270
9	-4.50000	3	3	50.00000	50.00000	81270
10	-4.91667	3	3	50.00000	50.00000	81270
11	-5.33333	3	3	50.00000	50.00000	81270
12	-5.66667	3	3	50.00000	50.00000	81270
13	-6.00000	3	3	50.00000	50.00000	81270
14	-6.58333	3	3	50.00000	50.00000	81270
15	-7.16667	3	3	50.00000	50.00000	81270
16	-7.75000	3	3	50.00000	50.00000	81270
17	-8.33333	3	3	50.00000	50.00000	81270
18	-8.91667	3	3	50.00000	50.00000	81270
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 21883. E at bottom node = 240740. kN/m²



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305 x 305 x 240mm Bar 9.50m Length

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Node	Level	Soil	Boundary	EI below node
	[m]	Left Right	Left Right	[kNm ² /m]

On the RIGHT: E at ground level = 21883. E at bottom node = 240740. kN/m²

Iter no.	Inc max displ	Node no.	Disp error.	Node no.	Press error.	Node no.
	[mm]		[mm]		[kN/m ²]	
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress		Pt [kN/m ²]	Pore Pressure		Soil		Stress	
			Vt [kN/m ²]	Ve [kN/m ²]		Pe [kN/m ²]	Pressure [kN/m ²]	Left [kN/m ²]	Right [kN/m ²]	Vt [kN/m ²]	Ve [kN/m ²]
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333
13	-6.00000	0.00000	132.58960	132.58960	66.29480	66.29480	0.00000	3	3	132.58960	132.58960
14	-6.58333	0.00000	146.91667	141.19417	76.31959	70.59708	5.72250	3	3	146.91667	141.19417
15	-7.16667	0.00000	160.33333	148.88833	85.88916	74.44417	11.44500	3	3	160.33333	148.88833
16	-7.75000	0.00000	173.75000	156.58250	95.45875	78.29125	17.16750	3	3	173.75000	156.58250
17	-8.33333	0.00000	187.16666	164.27666	105.02833	82.13833	22.89000	3	3	187.16666	164.27666
18	-8.91667	0.00000	200.58334	171.97084	114.59792	85.98542	28.61250	3	3	200.58334	171.97084
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500
20	-10.00000	0.00000	225.50000	186.26000	132.37000	93.13000	39.24000	3	3	225.50000	186.26000
21	-10.50000	0.00000	237.00000	192.85500	140.57250	96.42750	44.14500	3	3	237.00000	192.85500

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -9.50



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305 x 305 x 240mm Bar 9.50m Length

Job No. Sheet No. Rev.

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Dr. Ref.

Made by Date Checked Date
PW 11-Mar-2024

Stress						Pore						Stress											
Pore	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	Pt	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF																			
EXTREME values so far																							
Displacements [mm]						Moments [kNm/m]						Shears [kN/m]											
Min		Max		Min		Max		Min		Max		Min		Max		Min		Max		Min		Max	
0.00000		0.00000		0.00000		0.00000		0.00000		0.00000		0.00000		0.00000		0.00000		0.00000		0.00000		0.00000	
Surcharge 1 present in this stage																							

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	134820
2	-0.61111	0	1	50.00000	50.00000	134820
3	-1.22222	0	1	50.00000	50.00000	134820
4	-1.77778	0	2	50.00000	50.00000	134820
5	-2.33333	0	2	50.00000	50.00000	134820
6	-2.66667	0	3	50.00000	50.00000	134820
7	-3.27778	0	3	50.00000	50.00000	134820
8	-3.88889	0	3	50.00000	50.00000	134820
9	-4.50000	0	3	50.00000	50.00000	134820
10	-4.91667	0	3	50.00000	50.00000	134820
11	-5.33333	0	3	50.00000	50.00000	134820
12	-5.66667	3	3	50.00000	50.00000	134820
13	-6.00000	3	3	50.00000	50.00000	134820
14	-6.58333	3	3	50.00000	50.00000	134820
15	-7.16667	3	3	50.00000	50.00000	134820
16	-7.75000	3	3	50.00000	50.00000	134820
17	-8.33333	3	3	50.00000	50.00000	134820
18	-8.91667	3	3	50.00000	50.00000	134820
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²

On the RIGHT: E at ground level = 21883. E at bottom node = 240740. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error.	Node no.
displ		[mm]		[kN/m ²]		
1	0.0	1	3.0708	1	10.28	12
2	3.1	1	0.4520	1	11.98	7
3	3.5	1	0.4386	1	83.16	12
4	4.0	1	0.4157	1	9.65	6
5	4.4	1	0.4000	1	10.79	6
10	6.2	1	0.3250	1	10.10	6
15	7.7	1	0.2660	1	7.74	6
20	9.0	1	0.2186	1	6.46	8
30	10.8	1	0.1515	1	4.51	8
40	12.1	1	0.1083	1	3.22	8
50	13.1	1	0.0771	1	2.29	8
60	13.7	1	0.0548	1	1.63	8
70	14.2	1	0.0390	1	1.17	8
80	14.5	1	0.0290	1	0.88	10
90	14.8	1	0.0215	1	0.65	10
100	15.0	1	0.0160	1	0.48	10
120	15.2	1	0.0088	1	0.27	10
140	15.4	1	0.0048	1	0.15	10
150	15.4	1	0.0036	1	0.11	10
153	15.4	1	0.0033	1	0.10	10



Lancaster Lane, Brockholes
305 x 305 x 240mm Bar 9.50m Length

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Iter Inc Node Disp Node Press Node
no. max no. error. no. error no.
displ
[mm] [mm] [kN/m²]
Ground level left = -5.50 Ground level right = 0.00

Stress		Pore		Stress		Pore		Soil		Vt		Ve	
Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve		
Pt	Pe	Pressure	BM	SF	[kN/m ²]	[kN/m ²]	[kN/m ²]	Left	Right	[kN/m ²]	[kN/m ²]		
[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m]	[kN/m ²]	[kN/m ²]	[kN/m ²]						
1	0.00000	-15.41810	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111	
1.15726	1.15726	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444	
2	-0.61111	-13.77888	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889	
4.66969	4.66969	0.00000	0.21609	-1.78046	0.00000	0.00000	0.00000	0	2	a	38.55556	38.55556	
3	-1.22222	-12.14107	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889	
9.35375	9.35375	0.00000	2.17611	-5.93548	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667	
4	-1.77778	-10.65840	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667	
14.98431	14.98431	0.00000	6.98926	-12.82597	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667	
5	-2.33333	-9.19349	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667	
19.30793	19.30793	0.00000	16.42719	-21.27893	0.00000	0.00000	0.00000	0	3	a	56.83334	56.83334	
6	-2.66667	-8.33160	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	56.83334	56.83334	
-0.08764	-0.08764	0.00000	24.95039	-25.54889	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889	
7	-3.27778	-6.80994	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889	
-0.08788	-0.08788	0.00000	40.55095	-25.50134	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444	
8	-3.88889	-5.40059	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444	
-0.09594	-0.09594	0.00000	56.11869	-25.44518	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000	
9	-4.50000	-4.14668	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000	
-0.08766	-0.08766	0.00000	71.65061	-25.39334	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333	
10	-4.91667	-3.40292	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333	
-0.09605	-0.09605	0.00000	82.22177	-25.35081	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667	
11	-5.33333	-2.76503	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667	
-0.07886	-0.07886	0.00000	92.77628	-25.31601	0.00000	0.00000	0.00000	0	3	a	125.83333	125.83333	
12	-5.66667	-2.34008	3.83333	3.83333	162.37407	162.37407	0.00000	3	3	a	125.83333	125.83333	
-0.07268	-0.07268	0.00000	101.21002	1.77323	0.00000	0.00000	0.00000	3	3	a	132.58960	132.58960	
13	-6.00000	-1.99606	10.58960	10.58960	55.13071	55.13071	0.00000	3	3	a	132.58960	132.58960	
-0.05436	-0.05436	0.00000	91.59411	41.49427	0.00000	0.00000	0.00000	3	3		146.91667	141.19417	
14	-6.58333	-1.56470	24.91667	19.19417	36.47004	30.74754	5.72250	3	3		146.91667	141.19417	
42.75236	37.02986	5.72250	60.01194	52.30851	0.00000	0.00000	0.00000	3	3		160.33333	148.88833	
15	-7.16667	-1.28571	38.33333	26.88833	35.57816	24.13316	11.44500	3	3		160.33333	148.88833	
64.23761	52.79261	11.44500	30.56753	42.11716	0.00000	0.00000	0.00000	3	3		173.75000	156.58250	
16	-7.75000	-1.08797	51.75000	34.58250	45.29360	28.12610	17.16750	3	3		173.75000	156.58250	
72.48316	55.31566	17.16750	10.87526	25.82787	0.00000	0.00000	0.00000	3	3		187.16666	164.27666	
17	-8.33333	-0.92157	65.16666	42.27666	56.97160	34.08160	22.89000	3	3		187.16666	164.27666	
78.94414	56.05415	22.89000	0.43501	11.48892	0.00000	0.00000	0.00000	3	3		200.58334	171.97084	
18	-8.91667	-0.75941	78.58334	49.97084	69.18887	40.57636	28.61250	3	3		200.58334	171.97084	
85.32850	56.71600	28.61250	-2.52847	0.37287	0.00000	0.00000	0.00000	3	3		214.00000	179.66500	
*19	-9.50000	-0.59318	92.00000	57.66500	90.61572	56.28072	34.33500	3	3		214.00000	179.66500	
82.61351	48.27851	34.33500	0.00000	-0.00000	0.00000	0.00000	0.00000	3	3		225.50000	186.26000	
20	-10.00000	-0.34702	103.50000	64.26000	94.13083	54.89082	39.24000	3	3		225.50000	186.26000	
94.13083	54.89082	39.24000	0.00000	-0.00000	0.00000	0.00000	0.00000	3	3		237.00000	192.85500	
21	-10.50000	0.00000	115.00000	70.85500	103.16276	59.01776	44.14500	3	3		237.00000	192.85500	
103.16276	59.01776	44.14500	0.00000	-0.00000	0.00000	0.00000	0.00000						

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -9.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-15.41810	0.00000	-2.52847	101.21002	-25.54888	52.30851

Surcharge 1 present in this stage

Results Envelope

Node	Level	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
	[m]	Min	Max	Min	Max	Min	Max



Lancaster Lane, Brockholes

305 x 305 x 240mm Bar 9.50m Length

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Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-15.41810	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-13.77888	0.00000	0.00000	0.21609	-1.78046	0.00000
3	-1.22222	-12.14107	0.00000	0.00000	2.17611	-5.93548	0.00000
4	-1.77778	-10.65840	0.00000	0.00000	6.98926	-12.82597	0.00000
5	-2.33333	-9.19349	0.00000	0.00000	16.42719	-21.27893	0.00000
6	-2.66667	-8.33160	0.00000	0.00000	24.95039	-25.54888	0.00000
7	-3.27778	-6.80994	0.00000	0.00000	40.55095	-25.50134	0.00000
8	-3.88889	-5.40059	0.00000	0.00000	56.11869	-25.44518	0.00000
9	-4.50000	-4.14668	0.00000	0.00000	71.65061	-25.39334	0.00000
10	-4.91667	-3.40292	0.00000	0.00000	82.22177	-25.35080	0.00000
11	-5.33333	-2.76503	0.00000	0.00000	92.77628	-25.31601	0.00000
12	-5.66667	-2.34008	0.00000	0.00000	101.21002	0.00000	1.77323
13	-6.00000	-1.99606	0.00000	0.00000	91.59411	0.00000	41.49427
14	-6.58333	-1.56470	0.00000	0.00000	60.01194	0.00000	52.30851
15	-7.16667	-1.28571	0.00000	0.00000	30.56753	0.00000	42.11716
16	-7.75000	-1.08797	0.00000	0.00000	10.87526	0.00000	25.82787
17	-8.33333	-0.92157	0.00000	0.00000	0.43501	0.00000	11.48892
18	-8.91667	-0.75941	0.00000	-2.52847	0.00000	0.00000	0.37287
19	-9.50000	-0.59318	0.00000	0.00000	0.00000	-0.00000	0.00000
20	-10.00000	-0.34702	0.00000	0.00000	0.00000	-0.00000	0.00000
21	-10.50000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000



Lancaster Lane, Brockholes
305 x 305 x 283mm Bar 6.50m Length

Job No.	Sheet No.	Rev.
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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil	Boundary		EI below node [kNm ² /m]	
		Left	Right	Left	Right	
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690



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Node	Level	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
* 14	-6.50000	3	3	50.00000	50.00000	0.0
15	-7.00000	3	3	50.00000	50.00000	0.0
16	-7.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -6.50

Water data on LEFT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node	Stress					Pore			Stress		
	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	
Pt	Pe	Pressure	BM	SF				Left	Right		
[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m ²]	[kN/m ²]	[kN/m ²]	[kN/m ²]			[kN/m ²]	[kN/m ²]
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000				



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Stress							Pore		Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve	
Pt	Pe	Pressure	BM	SF				Left	Right			
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333	
62.91666	62.91666	0.00000	0.00000	0.00000								
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425	
66.38213	66.38213	0.00000	0.00000	0.00000								
14	-6.50000	0.00000	145.00000	145.00000	74.95250	74.95250	4.90500	3	3	145.00000	140.09500	
74.95250	70.04750	4.90500	0.00000	0.00000								
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000	
83.15500	73.34500	9.81000	0.00000	0.00000								
16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500	
91.35750	76.64250	14.71500	0.00000	0.00000								

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
* 14	-6.50000	3	3	50.00000	50.00000	0.0
15	-7.00000	3	3	50.00000	50.00000	0.0
16	-7.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -6.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 10200. E at bottom node = 232770. kN/m²

On the RIGHT: E at ground level = 10200. E at bottom node = 232770. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error	Node no.
			displ			
			[mm]		[kN/m ²]	
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00

Stress							Pore		Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve	
Pt	Pe	Pressure	BM	SF				Left	Right			
[kN/m ²]	[m]	[mm]	[kN/m ²]	Left	Right	[kN/m ²]	[kN/m ²]					
	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m]								



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Stress								Pore				Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve				
Pt	Pe	Pressure	BM	SF											
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111				
1.57972	1.57972	0.00000	0.00000	0.00000											
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444				
6.31889	6.31889	0.00000	0.00000	0.00000											
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889				
12.63778	12.63778	0.00000	0.00000	0.00000											
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556				
19.27778	19.27778	0.00000	0.00000	0.00000											
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667				
24.83333	24.83333	0.00000	0.00000	0.00000											
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334				
28.41667	28.41667	0.00000	0.00000	0.00000											
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889				
35.44444	35.44444	0.00000	0.00000	0.00000											
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444				
42.47222	42.47222	0.00000	0.00000	0.00000											
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000				
49.50000	49.50000	0.00000	0.00000	0.00000											
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333				
54.29166	54.29166	0.00000	0.00000	0.00000											
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667				
59.08334	59.08334	0.00000	0.00000	0.00000											
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333				
62.91666	62.91666	0.00000	0.00000	0.00000											
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425				
66.38213	66.38213	0.00000	0.00000	0.00000											
*14	-6.50000	0.00000	145.00000	140.09500	74.95250	70.04750	4.90500	3	3	145.00000	140.09500				
74.95250	70.04750	4.90500	0.00000	0.00000											
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000				
83.15500	73.34500	9.81000	0.00000	0.00000											
16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500				
91.35750	76.64250	14.71500	0.00000	0.00000											

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -6.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Surcharge 1 present in this stage

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	165690
2	-0.61111	0	1	50.00000	50.00000	165690
3	-1.22222	0	1	50.00000	50.00000	165690
4	-1.77778	0	2	50.00000	50.00000	165690
5	-2.33333	0	2	50.00000	50.00000	165690
6	-2.66667	0	3	50.00000	50.00000	165690
7	-3.27778	0	3	50.00000	50.00000	165690
8	-3.88889	0	3	50.00000	50.00000	165690
9	-4.50000	0	3	50.00000	50.00000	165690
10	-4.91667	0	3	50.00000	50.00000	165690
11	-5.33333	0	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
* 14	-6.50000	3	3	50.00000	50.00000	0.0
15	-7.00000	3	3	50.00000	50.00000	0.0
16	-7.50000	3	3	50.00000	50.00000	0.0



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Node	Level	Soil	Boundary	EI below node
	[m]	Left Right	Left Right	[kNm ² /m]

* Wall toe level: -6.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²
On the RIGHT: E at ground level = 10200. E at bottom node = 232770. kN/m²

Iter no.	Inc max displ	Node no.	Disp error.	Node no.	Press error.	Node no.
	[mm]		[mm]		[kN/m ²]	
1	0.0	1	2.6333	1	10.28	12
2	2.6	1	0.5206	1	13.21	7
3	3.2	1	0.4798	1	77.92	12
4	3.6	1	0.4463	1	12.41	6
5	4.1	1	0.4224	1	13.29	6
10	6.0	1	0.3404	1	11.06	8
15	7.6	1	0.2889	1	9.83	8
20	9.0	1	0.2573	1	8.75	8
30	11.4	1	0.2169	1	7.52	10
40	13.4	1	0.1841	1	6.42	10
50	15.1	1	0.1622	1	5.88	10
60	16.6	1	0.1441	1	5.22	10
70	18.0	1	0.1279	1	4.63	10
80	19.2	1	0.1135	1	4.11	10
90	20.3	1	0.1007	1	3.65	10
100	21.3	1	0.0894	1	3.24	10
120	22.9	1	0.0704	1	2.55	10
140	24.1	1	0.0555	1	2.01	10
150	24.6	1	0.0492	1	1.78	10
160	25.1	1	0.0437	1	1.58	10
180	25.9	1	0.0344	1	1.25	10
200	26.5	1	0.0271	1	0.98	10
250	27.5	1	0.0149	1	0.54	10
300	28.1	1	0.0082	1	0.30	10
350	28.4	1	0.0045	1	0.16	10
392	28.6	1	0.0027	1	0.10	10

Ground level left = -5.50 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress			Pore		Stress				
			Vt [kN/m ²]	Ve [kN/m ²]	Pt [kN/m ²]	Pe Pressure [kN/m ²]		Soil		Vt [kN/m ²]	Ve [kN/m ²]	
						Left	Right	Left	Right			
1	0.00000	-28.56359	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.16269	1.16269	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-25.56165	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
4.67669	4.67669	0.00000	0.21711	-1.78426	0.00000	0.00000	0.00000	0	1	a	38.55556	38.55556
3	-1.22222	-22.56085	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667
9.36102	9.36102	0.00000	2.18076	-5.94354	0.00000	0.00000	0.00000	0	2	a	56.83334	56.83334
4	-1.77778	-19.83795	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
14.99220	14.99220	0.00000	6.99956	-12.83834	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
5	-2.33333	-17.12951	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
19.31402	19.31402	0.00000	16.44558	-21.29485	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
6	-2.66667	-15.51835	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.07894	-0.07894	0.00000	24.97453	-25.56821	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
7	-3.27778	-12.61217	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.08356	-0.08356	0.00000	40.58816	-25.52404	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
8	-3.88889	-9.79746	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.09419	-0.09419	0.00000	56.17058	-25.46973	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
9	-4.50000	-7.10935	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.08815	-0.08815	0.00000	71.71782	-25.41830	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
10	-4.91667	-5.36709	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.09796	-0.09796	0.00000	82.29934	-25.37524	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333



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Stress						Pore			Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF								
11	-5.33333	-3.71106	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667
	-0.07959	0.00000	92.86386	-25.33991								
12	-5.66667	-2.45576	3.83333	3.83333	376.19735	376.19735	0.00000	3	3	a	125.83333	125.83333
	-0.06916	0.00000	101.30552	37.38609								
13	-6.00000	-1.26373	10.76425	10.76425	85.83428	85.83428	0.00000	3	3	a	132.76425	132.76425
	-0.04347	0.00000	67.93978	117.98836								
*14	-6.50000	0.45039	23.00000	18.09500	4.86358	-0.04142	4.90500	a	3	3	145.00000	140.09500
	276.62270	271.71770	4.90500	-0.00000	0.00000							
15	-7.00000	-0.23127	34.50000	24.69000	9.80011	-0.00989	9.81000	a	3	3	156.50000	146.69000
	9.80011	-0.00989	9.81000	-0.00000	0.00000							
16	-7.50000	0.00000	46.00000	31.28500	53.55256	38.83756	14.71500		3	3	168.00000	153.28500
	53.55256	38.83756	14.71500	-0.00000	0.00000							

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -6.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-28.56359	0.45039	-0.00000	101.30552	-25.56821	117.98836

Surcharge 1 present in this stage

Results Envelope

Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-28.56359	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-25.56165	0.00000	0.00000	0.21711	-1.78426	0.00000
3	-1.22222	-22.56085	0.00000	0.00000	2.18076	-5.94354	0.00000
4	-1.77778	-19.83795	0.00000	0.00000	6.99956	-12.83834	0.00000
5	-2.33333	-17.12951	0.00000	0.00000	16.44558	-21.29485	0.00000
6	-2.66667	-15.51835	0.00000	0.00000	24.97453	-25.56821	0.00000
7	-3.27778	-12.61217	0.00000	0.00000	40.58816	-25.52404	0.00000
8	-3.88889	-9.79746	0.00000	0.00000	56.17058	-25.46973	0.00000
9	-4.50000	-7.10935	0.00000	0.00000	71.71782	-25.41830	0.00000
10	-4.91667	-5.36709	0.00000	0.00000	82.29934	-25.37524	0.00000
11	-5.33333	-3.71106	0.00000	0.00000	92.86386	-25.33991	0.00000
12	-5.66667	-2.45576	0.00000	0.00000	101.30552	0.00000	37.38609
13	-6.00000	-1.26373	0.00000	0.00000	67.93978	0.00000	117.98836
14	-6.50000	0.00000	0.45039	-0.00000	0.00000	0.00000	0.00000
15	-7.00000	-0.23127	0.00000	-0.00000	0.00000	0.00000	0.00000
16	-7.50000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000



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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil	Boundary		EI below node [kNm ² /m]	
		Left	Right	Left	Right	
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690



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Node	Level	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
14	-6.50000	3	3	50.00000	50.00000	165690
15	-7.00000	3	3	50.00000	50.00000	165690
* 16	-7.50000	3	3	50.00000	50.00000	0.0
17	-8.00000	3	3	50.00000	50.00000	0.0
18	-8.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -7.50

Water data on LEFT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level	Pressure	Unit
	[m]	[kN/m ²]	[kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level	Disp	Stress			Pore			Soil		Stress	
			Vt	Ve	Pt	Pe	Pressure	Left	Right	Vt	Ve	
	[m]	[mm]	BM	SF	[kN/m ²]	[kN/m ²]	[kN/m ²]	[kN/m ²]	Left	Right	[kN/m ²]	[kN/m ²]
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111	
1.57972	1.57972	0.00000	0.00000	0.00000								
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444	
6.31889	6.31889	0.00000	0.00000	0.00000								
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889	
12.63778	12.63778	0.00000	0.00000	0.00000								
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556	
19.27778	19.27778	0.00000	0.00000	0.00000								
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667	
24.83333	24.83333	0.00000	0.00000	0.00000								
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334	
28.41667	28.41667	0.00000	0.00000	0.00000								
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889	
35.44444	35.44444	0.00000	0.00000	0.00000								
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444	
42.47222	42.47222	0.00000	0.00000	0.00000								
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000	
49.50000	49.50000	0.00000	0.00000	0.00000								
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333	
54.29166	54.29166	0.00000	0.00000	0.00000								



Lancaster Lane, Brockholes
305 x 305 x 283mm Bar 7.50m Length

Job No.	Sheet No.	Rev.
3067		
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Stress					Pore					Stress				
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve			
Pt	Pe	Pressure	BM	SF										
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667			
59.08334	59.08334	0.00000	0.00000	0.00000										
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333			
62.91666	62.91666	0.00000	0.00000	0.00000										
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425			
66.38213	66.38213	0.00000	0.00000	0.00000										
14	-6.50000	0.00000	145.00000	140.09500	74.95250	70.04750	4.90500	3	3	145.00000	140.09500			
74.95250	70.04750	4.90500	0.00000	0.00000										
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000			
83.15500	73.34500	9.81000	0.00000	0.00000										
16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500			
91.35750	76.64250	14.71500	0.00000	0.00000										
17	-8.00000	0.00000	179.50000	159.88000	99.56000	79.94000	19.62000	3	3	179.50000	159.88000			
99.56000	79.94000	19.62000	0.00000	0.00000										
18	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500			
107.76250	83.23750	24.52500	0.00000	0.00000										

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil	Boundary		EI below node	
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
14	-6.50000	3	3	50.00000	50.00000	165690
15	-7.00000	3	3	50.00000	50.00000	165690
* 16	-7.50000	3	3	50.00000	50.00000	0.0
17	-8.00000	3	3	50.00000	50.00000	0.0
18	-8.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -7.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 10200. E at bottom node = 238410. kN/m²
On the RIGHT: E at ground level = 10200. E at bottom node = 238410. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error	Node no.
displ			[kN/m ²]			
[mm]			[mm]			
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00



Lancaster Lane, Brockholes
305 x 305 x 283mm Bar 7.50m Length

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Iter no.	Inc max	Node no.	Disp error	Node no.	Press error	Node no.								
displ							Stress				Stress			
[mm]							[mm]				[kN/m ²]			
							Pore				Soil			
Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	Pressure	Soil	Vt	Ve
Pt	Pe	Pressure	BM	SF				Left	Right			Left	Right	
[kN/m ²]	[m]	[kN/m ²]	[kNm/m]	[kN/m ²]										
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111			
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000								
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444			
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000								
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889			
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000								
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556			
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000								
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667			
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000								
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334			
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000								
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889			
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000								
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444			
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000								
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000			
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000								
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333			
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000								
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667			
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000								
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333			
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000								
13	-6.00000	0.00000	132.76425	132.76425	66.38213	66.38213	0.00000	3	3	132.76425	132.76425			
66.38213	66.38213	0.00000	0.00000	0.00000	0.00000	0.00000								
14	-6.50000	0.00000	145.00000	140.09500	74.95250	70.04750	4.90500	3	3	145.00000	140.09500			
74.95250	70.04750	4.90500	0.00000	0.00000	0.00000	0.00000								
15	-7.00000	0.00000	156.50000	146.69000	83.15500	73.34500	9.81000	3	3	156.50000	146.69000			
83.15500	73.34500	9.81000	0.00000	0.00000	0.00000	0.00000								
*16	-7.50000	0.00000	168.00000	153.28500	91.35750	76.64250	14.71500	3	3	168.00000	153.28500			
91.35750	76.64250	14.71500	0.00000	0.00000	0.00000	0.00000								
17	-8.00000	0.00000	179.50000	159.88000	99.56000	79.94000	19.62000	3	3	179.50000	159.88000			
99.56000	79.94000	19.62000	0.00000	0.00000	0.00000	0.00000								
18	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500			
107.76250	83.23750	24.52500	0.00000	0.00000	0.00000	0.00000								

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -7.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Surcharge 1 present in this stage

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	165690
2	-0.61111	0	1	50.00000	50.00000	165690
3	-1.22222	0	1	50.00000	50.00000	165690
4	-1.77778	0	2	50.00000	50.00000	165690
5	-2.33333	0	2	50.00000	50.00000	165690



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305 x 305 x 283mm Bar 7.50m Length

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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
6	-2.66667	0	3	50.00000	50.00000	165690
7	-3.27778	0	3	50.00000	50.00000	165690
8	-3.88889	0	3	50.00000	50.00000	165690
9	-4.50000	0	3	50.00000	50.00000	165690
10	-4.91667	0	3	50.00000	50.00000	165690
11	-5.33333	0	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
14	-6.50000	3	3	50.00000	50.00000	165690
15	-7.00000	3	3	50.00000	50.00000	165690
* 16	-7.50000	3	3	50.00000	50.00000	0.0
17	-8.00000	3	3	50.00000	50.00000	0.0
18	-8.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -7.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²

On the RIGHT: E at ground level = 10200. E at bottom node = 238410. kN/m²

Iter no. Inc max no. Node error. Disp no. Node error. Press no. Node error.

Iter no.	Inc max	no. error.	Disp no.	Node error.	Press no.	Node error.
displ		[mm]		[kN/m ²]		
1	0.0	1	2.7657	1	10.28	12
2	2.8	1	0.4999	1	13.03	7
3	3.3	1	0.4627	1	80.71	12
4	3.7	1	0.4284	1	11.67	6
5	4.2	1	0.4039	1	12.56	6
10	6.0	1	0.3117	1	10.06	6
15	7.4	1	0.2466	1	7.94	8
20	8.5	1	0.2008	1	6.54	8
30	10.2	1	0.1370	1	4.63	10
40	11.4	1	0.0958	1	3.21	10
50	12.2	1	0.0679	1	2.41	10
60	12.8	1	0.0505	1	1.79	10
70	13.3	1	0.0381	1	1.35	10
80	13.6	1	0.0287	1	1.01	10
90	13.9	1	0.0216	1	0.76	10
100	14.0	1	0.0163	1	0.57	10
120	14.3	1	0.0092	1	0.33	10
140	14.4	1	0.0052	1	0.19	10
150	14.5	1	0.0040	1	0.14	10
160	14.5	1	0.0030	1	0.11	10
162	14.5	1	0.0028	1	0.10	10

Ground level left = -5.50 Ground level right = 0.00

Pore Node	Stress					Pore			Stress			
	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe Pressure	Displ	BM	SF				Left	Right			
[kN/m ²]	[kN/m ²]	[mm]	[kN/m ²]			[kN/m ²]						
1	0.00000	-14.53023	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.16218	1.16218	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-12.98620	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
4.67608	4.67608	0.00000	0.21701	-1.78391				0	1	a	38.55556	38.55556
3	-1.22222	-11.44332	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	49.66667	49.66667
9.36025	9.36025	0.00000	2.18034	-5.94279				0	2	a	56.83334	56.83334
4	-1.77778	-10.04579	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a		
14.99118	14.99118	0.00000	6.99859	-12.83708				0	2	a		
5	-2.33333	-8.66273	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
19.31339	19.31339	0.00000	16.44375	-21.29316				0	3	a		
6	-2.66667	-7.84680	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a		
-0.07899	-0.07899	0.00000	24.97210	-25.56637								



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Stress						Pore			Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF								
7	-3.27778	-6.39852	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
-0.08202	-0.08202	0.00000	40.58459	-25.52266								
8	-3.88889	-5.04171	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
-0.09142	-0.09142	0.00000	56.16646	-25.46966								
9	-4.50000	-3.81149	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
-0.08551	-0.08551	0.00000	71.71418	-25.41976								
10	-4.91667	-3.06324	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
-0.09657	-0.09657	0.00000	82.29659	-25.37767								
11	-5.33333	-2.40122	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667
-0.08054	-0.08054	0.00000	92.86224	-25.34245								
12	-5.66667	-1.94113	3.83333	3.83333	173.44838	173.44838	0.00000	3	3	a	125.83333	125.83333
-0.07477	-0.07477	0.00000	101.30469	3.59317								
13	-6.00000	-1.54681	10.76425	10.76425	68.65286	68.65286	0.00000	3	3	a	132.76425	132.76425
-0.05800	-0.05800	0.00000	90.46678	46.82846								
14	-6.50000	-1.06322	23.00000	18.09500	40.50391	35.59891	4.90500	3	3		145.00000	140.09500
23.76076	18.85576	4.90500	59.89518	65.32901								
15	-7.00000	-0.66895	34.50000	24.69000	26.76937	16.95937	9.81000	3	3		156.50000	146.69000
65.24783	55.43783	9.81000	25.13778	59.89518								
*16	-7.50000	-0.31503	46.00000	31.28500	14.68048	-0.03452	14.71500	a	3	3	168.00000	153.28500
115.23160	100.51660	14.71500	-0.00000	0.00000								
17	-8.00000	-0.27745	57.50000	37.88000	56.84795	37.22795	19.62000	3	3		179.50000	159.88000
56.84795	37.22795	19.62000	-0.00000	0.00000								
18	-8.50000	0.00000	69.00000	44.47500	70.10224	45.57724	24.52500	3	3		191.00000	166.47500
70.10224	45.57724	24.52500	-0.00000	0.00000								

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -7.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-14.53023	0.00000	-0.00000	101.30469	-25.56637	65.32900

Surcharge 1 present in this stage

Results Envelope

Node	Level	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-14.53023	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-12.98620	0.00000	0.00000	0.21701	-1.78391	0.00000
3	-1.22222	-11.44332	0.00000	0.00000	2.18034	-5.94279	0.00000
4	-1.77778	-10.04579	0.00000	0.00000	6.99859	-12.83708	0.00000
5	-2.33333	-8.66273	0.00000	0.00000	16.44375	-21.29316	0.00000
6	-2.66667	-7.84680	0.00000	0.00000	24.97210	-25.56637	0.00000
7	-3.27778	-6.39852	0.00000	0.00000	40.58459	-25.52266	0.00000
8	-3.88889	-5.04171	0.00000	0.00000	56.16646	-25.46966	0.00000
9	-4.50000	-3.81149	0.00000	0.00000	71.71418	-25.41976	0.00000
10	-4.91667	-3.06324	0.00000	0.00000	82.29659	-25.37767	0.00000
11	-5.33333	-2.40122	0.00000	0.00000	92.86224	-25.34245	0.00000
12	-5.66667	-1.94113	0.00000	0.00000	101.30469	0.00000	3.59317
13	-6.00000	-1.54681	0.00000	0.00000	90.46678	0.00000	46.82845
14	-6.50000	-1.06322	0.00000	0.00000	59.89518	0.00000	65.32900
15	-7.00000	-0.66895	0.00000	0.00000	25.13778	0.00000	59.89518
16	-7.50000	-0.31503	0.00000	-0.00000	0.00000	0.00000	0.00000
17	-8.00000	-0.27745	0.00000	-0.00000	0.00000	0.00000	0.00000
18	-8.50000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000



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305 x 305 x 283mm Bar 8.50m Length

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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User	0.00000	2.50000	6.00000	1.00000

Spec.

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil	Boundary		EI below node [kNm ² /m]	
		Left	Right	Left	Right	
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690



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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
14	-6.62500	3	3	50.00000	50.00000	165690
15	-7.25000	3	3	50.00000	50.00000	165690
16	-7.87500	3	3	50.00000	50.00000	165690
* 17	-8.50000	3	3	50.00000	50.00000	0.0
18	-9.00000	3	3	50.00000	50.00000	0.0
19	-9.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -8.50

Water data on LEFT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node	Level [m]	Disp [mm]	Stress			Pore			Stress			
			Vt [kN/m ²]	Ve [kN/m ²]	Pt [kN/m ²]	Pe [kN/m ²]	Pressure [kN/m ²]	Soil Left	Right	Vt [kN/m ²]	Ve [kN/m ²]	
Pt	Pe Pressure		BM	SF								
[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m]	[kN/m ²]	[kN/m ²]	[kN/m ²]	[kN/m ²]	Left	Right	[kN/m ²]	[kN/m ²]
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1		3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	2	1	1	13.44444	13.44444
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	3	1	1	26.88889	26.88889
6.31889	6.31889	0.00000	0.00000	0.00000	12.63778	12.63778	0.00000	4	2	2	38.55556	38.55556
3	-1.22222	0.00000	26.88889	26.88889	24.83333	24.83333	0.00000	5	2	2	49.66667	49.66667
12.63778	12.63778	0.00000	0.00000	0.00000	28.41667	28.41667	0.00000	6	3	3	56.83334	56.83334
4	-1.77778	0.00000	38.55556	38.55556	28.41667	28.41667	0.00000	7	3	3	70.88889	70.88889
19.27778	19.27778	0.00000	0.00000	0.00000	35.44444	35.44444	0.00000	8	3	3	84.94444	84.94444
5	-2.33333	0.00000	49.66667	49.66667	42.47222	42.47222	0.00000	9	3	3	99.00000	99.00000
24.83333	24.83333	0.00000	0.00000	0.00000	49.50000	49.50000	0.00000	10	3	3	108.58333	108.58333
6	-2.66667	0.00000	56.83334	56.83334	54.29166	54.29166	0.00000					
28.41667	28.41667	0.00000	0.00000	0.00000								
7	-3.27778	0.00000	70.88889	70.88889								
35.44444	35.44444	0.00000	0.00000	0.00000								
8	-3.88889	0.00000	84.94444	84.94444								
42.47222	42.47222	0.00000	0.00000	0.00000								
9	-4.50000	0.00000	99.00000	99.00000								
49.50000	49.50000	0.00000	0.00000	0.00000								
10	-4.91667	0.00000	108.58333	108.58333								



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Stress						Pore				Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve		
Pt	Pe	Pressure	BM	SF									
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000							
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667		
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000								
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333		
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000								
13	-6.00000	0.00000	132.50034	132.50034	66.25017	66.25017	0.00000	3	3	132.50034	132.50034		
66.25017	66.25017	0.00000	0.00000	0.00000	0.00000								
14	-6.62500	0.00000	147.87500	147.87500	77.00313	77.00313	6.13125	3	3	147.87500	141.74375		
77.00313	70.87187	6.13125	0.00000	0.00000									
15	-7.25000	0.00000	162.25000	149.98750	87.25625	74.99375	12.26250	3	3	162.25000	149.98750		
87.25625	74.99375	12.26250	0.00000	0.00000									
16	-7.87500	0.00000	176.62500	158.23125	97.50938	79.11562	18.39375	3	3	176.62500	158.23125		
97.50938	79.11562	18.39375	0.00000	0.00000									
17	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500		
107.76250	83.23750	24.52500	0.00000	0.00000									
18	-9.00000	0.00000	202.50000	173.07000	115.96500	86.53500	29.43000	3	3	202.50000	173.07000		
115.96500	86.53500	29.43000	0.00000	0.00000									
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500		
124.16750	89.83250	34.33500	0.00000	0.00000									

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil	Boundary		EI below node	
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
14	-6.62500	3	3	50.00000	50.00000	165690
15	-7.25000	3	3	50.00000	50.00000	165690
16	-7.87500	3	3	50.00000	50.00000	165690
* 17	-8.50000	3	3	50.00000	50.00000	0.0
18	-9.00000	3	3	50.00000	50.00000	0.0
19	-9.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -8.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 14535. E at bottom node = 240710. kN/m²
On the RIGHT: E at ground level = 14535. E at bottom node = 240710. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error.	Node no.
displ						
[mm]		[mm]		[kN/m ²]		
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1



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Iter Inc Node Disp Node Press Node
no. max no. error. no. error no.
displ
[mm] [mm] [kN/m²]

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Stress					Pore			Soil		Stress	
	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Left	Right	Vt	Ve	
[kN/m ²]	[m]	[mm]	[kN/m ²]			[kN/m ²]	[kN/m ²]					
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111	
1.57972	1.57972	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444	
6.31889	6.31889	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889	
12.63778	12.63778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556	
19.27778	19.27778	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667	
24.83333	24.83333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334	
28.41667	28.41667	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889	
35.44444	35.44444	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444	
42.47222	42.47222	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000	
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333	
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667	
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333	
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
13	-6.00000	0.00000	132.50034	132.50034	66.25017	66.25017	0.00000	3	3	132.50034	132.50034	
66.25017	66.25017	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000					
14	-6.62500	0.00000	147.87500	141.74375	77.00313	70.87187	6.13125	3	3	147.87500	141.74375	
77.00313	70.87187	6.13125	0.00000	0.00000	0.00000	0.00000	0.00000					
15	-7.25000	0.00000	162.25000	149.98750	87.25625	74.99375	12.26250	3	3	162.25000	149.98750	
87.25625	74.99375	12.26250	0.00000	0.00000	0.00000	0.00000	0.00000					
16	-7.87500	0.00000	176.62500	158.23125	97.50938	79.11562	18.39375	3	3	176.62500	158.23125	
97.50938	79.11562	18.39375	0.00000	0.00000	0.00000	0.00000	0.00000					
*17	-8.50000	0.00000	191.00000	166.47500	107.76250	83.23750	24.52500	3	3	191.00000	166.47500	
107.76250	83.23750	24.52500	0.00000	0.00000	0.00000	0.00000	0.00000					
18	-9.00000	0.00000	202.50000	173.07000	115.96500	86.53500	29.43000	3	3	202.50000	173.07000	
115.96500	86.53500	29.43000	0.00000	0.00000	0.00000	0.00000	0.00000					
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500	
124.16750	89.83250	34.33500	0.00000	0.00000	0.00000	0.00000	0.00000					

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -8.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Surcharge 1 present in this stage

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil	Boundary	EI below node
------	-------	------	----------	---------------



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[m]	Left	Right	Left	Right	[kNm2/m]	
1	0.00000	0	1	50.00000	50.00000	165690
2	-0.61111	0	1	50.00000	50.00000	165690
3	-1.22222	0	1	50.00000	50.00000	165690
4	-1.77778	0	2	50.00000	50.00000	165690
5	-2.33333	0	2	50.00000	50.00000	165690
6	-2.66667	0	3	50.00000	50.00000	165690
7	-3.27778	0	3	50.00000	50.00000	165690
8	-3.88889	0	3	50.00000	50.00000	165690
9	-4.50000	0	3	50.00000	50.00000	165690
10	-4.91667	0	3	50.00000	50.00000	165690
11	-5.33333	0	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
14	-6.62500	3	3	50.00000	50.00000	165690
15	-7.25000	3	3	50.00000	50.00000	165690
16	-7.87500	3	3	50.00000	50.00000	165690
* 17	-8.50000	3	3	50.00000	50.00000	0.0
18	-9.00000	3	3	50.00000	50.00000	0.0
19	-9.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -8.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):

On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²

On the RIGHT: E at ground level = 14535. E at bottom node = 240710. kN/m²

Iter no. Inc max no. Node error. Disp no. Node error. Press no. Node error.

Iter no.	Inc max no.	Node error.	Disp no.	Node error.	Press no.	Node error.
1	0.0	1	2.9120	1	10.28	12
2	2.9	1	0.4693	1	12.69	7
3	3.4	1	0.4428	1	82.21	12
4	3.8	1	0.4132	1	10.69	6
5	4.2	1	0.3925	1	11.69	6
10	6.0	1	0.3061	1	9.83	6
15	7.4	1	0.2415	1	7.49	8
20	8.5	1	0.1942	1	6.08	8
30	10.1	1	0.1281	1	4.07	10
40	11.2	1	0.0867	1	2.72	10
50	12.0	1	0.0584	1	1.83	8
60	12.4	1	0.0394	1	1.24	8
70	12.8	1	0.0272	1	0.91	10
80	13.0	1	0.0195	1	0.65	10
90	13.2	1	0.0139	1	0.46	10
100	13.3	1	0.0099	1	0.33	10
120	13.4	1	0.0050	1	0.17	10
136	13.5	1	0.0029	1	0.09	10

Ground level left = -5.50 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress			Pore			Stress			
			Vt [kN/m ²]	Ve [kN/m ²]	Pt [kN/m ²]	Pe [kN/m ²]	Pressure [kN/m ²]	Soil	Vt [kN/m ²]	Ve [kN/m ²]		
1	0.00000	-13.51255	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.16031	1.16031	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
4.67411	4.67411	0.00000	0.21666	-1.78274	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
9.35848	9.35848	0.00000	2.17890	-5.94049	0.00000	0.00000	0.00000	0	2	a	38.55556	38.55556
14.98924	14.98924	0.00000	6.99560	-12.83373	0.00000	0.00000	0.00000	0	2	a	38.55556	38.55556



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Stress						Pore				Stress			
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve		
Pt	Pe Pressure	BM	SF										
5	-2.33333	-8.11584	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667	
19.31224	19.31224	0.00000	16.43860	-21.28901									
6	-2.66667	-7.36715	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	56.83334	56.83334	
-0.08031	-0.08031	0.00000	24.96548	-25.56166									
7	-3.27778	-6.04215	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889	
-0.08194	-0.08194	0.00000	40.57490	-25.51766									
8	-3.88889	-4.80859	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444	
-0.09059	-0.09059	0.00000	56.15373	-25.46495									
9	-4.50000	-3.70158	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000	
-0.08400	-0.08400	0.00000	71.69872	-25.41568									
10	-4.91667	-3.03733	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333	
-0.09404	-0.09404	0.00000	82.27959	-25.37451									
11	-5.33333	-2.45929	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667	
-0.07845	-0.07845	0.00000	92.84415	-25.34020									
12	-5.66667	-2.06636	3.83333	3.83333	153.35508	153.35508	0.00000	3	3	a	125.83333	125.83333	
-0.07307	-0.07307	0.00000	101.28597	0.24586									
13	-6.00000	-1.73946	10.50034	10.50034	56.97328	56.97328	0.00000	3	3	a	132.50034	132.50034	
-0.05539	-0.05539	0.00000	92.68023	39.48033									
14	-6.62500	-1.28278	25.87500	19.74375	37.99377	31.86252	6.13125	3	3		147.87500	141.74375	
43.70321	37.57196	6.13125	59.46557	51.35925									
15	-7.25000	-0.96716	40.25000	27.98750	36.90080	24.63830	12.26250	3	3		162.25000	149.98750	
65.28615	53.02365	12.26250	28.48117	40.70463									
16	-7.87500	-0.72306	54.62500	36.23125	46.11621	27.72246	18.39375	3	3		176.62500	158.23125	
75.07386	56.68011	18.39375	8.58479	22.78494									
*17	-8.50000	-0.50363	69.00000	44.47500	58.55397	34.02896	24.52500	3	3		191.00000	166.47500	
82.97294	58.44794	24.52500	-0.00000	0.00000									
18	-9.00000	-0.31872	80.50000	51.07000	77.38540	47.95540	29.43000	3	3		202.50000	173.07000	
77.38540	47.95540	29.43000	-0.00000	0.00000									
19	-9.50000	0.00000	92.00000	57.66500	86.63956	52.30456	34.33500	3	3		214.00000	179.66500	
86.63956	52.30456	34.33500	-0.00000	0.00000									

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -8.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-13.51255	0.00000	-0.00000	101.28597	-25.56166	51.35925

Surcharge 1 present in this stage

Results Envelope

Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-13.51255	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-12.09183	0.00000	0.00000	0.21666	-1.78274	0.00000
3	-1.22222	-10.67225	0.00000	0.00000	2.17890	-5.94049	0.00000
4	-1.77778	-9.38681	0.00000	0.00000	6.99560	-12.83373	0.00000
5	-2.33333	-8.11584	0.00000	0.00000	16.43860	-21.28901	0.00000
6	-2.66667	-7.36715	0.00000	0.00000	24.96548	-25.56166	0.00000
7	-3.27778	-6.04215	0.00000	0.00000	40.57490	-25.51766	0.00000
8	-3.88889	-4.80859	0.00000	0.00000	56.15373	-25.46495	0.00000
9	-4.50000	-3.70158	0.00000	0.00000	71.69872	-25.41568	0.00000
10	-4.91667	-3.03733	0.00000	0.00000	82.27959	-25.37451	0.00000
11	-5.33333	-2.45929	0.00000	0.00000	92.84415	-25.34020	0.00000
12	-5.66667	-2.06636	0.00000	0.00000	101.28597	0.00000	0.24586
13	-6.00000	-1.73946	0.00000	0.00000	92.68023	0.00000	39.48033
14	-6.62500	-1.28278	0.00000	0.00000	59.46557	0.00000	51.35925
15	-7.25000	-0.96716	0.00000	0.00000	28.48117	0.00000	40.70463
16	-7.87500	-0.72306	0.00000	0.00000	8.58479	0.00000	22.78494
17	-8.50000	-0.50363	0.00000	-0.00000	0.00000	0.00000	0.00000
18	-9.00000	-0.31872	0.00000	-0.00000	0.00000	0.00000	0.00000
19	-9.50000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000



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INITIAL DATA

Soil properties

No.	Description	Unit Wt [kN/m ³]	K0	Ka	Kp	Kac	Kpc	Kr	Earth pressure coefficients.
1	Stiff CLAY	22.00000	0.47000	0.34901	8.38665	1.18154	5.79194	0.25000	Calculated
2	Medium dense SAND	20.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated
3	Extremely weak MUDSTONE	23.00000	0.50000	0.38968	7.13486	1.24849	5.34223	0.60000	Calculated

No.	c0 [kN/m ²]	y0 [m]	Gradient of c [kN/m ² /m]	E0 [kN/m ²]	Gradient of E [kN/m ² /m]	Drained/ Undrained
1	0.00000	0.00000	0.00000	17000	0.0	Drained
2	0.00000	0.00000	0.00000	20000	0.0	Drained
3	99.00000	0.00000	0.00000	150000	0.0	Drained

Parameters used to calculate Earth pressure coefficients

No.	Phi [°]	Delta/Phi Ratio	Beta [°]	Cw/C Ratio
1	32.00000	0.66000	20.00000	0.00000
2	30.00000	0.66000	20.00000	0.00000
3	30.00000	0.66000	20.00000	0.00000

Partial factor sets

Factor Set	Tan phi	phi	Cohesion	Undrained cohesion	Young's modulus	Live (restoring)	Live (disturbing)	Dead (restoring)	Dead (disturbing)
SLS	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
DA1-1	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	1.11110	1.00000	1.00000
DA1-2	1.25000	1.25000	1.40000	1.00000	0.00000	1.30000	1.00000	1.00000	1.00000

Surcharge properties

No.	Stage	Side	Level	Pressure	Factor	Partial Type	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]		[m]	[m]		
1	0	3	Right	0.00000	20.00000	User Spec.	0.00000	2.50000	6.00000	1.00000

Note: Only the parameters in bold have been affected by Partial Factors.

Surcharge Design properties

No.	Stage	Side	Level	Pressure	Offset	Width	Ks	
		In	Out	[m]	[kN/m ²]	[m]	[m]	
1	0	3	Right	0.00000	0.00000	2.50000	6.00000	1.00000

STAGE 0 : INITIAL CONDITION

Geometry

Node	Level [m]	Soil Left Right	Boundary Left Right	EI below node [kNm ² /m]
1	0.00000	1 1	50.00000 50.00000	165690
2	-0.61111	1 1	50.00000 50.00000	165690
3	-1.22222	1 1	50.00000 50.00000	165690
4	-1.77778	2 2	50.00000 50.00000	165690
5	-2.33333	2 2	50.00000 50.00000	165690
6	-2.66667	3 3	50.00000 50.00000	165690
7	-3.27778	3 3	50.00000 50.00000	165690
8	-3.88889	3 3	50.00000 50.00000	165690
9	-4.50000	3 3	50.00000 50.00000	165690
10	-4.91667	3 3	50.00000 50.00000	165690
11	-5.33333	3 3	50.00000 50.00000	165690
12	-5.66667	3 3	50.00000 50.00000	165690
13	-6.00000	3 3	50.00000 50.00000	165690



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Node	Level [m]	Soil		Boundary		EI below node [kNm ² /m]
		Left	Right	Left	Right	
14	-6.58333	3	3	50.00000	50.00000	165690
15	-7.16667	3	3	50.00000	50.00000	165690
16	-7.75000	3	3	50.00000	50.00000	165690
17	-8.33333	3	3	50.00000	50.00000	165690
18	-8.91667	3	3	50.00000	50.00000	165690
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

Water data on LEFT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Water data on RIGHT side

No.	Level [m]	Pressure [kN/m ²]	Unit wt. [kN/m ³]
1	-6.00000	0.00000	9.81000

Analysis details

SAFE model with redistribution
and with friction at wall/soil interface

	Left	Right
E profile Generated		
Boundary distances [m] :	50.00000	50.00000

Convergence control parameters

Maximum number of iterations : 900
Tolerance for displacement convergence [mm] : 0.01000
Tolerance for pressure convergence [kN/m²] : 0.10000
Damping coefficient : 1.00000
Maximum incremental displacement [m] : 1.00000

RESULTS FOR STAGE 0 : Initial condition (SLS)

Surcharge, strut or wall load changes

Surcharge no. 1 applied at this stage

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress		Pt [kN/m ²]	Pe [kN/m ²]	Pore Pressure [kN/m ²]	Soil		Vt [kN/m ²]	Ve [kN/m ²]
			Vt BM [kN/m ²]	Ve SF [kN/m ²]				Left	Right		
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
1.57972	1.57972	0.00000	0.00000	0.00000							
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
6.31889	6.31889	0.00000	0.00000	0.00000							
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
12.63778	12.63778	0.00000	0.00000	0.00000							
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
19.27778	19.27778	0.00000	0.00000	0.00000							
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
24.83333	24.83333	0.00000	0.00000	0.00000							
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
28.41667	28.41667	0.00000	0.00000	0.00000							
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
35.44444	35.44444	0.00000	0.00000	0.00000							
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
42.47222	42.47222	0.00000	0.00000	0.00000							
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000



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Stress					Pore					Stress	
Pore Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil		Vt	Ve
Pt	Pe	Pressure	BM	SF							
49.50000	49.50000	0.00000	0.00000	0.00000	0.00000	0.00000					
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
54.29166	54.29166	0.00000	0.00000	0.00000	0.00000	0.00000					
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
59.08334	59.08334	0.00000	0.00000	0.00000	0.00000	0.00000					
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333
62.91666	62.91666	0.00000	0.00000	0.00000	0.00000	0.00000					
13	-6.00000	0.00000	132.58960	132.58960	66.29480	66.29480	0.00000	3	3	132.58960	132.58960
66.29480	66.29480	0.00000	0.00000	0.00000	0.00000	0.00000					
14	-6.58333	0.00000	146.91667	141.19417	76.31959	70.59708	5.72250	3	3	146.91667	141.19417
76.31959	70.59708	5.72250	0.00000	0.00000	0.00000	0.00000					
15	-7.16667	0.00000	160.33333	148.88833	85.88916	74.44417	11.44500	3	3	160.33333	148.88833
85.88916	74.44417	11.44500	0.00000	0.00000	0.00000	0.00000					
16	-7.75000	0.00000	173.75000	156.58250	95.45875	78.29125	17.16750	3	3	173.75000	156.58250
95.45875	78.29125	17.16750	0.00000	0.00000	0.00000	0.00000					
17	-8.33333	0.00000	187.16666	164.27666	105.02833	82.13833	22.89000	3	3	187.16666	164.27666
105.02833	82.13833	22.89000	0.00000	0.00000	0.00000	0.00000					
18	-8.91667	0.00000	200.58334	171.97084	114.59792	85.98542	28.61250	3	3	200.58334	171.97084
114.59792	85.98542	28.61250	0.00000	0.00000	0.00000	0.00000					
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500
124.16750	89.83250	34.33500	0.00000	0.00000	0.00000	0.00000					
20	-10.00000	0.00000	225.50000	186.26000	132.37000	93.13000	39.24000	3	3	225.50000	186.26000
132.37000	93.13000	39.24000	0.00000	0.00000	0.00000	0.00000					
21	-10.50000	0.00000	237.00000	192.85500	140.57250	96.42750	44.14500	3	3	237.00000	192.85500
140.57250	96.42750	44.14500	0.00000	0.00000	0.00000	0.00000					

NOTE: Displacements from STAGE 0 are disregarded in later stages

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

Surcharge 1 present in this stage

STAGE 1 : PILE INSTALLATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	1	1	50.00000	50.00000	165690
2	-0.61111	1	1	50.00000	50.00000	165690
3	-1.22222	1	1	50.00000	50.00000	165690
4	-1.77778	2	2	50.00000	50.00000	165690
5	-2.33333	2	2	50.00000	50.00000	165690
6	-2.66667	3	3	50.00000	50.00000	165690
7	-3.27778	3	3	50.00000	50.00000	165690
8	-3.88889	3	3	50.00000	50.00000	165690
9	-4.50000	3	3	50.00000	50.00000	165690
10	-4.91667	3	3	50.00000	50.00000	165690
11	-5.33333	3	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
14	-6.58333	3	3	50.00000	50.00000	165690
15	-7.16667	3	3	50.00000	50.00000	165690
16	-7.75000	3	3	50.00000	50.00000	165690
17	-8.33333	3	3	50.00000	50.00000	165690
18	-8.91667	3	3	50.00000	50.00000	165690
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

RESULTS FOR STAGE 1 : Pile installation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
On the LEFT: E at ground level = 21883. E at bottom node = 240740. kN/m²



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Node	Level	Soil	Boundary		EI below node
	[m]	Left Right	Left	Right	[kNm ² /m]

On the RIGHT: E at ground level = 21883. E at bottom node = 240740. kN/m²

Iter no.	Inc max displ	Node no.	Disp error.	Node no.	Press error.	Node no.
	[mm]		[mm]		[kN/m ²]	
1	0.0	1	0.0000	1	0.00	1
2	0.0	1	0.0000	1	0.00	1
3	0.0	1	0.0000	1	0.00	1

Ground level left = 0.00 Ground level right = 0.00

Pore Node Pt	Level [m]	Disp [mm]	Stress		Pt [kN/m ²]	Pore Pressure		Soil		Stress	
			Vt [kN/m ²]	Ve [kN/m ²]		Pe [kN/m ²]	Pressure [kN/m ²]	Left	Right	Vt [kN/m ²]	Ve [kN/m ²]
1	0.00000	0.00000	3.36111	3.36111	1.57972	1.57972	0.00000	1	1	3.36111	3.36111
2	-0.61111	0.00000	13.44444	13.44444	6.31889	6.31889	0.00000	1	1	13.44444	13.44444
3	-1.22222	0.00000	26.88889	26.88889	12.63778	12.63778	0.00000	1	1	26.88889	26.88889
4	-1.77778	0.00000	38.55556	38.55556	19.27778	19.27778	0.00000	2	2	38.55556	38.55556
5	-2.33333	0.00000	49.66667	49.66667	24.83333	24.83333	0.00000	2	2	49.66667	49.66667
6	-2.66667	0.00000	56.83334	56.83334	28.41667	28.41667	0.00000	3	3	56.83334	56.83334
7	-3.27778	0.00000	70.88889	70.88889	35.44444	35.44444	0.00000	3	3	70.88889	70.88889
8	-3.88889	0.00000	84.94444	84.94444	42.47222	42.47222	0.00000	3	3	84.94444	84.94444
9	-4.50000	0.00000	99.00000	99.00000	49.50000	49.50000	0.00000	3	3	99.00000	99.00000
10	-4.91667	0.00000	108.58333	108.58333	54.29166	54.29166	0.00000	3	3	108.58333	108.58333
11	-5.33333	0.00000	118.16667	118.16667	59.08334	59.08334	0.00000	3	3	118.16667	118.16667
12	-5.66667	0.00000	125.83333	125.83333	62.91666	62.91666	0.00000	3	3	125.83333	125.83333
13	-6.00000	0.00000	132.58960	132.58960	66.29480	66.29480	0.00000	3	3	132.58960	132.58960
14	-6.58333	0.00000	146.91667	141.19417	76.31959	70.59708	5.72250	3	3	146.91667	141.19417
15	-7.16667	0.00000	160.33333	148.88833	85.88916	74.44417	11.44500	3	3	160.33333	148.88833
16	-7.75000	0.00000	173.75000	156.58250	95.45875	78.29125	17.16750	3	3	173.75000	156.58250
17	-8.33333	0.00000	187.16666	164.27666	105.02833	82.13833	22.89000	3	3	187.16666	164.27666
18	-8.91667	0.00000	200.58334	171.97084	114.59792	85.98542	28.61250	3	3	200.58334	171.97084
19	-9.50000	0.00000	214.00000	179.66500	124.16750	89.83250	34.33500	3	3	214.00000	179.66500
20	-10.00000	0.00000	225.50000	186.26000	132.37000	93.13000	39.24000	3	3	225.50000	186.26000
21	-10.50000	0.00000	237.00000	192.85500	140.57250	96.42750	44.14500	3	3	237.00000	192.85500

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -9.50



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Stress						Pore						Stress					
Pore	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve	
Pt	Pe	Pressure	BM	SF													
EXTREME values so far																	
Displacements [mm] Moments [kNm/m] Shears [kN/m]																	
Min Max Min Max Min Max																	
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000																	
Surcharge 1 present in this stage																	

STAGE 2 : SOIL EXCAVATION

Geometry

Node	Level	Soil		Boundary		EI below node
	[m]	Left	Right	Left	Right	[kNm ² /m]
1	0.00000	0	1	50.00000	50.00000	165690
2	-0.61111	0	1	50.00000	50.00000	165690
3	-1.22222	0	1	50.00000	50.00000	165690
4	-1.77778	0	2	50.00000	50.00000	165690
5	-2.33333	0	2	50.00000	50.00000	165690
6	-2.66667	0	3	50.00000	50.00000	165690
7	-3.27778	0	3	50.00000	50.00000	165690
8	-3.88889	0	3	50.00000	50.00000	165690
9	-4.50000	0	3	50.00000	50.00000	165690
10	-4.91667	0	3	50.00000	50.00000	165690
11	-5.33333	0	3	50.00000	50.00000	165690
12	-5.66667	3	3	50.00000	50.00000	165690
13	-6.00000	3	3	50.00000	50.00000	165690
14	-6.58333	3	3	50.00000	50.00000	165690
15	-7.16667	3	3	50.00000	50.00000	165690
16	-7.75000	3	3	50.00000	50.00000	165690
17	-8.33333	3	3	50.00000	50.00000	165690
18	-8.91667	3	3	50.00000	50.00000	165690
* 19	-9.50000	3	3	50.00000	50.00000	0.0
20	-10.00000	3	3	50.00000	50.00000	0.0
21	-10.50000	3	3	50.00000	50.00000	0.0

* Wall toe level: -9.50

RESULTS FOR STAGE 2 : Soil Excavation (SLS)

Calculation details

E Profiles assumed for calculation (generated):
 On the LEFT: E at ground level = 150000. E at bottom node = 150000. kN/m²
 On the RIGHT: E at ground level = 21883. E at bottom node = 240740. kN/m²

Iter no.	Inc max	Node no.	Disp error.	Node no.	Press error.	Node no.
displ		[mm]		[kN/m ²]		
1	0.0	1	3.0820	1	10.28	12
2	3.1	1	0.4311	1	11.92	7
3	3.5	1	0.4167	1	83.50	12
4	3.9	1	0.3931	1	9.57	6
5	4.3	1	0.3775	1	10.68	6
10	6.1	1	0.3011	1	9.60	6
15	7.4	1	0.2399	1	7.25	8
20	8.5	1	0.1930	1	5.89	8
30	10.1	1	0.1274	1	3.91	10
40	11.2	1	0.0864	1	2.64	8
50	11.9	1	0.0583	1	1.78	8
60	12.4	1	0.0393	1	1.20	8
70	12.8	1	0.0268	1	0.86	10
80	13.0	1	0.0192	1	0.61	10
90	13.2	1	0.0136	1	0.43	10
100	13.3	1	0.0097	1	0.31	10
120	13.4	1	0.0049	1	0.15	10
133	13.5	1	0.0031	1	0.10	10

Ground level left = -5.50 Ground level right = 0.00



Lancaster Lane, Brockholes
305 x 305 x 283mm Bar 9.50m Length

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Iter Inc Node Disp Node Press Node
no. max no. error. no. error no.
displ
[mm] [mm] [kN/m²]

Stress			Pore			Stress			Pore			
Node	Level	Disp	Vt	Ve	Pt	Pe	Pressure	Soil	Vt	Ve		
Pt	Pe	Pressure	BM	SF				Left	Right			
[kN/m ²]	[kN/m ²]	[kN/m ²]	[kNm/m]	[kN/m]	[kN/m ²]	[kN/m ²]	[kN/m ²]			[kN/m ²]	[kN/m ²]	
1	0.00000	-13.48057	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	3.36111	3.36111
1.15814	1.15814	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	13.44444	13.44444
2	-0.61111	-12.08774	0.00000	0.00000	0.00000	0.00000	0.00000	0	1	a	26.88889	26.88889
4.67093	4.67093	0.00000	0.21626	-1.78111	0.00000	0.00000	0.00000	0	1	a	38.55556	38.55556
3	-1.22222	-10.69606	0.00000	0.00000	0.00000	0.00000	0.00000	0	2	a	49.66667	49.66667
9.35542	9.35542	0.00000	2.17691	-5.93700	0.00000	0.00000	0.00000	0	2	a	56.83334	56.83334
4	-1.77778	-9.43598	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	70.88889	70.88889
14.98640	14.98640	0.00000	6.99116	-12.82855	0.00000	0.00000	0.00000	0	3	a	84.94444	84.94444
5	-2.33333	-8.19035	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	99.00000	99.00000
19.31021	19.31021	0.00000	16.43085	-21.28260	0.00000	0.00000	0.00000	0	3	a	108.58333	108.58333
6	-2.66667	-7.45687	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	118.16667	118.16667
-0.08361	-0.08361	0.00000	24.95544	-25.55401	0.00000	0.00000	0.00000	0	3	a	125.83333	125.83333
7	-3.27778	-6.15972	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	132.58960	132.58960
-0.08433	-0.08433	0.00000	40.55971	-25.50851	0.00000	0.00000	0.00000	0	3	a	146.91667	146.91667
8	-3.88889	-4.95398	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	160.33333	160.33333
-0.09295	-0.09295	0.00000	56.13250	-25.45434	0.00000	0.00000	0.00000	0	3	a	173.75000	173.75000
9	-4.50000	-3.87474	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	187.16666	187.16666
-0.08599	-0.08599	0.00000	71.67057	-25.40384	0.00000	0.00000	0.00000	0	3	a	200.58334	200.58334
10	-4.91667	-3.22939	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	214.00000	214.00000
-0.09547	-0.09547	0.00000	82.24630	-25.36185	0.00000	0.00000	0.00000	0	3	a	225.50000	225.50000
11	-5.33333	-2.67021	0.00000	0.00000	0.00000	0.00000	0.00000	0	3	a	237.00000	237.00000
-0.07973	-0.07973	0.00000	92.80545	-25.32702	0.00000	0.00000	0.00000	0	3	a		
12	-5.66667	-2.29235	3.83333	3.83333	152.80388	152.80388	0.00000	3	3	a		
-0.07490	-0.07490	0.00000	101.24280	0.16773	0.00000	0.00000	0.00000	3	3	a		
13	-6.00000	-1.98048	10.58960	10.58960	56.18940	56.18940	0.00000	3	3	a		
-0.05767	-0.05767	0.00000	92.69362	38.53747	0.00000	0.00000	0.00000	3	3	a		
14	-6.58333	-1.57569	24.91667	19.19417	39.19401	33.47151	5.72250	3	3	a		
42.24861	36.52611	5.72250	62.69428	50.53651	0.00000	0.00000	0.00000	3	3	a		
15	-7.16667	-1.30001	38.33333	26.88833	37.46443	26.01943	11.44500	3	3	a		
62.78674	51.34174	11.44500	33.73438	42.25991	0.00000	0.00000	0.00000	3	3	a		
16	-7.75000	-1.09656	51.75000	34.58250	45.94217	28.77467	17.16750	3	3	a		
72.00567	54.83817	17.16750	13.39107	27.27238	0.00000	0.00000	0.00000	3	3	a		
17	-8.33333	-0.92365	65.16666	42.27666	56.80534	33.91534	22.89000	3	3	a		
79.15566	56.26566	22.89000	1.91660	13.15169	0.00000	0.00000	0.00000	3	3	a		
18	-8.91667	-0.75727	78.58334	49.97084	68.69976	40.08725	28.61250	3	3	a		
85.80849	57.19598	28.61250	-1.95256	1.64279	0.00000	0.00000	0.00000	3	3	a		
*19	-9.50000	-0.58888	92.00000	57.66500	89.70548	55.37048	34.33500	3	3	a		
83.52594	49.19094	34.33500	-0.00000	0.00000	0.00000	0.00000	0.00000	3	3	a		
20	-10.00000	-0.34583	103.50000	64.26000	94.10248	54.86248	39.24000	3	3	a		
94.10248	54.86248	39.24000	-0.00000	0.00000	0.00000	0.00000	0.00000	3	3	a		
21	-10.50000	0.00000	115.00000	70.85500	103.16276	59.01776	44.14500	3	3	a		
103.16276	59.01776	44.14500	-0.00000	0.00000	0.00000	0.00000	0.00000	3	3	a		

Vt, Ve : vertical total and effective stress
Pt, Pe : horizontal total and effective stress

* Wall toe level: -9.50

EXTREME values so far

Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
Min	Max	Min	Max	Min	Max
-13.48057	0.00000	-1.95256	101.24280	-25.55401	50.53650

Surcharge 1 present in this stage

Results Envelope

Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
1	0.00000	-13.48057	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.61111	-12.08774	0.00000	0.00000	0.21626	-1.78111	0.00000



Lancaster Lane, Brockholes
305 x 305 x 283mm Bar 9.50m Length

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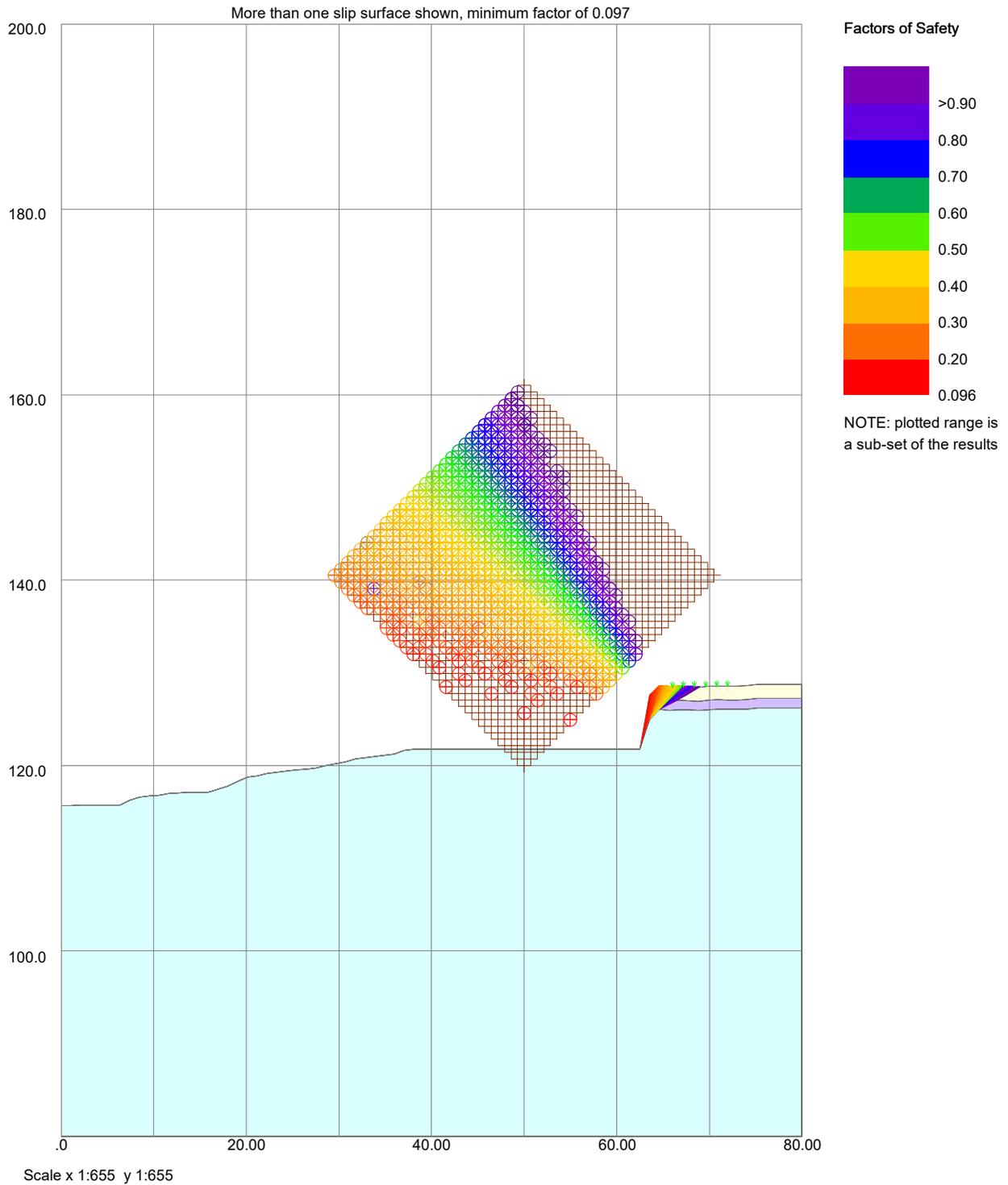
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PW 11-Mar-2024

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Node	Level [m]	Displacements [mm]		Moments [kNm/m]		Shears [kN/m]	
		Min	Max	Min	Max	Min	Max
3	-1.22222	-10.69606	0.00000	0.00000	2.17691	-5.93700	0.00000
4	-1.77778	-9.43598	0.00000	0.00000	6.99116	-12.82855	0.00000
5	-2.33333	-8.19035	0.00000	0.00000	16.43085	-21.28260	0.00000
6	-2.66667	-7.45687	0.00000	0.00000	24.95544	-25.55401	0.00000
7	-3.27778	-6.15972	0.00000	0.00000	40.55971	-25.50851	0.00000
8	-3.88889	-4.95398	0.00000	0.00000	56.13250	-25.45434	0.00000
9	-4.50000	-3.87474	0.00000	0.00000	71.67057	-25.40384	0.00000
10	-4.91667	-3.22939	0.00000	0.00000	82.24630	-25.36185	0.00000
11	-5.33333	-2.67021	0.00000	0.00000	92.80545	-25.32702	0.00000
12	-5.66667	-2.29235	0.00000	0.00000	101.24280	0.00000	0.16773
13	-6.00000	-1.98048	0.00000	0.00000	92.69362	0.00000	38.53747
14	-6.58333	-1.57569	0.00000	0.00000	62.69428	0.00000	50.53650
15	-7.16667	-1.30001	0.00000	0.00000	33.73438	0.00000	42.25991
16	-7.75000	-1.09656	0.00000	0.00000	13.39107	0.00000	27.27238
17	-8.33333	-0.92365	0.00000	0.00000	1.91660	0.00000	13.15169
18	-8.91667	-0.75727	0.00000	-1.95256	0.00000	0.00000	1.64279
19	-9.50000	-0.58888	0.00000	-0.00000	0.00000	0.00000	0.00000
20	-10.00000	-0.34583	0.00000	-0.00000	0.00000	0.00000	0.00000
21	-10.50000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000

APPENDIX C – OAYSIS SLOPE OUTPUT SHEETS



Job No.	Sheet No.	Rev.
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Method Partial Factors

Current selection: BS EN 1997-1:2011 DA1-2
 Factor on FAVOURABLE PERMANENT LOAD: 1.00000
 Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000
 Factor on FAVOURABLE VARIABLE LOAD: 0.00000
 Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000
 Factor on SOIL UNIT WEIGHT: 1.00000
 Factor on DRAINED SOIL COHESION: 1.25000
 Factor on UNDRAINED SOIL COHESION: 1.40000
 Factor on SOIL FRICTION ANGLE: 1.25000
 Factor on reinforcement pullout: 1.50000
 Economic ramification of failure: 1.00000
 Sliding along reinforcement: 1.50000

Material properties

No	Description	Unit Weight		Shear Strength Parameters Condition	Phi or c
		Above GWL	Below GWL		
	or c0'				
		[kN/m ³]	[kN/m ³]		Phi0 [°]
	[kN/m ²]				
1	CLAY	22.000	22.000	Drained - linear strength	32.000
0.0					
2	SAND	20.000	20.000	Drained - linear strength	30.000
0.0					
3	MUDSTONE	23.000	23.000	Drained - linear strength	30.000
100.00					

Coordinates of top of soil strata

The units of the following coordinates are in m

Stratum X -->	0.0	1.0587	2.1174	3.1761	4.2349	5.2936	6.3523
1	115.66	115.68	115.71	115.73	115.72	115.73	115.73
2	115.66	115.68	115.71	115.73	115.72	115.73	115.73
3	115.66	115.68	115.71	115.73	115.72	115.73	115.73
Stratum X -->	7.4110	8.4697	9.5284	10.587	11.646	12.705	13.763
1	116.24	116.56	116.68	116.76	116.94	117.01	117.07
2	116.24	116.56	116.68	116.76	116.94	117.01	117.07
3	116.24	116.56	116.68	116.76	116.94	117.01	117.07
Stratum X -->	14.822	15.881	16.939	17.998	19.057	20.116	21.174
1	117.10	117.07	117.42	117.77	118.25	118.72	118.88
2	117.10	117.07	117.42	117.77	118.25	118.72	118.88
3	117.10	117.07	117.42	117.77	118.25	118.72	118.88
Stratum X -->	22.233	23.292	24.350	25.409	26.468	27.527	28.585
1	119.11	119.26	119.37	119.50	119.60	119.74	120.00
2	119.11	119.26	119.37	119.50	119.60	119.74	120.00
3	119.11	119.26	119.37	119.50	119.60	119.74	120.00
Stratum X -->	29.644	30.703	31.761	32.820	33.879	34.938	35.996
1	120.20	120.40	120.68	120.82	120.93	121.09	121.24
2	120.20	120.40	120.68	120.82	120.93	121.09	121.24
3	120.20	120.40	120.68	120.82	120.93	121.09	121.24
Stratum X -->	37.055	38.114	39.172	40.231	41.290	42.349	43.407
1	121.59	121.73	121.73	121.73	121.73	121.73	121.73
2	121.59	121.73	121.73	121.73	121.73	121.73	121.73
3	121.59	121.73	121.73	121.73	121.73	121.73	121.73
Stratum X -->	44.466	45.525	46.583	47.642	48.701	49.760	50.818
1	121.73	121.73	121.73	121.73	121.73	121.73	121.73
2	121.73	121.73	121.73	121.73	121.73	121.73	121.73
3	121.73	121.73	121.73	121.73	121.73	121.73	121.73
Stratum X -->	51.877	52.936	53.994	55.053	56.112	57.171	58.229
1	121.73	121.73	121.73	121.73	121.73	121.73	121.73
2	121.73	121.73	121.73	121.73	121.73	121.73	121.73
3	121.73	121.73	121.73	121.73	121.73	121.73	121.73
Stratum X -->	59.288	60.347	61.405	62.464	63.523	64.582	65.640
1	121.73	121.73	121.73	121.73	127.49	128.58	128.42
2	121.73	121.73	121.73	121.73	125.99	127.08	126.92

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Stratum X -->							
3	50.380 121.73	60.347 121.73	61.405 121.73	62.464 121.73	63.523 124.99	64.582 126.08	65.640 125.92
Stratum X -->							
66.699	67.758	68.816	69.875	70.934	71.993	73.051	
1	128.52	128.48	128.45	128.53	128.59	128.54	128.55
2	127.02	126.98	126.95	127.03	127.09	127.04	127.05
3	126.02	125.98	125.95	126.03	126.09	126.04	126.05
Stratum X -->							
74.110	75.169	75.169					
1	128.60	128.73	128.73				
2	127.10	127.23	127.23				
3	126.10	126.23	126.23				

Stratum-linked data

No.	Material	Water table	Piezo Set/ Ru value
1	CLAY		- -
2	SAND		- -
3	MUDSTONE		- -

Surface Loads

No.	Limits of loaded area	Distributed load	Permanent / Variable load	Favourable / UnFavourable	Use in pull-out calc
	X1 [m]	X2 [m]	Vert [kN/m ²]	Horiz [kN/m ²]	
1	66.000	72.000	20.000	0.0	Permanent UnFavourable No

Slip Surface Specification

Circle centre specification: GRID
 Bottom left of grid: x = 50.00000 m y = 120.00000 m
 Inclination of grid: 45.00000 deg
 (positive anticlockwise direction about bottom left of grid)
 Centres on grid: 30 in x direction at 1.00000m spacing
 30 in y direction at 1.00000m spacing
 Initial radius of circle 1.00000 m
 Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (45.050m,126.36m) Radius 18.000m
 Iterations: 5 Horiz acceleration [%g]: 0.0
 Net vertical force [kN/m]: -15.474E-6 Slip weight [kN/m] 1.1589
 Net horiz force [kN/m]: -2.8468E-6 Disturbing moment [kN/m]: 20.491
 Restoring moment [kNm/m]: 1.9715
 Reinf.Rest.Moment [kNm/m]: 0.0
 Over-Design Factor: 0.096212

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

Point	Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
	x [m]	y [m]	L [kN/m ²]	R [kN/m ²]	T	E	E (u)
1	62.515	122.01	-	0.0	0.0	0.0	0.0
2	62.519	122.02	0.0	0.0	306.62E-6	29.382E-6	0.0
3	62.523	122.04	0.0	0.0	738.72E-6	89.717E-6	0.0
4	62.527	122.06	0.0	0.0	0.0012898	179.27E-6	0.0
5	62.531	122.07	0.0	0.0	0.0019533	296.08E-6	0.0
6	62.535	122.09	0.0	0.0	0.0027231	438.54E-6	0.0
7	62.539	122.10	0.0	0.0	0.0035899	604.06E-6	0.0
8	62.543	122.12	0.0	0.0	0.0045499	791.71E-6	0.0
9	62.546	122.13	0.0	0.0	0.0055948	998.99E-6	0.0
10	62.550	122.15	0.0	0.0	0.0067208	0.0012252	0.0
11	62.554	122.17	0.0	0.0	0.0079202	0.0014681	0.0
12	62.558	122.18	0.0	0.0	0.0091870	0.0017261	0.0
13	62.561	122.20	0.0	0.0	0.010519	0.0019985	0.0
14	62.565	122.21	0.0	0.0	0.011905	0.0022828	0.0
15	62.569	122.23	0.0	0.0	0.013343	0.0025782	0.0
16	62.573	122.25	0.0	0.0	0.014828	0.0028836	0.0
17	62.576	122.26	0.0	0.0	0.016355	0.0031977	0.0
18	62.580	122.28	0.0	0.0	0.017920	0.0035192	0.0
19	62.584	122.29	0.0	0.0	0.019513	0.0038460	0.0
20	62.587	122.31	0.0	0.0	0.021134	0.0041779	0.0
21	62.591	122.32	0.0	0.0	0.022776	0.0045132	0.0
22	62.595	122.34	0.0	0.0	0.024437	0.0048515	0.0
23	62.598	122.36	0.0	0.0	0.026114	0.0051924	0.0



GROUNDSOLVE LTD

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Section F-F

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Slip surface	coordinates	Pore Pressure	Interslice forces [kN/m]
24	62.602	122.37	0.0 0.0 0.027797 0.0055331 0.0
25	62.605	122.39	0.0 0.0 0.029485 0.0058733 0.0
26	62.609	122.40	0.0 0.0 0.031178 0.0062133 0.0
27	62.613	122.42	0.0 0.0 0.032868 0.0065511 0.0
28	62.616	122.43	0.0 0.0 0.034550 0.0068858 0.0
29	62.620	122.45	0.0 0.0 0.036226 0.0072180 0.0
30	62.623	122.47	0.0 0.0 0.037888 0.0075457 0.0
31	62.627	122.48	0.0 0.0 0.039534 0.0078681 0.0
32	62.630	122.50	0.0 0.0 0.041162 0.0081852 0.0
33	62.634	122.51	0.0 0.0 0.042766 0.0084958 0.0
34	62.637	122.53	0.0 0.0 0.044347 0.0088000 0.0
35	62.640	122.54	0.0 0.0 0.045899 0.0090965 0.0
36	62.644	122.56	0.0 0.0 0.047422 0.0093856 0.0
37	62.647	122.58	0.0 0.0 0.048911 0.0096659 0.0
38	62.651	122.59	0.0 0.0 0.050365 0.0099377 0.0
39	62.654	122.61	0.0 0.0 0.051788 0.010202 0.0
40	62.657	122.62	0.0 0.0 0.053166 0.010455 0.0
41	62.661	122.64	0.0 0.0 0.054500 0.010697 0.0
42	62.664	122.66	0.0 0.0 0.055793 0.010930 0.0
43	62.667	122.67	0.0 0.0 0.057042 0.011153 0.0
44	62.671	122.69	0.0 0.0 0.058243 0.011364 0.0
45	62.674	122.70	0.0 0.0 0.059395 0.011565 0.0
46	62.677	122.72	0.0 0.0 0.060499 0.011755 0.0
47	62.681	122.74	0.0 0.0 0.061550 0.011933 0.0
48	62.684	122.75	0.0 0.0 0.062550 0.012099 0.0
49	62.687	122.77	0.0 0.0 0.063494 0.012253 0.0
50	62.690	122.78	0.0 0.0 0.064381 0.012395 0.0
51	62.694	122.80	0.0 0.0 0.065216 0.012526 0.0
52	62.697	122.81	0.0 0.0 0.065986 0.012644 0.0
53	62.700	122.83	0.0 0.0 0.066711 0.012751 0.0
54	62.703	122.85	0.0 0.0 0.067371 0.012845 0.0
55	62.706	122.86	0.0 0.0 0.067970 0.012927 0.0
56	62.709	122.88	0.0 0.0 0.068505 0.012995 0.0
57	62.713	122.89	0.0 0.0 0.068991 0.013054 0.0
58	62.716	122.91	0.0 0.0 0.069408 0.013098 0.0
59	62.719	122.93	0.0 0.0 0.069769 0.013132 0.0
60	62.722	122.94	0.0 0.0 0.070064 0.013152 0.0
61	62.725	122.96	0.0 0.0 0.070309 0.013163 0.0
62	62.728	122.97	0.0 0.0 0.070486 0.013161 0.0
63	62.731	122.99	0.0 0.0 0.070599 0.013146 0.0
64	62.734	123.00	0.0 0.0 0.070654 0.013121 0.0
65	62.737	123.02	0.0 0.0 0.070653 0.013085 0.0
66	62.740	123.04	0.0 0.0 0.070584 0.013036 0.0
67	62.743	123.05	0.0 0.0 0.070459 0.012977 0.0
68	62.746	123.07	0.0 0.0 0.070277 0.012908 0.0
69	62.749	123.08	0.0 0.0 0.070035 0.012828 0.0
70	62.752	123.10	0.0 0.0 0.069733 0.012737 0.0
71	62.755	123.12	0.0 0.0 0.069376 0.012637 0.0
72	62.758	123.13	0.0 0.0 0.068962 0.012526 0.0
73	62.761	123.15	0.0 0.0 0.068489 0.012406 0.0
74	62.764	123.16	0.0 0.0 0.067965 0.012277 0.0
75	62.766	123.18	0.0 0.0 0.067389 0.012139 0.0
76	62.769	123.20	0.0 0.0 0.066754 0.011991 0.0
77	62.772	123.21	0.0 0.0 0.066073 0.011836 0.0
78	62.775	123.23	0.0 0.0 0.065340 0.011672 0.0
79	62.778	123.24	0.0 0.0 0.064559 0.011501 0.0
80	62.781	123.26	0.0 0.0 0.063729 0.011322 0.0
81	62.783	123.28	0.0 0.0 0.062854 0.011136 0.0
82	62.786	123.29	0.0 0.0 0.061932 0.010944 0.0
83	62.789	123.31	0.0 0.0 0.060968 0.010744 0.0
84	62.792	123.32	0.0 0.0 0.059960 0.010539 0.0
85	62.794	123.34	0.0 0.0 0.058912 0.010327 0.0
86	62.797	123.36	0.0 0.0 0.057825 0.010110 0.0
87	62.800	123.37	0.0 0.0 0.056701 0.009888 0.0
88	62.802	123.39	0.0 0.0 0.055540 0.009661 0.0
89	62.805	123.40	0.0 0.0 0.054347 0.009430 0.0
90	62.808	123.42	0.0 0.0 0.053121 0.009194 0.0
91	62.810	123.44	0.0 0.0 0.051867 0.008956 0.0
92	62.813	123.45	0.0 0.0 0.050584 0.008714 0.0
93	62.816	123.47	0.0 0.0 0.049274 0.008468 0.0
94	62.818	123.48	0.0 0.0 0.047938 0.008221 0.0
95	62.821	123.50	0.0 0.0 0.046583 0.007971 0.0
96	62.823	123.52	0.0 0.0 0.045205 0.007719 0.0
97	62.826	123.53	0.0 0.0 0.043815 0.007467 0.0
98	62.828	123.55	0.0 0.0 0.042402 0.007212 0.0
99	62.831	123.56	0.0 0.0 0.040977 0.006957 0.0
100	62.834	123.58	0.0 0.0 0.039541 0.006702 0.0
101	62.836	123.60	0.0 0.0 0.038092 0.006446 0.0
102	62.838	123.61	0.0 0.0 0.036644 0.006192 0.0



Job No.	Sheet No.	Rev.
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Slip surface coordinates		Pore Pressure	Interslice forces [kN/m]				
X [m]	Z [m]	[kN/m ²]	Normal	Shear	Factor		
103	62.841	123.63	0.0	0.0	0.035184	0.0059380	0.0
104	62.843	123.64	0.0	0.0	0.033725	0.0056852	0.0
105	62.846	123.66	0.0	0.0	0.032265	0.0054338	0.0
106	62.848	123.68	0.0	0.0	0.030807	0.0051842	0.0
107	62.851	123.69	0.0	0.0	0.029354	0.0049368	0.0
108	62.853	123.71	0.0	0.0	0.027909	0.0046921	0.0
109	62.855	123.72	0.0	0.0	0.026469	0.0044500	0.0
110	62.858	123.74	0.0	0.0	0.025045	0.0042114	0.0
111	62.860	123.76	0.0	0.0	0.023632	0.0039760	0.0
112	62.863	123.77	0.0	0.0	0.022237	0.0037447	0.0
113	62.865	123.79	0.0	0.0	0.020863	0.0035178	0.0
114	62.867	123.80	0.0	0.0	0.019506	0.0032950	0.0
115	62.869	123.82	0.0	0.0	0.018175	0.0030772	0.0
116	62.872	123.84	0.0	0.0	0.016872	0.0028648	0.0
117	62.874	123.85	0.0	0.0	0.015599	0.0026580	0.0
118	62.876	123.87	0.0	0.0	0.014355	0.0024567	0.0
119	62.878	123.88	0.0	0.0	0.013144	0.0022613	0.0
120	62.881	123.90	0.0	0.0	0.011973	0.0020726	0.0
121	62.883	123.92	0.0	0.0	0.010840	0.0018904	0.0
122	62.885	123.93	0.0	0.0	0.0097480	0.0017152	0.0
123	62.887	123.95	0.0	0.0	0.0086976	0.0015468	0.0
124	62.889	123.96	0.0	0.0	0.0076963	0.0013860	0.0
125	62.892	123.98	0.0	0.0	0.0067437	0.0012329	0.0
126	62.894	124.00	0.0	0.0	0.0058435	0.0010879	0.0
127	62.896	124.01	0.0	0.0	0.0049981	951.05E-6	0.0
128	62.898	124.03	0.0	0.0	0.0042088	822.58E-6	0.0
129	62.900	124.04	0.0	0.0	0.0034761	702.30E-6	0.0
130	62.902	124.06	0.0	0.0	0.0028075	591.28E-6	0.0
131	62.904	124.08	0.0	0.0	0.0022007	488.91E-6	0.0
132	62.906	124.09	0.0	0.0	0.0016613	395.95E-6	0.0
133	62.908	124.11	0.0	0.0	0.0011900	312.25E-6	0.0
134	62.910	124.12	0.0	0.0	789.90E-6	238.13E-6	0.0
135	62.912	124.14	0.0	0.0	464.00E-6	173.80E-6	0.0
136	62.914	124.16	0.0	0.0	213.26E-6	119.24E-6	0.0
137	62.916	124.17	0.0	0.0	41.173E-6	74.821E-6	0.0
138	62.918	124.19	0.0	0.0	-50.912E-6	40.480E-6	0.0
139	62.920	124.20	0.0	0.0	-60.208E-6	16.449E-6	0.0
140	62.922	124.22	0.0	-	15.474E-6	2.8468E-6	0.0

Slice No.	Strength Parameters		Average Pore Pressure [kN/m ²]	Slice Weight [kN/m]	Forces on base [kN/m]		
	c' [kN/m ²]	Tan phi			Normal	Shear (capacity)	Shear (mobilised)
1	0.0	0.49990	0.0	238.89E-6	103.24E-6	51.609E-6	536.41E-6
2	0.0	0.49990	0.0	709.95E-6	216.14E-6	108.05E-6	0.0011230
3	0.0	0.49990	0.0	0.0011702	325.75E-6	162.84E-6	0.0016925
4	0.0	0.49990	0.0	0.0016218	432.47E-6	216.19E-6	0.0022470
5	0.0	0.49990	0.0	0.0020623	535.91E-6	267.90E-6	0.0027844
6	0.0	0.49990	0.0	0.0024921	635.59E-6	317.73E-6	0.0033023
7	0.0	0.49990	0.0	0.0029114	732.55E-6	366.20E-6	0.0038061
8	0.0	0.49990	0.0	0.0033239	826.60E-6	413.21E-6	0.0042948
9	0.0	0.49990	0.0	0.0037234	917.53E-6	458.67E-6	0.0047672
10	0.0	0.49990	0.0	0.0041133	0.0010051	502.46E-6	0.0052224
11	0.0	0.49990	0.0	0.0044929	0.0010896	544.71E-6	0.0056615
12	0.0	0.49990	0.0	0.0048726	0.0011737	586.72E-6	0.0060982
13	0.0	0.49990	0.0	0.0052285	0.0012513	625.50E-6	0.0065012
14	0.0	0.49990	0.0	0.0055850	0.0013286	664.14E-6	0.0069029
15	0.0	0.49990	0.0	0.0059205	0.0014008	700.26E-6	0.0072782
16	0.0	0.49990	0.0	0.0062590	0.0014728	736.23E-6	0.0076522
17	0.0	0.49990	0.0	0.0065887	0.0015422	770.93E-6	0.0080128
18	0.0	0.49990	0.0	0.0068952	0.0016054	802.54E-6	0.0083414
19	0.0	0.49990	0.0	0.0072064	0.0016695	834.57E-6	0.0086743
20	0.0	0.49990	0.0	0.0075013	0.0017292	864.41E-6	0.0089844
21	0.0	0.49990	0.0	0.0077956	0.0017884	894.00E-6	0.0092919
22	0.0	0.49990	0.0	0.0080732	0.0018440	921.80E-6	0.0095809
23	0.0	0.49990	0.0	0.0083328	0.0018941	946.84E-6	0.0098411
24	0.0	0.49990	0.0	0.0086100	0.0019474	973.47E-6	0.010118
25	0.0	0.49990	0.0	0.0088607	0.0019956	997.61E-6	0.010369
26	0.0	0.49990	0.0	0.0091027	0.0020407	0.0010201	0.010603
27	0.0	0.49990	0.0	0.0093361	0.0020834	0.0010415	0.010825
28	0.0	0.49990	0.0	0.0095612	0.0021248	0.0010622	0.011040
29	0.0	0.49990	0.0	0.0097778	0.0021630	0.0010813	0.011239
30	0.0	0.49990	0.0	0.010008	0.0022033	0.0011014	0.011448
31	0.0	0.49990	0.0	0.010197	0.0022355	0.0011175	0.011615
32	0.0	0.49990	0.0	0.010388	0.0022672	0.0011334	0.011780



GROUNDSOLVE LTD

Lancaster Lane, Brockholes
Section F-F

Job No.	Sheet No.	Rev.
3067		
Drg. Ref.		
Made by PW	Date	Checked

Slice No.	Strength	Parameters	Average	Slice	Forces on base [kN/m]		
33	0.0	0.49990	0.0	0.010583	0.0022997	0.0011496	0.011949
34	0.0	0.49990	0.0	0.010759	0.0023273	0.0011634	0.012092
35	0.0	0.49990	0.0	0.010938	0.0023559	0.0011777	0.012240
36	0.0	0.49990	0.0	0.011098	0.0023796	0.0011895	0.012364
37	0.0	0.49990	0.0	0.011238	0.0023993	0.0011994	0.012466
38	0.0	0.49990	0.0	0.011407	0.0024253	0.0012124	0.012601
39	0.0	0.49990	0.0	0.011531	0.0024402	0.0012198	0.012679
40	0.0	0.49990	0.0	0.011660	0.0024563	0.0012279	0.012762
41	0.0	0.49990	0.0	0.011794	0.0024738	0.0012366	0.012853
42	0.0	0.49990	0.0	0.011922	0.0024897	0.0012446	0.012936
43	0.0	0.49990	0.0	0.012029	0.0025006	0.0012500	0.012992
44	0.0	0.49990	0.0	0.012114	0.0025076	0.0012535	0.013029
45	0.0	0.49990	0.0	0.012220	0.0025185	0.0012590	0.013086
46	0.0	0.49990	0.0	0.012305	0.0025245	0.0012620	0.013117
47	0.0	0.49990	0.0	0.012398	0.0025323	0.0012659	0.013157
48	0.0	0.49990	0.0	0.012469	0.0025352	0.0012673	0.013172
49	0.0	0.49990	0.0	0.012533	0.0025365	0.0012680	0.013179
50	0.0	0.49990	0.0	0.012590	0.0025375	0.0012685	0.013184
51	0.0	0.49990	0.0	0.012641	0.0025347	0.0012671	0.013170
52	0.0	0.49990	0.0	0.012715	0.0025401	0.0012698	0.013198
53	0.0	0.49990	0.0	0.012738	0.0025322	0.0012658	0.013157
54	0.0	0.49990	0.0	0.012768	0.0025264	0.0012629	0.013127
55	0.0	0.49990	0.0	0.012808	0.0025219	0.0012607	0.013103
56	0.0	0.49990	0.0	0.012826	0.0025159	0.0012577	0.013072
57	0.0	0.49990	0.0	0.012838	0.0025052	0.0012523	0.013016
58	0.0	0.49990	0.0	0.012844	0.0024956	0.0012475	0.012966
59	0.0	0.49990	0.0	0.012859	0.0024862	0.0012428	0.012918
60	0.0	0.49990	0.0	0.012852	0.0024754	0.0012374	0.012861
61	0.0	0.49990	0.0	0.012840	0.0024601	0.0012298	0.012782
62	0.0	0.49990	0.0	0.012822	0.0024448	0.0012221	0.012703
63	0.0	0.49990	0.0	0.012814	0.0024321	0.0012158	0.012637
64	0.0	0.49990	0.0	0.012784	0.0024158	0.0012077	0.012552
65	0.0	0.49990	0.0	0.012748	0.0023963	0.0011979	0.012451
66	0.0	0.49990	0.0	0.012707	0.0023780	0.0011888	0.012356
67	0.0	0.49990	0.0	0.012677	0.0023615	0.0011805	0.012270
68	0.0	0.49990	0.0	0.012625	0.0023403	0.0011699	0.012160
69	0.0	0.49990	0.0	0.012568	0.0023182	0.0011589	0.012045
70	0.0	0.49990	0.0	0.012521	0.0022990	0.0011492	0.011945
71	0.0	0.49990	0.0	0.012437	0.0022725	0.0011360	0.011807
72	0.0	0.49990	0.0	0.012380	0.0022506	0.0011250	0.011693
73	0.0	0.49990	0.0	0.012302	0.0022262	0.0011129	0.011567
74	0.0	0.49990	0.0	0.012236	0.0022038	0.0011017	0.011450
75	0.0	0.49990	0.0	0.012148	0.0021760	0.0010878	0.011306
76	0.0	0.49990	0.0	0.012039	0.0021468	0.0010732	0.011154
77	0.0	0.49990	0.0	0.011974	0.0021249	0.0010622	0.011041
78	0.0	0.49990	0.0	0.011856	0.0020934	0.0010465	0.010877
79	0.0	0.49990	0.0	0.011750	0.0020640	0.0010318	0.010724
80	0.0	0.49990	0.0	0.011655	0.0020376	0.0010186	0.010587
81	0.0	0.49990	0.0	0.011540	0.0020070	0.0010033	0.010428
82	0.0	0.49990	0.0	0.011436	0.0019795	989.52E-6	0.010285
83	0.0	0.49990	0.0	0.011312	0.0019478	973.72E-6	0.010120
84	0.0	0.49990	0.0	0.011168	0.0019131	956.35E-6	0.0099400
85	0.0	0.49990	0.0	0.011067	0.0018866	943.11E-6	0.0098023
86	0.0	0.49990	0.0	0.010915	0.0018510	925.31E-6	0.0096173
87	0.0	0.49990	0.0	0.010775	0.0018176	908.60E-6	0.0094437
88	0.0	0.49990	0.0	0.010647	0.0017872	893.40E-6	0.0092857
89	0.0	0.49990	0.0	0.010499	0.0017530	876.29E-6	0.0091079
90	0.0	0.49990	0.0	0.010347	0.0017192	859.44E-6	0.0089327
91	0.0	0.49990	0.0	0.010192	0.0016844	842.03E-6	0.0087518
92	0.0	0.49990	0.0	0.010063	0.0016549	827.30E-6	0.0085986
93	0.0	0.49990	0.0	0.0098715	0.0016139	806.77E-6	0.0083853
94	0.0	0.49990	0.0	0.0097350	0.0015845	792.09E-6	0.0082327
95	0.0	0.49990	0.0	0.0095518	0.0015455	772.58E-6	0.0080300
96	0.0	0.49990	0.0	0.0093798	0.0015108	755.23E-6	0.0078496
97	0.0	0.49990	0.0	0.0092188	0.0014762	737.92E-6	0.0076697
98	0.0	0.49990	0.0	0.0090541	0.0014426	721.17E-6	0.0074955
99	0.0	0.49990	0.0	0.0088592	0.0014037	701.72E-6	0.0072934
100	0.0	0.49990	0.0	0.0086882	0.0013692	684.45E-6	0.0071140
101	0.0	0.49990	0.0	0.0084881	0.0013314	665.55E-6	0.0069175
102	0.0	0.49990	0.0	0.0083242	0.0012982	648.95E-6	0.0067449
103	0.0	0.49990	0.0	0.0081188	0.0012596	629.65E-6	0.0065444
104	0.0	0.49990	0.0	0.0079236	0.0012225	611.12E-6	0.0063518
105	0.0	0.49990	0.0	0.0077382	0.0011880	593.87E-6	0.0061725
106	0.0	0.49990	0.0	0.0075382	0.0011509	575.33E-6	0.0059798



Job No.	Sheet No.	Rev.
3067		
Drg. Ref.		
Made by PW	Date	Checked

Slice No.	Strength	Parameters	Average	Slice	Forces on base [kN/m]		
107	0.0	0.49990	0.0	0.0073359	0.0011143	557.05E-6	0.0057898
108	0.0	0.49990	0.0	0.0071311	0.0010768	538.27E-6	0.0055946
109	0.0	0.49990	0.0	0.0069354	0.0010426	521.17E-6	0.0054169
110	0.0	0.49990	0.0	0.0067262	0.0010051	502.45E-6	0.0052223
111	0.0	0.49990	0.0	0.0065148	968.63E-6	484.21E-6	0.0050328
112	0.0	0.49990	0.0	0.0063017	932.26E-6	466.03E-6	0.0048438
113	0.0	0.49990	0.0	0.0060968	896.85E-6	448.33E-6	0.0046598
114	0.0	0.49990	0.0	0.0058795	860.63E-6	430.22E-6	0.0044716
115	0.0	0.49990	0.0	0.0056606	824.56E-6	412.19E-6	0.0042842
116	0.0	0.49990	0.0	0.0054406	788.69E-6	394.26E-6	0.0040978
117	0.0	0.49990	0.0	0.0052189	752.28E-6	376.06E-6	0.0039086
118	0.0	0.49990	0.0	0.0050038	717.79E-6	358.82E-6	0.0037294
119	0.0	0.49990	0.0	0.0047790	682.73E-6	341.29E-6	0.0035473
120	0.0	0.49990	0.0	0.0045531	647.29E-6	323.58E-6	0.0033631
121	0.0	0.49990	0.0	0.0043256	612.05E-6	305.96E-6	0.0031801
122	0.0	0.49990	0.0	0.0041037	577.96E-6	288.92E-6	0.0030029
123	0.0	0.49990	0.0	0.0038736	543.70E-6	271.79E-6	0.0028249
124	0.0	0.49990	0.0	0.0036426	509.24E-6	254.56E-6	0.0026459
125	0.0	0.49990	0.0	0.0034108	475.30E-6	237.60E-6	0.0024695
126	0.0	0.49990	0.0	0.0031784	441.68E-6	220.79E-6	0.0022948
127	0.0	0.49990	0.0	0.0029452	408.18E-6	204.05E-6	0.0021208
128	0.0	0.49990	0.0	0.0027209	376.47E-6	188.19E-6	0.0019560
129	0.0	0.49990	0.0	0.0024765	342.33E-6	171.13E-6	0.0017787
130	0.0	0.49990	0.0	0.0022498	311.14E-6	155.54E-6	0.0016166
131	0.0	0.49990	0.0	0.0020095	278.41E-6	139.17E-6	0.0014465
132	0.0	0.49990	0.0	0.0017766	247.22E-6	123.58E-6	0.0012845
133	0.0	0.49990	0.0	0.0015395	215.79E-6	107.87E-6	0.0011212
134	0.0	0.49990	0.0	0.0013024	184.95E-6	92.457E-6	960.96E-6
135	0.0	0.49990	0.0	0.0010672	154.66E-6	77.315E-6	803.59E-6
136	0.0	0.49990	0.0	828.17E-6	124.29E-6	62.130E-6	645.76E-6
137	0.0	0.49990	0.0	592.39E-6	94.783E-6	47.381E-6	492.47E-6
138	0.0	0.49990	0.0	354.67E-6	65.437E-6	32.712E-6	339.99E-6
139	0.0	0.49990	0.0	117.68E-6	36.639E-6	18.316E-6	190.37E-6

No.	Slice Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0		0.0	0.0	0.0	0.0
2	0.0		0.0	0.0	0.0	0.0
3	0.0		0.0	0.0	0.0	0.0
4	0.0		0.0	0.0	0.0	0.0
5	0.0		0.0	0.0	0.0	0.0
6	0.0		0.0	0.0	0.0	0.0
7	0.0		0.0	0.0	0.0	0.0
8	0.0		0.0	0.0	0.0	0.0
9	0.0		0.0	0.0	0.0	0.0
10	0.0		0.0	0.0	0.0	0.0
11	0.0		0.0	0.0	0.0	0.0
12	0.0		0.0	0.0	0.0	0.0
13	0.0		0.0	0.0	0.0	0.0
14	0.0		0.0	0.0	0.0	0.0
15	0.0		0.0	0.0	0.0	0.0
16	0.0		0.0	0.0	0.0	0.0
17	0.0		0.0	0.0	0.0	0.0
18	0.0		0.0	0.0	0.0	0.0
19	0.0		0.0	0.0	0.0	0.0
20	0.0		0.0	0.0	0.0	0.0
21	0.0		0.0	0.0	0.0	0.0
22	0.0		0.0	0.0	0.0	0.0
23	0.0		0.0	0.0	0.0	0.0
24	0.0		0.0	0.0	0.0	0.0
25	0.0		0.0	0.0	0.0	0.0
26	0.0		0.0	0.0	0.0	0.0
27	0.0		0.0	0.0	0.0	0.0
28	0.0		0.0	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0
31	0.0		0.0	0.0	0.0	0.0
32	0.0		0.0	0.0	0.0	0.0
33	0.0		0.0	0.0	0.0	0.0
34	0.0		0.0	0.0	0.0	0.0
35	0.0		0.0	0.0	0.0	0.0
36	0.0		0.0	0.0	0.0	0.0
37	0.0		0.0	0.0	0.0	0.0



Job No.	Sheet No.	Rev.
3067		
Drg. Ref.		
Made by PW	Date	Checked

Slice No.	Surface Load [kN/m _{hor} /m]	Point Load [kN/m]	Water Pressure on			
38	0.0	0.0	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0
61	0.0	0.0	0.0	0.0	0.0	0.0
62	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0
64	0.0	0.0	0.0	0.0	0.0	0.0
65	0.0	0.0	0.0	0.0	0.0	0.0
66	0.0	0.0	0.0	0.0	0.0	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0
74	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0
77	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0
81	0.0	0.0	0.0	0.0	0.0	0.0
82	0.0	0.0	0.0	0.0	0.0	0.0
83	0.0	0.0	0.0	0.0	0.0	0.0
84	0.0	0.0	0.0	0.0	0.0	0.0
85	0.0	0.0	0.0	0.0	0.0	0.0
86	0.0	0.0	0.0	0.0	0.0	0.0
87	0.0	0.0	0.0	0.0	0.0	0.0
88	0.0	0.0	0.0	0.0	0.0	0.0
89	0.0	0.0	0.0	0.0	0.0	0.0
90	0.0	0.0	0.0	0.0	0.0	0.0
91	0.0	0.0	0.0	0.0	0.0	0.0
92	0.0	0.0	0.0	0.0	0.0	0.0
93	0.0	0.0	0.0	0.0	0.0	0.0
94	0.0	0.0	0.0	0.0	0.0	0.0
95	0.0	0.0	0.0	0.0	0.0	0.0
96	0.0	0.0	0.0	0.0	0.0	0.0
97	0.0	0.0	0.0	0.0	0.0	0.0
98	0.0	0.0	0.0	0.0	0.0	0.0
99	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0
101	0.0	0.0	0.0	0.0	0.0	0.0
102	0.0	0.0	0.0	0.0	0.0	0.0
103	0.0	0.0	0.0	0.0	0.0	0.0
104	0.0	0.0	0.0	0.0	0.0	0.0
105	0.0	0.0	0.0	0.0	0.0	0.0
106	0.0	0.0	0.0	0.0	0.0	0.0
107	0.0	0.0	0.0	0.0	0.0	0.0
108	0.0	0.0	0.0	0.0	0.0	0.0
109	0.0	0.0	0.0	0.0	0.0	0.0
110	0.0	0.0	0.0	0.0	0.0	0.0
111	0.0	0.0	0.0	0.0	0.0	0.0



Job No.	Sheet No.	Rev.
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Drg. Ref.		
Made by PW	Date	Checked

W	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
Slice Surface Load [kN/m_hor/m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Point Load [kN/m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Pressure on ground surface [kN/m_hor/m]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX D – PARAPET WALL ASSESSMENT

PREPARED ON BEHALF OF GROUNDSOLVE LTD

A616 NEW MILL ROAD PARAPET
BROCKHOLES DEVELOPMENT, LANCASTER LANE

INSPECTION AND ASSESSMENT REPORT

REPORT REF. 891010-WCL-XX-XX-RP-C-0001



Wilde Consultants Ltd

Brindley Lodge
Adcroft Street
Stockport
Cheshire
SK1 3HS

T: 0161 474 7479

www.wildeconsultants.co.uk

DOCUMENT CONTROL SHEET

Version	Date	Status	Prepared By	Checked By	Approved By
0	Mar 2024	For Comment	D Freeman CEng MICE	J Kok Shun CEng MICE	D Freeman CEng MICE
1	Mar 2024	Final Issue	D Freeman CEng MICE	J Kok Shun CEng MICE	D Freeman CEng MICE

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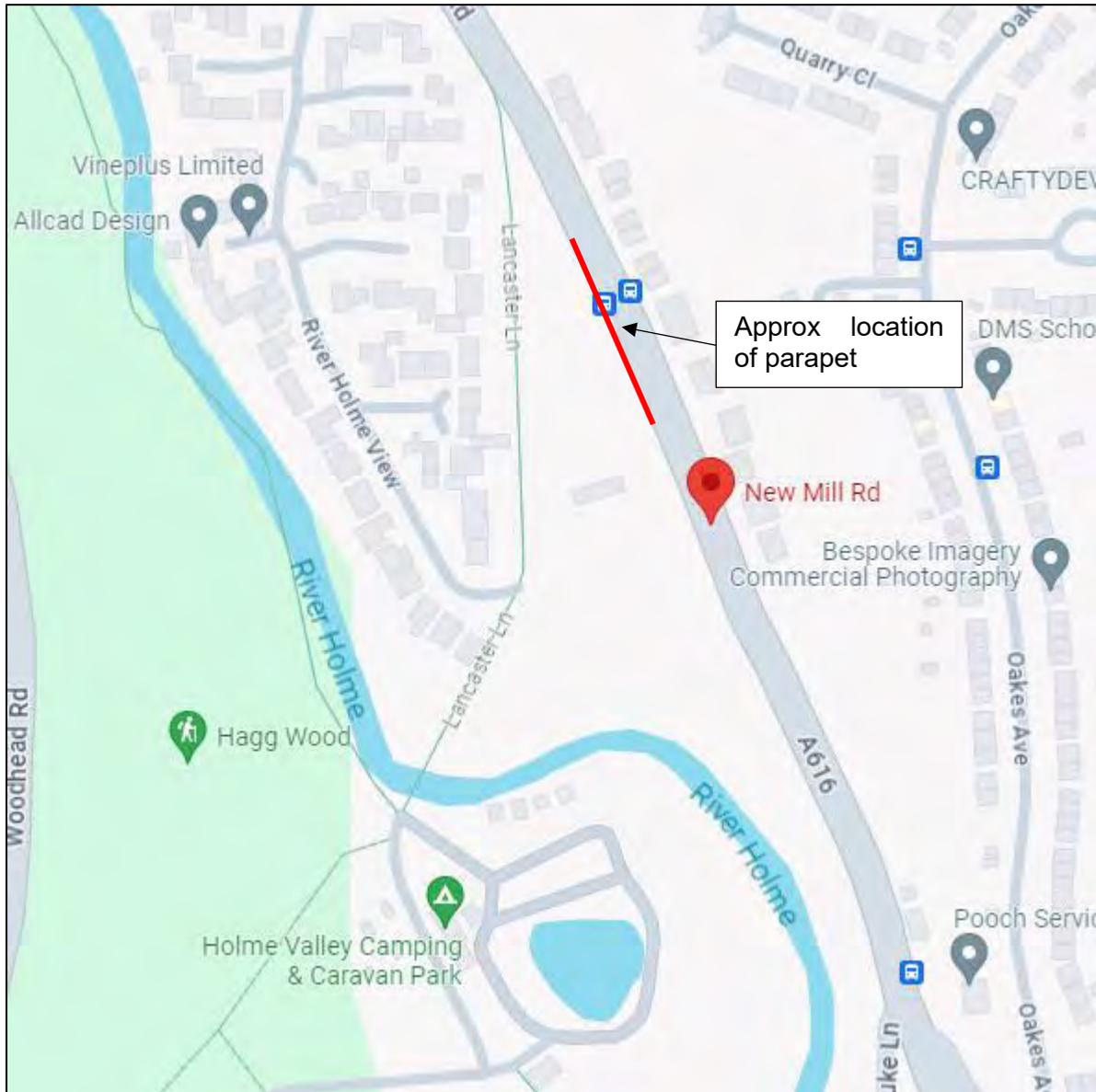
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Appendix C – PARAGON HIGHWAYS, ACCIDENT DATA SUMMARY REPORT C

LOCATION PLAN



EXECUTIVE SUMMARY

Wilde Consultants Ltd (WCL) were engaged by GroundSolve Ltd (GSL) to undertake an inspection and assessment of an existing stone masonry parapet along the A616 New Mill Road in Brockholes.

The parapet which is 118m in length is adjacent to the proposed Brockholes development site. Retaining walls are proposed on the eastern perimeter of the site to allow the proposed housing development. It is the intention that the existing parapet will remain in place.

The parapet wall is of mortared masonry construction with a stone masonry capping. The pointing is recessed to give the appearance of a drystone wall. The width of the wall considered in the assessment tapers from 420mm at back of footway level to 300mm at top of capping. The average height of the parapet above back of footway level is 1100mm.

An assessment in accordance with BS8779:2022 is required to confirm the following;

1. the suitability of the existing masonry wall to contain an errant vehicle,
2. the risk associated with projectile masonry following vehicle impact and taking account of the layout of the proposed Brockholes development by undertaking a FAR (fatal accident rate) risk assessment.

To inform the above assessment WCL undertook an inspection of the existing parapet wall on the 29th February 2024.

The wall was generally found to be in a good condition with areas of ivy growth and a single area of localised collapse which appears to be due to impact damage.

For the purposes of the assessment, it has been assumed that the area of collapse will be locally rebuilt as part of the proposed development.

In undertaking the assessment, it has been assumed that any retaining walls or other construction undertaken as part of the Brockholes development will not be detrimental to the foundation of the existing parapet.

The sign posted speed limit is 30mph and a speed camera is located directly adjacent to the wall. Therefore, the road speed has been considered to be 30mph.

The assessment confirms that the parapet is adequate to contain an errant vehicle.

The extent of debris spread in the event of a vehicle impact is between 9.5m and 12m depending on the location of impact. This extent would extend into the proposed gardens and interface with the proposed properties.

A FAR risk assessment has been undertaken based on the information provided in Paragon Highways Accident Summary Report and assumptions regarding the exposure time of residents within their gardens.

An indicative FAR risk assessment has been undertaken based on the following;

1. 1 vehicle impact every 20 years
2. Residents within the garden for 3 hours per day at weekends for 4 months of the year.
3. Each event results in a single fatality

The above assumptions give a Fatal Accident Rate of 7.

This can be compared with a FAR of 15 for travel by car or air and a FAR of 1 for travel by bus.

1.0 INTRODUCTION

- 1.1 Wilde Consultants Ltd (WCL) were engaged by GroundSolve Ltd (GSL) to undertake an inspection and assessment of an existing stone masonry parapet along the A616 New Mill Road in Brockholes.
- 1.2 The parapet which is 118m in length is adjacent to the proposed Brockholes development site. Retaining walls are proposed on the eastern perimeter of the site to allow the proposed housing development. It is the intention that the existing parapet will remain in place
- 1.3 WCL scope of work was to undertake an assessment of the existing parapet in accordance with BS8779:2022 to confirm the following;
- The suitability of the existing masonry wall to contain an errant vehicle,
 - The risk associated with projectile masonry following vehicle impact and taking account of the layout of the proposed Brockholes development by undertaking a FAR (fatal accident rate) risk assessment.
- 1.4 To inform the above assessment WCL undertook an inspection of the existing parapet wall on the 29th February 2024.
- WCL Personnel: D Freeman CEng MICE
- 1.5 The weather on the day of inspection was dry and cold with a temperature of ~5°C. There had been rain within 24 hours prior to the inspection.

2.0 AVAILABLE INFORMATION

2.1 No previous inspections were available at the time of writing.

2.2 No previous assessments were available at the time of writing.

2.3 The following drawings relating to Brockholes Development were made available at the time of writing:

Holloway Jennings Consulting Engineers Drawings;

- 5017 – 516 Brockholes Development, Lancaster Lane – Existing Burr Walls, Heights from road and site

Groundsolve Ltd Drawings;

- 5017-702 Rev G Brockholes Development, Lancaster Lane – Proposed Levels Sheet 2
- 5017-704 Rev A Brockholes Development, Lancaster Lane – Cross Sections, 1-3 Proposed
- 5017-705 Rev A Brockholes Development, Lancaster Lane – Cross Sections, 4-7 Proposed
- 5017-706 Rev A Brockholes Development, Lancaster Lane – Cross Sections, 8-10 Proposed

2.4 Paragon Highways Accident Data Summary Report dated March 2024.

3.0 DESCRIPTION OF STRUCTURE

- 3.1 The parapet wall is located on the west side New Mill Road, Brockholes at post code HD9 7EG.
- 3.2 The parapet is 118m in length is adjacent to the proposed Brockholes development site. Retaining walls are proposed on the eastern perimeter of the site to allow the proposed housing development. It is the intention that the existing parapet will remain in place
- 3.3 The parapet wall is of mortared masonry construction with a stone masonry capping. The pointing is recessed to give the appearance of a drystone wall. The width of the wall considered in the assessment tapers from 420mm at back of footway level to 300mm at top of capping. The average height of the parapet above back of footway level is 1100mm.
- 3.4 The parapet dimensions were measures as follows, chainage 0 is taken at the boundary fence to the substation at the north of the site. The width of the parapet at back of footway level could only be taken at 2 No. gate opening locations, with measurements taken each side of the gate at both locations.

Chainage	Parapet Height above footway	Width of coping	Width of parapet at back of footway level	Av width
0	1160	300		
10	1120	300		
20	1140	300		
30	1150	300		
40	1190	300	560, 420	Min 360
50	1170	300		
60	1170	330	480, 430	Min 380
70	1080	300		
80	1100	300		
90	1100	300		
100	1090	300		
110	1130	300		
118	1130	300		
Average	1133			370

- 3.5 For the purposes of the assessment the height of the parapet above footway level will be taken as 1100mm and the average width of the parapet at mid-height will conservatively be taken as 360mm.

4.0 INSPECTION FINDINGS

- 4.1 Generally, the structure was found to be in good condition with a single area of localised collapse at chainage 82m which is considered to be due to localised impact. (Photos 03,04).
- 4.2 Ivy growth was noted to the wall at the following chainages (Photo 05, typical);
- Ch 27-36m
 - Ch 51-57m
 - Ch 99-107m
- 4.3 Existing gate openings through the parapet were noted at the following chainages;
- Ch 38-41m (Photo 02)
 - Ch 60-62m
- 4.4 The following street furniture was noted on the footway adjacent to the parapet;
- Ch 31m sign post
 - Ch 55m lamp column
 - Ch 91m speed camera
- 4.5 For the purposes of the assessment, it has been assumed that the localised collapse noted at Ch 82m will be made good. No other defects which would be detrimental to the ability of the parapet to contain an errant vehicle were noted.

5.0 ASSESSMENT

- 5.1 An assessment in accordance with BS8779:2022 was undertaken to confirm the suitability of the existing parapet wall to contain an errant vehicle.
- 5.2 The parapet was assessed in accordance with BS8770 Fig 1, considering an unreinforced masonry form of construction.
- 5.3 For the purposes of the assessment the dimensions of the parapet were taken as follows;
- Height above back of footway level – 1100mm
 - Average width of the parapet at mid-height – 360mm

Conservatively a low unit-mortar bond strength has been considered.

- 5.4 The traffic speed is signposted as 30mph with a speed camera present along the length of parapet under consideration. In accordance with clause 7.2 BS8770 the traffic speed will be taken as 30mph.

The road alignment is predominantly straight with no features that would affect the vehicle divergence/impact speed.

The minimum impact speed considered in the assessment charts is 80kph (50mph). This is considered to be conservative without further consideration of vehicle divergence.

- 5.5 The assessment concludes that the parapet provides suitable containment for the traffic speed of 30mph.
- 5.6 Following a vehicle impact event individual pieces or large parapet panels of masonry often become ejected or dislodged. The consequence of debris ejection can be serious when properties within range are occupied.

The assessment shows a debris exit velocity of 6m/s and an extent of debris spread of 9.5m to 12m based on the proposed housing development drawings provided.

In all instances this extent of debris would interface with the proposed properties.

- 5.7 The risk associate with debris ejection is determined by undertaking a FAR (Fatal Accident Rate) Risk Assessment. The FAR value can be compared with published FAR values for common activities.
- 5.8 In order to undertake a FAR Risk Assessment information regarding the likely frequency of an errant vehicle incident is required. The Paragon Highways Accident Data Summary Report indicates 6 accidents in the vicinity of the site in the last 24 years up to December 2022. Of the 6 reported accidents only 1 appears to involve a vehicle impacting the parapet wall. Therefore, we have assumed 1 incident every 20 years which would result in debris ejection.

- 5.9 In addition, it is necessary to estimate the exposure time of a resident that may be affected by the debris ejection. It has been assumed that this exposure would be related to a resident being in their garden at the time of the incident. In calculating the exposure time, we have assumed that residents spend 3 hours per day in their garden at the weekend for a period of 4 months per year.
- 5.10 It should be noted that the result of the FAR risk assessment is very much dependent on the above assumptions. Should the local authority consider that different return periods or exposure times should be considered then the risk assessment can be revised accordingly.
- 5.11 Based on the above the FAR is 7. This can be compared with a FAR of 15 for travel by car or air and a FAR of 1 for travel by bus, see below;

Table 5 — Risk evaluation - Fatal Accident Rate (FAR) for common activities

Activity	FAR
Travel by bus	1
Travel by car or by air	15
Walking beside a road	20
Travel by motorcycle	300
Travel by helicopter	500

NOTE Reproduced from Department for Transport's Guidance on the design assessment and strengthening of masonry parapets on highway structures, Her Majesty's Stationery Office 2012 [2].

NOTE 2 The Hambly paper [2] is written in general terms and is not specifically aimed at parapet impacts.

- 5.12 It should be noted that this assessment assumes that an incident leads to a fatality. It also assumes that a person in the garden at the time of the incident is directly in the path of the ejected masonry.

6.0 CONCLUSION AND RECOMMENDATIONS

- 6.1 Generally, the structure was found to be in good condition with a single area of localised collapse at chainage 82m which is considered to be due to localised impact. This area of collapse should be made good to ensure that the parapet is capable of providing adequate containment.
- 6.2 The assessment concludes that the parapet provides suitable containment for the traffic speed of 30mph.
- 6.3 The assessment shows a debris exit velocity of 6m/s and an extent of debris spread of 9.5m to 12m based on the proposed housing development drawings provided.

In all instances this extent of debris would interface with the proposed properties.

- 6.4 An indicative FAR Risk Assessment has been undertaken based on the assumptions detailed in Section 5 above.

The FAR is 7 which can be compared with a FAR of 15 for travel by car or air and a FAR of 1 for travel by bus.

The client should review and consider the appropriateness of the assumptions made in undertaking this risk assessment.

Additional FAR Risk Assessments can be undertaken as necessary.

APPENDIX A – PHOTOGRAPHS

List of Photographs

Ref.	Location	Description
01	Parapet	View looking north along the parapet
02	Parapet	Typical section through parapet wall at ch 38m
03	Parapet	Ch 82m: Localised collapse.
04	Parapet	Ch 82m: Non-traffic face of parapet at location of localised collapse
05	Parapet	Ivy growth to top of parapet, typical at ch 27-36m, ch 51-57m, ch 99-103m.



Parapet

View looking north along the parapet

01



Parapet

Typical section through parapet wall at ch 38m

02



Parapet

Ch 82m: Localised collapse

03



Parapet

Ch 82m: Non-traffic face of parapet at location of localised collapse

04



Parapet Ivy growth to top of parapet, typical at ch 27-36m, ch 51-57m, ch 99-103m 05

APPENDIX B – ASSESSMENT CALCULATIONS

DESIGN CALCULATION

Brindley Lodge
Adcroft Street
Stockport
SK1 3HS
www.wildecivil.co.uk
wp@wilde.uk.com

Wilde

Consulting Engineers



Project Title:

Brockholes Development, Lancaster Lane
New Mills Road Parapet Assessment

Tel: 0161 474 7479
Fax: 0161 474 7492

Calculation Number:
891010-WCL-XX-XX-CA-C-0001

Project Number:
891-010

Sheet 1 of 21

Date:
March 2024

Client:
Groundsolve Ltd

Client Project Number:
-

Calculation Title:
Parapet Wall Assessment

Project Engineer:
D Freeman

Signature:

Date: March 24

Calculation Originator:
D Freeman

Signature:

Date: March 24

Verified By:
J Kok Shun

Signature:

Date: March 24

Approved By:
D Freeman

Signature:

Date: March 24

RECORD OF REVISION AND ISSUE

REV	DATE	DESCRIPTION	SHEET REF	BY	VERIFIED BY	APPROVED BY	DATE
0	March 2024	FIRST ISSUE	ALL	DRF	JKS	DRF	March 24
1	March 2024	UPDATED TO INCORPORATE ACCIDENT DATA	ALL	DRF	JKS	DRF	March 24

<i>Design By</i> DRF	<i>Date</i> March 24	<i>Check By</i> JKS	<i>Date</i> March 24	<i>Set</i> CA-C-001	<i>Page No</i> 2	<i>Rev</i> 0
<i>Reference</i>	<i>Calculations</i> Parapet Assessment				<i>Output</i>	

New Mill Road Parapet Assessment

The following calculations provide an assessment of the unreinforced masonry parapet along the length of New Mill Road adjacent to the proposed Brockholes Development. The assessment is undertaken in accordance with BS8779:2022 Assessment, maintenance and repair of masonry highway parapets for bridges and other structures – Code of Practice.

This assessment considers the suitability of the existing masonry wall to contain an errant vehicle, ie determines the parapet containment, and also undertakes a FAR (fatal accident rate) risk assessment to consider the risk associated with projectile masonry following vehicle impact and taking account of the layout of the proposed Brockholes development.

Relevant Drawings

The proposed Brockholes development is indicated on the following drawings which have been provided to Wilde Consultants Ltd by Groundsolve Ltd.

Holloway Jennings Consulting Engineers Drawings;

5017 – 516 Brockholes Development, Lancaster Lane – Existing Burr Walls, Heights from road and site

Groundsolve Ltd Drawings;

5017-702 Rev G Brockholes Development, Lancaster Lane – Proposed Levels Sheet 2

5017-704 Rev A Brockholes Development, Lancaster Lane – Cross Sections, 1-3 Proposed

5017-705 Rev A Brockholes Development, Lancaster Lane – Cross Sections, 4-7 Proposed

5017-706 Rev A Brockholes Development, Lancaster Lane – Cross Sections, 8-10 Proposed

Site Inspection

WCL undertook a site inspection on the 29/02/24. The wall was found to be generally in good condition with only a single defect which would be considered to be detrimental to the ability of the parapet to provide containment. The results of the inspection are presented in report ref 891010-WCL-XX-XX-RP-C-0001.

For the purposes of this assessment it is assumed the above defect will be made good prior to the completion of the proposed Brockholes development.

The parapet dimensions were measured as follows, chainage 0 is taken at the boundary fence to the substation at the north of the site. The width of the parapet at footway level could only be taken at 2 No. gate opening locations, the width was measured at each side of the gate opening.

<i>Design By</i> DRF	<i>Date</i> March 24	<i>Check By</i> JKS	<i>Date</i> March 24	<i>Set</i> CA-C-001	<i>Page No</i> 3	<i>Rev</i> 0
<i>Reference</i>	<i>Calculations</i> Parapet Assessment				<i>Output</i>	

Chainage	Parapet Height above footway	Width of coping	Width of parapet at back of footway level	Av width
0	1160	300		
10	1120	300		
20	1140	300		
30	1150	300		
40	1190	300	560, 420	Min 360
50	1170	300		
60	1170	330	480, 430	Min 380
70	1080	300		
80	1100	300		
90	1100	300		
100	1090	300		
110	1130	300		
118	1130	300		
Average	1133			370

For the purposes of the assessment the height of the parapet above footway level will be taken as **1100mm** and the average width of the parapet will conservatively be taken as **360mm**.

Assessment Methodology

The parapet will be assessed in accordance with BS8770 Fig 1, see below.

The parapet is considered to be of unreinforced mortared masonry construction.

The dimensions of the parapet will be taken as noted above.

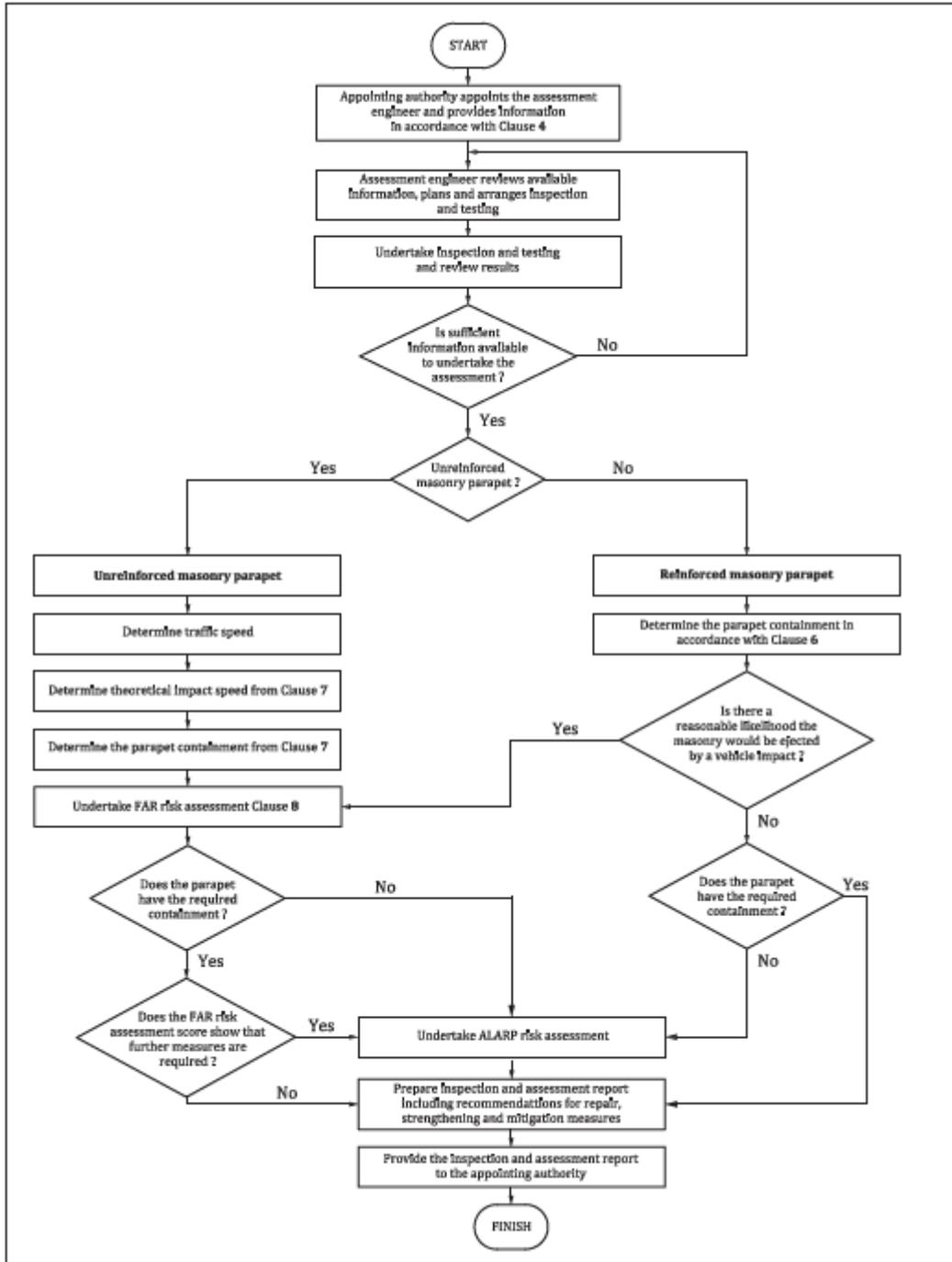
The traffic speed is signposted as 30mph with a speed camera present along the length of parapet under consideration. In accordance with clause 7.2 BS8770 the traffic speed will be taken as 30mph.

The road alignment is predominantly straight with no features that would affect the vehicle divergence/impact speed.

The minimum impact speed considered in the assessment charts is 80kph (50mph). This is considered to be conservative without further consideration of vehicle divergence.

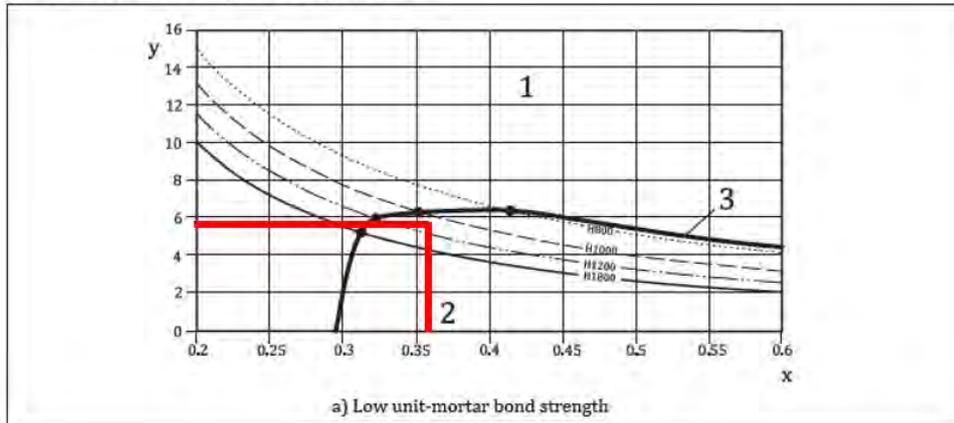
Design By DRF	Date March 24	Check By JKS	Date March 24	Set CA-C-001	Page No 4	Rev 0
Reference	Calculations Parapet Assessment				Output	

Figure 1 — Flowchart showing a suggested process for masonry parapet assessment



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Reference	Calculations Parapet Assessment				Output	

Figure 3 — Parapet performance chart: for 80 km/h for mortared parapets of height, H (mm) (density: 2.200 kg/m³) that contain and direct cars at an impact angle of 20° or less



Assessment of vehicle containment

Fig 3 above shows that the existing parapet, 1100mm high with 360mm av width at mid-height, provides adequate containment for an impact speed of 80kph.

The debris exit velocity is taken as 6m/s.

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Reference	Calculations Parapet Assessment				Output	

FAR Risk Assessment

Figure 10 — Extent of debris spread: definition

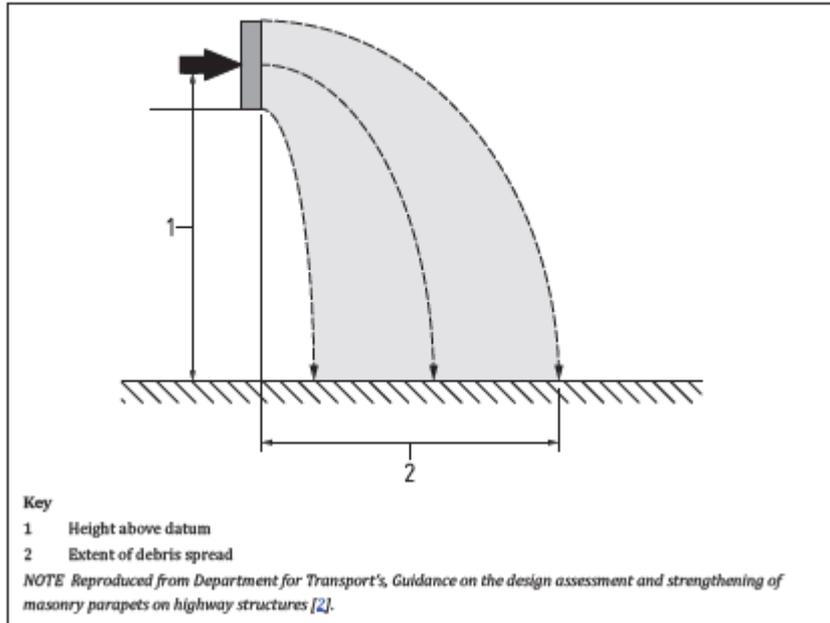


Table 7 — Extent of debris spread: values of *d*

Mean debris exit velocity (m/s)	Height above datum <i>h</i> (to mid-height of parapet)				
	2 m	4 m	6 m	8 m	10 m
<i>(from Figure 3 or Figure 4)</i>					
1	1	2	2	3	3
2	3	4	4	5	6
3	4	5	7	8	9
4	5	7	9	10	11
5	6	9	11	13	14
6	8	11	13	15	17
7	9	13	15	18	20
8	10	14	18	20	23
9	11	16	20	23	26
10	13	18	22	26	29
11	14	20	24	28	31
12	15	22	27	31	34

NOTE 1 Reproduced from Department for Transport's Guidance on the design assessment and strengthening of masonry parapets on highway structures; Her Majesty's Stationery Office 2012 [2].

*NOTE 2 Values calculated assuming (i) debris is ejected horizontally and in free flight; (ii) the extent of debris spread *d* is taken as twice the mean value, calculated from $d = v\sqrt{2h} / 9.81$*

NOTE 3 The resulting extent of debris spread can be rounded up to a whole number.

Plot 4 (ref Groundsolve Drg No. 702)

Height above datum is approx. 3.0m giving an extent of debris spread of approx. 9.5m.

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Reference	Calculations Parapet Assessment				Output	

Plots 5 to 9 (ref Groundsolve Drg No. 702)

Height above datum is approx. 5m giving an extent of debris of 12m.

In all instances this extent of debris would interface with the proposed properties, including buildings.

8.6 Calculated FAR value

The absolute risk should be determined by computing the fatal accident rate (FAR) value:

$$FAR = \frac{100000000}{T_r / N_{total}} \quad (6)$$

where:

T_r is the return period (from 8.2.3, converted into hours)

N_{total} is total number of vehicles affected by the errant vehicle impact event

NOTE 1 In the equation for N_{total} in 8.5, it is implicitly assumed that there will be one fatality per vehicle, though a greater (or lesser) number of fatalities per vehicle can be assumed depending on site conditions. Further information about car occupancy is obtainable from the DfT document: Car occupancy by trip purpose, NTS0906 [4].

In calculating the FAR value it is assumed that the projectile masonry could cause the death of a resident who is in the garden at the time a vehicle impacts the parapet.

In order to determine the return period a number of assumptions need to be made, these are as follows;

Frequency of errant vehicle incident.

Accident data has been provided by Paragon Highways, Accident Data Summary Report dated March 2024. The data shows 6 recorded accidents within the vicinity of the proposed development in the 24 years up to December 2022. Of the 6 accidents only 1 appears to have involved a vehicle impacting the parapet wall.

Therefore assume 1 incident every 20 years

$$\text{Frequency/hour} = 1/(20*365*24) = 5.71*10^{-6}$$

Exposure time of resident in their garden.

Say 3 hrs per day at weekends for 4 months of the year. This assumes that a single person is struck by projectile masonry, ie $N_{total} = 1$.

$$\text{Exposure time} = (3*2*4)/(24*7*12) = 0.012$$

$$\text{Probability of simultaneous exposure} = 5.71*10^{-6} * 0.012 = 7*10^{-8}$$

$$FAR = 100,000,000/(1/7*10^{-8}) = 7,$$

this is can be compared with the following;

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<i>Reference</i>	<i>Calculations</i> Parapet Assessment				<i>Output</i>	

Travel by bus – FAR = 1

Travel by car or by air – FAR = 15, see below

Table 5 — Risk evaluation - Fatal Accident Rate (FAR) for common activities

Activity	FAR
Travel by bus	1
Travel by car or by air	15
Walking beside a road	20
Travel by motorcycle	300
Travel by helicopter	500

NOTE Reproduced from Department for Transport's Guidance on the design assessment and strengthening of masonry parapets on highway structures, Her Majesty's Stationery Office 2012 [2].

NOTE 2 The Hambly paper [2] is written in general terms and is not specifically aimed at parapet impacts.

APPENDIX C – PARAGON HIGHWAYS, ACCIDENT DATA SUMMARY REPORT



Lancaster Lane, Brockholes

Accident Data Summary Report

March 2024

Project number 926K

Paragon Highways
Office 20/21 The Rear Walled Garden, Nostell
Estate

Wakefield WF4 1AB

☎ 01924 291536

✉ mail@paragonhighways.com
paragonhighways.com



Quality Management

	First Issue	Revision 1	Revision 2	Revision 3
Remarks				
Date	March 2024			
Prepared by	A Howarth			
Checked by				

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Appendices

Appendix A	CrashMap Injury Accident Data
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Figure

Figure 1.1	CrashMap Survey Area
Figure 1.2	Injury Accident Data Summary

1.0 Road Traffic Accidents

- 1.1 The personal injury accident data for the last 24 years up to December 2022 within the vicinity of the site has been obtained from the CrashMap website. The data used is provided by the Department for Transport which is based upon records provided to them by local police forces. The accident data can be found at Appendix A.
- 1.2 The study area includes areas of Lancaster Lane, the A616 New Mill Road, and Rockmill Road within vicinity of the site and can be seen on the image at Figure 1.1.

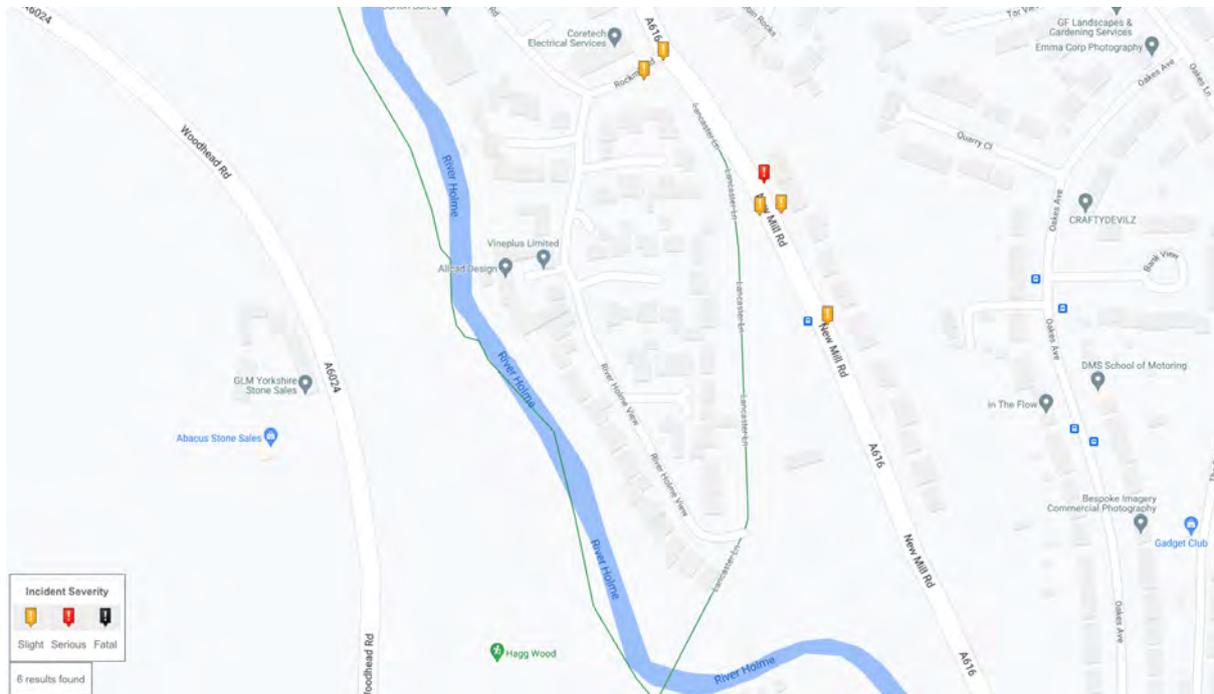


Figure 1.1 CrashMap Survey Area

- 1.3 According to the CrashMap data there have been 6 injury accidents reported within the past 24 years within the search area. The earliest accident recorded was in 2004, with the most recent being 2022. A summary of the accidents can be found within the table at Figure 1.2. The detailed reports of the collisions can be found at Appendix A.

Reference	Severity	Date / Time	Description
130017331	Slight	Jan 12 11 / 17:15	Vehicle 1 (van or goods vehicle 3.5t or under) is in the act of turning right at the junction of Rockmill Road / A616 New Mill Road when the driver of Vehicle 1 suffered a slight injury. The cause of the accident is unknown as no impact occurred.
130028177	Slight	Jan 19 11 / 09:08	Vehicle 1 (car excluding private hire) is in the act of turning right at the junction of Rockmill Road / A616 New Mill Road, whilst Vehicle 2 (pedal cycle) is proceeding normally along the carriageway. The front of Vehicle 1 impacts the front of Vehicle 2, and the rider of Vehicle 2 suffers a slight injury.
135AV0540	Serious	Oct 31 18 / 11:00	Vehicle 1 (motorcycle 50 - 125cc) is proceeding normally along the A616 New Mill Road on the carriageway, not on a bend, when the vehicle hits the kerb on the carriageway, causing the rider to then hit a wall or fence off carriageway. The rider of Vehicle 1 suffers a serious injury.
130513804	Slight	May 25 04 / 11:22	Vehicle 1 and Vehicle 2 (both cars including private hire) is proceeding normally along the carriageway, not on a bend, on the A616 New Mill Road, when the front of Vehicle 1 impacts the front of Vehicle 2. The driver and all three passengers of Vehicle 1, as well as the driver and all three passengers of Vehicle 2 suffer slight injuries.
131141157	Slight	Feb 07 22 / 20:00	Vehicle 1 (car excluding private hire) is making an unknown manoeuvre on the A616 New Mill Road, whilst Vehicle 2 (car excluding private hire) is parked in the carriageway. The front of Vehicle 1 impacts the offside of Vehicle 2 and the passenger of Vehicle 2 suffers a slight injury.
134741528	Slight	Jul 04 17 / 18:35	Vehicle 1 (motorcycle 125 – 500cc) is proceeding normally along the carriageway on the A616 New Mill Road, not on a bend, whilst Vehicle 2 (car excluding private hire) is waiting to proceed normally but if held up. The front of Vehicle 1 impacts the rear of Vehicle 2 and the rider of Vehicle 1 suffers a slight injury.

Figure 1.2 Injury Accident Data Summary

1.4 In conclusion, the analysis of the personal injury accident data shown at Figure 1.2 within the vicinity of Lancaster Lane, the A616 New Mill Road, and Rockmill Road over the last 24 years shows a relatively low number of accidents, with only six reported cases. This data, sourced from the Department for Transport via local police force records and analysed through the CrashMap website, offers a reliable

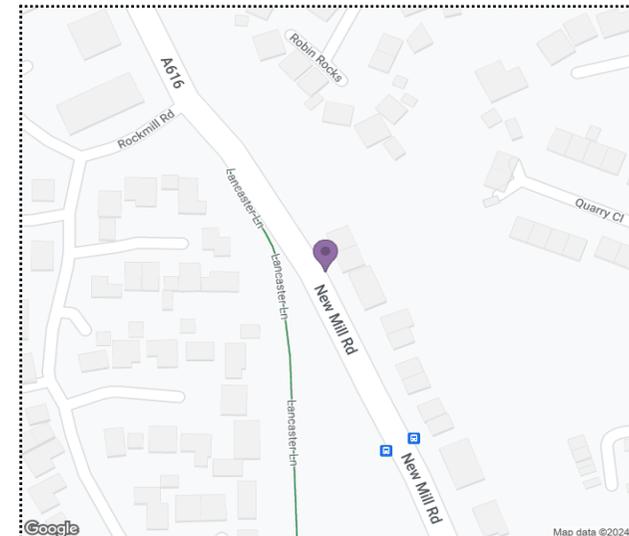
foundation for understanding the safety situation of the area in question. The incidents, recorded between 2004 and 2022, primarily suggest that driver recklessness or inexperience was a contributing factor, rather than any inherent road safety issues. This evidence indicates that the area surrounding the proposed site does not present significant safety risks from a road safety perspective.

Appendix A

CrashMap Injury Accident Data

Validated Data

Crash Date:	Wednesday, October 31, 2018	Time of Crash:	11:00:00	Crash Reference:	2018135AV0540
Highest Injury Severity:	Serious	Road Number:	A616	Casualties:	1
Highway Authority:	Kirklees			Vehicles:	1
Local Authority:	Kirklees			OS Grid Reference:	415262 410724
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Not at or within 20 metres of junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Not Applicable				



For more information about the data please visit: www.crashmap.co.uk/home/faq

To subscribe to unlimited reports using CrashMap Pro visit: www.crashmap.co.uk/home/premium_services

Validated Data

Crash Date:

Wednesday, October 31, 2018

Time of Crash: 11:00:00

Crash Reference: 2018135AV0540

Vehicles Involved

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Manoeuvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Motorcycle over 50cc and up to 125cc	11	Female	36 - 45	Vehicle proceeding normally along the carriageway, not on a bend	Nearside	Unknown	Kerb	Wall or fence

Casualties

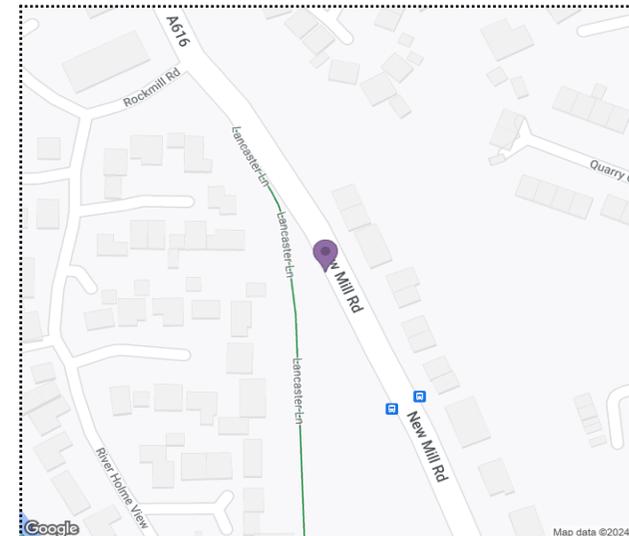
Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Serious	Driver or rider	Female	36 - 45	Unknown or other	Unknown or other

For more information about the data please visit: www.crashmap.co.uk/home/faq

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Validated Data

Crash Date:	Tuesday, May 25, 2004	Time of Crash:	11:22:00	Crash Reference:	2004130513804
Highest Injury Severity:	Slight	Road Number:	A616	Casualties:	2
Highway Authority:	Kirklees			Vehicles:	2
Local Authority:	Kirklees			OS Grid Reference:	415260 410710
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	Not at or within 20 metres of junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Not Applicable				
Vehicles Involved					



For more information about the data please visit: www.crashmap.co.uk/home/faq

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Validated Data**Crash Date:**

Tuesday, May 25, 2004

Time of Crash: 11:22:00**Crash Reference:** 2004130513804

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Maneuvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Car (including private hire cars)	6	Female	Over 75	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None
1	Car (including private hire cars)	6	Female	Over 75	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None
1	Car (including private hire cars)	6	Female	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Unknown	Other	None	None
2	Car (including private hire cars)	1	Male	11 - 15	Vehicle proceeding normally along the carriageway, not on a bend	Unknown	Other	None	None
1	Car (including private hire cars)	6	Female	Over 75	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None
2	Car (including private hire cars)	1	Male	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None
2	Car (including private hire cars)	1	Male	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None
2	Car (including private hire cars)	1	Male	26 - 35	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None

CasualtiesFor more information about the data please visit: www.crashmap.co.uk/home/faqTo subscribe to unlimited reports using CrashMap Pro visit: www.crashmap.co.uk/home/premium_services

Validated Data**Crash Date:**

Tuesday, May 25, 2004

Time of Crash: 11:22:00**Crash Reference:** 2004130513804

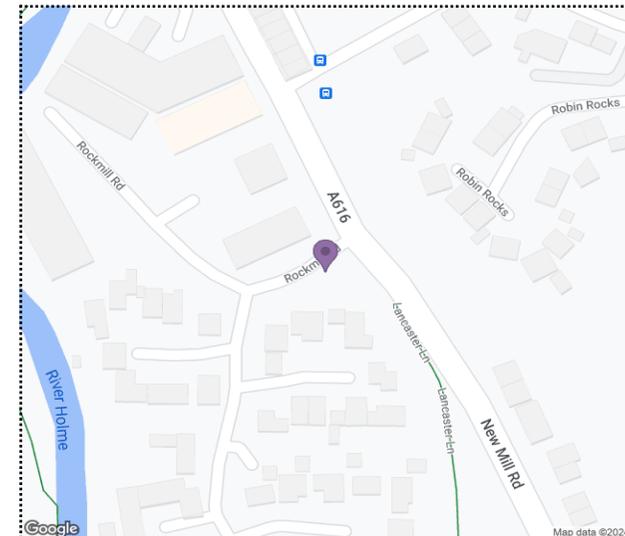
Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Female	26 - 35	Unknown or other	Unknown or other
1	1	Slight	Driver or rider	Female	Over 75	Unknown or other	Unknown or other
1	1	Slight	Driver or rider	Female	Over 75	Unknown or other	Unknown or other
1	1	Slight	Driver or rider	Female	Over 75	Unknown or other	Unknown or other
2	2	Slight	Driver or rider	Male	26 - 35	Unknown or other	Unknown or other
2	2	Slight	Driver or rider	Male	11 - 15	Unknown or other	Unknown or other
2	2	Slight	Driver or rider	Male	26 - 35	Unknown or other	Unknown or other
2	2	Slight	Driver or rider	Male	26 - 35	Unknown or other	Unknown or other

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Validated Data

Crash Date:	Wednesday, January 12, 2011	Time of Crash:	17:15:00	Crash Reference:	2011130017331
Highest Injury Severity:	Slight	Road Number:	U0	Casualties:	1
Highway Authority:	Kirklees	Vehicles:	1	OS Grid Reference:	415200 410780
Local Authority:	Kirklees				
Weather Description:	Fine without high winds				
Road Surface Description:	Wet or Damp				
Speed Limit:	30				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	T or staggered junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Give way or uncontrolled				



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Validated Data**Crash Date:**

Wednesday, January 12, 2011

Time of Crash: 17:15:00**Crash Reference:** 2011130017331**Vehicles Involved**

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Manoeuvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Van or goods vehicle 3.5 tonnes mgw and under	2	Male	36 - 45	Vehicle is in the act of turning right	Did not impact	Journey as part of work	None	None

Casualties

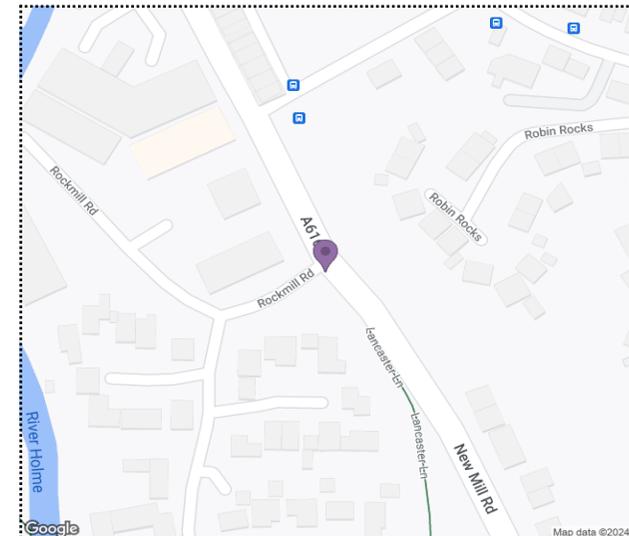
Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	36 - 45	Unknown or other	Unknown or other

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Validated Data

Crash Date:	Wednesday, January 19, 2011	Time of Crash:	09:08:00	Crash Reference:	2011130028177
Highest Injury Severity:	Slight	Road Number:	A616	Casualties:	1
Highway Authority:	Kirklees			Vehicles:	2
Local Authority:	Kirklees			OS Grid Reference:	415210 410790
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Daylight: regardless of presence of streetlights				
Carriageway Hazards:	None				
Junction Detail:	T or staggered junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Give way or uncontrolled				



For more information about the data please visit: www.crashmap.co.uk/home/faq

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Validated Data

Crash Date:

Wednesday, January 19, 2011

Time of Crash: 09:08:00

Crash Reference: 2011130028177

Vehicles Involved

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Manoeuvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Car (excluding private hire)	8	Male	36 - 45	Vehicle is in the act of turning right	Front	Unknown	None	None
2	Pedal cycle	-1	Male	56 - 65	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None

Casualties

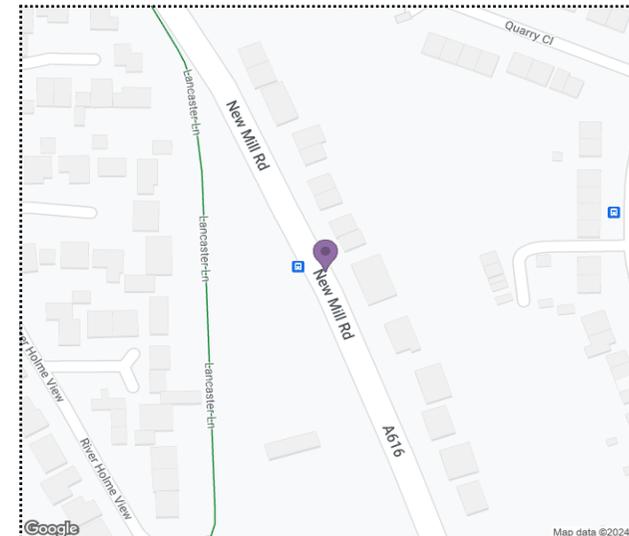
Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Slight	Driver or rider	Male	56 - 65	Unknown or other	Unknown or other

For more information about the data please visit: www.crashmap.co.uk/home/faq

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Validated Data

Crash Date:	Tuesday, July 4, 2017	Time of Crash:	18:35:00	Crash Reference:	2017134741528
Highest Injury Severity:	Slight	Road Number:	A616	Casualties:	1
Highway Authority:	Kirklees			Vehicles:	2
Local Authority:	Kirklees			OS Grid Reference:	415295 410651
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Darkness: street lighting unknown				
Carriageway Hazards:	None				
Junction Detail:	Not at or within 20 metres of junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Not Applicable				



For more information about the data please visit: www.crashmap.co.uk/home/faq

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Validated Data**Crash Date:**

Tuesday, July 4, 2017

Time of Crash: 18:35:00**Crash Reference:** 2017134741528**Vehicles Involved**

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Manoeuvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Motorcycle over 125cc and up to 500cc	2	Male	16 - 20	Vehicle proceeding normally along the carriageway, not on a bend	Front	Unknown	None	None
2	Car (excluding private hire)	3	Female	46 - 55	Vehicle is waiting to proceed normally but is held up	Back	Unknown	None	None

Casualties

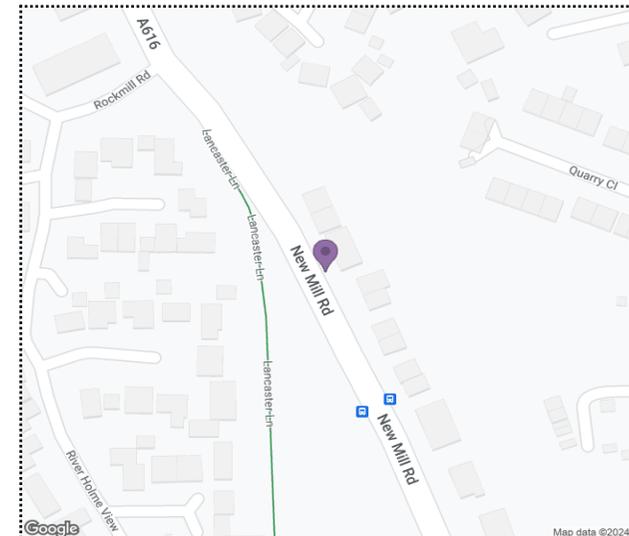
Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
1	1	Slight	Driver or rider	Male	16 - 20	Unknown or other	Unknown or other

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Validated Data

Crash Date:	Monday, February 7, 2022	Time of Crash:	20:00:00	Crash Reference:	2022131141157
Highest Injury Severity:	Slight	Road Number:	A616	Casualties:	1
Highway Authority:	Kirklees			Vehicles:	2
Local Authority:	Kirklees			OS Grid Reference:	415271 410710
Weather Description:	Fine without high winds				
Road Surface Description:	Dry				
Speed Limit:	30				
Light Conditions:	Darkness: street lights present and lit				
Carriageway Hazards:	None				
Junction Detail:	Not at or within 20 metres of junction				
Junction Pedestrian Crossing:	No physical crossing facility within 50 metres				
Road Type:	Single carriageway				
Junction Control:	Not Applicable				



For more information about the data please visit: www.crashmap.co.uk/home/faq

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Validated Data**Crash Date:** Monday, February 7, 2022**Time of Crash:** 20:00:00**Crash Reference:** 2022131141157**Vehicles Involved**

Vehicle Ref	Vehicle Type	Vehicle Age	Driver Gender	Driver Age Band	Vehicle Manoeuvre	First Point of Impact	Journey Purpose	Hit Object - On Carriageway	Hit Object - Off Carriageway
1	Car (excluding private hire)	9	Unknown	Unknown	Unknown	Front	Unknown	Unknown	Unknown
2	Car (excluding private hire)	-1	Unknown	Unknown	Vehicle is parked in the carriageway	Offside	Unknown	None	None

Casualties

Vehicle Ref	Casualty Ref	Injury Severity	Casualty Class	Gender	Age Band	Pedestrian Location	Pedestrian Movement
2	1	Slight	Vehicle or pillion passenger	Female	16 - 20	Unknown or other	Unknown or other

For more information about the data please visit: www.crashmap.co.uk/home/faq

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