

# **APPENDIX I**

*WALLAP output*

CARD GEOTECHNICS LIMITED  
 Program: WALLAP Version 6.05 Revision A41.B56.R46  
 Licensed from GEOSOLVE  
 Data filename/Run ID: Run1 - BEJ changes\_SLS SJM  
 Camden High Street  
 Rear sheet pile retaining wall

Sheet No.  
 Job No. 18648A  
 Made by : SJM  
 Date:16-06-2016  
 Checked :

Units: kN,m

**INPUT DATA**

**SOIL PROFILE**

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	26.85	1 Made Ground		1 Made Ground
2	26.35	2 Reworked Alluvium		2 Reworked Alluvium
3	25.85	3 Alluvium		3 Alluvium
4	24.85	4 London Clay Fm		4 London Clay Fm

**SOIL PROPERTIES**

-- Soil type -- No. Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC ( Nu )	Active limit Ka ( Kac )	Passive limit Kp ( Kpc )	Cohesion kN/m2 ( dc/dy )
1 Made Ground ( 24.85 )	18.00	5000	0.500	OC (0.200)	0.292 (0.000)	4.369 ( 0.000 )	
2 Reworked Alluvium	19.00	5000	1.000	NC (0.490)	1.000 (2.389)	1.000 ( 2.390 )	20.00u
3 Alluvium	18.00	5000	1.000	NC (0.490)	1.000 (2.389)	1.000 ( 2.390 )	20.00u
4 London Cl.. ( 24.85 )	20.00	25000 ( 5000 )	1.000	OC (0.490)	1.000 (2.389)	1.000 ( 2.390 )	70.00u ( 5.000 )

**Additional soil parameters associated with Ka and Kp**

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground	30.03	0.500	0.00	30.00	0.500	0.00
2 Reworked Alluvium	0.00	0.500	0.00	0.00	0.500	0.00
3 Alluvium	0.00	0.500	0.00	0.00	0.500	0.00
4 London Clay Fm	0.00	0.500	0.00	0.00	0.500	0.00

**GROUND WATER CONDITIONS**

Density of water = 10.00 kN/m3

Initial water table elevation          Active side          Passive side  
 26.35                                          26.35

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Active side			Passive side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	26.35	26.35	0.0	1	24.50	24.50	0.0 MC+WC

**WALL PROPERTIES**

Type of structure = Fully Embedded Wall  
 Elevation of toe of wall = 20.85  
 Maximum finite element length = 0.30 m  
 Youngs modulus of wall E = 2.1000E+08 kN/m2  
 Moment of inertia of wall I = 3.9650E-04 m4/m run  
 (Arcelor PU18) E.I = 83265 kN.m2/m run  
 Yield Moment of wall = Not defined

**SURCHARGE LOADS**

Surch- arge no.	Distance Elev.	from wall	Length parallel to wall	Width perpend. to wall	Surcharge		Equiv. soil type	Partial factor/ Category
					----- Near edge	----- Far edge		
1	25.85	0.75(A)	10.00	1.00	100.00	=	N/A	1.00 P/U

Note: A = Active side, P = Passive side  
 Limit State Categories P/U = Permanent Unfavourable  
 P/F = Permanent Favourable  
 Var = Variable (unfavourable)

**CONSTRUCTION STAGES**

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 25.85
2	Apply water pressure profile no.1 ( Mod. Conserv. )
3	Excavate to elevation 25.85 on PASSIVE side
4	Excavate to elevation 24.85 on PASSIVE side

**FACTORS OF SAFETY and ANALYSIS OPTIONS**

Limit State options: Serviceability Limit State  
 All loads and soil strengths are unfactored

Stability analysis:  
 Method of analysis - Strength Factor method  
 Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:  
 Minimum equivalent fluid density = 5.00 kN/m3  
 Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:  
 Method - Subgrade reaction model using Influence Coefficients  
 Open Tension Crack analysis? - No  
 Non-linear Modulus Parameter (L) = 0 m

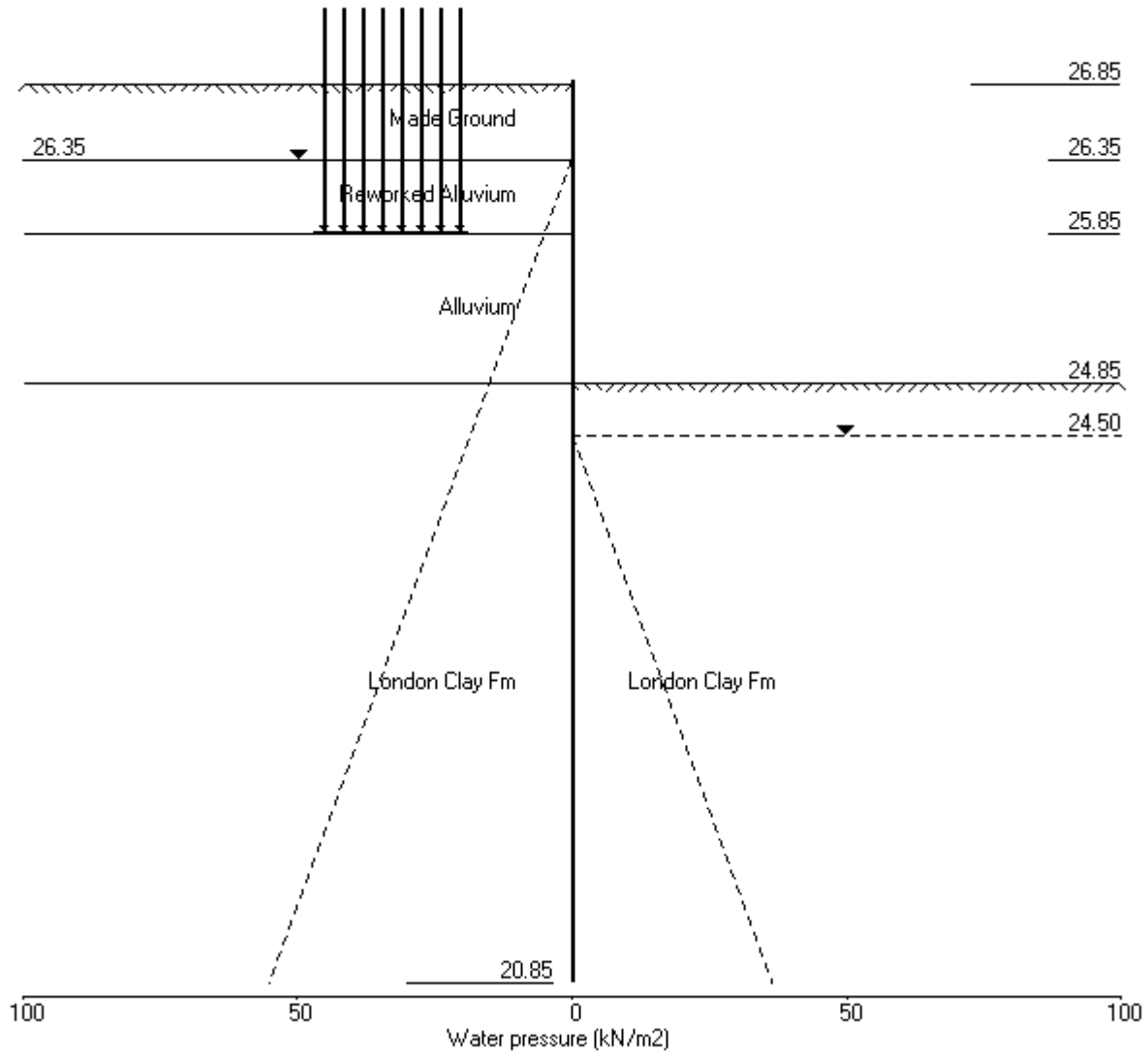
Boundary conditions:  
 Length of wall (normal to plane of analysis) = 30.00 m  
  
 Width of excavation on active side of wall = 20.00 m  
 Width of excavation on passive side of wall = 20.00 m  
  
 Distance to rigid boundary on active side = 20.00 m  
 Distance to rigid boundary on passive side = 20.00 m

**OUTPUT OPTIONS**

Stage no.	Stage description	----- Displacement Bending mom. Shear force	----- Active, Passive pressures	----- Graph. output
1	Apply surcharge no.1 at elev. 25.85	Yes	Yes	Yes
2	Apply water pressure profile no.1	Yes	Yes	Yes
3	Excav. to elev. 25.85 on PASSIVE side	Yes	Yes	Yes
4	Excav. to elev. 24.85 on PASSIVE side	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

Units: kN,m

Stage No.4 Excav. to elev. 24.85 on PASSIVE side



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 Rear sheet pile retaining wall

Sheet No.  
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Stage No. 3 Excavate to elevation 25.85 on PASSIVE side

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**  
 Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	--- Pass. ---	Strut Elev.	FoS for toe elev. =	Moment of equil. at elev.	Toe elev. for FoS = 1.000	Wall Penetration
3	26.85	25.85	Cant.	6.168	21.19	25.49	0.36

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**  
**Analysis options**

Length of wall perpendicular to section = 30.00m  
 Subgrade reaction model - Boussinesq Influence coefficients  
 Soil deformations are elastic until the active or passive limit is reached  
 Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall  
 Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	26.85	0.00	0.008	1.26E-03	0.0	0.0	
2	26.60	1.31	0.007	1.26E-03	0.2	0.0	
3	26.35	2.63	0.007	1.26E-03	0.7	0.1	
		2.50	0.007	1.26E-03	0.7	0.1	
4	26.10	5.11	0.007	1.26E-03	1.6	0.5	
5	25.85	10.32	0.007	1.26E-03	3.5	1.1	
		1.38	0.007	1.26E-03	3.5	1.1	
6	25.68	2.53	0.006	1.25E-03	3.9	1.7	
7	25.50	5.82	0.006	1.25E-03	4.6	2.4	
8	25.20	15.98	0.006	1.24E-03	7.9	4.2	
9	25.03	22.38	0.005	1.23E-03	11.2	5.9	
10	24.85	28.01	0.005	1.21E-03	15.6	8.2	
		-26.13	0.005	1.21E-03	15.6	8.2	
11	24.68	-21.33	0.005	1.19E-03	11.5	10.6	
12	24.50	-17.43	0.005	1.17E-03	8.1	12.3	
13	24.25	-13.29	0.005	1.13E-03	4.3	13.8	
14	24.00	-10.32	0.004	1.09E-03	1.3	14.4	
15	23.70	-7.77	0.004	1.03E-03	-1.4	14.4	
16	23.40	-5.88	0.004	9.88E-04	-3.5	13.6	
17	23.10	-4.30	0.003	9.42E-04	-5.0	12.3	
18	22.80	-2.85	0.003	9.01E-04	-6.1	10.5	
19	22.50	-1.37	0.003	8.66E-04	-6.7	8.6	
20	22.20	0.23	0.003	8.39E-04	-6.9	6.5	
21	21.90	2.06	0.002	8.19E-04	-6.5	4.4	
22	21.60	4.17	0.002	8.07E-04	-5.6	2.5	
23	21.30	6.63	0.002	8.01E-04	-4.0	1.0	
24	21.08	8.75	0.002	7.99E-04	-2.2	0.3	
25	20.85	11.10	0.001	7.98E-04	0.0	-0.0	

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Stage No.3 Excavate to elevation 25.85 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Earth pressure kN/m2		
1	26.85	0.00	0.00	0.00	0.00	0.00	0.00	1164
2	26.60	0.00	4.50	1.31	19.66	1.31	1.31a	1164
3	26.35	0.00	9.00	2.63	39.32	2.63	2.63a	1164
		Total>	9.00	2.50m	56.80	2.50	2.50a	1574
4	26.10	Total>	13.75	3.75m	61.55	5.11	5.11	1574
5	25.85	Total>	18.50	5.00m	66.30	10.32	10.32	1574
6	25.68	Total>	22.11	5.87m	69.91	14.25	14.25	1574
7	25.50	Total>	27.87	6.75m	75.67	20.34	20.34	1574
8	25.20	Total>	42.27	8.25m	90.07	35.28	35.28	1574
9	25.03	Total>	51.16	9.12m	98.96	44.48	44.48	1574
10	24.85	Total>	59.28	11.50	107.08	52.91	52.91	1574
		Total>	59.28	10.00m	226.58	26.52	26.52	7869
11	24.68	Total>	66.68	10.87m	236.07	34.21	34.21	8145
12	24.50	Total>	73.00	11.75m	244.48	40.93	40.93	8420
13	24.25	Total>	80.44	13.00m	254.91	49.10	49.10	8814
14	24.00	Total>	86.47	14.25m	263.93	56.00	56.00	9207
15	23.70	Total>	92.47	15.75m	273.51	63.18	63.18	9679
16	23.40	Total>	97.65	17.25m	282.27	69.64	69.64	10152
17	23.10	Total>	102.36	18.75m	290.57	75.72	75.72	10624
18	22.80	Total>	106.85	20.25m	298.64	81.64	81.64	11096
19	22.50	Total>	111.25	21.75m	306.63	87.53	87.53	11568
20	22.20	Total>	115.64	23.25m	314.60	93.48	93.48	12040
21	21.90	Total>	120.07	24.75m	322.62	99.56	99.56	12512
22	21.60	Total>	124.56	26.25m	330.70	105.82	105.82	12985
23	21.30	Total>	129.14	27.75m	338.86	112.28	112.28	13457
24	21.08	Total>	132.63	28.87m	345.04	117.29	117.29	13811
25	20.85	Total>	136.17	30.00m	351.26	122.44	122.44	14165

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Earth pressure kN/m2		
1	26.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	47.80	8.94	8.94	1798
6	25.68	Total>	3.15	0.87m	50.95	11.73	11.73	1798
7	25.50	Total>	6.30	1.75m	54.10	14.51	14.51	1798
8	25.20	Total>	11.70	3.25m	59.50	19.30	19.30	1798
9	25.03	Total>	14.85	4.12m	62.65	22.10	22.10	1798
10	24.85	Total>	18.00	5.00m	65.80	24.90	24.90	1798
		Total>	18.00	5.00m	185.30	52.65	52.65	8989
11	24.68	Total>	21.50	5.87m	190.89	55.54	55.54	9304
12	24.50	Total>	25.00	6.75m	196.48	58.36	58.36	9618
13	24.25	Total>	30.00	8.00m	204.47	62.39	62.39	10068
14	24.00	Total>	35.01	9.25m	212.46	66.32	66.32	10517
15	23.70	Total>	41.01	10.75m	222.05	70.95	70.95	11056
16	23.40	Total>	47.01	12.25m	231.64	75.52	75.52	11596
17	23.10	Total>	53.02	13.75m	241.23	80.03	80.03	12135
18	22.80	Total>	59.03	15.25m	250.82	84.49	84.49	12674
19	22.50	Total>	65.04	16.75m	260.41	88.90	88.90	13214

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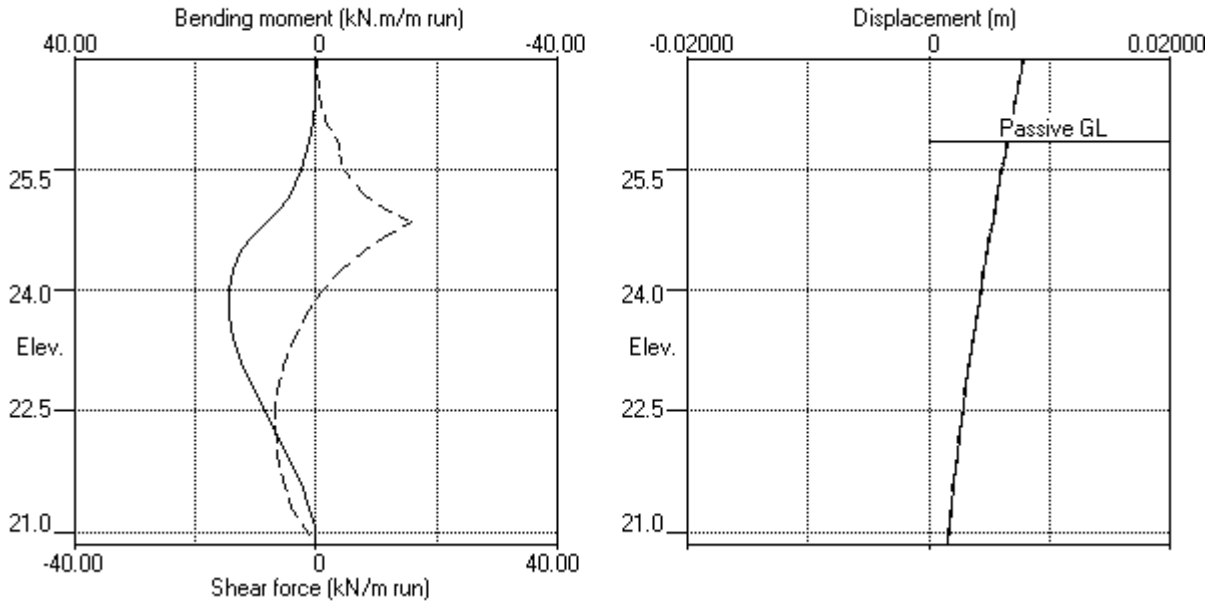
Stage No.3 Excavate to elevation 25.85 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	22.20	Total>	71.05	18.25m	270.01	93.25	93.25	13753
21	21.90	Total>	77.06	19.75m	279.61	97.50	97.50	14292
22	21.60	Total>	83.07	21.25m	289.20	101.65	101.65	14832
23	21.30	Total>	89.09	22.75m	298.80	105.65	105.65	15371
24	21.08	Total>	93.60	23.87m	306.01	108.54	108.54	15776
25	20.85	Total>	98.11	25.00m	313.21	111.34	111.34	16180

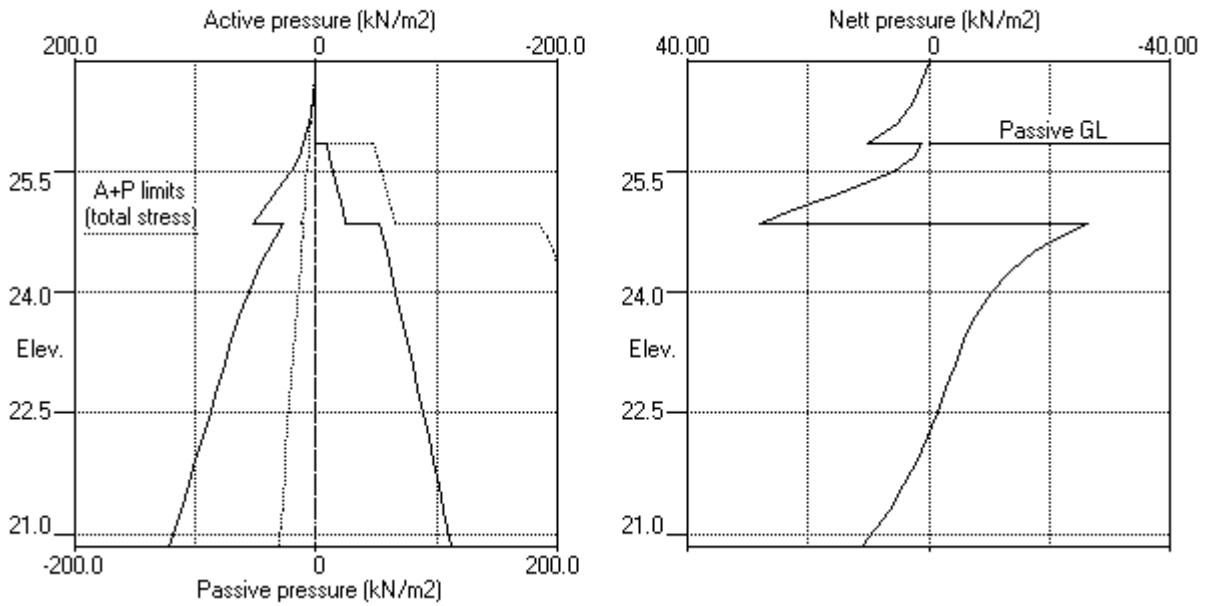
Note: 2.50a Soil pressure at active limit  
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. 25.85 on PASSIVE side



Stage No.3 Excav. to elev. 25.85 on PASSIVE side





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Stage No. 4 Excavate to elevation 24.85 on PASSIVE side

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**  
 Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	--- Pass. --- Elev.	Strut Elev.	FoS for toe elev. =	Moment of equil. at elev.	Toe elev. for FoS = 1.000	Wall Penetration
4	26.85	24.85	Cant.	4.313	21.20	24.30	0.55

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**  
**Analysis options**

Length of wall perpendicular to section = 30.00m  
 Subgrade reaction model - Boussinesq Influence coefficients  
 Soil deformations are elastic until the active or passive limit is reached  
 Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall  
 Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	26.85	0.00	0.011	1.90E-03	0.0	0.0	
2	26.60	1.31	0.011	1.90E-03	0.2	0.0	
3	26.35	2.63	0.010	1.90E-03	0.7	0.1	
		2.50	0.010	1.90E-03	0.7	0.1	
4	26.10	3.75	0.010	1.90E-03	1.4	0.4	
5	25.85	6.65	0.009	1.90E-03	2.7	1.0	
6	25.68	10.75	0.009	1.89E-03	4.3	1.6	
7	25.50	16.98	0.008	1.89E-03	6.7	2.5	
8	25.20	32.19	0.008	1.88E-03	14.1	5.5	
9	25.03	41.55	0.008	1.86E-03	20.5	8.5	
10	24.85	50.14	0.007	1.84E-03	28.5	12.8	
		-39.76	0.007	1.84E-03	28.5	12.8	
11	24.68	-34.30	0.007	1.81E-03	22.1	17.2	
12	24.50	-29.65	0.007	1.77E-03	16.5	20.5	
13	24.25	-24.34	0.006	1.70E-03	9.7	23.7	
14	24.00	-20.11	0.006	1.63E-03	4.2	25.4	
15	23.70	-15.96	0.005	1.53E-03	-1.3	25.8	
16	23.40	-12.41	0.005	1.44E-03	-5.5	24.6	
17	23.10	-9.18	0.004	1.36E-03	-8.7	22.4	
18	22.80	-6.05	0.004	1.28E-03	-11.0	19.4	
19	22.50	-2.89	0.004	1.22E-03	-12.4	15.8	
20	22.20	0.42	0.003	1.17E-03	-12.7	11.9	
21	21.90	4.00	0.003	1.13E-03	-12.1	8.1	
22	21.60	7.94	0.003	1.11E-03	-10.3	4.6	
23	21.30	12.36	0.002	1.10E-03	-7.2	1.8	
24	21.08	16.02	0.002	1.10E-03	-4.1	0.5	
25	20.85	20.02	0.002	1.10E-03	0.0	-0.0	

(continued)

Stage No.4 Excavate to elevation 24.85 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Earth pressure kN/m2		
1	26.85	0.00	0.00	0.00	0.00	0.00	0.00	1027
2	26.60	0.00	4.50	1.31	19.66	1.31	1.31a	1027
3	26.35	0.00	9.00	2.63	39.32	2.63	2.63a	1027
		Total>	9.00	2.50m	56.80	2.50	2.50a	1393
4	26.10	Total>	13.75	3.75m	61.55	3.75	3.75a	1393
5	25.85	Total>	18.50	5.00m	66.30	6.65	6.65	1393
6	25.68	Total>	22.11	5.87m	69.91	10.75	10.75	1393
7	25.50	Total>	27.87	6.75m	75.67	16.98	16.98	1393
8	25.20	Total>	42.27	8.25m	90.07	32.19	32.19	1393
9	25.03	Total>	51.16	9.12m	98.96	41.55	41.55	1393
10	24.85	Total>	59.28	11.50	107.08	50.14	50.14	1393
		Total>	59.28	10.00m	226.58	12.65	12.65	6966
11	24.68	Total>	66.68	10.87m	236.07	20.63	20.63	7210
12	24.50	Total>	73.00	11.75m	244.48	27.68	27.68	7454
13	24.25	Total>	80.44	13.00m	254.91	36.38	36.38	7802
14	24.00	Total>	86.47	14.25m	263.93	43.85	43.85	8151
15	23.70	Total>	92.47	15.75m	273.51	51.75	51.75	8569
16	23.40	Total>	97.65	17.25m	282.27	58.95	58.95	8987
17	23.10	Total>	102.36	18.75m	290.57	65.77	65.77	9405
18	22.80	Total>	106.85	20.25m	298.64	72.44	72.44	9823
19	22.50	Total>	111.25	21.75m	306.63	79.08	79.08	10241
20	22.20	Total>	115.64	23.25m	314.60	85.80	85.80	10659
21	21.90	Total>	120.07	24.75m	322.62	92.67	92.67	11077
22	21.60	Total>	124.56	26.25m	330.70	99.75	99.75	11495
23	21.30	Total>	129.14	27.75m	338.86	107.09	107.09	11913
24	21.08	Total>	132.63	28.87m	345.04	112.80	112.80	12226
25	20.85	Total>	136.17	30.00m	351.26	118.68	118.68	12540

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective stresses Active limit kN/m2	Effective stresses Passive limit kN/m2	Earth pressure kN/m2		
1	26.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.68	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	25.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	25.03	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	24.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	167.30	52.41	52.41	8562
11	24.68	Total>	3.50	0.87m	172.89	54.93	54.93	8862
12	24.50	Total>	7.00	1.75m	178.48	57.34	57.34	9161
13	24.25	Total>	12.00	3.00m	186.47	60.72	60.72	9590
14	24.00	Total>	17.00	4.25m	194.45	63.95	63.95	10018
15	23.70	Total>	23.00	5.75m	204.04	67.70	67.70	10531
16	23.40	Total>	29.01	7.25m	213.63	71.36	71.36	11045
17	23.10	Total>	35.01	8.75m	223.22	74.95	74.95	11559
18	22.80	Total>	41.02	10.25m	232.81	78.49	78.49	12073
19	22.50	Total>	47.02	11.75m	242.40	81.98	81.98	12586
20	22.20	Total>	53.04	13.25m	252.00	85.38	85.38	13100

(continued)

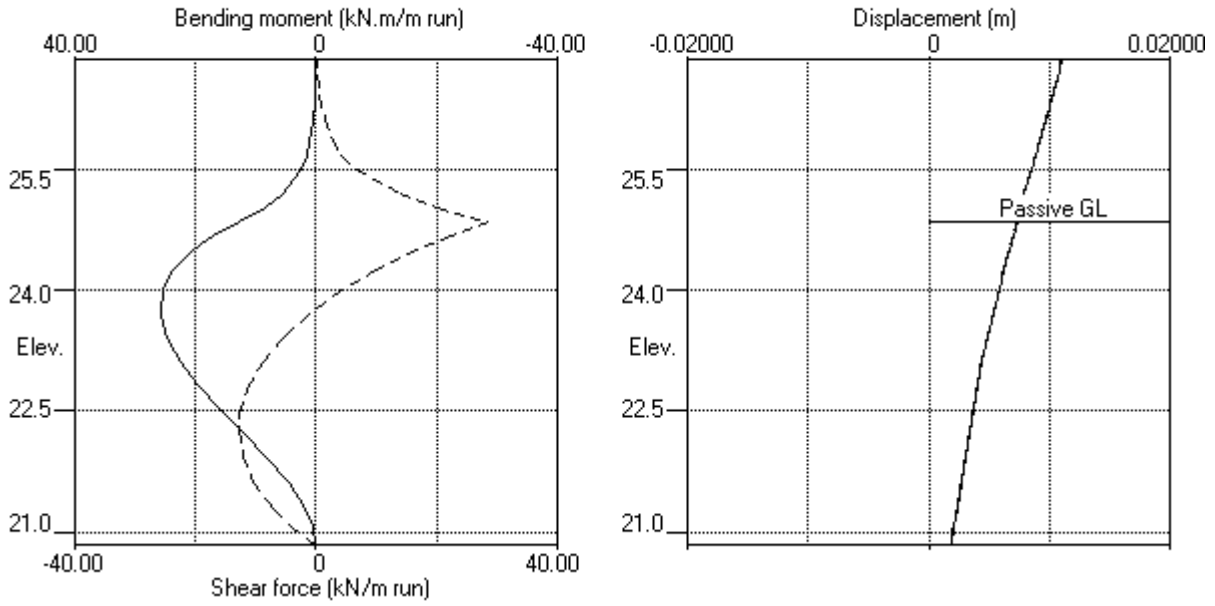
Stage No.4 Excavate to elevation 24.85 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	21.90	Total>	59.05	14.75m	261.60	88.67	88.67	13614
22	21.60	Total>	65.06	16.25m	271.20	91.80	91.80	14128
23	21.30	Total>	71.08	17.75m	280.80	94.73	94.73	14641
24	21.08	Total>	75.60	18.87m	288.01	96.77	96.77	15027
25	20.85	Total>	80.12	20.00m	295.21	98.66	98.66	15412

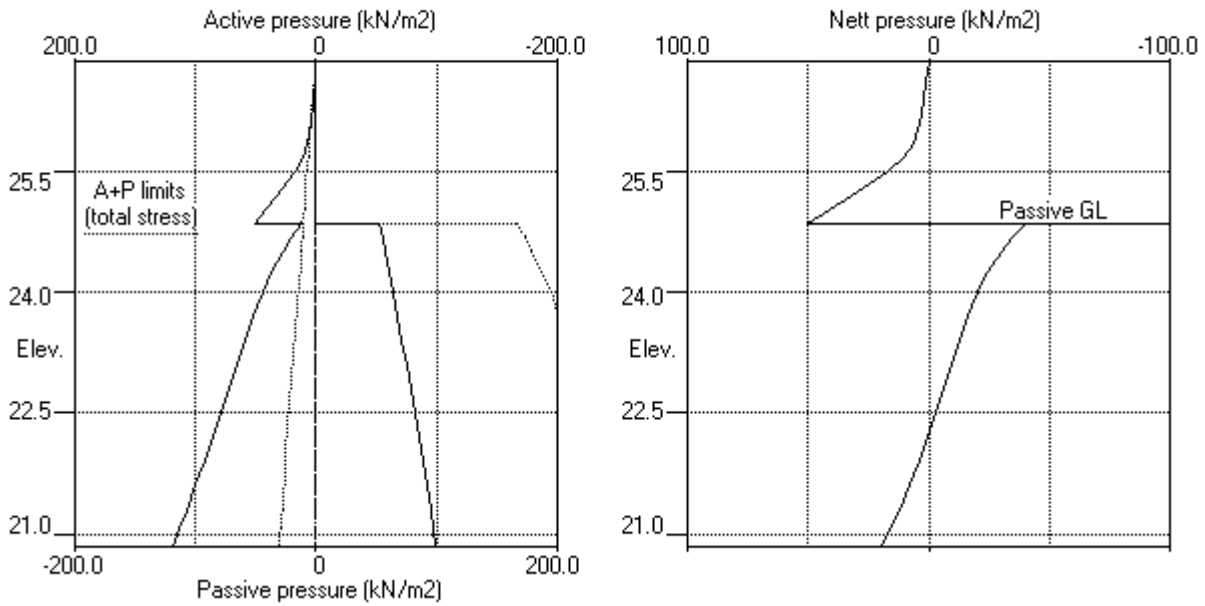
Note: 3.75a Soil pressure at active limit  
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 24.85 on PASSIVE side



Stage No.4 Excav. to elev. 24.85 on PASSIVE side



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 Data filename/Run ID: Run1 - BEJ changes\_SLS SJM  
 Camden High Street  
 Rear sheet pile retaining wall

Sheet No.  
 Job No. 18648A  
 Made by : SJM  
 Date:16-06-2016  
 Checked :

-----  
 Units: kN,m

**Summary of results**

**LIMIT STATE PARAMETERS**

Limit State: Serviceability Limit State  
 All loads and soil strengths are unfactored

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**  
 Factor of safety on soil strength

Stage No.	--- G.L. ---		Strut Elev.	FoS for toe elev. = 20.85		Toe elev. for FoS = 1.000	
	Act.	Pass.		Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
1	26.85	26.85	Cant.	Conditions not suitable for FoS calc.			
2	26.85	26.85	Cant.	Conditions not suitable for FoS calc.			
3	26.85	25.85	Cant.	6.168	21.19	25.49	0.36
4	26.85	24.85	Cant.	4.313	21.20	24.30	0.55

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 Made by : SJM  
 Date:16-06-2016  
 Checked :

Units: kN,m

**Summary of results**

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**

**Analysis options**

Length of wall perpendicular to section = 30.00m  
 Subgrade reaction model - Boussinesq Influence coefficients  
 Soil deformations are elastic until the active or passive limit is reached  
 Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall  
 Passive side 20.00 from wall

**Bending moment, shear force and displacement envelopes**

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	26.85	0.011	0.000	0.0	-0.0	0.0	0.0
2	26.60	0.011	0.000	0.0	-0.0	0.2	-0.4
3	26.35	0.010	0.000	0.1	-0.2	0.7	-1.3
4	26.10	0.010	0.000	0.5	-0.7	1.6	-2.7
5	25.85	0.009	0.000	1.1	-1.6	3.5	-4.2
6	25.68	0.009	0.000	1.7	-2.4	4.3	-5.1
7	25.50	0.008	0.000	2.5	-3.4	6.7	-5.8
8	25.20	0.008	0.000	5.5	-5.1	14.1	-5.2
9	25.03	0.008	0.000	8.5	-5.9	20.5	-3.5
10	24.85	0.007	0.000	12.8	-6.3	28.5	-0.9
11	24.68	0.007	0.000	17.2	-6.5	22.1	-1.3
12	24.50	0.007	0.000	20.5	-6.7	16.5	-1.3
13	24.25	0.006	0.000	23.7	-6.9	9.7	-0.6
14	24.00	0.006	0.000	25.4	-7.0	4.2	0.0
15	23.70	0.005	0.000	25.8	-6.7	1.5	-1.4
16	23.40	0.005	0.000	24.6	-6.1	2.5	-5.5
17	23.10	0.004	0.000	22.4	-5.3	3.1	-8.7
18	22.80	0.004	0.000	19.4	-4.3	3.5	-11.0
19	22.50	0.004	0.000	15.8	-3.2	3.5	-12.4
20	22.20	0.003	0.000	11.9	-2.2	3.2	-12.7
21	21.90	0.003	0.000	8.1	-1.4	2.6	-12.1
22	21.60	0.003	0.000	4.6	-0.7	2.0	-10.3
23	21.30	0.002	0.000	1.8	-0.2	1.2	-7.2
24	21.08	0.002	0.000	0.5	-0.1	0.6	-4.1
25	20.85	0.002	0.000	0.0	-0.0	0.0	-0.0

**Maximum and minimum bending moment and shear force at each stage**

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev. m	minimum kN.m/m	elev. m	maximum kN/m	elev. m	minimum kN/m	elev. m
1	0.0	26.85	-6.8	24.00	3.4	22.80	-5.7	25.50
2	0.0	26.85	-7.0	24.00	3.5	22.80	-5.8	25.50
3	14.4	24.00	-0.0	20.85	15.6	24.85	-6.9	22.20
4	25.8	23.70	-0.0	20.85	28.5	24.85	-12.7	22.20

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**Summary of results (continued)**

**Maximum and minimum displacement at each stage**

Stage no.	Displacement maximum	Displacement elev.	Displacement minimum	Displacement elev.	Stage description
	m		m		
1	0.003	26.85	0.000	26.85	Apply surcharge no.1 at elev. 25.85
2	0.003	26.85	0.000	26.85	Apply water pressure profile no.1
3	0.008	26.85	0.000	26.85	Excav. to elev. 25.85 on PASSIVE side
4	0.011	26.85	0.000	26.85	Excav. to elev. 24.85 on PASSIVE side

Units: kN,m

Bending moment, shear force, displacement envelopes

