



**3 KIDDERPORE AVENUE
LONDON
NW3 7SX**

DETAILED BASEMENT CONSTRUCTION PLAN

Revision	Notes	Issued by	Date
1.2	Report updated with Additional design data	GB	July 2014
1.1	Report updated to answer Planning comments	GB	November 2013
1.0	Report Issued	GB	August 2013

GB/8148 - Version 1.2

July 2014

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SECTION 2

Shearwater Consultancy Report of Structural Appraisal

5 Kidderpore Avenue London NW3 – ref a55485 dated June 2014

1a Kidderpore Avenue London NW3 – ref a55507 dated June 2014

SECTION 3

Taylor Whalley Spyra Drawing 8148_PH100 dated 30.04.14 showing
Existing and proposed surface water site catchment zones
and site surface water drainage layout

1.0 INTRODUCTION

The purpose of this document is to provide additional detailed design information for construction of the proposed basement at 3 Kidderpore Avenue, London, NW3 7SX.

As part of item 2.7 of the Section 106 agreement the detailed design is to incorporate appropriately conservative modelling relating to local Ground conditions, local water environment and the structural condition of neighbouring properties into the final design.

In corporation with Geotechnical Consulting Group, Taylor Whalley Spyra have produced addition detailed design calculations for the proposed basement structure which have reviewed the various basement wall conditions around the site, these are based on appropriate conservative modelling for the site and have taken into account the local ground conditions, local water environment and the structural condition of existing neighbouring properties (See Content Section 1).

Shearwater Consultancy has undertaken a structural appraisal of the neighbouring properties of no. 5 Kidderpore Avenue and 1a Kidderpore Avenue (See Content Section 2).

Taylor Whalley Spyra have undertaken a review of the existing surface water site catchment zones and site surface water drainage and have undertaken drawing 8148_PH100 this confirms the existing site conditions and also shows the proposed new condition for construction of the site drainage which maintains the existing local water environment and will not effect the structural condition of the existing neighbouring properties (See Content Section 3).

2.0 SECTION 106 REQUIREMENTS FOR DETAILED BASEMENT CONSTRUCTION PLAN

Item 2.7 (i). The names and qualifications of those certifying the information within the Detailed Basement Construction Plan are as follows:

Simon Lane BSc(Eng), CEng, FICE, FISTructE,
Hugh St John BSc PhD Hon. DSc
Andrew J Nichols BSc FRICS
Jacek R Gabrielczyk BSc(Eng), CEng, MICE, MISTructE, MCIHT, CWEM, MCIWEM

Item 2.7 (i.a). I am a Fellow of the Institution of Civil Engineers and a Fellow of the Institution of Structural Engineers since 1993 and equity director of TWS since 1996 and have extensive experience of designing in all structural forms and with all the common materials and have worked in project teams throughout the UK and in particular in London and the surrounding counties.

I undertake reviews for the Institution of Structural Engineers commenting on the content of technical papers prior to publication in engineering journals and proceedings.

Simon Lane Qualifications:

- BSc Civil Engineering - BSc (Eng)
- Chartered Engineer – Ceng
- Fellow of The Institution of Structural Engineers – FISTructE
- Fellow of The Institution of Civil Engineers – FICE

Taylor Whalley Spyra are retained as consulting civil and structural engineers for the project. The company was formed in 1955 and is a private company wholly owned by the directors. Our expertise covers all building types and we have particular experience of working in restricted central London locations.

Item 2.7 (i.b). A review of the information in Contents Section 1, 2 & 3 which is based on conservative design modelling has taken into account the condition of the existing properties of no.1a and no.5 Kidderpore Avenue. With reference to the Burland Categories this confirms that any effect on the adjoining properties will not impact on them beyond the Burland category of slight

Item 2.7 (i.c.ii). A detailed structural appraisal of the neighbouring properties of no.1a and no.5 Kidderpore Avenue has been undertaken by Andrew J Nichols a Chartered Surveyor and attended by Jacek R Gabrielczyk a Structural Engineer (See Content Section 2).

Item 2.7 (i.c.iii). A review of the method statement and temporary works sequencing drawings with the proposed method of monitoring and controlling risks associated with movement which may affect neighbouring properties associated with the basement works are appropriate and conservative to minimise the effect on neighbouring properties below the Burland category of slight.

Item 2.7 (i.c.iv). A review of the detailed design for the modelling of local ground conditions within the interpretative report on the ground investigation, with local water environment incorporating with detailed design drawings for ground water control and the structural review of the neighbouring properties no.1 and no.5 Kidderpore Avenue. These are conservative within their modelling and should not impact on the two neighbouring properties beyond the Burland category of slight (See Content Section 1).

Item 2.7 (i.c.v). The construction method statement confirms that a suitably qualified residential site engineer will be maintained on site during the construction phase of the basement to review works onsite as they progress for the main works and temporary works and to maintain a regular inspection of the monitoring procedure that will be located on site and to the adjoining properties and outside site to the front in Kidderpore Avenue. The site engineer will be interviewed by Taylor Whalley Sprya to confirm their suitability.

Item 2.7 (i.c.vi). A review of the information, with discussions with the design team and client concerning measures to ensure the on-going maintenance and upkeep of the basement and associated drainage/ground water diversion measures will form part of the CDM operating manual for the site. This involves specifying higher grade of materials with conservative design safety factors for longer design life of the basement with increased protection to below ground infrastructure. All drainage materials are specified for extended design life and are to be easily maintainable with suitable access points and silt traps, with gravel drainage and soakaways designed so they may be inspected and maintained without unnecessary complications. It is proposed that on site monitoring and that of adjoining properties continues for a further 12 months after the building is occupied to review the effects of the development on the adjoining properties and the below ground water environment (See Content Section 3 refer to note on Maintenance of Drainage on TWS drawing 8148_PH100).

3.0 CONCLUSION

The contents in section 1 are based on a conservative modelling of the site and GCG reviewing the behaviour of the retaining walls and utilising a series of sensitivity analysis assess different levels of movement and how these can be controlled. This analysis has been reflected within the detailed design calculations and has confirmed that settlement is less than the settlement that was originally estimated using the C580 empirical approach.

The contents in section 2 are based on a detailed site inspection of both neighbouring properties and concluded that both properties are structural sound and the condition of the buildings are satisfactory and consistent with the age and type of properties. This is consistent with the design modelling.

The contents in section 3 are based on a site survey and walk around to ascertain the existing surface water catchment areas and direction of surface water flow to adjoining sites. This is shown on drawing 8148_PH100 which also gives the new catchment areas and flow directions which maintain the existing site condition with regard to Surface water entering the ground. The

surface water that enters the public drainage system has been reduced with the aid of on site storage. The existing ground water flow is being maintained with the installation of a land drain and soakaway chambers. Design calculations are noted on the drawing with additional notes to confirm the detailed design model.

The detailed design information has used appropriately conservative modelling and confirms that effect of the proposed basement will not affect the surround area

For and on behalf of
TAYLOR WHALLEY SPYRA

A handwritten signature in black ink, consisting of a large, stylized 'S' and 'L' intertwined.

SIMON LANE
BSc(Eng), CEng, FICE, FIStructE,

CONTENTS 1

Appendix A – Report from Hugh St John BSc PDD Hon. Dsc) Additional analysis of retaining walls to look as sensitivity of the predicted wall movements to assumptions

Appendix B – Additional Wallap Analysis

Appendix C – Structural Calculations for construction

CONTENTS 2



**3 KIDDERPORE AVENUE
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ADDITIONAL INFORMATION FOR CONSTRUCTION STAGE

APPENDICES:

- Appendix A – Report From Hugh St John (BSc PhD Hon. Dsc) Additional Analysis of Retaining Walls to Look at the Sensitivity of the Predicted Wall Movements to Assumptions
- Appendix B – Additional Wallap Analysis
- Appendix C – Structural Calculations for Construction

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SIMON LANE
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APPENDIX A

Report From Hugh St John (BSc PhD Hon. Dsc) Additional Analysis of Retaining Walls to Look at
the Sensitivity of the Predicted Wall Movements to Assumptions

3 KIDDERPORE AVENUE.

ADDITIONAL ANALYSIS OF RETAINING WALLS TO LOOK AT THE SENSITIVITY OF THE PREDICTED WALL MOVEMENTS TO ASSUMPTIONS.

March 2014.

The purpose of this note is to address an issue raised by Arup in their review (dated 3rd June 2011) of the GCG report on building damage (2011) concerning the assumptions made in the calculations carried out of the likely behaviour of the retaining walls (item 4, page 15). This relates to condition 2.7 (i) (b) of the section 106 agreement.

Arup suggested that 'should planning permission be granted, as series of sensitivity analyses be carried out to assess the implications of high values of K_0 and lower values of E and thereby enable the detailed design to address the likelihood of different levels of movement and how these can be controlled on site'.

The damage assessment that was described in the GCG report presented the results of retaining wall analyses that had been carried out using the program WALLAP. However, this calculation was as a check of the estimates of settlement behind the wall which were made on the basis of the empirical evidence presented in CIRIA C580. The estimated maximum settlement resulting from the process of excavation was 5 mm. The WALLAP analysis (taking the worst case on the side of 1A Kidderpore Avenue) gave a maximum wall deflection of 5 mm for the bored pile wall. Based on the construction recommended in the CIRIA document, this would be equivalent to a maximum settlement of 2.5 mm (i.e. 50% of the maximum deflection).

The original analyses of both the bored pile wall on the right hand side of the building and the steel pile wall on the left were carried out making the recommended assumption that the coefficient of horizontal stress (K_0) had a value of 1.0 and the ground stiffness was given by the relationship $E_u/C_u = 1000$. This stiffness is related to the short term condition when the clay is undrained and refers to the time up to the point where the base slab is placed and the wall is effectively locked in place.

At this location the London Clay has very little cover and the parameter K_0 is likely to be relatively high. The reason that K_0 is taken to be 1.0 for bored pile walls is that the process of installing the wall reduces the stresses. The effect of reducing the stress is effectively allowed for in the movements attributed to pile installation. This is not the case for a steel wall which is jacked into place where the in-situ stresses are, in anything increased as the ground is pushed out of the way.

The following analyses have been carried out to examine the sensitivity:

Bored Pile Wall:

1. Base case.	Ko =1.0	Eu/Cu =1000
2. Worst case.	Ko=1.5	Eu/Cu =600
3. Moderate case.	Ko=1.3	Eu/Cu =600
4. Low stiffness case.	Ko =1.0	Eu/Cu =600
5. High stress case.	Ko =1.5	Eu/Cu = 1000

Steel Wall:

1. Base case.	Ko =1.0	Eu/Cu =1000
2. Worst case.	Ko=1.8	Eu/Cu =600
3. Moderate case.	Ko=1.5	Eu/Cu =600
4. Low stiffness case.	Ko =1.0	Eu/Cu =600
5. High stress case.	Ko =1.8	Eu/Cu = 1000

The range of lower value of Eu/Cu has been selected on the basis of experience. The range of Ko values reflects the possible range using the value of 1.0 as the lower value and 1.8 as the upper value for the jacked in pile. The upper value of Ko for the bored pile is taken as 1.5 to allow for some installation effects. The value of 1.8 in the upper 6 metres of London Clay is based on Burland et al (1979) and Mayne and Kulhawy (1985) which relate the Ko value to the stress history of the region (see fig 1).

The results of the additional analyses are attached together with the original results representing the base case.

The deflections at the head of the walls and the maximum deflection are tabulated below:

Case	Deflection at top of the wall (mm)	Max deflection (mm)
Bored pile wall		
1 (stage 12)	1	5
2	1	8
3	1	8
4	1	8
5	1	5
Steel Wall		
1 (stage 10)	1	6
2	1	9
3	1	9
4	1	9
5	0	6

It can be concluded from the above that in the case of both the bored pile wall and the sheet pile wall the variation of the parameters within reasonable bounds results in a possible increased deflection of the wall of around 3 mm. This equates to an additional settlement of 1.5 mm over what would have been estimated using the original wall deflections. This maximum settlement is still less than the settlement that was originally estimated using the C580 empirical approach.

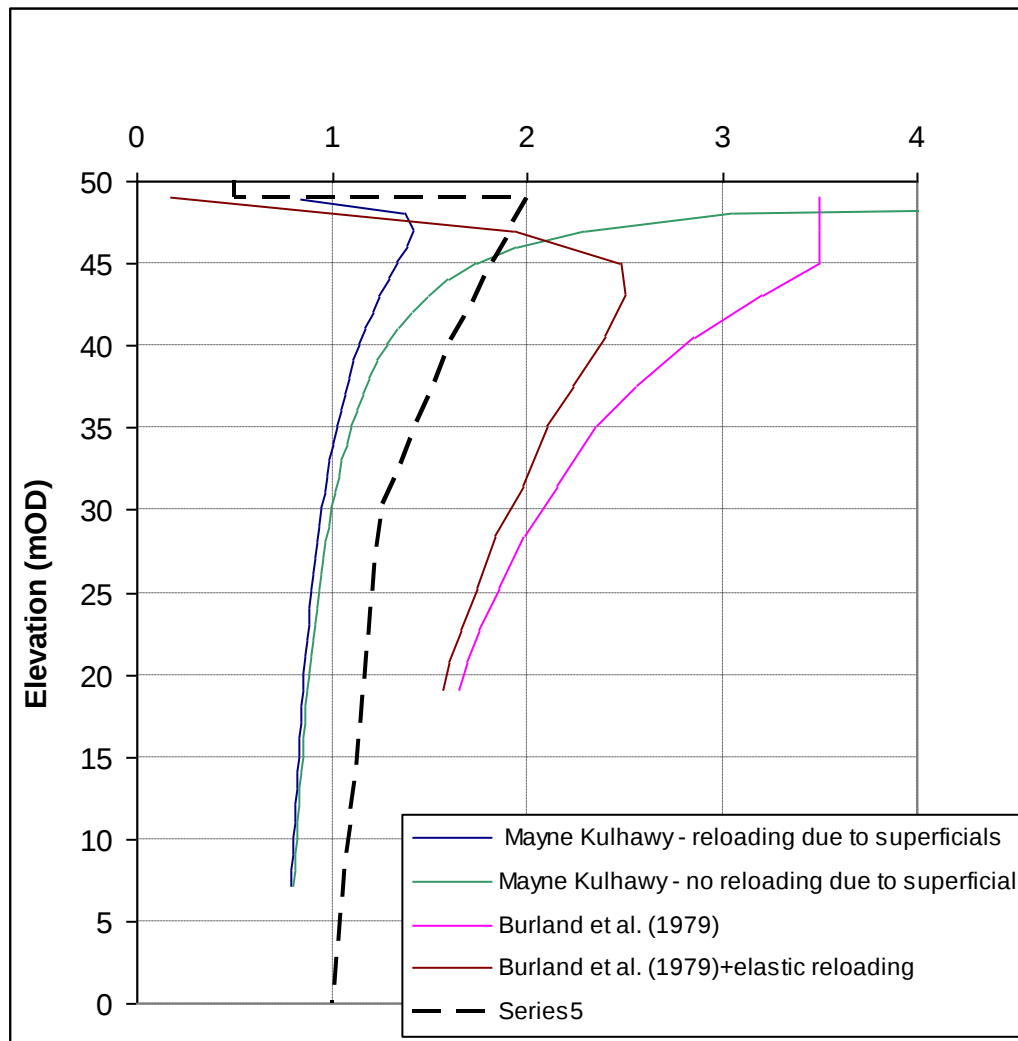


Fig 1. Estimated K_0 value for Hampstead region based on previous overburden of 50 m and depth of superficial deposits equal to 1 metre. The 'series 5' line is taken as the assumed current K_0 value with an average value of around 1.8 over the top 6 metres.

APPENDIX B

Additional Wallap Calculations

A.K.A. LTD.	Sheet No.
Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
Licensed from GEOSOLVE	Made by : PJBW
Data filename/Run ID: Kpore_SLS01 Eu600CuK01.0	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	30000	1.000	OC	1.000	1.000	50.00u
(49.50)		(4200)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	24000	1.000	OC	0.368	3.244	2.000d
(49.50)		(3360)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Made Ground	30.00	0.634	0.00	30.00	0.634	0.00	
2 London Clay	0.00	0.500	0.00	0.00	0.000	0.00	
3 LC Drained	24.00	0.647	0.00	24.00	0.670	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.		Active side			Passive side			
profile	Point	Elev.	Piezo	Water	Point	Elev.	Piezo	Water
no.	no.	m	elev. m	press. kN/m2	no.	m	elev. m	press. kN/m2
1	1	50.50	50.50	0.0	1	49.50	49.50	0.0
2	1	50.50	50.50	0.0	1	47.00	47.00	0.0
3	1	50.50	50.50	0.0	1	43.90	43.90	0.0
4	1	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 224.00 kN/m2
Moment of inertia of wall I = 8.4800E-03 m4/m run
E.I = 1.8995 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=	N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	130.00	N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	135.00	N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=	N/A	N/A

Note: A = Active side, P = Passive side
A trapezoidal surcharge is defined by two values:
N = at edge near to wall, F = at edge far from wall

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Apply surcharge no.2 at elevation 50.50
3	Apply surcharge no.3 at elevation 50.50
4	Change EI of wall to 75150 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
5	Apply water pressure profile no.1 No analysis at this stage
6	Excavate to elevation 49.50 on PASSIVE side
7	Install strut or anchor no.1 at elevation 50.00
8	Apply water pressure profile no.2 No analysis at this stage
9	Excavate to elevation 47.00 on PASSIVE side
10	Install strut or anchor no.2 at elevation 47.30
11	Apply water pressure profile no.3 No analysis at this stage
12	Excavate to elevation 43.90 on PASSIVE side
13	Install strut or anchor no.3 at elevation 44.30
14	Change EI of wall to 53860 kN.m2/m run Yield moment not defined Allow wall to relax with new modulus value
15	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
16	Apply water pressure profile no.4 No analysis at this stage
17	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Apply surcharge no.2 at elev. 50.50	No	No	No
3	Apply surcharge no.3 at elev. 50.50	No	No	No
4	Change EI of wall to 75150kN.m2/m run	No	No	No
5	Apply water pressure profile no.1	No	No	No
6	Excav. to elev. 49.50 on PASSIVE side	No	No	No
7	Install strut no.1 at elev. 50.00	No	No	No
8	Apply water pressure profile no.2	No	No	No
9	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
10	Install strut no.2 at elev. 47.30	No	No	No
11	Apply water pressure profile no.3	No	No	No
12	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
13	Install strut no.3 at elev. 44.30	No	No	No
14	Change EI of wall to 53860kN.m2/m run	No	No	No
15	Change soil type 2 to soil type 3	No	No	No
16	Apply water pressure profile no.4	No	No	No
17	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

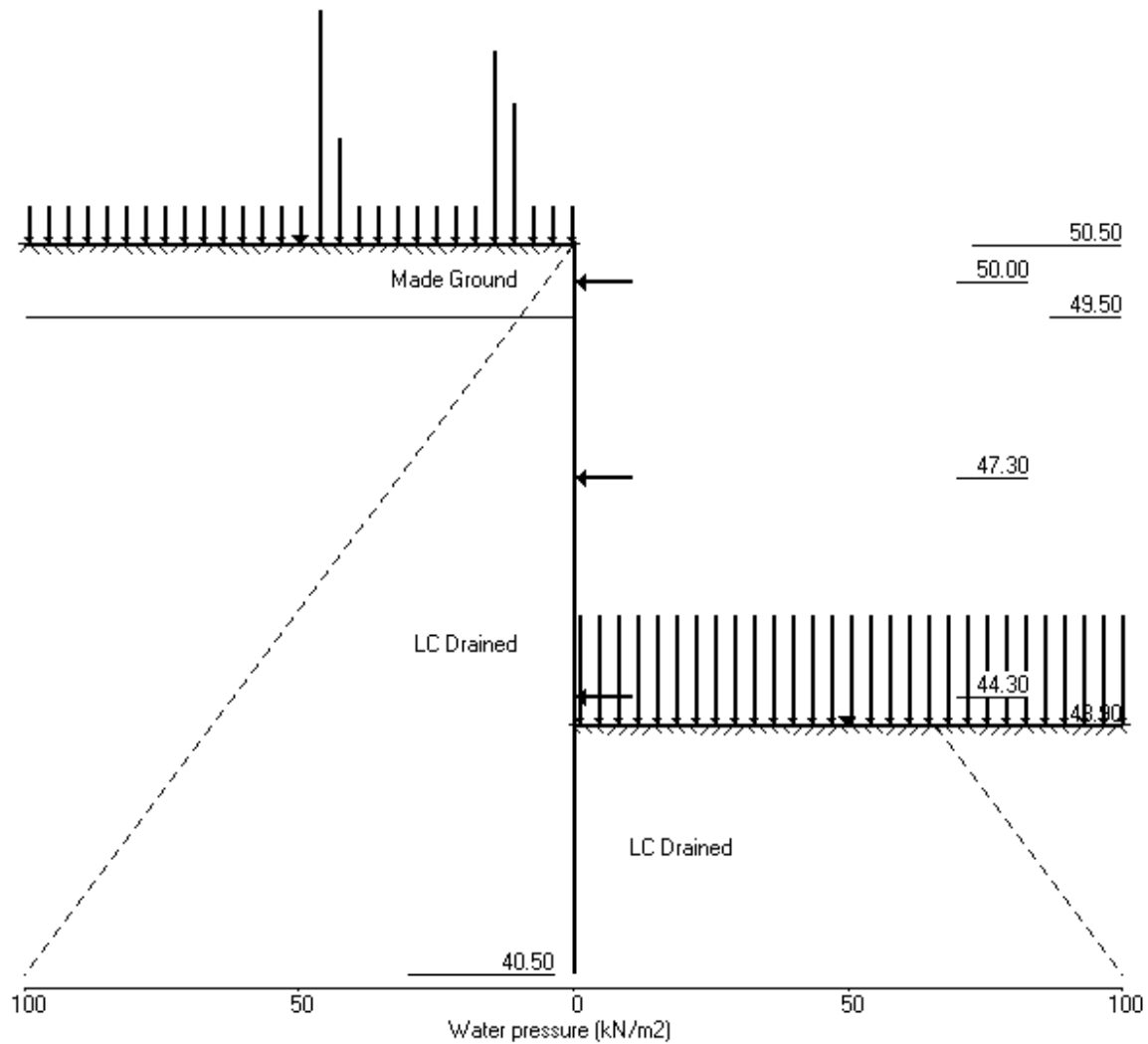
Program WALLAP - Copyright (C) 2012 by DL Borin, distributed by GEOSOLVE
69 Rodenhurst Road, London SW4, UK. Tel: +44 20 8674 7251

A.K.A. LTD.
 Program: WALLAP Version 6.05 Revision A44.B58.R48
 Licensed from GEOSOLVE
 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.0
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Stage No.17 Apply surcharge no.4 at elev. 43.90



A.K.A. LTD.	Sheet No.
Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
Licensed from GEOSOLVE	Made by : PJBW
Data filename/Run ID: Kpore_SLS01 Eu600CuK01.0	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 49.50 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
6	50.50 49.50	Cant.	4.528	41.29	48.79	0.71

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	7.13	0.002	6.29E-04	0.0	0.0		75150
2	50.00	14.52	0.002	6.26E-04	5.4	1.8		75150
3	49.50	26.92	0.002	6.00E-04	15.8	6.8		75150
		-22.04	0.002	6.00E-04	15.8	6.8		
4	49.05	-12.23	0.001	5.45E-04	8.1	11.8		75150
5	48.60	-10.17	0.001	4.66E-04	3.0	14.3		75150
6	48.00	-5.74	0.001	3.53E-04	-1.7	14.2		75150
7	47.65	-3.72	0.001	2.89E-04	-3.4	13.2		75150
8	47.30	-1.95	0.001	2.31E-04	-4.4	11.8		75150
9	47.00	-0.69	0.001	1.86E-04	-4.8	10.4		75150
10	46.60	0.44	0.001	1.36E-04	-4.8	8.4		75150
11	46.20	1.33	0.001	9.74E-05	-4.5	6.5		75150
12	45.60	1.75	0.000	5.58E-05	-3.6	3.9		75150
13	45.00	1.64	0.000	3.17E-05	-2.5	2.1		75150
14	44.65	1.63	0.000	2.40E-05	-2.0	1.3		75150
15	44.30	1.45	0.000	1.95E-05	-1.4	0.7		75150
16	43.90	1.14	0.000	1.71E-05	-0.9	0.2		75150
17	43.55	0.92	0.000	1.68E-05	-0.6	-0.1		75150
18	43.20	0.77	0.000	1.74E-05	-0.3	-0.2		75150
19	42.60	0.34	0.000	1.93E-05	0.1	-0.3		75150
20	42.00	0.09	0.000	2.10E-05	0.2	-0.2		75150
21	41.40	-0.13	0.000	2.21E-05	0.2	-0.1		75150
22	40.95	-0.19	0.000	2.24E-05	0.1	-0.0		75150
23	40.50	-0.36	0.000	2.25E-05	0.0	0.0		---

Run ID: Kpore_SLS01 Eu600CuK01.0
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.6 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total	Soil
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	stiffness coeff. kN/m3
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2473
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	2473
3	49.50	10.00	47.06	13.41	218.31	16.92	26.92	2473
		Total>	57.06	10.00w	157.06	17.50	17.50	10466
4	49.05	Total>	70.56	14.50w	176.86	33.51	33.51	11125
5	48.60	Total>	80.79	19.00w	193.39	44.07	44.07	11785
6	48.00	Total>	92.33	25.00w	213.33	57.98	57.98	12664
7	47.65	Total>	98.68	28.50w	224.58	65.65	65.65	13177
8	47.30	Total>	104.96	32.00w	235.76	73.16	73.16	13689
9	47.00	Total>	110.34	35.00w	245.34	79.47	79.47	14129
10	46.60	Total>	117.52	39.00w	258.12	87.63	87.63	14715
11	46.20	Total>	124.74	43.00w	270.94	95.69	95.69	15301
12	45.60	Total>	135.65	49.00w	290.25	107.38	107.38	16180
13	45.00	Total>	146.66	55.00w	309.66	118.86	118.86	17059
14	44.65	Total>	153.13	58.50w	321.03	125.61	125.61	17572
15	44.30	Total>	159.63	62.00w	332.43	132.29	132.29	18085
16	43.90	Total>	167.09	66.00w	345.49	139.90	139.90	18671
17	43.55	Total>	173.65	34.75m	356.95	146.60	146.60	19184
18	43.20	Total>	180.24	36.50m	368.44	153.34	153.34	19697
19	42.60	Total>	191.59	39.50m	388.19	164.85	164.85	20576
20	42.00	Total>	203.00	42.50m	408.00	176.47	176.47	21455
21	41.40	Total>	214.46	45.50m	427.86	188.14	188.14	22334
22	40.95	Total>	223.09	47.75m	442.79	196.97	196.97	22994
23	40.50	Total>	231.75	50.00m	457.75	205.75	205.75	23653

Node no.	Y coord	----- PASSIVE side -----						Total earth pressure	Soil stiffness coeff.
		Water	Vertic	Active	Passive	Earth			
		press. kN/m2	-al kN/m2	limit kN/m2	limit kN/m2	pressure kN/m2			
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	100.00	39.55	39.55	11207	
4	49.05	Total>	9.00	4.50w	115.30	45.74	45.74	11913	
5	48.60	Total>	18.00	9.00w	130.60	54.23	54.23	12619	
6	48.00	Total>	30.00	15.00w	151.00	63.72	63.72	13560	
7	47.65	Total>	37.01	18.50w	162.91	69.37	69.37	14110	
8	47.30	Total>	44.01	22.00w	174.81	75.11	75.11	14659	
9	47.00	Total>	50.01	25.00w	185.01	80.16	80.16	15129	
10	46.60	Total>	58.02	29.00w	198.62	87.19	87.19	15757	
11	46.20	Total>	66.03	33.00w	212.23	94.36	94.36	16385	
12	45.60	Total>	78.05	39.00w	232.65	105.62	105.62	17326	
13	45.00	Total>	90.08	45.00w	253.08	117.22	117.22	18267	
14	44.65	Total>	97.10	48.50w	265.00	123.98	123.98	18817	
15	44.30	Total>	104.12	52.00w	276.92	130.84	130.84	19366	
16	43.90	Total>	112.15	56.00w	290.55	138.76	138.76	19993	
17	43.55	Total>	119.18	59.50w	302.48	145.68	145.68	20542	
18	43.20	Total>	126.21	63.00w	314.41	152.57	152.57	21092	
19	42.60	Total>	138.27	34.50m	334.87	164.50	164.50	22033	
20	42.00	Total>	150.34	37.50m	355.34	176.39	176.39	22974	
21	41.40	Total>	162.42	40.50m	375.82	188.28	188.28	23916	
22	40.95	Total>	171.49	42.75m	391.19	197.16	197.16	24622	
23	40.50	Total>	180.56	45.00m	406.56	206.11	206.11	25328	

Run ID. Kpore_SLS01 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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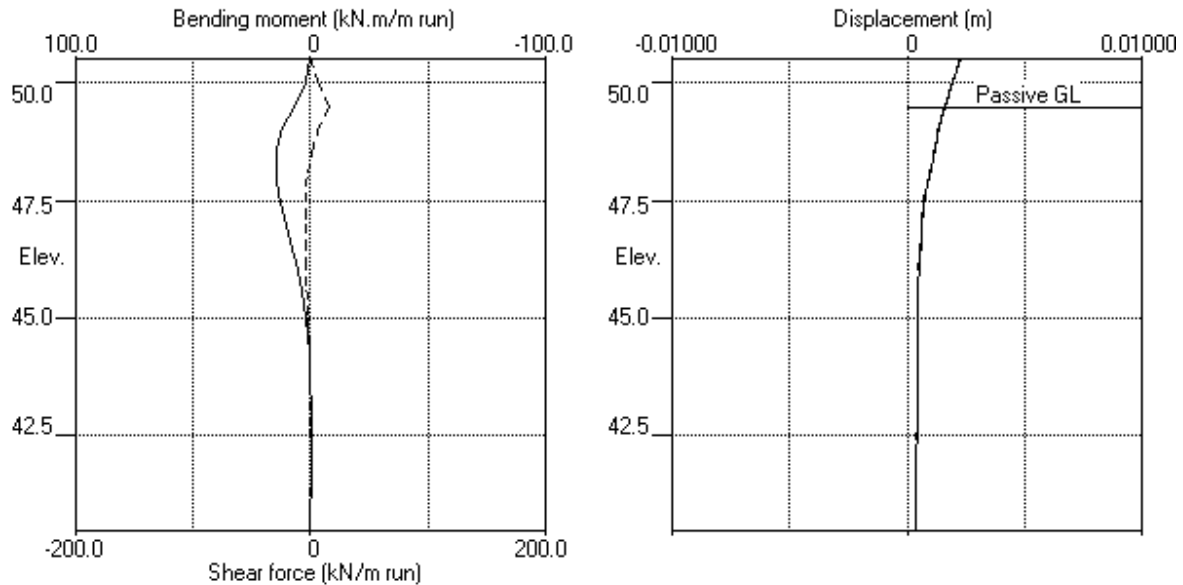
Stage No.6 Excavate to elevation 49.50 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Program: WALLAP Version 6.05 Revision A44.B58.R48
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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.0
 Kidderpore Ave, 3
 SLS type undrained calculation

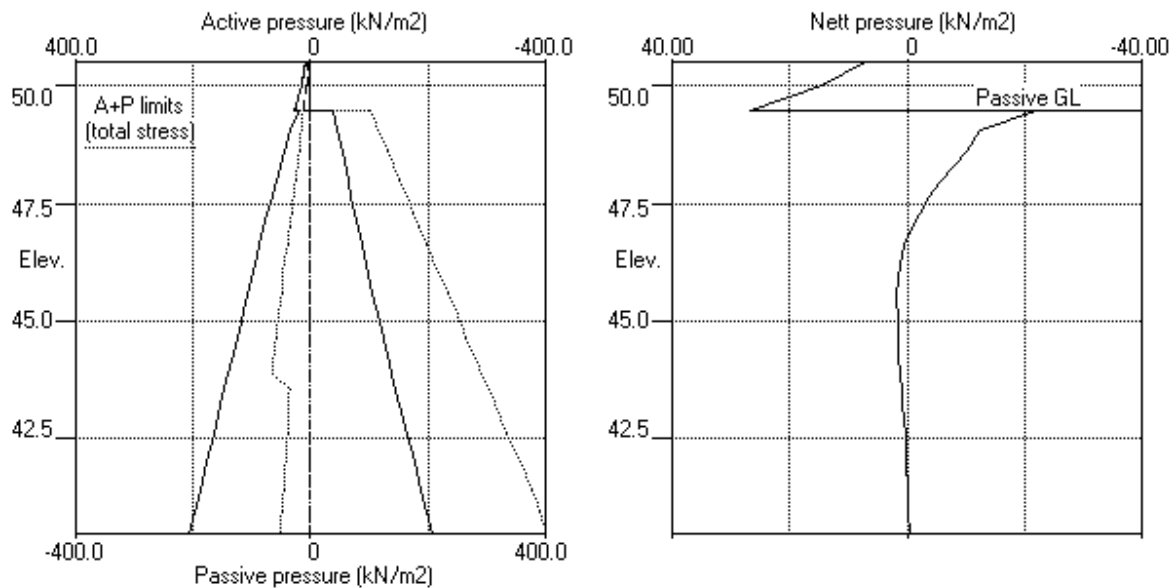
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.6 Excav. to elev. 49.50 on PASSIVE side



Stage No.6 Excav. to elev. 49.50 on PASSIVE side



A.K.A. LTD.	Sheet No.
Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
Licensed from GEOSOLVE	Made by : PJBW
Data filename/Run ID: Kpore_SLS01 Eu600CuK01.0	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 9 Excavate to elevation 47.00 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
9	50.50 47.00	50.00	3.756	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	20.45	0.001	-1.63E-03	0.0	0.0		75150
2	50.00	14.52	0.002	-1.64E-03	8.7	3.5	62.2	75150
		14.52	0.002	-1.64E-03	-53.4	3.5		
3	49.50	25.59	0.003	-1.58E-03	-43.4	-21.0		75150
		11.46	0.003	-1.58E-03	-43.4	-21.0		
4	49.05	22.26	0.004	-1.40E-03	-35.8	-39.0		75150
5	48.60	27.78	0.004	-1.12E-03	-24.6	-52.5		75150
6	48.00	35.84	0.005	-6.72E-04	-5.5	-61.7		75150
7	47.65	40.80	0.005	-3.86E-04	7.9	-61.3		75150
8	47.30	46.21	0.005	-1.12E-04	23.2	-56.0		75150
9	47.00	51.24	0.005	9.23E-05	37.8	-46.9		75150
		-12.89	0.005	9.23E-05	37.8	-46.9		
10	46.60	-14.03	0.005	3.04E-04	32.4	-32.8		75150
11	46.20	-14.03	0.005	4.47E-04	26.8	-21.0		75150
12	45.60	-13.02	0.004	5.61E-04	18.7	-7.5		75150
13	45.00	-11.06	0.004	5.86E-04	11.4	1.3		75150
14	44.65	-9.50	0.004	5.73E-04	7.8	4.6		75150
15	44.30	-8.01	0.004	5.46E-04	4.8	6.7		75150
16	43.90	-6.40	0.003	5.07E-04	1.9	8.0		75150
17	43.55	-5.00	0.003	4.70E-04	-0.1	8.2		75150
18	43.20	-3.62	0.003	4.32E-04	-1.6	7.9		75150
19	42.60	-1.69	0.003	3.76E-04	-3.2	6.2		75150
20	42.00	0.15	0.003	3.36E-04	-3.7	3.9		75150
21	41.40	1.91	0.002	3.13E-04	-3.1	1.7		75150
22	40.95	3.40	0.002	3.07E-04	-1.9	0.5		75150
23	40.50	4.87	0.002	3.05E-04	0.0	0.0		---
At elev. 50.00 Strut force =			62.2 kN/strut =			62.2 kN/m run		

Run ID: Kpore_SLS01 Eu600CuK01.0
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.9 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	20.45	20.45	13209
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	1063
3	49.50	10.00	47.06	13.41	218.31	15.59	25.59	1063
		Total>	57.06	10.00w	157.06	11.46	11.46	4851
4	49.05	Total>	70.56	14.50w	176.86	22.26	22.26	5157
5	48.60	Total>	80.79	19.00w	193.39	27.78	27.78	5463
6	48.00	Total>	92.33	25.00w	213.33	35.84	35.84	5870
7	47.65	Total>	98.68	28.50w	224.58	40.80	40.80	6108
8	47.30	Total>	104.96	32.00w	235.76	46.21	46.21	6346
9	47.00	Total>	110.34	35.00w	245.34	51.24	51.24	6549
10	46.60	Total>	117.52	39.00w	258.12	58.34	58.34	6821
11	46.20	Total>	124.74	43.00w	270.94	65.98	65.98	7093
12	45.60	Total>	135.65	49.00w	290.25	77.94	77.94	7500
13	45.00	Total>	146.66	55.00w	309.66	90.37	90.37	7908
14	44.65	Total>	153.13	58.50w	321.03	97.85	97.85	8146
15	44.30	Total>	159.63	62.00w	332.43	105.30	105.30	8383
16	43.90	Total>	167.09	66.00w	345.49	113.80	113.80	8655
17	43.55	Total>	173.65	34.75m	356.95	121.24	121.24	8893
18	43.20	Total>	180.24	36.50m	368.44	128.70	128.70	9130
19	42.60	Total>	191.59	39.50m	388.19	141.31	141.31	9538
20	42.00	Total>	203.00	42.50m	408.00	153.93	153.93	9945
21	41.40	Total>	214.46	45.50m	427.86	166.55	166.55	10353
22	40.95	Total>	223.09	47.75m	442.79	176.12	176.12	10659
23	40.50	Total>	231.75	50.00m	457.75	185.70	185.70	10964

Node no.	Y coord	----- PASSIVE side -----						Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water	Vertic	Active	Passive	Earth			
		press. kN/m2	-al kN/m2	limit kN/m2	limit kN/m2	pressure kN/m2			
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	135.00	64.12	64.12	7653	
10	46.60	Total>	8.00	4.00w	148.60	72.37	72.37	7970	
11	46.20	Total>	16.00	8.00w	162.20	80.02	80.02	8288	
12	45.60	Total>	28.01	14.00w	182.61	90.96	90.96	8764	
13	45.00	Total>	40.03	20.00w	203.03	101.43	101.43	9240	
14	44.65	Total>	47.05	23.50w	214.95	107.35	107.35	9518	
15	44.30	Total>	54.07	27.00w	226.87	113.31	113.31	9796	
16	43.90	Total>	62.10	31.00w	240.50	120.20	120.20	10113	
17	43.55	Total>	69.14	34.50w	252.44	126.24	126.24	10391	
18	43.20	Total>	76.19	38.00w	264.39	132.32	132.32	10669	
19	42.60	Total>	88.29	44.00w	284.89	143.00	143.00	11145	
20	42.00	Total>	100.42	50.00w	305.42	153.78	153.78	11621	
21	41.40	Total>	112.58	56.00w	325.98	164.64	164.64	12097	
22	40.95	Total>	121.72	60.50w	341.42	172.73	172.73	12455	
23	40.50	Total>	130.88	65.00w	356.88	180.83	180.83	12812	

Run ID. Kpore_SLS01 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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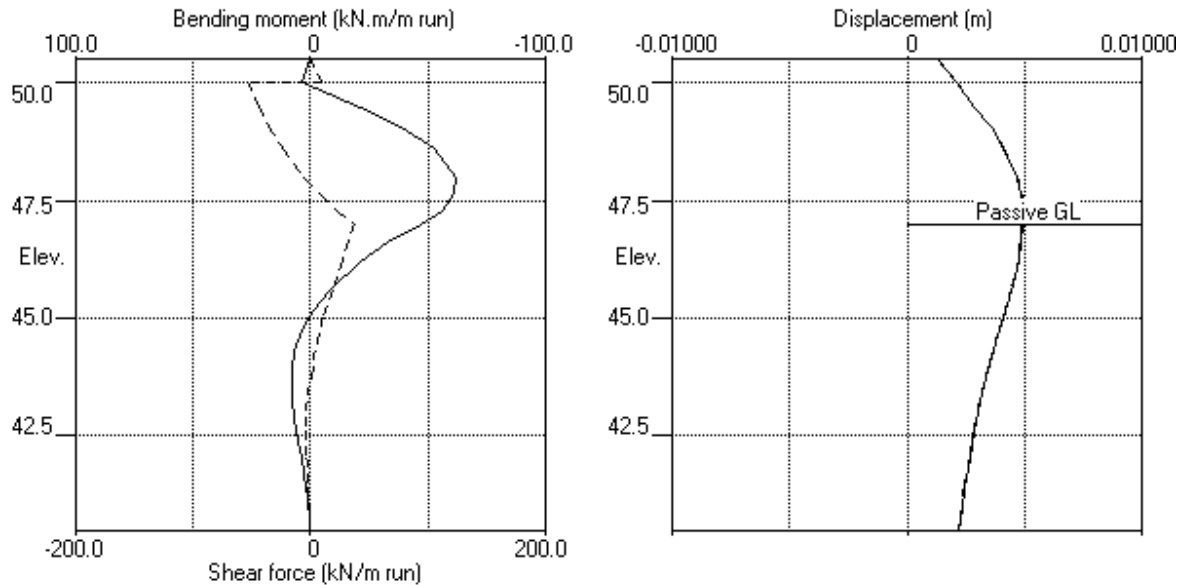
Stage No.9 Excavate to elevation 47.00 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation

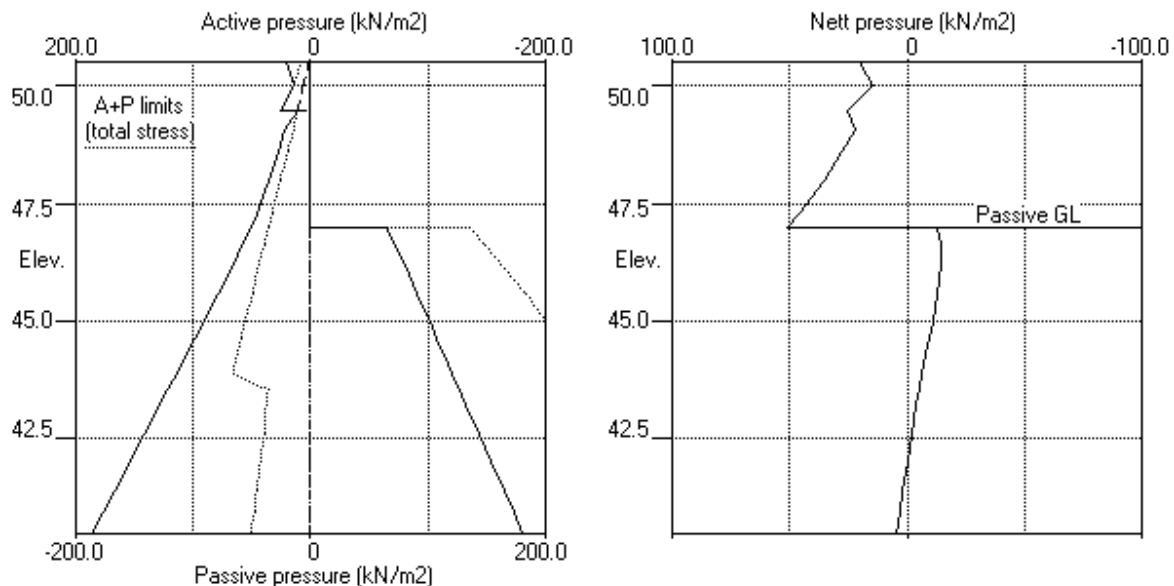
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.9 Excav. to elev. 47.00 on PASSIVE side



Stage No.9 Excav. to elev. 47.00 on PASSIVE side



A.K.A. LTD.	Sheet No.
Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
Licensed from GEOSOLVE	Made by : PJBW
Data filename/Run ID: Kpore_SLS01 Eu600CuK01.0	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 12 Excavate to elevation 43.90 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
12	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	18.19	0.001	-1.23E-03	0.0	0.0		75150
2	50.00	14.71	0.002	-1.23E-03	8.2	3.2	28.3	75150
		14.71	0.002	-1.23E-03	-20.0	3.2		
3	49.50	26.30	0.003	-1.23E-03	-9.8	-4.5		75150
		14.45	0.003	-1.23E-03	-9.8	-4.5		
4	49.05	27.01	0.003	-1.19E-03	-0.5	-7.1		75150
5	48.60	33.35	0.004	-1.16E-03	13.1	-4.2		75150
6	48.00	39.69	0.004	-1.18E-03	35.0	10.2		75150
7	47.65	41.30	0.005	-1.26E-03	49.2	25.0		75150
8	47.30	43.56	0.005	-1.43E-03	64.1	44.8	173.9	75150
		43.56	0.005	-1.43E-03	-109.8	44.8		
9	47.00	44.99	0.006	-1.54E-03	-96.5	13.9		75150
10	46.60	46.09	0.006	-1.52E-03	-78.3	-20.9		75150
11	46.20	47.03	0.007	-1.34E-03	-59.7	-48.3		75150
12	45.60	49.11	0.008	-8.52E-04	-30.8	-75.1		75150
13	45.00	55.00	0.008	-2.08E-04	0.4	-86.3		75150
14	44.65	58.50	0.008	1.85E-04	20.3	-82.8		75150
15	44.30	63.59	0.008	5.43E-04	41.6	-71.2		75150
16	43.90	71.50	0.008	8.64E-04	68.6	-49.3		75150
		-48.08	0.008	8.64E-04	68.6	-49.3		
17	43.55	-45.18	0.007	1.04E-03	52.3	-28.2		75150
18	43.20	-40.45	0.007	1.13E-03	37.3	-12.7		75150
19	42.60	-30.07	0.006	1.18E-03	16.2	2.4		75150
20	42.00	-17.91	0.005	1.14E-03	1.8	6.7		75150
21	41.40	-4.91	0.005	1.10E-03	-5.1	4.5		75150
22	40.95	5.50	0.004	1.08E-03	-4.9	1.7		75150
23	40.50	16.41	0.004	1.07E-03	0.0	0.0		---
At elev. 50.00		Strut force =		28.3 kN/strut =	28.3 kN/m run			
At elev. 47.30		Strut force =		173.9 kN/strut =	173.9 kN/m run			

Run ID: Kpore_SLS01 Eu600CuKo1.0
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.12 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					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		
1	50.50	0.00	25.00	7.13	115.97	18.19	18.19	16835
2	50.00	5.00	33.41	9.52	154.98	9.71	14.71	2718
3	49.50	10.00	47.06	13.41	218.31	16.30	26.30	2718
		Total>	57.06	10.00w	157.06	14.45	14.45	11451
4	49.05	Total>	70.56	14.50w	176.86	27.01	27.01	12172
5	48.60	Total>	80.79	19.00w	193.39	33.35	33.35	12893
6	48.00	Total>	92.33	25.00w	213.33	39.69	39.69	13855
7	47.65	Total>	98.68	28.50w	224.58	41.30	41.30	14416
8	47.30	Total>	104.96	32.00w	235.76	43.56	43.56	7598
9	47.00	Total>	110.34	35.00w	245.34	44.99	44.99	7842
10	46.60	Total>	117.52	39.00w	258.12	46.09	46.09	8167
11	46.20	Total>	124.74	43.00w	270.94	47.03	47.03	8492
12	45.60	Total>	135.65	49.00w	290.25	49.11	49.11	8980
13	45.00	Total>	146.66	55.00w	309.66	55.00	55.00a	9468
14	44.65	Total>	153.13	58.50w	321.03	58.50	58.50a	9753
15	44.30	Total>	159.63	62.00w	332.43	63.59	63.59	10037
16	43.90	Total>	167.09	66.00w	345.49	71.50	71.50	10362
17	43.55	Total>	173.65	34.75m	356.95	79.55	79.55	10647
18	43.20	Total>	180.24	36.50m	368.44	88.37	88.37	10932
19	42.60	Total>	191.59	39.50m	388.19	104.44	104.44	11420
20	42.00	Total>	203.00	42.50m	408.00	121.27	121.27	11908
21	41.40	Total>	214.46	45.50m	427.86	138.49	138.49	12395
22	40.95	Total>	223.09	47.75m	442.79	151.71	151.71	12761
23	40.50	Total>	231.75	50.00m	457.75	165.15	165.15	13127

Node no.	Y coord	----- PASSIVE side -----						Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2			
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	178.40	119.58	119.58	14766	
17	43.55	Total>	7.00	3.50w	190.30	124.73	124.73	15172	
18	43.20	Total>	14.00	7.00w	202.20	128.83	128.83	15577	
19	42.60	Total>	26.02	13.00w	222.62	134.50	134.50	16273	
20	42.00	Total>	38.05	19.00w	243.05	139.18	139.18	16968	
21	41.40	Total>	50.11	25.00w	263.51	143.39	143.39	17663	
22	40.95	Total>	59.17	29.50w	278.87	146.21	146.21	18185	
23	40.50	Total>	68.26	34.00w	294.26	148.74	148.74	18706	

Run ID. Kpore_SLS01 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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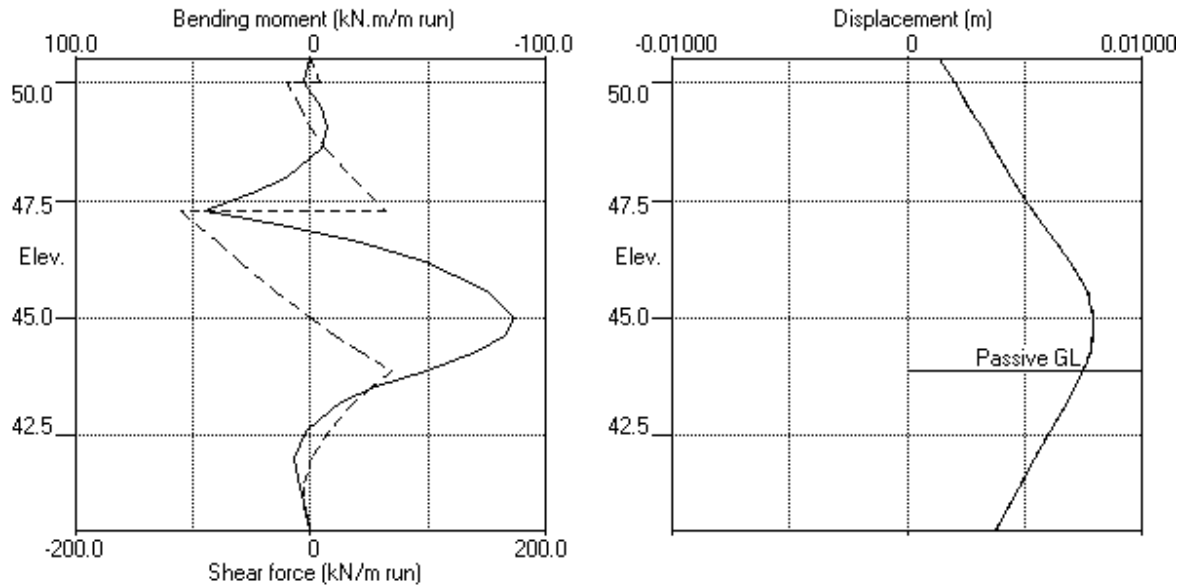
Stage No.12 Excavate to elevation 43.90 on PASSIVE side
Note: 58.50a Soil pressure at active limit
123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.0
 Kidderpore Ave, 3
 SLS type undrained calculation

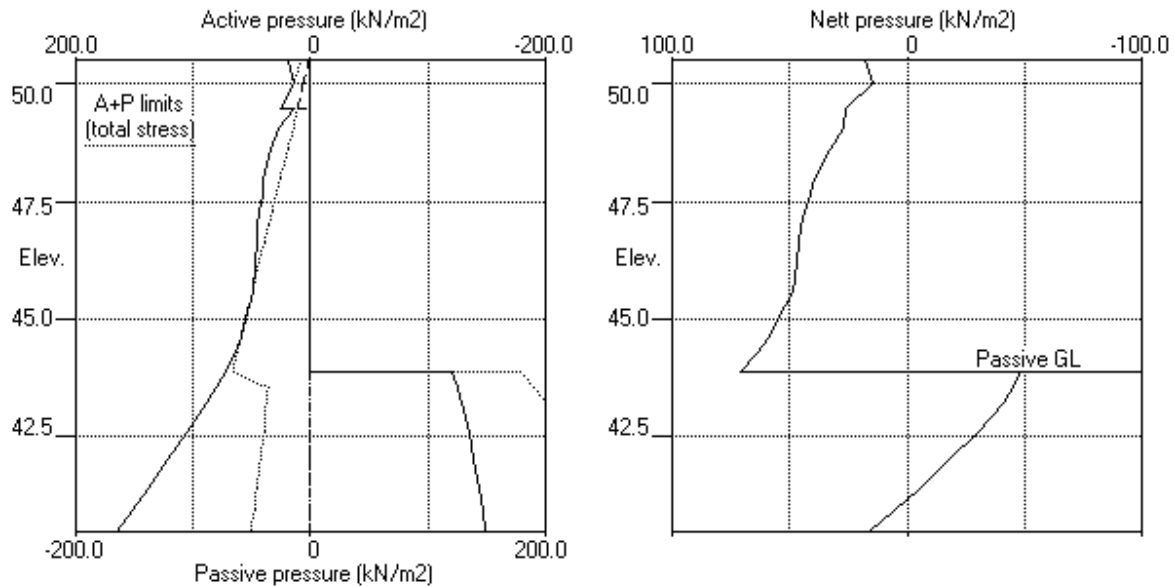
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Program: WALLAP Version 6.05 Revision A44.B58.R48
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 Data filename/Run ID: Kpore_SLS01 Eu600CuKo1.0
 Kidderpore Ave, 3
 SLS type undrained calculation

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| Sheet No.  
| Job No. TWS8148  
| Made by : PJBW  
|  
| Date: 4-03-2014  
| Checked :
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Units: kN, m

Stage No. 14 Change EI of wall to 53860 kN.m²/m run
Yield moment not defined
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr- ation
14	50.50 43.90		More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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
```

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	18.24	0.001	-1.23E-03	0.0	0.0		53860
2	50.00	14.70	0.002	-1.24E-03	8.2	3.0	28.6	53860
		14.70	0.002	-1.24E-03	-20.4	3.0		
3	49.50	26.28	0.003	-1.23E-03	-10.1	-4.7		53860
		14.35	0.003	-1.23E-03	-10.1	-4.7		
4	49.05	26.91	0.003	-1.18E-03	-0.9	-7.3		53860
5	48.60	33.42	0.004	-1.13E-03	12.7	-4.6		53860
6	48.00	40.11	0.004	-1.16E-03	34.8	9.6		53860
7	47.65	41.84	0.005	-1.27E-03	49.1	24.3		53860
8	47.30	43.90	0.005	-1.49E-03	64.1	44.2	166.0	53860
		43.90	0.005	-1.49E-03	-101.9	44.2		
9	47.00	44.84	0.006	-1.65E-03	-88.5	15.2		53860
10	46.60	45.20	0.006	-1.65E-03	-70.5	-17.2		53860
11	46.20	45.39	0.007	-1.44E-03	-52.4	-42.3		53860
12	45.60	49.00	0.008	-8.67E-04	-24.1	-65.9		53860
13	45.00	55.00	0.008	-1.23E-04	7.1	-73.9		53860
14	44.65	58.50	0.008	3.15E-04	27.0	-68.6		53860
15	44.30	62.97	0.008	6.89E-04	48.2	-55.2	16.8	53860
		62.97	0.008	6.89E-04	31.4	-55.2		
16	43.90	71.87	0.007	9.99E-04	58.4	-36.5		53860
		-47.34	0.007	9.99E-04	58.4	-36.5		
17	43.55	-42.96	0.007	1.15E-03	42.6	-18.2		53860
18	43.20	-37.05	0.007	1.21E-03	28.6	-5.2		53860
19	42.60	-25.59	0.006	1.19E-03	9.8	6.3		53860
20	42.00	-13.62	0.005	1.10E-03	-2.0	8.1		53860
21	41.40	-1.82	0.005	1.02E-03	-6.6	4.8		53860
22	40.95	7.28	0.004	1.00E-03	-5.4	1.7		53860
23	40.50	16.71	0.004	9.93E-04	0.0	0.0		--

At elev. 50.00 Strut force = 28.6 kN/strut = 28.6 kN/m run

At elev. 47.30 Strut force = 166.0 kN/strut = 166.0 kN/m run

At elev. 44.30 Strut force = 16.8 kN/strut = 16.8 kN/m run

Run ID. Kpore_SLS01 Eu600CuKo1.0
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	18.24	18.24	14213
2	50.00	5.00	33.41	9.52	154.98	9.70	14.70	4568
3	49.50	10.00	47.06	13.41	218.31	16.28	26.28	4568
		Total>	57.06	10.00w	157.06	14.35	14.35	18899
4	49.05	Total>	70.56	14.50w	176.86	26.91	26.91	20090
5	48.60	Total>	80.79	19.00w	193.39	33.42	33.42	18611
6	48.00	Total>	92.33	25.00w	213.33	40.11	40.11	20000
7	47.65	Total>	98.68	28.50w	224.58	41.84	41.84	20810
8	47.30	Total>	104.96	32.00w	235.76	43.90	43.90	21620
9	47.00	Total>	110.34	35.00w	245.34	44.84	44.84	14199
10	46.60	Total>	117.52	39.00w	258.12	45.20	45.20	14788
11	46.20	Total>	124.74	43.00w	270.94	45.39	45.39	15377
12	45.60	Total>	135.65	49.00w	290.25	49.00	49.00a	16261
13	45.00	Total>	146.66	55.00w	309.66	55.00	55.00a	17144
14	44.65	Total>	153.13	58.50w	321.03	58.50	58.50a	17660
15	44.30	Total>	159.63	62.00w	332.43	62.97	62.97	18175
16	43.90	Total>	167.09	66.00w	345.49	71.87	71.87	16235
17	43.55	Total>	173.65	34.75m	356.95	80.66	80.66	16681
18	43.20	Total>	180.24	36.50m	368.44	90.07	90.07	17127
19	42.60	Total>	191.59	39.50m	388.19	106.67	106.67	17892
20	42.00	Total>	203.00	42.50m	408.00	123.41	123.41	18656
21	41.40	Total>	214.46	45.50m	427.86	140.03	140.03	19421
22	40.95	Total>	223.09	47.75m	442.79	152.60	152.60	19994
23	40.50	Total>	231.75	50.00m	457.75	165.30	165.30	20567

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	119.21	119.21	16235
17	43.55	Total>	7.00	3.50w	190.30	123.62	123.62	16681
18	43.20	Total>	14.00	7.00w	202.20	127.12	127.12	17127
19	42.60	Total>	26.02	13.00w	222.62	132.26	132.26	17892
20	42.00	Total>	38.05	19.00w	243.05	137.03	137.03	18656
21	41.40	Total>	50.11	25.00w	263.51	141.85	141.85	19421

Run ID. Kpore_SLS01 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

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		
22	40.95	Total>	59.17	29.50w	278.87	145.32	145.32	19994
23	40.50	Total>	68.26	34.00w	294.26	148.59	148.59	20567

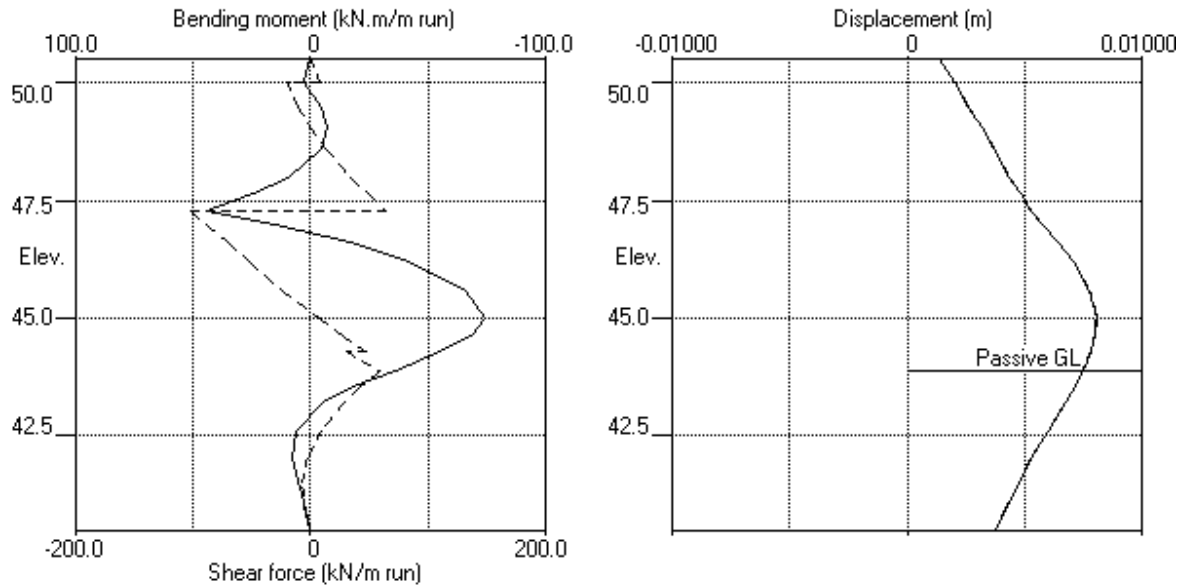
Note: 58.50a Soil pressure at active limit
123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.0
 Kidderpore Ave, 3
 SLS type undrained calculation

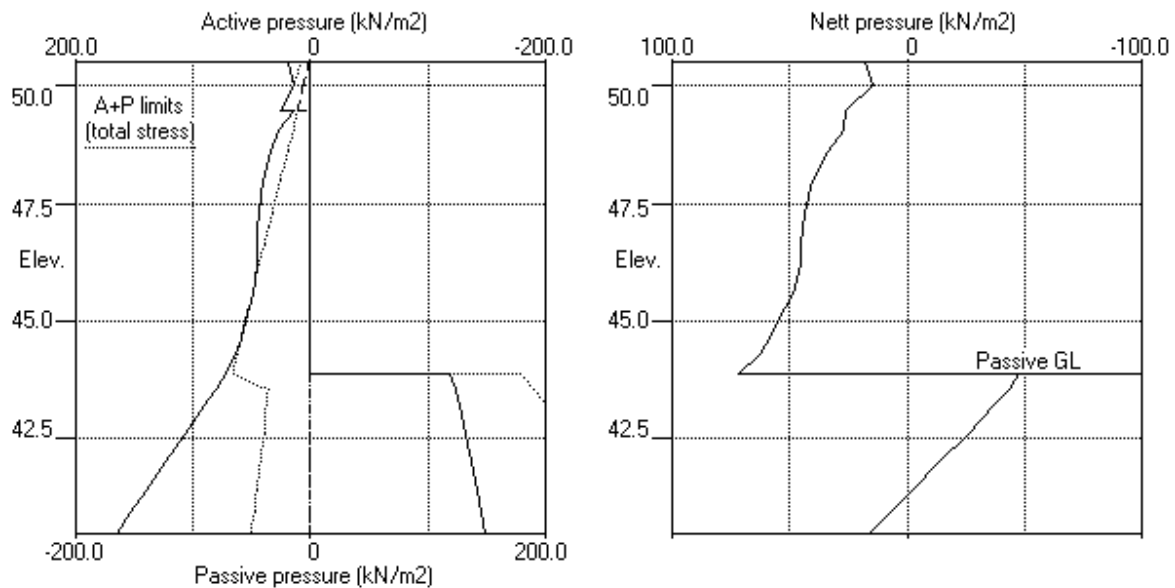
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.14 Change EI of wall to 53860kN.m2/m run



Stage No.14 Change EI of wall to 53860kN.m2/m run



				FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of Safety	equilib. at elev.	elev.	Penetr- ation
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	Cant.	6.685	41.41	49.94	0.56
3	50.50	50.50	Cant.	6.412	41.36	49.94	0.56
4	50.50	50.50		No analysis at this stage			
5	50.50	50.50		No analysis at this stage			
6	50.50	49.50	Cant.	4.528	41.29	48.79	0.71
7	50.50	49.50		No analysis at this stage			
8	50.50	49.50		No analysis at this stage			
9	50.50	47.00	50.00	3.756	n/a	46.66	0.34
10	50.50	47.00		No analysis at this stage			
All remaining stages have more than one strut - FoS calculation n/a							

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 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	50.50	0.002	0.000	0.0	0.0	0.0	0.0
2	50.00	0.002	0.000	3.5	0.0	8.7	-53.4
3	49.50	0.003	0.000	6.8	-21.0	15.8	-43.4
4	49.05	0.004	0.000	11.8	-39.0	8.1	-35.8
5	48.60	0.004	0.000	14.3	-52.5	18.7	-24.6
6	48.00	0.005	0.000	17.2	-61.7	44.4	-5.5
7	47.65	0.005	0.000	35.8	-61.3	61.6	-3.4
8	47.30	0.005	0.000	60.7	-56.0	80.4	-140.2
9	47.00	0.006	0.000	20.7	-46.9	37.8	-122.8
10	46.60	0.007	0.000	8.4	-32.8	32.4	-97.9
11	46.20	0.007	0.000	6.5	-58.3	26.8	-70.8
12	45.60	0.008	0.000	3.9	-88.2	18.7	-30.8
13	45.00	0.008	0.000	2.1	-92.3	22.8	-2.5
14	44.65	0.008	0.000	4.6	-82.8	53.7	-2.0
15	44.30	0.008	0.000	6.7	-71.2	86.1	-1.4
16	43.90	0.008	0.000	8.0	-49.3	68.6	-0.9
17	43.55	0.007	0.000	8.2	-31.9	52.3	-0.6
18	43.20	0.007	0.000	7.9	-18.7	37.3	-1.6
19	42.60	0.006	0.000	6.3	-1.4	22.0	-3.2
20	42.00	0.005	0.000	8.1	-0.2	7.7	-3.7
21	41.40	0.005	0.000	5.5	-0.1	0.2	-6.6
22	40.95	0.004	0.000	2.5	-0.0	0.1	-6.1
23	40.50	0.004	0.000	0.0	-0.0	0.0	-0.0

Run ID. Kpore_SLS01 Eu600CuKo1.0
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	0.9	50.00	-0.2	49.50	0.2	49.05	-0.6	49.50
2	0.8	50.00	-0.0	49.05	0.3	49.50	-0.5	50.00
3	0.8	50.00	-0.0	49.05	0.3	49.50	-0.5	50.00
4	No calculation at this stage							
5	No calculation at this stage							
6	14.3	48.60	-0.3	42.60	15.8	49.50	-4.8	46.60
7	No calculation at this stage							
8	No calculation at this stage							
9	8.2	43.55	-61.7	48.00	37.8	47.00	-53.4	50.00
10	No calculation at this stage							
11	No calculation at this stage							
12	44.8	47.30	-86.3	45.00	68.6	43.90	-109.8	47.30
13	No calculation at this stage							
14	44.2	47.30	-73.9	45.00	64.1	47.30	-101.9	47.30
15	No calculation at this stage							
16	No calculation at this stage							
17	60.7	47.30	-92.3	45.00	86.1	44.30	-140.2	47.30

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.074	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	0.135	50.50	0.000	50.50	Apply surcharge no.2 at elev. 50.50
3	0.137	50.50	0.000	50.50	Apply surcharge no.3 at elev. 50.50
4	Wall displacements reset to zero				Change EI of wall to 75150kN.m2/m run
5	No calculation at this stage				Apply water pressure profile no.1
6	0.002	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
7	No calculation at this stage				Install strut no.1 at elev. 50.00
8	No calculation at this stage				Apply water pressure profile no.2
9	0.005	47.00	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
10	No calculation at this stage				Install strut no.2 at elev. 47.30
11	No calculation at this stage				Apply water pressure profile no.3
12	0.008	44.65	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
13	No calculation at this stage				Install strut no.3 at elev. 44.30
14	0.008	45.00	0.000	50.50	Change EI of wall to 53860kN.m2/m run
15	No calculation at this stage				Change soil type 2 to soil type 3
16	No calculation at this stage				Apply water pressure profile no.4
17	0.008	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Run ID. Kpore_SLS01 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
Checked :

Summary of results (continued)

Strut forces at each stage (horizontal components)

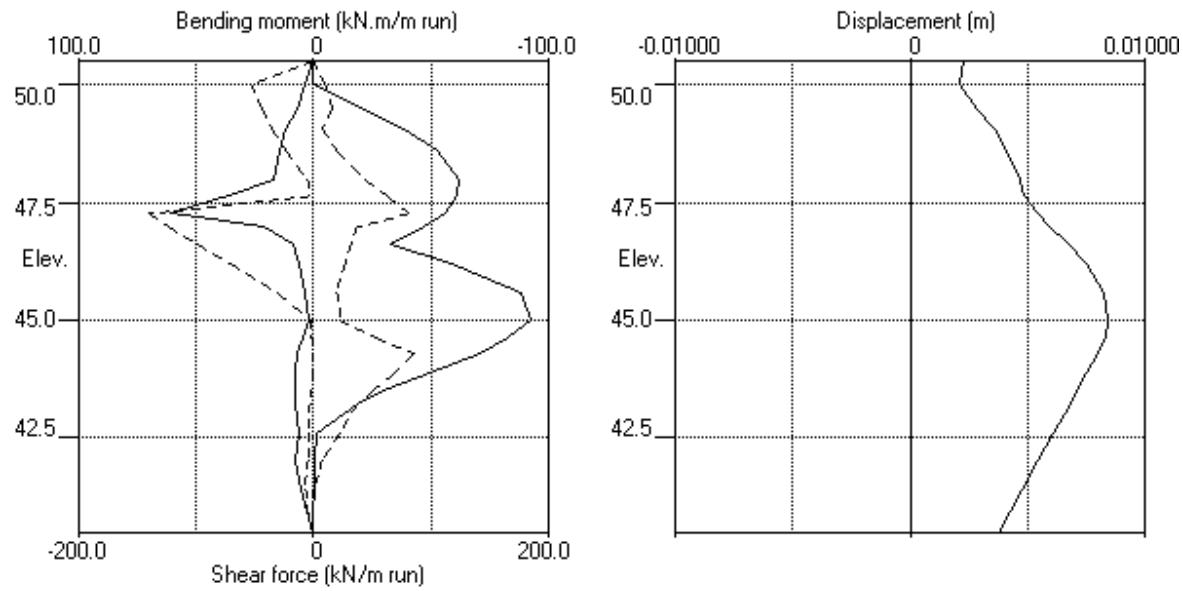
Stage no.	--- Strut no. 1 --- at elev. 50.00		--- Strut no. 2 --- at elev. 47.30		--- Strut no. 3 --- at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
9	62.19	62.19	---	---	---	---
12	28.26	28.26	173.86	173.86	---	---
14	28.62	28.62	165.99	165.99	16.82	16.82
17	28.59	28.59	220.62	220.62	86.06	86.06

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Data filename/Run ID: Kpore_SLS01 Eu600CuKol.0
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
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| Made by : PJBW
|
| Date: 4-03-2014
Checked :

Units: kN,m

Bending moment, shear force, displacement envelopes



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Data filename/Run ID: Kpore_SLS01 Eu600CuK01.3	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	30000	1.300	OC	1.000	1.000	50.00u
(49.50)		(4200)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	24000	1.300	OC	0.368	3.244	2.000d
(49.50)		(3360)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---			--- parameters for Kp ---		
Soil	Wall	Back-	Soil	Wall	Back-
friction	adhesion	fill	friction	adhesion	fill
angle	coeff.	angle	angle	coeff.	angle
1 Made Ground	30.00	0.634	0.00	30.00	0.634
2 London Clay	0.00	0.500	0.00	0.00	0.000
3 LC Drained	24.00	0.647	0.00	24.00	0.670

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Active side				Passive side			
Water press.	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m
	1	50.50	50.50	0.0	1	49.50	49.50
	2	50.50	50.50	0.0	1	47.00	47.00
	3	50.50	50.50	0.0	1	43.90	43.90
	4	50.50	50.50	0.0	1	43.90	43.90
					2	43.90	50.50
							66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 224.00 kN/m2
Moment of inertia of wall I = 8.4800E-03 m4/m run
E.I = 1.8995 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	130.00		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	135.00		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side

A trapezoidal surcharge is defined by two values:

N = at edge near to wall, F = at edge far from wall

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Apply surcharge no.2 at elevation 50.50
3	Apply surcharge no.3 at elevation 50.50
4	Change EI of wall to 75150 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
5	Apply water pressure profile no.1 No analysis at this stage
6	Excavate to elevation 49.50 on PASSIVE side
7	Install strut or anchor no.1 at elevation 50.00
8	Apply water pressure profile no.2 No analysis at this stage
9	Excavate to elevation 47.00 on PASSIVE side
10	Install strut or anchor no.2 at elevation 47.30
11	Apply water pressure profile no.3 No analysis at this stage
12	Excavate to elevation 43.90 on PASSIVE side
13	Install strut or anchor no.3 at elevation 44.30
14	Change EI of wall to 53860 kN.m2/m run Yield moment not defined Allow wall to relax with new modulus value
15	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
16	Apply water pressure profile no.4 No analysis at this stage
17	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Apply surcharge no.2 at elev. 50.50	No	No	No
3	Apply surcharge no.3 at elev. 50.50	No	No	No
4	Change EI of wall to 75150kN.m2/m run	No	No	No
5	Apply water pressure profile no.1	No	No	No
6	Excav. to elev. 49.50 on PASSIVE side	No	No	No
7	Install strut no.1 at elev. 50.00	No	No	No
8	Apply water pressure profile no.2	No	No	No
9	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
10	Install strut no.2 at elev. 47.30	No	No	No
11	Apply water pressure profile no.3	No	No	No
12	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
13	Install strut no.3 at elev. 44.30	No	No	No
14	Change EI of wall to 53860kN.m2/m run	No	No	No
15	Change soil type 2 to soil type 3	No	No	No
16	Apply water pressure profile no.4	No	No	No
17	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

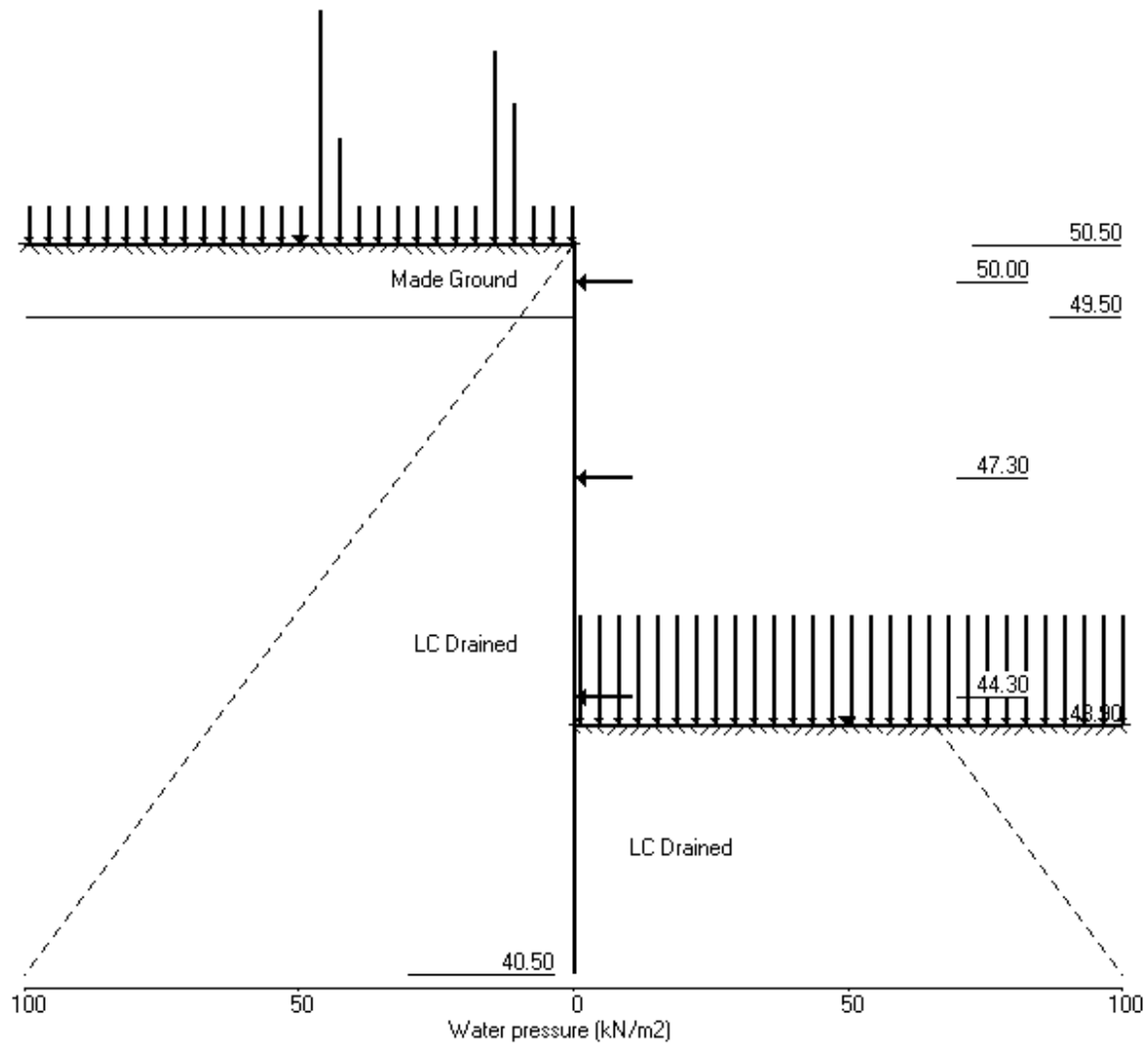
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 Kidderpore Ave, 3
 SLS type undrained calculation

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Stage No.17 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 49.50 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr
			Safety	at elev.		-ation
6	50.50 49.50	Cant.	4.528	41.29	48.79	0.71

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut	EI of
no.	coord	pressure	disp.	rotation	force	moment	forces	wall
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m	kN.m2/m
1	50.50	7.13	0.002	6.32E-04	0.0	0.0		75150
2	50.00	14.52	0.002	6.28E-04	5.4	1.8		75150
3	49.50	26.93	0.002	6.03E-04	15.8	6.8		75150
		-21.99	0.002	6.03E-04	15.8	6.8		
4	49.05	-12.20	0.001	5.47E-04	8.1	11.8		75150
5	48.60	-10.16	0.001	4.69E-04	3.0	14.3		75150
6	48.00	-5.75	0.001	3.55E-04	-1.7	14.2		75150
7	47.65	-3.74	0.001	2.91E-04	-3.4	13.3		75150
8	47.30	-1.98	0.001	2.33E-04	-4.4	11.8		75150
9	47.00	-0.71	0.001	1.88E-04	-4.8	10.4		75150
10	46.60	0.42	0.001	1.38E-04	-4.8	8.4		75150
11	46.20	1.32	0.001	9.87E-05	-4.5	6.5		75150
12	45.60	1.74	0.000	5.67E-05	-3.6	4.0		75150
13	45.00	1.64	0.000	3.24E-05	-2.6	2.1		75150
14	44.65	1.63	0.000	2.44E-05	-2.0	1.3		75150
15	44.30	1.45	0.000	1.98E-05	-1.4	0.7		75150
16	43.90	1.14	0.000	1.74E-05	-0.9	0.2		75150
17	43.55	0.92	0.000	1.70E-05	-0.6	-0.0		75150
18	43.20	0.78	0.000	1.76E-05	-0.3	-0.2		75150
19	42.60	0.35	0.000	1.94E-05	0.1	-0.3		75150
20	42.00	0.09	0.000	2.11E-05	0.2	-0.2		75150
21	41.40	-0.13	0.000	2.22E-05	0.2	-0.1		75150
22	40.95	-0.19	0.000	2.25E-05	0.1	-0.0		75150
23	40.50	-0.36	0.000	2.26E-05	0.0	-0.0		---

Run ID: Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.6 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2449
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	2449
3	49.50	10.00	47.06	13.41	218.31	16.93	26.93	2449
		Total>	57.06	10.00w	157.06	19.92	19.92	10370
4	49.05	Total>	70.56	14.50w	176.86	37.27	37.27	11023
5	48.60	Total>	80.79	19.00w	193.39	49.17	49.17	11677
6	48.00	Total>	92.33	25.00w	213.33	64.88	64.88	12548
7	47.65	Total>	98.68	28.50w	224.58	73.59	73.59	13056
8	47.30	Total>	104.96	32.00w	235.76	82.15	82.15	13564
9	47.00	Total>	110.34	35.00w	245.34	89.36	89.36	14000
10	46.60	Total>	117.52	39.00w	258.12	98.72	98.72	14580
11	46.20	Total>	124.74	43.00w	270.94	107.98	107.98	15161
12	45.60	Total>	135.65	49.00w	290.25	121.47	121.47	16032
13	45.00	Total>	146.66	55.00w	309.66	134.76	134.76	16903
14	44.65	Total>	153.13	58.50w	321.03	142.56	142.56	17411
15	44.30	Total>	159.63	62.00w	332.43	150.29	150.29	17919
16	43.90	Total>	167.09	66.00w	345.49	159.10	159.10	18500
17	43.55	Total>	173.65	34.75m	356.95	166.85	166.85	19008
18	43.20	Total>	180.24	36.50m	368.44	174.65	174.65	19516
19	42.60	Total>	191.59	39.50m	388.19	187.95	187.95	20387
20	42.00	Total>	203.00	42.50m	408.00	201.37	201.37	21259
21	41.40	Total>	214.46	45.50m	427.86	214.84	214.84	22130
22	40.95	Total>	223.09	47.75m	442.79	225.02	225.02	22783
23	40.50	Total>	231.75	50.00m	457.75	235.15	235.15	23436

Node no.	Y coord	----- PASSIVE side -----						Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2			
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	100.00	41.92	41.92	11100	
4	49.05	Total>	9.00	4.50w	115.30	49.47	49.47	11799	
5	48.60	Total>	18.00	9.00w	130.60	59.32	59.32	12499	
6	48.00	Total>	30.00	15.00w	151.00	70.63	70.63	13431	
7	47.65	Total>	37.01	18.50w	162.91	77.33	77.33	13975	
8	47.30	Total>	44.01	22.00w	174.81	84.12	84.12	14519	
9	47.00	Total>	50.01	25.00w	185.01	90.07	90.07	14985	
10	46.60	Total>	58.02	29.00w	198.62	98.29	98.29	15607	
11	46.20	Total>	66.03	33.00w	212.23	106.66	106.66	16228	
12	45.60	Total>	78.05	39.00w	232.65	119.73	119.73	17160	
13	45.00	Total>	90.08	45.00w	253.08	133.12	133.12	18093	
14	44.65	Total>	97.10	48.50w	265.00	140.93	140.93	18637	
15	44.30	Total>	104.12	52.00w	276.92	148.84	148.84	19181	
16	43.90	Total>	112.15	56.00w	290.55	157.96	157.96	19802	
17	43.55	Total>	119.18	59.50w	302.48	165.92	165.92	20346	
18	43.20	Total>	126.21	63.00w	314.41	173.86	173.86	20890	
19	42.60	Total>	138.27	34.50m	334.87	187.60	187.60	21822	
20	42.00	Total>	150.34	37.50m	355.34	201.28	201.28	22755	
21	41.40	Total>	162.42	40.50m	375.82	214.97	214.97	23687	
22	40.95	Total>	171.49	42.75m	391.19	225.21	225.21	24387	
23	40.50	Total>	180.56	45.00m	406.56	235.51	235.51	25086	

Run ID. Kpore_SLS01 Eu600CuKo1.3
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
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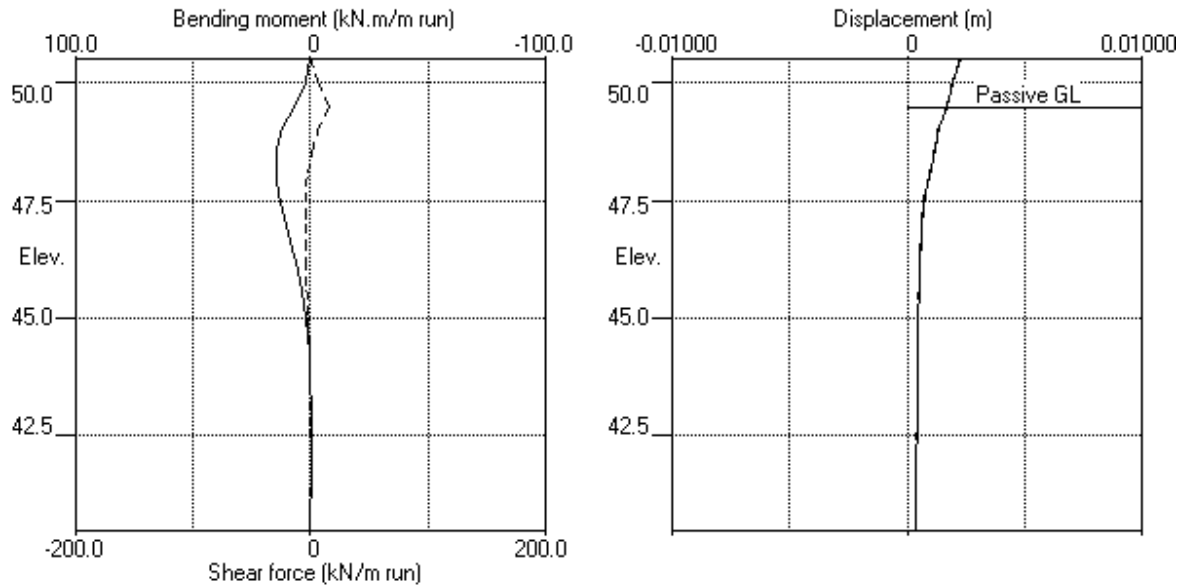
Stage No.6 Excavate to elevation 49.50 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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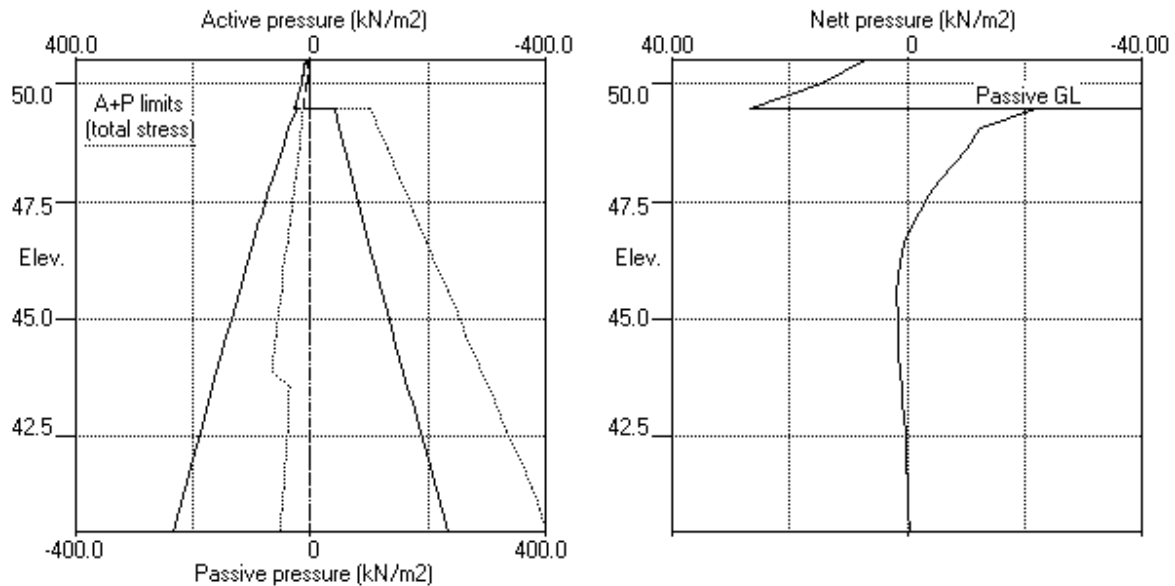
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 | Date: 4-03-2014
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Units: kN,m

Stage No.6 Excav. to elev. 49.50 on PASSIVE side



Stage No.6 Excav. to elev. 49.50 on PASSIVE side



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 9 Excavate to elevation 47.00 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
9	50.50 47.00	50.00	3.756	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	21.08	0.001	-1.74E-03	0.0	-0.0	67.4	75150
2	50.00	14.52	0.002	-1.75E-03	8.9	3.6		75150
		14.52	0.002	-1.75E-03	-58.5	3.6		
3	49.50	25.48	0.003	-1.68E-03	-48.5	-23.4		75150
		13.36	0.003	-1.68E-03	-48.5	-23.4		
4	49.05	25.09	0.004	-1.48E-03	-39.9	-43.5		75150
5	48.60	31.58	0.004	-1.17E-03	-27.1	-58.5		75150
6	48.00	41.10	0.005	-6.67E-04	-5.3	-68.5		75150
7	47.65	47.01	0.005	-3.50E-04	10.1	-67.7		75150
8	47.30	53.47	0.005	-5.07E-05	27.7	-61.2		75150
9	47.00	59.47	0.005	1.71E-04	44.6	-50.4		75150
		-17.34	0.005	1.71E-04	44.6	-50.4		
10	46.60	-18.13	0.005	3.96E-04	37.5	-33.9		75150
11	46.20	-17.62	0.005	5.41E-04	30.4	-20.4		75150
12	45.60	-15.71	0.004	6.44E-04	20.4	-5.4		75150
13	45.00	-12.84	0.004	6.50E-04	11.8	3.9		75150
14	44.65	-10.81	0.004	6.24E-04	7.7	7.2		75150
15	44.30	-8.90	0.004	5.85E-04	4.2	9.3		75150
16	43.90	-6.89	0.003	5.33E-04	1.1	10.2		75150
17	43.55	-5.20	0.003	4.86E-04	-1.1	10.2		75150
18	43.20	-3.60	0.003	4.40E-04	-2.6	9.5		75150
19	42.60	-1.42	0.003	3.74E-04	-4.1	7.2		75150
20	42.00	0.55	0.003	3.27E-04	-4.4	4.5		75150
21	41.40	2.37	0.002	3.02E-04	-3.5	1.9		75150
22	40.95	3.87	0.002	2.94E-04	-2.1	0.6		75150
23	40.50	5.36	0.002	2.93E-04	0.0	-0.0		---
At elev. 50.00 Strut force =				67.4 kN/strut =		67.4 kN/m run		

Run ID: Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.9 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	21.08	21.08	13254
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	1105
3	49.50	10.00	47.06	13.41	218.31	15.48	25.48	1105
		Total>	57.06	10.00w	157.06	13.36	13.36	5012
4	49.05	Total>	70.56	14.50w	176.86	25.09	25.09	5328
5	48.60	Total>	80.79	19.00w	193.39	31.58	31.58	5644
6	48.00	Total>	92.33	25.00w	213.33	41.10	41.10	6065
7	47.65	Total>	98.68	28.50w	224.58	47.01	47.01	6311
8	47.30	Total>	104.96	32.00w	235.76	53.47	53.47	6556
9	47.00	Total>	110.34	35.00w	245.34	59.47	59.47	6767
10	46.60	Total>	117.52	39.00w	258.12	67.95	67.95	7047
11	46.20	Total>	124.74	43.00w	270.94	77.03	77.03	7328
12	45.60	Total>	135.65	49.00w	290.25	91.19	91.19	7749
13	45.00	Total>	146.66	55.00w	309.66	105.83	105.83	8170
14	44.65	Total>	153.13	58.50w	321.03	114.56	114.56	8416
15	44.30	Total>	159.63	62.00w	332.43	123.24	123.24	8661
16	43.90	Total>	167.09	66.00w	345.49	133.11	133.11	8942
17	43.55	Total>	173.65	34.75m	356.95	141.73	141.73	9188
18	43.20	Total>	180.24	36.50m	368.44	150.33	150.33	9433
19	42.60	Total>	191.59	39.50m	388.19	164.84	164.84	9854
20	42.00	Total>	203.00	42.50m	408.00	179.30	179.30	10275
21	41.40	Total>	214.46	45.50m	427.86	193.74	193.74	10696
22	40.95	Total>	223.09	47.75m	442.79	204.66	204.66	11012
23	40.50	Total>	231.75	50.00m	457.75	215.58	215.58	11328

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	76.81	76.81	8099
10	46.60	Total>	8.00	4.00w	148.60	86.08	86.08	8435
11	46.20	Total>	16.00	8.00w	162.20	94.65	94.65	8771
12	45.60	Total>	28.01	14.00w	182.61	106.90	106.90	9275
13	45.00	Total>	40.03	20.00w	203.03	118.67	118.67	9779
14	44.65	Total>	47.05	23.50w	214.95	125.37	125.37	10073
15	44.30	Total>	54.07	27.00w	226.87	132.14	132.14	10367
16	43.90	Total>	62.10	31.00w	240.50	140.00	140.00	10703
17	43.55	Total>	69.14	34.50w	252.44	146.93	146.93	10997
18	43.20	Total>	76.19	38.00w	264.39	153.93	153.93	11291
19	42.60	Total>	88.29	44.00w	284.89	166.26	166.26	11795
20	42.00	Total>	100.42	50.00w	305.42	178.75	178.75	12299
21	41.40	Total>	112.58	56.00w	325.98	191.37	191.37	12803
22	40.95	Total>	121.72	60.50w	341.42	200.78	200.78	13180
23	40.50	Total>	130.88	65.00w	356.88	210.22	210.22	13558

Run ID. Kpore_SLS01 Eu600CuKo1.3
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
Checked :

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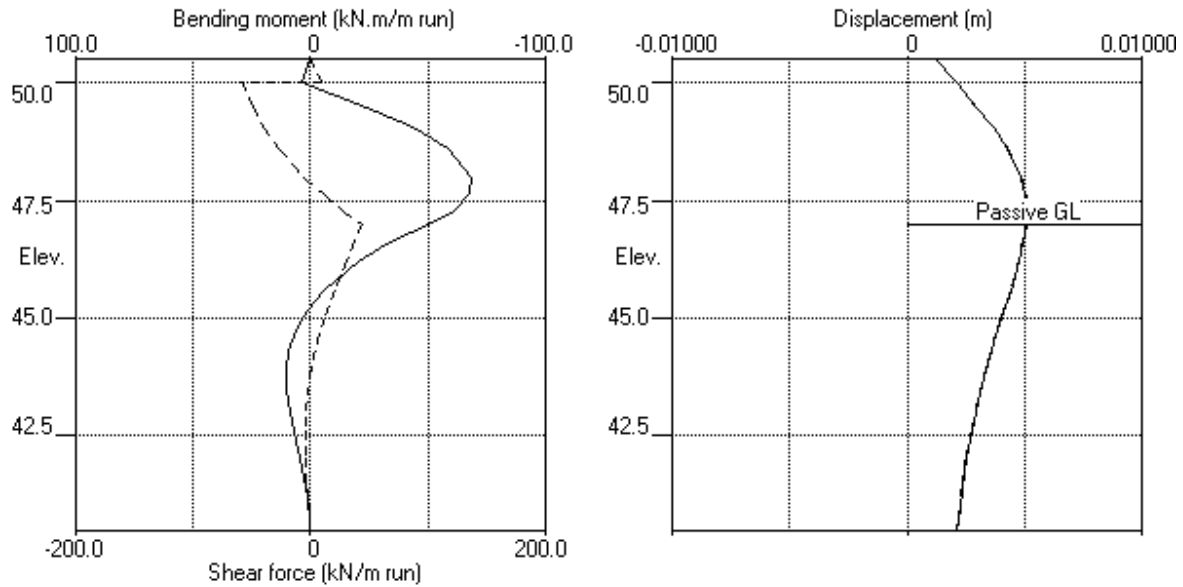
Stage No.9 Excavate to elevation 47.00 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.3
 Kidderpore Ave, 3
 SLS type undrained calculation

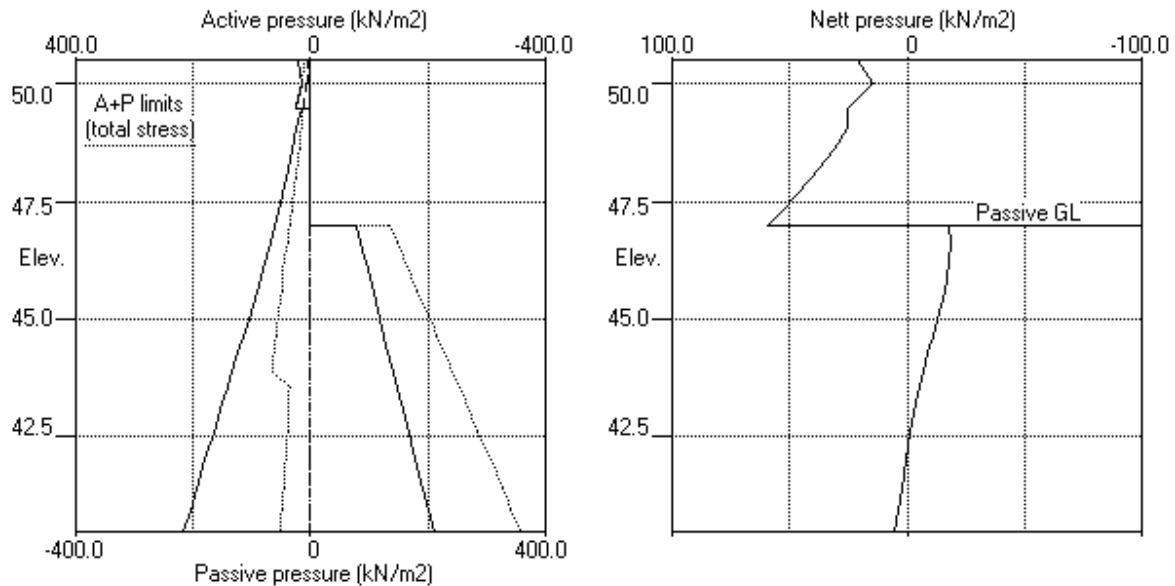
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.9 Excav. to elev. 47.00 on PASSIVE side



Stage No.9 Excav. to elev. 47.00 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS01 Eu600CuK01.3	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 12 Excavate to elevation 43.90 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
			-----	-----
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
12	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	18.56	0.001	-1.29E-03	0.0	-0.0		75150
2	50.00	14.73	0.002	-1.29E-03	8.3	3.3	29.2	75150
		14.73	0.002	-1.29E-03	-20.9	3.3		
3	49.50	26.27	0.003	-1.28E-03	-10.6	-4.9		75150
		16.71	0.003	-1.28E-03	-10.6	-4.9		
4	49.05	30.40	0.003	-1.25E-03	-0.0	-7.6		75150
5	48.60	37.80	0.004	-1.21E-03	15.3	-4.1		75150
6	48.00	45.32	0.005	-1.25E-03	40.3	12.6		75150
7	47.65	47.44	0.005	-1.34E-03	56.5	29.5		75150
8	47.30	50.32	0.005	-1.54E-03	73.6	52.4	201.2	75150
		50.32	0.005	-1.54E-03	-127.6	52.4		
9	47.00	52.13	0.006	-1.67E-03	-112.2	16.4		75150
10	46.60	53.65	0.007	-1.65E-03	-91.1	-24.1		75150
11	46.20	55.03	0.007	-1.44E-03	-69.3	-56.0		75150
12	45.60	58.03	0.008	-8.73E-04	-35.4	-87.0		75150
13	45.00	64.04	0.008	-1.37E-04	1.2	-97.2		75150
14	44.65	69.57	0.008	3.04E-04	24.6	-92.7		75150
15	44.30	76.60	0.008	7.05E-04	50.2	-79.7		75150
16	43.90	86.38	0.008	1.05E-03	82.8	-53.3		75150
		-62.15	0.008	1.05E-03	82.8	-53.3		
17	43.55	-57.38	0.007	1.24E-03	61.9	-28.1		75150
18	43.20	-50.56	0.007	1.33E-03	43.0	-10.0		75150
19	42.60	-36.45	0.006	1.35E-03	16.9	6.6		75150
20	42.00	-20.72	0.005	1.28E-03	-0.3	10.2		75150
21	41.40	-4.36	0.004	1.21E-03	-7.8	6.2		75150
22	40.95	8.54	0.004	1.19E-03	-6.9	2.2		75150
23	40.50	22.01	0.003	1.18E-03	0.0	-0.0		---
At elev. 50.00		Strut force =		29.2 kN/strut =	29.2 kN/m run			
At elev. 47.30		Strut force =		201.2 kN/strut =	201.2 kN/m run			

Run ID: Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.12 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	18.56	18.56	16885
2	50.00	5.00	33.41	9.52	154.98	9.73	14.73	2721
3	49.50	10.00	47.06	13.41	218.31	16.27	26.27	2721
		Total>	57.06	10.00w	157.06	16.71	16.71	11466
4	49.05	Total>	70.56	14.50w	176.86	30.40	30.40	12188
5	48.60	Total>	80.79	19.00w	193.39	37.80	37.80	12911
6	48.00	Total>	92.33	25.00w	213.33	45.32	45.32	13874
7	47.65	Total>	98.68	28.50w	224.58	47.44	47.44	14436
8	47.30	Total>	104.96	32.00w	235.76	50.32	50.32	7828
9	47.00	Total>	110.34	35.00w	245.34	52.13	52.13	8079
10	46.60	Total>	117.52	39.00w	258.12	53.65	53.65	8414
11	46.20	Total>	124.74	43.00w	270.94	55.03	55.03	8750
12	45.60	Total>	135.65	49.00w	290.25	58.03	58.03	9252
13	45.00	Total>	146.66	55.00w	309.66	64.04	64.04	9755
14	44.65	Total>	153.13	58.50w	321.03	69.57	69.57	10048
15	44.30	Total>	159.63	62.00w	332.43	76.60	76.60	10342
16	43.90	Total>	167.09	66.00w	345.49	86.38	86.38	10677
17	43.55	Total>	173.65	34.75m	356.95	96.22	96.22	10970
18	43.20	Total>	180.24	36.50m	368.44	106.91	106.91	11263
19	42.60	Total>	191.59	39.50m	388.19	126.18	126.18	11766
20	42.00	Total>	203.00	42.50m	408.00	146.14	146.14	12269
21	41.40	Total>	214.46	45.50m	427.86	166.39	166.39	12771
22	40.95	Total>	223.09	47.75m	442.79	181.86	181.86	13148
23	40.50	Total>	231.75	50.00m	457.75	197.59	197.59	13525

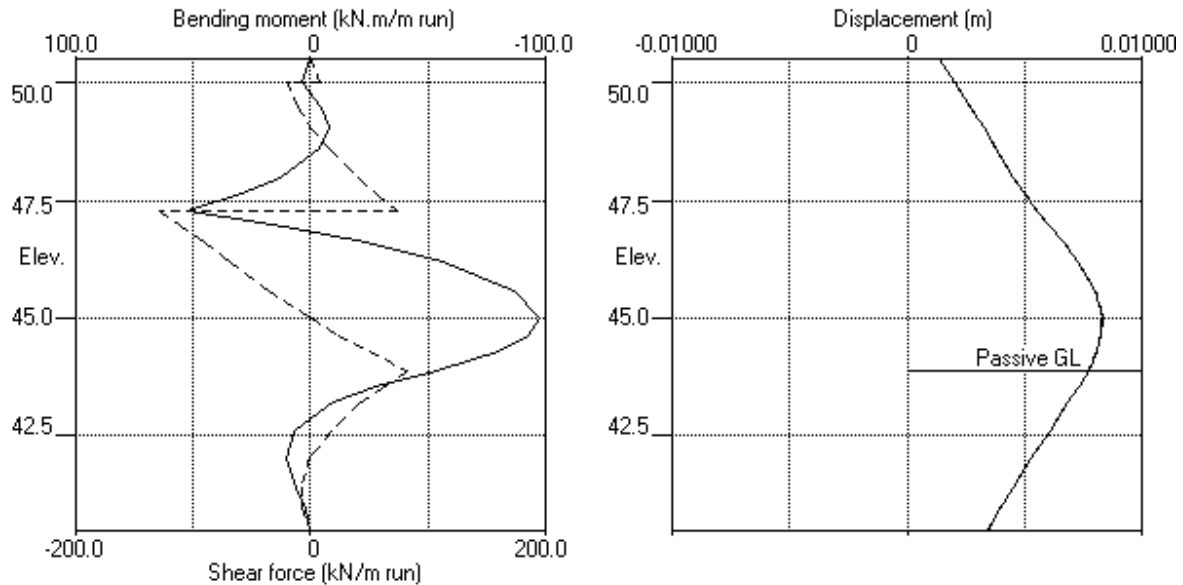
Node no.	Y coord	----- PASSIVE side -----						Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective stresses		Earth pressure kN/m2			
				Active limit kN/m2	Passive limit kN/m2				
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	178.40	148.53	148.53	15859	
17	43.55	Total>	7.00	3.50w	190.30	153.60	153.60	16295	
18	43.20	Total>	14.00	7.00w	202.20	157.46	157.46	16730	
19	42.60	Total>	26.02	13.00w	222.62	162.63	162.63	17477	
20	42.00	Total>	38.05	19.00w	243.05	166.87	166.87	18224	
21	41.40	Total>	50.11	25.00w	263.51	170.75	170.75	18970	
22	40.95	Total>	59.17	29.50w	278.87	173.33	173.33	19530	
23	40.50	Total>	68.26	34.00w	294.26	175.57	175.57	20090	

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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.3
 Kidderpore Ave, 3
 SLS type undrained calculation

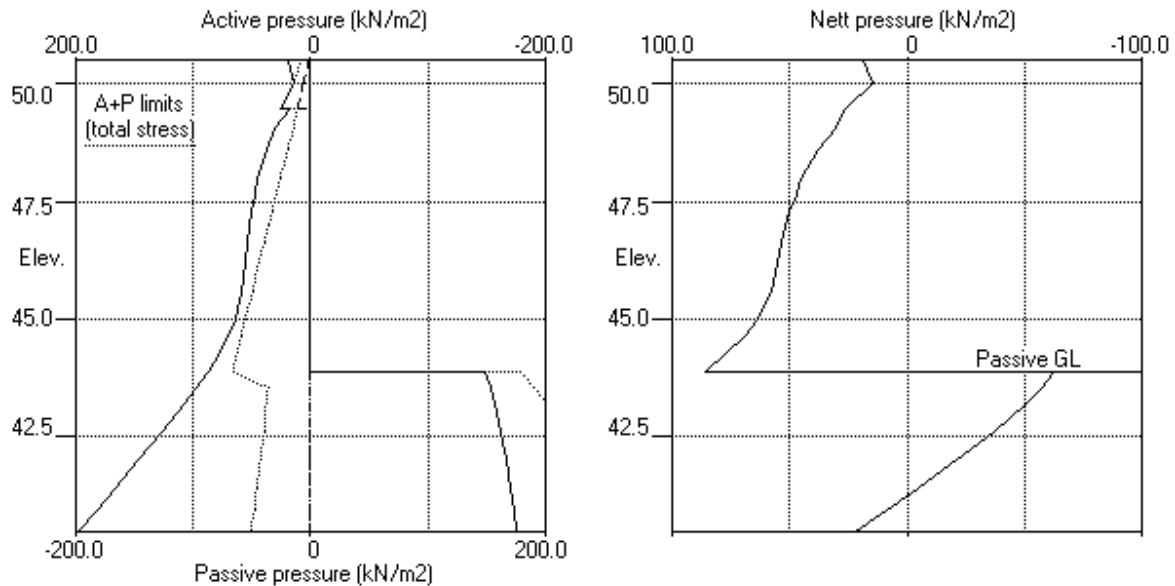
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Program: WALLAP Version 6.05 Revision A44.B58.R48
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 Data filename/Run ID: Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

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| Sheet No.  
| Job No. TWS8148  
| Made by : PJBW  
|  
| Date: 4-03-2014  
| Checked :
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Units: kN, m

Stage No. 14 Change EI of wall to 53860 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000		
Stage	---	G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
14	50.50	43.90		More than one	strut		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m

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
```

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	18.61	0.001	-1.29E-03	0.0	-0.0		53860
2	50.00	14.73	0.002	-1.30E-03	8.3	3.1	29.8	53860
		14.73	0.002	-1.30E-03	-21.4	3.1		
3	49.50	26.24	0.003	-1.29E-03	-11.2	-5.1		53860
		16.59	0.003	-1.29E-03	-11.2	-5.1		
4	49.05	30.29	0.003	-1.24E-03	-0.6	-8.0		53860
5	48.60	37.87	0.004	-1.18E-03	14.7	-4.8		53860
6	48.00	45.81	0.004	-1.22E-03	39.8	11.6		53860
7	47.65	48.07	0.005	-1.35E-03	56.2	28.5		53860
8	47.30	50.74	0.005	-1.60E-03	73.5	51.3	191.4	53860
		50.74	0.005	-1.60E-03	-117.9	51.3		
9	47.00	51.99	0.006	-1.79E-03	-102.5	17.6		53860
10	46.60	52.70	0.007	-1.79E-03	-81.5	-19.8		53860
11	46.20	53.24	0.007	-1.55E-03	-60.3	-48.8		53860
12	45.60	55.50	0.008	-8.87E-04	-27.7	-75.9		53860
13	45.00	61.80	0.008	-4.37E-05	7.5	-82.8		53860
14	44.65	68.00	0.008	4.46E-04	30.2	-76.7		53860
15	44.30	75.98	0.008	8.67E-04	55.4	-62.3	16.8	53860
		75.98	0.008	8.67E-04	38.6	-62.3		
16	43.90	86.88	0.008	1.21E-03	71.2	-39.5		53860
		-61.15	0.008	1.21E-03	71.2	-39.5		
17	43.55	-54.66	0.007	1.37E-03	50.9	-17.5		53860
18	43.20	-46.46	0.007	1.42E-03	33.2	-2.2		53860
19	42.60	-31.16	0.006	1.35E-03	9.9	10.4		53860
20	42.00	-15.79	0.005	1.22E-03	-4.2	11.5		53860
21	41.40	-1.02	0.004	1.12E-03	-9.2	6.4		53860
22	40.95	10.19	0.004	1.09E-03	-7.1	2.2		53860
23	40.50	21.53	0.003	1.08E-03	0.0	-0.0		--

At elev. 50.00 Strut force = 29.8 kN/strut = 29.8 kN/m run

At elev. 47.30 Strut force = 191.4 kN/strut = 191.4 kN/m run

At elev. 44.30 Strut force = 16.8 kN/strut = 16.8 kN/m run

Run ID. Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	18.61	18.61	15231
2	50.00	5.00	33.41	9.52	154.98	9.73	14.73	4520
3	49.50	10.00	47.06	13.41	218.31	16.24	26.24	4520
		Total>	57.06	10.00w	157.06	16.59	16.59	18706
4	49.05	Total>	70.56	14.50w	176.86	30.29	30.29	19885
5	48.60	Total>	80.79	19.00w	193.39	37.87	37.87	18506
6	48.00	Total>	92.33	25.00w	213.33	45.81	45.81	19886
7	47.65	Total>	98.68	28.50w	224.58	48.07	48.07	20691
8	47.30	Total>	104.96	32.00w	235.76	50.74	50.74	21497
9	47.00	Total>	110.34	35.00w	245.34	51.99	51.99	14293
10	46.60	Total>	117.52	39.00w	258.12	52.70	52.70	14886
11	46.20	Total>	124.74	43.00w	270.94	53.24	53.24	15478
12	45.60	Total>	135.65	49.00w	290.25	55.50	55.50	16368
13	45.00	Total>	146.66	55.00w	309.66	61.80	61.80	17257
14	44.65	Total>	153.13	58.50w	321.03	68.00	68.00	17776
15	44.30	Total>	159.63	62.00w	332.43	75.98	75.98	18295
16	43.90	Total>	167.09	66.00w	345.49	86.88	86.88	16504
17	43.55	Total>	173.65	34.75m	356.95	97.58	97.58	16957
18	43.20	Total>	180.24	36.50m	368.44	108.95	108.95	17411
19	42.60	Total>	191.59	39.50m	388.19	128.82	128.82	18188
20	42.00	Total>	203.00	42.50m	408.00	148.61	148.61	18965
21	41.40	Total>	214.46	45.50m	427.86	168.06	168.06	19742
22	40.95	Total>	223.09	47.75m	442.79	182.69	182.69	20325
23	40.50	Total>	231.75	50.00m	457.75	197.35	197.35	39212

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	148.03	148.03	16504
17	43.55	Total>	7.00	3.50w	190.30	152.25	152.25	16957
18	43.20	Total>	14.00	7.00w	202.20	155.42	155.42	17411
19	42.60	Total>	26.02	13.00w	222.62	159.99	159.99	18188
20	42.00	Total>	38.05	19.00w	243.05	164.40	164.40	18965
21	41.40	Total>	50.11	25.00w	263.51	169.08	169.08	19742

Run ID. Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

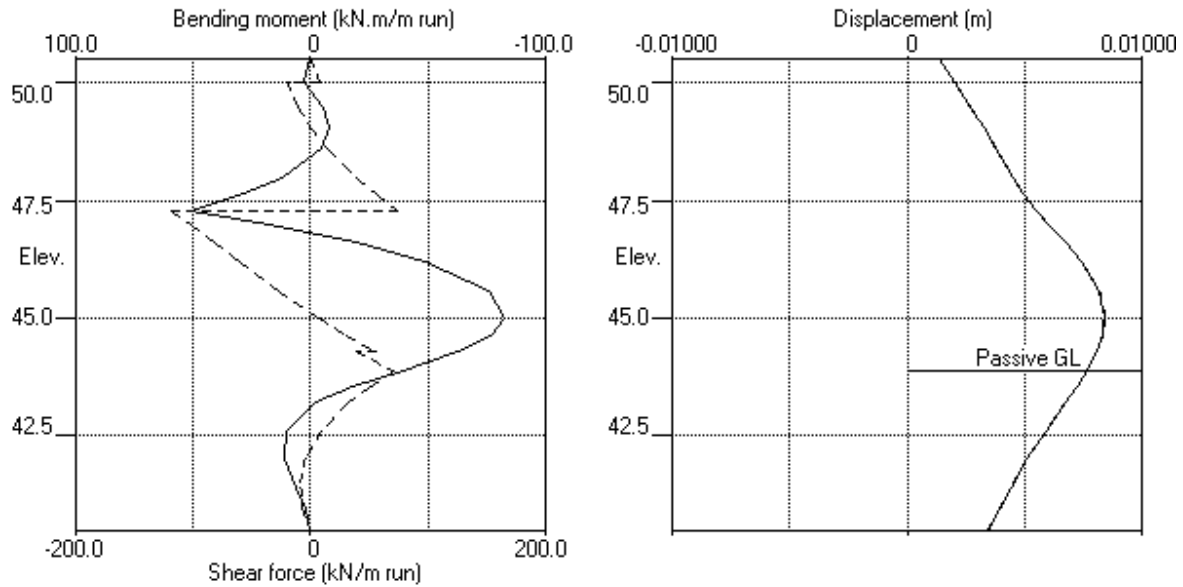
Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	----- Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
22	40.95	Total>	59.17	29.50w	278.87	172.50	172.50	20325
23	40.50	Total>	68.26	34.00w	294.26	175.82	175.82	39212

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 Kidderpore Ave, 3
 SLS type undrained calculation

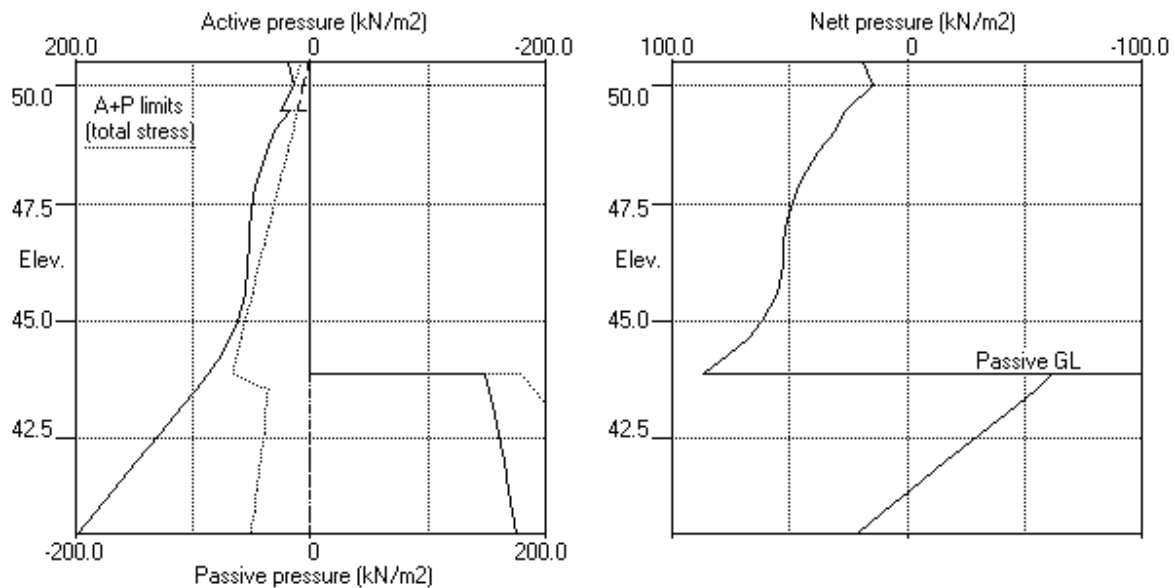
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Units: kN,m

Stage No.14 Change EI of wall to 53860kN.m²/m run



Stage No.14 Change EI of wall to 53860kN.m²/m run



				FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of Safety	of equilib. at elev.	elev.	Penetr- ation
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	Cant.	6.685	41.41	49.94	0.56
3	50.50	50.50	Cant.	6.412	41.36	49.94	0.56
4	50.50	50.50		No analysis at this stage			
5	50.50	50.50		No analysis at this stage			
6	50.50	49.50	Cant.	4.528	41.29	48.79	0.71
7	50.50	49.50		No analysis at this stage			
8	50.50	49.50		No analysis at this stage			
9	50.50	47.00	50.00	3.756	n/a	46.66	0.34
10	50.50	47.00		No analysis at this stage			
All remaining stages have more than one strut - FoS calculation n/a							

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Data filename/Run ID: Kpore_SLS01 Eu600CuK01.3	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	50.50	0.002	0.000	0.0	-0.0	0.0	0.0
2	50.00	0.002	0.000	3.6	0.0	8.9	-58.5
3	49.50	0.003	0.000	6.8	-23.4	15.8	-48.5
4	49.05	0.004	0.000	11.8	-43.5	8.1	-39.9
5	48.60	0.004	0.000	14.3	-58.5	18.3	-27.1
6	48.00	0.005	0.000	16.8	-68.5	44.1	-5.3
7	47.65	0.005	0.000	35.3	-67.7	61.3	-3.4
8	47.30	0.006	0.000	60.0	-61.2	80.1	-139.2
9	47.00	0.006	0.000	20.3	-50.4	44.6	-121.9
10	46.60	0.007	0.000	8.4	-33.9	37.5	-96.9
11	46.20	0.008	0.000	6.5	-58.3	30.4	-69.8
12	45.60	0.008	0.000	4.0	-87.6	20.4	-35.4
13	45.00	0.009	0.000	3.9	-97.2	23.8	-2.6
14	44.65	0.009	0.000	7.2	-92.7	54.6	-2.0
15	44.30	0.008	0.000	9.3	-79.7	87.1	-2.7
16	43.90	0.008	0.000	10.2	-53.3	82.8	-0.9
17	43.55	0.007	0.000	10.2	-30.5	61.9	-1.1
18	43.20	0.007	0.000	9.5	-18.4	43.0	-2.6
19	42.60	0.006	0.000	10.4	-4.2	17.9	-4.1
20	42.00	0.005	0.000	11.5	-0.2	7.0	-4.4
21	41.40	0.004	0.000	6.4	-0.1	0.2	-9.2
22	40.95	0.004	0.000	2.2	-0.0	0.1	-7.1
23	40.50	0.003	0.000	0.0	-0.0	0.0	-0.0

Run ID. Kpore_SLS01 Eu600CuKo1.3
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
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Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	0.9	50.00	-0.2	49.50	0.2	49.05	-0.6	49.50
2	0.8	50.00	-0.0	49.05	0.3	49.50	-0.5	50.00
3	0.8	50.00	-0.0	49.05	0.3	49.50	-0.5	50.00
4	No calculation at this stage							
5	No calculation at this stage							
6	14.3	48.60	-0.3	42.60	15.8	49.50	-4.8	46.60
7	No calculation at this stage							
8	No calculation at this stage							
9	10.2	43.90	-68.5	48.00	44.6	47.00	-58.5	50.00
10	No calculation at this stage							
11	No calculation at this stage							
12	52.4	47.30	-97.2	45.00	82.8	43.90	-127.6	47.30
13	No calculation at this stage							
14	51.3	47.30	-82.8	45.00	73.5	47.30	-117.9	47.30
15	No calculation at this stage							
16	No calculation at this stage							
17	60.0	47.30	-89.0	45.00	87.1	44.30	-139.2	47.30

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.074	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	0.135	50.50	0.000	50.50	Apply surcharge no.2 at elev. 50.50
3	0.137	50.50	0.000	50.50	Apply surcharge no.3 at elev. 50.50
4	Wall displacements reset to zero				Change EI of wall to 75150kN.m2/m run
5	No calculation at this stage				Apply water pressure profile no.1
6	0.002	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
7	No calculation at this stage				Install strut no.1 at elev. 50.00
8	No calculation at this stage				Apply water pressure profile no.2
9	0.005	47.30	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
10	No calculation at this stage				Install strut no.2 at elev. 47.30
11	No calculation at this stage				Apply water pressure profile no.3
12	0.008	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
13	No calculation at this stage				Install strut no.3 at elev. 44.30
14	0.008	45.00	0.000	50.50	Change EI of wall to 53860kN.m2/m run
15	No calculation at this stage				Change soil type 2 to soil type 3
16	No calculation at this stage				Apply water pressure profile no.4
17	0.009	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Run ID. Kpore_SLS01 Eu600CuKo1.3
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
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Summary of results (continued)

Strut forces at each stage (horizontal components)

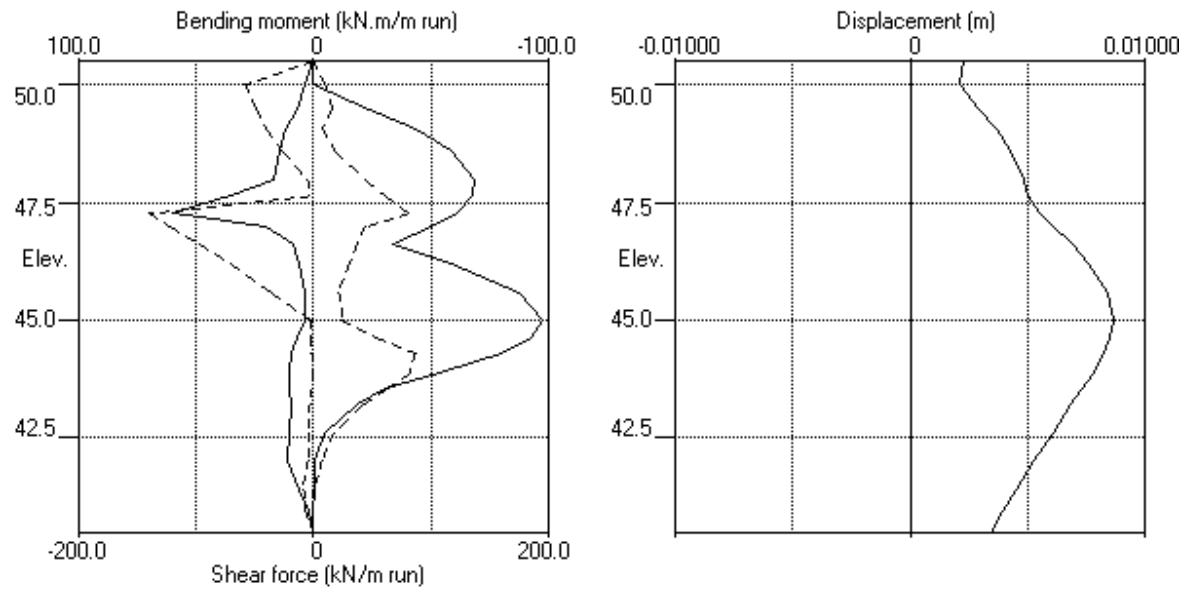
Stage no.	--- Strut no. 1 --- at elev. 50.00		--- Strut no. 2 --- at elev. 47.30		--- Strut no. 3 --- at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
9	67.43	67.43	---	---	---	---
12	29.18	29.18	201.20	201.20	---	---
14	29.76	29.76	191.39	191.39	16.78	16.78
17	29.00	29.00	219.33	219.33	89.76	89.76

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Units: kN,m

Bending moment, shear force, displacement envelopes



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	30000	1.500	OC	1.000	1.000	50.00u
(49.50)		(4200)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	24000	1.500	OC	0.368	3.244	2.000d
(49.50)		(3360)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Made Ground	30.00	0.634	0.00	30.00	0.634	0.00	
2 London Clay	0.00	0.500	0.00	0.00	0.000	0.00	
3 LC Drained	24.00	0.647	0.00	24.00	0.670	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.		Active side			Passive side			
profile no.	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	50.50	50.50	0.0	1	49.50	49.50	0.0
2	1	50.50	50.50	0.0	1	47.00	47.00	0.0
3	1	50.50	50.50	0.0	1	43.90	43.90	0.0
4	1	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 224.00 kN/m2
Moment of inertia of wall I = 8.4800E-03 m4/m run
E.I = 1.8995 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	130.00		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	135.00		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side

A trapezoidal surcharge is defined by two values:

N = at edge near to wall, F = at edge far from wall

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Apply surcharge no.2 at elevation 50.50
3	Apply surcharge no.3 at elevation 50.50
4	Change EI of wall to 75150 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
5	Apply water pressure profile no.1 No analysis at this stage
6	Excavate to elevation 49.50 on PASSIVE side
7	Install strut or anchor no.1 at elevation 50.00
8	Apply water pressure profile no.2 No analysis at this stage
9	Excavate to elevation 47.00 on PASSIVE side
10	Install strut or anchor no.2 at elevation 47.30
11	Apply water pressure profile no.3 No analysis at this stage
12	Excavate to elevation 43.90 on PASSIVE side
13	Install strut or anchor no.3 at elevation 44.30
14	Change EI of wall to 53860 kN.m2/m run Yield moment not defined Allow wall to relax with new modulus value
15	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
16	Apply water pressure profile no.4 No analysis at this stage
17	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Apply surcharge no.2 at elev. 50.50	No	No	No
3	Apply surcharge no.3 at elev. 50.50	No	No	No
4	Change EI of wall to 75150kN.m2/m run	No	No	No
5	Apply water pressure profile no.1	No	No	No
6	Excav. to elev. 49.50 on PASSIVE side	No	No	No
7	Install strut no.1 at elev. 50.00	No	No	No
8	Apply water pressure profile no.2	No	No	No
9	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
10	Install strut no.2 at elev. 47.30	No	No	No
11	Apply water pressure profile no.3	No	No	No
12	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
13	Install strut no.3 at elev. 44.30	No	No	No
14	Change EI of wall to 53860kN.m2/m run	No	No	No
15	Change soil type 2 to soil type 3	No	No	No
16	Apply water pressure profile no.4	No	No	No
17	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

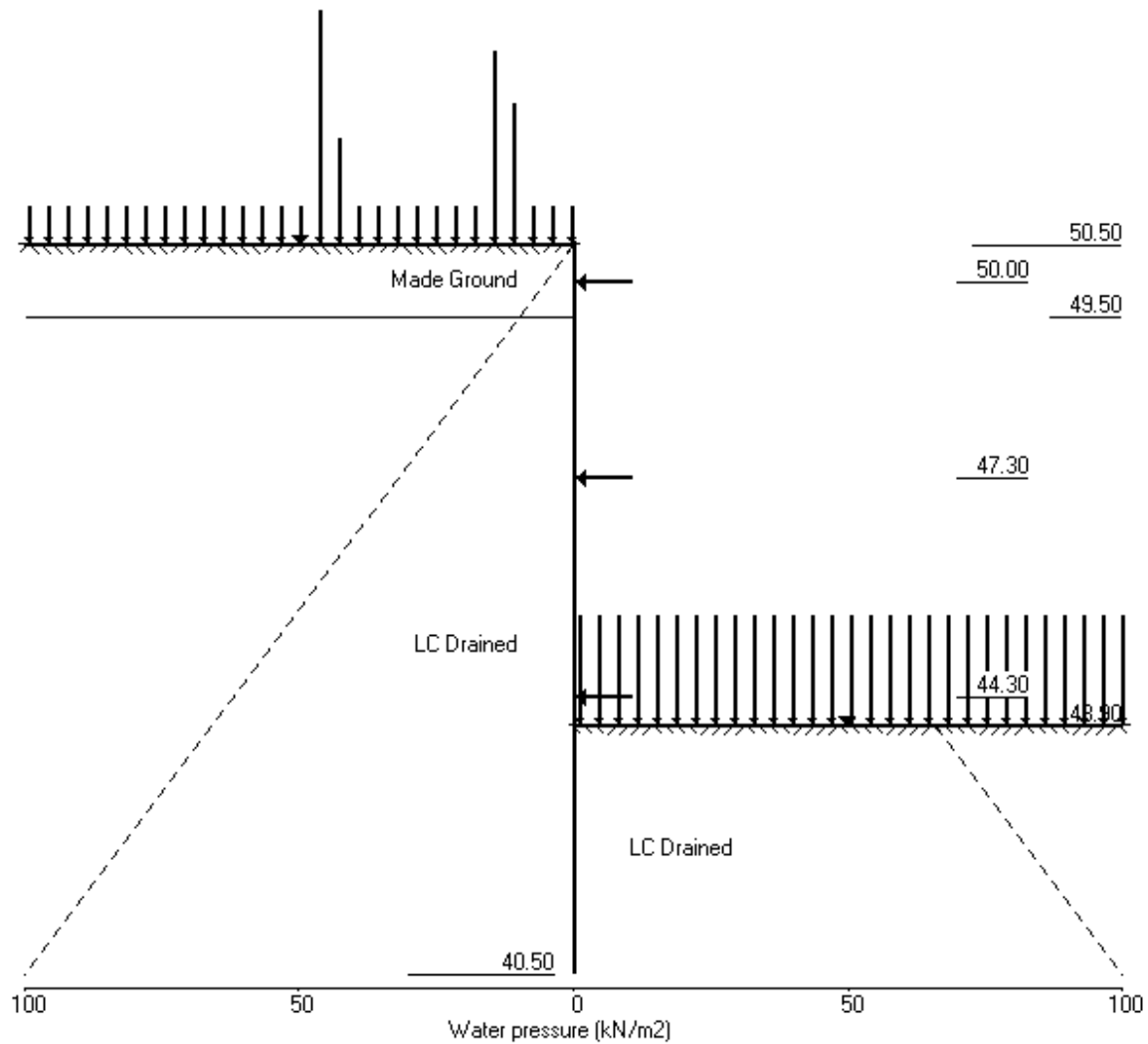
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Stage No.17 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 49.50 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr- -ation
6	50.50 49.50	Cant.	4.528	41.29	48.79	0.71

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	7.13	0.002	6.32E-04	0.0	0.0		75150
2	50.00	14.52	0.002	6.28E-04	5.4	1.8		75150
3	49.50	26.93	0.002	6.03E-04	15.8	6.8		75150
		-21.99	0.002	6.03E-04	15.8	6.8		
4	49.05	-12.20	0.001	5.47E-04	8.1	11.8		75150
5	48.60	-10.16	0.001	4.69E-04	3.0	14.3		75150
6	48.00	-5.75	0.001	3.55E-04	-1.7	14.2		75150
7	47.65	-3.74	0.001	2.91E-04	-3.4	13.3		75150
8	47.30	-1.98	0.001	2.33E-04	-4.4	11.8		75150
9	47.00	-0.71	0.001	1.88E-04	-4.8	10.4		75150
10	46.60	0.42	0.001	1.38E-04	-4.8	8.4		75150
11	46.20	1.32	0.001	9.87E-05	-4.5	6.5		75150
12	45.60	1.74	0.000	5.67E-05	-3.6	4.0		75150
13	45.00	1.64	0.000	3.24E-05	-2.6	2.1		75150
14	44.65	1.63	0.000	2.44E-05	-2.0	1.3		75150
15	44.30	1.45	0.000	1.98E-05	-1.4	0.7		75150
16	43.90	1.14	0.000	1.74E-05	-0.9	0.2		75150
17	43.55	0.92	0.000	1.70E-05	-0.6	-0.0		75150
18	43.20	0.78	0.000	1.76E-05	-0.3	-0.2		75150
19	42.60	0.35	0.000	1.94E-05	0.1	-0.3		75150
20	42.00	0.09	0.000	2.11E-05	0.2	-0.2		75150
21	41.40	-0.13	0.000	2.22E-05	0.2	-0.1		75150
22	40.95	-0.19	0.000	2.25E-05	0.1	-0.0		75150
23	40.50	-0.36	0.000	2.26E-05	0.0	0.0		---

Run ID: Kpore_SLS01 Eu600CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.6 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	ACTIVE 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		
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2449
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	2449
3	49.50	10.00	47.06	13.41	218.31	16.93	26.93	2449
		Total>	57.06	10.00w	157.06	21.52	21.52	10370
4	49.05	Total>	70.56	14.50w	176.86	39.77	39.77	11023
5	48.60	Total>	80.79	19.00w	193.39	52.57	52.57	11677
6	48.00	Total>	92.33	25.00w	213.33	69.48	69.48	12548
7	47.65	Total>	98.68	28.50w	224.58	78.89	78.89	13056
8	47.30	Total>	104.96	32.00w	235.76	88.15	88.15	13564
9	47.00	Total>	110.34	35.00w	245.34	95.96	95.96	14000
10	46.60	Total>	117.52	39.00w	258.12	106.12	106.12	14580
11	46.20	Total>	124.74	43.00w	270.94	116.18	116.18	15161
12	45.60	Total>	135.65	49.00w	290.25	130.87	130.87	16032
13	45.00	Total>	146.66	55.00w	309.66	145.36	145.36	16903
14	44.65	Total>	153.13	58.50w	321.03	153.86	153.86	17411
15	44.30	Total>	159.63	62.00w	332.43	162.29	162.29	17919
16	43.90	Total>	167.09	66.00w	345.49	171.90	171.90	18500
17	43.55	Total>	173.65	34.75m	356.95	180.35	180.35	19008
18	43.20	Total>	180.24	36.50m	368.44	188.85	188.85	19516
19	42.60	Total>	191.59	39.50m	388.19	203.35	203.35	20387
20	42.00	Total>	203.00	42.50m	408.00	217.97	217.97	21259
21	41.40	Total>	214.46	45.50m	427.86	232.64	232.64	22130
22	40.95	Total>	223.09	47.75m	442.79	243.72	243.72	22783
23	40.50	Total>	231.75	50.00m	457.75	254.75	254.75	23436

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		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	100.00	43.52	43.52	11100
4	49.05	Total>	9.00	4.50w	115.30	51.97	51.97	11799
5	48.60	Total>	18.00	9.00w	130.60	62.72	62.72	12499
6	48.00	Total>	30.00	15.00w	151.00	75.23	75.23	13431
7	47.65	Total>	37.01	18.50w	162.91	82.63	82.63	13975
8	47.30	Total>	44.01	22.00w	174.81	90.12	90.12	14519
9	47.00	Total>	50.01	25.00w	185.01	96.67	96.67	14985
10	46.60	Total>	58.02	29.00w	198.62	105.69	105.69	15607
11	46.20	Total>	66.03	33.00w	212.23	114.86	114.86	16228
12	45.60	Total>	78.05	39.00w	232.65	129.13	129.13	17160
13	45.00	Total>	90.08	45.00w	253.08	143.72	143.72	18093
14	44.65	Total>	97.10	48.50w	265.00	152.23	152.23	18637
15	44.30	Total>	104.12	52.00w	276.92	160.84	160.84	19181
16	43.90	Total>	112.15	56.00w	290.55	170.76	170.76	19802
17	43.55	Total>	119.18	59.50w	302.48	179.42	179.42	20346
18	43.20	Total>	126.21	63.00w	314.41	188.06	188.06	20890
19	42.60	Total>	138.27	34.50m	334.87	203.00	203.00	21822
20	42.00	Total>	150.34	37.50m	355.34	217.88	217.88	22755
21	41.40	Total>	162.42	40.50m	375.82	232.77	232.77	23687
22	40.95	Total>	171.49	42.75m	391.19	243.91	243.91	24387
23	40.50	Total>	180.56	45.00m	406.56	255.11	255.11	25086

Run ID. Kpore_SLS01 Eu600CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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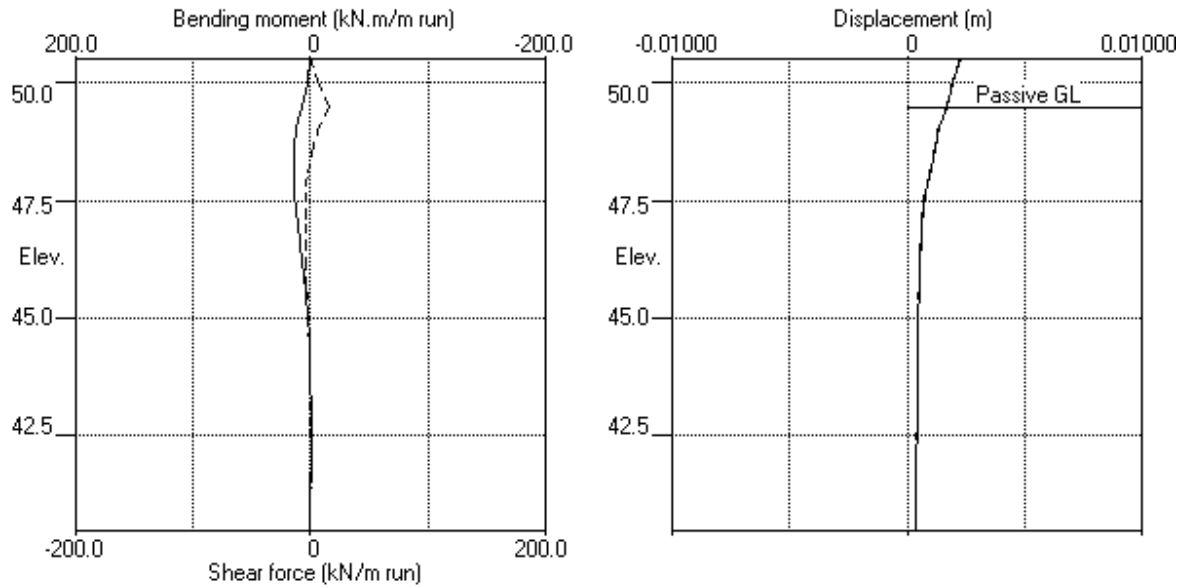
Stage No.6 Excavate to elevation 49.50 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Program: WALLAP Version 6.05 Revision A44.B58.R48
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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.5
 Kidderpore Ave, 3
 SLS type undrained calculation

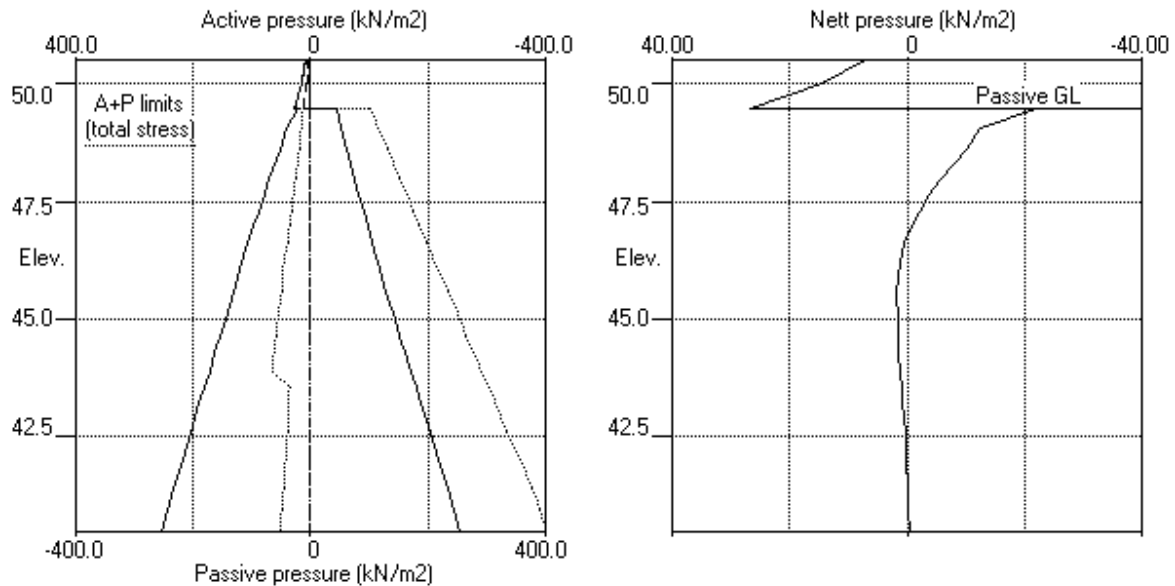
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Stage No.6 Excav. to elev. 49.50 on PASSIVE side



Stage No.6 Excav. to elev. 49.50 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS01 Eu600CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 9 Excavate to elevation 47.00 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
9	50.50 47.00	50.00	3.756	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	21.48	0.001	-1.81E-03	0.0	0.0	70.9	75150
2	50.00	14.52	0.002	-1.82E-03	9.0	3.6		75150
		14.52	0.002	-1.82E-03	-61.9	3.6		
3	49.50	25.39	0.003	-1.74E-03	-51.9	-25.0		75150
		14.60	0.003	-1.74E-03	-51.9	-25.0		
4	49.05	26.95	0.004	-1.53E-03	-42.5	-46.5		75150
5	48.60	34.09	0.004	-1.20E-03	-28.8	-62.5		75150
6	48.00	44.59	0.005	-6.64E-04	-5.2	-72.9		75150
7	47.65	51.15	0.005	-3.27E-04	11.6	-71.9		75150
8	47.30	58.32	0.005	-9.59E-06	30.7	-64.6		75150
9	47.00	64.97	0.005	2.24E-04	49.2	-52.6		75150
		-20.41	0.005	2.24E-04	49.2	-52.6		
10	46.60	-20.93	0.005	4.56E-04	40.9	-34.6		75150
11	46.20	-20.06	0.005	6.01E-04	32.7	-19.9		75150
12	45.60	-17.51	0.004	6.96E-04	21.5	-4.0		75150
13	45.00	-14.02	0.004	6.89E-04	12.0	5.7		75150
14	44.65	-11.66	0.004	6.55E-04	7.5	9.0		75150
15	44.30	-9.46	0.003	6.09E-04	3.8	10.9		75150
16	43.90	-7.17	0.003	5.48E-04	0.5	11.7		75150
17	43.55	-5.30	0.003	4.94E-04	-1.7	11.4		75150
18	43.20	-3.55	0.003	4.43E-04	-3.2	10.5		75150
19	42.60	-1.22	0.003	3.70E-04	-4.7	7.9		75150
20	42.00	0.82	0.002	3.20E-04	-4.8	4.8		75150
21	41.40	2.67	0.002	2.93E-04	-3.7	2.0		75150
22	40.95	4.17	0.002	2.85E-04	-2.2	0.6		75150
23	40.50	5.65	0.002	2.83E-04	0.0	0.0		---
At elev. 50.00 Strut force =			70.9 kN/strut =			70.9 kN/m run		

Run ID: Kpore_SLS01 Eu600CuK01.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

(continued)

Stage No.9 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	21.48	21.48	13282
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	1135
3	49.50	10.00	47.06	13.41	218.31	15.39	25.39	1135
		Total>	57.06	10.00w	157.06	14.60	14.60	5124
4	49.05	Total>	70.56	14.50w	176.86	26.95	26.95	5447
5	48.60	Total>	80.79	19.00w	193.39	34.09	34.09	5769
6	48.00	Total>	92.33	25.00w	213.33	44.59	44.59	6200
7	47.65	Total>	98.68	28.50w	224.58	51.15	51.15	6451
8	47.30	Total>	104.96	32.00w	235.76	58.32	58.32	6702
9	47.00	Total>	110.34	35.00w	245.34	64.97	64.97	6917
10	46.60	Total>	117.52	39.00w	258.12	74.38	74.38	7204
11	46.20	Total>	124.74	43.00w	270.94	84.43	84.43	7491
12	45.60	Total>	135.65	49.00w	290.25	100.07	100.07	7921
13	45.00	Total>	146.66	55.00w	309.66	116.17	116.17	8352
14	44.65	Total>	153.13	58.50w	321.03	125.74	125.74	8603
15	44.30	Total>	159.63	62.00w	332.43	135.25	135.25	8854
16	43.90	Total>	167.09	66.00w	345.49	146.03	146.03	9141
17	43.55	Total>	173.65	34.75m	356.95	155.42	155.42	9392
18	43.20	Total>	180.24	36.50m	368.44	164.78	164.78	9643
19	42.60	Total>	191.59	39.50m	388.19	180.55	180.55	10073
20	42.00	Total>	203.00	42.50m	408.00	196.23	196.23	10504
21	41.40	Total>	214.46	45.50m	427.86	211.87	211.87	10934
22	40.95	Total>	223.09	47.75m	442.79	223.68	223.68	11257
23	40.50	Total>	231.75	50.00m	457.75	235.50	235.50	11580

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	85.38	85.38	8424
10	46.60	Total>	8.00	4.00w	148.60	95.31	95.31	8773
11	46.20	Total>	16.00	8.00w	162.20	104.48	104.48	9123
12	45.60	Total>	28.01	14.00w	182.61	117.58	117.58	9647
13	45.00	Total>	40.03	20.00w	203.03	130.19	130.19	10171
14	44.65	Total>	47.05	23.50w	214.95	137.40	137.40	10477
15	44.30	Total>	54.07	27.00w	226.87	144.71	144.71	10782
16	43.90	Total>	62.10	31.00w	240.50	153.20	153.20	11132
17	43.55	Total>	69.14	34.50w	252.44	160.72	160.72	11438
18	43.20	Total>	76.19	38.00w	264.39	168.33	168.33	11743
19	42.60	Total>	88.29	44.00w	284.89	181.76	181.76	12267
20	42.00	Total>	100.42	50.00w	305.42	195.41	195.41	12792
21	41.40	Total>	112.58	56.00w	325.98	209.20	209.20	13316
22	40.95	Total>	121.72	60.50w	341.42	219.51	219.51	13709
23	40.50	Total>	130.88	65.00w	356.88	229.85	229.85	14102

Run ID. Kpore_SLS01 Eu600CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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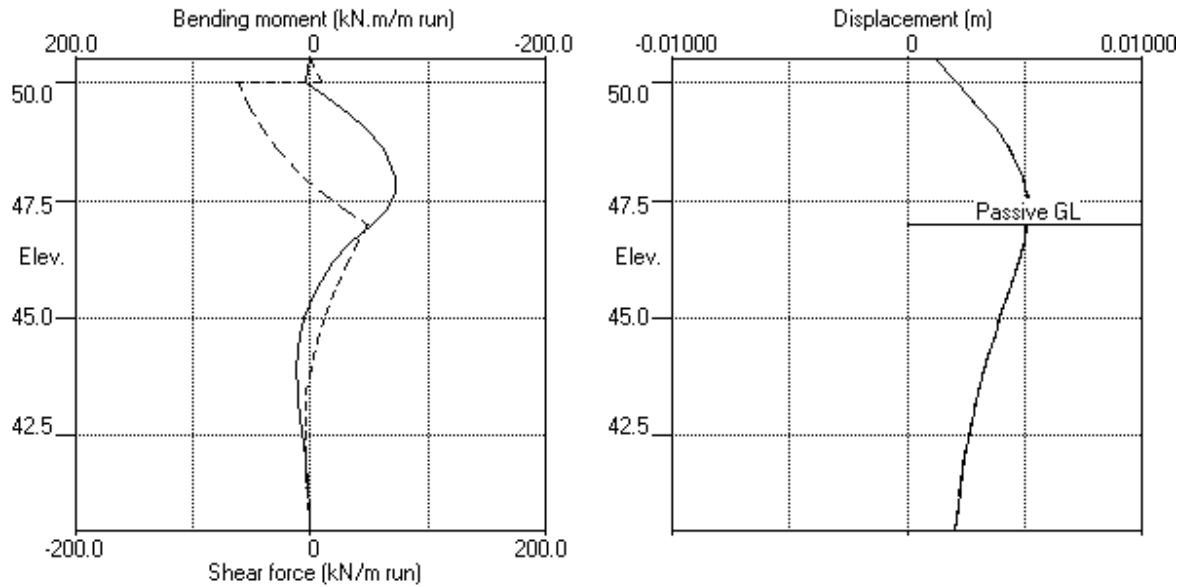
Stage No.9 Excavate to elevation 47.00 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS01 Eu600CuKol.5
 Kidderpore Ave, 3
 SLS type undrained calculation

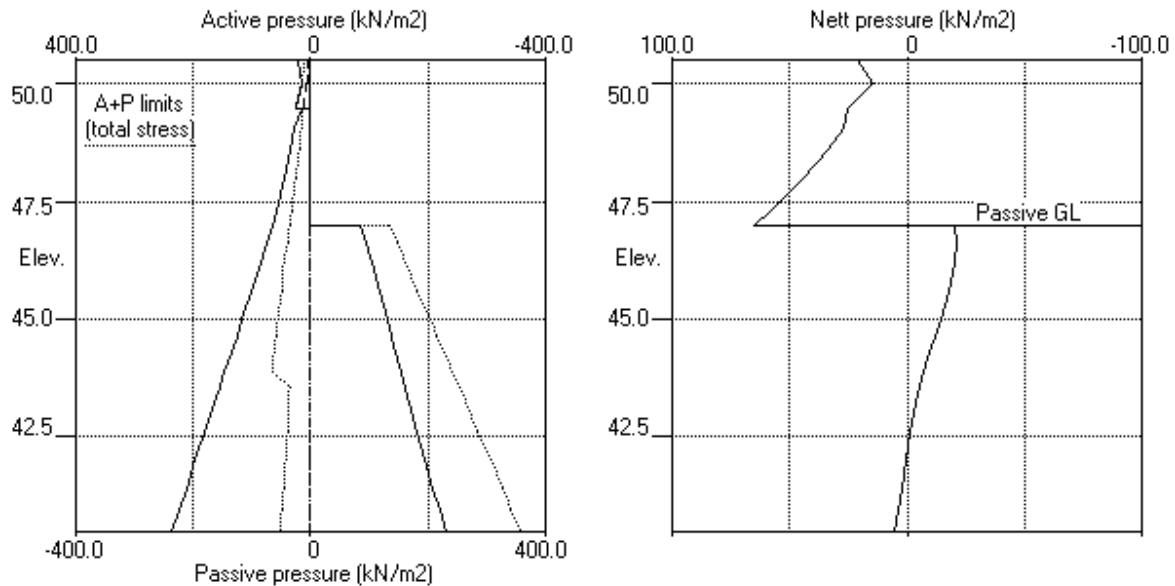
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.9 Excav. to elev. 47.00 on PASSIVE side



Stage No.9 Excav. to elev. 47.00 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS01 Eu600CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 12 Excavate to elevation 43.90 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor	Moment
No.	Act. Pass.	Elev.	of	equilib.
			Safety	at elev.
12	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	18.79	0.001	-1.32E-03	0.0	0.0		75150
2	50.00	14.75	0.002	-1.33E-03	8.4	3.3	29.9	75150
		14.75	0.002	-1.33E-03	-21.5	3.3		
3	49.50	26.24	0.003	-1.32E-03	-11.2	-5.2		75150
		18.19	0.003	-1.32E-03	-11.2	-5.2		
4	49.05	32.63	0.003	-1.28E-03	0.2	-7.9		75150
5	48.60	40.73	0.004	-1.25E-03	16.7	-4.1		75150
6	48.00	49.06	0.005	-1.29E-03	43.6	13.9		75150
7	47.65	51.53	0.005	-1.39E-03	61.2	32.3		75150
8	47.30	54.80	0.006	-1.60E-03	79.8	57.1	218.8	75150
		54.80	0.006	-1.60E-03	-139.0	57.1		
9	47.00	56.85	0.006	-1.75E-03	-122.2	17.9		75150
10	46.60	58.63	0.007	-1.73E-03	-99.1	-26.2		75150
11	46.20	60.27	0.007	-1.50E-03	-75.3	-60.9		75150
12	45.60	63.85	0.008	-8.83E-04	-38.1	-94.5		75150
13	45.00	70.84	0.008	-8.65E-05	2.3	-105.2		75150
14	44.65	77.17	0.008	3.91E-04	28.2	-99.9		75150
15	44.30	85.18	0.008	8.22E-04	56.6	-85.2		75150
16	43.90	96.28	0.008	1.19E-03	92.9	-55.5		75150
		-72.73	0.008	1.19E-03	92.9	-55.5		
17	43.55	-66.47	0.007	1.38E-03	68.5	-27.4		75150
18	43.20	-58.00	0.007	1.47E-03	46.8	-7.5		75150
19	42.60	-41.02	0.006	1.46E-03	17.1	10.1		75150
20	42.00	-22.62	0.005	1.36E-03	-2.0	12.9		75150
21	41.40	-3.79	0.004	1.28E-03	-10.0	7.5		75150
22	40.95	10.90	0.004	1.25E-03	-8.4	2.7		75150
23	40.50	26.23	0.003	1.24E-03	0.0	0.0		---
At elev. 50.00		Strut force =		29.9 kN/strut =		29.9 kN/m run		
At elev. 47.30		Strut force =		218.8 kN/strut =		218.8 kN/m run		

Run ID: Kpore_SLS01 Eu600CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.12 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					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		
1	50.50	0.00	25.00	7.13	115.97	18.79	18.79	16932
2	50.00	5.00	33.41	9.52	154.98	9.75	14.75	2725
3	49.50	10.00	47.06	13.41	218.31	16.24	26.24	2725
		Total>	57.06	10.00w	157.06	18.19	18.19	11480
4	49.05	Total>	70.56	14.50w	176.86	32.63	32.63	12203
5	48.60	Total>	80.79	19.00w	193.39	40.73	40.73	12926
6	48.00	Total>	92.33	25.00w	213.33	49.06	49.06	13890
7	47.65	Total>	98.68	28.50w	224.58	51.53	51.53	14453
8	47.30	Total>	104.96	32.00w	235.76	54.80	54.80	8021
9	47.00	Total>	110.34	35.00w	245.34	56.85	56.85	8278
10	46.60	Total>	117.52	39.00w	258.12	58.63	58.63	8622
11	46.20	Total>	124.74	43.00w	270.94	60.27	60.27	8965
12	45.60	Total>	135.65	49.00w	290.25	63.85	63.85	9480
13	45.00	Total>	146.66	55.00w	309.66	70.84	70.84	9995
14	44.65	Total>	153.13	58.50w	321.03	77.17	77.17	10296
15	44.30	Total>	159.63	62.00w	332.43	85.18	85.18	10596
16	43.90	Total>	167.09	66.00w	345.49	96.28	96.28	10940
17	43.55	Total>	173.65	34.75m	356.95	107.38	107.38	11240
18	43.20	Total>	180.24	36.50m	368.44	119.37	119.37	11541
19	42.60	Total>	191.59	39.50m	388.19	140.86	140.86	12056
20	42.00	Total>	203.00	42.50m	408.00	162.95	162.95	12571
21	41.40	Total>	214.46	45.50m	427.86	185.23	185.23	13086
22	40.95	Total>	223.09	47.75m	442.79	202.21	202.21	13472
23	40.50	Total>	231.75	50.00m	457.75	219.45	219.45	13858

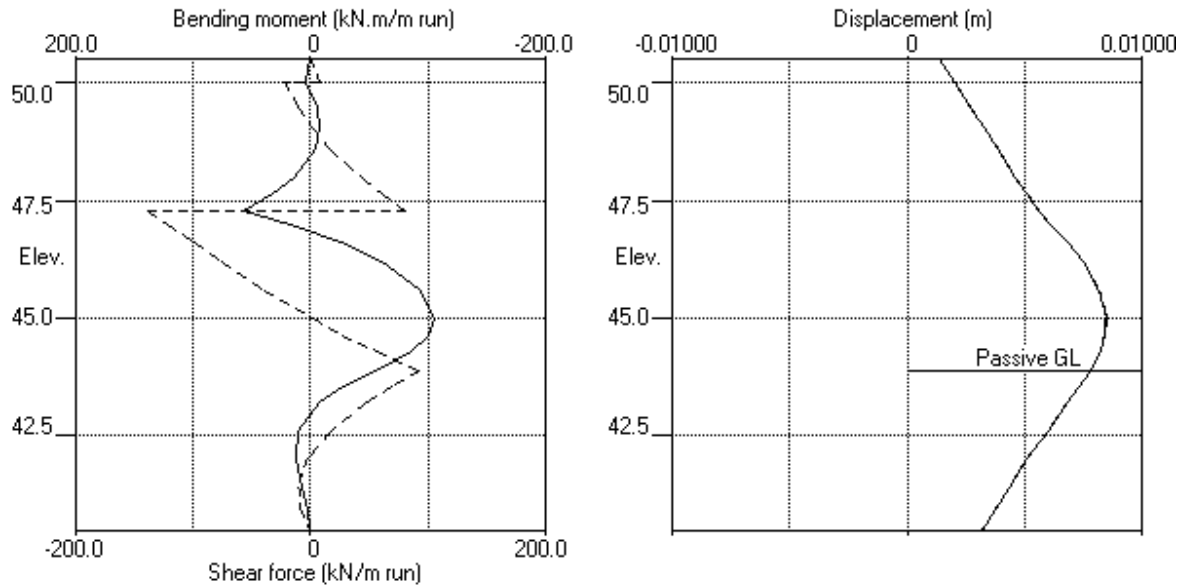
Node no.	Y coord	----- PASSIVE side -----						Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water	Vertic	Active	Passive	Earth			
		press. kN/m2	-al kN/m2	limit kN/m2	limit kN/m2	pressure kN/m2			
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	178.40	169.00	169.00	16864	
17	43.55	Total>	7.00	3.50w	190.30	173.85	173.85	17327	
18	43.20	Total>	14.00	7.00w	202.20	177.37	177.37	17790	
19	42.60	Total>	26.02	13.00w	222.62	181.89	181.89	18584	
20	42.00	Total>	38.05	19.00w	243.05	185.57	185.57	19378	
21	41.40	Total>	50.11	25.00w	263.51	189.03	189.03	20172	
22	40.95	Total>	59.17	29.50w	278.87	191.30	191.30	20768	
23	40.50	Total>	68.26	34.00w	294.26	193.22	193.22	21363	

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 Kidderpore Ave, 3
 SLS type undrained calculation

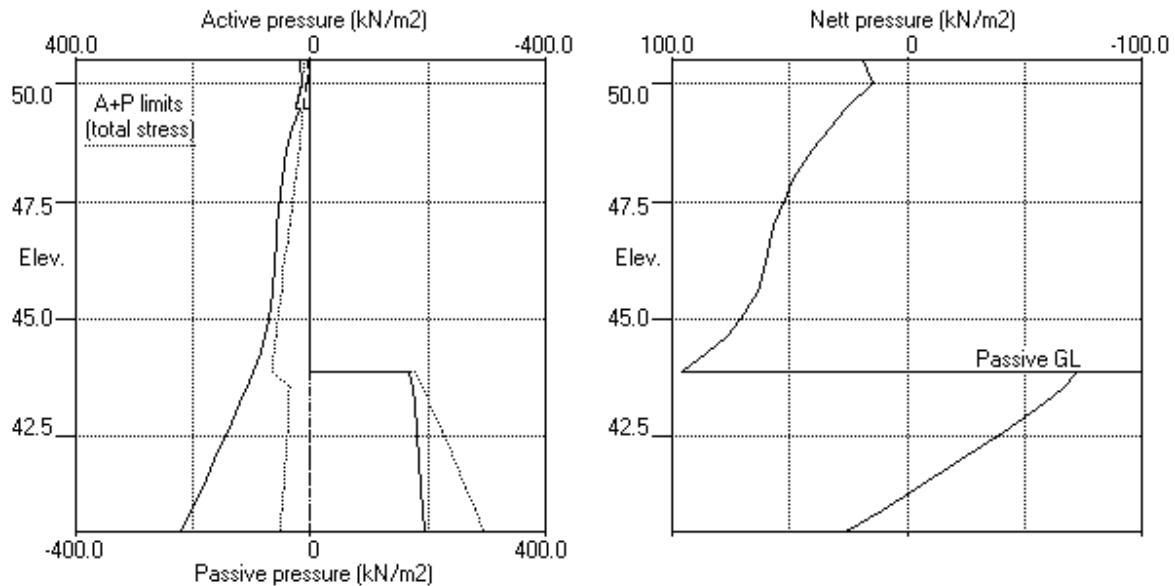
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Stage No.12 Excav. to elev. 43.90 on PASSIVE side



```
| Sheet No.  
| Job No. TWS8148  
| Made by : PJBW  
|  
| Date: 4-03-2014  
| Checked :
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Stage No. 14 Change EI of wall to 53860 kN.m²/m run
Yield moment not defined
Allow wall to relax with new modulus value

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr- -ation
14	50.50 43.90		More than one strut			

Analysis options

Open Tension Crack analysis - No

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

*** Wall displacements reset to zero at stage 4

At elev. 50.00	Strut force =	30.5 kN/strut =	30.5 kN/m run
At elev. 47.30	Strut force =	208.3 kN/strut =	208.3 kN/m run
At elev. 44.30	Strut force =	18.1 kN/strut =	18.1 kN/m run

Run ID. Kpore_SLS01 Eu600CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	18.85	18.85	15698
2	50.00	5.00	33.41	9.52	154.98	9.74	14.74	4631
3	49.50	10.00	47.06	13.41	218.31	16.21	26.21	4631
		Total>	57.06	10.00w	157.06	18.06	18.06	19150
4	49.05	Total>	70.56	14.50w	176.86	32.52	32.52	20357
5	48.60	Total>	80.79	19.00w	193.39	40.83	40.83	18275
6	48.00	Total>	92.33	25.00w	213.33	49.60	49.60	19638
7	47.65	Total>	98.68	28.50w	224.58	52.22	52.22	20433
8	47.30	Total>	104.96	32.00w	235.76	55.25	55.25	21229
9	47.00	Total>	110.34	35.00w	245.34	56.69	56.69	14292
10	46.60	Total>	117.52	39.00w	258.12	57.56	57.56	14884
11	46.20	Total>	124.74	43.00w	270.94	58.28	58.28	15477
12	45.60	Total>	135.65	49.00w	290.25	61.04	61.04	16366
13	45.00	Total>	146.66	55.00w	309.66	68.35	68.35	17256
14	44.65	Total>	153.13	58.50w	321.03	75.44	75.44	17774
15	44.30	Total>	159.63	62.00w	332.43	84.52	84.52	18293
16	43.90	Total>	167.09	66.00w	345.49	96.87	96.87	16747
17	43.55	Total>	173.65	34.75m	356.95	108.94	108.94	17207
18	43.20	Total>	180.24	36.50m	368.44	121.70	121.70	17667
19	42.60	Total>	191.59	39.50m	388.19	143.85	143.85	18455
20	42.00	Total>	203.00	42.50m	408.00	165.69	165.69	19244
21	41.40	Total>	214.46	45.50m	427.86	187.02	187.02	20032
22	40.95	Total>	223.09	47.75m	442.79	203.00	203.00	20624
23	40.50	Total>	231.75	50.00m	457.75	218.82	218.82	39981

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	168.41	168.41	16747
17	43.55	Total>	7.00	3.50w	190.30	172.29	172.29	17207
18	43.20	Total>	14.00	7.00w	202.20	175.03	175.03	17667
19	42.60	Total>	26.02	13.00w	222.62	178.91	178.91	18455
20	42.00	Total>	38.05	19.00w	243.05	182.84	182.84	19244
21	41.40	Total>	50.11	25.00w	263.51	187.24	187.24	20032

Run ID. Kpore_SLS01 Eu600CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

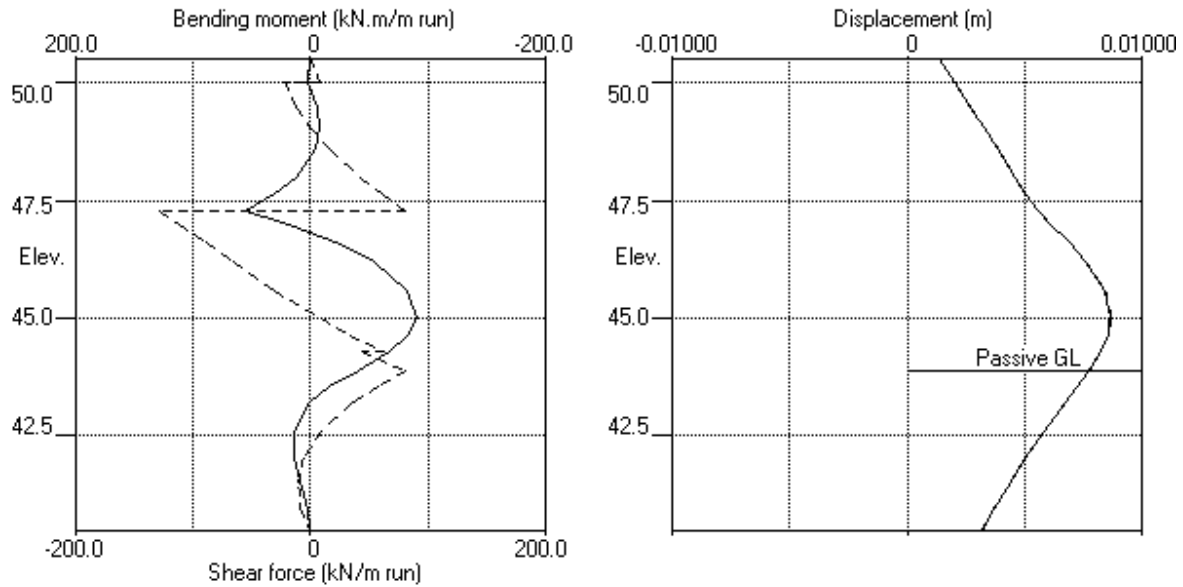
Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	----- Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
22	40.95	Total>	59.17	29.50w	278.87	190.52	190.52	20624
23	40.50	Total>	68.26	34.00w	294.26	193.84	193.84	39981

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 Kidderpore Ave, 3
 SLS type undrained calculation

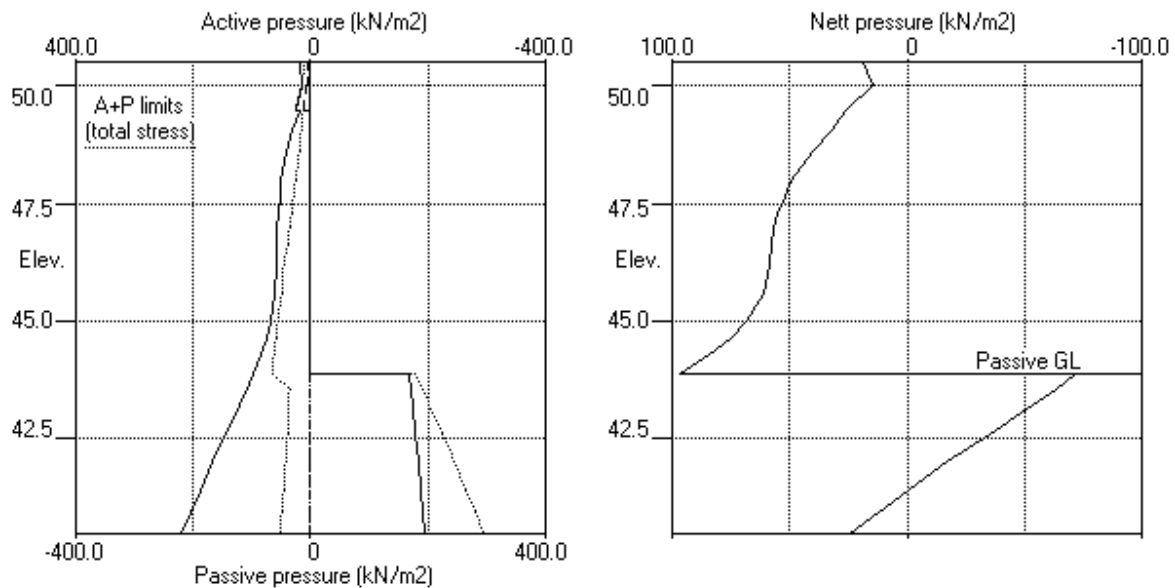
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.14 Change EI of wall to 53860kN.m²/m run



Stage No.14 Change EI of wall to 53860kN.m²/m run



				FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of Safety	equilib. at elev.	elev.	Penetr- ation
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	Cant.	6.685	41.41	49.94	0.56
3	50.50	50.50	Cant.	6.412	41.36	49.94	0.56
4	50.50	50.50		No analysis at this stage			
5	50.50	50.50		No analysis at this stage			
6	50.50	49.50	Cant.	4.528	41.29	48.79	0.71
7	50.50	49.50		No analysis at this stage			
8	50.50	49.50		No analysis at this stage			
9	50.50	47.00	50.00	3.756	n/a	46.66	0.34
10	50.50	47.00		No analysis at this stage			
All remaining stages have more than one strut - FoS calculation n/a							

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 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	50.50	0.002	0.000	0.0	0.0	0.0	0.0
2	50.00	0.002	0.000	3.6	0.0	9.0	-61.9
3	49.50	0.003	0.000	6.8	-25.0	15.8	-51.9
4	49.05	0.004	0.000	11.8	-46.5	8.1	-42.5
5	48.60	0.004	0.000	14.3	-62.5	17.7	-28.8
6	48.00	0.005	0.000	15.3	-72.9	44.9	-5.2
7	47.65	0.005	0.000	34.2	-71.9	62.7	-3.4
8	47.30	0.006	0.000	59.5	-64.6	81.6	-139.0
9	47.00	0.006	0.000	20.2	-52.6	49.2	-122.2
10	46.60	0.007	0.000	8.4	-34.6	40.9	-99.1
11	46.20	0.008	0.000	6.5	-60.9	32.7	-75.3
12	45.60	0.008	0.000	4.0	-94.5	21.5	-38.1
13	45.00	0.009	0.000	5.7	-105.2	25.3	-2.6
14	44.65	0.009	0.000	9.0	-99.9	56.2	-2.0
15	44.30	0.008	0.000	10.9	-85.2	88.6	-8.1
16	43.90	0.008	0.000	11.7	-55.5	92.9	-0.9
17	43.55	0.008	0.000	11.4	-30.5	68.5	-1.7
18	43.20	0.007	0.000	10.5	-20.1	46.8	-3.2
19	42.60	0.006	0.000	13.8	-6.5	18.5	-4.7
20	42.00	0.005	0.000	14.0	-0.2	9.3	-6.0
21	41.40	0.004	0.000	7.6	-0.1	0.7	-11.2
22	40.95	0.004	0.000	2.7	-0.0	0.1	-8.4
23	40.50	0.003	0.000	0.0	0.0	0.0	-0.0

Run ID. Kpore_SLS01 Eu600CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	0.9	50.00	-0.2	49.50	0.2	49.05	-0.6	49.50
2	0.8	50.00	-0.0	49.05	0.3	49.50	-0.5	50.00
3	0.8	50.00	-0.0	49.05	0.3	49.50	-0.5	50.00
4	No calculation at this stage							
5	No calculation at this stage							
6	14.3	48.60	-0.3	42.60	15.8	49.50	-4.8	46.60
7	No calculation at this stage							
8	No calculation at this stage							
9	11.7	43.90	-72.9	48.00	49.2	47.00	-61.9	50.00
10	No calculation at this stage							
11	No calculation at this stage							
12	57.1	47.30	-105.2	45.00	92.9	43.90	-139.0	47.30
13	No calculation at this stage							
14	55.9	47.30	-89.9	45.00	80.2	43.90	-128.5	47.30
15	No calculation at this stage							
16	No calculation at this stage							
17	59.5	47.30	-86.2	45.00	88.6	44.30	-137.7	47.30

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.074	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	0.135	50.50	0.000	50.50	Apply surcharge no.2 at elev. 50.50
3	0.137	50.50	0.000	50.50	Apply surcharge no.3 at elev. 50.50
4	Wall displacements reset to zero				Change EI of wall to 75150kN.m2/m run
5	No calculation at this stage				Apply water pressure profile no.1
6	0.002	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
7	No calculation at this stage				Install strut no.1 at elev. 50.00
8	No calculation at this stage				Apply water pressure profile no.2
9	0.005	47.30	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
10	No calculation at this stage				Install strut no.2 at elev. 47.30
11	No calculation at this stage				Apply water pressure profile no.3
12	0.008	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
13	No calculation at this stage				Install strut no.3 at elev. 44.30
14	0.009	45.00	0.000	50.50	Change EI of wall to 53860kN.m2/m run
15	No calculation at this stage				Change soil type 2 to soil type 3
16	No calculation at this stage				Apply water pressure profile no.4
17	0.009	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Run ID. Kpore_SLS01 Eu600CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
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Summary of results (continued)

Strut forces at each stage (horizontal components)

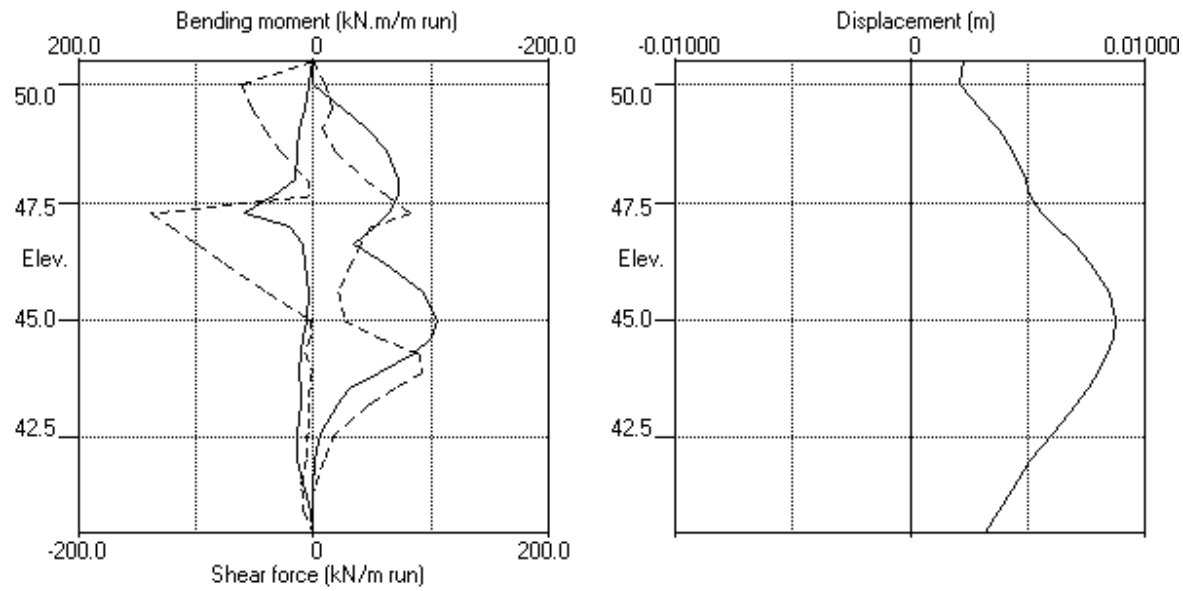
Stage no.	--- Strut no. 1 --- at elev. 50.00		--- Strut no. 2 --- at elev. 47.30		--- Strut no. 3 --- at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
9	70.87	70.87	---	---	---	---
12	29.87	29.87	218.80	218.80	---	---
14	30.50	30.50	208.30	208.30	18.10	18.10
17	30.30	30.30	219.33	219.33	96.70	96.70

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SLS type undrained calculation

| Sheet No.
| Job No. TWS8148
| Made by : PJBW
|
| Date: 4-03-2014
Checked :

Units: kN,m

Bending moment, shear force, displacement envelopes



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS01 Eu1000CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --		Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No.	Description	kN/m3	Eh,kN/m2	Ko	NC/OC	Ka	Kp	kN/m2
	(Datum elev.)		(dEh/dy)	(dKo/dy)	(Nu)	(Kac)	(Kpc)	(dc/dy)
1	Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
					(0.200)	(0.000)	(0.000)	
2	London Clay	20.00	50000	1.500	OC	1.000	1.000	50.00u
	(49.50)		(7000)		(0.490)	(2.389)	(2.000)	(7.000)
3	LC Drained	20.00	40000	1.500	OC	0.368	3.244	2.000d
	(49.50)		(5600)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----		friction	adhesion	fill	friction	adhesion	fill
No.	Description	angle	coeff.	angle	angle	coeff.	angle
1	Made Ground	30.00	0.634	0.00	30.00	0.634	0.00
2	London Clay	0.00	0.500	0.00	0.00	0.000	0.00
3	LC Drained	24.00	0.647	0.00	24.00	0.670	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.		Active side			Passive side			
profile no.	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	50.50	50.50	0.0	1	49.50	49.50	0.0
2	1	50.50	50.50	0.0	1	47.00	47.00	0.0
3	1	50.50	50.50	0.0	1	43.90	43.90	0.0
4	1	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 224.00 kN/m2
Moment of inertia of wall I = 8.4800E-03 m4/m run
E.I = 1.8995 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	130.00		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	135.00		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side
A trapezoidal surcharge is defined by two values:
N = at edge near to wall, F = at edge far from wall

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Apply surcharge no.2 at elevation 50.50
3	Apply surcharge no.3 at elevation 50.50
4	Change EI of wall to 75150 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
5	Apply water pressure profile no.1 No analysis at this stage
6	Excavate to elevation 49.50 on PASSIVE side
7	Install strut or anchor no.1 at elevation 50.00
8	Apply water pressure profile no.2 No analysis at this stage
9	Excavate to elevation 47.00 on PASSIVE side
10	Install strut or anchor no.2 at elevation 47.30
11	Apply water pressure profile no.3 No analysis at this stage
12	Excavate to elevation 43.90 on PASSIVE side
13	Install strut or anchor no.3 at elevation 44.30
14	Change EI of wall to 53860 kN.m2/m run Yield moment not defined Allow wall to relax with new modulus value
15	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
16	Apply water pressure profile no.4 No analysis at this stage
17	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Apply surcharge no.2 at elev. 50.50	No	No	No
3	Apply surcharge no.3 at elev. 50.50	No	No	No
4	Change EI of wall to 75150kN.m2/m run	No	No	No
5	Apply water pressure profile no.1	No	No	No
6	Excav. to elev. 49.50 on PASSIVE side	No	No	No
7	Install strut no.1 at elev. 50.00	No	No	No
8	Apply water pressure profile no.2	No	No	No
9	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
10	Install strut no.2 at elev. 47.30	No	No	No
11	Apply water pressure profile no.3	No	No	No
12	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
13	Install strut no.3 at elev. 44.30	No	No	No
14	Change EI of wall to 53860kN.m2/m run	No	No	No
15	Change soil type 2 to soil type 3	No	No	No
16	Apply water pressure profile no.4	No	No	No
17	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

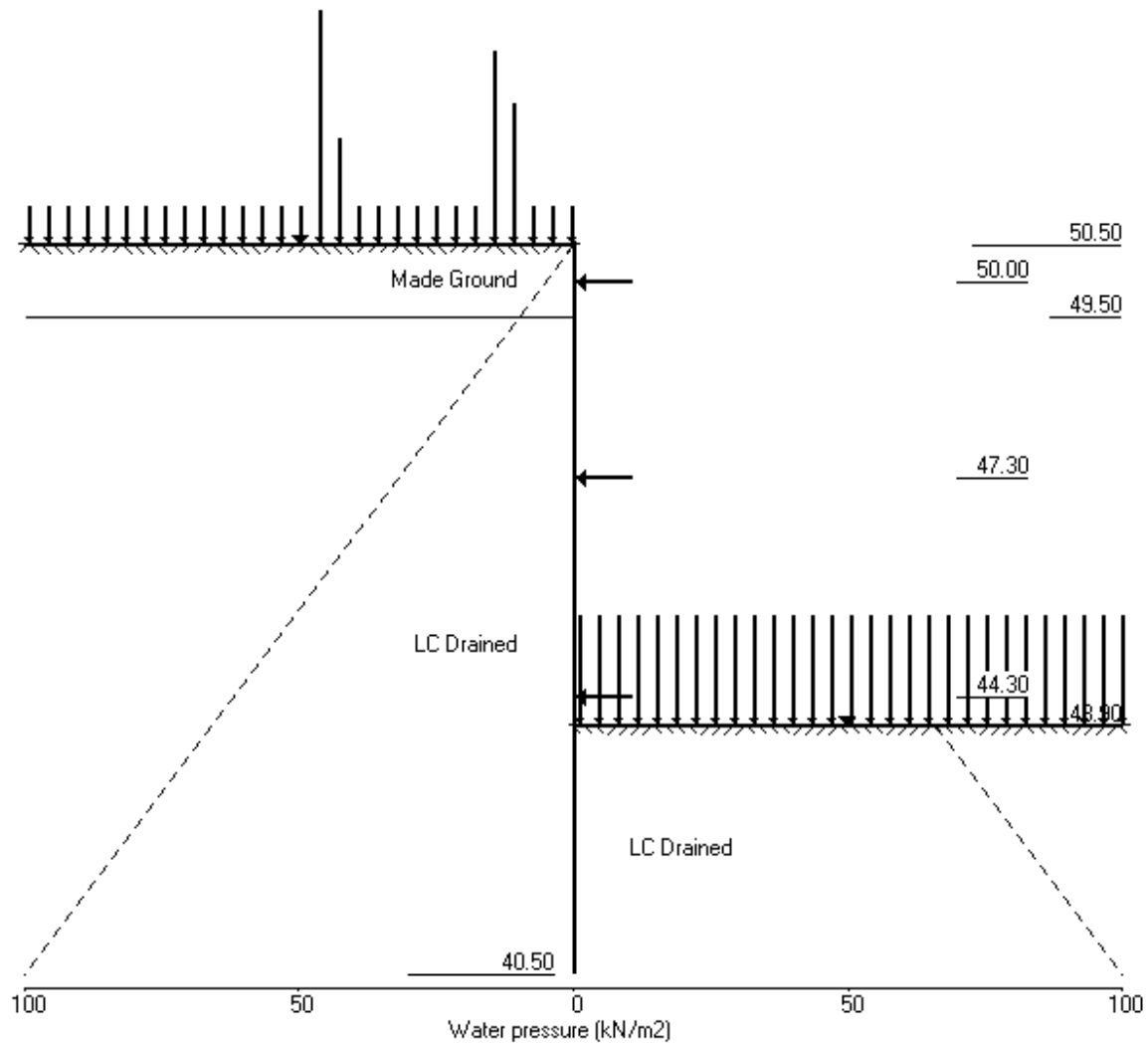
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 Kidderpore Ave, 3
 SLS type undrained calculation

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Stage No.17 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 49.50 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
6	50.50 49.50	Cant.	4.528	41.29	48.79	0.71

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	7.13	0.001	4.65E-04	0.0	0.0		75150
2	50.00	14.52	0.001	4.62E-04	5.4	1.8		75150
3	49.50	29.21	0.001	4.36E-04	16.3	6.7		75150
		-28.40	0.001	4.36E-04	16.3	6.7		
4	49.05	-14.46	0.001	3.82E-04	6.7	11.3		75150
5	48.60	-10.38	0.001	3.10E-04	1.1	12.9		75150
6	48.00	-4.67	0.000	2.11E-04	-3.4	11.7		75150
7	47.65	-2.21	0.000	1.60E-04	-4.6	10.2		75150
8	47.30	-0.35	0.000	1.17E-04	-5.1	8.5		75150
9	47.00	0.86	0.000	8.67E-05	-5.0	6.9		75150
10	46.60	1.73	0.000	5.50E-05	-4.5	5.0		75150
11	46.20	2.25	0.000	3.30E-05	-3.7	3.3		75150
12	45.60	2.08	0.000	1.41E-05	-2.4	1.4		75150
13	45.00	1.49	0.000	7.01E-06	-1.3	0.3		75150
14	44.65	1.29	0.000	6.28E-06	-0.8	-0.0		75150
15	44.30	0.97	0.000	6.89E-06	-0.4	-0.2		75150
16	43.90	0.59	0.000	8.43E-06	-0.1	-0.3		75150
17	43.55	0.37	0.000	1.00E-05	0.1	-0.3		75150
18	43.20	0.26	0.000	1.15E-05	0.2	-0.3		75150
19	42.60	-0.04	0.000	1.34E-05	0.3	-0.2		75150
20	42.00	-0.13	0.000	1.45E-05	0.2	-0.1		75150
21	41.40	-0.17	0.000	1.49E-05	0.1	-0.0		75150
22	40.95	-0.09	0.000	1.49E-05	0.0	0.0		75150
23	40.50	-0.13	0.000	1.49E-05	0.0	0.0		---

Run ID: Kpore_SLS01 Eu1000CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
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Stage No.6 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2823
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	2823
3	49.50	10.00	47.06	13.41	218.31	19.21	29.21	2823
		Total>	57.06	10.00w	157.06	18.70	18.70	19793
4	49.05	Total>	70.56	14.50w	176.86	38.94	38.94	21040
5	48.60	Total>	80.79	19.00w	193.39	52.68	52.68	22287
6	48.00	Total>	92.33	25.00w	213.33	70.18	70.18	23950
7	47.65	Total>	98.68	28.50w	224.58	79.79	79.79	24920
8	47.30	Total>	104.96	32.00w	235.76	89.08	89.08	25890
9	47.00	Total>	110.34	35.00w	245.34	96.85	96.85	26721
10	46.60	Total>	117.52	39.00w	258.12	106.88	106.88	27830
11	46.20	Total>	124.74	43.00w	270.94	116.76	116.76	28938
12	45.60	Total>	135.65	49.00w	290.25	131.16	131.16	30601
13	45.00	Total>	146.66	55.00w	309.66	145.41	145.41	32263
14	44.65	Total>	153.13	58.50w	321.03	153.82	153.82	33233
15	44.30	Total>	159.63	62.00w	332.43	162.20	162.20	34203
16	43.90	Total>	167.09	66.00w	345.49	171.77	171.77	35311
17	43.55	Total>	173.65	34.75m	356.95	180.22	180.22	36281
18	43.20	Total>	180.24	36.50m	368.44	188.73	188.73	37251
19	42.60	Total>	191.59	39.50m	388.19	203.30	203.30	38914
20	42.00	Total>	203.00	42.50m	408.00	218.00	218.00	40576
21	41.40	Total>	214.46	45.50m	427.86	232.76	232.76	42239
22	40.95	Total>	223.09	47.75m	442.79	243.90	243.90	43486
23	40.50	Total>	231.75	50.00m	457.75	255.00	255.00	44733

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	100.00	47.10	47.10	21876
4	49.05	Total>	9.00	4.50w	115.30	53.40	53.40	23254
5	48.60	Total>	18.00	9.00w	130.60	63.07	63.07	24632
6	48.00	Total>	30.00	15.00w	151.00	74.85	74.85	26470
7	47.65	Total>	37.01	18.50w	162.91	82.00	82.00	27542
8	47.30	Total>	44.01	22.00w	174.81	89.43	89.43	28614
9	47.00	Total>	50.01	25.00w	185.01	95.99	95.99	29532
10	46.60	Total>	58.02	29.00w	198.62	105.15	105.15	30757
11	46.20	Total>	66.03	33.00w	212.23	114.50	114.50	31982
12	45.60	Total>	78.05	39.00w	232.65	129.08	129.08	33820
13	45.00	Total>	90.08	45.00w	253.08	143.92	143.92	35658
14	44.65	Total>	97.10	48.50w	265.00	152.54	152.54	36730
15	44.30	Total>	104.12	52.00w	276.92	161.22	161.22	37801
16	43.90	Total>	112.15	56.00w	290.55	171.18	171.18	39026
17	43.55	Total>	119.18	59.50w	302.48	179.85	179.85	40098
18	43.20	Total>	126.21	63.00w	314.41	188.47	188.47	41170
19	42.60	Total>	138.27	34.50m	334.87	203.34	203.34	43008
20	42.00	Total>	150.34	37.50m	355.34	218.14	218.14	44845
21	41.40	Total>	162.42	40.50m	375.82	232.94	232.94	46683
22	40.95	Total>	171.49	42.75m	391.19	244.00	244.00	48061
23	40.50	Total>	180.56	45.00m	406.56	255.13	255.13	49439

Run ID. Kpore_SLS01 Eu1000CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

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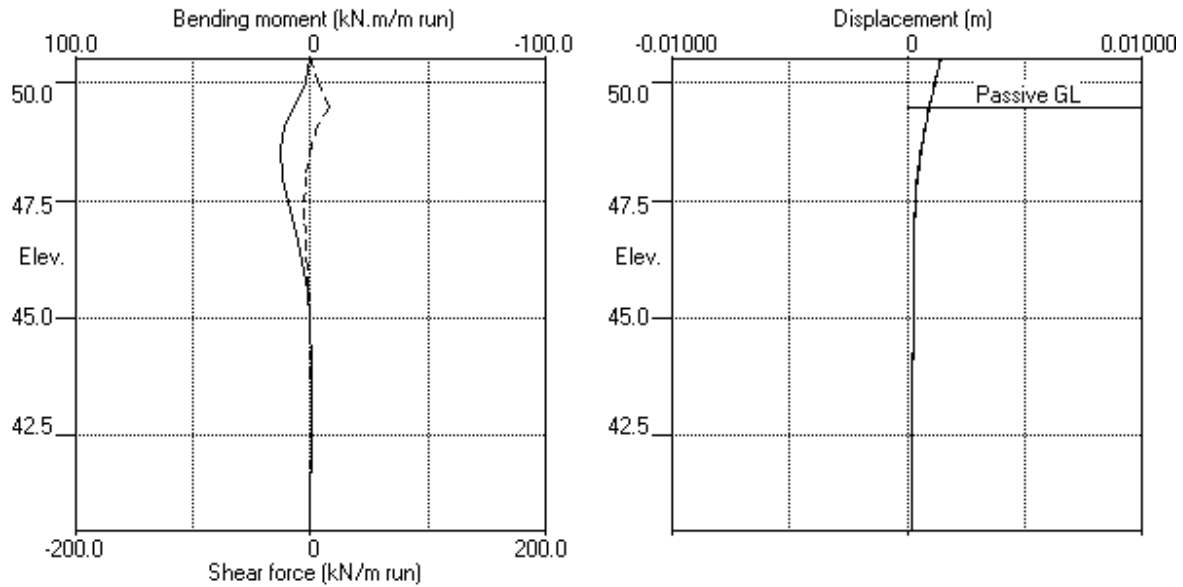
Stage No.6 Excavate to elevation 49.50 on PASSIVE side
Note: 14.52a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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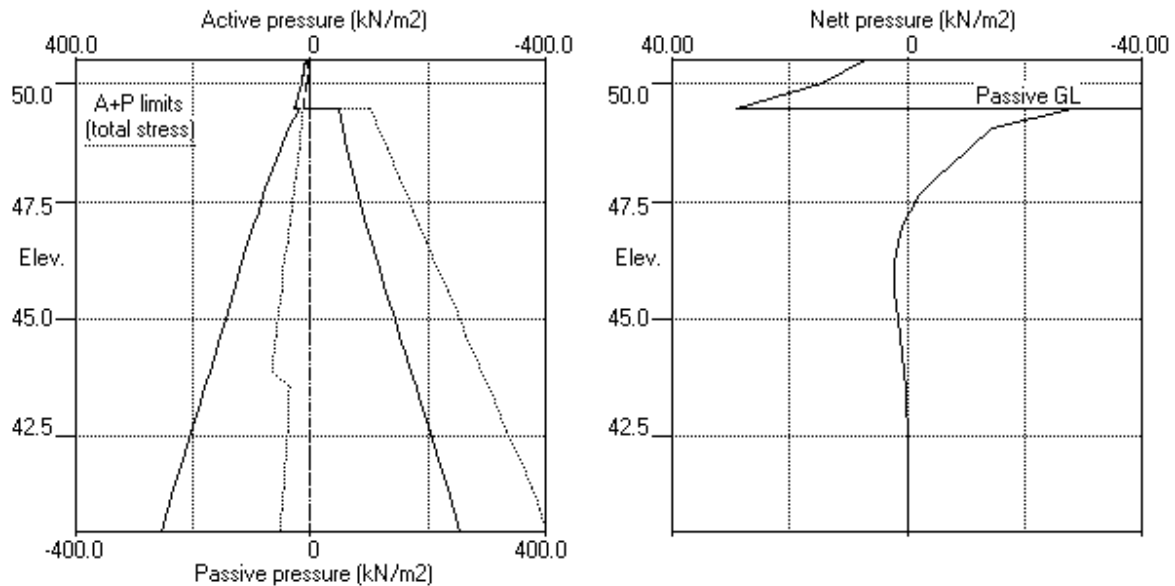
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Stage No.6 Excav. to elev. 49.50 on PASSIVE side



Stage No.6 Excav. to elev. 49.50 on PASSIVE side



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 9 Excavate to elevation 47.00 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr- -ation
9	50.50 47.00	50.00	3.756	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	16.80	0.001	-1.19E-03	0.0	0.0		75150
2	50.00	14.52	0.001	-1.19E-03	7.8	3.0	59.2	75150
		14.52	0.001	-1.19E-03	-51.3	3.0		
3	49.50	27.99	0.002	-1.13E-03	-40.7	-20.5		75150
		10.00	0.002	-1.13E-03	-40.7	-20.5		
4	49.05	22.60	0.002	-9.64E-04	-33.4	-37.1		75150
5	48.60	29.58	0.003	-7.05E-04	-21.6	-49.5		75150
6	48.00	40.04	0.003	-2.82E-04	-0.8	-56.5		75150
7	47.65	47.00	0.003	-2.48E-05	14.5	-54.1		75150
8	47.30	54.82	0.003	2.08E-04	32.3	-46.1		75150
9	47.00	62.24	0.003	3.67E-04	49.8	-33.8		75150
		-31.50	0.003	3.67E-04	49.8	-33.8		
10	46.60	-29.26	0.003	5.01E-04	37.7	-16.4		75150
11	46.20	-25.42	0.003	5.55E-04	26.8	-3.7		75150
12	45.60	-18.80	0.002	5.39E-04	13.5	7.7		75150
13	45.00	-12.28	0.002	4.59E-04	4.2	12.4		75150
14	44.65	-8.75	0.002	4.00E-04	0.5	13.1		75150
15	44.30	-5.81	0.002	3.40E-04	-2.1	12.7		75150
16	43.90	-3.16	0.002	2.76E-04	-3.9	11.4		75150
17	43.55	-1.33	0.001	2.26E-04	-4.6	9.8		75150
18	43.20	0.09	0.001	1.85E-04	-4.9	8.1		75150
19	42.60	1.39	0.001	1.32E-04	-4.4	5.2		75150
20	42.00	2.01	0.001	1.00E-04	-3.4	2.7		75150
21	41.40	2.21	0.001	8.56E-05	-2.1	1.0		75150
22	40.95	2.38	0.001	8.18E-05	-1.1	0.3		75150
23	40.50	2.46	0.001	8.10E-05	0.0	0.0		---
At elev. 50.00 Strut force =			59.2 kN/strut =			59.2 kN/m run		

Run ID: Kpore_SLS01 Eu1000CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
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Stage No.9 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	16.80	16.80	13614
2	50.00	5.00	33.41	9.52	154.98	9.52	14.52a	1302
3	49.50	10.00	47.06	13.41	218.31	17.99	27.99	1302
		Total>	57.06	10.00w	157.06	10.00	10.00a	9625
4	49.05	Total>	70.56	14.50w	176.86	22.60	22.60	10232
5	48.60	Total>	80.79	19.00w	193.39	29.58	29.58	10838
6	48.00	Total>	92.33	25.00w	213.33	40.04	40.04	11647
7	47.65	Total>	98.68	28.50w	224.58	47.00	47.00	12118
8	47.30	Total>	104.96	32.00w	235.76	54.82	54.82	12590
9	47.00	Total>	110.34	35.00w	245.34	62.24	62.24	12994
10	46.60	Total>	117.52	39.00w	258.12	72.84	72.84	13533
11	46.20	Total>	124.74	43.00w	270.94	84.13	84.13	14072
12	45.60	Total>	135.65	49.00w	290.25	101.41	101.41	14881
13	45.00	Total>	146.66	55.00w	309.66	118.69	118.69	15689
14	44.65	Total>	153.13	58.50w	321.03	128.69	128.69	16161
15	44.30	Total>	159.63	62.00w	332.43	138.44	138.44	16632
16	43.90	Total>	167.09	66.00w	345.49	149.31	149.31	17171
17	43.55	Total>	173.65	34.75m	356.95	158.63	158.63	17643
18	43.20	Total>	180.24	36.50m	368.44	167.80	167.80	18115
19	42.60	Total>	191.59	39.50m	388.19	183.07	183.07	18923
20	42.00	Total>	203.00	42.50m	408.00	198.10	198.10	19732
21	41.40	Total>	214.46	45.50m	427.86	213.00	213.00	20540
22	40.95	Total>	223.09	47.75m	442.79	224.20	224.20	21147
23	40.50	Total>	231.75	50.00m	457.75	235.39	235.39	21753

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	93.74	93.74	17562
10	46.60	Total>	8.00	4.00w	148.60	102.10	102.10	18290
11	46.20	Total>	16.00	8.00w	162.20	109.55	109.55	19019
12	45.60	Total>	28.01	14.00w	182.61	120.22	120.22	20111
13	45.00	Total>	40.03	20.00w	203.03	130.97	130.97	21204
14	44.65	Total>	47.05	23.50w	214.95	137.43	137.43	21841
15	44.30	Total>	54.07	27.00w	226.87	144.25	144.25	22479
16	43.90	Total>	62.10	31.00w	240.50	152.47	152.47	23207
17	43.55	Total>	69.14	34.50w	252.44	159.96	159.96	23845
18	43.20	Total>	76.19	38.00w	264.39	167.72	167.72	24482
19	42.60	Total>	88.29	44.00w	284.89	181.68	181.68	25575
20	42.00	Total>	100.42	50.00w	305.42	196.09	196.09	26668
21	41.40	Total>	112.58	56.00w	325.98	210.78	210.78	27760
22	40.95	Total>	121.72	60.50w	341.42	221.82	221.82	28580
23	40.50	Total>	130.88	65.00w	356.88	232.93	232.93	29400

Run ID. Kpore_SLS01 Eu1000CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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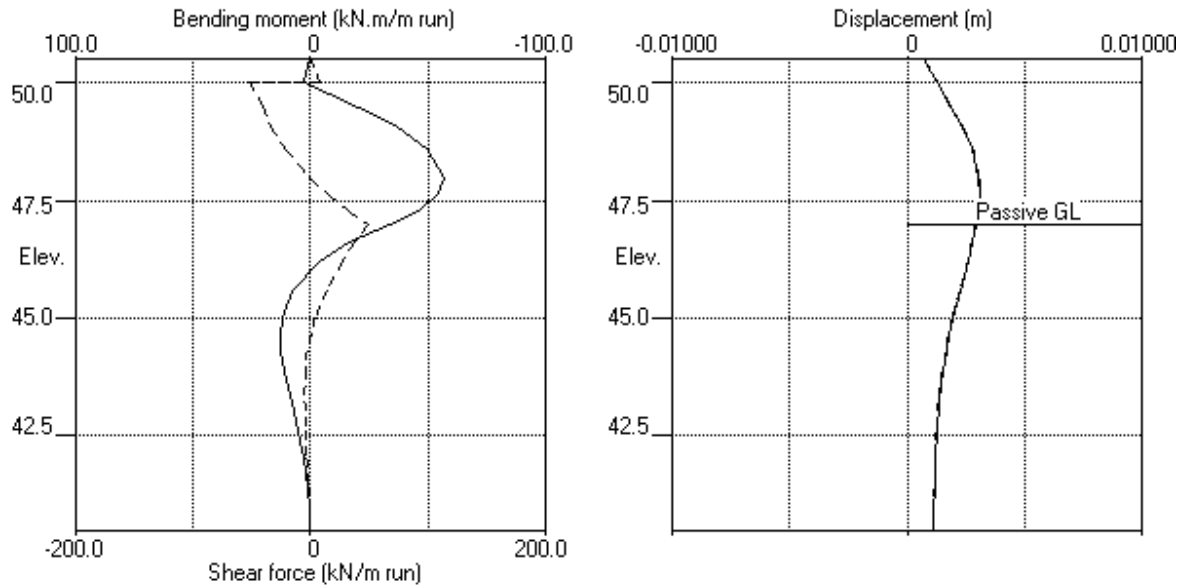
Stage No.9 Excavate to elevation 47.00 on PASSIVE side
Note: 10.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Program: WALLAP Version 6.05 Revision A44.B58.R48
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 Data filename/Run ID: Kpore_SLS01 Eu1000CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation

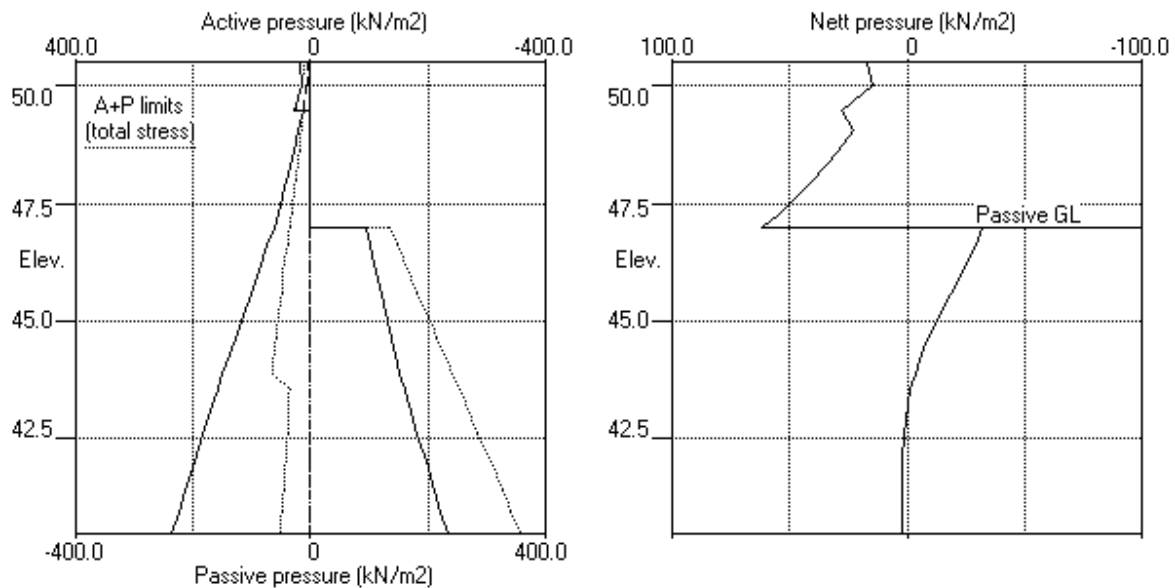
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.9 Excav. to elev. 47.00 on PASSIVE side



Stage No.9 Excav. to elev. 47.00 on PASSIVE side



A.K.A. LTD.	Sheet No.
Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
Licensed from GEOSOLVE	Made by : PJBW
Data filename/Run ID: Kpore_SLS01 Eu1000CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation	Checked :

Units: kN,m

Stage No. 12 Excavate to elevation 43.90 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor	Moment
No.	Act. Pass.	Elev.	of	equilib.
			Safety	at elev.
12	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	14.92	0.001	-8.54E-04	0.0	0.0		75150
2	50.00	14.69	0.001	-8.60E-04	7.4	2.8	29.7	75150
		14.69	0.001	-8.60E-04	-22.3	2.8		
3	49.50	28.60	0.002	-8.46E-04	-11.5	-6.1		75150
		14.25	0.002	-8.46E-04	-11.5	-6.1		
4	49.05	29.29	0.002	-8.00E-04	-1.7	-9.2		75150
5	48.60	37.30	0.002	-7.52E-04	13.3	-6.7		75150
6	48.00	44.87	0.003	-7.60E-04	37.9	8.7		75150
7	47.65	46.75	0.003	-8.39E-04	54.0	24.9		75150
8	47.30	49.46	0.003	-1.00E-03	70.8	46.8	185.1	75150
		49.46	0.003	-1.00E-03	-114.3	46.8		
9	47.00	50.57	0.004	-1.12E-03	-99.3	14.8		75150
10	46.60	50.87	0.004	-1.11E-03	-79.0	-20.7		75150
11	46.20	51.15	0.005	-9.30E-04	-58.6	-48.0		75150
12	45.60	53.61	0.005	-4.46E-04	-27.2	-73.4		75150
13	45.00	61.29	0.005	1.64E-04	7.3	-79.4		75150
14	44.65	69.01	0.005	5.19E-04	30.1	-73.0		75150
15	44.30	79.08	0.005	8.24E-04	56.0	-58.1		75150
16	43.90	93.11	0.004	1.05E-03	90.5	-29.2		75150
		-85.29	0.004	1.05E-03	90.5	-29.2		
17	43.55	-81.33	0.004	1.12E-03	61.3	-1.0		75150
18	43.20	-65.55	0.004	1.09E-03	35.6	15.5		75150
19	42.60	-39.18	0.003	9.31E-04	4.2	25.0		75150
20	42.00	-16.02	0.002	7.49E-04	-12.4	20.4		75150
21	41.40	3.79	0.002	6.27E-04	-16.0	10.1		75150
22	40.95	17.79	0.002	5.87E-04	-11.2	3.2		75150
23	40.50	31.94	0.002	5.78E-04	0.0	0.0		---
At elev. 50.00		Strut force =		29.7 kN/strut =	29.7 kN/m run			
At elev. 47.30		Strut force =		185.1 kN/strut =	185.1 kN/m run			

Run ID: Kpore_SLS01 Eu1000CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.12 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	14.92	14.92	17124
2	50.00	5.00	33.41	9.52	154.98	9.69	14.69	2750
3	49.50	10.00	47.06	13.41	218.31	18.60	28.60	2750
		Total>	57.06	10.00w	157.06	14.25	14.25	19303
4	49.05	Total>	70.56	14.50w	176.86	29.29	29.29	20519
5	48.60	Total>	80.79	19.00w	193.39	37.30	37.30	21736
6	48.00	Total>	92.33	25.00w	213.33	44.87	44.87	23357
7	47.65	Total>	98.68	28.50w	224.58	46.75	46.75	13917
8	47.30	Total>	104.96	32.00w	235.76	49.46	49.46	14459
9	47.00	Total>	110.34	35.00w	245.34	50.57	50.57	14923
10	46.60	Total>	117.52	39.00w	258.12	50.87	50.87	15542
11	46.20	Total>	124.74	43.00w	270.94	51.15	51.15	16161
12	45.60	Total>	135.65	49.00w	290.25	53.61	53.61	17089
13	45.00	Total>	146.66	55.00w	309.66	61.29	61.29	18018
14	44.65	Total>	153.13	58.50w	321.03	69.01	69.01	18560
15	44.30	Total>	159.63	62.00w	332.43	79.08	79.08	19101
16	43.90	Total>	167.09	66.00w	345.49	93.11	93.11	19720
17	43.55	Total>	173.65	34.75m	356.95	106.93	106.93	20262
18	43.20	Total>	180.24	36.50m	368.44	121.35	121.35	20804
19	42.60	Total>	191.59	39.50m	388.19	145.79	145.79	21732
20	42.00	Total>	203.00	42.50m	408.00	169.05	169.05	22661
21	41.40	Total>	214.46	45.50m	427.86	191.11	191.11	23589
22	40.95	Total>	223.09	47.75m	442.79	207.36	207.36	24286
23	40.50	Total>	231.75	50.00m	457.75	223.68	223.68	24982

Node no.	Y coord	----- PASSIVE side -----						Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective stresses		Earth pressure kN/m2			
				Active limit kN/m2	Passive limit kN/m2				
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		Total>	0.00	0.00	178.40	178.40	178.40p	34030	
17	43.55	Total>	7.00	3.50w	190.30	188.26	188.26	34964	
18	43.20	Total>	14.00	7.00w	202.20	186.90	186.90	35899	
19	42.60	Total>	26.02	13.00w	222.62	184.97	184.97	37501	
20	42.00	Total>	38.05	19.00w	243.05	185.07	185.07	39104	
21	41.40	Total>	50.11	25.00w	263.51	187.32	187.32	40706	
22	40.95	Total>	59.17	29.50w	278.87	189.57	189.57	41908	
23	40.50	Total>	68.26	34.00w	294.26	191.74	191.74	43109	

Run ID. Kpore_SLS01 Eu1000CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

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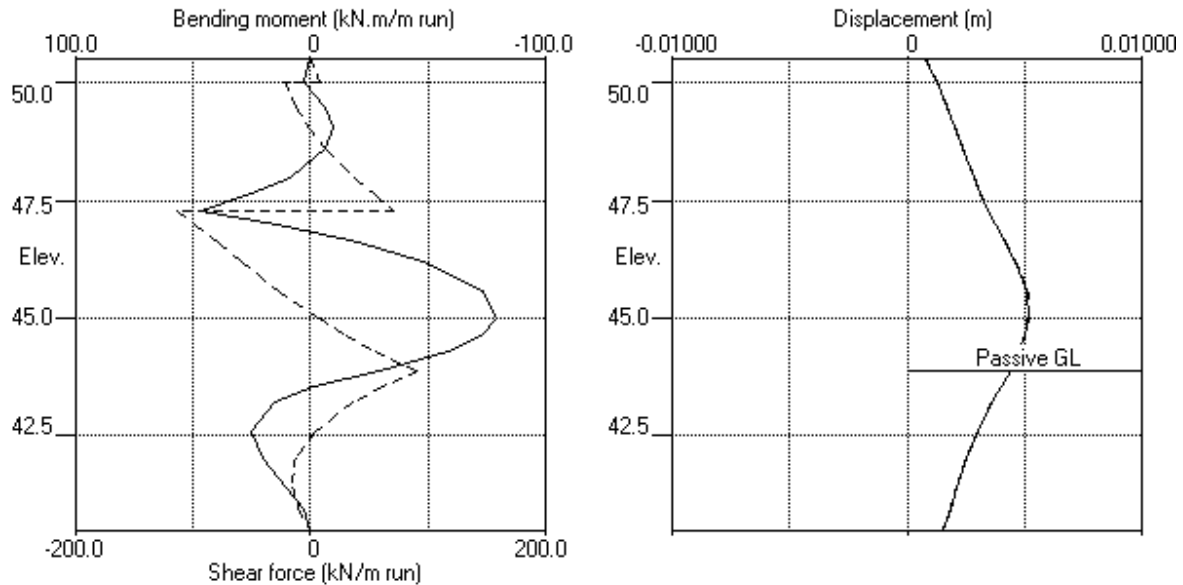
Stage No.12 Excavate to elevation 43.90 on PASSIVE side
Note: 12.34a Soil pressure at active limit
178.40p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS01 Eu1000CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation

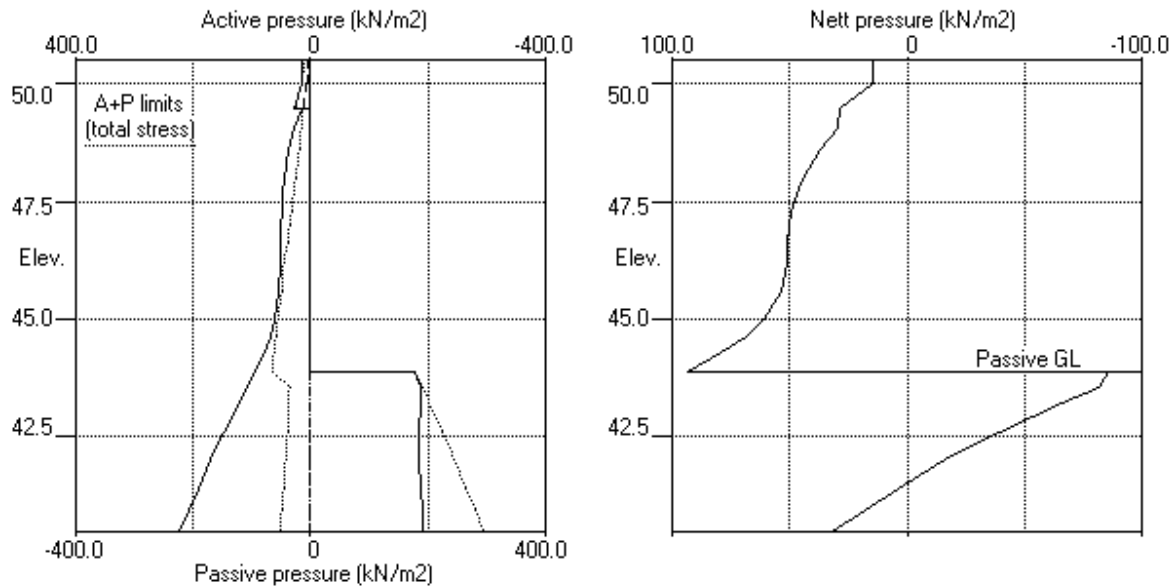
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Stage No.12 Excav. to elev. 43.90 on PASSIVE side



Program: WALLAP Version 6.05 Revision A44.B58.R48
 Licensed from GEOSOLVE
 Data filename/Run ID: Kpore_SLS01 Eul000CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

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| Sheet No.  
| Job No. TWS8148  
| Made by : PJBW  
|  
| Date: 4-03-2014  
| Checked :
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Units: kN, m

Stage No. 14 Change EI of wall to 53860 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000		
Stage	---	G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
14	50.50	43.90		More than one	strut		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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
```

*** Wall displacements reset to zero at stage 4

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	EI of wall kN.m2/m
1	50.50	15.03	0.001	-8.71E-04	0.0	0.0		53860
2	50.00	14.68	0.001	-8.81E-04	7.4	2.6	30.0	53860
		14.68	0.001	-8.81E-04	-22.6	2.6		
3	49.50	28.55	0.002	-8.60E-04	-11.8	-6.3		53860
		13.97	0.002	-8.60E-04	-11.8	-6.3		
4	49.05	28.92	0.002	-7.94E-04	-2.1	-9.4		53860
5	48.60	37.16	0.002	-7.24E-04	12.8	-7.0		53860
6	48.00	45.45	0.003	-7.28E-04	37.5	8.1		53860
7	47.65	47.64	0.003	-8.32E-04	53.8	24.1		53860
8	47.30	50.11	0.003	-1.05E-03	70.9	46.0	177.0	53860
		50.11	0.003	-1.05E-03	-106.1	46.0		
9	47.00	50.38	0.004	-1.23E-03	-91.0	16.0		53860
10	46.60	49.52	0.004	-1.23E-03	-71.0	-16.9		53860
11	46.20	48.59	0.005	-1.02E-03	-51.4	-41.8		53860
12	45.60	49.96	0.005	-4.60E-04	-21.8	-64.2		53860
13	45.00	58.03	0.005	2.45E-04	10.6	-68.3		53860
14	44.65	66.74	0.005	6.44E-04	32.4	-61.1		53860
15	44.30	78.22	0.005	9.68E-04	57.8	-45.7	14.0	53860
		78.22	0.005	9.68E-04	43.8	-45.7		
16	43.90	93.98	0.004	1.19E-03	78.2	-20.6		53860
		-83.56	0.004	1.19E-03	78.2	-20.6		
17	43.55	-76.90	0.004	1.23E-03	50.2	4.4		53860
18	43.20	-59.16	0.004	1.15E-03	26.3	18.0		53860
19	42.60	-31.68	0.003	9.16E-04	-0.9	24.1		53860
20	42.00	-9.93	0.002	6.85E-04	-13.4	18.2		53860
21	41.40	6.90	0.002	5.45E-04	-14.3	8.2		53860
22	40.95	18.82	0.002	5.05E-04	-8.5	2.2		53860
23	40.50	19.00	0.002	4.97E-04	0.0	0.0		--

At elev. 50.00 Strut force = 30.0 kN/strut = 30.0 kN/m run

At elev. 47.30 Strut force = 177.0 kN/strut = 177.0 kN/m run

At elev. 44.30 Strut force = 14.0 kN/strut = 14.0 kN/m run

Run ID. Kpore_SLS01 Eu1000CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	15.03	15.03	12636
2	50.00	5.00	33.41	9.52	154.98	9.68	14.68	3983
3	49.50	10.00	47.06	13.41	218.31	18.55	28.55	3983
		Total>	57.06	10.00w	157.06	13.97	13.97	27575
4	49.05	Total>	70.56	14.50w	176.86	28.92	28.92	29312
5	48.60	Total>	80.79	19.00w	193.39	37.16	37.16	31050
6	48.00	Total>	92.33	25.00w	213.33	45.45	45.45	37123
7	47.65	Total>	98.68	28.50w	224.58	47.64	47.64	38626
8	47.30	Total>	104.96	32.00w	235.76	50.11	50.11	40129
9	47.00	Total>	110.34	35.00w	245.34	50.38	50.38	23880
10	46.60	Total>	117.52	39.00w	258.12	49.52	49.52	24871
11	46.20	Total>	124.74	43.00w	270.94	48.59	48.59	25861
12	45.60	Total>	135.65	49.00w	290.25	49.96	49.96	27347
13	45.00	Total>	146.66	55.00w	309.66	58.03	58.03	28833
14	44.65	Total>	153.13	58.50w	321.03	66.74	66.74	29700
15	44.30	Total>	159.63	62.00w	332.43	78.22	78.22	30566
16	43.90	Total>	167.09	66.00w	345.49	93.98	93.98	29839
17	43.55	Total>	173.65	34.75m	356.95	109.14	109.14	30659
18	43.20	Total>	180.24	36.50m	368.44	124.55	124.55	31478
19	42.60	Total>	191.59	39.50m	388.19	149.54	149.54	32883
20	42.00	Total>	203.00	42.50m	408.00	172.10	172.10	34288
21	41.40	Total>	214.46	45.50m	427.86	192.66	192.66	35693
22	40.95	Total>	223.09	47.75m	442.79	207.88	207.88	84525
23	40.50	Total>	231.75	50.00m	457.75	217.22	217.22	211264

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	177.54	177.54	29839
17	43.55	Total>	7.00	3.50w	190.30	186.04	186.04	30659
18	43.20	Total>	14.00	7.00w	202.20	183.71	183.71	31478
19	42.60	Total>	26.02	13.00w	222.62	181.21	181.21	32883
20	42.00	Total>	38.05	19.00w	243.05	182.03	182.03	34288
21	41.40	Total>	50.11	25.00w	263.51	185.76	185.76	35693

Run ID. Kpore_SLS01 Eu1000CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
| Checked :

(continued)

Stage No.14 Change EI of wall to 53860 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

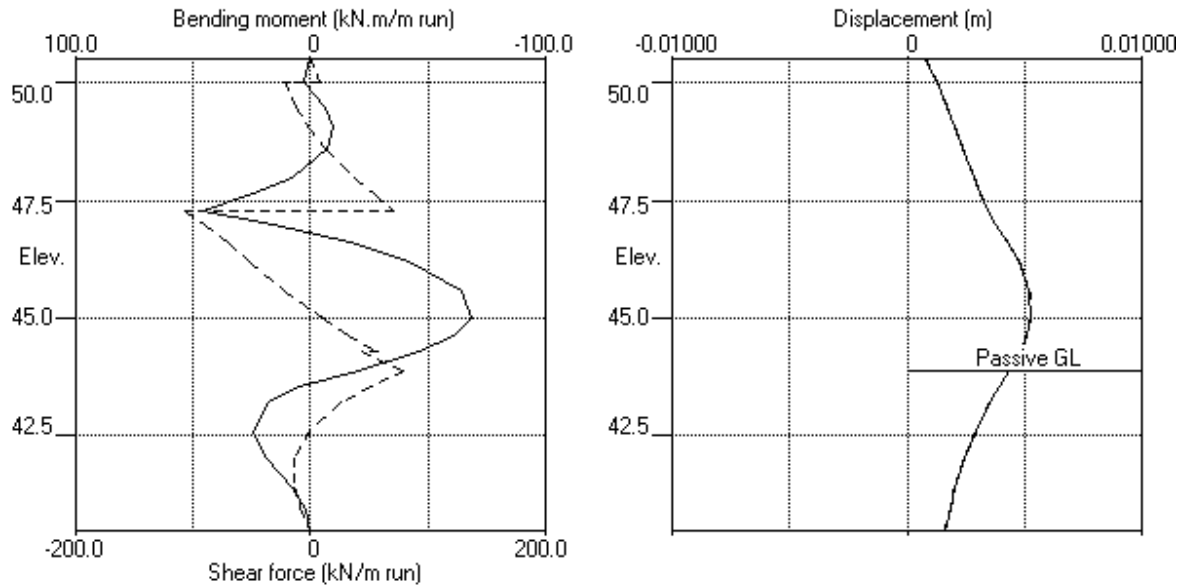
Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	40.95	Total>	59.17	29.50w	278.87	189.06	189.06	84525
23	40.50	Total>	68.26	34.00w	294.26	198.21	198.21	211264

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 Kidderpore Ave, 3
 SLS type undrained calculation

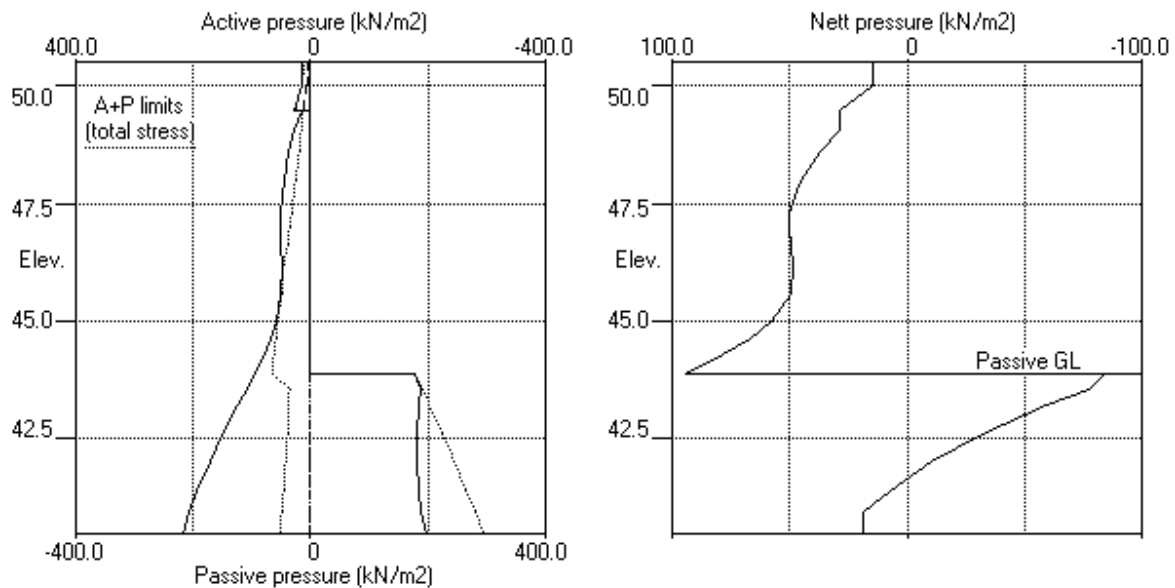
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 | Date: 4-03-2014
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Units: kN,m

Stage No.14 Change EI of wall to 53860kN.m²/m run



Stage No.14 Change EI of wall to 53860kN.m²/m run



				FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of Safety	equilib. at elev.	elev.	Penetr- ation
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	Cant.	6.685	41.41	49.94	0.56
3	50.50	50.50	Cant.	6.412	41.36	49.94	0.56
4	50.50	50.50		No analysis at this stage			
5	50.50	50.50		No analysis at this stage			
6	50.50	49.50	Cant.	4.528	41.29	48.79	0.71
7	50.50	49.50		No analysis at this stage			
8	50.50	49.50		No analysis at this stage			
9	50.50	47.00	50.00	3.756	n/a	46.66	0.34
10	50.50	47.00		No analysis at this stage			
All remaining stages have more than one strut - FoS calculation n/a							

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 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Job No. TWS8148
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 | Date: 4-03-2014
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Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	50.50	0.001	0.000	0.0	0.0	0.0	0.0
2	50.00	0.001	0.000	3.0	0.0	7.8	-51.3
3	49.50	0.002	0.000	6.7	-20.5	16.3	-40.7
4	49.05	0.002	0.000	11.3	-37.1	6.7	-33.4
5	48.60	0.003	0.000	12.9	-49.5	16.4	-21.6
6	48.00	0.003	0.000	12.2	-56.5	42.1	-3.4
7	47.65	0.003	0.000	30.0	-54.1	59.4	-4.6
8	47.30	0.003	0.000	54.2	-46.1	78.2	-127.2
9	47.00	0.004	0.000	18.1	-33.8	49.8	-109.9
10	46.60	0.004	0.000	5.0	-21.4	37.7	-84.9
11	46.20	0.005	0.000	3.3	-50.5	26.8	-58.6
12	45.60	0.005	0.000	7.7	-73.4	13.5	-27.2
13	45.00	0.005	0.000	12.4	-79.4	35.8	-1.3
14	44.65	0.005	0.000	13.1	-73.0	66.7	-0.8
15	44.30	0.005	0.000	12.7	-58.1	99.1	-18.5
16	43.90	0.005	0.000	11.4	-29.2	90.5	-3.9
17	43.55	0.004	0.000	9.8	-9.2	61.3	-4.6
18	43.20	0.004	0.000	18.0	-2.6	35.6	-4.9
19	42.60	0.003	0.000	25.0	-0.2	10.1	-4.4
20	42.00	0.003	0.000	20.4	-0.1	3.9	-13.4
21	41.40	0.002	0.000	10.1	-0.0	0.1	-16.0
22	40.95	0.002	0.000	3.2	0.0	0.0	-11.2
23	40.50	0.002	0.000	0.0	0.0	0.0	-0.0

Run ID. Kpore_SLS01 Eu1000CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation

| Sheet No.
 | Date: 4-03-2014
 | Checked :

Summary of results (continued)

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	0.9	50.00	-0.2	49.50	0.2	49.05	-0.4	50.00
2	0.8	50.00	-0.0	49.05	0.9	49.50	-0.5	50.00
3	0.8	50.00	-0.0	49.05	0.9	49.50	-0.5	50.00
4	No calculation at this stage							
5	No calculation at this stage							
6	12.9	48.60	-0.3	43.55	16.3	49.50	-5.1	47.30
7	No calculation at this stage							
8	No calculation at this stage							
9	13.1	44.65	-56.5	48.00	49.8	47.00	-51.3	50.00
10	No calculation at this stage							
11	No calculation at this stage							
12	46.8	47.30	-79.4	45.00	90.5	43.90	-114.3	47.30
13	No calculation at this stage							
14	46.0	47.30	-68.3	45.00	78.2	43.90	-106.1	47.30
15	No calculation at this stage							
16	No calculation at this stage							
17	54.2	47.30	-72.5	45.60	99.1	44.30	-127.2	47.30

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.075	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	0.129	50.50	0.000	50.50	Apply surcharge no.2 at elev. 50.50
3	0.131	50.50	0.000	50.50	Apply surcharge no.3 at elev. 50.50
4	Wall displacements reset to zero				Change EI of wall to 75150kN.m2/m run
5	No calculation at this stage				Apply water pressure profile no.1
6	0.001	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
7	No calculation at this stage				Install strut no.1 at elev. 50.00
8	No calculation at this stage				Apply water pressure profile no.2
9	0.003	47.65	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
10	No calculation at this stage				Install strut no.2 at elev. 47.30
11	No calculation at this stage				Apply water pressure profile no.3
12	0.005	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
13	No calculation at this stage				Install strut no.3 at elev. 44.30
14	0.005	45.00	0.000	50.50	Change EI of wall to 53860kN.m2/m run
15	No calculation at this stage				Change soil type 2 to soil type 3
16	No calculation at this stage				Apply water pressure profile no.4
17	0.005	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Run ID. Kpore_SLS01 Eu1000CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation

| Sheet No.
| Date: 4-03-2014
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Summary of results (continued)

Strut forces at each stage (horizontal components)

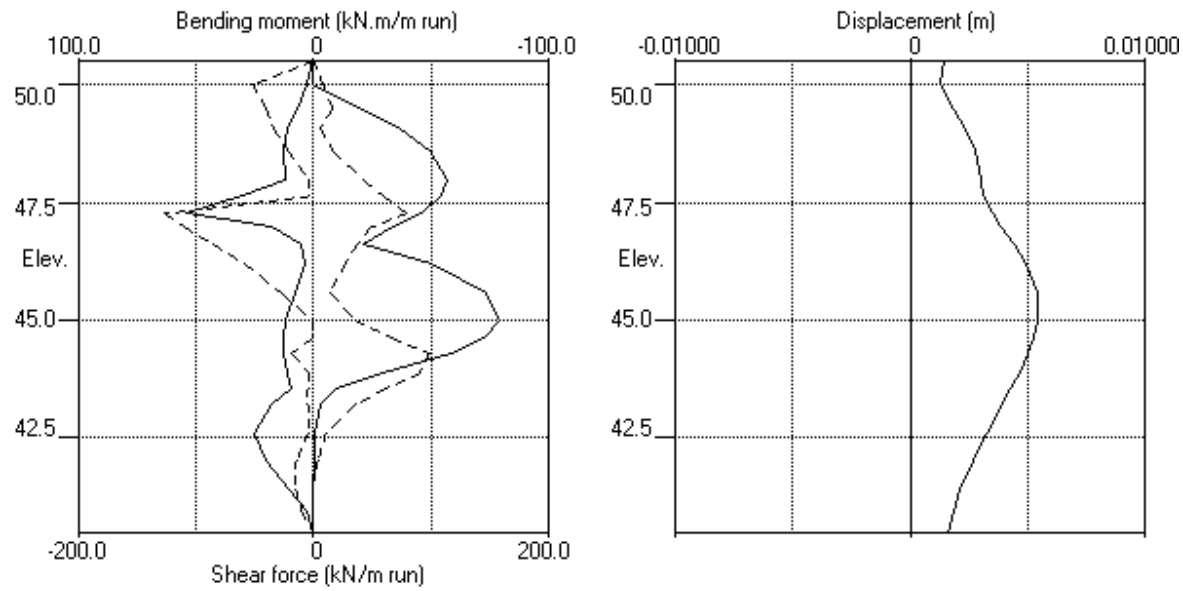
Stage no.	--- Strut no. 1 --- at elev. 50.00		--- Strut no. 2 --- at elev. 47.30		--- Strut no. 3 --- at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
9	59.18	59.18	---	---	---	---
12	29.71	29.71	185.10	185.10	---	---
14	30.00	30.00	176.99	176.99	13.98	13.98
17	30.59	30.59	205.39	205.39	117.64	117.64

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Units: kN,m

Bending moment, shear force, displacement envelopes



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	30000	1.000	OC	1.000	1.000	50.00u
(49.50)		(4200)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	24000	1.000	OC	0.368	3.244	2.000d
(49.50)		(3360)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Made Ground	30.00	0.634	0.00	30.00	0.634	0.00	
2 London Clay	0.00	0.500	0.00	0.00	0.000	0.00	
3 LC Drained	24.00	0.647	0.00	24.00	0.670	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.		Active side			Passive side			
profile no.	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	50.50	50.50	0.0	1	49.50	49.50	0.0
2	1	50.50	50.50	0.0	1	47.00	47.00	0.0
3	1	50.50	50.50	0.0	1	43.90	43.90	0.0
4	1	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.0500E+08 kN/m2
Moment of inertia of wall I = 1.2090E-04 m4/m run
E.I = 24785 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	=		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	=		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Change EI of wall to 24785 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
3	Apply water pressure profile no.1 No analysis at this stage
4	Excavate to elevation 49.50 on PASSIVE side
5	Install strut or anchor no.1 at elevation 50.00
6	Apply water pressure profile no.2 No analysis at this stage
7	Excavate to elevation 47.00 on PASSIVE side
8	Install strut or anchor no.2 at elevation 47.30
9	Apply water pressure profile no.3 No analysis at this stage
10	Excavate to elevation 43.90 on PASSIVE side
11	Install strut or anchor no.3 at elevation 44.30
12	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
13	Apply water pressure profile no.4 No analysis at this stage
14	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Change EI of wall to 24785kN.m ² /m run	No	No	No
3	Apply water pressure profile no.1	No	No	No
4	Excav. to elev. 49.50 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 50.00	No	No	No
6	Apply water pressure profile no.2	No	No	No
7	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
8	Install strut no.2 at elev. 47.30	No	No	No
9	Apply water pressure profile no.3	No	No	No
10	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
11	Install strut no.3 at elev. 44.30	No	No	No
12	Change soil type 2 to soil type 3	No	No	No
13	Apply water pressure profile no.4	No	No	No
14	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

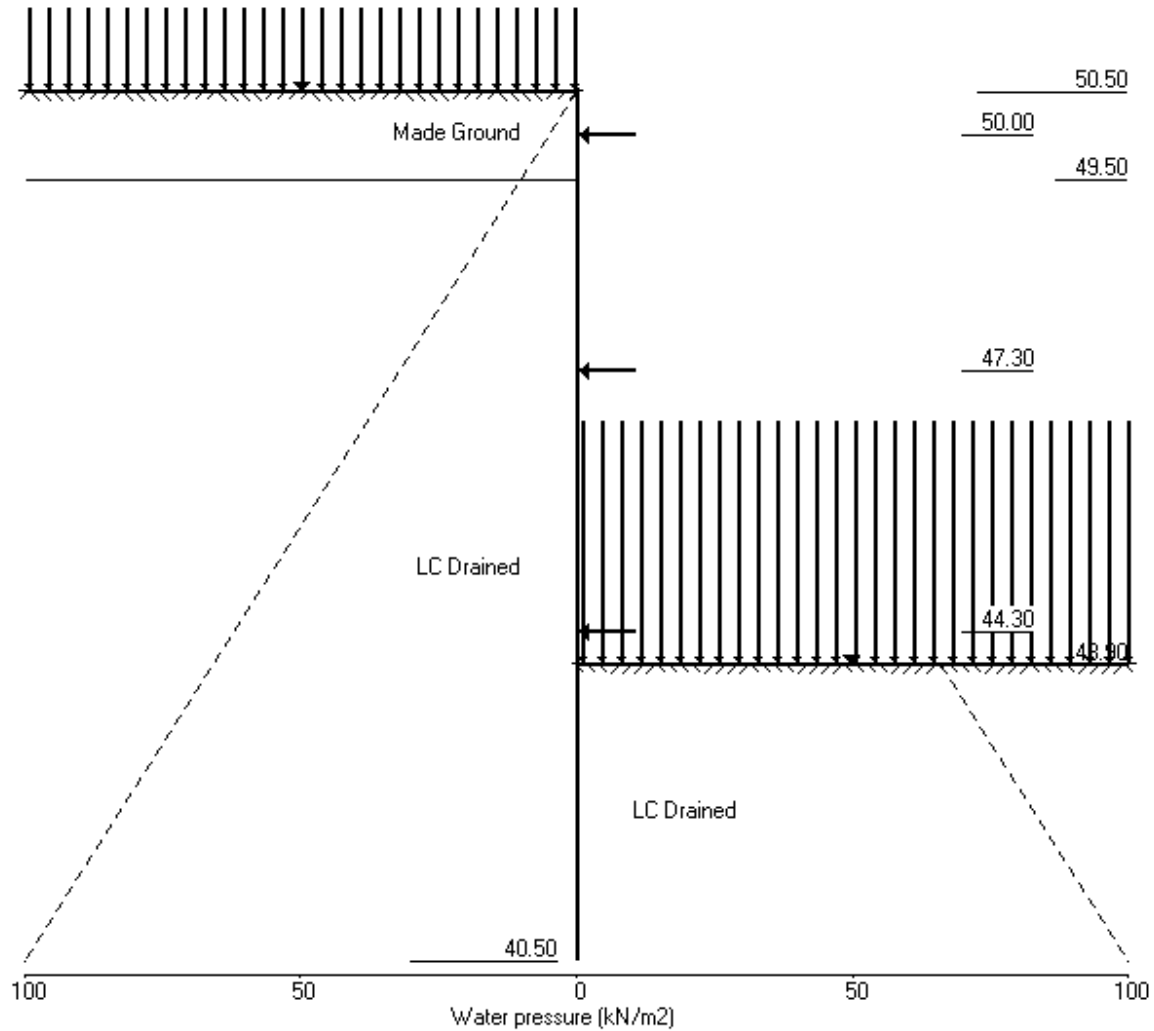
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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

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 | Date: 4-03-2014
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Units: kN,m

Stage No.14 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 49.50 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilb. at elev.	Toe elev.	Wall Penetr- -ation
4	50.50 49.50	Cant.	6.076	41.23	48.80	0.70

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	7.13	0.002	5.93E-04	0.0	0.0	
2	50.00	13.27	0.002	5.89E-04	5.1	1.3	
3	49.50	19.41	0.001	5.57E-04	13.3	5.7	
		-20.31	0.001	5.57E-04	13.3	5.7	
4	49.05	-14.36	0.001	4.84E-04	5.5	9.6	
5	48.60	-8.94	0.001	3.83E-04	0.2	10.6	
6	48.00	-3.37	0.001	2.52E-04	-3.5	9.2	
7	47.65	-1.12	0.001	1.87E-04	-4.3	7.7	
8	47.30	0.44	0.001	1.34E-04	-4.4	6.2	
9	47.00	1.30	0.001	9.97E-05	-4.1	4.9	
10	46.60	1.90	0.001	6.59E-05	-3.5	3.4	
11	46.20	2.03	0.001	4.46E-05	-2.7	2.1	
12	45.60	1.71	0.000	2.89E-05	-1.6	0.9	
13	45.00	1.14	0.000	2.51E-05	-0.7	0.2	
14	44.65	0.82	0.000	2.56E-05	-0.4	0.1	
15	44.30	0.53	0.000	2.68E-05	-0.1	-0.0	
16	43.90	0.27	0.000	2.83E-05	0.0	-0.0	
17	43.55	0.10	0.000	2.92E-05	0.1	0.0	
18	43.20	-0.02	0.000	2.98E-05	0.1	0.0	
19	42.60	-0.13	0.000	2.98E-05	0.1	0.1	
20	42.00	-0.13	0.000	2.91E-05	-0.0	0.1	
21	41.40	-0.05	0.000	2.84E-05	-0.1	0.1	
22	40.95	0.06	0.000	2.80E-05	-0.1	0.0	
23	40.50	0.25	0.000	2.79E-05	-0.0	-0.0	

Run ID: Kpore_SLS02 Eu600CuKo1.0
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.4 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2635
2	50.00	5.00	29.00	8.27	134.52	8.27	13.27a	2635
3	49.50	10.00	33.00	9.41	153.08	9.41	19.41a	2635
		Total>	43.00	10.00w	143.00	11.15	11.15	11119
4	49.05	Total>	52.00	14.50w	158.30	23.11	23.11	11820
5	48.60	Total>	61.00	19.00w	173.60	34.81	34.81	12520
6	48.00	Total>	73.00	25.00w	194.00	49.57	49.57	13454
7	47.65	Total>	80.00	28.50w	205.90	57.70	57.70	13999
8	47.30	Total>	87.00	32.00w	217.80	65.47	65.47	14544
9	47.00	Total>	93.00	35.00w	228.00	71.90	71.90	15011
10	46.60	Total>	101.00	39.00w	241.60	80.20	80.20	15633
11	46.20	Total>	109.00	43.00w	255.20	88.27	88.27	16256
12	45.60	Total>	121.00	49.00w	275.60	100.12	100.12	17190
13	45.00	Total>	133.00	55.00w	296.00	111.86	111.86	18124
14	44.65	Total>	140.00	58.50w	307.90	118.70	118.70	18669
15	44.30	Total>	147.00	62.00w	319.80	125.57	125.57	19214
16	43.90	Total>	155.00	66.00w	333.40	133.45	133.45	19836
17	43.55	Total>	162.00	34.75m	345.30	140.38	140.38	20381
18	43.20	Total>	169.00	36.50m	357.20	147.34	147.34	20926
19	42.60	Total>	180.99	39.50m	377.59	159.31	159.31	21860
20	42.00	Total>	192.99	42.50m	397.99	171.34	171.34	22794
21	41.40	Total>	204.99	45.50m	418.39	183.42	183.42	23728
22	40.95	Total>	213.99	47.75m	433.69	192.51	192.51	24429
23	40.50	Total>	222.99	50.00m	448.99	201.63	201.63	25129

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	100.00	31.46	31.46	11329
4	49.05	Total>	9.00	4.50w	115.30	37.47	37.47	12043
5	48.60	Total>	18.00	9.00w	130.60	43.74	43.74	12757
6	48.00	Total>	30.00	15.00w	151.00	52.95	52.95	13709
7	47.65	Total>	37.01	18.50w	162.91	58.81	58.81	14264
8	47.30	Total>	44.01	22.00w	174.81	65.03	65.03	14819
9	47.00	Total>	50.01	25.00w	185.01	70.60	70.60	15295
10	46.60	Total>	58.02	29.00w	198.62	78.31	78.31	15929
11	46.20	Total>	66.03	33.00w	212.23	86.25	86.25	16564
12	45.60	Total>	78.05	39.00w	232.65	98.42	98.42	17515
13	45.00	Total>	90.08	45.00w	253.08	110.71	110.71	18467
14	44.65	Total>	97.10	48.50w	265.00	117.89	117.89	19022
15	44.30	Total>	104.12	52.00w	276.92	125.04	125.04	19577
16	43.90	Total>	112.15	56.00w	290.55	133.19	133.19	20212
17	43.55	Total>	119.18	59.50w	302.48	140.29	140.29	20767
18	43.20	Total>	126.21	63.00w	314.41	147.36	147.36	21322
19	42.60	Total>	138.27	34.50m	334.87	159.44	159.44	22274
20	42.00	Total>	150.34	37.50m	355.34	171.48	171.48	23225
21	41.40	Total>	162.42	40.50m	375.82	183.47	183.47	24177
22	40.95	Total>	171.49	42.75m	391.19	192.44	192.44	24891
23	40.50	Total>	180.56	45.00m	406.56	201.38	201.38	25605

Run ID. Kpore_SLS02 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
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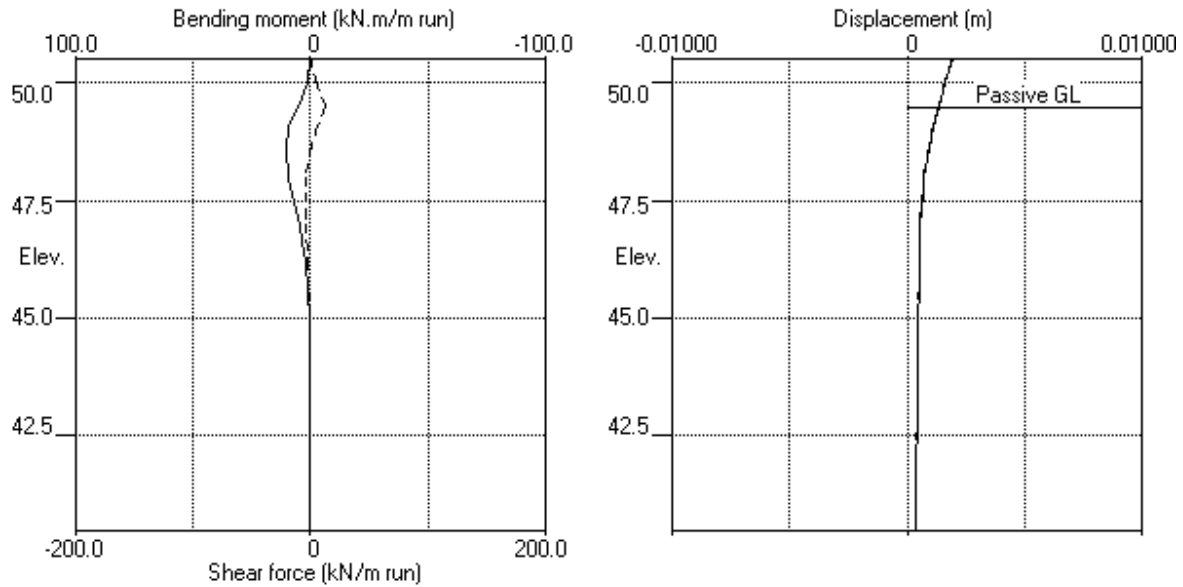
Stage No.4 Excavate to elevation 49.50 on PASSIVE side
Note: 19.41a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS02 Eu600CuKol.0
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

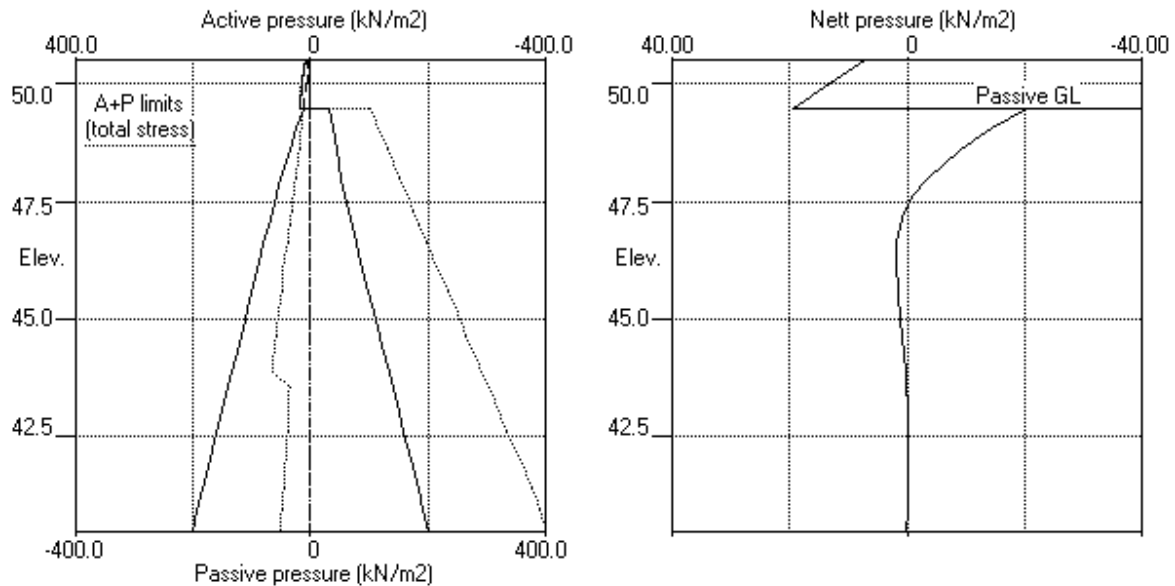
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Stage No.4 Excav. to elev. 49.50 on PASSIVE side



Stage No.4 Excav. to elev. 49.50 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.0	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 47.00 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr- -ation
7	50.50 47.00	50.00	4.263	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	23.84	0.001	-2.21E-03	0.0	-0.0	41.8
2	50.00	13.27	0.002	-2.23E-03	9.3	3.4	
		13.27	0.002	-2.23E-03	-32.6	3.4	
3	49.50	19.41	0.003	-2.12E-03	-24.4	-11.0	41.8
		10.00	0.003	-2.12E-03	-24.4	-11.0	
4	49.05	14.50	0.004	-1.76E-03	-18.9	-21.0	
5	48.60	19.00	0.004	-1.23E-03	-11.3	-28.1	41.8
6	48.00	25.00	0.005	-4.08E-04	1.9	-31.5	
7	47.65	28.50	0.005	7.48E-05	11.2	-29.3	
8	47.30	32.38	0.005	4.88E-04	21.9	-22.9	41.8
9	47.00	38.98	0.005	7.48E-04	32.6	-14.8	
		-27.07	0.005	7.48E-04	32.6	-14.8	
10	46.60	-23.59	0.004	9.31E-04	22.4	-3.9	41.8
11	46.20	-19.04	0.004	9.60E-04	13.9	3.2	
12	45.60	-11.98	0.003	8.43E-04	4.6	8.1	
13	45.00	-6.06	0.003	6.49E-04	-0.8	8.7	41.8
14	44.65	-3.42	0.003	5.33E-04	-2.5	8.1	
15	44.30	-1.42	0.003	4.28E-04	-3.3	7.0	
16	43.90	0.14	0.002	3.28E-04	-3.6	5.6	41.8
17	43.55	0.98	0.002	2.59E-04	-3.4	4.3	
18	43.20	1.42	0.002	2.06E-04	-2.9	3.2	
19	42.60	1.55	0.002	1.49E-04	-2.1	1.7	41.8
20	42.00	1.25	0.002	1.21E-04	-1.2	0.7	
21	41.40	0.85	0.002	1.10E-04	-0.6	0.2	
22	40.95	0.61	0.002	1.08E-04	-0.2	0.1	41.8
23	40.50	0.48	0.002	1.08E-04	0.0	-0.0	
At elev. 50.00 Strut force =				41.8 kN/strut =		41.8 kN/m run	

Run ID: Kpore_SLS02 Eu600CuK01.0
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.7 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	23.84	23.84	12623
2	50.00	5.00	29.00	8.27	134.52	8.27	13.27a	1348
3	49.50	10.00	33.00	9.41	153.08	9.41	19.41a	1348
		Total>	43.00	10.00w	143.00	10.00	10.00a	5955
4	49.05	Total>	52.00	14.50w	158.30	14.50	14.50a	6331
5	48.60	Total>	61.00	19.00w	173.60	19.00	19.00a	6706
6	48.00	Total>	73.00	25.00w	194.00	25.00	25.00a	7206
7	47.65	Total>	80.00	28.50w	205.90	28.50	28.50a	7498
8	47.30	Total>	87.00	32.00w	217.80	32.38	32.38	7790
9	47.00	Total>	93.00	35.00w	228.00	38.98	38.98	8040
10	46.60	Total>	101.00	39.00w	241.60	48.50	48.50	8373
11	46.20	Total>	109.00	43.00w	255.20	58.45	58.45	8707
12	45.60	Total>	121.00	49.00w	275.60	73.43	73.43	9207
13	45.00	Total>	133.00	55.00w	296.00	87.92	87.92	9707
14	44.65	Total>	140.00	58.50w	307.90	96.03	96.03	9999
15	44.30	Total>	147.00	62.00w	319.80	103.87	103.87	10291
16	43.90	Total>	155.00	66.00w	333.40	112.53	112.53	10624
17	43.55	Total>	162.00	34.75m	345.30	119.89	119.89	10916
18	43.20	Total>	169.00	36.50m	357.20	127.09	127.09	11208
19	42.60	Total>	180.99	39.50m	377.59	139.18	139.18	11708
20	42.00	Total>	192.99	42.50m	397.99	151.11	151.11	12208
21	41.40	Total>	204.99	45.50m	418.39	163.02	163.02	12709
22	40.95	Total>	213.99	47.75m	433.69	171.99	171.99	13084
23	40.50	Total>	222.99	50.00m	448.99	181.01	181.01	13459

Node no.	Y coord	----- PASSIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	66.05	66.05	10861
10	46.60	Total>	8.00	4.00w	148.60	72.09	72.09	11312
11	46.20	Total>	16.00	8.00w	162.20	77.49	77.49	11763
12	45.60	Total>	28.01	14.00w	182.61	85.41	85.41	12438
13	45.00	Total>	40.03	20.00w	203.03	93.98	93.98	13114
14	44.65	Total>	47.05	23.50w	214.95	99.45	99.45	13508
15	44.30	Total>	54.07	27.00w	226.87	105.29	105.29	13903
16	43.90	Total>	62.10	31.00w	240.50	112.39	112.39	14353
17	43.55	Total>	69.14	34.50w	252.44	118.91	118.91	14747
18	43.20	Total>	76.19	38.00w	264.39	125.67	125.67	15142
19	42.60	Total>	88.29	44.00w	284.89	137.63	137.63	15817
20	42.00	Total>	100.42	50.00w	305.42	149.86	149.86	16493
21	41.40	Total>	112.58	56.00w	325.98	162.16	162.16	17169
22	40.95	Total>	121.72	60.50w	341.42	171.37	171.37	17676
23	40.50	Total>	130.88	65.00w	356.88	180.53	180.53	18183

Run ID. Kpore_SLS02 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
| Checked :

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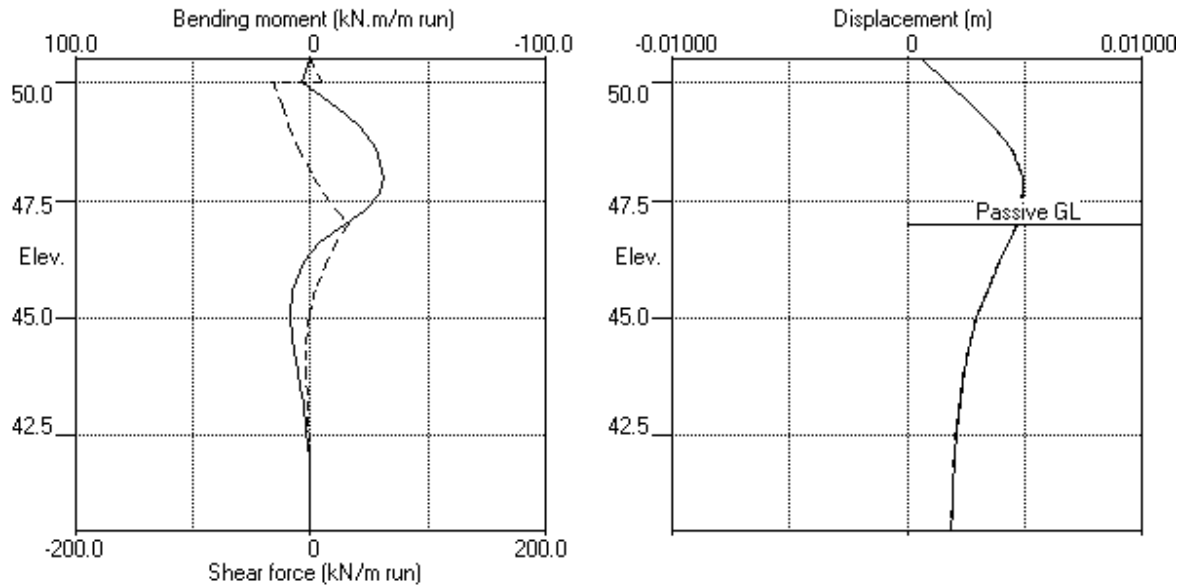
Stage No.7 Excavate to elevation 47.00 on PASSIVE side
Note: 28.50a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

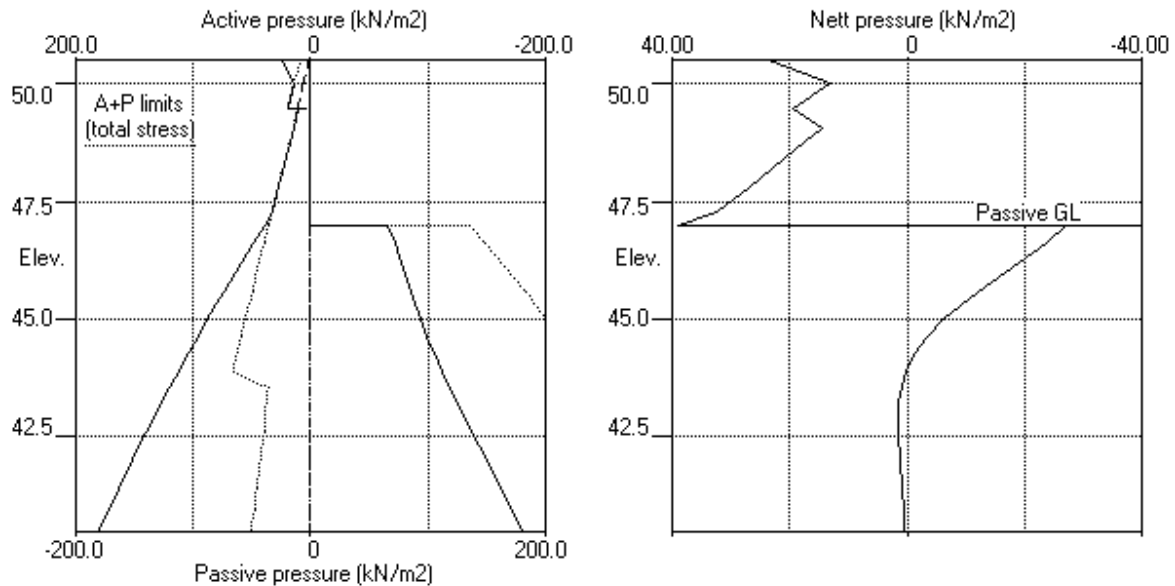
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.7 Excav. to elev. 47.00 on PASSIVE side



Stage No.7 Excav. to elev. 47.00 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.0	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 10 Excavate to elevation 43.90 on PASSIVE side

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

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
10	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	18.92	0.001	-1.38E-03	0.0	-0.0	
2	50.00	13.37	0.002	-1.40E-03	8.1	2.8	23.0
		13.37	0.002	-1.40E-03	-14.9	2.8	
3	49.50	20.59	0.002	-1.36E-03	-6.4	-2.8	
		14.98	0.002	-1.36E-03	-6.4	-2.8	
4	49.05	23.32	0.003	-1.23E-03	2.2	-4.2	
5	48.60	30.33	0.003	-1.10E-03	14.3	-0.9	
6	48.00	35.01	0.004	-1.14E-03	33.9	13.1	
7	47.65	33.60	0.005	-1.37E-03	45.9	27.2	
8	47.30	32.00	0.005	-1.84E-03	57.4	46.0	147.4
		32.00	0.005	-1.84E-03	-90.0	46.0	
9	47.00	35.00	0.006	-2.21E-03	-79.9	20.5	
10	46.60	39.00	0.007	-2.27E-03	-65.1	-8.7	
11	46.20	43.00	0.008	-1.92E-03	-48.7	-31.7	
12	45.60	49.00	0.008	-8.79E-04	-21.1	-53.2	
13	45.00	55.00	0.009	4.65E-04	10.1	-57.1	
14	44.65	58.50	0.008	1.22E-03	29.9	-50.2	
15	44.30	62.00	0.008	1.83E-03	51.0	-36.1	
16	43.90	66.00	0.007	2.21E-03	76.6	-10.7	
		-93.35	0.007	2.21E-03	76.6	-10.7	
17	43.55	-81.45	0.006	2.21E-03	46.0	11.4	
18	43.20	-59.14	0.005	1.97E-03	21.4	22.5	
19	42.60	-27.13	0.004	1.40E-03	-4.5	24.7	
20	42.00	-5.50	0.004	9.00E-04	-14.3	17.1	
21	41.40	7.85	0.003	6.04E-04	-13.6	7.5	
22	40.95	15.17	0.003	5.15E-04	-8.4	2.2	
23	40.50	22.07	0.003	4.95E-04	0.0	-0.0	
At elev. 50.00		Strut force =	23.0 kN/strut =	23.0 kN/m run			
At elev. 47.30		Strut force =	147.4 kN/strut =	147.4 kN/m run			

Run ID: Kpore_SLS02 Eu600CuK01.0
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.10 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total	Soil
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	stiffness coeff. kN/m3
1	50.50	0.00	25.00	7.13	115.97	18.92	18.92	12979
2	50.00	5.00	29.00	8.27	134.52	8.37	13.37	2654
3	49.50	10.00	33.00	9.41	153.08	10.59	20.59	2654
		Total>	43.00	10.00w	143.00	14.98	14.98	11195
4	49.05	Total>	52.00	14.50w	158.30	23.32	23.32	11900
5	48.60	Total>	61.00	19.00w	173.60	30.33	30.33	12605
6	48.00	Total>	73.00	25.00w	194.00	35.01	35.01	13546
7	47.65	Total>	80.00	28.50w	205.90	33.60	33.60	14094
8	47.30	Total>	87.00	32.00w	217.80	32.00	32.00a	9390
9	47.00	Total>	93.00	35.00w	228.00	35.00	35.00a	9692
10	46.60	Total>	101.00	39.00w	241.60	39.00	39.00a	10094
11	46.20	Total>	109.00	43.00w	255.20	43.00	43.00a	10496
12	45.60	Total>	121.00	49.00w	275.60	49.00	49.00a	11099
13	45.00	Total>	133.00	55.00w	296.00	55.00	55.00a	11702
14	44.65	Total>	140.00	58.50w	307.90	58.50	58.50a	12053
15	44.30	Total>	147.00	62.00w	319.80	62.00	62.00a	12405
16	43.90	Total>	155.00	66.00w	333.40	66.00	66.00a	12807
17	43.55	Total>	162.00	34.75m	345.30	70.36	70.36	13159
18	43.20	Total>	169.00	36.50m	357.20	85.10	85.10	13511
19	42.60	Total>	180.99	39.50m	377.59	108.18	108.18	14114
20	42.00	Total>	192.99	42.50m	397.99	127.65	127.65	14717
21	41.40	Total>	204.99	45.50m	418.39	144.28	144.28	15320
22	40.95	Total>	213.99	47.75m	433.69	155.83	155.83	15772
23	40.50	Total>	222.99	50.00m	448.99	167.27	167.27	16224

Node no.	Y coord	PASSIVE side						
		Effective stresses					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		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	159.35	159.35	24261
17	43.55	Total>	7.00	3.50w	190.30	151.81	151.81	24927
18	43.20	Total>	14.00	7.00w	202.20	144.25	144.25	25594
19	42.60	Total>	26.02	13.00w	222.62	135.31	135.31	26736
20	42.00	Total>	38.05	19.00w	243.05	133.16	133.16	27878
21	41.40	Total>	50.11	25.00w	263.51	136.43	136.43	29021
22	40.95	Total>	59.17	29.50w	278.87	140.67	140.67	29878
23	40.50	Total>	68.26	34.00w	294.26	145.19	145.19	30734

Run ID. Kpore_SLS02 Eu600CuKo1.0
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

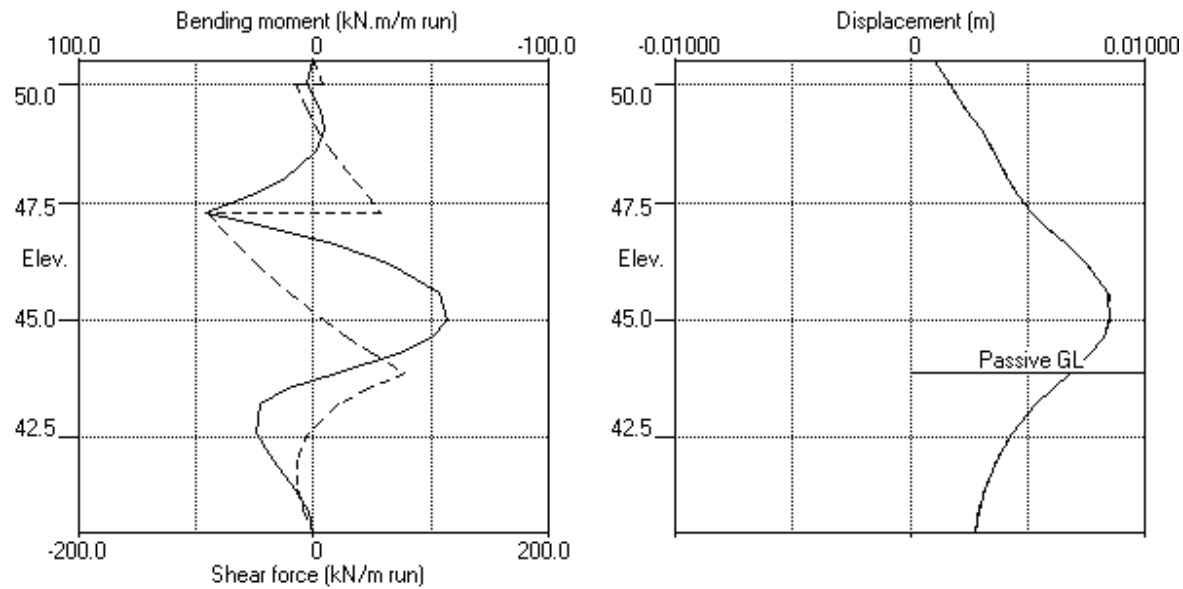
| Sheet No.
| Date: 4-03-2014
Checked :

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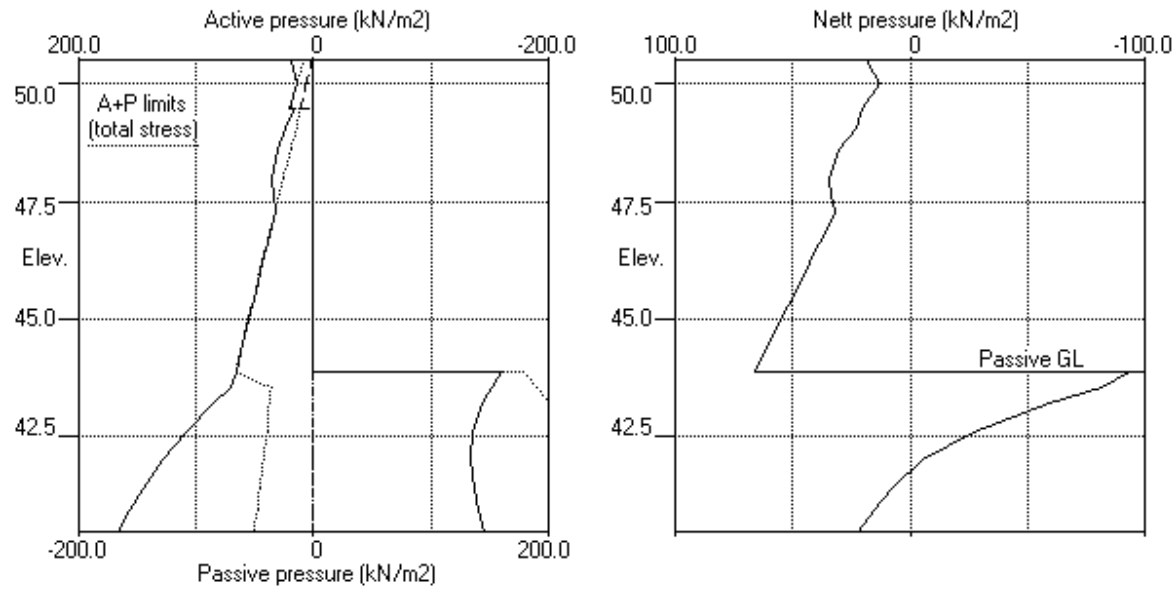
Stage No.10 Excavate to elevation 43.90 on PASSIVE side
Note: 66.00a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Excav. to elev. 43.90 on PASSIVE side



Stage No.10 Excav. to elev. 43.90 on PASSIVE side



			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000		
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr- ation	
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	No analysis at this stage				
3	50.50	50.50	No analysis at this stage				
4	50.50	49.50	Cant.	6.076	41.23	48.80	0.70
5	50.50	49.50	No analysis at this stage				
6	50.50	49.50	No analysis at this stage				
7	50.50	47.00	50.00	4.263	n/a	46.66	0.34
8	50.50	47.00	No analysis at this stage				
All remaining stages have more than one strut - FoS calculation n/a							

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Kidderpore Ave, 3

SLS type undrained calculation, zero-pile option

| Sheet No.

| Job No. TWS8148

| Made by : PJBW

|

| Date: 4-03-2014

| Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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	50.50	0.002	0.000	0.0	-0.0	0.0	0.0
2	50.00	0.002	0.000	3.4	0.0	9.3	-32.6
3	49.50	0.003	0.000	5.7	-11.0	13.3	-24.4
4	49.05	0.004	0.000	9.6	-21.0	5.5	-18.9
5	48.60	0.004	0.000	10.6	-28.1	17.6	-11.3
6	48.00	0.005	0.000	18.4	-31.5	39.1	-3.5
7	47.65	0.005	0.000	34.6	-29.3	53.8	-4.3
8	47.30	0.005	0.000	57.1	-22.9	70.3	-120.8
9	47.00	0.006	0.000	23.1	-14.8	32.6	-105.4
10	46.60	0.007	0.000	3.4	-14.7	22.4	-82.9
11	46.20	0.008	0.000	3.2	-43.2	13.9	-58.2
12	45.60	0.009	0.000	8.1	-66.4	4.6	-21.1
13	45.00	0.009	0.000	8.7	-63.5	28.9	-0.8
14	44.65	0.009	0.000	8.1	-50.2	58.0	-2.5
15	44.30	0.008	0.000	7.0	-36.1	88.9	-3.3
16	43.90	0.007	0.000	5.6	-15.7	76.6	-3.6
17	43.55	0.006	0.000	11.4	-2.5	46.0	-3.4
18	43.20	0.005	0.000	22.5	0.0	27.5	-2.9
19	42.60	0.004	0.000	24.7	0.0	11.6	-4.5
20	42.00	0.004	0.000	17.1	0.0	0.0	-14.3
21	41.40	0.003	0.000	9.8	0.0	0.0	-13.6
22	40.95	0.003	0.000	3.6	0.0	0.0	-10.9
23	40.50	0.003	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.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	4.8	48.60	-0.0	40.50	5.1	49.50	-1.9	47.30
2	No calculation at this stage							
3	No calculation at this stage							
4	10.6	48.60	-0.0	43.90	13.3	49.50	-4.4	47.30
5	No calculation at this stage							
6	No calculation at this stage							
7	8.7	45.00	-31.5	48.00	32.6	47.00	-32.6	50.00
8	No calculation at this stage							
9	No calculation at this stage							
10	46.0	47.30	-57.1	45.00	76.6	43.90	-90.0	47.30
11	No calculation at this stage							
12	No calculation at this stage							
13	No calculation at this stage							
14	57.1	47.30	-66.4	45.60	88.9	44.30	-120.8	47.30

Run ID. Kpore_SLS02 Eu600CuK01.0

Kidderpore Ave, 3

SLS type undrained calculation, zero-pile option

| Sheet No.

| Date: 4-03-2014

| Checked :

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	0.002	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	Wall displacements reset to zero				Change EI of wall to 24785kN.m2/m run
3	No calculation at this stage				Apply water pressure profile no.1
4	0.002	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
5	No calculation at this stage				Install strut no.1 at elev. 50.00
6	No calculation at this stage				Apply water pressure profile no.2
7	0.005	47.65	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
8	No calculation at this stage				Install strut no.2 at elev. 47.30
9	No calculation at this stage				Apply water pressure profile no.3
10	0.009	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
11	No calculation at this stage				Install strut no.3 at elev. 44.30
12	No calculation at this stage				Change soil type 2 to soil type 3
13	No calculation at this stage				Apply water pressure profile no.4
14	0.009	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Strut forces at each stage (horizontal components)

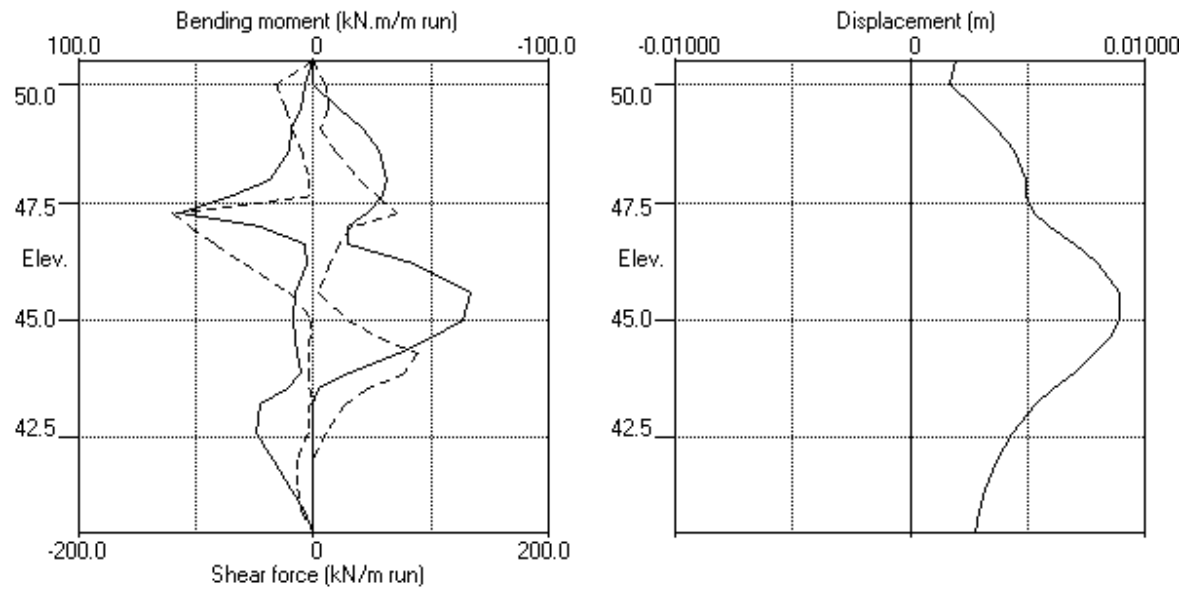
Stage no.	Strut no. 1 at elev. 50.00		Strut no. 2 at elev. 47.30		Strut no. 3 at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
7	41.84	41.84	---	---	---	---
10	22.98	22.98	147.35	147.35	---	---
14	21.75	21.75	191.11	191.11	89.42	89.42

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SLS type undrained calculation, zero-pile option

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Units: kN,m

Bending moment, shear force, displacement envelopes



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	30000	1.500	OC	1.000	1.000	50.00u
(49.50)		(4200)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	24000	1.500	OC	0.368	3.244	2.000d
(49.50)		(3360)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Made Ground	30.00	0.634	0.00	30.00	0.634	0.00	
2 London Clay	0.00	0.500	0.00	0.00	0.000	0.00	
3 LC Drained	24.00	0.647	0.00	24.00	0.670	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.		Active side			Passive side			
profile no.	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	50.50	50.50	0.0	1	49.50	49.50	0.0
2	1	50.50	50.50	0.0	1	47.00	47.00	0.0
3	1	50.50	50.50	0.0	1	43.90	43.90	0.0
4	1	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.0500E+08 kN/m2
Moment of inertia of wall I = 1.2090E-04 m4/m run
E.I = 24785 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	=		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	=		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Change EI of wall to 24785 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
3	Apply water pressure profile no.1 No analysis at this stage
4	Excavate to elevation 49.50 on PASSIVE side
5	Install strut or anchor no.1 at elevation 50.00
6	Apply water pressure profile no.2 No analysis at this stage
7	Excavate to elevation 47.00 on PASSIVE side
8	Install strut or anchor no.2 at elevation 47.30
9	Apply water pressure profile no.3 No analysis at this stage
10	Excavate to elevation 43.90 on PASSIVE side
11	Install strut or anchor no.3 at elevation 44.30
12	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
13	Apply water pressure profile no.4 No analysis at this stage
14	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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. 50.50	No	No	No
2	Change EI of wall to 24785kN.m ² /m run	No	No	No
3	Apply water pressure profile no.1	No	No	No
4	Excav. to elev. 49.50 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 50.00	No	No	No
6	Apply water pressure profile no.2	No	No	No
7	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
8	Install strut no.2 at elev. 47.30	No	No	No
9	Apply water pressure profile no.3	No	No	No
10	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
11	Install strut no.3 at elev. 44.30	No	No	No
12	Change soil type 2 to soil type 3	No	No	No
13	Apply water pressure profile no.4	No	No	No
14	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

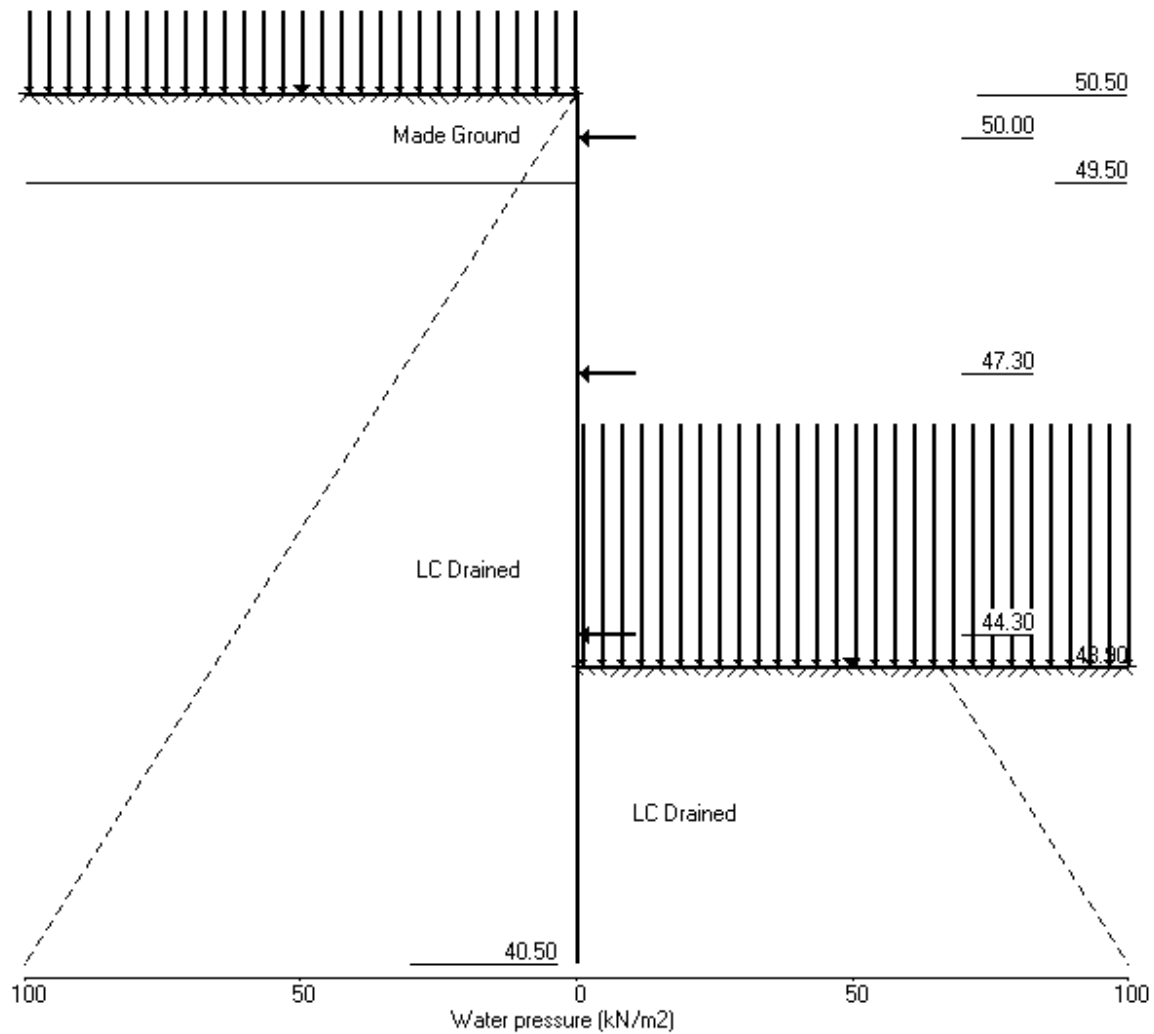
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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

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 | Date: 4-03-2014
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Units: kN,m

Stage No.14 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 49.50 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilb. at elev.	Toe elev.	Wall Penetr- -ation
4	50.50 49.50	Cant.	6.076	41.23	48.80	0.70

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	7.13	0.002	5.94E-04	0.0	-0.0	
2	50.00	13.27	0.002	5.91E-04	5.1	1.3	
3	49.50	19.41	0.001	5.58E-04	13.3	5.7	
		-20.29	0.001	5.58E-04	13.3	5.7	
4	49.05	-14.35	0.001	4.85E-04	5.5	9.6	
5	48.60	-8.94	0.001	3.84E-04	0.2	10.6	
6	48.00	-3.38	0.001	2.53E-04	-3.5	9.2	
7	47.65	-1.12	0.001	1.88E-04	-4.2	7.8	
8	47.30	0.44	0.001	1.35E-04	-4.4	6.2	
9	47.00	1.30	0.001	1.00E-04	-4.1	4.9	
10	46.60	1.89	0.001	6.63E-05	-3.5	3.4	
11	46.20	2.03	0.001	4.49E-05	-2.7	2.1	
12	45.60	1.71	0.000	2.91E-05	-1.6	0.9	
13	45.00	1.15	0.000	2.52E-05	-0.7	0.2	
14	44.65	0.82	0.000	2.57E-05	-0.4	0.1	
15	44.30	0.53	0.000	2.69E-05	-0.1	-0.0	
16	43.90	0.27	0.000	2.84E-05	0.0	-0.0	
17	43.55	0.10	0.000	2.93E-05	0.1	0.0	
18	43.20	-0.02	0.000	2.99E-05	0.1	0.0	
19	42.60	-0.13	0.000	2.99E-05	0.1	0.1	
20	42.00	-0.13	0.000	2.93E-05	-0.0	0.1	
21	41.40	-0.06	0.000	2.85E-05	-0.1	0.1	
22	40.95	0.06	0.000	2.81E-05	-0.1	0.0	
23	40.50	0.25	0.000	2.80E-05	0.0	0.0	

Run ID: Kpore_SLS02 Eu600CuKo1.5
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.4 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2624
2	50.00	5.00	29.00	8.27	134.52	8.27	13.27a	2624
3	49.50	10.00	33.00	9.41	153.08	9.41	19.41a	2624
		Total>	43.00	10.00w	143.00	15.16	15.16	11074
4	49.05	Total>	52.00	14.50w	158.30	29.36	29.36	11772
5	48.60	Total>	61.00	19.00w	173.60	43.30	43.30	12469
6	48.00	Total>	73.00	25.00w	194.00	61.07	61.07	13400
7	47.65	Total>	80.00	28.50w	205.90	70.94	70.94	13942
8	47.30	Total>	87.00	32.00w	217.80	80.47	80.47	14485
9	47.00	Total>	93.00	35.00w	228.00	88.40	88.40	14950
10	46.60	Total>	101.00	39.00w	241.60	98.70	98.70	15570
11	46.20	Total>	109.00	43.00w	255.20	108.77	108.77	16190
12	45.60	Total>	121.00	49.00w	275.60	123.62	123.62	17121
13	45.00	Total>	133.00	55.00w	296.00	138.35	138.35	18051
14	44.65	Total>	140.00	58.50w	307.90	146.95	146.95	18593
15	44.30	Total>	147.00	62.00w	319.80	155.57	155.57	19136
16	43.90	Total>	155.00	66.00w	333.40	165.45	165.45	19756
17	43.55	Total>	162.00	34.75m	345.30	174.13	174.13	20299
18	43.20	Total>	169.00	36.50m	357.20	182.83	182.83	20842
19	42.60	Total>	180.99	39.50m	377.59	197.81	197.81	21772
20	42.00	Total>	192.99	42.50m	397.99	212.84	212.84	22702
21	41.40	Total>	204.99	45.50m	418.39	227.92	227.92	23632
22	40.95	Total>	213.99	47.75m	433.69	239.25	239.25	24330
23	40.50	Total>	222.99	50.00m	448.99	250.63	250.63	25028

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	100.00	35.44	35.44	11272
4	49.05	Total>	9.00	4.50w	115.30	43.71	43.71	11982
5	48.60	Total>	18.00	9.00w	130.60	52.24	52.24	12693
6	48.00	Total>	30.00	15.00w	151.00	64.44	64.44	13639
7	47.65	Total>	37.01	18.50w	162.91	72.06	72.06	14192
8	47.30	Total>	44.01	22.00w	174.81	80.03	80.03	14744
9	47.00	Total>	50.01	25.00w	185.01	87.10	87.10	15218
10	46.60	Total>	58.02	29.00w	198.62	96.80	96.80	15849
11	46.20	Total>	66.03	33.00w	212.23	106.74	106.74	16480
12	45.60	Total>	78.05	39.00w	232.65	121.91	121.91	17427
13	45.00	Total>	90.08	45.00w	253.08	137.21	137.21	18374
14	44.65	Total>	97.10	48.50w	265.00	146.13	146.13	18926
15	44.30	Total>	104.12	52.00w	276.92	155.04	155.04	19479
16	43.90	Total>	112.15	56.00w	290.55	165.18	165.18	20110
17	43.55	Total>	119.18	59.50w	302.48	174.03	174.03	20662
18	43.20	Total>	126.21	63.00w	314.41	182.86	182.86	21214
19	42.60	Total>	138.27	34.50m	334.87	197.94	197.94	22161
20	42.00	Total>	150.34	37.50m	355.34	212.97	212.97	23108
21	41.40	Total>	162.42	40.50m	375.82	227.97	227.97	24055
22	40.95	Total>	171.49	42.75m	391.19	239.19	239.19	24765
23	40.50	Total>	180.56	45.00m	406.56	250.38	250.38	25475

Run ID. Kpore_SLS02 Eu600CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
| Checked :

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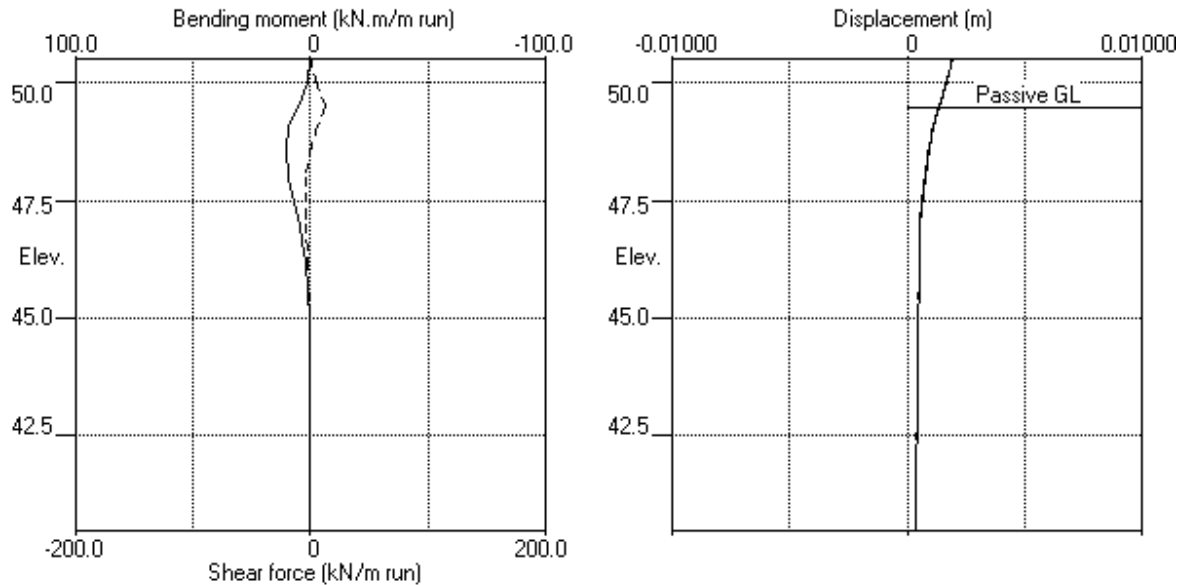
Stage No.4 Excavate to elevation 49.50 on PASSIVE side
Note: 19.41a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS02 Eu600CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

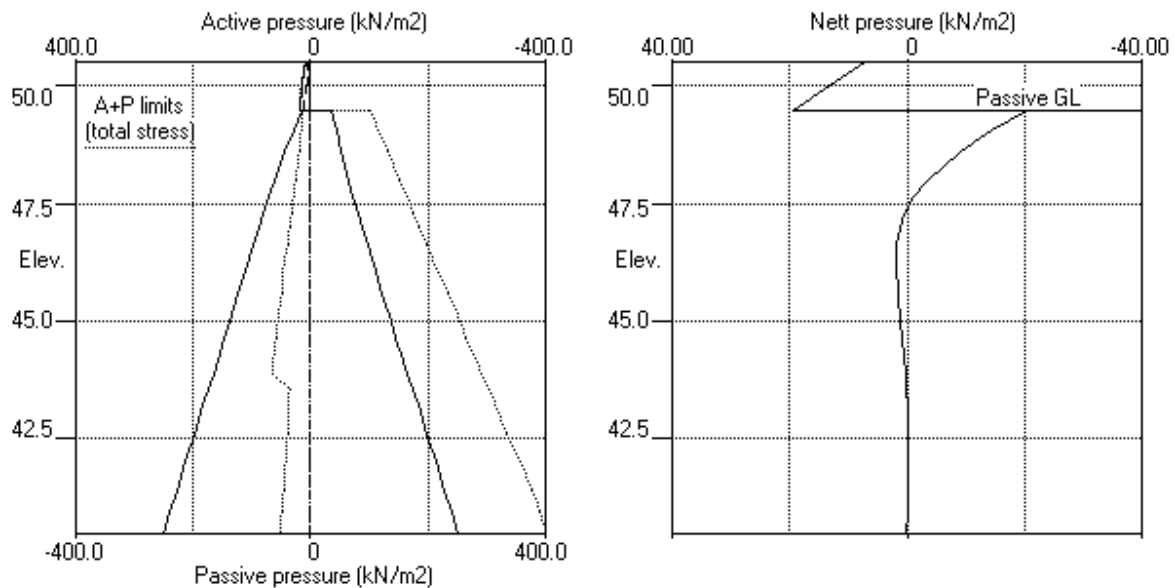
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.4 Excav. to elev. 49.50 on PASSIVE side



Stage No.4 Excav. to elev. 49.50 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 47.00 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
7	50.50 47.00	50.00	4.263	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	24.55	0.001	-2.33E-03	0.0	-0.0	44.6
2	50.00	13.27	0.002	-2.35E-03	9.5	3.5	
		13.27	0.002	-2.35E-03	-35.1	3.5	
3	49.50	19.41	0.003	-2.23E-03	-26.9	-12.2	44.6
		10.00	0.003	-2.23E-03	-26.9	-12.2	
4	49.05	14.50	0.004	-1.84E-03	-21.4	-23.4	
5	48.60	19.00	0.005	-1.26E-03	-13.9	-31.6	44.6
6	48.00	28.20	0.005	-3.55E-04	0.3	-34.3	
7	47.65	35.88	0.005	1.69E-04	11.5	-32.3	
8	47.30	44.76	0.005	6.26E-04	25.6	-25.9	44.6
9	47.00	53.24	0.005	9.13E-04	40.3	-16.1	
		-36.01	0.005	9.13E-04	40.3	-16.1	
10	46.60	-30.73	0.004	1.10E-03	26.9	-2.9	44.6
11	46.20	-24.20	0.004	1.10E-03	16.0	5.4	
12	45.60	-14.49	0.003	9.29E-04	4.4	10.6	
13	45.00	-6.71	0.003	6.81E-04	-2.0	10.6	44.6
14	44.65	-3.39	0.002	5.42E-04	-3.8	9.5	
15	44.30	-0.96	0.002	4.20E-04	-4.5	8.0	
16	43.90	0.84	0.002	3.07E-04	-4.6	6.1	44.6
17	43.55	1.72	0.002	2.32E-04	-4.1	4.6	
18	43.20	2.11	0.002	1.78E-04	-3.4	3.2	
19	42.60	2.03	0.002	1.22E-04	-2.2	1.5	44.6
20	42.00	1.49	0.002	9.92E-05	-1.1	0.6	
21	41.40	0.86	0.002	9.20E-05	-0.4	0.1	
22	40.95	0.47	0.002	9.10E-05	-0.1	0.0	44.6
23	40.50	0.17	0.002	9.10E-05	-0.0	-0.0	
At elev. 50.00 Strut force =			44.6 kN/strut =		44.6 kN/m run		

Run ID: Kpore_SLS02 Eu600CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.7 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	24.55	24.55	12637
2	50.00	5.00	29.00	8.27	134.52	8.27	13.27a	1445
3	49.50	10.00	33.00	9.41	153.08	9.41	19.41a	1445
		Total>	43.00	10.00w	143.00	10.00	10.00a	6342
4	49.05	Total>	52.00	14.50w	158.30	14.50	14.50a	6742
5	48.60	Total>	61.00	19.00w	173.60	19.00	19.00a	7141
6	48.00	Total>	73.00	25.00w	194.00	28.20	28.20	7674
7	47.65	Total>	80.00	28.50w	205.90	35.88	35.88	7985
8	47.30	Total>	87.00	32.00w	217.80	44.76	44.76	8295
9	47.00	Total>	93.00	35.00w	228.00	53.24	53.24	8562
10	46.60	Total>	101.00	39.00w	241.60	65.45	65.45	8917
11	46.20	Total>	109.00	43.00w	255.20	78.12	78.12	9272
12	45.60	Total>	121.00	49.00w	275.60	97.05	97.05	9805
13	45.00	Total>	133.00	55.00w	296.00	115.18	115.18	10338
14	44.65	Total>	140.00	58.50w	307.90	125.26	125.26	10648
15	44.30	Total>	147.00	62.00w	319.80	134.98	134.98	10959
16	43.90	Total>	155.00	66.00w	333.40	145.70	145.70	11314
17	43.55	Total>	162.00	34.75m	345.30	154.81	154.81	11625
18	43.20	Total>	169.00	36.50m	357.20	163.73	163.73	11936
19	42.60	Total>	180.99	39.50m	377.59	178.74	178.74	12469
20	42.00	Total>	192.99	42.50m	397.99	193.57	193.57	13001
21	41.40	Total>	204.99	45.50m	418.39	208.39	208.39	13534
22	40.95	Total>	213.99	47.75m	433.69	219.55	219.55	13934
23	40.50	Total>	222.99	50.00m	448.99	230.77	230.77	14333

Node no.	Y coord	----- PASSIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	89.26	89.26	12468
10	46.60	Total>	8.00	4.00w	148.60	96.18	96.18	12985
11	46.20	Total>	16.00	8.00w	162.20	102.32	102.32	13502
12	45.60	Total>	28.01	14.00w	182.61	111.54	111.54	14278
13	45.00	Total>	40.03	20.00w	203.03	121.89	121.89	15054
14	44.65	Total>	47.05	23.50w	214.95	128.65	128.65	15507
15	44.30	Total>	54.07	27.00w	226.87	135.94	135.94	15959
16	43.90	Total>	62.10	31.00w	240.50	144.87	144.87	16476
17	43.55	Total>	69.14	34.50w	252.44	153.10	153.10	16929
18	43.20	Total>	76.19	38.00w	264.39	161.63	161.63	17381
19	42.60	Total>	88.29	44.00w	284.89	176.71	176.71	18157
20	42.00	Total>	100.42	50.00w	305.42	192.08	192.08	18933
21	41.40	Total>	112.58	56.00w	325.98	207.53	207.53	19709
22	40.95	Total>	121.72	60.50w	341.42	219.09	219.09	20291
23	40.50	Total>	130.88	65.00w	356.88	230.59	230.59	20872

Run ID. Kpore_SLS02 Eu600CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
| Checked :

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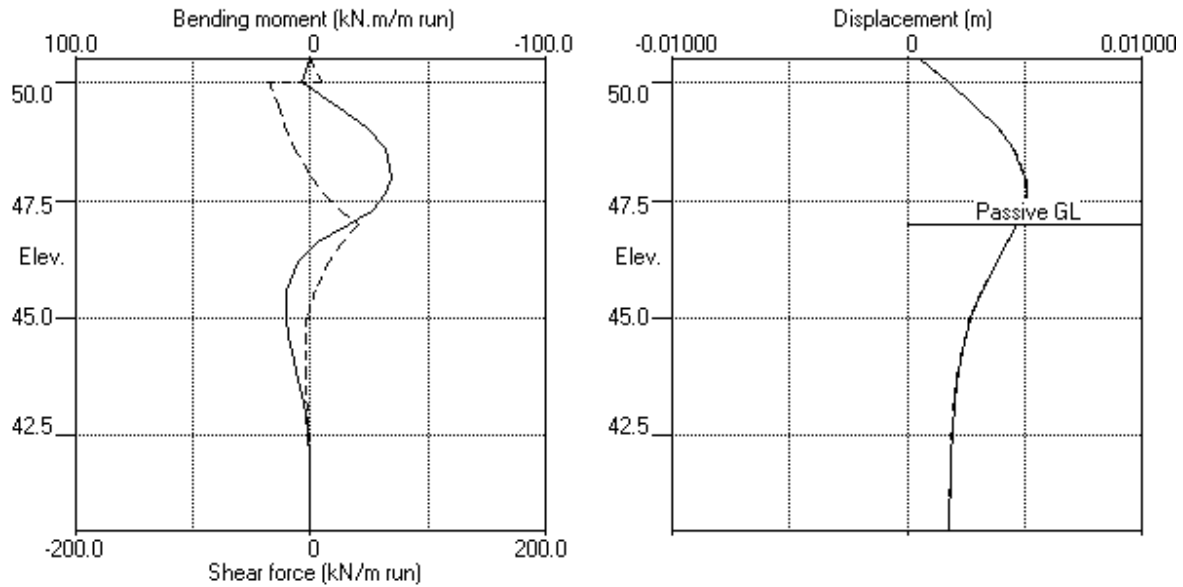
Stage No.7 Excavate to elevation 47.00 on PASSIVE side
Note: 19.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

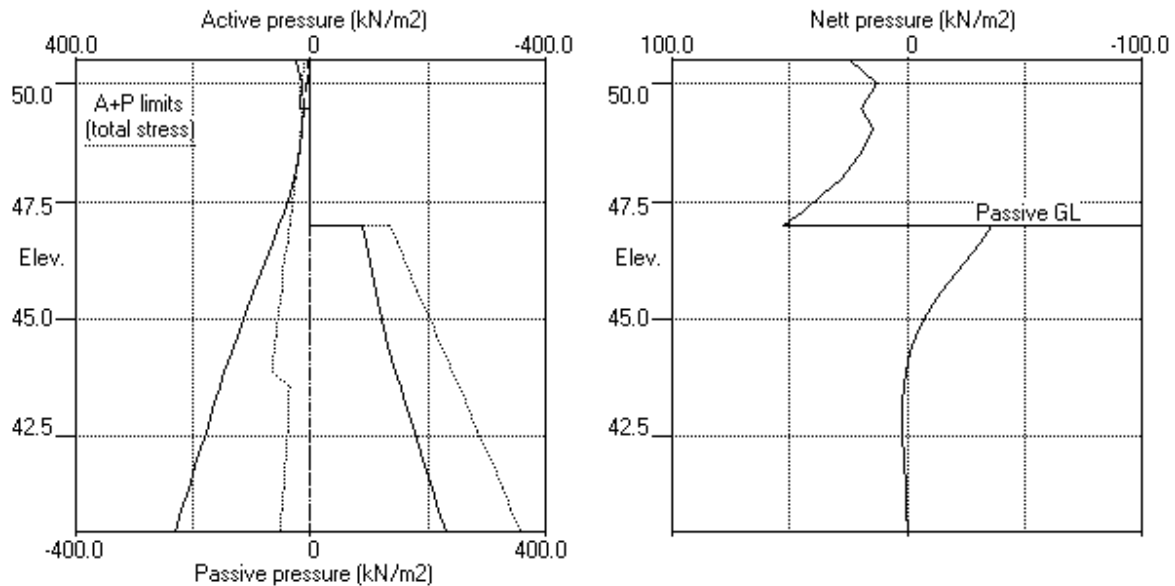
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.7 Excav. to elev. 47.00 on PASSIVE side



Stage No.7 Excav. to elev. 47.00 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 10 Excavate to elevation 43.90 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
10	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 2

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	50.50	19.33	0.001	-1.45E-03	0.0	-0.0	
2	50.00	13.37	0.002	-1.47E-03	8.2	2.8	24.5
		13.37	0.002	-1.47E-03	-16.4	2.8	
3	49.50	20.66	0.002	-1.42E-03	-7.8	-3.5	
		15.29	0.002	-1.42E-03	-7.8	-3.5	
4	49.05	23.87	0.003	-1.27E-03	1.0	-5.5	
5	48.60	31.03	0.004	-1.12E-03	13.3	-2.7	
6	48.00	38.82	0.004	-1.13E-03	34.3	13.1	
7	47.65	41.27	0.005	-1.37E-03	48.3	27.6	
8	47.30	41.73	0.005	-1.85E-03	62.8	47.2	157.7
		41.73	0.005	-1.85E-03	-94.8	47.2	
9	47.00	41.65	0.006	-2.23E-03	-82.3	20.7	
10	46.60	39.63	0.007	-2.29E-03	-66.1	-8.7	
11	46.20	43.00	0.008	-1.93E-03	-49.6	-32.7	
12	45.60	49.00	0.008	-8.56E-04	-22.0	-54.9	
13	45.00	55.00	0.009	5.37E-04	9.2	-59.4	
14	44.65	58.50	0.008	1.33E-03	29.1	-52.8	
15	44.30	67.25	0.008	1.97E-03	51.1	-37.5	
16	43.90	85.44	0.007	2.36E-03	81.6	-11.5	
		-92.96	0.007	2.36E-03	81.6	-11.5	
17	43.55	-87.39	0.006	2.36E-03	50.1	11.3	
18	43.20	-66.35	0.005	2.11E-03	23.2	25.5	
19	42.60	-29.58	0.004	1.47E-03	-5.6	27.5	
20	42.00	-5.31	0.003	9.11E-04	-16.1	18.8	
21	41.40	9.12	0.003	5.86E-04	-14.9	8.2	
22	40.95	16.72	0.003	4.90E-04	-9.1	2.4	
23	40.50	23.77	0.002	4.68E-04	0.0	-0.0	
At elev. 50.00 Strut force =				24.5 kN/strut =		24.5 kN/m run	
At elev. 47.30 Strut force =				157.7 kN/strut =		157.7 kN/m run	

Run ID: Kpore_SLS02 Eu600CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.10 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	19.33	19.33	12981
2	50.00	5.00	29.00	8.27	134.52	8.37	13.37	2656
3	49.50	10.00	33.00	9.41	153.08	10.66	20.66	2656
		Total>	43.00	10.00w	143.00	15.29	15.29	11202
4	49.05	Total>	52.00	14.50w	158.30	23.87	23.87	11908
5	48.60	Total>	61.00	19.00w	173.60	31.03	31.03	12613
6	48.00	Total>	73.00	25.00w	194.00	38.82	38.82	13554
7	47.65	Total>	80.00	28.50w	205.90	41.27	41.27	14103
8	47.30	Total>	87.00	32.00w	217.80	41.73	41.73	9600
9	47.00	Total>	93.00	35.00w	228.00	41.65	41.65	9908
10	46.60	Total>	101.00	39.00w	241.60	39.63	39.63	10319
11	46.20	Total>	109.00	43.00w	255.20	43.00	43.00a	10730
12	45.60	Total>	121.00	49.00w	275.60	49.00	49.00a	11347
13	45.00	Total>	133.00	55.00w	296.00	55.00	55.00a	11963
14	44.65	Total>	140.00	58.50w	307.90	58.50	58.50a	12323
15	44.30	Total>	147.00	62.00w	319.80	67.25	67.25	12683
16	43.90	Total>	155.00	66.00w	333.40	85.44	85.44	13094
17	43.55	Total>	162.00	34.75m	345.30	102.91	102.91	13453
18	43.20	Total>	169.00	36.50m	357.20	120.36	120.36	13813
19	42.60	Total>	180.99	39.50m	377.59	147.68	147.68	14429
20	42.00	Total>	192.99	42.50m	397.99	170.80	170.80	15046
21	41.40	Total>	204.99	45.50m	418.39	190.64	190.64	15662
22	40.95	Total>	213.99	47.75m	433.69	204.45	204.45	16125
23	40.50	Total>	222.99	50.00m	448.99	218.11	218.11	16587

Node no.	Y coord	----- PASSIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	178.40	178.40p	25976
17	43.55	Total>	7.00	3.50w	190.30	190.30	190.30p	26689
18	43.20	Total>	14.00	7.00w	202.20	186.71	186.71	27403
19	42.60	Total>	26.02	13.00w	222.62	177.26	177.26	28626
20	42.00	Total>	38.05	19.00w	243.05	176.11	176.11	29849
21	41.40	Total>	50.11	25.00w	263.51	181.52	181.52	31072
22	40.95	Total>	59.17	29.50w	278.87	187.73	187.73	31989
23	40.50	Total>	68.26	34.00w	294.26	194.33	194.33	32907

Run ID. Kpore_SLS02 Eu600CuKo1.5
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
| Checked :

(continued)

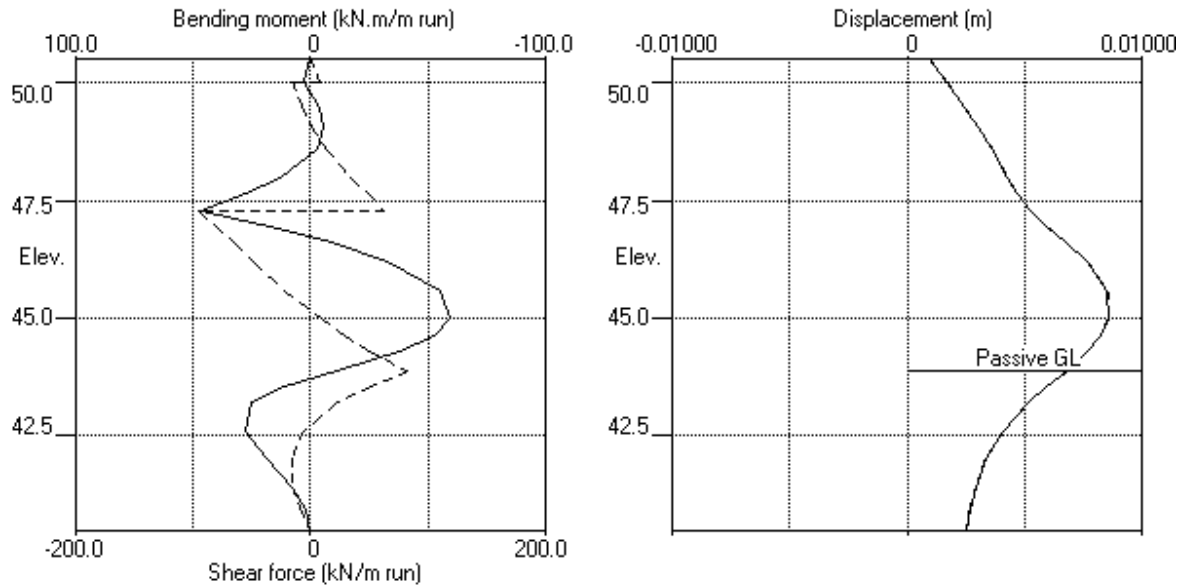
Stage No.10 Excavate to elevation 43.90 on PASSIVE side
Note: 58.50a Soil pressure at active limit
190.30p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

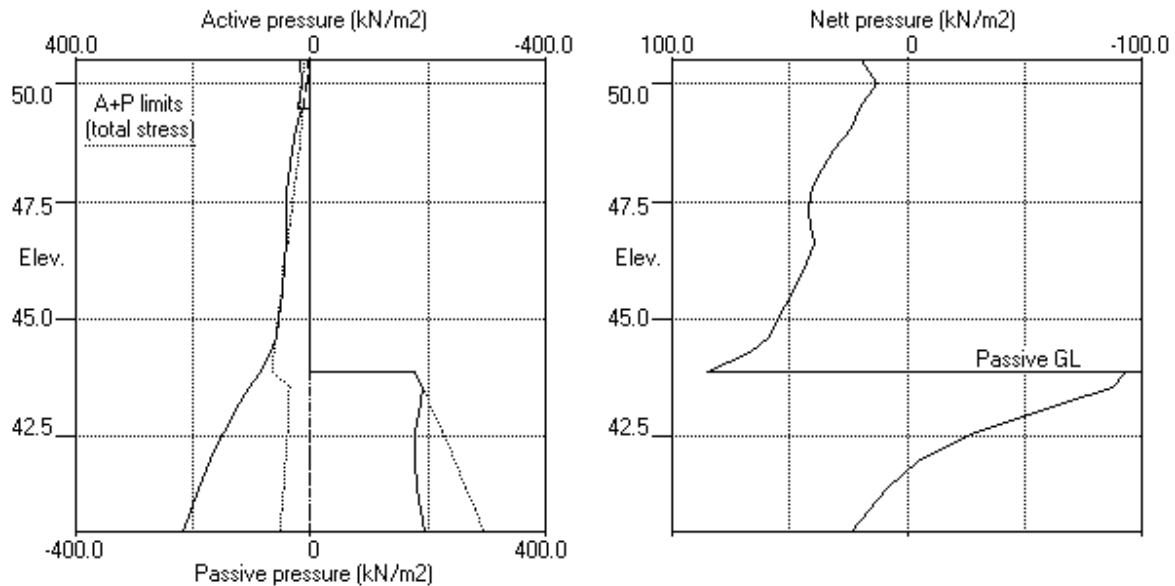
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 | Job No. TWS8148
 | Made by : PJBW
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 | Date: 4-03-2014
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Stage No.10 Excav. to elev. 43.90 on PASSIVE side



Stage No.10 Excav. to elev. 43.90 on PASSIVE side



			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000		
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr- ation	
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	No analysis at this stage				
3	50.50	50.50	No analysis at this stage				
4	50.50	49.50	Cant.	6.076	41.23	48.80	0.70
5	50.50	49.50	No analysis at this stage				
6	50.50	49.50	No analysis at this stage				
7	50.50	47.00	50.00	4.263	n/a	46.66	0.34
8	50.50	47.00	No analysis at this stage				
All remaining stages have more than one strut - FoS calculation n/a							

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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.5	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	50.50	0.002	0.000	0.0	-0.0	0.0	0.0
2	50.00	0.002	0.000	3.5	0.0	9.5	-35.1
3	49.50	0.003	0.000	5.7	-12.2	13.3	-26.9
4	49.05	0.004	0.000	9.6	-23.4	5.5	-21.4
5	48.60	0.005	0.000	10.6	-31.6	15.9	-13.9
6	48.00	0.005	0.000	16.9	-34.3	37.3	-3.5
7	47.65	0.005	0.000	32.6	-32.3	52.1	-4.2
8	47.30	0.005	0.000	53.8	-25.9	68.5	-116.1
9	47.00	0.006	0.000	21.4	-16.1	40.3	-100.6
10	46.60	0.007	0.000	3.4	-14.2	26.9	-78.2
11	46.20	0.008	0.000	5.4	-41.5	16.0	-53.5
12	45.60	0.009	0.000	10.6	-62.0	4.4	-22.0
13	45.00	0.009	0.000	10.6	-59.4	33.7	-2.0
14	44.65	0.008	0.000	9.5	-52.8	62.8	-3.8
15	44.30	0.008	0.000	8.0	-37.5	93.6	-14.5
16	43.90	0.007	0.000	6.1	-11.5	81.6	-4.6
17	43.55	0.006	0.000	11.3	-2.2	50.1	-4.1
18	43.20	0.006	0.000	25.5	0.0	23.2	-3.4
19	42.60	0.005	0.000	27.5	0.0	7.4	-5.6
20	42.00	0.004	0.000	18.8	0.0	0.3	-16.1
21	41.40	0.003	0.000	8.2	0.0	0.0	-14.9
22	40.95	0.003	0.000	3.0	0.0	0.0	-9.1
23	40.50	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.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	4.8	48.60	-0.0	50.50	5.1	49.50	-1.9	47.30
2	No calculation at this stage							
3	No calculation at this stage							
4	10.6	48.60	-0.0	43.90	13.3	49.50	-4.4	47.30
5	No calculation at this stage							
6	No calculation at this stage							
7	10.6	45.00	-34.3	48.00	40.3	47.00	-35.1	50.00
8	No calculation at this stage							
9	No calculation at this stage							
10	47.2	47.30	-59.4	45.00	81.6	43.90	-94.8	47.30
11	No calculation at this stage							
12	No calculation at this stage							
13	No calculation at this stage							
14	53.8	47.30	-62.0	45.60	93.6	44.30	-116.1	47.30

Run ID. Kpore_SLS02 Eu600CuK01.5
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
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Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.002	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	Wall displacements reset to zero				Change EI of wall to 24785kN.m2/m run
3	No calculation at this stage				Apply water pressure profile no.1
4	0.002	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
5	No calculation at this stage				Install strut no.1 at elev. 50.00
6	No calculation at this stage				Apply water pressure profile no.2
7	0.005	47.65	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
8	No calculation at this stage				Install strut no.2 at elev. 47.30
9	No calculation at this stage				Apply water pressure profile no.3
10	0.009	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
11	No calculation at this stage				Install strut no.3 at elev. 44.30
12	No calculation at this stage				Change soil type 2 to soil type 3
13	No calculation at this stage				Apply water pressure profile no.4
14	0.009	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Strut forces at each stage (horizontal components)

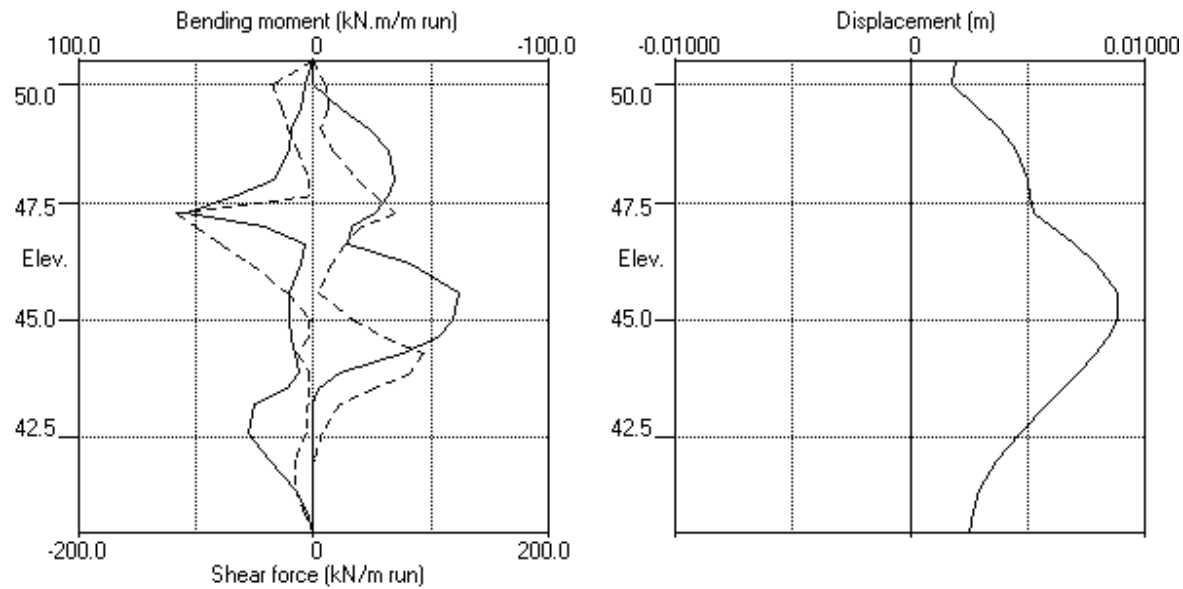
Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 50.00		at elev. 47.30		at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
7	44.56	44.56	---	---	---	---
10	24.53	24.53	157.66	157.66	---	---
14	23.63	23.63	184.61	184.61	108.08	108.08

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Bending moment, shear force, displacement envelopes



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	30000	1.800	OC	1.000	1.000	50.00u
(49.50)		(4200)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	24000	1.800	OC	0.368	3.244	2.000d
(49.50)		(3360)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Made Ground	30.00	0.634	0.00	30.00	0.634	0.00	
2 London Clay	0.00	0.500	0.00	0.00	0.000	0.00	
3 LC Drained	24.00	0.647	0.00	24.00	0.670	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.		Active side			Passive side			
profile no.	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	50.50	50.50	0.0	1	49.50	49.50	0.0
2	1	50.50	50.50	0.0	1	47.00	47.00	0.0
3	1	50.50	50.50	0.0	1	43.90	43.90	0.0
4	1	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall

Elevation of toe of wall = 40.50

Maximum finite element length = 0.60 m

Youngs modulus of wall E = 2.0500E+08 kN/m2

Moment of inertia of wall I = 1.2090E-04 m4/m run

E.I = 24785 kN.m2/m run

Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	=		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	=		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Change EI of wall to 24785 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
3	Apply water pressure profile no.1 No analysis at this stage
4	Excavate to elevation 49.50 on PASSIVE side
5	Install strut or anchor no.1 at elevation 50.00
6	Apply water pressure profile no.2 No analysis at this stage
7	Excavate to elevation 47.00 on PASSIVE side
8	Install strut or anchor no.2 at elevation 47.30
9	Apply water pressure profile no.3 No analysis at this stage
10	Excavate to elevation 43.90 on PASSIVE side
11	Install strut or anchor no.3 at elevation 44.30
12	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
13	Apply water pressure profile no.4 No analysis at this stage
14	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Change EI of wall to 24785kN.m ² /m run	No	No	No
3	Apply water pressure profile no.1	No	No	No
4	Excav. to elev. 49.50 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 50.00	No	No	No
6	Apply water pressure profile no.2	No	No	No
7	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
8	Install strut no.2 at elev. 47.30	No	No	No
9	Apply water pressure profile no.3	No	No	No
10	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
11	Install strut no.3 at elev. 44.30	No	No	No
12	Change soil type 2 to soil type 3	No	No	No
13	Apply water pressure profile no.4	No	No	No
14	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

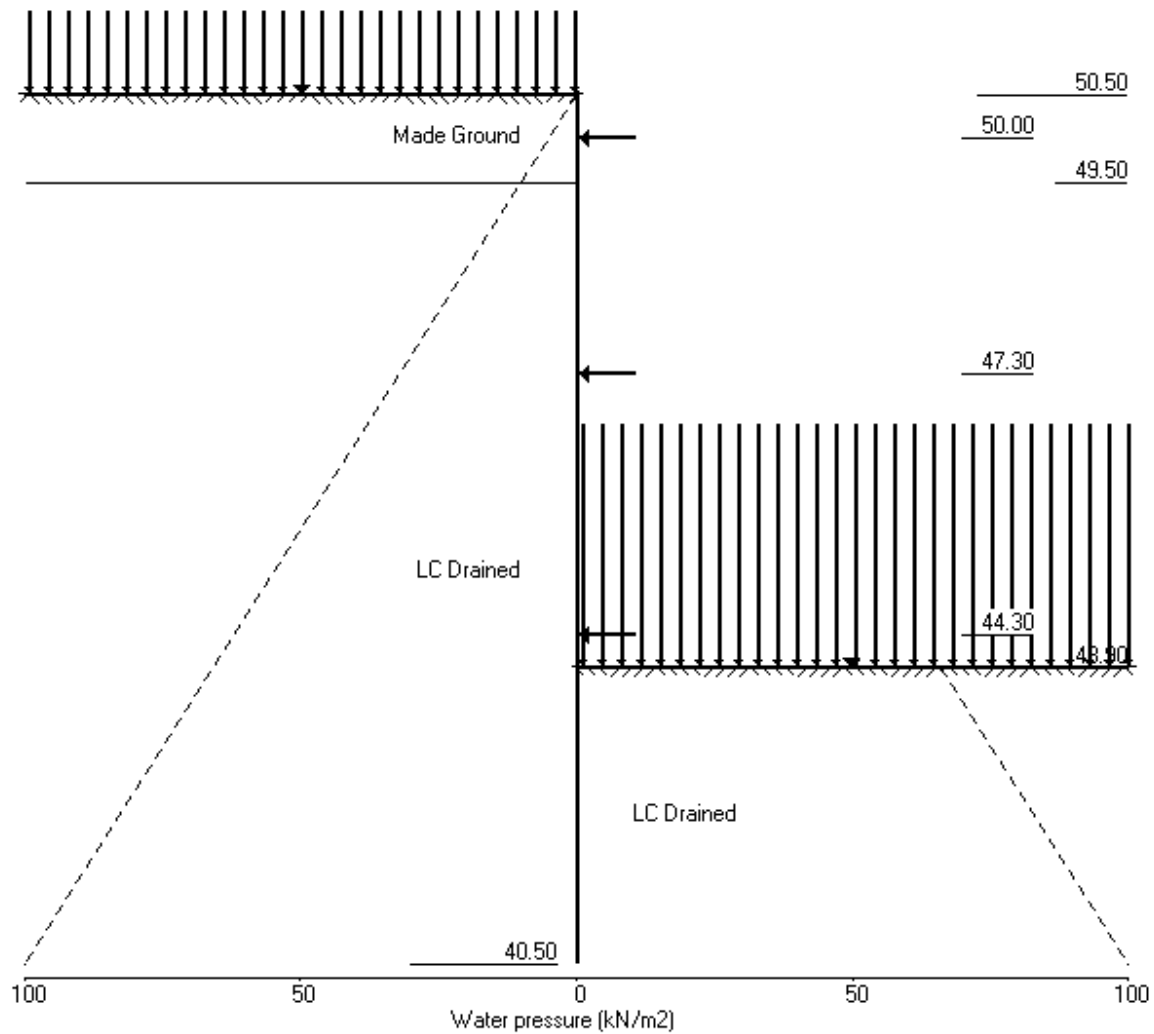
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 Kidderpore Ave, 3
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Stage No.14 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 49.50 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilb. at elev.	Toe elev.	Wall Penetr- -ation
4	50.50 49.50	Cant.	6.076	41.23	48.80	0.70

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	7.13	0.002	5.94E-04	0.0	0.0	
2	50.00	13.27	0.002	5.91E-04	5.1	1.3	
3	49.50	19.41	0.001	5.59E-04	13.3	5.7	
		-20.29	0.001	5.59E-04	13.3	5.7	
4	49.05	-14.35	0.001	4.85E-04	5.5	9.6	
5	48.60	-8.94	0.001	3.85E-04	0.2	10.6	
6	48.00	-3.38	0.001	2.53E-04	-3.5	9.2	
7	47.65	-1.13	0.001	1.88E-04	-4.2	7.8	
8	47.30	0.44	0.001	1.35E-04	-4.4	6.2	
9	47.00	1.30	0.001	1.00E-04	-4.1	4.9	
10	46.60	1.89	0.001	6.64E-05	-3.5	3.4	
11	46.20	2.03	0.001	4.50E-05	-2.7	2.1	
12	45.60	1.71	0.000	2.92E-05	-1.6	0.9	
13	45.00	1.15	0.000	2.53E-05	-0.7	0.2	
14	44.65	0.82	0.000	2.57E-05	-0.4	0.1	
15	44.30	0.53	0.000	2.69E-05	-0.1	-0.0	
16	43.90	0.27	0.000	2.84E-05	0.0	-0.0	
17	43.55	0.10	0.000	2.94E-05	0.1	0.0	
18	43.20	-0.02	0.000	2.99E-05	0.1	0.0	
19	42.60	-0.13	0.000	3.00E-05	0.1	0.1	
20	42.00	-0.13	0.000	2.93E-05	-0.0	0.1	
21	41.40	-0.06	0.000	2.85E-05	-0.1	0.1	
22	40.95	0.06	0.000	2.82E-05	-0.1	0.0	
23	40.50	0.25	0.000	2.81E-05	0.0	-0.0	

Run ID: Kpore_SLS02 Eu600CuKo1.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.4 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2622
2	50.00	5.00	29.00	8.27	134.52	8.27	13.27a	2622
3	49.50	10.00	33.00	9.41	153.08	9.41	19.41a	2622
		Total>	43.00	10.00w	143.00	17.56	17.56	11064
4	49.05	Total>	52.00	14.50w	158.30	33.11	33.11	11761
5	48.60	Total>	61.00	19.00w	173.60	48.40	48.40	12458
6	48.00	Total>	73.00	25.00w	194.00	67.96	67.96	13388
7	47.65	Total>	80.00	28.50w	205.90	78.89	78.89	13930
8	47.30	Total>	87.00	32.00w	217.80	89.47	89.47	14472
9	47.00	Total>	93.00	35.00w	228.00	98.30	98.30	14937
10	46.60	Total>	101.00	39.00w	241.60	109.80	109.80	15557
11	46.20	Total>	109.00	43.00w	255.20	121.07	121.07	16176
12	45.60	Total>	121.00	49.00w	275.60	137.72	137.72	17106
13	45.00	Total>	133.00	55.00w	296.00	154.25	154.25	18035
14	44.65	Total>	140.00	58.50w	307.90	163.90	163.90	18577
15	44.30	Total>	147.00	62.00w	319.80	173.57	173.57	19119
16	43.90	Total>	155.00	66.00w	333.40	184.65	184.65	19739
17	43.55	Total>	162.00	34.75m	345.30	194.38	194.38	20281
18	43.20	Total>	169.00	36.50m	357.20	204.13	204.13	20823
19	42.60	Total>	180.99	39.50m	377.59	220.91	220.91	21753
20	42.00	Total>	192.99	42.50m	397.99	237.74	237.74	22682
21	41.40	Total>	204.99	45.50m	418.39	254.61	254.61	23611
22	40.95	Total>	213.99	47.75m	433.69	267.30	267.30	24308
23	40.50	Total>	222.99	50.00m	448.99	280.03	280.03	25005

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	100.00	37.84	37.84	11260
4	49.05	Total>	9.00	4.50w	115.30	47.46	47.46	11969
5	48.60	Total>	18.00	9.00w	130.60	57.34	57.34	12679
6	48.00	Total>	30.00	15.00w	151.00	71.34	71.34	13625
7	47.65	Total>	37.01	18.50w	162.91	80.01	80.01	14176
8	47.30	Total>	44.01	22.00w	174.81	89.03	89.03	14728
9	47.00	Total>	50.01	25.00w	185.01	97.00	97.00	15201
10	46.60	Total>	58.02	29.00w	198.62	107.90	107.90	15831
11	46.20	Total>	66.03	33.00w	212.23	119.04	119.04	16462
12	45.60	Total>	78.05	39.00w	232.65	136.01	136.01	17408
13	45.00	Total>	90.08	45.00w	253.08	153.11	153.11	18354
14	44.65	Total>	97.10	48.50w	265.00	163.08	163.08	18905
15	44.30	Total>	104.12	52.00w	276.92	173.04	173.04	19457
16	43.90	Total>	112.15	56.00w	290.55	184.38	184.38	20088
17	43.55	Total>	119.18	59.50w	302.48	194.28	194.28	20639
18	43.20	Total>	126.21	63.00w	314.41	204.15	204.15	21191
19	42.60	Total>	138.27	34.50m	334.87	221.03	221.03	22137
20	42.00	Total>	150.34	37.50m	355.34	237.87	237.87	23083
21	41.40	Total>	162.42	40.50m	375.82	254.67	254.67	24029
22	40.95	Total>	171.49	42.75m	391.19	267.24	267.24	24738
23	40.50	Total>	180.56	45.00m	406.56	279.78	279.78	25447

Run ID. Kpore_SLS02 Eu600CuKo1.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
| Checked :

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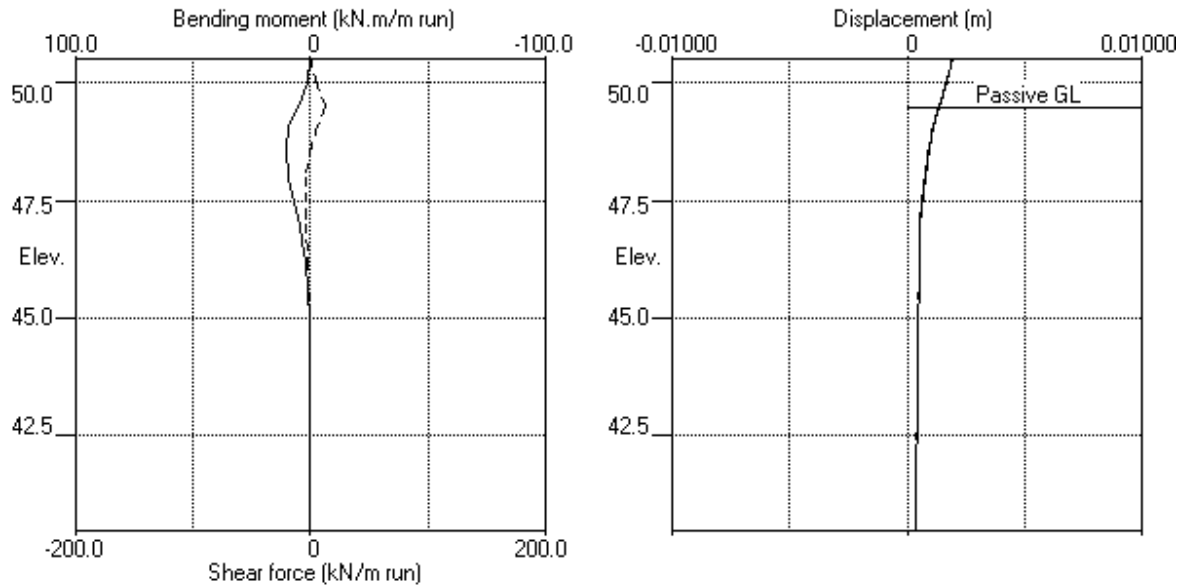
Stage No.4 Excavate to elevation 49.50 on PASSIVE side
Note: 19.41a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Data filename/Run ID: Kpore_SLS02 Eu600CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

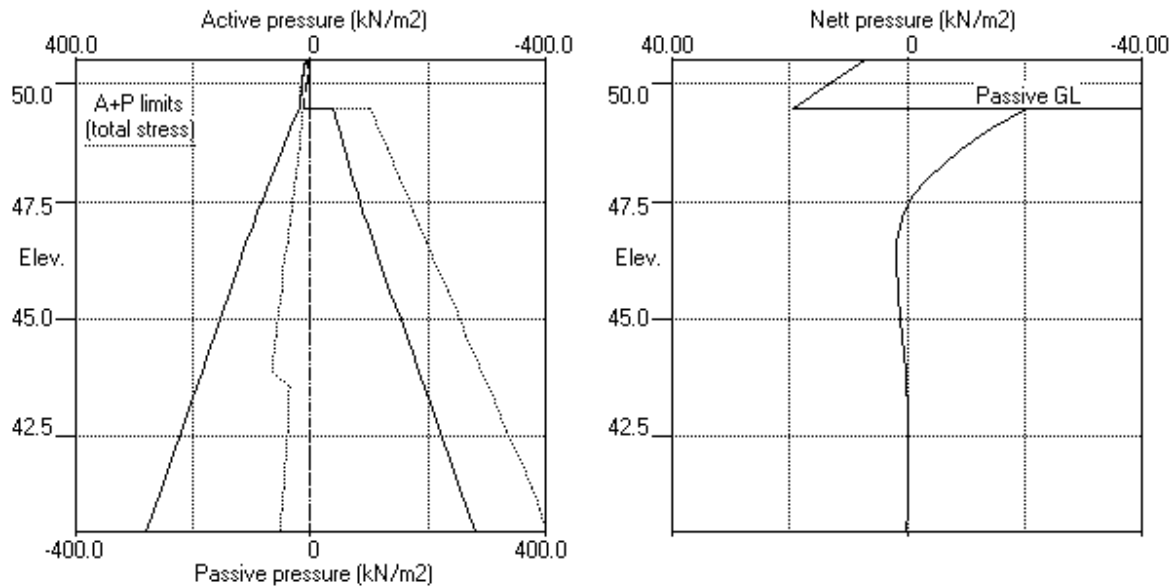
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.4 Excav. to elev. 49.50 on PASSIVE side



Stage No.4 Excav. to elev. 49.50 on PASSIVE side



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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.8	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 47.00 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
7	50.50 47.00	50.00	4.263	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	25.29	0.001	-2.45E-03	0.0	0.0	46.9
2	50.00	13.27	0.002	-2.48E-03	9.6	3.6	
		13.27	0.002	-2.48E-03	-37.2	3.6	
3	49.50	19.41	0.003	-2.34E-03	-29.1	-13.2	46.9
		10.00	0.003	-2.34E-03	-29.1	-13.2	
4	49.05	14.50	0.004	-1.93E-03	-23.5	-25.3	
5	48.60	20.67	0.005	-1.31E-03	-15.6	-33.4	46.9
6	48.00	32.66	0.005	-3.40E-04	0.4	-38.3	
7	47.65	41.38	0.005	2.37E-04	13.3	-36.0	
8	47.30	51.51	0.005	7.39E-04	29.6	-28.6	46.9
9	47.00	61.22	0.005	1.04E-03	46.5	-17.3	
		-43.30	0.005	1.04E-03	46.5	-17.3	
10	46.60	-36.49	0.004	1.23E-03	30.5	-2.1	46.9
11	46.20	-28.31	0.004	1.22E-03	17.6	7.2	
12	45.60	-16.45	0.003	1.00E-03	4.1	12.6	
13	45.00	-7.19	0.003	7.12E-04	-3.0	12.1	46.9
14	44.65	-3.34	0.002	5.54E-04	-4.8	10.7	
15	44.30	-0.59	0.002	4.18E-04	-5.5	8.8	
16	43.90	1.38	0.002	2.96E-04	-5.3	6.5	46.9
17	43.55	2.29	0.002	2.17E-04	-4.7	4.8	
18	43.20	2.63	0.002	1.61E-04	-3.8	3.2	
19	42.60	2.38	0.002	1.07E-04	-2.3	1.4	46.9
20	42.00	1.66	0.002	8.61E-05	-1.1	0.5	
21	41.40	0.87	0.002	8.10E-05	-0.4	0.1	
22	40.95	0.36	0.002	8.08E-05	-0.1	0.0	46.9
23	40.50	-0.04	0.002	8.10E-05	0.0	-0.0	
At elev. 50.00 Strut force =			46.9 kN/strut =		46.9 kN/m run		

Run ID: Kpore_SLS02 Eu600CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.7 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Total earth pressure	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	coeff. kN/m3
1	50.50	0.00	25.00	7.13	115.97	25.29	25.29	12644
2	50.00	5.00	29.00	8.27	134.52	8.27	13.27a	1502
3	49.50	10.00	33.00	9.41	153.08	9.41	19.41a	1502
		Total>	43.00	10.00w	143.00	10.00	10.00a	6566
4	49.05	Total>	52.00	14.50w	158.30	14.50	14.50a	6980
5	48.60	Total>	61.00	19.00w	173.60	20.67	20.67	7393
6	48.00	Total>	73.00	25.00w	194.00	32.66	32.66	7945
7	47.65	Total>	80.00	28.50w	205.90	41.38	41.38	8267
8	47.30	Total>	87.00	32.00w	217.80	51.51	51.51	8588
9	47.00	Total>	93.00	35.00w	228.00	61.22	61.22	8864
10	46.60	Total>	101.00	39.00w	241.60	75.18	75.18	9232
11	46.20	Total>	109.00	43.00w	255.20	89.63	89.63	9599
12	45.60	Total>	121.00	49.00w	275.60	111.10	111.10	10151
13	45.00	Total>	133.00	55.00w	296.00	131.52	131.52	10703
14	44.65	Total>	140.00	58.50w	307.90	142.82	142.82	11024
15	44.30	Total>	147.00	62.00w	319.80	153.69	153.69	11346
16	43.90	Total>	155.00	66.00w	333.40	165.66	165.66	11714
17	43.55	Total>	162.00	34.75m	345.30	175.82	175.82	12035
18	43.20	Total>	169.00	36.50m	357.20	185.76	185.76	12357
19	42.60	Total>	180.99	39.50m	377.59	202.50	202.50	12909
20	42.00	Total>	192.99	42.50m	397.99	219.07	219.07	13460
21	41.40	Total>	204.99	45.50m	418.39	235.63	235.63	14012
22	40.95	Total>	213.99	47.75m	433.69	248.10	248.10	14425
23	40.50	Total>	222.99	50.00m	448.99	260.63	260.63	14839

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Total earth pressure	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	coeff. kN/m3
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	104.52	104.52	13521
10	46.60	Total>	8.00	4.00w	148.60	111.67	111.67	14082
11	46.20	Total>	16.00	8.00w	162.20	117.94	117.94	14643
12	45.60	Total>	28.01	14.00w	182.61	127.55	127.55	15484
13	45.00	Total>	40.03	20.00w	203.03	138.71	138.71	16326
14	44.65	Total>	47.05	23.50w	214.95	146.16	146.16	16816
15	44.30	Total>	54.07	27.00w	226.87	154.28	154.28	17307
16	43.90	Total>	62.10	31.00w	240.50	164.28	164.28	17868
17	43.55	Total>	69.14	34.50w	252.44	173.53	173.53	18359
18	43.20	Total>	76.19	38.00w	264.39	183.13	183.13	18850
19	42.60	Total>	88.29	44.00w	284.89	200.12	200.12	19691
20	42.00	Total>	100.42	50.00w	305.42	217.41	217.41	20532
21	41.40	Total>	112.58	56.00w	325.98	234.76	234.76	21374
22	40.95	Total>	121.72	60.50w	341.42	247.74	247.74	22005
23	40.50	Total>	130.88	65.00w	356.88	260.66	260.66	22636

Run ID. Kpore_SLS02 Eu600CuKo1.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
| Checked :

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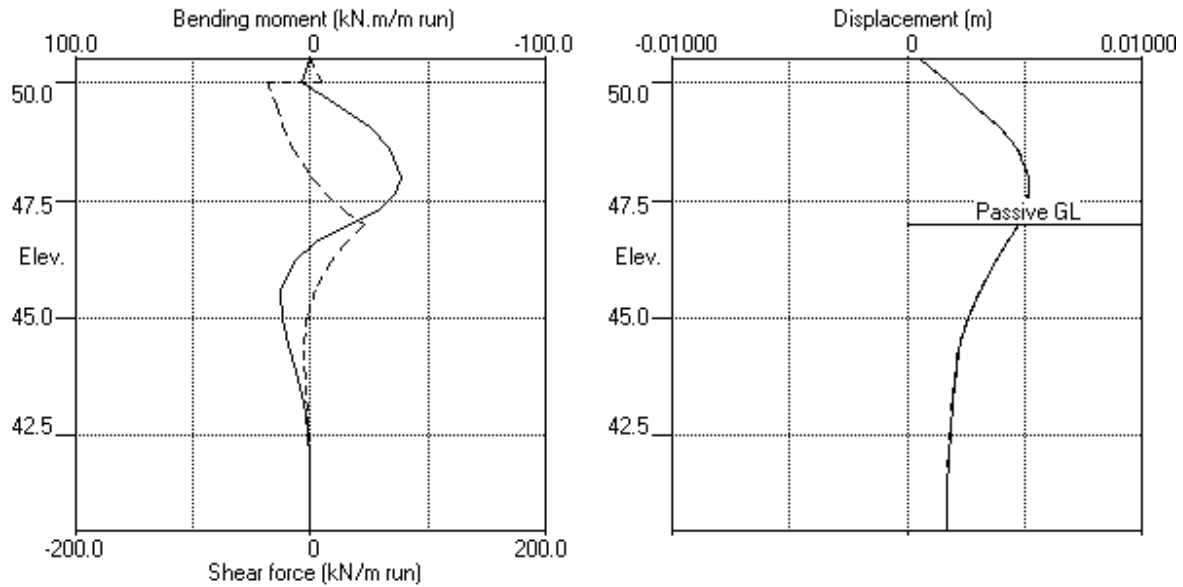
Stage No.7 Excavate to elevation 47.00 on PASSIVE side
Note: 14.50a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

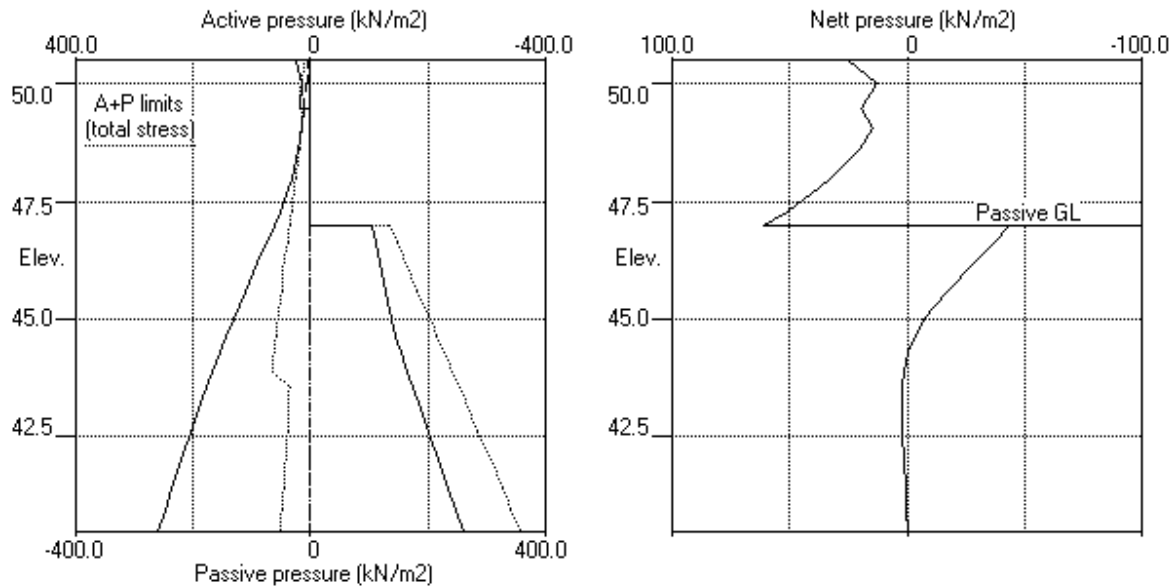
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.7 Excav. to elev. 47.00 on PASSIVE side



Stage No.7 Excav. to elev. 47.00 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu600CuK01.8	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 10 Excavate to elevation 43.90 on PASSIVE side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
10	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m

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

*** Wall displacements reset to zero at stage 2

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	50.50	19.43	0.001	-1.46E-03	0.0	0.0	
2	50.00	13.39	0.002	-1.48E-03	8.2	2.8	24.4
		13.39	0.002	-1.48E-03	-16.2	2.8	
3	49.50	20.81	0.002	-1.44E-03	-7.6	-3.4	
		15.93	0.002	-1.44E-03	-7.6	-3.4	
4	49.05	25.01	0.003	-1.29E-03	1.6	-5.3	
5	48.60	34.16	0.004	-1.15E-03	14.9	-1.1	
6	48.00	44.58	0.004	-1.21E-03	38.5	14.9	
7	47.65	47.44	0.005	-1.48E-03	54.6	31.2	
8	47.30	48.15	0.005	-2.03E-03	71.3	53.4	176.0
		48.15	0.005	-2.03E-03	-104.7	53.4	
9	47.00	48.32	0.006	-2.47E-03	-90.2	24.3	
10	46.60	46.42	0.007	-2.57E-03	-71.3	-7.7	
11	46.20	44.03	0.008	-2.23E-03	-53.2	-32.3	
12	45.60	49.00	0.009	-1.10E-03	-25.3	-59.5	
13	45.00	55.00	0.009	4.25E-04	5.9	-66.0	
14	44.65	61.74	0.009	1.30E-03	26.4	-58.8	
15	44.30	75.58	0.008	2.04E-03	50.4	-45.6	
16	43.90	95.38	0.007	2.57E-03	84.6	-19.2	
		-83.02	0.007	2.57E-03	84.6	-19.2	
17	43.55	-75.48	0.007	2.67E-03	56.9	5.3	
18	43.20	-67.50	0.006	2.48E-03	31.8	20.5	
19	42.60	-43.87	0.004	1.85E-03	-1.6	32.3	
20	42.00	-11.15	0.003	1.17E-03	-18.1	23.5	
21	41.40	9.47	0.003	7.68E-04	-18.6	10.6	
22	40.95	20.82	0.003	6.43E-04	-11.8	3.2	
23	40.50	31.47	0.002	6.14E-04	0.0	-0.0	
At elev. 50.00 Strut force =				24.4 kN/strut =	24.4 kN/m run		
At elev. 47.30 Strut force =				176.0 kN/strut =	176.0 kN/m run		

Run ID: Kpore_SLS02 Eu600CuKo1.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.10 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Total earth pressure	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	50.50	0.00	25.00	7.13	115.97	19.43	19.43	12980
2	50.00	5.00	29.00	8.27	134.52	8.39	13.39	2655
3	49.50	10.00	33.00	9.41	153.08	10.81	20.81	2655
		Total>	43.00	10.00w	143.00	15.93	15.93	11200
4	49.05	Total>	52.00	14.50w	158.30	25.01	25.01	11905
5	48.60	Total>	61.00	19.00w	173.60	34.16	34.16	12611
6	48.00	Total>	73.00	25.00w	194.00	44.58	44.58	13552
7	47.65	Total>	80.00	28.50w	205.90	47.44	47.44	14100
8	47.30	Total>	87.00	32.00w	217.80	48.15	48.15	9536
9	47.00	Total>	93.00	35.00w	228.00	48.32	48.32	9842
10	46.60	Total>	101.00	39.00w	241.60	46.42	46.42	10250
11	46.20	Total>	109.00	43.00w	255.20	44.03	44.03	10659
12	45.60	Total>	121.00	49.00w	275.60	49.00	49.00a	11271
13	45.00	Total>	133.00	55.00w	296.00	55.00	55.00a	11884
14	44.65	Total>	140.00	58.50w	307.90	61.74	61.74	12241
15	44.30	Total>	147.00	62.00w	319.80	75.58	75.58	12598
16	43.90	Total>	155.00	66.00w	333.40	95.38	95.38	13006
17	43.55	Total>	162.00	34.75m	345.30	114.82	114.82	13364
18	43.20	Total>	169.00	36.50m	357.20	134.71	134.71	13721
19	42.60	Total>	180.99	39.50m	377.59	166.91	166.91	14333
20	42.00	Total>	192.99	42.50m	397.99	194.54	194.54	14946
21	41.40	Total>	204.99	45.50m	418.39	218.17	218.17	15558
22	40.95	Total>	213.99	47.75m	433.69	234.55	234.55	16017
23	40.50	Total>	222.99	50.00m	448.99	250.72	250.72	16477

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Total earth pressure	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	178.40	178.40p	26213
17	43.55	Total>	7.00	3.50w	190.30	190.30	190.30p	26933
18	43.20	Total>	14.00	7.00w	202.20	202.20	202.20p	27653
19	42.60	Total>	26.02	13.00w	222.62	210.79	210.79	28887
20	42.00	Total>	38.05	19.00w	243.05	205.69	205.69	30121
21	41.40	Total>	50.11	25.00w	263.51	208.70	208.70	31355
22	40.95	Total>	59.17	29.50w	278.87	213.73	213.73	32281
23	40.50	Total>	68.26	34.00w	294.26	219.25	219.25	33207

Run ID. Kpore_SLS02 Eu600CuKo1.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
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(continued)

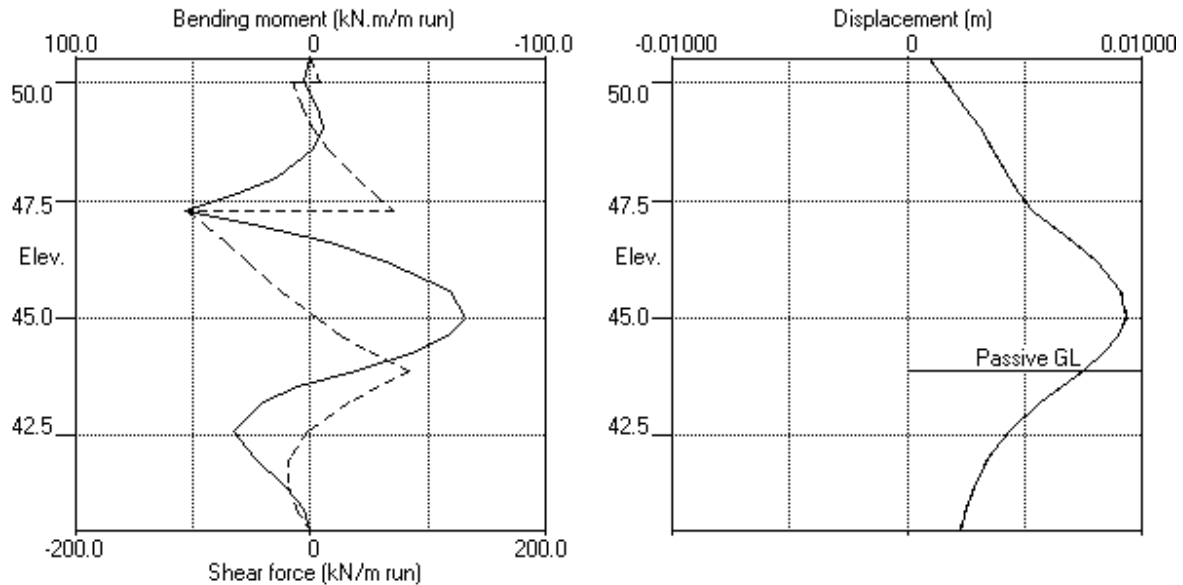
Stage No.10 Excavate to elevation 43.90 on PASSIVE side
Note: 55.00a Soil pressure at active limit
202.20p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

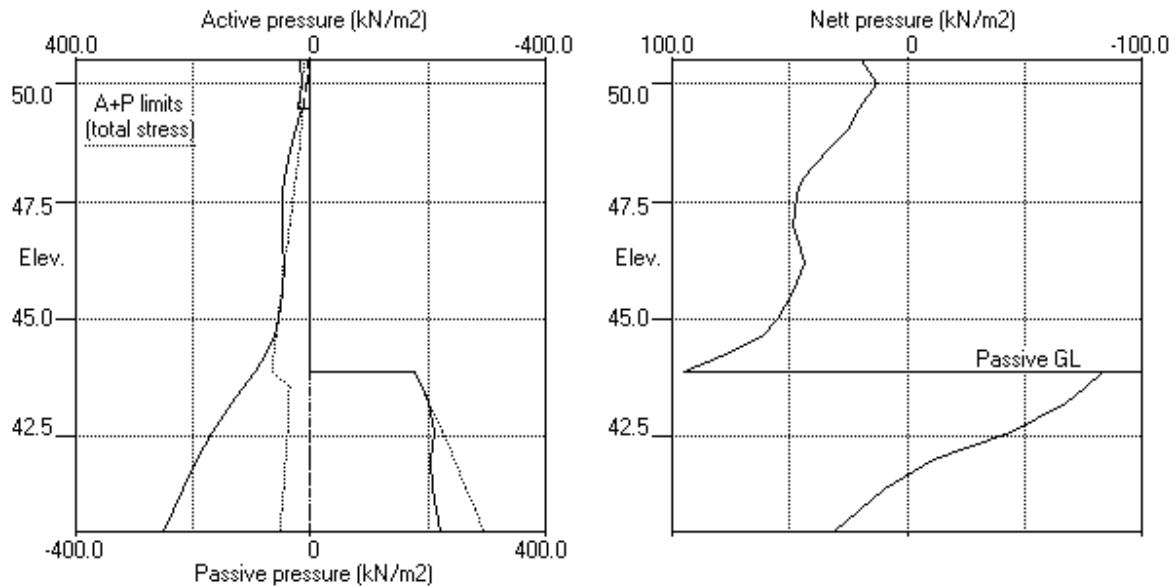
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 | Job No. TWS8148
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Stage No.10 Excav. to elev. 43.90 on PASSIVE side



Stage No.10 Excav. to elev. 43.90 on PASSIVE side



			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000		
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr- ation	
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	No analysis at this stage				
3	50.50	50.50	No analysis at this stage				
4	50.50	49.50	Cant.	6.076	41.23	48.80	0.70
5	50.50	49.50	No analysis at this stage				
6	50.50	49.50	No analysis at this stage				
7	50.50	47.00	50.00	4.263	n/a	46.66	0.34
8	50.50	47.00	No analysis at this stage				
All remaining stages have more than one strut - FoS calculation n/a							

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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	50.50	0.002	0.000	0.0	0.0	0.0	0.0
2	50.00	0.002	0.000	3.6	0.0	9.6	-37.2
3	49.50	0.003	0.000	5.7	-13.2	13.3	-29.1
4	49.05	0.004	0.000	9.6	-25.3	5.5	-23.5
5	48.60	0.005	0.000	10.6	-33.4	15.9	-15.6
6	48.00	0.005	0.000	16.1	-38.3	39.5	-3.5
7	47.65	0.005	0.000	32.9	-36.0	55.7	-4.2
8	47.30	0.005	0.000	55.5	-28.6	72.6	-114.7
9	47.00	0.006	0.000	24.3	-17.3	46.5	-99.3
10	46.60	0.007	0.000	3.4	-11.6	30.5	-76.8
11	46.20	0.008	0.000	7.2	-37.2	17.6	-53.2
12	45.60	0.009	0.000	12.6	-59.8	4.1	-25.3
13	45.00	0.009	0.000	12.1	-66.0	35.1	-3.0
14	44.65	0.009	0.000	10.7	-58.8	64.2	-4.8
15	44.30	0.009	0.000	8.8	-45.6	95.0	-25.9
16	43.90	0.008	0.000	6.5	-19.2	84.6	-5.3
17	43.55	0.008	0.000	5.3	-6.4	56.9	-4.7
18	43.20	0.007	0.000	20.5	-3.8	31.8	-3.8
19	42.60	0.006	0.000	32.3	0.0	3.1	-2.3
20	42.00	0.005	0.000	23.5	0.0	1.3	-18.1
21	41.40	0.004	0.000	10.6	0.0	0.3	-18.6
22	40.95	0.003	0.000	3.2	0.0	0.0	-11.8
23	40.50	0.003	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.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	4.8	48.60	-0.0	40.50	5.1	49.50	-1.9	47.30
2	No calculation at this stage							
3	No calculation at this stage							
4	10.6	48.60	-0.0	43.90	13.3	49.50	-4.4	47.30
5	No calculation at this stage							
6	No calculation at this stage							
7	12.6	45.60	-38.3	48.00	46.5	47.00	-37.2	50.00
8	No calculation at this stage							
9	No calculation at this stage							
10	53.4	47.30	-66.0	45.00	84.6	43.90	-104.7	47.30
11	No calculation at this stage							
12	No calculation at this stage							
13	No calculation at this stage							
14	55.5	47.30	-59.8	45.60	95.0	44.30	-114.7	47.30

Run ID. Kpore_SLS02 Eu600CuKo1.8

Kidderpore Ave, 3

SLS type undrained calculation, zero-pile option

| Sheet No.

| Date: 4-03-2014

| Checked :

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	-----	Displacement		-----	Stage description
	maximum	elev.	minimum	elev.	-----
	m		m		
1	0.002	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	Wall displacements reset to zero				Change EI of wall to 24785kN.m2/m run
3	No calculation at this stage				Apply water pressure profile no.1
4	0.002	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
5	No calculation at this stage				Install strut no.1 at elev. 50.00
6	No calculation at this stage				Apply water pressure profile no.2
7	0.005	47.65	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
8	No calculation at this stage				Install strut no.2 at elev. 47.30
9	No calculation at this stage				Apply water pressure profile no.3
10	0.009	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
11	No calculation at this stage				Install strut no.3 at elev. 44.30
12	No calculation at this stage				Change soil type 2 to soil type 3
13	No calculation at this stage				Apply water pressure profile no.4
14	0.009	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Strut forces at each stage (horizontal components)

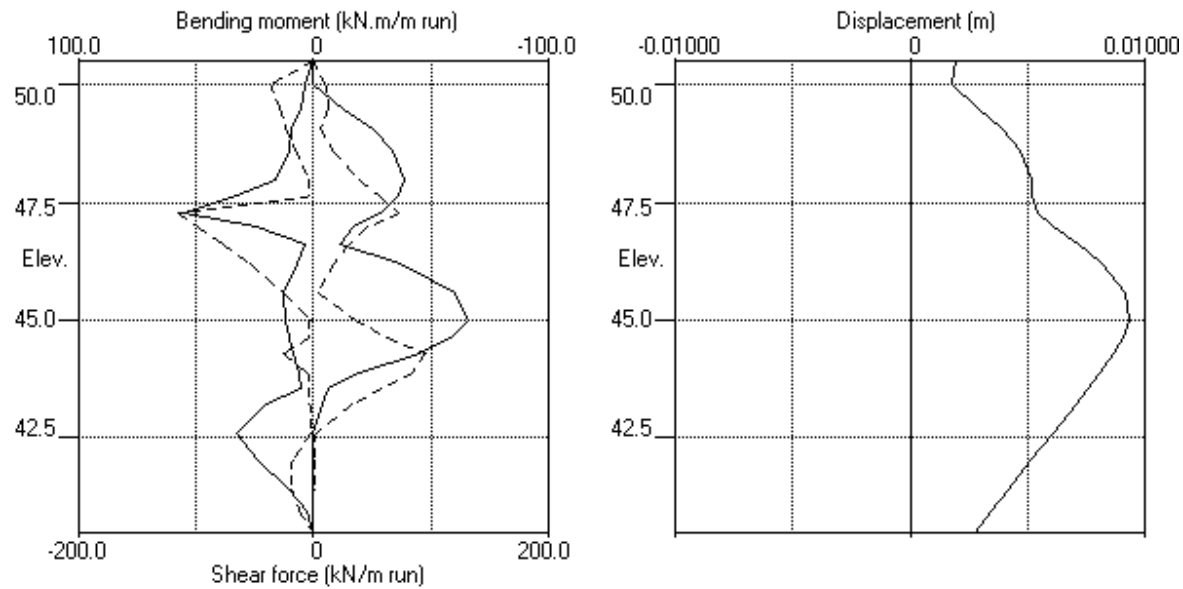
Stage no.	---	Strut no. 1	---	Strut no. 2	---	Strut no. 3	---
		at elev. 50.00		at elev. 47.30		at elev. 44.30	
		kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
7		46.86	46.86	---	---	---	---
10		24.40	24.40	176.00	176.00	---	---
14		24.38	24.38	187.28	187.28	120.88	120.88

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Bending moment, shear force, displacement envelopes



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	50.50	1 Made Ground		1 Made Ground
2	49.50	2 London Clay		2 London Clay

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground	18.00	10000	0.500	NC	0.285	4.639	0.0d
				(0.200)	(0.000)	(0.000)	
2 London Clay	20.00	50000	1.800	OC	1.000	1.000	50.00u
(49.50)		(7000)		(0.490)	(2.389)	(2.000)	(7.000)
3 LC Drained	20.00	40000	1.800	OC	0.368	3.244	2.000d
(49.50)		(5600)		(0.250)	(1.420)	(5.040)	

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---			--- parameters for Kp ---		
Soil	Wall	Back-	Soil	Wall	Back-
friction	adhesion	fill	friction	adhesion	fill
angle	coeff.	angle	angle	coeff.	angle
1 Made Ground	30.00	0.634	0.00	30.00	0.634
2 London Clay	0.00	0.500	0.00	0.00	0.000
3 LC Drained	24.00	0.647	0.00	24.00	0.670

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	50.50	50.50

Automatic water pressure balancing at toe of wall : No

Water press.	Active side				Passive side			
profile	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
	1	50.50	50.50	0.0	1	49.50	49.50	0.0
	2	50.50	50.50	0.0	1	47.00	47.00	0.0
	3	50.50	50.50	0.0	1	43.90	43.90	0.0
	4	50.50	50.50	0.0	1	43.90	43.90	0.0
					2	43.90	50.50	66.0

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 40.50
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 2.0500E+08 kN/m2
Moment of inertia of wall I = 1.2090E-04 m4/m run
E.I = 24785 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	50.00	1.00	0.300000	2.080E+07	12.50	0.00	0	No
2	47.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No
3	44.30	1.00	0.300000	2.080E+07	12.50	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2	----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	50.50	0.00 (A)	1000.00	100.00	25.00	=		N/A	N/A
2	50.50	0.80 (A)	1000.00	0.50	65.00	=		N/A	N/A
3	50.50	3.20 (A)	1000.00	0.30	40.00	=		N/A	N/A
4	43.90	-0.00 (P)	1000.00	100.00	73.20	=		N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 50.50
2	Change EI of wall to 24785 kN.m2/m run Yield moment not defined Reset wall displacements to zero at this stage
3	Apply water pressure profile no.1 No analysis at this stage
4	Excavate to elevation 49.50 on PASSIVE side
5	Install strut or anchor no.1 at elevation 50.00
6	Apply water pressure profile no.2 No analysis at this stage
7	Excavate to elevation 47.00 on PASSIVE side
8	Install strut or anchor no.2 at elevation 47.30
9	Apply water pressure profile no.3 No analysis at this stage
10	Excavate to elevation 43.90 on PASSIVE side
11	Install strut or anchor no.3 at elevation 44.30
12	Change properties of soil type 2 to soil type 3 No analysis at this stage Ko pressures will not be reset
13	Apply water pressure profile no.4 No analysis at this stage
14	Apply surcharge no.4 at elevation 43.90

FACTORS OF SAFETY and ANALYSIS OPTIONS

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 = 6.60 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) = 1000.00 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	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 50.50	No	No	No
2	Change EI of wall to 24785kN.m ² /m run	No	No	No
3	Apply water pressure profile no.1	No	No	No
4	Excav. to elev. 49.50 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 50.00	No	No	No
6	Apply water pressure profile no.2	No	No	No
7	Excav. to elev. 47.00 on PASSIVE side	Yes	Yes	Yes
8	Install strut no.2 at elev. 47.30	No	No	No
9	Apply water pressure profile no.3	No	No	No
10	Excav. to elev. 43.90 on PASSIVE side	Yes	Yes	Yes
11	Install strut no.3 at elev. 44.30	No	No	No
12	Change soil type 2 to soil type 3	No	No	No
13	Apply water pressure profile no.4	No	No	No
14	Apply surcharge no.4 at elev. 43.90	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

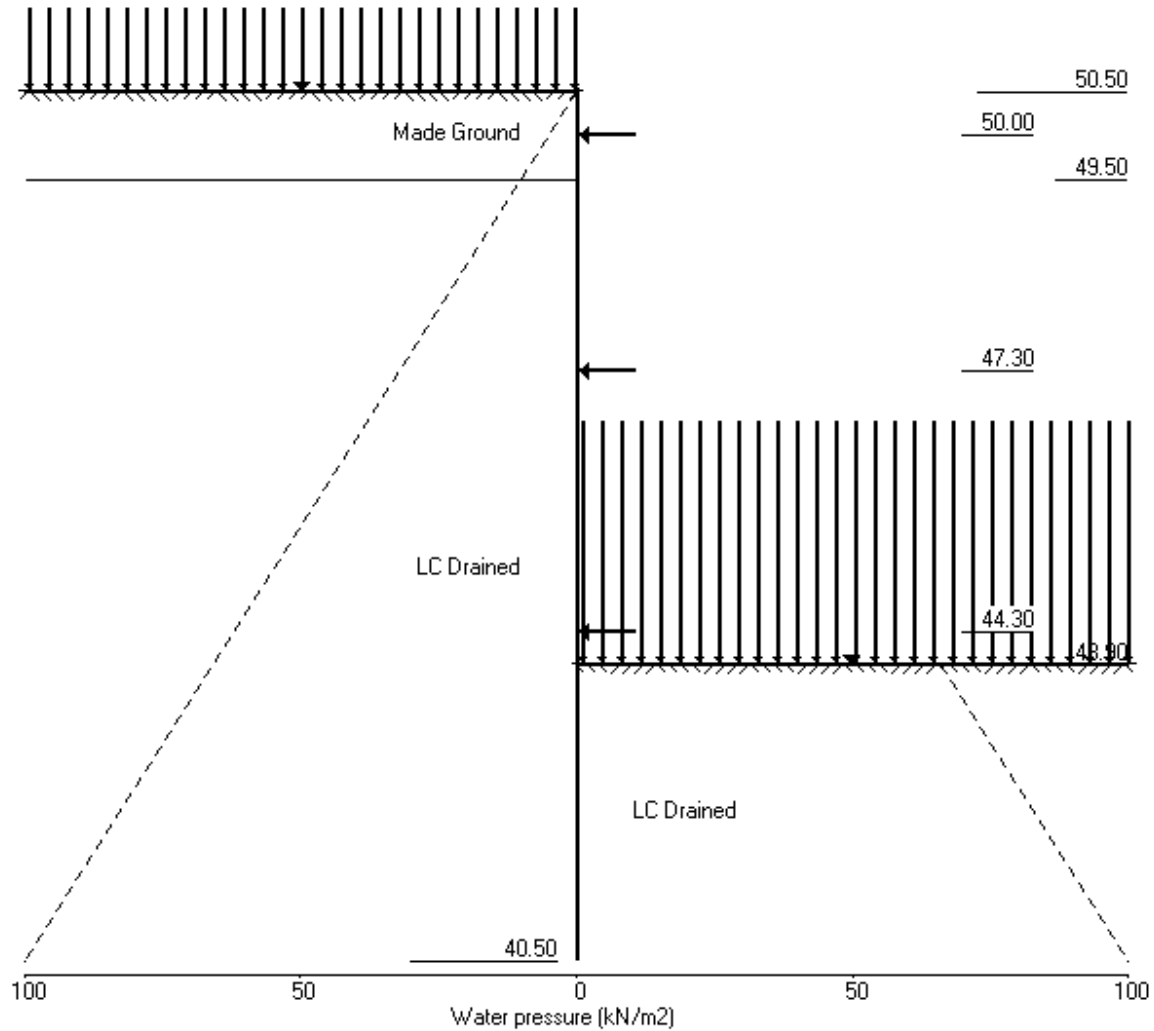
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Stage No.14 Apply surcharge no.4 at elev. 43.90



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Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 49.50 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr- -ation
4	50.50 49.50	Cant.	6.076	41.23	48.80	0.70

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	7.13	0.001	3.90E-04	0.0	0.0	
2	50.00	13.47	0.001	3.87E-04	5.2	1.4	
3	49.50	21.66	0.001	3.60E-04	13.9	5.9	
		-26.51	0.001	3.60E-04	13.9	5.9	
4	49.05	-16.83	0.001	3.01E-04	4.2	9.5	
5	48.60	-8.75	0.000	2.23E-04	-1.6	9.7	
6	48.00	-1.58	0.000	1.29E-04	-4.7	7.1	
7	47.65	0.80	0.000	8.78E-05	-4.8	5.4	
8	47.30	2.11	0.000	5.74E-05	-4.3	3.8	
9	47.00	2.58	0.000	3.92E-05	-3.6	2.6	
10	46.60	2.57	0.000	2.43E-05	-2.6	1.4	
11	46.20	2.16	0.000	1.71E-05	-1.6	0.5	
12	45.60	1.30	0.000	1.45E-05	-0.6	-0.0	
13	45.00	0.56	0.000	1.59E-05	-0.0	-0.2	
14	44.65	0.26	0.000	1.71E-05	0.1	-0.1	
15	44.30	0.06	0.000	1.80E-05	0.2	-0.1	
16	43.90	-0.07	0.000	1.85E-05	0.2	-0.0	
17	43.55	-0.13	0.000	1.85E-05	0.1	0.1	
18	43.20	-0.14	0.000	1.81E-05	0.1	0.1	
19	42.60	-0.12	0.000	1.71E-05	0.0	0.1	
20	42.00	-0.08	0.000	1.60E-05	-0.0	0.1	
21	41.40	-0.02	0.000	1.52E-05	-0.1	0.1	
22	40.95	0.07	0.000	1.48E-05	-0.1	0.0	
23	40.50	0.21	0.000	1.47E-05	0.0	-0.0	

Run ID: Kpore_SLS02 Eu1000CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.4 Excavate to elevation 49.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Total earth pressure	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	50.50	0.00	25.00	7.13	115.97	7.13	7.13a	2874
2	50.00	5.00	29.00	8.27	134.52	8.47	13.47	2874
3	49.50	10.00	33.00	9.41	153.08	11.66	21.66	2874
		Total>	43.00	10.00w	143.00	14.50	14.50	20136
4	49.05	Total>	52.00	14.50w	158.30	31.91	31.91	21404
5	48.60	Total>	61.00	19.00w	173.60	48.53	48.53	22673
6	48.00	Total>	73.00	25.00w	194.00	68.90	68.90	24364
7	47.65	Total>	80.00	28.50w	205.90	79.88	79.88	25351
8	47.30	Total>	87.00	32.00w	217.80	90.33	90.33	26337
9	47.00	Total>	93.00	35.00w	228.00	98.96	98.96	27183
10	46.60	Total>	101.00	39.00w	241.60	110.17	110.17	28311
11	46.20	Total>	109.00	43.00w	255.20	121.16	121.16	29438
12	45.60	Total>	121.00	49.00w	275.60	137.55	137.55	31130
13	45.00	Total>	133.00	55.00w	296.00	154.00	154.00	32821
14	44.65	Total>	140.00	58.50w	307.90	163.65	163.65	33808
15	44.30	Total>	147.00	62.00w	319.80	173.36	173.36	34794
16	43.90	Total>	155.00	66.00w	333.40	184.51	184.51	35922
17	43.55	Total>	162.00	34.75m	345.30	194.30	194.30	36908
18	43.20	Total>	169.00	36.50m	357.20	204.11	204.11	37895
19	42.60	Total>	180.99	39.50m	377.59	220.94	220.94	39587
20	42.00	Total>	192.99	42.50m	397.99	237.80	237.80	41278
21	41.40	Total>	204.99	45.50m	418.39	254.67	254.67	42969
22	40.95	Total>	213.99	47.75m	433.69	267.34	267.34	44238
23	40.50	Total>	222.99	50.00m	448.99	280.04	280.04	45506

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Total earth pressure	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	100.00	41.01	41.01	20644
4	49.05	Total>	9.00	4.50w	115.30	48.74	48.74	21945
5	48.60	Total>	18.00	9.00w	130.60	57.28	57.28	23245
6	48.00	Total>	30.00	15.00w	151.00	70.47	70.47	24979
7	47.65	Total>	37.01	18.50w	162.91	79.08	79.08	25991
8	47.30	Total>	44.01	22.00w	174.81	88.22	88.22	27003
9	47.00	Total>	50.01	25.00w	185.01	96.39	96.39	27870
10	46.60	Total>	58.02	29.00w	198.62	107.59	107.59	29026
11	46.20	Total>	66.03	33.00w	212.23	119.01	119.01	30182
12	45.60	Total>	78.05	39.00w	232.65	136.25	136.25	31916
13	45.00	Total>	90.08	45.00w	253.08	153.43	153.43	33650
14	44.65	Total>	97.10	48.50w	265.00	163.39	163.39	34661
15	44.30	Total>	104.12	52.00w	276.92	173.30	173.30	35673
16	43.90	Total>	112.15	56.00w	290.55	184.59	184.59	36829
17	43.55	Total>	119.18	59.50w	302.48	194.42	194.42	37841
18	43.20	Total>	126.21	63.00w	314.41	204.25	204.25	38852
19	42.60	Total>	138.27	34.50m	334.87	221.07	221.07	40586
20	42.00	Total>	150.34	37.50m	355.34	237.88	237.88	42320
21	41.40	Total>	162.42	40.50m	375.82	254.68	254.68	44055
22	40.95	Total>	171.49	42.75m	391.19	267.27	267.27	45355
23	40.50	Total>	180.56	45.00m	406.56	279.83	279.83	46656

Run ID. Kpore_SLS02 Eu1000CuK01.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Date: 4-03-2014
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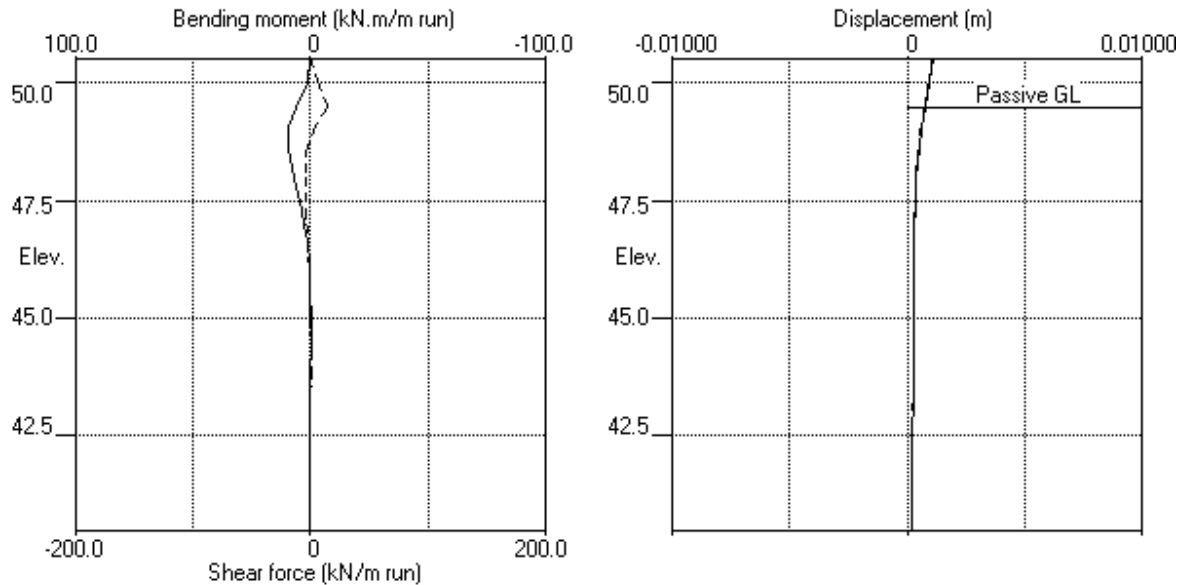
Stage No.4 Excavate to elevation 49.50 on PASSIVE side
Note: 7.13a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Program: WALLAP Version 6.05 Revision A44.B58.R48
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 Data filename/Run ID: Kpore_SLS02 Eu1000CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

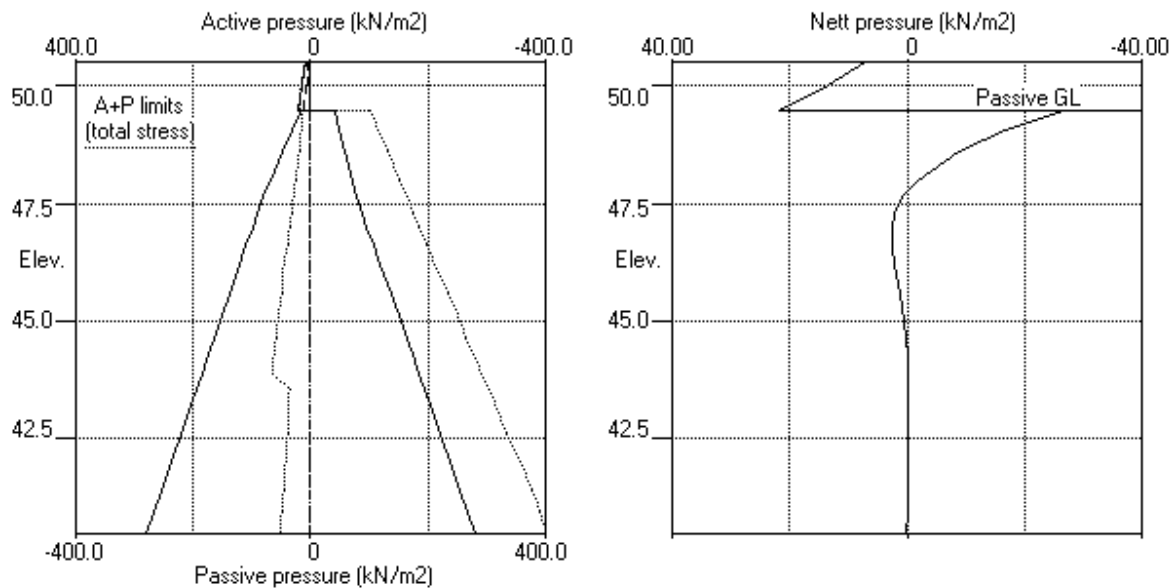
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
Checked :

Units: kN,m

Stage No.4 Excav. to elev. 49.50 on PASSIVE side



Stage No.4 Excav. to elev. 49.50 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu1000CuK01.8	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 47.00 on PASSIVE side

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

			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000	
			-----		-----	
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration
7	50.50 47.00	50.00	4.263	n/a	46.66	0.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	19.98	0.000	-1.77E-03	0.0	0.0	40.4
2	50.00	13.34	0.001	-1.79E-03	8.3	3.0	
		13.34	0.001	-1.79E-03	-32.0	3.0	
3	49.50	19.71	0.002	-1.66E-03	-23.8	-11.1	40.4
		10.00	0.002	-1.66E-03	-23.8	-11.1	
4	49.05	14.50	0.003	-1.29E-03	-18.3	-21.0	
5	48.60	19.00	0.003	-7.55E-04	-10.7	-27.8	40.4
6	48.00	26.18	0.003	3.39E-05	2.8	-28.3	
7	47.65	36.22	0.003	4.61E-04	13.7	-25.5	
8	47.30	48.18	0.003	8.05E-04	28.5	-18.3	40.4
9	47.00	59.72	0.003	9.81E-04	44.7	-7.5	
		-58.18	0.003	9.81E-04	44.7	-7.5	
10	46.60	-43.71	0.002	1.01E-03	24.3	5.8	40.4
11	46.20	-29.16	0.002	8.77E-04	9.7	12.0	
12	45.60	-11.78	0.001	5.83E-04	-2.5	12.6	
13	45.00	-1.42	0.001	3.22E-04	-6.5	8.9	40.4
14	44.65	1.73	0.001	2.11E-04	-6.4	6.6	
15	44.30	3.30	0.001	1.33E-04	-5.6	4.4	
16	43.90	3.74	0.001	7.72E-05	-4.2	2.5	40.4
17	43.55	3.41	0.001	5.13E-05	-2.9	1.2	
18	43.20	2.76	0.001	4.01E-05	-1.8	0.4	
19	42.60	1.51	0.001	3.84E-05	-0.5	-0.2	40.4
20	42.00	0.52	0.001	4.49E-05	0.1	-0.2	
21	41.40	-0.06	0.001	5.01E-05	0.2	-0.1	
22	40.95	-0.26	0.001	5.18E-05	0.1	-0.0	40.4
23	40.50	-0.32	0.001	5.21E-05	-0.0	0.0	
At elev. 50.00 Strut force =			40.4 kN/strut =		40.4 kN/m run		

Run ID: Kpore_SLS02 Eu1000CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.7 Excavate to elevation 47.00 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	19.98	19.98	12793
2	50.00	5.00	29.00	8.27	134.52	8.34	13.34	1702
3	49.50	10.00	33.00	9.41	153.08	9.71	19.71	1702
		Total>	43.00	10.00w	143.00	10.00	10.00a	12273
4	49.05	Total>	52.00	14.50w	158.30	14.50	14.50a	13046
5	48.60	Total>	61.00	19.00w	173.60	19.00	19.00a	13819
6	48.00	Total>	73.00	25.00w	194.00	26.18	26.18	14850
7	47.65	Total>	80.00	28.50w	205.90	36.22	36.22	15452
8	47.30	Total>	87.00	32.00w	217.80	48.18	48.18	16053
9	47.00	Total>	93.00	35.00w	228.00	59.72	59.72	16569
10	46.60	Total>	101.00	39.00w	241.60	76.09	76.09	17256
11	46.20	Total>	109.00	43.00w	255.20	92.44	92.44	17943
12	45.60	Total>	121.00	49.00w	275.60	115.34	115.34	18974
13	45.00	Total>	133.00	55.00w	296.00	135.75	135.75	20005
14	44.65	Total>	140.00	58.50w	307.90	146.64	146.64	20606
15	44.30	Total>	147.00	62.00w	319.80	156.98	156.98	21208
16	43.90	Total>	155.00	66.00w	333.40	168.34	168.34	21895
17	43.55	Total>	162.00	34.75m	345.30	178.03	178.03	22497
18	43.20	Total>	169.00	36.50m	357.20	187.61	187.61	23098
19	42.60	Total>	180.99	39.50m	377.59	204.01	204.01	24129
20	42.00	Total>	192.99	42.50m	397.99	220.52	220.52	25160
21	41.40	Total>	204.99	45.50m	418.39	237.18	237.18	26191
22	40.95	Total>	213.99	47.75m	433.69	249.78	249.78	26964
23	40.50	Total>	222.99	50.00m	448.99	262.44	262.44	27737

Node no.	Y coord	----- PASSIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	135.00	117.90	117.90	29787
10	46.60	Total>	8.00	4.00w	148.60	119.81	119.81	31022
11	46.20	Total>	16.00	8.00w	162.20	121.60	121.60	32258
12	45.60	Total>	28.01	14.00w	182.61	127.11	127.11	34111
13	45.00	Total>	40.03	20.00w	203.03	137.17	137.17	35965
14	44.65	Total>	47.05	23.50w	214.95	144.91	144.91	37046
15	44.30	Total>	54.07	27.00w	226.87	153.68	153.68	38127
16	43.90	Total>	62.10	31.00w	240.50	164.60	164.60	39363
17	43.55	Total>	69.14	34.50w	252.44	174.62	174.62	40444
18	43.20	Total>	76.19	38.00w	264.39	184.86	184.86	41525
19	42.60	Total>	88.29	44.00w	284.89	202.51	202.51	43378
20	42.00	Total>	100.42	50.00w	305.42	220.00	220.00	45232
21	41.40	Total>	112.58	56.00w	325.98	237.24	237.24	47085
22	40.95	Total>	121.72	60.50w	341.42	250.04	250.04	48475
23	40.50	Total>	130.88	65.00w	356.88	262.76	262.76	49865

Run ID. Kpore_SLS02 Eu1000CuK01.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
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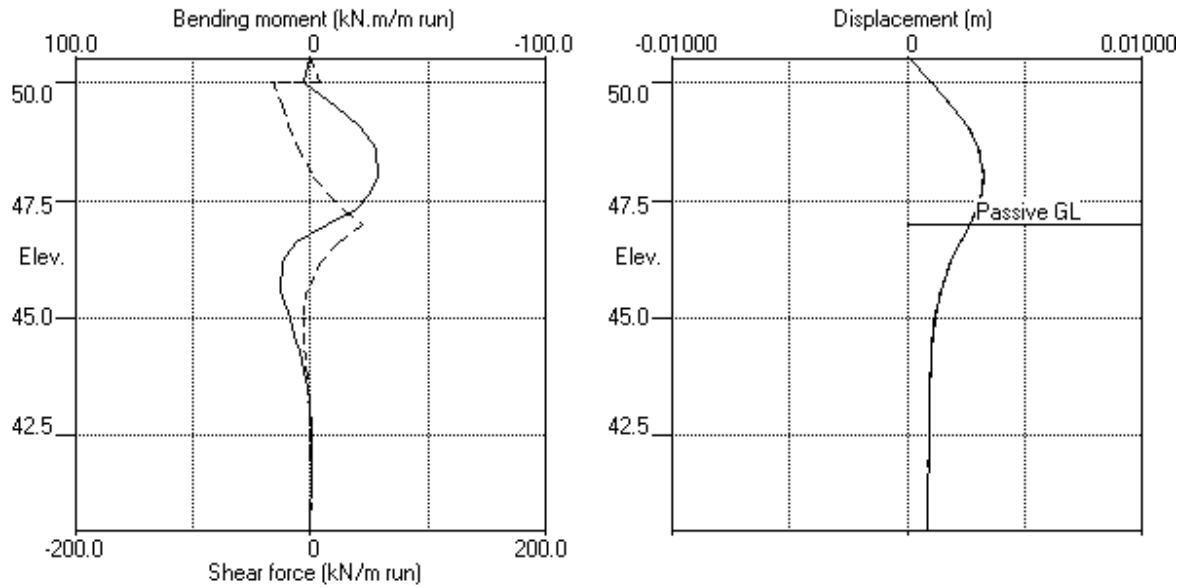
Stage No.7 Excavate to elevation 47.00 on PASSIVE side
Note: 19.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

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 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

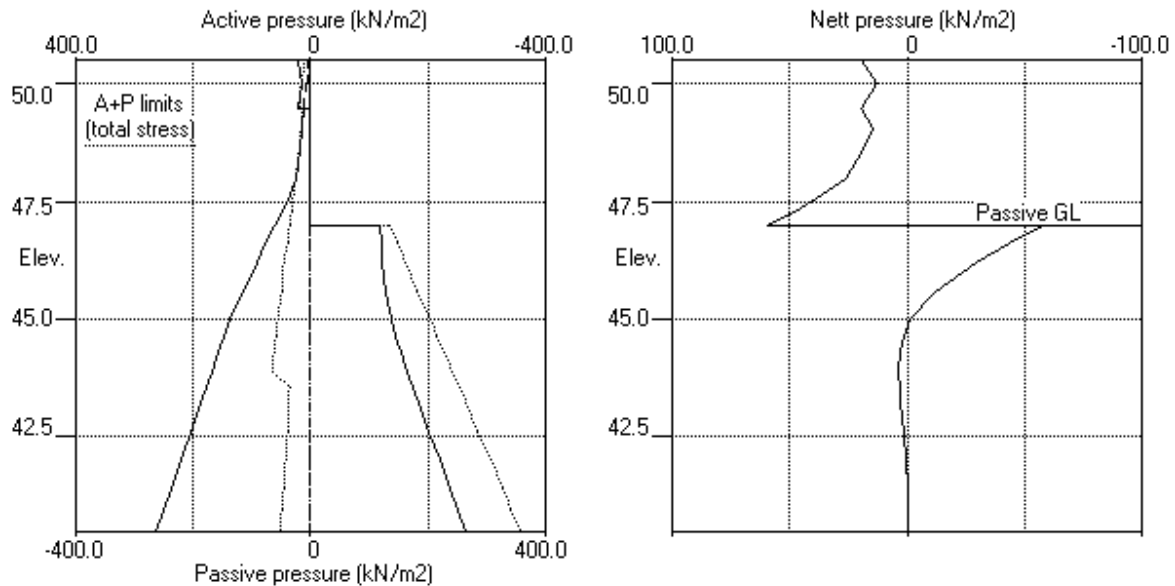
| Sheet No.
 | Job No. TWS8148
 | Made by : PJBW
 |
 | Date: 4-03-2014
 | Checked :

Units: kN,m

Stage No.7 Excav. to elev. 47.00 on PASSIVE side



Stage No.7 Excav. to elev. 47.00 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
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Data filename/Run ID: Kpore_SLS02 Eu1000CuK01.8	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Stage No. 10 Excavate to elevation 43.90 on PASSIVE side

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

			FoS for toe elev. = 40.50	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
10	50.50 43.90		More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 1000.00m
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

*** Wall displacements reset to zero at stage 2

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	50.50	15.68	0.000	-1.04E-03	0.0	0.0	
2	50.00	13.42	0.001	-1.06E-03	7.3	2.4	24.9
		13.42	0.001	-1.06E-03	-17.6	2.4	
3	49.50	20.75	0.002	-9.95E-04	-9.0	-4.4	
		17.30	0.002	-9.95E-04	-9.0	-4.4	
4	49.05	27.54	0.002	-8.12E-04	1.1	-6.9	
5	48.60	35.90	0.002	-6.20E-04	15.3	-3.8	
6	48.00	41.16	0.003	-6.40E-04	38.4	14.5	
7	47.65	43.44	0.003	-9.11E-04	53.2	30.6	
8	47.30	42.68	0.003	-1.46E-03	68.3	52.1	163.1
		42.68	0.003	-1.46E-03	-94.8	52.1	
9	47.00	40.40	0.004	-1.91E-03	-82.3	25.7	
10	46.60	39.00	0.005	-2.06E-03	-66.4	-4.9	
11	46.20	43.00	0.005	-1.78E-03	-50.0	-28.6	
12	45.60	49.00	0.006	-8.09E-04	-22.4	-51.6	
13	45.00	55.00	0.006	4.97E-04	8.8	-56.5	
14	44.65	58.50	0.006	1.24E-03	28.6	-50.0	
15	44.30	62.00	0.005	1.85E-03	49.7	-36.4	
16	43.90	85.45	0.005	2.22E-03	79.2	-8.7	
		-92.95	0.005	2.22E-03	79.2	-8.7	
17	43.55	-79.53	0.004	2.18E-03	49.0	13.3	
18	43.20	-66.50	0.003	1.91E-03	23.5	25.5	
19	42.60	-39.27	0.002	1.21E-03	-8.2	32.4	
20	42.00	-0.93	0.002	5.80E-04	-20.3	20.3	
21	41.40	14.40	0.001	2.39E-04	-16.3	8.0	
22	40.95	18.50	0.001	1.48E-04	-8.9	2.1	
23	40.50	20.89	0.001	1.28E-04	0.0	0.0	
At elev. 50.00 Strut force =				24.9 kN/strut =		24.9 kN/m run	
At elev. 47.30 Strut force =				163.1 kN/strut =		163.1 kN/m run	

Run ID: Kpore_SLS02 Eu1000CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

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Stage No.10 Excavate to elevation 43.90 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	25.00	7.13	115.97	15.68	15.68	12918
2	50.00	5.00	29.00	8.27	134.52	8.42	13.42	2680
3	49.50	10.00	33.00	9.41	153.08	10.75	20.75	2680
		Total>	43.00	10.00w	143.00	17.30	17.30	18834
4	49.05	Total>	52.00	14.50w	158.30	27.54	27.54	20021
5	48.60	Total>	61.00	19.00w	173.60	35.90	35.90	21207
6	48.00	Total>	73.00	25.00w	194.00	41.16	41.16	22789
7	47.65	Total>	80.00	28.50w	205.90	43.44	43.44	23712
8	47.30	Total>	87.00	32.00w	217.80	42.68	42.68	16832
9	47.00	Total>	93.00	35.00w	228.00	40.40	40.40	17373
10	46.60	Total>	101.00	39.00w	241.60	39.00	39.00a	18093
11	46.20	Total>	109.00	43.00w	255.20	43.00	43.00a	18814
12	45.60	Total>	121.00	49.00w	275.60	49.00	49.00a	19895
13	45.00	Total>	133.00	55.00w	296.00	55.00	55.00a	20976
14	44.65	Total>	140.00	58.50w	307.90	58.50	58.50a	21607
15	44.30	Total>	147.00	62.00w	319.80	62.00	62.00a	22237
16	43.90	Total>	155.00	66.00w	333.40	85.45	85.45	22958
17	43.55	Total>	162.00	34.75m	345.30	110.77	110.77	23588
18	43.20	Total>	169.00	36.50m	357.20	135.70	135.70	24219
19	42.60	Total>	180.99	39.50m	377.59	173.20	173.20	25300
20	42.00	Total>	192.99	42.50m	397.99	201.58	201.58	26381
21	41.40	Total>	204.99	45.50m	418.39	223.03	223.03	27462
22	40.95	Total>	213.99	47.75m	433.69	236.90	236.90	28273
23	40.50	Total>	222.99	50.00m	448.99	250.29	250.29	29083

Node no.	Y coord	----- PASSIVE side -----						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	Total earth pressure kN/m2	
1	50.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	49.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	49.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	48.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	47.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	47.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	47.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	46.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	46.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	45.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	44.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	44.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	178.40	178.40	178.40p	52904
17	43.55	Total>	7.00	3.50w	190.30	190.30	190.30p	54357
18	43.20	Total>	14.00	7.00w	202.20	202.20	202.20p	55810
19	42.60	Total>	26.02	13.00w	222.62	212.46	212.46	58301
20	42.00	Total>	38.05	19.00w	243.05	202.50	202.50	60792
21	41.40	Total>	50.11	25.00w	263.51	208.63	208.63	63283
22	40.95	Total>	59.17	29.50w	278.87	218.40	218.40	65151
23	40.50	Total>	68.26	34.00w	294.26	229.39	229.39	67020

Run ID. Kpore_SLS02 Eu1000CuK01.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

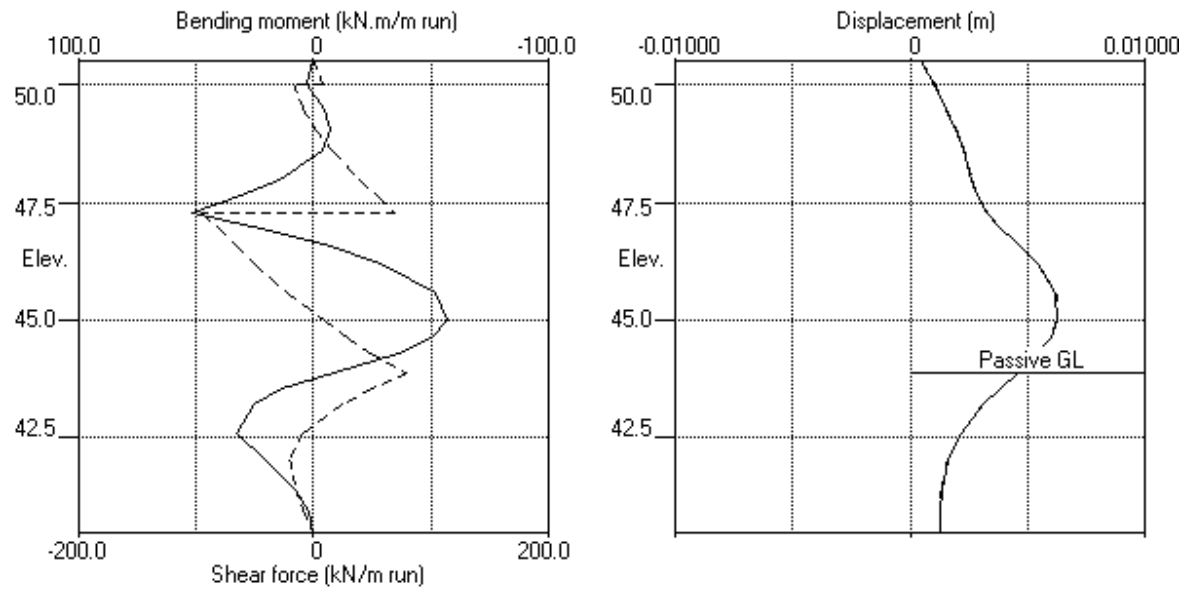
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| Date: 4-03-2014
| Checked :

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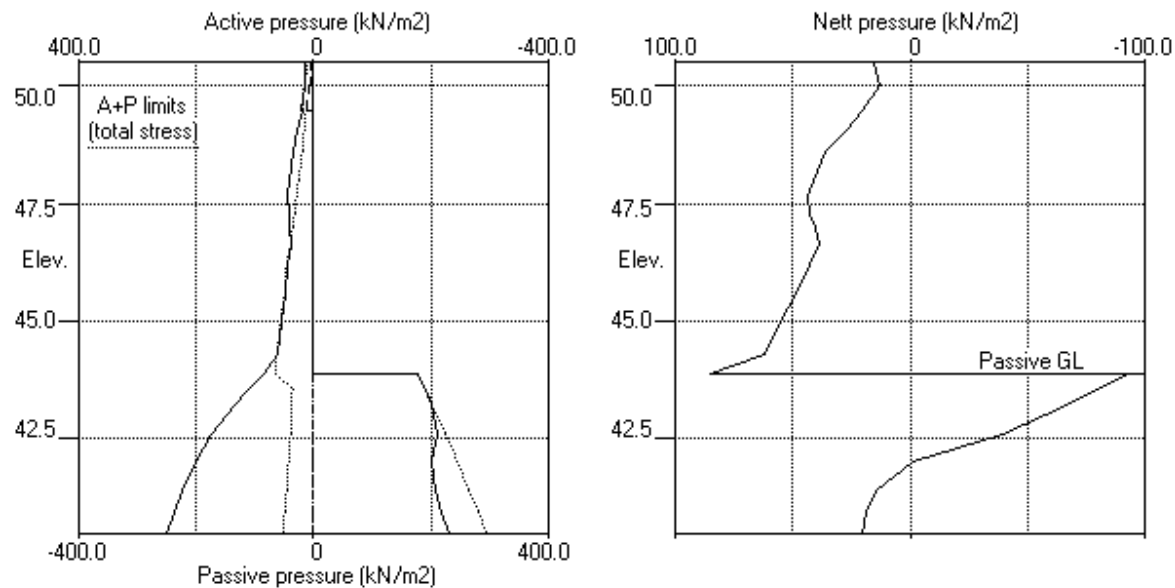
Stage No.10 Excavate to elevation 43.90 on PASSIVE side
Note: 62.00a Soil pressure at active limit
202.20p Soil pressure at passive limit

Units: kN,m

Stage No.10 Excav. to elev. 43.90 on PASSIVE side



Stage No.10 Excav. to elev. 43.90 on PASSIVE side



			FoS for toe elev. = 40.50		Toe elev. for FoS = 1.000		
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr- ation	
1	50.50	50.50	Cant.	10.023	41.29	49.96	0.54
2	50.50	50.50	No analysis at this stage				
3	50.50	50.50	No analysis at this stage				
4	50.50	49.50	Cant.	6.076	41.23	48.80	0.70
5	50.50	49.50	No analysis at this stage				
6	50.50	49.50	No analysis at this stage				
7	50.50	47.00	50.00	4.263	n/a	46.66	0.34
8	50.50	47.00	No analysis at this stage				
All remaining stages have more than one strut - FoS calculation n/a							

A.K.A. LTD.	Sheet No.
Program: WALLAP Version 6.05 Revision A44.B58.R48	Job No. TWS8148
Licensed from GEOSOLVE	Made by : PJBW
Data filename/Run ID: Kpore_SLS02 Eu1000CuK01.8	
Kidderpore Ave, 3	Date: 4-03-2014
SLS type undrained calculation, zero-pile option	Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 1000.00m
 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	50.50	0.001	0.000	0.0	0.0	0.0	0.0
2	50.00	0.001	0.000	3.0	0.0	8.3	-32.0
3	49.50	0.002	0.000	5.9	-11.1	13.9	-23.8
4	49.05	0.003	0.000	9.5	-21.0	4.2	-18.3
5	48.60	0.003	0.000	9.7	-27.8	17.0	-10.7
6	48.00	0.003	0.000	17.2	-28.3	40.3	-4.7
7	47.65	0.003	0.000	34.0	-25.5	55.4	-4.8
8	47.30	0.003	0.000	56.5	-18.3	71.9	-112.8
9	47.00	0.004	0.000	25.7	-7.5	44.7	-97.3
10	46.60	0.005	0.000	5.8	-10.3	24.3	-74.8
11	46.20	0.006	0.000	12.0	-35.8	9.7	-50.2
12	45.60	0.006	0.000	12.6	-54.8	0.0	-22.4
13	45.00	0.006	0.000	8.9	-56.5	37.0	-6.5
14	44.65	0.006	0.000	6.6	-50.0	66.1	-6.4
15	44.30	0.006	0.000	4.4	-36.4	96.9	-26.2
16	43.90	0.005	0.000	2.5	-8.7	79.2	-4.2
17	43.55	0.005	0.000	13.3	0.0	49.0	-2.9
18	43.20	0.004	0.000	25.5	0.0	23.5	-1.8
19	42.60	0.004	0.000	32.4	-0.2	0.0	-8.2
20	42.00	0.003	0.000	20.3	-0.2	0.1	-20.3
21	41.40	0.002	0.000	8.0	-0.1	0.2	-16.3
22	40.95	0.002	0.000	2.1	-0.0	0.1	-8.9
23	40.50	0.001	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.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	5.3	49.05	-0.1	45.00	6.8	49.50	-2.6	47.65
2	No calculation at this stage							
3	No calculation at this stage							
4	9.7	48.60	-0.2	45.00	13.9	49.50	-4.8	47.65
5	No calculation at this stage							
6	No calculation at this stage							
7	12.6	45.60	-28.3	48.00	44.7	47.00	-32.0	50.00
8	No calculation at this stage							
9	No calculation at this stage							
10	52.1	47.30	-56.5	45.00	79.2	43.90	-94.8	47.30
11	No calculation at this stage							
12	No calculation at this stage							
13	No calculation at this stage							
14	56.5	47.30	-54.8	45.60	96.9	44.30	-112.8	47.30

Run ID. Kpore_SLS02 Eu1000CuK01.8
 Kidderpore Ave, 3
 SLS type undrained calculation, zero-pile option

| Sheet No.
 | Date: 4-03-2014
 | Checked :

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.001	50.50	0.000	50.50	Apply surcharge no.1 at elev. 50.50
2	Wall displacements reset to zero				Change EI of wall to 24785kN.m2/m run
3	No calculation at this stage				Apply water pressure profile no.1
4	0.001	50.50	0.000	50.50	Excav. to elev. 49.50 on PASSIVE side
5	No calculation at this stage				Install strut no.1 at elev. 50.00
6	No calculation at this stage				Apply water pressure profile no.2
7	0.003	48.00	0.000	50.50	Excav. to elev. 47.00 on PASSIVE side
8	No calculation at this stage				Install strut no.2 at elev. 47.30
9	No calculation at this stage				Apply water pressure profile no.3
10	0.006	45.00	0.000	50.50	Excav. to elev. 43.90 on PASSIVE side
11	No calculation at this stage				Install strut no.3 at elev. 44.30
12	No calculation at this stage				Change soil type 2 to soil type 3
13	No calculation at this stage				Apply water pressure profile no.4
14	0.006	45.00	0.000	50.50	Apply surcharge no.4 at elev. 43.90

Strut forces at each stage (horizontal components)

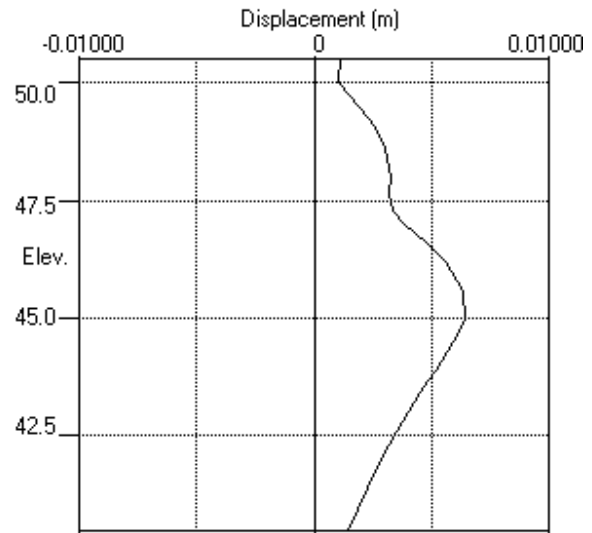
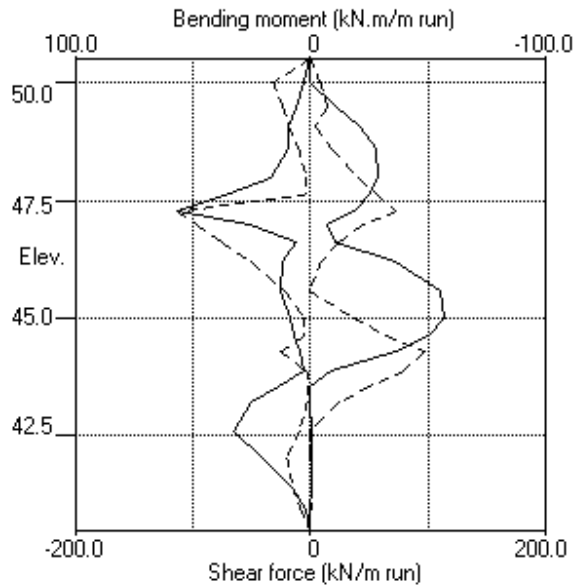
Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 50.00		at elev. 47.30		at elev. 44.30	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
7	40.37	40.37	---	---	---	---
10	24.85	24.85	163.08	163.08	---	---
14	23.93	23.93	184.62	184.62	123.14	123.14

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Program: WALLAP Version 6.05 Revision A44.B58.R48
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Data filename/Run ID: Kpore_SLS02 Eu1000CuK01.8
Kidderpore Ave, 3
SLS type undrained calculation, zero-pile option

| Sheet No.
| Job No. TWS8148
| Made by : PJBW
|
| Date: 4-03-2014
Checked :

Units: kN,m

Bending moment, shear force, displacement envelopes



APPENDIX C

Structural Calculations for Construction



STRUCTURAL CALCULATIONS FOR CONSTRUCTION

Project:
3 Kidderpore Avenue
LONDON NW3

Job No: 8148

Rev. A / ICT / 25.03.2014 – Revised for construction

3 Dufferin Avenue,
Barbican, London, EC1Y 8PQ

T: 020 7253 2626
F: 020 7253 2767

E: tw@tw.uk.com
W: www.tw.uk.com

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8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



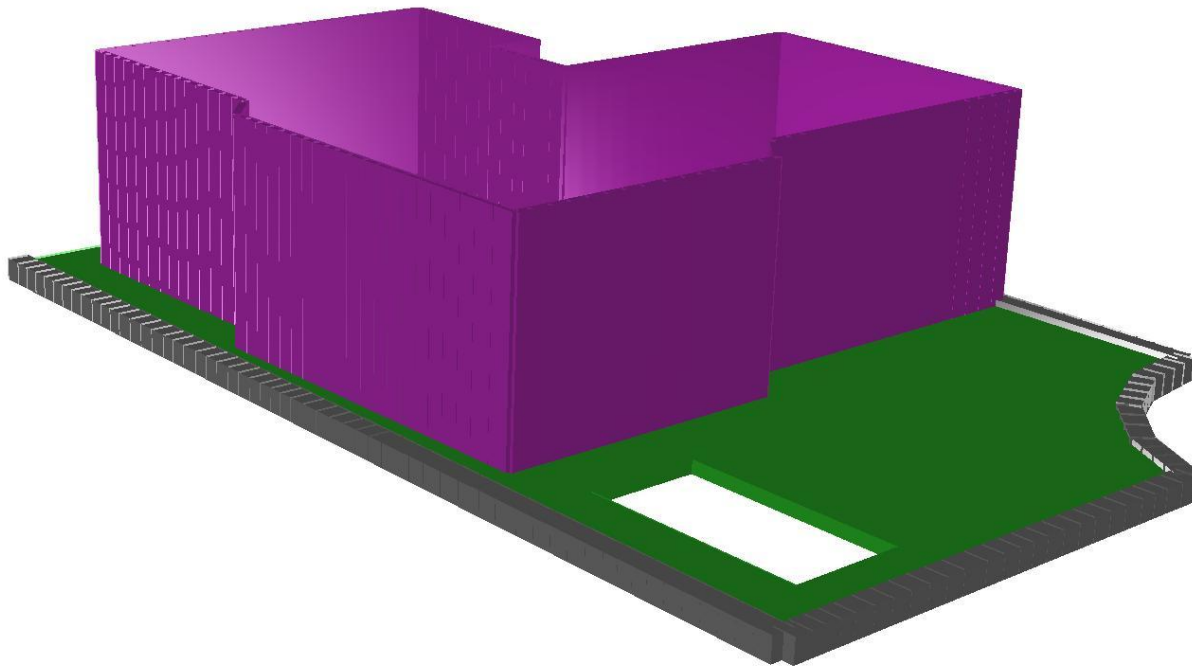
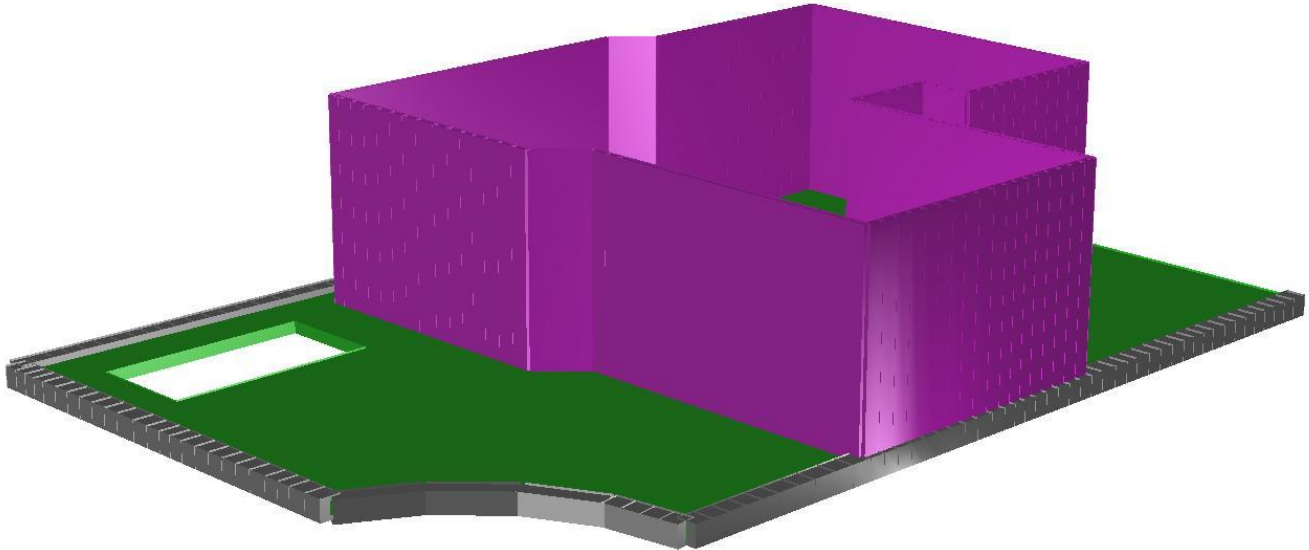
CONTENTS

1. Model Representation of the Front Slab and Building Relation
2. Loading
3. Front Block GF Level Slab
4. Garden Block GF Level Slab
5. Garden Block Basement Level Slab
6. Retaining Wall Design

Job No	Description	Page:	2
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

1. MODEL REPRESENTATION OF THE FRONT SLAB AND BUILDING RELATION

Walls are not considered as a structural member in the analysis models.



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		By:	I. Tozluoglu
		Checked:	U. Mizrahi



2. LOADING

2.1. Dead Loads

Dead Loads from Existing Building

Floors

Boards & Joists	: 0.35kN/m ²
Soffite	: 0.15kN/m ²
Light Weight Partitions	: 1.00kN/m ²
Total	: 1.50kN/m ²

Pitch Roofs

Tiles	: 0.6kN/m ²
Battens and Felt	: 0.1kN/m ²
Rafters	: 0.15kN/m ²
Total	: 0.85kN/m ²

Existing Brick Wall Density: 18kN/m³

Dead Loads for New Slabs

Garden Slab

Finishes and soil	: 6.00kN/m ²	
Insulation and water proofing	: 0.50kN/m ²	:
Ceiling and services	: 0.50kN/m ²	
Total	: 7.00kN/m ²	

Basement Slab

Finishes	: 2.00kN/m ²
----------	-------------------------

Selfweight of slabs has been automatically added by the software.

RC Slab Density: 25kN/m²

2.2. Imposed Loads

All Residential Areas : 1.5kN/m²

Garden Ground Floor Level Slab : 5.0kN/m²

Front Slab, Area by the road (construction phase): 20kN/m²

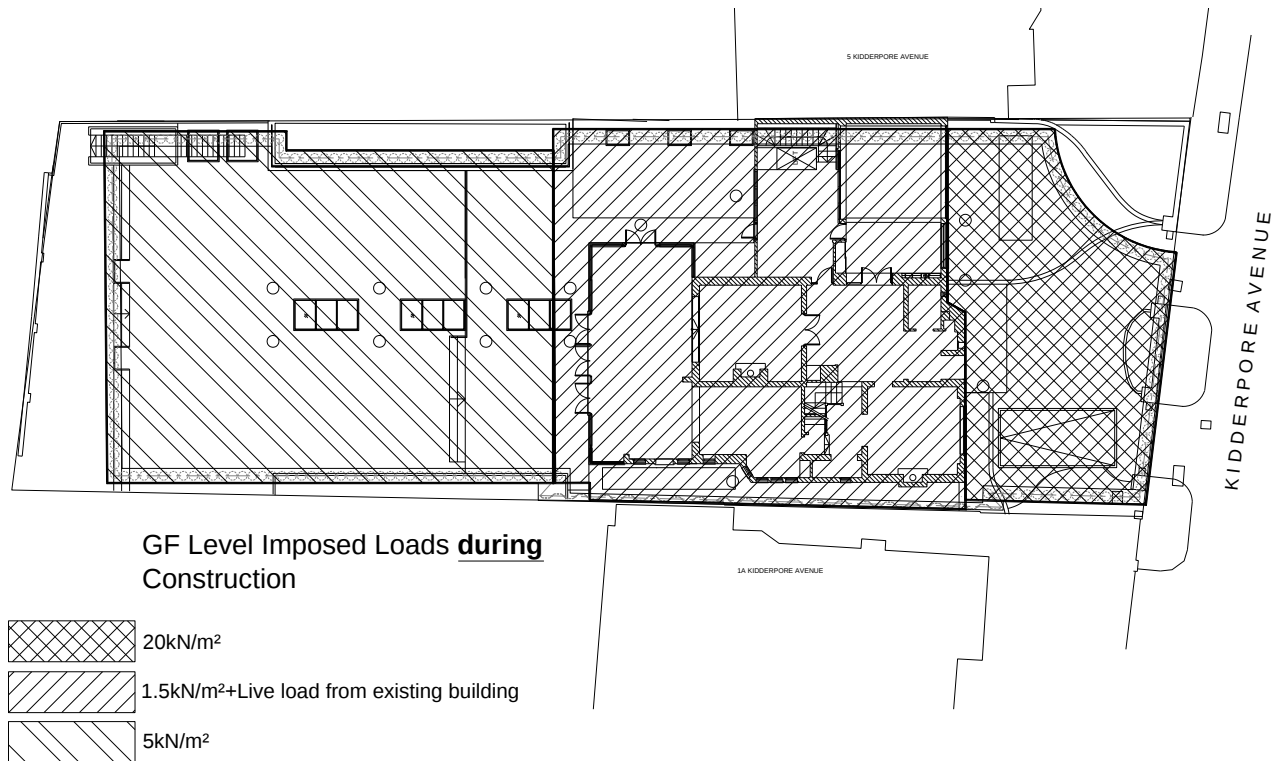
Front Slab, Rear Garden (construction phase) : 5.0kN/m²

1.2m Deep Pool Water : 12kN/m²

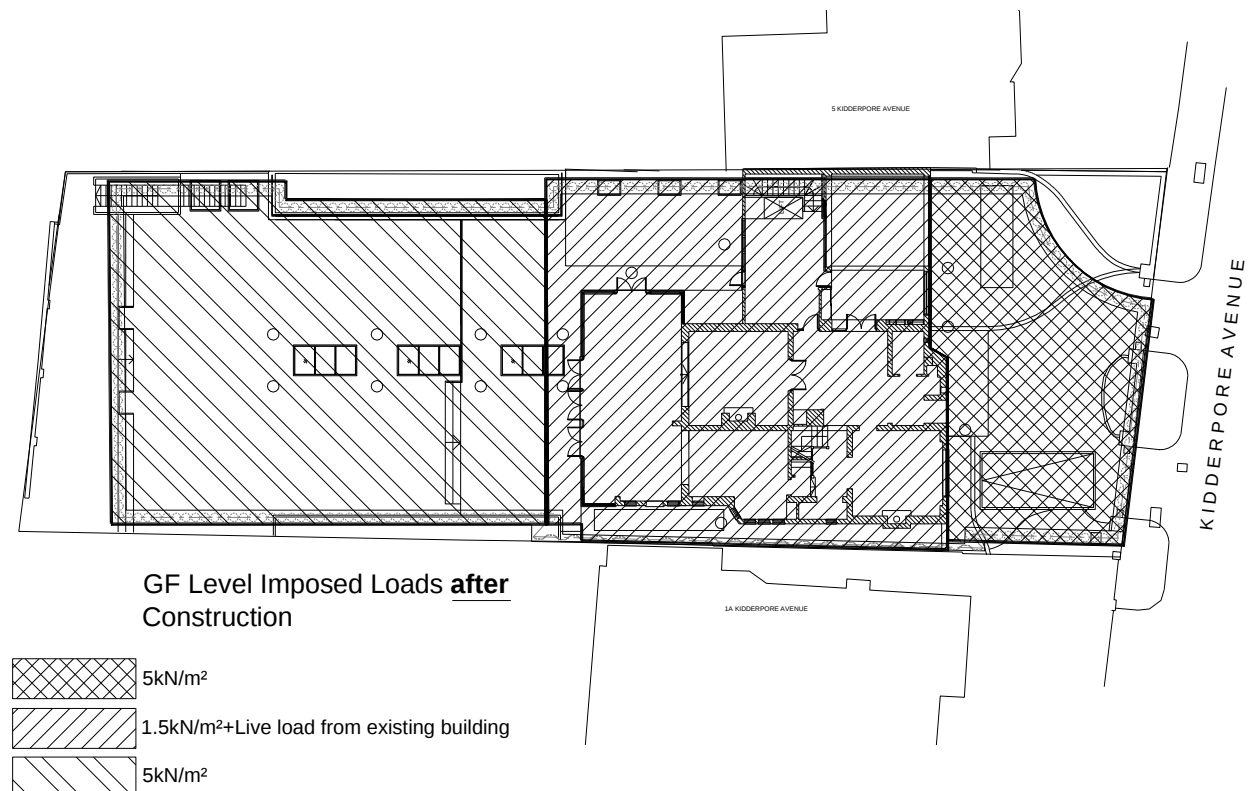
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		By:	I. Tozluoglu
		Checked:	U. Mizrahi

2.3. Loading Schedule

2.3.1. Imposed Loads for Ground Floor Level Slab During Construction



2.3.1. Imposed Loads for Ground Floor Level Slab After Construction

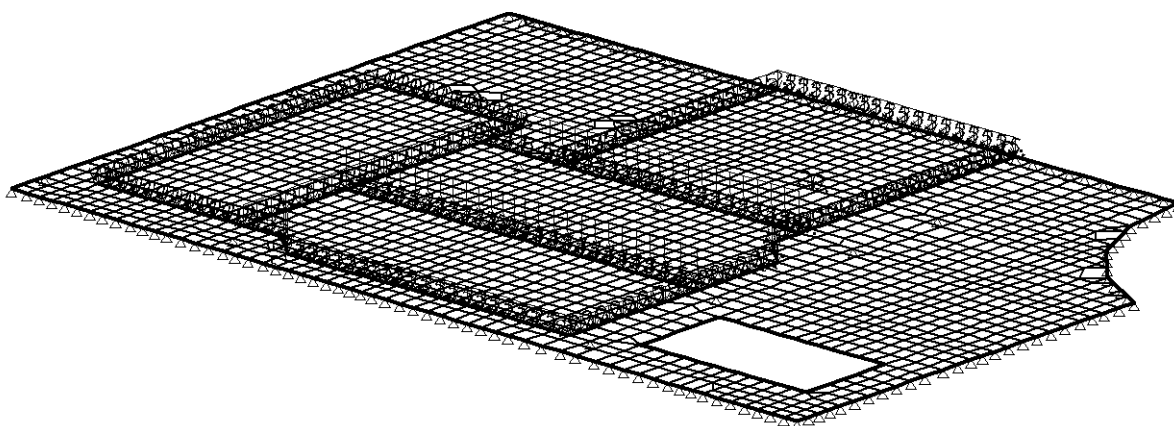


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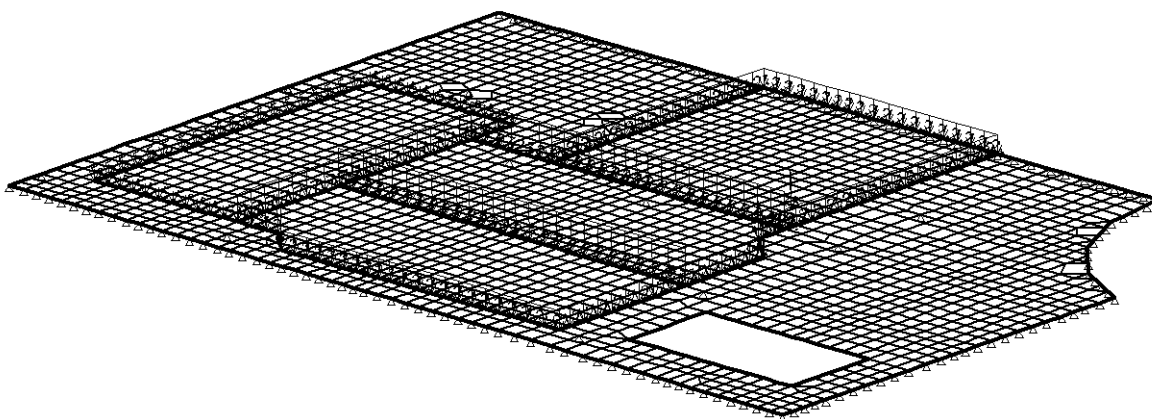
3. FRONT BLOCK GF LEVEL SLAB

3.1. Loading

3.1.1. Dead Loads from Existing Building

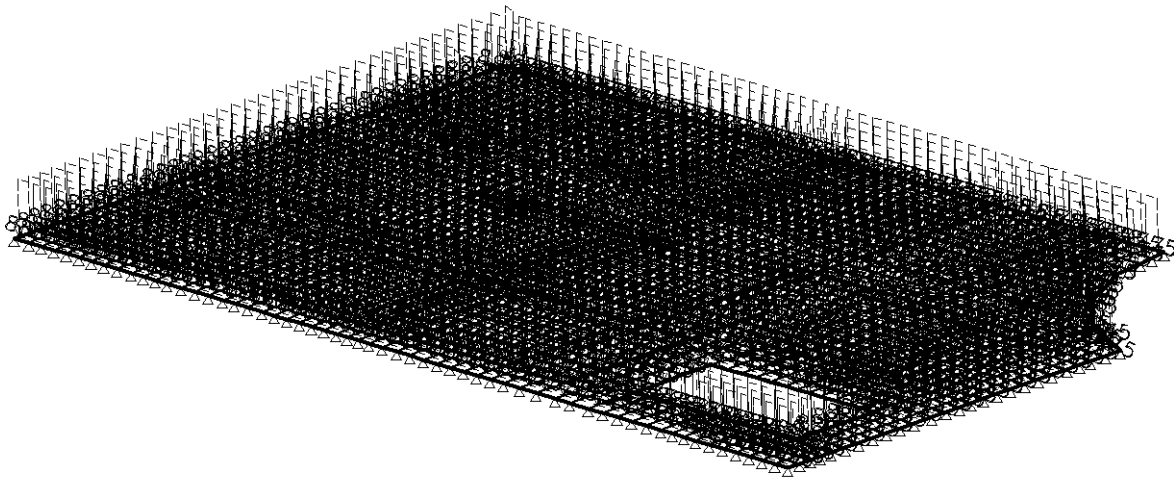


3.1.2. Live Loads from Existing Building



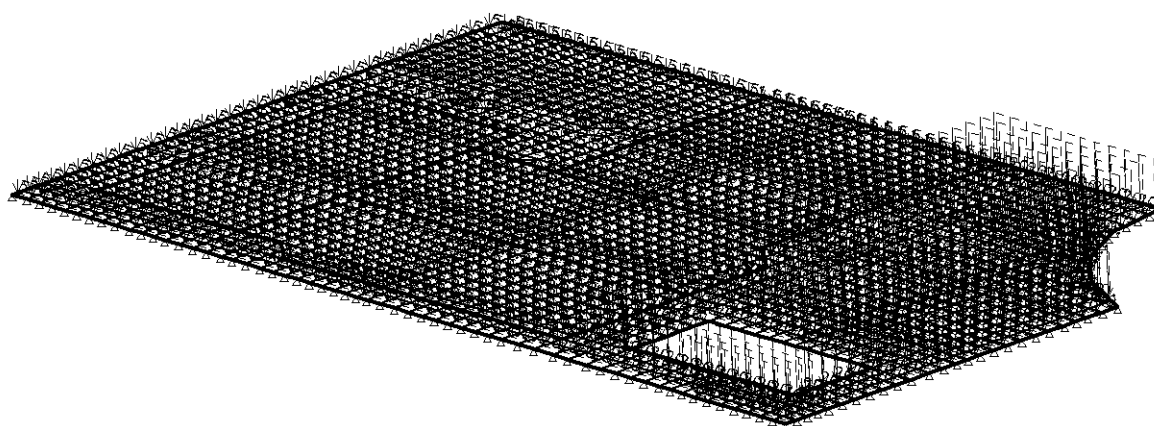
Job No	Description	Page:	6
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

3.1.3. Self-weight Loads from Existing Building

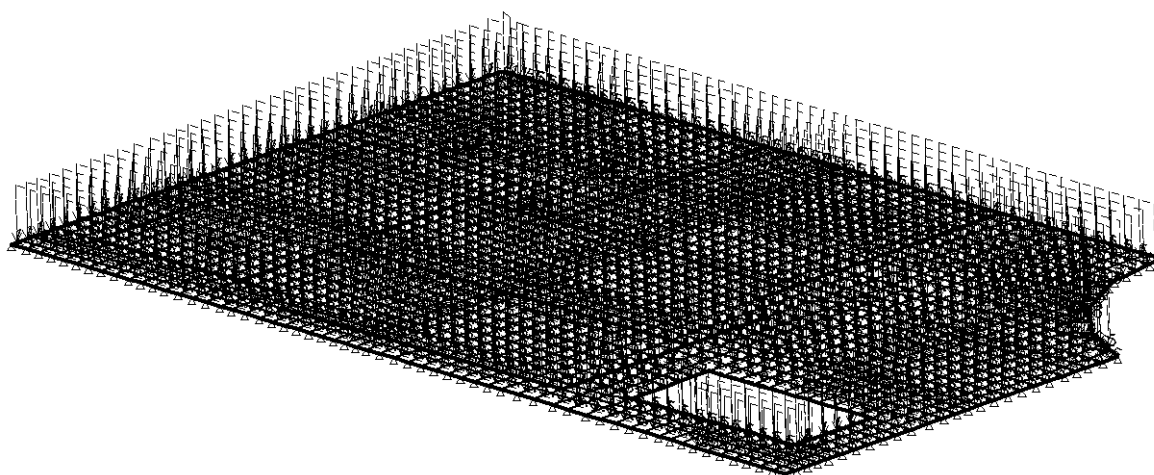


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		By:	I. Tozluoglu
		Checked:	U. Mizrahi

3.1.4. Live Loads During Construction



3.1.5. Dead Loads During Construction



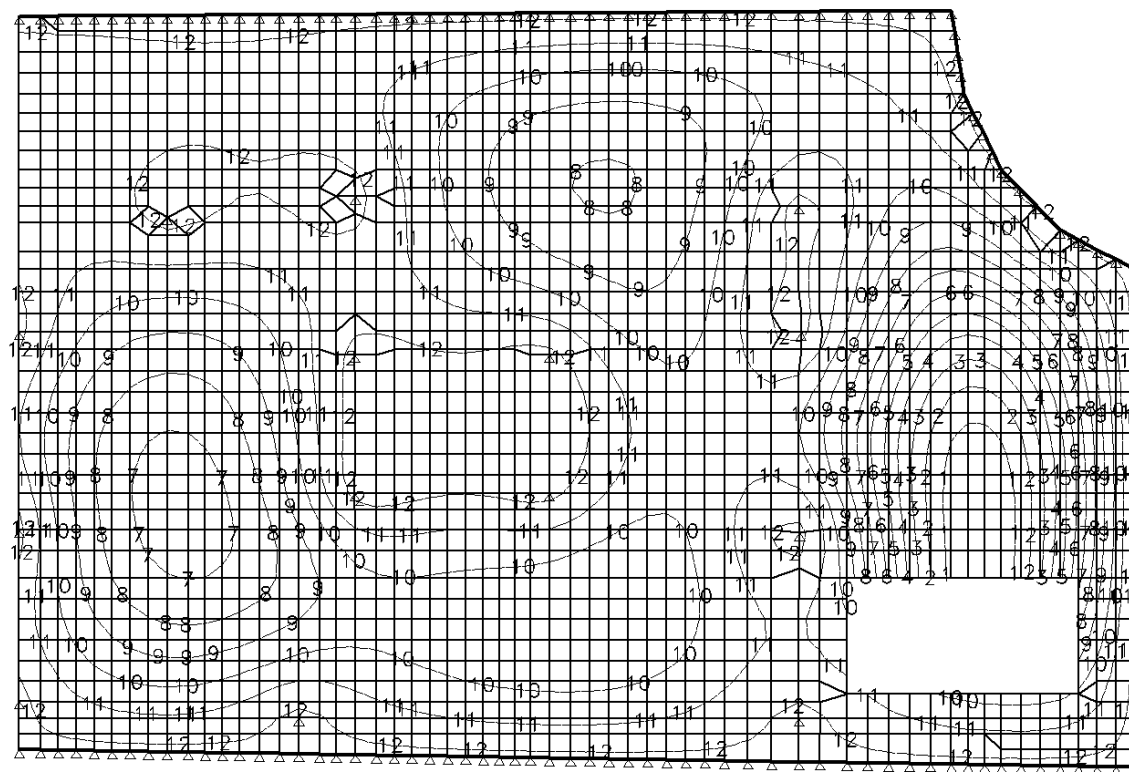
Job No	Description	Page:	8
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		Checked:	U. Mizrahi



3.2. Deflections

Immediate Deflections during Construction

(Dead Load + Live Load)



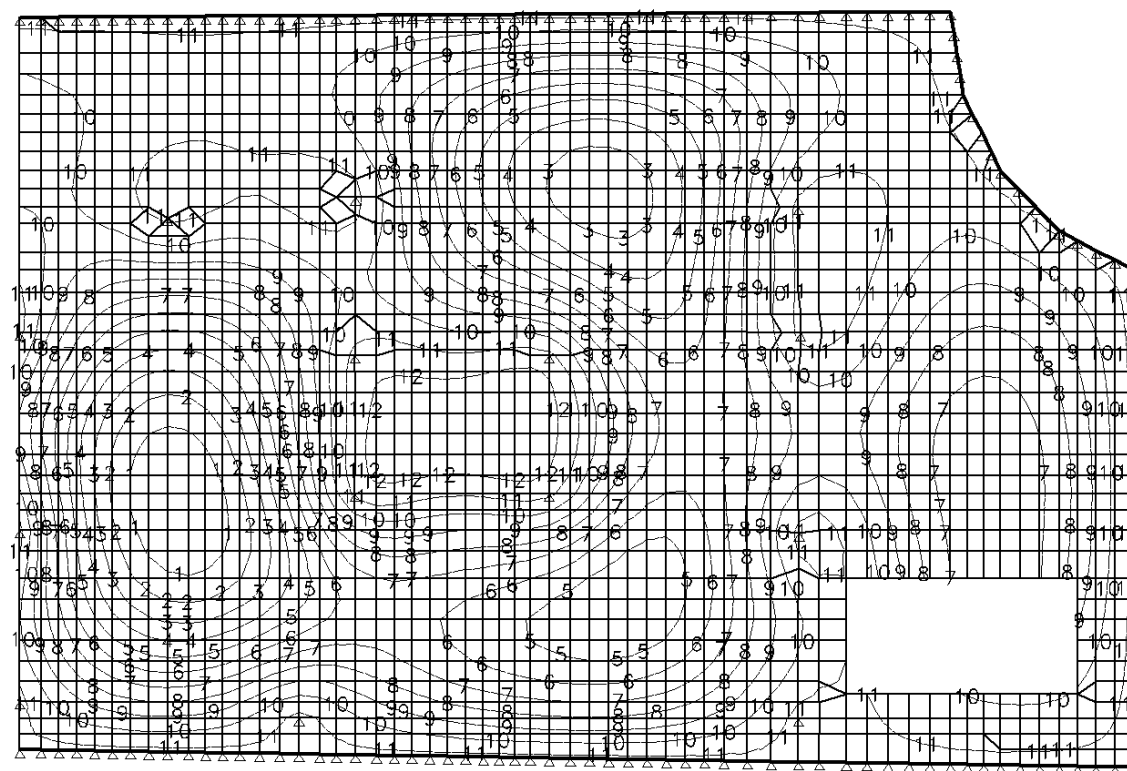
LINE	VALUE
min	-8.82
1	-8.10
2	-7.38
3	-6.66
4	-5.94
5	-5.22
6	-4.50
7	-3.78
8	-3.06
9	-2.34
10	-1.62
11	-0.90
12	-0.18
max	0.54

IMMEDIATE DEFLECTION COMB. NO. 2 1*II+1*II

Job No	Description	Page:	9
8148	3 Kidderpore Avenue	Date:	17.02.11
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		Checked:	U. Mizrahi



Long Term Deflections after Construction



LINE	VALUE
min	-12.4
1	-11.3
2	-10.2
3	-9.1
4	-8.0
5	-6.9
6	-5.8
7	-4.7
8	-3.6
9	-2.5
10	-1.4
11	-0.3
12	0.8
max	1.9

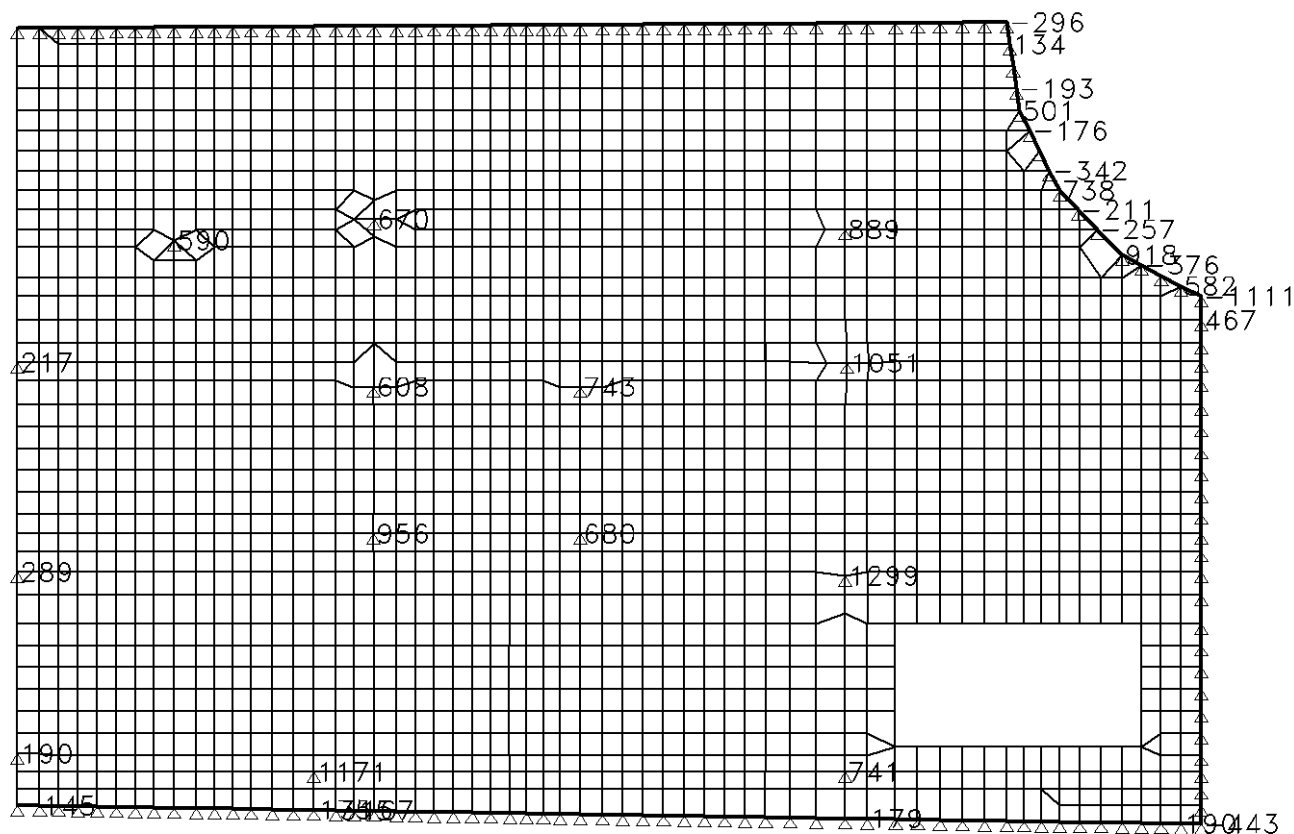
SLAB DEFLECTIONS COMB. NO. 4 1*1.00+4*1.00+5*1.00

Job No	Description	Page:	10
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



3.3. Pile Support Reactions

Dead Load + Live Load during Construction



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		By:	I. Tozluoglu
		Checked:	U. Mizrahi

3.4. RC Slab Reinforcement Design

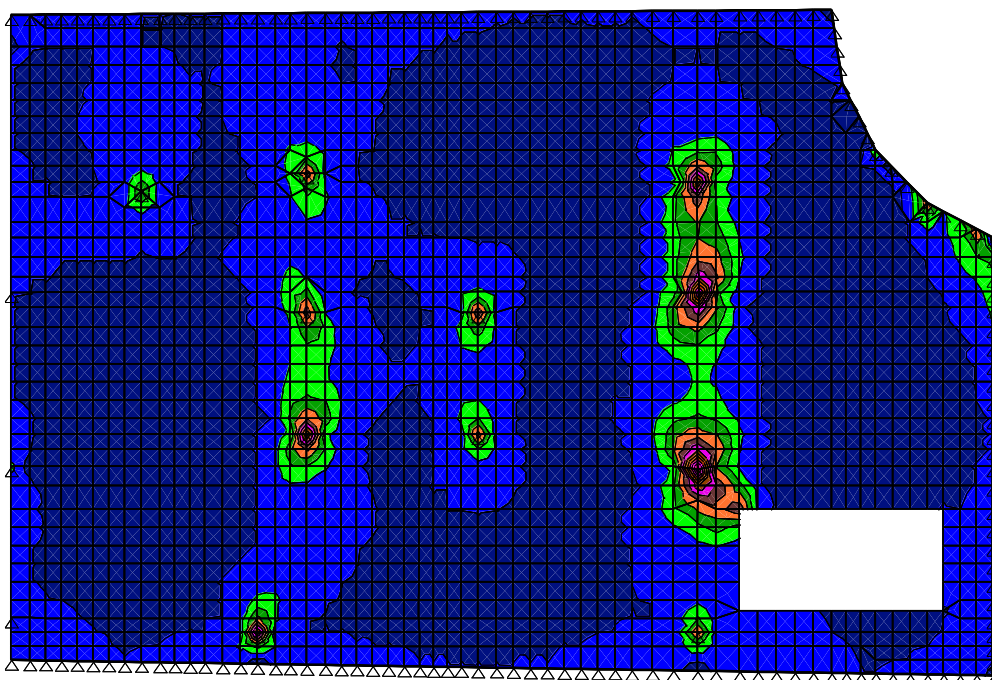
Unit: mm²/m

Loading: 1.35DL + 1.5LL

Design according to EC2

X Direction Top Reinforcement

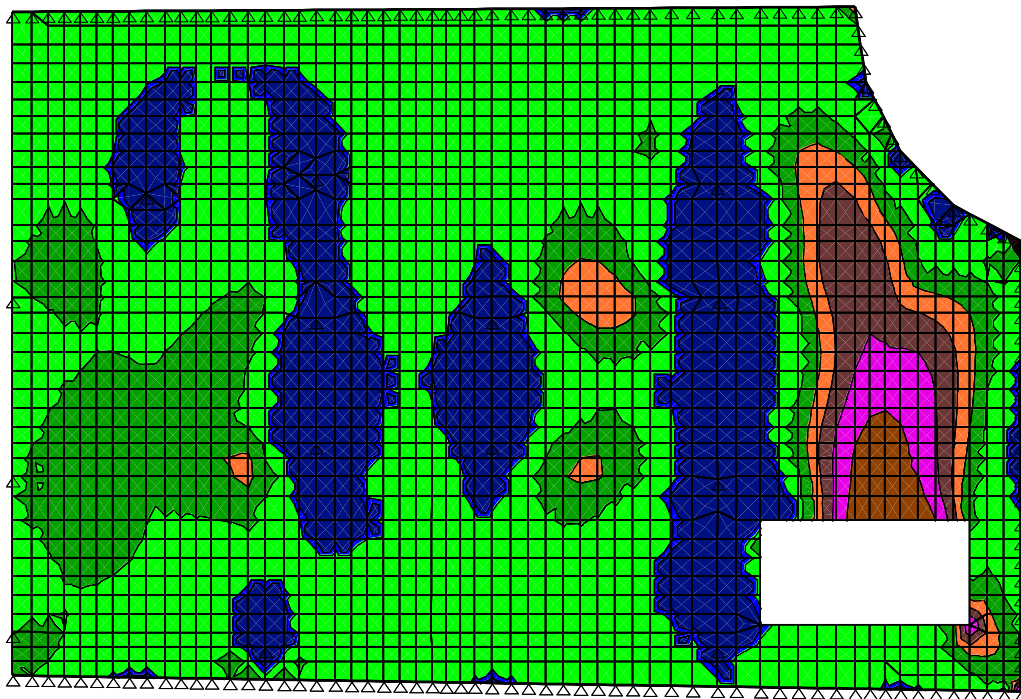
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3	1169
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5	1948
6	2338
7	2727
8	3117
9	3507
10	3896
11	4286
12	4676
13	5065



Job No	Description	Page:	12
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X Direction Bottom Reinforcement

LINE	VALUE
195	
391	
586	
782	
977	
1173	
1368	
1564	
1759	
1955	
2150	
2346	
2541	

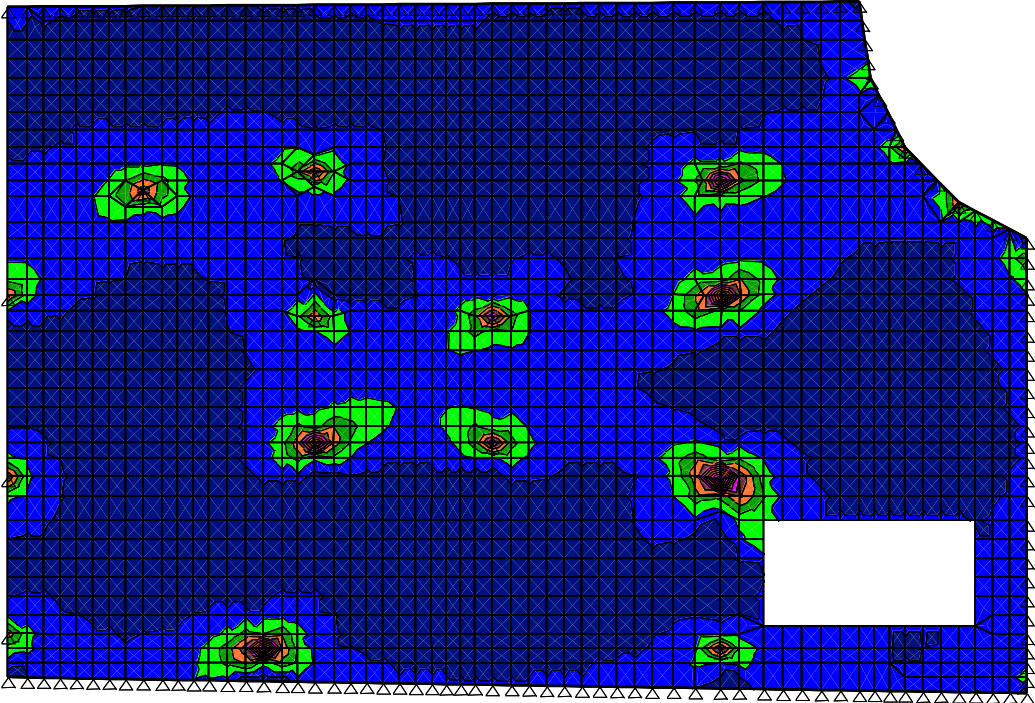


Job No	Description	Page:	13
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Y Direction Top Reinforcement

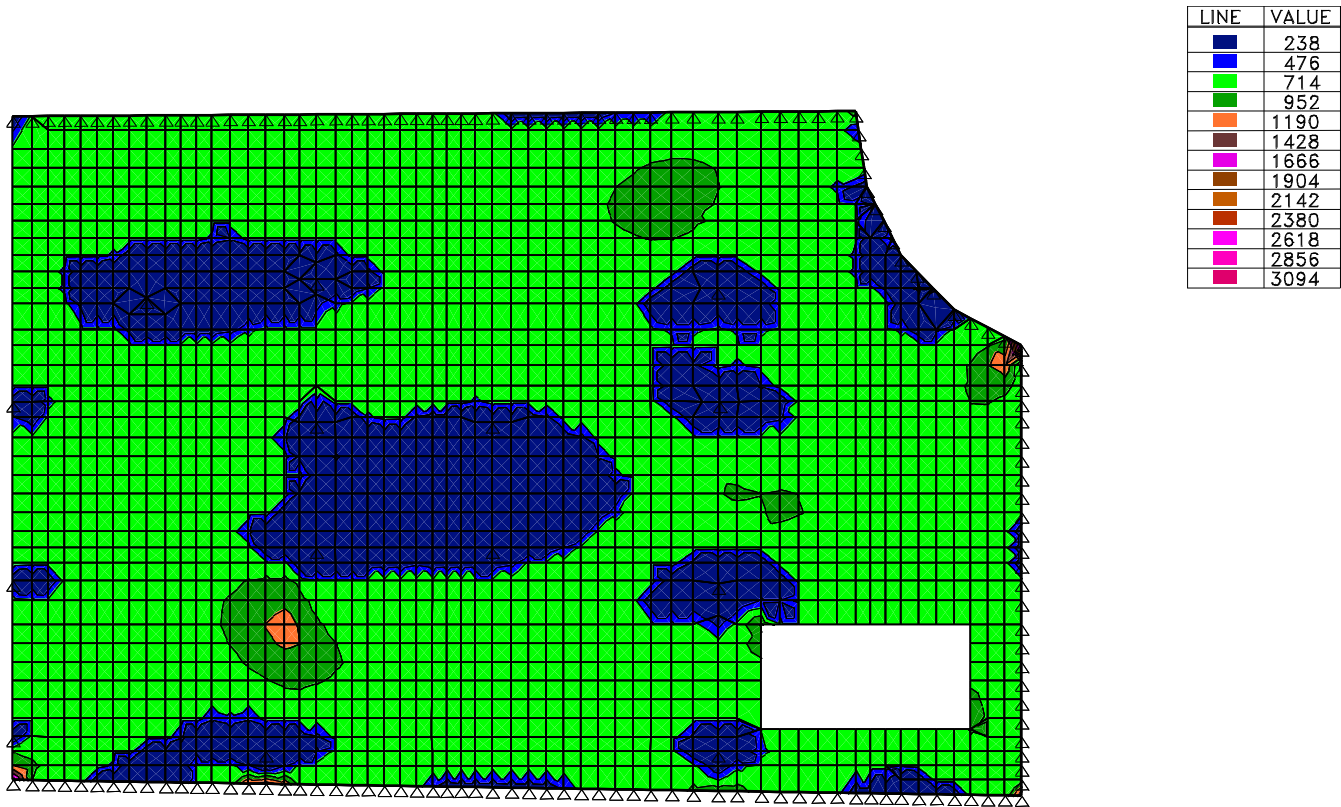
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	648
	973
	1297
	1622
	1946
	2270
	2595
	2919
	3244
	3568
	3892
	4217



Job No	Description	Page:	14
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Y Direction Bottom Reinforcement



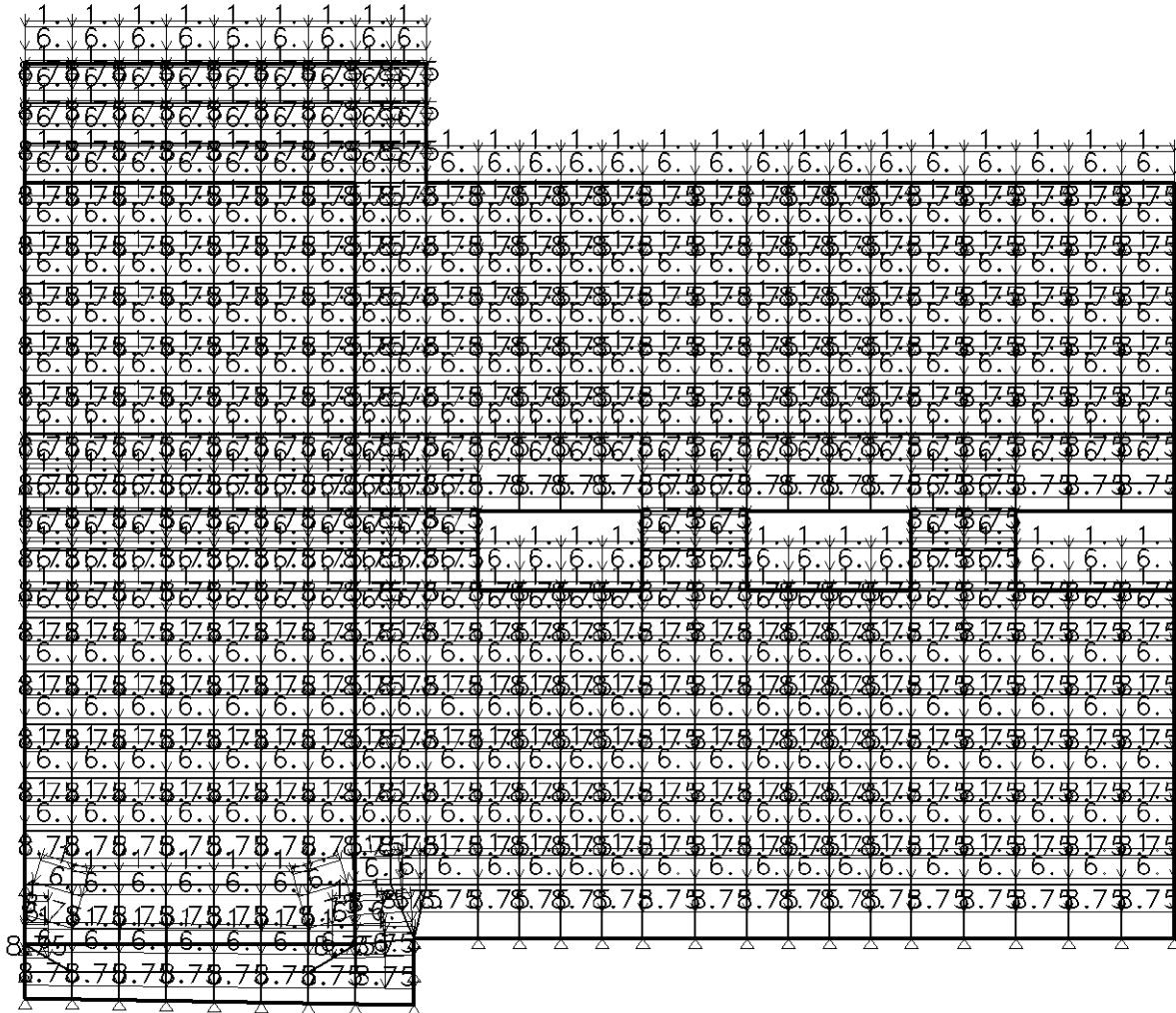
Job No	Description	Page:	15
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



4. Garden Block GF Level Slab

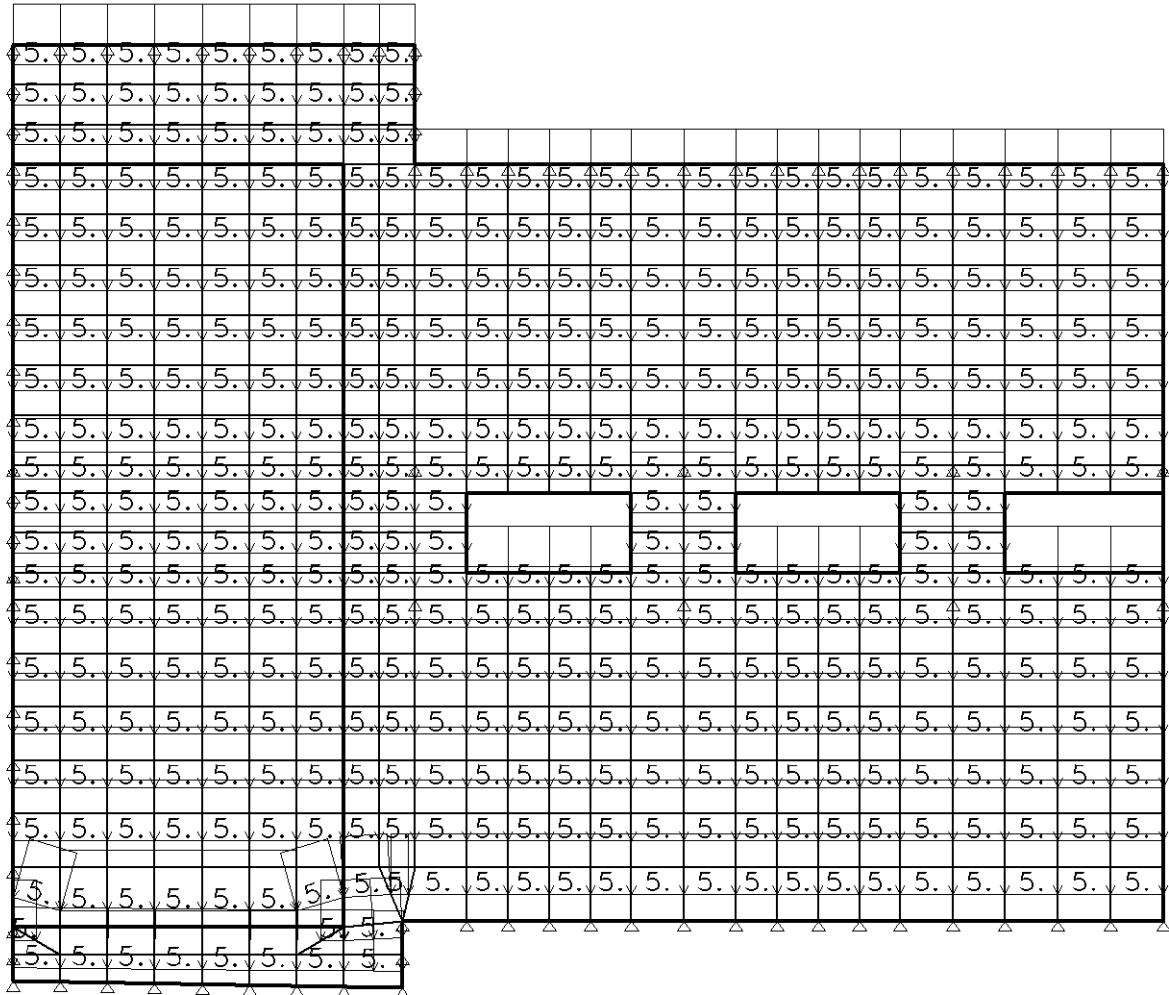
4.1. Loading

4.1.1. Dead Loads (inc. Self-weight)



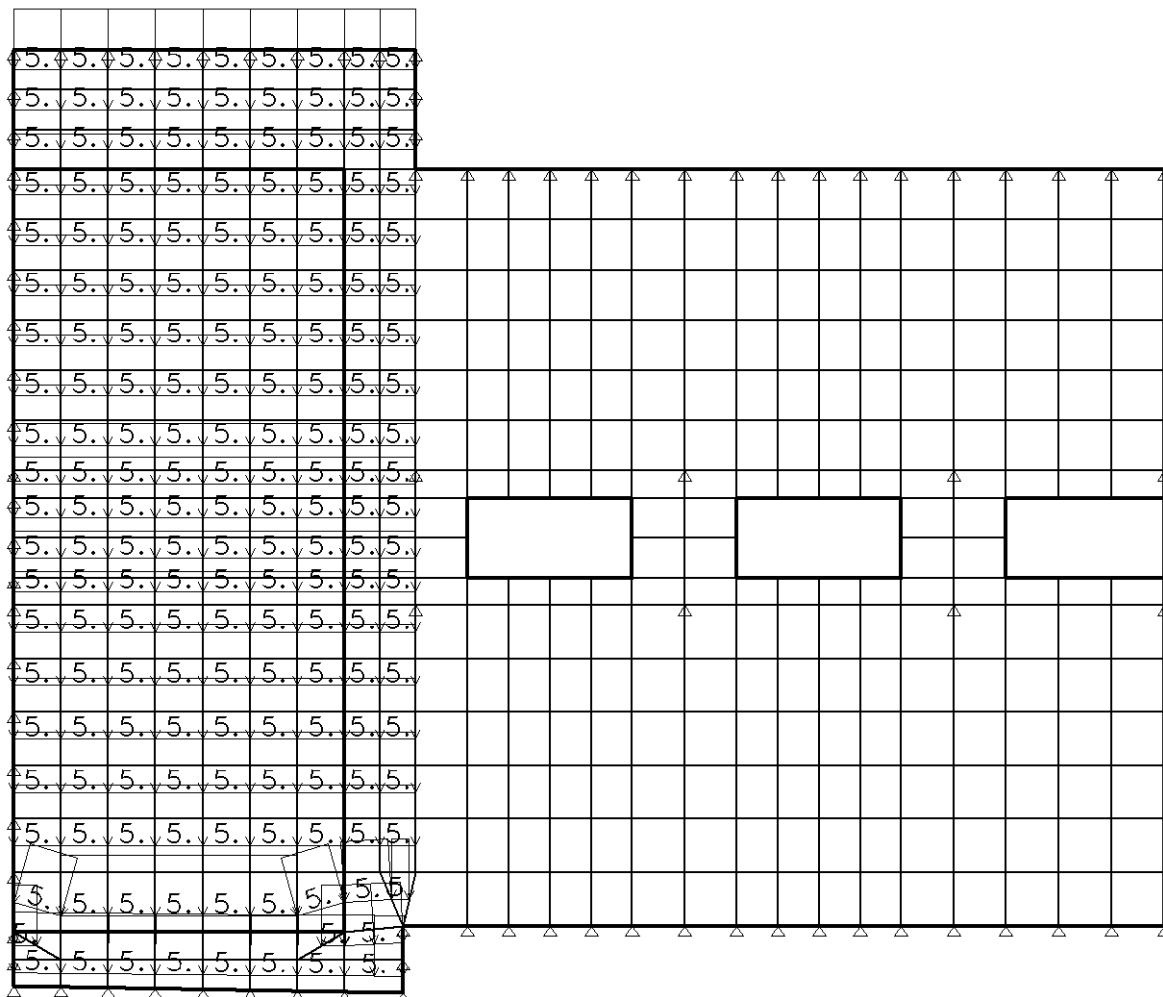
Job No	Description	Page:	16
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

4.1.2. Live Load 1



Job No	Description	Page:	17
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

4.1.3. Live Load 2



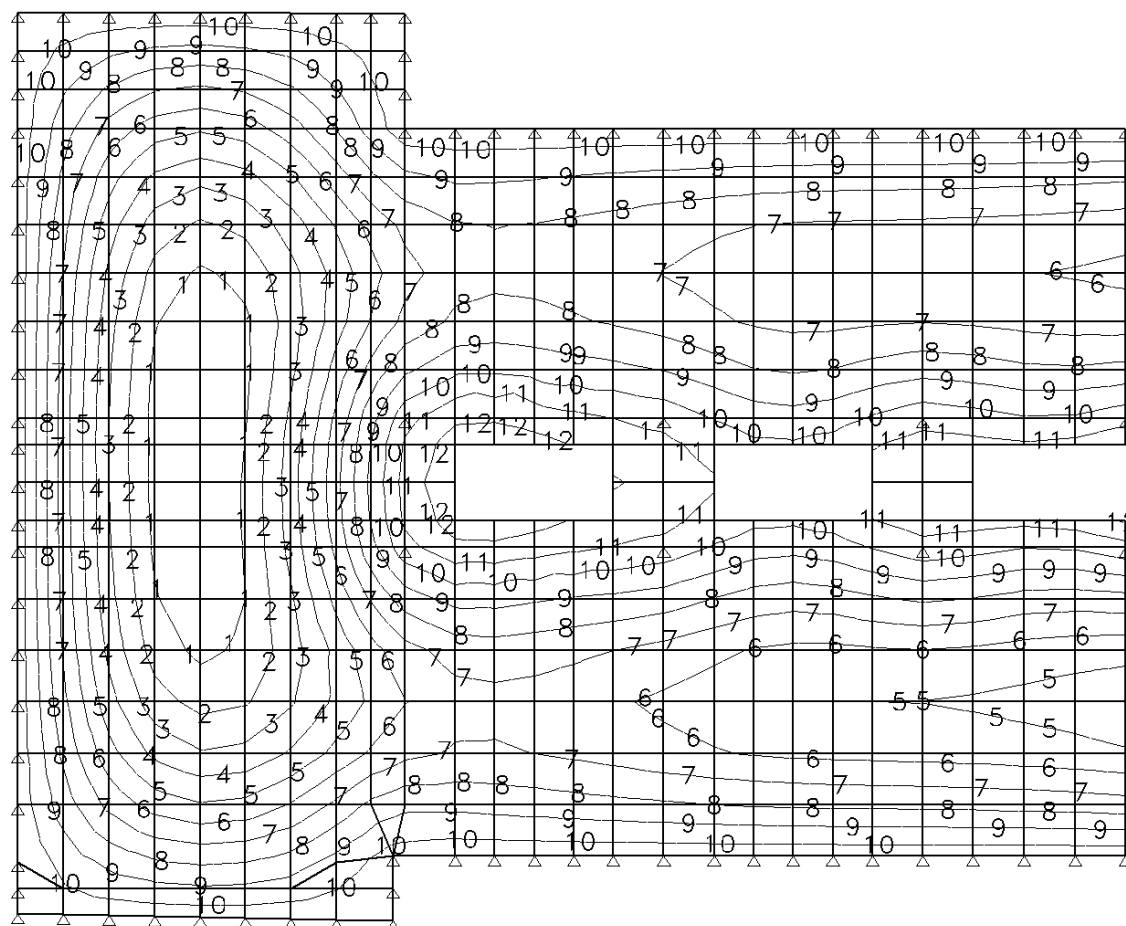
Job No	Description	Page:	18
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



4.2. Deflections

Immediate Deflections

(Dead Load + Live Load)



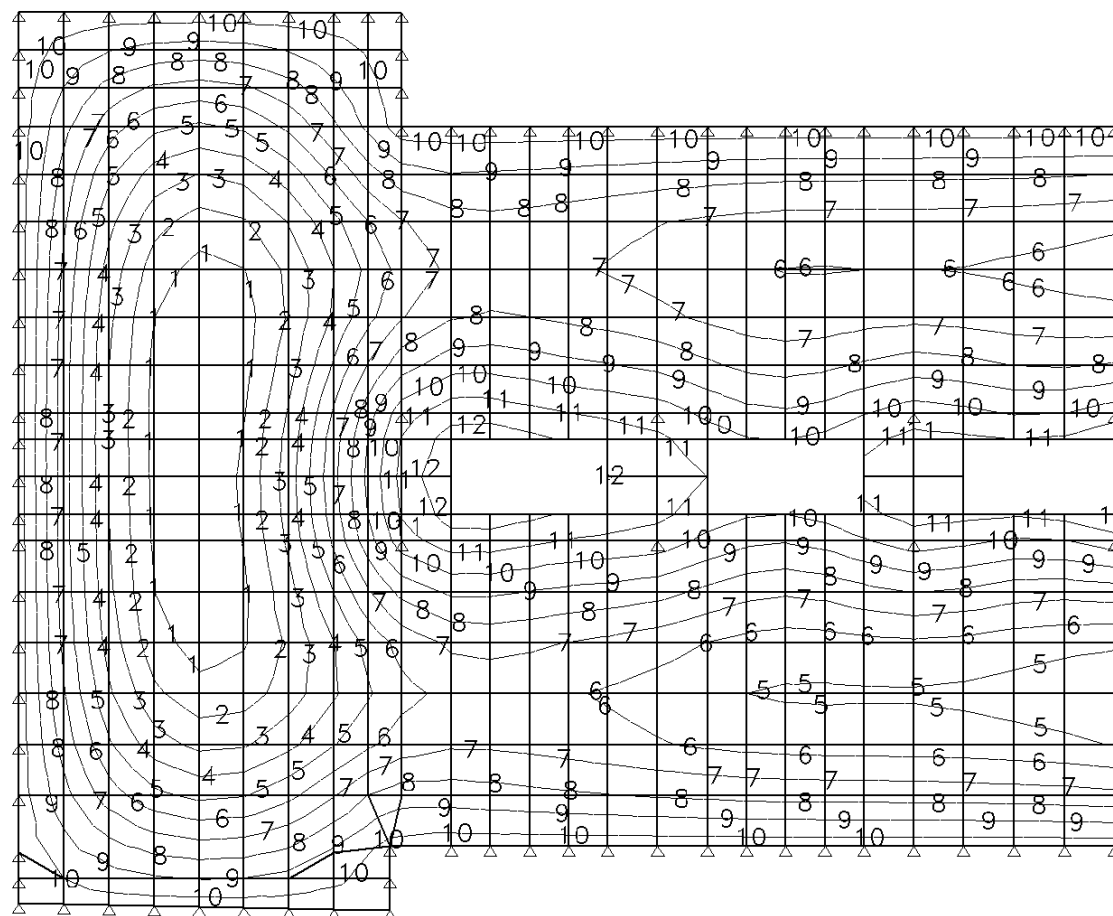
LINE	VALUE
min	-6.18
1	-5.60
2	-5.02
3	-4.44
4	-3.86
5	-3.28
6	-2.70
7	-2.12
8	-1.54
9	-0.96
10	-0.38
11	0.20
12	0.78
max	1.37

IMMEDIATE DEFLECTION COMBINATIONS ENVELOPE

Job No	Description	Page:	19
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Long Term Deflections



LINE	VALUE
min	-18.1
1	-16.4
2	-14.7
3	-13.0
4	-11.2
5	-9.5
6	-7.8
7	-6.1
8	-4.4
9	-2.7
10	-0.9
11	0.8
12	2.5
max	4.2

SLAB DEFLECTIONS COMBINATIONS ENVELOPE

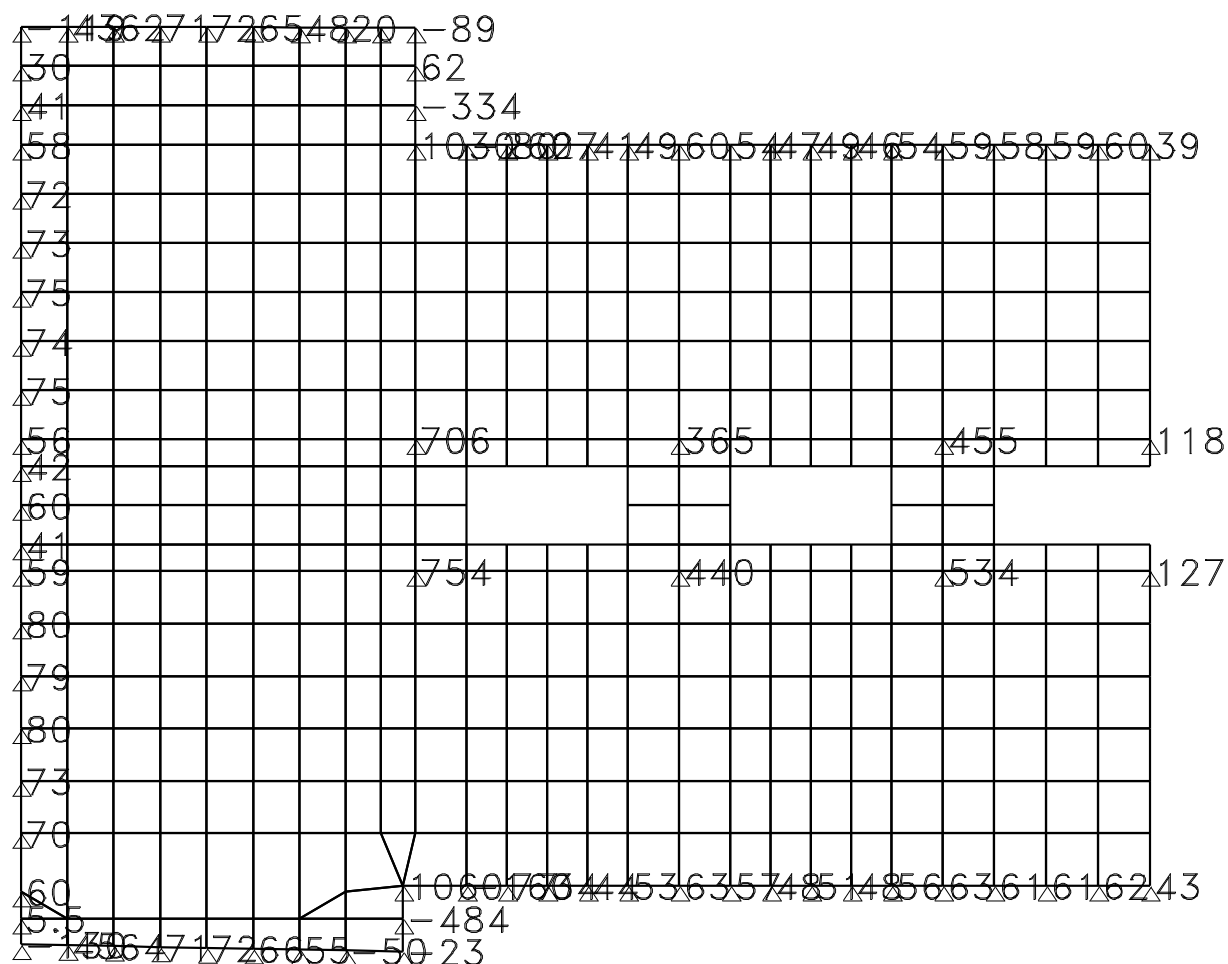
Job No	Description	Page:	20
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



4.3. Pile Support Reactions

Loading: Dead Load + Live Load

Units: kN



Job No	Description	Page:	21
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

4.4. RC Slab Reinforcement Design

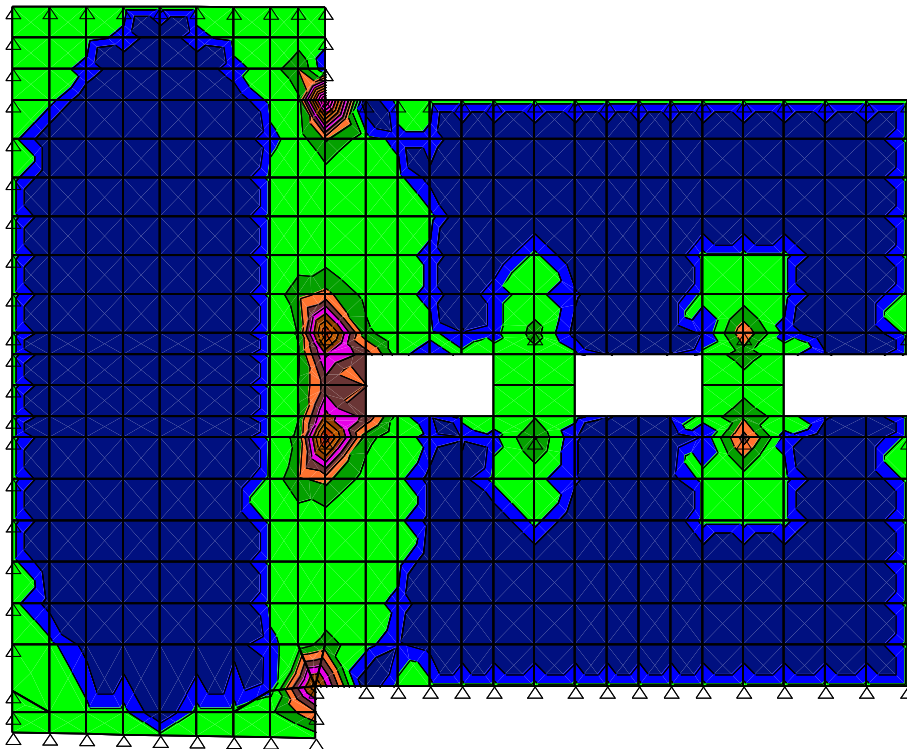
Unit: mm²/m

Loading: 1.35DL + 1.5LL

Design according to EC2

X Direction Top Reinforcement

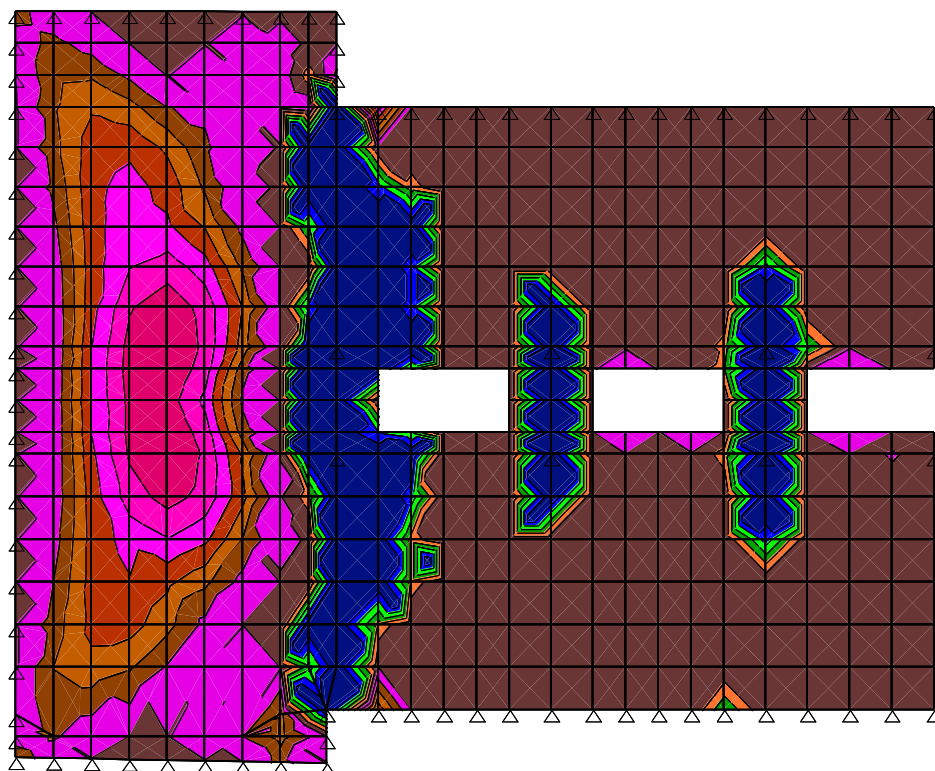
LINE	VALUE
■	246
■	492
■	738
■	984
■	1230
■	1476
■	1722
■	1968
■	2214
■	2460
■	2706
■	2952
■	3198



Job No	Description	Page:	22
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

X Direction Bottom Reinforcement

LINE	VALUE
95	
191	
287	
382	
478	
574	
670	
765	
861	
957	
1053	
1148	
1244	

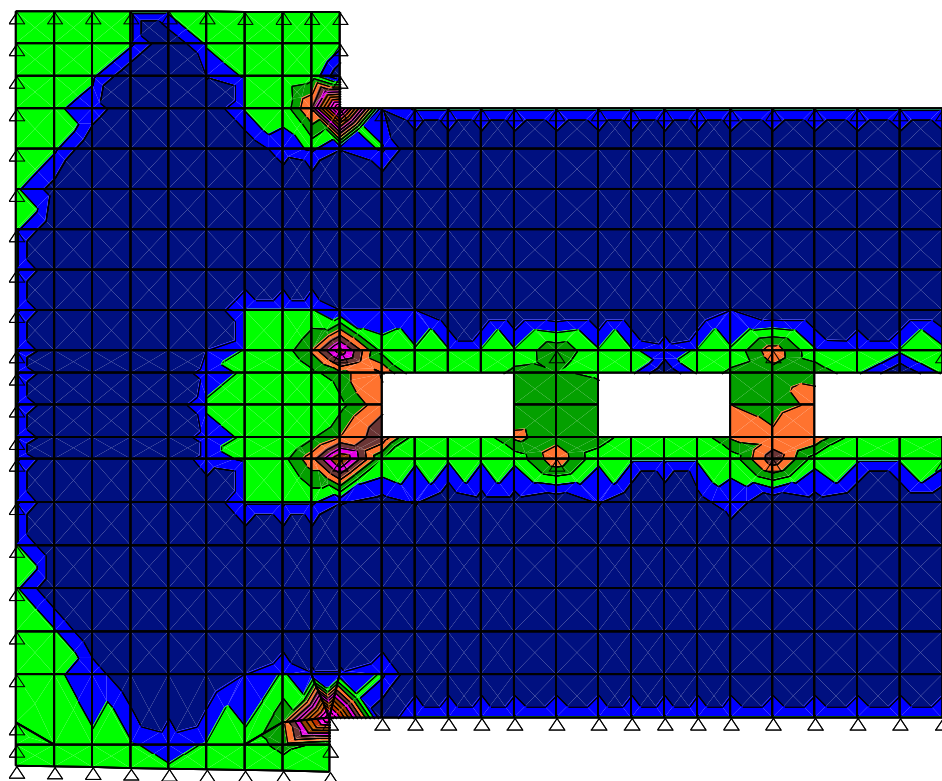


Job No	Description	Page:	23
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Y Direction Top Reinforcement

LINE	VALUE
268	268
537	537
806	806
1074	1074
1343	1343
1612	1612
1881	1881
2149	2149
2418	2418
2687	2687
2956	2956
3224	3224
3493	3493

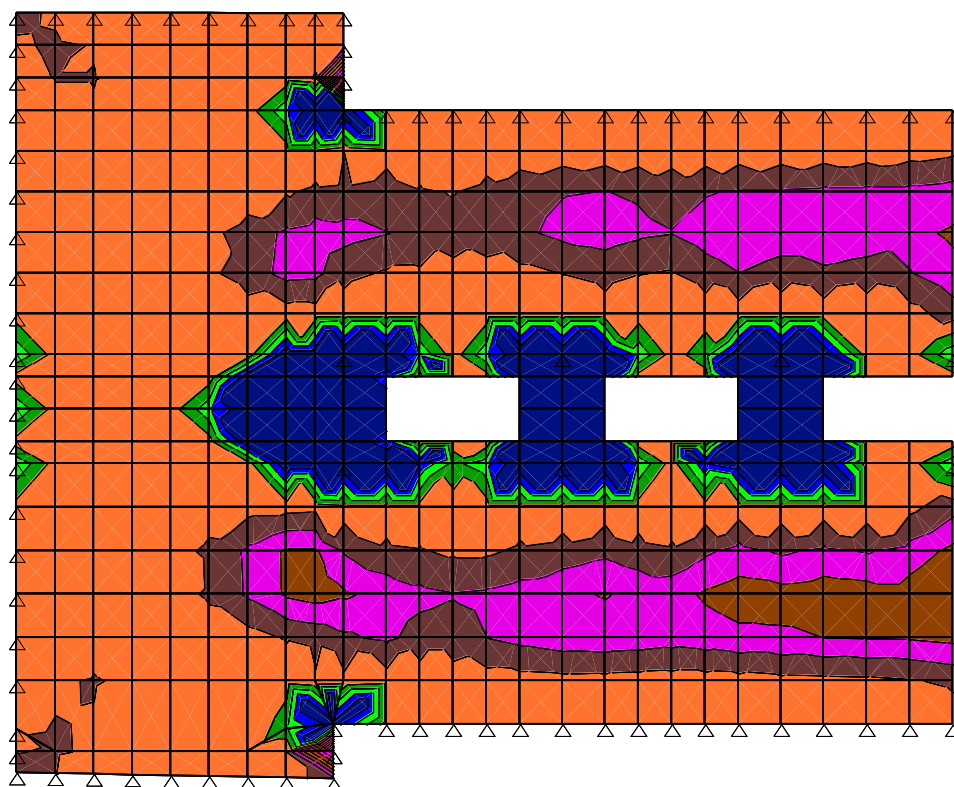


Job No	Description	Page:	24
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Y Direction Bottom Reinforcement

LINE	VALUE
128	128
256	256
384	384
512	512
640	640
768	768
897	897
1025	1025
1153	1153
1281	1281
1409	1409
1537	1537
1666	1666



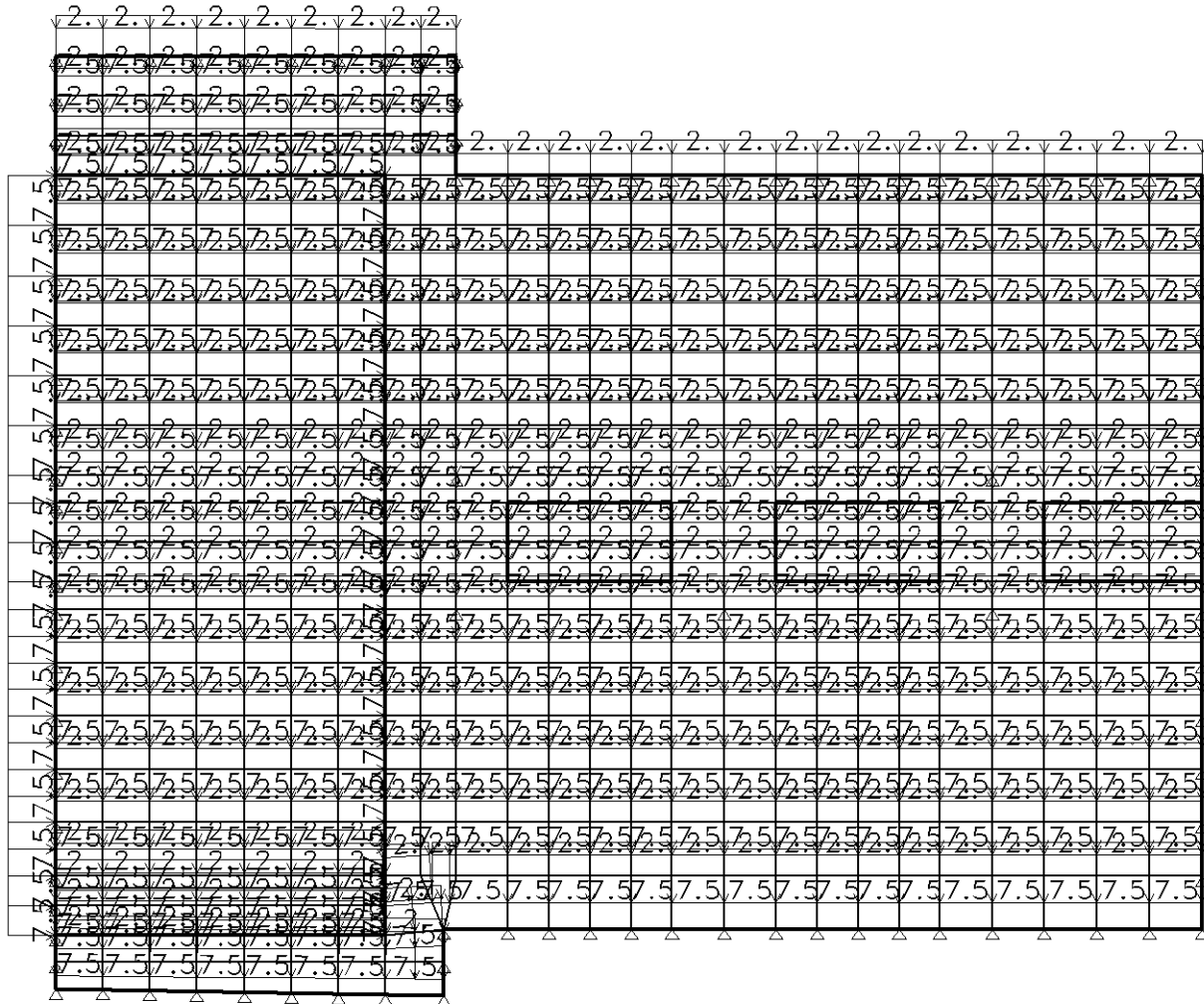
Job No	Description	Page:	25
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



5. GARDEN BLOCK BASEMENT LEVEL SLAB

5.1. Loading

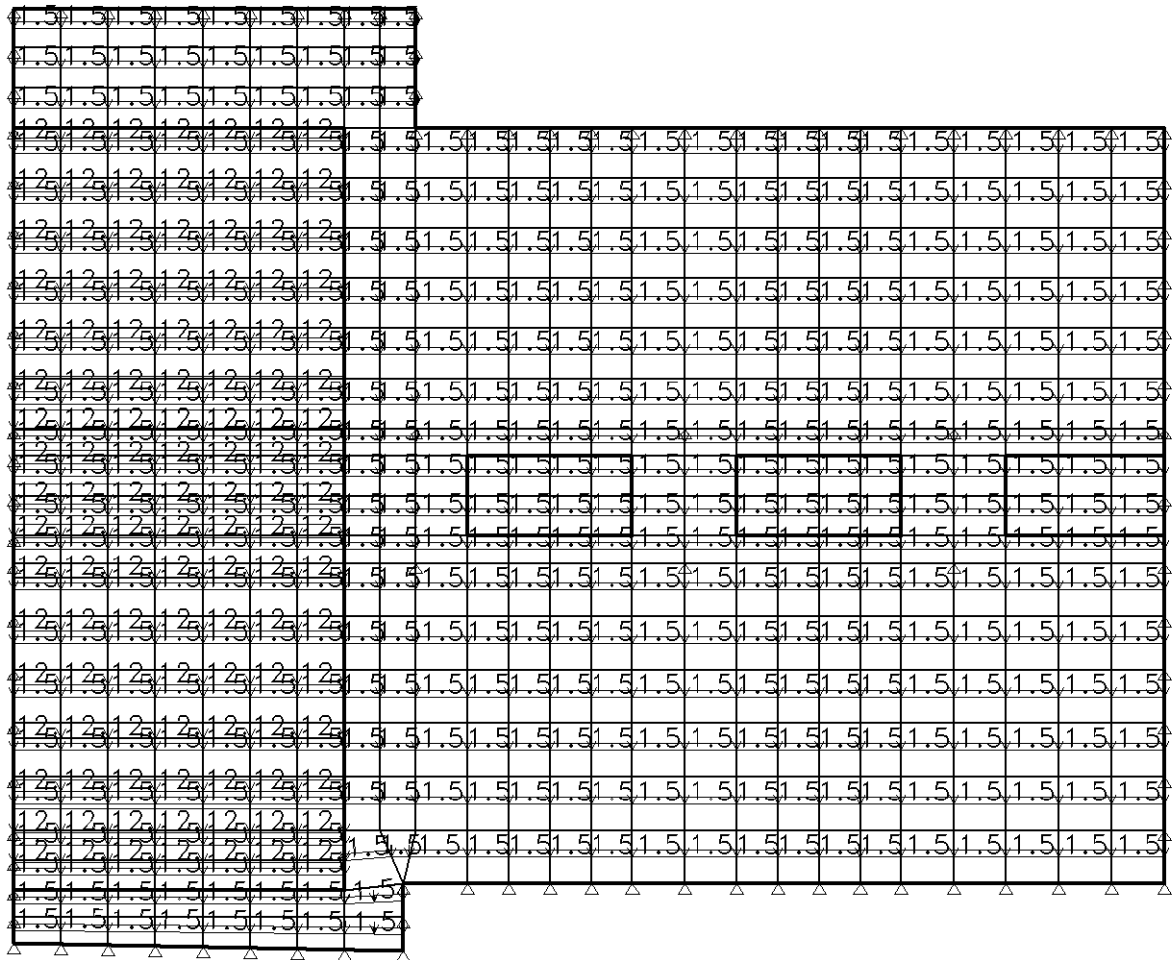
5.1.1. Dead Loads (inc. Self-weight)



Job No	Description	Page:	26
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



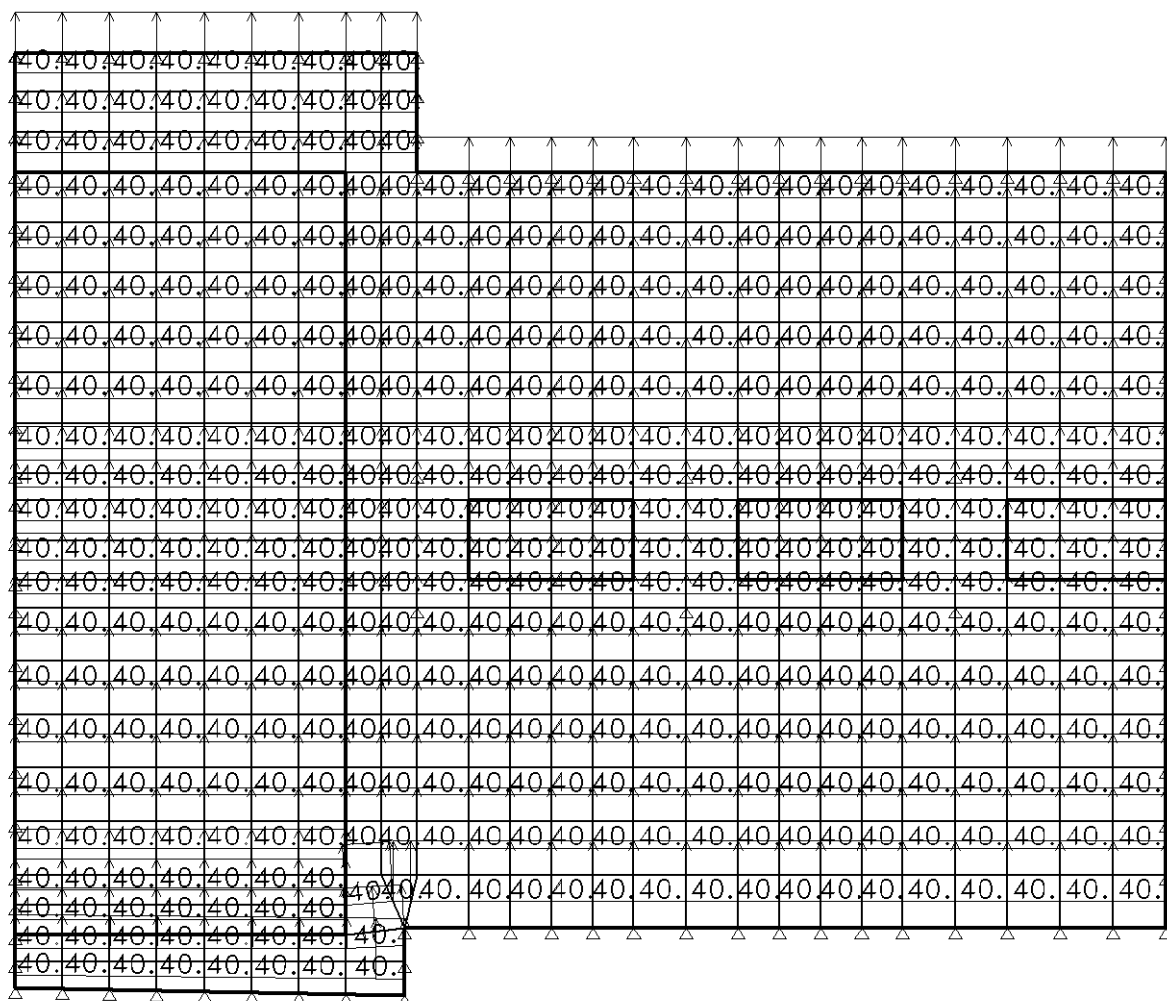
5.1.2. Live Load



Job No	Description	Page:	27
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



5.1.3. Sub-basement Water Pressure



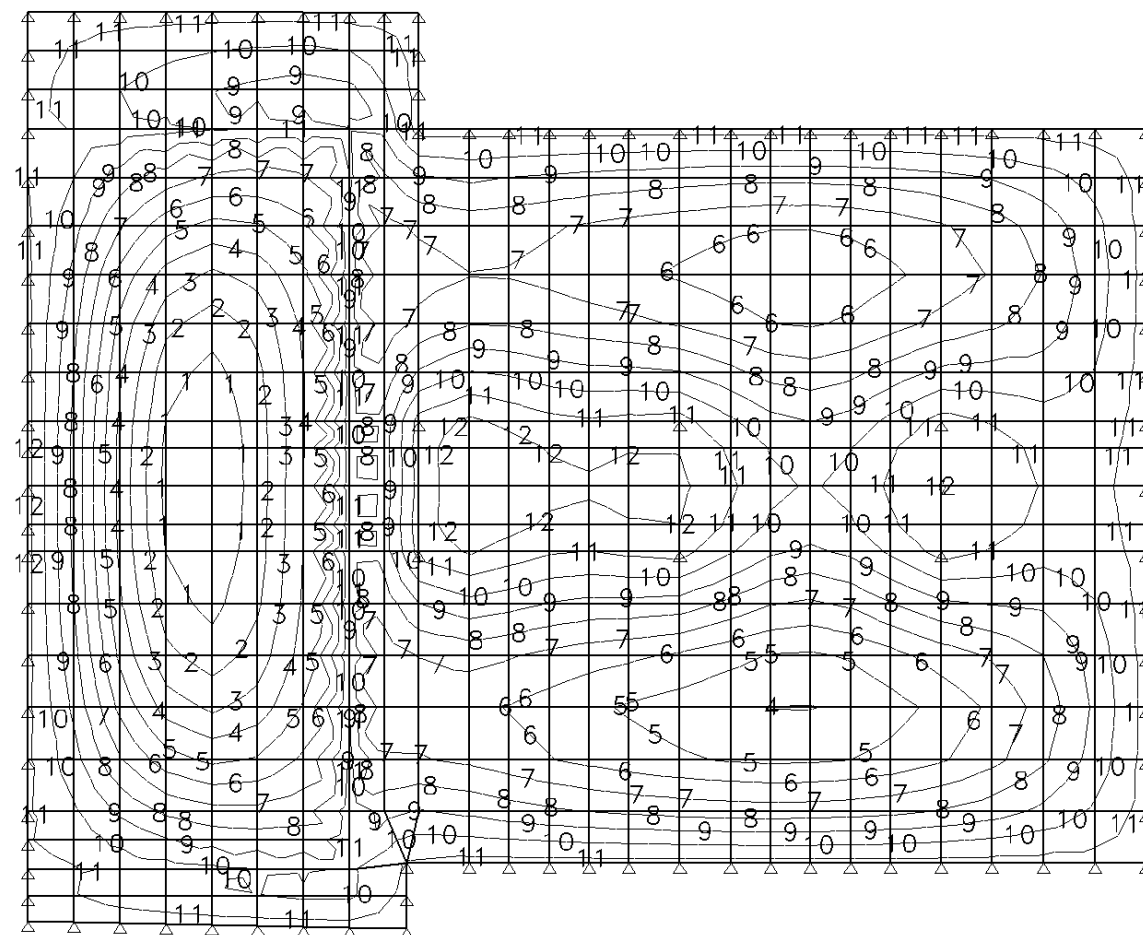
Job No	Description	Page:	28
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



5.2. Deflections

Immediate Deflections

(Dead Load + Live Load)



LINE	VALUE
min	-3.04
1	-2.77
2	-2.50
3	-2.23
4	-1.97
5	-1.70
6	-1.43
7	-1.17
8	-0.90
9	-0.63
10	-0.36
11	-0.10
12	0.17
max	0.44

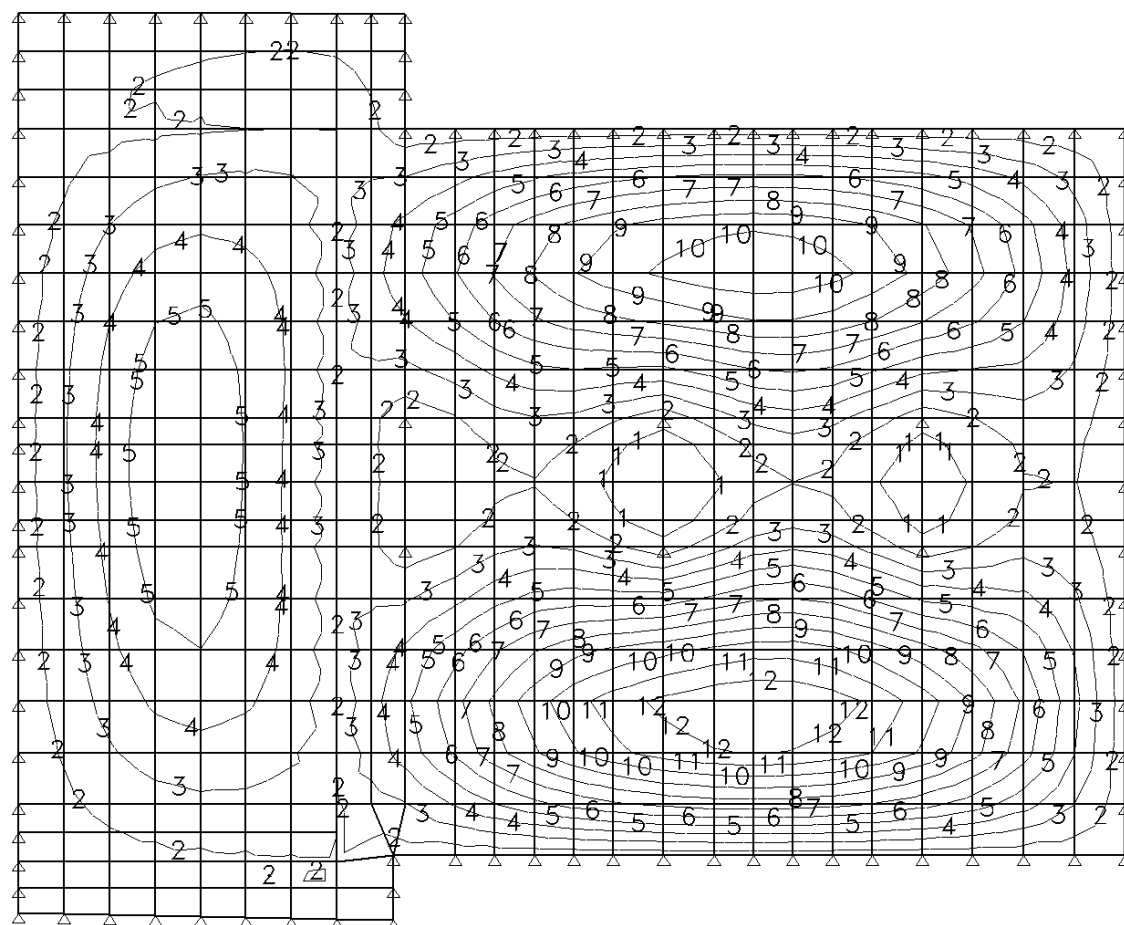
IMMEDIATE DEFLECTION COMB. NO. 2 1*1.00+2*1.00

Job No	Description	Page:	29
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
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Immediate Deflections

(Dead Load + Subbasement Water Pressure)



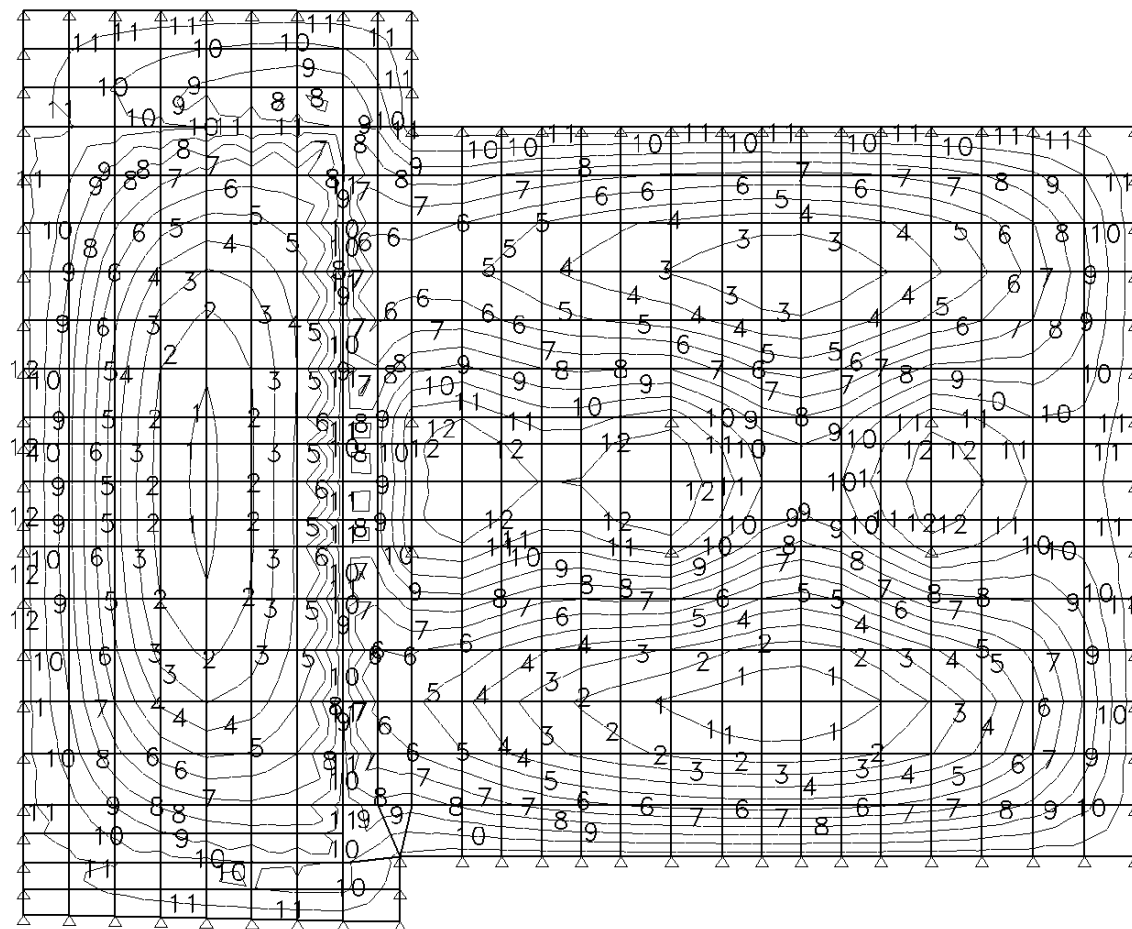
LINE	VALUE
min	-1.4
1	-0.4
2	0.6
3	1.7
4	2.7
5	3.7
6	4.7
7	5.8
8	6.8
9	7.8
10	8.8
11	9.9
12	10.9
max	11.9

Dz CONTOUR LINES LOAD NO. 3 1*1.00+3*1.00

Job No	Description	Page:	30
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Long Term Deflections



LINE	VALUE
min	-7.05
1	-6.44
2	-5.83
3	-5.22
4	-4.61
5	-4.01
6	-3.40
7	-2.79
8	-2.18
9	-1.57
10	-0.96
11	-0.36
12	0.25
max	0.86

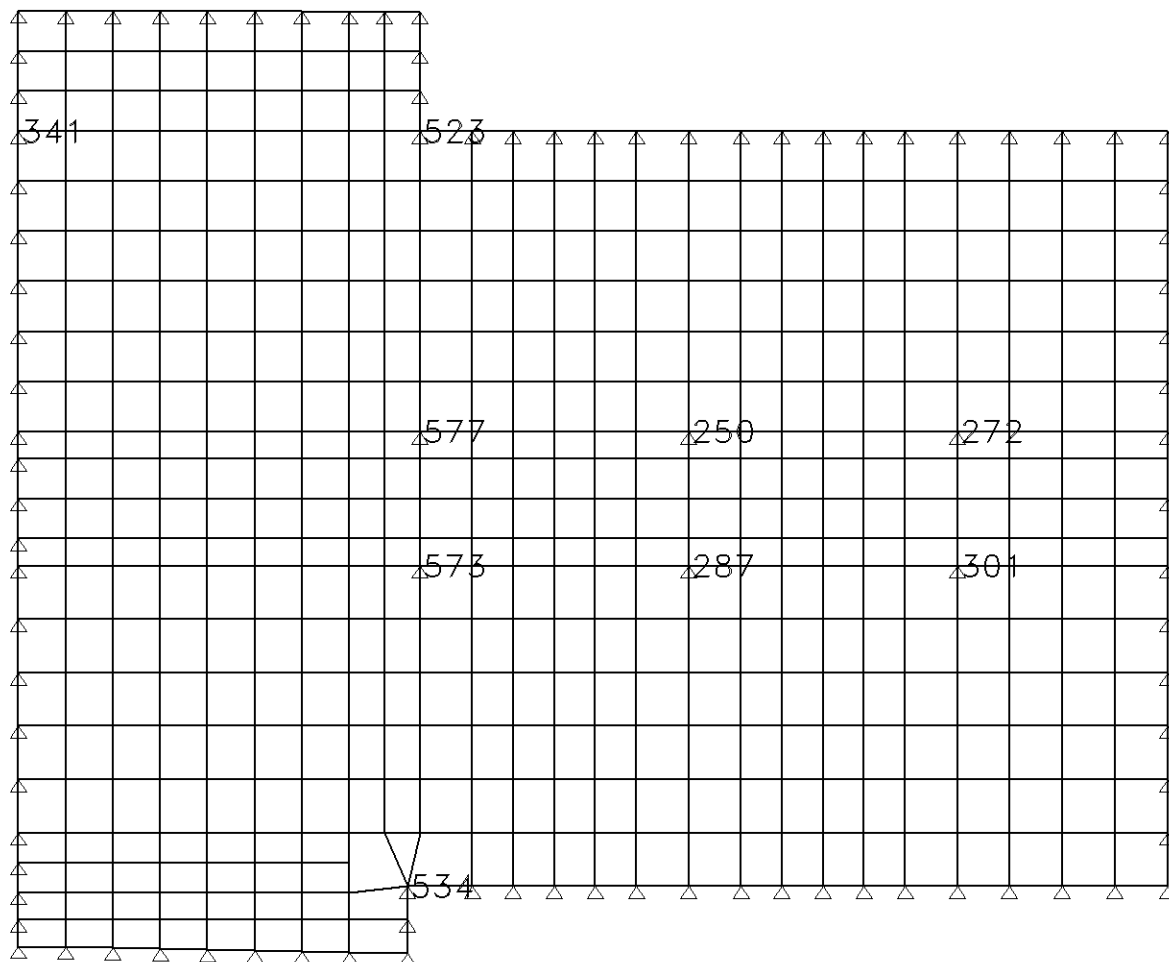
SLAB DEFLECTIONS COMB. NO. 2 1*1.00+2*1.00

Job No	Description	Page:	31
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



5.3. Reactions

5.3.1. Dead Load + Live Load

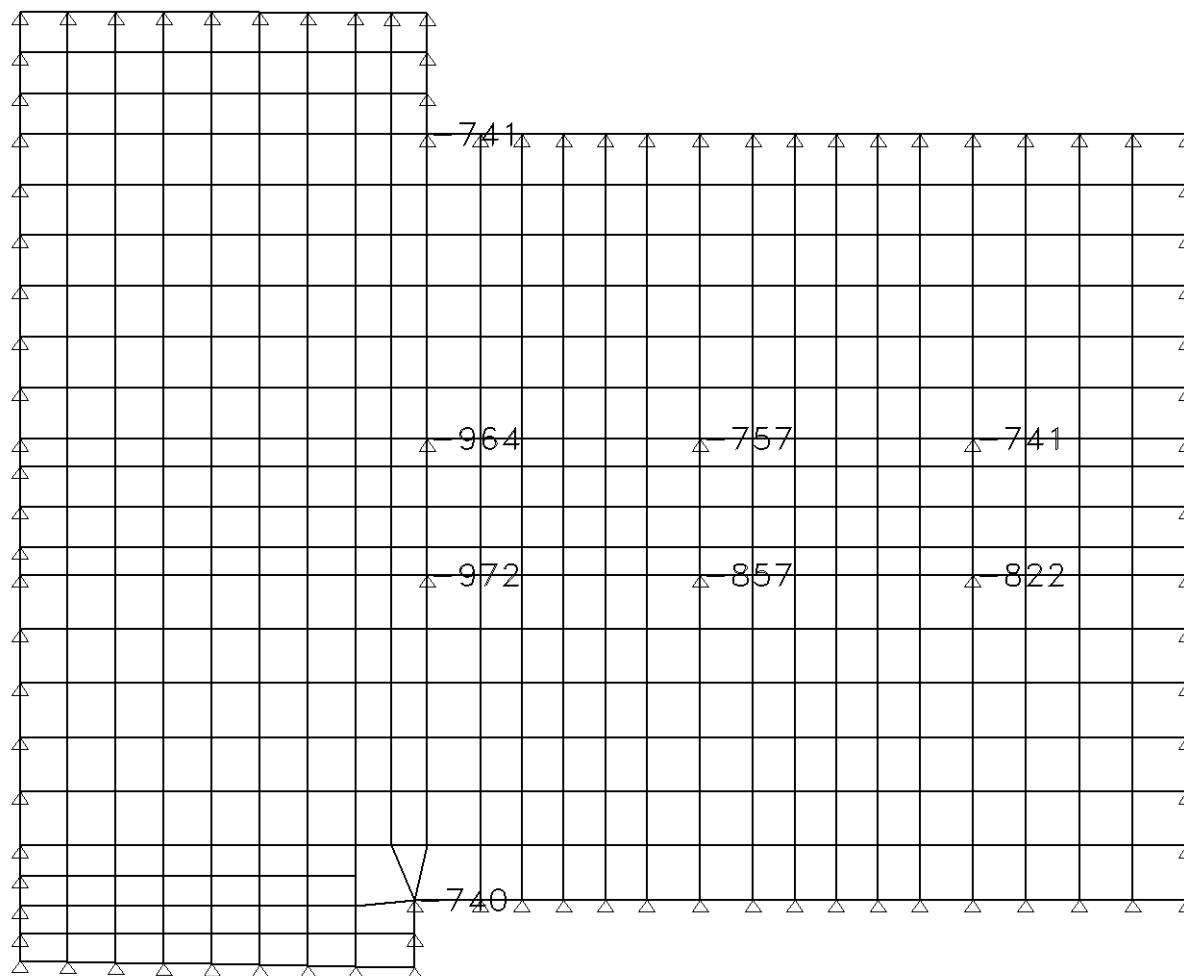


X3 REACTIONS COMB. NO. 2 1*1.00+2*1.00

Job No	Description	Page:	32
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
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5.3.2. Dead Load + Subbasement Water Pressure



X3 REACTIONS COMB. NO. 3 1*1.00+3*1.00

Job No	Description	Page:	33
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

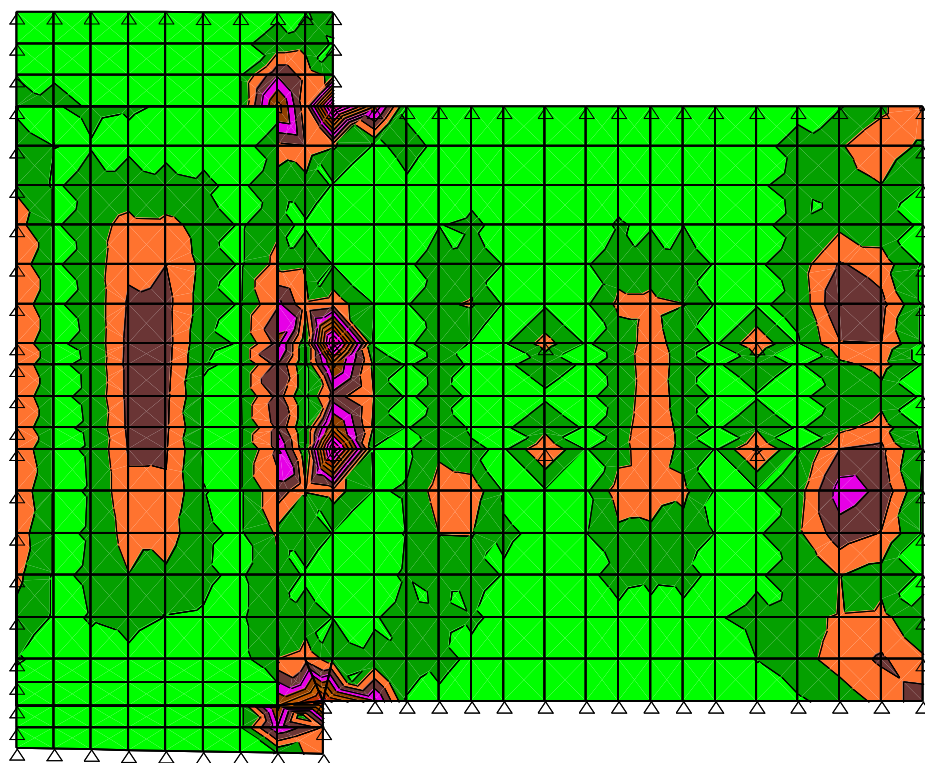
5.4. RC Slab Reinforcement Design

Unit: mm²/m

Loading: Combinations Envelope

Design according to EC2

X Direction Top Reinforcement

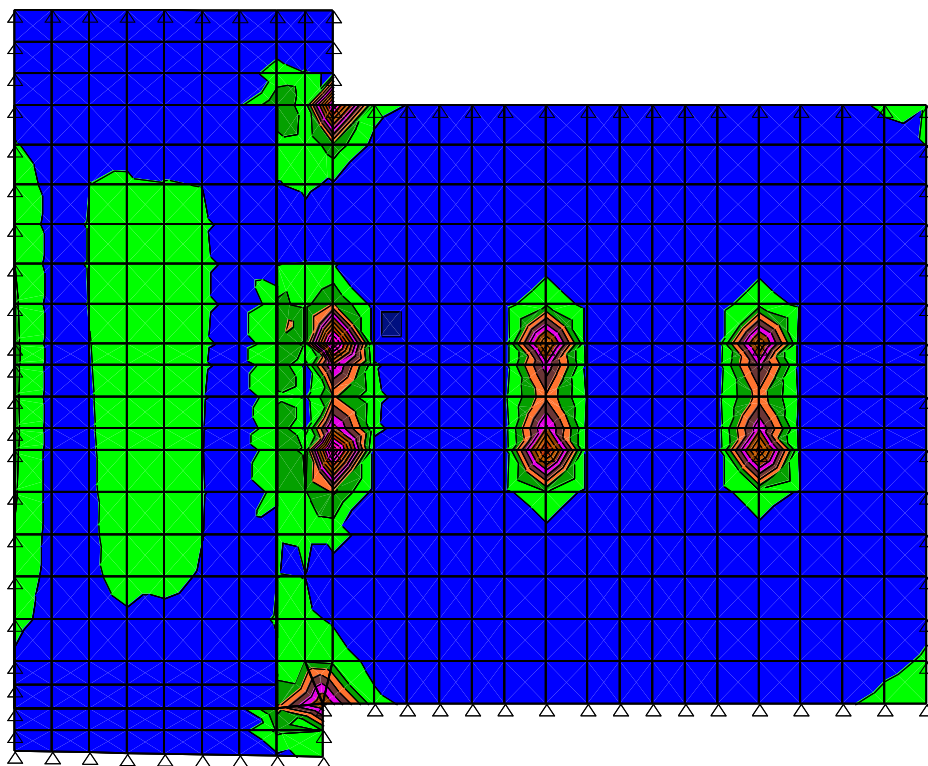


LINE	VALUE
164	164
328	328
493	493
657	657
821	821
986	986
1150	1150
1314	1314
1479	1479
1643	1643
1807	1807
1972	1972
2136	2136

Job No	Description	Page:	34
8148	3 Kidderpore Avenue	Date:	17.02.11
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		Checked:	U. Mizrahi

X Direction Bottom Reinforcement

LINE	VALUE
290	290
580	580
870	870
1161	1161
1451	1451
1741	1741
2031	2031
2322	2322
2612	2612
2902	2902
3193	3193
3483	3483
3773	3773

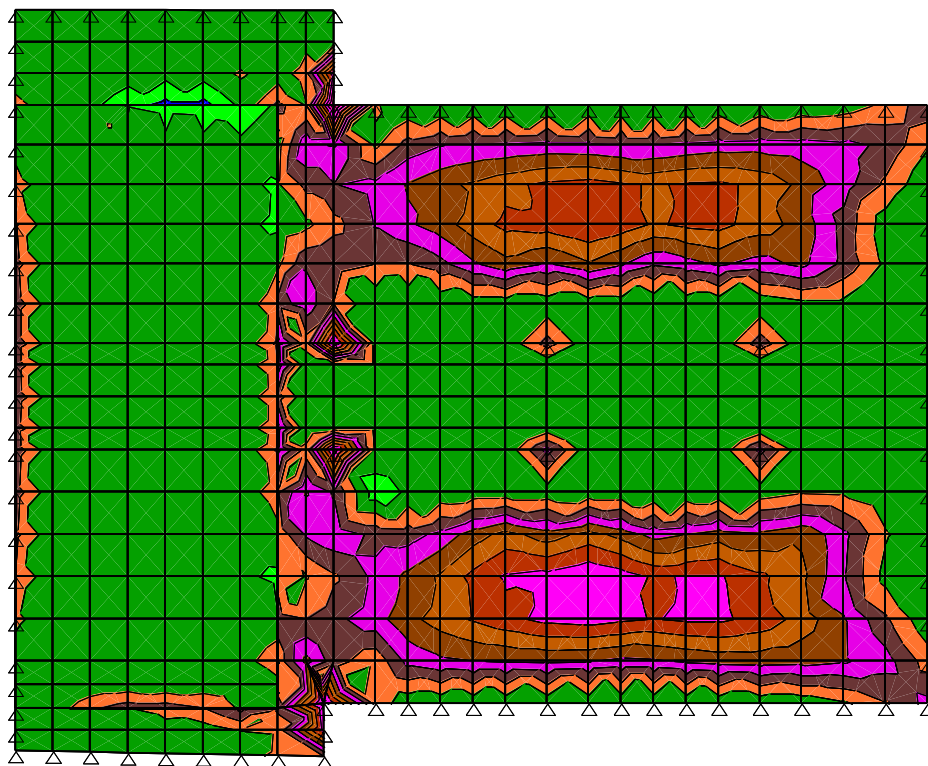


Job No	Description	Page:	35
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi



Y Direction Top Reinforcement

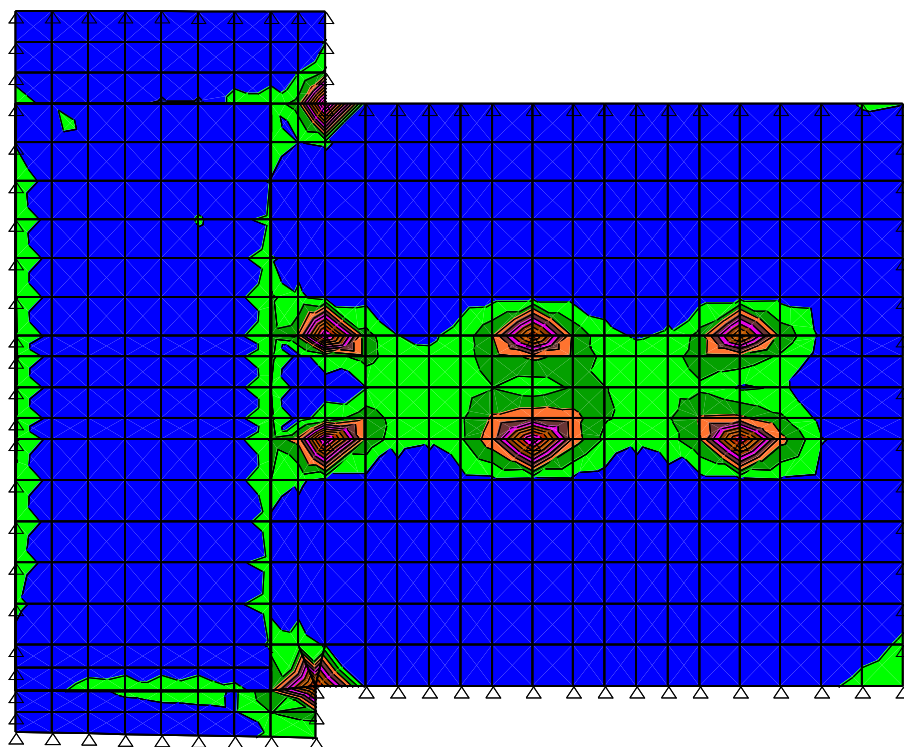
LINE	VALUE
148	148
296	296
444	444
593	593
741	741
889	889
1038	1038
1186	1186
1334	1334
1483	1483
1631	1631
1779	1779
1927	1927



Job No	Description	Page:	36
8148	3 Kidderpore Avenue	Date:	17.02.11
		By:	I. Tozluoglu
		Checked:	U. Mizrahi

Y Direction Bottom Reinforcement

LINE	VALUE
292	292
585	585
878	878
1171	1171
1464	1464
1757	1757
2050	2050
2343	2343
2636	2636
2929	2929
3222	3222
3515	3515
3808	3808



Job No	Description	Page:	37
8148	3 Kidderpore Avenue	Date:	17.02.11
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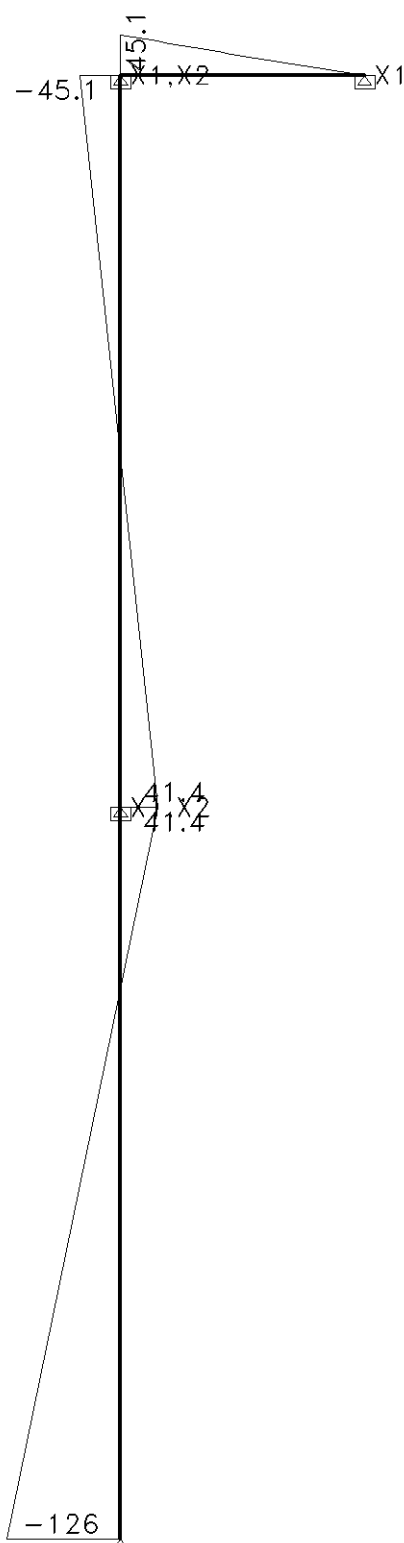
6. RETAINING WALL DESIGN

Earth Forces Data by Geotechnical Consulting Group

Wall Type	450 mm bored piles at 600 mm c/c		zero-piles
Load condition	with wall surcharge		without wall surcharge
Wall max. BM : kNm/m	186	177	140
Wall max. SF : kN/m	208	195	180
Load GF Slab (+50.0) : kN/m	95	80	70
Load BL-1 Slab (+47.3) : kN/m	320	295	290
Load BL-2 Slab (+44.3) : kN/m <i>[note these values are from SLS case]</i>	105	90	105
Wall toe level : m OD	+40.5		
Maximum wall deflection : mm	5	5	6

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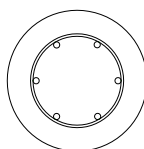
6.1. RC Pile Design



Loads:

Moment at the bottom: $186 \times 0.45 = 83.7 \text{ kNm}$
 Load from existing buildings' at top: $65 \times 0.45 = 30 \text{ kN}$
 New RC Slab Loads at storey levels = 15 kN

RC Design



6T20 Vertical Reinforcement
 T8@125 Links
 75mm Cover

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6.2. Sheet Pile Design

Loads:

Existing building axial load : 54kN/m
Ground floor level axial load : 43kN/m
Basement level axial load : 38kN/m
Approximate total load : 135kN/m

Loads for ULS

$N_{Ed} = 135 \times 1.4 = 189 \text{ kN/m}$
 $V_{Ed} = 180 \times 1.4 = 252 \text{ kN/m}$
 $M_{Ed} = 140 \times 1.4 = 196 \text{ kNm/m}$

Section Properties

Giken Zero Piles

SM-J Section



Dimensions		
Pile Width	Pile Wall Height	Flange Thickness
mm	mm	mm
600	200	13.0



Zero Piler

Per Pile				Per Linear Meter of Wall			
Sectional Area	Mass	Moment of Inertia	Section Modulus	Sectional Area	Mass	Moment of Inertia	Section Modulus
cm ²	kg / m	cm ⁴	cm ³	cm ² / m	kg / m ²	cm ⁴ / m	cm ³ / m
111.2	87.3	7 250	705	185.3	145.0	12 090	1 175

Dimensions and properties are subject to alteration by pile manufacturers without prior notice.

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		Checked:	U. Mizrahi



Design to BS EN 1993-5

$$N_{cr} = 210000 \times 7250 \times 0.85 \times 10^4 \times \pi^2 / 3000^2 = 14191 \text{ kN}$$

$$N_{Ed} / N_{cr} = 189 / 14191 = 0.013 < 0.04 \text{ no need for buckling check}$$

$$N_{plRd} = 18530 \times 275 / 1.0 = 5096 \text{ kN}$$

$$189 / 5096 = 0.04 < 0.25 \text{ effect of the axial load on plastic moment can be neglected}$$

$$M_{cRd} = 0.95 \times 1175 \times 10^3 \times 275 = 307 \text{ kNm} > 196 \text{ kN} (M_{Ed})$$

$$\bar{\lambda} = \sqrt{\frac{18530 \times 275}{14191000}} = 0.60$$

BS EN 1993-1-1 6.3.1.2

$$\chi = 0.70$$

BS EN 1993-1-1 Figure 6.4

$$\frac{189 \cdot 10^3}{0.70 \times 5096 \cdot 10^3 (1.0/1.1)} + 1.15 \frac{196 \cdot 10^6}{307 \cdot 10^6 \times (1.0/1.1)} = 0.86 < 1.0 \text{ OK}$$

BS EN 1993-5 (5.13)

Shear Check

$$A_v = 200 \times 13 \times 3 = 7800 \text{ mm}$$

$$V_{plRd} = 7800 \times 275 / \sqrt{3} = 1238 \text{ kN} > 252 \text{ kN OK}$$

Shearwater Consultancy Report of Structural Appraisal for
5 Kidderpore Avenue London NW3 – ref a55485 dated June 2014.
Shearwater Consultancy Report of Structural Appraisal for
1a Kidderpore Avenue London NW3 – ref a55507 dated June 2014.

REPORT OF STRUCTURAL APPRAISAL

of

5 KIDDERPORE AVENUE

London

NW3

Prepared by

The Shearwater Consultancy Limited

5 Percy Street

London

W1T 1DG

June 2014

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REPORT OF SURVEY FINDINGS

BUILDING FORM AND CONSTRUCTION	7
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CONDITION OF THE BUILDING	14
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REVIEW OF FINDINGS	20
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APPENDIX A: CONDITIONS OF ENGAGEMENT

REPORT SUMMARY

Instructions

The purpose of this report is to provide a structural appraisal of 5 Kidderpore Avenue, London NW3.

Method of Appraisal

The findings within this report are based upon an appraisal carried out in accordance with our Conditions of Engagement for Residential Building Surveys.

Property Description

5 Kidderpore Avenue comprises a period building of notable character extended in varying phases to the side and rear.

Principal Findings

Original parts of the property have acquired some movement patterns associated with longstanding settling down of structure or alteration. No evidence of progressive movement is apparent and condition generally remains within normal and acceptable limits with regard to age and type of construction.

I00 INTRODUCTION

I01 Instructions

The purpose of this report is to provide a detailed structural appraisal of 5 Kidderpore Avenue.

This requirement arises pursuant to Clause 2.7 (II) of an agreement dated 15th December 2011 between

(1) Cathcart Investments Limited

and

(2) The Mayor and Burgesses of the London Borough of Camden

relating to land known as 3 Kidderpore Avenue, London NW3 7SX pursuant to Section 106 of the Town & Country Planning Act 1990 (as amended) and Section 278 of the Highways Act 1980.

I02 Scope of Survey

Reference is made to our Conditions of Engagement relating to Residential Building Surveys. The scope of this report is limited to the building structure and excludes external and internal finishes, joinery, installed building services and drainage.

I03 Property Description

The original property stands towards the Kidderpore Avenue site boundary comprising a single raised ceiling room of approximately rectangular proportions. The relatively modest and traditional proportions of this building are dominated both internally and externally by a notable leaded light frontispiece in the form of a north light bay. This is consistent with original use of the property which is understood to have comprised a purpose built studio annex of 7 Kidderpore Avenue adjoining.

A narrow addition to the rear of the main studio room incorporates a fireplace and chimney believed to form an original part of the studio building.

The date of construction cannot be established with complete certainty. It is however recorded that Kidderpore Avenue together with a number of adjoining roads were acquired for speculative housing developments in 1890 with building taking place over the following 20 year period. It is thought likely therefore that the studio building dates from the early 1900's which is consistent with a number of features of the construction including the roof framing.

Extensions to each side and rear of the original studio are thought likely to have been constructed in a number of separate phases. These extensions are of relatively contemporary construction incorporating cavity walls, suspended in-situ concrete floors and concrete roof tiles laid to a relatively shallow pitch. These are thought likely to date from some time between the early 1960's and mid 1970's.

A contemporary brick cavity wall terminated with "brick fins" extends forward of the property upon the east boundary reverting to a lower brick boundary wall raised from a retaining structure.

I04 Searches

The following online searches have been made for the purposes of preparing this report:

- British History Online – A History of the County of Middlesex: Volume 9: Hampstead, Paddington
- Surface geology information to assist in determining ground conditions held upon the British Geological Survey public access website
- Development Control and Building Control information held upon the London Borough of Camden public access website.

I05 Documentation

No information concerning construction of the property nor previous works of alteration and extension have been made available for the purposes of preparing this report.

106	Orientation	Handings within this report are as viewing the front of the property from Kidderpore Avenue and the front elevation is deemed to be northeast facing.
107	Third Parties	This report is prepared solely for the stated purpose and no responsibility is accepted in whole or part with regard to any other parties.

GI00 GENERAL INFORMATIVES

GI01 Informative Notes

The following matters were noted from searches to establish background information concerning the property.

GI02 Development Control

The Planning Register records two consents, both dating from 1998 and both relating to tree removal and crown reduction.

GI03 Building Control

The Building Control register records an application dating from September 1995 relating to underpinning the existing bay window foundations. These works are recorded as having been completed on 24th November 1995.

No records concerning the various extensions were identified which are therefore likely to pre-date records transferred to the public access website.

GI04 Ground Conditions

Reference to the British Geological Survey public access website indicates ground conditions to comprise Claygate beds. No overlying superficial deposits are recorded. These ground conditions are comparable with but not identical to London clay formation within the London basin.

GI05 National Heritage List

The property is not recorded as a listed building.

GI06 Survey Informatives

Access was made available to all parts of the property. External assessment of roof structures was made from flat roofs above extensions upon the left hand side of the property and inspection was made of the void formed within the roof frame of the original studio.

GI07 Photographic Record

Weather conditions at the time of survey were dull with intermittent showers turning to prolonged spells of rain. Internally, the property is occupied as a family dwelling.

It is understood that a small undercroft exists beneath the ground floor extension upon the left hand side of the property but of which no inspection was undertaken.

Although not forming part of this inspection, the owner of the property advises that drainage runs beneath this undercroft and along the southeast boundary.

A photographic record of the survey is held upon the project folder for reference and to support survey findings. In order however to respect privacy of the Building Owner, these have not been included within this report which may be published upon a public access website.

REPORT OF SURVEY FINDINGS

PART ONE : BUILDING FORM & CONSTRUCTION

1.00 BUILDING FORM AND CONSTRUCTION

GENERAL ARRANGEMENT

1.01 Introduction	01 The original early 19th century building has been subject to extensive alteration including the following: ▪ Formation of communicating openings through the left hand (southeast) wall at ground and gallery levels. ▪ Excavation for and construction of a stairwell upon the left hand side of the fireplace bay providing access to lower ground floor level bedrooms behind the original studio. ▪ Formation of an opening at gallery / first floor level upon the rear left hand corner linking the gallery and first floor bathroom; this opening is formed through the hip and corner structure of the original building. ▪ Removal of original load bearing walls upon the rear right hand corner of the building providing open plan link accommodation to the dining area and kitchen. 02 The front right hand (north) corner is of low rise single storey construction beneath a flat roof and believed to comprise the original annex link from 7 Kidderpore Avenue adjoining. 03 The more modern extensions are thought to have been constructed in a number of phases, not being contemporaneous with each other.
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THE SITE			
1.02	Ground Conditions	01	Characteristics of ground conditions generally within a particular area can be determined by reference to geological maps. Exact ground conditions underlying a particular site cannot however be established without site investigation in order to confirm local geology and the effects of any historical influences which may have resulted in disturbed ground conditions.
1.03	Topography	01	Properties lining Kidderpore Avenue and adjoining streets typically occupy sloping sites. Existing site levels relative to 7 Kidderpore Avenue appear relatively constant. Finished levels to the front of 3 Kidderpore Avenue are however significantly lower. It is thought likely that these may have been artificially reduced, cutting into the ground formation which is held in place behind a retaining structure beneath 5 Kidderpore Avenue.
		02	Garden levels to the rear of 5 Kidderpore Avenue are significantly below those at the front of the property. It is not known to what extent these may have been artificially lowered when constructing the lower ground floor level of the more contemporary extensions. It is however likely that the these extensions and alterations necessitated construction of a retaining structure to the rear of the original studio building or alternatively the rear walls of which may have been underpinned.
FOUNDATIONS			
1.04	Original Building	01	Foundations of the original studio building are likely to comprise a nominal thickening of brick walls constructed at a shallow and consistent depth. Ground conditions and influences upon foundations are therefore likely to be reasonably constant beneath all parts of the original property.
		02	The intensity of structural loads distributed to the foundations is however likely to vary as a result of window and bay openings formed within the external walls above. These may have the effect of concentrating structural loads within panels of brickwork between openings. This can result in “differential movement” patterns where heavily loaded foundations have settled over the life of a building relative to other parts. This comprises a normal characteristic of period buildings in particular.

		03	Local Authority building control archives indicate the front bay to have been underpinned in 1995. It is common to find that bay structures were often provided with even less substantial foundations than the building to which they are attached. For this reason, it is not uncommon to encounter bay projections which have been underpinned over the life of the building.
		04	It is speculated that underpinning requirements may have arisen as a result of ground movement associated with moisture related volume changes in the clay soils exacerbated by the influence of trees although no certainty can be attached.
		05	Clay subsoils are of particular significance with regard to mature wooded gardens. In these circumstances, variations in ground moisture content associated with extraction of moisture by tree root systems may bring about volume changes in soils and consequential foundation movement.
1.05	Extensions	01	Taking into account the approximate age of the various extensions, these are likely to be raised from concrete trench fill foundations. Building practice at the period of construction would probably have provided foundations to a depth of between 600mm-1000mm although this would have depended in part upon site conditions.
	RETAINING WALLS		
1.06	Rear Extensions	01	It has been noted that in order to reduce ground levels for construction of the rear extensions, ground formation or foundations beneath the rear parts of the studio would have required support. It is considered most likely that mass concrete underpinning of original foundations would have been provided also fulfilling the purposes of a retaining structure. It is thought this would have extended beneath the south side of the rear vaulted bay where the stairwell has been extended down.
		02	In this case, the nature and depth of foundations between different parts of the studio building may vary considerably. This creates a propensity for differential movement to occur, particularly within the context of local ground conditions.

EXTERNAL WALLS			
1.07	Form of Construction	01	External walls of the studio building are believed to be of solid bonded brick construction of approximately one and a half brick overall thickness. The north light bay framing is of timber construction above sill level and some components of which are likely to be load bearing, supporting flat roof joists above.
		02	Brickwork above window openings within the single storey link upon the north corner is carried upon a combination of gauged and segmental brick arches. These may have comprised a facing to timber backing lintels upon the internal wall face.
1.08	Alterations	01	A number of large communicating openings into more recent additions have been formed within the original walls. Alternative structural support of original walls and roof structure is now enclosed within plasterboard linings or similar and arrangement of which cannot be established. It is considered likely however that the roof and walls above these openings will be carried upon steel beams spanning between load bearing brick structure.
1.09	Extensions	01	External walls of more recent extensions are generally believed to be of contemporary cavity construction. This is a form of double wall construction with internal and external walls separated by an air space (cavity). Proprietary steel ties placed across the cavity ensure stability of the two walls enabling these to act together structurally. A properly constructed cavity wall should prevent dampness within the external walls crossing to the internal skin.
		02	At lower level, brickwork above wide “patio” door openings is carried upon the edge of concrete floor or terrace construction above. At ground floor level it is thought brickwork above openings may be carried upon a combination of concrete and steel lintels.
		03	A more recent kitchen extension enclosing against the flank wall of 7 Kidderpore Avenue partially comprises a lightweight timber framed construction raised from a brick apron.

ROOF STRUCTURE			
1.10	Studio Building	01	The hip roof is framed around timber trusses in order to achieve good clear spans over the original studio building. The trusses are of “king post” pattern but with a long metal bolt replacing the central timber post of the traditional truss form. This comprises a more efficient form of truss fabrication and is consistent with a building dating from the turn of the previous century.
		02	Intermediate support is provided to the common rafters by timber purlins which are clasped between the truss principals and tie beams. Each pair of common rafters either side of the central ridge is tied by raised ceiling joists to which lath and plaster finishes have been applied. Configuration of the timber roof frame is adapted within the front roof slope in order to accommodate the raised flat roof of the north light bay.
		03	The subsidiary roof between the chimney and main roof frame is of timber raft construction, linings being applied directly to the rafter soffits.
1.11	Extension Roofs	01	A timber rafter roof of low pitch is provided above the rear ground floor room with boarded soffit internally. Rafter sections are considered to be relatively modest having regard to the low pitch and span.
		02	A number of flat roofs of timber construction infill between the boundary wall with 3 Kidderpore Avenue and original studio building.
		03	An original or early flat roof structure above the former annex link with 7 Kidderpore Avenue could not be accessed for inspection. A further pitched timber roof has been raised above the lightweight timber framed kitchen extension.

1.12	Chimneys & Flues	01	A chimney is incorporated within the rear wall of the studio building. This contains a flue serving the fireplace within the principal room.
		02	The chimney is raised with a brick stack above roof level terminated with a clay pot.
	SEPARATING WALLS		
1.13	Southeast Boundary (3 Kidderpore Avenue)	01	The entrance hall and gallery level extension of 5 Kidderpore Avenue are believed to be enclosed by a solid bonded brick wall standing on or adjacent the boundary. This is of render finish rising above the roof level of 3 Kidderpore Avenue adjoining. Inspection suggests a lining wall may have been raised against this structure within the garage of 3 Kidderpore Avenue but which has not been confirmed. This wall is thought to form one of the earlier additions to the subject property.
		02	A contemporary brick wall of cavity construction has been raised forward of this structure enclosing and rising above the entrance porch roof of 5 Kidderpore Avenue. This wall is thought likely to contemporaneous with construction of 3 Kidderpore Avenue in present form but which has not been established with certainty.
		03	To the rear of the original galleried extension, a contemporary cavity wall has been raised adjacent to the earlier solid bonded wall. This forms part of 3 Kidderpore Avenue and has been raised against an earlier brick wall enclosing the ground floor rear extension of the subject property.
		04	Condition and arrangement of separating walls therefore varies considerably along this boundary.
1.14	Northwest Boundary (7 Kidderpore Avenue)	01	The subject property is thought to enclose upon the former flank wall of this property but which has not been established with certainty.

INTERNAL WALLS			
1.15	Form of Construction	01	These are partly formed by former external walls enclosing the studio building.
		02	Internal partition walls of brick construction have been constructed within more contemporary extensions.
FLOORS			
1.16	Studio Building	01	Floors within the original building are of traditional timber joist construction.
1.17	Extensions	01	These are generally either of ground bearing concrete slab or suspended concrete slabs spanning between load bearing brick walls.

REPORT OF SURVEY FINDINGS

PART TWO : CONDITION OF THE BUILDING

2.00 CONDITION OF THE BUILDING

FOUNDATION ASSESSMENT	
2.01 Front Bay	01 Condition and adequacy of foundations within the ground can only be determined by the existence of any patterns of damage or distress within the building above which may be consistent with foundation movement.
	02 Minor vertical cracking occurs internally where the front bay adjoins the front wall. Externally, brickwork surfaces are largely overgrown with climbing plants on trellising but no evidence of cracking or defect is apparent within the limits of inspection.
	03 Cracking is consistent with differential movement between the bay and studio building. The bay is however recorded as having been underpinned and the minor cracking apparent is not of any structural significance. Inspection suggests that previous underpinning works have therefore adequately stabilised the north light bay.
2.02 Entrance & Gallery Level Extension	01 Diagonal cracking of approximately 2mm-3mm width occurs beneath the first floor window apron of the side extension adjoining 3 Kidderpore Avenue. Cracking extends vertically adjacent the window opening. This is considered to be consistent with settling down of structure towards the boundary wall and may have been exacerbated by old movement within the ground floor door opening below.
	02 Brickwork coursing externally is also consistent with old settlement having occurred towards the boundary.
	03 The retaining wall above 3 Kidderpore Avenue and boundary wall has been rebuilt. It is likely that ground conditions beneath this part of the property may have been locally disturbed during the course of these works. Old movement patterns may originally have been associated with this disturbance.

2.03 Rear Bathroom Extension	04	No evidence of significant or progressive structural movement is apparent and internal plaster damage is considered likely to be of some longstanding. No corresponding defects occur within the external finishes.
	05	Vertical cracking within the same length of wall is associated with a transition from brick to timber frame tile hung construction and is not considered to be of structural significance.
	01	A vertical joint occurs within the party or separating wall with 3 Kidderpore Avenue. This is located within cupboards enclosing against the wall within the ground floor bathroom lobby.
	02	Brickwork coursing either side of the joint varies over the height of the wall. Since the age and type of construction also varies, this is consistent with a joint between different periods of construction. Misaligned brickwork coursing is not therefore associated with differential settlement.
	03	Externally, plan alignment of the flank wall of 3 Kidderpore Avenue converges with the older brick wall enclosing the bathroom extension. It is thought possible that the flank wall of 3 Kidderpore Avenue slightly oversails or may take some bearing upon the brick separating wall to the rear of this vertical joint. As built arrangements cannot however be established without opening up of the flat roof structure above.
2.04 Tree Planting	01	Some risk of seasonal movement exists having regard to the combination of ground conditions and tree planting.

EXTERNAL WALLS			
2.05	Original Studio Building	01	Vertical and diagonal cracking patterns extend from the right hand arch spring of the opening into the rear fireplace bay. These are estimated as being in the order of 2mm-3mm thickness. Further local cracking occurs within the intrados at approximately three quarter height of the arch rise.
		02	Cracking patterns are considered to be consistent with movement resulting from deflection of supporting structure where the rear wall has been opened out into the kitchen extension. This may be associated with slight settling down of the brick pier between these openings.
		03	It is thought that these cracking patterns may be relatively recent although not of structural significance.
2.06	Extensions & Additions	01	No evidence of cracking or defect is apparent within the more contemporary construction.
ROOF STRUCTURE			
2.07	Studio Roof	01	Whilst alignment of tiled slopes remains fair, the roof frame has experienced old movement and distortion consistent with the age of the building.
		02	Misalignment of ceiling soffits is discernable sloping towards the front of the property. This is consistent with significant deflection of the timber purlin or beam carrying the roof structure above the bay opening. Movement patterns are however considered to be of longstanding and commensurate with the age and type of construction.

2.08 Extension Roofs	03	A number of rafters have become slightly displaced relative to the ridge and evidence of slight lateral displacement occurs within the rafter framework. This is once more consistent with the age of property and is likely to have been brought about by deflection of roof structure above the bay opening.
	04	Longstanding deflection which has occurred within the roof structure results in some rafters not being fully supported upon purlin bearings. In these locations packing pieces should be introduced.
	05	A number of rafters exhibit splits and shakes commensurate with age.
	06	The hip roof structure upon the south corner has been adapted where opened out between the gallery and rear first floor bathroom. Exact arrangements and adequacy cannot however be determined without removal of ceiling linings. No evidence of movement or defect is presently apparent within this location.
	07	No evidence of significant progressive movement is considered to exist within the roof structure. The large bay opening within the front elevation does however create an inherent weakness within arrangement of the roof frame which has resulted in longstanding deflection and distortion. There is a possibility that some future deflection may occur sufficient to result in cosmetic damage of finishes although not likely to be of structural significance.
	08	Roof structure above the rear bay has deflected slightly relative to the chimney but remaining within acceptable limits.
	01	Alignment of tiled slopes which can be viewed remains satisfactory. Slight deflection of soffits occurs above the first floor bathroom extension but remaining within acceptable limits.

		02	Flat roof structures remain reasonably firm and of fair alignment. Locally “spongy” areas are likely to be associated with deterioration of insulation materials.
		03	Alignment of the roof terrace remains satisfactory.
	PARTY & SEPARATING WALLS		
2.09	Southeast Boundary (3 Kidderpore Avenue)	01	The cavity wall to the front of 5 Kidderpore Avenue is not closed at roof level. The cavity together with metal cavity ties has therefore been open and exposed to weathering for an unknown period. The upper courses of this wall have acquired some distortion and require rebuilding followed by closing of the cavity.
		02	Although overall alignment remains fair, it is noted that this wall remains relatively slender and with limited lateral restraint.
		03	It is thought that some central and rear lengths of this wall may have been rebuilt ancillary to previous redevelopment of 3 Kidderpore Avenue. Further investigation would however be necessary to establish these details.
	INTERNAL WALLS		
2.10	Condition	01	Local distortion of door openings occurs but remaining within acceptable limits. This is likely to be associated with deflection of the suspended ground floor slab from which the partitions are raised.

FLOORS			
2.11	Studio Building	01	Alignment of this floor falls towards the centre of the studio. This may be associated with consolidation of the ground or over site material supporting brick sleeper walls and floor construction. This is considered to be of longstanding.
		02	Although air bricks are provided to the front elevation, adequacy of ventilation and moisture content of timbers cannot be established, nor therefore any potential risks associated with timber decay. The floor does however remain reasonably firm.
2.12	Side Extension	01	Alignment of the gallery floor falls towards the boundary with 3 Kidderpore Avenue consistent with old movement patterns within the front wall.
2.13	Rear Additions	01	Alignment of suspended concrete floors falls towards the rear of the property being particularly noticeable towards the bathroom door opening.
		02	General consolidation of the lower ground floor slab has occurred.
BOUNDARY WALLS			
2.14	Southeast Boundary	01	Vertical fracturing and distortion occurs within the front length of boundary wall with 3 Kidderpore Avenue.

REPORT OF SURVEY FINDINGS

PART THREE : REVIEW OF FINDINGS

3.00 REVIEW OF FINDINGS

3.01	General Arrangement	01	5 Kidderpore Avenue comprises a period property of traditional construction which has been extensively altered and extended.
3.02	Foundations	01	It is considered likely that rear parts of the original building have been retained or underpinned. Load distribution to foundations will have been altered as a result of various structural openings formed within the original building. This is likely to bring about an increased propensity for movement associated with changes in ground conditions whether resulting from volume changes within clay subsoils or other causes.
		02	Old movement patterns associated with settling down of structure occur within different parts of the property but are considered to be of longstanding. No evidence of significant or progressive structural movement is apparent associated with the foundations or ground conditions.
		03	Seasonal movement risks will remain taking into account ground and site conditions.
3.03	External Walls	01	Original structure has been extensively altered. Local cracking and differential movement occurs where opened out into the kitchen extension.
3.04	Roof Structure	01	Original roof framing is of reasonably robust design but has been compromised by the large bay opening formed within the front elevation. This has resulted in longstanding deflection and movement within the roof frame and some distortion of framing timbers. Old movement patterns are considered to remain within acceptable limits.
		02	The possibility of slight future deflection does exist. This is not considered likely to be of structural significance but may affect some aspects of serviceability and induce cracking within finishes and linings.

3.05	Party & Separating Walls	01	Construction upon the southeast boundary with 3 Kidderpore Avenue changes along the length of the wall and exact arrangements cannot be fully determined.
		02	The front length cavity wall requires capping and upper courses rebuilding.
		03	Further investigation will be necessary to resolve and confirm setting out between different phases of boundary wall construction between rear parts of the two properties.
3.06	Extensions & Additions	01	Condition of more contemporary extensions generally remains satisfactory.
3.07	Summary	01	Inspection has identified old movement patterns primarily affecting the original studio building. These result in part from original methods of construction and weaknesses surrounding the front bay and in part as a result of alteration to the original structure. No evidence of significant or progressive movement is however apparent.
3.08	Instructions	01	This report is prepared pursuant to the Section 106 Agreement identified within part I01 of this report.
3.09	Document Reference	01	AJN / kaa / Reports14 / a55485.
			 <u>Andrew J Nichols BSc FRICS</u> for the Shearwater Consultancy Limited
3.10	Date of Report	01	30 th June 2014.

APPENDIX A : CONDITIONS OF ENGAGEMENT

The Report

1. The report will advise as to construction and condition of the building as far as possible subject to the limitations described below together with defects or disrepair which are or are likely to give rise to significant expenditure
2. The report will not include a valuation.

Review of Supporting Documentation (Technical Due Diligence)

3. Technical due diligence comprises review of drawings, specifications, statutory consents and other documents relating to construction, alteration or other works concerning the property which may be provided by the vendor.
4. Material provided for these purposes may vary considerably in quantity and content. Where formal due diligence of design and construction packages is required within the scope of survey, this requirement should be notified in advance in order that the level of review can be agreed.

The Inspection

5. As much of the surface area as is practical and readily visible from any part of the Building or surrounding area to which access can reasonably be gained will be inspected.
6. No entry will be made to other properties, buildings, or land which appear to be in other ownership.
7. Fitted carpets or floorboards will not be lifted unless in locations found to be loose and capable of lifting without risk of damage.
8. Large items of furniture will not be moved.

9. Trial holes for the purpose of exposing foundations or other below ground structures and exposure of other structural elements is likely to cause damage and requires builders' attendance. This will not therefore be undertaken except by prior arrangement and with the express consent of the vendor.

Roofs

10. Roof voids will be inspected where accessible trap doors are provided which can be reached from a surveyor's ladder.
11. Flat roofs will be inspected where safe access is provided from within the building.
12. Some roof types are of flat or low pitch construction such that inspection of external finishes from ground level is limited or impractical. In these circumstances, alternative means of external access can be arranged (at extra cost) provided reasonable notice of this requirement is given at the time of confirmation of instructions.

Installed Building Services

13. Service installations will not be considered within the scope of inspection. Advice as to condition and adequacy of service installations requires specialist inspection and report which can be arranged at additional cost if required.

Drainage

14. Below ground drainage will not be inspected or tested within the scope of inspection. Advice as to condition and adequacy of below ground drainage requires specialist inspection and can be arranged at additional cost if required.

Environmental Appraisal

15. Advice as to site history, contaminated land and similar matters requires a specialist inspection or report which can be arranged (at extra cost) providing reasonable notice is given.

Purpose Built or Converted Flats and Maisonettes

16. Where the subject property forms part of a larger development, the inspection will extend to the interior and exterior fabric of the subject property together with cursory inspection of remaining exterior parts and common areas sufficient to identify general condition only. In the case of developments comprising two or more separate blocks of flats or mansion block buildings, inspection will extend only to the block or building within which the property is located.

Professional Fees

17. The fee quoted above is based on the description given to us, but we reserve the right to amend this should the property be substantially different from that envisaged or described.
18. Our invoice will be presented upon completion of the survey report and shall be due for settlement within 30 days of presentation.
19. The fee quoted will not include allowance to undertake formal technical due diligence unless agreed in advance.

Third Parties

20. The Report is provided for the sole use of the named client(s) and any professional advisers. The Surveyor accepts responsibility to the client alone for the stated purposes and that the report will be prepared with the skill care and diligence reasonably to be expected of a competent chartered surveyor, but accepts no responsibility whatsoever to any person other than the client himself. Any such person relies upon the report at his own risk.

Revised: October 2013

REPORT OF STRUCTURAL APPRAISAL

of

1A KIDDERPORE AVENUE

London

NW3

Prepared by

The Shearwater Consultancy Limited

5 Percy Street

London

W1T 1DG

June 2014

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APPENDIX A: CONDITIONS OF ENGAGEMENT

REPORT SUMMARY

Instructions

The purpose of this report is to provide a structural appraisal of 1a Kidderpore Avenue, London NW3.

Method of Appraisal

The findings within this report are based upon an appraisal carried out in accordance with our Conditions of Engagement for Residential Building Surveys.

Property Description

1a Kidderpore Avenue comprises a period building which has been altered and extended in a number of phases.

Principal Findings

Condition of structure of both the original property and subsequent extensions was found to remain generally satisfactory and commensurate with age. Local evidence of old movement within some parts of the structure is considered to remain within normal and acceptable limits with regard to the age and type of construction.

I00 INTRODUCTION

I01 Instructions

The purpose of this report is to provide a detailed structural appraisal of 1a Kidderpore Avenue.

This requirement arises pursuant to Clause 2.7 (II) of an agreement dated 15th December 2011 between

(1) Cathcart Investments Limited

and

(2) The Mayor and Burgesses of the London Borough of Camden

relating to land known as 3 Kidderpore Avenue, London NW3 7SX pursuant to Section 106 of the Town & Country Planning Act 1990 (as amended) and Section 278 of the Highways Act 1980.

I02 Scope of Survey

Reference is made to our Conditions of Engagement relating to Residential Building Surveys. The scope of this report is limited to the building structure and excludes external and internal finishes, joinery, installed building services and drainage.

I03 Property Description

The property stands upon land thought likely to have been transferred from the title of 1 Kidderpore Avenue adjoining against which the subject property encloses. As originally constructed, 1a Kidderpore Avenue comprises a two-bedroom semi-detached property the front elevation of which incorporates a tile hung gabled bay largely glazed at first floor in the proportions of a venetian window. A shallow single storey addition constructed upon the front of the property and ancillary alterations to create a garage within the ground floor footprint have resulted in some alteration of the original architectural style and proportions of the property.

The principal reception room within the rear parts of the property is thought likely to have once comprised a separate outbuilding. This now communicates with the main house beneath a flat roof link building whilst a further large single storey kitchen extension has been constructed upon the side of the former outbuilding. Various communicating openings have been formed at ground floor level between different parts of the property as extended over the years and the ground floor of which is believed to have been substantially reconfigured over the life of the building.

The date of construction has not been established with certainty. It is however recorded that Kidderpore Avenue was developed over a 20 year period from the late 1800's. Although largely comprising speculative housing of the time, 1 Kidderpore Avenue adjoining is understood to have been designed by a prominent Scottish architect of the period as a bespoke commission.

It is not known with certainty whether this commission extended to the subject property. Where the roof of the property encloses upon a substantial chimney stack serving 1 Kidderpore Avenue adjoining the chimney is partially constructed in common brickwork, reverting to facing brick above roof level. This suggests that the subject property is likely to have been built contemporaneous with 1 Kidderpore Avenue and may have been occupied as ancillary accommodation prior to transfer as a separate title.

104 Searches

The following online searches have been made for the purposes of preparing this report:

- British History Online – A History of the County of Middlesex: Volume 9: Hampstead, Paddington
- Surface geology information to assist in determining ground conditions held upon the British Geological Survey public access website
- Development Control and Building Control information held upon the London Borough of Camden public access website.

105	Documentation	No information concerning construction of the property nor previous works of alteration and extension have been made available for the purposes of preparing this report.
106	Orientation	Handings within this report are as viewing the front of the property from Kidderpore Avenue and the front elevation is deemed to be northeast facing.
107	Third Parties	This report is prepared solely for the stated purpose and no responsibility is accepted in whole or part with regard to any other parties.

GI00 GENERAL INFORMATIVES

GI01 Informative Notes

The following matters were noted from searches to establish background information concerning the property.

GI02 Development Control

The Planning register records five consents between 2005 and 2012, all relating to tree removal or crown reduction.

GI03 Building Control

The Building Control register records an application dating from June 2009 relating to various unspecified refurbishment works and minor layout alterations.

No records concerning the various extensions were identified which are therefore likely to pre-date records transferred to the public access website.

GI04 Ground Conditions

Reference to the British Geological Survey public access website indicates ground conditions to comprise Claygate beds. No overlying superficial deposits are recorded. These ground conditions are comparable with but not identical to London clay formation within the London basin.

GI05 National Heritage List

The property is not recorded as a listed building.

GI06 Survey Informatives

Access was made available to all parts of the property. External assessment of roof structures was made from flat roofs above extensions to the rear of the property and inspection was made of the void formed above the original house. No means of access is available to the void formed above the rear reception room.

GI07 Photographic Record

Weather conditions at the time of survey were dry and sunny.

Although not forming part of this inspection, it is noted that the main drainage runs beneath concrete aprons along the boundary with 3 Kidderpore Avenue.

A photographic record of the survey is held upon the project folder for reference and to support survey findings. In order however to respect privacy of the building owner, these have not been included within this report which may be published upon a public access website.

REPORT OF SURVEY FINDINGS

PART ONE : BUILDING FORM & CONSTRUCTION

1.00 BUILDING FORM AND CONSTRUCTION

GENERAL ARRANGEMENT

1.01 Introduction	01 The original semi-detached property has been subject to extensive alteration including the following: ▪ Construction of a single storey extension forward of the original building line beneath a flat roof. ▪ Substantial reconfiguration of the original ground floor retaining only the entrance hall and stairwell as original. ▪ Formation of two communicating openings through the original rear wall into the extensions and link accommodation with the former detached building (now reception room). ▪ Reconfiguration of the first floor bathroom. ▪ Provision of larger window openings within the garden facing elevations of the rear additions.
THE SITE 1.02 Ground Conditions	01 Characteristics of ground conditions generally within a particular area can be determined by reference to geological maps. Exact ground conditions underlying a particular site cannot however be established without site investigation in order to confirm local geology and the effects of any historical influences which may have resulted in disturbed ground conditions.

1.03	Topography	01	Properties lining Kidderpore Avenue and adjoining streets typically occupy sloping sites. Existing site levels are slightly below those of 3 Kidderpore Avenue adjoining but more constant with 1 Kidderpore Avenue upon the opposite boundary.
		02	Garden levels to the rear of 1a Kidderpore Avenue are below those at the front of the property with a gradient falling away towards the rear site boundary.
	FOUNDATIONS		
1.04	Original Building	01	Foundations of the original studio building are likely to comprise a nominal thickening of brick walls constructed at a shallow and consistent depth. Ground conditions and influences upon foundations are therefore likely to be reasonably constant beneath all parts of the original property.
		02	The intensity of structural loads distributed to the foundations is however likely to vary as a result of window and bay openings formed within the external walls above. These may have the effect of concentrating structural loads within panels of brickwork between openings. This can result in “differential movement” patterns where heavily loaded foundations have settled over the life of a building relative to other parts. This comprises a normal characteristic of period buildings in particular.
		03	Clay subsoils are of particular significance with regard to mature wooded gardens. In these circumstances, variations in ground moisture content associated with extraction of moisture by tree root systems may bring about volume changes in soils and consequential foundation movement.
1.05	Alterations	01	Front parts of the property have been subject to significant alteration, first floor structure having been re-supported upon steel beams where supporting walls have been removed at ground floor. These beams distribute locally increased loads upon brickwork bearings which may also result in differential movement patterns relative to normally loaded brickwork and foundations.

1.06	Extensions	01	The age of these extensions and therefore method of foundation construction is difficult to assess with certainty. These may however comprise brick corbel footings laid upon a shallow concrete base.
	RETAINING WALLS		
1.07	Northwest Boundary	01	An insitu concrete retaining structure of approximately 600mm height supports raised ground levels on the site of 3 Kidderpore Avenue adjoining.
	EXTERNAL WALLS		
1.08	Form of Construction	01	External walls of the original semi-detached house are believed to be of solid bonded brick construction of approximately one and a half brick overall thickness. This reduces to one brick thickness upon the front tile hung bay at first floor.
		02	Brickwork above original ground floor window openings is believed to have been supported upon segmental brick arches which are likely to have comprised a facing to timber backing lintels. Gauged brick arches are provided above first floor window openings with a concrete or render faced lintel above the stairwell window which comprises a later alteration.
1.09	Extensions	01	Window openings are thought to have been generally altered or enlarged subsequent to original construction. These are concrete or render faced and likely to comprise insitu concrete cast around steel beams where spanning above wider window and door openings. Brickwork is of solid bonded load bearing construction.

ROOF STRUCTURE			
1.10	Original House	01	The main roof comprises a traditional roof of timber construction arranged as a hip pattern. A dormer roof infills between the main hip slope and chimney stack located upon the flank wall.
		02	Timber rafters are paired either side of a central ridge supported upon load bearing walls to front and rear. The hip slope construction is trimmed relative to traditional hip rafters and is supported upon the flank wall.
		03	Rafter pairs are tied by raised ties which act as ceiling joists. Intermediate support to rafters is provided to the hip slope only in the form of a traditional purlin which extends as the ridge plate supporting roof slopes behind the front gabled bay. This is finished at a lower level therefore than the main roof.
		04	Ceiling joists are stiffened by timber hangers from the main ridge. The ceiling joists are however overlaid with sheet chipboard and fixing details between hangers and joists cannot therefore be assessed. In general terms however the roof can be considered as following a traditional form of construction commensurate with the age of the property.
1.11	Reception Room Roof	01	This roof comprises a steeply pitched structure with ridge orientated front to rear. The soffit is boarded at eaves level with no access being provided to the void formed within the roof framing. A pair of kneelers along each flank wall are however thought to comprise timber truss bearings.
		02	Traditional timber truss construction of the period would be capable of achieving clear spans across this room without intermediate support. The timber rafters would in turn be carried upon purlins spanning between gable walls at each end of the room with intermediate support from the truss frame. Ceiling joists are similarly likely to span from front to rear with intermediate support from the truss ties.

1.12	Flat Roofs	01	These are generally believed to comprise traditional timber joist construction. It is however possible that a small roof area forming part of the link between original house and later extensions is of solid construction.
	CHIMNEYS & FLUES		
1.13	General Arrangement	01	A chimney has been raised upon the flank wall of the original house. This contains a flue serving the ground floor fireplace and may originally have also served a fireplace within the larger front bedroom.
		02	The chimney is raised with a brick stack above roof level.
		03	The substantial chimney located upon the party wall and rising externally upon the flank wall of 1 Kidderpore Avenue is believed to serve the adjoining property only.
	SEPARATING WALLS		
1.14	Original House	01	The original house primarily encloses upon the flank wall of 1 Kidderpore Avenue. The line of this wall steps back however behind the large chimney breast such that the rear length of this wall reverted to external construction. This has however been subsequently enclosed upon at ground floor level.
		02	The rear building now forming the reception room of 1a Kidderpore Avenue similarly encloses upon the rear parts of 1a Kidderpore Avenue adjoining. This abutment is terminated with a lead lined parapet gutter to front and rear of a small tiled roof.

INTERNAL WALLS			
1.15	Form of Construction	01	Within original parts of the property partitioning at ground floor is of solid brick or block construction. Much of this is believed to date from reconfiguration of the ground floor, not being original to the property.
		02	First floor partitions are primarily of framed construction except for a short length of the 'spine' wall enclosing the entrance hall and small first floor bedroom above.
		03	Within the rear extensions internal walls are generally of solid construction.
FLOORS			
1.16	Original House	01	The first floor is of traditional timber joist construction with timber stair flight from the ground floor entrance hall. The ground floor is of solid construction.
1.17	Extensions	01	These floors are similarly of solid construction, believed to comprise insitu concrete cast on a prepared base.

REPORT OF SURVEY FINDINGS

PART TWO : CONDITION OF THE BUILDING

2.00 CONDITION OF THE BUILDING

FOUNDATIONS			
2.01	Assessment	01	Condition and adequacy of foundations within the ground can only be determined by the existence of any patterns of damage or distress within the building above which may be consistent with foundation movement.
		02	No evidence of movement associated with foundations or ground conditions is apparent. Minor diagonal hair cracking travelling above and below the rear stairwell window may be consistent with local movement or consolidation upon the south corner of the original building adjoining 1 Kidderpore Avenue. This is not considered however to be of structural significance.
		03	No evidence of movement associated with foundations or ground conditions occurs within the various rear extensions.
2.02	Tree Planting	01	Some risk of seasonal movement exists having regard to the combination of ground conditions and tree planting to front and rear of the property.
EXTERNAL WALLS			
2.03	Original Building	01	Minor old cracking patterns which occur within the first floor bay window aprons relative to the front wall are consistent with slight differential movement but not considered to be of structural significance. These patterns may partly be associated with ground floor alterations and extension to the front of the property which required re-supporting of the first floor bay structure. Condition is considered to remain satisfactory.

	02	Minor horizontal cracking extending from the window head of the small front bedroom may be associated with slight movement or displacement of the rafter bearings and outward 'thrust' upon the brickwork. The raised ceiling ties may not triangulate the roof structure as effectively as ceiling joists which tie the rafter feet at eaves level. Cracking is however considered to be of long standing and not of structural significance.
	03	Within the front consulting room minor cracking and displacement of plasterboard ceiling linings occurs. This is associated with slight deflection of supporting structure to the first floor bay above and is considered to remain within acceptable limits.
	04	Minor step pattern cracking externally beneath the small front bedroom window is consistent with deflection of supporting structure above the entrance hall. Movement patterns are not of significance although brickwork should be repointed in order to prevent risk of damp penetration.
	05	Vertical cracking occurs behind the rainwater downpipe located upon the party wall line with 1 Kidderpore Avenue. This extends approximately nine courses down from the eaves soffit with evidence of further old repointing below. Cracking is considered consistent with slight differential movement between the properties, exacerbated by slight variation within relative ground levels which is likely to be mirrored within varying foundation depths. Movement patterns are once more considered to be of long standing however with no significant or progressive structural movement. Open brickwork joints should be repointed.
2.04 Extension Walls	01	Condition and alignment remains generally satisfactory. Diagonal and horizontal cracking around both window heads within the reception room is considered to be associated with change in background between brick surfaces and the concrete lintel bearing. This is not considered to be of structural significance.
	02	Repointing between the lintel bearing between kitchen and reception room windows may be associated with previous differential movement but present condition remains satisfactory.

ROOF STRUCTURE

2.05 Main Roof

- 03 Visual appraisal suggests the kitchen window lintel to have acquired distortion and settled towards the north corner of the property. Close assessment establishes however that the depth of the lintel varies by 30mm along its length. This has the result of creating a false impression that movement or displacement has occurred within the lintel itself.
- 01 Alignment of tiled slopes remains satisfactory with no evidence of sagging or deflection within the roof structure. Within the roof void, rafter pairs remain suitably aligned and butt jointed against the ridge plate with no evidence of lateral movement or displacement.
- 02 Isolated splits and shakes occur within some rafters commensurate with age.
- 03 Timber packing pieces have been inserted into the joint formed between the main ridge and hip rafters to front and rear. This arrangement appears to be of some longstanding and the packing pieces remain securely wedged. It is possible that this comprises a poorly formed joint dating from original construction of the property although the possibility of a repair in response to movement within the hip rafters cannot be disregarded. In either case, this condition appears to be of some considerable long standing with no evidence of recent or progressive movement being apparent.
- 04 Slight 'spread' of the hip slope may have occurred since the hip slope rafters will not be restrained at eaves level by the raised collars which form the ceiling joists. The hip roof slope will therefore have been more susceptible to movement than those to front and rear, particularly in the event of any movement or alteration within the supporting structure.
- 05 Slight deflection has occurred within the dormer infilled roof behind the flank chimney stack.

2.06	Pitched Roof above Reception Room	06	Ceiling levels 'hog' over the separating partition between front bedrooms where direct support is provided to stiffening binders.
		07	Filled diagonal cracking within sloping soffits of the front first floor bay is consistent with minor old movement patterns. These are not however considered to be of structural significance and no evidence of progressive movement occurs.
		01	Tiled slopes deflect between supporting gable end brickwork and intermediate timber trusses. This has resulted in opening of tile perpend above the brick gables.
		02	Whilst deflection has been sufficient to potentially affect serviceability of roof coverings, this is nonetheless considered to remain within acceptable limits for the age of property.
		03	It is possible that movement may have resulted in some opening or weakening of carpentry joints within the roof structure. In the absence of access to the roof void, condition cannot however be verified.
2.07	Extension Flat Roofs	04	Minor horizontal cracking along the top of cornicing within the reception room is also likely to be consistent with slight deflection of the roof structure.
		01	Local deflection and cracking of ceiling finishes occurs within the small room formed within the front extension. This may partly be associated with deflection of supporting structure to the main wall above.
		02	No evidence of significant deflection was identified within rear extension flat roofs which remain firm and free of excess 'spring' or vibration. Minor cracking radiating from corners of the roof light apron above the kitchen is not considered to be of significance.

SEPARATING WALL			
2.08	Condition	01	No evidence of movement or defect is apparent within the separating wall shared with 1 Kidderpore Avenue adjoining.
INTERNAL WALLS			
2.09	Condition	01	First floor partitions have acquired slight distortion. This is evidenced by slight distortion of door openings and misalignment of some lengths of picture rail relative to external walls. This is likely to be associated with slight deflection of timber floor joists from which some lengths of first floor partitioning are directly raised. Movement is not considered to be of significance and is commensurate with the age of property.
		02	No evidence of movement or defect was noted within internal walls separating ground floor rooms.
FLOORS			
2.10	First Floor	01	Timber first floor structures remain firm but 'hogging' slightly either side of the load bearing partition between ground floor entrance hall and adjoining rooms. Floors remain free of excess vibration and satisfactory. Minor misalignment within the front bay is within acceptable limits.
		02	Some parts of the first floor will have been re-supported upon concealed structural beams or new load bearing partitions at ground floor ancillary to internal alterations undertaken within the property.
		03	A plywood sheet overlay to the first floor boards precludes confirmation of floor joist span.

2.11	Staircase	01	Condition and alignment of the stair flight remains satisfactory.
2.12	Ground Floor	01	Within front parts of the property some unevenness occurs within the small front room. This is believed to have been converted from garaging in which case the original ground floor slab may not have been fully levelled prior to conversion.
		02	Solid floors within original parts of the main house remain generally satisfactory although with evidence of possible consolidation at the foot of the staircase where parquet block joints have opened up.
		03	Within the rear reception room sheet carpets are believed to be laid over board and battens to a solid slab. Alignment remains fair.
		04	Condition and alignment of flooring within the kitchen extension similarly remains satisfactory.
	CHIMNEY		
2.13	Condition	01	Alignment of the chimney and stack upon the flank wall remains satisfactory.
	BOUNDARIES		
2.14	Northwest Boundary	01	The retaining structure to raised levels of 3 Kidderpore Avenue is largely overgrown. Horizontal cracking is however apparent along the concrete face in some locations together with local disintegration along the front length beneath precast plank fencing. This is in poor and potentially unstable condition.
2.15	Screen Wall	01	The side entrance gate is hung in a one brick screen wall rendered upon the internal face. This length of wall is not restrained, comprises a relatively slender structure and is potentially susceptible to any source of movement.

REPORT OF SURVEY FINDINGS

PART THREE : REVIEW OF FINDINGS

3.00 REVIEW OF FINDINGS

3.01	General Arrangement	01	1a Kidderpore Avenue comprises a period property of traditional construction which has been extensively reconfigured internally at ground floor and extended to front and rear.
3.02	Foundations	01	Extensive alterations to the property are likely to have resulted in some changes of load distribution to foundations. No evidence of significant movement or defect associated with foundations or ground conditions is however apparent from inspection.
		02	Seasonal movement risks remain taking into account ground and site conditions.
3.03	External Walls	01	Limited old movement and cracking patterns have been identified. Some of these are likely to result from past alteration. No cracking or movement of structural significance occurs within the property.
3.04	Roof Structure	01	Condition and alignment of the main pitched roof remains satisfactory. Evidence of poor carpentry joints or subsequent movement occurs where hip rafters abut the ridge but with no evidence of significant or progressive movement being apparent.
		02	Longstanding deflection of pitched timber roof structures above the reception room has resulted in slight displacement of plain tile finishes adjacent gables. Movement is however considered to remain within acceptable limits for the age of property.
3.05	Party & Internal Walls	01	No evidence of significant movement is apparent.
3.06	Floors	01	Condition and alignment of floors remains generally satisfactory. Timber upper floors remain firm with slight irregularity commensurate with the age and type of construction.

3.07	Summary	01	Inspection has not identified any evidence of significant movement or defect within the original building or subsequent extensions. Limited old movement patterns and cracking which have been identified are considered to be consistent with the methods of construction, in some cases possibly exacerbated by subsequent alteration. Condition is however considered to remain satisfactory and consistent with the age and type of property.
3.08	Instructions	01	This report is prepared pursuant to the Section 106 Agreement identified within part I01 of this report.
3.09	Document Reference	01	AJN / pb / Reports14 / a55507.  Andrew J Nichols BSc FRICS for the Shearwater Consultancy Limited
3.10	Date of Report	01	30 th June 2014.

APPENDIX A : CONDITIONS OF ENGAGEMENT

The Report

1. The report will advise as to construction and condition of the building as far as possible subject to the limitations described below together with defects or disrepair which are or are likely to give rise to significant expenditure
2. The report will not include a valuation.

Review of Supporting Documentation (Technical Due Diligence)

3. Technical due diligence comprises review of drawings, specifications, statutory consents and other documents relating to construction, alteration or other works concerning the property which may be provided by the vendor.
4. Material provided for these purposes may vary considerably in quantity and content. Where formal due diligence of design and construction packages is required within the scope of survey, this requirement should be notified in advance in order that the level of review can be agreed.

The Inspection

5. As much of the surface area as is practical and readily visible from any part of the Building or surrounding area to which access can reasonably be gained will be inspected.
6. No entry will be made to other properties, buildings, or land which appear to be in other ownership.
7. Fitted carpets or floorboards will not be lifted unless in locations found to be loose and capable of lifting without risk of damage.
8. Large items of furniture will not be moved.

9. Trial holes for the purpose of exposing foundations or other below ground structures and exposure of other structural elements is likely to cause damage and requires builders' attendance. This will not therefore be undertaken except by prior arrangement and with the express consent of the vendor.

Roofs

10. Roof voids will be inspected where accessible trap doors are provided which can be reached from a surveyor's ladder.
11. Flat roofs will be inspected where safe access is provided from within the building.
12. Some roof types are of flat or low pitch construction such that inspection of external finishes from ground level is limited or impractical. In these circumstances, alternative means of external access can be arranged (at extra cost) provided reasonable notice of this requirement is given at the time of confirmation of instructions.

Installed Building Services

13. Service installations will not be considered within the scope of inspection. Advice as to condition and adequacy of service installations requires specialist inspection and report which can be arranged at additional cost if required.

Drainage

14. Below ground drainage will not be inspected or tested within the scope of inspection. Advice as to condition and adequacy of below ground drainage requires specialist inspection and can be arranged at additional cost if required.

Environmental Appraisal

15. Advice as to site history, contaminated land and similar matters requires a specialist inspection or report which can be arranged (at extra cost) providing reasonable notice is given.

Purpose Built or Converted Flats and Maisonettes

16. Where the subject property forms part of a larger development, the inspection will extend to the interior and exterior fabric of the subject property together with cursory inspection of remaining exterior parts and common areas sufficient to identify general condition only. In the case of developments comprising two or more separate blocks of flats or mansion block buildings, inspection will extend only to the block or building within which the property is located.

Professional Fees

17. The fee quoted above is based on the description given to us, but we reserve the right to amend this should the property be substantially different from that envisaged or described.
18. Our invoice will be presented upon completion of the survey report and shall be due for settlement within 30 days of presentation.
19. The fee quoted will not include allowance to undertake formal technical due diligence unless agreed in advance.

Third Parties

20. The Report is provided for the sole use of the named client(s) and any professional advisers. The Surveyor accepts responsibility to the client alone for the stated purposes and that the report will be prepared with the skill care and diligence reasonably to be expected of a competent chartered surveyor, but accepts no responsibility whatsoever to any person other than the client himself. Any such person relies upon the report at his own risk.

Revised: October 2013

Taylor Whalley Spyra Drawing 8148_PH100 dated 30.04.14 showing
Existing and proposed surface water site catchment zones
and site surface water drainage layout.

[illegible]