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APPENDICES

Appendix A

Summary of Soil Testing Results

Table A.1 Summary of test results from borehole No.8

Summary of test results, borehole No.8																
Project: BMA flood diversion tunnel (Saensaep Latphrao-Phrakhanong project)											Ground Water Level: - 0.5 m					
Sample	Depth (m)			γ_t	Natural	Atterberg Limit (%)			S_u	SPT	Sieve Analysis, % Finer					Classi-
No.	From	To	Avg.	kN/m^3	w_n (%)	LL	PL	PI	kN/m^2	(blows/ft)	3/8"	4	10	40	200	fication
ST-01	3.00	3.50	3.25	15.30	74.00				17.66							CH
ST-02	4.50	5.00	4.75	14.72	95.50				10.79							CH
ST-03	6.00	6.50	6.25	15.01	89.40	101.70	35.30	66.40	14.72							CH
ST-04	7.50	8.00	7.75	14.62	102.00				10.79							CH
ST-05	9.00	9.50	9.25	14.42	104.40				13.73							CH
ST-06	10.50	11.00	10.75	15.01	88.50				14.72							CH
ST-07	12.00	12.50	12.25	15.70	72.70				15.70							CH
ST-08	13.50	14.00	13.75	15.01	77.30				42.18							CH
ST-09	15.00	15.50	15.25	18.54	35.40				48.07							CL
SS-10	16.50	16.95	16.73	20.99	31.90	94.90	32.30	62.60	63.77	10						CL
ST-11	17.50	18.00	17.75													CL
SS-12	18.00	18.45	18.23		30.60					12						CL
SS-13	19.50	19.95	19.73		22.10					17						CL
SS-14	21.00	21.45	21.23							19		100	99	95	39	SC/CL
SS-15	22.50	22.95	22.73	20.31	21.70				212.88	25						CL
SS-16	24.00	24.45	24.23	20.80						36	100	98	91	61	18	SM-SP
SS-17	25.50	25.95	25.73							28	100	98	84	43	10	SM-SP
SS-18	27.00	27.45	27.23							43						SM-SP
SS-19	28.50	28.95	28.73							38	100	99	93	63	9	SM-SP
SS-20	30.00	30.45	30.23							36						SM-SP
SS-21	31.50	31.95	31.73							25		100	98	64	9	SM-SP
SS-22	33.00	33.45	33.23							50	100	98	96	39	11	SM-SP
SS-23	34.50	34.95	34.73							33						SM-SP
SS-24	36.00	36.45	36.23							33		100	99	24	12	SM-SP
SS-25	37.50	37.95	37.73		23.80	52.80	27.60	25.20		29						CL
ST-26	39.00	39.50	39.25													CL
SS-27	39.55	40.00	39.78	20.70	19.30				196.20	42						CL

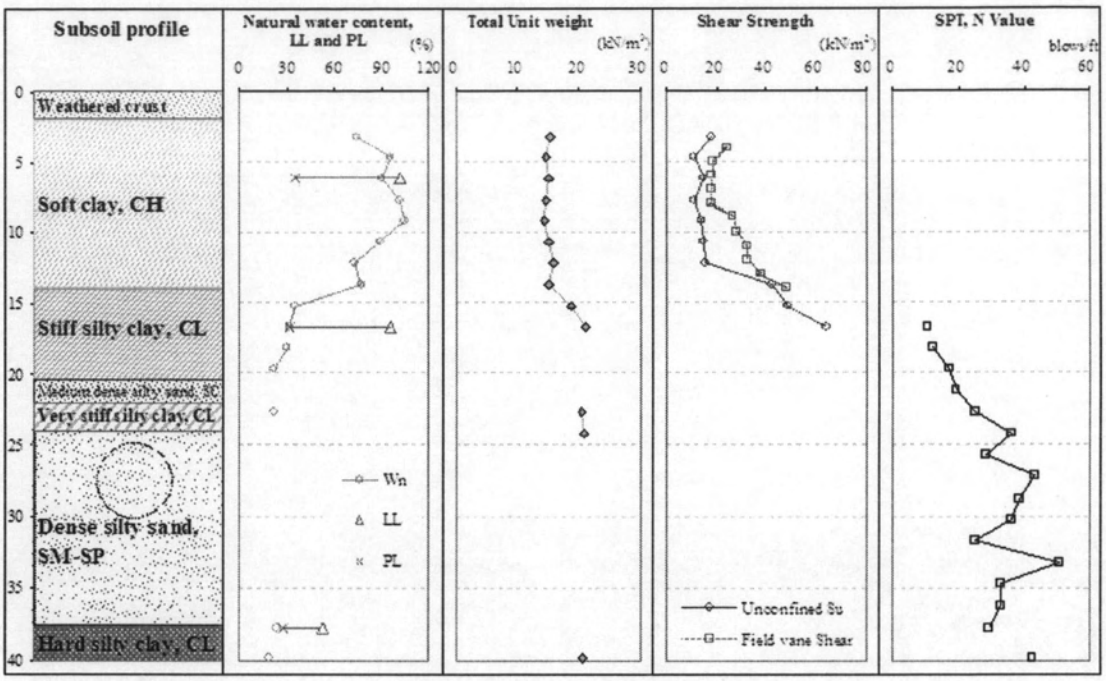

Figure A.1 Typical soil profile of borehole No.8

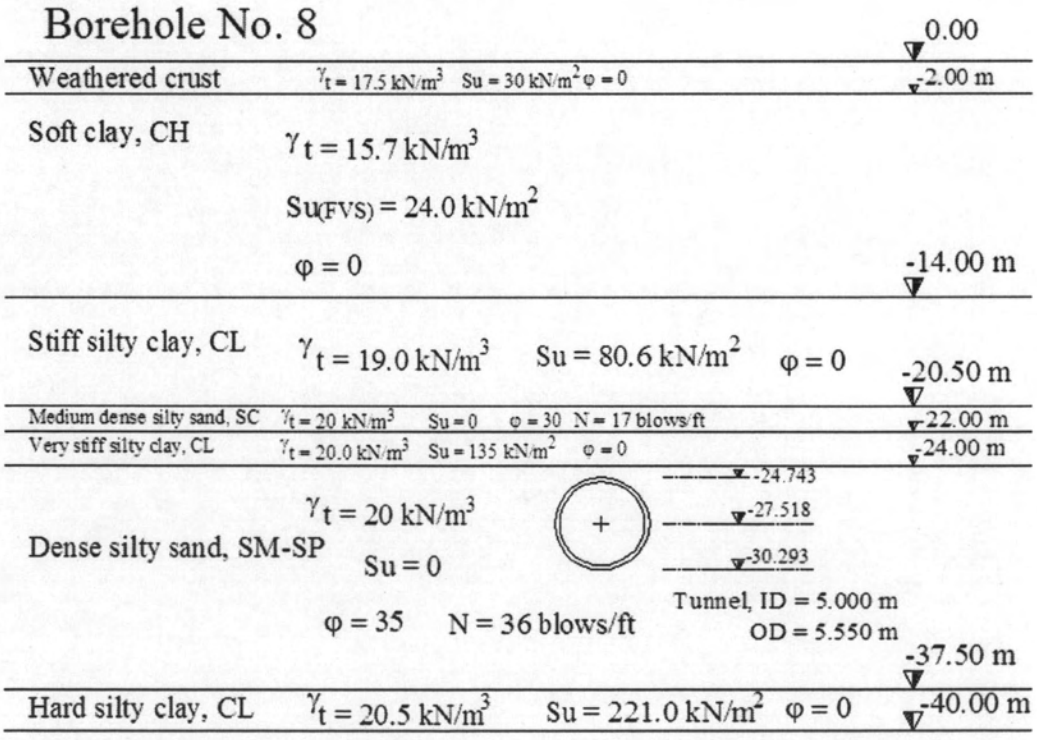

Figure A.2 Engineering properties of borehole No.8 for FE analysis

Table A.2 Summary of test results from borehole No.9

Summary of test results, borehole No.9																
Project: BMA flood diversion tunnel (Saensaep Latphrao-Phrakhanong project)											Ground Water Level: -0.8 m					
Sample	Depth (m.)			γ_t	Natural	Atterberg Limit (%)			S_u	SPT	Sieve Analysis, % Finer					Classi-
No.	From	To	Avg.	kN/m^3	w_n (%)	LL	PL	PI	kN/m^2	(blows/ft)	3/8"	4	10	40	200	fication
ST-01	3.00	3.50	3.25	15.60	70.70				41.20							CH
ST-02	4.50	5.00	4.75	16.19	68.80				28.45							CH
ST-03	6.00	6.50	6.25	15.21	85.00	88.30	35.90	52.40	19.62							CH
ST-04	7.50	8.00	7.75	14.81	93.90				22.56							CH
ST-05	9.00	9.50	9.25	14.52	102.40				23.54							CH
ST-06	10.50	11.00	10.75	15.50	79.10				26.49							CH
ST-07	12.00	12.50	12.25	15.40	84.60				9.81							CH
ST-08	13.50	14.00	13.75	18.25	39.20				60.82							CL
SS-09	15.00	15.45	15.23	19.23	27.40	66.70	23.70	43.00		9						CL
SS-10	16.50	16.95	16.73	18.54	32.50				92.21	12						CL
ST-11	17.50	18.00	17.75	18.34	41.30				104.97							CL
SS-12	18.00	18.45	18.23	17.56	36.90					16						CL
SS-13	19.50	19.95	19.73	18.44	33.30				67.69	11						CL
SS-14	21.00	21.45	21.23		23.40					14			100	96	39	SC
SS-15	22.50	22.95	22.73	20.40	17.80				93.20	20		100	94	75	58	CL
SS-16	24.00	24.45	24.23							23	100	96	87	52	15	SM
SS-17	25.50	25.95	25.73							32		100	98	81	13	SM
SS-18	27.00	27.45	27.23							32						(SM)
SS-19	28.50	28.95	28.73							38			100	94	78	CL
SS-20	30.00	30.45	30.23							33	100	99	88	48	8	SM-SP
SS-21	31.50	31.95	31.73							56		100	98	72	11	SM-SP
SS-22	33.00	33.45	33.23							51						SM-SP
SS-23	34.50	34.95	34.73							40		100	98	24	14	SM
SS-24	36.00	36.45	36.23							29						SM-SP
SS-25	37.50	37.95	37.73							28	100	99	79	22	9	SM-SP
SS-26	39.55	40.00	39.78	20.80	19.00	57.30	27.20	30.10		33						CL

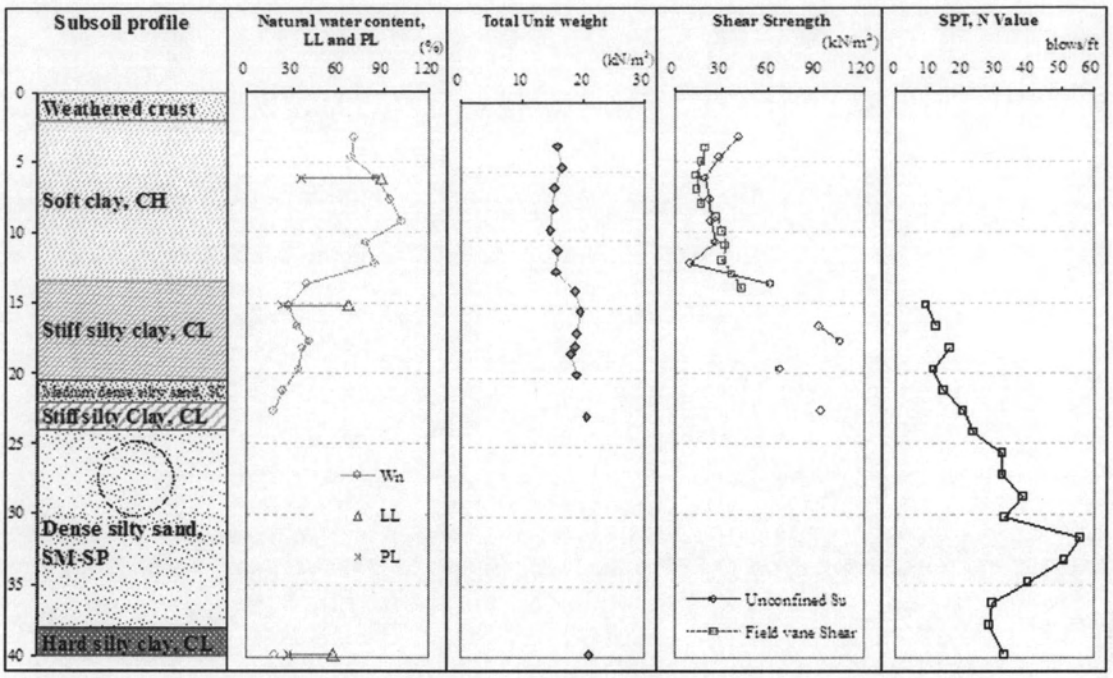

Figure A.3 Typical soil profile of borehole No.9

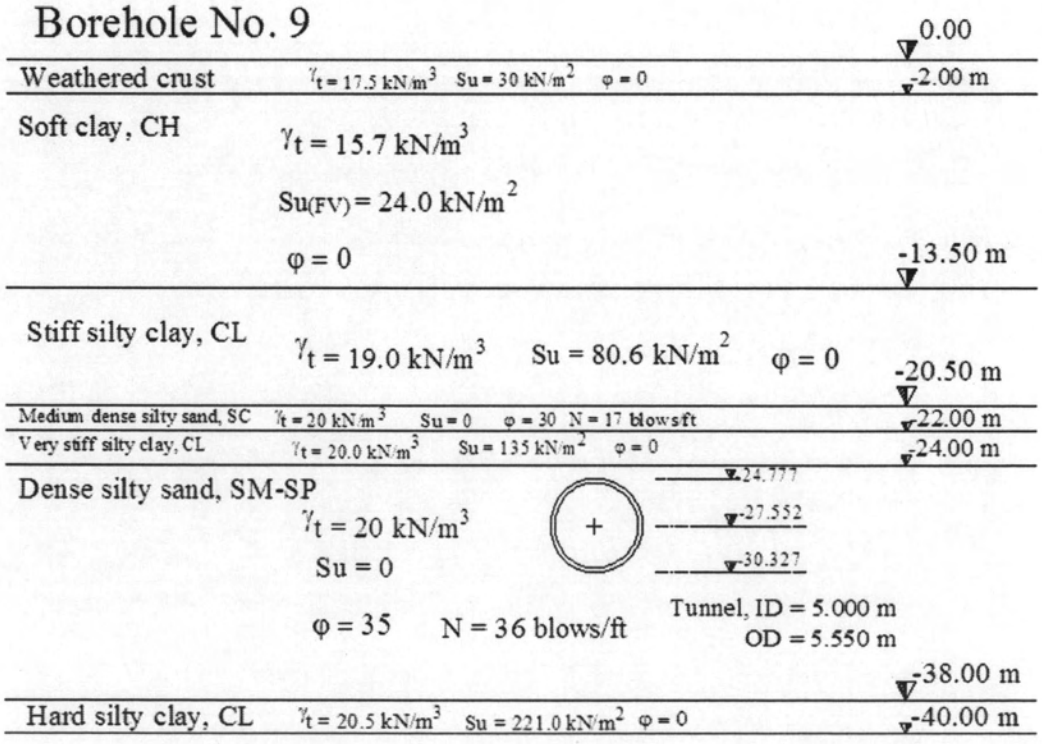

Figure A.4 Engineering properties of borehole No.9 for FE analysis

Table A.3 Summary of test results from borehole No.18

Summary of test results, borehole No.18																	
Project: BMA flood diversion tunnel (Saensaep Latphrao-Phrakhanong project)											Ground Water Level: -1.10 m						
Sample	Depth (m)			γ_t	Natural	Atterberg Limit (%)			S_u	SPT	Sieve Analysis, % Finer						Classi-
No.	From	To	Avg.	kN/m^3	w_n (%)	LL	PL	PI	kN/m^2	(blows/ft)	3/8"	4	10	40	200		fication
ST-01	3.00	3.50	3.25	14.72	95.10				13.73								CH
ST-02	4.50	5.00	4.75														CH
ST-03	6.00	6.50	6.25	16.58	62.00	65.30	25.90	39.40	11.77								CH
ST-04	7.50	8.00	7.75	16.28	69.80				13.73								CH
ST-05	9.00	9.50	9.25	14.72	90.30				12.75								CH
ST-06	10.50	11.00	10.75	15.11	86.30				15.70								CH
ST-07	12.00	12.50	12.25	15.60	72.90				41.20								CH
ST-08	13.50	14.00	13.75	17.76	40.20				51.99								CH
ST-09	15.00	15.50	15.25	19.33	30.40	62.80	22.70	40.10	51.01								CH
ST-10	16.00	16.50	16.25	19.23	31.80				80.44								CL
SS-11	16.50	16.95	16.73	17.85	34.00				115.76	19							CL
SS-12	18.00	18.45	18.23	17.76	41.30					13							CL
SS-13	19.50	19.95	19.73	19.13	25.30					15							CL
SS-14	21.00	21.45	21.23	19.52	21.40					22							CL
SS-15	22.50	22.95	22.73	20.31	22.70				191.30	28							CL
SS-16	24.00	24.45	24.23	20.31	23.40					27							CL
SS-17	25.50	25.95	25.73	21.19	14.50				243.29	29							CL
SS-18	27.00	27.45	27.23	20.01	20.50					48							CL
ST-19	28.00	28.50	28.25														CL
SS-20	28.50	28.95	28.73	20.11	19.50					38							CL
SS-21	30.00	30.45	30.23	20.21	21.90	45.70	17.20	28.50	119.68	22							CL
SS-22	31.50	31.95	31.73		20.50					18							CL
SS-23	33.00	33.45	33.23	20.01	23.10					24							CL
SS-24	34.50	34.95	34.73							41			100	85	11		SM-SP
SS-25	36.00	36.45	36.23							32			100	43	17		SM
SS-26	37.50	37.95	37.73		30.30	52.60	27.30	25.30		8							CL
SS-27	39.55	40.00	39.78		36.20					7							CL

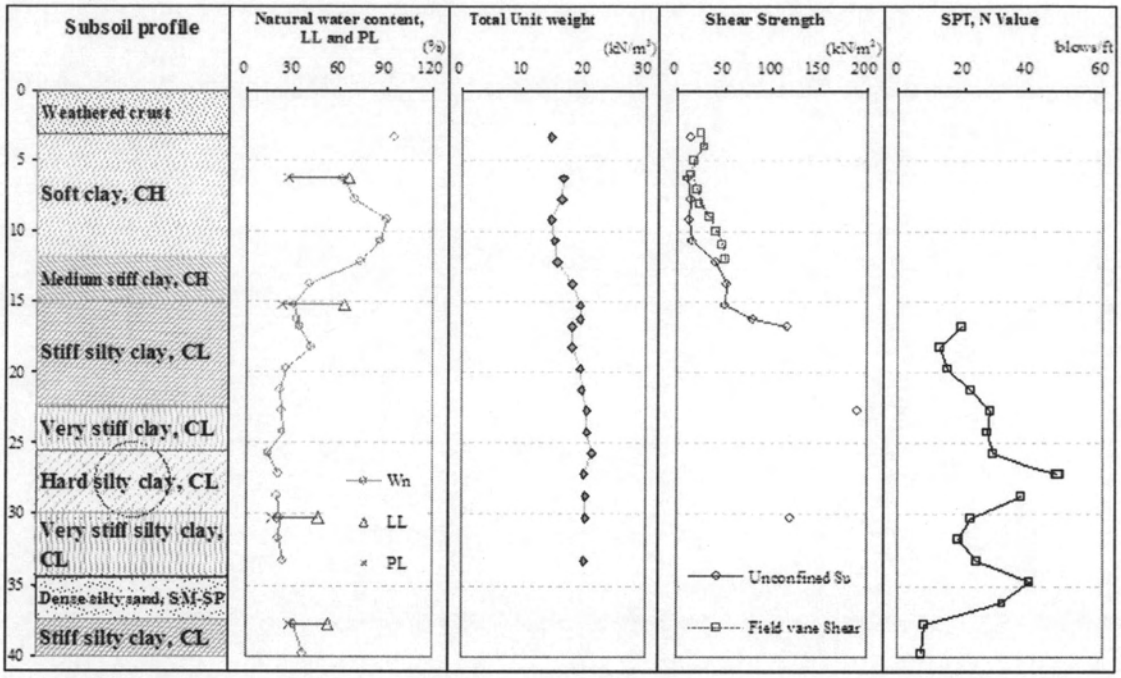

Figure A.5 Typical soil profile of borehole No.18

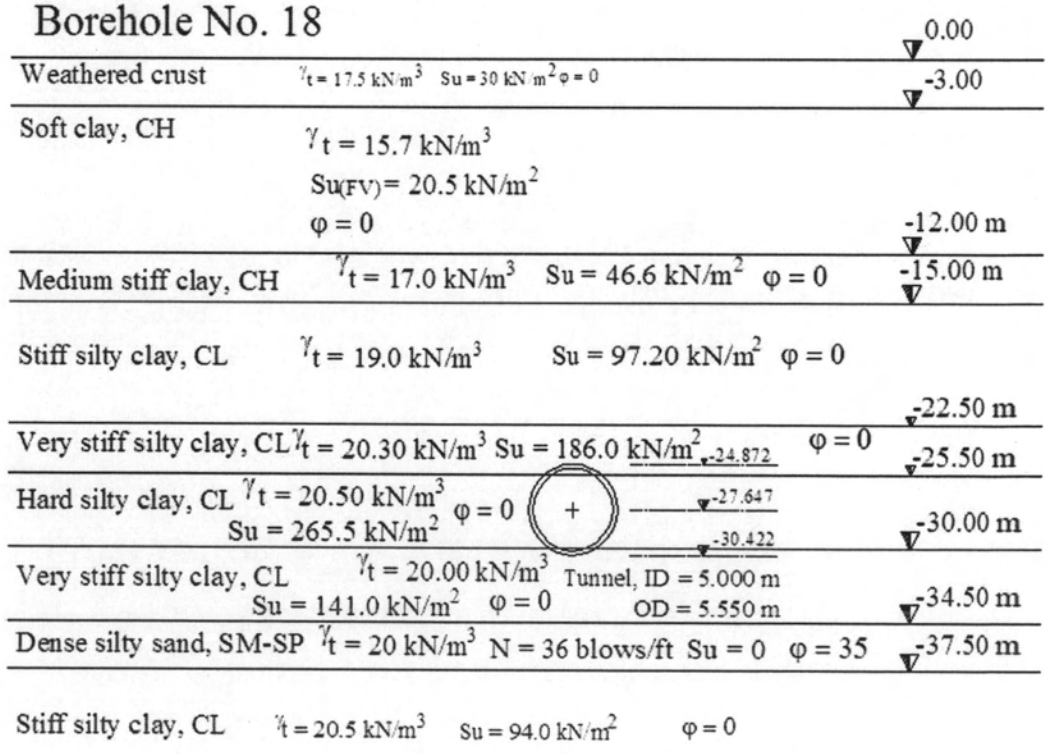

Figure A.6 Engineering properties of borehole No.18 for FE analysis

Appendix B

Monitored Data

Table B.1 Data of ground surface settlement, array number GS16

GROUND SURFACE SETTLEMENT ARRAY No.GS16															
Activity date		09/07/05	10/07/05	11/07/05	11/07/05	11/07/05	11/07/05	11/07/05	11/07/05	12/07/05	12/07/05	18/07/05	25/07/05	11/10/05	11/01/06
Activity	*Initial*	EX P1607	EX P1638	EX P1642	EX P1644	EX P1645	EX P1646	EX P1647	EX P1648	EX P1650	EX P1654	EX P1735	EX P1845	EX P2833	EX P3273
Tunnel face sta. (m)	*reading*	-30	-10	-5	0	+1	+2	+3.5	+5	+8	+13	1 week	2 weeks	3 months	6 months
Point No.	**Vertical movements (mm)**														
GS16/4L	*0.000*	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1
GS16/3L	*0.000*	0	0	0	-1	-1	-2	2	2	4	1	-3	-2	-2	-3
GS16/2L	*0.000*	0	0	0	-3	-3	-3	-3	-3	-3	-4	-10	-10	-10	-11
GS16/1L	*0.000*	0	0	0	-1	-1	-2	-2	-2	-3	-10	-19	-19	-19	-20
GS16R	*0.000*	-1	-3	-3	-8	-8	-9	-9	-9	-9	-17	-25	-26	-26	-27
GS16/1R	*0.000*	0	-1	-1	-6	-6	-6	-5	-5	-6	-13	-22	-22	-22	-23
GS16/2R	*0.000*	0	0	0	-3	-3	-3	-3	-3	-3	-8	-16	-16	-16	-16
GS16/3R	*0.000*	0	0	0	-2	-2	-2	-2	-2	-3	-2	-4	-4	-4	-4
GS16/4R	*0.000*	0	0	0	0	0	0	0	0	0	-5	-6	-6	-6	-6

Table B.2 Data of ground surface settlement, array number GS17

GROUND SURFACE SETTLEMENT ARRAY No.GS17															
Activity date		15/07/05	16/07/05	16/07/05	17/07/05	17/07/05	17/07/05	17/07/05	17/07/05	17/07/05	17/07/05	24/07/05	31/07/05	17/10/05	17/01/06
Activity	*Initial*	EX P1690	EX P1706	EX P1711	EX P1713	EX P1714	EX P1715	EX P1716	EX P1717	EX P1719	EX P1724	EX P1829	EX P1939	EX P2833	EX P3380
Tunnel face sta. (m)	*reading*	-30	-10	-5	-2	-1	0	+1	+2	+5	+10	1 week	2 weeks	3 months	6 months
Point No.	**Vertical movements (mm)**														
GS17/2L	*0*	0	0	0	0	0	0	0	0	0	-1	-2	-2	-3	-3
GS17/1L	*0*	0	0	0	0	-2	-2	-2	-4	-6	-7	-11	-11	-13	-13
GS17	*0*	0	-2	-2	-2	-6	-9	-9	-11	-14	-14	-25	-25	-27	-27
GS17/1R	*0*	0	-2	-2	-2	-4	-4	-4	-8	-9	-10	-20	-20	-21	-21
GS17/2R	*0*	0	0	0	0	-4	-4	-4	-4	-4	-4	-11	-11	-11	-11
GS17/3R	*0*	0	0	0	0	-2	-2	-2	-2	-2	-2	-4	-4	-4	-4

Table B.3 Data of ground surface settlement, array number GS18

GROUND SURFACE SETTLEMENT ARRAY No.GS18															
Activity date		18/07/05	19/07/05	20/07/05	20/07/05	20/07/05	20/07/05	20/07/05	20/07/05	20/07/05	21/07/05	27/07/05	03/08/05	20/10/05	20/01/06
Activity	*Initial*	EX P1747	EX P1763	EX P1768	EX P1770	EX P1771	EX P1772	EX P1773	EX P1774	EX P1776	EX P1781	EX P1878	EX P1969	EX P2833	EX P3425
Tunnel face sta. (m)	*reading*	-30	-10	-5	0	+1	+2	+4	+5	+8	+13	1 week	2 weeks	3 months	6 months
Point No.	**Vertical movements (mm)**														
GS18/3L	*0*	0	0	0	0	0	-2	-2	-2	-2	-1	-5	-5	-5	-5
GS18/2L	*0*	0	0	0	-1	-1	-1	-1	-1	-1	-2	-8	-8	-8	-8
GS18/1L	*0*	0	0	-1	-2	-2	-3	-3	-3	-5	-6	-14	-14	-14	-14
GS18	*0*	0	0	-2	-4	-4	-5	-5	-5	-6	-8	-18	-18	-18	-18
GS18/1R	*0*	0	0	-1	-2	-3	-4	-4	-4	-6	-6	-13	-13	-13	-13
GS18/2R	*0*	0	0	0	0	-1	-2	-2	-2	-3	-4	-8	-8	-8	-8

Table B.4 Data of ground surface settlement, array number GS-BTS

GROUND SURFACE SETTLEMENT ARRAY No.GS-BTS														
Activity date	03/03/06	03/03/06	06/03/06	07/03/06	07/03/06	07/03/06	07/03/06	07/03/06	07/03/06	08/03/06	09/03/06	16/03/06	23/03/06	-
Activity	EX P3930	EX P3930	EX P3970	EX P3980	EX P3986	EX P3988	EX P3990	EX P3992	EX P3994	EX P4000	EX P4010	EX P4121	EX P4212	-
Tunnel face sta. (m)	*Initial*	-30	-10	-5	-2	-1	0	+1	+2	+5	+10	1 week	2 weeks	3 months
Point No.	**Vertical movements (mm)**													
GS-BTS/1L	*0.000*	0	0	0	-1	-1	-1	-1	-1	-3	-3	-3	-3	-3
GS-BTS	*0.000*	0	-1	-1	-3	-3	-3	-3	-4	-5	-5	-5	-6	-6
GS-BTS/1R	*0.000*	0	-1	-1	-1	-1	-1	-1	-1	-2	-3	-3	-3	-3

Table B.5 Data of ground surface settlement, array number G35

GROUND SURFACE SETTLEMENT ARRAY No.GS-35														
Activity date	05/03/06	05/03/06	07/C3/06	08/03/06	08/03/06	08/03/06	08/03/06	08/03/06	08/03/06	09/03/06	09/03/06	16/03/06	23/03/06	-
Activity	EX P3954	EX P3954	EX P3994	EX P4004	EX P4010	EX P4012	EX P4014	EX P4016	EX P4018	EX P4024	EX P4034	EX P4128	EX P4220	-
Tunnel face sta. (m)	*Initial*	-30	-10	-5	-2	-1	0	+1	+2	+5	+10	1 week	2 weeks	3 months
Point No.	**Vertical movements (mm)**													
GS35/1R	*0.000*	0	0	0	0	0	0	0	0	-1	-1	-3	-3	-3
GS35/1L	*0.000*	0	0	0	0	0	0	0	0	0	0	-3	-3	-3
GS35	*0.000*	0	0	0	0	0	0	0	0	-1	-1	-4	-4	-4

Table B.6 Data of extensometer number ME-1 (Klongtan Bridge area)

Extensometer No. ME-1																			
Tunnel face (m)		*Initial*	-30.0	**-11.00**	**-7.50**	**-4.50**	**-2.40**	**-1.50**	**0.00**	**+1.50**	**+3.00**	**+4.50**	**+6.00**	**+8.00**	**+10.00**	**+13.50**	1 week	2 weeks	3 months	6 months
Surface settlement (mm)		0.00	-1.00	-3.00	-3.00	-3.00	-8.00	-8.00	-8.00	-9.00	-9.00	-9.00	-9.00	-9.00	-17.00	-17.00	-25.00	-26.00	-26.00	-27.00
Spider magnet No.	Depth (m)	**Cumulative vertical movements (mm)**																		
ME-1/4	-3.094	0.00	-1.25	-2.75	-2.75	-1.25	-7.25	-6.75	-7.25	-8.25	-7.75	-7.75	-6.75	-6.25	-16.75	-16.75	-22.25	-24.75	-26.75	-26.75
ME-1/3	-13.111	0.00	-0.75	-2.75	-1.75	-1.25	-8.75	-6.75	-9.25	-10.75	-10.75	-10.25	-9.75	-9.25	-18.75	-19.25	-19.25	-25.25	-24.75	-26.25
ME-1/2	-18.594	0.00	-1.75	-2.25	-1.25	-1.75	-6.75	-6.75	-10.25	-13.75	-15.25	-16.25	-17.25	-17.75	-28.75	-28.75	-31.75	-33.75	-32.75	-33.75
ME-1/1	-23.37	0.00	-0.50	-2.50	-1.50	-2.00	-9.50	-12.5	-19.5	-24.5	-25.50	-26.50	-26.50	-27.00	-40.00	-39.50	-40.00	-43.00	-42.00	-42.50

Table B.7 Data of extensometer number ME-2 (BTS-Sukumvit area)

Extensometer No. ME-2																							
Tunnel face (m)		*Initial*	-30.0	-12.0	-8.00	-5.00	-3.00	-2.00	-1.50	-1.00	-0.50	0.00	+0.50	+1.00	+1.50	+2.00	+3.00	+5.00	+8.00	**+13.50**	0.5 week	1 week	2 weeks	3 months
Surface sett. (mm)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.50	-1.00	-1.00	-1.00	-1.50	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-3	-3	-3	-3
Spider magnet No.	Depth (m)	**Cumulative vertical movements (mm)**																						
ME-1/3	-3.106	0.00	0.00	1.00	2.50	1.00	1.50	1.00	0.00	0.00	0.50	0.00	-1.00	-1.50	-1.00	0.00	1.00	1.00	0.00	0.00	-4.5	-3	-3	-2.5
ME-1/2	-12.655	0.00	0.00	1.50	0.00	1.50	0.50	-0.50	-0.50	-1.50	-1.50	0.00	-2.50	-0.50	-1.00	0.00	-1.00	0.50	0.50	0.00	-5	-4	-3	-4.5
ME-1/1	-22.692	0.00	0.00	2.50	-0.50	1.50	0.50	0.50	0.50	-2.00	-2.00	-2.00	1.00	-1.50	-1.00	-1.50	-1.50	-2.00	-2.50	-3.50	-7	-4.5	-5.5	-5

Table B.8 Lateral movements obtained from IC (BTS-Sukumvit area)

	Position of TBM's face (m)											
Depth	Initial	-12	-8	-5	-3	-2	-1.5	-1	-0.5	0	+0.5	+1
(m)	Lateral movements (mm)											
0.00	0.00	-0.16	-1.20	-1.67	-2.13	-1.30	-0.94	5.51	8.20	13.25	8.65	11.55
-0.50	0.00	-0.12	-1.07	-1.58	-2.00	-1.17	-0.81	6.15	8.58	14.34	9.38	12.28
-1.00	0.00	-0.06	-1.05	-1.52	-1.93	-1.15	-0.79	6.56	8.80	14.45	9.55	12.45
-1.50	0.00	-0.01	-0.50	-0.72	-0.98	0.40	0.86	8.50	10.50	16.10	11.20	14.10
-2.00	0.00	-0.14	-0.88	-1.20	-1.57	-0.53	-0.08	7.12	9.27	14.97	10.02	12.92
-2.50	0.00	-0.19	-1.08	-1.45	-1.82	-0.88	-0.48	6.52	8.72	14.47	9.52	12.42
-3.00	0.00	-0.27	-1.27	-1.68	-2.10	-1.27	-0.86	5.83	8.13	13.84	8.93	11.83
-3.50	0.00	-0.31	-1.45	-1.92	-2.33	-1.65	-1.24	5.20	7.60	13.35	8.40	11.35
-4.00	0.00	-0.34	-1.68	-2.35	-2.87	-2.53	-2.18	3.87	6.52	12.37	7.32	10.27
-4.50	0.00	-0.32	-1.97	-2.68	-3.35	-3.42	-3.11	2.58	5.48	11.44	6.33	9.23
-5.00	0.00	-0.24	-2.03	-2.80	-3.57	-3.83	-3.63	1.82	4.92	10.97	5.82	8.72
-5.50	0.00	-0.19	-2.18	-3.10	-3.97	-4.58	-4.43	0.57	3.97	10.17	4.92	7.82
-6.00	0.00	-0.12	-2.27	-3.28	-4.25	-5.17	-5.01	-0.32	3.23	9.54	4.23	7.13
-6.50	0.00	0.01	-2.23	-3.25	-4.22	-5.28	-5.18	-0.13	3.42	9.72	4.37	7.27
-7.00	0.00	0.11	-1.93	-2.80	-3.72	-4.58	-4.43	1.22	4.52	10.67	5.37	8.27
-7.50	0.00	0.19	-1.50	-2.27	-3.04	-3.55	-3.29	2.70	5.80	11.90	6.60	9.50
-8.00	0.00	0.11	-1.63	-2.40	-3.22	-3.68	-3.43	2.42	5.62	11.72	6.42	9.32
-8.50	0.00	0.08	-1.87	-2.73	-3.65	-4.22	-4.06	1.13	4.63	10.94	5.53	8.43
-9.00	0.00	0.04	-2.45	-3.57	-4.64	-6.15	-5.89	-1.75	2.25	8.80	3.30	6.20
-9.50	0.00	0.16	-2.78	-4.15	-5.37	-7.48	-7.33	-3.33	0.82	7.42	1.87	4.77
-10.00	0.00	0.29	-2.50	-3.82	-4.99	-6.95	-6.74	-2.20	1.70	8.20	2.70	5.60
-10.50	0.00	0.43	-2.12	-3.33	-4.35	-6.12	-5.86	-1.07	2.73	9.19	3.73	6.58
-11.00	0.00	0.56	-2.03	-3.30	-4.32	-6.18	-5.93	-1.23	2.67	9.17	3.67	6.52
-11.50	0.00	0.69	-2.00	-3.32	-4.39	-6.35	-6.14	-1.60	2.45	9.00	3.45	6.30
-12.00	0.00	0.81	-1.98	-3.35	-4.52	-6.68	-6.53	-2.18	2.02	8.67	3.07	5.92
-12.50	0.00	0.93	-1.97	-3.38	-4.65	-7.02	-6.86	-2.67	1.63	8.34	2.68	5.53
-13.00	0.00	1.06	-1.83	-3.25	-4.47	-6.88	-6.78	-2.68	1.72	8.47	2.77	5.62
-13.50	0.00	1.19	-1.60	-2.97	-4.14	-6.50	-6.34	-2.10	2.25	9.00	3.30	6.15
-14.00	0.00	1.34	-1.45	-2.85	-3.99	-6.35	-6.19	-1.90	2.50	9.25	3.55	6.40
-14.50	0.00	1.48	-1.32	-2.71	-3.90	-6.27	-6.16	-1.62	2.73	9.44	3.78	7.13
-15.00	0.00	1.59	-1.20	-2.55	-3.74	-6.15	-5.99	-1.50	2.90	9.60	3.95	7.30
-15.50	0.00	1.69	-1.20	-2.60	-3.74	-6.35	-6.14	-1.60	2.80	9.50	3.85	7.10
-16.00	0.00	1.78	-1.07	-2.41	-3.55	-6.12	-5.91	-1.37	3.08	9.79	4.13	7.38
-16.50	0.00	1.93	-1.02	-2.46	-3.60	-6.37	-6.16	-1.72	2.83	9.59	3.93	7.48
-17.00	0.00	2.01	-0.93	-2.33	-3.52	-6.28	-6.13	-1.33	3.12	9.77	4.17	7.72
-17.50	0.00	2.08	-0.62	-1.91	-3.00	-5.52	-5.36	-0.02	4.23	10.79	5.23	8.78
-18.00	0.00	2.11	-0.32	-1.56	-2.55	-4.87	-4.71	0.73	4.98	11.49	5.93	9.48
-18.50	0.00	2.13	-0.35	-1.65	-2.64	-5.00	-4.89	0.45	4.75	11.25	5.75	9.30
-19.00	0.00	2.15	-0.44	-1.78	-2.87	-5.38	-5.33	-0.08	4.27	10.82	5.32	8.87
-19.50	0.00	2.17	-0.27	-1.56	-2.55	-4.97	-4.86	0.33	4.73	11.34	5.83	9.33
-20.00	0.00	2.10	-0.44	-1.78	-2.87	-5.43	-5.38	-0.38	4.17	10.76	5.22	8.77

Note:

Outward lateral movement is mentioned with negative sign (-)

Table B.9 Lateral movements obtained from IC (cont.)

	Position of TBM's face (m)											
Depth	Initial	-12	-8	-5	-3	-2	-1.5	-1	-0.5	0	+0.5	+1
(m)	Lateral movements (mm)											
-20.50	0.00	2.03	-0.62	-2.11	-3.25	-6.07	-6.06	-1.42	3.38	10.03	4.48	8.03
-21.00	0.00	2.11	-0.74	-2.28	-3.47	-6.63	-6.68	-2.23	2.72	9.47	3.82	7.37
-21.50	0.00	2.21	-0.69	-2.23	-3.47	-6.78	-6.83	-2.23	2.67	9.42	3.77	6.82
-22.00	0.00	2.28	-0.47	-1.96	-3.15	-6.42	-6.46	-1.57	3.28	9.93	4.38	7.43
-22.50	0.00	2.28	-0.47	-2.01	-3.20	-6.52	-6.56	-1.72	3.13	9.83	4.68	7.33
-23.00	0.00	2.26	-0.59	-2.13	-3.37	-6.63	-6.73	-1.88	2.97	9.67	4.52	7.17
-23.50	0.00	2.21	-0.74	-2.28	-3.52	-6.83	-6.93	-2.13	2.72	9.47	4.32	6.92
-24.00	0.00	2.16	-1.14	-2.83	-4.22	-7.93	-8.08	-2.18	3.12	10.12	4.82	6.87
-24.50	0.00	2.21	-1.09	-2.78	-4.17	-7.98	-8.08	-2.28	3.02	10.07	4.72	6.77
-25.00	0.00	2.28	-0.77	-2.32	-3.60	-7.27	-7.31	-1.07	4.08	11.08	5.73	7.98
-25.50	0.00	2.28	-0.31	-1.60	-2.59	-5.60	-5.64	1.30	6.05	12.90	7.65	9.90
-26.00	0.00	2.28	-0.09	-1.23	-2.12	-4.78	-4.78	2.27	6.97	13.77	8.57	11.17
-26.50	0.00	2.28	-0.26	-1.45	-2.39	-5.15	-5.14	1.60	6.40	13.25	8.05	10.65
-27.00	0.00	2.28	-0.17	-1.27	-2.20	-4.82	-4.76	2.03	6.73	13.53	8.38	10.98
-27.50	0.00	2.10	-0.16	-1.25	-2.19	-4.45	-4.34	2.35	7.00	13.80	8.70	11.30
-28.00	0.00	1.95	-0.40	-1.55	-2.49	-4.80	-4.69	1.70	6.50	13.35	8.20	10.80
-28.50	0.00	1.75	-0.75	-2.00	-2.89	-5.50	-5.34	0.70	5.60	12.45	7.30	9.85
-29.00	0.00	1.58	-0.97	-2.22	-3.10	-5.72	-5.56	0.43	5.33	12.18	7.03	9.58
-29.50	0.00	1.42	-1.10	-2.35	-3.19	-5.65	-5.54	0.65	5.45	12.25	7.10	10.60
-30.00	0.00	1.25	-1.07	-2.22	-3.05	-5.12	-5.01	1.58	6.13	12.78	7.73	11.23
-30.50	0.00	1.25	-0.85	-1.80	-2.69	-4.30	-4.19	2.60	7.00	13.60	8.55	11.85
-31.00	0.00	1.25	-0.83	-1.78	-2.62	-4.28	-4.18	2.37	6.87	13.52	8.47	11.47
-31.50	0.00	1.25	-0.87	-1.82	-2.60	-4.27	-4.16	4.78	8.03	14.08	9.33	12.03
-32.00	0.00	1.25	-0.83	-1.73	-2.57	-4.08	-3.98	4.07	7.07	12.97	8.32	10.97
-32.50	0.00	1.25	-0.88	-1.83	-2.67	-4.28	-4.18	3.52	6.62	12.57	7.87	8.02
-33.00	0.00	1.25	-0.92	-1.87	-2.65	-4.27	-4.16	2.88	5.28	10.88	6.33	6.48
-33.50	0.00	1.25	-0.95	-1.85	-2.64	-4.25	-4.04	1.55	3.60	9.05	4.55	4.70
-34.00	0.00	1.25	-0.72	-1.47	-2.20	-3.42	-3.21	1.68	3.28	8.48	4.08	4.23
-34.50	0.00	1.25	-0.63	-1.28	-1.97	-3.03	-2.83	0.87	2.02	6.82	2.72	2.87
-35.00	0.00	1.25	-0.55	-1.15	-1.74	-2.80	-2.59	-0.45	0.55	4.15	1.10	1.25
-35.50	0.00	1.25	-0.55	-1.10	-1.64	-2.60	-2.39	-1.40	-0.60	1.40	-0.10	0.05
-36.00	0.00	1.25	-0.37	-0.77	-1.30	-1.92	-1.71	-0.77	-0.27	0.08	0.18	0.33
-36.50	0.00	1.25	-0.25	-0.60	-1.14	-1.45	-1.24	-0.35	0.15	0.45	0.55	0.70
-37.00	0.00	1.25	-0.17	-0.52	-1.00	-1.17	-1.01	-1.62	-1.12	-0.72	-0.72	-0.57
-37.50	0.00	1.25	-0.10	-0.45	-0.94	-1.05	-0.94	-1.50	-1.00	-0.65	-0.65	-0.50
-38.00	0.00	1.05	-0.05	-0.35	-0.84	-0.85	-0.80	-1.30	-0.80	-0.50	-0.50	-0.40
-38.50	0.00	0.85	-0.05	-0.30	-0.59	-0.65	-0.65	-1.10	-0.60	-0.40	-0.30	-0.30
-39.00	0.00	0.62	-0.28	-0.43	-0.68	-0.83	-0.78	-1.33	-0.83	-0.63	-0.58	-0.58
-39.50	0.00	0.43	-0.22	-0.32	-0.52	-0.62	-0.62	-1.12	-0.62	-0.52	-0.47	-0.47
-40.00	0.00	0.22	-0.08	-0.13	-0.23	-0.28	-0.33	-0.28	-0.28	-0.28	-0.23	-0.23
-40.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note:

Outward lateral movement is mentioned with negative sign (-)

Table B.10 Lateral movements obtained from IC (cont.)

	Position of TBM's face (m)										
Depth	Initial	+1.5	+2	+3	+5	+8	+12	0.5 week	1 week	2 weeks	3 months
(m)	Lateral movements (mm)										
0.00	0.00	4.70	10.76	6.75	6.05	6.45	7.45	5.55	8.33	8.35	7.15
-0.50	0.00	5.28	10.89	7.38	6.53	6.98	8.13	6.03	8.82	8.73	7.58
-1.00	0.00	5.70	10.91	7.75	6.85	7.30	8.40	6.30	9.03	8.95	7.85
-1.50	0.00	7.55	12.46	9.50	8.60	9.05	10.10	8.05	10.99	10.65	9.55
-2.00	0.00	6.47	11.48	8.37	7.42	7.87	8.92	6.82	9.85	9.47	8.32
-2.50	0.00	6.07	11.08	7.92	6.92	7.37	8.42	6.27	9.40	8.92	7.72
-3.00	0.00	5.58	10.64	7.38	6.38	6.83	7.83	5.73	8.72	8.33	7.13
-3.50	0.00	5.15	10.26	6.90	5.85	6.35	7.30	5.25	8.23	7.80	6.60
-4.00	0.00	4.12	9.37	5.92	4.82	5.32	6.27	4.22	7.27	6.77	5.57
-4.50	0.00	3.18	8.49	5.03	3.88	4.43	5.38	3.38	6.43	5.88	4.73
-5.00	0.00	2.72	8.07	4.62	3.42	4.02	4.97	2.97	6.02	5.47	4.32
-5.50	0.00	1.87	7.32	3.82	2.57	3.22	4.22	2.22	5.27	4.72	3.62
-6.00	0.00	1.28	6.74	3.23	1.93	2.63	3.63	1.68	4.73	4.13	3.08
-6.50	0.00	1.62	6.82	3.57	2.27	2.97	4.07	2.02	5.02	4.42	3.42
-7.00	0.00	2.87	7.57	4.82	3.52	4.22	5.27	3.27	6.12	5.57	4.67
-7.50	0.00	4.30	8.65	6.20	4.90	5.60	6.60	4.65	7.40	6.85	6.05
-8.00	0.00	4.22	8.52	6.07	4.82	5.47	6.42	4.52	7.22	6.72	5.92
-8.50	0.00	3.38	7.94	5.23	4.18	4.58	5.53	3.63	6.48	5.93	5.03
-9.00	0.00	1.05	6.00	2.95	2.35	2.30	3.30	1.40	4.35	3.85	2.85
-9.50	0.00	-0.28	4.67	1.67	1.17	1.02	2.02	0.17	3.12	2.62	1.67
-10.00	0.00	0.80	5.30	2.75	1.95	2.05	3.05	1.20	4.10	3.45	2.65
-10.50	0.00	1.98	6.24	3.93	2.98	3.23	4.23	2.38	5.23	4.53	3.83
-11.00	0.00	2.07	6.22	4.07	3.12	3.32	4.32	2.52	5.32	4.62	3.97
-11.50	0.00	1.95	6.05	4.00	3.10	3.25	4.25	2.50	5.25	4.55	3.95
-12.00	0.00	1.62	5.72	3.72	2.87	2.97	3.97	2.27	4.97	4.27	3.72
-12.50	0.00	1.38	5.39	3.53	2.68	2.73	3.73	2.08	4.73	4.03	3.53
-13.00	0.00	1.57	5.47	3.72	2.87	2.92	3.92	2.27	4.92	4.22	3.72
-13.50	0.00	2.25	5.95	4.40	3.50	3.60	4.60	2.95	5.55	4.85	4.40
-14.00	0.00	2.65	6.15	4.80	3.85	4.00	5.00	3.35	5.90	5.20	4.80
-14.50	0.00	3.08	6.29	5.23	4.13	4.38	5.38	3.73	6.23	5.48	5.18
-15.00	0.00	3.35	6.40	5.50	4.35	4.65	5.65	4.00	6.45	5.70	5.45
-15.50	0.00	3.40	6.25	5.45	4.35	4.65	5.60	4.05	6.40	5.65	5.45
-16.00	0.00	3.88	6.54	5.93	4.78	5.08	6.03	4.48	6.83	6.03	5.88
-16.50	0.00	3.78	6.34	5.83	4.73	4.98	5.93	4.43	6.73	5.93	5.83
-17.00	0.00	4.22	6.42	6.27	4.97	5.37	6.32	4.82	7.07	6.22	6.22
-17.50	0.00	5.53	7.29	7.58	5.98	6.63	7.58	6.13	8.28	7.33	7.48
-18.00	0.00	6.38	7.94	8.43	6.78	7.43	8.38	6.98	9.08	8.13	8.33
-18.50	0.00	6.30	7.81	8.30	6.75	7.30	8.20	6.85	8.90	8.00	8.20
-19.00	0.00	5.97	7.42	7.92	6.47	6.92	7.77	6.47	8.52	7.62	7.82
-19.50	0.00	6.53	7.89	8.48	7.03	7.43	8.33	6.98	9.03	8.13	8.33
-20.00	0.00	6.07	7.42	7.97	6.67	6.92	7.77	6.47	8.52	7.67	7.87

Note:

Outward lateral movement is mentioned with negative sign (-)

Table B.11 Lateral movements obtained from IC (cont.)

	Position of TBM's face (m)										
Depth	Initial	+1.5	+2	+3	+5	+8	+12	0.5 week	1 week	2 weeks	3 months
(m)	Lateral movements (mm)										
-20.50	0.00	5.38	6.78	7.33	6.13	6.28	7.13	5.88	7.93	7.08	7.33
-21.00	0.00	4.87	6.22	6.82	5.67	5.77	6.67	5.42	7.47	6.57	6.87
-21.50	0.00	5.02	6.12	6.97	5.72	5.87	6.77	5.52	7.52	6.57	6.97
-22.00	0.00	5.68	6.53	7.63	6.28	6.53	7.43	6.18	8.13	7.18	7.63
-22.50	0.00	5.73	6.43	7.63	6.28	6.48	7.53	6.13	8.13	7.08	7.53
-23.00	0.00	5.72	6.27	7.57	6.22	6.37	7.42	5.97	8.02	6.97	7.42
-23.50	0.00	5.62	6.07	7.42	6.07	6.22	7.22	5.82	7.82	6.77	7.22
-24.00	0.00	6.07	6.92	7.92	6.97	6.67	7.77	6.22	8.42	7.37	7.72
-24.50	0.00	6.12	6.82	7.97	7.02	6.72	7.77	6.27	8.42	7.37	7.77
-25.00	0.00	7.33	7.73	9.13	8.03	7.88	8.88	7.43	9.48	8.43	8.93
-25.50	0.00	9.50	9.40	11.20	9.75	9.90	10.80	9.40	11.35	10.25	10.80
-26.00	0.00	10.62	10.22	12.22	10.62	10.87	11.77	10.37	12.27	11.07	11.72
-26.50	0.00	10.20	9.80	11.65	10.25	10.30	11.20	9.75	11.65	10.55	11.15
-27.00	0.00	10.63	10.08	12.03	10.58	10.68	11.53	10.03	11.98	10.78	11.43
-27.50	0.00	11.10	10.40	12.45	10.95	11.00	11.90	10.30	12.30	10.75	11.60
-28.00	0.00	10.70	10.05	12.35	10.65	10.65	11.60	9.90	12.00	10.30	11.15
-28.50	0.00	9.90	9.25	11.50	9.90	9.80	10.70	9.00	11.10	9.45	10.25
-29.00	0.00	9.83	8.98	11.33	9.68	9.58	10.48	8.73	10.88	9.13	9.93
-29.50	0.00	10.05	9.05	11.45	9.80	9.70	10.55	8.80	10.95	9.20	9.95
-30.00	0.00	10.88	9.53	12.18	10.33	10.43	11.13	9.48	11.53	9.73	10.53
-30.50	0.00	12.95	10.30	14.05	11.15	12.00	12.50	10.25	12.80	10.50	11.55
-31.00	0.00	11.52	10.32	12.77	10.82	11.02	11.67	10.27	12.07	10.32	11.12
-31.50	0.00	10.68	10.28	12.08	11.48	10.83	11.53	10.23	11.78	10.73	11.13
-32.00	0.00	7.92	9.12	9.52	10.47	8.72	9.57	9.07	9.87	9.62	9.62
-32.50	0.00	4.62	8.82	6.52	7.57	6.47	7.57	8.77	8.07	8.62	8.42
-33.00	0.00	2.98	6.83	4.83	6.08	4.88	6.38	6.78	6.38	6.88	6.63
-33.50	0.00	2.05	4.85	3.75	4.20	3.65	4.95	4.80	4.85	5.00	4.90
-34.00	0.00	1.88	4.13	3.48	3.78	3.33	4.08	4.08	4.23	4.43	4.33
-34.50	0.00	0.82	2.52	2.27	2.27	2.12	2.87	2.47	2.87	2.87	2.82
-35.00	0.00	-0.60	0.75	0.65	0.70	0.60	1.60	0.70	1.25	1.20	1.15
-35.50	0.00	-1.55	-0.55	-0.55	-0.45	-0.55	0.85	-0.45	0.15	-0.05	-0.05
-36.00	0.00	-1.07	-0.42	-0.37	-0.12	-0.27	0.58	-0.17	0.13	0.18	0.18
-36.50	0.00	-0.50	0.05	0.10	0.30	0.20	0.95	0.30	0.55	0.60	0.60
-37.00	0.00	-1.62	-1.17	-1.12	-0.92	-1.07	-0.12	-0.97	-0.67	-0.82	-0.72
-37.50	0.00	-1.35	-1.05	-0.95	-0.80	-0.90	-0.30	-0.85	-0.65	-0.70	-0.65
-38.00	0.00	-1.05	-0.85	-0.70	-0.65	-0.65	-0.15	-0.60	-0.45	-0.55	-0.50
-38.50	0.00	-0.75	-0.65	-0.50	-0.50	-0.45	0.00	-0.40	-0.30	-0.40	-0.35
-39.00	0.00	-0.83	-0.83	-0.63	-0.73	-0.63	-0.58	-0.63	-0.63	-0.63	-0.63
-39.50	0.00	-0.62	-0.62	-0.52	-0.57	-0.52	-0.47	-0.52	-0.52	-0.52	-0.52
-40.00	0.00	-0.28	-0.28	-0.28	-0.28	-0.28	-0.23	-0.28	-0.28	-0.28	-0.28
-40.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note:

Outward lateral movement is mentioned with negative sign (-)

Table B.12 Data of Klongtan bridge's settlement

TBM's face st. (m)	*Settlement points on the Klongtan Bridge's columns*											
	Point C		**Point D**		**Point E**		**Point F**		**Point G**		**Point H**	
	Activity date	Sett. (mm)	Activity date	Sett. (mm)	Activity date	Sett. (mm)	Activity date	Sett. (mm)	Activity date	Sett. (mm)	Activity date	Sett. (mm)
-30.00	08/07/05	0	09/07/05	0	10/07/05	0	11/07/05	0	13/07/05	0	13/07/05	0
-20.40	09/07/05	0	10/07/05	0	11/07/05	0	12/07/05	0	14/07/05	0	14/07/05	0
-19.20	09/07/05	0	10/07/05	0	11/07/05	0	12/07/05	0	14/07/05	0	14/07/05	0
-18.00	09/07/05	0	10/07/05	0	11/07/05	0	12/07/05	0	14/07/05	0	15/07/05	0
-16.80	09/07/05	0	10/07/05	0	11/07/05	0	13/07/05	0	14/07/05	0	15/07/05	0
-15.60	09/07/05	0	10/07/05	0	11/07/05	0	13/07/05	0	14/07/05	0	15/07/05	0
-14.40	09/07/05	0	10/07/05	0	11/07/05	0	13/07/05	0	14/07/05	0	15/07/05	0
-13.20	10/07/05	0	10/07/05	0	11/07/05	0	13/07/05	0	14/07/05	0	15/07/05	0
-12.00	10/07/05	0	11/07/05	0	12/07/05	0	13/07/05	0	14/07/05	-1	15/07/05	0
-10.80	10/07/05	0	11/07/05	0	12/07/05	0	13/07/05	0	14/07/05	-1	15/07/05	0
-9.60	10/07/05	0	11/07/05	0	12/07/05	0	13/07/05	0	14/07/05	-1	15/07/05	0
-8.40	10/07/05	0	11/07/05	0	12/07/05	0	14/07/05	0	14/07/05	-1	15/07/05	0
-7.20	10/07/05	0	11/07/05	0	12/07/05	0	14/07/05	0	14/07/05	-1	15/07/05	0
-6.00	10/07/05	-2	11/07/05	0	12/07/05	0	14/07/05	0	14/07/05	-1	15/07/05	0
-4.80	10/07/05	-2	11/07/05	0	12/07/05	0	14/07/05	0	14/07/05	-1	15/07/05	0
-3.60	10/07/05	-2	11/07/05	0	12/07/05	0	14/07/05	0	15/07/05	-1	15/07/05	-2
-2.40	10/07/05	-2	11/07/05	0	12/07/05	0	14/07/05	0	15/07/05	-1	15/07/05	-2
-1.20	10/07/05	-8	11/07/05	0	12/07/05	0	14/07/05	-3	15/07/05	-1	15/07/05	-2
0.00	10/07/05	-8	11/07/05	-3	13/07/05	-6	14/07/05	-3	15/07/05	-1	15/07/05	-2
1.20	10/07/05	-8	12/07/05	-4	13/07/05	-9	14/07/05	-3	15/07/05	-1	15/07/05	-2
2.40	11/07/05	-8	12/07/05	-8	13/07/05	-10	14/07/05	-6	15/07/05	-1	16/07/05	-2
3.60	11/07/05	-9	12/07/05	-8	13/07/05	-10	14/07/05	-9	15/07/05	-12	16/07/05	-7
4.80	11/07/05	-10	12/07/05	-8	13/07/05	-10	14/07/05	-9	15/07/05	-12	16/07/05	-7
6.00	11/07/05	-10	12/07/05	-18	13/07/05	-10	14/07/05	-9	15/07/05	-12	16/07/05	-7
7.20	11/07/05	-13	12/07/05	-18	14/07/05	-10	14/07/05	-9	15/07/05	-15	16/07/05	-11
8.40	11/07/05	-16	12/07/05	-22	14/07/05	-10	14/07/05	-9	15/07/05	-15	16/07/05	-11
9.60	11/07/05	-16	12/07/05	-22	14/07/05	-19	14/07/05	-17	15/07/05	-19	16/07/05	-11
10.80	11/07/05	-17	13/07/05	-28	14/07/05	-19	14/07/05	-17	15/07/05	-19	16/07/05	-11
12.00	11/07/05	-17	13/07/05	-28	14/07/05	-19	15/07/05	-17	15/07/05	-19	16/07/05	-11
13.20	11/07/05	-17	13/07/05	-28	14/07/05	-22	15/07/05	-18	15/07/05	-19	16/07/05	-20
14.40	11/07/05	-18	13/07/05	-29	14/07/05	-22	15/07/05	-18	15/07/05	-19	16/07/05	-20
15.60	11/07/05	-18	13/07/05	-29	14/07/05	-22	15/07/05	-18	15/07/05	-19	16/07/05	-20
16.80	11/07/05	-18	13/07/05	-29	14/07/05	-23	15/07/05	-18	16/07/05	-20	16/07/05	-20
18.00	11/07/05	-18	13/07/05	-29	14/07/05	-23	15/07/05	-18	16/07/05	-20	16/07/05	-20
19.20	11/07/05	-18	14/07/05	-29	14/07/05	-23	15/07/05	-18	16/07/05	-20	16/07/05	-20
20.40	11/07/05	-23	14/07/05	-29	14/07/05	-23	15/07/05	-19	16/07/05	-20	17/07/05	-20
1 week	17/07/05	-28	18/07/05	-33	20/07/05	-23	21/07/05	-26	22/07/05	-25	22/07/05	-26
2 weeks	24/07/05	-30	25/07/05	-35	27/07/05	-29	28/07/05	-26	29/07/05	-25	29/07/05	-26
3 months	07/10/05	-29	11/10/05	-34	13/10/05	-28	14/10/05	-25	15/10/05	-25	15/10/05	-28
6 months	07/01/06	-29	11/01/06	-33	13/01/06	-27	14/01/06	-25	15/01/06	-25	15/01/06	-29

Table B.13 Data of 3-storey chophouses' settlement

Settlement points above the foundations of 3-storey shophouses located on the right side of Klongtan Bridge										
TBM's face st. (m)	Point C_1		Point C_2		Point C_3		Point C_4		Point C_5	
	Activity Date	Sett. (mm)	Activity Date	Sett. (mm)	Activity Date	Sett. (mm)	Activity Date	Sett. (mm)	Activity Date	Sett. (mm)
-30.00	09/07/05	0	09/07/05	0	10/07/05	0	13/07/05	0	14/07/05	0
-20.40	10/07/05	0	10/07/05	0	11/07/05	0	14/07/05	0	14/07/05	0
-19.20	10/07/05	0	10/07/05	0	11/07/05	0	14/07/05	0	14/07/05	0
-18.00	10/07/05	0	10/07/05	0	11/07/05	0	14/07/05	0	14/07/05	0
-16.80	10/07/05	0	10/07/05	0	11/07/05	0	14/07/05	0	15/07/05	0
-15.60	10/07/05	0	10/07/05	0	11/07/05	0	14/07/05	0	15/07/05	0
-14.40	10/07/05	0	10/07/05	0	11/07/05	0	14/07/05	0	15/07/05	0
-13.20	10/07/05	0	10/07/05	0	12/07/05	0	14/07/05	-2	15/07/05	0
-12.00	10/07/05	0	10/07/05	0	12/07/05	0	14/07/05	-2	15/07/05	0
-10.80	10/07/05	0	10/07/05	0	12/07/05	-2	14/07/05	-2	15/07/05	0
-9.60	10/07/05	0	10/07/05	0	12/07/05	-2	14/07/05	-2	15/07/05	-1
-8.40	11/07/05	0	11/07/05	0	12/07/05	-4	14/07/05	-2	15/07/05	-1
-7.20	11/07/05	0	11/07/05	0	12/07/05	-4	14/07/05	-2	15/07/05	-1
-6.00	11/07/05	0	11/07/05	0	12/07/05	-4	14/07/05	-2	15/07/05	-1
-4.80	11/07/05	0	11/07/05	0	12/07/05	-4	14/07/05	-2	15/07/05	-1
-3.60	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-2	15/07/05	-1
-2.40	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-2	15/07/05	-2
-1.20	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-2	15/07/05	-2
0.00	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-2	15/07/05	-2
1.20	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-2	15/07/05	-2
2.40	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-2	15/07/05	-2
3.60	11/07/05	0	11/07/05	0	13/07/05	-8	15/07/05	-6	16/07/05	-5
4.80	12/07/05	0	12/07/05	0	14/07/05	-8	15/07/05	-6	16/07/05	-5
6.00	12/07/05	0	12/07/05	-2	14/07/05	-8	15/07/05	-6	16/07/05	-5
7.20	12/07/05	0	12/07/05	-2	14/07/05	-8	15/07/05	-6	16/07/05	-5
8.40	12/07/05	0	12/07/05	-2	14/07/05	-8	15/07/05	-6	16/07/05	-5
9.60	12/07/05	0	12/07/05	-4	14/07/05	-8	15/07/05	-6	16/07/05	-5
10.80	12/07/05	0	12/07/05	-4	14/07/05	-8	15/07/05	-7	16/07/05	-5
12.00	12/07/05	0	12/07/05	-4	14/07/05	-8	15/07/05	-7	16/07/05	-11
13.20	12/07/05	0	12/07/05	-4	14/07/05	-8	15/07/05	-7	16/07/05	-11
14.40	13/07/05	-2	13/07/05	-8	14/07/05	-8	15/07/05	-7	16/07/05	-11
15.60	13/07/05	-2	13/07/05	-8	14/07/05	-8	15/07/05	-7	16/07/05	-11
16.80	13/07/05	-2	13/07/05	-8	14/07/05	-8	16/07/05	-9	16/07/05	-11
18.00	13/07/05	-2	13/07/05	-8	14/07/05	-8	16/07/05	-9	16/07/05	-11
19.20	13/07/05	-2	13/07/05	-8	14/07/05	-8	16/07/05	-9	16/07/05	-11
20.40	13/07/05	-2	13/07/05	-8	14/07/05	-8	16/07/05	-9	16/07/05	-11
1 week	18/07/05	-2	18/07/05	-9	20/07/05	-12	22/07/05	-15	22/07/05	-14
2 weeks	25/07/05	-2	25/07/05	-11	27/07/05	-13	29/07/05	-15	29/07/05	-14
3 months	11/10/05	-	11/10/05	-	13/10/05	-	15/10/05	-	15/10/05	-
6 months	11/01/06	-	11/01/06	-	13/01/06	-	15/01/06	-	15/01/06	-

Table B.14 Data of 4-storey chophouses' settlement

Settlement points above the foundations of 4-storey shophouses located on the right side of Klongtan Bridge								
TBM's face st. (m)	**Point D_1**		**Point D_2**		**Point D_3**		**Point D_4**	
	Activity Date	Settlement (mm)	Activity Date	Settlement (mm)	Activity Date	Settlement (mm)	Activity Date	Settlement (mm)
-30.00	14/07/05	0	15/07/05	0	15/07/05	0	15/07/05	0
-20.40	14/07/05	0	15/07/05	0	16/07/05	0	16/07/05	0
-19.20	14/07/05	0	15/07/05	0	16/07/05	0	16/07/05	0
-18.00	15/07/05	0	15/07/05	0	16/07/05	0	16/07/05	0
-16.80	15/07/05	0	15/07/05	0	16/07/05	0	16/07/05	0
-15.60	15/07/05	0	16/07/05	0	16/07/05	0	16/07/05	0
-14.40	15/07/05	0	16/07/05	0	16/07/05	0	16/07/05	0
-13.20	15/07/05	0	16/07/05	0	16/07/05	0	16/07/05	0
-12.00	15/07/05	0	16/07/05	0	16/07/05	-2	16/07/05	0
-10.80	15/07/05	0	16/07/05	0	16/07/05	-2	16/07/05	0
-9.60	15/07/05	0	16/07/05	0	16/07/05	-2	16/07/05	0
-8.40	15/07/05	0	16/07/05	0	16/07/05	-2	16/07/05	0
-7.20	15/07/05	0	16/07/05	-3	16/07/05	-2	16/07/05	0
-6.00	15/07/05	0	16/07/05	-3	16/07/05	-2	16/07/05	0
-4.80	15/07/05	0	16/07/05	-3	16/07/05	-2	16/07/05	0
-3.60	15/07/05	0	16/07/05	-3	16/07/05	-2	16/07/05	0
-2.40	15/07/05	0	16/07/05	-3	17/07/05	-2	17/07/05	0
-1.20	15/07/05	0	16/07/05	-3	17/07/05	-2	17/07/05	0
0.00	15/07/05	0	16/07/05	-3	17/07/05	-2	17/07/05	0
1.20	15/07/05	0	16/07/05	-3	17/07/05	-4	17/07/05	0
2.40	16/07/05	0	17/07/05	-3	17/07/05	-5	17/07/05	0
3.60	16/07/05	-1	17/07/05	-3	17/07/05	-5	17/07/05	0
4.80	16/07/05	-1	17/07/05	-3	17/07/05	-5	17/07/05	0
6.00	16/07/05	-1	17/07/05	-7	17/07/05	-5	17/07/05	0
7.20	16/07/05	-1	17/07/05	-14	17/07/05	-5	17/07/05	0
8.40	16/07/05	-2	17/07/05	-14	17/07/05	-5	17/07/05	0
9.60	16/07/05	-2	17/07/05	-14	17/07/05	-5	17/07/05	0
10.80	16/07/05	-11	17/07/05	-14	17/07/05	-5	17/07/05	0
12.00	16/07/05	-11	17/07/05	-14	17/07/05	-5	17/07/05	0
13.20	16/07/05	-11	17/07/05	-14	17/07/05	-5	17/07/05	0
14.40	16/07/05	-11	17/07/05	-14	17/07/05	-5	17/07/05	0
15.60	16/07/05	-11	17/07/05	-14	18/07/05	-5	18/07/05	0
16.80	16/07/05	-10	17/07/05	-14	18/07/05	-5	18/07/05	0
18.00	16/07/05	-11	17/07/05	-15	18/07/05	-5	18/07/05	0
19.20	16/07/05	-11	17/07/05	-15	18/07/05	-5	18/07/05	0
20.40	16/07/05	-11	18/07/05	-15	18/07/05	-5	18/07/05	0
1 week	22/07/05	-17	23/07/05	-21	23/07/05	-14	23/07/05	-3
2 weeks	29/07/05	-19	30/07/05	-22	30/07/05	-15	30/07/05	-5
3 months	15/10/05	-	16/10/05	-	16/10/05	-	16/10/05	-
6 months	15/01/06	-	16/01/06	-	16/01/06	-	16/01/06	-

Appendix C

EPB Shield Machine

The real pictures of EPB shield machine used in the BMA flood diversion tunnel and the backup unit are shown in Figure B.1 to B.4.

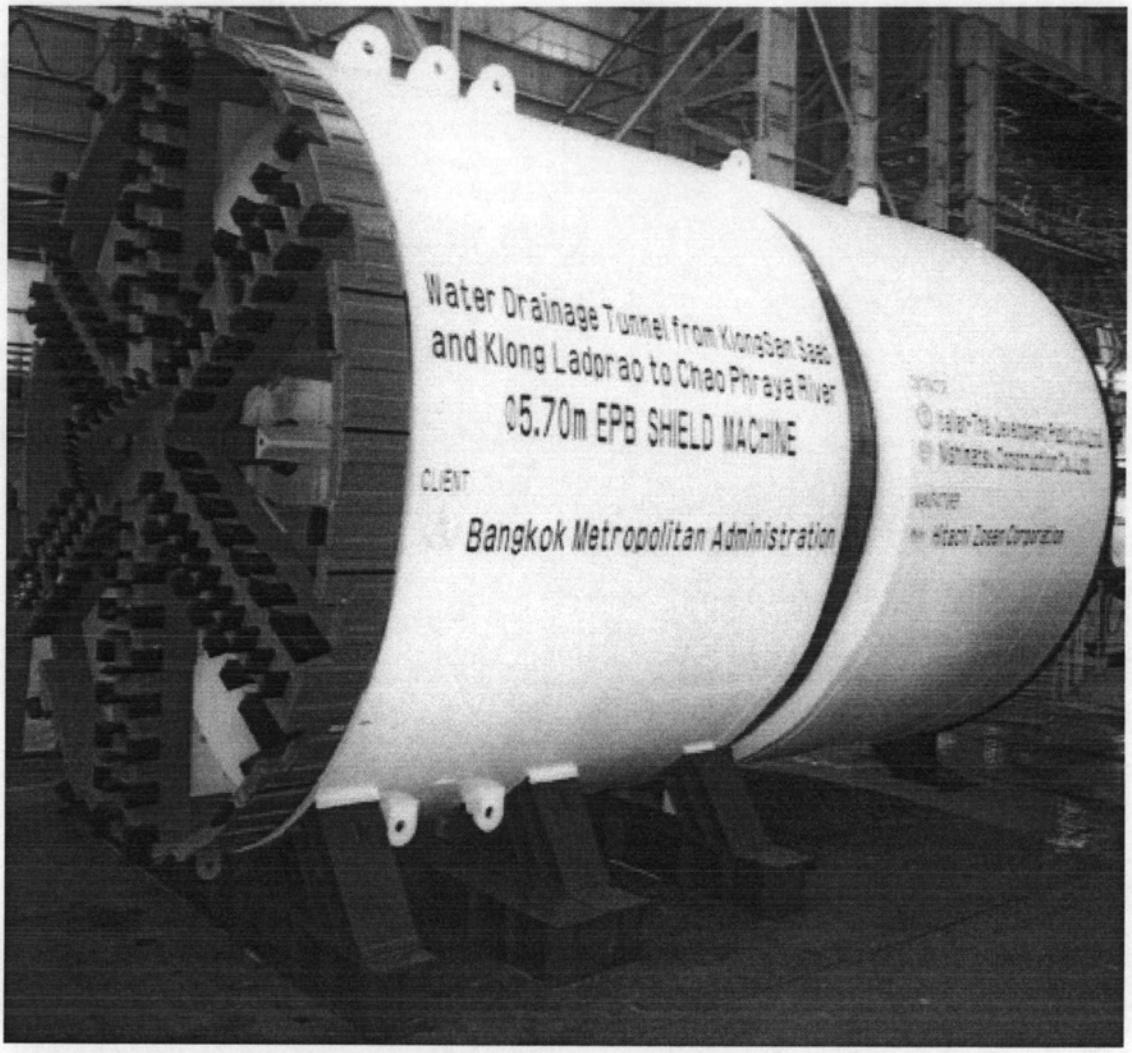

Figure C.1 Articulated EPB shield for MBA flood diversion tunnel (Saensaep-Latphrao Phrakhanong project)

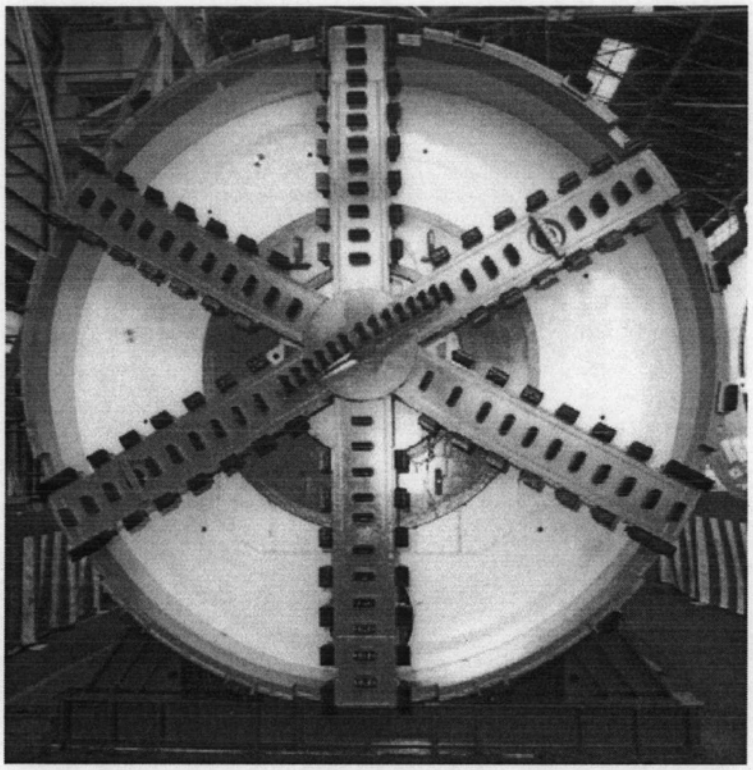

Figure C.2 Front view of EPB

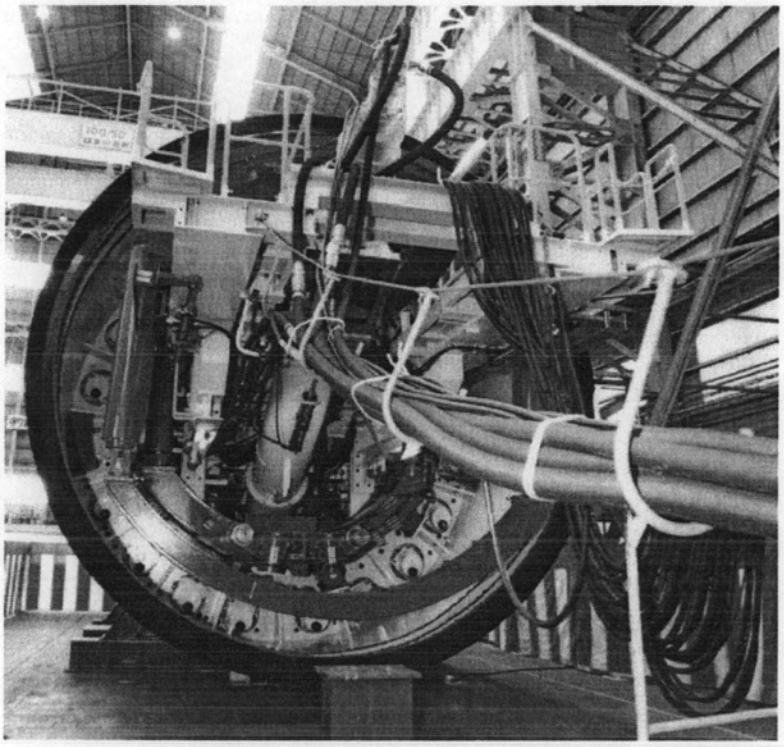

Figure C.3 Back view of EPB

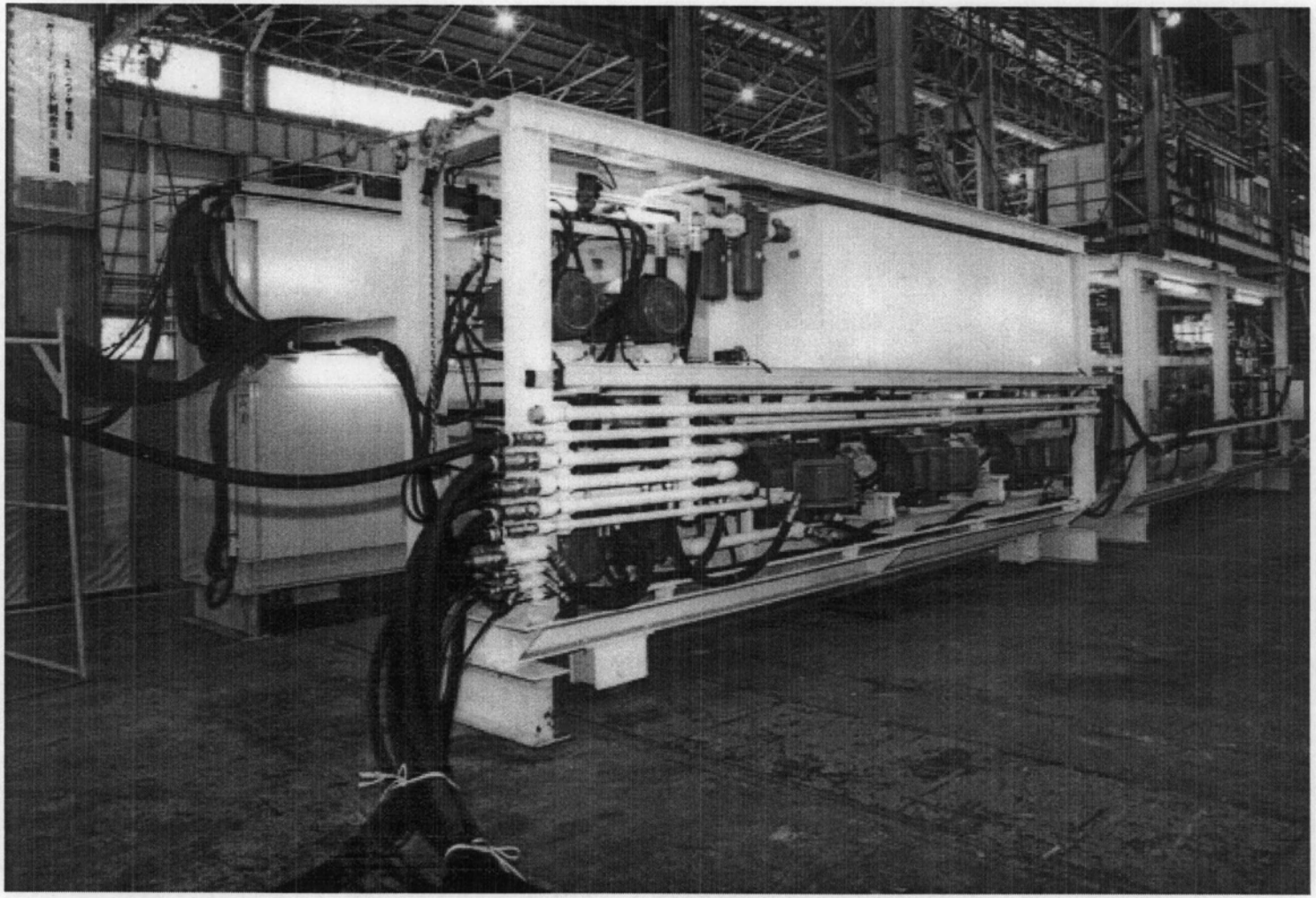

Figure C.4 Backup unit of EPB

Appendix D

Model Geometries for FE Analyses and Output Graphics

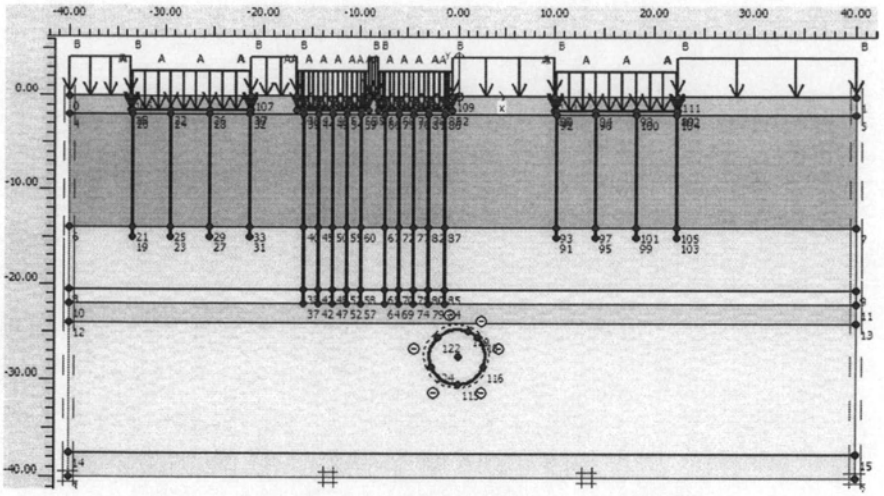

Figure D.1 Input geometry of section GS16

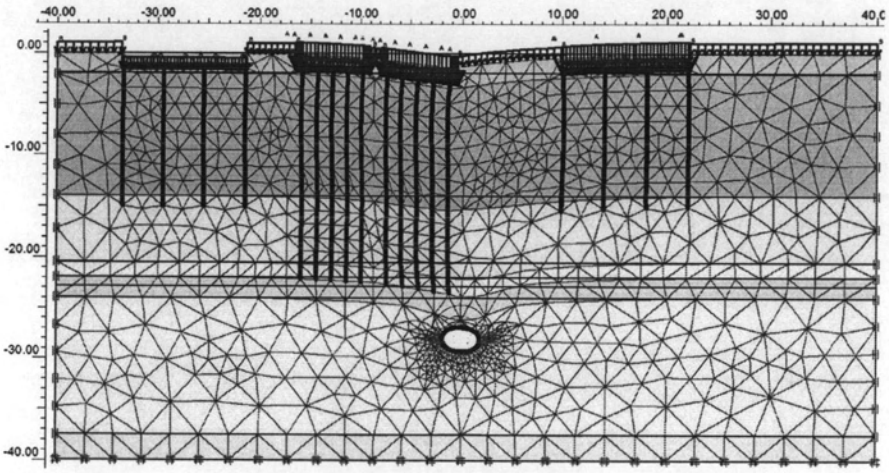

Figure D.2 Deformation mesh generated at section GS16

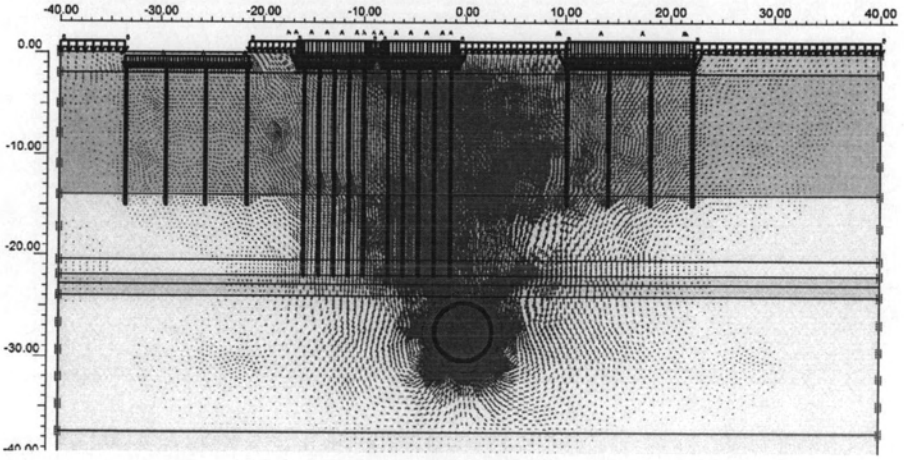

Figure D.3 Total displacement arrows at section GS16

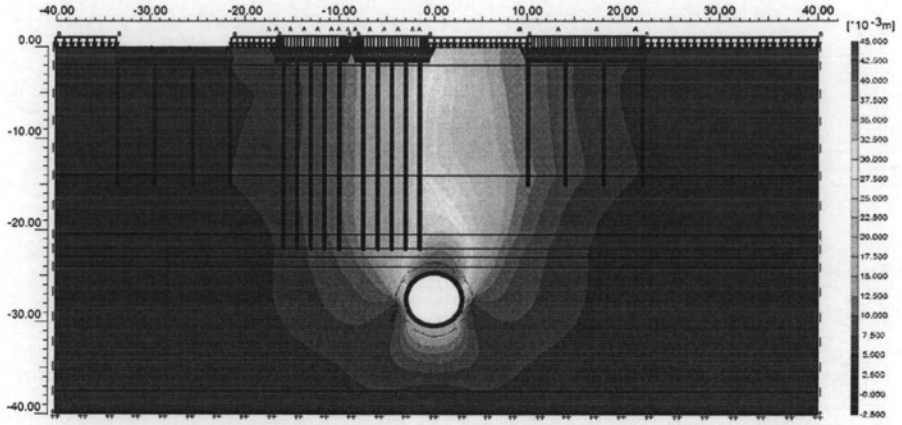

Figure D.4 Total displacement shadings at section GS16

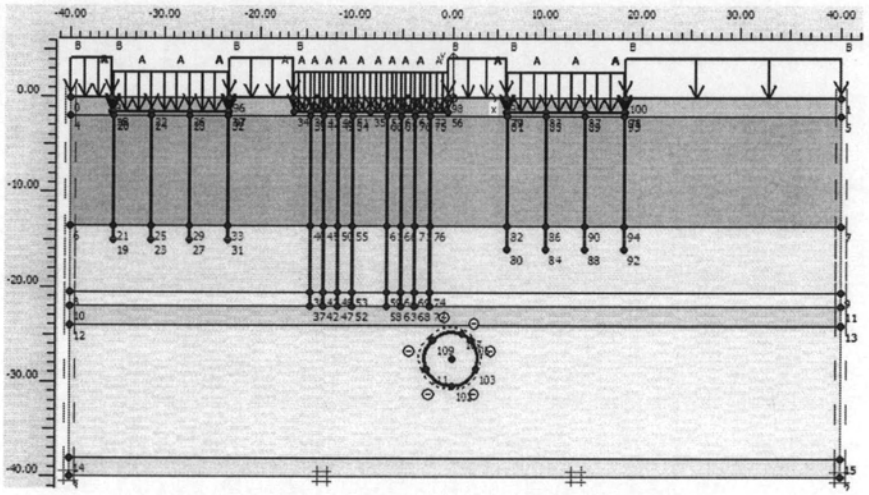

Figure D.5 Input geometry of section GS17

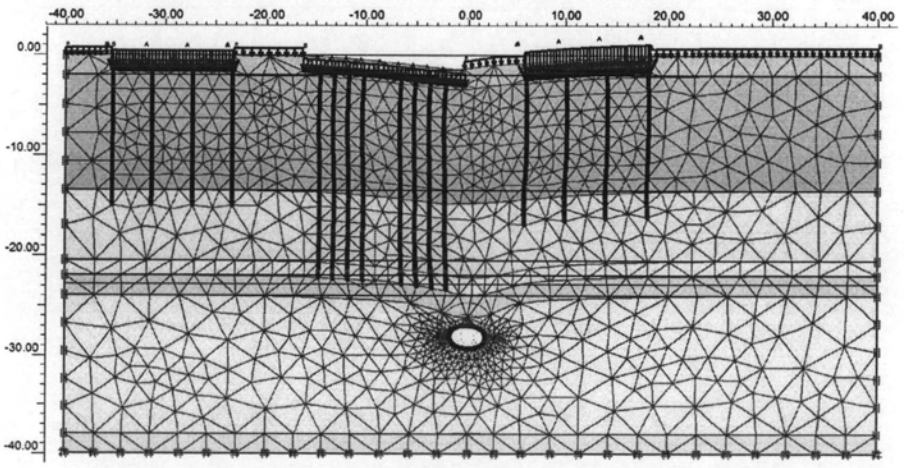

Figure D.6 Deformation mesh generated at section GS17

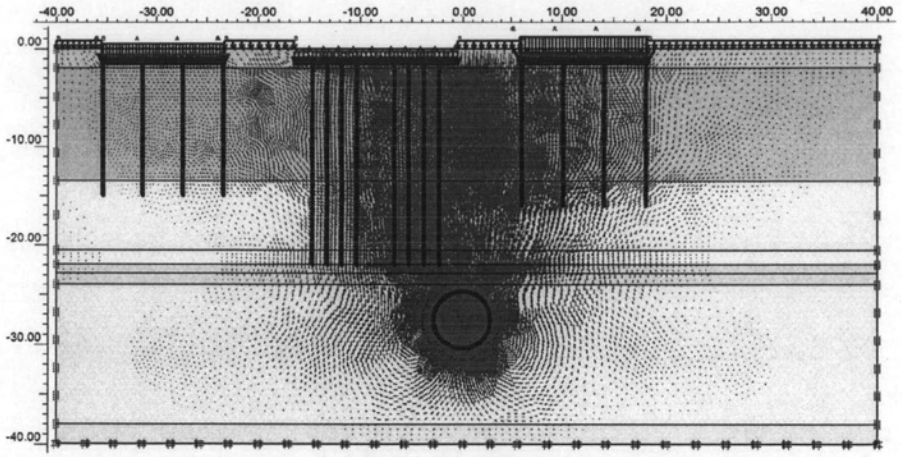

Figure D.7 Total displacement arrows at section GS17

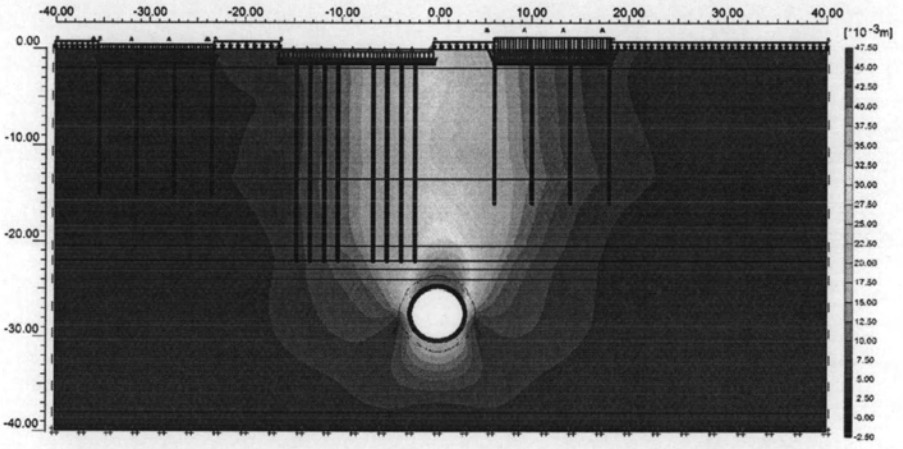

Figure D.8 Total displacement shadings at section GS17

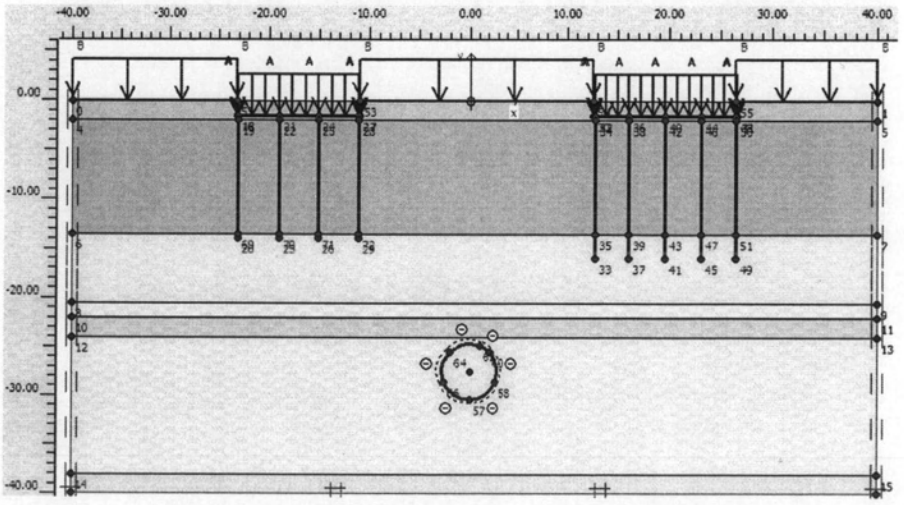

Figure D.9 Input geometry of section GS18

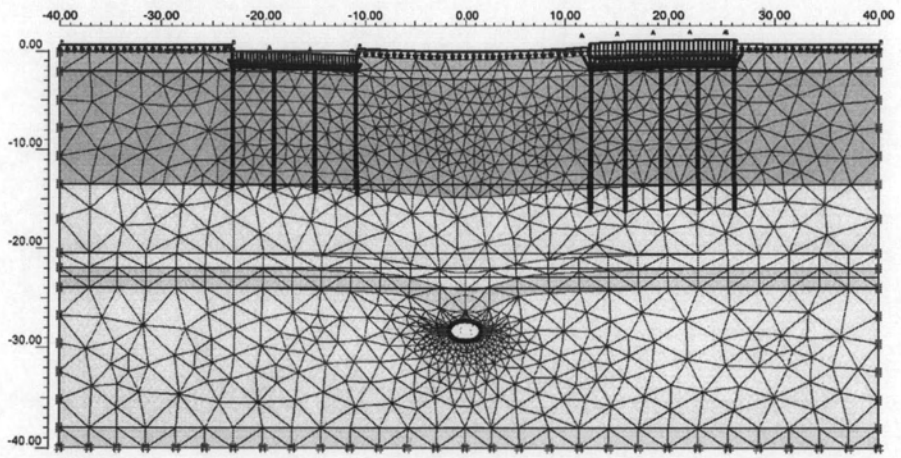

Figure D.10 Deformation mesh generated at section GS18

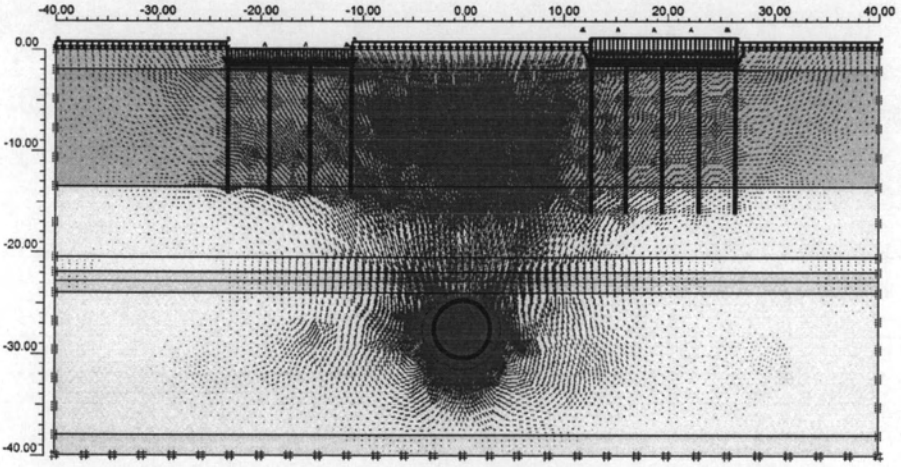

Figure D.11 Total displacement arrows at section GS18

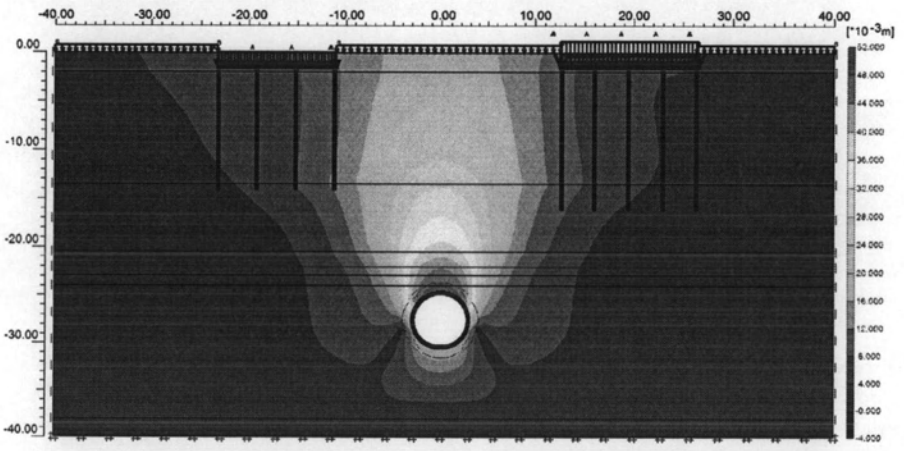

Figure D.12 Total displacement shadings at section GS18

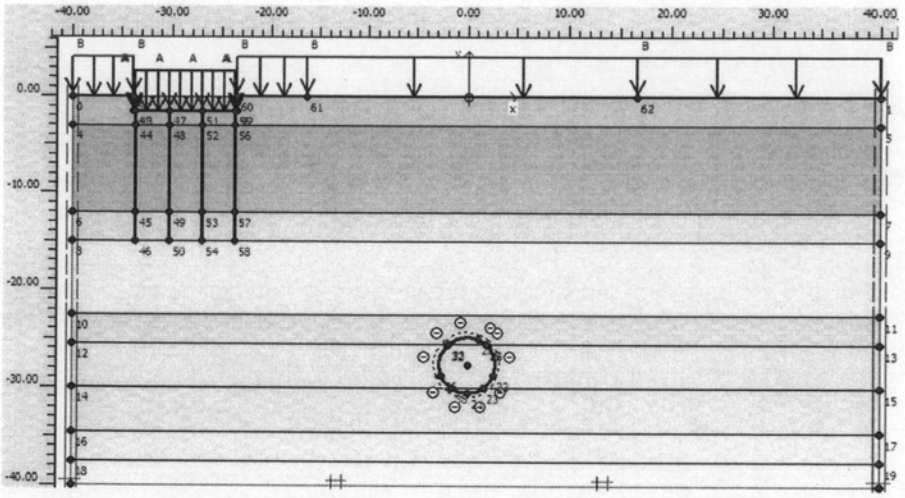

Figure D.13 Input geometry of section GS-BTS

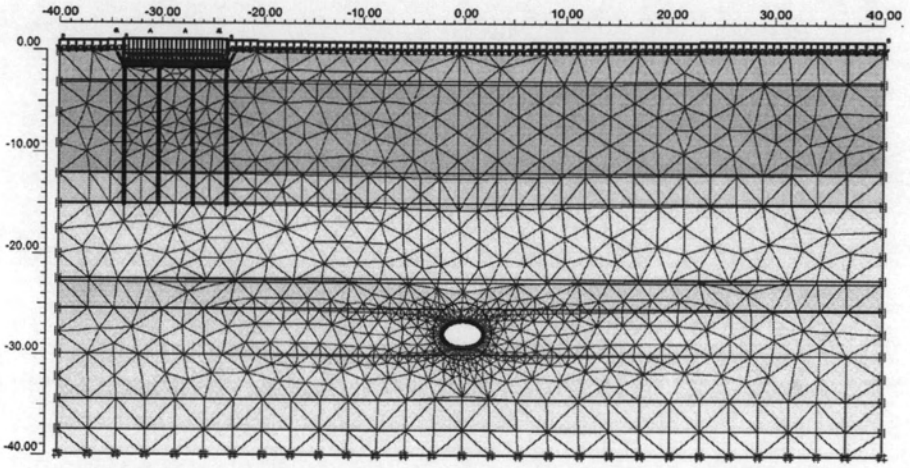

Figure D.14 Deformation mesh generated at section GS-BTS

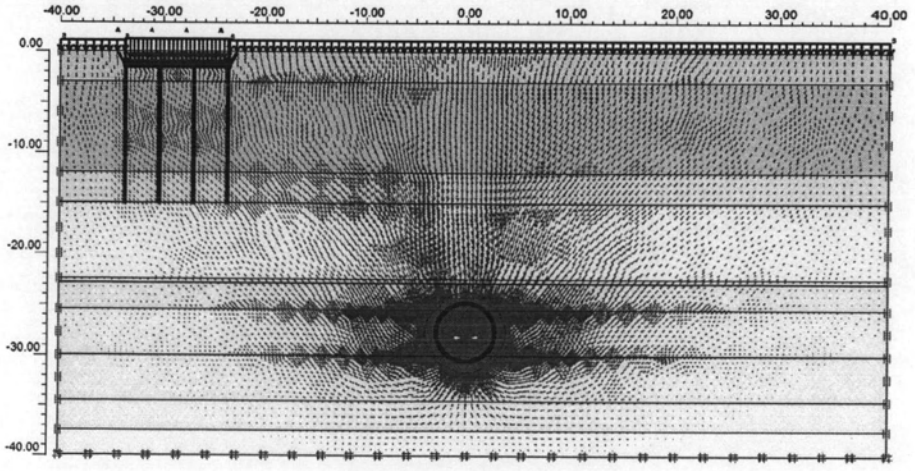

Figure D.15 Total displacement arrows at section GS-BTS

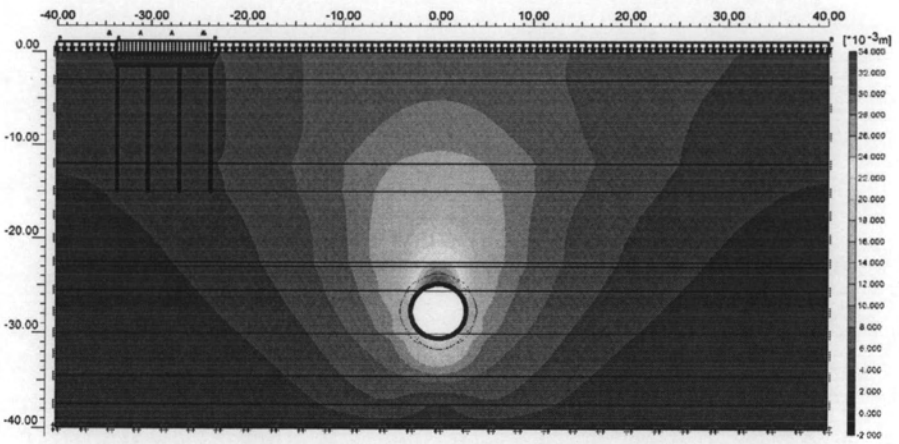

Figure D.16 Total displacement shadings at section GS-BTS

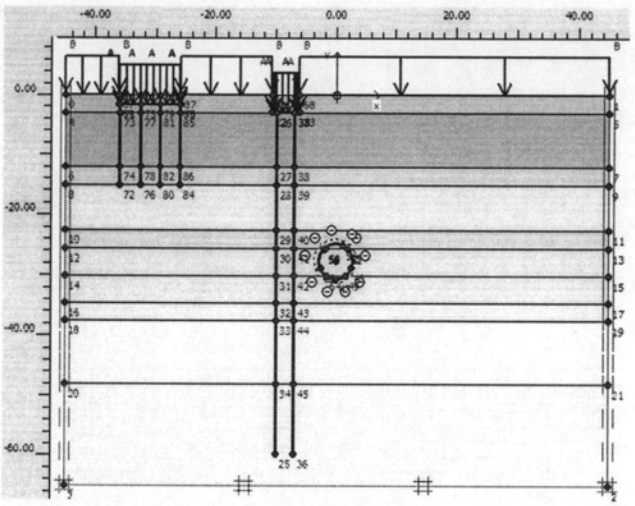

Figure D.17 Input geometry of section GS35

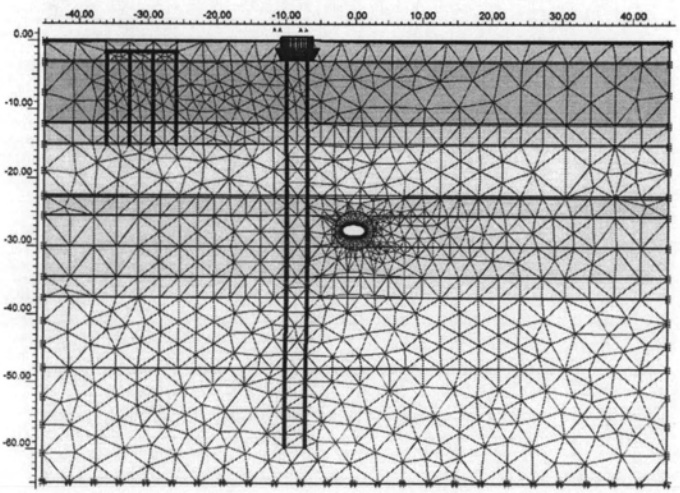

Figure D. 18 Deformation mesh generated at section GS35

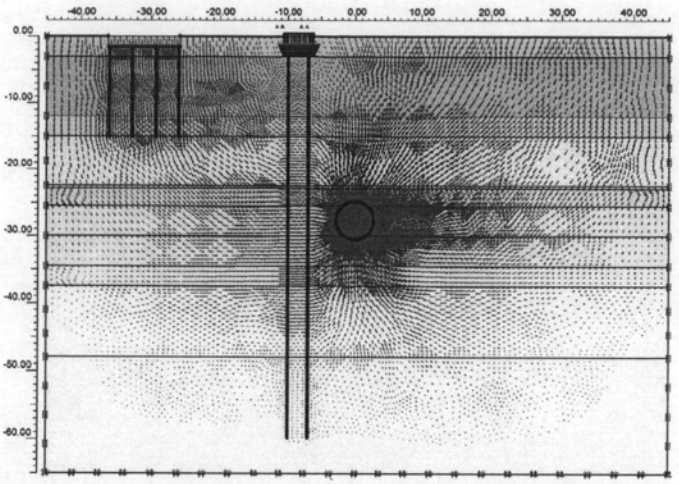

Figure D.19 Total displacement arrows at section GS35

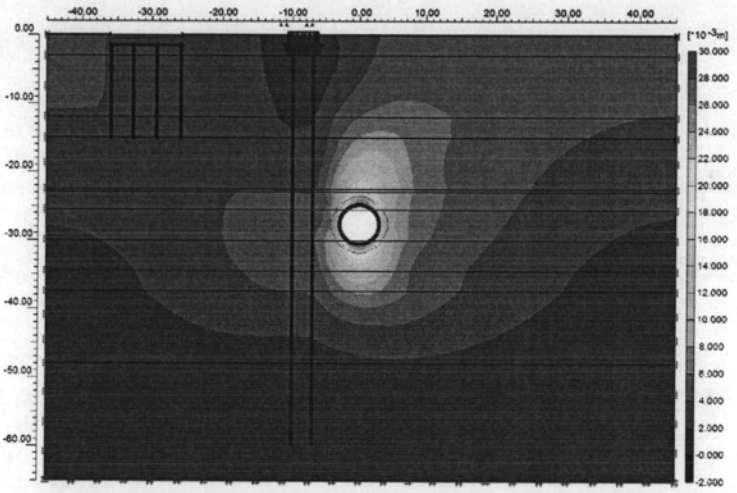

Figure D.20 Total displacement shadings at section GS35

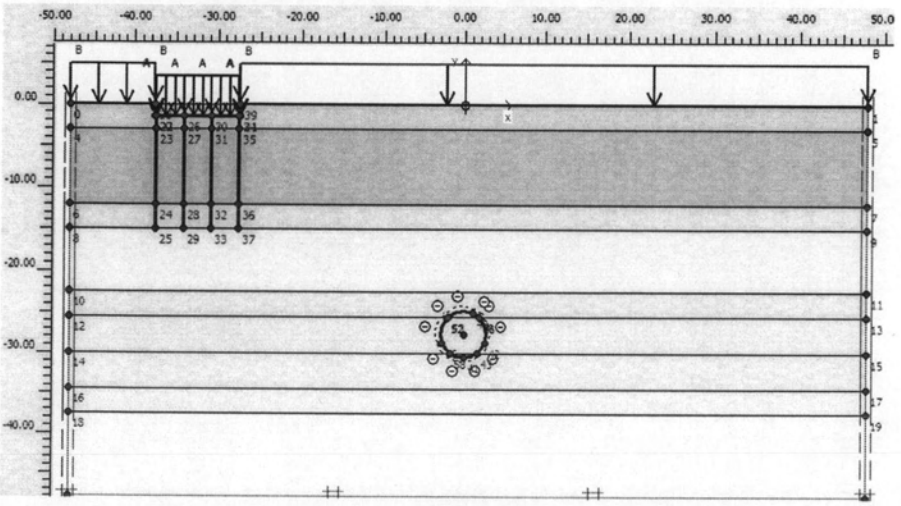

Figure D.21 Input geometry of section ME-2

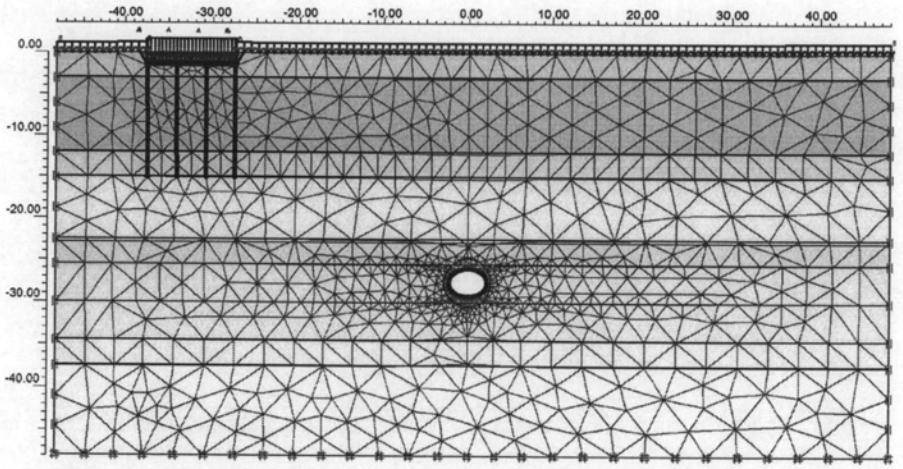

Figure D.22 Deformation mesh generated at section ME-2

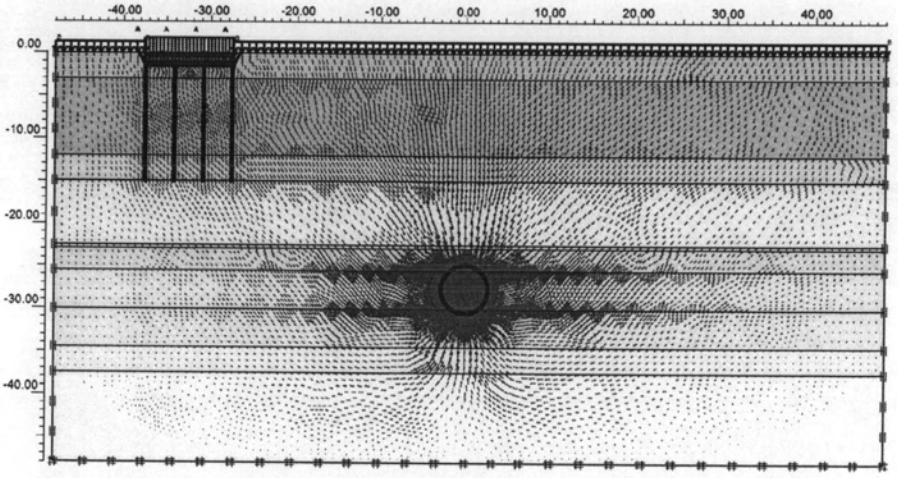

Figure D.23 Total displacement arrows at section ME-2

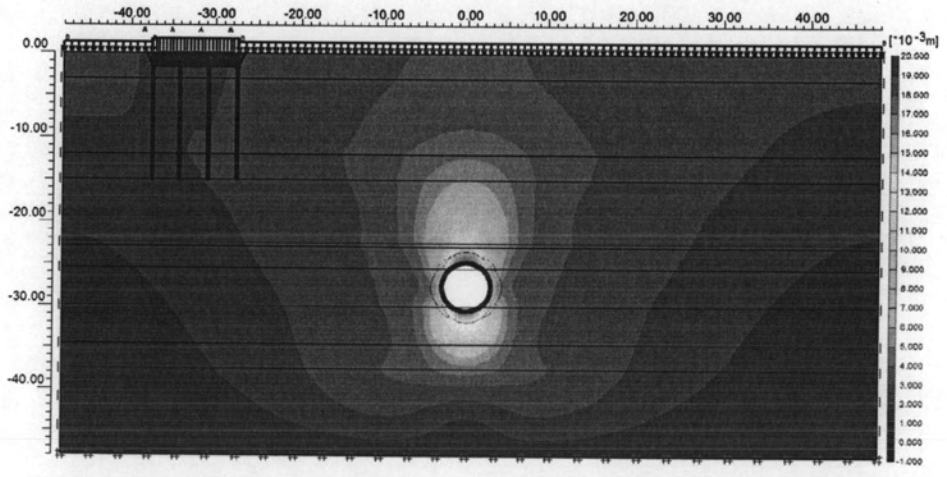

Figure D.24 Total displacement shadings at section ME-2

VITA

Soktay LIM was born on November 11, 1974 in Kompomg Speu province, Cambodia. After one year studying in preparative class, he passed the entrant examination at the Institute of Technology of Cambodia (ITC) as the first generation under the support from AUPELF-UREF, a French speaking agency for research and university.

In summer 1996, he was sponsored by the AUPELF-UREF for linguistic practicum and French culture at the Michel de Montaigne University, France. Subsequently, he was awarded a scholarship to finish his fifth year of engineering study in Belgium at Gembloux Agricultural University (Faculté Universitaire des Sciences Agronomiques de Gembloux, FUSAGx). His research within this one year was focus on the stability of the earthen dam, where the necessary data was given from a project in Algeria.

Soktay was selected as a young lecturer in the Department of Rural Engineering at ITC in 1999 after getting his bachelor degree in that year. After one year of hard working in the department, he was grained another scholarship to continue his Postgraduate Diploma (in French: Diplôme d'Etudes Approfondies, DEA) at Catholic University of Louvain (Université catholique de Louvain), Belgium. During this time his work was mainly concentrated on hydrology of micro-watersheds in brabant wallonia region of that country. After one year and one month of his intensive work, he got a Postgraduate Diploma in agronomic sciences and biological engineering (DEA en sciences agronomiques et ingénierie biologique). However, his diploma was issued on January 18, 2002, about three months after his oral defense.

After continuing his lecture about two years at ITC and in order to create a good relationship within the engineering network in the region, he was delighted to accept a scholarship from AUN/Seed-Net (ASEAN University Network/Southeast Asia Engineering Education Development Network), which was supported by JICA (Japan International Cooperation Agency), to carry on his Ph.D. research in Geotechnical Engineering at Chulalongkorn University. Throughout this three and half-year period, he also had occasion of six months to pursue his work and to perform some tests in the geotechnical laboratory at Kobe University, Japan, where he was warmly welcome by Professor Satoru SHIBUYA as his co-advisor.