Appendix A

Figures 1 through 19 Ground Model for Settlement Analysis

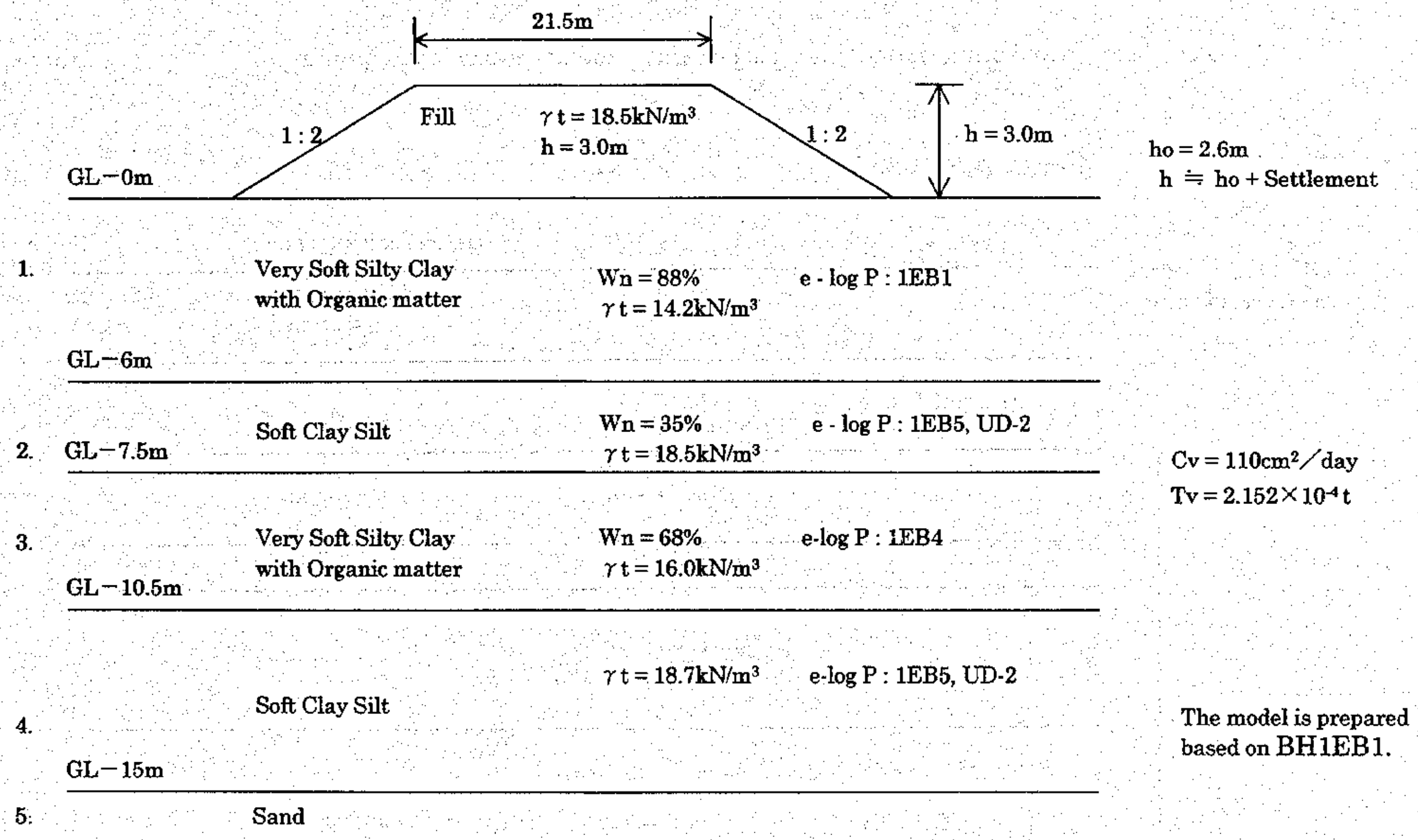


Figure-1 Ground Model of Settlement Analysis for STA 0+000 to STA 2+000

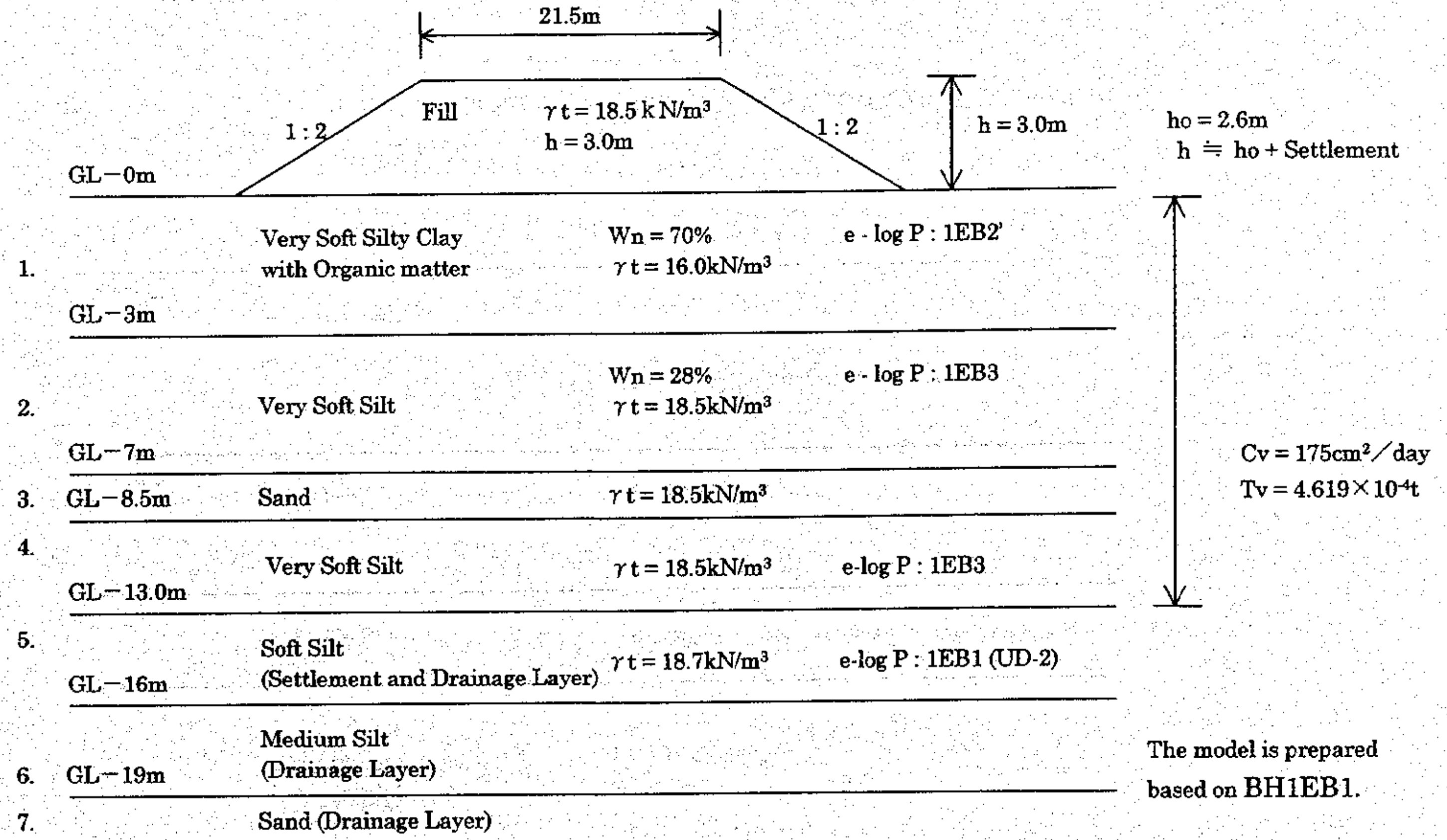


Figure-2 Ground Model of Settlement Analysis for STA 2+000 to Hatia River West Bank

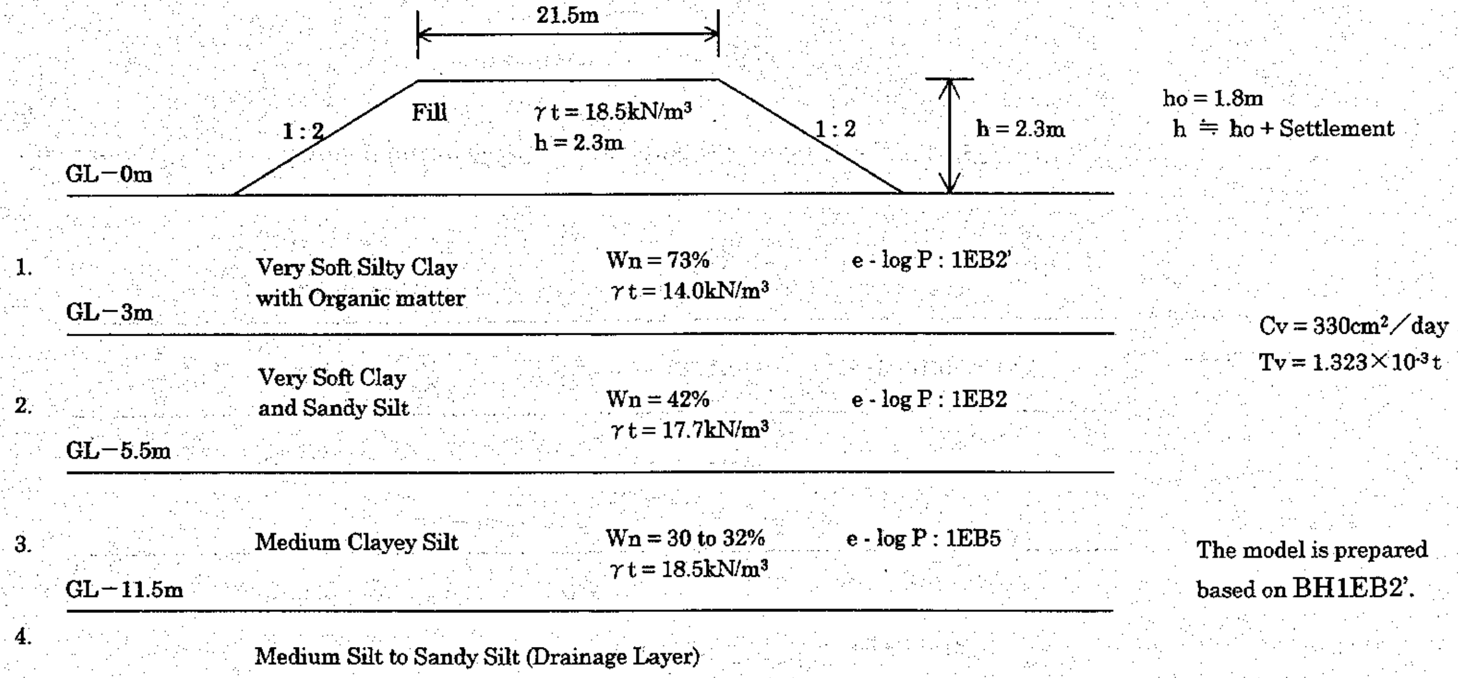


Figure-3 Ground Model of Settlement Analysis for Hatia River East Bank to STA 3+700

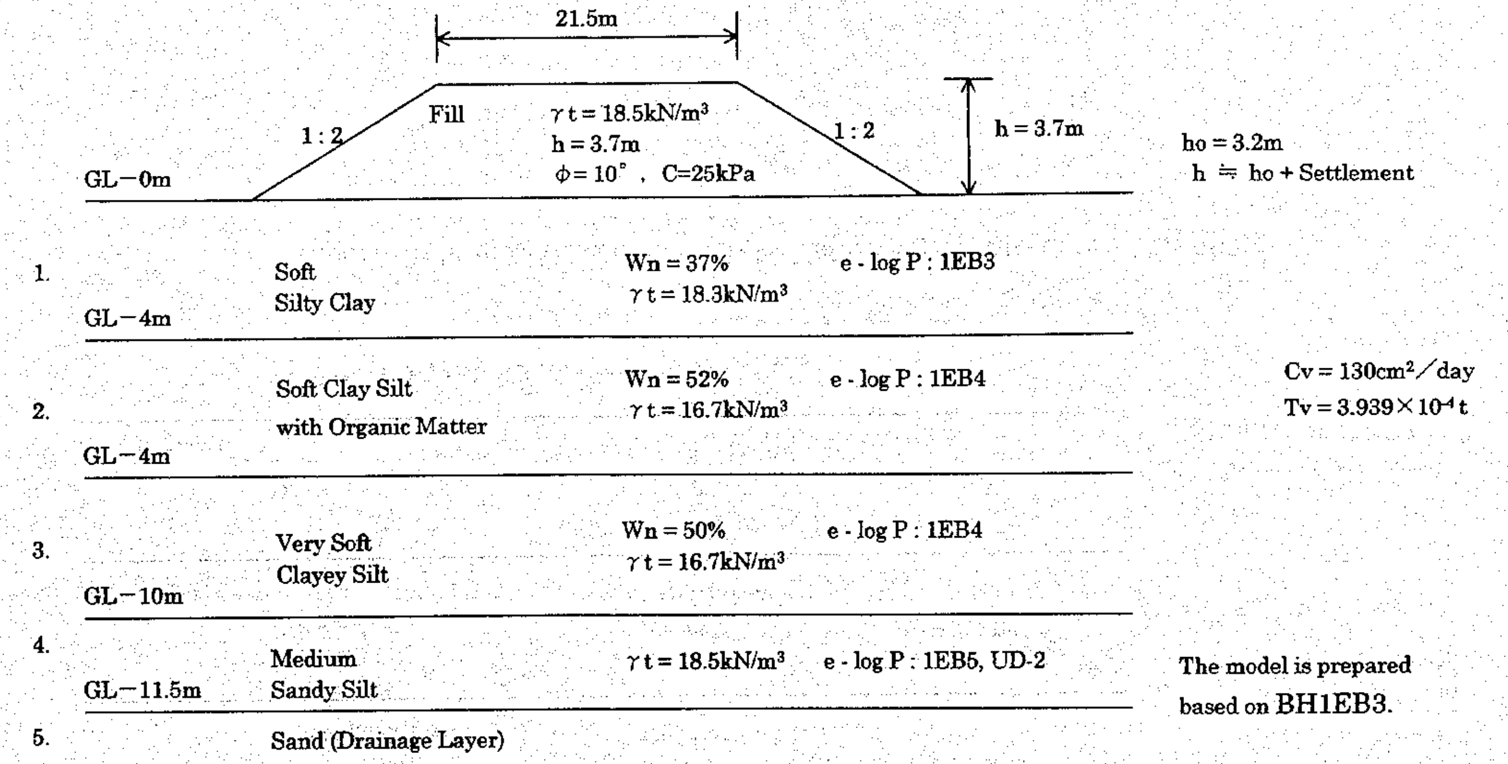


Figure-4 Ground Model of Settlement Analysis for STA 3+700 to STA 5+400

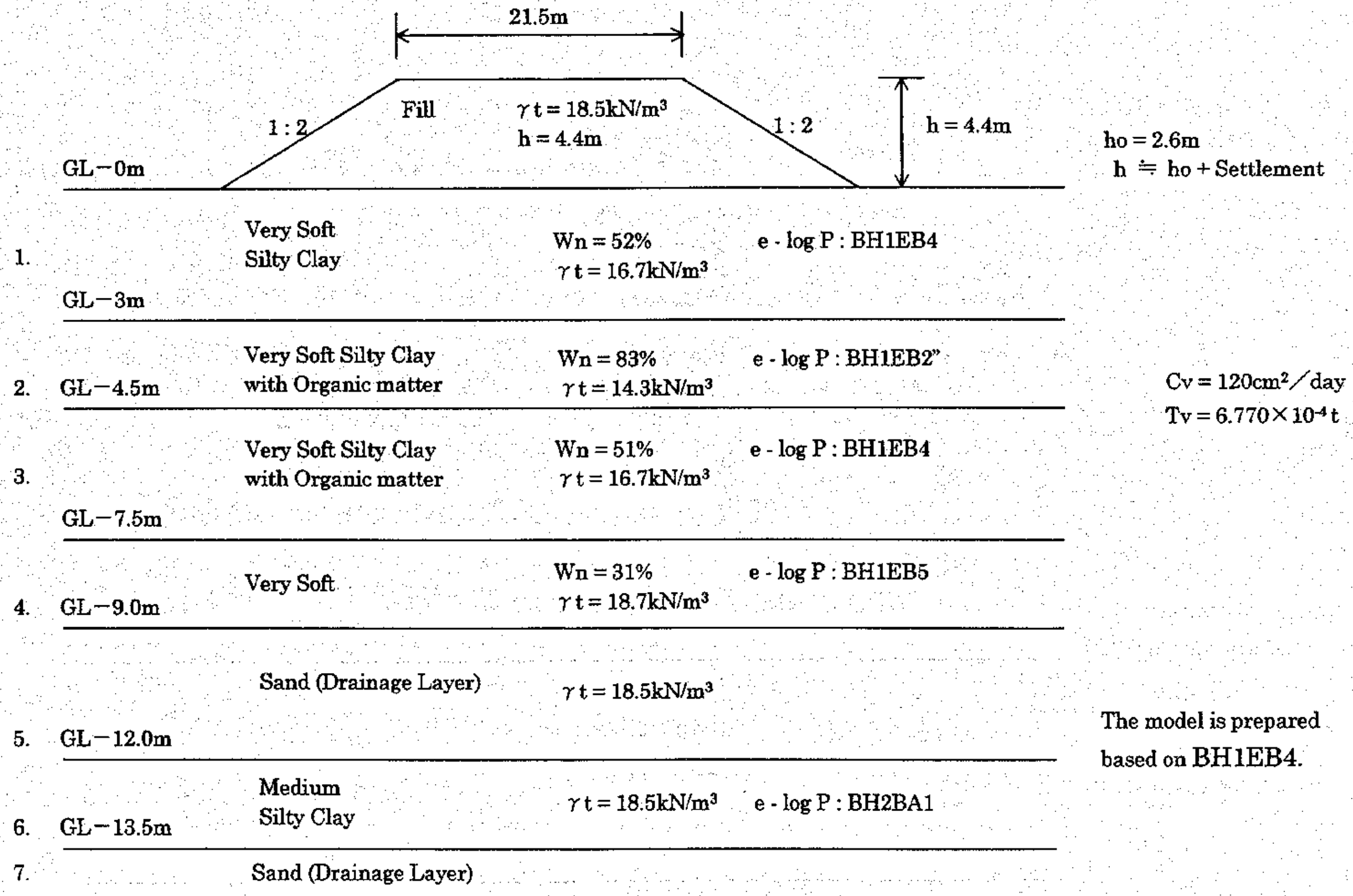


Figure-5 Ground Model of Settlement Analysis for STA 5+400 to STA 6 + 500

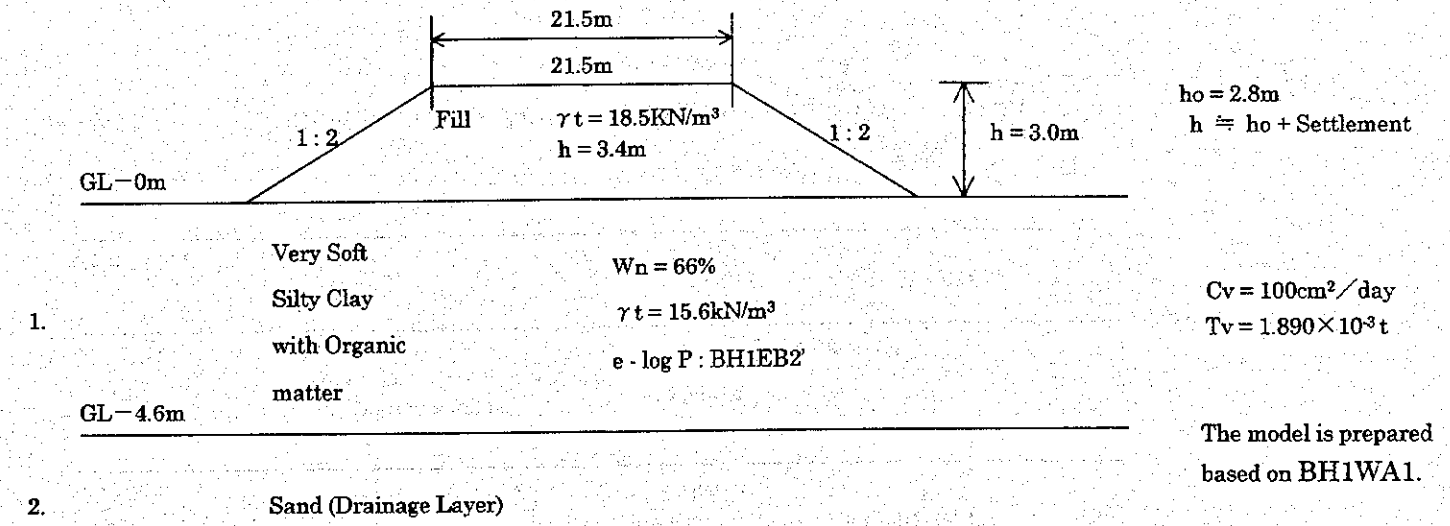


Figure-6 Ground Model of Settlement Analysis for STA 6+500 to STA 6+900

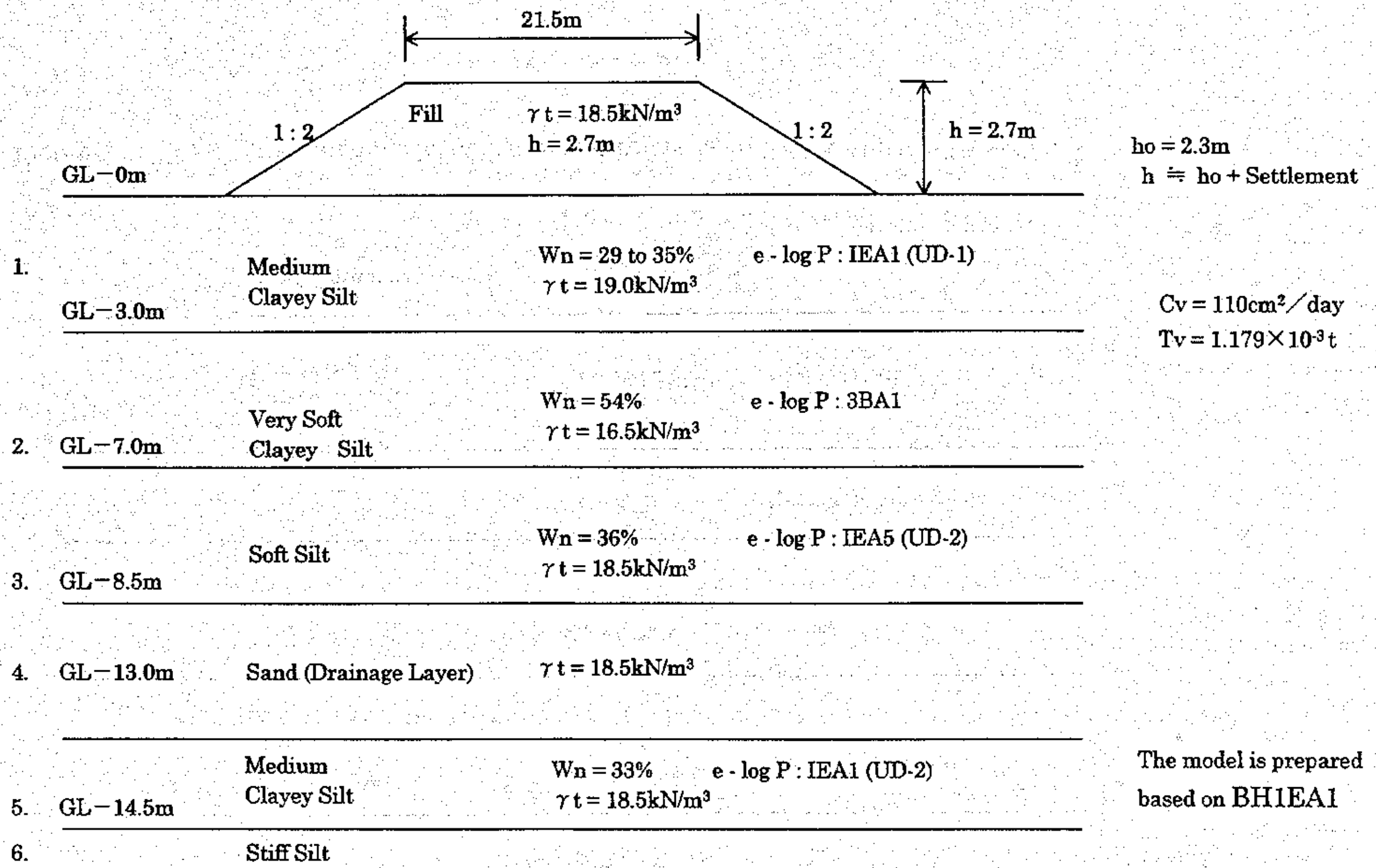


Figure-7 Ground Model of Settlement Analysis for Rupsa East Viaduct to STA 8+900

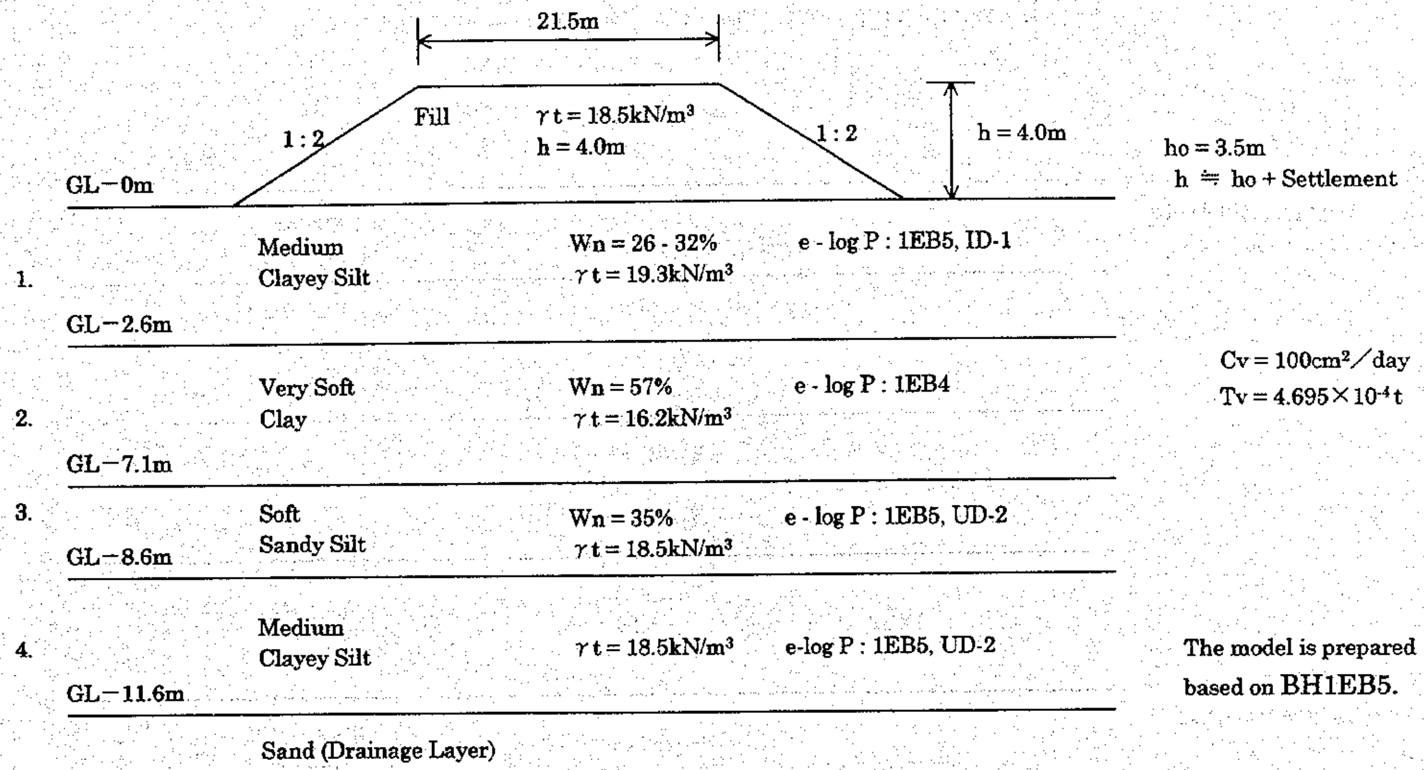


Figure-8 Ground Model of Settlement Analysis for STA 8+900 to STA 9+900

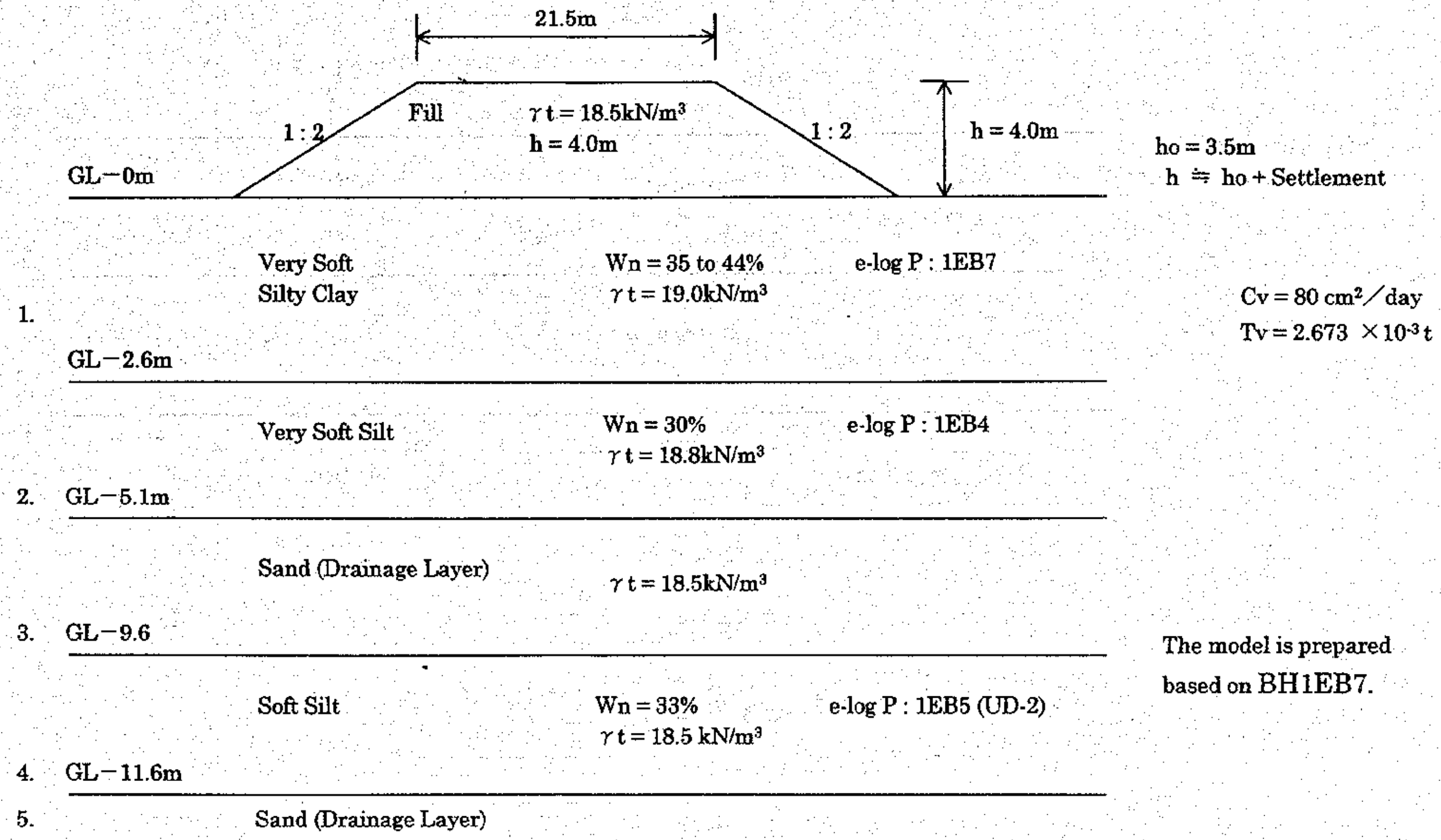


Figure-9 Ground Model of Settlement Analysis for STA 9+900 to Molonghata Bridge

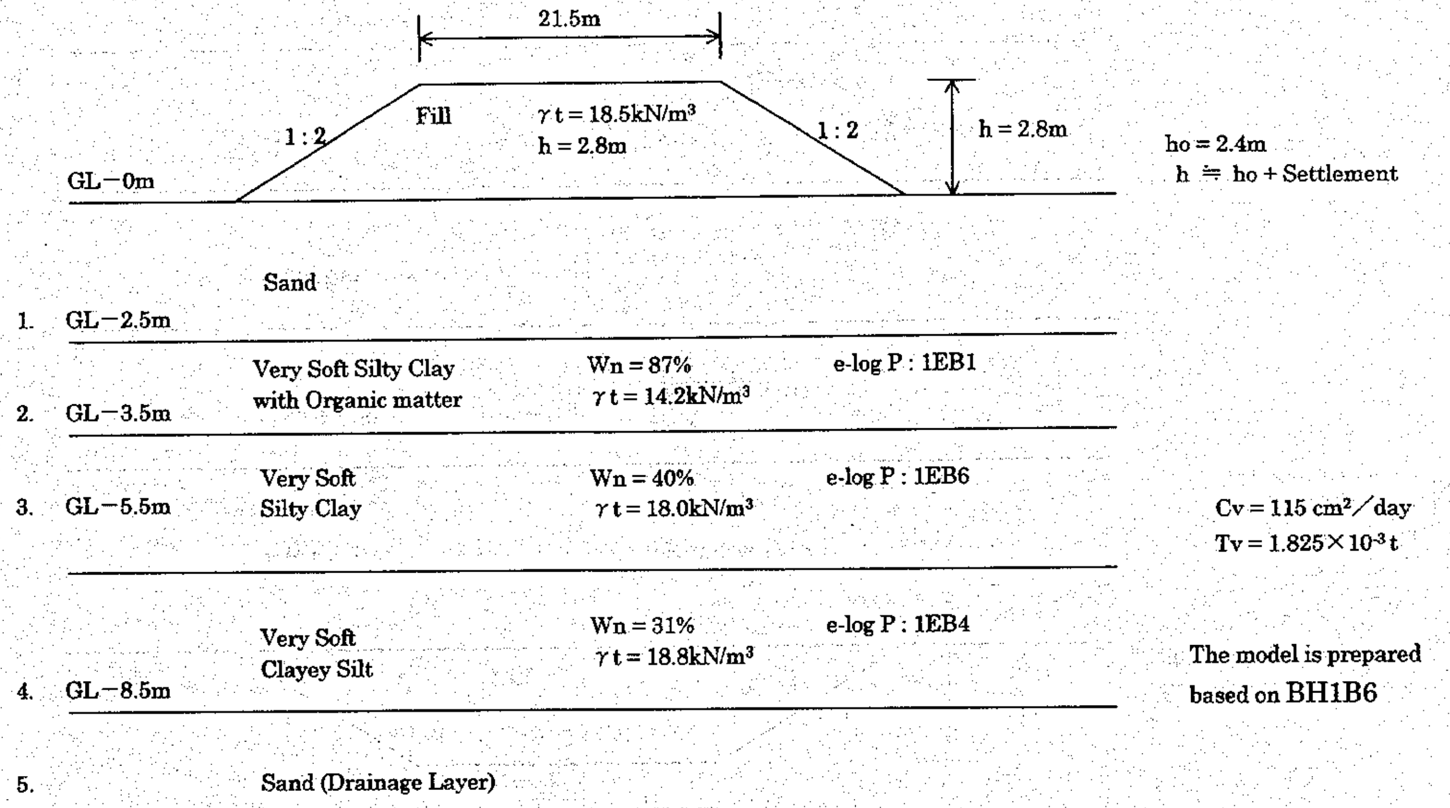


Figure-10 Ground Model of Settlement Analysis for Molonghata Bridge to End of Route 1

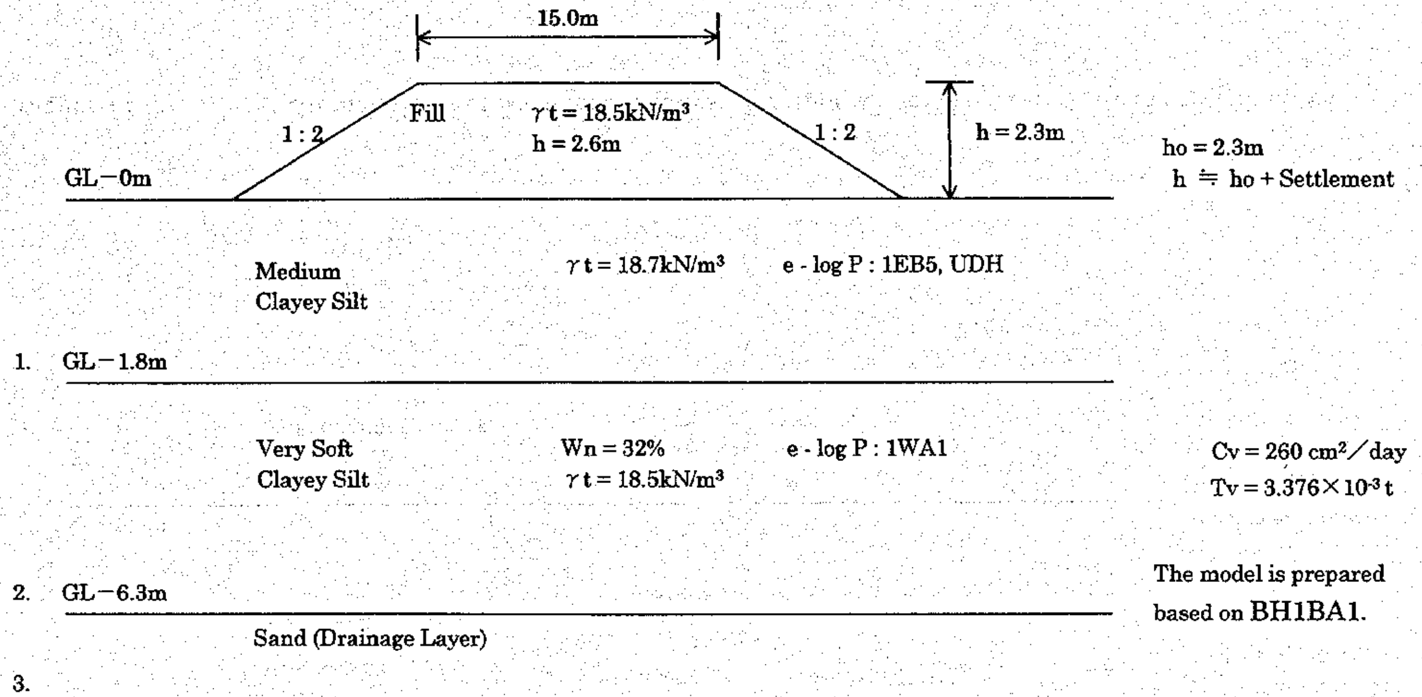


Figure-11 Ground Model of Settlement Analysis for Rupsa River West Access Road at River Bank Side

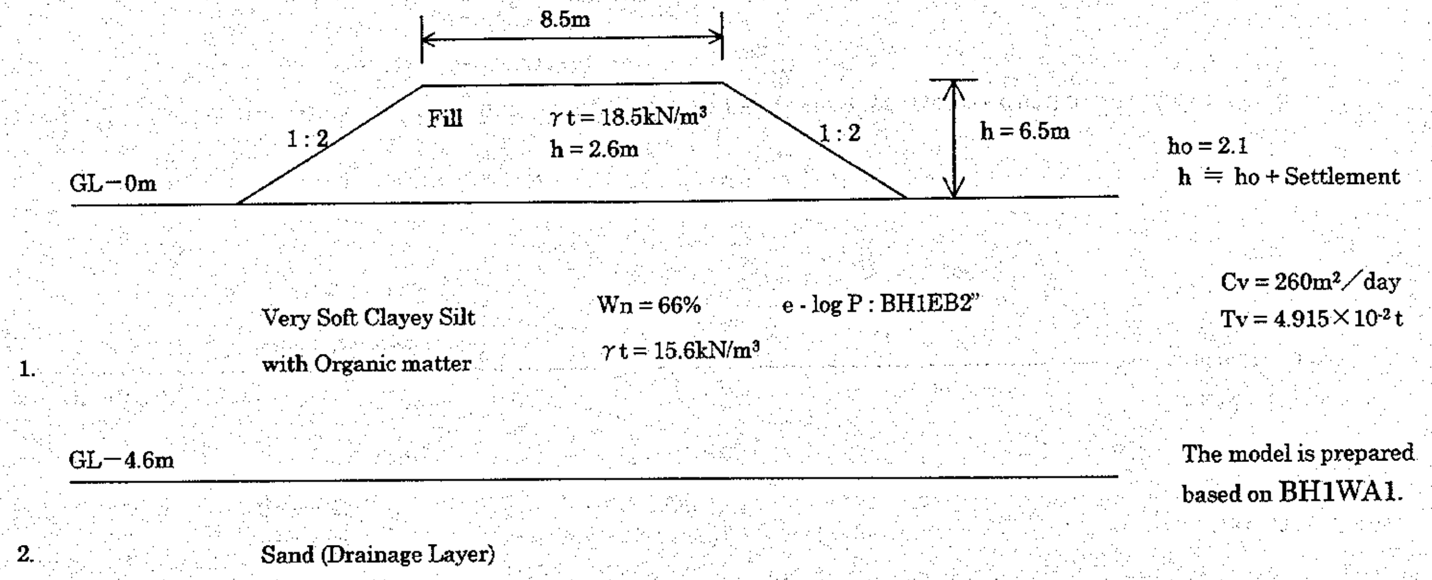


Figure-12 Ground Model of Settlement Analysis for Rupsa River West Access Road at Viaduct Side

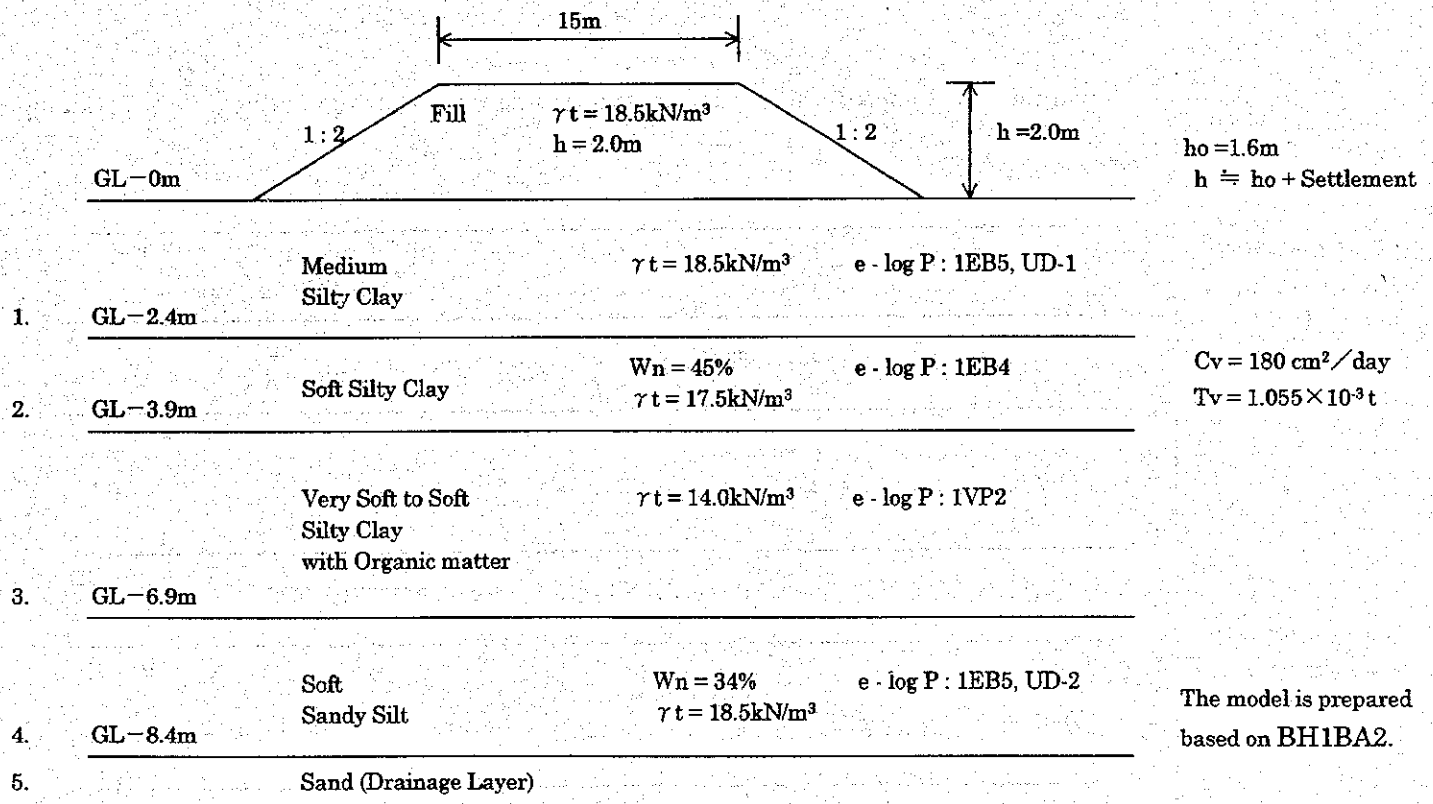


Figure-13 Ground Model of Settlement Analysis for Rupsa River East Access Road

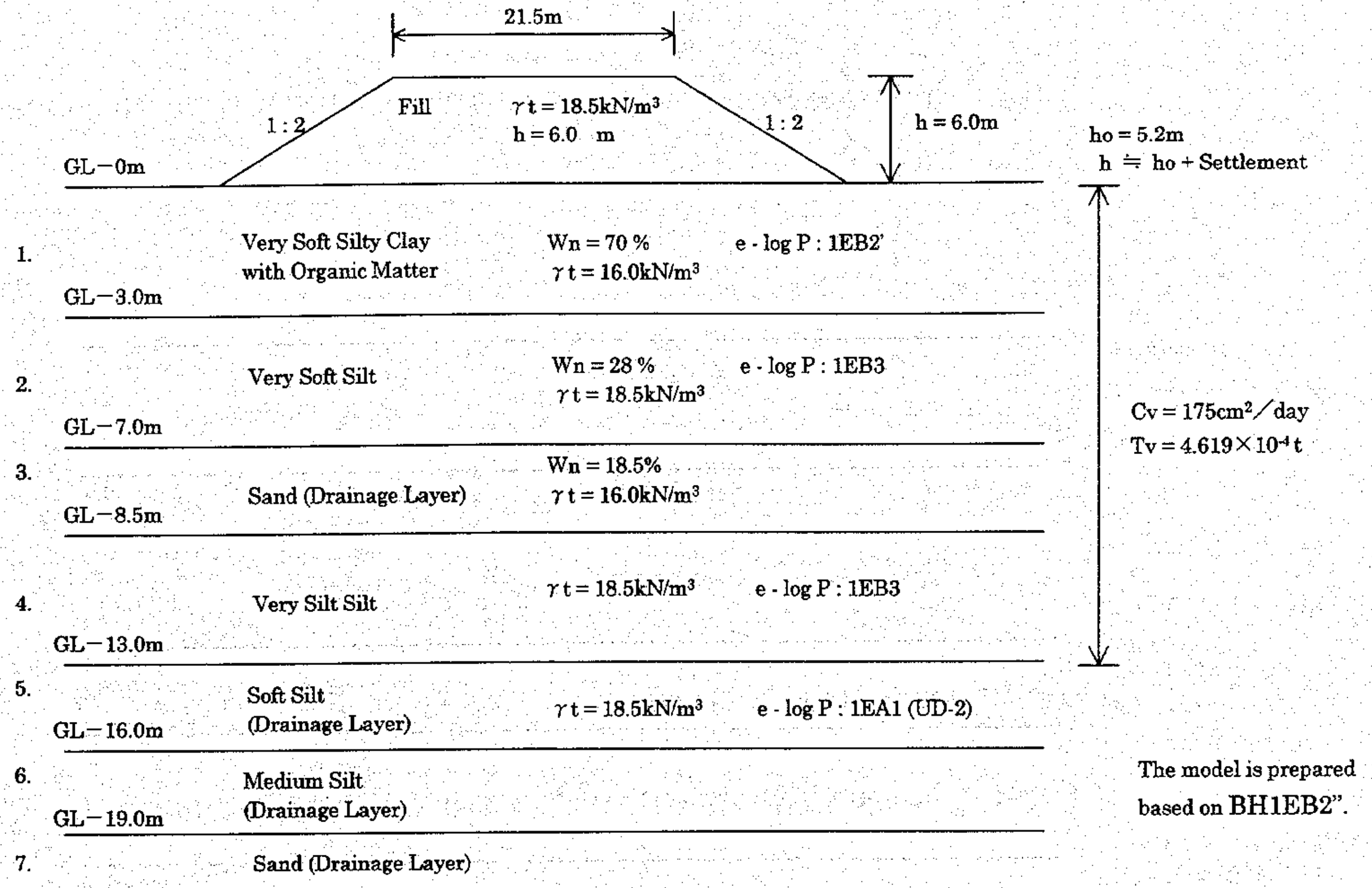


Figure-14 Ground Model of Settlement Analysis for to Hatia Bridge West Abutment

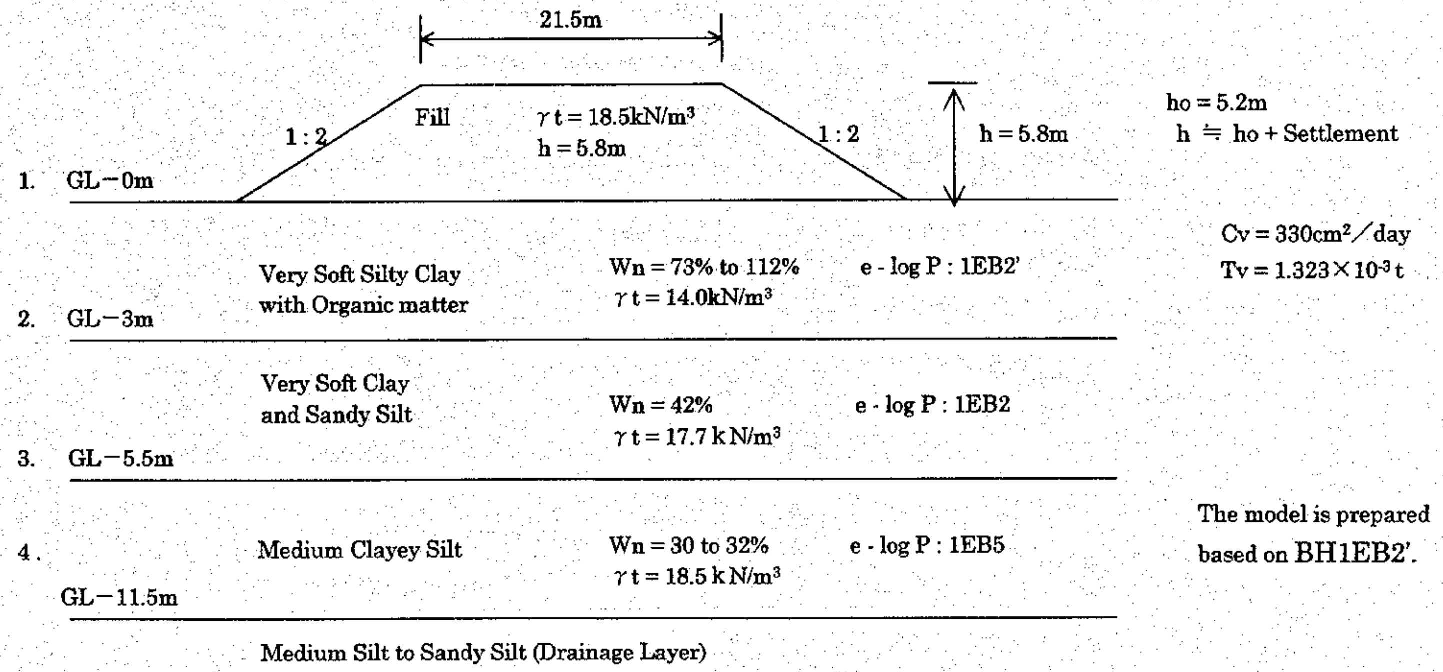


Figure-15 Ground Model of Settlement Analysis for to Hatia Bridge East Abutment

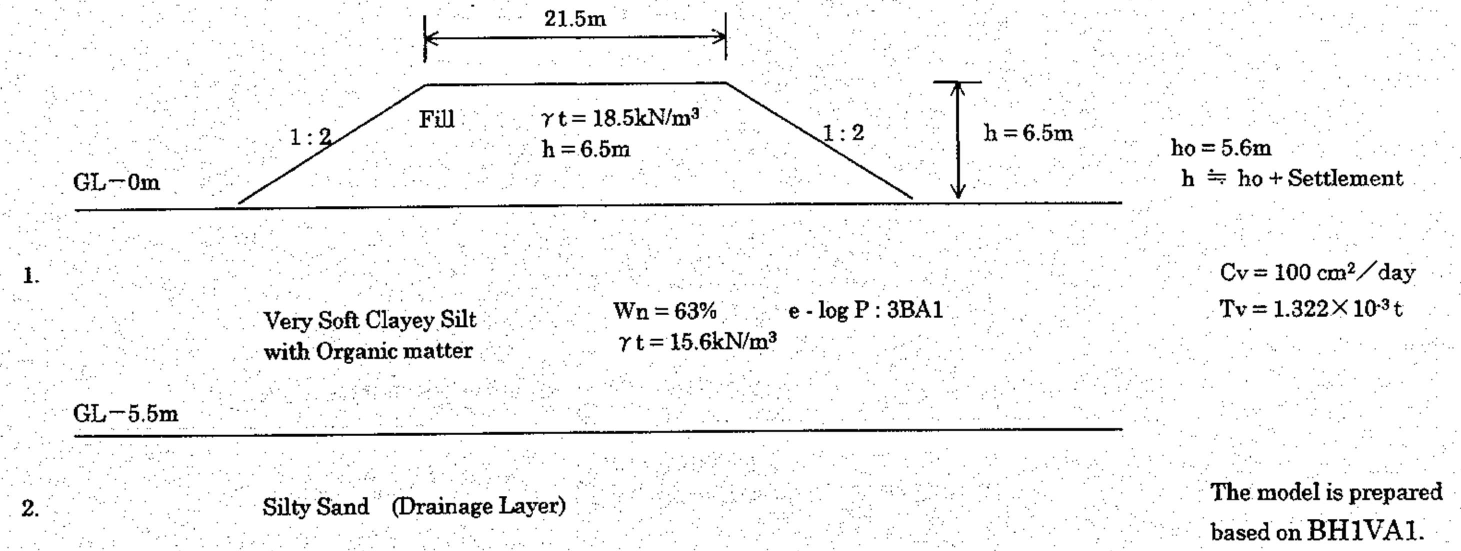


Figure-16 Ground Model of Settlement Analysis for West Approach to Viaduct

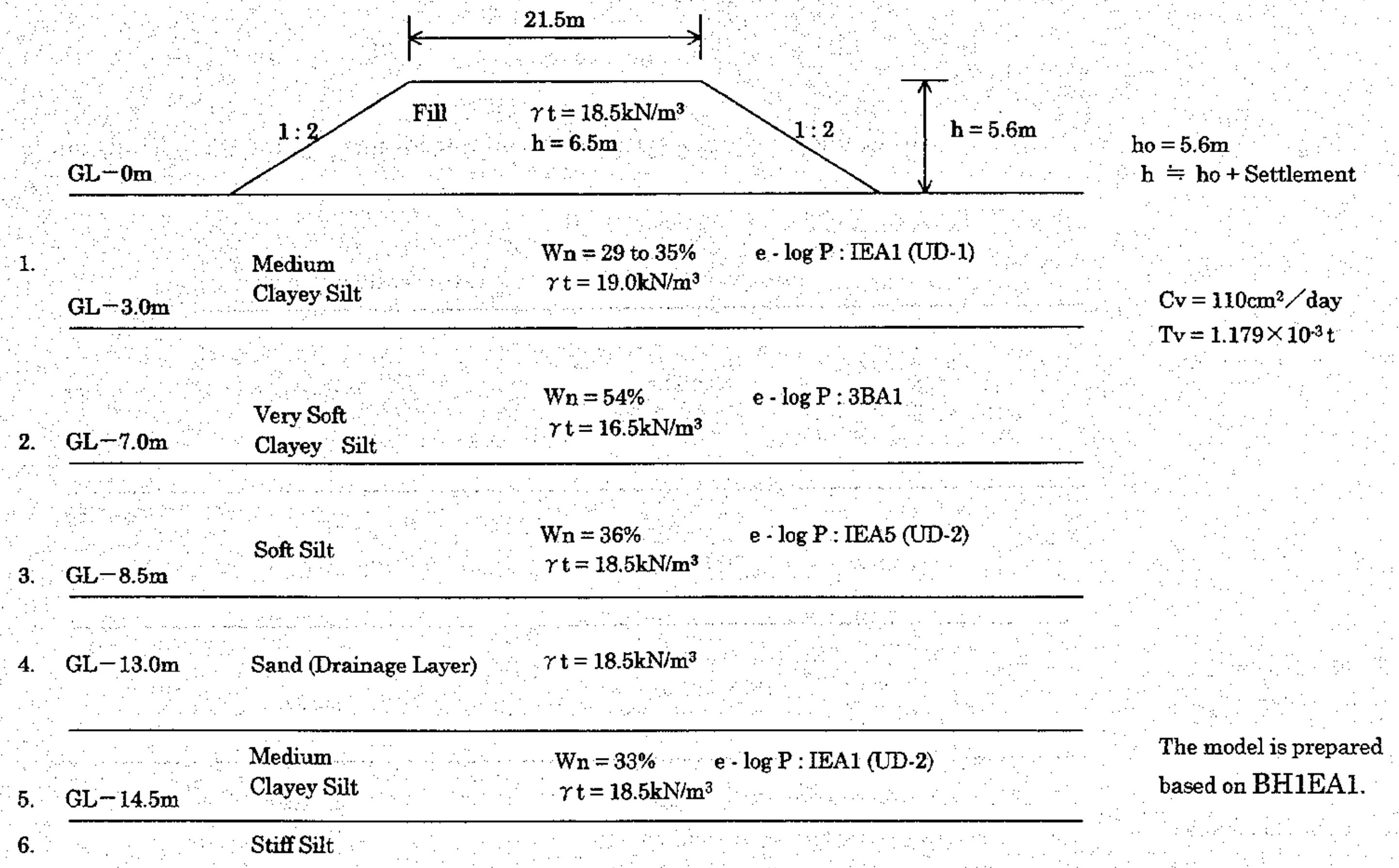


Figure-17 Ground Model of Settlement Analysis for East Approach to Viaduct

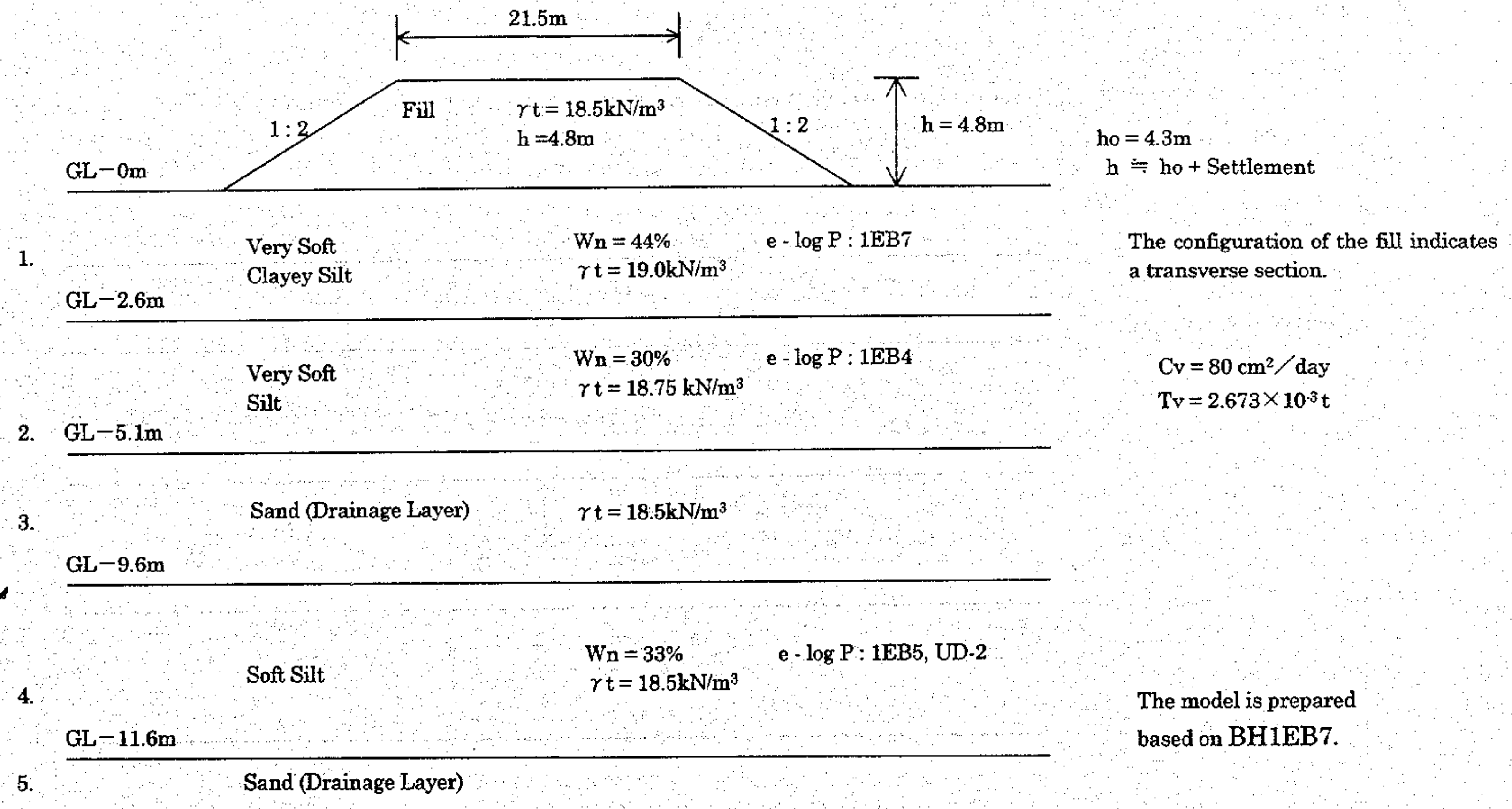
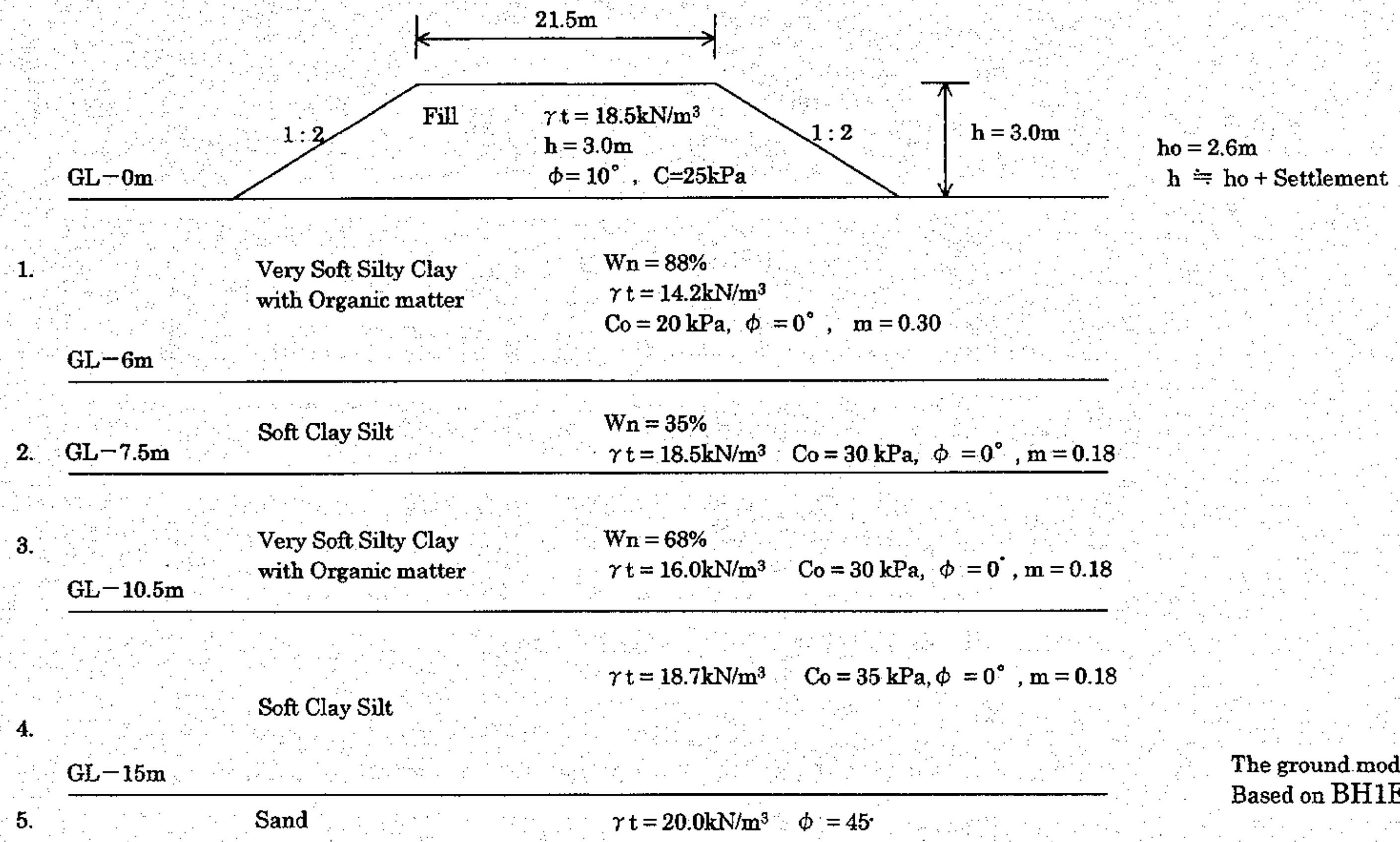


Figure- 18 Ground Model of Settlement Analysis for Molonghata Bridge Approach



The ground model is prepared
Based on BH1EB1.

Figure-19 Ground Model of Stability Analysis for STA 0+000 to STA 2+000

Appendix B

Tables-1 through 38
Settlement Calculation Sheet
And
Settlement VS. Time

Table-1 Settlement Calculation Sheet, STA 0+000 to STA 2+000

Layer No.	D (cm)	σ vó (kPa)	σ vó+ΔP (kPa)	e_0	e_1	S (cm)
1	600	30.1	8.33	2.115	2.00	22.2
2	150	49.1	10.02	0.925	0.900	1.9
3	300	64.5	11.11	1.195	1.130	8.9
4	450	93.0	13.96	0.905	0.890	3.5
					Total	36.6

Table-2 Settlement VS. Time, STA 0+000 to STA 2+000

Time (months) *	6	12	24	36	60
Settlement (cm)	8	15	20	23	29
Residual Settlement (cm)	29	22	17	14	8

* Time from reaching height of 3.0m

Table-3 Settlement Calculation Sheet, STA 2+000 to Hatia River

Layer No.	D (cm)	σ vó (kPa)	σ vó+ΔP (kPa)	e_0	e_1	S (cm)
1	300	12.5	71.7	2.84	2.60	18.8
2	400	38.5	96.5	0.959	0.918	8.4
3	450	87.4	139.7	0.924	0.894	7.0
5	300	119.3	166.8	0.856	0.838	2.9
					Total	37.1

Table-4 Settlement VS. Time, STA 2+000 to Hatia River

Time (months) *	6	12	24	36	60
Settlement (cm)	15	21	27	31	34
Residual Settlement (cm)	22	16	10	6	3

* Time from reaching height of 3.0m

Table-5 Settlement Calculation Sheet, Hatia River East Bank to SAT 3+700

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	150	10.0	52.6	2.86	2.63	17.9
2	425	25.6	61.2	0.918	0.872	6.0
3	850	60.8	95.8	0.918	0.902	2.5*
					Total	26.4

* Half of calculated value

Table-6 Settlement VS. Time, Hatia River East Bank to SAT 3+700

Time (months) *	6	12	24	36	60
Settlement (cm)	18	21	24	–	–
Residual Settlement (cm)	9	6	3	–	–

* Time from reaching height of 2.3m

Table-7 Settlement Calculation Sheet, STA 3+700 to SAT 5+400

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	400	22.1	90.6	0.968	0.917	10.4
2	300	48.8	115.6	1.216	1.106	14.9
3	300	68.9	133.8	1.138	1.100	12.1
4	150	85.3	146.7	0.906	0.89	0.7*
					Total	38.1

* Half of calculated value

Table-8 Settlement VS. Time, STA 3+700 to SAT 5+400

Time (months) *	6	12	24	36	60	72
Settlement (cm)	9	12	17	24	33	34
Residual Settlement (cm)	29	26	11	7	5	4

* Time from reaching height of 3.7m

Table-9 Settlement Calculation Sheet, STA 5+400 to SAT 6+500

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	300	21.1	100.7	1.259	1.145	15.1
2	150	34.3	113.1	1.23	1.05	12.1
3	300	47.6	12436	1.218	1.117	13.7
4	150	64.1	139.1	0.917	0.890	2.1
6	150	102.3	172.0	0.738	0.722	0.7*
					Total	43.7

* Half of calculated value

Table-10 Settlement VS. Time, STA 5+400 to SAT 6+500

Time (months) *	6	12	24	36	48
Settlement (cm)	19	24	36	39	40
Residual Settlement (cm)	25	20	10	5	4

* Time from reaching height of 4.4m

Table-11 Settlement Calculation Sheet, STA 6+500 to Rupsa West Viaduct

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	550	30.4	80.6	1.31	1.12	37.8
					Total	37.8

Table-12 Settlement VS. Time, STA 6+500 to Rupsa West Viaduct

Time (months) *	3	6	12	18
Settlement (cm)	14	24	32	36
Residual Settlement (cm)	24	14	6	2

* Time from reaching height of 3.7m

Table-13 Settlement Calculation Sheet, Rupsa East Viaduct to SAT 8+900

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	300	21.5	71.5	0.925	0.872	8.2
2	400	48.0	97.9	1.373	1.21	27.4
3	150	67.4	115.3	0.915	0.896	1.5
5	150	118.4	161.2	0.855	0.840	1.2
					Total	38.3

Table-14 Settlement VS. Time, Rupsa East Viaduct to SAT 8+900

Time (months) *	6	12	24
Settlement (cm)	21	28	34
Residual Settlement (cm)	17	10	4

* Time from reaching height of 2.7m

Table-15 Settlement Calculation Sheet, STA 8+900 to SAT 9+900

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	260	21.7	95.7	0.862	0.815	6.7
2	450	47.4	120.2	1.218	1.125	18.9
3	150	67.6	137.6	0.915	0.890	2.0
4	300	87.1	154.0	0.906	0.887	3.0
					Total	30.6

Table-16 Settlement VS. Time, STA 8+900 to SAT 9+900

Time (months) *	6	12	24	36	60
Settlement (cm)	18	21	24	27	29
Residual Settlement (cm)	13	10	7	4	2

* Time from reaching height of 4.0m

Table-17 Settlement Calculation Sheet, STA 9+900 to Molonghata Bridge

Layer No.	D (cm)	σ v6 (kPa)	σ v6+ΔP (kPa)	e_0	e_1	S (cm)
1	260	11.7	85.7	0.918	0.918	8.9
2	250	34.3	107.6	1.239	1.239	11.1
4	200	92.0	159	0.904	0.904	2.0
					Total	22.0

Table-18 Settlement VS. Time (STA 9+900 to Molonghata Bride)

Most part of the settlement will be developed during construction of the fill.

Table-19 Settlement Calculation Sheet, Molonghata Bridge to End

Layer No.	D (cm)	σ v6 (kPa)	σ v6+ΔP (kPa)	e_0	e_1	S (cm)
2	100	29.9	81.6	2.15	2.00	4.8
3	200	40.0	91.0	0.984	0.920	6.5
4	300	61.1	110.5	1.198	1.140	7.9
					Total	19.2

Table-20 Settlement VS. Time, Molonghata Bridge to End

Time (months) *	6	12	24
Settlement (cm)	12	16	18
Residual Settlement (cm)	6	3	1

* Time from reaching height of 2.8m

Table-21 Settlement Calculation Sheet, West Access Road, River Bank Side

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	180	11.9	6.03	0.874	0.837	3.6
2	450	38.9	85.8	0.900	0.865	8.3
					Total	11.9

Table-22 Settlement VS. Time, West Access Road, River Bank Side

Time (months) *	6	12
Settlement (cm)	9	11
Residual Settlement (cm)	2	1

* Time from reaching height of 2.6m

Table-23 Settlement Calculation Sheet, West Access Road, Viaduct Side

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	460	15.9	62.9	1.13	1.16	29.9
					Total	29.9

Table-24 Settlement VS. Time, West Access Road, Viaduct Side

Time (Months) *	6	12
Settlement (cm)	27	29
Residual Settlement (cm)	3	1

* Time from reaching height of 2.6m

Table-25 Settlement Calculation Sheet, East Access Road

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	240	17.2	54.1	0.866	0.840	3.3
2	150	33.0	68.8	1.242	1.189	3.5
3	300	44.7	76.5	4.46	4.36	5.5
4	10	57.0	85.7	0.92	0.906	1.1
					Total	13.4

Table-26 Settlement VS. Time, East Access Road

Time (months) *	6	12	24	36
Settlement (cm)	9	11	12	13
Residual Settlement (cm)	5	3	2	1

* Time from reaching height of 2.0m

Table-27 Settlement Calculation Sheet, Hatia Bridge West Approach, 18m behind abutment

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	300	12.5	123.5	2.79	2.33	36.4
2	400	38.5	147.5	0.959	0.890	14.1
3	450	87.4	189.3	0.924	0.868	13.1
5	300	119.3	213.0	0.855	0.828	2.2*
					Total	65.8

* Half of the calculated settlement

Table-28 Settlement Calculation Sheet, Hatia Bridge West Approach, 5m behind abutment

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	300	12.5	118.1	2.79	2.355	34.4
2	400	38.5	129.8	0.959	0.898	12.5
3	450	87.4	163.5	0.924	0.878	10.8
5	300	119.3	181.8	0.855	0.836	1.5*
						59.2
					Total	61.8**

* Half of the calculated Settlement
**After correction of stress

Table-29 Settlement VS. Time, Hatia Bridge West Approach, 18m behind Abutment

Time *	1	2	3	4	5	6	7	8
Settlement (cm)	21	36	40	42	46	53	57	62
Residual Settlement (cm)	45	30	26	24	20	13	9	4

* 1. At reaching to 6.0m (12 months from commencement of fill)
2. At the end of 11 months' curing period (23 months from commencement of fill)
3. At the completion of backfill behind abutment (Assumed 29 months from commencement of fill)
4. At 0.5 year after completion of backfill behind abutment
5. At 1 year after completion of backfill behind abutment
6. At 2 year after completion of backfill behind abutment
7. At 3 year after completion of backfill behind abutment
8. At 5 year after completion of backfill behind abutment

Table-30 Settlement VS. Time, Hatia Bridge West Approach, 5m behind Abutment

Time *	1	2	3	4	5	6	7	8
Settlement (cm)	Nil	5	5	21	29	40	48	56
Residual Settlement (cm)	62	57	57	41	33	22	14	6

* 1. At reaching to 6.0m (12 months from commencement of fill)
2. At the end of 11 months' curing period (23 months from commencement of fill)
3. At the completion of backfill behind abutment (Assumed 29 months from commencement of fill)
4. At 0.5 year after completion of backfill behind abutment
5. At 1 year after completion of backfill behind abutment
6. At 2 year after completion of backfill behind abutment
7. At 3 year after completion of backfill behind abutment
8. At 5 year after completion of backfill behind abutment

Table-31 Settlement Calculation Sheet Hatia Bridge Eest Approach

Layer No.	D (cm)	σ vó (kPa)	σ vó+$\triangle$P (kPa)	e_0	e_1	S (cm)
1	300	6	113.3	2.820	2.372	35.2
2	250	21.6	127.2	0.910	0.832	10.2
3	600	56.7	1583.0	0.920	0.900	3.1 *
					Total	48.5

* Half of the calculated settlement

Table-32 Time VS. Settlement, Hatia Bridge East Approach

Time *	1	2	3	4	5	6
Settlement (cm)	18	26	33	38	44	46
Residual Settlement (cm)	31	23	16	11	5	3

* 1. At reaching to5.8m (7 months from commencement of fill)
2. At the end of 5 months' curing period (12 months from commencement of fill)
3. At 0.5 year after completion of backfill behind abutment
4. At 1 year after completion of backfill behind abutment
5. At 2 years after completion of backfill behind abutment
6 At 3 years after completion of backfill behind abutment

Table-33 Settlement Calculation Sheet, West Approach to Viaduct

Layer No.	D (cm)	σ vó (kPa)	σ vó+ΔP (kPa)	e_0	e_i	S (cm)
1	550	20.0	140.2	1.41	1.065	78.7
					Total	78.7

Table-34 Settlement VS. Time, Hatia Bridge East Approach

Time *	1	2	3	4	5	6
Settlement (cm)	30	46	60	68	73	76
Residual Settlement (cm)	49	33	19	11	6	3

* 1. At reaching to 6.5m (6 months from commencement of fill)
2. At the end of 4 months curing period (10 months from commencement of fill)
3. At 0.5 year after completion of backfill behind abutment
4. At 1 year after completion of backfill behind abutment
5. At 1.5 years after completion of backfill behind abutment
6. At 2 years after completion of backfill behind abutment

Table-35 Settlement Calculation Sheet, East Approach to Viaduct

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	300	21.5	141.8	0.925	0.840	13.2
2	400	48.0	166.8	1.373	1.210	58.8
3	150	67.4	182.8	0.915	0.880	2.7
5	150	118.4	221.6	0.855	0.826	2.3
					Total	77.0

Tabl-36 Settlement VS. Time, East Approach to Viaduct

Time *	1	2	3	4	5	6
Settlement (cm)	31	58	41	65	70	72
Residual Settlement (cm)	46	19	36	12	7	5

* 1. At reaching to 6.5m (6 months from commencement of fill)
2. At the end of 4 months curing period (10 months from commencement of fill)
3. At 0.5 year after completion of backfill behind abutment
4. At 1 year after completion of backfill behind abutment
5. At 1.5 years after completion of backfill behind abutment
6 At 2 years after completion of backfill behind abutment

Table-37 Settlement Calculation Sheet, Molonghata Bridge Approach

Layer No.	D (cm)	σ vó (kPa)	σ vó+△P (kPa)	e_0	e_1	S (cm)
1	260	11.7	10.1	0.918	0.839	10.7
2	250	34.3	12.2	1.239	1.125	12.7
4	200	92.0	17.3	0.904	0.885	2.0
					Total	25.4

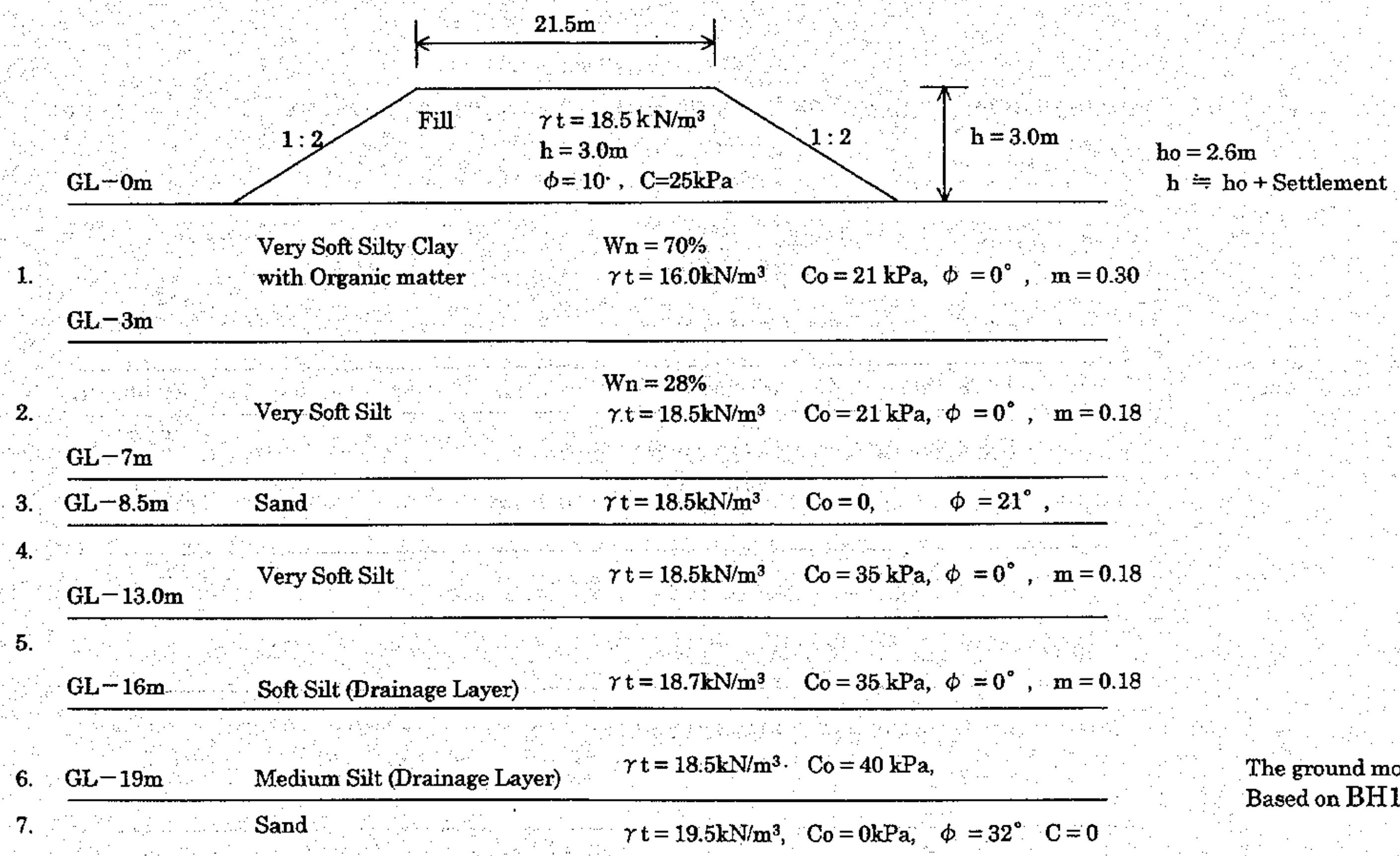
Table-38 Settlement VS. Time, Molonghata Bridge Approach

Time (months) *	6	12	24
Settlement (cm)	20	24	25
Residual Settlement (cm)	6	2	1

* Time from reaching height of 4.8m

Appendix C

Figures-20 through 36
Ground Model
Of
Stability Analysis



The ground model is prepared
Based on BH1EB2".

Figure-20 Ground Model of Stability Analysis for STA 2+000 to Hatia River West Bank

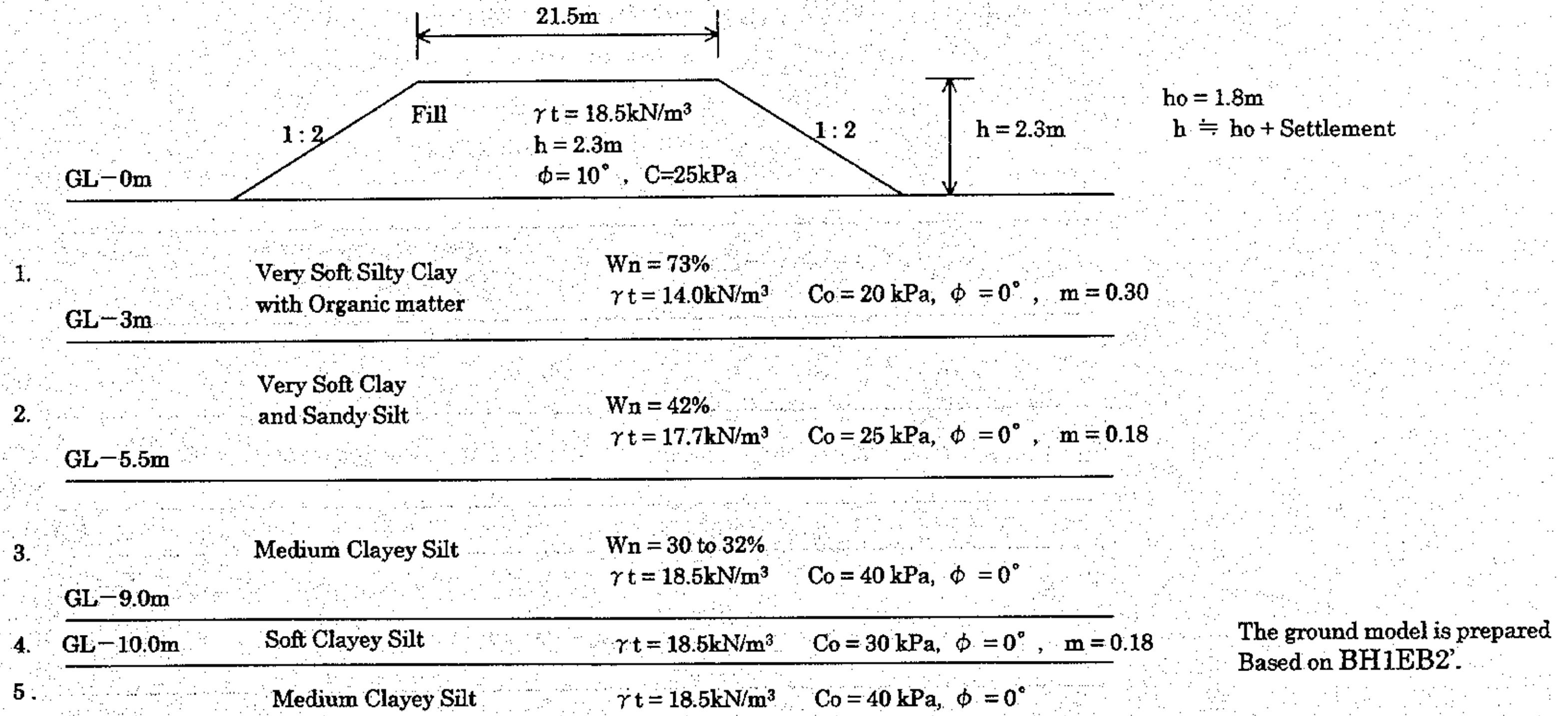


Figure-21 Ground Model of Stability Analysis for Hatia River East Bank to STA 3+700

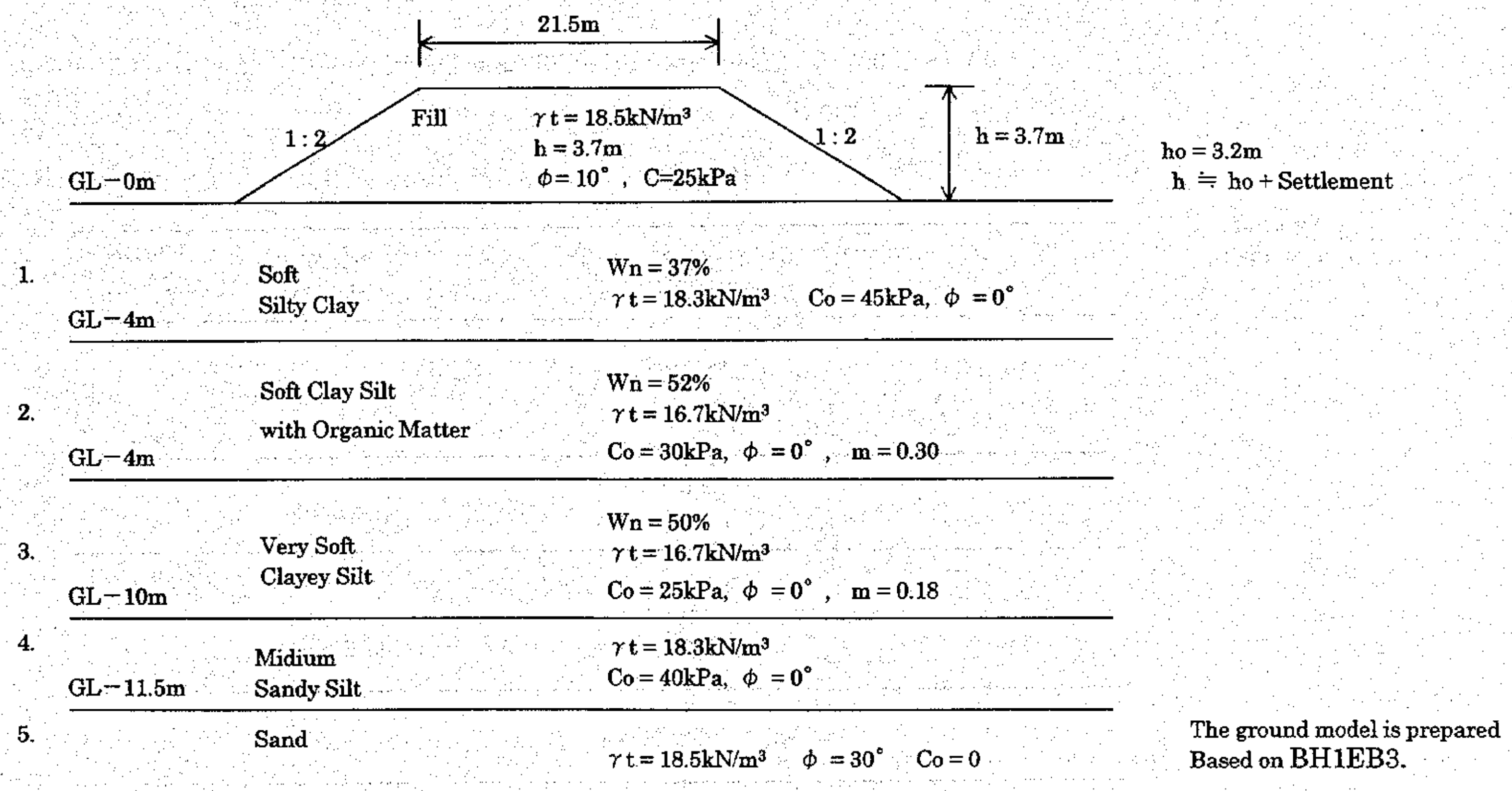


Figure-22 Ground Model of Stability Analysis for STA 3+700 to STA 5+400

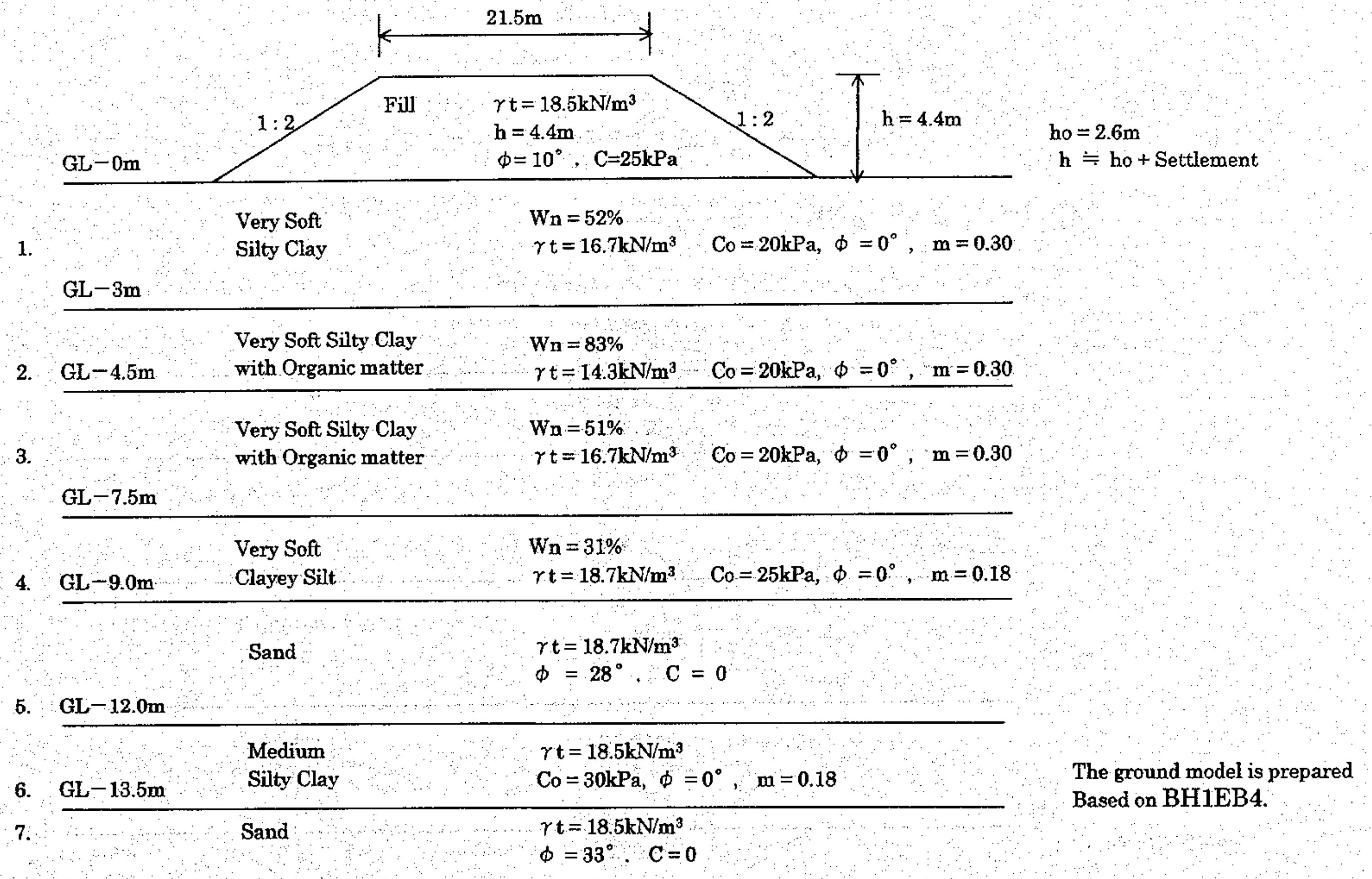


Figure-23 Ground Model of Stability Analysis for STA 5+400 to STA 6 + 500

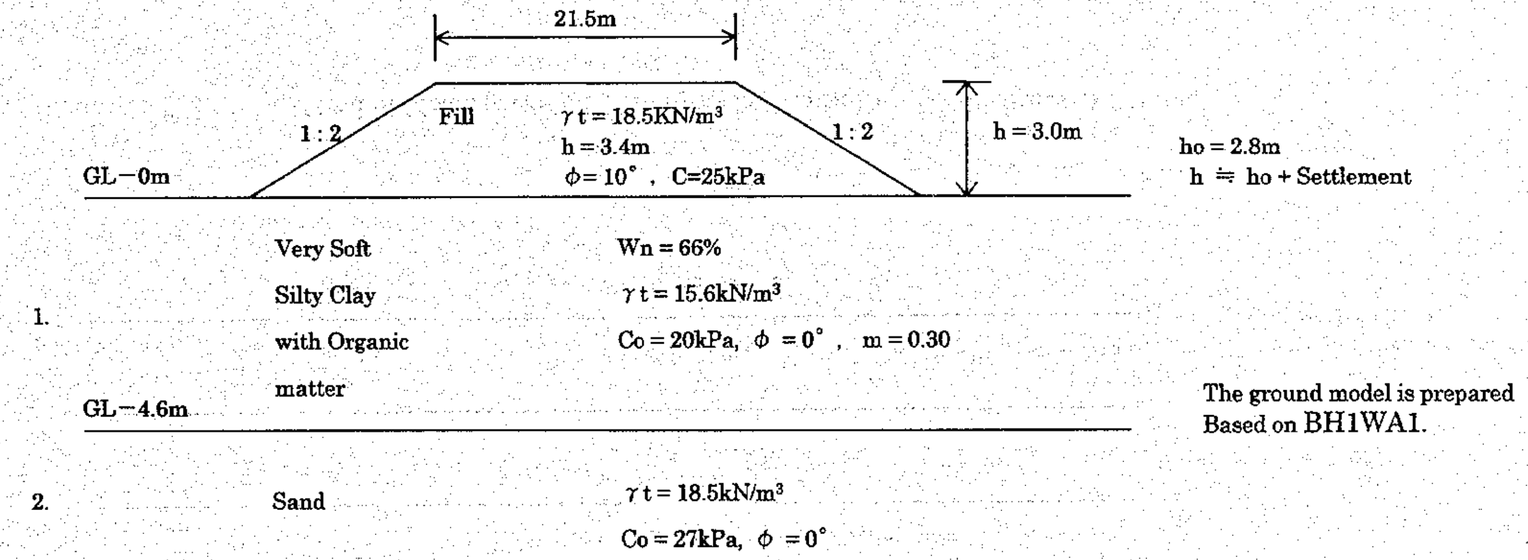


Figure-24 Ground Model of Stability Analysis for STA 6+500 to STA 6+900

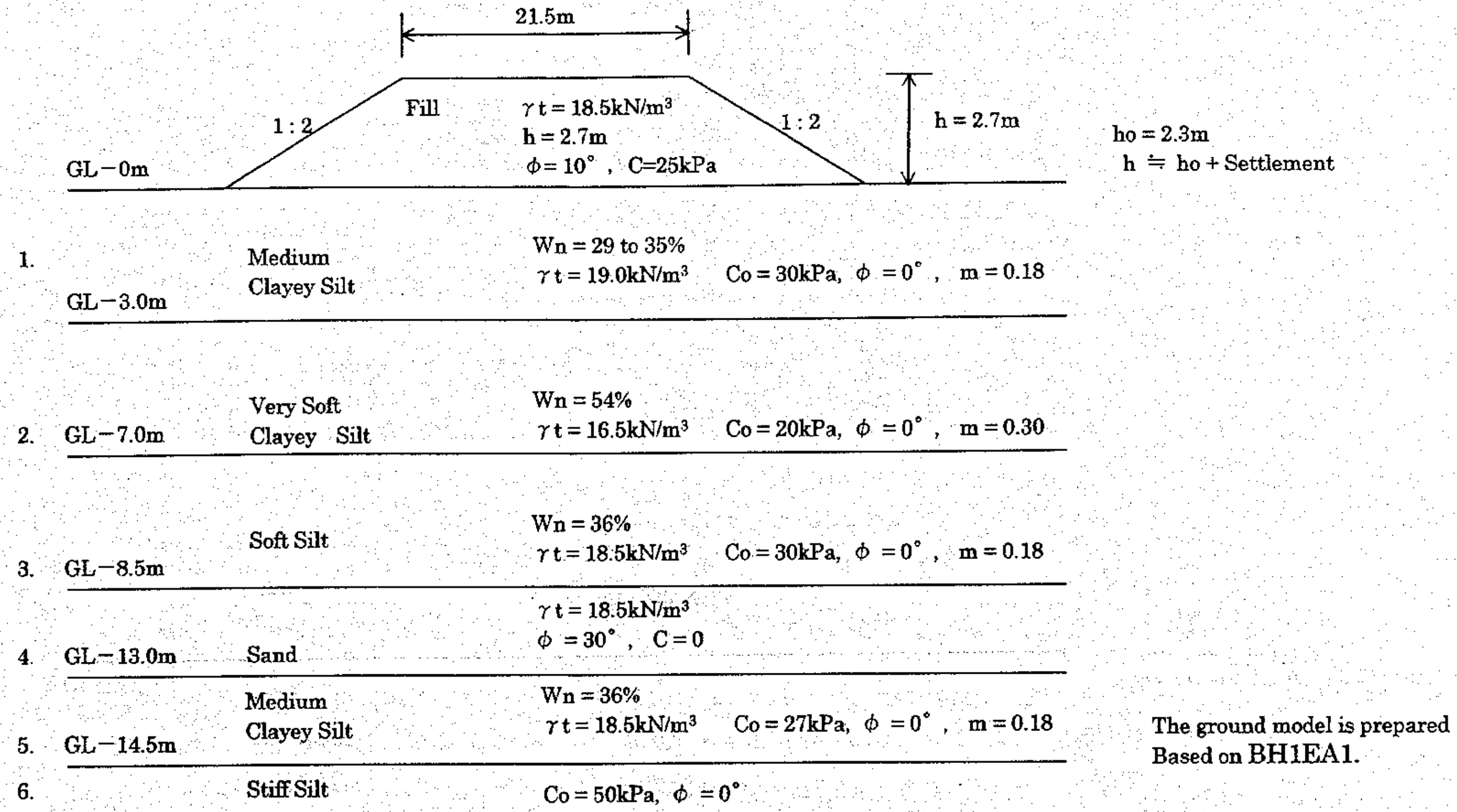


Figure-25 Ground Model of Stability Analysis for Rupsa East Viaduct to STA 8+900

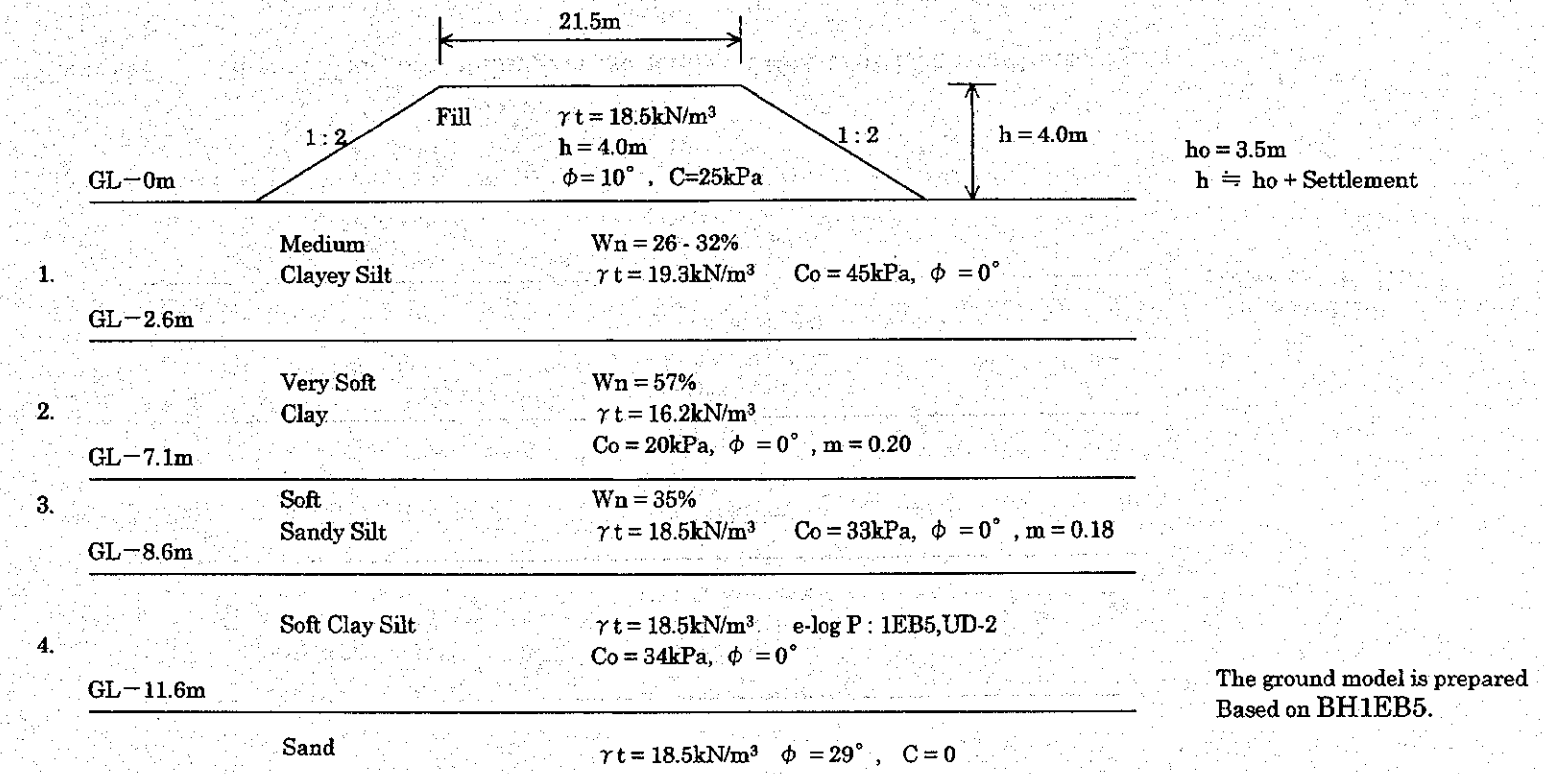


Figure-26 Ground Model of Stability Analysis for STA 8+900 to STA 9+900

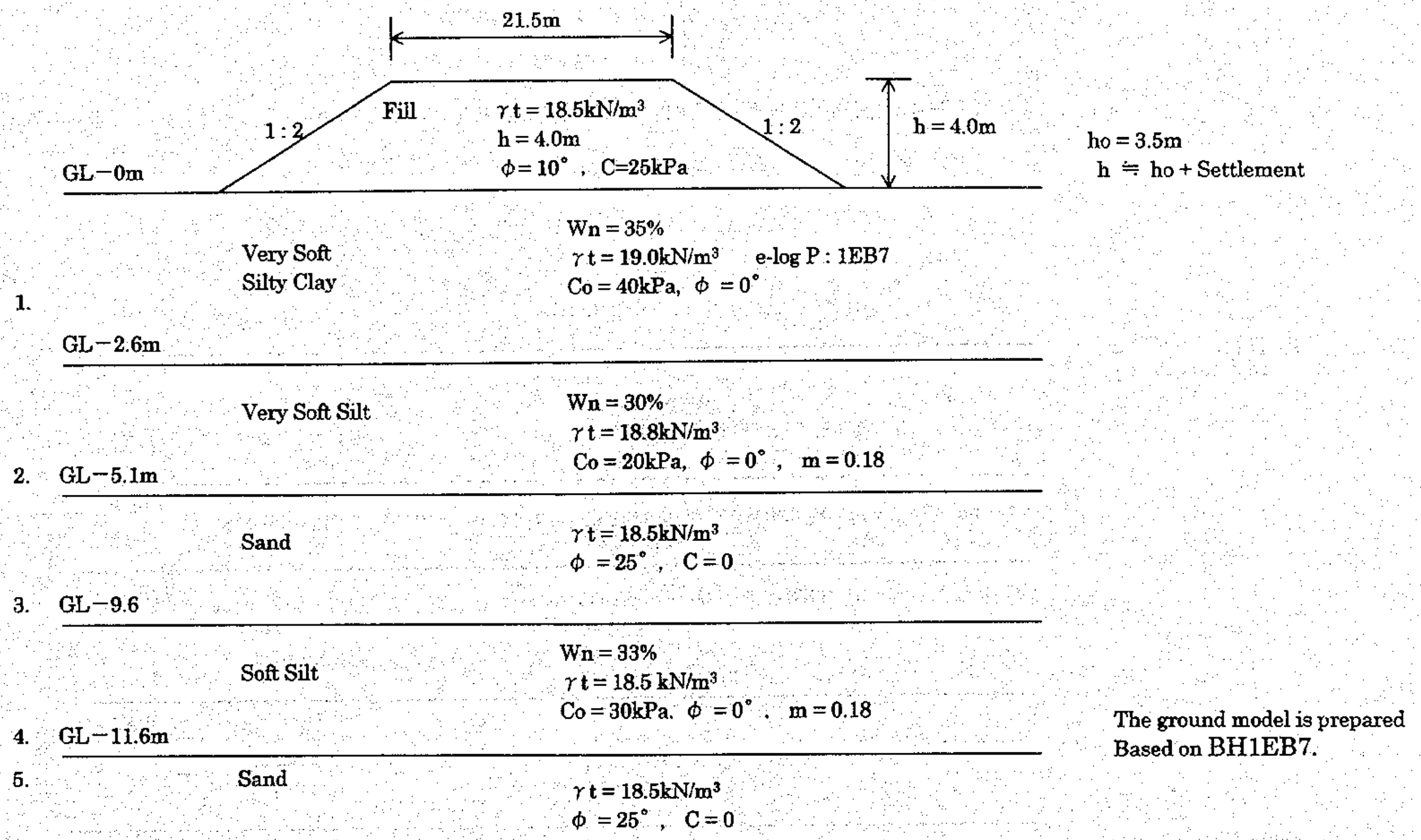


Figure-27 Ground Model of Stability Analysis for STA 9+900 to Molonghata Bridge

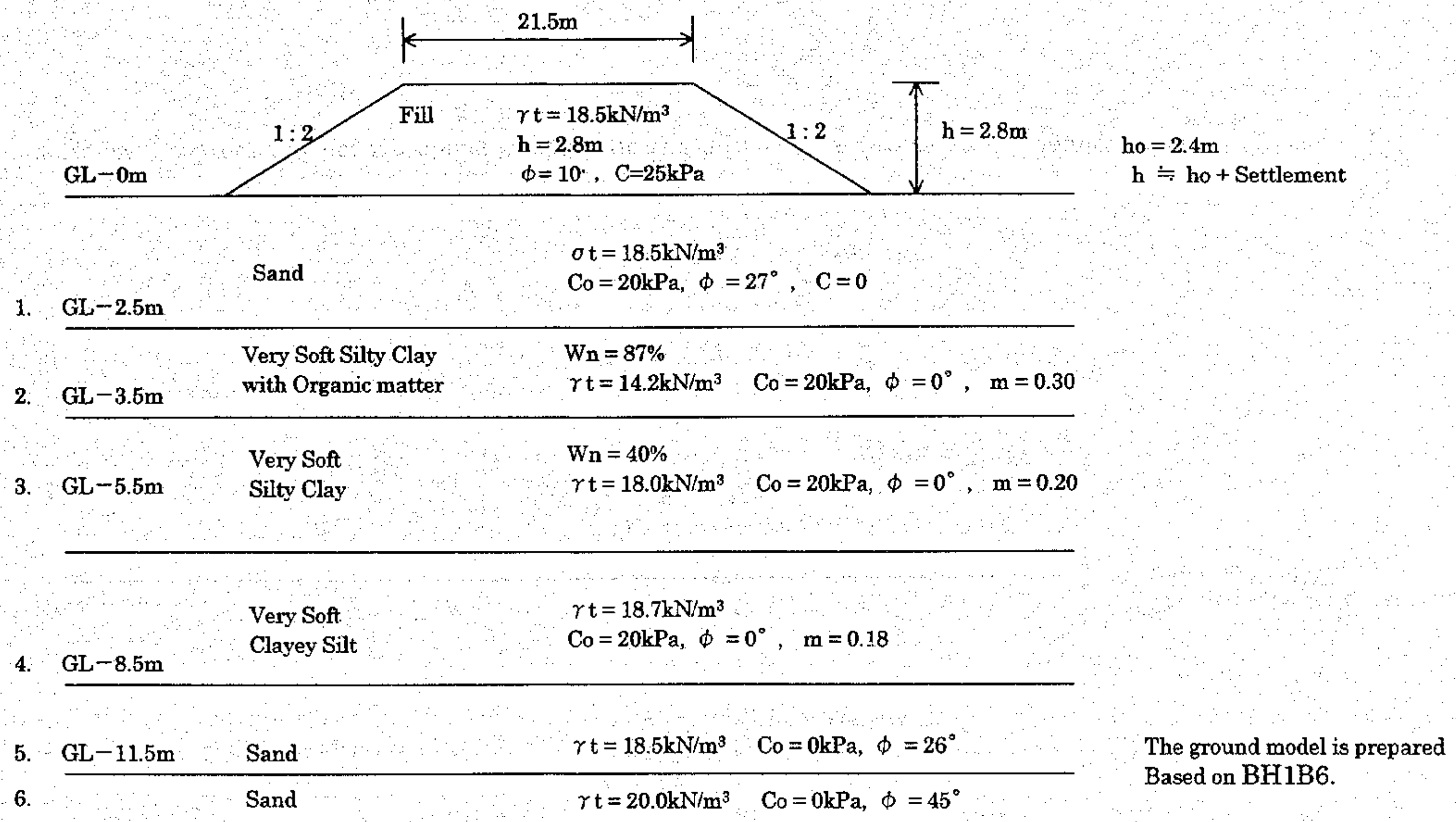


Figure-28 Ground Model of Stability Analysis for Molonghata Bridge to End of Route 1

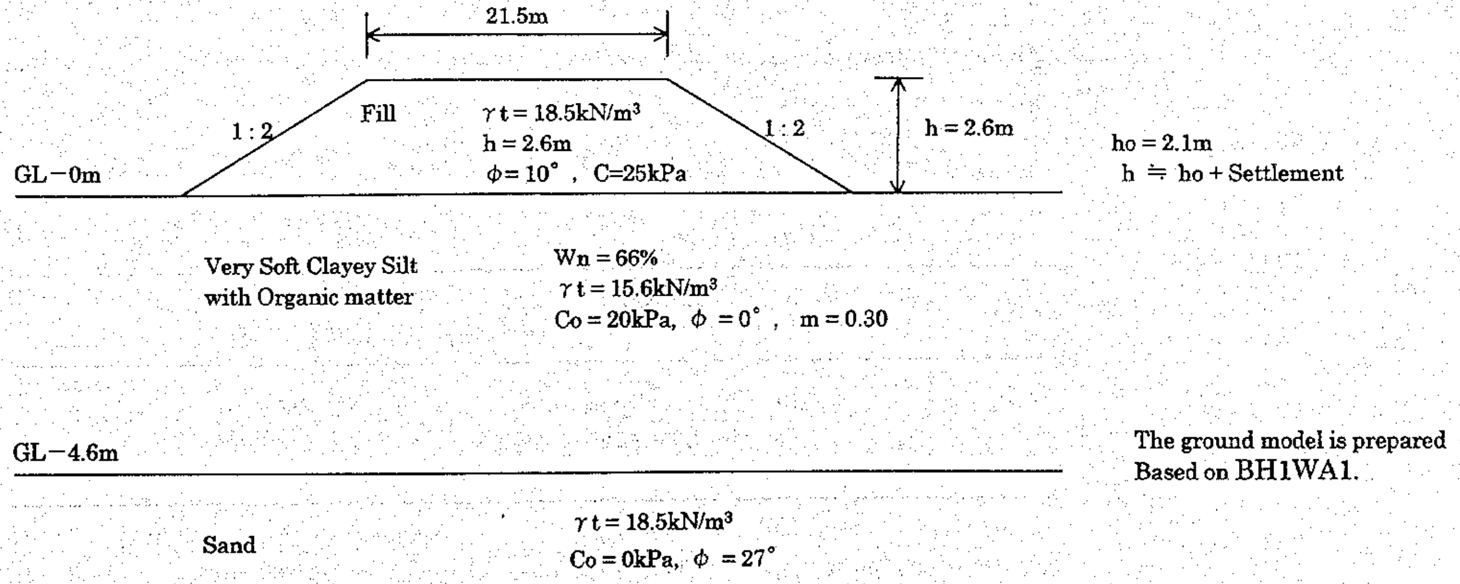


Figure-29 Ground Model of Stability Analysis for Rupsa River West Access Road (Viaduct Side)

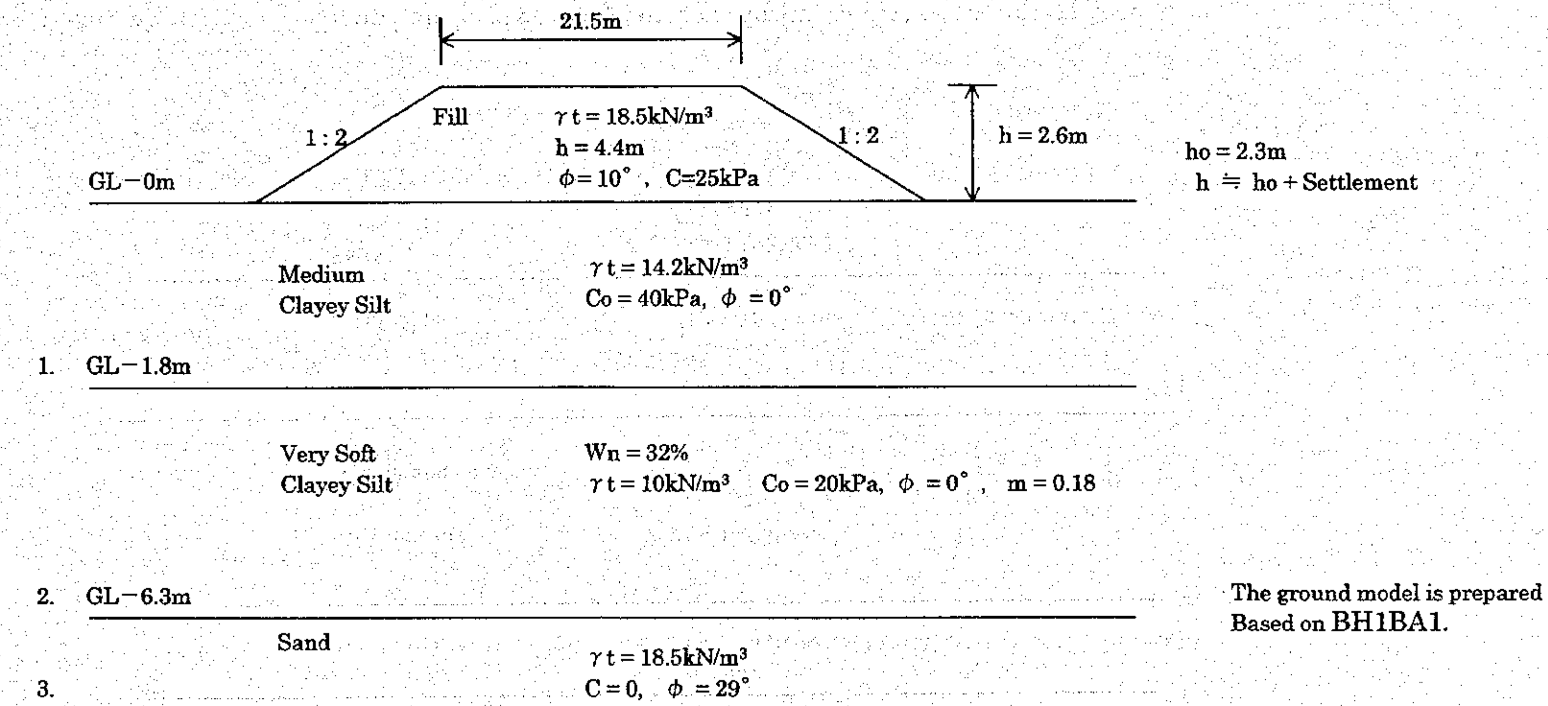


Figure-30 Ground Model of Stability Analysis for Rupsa River West Access Road (River Bank Side)

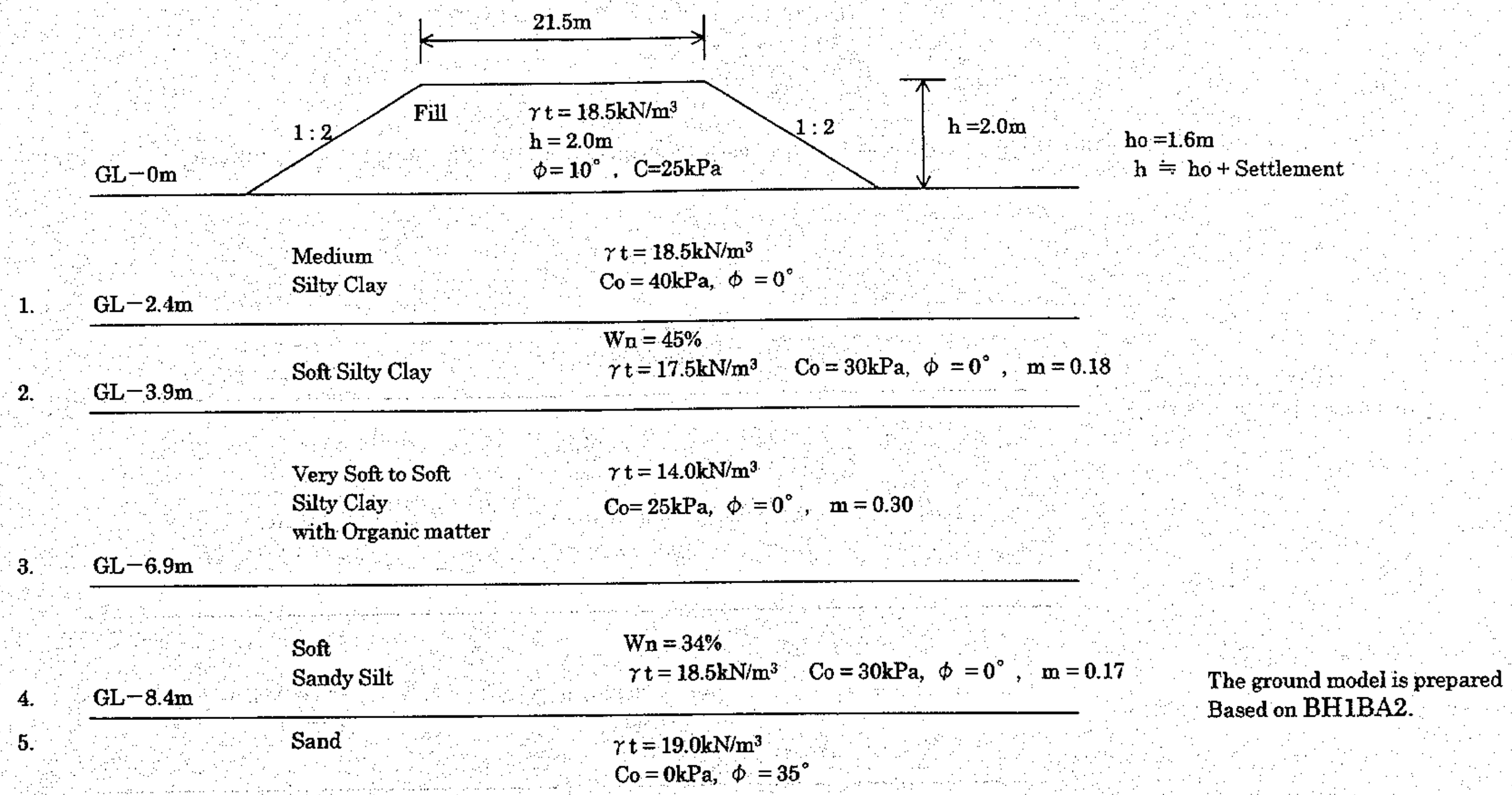
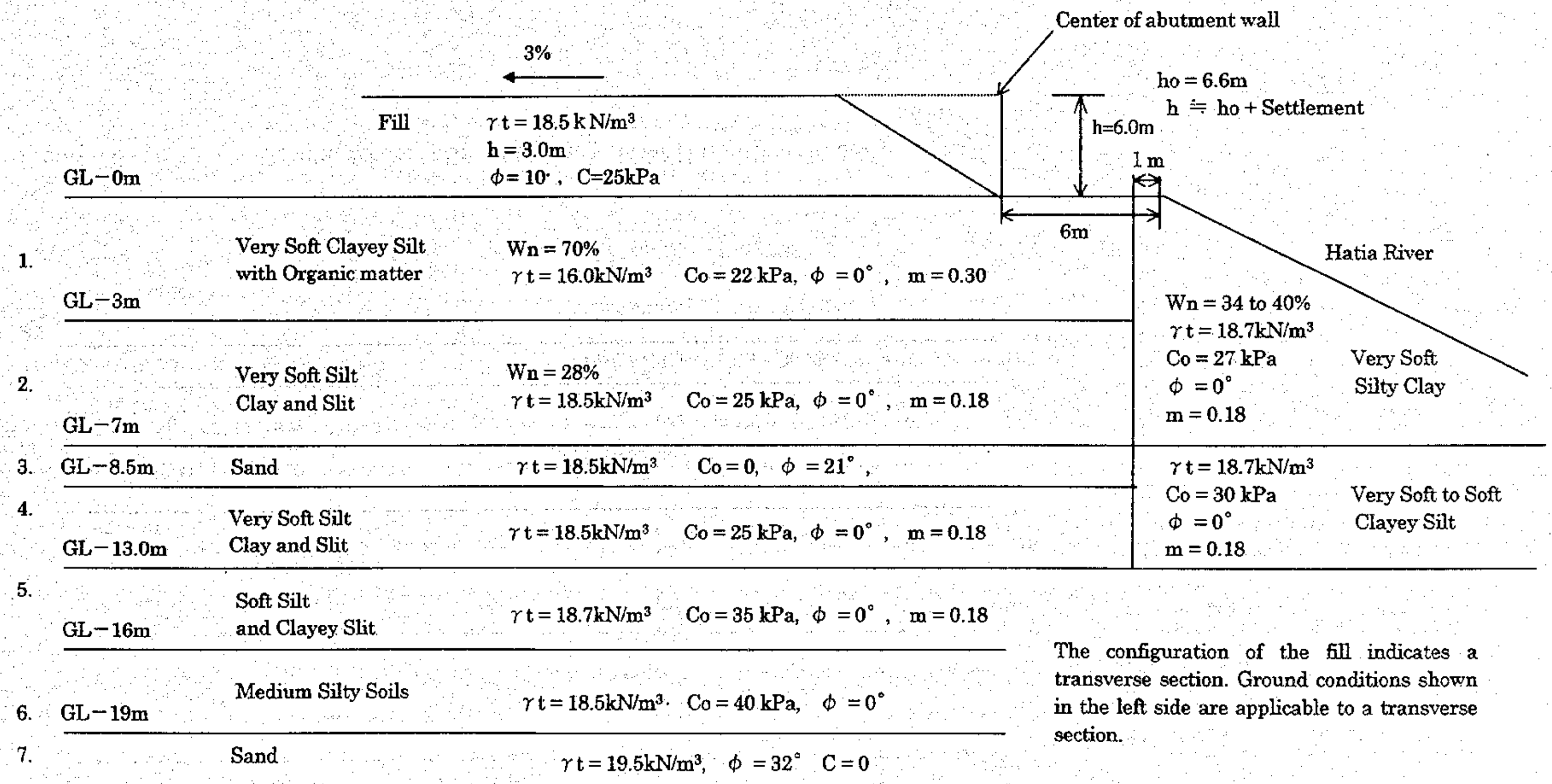


Figure-31 Ground Model of Stability Analysis for Rupsa River East Access Road



The configuration of the fill indicates a transverse section. Ground conditions shown in the left side are applicable to a transverse section.

The ground model is prepared
Based on BH1EB2" and BH1EB2.

Figure-32 Ground Model of Stability Analysis for Hatia Bridge West Approach

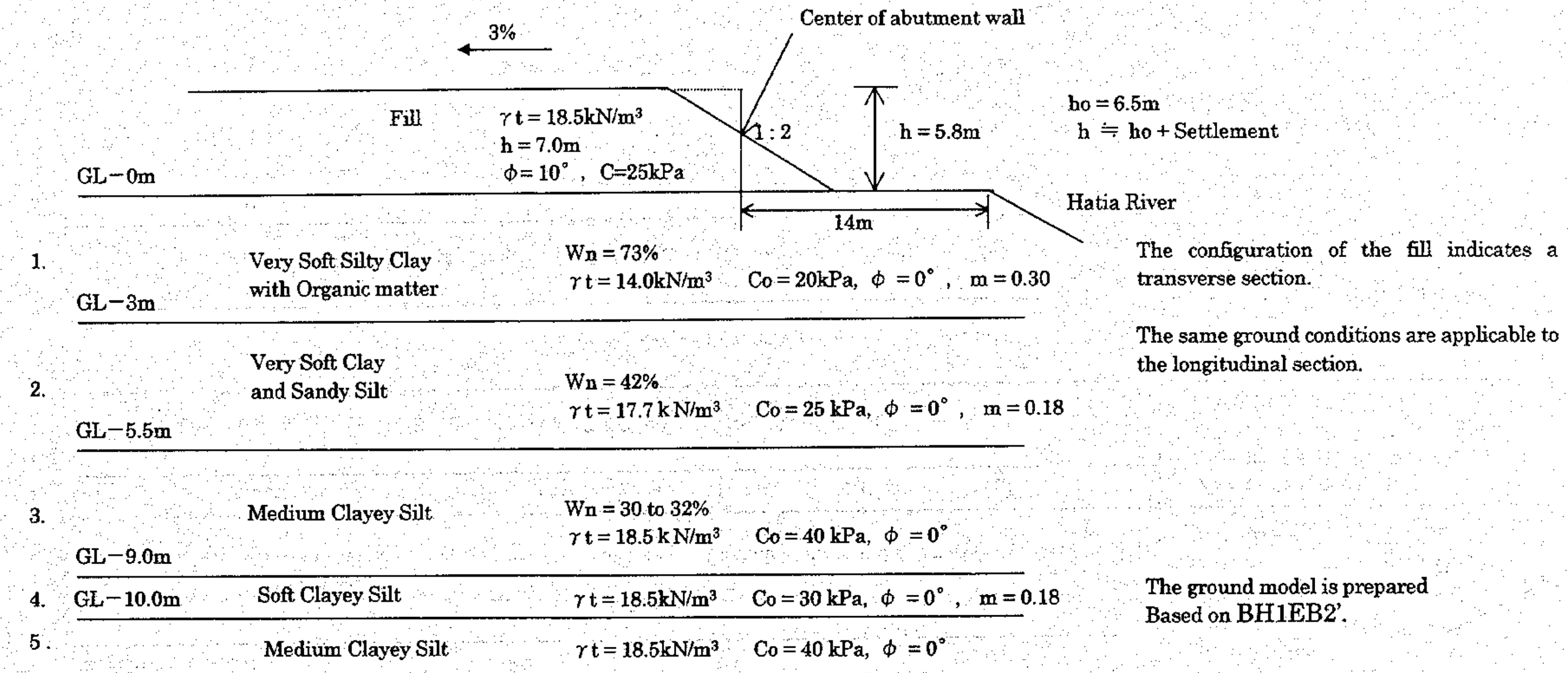
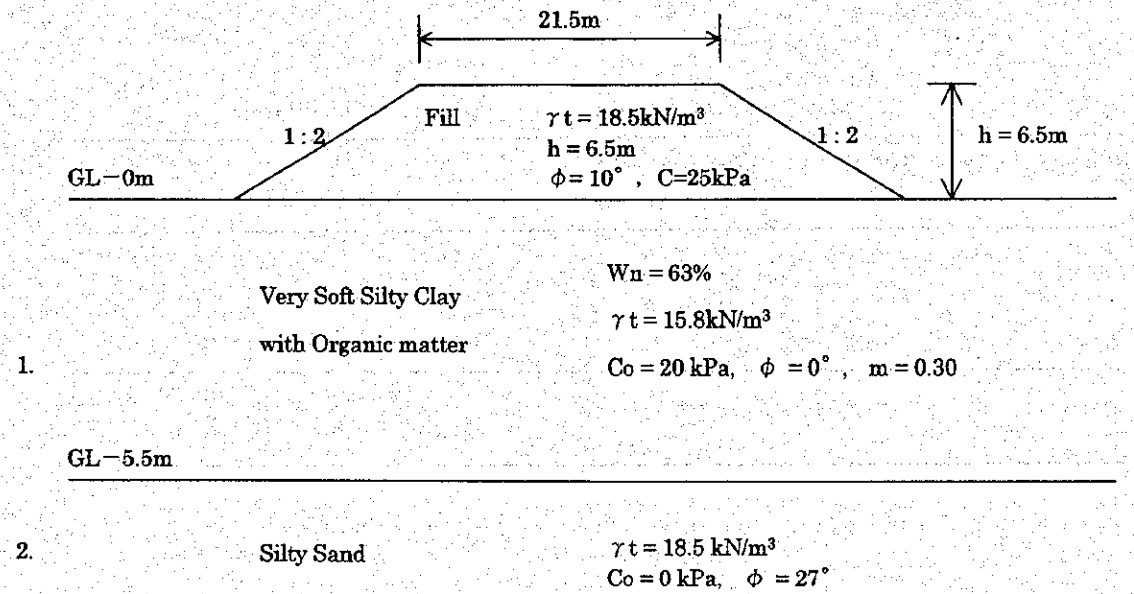


Figure-33 Ground Model of Stability Analysis for Hatia River East Approach



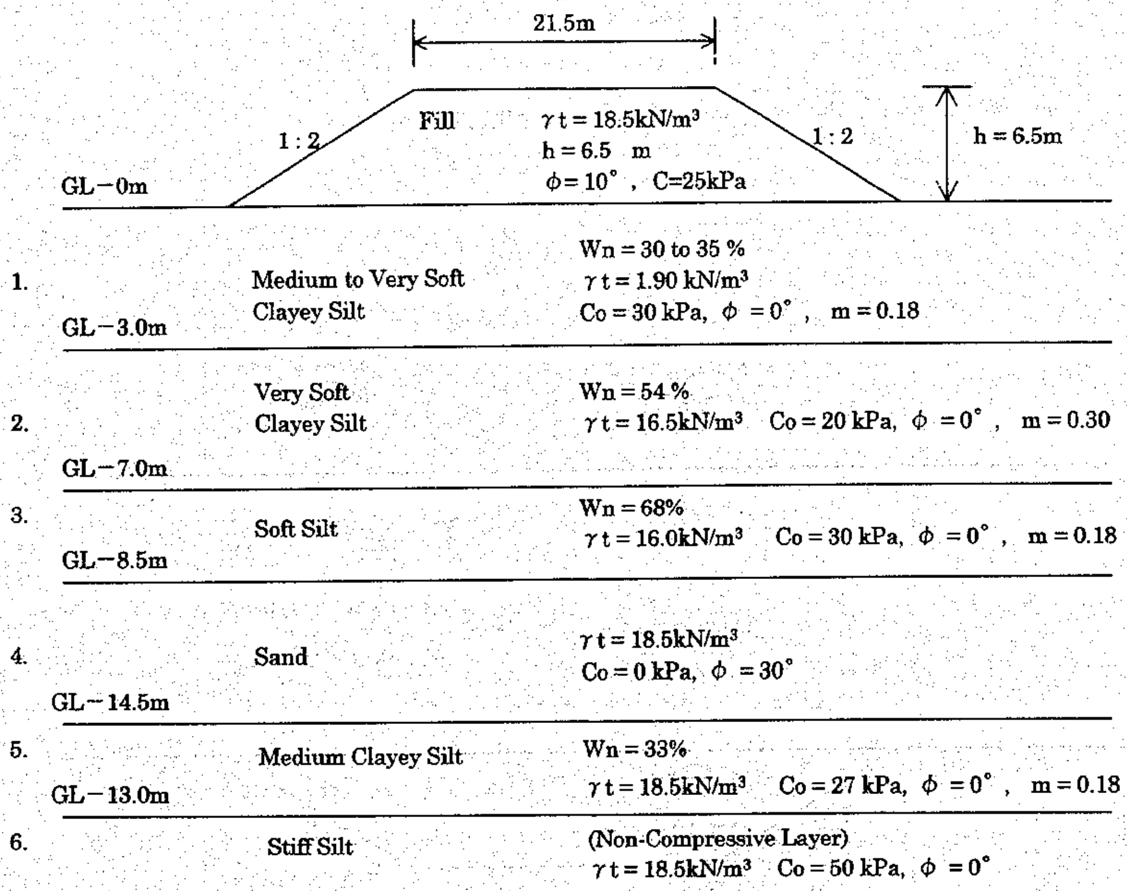
$h_o = 5.6m$
$h \fallingdotseq h_o$ + Settlement

The configuration of the fill indicates a transverse section.

The same ground conditions are applicable to the longitudinal section. Configurations of the fill in the longitudinal section should be referred to Figures 2.4.15 and 2.4.16 of the main text.

The ground model is prepared
Based on BH1VA1.

Figure-34 Ground Model of Stability Analysis for West Approach to Viaduct



$h_o = 5.6m$
$h \fallingdotseq h_o$ + Settlement

The configuration of the fill indicates a transverse section.

The same ground conditions are applicable to the longitudinal section. Configurations of the fill in the longitudinal section should be referred to Figures 2.4.15 and 2.4.16 of the main text.

The ground model is prepared Based on BH1EA1.

Figure-35 Ground Model of Stability Analysis for East Approach Viaduct

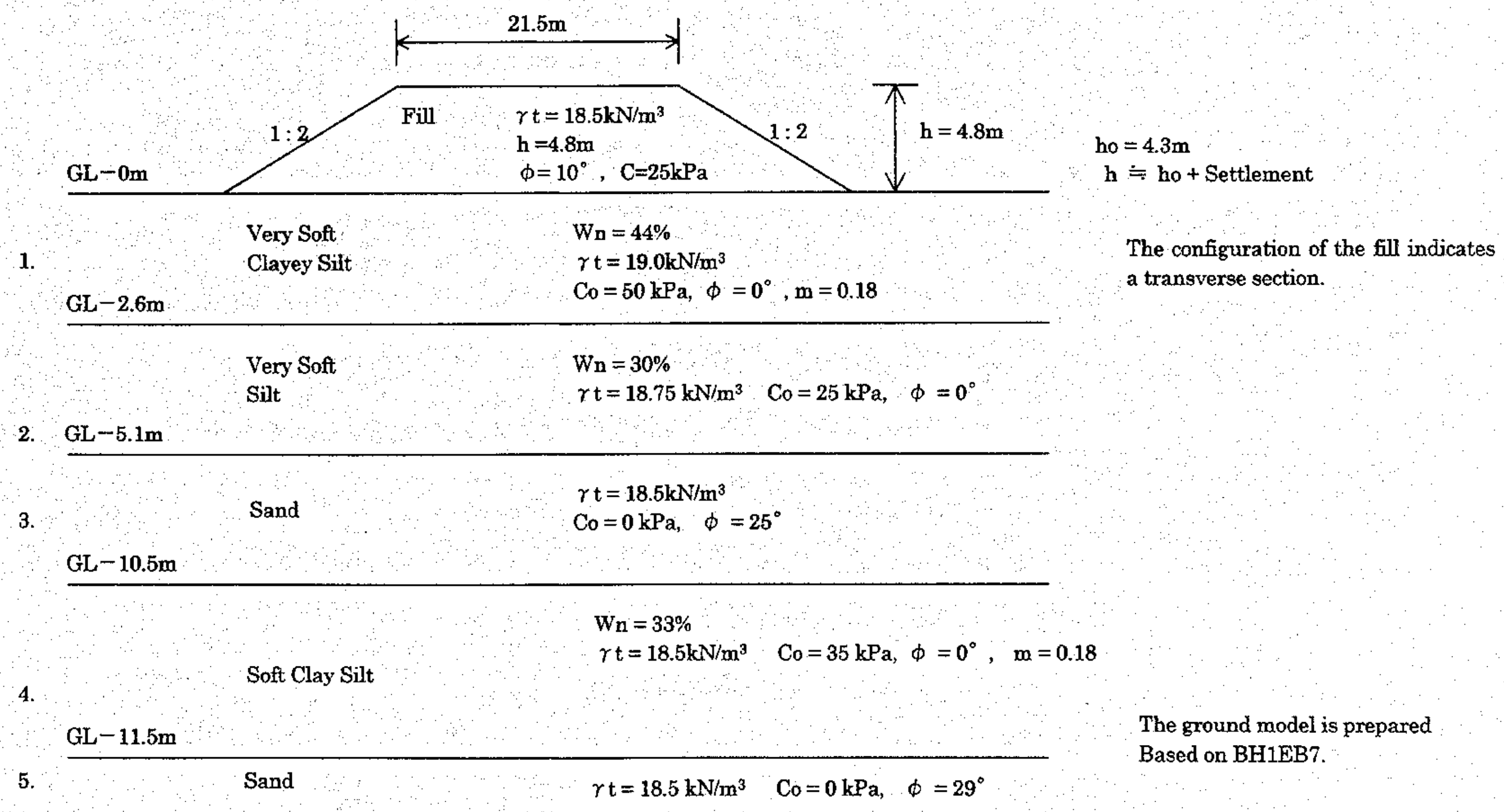


Figure-36 Ground Model of Stability Analysis for Molonghata Bridge Approaches