PARTNER FOR DESIGN

Uniaxial Compressive Strength Test (v)

GEOMINE

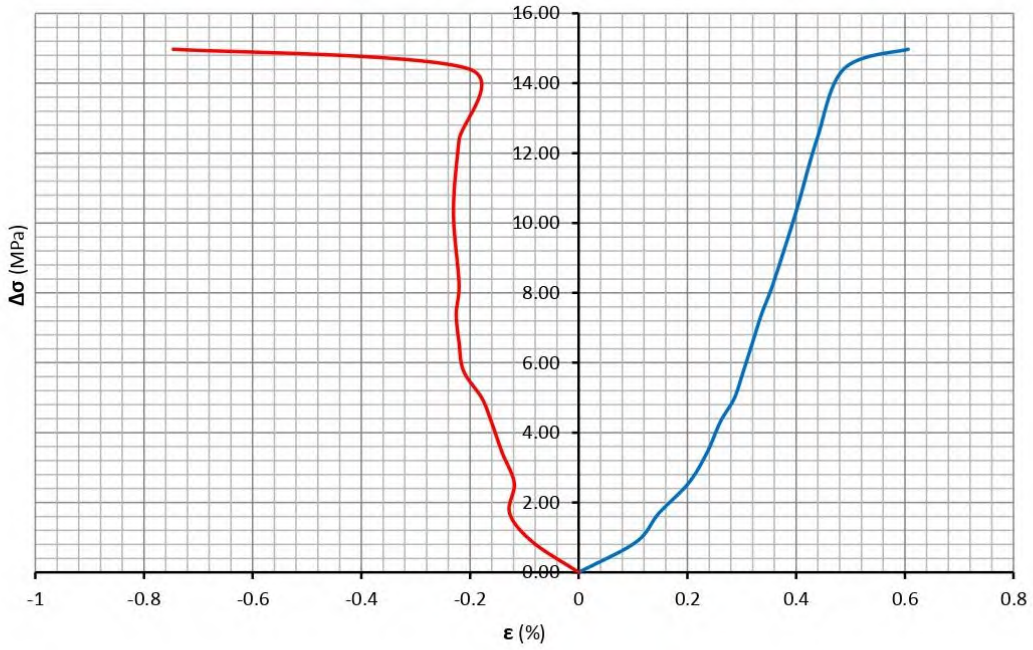
Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 07
Depth : 11.00 - 11.20 m

Date Tested : 3/11/2021

Results		
σ_{max*}	MPa	14.97
v	-	0.45
E	MPa	1255

* Coreccted by Hoek and Brown (1980a)

STRESS - STRAIN CURVE



F GWL OL 033; R 01-(22/09/14)

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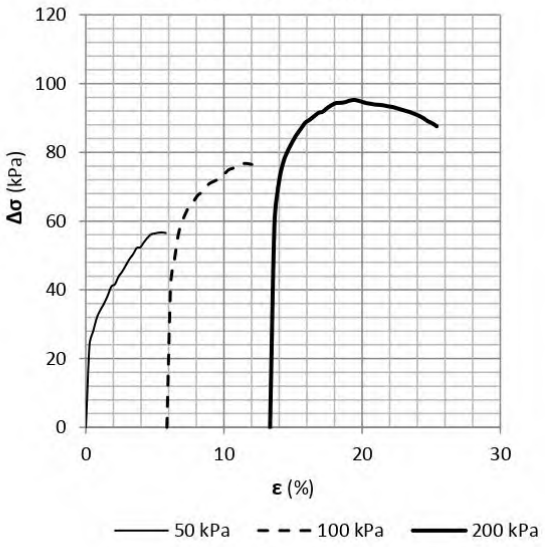
PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 02.60 -03.00 m
Date Tested : 28/10/2021

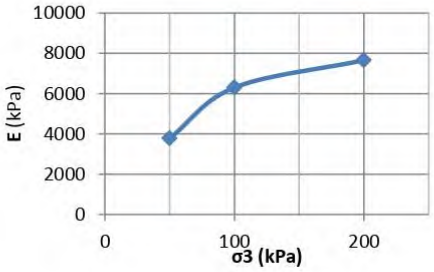
GEOMINE

STRESS - STRAIN CURVE

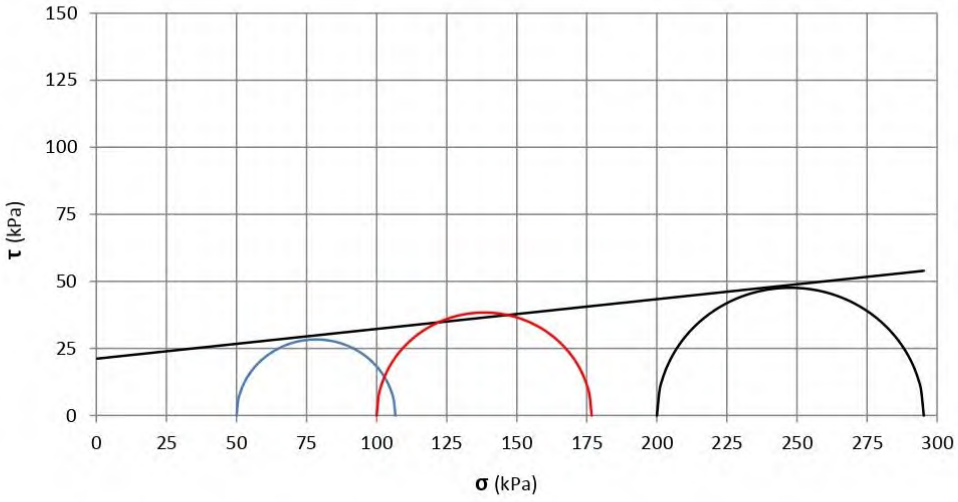


No.	σ3 (kPa)	Δσ (kPa)	ε_f (%)
1.	50	56.70	5.53
2.	100	76.73	11.45
3.	200	95.24	19.37

Results		
c	kPa	21.2
ø	°	6.3



MOHR's DIAGRAM



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F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 02.60 -03.00 m
Date Tested : 28/10/2021

GEOMINE

Height of Sample: 76 mm
Diameter of Sample: 38 mm
Calibration Dial Gauge: 0.091 kg/div
Calibration Strain Gauge: 0.01 mm/div

--- Triaxial S H E A R I N G ---

Strain Gauge (div)	Deviator Stress (kPa)	Strain (%)
0	0	0
20	24.01	0.26
40	27.94	0.53
60	31.84	0.79
80	34.14	1.05
100	36.03	1.32
120	38.3	1.58
140	40.96	1.84
160	41.63	2.11
180	43.87	2.37
200	45.31	2.63
220	47.14	2.89
240	48.95	3.16
260	50.37	3.42
280	52.17	3.68
300	52.41	3.95
320	53.88	4.21
340	55.19	4.47
360	56.18	4.74
380	56.41	5
400	56.63	5.26
420	56.7	5.53
440	56.54	5.79

Deviator Stress Maximum: 56.70 kPa
Strain at Failure: 5.79 %
Deviator Stress at (50%): 47.14 kPa
Strain at (50%): 2.89 %

$E_{o.}$: 1969.86 kPa
E_{50}: 1628.45 kPa

+ + + + + + + + + STAGE - 1 + + + + + + + + +

Height of Sample: 71.6 mm
Diameter of Sample: 38 mm
Calibration Dial Gauge: 0.091 kg/div
Calibration Strain Gauge: 0.01 mm/div

--- Triaxial S H E A R I N G ---

Strain Gauge (div)	Deviator Stress (kPa)	Strain (%)
420	0	5.87
440	41.65	6.15
460	49.03	6.42
480	56.22	6.7
500	59.93	6.98

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F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 02.60 -03.00 m
Date Tested : 28/10/2021

GEOMINE

520	62.58	7.26
540	64.77	7.54
560	65.9	7.82
580	67.47	8.1
600	68.37	8.38
620	69.7	8.66
640	70.87	8.94
660	71.46	9.22
680	72.04	9.5
700	73.26	9.78
720	73.83	10.06
740	74.9	10.34
760	75.31	10.61
780	75.86	10.89
800	76.41	11.17
820	76.73	11.45
840	76.7	11.73
860	76.46	12.01

Deviator Stress Maximum: 76.73 kPa
Strain at Failure: 12.01 %
Deviator Stress at (50%): 70.87 kPa
Strain at (50%): 8.94 %

$E_{o:}$ 3158.95 kPa
E_{50}: 792.91 kPa

+ + + + + + + + + STAGE - 2 + + + + + + + + +

Height of Sample: 63 mm
Diameter of Sample: 38 mm
Calibration Dial Gauge: 0.091 kg/div
Calibration Strain Gauge: 0.01 mm/div

--- Triaxial S H E A R I N G ---

Strain Gauge (div)	Deviator Stress (kPa)	Strain (%)
840	0	13.33
860	59.1	13.65
880	71.1	13.97
900	77.03	14.29
920	80.31	14.6
940	82.81	14.92
960	85.01	15.24
980	86.8	15.56
1000	88.56	15.87
1020	89.44	16.19
1040	90.44	16.51
1060	91.43	16.83
1080	91.81	17.14
1100	92.85	17.46
1120	93.68	17.78
1140	94.31	18.1
1160	94.4	18.41
1180	94.55	18.73

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F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 02.60 -03.00 m
Date Tested : 28/10/2021

GEOMINE

1200	94.96	19.05
1220	95.24	19.37
1240	95.06	19.68
1260	94.68	20
1280	94.31	20.32
1300	94.12	20.63
1320	93.87	20.95
1340	93.81	21.27
1360	93.62	21.59
1380	93.37	21.9
1400	93.18	22.22
1420	92.79	22.54
1440	92.41	22.86
1460	92.03	23.17
1480	91.65	23.49
1500	91.15	23.81
1520	90.59	24.13
1540	89.91	24.44
1560	89.05	24.76
1580	88.43	25.08
1600	87.58	25.4

Deviator Stress Maximum: 95.24 kPa
Strain at Failure: 25.40 %
Deviator Stress at (50%): 95.24 kPa
Strain at (50%): 19.37 %

$E_{o:}$ 1861.9 kPa
E_{50}: 491.81 kPa

+ + + + + + + + + STAGE - 3 + + + + + + + + +

No. Container : 1155
Wet Soil + Container : 167.52 gram
Dry Soil + Container : 117.85 gram
Weight of Container : 4.24 gram
Density : 18.94 kN/m3
Moisture Content : 43.72 %
Dry Density : 13.18 kN/m3

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F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 04.00 - 04.40 m

Date Tested : 26/10/2021

GEOMINE

Test		Results
Unit Weight	kN/m^3	18.3
SL	%	-
Gs	-	3.59
MC	%	64
PL	%	34
LL	%	79
PI	%	45
Fines (#200)	%	87
D_{10}	mm	0.0069
D_{30}	mm	0.0084
D_{60}	mm	0.0149
C_u	-	2
C_c	-	0.69

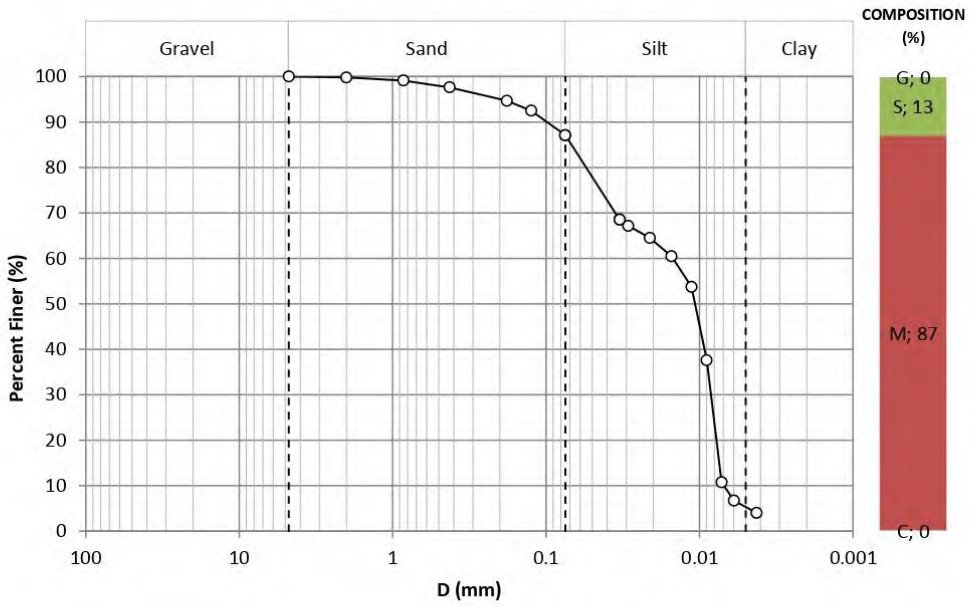
* Casagrande's Method

** Based on Consistency Index (Ic)

Properties		Results
I_F	%	-0.29
I_T	%	-154.53
I_L	%	0.67
I_C	%	0.33
S_r	%	100.00
e	-	2.20
n	-	0.69
A	-	-

Consistency**	Soft
Activity	-
Plasticity Symbol	CH or OH

PARTICLE SIZE DISTRIBUTION



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F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 04.00 - 04.40 m

Date Tested : 26/10/2021

GEOMINE

Moisture Content

No. Test	1	2	3
No. Container	1074	1085	1061
Weight of Container	4.90	4.93	4.70
Weight of wet soil and container	113.77	103.68	114.94
Weight of dry soil and container	71.16	65.40	71.46
Moisture Content	64.31	63.30	65.13
Average MC	64.25		

Unit weight

No. Ring	3
No. Container	1081
Weight of Ring	27.16
Volume of Ring	15.669
Weight of Container	4.69
Weight of wet soil and ring and containe	60.46
Weight of dry soil and ring and containe	49.42
Water Content	62.834
Density	18.259
Dry Density	11.213
Saturation	100
Void ratio	2.2032
Porosity	0.6878

Specific Gravity

No. Test	1	2
No. Pycknometer	201	201
Weight of Pycknometer + soil	71.09	71.09
Weight of Pycknometer + water + soil	166.55	166.55
T° C	28	28
Weight of Pycknometer	52.92	52.92
Weight of Pycknometer + water	153.44	153.44
Specific Gravity	3.592	3.592
Average Specific Gravity	3.592	

Shrinkage Limit

No. Ring	-
No. Container	-
Weight of Ring	-
Volume of Ring	-
Weight of Container	-
Weight of wet soil and container	-
Weight of dry soil and container	-
Weight of plate	-
Weight of plate and Mercury	-
Volume dry soil	-
Shrinkage Limit	-

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 08-(04.00-04.40 m)-Classification.xlsm

F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 04.00 - 04.40 m

Date Tested : 26/10/2021

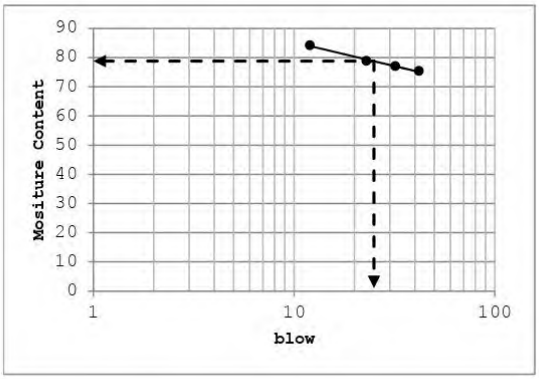
GEOMINE

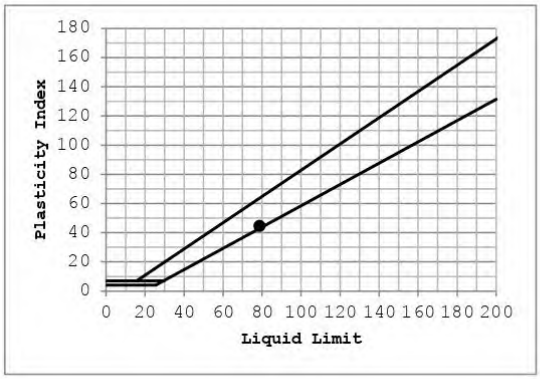
Plastic Limit

No. Test	1	2	3
No. Container	1142	1108	1041
Weight of Container	5.03	4.71	5.34
Weight of wet soil and container	12.68	12.67	12.41
Weight of dry soil and container	10.75	10.66	10.58
Plastic Limit	33.74	33.78	34.92
Average	34.15		

Liquid Limit

No. Test	1	2	3	4	5
No. Container	1141	1179	1110	1140	-
Weight of Container	4.54	4.33	5.03	4.37	-
Weight of wet soil and container	15.57	15.64	15.92	15.68	-
Weight of dry soil and container	10.83	10.72	11.12	10.51	-
Water Content	75.36	77.00	78.82	84.20	-
Number of blows	42	32	23	12	-
Liquid Limit	78.80				





Sieve Analysis

Bowl	0
Soil + Bowl	80.3
Weight of dry soil	80.3

Sieve No.	Sieve Diameter	Weight of Soil Retained	Percent Retained	Cumulative Percent Retained	Percent Finer
4	4.75	0.001	0.00	0.00	100.00
10	2	0.14	0.17	0.18	99.82
20	0.85	0.56	0.70	0.87	99.13
40	0.425	1.19	1.48	2.35	97.65
80	0.18	2.37	2.95	5.31	94.69
120	0.125	1.77	2.20	7.51	92.49
200	0.075	4.31	5.37	12.88	87.12
Pan	0	3.03	87.12	100	0.00

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F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 04.00 - 04.40 m

Date Tested : 26/10/2021

GEOMINE

Hydrometer

Dry Sample

Weight of sample	66.929		
Zerro correction	-1	Gs	3.5918
Meniscus correction	1	a	0.8629

Time	t (minute)	T (Co)	Ra	Diameter	Percent Finer
12:20	0				
12:21	1	27	47	0.0291	67.19
12:22	2	27	45	0.0211	64.50
12:24	4	27	42	0.0152	60.47
12:28	8	27	37	0.0113	53.75
12:35	15	27	25	0.0090	37.63
12:50	30	27	5	0.0072	10.75
13:05	45	27	2	0.0059	6.72
13:50	90	27	0	0.0042	4.03
15:20	180	0	0	0.0000	0.00
9:20	1260	0	0	0.0000	0.00
12:20	1440	0	0	0.0000	0.00

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F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Falling Head

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 04.00 -04.40 m
Date Tested : 27/10/2021

GEOMINE

Time (minute)	Volume (cm3)	delta time (minute)	delta volume (cm3)
0	4.4	0	0
80	4.6	80	0.2
140	4.8	60	0.2
210	5	70	0.2
288	5.2	78	0.2
348	5.3	60	0.1
400	5.4	52	0.1
456	5.5	56	0.1

t-sample (cm): 6.60
Area-sample (cm2): 11.34
Head (cm): 50

k (cm/s): 4.850E-07

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F GWL OL 040; R 01-(6/12/18)

PARTNER FOR DESIGN

Uniaxial Compressive Strength Test (v)

GEOMINE

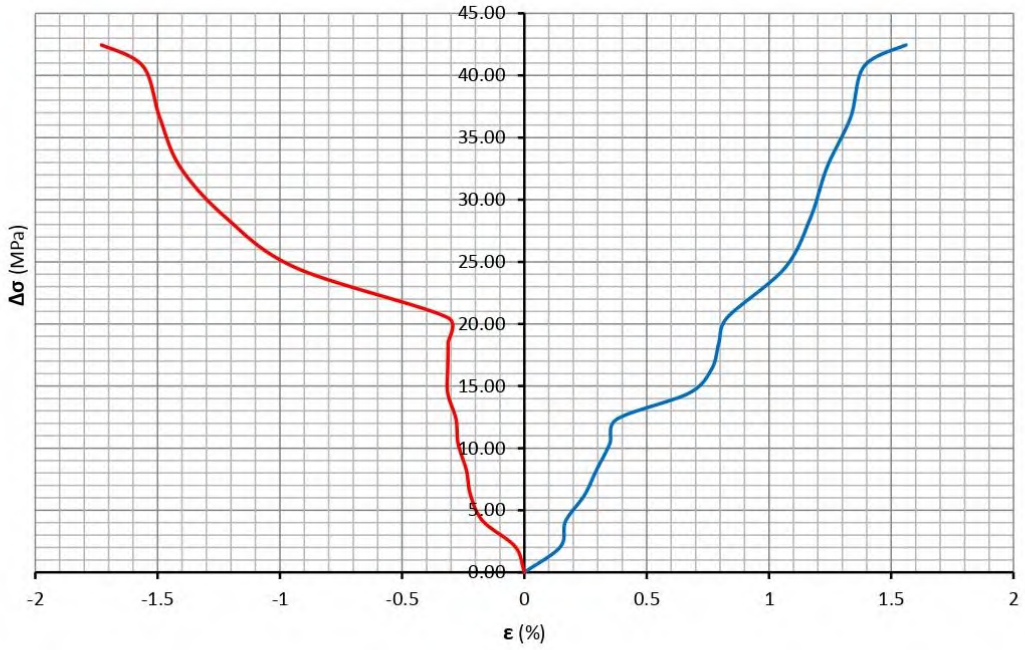
Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 08
Depth : 17.30 - 17.50 m

Date Tested : 3/11/2021

Results		
σ_{max*}	MPa	42.46
v	-	0.43
E	MPa	2386

* Coreccted by Hoek and Brown (1980a)

STRESS - STRAIN CURVE



F GWL OL 033; R 01-(22/09/14)

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PARTNER FOR DESIGN

Properties Test (Rock)

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : : 21 031
Area : -
Point ID : DHG 08
Depth : 19.15 - 19.52 m
Date Tested : 27/10/2021

GEOMINE

Result		
Natural Density	kN/m^3	30.90
Dry Density	kN/m^3	30.75
Saturated Density	kN/m^3	31.27
Spesific Gravity	-	3.25
Natural Water Content	%	0
Absorption	%	2
Saturation	%	0.05
Porosity	-	0.05
Void Ratio	-	0.06

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F GWL OL 026; R 04-(10/7/21)

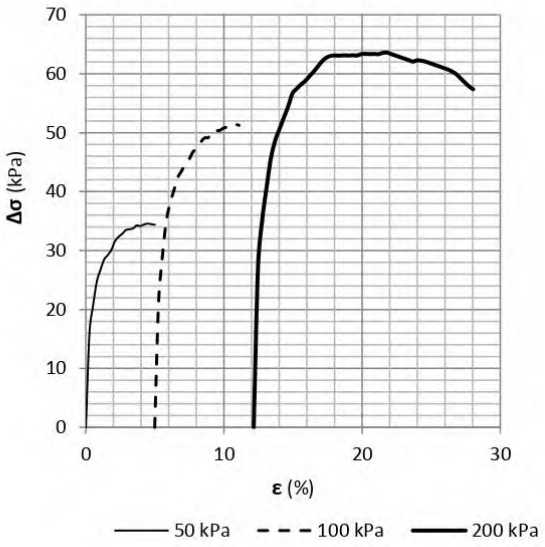
PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

GEOMINE

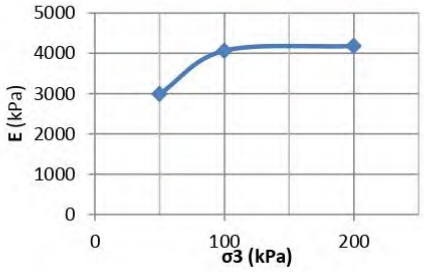
Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 02.70 -03.10 m
Date Tested : 28/10/2021

STRESS - STRAIN CURVE

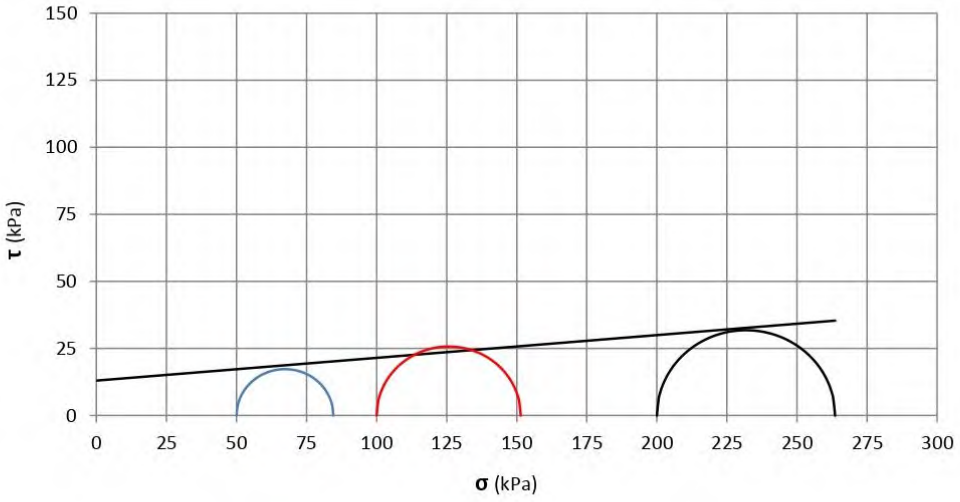


No.	σ3 (kPa)	Δσ (kPa)	ε_f (%)
1.	50	34.56	4.47
2.	100	51.42	10.80
3.	200	63.58	21.81

Results		
c	kPa	13.0
ø	°	4.8



MOHR's DIAGRAM



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F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 02.70 -03.10 m
Date Tested : 28/10/2021

GEOMINE

Height of Sample: 76 mm
Diameter of Sample: 38 mm
Calibration Dial Gauge: 0.1391 kg/div
Calibration Strain Gauge: 0.01 mm/div

--- Triaxial S H E A R I N G ---

Strain Gauge (div)	Deviator Stress (kPa)	Strain (%)
0	0	0
20	16.15	0.26
40	20.74	0.53
60	24.7	0.79
80	26.7	1.05
100	28.44	1.32
120	29.21	1.58
140	30.1	1.84
160	31.58	2.11
180	32.33	2.37
200	32.84	2.63
220	33.47	2.89
240	33.61	3.16
260	33.76	3.42
280	34.26	3.68
300	34.16	3.95
320	34.42	4.21
340	34.56	4.47
360	34.47	4.74
380	34.37	5

Deviator Stress Maximum: 34.56 kPa
Strain at Failure: 5.00 %
Deviator Stress at (50%): 32.33 kPa
Strain at (50%): 2.37 %

$E_{o:}$ 1930.77 kPa
E_{50}: 1365.10 kPa

+ + + + + + + + + STAGE - 1 + + + + + + + + +

Height of Sample: 72.2 mm
Diameter of Sample: 38 mm
Calibration Dial Gauge: 0.1391 kg/div
Calibration Strain Gauge: 0.01 mm/div

--- Triaxial S H E A R I N G ---

Strain Gauge (div)	Deviator Stress (kPa)	Strain (%)
360	0	4.99
380	21.03	5.26
400	28.96	5.54
420	34.89	5.82
440	38.01	6.09
460	40.19	6.37
480	42.36	6.65
500	43.49	6.93

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(02.70-03.10 m)-TX UU.xlsm

F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 02.70 -03.10 m
Date Tested : 28/10/2021

GEOMINE

520	44.62	7.2
540	45.5	7.48
560	46.73	7.76
580	47.38	8.03
600	48.36	8.31
620	49.11	8.59
640	49.18	8.86
660	50.15	9.14
680	50.33	9.42
700	50.4	9.7
720	50.79	9.97
740	50.97	10.25
760	51.36	10.53
780	51.42	10.8
800	51.26	11.08

Deviator Stress Maximum: 51.42 kPa E_o: 2249.27 kPa
Strain at Failure: 11.08 % E_{50}: 589.74 kPa
Deviator Stress at (50%): 47.38 kPa
Strain at (50%): 8.03 %

+ + + + + + + + + STAGE - 2 + + + + + + + + +

Height of Sample: 64.2 mm
Diameter of Sample: 38 mm
Calibration Dial Gauge: 0.1391 kg/div
Calibration Strain Gauge: 0.01 mm/div

--- Triaxial S H E A R I N G ---

Strain Gauge (div)	Deviator Stress (kPa)	Strain (%)
780	0	12.15
800	27.16	12.46
820	35.31	12.77
840	40.72	13.08
860	45.67	13.4
880	48.69	13.71
900	50.62	14.02
920	52.54	14.33
940	54.44	14.64
960	56.64	14.95
980	57.47	15.26
1000	58.19	15.58
1020	58.8	15.89
1040	59.61	16.2
1060	60.42	16.51
1080	61.31	16.82
1100	62.2	17.13
1120	62.78	17.45
1140	63.04	17.76
1160	63.11	18.07
1180	63.07	18.38

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(02.70-03.10 m)-TX UU.xlsm

F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Triaxial Unconsolidated Undrained Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 02.70 -03.10 m
Date Tested : 28/10/2021

GEOMINE

1200	63.13	18.69
1220	63.08	19
1240	63.14	19.31
1260	63.09	19.63
1280	63.34	19.94
1300	63.38	20.25
1320	63.33	20.56
1340	63.37	20.87
1360	63.32	21.18
1380	63.55	21.5
1400	63.58	21.81
1420	63.33	22.12
1440	63.08	22.43
1460	62.82	22.74
1480	62.57	23.05
1500	62.32	23.36
1520	62.06	23.68
1540	62.28	23.99
1560	62.21	24.3
1580	62.04	24.61
1600	61.79	24.92
1620	61.53	25.23
1640	61.28	25.55
1660	61.02	25.86
1680	60.76	26.17
1700	60.42	26.48
1720	59.98	26.79
1740	59.28	27.1
1760	58.58	27.41
1780	57.89	27.73
1800	57.37	28.04

Deviator Stress Maximum: 63.58 kPa
Strain at Failure: 28.04 %
Deviator Stress at (50%): 63.34 kPa
Strain at (50%): 19.94 %

$E_{o.}$: 1072.54 kPa
E_{50}: 317.67 kPa

+ + + + + + + + + STAGE - 3 + + + + + + + + +

No. Container : 1132
Wet Soil + Container : 153.19 gram
Dry Soil + Container : 100.19 gram
Weight of Container : 4.46 gram
Density : 17.26 kN/m3
Moisture Content : 55.36 %
Dry Density : 11.11 kN/m3

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F GWL OL 008; R 05-(14/09/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 07.00 - 07.40 m

Date Tested : 26/10/2021

GEOMINE

Test		Results
Unit Weight	kN/m^3	17.4
SL	%	-
Gs	-	3.54
MC	%	92
PL	%	52
LL	%	97
PI	%	45
Fines (#200)	%	96
D_{10}	mm	0.0014
D_{30}	mm	0.0028
D_{60}	mm	0.0055
C_u	-	4
C_c	-	1.01

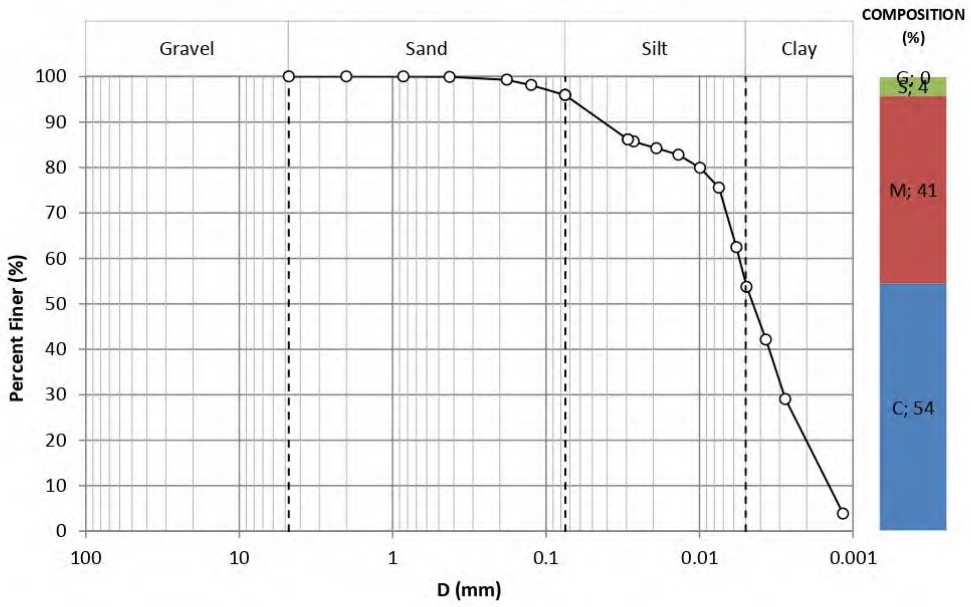
* Casagrande's Method

** Based on Consistency Index (Ic)

Properties		Results
I_F	%	-0.59
I_T	%	-77.34
I_L	%	0.89
I_C	%	0.11
S_r	%	100.00
e	-	2.73
n	-	0.73
A	-	4.07

Consistency**	Very Soft
Activity	Active
Plasticity Symbol	MH or OH

PARTICLE SIZE DISTRIBUTION



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F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 07.00 - 07.40 m

Date Tested : 26/10/2021

GEOMINE

Moisture Content

No. Test	1	2	3
No. Container	1229	1117	1069
Weight of Container	4.62	4.96	4.97
Weight of wet soil and container	107.42	128.54	123.72
Weight of dry soil and container	58.70	69.04	66.56
Moisture Content	90.09	92.85	92.81
Average MC	91.92		

Unit weight

No. Ring	11
No. Container	1070
Weight of Ring	26.93
Volume of Ring	15.216
Weight of Container	4.77
Weight of wet soil and ring and containe	58.17
Weight of dry soil and ring and containe	46.12
Water Content	83.564
Density	17.396
Dry Density	9.4768
Saturation	100
Void ratio	2.7305
Porosity	0.7319

Specific Gravity

No. Test	1	2
No. Pycknometer	203	203
Weight of Pycknometer + soil	77.16	77.16
Weight of Pycknometer + water + soil	168.61	168.61
T° C	28	28
Weight of Pycknometer	54.5	54.5
Weight of Pycknometer + water	152.36	152.36
Specific Gravity	3.535	3.535
Average Specific Gravity	3.535	

Shrinkage Limit

No. Ring	-
No. Container	-
Weight of Ring	-
Volume of Ring	-
Weight of Container	-
Weight of wet soil and container	-
Weight of dry soil and container	-
Weight of plate	-
Weight of plate and Mercury	-
Volume dry soil	-
Shrinkage Limit	-

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(07.00-07.40 m)-Classification.xlsm

F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 07.00 - 07.40 m

Date Tested : 26/10/2021

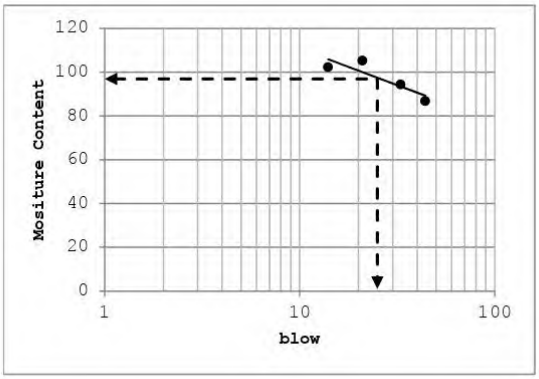
GEOMINE

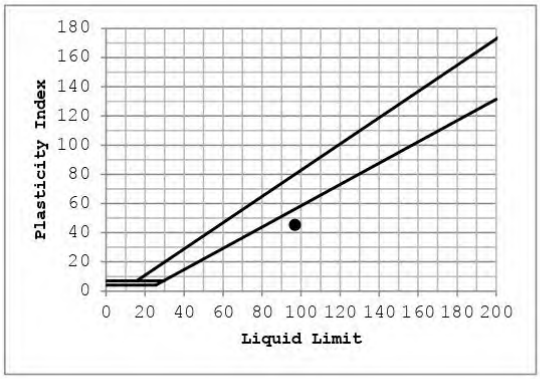
Plastic Limit

No. Test	1	2	3
No. Container	1191	1187	1230
Weight of Container	4.28	4.44	4.56
Weight of wet soil and container	11.8	11.82	11.12
Weight of dry soil and container	9.28	9.25	8.91
Plastic Limit	50.40	53.43	50.80
Average	51.54		

Liquid Limit

No. Test	1	2	3	4	5
No. Container	1232	1066	1224	1120	-
Weight of Container	4.39	4.8	4.57	4.96	-
Weight of wet soil and container	15.54	15.7	15.53	15.7	-
Weight of dry soil and container	10.36	10.41	9.91	10.27	-
Water Content	86.77	94.30	105.24	102.26	-
Number of blows	44	33	21	14	-
Liquid Limit	96.92				





Sieve Analysis

Bowl	0
Soil + Bowl	80.33
Weight of dry soil	80.33

Sieve No.	Sieve Diameter	Weight of Soil Retained	Percent Retained	Cumulative Percent Retained	Percent Finer
4	4.75	0.001	0.00	0.00	100.00
10	2	0	0.00	0.00	100.00
20	0.85	0	0.00	0.00	100.00
40	0.425	0.05	0.06	0.06	99.94
80	0.18	0.52	0.65	0.71	99.29
120	0.125	0.93	1.16	1.87	98.13
200	0.075	1.77	2.20	4.07	95.93
Pan	0	1.39	95.93	100	0.00

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F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

Classification Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 07.00 - 07.40 m

Date Tested : 26/10/2021

GEOMINE

Hydrometer

Dry Sample

Weight of sample 75.669

Zerro correction -1 Gs 3.5353

Meniscus correction 1 a 0.8682

Time	t (minute)	T (Co)	Ra	Diameter	Percent Finer
12:20	0				
12:21	1	27	56	0.0269	85.70
12:22	2	27	55	0.0191	84.25
12:24	4	27	54	0.0137	82.80
12:28	8	27	52	0.0099	79.89
12:35	15	27	49	0.0075	75.53
12:50	30	27	40	0.0057	62.46
13:05	45	27	34	0.0049	53.75
13:50	90	27	26	0.0037	42.12
15:20	180	27	17	0.0028	29.05
9:20	1260	26	0	0.0012	3.85
12:20	1440	0	0	0.0000	0.00

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(07.00-07.40 m)-Classification.xlsm

F GWL OL 001; R 12-(17/10/18)

PARTNER FOR DESIGN

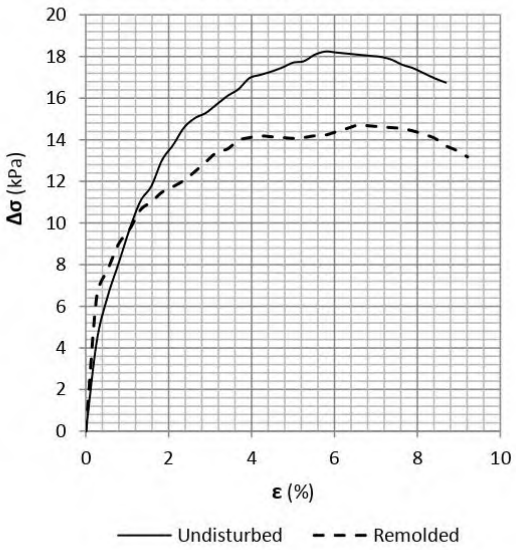
Unconfined Compression Test

GEOMINE

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 14.10 - 14.31 m

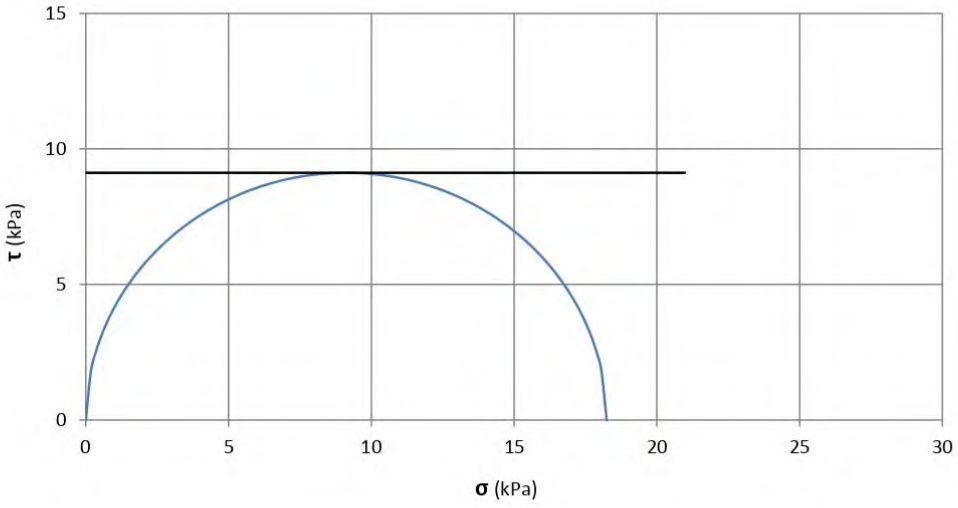
Date Tested : 29/10/2021

STRESS - STRAIN CURVE



Results		Undisturbed	Remolded
σ_{max}	kPa	18.2	14.7
ε_f	%	5.79	6.58
S_t	-	1.24	
c	kPa	9.1	7.4
E_{50}	kPa	745	807
E_{sec}	kPa	315	224

MOHR's DIAGRAM



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F GWL OL 002; R 05-(6/09/18)

PARTNER FOR DESIGN

Unconfined Compression Test

GEOMINE

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 14.10 - 14.31 m

Date Tested : 29/10/2021

Undisturbed

Height of Sample : 76 mm
Diameter of Sample : 38 mm
Calibration Dial Gauge : 0.04826 kg/div
Calibration Strain Load : 0.01 mm/div

Water Content : 62.66 %
Unit Weight : 13.98 kN/m3
Dry Density : 8.59 kN/m3

Strain Gauge (div)	Deviator Stress (kPa)	ε (%)	Strain Gauge (div)	Deviator Stress (kPa)	ε (%)
0	0.00	0.0000	-	-	-
20	4.33	0.2632			
40	6.48	0.5263			
60	8.06	0.7895			
80	9.68	1.0526			
100	11.04	1.3158			
120	11.77	1.5789			
140	13.03	1.8421			
160	13.75	2.1053			
180	14.58	2.3684			
200	15.04	2.6316			
220	15.29	2.8947			
240	15.70	3.1579			
260	16.11	3.4211			
280	16.44	3.6842			
300	16.96	3.9474			
320	17.12	4.2105			
340	17.28	4.4737			
360	17.47	4.7368			
380	17.71	5.0000			
400	17.78	5.2632			
420	18.09	5.5263			
440	18.24	5.7895			
460	18.19	6.0526			
480	18.14	6.3158			
500	18.09	6.5789			
520	18.04	6.8421			
540	17.99	7.1053			
560	17.86	7.3684			
580	17.61	7.6316			
600	17.44	7.8947			
620	17.20	8.1579			
640	16.95	8.4211			
660	16.75	8.6842			

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(14.10-14.31 m)-UCT.xlsm

F GWL OL 002; R 05-(6/09/18)

PARTNER FOR DESIGN

Unconfined Compression Test

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 14.10 - 14.31 m

Date Tested : 29/10/2021

GEOMINE

Remolded

Height of Sample : 76 mm
Diameter of Sample : 38 mm
Calibration Dial Gauge : 0.04826 kg/div
Calibration Strain Load : 0.01 mm/div

Strain Gauge (div)	Deviator Stress (kPa)	ε (%)	Strain Gauge (div)	Deviator Stress (kPa)	ε (%)
0	0	0.0000	-	-	-
20	6.49	0.2632			
40	7.75	0.5263			
60	8.99	0.7895			
80	9.68	1.0526			
100	10.62	1.3158			
120	11.01	1.5789			
140	11.49	1.8421			
160	11.75	2.1053			
180	12.05	2.3684			
200	12.47	2.6316			
220	12.93	2.8947			
240	13.39	3.1579			
260	13.56	3.4211			
280	13.98	3.6842			
300	14.10	3.9474			
320	14.18	4.2105			
340	14.15	4.4737			
360	14.11	4.7368			
380	14.07	5.0000			
400	14.11	5.2632			
420	14.19	5.5263			
440	14.23	5.7895			
460	14.39	6.0526			
480	14.55	6.3158			
500	14.71	6.5789			
520	14.67	6.8421			
540	14.63	7.1053			
560	14.58	7.3684			
580	14.54	7.6316			
600	14.42	7.8947			
620	14.26	8.1579			
640	14.07	8.4211			
660	13.72	8.6842			
680	13.48	8.9474			
700	13.17	9.2105			

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(14.10-14.31 m)-UCT.xlsm

F GWL OL 002; R 05-(6/09/18)

PARTNER FOR DESIGN

Falling Head

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 16.27 -16.48 m
Date Tested : 27/10/2021

GEOMINE

Time (minute)	Volume (cm3)	delta time (minute)	delta volume (cm3)
0	5.6	0	0
30	9.3	30	3.7
80	14.6	50	5.3
210	20.5	130	5.9
288	25.2	78	4.7
348	30	60	4.8
400	34.2	52	4.2
456	37.5	56	3.3

t-sample (cm): 6.60
Area-sample (cm2): 11.34
Head (cm): 50

k (cm/s): 1.387E-05

D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(16.27-16.48 m)-Falling Head.xlsm

F GWL OL 040; R 01-(6/12/18)

PARTNER FOR DESIGN

Properties Test (Rock)

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : : 21 031
Area : -
Point ID : DHG 09
Depth : 18.30 - 18.50 m
Date Tested : 25/10/2021

GEOMINE

Result		
Natural Density	kN/m^3	13.25
Dry Density	kN/m^3	7.97
Saturated Density	kN/m^3	14.67
Spesific Gravity	-	2.41
Natural Water Content	%	66
Absorption	%	84
Saturation	%	0.67
Porosity	-	0.67
Void Ratio	-	2.03

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F GWL OL 026; R 04-(10/7/21)

PARTNER FOR DESIGN

Uniaxial Compressive Strength Test (v)

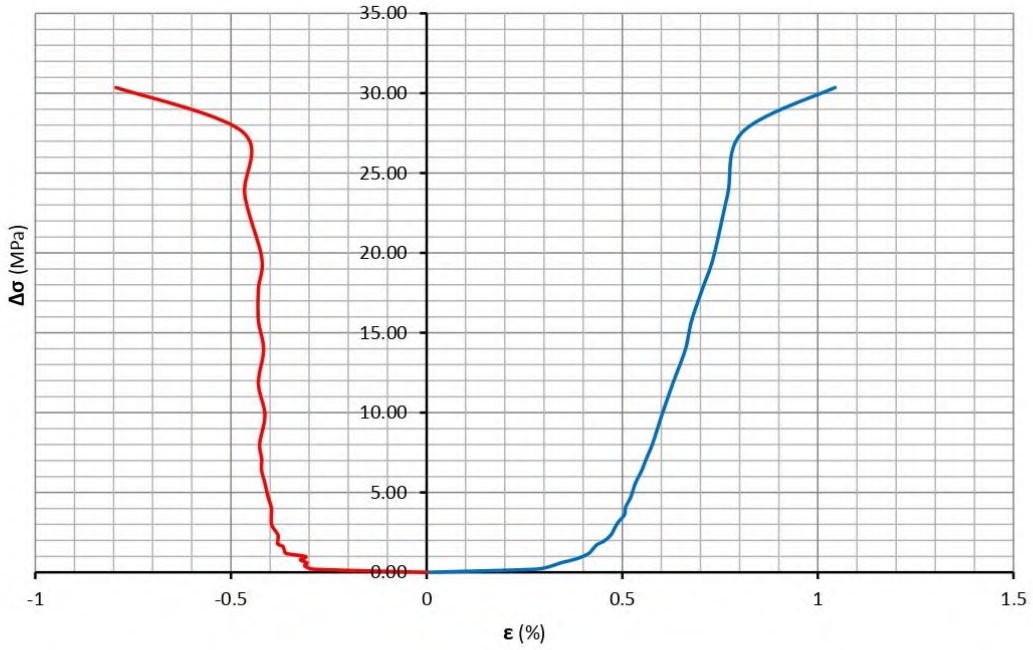
GEOMINE

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : 21 031
Area : -
Point ID : DHG 09
Depth : 28.55 - 28.76 m
Date Tested : 3/11/2021

Results		
σ_{max*}	MPa	30.35
v	-	0.46
E	MPa	6031

* Coreccted by Hoek and Brown (1980a)

STRESS - STRAIN CURVE



F GWL OL 033; R 01-(22/09/14)

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PARTNER FOR DESIGN

Properties Test (Rock)

Client ID : Geomine
Project ID : Hengjaya Mineralindo
GWL ID : : 21 031
Area : -
Point ID : DHG 09
Depth : 29.30 - 29.55 m
Date Tested : 27/10/2021

GEOMINE

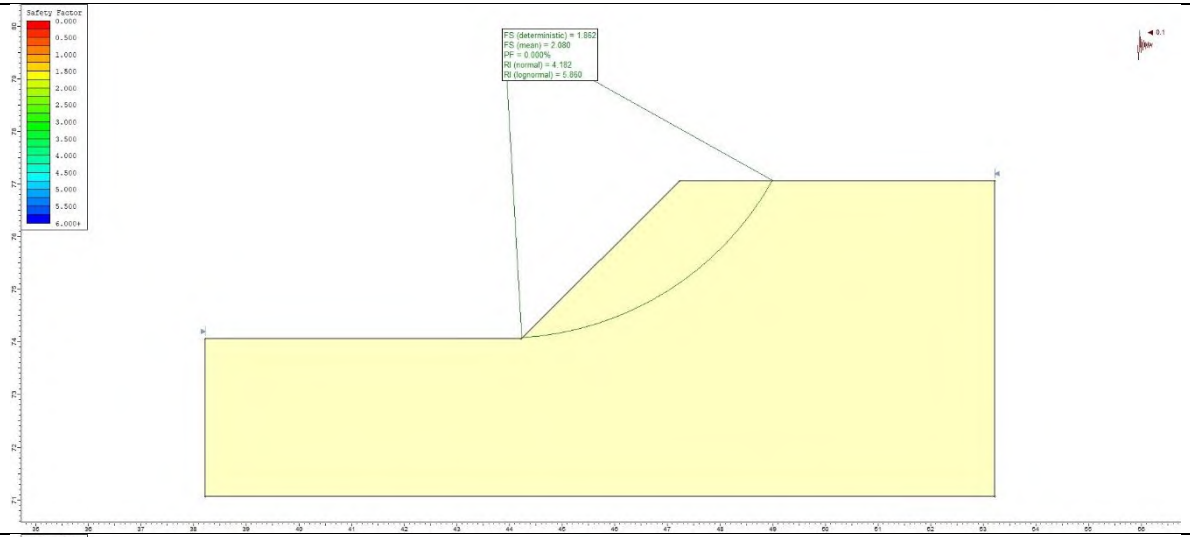
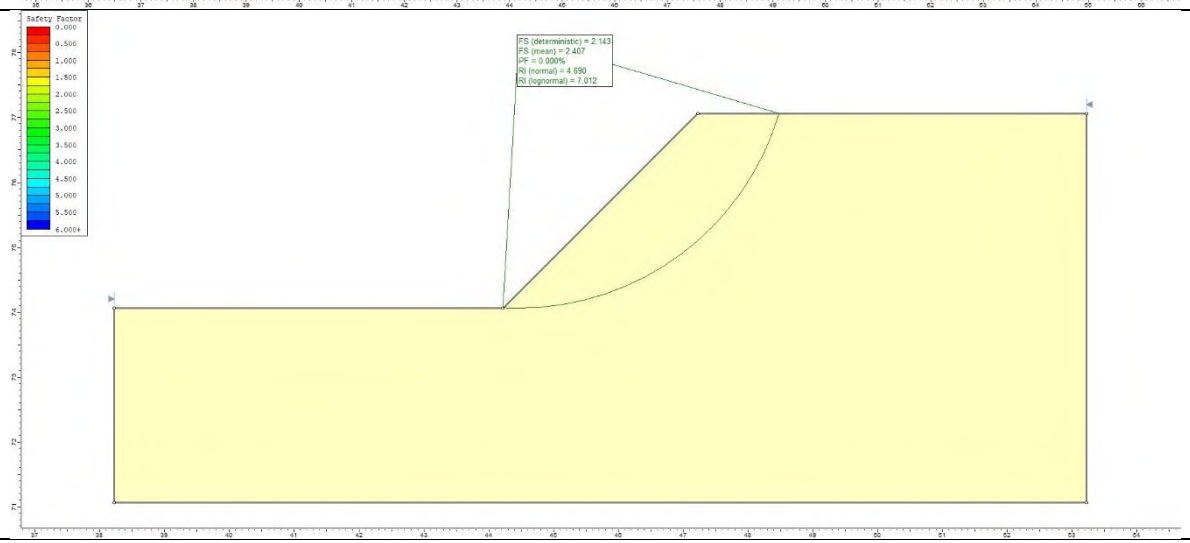
Result		
Natural Density	kN/m^3	22.60
Dry Density	kN/m^3	21.19
Saturated Density	kN/m^3	23.00
Spesific Gravity	-	2.59
Natural Water Content	%	7
Absorption	%	9
Saturation	%	0.18
Porosity	-	0.18
Void Ratio	-	0.22

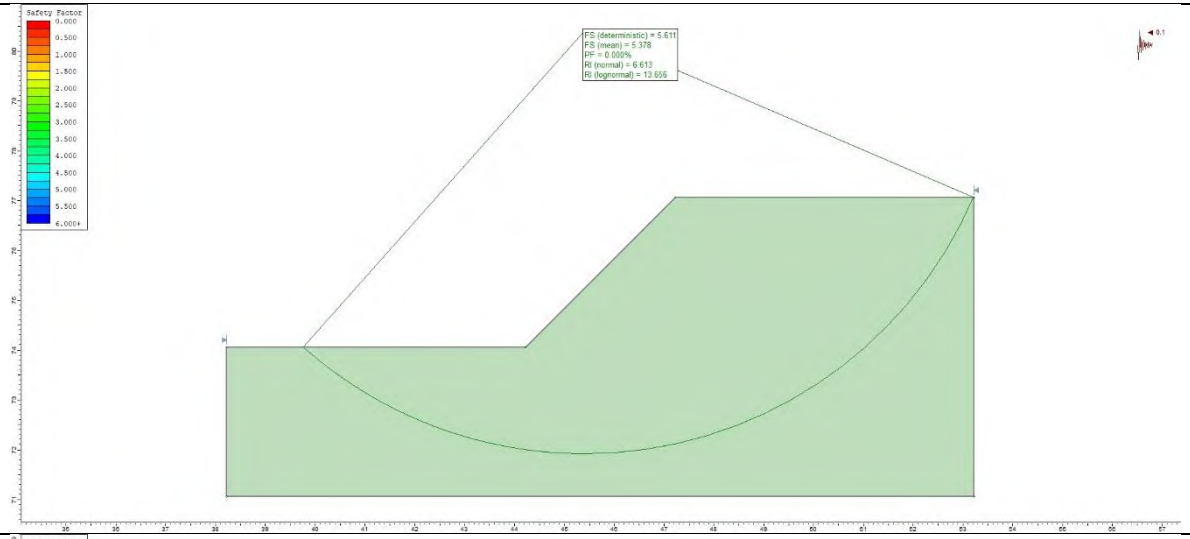
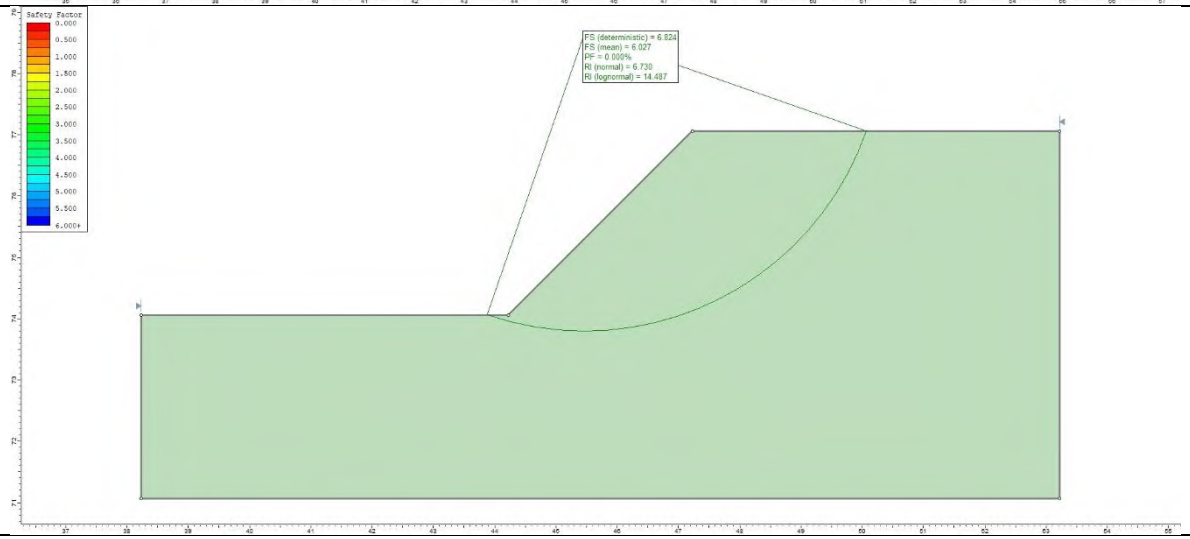
D:\Projects\2021\21 031\Technical\Test Data\F 21 031 GWL-X-DHG 09-(29.30-29.55 m)-Properties (Rock).xlsm

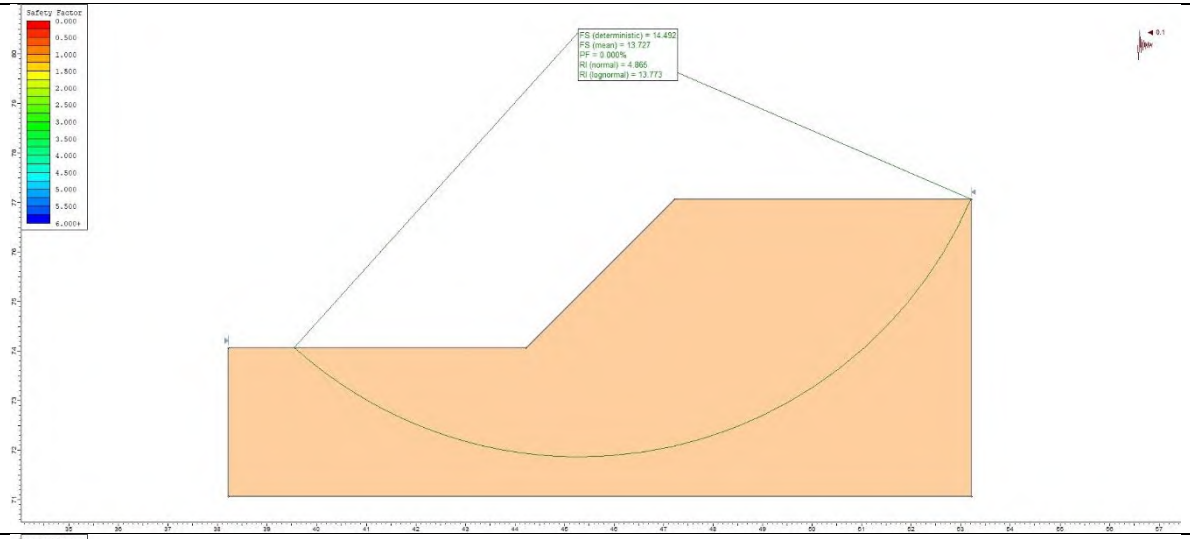
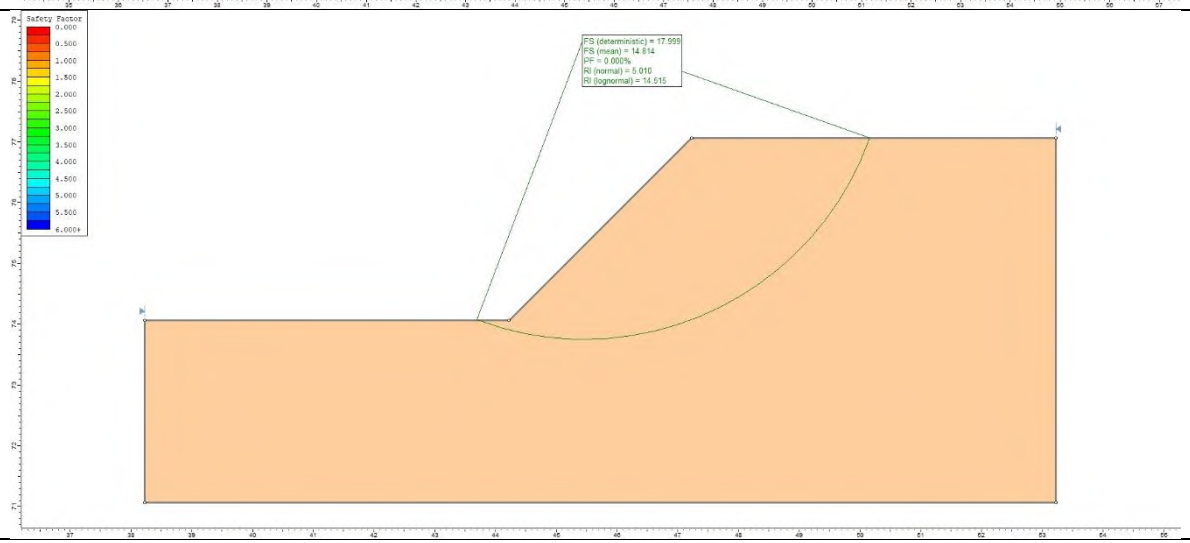
F GWL OL 026; R 04-(10/7/21)

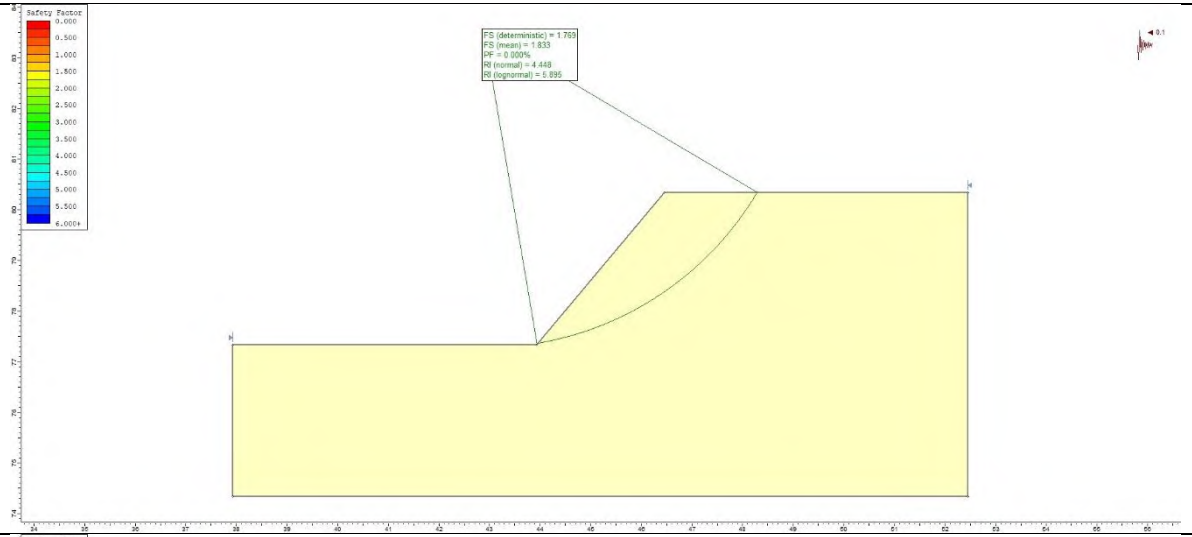
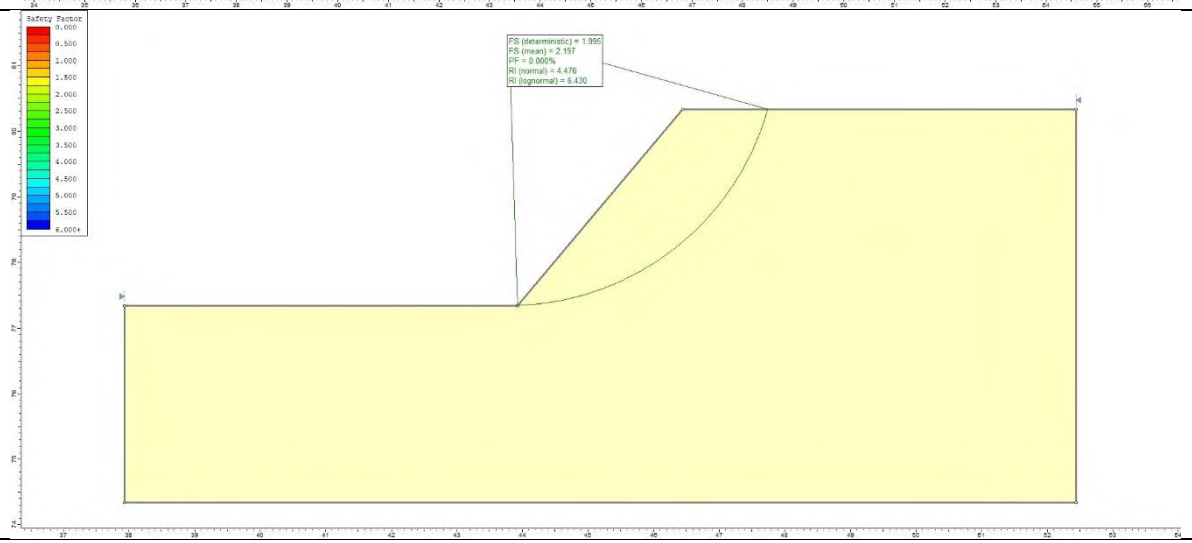
Lampiran E

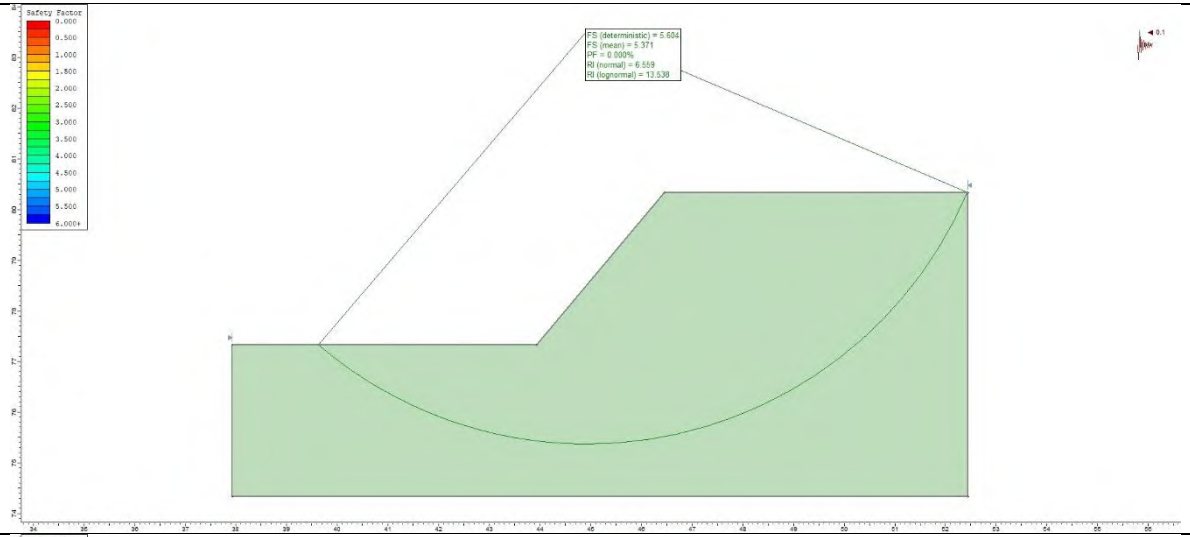
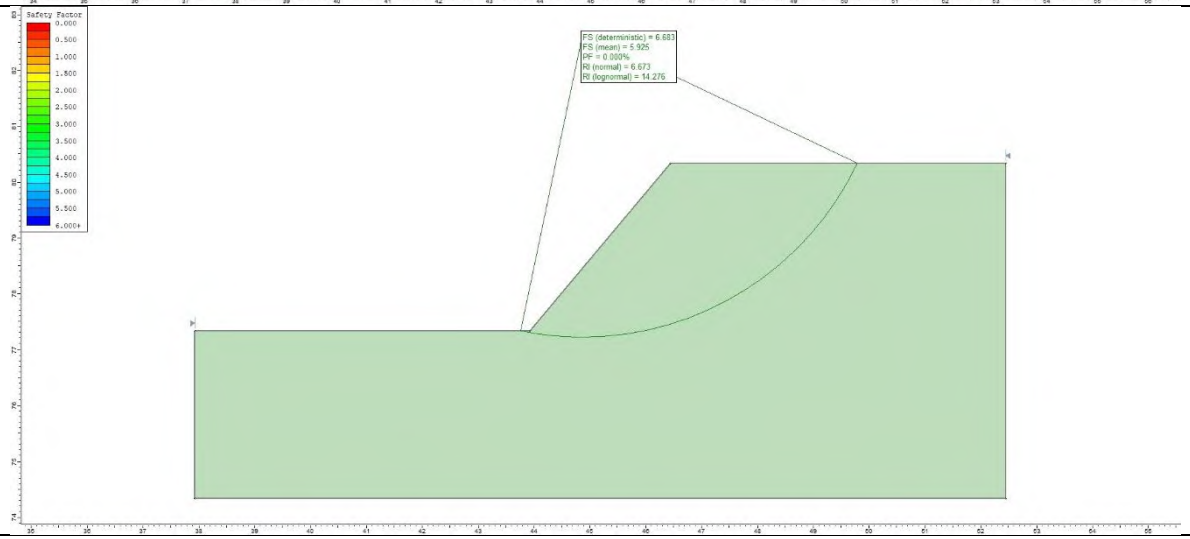
Hasil Analisis Kestabilan Lereng

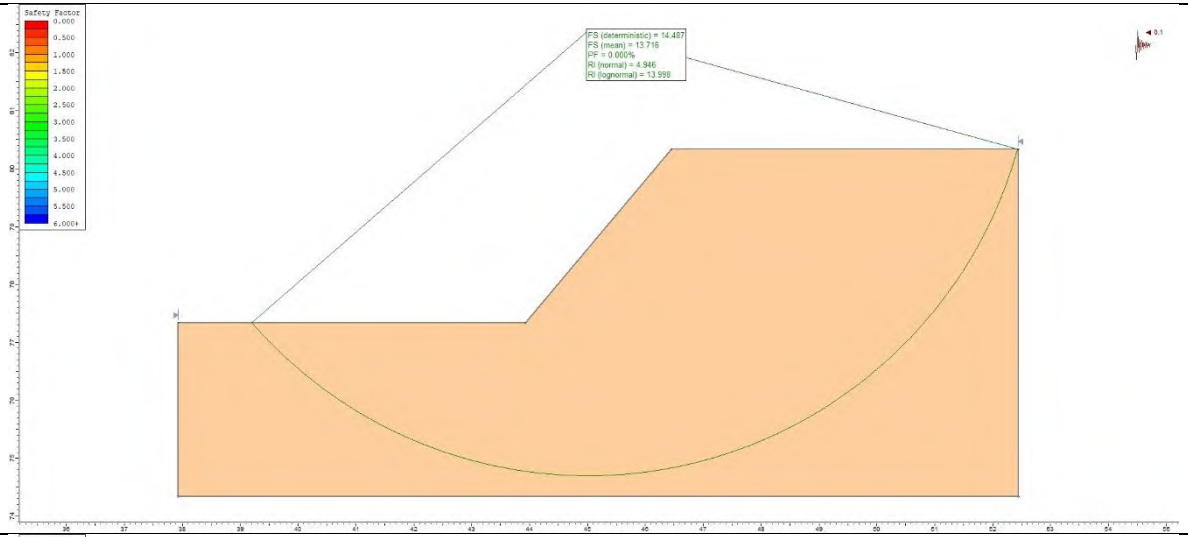
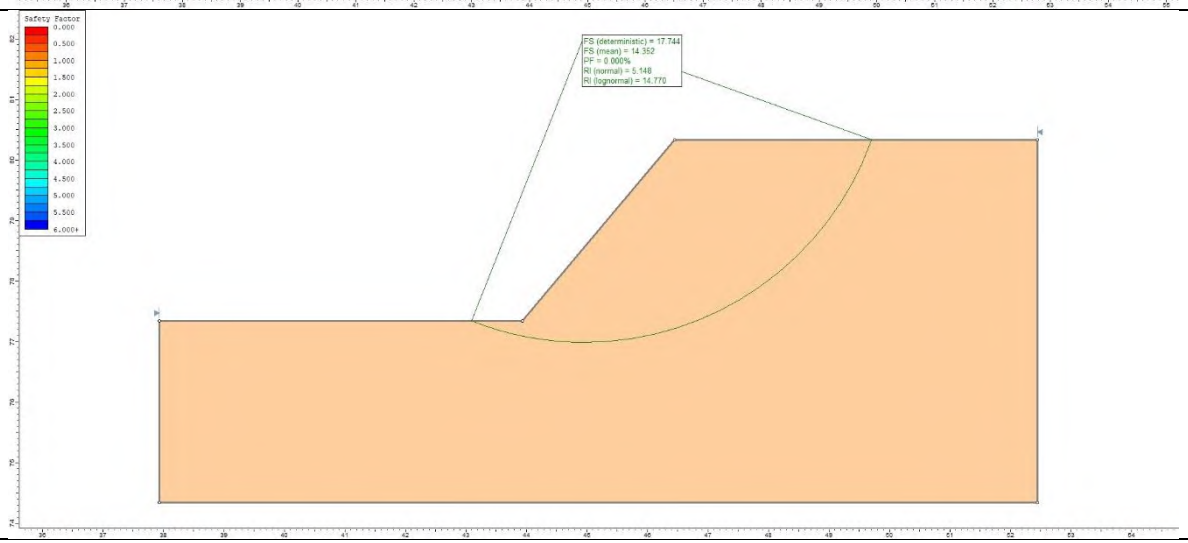
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=45	Dinamik		1,86
	Statik		2,14

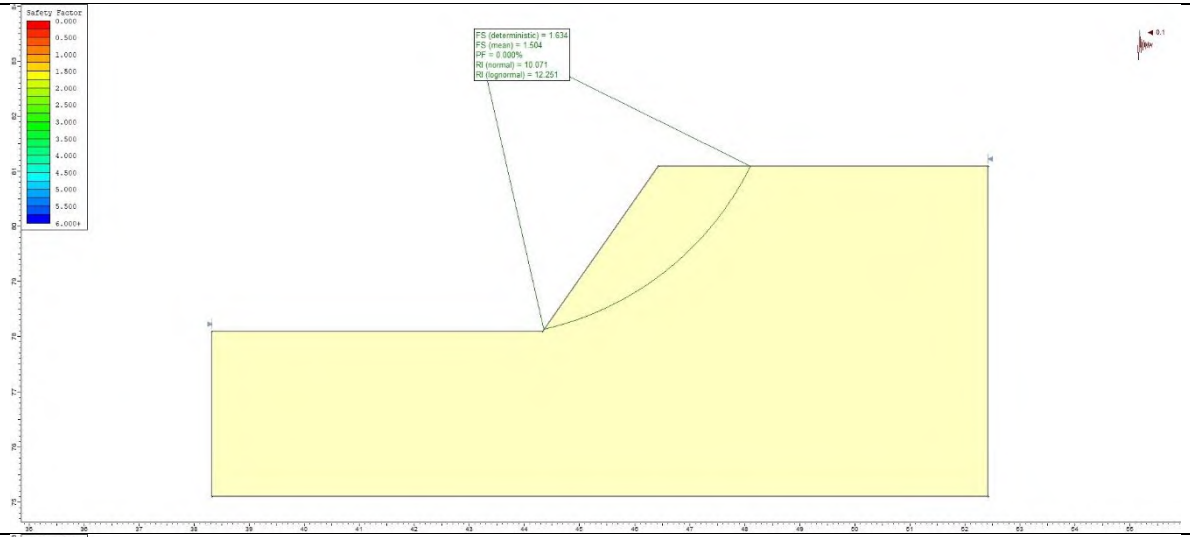
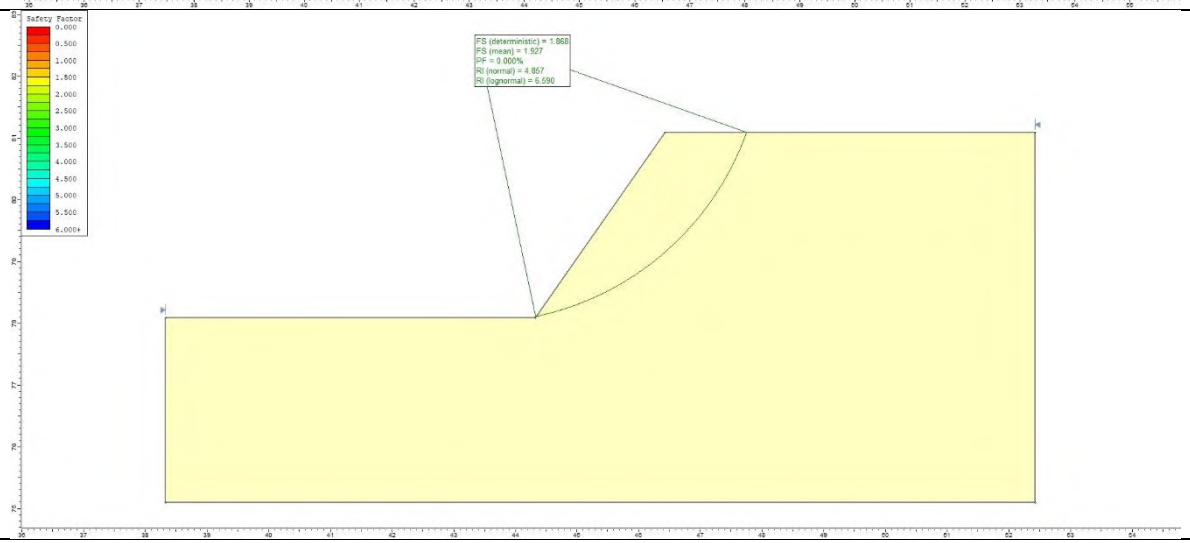
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=45	Dinamik		5,61
	Statik		6,82

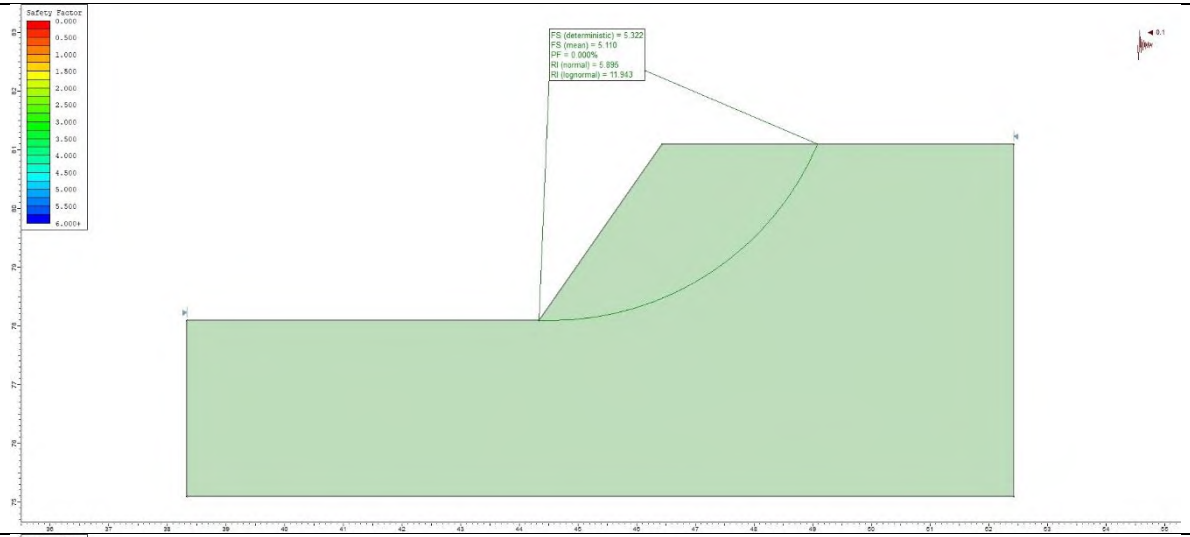
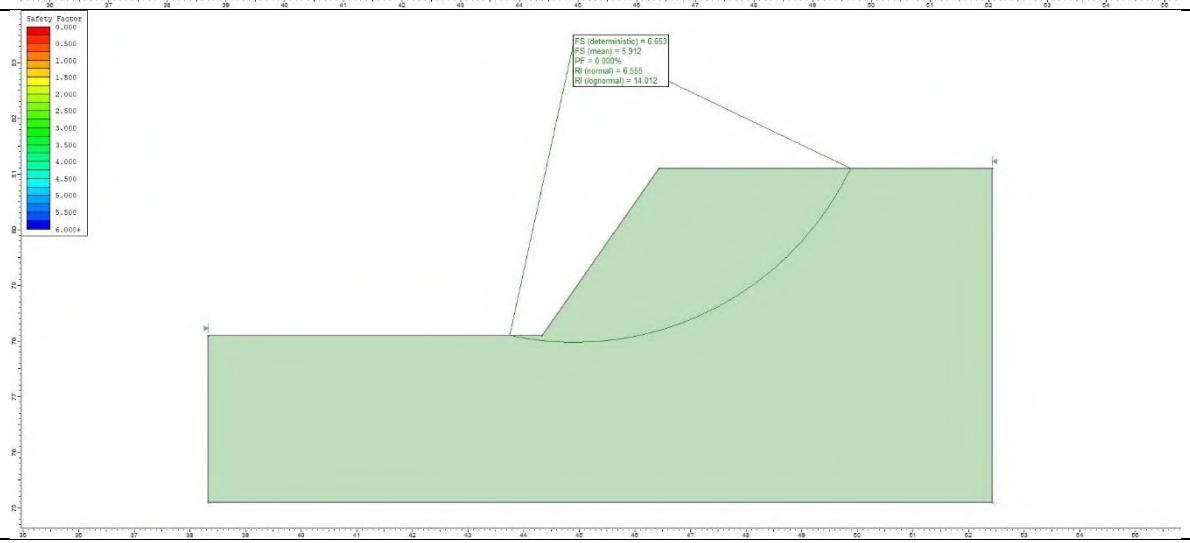
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=45	Dinamik		14,49
	Statik		17,99

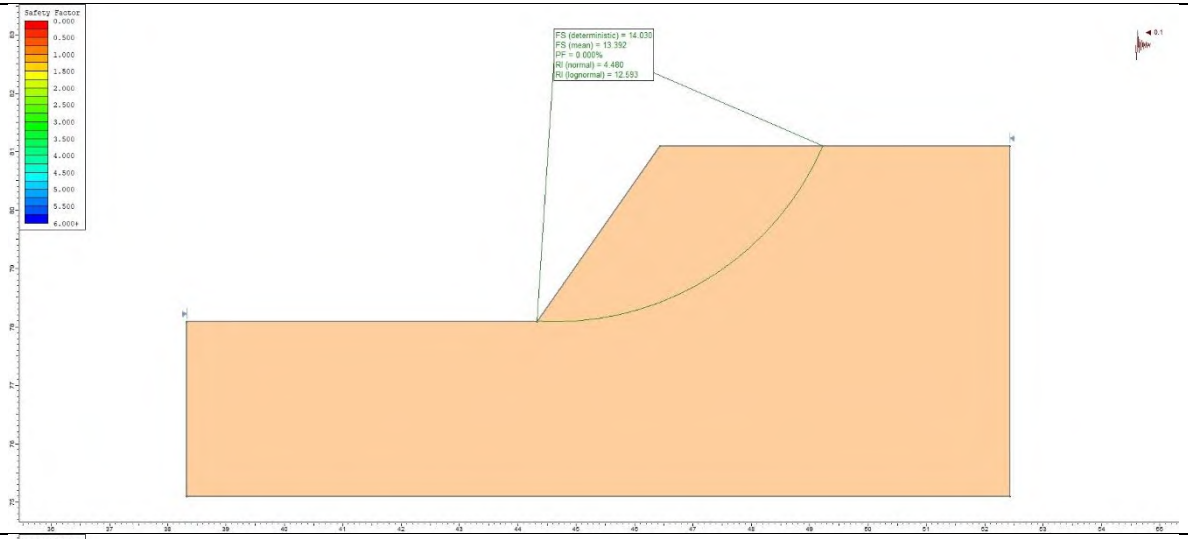
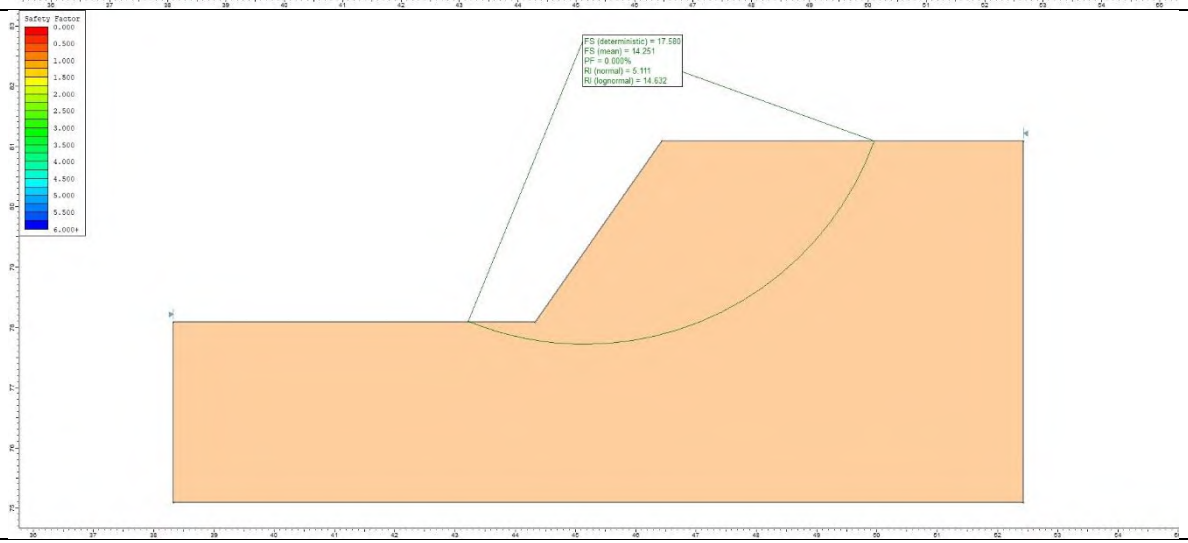
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=50	Dinamik		1,77
	Statik		1,99

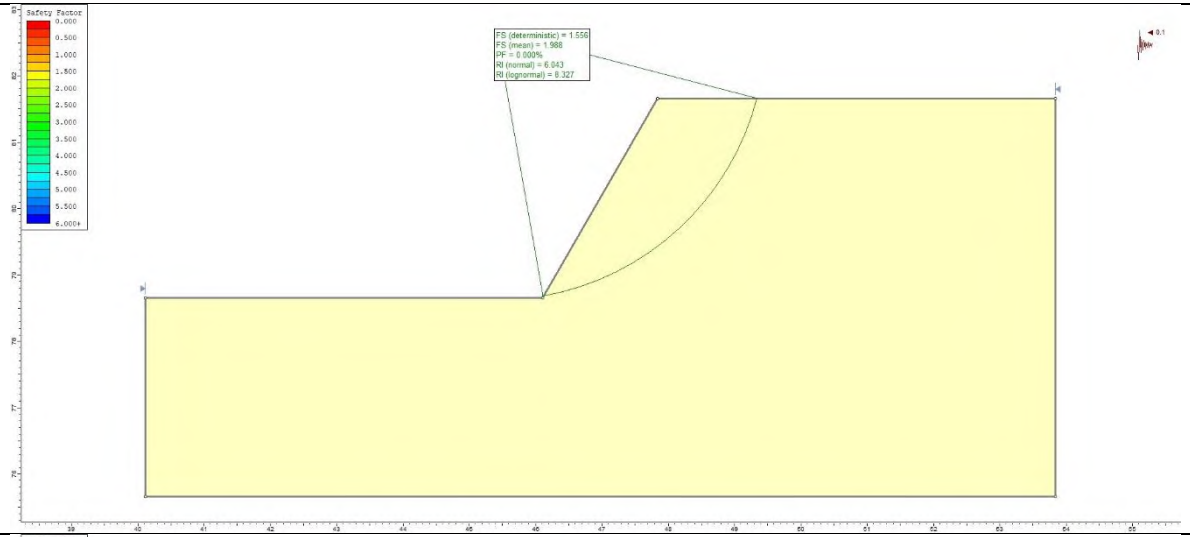
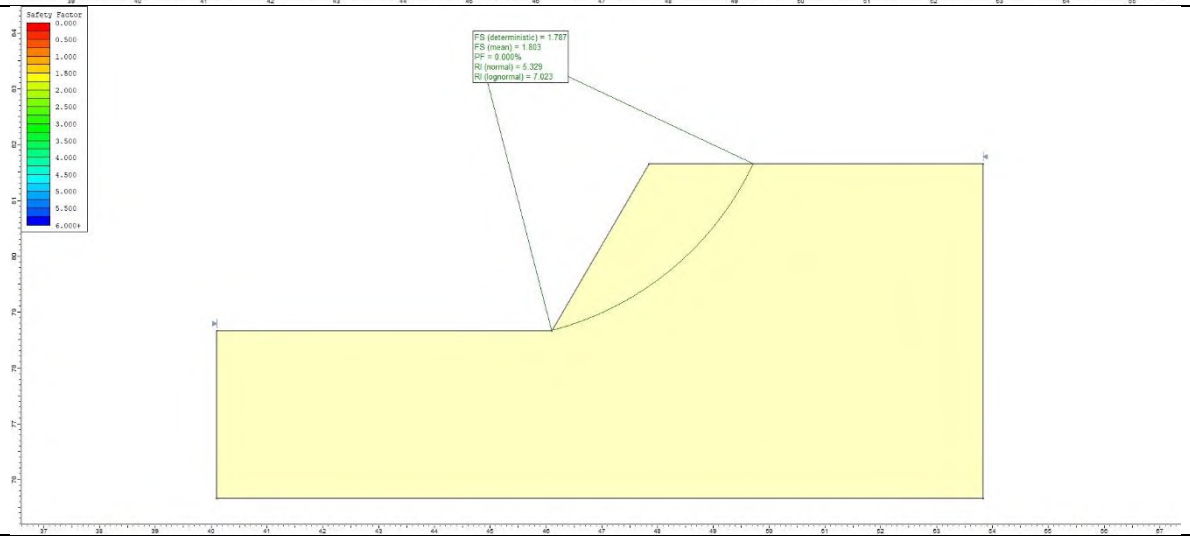
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=50	Dinamik		5,60
	Statik		6,68

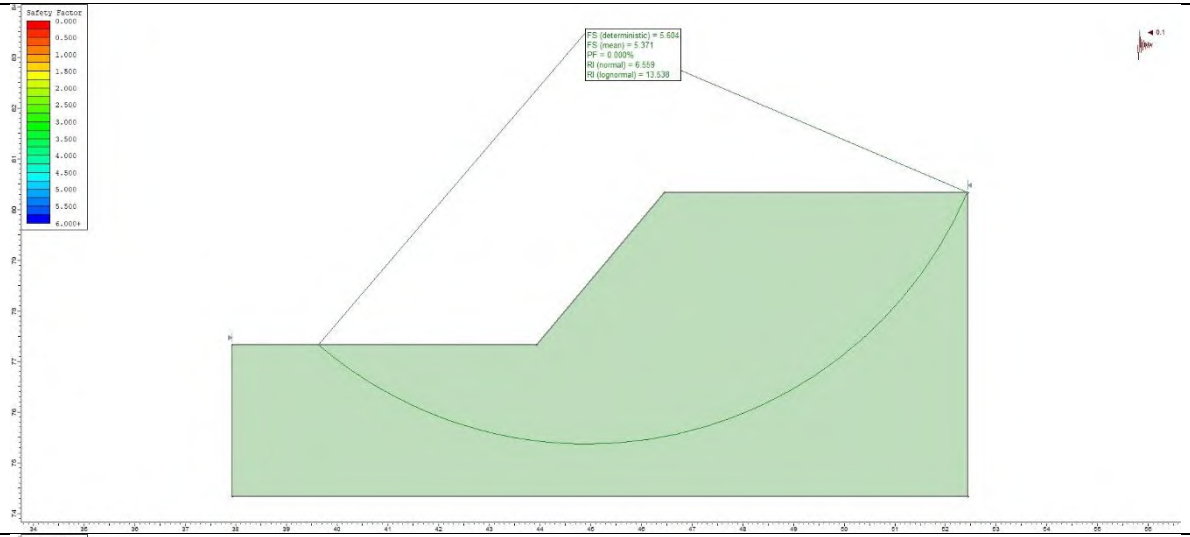
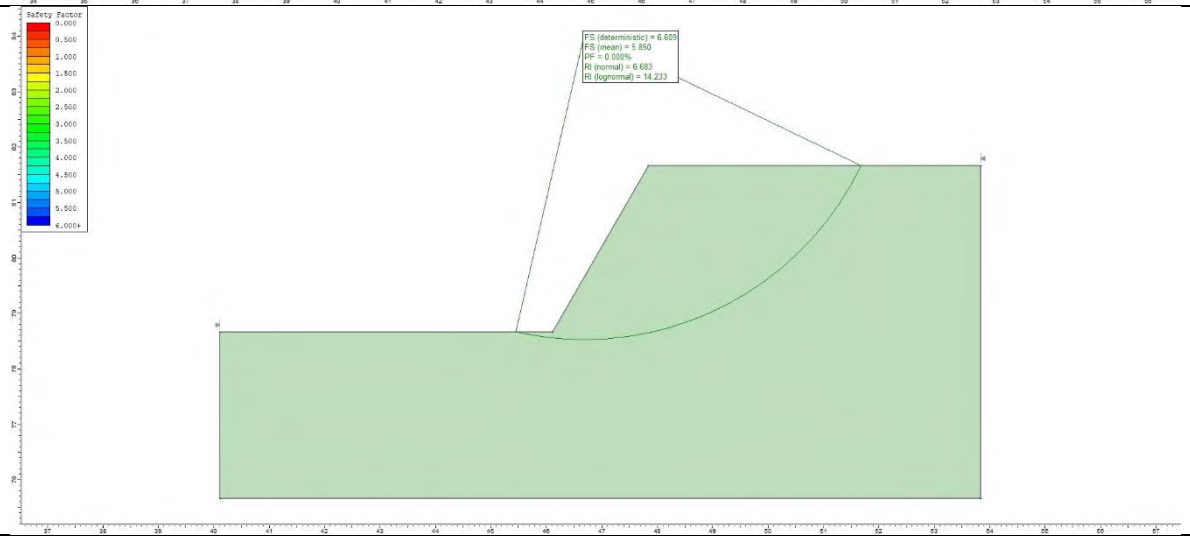
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=50	Dinamik		14,49
	Statik		17,74

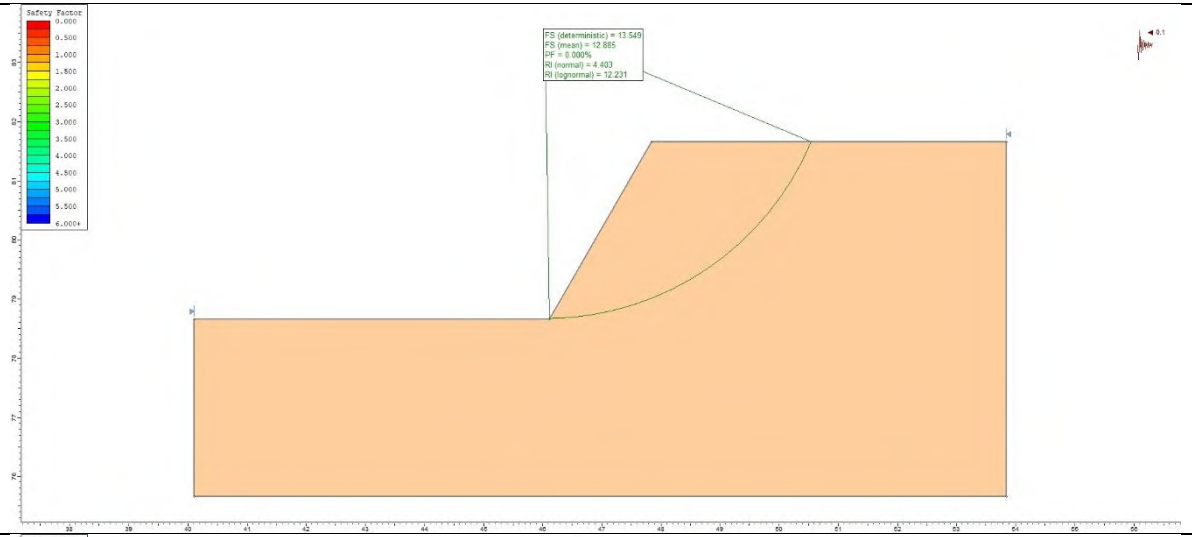
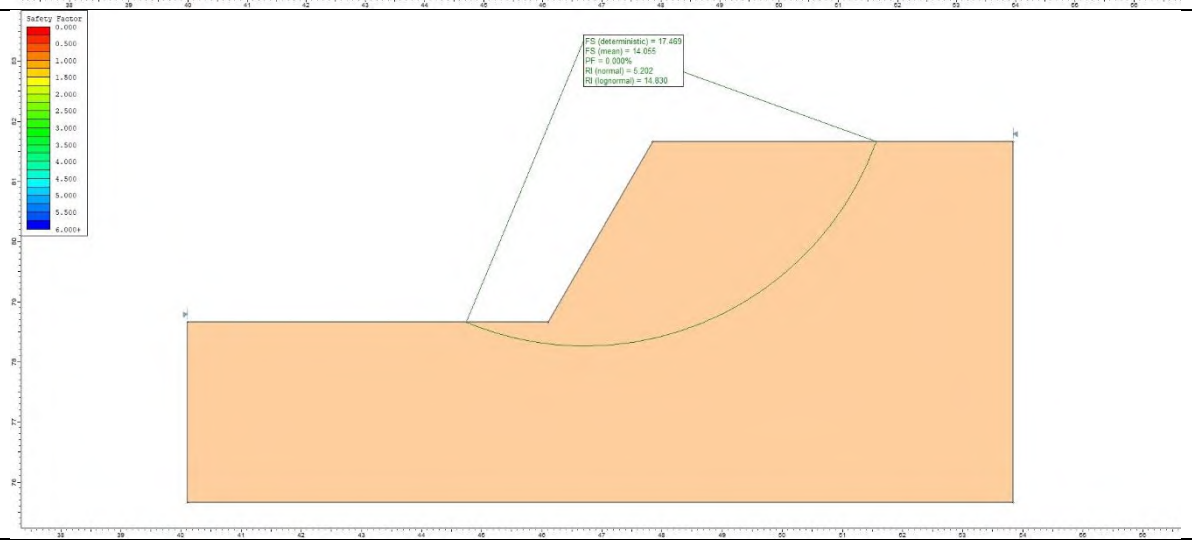
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=55	Dinamik		1,63
	Statik		1,87

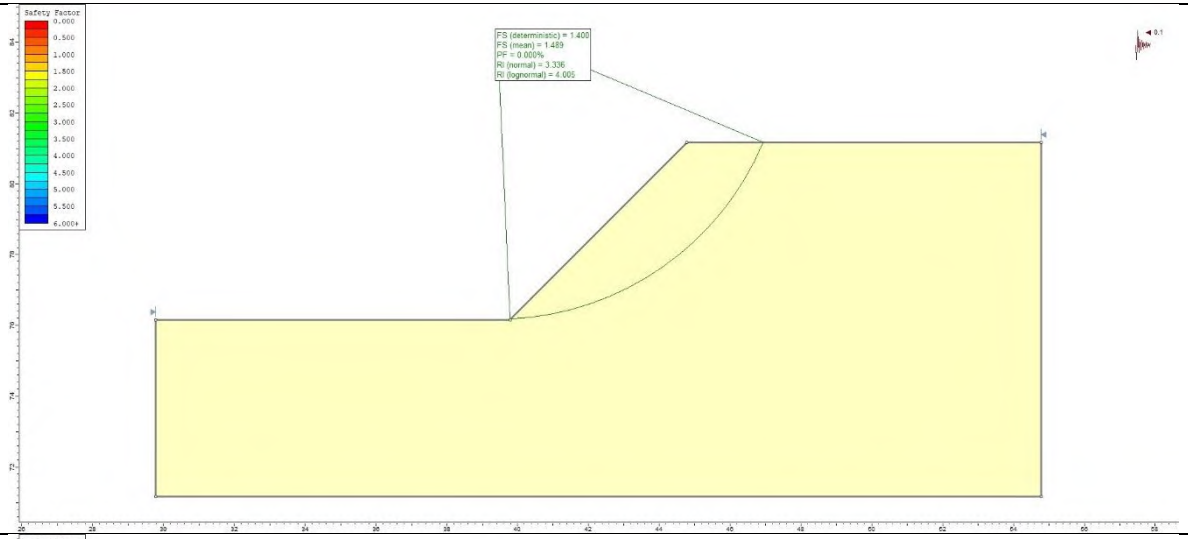
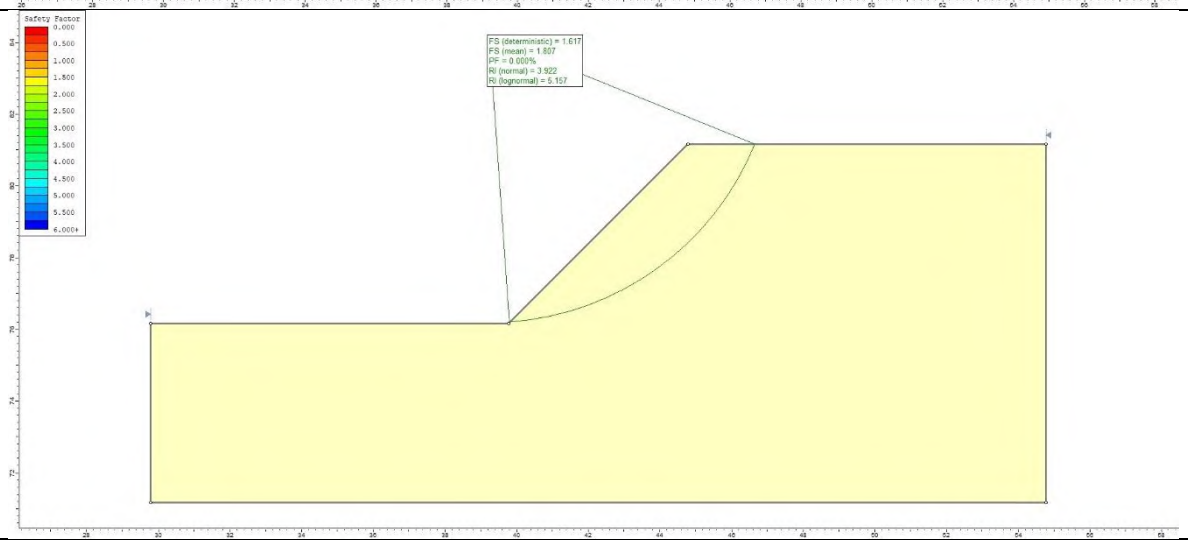
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=55	Dinamik		5,32
	Statik		6,65

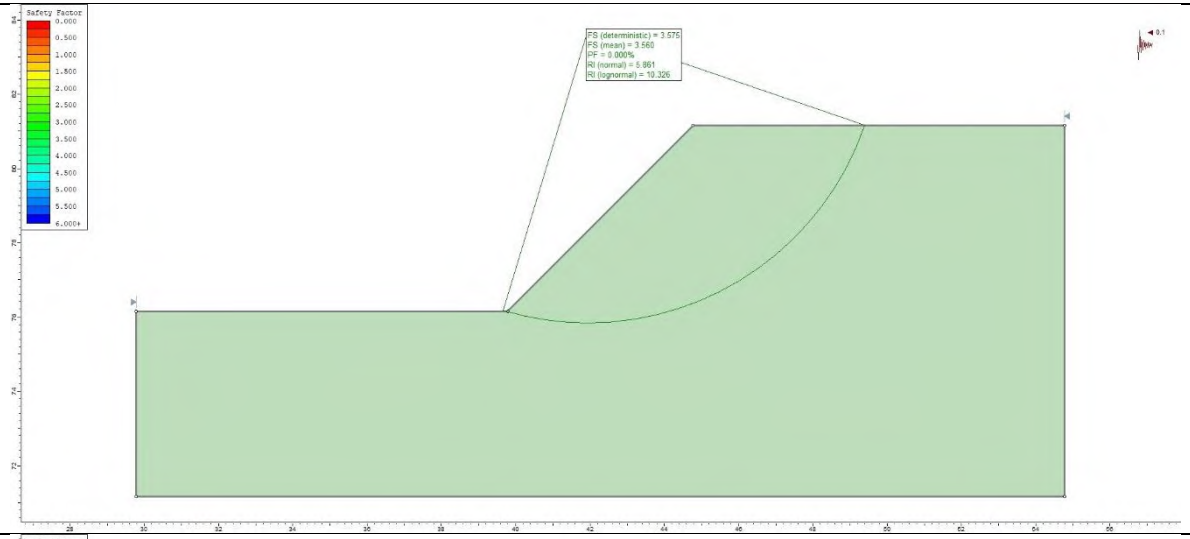
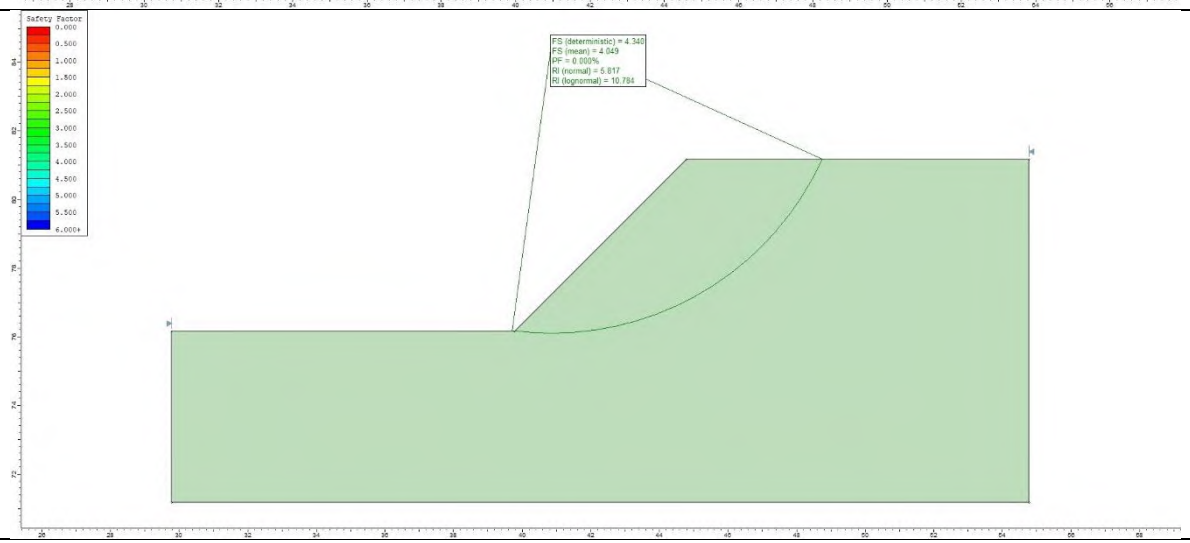
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=55	Dinamik		14,03
	Statik		17,58

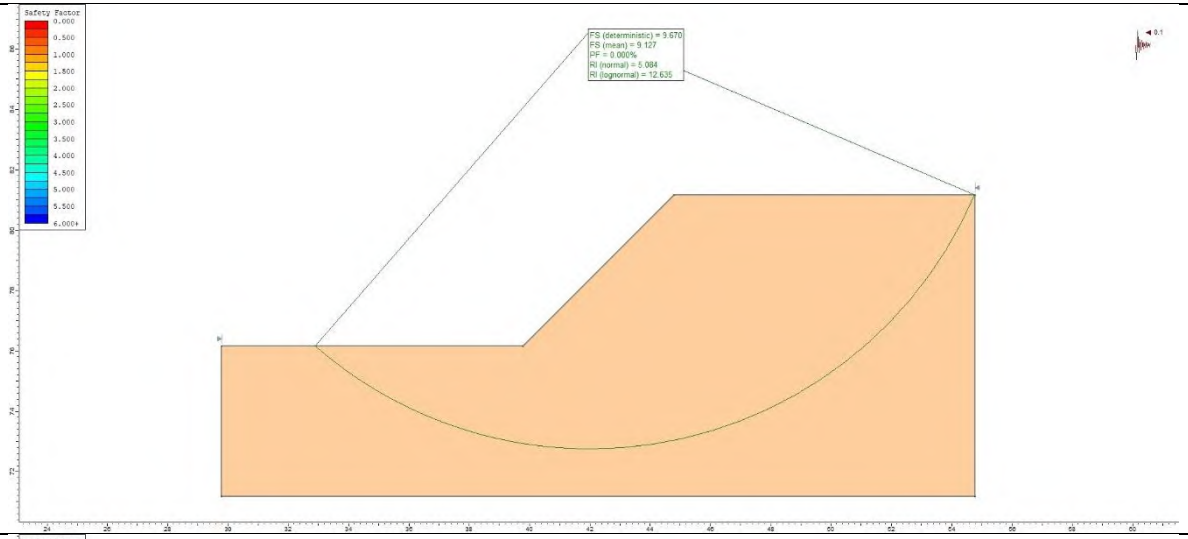
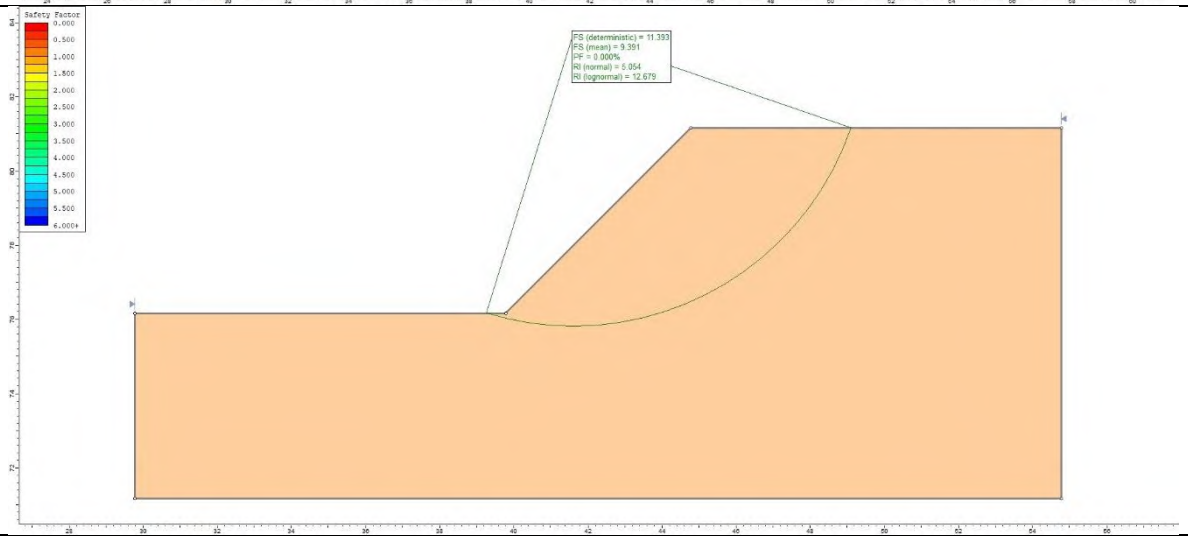
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=60	Dinamik		1,56
	Statik		1,79

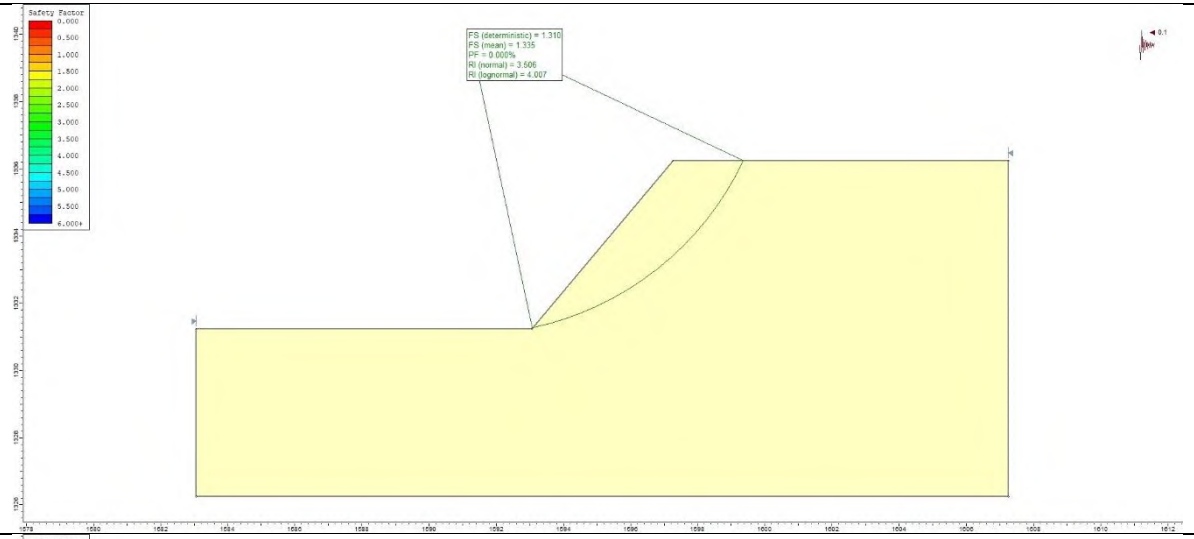
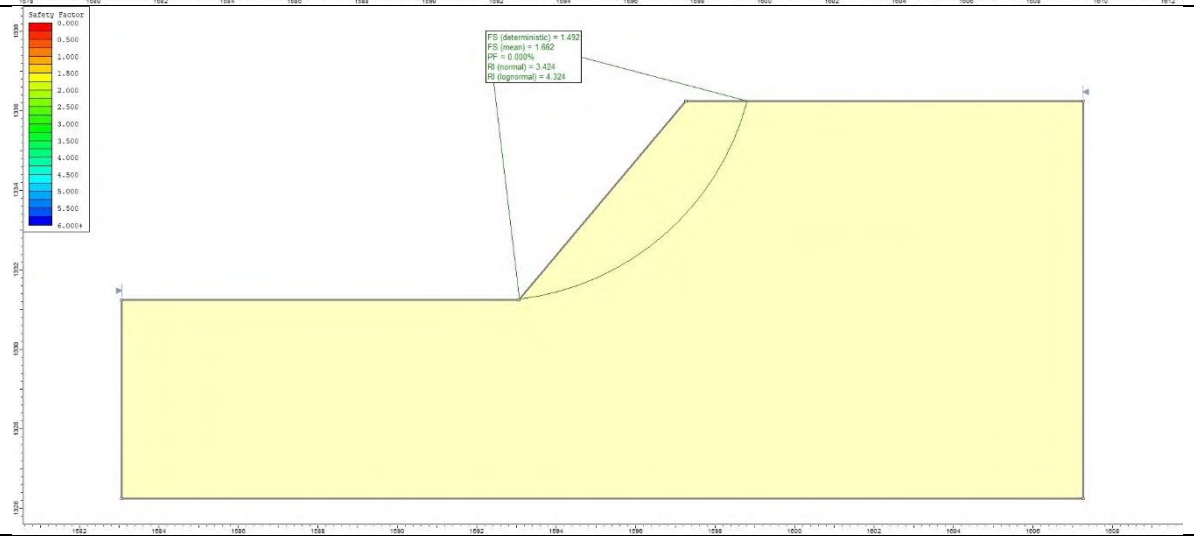
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=60	Dinamik		5,13
	Statik		6,61

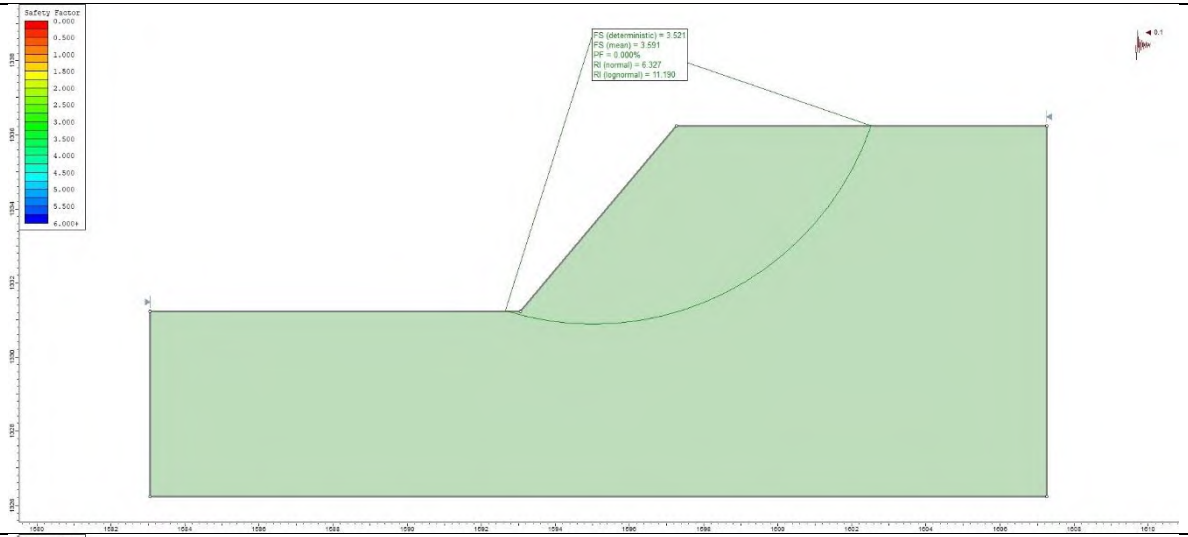
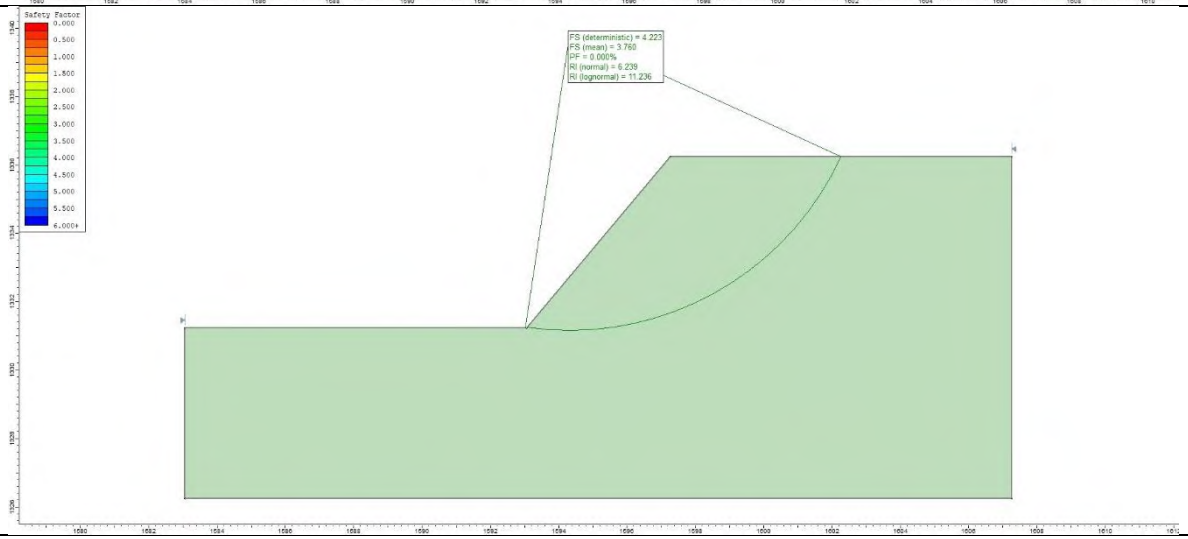
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=60	Dinamik		13,55
	Statik		17,47

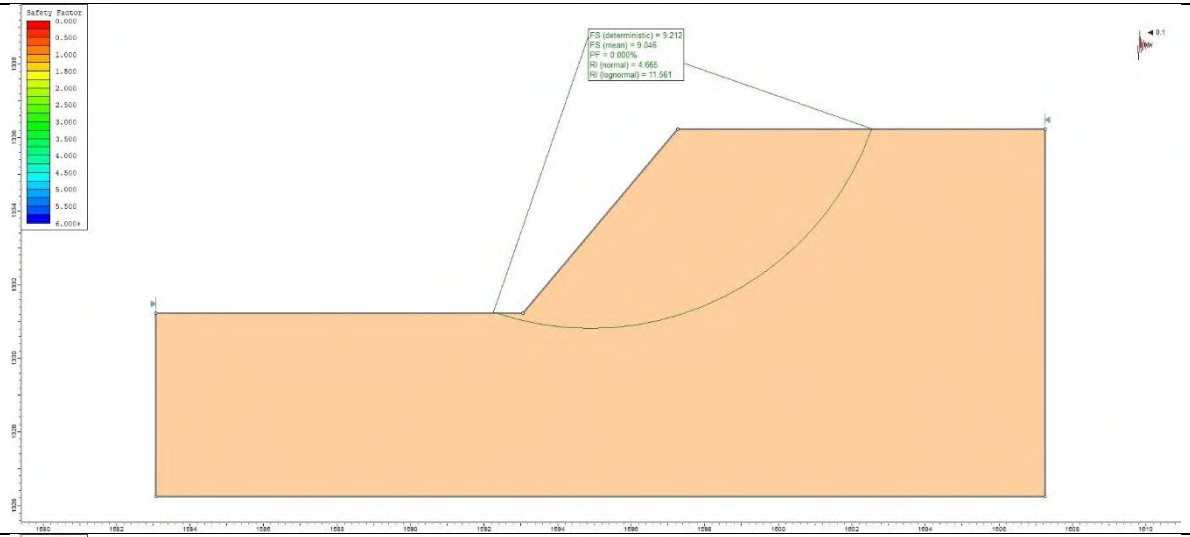
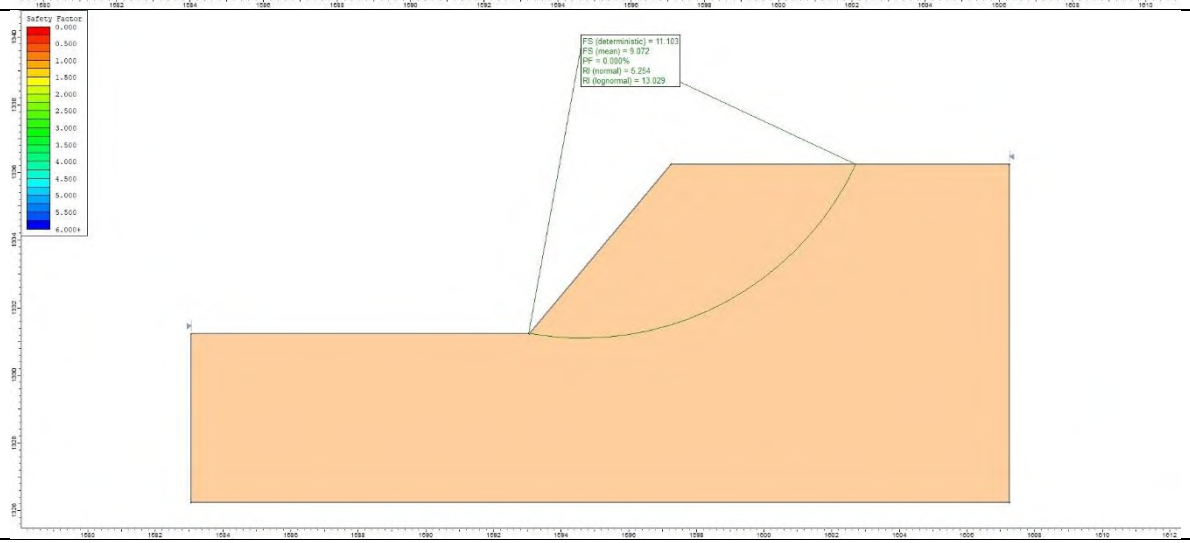
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=45	Dinamik		1,40
	Statik		1,62

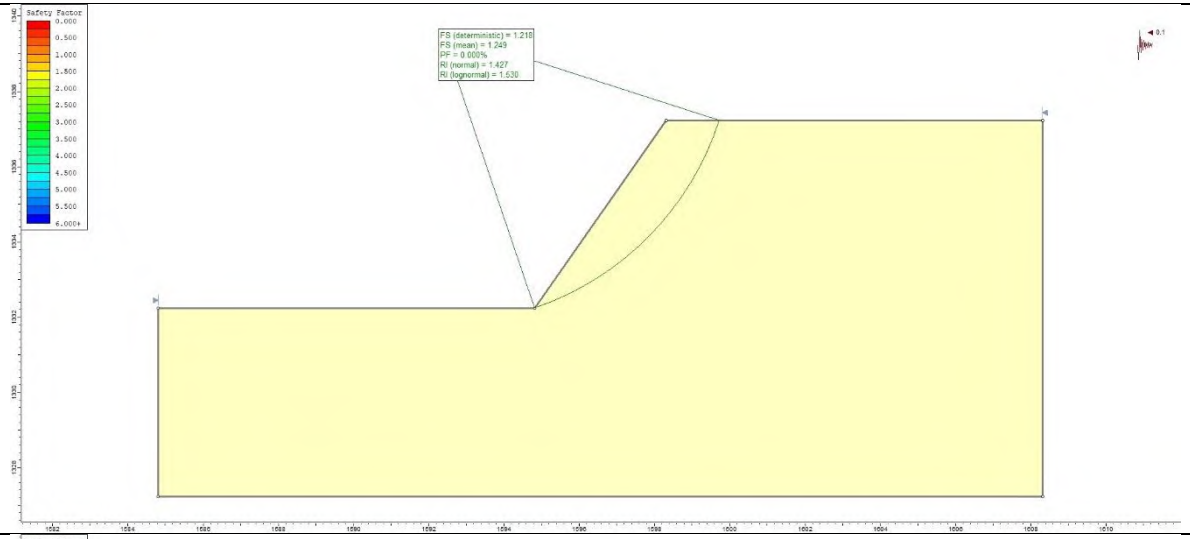
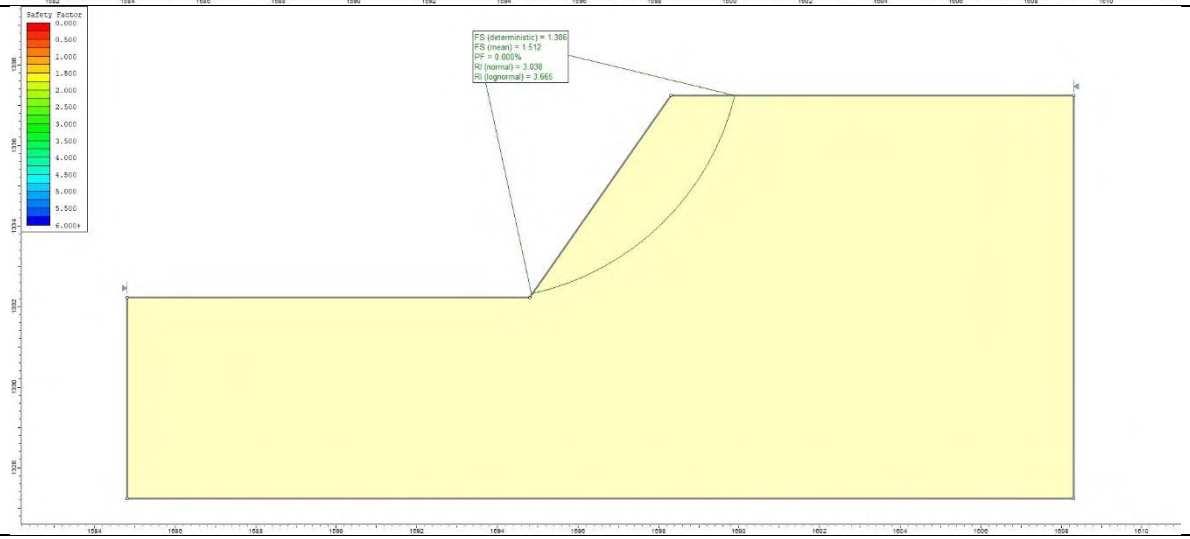
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=45	Dinamik		3,57
	Statik		4,34

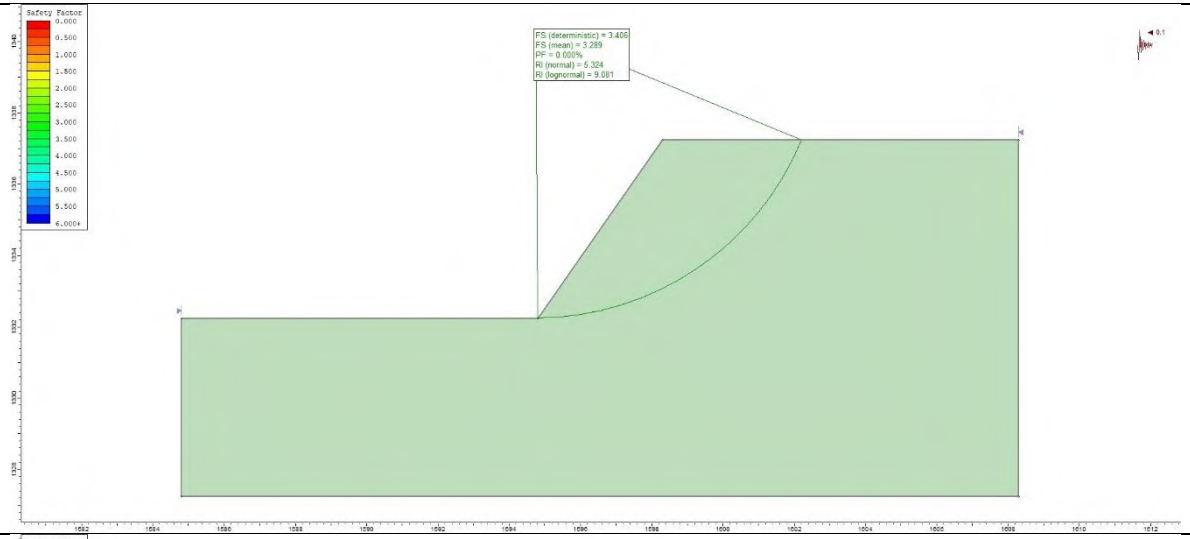
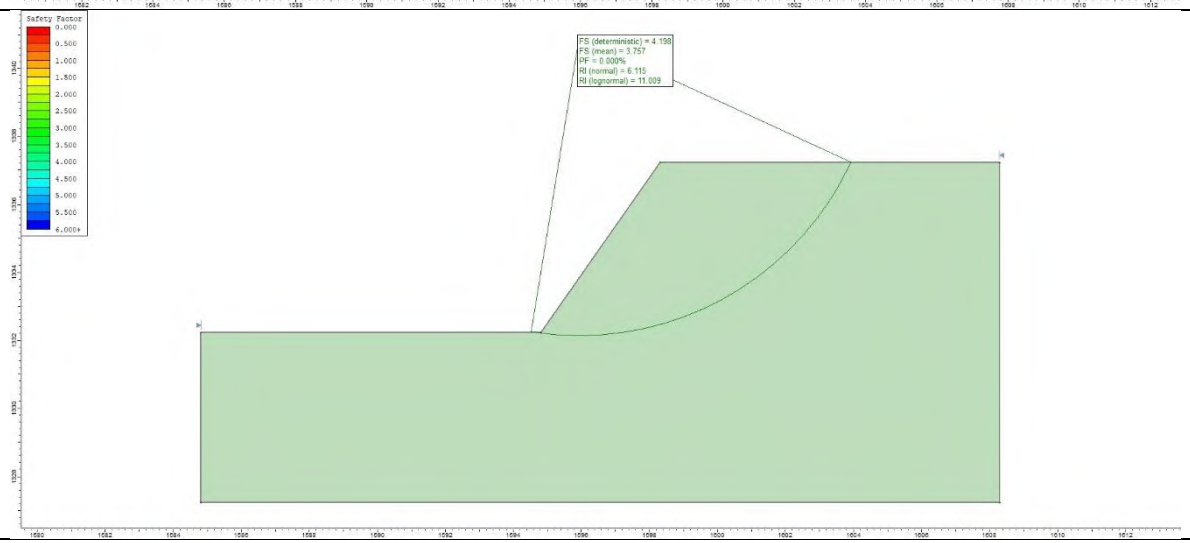
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=45	Dinamik		9,67
	Statik		11,39

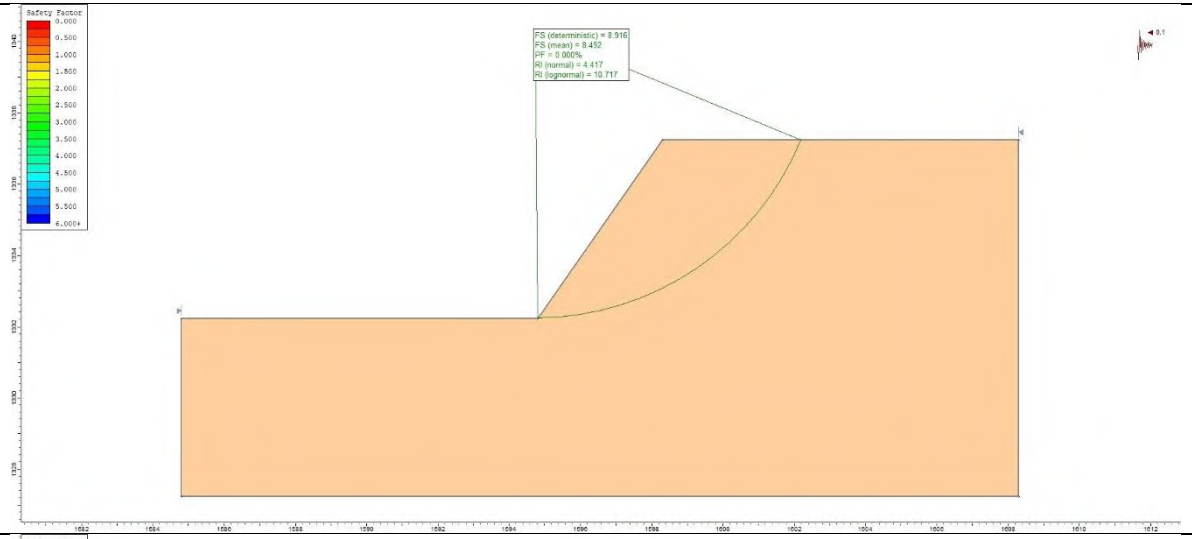
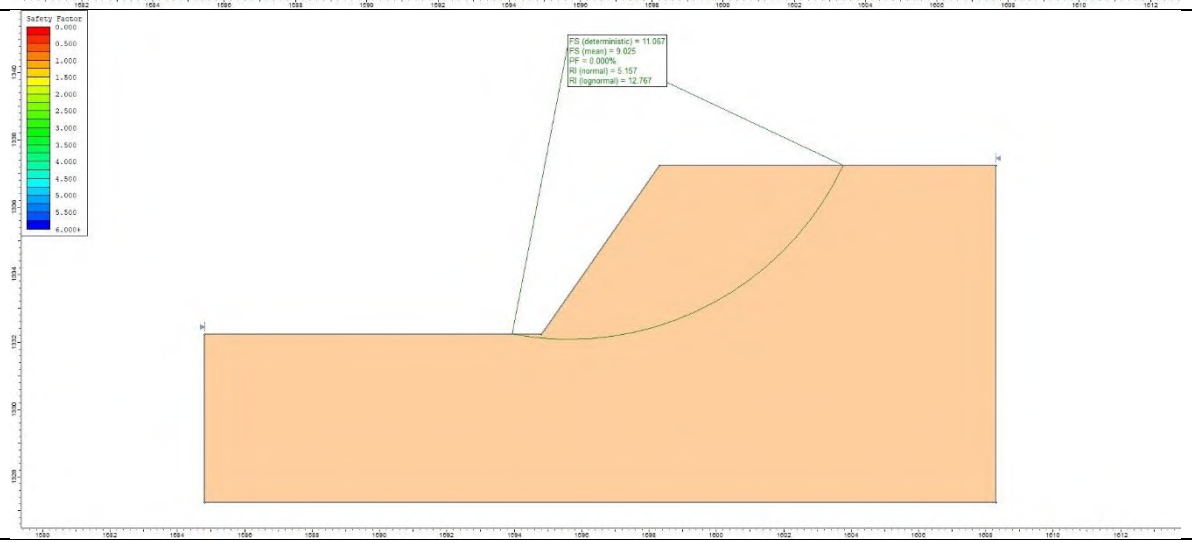
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=50	Dinamik		1,30
	Statik		1,49

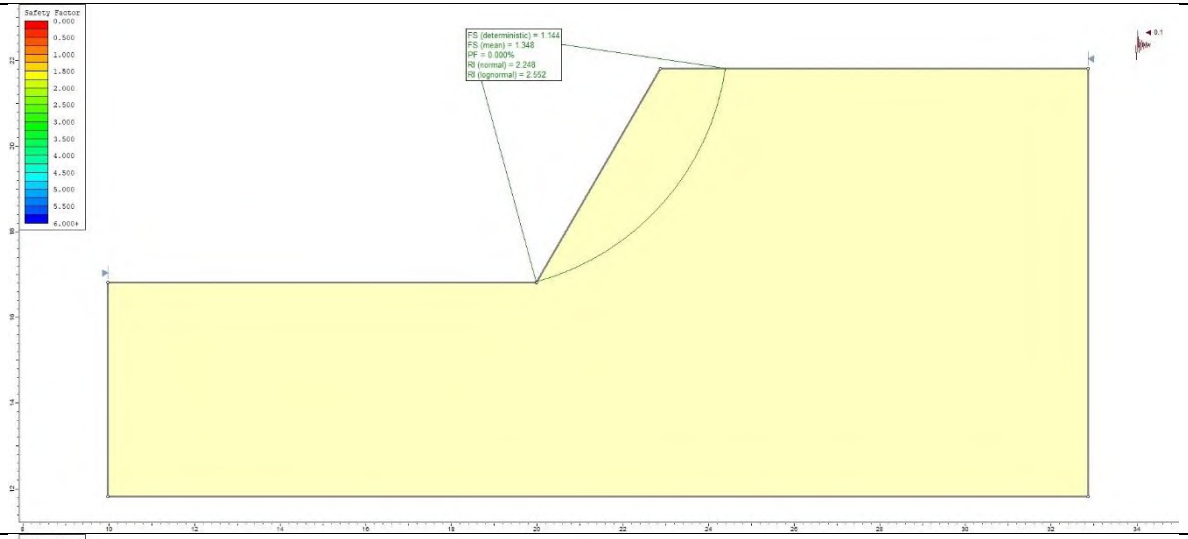
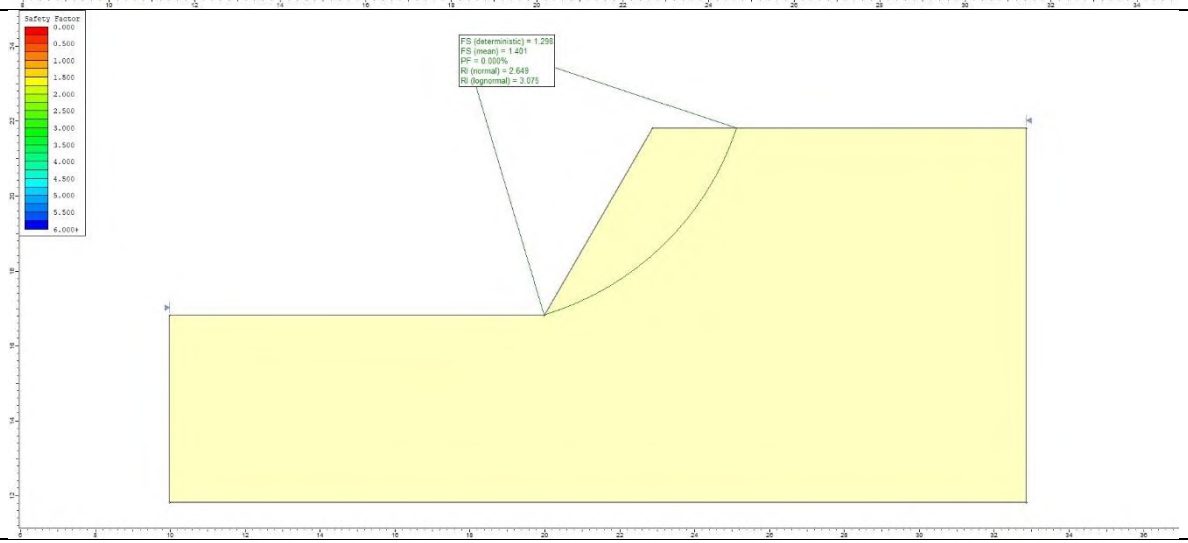
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=50	Dinamik		3,52
	Statik		4,22

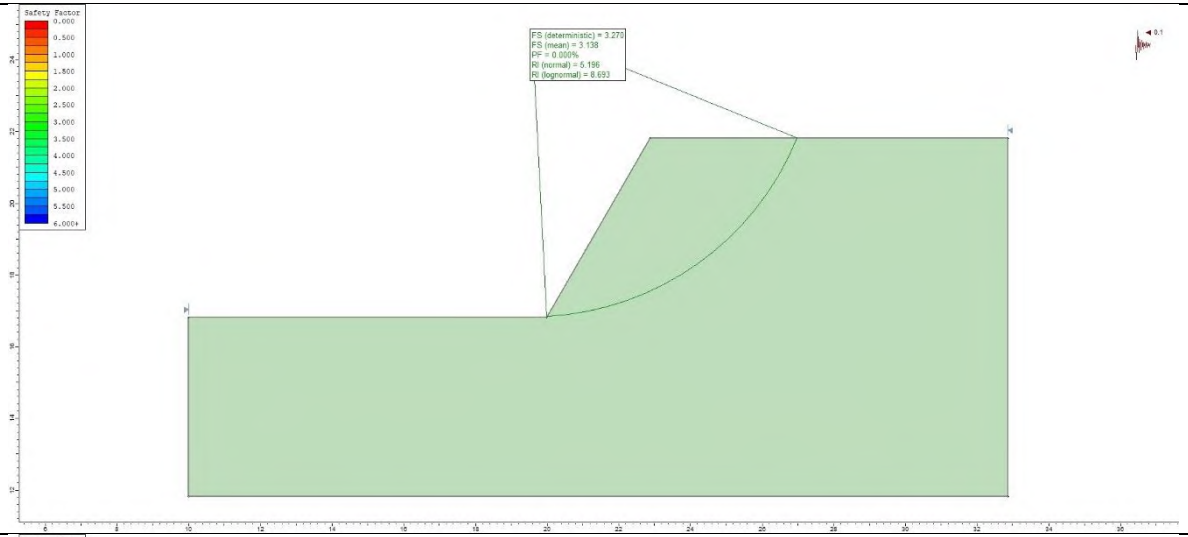
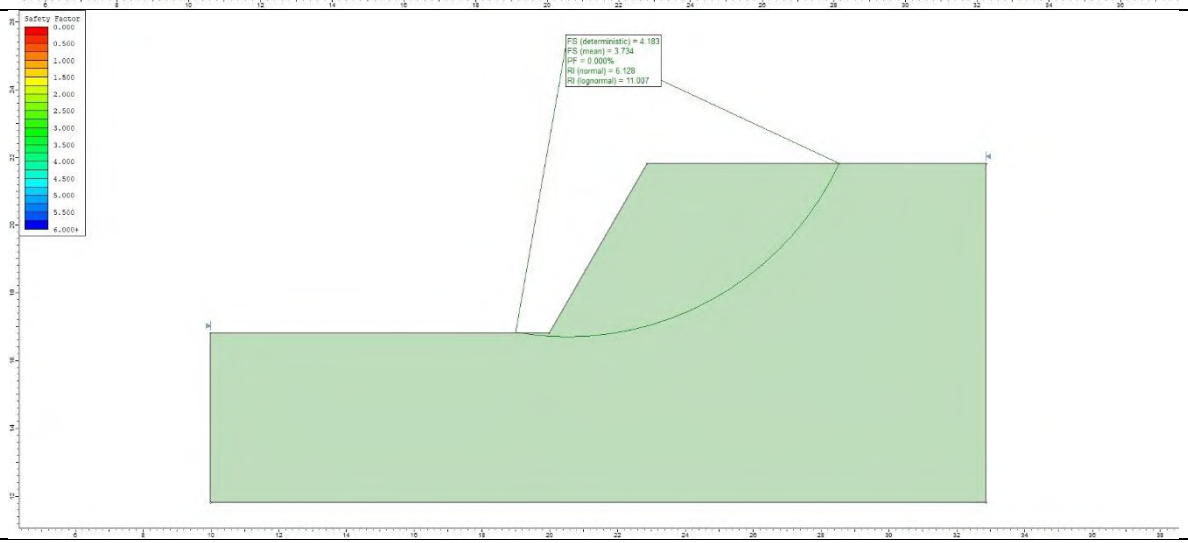
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=50	Dinamik		9,21
	Statik		11,10

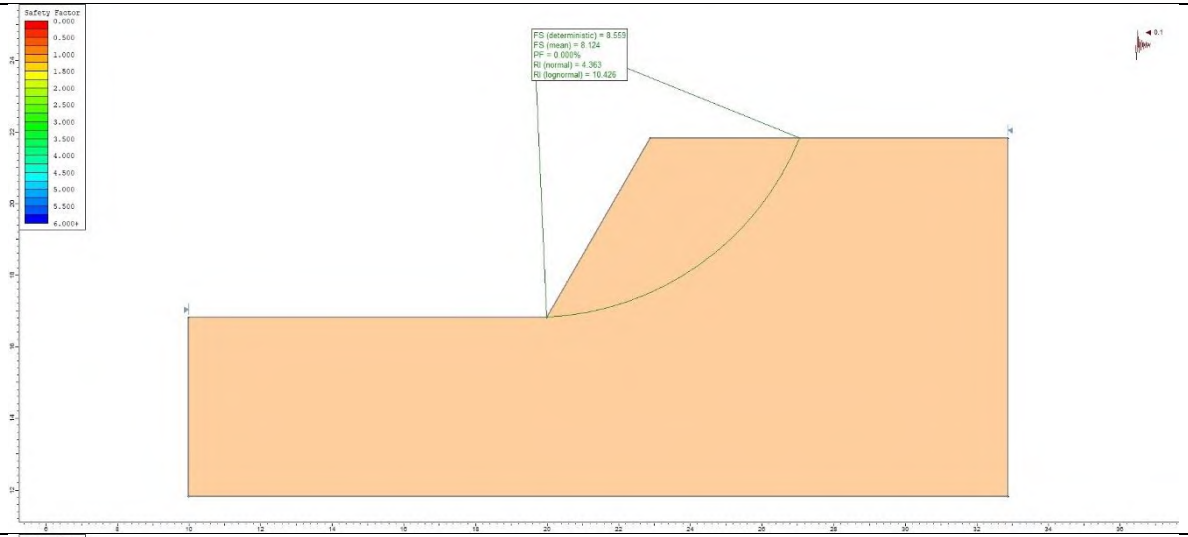
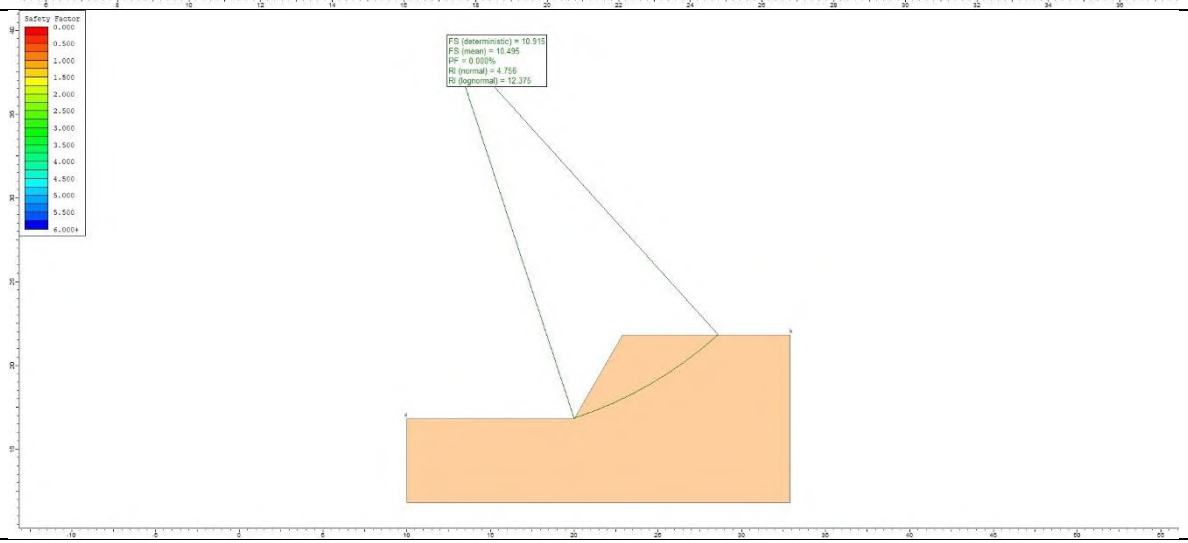
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=55	Dinamik		1,22
	Statik		1,39

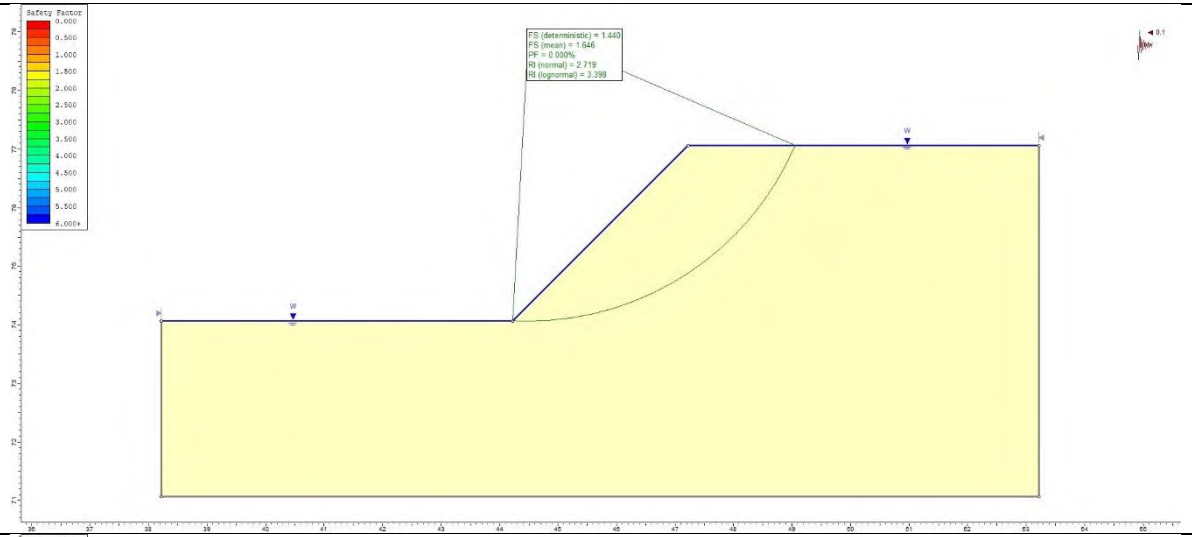
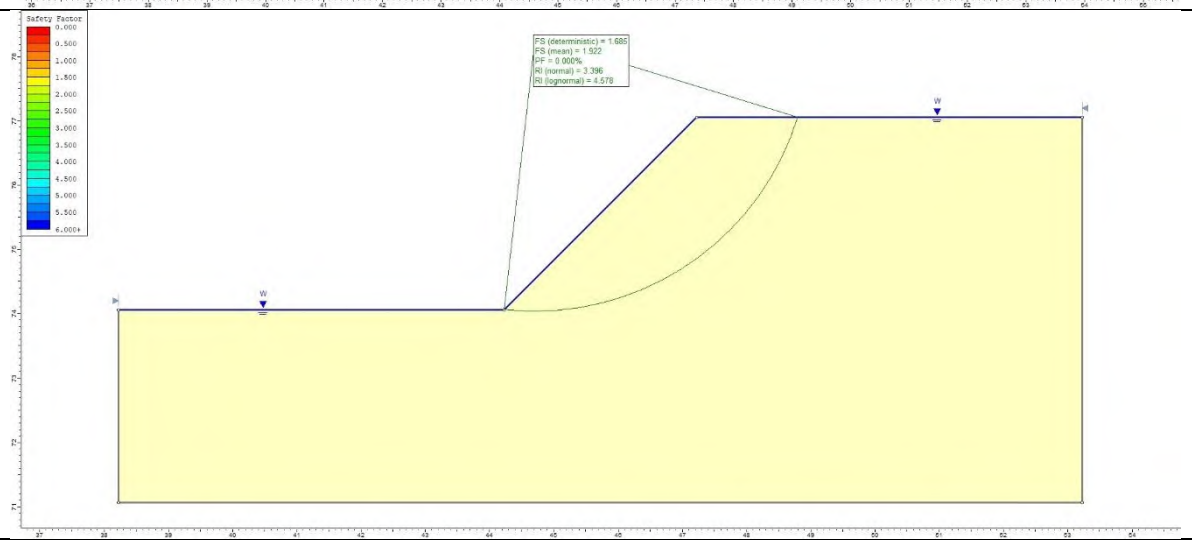
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=55	Dinamik		3,41
	Statik		4,20

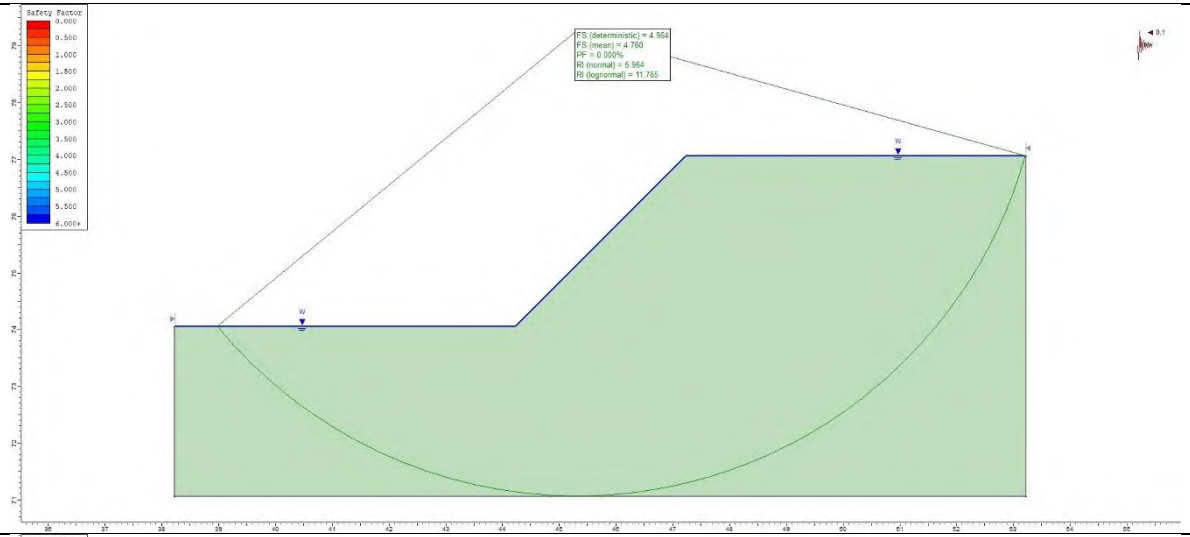
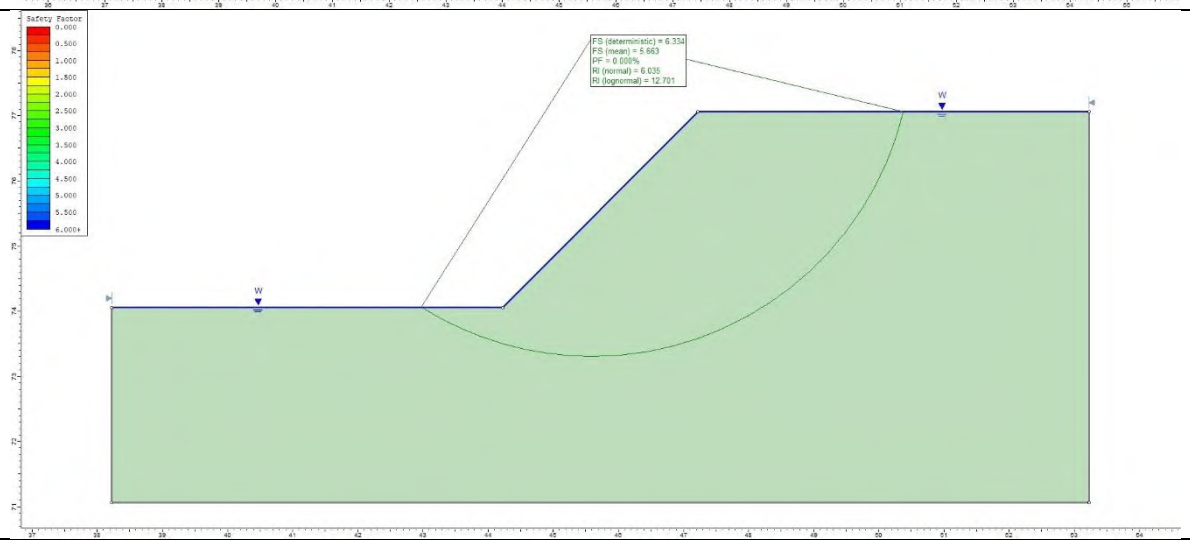
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=55	Dinamik		8,92
	Statik		11,07

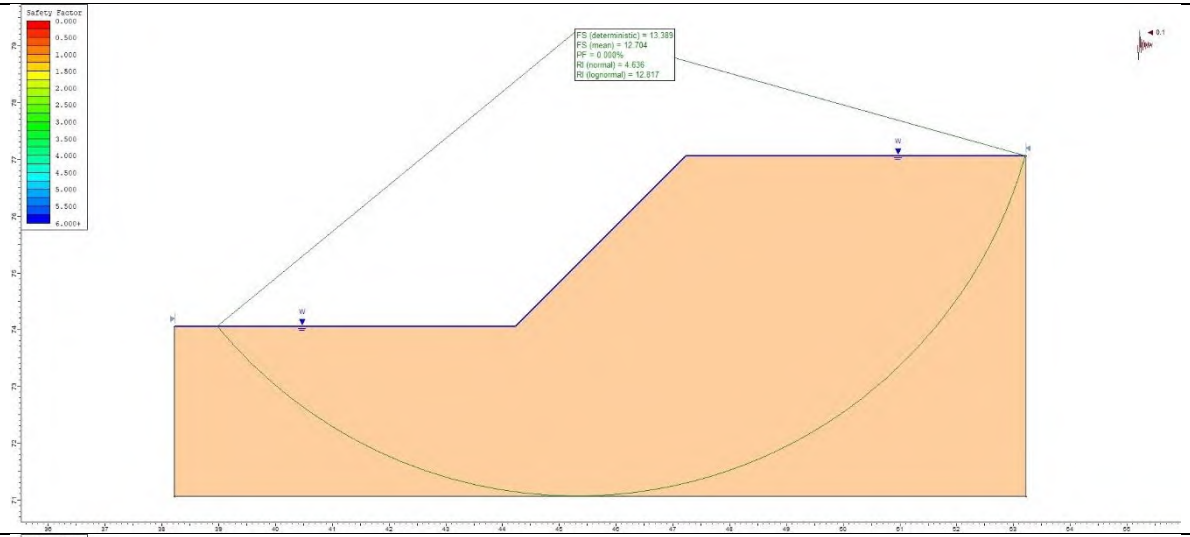
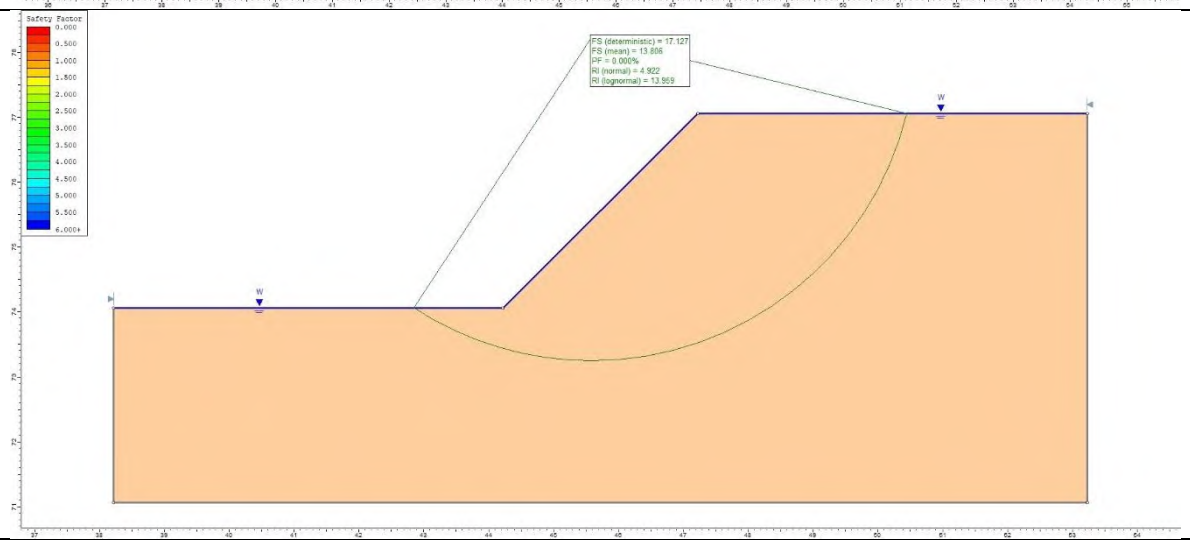
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=60	Dinamik		1,14
	Statik		1,30

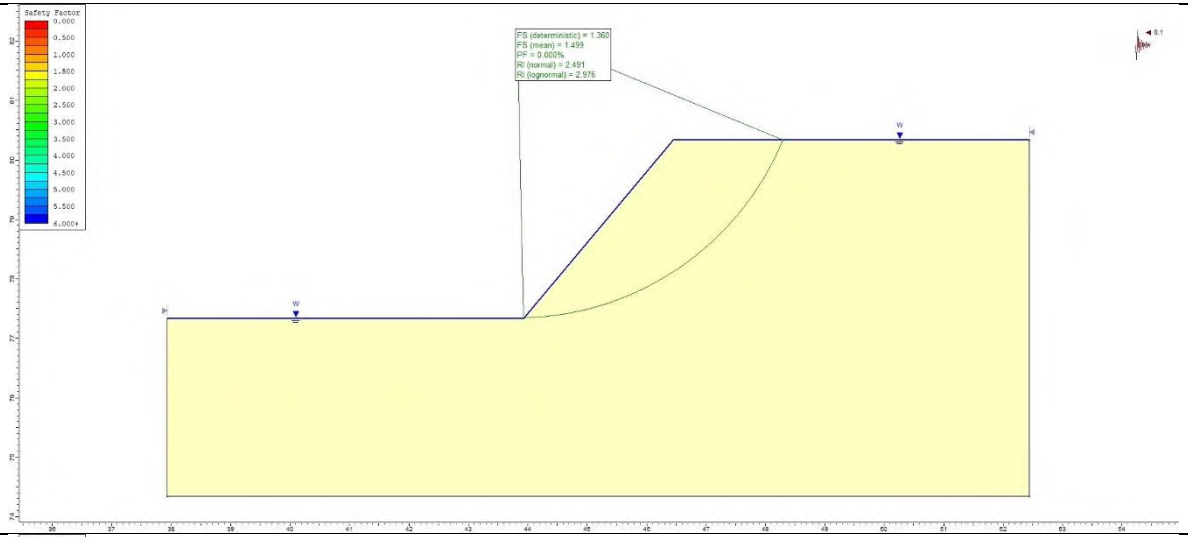
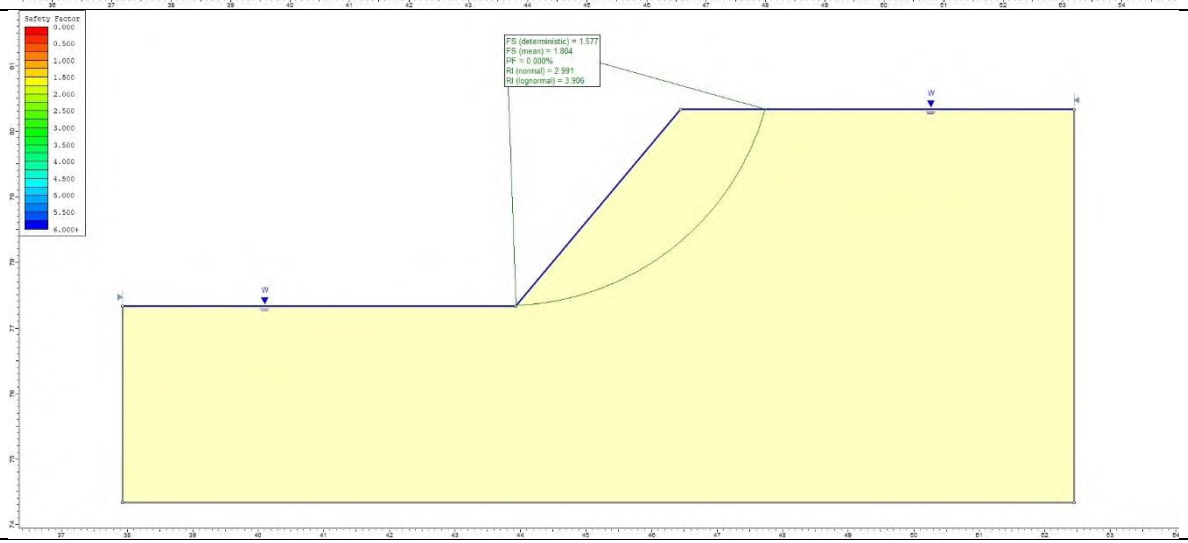
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=60	Dinamik		3,27
	Statik		4,18

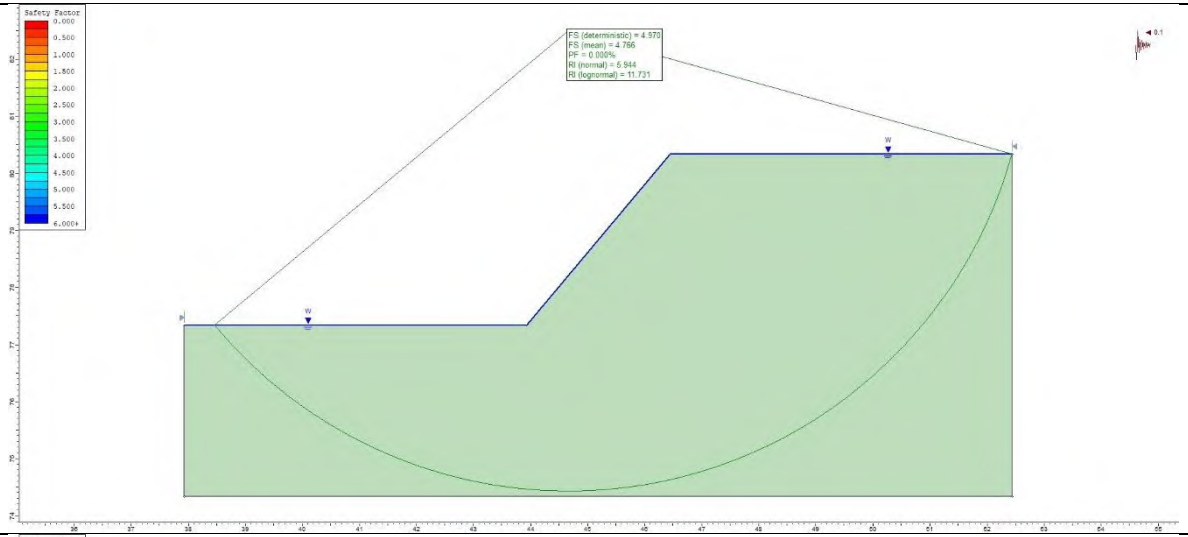
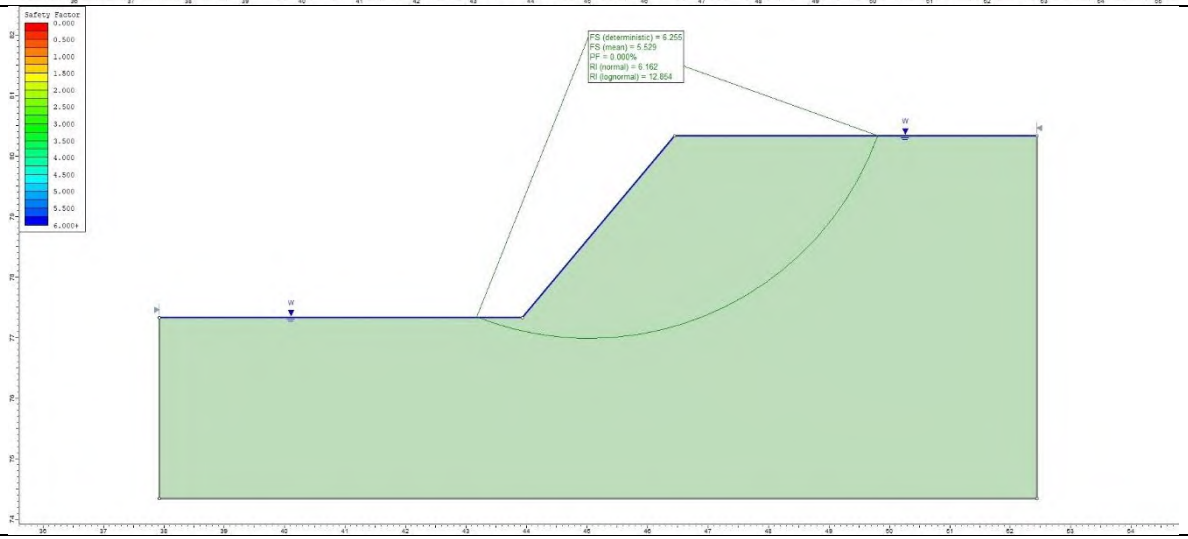
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=60	Dinamik		8,56
	Statik		10,91

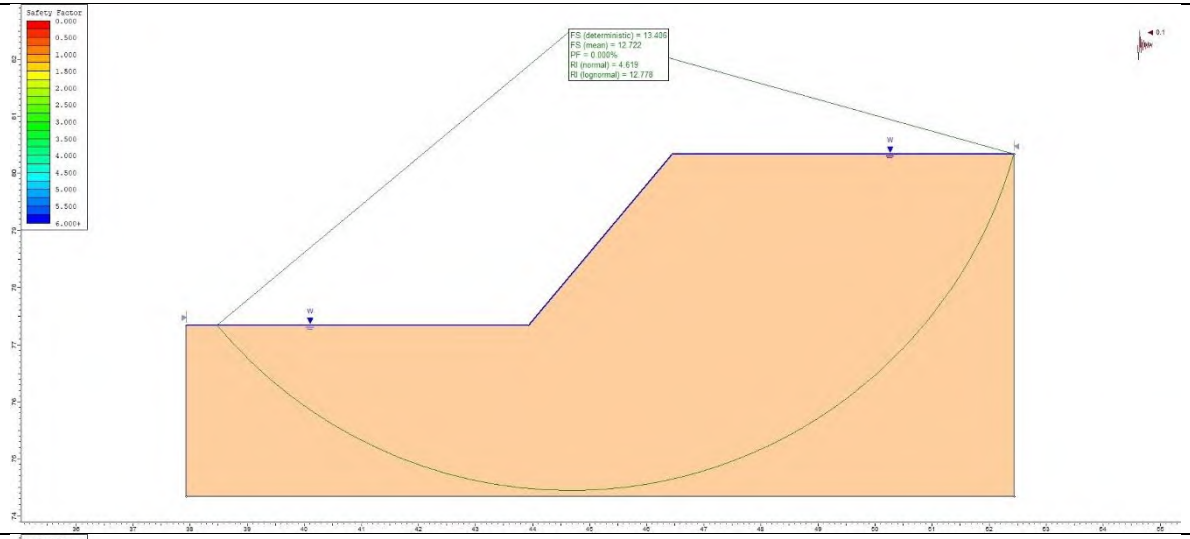
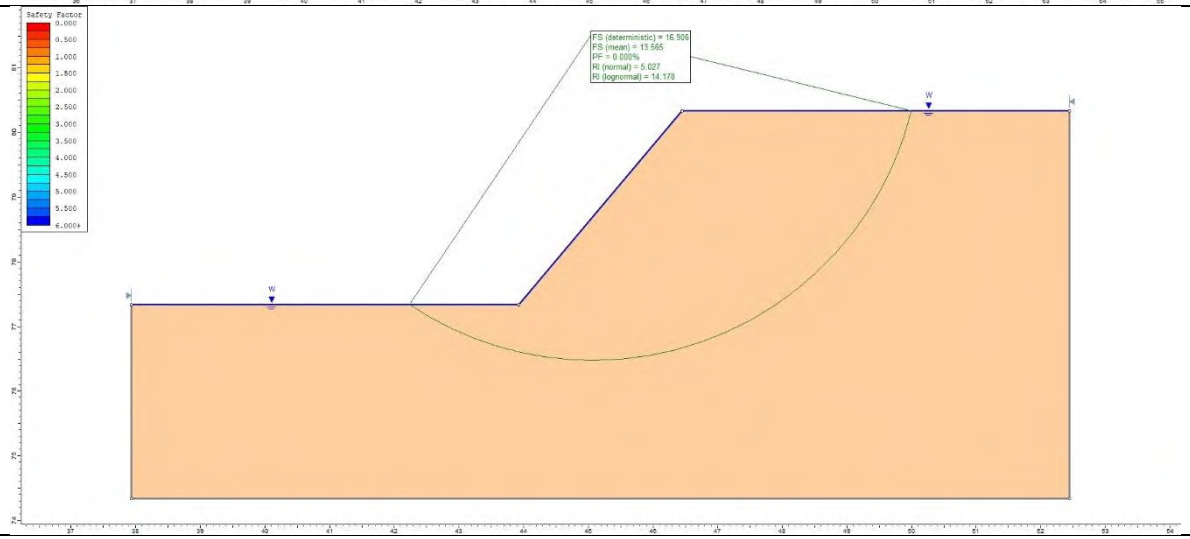
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=45	Dinamik		1,44
	Statik		1,68

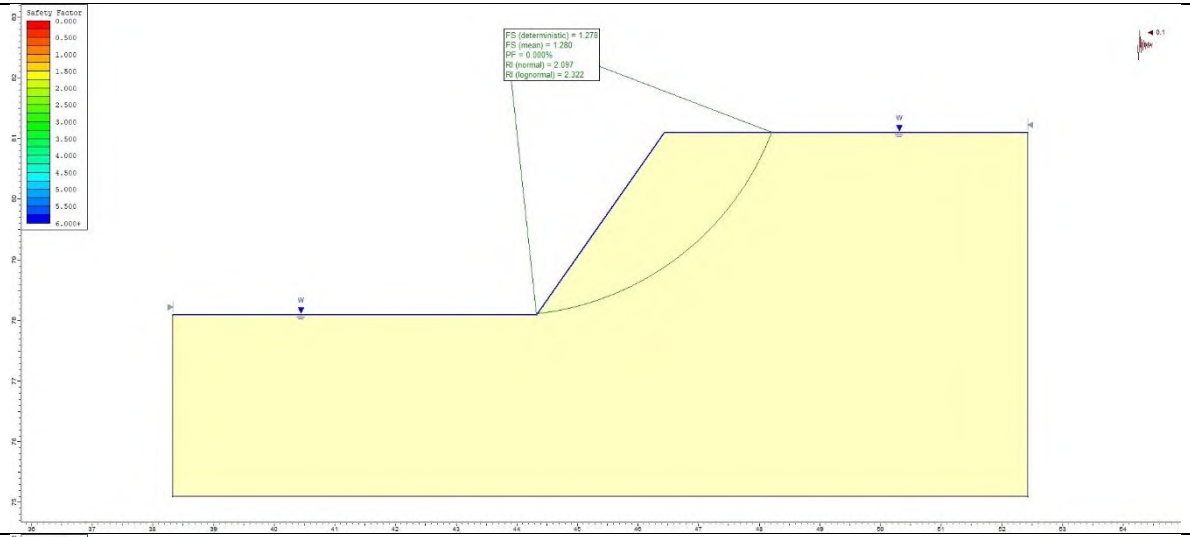
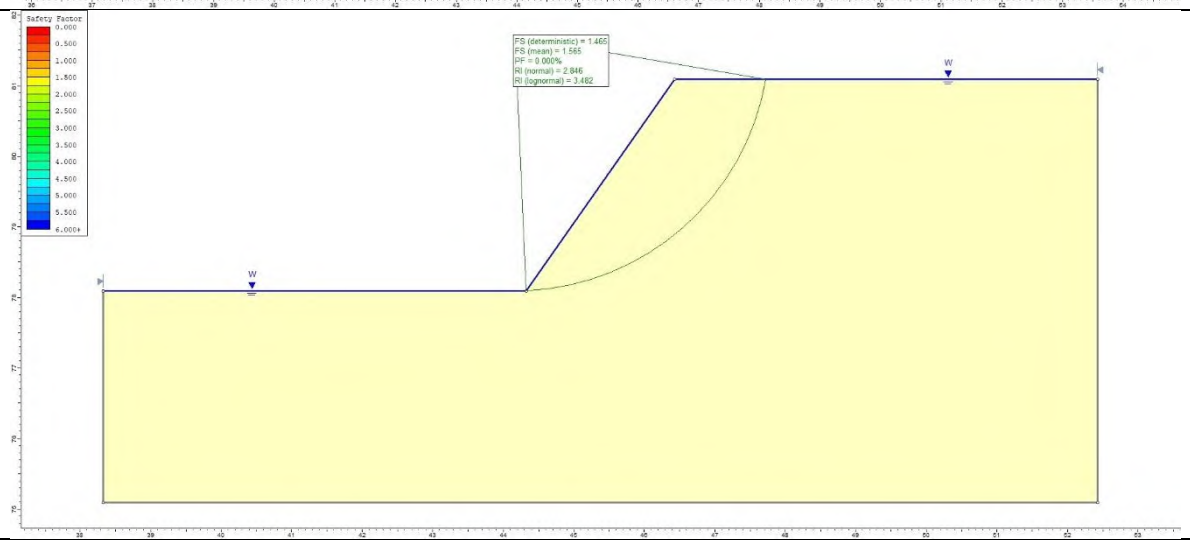
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=45	Dinamik		4,96
	Statik		6,33

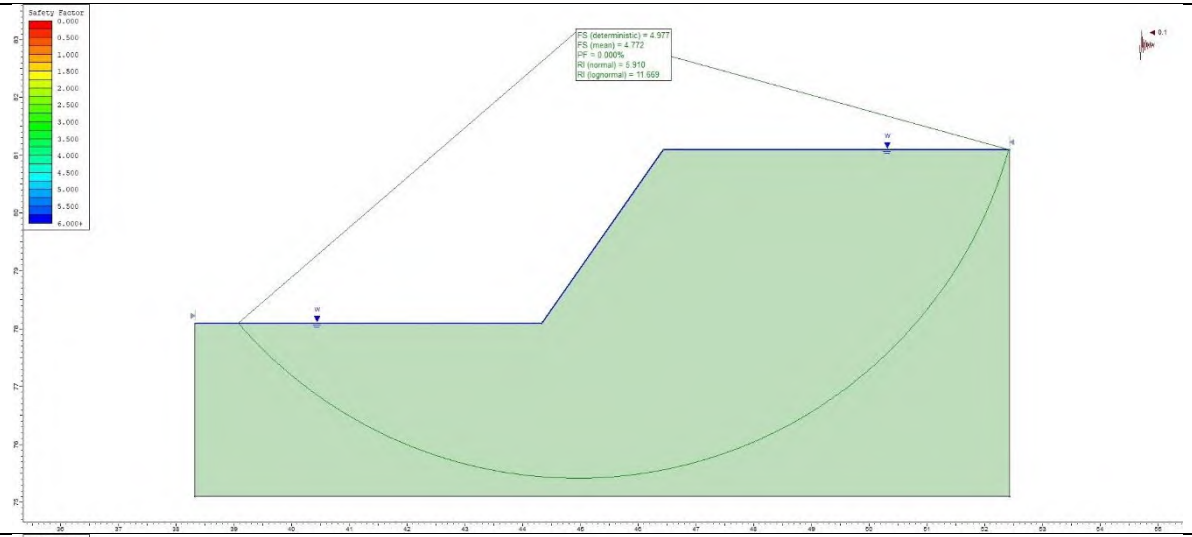
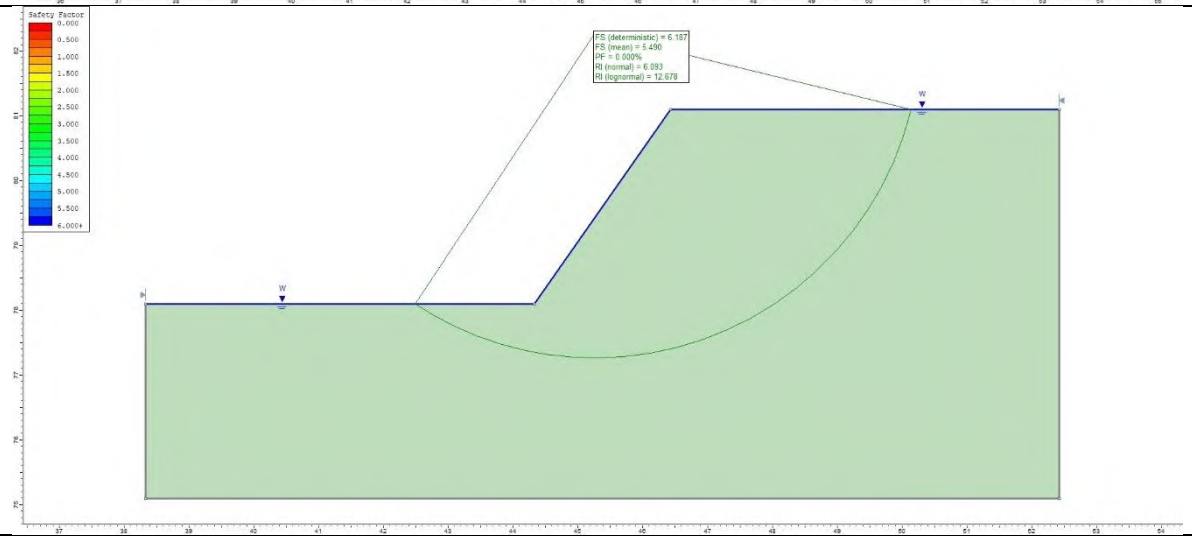
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=45	Dinamik		13,39
	Statik		17,13

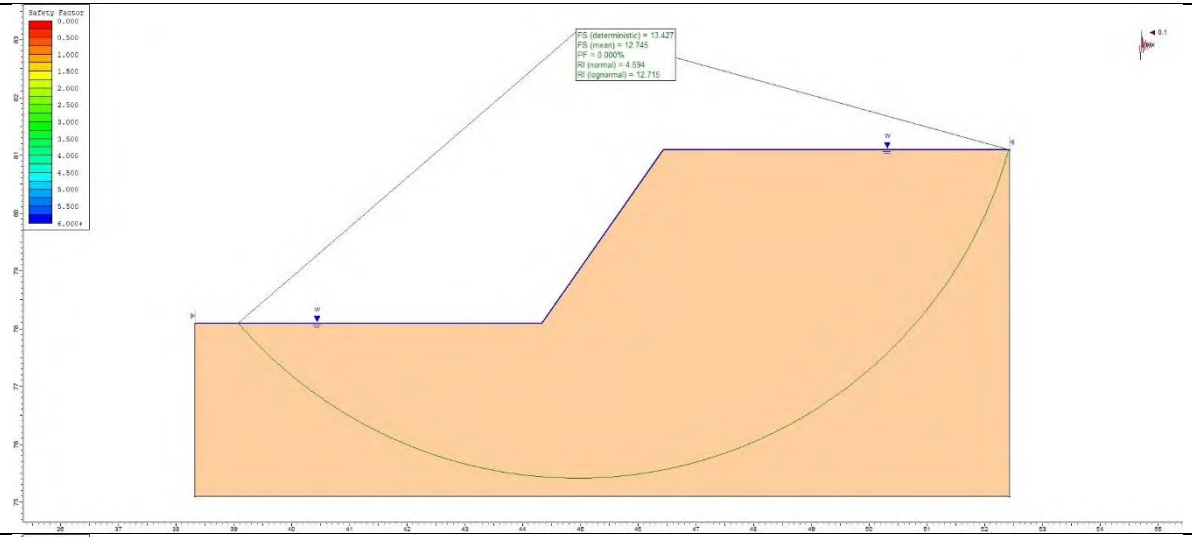
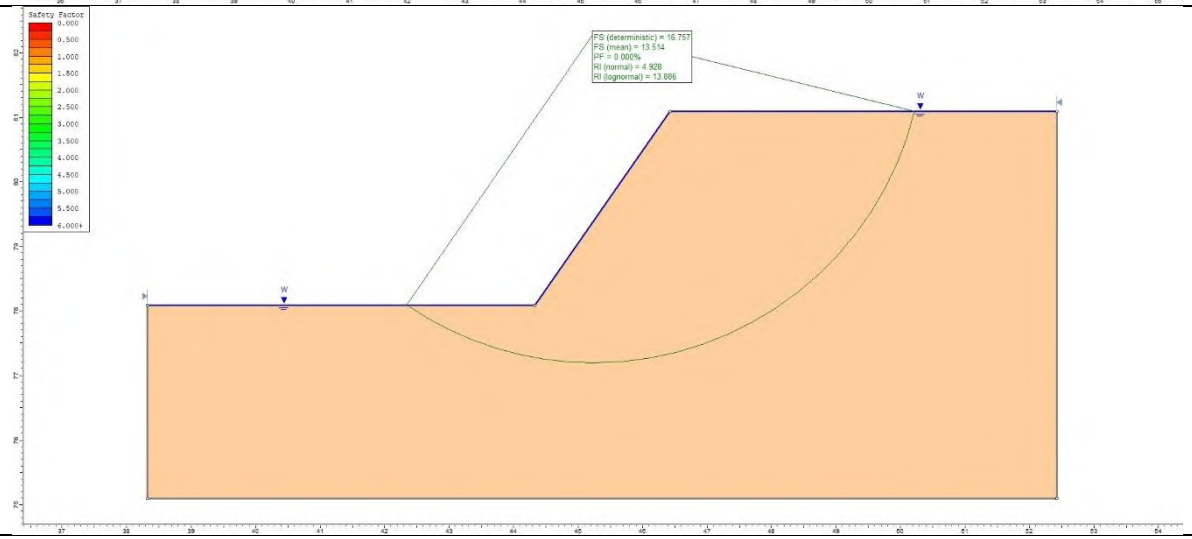
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=50	Dinamik		1,36
	Statik		1,58

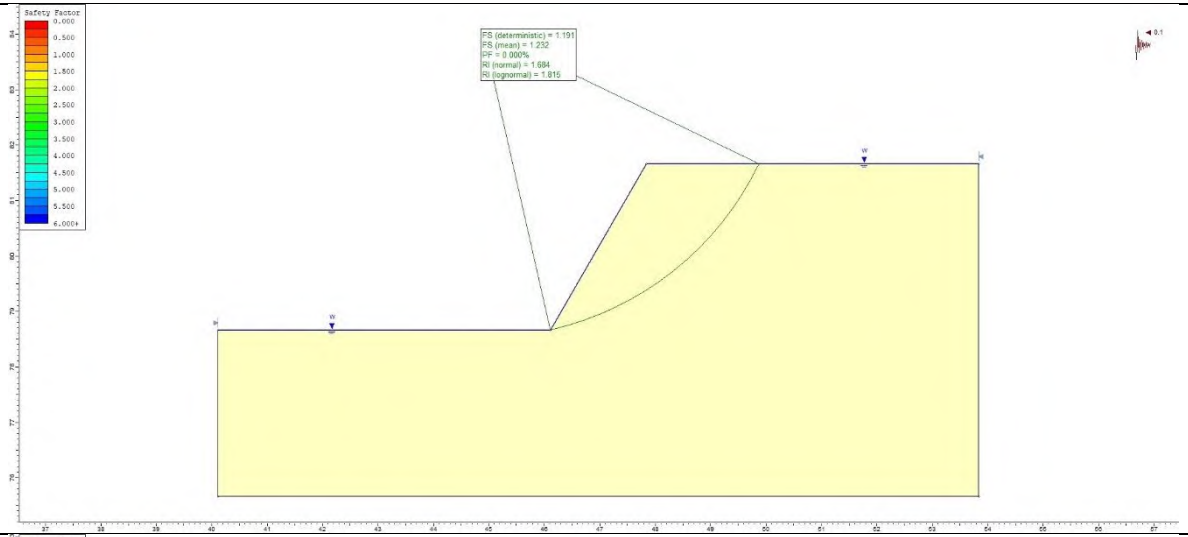
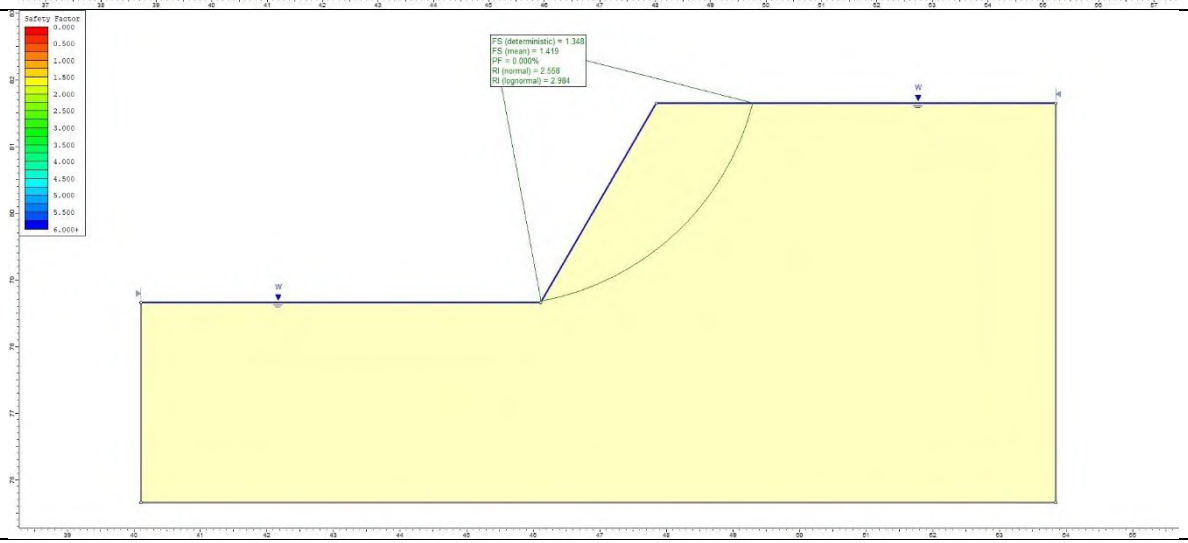
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=50	Dinamik		4,97
	Statik		6,25

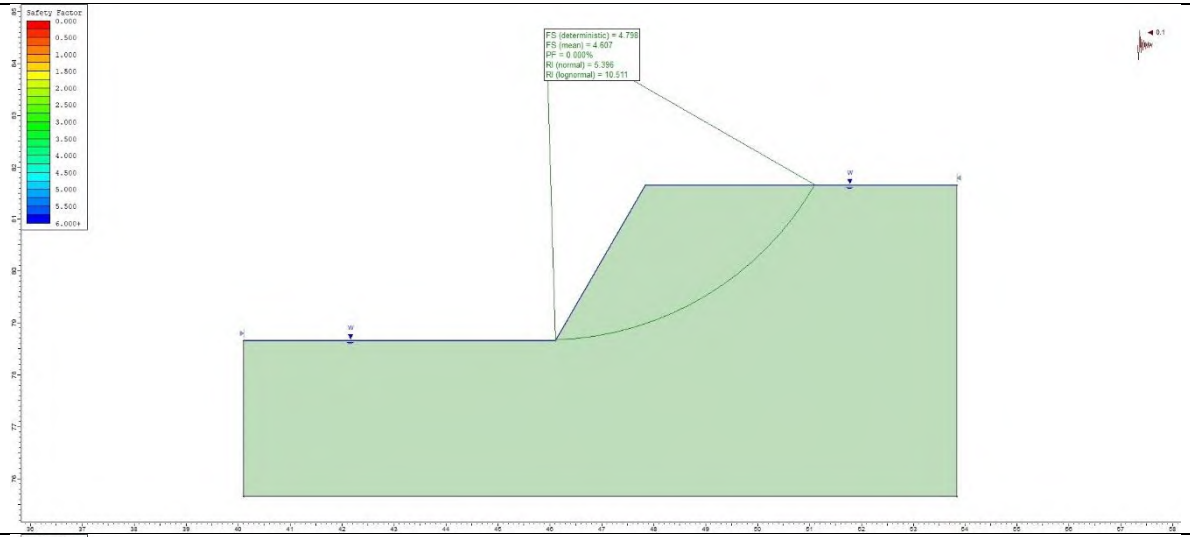
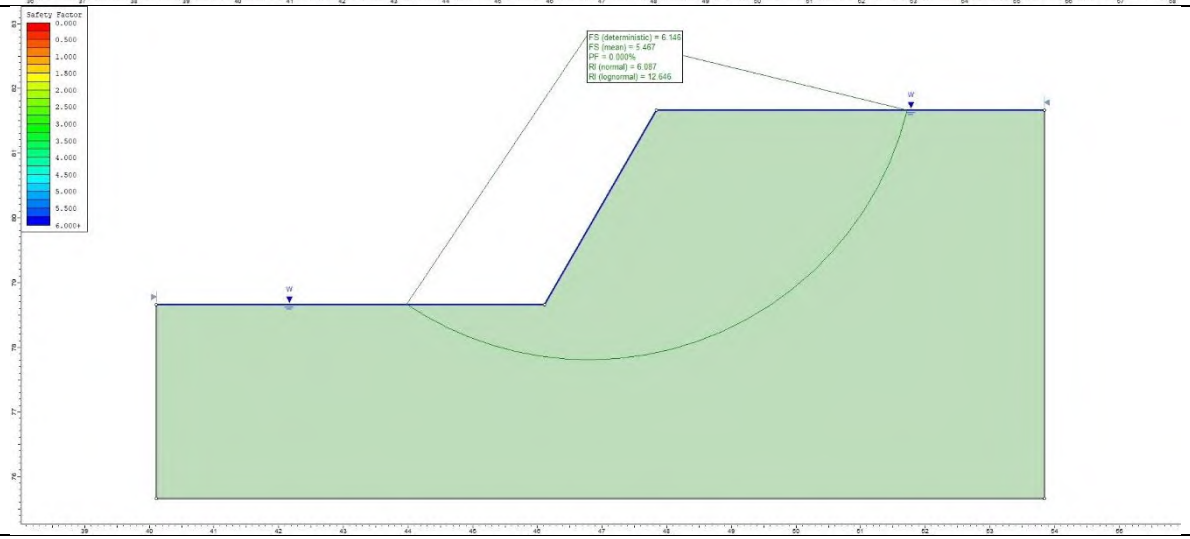
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=50	Dinamik		13,41
	Statik		16,61

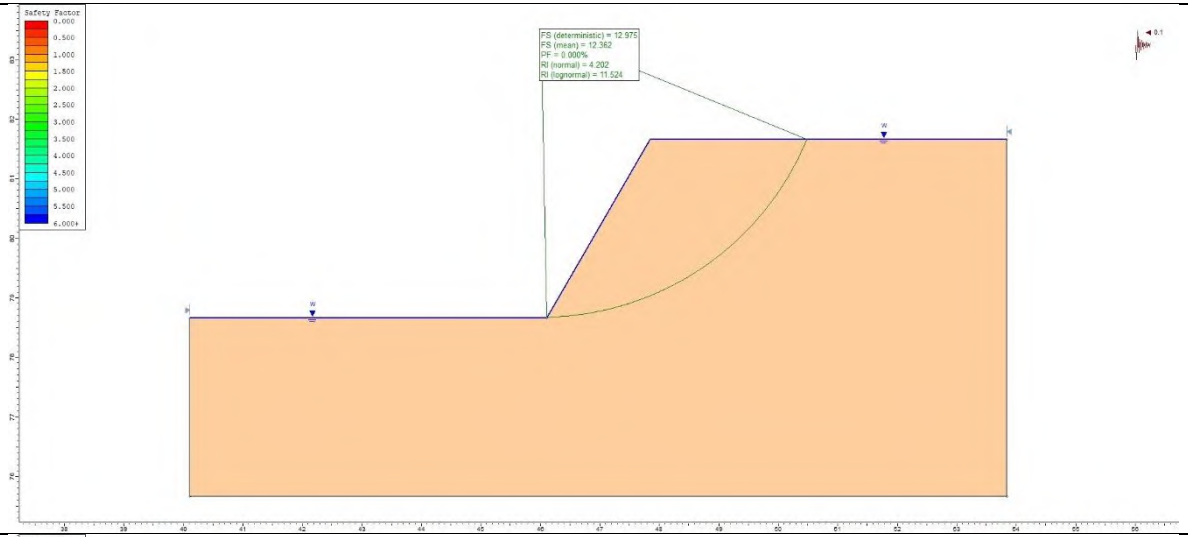
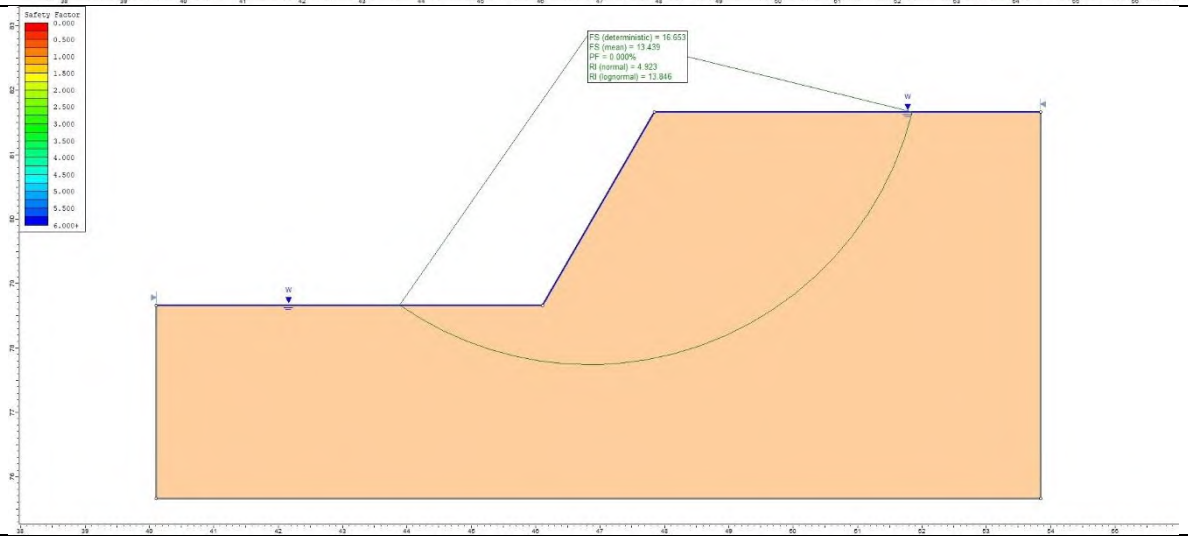
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=55	Dinamik		1,29
	Statik		1,46

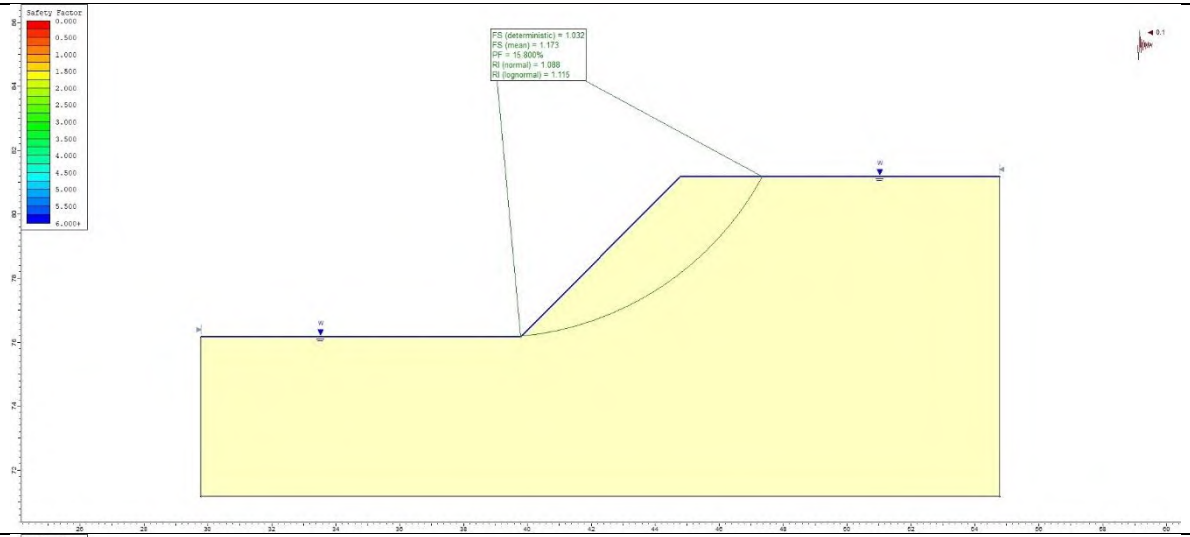
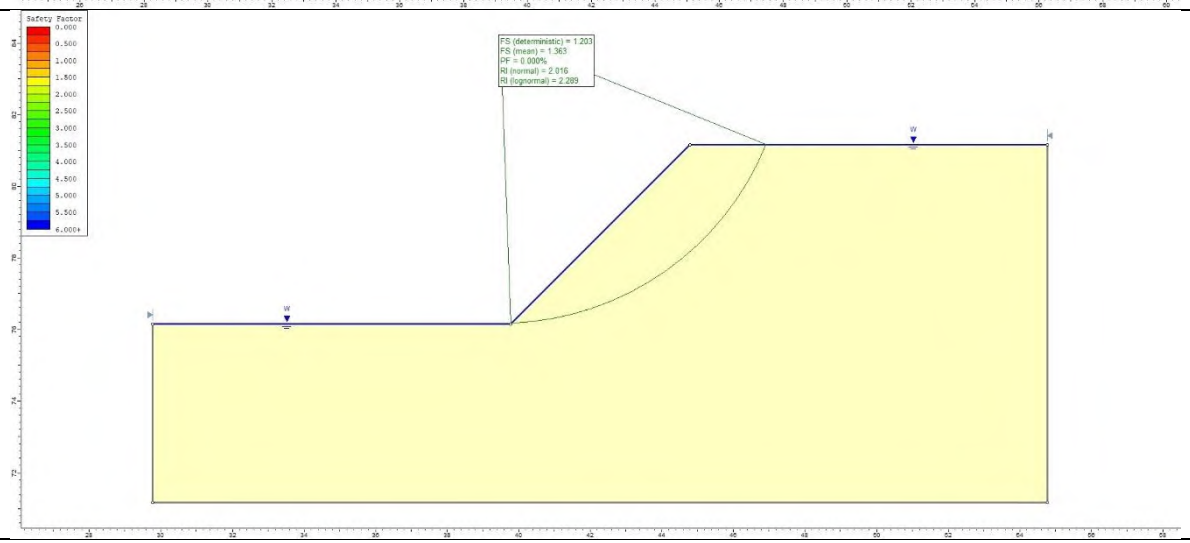
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=55	Dinamik		4,97
	Statik		6,19

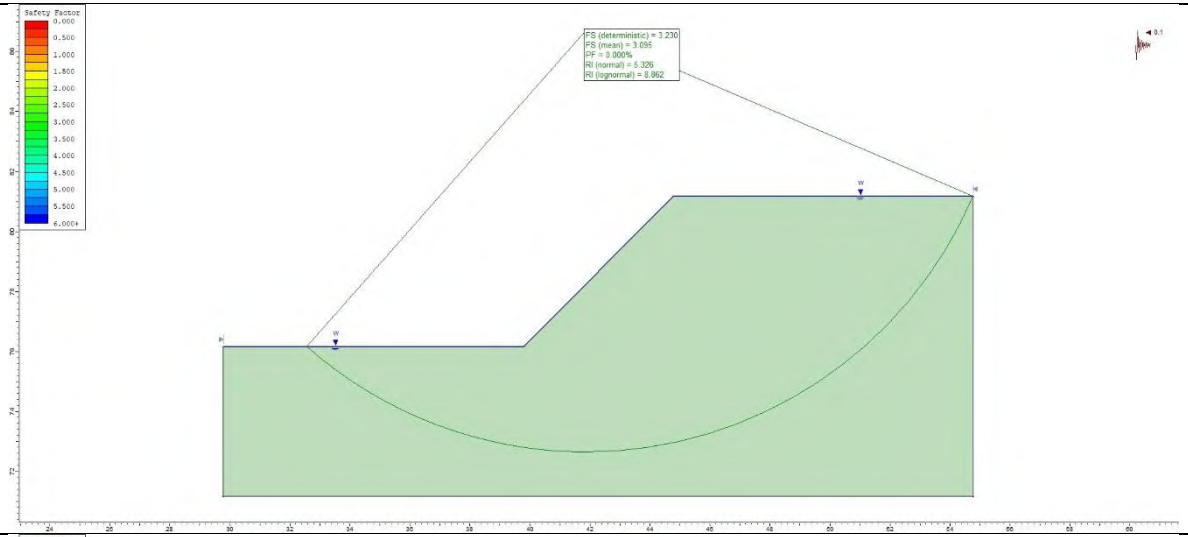
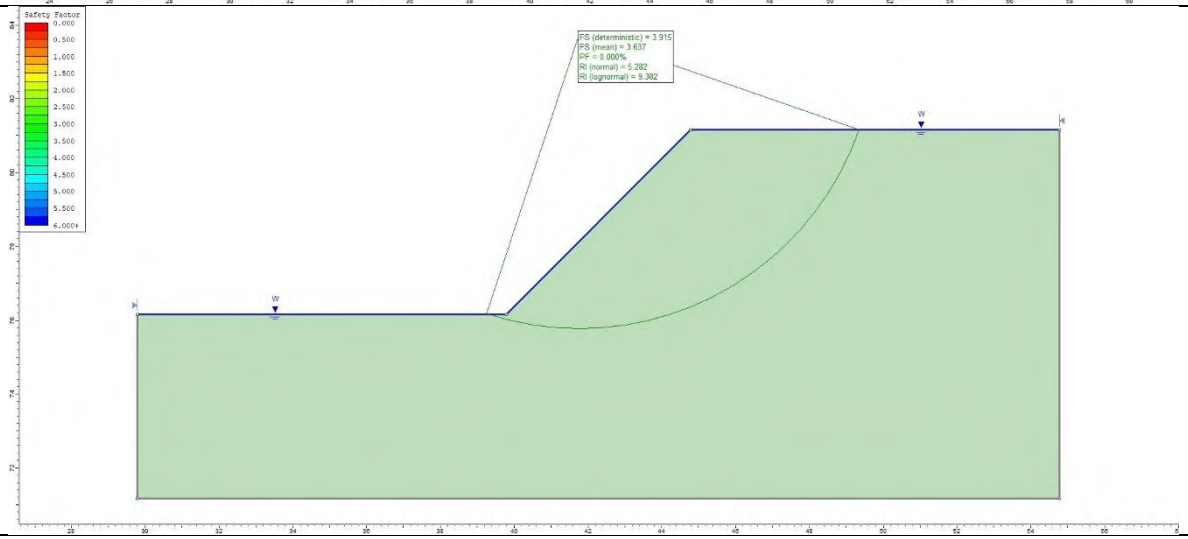
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=55	Dinamik		13,43
	Statik		16,76

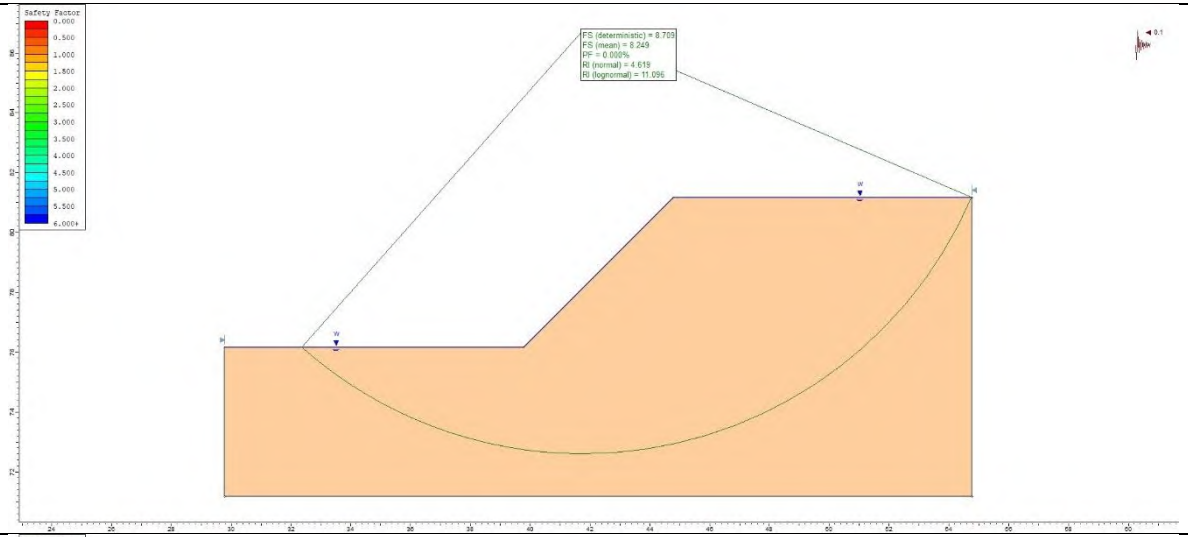
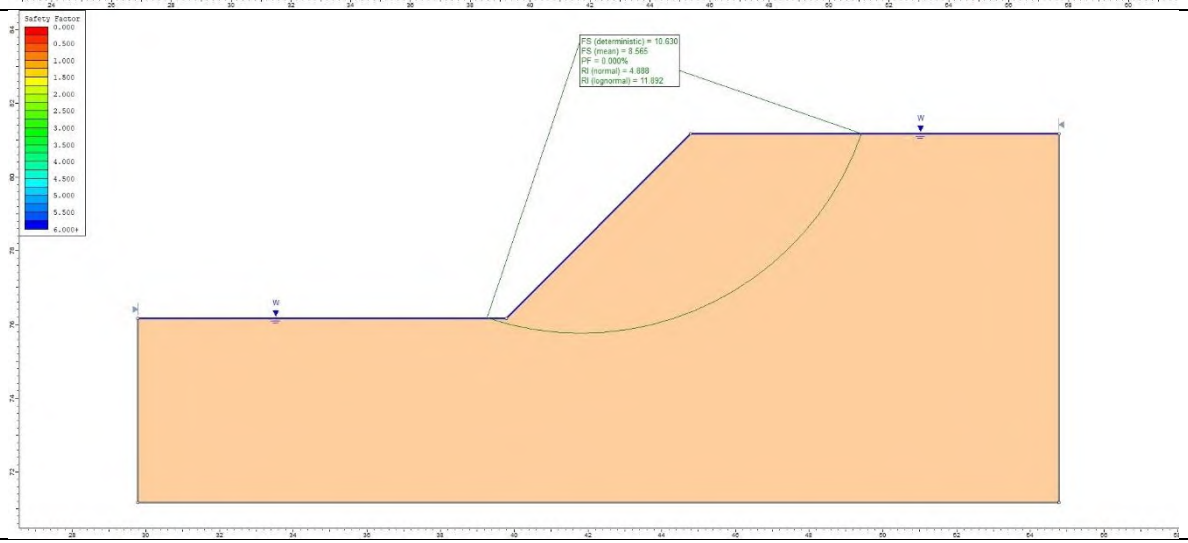
Limonite			
Lereng	Kondisi	Gambar	FK
H=3 S=60	Dinamik		1,19
	Statik		1,35

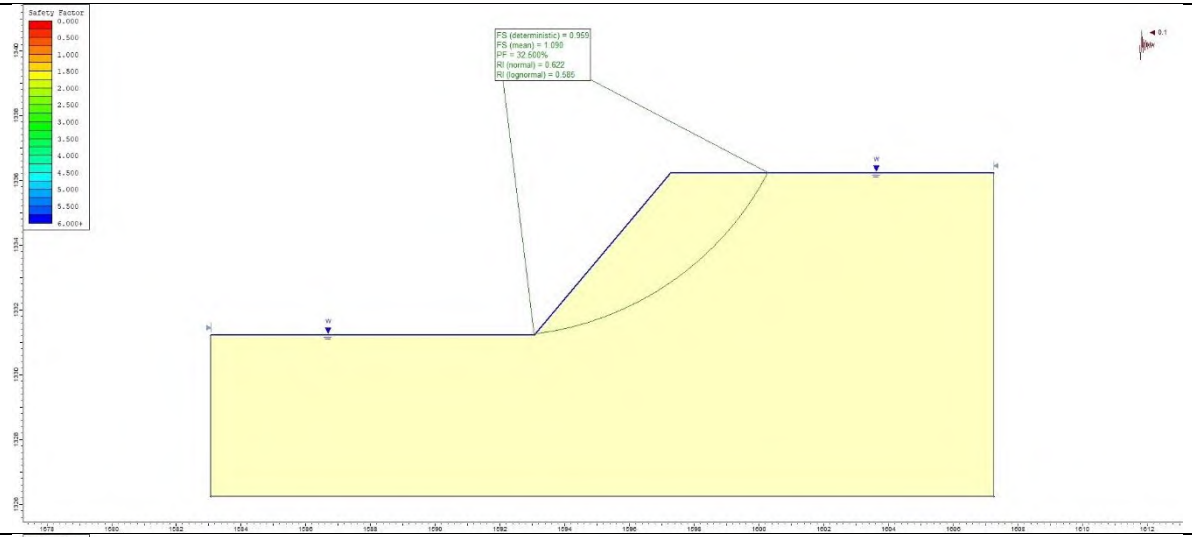
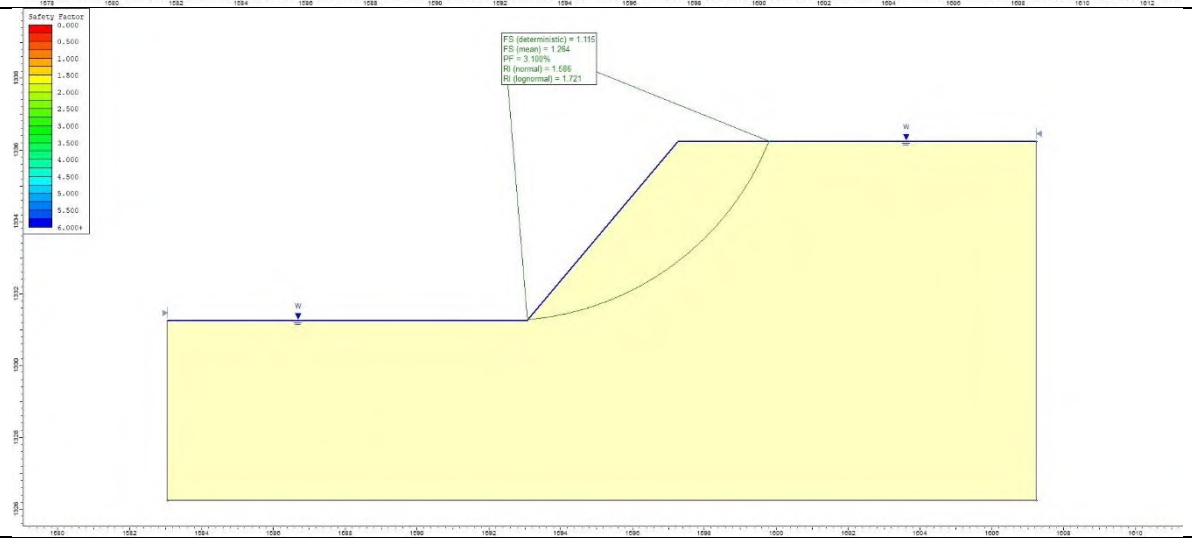
Saprolite			
Lereng	Kondisi	Gambar	FK
H=3 S=60	Dinamik		4,80
	Statik		6,15

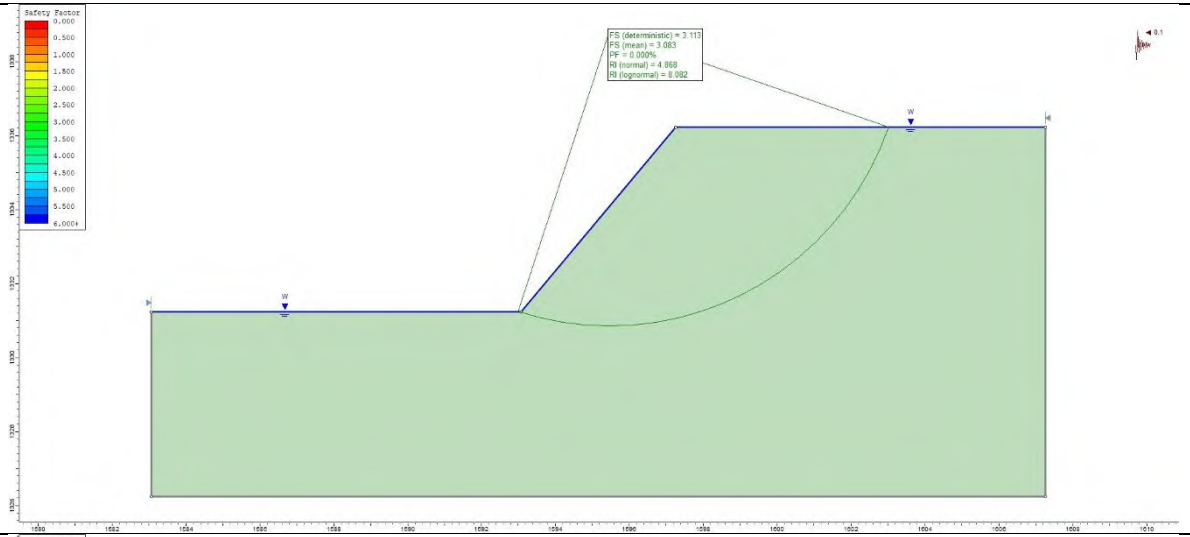
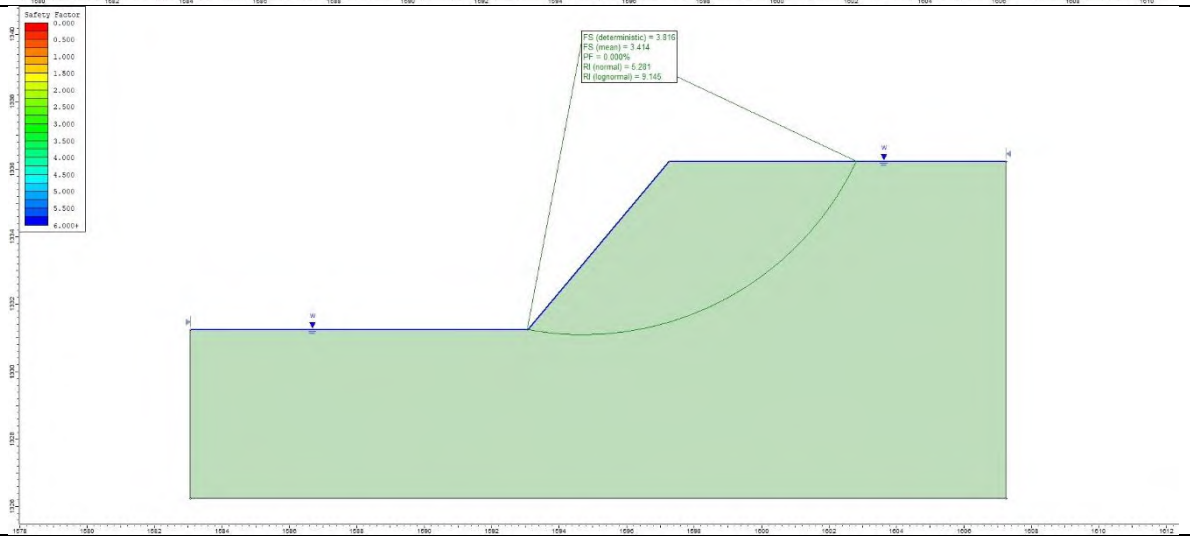
Bedrock			
Lereng	Kondisi	Gambar	FK
H=3 S=60	Dinamik		12,97
	Statik		16,65

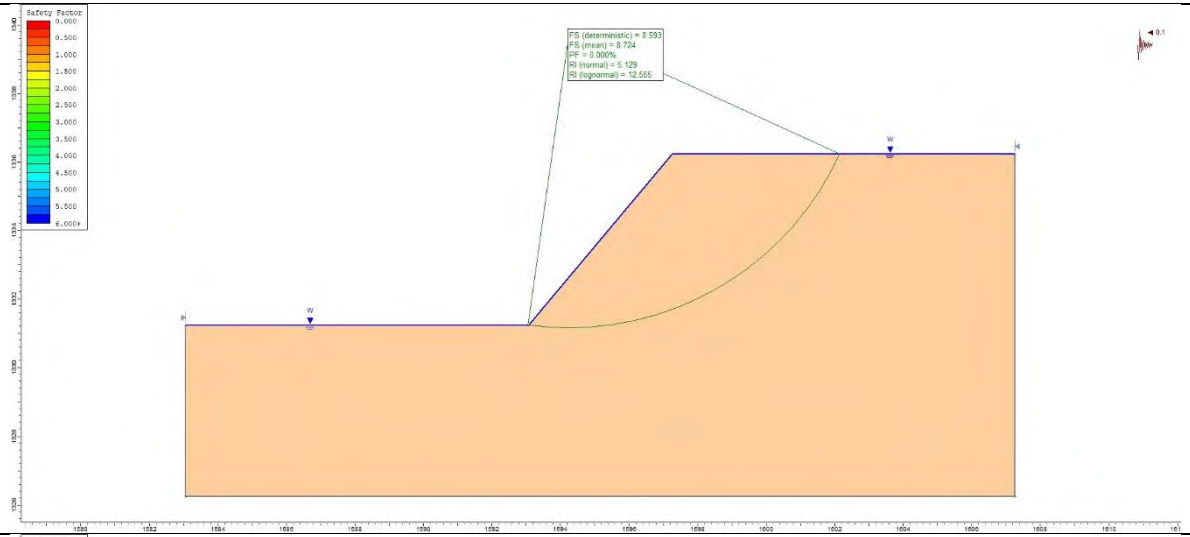
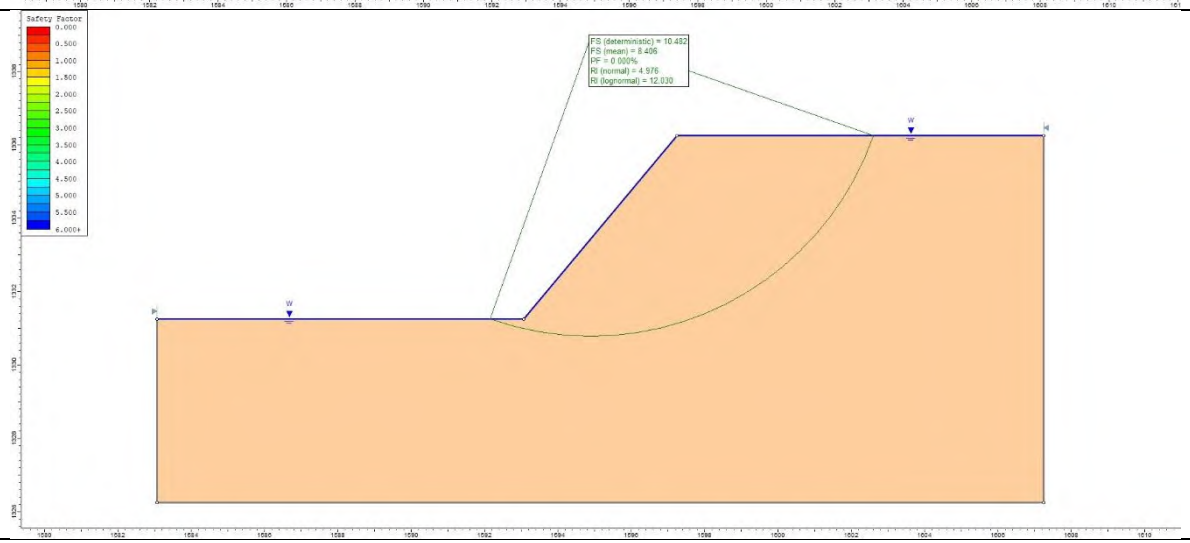
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=45	Dinamik		1,03
	Statik		1,20

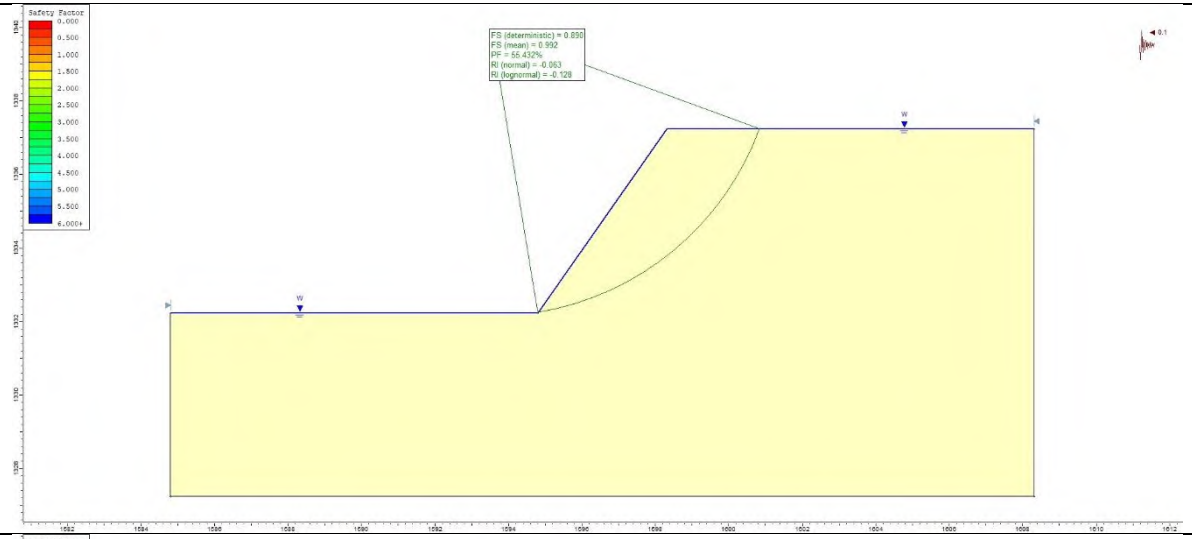
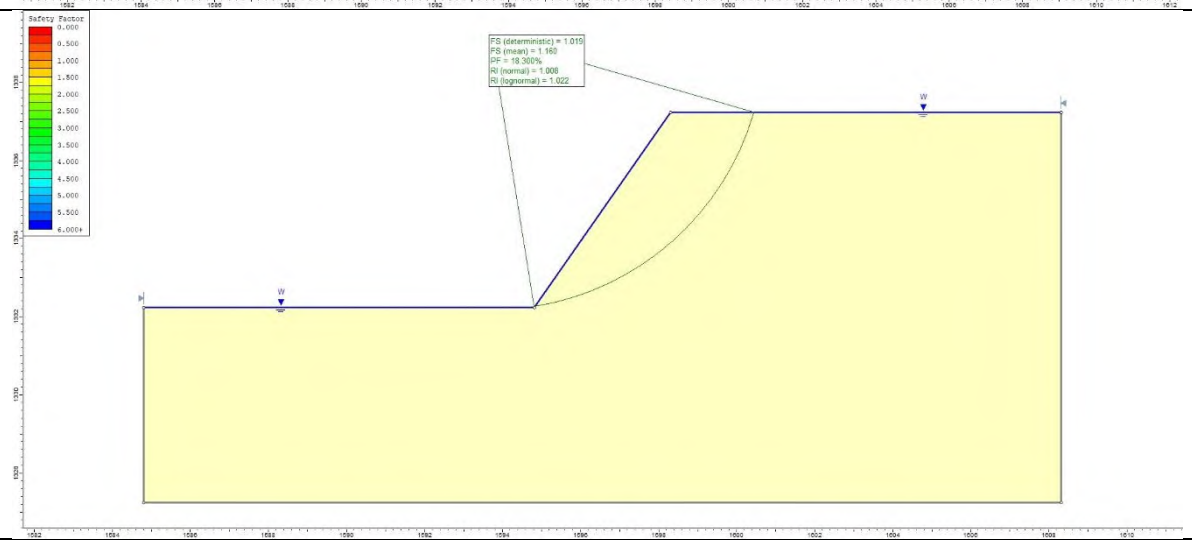
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=45	Dinamik		3,23
	Statik		3,91

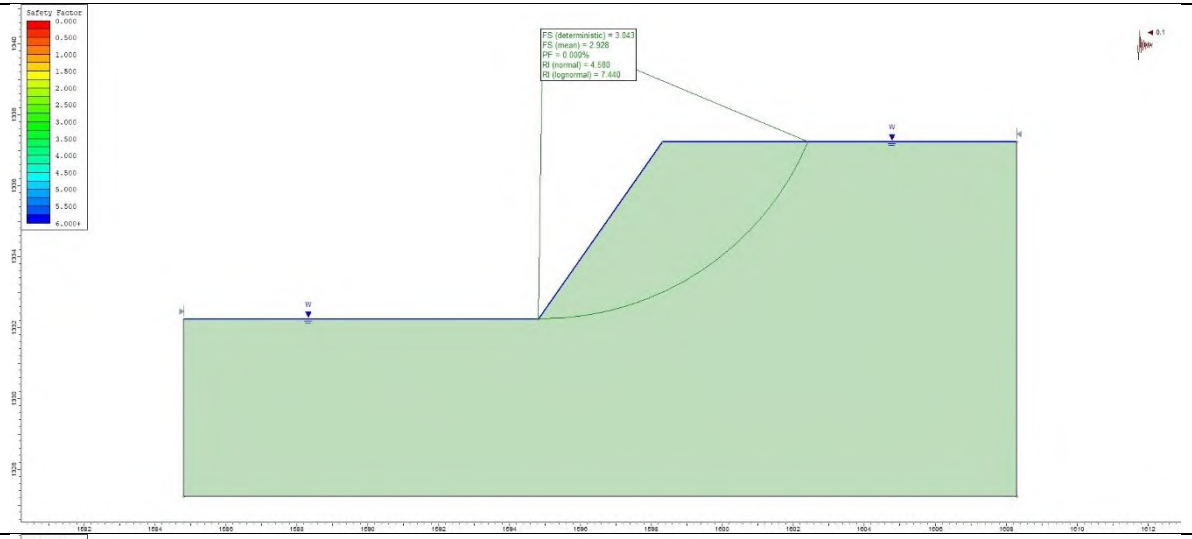
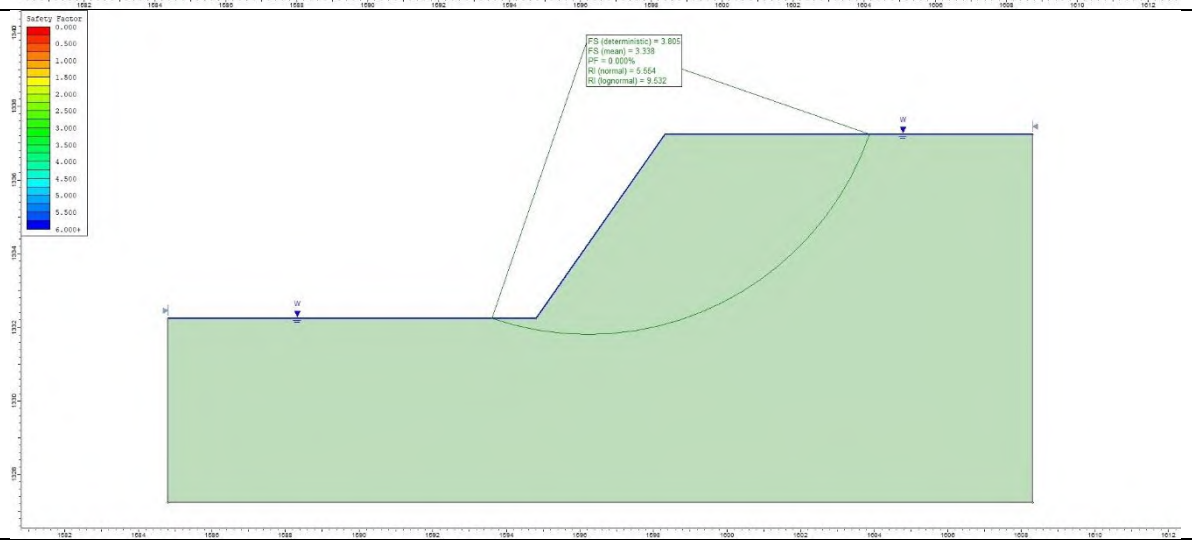
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=45	Dinamik		8,71
	Statik		10,63

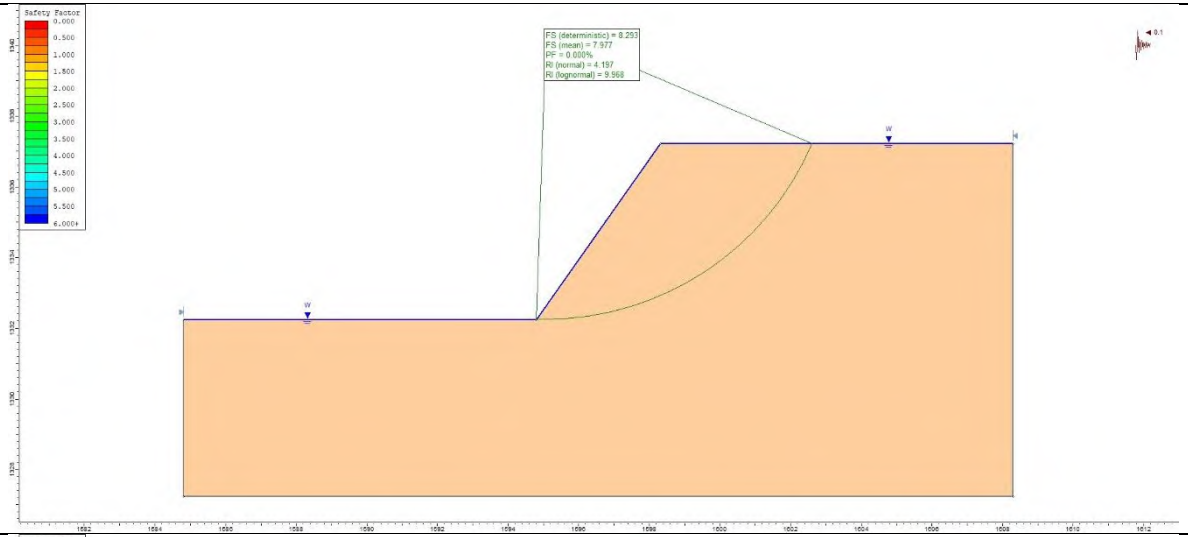
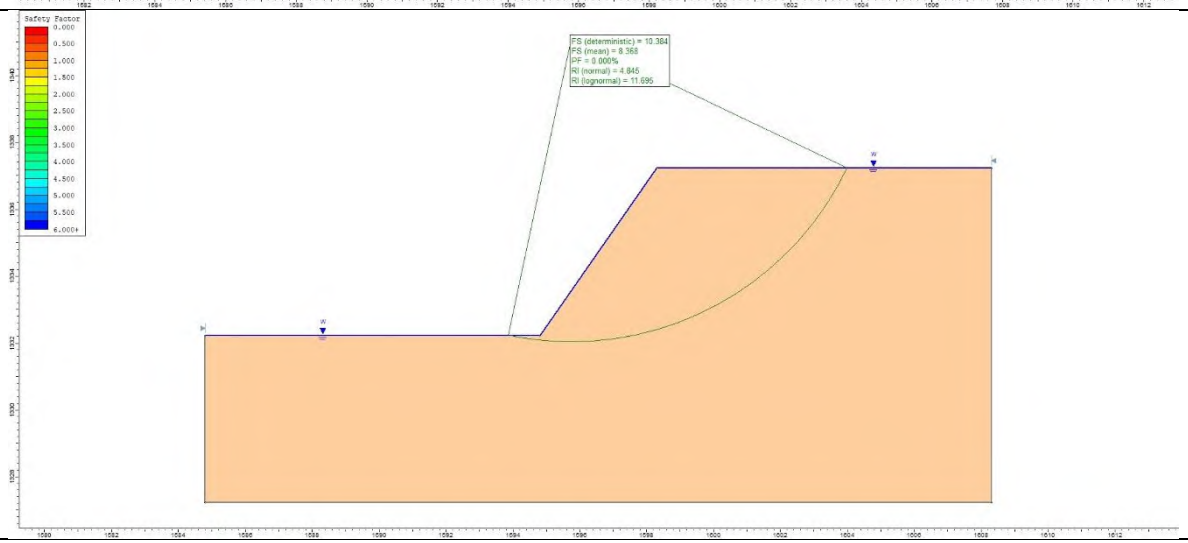
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=50	Dinamik		0,96
	Statik		1,11

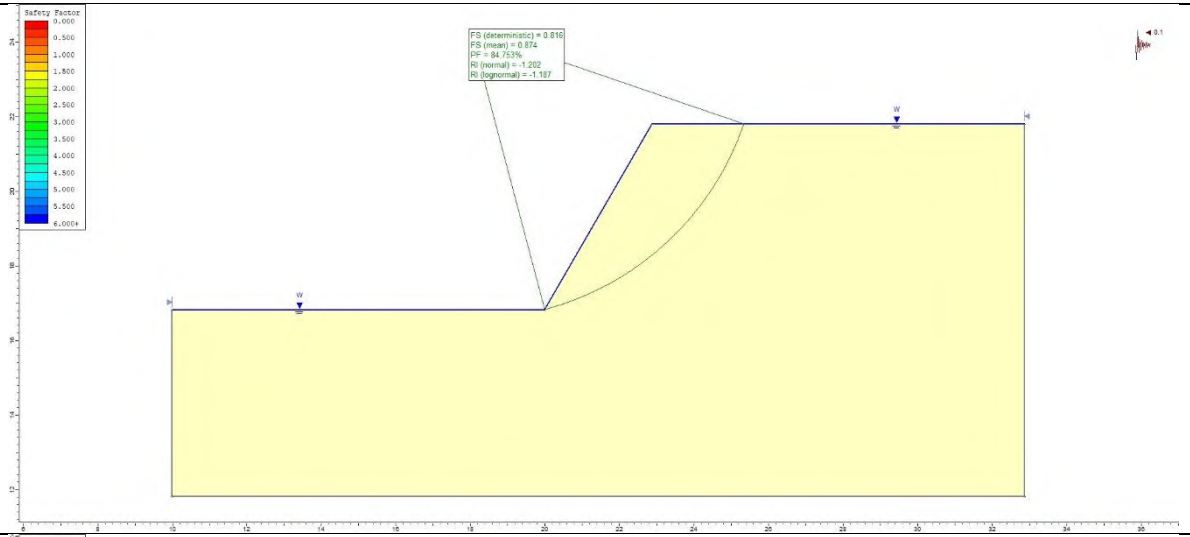
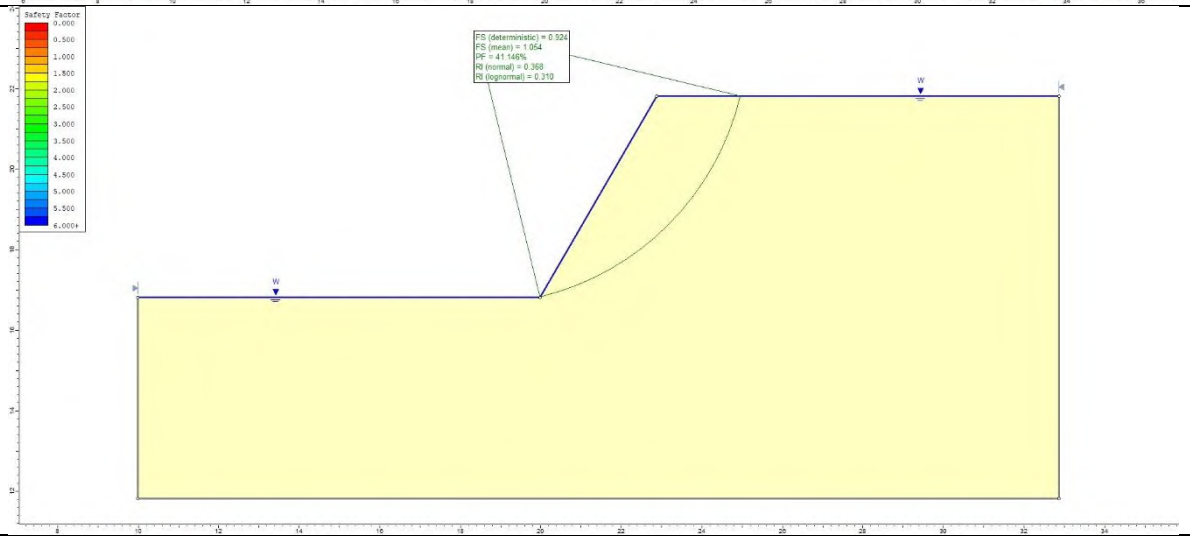
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=50	Dinamik		3,11
	Statik		3,82

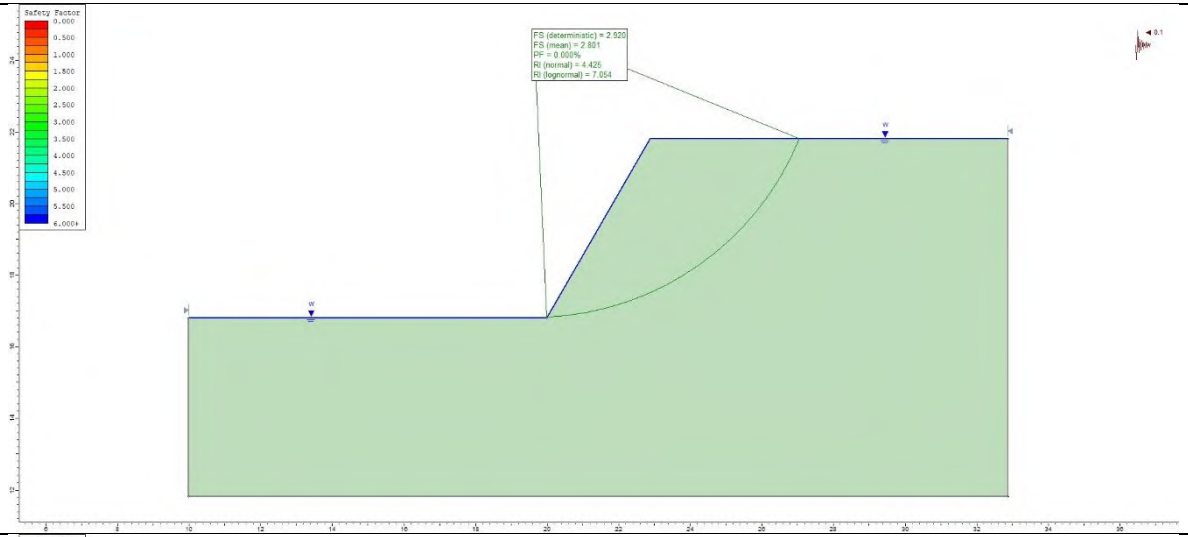
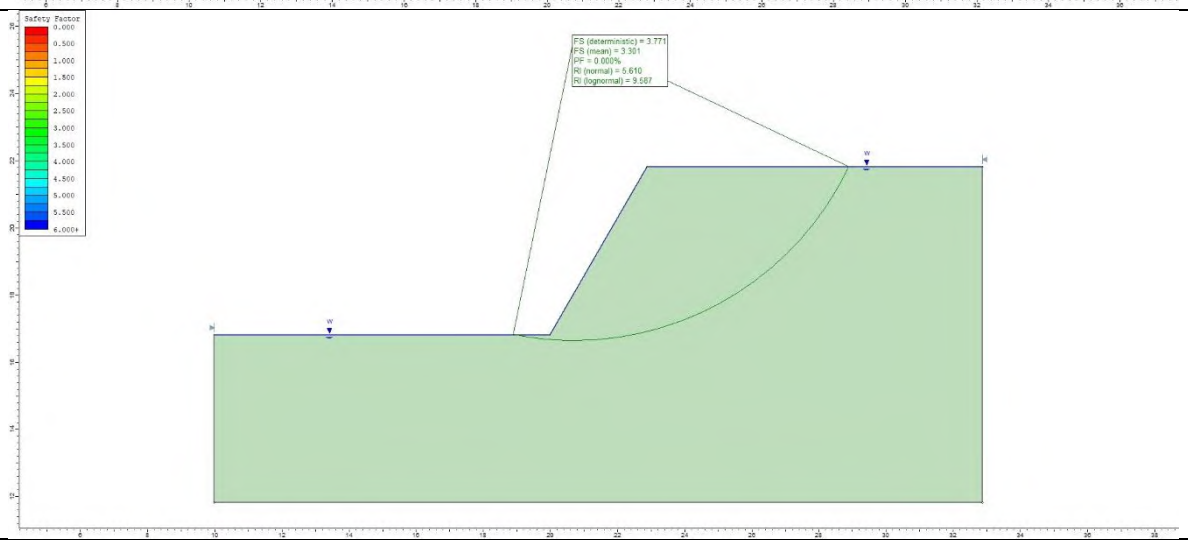
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=50	Dinamik		8,59
	Statik		10,48

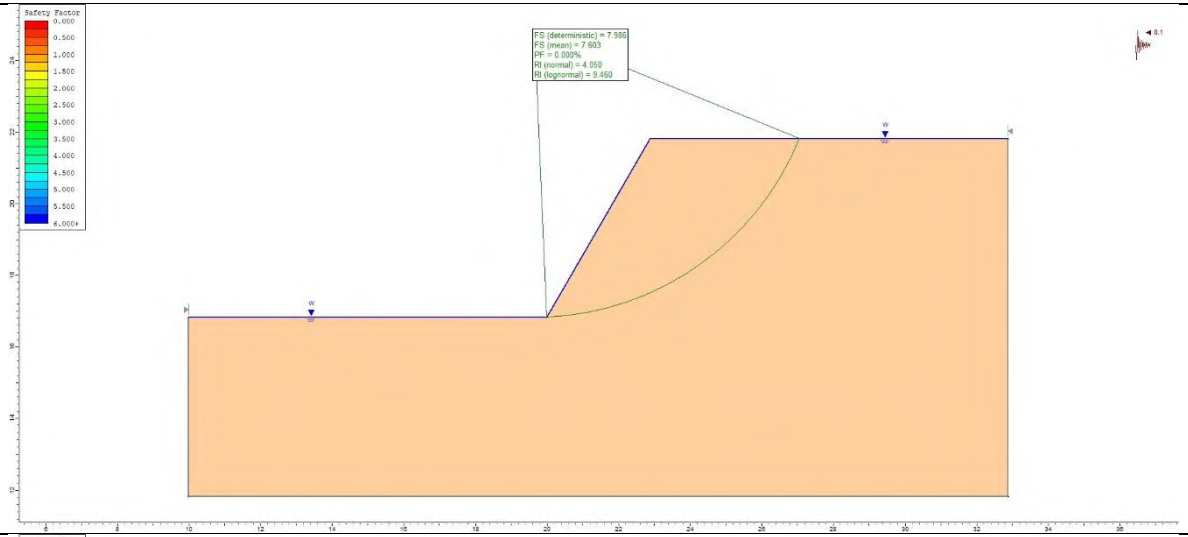
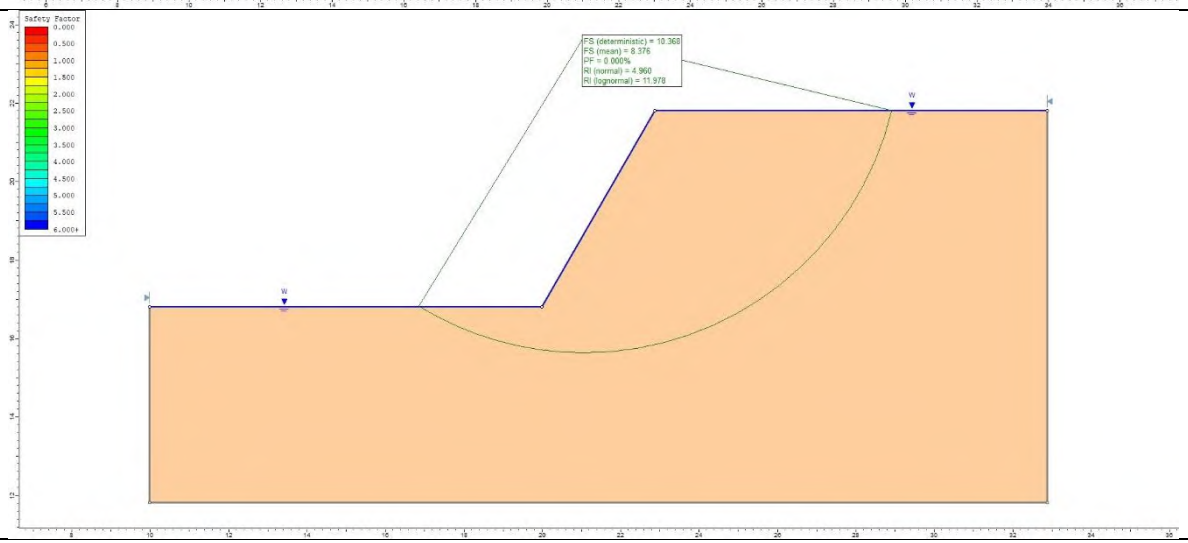
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=55	Dinamik		0,89
	Statik		1,02

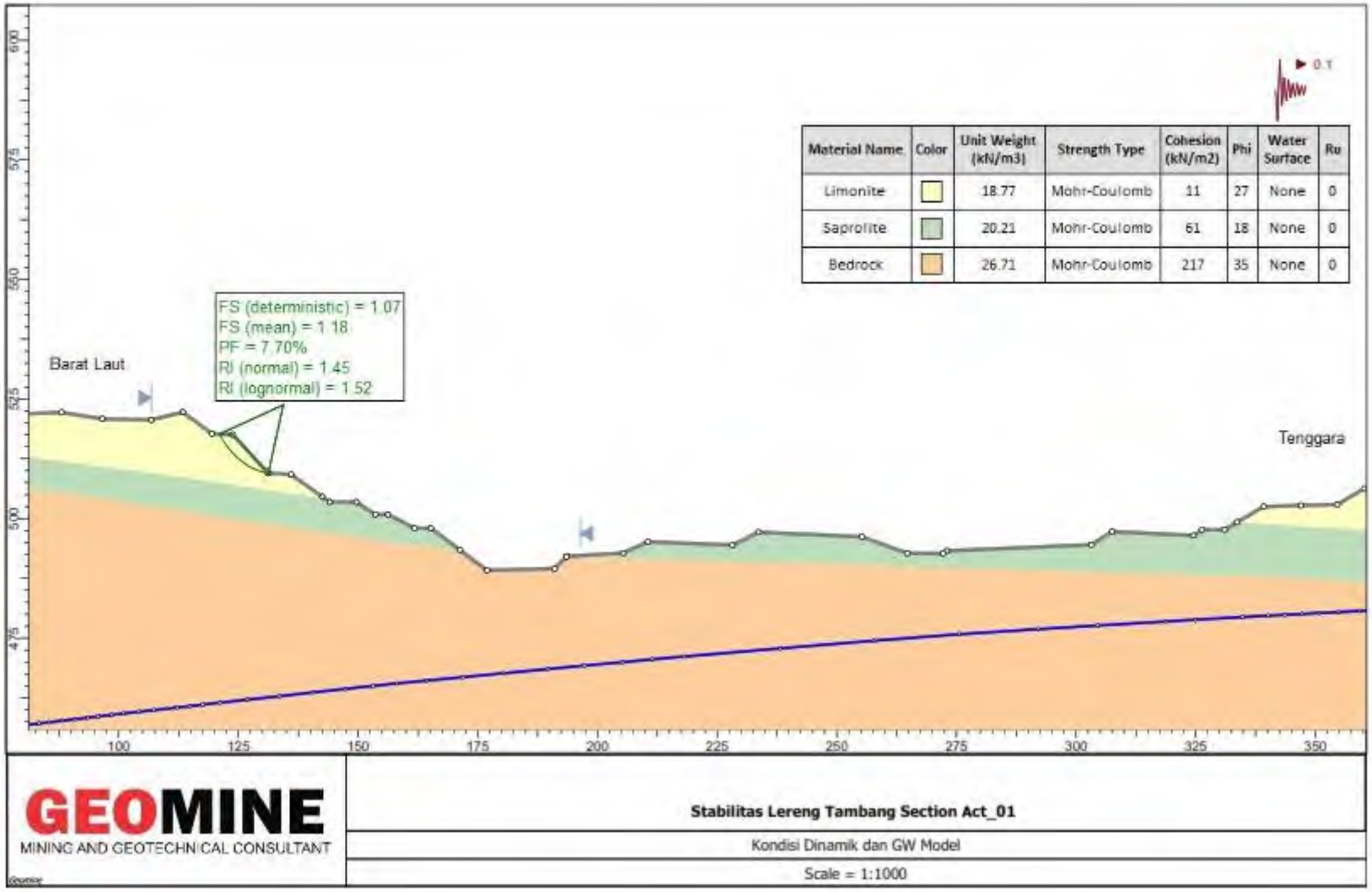
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=55	Dinamik		3,04
	Statik		3,80

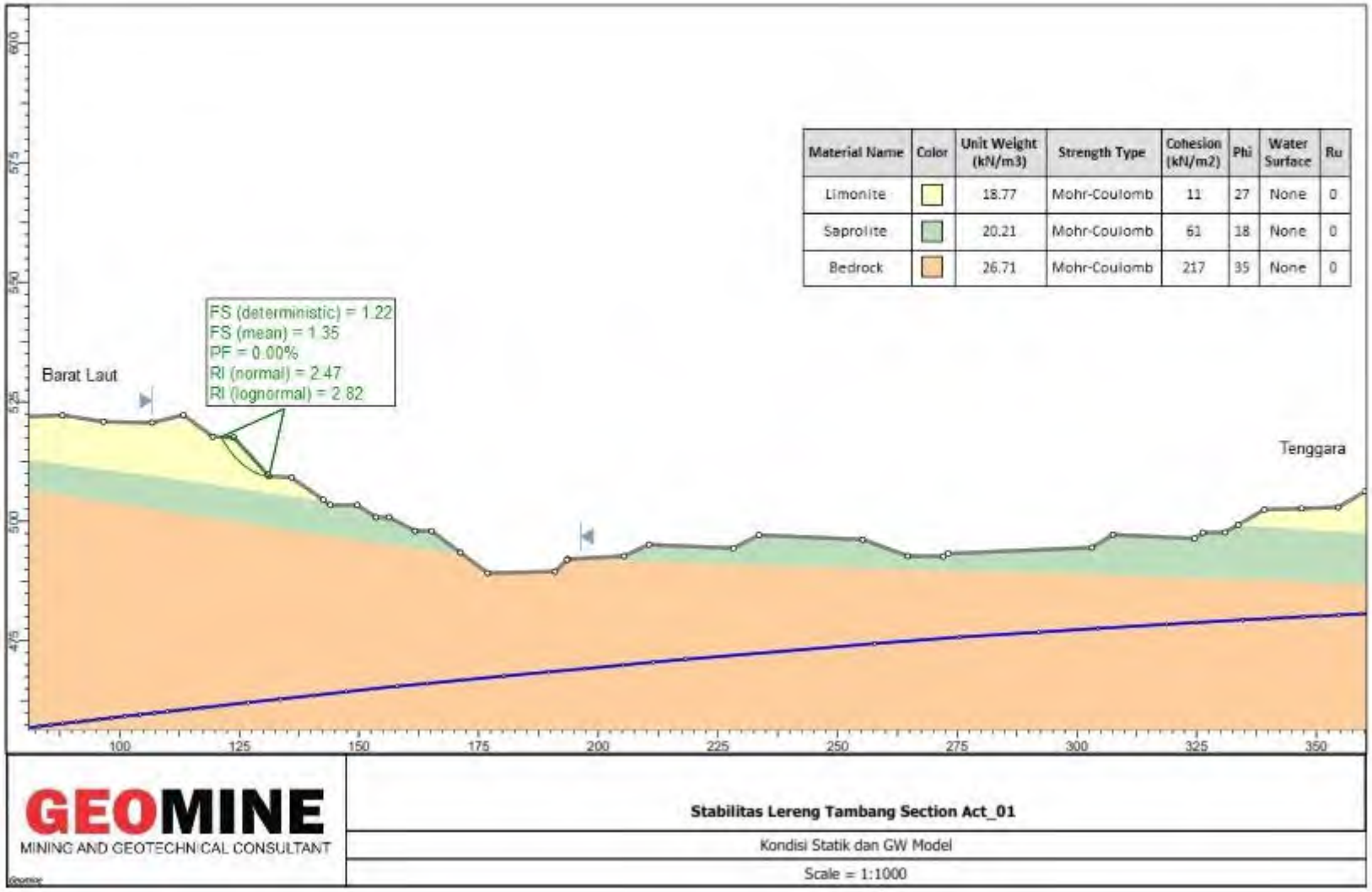
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=55	Dinamik		8,29
	Statik		10,38

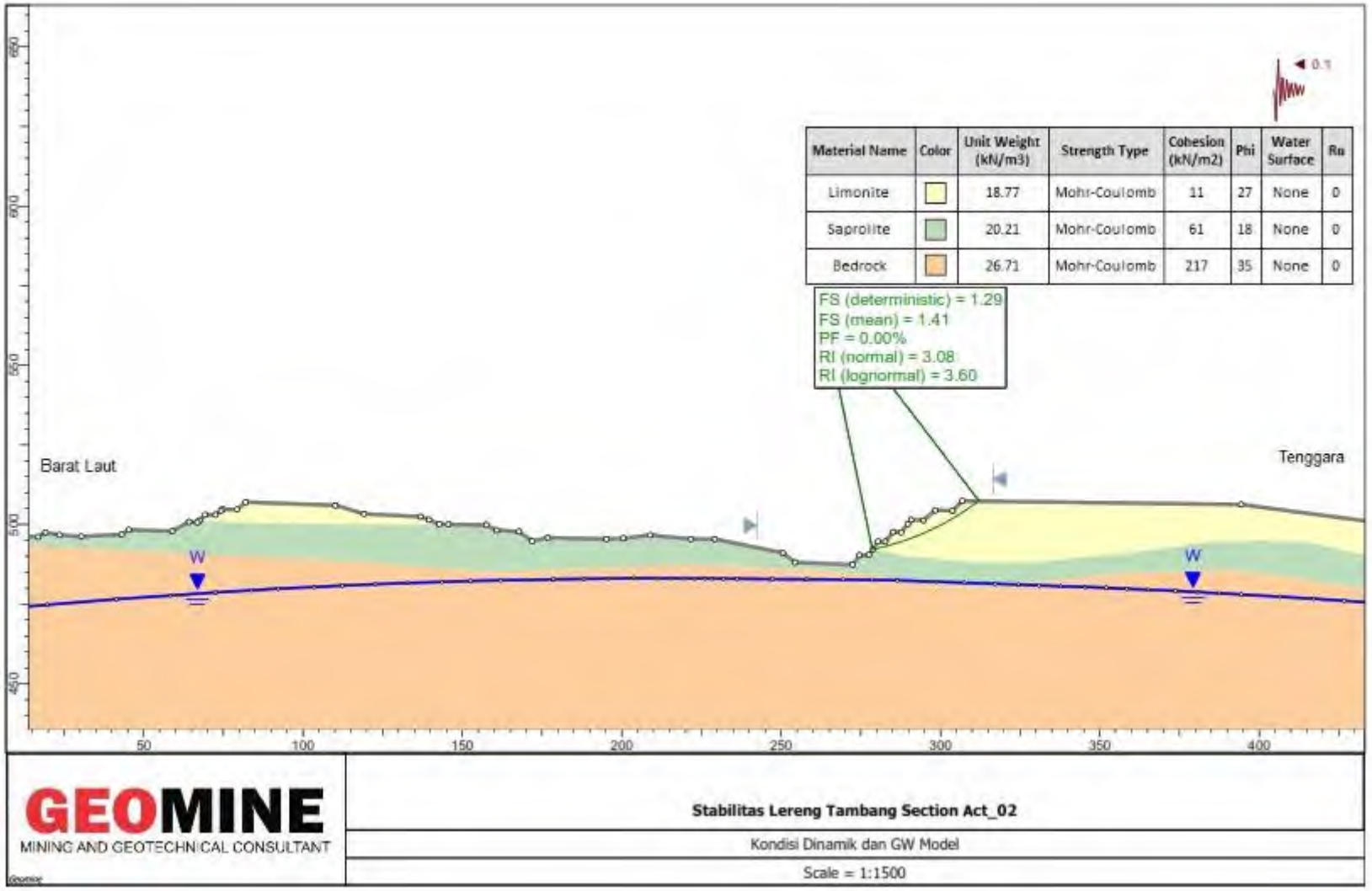
Limonite			
Lereng	Kondisi	Gambar	FK
H=5 S=60	Dinamik		0,82
	Statik		0,92

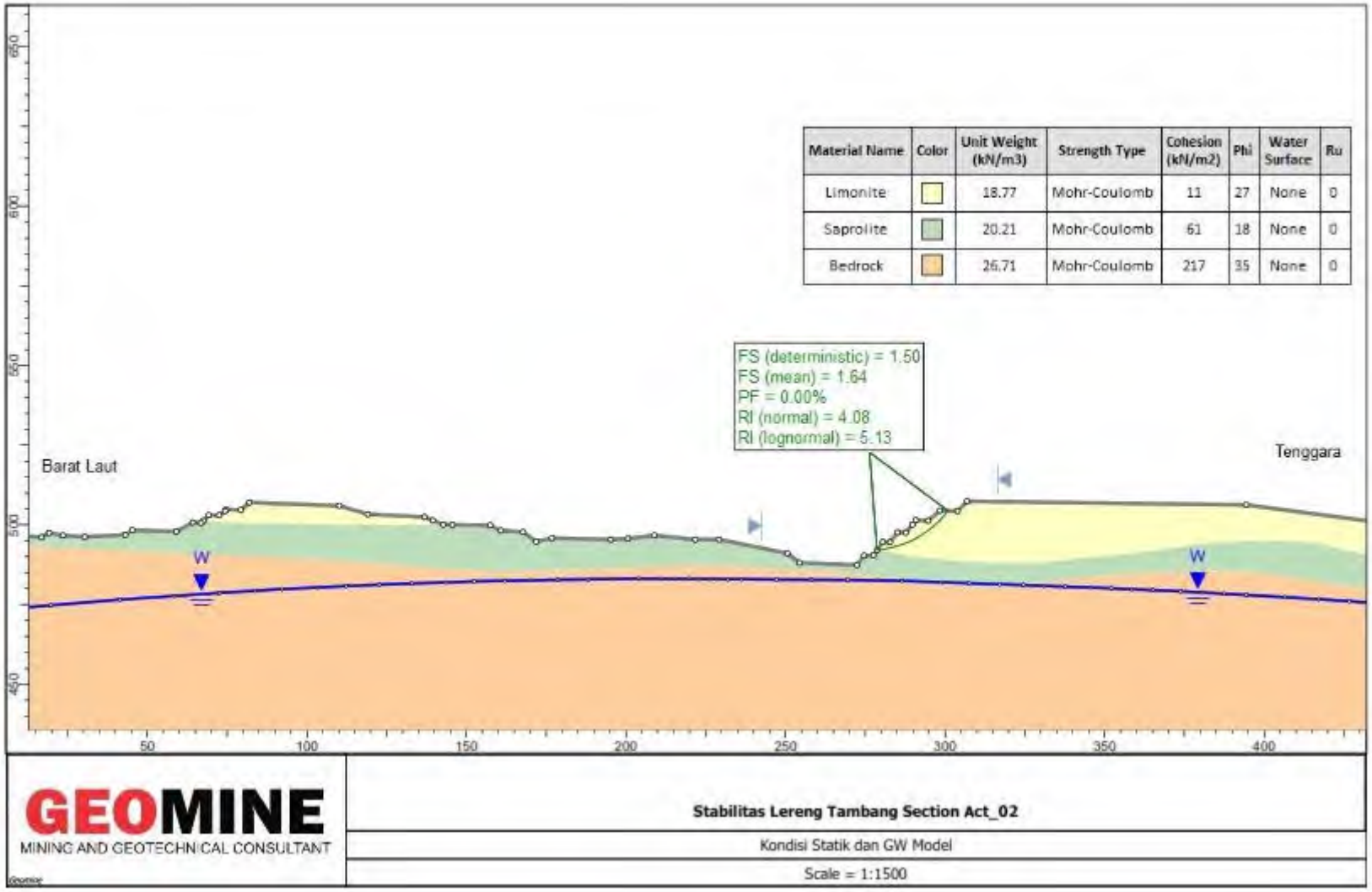
Saprolite			
Lereng	Kondisi	Gambar	FK
H=5 S=60	Dinamik		2,92
	Statik		3,77

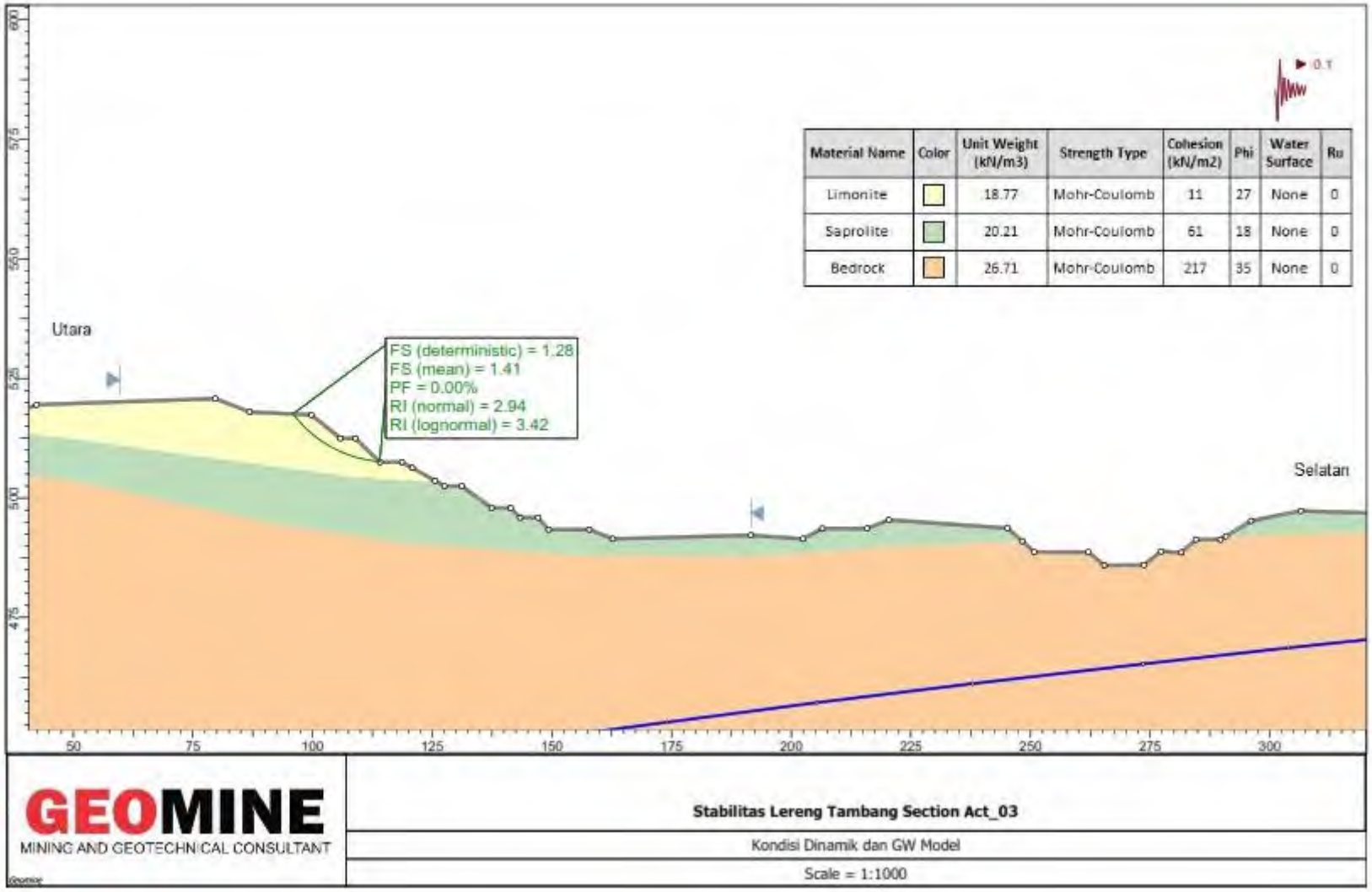
Bedrock			
Lereng	Kondisi	Gambar	FK
H=5 S=60	Dinamik		7,99
	Statik		10,37


0.1
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.07
FS (mean) = 1.18
PF = 7.70%
RI (normal) = 1.45
RI (lognormal) = 1.52
Barat Laut
Tenggara
600
575
550
525
500
475
100
125
150
175
200
225
250
275
300
325
350
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section Act_01
Kondisi Dinamik dan GW Model
Scale = 1:1000


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.22
FS (mean) = 1.35
PF = 0.00%
RI (normal) = 2.47
RI (lognormal) = 2.82
Barat Laut
Tenggara
600
575
550
525
500
475
100
125
150
175
200
225
250
275
300
325
350
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section Act_01
Kondisi Statik dan GW Model
Scale = 1:1000


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.29
FS (mean) = 1.41
PF = 0.00%
RI (normal) = 3.08
RI (logriormal) = 3.60
Barat Laut
Tenggara
W
W
650
600
550
500
450
50
100
150
200
250
300
350
400
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section Act_02
Kondisi Dinamik dan GW Model
Scale = 1:1500


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.50
FS (mean) = 1.64
PF = 0.00%
RI (normal) = 4.08
RI (lognormal) = 5.13
Barat Laut
Tenggara
W
W
650
600
550
500
450
50
100
150
200
250
300
350
400
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section Act_02
Kondisi Statik dan GW Model
Scale = 1:1500


0.1
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Utara
FS (deterministic) = 1.28
FS (mean) = 1.41
PF = 0.00%
RI (normal) = 2.94
RI (lognormal) = 3.42
Selatan
600
575
550
525
500
475
50
75
100
125
150
175
200
225
250
275
300
GEOMINE
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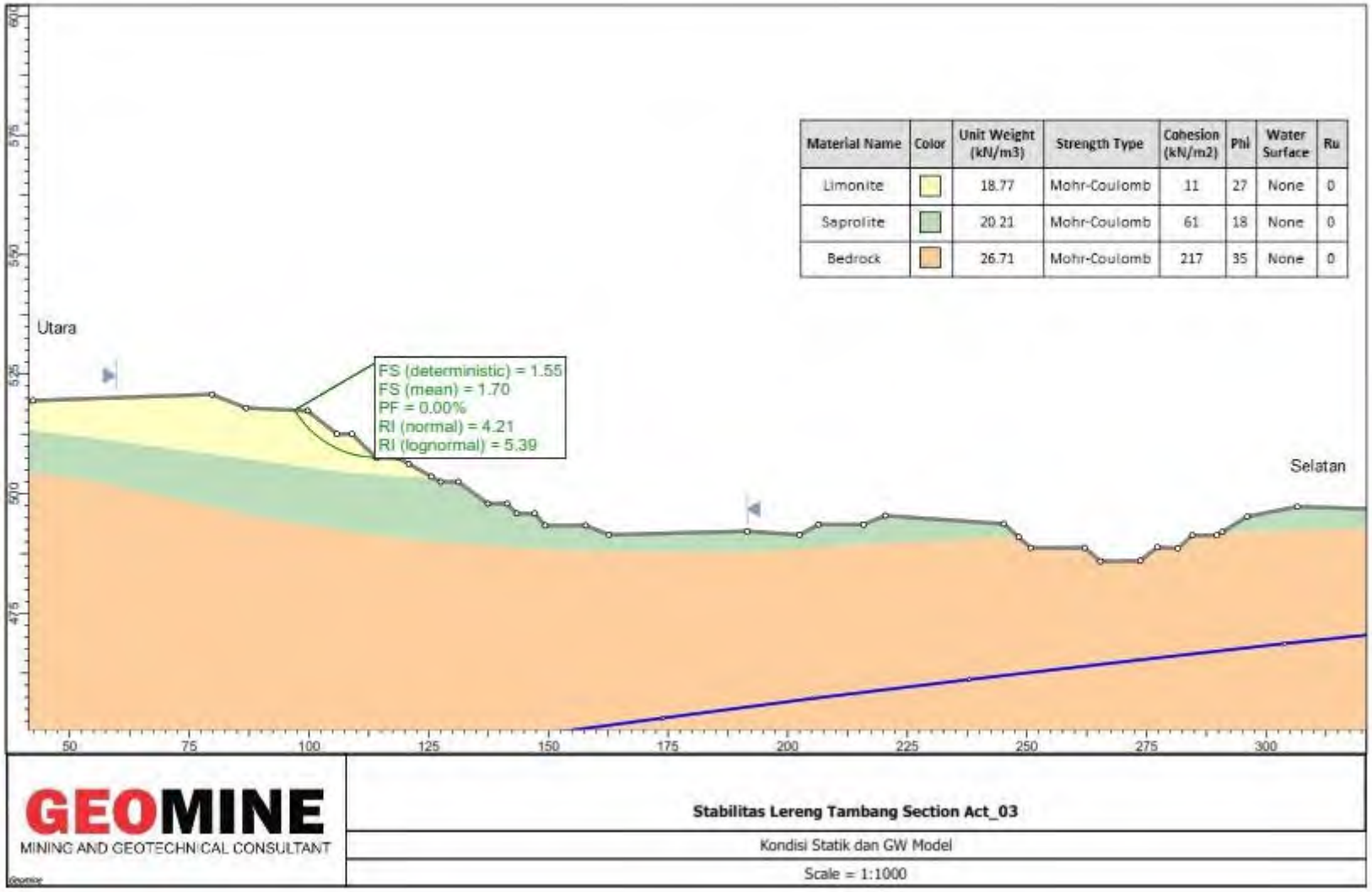
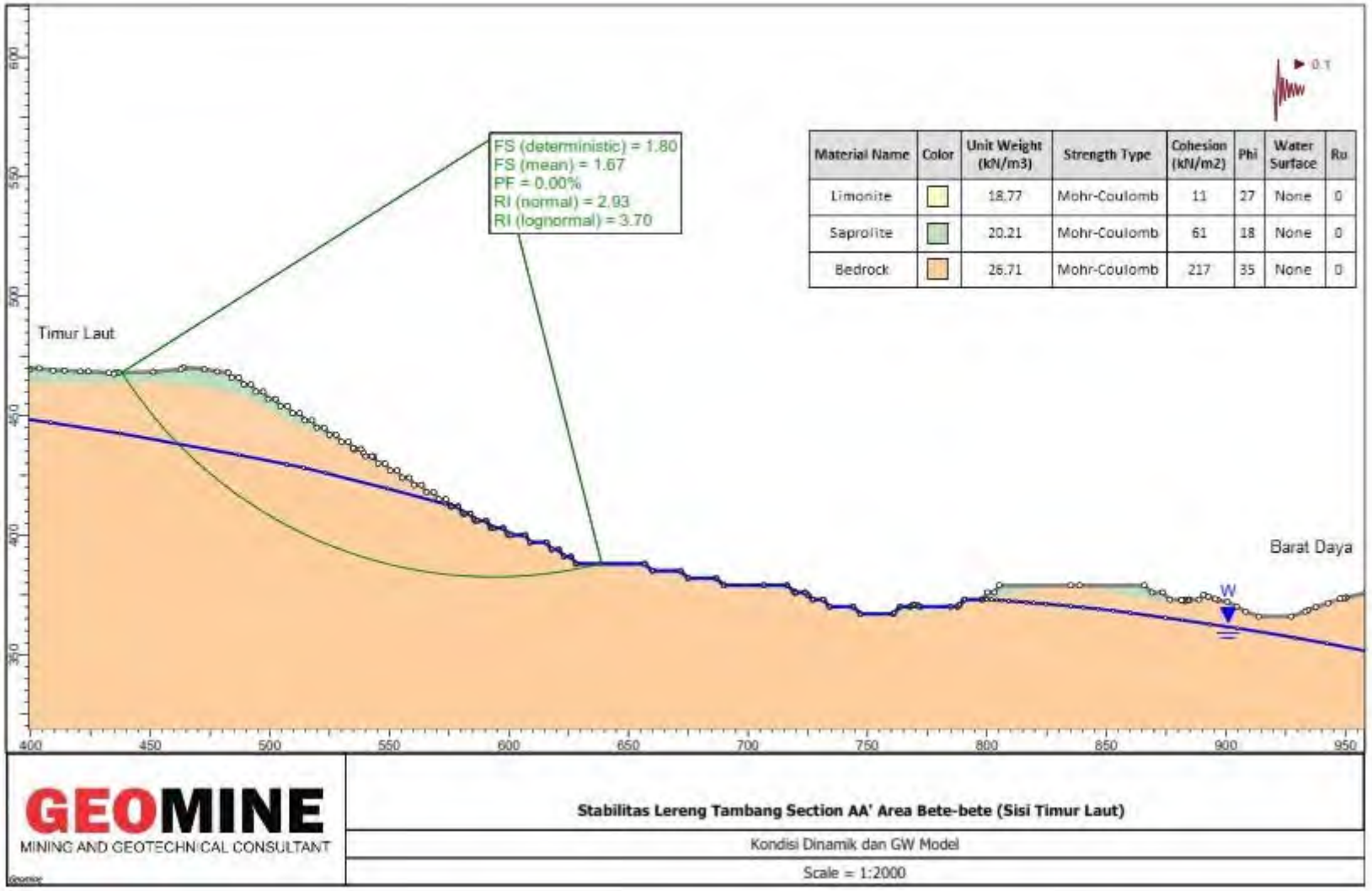
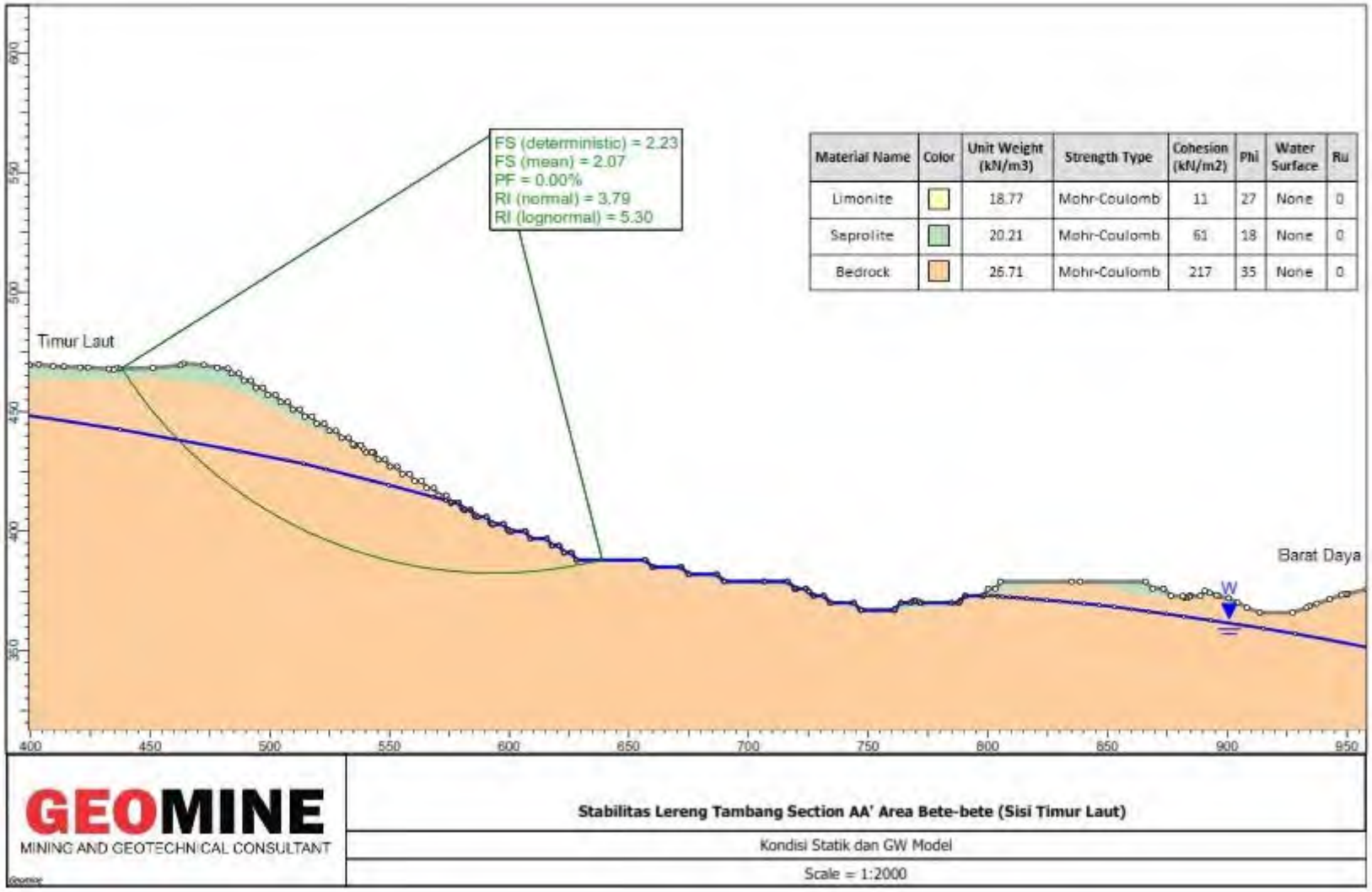
Stabilitas Lereng Tambang Section Act_03
Kondisi Dinamik dan GW Model
Scale = 1:1000


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Utara
Selatan
FS (deterministic) = 1.55
FS (mean) = 1.70
PF = 0.00%
RI (normal) = 4.21
RI (lognormal) = 5.39
600
575
550
525
500
475
50
75
100
125
150
175
200
225
250
275
300
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section Act_03
Kondisi Statik dan GW Model
Scale = 1:1000



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kN/m2)	Phi	Water Surface	Ru
Limonite		18.77	Mohr-Coulomb	11	27	None	0
Saprolite		20.21	Mohr-Coulomb	61	18	None	0
Bedrock		26.71	Mohr-Coulomb	217	35	None	0



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kN/m2)	Phi	Water Surface	Ru
Limonite		18.77	Mohr-Coulomb	11	27	None	0
Saprolite		20.21	Mohr-Coulomb	61	18	None	0
Bedrock		26.71	Mohr-Coulomb	217	35	None	0

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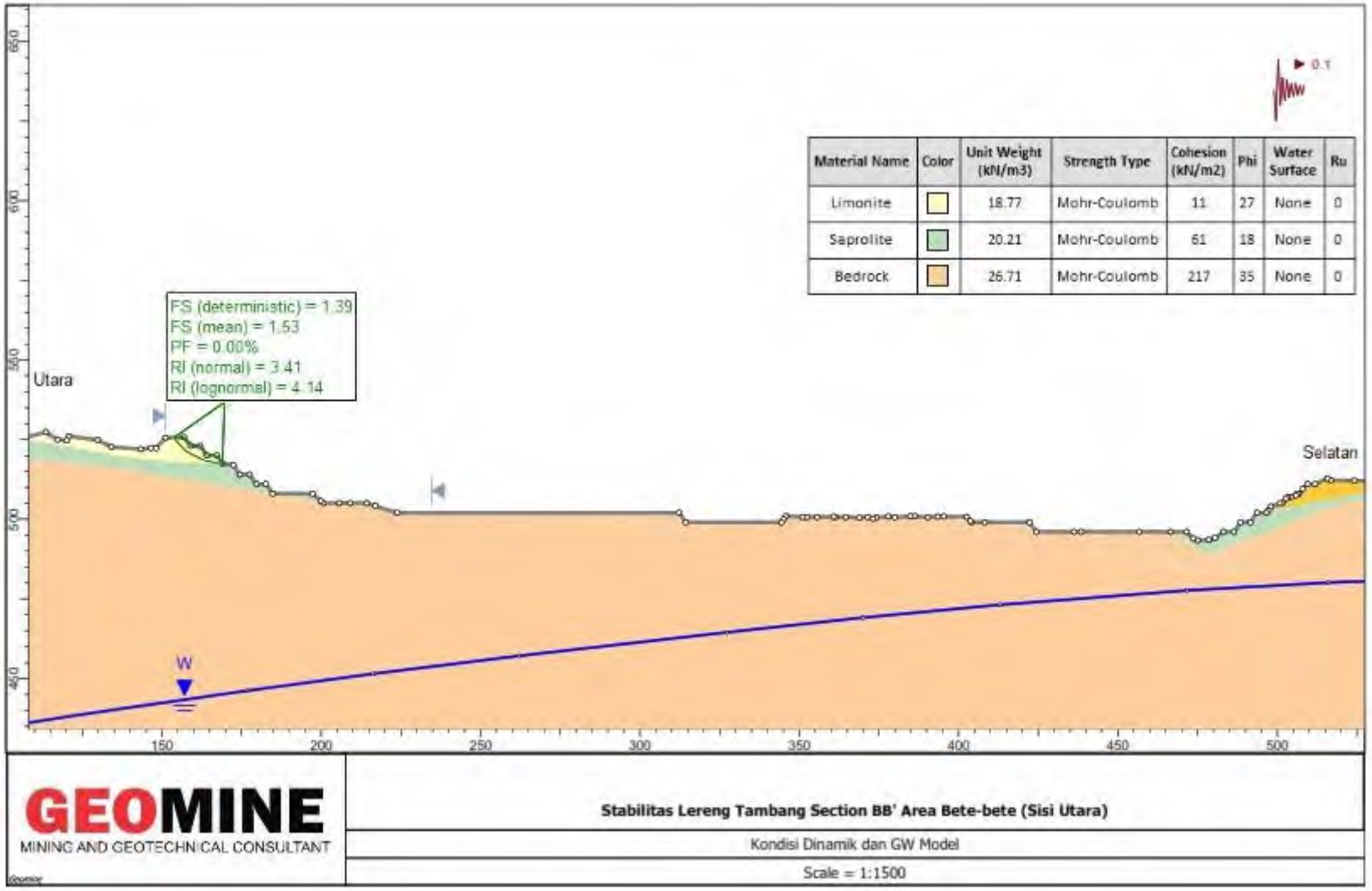
Stabilitas Lereng Tambang Section AA' Area Bete-bete (Sisi Timur Laut)

Kondisi Statik dan GW Model

Scale = 1:2000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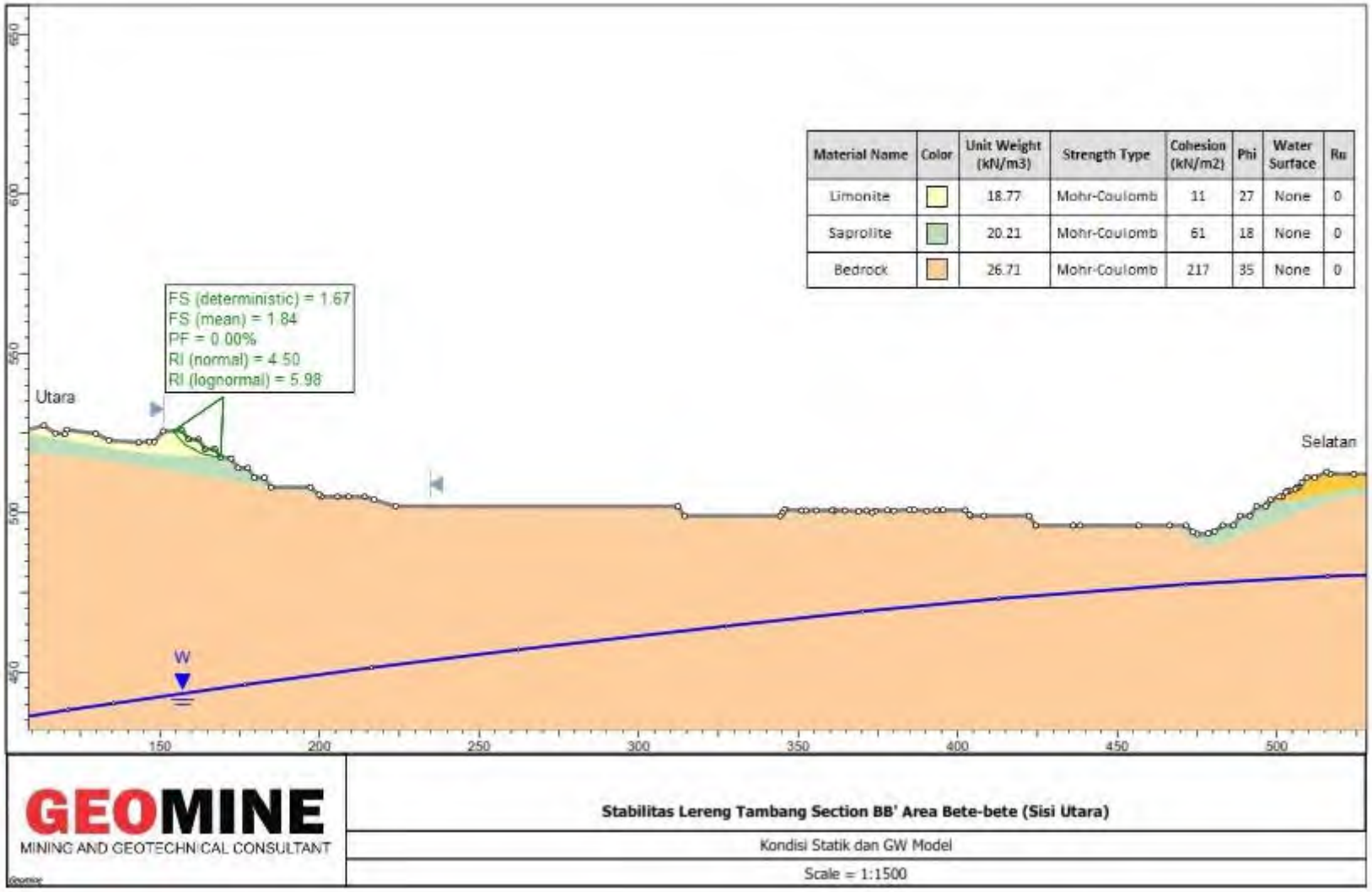
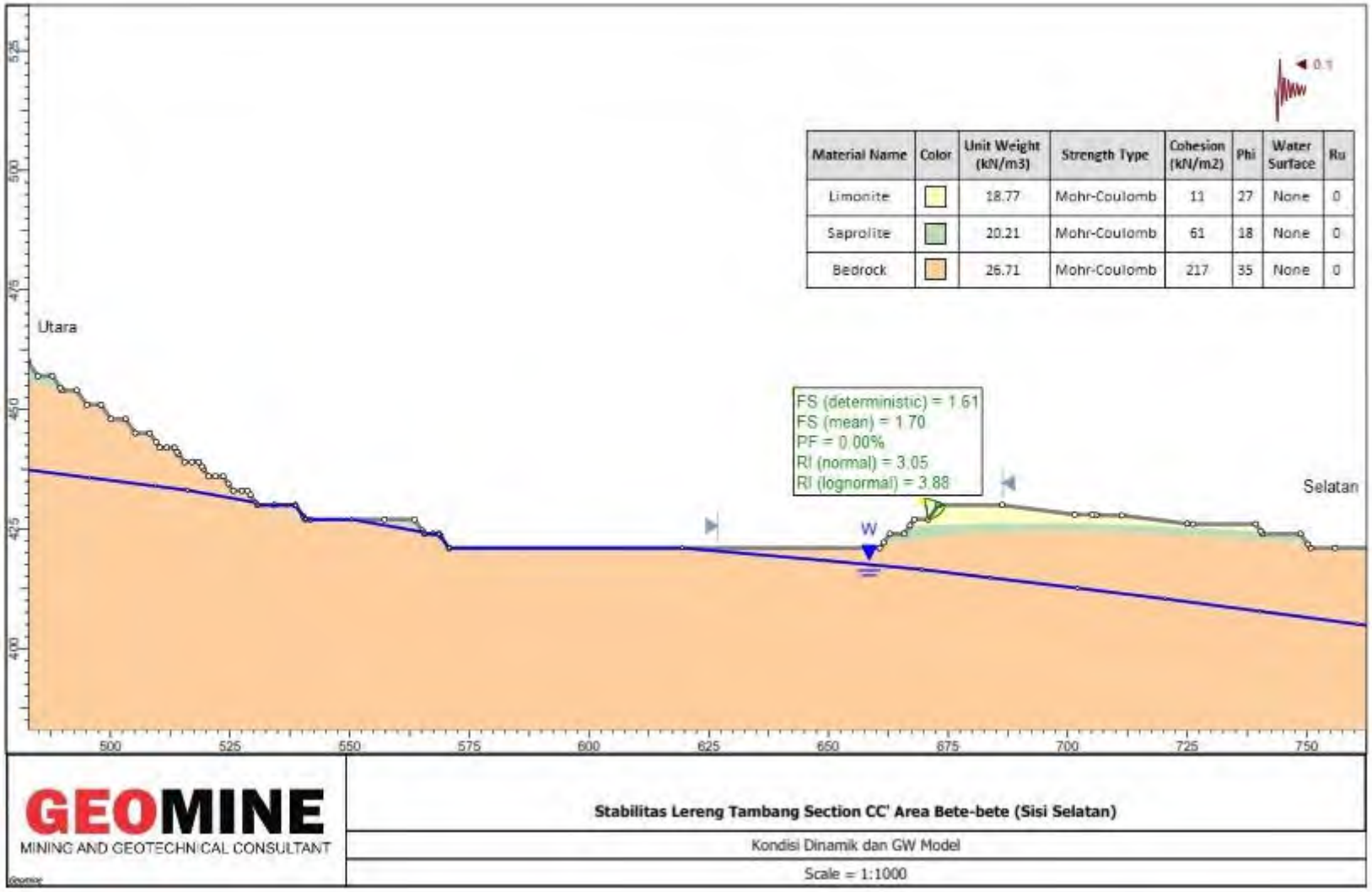
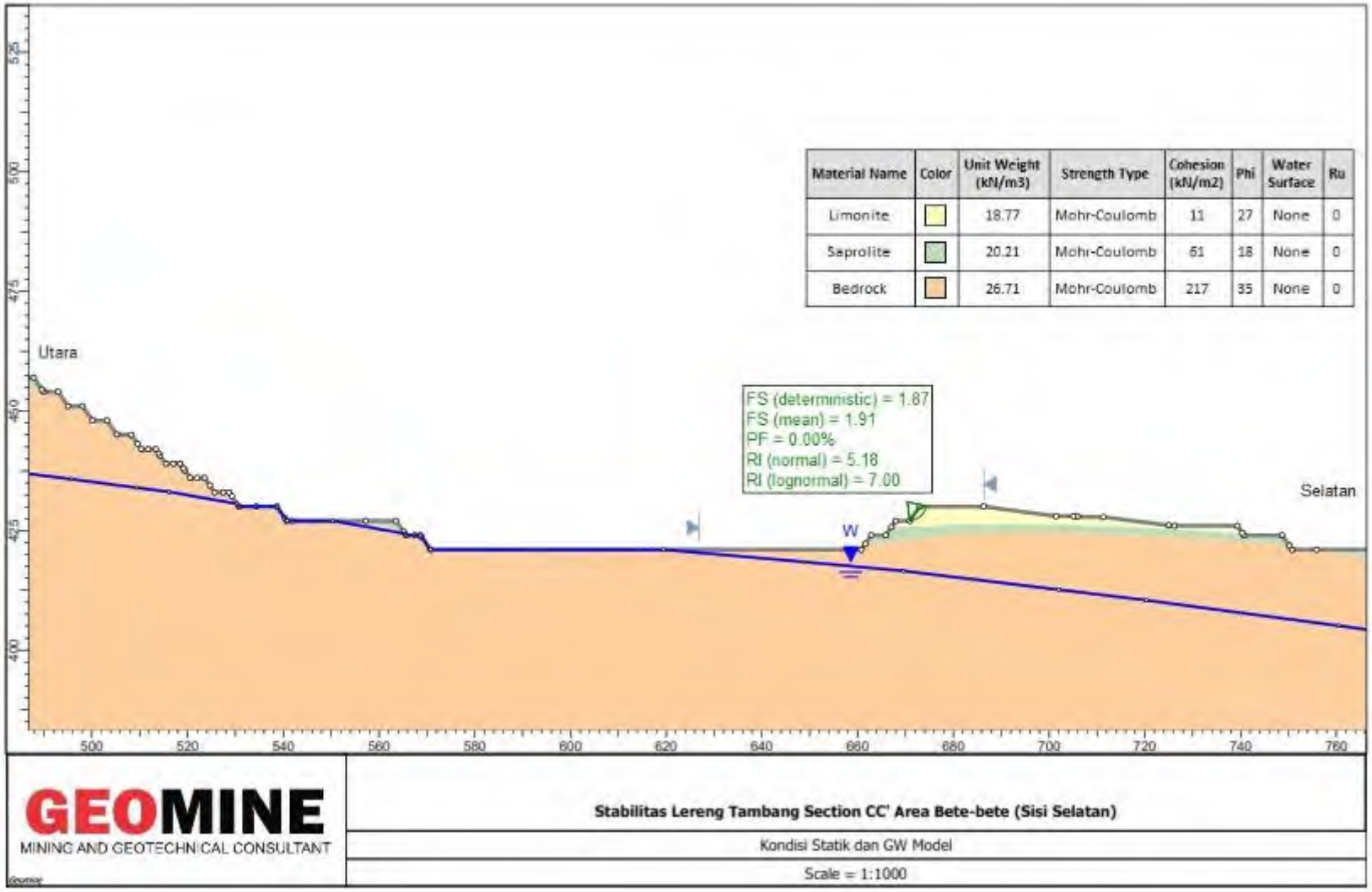
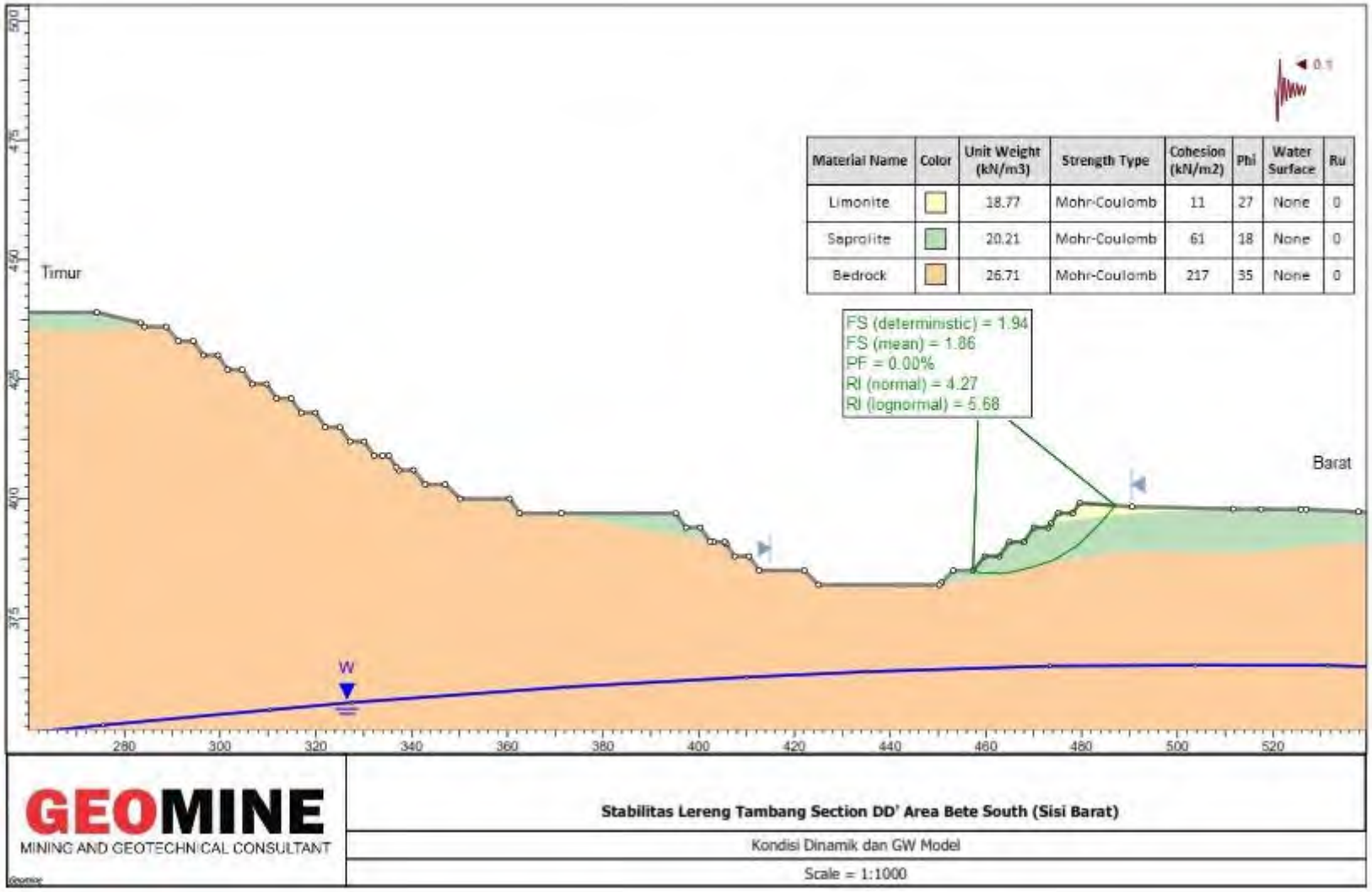
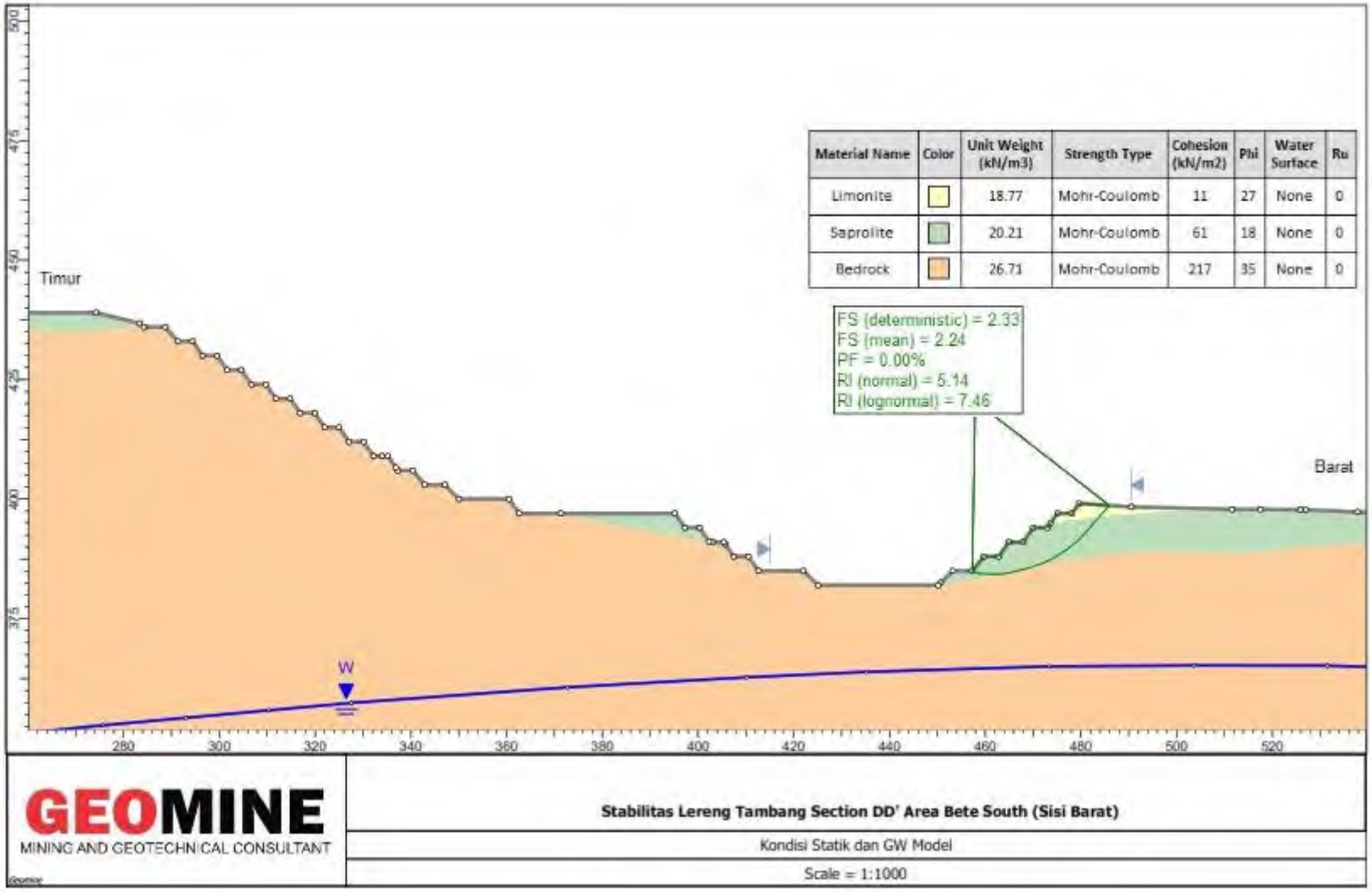
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.39
FS (mean) = 1.53
PF = 0.00%
RI (normal) = 3.41
RI (lognormal) = 4.14
Utara
Selatan
W
650
600
550
500
450
150
200
250
300
350
400
450
500
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section BB' Area Bete-bete (Sisi Utara)
Kondisi Dinamik dan GW Model
Scale = 1:1500

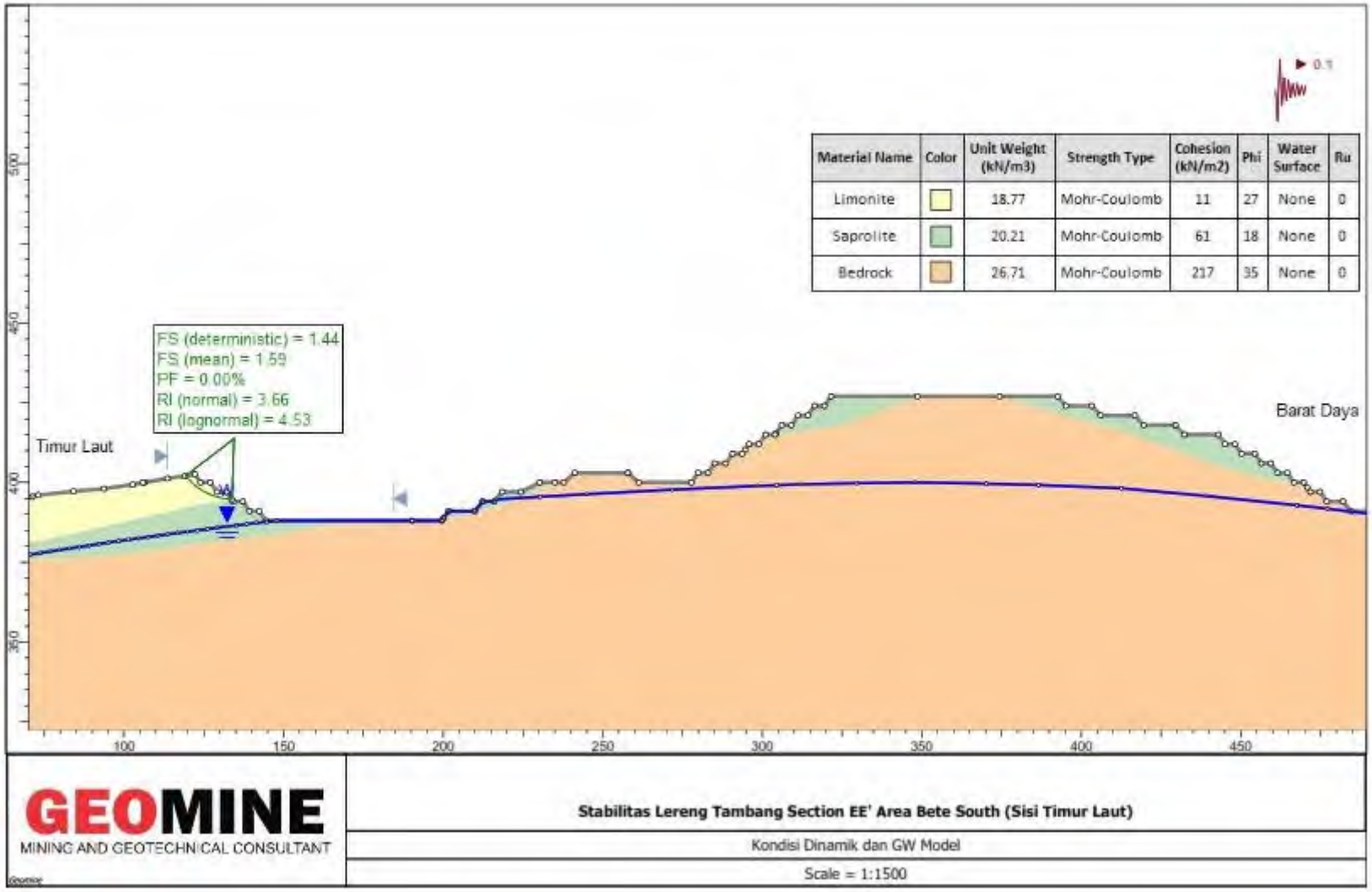

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.67
FS (mean) = 1.84
PF = 0.00%
RI (normal) = 4.50
RI (lognormal) = 5.98
Utara
Selatan
W
650
600
550
500
450
150
200
250
300
350
400
450
500
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section BB' Area Bete-bete (Sisi Utara)
Kondisi Statik dan GW Model
Scale = 1:1500

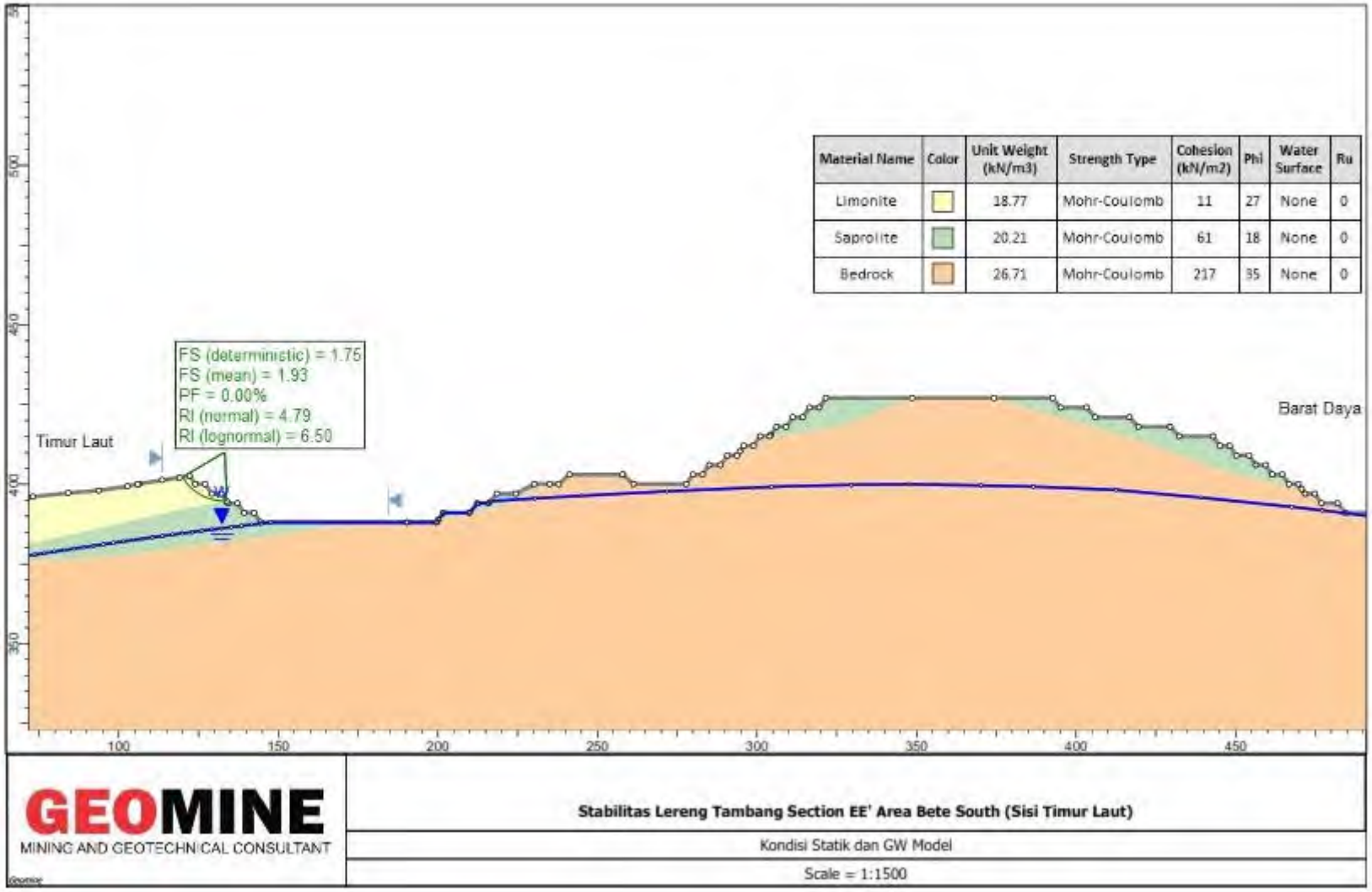

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Utara
Selatan
FS (deterministic) = 1.61
FS (mean) = 1.70
PF = 0.00%
RI (normal) = 3.05
RI (lognormal) = 3.88
W
500
525
550
575
600
625
650
675
700
725
750
400
425
450
475
500
525
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section CC' Area Bete-bete (Sisi Selatan)
Kondisi Dinamik dan GW Model
Scale = 1:1000

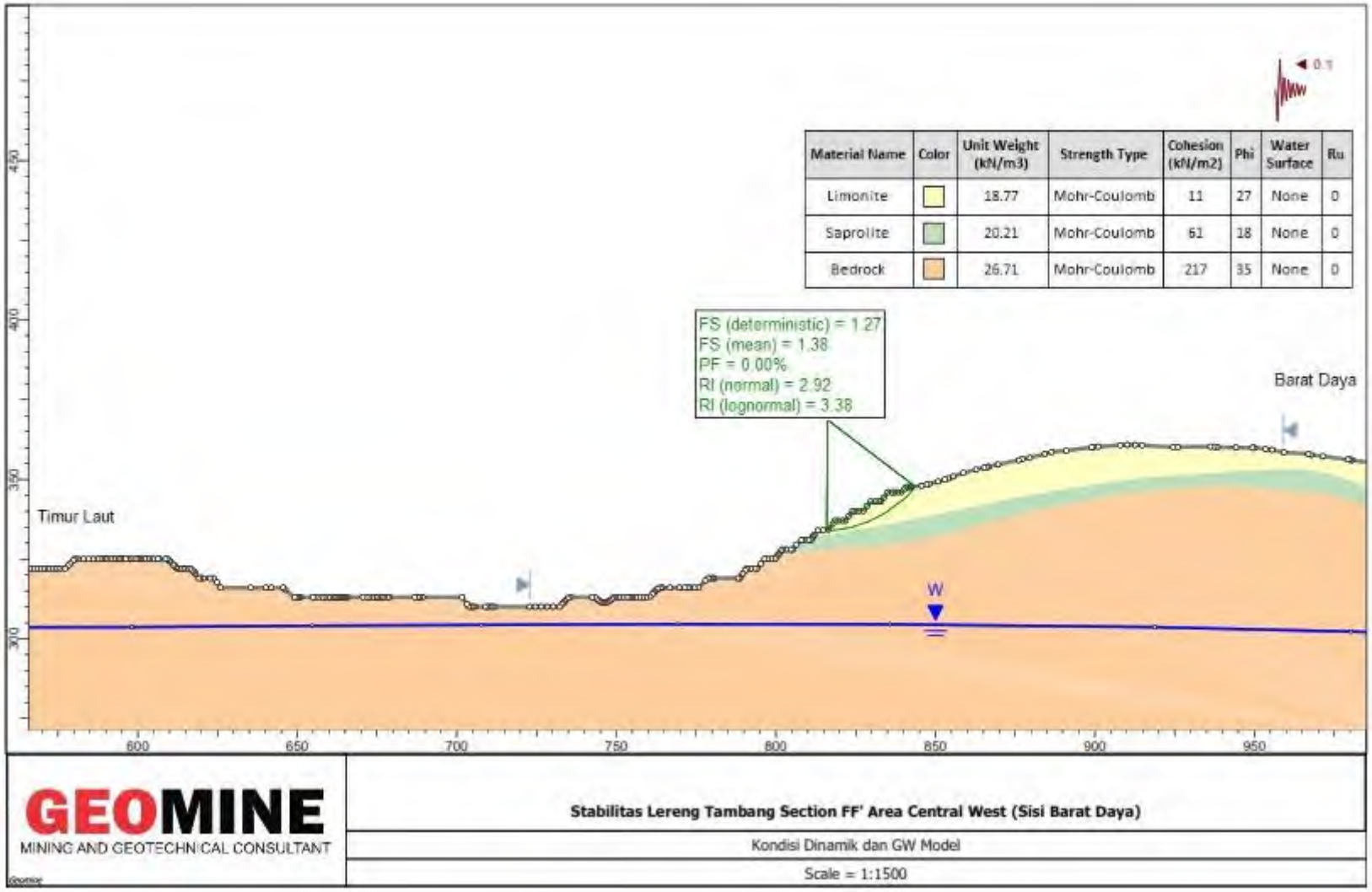

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Utara
Selatan
W
FS (deterministic) = 1.87
FS (mean) = 1.91
PF = 0.00%
RI (normal) = 5.18
RI (lognormal) = 7.00
525
500
475
450
425
400
500
520
540
560
580
600
620
640
660
680
700
720
740
760
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section CC' Area Bete-bete (Sisi Selatan)
Kondisi Statik dan GW Model
Scale = 1:1000

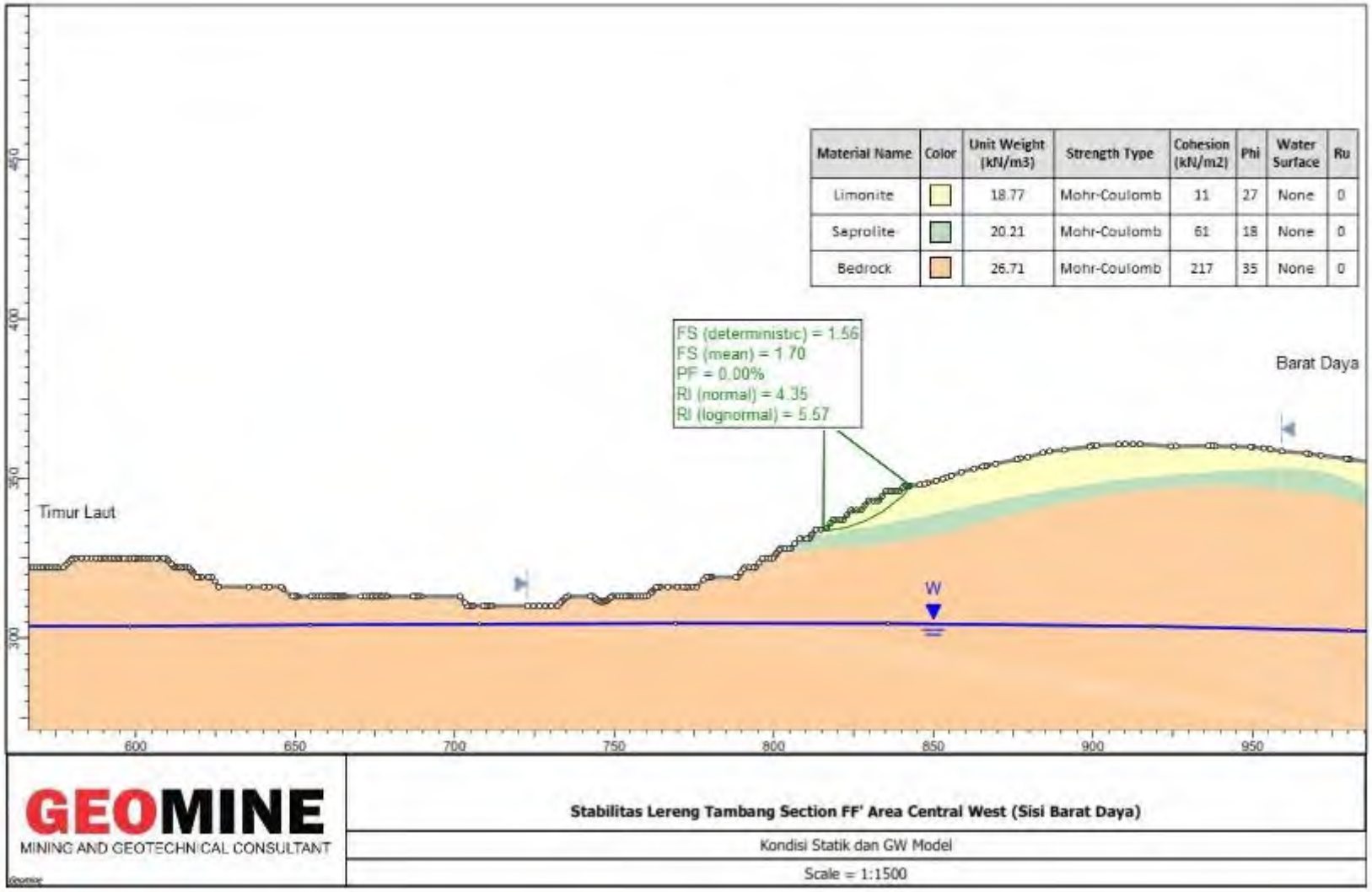

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.94
FS (mean) = 1.86
PF = 0.00%
RI (normal) = 4.27
RI (lognormal) = 5.68
Timur
Barat
W
500
475
450
425
400
375
280
300
320
340
360
380
400
420
440
460
480
500
520
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section DD' Area Bete South (Sisi Barat)
Kondisi Dinamik dan GW Model
Scale = 1:1000

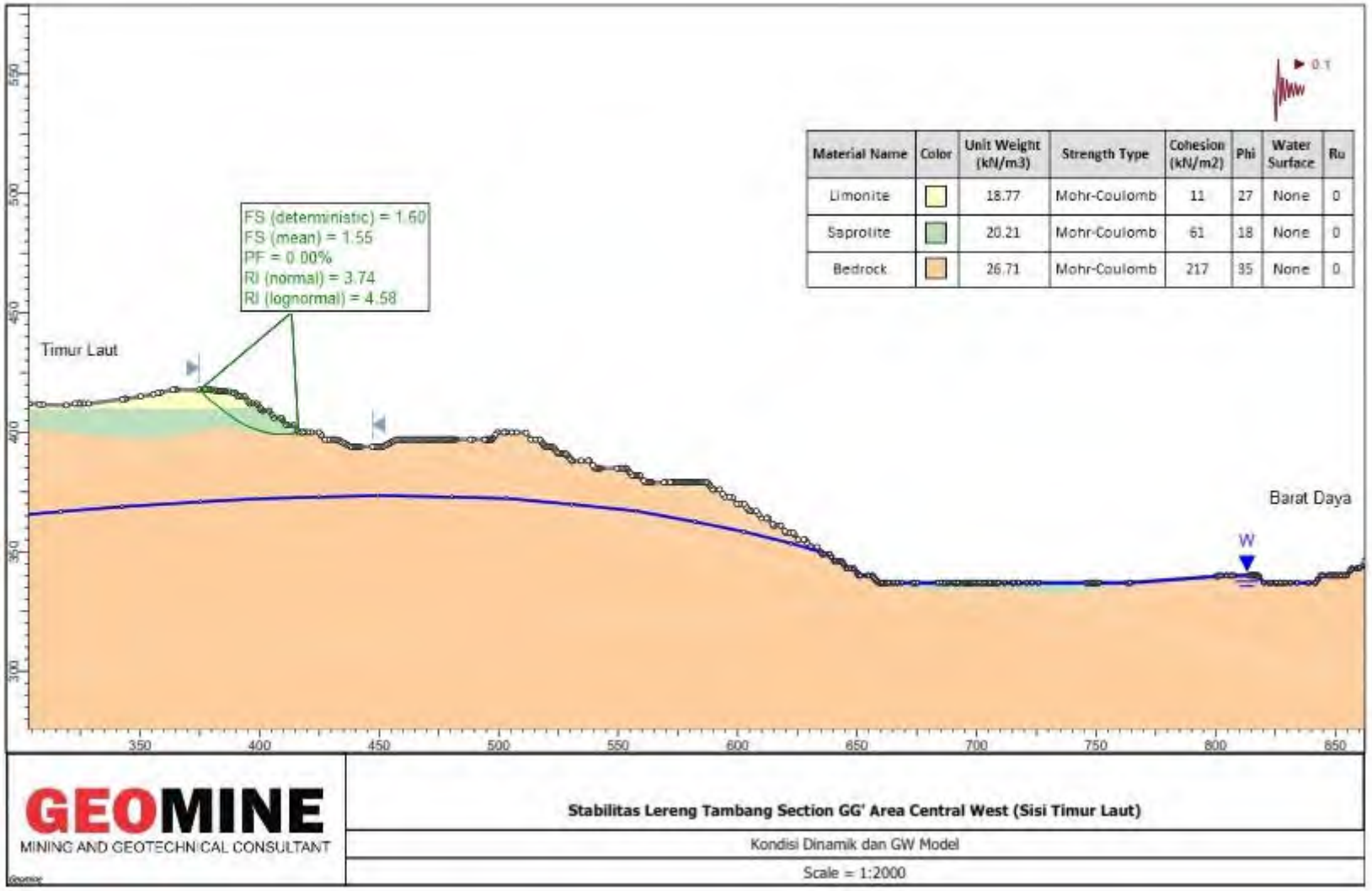

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Timur
Barat
FS (deterministic) = 2.33
FS (mean) = 2.24
PF = 0.00%
RI (normal) = 5.14
RI (lognormal) = 7.46
W
500
475
450
425
400
375
280
300
320
340
360
380
400
420
440
460
480
500
520
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section DD' Area Bete South (Sisi Barat)
Kondisi Statik dan GW Model
Scale = 1:1000

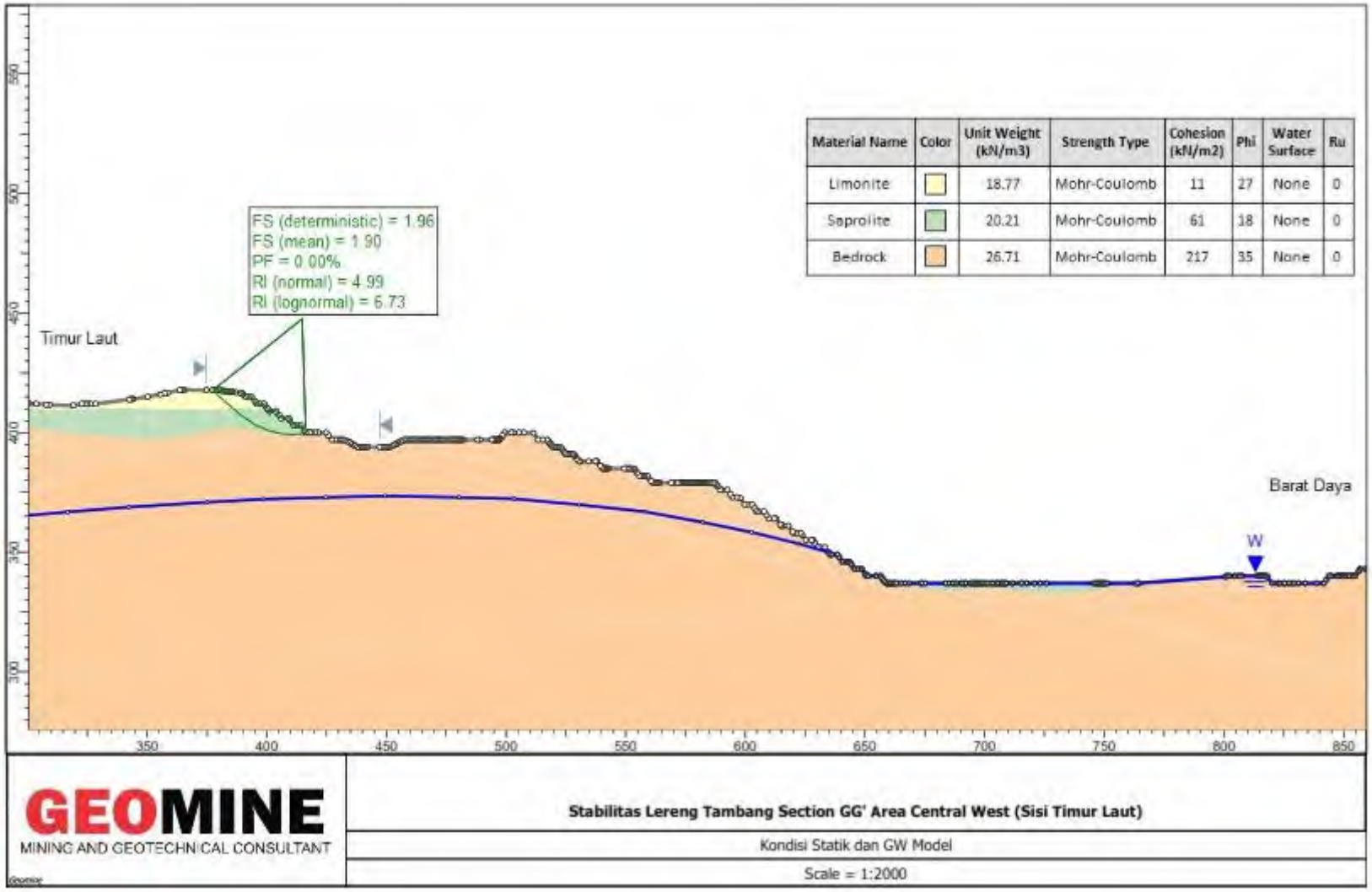

0.1
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.44
FS (mean) = 1.59
PF = 0.00%
RI (normal) = 3.66
RI (lognormal) = 4.53
Timur Laut
Barat Daya
500
450
400
350
100
150
200
250
300
350
400
450
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section EE' Area Bete South (Sisi Timur Laut)
Kondisi Dinamik dan GW Model
Scale = 1:1500

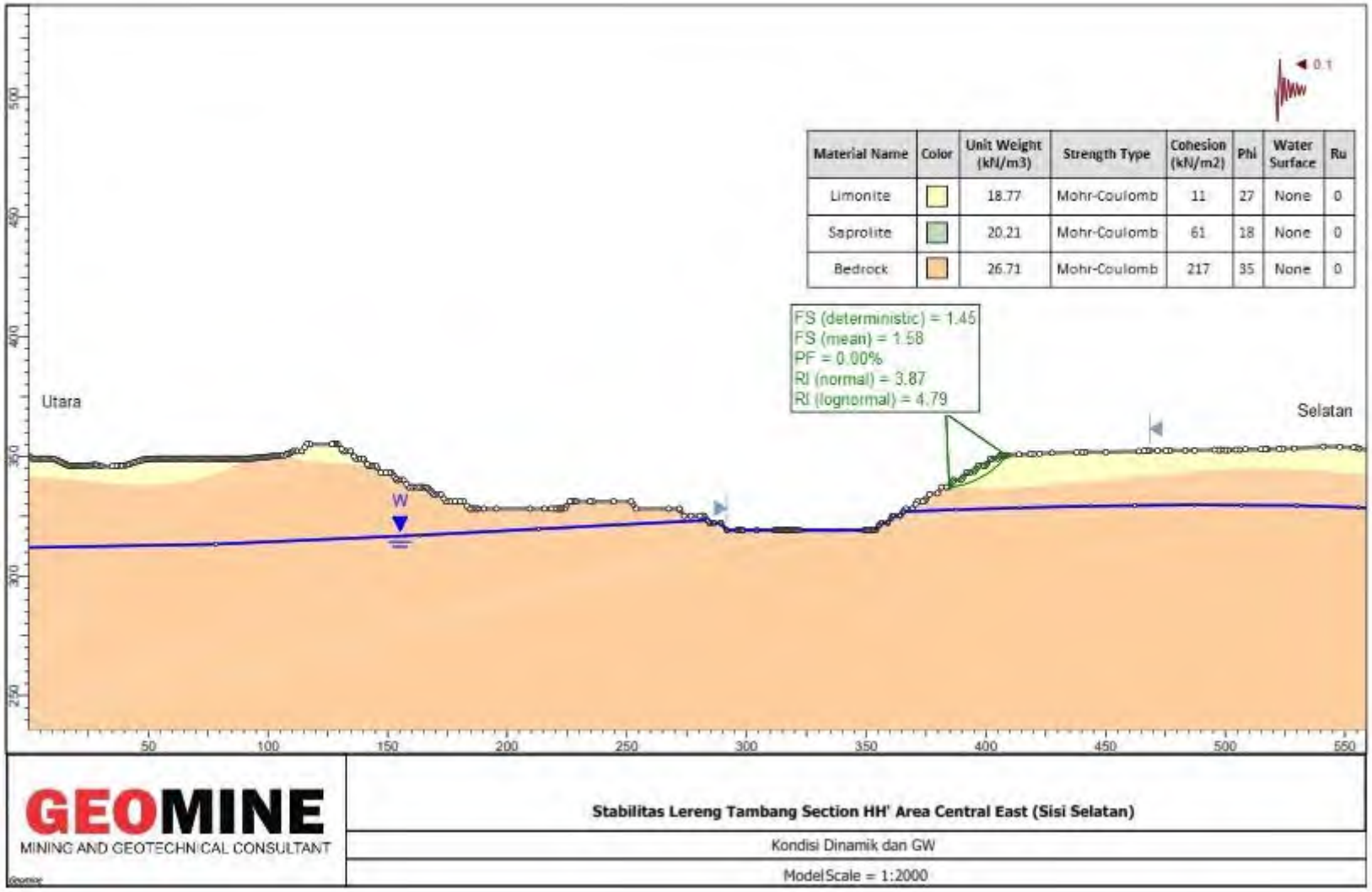

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.75
FS (mean) = 1.93
PF = 0.00%
RI (normal) = 4.79
RI (lognormal) = 6.50
Timur Laut
Barat Daya
500
450
400
350
100
150
200
250
300
350
400
450
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section EE' Area Bete South (Sisi Timur Laut)
Kondisi Statik dan GW Model
Scale = 1:1500

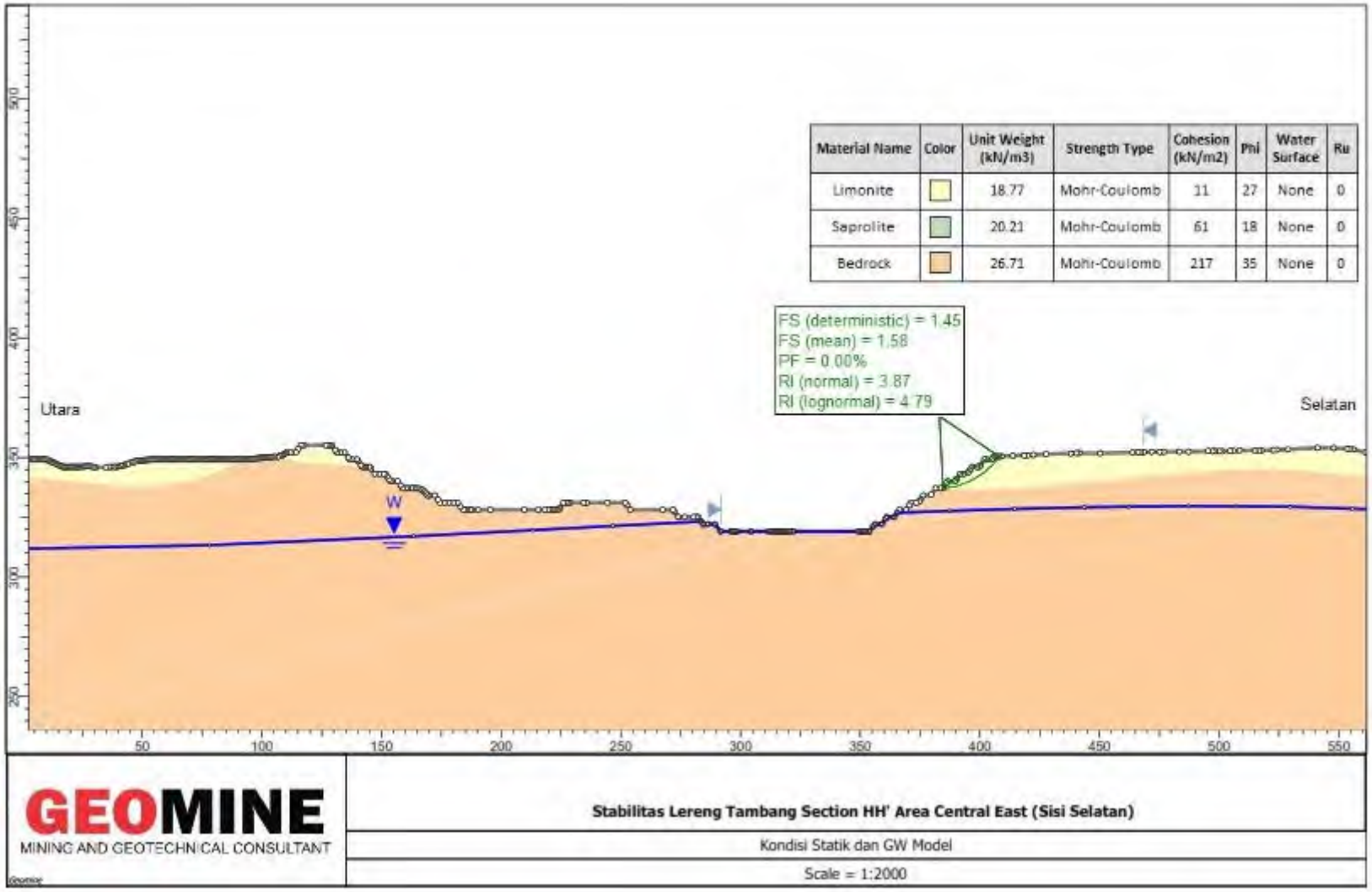

0.1
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.27
FS (mean) = 1.38
PF = 0.00%
RI (normal) = 2.92
RI (lognormal) = 3.38
Barat Daya
Timur Laut
W
450
400
350
300
600
650
700
750
800
850
900
950
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section FF' Area Central West (Sisi Barat Daya)
Kondisi Dinamik dan GW Model
Scale = 1:1500

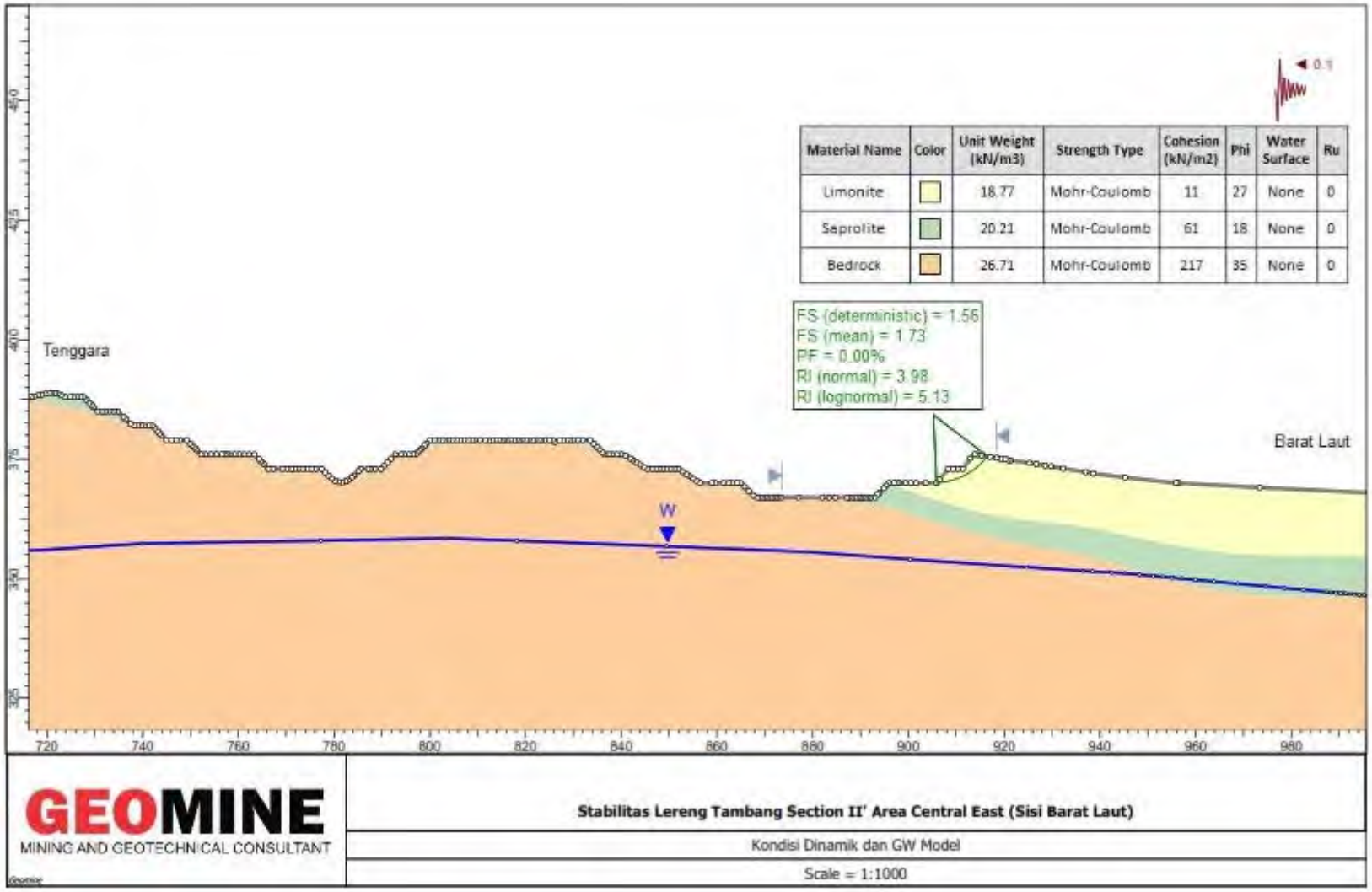

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.56
FS (mean) = 1.70
PF = 0.00%
RI (normal) = 4.35
RI (lognormal) = 5.57
Barat Daya
Timur Laut
W
450
400
350
300
600
650
700
750
800
850
900
950
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section FF' Area Central West (Sisi Barat Daya)
Kondisi Statik dan GW Model
Scale = 1:1500

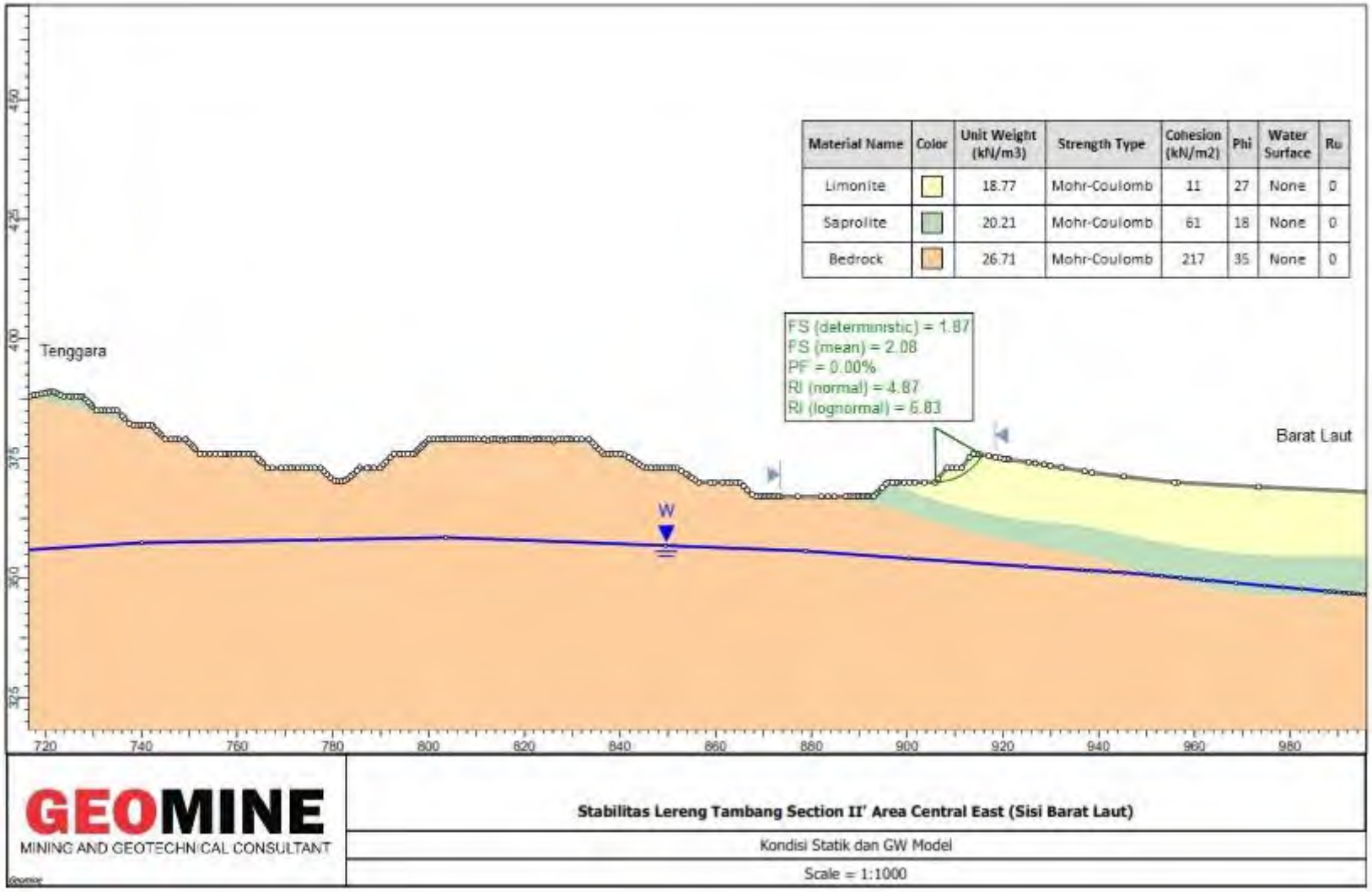

FS (deterministic) = 1.60
FS (mean) = 1.55
PF = 0.00%
RI (normal) = 3.74
RI (lognormal) = 4.58
Timur Laut
Barat Daya
W
0.1
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
350
400
450
500
550
600
650
700
750
800
850
300
350
400
450
500
550
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section GG' Area Central West (Sisi Timur Laut)
Kondisi Dinamik dan GW Model
Scale = 1:2000

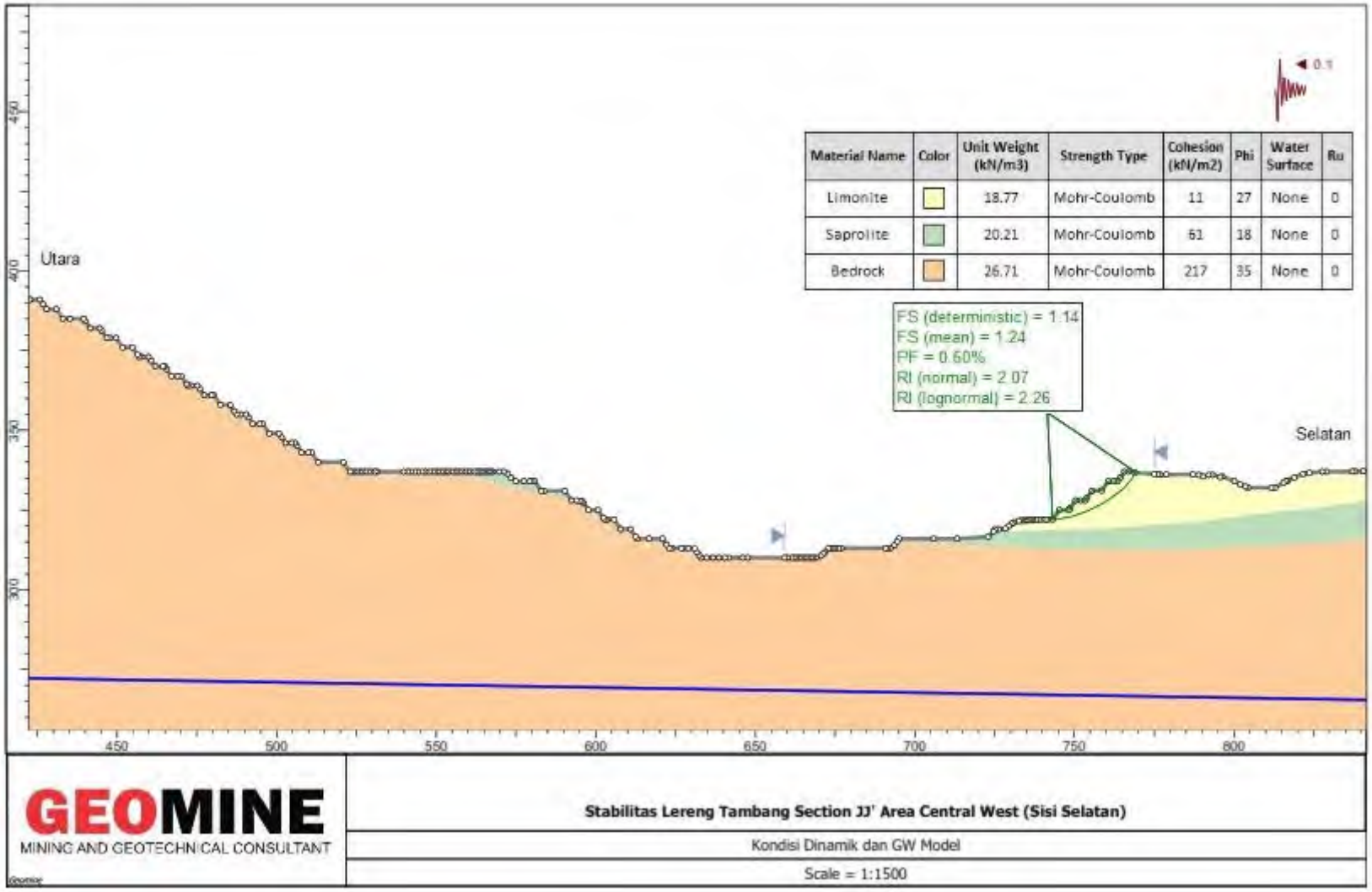

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.96
FS (mean) = 1.90
PF = 0.00%
RI (normal) = 4.99
RI (lognormal) = 6.73
Timur Laut
Barat Daya
W
550
500
450
400
350
300
350
400
450
500
550
600
650
700
750
800
850
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section GG' Area Central West (Sisi Timur Laut)
Kondisi Statik dan GW Model
Scale = 1:2000

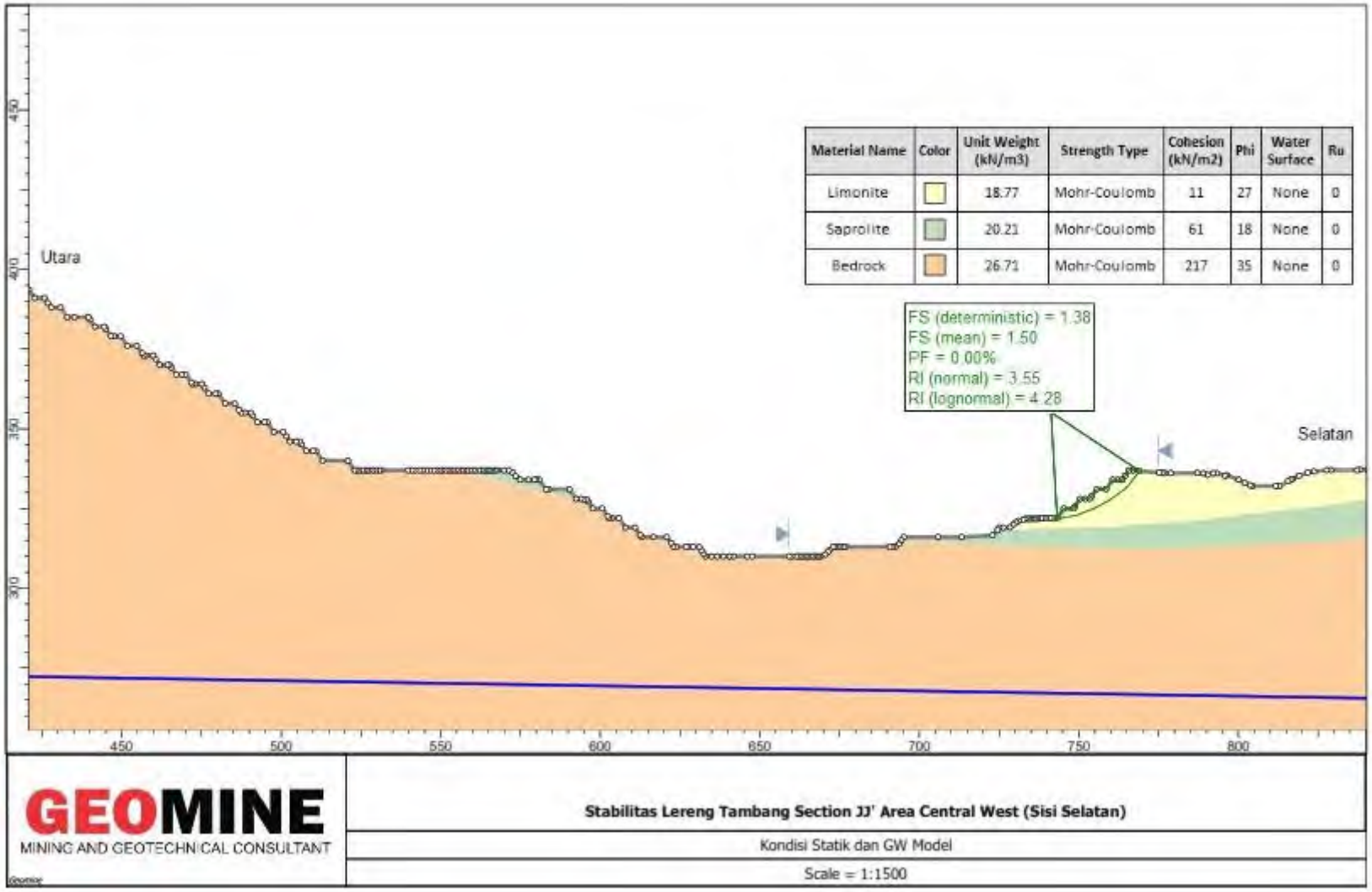

0.1
Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.45
FS (mean) = 1.58
PF = 0.00%
RI (normal) = 3.87
RI (lognormal) = 4.79
Utara
Selatan
W
500
450
400
350
300
250
50
100
150
200
250
300
350
400
450
500
550
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section HH' Area Central East (Sisi Selatan)
Kondisi Dinamik dan GW
Model Scale = 1:2000

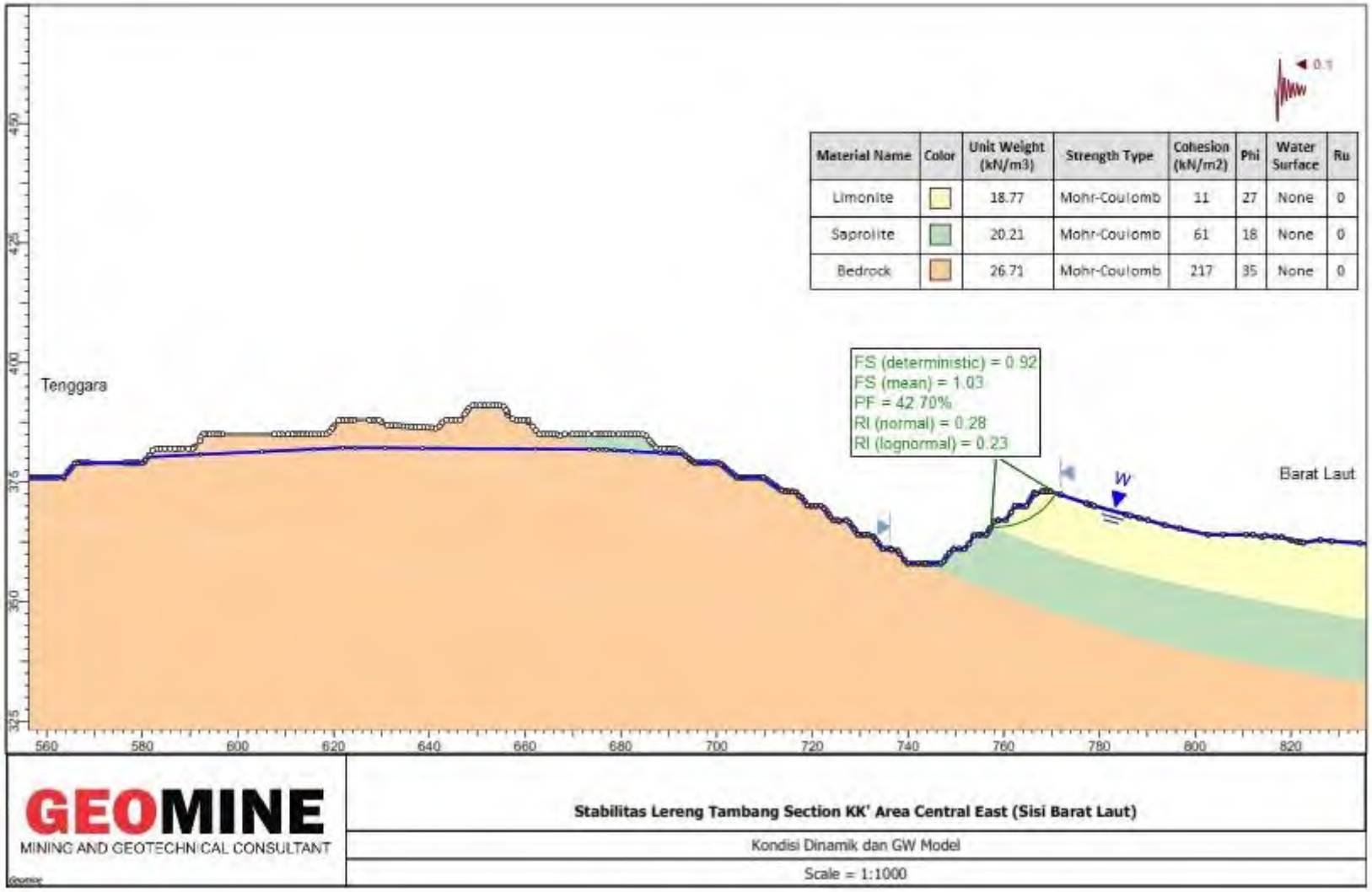

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.45
FS (mean) = 1.58
PF = 0.00%
RI (normal) = 3.87
RI (lognormal) = 4.79
Utara
Selatan
W
500
450
400
350
300
250
50
100
150
200
250
300
350
400
450
500
550
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section HH' Area Central East (Sisi Selatan)
Kondisi Statik dan GW Model
Scale = 1:2000

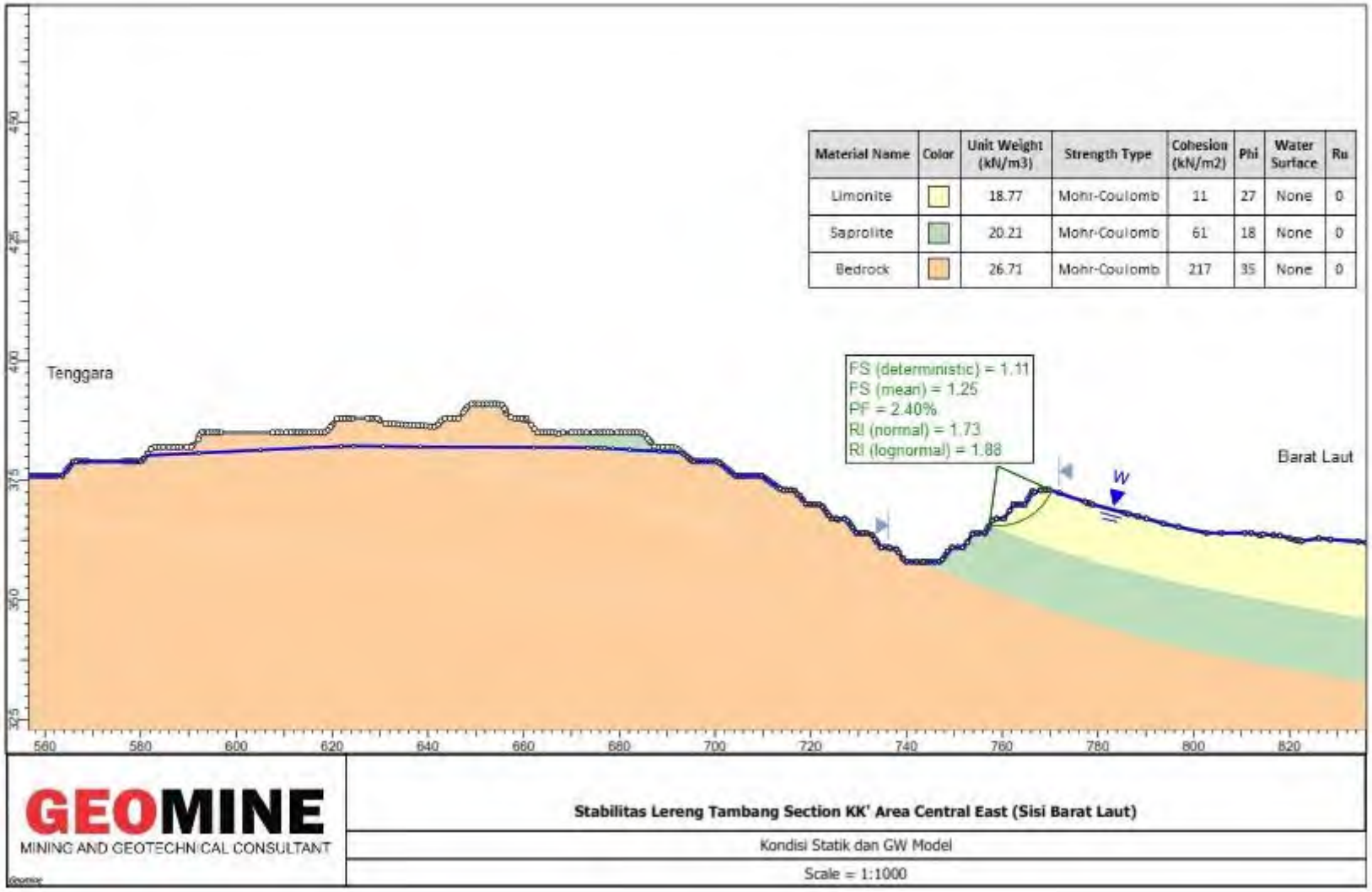

Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.56
FS (mean) = 1.73
PF = 0.00%
RI (normal) = 3.98
RI (lognormal) = 5.13
Tenggara
Barat Laut
W
450
425
400
375
350
325
720
740
760
780
800
820
840
860
880
900
920
940
960
980
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section II' Area Central East (Sisi Barat Laut)
Kondisi Dinamik dan GW Model
Scale = 1:1000


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.87
FS (mean) = 2.08
PF = 0.00%
RI (normal) = 4.87
RI (lognormal) = 6.83
Tenggara
Barat Laut
W
450
425
400
375
350
325
720
740
760
780
800
820
840
860
880
900
920
940
960
980
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section II' Area Central East (Sisi Barat Laut)
Kondisi Statik dan GW Model
Scale = 1:1000


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 1.14
FS (mean) = 1.24
PF = 0.60%
RI (normal) = 2.07
RI (lognormal) = 2.26
Utara
Selatan
450
400
350
300
450
500
550
600
650
700
750
800
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section JJ' Area Central West (Sisi Selatan)
Kondisi Dinamik dan GW Model
Scale = 1:1500


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Utara
Selatan
FS (deterministic) = 1.38
FS (mean) = 1.50
PF = 0.00%
RI (normal) = 3.55
RI (lognormal) = 4.28
450
400
350
300
450
500
550
600
650
700
750
800
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section JJ' Area Central West (Sisi Selatan)
Kondisi Statik dan GW Model
Scale = 1:1500


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
FS (deterministic) = 0.92
FS (mean) = 1.03
PF = 42.70%
RI (normal) = 0.28
RI (lognormal) = 0.23
Tenggara
Barat Laut
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section KK' Area Central East (Sisi Barat Laut)
Kondisi Dinamik dan GW Model
Scale = 1:1000


Material Name | Color | Unit Weight (kN/m3) | Strength Type | Cohesion (kN/m2) | Phi | Water Surface | Ru
Limonite | 18.77 | Mohr-Coulomb | 11 | 27 | None | 0
Saprolite | 20.21 | Mohr-Coulomb | 61 | 18 | None | 0
Bedrock | 26.71 | Mohr-Coulomb | 217 | 35 | None | 0
Tenggara
FS (deterministic) = 1.11
FS (mean) = 1.25
PF = 2.40%
RI (normal) = 1.73
RI (lognormal) = 1.88
Barat Laut
WT
450
425
400
375
350
325
560
580
600
620
640
660
680
700
720
740
760
780
800
820
GEOMINE
MINING AND GEOTECHNICAL CONSULTANT
Stabilitas Lereng Tambang Section KK' Area Central East (Sisi Barat Laut)
Kondisi Statik dan GW Model
Scale = 1:1000

Appendix 7
Curriculum Vitae Authors

DANIEL MADRE , MSc (GEOLOGY)

EXPLORATION SPECIALIST

Summary

Daniel Madre has been an Australian coal and mineral geologist since 1980, with full time work experience in Indonesia since 1988. He is specialist in exploration and for this reason is familiar with most coal and mineral projects in the country since their earliest stage of development. He has a diverse network of professionals throughout the industry. Daniel has a Master of Science degree in Geology. Daniel Madre is a member of the Australasian Institute of Mining and Metallurgy (no: 100878), the Australian Institute of Geoscientists (no: 5632), Ikatan Ahli Geologi Indonesia (no: 5000) and Masyarakat Geologi, Ekonomi Indonesia (no: B-0718). Daniel is a Competent Person in Indonesia for KCMI Code for Coal Resources.

Daniel runs a successful exploration consultancy and has in-house capabilities that range from geology, geophysics, drilling, geological modelling, mine design and planning. The company has discovered coal in East Kalimantan and Sumatra which has resulted in numerous coal mine developments. The company is formally registered by the Indonesian Department of Minerals and Energy to carry out exploration surveys and report coal and mineral resources.

Since 2005, the company diversified into nickel and mineral sands exploration and resource development. This work resulted in the development of the first nickel mine in Kalimantan. Other nickel projects investigated by the company are located in Sulawesi, Halmahera and Papua. Mineral sands projects have been investigated in Sumatra and Papua.

Commodities

Coal, oil shale, nickel laterites, phosphate, gold, manganese and mineral sands

Countries

Indonesia, Australia, USA, PNG, Kenya

Experience

Nov, 2000 - present PT Danmar Explorindo Jakarta, Indonesia
Managing Director
1996–Nov 2000 Independent Consultant Jakarta, Indonesia
Consultant Geologist
1988–1996 PT Petrosea Jakarta, Indonesia
Manager of Geology
1982–1988 Greenvale/Esperance group Sydney, Australia
Exploration Manager
1981–1982 Oil Refining & Exploration PL Sydney, Australia
Field geologist
1980 – 1981 NSW Coastal Engineers Sydney, Australia
Lab attendant

Education

1986- 1989 University of Wollongong Australia
Master of Science (geology)
1978- 1980 University of Sydney Australia
Bachelor of Science (geology and marine science)

Some Articles & Publications

- **1987, The Geology of the Alpha Oil Shale Deposit, Fuel, Vol.66, Butterworths UK**
- **1990, Torbanite Deposits of the World, Thesis: University of Wollongong**
- **2000, Coal Geology of the Bengkulu Block, Journal Asian Earth Science, Elsevier Advances in Sedimentology Series, Elsevier Special editions**
- **2005, Coal Geology of the Bengkulu Block. Proc. SE Asian Coal Geology Conference, Bandung**
- **2012, Coal Deposits of Sumatra, Coal Trans Conference Bali**
- **2012, Low Rank Coal Deposits of Indonesia, Coal Trans Conference Bali**
- **2013, Tectonic Framework of Sumatra & the Distribution of Coal Deposits, Ozmine Conference, Jakarta**
- **2014, Coal Potential of Sumatra, Coal Markets Workshop, Singapore**
- **2014 Adding Value Through Optimizing Exploration Techniques, 2nd Asian Nickel Conference**
- **2014 Coal Potential of Sumatra, World Coal Magazine volume 23**
- **2016 The Exploration Potential of Sumatra, Sumatra Miner Conference, Palembang Sumatra**
- **2016 Why Things are Improving in the Indonesian Coal Industry, RTC Kalimantan, Conference Balipapan, Indonesia**
- **2019 The Coal and Mineral Potential of Sumatra, Sumatra Miner Conference, Palembang Sumatra**

Resume

Name: Tobias Geoffrey Maya
Date of Birth: 26 March 1981
Marital Status: Married
Nationality: Australian

Address: Jl. H. Saidi II No. 16 RT.011 RW.07,
Cipete Utara, Kebayoran Baru,
Jakarta Selatan 12150,

Mobile: (+62) 0812 3869379 ;
Email : tobiasmaya@yahoo.com.au
tobias.maya@danmar.asia

Since 2004, Tobias has been working full time in the Indonesian coal and minerals exploration industry specializing in exploration geology, regional mineral studies, due diligence work, database validation and resource development. Tobias has a Bachelor of Science degree from the Charles Sturt University in NSW, Australia. He has also held a membership with the AusIMM since 2009.

Tobias has more than 15 years exploration experience throughout the country. This work includes the exploration and development of numerous nickel laterite projects. providing a key role in the optimization of exploration techniques that can be used to minimize costs & maximize project value, increasing confidence in estimation of Nickel laterite volumes to determine what are the controlling factors for project development within Indonesian deposits.

EDUCATION AND TRAINING

2006-2013	Completed BSc with major in Spatial Science with 2 minors in information technology and management Charles Sturt University, Wagga Wagga, NSW
2013	Certificate for successful completion of Valuation and Technical-Economic Assessment of Mining Projects, SRK Consultacy
2009	Certificate for successful completion of Mining and Minerals optimization course, Whittle Consultacy
1999-2001	Completed Geographic Information Systems (GIS)Diploma Wollongong TAFE
1998	Higher School Certificate; Bulli High School
1996	School Certificate; Bulli High School
1994	St Johns Ambulance First Aid Certificate

MEMBERSHIP OF PROFESSIONAL ORGANIZATIONS

Since 2009 Member of the AusIMM (No.304661)

EMPLOYMENT & WORK EXPERIENCE

2013 – Present **PT. Geo Search (full-time) part of the Danmar Group**

- President Director.
- Geophysical surveys
- Principle consultant to PT Danmar Explorindo

2004 – 2013 **PT. Danmar Explorindo (full-time)**

- Head GIS/Resource Geologist (SURPAC).
- Management Coal and Mineral Exploration, (Drilling, Survey, Resource Estimates).
- Business development / client relationship manager
- Coal Reconciliations of Operational Mines(monthly)
- Database validation (JORC)
- Training Personnel in GIS (SURPAC, Mapinfo, ESRI,).
- Drafting JORC reports under Principle Mr Daniel Madre, MSc (AusIMM member - 100878)

Provided above Consultancy services for following projects:

2018-present **PT.Hengjaya Mineralindo (HM)** - Morowali, Sulawesi.
-Laterite Nickel Exploration and database validation
-Resource Geology assessments
-Mine planning and production reconciliations
-UltraGPR survey 203km

2018-Present **PT.Kumamba Mining (KM**) - Sarmi, Papua, Indonesia
-Exploration management and database validation
- Geology assessments
- Trial UltraGPR survey 30km
- Trial Ground Magnetometer survey 30km

2018-present **PT.Halmahera Sukses Minerals (HSM)** - Halmahera, Maluku.
-Laterite Nickel Exploration and database validation
-Resource Geology assessments
-UltraGPR survey 75km

2017-2019 **PT.Sarana Mineralindo Perkasa (SMP)** - Morowali, Sulawesi..
- Laterite Nickel Exploration and database validation
-Resource Geology assessments
-Mine planning and pit optimization
-UltraGPR survey 85km

2017-2018 **PT.Ceria Nugraha Indotama (CNI)** - Kolaka, Sulawesi..
-Laterite Nickel Exploration and database validation
-UltraGPR survey 175km

2017-2018 **PT.Tiga Samudra Perkasa (TPS)** - Malili, Sulawesi
-Laterite Nickel Exploration and database validation
-Resource Geology assessments
-UltraGPR survey 75km

2018-2019 **PT.Sulawesi Cahaya Mineral (SCM)** – North Konawe, Sulawesi
-Laterite Nickel Exploration and Project support
-UltraGPR survey 600km

2005-2019 **PT.Ratu Samban Mining (RSM)** - Bengkulu, Sumatra.
-Thermal Coal Exploration management and database validation
-Resource Geology assessments
-Mine planning and production reconciliations
-Nedo regional study 2011
-Jogmec regional study 2013
-Bathymetric survey

2009-2018 **PT.Gunung Bara utama (GBU)** - Kutai Barat, East Kalimantan.
-Thermal Coal Exploration management and database validation
-Resource Geology assessments
-Pre-JORC study 2010
-JORC (2004) compliant reports 2011 & 2012

2005-2011 **PT.Itamatra Nusantara (ITM)** - Morowali, Central Sulawesi.
-Laterite Nickel Exploration management and database validation
-Resource Geology assessments
-Bathymetric survey

2004-2010 **PT.Telen Indoclay (TIC) Long Ikis Nickel** - Pasir, East Kalimantan
-Laterite Nickel Exploration management
-database validation
-Resource Geology assessments
-Mine Construction and Production
-Mine planning and production reconciliations
-Grade control
-Bathymetric survey

2010-2016 **PT.Trisula Kencana Sakti (TKS)** - Barito Utara, Central Kalimantan for **Golden Energy Mines (GEMS)**
-Thermal Coal Exploration management and database validation
-Resource Geology assessments
-JORC (2004) compliant reports 2010 & 2012
-JORC (2012) compliant reports 2013

2010-2018 **PT.Moa Maju Kurina Utama (MMKU)** - Bulungan, North Kalimantan
-Lignite Exploration management and database validation
-Resource Geology assessments
-Mine planning
-JORC (2004) compliant reports 2010 & 2011
-JORC (2012) compliant reports 2013

2011-2015 **PT.Delta Samudra (DS)** - Kutai Barat, East Kalimantan
-Lignite Exploration management and database validation
-Resource Geology assessments
-JORC (2004) compliant reports 2013

2012-2018 **PT.Berau Usaha Mandiri (BUM)** - Berau, East Kalimantan
-Lignite database validation
-Resource Geology assessments
-Mine planning

2010-2015 **PT.Inti Putera Kanaan (IPK)** - Musi banyuisn, South Sumatra
-Lignite Exploration management and database validation
-Resource Geology assessments
-Mine planning
-JORC (2004) compliant report 2012

2006-2014 **PT.Mulawarman Putra Abadi Sakti (MPAS)** - East Kalimantan
-PCI Coal Exploration management and database validation
-Resource Geology assessments
-JORC (2012) compliant reports 2014

2011-2013 **PT.Satria Lestari (SL)** - Tenggarong, East Kalimantan
-Thermal Coal exploration management and database validation
- Resource Geology assessment

2013 **Jingella Resources Pty Ltd** - Dingo, Queensland, Australia
-PCI Coal database validation
-Resource Geology assessments

2013 **Greenvale Mining Pty Ltd - (Alpha Oil shale)**
Alpha, Queensland, Australia
-Torbanite / Cannel Coal database validation
-Resource Geology assessments

2013 **PT.Bumi Merapi Energi (BME)** - Lahat, South Sumatra
-Thermal Coal database validation
-Resource Geology assessments
-Mine planning
-JORC (2004) compliant report 2012

2010-2012 **PT.Komunitas Bangun Bersama (KBB)** - Samarinda, East Kalimantan
-Lignite Resource Geology assessment
-JORC (2004) compliant reports 2010 & 2012

2012 **PT.Delma Mining Corporation (DMC)** - Bulungan, North Kalimantan
-Lignite database validation
-Resource Geology assessments
-JORC (2004) compliant report 2012

2012 **PT.Indonesia Pacific Energy (IPE) & PT.Mega Multi Cemerlang (MMC)** - Meulaboh, Aceh Barat & Nagan Raya, Aceh
-Lignite database validation
-Resource Geology assessments
-JORC (2004) compliant report 2012

2012 **Draig Resources Pty. Ltd** - Teeg & Nariin Teeg mining license, ovorhangay Province, Central Mongolia
-PCI COAL database validation
-Resource Geology assessments
-JORC (2004) compliant report 2012

2004-2010 **PT.Tunas Inti Abdai (TIA)** - Tanah Bumbu, South Kalimantan for **ABM investama (ABM)**
-Thermal Coal Exploration management and database validation
-Resource Geology assessments
-JORC (2004) compliant reports 2010 & 2011

2010 **PT.Bukit Utama Sehjatera (BUS)** - Sorong, West Papua
-Lignite Exploration management and database validation
-Resource Geology assessments

2010 **PT.Sri Bangun Jaya Persada (SBJP)** - East Kalimantan
-PCI COAL Exploration management and database validation
-Resource Geology assessments

2006-2010 **PT.Mifa Bersaudara (MIFA) & PT.Bara Energy Leastari (BEL)**
- Meulaboh, Aceh Barat & Nagan Raya, Aceh
-Lignite Exploration management and database validation
-Resource Geology assessments
-Mine planning
-JORC (2004) compliant report 2010

2009 **PT.Bakti Pertiwi Nusantara (BPN)** –
Weda Utara, Central Halmahera, maluku
-Laterite Nickel database validation
-Resource Geology assessments
-JORC (2004) compliant report 2009

2009 **Bildan.Pty.Ltd -** Pulau Talud, North sulawesi
-Manganese Exploration management

2008 **PT.Berau Bara Energy (BBE)** - Berau, East Kalimantan
-Thermal Coal database validation
-Resource Geology assessments
-JORC (2004) compliant report 2008

2008 **PT.Tripabara (TPB) -** Tapan, West Sumatra Province
-Thermal Coal Exploration management and database validation

2008 **PT.Lion Power Energy (LPE) -** Prabumuliah, South Sumatra
-Lignite Exploration management and database validation
-Resource Geology assessments

2007-2008 **PT.Ratu Samban Mining (RSM) -** Krui, Lampung. Sumatra.
-Iron Sand Exploration management

2006-2008 **PT.Tekno Marina Cipta (TMC)** - Kota Bangun, East Kalimantan
-Thermal Coal Exploration management and database validation
-Resource Geology assessments

2004-2007 **CV. Gudang Hitam Prima (GHP/BBM)** - Sanga Sanga Coal Mine, Samarinda, East Kalimantan
-Thermal Coal Exploration management and database validation
-Resource Geology assessments
-Mine planning and production reconciliations

2006 **PT.Borneo Indobara (BIB) -** Tanah Bumbu, south kalimantan for SINAR MAS MINING
- Project Due diligence study Grimulya Block

2004-2006 **PT. Multi Prima Energy (MPE) -** Loa Raya Coal Mine, Tenggarong, East Kalimantan.
-Thermal Coal Exploration management and database validation
-Resource Geology assessments
-Mine planning and production reconciliations

Previous Employment

1999- 2004 Natural Beauty Floor Sanding (full-time)

- Surface preparation; punch & fill, sanding & edging
- Applying coating product

September 2000 Hydrographic Sciences Australia (2 weeks work experience)

- Re-editing Hydrographic charts
- Hydrographic chart compilation
- Sounding selection

CONFERENCE PAPER PRESENTATIONS

November 2018	**"Indoneisa, Hi-CV coal supply?"** - 7th annual Coaltrans Emerging Asia Marketes, Hanoi, Vietnam
May 2018	**" Developing efficiency in the Indonesian coal supply chain"** - 24th annual Coaltrans Asia, Bali,
September 2017	" **Exploration potential for new Nickel supplies in Indonesia"** - Metal Bulletin: 5th Asian Nickel Conference, Jakarta,
July 2016	**" Which Indonesian coal energy projects will attract Korean investors through 2020?"** - Korea Coaltrans Asia, Seoul,
March 2015	**"The Coal Potential of Sumatra"** - Sumatra Miner 2015 conference
September 2014	**"Adding value through optimizing exploration techniques"** - 2nd Asian Nickel Conference
December 2012	**"Low Rank Coal Deposits of Indonesia"** - IHS Mcloskey Asia Pacific Coal Outlook Conference 2012, Bali
June 2012	**"The Coal Deposits of Sumatra"** - 18th annual Coaltrans Asia, Bali

SOFTWARE EXPERIENCE

- SURPAC Mining software – Good Knowledge of Geodatabase, Surface modelling, Block Modelling, Pit optimisation, Pit design modules.
- WHITTLE Pit optimisation Software – good knowledge of Pit optimisation procedure and analysis
- ArcGIS 9.3 and ArcView 3.2 GIS Software – Good knowledge of Spatial interpolation techniquies and map design
- MapINFO and Surfer GIS software
- Microsoft 7-10, VISTA, XP and NT operation systems
- Microsoft office 2003, 2007 & 2010 Word, Excel, Access, Powerpoint
- Adobe acrobat 8 Professional
- AutoCAD 2009

REFERENCES

Daniel Madre (Director)
PT.Danmar Explorindo
SANUR, BALI
Ph. +62 81 23851151
daniel.madre@danmar.asia

CV – Charles Edward Watson

Date of Birth : 9th October 1951
Nationality : British
Address : 11 Cassidy Avenue, Lincoln
7608, Canterbury, New Zealand
Education : B.Sc (Hons) Geology, University of London (1971-1974)
Australasian Institution of Mining & Metallurgy, Fellow (2012)

Professional Experience :

July 2022 – present: Technical Adviser, PT Hengjaya Mineralindo, Sulawesi, Indonesia

Assisted QAQC HOD to update, report and submit final QAQC section for JORC 2012 compliant technical report. Assess existing sample prep lab/assay lab procedures and implement improvements to increase output while maintaining accuracy and precision.Plan, design and implement changes to accommodate Limonite production phase.

July 2019 – Mar 2020: Technical Adviser, PT Hengjaya Mineralindo, Sulawesi, Indonesia

Undertook a Technical Audit of the Sample Processing and Assay Laboratories at the PTHM mine site at Tangofa, Sulawesi, Indonesia. Prime objective the optimization of production and Quality Control during the ramp up in lateritic nickel ore production from 70,000 wmt to 200,000 wmt per month. Addressed sampling flow and assay capacity & capability; current restrictions eg sample turnaround time, shift hours and manpower; staff skillsets required for current and expanded operations; equipment selection and utilisation; liaison with Drilling Contractor Danmar on JORC compliance, assay results and storage; amendment of SOP's where required; implemented improved monthly reporting of data for management. Included as a Qualified Person for the compilation of QA/QC section of independent JORC Compliant Nickel Resource Estimate, 30th June 2020, for submission to the ASX.

Jan 2013 – Dec 2017: Managing Director, Mineral Services Ltd. Lincoln, New Zealand

Established, commissioned and managed Mineral Processing Laboratory at Kiunga, in the Western Province, Papua New Guinea, processing drill samples collected from a high quality magnetite source. Trained local staff in skills required and monitored programme to meet the throughput from the drill programme. Working in a very challenging environment, programme was completed on time and selected sample cons sent off for assay.

Established and operated Mineral Processing Facility at Greymouth providing heavy mineral separation, recovery and identification services to the West Coast alluvial gold mining sector and overseas clients. Undertook mineralogical examination and reporting on heavy mineral samples containing diamonds, gold and tin from various projects in West Africa.

Commissioned and operated Gold Room at Greymouth for smelting of alluvial gold and the production of gold dore bars for Southern Gold Buyers; undertook fire assay of samples from gold dore bars to determine gold fineness prior to despatch of bars to Perth Mint for refining.

Apr 2010 – Dec 2012 : Geologist, Gold & Green Resources, Hokitika, New Zealand

Compiled Gold Exploration and Mining Permit applications for clients; compiled and submitted Resource Consent and Access Agreement applications for clients; mineralogical investigation of concentrates from West Coast gold mining operations; researched West Coast and Central Otago alluvial gold mining operations.

Jan 2009 – Mar 2010 : Technical Services Manager, Woodlark Mining Limited, PNG

Established, commissioned and managed Prep Lab at Woodlark Mining gold project; recovered gold grains from island wide pan con survey and classified based on morphology and surface textures of alluvial gold grains. Responsible for maintaining company relations with Provincial Government & the Mineral Resources Authority in Port Moresby.

Mar 2005 – Dec 2009 : Alotau Manager, Woodlark Mining Limited, Papua New Guinea

Established base for exploration operations on Woodlark Island supporting two drill gold sampling programme; Managed Logistics for field operations, including initial construction of Bomagai Camp, while establishing and managing gold Preparation Laboratory in Alotau.

Dec 2001 – Oct 2004 : Operations Manager, PT Galuh Cempaka, Indonesia

Managed operations at Galuh Cempaka Diamond Project following purchase from Ashton Mining / MMC JV; Designed drill sampling programme to increase diamond reserves; produced updated Feasibility Study prior to commencing Dry Mining operations.

2000 – May 2011 : Director, Tristate Resources, Mildura, Victoria, Australia

Established and commissioned Heavy Mineral Laboratory at Mildura to process samples produced from major Mineral Sand companies' drilling and bulk sampling activities in the Murray Basin.

Jan 1993 – Dec 1999 : Technical Advisor, PT Indo Mineratama, Indonesia

Provided technical and logistical support to IndoMin Resources and Ocean Resources projects; Compilation of technical data for IndoMin Resources IPO on Vancouver Stock Exchange; Undertook Technical Audit of Aokam Thai No. 3 Dredge prior to mobilisation to Ocean Resources Offshore Diamond Project; Commissioned Navstar DGPS system and instructed local staff in its use at the Offshore Diamond Project; Monitored drill programme

Undertook detailed Scoping Study on Tin Tailings Project on Indonesian Tin Islands.

Oct 1989 – Dec 1992 : Operations Manager, Shell-Billiton Heavy Mineral Project, Indonesia

Managed field programmes from first reconnaissance through to follow-up drilling at Kumamba and other Mineral Sand projects; prepared semi-annual work programmes and budgets and submitted Monthly and Quarterly Reports to Government and Joint Venture partners; Established and managed fully equipped Heavy Mineral Laboratory at Pangkal Pinang for processing of samples from Heavy Mineral Sands project, gold, diamond and tin projects with particular reference to gold grain morphologies and surface textures as part of provenance studies.

Mar 1989 – Sep 1989 : Geologist, BP Minerals, Indonesia

Managed exploration programme and upgraded sample processing lab at gold / zircon project in Central Kalimantan, Indonesia.

Sep 1987 – Mar 1989 : Project Manager, Acorn Diamonds Indonesia

Managed advanced exploration programme at alluvial diamond project in South Kalimantan; included bulk sampling with open pits and sheet pile caissons, plant operation, diamond and gold recovery and recording; supervised drilling programme utilising five drills; prepared budgets and work programmes for Government and management; active in preparation of Feasibility Study by Alluvial Dredges; undertook investor presentations in Australia & Europe.

Jan 1983 – Mar 1987 : Senior Geologist, De Beers, Kimberley, South Africa

Managed De Beers Kimberley Heavy Mineral Laboratory and co-ordinated operations at four other regional laboratories; Liaised with Exploration Managers over new techniques for improving operational efficiency and with Research Geologists to ensure new developments in mineral chemistry and surface texture analysis circulated into all laboratories.

Jan 1982 – Dec 1982 : Senior Geologist, De Beers, Lobatse, Botswana

Supervised loam sampling, geophysical surveys and RC Drill programme in Prospecting Licences for diamonds in South Western Botswana.

Aug 1977 – Dec 1981 : Staff Geologist, Zaire Exploration, Tshikapa / Lubumbashi, Congo

Supervised loam sampling, ground magnetometry and drilling programmes for diamonds in Kasai and Shaba (Katanga) provinces; follow up test work on kimberlites on Kundelungu Plateau; Responsible for staff of 800; introduced to diamond sorting, grading and purchasing.

Dec 1974 – Jul 1977 : Geologist, De Beers, Kimberley, South Africa

Introduction to all aspects of hard rock diamond exploration, eg loam and stream sampling, ground magnetometry, churn and reverse circulation drilling, laboratory techniques, target selection and mining operations.

C.E.Watson
11th July 2022

COMPANY

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Australia

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Singapore 049145

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Jl. Jend. Sudirman Kav. 71
Jakarta 12190, Indonesia

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Melbourne Victoria 3000
Australia

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Central, Hong Kong

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Jakarta 10220, Indonesia

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