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LAMPIRAN

**Lampiran 1 (Material Properties Waste & Buttress In-Pit Dump
Seam 28-29)**

 <p>ZEKON INDONESIA INTEGRATED ENGINEERING AND CONSTRUCTION Website : www.zekon.co.id Email : info@zekon.co.id</p>	<h2 style="margin: 0;"><u>TECHNICAL NOTE</u></h2>	 <p>PT. JEMBAYAN MUARABARA</p>
Client : PT. JEMBAYAN MUARABARA (JMB)	Date : September 26 th , 2019	
Project : Slope Stability Analysis of IPD 303 JMB	Attention : Komang Suandra	
Location : District of Separi – East Kalimantan	:	
Subject : Slope Stability Analysis	:	

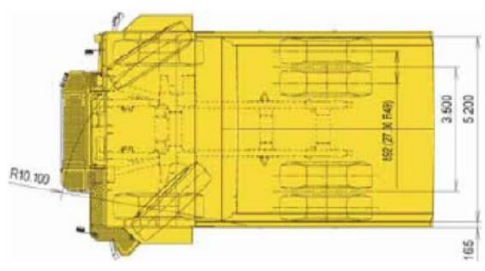
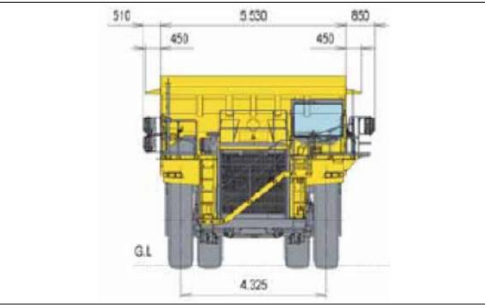
6. SUMMARY OF MATERIAL PROPERTIES

Summary of material properties that is used in slope stability analysis is presented as follow:

Material Name	Color	Unit Weight (kN/m ³)	Sat. Unit Weight (kN/m ³)	Strength Type	Cohesion (kN/m ²)	Phi	Cohesion Type	Water Surface	Hu Type	Hu	Ru
COAL Seam	■	12.5	13	Mohr-Coulomb	10	15		Water Surface	Automatically Calculated	1	
Buttress	■	17	17.5	Undrained	70		Constant	None			0
CLAYSTONE	■	19	20	Undrained	300		Constant	None			0
Bedding Shear	■	12.5	13	Mohr-Coulomb	223	55		Water Surface	Automatically Calculated	1	
Interbed	■	19	20	Mohr-Coulomb	157	59		Water Surface	Automatically Calculated	0	
WD-1	■	16	16.5	Undrained	50		Constant	None			0
WD-2	■	16	16.5	Undrained	50		FDepth	None			0
Stage 6	■	16	16.5	Undrained	50		Constant	None			0

7. SURCHARGE LOAD

The using of HD 785-7 Komatsu will be generating great surcharge load over disposal area. Technical specification of HD 785-7 can be seen below:

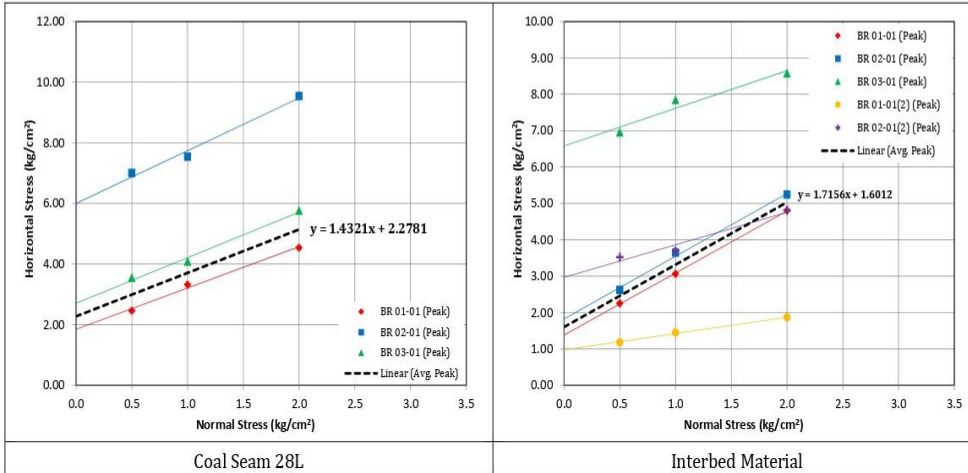
	<p>WEIGHT (APPROX.)</p> <p>Empty weight..... 72.600 kg Gross vehicle weight..... 166.000 kg Not to exceed max. gross vehicle weight, including options, fuel and payload. Weight distribution Empty: Front axle..... 47% Rear axle..... 53% Loaded: Front axle..... 31,5% Rear axle..... 68,5%</p>
	<p>TYRES</p> <p>Standard tyres..... 27.00 R49 Overall width = 758 mm Overall diameter = 2697 mm Estimated contact area = 0.575 m²</p>

Design surcharge load shall be empty weight plus permissible payload divided by estimated contact area that has considered the weight distribution. For 80% of max. payload, the design surcharge load is 433 kPa.

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Subject : Slope Stability Analysis	:

3. PARAMETER SELECTION OF COAL SEAM 28L & INTERBED MATERIAL

Laboratory testing results for coal seam 28L and interbed material is presented as follow:



Summary strength properties of coal seam 28L and interbed material is presented as follow:

Soil Type	c (kPa)	φ (°)
Coal Seam 28L	223	55
Interbed Material	157	59

Comment:

Both coal seam 28L and interbed material should not be the trigger of encountered problem as predicted earlier. The laboratory results above showed good condition of coal seam 28L & interbed material as well as the existing condition as depicted below:



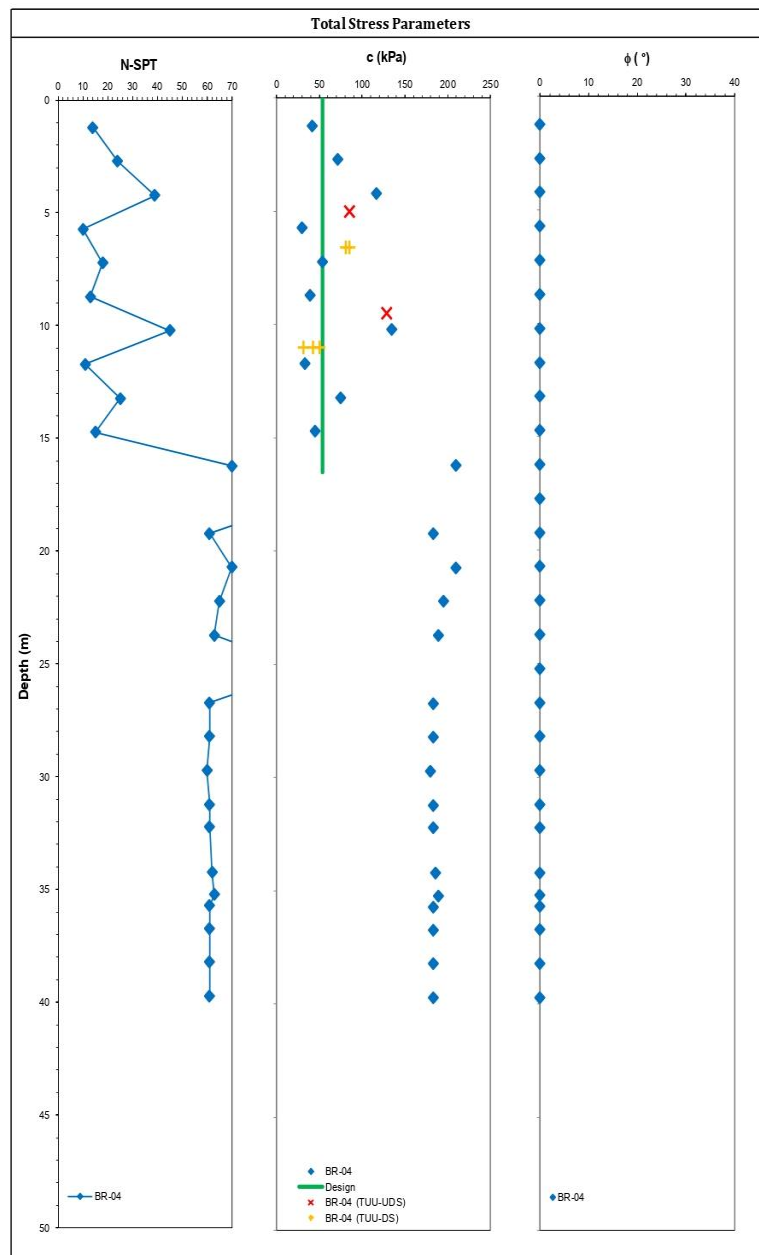
Excavated Coal Seam 28L & Interbed Material

Condition of Coal Seam 28L & Interbed Material

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Subject : Slope Stability Analysis	:

4. PARAMETER SELECTION OF BUTTRESS MATERIAL

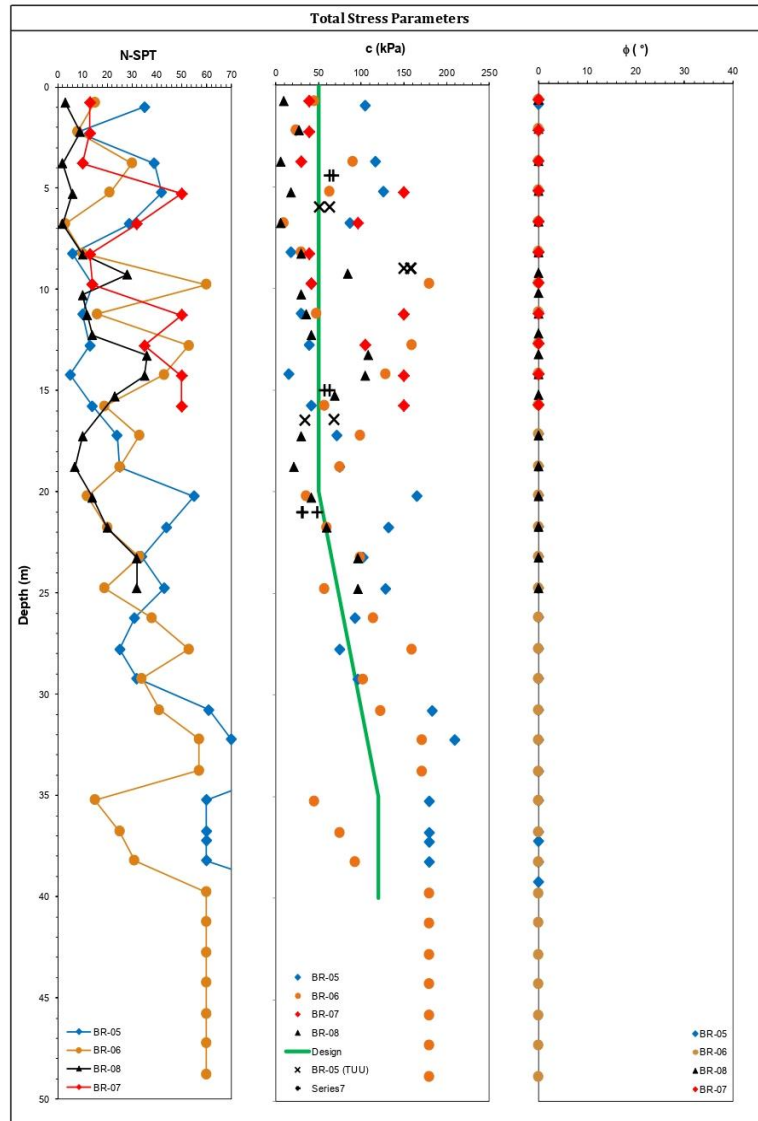
Properties of buttress is determined from field investigation data and laboratory results of BR-04. Variation of buttress strength properties is presented below:









Client : PT. JEMBAYAN MUARABARA (JMB)	Date : September 26 th , 2019
Project : Slope Stability Analysis of IPD 303 JMB	Attention : Komang Suandra
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Subject : Slope Stability Analysis	

5. PARAMETER SELECTION OF WASTE DUMP MATERIAL

Properties of waste dump material is determined from field investigation data and laboratory results of BR-05 through BR-08. Variation of waste dump material strength properties is presented below:

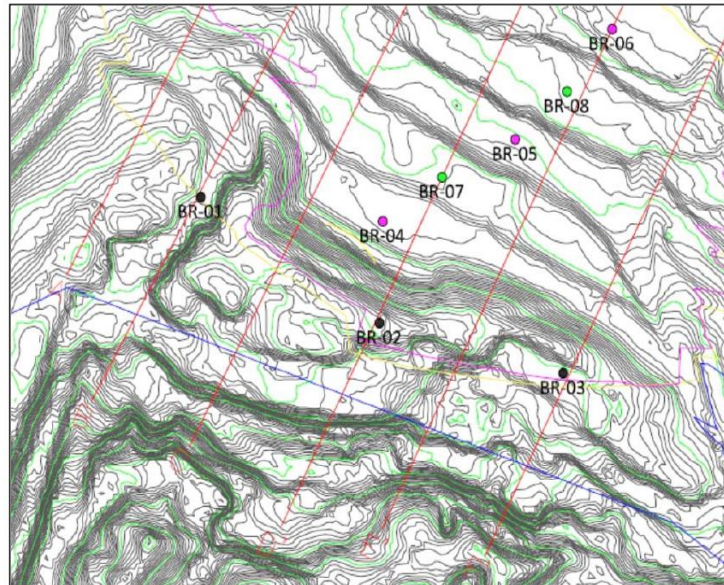


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Client : PT. JEMBAYAN MUARABARA (JMB)		Date : September 26 th , 2019
Project : Slope Stability Analysis of IPD 303 JMB		Attention : Komang Suandra
Location : District of Separi – East Kalimantan		
Subject : Slope Stability Analysis		
1. PROBLEM		
<p>ZEKON has been invited by JMB to provide technical analysis to solve problem encountered at Inpit Dump 303 JMB. Our team visited the site on July 2019 to collect important information such as field documentations and other required data. General findings that encountered at IPD 303 JMB mentioned as follow:</p>		
<ul style="list-style-type: none"> • Crack line on RL +40 m • Crack line on RL +0 m • Crack line at toe of buttress • Ground subsidence along the crack line on RL +40 m 		
		
		
<p>Preliminary suspect that generate problem on IPD 303 JMB is the bedding shear of coal seam 28L. Further action to prove this problem is by collecting core samples from 3 (three) boreholes (BR-01, BR-02 and BR-03) along the toe of buttress.</p>		
<p>Collected data that collected during site visit is listed as follow:</p>		
<ul style="list-style-type: none"> • Topographic maps (July 1st and 19th, 2019) • Design stage of IPD 303 JMB (Stage 1 through 7) • Design report (Golder, 2018) • Monitoring data in period of July 18th through 20th (PAMA, 2019) • Material specification of buttress (Requirement : DCP < 10 blows/100 mm) 		
1		

Client	: PT. JEMBAYAN MUARABARA (JMB)	Date	: September 26 th , 2019
Project	: Slope Stability Analysis of IPD 303 JMB	Attention	: Komang Suandra
Location	: District of Separi – East Kalimantan		:
Subject	: Slope Stability Analysis		:

2. REQUEST OF GEOTECHNICAL DRILLING

ZEKON has requested JMB to provide geotechnical drilling at IPD 303 JMB in order to assess soil properties required for performing slope stability analysis. General layout of geotechnical drilling is depicted as follow:



Layout of Geotechnical Drilling

ID	Coordinates		Depth (m)	Requirement
	x (m)	y (m)		
BR-01	516378.6411	9982739.5090	15	Collect core sample of seam 28L & interbed material
BR-02	516674.7676	9982547.9042	15	Collect core sample of seam 28L & interbed material
BR-03	516979.2156	9982471.3585	15	Collect core sample of seam 28L & interbed material
BR-04	516680.2993	9982702.6240	40	SPT and UDS on buttress material
BR-05	516899.8928	9982827.3502	45	SPT and UDS on waste dump material
BR-06	517060.4628	9982995.2876	50	SPT and UDS on waste dump material
BR-07	516778.6537	9982769.9406	25	SPT and UDS on waste dump material
BR-08	516985.6493	9982900.2165	25	SPT and UDS on waste dump material

Samples collected from field have been delivered and tested in laboratory to assess the following properties:

- Index properties (particle size distribution, natural water content, bulk density, specific gravity, atterberg limit)
- Strength properties (direct shear test, unconfined compression test, Triaxial UU)

Lampiran 2 (Material Properties Batuan In-Pit Dump Seam 28-29)

**JEMBAYAN MUARA BARA - PIT 303
GEOTECHNICAL DATA FOR EACH MATERIAL (LAYER)**

Name Of Litology	σc (Mpa) Compressive Strength	σn (Mpa)	E (Mpa) Young's Modulus	u Poisson Ratio	τ (Mpa)		Cohesion (MPa)		Phi (°) Friction Angle		Remarks	
					Peak	Residual	Peak	Residual	Peak	Residual		
Overburden	0.70		82.25	0.32							UCS (BH02)	
		0.064			0.159	0.129	0.11	0.10	37.91	28.00	DS (BH02)	
		0.185			0.253	0.193						
		0.190			0.257	0.196						
	0.70		82.25	0.32								
Interburden 1 (Seam 20-22)	9.31		1504.78	24.00							Coal Layer (BH02)	
	2.44		183.69	0.29							UCS (BH02)	
Interburden 2 (seam 22-24)	3.93		184.27	0.26							UCS (BH02)	
	1.44		94.20	0.31							UCS (BH04)	
	1.19		119.67	0.25							UCS (BH04)	
	2.14		110.20	0.31							UCS (BH05)	
	2.18		127.09	0.28								
Interburden 3 (seam 24-25)		0.069			0.101	0.075	0.069	0.053	25.25	17.95	DS (BH04)	
		0.138			0.134	0.098						
		0.206			0.166	0.12						
		0.069			0.201	0.111	0.154	0.086	34.27	19.95	DS (BH04)	
		0.139			0.249	0.136						
		0.201			0.291	0.159						
		0.063			0.179	0.125	0.132	0.099	36.68	22.57	DS (BH04)	
		0.135			0.233	0.155						
		0.184			0.269	0.175						
		0.068			0.167	0.108	0.121	0.086	34.13	17.81	DS (BH05)	
		0.18			0.215	0.13						
		0.208			0.262	0.153						
		1.85		106.33	0.31							UCS (BH04)
		0.25		27.97	0.25							UCS (BH04)
		1.72		95.64	0.31							UCS (BH05)
	0.69		90.17	0.31							UCS (BH05)	
	5.99		328.8	0.31							UCS (BH05)	
	10.56		442.91	0.23							UCS (BH02)	
	2.48		205.06	0.3							UCS (BH01)	
	3.36285714		185.2686	0.288571								
Interburden 4 (seam 25-26)	4.95		457.26	0.30							UCS (BH01)	
	0.25		10.56	0.29							UCS (BH03)	
	6.56		428.14	0.31							Coal Layer (BH04)	
		0.06				0.21	1.51				DS (BH05)	
		0.13				0.25	0.18					
		0.20			0.30	0.21						
	3.92		298.65	0.30								
Interburden 5 (seam26-28)	4.92		269.74	0.31							UCS (BH05)	
	10.63		1127.86	0.25							UCS (BH04)	
	2.94		164.45	0.23							UCS (BH03)	
	9.11		909.55	0.29							UCS (BH01)	
		0.074				0.272	0.158				DS (BH-03)	
	0.144				0.323	0.190						
	0.231				0.387	0.230						
	6.90		617.90	0.27								
Interburden 6 (Seam 28-29)	0.52		63.71	0.30							UCS (BH03)	
	1.60		110.56	0.31							UCS (BH04)	
	4.13		536.85	0.25							UCS (BH05)	
		0.068				0.120	0.075	0.08	0.05	29.03	20.80	DS (BH04)
		0.147				0.164	0.106					
		0.223				0.206	0.134					
		0.067				0.106	0.069	0.081	0.048	20.31	17.38	DS (BH01)
		0.138				0.132	0.091					
		0.207				0.158	0.112					
		0.055				0.134	0.104	0.092	0.074	37.31	28.17	DS (BH01)
	0.13				0.191	0.144						
	0.188				0.235	0.175						
	2.08333333		237.04	0.286667								
Interburden 7 (seam 29-31)	0.98		185.46	0.24							UCS (BH01)	
	2.16		203.67	0.23							UCS (BH03)	
	1.57		194.565	0.235								
Interburden 8 (seam 31-below)	2.02		140.76	0.29							UCS (BH03)	
	2.02		140.76	0.29								

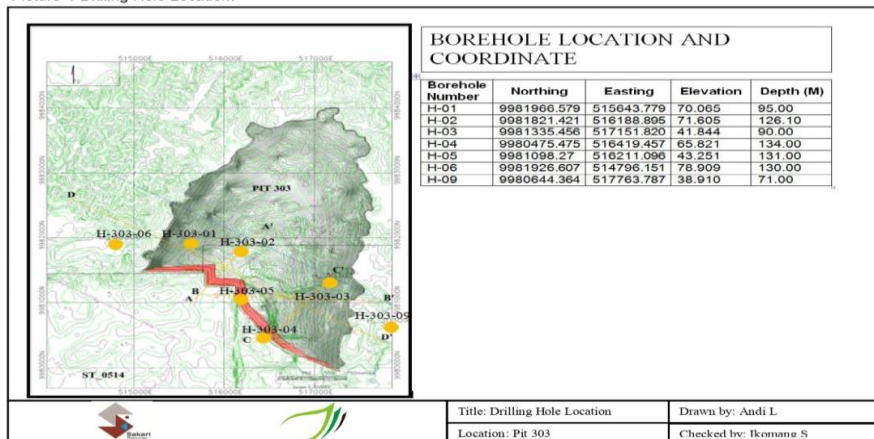
**JEMBAYAN MUARA BARA-PIT 303
SUMMARY OF GEOTECHNICAL DATA**

Name Of Litology	Y (KN/m3)	Generalised Hoek-Brown								Mohr-Coulomb		Remarks
		σ_c (Mpa) Compressive Strength	E (Mpa) Young's Modulus	ν Poisson Ratio	GSI	mi	mb	s	a	c' (Mpa)	ϕ (deg)	
Overburden	22	0.70	82.25	0.32	60	7	1.678	0.0117	0.503	0.038	30.36	
Interburden 1 (Seam 20-22)	22	2.44	183.69	0.29	65	7	2.006	0.0205	0.502	0.145	31.76	
Interburden 2 (Seam 22-24)	22	2.18	127.09	0.28	70	7	2.398	0.0357	0.501	0.146	33.12	
Interburden 3 (Seam 24-25)	22	3.36	185.27	0.29	70	7	2.398	0.0357	0.501	0.225	33.12	
Interburden 4 (Seam 25-26)	22	3.92	298.65	0.30	70	7	2.398	0.0357	0.501	0.263	33.12	
Interburden 5 (Seam 26-28)	22	6.90	617.90	0.27	70	7	2.398	0.0357	0.501	0.462	33.12	
Interburden 6 (Seam 28-29)	22	2.08	237.04	0.29	70	7	2.398	0.0357	0.501	0.139	33.12	
Interburden 7 (Seam 29-31)	22	1.57	194.57	0.24	70	7	2.398	0.0357	0.501	0.105	33.12	
Interburden 8 (Seam 31-below)	22	2.02	140.76	0.29	70	7	2.398	0.0357	0.501	0.135	33.12	
Coal (Seam 20-25)	14	9.31	1504.78	24.00	45	15	2.104	0.0022	0.508	0.487	32.49	
Coal (Seam 26-31)	14	6.56	428.14	0.31	45	15	2.104	0.0022	0.508	0.343	32.49	



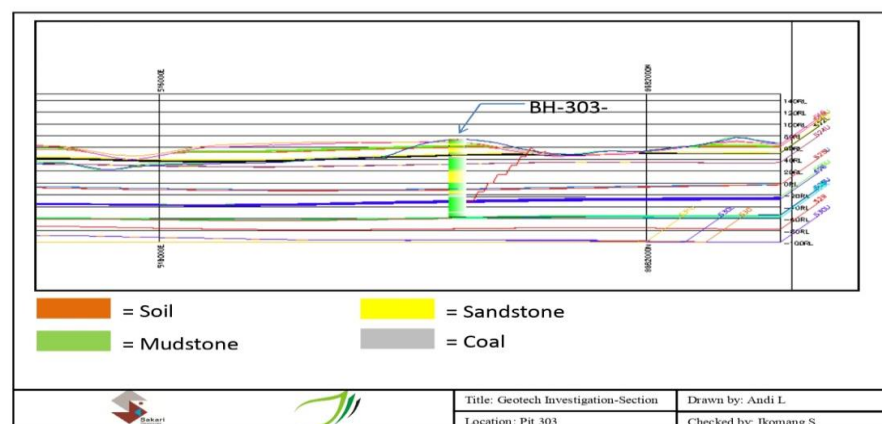
**PT SINERGY CONSULTANCY SERVICES
GEOTECHNICAL AND HYDROLOGY SECTION**

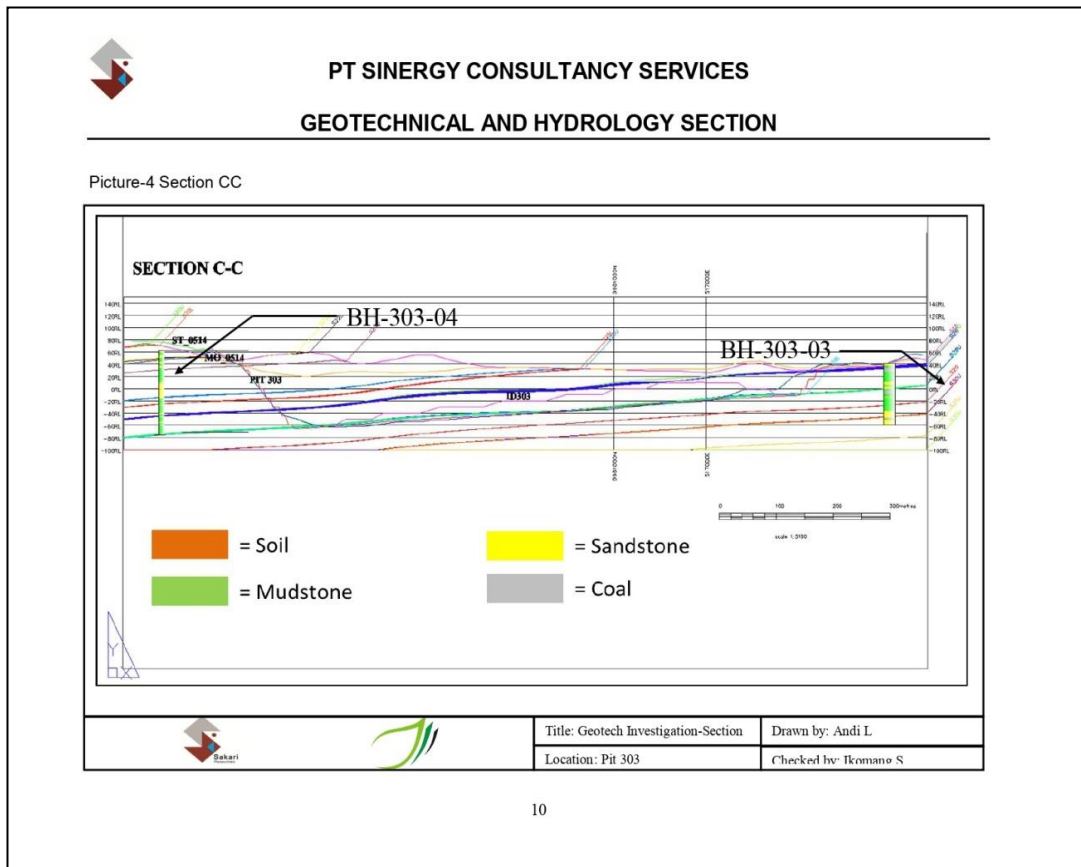
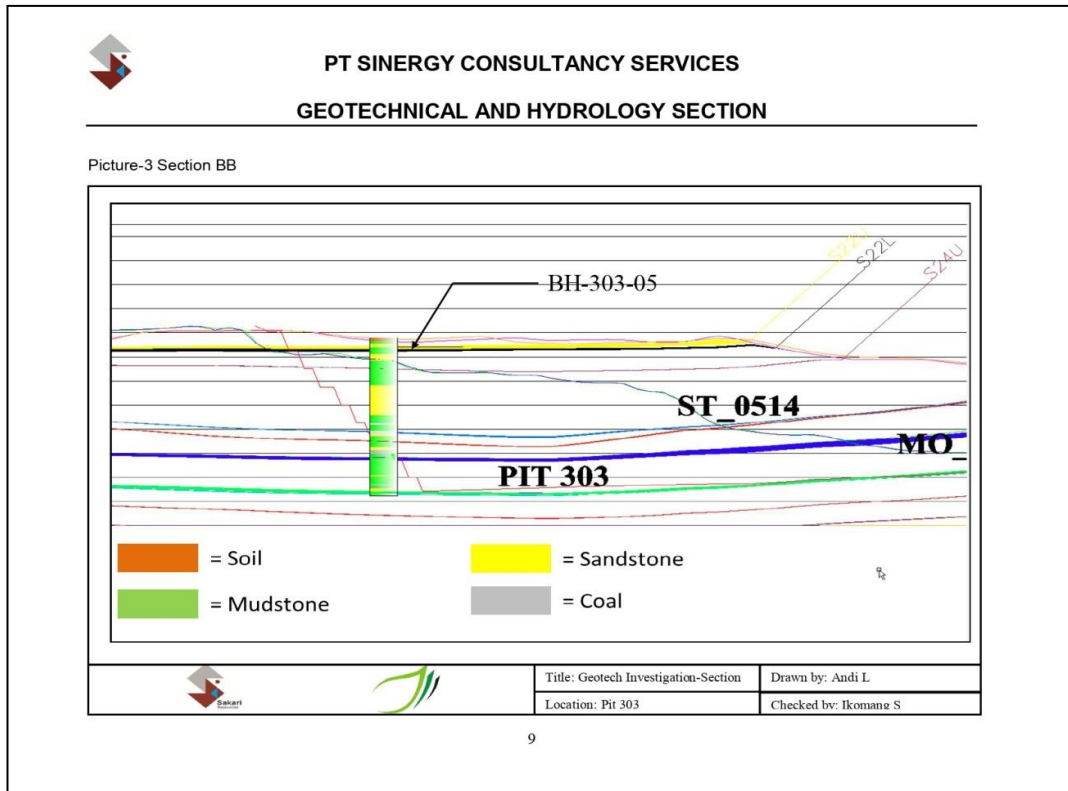
Picture-1 Drilling Hole Location.



**PT SINERGY CONSULTANCY SERVICES
GEOTECHNICAL AND HYDROLOGY SECTION**

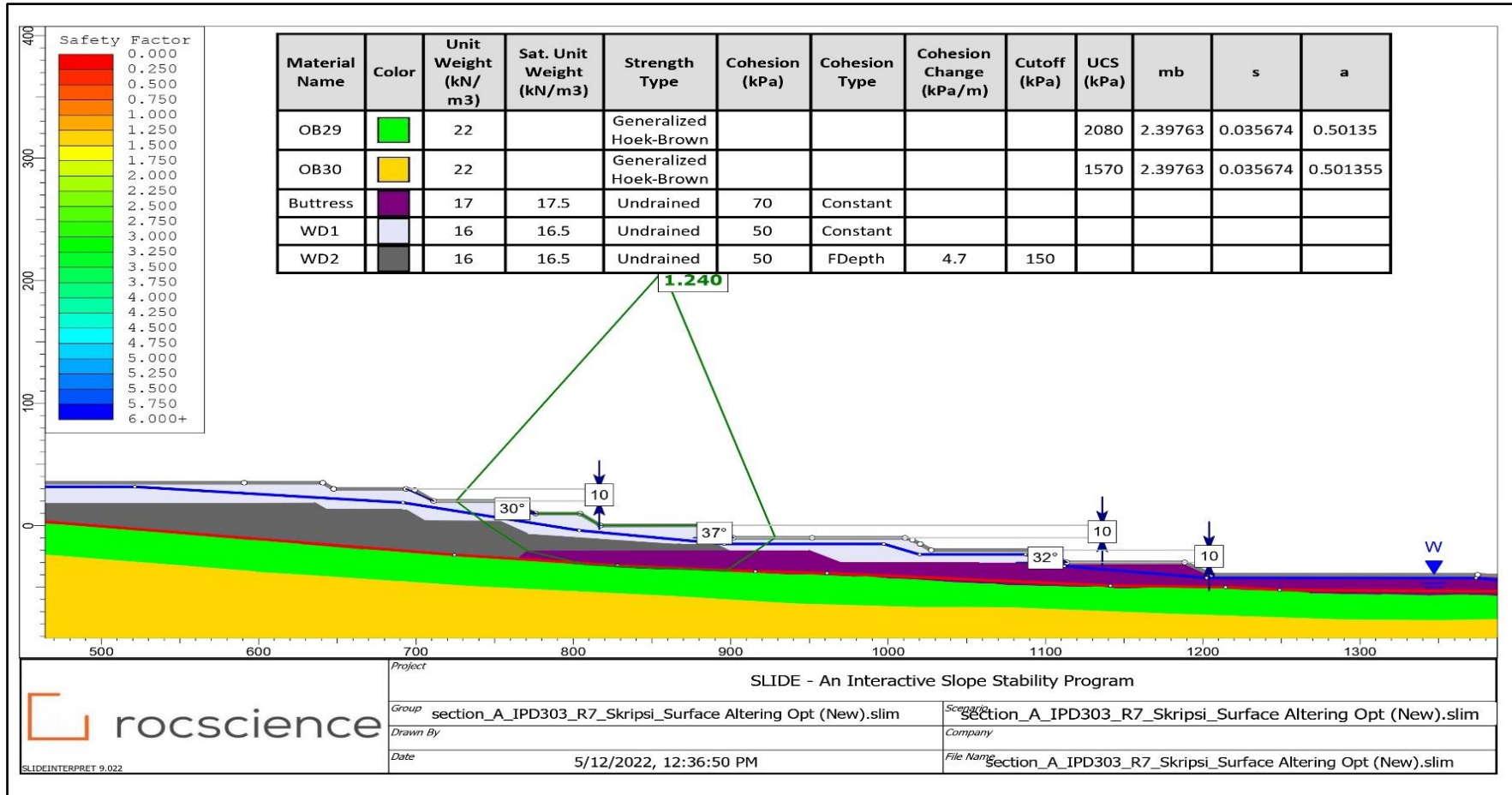
Picture-2 Section AA



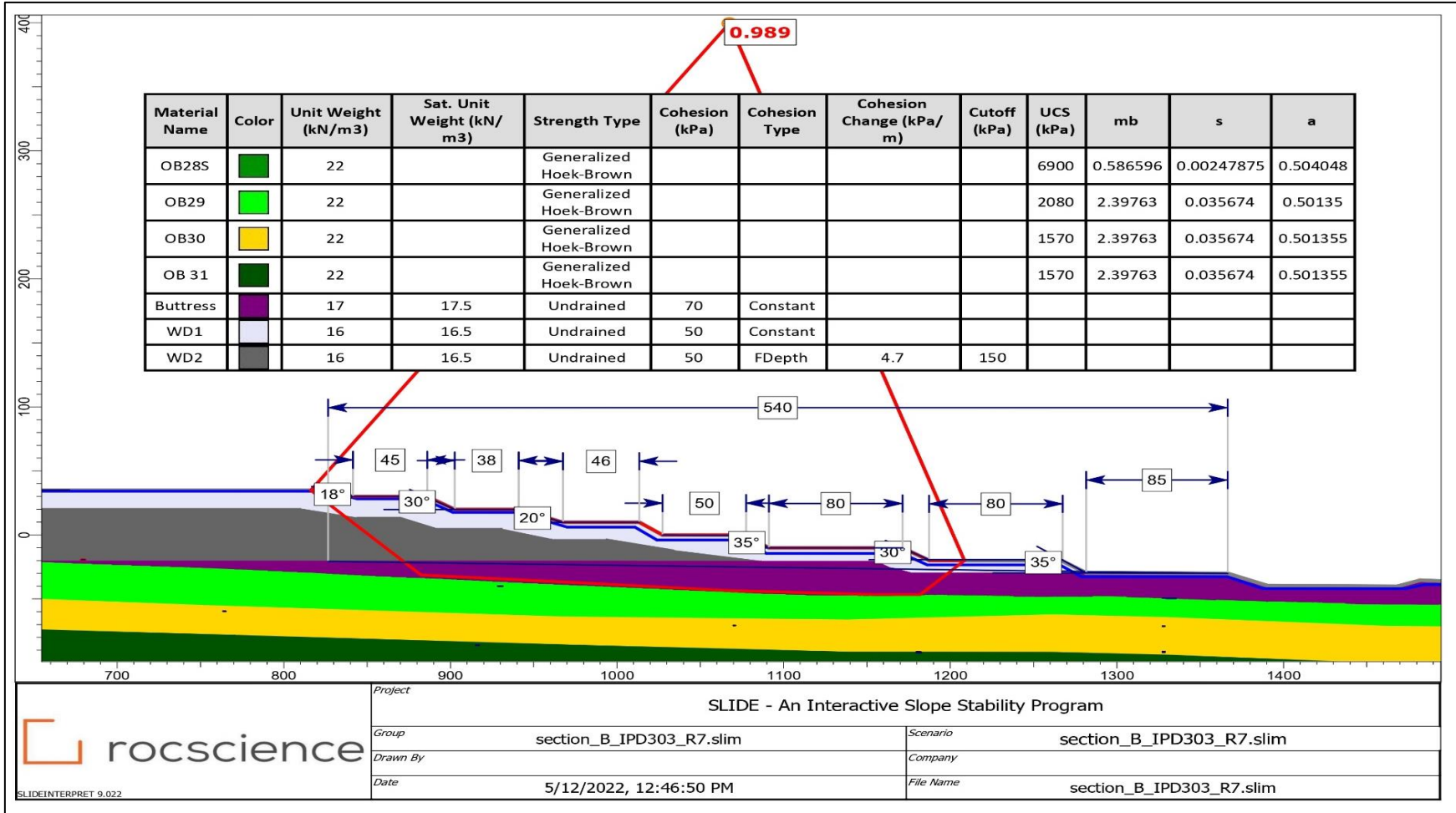


Lampiran 3 (Hasil Analisis Kestabilan Desain Lereng *In-Pit Dump Pit 303*)

Crosssection A



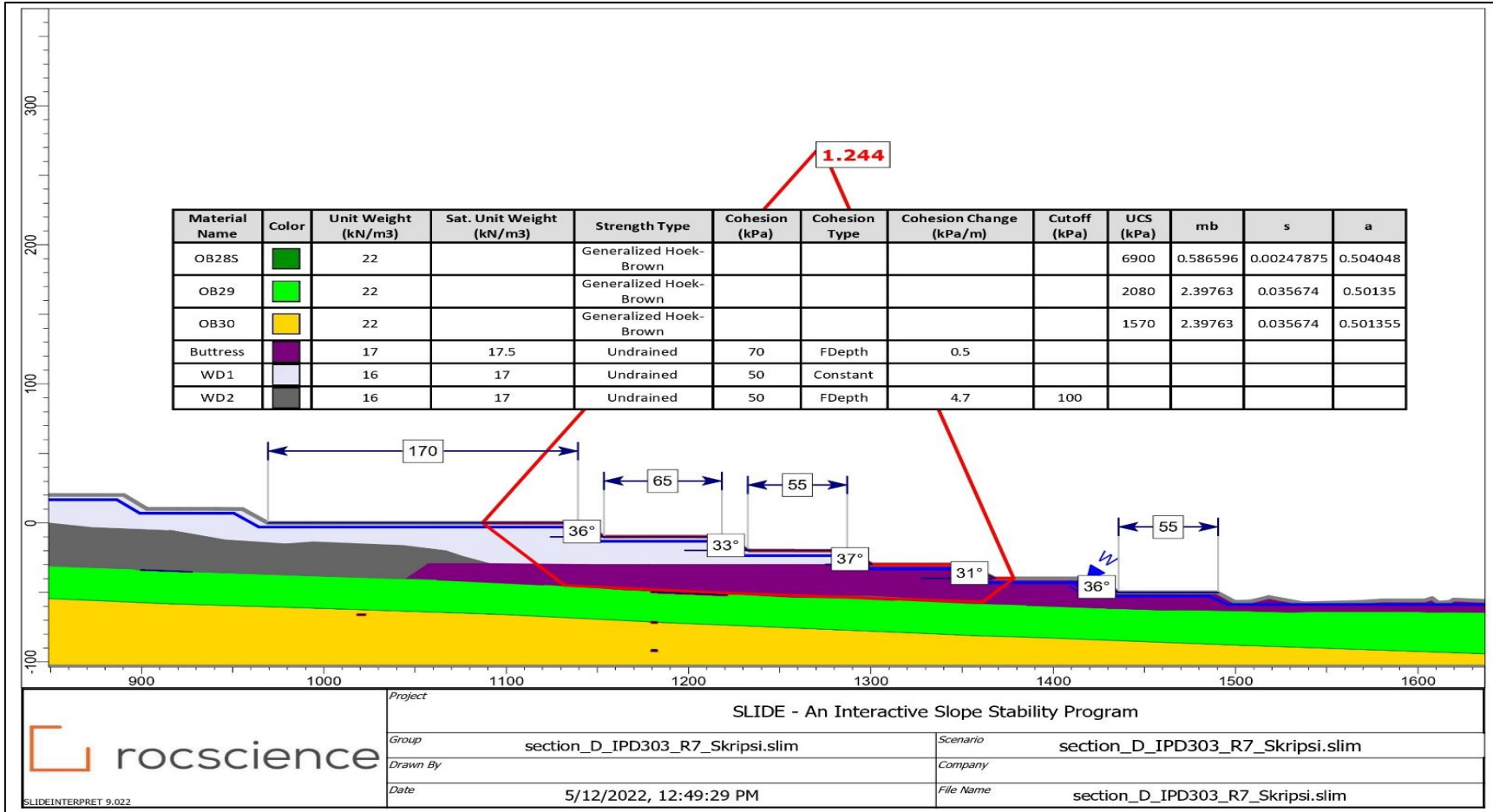
Crosssection B



SLIDEINTERPRET 9.022

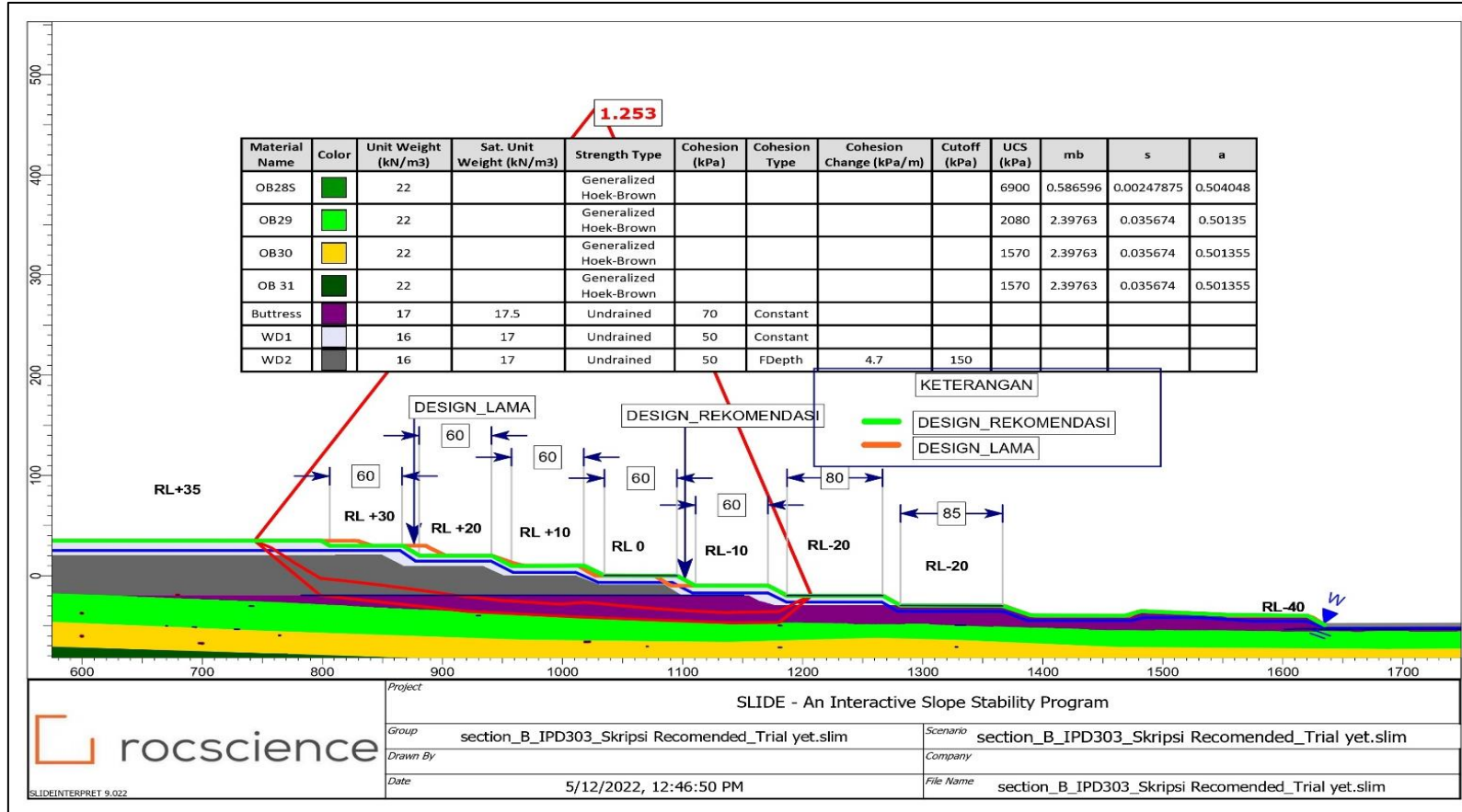
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Drawn By				Company			
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Crosssection D



Lampiran 4 (Hasil Analisis Kestabilan Desain Lereng Rekomendasi *In-Pit Dump* Crosssection B & C)

Crosssection B



Crosssection C

