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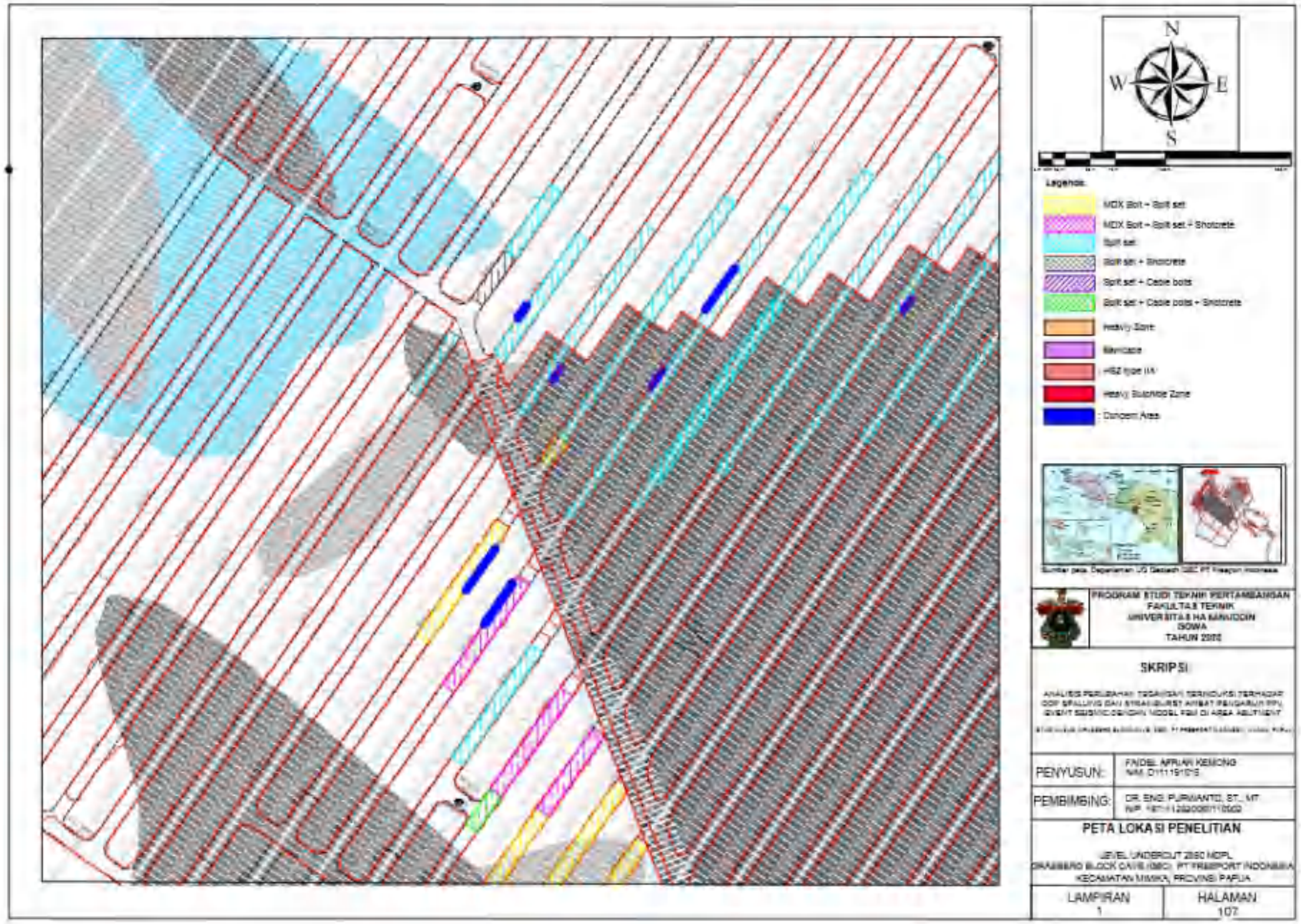
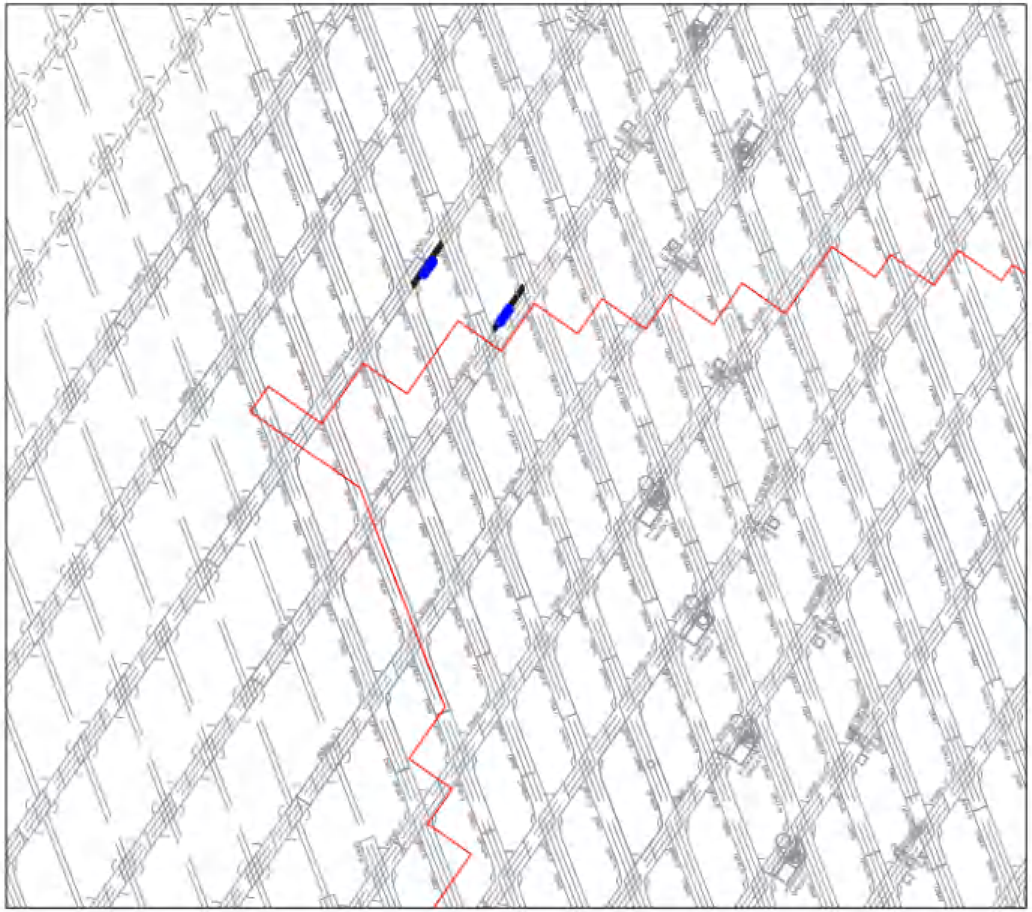
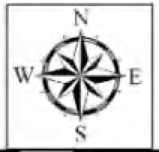
LAMPIRAN

LAMPIRAN 1
PETA LOKASI PENELITIAN


N
W
E
S
Legends:
MDX Bolt + Split set
MDX Bolt + Split set + Shotcrete
Split set
Split set + Shotcrete
Split set + Cable bolts
Split set + Cable bolts + Shotcrete
Heavy Zone
Heavy Sulphide Zone
Concern Area
PROGRAM STUDI TEKNIK PERTAMBANGAN
FAKULTAS TEKNIK
GOWA
SKRIPSI
PENYUSUN:
PEMBIMBING:
PETA LOKASI PENELITIAN
KECAMATAN MIMIKA, PROVINSI PAPUA
LAMPIRAN
1
HALAMAN
107





Legenda:

: Cave Line

: Concern Area

Sumber peta: Departemen UG Geotech GBC PT Freeport Indonesia.

PROGRAM STUDI TEKNIK PERTAMBANGAN
FAKULTAS TEKNIK
UNIVERSITAS HASANUDDIN
GOWA
TAHUN 2023

SKRIPSI

ANALISIS PERUBAHAN TEGANGAN TERINDUKSI TERHADAP DOF SPALLING DAN STRAINBURST AKIBAT PENGARUH PPV EVENT SEISMIC DENGAN MODEL FEM DI AREA ABUTMENT

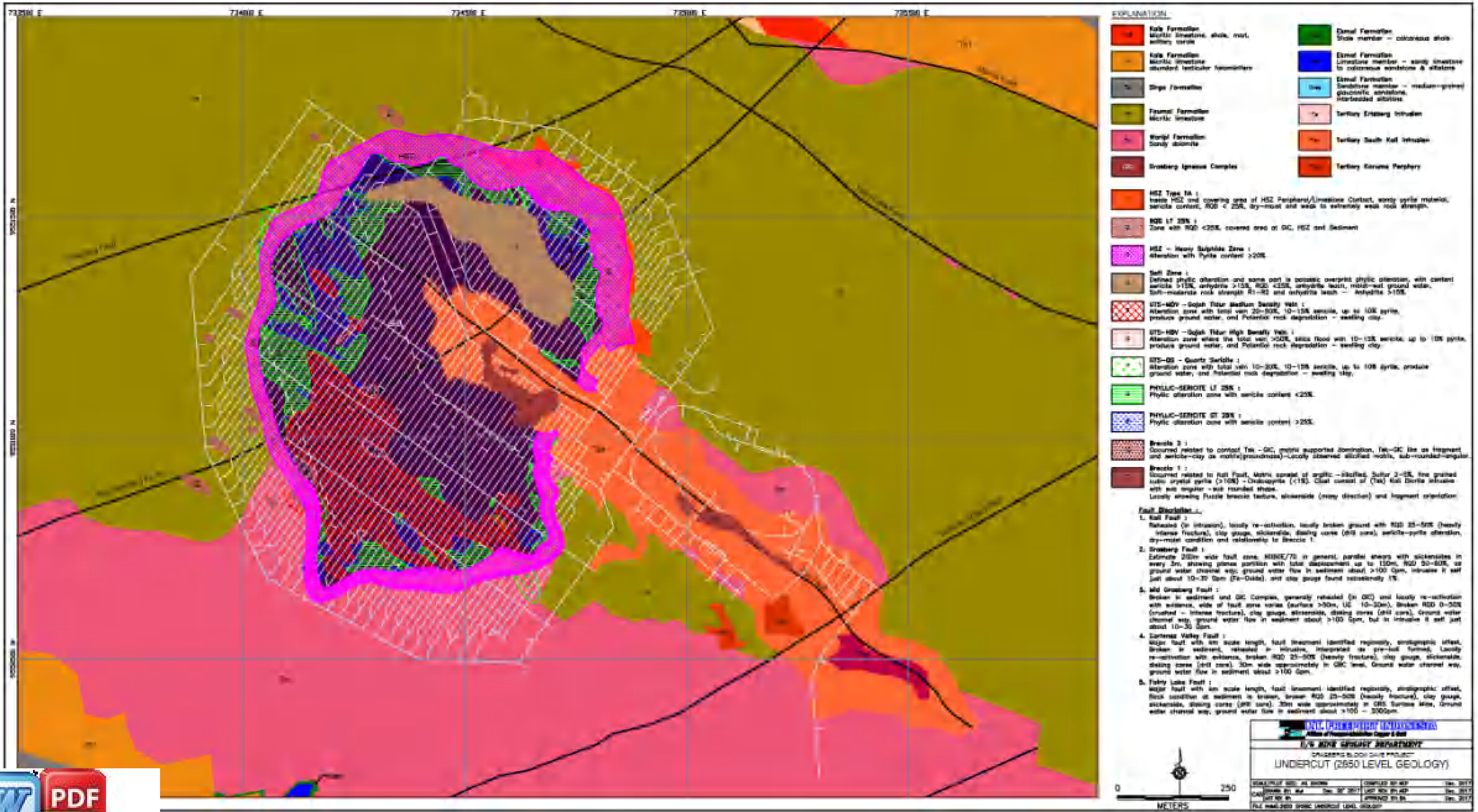
PENYUSUN:	FADEL APRIAN KEMONG NIM. D111191018
PEMBIMBING:	DR. ENG. PURWANTO, ST., MT NIP. 197111282008011002

PETA LOKASI PENELITIAN

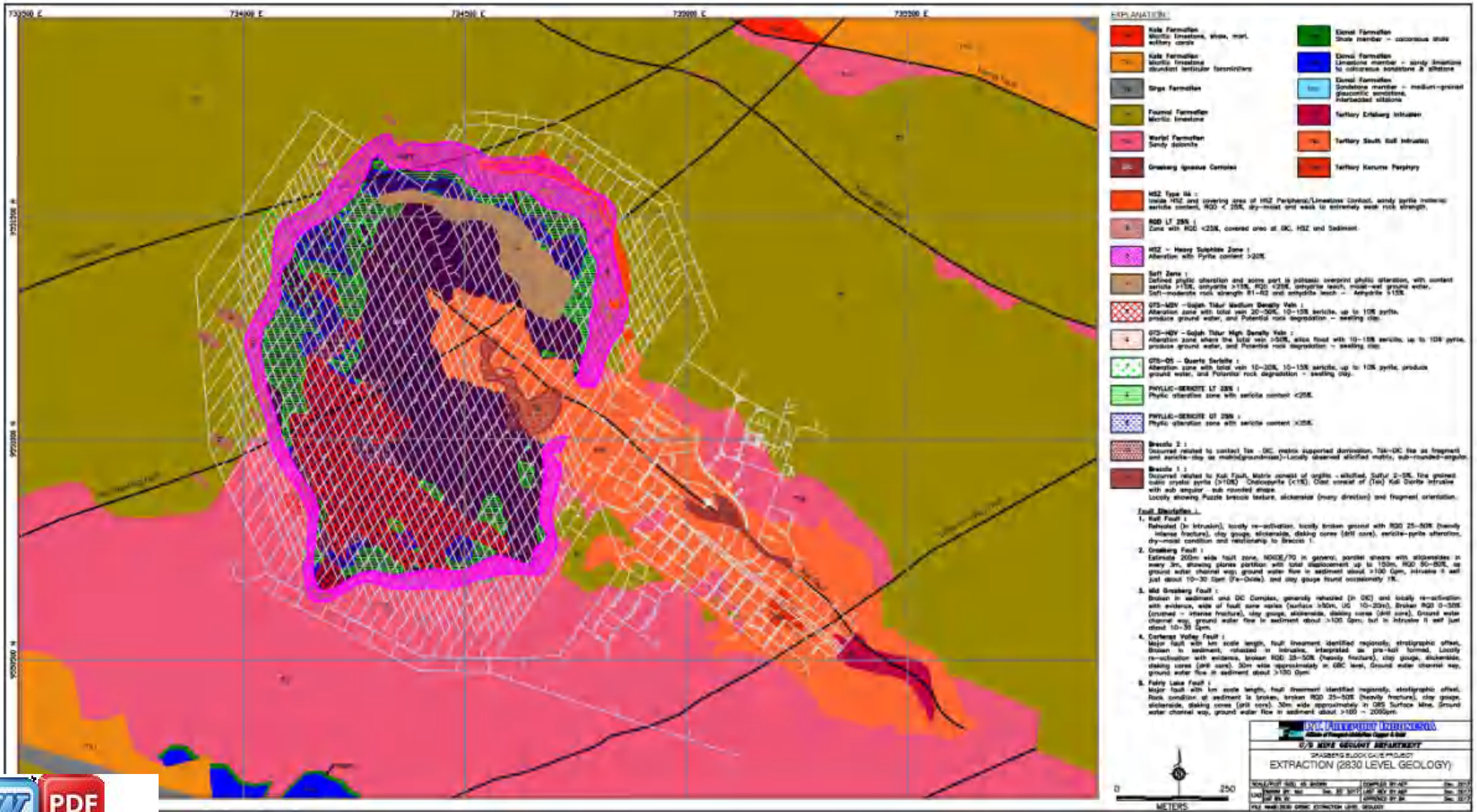
LEVEL EXTRACTION 2830 MDPL
GRASBERG BLOCK CAVE (GBC), PT FREEPORT INDONESIA
KECAMATAN MIMIKA, PROVINSI PAPUA

LAMPIRAN	HALAMAN
1	108

LAMPIRAN 2
PETA GEOLOGI



EXPLANATION
PT. FREEPORT INDONESIA
UNDERCUT (2850 LEVEL GEOLOGY)
0
250
METERS


EXPLANATION
EXTRACTION (2830 LEVEL GEOLOGY)
0
250
METERS

LAMPIRAN 3

HEADING INPECTION SHEET

Lampiran 3 Lembar *Heading Mapping Sheet*

Date:

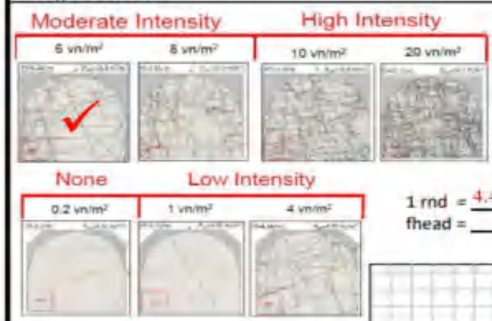
GBC GEOTECHNICAL DATA MAPPING SHEET

UCUT PB3C DD16S
WACC. 2 to East

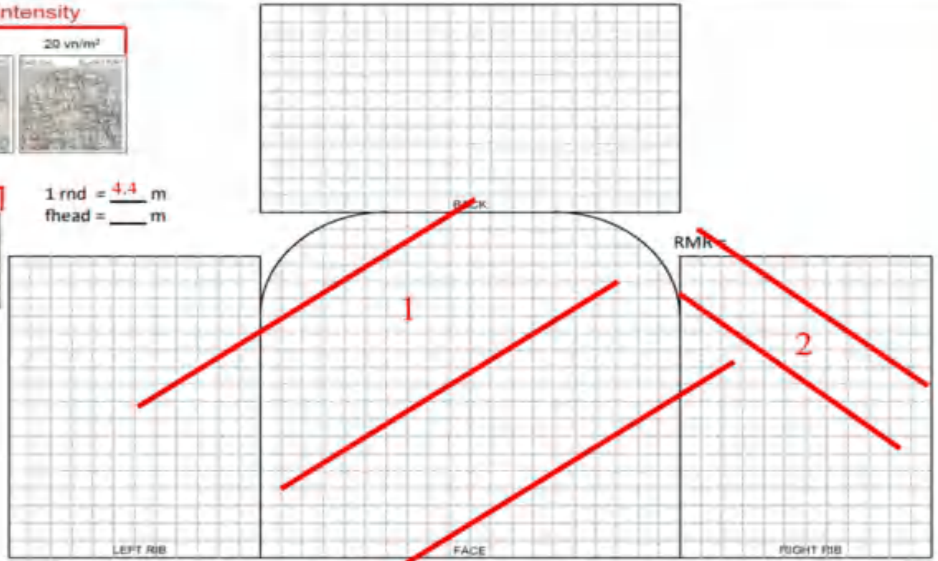
Drift Name:	Mapper:
Drift Size H: 4.7 m	W: 4.8 m
Overbreak 1:	
Overbreak 2:	
Support Walls:	
Support Back:	
LW Jnts/m:	LW RQD:
RW Jnts/m:	RW RQD:
Face Jnts/m: 1-3/m	Face RQD: 75-90%
Roof Jnts/m:	Roof RQD:
Avg Jnts/m:	Avg RQD:
Rock Type:	
Rock Strength: R4 – R5	Vein Strength: R3
Rock Type Weather: W1	Vein Intensity: mod
Rock Type Water: Dry	Vein Type: Vn 0
Rock Type Joints Sets #:	

Joint Set #	Set (S) or Individual (I)	Dip	Dip Direction	Type	Trace Length	Termination (End1/End2)	Spacing	Roughness	Shape	Infilling	Comment
1		60	145	Jn	1-3 m	0	> 2 m	Vr	Pl	Cl	Very Favourable
2		40	235	Jn	1-3 m	0	>2 m	Vr	Pl	Cl	

Notes:



1 rnd = 4.4 m
fhead = ____ m



Vein Type
Vn 0: No vein
Vn 1: biotite
Vn 2: Sulphide/anhydrite/sericite/chlorite selvage
Vn 3: Quartz-anhydrite/sulphide/dark biotite
Vn 4: Anhydrite/sulphide/dark biotite
Vn 5: gypsum/sulphide/anhydrite
Vn 6: magnetite/sulphide/quartz
Vn 7: serpentine/sulphide
Vn 8: calcite
Vn 9: garnet/sulphide
Vn 10: epidote/chlorite
Vn 11: stockwork
…2: oxidation vein

…	Continuity	Spacing	Infilling	Shape	Roughness	Water (Jw)	Weathering	Strength
…ault Zone	<1cm	1-2m	CL:Clean	PL=Planar	SL:Slickensided	Dry	**W1**: Fresh	**R0**:Extremely weak -Indented by thumbnail
…hear	1-2cm	2-5m	GO:Gouge	UN=Undulating	SM:Smooth	Medium (drips of water)	**W2**:Slightly weathered	**R1**:Very weak - Peeled by pocket knife
…oint	2-5cm	5-10m	BR:Broken Rock	ST=Stepped	RO:Rough	Jet Inflow (or high pressure)	**W3**:Mod weathered	**R2**:Weak - Peeled with pocket knife is difficult
…ein	5-10cm	10-20m	SU:Sulphides	CU=Curved	VR: Very Rough	Large Inflow (or high press)	**W4**:Highly weathered	**R3**:Med - Knife not peel/fracture with hammer one blow
…edding	10-15cm	20-50m	CL:Chlorite	Jv=No of Jnts/m:		Exceptional high flow	**W5**:Completely Weathered	**R4**:Strong - Breaks with more than one hammer blow
…ontact	15-50cm	50-100m	QZ:Quartz	RQD=115-3.3*Jv:			**W6**:Residual Soil	**R5**:V.Strong - Requires many hammer blows to fracture
…oliation	50-100cm	>100m	CA:Calcite	Joint Set #	1, 1+Ran, 2, 2+Ran, 3, 3+Ran, 4 or more sets			**R6**:Ext Strong >250MPa - Chipped by hammer blow
…onjugate			EP:Epidote	Massive, no or few joints		crushed rock		

Vein Intensity
1 - None (0 per 1m)
2 - Low (1-4 per 1m)
3 - Mod (6-8 per 1m)
4 - High (10-20 per 1m)
5 - V.High (>20 per 1m)

Termination
R - Rock Mass
D - Discontinuity
C - Censored

Date:

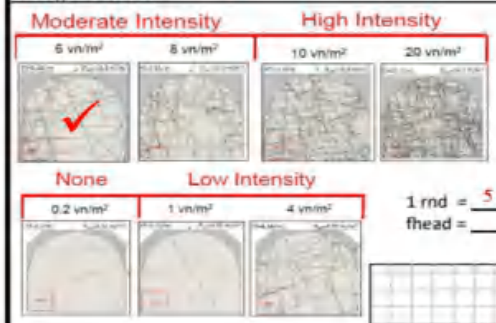
GBC GEOTECHNICAL DATA MAPPING SHEET

UCUT PB3C DD17N
WACC. 2 to East

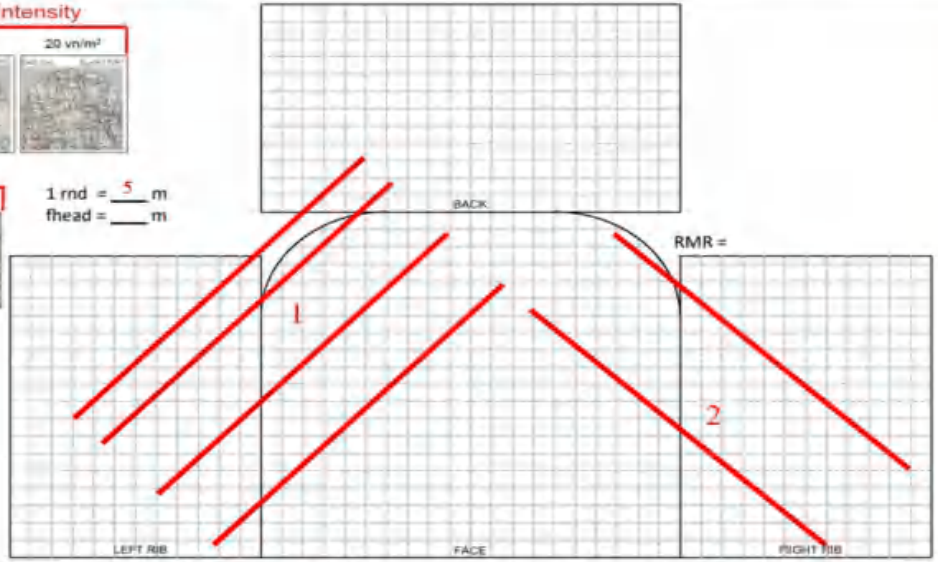
Drift Name:		Mapper:	
Drift Size	H: 4 m	W: 4.6 m	
Overbreak 1:			
Overbreak 2:			
Support Walls:			
Support Back:			
LW Jnts/m:		LW RQD:	
RW Jnts/m:		RW RQD:	
Face Jnts/m:	1-3/m	Face RQD:	75-90%
Roof Jnts/m:		Roof RQD:	
Avg Jnts/m:		Avg RQD:	
Rock Type:			
Rock Strength:	R4 – R5	Vein Strength:	R3
Rock Type Weather:	Fresh	Vein Intensity:	mod
Rock Type Water:	Damp	Vein Type:	Vn 0
Rock Type Joints Sets #:			

Joint Set #	Set (S) or Individual (I)	Dip	Dip Direction	Type	Trace Length	Termination (End1/End2)	Spacing	Roughness	Shape	Infilling	Comment
1		60	220	Jn	1-3 m	0	0.6-2 m	Ro	Pl	Cl	
											Very Favourable
2		70	135	Jn	1-3 m	0	0.6-2 m	Ro	Pl	Cl	

Notes:



1 rnd = 5 m
fhead = ____ m



Vein Type
Vn 0: No vein
Vn 1: biotite
Vn 2: Sulphide/anhydrite/sericite/chlorite selvage
Vn 3: Quartz-anhydrite/sulphide/dark biotite
Vn 4: Anhydrite/sulphide/dark biotite
Vn 5: gypsum/sulphide/anhydrite
Vn 6: magnetite/sulphide/quartz
Vn 7: serpentine/sulphide
Vn 8: calcite
Vn 9: garnet/sulphide
Vn 10: epidote/chlorite
Vn 11: stockwork
Vn 12: oxidation vein

Type	Continuity	Spacing	Infilling	Shape	Roughness	Water (Jw)	Weathering	Strength	Vein Intensity
Fault Zone	<1cm	1-2m	CL:Clean	PL=Planar	SL:Slickensided	Dry	W1: Fresh	R0:Extremely weak -Indented by thumbnail	1 - None (0 per 1m)
Shear	1-2cm	2-5m	GO:Gouge	UN=Undulating	SM:Smooth	Medium (drips of water)	W2:Slightly weathered	R1:Very weak - Peeled by pocket knife	2 - Low (1-4 per 1m)
Joint	2-5cm	5-10m	BR:Broken Rock	ST=Stepped	RO:Rough	Jet Inflow (or high pressure)	W3:Mod weathered	R2:Weak - Peeled with pocket knife is difficult	3 - Mod (6-8 per 1m)
Vein	5-10cm	10-20m	SU:Sulphides	CU=Curved	VR: Very Rough	Large Inflow (or high press)	W4:Highly weathered	R3:Med - Knife not peel/fracture with hammer one blow	4 - High (10-20 per 1m)
Bedding	10-15cm	20-50m	CL:Chlorite	Jv=No of Jnts/m:		Exceptional high flow	W5:Completely Weathered	R4:Strong - Breaks with more than one hammer blow	5 - V.High (>20 per 1m)
Contact	15-50cm	50-100m	QZ:Quartz	RQD=115-3.3*Jv:			W6:Residual Soil	R5:V.Strong - Requires many hammer blows to fracture	**Termination**
Foliation	50-100cm	>100m	CA:Calcite	Joint Set #	1, 1+Ran, 2, 2+Ran, 3, 3+Ran, 4 or more sets			R6:Ext Strong >250MPa - Chipped by hammer blow	R - Rock Mass
Conjugate			EP:Epidote	Massive, no or few joints		crushed rock			D - Discontinuity
									C - Censored

Date:

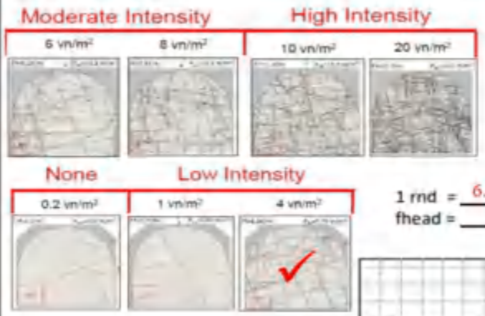
GBC GEOTECHNICAL DATA MAPPING SHEET

UCUT PB2N DD17S
WACC. 2 to East

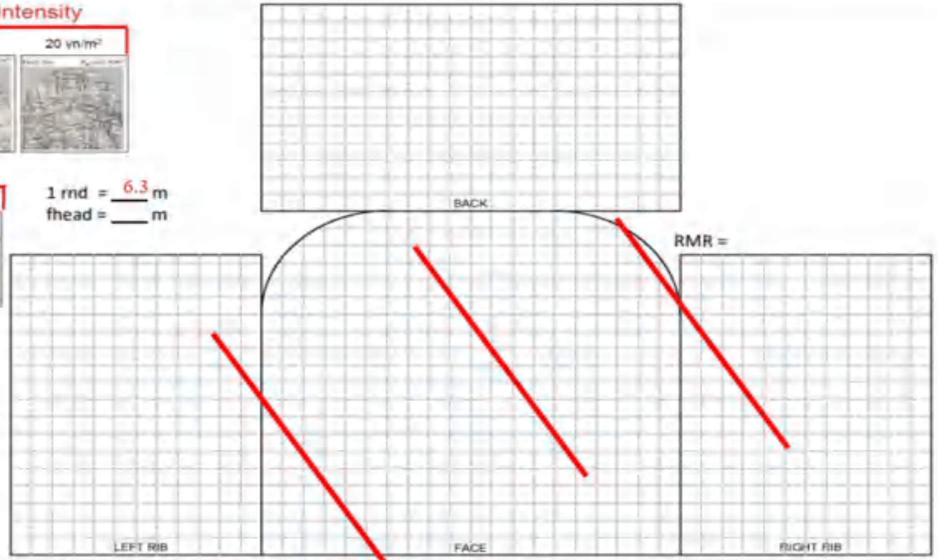
Drift Name:	Mapper:
Drift Size H: 4.7 m	W: 4.8 m
Overbreak 1:	
Overbreak 2:	
Support Walls:	
Support Back:	
LW Jnts/m:	LW RQD:
RW Jnts/m:	RW RQD:
Face Jnts/m: 1-3/m	Face RQD: 75-90%
Roof Jnts/m:	Roof RQD:
Avg Jnts/m:	Avg RQD:
Rock Type:	
Rock Strength: R4 – R5	Vein Strength: R3
Rock Type Weather: W1	Vein Intensity: mod
Rock Type Water: Wet	Vein Type: Vn 0
Rock Type Joints Sets #:	

Joint Set #	Set (S) or Individual (I)	Dip	Dip Direction	Type	Trace Length	Termination (End1/End2)	Spacing	Roughness	Shape	Infilling	Comment
1		65	120	Jn	3-10 m	0	>2 m	Vr	Pl	Go	Very Favourable

Notes:



1 rnd = 6.3 m
fhead = ____ m



Vein Type
Vn 0: No vein
Vn 1: biotite
Vn 2: Sulphide/anhydrite/sericite/chlorite selvage
Vn 3: Quartz-anhydrite/sulphide/dark biotite
Vn 4: Anhydrite/sulphide/dark biotite
Vn 5: gypsum/sulphide/anhydrite
Vn 6: magnetite/sulphide/quartz
Vn 7: serpentine/sulphide
Vn 8: calcite
Vn 9: garnet/sulphide
Vn 10: epidote/chlorite
Vn 11: stockwork
Vn 12: oxidation vein

[Typ]e	Continuity	Spacing	Infilling	Shape	Roughness	Water (Jw)	Weathering	Strength	Vein Intensity
Fault Zone	<1cm	1-2m	CL:Clean	PL=Planar	SL:Slickensided	Dry	W1: Fresh	R0:Extremely weak -Indented by thumbnail	1 - None (0 per 1m)
Shear	1-2cm	2-5m	GO:Gouge	UN=Undulating	SM:Smooth	Medium (drips of water)	W2:Slightly weathered	R1:Very weak - Peeled by pocket knife	2 - Low (1-4 per 1m)
Joint	2-5cm	5-10m	BR:Broken Rock	ST=Stepped	RO:Rough	Jet Inflow (or high pressure)	W3:Mod weathered	R2:Weak - Peeled with pocket knife is difficult	3 - Mod (6-8 per 1m)
Vein	5-10cm	10-20m	SU:Sulphides	CU=Curved	VR: Very Rough	Large Inflow (or high press)	W4:Highly weathered	R3:Med – Knife not peel/fracture with hammer one blow	4 - High (10-20 per 1m)
Bedding	10-15cm	20-50m	CL:Chlorite	Jv=No of jnts/m:		Exceptional high flow	W5:Completely Weathered	R4:Strong – Breaks with more than one hammer blow	5 - V.High (>20 per 1m)
Contact	15-50cm	50-100m	QZ:Quartz	RQD=115-3.3*Jv:			W6:Residual Soil	R5:V.Strong - Requires many hammer blows to fracture	**Termination**
Foliation	50-100cm	>100m	CA:Calcite	Joint Set # 1, 1+Ran, 2, 2+Ran, 3, 3+Ran, 4 or more sets				R6:Ext Strong >250MPa - Chipped by hammer blow	R - Rock Mass
Conjugate			EP:Epidote	Massive, no or few joints crushed rock					D - Discontinuity
									C - Censored

Date:

GBC GEOTECHNICAL DATA MAPPING SHEET

UCUT PB2N DD15S
WACC. 2 to East

Drift Name:	Mapper:
Drift Size H: 4.1 m	W: 4.7 m
Overbreak 1:	
Overbreak 2:	
Support Walls:	
Support Back:	
LW Jnts/m:	LW RQD:
RW Jnts/m:	RW RQD:
Face Jnts/m: 1-3/m	Face RQD: 75-90%
Roof Jnts/m:	Roof RQD:
Avg Jnts/m:	Avg RQD:
Rock Type:	
Rock Strength: R5	Vein Strength: R3
Rock Type Weather: W2	Vein Intensity: mod
Rock Type Water: Dry	Vein Type: Vn 0
Rock Type Joints Sets #:	

Joint Set #	Set (S) or Individual (I)	Dip	Dip Direction	Type	Trace Length	Termination (End1/End2)	Spacing	Roughness	Shape	Infilling	Comment
1		40	240	Jn	3-10 m	0	0.6-2 m	Ro	Pl	Cl	Very Favourable

Notes:

Moderate Intensity — High Intensity

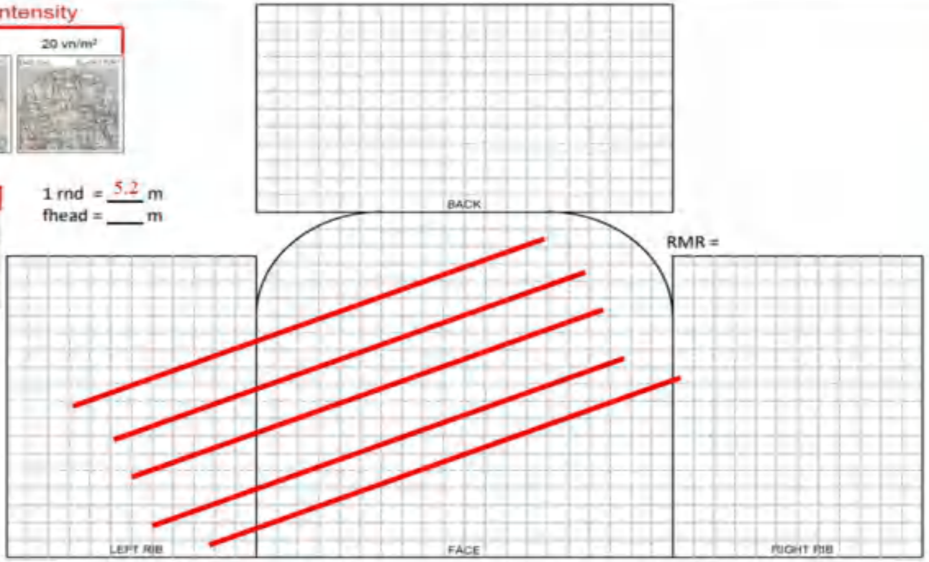
6 vn/m²	8 vn/m²	10 vn/m²	20 vn/m²

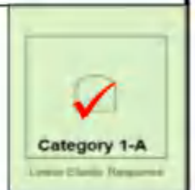
None — Low Intensity

0.2 vn/m²	1 vn/m²	4 vn/m²

1 rnd = 5.2 m
fhead = ____ m

RMR =





Vein Type
Vn 0: No vein
Vn 1: biotite
Vn 2: Sulphide/anhydrite/sericite/chlorite selvage
Vn 3: Quartz-anhydrite/sulphide/dark biotite
Vn 4: Anhydrite/sulphide/dark biotite
Vn 5: gypsum/sulphide/anhydrite
Vn 6: magnetite/sulphide/quartz
Vn 7: serpentine/sulphide
Vn 8: calcite
Vn 9: garnet/sulphide
Vn 10: epidote/chlorite
Vn 11: stockwork
Vn 12: oxidation vein

Type	Continuity	Spacing	Infilling	Shape	Roughness	Water (Jw)
Fault Zone	<1cm	1-2m	CL:Clean	PL=Planar	SL:Slickensided	Dry
Shear	1-2cm	2-5m	GO:Gouge	UN=Undulating	SM:Smooth	Medium (drips of water)
Joint	2-5cm	5-10m	BR:Broken Rock	ST=Stepped	RO:Rough	Jet Inflow (or high pressure)
Vein	5-10cm	10-20m	SU:Sulphides	CU=Curved	VR: Very Rough	Large Inflow (or high press)
Bedding	10-15cm	20-50m	CL:Chlorite	Jv=No of Jnts/m:		Exceptional high flow
Contact	15-50cm	50-100m	QZ:Quartz	RQD=115-3.3*Jv:		
Foliation	50-100cm	>100m	CA:Calcite	Joint Set #	1, 1+Ran, 2, 2+Ran, 3, 3+Ran, 4 or more sets	
Conjugate			EP:Epidote	Massive, no or few joints		crushed rock

Weathering	Strength	Vein Intensity
W1: Fresh	R0:Extremely weak -Indented by thumbnail	1 - None (0 per 1m)
W2:Slightly weathered	R1:Very weak - Peeled by pocket knife	2 - Low (1-4 per 1m)
W3:Mod weathered	R2:Weak - Peeled with pocket knife is difficult	3 - Mod (6-8 per 1m)
W4:Highly weathered	R3:Med - Knife not peel/fracture with hammer one blow	4 - High (10-20 per 1m)
W5:Completely Weathered	R4:Strong - Breaks with more than one hammer blow	5 - V.High (>20 per 1m)
W6:Residual Soil	R5:V.Strong - Requires many hammer blows to fracture	**Termination**
	R6:Ext Strong >250MPa - Chipped by hammer blow	R - Rock Mass
		D - Discontinuity
		C - Censored

Date:

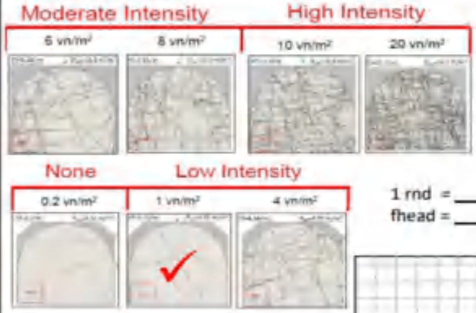
GBC GEOTECHNICAL DATA MAPPING SHEET

EXTN PB2N P14 DP46-47
WACC. 2 to East

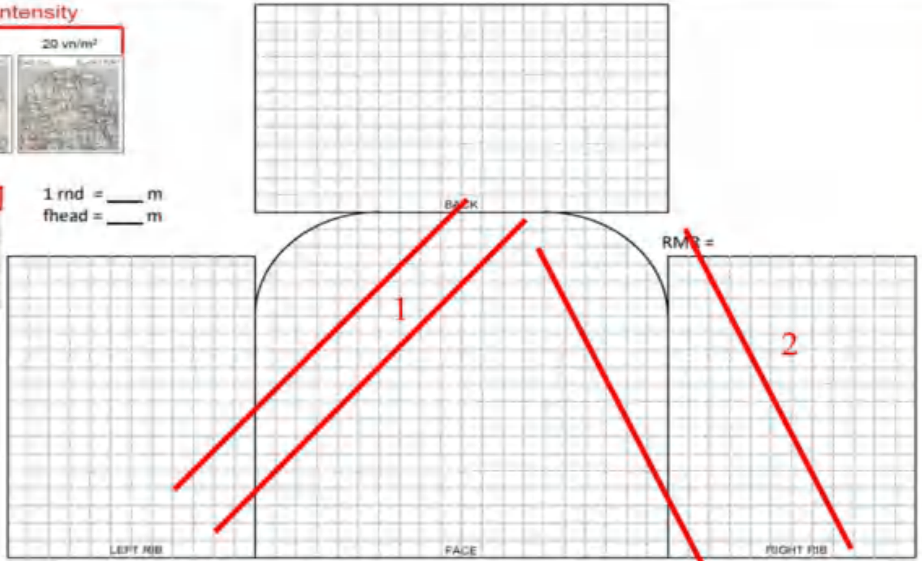
Drift Name:		Mapper:	
Drift Size	H: 4 m	W: 4.5 m	
Overbreak 1:			
Overbreak 2:			
Support Walls:			
Support Back:			
LW Jnts/m:		LW RQD:	
RW Jnts/m:		RW RQD:	
Face Jnts/m:	1-3/m	Face RQD:	75-90%
Roof Jnts/m:		Roof RQD:	
Avg Jnts/m:		Avg RQD:	
Rock Type:			
Rock Strength:	R5	Vein Strength:	R3
Rock Type Weather:	W1	Vein Intensity:	mod
Rock Type Water:	Wet	Vein Type:	Vn 0
Rock Type Joints Sets #:			

Joint Set #	Set (S) or Individual (I)	Dip	Dip Direction	Type	Trace Length	Termination (End1/End2)	Spacing	Roughness	Shape	Infilling	Comment
1		70	120	Jn	1-3 m	0	>2 m	Vr	St	none	Very Favourable
2		60	340	Jn	1-3 m	0	>2 m	Vr	St	none	

Notes:



1 rnd = ____ m
fhead = ____ m



Vein Type
Vn 0: No vein
Vn 1: biotite
Vn 2: Sulphide/anhydrite/sericite/chlorite selvage
Vn 3: Quartz-anhydrite/sulphide/dark biotite
Vn 4: Anhydrite/sulphide/dark biotite
Vn 5: gypsum/sulphide/anhydrite
Vn 6: magnetite/sulphide/quartz
Vn 7: serpentine/sulphide
Vn 8: calcite
Vn 9: garnet/sulphide
Vn 10: epidote/chlorite
Vn 11: stockwork
12: oxidation vein

Type	Continuity	Spacing	Infilling	Shape	Roughness	Water (Jw)
:Fault Zone	<1cm	1-2m	CL:Clean	PL=Planar	SL:Slickensided	Dry
:Shear	1-2cm	2-5m	GO:Gouge	UN=Undulating	SM:Smooth	Medium (drips of water)
:Joint	2-5cm	5-10m	BR:Broken Rock	ST=Stepped	RO:Rough	Jet Inflow (or high pressure)
:Vein	5-10cm	10-20m	SU:Sulphides	CU=Curved	VR: Very Rough	Large Inflow (or high press)
:Bedding	10-15cm	20-50m	CL:Chlorite	Jv=No of Jnts/m:		Exceptional high flow
:Contact	15-50cm	50-100m	QZ:Quartz	RQD=115-3.3*Jv:		
:Foliation	50-100cm	>100m	CA:Calcite	Joint Set # Massive, no or few joints	1, 1+Ran, 2, 2+Ran, 3, 3+Ran, 4 or more sets	crushed rock
:Conjugate			EP:Epidote			

Weathering	Strength	Vein Intensity
W1: Fresh	**R0**:Extremely weak -Indented by thumbnail	1 - None (0 per 1m)
W2:Slightly weathered	**R1**:Very weak - Peeled by pocket knife	2 - Low (1-4 per 1m)
W3:Mod weathered	**R2**:Weak - Peeled with pocket knife is difficult	3 - Mod (6-8 per 1m)
W4:Highly weathered	**R3**:Med - Knife not peel/fracture with hammer one blow	4 - High (10-20 per 1m)
W5:Completely Weathered	**R4**:Strong - Breaks with more than one hammer blow	5 - V.High (>20 per 1m)
W6:Residual Soil	**R5**:V.Strong - Requires many hammer blows to fracture	**Termination**
	R6:Ext Strong >250MPa - Chipped by hammer blow	R - Rock Mass
		D - Discontinuity
		C - Censored

Date:

GBC GEOTECHNICAL DATA MAPPING SHEET

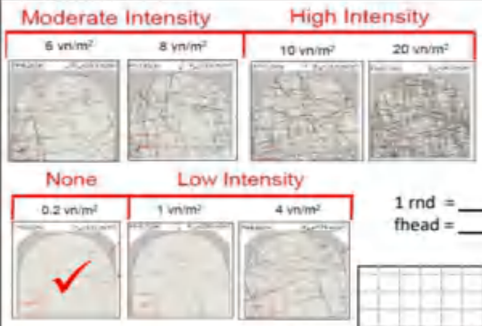
EXTN PB2N P15 DP45-46
WACC. 2 to East

Drift Name: | Mapper:

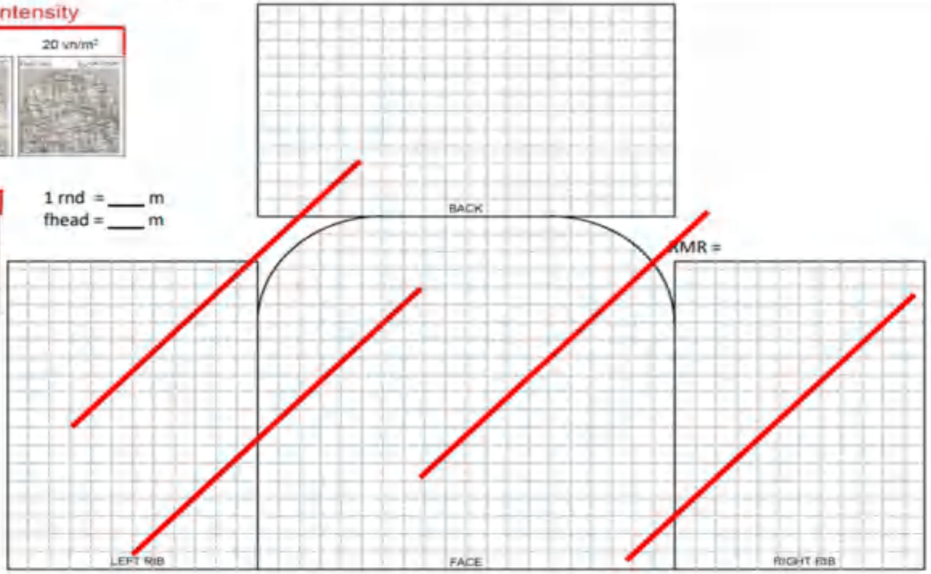
Drift Size	H: 4.2 m	W: 4.6 m	
Overbreak 1:			
Overbreak 2:			
Support Walls:			
Support Back:			
LW Jnts/m:		LW RQD:	
RW Jnts/m:		RW RQD:	
Face Jnts/m:	1-3/m	Face RQD:	50-75 %
Roof Jnts/m:		Roof RQD:	
Avg Jnts/m:		Avg RQD:	
Rock Type:			
Rock Strength:	R4 – R5	Vein Strength:	R3
Rock Type Weather:	Fresh	Vein Intensity:	mod
Rock Type Water:	Dry	Vein Type:	o
Rock Type Joints Sets #:			

Joint Set #	Set (S) or Individual (I)	Dip	Dip Direction	Type	Trace Length	Termination (End1/End2)	Spacing	Roughness	Shape	Infilling	Comment
1		60	220	Jn	3-10 m	0	0.6-2 m	Ro	Pl	none	Very Favourable

Notes:



1 rnd = ____ m
fhead = ____ m



Vein Type
Vn 0: No vein
Vn 1: biotite
Vn 2: Sulphide/anhydrite/sericite/chlorite selvage
Vn 3: Quartz-anhydrite/sulphide/dark biotite
Vn 4: Anhydrite/sulphide/dark biotite
Vn 5: gypsium/sulphide/anhydrite
Vn 6: magnetite/sulphide/quartz
Vn 7: serpentine/sulphide
Vn 8: calcite
Vn 9: garnet/sulphide
Vn 10: epidute/chlorite
11: stockwork
12: oxidation vein

Type	Continuity	Spacing	Infilling	Shape	Roughness	Water (Jw)	Weathering	Strength	Vein Intensity
Fault Zone	<1cm	1-2m	CL:Clean	PL=Planar	SL:Slickensided	Dry	**W1**: Fresh	**R0**:Extremely weak -Indented by thumbnail	1 - None (0 per 1m)
Shear	1-2cm	2-5m	GO:Gouge	UN=Undulating	SM:Smooth	Medium (drips of water)	**W2**:Slightly weathered	**R1**:Very weak - Peeled by pocket knife	2 - Low (1-4 per 1m)
Joint	2-5cm	5-10m	BR:Broken Rock	ST=Stepped	RO:Rough	Jet Inflow (or high pressure)	**W3**:Mod weathered	**R2**:Weak - Peeled with pocket knife is difficult	3 - Mod (6-8 per 1m)
Vein	5-10cm	10-20m	SU:Sulphides	CU=Curved	VR: Very Rough	Large Inflow (or high press)	**W4**:Highly weathered	**R3**:Med - Knife not peel/fracture with hammer one blow	4 - High (10-20 per 1m)
Bedding	10-15cm	20-50m	CL:Chlorite	Jv=No of Jnts/m:		Exceptional high flow	**W5**:Completely Weathered	**R4**:Strong – Breaks with more than one hammer blow	5 - V.High (>20 per 1m)
Contact	15-50cm	50-100m	QZ:Quartz	RQD=115-3.3*Jv:			**W6**:Residual Soil	**R5**:V.Strong – Requires many hammer blows to fracture	**Termination**
Foliation	50-100cm	>100m	CA:Calcite	Joint Set #	1, 1+Ran, 2, 2+Ran, 3, 3+Ran, 4 or more sets			**R6**:Ext Strong >250MPa - Chipped by hammer blow	R - Rock Mass
Conjugate			EP:Epidote	Massive, no or few joints		crushed rock			D - Discontinuity
									C - Censored

LAMPIRAN 4

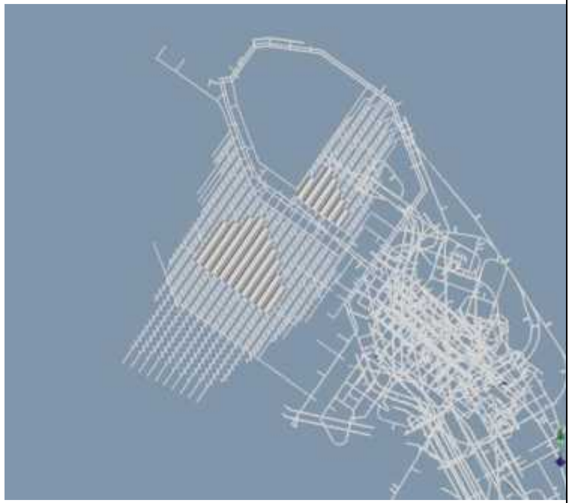
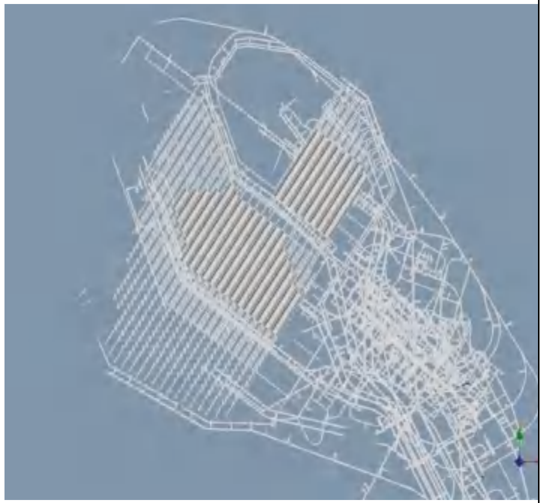
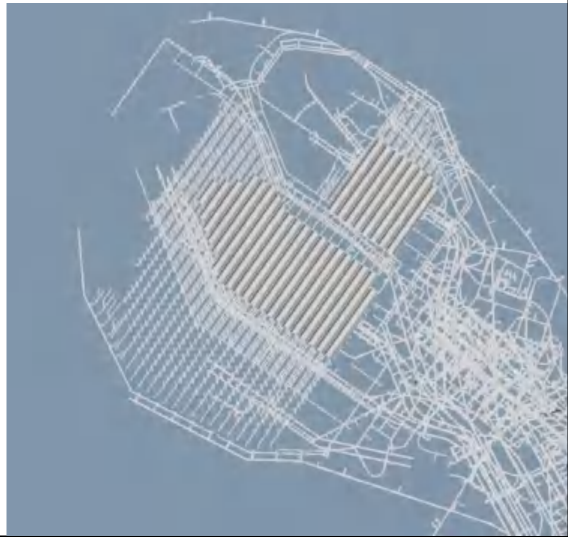
DATA *STRESS TENSOR*

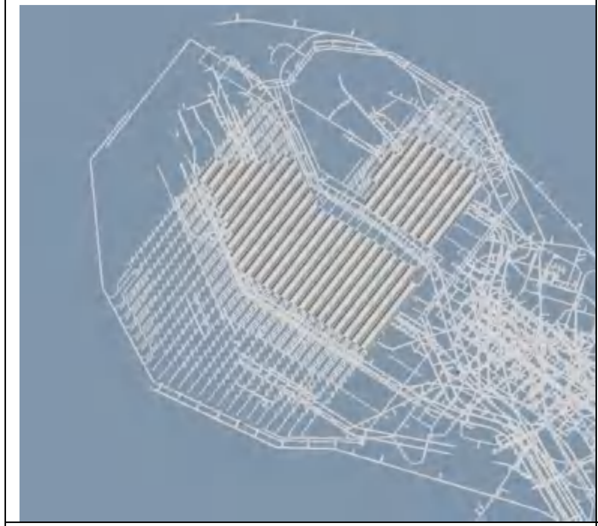
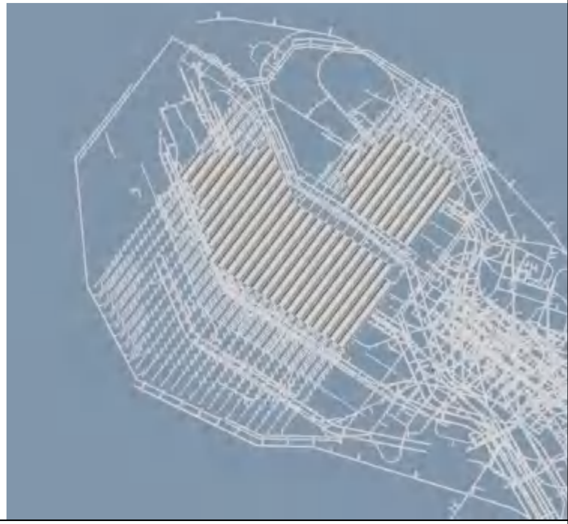
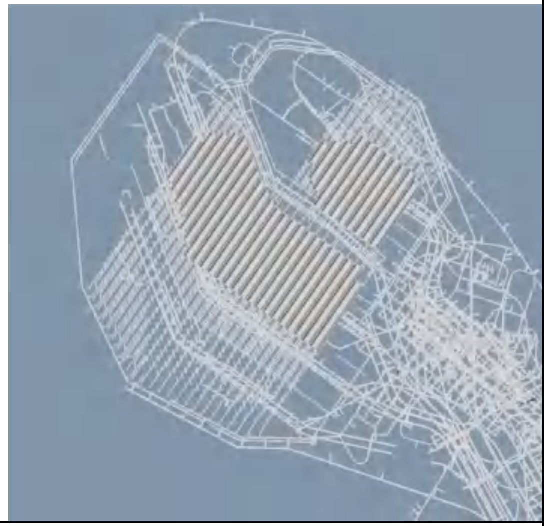
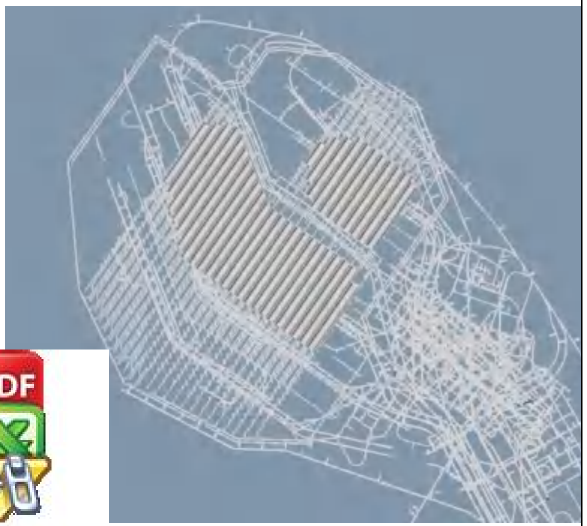
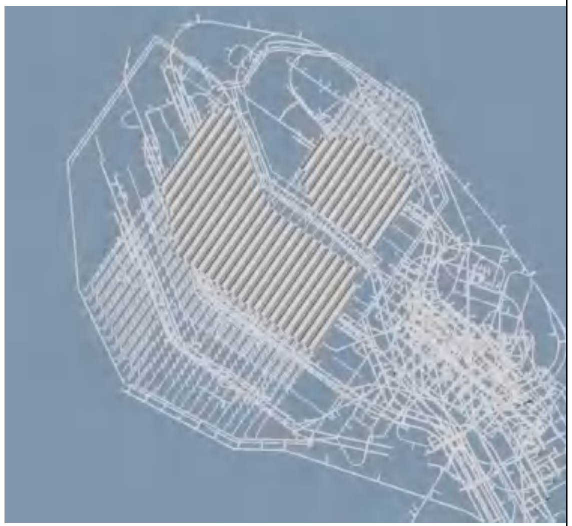
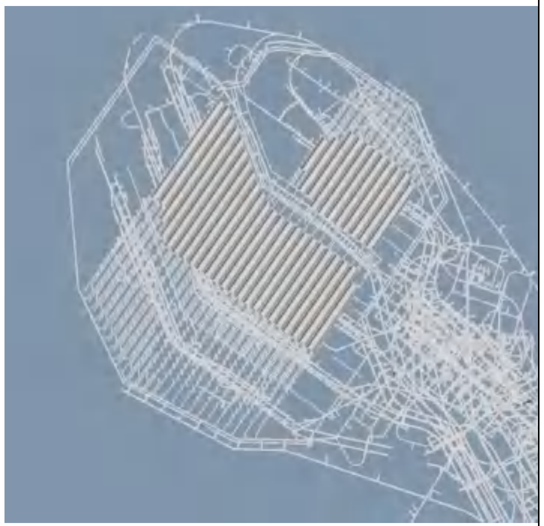
Lampiran 4 Data Koordinat pada *Stress Tensor*

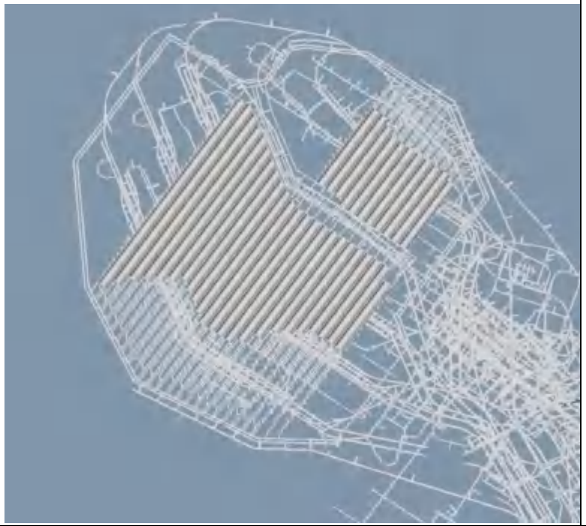
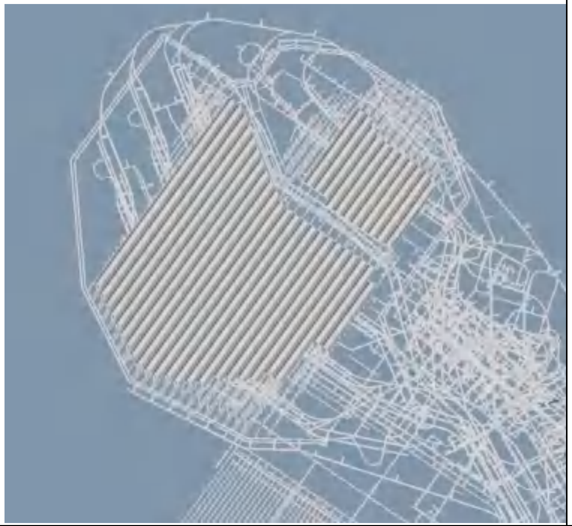
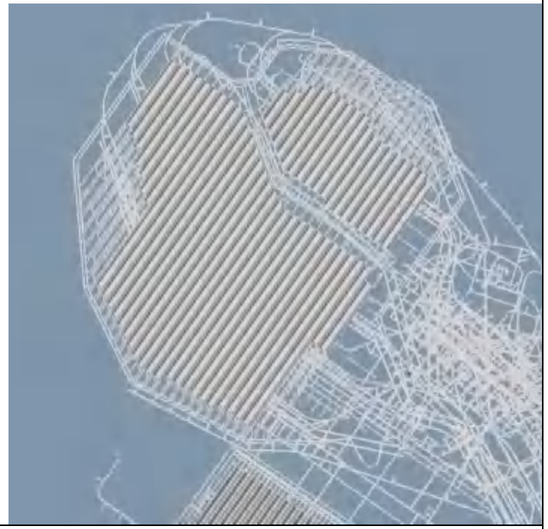
Location Damage	*Coordinate N*	*Coordinate E*	*Coordinate D*	*Trend*	*Plunge*
UCUT PB3C DD16S *Ring* 219	734246,83	9551202,65	2840,67	0	215
UCUT PB3C DD16S *Ring* 220	734248,09	9551204,45	2840,74	0	215
UCUT PB3C DD16S *Ring* 221	734249,36	9551206,25	2840,8	0	215
UCUT PB3C DD16S *Ring* 222	734250,62	9551208,06	2840,87	0	215
UCUT PB3C DD16S *Ring* 223	734251,88	9551209,86	2840,94	0	215
UCUT PB3C DD16S *Ring* 224	734253,14	9551211,66	2841	0	215
UCUT PB3C DD16S *Ring* 225	734254,4	9551213,46	2841,07	0	215
UCUT PB3C DD16S *Ring* 226	734255,67	9551215,26	1841,13	0	215
UCUT PB3C DD17N *Ring* 217	734255,97	9551189,55	2840,45	0	215
UCUT PB3C DD17N *Ring* 218	734257,23	9551191,35	2840,51	0	215
UCUT PB3C DD17N *Ring* 219	734258,49	9551193,15	2840,58	0	215
UCUT PB3C DD17N *Ring* 220	734259,75	9551194,95	2840,65	0	215
UCUT PB3C DD17N *Ring* 221	734261,02	9551196,75	2840,71	0	215
UCUT PB3C DD17N *Ring* 222	734262,28	9551198,56	2840,78	0	215
UCUT PB3C DD17N *Ring* 223	734263,54	9551200,36	2840,84	0	215
UCUT PB3C DD17N *Ring* 224	734264,8	9551202,16	2840,91	0	215
UCUT PB2N DD17S *Ring* 282	734281,4	9551226,1	2840,56	0	215
UCUT PB2N DD17S *Ring* 283	734282,66	9551227,9	2840,625	0	215
UCUT PB2N DD17S *Ring* 284	734283,925	9551229,7	2840,69	0	215
UCUT PB2N DD17S *Ring* 285	734285,185	9551231,505	2840,76	0	215
UCUT PB2N DD17S *Ring* 286	734286,45	9551233,305	2840,825	0	215
UCUT PB2N DD17S *Ring* 287	734287,71	9551235,11	2840,89	0	215
T PB2N *Ring* 288	734288,97	9551236,91	2840,955	0	215
T PB2N *Ring* 289	734290,235	9551238,71	2341,02	0	215

Location Damage	*Coordinate N*	*Coordinate E*	*Coordinate D*	*Trend*	*Plunge*
UCUT PB2N DD15S *Ring* 255	734246,83	9551202,65	2820,66	0	215
UCUT PB2N DD15S *Ring* 256	734282,19	9551306,48	2820,48	0	215
UCUT PB2N DD15S *Ring* 257	734283,92	9551307,93	2820,27	0	215
EXTN PB2N P14 DP46-47 A-A'	734283,92	9551307,93	2820,27	0	215
EXTN PB2N P14 DP46-47 B-B'	734282,19	9551306,48	2820,48	0	215
EXTN PB2N P14 DP46-47 C-C'	734246,83	9551202,65	2820,66	0	215
EXTN PB2N P15 DP45-46 A-A'	734285,375	9551275,29	2820,465	0	215
EXTN PB2N P15 DP45-46 B-B'	734302,19	9551326,48	2820,48	0	215
EXTN PB2N P15 DP45-46 C-C'	734285,375	9551275,29	2820,465	0	215

Lampiran 4 *Frame Cave Shape* pada *Stress*

Frame 70	*Frame* 75	*Frame* 81
		
Frame 82	*Frame* 83	*Frame* 84
		

Frame 85	*Frame* 86	*Frame* 87
		
Frame 88	*Frame* 89	*Frame* 90
		

Frame 100	*Frame* 110	*Frame* 120
		
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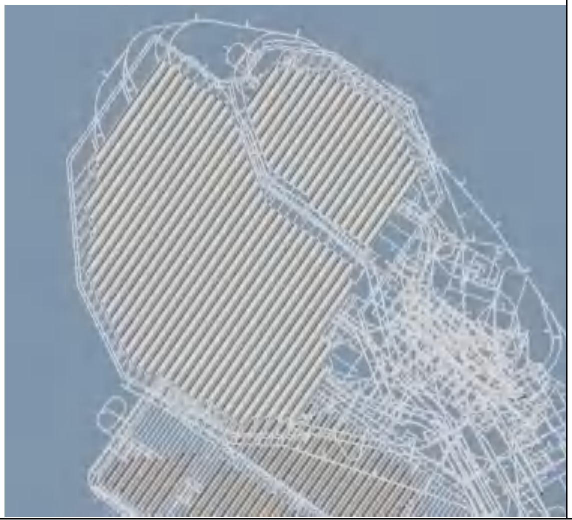
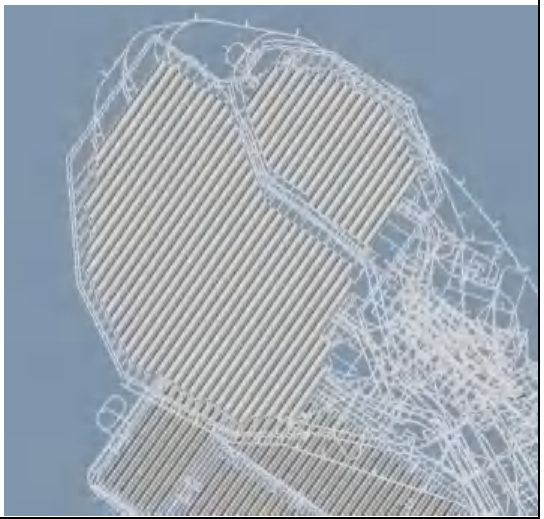
		

Lampiran 4 Hasil *Stress Grid* pada GSST

Stage	UCUT PB3C (DD16S_DD17N)				UCUT PB2N (DD15S_DD17S)				EXTN PB2N (P14DP46-47_P15DP45-46)				*Frame*
	σ1 (MPa)	σ2 (MPa)	σ3 (MPa)	Angel (°)	σ1 (MPa)	σ2 (MPa)	σ3 (MPa)	Angel (°)	σ1 (MPa)	σ2 (MPa)	σ3 (MPa)	Angel (°)	
0	24	27	27	37	27	25	21	25	28	25	21	-26	70
1	25	27	32	63	27	25	21	25	28	25	21	-26	75
2	23	27	35	55	28	25	21	26	30	27	19	-38	81
3	22	26	38	52	28	25	22	27	32	27	20	-38	82
4	23	26	39	56	28	25	21	30	33	28	20	-42	83
5	24	27	40	69	28	26	21	41	27	27	14	-38	84
6	16	17	33	-35	28	26	19	41	26	24	7	-20	85
7	2	3	6	20	31	14	18	46	25	23	6	-22	86
8	1	1	3	43	14	6	4	25	18	16	5	-10	87
9	1	1	3	49	6	4	2	69	14	8	5	6	88
10	1	1	3	71	5	3	2	76	14	6	5	13	89
11	2	1	6	78	8	3	3	-80	1	5	5	21	90
12	2	2	10	86	8	3	3	-77	11	6	6	-74	100
13	4	3	11	-39	8	3	3	-76	12	6	6	-77	110
14	-	-	-	-	8	3	3	84	11	6	6	-72	120
[illegible]	-	-	-	-	10	4	3	80	11	6	6	-66	130
[illegible]	-	-	-	-	-	-	-	-	11	6	6	-79	140
[illegible]	-	-	-	-	-	-	-	-	13	7	7	72	150

LAMPIRAN 5

DATA MONITORING *CONVERGENCE*

Lampiran 5 Data Monitoring *Convergence* pada Stasiun Lokasi Penelitian

DD16S from West Acc.2 to East -10								
Date	*Raw Data (mm)*	*Correction Factor*	*Corrected Data (mm)*	*Cumulative Convergence (mm)*	*Corrective Value (mm)*	*Convergence Rate (mm/d)*	*Calibration Tools result*	*factor calibration*
25/12/2020	4195,90	1,00	4195,90	0,00	0,00	0,00	369,23	0,00
08/01/2021	4183,10	1,00	4182,52	13,38	13,38	-0,96	369,82	0,58
16/01/2021	4231,86	1,00	4234,62	-38,72	13,38	1,76	366,47	-2,76
26/03/2021	4235,67	1,00	4234,90	-39,00	13,38	0,43	370,00	0,77
02/04/2021	4234,68	1,00	4232,37	-36,47	13,38	0,37	371,55	2,31
24/04/2021	4178,51	1,00	4175,23	20,67	20,67	-0,17	372,52	3,28
30/04/2021	4172,95	1,00	4169,92	25,98	25,98	-0,21	372,27	3,03
07/05/2021	4169,45	1,00	4167,18	28,72	28,72	-0,22	371,50	2,27
13/05/2021	4174,60	1,00	4171,21	24,69	28,72	-0,18	372,63	3,39
04/06/2021	4163,32	1,00	4158,60	37,30	37,30	-0,23	373,95	4,72

DD17N from West Acc.2 to East -9								
Date	*Raw Data (mm)*	*Correction Factor*	*Corrected Data (mm)*	*Cumulative Convergence (mm)*	*Corrective Value (mm)*	*Convergence Rate (mm/d)*	*Calibration Tools result*	*factor calibration*
19/09/2020	4535,99	1,00	4535,99	0,00	0,00	0,00	370,86	0,00
0/2020	4561,61	1,00	4536,12	-0,13	0,00	0,01	396,35	25,49
2/2020	4213,31	1,00	4213,31	0,00	0,00	0,00	372,91	0,00
1/2021	4213,84	1,00	4220,28	-6,97	0,00	0,23	366,47	-6,44

Date	Raw Data (mm)	Correction Factor	Corrected Data (mm)	Cumulative Convergence (mm)	Corrective Value (mm)	Convergence Rate (mm/d)	Calibration Tools result	factor calibration
05/02/2021	4211,46	1,00	4213,39	0,83	0,00	0,00	370,98	-1,93
12/02/2021	4204,22	1,00	4214,10	7,93	0,00	0,11	363,03	-9,88
19/02/2021	4213,37	1,00	4215,50	21,90	0,00	0,31	370,78	-2,13
26/02/2021	4211,06	1,00	4213,11	43,80	0,20	-0,03	370,86	-2,05
26/03/2021	4214,78	1,00	4217,69	4,38	0,20	0,16	370,00	-2,91
02/04/2021	4213,02	1,00	4214,38	1,07	0,20	0,15	371,55	-1,36
24/04/2021	4214,21	1,00	4214,60	1,29	0,20	0,06	372,52	-0,39
30/04/2021	4213,29	1,00	4213,93	0,62	0,20	0,10	372,27	-0,64
28/05/2021	4213,46	1,00	4212,98	0,33	0,33	-0,01	373,39	0,48
04/06/2021	4212,73	1,00	4211,69	1,62	1,62	-0,23	373,95	1,04

DD17S from West Acc.2 to East -8

Date	Raw Data (mm)	Correction Factor	Corrected Data (mm)	Cumulative Convergence (mm)	Corrective Value (mm)	Convergence Rate (mm/d)	Calibration Tools result	factor calibration
26/05/2021	4317,75	1,00	4317,75	0,00	0,00	0,00	370,86	0,00
02/06/2021	4315,55	1,00	4313,50	-0,31	4,25	-0,05	372,91	2,05
07/06/2021	4313,80	1,00	4315,43	16,26	4,25	-0,02	369,23	-1,63
6/2021	4300,30	1,00	4301,35	40,63	16,40	-0,15	369,82	-1,05
7/2021	4317,72	1,00	4322,11	40,63	16,40	0,04	366,47	-4,39

Date	*Raw Data (mm)*	*Correction Factor*	*Corrected Data (mm)*	*Cumulative Convergence (mm)*	*Corrective Value (mm)*	*Convergence Rate (mm/d)*	*Calibration Tools result*	*factor calibration*
05/08/2021	4316,21	1,00	4316,07	41,57	16,40	-0,01	371,00	0,14
24/08/2021	4306,25	1,00	4314,09	3,66	16,40	-0,03	363,03	-7,84
07/09/2021	4314,47	1,00	4314,47	3,28	16,40	-0,02	370,86	0,00
19/09/2021	4314,13	1,00	4314,99	2,76	16,40	-0,01	370,00	-0,86
03/10/2021	4313,90	1,00	4313,22	4,53	16,40	-0,02	371,55	0,68
12/10/2021	4314,96	1,00	4313,31	4,44	16,40	-0,02	372,52	1,65
28/11/2021	4313,65	1,00	4312,25	5,50	16,40	-0,02	372,27	1,40
07/12/2021	4313,41	1,00	4312,77	4,98	16,40	-0,02	371,50	0,64
14/12/2021	4312,26	1,00	4310,50	7,25	16,40	-0,03	372,63	1,76
28/12/2021	4305,80	1,00	4302,71	15,04	16,40	-0,06	373,95	3,09
DD15-S From UCUT Slot West Acc. To West-23								
Date	*Raw Data (mm)*	*Correction Factor*	*Corrected Data (mm)*	*Cumulative Convergence (mm)*	*Corrective Value (mm)*	*Convergence Rate (mm/d)*	*Calibration Tools result*	*factor calibration*
11/02/2021	4145,98	1,00	4145,98	0,00	0,00	0,00	371,12	0,00
18/02/2021	4122,33	1,00	4122,66	4,91	0,00	3,33	370,79	-0,33
2/2021	4104,73	1,00	4105,07	8,61	0,00	2,92	370,78	-0,34
3/2021	4068,89	1,00	4067,99	16,42	0,00	3,54	372,02	0,90
3/2021	4317,35	1,00	4318,47	-1,72	Corrective Value (mm)	-4,42	370,00	-1,12

EXTN Panel 14 West from Middle Acc. To West-46								
Date	*Raw Data (mm)*	*Correction Factor*	*Corrected Data (mm)*	*Cumulative Convergence (mm)*	*Corrective Value (mm)*	*Convergence Rate (mm/d)*	*Calibration Tools result*	*factor calibration*
26/05/2021	4188,68	1,00	4188,68	0,00	0,00	0,00	432,40	0,00
02/06/2021	4188,98	1,00	4189,54	-0,86	0,00	-0,12	431,84	-0,56
07/06/2021	4171,44	1,00	4172,15	16,53	16,53	1,38	431,69	-0,71
05/08/2021	3472,52	1,00	3472,52	16,53	16,53	0,23	431,48	0,00
30/08/2021	3478,36	1,00	3477,62	11,44	16,53	0,12	432,22	0,74
16/09/2021	3476,50	1,00	3475,08	8,88	16,53	0,08	432,90	1,42
12/10/2021					16,53			

EXTN Panel 15 West from Middle Acc. To West-45								
Date	*Raw Data (mm)*	*Correction Factor*	*Corrected Data (mm)*	*Cumulative Convergence (mm)*	*Corrective Value (mm)*	*Convergence Rate (mm/d)*	*Calibration Tools result*	*factor calibration*
26/05/2021	4434,76	1,00	4434,76	0,00	0,00	0,00	432,40	0,00
02/06/2021	4434,51	1,00	4435,07	5,33	0,00	-0,04	431,84	-0,56
07/06/2021	4417,79	1,00	4418,50	35,88	16,26	1,36	431,69	-0,71
24/06/2021	4312,53	1,00	4312,87	30,11	121,89	4,20	432,06	-0,34
30/06/2021	3884,76	1,00	3884,76	30,27	121,89	0,61	432,30	0,00
[illegible]7/2021	3881,91	1,00	3881,94	44,21	124,72	0,53	432,28	-0,03
[illegible]8/2021	3886,09	1,00	3888,03	44,21	124,72	0,43	430,37	-1,94
[illegible]2/2021	3885,42	1,00	3887,36	19,30	124,72	0,42	430,37	-1,94

LAMPIRAN 6

DATA ESTIMASI *BULKING FACTOR*

Lampiran 6 Contoh Data untuk Estimasi Nilai *Bulking Factor* (BF)

Panel	DP	X	Y	Z	*Lithology*	DOF (m)	DOD (m)	*Cave distance* (m)	*Convergence* (mm)	*Bulking Factor* (%)
P27W	43/44	734460	9550936	2831	Tgdd	0,5	1,1	-61,2	95,8	4,01
P27W	43/44	734463	9550932	2831	Tgdd	1	1	-61,2	95,8	4,41
P26W	38/39	734507	9551048	2831	Tgdd	0,5	0,9	5,6	19,6	1,00
P26W	39/40	734493	9551035	2831	Contact Tsk & Tgdfa	0,4	1,2	-14,8	36,4	1,40
P26W	39/40	734496	9551031	2831	Contact Tsk & Tgdfa	0,2	0,2	-14,8	36,4	8,38
P26W	40/41	734482	9551019	2831	Contact Tsk & Tgdfa	0,4	0,4	-14,1	37	4,26
P26W	40/41	734484	9551015	2831	Contact Tsk & Tgdfa	0,4	0,8	-14,1	37	2,13
P26W	41/42	734470	9551003	2831	Tgdd	0,3	0,3	-34,1	12,4	1,90
P26W	41/42	734470	9551003	2831	Tgdd	0,3	0,3	-34,1	12,4	1,90
P26W	43/44	734447	9550970	2831	Tgdd	0,7	0,7	-74,1	86,7	5,70
P26W	43/44	734450	9550966	2831	Tgdd	0,2	0,2	-74,1	86,7	19,95
P26W	44/45	734436	9550953	2831	Tgdd	0,9	0,9	-94,1	96,4	4,93
P27W	39/40	734506	9551002	2831	Tgdd Phyllic	0,6	0,9	4	17	0,87
P27W	39/40	734506	9551002	2831	Tgdd Phyllic	0,6	0,9	4	17	0,87
P27W	41/42	734483	9550969	2831	Tgdd	0,2	0,2	-36,7	7,3	1,68
P27W	41/42	734483	9550969	2831	Tgdd	0,2	0,2	-36,7	7,3	1,68
P27W	42/43	734472	9550952	2831	Tgdd	0,3	0,3	-56,7	21	3,22
P27W	42/43	734472	9550952	2831	Tgdd	0,3	0,3	-56,7	21	3,22
P27W	43/44	734460	9550936	2831	Tgdd	0,5	1	-76,7	82,8	3,81
P27W	43/44	734463	9550932	2831	Tgdd	0,1	1,2	-76,7	82,8	3,18
P22W	39/40	734444	9551167	2831	Tsk	0,2	0,2	28,6	0,4	0,09
P22W	40/41	734430	9551154	2831	Tgdd	0,1	0,1	46	0,8	0,37
P22W	40/41	734433	9551150	2831	Tgdd	0,2	0,2	43,5	0,8	0,18
P22W	41/42	734418	9551138	2831	Tgdd	0,1	0,1	60	2,2	1,01
[illegible]	41/42	734421	9551134	2831	Tgdd	0,7	0,7	56	2,2	0,14
[illegible]	33/34	734591	9551063	2831	Breccia	0,4	0,4	83,4	7,1	0,82
[illegible]	34/35	734577	9551050	2831	Breccia	0,4	0,8	66,3	7,1	0,41
[illegible]	38/39	734533	9550980	2831	Contact Tsk & Tgdfa	0,3	0,5	8,6	28,6	2,63

Panel	DP	X	Y	Z	*Lithology*	DOF (m)	DOD (m)	*Cave distance* (m)	*Convergence* (mm)	*Bulking Factor* (%)
P28W	39/40	734519	9550968	2831	Contact Tsk & Tgdfa	0,5	0,9	-8,6	18,3	0,94
P28W	39/40	734522	9550964	2831	Contact Tsk & Tgdfa	0,6	0,6	-7	18,3	1,40
P28W	40/41	734508	9550952	2831	Tgdd	0,7	0,7	-23,4	13,7	0,90
P25W	42/43	734446	9551020	2831	Tgdd	0,6	0,6	-99,7	1,6	0,12
P25W	42/43	734448	9551016	2831	Tgdd	1,3	2,6	-99,7	1,6	0,03
P22W	38/39	734453	9551187	2831	Tsk	0,3	0,6	45	2,2	0,17
P22W	38/39	734456	9551183	2831	Tsk	0,1	0,1	40	2,2	1,01
P22W	39/40	734442	9551171	2831	Tsk	0,5	0,5	39	1,6	0,15
P22W	39/40	734444	9551167	2831	Tsk	0,3	0,3	34	1,6	0,25
P22W	40/41	734430	9551154	2831	Tgdd	0,3	0,3	32	106	16,26
P22W	40/41	734433	9551150	2831	Tgdd	0,3	0,3	27	106	16,26
P25W	41/42	734457	9551036	2831	Tgdd	0,2	0,3	-77	20	3,07
P25W	41/42	734460	9551032	2831	Tgdd	0,6	0,6	-77	20	1,53
P28W	30/31	734623	9551116	2831	Tsk	0,4	0,4	106	1	0,12
P28W	30/31	734625	9551112	2831	Tsk	0,3	0,3	103	1	0,15
P28W	31/32	734611	9551099	2831	Breccia	0,3	0,9	86	4,4	0,23
P28W	31/32	734614	9551095	2831	Breccia	0,3	0,3	88	4,4	0,68
P22W	41/42	734418	9551138	2831	Tgdd	0,3	0,3	16,2	122,4	18,78
P22W	41/42	734418	9551138	2831	Tgdd	0,3	0,3	16,2	122,4	18,78
P22W	40/41	734430	9551154	2831	Tgdd	0,3	0,3	36,2	104	15,96
P22W	40/41	734433	9551150	2831	Tgdd	0,5	0,5	36,2	104	9,57
P22W	39/40	734442	9551171	2831	Tsk	0,4	0,4	56,2	1,6	0,18
P22W	39/40	734442	9551171	2831	Tsk	0,4	0,4	56,2	1,6	0,18
P22W	38/39	734453	9551187	2831	Tsk	0,7	0,7	76,2	1,1	0,07
[illegible]	38/39	734456	9551183	2831	Tsk	0,3	0,3	76,2	1,1	0,17
[illegible]	37/38	734465	9551204	2831	Tsk	0,4	0,4	96,2	1	0,12
[illegible]	37/38	734465	9551204	2831	Tsk	0,4	0,4	96,2	1	0,12
[illegible]	36/37	734476	9551220	2831	Tsk	0,3	0,4	116,2	1,4	0,16

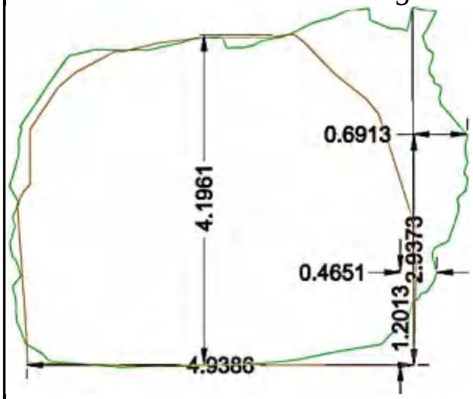
Panel	DP	X	Y	Z	*Lithology*	DOF (m)	DOD (m)	*Cave distance* (m)	*Convergence* (mm)	*Bulking Factor* (%)
P22W	36/37	734479	9551216	2831	Tsk	0,4	0,4	116,2	1,4	0,16
P22W	W2	734499	9551253	2831	Tsk	0,5	0,5	156,2	2,8	0,26
P22W	W2	734502	9551249	2831	Tsk	0,4	0,4	156,2	2,8	0,32
P23W	37/38	734477	9551170	2831	Tsk	0,5	0,5	16,6	6,3	0,58
P24W	37/38	734491	9551136	2831	Contact Tsk & Tgdfa	0,3	0,3	18	6,3	0,97
P22W	37/38	734465	9551204	2831	Tsk	0,2	0,2	60	4,9	1,13
P22W	37/38	734467	9551200	2831	Tsk	0,3	0,3	60	4,9	0,75
P22W	38/39	734453	9551187	2831	Tsk	0,8	0,8	48	5,9	0,34
P22W	38/39	734456	9551183	2831	Tsk	0,3	0,3	48	5,9	0,91
P22W	39/40	734442	9551171	2831	Tsk	0,5	0,5	37	5	0,46
P22W	39/40	734444	9551167	2831	Tsk	0,4	0,4	37	5	0,58
P22W	40/41	734430	9551154	2831	Tgdd	0,7	0,7	24	109,2	7,18
P22W	40/41	734433	9551150	2831	Tgdd	1,3	1,4	24	109,2	3,59
P22W	41/42	734418	9551138	2831	Tgdd	0,9	0,9	13	131,7	6,74
P22W	41/42	734421	9551134	2831	Tgdd	1,2	1,2	13	131,7	5,05
P24W	44/45	734410	9551021	2831	Tgdd	0,5	0,5	-176,9	59,9	5,51
P25W	W1	734587	9551221	2831	Tsk	0,5	0,5	97	1,6	0,15
P25W	W2	734581	9551205	2831	Tsk	0	0,3	77	5,1	0,78
P25W	33/34	734549	9551168	2831	Tsk	0,3	0,8	37	6,5	0,37
P25W	36/37	734515	9551119	2831	Tsk	0,7	0,7	-11	17,7	1,16
P26W	W4	734585	9551167	2831	Tsk	0,5	0,5	77	24,1	2,22
P26W	W3	734593	9551178	2831	Tsk	0,4	0,5	90	10,6	0,98
P26W	W3	734596	9551174	2831	Tsk	0,5	0,5	90	10,6	0,98
P26W	W2	734601	9551190	2831	Tsk	0,1	0,2	102	9,8	2,26
[illegible]	W2	734604	9551186	2831	Tsk	0,4	0,5	102	9,8	0,90
[illegible]	32/33	734574	9551150	2831	Tsk	0,2	0,4	64	4,5	0,52
[illegible]	33/34	734565	9551130	2831	Breccia	0,2	0,6	44	29,2	2,24

LAMPIRAN 7

SECTION DRIFT SURVEI SCAN

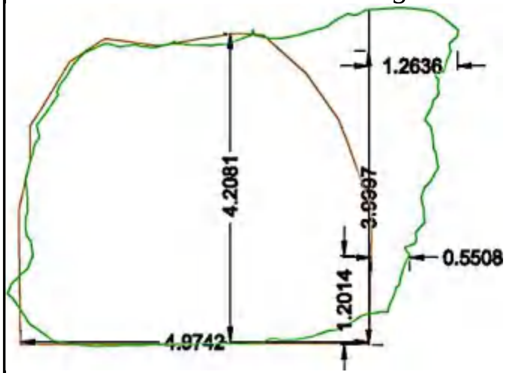
Lampiran 7 Hasil *Section Drift Survei Scan*

UCUT PB3C DD16N *Ring* 219

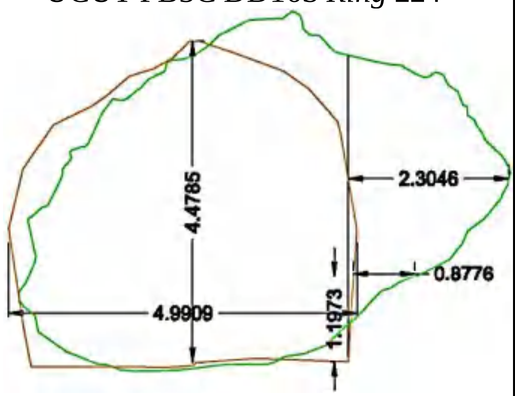


UCUT PB3C DD16S *Ring* 223

UCUT PB3C DD16S *Ring* 220

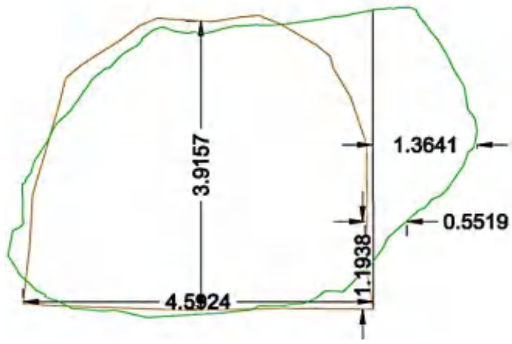


UCUT PB3C DD16S *Ring* 224

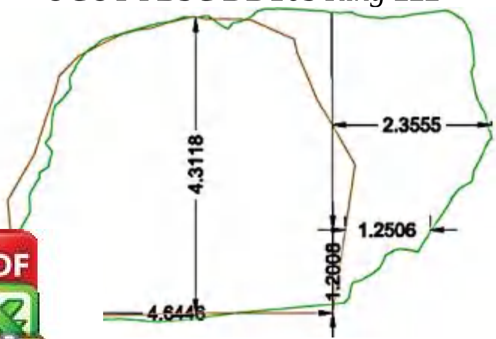


UCUT PB3C DD16S *Ring* 221

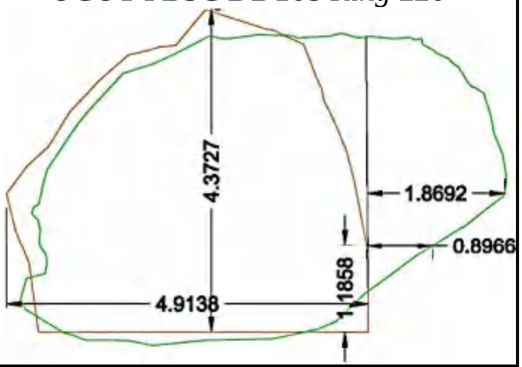
UCUT PB3C DD16S *Ring* 225



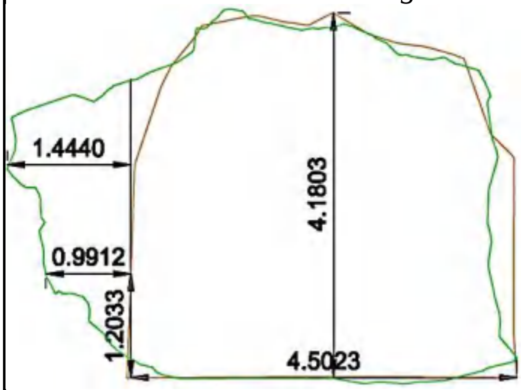
UCUT PB3C DD16S *Ring* 222



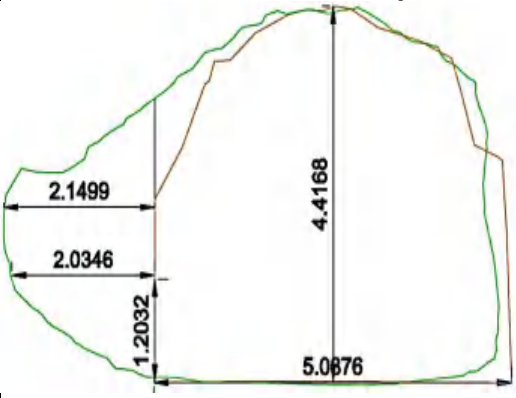
UCUT PB3C DD16S *Ring* 226



UCUT PB3C DD17N *Ring* 217

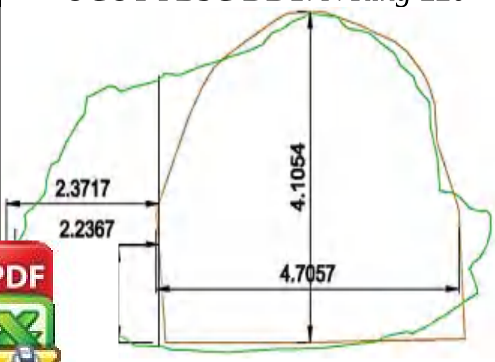


UCUT PB3C DD17N *Ring* 218

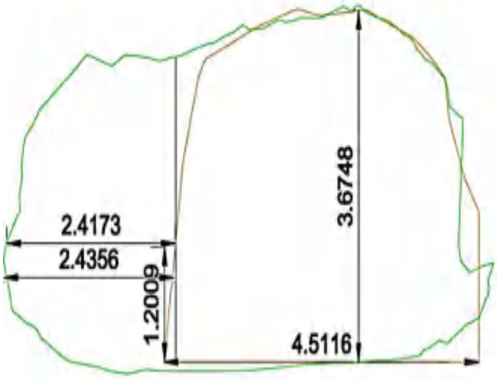


UCUT PB3C DD17N *Ring* 219

UCUT PB3C DD17N *Ring* 220

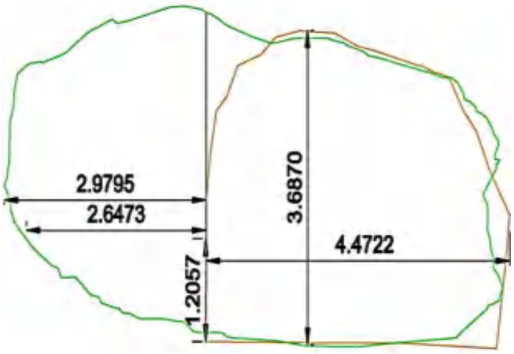


UCUT PB3C DD17N *Ring* 221

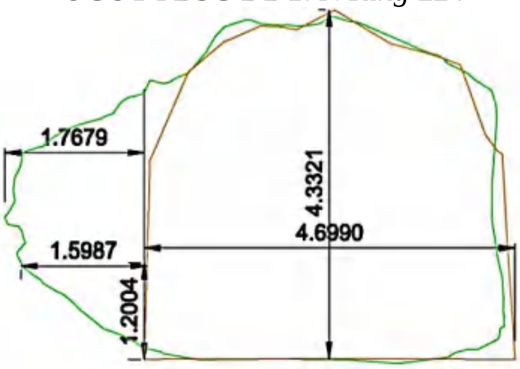


UCUT PB3C DD17N *Ring* 222

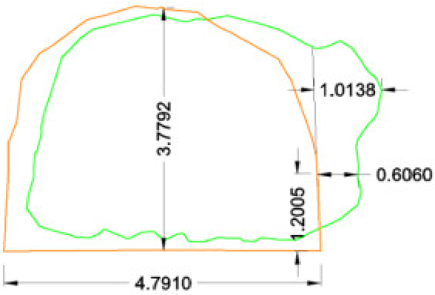
UCUT PB3C DD17N *Ring* 223



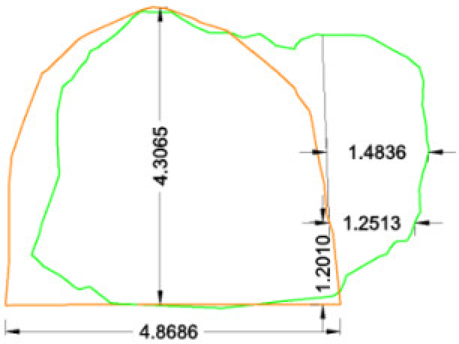
UCUT PB3C DD17N *Ring* 224



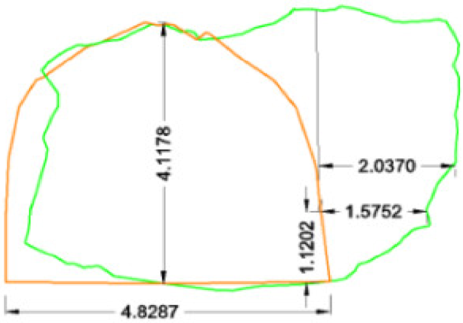
UCUT PB2N DD17S *Ring* 269



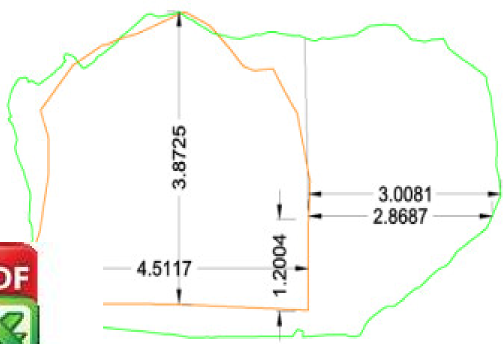
UCUT PB2N DD17S *Ring* 270



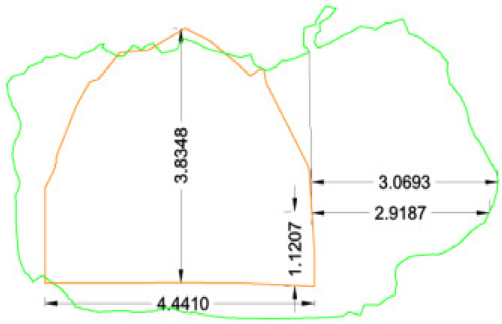
UCUT PB2N DD17S *Ring* 271



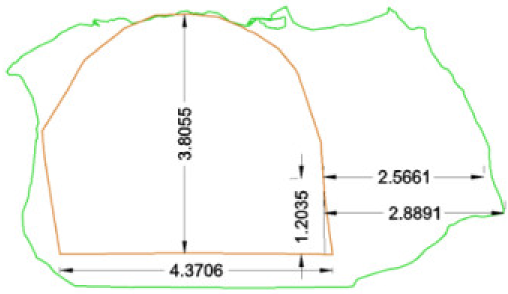
UCUT PB2N DD17S *Ring* 272



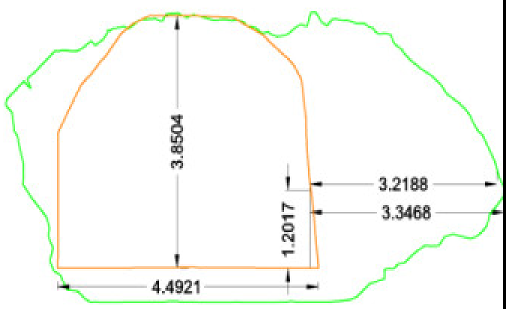
UCUT PB2N DD17S *Ring* 273



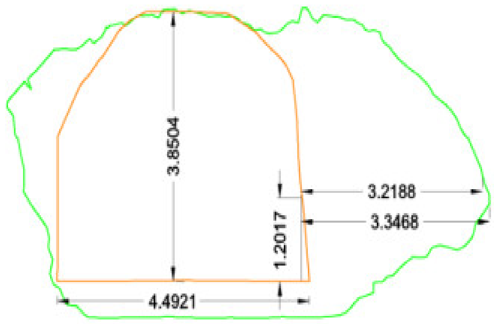
UCUT PB2N DD17S *Ring* 274



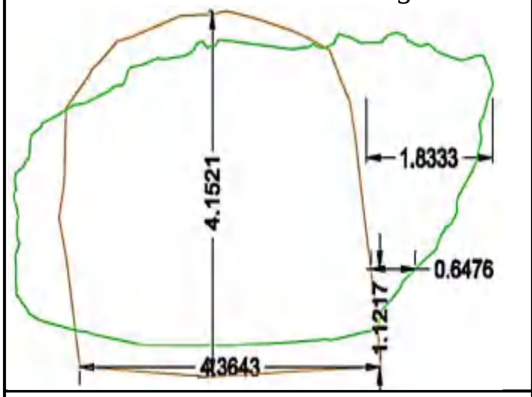
UCUT PB2N DD17S *Ring* 275



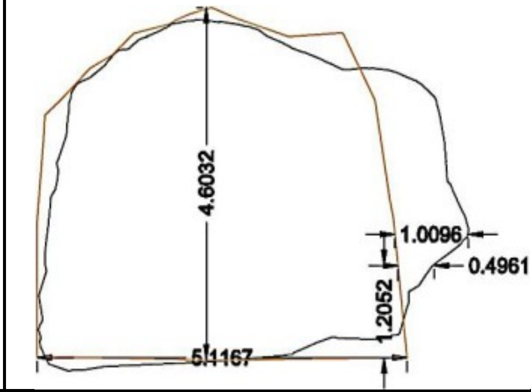
UCUT PB2N DD17S *Ring* 276



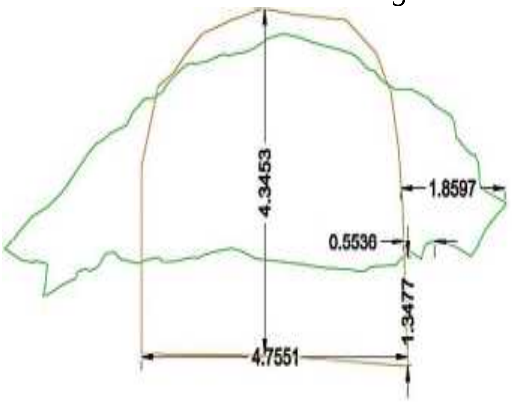
UCUT PB2N DD15S *Ring* 255



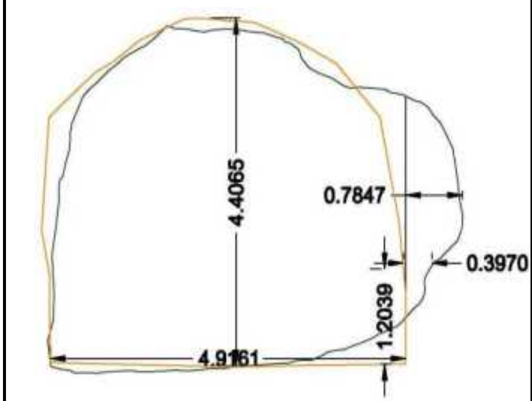
EXTN PB2N P14 DP46-47 B-B'



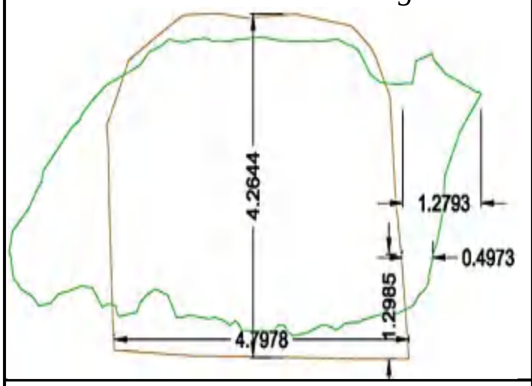
UCUT PB2N DD15S *Ring* 256



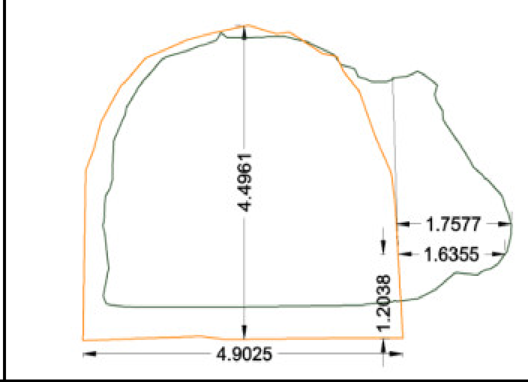
EXTN PB2N P14 DP46-47 C-C'



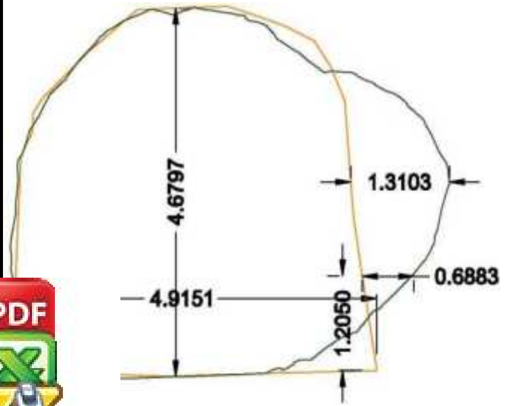
UCUT PB2N DD15S *Ring* 257



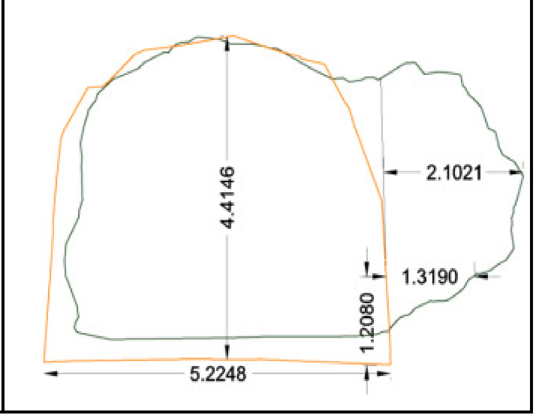
EXTN PB2N P15 DP45-46 A-A'



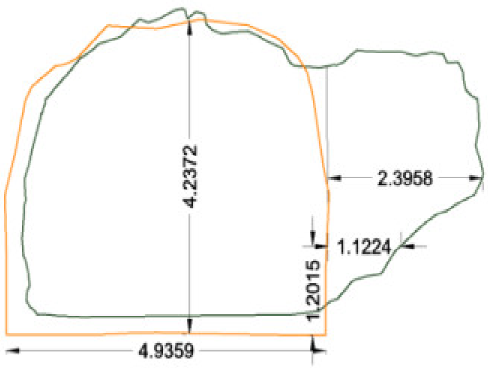
EXTN PB2N P14 DP46-47 A-A'



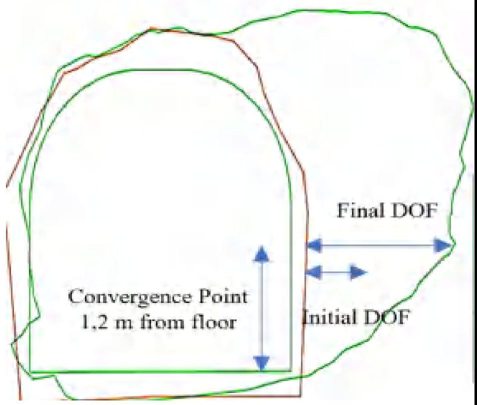
EXTN PB2N P15 DP45-46 B-B'



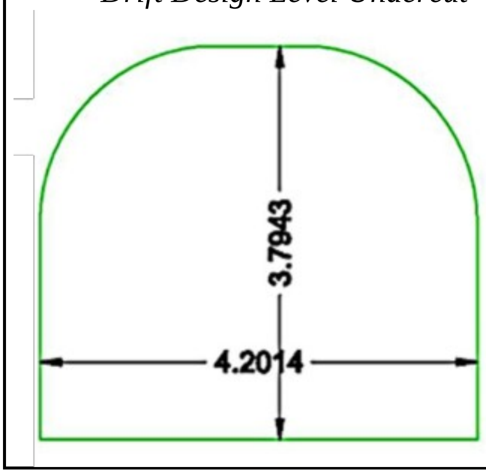
EXTN PB2N P15 DP45-46 C-C'



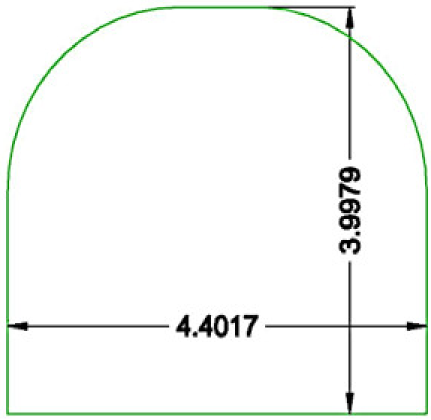
Section Interpretation



Drift Design Level Undercut



Drift Design Level Extraction



LAMPIRAN 8

DATA *TRIAL AND ERROR* FEM

Lampiran 8 Perhitungan *Crack Initation* (ci) Terhadap DOF Secara Analitik

Location	*Initial* DOF (m)	w (m)	a (m)	Rf (m)	σ1 (MPa)	σ3 (MPa)	σmax, (MPa)	UCS (MPa)	ci
UCUT PB3C DD16S *Ring* 219	0,2	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 220	0,2	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 221	0,19	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 222	0,19	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 223	0,19	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 224	0,18	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 225	0,18	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD16S *Ring* 226	0,18	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD17N *Ring* 217	0,63	4,2	2,97	3,6	40	24	68	100	0,46
UCUT PB3C DD17N *Ring* 218	0,23	4,2	2,97	3,2	40	24	68	100	0,57
UCUT PB3C DD17N *Ring* 219	0,61	4,2	2,97	3,58	40	24	68	100	0,47
UCUT PB3C DD17N *Ring* 220	0,60	4,2	2,97	3,57	40	24	68	100	0,47
UCUT PB3C DD17N *Ring* 221	0,59	4,2	2,97	3,56	40	24	68	100	0,47
UCUT PB3C DD17N *Ring* 222	0,59	4,2	2,97	3,56	40	24	68	100	0,47
[illegible]3C [illegible]*ng* [illegible]	0,58	4,2	2,97	3,55	40	24	68	100	0,48
[illegible]3C [illegible]*ng* [illegible]	0,57	4,2	2,97	3,54	40	24	68	100	0,48

Location	*Initial* DOF (m)	w (m)	a (m)	Rf (m)	σ1 (MPa)	σ3 (MPa)	σmax, (MPa)	UCS (MPa)	ci
UCUT PB2N DD17S *Ring* 269	0,54	4,2	2,97	3,51	31	4	67,3	100	0,48
UCUT PB2N DD17S *Ring* 270	0,54	4,2	2,97	3,51	31	4	67,3	100	0,48
UCUT PB2N DD17S *Ring* 271	0,55	4,2	2,97	3,52	31	4	67,3	100	0,48
UCUT PB2N DD17S *Ring* 272	0,56	4,2	2,97	3,53	31	4	67,3	100	0,48
UCUT PB2N DD17S *Ring* 273	0,57	4,2	2,97	3,54	31	4	67,3	100	0,47
UCUT PB2N DD17S *Ring* 274	0,58	4,2	2,97	3,55	31	4	67,3	100	0,47
UCUT PB2N DD17S *Ring* 275	0,59	4,2	2,97	3,56	31	4	67,3	100	0,47
UCUT PB2N DD17S *Ring* 276	0,59	4,2	2,97	3,56	31	4	67,3	100	0,47
UCUT PB2N DD15S *Ring* 255	0,22	4,2	2,97	3,19	31	4	67,3	100	0,57
UCUT PB2N DD15S *Ring* 256	0,22	4,2	2,97	3,19	31	4	67,3	100	0,57
UCUT PB2N DD15S *Ring* 257	0,23	4,2	2,97	3,20	31	4	67,3	100	0,56
EXTN PB2N P14DP46-47 A-A'	0,22	4,4	3,11	3,33	35	14	66,5	100	0,56
EXTN PB2N P14DP46-47 B-B'	0,22	4,4	3,11	3,33	35	14	66,5	100	0,56
EXTN PB2N P14DP46-47 C-C'	0,22	4,4	3,11	3,33	35	14	66,5	100	0,56
EXTN PB2N P15 DP45-46 [illegible]	1,64	4,4	3,11	4,75	0,48	100	66,5	100,57	34,07
[illegible] 2N [illegible]-46	1,32	4,4	3,11	4,43	0,48	100	66,5	90,71	24,21

Location	*Initial* DOF (m)	w (m)	a (m)	Rf (m)	σ1 (MPa)	σ3 (MPa)	σmax, (MPa)	UCS (MPa)	ci
EXTN PB2N P15 DP45-46 C-C'	1,12	4,4	3,11	4,23	0,48	100	66,5	84,58	18,08

Lampiran 8 Perhitungan Perubahan Tegangan Terinduksi Secara Analitik

Location	*Final* DOF (m)	w (m)	a (m)	Rf (m)	σc (MPa)	ci	*Initial* σmax, (MPa)	*Final* σmax, (MPa)	Δσmax, (Mpa)
UCUT PB3C DD16S *Ring* 219	0,47	4,20	2,97	3,44	100	0,57	68	77,01	9,01
UCUT PB3C DD16S *Ring* 220	0,55	4,20	2,97	3,52	100	0,57	68	80,07	12,07
UCUT PB3C DD16S *Ring* 221	1,25	4,20	2,97	4,22	100	0,57	68	106,83	38,83
UCUT PB3C DD16S *Ring* 222	1,72	4,20	2,97	4,69	100	0,57	68	124,80	56,80
UCUT PB3C DD16S *Ring* 223	1,44	4,20	2,97	4,41	100	0,57	68	114,10	46,10
UCUT PB3C DD16S *Ring* 224	0,88	4,20	2,97	3,85	100	0,57	68	92,69	24,69
UCUT PB3C DD16S *Ring* 225	0,89	4,20	2,97	3,86	100	0,57	68	93,07	25,07
UCUT PB3C DD16S *Ring* 226	0,55	4,20	2,97	3,52	100	0,57	68	80,07	12,07
UCUT PB3C DD17N *Ring* 217	0,99	4,2	2,97	3,96	100	0,46	68	79,53	11,53
UCUT PB3C DD17N *Ring* 218	2,04	4,2	2,97	5,01	100	0,57	68	112,48	44,48
UCUT PB3C DD17N *Ring* [illegible]	2,64	4,2	2,97	5,61	100	0,47	68	131,89	63,89
[illegible]3C [illegible]*ing*	2,24	4,2	2,97	5,21	100	0,47	68	119,79	51,79

Location	*Final* DOF (m)	w (m)	a (m)	Rf (m)	σc (MPa)	ci	*Initial* σmax, (MPa)	*Final* σmax, (MPa)	$\Delta\sigma max$, (Mpa)
UCUT PB3C DD17N *Ring* 221	2,42	4,2	2,97	5,39	100	0,47	68	126,02	58,02
UCUT PB3C DD17N *Ring* 222	2,25	4,2	2,97	5,22	100	0,47	68	121,11	53,11
UCUT PB3C DD17N *Ring* 223	2,65	4,2	2,97	5,62	100	0,48	68	134,42	66,42
UCUT PB3C DD17N *Ring* 224	1,60	4,2	2,97	4,57	100	0,48	68	101,16	33,16
UCUT PB2N DD17S *Ring* 269	0,61	4,2	2,97	3,58	0,48	100	67,30	69,7	2,40
UCUT PB2N DD17S *Ring* 270	1,25	4,2	2,97	4,22	0,48	100	67,30	90,08	22,78
UCUT PB2N DD17S *Ring* 271	1,57	4,2	2,97	4,54	0,48	100	67,30	100,01	32,71
UCUT PB2N DD17S *Ring* 272	2,87	4,2	2,97	5,84	0,48	100	67,30	141,21	73,91
UCUT PB2N DD17S *Ring* 273	2,92	4,2	2,97	5,89	0,47	100	67,30	142,24	74,94
UCUT PB2N DD17S *Ring* 274	2,57	4,2	2,97	5,54	0,47	100	67,30	130,56	63,26
UCUT PB2N DD17S *Ring* 275	3,22	4,2	2,97	6,19	0,47	100	67,30	150,55	83,25
UCUT PB2N DD17S *Ring* 276	2,58	4,2	2,97	5,55	0,47	100	67,30	129,76	62,46
UCUT PB2N DD15S *Ring* 255	0,64	4,2	2,97	3,19	100	0,57	67,3	83,32	16,02
UCUT PB2N [illegible]*ing*	0,55	4,2	2,97	3,19	100	0,57	67,3	79,89	12,59

Location	*Final* DOF (m)	w (m)	a (m)	Rf (m)	σc (MPa)	ci	*Initial* σmax, (MPa)	*Final* σmax, (MPa)	$\Delta\sigma max$, (Mpa)
UCUT PB2N DD15S *Ring* 257	0,49	4,2	2,97	3,20	100	0,56	67,3	77,16	9,86
EXTN PB2N P14DP46-47 A-A'	0,69	4,4	3,11	3,80	100	0,56	66,5	83,51	17,01
EXTN PB2N P14DP46-47 B-B'	0,50	4,4	3,11	3,61	100	0,56	66,5	76,63	10,13
EXTN PB2N P14DP46-47 C-C'	0,40	4,4	3,11	3,51	100	0,56	66,5	73,01	6,51
EXTN PB2N P15DP45-46 A-A'	0,69	4,4	3,11	3,80	100	0,56	66,5	83,51	17,01
EXTN PB2N P15DP45-46 B-B'	0,50	4,4	3,11	3,61	100	0,56	66,5	76,63	10,13
EXTN PB2N P15DP45-46 C-C'	0,40	4,4	3,11	3,51	100	0,56	66,5	73,01	6,51

Lampiran 8 Perhitungan DOF Prediksi Lokasi Penelitian

Location	a (m)	PPV (mm/s)	UCS x ci (MPa)	C1	C2	σmax	Rf (m)	DOF Prediksi (m)
UCUT PB3C DD16S	2,97	26,77874	40	0,5	0,61	68	4,34	1,37
UCUT PB3C DD17N	2,97	25,05406	40	0,5	0,61	68	4,32	1,35
UCUT PB2N DD17S	2,97	10,72293	40	0,5	0,55	67,3	4,13	1,16
UCUT PB2N DD15S	2,97	2,911807	40	0,5	0,52	67,3	4,05	1,08
EXTN PB2N P14 DP46-47	3,14	6,614798	40	0,5	0,54	66,5	4,29	1,15
EXTN PB2N P15 DP45-46	3,14	3,681979	40	0,5	0,52	66,5	4,26	1,12

Lampiran 8 Perhitungan *Factor of Safety* (FS) Lokasi Penelitian

Location	Initial FS	p (ton/m3)	DOF intial (m)	CD initial	Final DOF (m)	Final FS
UCUT PB3C DD16S	1,3	2,9	0,19	0,72	0,69	0,36
UCUT PB3C DD17N	1,3	2,9	0,55	2,07	1,55	0,46
UCUT PB2N DD17S	1,3	2,9	0,78	2,94	1,63	0,62
[illegible] PB2N DD15S	1,3	2,9	0,22	0,83	0,34	0,84
[illegible]32N P14 DP46-47	1,3	2,9	0,22	0,83	0,31	0,92
[illegible]32N P15 DP45-46	1,3	2,9	0,54	2,04	0,82	0,86
Mean	1,3	2,9	0,42	1,57	0,89	0,68

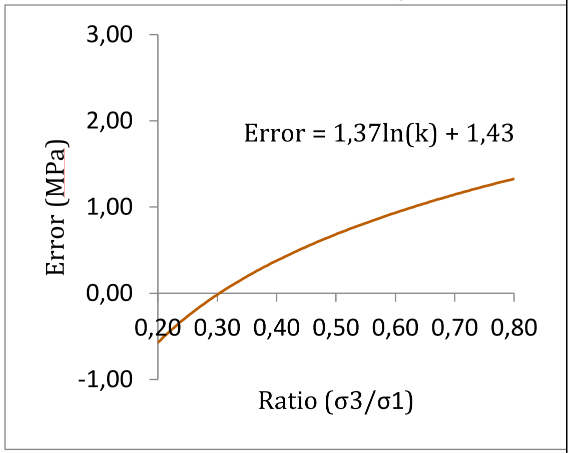
Lampiran 8 Perbandingan Nilai Numerik (*Trial and Error*) dan Analitik

Section	*Location*	σmax (MPa)				
		σ3/σ1 = 0,2	σ3/σ1 = 0,4	σ3/σ1 = 0,6	σ3/σ1 = 0,8	*Analytical*
1	UCUT PB3C DD16S *Ring* 219	9,35	8,62	8,76	7,91	9,01
2	UCUT PB3C DD16S *Ring* 220	11,19	10,5	10,42	9,33	12,07
3	UCUT PB3C DD16S *Ring* 221	27,32	26,97	24,96	21,78	38,83
4	UCUT PB3C DD16S *Ring* 222	38,14	38,04	34,71	30,14	56,8
5	UCUT PB3C DD16S *Ring* 223	31,69	31,45	28,9	25,16	46,1
6	UCUT PB3C DD16S *Ring* 224	18,79	18,27	17,27	15,2	24,69
7	UCUT PB3C DD16S *Ring* 225	19,02	18,5	17,48	15,38	25,07
8	UCUT PB3C DD16S *Ring* 226	11,19	10,5	10,42	9,33	12,07
9	UCUT PB3C DD17N *Ring* 217	4,94	4,94	7,01	5,97	11,53
10	UCUT PB3C DD17N *Ring* 218	15,21	9,07	26,21	25,63	44,48
11	UCUT PB3C DD17N *Ring* 219	21,08	11,42	37,18	36,86	63,89
12	UCUT PB3C DD17N *Ring* 220	17,17	9,85	29,86	29,37	51,79
13	UCUT PB3C DD17N *Ring* 221	18,93	10,56	33,15	32,74	58,02
14	UCUT PB3C DD17N *Ring* 222	17,27	9,89	30,05	29,56	53,11
15	UCUT PB3C DD17N *Ring* 223	21,18	11,46	37,36	37,05	66,42
16	UCUT PB3C DD17N *Ring* 224	10,91	7,34	18,16	17,39	33,16
17	UCUT PB2N DD17S *Ring* 269	1,71	1,75	1,54	1,32	2,40
18	UCUT PB2N DD17S *Ring* 270	16,28	16,63	14,67	12,56	22,78
19	UCUT PB2N DD17S *Ring* 271	23,47	23,98	21,15	18,11	32,71
	UCUT PB2N DD17S *Ring* 272	53,23	54,39	47,97	41,08	73,91
	UCUT PB2N DD17S *Ring* 273	54,19	55,37	48,83	41,82	74,94

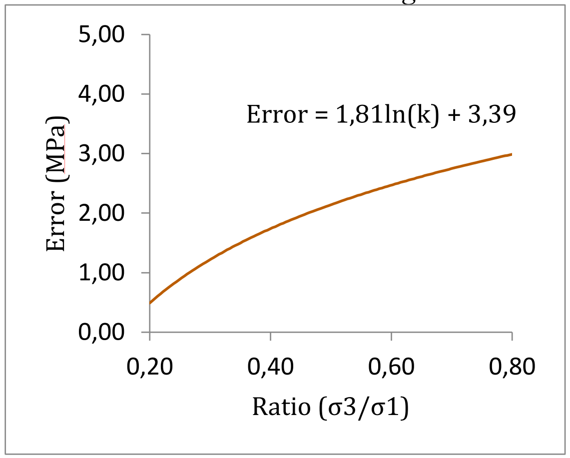
Section	*Location*	σ_{max} (MPa)				
		σ_3/σ_1 = 0,2	σ_3/σ_1 = 0,4	σ_3/σ_1 = 0,6	σ_3/σ_1 = 0,8	*Analytical*
22	UCUT PB2N DD17S *Ring* 274	45,93	46,93	41,38	35,44	63,26
23	UCUT PB2N DD17S *Ring* 275	60,70	62,02	54,69	46,84	83,25
24	UCUT PB2N DD17S *Ring* 276	45,74	46,73	41,21	35,30	62,46
25	UCUT PB2N DD15S *Ring* 255	2,1	4,16	3,11	7,2	16,02
26	UCUT PB2N DD15S *Ring* 256	1,3	2,69	1,99	5,31	12,59
27	UCUT PB2N DD15S *Ring* 257	0,76	1,71	1,24	4,04	9,86
28	EXTN PB2N P14 DP46-47 A-A'	24,41	23,79	19,76	23,33	17,01
29	EXTN PB2N P14DP46-47 B-B'	20,04	19,32	17,14	19,39	10,13
30	EXTN PB2N P14DP46-47 C-C'	17,73	16,97	15,76	17,31	6,51
31	EXTN PB2N P15 DP45-46 A-A'	3,73	8,14	14,80	20,61	34,07
32	EXTN PB2N P15 DP45-46 B-B'	2,65	5,79	10,52	14,65	24,21
33	EXTN PB2N P15 DP45-46 C-C'	1,98	4,32	7,85	10,93	18,08

Lampiran 8 Grafik *Trial and Error* Nilai k pada *Field Stress Software*RS2

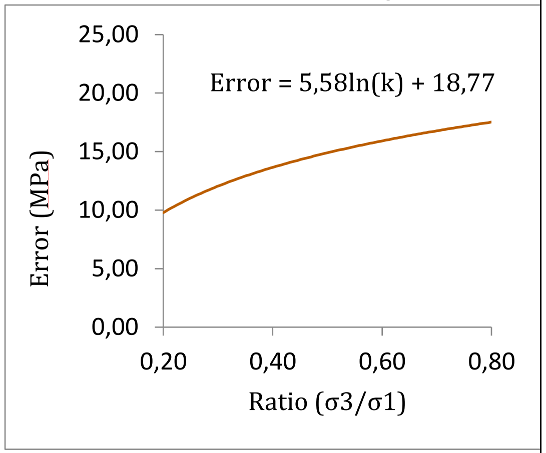
UCUT PB3C DD16S *Ring* 219



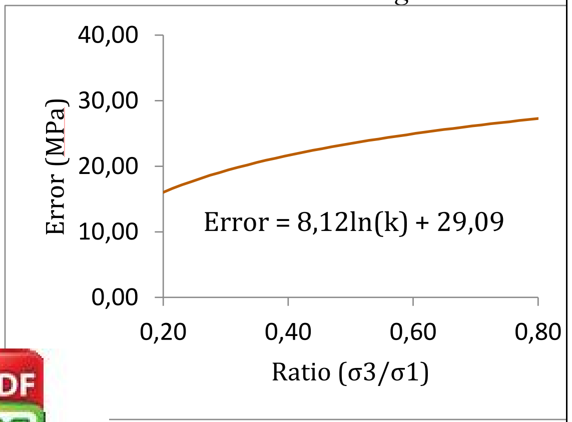
UCUT PB3C DD16S *Ring* 220



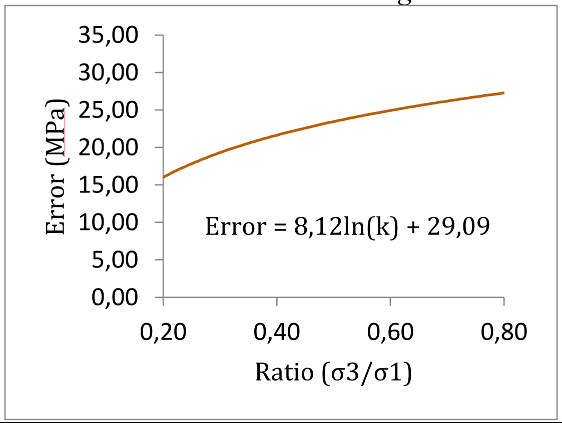
UCUT PB3C DD16S *Ring* 221



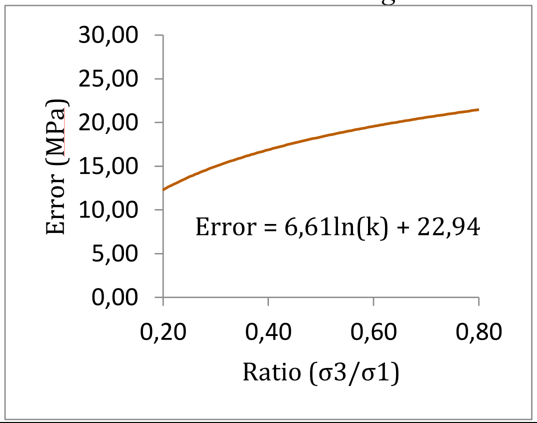
UCUT PB3C DD16S *Ring* 222



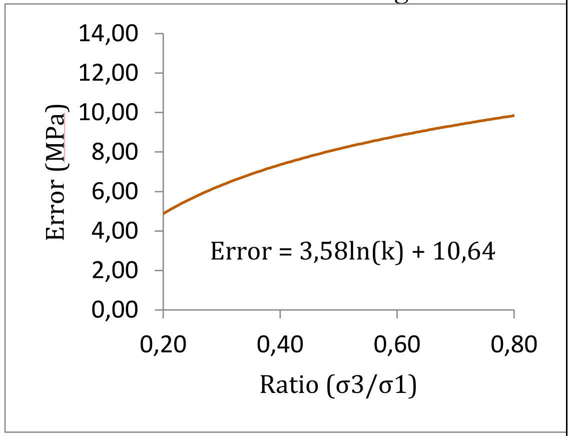
UCUT PB3C DD16S *Ring* 223



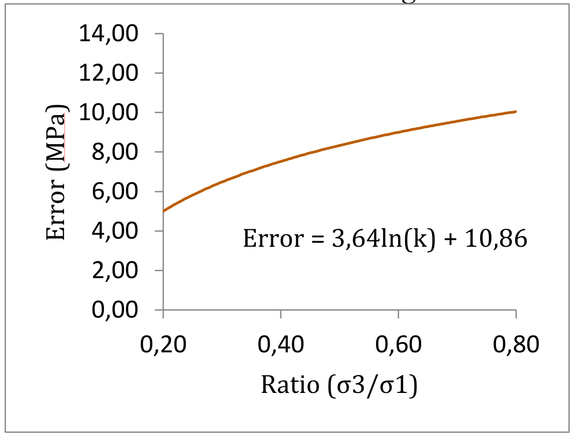
UCUT PB3C DD16S *Ring* 224



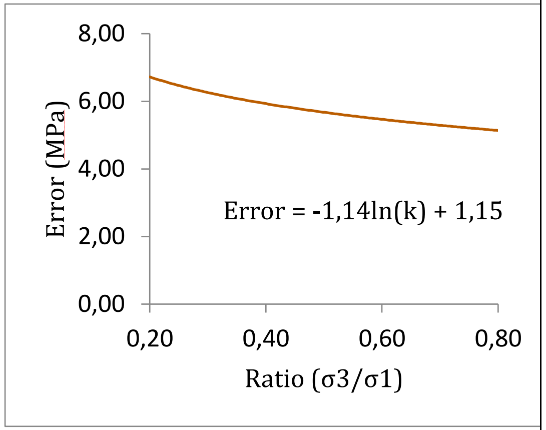
UCUT PB3C DD16S *Ring* 225



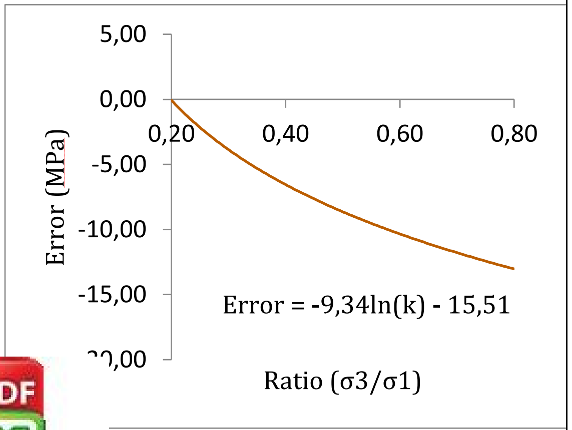
UCUT PB3C DD16S *Ring* 226



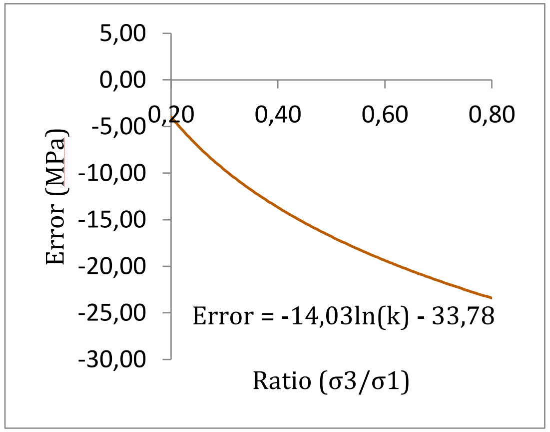
UCUT PB3C DD17N *Ring* 217



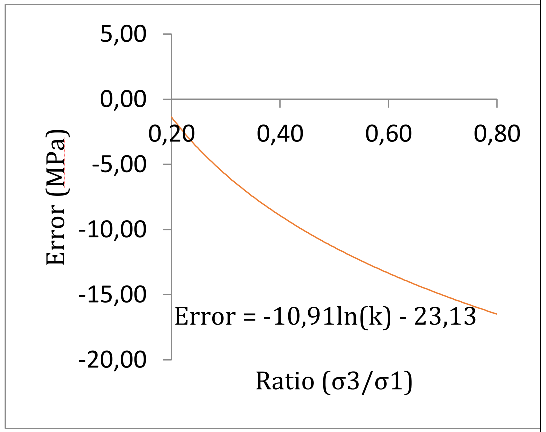
UCUT PB3C DD17N *Ring* 218

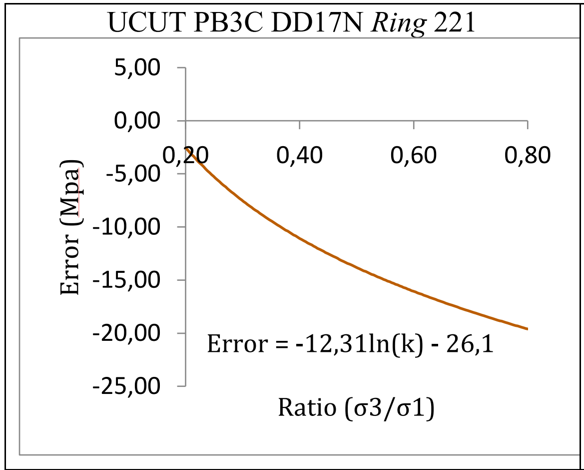


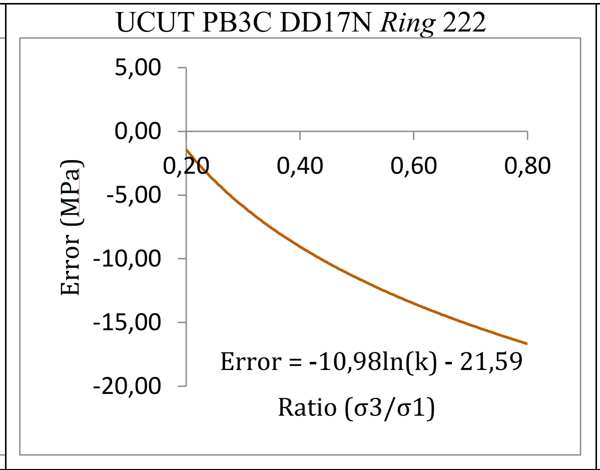
UCUT PB3C DD17N *Ring* 219

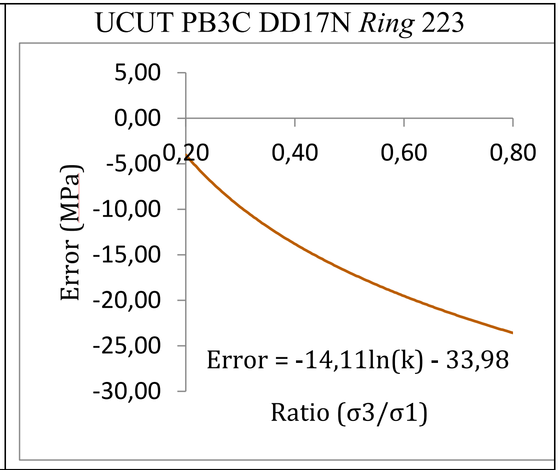


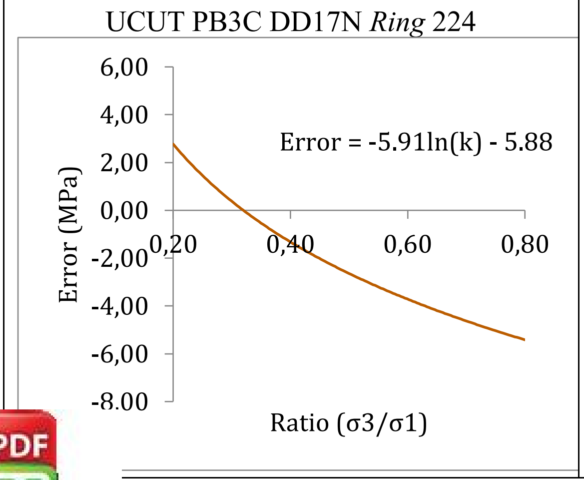
UCUT PB3C DD17N *Ring* 220

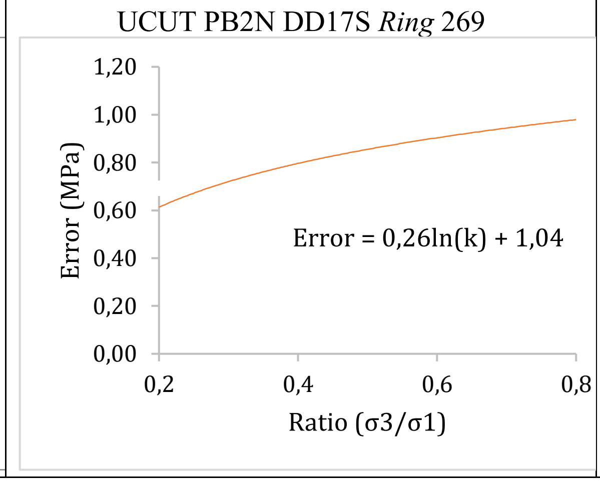


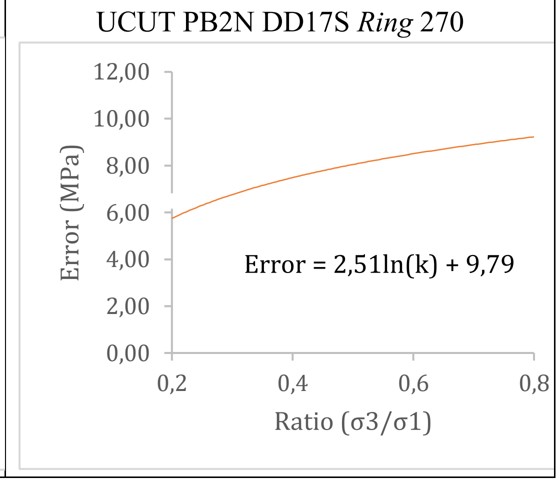

UCUT PB3C DD17N *Ring* 221
5,00
0,00
-5,00
-10,00
-15,00
-20,00
-25,00
0,20
0,40
0,60
0,80
Error (Mpa)
Error = -12,31ln(k) - 26,1
Ratio (σ3/σ1)


UCUT PB3C DD17N *Ring* 222
5,00
0,00
-5,00
-10,00
-15,00
-20,00
0,20
0,40
0,60
0,80
Error (MPa)
Error = -10,98ln(k) - 21,59
Ratio (σ3/σ1)

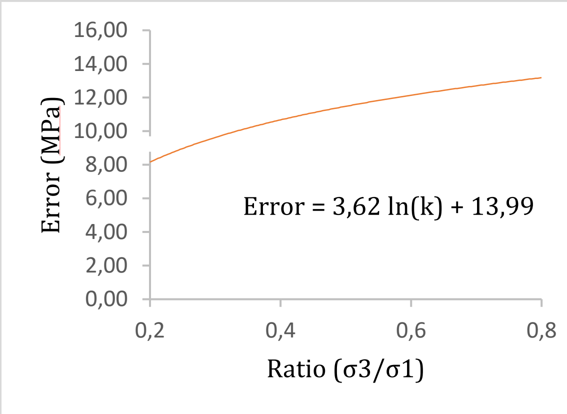

UCUT PB3C DD17N *Ring* 223
5,00
0,00
-5,00
-10,00
-15,00
-20,00
-25,00
-30,00
0,20
0,40
0,60
0,80
Error (MPa)
Error = -14,11ln(k) - 33,98
Ratio (σ3/σ1)


UCUT PB3C DD17N *Ring* 224
6,00
4,00
2,00
0,00
-2,00
-4,00
-6,00
-8.00
0,20
0,40
0,60
0,80
Error (MPa)
Error = -5.91ln(k) - 5.88
Ratio (σ3/σ1)

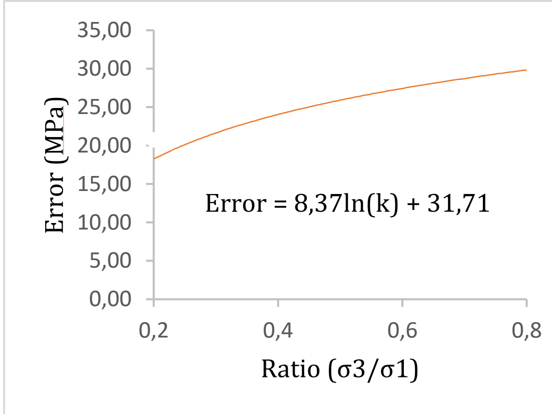

UCUT PB2N DD17S *Ring* 269
1,20
1,00
0,80
0,60
0,40
0,20
0,00
0,2
0,4
0,6
0,8
Error (MPa)
Error = 0,26ln(k) + 1,04
Ratio (σ3/σ1)


UCUT PB2N DD17S *Ring* 270
12,00
10,00
8,00
6,00
4,00
2,00
0,00
0,2
0,4
0,6
0,8
Error (MPa)
Error = 2,51ln(k) + 9,79
Ratio (σ3/σ1)

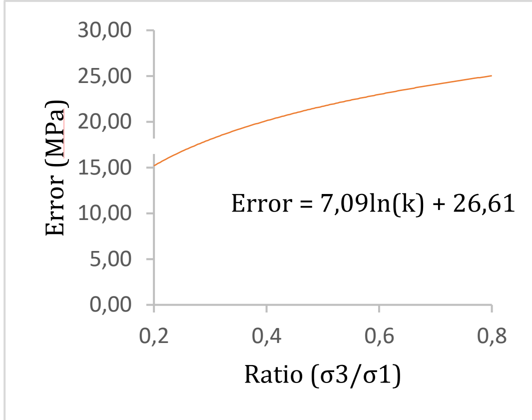
UCUT PB2N DD17S *Ring* 271



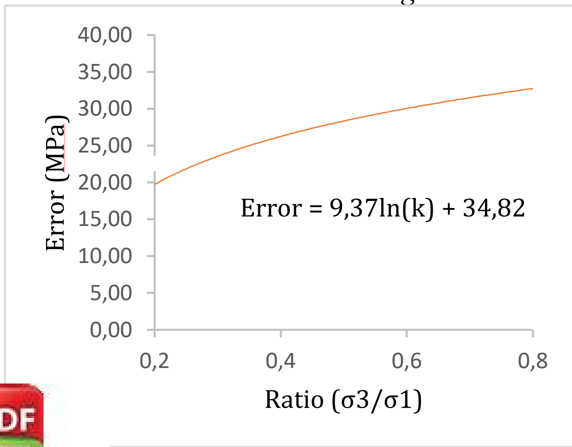
UCUT PB2N DD17S *Ring* 272



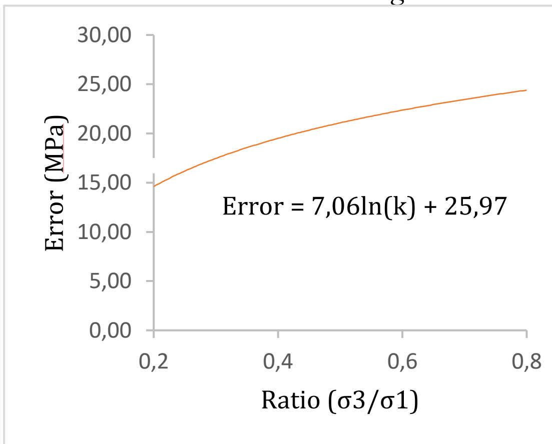
UCUT PB2N DD17S *Ring* 273



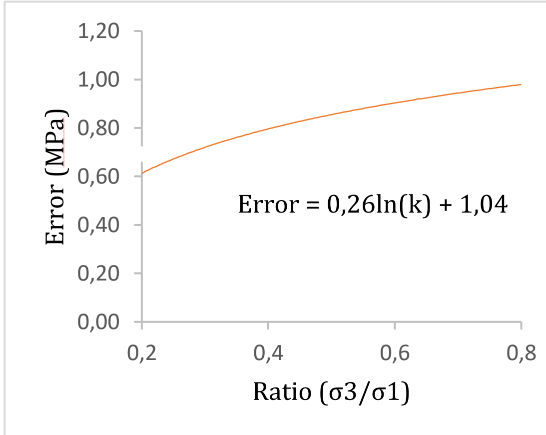
UCUT PB2N DD17S *Ring* 274



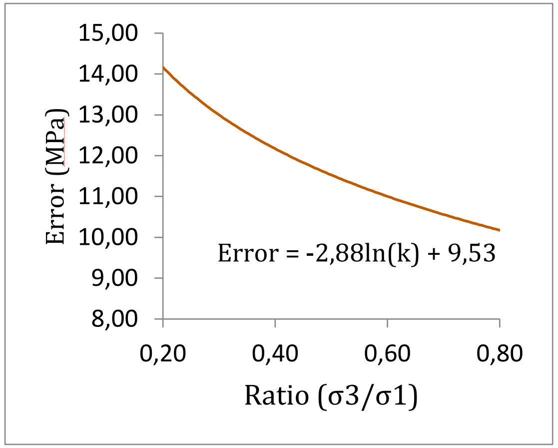
UCUT PB2N DD17S *Ring* 275



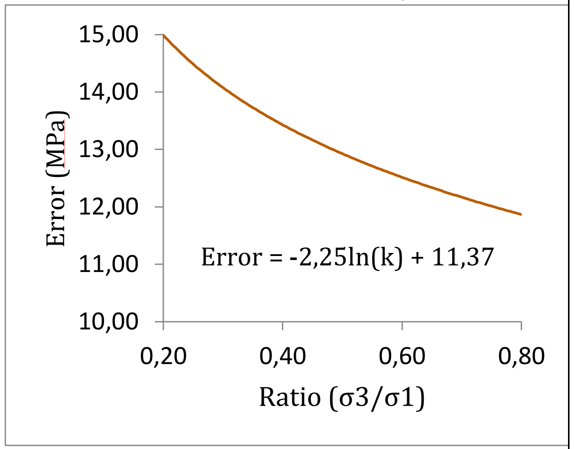
UCUT PB2N DD17S *Ring* 276



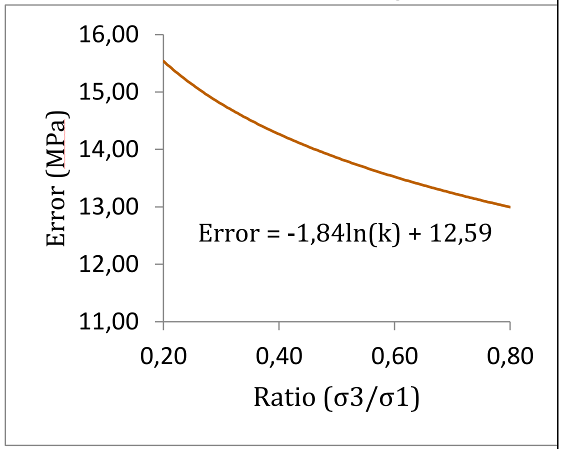
UCUT PB2N DD15S *Ring* 225



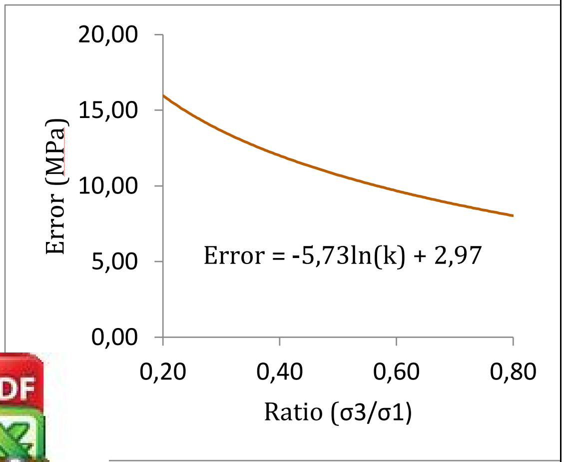
UCUT PB2N DD15S *Ring* 226



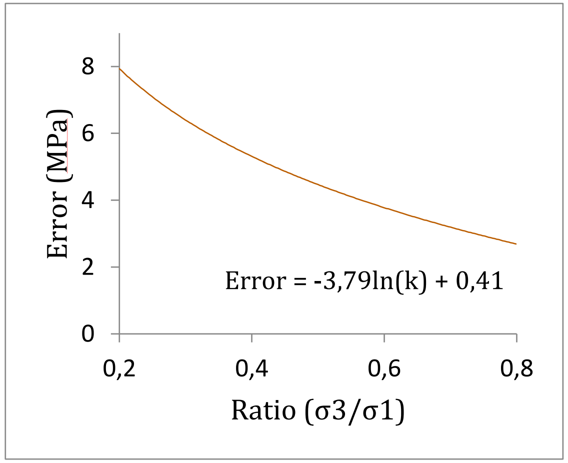
UCUT PB2N DD15S *Ring* 227



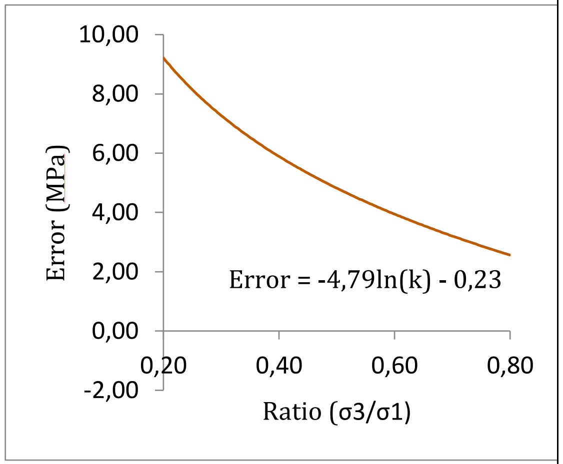
EXTN PB2N P14 DP46-47 A-A’



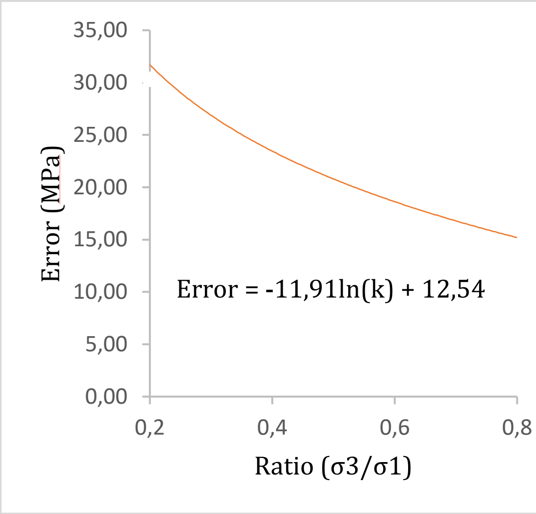
EXTN PB2N P14 DP46-47 B-B’



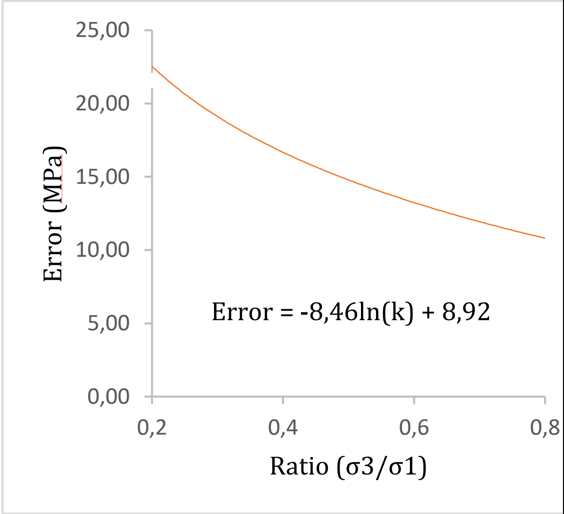
EXTN PB2N P14 DP46-47 C-C’



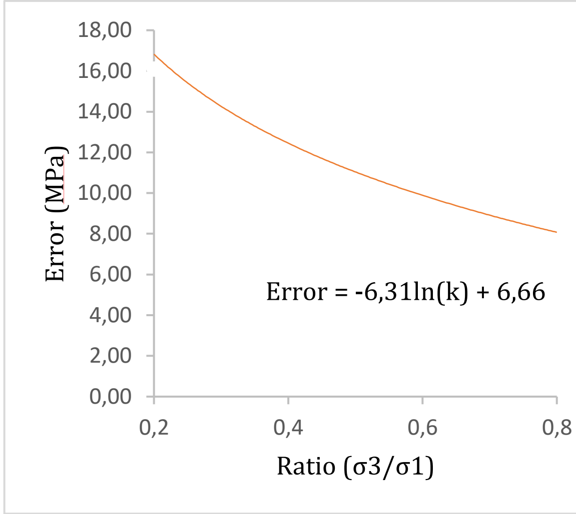
EXTN PB2N P15 DP45-46 A-A’



EXTN PB2N P15 DP45-46 B-B’



EXTN PB2N P15 DP45-46 C-C’



LAMPIRAN 9
DATA *RECORD SEISMIC*

Lampiran 9 *Record Seismic* Monitoring Magnitudo 2,1 Mw

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
1	XPLOR-2_001	9548322	737280	3955	4318	0,000204	9,7	2,1	13,3	0,01	0,20
2	SGMHydro_1_001	9549500	736868	3096,5	3109,9	0,000202	9,1	2,1	13,3	0,02	0,20
3	EFD SGM_001	9548748	737794	2597,5	4294,4	4,02E-05	11,1	2,1	13,3	0,01	0,04
4	EFD SGM_002	9548743	737800	2597,6	4302,9	4,76E-05	9,5	2,1	13,3	0,01	0,05
5	BG_SGM3_001	9548818	735123	3018,6	2565,8	0,000308	10,4	2,1	13,3	0,02	0,31
6	SGMP15DOZ_001	9548754	737372	3126,8	3960,1	4,45E-05	9,1	2,1	13,3	0,02	0,04
7	SGM_KL_XC2_001	9550251	734601	3048	1057,9	0,000643	10,6	2,1	13,3	0,06	0,64
9	DOZSGM_J4_001	9549280	737362	3118,5	3643,6	0,000117	7,6	2,1	13,3	0,02	0,12
10	OHS#31	9550143	734051	3608,8	1372,3	0,000231	18	2,1	13,3	0,05	0,23
11	OHS#32	9550187	734060	3291	1178,6	0,000115	28,2	2,1	13,3	0,05	0,12
12	Carstenz1	9550624	735791	3179	1646,4	5,68E-05	16,6	2,1	13,3	0,04	0,06
13	Carstenz2	9550606	735836	3565,9	1813,9	4,61E-05	33,3	2,1	13,3	0,03	0,05
14	Tyreshop_001	9552595	735114	3784,4	1842,3	1,1E-06	1495,8	2,1	13,3	0,03	0,00
15	KL_XC7_1_001	9550462	734129	3053	831,7	0,000793	24,8	2,1	13,3	0,07	0,79
16	KL_XC7_1_002	9550473	734119	2970,2	804,8	5,17E-05	15,8	2,1	13,3	0,08	0,05
17	KL_XC7_2_001	9550485	734109	2872,5	784,4	0,000815	16,8	2,1	13,3	0,08	0,82
[illegible]	KL_XC7_2_002	9550497	734099	2774,7	776,2	5,33E-05	13,9	2,1	13,3	0,08	0,05
[illegible]	GRS-A6 TRI	9551074	734986	3038,3	731,4	0,000284	1330,4	2,1	13,3	0,08	0,28
[illegible]	GRS-A6_UNI_004	9551048	734966	3132,7	752,3	0,000189	62,4	2,1	13,3	0,08	0,19

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
21	GRS-A6_UNI_005	9551021	734946	3227	785,8	2,28E-05	605,7	2,1	13,3	0,08	0,02
22	GRS-A6_UNI_006	9550993	734927	3321,2	831	0,000208	62,2	2,1	13,3	0,07	0,21
23	GRS-K3_TRI	9551738	734080	3112,6	613,8	0,001613	30,4	2,1	13,3	0,10	1,61
24	GRS-K3_UNI_004	9551818	734029	3397,4	854,5	0,000458	88,5	2,1	13,3	0,07	0,46
25	GRS-K3_UNI_006	9551874	733991	3585,6	1034,3	0,000374	92,3	2,1	13,3	0,06	0,37
26	KL-XC5-2_001	9550649	734303	2920,4	601	0,000644	22,2	2,1	13,3	0,10	0,64
27	KL-XC5-2_002	9550737	734301	2870,9	507,8	0,001077	49	2,1	13,3	0,12	1,08
28	KL-XC5-1_001	9550470	734312	3012	794,4	0,000437	20	2,1	13,3	0,08	0,44
29	KL-XC5-1_002	9550560	734307	2966,8	696,8	0,000566	35,3	2,1	13,3	0,09	0,57
30	AM16_01_001	9550716	734735	2991	698,7	0,000132	30,8	2,1	13,3	0,09	0,13
31	AM16_01_002	9550460	734760	3002,1	921,5	0,000397	15,9	2,1	13,3	0,07	0,40
32	AM16_02_001	9550361	734772	3011,9	1014,1	0,000295	24,1	2,1	13,3	0,06	0,30
33	AM16_02_002	9550264	734785	3020,3	1106,6	0,000106	22,6	2,1	13,3	0,06	0,11
34	AM16_02_003	9550164	734800	3028,8	1203,3	0,000117	14,2	2,1	13,3	0,05	0,12
35	2830ExRCH_001	9551124	735107	2844,9	810,4	0,000229	19,4	2,1	13,3	0,08	0,23
37	2830_BUSLD_002	9550896	734920	2822,1	705,6	0,000984	31,8	2,1	13,3	0,09	0,98
38	UCUTDBAY_001	9551156	734971	2861,8	671,6	0,000581	37,6	2,1	13,3	0,09	0,58
[illegible]	UCUTDBAY_002	9551142	734961	2835,5	663	0,000321	19	2,1	13,3	0,09	0,32
[illegible]	UCCG45Rais_001	9550768	734783	2861	674	0,000407	18,4	2,1	13,3	0,09	0,41
[illegible]	UCCG45Rais_002	9550781	734792	2836	670,6	0,000377	15,5	2,1	13,3	0,09	0,38

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
42	DDS22_001	9550716	734735	2841,7	679,9	0,000532	23,5	2,1	13,3	0,09	0,53
48	Panel19	9551348	734468	2830	193,1	0,01051	52,3	2,1	13,3	0,31	10,51
50	Panel 14	9551514	734393	2833,5	284,6	0,008565	115,4	2,1	13,3	0,21	8,57
51	Panel 17	9551418	734445	2833,6	223,3	0,006874	90	2,1	13,3	0,27	6,87
53	EFD_FLOOR	9551241	735063	2817,7	756,8	0,00055	28,5	2,1	13,3	0,08	0,55
54	EFD_BACKS	9551251	735049	2841	743,3	0,000549	25,7	2,1	13,3	0,08	0,55
55	CG44MCC_001	9551041	734582	2768,1	347,6	0,002227	18	2,1	13,3	0,17	2,23
56	CG44MCC_002	9551042	734583	2778,2	345,9	0,002396	22,6	2,1	13,3	0,18	2,40
57	INT4XC6_001	9551269	734528	2792,3	226,6	0,006962	37,5	2,1	13,3	0,26	6,96
58	INT4XC6_002	9551269	734530	2797,6	227,6	0,005719	42,8	2,1	13,3	0,26	5,72
60	MLC21_001	9551487	734826	2802,4	574,7	0,001293	16,3	2,1	13,3	0,11	1,29
61	MLC21_002	9551498	734800	2789,4	557,5	0,000887	34,6	2,1	13,3	0,11	0,89
62	MLC41_001	9551445	734260	2807,2	208,3	0,02578	67,7	2,1	13,3	0,28	25,78

Lampiran 9 *Record Seismic* Monitoring Magnitudo 1,9 Mw

Sensor	*Description*	SenN	SenE	SenD	SrcDist	PPV (m/s)	Freq (Hz)	Mw	Ro	SD	PPV (mm/s)
	MLC21_001	9551487	734825,6	2802,4	622,6	5,18E-05	31,5	1,9	24,2	0,08	0,52
	MLC21_002	9551498	734800,1	2789,4	602,5	4,04E-05	29,2	1,9	24,2	0,08	0,40
	MLC41_001	9551445	734259,8	2807,2	141,4	0,001024	89,7	1,9	24,2	0,30	1,02

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
4	Surabaya2	9552259	735571,5	3312,6	1711,1	2,43E-06	86,3	1,9	24,2	0,03	0,02
5	OHS#31	9550143	734050,9	3608,8	1410,8	6,96E-06	22,5	1,9	24,2	0,03	0,07
6	OHS#32	9550187	734060,2	3291	1223,3	1,55E-05	42,9	1,9	24,2	0,04	0,15
7	ODG1	9550941	732903,3	3877,9	1726,3	1,03E-06	784,2	1,9	24,2	0,03	0,01
8	Carstenz1	9550624	735790,8	3179	1739,3	2,69E-06	32,4	1,9	24,2	0,03	0,03
9	Carstenz2	9550606	735836,1	3565,9	1899,6	1,07E-05	68,5	1,9	24,2	0,03	0,11
10	KDL_001	9551323	733139,1	3816,6	1466,3	4,17E-07	283	1,9	24,2	0,03	0,00
11	KDL_002	9551145	733196,4	3449,3	1212,6	4,53E-07	475,9	1,9	24,2	0,04	0,00
12	Tyreshop_001	9552595	735114,2	3784,4	1825,4	1,02E-06	1241,1	1,9	24,2	0,03	0,01
13	Southramp_002	9550390	734355,3	3172,5	987,4	5,63E-07	1048,1	1,9	24,2	0,05	0,01
14	KL_XC7_1_002	9550473	734119,4	2970,2	854,8	6,03E-07	24,3	1,9	24,2	0,06	0,01
15	KL_XC7_2_001	9550485	734108,8	2872,5	834,6	1,86E-05	20	1,9	24,2	0,06	0,19
16	GRS-A6 TRI	9551074	734986	3038,3	817,6	0,000174	733,7	1,9	24,2	0,06	1,74
17	GRS-A6_UNI_004	9551048	734966	3132,7	835,8	0,000102	721,6	1,9	24,2	0,06	1,02
	GRS-A6_UNI_005	9551021	734946	3227	865,5	2,19E-05	707,9	1,9	24,2	0,06	0,22
	GRS-A6_UNI_006	9550993	734927	3321,2	906,5	0,000102	687,2	1,9	24,2	0,05	1,02
	GRS-K3_TRI	9551738	734079,7	3112,6	531	8,88E-05	32,9	1,9	24,2	0,09	0,89

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
21	GRS-K3_UNI_004	9551818	734029,3	3397,4	782,8	2,68E-05	48,4	1,9	24,2	0,06	0,27
22	GRS-K3_UNI_006	9551874	733991,2	3585,6	967,5	1,08E-05	46,8	1,9	24,2	0,05	0,11
23	KL-XC5-2_001	9550649	734303,1	2920,4	670,3	2,51E-05	26,8	1,9	24,2	0,07	0,25
24	KL-XC5-2_002	9550737	734301,4	2870,9	578,5	2,54E-05	42,6	1,9	24,2	0,08	0,25
25	KL-XC5-1_001	9550470	734311,7	3012	862	1,29E-05	24,9	1,9	24,2	0,06	0,13
26	AM16_02_002	9550264	734784,9	3020,3	1198,4	2,65E-06	27,8	1,9	24,2	0,04	0,03
27	AM16_02_003	9550164	734799,6	3028,8	1294,3	2,55E-06	35,9	1,9	24,2	0,04	0,03
28	SGMHydro_1_001	9549500	736867,5	3096,5	3209,6	1,14E-06	49,7	1,9	24,2	0,02	0,01
29	EFD SGM_001	9548748	737793,5	2597,5	4395,6	5,61E-07	295,8	1,9	24,2	0,01	0,01
30	EFD SGM_002	9548743	737800,4	2597,6	4404,1	1,45E-06	407,1	1,9	24,2	0,01	0,01
31	BG_SGM3_001	9548818	735122,5	3018,6	2653,4	3,29E-06	15,9	1,9	24,2	0,02	0,03
32	SGMP15DOZ_001	9548754	737371,7	3126,8	4060,7	2,76E-06	648	1,9	24,2	0,01	0,03
33	SGM_KL_XC2_001	9550251	734601,2	3048	1142	9,74E-06	310,8	1,9	24,2	0,04	0,10
34	GBCSGM_EFD_002	9551251	735052,6	2831,6	825	2,41E-05	27,1	1,9	24,2	0,06	0,24
	DOZSGM_J4_001	9549280	737361,8	3118,5	3743,1	3,59E-07	19,2	1,9	24,2	0,01	0,00
	2830TRK40_001	9550758	734855	2810	834,5	8,43E-06	30,9	1,9	24,2	0,06	0,08
	2830TRK40_002	9550779	734848	2833	815	9,01E-06	22,9	1,9	24,2	0,06	0,09

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
38	2830CBHOLE_002	9550965	735011	2817	854,3	6,78E-05	42,6	1,9	24,2	0,06	0,68
39	2830C13EVR_001	9550834	735208	2827	1088	1,16E-05	28,1	1,9	24,2	0,05	0,12
40	2830C13EVR_002	9550854	735215	2806	1086,1	1,09E-05	32,8	1,9	24,2	0,05	0,11
41	2830EXHMTC_001	9550600	735378	2840	1350,1	2,70E-05	79,6	1,9	24,2	0,04	0,27
42	2830EXHMTC_002	9550586	735387	2814	1365,3	1,70E-05	27,2	1,9	24,2	0,04	0,17
43	Ci3-2_001	9550287	735035	2595	1324,2	4,76E-06	39,1	1,9	24,2	0,04	0,05
44	Ci3-2_002	9550306	735028	2695	1290,5	1,27E-05	428,2	1,9	24,2	0,04	0,13
45	2850_RSBR_001	9550647	735123,6	2868	1113,4	7,31E-06	37,8	1,9	24,2	0,04	0,07
46	2850_RSBR_002	9550634	735113,6	2842,8	1112,8	9,70E-06	53,1	1,9	24,2	0,04	0,10
47	WFD3_001	9550476	734572,1	2837,7	901,5	2,94E-06	58,8	1,9	24,2	0,05	0,03
48	magazine_001	9550651	735110,3	2842,8	1099,9	1,99E-05	32,3	1,9	24,2	0,04	0,20
49	magazine_002	9550647	735123,6	2868	1113,4	1,94E-05	29,3	1,9	24,2	0,04	0,19
50	2535_Tspur_001	9550806	735027	2543	987,9	2,80E-05	28,6	1,9	24,2	0,05	0,28
51	2535_Tspur_002	9550745	735034,9	2528,8	1030,7	1,60E-05	35,2	1,9	24,2	0,05	0,16
	2830_IRamp_001	9551028	735309,7	2775,1	1117,9	1,22E-05	40,6	1,9	24,2	0,04	0,12
	2830_IRamp_002	9551034	735291,8	2794	1098,2	3,00E-07	161,4	1,9	24,2	0,04	0,00
	Hoistroom1_001	9550898	735092,1	2865,1	956,2	2,87E-05	35,1	1,9	24,2	0,05	0,29

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
55	Hoistroom1_002	9550904	735063,1	2879,8	928	2,26E-05	44,8	1,9	24,2	0,053	0,23

Lampiran 9 *Record Seismic* Monitoring Magnitudo 0,7 Mw

Sensor	Description	SenN	SenE	SenD	SrcDist	PPV (m/s)	F (Hz)	Ro	Mw	SD	PPV (mm/s)
1	2830_BUSLD_002	9550896	734920	2822,1	745,7	0,000243	16,2	8	0,7	0,02	0,24
2	CG33MLC_002	9551363	734681	2807,5	382,2	0,000817	21,2	8	0,7	0,03	0,82
3	Panel29	9551151	734687	2837,4	417,1	0,000524	19,425	8	0,7	0,03	0,52
4	Panel34	9551053	734802	2839,4	563,3	0,000206	17,175	8	0,7	0,02	0,21
5	Panel19	9551348	734468	2830	168,6	0,002672	22,75	8	0,7	0,07	2,67
6	Panel23	9551258	734541	2832	244,6	0,001242	20,35	8	0,7	0,05	1,24
7	Panel 17	9551418	734445	2833,6	175,8	0,003022	29,725	8	0,7	0,07	3,02
8	CG44MCC_001	9551041	734582	2768,1	396,2	0,000306	12,85	8	0,7	0,03	0,31
9	CG44MCC_002	9551042	734583	2778,2	394,4	0,000307	18,45	8	0,7	0,03	0,31
10	INT4XC6_001	9551269	734528	2792,3	233,5	0,001343	29,1	8	0,7	0,05	1,34
[illegible]	INT4XC6_002	9551269	734530	2797,6	234,3	0,002082	27,35	8	0,7	0,05	2,08
[illegible]	EXH4XC40_001	9551183	734410	2782,1	177,1	0,002116	24,475	8	0,7	0,07	2,12
[illegible]	MLC21_001	9551487	734826	2802,4	551,6	0,00022	18,425	8	0,7	0,02	0,22

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
14	MLC21_002	9551498	734800	2789,4	532,1	0,000197	20,55	8	0,7	0,02	0,20
15	MLC41_001	9551445	734260	2807,2	140,6	0,01097	20,925	8	0,7	0,08	1,10
16	MLC41_002	9551438	734241	2781,8	148,5	0,000692	163,475	8	0,7	0,08	0,69
17	GRS-K3_TRI	9551738	734080	3112,6	554	0,000193	17,575	8	0,7	0,02	0,19
18	GRS-K3_UNI_004	9551818	734029	3397,4	803,5	0,000107	17,3	8	0,7	0,02	0,11
19	KLXC7GDW-1_001	9551333	734144	2913	178,5	0,002335	24,075	8	0,7	0,07	2,34
20	KLXC7GDW-1_002	9551239	734152	2945,6	202	0,001376	19,025	8	0,7	0,06	1,38
21	KLXC7GSW-2_001	9551144	734160	2978,9	264,8	0,000335	16,875	8	0,7	0,05	0,34
22	KLXC7GSW-2_002	9550988	734174	3031,4	402	0,000138	14,875	8	0,7	0,03	0,14
23	GBC-SGMLPS_001	9550742	735078	2694,4	973,6	0,000222	12,675	8	0,7	0,01	0,22
24	2830CBHOLE_001	9550956	735015	2840	797,1	0,001963	176,075	8	0,7	0,02	1,96
25	WFD3_001	9550476	734572	2837,7	880,2	0,000548	36,575	8	0,7	0,01	0,55
[illegible]	WFD3_002	9550449	734592	2838	911,9	0,001086	29,975	8	0,7	0,01	1,09
[illegible]	2535_Tspur_002	9550745	735035	2528,8	976,3	0,00011	15,15	8	0,7	0,01	0,11

Lampiran 9 *Record Seismic* Monitoring Magnitudo 0,8 Mw

Sensor	Description	SenN	SenE	SenD	SrcDist	PPV (m/s)	Freq (Hz)	Mw	Ro	SD	PPV (mm/s)
1	CG44MCC_002	9551042	734582,8	2778,2	447,1	4,63E-05	32,1	0,8	24,2	0,03	0,05
2	INT4XC6_001	9551269	734528,1	2792,3	304,4	0,000255	39,6	0,8	24,2	0,04	0,25
3	INT4XC6_002	9551269	734529,8	2797,6	305,4	0,0003	39,7	0,8	24,2	0,04	0,30
4	EXH4XC40_001	9551183	734410	2782,1	227,2	0,000186	28,1	0,8	24,2	0,06	0,19
5	MLC21_001	9551487	734825,6	2802,4	622,6	5,18E-05	31,5	0,8	24,2	0,02	0,05
6	MLC21_002	9551498	734800,1	2789,4	602,5	4,04E-05	29,2	0,8	24,2	0,02	0,04
7	MLC41_001	9551445	734259,8	2807,2	141,4	0,001024	89,7	0,8	24,2	0,09	1,02
8	Surabaya2	9552259	735571,5	3312,6	1711,1	2,43E-06	86,3	0,8	24,2	0,01	0,00
9	OHS#31	9550143	734050,9	3608,8	1410,8	6,96E-06	22,5	0,8	24,2	0,01	0,01
10	OHS#32	9550187	734060,2	3291	1223,3	1,55E-05	42,9	0,8	24,2	0,01	0,02
11	ODG1	9550941	732903,3	3877,9	1726,3	1,03E-06	784,2	0,8	24,2	0,01	0,00
12	Carstenz1	9550624	735790,8	3179	1739,3	2,69E-06	32,4	0,8	24,2	0,01	0,00
13	Carstenz2	9550606	735836,1	3565,9	1899,6	1,07E-05	68,5	0,8	24,2	0,01	0,01
14	KDL_001	9551323	733139,1	3816,6	1466,3	4,17E-07	283	0,8	24,2	0,01	0,00
[illegible]	KDL_002	9551145	733196,4	3449,3	1212,6	4,53E-07	475,9	0,8	24,2	0,01	0,00
[illegible]	Tyreshop_001	9552595	735114,2	3784,4	1825,4	1,02E-06	1241,1	0,8	24,2	0,01	0,00
[illegible]	Southramp_002	9550390	734355,3	3172,5	987,4	5,63E-07	1048,1	0,8	24,2	0,01	0,00

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
18	KL_XC7_1_002	9550473	734119,4	2970,2	854,8	6,03E-07	24,3	0,8	24,2	0,02	0,00
19	KL_XC7_2_001	9550485	734108,8	2872,5	834,6	1,86E-05	20	0,8	24,2	0,02	0,02
20	GRS-A6 TRI	9551074	734986	3038,3	817,6	0,000174	733,7	0,8	24,2	0,02	0,17
21	GRS-A6_UNI_004	9551048	734966	3132,7	835,8	0,000102	721,6	0,8	24,2	0,02	0,10
22	GRS-A6_UNI_005	9551021	734946	3227	865,5	2,19E-05	707,9	0,8	24,2	0,02	0,02
23	KL-XC5-1_002	9550560	734306,5	2966,8	765,1	2,38E-05	28,7	0,8	24,2	0,02	0,02
24	AM16_01_001	9550716	734735,1	2991	795,1	1,99E-05	57,7	0,8	24,2	0,02	0,02
25	AM16_01_002	9550460	734759,9	3002,1	1015,4	7,96E-06	42	0,8	24,2	0,01	0,01
26	AM16_02_001	9550361	734771,8	3011,9	1106,9	5,31E-06	31,5	0,8	24,2	0,01	0,01
27	CG44MCC_002	9551042	734582,8	2778,2	447,1	4,63E-05	32,1	0,8	24,2	0,03	0,05
28	INT4XC6_001	9551269	734528,1	2792,3	304,4	0,000255	39,6	0,8	24,2	0,04	0,25
29	INT4XC6_002	9551269	734529,8	2797,6	305,4	0,0003	39,7	0,8	24,2	0,04	0,30
30	EXH4XC40_001	9551183	734410	2782,1	227,2	0,000186	28,1	0,8	24,2	0,06	0,19
31	MLC21_001	9551487	734825,6	2802,4	622,6	5,18E-05	31,5	0,8	24,2	0,02	0,05
	MLC21_002	9551498	734800,1	2789,4	602,5	4,04E-05	29,2	0,8	24,2	0,02	0,04
	MLC41_001	9551445	734259,8	2807,2	141,4	0,001024	89,7	0,8	24,2	0,09	1,02
	Surabaya2	9552259	735571,5	3312,6	1711,1	2,43E-06	86,3	0,8	24,2	0,01	0,00

Lampiran 9 *Record Seismic* Monitoring Magnitudo 1,1 Mw

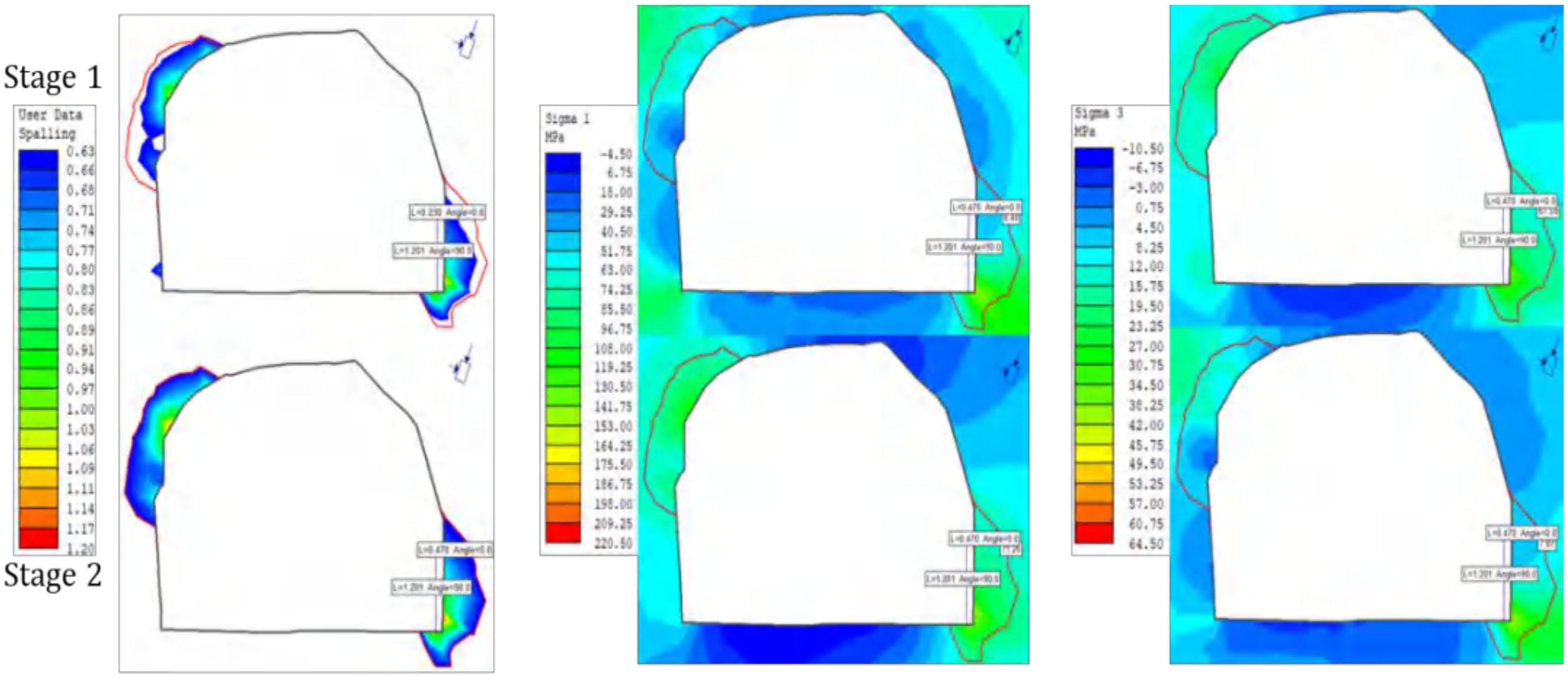
Sensor	*Description*	SenN	SenE	SenD	SrcDist	PPV (m/s)	F (Hz)	Ro	Mw	SD	PPV (mm/s)
1	2830_BUSLD_002	9550896	734920	2822,1	745,7	0,000243	16,2	15	1,1	0,02	0,24
2	CG33MLC_002	9551363	734681	2807,5	382,2	0,000817	21,2	15	1,1	0,03	0,82
3	Panel29	9551151	734687	2837,4	417,1	0,000524	19,425	15	1,1	0,03	0,52
4	Panel34	9551053	734802	2839,4	563,3	0,000206	17,175	15	1,1	0,02	0,21
5	Panel19	9551348	734468	2830	168,6	0,002672	22,75	15	1,1	0,07	2,67
6	Panel23	9551258	734541	2832	244,6	0,001242	20,35	15	1,1	0,05	1,24
7	Panel 17	9551418	734445	2833,6	175,8	0,003022	29,725	15	1,1	0,07	3,02
8	CG44MCC_001	9551041	734582	2768,1	396,2	0,000306	12,85	15	1,1	0,03	0,31
9	CG44MCC_002	9551042	734583	2778,2	394,4	0,000307	18,45	15	1,1	0,03	0,31
10	INT4XC6_001	9551269	734528	2792,3	233,5	0,001343	29,1	15	1,1	0,05	1,34
11	INT4XC6_002	9551269	734530	2797,6	234,3	0,002082	27,35	15	1,1	0,05	2,08
12	EXH4XC40_001	9551183	734410	2782,1	177,1	0,002116	24,475	15	1,1	0,07	2,12
13	MLC21_001	9551487	734826	2802,4	551,6	0,00022	18,425	15	1,1	0,02	0,22
14	MLC21_002	9551498	734800	2789,4	532,1	0,000197	20,55	15	1,1	0,02	0,20
[illegible]	MLC41_001	9551445	734260	2807,2	140,6	0,01097	20,925	15	1,1	0,08	1,10
[illegible]	MLC41_002	9551438	734241	2781,8	148,5	0,000692	163,475	15	1,1	0,08	0,69
[illegible]	GRS-K3_TRI	9551738	734080	3112,6	554	0,000193	17,575	15	1,1	0,02	0,19

Sensor	*Description*	SenN	SenE	SenD	SrcDist (m)	PPV (m/s)	f (Hz)	Mw	Ro (m)	SD	PPV (mm/s)
18	GRS-K3_UNI_004	9551818	734029	3397,4	803,5	0,000107	17,3	15	1,1	0,02	0,11
19	KLXC7GDW-1_001	9551333	734144	2913	178,5	0,002335	24,075	15	1,1	0,07	2,34
20	KLXC7GDW-1_002	9551239	734152	2945,6	202	0,001376	19,025	15	1,1	0,06	1,38
21	KLXC7GSW-2_001	9551144	734160	2978,9	264,8	0,000335	16,875	15	1,1	0,05	0,34
22	KLXC7GSW-2_002	9550988	734174	3031,4	402	0,000138	14,875	15	1,1	0,03	0,14
23	GBC-SGMLPS_001	9550742	735078	2694,4	973,6	0,000222	12,675	15	1,1	0,01	0,22
24	2830CBHOLE_001	9550956	735015	2840	797,1	0,001963	176,075	15	1,1	0,02	1,96
25	WFD3_001	9550476	734572	2837,7	880,2	0,000548	36,575	15	1,1	0,01	0,55
26	WFD3_002	9550449	734592	2838	911,9	0,001086	29,975	15	1,1	0,01	1,09
27	2535_Tspur_002	9550745	735035	2528,8	976,3	0,00011	15,15	15	1,1	0,01	0,11

LAMPIRAN 10

HASIL ANALISIS MODEL FEM

MODEL FEM UCUT PB3C DD16S RING 219



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan

Fakultas Teknik Universitas Hasanuddin

Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*

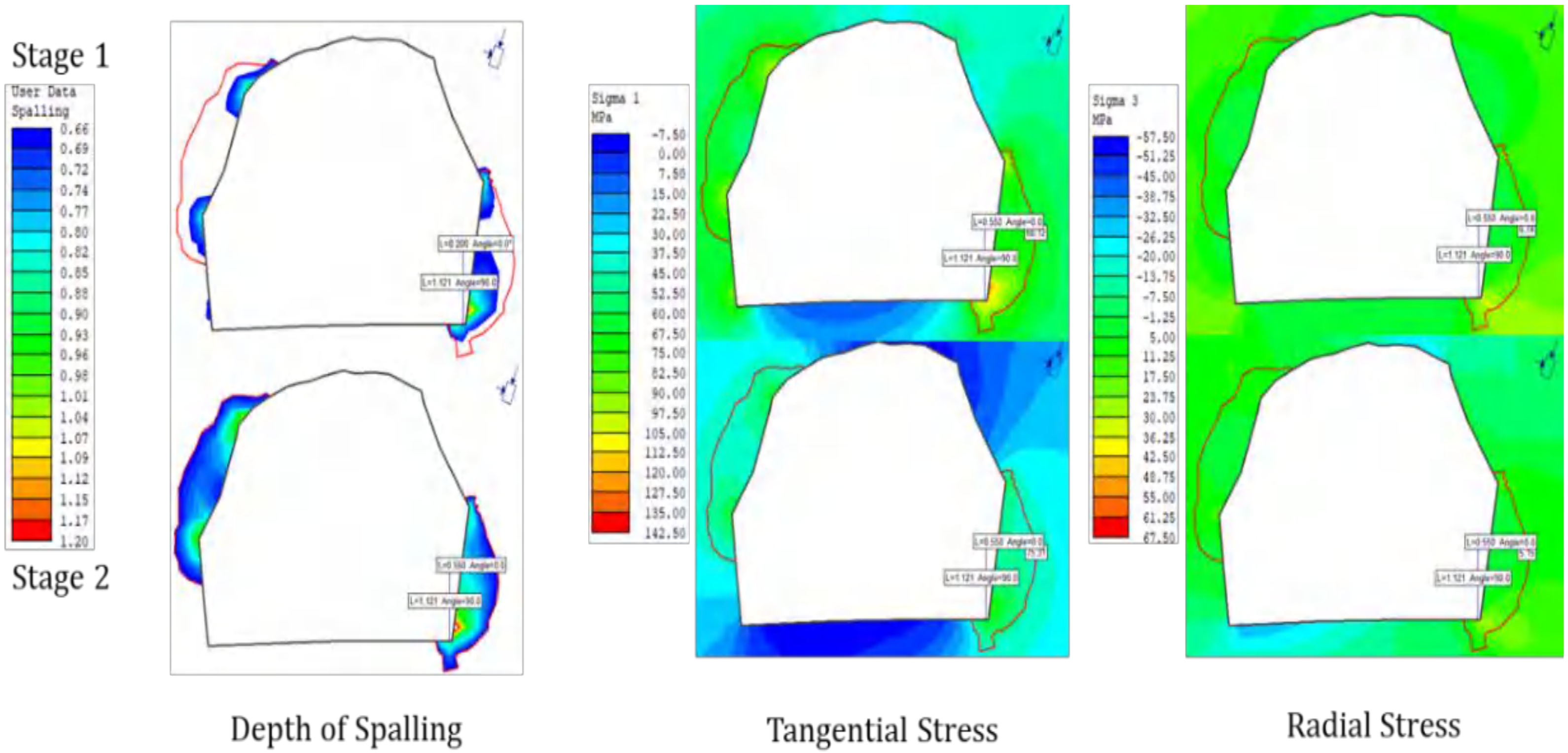
Dibuat Oleh:

Faidel Afrian Kemong
D111191015

Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,20	0,47
σ1 (MPa)	67,59	71,26
σ3 (MPa)	8,40	7,87

Lampiran 10 | Halaman 169

MODEL FEM UCUT PB3C DD16S RING 220

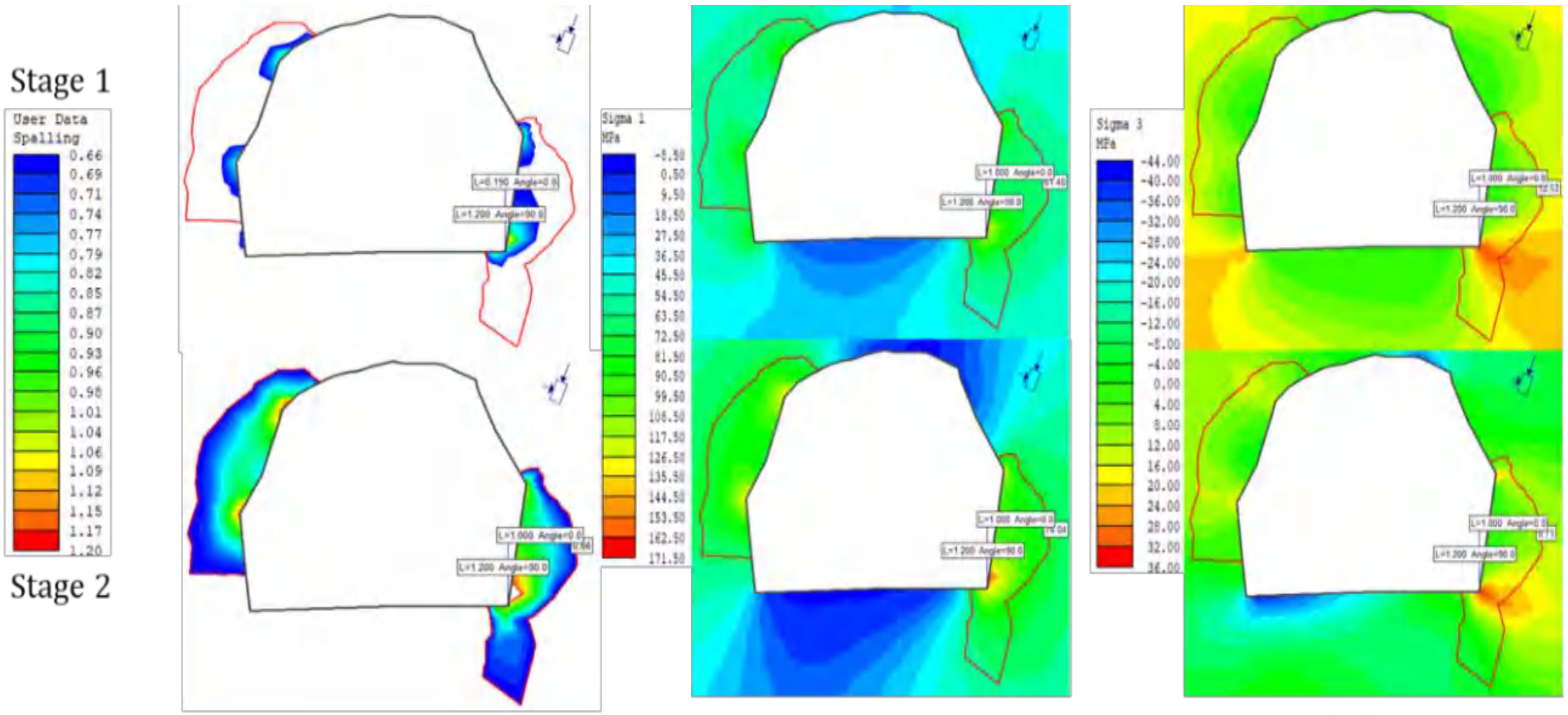


Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*
Dibuat Oleh: Faidel Afrian Kemong D111191015	

Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,20	0,55
σ1 (MPa)	68,12	75,31
σ3 (MPa)	6,74	5,15

Lampiran 10 | Halaman 170

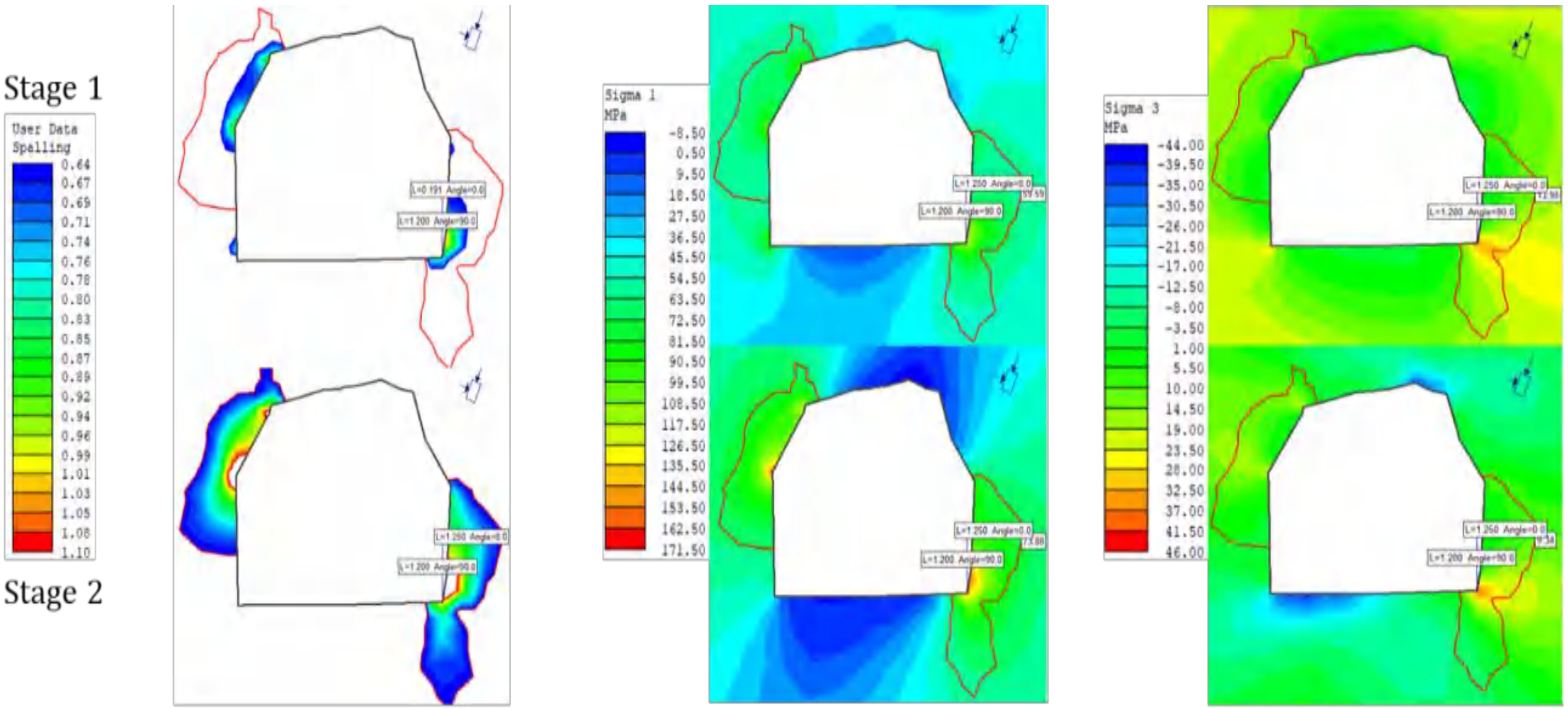
MODEL FEM UCUT PB3C DD16S RING 221



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,19	1,00
	σ1 (MPa)	61,40	76,04
	σ3 (MPa)	12,53	3,47
			Lampiran 10 / Halaman 171

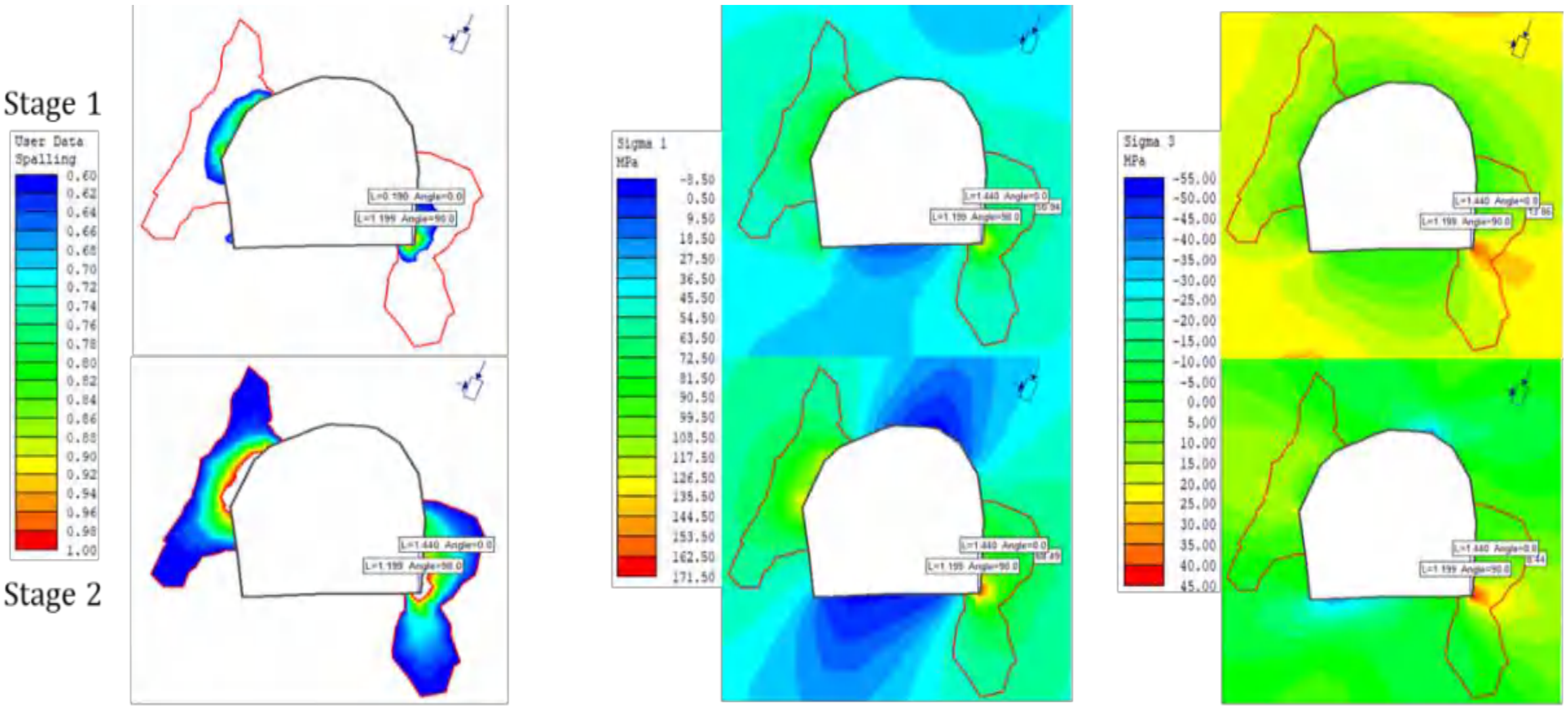
MODEL FEM UCUT PB3C DD16S RING 222



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,19	1,25
	σ1 (MPa)	59,59	73,88
	σ3 (MPa)	13,95	9,34
			Lampiran 10 — Halaman 172

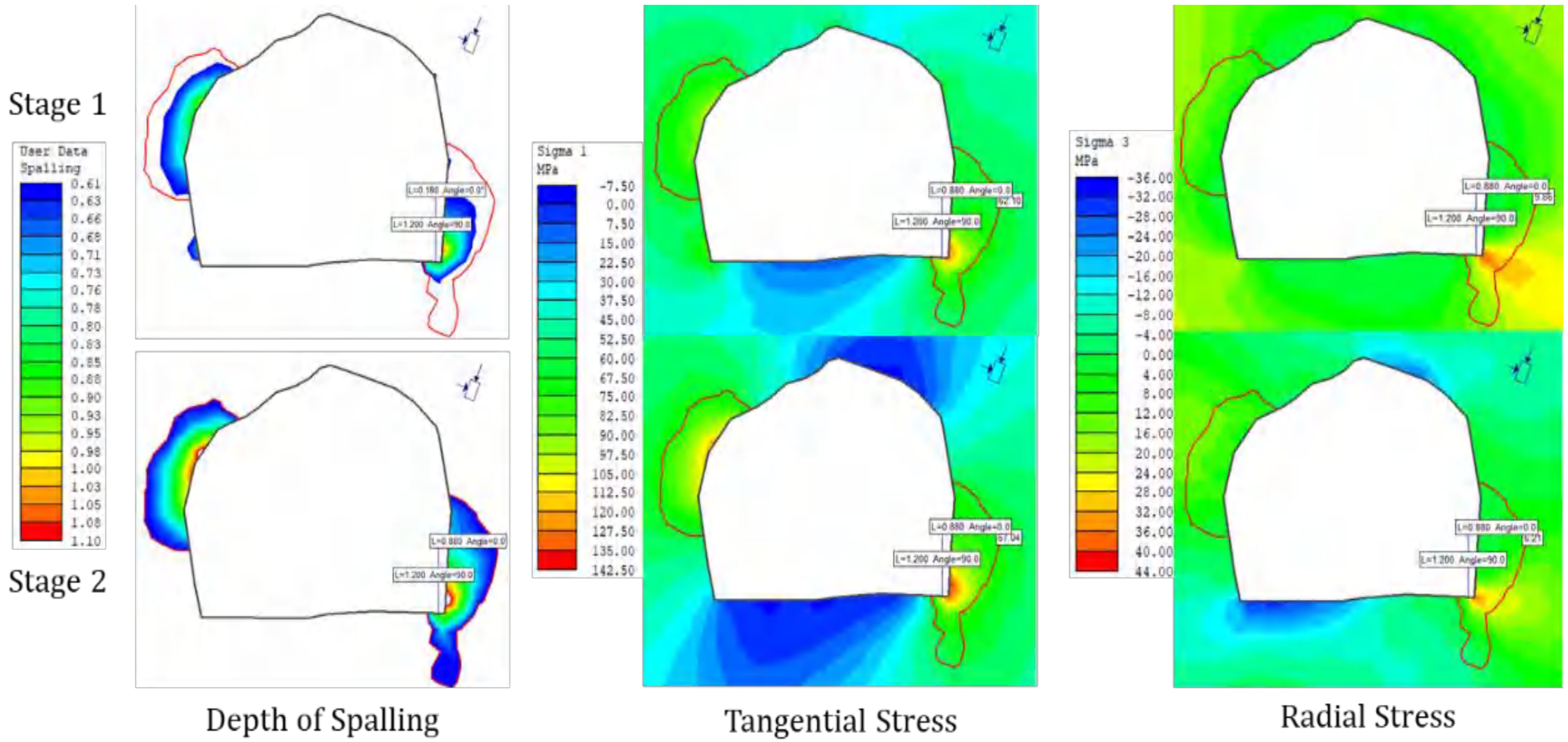
MODEL FEM UCUT PB3C DD16S RING 223



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: DOF (m) σ1 (MPa) σ3 (MPa)	*Spalling* (*Stage* 1) 0,19 56,94 13,86	*Strainburst* (*Stage* 2) 1,44 68,49 -3,02
			Lampiran 10 | Halaman 173

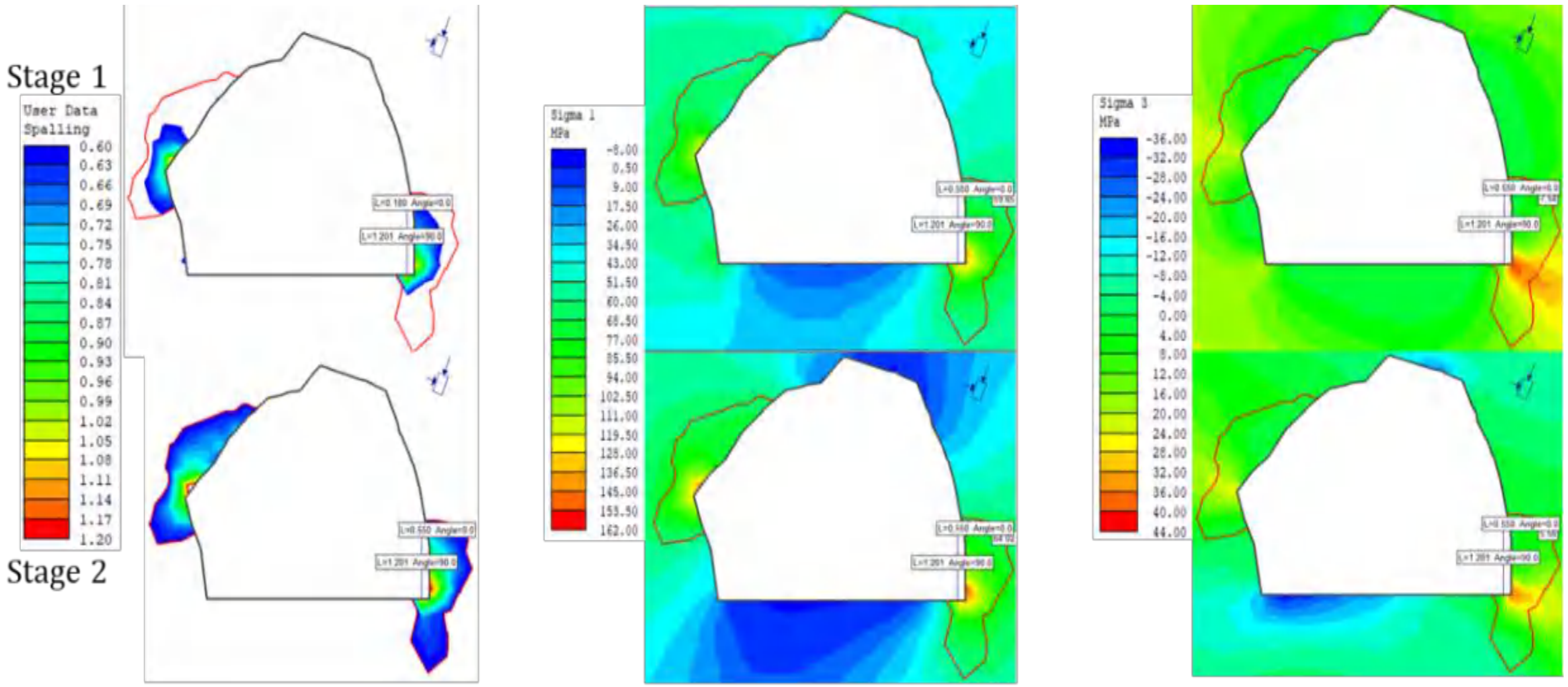
MODEL FEM UCUT PB3C DD16S RING 224



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	

Dibuat Oleh:	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,18	0,88
Faidel Afrian Kemong	σ1 (MPa)	62,10	67,04
D111191015	σ3 (MPa)	9,86	6,21

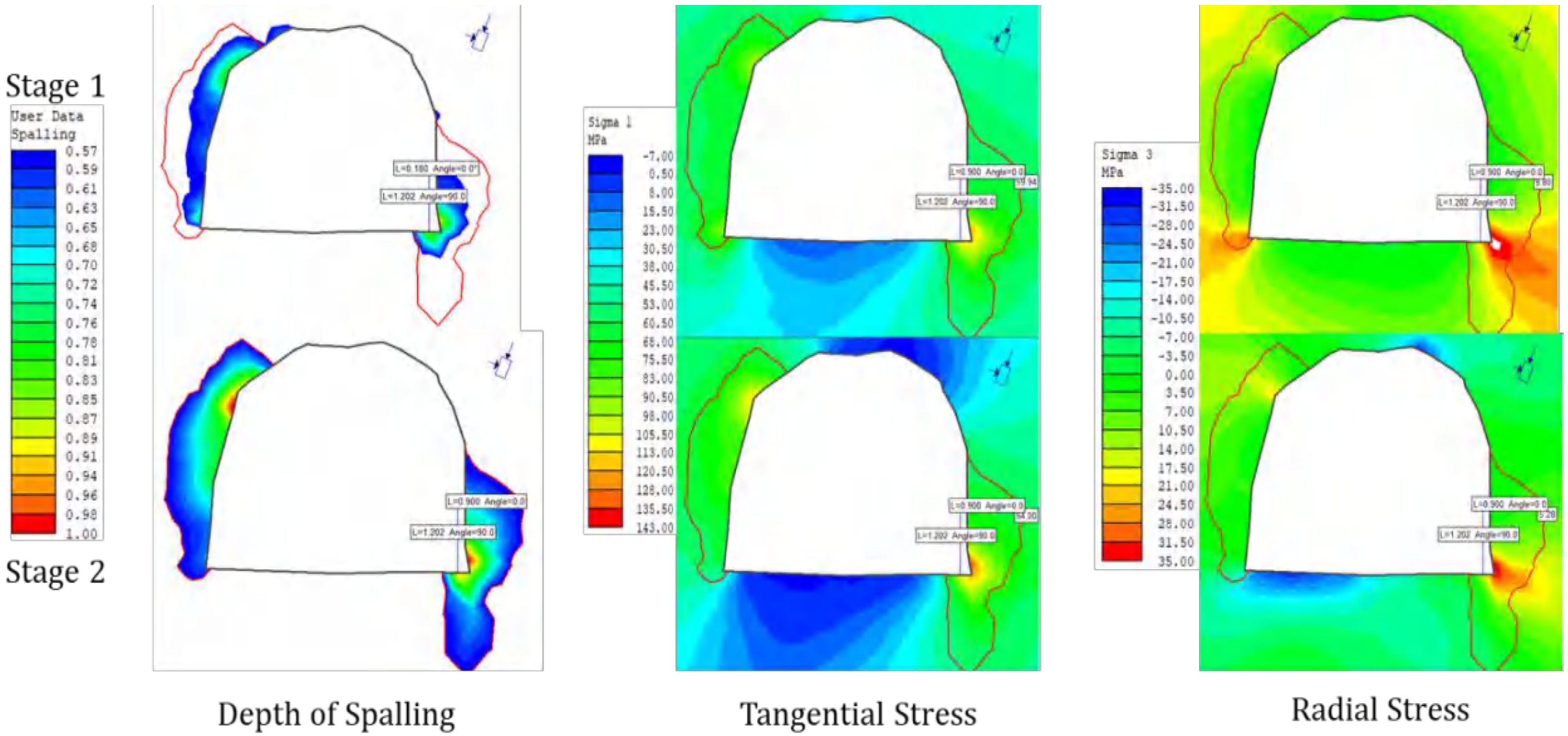
MODEL FEM UCUT PB3C DD16S RING 225



Depth of Spalling | Tangential Stress | Radial Stress

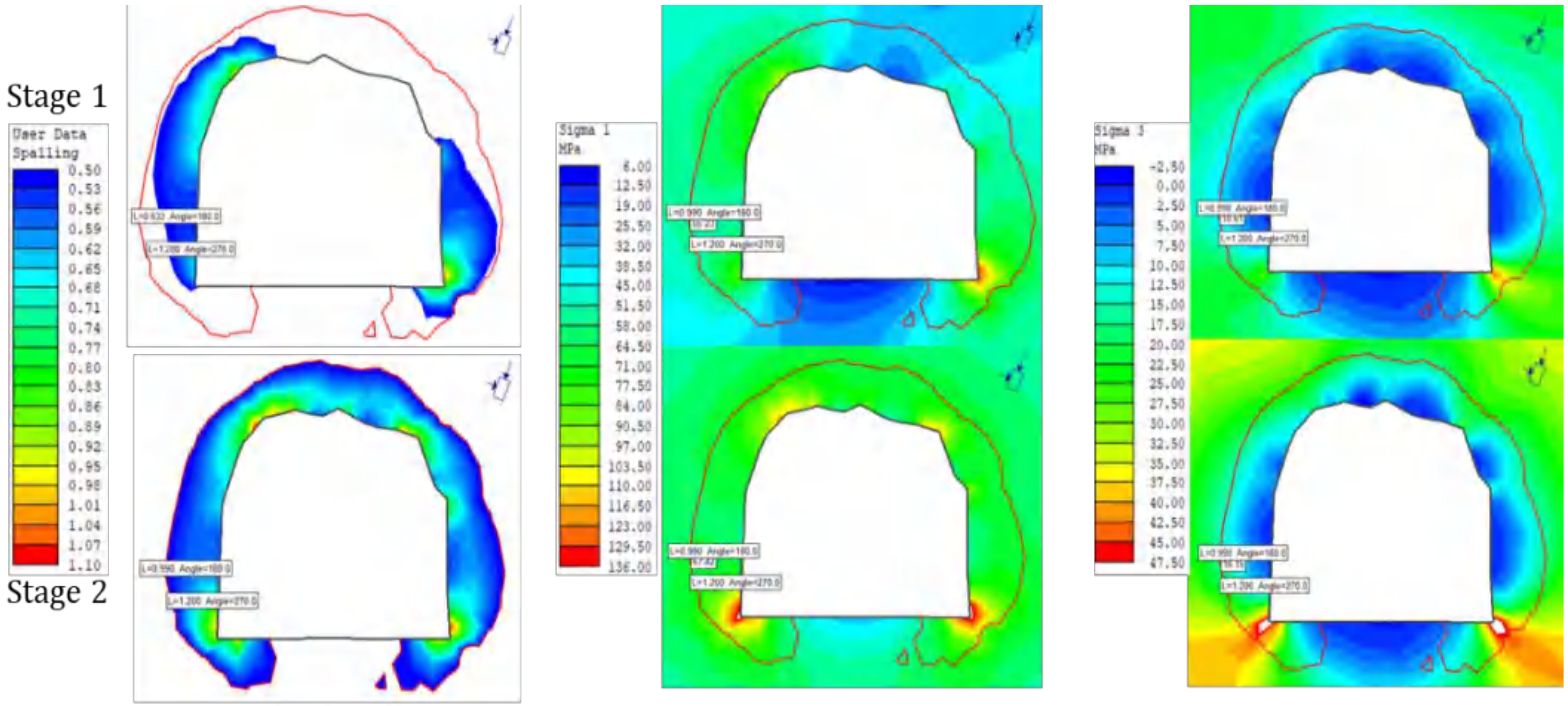
	Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
	Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: *Spalling* (*Stage* 1) *Strainburst* (*Stage* 2) DOF (m) 0,18 0,55 σ1 (MPa) 59,65 64,02 σ3 (MPa) 7,54 5,56	Lampiran 10 — Halaman 175

MODEL FEM UCUT PB3C DD16S RING 226



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*				
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)		
	DOF (m)	0,18	0,90		
	σ1 (MPa)	59,94	64,00		
	σ3 (MPa)	9,87	3,83	Lampiran 10	Halaman 176

MODEL FEM UCUT PB3C DD17N RING 217



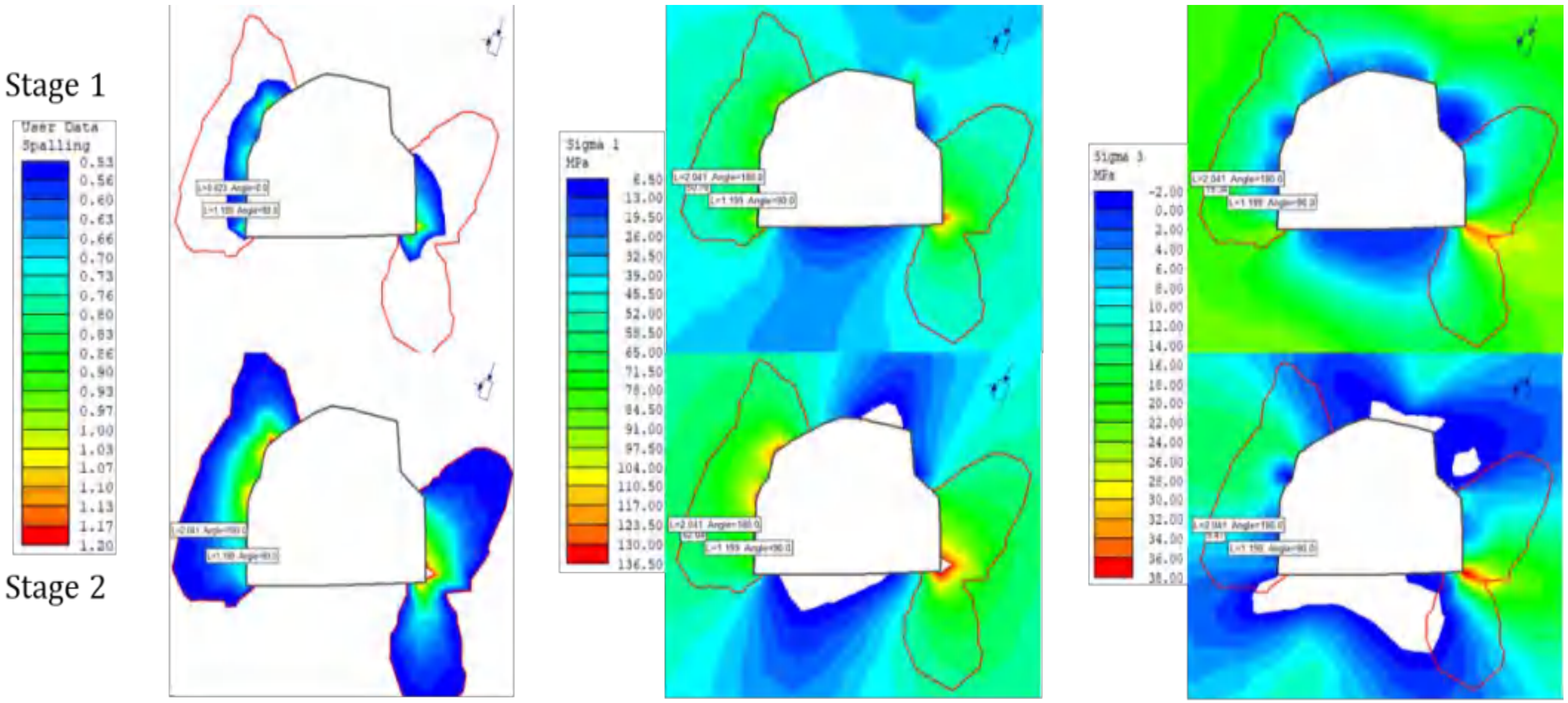
Depth of Spalling

Tangensial Stress

Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: *Spalling* (*Stage* 1) *Strainburst* (*Stage* 2) DOF (m) 0,63 0,99 σ1 (MPa) 55,23 67,42 σ3 (MPa) 15,15 10,61		Lampiran 10 / Halaman 177

MODEL FEM UCUT PB3C DD17N RING 218

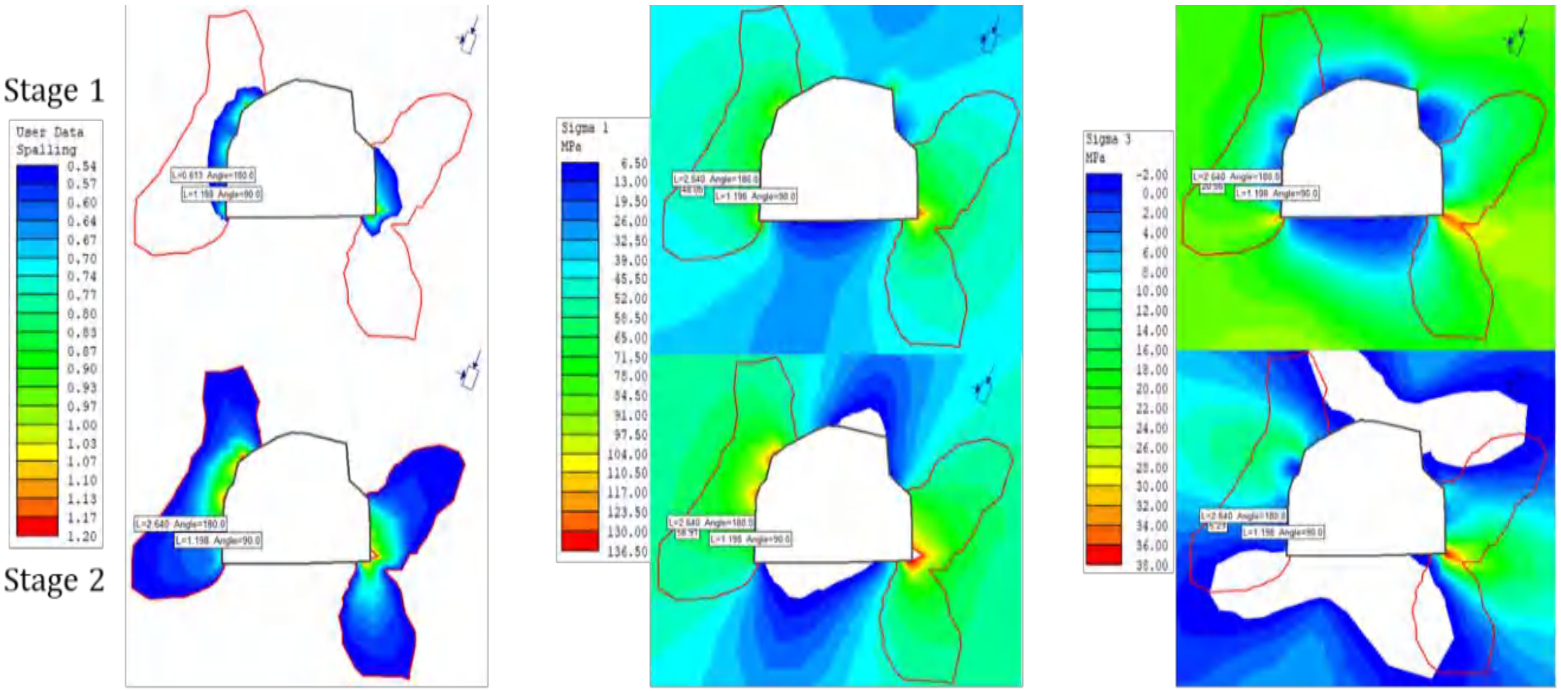


Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
Dibuat Oleh: Faidel Afrian Kemong D111191015		Lampiran 10 / Halaman 178

Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,23	2,04
σ1 (MPa)	50,76	62,04
σ3 (MPa)	19,34	9,47

MODEL FEM UCUT PB3C DD17N RING 219

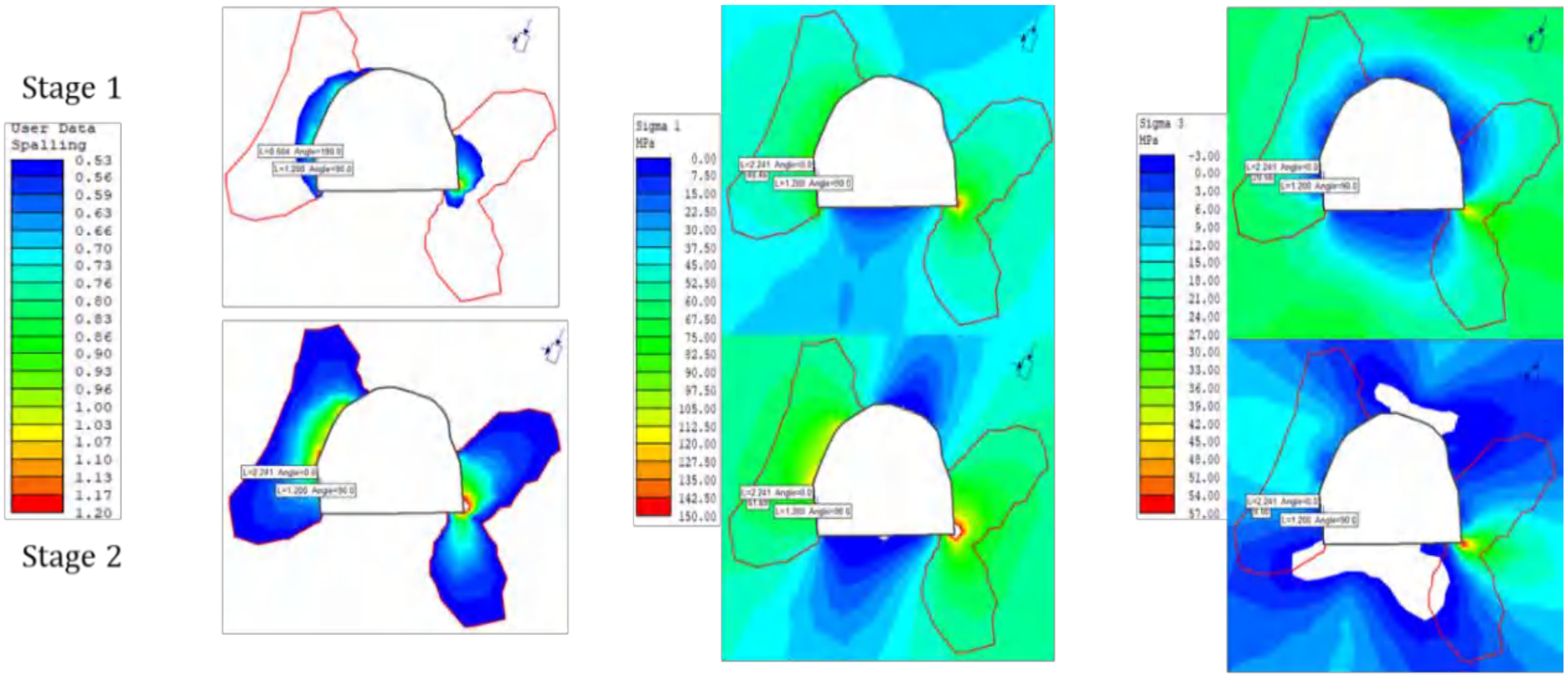


Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,61	2,64
	σ1 (MPa)	48,06	58,91
	σ3 (MPa)	20,56	5,23
			Lampiran 10 / Halaman 179

MODEL FEM UCUT PB3C DD17N RING 220

Stage 1



Stage 2

Depth of Spalling

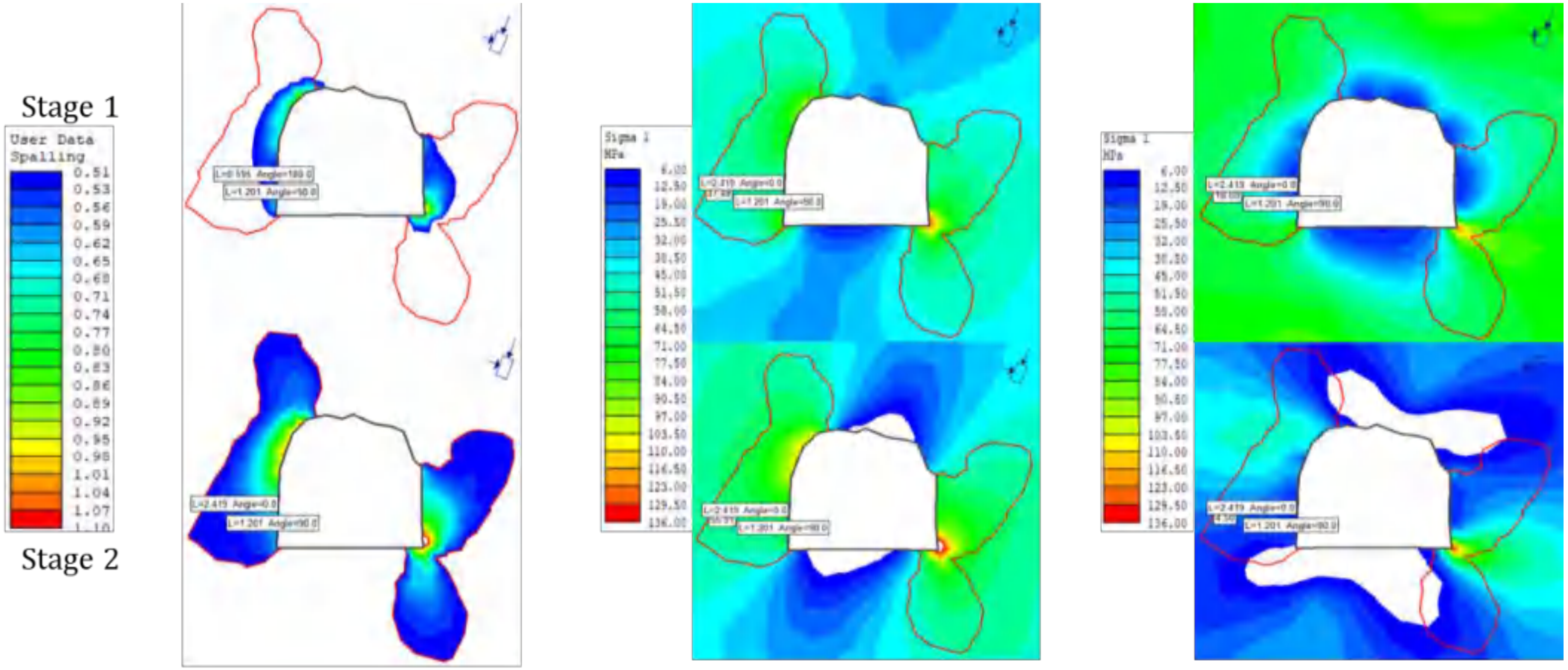
Tangential Stress

Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,60	2,24
	σ1 (MPa)	48,46	61,69
	σ3 (MPa)	20,56	8,6

Lampiran 10 | Halaman 180

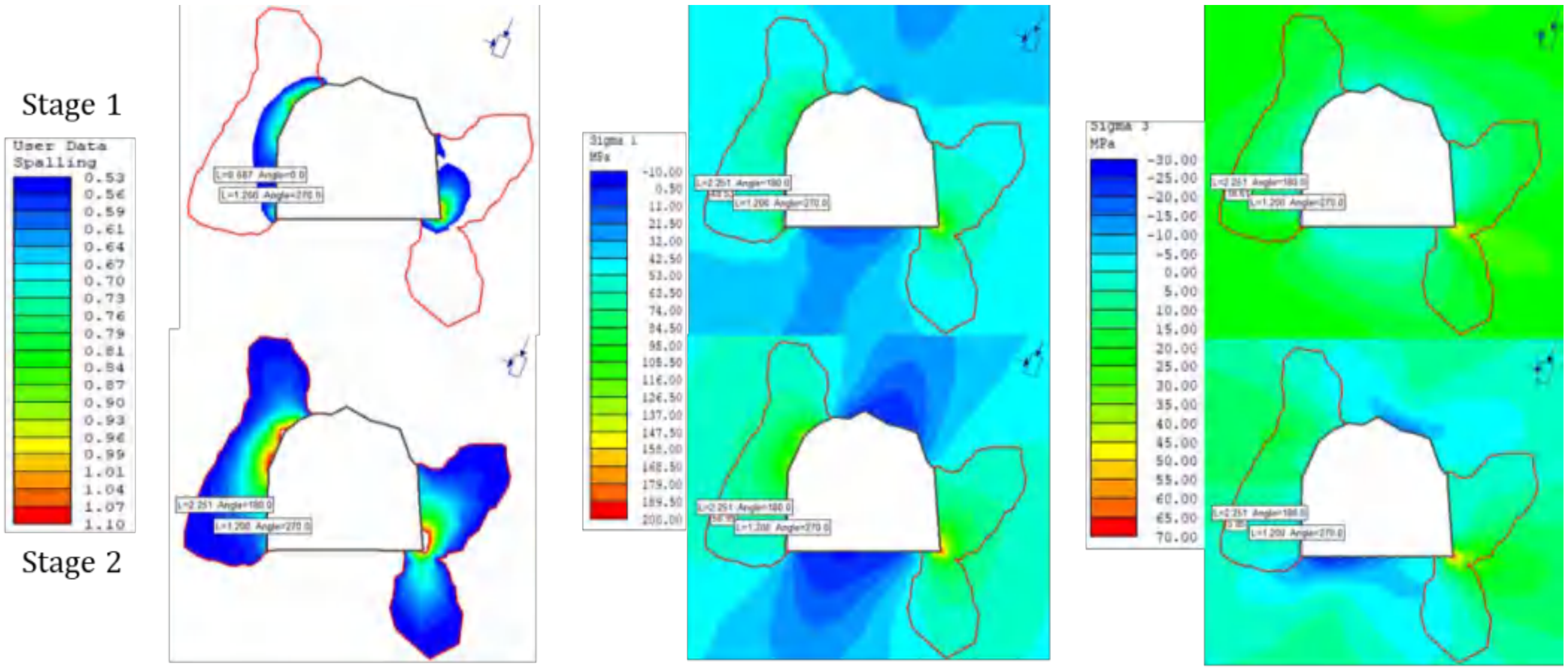
MODEL FEM UCUT PB3C DD17N RING 221



Depth of Spalling | Tangential Stress | Radial Stress

	Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
a 4	Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: DOF (m) σ1 (MPa) σ3 (MPa)	*Spalling* (*Stage* 1) 0,59 47,49 18,9	*Strainburst* (*Stage* 2) 2,42 55,01 4,5	Lampiran 10 | Halaman 181

MODEL FEM UCUT PB3C DD17N RING 222

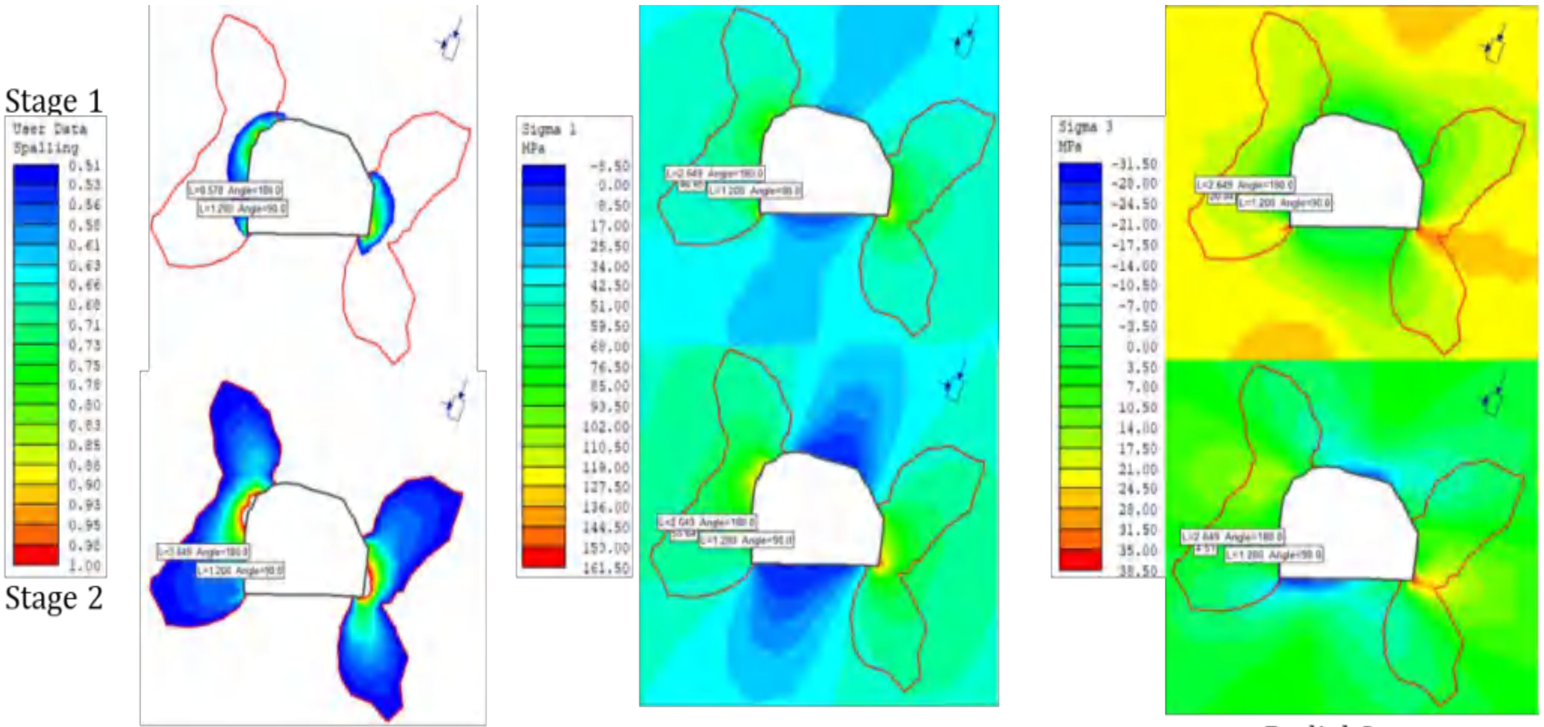


Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh:	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,59	2,25	
Faidel Afrian Kemong	σ1 (MPa)	48,53	58,99	
D111191015	σ3 (MPa)	18,51	5,85	Lampiran 10 / Halaman 182

a
4

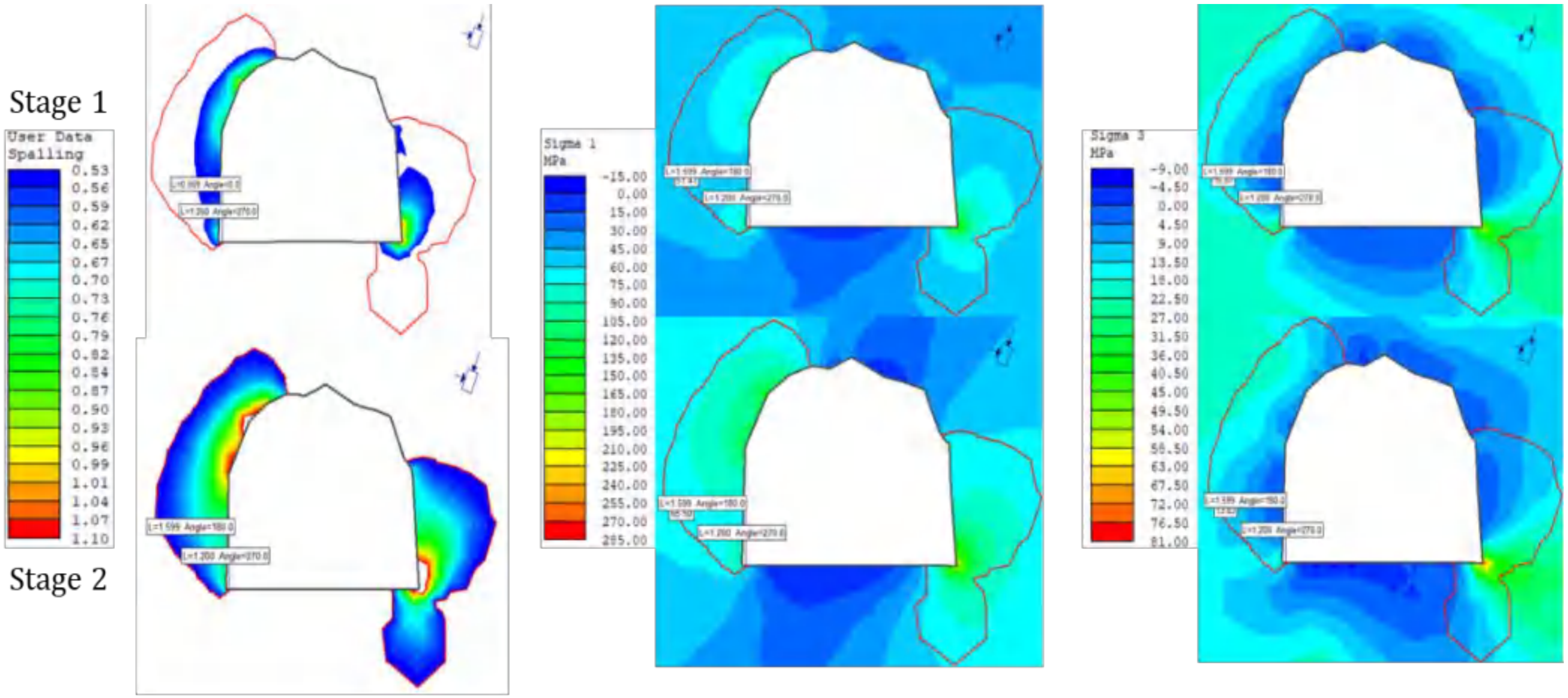
MODEL FEM UCUT PB3C DD17N RING 223



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,58	2,65	
	σ1 (MPa)	46,65	55,64	
	σ3 (MPa)	20,4	4,51	Lampiran 10 — Halaman 183

MODEL FEM UCUT PB3C DD17N RING 224

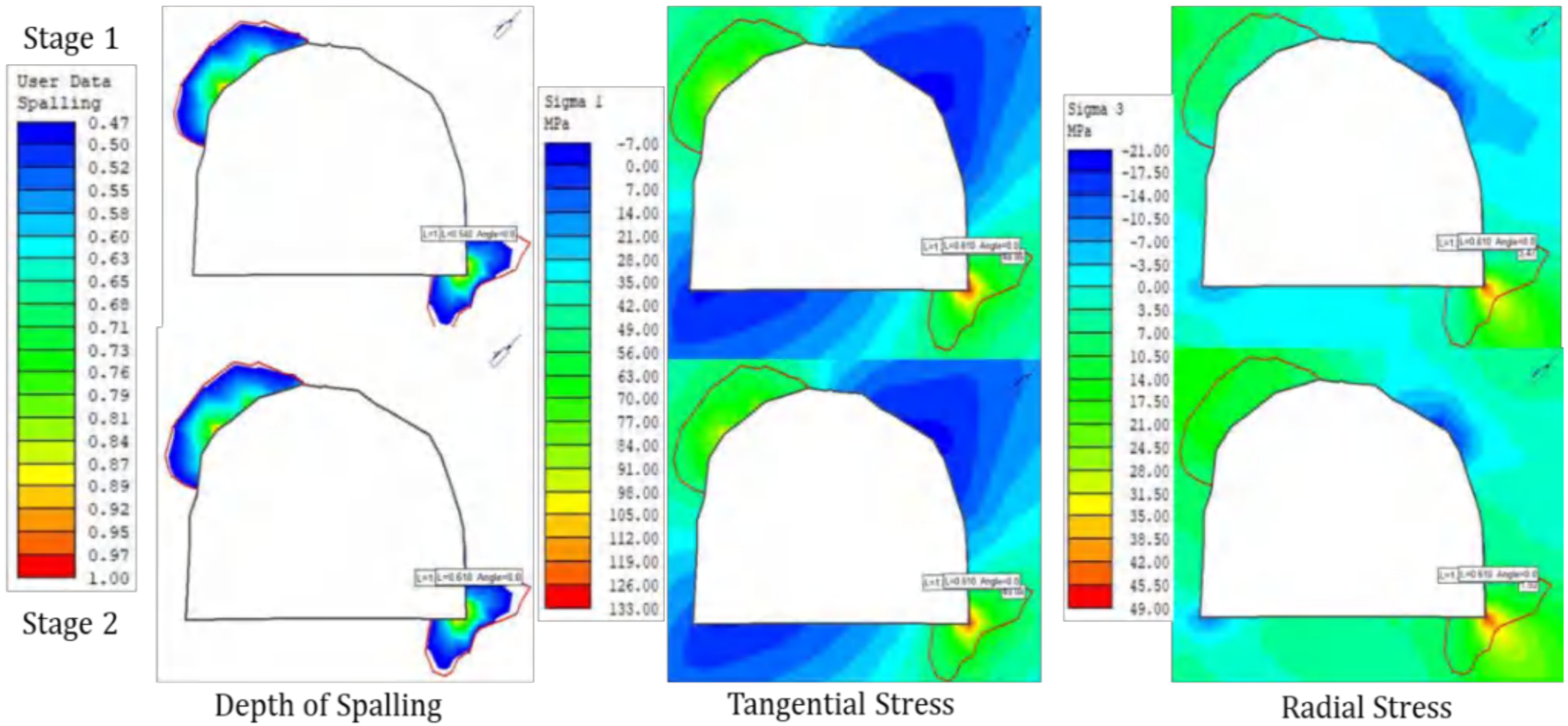


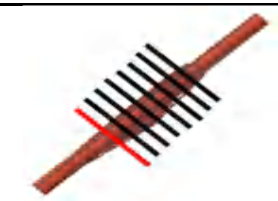
Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
Dibuat Oleh: Faidel Afrian Kemong D111191015		Lampiran 10 — Halaman 184

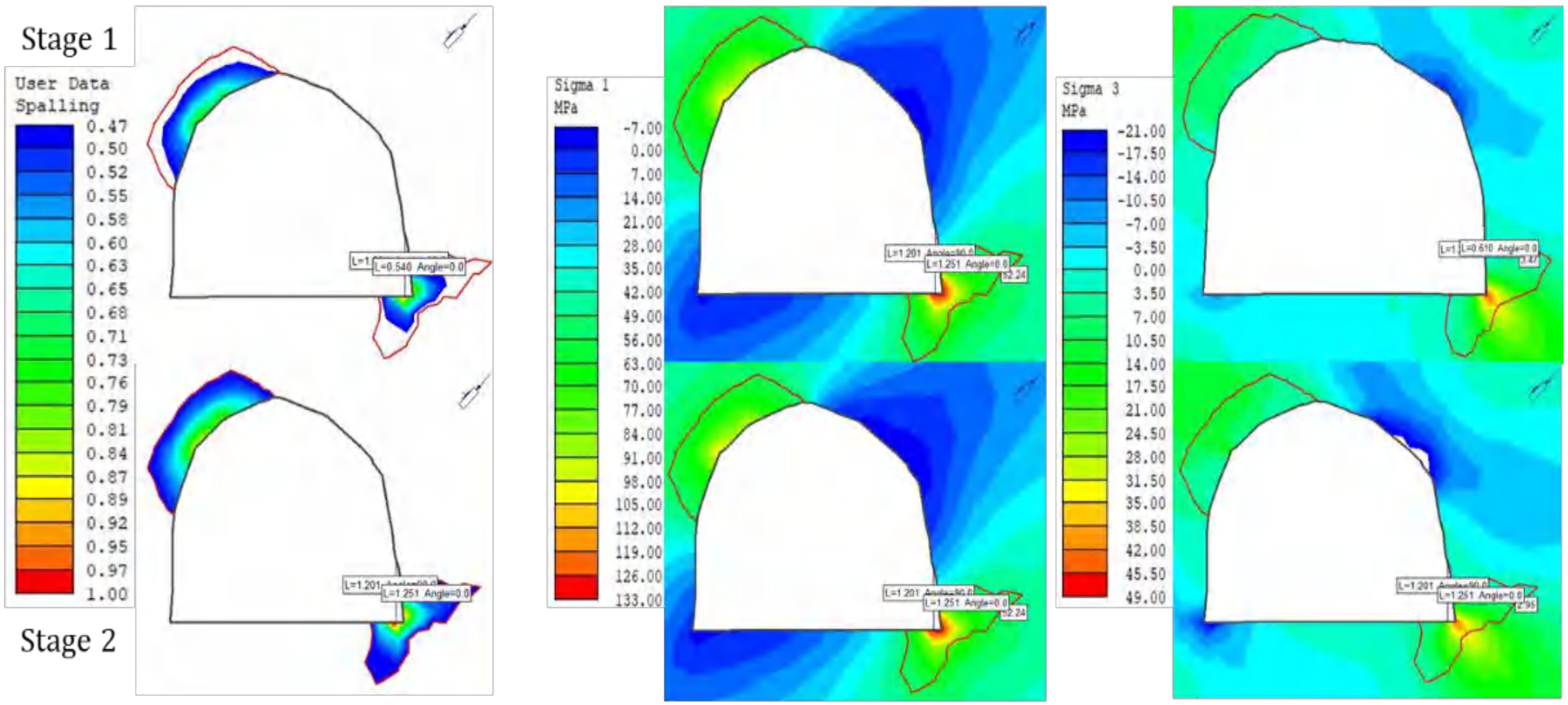
Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,57	1,6
$\sigma 1$ (MPa)	51,47	65,5
$\sigma 3$ (MPa)	15,97	13,83

MODEL FEM UCUT PB2N DD17S RING 269



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,54	0,61	
	σ1 (MPa)	38,11	47,22	
	σ3 (MPa)	3,49	0,45	Lampiran 10 — Halaman 185

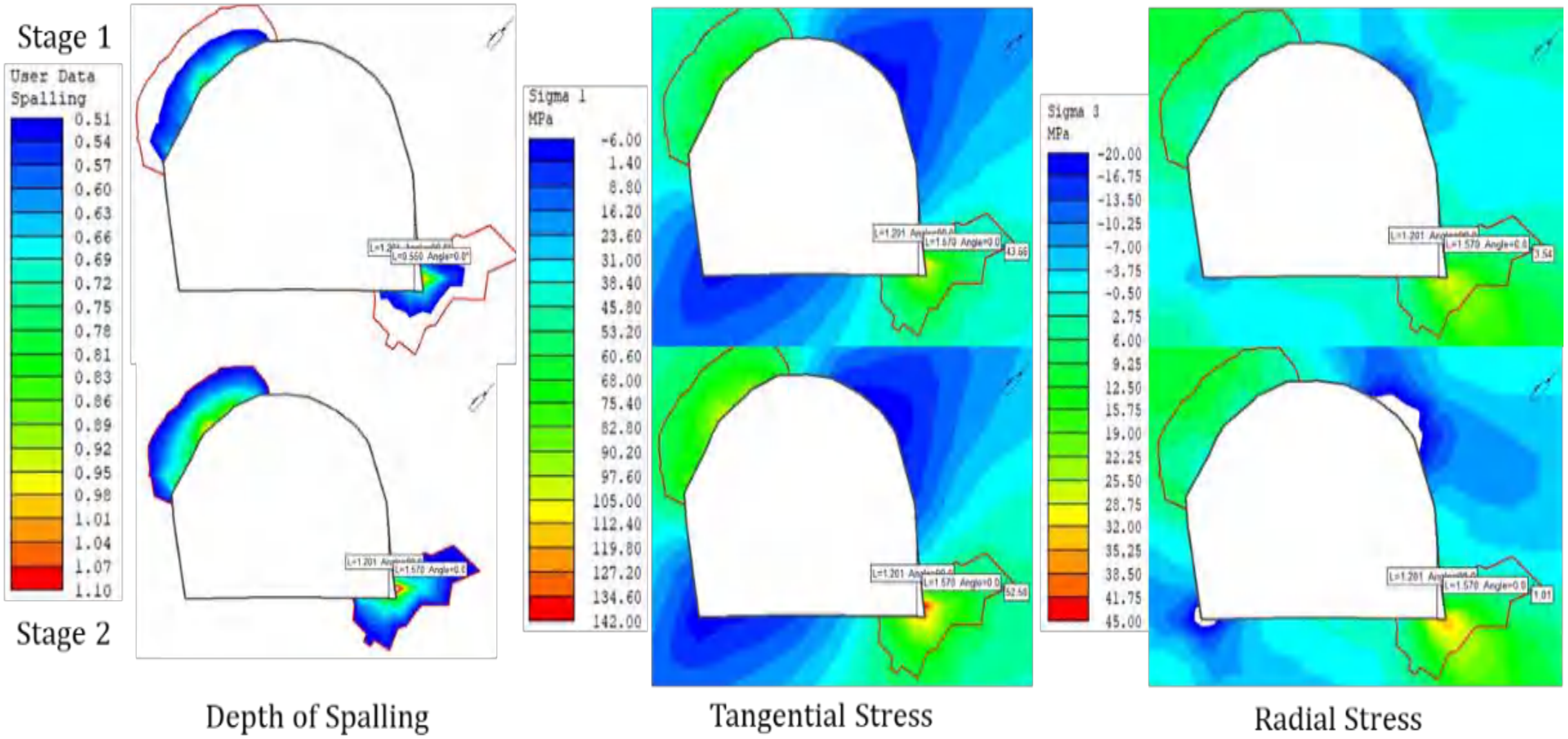
MODEL FEM UCUT PB2N DD17S RING 270



Depth of Spalling | Tangential Stress | Radial Stress

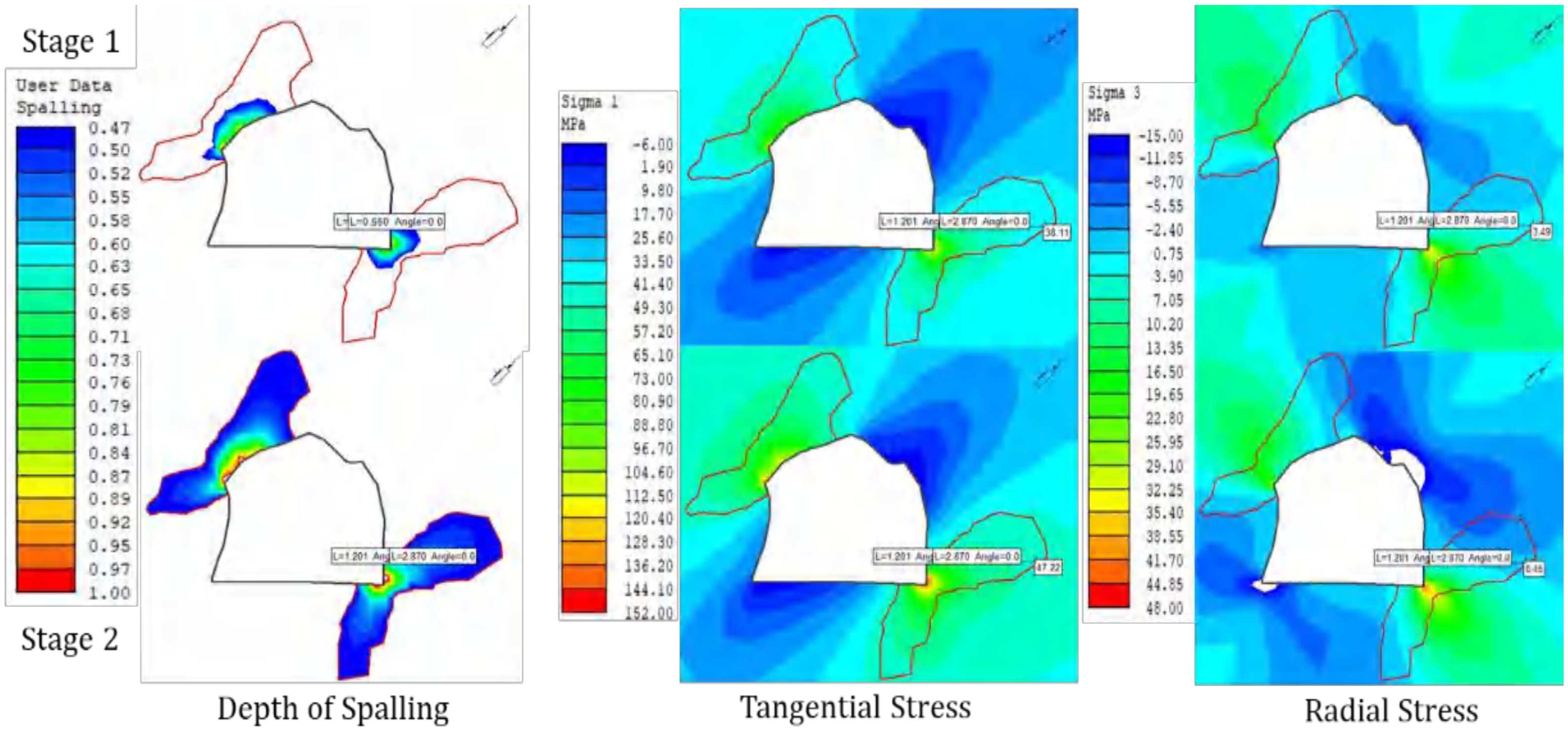
Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: *Spalling* (*Stage* 1) *Strainburst* (*Stage* 2) DOF (m) 0,54 1,25 σ1 (MPa) 40,64 47,52 σ3 (MPa) 3,54 1,01	Lampiran 10 — Halaman 186

MODEL FEM UCUT PB2N DD17S RING 271



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,55	1,57	
	σ1 (MPa)	40,64	52,92	
	σ3 (MPa)	3,54	1,15	Lampiran 10 / Halaman 187

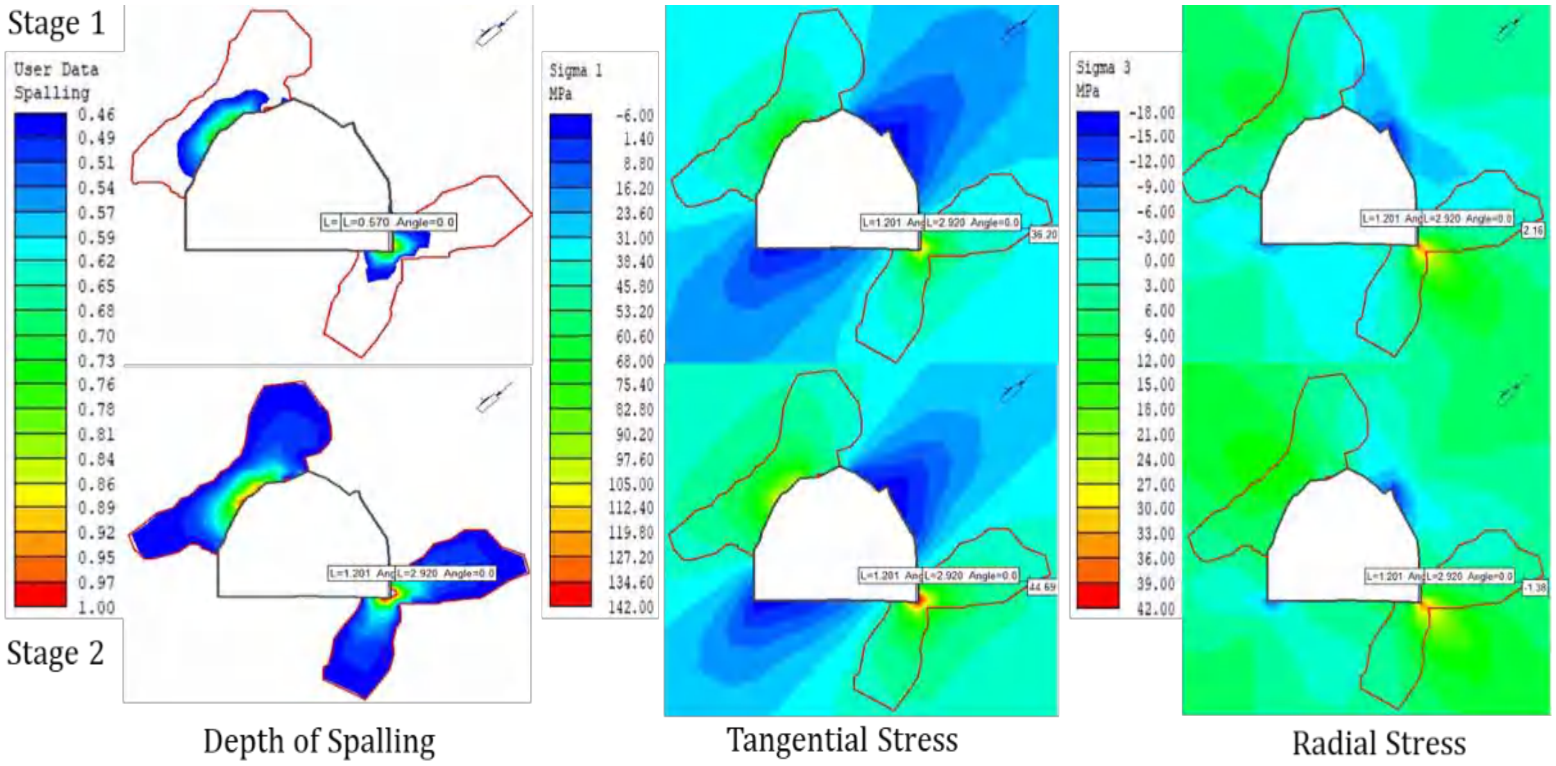
MODEL FEM UCUT PB2N DD17S RING 272



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,56	2,87
	σ1 (MPa)	38,11	47,22
	σ3 (MPa)	3,49	0,45

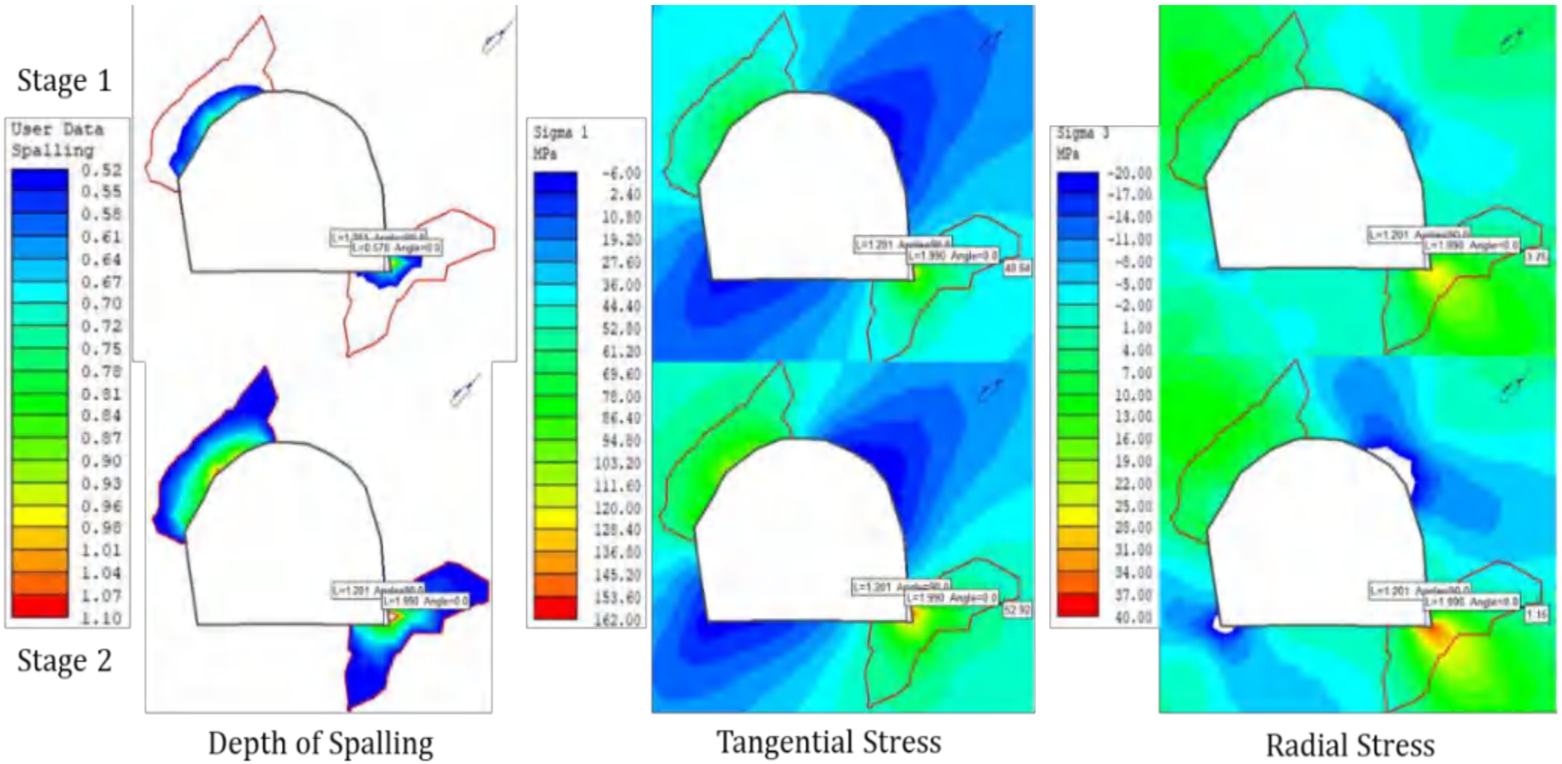
Lampiran 10 | Halaman 188

MODEL FEM UCUT PB2N DD17S RING 273



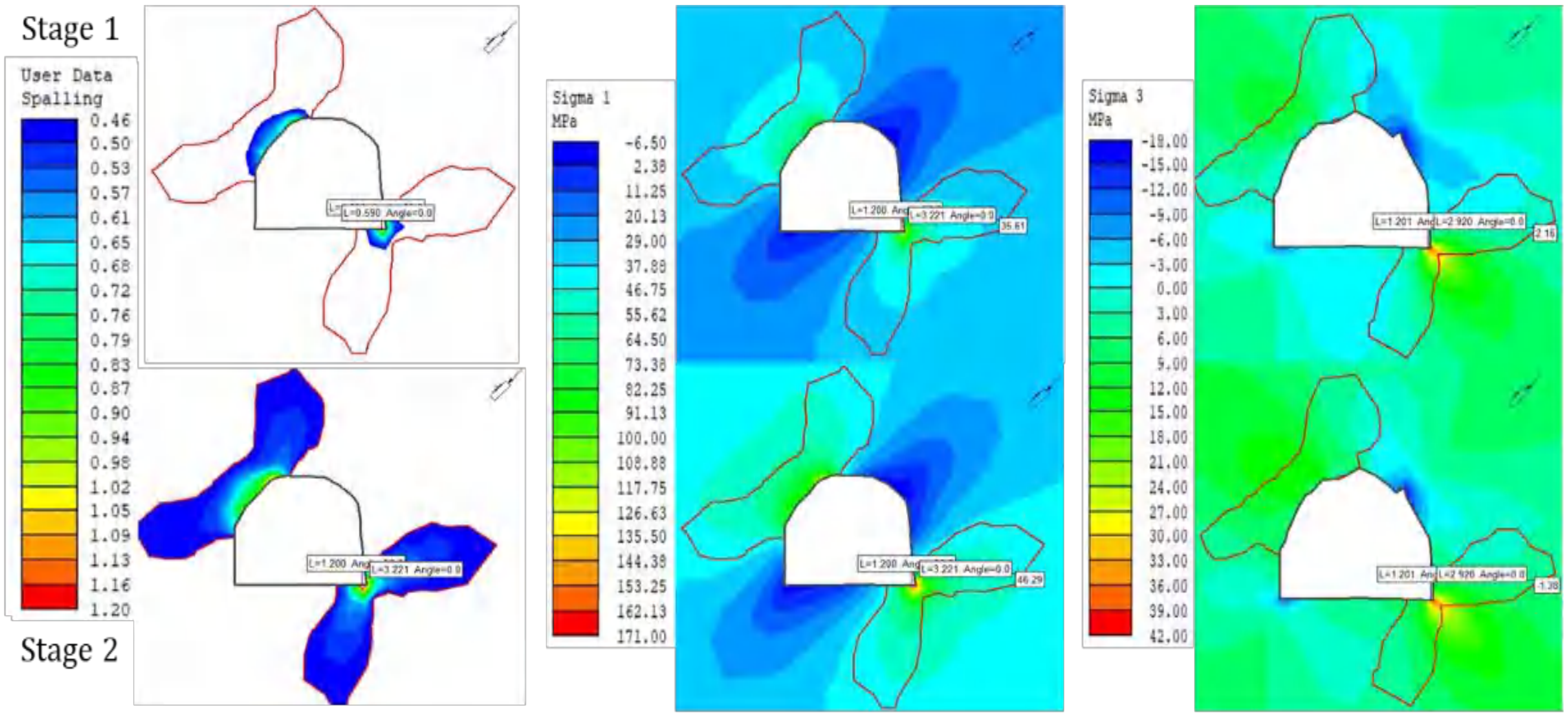
Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,57	2,92
	σ1 (MPa)	40,64	47,52
	σ3 (MPa)	3,54	1,01
			Lampiran 10 | Halaman 189

MODEL FEM UCUT PB2N DD17S RING 274



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,58	2,57
	σ1 (MPa)	40,64	52,92
	σ3 (MPa)	3,54	1,15
		Lampiran 10	Halaman 190

MODEL FEM UCUT PB2N DD17S RING 275



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan
Fakultas Teknik Universitas Hasanuddin

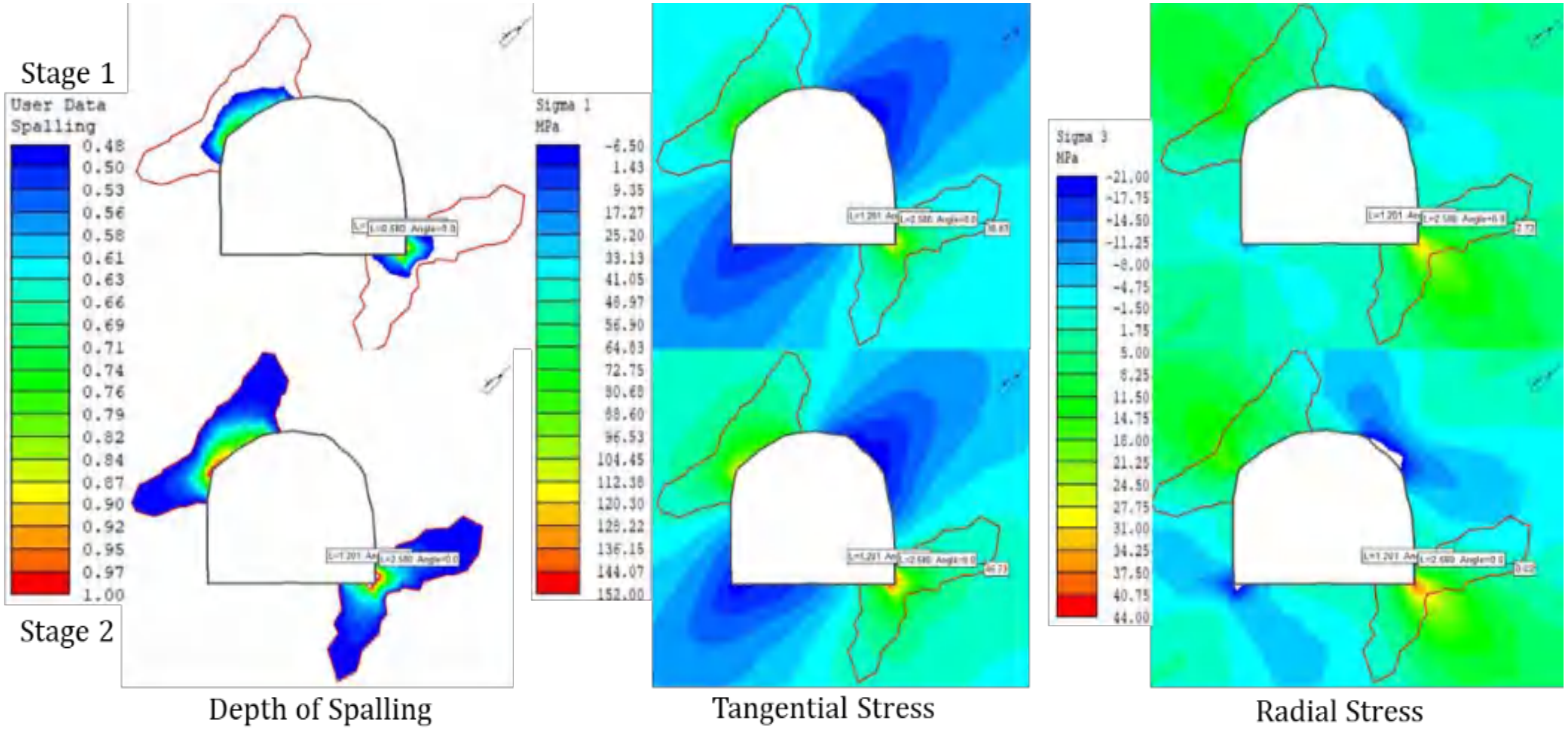
Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*

Dibuat Oleh:
Faidel Afrian Kemong
D111191015

Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,59	3,22
σ1 (MPa)	35,61	46,29
σ3 (MPa)	3,01	-0,17

Lampiran 10 | Halaman 191

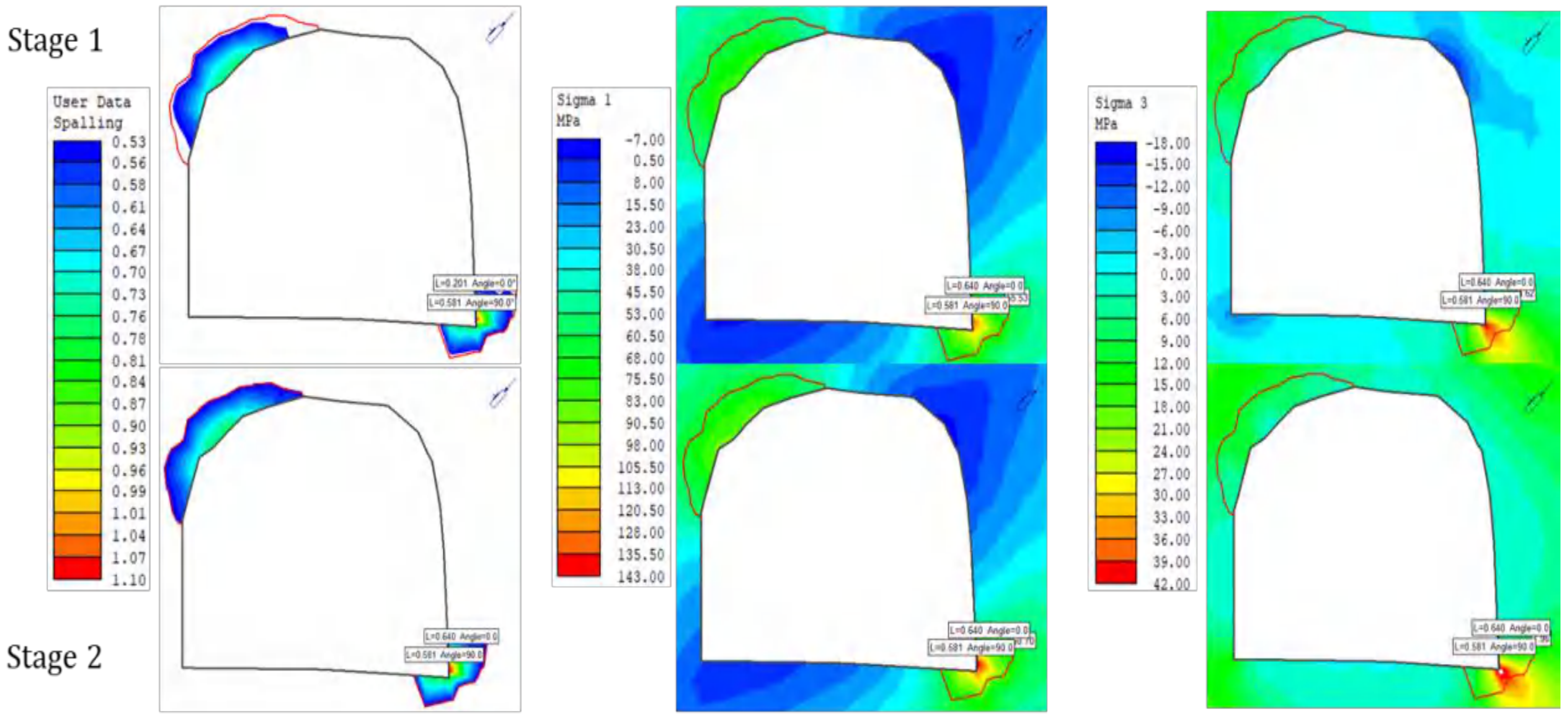
MODEL FEM UCUT PB2N DD17S RING 276



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,59	2,58	
	σ1 (MPa)	38,83	47,94	
	σ3 (MPa)	2,73	-0,01	Lampiran 10 / Halaman 192

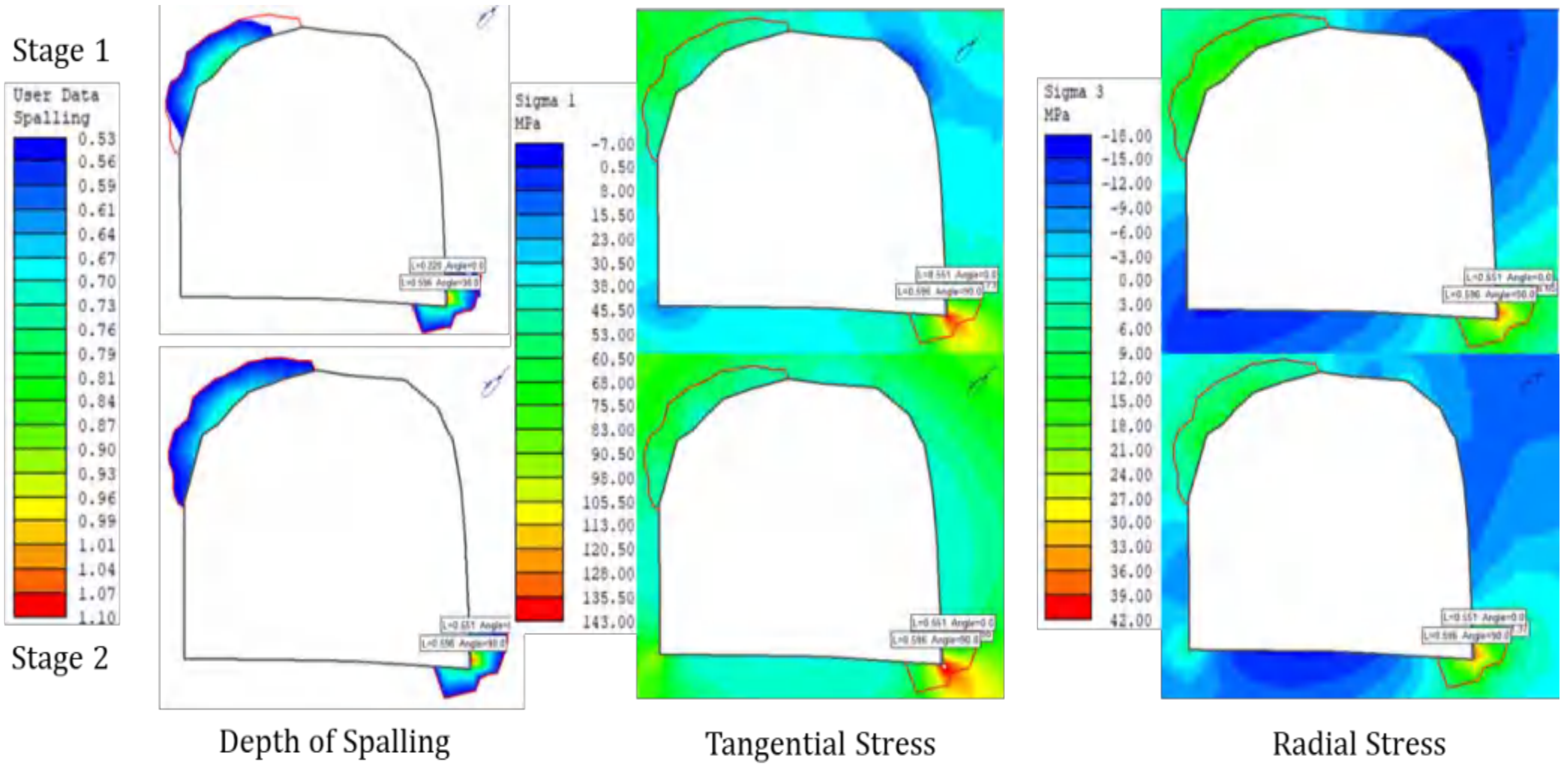
MODEL FEM UCUT PB2N DD15S RING 255



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: *Spalling* (*Stage* 1) *Strainburst* (*Stage* 2) DOF (m) 0,22 0,64 σ1 (MPa) 55,53 60,70 σ3 (MPa) 7,96 4,62	Lampiran 10 | Halaman 193

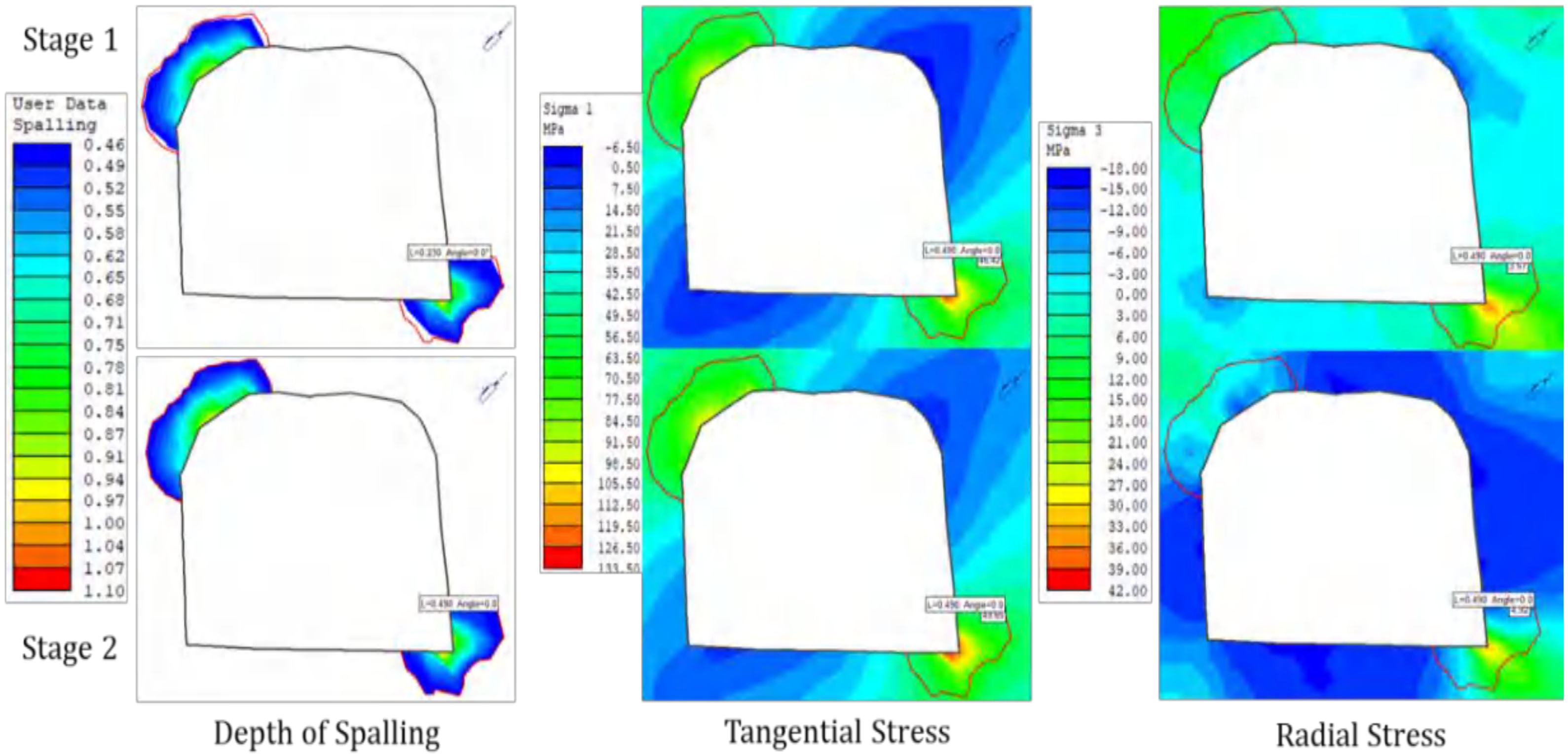
MODEL FEM UCUT PB2N DD15S RING 256



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,22	0,55
	σ1 (MPa)	56,65	61,37
	σ3 (MPa)	9,18	4,73

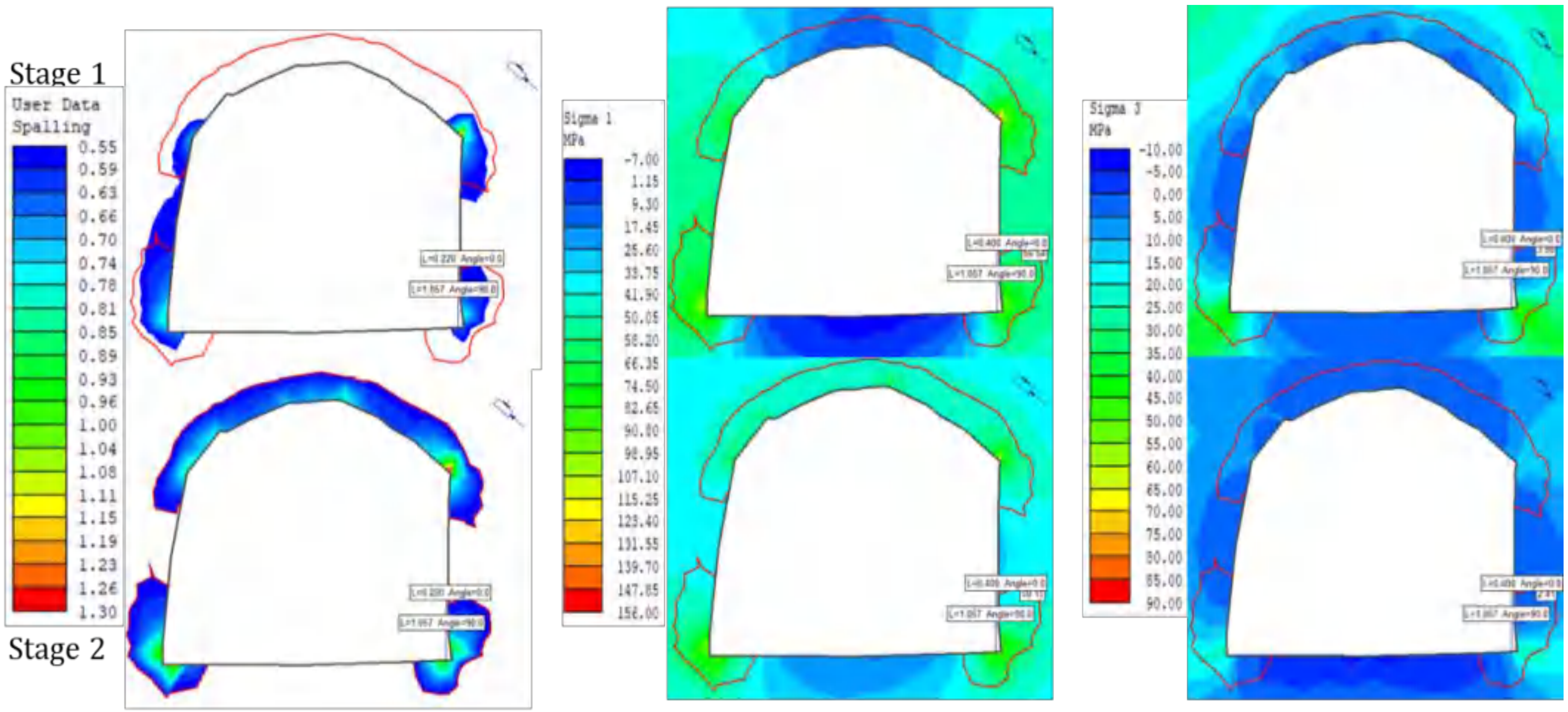
Lampiran 10 | Halaman 194

MODEL FEM UCUT PB2N DD15S RING 257



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,23	0,49	
	σ1 (MPa)	46,42	49,65	
	σ3 (MPa)	4,92	3,67	Lampiran 10 — Halaman 195

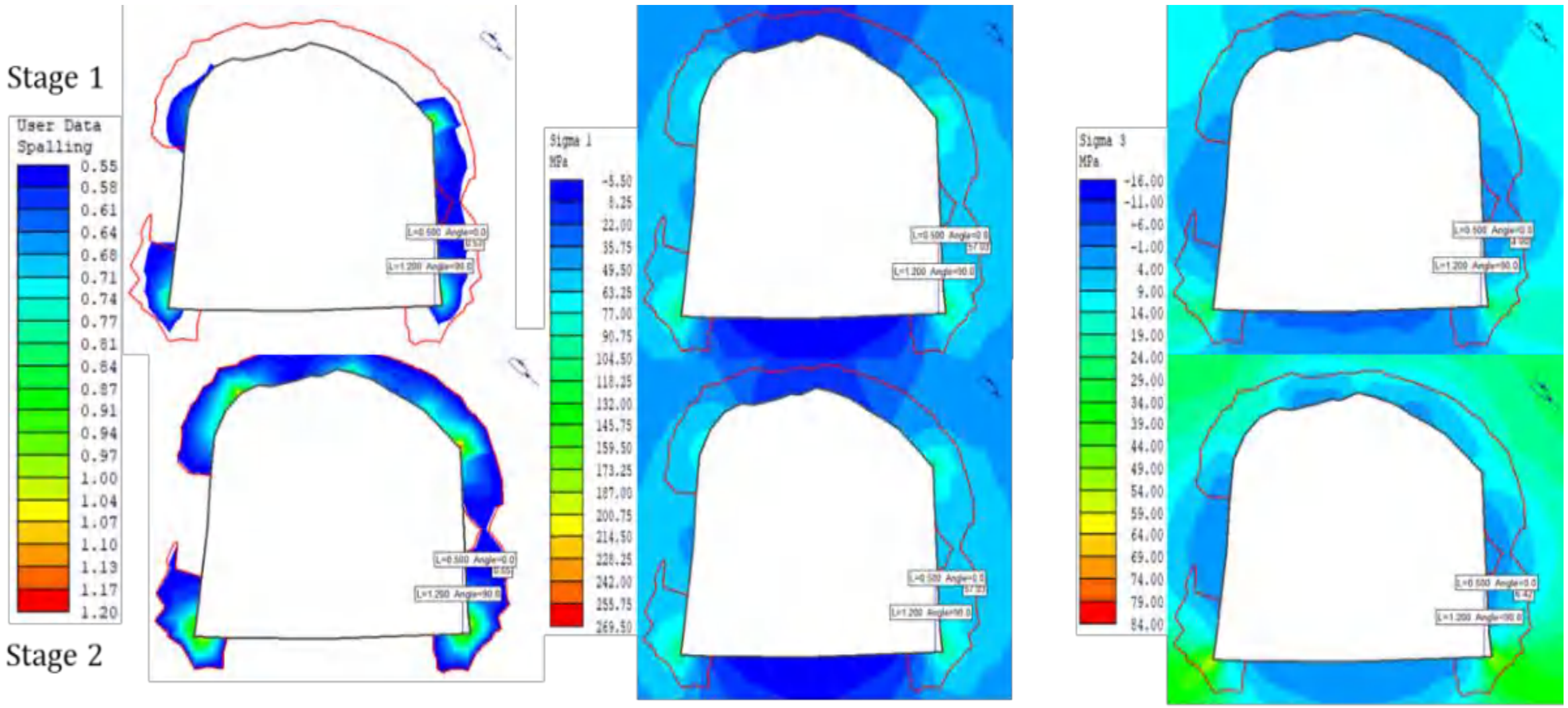
MODEL FEM EXTN PB2N P14 DP46-47 SECTION A-A’



Depth of Spalling Tangential Stress Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,22	0,69	
	σ1 (MPa)	56,30	62,33	Lampiran 10
	σ3 (MPa)	7,70	5,30	Halaman 196

MODEL FEM EXTN PB2N P14 DP46-47 SECTION B-B’



Depth of Spalling | Tangential Stress | Radial Stress

Departemen Teknik Pertambangan

Fakultas Teknik Universitas Hasanuddin

Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*

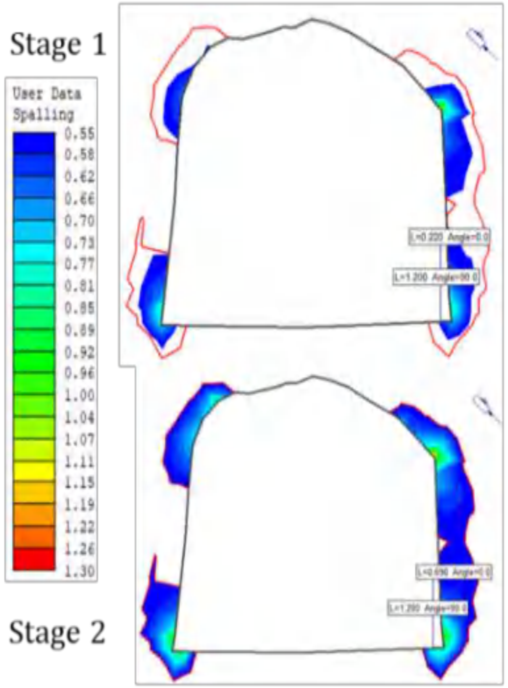
Dibuat Oleh:

Faidel Afrian Kemong
D111191015

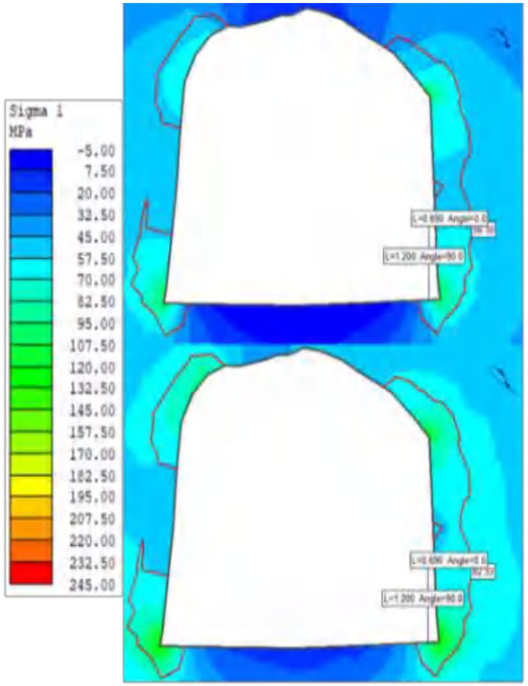
Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,22	0,50
σ1 (MPa)	61,27	57,03
σ3 (MPa)	8,64	6,22

Lampiran 10 | Halaman 197

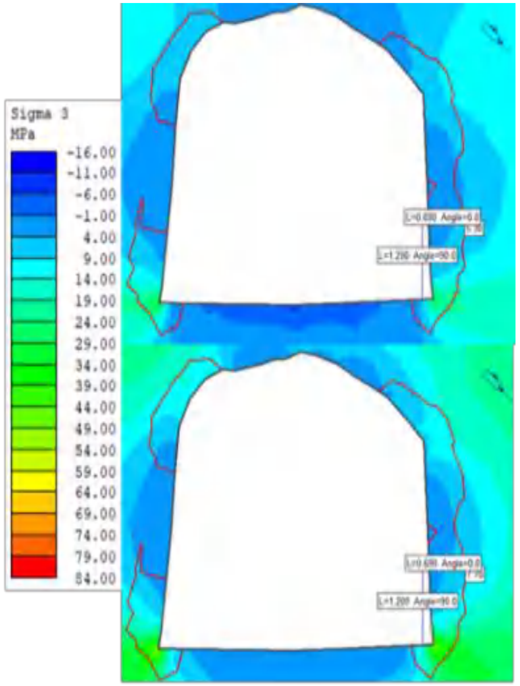
MODEL FEM EXTN PB2N P14 DP46-47 SECTION C-C’



Depth of Spalling



Tangential Stress

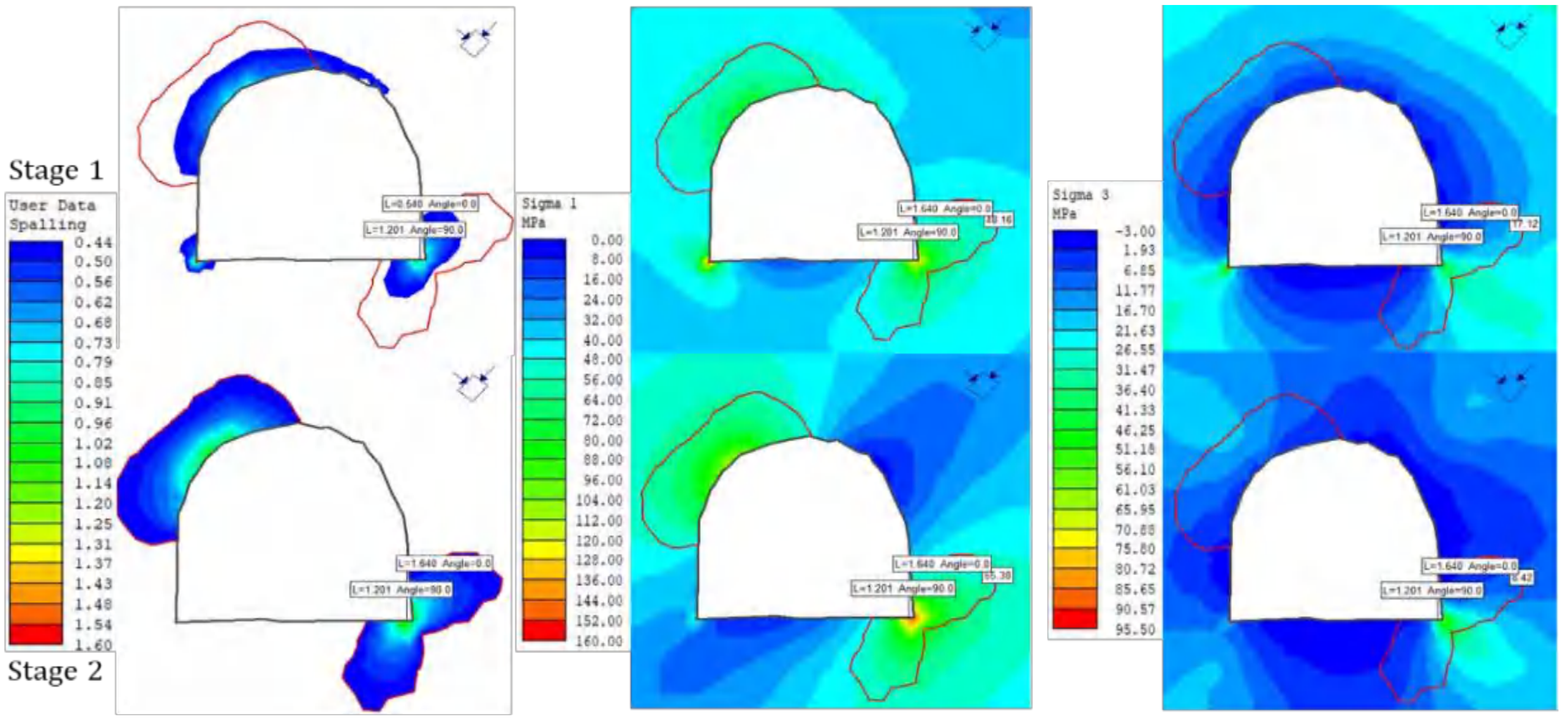


Radial Stress

Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*		
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
	DOF (m)	0,22	0,40
	σ1 (MPa)	56,54	59,11
	σ3 (MPa)	3,98	2,41

Lampiran 10 | Halaman 198

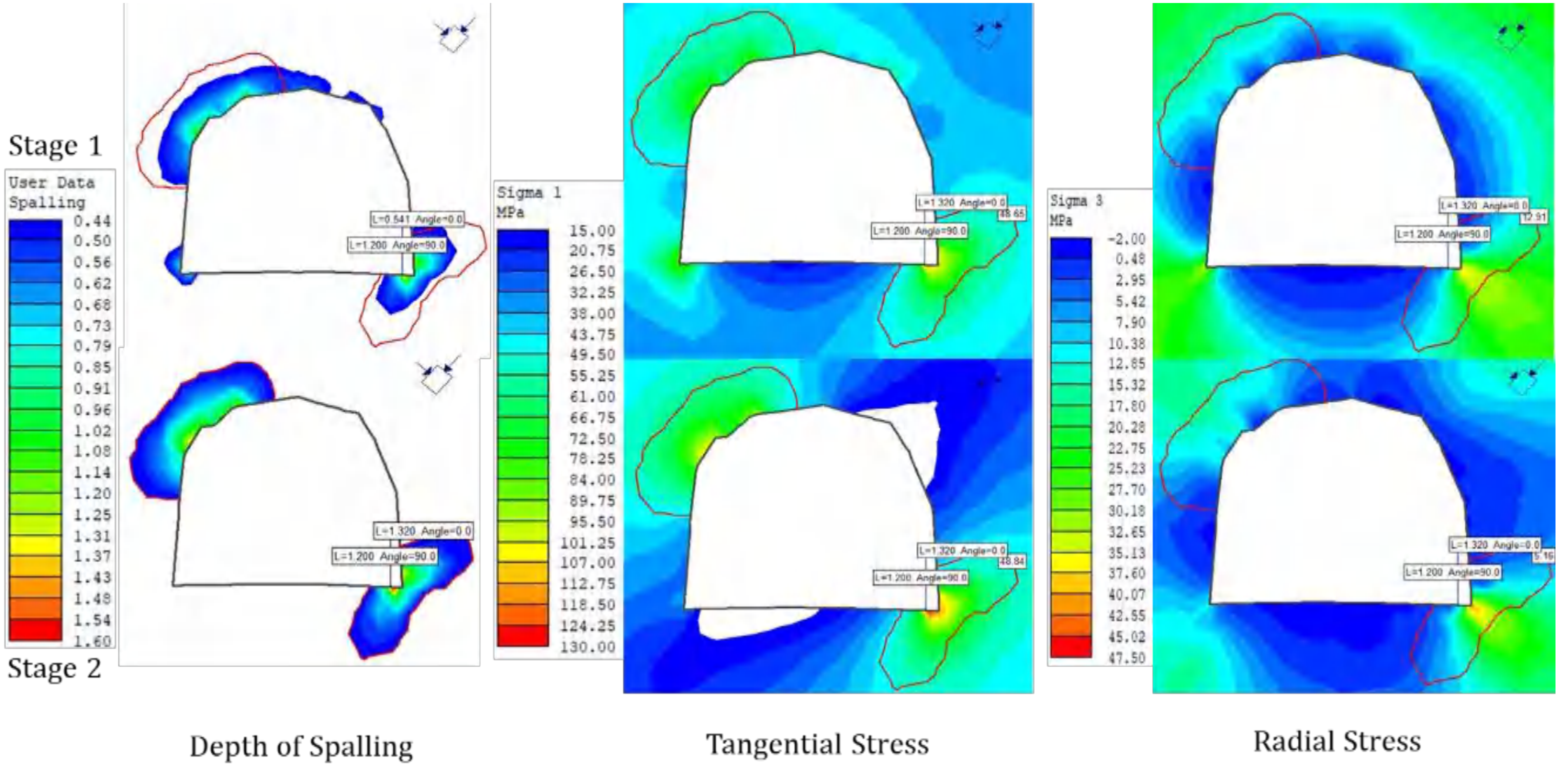
MODEL FEM EXTN P15 DP45-46 SECTION A-A’



Depth of Spalling | Tangential Stress | Radial Stress

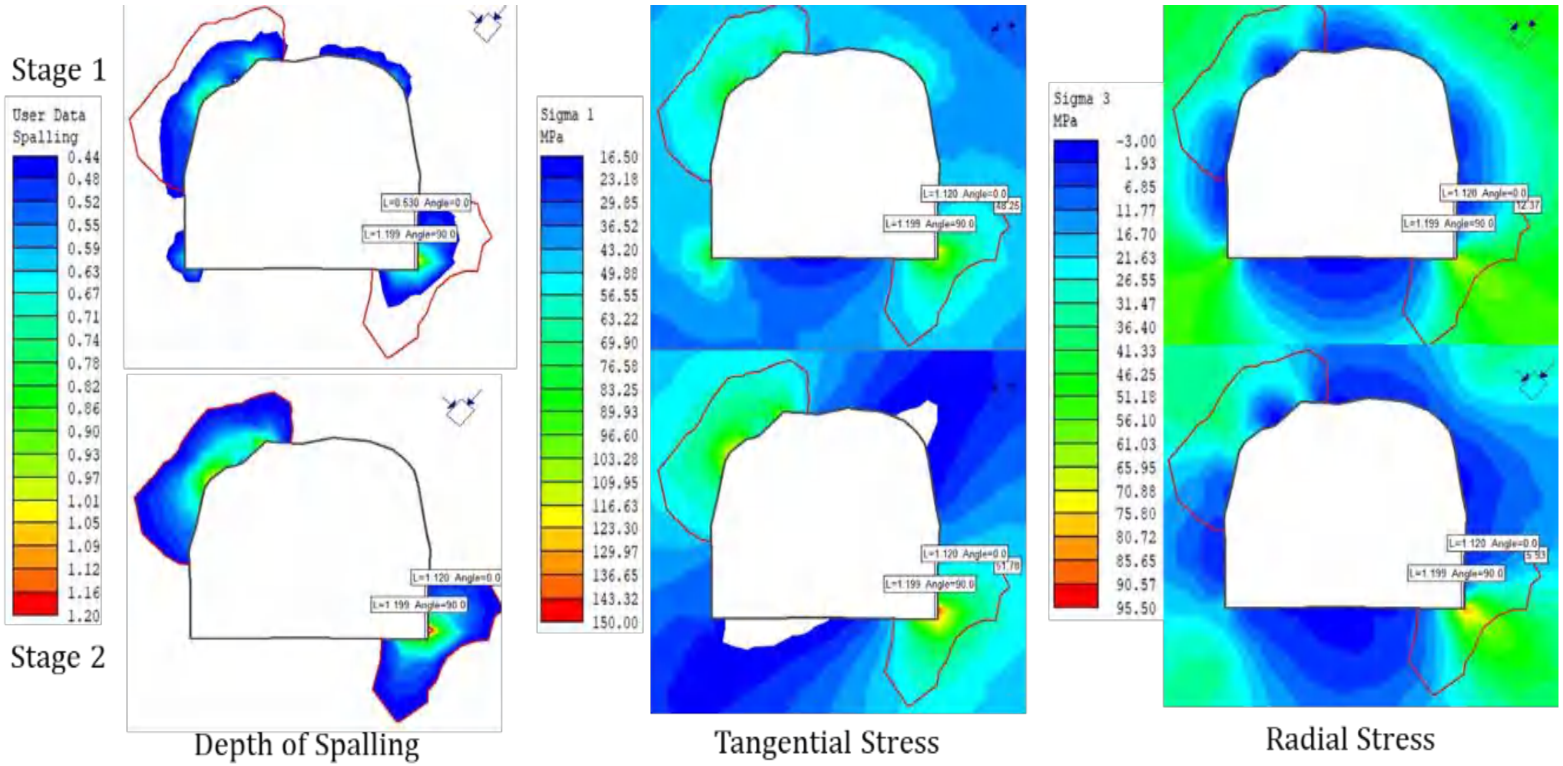
	Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
	Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: *Spalling* (*Stage* 1) *Strainburst* (*Stage* 2) DOF (m) 0,54 1,64 σ1 (MPa) 48,16 55,38 σ3 (MPa) 17,12 8,42	Lampiran 10 Halaman 199

MODEL FEM EXTN PB2N P15 DP45-46 SECTION B-B'



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*			
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)	
	DOF (m)	0,54	1,32	
	σ1 (MPa)	46,65	48,84	
	σ3 (MPa)	12,91	5,16	Lampiran 10 — Halaman 200

MODEL FEM EXTN PB2N P15 DP45-46 SECTION C-C'



Departemen Teknik Pertambangan Fakultas Teknik Universitas Hasanuddin	Analisis Perubahan Tegangan Terinduksi Terhadap DOF *Spalling* dan *Strainburst* Akibat Pengaruh PPV *Event Seismic* Dengan Model FEM di Area *Abutment*	
Dibuat Oleh: Faidel Afrian Kemong D111191015	Keterangan: *Spalling* (*Stage* 1) *Strainburst* (*Stage* 2) DOF (m) 0,53 1,12 σ1 (MPa) 48,25 51,78 σ3 (MPa) 12,37 5,93	Lampiran 10 Halaman 201

Keterangan:	*Spalling* (*Stage* 1)	*Strainburst* (*Stage* 2)
DOF (m)	0,53	1,12
σ1 (MPa)	48,25	51,78
σ3 (MPa)	12,37	5,93

LAMPIRAN 11

KARTU KONSULTASI TUGAS AKHIR

Lampiran B 10

Kartu Konsultasi Tugas Akhir

JUDUL: ANALISIS PERUBAHAN TEGANGAN TERINDUKSI TERHADAP DOF SPALLING DAN STRAINBURST AKIBAT PENGARUH PPV EVENT SEISMIC DENGAN MODEL FEM DI AREA ABUTMENT

(Konsultasi minimal 8 kali)

TANGGAL	MATERI KONSULTASI	PARAF DOSEN
01 September 2023	sesuaikan format penulisan skripsi dengan pedoman seperti poin-poin yang harus ada dan hilangkan poin-poin yang tidak perlu dimasukkan ke dalam skripsi. Perbaiki penomoran dari bab I sampai bab V serta lampiran harus diberikan penomoran. Perbaiki Bab I yaitu latar belakang dan tujuan penelitian harus mencakup alasan dilakukannya penelitian sesuai dengan judul skripsi	
29 September 2023	Perbaiki Bab II supaya penjelasannya lebih ringkas tetapi dapat memenuhi poin-poin yang akan diteliti, perbaiki penulisan istilah persamaan, gambar serta tabel di BAB II. parafrase penggunaan bahasa di BAB II dan hilangkan penjelasan yang sama. Bimbingan terkait sub bab apa saja yang harus dimasukkan ke dalam BAB II.	
13 oktober 2023	perbaikan Bab III, meliputi penjelasan lokasi penelitian, variabel penelitian dan teknik analisis yang akan dilakukan. perbaikan kualitas gambar yang dimasukkan ke dalam BAB III, dan perbaikan penulisan data-data yang ada, serta menggabungkan beberapa gambar atau tabel supaya tidak ada penjelasan yang sama.	

TANGGAL	MATERI KONSULTASI	PARAF DOSEN
27 oktober 2023	Perbaikan Bab IV meliputi: menambahkan poin untuk hasil analisis yang dihasilkan, memeriksa seluruh hasil analisis yang telah diperoleh, melakukan parafrase bahasa supaya lebih efektif di Bab IV. Perbaiki gambar model dan grafik yang dihasilkan supaya diberi keterangan. sesuaikan penjelasan Bab IV dengan lampiran. serta melakukan perbaikan di Balampiran	
10 November 2023	Perbaiki abstrak dan Bab V yakni kesimpulan dan saran, menghilangkan poin-poin yang tidak perlu dimasukkan dan memperbaiki penggunaan kata supaya efektif serta melengkapi daftar pustaka	
20 November 2023	Perbaikan pada lembar pengesahan dan memeriksa kembali keseluruhan isi skripsi agar sesuai dengan format penulisan skripsi yang berlaku.	
24 November 2023	Acc untuk seminar hasil dan bimbingan terkait PPT seminar hasil, perbaikan penulisan pada artikel dan poster.	
05 Januari 2024	Perbaiki penulisan di poster dan artikel kemudian untuk draft skripsi supaya penjelasannya dikurangi supaya halamannya lebih ringkas. Perhatikan typo dan format penulisan mulai dari Bab I sampai Bab IV. Periksa kembali keseluruhan isi skripsi supaya tidak ada gambar, atau tabel yang kosong di lampiran.	
12 Januari 2024	Perbaiki diagram alir, perbaiki hasil analisis supaya lebih ringkas kalau bisa gabungkan. Perbaiki model hasil analisis supaya lebih sederhana, artikel dan poster di submit.	
26 Februari 2024	Acc untuk ujian sarjana, konsultasi PPT dan submit artikel.	