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Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NW/CL									
				0.05		BITUMEN						
				0.20		FILL GRAVEL (GP) medium size, grey.						
				0.50		NATURAL PHYLLITE (DW)						
				1.0		PHYLLITE, fine grained, light grey mottled light brown and orange, foliated, closely spaced fractures, with limonite infill, with trace quartz veins, with a residual soil zone from 1.15m to 1.20m.	DW			100	22	0.80 m; J, 40°, S, R, O, L 0.90 m; F, 60°, P, S, O, L 1.05 m; F, 60°, P, S, O, L
				2.0						100	17	1.76 m; F, 50°, P, S, O, C 1.82 m; J, 10°, S, R, O, L 1.95 m; F, 65°, P, R, O, L 2.07 m; F, 25°, P, R, O, L 2.13 m; F, 20°, P, R, O, L 2.23 m; F, 50°, S, R, O, L 2.26 m; F, 50°, S, S, O, W
				3.0						100	18	2.52 m; F, 50°, P, S, O, L 2.57 m; F, 60°, S, R, O, Q 2.88 m; J, 40°, P, R, O, L
				3.20								3.00-3.20 m; F, 60°, P, R, O, L
				4.0		PHYLLITE, fine grained, grey with orange and dark grey streaks, foliated, closely to moderately widely spaced fractures, and some limonite infill, with trace quartz veins.	DW - SW			92	54	3.68 m; F, 20°, S, R, O, W 3.89 m; J, 45°, U, R, O, L 4.05 m; F, 50°, P, S, O, Q 4.19-4.42 m; F, 45°, S, R, O, L
				5.0								5.30 m; J, 15°, S, V, O, L 5.36 m; F, 50°, P, R, O, Z 5.50 m; F, 50°, P, R, O, L 5.66 m; F, 50°, S, R, O, Z
				6.0		PHYLLITE, fine grained, grey with orange veins, foliated, with closely spaced fractures, trace quartz veins and limonite infill.				100	30	6.13 m; F, 60°, P, R, O, L 6.29 m; F, 62°, S, R, O, L 6.34 m; F, 40°, P, R, O, L 6.63 m; F, 60°, P, R, O, L 6.90 m; F, 61°, S, S, O, Z
				7.0								7.50 m; J, 12°, U, R, O, L 7.90 m; F, 40°, S, S, O, L 8.06 m; F, 50°, P, R, O, Z 8.16 m; J, 20°, P, R, O, L
				8.0			SW			100	15	8.42 m; F, 50°, P, R, O, L 8.61 m; F, 40°, S, V, O, Q 8.73 m; J, 55°, S, R, O, L
				9.0		PHYLLITE, fine grained, dark grey with white veins, foliated, with moderately widely spaced fractures.	SW - FR			100	59	9.08 m; F, 40°, P, S, O, W 9.14 m; F, 40°, P, S, O, W 9.27 m; F, 45°, S, S, O, Z 9.44 m; F, 60°, T, R, O, Z 9.78 m; F, 40°, P, R, O, W
				10.0								

Comments:
1) Groundwater not observed. 2) ATV survey carried out. 3) Monitoring well installed to 29.5m on completion.

Defects - 1.54m : F, 60°, P, R, O, C

Type	Dip (Deg)	Planarity	Roughness	Aperture	Infill
B - Bedding	C - Curvilinear	L - Slickensides	C - Closed	C - Clay	
C - Clay seam	D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide	
F - Foliation	P - Planar	R - Rough	N - Clean	K - Calcite	
H - Schistosity	S - Subplanar	S - Smooth	O - Open	L - Limonite	
J - Joint	T - Stepped	V - Very rough	S - Stain	Q - Quartz	
L - Cleavage	R - Fracture	S - Shear zone	U - Undulating	S - Secondary mineral	
T - Contact	Z - Decomposed zone	V - Vein		U - Unidentified mineral	
				W - Weathered rock	
				X - Carbonaceous	
				Z - Clean	
				DI - Drilling induced break	

Weathering Grades

RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered

Rock Strength

VW - Very weak
W - Weak
MS - Medium strong
S - Strong
WS - Very strong
ES - Extremely strong

Samples

U50

SPT

Disturbed Sample

Approved: _____
Date: _____

SOIL SURVEYS 00:LIBRARY 2012:05:G.LB Log SOIL SURVEY BOREHOLE LOG 111-12936 NEW.GPJ <<DrawingFiles>> 21/05/2012 14:34 8.30.002 Developed by Dajgeel



Easting: 502005 Northing: 6961961 RL: 16.17 m
Logger: CS/CB Operator: PD Machine: MC450

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	FR	Casing									
				11.0		PHYLLITE, fine grained, dark grey with white veins, foliated, with moderately widely spaced fractures. (continued)	SW - FR			100	59	10.63 m; F, 40°, P, R, O, Z 10.85 m; F, 40°, P, R, O, Z 10.91 m; F, 40°, P, R, O, Z
				12.0								11.74 m; J, 10°, S, R, O, Z 11.82 m; F, 50°, S, S, O, Z 11.90 m; F, 50°, S, S, O, Z 12.12 m; F, 40°, S, R, O, Z 12.21 m; F, 40°, T, R, O, Z
				13.0						100	70	12.62 m; F, 40°, S, R, O, Z 12.73 m; J, 60°, S, S, O, Z 12.83 m; J, 50°, P, S, O, Z
				14.0								13.14-13.45 m; F, 40°, P, S, O, W 14.13 m; F, 60°, P, R, O, Z
				15.0								14.61 m; F, 40°, P, S, O, Z 14.80 m; F, 52°, S, S, O, Z
				16.0						100	71	15.15 m; F, 50°, P, S, O, Z 15.31 m; F, 30°, T, R, O, Z 15.40 m; J, 15°, U, R, O, Z
				17.0								15.70 m; J, 20°, P, R, O, Z 15.78 m; J, 15°, P, R, O, Z 15.93 m; F, 60°, P, S, O, Z 16.12 m; F, 50°, S, S, O, Z
				18.0	18.00					100	78	17.47 m; F, 50°, P, S, O, Z 17.65 m; F, 40°, S, S, O, Z
				19.0		PHYLLITE, fine grained, grey with white veins and some dark grey bands, foliated, with moderately widely spaced fractures.						18.41 m; J, 30°, T, S, O, Z 18.65 m; J, 10°, S, R, O, Z
				20.0						100	86	18.90 m; J, 50°, C, R, O, Z 19.11 m; J, 20°, P, R, O, S 19.47 m; J, 10°, T, R, O, Z

Comments:
1) Groundwater not observed. 2) ATV survey carried out.
3) Monitoring well installed to 29.5m on completion.

Defects - 1.54m : F, 60°, P, R, O, C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Fill
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	V - Very rough	S - Stain	Q - Quartz
	L - Cleavage					S - Secondary mineral
	R - Fracture					U - Unidentified mineral
	S - Shear zone					W - Weathered rock
	T - Contact					X - Carbonaceous
	V - Vein					Z - Clean
	Z - Decomposed Zone					
	DI - Drilling induced break					

Weathering Grades

RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength

VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples

U50
SPT
Disturbed Sample

Approved: _____
Date: _____

SOIL SURVEYS 00: LIBRARY 2012:05:G.LB Log SOIL SURVEY BOREHOLE LOG 111-12936 NEW.GPJ <<DrawingFiles>> 21/05/2012 14:34 8.30.002 Developed by Dajgei



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BOREHOLE RECORD SHEET

Location Number: BH 328

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 27/02/2012

Easting: 502005 Northing: 6961961 RL: 16.17 m
Logger: CS/CB Operator: PD Machine: MC450

Page: 3 OF 4

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks							
TC	WB	RR	Casing																
				21.0	[Wavy line graphic]	PHYLLITE, fine grained, grey with white veins and some dark grey bands, foliated, with moderately widely spaced fractures. (continued)	FR	[Cross-hatch pattern]	[Vertical dashed lines]	100	86	20.21 m; F, 45°, P, R, O, Z							
				22.0								20.48 m; F, 60°, P, S, O, Z							
												20.54 m; F, 55°, P, S, O, Z							
												20.73 m; J, 75°, S, R, O, Z							
												21.04 m; F, 50°, P, S, O, Z							
												21.20 m; F, 40°, P, S, O, Z							
												21.42 m; J, 50°, P, R, O, S							
												21.64 m; F, 40°, P, R, O, Z							
												22.34 m; F, 20°, S, R, O, Z							
												23.00-23.40 m; F, 40°, S, R, O, Z							
				24.0	[Wavy line graphic]	PHYLLITE, fine grained, grey with white veins and some dark grey bands, foliated, with moderately widely spaced fractures, with some pymatic folding.	FR	[Cross-hatch pattern]	[Vertical dashed lines]	95	73	23.64 m; F, 40°, S, S, O, Z							
												24.12 m; F, 40°, S, S, O, Z							
												24.20 m; J, 30°, S, R, O, Z							
												24.62 m; F, 35°, S, S, O, Z							
												24.65 m; J, 20°, S, R, O, Q							
												24.75 m; F, 40°, P, S, O, S							
												24.86 m; F, 25°, S, R, O, Z							
												25.22 m; J, 50°, C, R, O, S							
												25.52 m; F, 20°, S, R, O, Z							
												25.78 m; F, 20°, P, S, O, Z							
				27.0	[Wavy line graphic]			[Cross-hatch pattern]	[Vertical dashed lines]	100	83	27.70 m; F, 40°, S, R, O, Z							
												27.83 m; J, 35°, P, R, O, Q							
												28.45 m; F, 15°, P, R, O, Z							
												28.66 m; F, 35°, S, R, O, Z							
												28.75 m; F, 30°, P, R, O, Z							
												28.88 m; F, 35°, P, R, O, Z							
												29.36 m; F, 35°, S, R, O, Z							
												29.79 m; F, 32°, P, R, O, Z							
				29.0								[Wavy line graphic]			[Cross-hatch pattern]	[Vertical dashed lines]	100	100	
				30.0															

Comments:
1) Groundwater not observed. 2) ATV survey carried out. 3) Monitoring well installed to 29.5m on completion.

Defects - 1.54m : F,60°,P,R,O,C

Depth (m)	Type	Dip (Deg)	Planarity	Roughness	Aperture	Fill
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	F - Foliation		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide
	H - Schistosity		P - Planar	R - Rough	N - Clean	K - Calcite
	J - Joint		S - Subplanar	S - Smooth	O - Open	L - Limonite
	L - Cleavage		T - Stepped	V - Very rough	S - Stain	Q - Quartz
	R - Fracture		U - Undulating			S - Secondary mineral
	S - Shear zone					U - Unidentified mineral
	T - Contact					W - Weathered rock
	V - Vein					X - Carbonaceous
	Z - Decomposed Zone					Z - Clean
	DI - Drilling induced break					

Weathering Grades

RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength

VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples

U50 [Bar chart]

SPT [Bar chart]

Disturbed Sample [Bar chart]

Approved: _____
Date: _____

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BOREHOLE RECORD SHEET

Location Number: BH 328

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 27/02/2012

Easting: 502005 Northing: 6961961 RL: 16.17 m
Logger: CS/CB Operator: PD Machine: MC450

Page: 4 OF 4

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NW/CL									
				31.0		PHYLLITE, fine grained, grey with white veins and some dark grey bands, foliated, with moderately widely spaced fractures, with some pynatic folding. (continued)	FR			100	100	30.05 m; F, 45°, P, R, O, Z
				30.33 m; F, 25°, P, R, O, Z								
				30.69 m; F, 25°, S, R, O, Z								
				30.91 m; F, 30°, P, S, O, Z								
				31.24 m; F, 30°, P, S, O, Z								
				31.53 m; F, 30°, P, S, O, Z								
				31.71 m; F, 40°, S, R, O, Z								
				32.12 m; F, 40°, P, R, O, Z								
				32.34 m; J, 20°, S, R, O, Z								
				33.29 m; J, 45°, C, V, O, Z								
				33.60 m; J, 80°, U, V, O, Z								
				34.23 m; F, 40°, P, R, O, Z								
				34.87 m; F, 40°, P, S, O, Z								
				35.04 m; F, 40°, S, R, O, Z								
				35.25 m; J, 50°, S, R, O, Q								
				35.55 m; J, 80°, U, R, O, Z								
				36.15 m; J, 80°, S, R, O, Q								
				36.59 m; J, 32°, P, R, O, Q								
				37.15 m; F, 60°, P, S, O, Z								
				37.28 m; J, 50°, S, V, O, Z								
				37.43 m; J, 50°, P, V, O, Z								
				37.73 m; J, 20°, P, R, O, Z								
				38.51 m; F, 70°, P, R, O, Z								
				38.54 m; F, 65°, P, R, O, Z								
				39.10 m; F, 40°, P, R, O, Z								
				39.16 m; J, 80°, U, C,								

Comments: BOREHOLE BH 328 TERMINATED AT 40.00m
 1) Groundwater not observed. 2) ATV survey carried out.
 3) Monitoring well installed to 29.5m on completion.

Weathering Grades: RS - Residual Soil, XW - Extremely weathered, DW - Distinctly weathered, SW - Slightly weathered, FR - Fresh

Rock Strength: VW - Very weak, W - Weak, MS - Medium strong, S - Strong, VS - Very strong, ES - Extremely strong

Samples: U50, SPT, Disturbed Sample

Approved: _____ **Date:** _____

Water First Noted Water Steady Level

Depth (m) Type Dip (Deg) Planarity Roughness Aperture Fills
 B - Bedding C - Curvilinear L - Slickensides C - Closed C - Clay
 Cl - Clay seam D - Discontinuous P - Polished F - Filled F - Iron Oxide
 F - Foliation P - Planar R - Rough N - Clean K - Kaolinite
 H - Schistosity S - Subplanar S - Smooth O - Open L - Limonite
 J - Joint T - Stepped V - Very rough S - Sand Q - Quartz
 L - Cleavage R - Fracture U - Undulating S - Secondary mineral
 S - Shear zone U - Unidentified mineral
 T - Contact W - Weathered rock
 V - Vein X - Carbonaceous
 Z - Decomposed Zone Z - Clean
 DI - Drilling induced break

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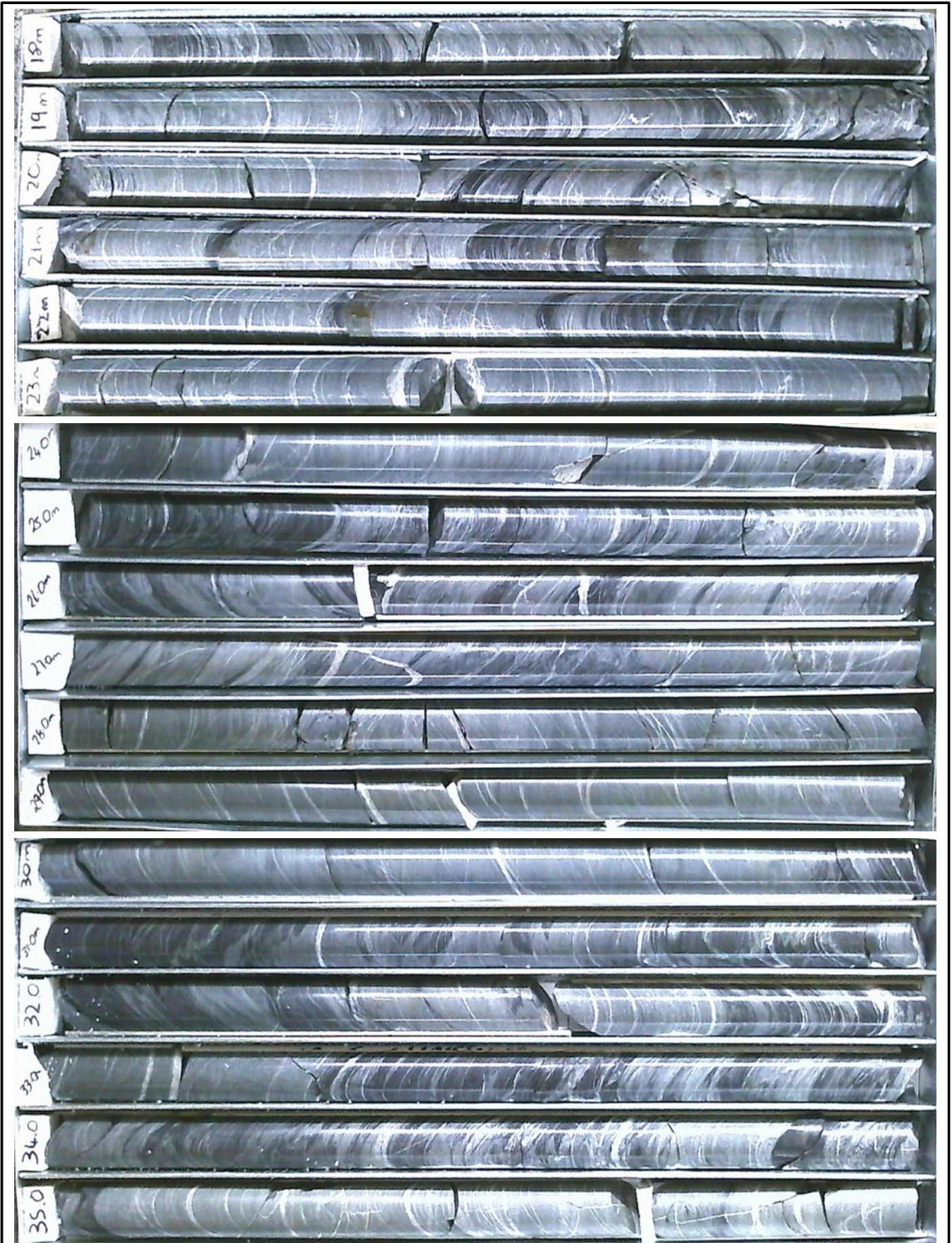


TITLE

AECOM
Brisbane
Cross River Rail
Core Photo - BH 328

DRAWN	DT	DATE	26/04/2012
CHECKED	CB	DATE	26/04/2012
SCALE	Not To Scale		A4
PROJECT No	110-12936	FIGURE No	1/2

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TITLE

AECOM
Brisbane
Cross River Rail
Core Photo - BH 328

DRAWN	DT	DATE	26/04/2012
CHECKED	CB	DATE	26/04/2012
SCALE	Not To Scale		A4
PROJECT No	110-12936	FIGURE No	2/2



COMPOSITE LOG

BOREHOLE TELEVIEWER LOGS AND STRUCTURES



Hole Name CRR328
Field Brisbane City
Log Date 7th Mar,2012
Location QLD

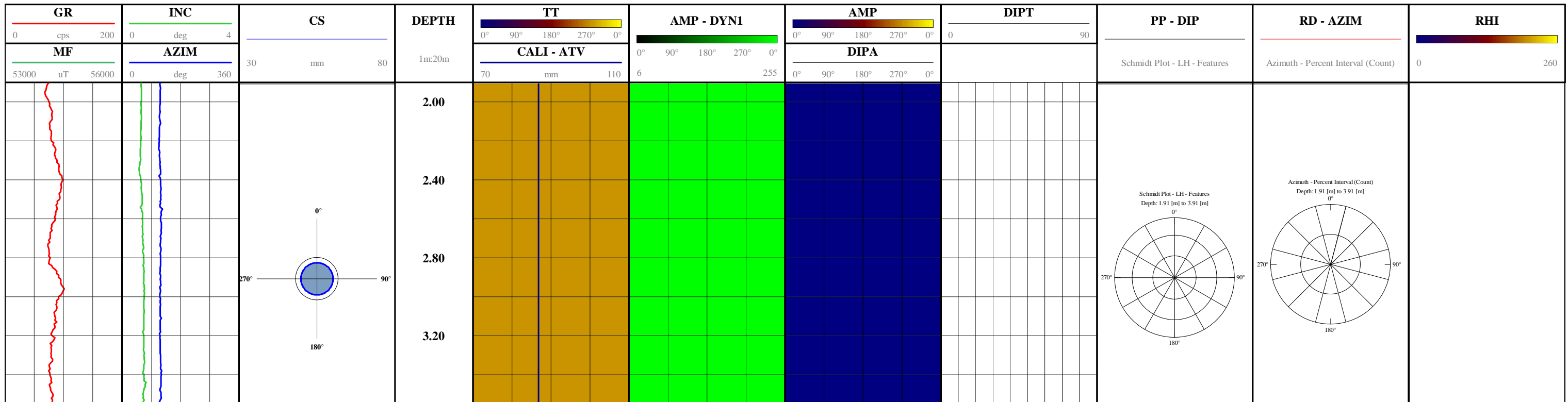
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Bit Size 76mm
Casing Type PVC
Casing Depth N/A

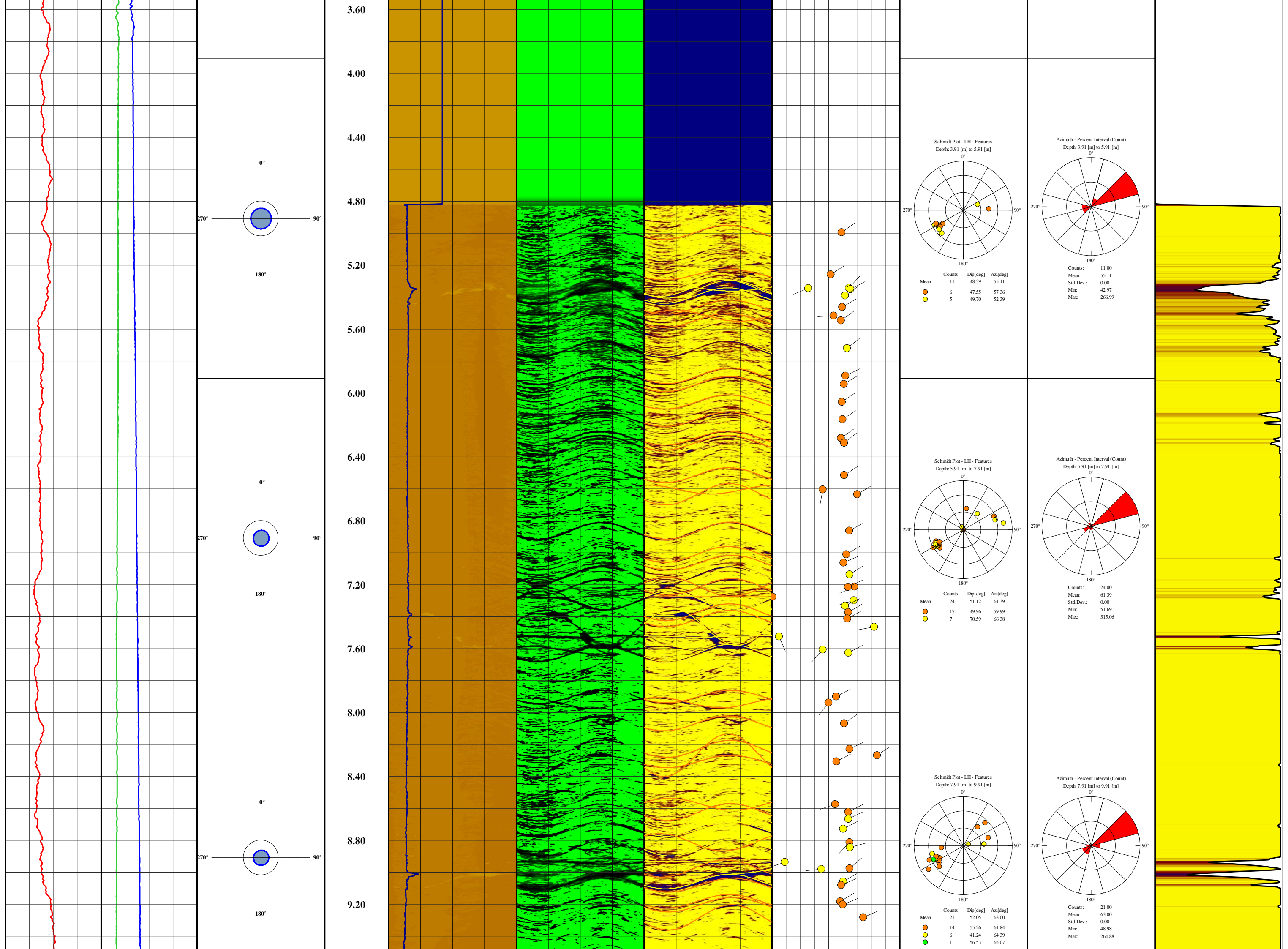
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Collar Easting N/A
Collar Northing N/A
Reduced Level N/A

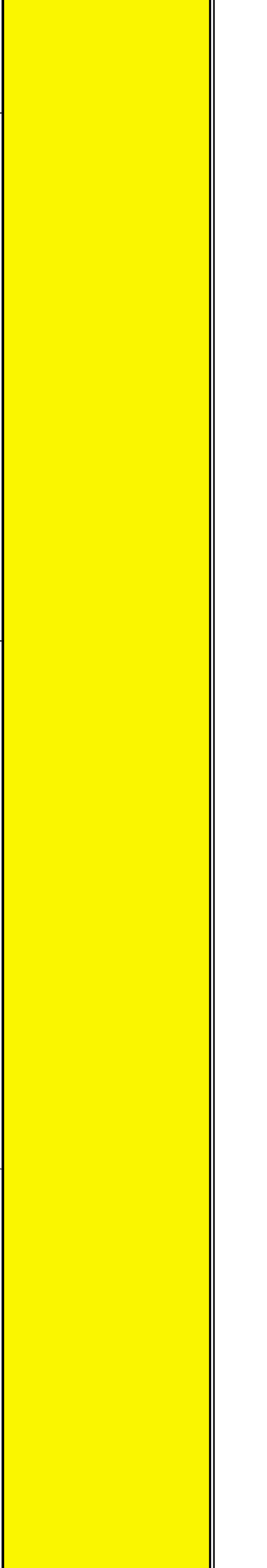
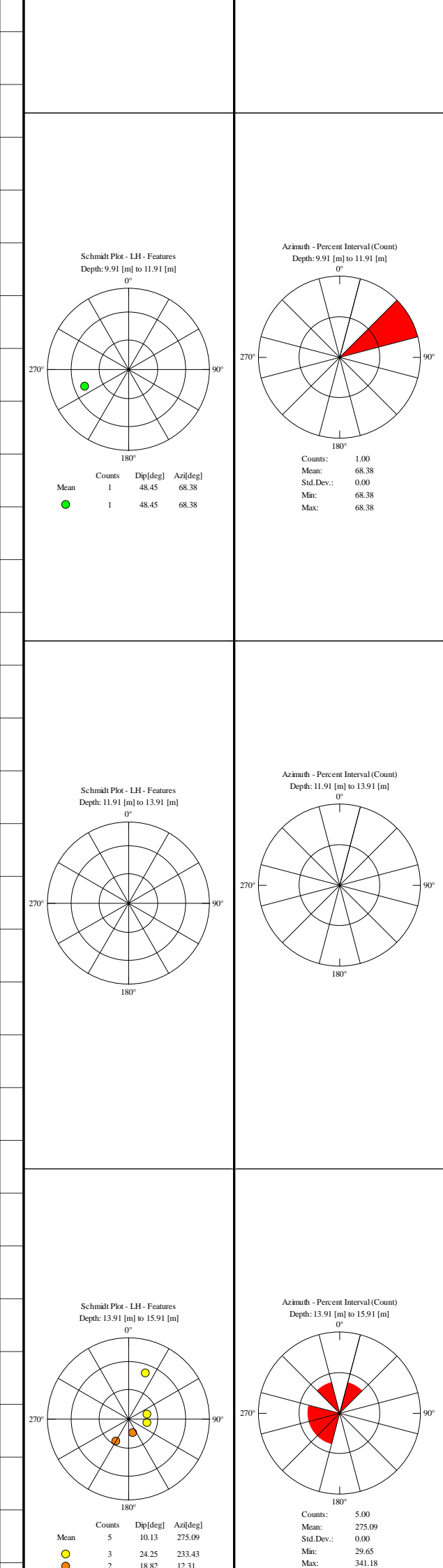
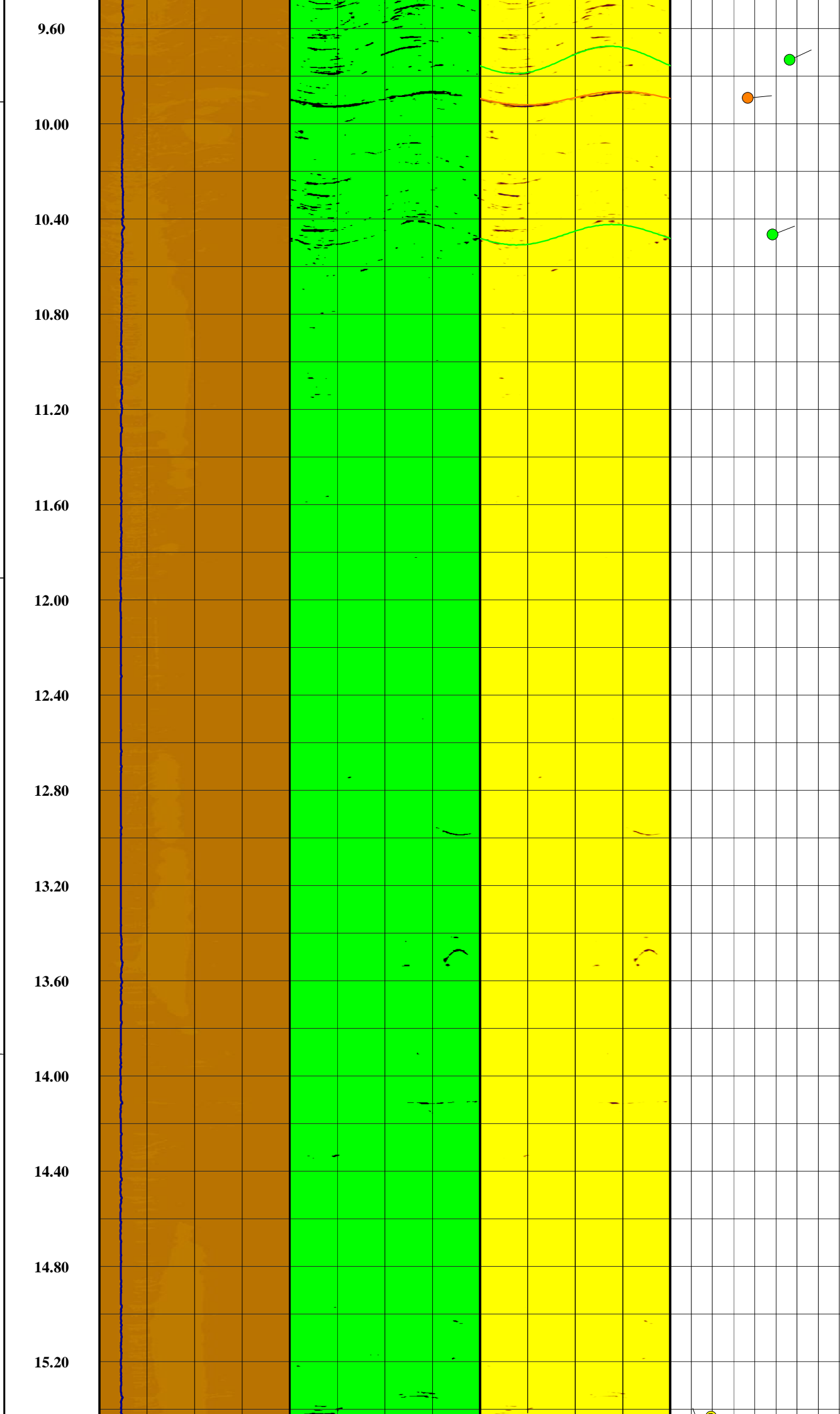
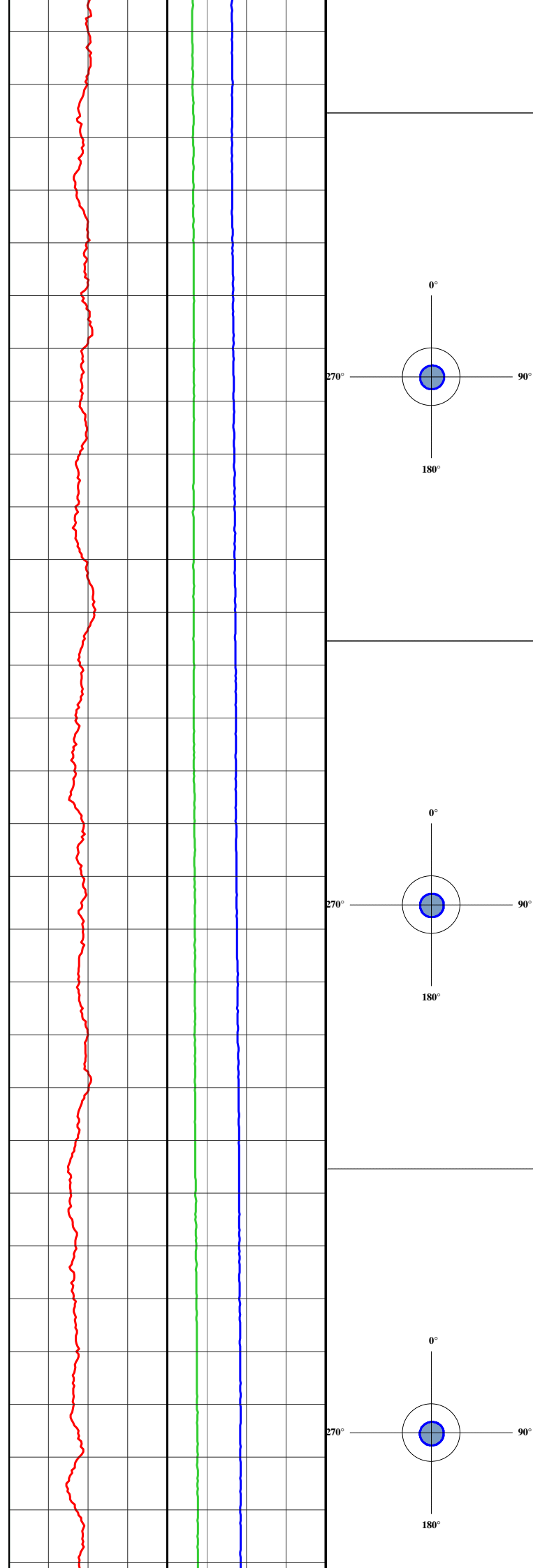
Logging Unit SV031
Engineer J.Mackay
Client Represent Julian Irons
Service Type Televiewer

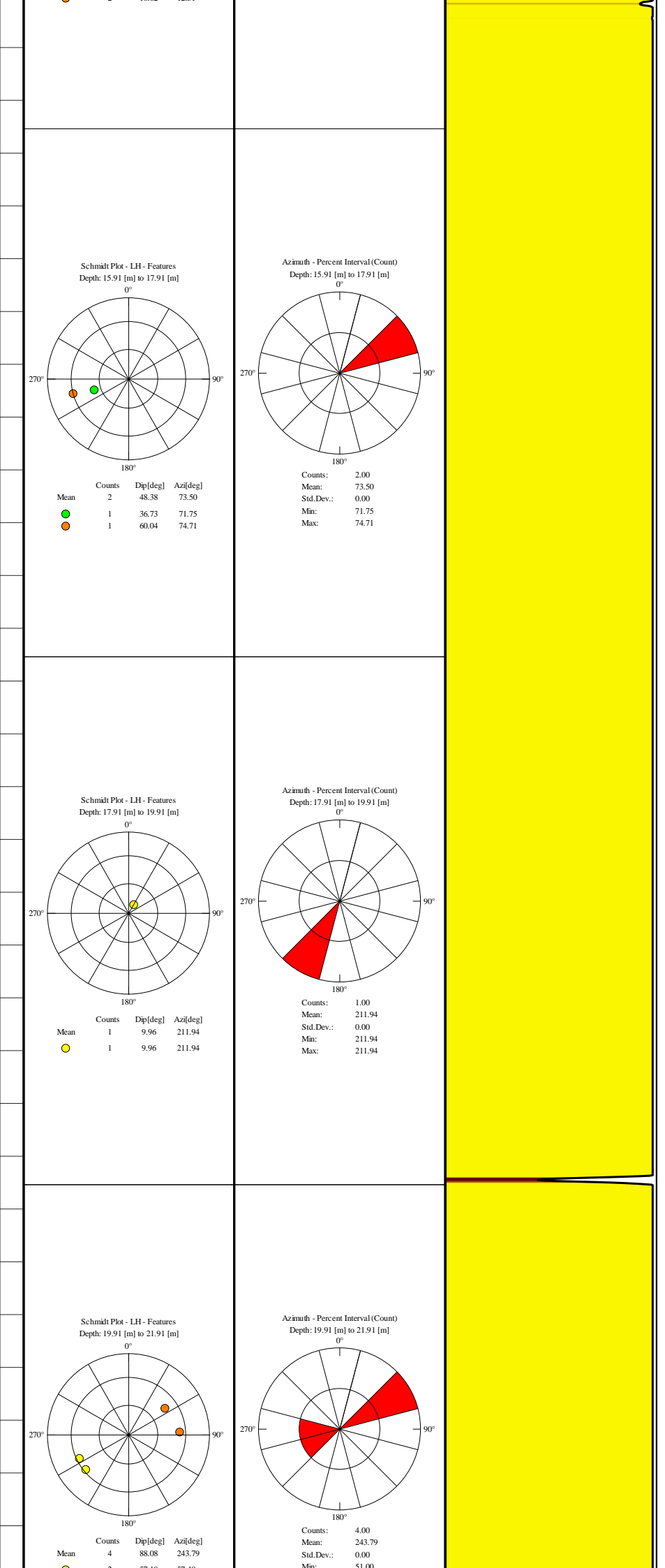
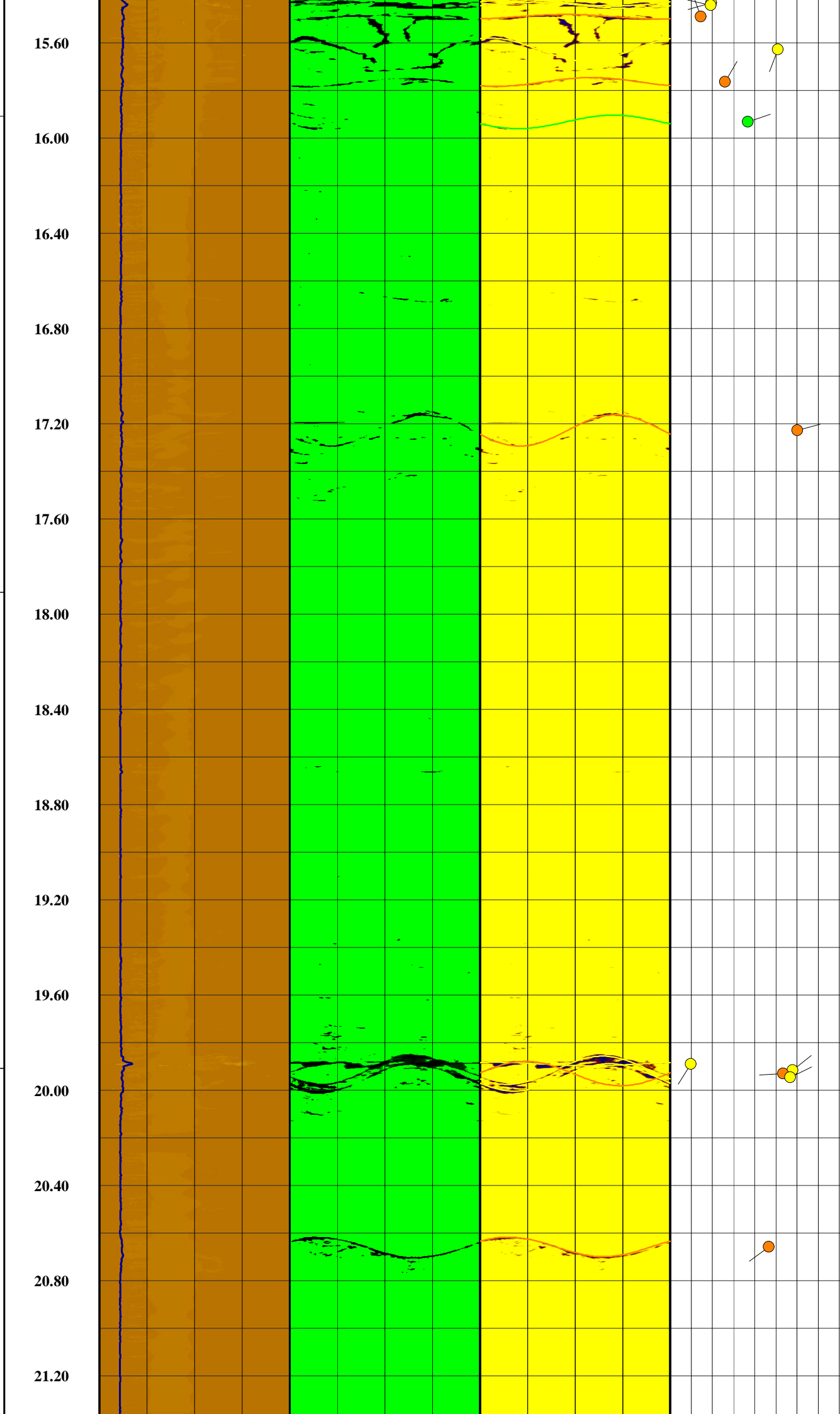
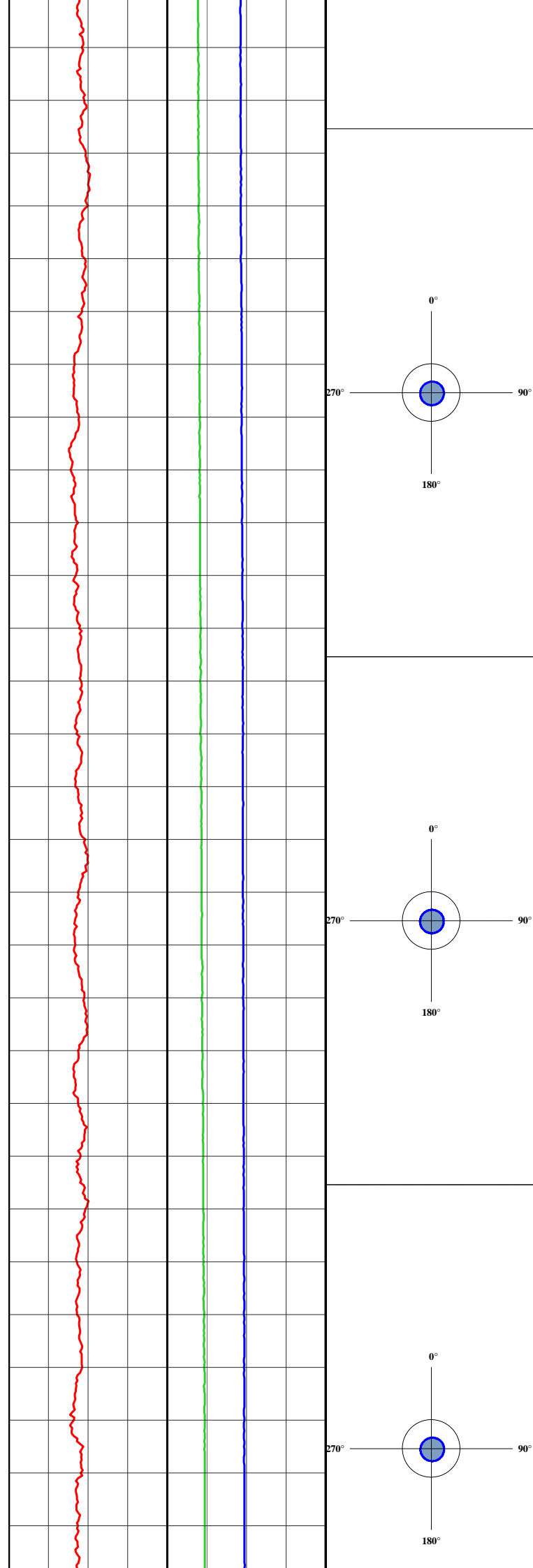
TELEVIEWER LOGS	STRUCTURAL LOGS	TADPOLES	COMMENTS
<p>MF Mag Field GR Gamma INC Tool Inclination (0 = Vertical Down) AZIM Tool Azimuth TT Travel Time Image AMP Amplitude Image AMP - DYN1 Amplitude Image Dynamic 1</p>	<p>DIPA Structures Apparent (Sinusoid Presentation) DIPT Structures True (Tadpole Presentation) PP - DIP Polar Projection Dip (Schmidt) RD - AZIM Rose Diagram - Azimuth CS Cross Section</p>	<p>● Partially Open Fracture ● Closed Fracture ● Foliation/Banding/Bedding</p>	<p>Image data is presented oriented to True North. Magnetic Declination = 10.97 deg Cross Sections are plotted at 2m intervals: White : Tool Position, Light Blue : Nominal Hole Size and Blue : Actual Hole Size</p>
PROCESSED LOGS			
CALI - ATV Calliper Average from ATV	RHI Rock Hardness Index		

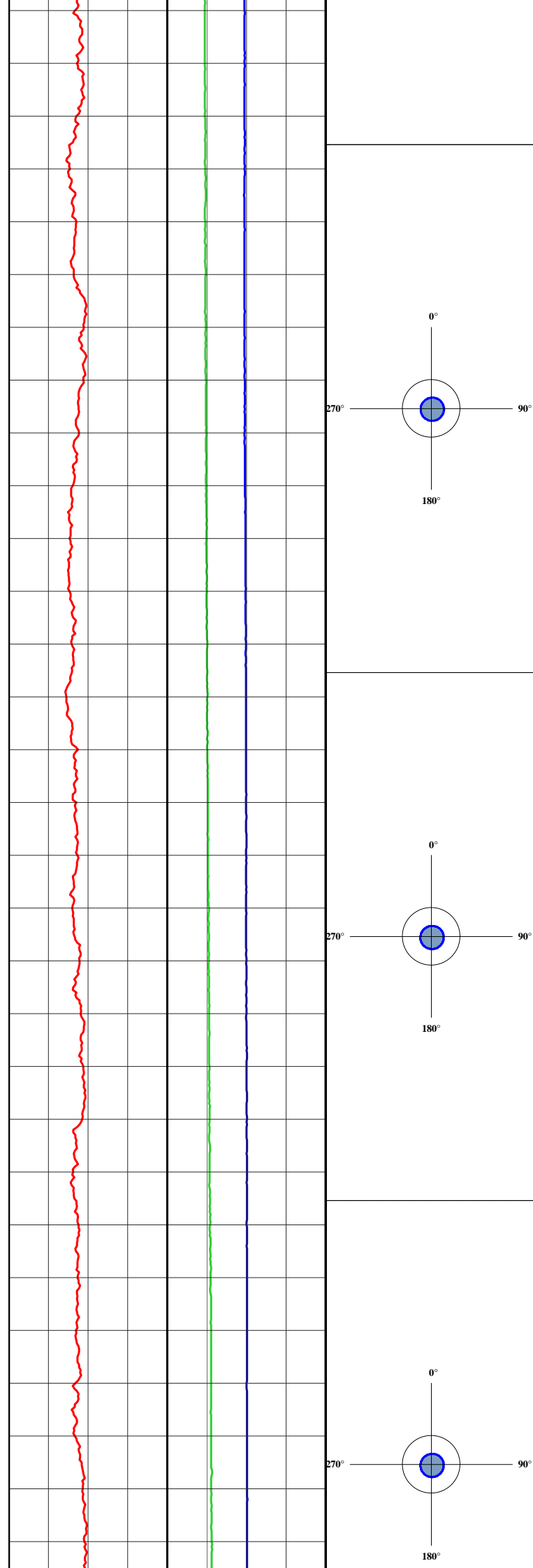
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 Therefore Surtron Technologies (Australia) Pty Ltd shall not be liable or responsible for any loss, damage, cost or expense incurred or sustained by anyone resulting from any interpretations.



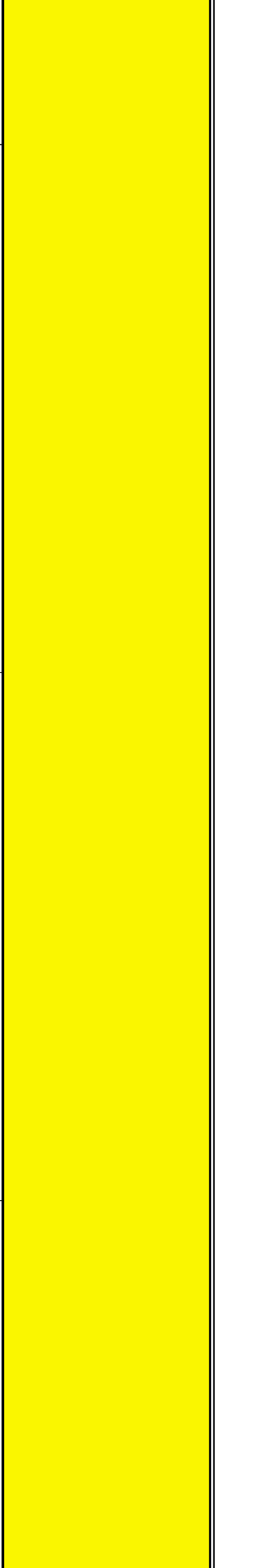
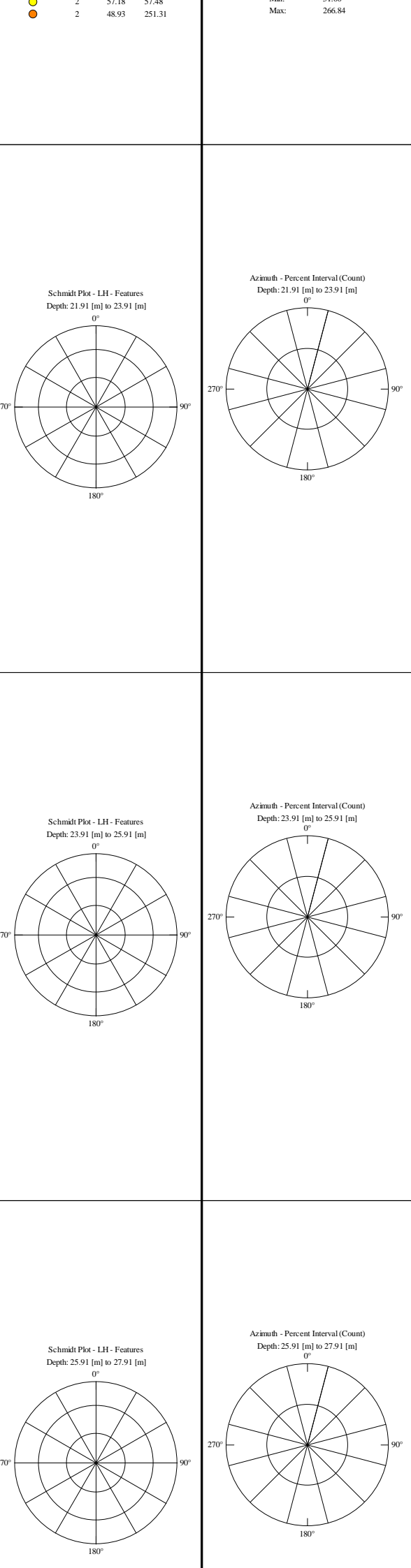
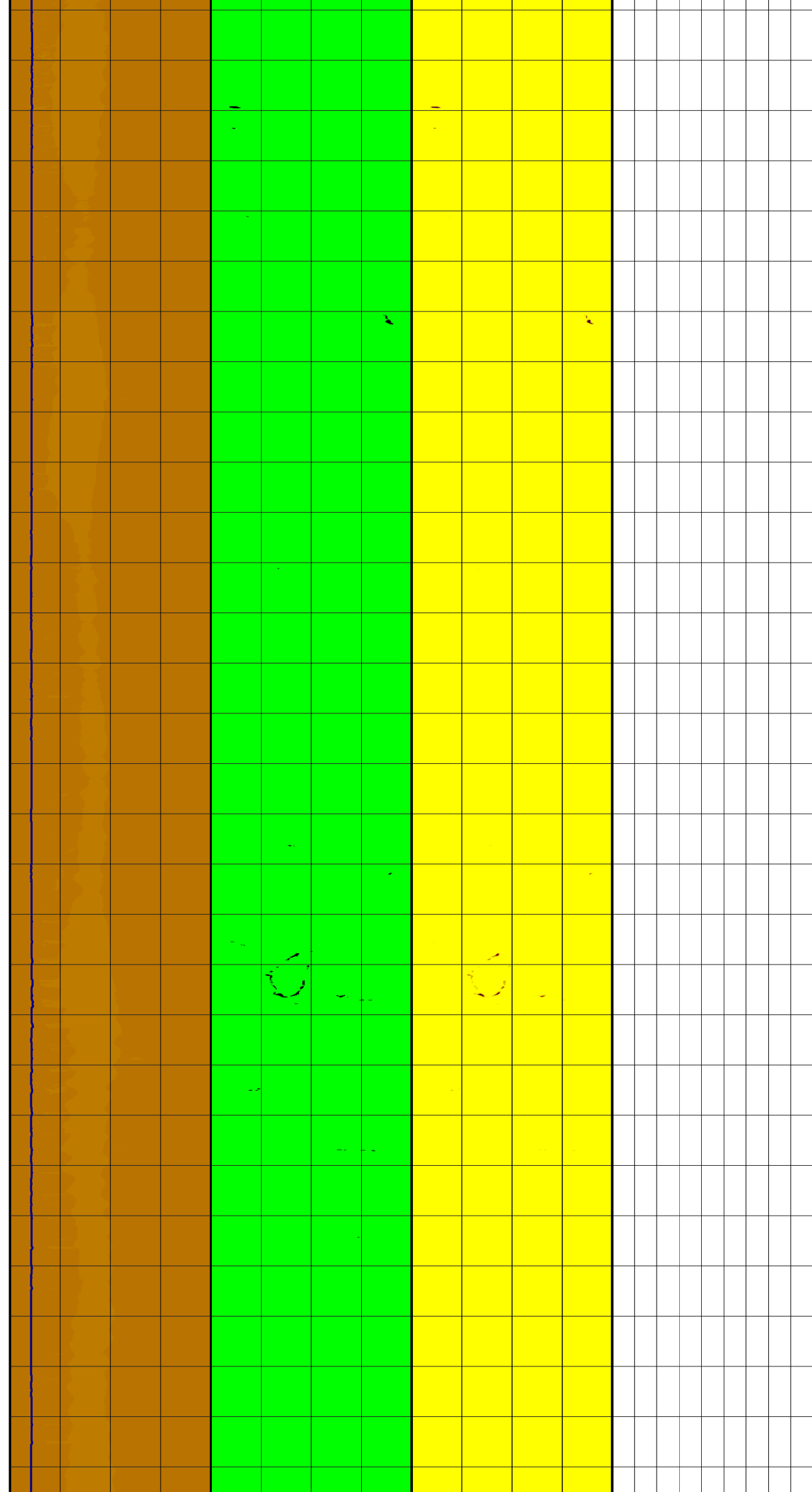


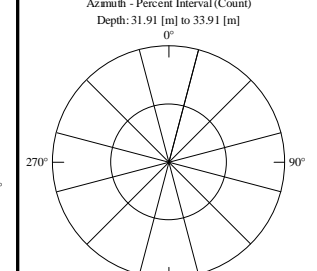
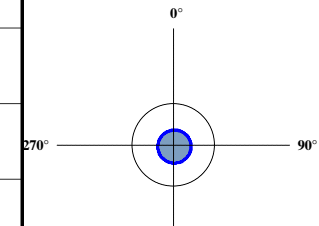
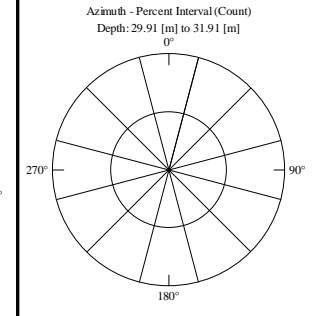
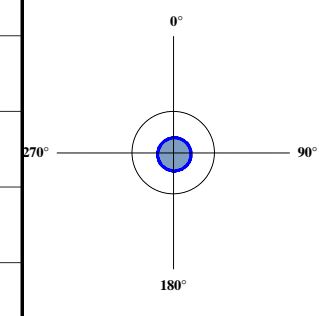
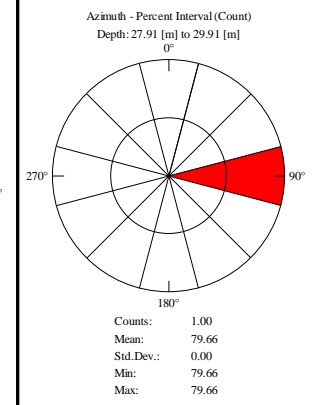
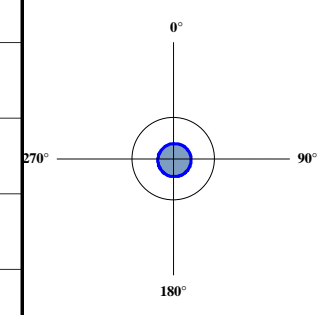
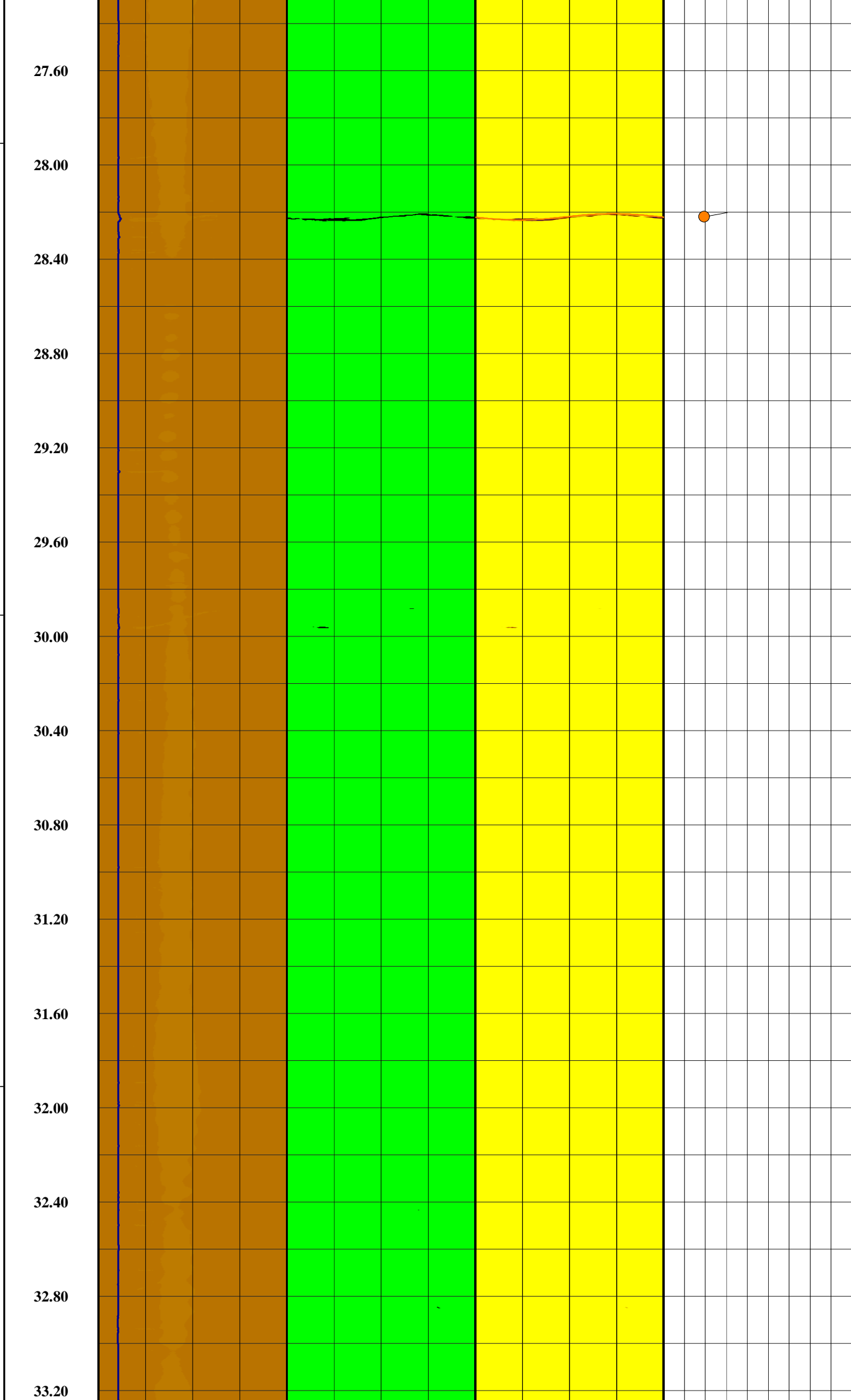
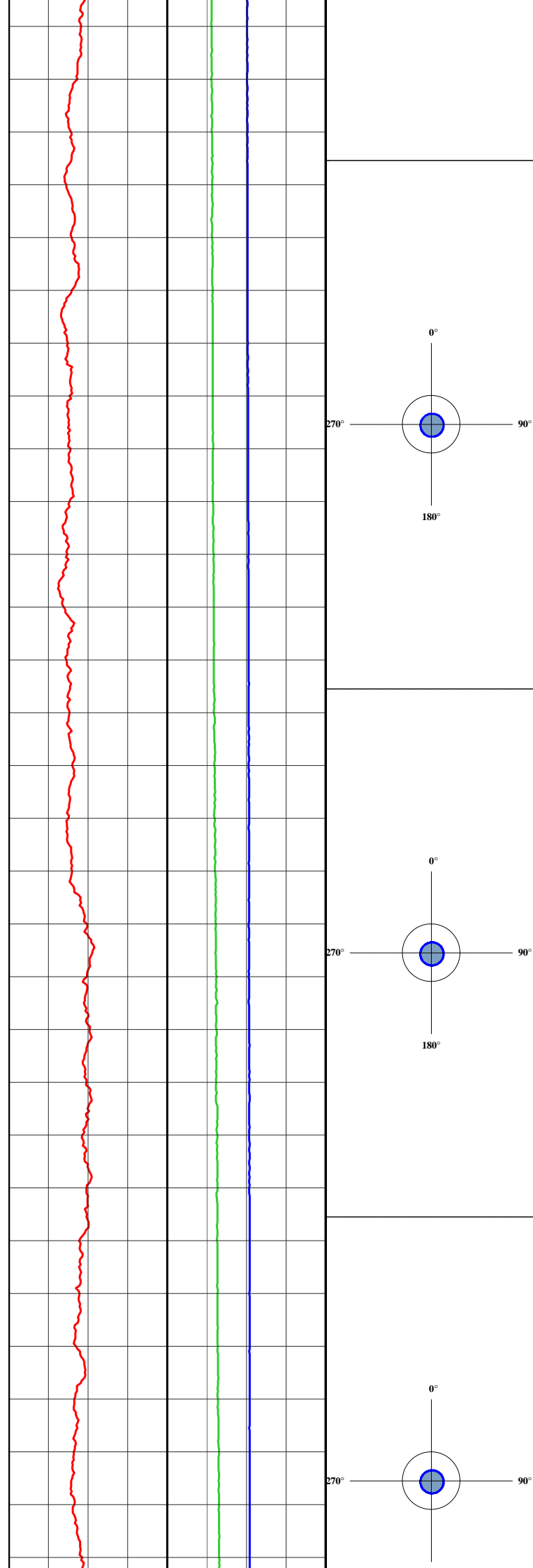


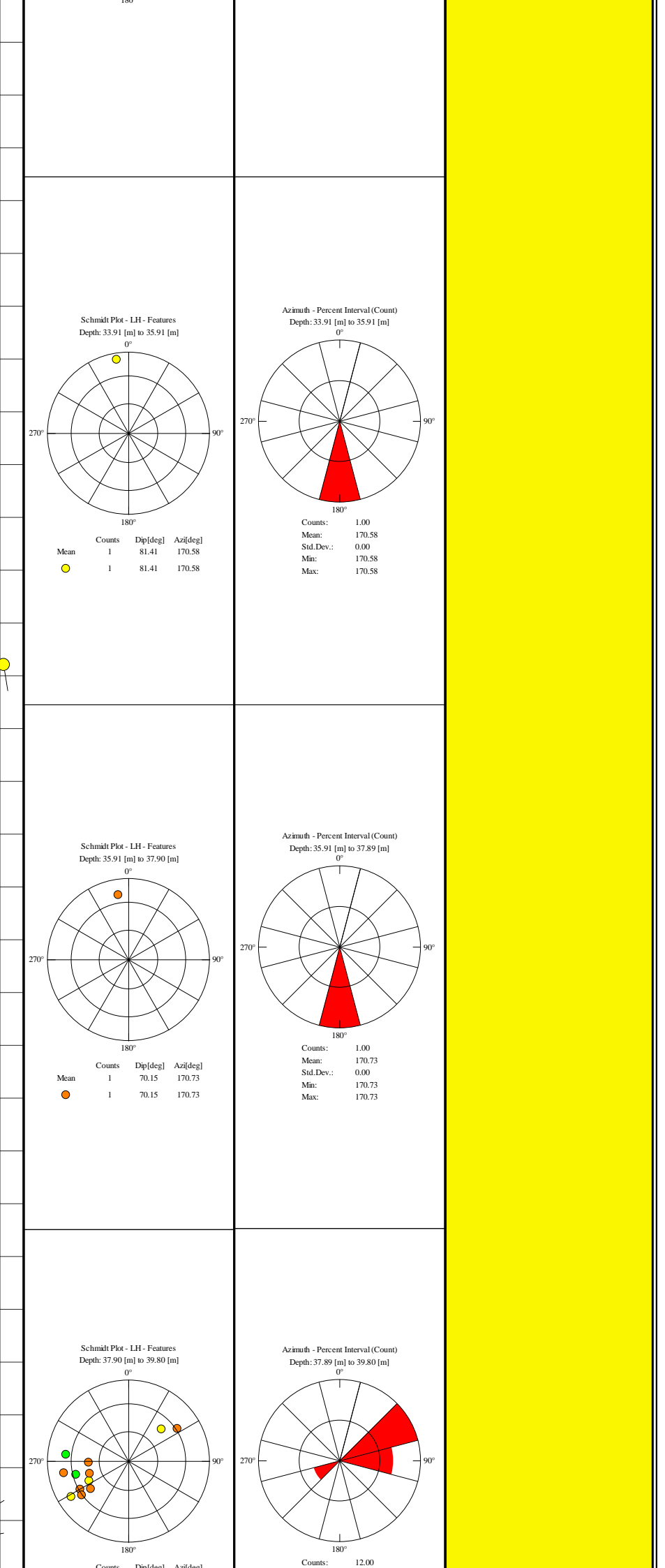
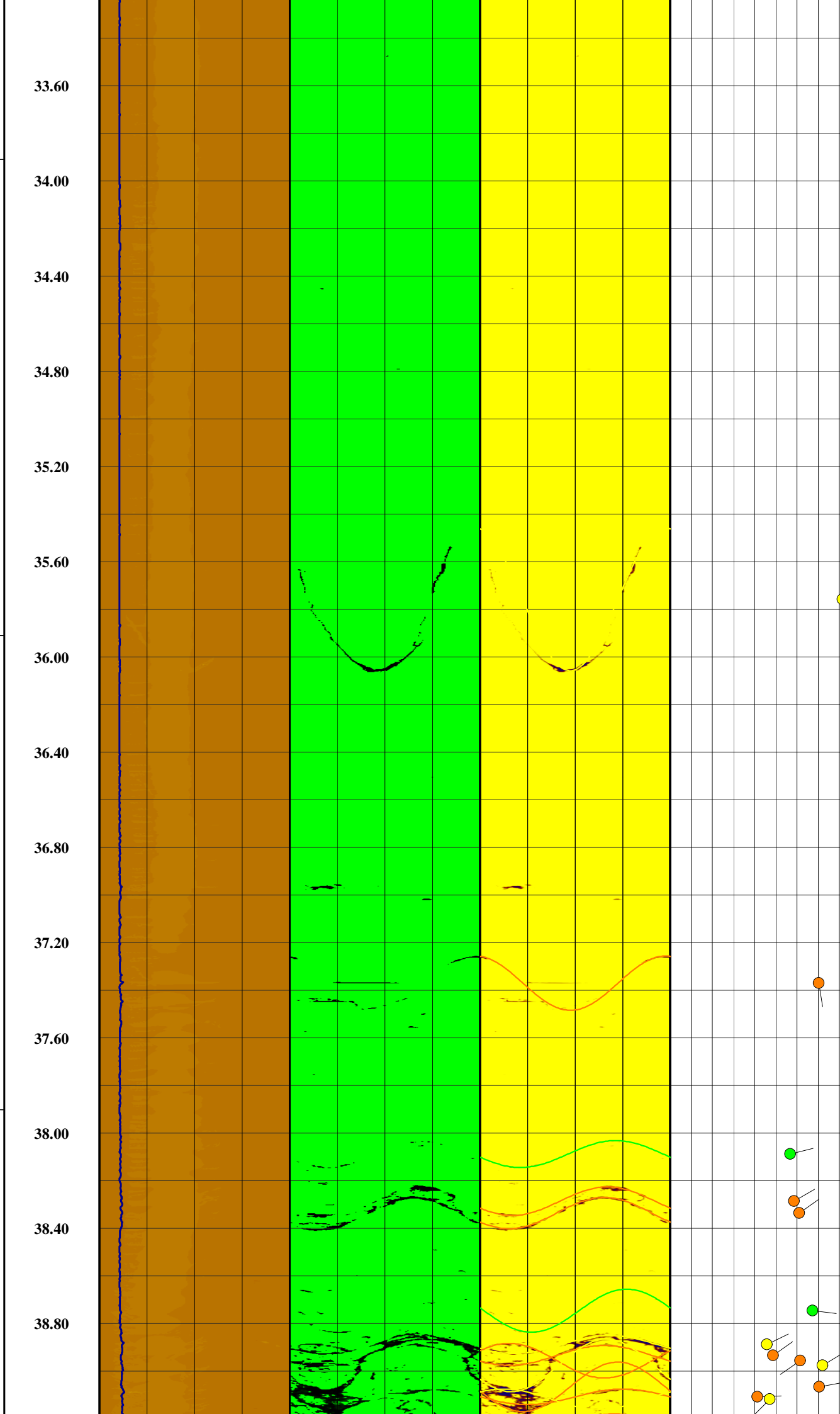
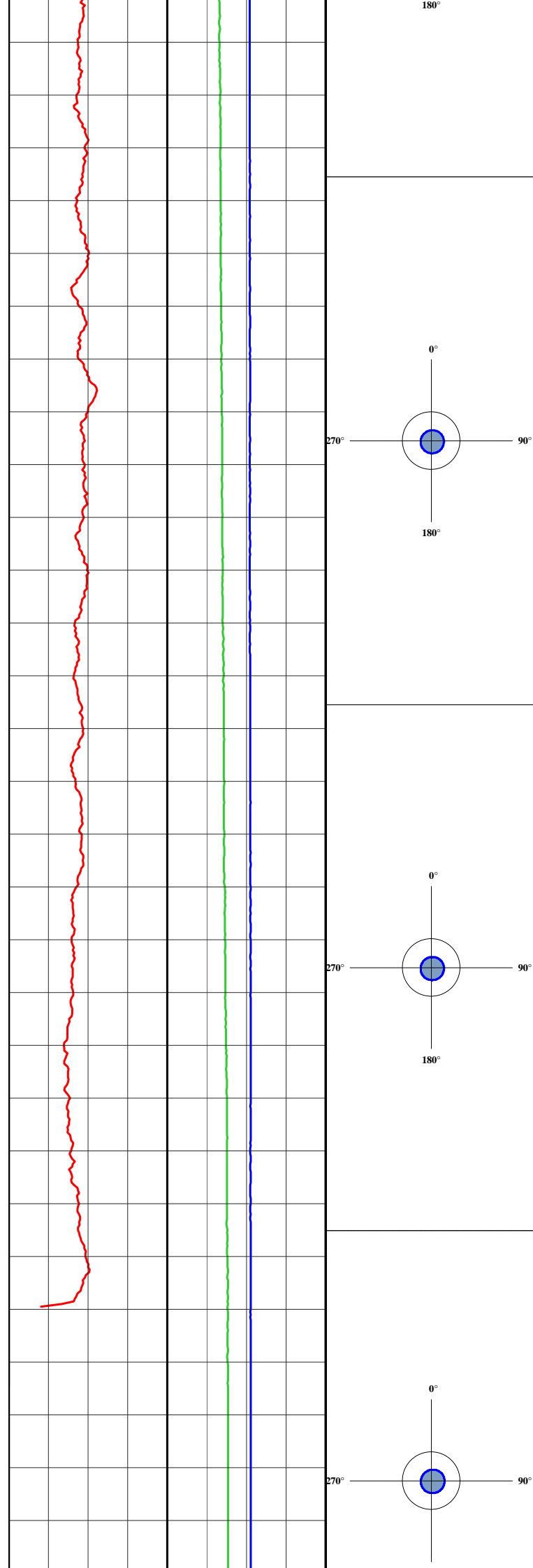


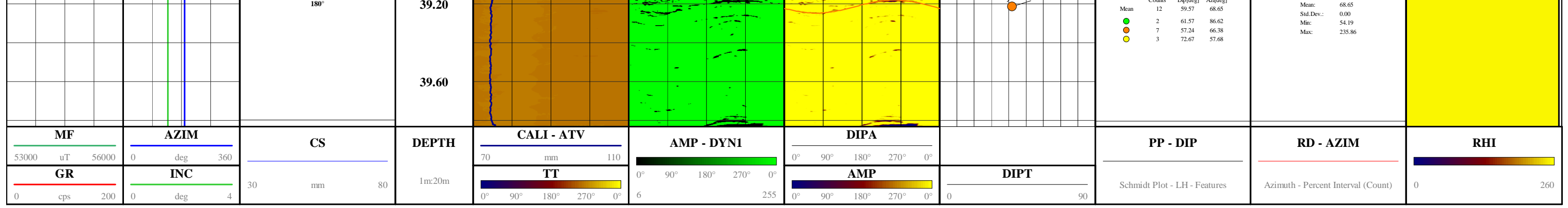


21.60
22.00
22.40
22.80
23.20
23.60
24.00
24.40
24.80
25.20
25.60
26.00
26.40
26.80
27.20









IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT:	CRR	BH No.:	328	Packer type:	Double
PROJECT No.:	110-12936	Test No.:	1	Packer pressure:	3000kPa
		Date:	29/02/2012	Gauge pressures measured in:	kPa
				Tested by:	CS

Vertical depth to:	Top of test section (m):	35.00	Depth of centre of test section (m)	36.25
	Base of test section (m):	37.50	Length of test section (m):	2.50
	Centre of test section(m):	36.25		
	Base of casing (m):	3.00	Gauge Height above ground level	0.00
	Ground water (m)	NR	Hole Diameter in test section (mm)	75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	4114.2	4114.8	4115.1	4115.2	Flow (l/min)
	Water Take	0.00	0.60	0.30	0.10	0.067
2nd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 200	Flow reading	4117.4	4117.6	4118.4	4118.9
	Water Take	0.00	0.20	0.80	0.50	0.100
3rd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 400	Flow reading	4120.4	4120.8	4121.6	4122.2
	Water Take	0.00	0.40	0.80	0.60	0.120
4th period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 200	Flow reading	4122.2	4122.4	4122.5	4122.6
	Water Take	0.00	0.20	0.10	0.10	0.027
5th period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 100	Flow reading	4121.4	4121.4	4121.4	4121.4
	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q) (l/min)	Gauge Press (kPa)	Gauge Press (m of water)	Friction Loss (m)*		Total Head (m)	Lugeon Value	Perm. (m/s)
				Basic	In extra rods			
1st	0.067	100.00	10.220	0.000	0.000	46.470	0.059	6.38E-09
2nd	0.100	200.00	20.440	0.000	0.000	56.690	0.072	7.85E-09
3rd	0.120	400.00	40.880	0.000	0.000	77.130	0.064	6.92E-09
4th	0.027	200.00	20.440	0.000	0.000	56.690	0.019	2.09E-09
5th	0.000	100.00	10.220	0.000	0.000	46.470	0.000	0.00E+00

*Where friction loss is assumed to be negligible.

N.B. Pressure Conversion: 1 bar = 100 kPa = 14.503 psi

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT:	CRR	BH No.:	328	Packer type:	Double
PROJECT No.:	110-12936	Test No.:	2	Packer pressure:	3000kPa
		Date:	29/02/2012	Gauge pressures measured in:	kPa
				Tested by:	Jl

Vertical depth to:

Top of test section (m):	24.00
Base of test section (m):	26.00
Centre of test section(m):	25.00
Base of casing (m):	3.00
Ground water (m)	NR

Depth of centre of test section (m)	25.00
Length of test section (m):	2.00

Gauge Height above ground level	0.00
Hole Diameter in test section (mm)	75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	4138.0	4138.4	4138.9	4139.3	Flow (l/min)
	Water Take	0.00	0.40	0.50	0.40	0.087
2nd period	Time (mins)	0	5	10	15	Average
	Flow reading	4141.3	4141.5	4141.6	4141.8	Flow (l/min)
Gauge Pressure 200	Water Take	0.00	0.20	0.10	0.20	0.033
	Time (mins)	0	5	10	15	Average
Gauge Pressure 400	Flow reading	4143.1	4143.7	4144.1	4144.3	Flow (l/min)
	Water Take	0.00	0.60	0.40	0.20	0.080
4th period	Time (mins)	0	5	10	15	Average
	Flow reading	4144.8	4145.4	4146.2	4146.7	Flow (l/min)
Gauge Pressure 600	Water Take	0.00	0.60	0.80	0.50	0.127
	Time (mins)	0	5	10	15	Average
Gauge Pressure 300	Flow reading	4146.2	4146.2	4146.2	4146.2	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q) (l/min)	Gauge Press (kPa)	Gauge Press (m of water)	Friction Loss (m)*		Total Head (m)	Lugeon Value	Perm. (m/s)
				Basic	In extra rods			
1st	0.087	100.00	10.220	0.000	0.000	35.220	0.126	1.30E-08
2nd	0.033	200.00	20.440	0.000	0.000	45.440	0.037	3.86E-09
3rd	0.080	400.00	40.880	0.000	0.000	65.880	0.062	6.40E-09
4th	0.127	600.00	61.320	0.000	0.000	86.320	0.075	7.73E-09
5th	0.000	300.00	30.660	0.000	0.000	55.660	0.000	0.00E+00

*Where friction loss is assumed to be negligible.

N.B. Pressure Conversion: 1 bar = 100 kPa = 14.503 psi