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Simpevarp site investigation

Geophysical borehole logging in borehole KSH01A, KSH01B and part of KSH02

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Rambøll

April 2003

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Keywords: geophysical logging.

Summary

According to a request from Svensk Kärnbränslehantering AB geophysical borehole logging has been performed in borehole KSH01A, KSH01B and KSH02, all situated in Simpevarp, Oskarshamn, Sweden.

The logging in KSH01A was recorded from 0 m to 1003 m. KSH01B and KSH02 were recorded from 0 m to 100 m.

The present report comprises a description of the applied equipment and the performed logging program, the fieldwork and a presentation and discussion of the results.

Composite sheets of all the processed logs are included in Appenix 1–3.

The logging data was delivered in digital form on a CD as WellCad and Excel files as processed (shifted) files and as raw files in Century and Robertson format.

Contents

1 Introduction

According to a request from Svensk Kärnbränslehantering, geophysical borehole logging has been performed in borehole KSH01A, KSH01B and part of KSH02, all situated in Simpevarp, Oskarshamn, Sweden, Figure 1-1.

The logging program has been executed by RAMBØLL. RAMBØLL is acting as a subcontractor to DGE and ÅF-IPK.

The fieldwork was conducted during the period February 11–15, 2003 in accordance with the instructions and guidelines from SKB (activity plan AP PS 400-03-001 and method description MD 221.002, SKB internal controlling documents) and under supervision of Leif Stenberg, SKB. The work has been carried out in accordance with RAMBØLLs guidelines and standards for logging operations.

In borehole KSH01A logging data was recorded from 0 m to 1003 m. The borehole is cored with a diameter of 76 mm and a slight inclination of app. –80,6 degrees from the horizontal plan. In borehole KSH01B the logs were performed from 0 m to 100 m. The diameter is 76 mm and the inclination app. –87,9 degrees from the horizontal plan. In borehole KSH02 the logs were performed from 0 m to 100 m. The diameter is 76 mm and the inclination app. –85 degrees from the horizontal plan.

Borrhål:	Y-koordinat:	X-koordinat:	
KSH01	1552442,971	6366013,519	Klart
KSH02	1551528,952	6365658,355	Planerat
KSH03	1550906	6365297	Planerat
HSH01	1552545,717	6366217,770	Klart
HSH02	1551368,337	6365682,896	Klart
HSH03	1552544,526	6366213,946	Klart

Figure 1-1. *General overview over the Simpevarp subarea.*

2 Objective and scope

The objective of the surveys is to both receive information of the borehole itself, and from the rock mass around the borehole. Geophysical logging was used to measure changes in physical properties in the borehole fluid and the bedrock surrounding the boreholes. Acoustic Televiewer was used for determination of the deviation of the borehole (azimuth and inclination).

This field report describes the equipment used as well the measurement procedures. Geophysical logging data is presented in graphs as a function of depth in Appendix 1–3.

3 Equipment and logging programme

The geophysical borehole-logging programme in all three boreholes was performed with 7 multi tool probes and resulted in a suite of 20 log types, listed in Table 5-1. The tools and recorded logs are listed in Table 3-1.

Table 3-1. Logging tools and logs recorded in all borings.

Tool	Recorded logs	Dimension	Source detector spacing	Source type
Century 8622 Magnetic susceptibility	Magnetic susceptibility, natural gamma	203 x 4.1 cm		
Century 9030 Gamma density	Gamma density, natural gamma, 140 cm focused guard log resistivity, 10 cm 1-arm caliper	307 x 5.6 cm	20.3 cm	125 mCi Cs137
Century 9041 Normal resistivity and Single point resistance	Normal resistivity (16 & 64 inch), Lateral, single point resistance and natural gamma	237 x 5.3 cm		
Century 9042 Fluid resistivity and temperature	Fluid resistivity, fluid temperature, fluid delta temperature, natural gamma	137 x 4.1 cm		
Century 9072 3 m focused guard	3 m focused guard log resistivity and natural gamma	310 x 6.4 cm		
Century 9310 Sonic	Full wave form travel-time providing P & S-wave velocity picking, compensated P-wave travel-time, and natural gamma	300 x 6.1 cm	Near 91.4 cm, Far 121.9 cm	
RG 25 112 000 HiRAT Acoustic televiewer	Full waveform acoustic amplitude and travel-time, 360° orientated acoustic image, 360° very high resolution caliper, Borehole azimuth and dip	246 x 4 cm		

4 Fieldwork description

4.1 General

The logging programme in borehole KSH02 was executed on February 11 and 12, 2003 and in borehole KSH01A and KSH01B in the period from February 12–15, 2003.

The fluid resistivity and temperature logs are recorded in a downward direction, as the first log run. All other log types are recorded running the tool in upward direction in the borehole.

The applied logging equipment was cleaned according to SKB cleaning level 2 (SKB MD 600.004) before arriving at the site. Before logging the wire and logging tools were also cleaned at the site using alcohol.

The applied logging equipment was calibrated before arriving at the site. The procedures and calibration values were delivered separately.

For control each log run is normally recorded both in down and in upward direction using the down run as a repeat section. For logging tool 9030 and 9042 the data is controlled by recording a repeat section in the same direction, upward for the 9030 and downward for the 9042. The depth of the probe in the borehole is shown on both the recording computer and the winch. On the winch the tension of the cable is also shown. The winch will stop automatically if the tension changes rapidly. The tension was recorded on all log runs using Century equipment.

All data was recorded with max.10 cm sample interval. The speed of the logging tools was in general 10 m/min for the used log runs, except the 9310 sonic tool in the KSH01B and KSH02, where the speed was 20 m/min.

The logging programme was recorded with the following comments below.

4.2 Borehole KSH01A

Century 9030. Medium Guard log

It was not possible to obtain realistic values from the medium guard log. The problem is possibly caused by electric problems between the probe, wire and the 100 m steel casing.

4.3 Borehole KSH02

Century 9030. Medium Guard log

Problems with the guard log values were saturated due to high resistivity values. Only the lower part of the boring from 100 m to 80 m was recorded.

Century 9310. Sonic log

Due to bad picking of the arrival time from the far receiver, the data were clipped under 3000 m/s and over 8000 m/s.

5 Presentation and discussion of results

All relevant logging events were described in the daily report sheet which were delivered separately. A function test of the deviations measurements in the HiRAT tool was performed before arriving at the site, following SKB document SKB MD 224.001.

The logs have not been filtered during logging or presentation. Logs presented on Draw. Nos. 1.1, 2.1 and 3.1 in Appendix 1–3 are presented in Table 5-1.

Table 5-1. Logs presented on Draw. Nos. 1.1, 2.1 and 3.1 in Appendix 1–3.

Log	Log name short	Unit	Tool
Caliper, 1-arm	CALIPER1	mm	9030
Gamma-gamma density	DENSITY	kg/m3	9030
Focused guard log resistivity, 140 cm	RES(MG)	ohm-m	9030
Natural gamma	GAM(NAT)	µR/h	9030
Normal resistivity 16 inch	RES(16N)	ohm-m	9041
Normal resistivity 64 inch	RES(64N)	ohm-m	9041
Lateral resistivity	LATERAL	ohm-m	9041
Single point resistance	SPR	ohm	9041
Fluid temperature	TEMP(FL)	deg C	9042
Fluid resistivity	RES(FL)	ohm-m	9042
Focused guard log resistivity, 300 cm	RES(DG)	ohm-m	9072
P-wave velocity	P-VEL	m/s	9310
Full wave form, near receiver	AMP(N)	µs	9310
Full wave form, far receiver	AMP(F)	µs	9310
Magnetic susceptibility	MAGSUSCEP	SI*10-5	8622
Caliper, high resolution. 360°	CALIPER 3D	mm	HiRAT
High resolution 1D Caliper	CALIPER MEAN	mm	HiRAT
Borehole azimuth magnetic north	AZIMUTH MN	deg	HiRAT
Borehole Inclination from lateral	DIP	deg	HiRAT
360° orientated acoustic travel time	TRAVEL TIME	100 ns	HiRAT
360° orientated acoustic travel time	AMPLITUDE	–	HiRAT

5.1 Calculated curves

5.1.1 Calculation of coordinates

To convert the measured azimuth and inclination to grid-coordinates, one needs to take into account the magnetic declination on the site at the time of data acquisition. The actual declination was found by means of the current International Geomagnetic Reference Field (IGRF). The actual values can be found below. Disturbances from solar storms etc. were not taken into account. By means of the "Radius Of Curvature" method implemented in WellCad, the azimuth and inclination was converted to northing, easting and TVD coordinates relative to the top of the borehole. In the same calculation the magnetic declination was added. Finally the relative coordinates were added to the given coordinate in RT90 for the top of the borehole.

```
Model: IGRF2000
  Latitude: 57 deg, 24 min, 59 sec
  Longitude: 16 deg,  40 min, 41 sec
  Elevation: 0.03 km
  Date of Interest: 2/12/2003
  ------------------------------------------------------------------
------
   D(+ East)    I (+ Down)
     (deg)         (deg)
    3d    5m    71d   17m
```

5.1.2 Conversion of the magnetic susceptibility

The magnetic susceptibility was converted for CGS units to SI units by multiplying the CGS value by 4π.

5.1.3 Conversion of natural gamma

The natural gamma log was converted from CPS to μR/h by multiplying the constant 0.077. This constant was computed from the logs previously performed in KLX02.

5.2 Borehole KSH01A

In order to obtain an exact depth calibration in borehole KSH01A, the track marks made while drilling are used. The connection between the track marks and the logs is obtained from the HiRAT Acoustic tool.

The HiRAT logs is merged from three files using the topmost-recorded file, KSH01a_Hirat_Up_120pixels_run4 as the primary file. This file is recorded from a depth of 603 m to 0 m. The next file is then added in continuation of the previous file using geological features. This practice is used with all three files. After the files are merged, the HiRAT image logs are shifted 1.99 m down and the natural gamma 0.57 m down.

To obtain a common depth reference point, the track mark at 108.23 m in the HiRAT file is used as the marker at depth 110 m. The HiRAT tool is therefore shifted 1.77 m down. The same correction value is used for the whole boring.

The reference mark made in the borehole, the recorded track marks from the HiRAT and the corrected depth are observed in the following depths, Table 5-2.

Table 5-2. The reference mark made in the borehole, the recorded track marks from the HiRAT and the corrected depth.

Reference mark	HIRAT recorded	HIRAT after shift
110	108.23	110
150	148.24	150.01
200	198.26	200.03
250	248.28	250.05
300	298.31	300.08
350	348.35	350.12
400	398.37	400.14
450	448.38	450.15
500	498.43	500.2
550	548.43	550.2
600	598.48	600.25
650	648.51	650.28
700	698.49	700.26
750	748.51	750.28
800	798.57	800.34
850	848.58	850.35
900	897.62	899.39
950	948.65	950.42

Using the natural gamma from the HiRAT as reference, the natural gamma logs from the other probes are aligned to the same depth, and the shift correction value for the other tools is found. These values are shown in Table 5-3.

Table 5-3. Shift correction values in borehole KSH01A for the other tools using the natural gamma logs from the other probes.

Tool	Shift correction value
8622	1.62 m down
9030	1.03 m down
9041	1.70 m down
9042	0.94 m down
9072	1.32 m down
9310	1.54 m down
HiRAT	1.77 m down

The complete log suite for borehole KSH01A is presented as composite log sheets in Draw. No. 1.1 in Appendix 1. The logs presented on Draw. No. 1.1 are listed in Table 5-1.

5.3 Borehole KSH01B

Using the natural gamma from the 9042 as reference, the natural gamma logs from the other probes are aligned to the same depth, and the shift correction value for the other tools is found. These values are shown in Table 5-4.

Table 5-4. Shift correction values in borehole KSH01B for the other tools using the natural gamma logs from the other probes.

Tool	Shift correction value
8622	0
9030	0.18 m up
9030. Medium guard	0.07 m down
9041	0
9042	0
9072	0
9310	0.02 m down
HiRAT	0.04 m down

The complete log suite for borehole KSH01B is presented as composite log sheet in Draw. No. 2.1 in Appendix 2. The logs presented on Draw. No. 2.1 are listed in Table 5-1.

5.4 Borehole KSH02

Using the natural gamma from the 9042, the natural gamma logs from the other probes are aligned to the same depth, and the shift correction value for the other tools is found. These values are shown in Table 5-5.

Table 5-5. Shift correction values in borehole KSH02 for the other tools using the natural gamma logs from the other probes.

Tool	Shift correction value
8622	0
9030	0.35 m up
9030. Medium guard	0.10 m down
9041	0.30 m up
9042	0
9072	0
9310	0.1 m up
HiRAT	0.08 m down

The complete log suite for borehole KSH02 is presented as composite log sheet in Draw. No. 3.1 in Appendix 3. The logs presented on Draw. No. 3.1 are listed in Table 5-1.

6 Digital delivery

6.1 Delivery of logging data

Geophysical logging data were delivered in digital format on a CD directly after the termination of the field activities. Recorded files have been delivered in WellCad format. Processed and shifted files have been delivered in both WellCad and Excel files. The Excel files are delivered in a structure adjusted for SICADA.

The delivered data have been inserted in the database (SICADA) of SKB. The SICADA reference to the present activity is Field note No. 43.

Only the recorded log files used in the drawings has been delivered. The recorded files in WellCad *.wcl format are listed in Table 6-1.

The drawing files in WellCad *.wcl format are listed in Table 6-2.

The data files in Excel format are listed in Table 6-3. The Excel files contain the sheets listed in Table 6-4.

6.2 Calculation of the total magnetic field

The data delivered in the “tot magn field” column, in the “Acoustic televiewer” sheet, was calculated as the square root of the sum of the 3 components, from the magnetometer in the HiRAT probe, squared.

6.3 Calculation of the magnetic inclination

The data delivered in the “magn_inclination” column, in the “Acoustic televiewer” sheet, was found by calculating the angle between the z component and the summarized vector of the x and y components from the magnetometer in the HiRAT probe.

Table 6-1. Recorded log files in WellCad format.

Borehole	Probe	Log direction	WellCad File
KSH01A	9042	down	KSH01a_02-12-03_11-16_9042C_.10_0.10_1003.60_ORIG.wcl
KSH01A	8622	up	KSH01a_02-12-03_15-32_8622C_.10_-1.90_1001.50_ORIG.wcl
KSH01A	9072	up	KSH01a_02-12-03_17-51_9072C_.10_-1.10_1001.60_ORIG.wcl
KSH01A	HiRAT	up	KSH01a_HiRAT_up_120pixels_run2.wcl
KSH01A	HiRAT	up	KSH01a_HiRAT_up_120pixels_run3.wcl
KSH01A	HiRAT	up	KSH01a_HiRAT_up_120pixels_run4.wcl
KSH01A	9030	up	KSH01a_02-14-03_12-47_9030CA_.10_91.30_1001.00_ORIG.wcl
KSH01A	9041	up	KSH01a_02-14-03_15-22_9041C_.10_-2.00_1000.40_ORIG.wcl
KSH01A	9310	up	KSH01a_02-15-03_11-33_9310C2_.10_483.90_999.00_ORIG.wcl
KSH01A	9310	up	KSH01a_02-15-03_12-26_9310C2_.10_406.40_492.00_ORIG.wcl
KSH01A	9310	up	KSH01a_02-15-03_12-41_9310C2_.10_-1.70_412.00_ORIG.wcl
KSH01B	8622	up	KSH01b_02-12-03_14-38_8622C_.10_0.00_100.20_ORIG.wcl
KSH01B	9030	up	KSH01b_02-14-03_11-43_9030CA_.10_0.40_100.10_ORIG.wcl
KSH01B	9041	up	KSH01b_02-14-03_17-07_9041C_.10_5.50_100.50_ORIG.wcl
KSH01B	9042	down	KSH01b_02-12-03_14-08_9042C_.10_0.10_100.10_ORIG.wcl
KSH01B	9072	up	KSH01b_02-12-03_19-58_9072C_.10_0.20_100.20_ORIG.wcl
KSH01B	9310	up	KSH01b_02-14-03_17-44_9310C2_.10_0.00_99.30_ORIG.wcl
KSH01B	HiRAT	up	KSH01b_HiRAT_up_120pixels_run1.wcl
KSH02	8622	up	KSH02a_02-11-03_15-24_8622C_.02_0.38_100.38_ORIG.wcl
KSH02	9030	up	KSH02a_02-11-03_16-51_9030CA_.10_0.40_100.20_ORIG.wcl
KSH02	9041	up	KSH02a_02-11-03_18-19_9041C_.10_0.10_100.30_ORIG.wcl
KSH02	9042	down	KSH02a_02-11-03_14-05_9042C_.02_0.20_100.08_ORIG.wcl
KSH02	9072	up	KSH02a_02-11-03_15-59_9072C_.02_0.62_100.42_ORIG.wcl
KSH02	9310	up	KSH02a_02-11-03_17-38_9310C2_.10_-0.10_99.20_ORIG.wcl
KSH02	HiRAT	up	KSH02a_HiRAT_up_0-100_120pixels_run1.wcl

Table 6-2. Drawing files in WellCad format.

Borehole	Drawing	WellCad file
KSH01A	1.1	KSH01A_Presentation.WCL
KSH01A	1.2	KSH01A_Deviation.WCL
KSH01A	1.3	KSH01A_Deviation.WCL
KSH01B	2.1	KSH01B_Presentation.WCL
KSH01B	2.2	KSH01B_Deviation.WCL
KSH01B	2.3	KSH01B_Deviation.WCL
KSH02	3.1	KSH02a_Presentation.WCL
KSH02	3.2	KSH02a_Deviation.WCL
KSH02	3.3	KSH02a_Deviation.WCL

Table 6-3. Data files in excel, in SICADA format.

Borehole	Excel file
KSH01A	KSH01A_data.xls
KSH01B	KSH01B_data.xls
KSH02	KSH02a_data.xlsL

Table 6-4. Sheets included in the excel files, in SICADA format.

Sheet	Borehole	Other
Acoustic televiewer	KSH01A, KSH01B, KSH02	See description of “total magnetic field” and “magnetic inclination” below.
Gyro	Not recorded	
Focused resistivity 140 cm	KSH01B and KSH02. Not recorded in KSH01A	
Focused resistivity 300 cm	KSH01A, KSH01B, KSH02	
Fullwave sonic	KSH01A, KSH01B, KSH02	column: v_velocity (shear wave). Not interpreted from the recorded data.
Caliper1	KSH01A, KSH01B, KSH02	
Caliper mean	KSH01A, KSH01B, KSH02	From Acoustic televiewer
Fluid resistivity	KSH01A, KSH01B, KSH02	
Fluid Temperature	KSH01A, KSH01B, KSH02	
Density	KSH01A, KSH01B, KSH02	
Resistivity	KSH01A, KSH01B, KSH02	Includes Lateral, normal 16” and 64”
Natural gamma	KSH01A, KSH01B, KSH02	
Self potential	Not recorded	
Single point resistivity	KSH01A, KSH01B, KSH02	
Magnetic susceptibility	KSH01A, KSH01B, KSH02	

Geophysical borehole logging, borehole KSH01A

Borehole No. KSH01A

Co-ordinates inRT90

X: 6366013.461 Y: 1552442.978 Z: 5.314

Diametre:	70 mm from 100 to 1003 m
Reaming Diametre:	200 mm from 0 to 100 m
Outer Casing:	-
Inner Casing:	-
Borehole Length:	1003 m
Cone:	-
Inclination at ground surface:	- 80.60 deg
Azimuth:	174.15 deg
Comments:	-

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030	mm
DENSITY	Gamma-gamma density	9030	Kg/m3
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9030	µR/h
RES(16N)	Normal resistivity 16 inch	9041	ohm-m
RES(64N)	Normal resistivity 64 inch	9041	ohm-m
LATERAL	Lateral resistivity	9041	ohm-m
SPR	Single point resistance	9041	ohm-m
TEMP(FL)	Fluid temperature	9042	deg C
RES(FL)	Fluid resistivity	9042	ohm-m
RES(DG)	Focused guard log resistivity, 300cm	9072	ohm-m
P-VEL	P-wave velocity	9310	m/s
AMP(N)	Full wave form, near receiver	9310	µs
AMP(F)	Full wave form, far receiver	9310	µs
MAGSUSCEP	Magnetic susceptibility	9622	SI*10-5
CALIPER 3D	Caliper, high resolution 360 degrees	HiRAT	mm
CALIPER MEAN	High resolution 1D caliper	HiRAT	mm
AZIMUTH MN	Borehole azimuth magnetic north	HiRAT	deg
DIP	Borehole inclination from lateral	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-

Rev.	Date	Drawn by	Control	Approved
0	05032003	JRI	FDH	UTN

Job 360210A

Scale 1:500

DGE, Håndværkersvinget 11, 2970 Hørsholm, Phor
RAMBØLL. Bredevej 2, DK-2830 Virum, Phone + 4

SKB geophysical borehole logging
Borehole KSH01A

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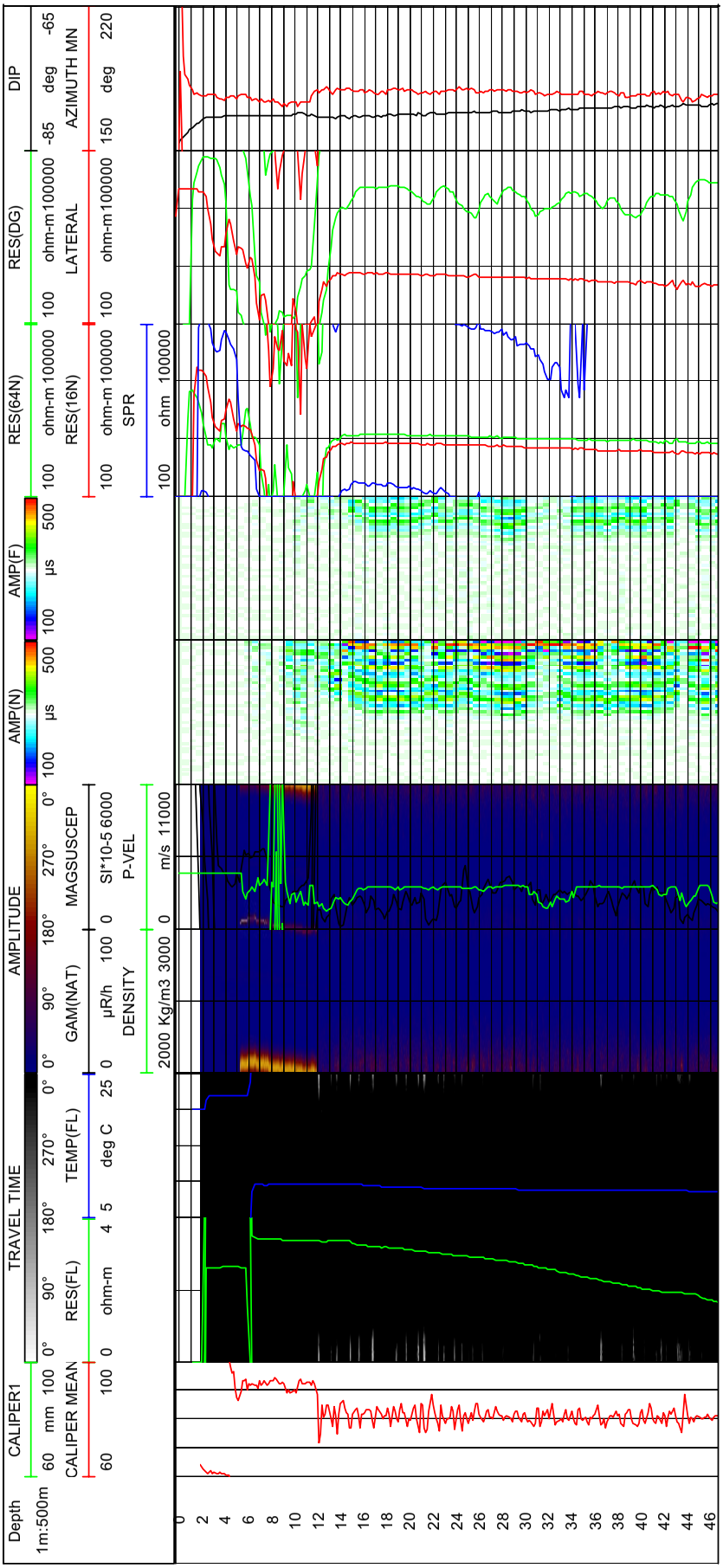

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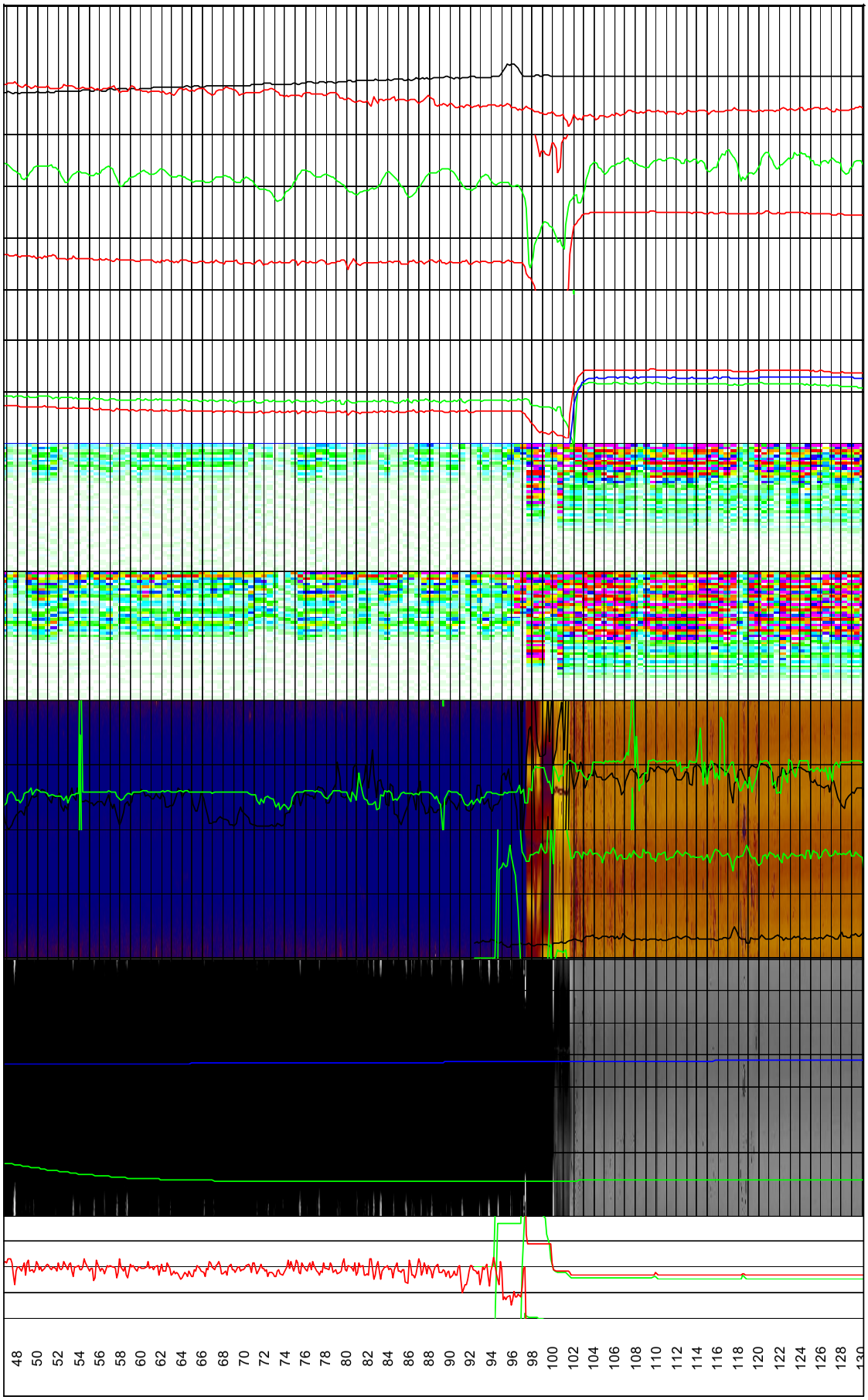
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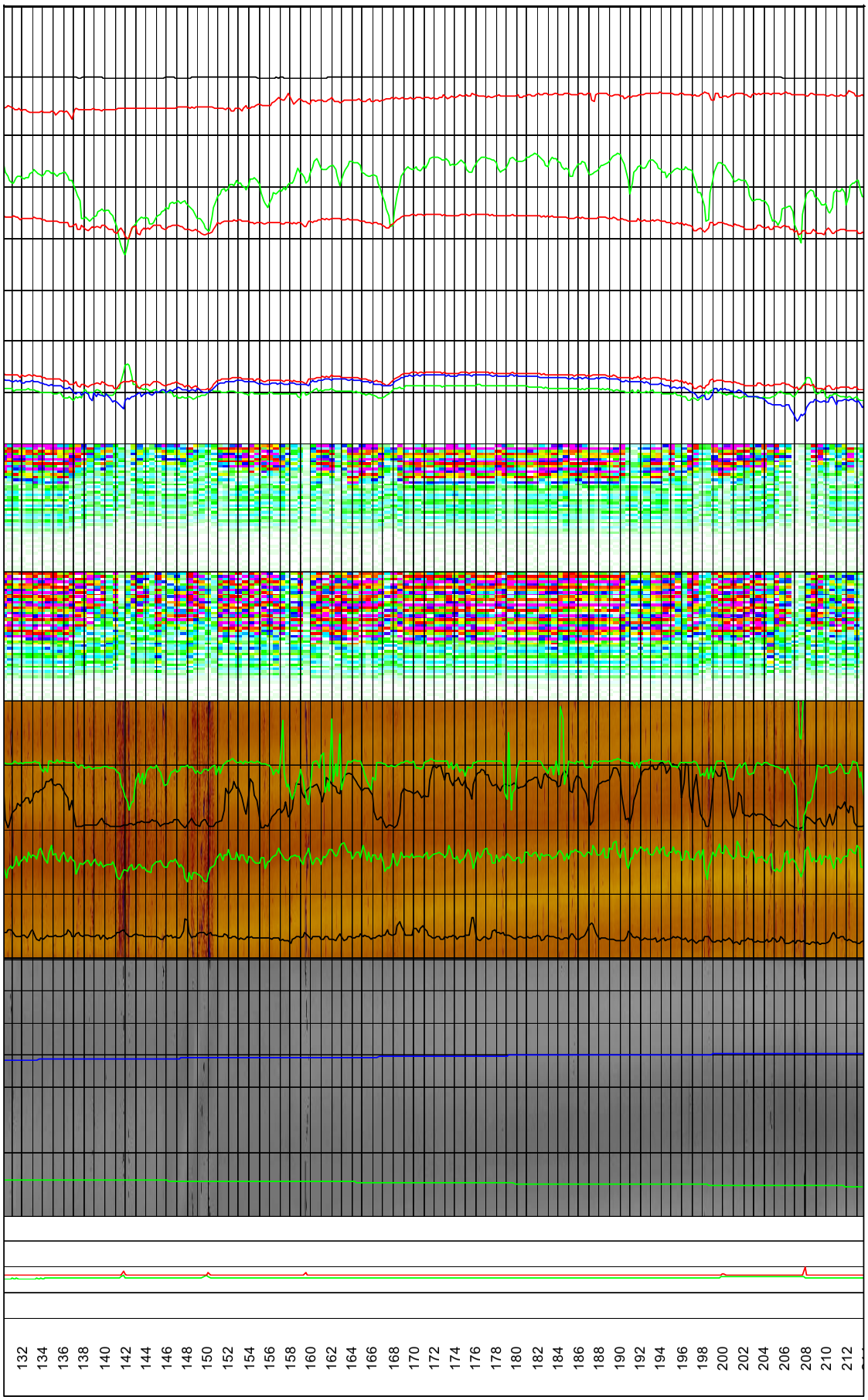
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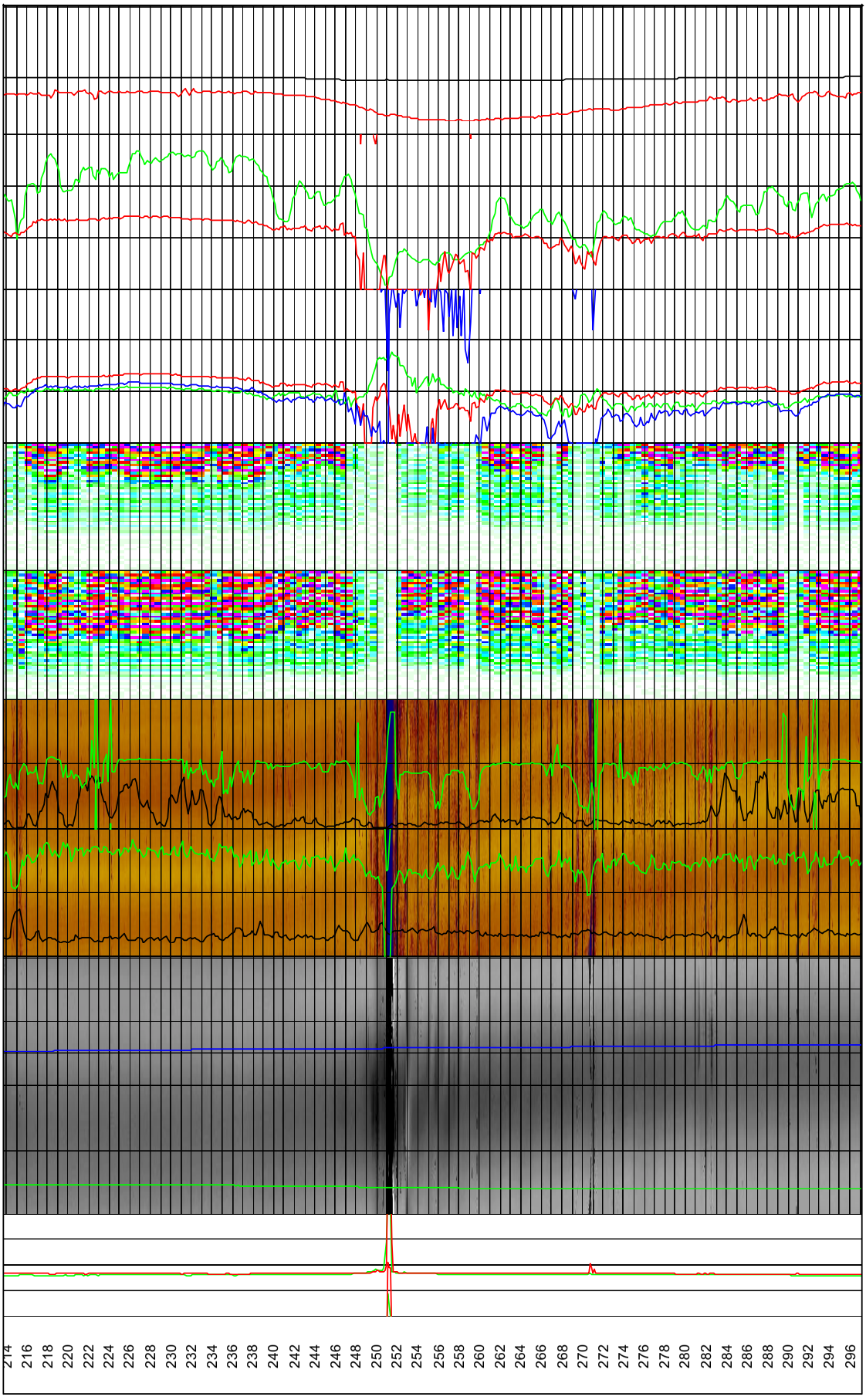
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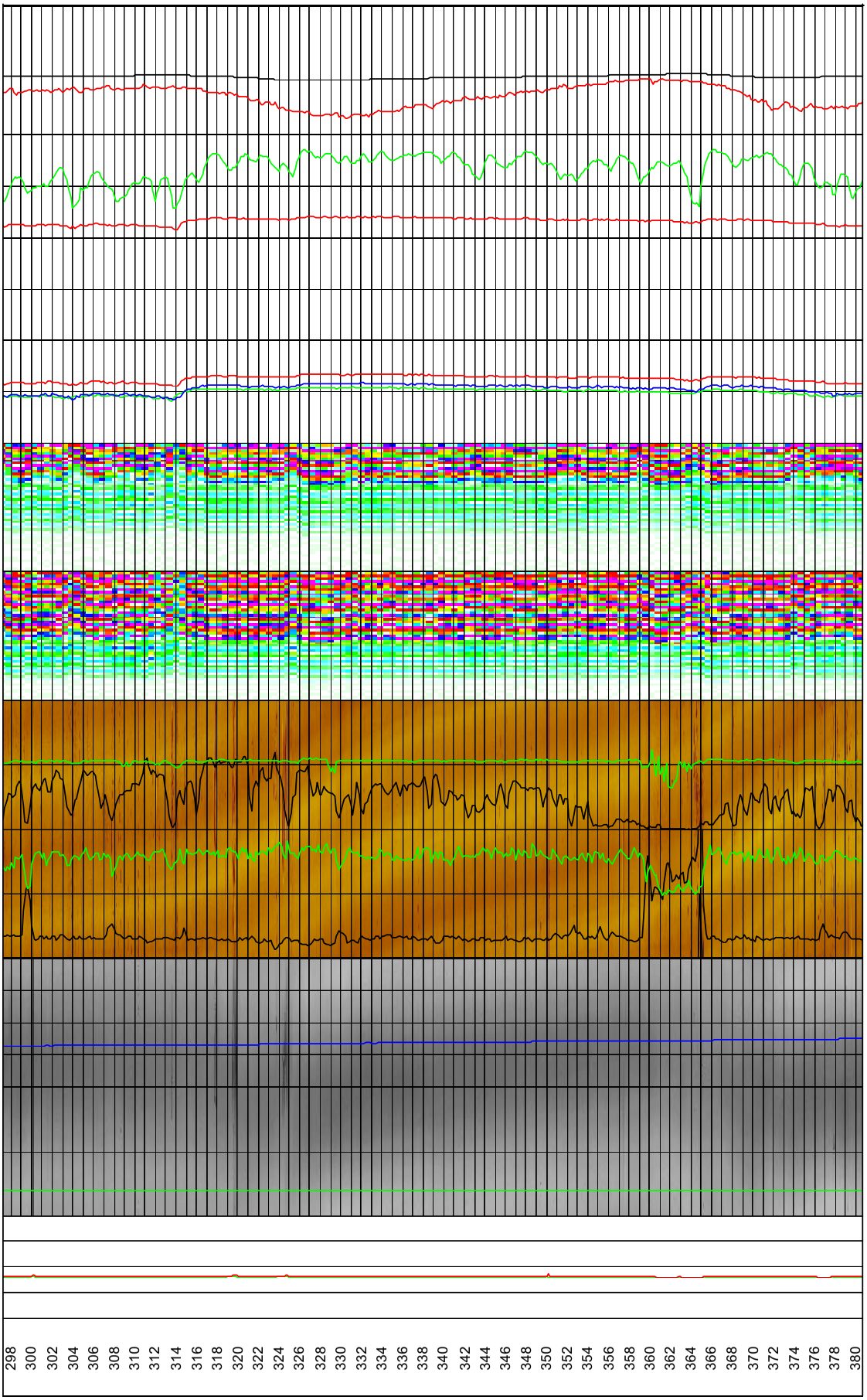
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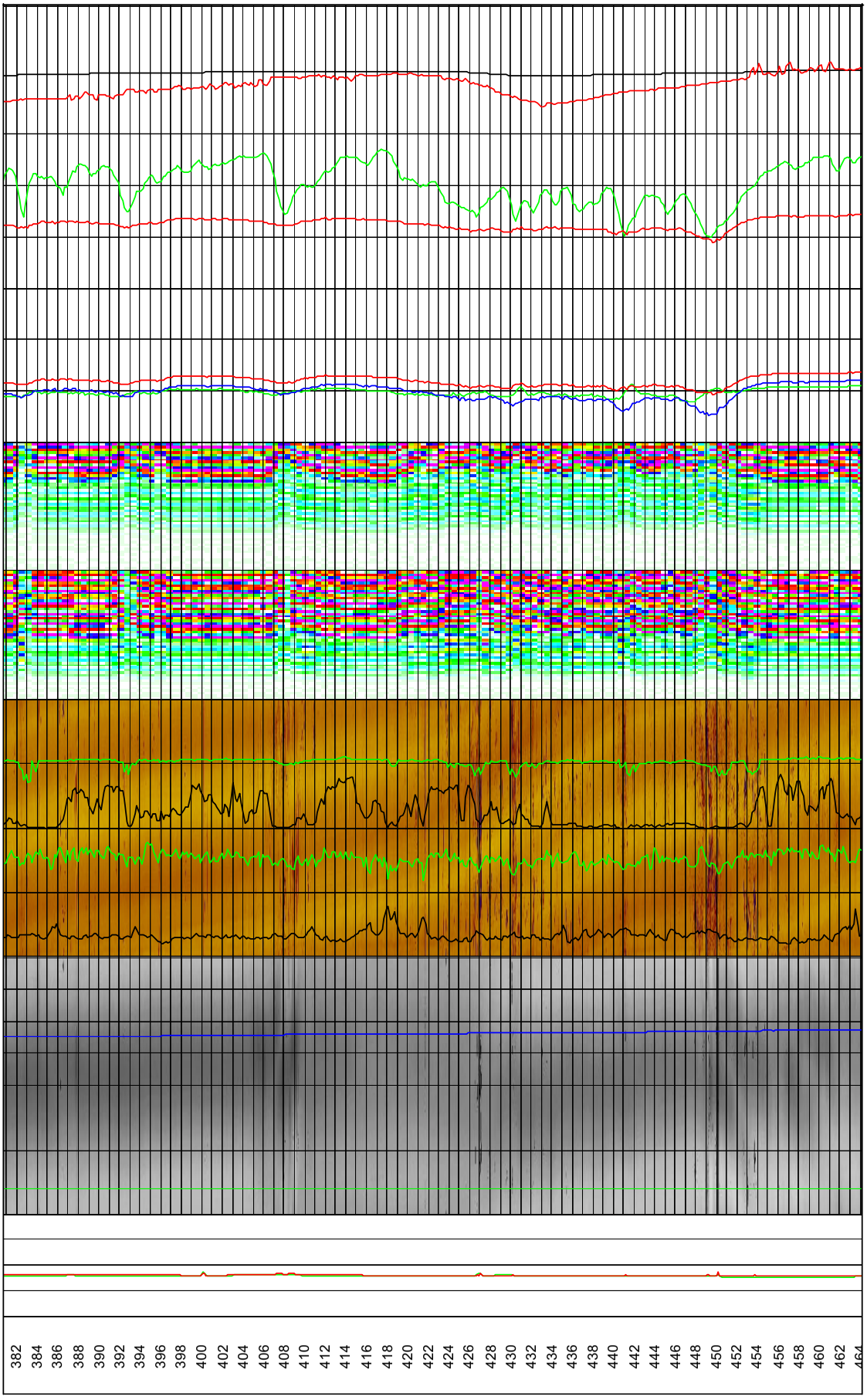
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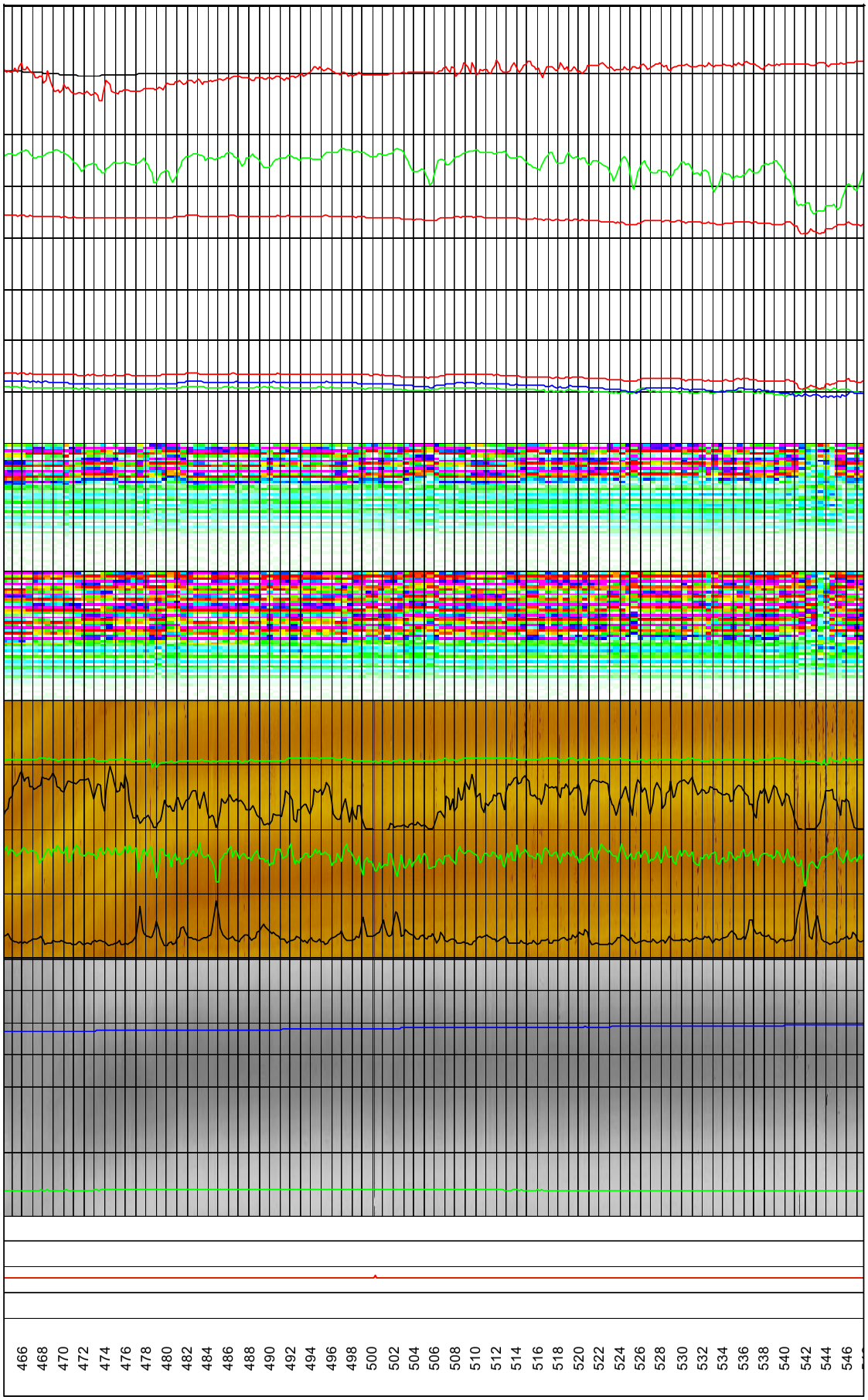
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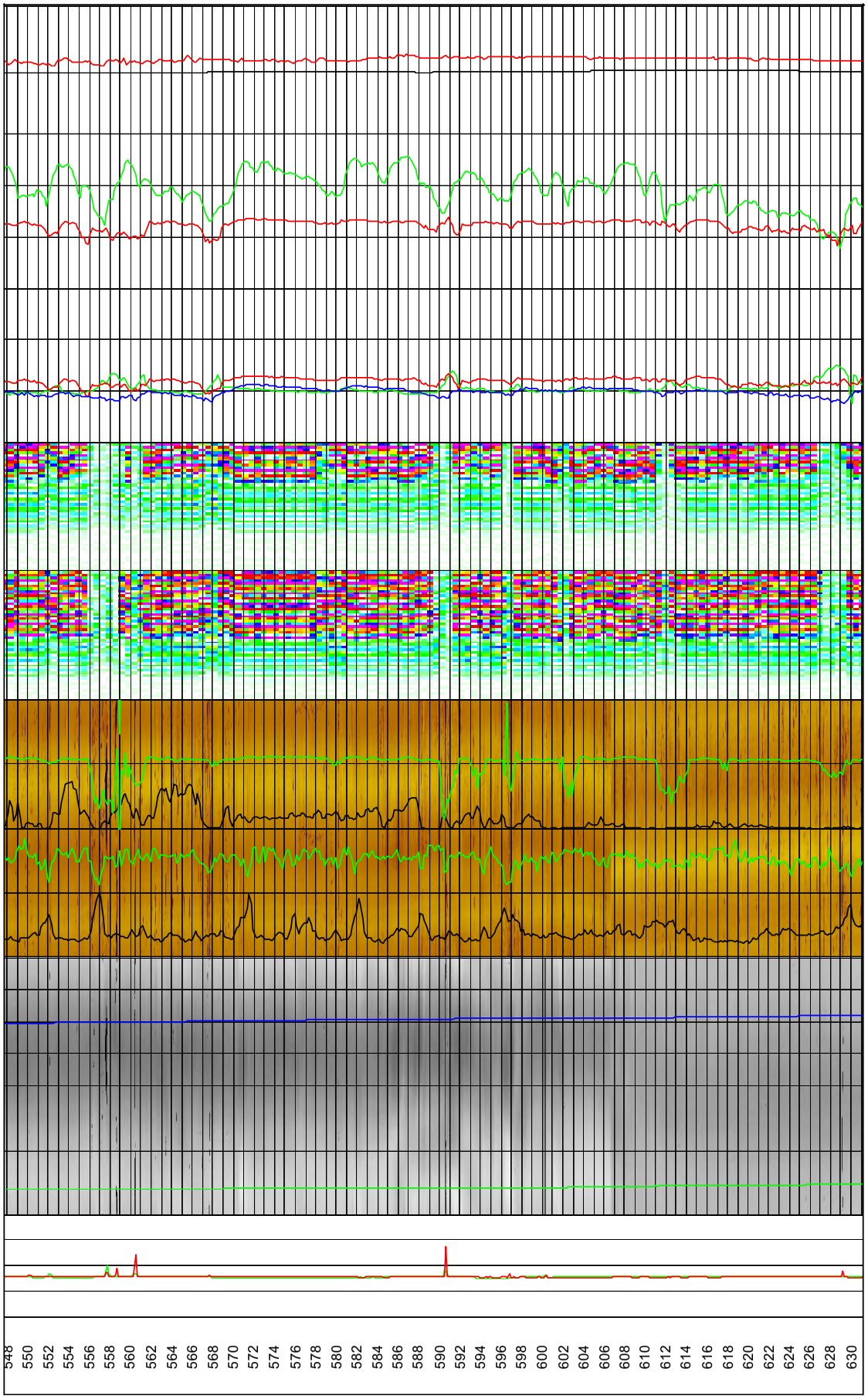
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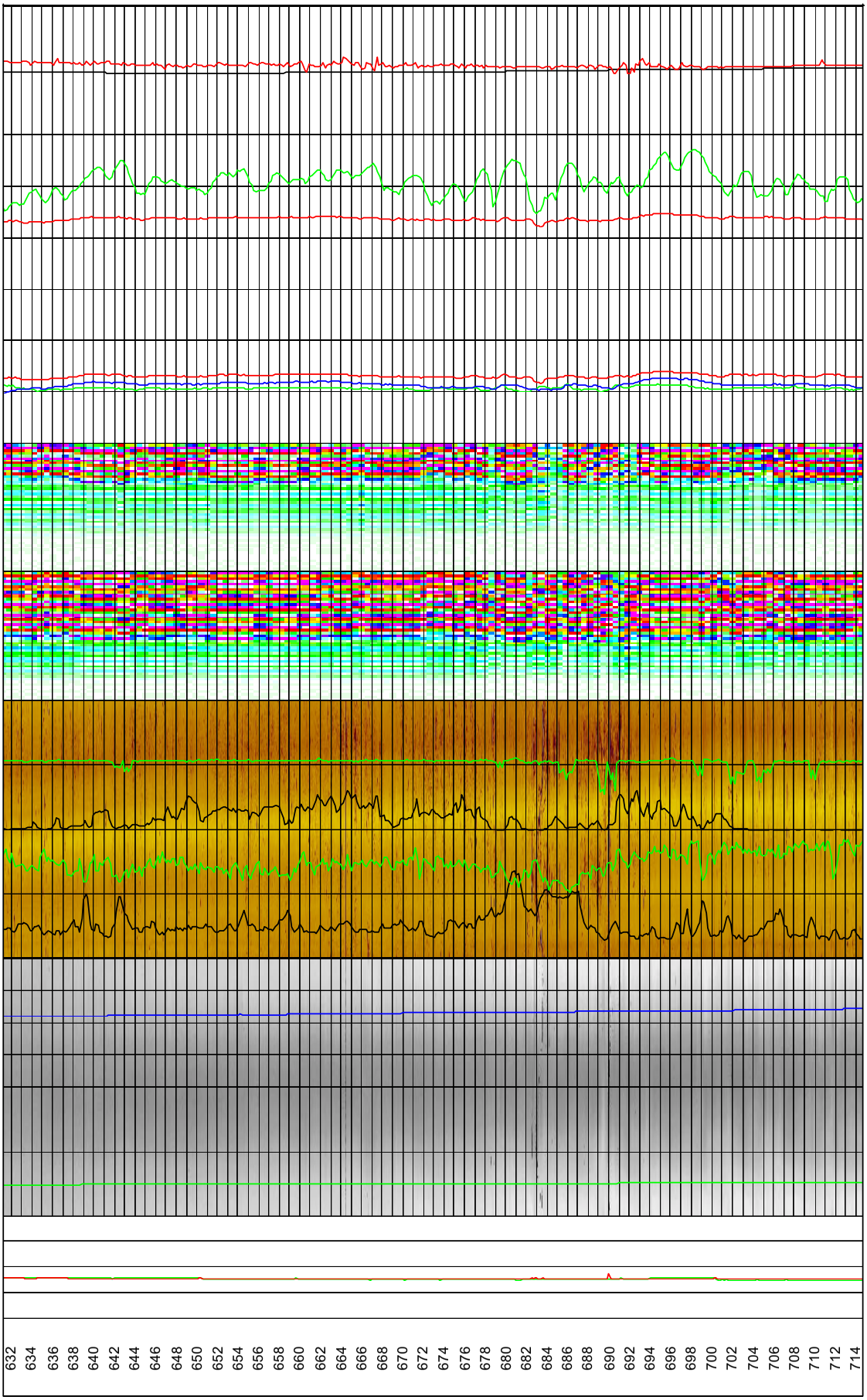
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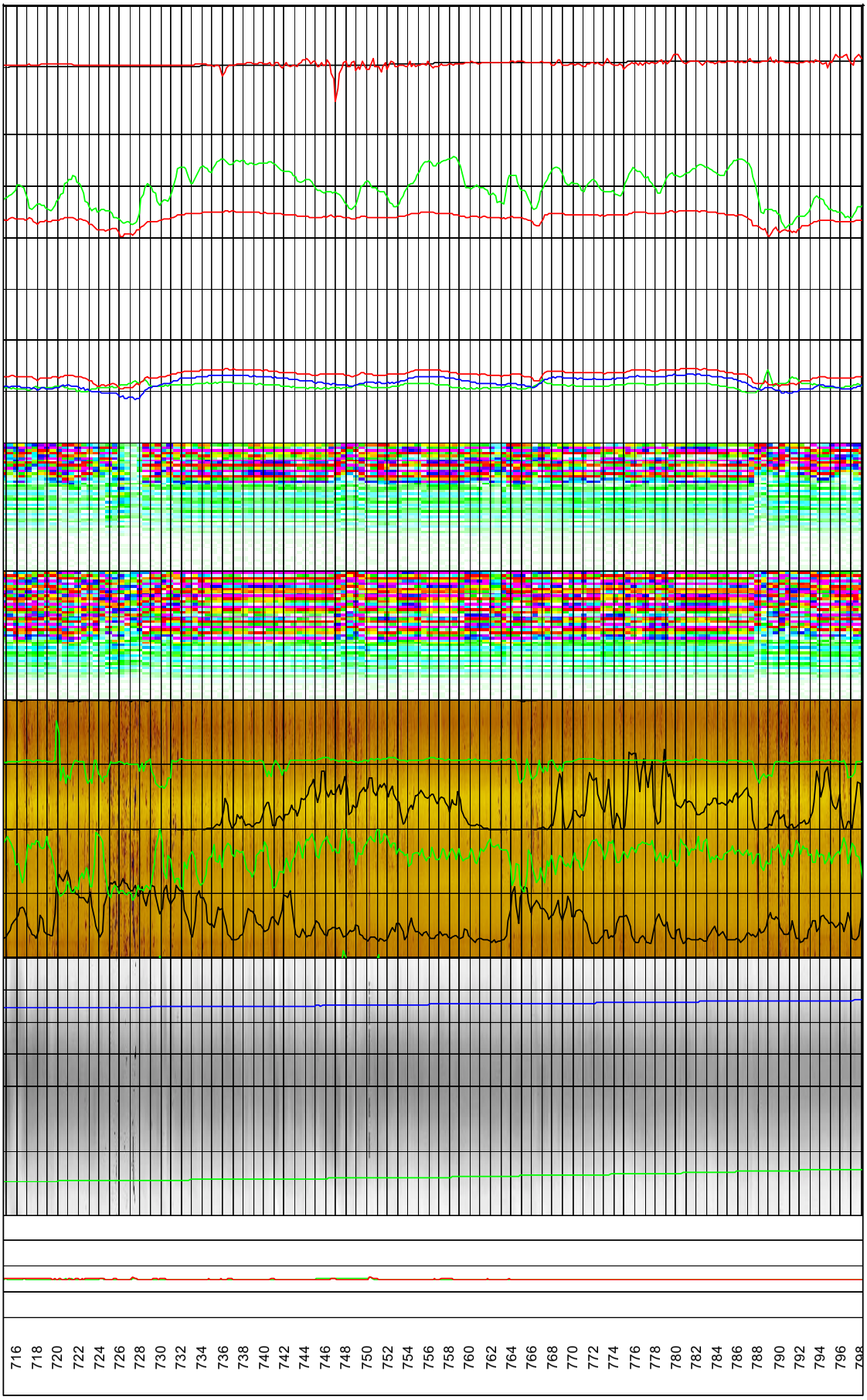
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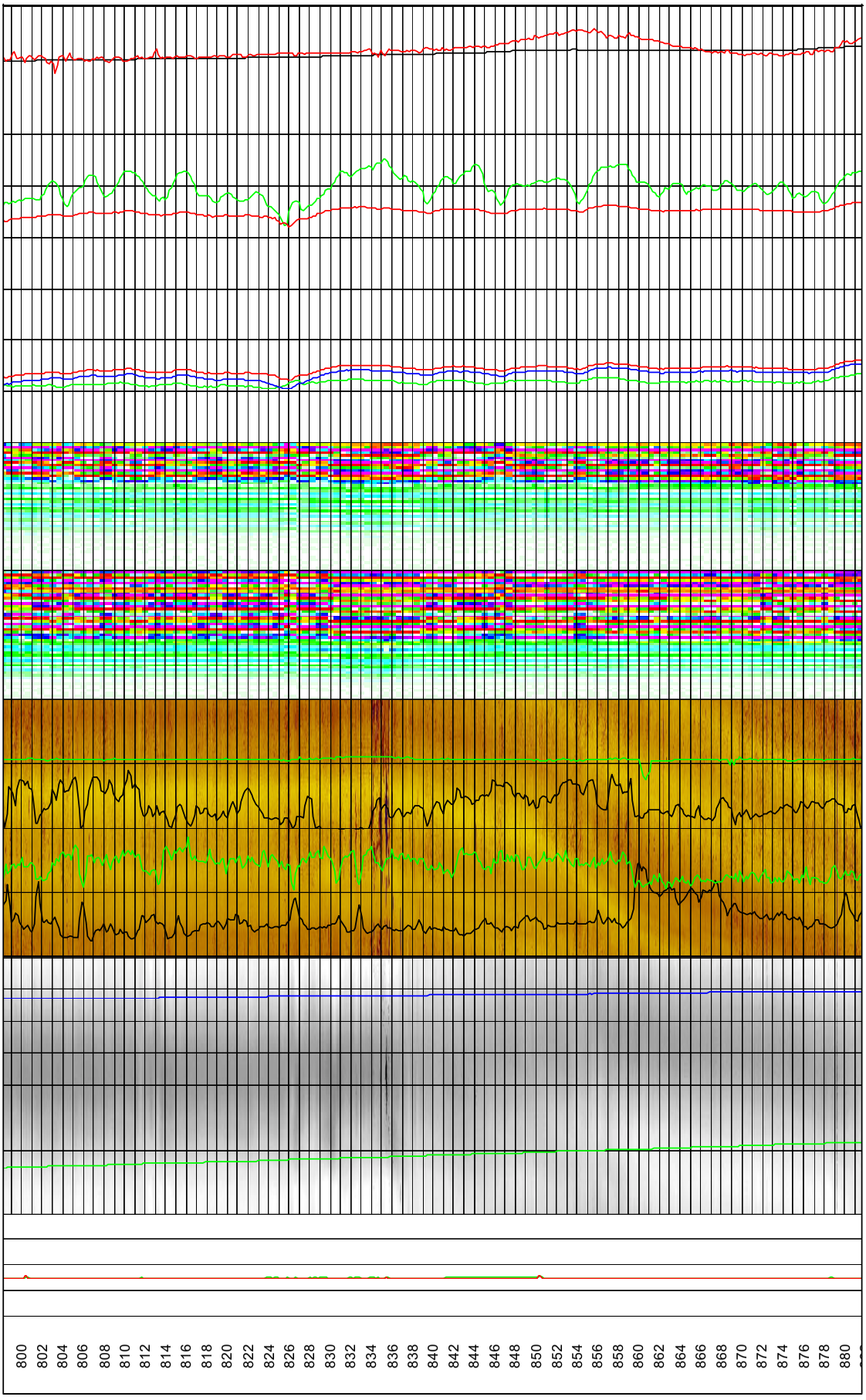
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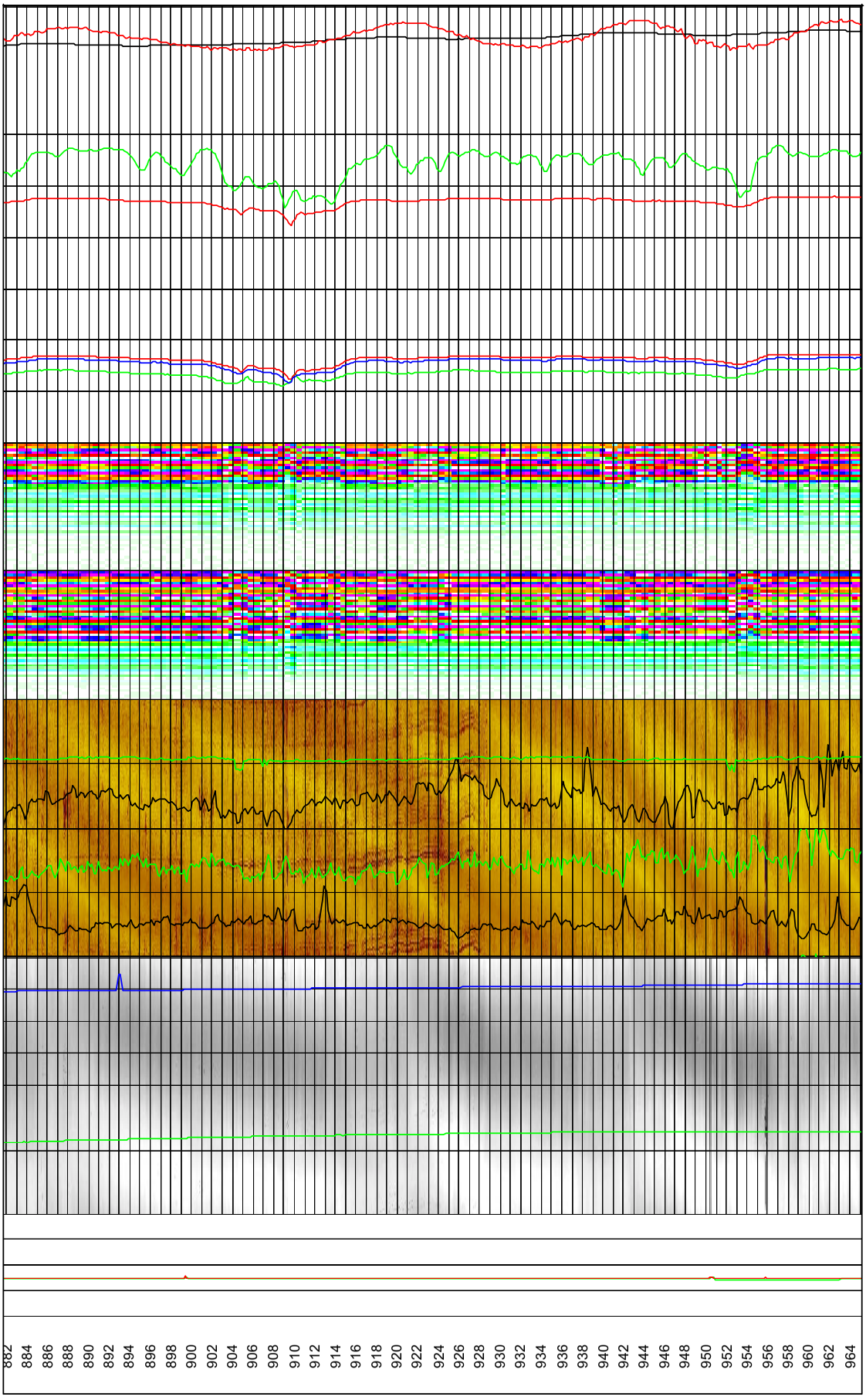
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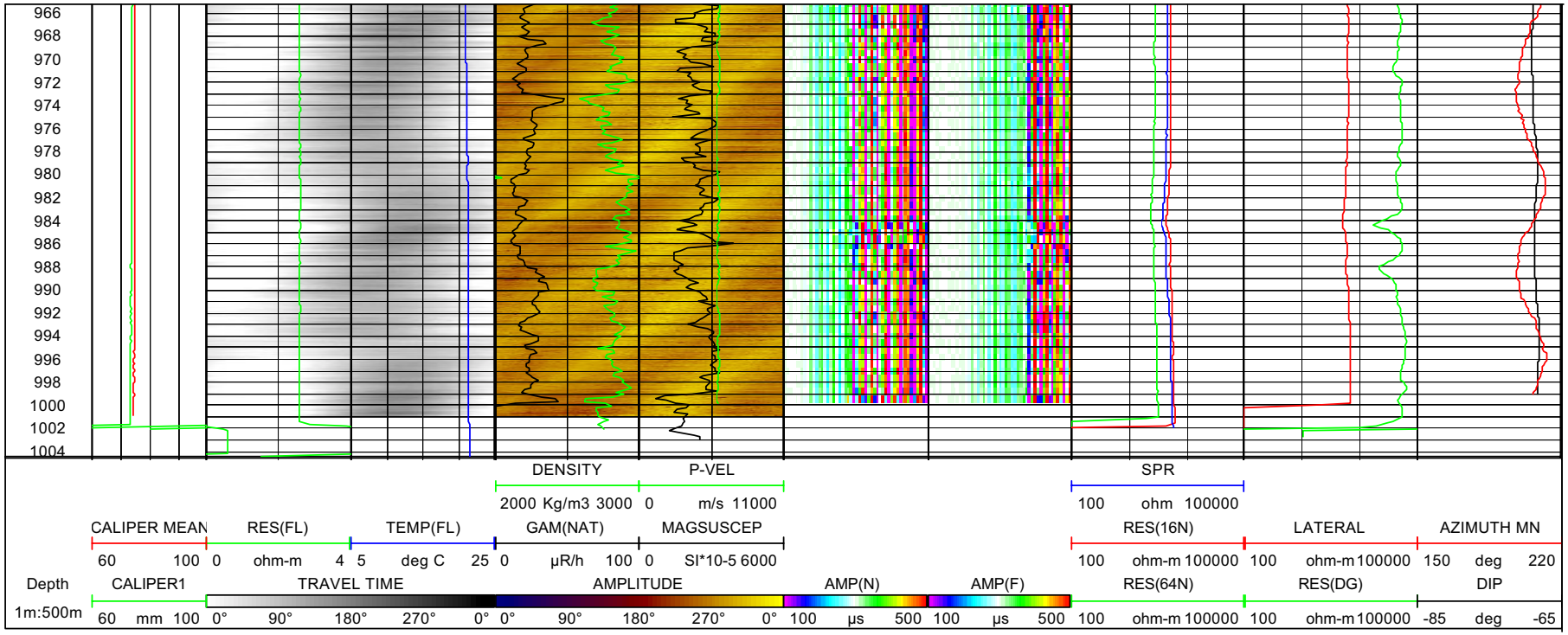
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978
980
982
984
986
988
990
992
994
996
998
1000
1002
1004
DENSITY
P-VEL
2000 Kg/m3 3000
0 m/s 11000
SPR
100 ohm 100000
CALIPER MEAN
RES(FL)
TEMP(FL)
GAM(NAT)
MAGSUSCEP
RES(16N)
LATERAL
AZIMUTH MN
60 100
0 ohm-m 4
5 deg C 25
0 µR/h 100
0 SI*10-5 6000
100 ohm-m 100000
100 ohm-m 100000
150 deg 220
Depth
CALIPER1
TRAVEL TIME
AMPLITUDE
AMP(N)
AMP(F)
RES(64N)
RES(DG)
DIP
1m:500m
60 mm 100
0° 90° 180° 270° 0°
0° 90° 180° 270° 0°
100 µs 500
100 µs 500
100 ohm-m 100000
100 ohm-m 100000
-85 deg -65

Geophysical borehole logging, borehole KSH01B

Borehole No. KSH01B

Co-ordinates inRT90

X: 6366014.048 Y: 1552442.890 Z: 5.448

Diametre:	76 mm from 0 to 100 m
Reaming Diametre:	-
Outer Casing:	-
Inner Casing:	-
Borehole Length:	100 m
Cone:	-
Inclination at ground surface:	-87.88 deg
Azimuth:	177.762 deg
Comments:	-

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030	mm
DENSITY	Gamma-gamma density	9030	Kg/m3
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9030	µR/h
RES(16N)	Normal resistivity 16 inch	9041	ohm-m
RES(64N)	Normal resistivity 64 inch	9041	ohm-m
LATERAL	Lateral resistivity	9041	ohm-m
SPR	Single point resistance	9041	ohm-m
TEMP(FL)	Fluid temperature	9042	deg C
RES(FL)	Fluid resistivity	9042	ohm-m
RES(DG)	Focused guard log resistivity, 300cm	9072	ohm-m
P-VEL	P-wave velocity	9310	m/s
AMP(N)	Full wave form, near receiver	9310	µs
AMP(F)	Full wave form, far receiver	9310	µs
MAGSUSCEP	Magnetic susceptibility	9622	SI*10-5
CALIPER 3D	Caliper, high resolution 360 degrees	HiRAT	mm
CALIPER MEAN	High resolution 1D caliper	HiRAT	mm
AZIMUTH MN	Borehole azimuth magnetic north	HiRAT	deg
DIP	Borehole inclination from lateral	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-

Rev.	Date	Drawn by	Control	Approved
0	06032003	FDH	JRI	UTN

Job 360210A

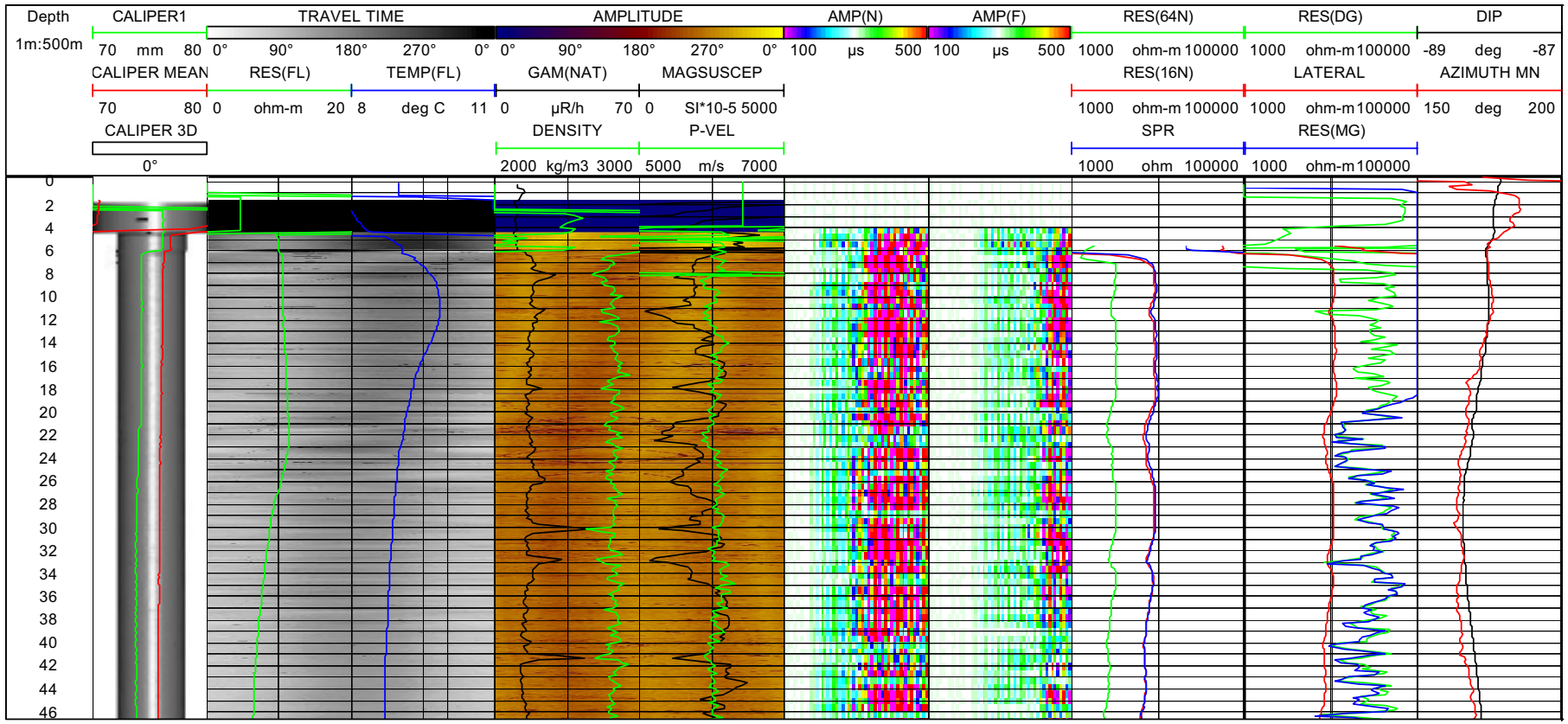
Scale 1:500

DGE, Håndværkersvinget 11, 2970 Hørsholm, Phon
RAMBØLL. Bredevej 2, DK-2830 Virum, Phone + 4

SKB geophysical borehole logging
Borehole KSH01B

Filename: KSH01b_P

Drawing nc
2.1


Depth
1m:500m
CALIPER1
70 mm 80
CALIPER MEAN
70 80
CALIPER 3D
0°
TRAVEL TIME
0° 90° 180° 270° 0°
RES(FL)
0 ohm-m 20
TEMP(FL)
8 deg C 11
AMPLITUDE
0° 90° 180° 270° 0°
GAM(NAT)
0 µR/h 70
MAGSUSCEP
0 SI*10-5 5000
DENSITY
2000 kg/m3 3000
P-VEL
5000 m/s 7000
AMP(N)
100 µs 500
AMP(F)
100 µs 500
RES(64N)
1000 ohm-m 100000
RES(16N)
1000 ohm-m 100000
SPR
1000 ohm 100000
RES(DG)
1000 ohm-m 100000
LATERAL
1000 ohm-m 100000
RES(MG)
1000 ohm-m 100000
DIP
-89 deg -87
AZIMUTH MN
150 deg 200
0
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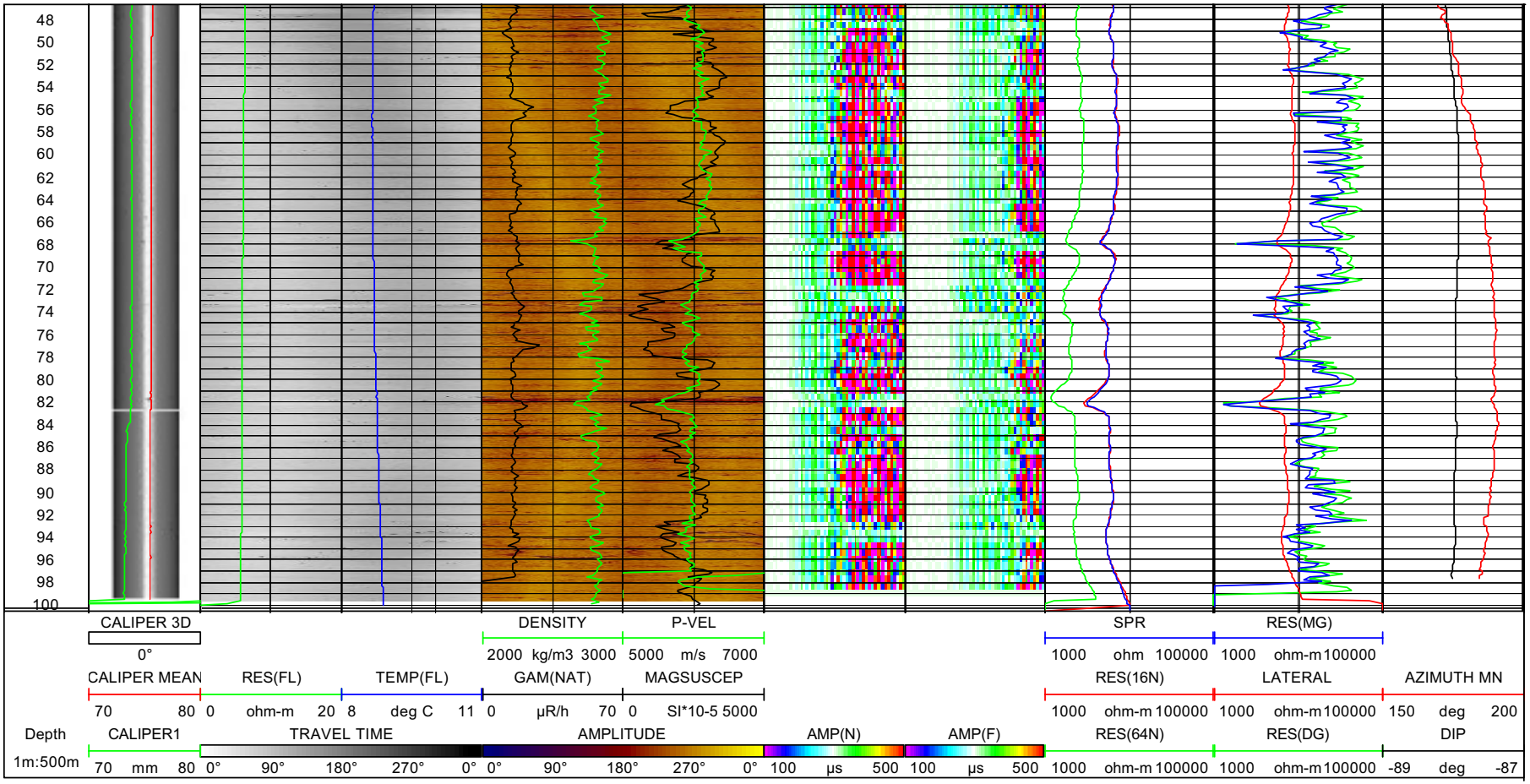
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90
92
94
96
98
100
CALIPER 3D
0°
DENSITY
2000 kg/m3 3000
P-VEL
5000 m/s 7000
SPR
1000 ohm 100000
RES(MG)
1000 ohm-m 100000
CALIPER MEAN
70 80
RES(FL)
0 ohm-m 20
TEMP(FL)
8 deg C 11
GAM(NAT)
0 µR/h 70
MAGSUSCEP
0 SI*10-5 5000
RES(16N)
1000 ohm-m 100000
LATERAL
1000 ohm-m 100000
AZIMUTH MN
150 deg 200
Depth
1m:500m
CALIPER1
70 mm 80
TRAVEL TIME
0° 90° 180° 270° 0°
AMPLITUDE
0° 90° 180° 270° 0°
AMP(N)
100 µs 500
AMP(F)
100 µs 500
RES(64N)
1000 ohm-m 100000
RES(DG)
1000 ohm-m 100000
DIP
-89 deg -87

Geophysical borehole logging, borehole KSH02

Borehole No. KSH02

Co-ordinates inRT90

X: 6365658.355 Y: 1551528.952 Z: 5.745

Diametre:	200 mm from 0 to 100 m
Reaming Diametre:	-
Outer Casing:	-
Inner Casing:	-
Borehole Length:	100 m
Cone:	-
Inclination at ground surface:	- 85 deg
Azimuth:	330 deg
Comments:	Steg 1

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030	mm
DENSITY	Gamma-gamma density	9030	Kg/m3
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9030	µR/h
RES(16N)	Normal resistivity 16 inch	9041	ohm-m
RES(64N)	Normal resistivity 64 inch	9041	ohm-m
LATERAL	Lateral resistivity	9041	ohm-m
SPR	Single point resistance	9041	ohm-m
TEMP(FL)	Fluid temperature	9042	deg C
RES(FL)	Fluid resistivity	9042	ohm-m
RES(DG)	Focused guard log resistivity, 300cm	9072	ohm-m
P-VEL	P-wave velocity	9310	m/s
AMP(N)	Full wave form, near receiver	9310	µs
AMP(F)	Full wave form, far receiver	9310	µs
MAGSUSCEP	Magnetic susceptibility	9622	SI*10-5
CALIPER 3D	Caliper, high resolution 360 degrees	HiRAT	mm
CALIPER MEAN	High resolution 1D caliper	HiRAT	mm
AZIMUTH MN	Borehole azimuth magnetic north	HiRAT	deg
DIP	Borehole inclination from lateral	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-

Rev.	Date	Drawn by	Control	Approved
0	05032003	FDH	JRI	UTN

Job 360210A

Scale 1:500

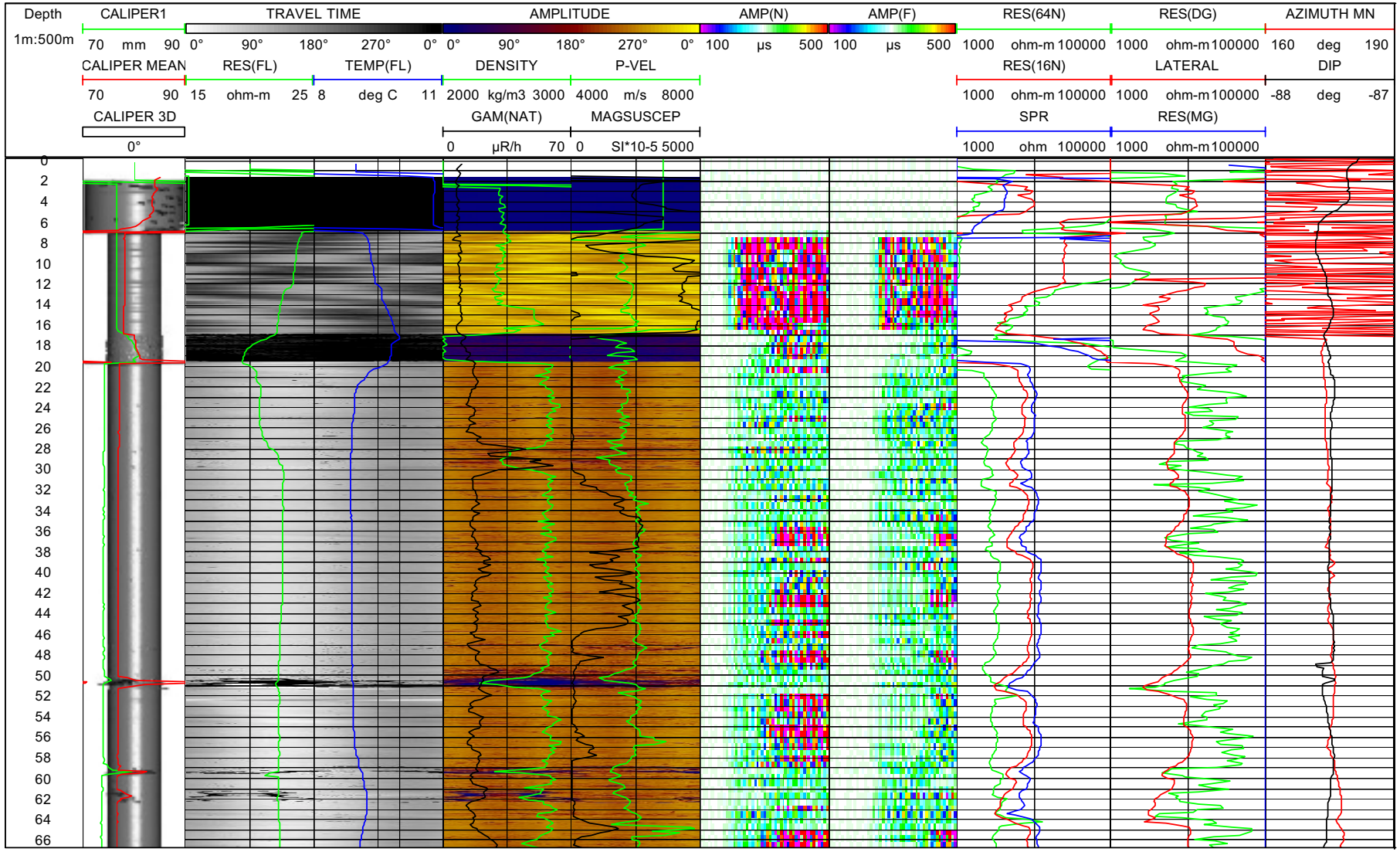
DGE, Håndværkersvinget 11, 2970 Hørsholm, Phone +45 70 10 34 00, Fax + 45
RAMBØLL. Bredevej 2, DK-2830 Virum, Phone + 45 45 98 60 00, Fax + 45 45 9

SKB geophysical borehole logging

Borehole KSH02, steg 1

Filename: KSH02a_Presentation.wcl

Drawing no.: 3.1


Depth
1m:500m
CALIPER1
70 mm 90
CALIPER MEAN
70 90
CALIPER 3D
0°
TRAVEL TIME
0° 90° 180° 270° 0°
RES(FL)
15 ohm-m 25
TEMP(FL)
8 deg C 11
AMPLITUDE
0° 90° 180° 270° 0°
DENSITY
2000 kg/m3 3000
P-VEL
4000 m/s 8000
GAM(NAT)
0 µR/h 70
MAGSUSCEP
0 SI*10-5 5000
AMP(N)
100 µs 500
AMP(F)
100 µs 500
RES(64N)
1000 ohm-m 100000
RES(16N)
1000 ohm-m 100000
SPR
1000 ohm 100000
RES(DG)
1000 ohm-m 100000
LATERAL
1000 ohm-m 100000
RES(MG)
1000 ohm-m 100000
AZIMUTH MN
160 deg 190
DIP
-88 deg -87
0
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4
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8
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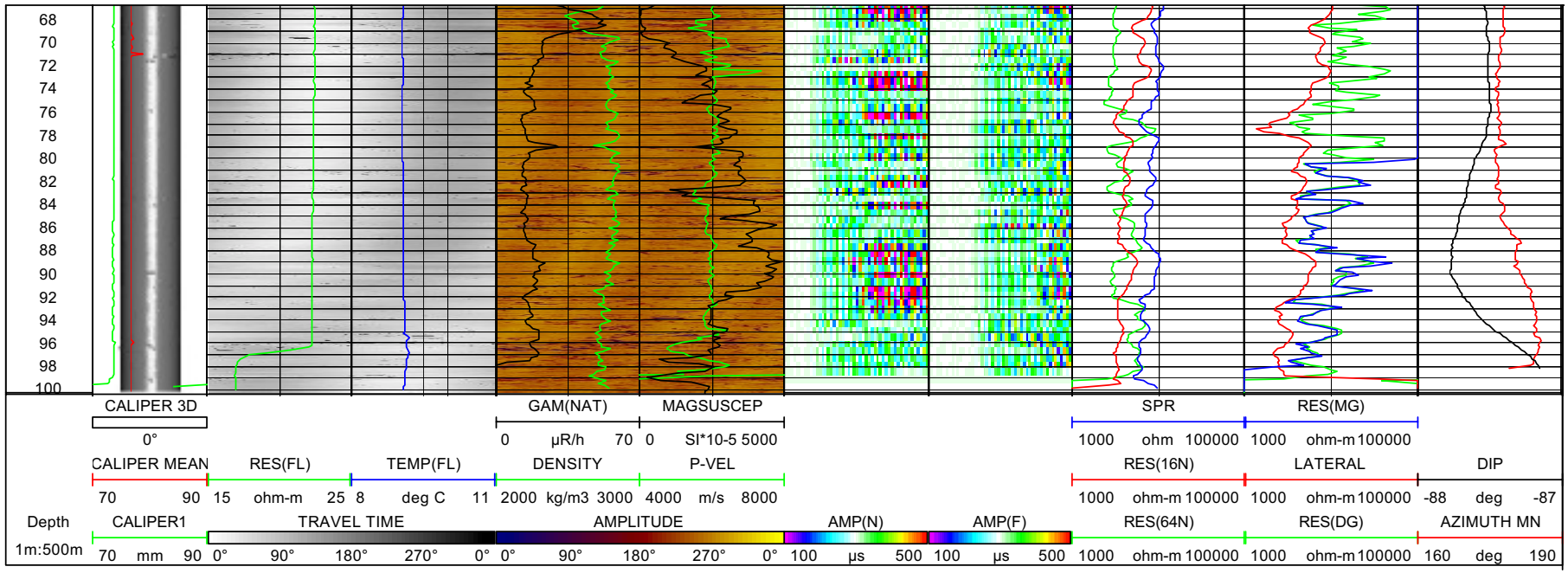
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70
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80
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86
88
90
92
94
96
98
100
CALIPER 3D
0°
GAM(NAT)
MAGSUSCEP
0 µR/h 70 0 SI*10-5 5000
SPR
RES(MG)
1000 ohm 100000 1000 ohm-m 100000
CALIPER MEAN
RES(FL)
TEMP(FL)
DENSITY
P-VEL
RES(16N)
LATERAL
DIP
70 90 15 ohm-m 25 8 deg C 11 2000 kg/m3 3000 4000 m/s 8000
1000 ohm-m 100000 1000 ohm-m 100000 -88 deg -87
Depth
1m:500m
CALIPER1
TRAVEL TIME
AMPLITUDE
AMP(N)
AMP(F)
RES(64N)
RES(DG)
AZIMUTH MN
70 mm 90 0° 90° 180° 270° 0° 0° 90° 180° 270° 0° 100 µs 500 100 µs 500 1000 ohm-m 100000 1000 ohm-m 100000 160 deg 190