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Forsmark site investigation

Geophysical borehole logging in boreholes KFM09A, KFM07B, HFM25, HFM27 and HFM28

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February 2006

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Abstract

Geophysical borehole logging has been performed in boreholes KFM09A, KFM07B, HFM25, HFM27 and HFM28 all situated in Forsmark, Sweden.

The objective of the survey is to determine the physical properties of the rock mass around the borehole, e.g. to determine rock types and quantify the fracture frequency and localise deformation zones in the rock. Geophysical borehole logging was used to measure changes in physical properties in the borehole fluid and the bedrock surrounding the boreholes.

The logging in KFM09A was recorded from 10 m to 800 m. KFM07B was recorded from 67 m to 299 m. HFM25 was recorded from 9 m to 187 m. HFM27 was recorded from 10 m to 127 m and HFM28 was recorded from 12 m to 151 m.

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

Composite sheets of all the processed logs are included in Appendix 1 to Appendix 5.

Sammanfattning

Geofysisk borrhålsloggning har genomförts i borrhålen KFM09A, KFM07B, HFM25, HFM27 och HFM28 i Forsmark.

Syftet med geofysisk borrhålsloggning är att bestämma bergets fysikaliska egenskaper för att bestämma bergartsfördelningen i det genomborrade bergpartiet samt att kvantifiera sprickfrekvensen och att lokalisera deformationszoner. Med geofysisk borrhålsloggning mäts bergets och borrhålsvattnets fysikaliska egenskaper i borrhålet och omgivande berg.

Den geofysiska borrhålsloggningen genomfördes i KFM09A från 10 m till 800 m. I KFM07B från 67 m till 299 m. I HFM25 från 9 m till 187 m. I HFM27 från 10 m till 127 m och i HFM28 från 12 m till 151 m.

Rapporten beskriver använd utrustning, genomfört loggningsprogram, fältarbete, leverans av data och en diskussion av resultatet.

Processerade loggar presenteras i Appendix 1 till 5.

Contents

1 Introduction

This document reports the results gained by the geophysical borehole logging in the boreholes KFM9A, KFM07B, HFM25, HFM27 and HFM28, which is one of the activities performed within the site investigation at Forsmark. The work was carried out in accordance with activity plan AP PF 400-05-098 (SKB internal controlling document). In Table 1-1 controlling documents for performing this activity are listed.

All measurements were conducted by RAMBØLL during the period November 9 to 13 2005. The borehole was recorded from Top Of Casing (TOC) to the bottom of the borehole. The technical data from the boreholes are shown in Table 1-2. The location of the boreholes is shown in Figure 1-1.

The delivered raw and processed data have been inserted in the database of SKB (SICADA) and data are traceable by the activity plan number.

Table 1-1. Controlling documents for the performance of the activity (SKB internal controlling documents).

Activity plan	Number	Version
Geofysisk borrhålsloggning i KFM09A, KFM07B, HFM25, HFM27, HFM28	AP PF 400-05-098	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för geofysisk borrhålsloggning	SKB MD 221.002	2.0
Metodbeskrivning för krökningsmätning av hammar- och kärnborrhål	SKB MD 224.001	1.0

Table 1-2. Technical data for the boreholes.

Borehole Parameter	KFM09A	KFM07B	HFM25	HFM27	HFM28
Co-ordinates (RT90)	1630647.520 6700115.095	1631036.833 6700123.622	1633039.368 6699616.177	1631245.94 6699595.26	1630597.240 6700068.840
Elevation (RHB70)	4.296	3.363	3.858	2.45	4.266
Azimuth	200.1°	134.3°	140.8	337.26°	146.8°
Inclination (from horizontal)	–59.9°	–53.7°	–57.8°	–67.83°	–84.8°
Length (m)	799.7	299	187.5	127.5	151.2
Casing (m)	10	67	9	10	12
Borehole diameter (mm)	77	76	140.6–138.6	139	138.3–135.1

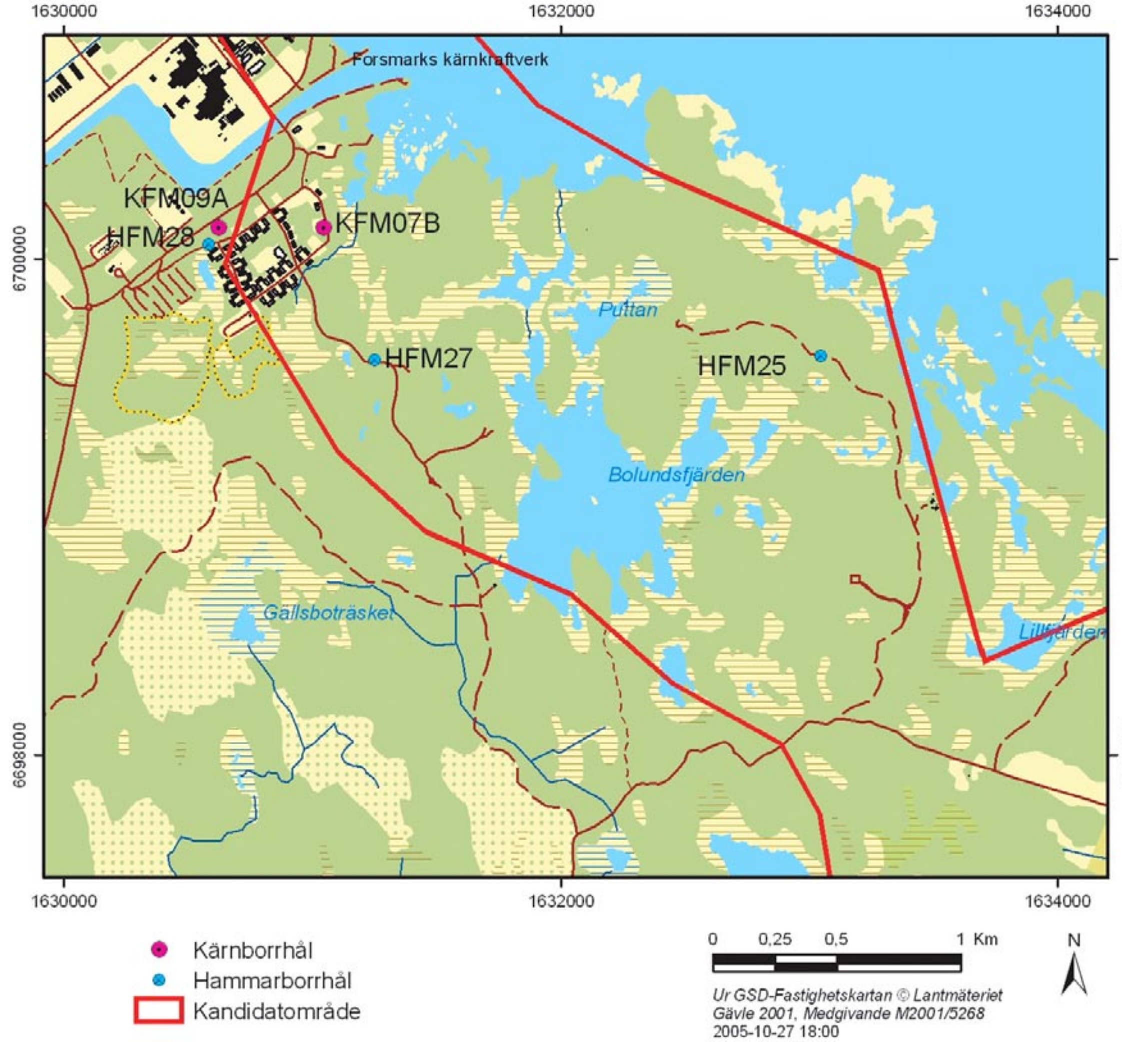

Figure 1-1. *General overview over the Forsmark areas showing the location of the core borings KFM09A and KFM07B and boreholes HFM25, HFM27 and HFM28.*

2 Objective and scope

The objective of the survey is to both receive information of the borehole itself, and from the rock mass around the borehole. Geophysical borehole 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) as well as to determine the length marks in the core-drilled borehole, KFM09A and KFM07B.

This field report describes the equipment used as well as the measurement procedures. Geophysical borehole logging data is presented in Appendix 1(KFM09A), in Appendix 2 (KFM07B), in Appendix 3 (HFM25), in Appendix 4 (HFM27) and in Appendix 5 (HFM28).

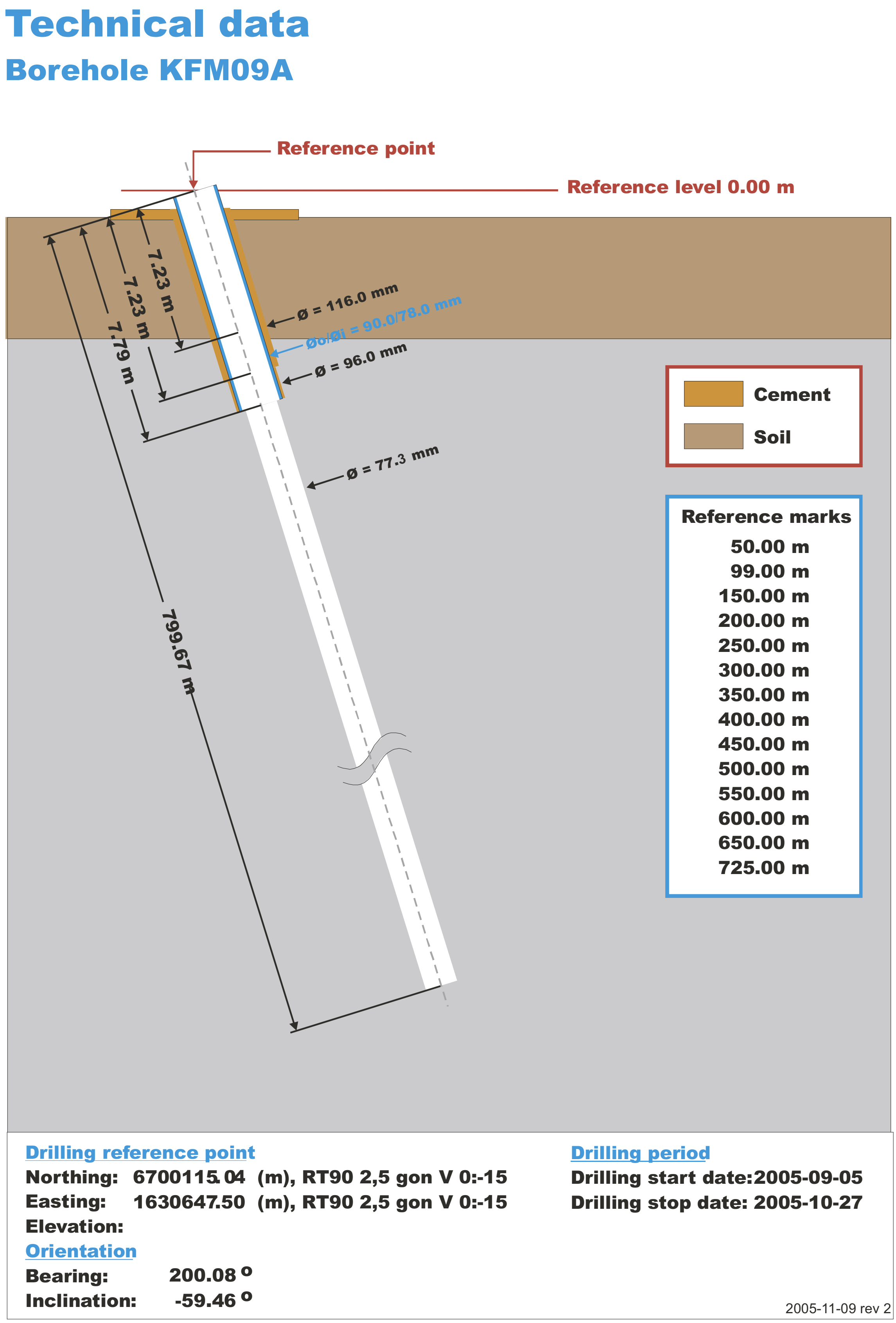

Figure 2-1. *Technical description of borehole KFM09A.*

Technical data

Borehole KFM07B

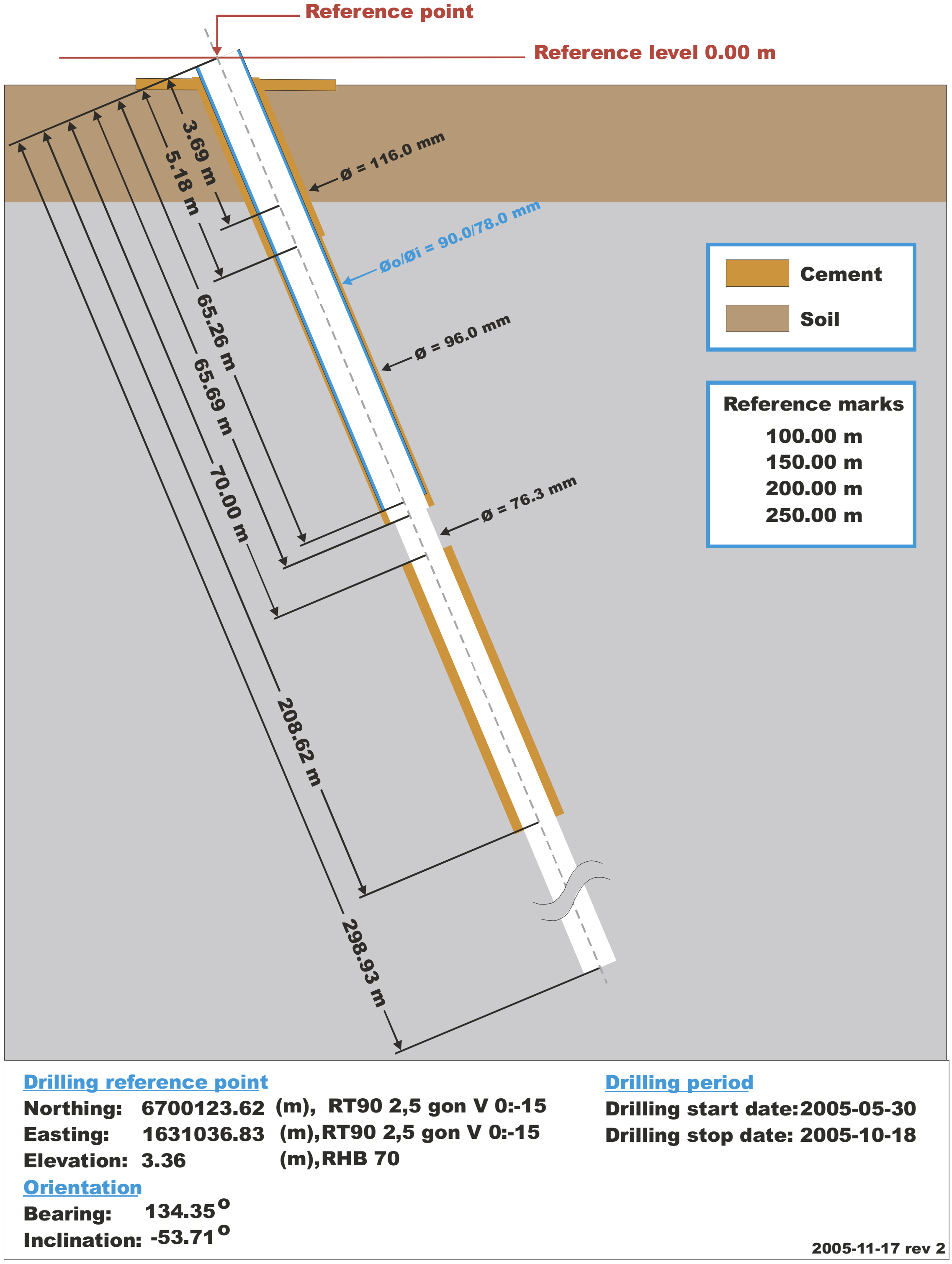

Figure 2-2. *Technical description of borehole KFM07B.*

3 Equipment

The geophysical borehole logging program in KFM9A, KFM07B, HFM25, HFM27 and HFM28 were performed with 7 multi tool probes and resulted in a suite of 19 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.

Tool	Recorded logs	Dimension Length, diameter	Source detector spacing and type	Tool position in borehole	Comment
Century 8144 Normal resistivity.	Normal resistivity (16 and 64 inch), single point resistance and natural gamma.	237cm, 5.3 cm			
Century 8622 Magnetic susceptibility.	Magnetic susceptibility, natural gamma.	203 cm, 4.1 cm			
Century 9042 Fluid temperature and fluid resistivity.	Fluid temperature, fluid resistivity and natural gamma.	137 cm, 4.1 cm			
Century 9072 3 m focused guard.	3 m focused guard log resistivity and natural gamma.	310 cm, 6.4 cm			
Century 9139 Compensated gamma density.	Compensated gamma density, natural gamma, 127 cm focused guard log resistivity, 1-arm caliper.	380.3 cm, 5.6 cm	20.3 cm 125 m 200 mCi Cs137	Sidewall. Gamma source focused.	
Century 9310 Sonic.	Full wave form travel-time providing P- and S-wave velocity picking, compensated P-wave travel-time and natural gamma.	283.2 cm, 5.1 cm	Near 2 ft Far 3 ft	Centralized	
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 and natural gamma.	246 cm, 4 cm		Centralized	

4 Execution

4.1 General

In general the measurement procedures follow the SKB method description (MD 221.002, SKB internal controlling document). The logging program was executed in the period November 9 to 13, 2005. All relevant logging events are described in the daily report sheets delivered to SICADA and are traceable by the activity number.

The fluid resistivity and temperature logs are recorded in 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 calibrated and cleaned before arriving at the site according to SKB cleaning level 2 (SKB internal controlling document SKB MD 600.004). Furthermore, all equipment was wiped with alcohol before it was lowered into the borehole.

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 9139 recording a repeat section in upward direction controls the data. 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 automatically stop, if the tension changes rapidly. The tension was recorded on all log runs using Century equipment, except tool 9310.

All data was recorded with max.10 cm sample interval. The speed of the logging for the 9139 tool was 5 m/min, for the 8622 tool 20 m/min and for all other tools 10 m/min.

4.2 Nonconformities

The HiRAT probe has not been optimal centralised in boreholes HFM25, HFM27 and HFM28. Due to the poor centralisation the acoustical travel time, acoustical amplitude and therefore the calculated caliper-mean are of reduced quality. The measured DIP and Azimuth are however not disturbed.

5 Results

5.1 Presentation

All relevant logging events were described in the daily report sheets, which were delivered separately.

Logs presented in Appendix 1–5 (drawings no. 1.1–5.1) are listed in Table 5-1.

Table 5-1. Logs presented in drawings no. 1.1, Appendix 1.

Log	Log name short	Unit	Tool
Fluid temperature	TEMP(FL)	Deg C	9042
Fluid resistivity	RES(FL)	Ohm-m	9042
Normal resistivity 16 inch	RES(16N)	Ohm-m	8144
Normal resistivity 64 inch	RES(64N)	Ohm-m	8144
Lateral resistivity	LATERAL	Ohm-m	8144
Single point resistance	SPR	Ohm	8144
Magnetic susceptibility	MAGSUSCEP	$SI\times10^{-5}$	8622
Caliper, 1-arm	CALIPER1	mm	9139
Gamma-gamma density	DENSITY	kg/m^3	9139
Focused guard log resistivity, 127 cm	RES(SG)	Ohm-m	9139
Natural gamma	GAM(NAT)	μR/h	9072
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
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 horizontal	DIP	Deg	HIRAT
360° orientated acoustic travel time	TRAVEL TIME	100 ns	HiRAT
360° orientated acoustic travel time	AMPLITUDE	–	HiRAT

5.2 Orientation, alignment and stretch of logs

5.2.1 Orientation of images

The orientation of the results from the HiRAT Acoustic tool, are processed in the tool while recording, using the magnetometers and accelerometers in the tool.

5.2.2 Overlapping data

If the log data from one probe have been recorded in more than one file, the files are merged using events in both files. Overlapping in data is always used from the topmost-recorded file (overlapping data are never the mean value from two log runs).

5.2.3 Alignment of data

In order to obtain an exact depth calibration, the track marks made while drilling are used. In boreholes without track marks, gamma events in the top and the bottom of the borehole are used. The connection between the track marks and the logs is obtained from the HiRAT Acoustic tool. The depths from the track marks and from the HiRAT tool are used to make a new depth scale in WellCAD. All log files are shifted using the new depth scale.

5.2.4 Stretch of logs

There is a minor difference in the depth registration between up- and down runs for the used winch. The size of the defect is about 1.5 m/km. To compensate for this the logs are stretched using another new depth scale for each tool. The depth scale is made by using gamma events from the tool compared with the same gamma events from the HiRAT tool. The events in both files are matched, and the new depth scale is made and added to the log. The bottom of the borehole is considered in stretching the logs in case that 1data will occur below the bottom of the borehole.

5.2.5 Removing of data

The processing of the data includes removing of spikes, negative and unrealistic values and data in the casing.

5.2.6 Repicking of sonic log

The sonic velocity is normally calculated using an automatic picking routine in the sonic tool, 9310. In inclined boreholes the routine is often picking the wrong arrivals, due to so-called “road noise”. Therefore all sonic logs have been manually repicked in WellCAD using the full wave signal.

5.3 Calculated log curves

The different logs are calculated as described in Table 5-2.

Table 5-2. Calculated log curves.

Log	Description of log calculation
Caliper, 1-arm	The Caliper was converted from [cm] to [mm] units by multiplying [cm] with 10.
Gamma-gamma density	The Gamma-gamma was converted from [g/cm^3] to [kg/m^3] units by multiplying with 1,000.
Focused guard log resistivity, 140 cm	–
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 borehole KLX02 located in Oskarshamn.
Fluid temperature	–
Fluid resistivity	–
Normal resistivity 16 inch	–
Normal resistivity 64 inch	–
Lateral resistivity	–
Single point resistance	–
Self-potential	–
Focused guard log resistivity, 300 cm	–
P-wave velocity	The P-VEL velocity is calculated using the difference in distance between the far and near receiver divided by the difference between the first arrival from the far and near signal. (121.9 cm–91.4 cm)/(Time(far)–Time(near)).
Full wave form, near receiver	–
Full wave form, far receiver	–
Magnetic susceptibility	The magnetic susceptibility was converted for CGS units to SI units by multiplying the CGS value by 4π.
Caliper, high resolution. 360°. CALIPER 3D	The Caliper 3D is calculated using the acoustic travel time and the velocity in the borehole fluid. The velocity in the fluid is calculated using the fluid temperature and fluid conductivity.
High resolution 1D Caliper CALIPER MEAN	The Caliper mean is calculated using the mean travel time from the acoustic televiewer, the fluid temperature, fluid velocity and the internal travel time in the acoustic televiewer.
Borehole azimuth magnetic north	See 5.3.1
Borehole Inclination from lateral	See 5.3.1
360° orientated acoustic travel time	–
360° orientated acoustic amplitude	–

5.3.1 Calculation of coordinates

To convert the measured azimuth and inclination to grid-coordinates, one needs to take into account the magnetic declination at 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 were 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. The coordinates were calculated from 5 m below the casing bottom.

5.4 Borehole KFM09A

In order to obtain an exact depth calibration in borehole KFM09A, the reference track marks made while drilling are used. The correlation between the track marks and the logs is obtained from the HiRAT Acoustic tool.

The reference track marks in the borehole and the recorded track marks from the HiRAT are observed in the following depths, Table 5-3.

Table 5-3. The reference track marks in the borehole and the recorded track marks from the HiRAT in borehole KFM09A.

Reference mark	HIRAT recorded
50.00	50
100.00	99.13
150.00	150.23
200.00	200.38
250.00	250.5
300.00	300.59
350.00	350.74
400.00	400.84
450.00	450.93
500.00	501.07
550.00	551.14
600.00	601.23
650.00	651.49
725.00	726.6

To compensate for the difference between the reference track marks and the recorded track marks the logs are stretched. The result from the stretching is a new depth scale. The new depth scale is applied to the HiRAT file. In this way a perfect match between given depths of the reference marks and the recorded data is obtained. By means of alignment of the observed gamma events in KFM09A, between all log runs, the obtained reference mark correlation is transferred to the other logs.

The complete log suite for borehole KFM09A is presented as composite log sheets in drawing 1.1 in Appendix 1. The logs presented in drawing no. 1.1 are listed in Table 5-1.

5.5 Borehole KFM07B

In order to obtain an exact depth calibration in borehole KFM07B, the reference track marks made while drilling are used. The correlation between the track marks and the logs is obtained from the HiRAT Acoustic tool.

The reference track marks in the borehole and the recorded track marks from the HiRAT are observed in the following depths, Table 5-4.

Table 5-4. The reference track marks in the borehole and the recorded track marks from the HiRAT in borehole KFM07B.

Reference mark	HIRAT recorded
100.00	100
150.00	150.13
200.00	200.214
250.00	250.352

To compensate for the difference between the reference track marks and the recorded track marks the logs are stretched. The result from the stretching is a new depth scale. The new depth scale is applied to the HiRAT file. In this way a perfect match between given depths of the reference marks and the recorded data is obtained. By means of alignment of the observed gamma events in KFM07B, between all log runs, the obtained reference mark correlation is transferred to the other logs.

The complete log suite for borehole KFM07B is presented as composite log sheets in drawing 2.1 in Appendix 2. The logs presented in drawing no. 2.1 are listed in Table 5-1.

5.6 Borehole HFM25

Using the natural gamma from the HiRAT as reference, the natural gamma logs from the other probes are aligned to the same depth. A new depth scale is added to each log and afterwards the logs are stretched using the events shown in Table 5-5.

Table 5-5. Gamma events in borehole HFM25.

Events	Depths
Top event	9.26
Bottom event	181.3

The complete log suite for borehole HFM25 is presented as composite log sheet in drawing 3.1 in Appendix 3. The logs presented in drawing no. 3.1 are listed in Table 5-1.

5.7 Borehole HFM27

Using the natural gamma from the HiRAT as reference, the natural gamma logs from the other probes are aligned to the same depth. A new depth scale is added to each log and afterwards the logs are stretched using the events shown in Table 5-6.

Table 5-6. Gamma events in borehole HFM27.

Events	Depths
Top event	6.04
Bottom event	111.5

The complete log suite for borehole HFM27 is presented as composite log sheet in drawing 4.1 in Appendix 4. The logs presented in drawing no. 4.1 are listed in Table 5-1.

5.8 Borehole HFM28

Using the natural gamma from the HiRAT as reference, the natural gamma logs from the other probes are aligned to the same depth. A new depth scale is added to each log and afterwards the logs are stretched using the events shown in Table 5-7.

The complete log suite for borehole HFM28 is presented as composite log sheet in drawing 5.1 in Appendix 5. The logs presented in drawing no. 5.1 are listed in Table 5-1.

Table 5-7. Gamma events in borehole HFM28.

Events	Depths
Top event	28.5
Bottom event	135.9

6 Data delivery

Geophysical logging data from the measurements, recorded in Century and Robertson format, were delivered directly after the termination of the field activities. The recorded data files used in the processing have also been delivered in WellCAD format, Table 6-1.

The delivered data have been inserted in the database (SICADA) of SKB and are traceable by the activity plan number.

The processed files shown on the drawings have been delivered in WellCAD, Table 6-2, and as EXCEL files (one for each borehole) in SICADA format, Table 6-3.

Table 6-1. Recorded log files in Century or Robertson format used for processing.

Borehole	Probe	Log direction	WellCAD File	Description
KFM09A	8144	Up	KFM09A_11-11-05_14-09_8144C_.02_-2.50_ 796.52_ORIG.log	Start Depth: 796.52 m. End Depth: –2.5 m
KFM09A	8622	Up	KFM09A_11-09-05_17-37_8622C_.02_-0.85_ 797.43_ORIG.log	Start Depth: 797.43 m. End Depth: –0.85 m
KFM09A	9042	Down	KFM09A_11-09-05_15-06_9042C_.02_0.22_ 798.38_ORIG.log	Start Depth: 0.22 m. End Depth: 798.38 m
KFM09A	9072	Up	KFM09A_11-10-05_10-11_9072C_.02_-1.45_ 233.29_ORIG.log	Start Depth: 233.29 m. End Depth: –1.45 m
KFM09A	9072	Up	KFM09A_11-10-05_08-56_9072C_.02_299.99_ 667.66_ORIG.log	Start Depth: 667.66 m. End Depth: 299.99 m
KFM09A	9072	Up	KFM09A_11-10-05_07-55_9072C_.02_449.72_ 798.99_ORIG.log	Start Depth: 798.99 m. End Depth: 449.72 m
KFM09A	9072	Up	KFM09A_11-10-05_09-51_9072C_.02_201.84_ 353.46_ORIG.log	Start Depth: 353.46 m. End Depth: 201.84 m
KFM09A	9139	Up	KFM09A_11-10-05_13-39_9139A_.02_-0.88_ 799.16_ORIG.log	Start Depth: 799.16 m. End Depth: –0.88 m
KFM09A	9310	Up	KFM09A_11-10-05_17-47_9310C2_.10_-1.30_ 796.40_ORIG.log	Start Depth: 796.4 m. End Depth: –1.3 m
KFM09A	HiRAT	Up	KFM09A_90pixels_up_run1.HED	Start Depth: 800 m. End Depth: 0 m
KFM07B	8144	Up	KFM07B_11-12-05_10-55_8144C_.02_-0.35_ 298.50_ORIG.log	Start Depth: 298.5 m. End Depth: –0.35 m
KFM07B	8622	Up	KFM07B_11-11-05_18-28_8622C_.02_-0.45_ 298.20_ORIG.log	Start Depth: 298.2 m. End Depth: –0.45 m
KFM07B	9042	Down	KFM07B_11-12-05_07-25_9042C_.02_0.22_ 298.95_ORIG.log	Start Depth: 0.22 m. End Depth: 298.95 m
KFM07B	9072	Up	KFM07B_11-12-05_08-47_9072C_.02_-0.95_ 297.70_ORIG.log	Start Depth: 297.7 m. End Depth: –0.95 m
KFM07B	9139	Up	KFM07B_11-12-05_09-40_9139A_.02_-0.97_ 297.51_ORIG.log	Start Depth: 297.51 m. End Depth: –0.97 m
KFM07B	9310	Up	KFM07B_11-11-05_16-16_9310C2_.10_-0.70_ 297.30_ORIG.log	Start Depth: 297.3 m. End Depth: –0.7 m
KFM07B	HiRAT	Up	KFM07B_90pixels_Up_run2.HED	Start Depth: 173 m. End Depth: 0 m
KFM07B	HiRAT	Up	KFM07B_90pixels_Up_run1.HED	Start Depth: 300 m. End Depth: 157 m

HFM25	8144	Up	HFM25_11-12-05_16-32_8144C_.02_-0.16_ 186.76_ORIG.log	Start Depth: 186.76 m. End Depth: –0.16 m
HFM25	8622	Up	HFM25_11-12-05_14-44_8622C_.02_-0.22_ 186.46_ORIG.log	Start Depth: 186.46 m. End Depth: –0.22 m
HFM25	9042	Down	HFM25_11-12-05_13-21_9042C_.02_0.22_ 187.96_ORIG.log	Start Depth: 0.22 m. End Depth: 187.96 m
HFM25	9072	Up	HFM25_11-12-05_14-14_9072C_.02_-0.36_ 186.26_ORIG.log	Start Depth: 186.26 m. End Depth: –0.36 m
HFM25	9139	Up	HFM25_11-12-05_15-13_9139A_.02_-0.20_ 186.70_ORIG.log	Start Depth: 186.7 m. End Depth: –0.2 m
HFM25	9310	Up	HFM25_11-12-05_17-09_9310C2_.10_-0.50_ 185.70_ORIG.log	Start Depth: 185.7 m. End Depth: –0.5 m
HFM25	HiRAT	Up	HFM25_90pixels_up_run1.HED	Start Depth: 187.5 m. End Depth: 0 m
HFM27	8144	Up	HFM27_11-13-05_09-26_8144C_.02_0.04_ 127.50_ORIG.log	Start Depth: 127.5 m. End Depth: 0.04 m
HFM27	8622	Up	HFM27_11-13-05_09-49_8622C_.02_-0.12_ 127.14_ORIG.log	Start Depth: 127.14 m. End Depth: –0.12 m
HFM27	9042	Down	HFM27_11-13-05_07-33_9042C_.02_0.22_ 132.67_ORIG.log	Start Depth: 0.22 m. End Depth: 132.67 m
HFM27	9072	Up	HFM27_11-13-05_08-17_9072C_.02_0.20_ 127.40_ORIG.log	Start Depth: 127.4 m. End Depth: 0.2 m
HFM27	9139	Up	HFM27_11-13-05_08-48_9139A_.02_-0.07_ 126.82_ORIG.log	Start Depth: 126.82 m. End Depth: –0.07 m
HFM27	9310	Up	HFM27_11-13-05_10-33_9310C2_.10_-0.20_ 126.00_ORIG.log	Start Depth: 126 m. End Depth: –0.2 m
HFM27	HiRAT	Up	HFM27_90pixels_Up_run1.HED	Start Depth: 127.5 m. End Depth: 0 m
HFM28	8144	Up	HFM28_11-13-05_14-50_8144C_.02_0.05_ 148.57_ORIG.log	Start Depth: 148.57 m. End Depth: 0.05 m
HFM28	8622	Up	HFM28_11-13-05_16-04_8622C_.02_-0.16_ 149.21_ORIG.log	Start Depth: 149.21 m. End Depth: –0.16 m
HFM28	9042	Down	HFM28_11-13-05_12-49_9042C_.02_0.22_ 149.10_ORIG.log	Start Depth: 0.22 m. End Depth: 149.1 m
HFM28	9072	Up	HFM28_11-13-05_13-26_9072C_.02_0.17_ 148.39_ORIG.log	Start Depth: 148.39 m. End Depth: 0.17 m
HFM28	9139	Up	HFM28_11-13-05_14-03_9139A_.02_0.00_ 149.89_ORIG.log	Start Depth: 149.89 m. End Depth: 0 m
HFM28	9310	Up	HFM28_11-13-05_15-37_9310C2_.10_0.00_ 148.00_ORIG.log	Start Depth: 148 m. End Depth: 0 m
HFM28	HiRAT	Up	HFM28_90pixels_Up_run4.HED	Start Depth: 16 m. End Depth: 0 m
HFM28	HiRAT	Up	HFM28_90pixels_Up_run1.HED	Start Depth: 146 m. End Depth: 48 m
HFM28	HiRAT	Up	HFM28_90pixels_Up_run2.HED	Start Depth: 60 m. End Depth: 25 m
HFM28	HiRAT	Up	HFM28_90pixels_Up_run3.HED	Start Depth: 30 m. End Depth: 10 m

Table 6-2. Drawing files in WellCad format.

Borehole	Drawing	WellCad file
KFM09A	1.1	KFM09A_Presentation.WCL
KFM07B	2.1	KFM07B_Presentation.WCL
HFM25	3.1	HFM25_Presentation.WCL
HFM27	4.1	HFM27_Presentation.WCL
HFM28	5.1	HFM28_Presentation.WCL

Table 6-3. Data files in SICADA format.

Sheet	Comment
"Borehole"_CALIPER1_GP040 - Caliper logging.xls	
"Borehole"_CALIPER MEAN_GP041 - 3-D caliper.xls	
"Borehole"_TEMP(FL)_RES(FL)_GP060 – Fluid temperature and resistivity logging.xls	
"Borehole"_DENSITY_GP090 – Density logging.xls	
"Borehole"_MAGSUSCEP_GP110 - Magnetic susceptibility logging.xls	
"Borehole"_GAM(NAT)_GP120 - Natural gamma logging.xls	
"Borehole"_SPR_GP150 - Single point resistance logging.xls	
"Borehole"_RES(64N)_GP160 - Resistivity, normal 1.6 m (64 in).xls	
"Borehole"_RES(MG)_GP161 - Resistivity, focused 140 cm.xls	
"Borehole"_RES(DG)_GP162 - Resistivity, focused 300 cm.xls	
"Borehole"_LATERAL_GP163 - Resistivity, lateral 1.6–0.1 m.xls	
"Borehole"_RES(16N)_GP164 - Resistivity, normal 0.4 m (16 in).xls	
"Borehole"_P-VEL_GP175 - Fullwave sonic.xls	
"Borehole"_GP830 - Acoustic televiewer.xls	

Appendix 1

Borehole KFM09A. Drawing no. 1.1. Borehole logs.

Co-ordinates in RT90 2,5 gon V 0:-15

Northing: 6700115.09m Easting: 1630647.52m Elevation: 4.30m, RHB70

Diameter:	77.3mm
Reaming Diameter:	
Outer Casing:	90.0mm
Inner Casing:	78.0mm
Borehole Length:	799.67m
Cone:	
Inclination at ground surface:	-59.90°
Azimuth:	200.07° GN
Comments:	

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030/9139	mm
DENSITY	Gamma-gamma density	9030/9139	kg/m³
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9072	µR/h
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	8622	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 horizontal	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-
THORIUM	Spectral gamma, Thorium component	9080	PPM
URANIUM	Spectral gamma, Uranium component	9080	PPM
POTASSIUM	Spectral gamma, Potassium component	9080	percent
RES(16N)	Normal resistivity 16 inch	8144	ohm-m
RES(64N)	Normal resistivity 64 inch	8144	ohm-m
LATERAL	Lateral resistivity	8144	ohm-m
SPR	Single point resistivity	8144	ohm
SP	Self Potential	8144	mV
RES(SG)	Focused guard log resistivity, 128 cm	9139	ohm-m

Rev.	Date	Drawn by	Control	Approved
1	2006-01-17	JRI	UTN	UTN

Job 547310A

Scale 1:500

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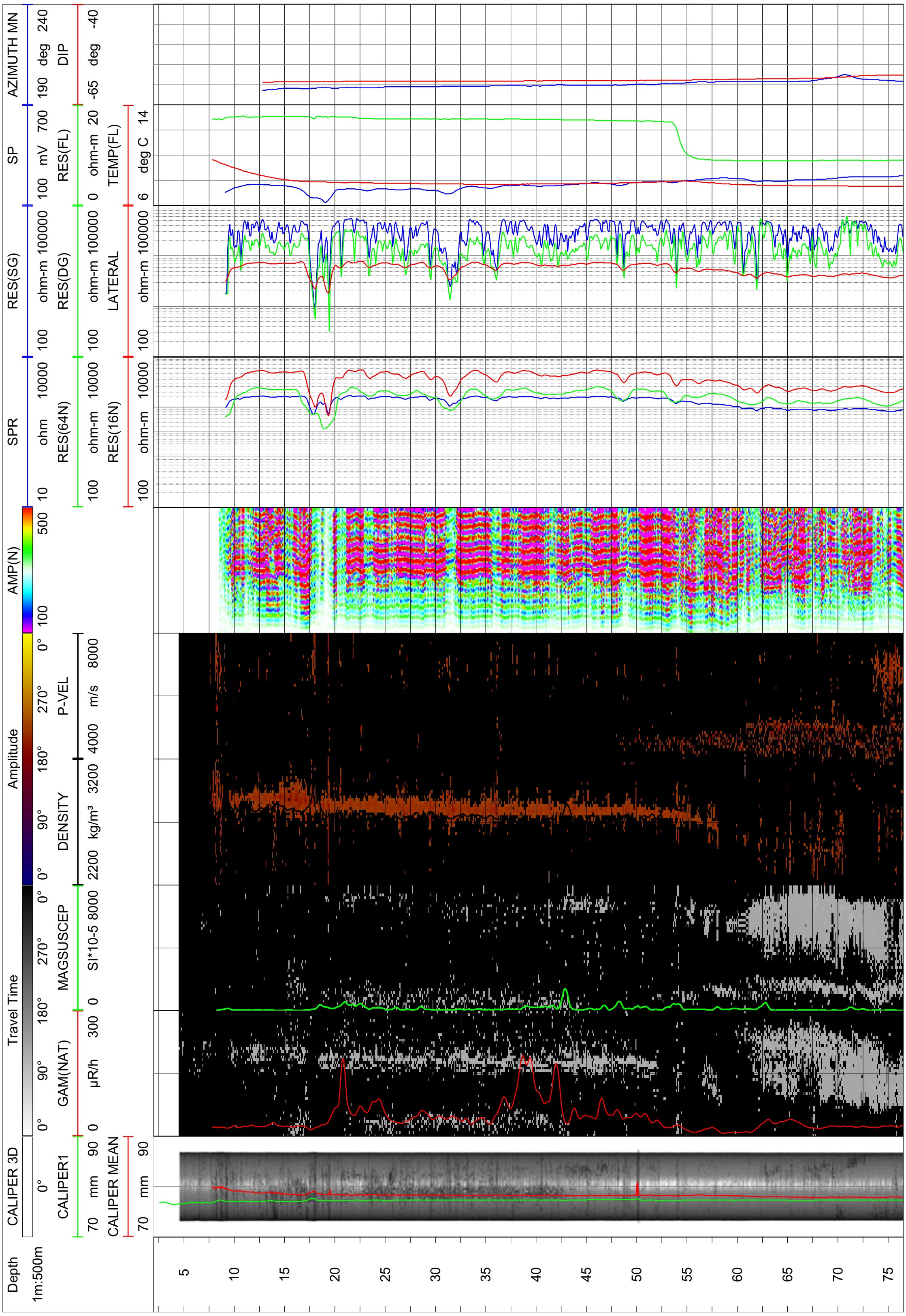
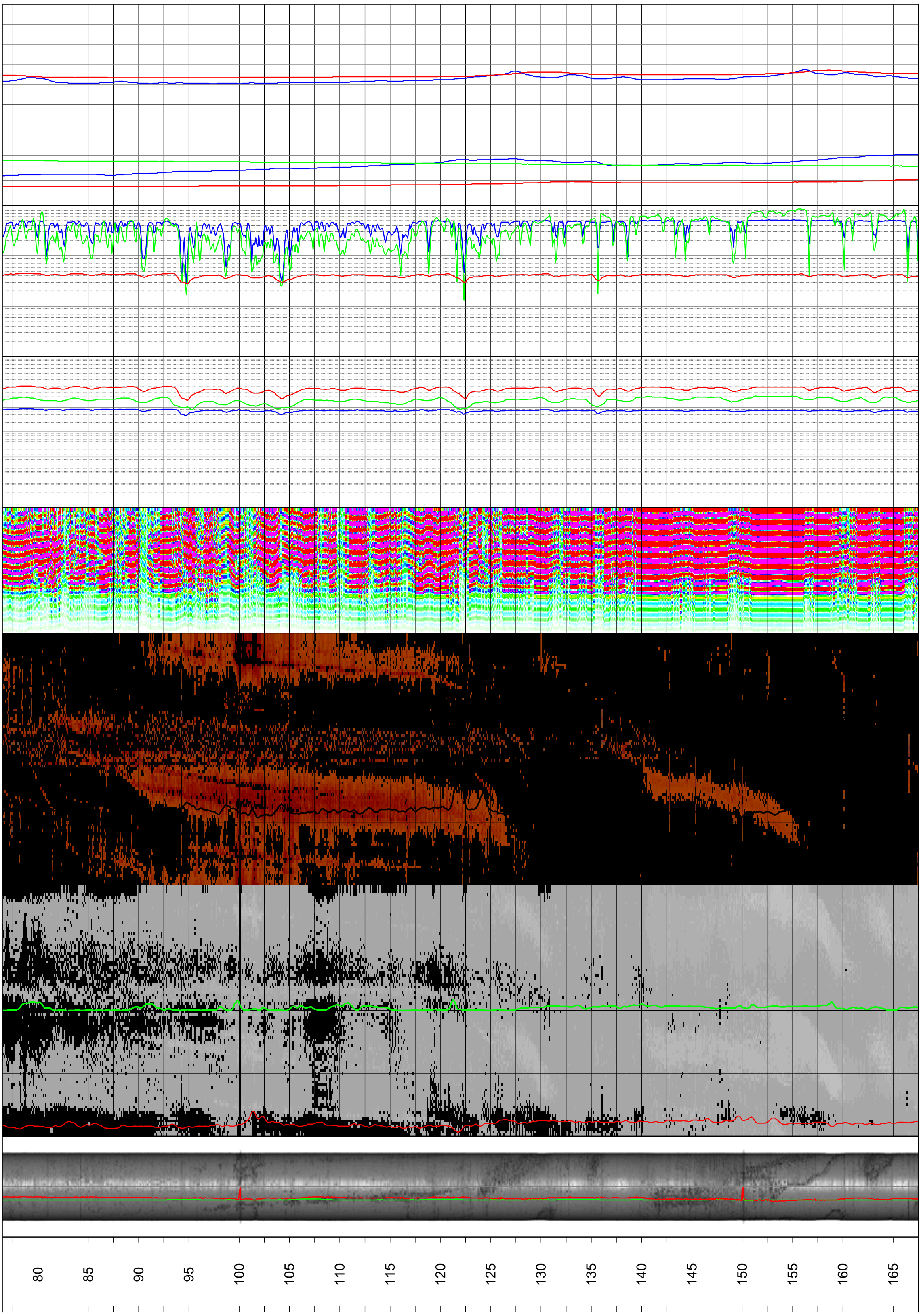
SKB geophysical borehole logging
Borehole KFM09A

Presentation

Filename: KFM09A_Presentation.wcl

Drawing no.: **1.1**


Depth
1m:500m
CALIPER 3D
0°
CALIPER1
70 mm 90
CALIPER MEAN
70 mm 90
Travel Time
0° 90° 180° 270° 0°
GAM(NAT)
0 μR/h 300
MAGSUSCEP
0 SI*10-5 8000
Amplitude
0° 90° 180° 270° 0°
DENSITY
2200 kg/m³ 3200
P-VEL
4000 m/s 8000
AMP(N)
100 500
SPR
10 ohm 10000
RES(64N)
100 ohm-m 10000
RES(16N)
100 ohm-m 10000
RES(SG)
100 ohm-m 100000
RES(DG)
100 ohm-m 100000
LATERAL
100 ohm-m 100000
SP
100 mV 700
RES(FL)
0 ohm-m 20
TEMP(FL)
6 deg C 14
AZIMUTH MN
190 deg 240
DIP
-65 deg -40
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75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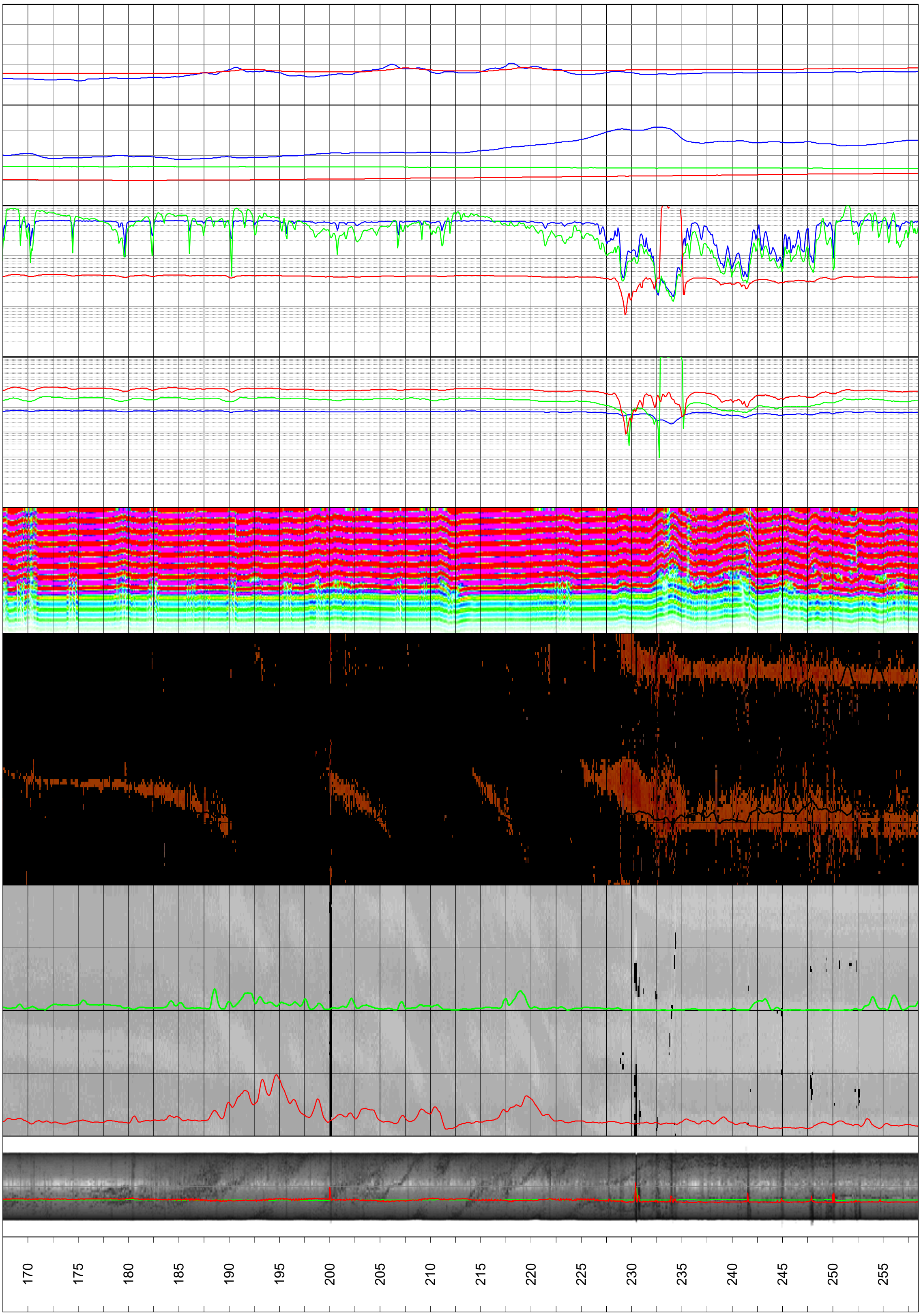
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165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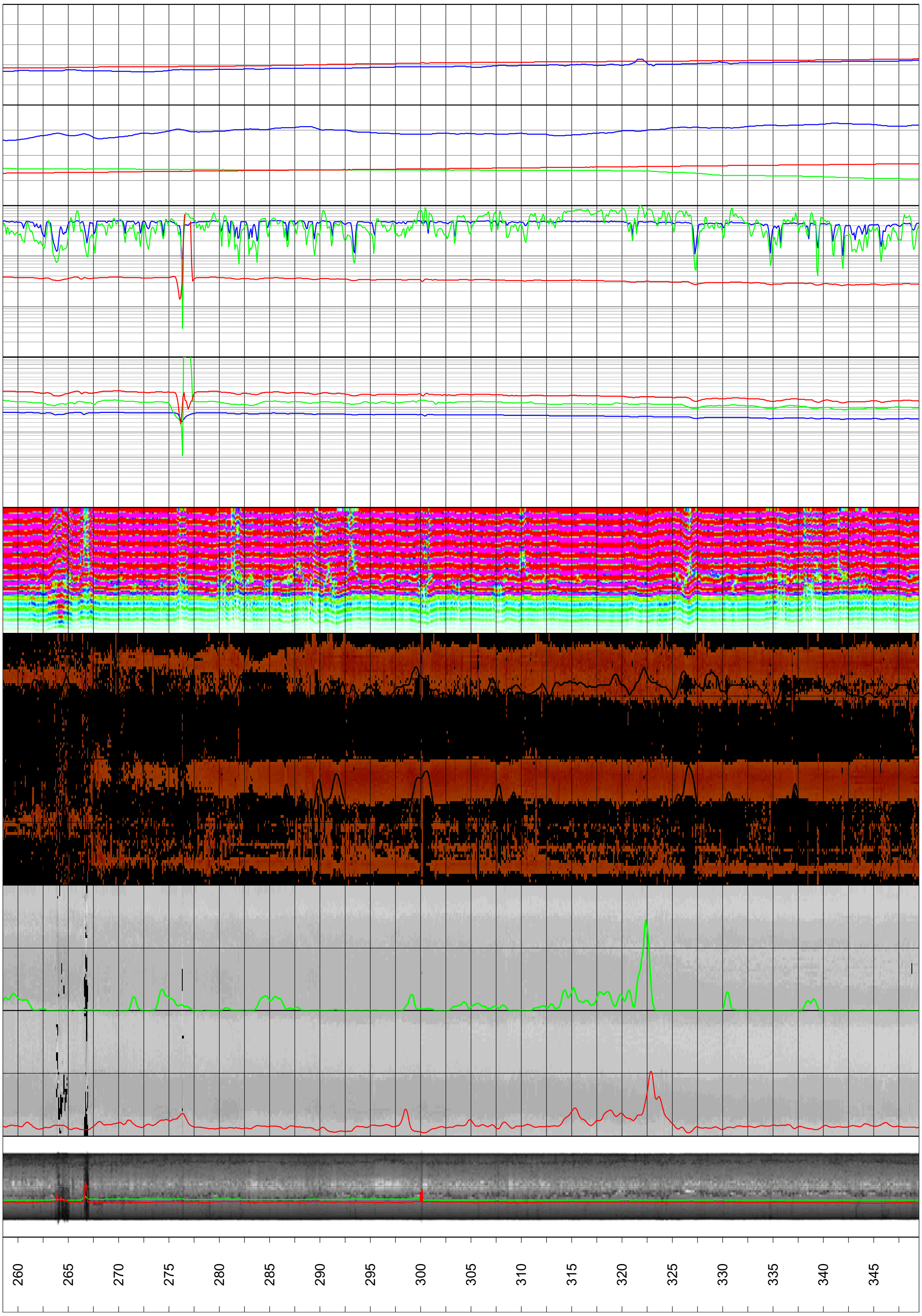
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255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315
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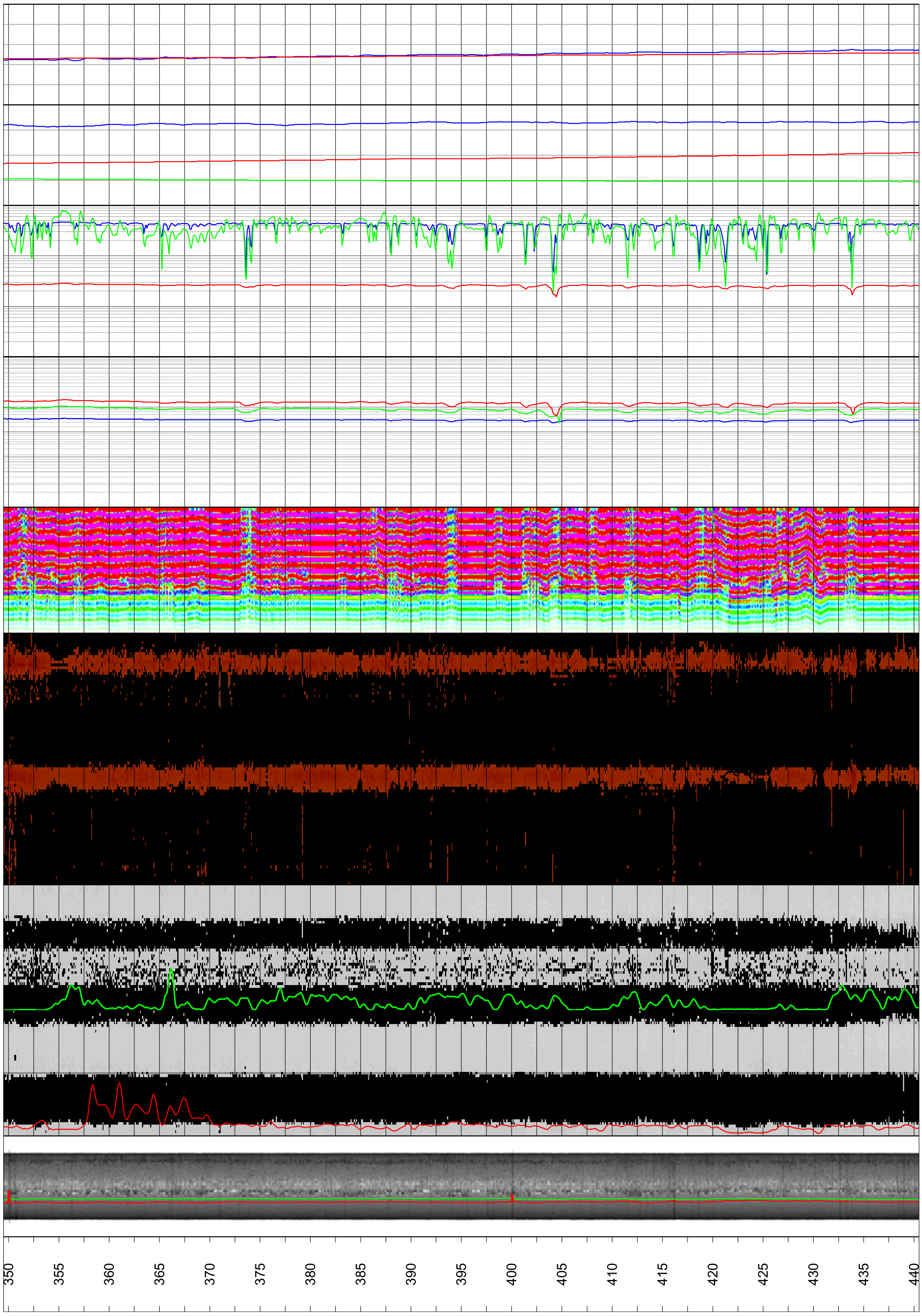
335
340
345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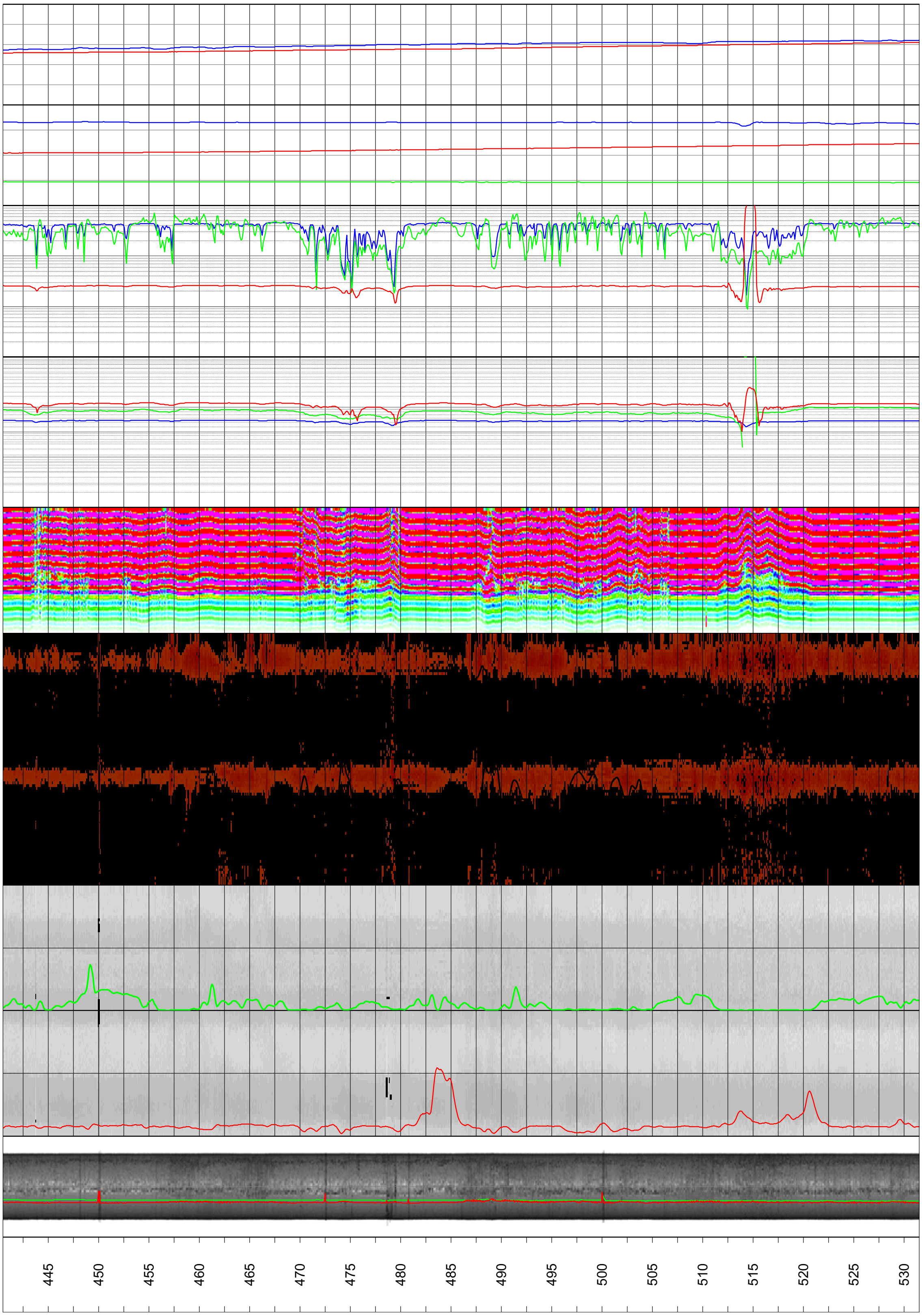
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425
430
435
440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465
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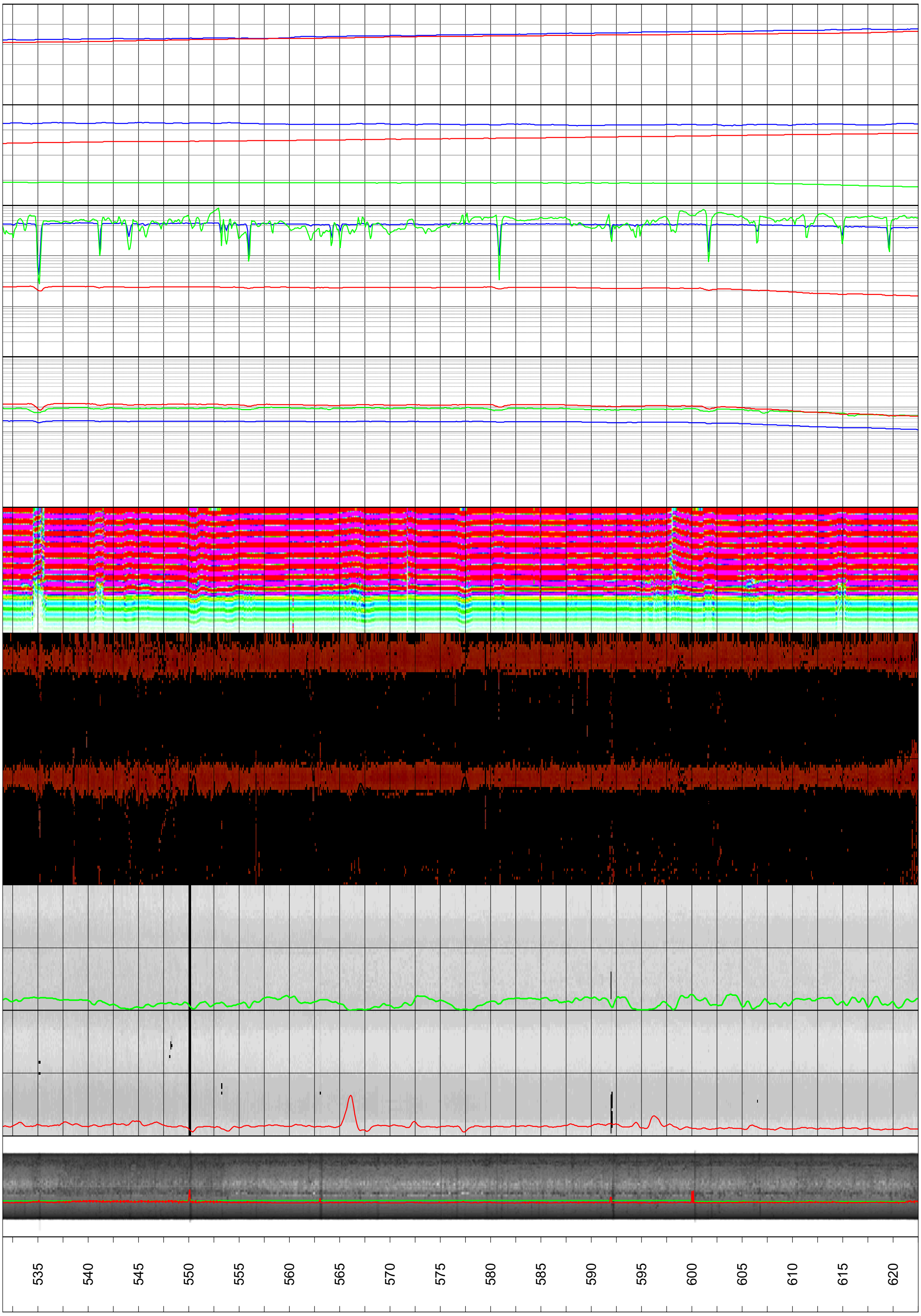
480
485
490
495
500
505
510
515
520
525
530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545
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555
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565
570
575
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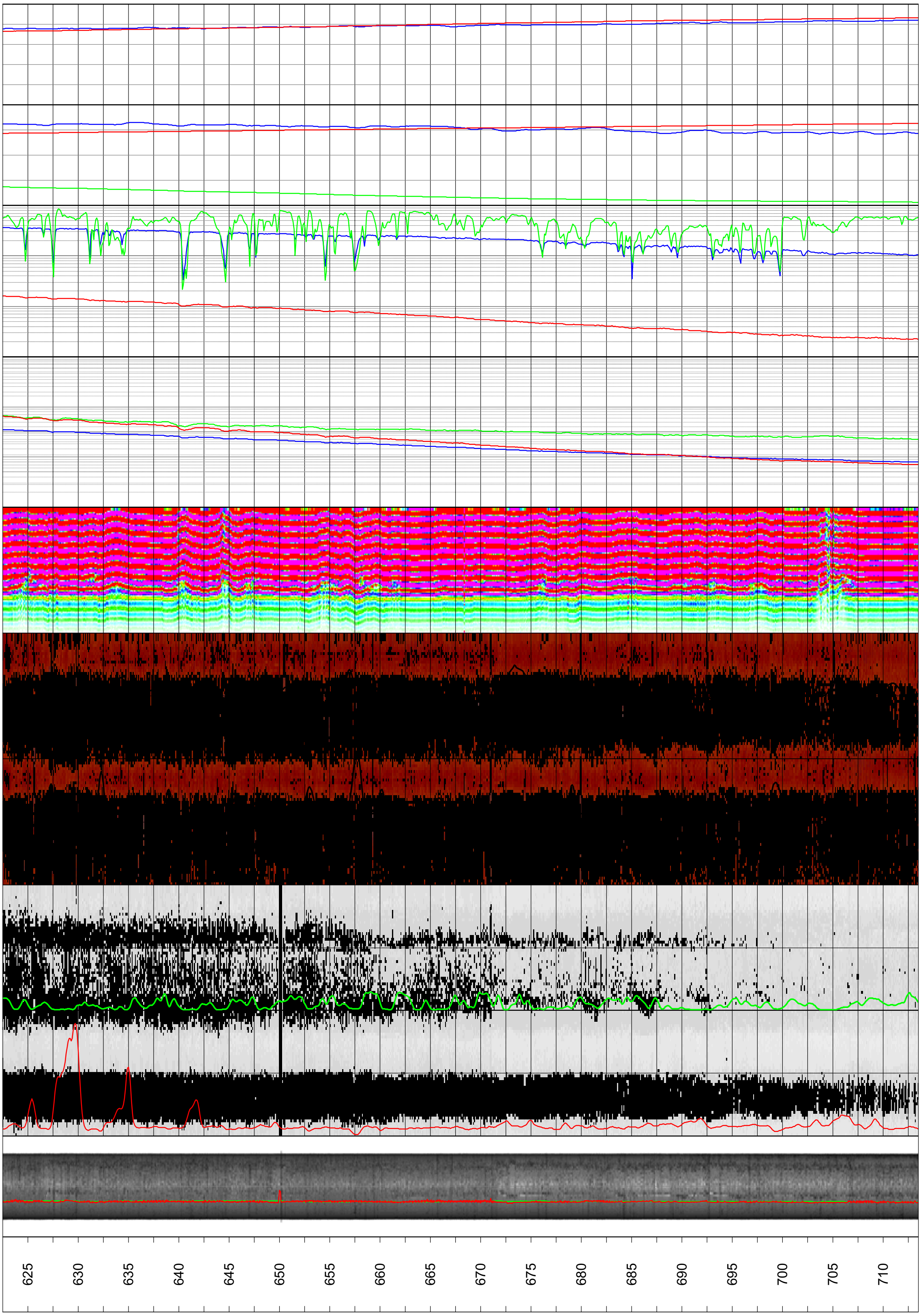
585
590
595
600
605
610
615
620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635
640
645
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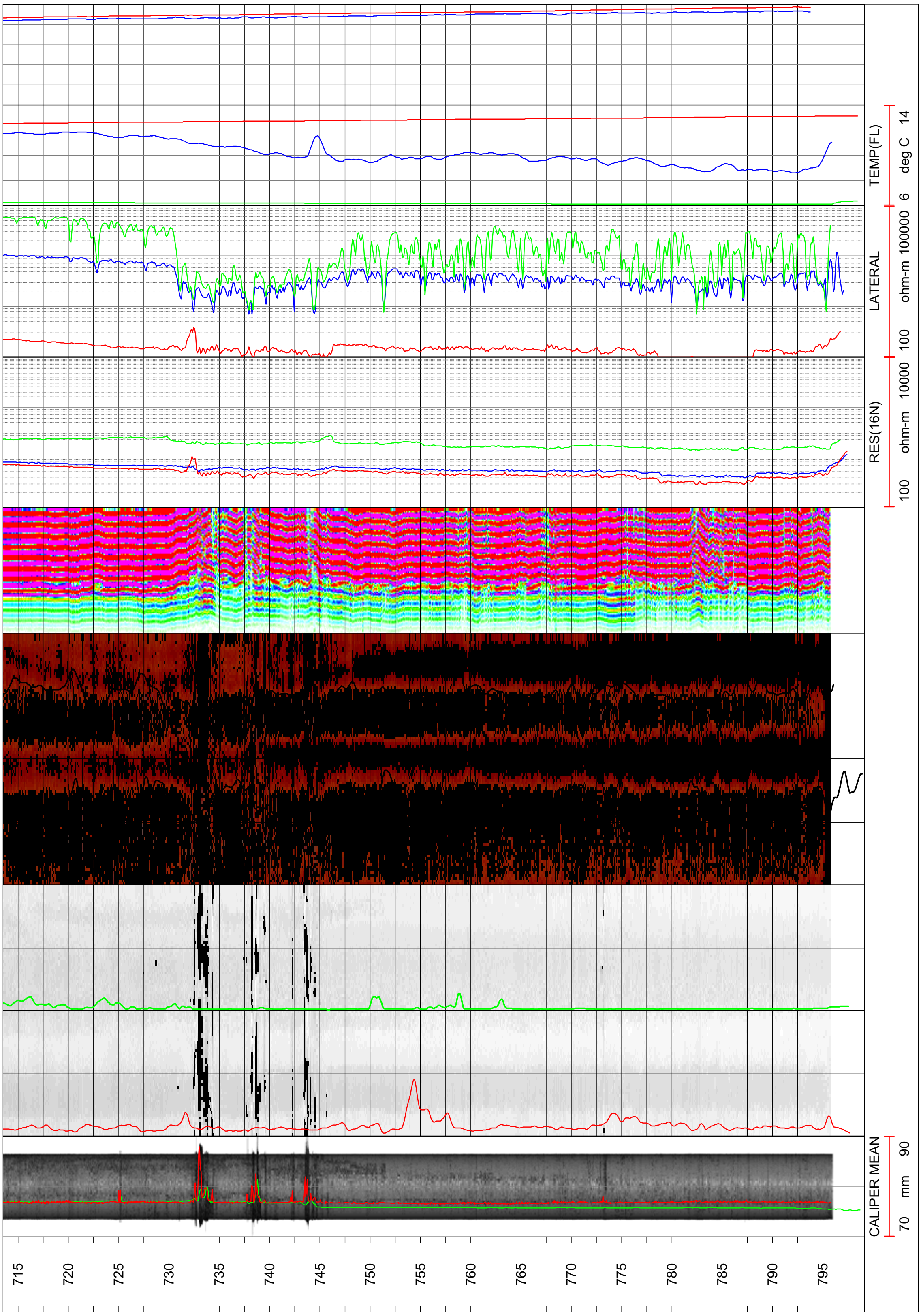
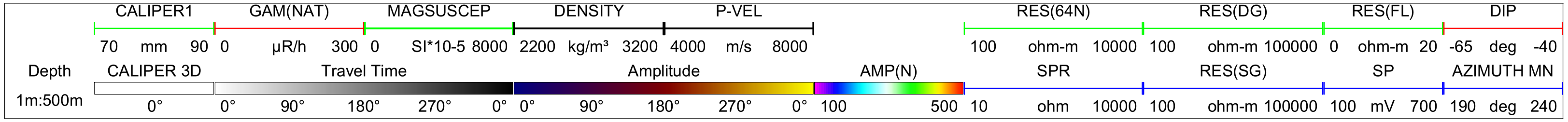
655
660
665
670
675
680
685
690
695
700
705
710


TEMP(FL)
deg C
6
14
LATERAL
ohm-m
100
100000
RES(16N)
ohm-m
100
10000
CALIPER MEAN
mm
70
90
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795


CALIPER1
GAM(NAT)
MAGSUSCEP
DENSITY
P-VEL
RES(64N)
RES(DG)
RES(FL)
DIP
70 mm 90
0 µR/h 300
0 SI*10-5 8000
2200 kg/m³ 3200
4000 m/s 8000
100 ohm-m 10000
100 ohm-m 100000
0 ohm-m 20
-65 deg -40
Depth
1m:500m
CALIPER 3D
0°
Travel Time
0° 90° 180° 270° 0°
Amplitude
0° 90° 180° 270° 0°
AMP(N)
100 500
SPR
10 ohm 10000
RES(SG)
100 ohm-m 100000
SP
100 mV 700
AZIMUTH MN
190 deg 240

Appendix 2

Borehole KFM07B. Drawing no. 2.1. Borehole logs.

Co-ordinates in RT90 2,5 gon V 0:-15

Northing: 6700123.62m Easting: 1631036.83m Elevation: 3.36m, RHB70

Diameter:	76.3mm
Reaming Diameter:	
Outer Casing:	90mm
Inner Casing:	78mm
Borehole Length:	298.93m
Cone:	
Inclination at ground surface:	-53.71°
Azimuth:	134.35°GN
Comments:	

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030/9139	mm
DENSITY	Gamma-gamma density	9030/9139	kg/m³
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9072	μR/h
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	8622	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 horizontal	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-
THORIUM	Spectral gamma, Thorium component	9080	PPM
URANIUM	Spectral gamma, Uranium component	9080	PPM
POTASSIUM	Spectral gamma, Potassium component	9080	percent
RES(16N)	Normal resistivity 16 inch	8144	ohm-m
RES(64N)	Normal resistivity 64 inch	8144	ohm-m
LATERAL	Lateral resistivity	8144	ohm-m
SPR	Single point resistivity	8144	ohm
SP	Self Potential	8144	mV
RES(SG)	Focused guard log resistivity, 128 cm	9139	ohm-m

Rev.	Date	Drawn by	Control	Approved
0	2006-01-17	JRI	UTN	UTN

Job
547310A

Scale
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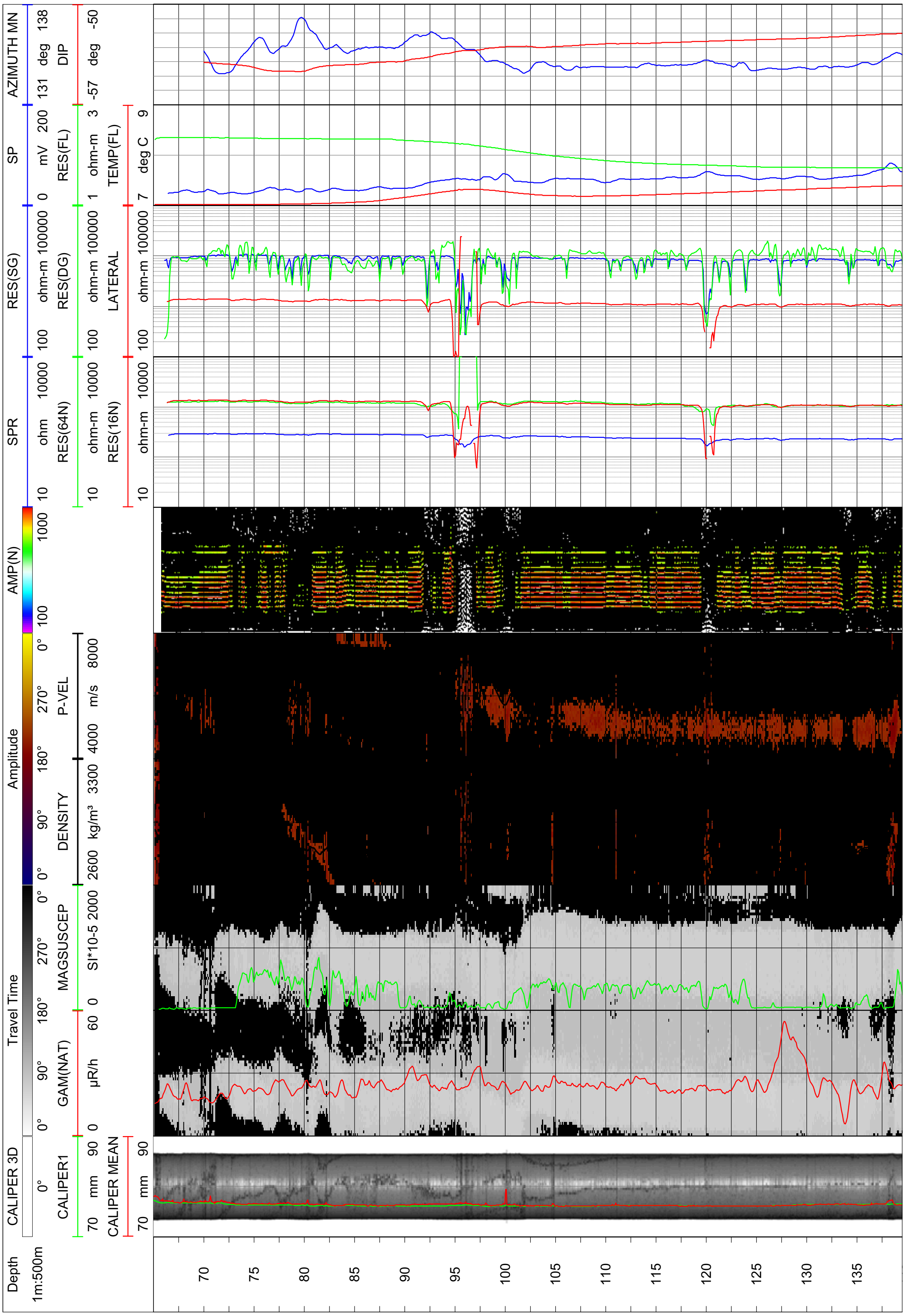
SKB geophysical borehole logging
Borehole KFM07B

Presentation

Filename:
KFM07B_Presentation.wcl

Drawing no.:
2.1


AZIMUTH MN
131 deg 138
DIP
-57 deg -50
SP
0 mV 200
RES(FL)
1 ohm-m 3
TEMP(FL)
7 deg C 9
RES(SG)
100 ohm-m 100000
RES(DG)
100 ohm-m 100000
LATERAL
100 ohm-m 100000
SPR
10 ohm 10000
RES(64N)
10 ohm-m 10000
RES(16N)
10 ohm-m 10000
AMP(N)
100 1000
Amplitude
0° 90° 180° 270° 0°
P-VEL
4000 m/s 8000
DENSITY
2600 kg/m³ 3300
Travel Time
0° 90° 180° 270° 0°
MAGSUSCEP
0 SI*10-5 2000
GAM(NAT)
0 µR/h 60
CALIPER 3D
0°
CALIPER1
70 mm 90
CALIPER MEAN
70 mm 90
Depth
1m:500m
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75
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85
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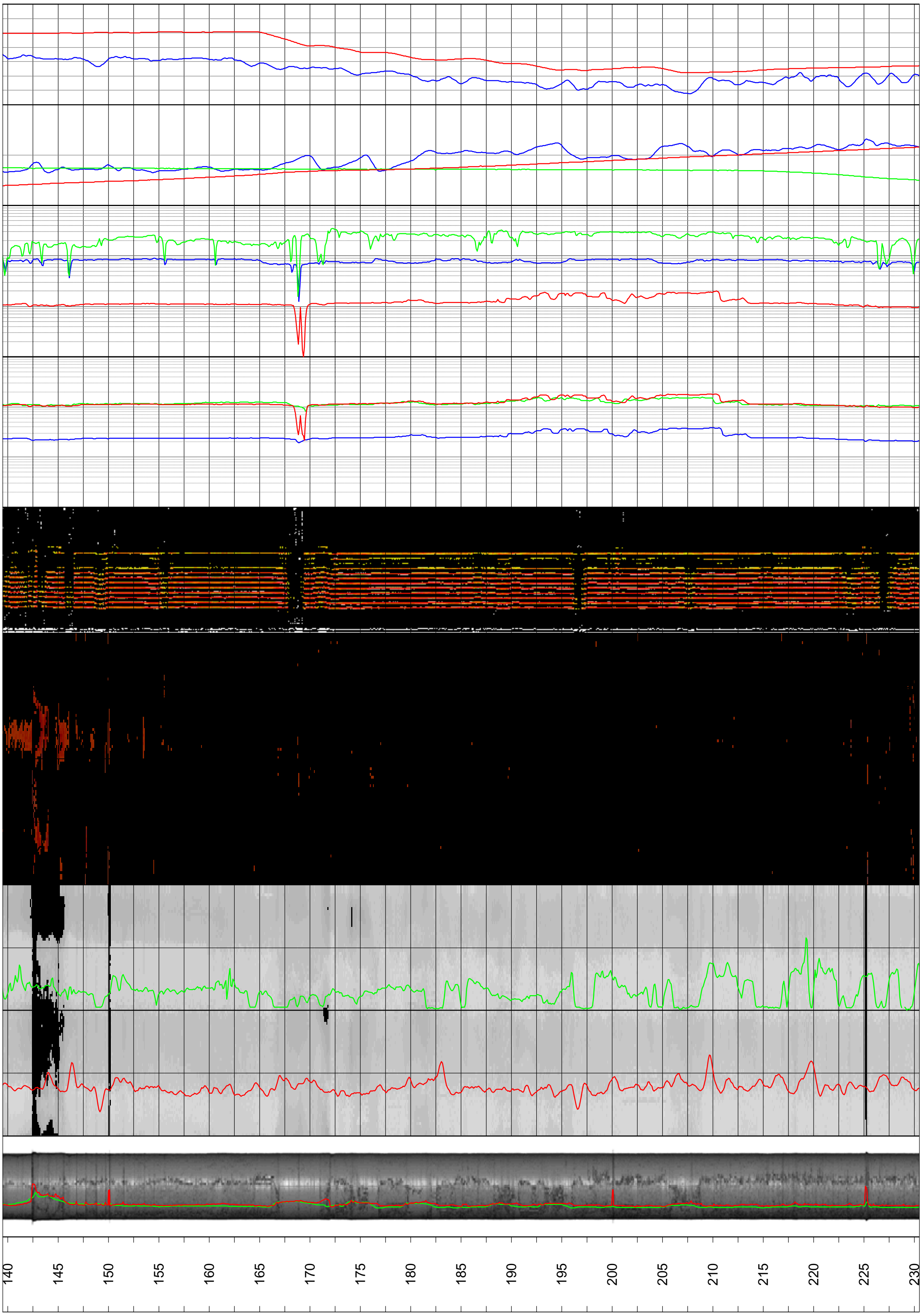
110
115
120
125
130
135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150
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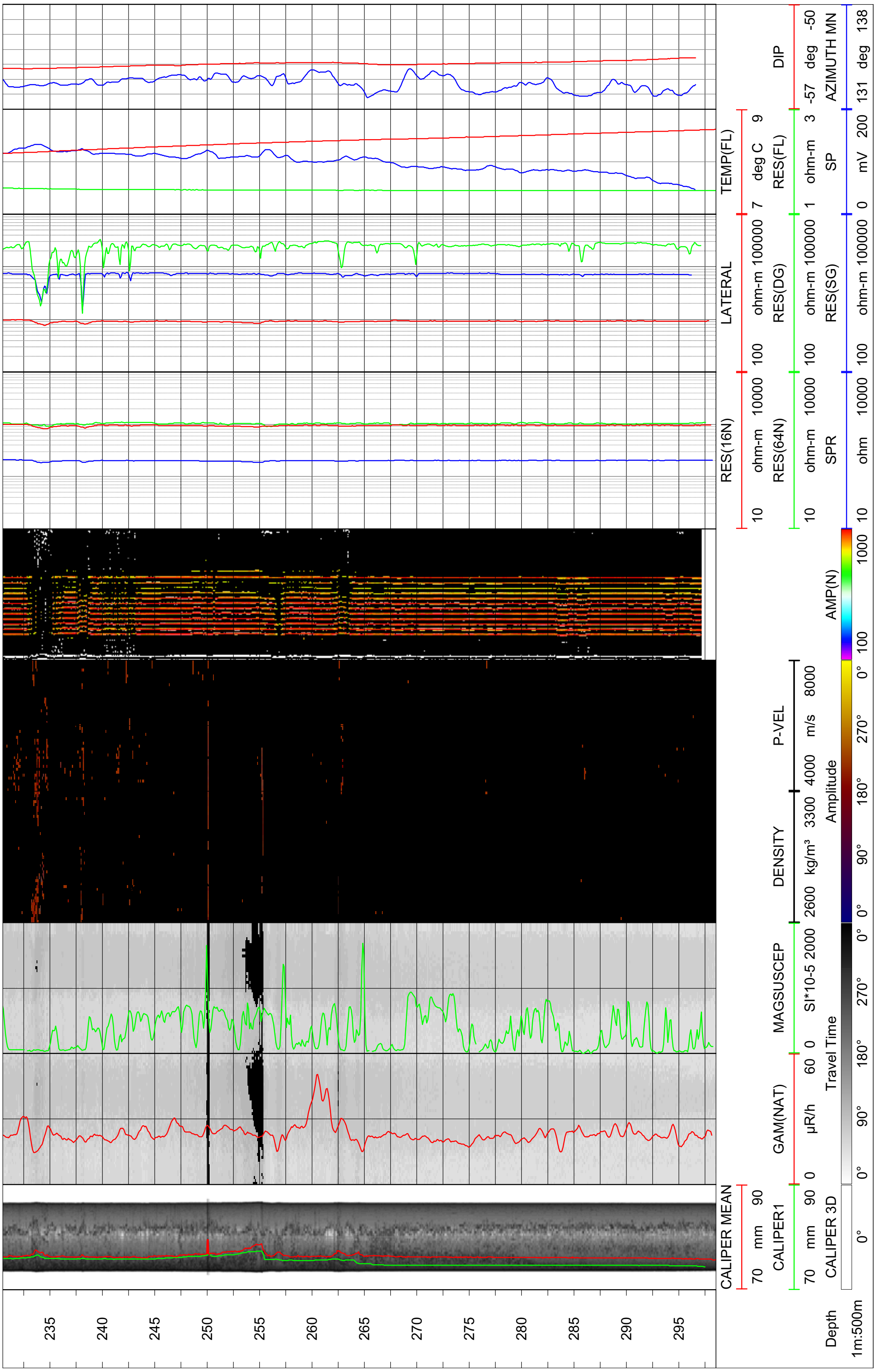
180
185
190
195
200
205
210
215
220
225
230


Depth
1m:500m
235
240
245
250
255
260
265
270
275
280
285
290
295
CALIPER MEAN
70 mm 90
CALIPER1
70 mm 90
CALIPER 3D
0°
GAM(NAT)
0 µR/h 60
MAGSUSCEP
0 SI*10-5 2000
Travel Time
0° 90° 180° 270° 0°
DENSITY
2600 kg/m³ 3300
P-VEL
4000 m/s 8000
Amplitude
0° 90° 180° 270° 0°
AMP(N)
100 1000
RES(16N)
10 ohm-m 10000
RES(64N)
10 ohm-m 10000
SPR
10 ohm 10000
LATERAL
100 ohm-m 100000
RES(DG)
100 ohm-m 100000
RES(SG)
100 ohm-m 100000
TEMP(FL)
7 deg C 9
RES(FL)
1 ohm-m 3
SP
0 mV 200
DIP
-57 deg -50
AZIMUTH MN
131 deg 138

Appendix 3

Borehole HFM25. Drawing no. 3.1. Borehole logs.

Co-ordinates in RT90 2,5 gon V 0:-15

Northing: 6699616.177m Easting: 1633039.833m Elevation: 3.858m, RHB70

Diameter:	139mm
Reaming Diameter:	
Outer Casing:	
Inner Casing:	
Borehole Length:	187.5
Cone:	
Inclination at ground surface:	-57.8°
Azimuth:	140.8°
Comments:	

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030/9139	mm
DENSITY	Gamma-gamma density	9030/9139	kg/m³
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9072	μR/h
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	8622	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 horizontal	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-
THORIUM	Spectral gamma, Thorium component	9080	PPM
URANIUM	Spectral gamma, Uranium component	9080	PPM
POTASSIUM	Spectral gamma, Potassium component	9080	percent
RES(16N)	Normal resistivity 16 inch	8144	ohm-m
RES(64N)	Normal resistivity 64 inch	8144	ohm-m
LATERAL	Lateral resistivity	8144	ohm-m
SPR	Single point resistivity	8144	ohm
SP	Self Potential	8144	mV
RES(SG)	Focused guard log resistivity, 128 cm	9139	ohm-m

Rev.	Date	Drawn by	Control	Approved
1	2006-01-19	JRI	JRI	UTN

Job 547310A

Scale 1:500

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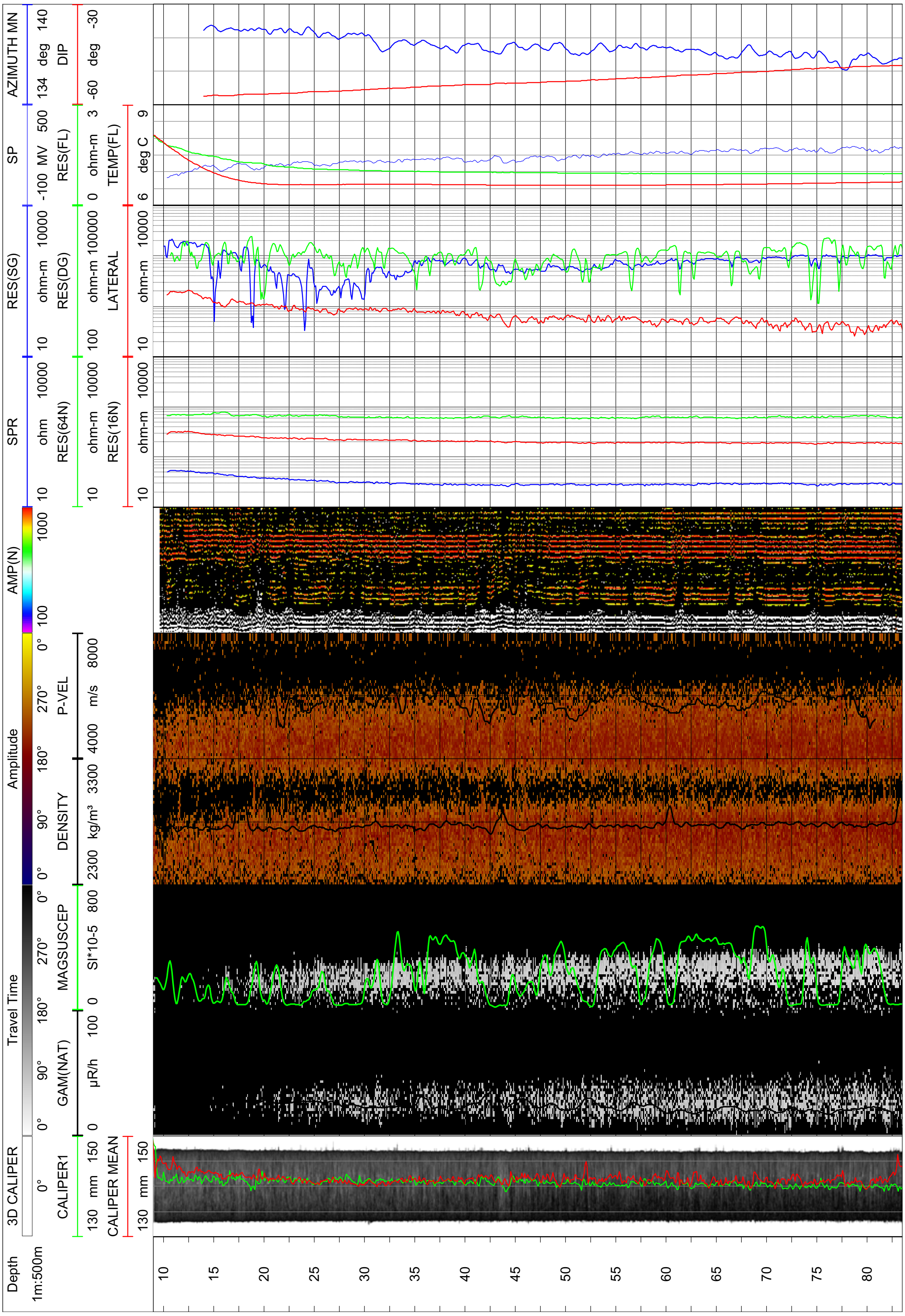
SKB geophysical borehole logging

Borehole HFM25

Presentation

Filename: HFM25_Presentation.wcl

Drawing no.: **3.1**


AZIMUTH MN
134 deg 140
DIP
-60 deg -30
SP
-100 MV 500
RES(FL)
0 ohm-m 3
TEMP(FL)
6 deg C 9
RES(SG)
10 ohm-m 10000
RES(DG)
100 ohm-m 100000
LATERAL
10 ohm-m 10000
SPR
10 ohm 10000
RES(64N)
10 ohm-m 10000
RES(16N)
10 ohm-m 10000
AMP(N)
100 1000
Amplitude
0° 90° 180° 270° 0°
P-VEL
4000 m/s 8000
DENSITY
2300 kg/m³ 3300
Travel Time
0° 90° 180° 270° 0°
MAGSUSCEP
0 SI*10-5 800
GAM(NAT)
0 µR/h 100
3D CALIPER
0°
CALIPER1
130 mm 150
CALIPER MEAN
130 mm 150
Depth
1m:500m
10
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30
35
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45
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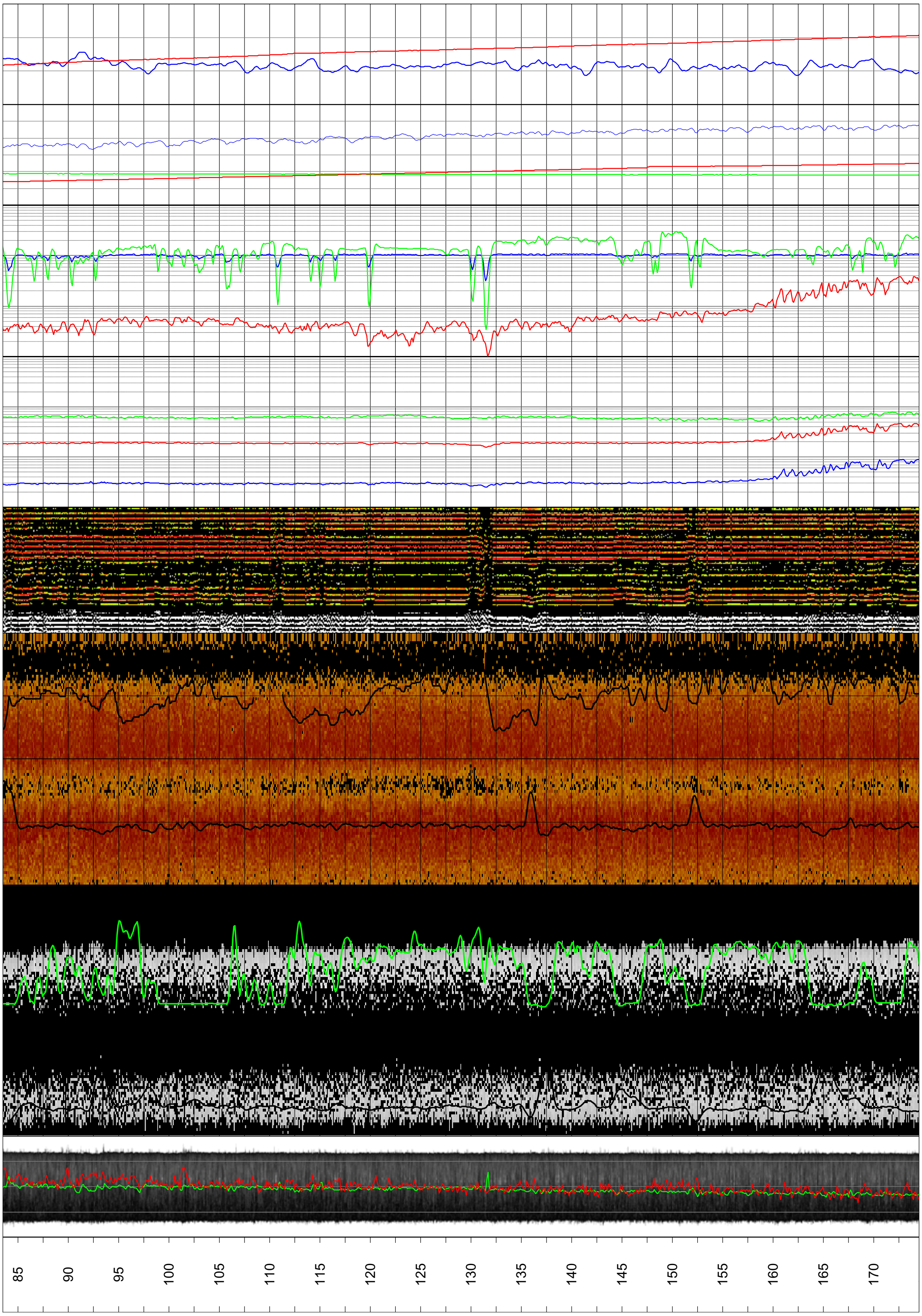
55
60
65
70
75
80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90
95
100
105
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115
120
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135
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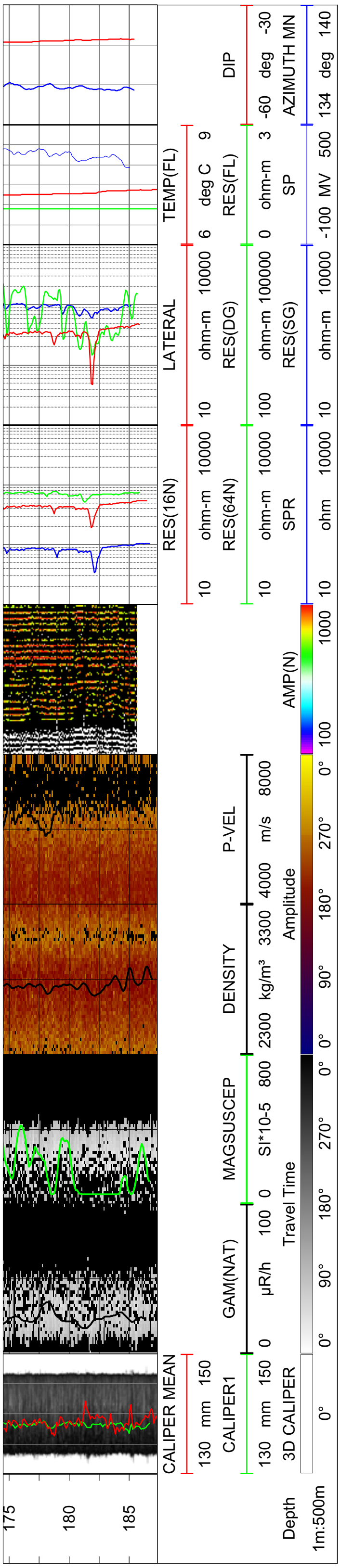
145
150
155
160
165
170


Depth
1m:500m
175
180
185
CALIPER MEAN
130 mm 150
CALIPER1
130 mm 150
3D CALIPER
0°
GAM(NAT)
0 µR/h 100
MAGSUSCEP
0 SI*10-5 800
Travel Time
0° 90° 180° 270° 0°
DENSITY
2300 kg/m³ 3300
P-VEL
4000 m/s 8000
Amplitude
0° 90° 180° 270° 0°
AMP(N)
100 1000
RES(16N)
10 ohm-m 10000
RES(64N)
10 ohm-m 10000
SPR
10 ohm 10000
LATERAL
10 ohm-m 10000
RES(DG)
100 ohm-m 100000
RES(SG)
10 ohm-m 10000
TEMP(FL)
6 deg C 9
RES(FL)
0 ohm-m 3
SP
-100 MV 500
DIP
-60 deg -30
AZIMUTH MN
134 deg 140

Borehole HFM27. Drawing no. 4.1. Borehole logs.

Co-ordinates in RT90 2,5 gon V 0:-15

Northing: 6699595.26m Easting: 1631245.94m Elevation: 2.45m, RHB70

Diameter:	139mm
Reaming Diameter:	
Outer Casing:	168.3mm
Inner Casing:	160mm
Borehole Length:	127.5m
Cone:	
Inclination at ground surface:	-67.83°
Azimuth:	337.26°
Comments:	

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030/9139	mm
DENSITY	Gamma-gamma density	9030/9139	kg/m³
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9072	µR/h
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	8622	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 horizontal	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-
THORIUM	Spectral gamma, Thorium component	9080	PPM
URANIUM	Spectral gamma, Uranium component	9080	PPM
POTASSIUM	Spectral gamma, Potassium component	9080	percent
RES(16N)	Normal resistivity 16 inch	8144	ohm-m
RES(64N)	Normal resistivity 64 inch	8144	ohm-m
LATERAL	Lateral resistivity	8144	ohm-m
SPR	Single point resistivity	8144	ohm
SP	Self Potential	8144	mV
RES(SG)	Focused guard log resistivity, 128 cm	9139	ohm-m

Rev.	Date	Drawn by	Control	Approved
1	2006-01-19	JRI	UTN	UTN

Job 547310A **Scale** 1:500

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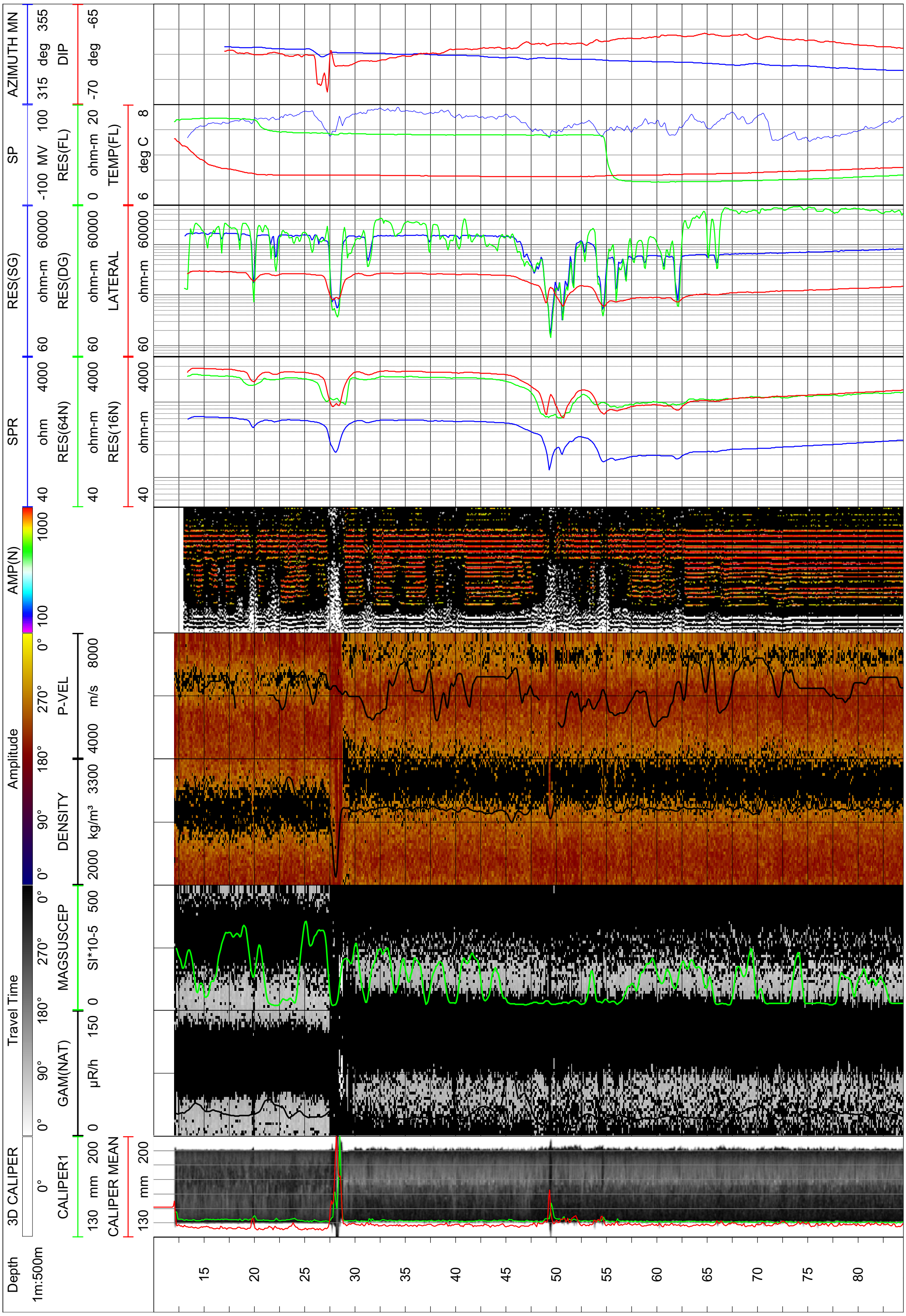
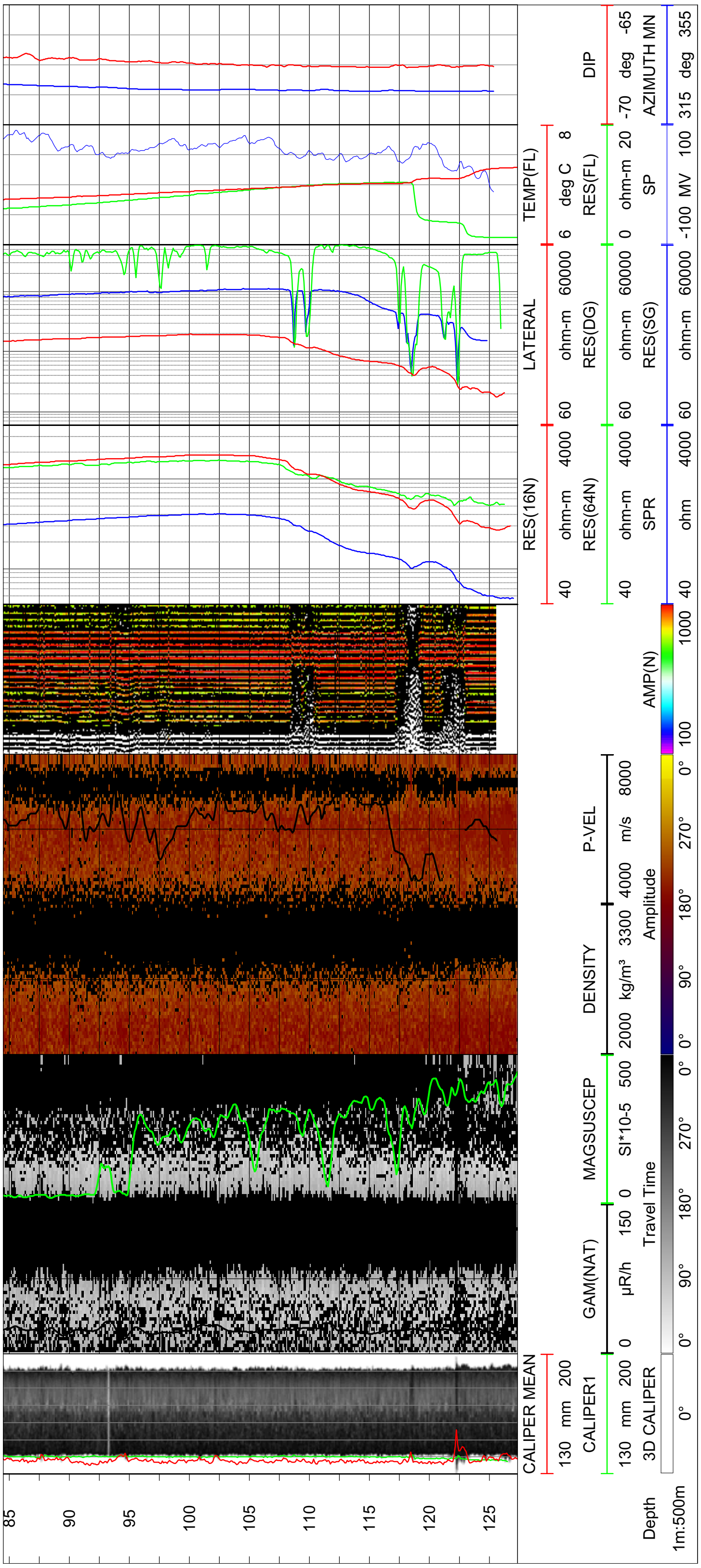
SKB geophysical borehole logging
Borehole HFM27

Presentation

Filename:
HFM27_Presentation.wcl

Drawing no.:
4.1


AZIMUTH MN 315 deg 355
DIP -70 deg -65
SP -100 MV 100
RES(FL) 0 ohm-m 20
TEMP(FL) 6 deg C 8
RES(SG) 60 ohm-m 60000
RES(DG) 60 ohm-m 60000
LATERAL 60 ohm-m 60000
SPR 40 ohm 4000
RES(64N) 40 ohm-m 4000
RES(16N) 40 ohm-m 4000
AMP(N) 100 1000
Amplitude 0° 90° 180° 270° 0°
DENSITY 2000 kg/m³ 3300
P-VEL 4000 m/s 8000
Travel Time 0° 90° 180° 270° 0°
GAM(NAT) 0 µR/h 150
MAGSUSCEP 0 SI*10-5 500
3D CALIPER 0°
CALIPER1 130 mm 200
CALIPER MEAN 130 mm 200
Depth 1m:500m
15
20
25
30
35
40
45
50
55
60
65
70
75
80


Depth
1m:500m
85
90
95
100
105
110
115
120
125
CALIPER MEAN
130 mm 200
CALIPER1
130 mm 200
3D CALIPER
GAM(NAT)
0 µR/h 150
MAGSUSCEP
0 SI*10-5 500
Travel Time
DENSITY
2000 kg/m³ 3300
P-VEL
4000 m/s 8000
Amplitude
AMP(N)
100 1000
RES(16N)
40 ohm-m 4000
RES(64N)
40 ohm-m 4000
SPR
40 ohm 4000
LATERAL
60 ohm-m 60000
RES(DG)
60 ohm-m 60000
RES(SG)
60 ohm-m 60000
TEMP(FL)
6 deg C 8
RES(FL)
0 ohm-m 20
SP
-100 MV 100
DIP
-70 deg -65
AZIMUTH MN
315 deg 355

Appendix 5

Borehole HFM28. Drawing no. 5.1. Borehole logs.

Co-ordinates in RT90 2,5 gon V 0:-15

Northing: 6700068.84m Easting: 1630597.24m Elevation: 4.27m, RHB70

Diameter:	135.1 - 138.1mm
Reaming Diameter:	
Outer Casing:	
Inner Casing:	
Borehole Length:	
Cone:	
Inclination at ground surface:	-84.8°
Azimuth:	146.8° GN
Comments:	

Borehole logging programme

Name	Description	Tool	Unit
CALIPER1	Caliper, 1-arm	9030/9139	mm
DENSITY	Gamma-gamma density	9030/9139	kg/m^3
RES(MG)	Focused guard log resistivity, 140cm	9030	ohm-m
GAM(NAT)	Natural gamma	9072	μR/h
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	8622	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 horizontal	HiRAT	deg
TRAVEL TIME	360 degrees orientated acoustic travel time	HiRAT	100 ns
AMPLITUDE	360 degrees orientated acoustic amplitude	HiRAT	-
THORIUM	Spectral gamma, Thorium component	9080	PPM
URANIUM	Spectral gamma, Uranium component	9080	PPM
POTASSIUM	Spectral gamma, Potassium component	9080	percent
RES(16N)	Normal resistivity 16 inch	8144	ohm-m
RES(64N)	Normal resistivity 64 inch	8144	ohm-m
LATERAL	Lateral resistivity	8144	ohm-m
SPR	Single point resistivity	8144	ohm
SP	Self Potential	8144	mV
RES(SG)	Focused guard log resistivity, 128 cm	9139	ohm-m

Rev.	Date	Drawn by	Control	Approved
1	2006-01-19	JRI	UTN	UTN

Job: 547310A

Scale: 1:500

RAMBØLL

Rambøll. Bredevej 2, DK-2830 Virum
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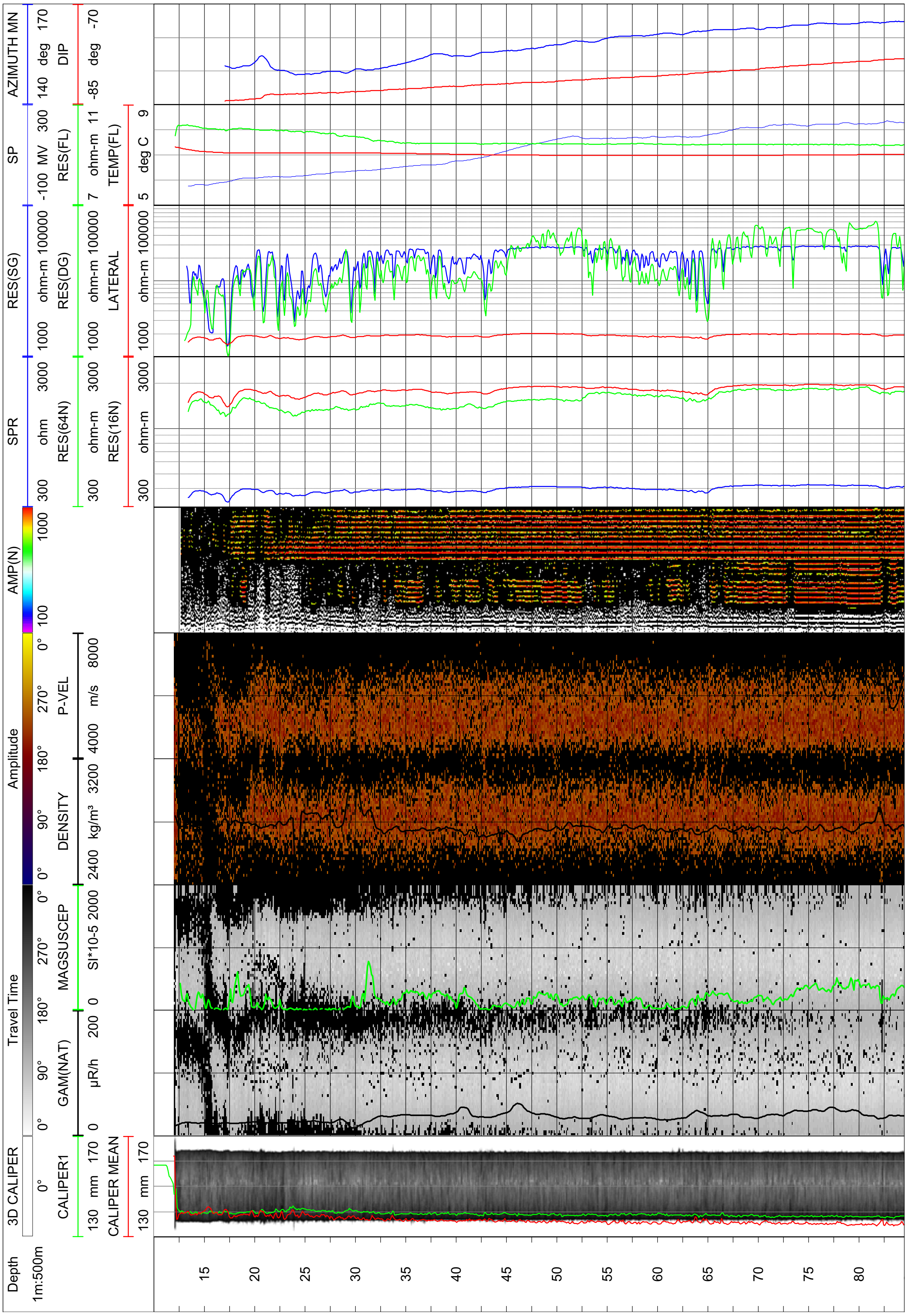
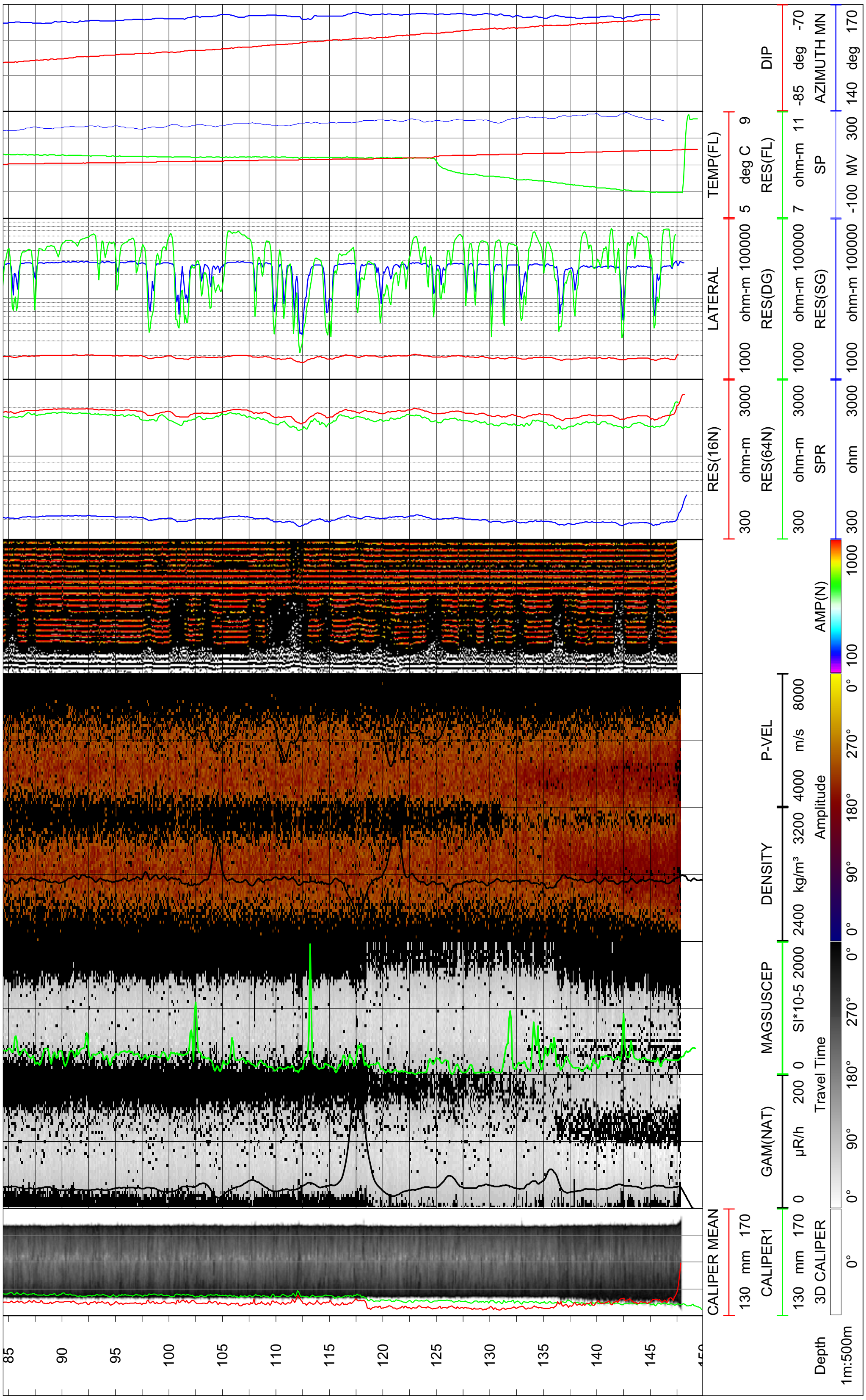
SKB geophysical borehole logging
Borehole HFM28

Presentation

Filename: HFM28_Presentation.wcl

Drawing no.: **5.1**


AZIMUTH MN 140 deg 170
DIP -85 deg -70
SP -100 MV 300
RES(FL) 7 ohm-m 11
TEMP(FL) 5 deg C 9
RES(SG) 1000 ohm-m 100000
RES(DG) 1000 ohm-m 100000
LATERAL 1000 ohm-m 100000
SPR 300 ohm 3000
RES(64N) 300 ohm-m 3000
RES(16N) 300 ohm-m 3000
AMP(N) 100 1000
Amplitude 0° 90° 180° 270° 0°
DENSITY 2400 kg/m³ 3200
P-VEL 4000 m/s 8000
Travel Time 0° 90° 180° 270° 0°
GAM(NAT) 0 µR/h 200
MAGSUSCEP 0 SI*10-5 2000
3D CALIPER 0°
CALIPER1 130 mm 170
CALIPER MEAN 130 mm 170
Depth 1m:500m
15 20 25 30 35 40 45 50 55 60 65 70 75 80


Depth
1m:500m
85
90
95
100
105
110
115
120
125
130
135
140
145
CALIPER MEAN
130 mm 170
CALIPER1
130 mm 170
3D CALIPER
GAM(NAT)
0 μR/h 200
MAGSUSCEP
0 SI*10-5 2000
Travel Time
DENSITY
2400 kg/m³ 3200
P-VEL
4000 m/s 8000
Amplitude
AMP(N)
100 1000
RES(16N)
300 ohm-m 3000
RES(64N)
300 ohm-m 3000
SPR
300 ohm 3000
LATERAL
1000 ohm-m 100000
RES(DG)
1000 ohm-m 100000
RES(SG)
1000 ohm-m 100000
TEMP(FL)
5 deg C 9
RES(FL)
7 ohm-m 11
SP
-100 MV 300
DIP
-85 deg -70
AZIMUTH MN
140 deg 170