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Oskarshamn site investigation

RAMAC, BIPS and deviation logging in borehole KLX15A

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May 2007

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Keywords: BIPS, RAMAC, Radar, TV, Deviation logging, Flexit.

Abstract

This report includes the data gained in geophysical logging operations performed within the site investigation at Oskarshamn. The logging operations presented here includes borehole radar (RAMAC), BIPS and deviation logging in the core drilled borehole KLX15A. All measurements were conducted by Malå Geoscience AB/RAYCON during March and April 2007.

The objective of the radar surveys is to achieve information on the rock mass around the borehole. Borehole radar is used to investigate the nature and the structure of the rock mass enclosing the boreholes.

The objective of the BIPS logging is to achieve information of the borehole including occurrence of rock types as well as determination of fracture distribution and orientation.

The objective of the deviation measurement is to achieve information on borehole coordinates as well as dip and azimuth along the borehole length.

This report describes the equipment used as well as the measurement procedures and data gained. For the BIPS survey, the result is presented as images. Radar data is presented in radargrams and the identified reflectors are listed. The deviation measurement is presented as a list of data.

The borehole radar data quality from KLX15A was good. In parts with lower quality, this is most probably due to more conductive conditions. This conductive environment of course reduces the possibility to distinguish and interpret possible structures in the rock mass which otherwise could give a reflection. The borehole radar measurements resulted in 287 identified radar reflectors in KLX15A and of these 36 were orientated (strike/dip).

The BIPS images is not of the best quality. Mud covering the lowermost part of the borehole wall are present along the whole borehole length. The visibility through the mud is limited specially in the deepest part of the borehole. The borehole wall is also partly effected by discolouring induced by the drilling.

Sammanfattning

Denna rapport omfattar geofysiska loggningar inom platsundersökningsprogrammet för Oskarshamn. Mätningarna som presenteras här omfattar borrhålsradarmätningar (RAMAC), och BIPS-loggningar i kärnborrhålet KLX15A. I alla borrhål genomfördes även avvikelsemätningar, s k krökningsmätningar. Alla mätningar är utförda av Malå Geoscience AB/RAYCON under mars och april 2007.

Syftet med radarmätningarna är att samla information om bergmassan runt borrhålet. Borrhålsradar används till att karakterisera bergets egenskaper och strukturer i bergmassan närmast borrhålet.

Syftet med BIPS-loggningen är att skaffa information om borrhålet inkluderande förekommande bergarter och bestämning av sprickors fördelning och deras orientering.

Syftet med krökningsmätningarna är att mäta lutning och riktning och därmed få fram koordinater för punkter längs med borrhålet.

Rapporten beskriver utrustningen som använts liksom mätprocedurer och en beskrivning och tolkning av data som erhållits. För BIPS-loggningen presenteras data som plottar längs med borrhålet. Radardata presenteras i radargram och en lista över tolkade radarreflektorer ges. Krökningsmätningen presenteras som en lista med lägesdata.

Borrhålsradardata från KLX15A var bra. I delar med sämre djuppenetration är detta troligen till stor del beroende på en konduktiv miljö. En konduktiv miljö minskar möjligheterna att identifiera strukturer från borrhålsradardata. 287 radarreflektorer har identifierats i KLX15A och av dessa har 36 orienterats (med strykning/stupning).

BIPS bilderna är inte av bästa kvalitet. Det är främst borrhålskax som täcker borrhålsväggens nedre del som försämrar sikten men även missfärgningen från borrningen bidrar till den försämrade kvalitén.

Contents

1 Introduction

This report presents the data gained in geophysical logging operations, which is one of the activities performed within the site investigation at Oskarshamn. The logging operations presented here includes borehole radar (RAMAC) and BIPS in the core drilled borehole KLX15A. Deviation measurements were also carried out.

The work was carried out in accordance with activity plan AP PS 400-07-037. In Table 1-1 the controlling documents for performing this activity are listed. Both the activity plan and method descriptions are SKB's internal controlling documents.

This report includes measurements from 0 to 977 m in KLX15A. The borehole was core drilled with a diameter of 76 mm from 75 m depth.

All measurements were conducted by Malå Geoscience AB/RAYCON during March and April 2007. The investigation site and location of the boreholes is shown in Figure 1-1.

The used investigation techniques comprised:

- Borehole radar measurements (Malå Geoscience AB's RAMAC system) with dipole and directional radar antennas.
- Borehole TV logging with the so-called BIP-system (Borehole Image Processing System), which is a high resolution, side viewing, colour borehole TV system.
- Borehole deviation equipment (Flexit SmartTool from Flexit AB), measuring azimuth, inclination (dip), tool face (gravity and magnetic) and magnetic dip.

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's internal controlling documents).

Activity plan	**Number**	**Version**
Borrhålsradar, BIPS och Flexit-mätning i KLX15A	AP PS 400-07-037	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för TV- loggning med BIPS	SKB MD 222.006	1.0
Metodbeskrivning för borrhålsradar	SKB MD 252.020	3.0
Metodbeskrivning för krökningsmätning av hammar- och kärnborrhål	SKB MD 224.001	1.0

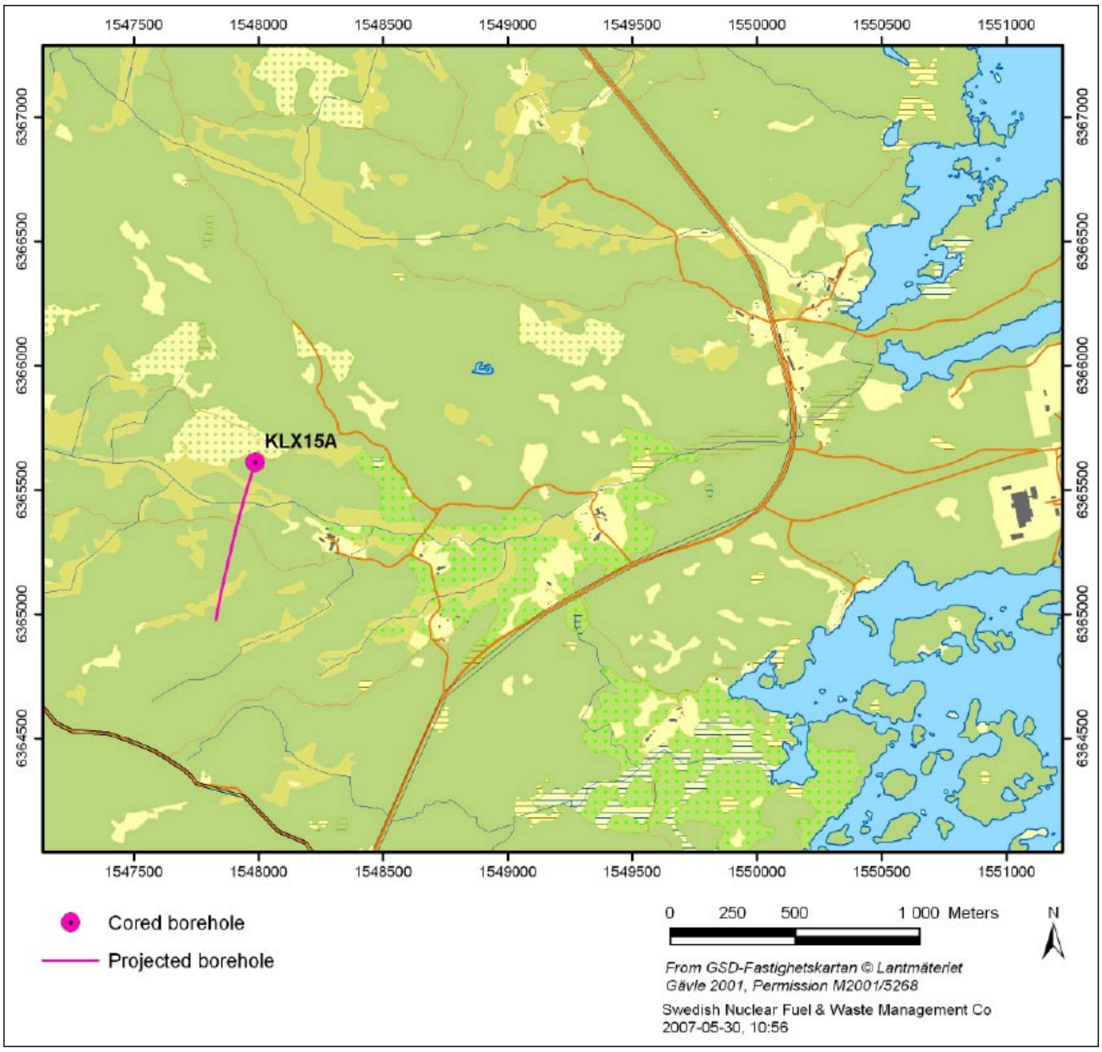


Figure 1-1. *Map of the location of the boreholes KLX15A in the Laxemar subarea, Oskarshamn.*

2 Objective and scope

The objective of the radar and BIPS surveys is to achieve information on the borehole conditions (borehole wall) as well as on the rock mass around the borehole. Borehole radar is engaged to investigate the nature and the structure of the rock mass enclosing the boreholes, and borehole TV for geological surveying of the borehole including determination of rock types as well as fracture distribution and orientation.

The objective of deviation logging is to achieve information of the borehole coordinates as well as dip and azimuth along the entire borehole length.

This report describes the equipment used for the radar, BIPS and deviation surveys as well as the measurement procedures and data gained. For the BIPS survey, the result is presented as images. Radar data is presented in radargrams and the identified reflectors are listed. The deviation measurements are presented as lists of data (coordinates etc).

3 Equipment

3.1 Radar measurements RAMAC

The RAMAC GPR system owned by SKB is a fully digital GPR system where emphasis has been laid on fast survey speed and easy field operation. The system operates dipole and directional antennas (see Figure 3-1). A system description is given in the SKB internal controlling document MD 252.021.

The borehole radar system consists of a transmitter and a receiver antenna. During operation an electromagnetic pulse, within the frequency range of 20 MHz up to 250 MHz, is emitted into the bedrock. Once a feature, e.g. a water-filled fracture, with sufficiently different electrical properties is encountered, the pulse is reflected back to the receiver and recorded.

3.2 TV-Camera, BIPS

The BIPS 1500 system used is owned by SKB and described in SKB internal controlling document MD 222.005. The BIPS method for borehole logging produces a digital scan of the borehole wall. In principle, a standard CCD video camera is installed in the probe in front of a conical mirror (see Figure 3-2). An acrylic window covers the mirror part and the borehole image is reflected through the window and displayed on the cone, from where it is recorded. During the measuring operation, pixel circles are grabbed with a resolution of 360 pixels/circle.

The system orientates the BIPS images according to two alternative methods, either using a compass (vertical boreholes) or with a gravity sensor (inclined boreholes).

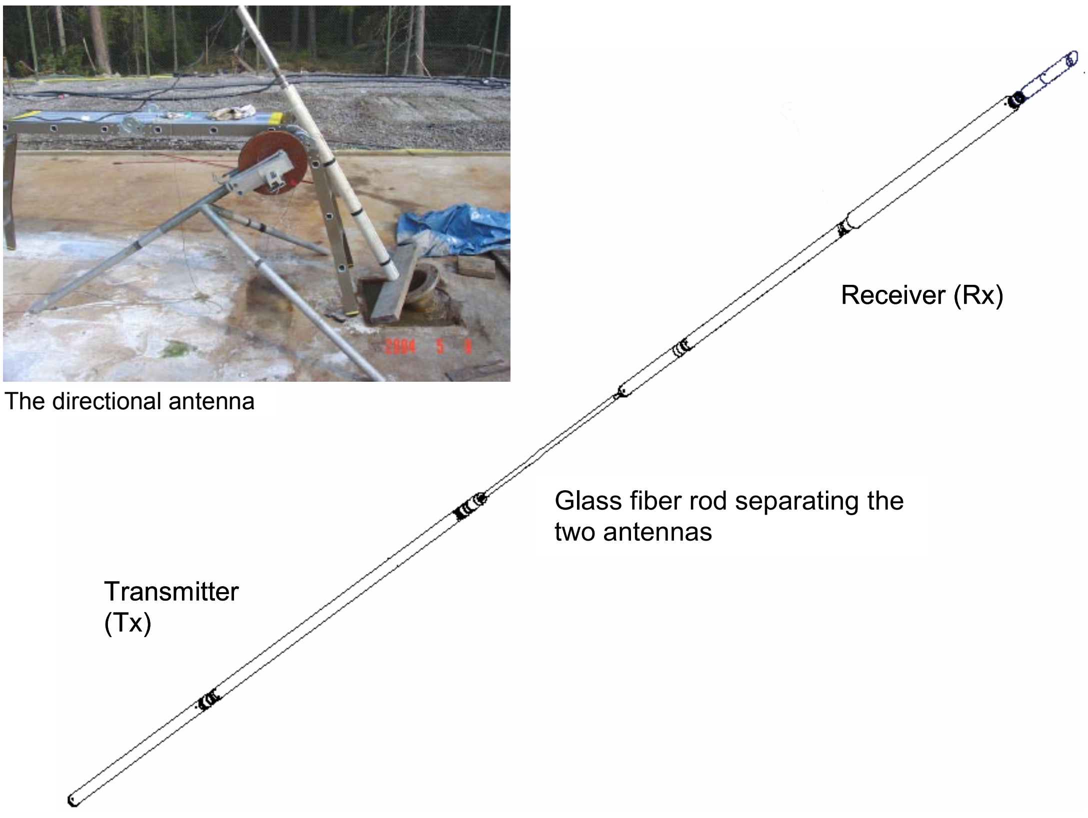


Figure 3-1. *Example of a borehole radar antenna.*

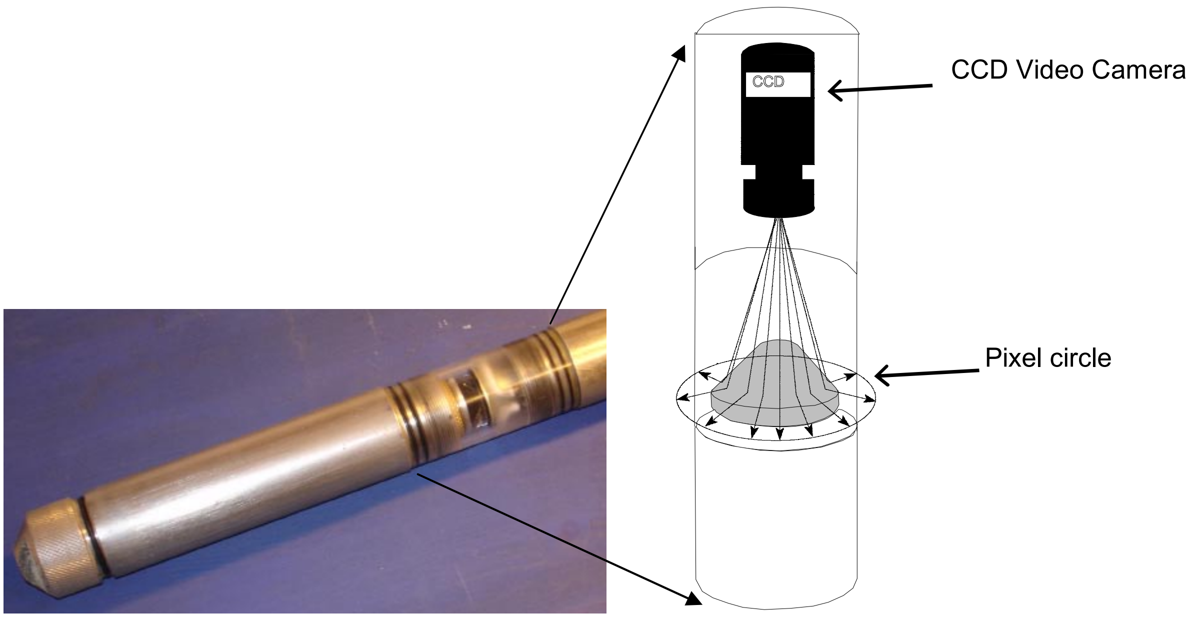


Figure 3-2. *The BIP-system. Illustration of the conical mirror scanning.*

3.3 Deviation measurements, Flexit SmartTool

The deviation measurements were carried out with the Flexit SmartTool Deviation equipment, Figure 3-3. The system is based on station readings.

The system consist of a borehole probe (SensIT) including 3-component magnetometers and accelerometers, measuring a number of different parameters. Table 3-1 describe the delivered parameters. Inside the probe the radio link is also built in were all data is downloaded after the end of the survey. The probe are controlled during the measurement either by an external PC and the software package called MeasureIT or a data pad StoreIT. For processing and reporting data the PC software MeasureIT and DisplayIT are used.

In the Flexit SmartTool system there is a magnetic integrity check to detect magnetic disturbance in the survey measurements. Magnetic disturbance results in incorrect/inaccurate azimuth values. The operator can select the average values for this parameters in the MeasureIT software and run a magnetic integrity check and if necessary change or delete azimuth values. If the azimuth value is changed the new added value by the operator is interpolated from the nearby station readings.

For more information and technical specification visit www.flexit.se.

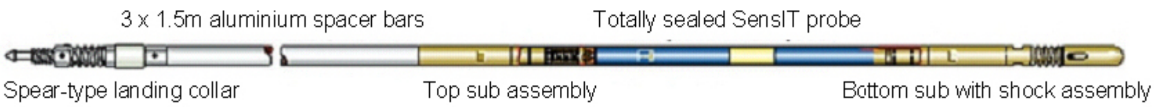


Figure 3-3. *The FlexIT SmartTool-system. Illustration of the set-up in the borehole.*

Table 3-1. Flexit SmartTool result tables.

Dip:	Inclination of the borehole at the position for reading
Azimuth:	Direction of the borehole at the position for reading
Easting northing and elevation:	Co-ordinate of the borehole at the position for reading
Mag. field:	Strength of earth's magnetic field
Mag. dip:	Inclination of earth's magnetic field
Grav. field:	Indicates if the probe was moved during recording at that station
Status:	Indicates if the azimuth value at the reading station was disturbed or changed by the operator. If the azimuth value has been edited or the magnetic integrity check have indicated a magnetic disturbance at the reading station a symbol with more than two "hands" is visible in the status field. 
Updown:	Shows the distance the actual reading station is above or below the planned straight line for the borehole given the starting direction.
Left/right:	Shows the distance the actual reading station is left or right the planned straight line for the borehole given the starting direction.
Short fall:	Shows the amount the actual point falls short of the planned survey point

4 Execution

4.1 General

4.1.1 RAMAC Radar

The measurements in KLX15A were carried out with dipole radar antennas, with frequencies of 250, 100 and 20 MHz. Measurements were also carried out with a directional antenna, with a central frequency of 60 MHz.

During logging the dipole antennas (transmitter and receiver) were lowered continuously into the borehole and data were recorded on a field PC along the measured interval. The measurement with the directional antenna was made step wise, with a short pause for each measurement occasion. The antennas (transmitter and receiver, both for dipole and directional) were kept at a fixed separation by glass fiber rods according to Table 4-1. See also Figures 3-1 and 4-1.

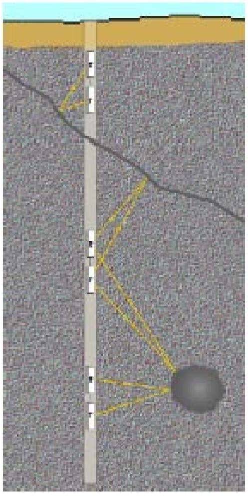
All measurements were performed in accordance with the instructions and guidelines from SKB (internal document MD 252.020). All cleaning of the antennas and cable was performed according to the internal document SKB MD 600.004 before the logging operation.

The functionality of the directional antenna was tested before measurements in KLX15A. This was performed by measurements in the air, where the receiver antenna and the transmitter antenna are placed apart. While transmitting and measuring the receiver antenna is turned around and by that giving the direction from the receiver antenna to the transmitter antenna. The difference in direction is measured by compass and the result difference achieved from the directional antenna was approximately 4 degrees. This can be considered to be very good due to the disturbed environment, with metallic objects etc at the test site.

For more information on system settings used in the investigation of KLX15A see Table 4-1 below.

Table 4-1. Radar logging information from KLX15A.

Site:	**Oskarshamn**	**Logging company:**	**MALÅ GeoScience/RAYCON**		
BH:	**KLX15A**	**Equipment:**	**SKB RAMAC**		
Type:	**Directional/dipole**	**Manufacturer:**	**MALÅ GeoScience**		
Operator:	**CG**	Antenna **Directional**	**250 MHz**	**100 MHz**	**20 MHz**
Logging date:		2007-04-02	2007-03-29	2007-04-01	2007-04-01
Reference:		T.O.C.	T.O.C.	T.O.C.	T.O.C.
Sampling frequency (MHz):		615	2,424	891	239
Number of samples:		512	619	518	518
Number of stacks:		32	Auto	Auto	Auto
Signal position:		410.5	–0.36	–0.36	–1.42
Logging from (m):		80.4	1.5	2.6	6.25
Logging to (m):		969.4	979.7	976.1	972.55
Trace interval (m):		0.5	0.1	0.2	0.25
Antenna separation (m):		5.73	2.4	3.9	10.05



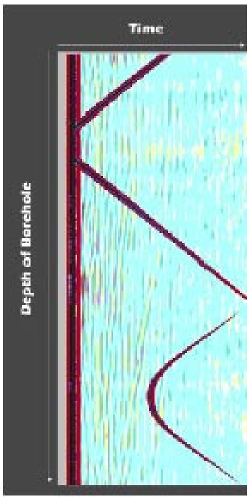


Figure 4-1. *The principle of radar borehole reflection survey and an example of result.*

4.1.2 BIPS

All measurements were performed in accordance with the instructions and guidelines from SKB (internal document MD 222.006). All cleaning of the probe and cable was performed according to the internal document SKB MD 600.004 before the logging operation.

During the measurement, a pixel circle with a resolution of 360 pixels/circle was used and the digital circles were stored at every 1 mm on a MO-disc in the surface unit. The maximum speed during data collection was 1.5 m/minute.

A gravity sensor based on an air bulb in an alcohol liquid was used to measure the orientation of the images in the borehole KLX15A.

In order to control the quality of the system, calibration measurements were performed in a test pipe before logging and after logging. Figure 4-2 shows the results of the test logging performed before and after the logging campaign in March/April 2007. The results showed no difference regarding the colours and focus of the images. Results of the test loggings were included in the delivery of the raw data.

The BIPS logging information is found in the header for every single borehole presented in Appendix 2 in this report.

4.1.3 Deviation measuremnts

The deviation measurements were carried out according to the instructions and guidelines from SKB (internal document MD 224.001). All cleaning of the probe and cable was performed according to the internal document SKB MD 600.004 before the logging operation.

During the logging a measurement was performed for each 3 m. The logging was carried out in two directions, both from the surface measuring to the bottom of the borehole and a second run measuring from the bottom of the borehole up to the surface. For the operation in the core drilled boreholes the RAMAC/BIPS winch installed in the container was used together with the standard length measuring devices. For an accurate depth control the length recording was adjusted regularly for every 50 metre by the actual marks on the logging cable. Maximum depth error for the measuring wheel is 0.5%.

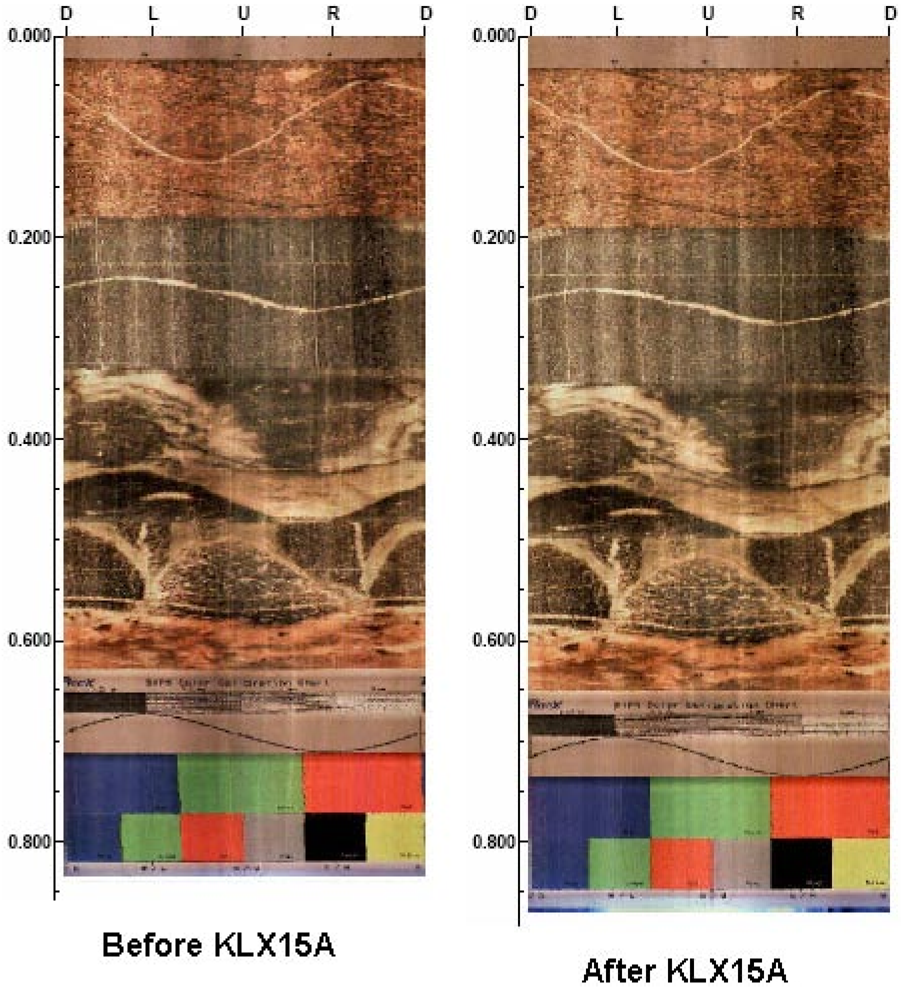


Figure 4-2. Results from logging in the test pipe before and after the logging campaign in March/April, 2007.

4.1.4 Length measurements

During logging the depth recording for the RAMAC systems is taken care of by a measuring wheel mounted on the cable winch. The logging is measured from TOC (Top of Casing). The length is adjusted to the bottom of casing when visible in the BIPS image.

During the BIPS logging in core drilled boreholes, where the reference marks in the borehole wall is visible on the image, the position where the depth mark is visible is marked with scotch tape on the logging cable. During BIPS logging the measured length was adjusted to true length according to depth mark visible in the BIPS image. The adjusted true length is marked with red in the image plot together with the non-adjusted measured length. The non-adjusted length is marked with black as seen in Appendix 2. The tape marks on the logging cable are then used for controlling the RAMAC measurement.

The experience we have from earlier measurements with dipole antennas in the core drilled boreholes in Forsmark and Oskarshamn for the radar logging is that the depth divergence is less than 100 cm in the deepest parts of a 1,000 metre deep borehole.

The depth divergence is taken into account in the resulting tables in Chapter 5.

4.2 Analyses and Interpretatoin

4.2.1 Radar

The result from radar measurements is most often presented in the form of a radargram where the position of the probes is shown along one axis and the radar wave propagation and reflection is shown along the other axis. The amplitude of the received signal is shown in the radargram with a grey scale where black colour corresponds to large positive signals and white colour to large negative signals. Grey colour corresponds to no reflected signals.

The presented data in this report is adjusted for the measurement point of the antennas. The measurement point is defined to be the central point between the transmitter and the receiver antenna.

The two basic patterns to interpret in borehole measurements are point and plane reflectors. In the reflection mode, borehole radar essentially gives a high-resolution image of the rock mass, showing the geometry of plane structures which may or may not, intersect the borehole (contact between layers, thin marker beds, fractures) or showing the presence of local features around the borehole (cavities, lenses etc.).

The distance to a reflecting object or plane is determined by measuring the difference in arrival time between the direct and the reflected pulse. The basic assumption is that the speed of propagation is the same everywhere.

There are several ways to determine the radar wave propagation velocity. Each of them has its advantages and its disadvantages. For this logging campaign the velocity determination earlier performed between KLX07A and KLX07B by keeping the transmitter fixed in one borehole while moving the receiver downwards in a nearby borehole was used. The velocity measurement was performed with the 20 MHz antennas in boreholes KLX07A and KLX07B /1/.

The result is plotted in Figure 4-3 and the calculation shows a velocity varying between 110 and 117 m/micro seconds. The lower velocities most probably represent a fracture zone in the depth interval 40 to 60 m.

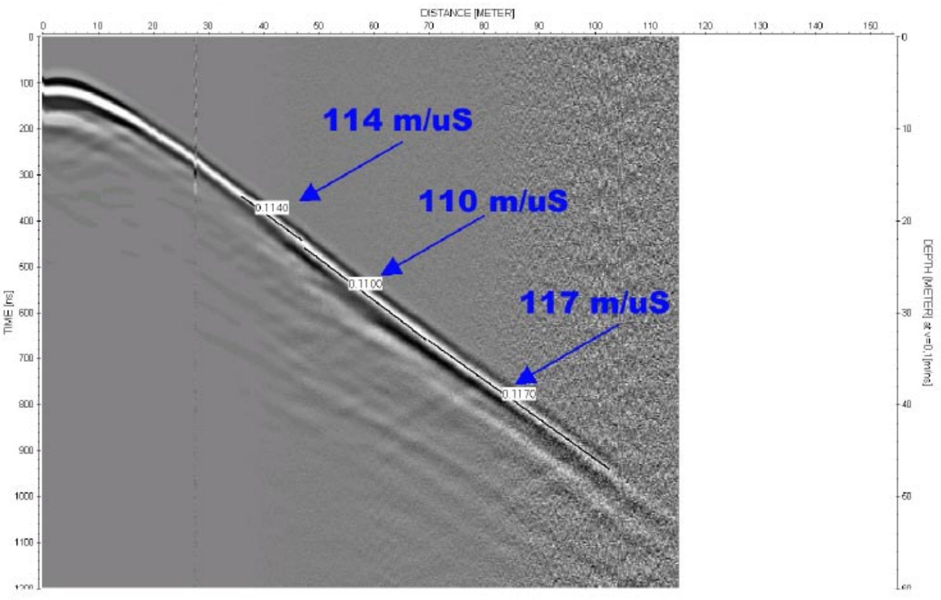


Figure 4-3. *Results from velocity measurements /1/.*

The visualization of data is made with ReflexWin, a Windows based processing software for filtering and analysis of borehole radar data. The processing steps are shown in Table 4-2. It should be observed that the processing steps in Table 4-2 below refer to Appendix 1 in this report. The filters applied affect the whole borehole length and are not always suitable in all parts, depending on the geological conditions and conductivity of the borehole fluid. During interpretation further processing can be done, most often in form of bandpass filtering. This filtering can be applied just in parts of the borehole, where needed.

For the interpretation of the intersection angle between the borehole axis and the planes visible on the radargrams the RadinterSKB software has been used. The interpreted intersection points and intersection angles of the detected structures are presented in the Table 5-2 and are also visible on the radargrams in Appendix 1.

4.2.2 BIPS

The visualization of data is made with BDPP, a Windows based processing software for filtering, presentation and analysis of BIPS data. As no fracture mapping of the BIPS image is performed, the raw data was delivered on a CD-ROM together with printable pictures in *.pdf format before the field crew left the investigation site.

The printed results were delivered with measured length, together with adjusted length according to the length marks visible in the BIPS image. For printing of the BIPS images the printing software BIPP from RaaX was used.

4.2.3 Deviation measurements

The resulting data from the deviation measurements were corrected relatively to the magnetic North, 2.73 degrees east of RT90 North for the presentation in Appendix 3. For delivery to SICADA the azimuth was delivered relatively to magnetic North.

4.3 Nonconformities

The logging stopped at 979 m length due to the fact that the probes could not be lowered below 979 m length probably caused by a piece of rock or another unknown thing which was blocking the borehole at that position. No logging was performed between 979 m length and 1,000 m. Otherwise no nonconformities occurred during the logging campaign in March/April, 2007.

Table 4-2. Processing steps for borehole radar data from KLX15A.

Site:	**Oskarshamn**	**Logging company:**	**MALÅ GeoScience/RAYCON**	
BH:	**KLX15A**	**Equipment:**	**SKB RAMAC**	
Type:	**Directional/dipole**	**Manufacturer:**	**MALÅ GeoScience**	
Interpret:	**JG**	**Antenna**		
	Directional	**250 MHz**	**100 MHz**	**20 MHz**
Processing:	Move start time (–41 samples)	Move start time (–11)	Move start time (–37.1)	Move start time (–92.2)
	DC shift (414–511	DC shift (190–230)	DC shift (470–530)	DC shift (1,800–2,000)
	Time gain (start 71 lin 100 exp 1 (FIR)	Gain (start 10 lin 2.4 exp 1.1)	Gain (start 30 lin 2 exp 0.6)	Gain (start 3 lin 3.6 exp 0.1)

5 Results

The results from the BIPS measurements for KLX15A were delivered as raw data (*.bip-files) on CD-ROM disks and MO-disks to SKB together with printable BIPS pictures in *.pdf format before the field crew left the investigation site. The information of the measurements was registered in SICADA, and the digital data and VHS tapes are stored by SKB.

The RAMAC radar data was delivered as raw data (file format *.rd3 (dipole antennas) or *.rd5 (directional antenna)) for KLX15A with corresponding information files (file format *.rad) whereas the data processing steps and results are presented in this report. Relevant information, including the interpretation presented in this report, was inserted into the SKB database SICADA.

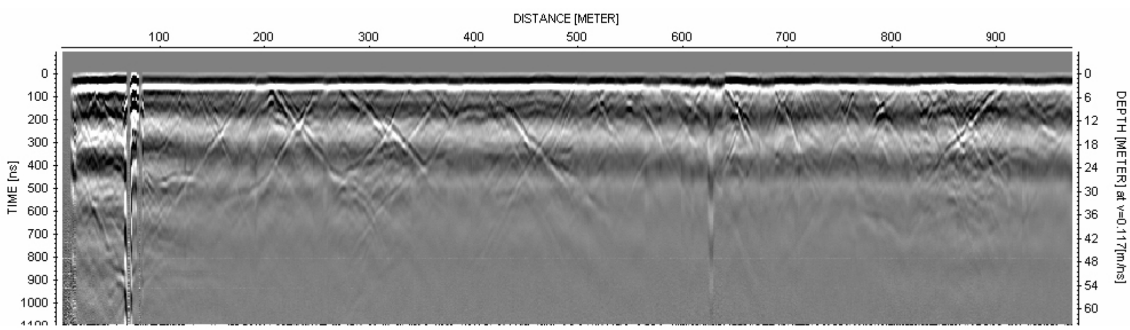
The results from the deviation measurement were delivered to SKB in form of raw Flexit files and Excel-files, and also presented in Appendix 3 in this report. Each reading station length are referred from T.O.C. in the appendices.

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

5.1 RAMAC logging

The results of the interpretation of the radar measurements are presented in Tables 5-1 to 5-4. Radar data is also visualized in Appendix 1. It should be remembered that the images in Appendix 1 are only a composite picture of all events 360 degrees around the borehole, and do not reflect the orientation of the structures.

Only the larger clearly visible structures are interpreted in RadinterSKB. An overview of the borehole are given in Figure 5-1 below. A number of minor structures also exist but not interpreted as indicated in Appendix 1. Often a number of structures can be noticed, but most probably lying so close to each other that it is impossible to distinguish one from the other. Larger structures parallel to the borehole, if present, are also indicated in Appendix 1. It should also be pointed out that reflections interpreted will always get an intersection point with the borehole, but being located further away. They may in some cases not reach the borehole.



KLX15A

Figure 5-1. An overview (20 MHz data) of the radar data for the borehole KLX15A.

The data quality from KLX15A (as seen in Appendix1) is good, but in smaller parts of lower quality due to more conductive conditions. A conductive environment makes the radar wave to attenuate, which decreases the penetration. This conductive environment of course also reduces the possibility to distinguish and interpret possibly structures in the rock which otherwise could give a reflection.

The effect of a conductive environment is also seen in the directional antenna for KLX15A, which makes it more difficult to interpret the direction to the identified structures.

As also seen in Appendix 1 the resolution and penetration of radar waves depend on the antenna frequency used. Low antenna frequency gives less resolution but higher penetration depth compared to a higher frequency. If structures can be identified with all three antenna frequencies, it can probably be explained by that the structure is quite significant.

In Table 5-1 below the distribution of identified structures along the borehole are listed for KLX15A.

Table 5-2 summarises the interpretation of radar data from KLX15A. The direction to the reflector (object) is also given. As seen some radar reflectors in Table 5-2 are marked with ±, which indicates an uncertainty in the interpretation of direction. The direction can in these cases be ± 180 degrees. The direction to the reflector (object) is defined in Figure 5-2. As the borehole inclination is less than 85° the direction to object is calculated using gravity roll. The direction to object and the intersection angle are recalculated to strike and dip, also given in Table 5-2. The plane strike is the angle between line of the plane's cross-section with the surface and the Magnetic North directioṇ. It counts clockwise and can be between 0 and 359 degrees. A strike of 0 degrees implies a dip to the east while a strike of 180 degrees implies a dip to the west. The plane dip is the angle between the plane and the surface. It can vary between 0 and 90 degrees.

Observe that a structure can have several different angles, if the structure is undulating, and thereby also different intersection depths is given. This is seen for instance for structure 29 in Table 5-2 and Appendix 1. To this structure, most likely, also structure 29 x and 29xx belongs.

Table 5-1. Identified structures as a function of depth in KLX15A.

Depth (m)	No. of structures
–50	12
50–100	13
100–150	19
150–200	20
200–250	14
250–300	15
300–350	13
350–400	11
400–450	15
450–500	15
500–550	21
550–600	12
600–650	13
650–700	11
700–750	28
750–800	16
800–850	15
850–900	7
900–950	9
950–	9

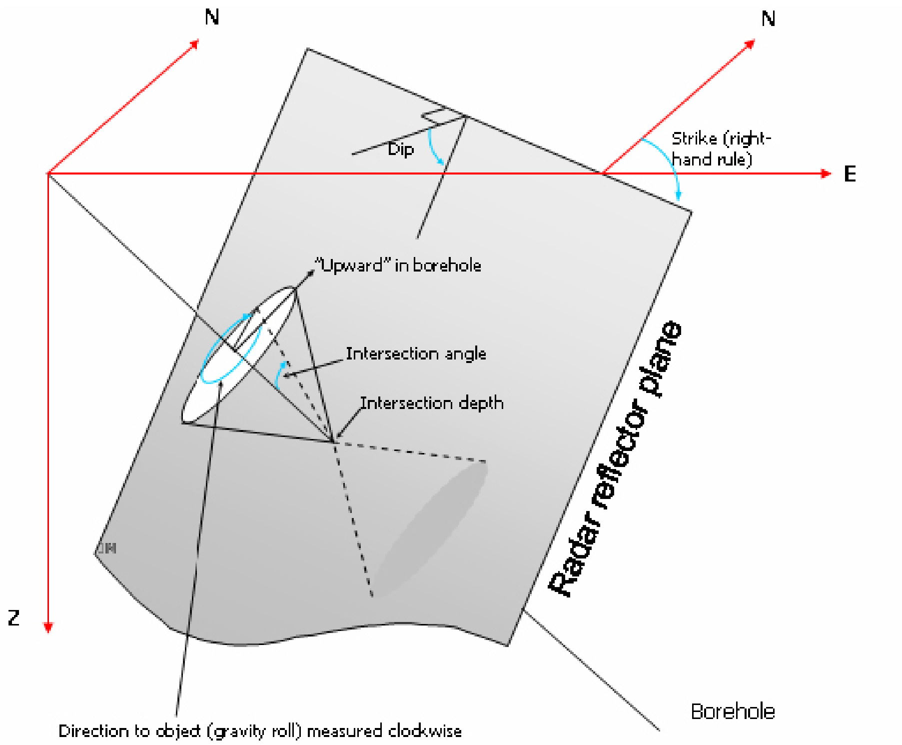


Figure 5-2. *Definition of intersection angle, direction to object using gravity roll, dip and strike using the right hand rule as presented in Table 5-2.*

Table 5-2. Interpretation of radar reflectors from the dipole antennas 250, 100 and 20 MHz, and the directional antenna 60 MHz in borehole KLX15A.

RADINTER MODEL INFORMATION
(Directional antenna)

Site: Oskarshamn
Borehole name: KLX15A
Nominal velocity (m/μs): 117.0

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
246	–3.2	14					
2	6.1	51					
1	14.5	44					
4	18.3	40					
3	18.7	47					
5	22.2	44					
6	22.3	35					
7	28.9	39					
14	31.2	8					
8	47.0	48					
10	46.0	57					
9	48.8	60					
11	57.0	41					
12	57.5	56					
13	61.1	43					
239	63.0	40					
240	72.2	42	303	76	245		

RADINTER MODEL INFORMATION
(Directional antenna)

Site: **Oskarshamn**
Borehole name: **KLX15A**
Nominal velocity (m/µs): **117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
15	83.1	39					
16	85.2	78					
17	91.9	56					
20	94.2	15					
19	96.6	21					
224	96.9	38					
24	99.5	15					
225	104.4	47					
19x	105.8	38					
21	105.8	48	192	7	207		
22	107.5	45					
23	109.9	56					
226	113.4	40					
25	118.1	48	159 ±	13	14	77	272
26	121.1	44					
27	125.1	49	24	79	302		
27x	126.2	49					
248	126.7	70					
28	128.6	46					
29	129.2	31					
29xx	130.8	49					
29x	132.0	50	186	4	169		
30	135.7	70					
33	136.7	56					
31	139.0	36					
227	148.8	25					
32	153.5	44	351 ±	85	279	10	65
35	152.9	45					
34	156.1	48					
36x	159.1	39					
36	163.1	23					
38	165.6	48					
37	167.2	27					
42	169.5	58	249 ±	37	241	53	317
39	170.4	46					
40	170.9	54					
41	176.7	46					
43	181.6	47					
48xx	183.2	21					
44	185.0	48					
46	187.1	76					
45	192.9	32					
48	195.9	23	162	29	71		
50	196.8	51					

RADINTER MODEL INFORMATION
(Directional antenna)

Site: **Oskarshamn**
Borehole name: **KLX15A**
Nominal velocity (m/μs): **117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
48x	197.9	29					
47	198.7	46					
55	200.9	24					
49	207.3	41					
57	211.6	9					
51	214.0	63					
52	216.9	56	51 ±	66	315	30	222
59	221.3	52					
58	223.4	19					
56	230.2	45					
60	231.3	34					
53	236.8	13					
54	237.4	15					
61	242.3	38					
62	244.9	39					
63	248.0	44					
72x	252.4	5					
64	253.6	57	114 ±	38	339	59	250
66	261.3	20	174	31	94		
65	263.0	55					
66xx	264.2	34					
66xxxx	264.7	29					
66x	265.0	24					
66xxx	272.2	23					
67	275.2	42					
72	280.9	11					
68	283.8	46	195 ±	11	177	82	296
69	286.6	44					
70	288.3	35					
71	289.1	43					
73	294.0	53					
74	301.0	58					
75	311.2	29					
76	324.4	20	339 ±	73	84	34	68
77	326.4	54					
76x	326.6	22					
90	331.5	12					
78	336.1	64					
79	339.4	40	168	13	60		
81	344.7	56					
82	345.3	42	153	21	30		
83	346.3	44					
80	346.4	28					
82x	349.6	35					

RADINTER MODEL INFORMATION
(Directional antenna)

Site: Oskarshamn
Borehole name: KLX15A
Nominal velocity (m/μs): 117.0

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
84	361.6	58					
86	361.9	29	195 ±	23	139	82	118
85	364.9	60					
87	370.3	66					
88	379.5	36					
228	383.1	10					
229	385.9	34					
89	389.8	77					
241	390.3	22	132	47	34		
91	391.1	58					
241xx	397.2	20					
82xx	402.5	14					
92	402.7	34	198	20	151		
93	401.1	19					
94	405.6	63					
241x	410.3	15					
95	410.5	62					
230	418.4	45					
96	423.7	35					
98	426.5	52					
97	433.0	27	105 ±	60	6	78	223
249	434.9	19					
99	432.1	47					
100	436.0	42					
102	440.4	54					
101	447.5	24					
103	453.3	55					
104	454.5	54					
105	455.6	37					
231	456.2	57					
107	467.2	66					
106	468.7	19					
108	471.0	45					
110	472.9	26					
109	473.2	65					
111	474.3	19					
112	480.7	47					
113	485.6	71					
114	488.4	80					
255	489.0	29					
232	493.6	55					
125	502.3	69					
116	503.8	56					
117	504.0	77	126 ±	33	309	29	265

RADINTER MODEL INFORMATION
(Directional antenna)

Site:	**Oskarshamn**
Borehole name:	**KLX15A**
Nominal velocity (m/μs):	**117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
115	504.6	35	177 ±	14	93	86	101
118	504.9	59					
66xxxxx	506.9	6					
119	511.1	24					
252	512.7	9					
115x	513.5	26					
121	513.7	34					
120	515.9	19					
122	520.2	33					
233	523.5	9					
126x	526.3	25					
126	529.5	31	306	85	240		
124	530.3	52					
242	533.3	56					
128	537.5	57					
130	538.5	29					
250	541.9	36					
127	549.0	30					
123	550.9	16	0	65	103		
129	557.9	53					
131	571.0	30	6 ±	81	108	19	119
131x	571.9	23					
134	573.2	7					
132	575.3	41					
133	579.9	46					
235	581.7	29					
135x	584.8	29					
234	585.3	10					
135	587.0	26	345 ±	74	88	27	71
243	589.4	54					
137	603.0	58					
136	604.8	34					
138	605.4	50					
139	610.8	56					
140	614.7	26					
143	615.0	19	348	68	90		
142	625.8	53					
244	630.0	49					
148	630.5	37					
141	631.1	29	108 ±	56	4	78	225
141x	634.2	33					
144	637.9	41					
145	640.1	44					
147	652.2	71					

RADINTER MODEL INFORMATION
(Directional antenna)

Site: **Oskarshamn**
Borehole name: **KLX15A**
Nominal velocity (m/μs): **117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
146	658.9	38					
149	660.1	71					
150	662.1	23					
152	668.0	52					
154	671.1	27					
151	673.1	25					
155	673.6	37					
153	681.2	42	354 ±	89	278	7	66
156	689.3	56					
157	692.1	57					
164	700.7	40					
160	705.3	20					
251	705.8	49					
158	706.5	45					
159	708.1	44					
161	711.7	34					
163	715.8	19					
162	718.1	59	309 ±	65	256	31	333
165	714.9	45	309 ±	76	248	34	358
236	721.5	26					
251x	724.4	29					
166	725.1	45					
177	725.2	17					
167	726.1	40					
169	729.4	43					
168	730.4	37					
170	731.8	50					
172	732.5	58					
174	732.9	63					
247	733.4	3					
171	733.5	35					
172x	735.2	37					
175	737.3	33					
173	737.4	57					
176	737.8	53	294 ±	62	247	40	337
178	739.3	46					
245	743.4	35	285	75	225		
179	748.9	58					
237	750.8	56					
187	753.2	15					
180	753.8	59					
181	759.0	58					
184	763.3	59					
183	764.9	52					

RADINTER MODEL INFORMATION
(Directional antenna)

Site: Oskarshamn
Borehole name: KLX15A
Nominal velocity (m/µs): 117.0

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
198	766.1	14					
182	769.4	38					
186	772.4	50					
185	773.8	47	189 ±	6	184	84	288
189	786.8	50					
190	790.1	54					
191	792.6	50					
192	793.5	56					
188	795.5	17					
195	799.9	40					
193	802.8	36					
194	807.0	52					
197x	807.7	37	60 ±	81	325	45	199
253	811.1	49					
196	811.7	71					
199	822.0	69					
197	826.7	18					
217	829.2	16					
201xx	832.9	22					
200	836.8	64					
201	841.8	28	282	77	219		
201x	843.0	31					
203	846.4	72					
202	846.9	62					
217x	847.4	23					
204	856.1	64					
206	868.3	48					
205	868.8	57					
238	870.2	51					
207	883.4	30					
208	886.1	40					
207x	889.5	18					
209xxx	911.7	23					
211	913.4	17					
209x	915.6	31					
209xx	918.9	41					
209	921.5	19	348 ±	68	88	29	77
210	925.8	49					
216	927.8	62					
212	932.5	59					
213	936.5	55					
215	951.4	49					
214	955.5	53					
220	960.4	68					

RADINTER MODEL INFORMATION (Directional antenna)							
Site:	Oskarshamn						
Borehole name:	KLX15A						
Nominal velocity (m/μs):	117.0						
Name	**Intersection depth**	**Intersection angle**	**RadInter direction to object (gravity roll)**	**Dip 1**	**Strike 1**	**Dip 2**	**Strike 2**
218	966.3	61					
219	969.2	41					
221	977.9	48					
223	980.4	52					
222	987.5	52					
254	1,002.0	33					

In Appendix 1, the amplitude of the first arrival is plotted against the depth, for the 250 MHz dipole antennas. The amplitude variation along the borehole indicates changes of the electrical conductivity of the volume of rock surrounding the borehole. A decrease in this amplitude may indicate fracture zones, clay or rock volumes with increases in water content, i.e. increases in electric conductivity. The decrease in amplitude is shown in Table 5-3.

Finally, the structures considered as the most important (clear in the radargram, identified with several antenna frequencies, stretching out far from the borehole wall etc.) are listed in Table 5-4 below.

Observe that it can be very difficult to classify different structures in an objective manner, along a borehole. This is due to the fact that the water quality (the conductivity) amongst others varies along the borehole length and by that reason affects the results of the radar logging, by for instance attenuating the radar waves differently. Also the intersection angle of the identified structures affects the amplitude on the resulting radargram. A small intersection angle will most often give an increased amplitude compared to a larger intersection angle, and by that a more clear structure.

Table 5-3. Borehole length intervals in KLX15A with decreased amplitude for the 250 MHz antenna.

Length (m)	Length (m)
130	570–580
190–200	605
265	615
280–290	625–635
325–330	665–670
345–350	680–685
380–385	710–720
405	775
505	820
515	915–920
530	930–935
540	

Table 5-4. Some important structures in KLX15A.

Borehole	KLX15A
Structures	8, 27, 27x, 29, 29x, 32, 48, 48x, 48xx, 66, 66x, 66xx, 66xxx, 66xxxx, 82, 82x, 86, 115, 115x, 117, 131, 141, 146, 148, 185, 197, 197x, 209, 209x, 209xx, 209xxx, 241, 241x, 241xx, 246, 251 and 251x

5.2 BIPS logging

The BIPS pictures from KLX15A are presented in Appendix 2.

In order to control the quality of the system, calibration measurements were performed in a test pipe before and after the logging. The resulting images displayed with no difference regarding the colours and focus of the images. Results of the test loggings were included in the delivery of the raw data.

To get the best possible depth accuracy, the BIPS images are adjusted to the reference mark on the cable for the logging.

The error in the depth recording depends mainly on the tension of the cable and error of the depth readings from the measuring wheel. The adjusted depth is showed in red colour and the recording depth have black colour in the printouts.

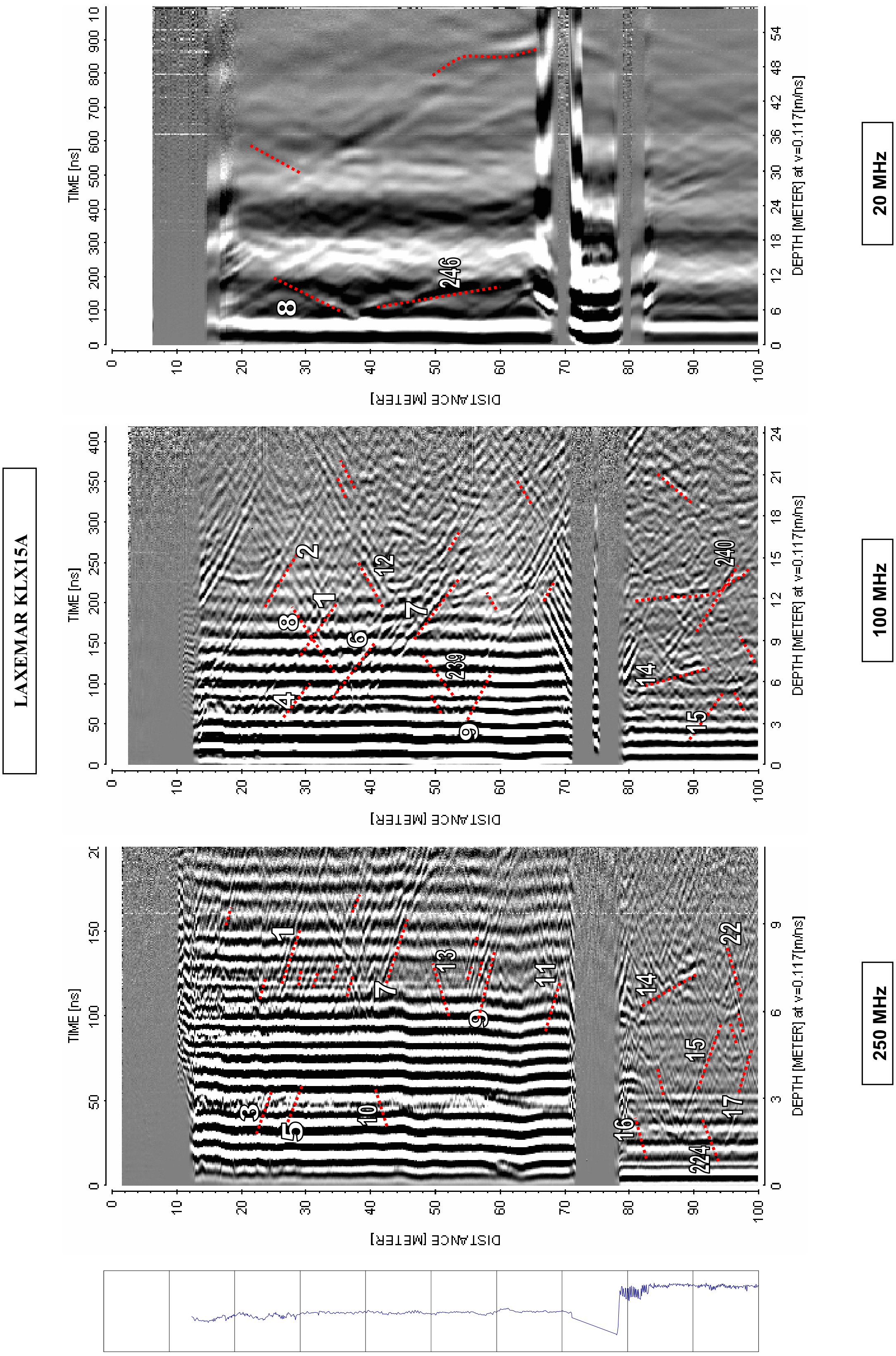
The BIPS images is not of the best quality. In between 11 metres to 72 metres where the borehole diameter is 198 mm the visibility is very poor mainly depending on the lack of light from the probe due to the large borehole diameter. In the rest of the borehole it is mainly the mud that covers the lower most part of the borehole wall that limits the visibility. Specially in the deepest part of the borehole the mud is thicker on the downside of the borehole wall and it is impossible to see through the mud cake. Another limitation of the image quality is the discolouring of the borehole wall induced by the drilling that partly covers the borehole wall.

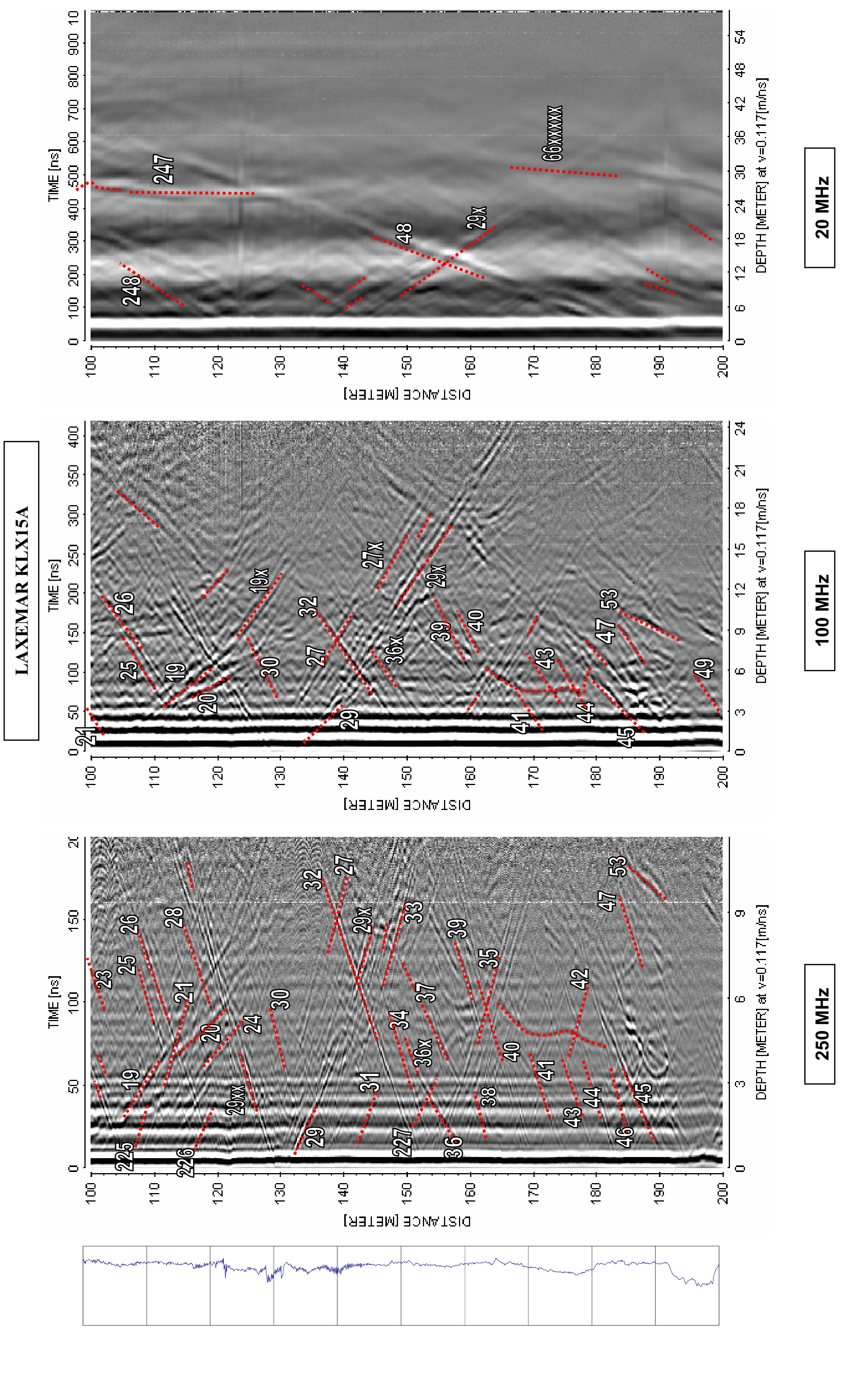
References

/1/ **Gustafsson J, Gustafsson C, 2005.** Oskarshamn site investigation. RAMAC and BIPS logging in boreholes KLX07A, KLX07B, HLX34 and HLX35 and deviation logging in boreholes KLX07B, HLX34 and HLX35. SKB P-05-231, Svensk Kärnbränslehantering AB.

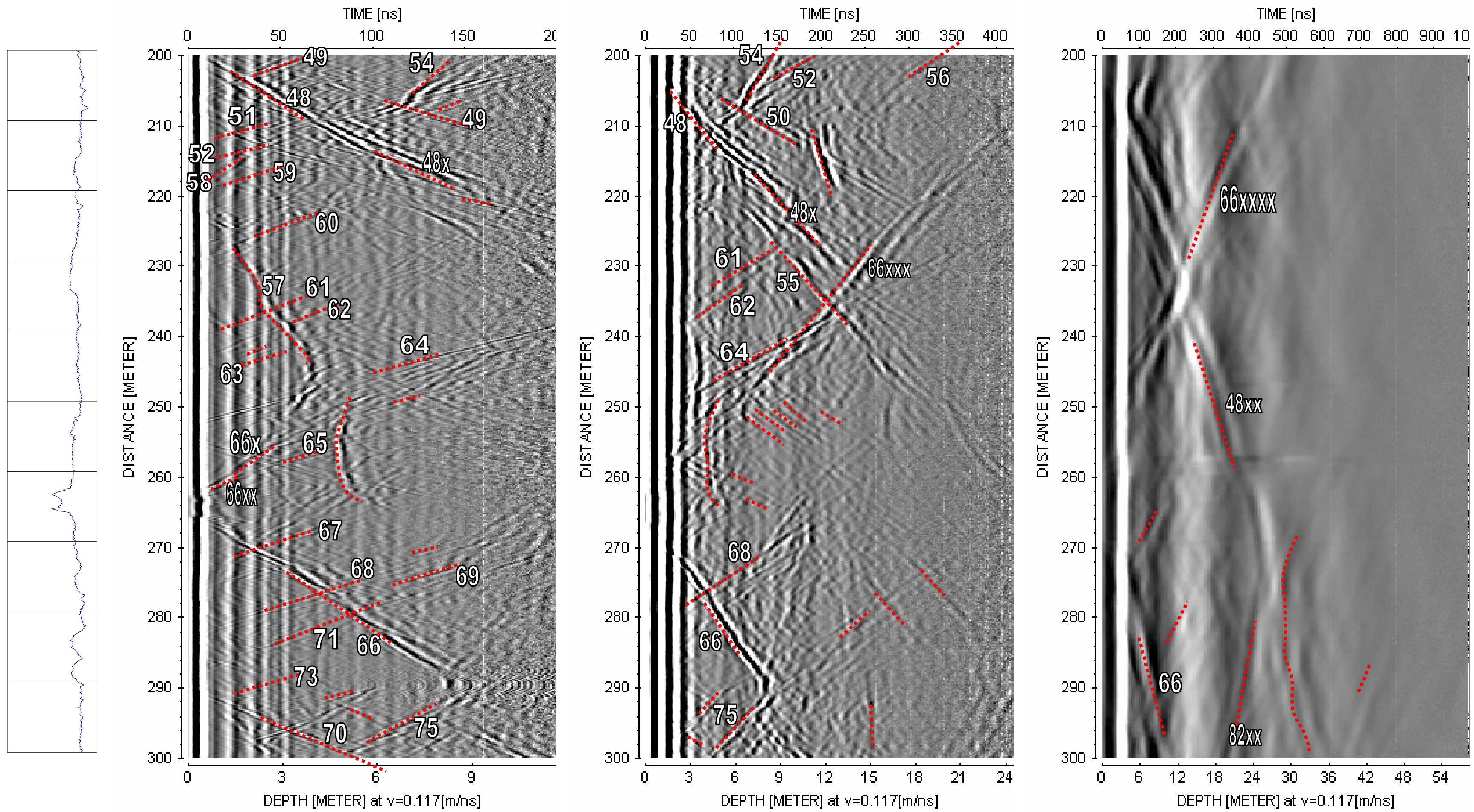
Appendix 1

Radar logging in KLX15A, 0 to 977 m, dipole antennas 250, 100 and 20 MHz




LAXEMAR KLX15A
250 MHz
100 MHz
20 MHz
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0.117[m/ns]

LAXEMAR KLX15A

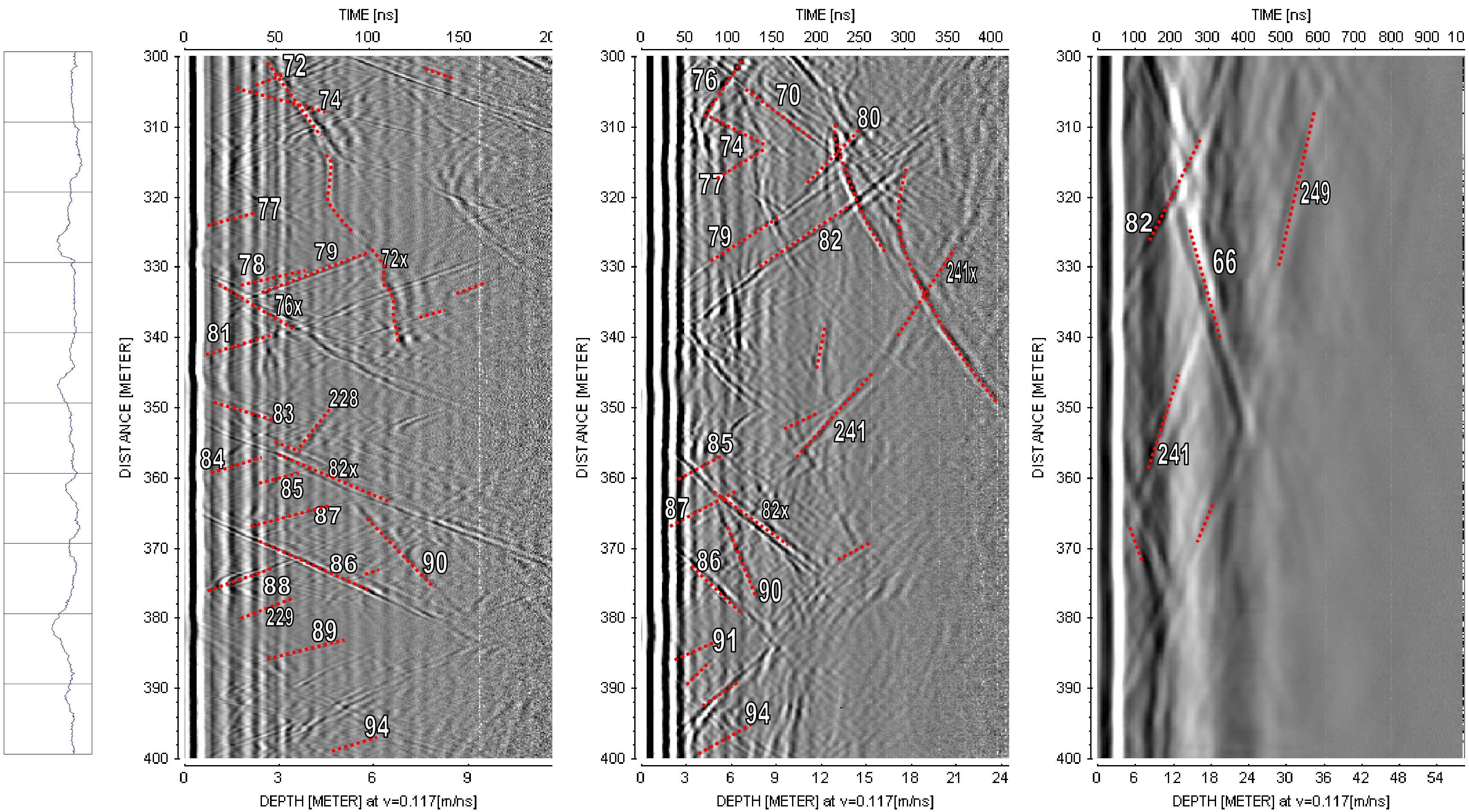


250 MHz

100 MHz

20 MHz

LAXEMAR KLX15A

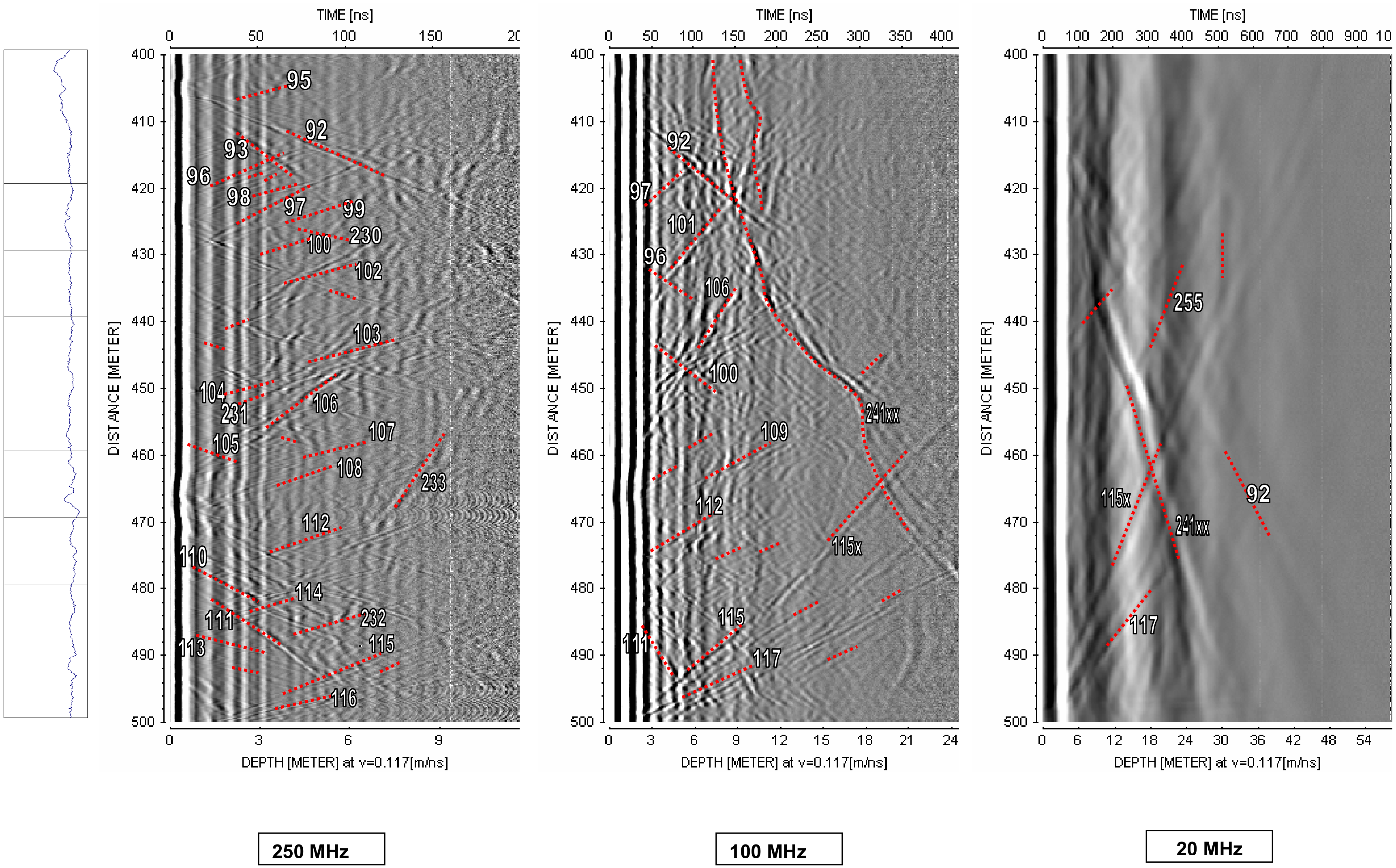


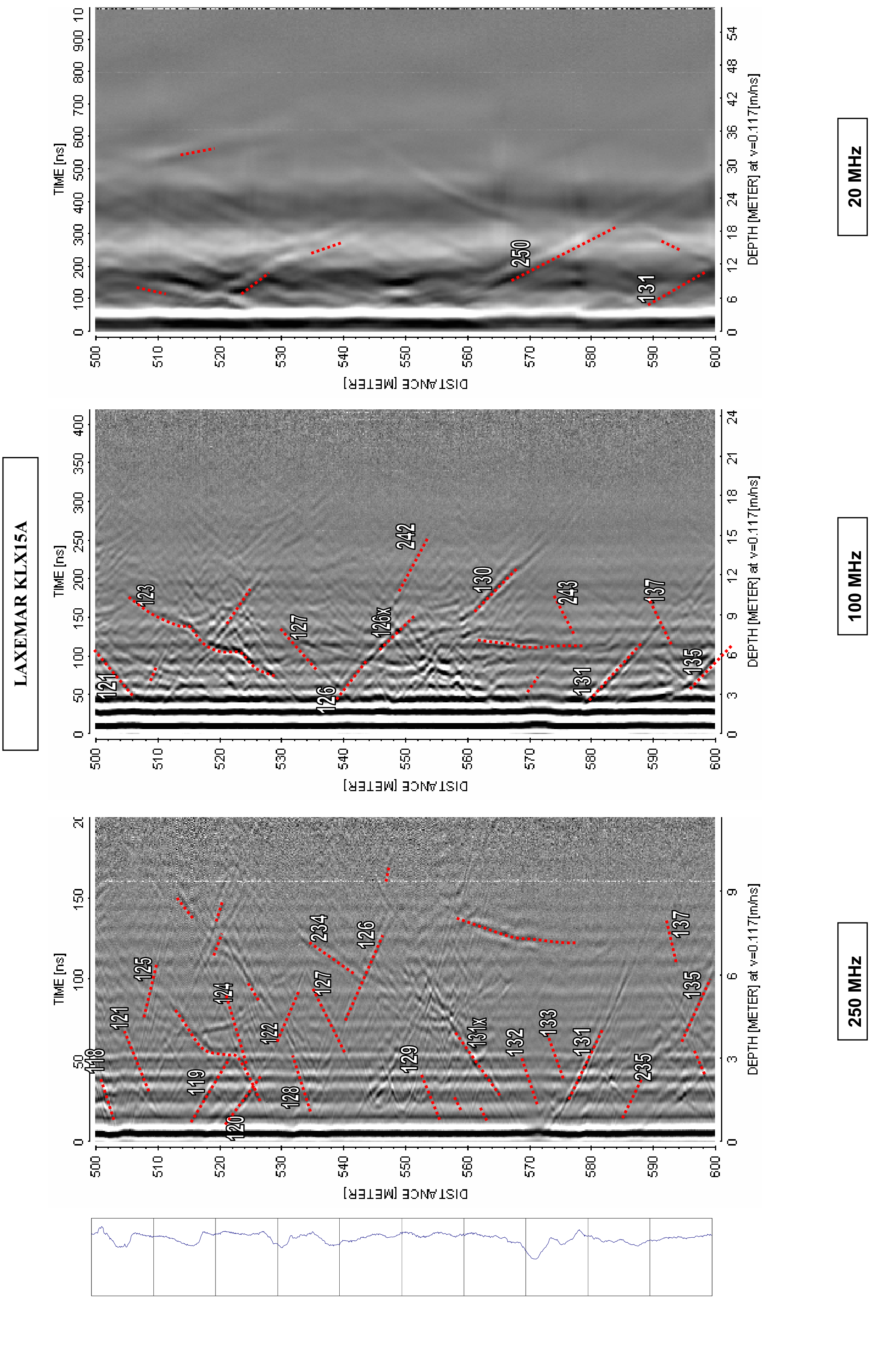
250 MHz

100 MHz

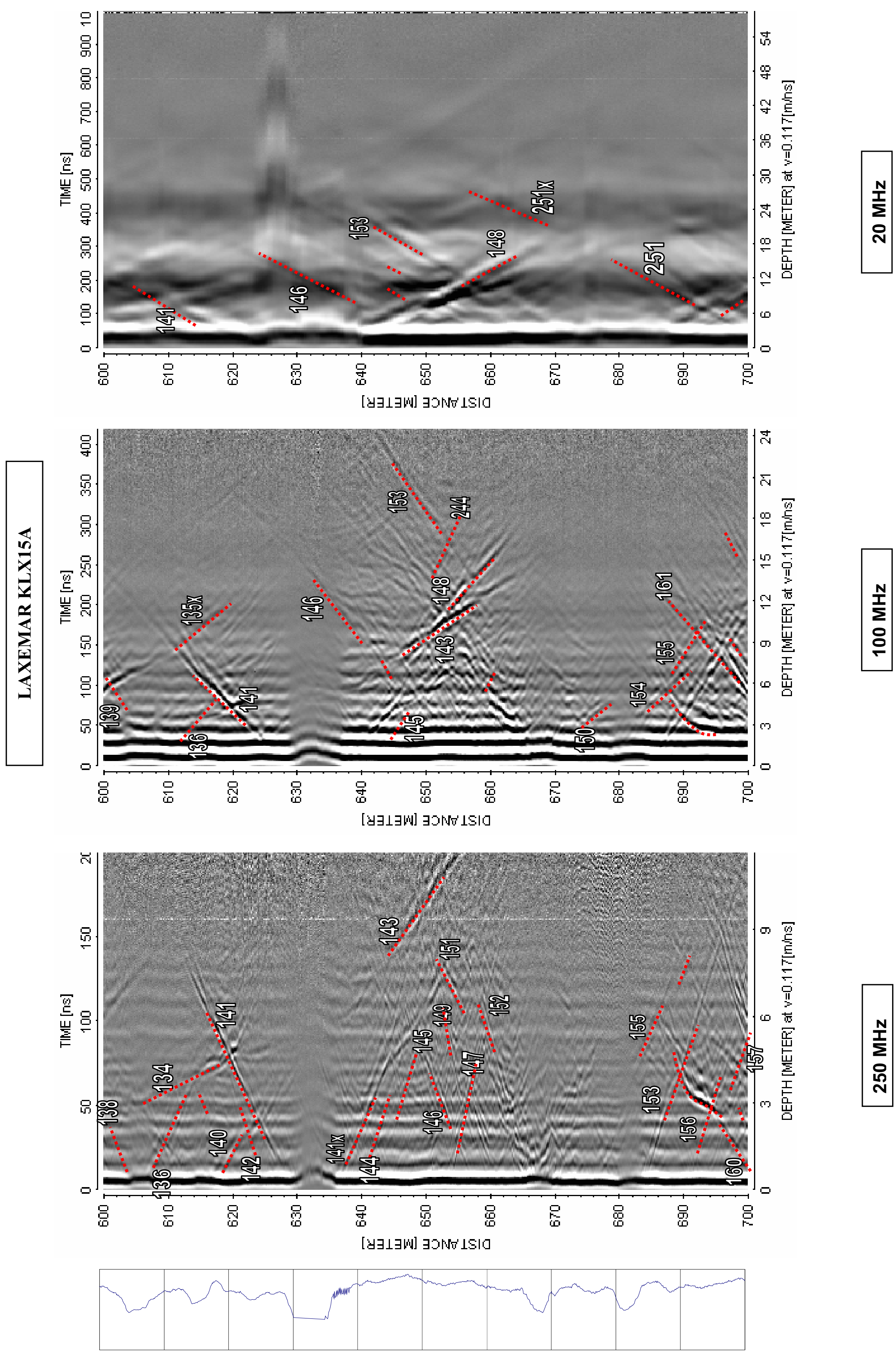
20 MHz

LAXEMAR KLX15A



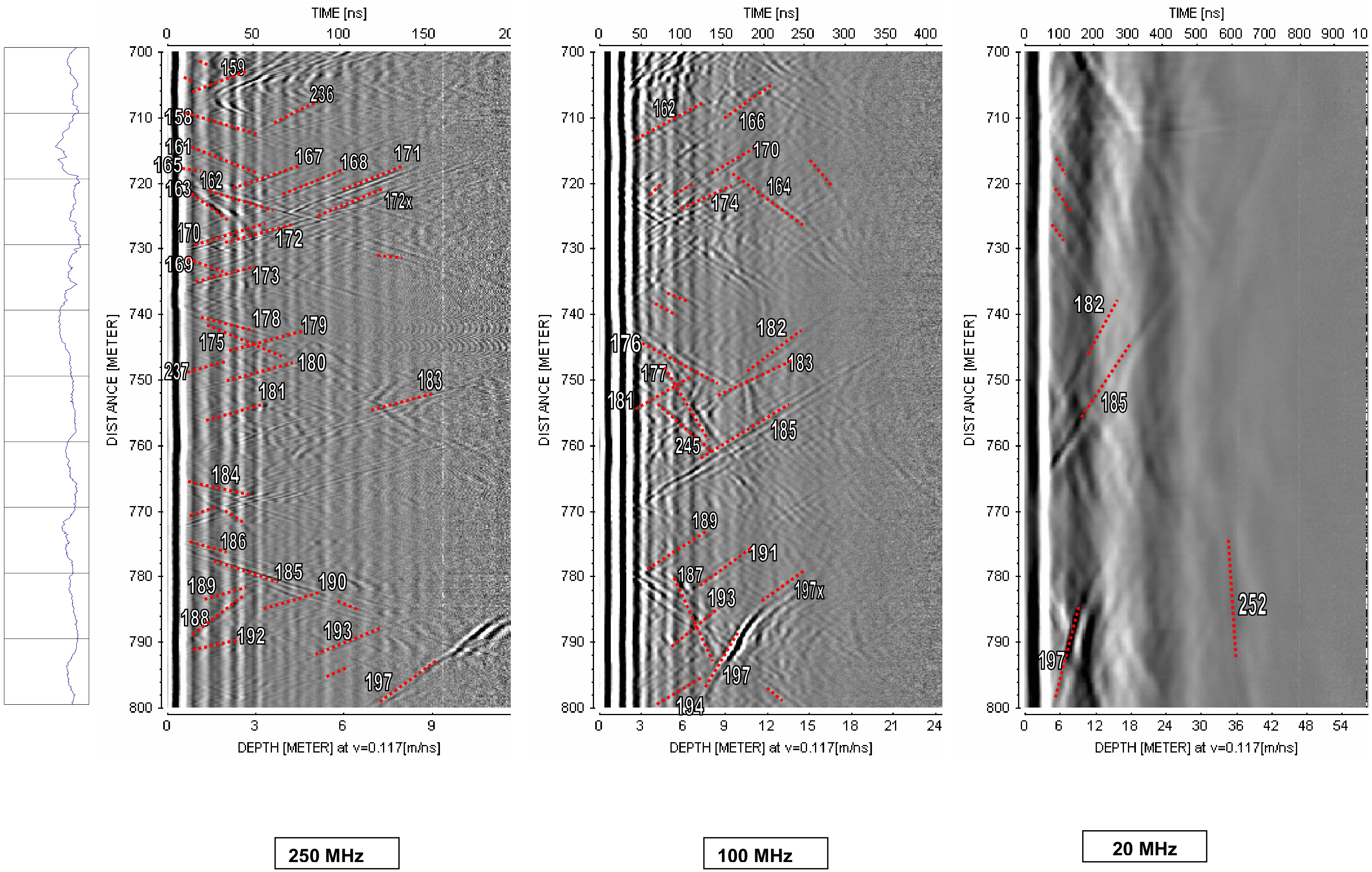


LAXEMAR KLX15A
250 MHz
100 MHz
20 MHz
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0.117[m/ns]

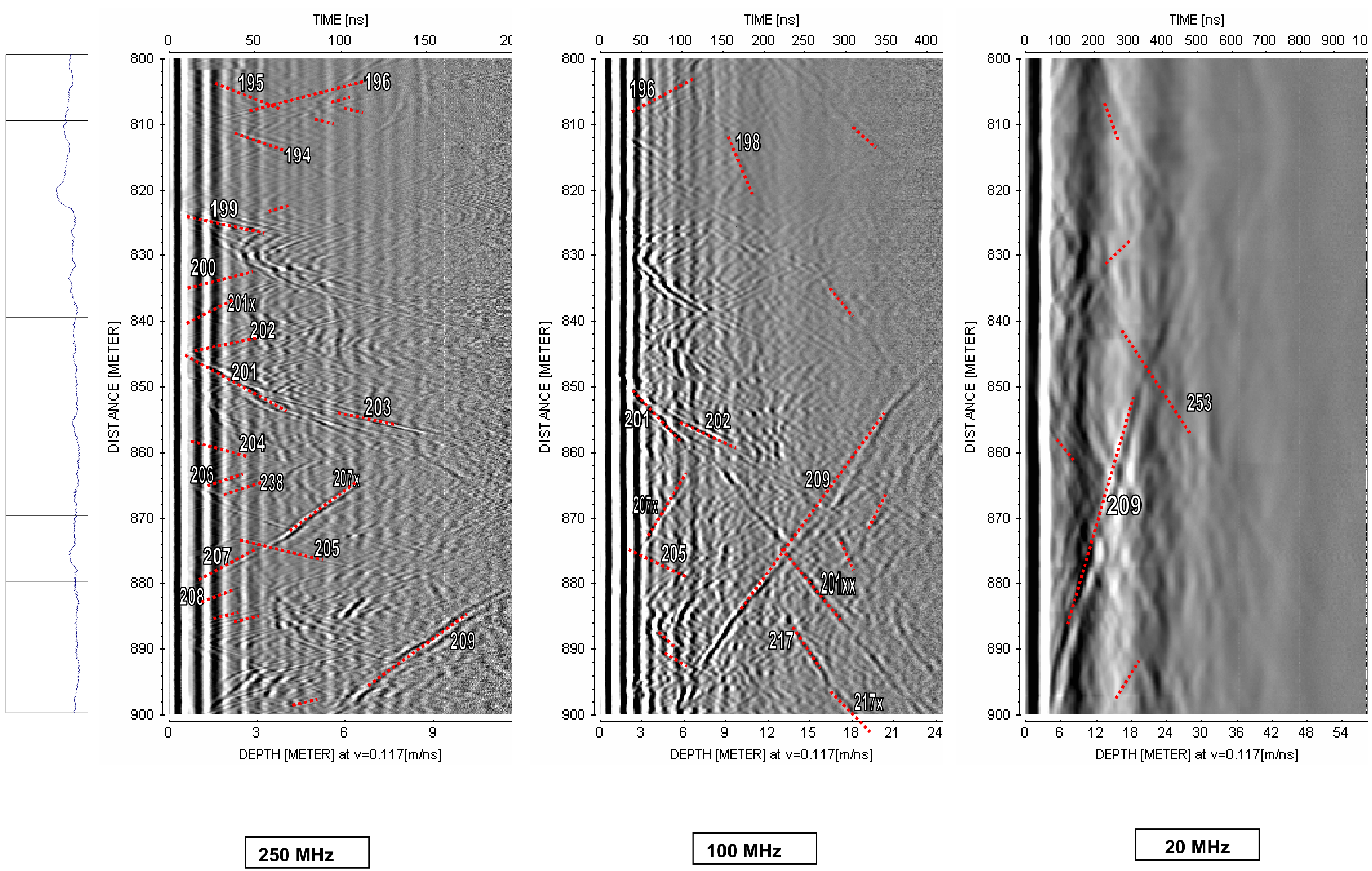


LAXEMAR KLX15A
250 MHz
100 MHz
20 MHz
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0.117[m/ns]

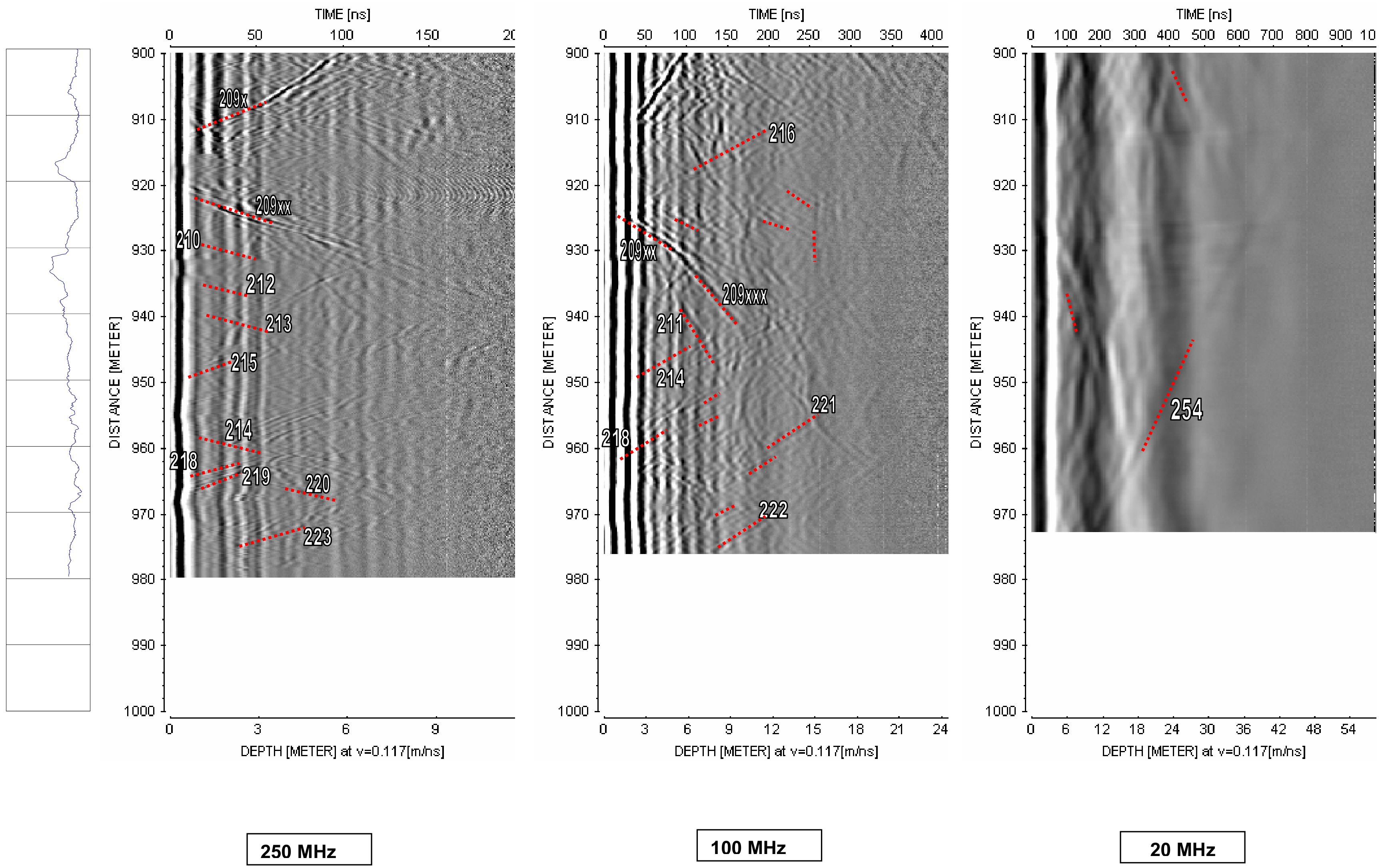
LAXEMAR KLX15A



LAXEMAR KLX15A



LAXEMAR KLX15A



Appendix 2

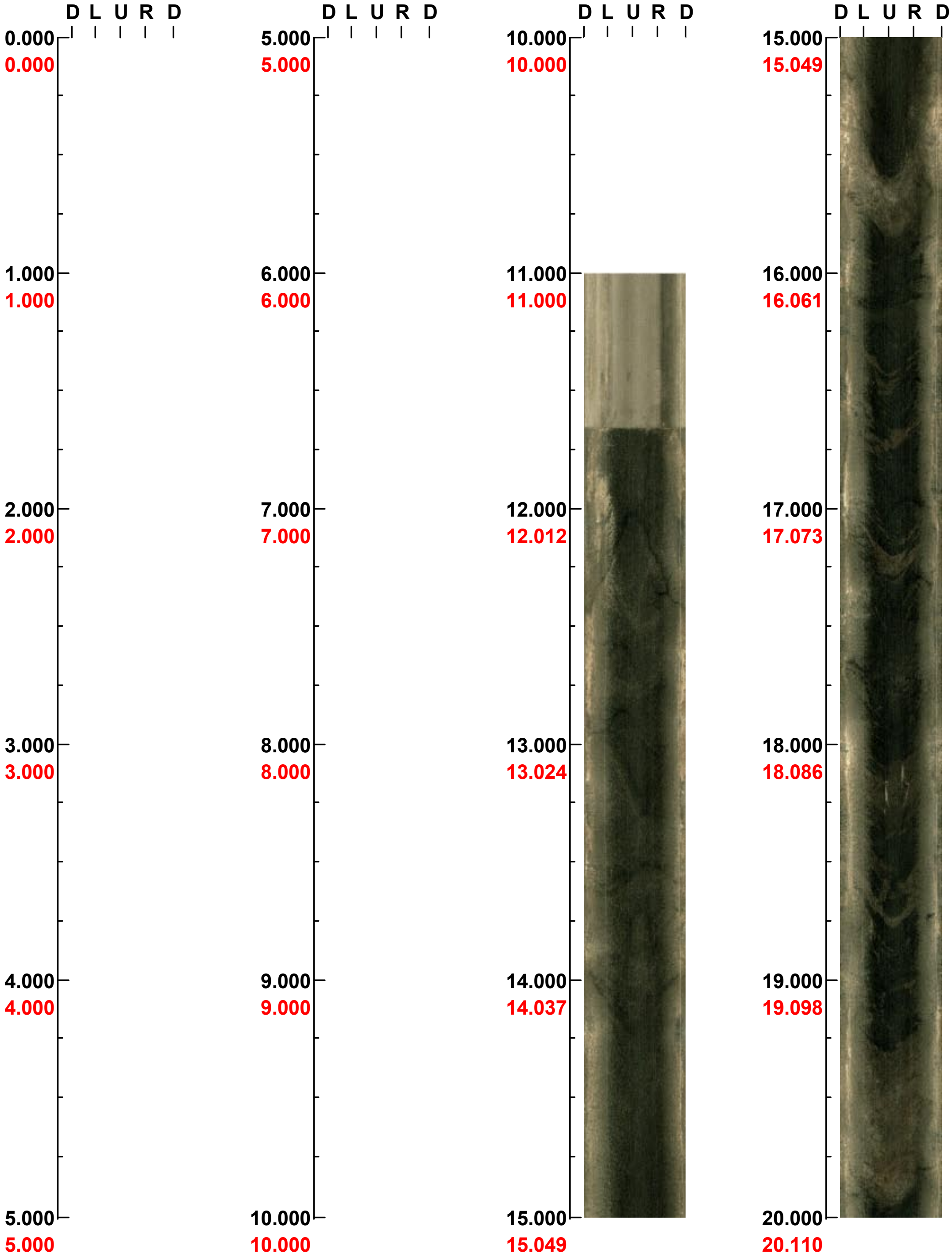
BIPS logging in KLX15A, 11 to 979 m

Project name: Laxemar

Image file	: c:\work\r5606k~1\bips\klx15a_1.bip
BDT file	: c:\work\r5606k~1\bips\klx15a_1.bdt
Locality	: LAXEMAR
Bore hole number	: KLX15A
Date	: 07/03/29
Time	: 09:35:00
Depth range	: 11.000 - 72.668 m
Azimuth	: 200
Inclination	: -55
Diameter	: 198.0 mm
Magnetic declination	: 0.0
Span	: 4
Scan interval	: 0.25
Scan direction	: To bottom
Scale	: 1/25
Aspect ratio	: 70 %
Pages	: 4
Color	: +0 +0 +0

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 0.000 - 20.000 m



(1 / 4) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 20.000 - 40.000 m

(2 / 4) **Scale: 1/25** **Aspect ratio: 70 %**

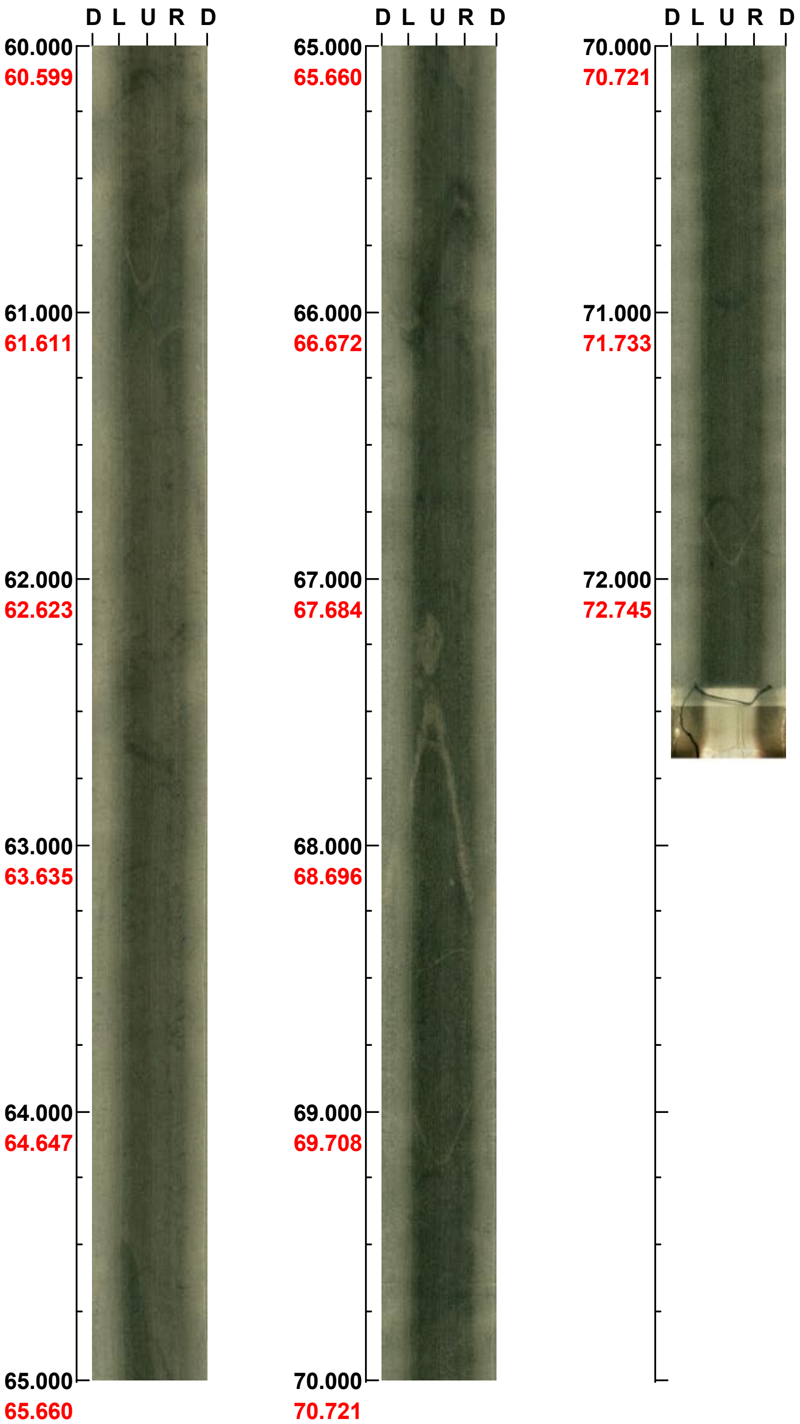
Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 40.000 - 60.000 m

(3 / 4) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 60.000 - 72.668 m



(4 / 4) **Scale: 1/25** **Aspect ratio: 70 %**

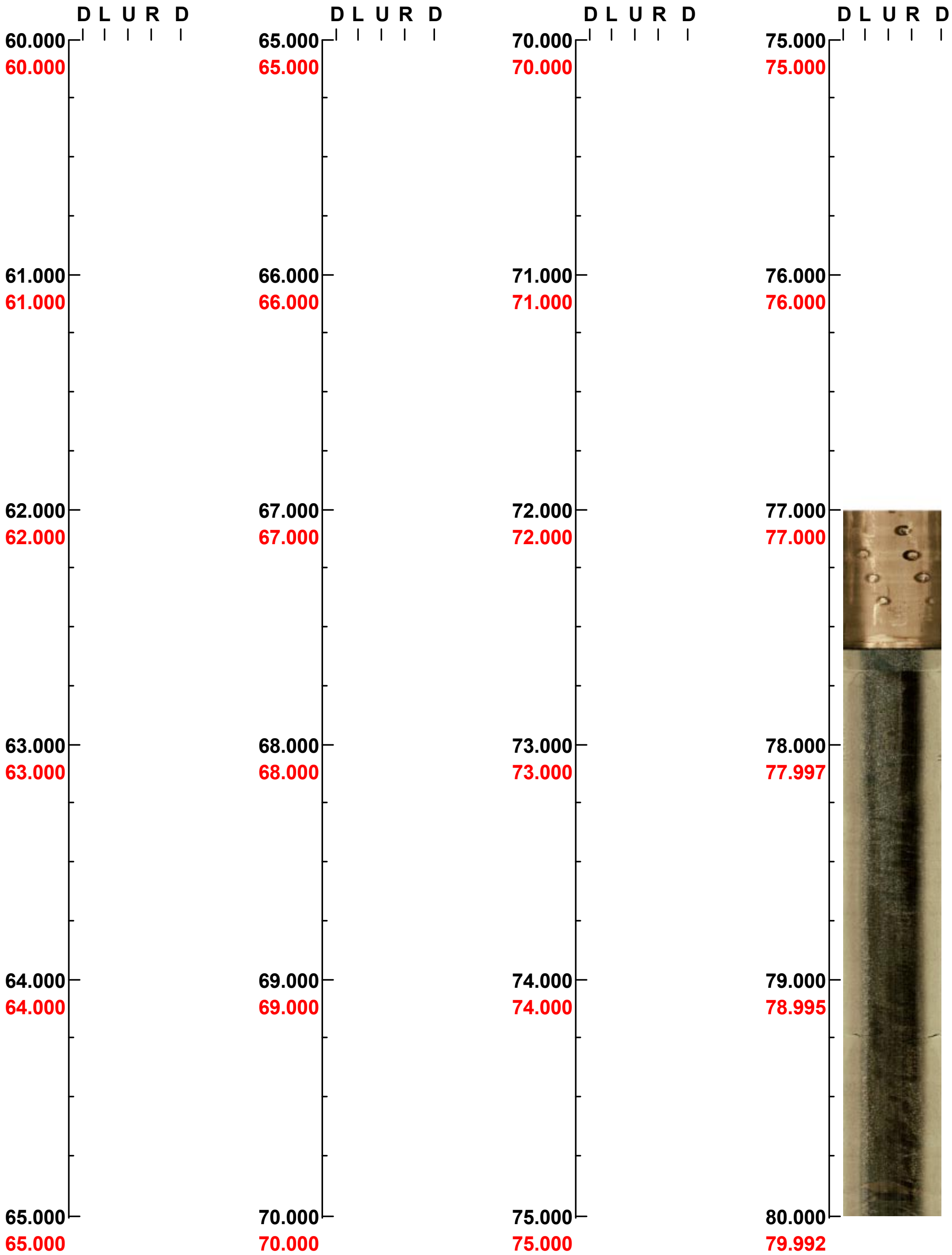
Project name: Laxemar

Image file	: c:\work\r5606k~1\bips\klx15a_2.bip
BDT file	: c:\work\r5606k~1\bips\klx15a_2.bdt
Locality	: LAXEMAR
Bore hole number	: KLX15A
Date	: 07/03/28
Time	: 12:39:00
Depth range	: 77.000 - 979.258 m
Azimuth	: 200
Inclination	: -55
Diameter	: 76.0 mm
Magnetic declination	: 0.0
Span	: 4
Scan interval	: 0.25
Scan direction	: To bottom
Scale	: 1/25
Aspect ratio	: 175 %
Pages	: 27
Color	: +0 +0 +0

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

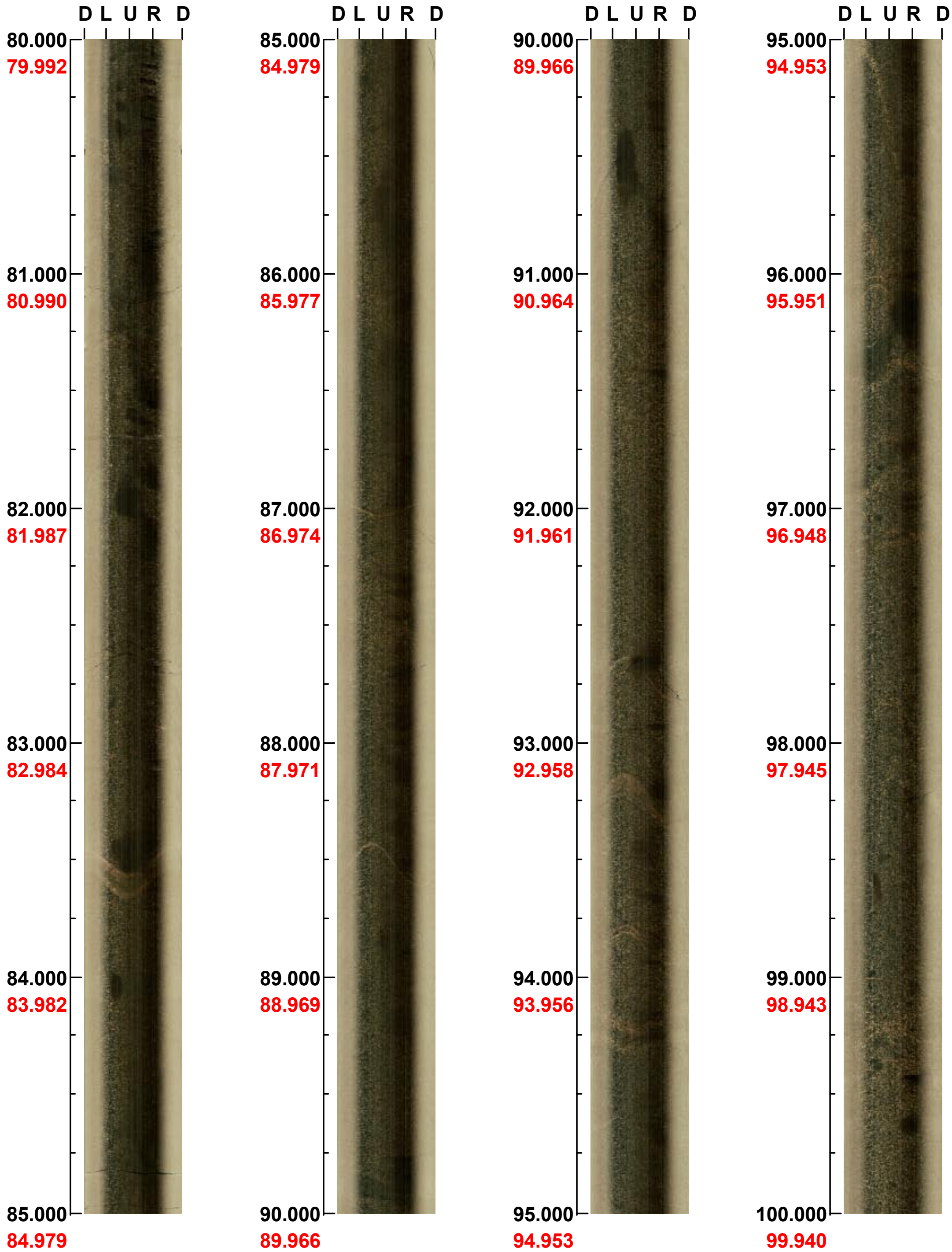
Depth range: 60.000 - 80.000 m



(1 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

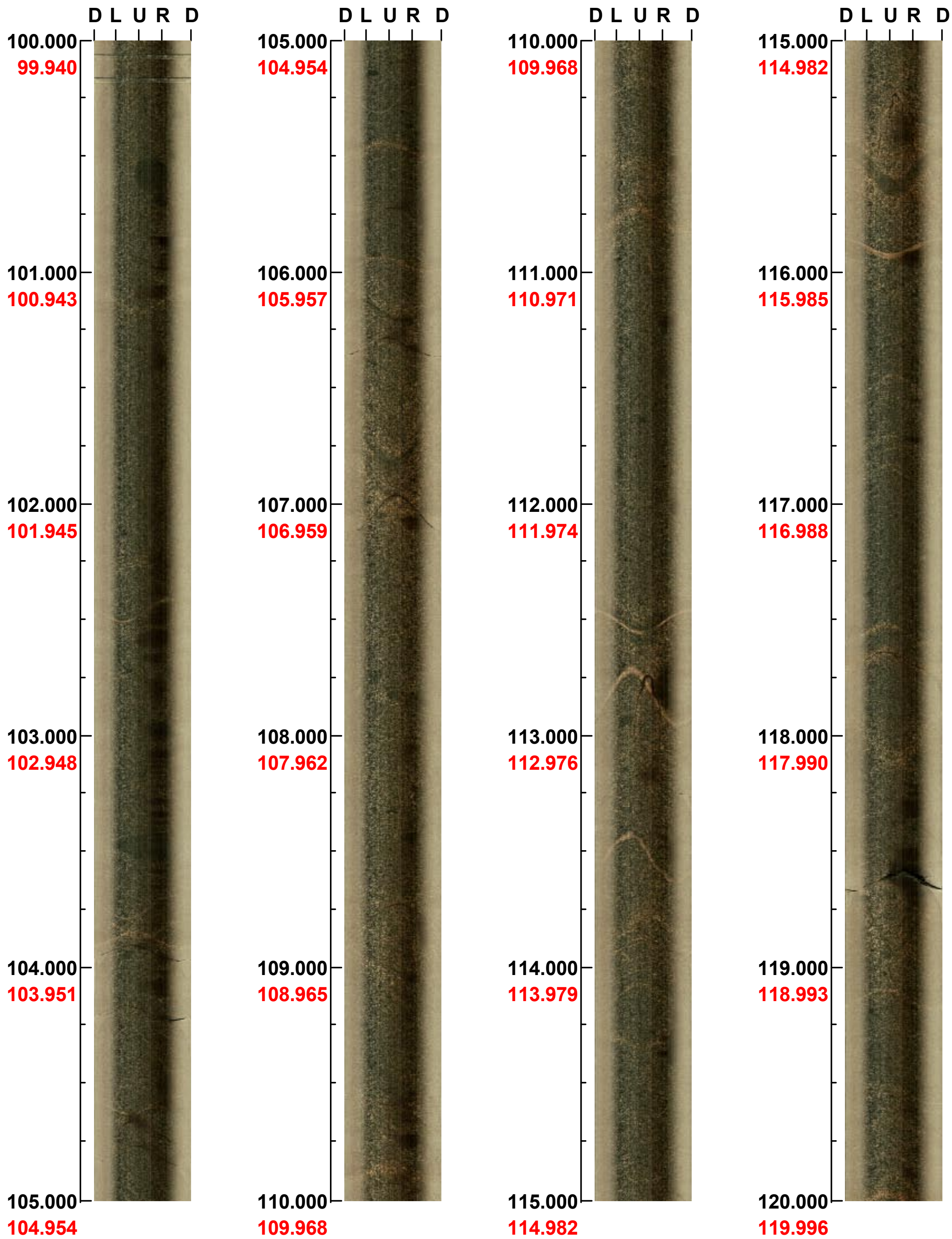
Depth range: 80.000 - 100.000 m



(2 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

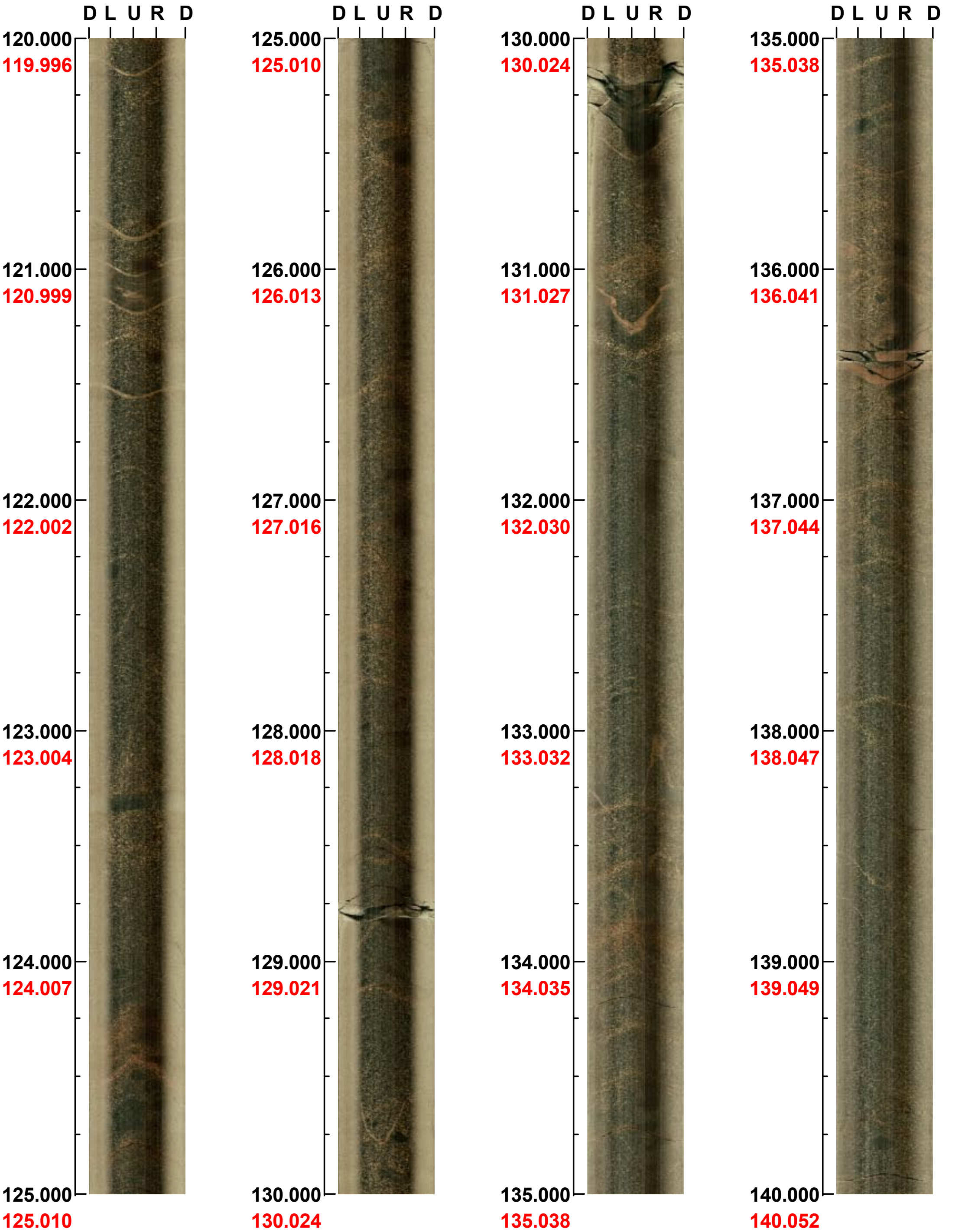
Depth range: 100.000 - 120.000 m



(3 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 120.000 - 140.000 m



(4 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A		Azimuth: 200		Inclination: -55

Depth range: 140.000 - 160.000 m

(5 / 27)		Scale: 1/25		Aspect ratio: 175 %

Project name: Laxemar
Bore hole No.: KLX15A Azimuth: 200 Inclination: -55

Depth range: 160.000 - 180.000 m

(6 / 27) Scale: 1/25 Aspect ratio: 175 %

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 180.000 - 200.000 m

(7 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

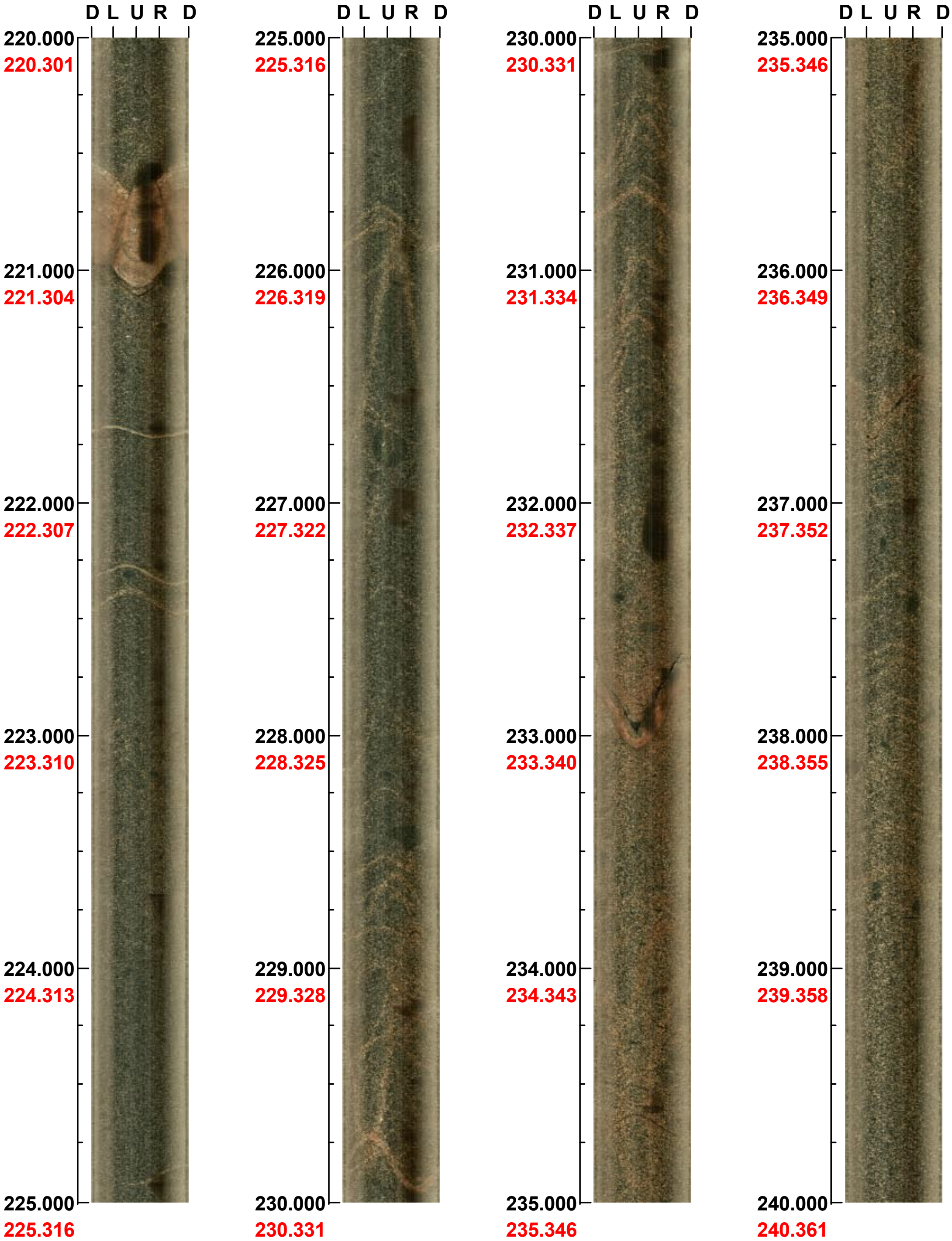
Depth range: 200.000 - 220.000 m

(8 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 220.000 - 240.000 m

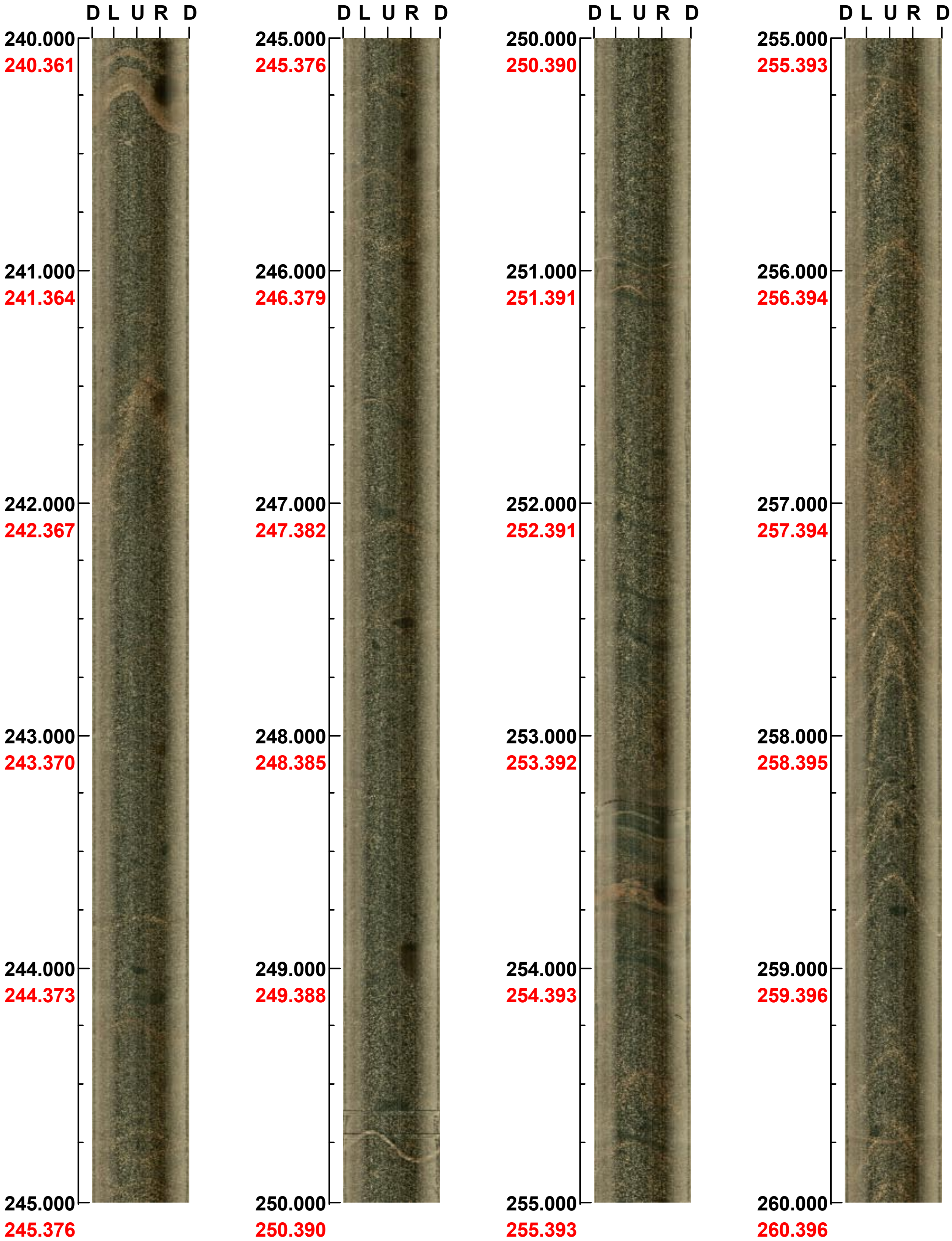


(9 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 240.000 - 260.000 m



(10 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 260.000 - 280.000 m

(11 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 280.000 - 300.000 m

D L U R D

280.000 / 280.408

281.000 / 281.409

282.000 / 282.409

283.000 / 283.410

284.000 / 284.411

285.000 / 285.411

D L U R D

285.000 / 285.411

286.000 / 286.412

287.000 / 287.412

288.000 / 288.413

289.000 / 289.414

290.000 / 290.414

D L U R D

290.000 / 290.414

291.000 / 291.415

292.000 / 292.415

293.000 / 293.416

294.000 / 294.417

295.000 / 295.417

D L U R D

295.000 / 295.417

296.000 / 296.418

297.000 / 297.418

298.000 / 298.419

299.000 / 299.420

300.000 / 300.421

(12 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A Azimuth: 200 Inclination: -55

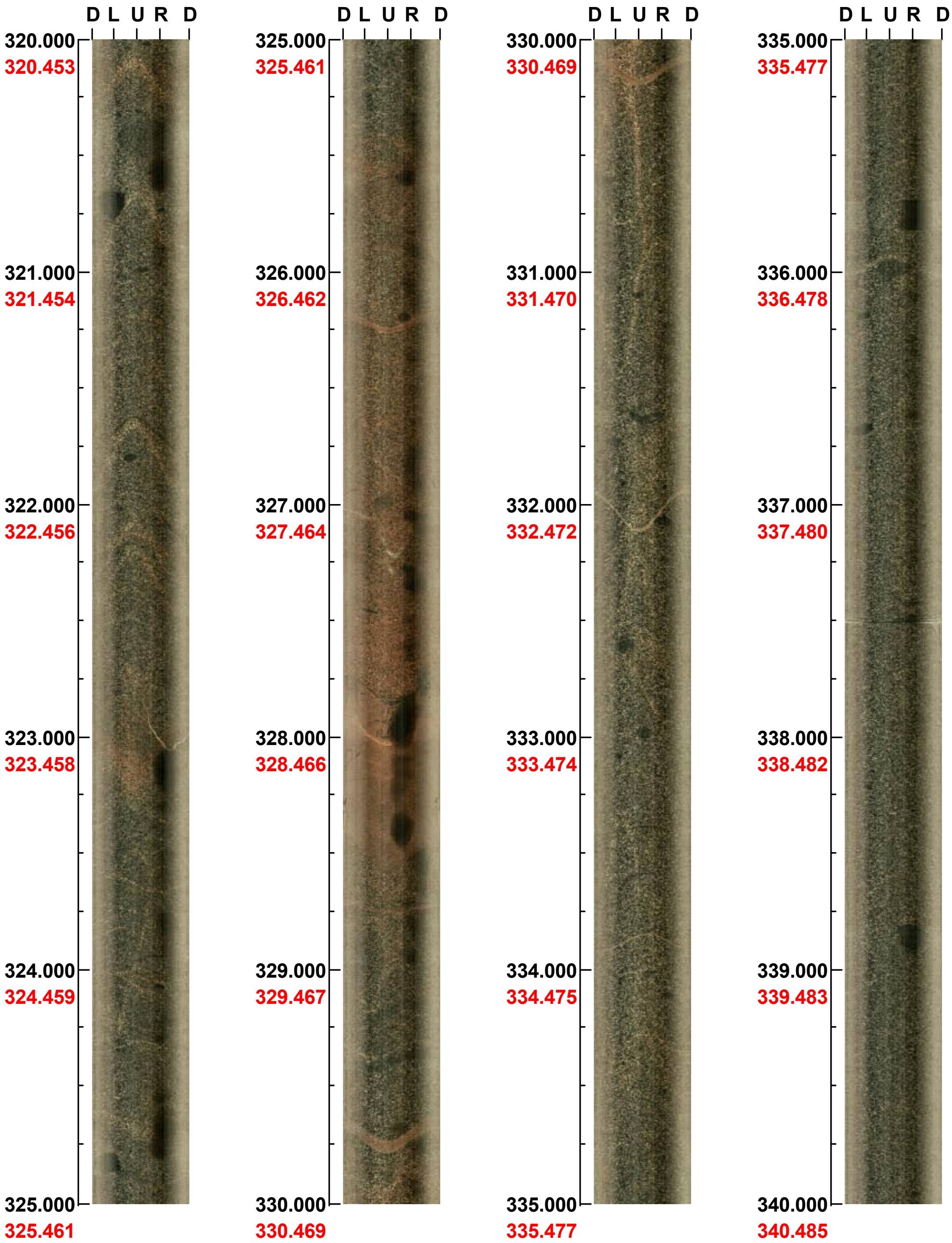
Depth range: 300.000 - 320.000 m

(13 / 27) Scale: 1/25 Aspect ratio: 175 %

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 320.000 - 340.000 m



(14 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 340.000 - 360.000 m

(15 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

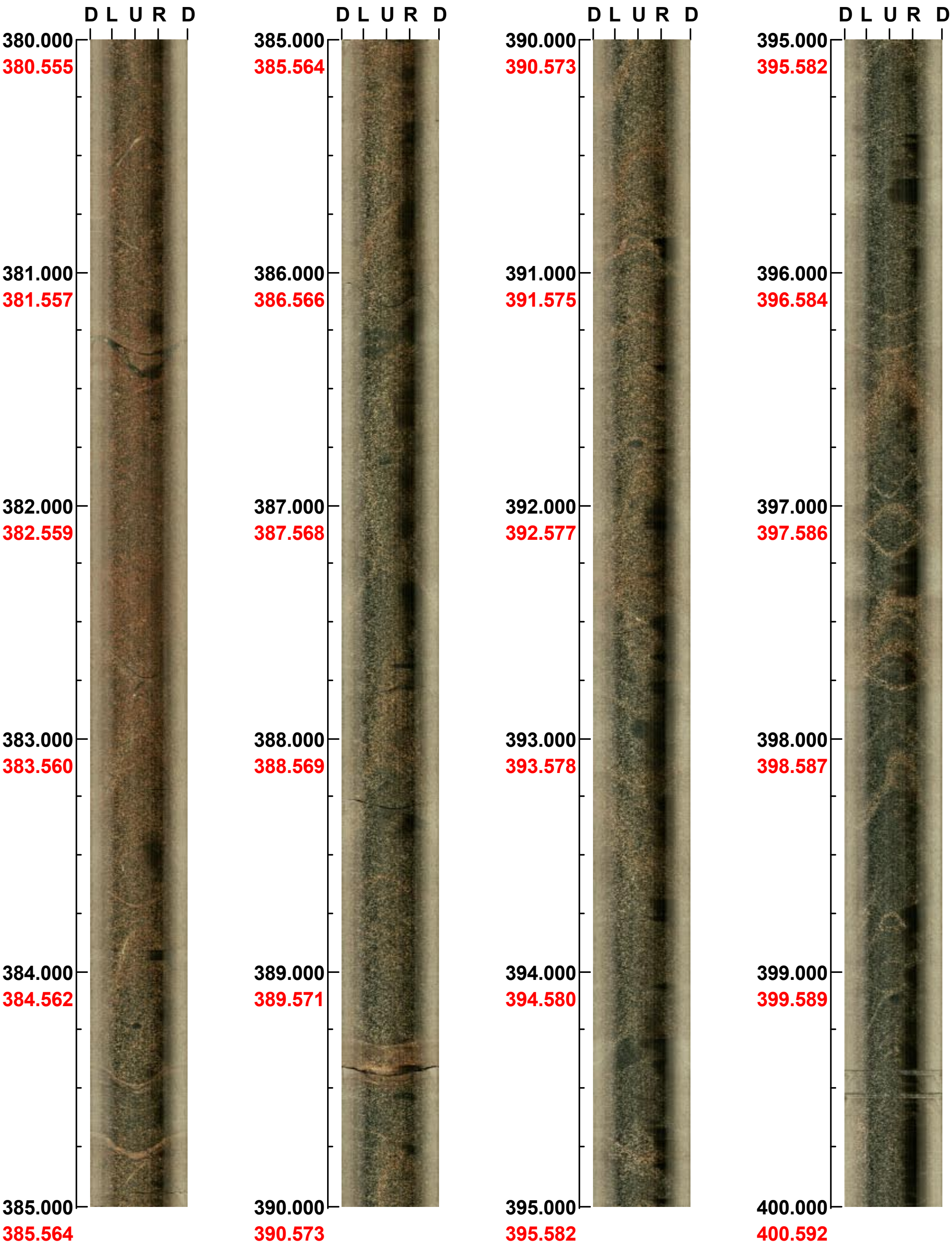
Depth range: 360.000 - 380.000 m

(16 / 27) Scale: 1/25 Aspect ratio: 175 %

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 380.000 - 400.000 m



(17 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 400.000 - 420.000 m

(18 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

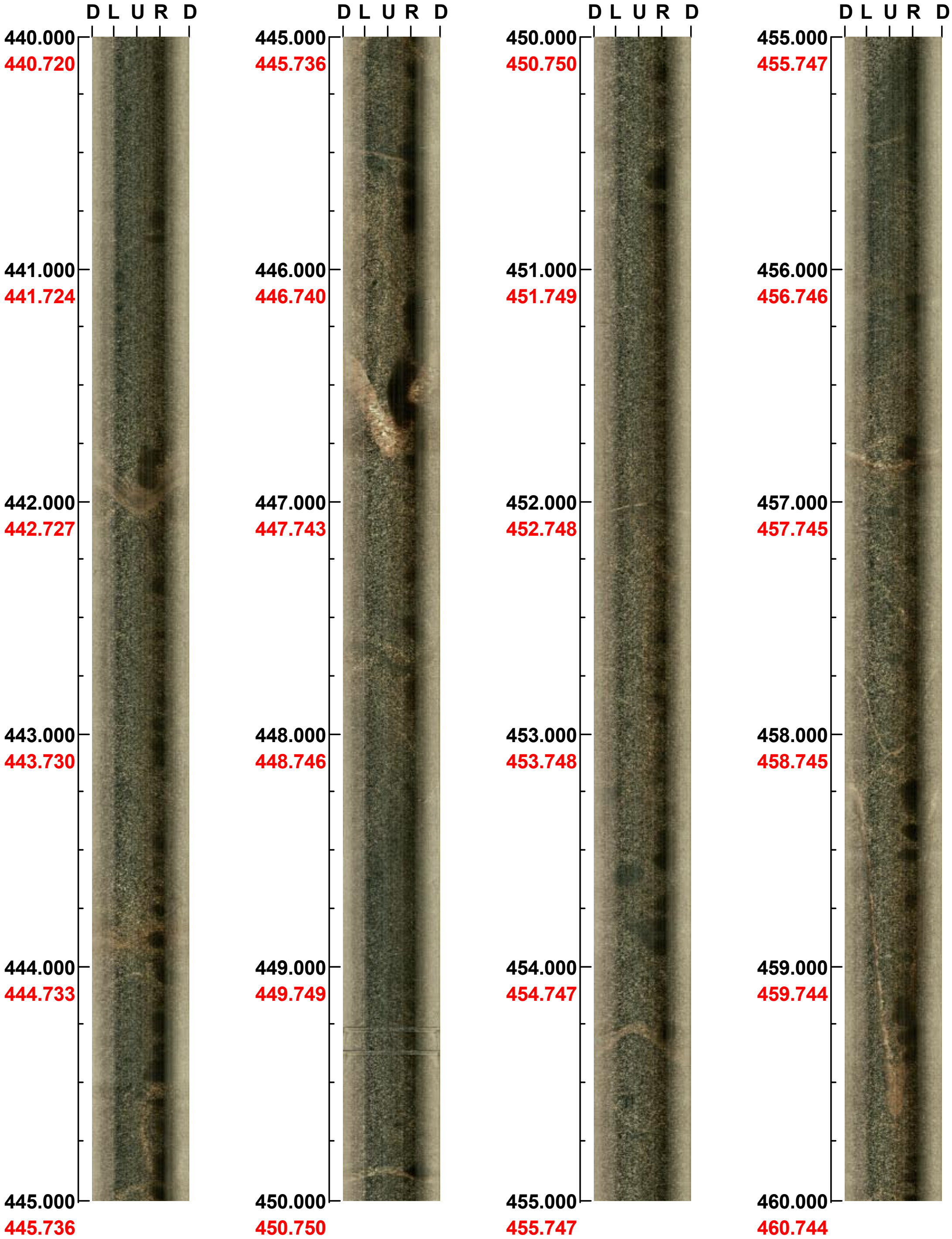
Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 420.000 - 440.000 m

(19 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 440.000 - 460.000 m



(20 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

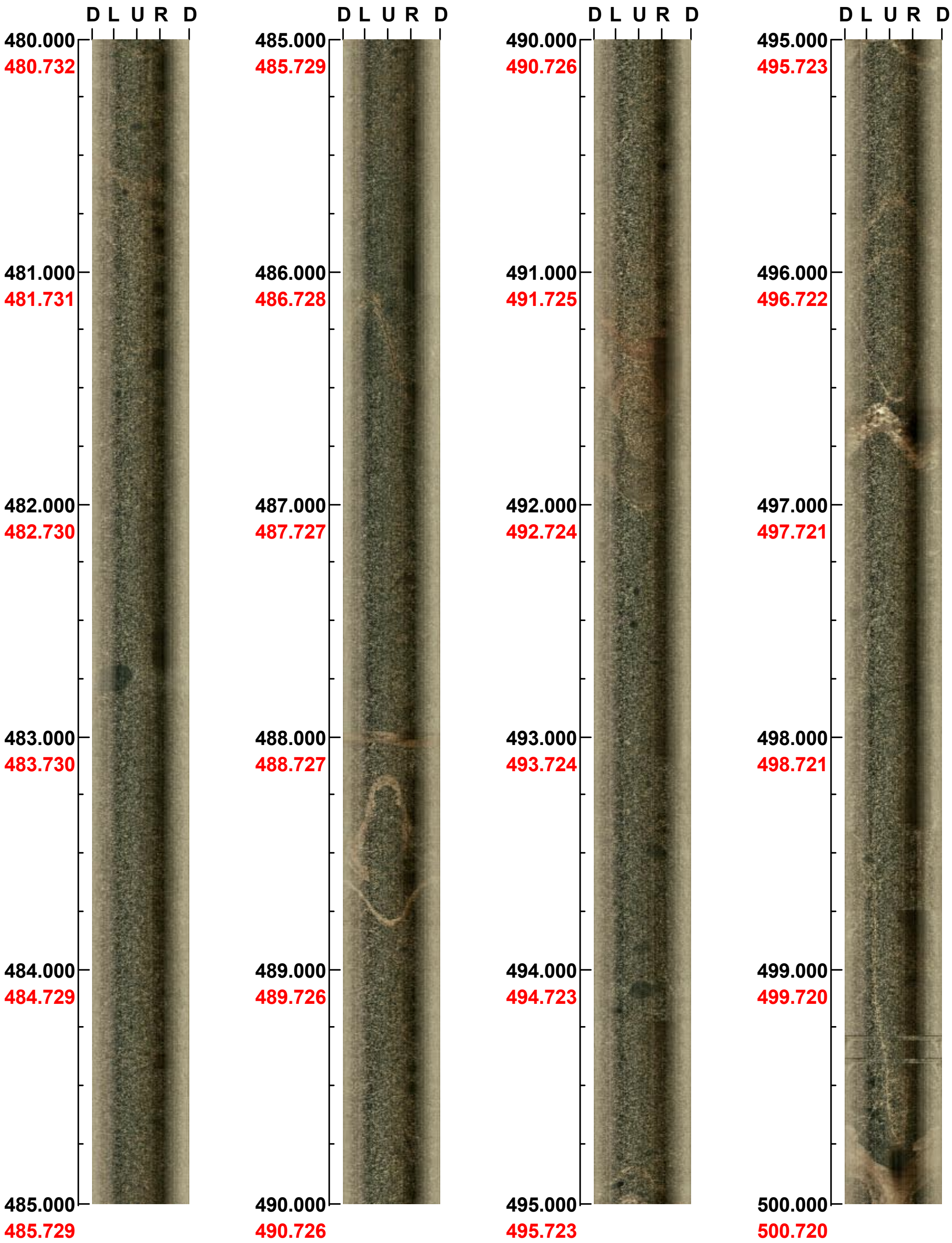
Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 460.000 - 480.000 m

(21 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 480.000 - 500.000 m



(22 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 500.000 - 520.000 m

(23 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 520.000 - 540.000 m

(24 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 540.000 - 560.000 m

(25 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 560.000 - 580.000 m

D L U R D

560.000
560.731

561.000
561.733

562.000
562.735

563.000
563.737

564.000
564.739

565.000
565.741

D L U R D

565.000
565.741

566.000
566.743

567.000
567.745

568.000
568.747

569.000
569.749

570.000
570.752

D L U R D

570.000
570.752

571.000
571.754

572.000
572.756

573.000
573.758

574.000
574.760

575.000
575.762

D L U R D

575.000
575.762

576.000
576.764

577.000
577.766

578.000
578.768

579.000
579.770

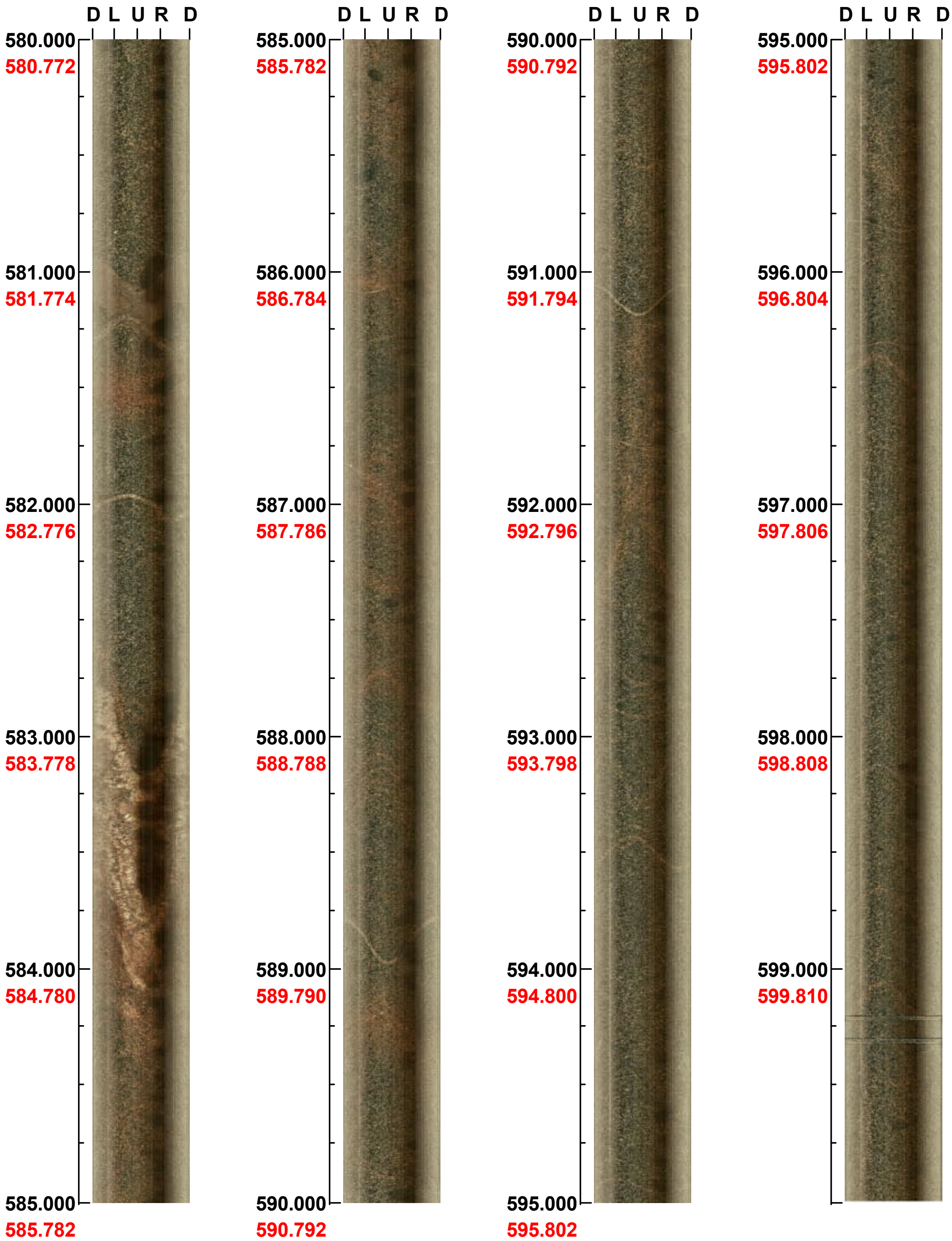
580.000
580.772

(26 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 580.000 - 599.991 m

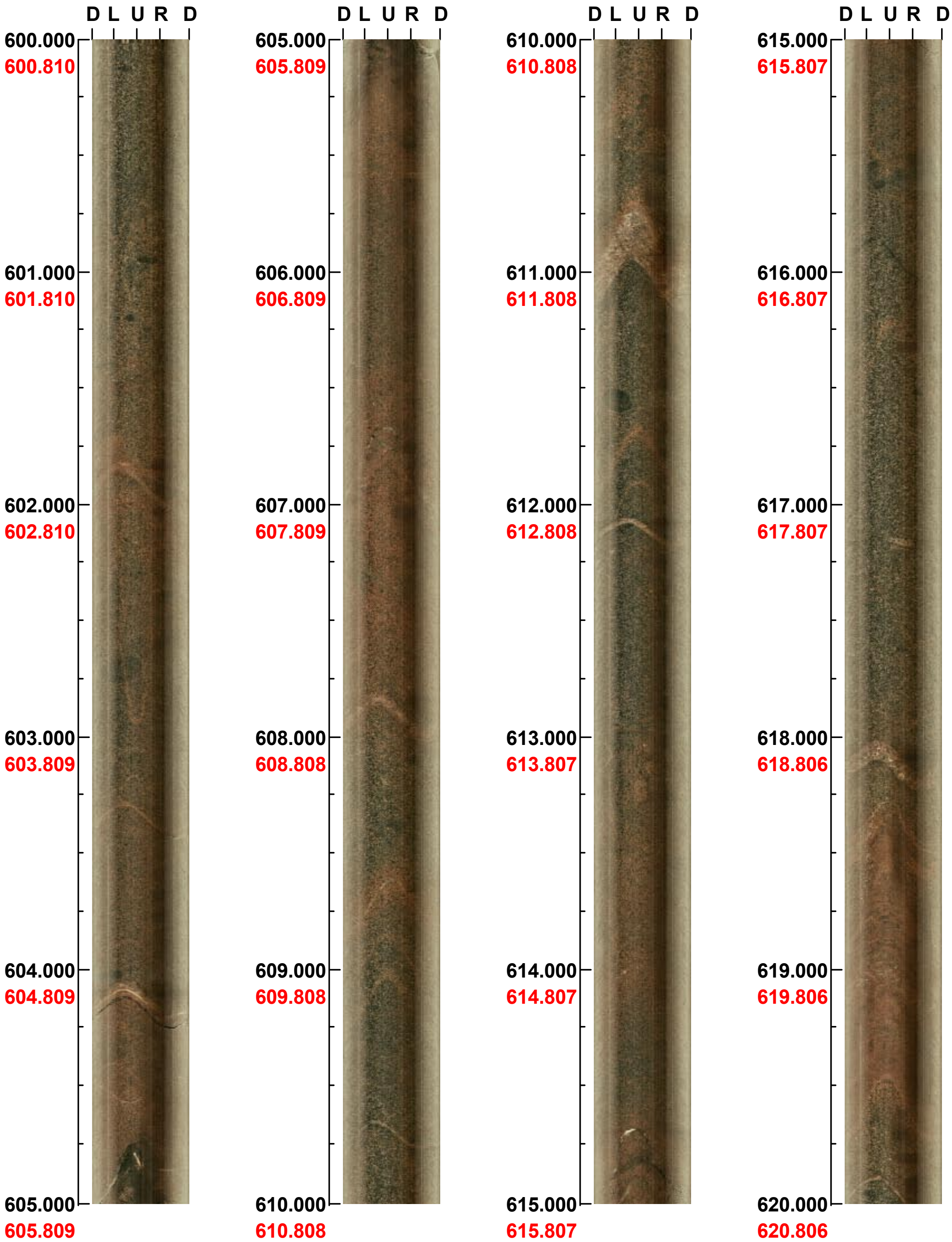


(27 / 27) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 600.000 - 620.000 m



(1 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

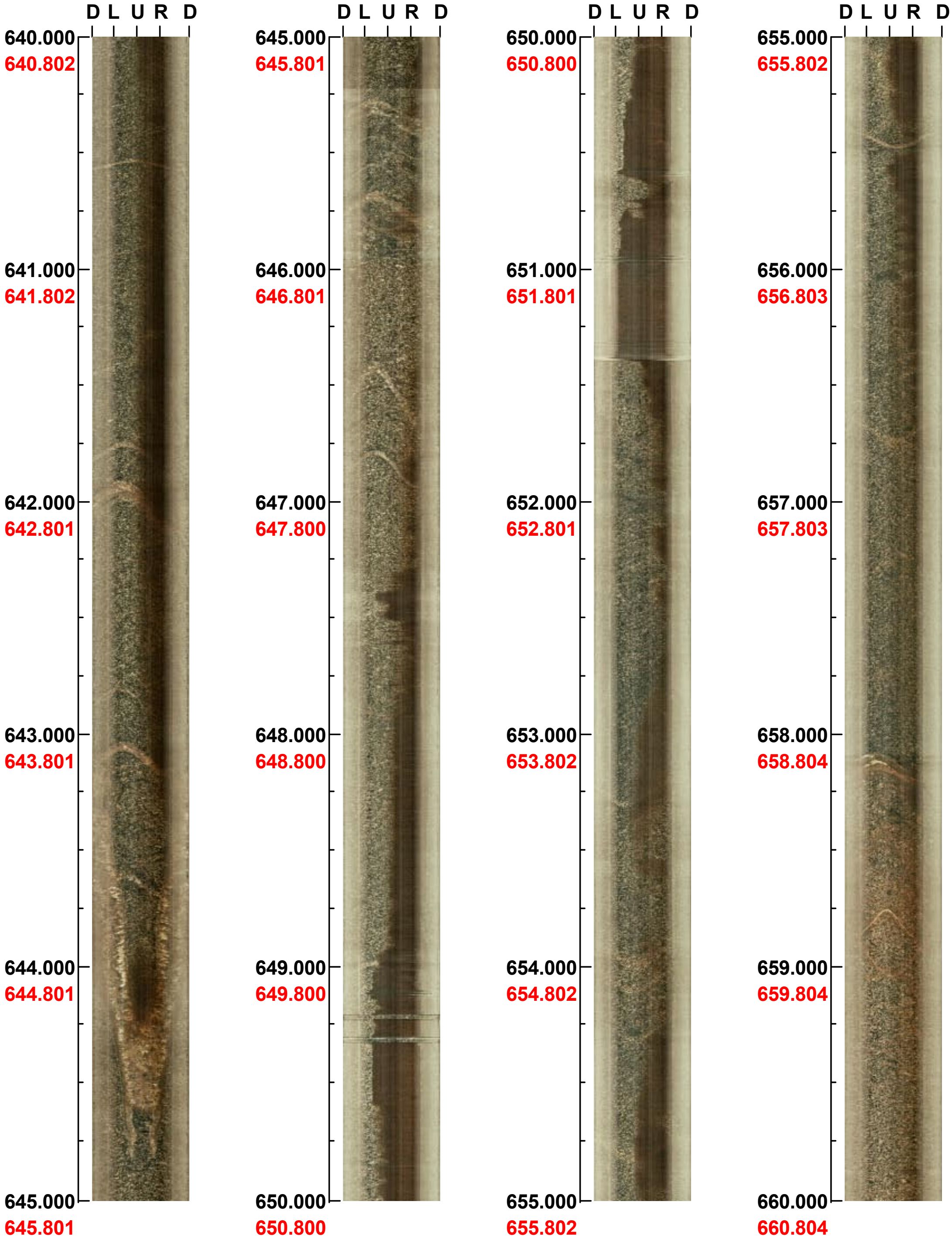
Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 620.000 - 640.000 m

(2 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 640.000 - 660.000 m



(3 / 19) Scale: 1/25 Aspect ratio: 175 %

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 660.000 - 680.000 m

(4 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A   Azimuth: 200   Inclination: -55

Depth range: 680.000 - 700.000 m

(5 / 19)   Scale: 1/25   Aspect ratio: 175 %

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 700.000 - 720.000 m

(6 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

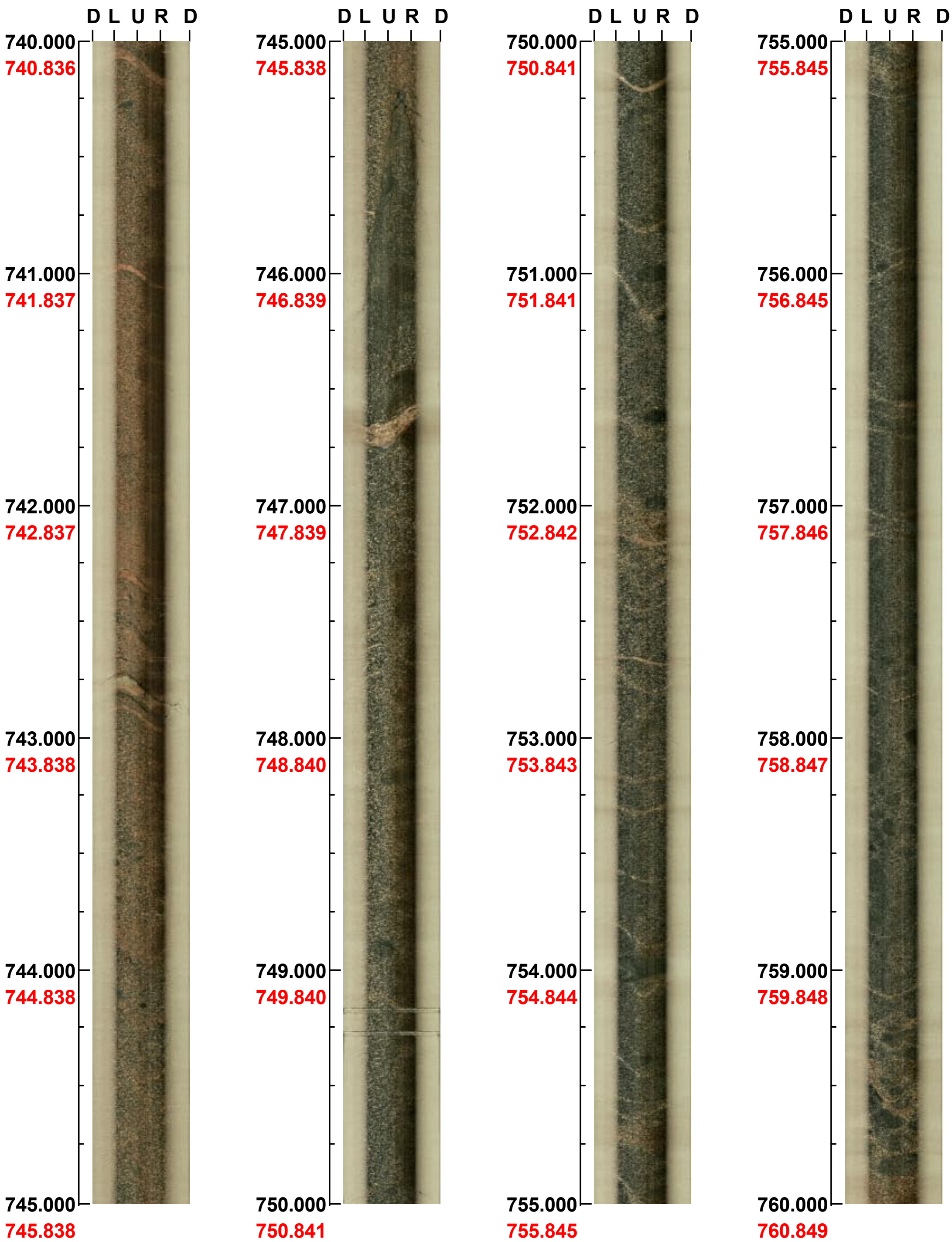
Project name: Laxemar
Bore hole No.: KLX15A Azimuth: 200 Inclination: -55

Depth range: 720.000 - 740.000 m

(7 / 19) Scale: 1/25 Aspect ratio: 175 %

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 740.000 - 760.000 m



(8 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A Azimuth: 200 Inclination: -55

Depth range: 760.000 - 780.000 m

(9 / 19) Scale: 1/25 Aspect ratio: 175 %

Project name: Laxemar

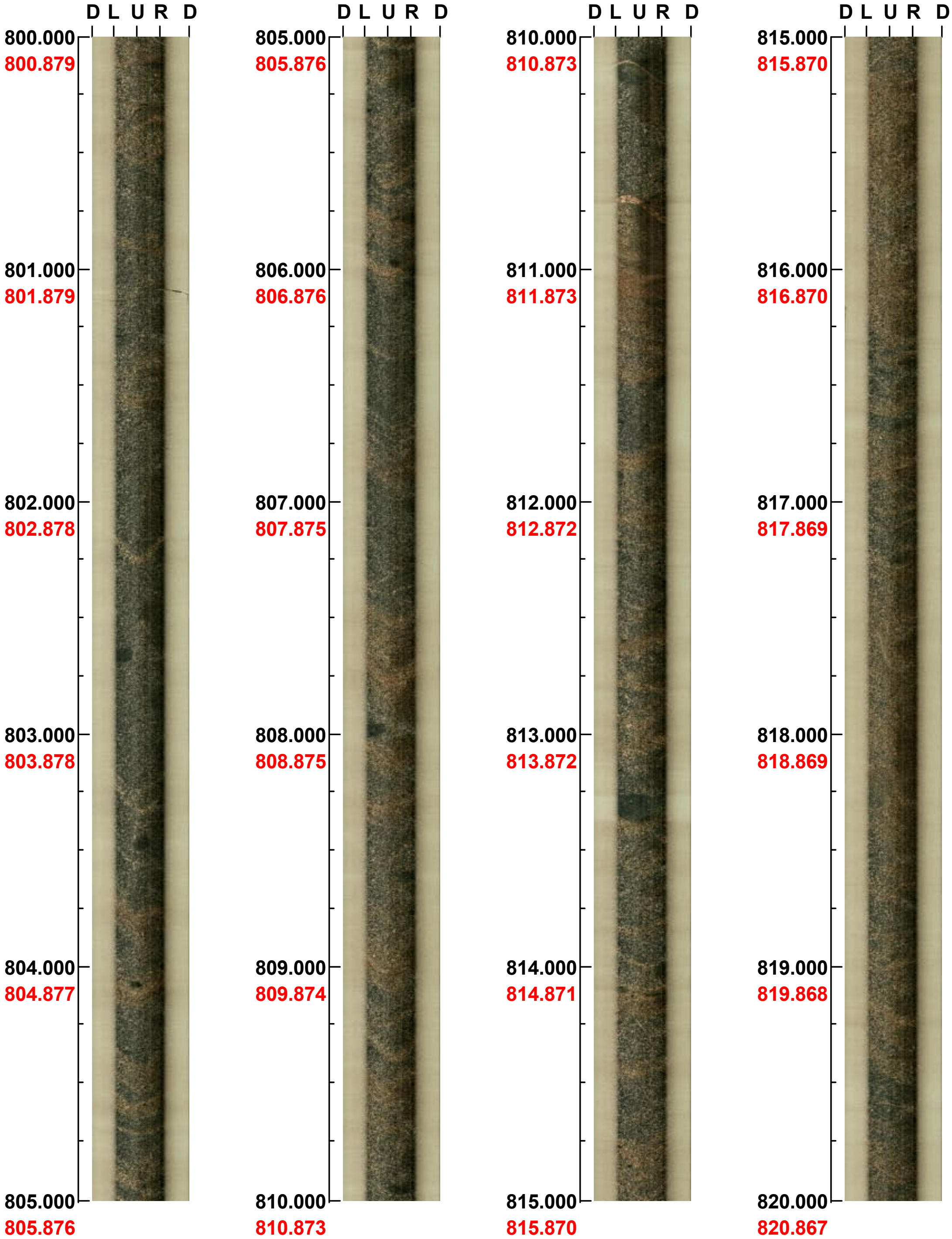
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 780.000 - 800.000 m

(10 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

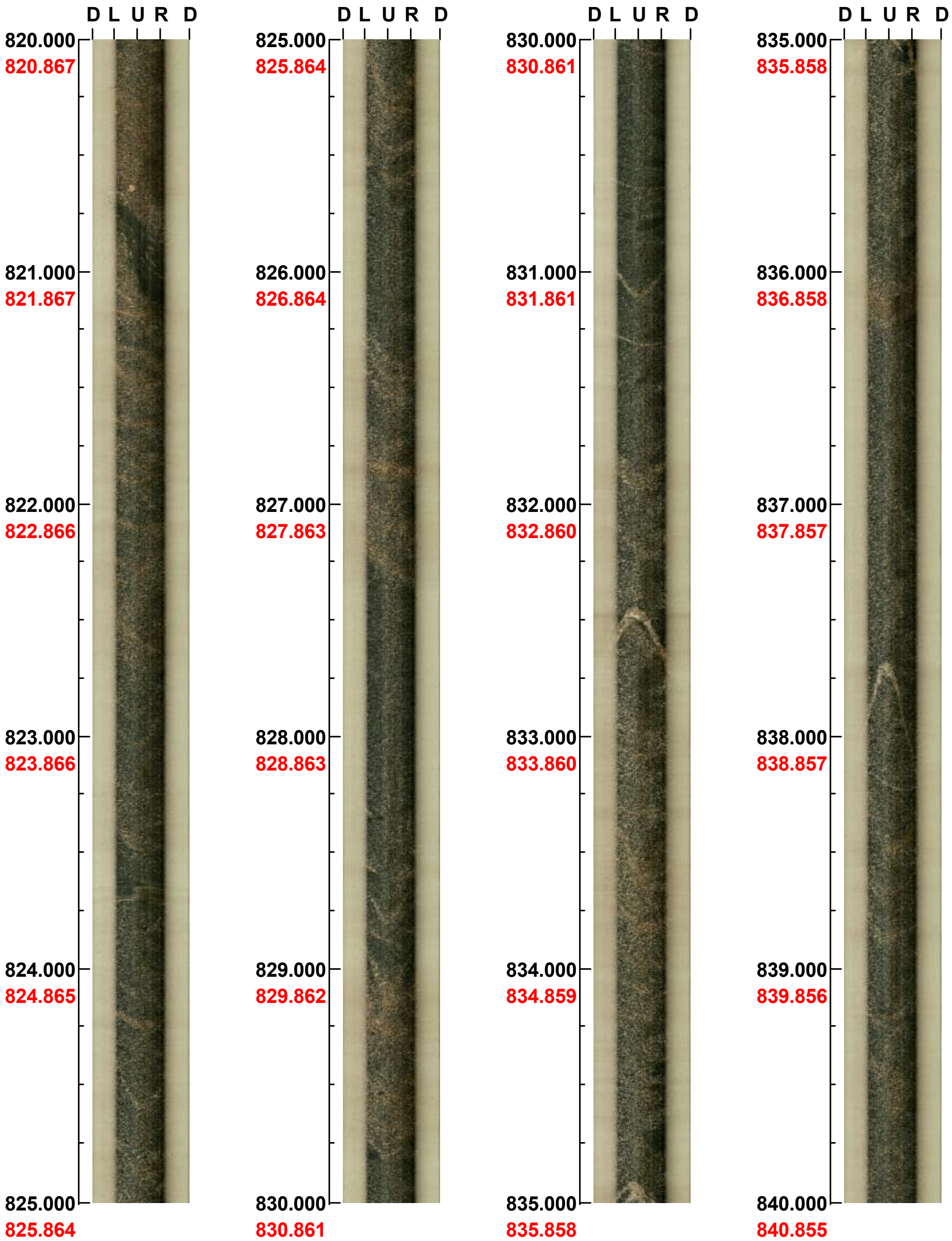
Depth range: 800.000 - 820.000 m



(11 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

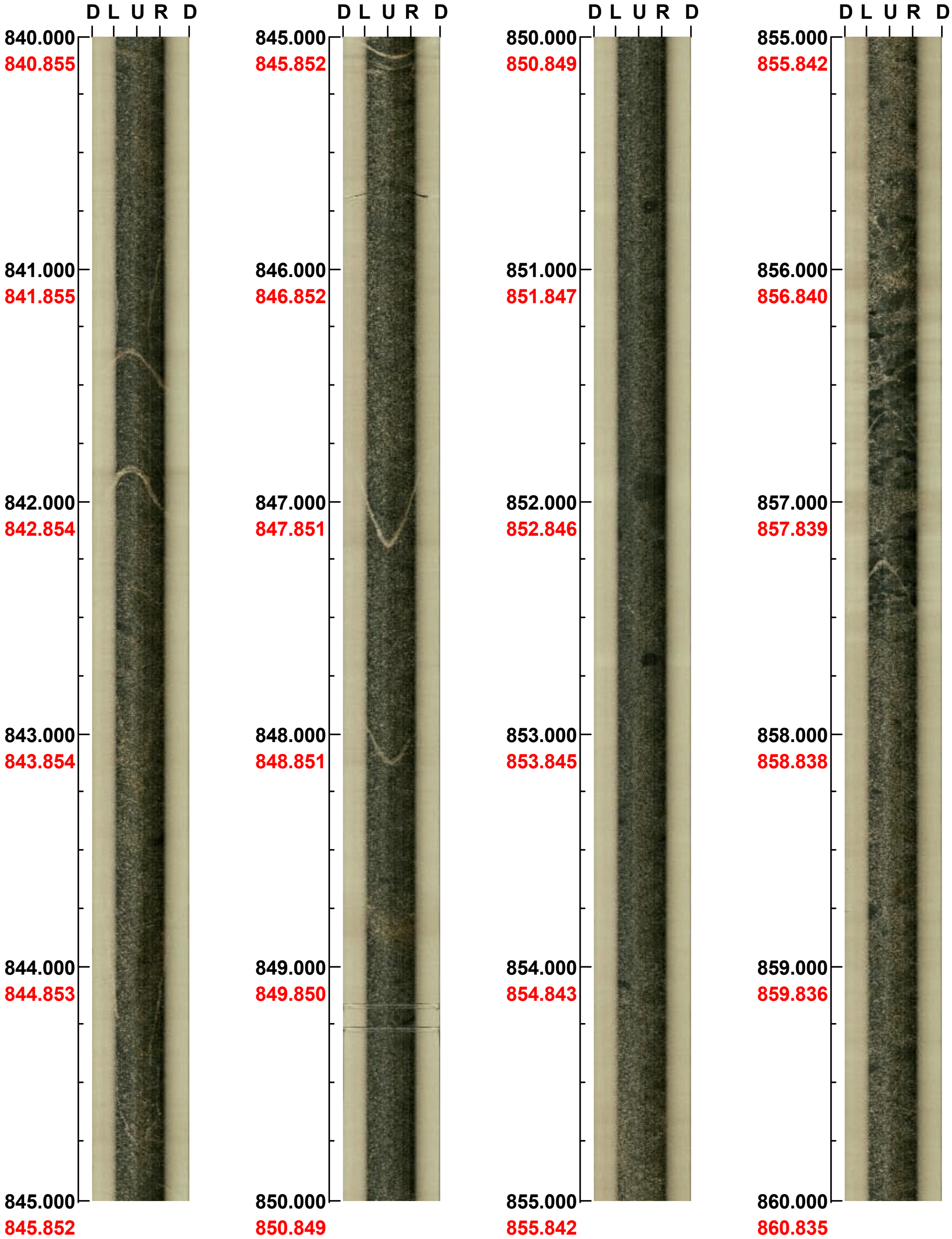
Depth range: 820.000 - 840.000 m



(12 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 840.000 - 860.000 m



(13 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar

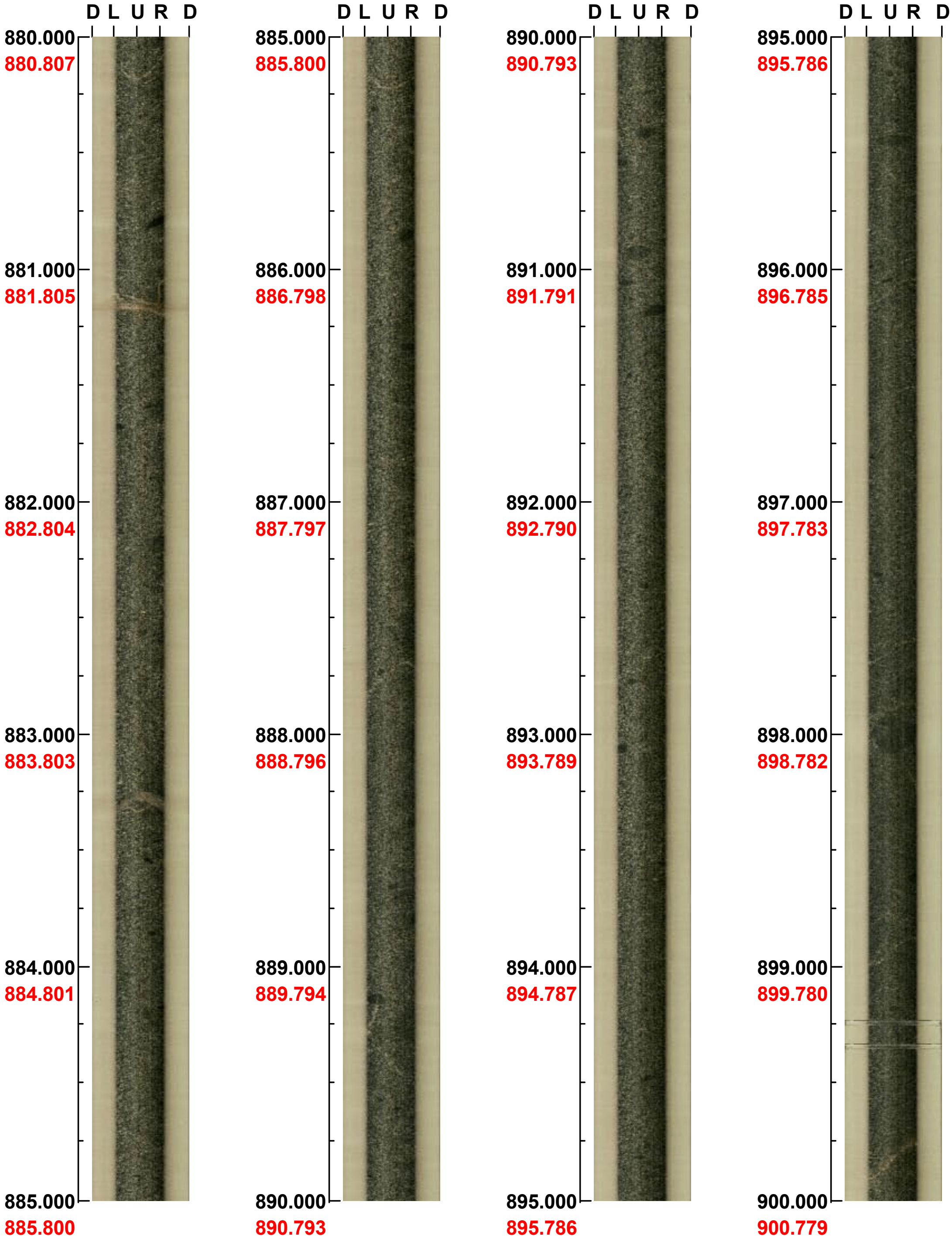
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 860.000 - 880.000 m

(14 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 880.000 - 900.000 m



(15 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 900.000 - 920.000 m

(16 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

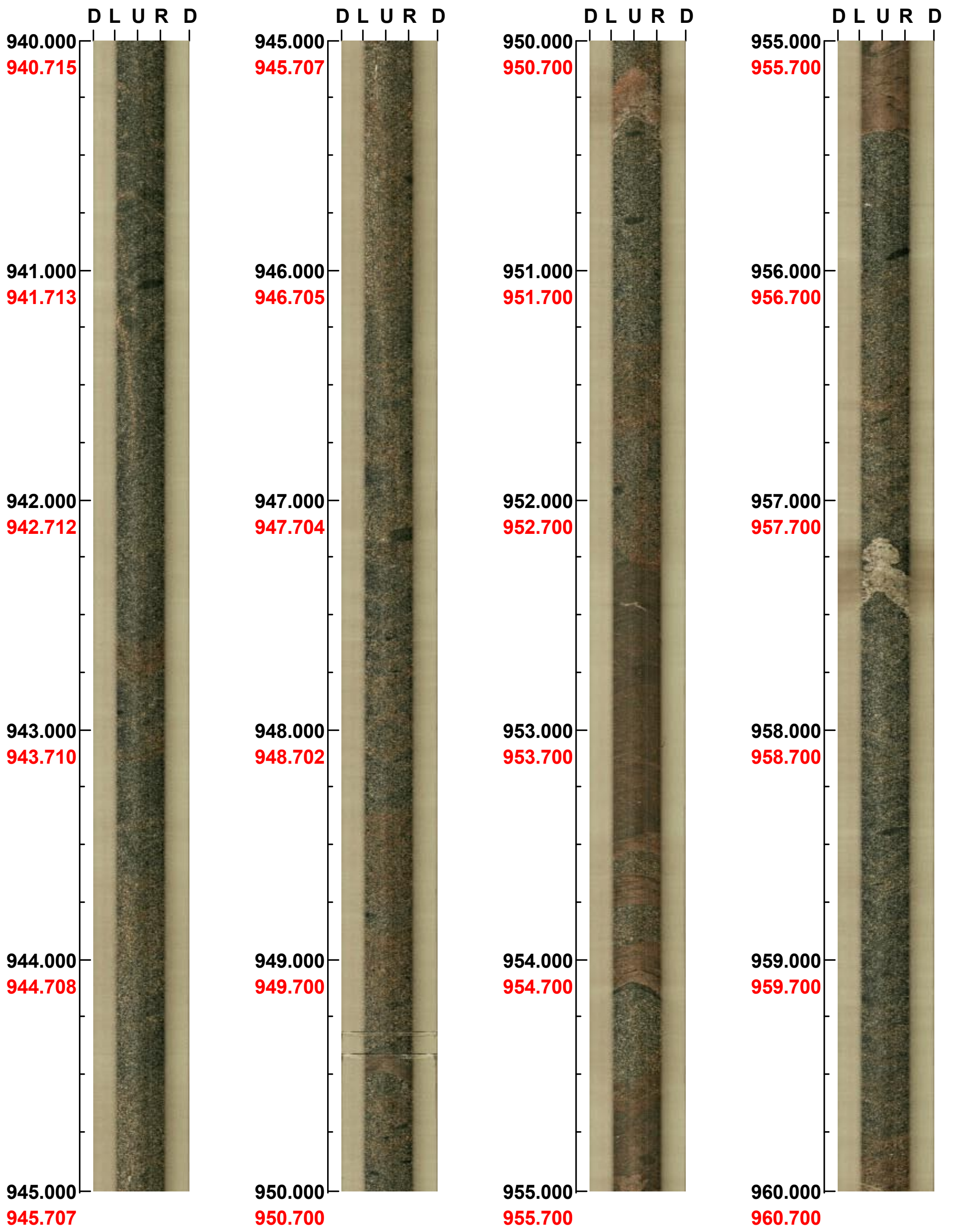
Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 920.000 - 940.000 m

(17 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 940.000 - 960.000 m



(18 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Project name: Laxemar
Bore hole No.: KLX15A **Azimuth: 200** **Inclination: -55**

Depth range: 960.000 - 979.258 m

(19 / 19) **Scale: 1/25** **Aspect ratio: 175 %**

Deviation logging in KLX15A, 0 to 978 m

Flexit

FLEXIT

Survey name:	**KLX15A**
Survey date:	01/04/2007 10:35:51
Project:	PLU
Location:	Laxemar

Country:	Sweden		
Survey company:	Malå GeoScience AB / RAYCON		
Surveyed by:	Christer Gustafsson		
Survey type:	STANDARD		
Operating conditions:			
General comments:			
Client name:	SKB		
Client ID number:	APPS 400-07-037		
Client reference:	Leif Stenberg		
Drill company:	SMOY		
Drill rig:			
Drill diameter:	195mm / 76mm	Survey run on:	Wireline
Survey direction:	INTO hole	Magnetic Var.:	2,73 degrees East of North

Conventions

Linear units:	Metres
Angular units:	Degrees
Temperature units:	Centigrade
Co-ordinate system:	0 North
Elevation positive	Up
Dip origin:	0 Horizontal
Dip positive:	Up

Magnetic Integrity Check (MagIC)

	Mid value	± limit	
Field strength:	49800	1000	nano Tesla
Magnetic dip:	71.1	1.5	Degrees

SURVEY	Actual start	End of survey	Difference
Station:	0,0	978,0	978,0
East:	1547987,47	1547831,50	-155,97
North:	6365614,17	6364992,02	-622,15
Elevation:	14,59	-722,73	-737,32
Dip:	-54,51	-46,60	7,91
Azimuth:	198,80	190,81	-7,99

OFFSETS at end

Offsets relative to:
ACTUAL START
92,37 metres upwards
52,85 metres left
6,55 metres shortfall

Printed on: 2007-05-31 15:15:17

Page 1 of 11

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

Printed on 2007-05-31 15:15:22

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
0,0	-54,51	198,80	1547987,47	6365614,17	14,59	14867	-35,17	0,999396	✍✍✍	0,00	0,00	0,00
3,0	-54,43	198,80	1547986,91	6365612,52	12,15	14524	72,26	0,999423	✍✍	0,00	0,00	0,00
6,0	-54,34	198,80	1547986,35	6365610,87	9,71	48758	71,92	0,996826	✍✍	0,01	0,00	0,00
9,0	-54,28	198,80	1547985,78	6365609,21	7,27	48420	70,21	0,997024	✍✍	0,02	0,00	0,00
12,0	-54,49	198,80	1547985,22	6365607,56	4,83	50954	71,00	0,998082	✍✍	0,03	0,00	0,00
15,0	-54,42	199,05	1547984,65	6365605,91	2,39	51363	70,72	0,997122	✍	0,03	0,00	0,00
18,0	-54,21	199,29	1547984,08	6365604,25	-0,04	51452	70,71	0,996868	✍	0,04	0,02	0,00
21,0	-53,89	198,85	1547983,50	6365602,59	-2,47	51367	70,74	0,996218	✍	0,06	0,02	0,00
24,0	-53,92	198,46	1547982,94	6365600,91	-4,90	51064	70,60	0,997714	✍	0,09	0,02	0,00
27,0	-53,79	197,12	1547982,40	6365599,23	-7,32	50482	70,48	0,996892	✍	0,13	-0,01	0,00
30,0	-53,43	198,76	1547981,85	6365597,54	-9,73	50686	70,97	0,998728	✍	0,17	-0,04	0,00
33,0	-53,43	197,86	1547981,29	6365595,84	-12,14	50008	70,60	0,996716	✍	0,23	-0,05	0,00
36,0	-53,25	197,95	1547980,74	6365594,13	-14,55	49977	70,96	0,997360	✍	0,29	-0,08	0,00
39,0	-53,16	197,10	1547980,19	6365592,42	-16,95	50048	70,60	0,997185	✍	0,36	-0,12	0,00
42,0	-53,05	198,51	1547979,64	6365590,71	-19,35	49980	71,30	0,999503	✍	0,43	-0,15	0,00
45,0	-52,84	197,62	1547979,08	6365588,99	-21,75	50133	71,01	0,997357	✍	0,51	-0,18	-0,01
48,0	-52,55	198,80	1547978,52	6365587,26	-24,13	50490	70,94	0,998329	✍	0,61	-0,20	-0,01
51,0	-52,40	198,09	1547977,94	6365585,53	-26,51	50162	70,86	0,996360	✍	0,72	-0,21	-0,01
54,0	-52,42	197,97	1547977,37	6365583,79	-28,89	50006	70,85	0,999675	✍	0,82	-0,23	-0,01
57,0	-52,08	196,52	1547976,83	6365582,03	-31,26	50338	70,82	0,996785	✍	0,94	-0,28	-0,01
60,0	-52,07	196,74	1547976,30	6365580,27	-33,63	49917	70,70	0,999017	✍	1,07	-0,35	-0,02
63,0	-51,86	196,54	1547975,77	6365578,50	-35,99	49825	70,77	0,996130	✍	1,20	-0,42	-0,02
66,0	-51,65	196,85	1547975,24	6365576,72	-38,35	49947	70,74	0,997252	✍	1,34	-0,49	-0,03
69,0	-51,55	196,70	1547974,70	6365574,93	-40,70	50079	70,74	0,997179	✍	1,49	-0,55	-0,03
72,0	-50,43	194,73	1547974,19	6365573,11	-43,03	50126	71,04	0,998168	✍	1,68	-0,66	-0,04
75,0	-50,51	195,58	1547973,69	6365571,27	-45,34	49395	71,68	0,999094	✍	1,88	-0,78	-0,05
78,0	-50,54	194,88	1547973,19	6365569,43	-47,66	49884	71,32	0,999056	✍	2,09	-0,90	-0,06
81,0	-50,72	196,33	1547972,68	6365567,60	-49,98	49923	71,26	0,999696	✍	2,29	-1,00	-0,07
84,0	-50,75	196,71	1547972,14	6365565,78	-52,30	49706	71,31	1,000148	✍	2,49	-1,08	-0,07
87,0	-50,80	195,86	1547971,60	6365563,96	-54,62	49449	71,42	1,000202	✍	2,68	-1,16	-0,08
90,0	-50,79	196,68	1547971,07	6365562,14	-56,95	49799	71,11	0,999859	✍	2,87	-1,25	-0,09
93,0	-50,79	196,60	1547970,53	6365560,32	-59,27	49578	71,15	1,000101	✍	3,07	-1,32	-0,09
96,0	-50,82	196,90	1547969,98	6365558,51	-61,60	49888	71,20	0,999984	✍	3,26	-1,38	-0,10
99,0	-50,81	197,05	1547969,43	6365556,69	-63,92	49626	71,12	1,000283	✍	3,45	-1,45	-0,11

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

Printed on 2007-05-31 15:15:23

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
102,0	-50,82	196,50	1547968,88	6365554,88	-66,25	49682	71,10	0,999988	✍	3,64	-1,51	-0,12
105,0	-50,80	195,56	1547968,36	6365553,06	-68,57	50268	71,16	1,000065	✍	3,83	-1,60	-0,12
108,0	-50,78	196,98	1547967,83	6365551,24	-70,90	49788	71,18	0,999838	✍	4,03	-1,69	-0,13
111,0	-50,75	197,07	1547967,27	6365549,42	-73,22	49761	71,23	0,999836	✍	4,22	-1,75	-0,14
114,0	-50,72	197,24	1547966,71	6365547,61	-75,55	50057	71,33	0,999749	✍	4,42	-1,80	-0,14
117,0	-50,71	196,40	1547966,16	6365545,79	-77,87	50339	70,98	0,999463	✍	4,62	-1,87	-0,15
120,0	-50,69	197,03	1547965,62	6365543,97	-80,19	49596	70,97	1,000086	✍	4,82	-1,94	-0,16
123,0	-50,67	196,44	1547965,07	6365542,15	-82,51	49276	71,05	1,000038	✍	5,01	-2,00	-0,17
126,0	-50,65	197,39	1547964,52	6365540,33	-84,83	49722	70,99	0,999640	✍	5,21	-2,07	-0,17
129,0	-50,59	197,24	1547963,95	6365538,51	-87,15	50642	71,38	0,999711	✍	5,42	-2,12	-0,18
132,0	-50,58	196,81	1547963,39	6365536,69	-89,47	49626	70,92	1,000008	✍	5,62	-2,17	-0,19
135,0	-50,54	195,92	1547962,85	6365534,86	-91,78	49634	71,10	0,999989	✍	5,83	-2,26	-0,20
138,0	-50,56	195,73	1547962,33	6365533,03	-94,10	49343	71,09	0,999799	✍	6,03	-2,35	-0,21
141,0	-50,53	196,17	1547961,81	6365531,19	-96,42	49227	71,11	1,000073	✍	6,24	-2,45	-0,21
144,0	-50,47	196,75	1547961,27	6365529,36	-98,73	49473	71,27	0,999989	✍	6,45	-2,53	-0,22
147,0	-50,46	196,97	1547960,72	6365527,54	-101,04	49524	71,20	1,000115	✍	6,66	-2,59	-0,23
150,0	-50,45	196,80	1547960,16	6365525,71	-103,36	49310	71,26	1,000141	✍	6,87	-2,66	-0,24
153,0	-50,40	196,31	1547959,62	6365523,88	-105,67	49345	71,14	1,000199	✍	7,08	-2,73	-0,25
156,0	-50,39	196,27	1547959,08	6365522,04	-107,98	49373	71,17	0,999985	✍	7,29	-2,81	-0,26
159,0	-50,35	195,90	1547958,55	6365520,20	-110,29	49297	71,30	0,999942	✍	7,51	-2,91	-0,26
162,0	-50,35	196,42	1547958,02	6365518,36	-112,60	49907	71,30	0,999846	✍	7,72	-2,99	-0,27
165,0	-50,36	196,47	1547957,48	6365516,53	-114,91	49629	71,10	0,999887	✍	7,94	-3,07	-0,28
168,0	-50,35	196,40	1547956,93	6365514,69	-117,22	49733	71,26	1,000269	✍	8,16	-3,15	-0,29
171,0	-50,33	196,54	1547956,39	6365512,86	-119,53	49721	71,16	1,000336	✍	8,37	-3,23	-0,30
174,0	-50,34	196,36	1547955,85	6365511,02	-121,84	49776	70,99	0,999999	✍	8,59	-3,31	-0,31
177,0	-50,36	195,95	1547955,32	6365509,18	-124,15	49733	71,01	1,000438	✍	8,81	-3,40	-0,32
180,0	-50,37	196,62	1547954,78	6365507,34	-126,46	49752	71,11	1,000034	✍	9,02	-3,48	-0,33
183,0	-50,35	196,35	1547954,24	6365505,51	-128,77	49843	71,08	0,999641	✍	9,24	-3,56	-0,34
186,0	-50,35	196,04	1547953,70	6365503,67	-131,08	49426	71,19	1,000208	✍	9,45	-3,64	-0,34
189,0	-50,37	197,02	1547953,16	6365501,84	-133,39	50440	71,05	1,000123	✍	9,67	-3,72	-0,35
192,0	-50,38	197,01	1547952,60	6365500,01	-135,70	50571	71,08	1,000167	✍	9,88	-3,78	-0,36
195,0	-50,40	197,66	1547952,03	6365498,18	-138,01	50617	70,94	1,000102	✍	10,10	-3,83	-0,37
198,0	-50,39	197,65	1547951,45	6365496,36	-140,32	50333	70,80	1,000250	✍	10,31	-3,87	-0,38
201,0	-50,35	196,24	1547950,89	6365494,53	-142,64	49593	71,20	0,999964	✍	10,53	-3,93	-0,39

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
204,0	-50,29	196,63	1547950,35	6365492,69	-144,94	49662	71,12	0,999995	✍	10,75	-4,01	-0,40
207,0	-50,30	196,19	1547949,81	6365490,85	-147,25	49541	71,30	0,999998	✍	10,97	-4,09	-0,40
210,0	-50,26	195,64	1547949,28	6365489,01	-149,56	49327	71,37	0,999927	✍	11,19	-4,18	-0,41
213,0	-50,26	195,51	1547948,77	6365487,16	-151,87	49308	71,41	0,999774	✍	11,41	-4,29	-0,42
216,0	-50,21	196,11	1547948,24	6365485,31	-154,17	49558	71,35	1,000052	✍	11,63	-4,39	-0,43
219,0	-50,17	196,13	1547947,71	6365483,47	-156,48	50148	71,31	0,999908	✍	11,85	-4,48	-0,44
222,0	-50,15	195,44	1547947,19	6365481,62	-158,78	49373	71,28	1,000136	✍	12,08	-4,58	-0,45
225,0	-50,11	195,36	1547946,68	6365479,77	-161,08	49453	71,24	1,000084	✍	12,30	-4,70	-0,46
228,0	-50,08	195,50	1547946,16	6365477,91	-163,38	49431	71,07	1,000144	✍	12,53	-4,81	-0,48
231,0	-50,07	196,17	1547945,64	6365476,06	-165,69	50325	70,82	0,999830	✍	12,76	-4,91	-0,49
234,0	-50,07	195,57	1547945,11	6365474,21	-167,99	49535	71,20	1,000174	✍	12,99	-5,01	-0,50
237,0	-50,04	195,62	1547944,59	6365472,35	-170,29	49643	71,15	1,000190	✍	13,22	-5,12	-0,51
240,0	-50,02	195,08	1547944,08	6365470,49	-172,58	49395	71,30	0,999823	✍	13,45	-5,23	-0,52
243,0	-49,99	195,12	1547943,58	6365468,63	-174,88	49719	71,29	1,000268	✍	13,69	-5,36	-0,53
246,0	-49,98	195,12	1547943,08	6365466,77	-177,18	49422	71,32	1,000342	✍	13,92	-5,48	-0,54
249,0	-49,96	194,92	1547942,58	6365464,91	-179,48	49658	71,62	1,000409	✍	14,15	-5,61	-0,55
252,0	-49,94	195,14	1547942,08	6365463,04	-181,77	49647	71,57	1,000133	✍	14,39	-5,73	-0,57
255,0	-49,91	195,25	1547941,57	6365461,18	-184,07	49525	71,45	0,999962	✍	14,62	-5,86	-0,58
258,0	-49,91	195,60	1547941,06	6365459,31	-186,36	49317	71,40	0,999893	✍	14,86	-5,97	-0,59
261,0	-49,88	195,57	1547940,54	6365457,45	-188,66	49787	71,12	1,000102	✍	15,10	-6,08	-0,60
264,0	-49,87	195,04	1547940,03	6365455,59	-190,95	49449	71,11	0,999914	✍	15,34	-6,20	-0,61
267,0	-49,85	194,85	1547939,53	6365453,72	-193,25	49197	71,12	1,000238	✍	15,58	-6,33	-0,62
270,0	-49,83	195,16	1547939,03	6365451,85	-195,54	49407	71,31	0,999841	✍	15,82	-6,45	-0,64
273,0	-49,81	194,89	1547938,53	6365449,98	-197,83	49502	71,21	1,000009	✍	16,06	-6,58	-0,65
276,0	-49,83	194,88	1547938,03	6365448,11	-200,12	49542	71,21	1,000152	✍	16,30	-6,71	-0,66
279,0	-49,81	194,81	1547937,53	6365446,24	-202,42	49771	71,10	0,999938	✍	16,54	-6,85	-0,67
282,0	-49,79	193,92	1547937,05	6365444,36	-204,71	50188	71,42	1,000163	✍	16,79	-7,00	-0,69
285,0	-49,77	194,45	1547936,58	6365442,49	-207,00	49593	71,29	1,000104	✍	17,03	-7,15	-0,70
288,0	-49,76	195,02	1547936,09	6365440,61	-209,29	49491	71,20	1,000337	✍	17,27	-7,29	-0,72
291,0	-49,77	194,78	1547935,59	6365438,74	-211,58	49522	71,20	0,999877	✍	17,52	-7,42	-0,73
294,0	-49,75	195,05	1547935,09	6365436,87	-213,87	49368	71,28	1,000022	✍	17,76	-7,55	-0,74
297,0	-49,73	195,05	1547934,59	6365434,99	-216,16	49405	71,24	1,000394	✍	18,01	-7,68	-0,75
300,0	-49,73	195,30	1547934,08	6365433,12	-218,45	49466	71,20	1,000108	✍	18,25	-7,80	-0,77
303,0	-49,72	195,12	1547933,57	6365431,25	-220,74	49482	71,34	1,000438	✍	18,50	-7,92	-0,78

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
306,0	-49,74	195,34	1547933,06	6365429,38	-223,02	49482	71,20	1,000303	✍	18,75	-8,04	-0,79
309,0	-49,72	195,00	1547932,55	6365427,51	-225,31	49439	71,22	1,000340	✍	19,00	-8,17	-0,80
312,0	-49,73	194,81	1547932,05	6365425,63	-227,60	49331	71,23	1,000119	✍	19,24	-8,30	-0,82
315,0	-49,76	194,86	1547931,56	6365423,76	-229,89	49490	71,11	1,000285	✍	19,49	-8,43	-0,83
318,0	-49,73	195,45	1547931,05	6365421,89	-232,18	49538	71,05	1,000327	✍	19,73	-8,56	-0,84
321,0	-49,71	195,08	1547930,54	6365420,02	-234,47	49489	71,23	1,000207	✍	19,98	-8,68	-0,86
324,0	-49,71	195,90	1547930,02	6365418,15	-236,76	49609	71,31	1,000558	✍	20,23	-8,79	-0,87
327,0	-49,70	195,12	1547929,50	6365416,28	-239,05	50019	71,17	1,000606	✍	20,48	-8,90	-0,88
330,0	-49,70	195,05	1547929,00	6365414,41	-241,33	49562	71,30	1,000516	✍	20,73	-9,02	-0,89
333,0	-49,69	194,93	1547928,50	6365412,53	-243,62	49627	71,16	1,000496	✍	20,97	-9,15	-0,91
336,0	-49,68	195,02	1547927,99	6365410,66	-245,91	49548	71,21	1,000360	✍	21,22	-9,28	-0,92
339,0	-49,68	195,55	1547927,48	6365408,78	-248,20	49704	71,22	1,000168	✍	21,47	-9,40	-0,93
342,0	-49,66	195,80	1547926,96	6365406,91	-250,48	49902	71,21	1,000085	✍	21,72	-9,51	-0,94
345,0	-49,65	195,63	1547926,43	6365405,04	-252,77	49751	71,21	1,000386	✍	21,97	-9,61	-0,96
348,0	-49,66	195,77	1547925,91	6365403,17	-255,06	50754	71,14	1,000870	✍	22,23	-9,72	-0,97
351,0	-49,64	194,32	1547925,40	6365401,30	-257,34	49552	70,97	1,000765	✍	22,48	-9,84	-0,98
354,0	-49,61	195,46	1547924,90	6365399,42	-259,63	49688	71,01	1,000184	✍	22,73	-9,98	-1,00
357,0	-49,60	195,02	1547924,39	6365397,55	-261,91	49542	71,17	1,000259	✍	22,98	-10,10	-1,01
360,0	-49,59	195,82	1547923,87	6365395,67	-264,20	49876	71,16	1,000047	✍	23,24	-10,21	-1,02
363,0	-49,59	195,34	1547923,35	6365393,80	-266,48	49552	71,16	1,000426	✍	23,49	-10,32	-1,04
366,0	-49,57	195,54	1547922,83	6365391,92	-268,77	49527	71,09	1,000248	✍	23,75	-10,44	-1,05
369,0	-49,57	194,92	1547922,32	6365390,04	-271,05	49410	71,10	1,000333	✍	24,00	-10,56	-1,06
372,0	-49,51	194,95	1547921,82	6365388,16	-273,33	49244	71,23	1,000531	✍	24,26	-10,69	-1,08
375,0	-49,51	195,02	1547921,32	6365386,28	-275,61	49518	71,17	1,000164	✍	24,51	-10,82	-1,09
378,0	-49,52	194,45	1547920,82	6365384,40	-277,90	49896	71,39	1,000732	✍	24,77	-10,96	-1,10
381,0	-49,51	194,55	1547920,34	6365382,51	-280,18	50007	71,39	1,000189	✍	25,03	-11,10	-1,12
384,0	-49,48	195,07	1547919,84	6365380,63	-282,46	49665	71,44	1,000232	✍	25,29	-11,24	-1,13
387,0	-49,46	194,86	1547919,33	6365378,75	-284,74	49564	71,35	1,000470	✍	25,55	-11,37	-1,15
390,0	-49,41	194,70	1547918,84	6365376,86	-287,02	49584	71,18	1,000387	✍	25,81	-11,50	-1,16
393,0	-49,40	194,86	1547918,34	6365374,97	-289,30	49483	71,10	1,000339	✍	26,07	-11,64	-1,18
396,0	-49,38	194,00	1547917,85	6365373,08	-291,57	49235	71,41	1,000454	✍	26,33	-11,79	-1,19
399,0	-49,38	194,41	1547917,37	6365371,19	-293,85	49288	71,41	1,000345	✍	26,60	-11,95	-1,21
402,0	-49,41	194,05	1547916,89	6365369,29	-296,13	49417	71,35	1,000351	✍	26,86	-12,10	-1,22
405,0	-49,38	194,63	1547916,41	6365367,40	-298,41	49610	71,22	1,000750	✍	27,12	-12,25	-1,24

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
408,0	-49,38	194,57	1547915,92	6365365,51	-300,68	49545	71,24	1,000235	✍	27,39	-12,40	-1,25
411,0	-49,37	194,18	1547915,43	6365363,62	-302,96	49425	71,34	1,000402	✍	27,65	-12,55	-1,27
414,0	-49,34	194,39	1547914,95	6365361,73	-305,24	49413	71,21	1,000681	✍	27,91	-12,70	-1,28
417,0	-49,37	194,47	1547914,46	6365359,83	-307,51	49312	71,24	1,000152	✍	28,18	-12,85	-1,30
420,0	-49,35	194,33	1547913,98	6365357,94	-309,79	49267	71,30	1,000543	✍	28,44	-13,00	-1,31
423,0	-49,34	194,20	1547913,49	6365356,05	-312,06	49444	71,34	1,000424	✍	28,71	-13,16	-1,33
426,0	-49,33	193,76	1547913,02	6365354,15	-314,34	49224	71,37	1,000658	✍	28,97	-13,32	-1,35
429,0	-49,29	194,01	1547912,55	6365352,25	-316,61	49199	71,38	1,000538	✍	29,24	-13,49	-1,36
432,0	-49,28	194,38	1547912,07	6365350,35	-318,89	49369	71,29	1,000412	✍	29,51	-13,64	-1,38
435,0	-49,26	194,75	1547911,58	6365348,46	-321,16	49394	71,34	1,000180	✍	29,78	-13,79	-1,39
438,0	-49,24	194,43	1547911,09	6365346,56	-323,43	49350	71,28	1,000396	✍	30,05	-13,93	-1,41
441,0	-49,21	194,27	1547910,60	6365344,67	-325,71	49544	71,19	1,000636	✍	30,32	-14,08	-1,43
444,0	-49,18	194,31	1547910,12	6365342,77	-327,98	49714	71,11	1,000688	✍	30,59	-14,24	-1,44
447,0	-49,17	193,63	1547909,64	6365340,86	-330,25	49240	71,13	1,000478	✍	30,86	-14,40	-1,46
450,0	-49,13	193,63	1547909,18	6365338,96	-332,52	49470	71,11	1,000184	✍	31,14	-14,58	-1,48
453,0	-49,11	193,92	1547908,71	6365337,05	-334,78	49605	70,91	1,000805	✍	31,41	-14,75	-1,50
456,0	-49,11	193,96	1547908,24	6365335,14	-337,05	49608	71,34	1,000182	✍	31,69	-14,92	-1,51
459,0	-49,07	193,90	1547907,77	6365333,24	-339,32	49597	71,07	1,000176	✍	31,97	-15,09	-1,53
462,0	-49,05	194,40	1547907,29	6365331,33	-341,59	50008	71,11	1,000659	✍	32,25	-15,25	-1,55
465,0	-49,05	194,54	1547906,80	6365329,43	-343,85	50205	71,02	1,000141	✍	32,53	-15,39	-1,56
468,0	-49,04	194,20	1547906,31	6365327,52	-346,12	50059	71,13	1,000414	✍	32,81	-15,55	-1,58
471,0	-49,01	194,08	1547905,83	6365325,61	-348,38	49875	71,02	1,000687	✍	33,09	-15,71	-1,60
474,0	-48,99	193,97	1547905,35	6365323,70	-350,65	49848	71,06	1,000719	✍	33,37	-15,87	-1,62
477,0	-48,96	193,83	1547904,88	6365321,79	-352,91	49477	71,18	1,000360	✍	33,66	-16,04	-1,64
480,0	-48,92	194,15	1547904,40	6365319,88	-355,17	49513	71,13	1,000408	✍	33,94	-16,20	-1,65
483,0	-48,94	193,77	1547903,93	6365317,97	-357,43	49501	71,18	1,000678	✍	34,23	-16,37	-1,67
486,0	-48,89	193,93	1547903,45	6365316,05	-359,69	49360	71,38	1,000555	✍	34,51	-16,54	-1,69
489,0	-48,89	193,85	1547902,98	6365314,14	-361,96	49521	71,17	1,000266	✍	34,80	-16,71	-1,71
492,0	-48,85	194,03	1547902,51	6365312,22	-364,21	49645	71,10	1,000248	✍	35,09	-16,87	-1,73
495,0	-48,84	194,18	1547902,02	6365310,31	-366,47	49433	71,06	1,000793	✍	35,38	-17,04	-1,75
498,0	-48,82	193,71	1547901,55	6365308,39	-368,73	49360	71,20	1,000415	✍	35,67	-17,20	-1,76
501,0	-48,80	193,42	1547901,08	6365306,47	-370,99	49392	71,41	1,000489	✍	35,96	-17,38	-1,78
504,0	-48,76	193,75	1547900,62	6365304,55	-373,25	49688	71,61	1,000767	✍	36,26	-17,56	-1,80
507,0	-48,75	193,27	1547900,16	6365302,63	-375,50	49756	71,29	1,000571	✍	36,55	-17,75	-1,82

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
510,0	-48,74	193,81	1547899,70	6365300,70	-377,76	49464	71,21	1,000151	✍	36,85	-17,93	-1,84
513,0	-48,71	194,10	1547899,22	6365298,78	-380,01	49995	71,24	1,000422	✍	37,14	-18,09	-1,86
516,0	-48,71	194,11	1547898,74	6365296,86	-382,27	50402	70,99	1,000215	✍	37,44	-18,26	-1,88
519,0	-48,68	194,53	1547898,25	6365294,94	-384,52	50366	71,32	1,000317	✍	37,74	-18,41	-1,90
522,0	-48,64	193,71	1547897,76	6365293,02	-386,77	49621	71,22	1,000884	✍	38,04	-18,57	-1,92
525,0	-48,62	193,35	1547897,30	6365291,10	-389,02	49520	71,24	1,000521	✍	38,34	-18,76	-1,94
528,0	-48,61	193,37	1547896,84	6365289,17	-391,27	49424	71,35	1,000564	✍	38,64	-18,94	-1,96
531,0	-48,64	193,53	1547896,38	6365287,24	-393,52	49847	71,25	1,000457	✍	38,94	-19,13	-1,98
534,0	-48,66	193,15	1547895,92	6365285,31	-395,78	49667	71,32	1,000912	✍	39,24	-19,32	-2,00
537,0	-48,65	193,71	1547895,46	6365283,38	-398,03	49728	71,40	1,000632	✍	39,54	-19,50	-2,03
540,0	-48,63	193,41	1547895,00	6365281,45	-400,28	49585	71,30	1,000417	✍	39,84	-19,68	-2,05
543,0	-48,62	193,39	1547894,54	6365279,52	-402,53	49472	71,28	1,000726	✍	40,14	-19,87	-2,07
546,0	-48,61	193,24	1547894,08	6365277,59	-404,78	49297	71,31	1,000736	✍	40,44	-20,06	-2,09
549,0	-48,57	192,91	1547893,63	6365275,66	-407,03	49148	71,45	1,000653	✍	40,74	-20,26	-2,11
552,0	-48,54	192,89	1547893,19	6365273,73	-409,28	49328	71,39	1,000779	✍	41,04	-20,46	-2,13
555,0	-48,52	193,07	1547892,74	6365271,79	-411,53	49443	71,24	1,000813	✍	41,35	-20,66	-2,15
558,0	-48,49	192,98	1547892,29	6365269,85	-413,78	49411	71,26	1,000699	✍	41,65	-20,86	-2,18
561,0	-48,48	192,69	1547891,85	6365267,91	-416,02	49485	71,33	1,000612	✍	41,96	-21,07	-2,20
564,0	-48,48	192,70	1547891,41	6365265,97	-418,27	49443	71,29	1,000626	✍	42,26	-21,28	-2,22
567,0	-48,45	192,74	1547890,98	6365264,03	-420,51	49444	71,25	1,000607	✍	42,57	-21,49	-2,25
570,0	-48,45	193,51	1547890,53	6365262,10	-422,76	50279	71,13	1,000962	✍	42,88	-21,69	-2,27
573,0	-48,43	192,97	1547890,07	6365260,16	-425,00	49592	71,10	1,000993	✍	43,19	-21,88	-2,29
576,0	-48,40	193,29	1547889,62	6365258,22	-427,25	50299	71,19	1,000745	✍	43,50	-22,08	-2,31
579,0	-48,38	193,21	1547889,16	6365256,28	-429,49	49466	71,27	1,000505	✍	43,81	-22,27	-2,34
582,0	-48,36	193,24	1547888,70	6365254,34	-431,73	49620	71,20	1,000330	✍	44,13	-22,46	-2,36
585,0	-48,31	192,86	1547888,25	6365252,40	-433,97	49536	71,27	1,000553	✍	44,44	-22,66	-2,38
588,0	-48,29	192,89	1547887,81	6365250,45	-436,21	49241	71,43	1,000748	✍	44,76	-22,87	-2,41
591,0	-48,27	193,17	1547887,36	6365248,51	-438,45	49424	71,28	1,000834	✍	45,07	-23,07	-2,43
594,0	-48,24	192,85	1547886,91	6365246,56	-440,69	49375	71,22	1,000891	✍	45,39	-23,27	-2,45
597,0	-48,24	192,80	1547886,47	6365244,61	-442,93	49315	71,29	1,000478	✍	45,71	-23,48	-2,48
600,0	-48,23	192,86	1547886,02	6365242,66	-445,17	49443	71,31	1,001007	✍	46,03	-23,69	-2,50
603,0	-48,20	193,14	1547885,57	6365240,72	-447,40	49320	71,27	1,001297	✍	46,35	-23,89	-2,52
606,0	-48,21	193,54	1547885,11	6365238,77	-449,64	49672	71,00	1,000878	✍	46,67	-24,08	-2,55
609,0	-48,20	193,81	1547884,64	6365236,83	-451,88	49628	71,07	1,000713	✍	46,99	-24,26	-2,57

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
612,0	-48,20	192,52	1547884,18	6365234,88	-454,11	49286	71,35	1,000450	✍	47,32	-24,46	-2,59
615,0	-48,18	193,59	1547883,73	6365232,93	-456,35	49771	70,75	1,000575	✍	47,64	-24,66	-2,62
618,0	-48,19	193,99	1547883,25	6365230,99	-458,59	49591	70,87	1,000788	✍	47,96	-24,83	-2,64
621,0	-48,18	193,56	1547882,78	6365229,05	-460,82	49540	71,03	1,000837	✍	48,29	-25,01	-2,66
624,0	-48,16	193,33	1547882,31	6365227,10	-463,06	49423	71,17	1,000990	✍	48,61	-25,19	-2,69
627,0	-48,13	193,32	1547881,85	6365225,15	-465,29	49407	71,41	1,000857	✍	48,94	-25,38	-2,71
630,0	-48,18	193,93	1547881,38	6365223,21	-467,53	49578	71,16	1,000572	✍	49,26	-25,56	-2,73
633,0	-48,12	194,42	1547880,89	6365221,27	-469,76	49500	71,08	1,000685	✍	49,59	-25,73	-2,76
636,0	-48,11	193,50	1547880,41	6365219,32	-471,99	49705	71,01	1,000526	✍	49,92	-25,89	-2,78
639,0	-48,07	193,89	1547879,93	6365217,38	-474,23	49660	71,07	1,000772	✍	50,25	-26,07	-2,80
642,0	-48,08	193,37	1547879,46	6365215,43	-476,46	49733	71,03	1,001068	✍	50,58	-26,25	-2,83
645,0	-48,08	193,09	1547879,00	6365213,48	-478,69	49572	70,98	1,000515	✍	50,90	-26,45	-2,85
648,0	-48,10	192,56	1547878,56	6365211,52	-480,92	49278	71,39	1,000615	✍	51,23	-26,66	-2,88
651,0	-48,09	191,58	1547878,14	6365209,57	-483,16	48700	71,21	1,000443	✍	51,55	-26,89	-2,90
654,0	-48,07	192,98	1547877,71	6365207,61	-485,39	49287	71,29	1,001057	✍	51,88	-27,12	-2,93
657,0	-48,07	192,10	1547877,28	6365205,65	-487,62	48912	71,34	1,000817	✍	52,21	-27,34	-2,96
660,0	-48,07	191,79	1547876,86	6365203,69	-489,85	48992	70,91	1,000626	✍	52,53	-27,58	-2,98
663,0	-48,04	192,29	1547876,44	6365201,73	-492,08	50128	71,25	1,000583	✍	52,86	-27,81	-3,01
666,0	-48,05	196,72	1547875,94	6365199,79	-494,32	45770	69,48	1,000874	✍✍	53,19	-27,96	-3,03
669,0	-48,03	192,97	1547875,43	6365197,85	-496,55	49328	71,26	1,000563	✍	53,52	-28,10	-3,05
672,0	-48,03	193,16	1547874,97	6365195,89	-498,78	49383	71,28	1,000580	✍	53,85	-28,30	-3,08
675,0	-48,00	194,28	1547874,50	6365193,94	-501,01	49896	71,14	1,000818	✍	54,18	-28,48	-3,10
678,0	-47,96	194,45	1547874,00	6365192,00	-503,24	49668	71,06	1,000874	✍	54,52	-28,63	-3,13
681,0	-47,95	194,63	1547873,50	6365190,05	-505,46	50052	70,96	1,000524	✍	54,86	-28,78	-3,15
684,0	-47,94	192,50	1547873,02	6365188,10	-507,69	49503	70,96	1,000330	✍	55,19	-28,97	-3,17
687,0	-47,92	194,15	1547872,56	6365186,15	-509,92	49777	70,98	1,001045	✍	55,53	-29,16	-3,20
690,0	-47,91	194,17	1547872,07	6365184,20	-512,14	49875	70,82	1,000990	✍	55,87	-29,32	-3,22
693,0	-47,88	193,49	1547871,59	6365182,24	-514,37	49939	71,10	1,001069	✍	56,21	-29,50	-3,25
696,0	-47,88	193,30	1547871,12	6365180,29	-516,60	49658	71,01	1,000837	✍	56,55	-29,69	-3,27
699,0	-47,83	193,55	1547870,65	6365178,33	-518,82	49815	71,04	1,001017	✍	56,89	-29,87	-3,30
702,0	-47,79	193,81	1547870,18	6365176,37	-521,04	49856	71,12	1,000900	✍	57,23	-30,05	-3,32
705,0	-47,77	193,90	1547869,70	6365174,41	-523,26	49742	71,16	1,000818	✍	57,58	-30,23	-3,35
708,0	-47,81	193,88	1547869,21	6365172,46	-525,49	49692	71,20	1,000971	✍	57,92	-30,40	-3,37
711,0	-47,73	193,59	1547868,73	6365170,50	-527,71	49687	71,21	1,000890	✍	58,27	-30,58	-3,40

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
714,0	-47,68	193,67	1547868,26	6365168,53	-529,93	49699	71,21	1,000751	✍	58,62	-30,76	-3,42
717,0	-47,65	193,78	1547867,78	6365166,57	-532,14	49695	71,20	1,000676	✍	58,97	-30,94	-3,45
720,0	-47,61	193,74	1547867,30	6365164,61	-534,36	49708	71,23	1,000299	✍	59,32	-31,12	-3,48
723,0	-47,58	193,88	1547866,81	6365162,64	-536,58	49735	71,20	1,000692	✍	59,68	-31,29	-3,50
726,0	-47,53	193,67	1547866,33	6365160,68	-538,79	49706	71,23	1,000759	✍	60,03	-31,47	-3,53
729,0	-47,50	193,64	1547865,85	6365158,71	-541,00	49708	71,27	1,000627	✍	60,39	-31,65	-3,56
732,0	-47,51	193,57	1547865,38	6365156,74	-543,21	49705	71,22	1,000708	✍	60,75	-31,83	-3,58
735,0	-47,48	193,27	1547864,91	6365154,77	-545,43	49679	71,19	1,000831	✍	61,11	-32,02	-3,61
738,0	-47,46	193,52	1547864,44	6365152,79	-547,64	49726	71,19	1,000668	✍	61,47	-32,22	-3,64
741,0	-47,43	192,94	1547863,97	6365150,82	-549,85	49703	71,17	1,000737	✍	61,83	-32,41	-3,67
744,0	-47,41	192,44	1547863,53	6365148,84	-552,06	49676	71,13	1,000645	✍	62,19	-32,63	-3,70
747,0	-47,37	192,95	1547863,08	6365146,86	-554,26	49869	71,14	1,000895	✍	62,55	-32,84	-3,73
750,0	-47,35	192,91	1547862,62	6365144,88	-556,47	49467	71,32	1,000910	✍	62,92	-33,05	-3,76
753,0	-47,31	192,50	1547862,18	6365142,89	-558,68	49313	71,22	1,000806	✍	63,28	-33,27	-3,79
756,0	-47,30	192,69	1547861,73	6365140,91	-560,88	49113	71,37	1,001074	✍	63,65	-33,49	-3,82
759,0	-47,29	192,22	1547861,30	6365138,92	-563,08	49262	71,12	1,000804	✍	64,02	-33,71	-3,85
762,0	-47,25	192,78	1547860,85	6365136,93	-565,29	49575	71,20	1,000633	✍	64,39	-33,94	-3,88
765,0	-47,24	192,43	1547860,41	6365134,95	-567,49	49347	71,11	1,000867	✍	64,76	-34,16	-3,91
768,0	-47,23	192,17	1547859,98	6365132,96	-569,69	49042	71,37	1,000953	✍	65,12	-34,39	-3,94
771,0	-47,23	193,46	1547859,52	6365130,97	-571,90	50534	71,53	1,000846	✍	65,50	-34,60	-3,97
774,0	-47,22	193,09	1547859,06	6365128,99	-574,10	49808	71,04	1,000942	✍	65,87	-34,80	-4,00
777,0	-47,19	192,38	1547858,61	6365127,00	-576,30	49702	71,19	1,000952	✍	66,24	-35,01	-4,03
780,0	-47,21	192,25	1547858,17	6365125,01	-578,50	49351	71,41	1,001055	✍	66,61	-35,24	-4,06
783,0	-47,20	191,66	1547857,75	6365123,01	-580,70	49462	71,29	1,000535	✍	66,98	-35,48	-4,10
786,0	-47,19	192,37	1547857,33	6365121,02	-582,90	49260	71,42	1,000685	✍	67,35	-35,72	-4,13
789,0	-47,17	192,78	1547856,88	6365119,03	-585,10	49400	71,30	1,000885	✍	67,72	-35,95	-4,16
792,0	-47,14	192,27	1547856,44	6365117,04	-587,30	49471	71,19	1,000980	✍	68,10	-36,17	-4,19
795,0	-47,12	192,63	1547856,00	6365115,04	-589,50	49640	70,99	1,001088	✍	68,47	-36,39	-4,23
798,0	-47,09	192,39	1547855,56	6365113,05	-591,70	49418	71,09	1,000926	✍	68,85	-36,62	-4,26
801,0	-47,09	192,18	1547855,12	6365111,06	-593,90	49120	71,39	1,001167	✍	69,22	-36,85	-4,29
804,0	-47,05	191,16	1547854,71	6365109,05	-596,09	49267	71,31	1,000669	✍	69,60	-37,10	-4,32
807,0	-47,01	191,91	1547854,30	6365107,05	-598,29	49013	71,28	1,000816	✍	69,98	-37,36	-4,36
810,0	-46,97	192,51	1547853,87	6365105,05	-600,48	49170	71,11	1,000562	✍	70,36	-37,60	-4,39
813,0	-46,97	192,07	1547853,43	6365103,05	-602,68	49283	71,15	1,001162	✍	70,74	-37,83	-4,43

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

Printed on 2007-05-31 15:15:23

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
816,0	-46,94	191,76	1547853,01	6365101,05	-604,87	49523	71,34	1,000822	✍	71,12	-38,07	-4,46
819,0	-46,91	192,54	1547852,58	6365099,04	-607,06	49530	71,26	1,000978	✍	71,51	-38,31	-4,50
822,0	-46,89	192,74	1547852,13	6365097,04	-609,25	49490	71,18	1,000745	✍	71,90	-38,53	-4,53
825,0	-46,87	192,44	1547851,68	6365095,04	-611,44	49329	71,28	1,000881	✍	72,28	-38,75	-4,56
828,0	-46,84	191,83	1547851,25	6365093,04	-613,63	49141	71,32	1,001012	✍	72,67	-38,99	-4,60
831,0	-46,83	192,33	1547850,82	6365091,03	-615,82	49269	71,13	1,000866	✍	73,06	-39,23	-4,63
834,0	-46,81	192,64	1547850,38	6365089,03	-618,00	49704	71,14	1,000371	✍	73,45	-39,46	-4,67
837,0	-46,78	192,75	1547849,93	6365087,02	-620,19	49683	71,07	1,001092	✍	73,85	-39,68	-4,70
840,0	-46,77	192,22	1547849,48	6365085,02	-622,38	49668	71,12	1,000912	✍	74,24	-39,90	-4,73
843,0	-46,74	192,07	1547849,05	6365083,01	-624,56	49846	71,06	1,000860	✍	74,63	-40,14	-4,77
846,0	-46,73	192,27	1547848,62	6365081,00	-626,75	49799	71,02	1,000970	✍	75,03	-40,38	-4,81
849,0	-46,70	191,74	1547848,19	6365078,99	-628,93	49724	71,02	1,001308	✍	75,42	-40,62	-4,84
852,0	-46,69	191,22	1547847,78	6365076,97	-631,11	49768	70,94	1,001073	✍	75,82	-40,88	-4,88
855,0	-46,68	191,16	1547847,38	6365074,95	-633,30	49719	71,00	1,000997	✍	76,21	-41,16	-4,92
858,0	-46,69	191,49	1547846,98	6365072,93	-635,48	49625	71,08	1,000975	✍	76,61	-41,42	-4,96
861,0	-46,67	191,25	1547846,57	6365070,91	-637,66	49575	71,06	1,000999	✍	77,00	-41,69	-4,99
864,0	-46,68	191,24	1547846,17	6365068,89	-639,84	49561	71,12	1,000959	✍	77,39	-41,96	-5,03
867,0	-46,67	191,32	1547845,77	6365066,88	-642,03	49452	71,14	1,000915	✍	77,79	-42,23	-5,07
870,0	-46,66	191,07	1547845,37	6365064,86	-644,21	49414	71,13	1,000892	✍	78,18	-42,50	-5,11
873,0	-46,63	191,08	1547844,97	6365062,84	-646,39	49629	71,14	1,000854	✍	78,58	-42,78	-5,15
876,0	-46,63	191,25	1547844,57	6365060,81	-648,57	49732	71,33	1,000760	✍	78,97	-43,05	-5,19
879,0	-46,62	192,08	1547844,15	6365058,80	-650,75	49879	71,09	1,000771	✍	79,37	-43,31	-5,23
882,0	-46,62	191,28	1547843,74	6365056,78	-652,93	49711	70,95	1,000760	✍	79,77	-43,56	-5,26
885,0	-46,63	191,37	1547843,33	6365054,76	-655,11	49778	70,92	1,000823	✍	80,17	-43,83	-5,30
888,0	-46,62	191,59	1547842,92	6365052,74	-657,29	49678	71,07	1,000996	✍	80,57	-44,09	-5,34
891,0	-46,62	190,95	1547842,52	6365050,72	-659,47	49677	70,94	1,001499	✍	80,96	-44,36	-5,38
894,0	-46,67	191,19	1547842,13	6365048,70	-661,66	49707	70,94	1,001104	✍	81,36	-44,64	-5,42
897,0	-46,66	190,80	1547841,73	6365046,68	-663,84	49345	70,99	1,000814	✍	81,75	-44,92	-5,46
900,0	-46,65	191,03	1547841,34	6365044,65	-666,02	49214	71,04	1,001118	✍	82,15	-45,20	-5,50
903,0	-46,66	191,53	1547840,94	6365042,64	-668,20	49195	71,05	1,001112	✍	82,54	-45,47	-5,53
906,0	-46,68	191,14	1547840,54	6365040,62	-670,38	49614	70,89	1,001137	✍	82,94	-45,74	-5,57
909,0	-46,73	191,28	1547840,14	6365038,60	-672,57	49818	70,88	1,000984	✍	83,33	-46,01	-5,61
912,0	-46,73	191,64	1547839,73	6365036,58	-674,75	49410	71,04	1,001021	✍	83,72	-46,28	-5,65
915,0	-46,72	192,67	1547839,29	6365034,57	-676,94	49766	70,69	1,001246	✍	84,12	-46,51	-5,68

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX15A

Survey date : 01/04/2007 10:35:51

Printed on 2007-05-31 15:15:24

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
918,0	-46,68	191,06	1547838,87	6365032,56	-679,12	49370	71,08	1,000822	✍	84,51	-46,76	-5,72
921,0	-46,65	190,44	1547838,49	6365030,54	-681,30	48907	71,39	1,000992	✍	84,90	-47,05	-5,76
924,0	-46,64	189,58	1547838,13	6365028,51	-683,48	48753	71,57	1,000940	✍	85,30	-47,36	-5,80
927,0	-46,63	190,19	1547837,77	6365026,48	-685,66	49100	71,35	1,000709	✍	85,69	-47,68	-5,84
930,0	-46,64	189,47	1547837,42	6365024,45	-687,84	49356	71,37	1,001111	✍	86,08	-48,00	-5,89
933,0	-47,45	190,15	1547837,08	6365022,44	-690,04	49548	70,35	1,016549	✍	86,45	-48,32	-5,93
936,0	-46,59	190,35	1547836,71	6365020,42	-692,23	49202	71,35	1,001274	✍	86,82	-48,63	-5,97
939,0	-46,58	189,37	1547836,36	6365018,39	-694,41	49333	71,27	1,000926	✍	87,21	-48,95	-6,01
942,0	-46,57	190,41	1547836,00	6365016,36	-696,59	49557	71,21	1,001127	✍	87,61	-49,27	-6,05
945,0	-46,59	189,84	1547835,64	6365014,33	-698,77	49599	71,09	1,000976	✍	88,00	-49,58	-6,10
948,0	-46,55	191,14	1547835,27	6365012,30	-700,95	49756	71,23	1,001026	✍	88,40	-49,88	-6,14
951,0	-46,53	190,76	1547834,87	6365010,28	-703,13	49583	71,16	1,001062	✍	88,80	-50,16	-6,18
954,0	-46,54	191,20	1547834,48	6365008,25	-705,30	49612	70,78	1,000985	✍	89,20	-50,44	-6,22
957,0	-46,52	190,41	1547834,09	6365006,22	-707,48	49481	71,26	1,000927	✍	89,60	-50,73	-6,26
960,0	-46,54	191,41	1547833,70	6365004,20	-709,66	49723	71,43	1,000917	✍	90,00	-51,01	-6,30
963,0	-46,56	190,08	1547833,32	6365002,17	-711,84	49293	71,34	1,001040	✍	90,40	-51,30	-6,34
966,0	-46,57	190,88	1547832,94	6365000,14	-714,02	49555	70,72	1,001161	✍	90,79	-51,60	-6,38
969,0	-46,57	189,87	1547832,57	6364998,11	-716,19	49464	71,36	1,000887	✍	91,19	-51,90	-6,42
972,0	-46,57	189,74	1547832,22	6364996,08	-718,37	49102	71,33	1,000939	✍	91,58	-52,22	-6,47
975,0	-46,60	189,89	1547831,87	6364994,05	-720,55	49510	71,34	1,001189	✍	91,98	-52,54	-6,51
978,0	-46,60	190,81	1547831,50	6364992,02	-722,73	49630	71,10	1,001028	✍	92,37	-52,85	-6,55