

Oskarshamn site investigation

Boremap mapping of core drilled MDZ boreholes KLX09G, KLX10B and KLX10C

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December 2007

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This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

Data in SKB's database can be changed for different reasons. Minor changes in SKB's database will not necessarily result in a revised report. Data revisions may also be presented as supplements, available at www.skb.se.

A pdf version of this document can be downloaded from www.skb.se.

Abstract

The purpose of the MDZ (KLX09G, KLX10B and KLX10C) core drilled boreholes is to obtain enhanced knowledge and understanding for the assessment of hydraulic patterns and physical properties as well as the properties and need of injection, by compiling the relation of existing structures to lithology, orientation, geophysical character, rock stress, ground-water conditions and tectonics in the area of interest.

The lithology in all boreholes is dominated by Ävrö granite (501044). Subordinate rock types are: fine-grained diorite-gabbro (505102) and fine-grained granite (511058) in KLX09G; fine-grained granite (511058) in KLX10B; and fine-grained dioritoid (501030) and fine-grained diorite-gabbro (505102) in KLX10C. Mylonites of varying intensity are present in KLX09G. Structures indicating displacement such as cataclasites, breccias, brittle-ductile shear-zones and ductile shear-zones occur frequently in KLX10C.

Sammanfattning

Målsättningen med MDZ kärnborrhålen (KLX09G, KLX10B and KLX10C) är att erhålla ökad kunskap och förståelse för bedömning av det aktuella områdets hydrauliska mönster, fysikaliska egenskaper och behov av injektering genom att sammanställa befintliga strukturers koppling till litologi, orientering, geofysisk karaktär, bergspänning, grundvattenförhållanden och tektonik.

Litologin i samtliga borrhål domineras av Ävrö granit (501044). Underordnade bergarter är: finkornig diorit-gabbro (505102) och finkornig granit (511058) i KLX09G; finkornig granit (511058) i KLX10B; och finkornig dioritoid (501030) och finkornig diorit-gabbro (505102) i KLX10C. Mylonit av varierande intensitet påträffas i KLX09G. Andra strukturer som indikerar rörelser så som kataklasiter, breccior, spröda till plastiska deformationszoner och plastiska skjuvzoner förekommer frekvent i KLX10C.

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1 Introduction

This report comprises the MDZ-boreholes (MDZ = Minor Deformation Zone) and consists of the following three boreholes: KLX09G, KLX10B and KLX10C.

The MDZ-boreholes are situated within the Laxemar area (Figure 1-1). Mapping of the drill cores was performed between 2006-04-03 and 2006-04-27. Table 1-1 shows the orientation of the boreholes.

Table 1-1. Orientation of the MDZ boreholes.

Borehole	Bearing (°)	Inclination (°)	Length (m)
KLX09G	086.4	-61.1	~ 100
KLX10B	167.8	-60.0	~ 50
KLX10C	349.9	-60.3	~ 145

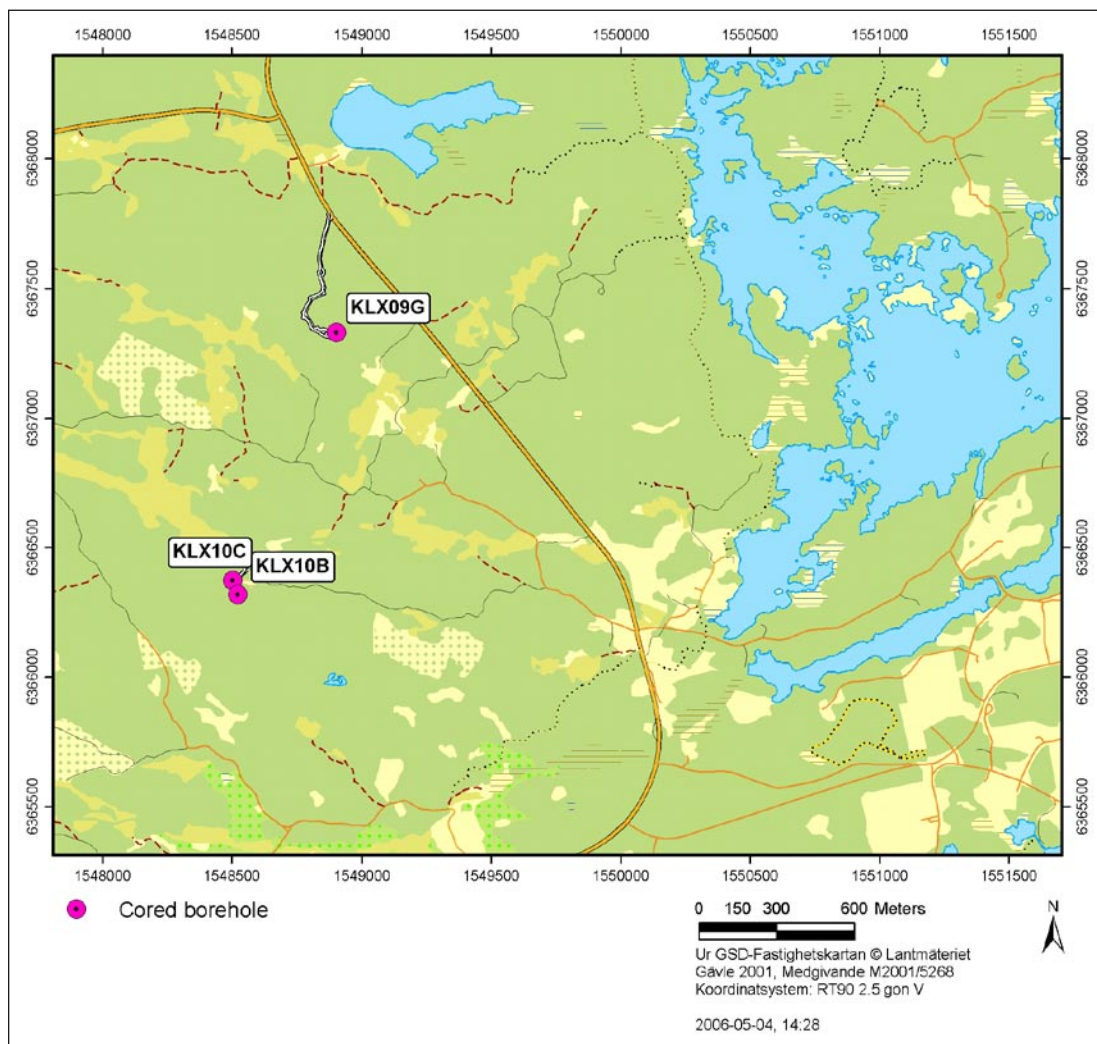


Figure 1-1. Location of the core drilled MDZ boreholes.

Detailed mapping of the drill core is essential for a three dimensional modelling of the geology at depth. The mapping is based on the use of BIPS-image (Borehole Image Processing System) of the borehole wall and by the study of the drill core itself. The BIPS-image enables the study of orientations, since the Boremap software calculates strike and dip of planar features such as foliations, rock contacts and fractures.

The work was carried out in accordance with activity plan AP PS 400-06-046. In Table 1-2 controlling documents for performing this activity are listed. Both Activity plan and Method descriptions are SKB's internal controlling documents. Rock type nomenclature that has been used is shown in Table 1-3.

The term *oxidation* has been used as an alteration type until the mapping of KLX05. However, research has shown that the red colour of the bedrock is actually not only a result of oxidation. Since April 2005 the term *red staining* is used instead of the term *oxidation*.

Table 1-2. Controlling documents for the performance of the activity.

Activity plan	Number	Version
Boremapkartering av KLX09G, KLX10B och KLX10C	AP PS 400-06-046	1.0
Method descriptions	Number	Version
Nomenklatur vid Boremapkartering	SKB MD 143.008	1.0
Method Description for Boremap mapping	SKB MD 143.006	2.0
Mätsystembeskrivning för Boremap	SKB MD 146.005	1.0
Instruktion: Regler för bergarters benämningar vid platsundersökningen i Oskarshamn	SKB MD 132.004	1.0
Instruktion för längdkalibrering vid undersökningar i kärnbråhå	SKB MD 620.010	2.0

Table 1-3. Rock type nomenclature for the site investigation at Oskarshamn.

Rock type	Rock code	Rock description
Dolerite	501027	Dolerite
Fine-grained Götemar granite	531058	Granite, fine-to medium-grained, ("Götemar granite")
Coarse-grained Götemar granite	521058	Granite, coarse-grained, ("Götemar granite")
Fine-grained granite	511058	Granite, fine-to medium-grained
Pegmatite	501061	Pegmatite
Granite	501058	Granite, medium- to coarse-grained
Ävrö granite	501044	Granite to quartz monzodiorite, generally porphyritic
Quartz monzodiorite	501036	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic
Diorite/gabbro	501033	Diorite to gabbro
Fine-grained dioritoid	501030	Intermediate magmatic rock
Fine-grained diorite-gabbro	505102	Mafic rock, fine-grained
Sulphide mineralization	509010	Sulphide mineralization
Sandstone	506007	Sandstone

2 Objective and scope

The core drilled boreholes KLX09G, KLX10B and KLX10C are drilled within the Minor Deformation Zone program (MDZ).

The purpose of the MDZ program is to obtain enhanced knowledge and understanding for the assessment of hydraulic patterns, physical properties and the need of injection by compiling the relation of existing structures to lithology, orientation, geophysical character, rock stress, ground-water conditions and tectonics in the area of interest.

3 Equipment

3.1 Description of software

Software used for the mapping was Boremap v. 3.7, with bedrock and mineral standards of SKB. The data presentation was made using WellCad v. 4, Microsoft Access and Microsoft Excel. Boremap is the software that unites orthodox core mapping with modern video mapping, where Boremap shows the image from BIPS (Borehole Image Processing System) and extracts the geometrical parameters: length, width, strike and dip from the image.

3.2 Other equipment

The following equipment is used to facilitate the core mapping: folding rule and pen, diluted hydrochloric acid, knife, water-filled atomiser and hand lens.

3.3 BIPS-image sequences

Table 3-1. BIPS-image length.

Borehole	Length (m)
KLX09G	9.30–99.55
KLX10B	9.00–50.00
KLX10C	9.00–145.45

3.4 BIPS-image: resolution, contrast and quality

The visibility of thin fractures in BIPS depends on image resolution, image contrast and image quality. Resolution of the BIPS-image is perhaps the principal reason why very thin fractures as well as very thin apertures are not visible in the BIPS-image and the resolution depends on the BIPS video camera pixel size and illumination angle.

Thick fractures are always visible in both drill core and the BIPS-image. However, the visibility of thin fractures depends strongly on the contrast between the fracture and the wall rock. A bright fracture in a dark rock is clearly visible in the BIPS-image. But a bright coloured fracture in a light coloured rock might, however, be clearly visible in the drill core but not visible in the BIPS-image, especially if the fracture and wall rock have the same colour. The opposite is true for dark fractures.

In very rare cases when the BIPS-image contrast between a very thin fracture and the wall rock is very strong the fracture might be visible in the BIPS-image even if it is not visible in the drill core.

BIPS-image quality is sometimes limited due to:

- 1) blackish coatings probably related to the drilling equipment,
- 2) vertical bleached bands from the clayey mixture of drill cuttings and water,
- 3) light and dark bands at high angle to the drill hole related to the automatic aperture of the video camera,
- 4) vertical enlargements of pixels due to stick-slip movement of the camera probe.

Vertical bleached bands and blackish coatings are usually the main disturbances in the BIPS-image quality.

The image quality is classified into four levels; good, acceptable, bad and very bad. With good quality it means a more or less clear image which is easy to interpret. If the quality is acceptable means that the image is not good, but the mapping can be performed without any problems. An image of bad quality is somewhat difficult to interpret while an image of very bad quality cannot be interpreted except from very obvious and outstanding features. It should be remembered that even if only 10–20% of the image is visible, this is often enough for an acceptable interpretation. When the BIPS-image quality is so bad that fractures and structures cannot be identified they can still be oriented using the *guide-line method* (Section 4.3.3). The BIPS-image quality for the MDZ boreholes is presented in Table 3-2.

Table 3-2. BIPS-image quality.

Borehole	Interval (m)	Quality
KLX09G	0–9.30	No image
	9.30–99.55	Acceptable
KLX10B	0–9.00	No image
	9.00–50.00	Acceptable
KLX10C	0–9.00	No image
	9.00–21.60	Good
	21.60–145.45	Acceptable

4 Execution

4.1 General

Mapping of the drill cores of the boreholes was performed and documented according to Activity plan AP PS 400-06-046 (SKB, internal document) referring to the *Method Description for Boremap mapping* (SKB MD 143.006, v. 2.0), *Nomenklatur vid Boremapkartering* (SKB MD 143.008, v. 1.0), *Instruktion: Regler för bergarters benämningar vid platsundersökningen i Oskarshamn* (SKB MD 132.004, v. 1.0) and *Instruktion för längdkalibrering vid undersökningar i kärnbrorrhål* (SKB MD 620.010, v. 2.0), all of them SKB internal documents.

The drill cores were displayed on inclined roller tables and mapped in its entire length with the Boremap software. The core mapping was carried out without any detailed geological knowledge of the area but with access to geophysical logs from the borehole and rock samples.

The mapping was performed by Karl-Johan Mattsson and Stefan Eklund (Geosigma AB).

4.2 Preparations

Any depth registered in the BIPS-image deviates from the true depth in the borehole, a deviation which increases with depth, about 0.5 m/100 m. This problem is usually eliminated by adjusting the depth of the BIPS-image to reference slots cut into the borehole walls every fiftieth meter, but the MDZ boreholes lack these reference marks.

Necessary data adjustment is borehole diameter, reference marks, length and deviation; both collected from SICADA database (Appendices 6 and 7). The Boremap software uses all the data extracted from SICADA database to calculate the true orientations of the different observations.

4.3 Execution of measurements

Concepts used during the core mapping, are defined in this chapter.

4.3.1 Fracture definitions

Definitions of different fracture types and aperture crush zones and sealed fracture network are found in *Nomenklatur vid Boremapkartering* (SKB MD 143.008, v. 1.0), SKB internal document. Apertures for broken fractures have been mapped in accordance with the definitions in MD 143.008 v. 1.0.

Two types of fractures are mapped in Boremap; broken and unbroken. Broken are fractures that split the core while unbroken fractures do not split the core. All fractures are described with their fracture minerals and other characteristics, e.g. width, aperture and roughness. Visible apertures are measured down to 1 mm in the BIPS-image. Smaller apertures, which are impossible to detect in the BIPS-image, are denoted a value of 0.5 mm. If the core pieces don't fit well, the aperture is considered "probable". If the core pieces do fit well, but the fracture surfaces are dull or altered, the aperture is considered "possible".

All fractures with apertures > 0 mm are treated as open in the SICADA database. Only few broken fractures are given the aperture = 0 mm. Unbroken fractures usually have apertures = 0 mm. Unbroken fractures that have apertures > 0 mm are interpreted as partly open and are included in the open-category. Open and sealed fractures are finally frequency calculated and shown in Appendix 1.

4.3.2 Fracture alteration and joint alteration number

Joint alteration number is principally related to the thickness of, and the clay content in a fracture. Thick fractures rich in clay minerals are given joint alteration numbers between 2 and 3. The majority of the broken fractures are very thin to extremely thin and seldom contain clay minerals. These fractures receive joint alteration numbers between 1 and 2.

A subdivision of fractures with joint alteration numbers between 1 and 2 was introduced to facilitate both the evaluation process for fracture alterations and the possibility to compare the alterations between different fractures in the boreholes. The subdivision is based on fracture mineralogy as follows:

- a) fracture wall alterations,
- b) fracture mineral fillings assumed to have been deposited from circulating water-rich solutions,
- c) fracture mineral fillings most likely resulting from altered wall rock material.

Joint alteration number equal to 1: Fractures with or without wall rock alteration, e.g. oxidation or epidotization, and without mineral fillings is considered as fresh. The joint alteration number is thus set to 1.

Minerals such as calcite, quartz, fluorite, zeolites, laumontite and sulphides are regarded as deposited by circulating water-rich solutions and not as true fracture alteration minerals. The joint alteration number is thus set to 1.

Joint alteration number equal to 1.5: Epidote, prehnite, hematite, chlorite and/or clay minerals are regarded as fracture minerals most likely resulting from altered wall rock. A weak alteration is thus assumed and the joint alteration number was set to 1.5. Extra considerations have been given to clay minerals since the occurrence of these minerals often resulted in a higher joint alteration number.

Joint alteration numbers higher than 1.5: When the mineral fillings is thick and contain a few mm of clay minerals, often together with epidote and chlorite, the joint alteration number is set to 2. In rare cases, when a fracture contains 5–10 mm thick clay, together with chlorite, the joint alteration number is set to 3.

When the alteration of a fracture is too thick (and/or intense) to give the fracture the joint alteration number 1.5 and too thin and/or weak to give it a 2, 1.7 and 1.8 is used.

4.3.3 Mapping of fractures not visible in the BIPS-image

Not all fractures are visible in the BIPS-images, and these fractures are orientated by using the *guide-line method*, based on the following data:

- Amplitude (measured along the drill core) which is the interval between fracture extremes along the drill core.
- The relation between the orientations of the fracture trace, measured on the drill core and a well defined structure visible in the BIPS-image.
- Absolute depth.

Orientation of fractures and other structures with the *guide-line method* is done in the following way: The first step is to calculate the amplitude of the fracture trace in the BIPS-image (with 76 mm diameter) from the measured fracture amplitude in the drill core (with 50 mm diameter). The second step is the correction of strike and dip. This is done by rotating the fracture trace in the BIPS-image relative to a feature with known orientation. The fracture trace is then put at the correct depth according to the depth measured on the drill core.

The *guide-line method* can be used to orientate any feature that is not visible in the BIPS-image. It is also a valuable tool to control that the personnel working with the drill core is observing the same feature as the personnel delineating the trace in the BIPS-image, especially in intervals rich in fractures.

The error of orientating fractures using the *guide-line method* is not known but experience and an estimation using stereographic plots indicated that the error is most likely insignificant. Accordingly, the *guide-line method* is so far considered better than mapping lots of non-oriented fractures. The fractures in question are mapped as “non-visible in BIPS” and can therefore be separated from fractures visible in BIPS which probably have a more accurate orientation.

4.3.4 Definition of veins and dikes

Rock occurrence is the way Boremap handles the occurrence of lithology up to 1 metre wide. Chiefly two different rock occurrences are mapped: veins and dikes. These two are separated by their respectively length in the drill core; veins are set to 0–20 cm and dikes are set to 20–100 cm. Rock occurrences that covers more than 100 cm of the drill core are mapped under the feature *rock type*.

4.3.5 Mineral codes

In cases where properties and/or minerals are not represented in the mineral list, the following mineral codes have been used:

- X5 Bleached fracture walls.
- X7 Broken fracture with a fresh appearance and no mineral fill.
- X8 Fractures with epidotized/saussuritized walls.
- X9 Weathered appearance.

4.4 Data handling

Mapping of the drill core is performed on-line on the SKB network, in order to obtain the best possible data security. Before every break (> 15 minutes) a back-up is saved on the local disk. As a regular quality check every working day a summary report (from Boremap) and a WellCad plot is printed in order to find possible misprints. The mapping is also quality checked by a routine in Boremap before it is exported to and archived in SICADA database. Personnel from SKB also perform spot test controls and regular quality revisions. All primary data is stored in SKB's database SICADA and only these data are later used for interpretation and modelling.

4.5 Geological summary table, general description

A geological summary table (Appendix 1) is an overview of the features mapped with the Boremap software. It also facilitates comparisons between Boremap information collected from different boreholes and is more objective than a pure descriptive borehole summary. The table is the result of cooperation between Jan Ehrenborg from the mapping personnel and Pär Kinnbom from PO (site investigation, Oskarshamn). The aim was to make a standard form in handy A4-size, where all information is taken directly from the Boremap database using simple and well defined search paths for each geological parameter (Appendix 2).

Data from the Boremap database cannot automatically be extracted into the geological summary table. First the data has to be sorted out and frequencies in the different column must be calculated in Microsoft Excel. WellCad is used to create the geological summary table from

the frequency calculations of mapped features. From the Boremap database the data to the non-frequency columns are retrieved, i.e. lithology and red staining.

The geological summary table consists of 23 columns, each one representing a specific geological parameter, presented as either intervals or frequencies (see Section 4.5.1 for column description). Intervals are calculated for parameters with a width ≥ 1 m and frequencies for parameters with a width < 1 m. Frequency information is treated as treated as point observations. It should be noted that parameters with a thickness of only 1 mm get the same “value” as a similar parameter with a thickness of 999 mm since both are treated as point observations and used for frequency calculations.

Parameters are sometimes related in such a way that the mapping of one parameter cause a decrease in the frequency of another parameter. This type of intimate relationship between parameters has been noted for the following cases;

- There is a decrease in the frequency of *unbroken fractures* with oxidised walls and without mineral fillings in intervals mapped with *Alteration – red staining*.
- No *unbroken fractures* are mapped in intervals of *sealed fracture network*.
- No *broken fractures* are mapped in intervals with *crush*.
- Hybrid rock and composite dikes generally include a large amount of fine to medium grained granite veins. These veins are not mapped and the frequency presented for veins + dikes in column 6 (Appendix 1) are lower than the true frequency in composite dike intervals.

4.5.1 Columns in the geological summary table

The geological summary table includes the following 23 columns:

Column 1: *Rock type/Lithology*, interval column. Only lithologies longer than 1 m are presented here. Shorter lithologies are presented in column 6. This column is identical with the ordinary WellCad presentation.

Column 2: *Rock type/Grain size*, interval column. Interval limits follows column 1. This column is identical with the ordinary WellCad presentation.

Column 3: *Rock type/Texture*, interval column. Interval limits follows column 1. This column is identical with the ordinary WellCad presentation.

Column 4: *Alteration/Type*, interval column. No frequency column is presented for alteration/type. The alteration/ type column are identical with the ordinary WellCad presentation.

Column 5: *Alteration/Intensity*, interval column. This column is identical with the ordinary WellCad presentation.

Column 6: *Rock occurrence/Veins + Dikes < 1 m wide*, frequency column. This rock type column can be seen as the frequency complement to the rock type/lithology interval column. Only rock type sections that are thinner than 1 m can be described as rock occurrences in Boremap. Thicker rock type sections are mapped as rock type.

Column 7: *Structure/Shear zone < 1 m wide*, frequency column. This column includes ductile shear structures as well as brittle-ductile shear structures and these are mapped as rock occurrences in Boremap. Ductile sections in mm – cm scale are mapped as shear structures and in dm – m scale as sections with foliation in column 12.

Column 8: *Structure/Brecciated < 1 m wide*, frequency column. Breccias < 1 m wide are mapped as rock occurrence in Boremap. Very thin micro breccias along sealed/natural fracture planes are generally not considered.

Column 9: *Structure/Brecciated ≥ 1 m wide*, interval column. Breccias > 1 m wide are mapped as rock type/structure in Boremap.

Column 10: *Structure/Mylonite < 1 m wide*, frequency column. Mylonites < 1 m wide are mapped as rock occurrence/structure in Boremap.

Column 11: *Structure/Mylonite ≥ 1 m wide* is an interval column. Mylonites > 1 m wide are mapped as rock type/structure in Boremap.

Column 12: *Structure/Foliated < 1 m wide* is a frequency column. Sections with foliation < 1 m wide are mapped as rock occurrence/structure in Boremap. Very thin sections with foliation are called ductile shear structures and presented in column 7.

Column 13: *Structure/Foliated ≥ 1 m wide* is an interval column. Sections with foliation ≥ 1 m wide are mapped as rock type/structure in Boremap.

Column 14: *Sealed fractures/All*, frequency column. This column includes all fractures mapped as unbroken in the Boremap system and this includes unbroken fractures where the drill core is not broken as well as unbroken fractures interpreted to have broken up artificially during/after drilling.

Column 15: *Sealed fractures/Broken fractures with aperture = 0*, frequency column. This column includes unbroken fractures interpreted to have broken up artificially during/after drilling.

Column 16: *Sealed fractures/Sealed fracture network < 1 m wide*, frequency column. The sealed fracture network parameter is the only parameter that is generally evaluated directly from observations of the drill core. These types of sealed fractures can only in rare cases be observed in the BIPS-image.

Column 17: *Sealed fractures/Sealed fracture network ≥ 1 m wide*, interval column.

Column 18: *Open fractures/All apertures > 0*, frequency column. This column includes all broken fractures, both fractures that with certainty were open before drilling and fractures that probably or possibly were open before drilling.

Column 19: *Open fractures/Uncertain, Aperture = 0.5 probable + 0.5 possible*, frequency column. This column includes fractures that probably or possibly open before drilling.

Column 20: *Open fractures/Certain, Aperture = 0.5 and > 0.5*, frequency column. This column includes fractures that with certainty were open before drilling.

Column 21: *Open fractures/Joint alteration > 1.5*, frequency column. This column show fractures with stronger joint alteration than normal. This parameter is generally correlated with the location of lithologies with a more weathered appearance.

Column 22: *Open fractures/Crush < 1 m wide*, frequency column. This column includes shorter sections with crush.

Column 23: *Open fractures/Crush ≥ 1 m wide*, interval column. This column includes longer sections with crush.

4.6 Nonconformities

Due to the lack of reference marks for length adjustments recorded length from the BIPS-logging was used.

The uppermost part of the drill core is not covered by a BIPS-image. In these intervals only broken fractures and rock types were mapped, and the mapped features are not oriented.

5 Results

5.1 General

All results from the mapping are principally found in the appendices. Information from the SICADA database is shown in the geological summary tables in Appendix 1 and as WellCad diagrams in Appendix 4. The BIPS-images are presented in Appendix 3. The search paths to the geological summary table are presented in Appendix 2 and In-data, such as borehole length, deviation data and borehole diameter are presented in Appendices 6 and 7.

Original data from the reported activity are stored in the primary database SICADA. Data are traceable in SICADA by the Activity plan number (AP PS 400-06-046). Only data in databases are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the databases may be revised, if needed. Such revisions will not necessarily result in a revision of the P-report, although the normal procedure is that major revisions entail a revision of the P-report. Minor revisions are normally presented as supplements, available at www.skb.se.

The MDZ boreholes vary between 50 m and 146 m in length (Table 5-1).

5.2 Lithology and structures

The lithology in KLX09G is dominated by Ävrö granite (501044). The Ävrö granite is mylonitic in two intervals: 40.4–43.5 m, and 53.3 to 56.0 m. Subordinated rock types are fine-grained granite (511058) which occurs between 35 and 36.7 m, and fine-grained diorite-gabbro (505102) which is observed between 63.4 to 65.1 m. The section 40.4–65.0 m has a higher frequency of open fractures, open fractures with aperture > 0.5 mm, sealed fracture networks and it is also red stained.

KLX10B is dominated by Ävrö granite (501044). With subordinate fine-grained granite (511058), which occurs in two intervals: 10.3–20.3 m and 48.1–49.4 m length. Two sections 10.0–20.0 m and 40.0–50.0 m, have a higher frequency of open fractures. The first section is also characterized by a change in lithology, red-staining, crush zones and open fractures with aperture > 0.5 mm. The latter section has the same characteristics as with the exception of the change in lithology.

The lithology in KLX10C is dominated by Ävrö granite (501044). Subordinated rock types are fine-grained diorite-gabbro (505102), which occurs from 104.7 to 106.1 m, and fine-grained dioritoid (501030), which occurs in two intervals: 16.5–19.6, and 120.2–127.1 m. The interval 15–20 m has an high frequency of open fractures with aperture > 0.5 mm. This interval is also characterized by a change in lithology, medium to strong chloritization and has an elevated frequency of open fractures. Structures such as cataclasites, breccias, brittle-ductile shear zones and ductile shear zones occur frequently throughout the borehole.

Table 5-1. Length of the MDZ drill cores.

Borehole	Length (m)
KLX09G	0.00–50.25
KLX10B	0.00–146.25
KLX10C	0.00–100.10

Table 5-2. Lithology in the MDZ drill cores.

Rock type	KLX09G (%)	KLX10B (%)	KLX10C (%)
Ävrö granite (501044)	96.2	72.4	91.7
Fine-grained granite (511058)	2.0	27.6	–
Fine-grained diorite-gabbro (505102)	1.9	–	1.0
Fine-grained dioritoid (501030)	–	–	7.3

5.3 Fracture mineralogy

The most frequently occurring minerals in sealed fractures are calcite and chlorite and to a lesser extent hematite. Fluorite- and muscovite-bearing sealed fractures occur in KLX09G. In the uppermost part of the drill cores, to about 9 m length, open fractures often lack any visible minerals and have a weathered appearance, mapped as X9.

Calcite and chlorite are the most frequently occurring minerals in open fractures, followed by clay minerals, pyrite and hematite. Gouges occur in KLX10B and KLX10C at ~ 45 m and ~ 20 m borehole length, respectively. Table 5-3 and 5-4 shows the frequency in sealed fractures and open fractures respectively.

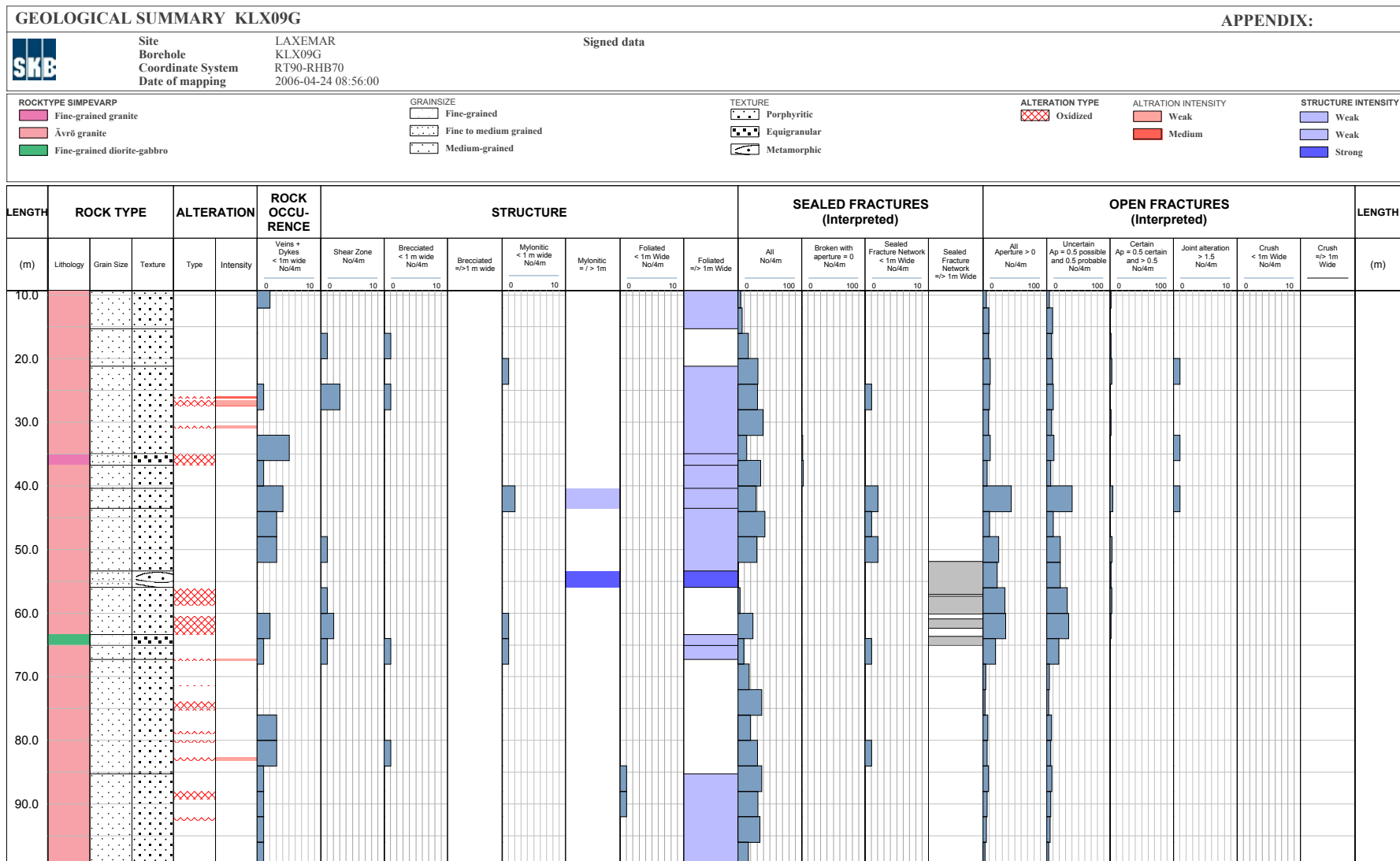
Table 5-3. Minerals and rock wall alteration in sealed fractures in the MDZ drill cores.

Mineral	KLX09G (%)	KLX010B (%)	KLX10C (%)
Calcite	60	70	51
Oxidized Walls	51	36	57
Chlorite	43	35	32
Hematite	16	5	13
Epidote	10	1	4
Quartz	8	9	11
Fluorite	3	2	0
Prehnite	11	2	13
White feldspar	1	1	8
Muscovite	1	0	0
Adularia	6	2	11
Pyrite	3	3	0
Clay Minerals	1	0	0
Laumontite	0	0	2
X8	1	0	0
X7	0	2	0
X5	0	1	1
Iron Hydroxide	0	0	0

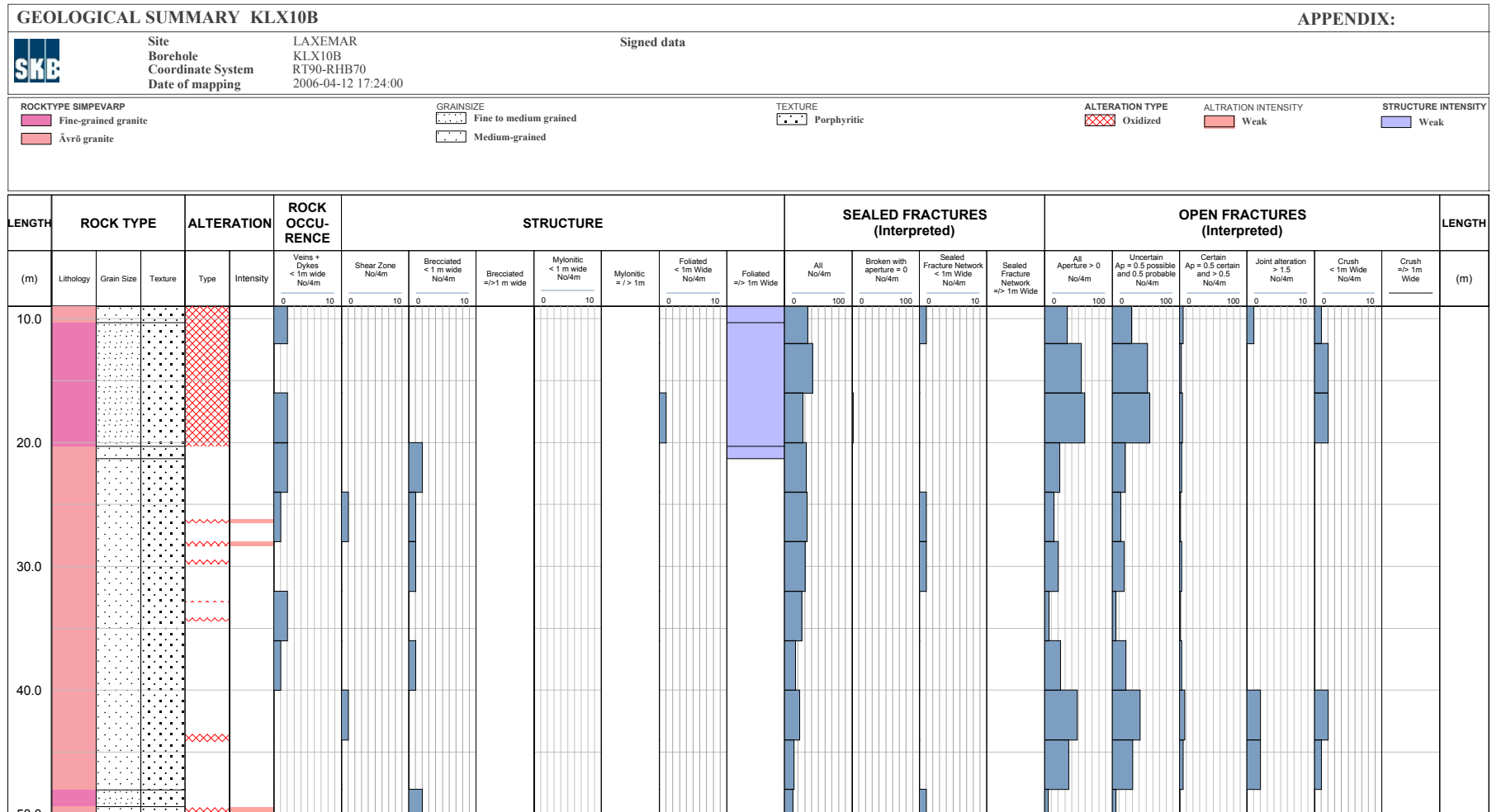
Table 5-4. Minerals and rock wall alteration in open fractures in the MDZ drill cores.

Mineral	KLX09G (%)	KLX10B (%)	KLX10C (%)
Calcite	87	78	88
Chlorite	82	72	68
Pyrite	22	29	11
Hematite	27	6	18
Clay Minerals	27	28	10
Oxidized Walls	9	5	15
Fluorite	2	0	0
Epidote	5	2	14
Laumontite	0	0	13
Quartz	2	1	0
Sulfides	0	1	0
Adularia	0	0	5
Prehnite	1	0	2
X7	0	2	2
X9	0	3	0

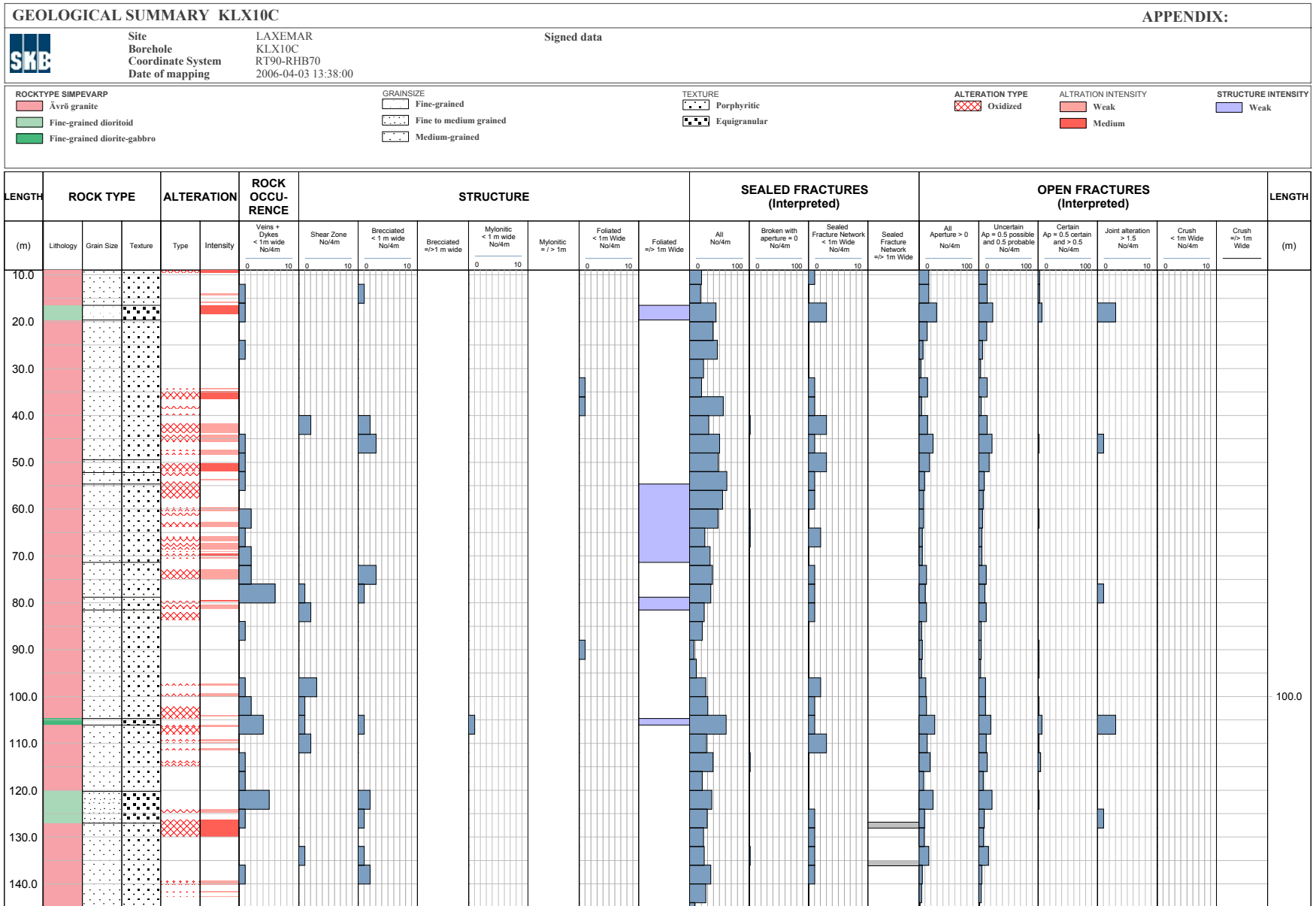
A. Geological summary table KLX09G



B. Geological summary table KLX10B



C. Geological summary table KLX10C



Search paths for the geological summary table

TABLE HEAD LINES		INFORMATION SOURCE			PRESENTATION
Head lines	Sub head lines	Varcode	First suborder	Second suborder	Interval / frequency
Rock type	Lithology	5	Sub 1		Interval
	Grain size	5	Sub 5		Interval
	Texture	5	Sub 6		Interval
Alteration	Type	7	Sub 1 = 700		Interval
	Intensity	7	Sub 1 = 700	Sub 2	Interval
Rock occurrence	Vein + dyke	31	Sub 1 = 2 and 18		Frequency
Structure	Shear zone, < 1m wide	31	Sub 4 = 41 and 42		Frequency
	Brecciated, < 1m wide	31	Sub 4 = 7		Frequency
	Brecciated, >= 1m wide	5	Sub 3 = 7	Sub 4; 101 and 102 = 102	Interval
		5	Sub 3 = 7	Sub 4; 103 and 104 = 104	Interval
	Mylonite, < 1 m wide	31	Sub 4 = 34		Frequency
	Mylonite, >= 1 m wide	5	Sub 3 = 34	Sub 4; 101 and 102 = 102	Interval
		5	Sub 3 = 34	Sub 4; 103 and 104 = 104	Interval
	Foliated, < 1 m wide	31	Sub 4 = 81		Frequency
Foliated, >= 1 m wide	5	Sub 3 = 81	Sub 4; 101 and 102 = 102	Interval	
	5	Sub 3 = 81	Sub 4; 103 and 104 = 104	Interval	
Sealed fracture	All unbroken fractures and broken fractures	3			Frequency
	Broken fractures, Aperture = 0	2	SNUM 11= 0		Frequency
	Sealed fracture network < 1 m wide	32			Frequency
	Sealed fracture network >= 1 m wide	32			Interval
Open fractures	All, Aperture > 0	2 and 3	SNum 11>0		Frequency
	Uncertain, Aperture = 0.5 possible and 0.5 probable	2 and 3	SNum 11>0	Sub 12 = 3	Frequency
		2 and 3	SNum 11>0	Sub 12 = 2	Frequency
	Certain, Aperture = 0.5 and >0.5	2 and 3	SNum 11>0	Sub 12 = 1	Frequency
	Joint alteration > 1.5	2	SNum16 > 1.5		Frequency
	Crush < 1 m wide	4			Frequency
Crush >= 1 m wide	4			Interval	

A. BIPS-image of KLX09G

Borehole Image Report

Borehole Name: KLX09G
Mapping Name: KLX09G_KJM_STE
Mapping Range: 0.300 - 100.100 m
Diameter: 76.0 mm
Printed Range: 9.000 - 99.752
Pages: 6

Image File Information:

File: D:\BIPS_Images\KLX10B-C_KLX09G\KLX09G.BIP
Date/Time: 2006-02-07 16:32:00
Start Depth: 9.000 m
End Depth: 99.752 m
Resolution: 1.00 mm/pixel (depth)
Orientation: Gravmetric
Image height: 90752 pixels
Image width: 360 pixels
BIP Version: BIP-III
Locality: LAXEMAR
Borehole: KLX09G
Scan Direction: Down
Color adjust: 0 0 0 (RGB)

Borehole: KLX09G
Mapping: KLX09G_KJM_STE

Depth range: 9.000 - 29.000 m
Azimuth: 87.6
Inclination: -60.9



Printed: 2006-04-27 14:52:28

Scale: 1 : 20

Aspect: 150 %

2 (6)

Borehole: KLX09G
Mapping: KLX09G_KJM_STE

Depth range: 29.000 - 49.000 m
Azimuth: 88.0
Inclination: -60.5



Printed: 2006-04-27 14:52:28

Scale: 1 : 20

Aspect: 150 %

3 (6)

Borehole: KLX09G
Mapping: KLX09G_KJM_STE

Depth range: 49.000 - 69.000 m
Azimuth: 89.8
Inclination: -59.9



Printed: 2006-04-27 14:52:28

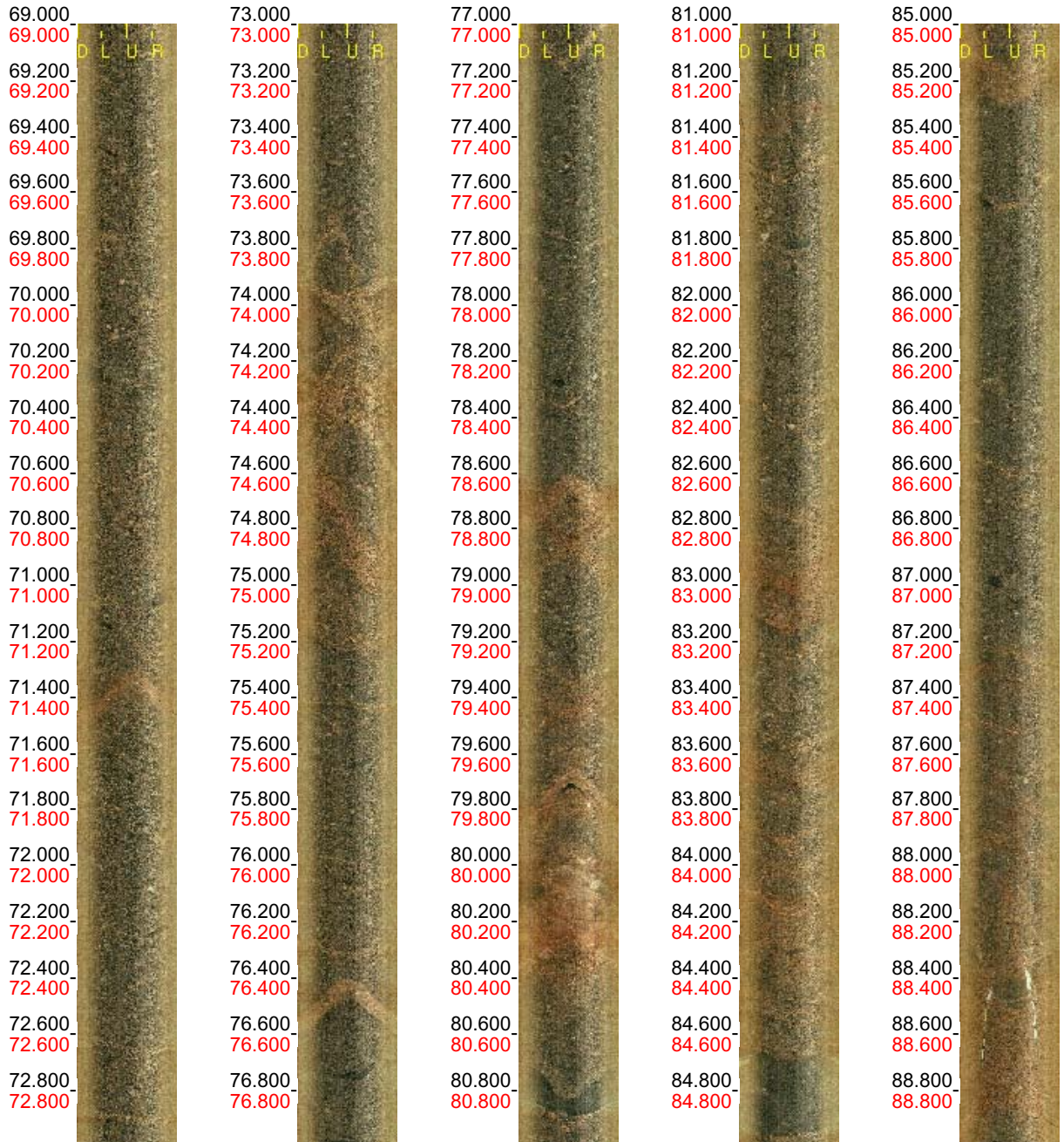
Scale: 1 : 20

Aspect: 150 %

4 (6)

Borehole: KLX09G
Mapping: KLX09G_KJM_STE

Depth range: 69.000 - 89.000 m
Azimuth: 90.9
Inclination: -59.2



Printed: 2006-04-27 14:52:28

Scale: 1 : 20

Aspect: 150 %

5 (6)

Borehole: KLX09G
Mapping: KLX09G_KJM_STE

Depth range: 89.000 - 99.752 m
Azimuth: 92.3
Inclination: -58.7



B. BIPS-image of KLX10B

Borehole Image Report

Borehole Name: KLX10B
Mapping Name: KLX10B_KJM_2
Mapping Range: 8.000 - 50.240 m
Diameter: 76.0 mm
Printed Range: 8.000 - 50.240
Pages: 4

Image File Information:

File: D:\BIPS_Images\KLX10B-C_KLX09G\KLX10B\KLX10B.BIP
Date/Time: 2006-03-22 12:28:00
Start Depth: 8.000 m
End Depth: 50.240 m
Resolution: 1.00 mm/pixel (depth)
Orientation: Gravmetric
Image height: 42240 pixels
Image width: 360 pixels
BIP Version: BIP-III
Locality: LAXEMAR
Borehole: KLX10B
Scan Direction: Down
Color adjust: 0 0 0 (RGB)

Borehole: KLX10B
Mapping: KLX10B_KJM_2

Depth range: 8.000 - 28.000 m
Azimuth: 170.4
Inclination: -59.6



Printed: 2006-04-27 15:03:39

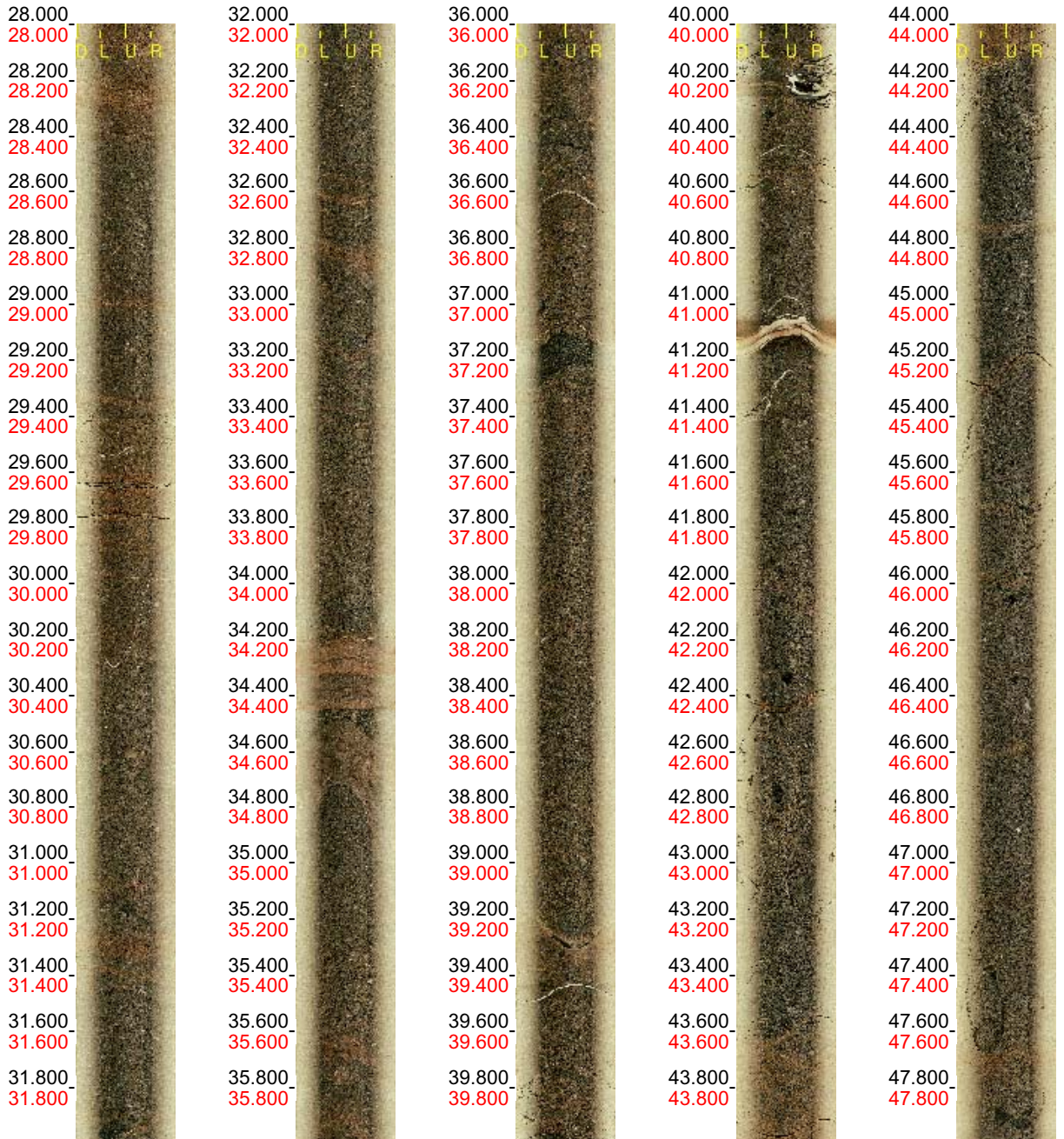
Scale: 1 : 20

Aspect: 150 %

2 (4)

Borehole: KLX10B
Mapping: KLX10B_KJM_2

Depth range: 28.000 - 48.000 m
Azimuth: 169.5
Inclination: -59.2



Printed: 2006-04-27 15:03:39

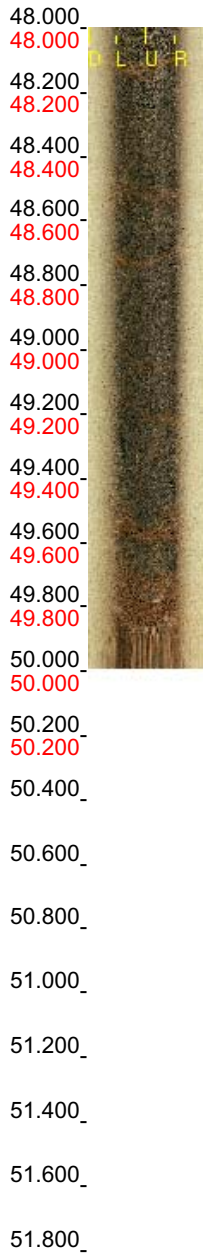
Scale: 1 : 20

Aspect: 150 %

3 (4)

Borehole: KLX10B
Mapping: KLX10B_KJM_2

Depth range: 48.000 - 50.240 m
Azimuth: 170.0
Inclination: -58.6



Printed: 2006-04-27 15:03:39

Scale: 1 : 20

Aspect: 150 %

4 (4)

C. BIPS-image of KLX10C

Borehole Image Report

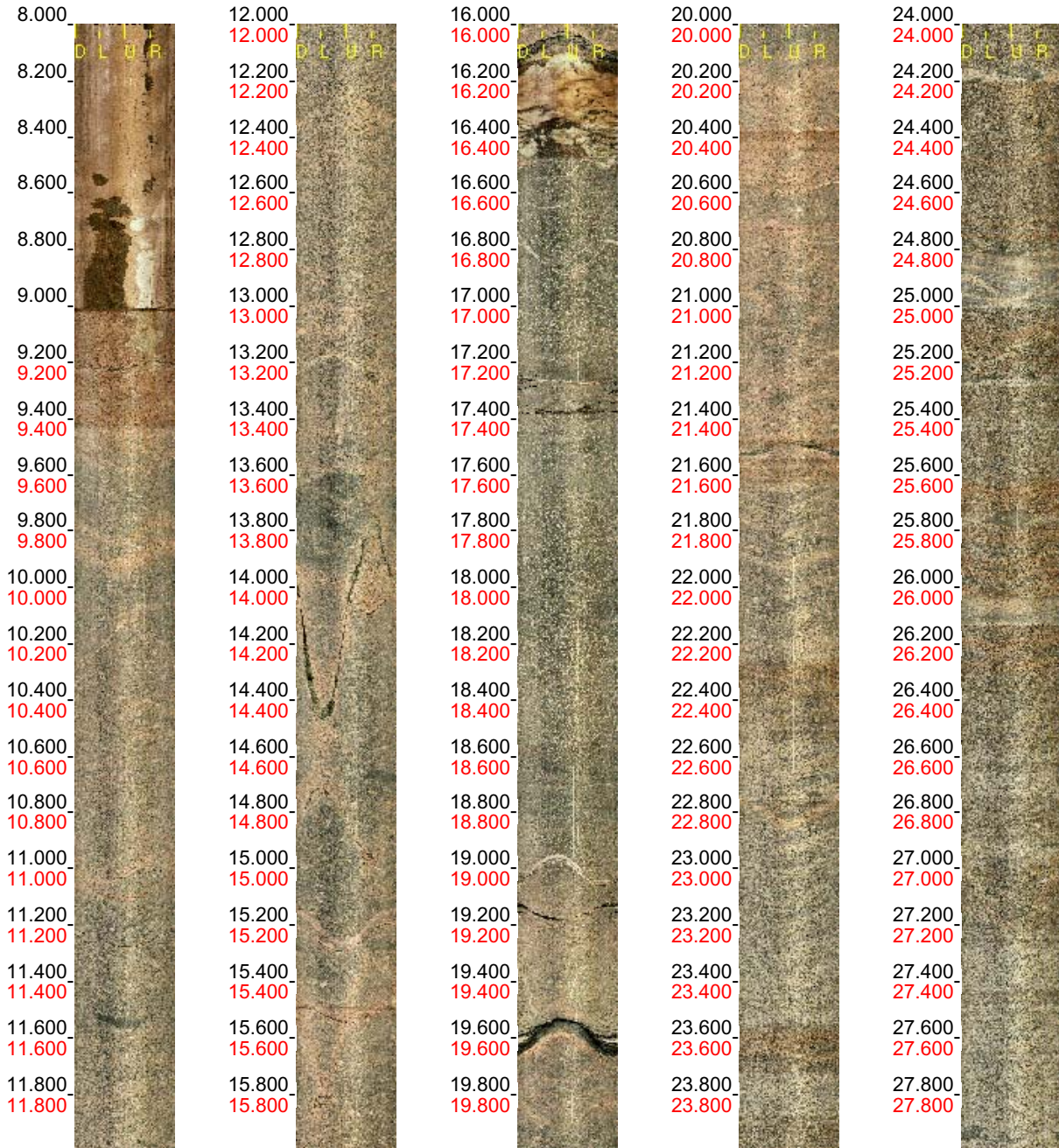
Borehole Name: KLX10C
Mapping Name: KLX10C_KJM_2
Mapping Range: 9.010 - 145.342 m
Diameter: 76.0 mm
Printed Range: 8.000 - 145.600
Pages: 8

Image File Information:

File: G:\skb\bips\oskarshamn\KLX10C\used\KLX10C_9-145m.BIP
Date/Time: 2006-03-23 15:01:00
Start Depth: 8.000 m
End Depth: 145.600 m
Resolution: 1.00 mm/pixel (depth)
Orientation: Gravmetric
Image height: 137600 pixels
Image width: 360 pixels
BIP Version: BIP-III
Locality: LAXEMAR
Borehole: KLX10C
Scan Direction: Down
Color adjust: 0 0 0 (RGB)

Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 8.000 - 28.000 m
Azimuth: 353.7
Inclination: -59.9



Printed: 2006-04-27 14:57:32

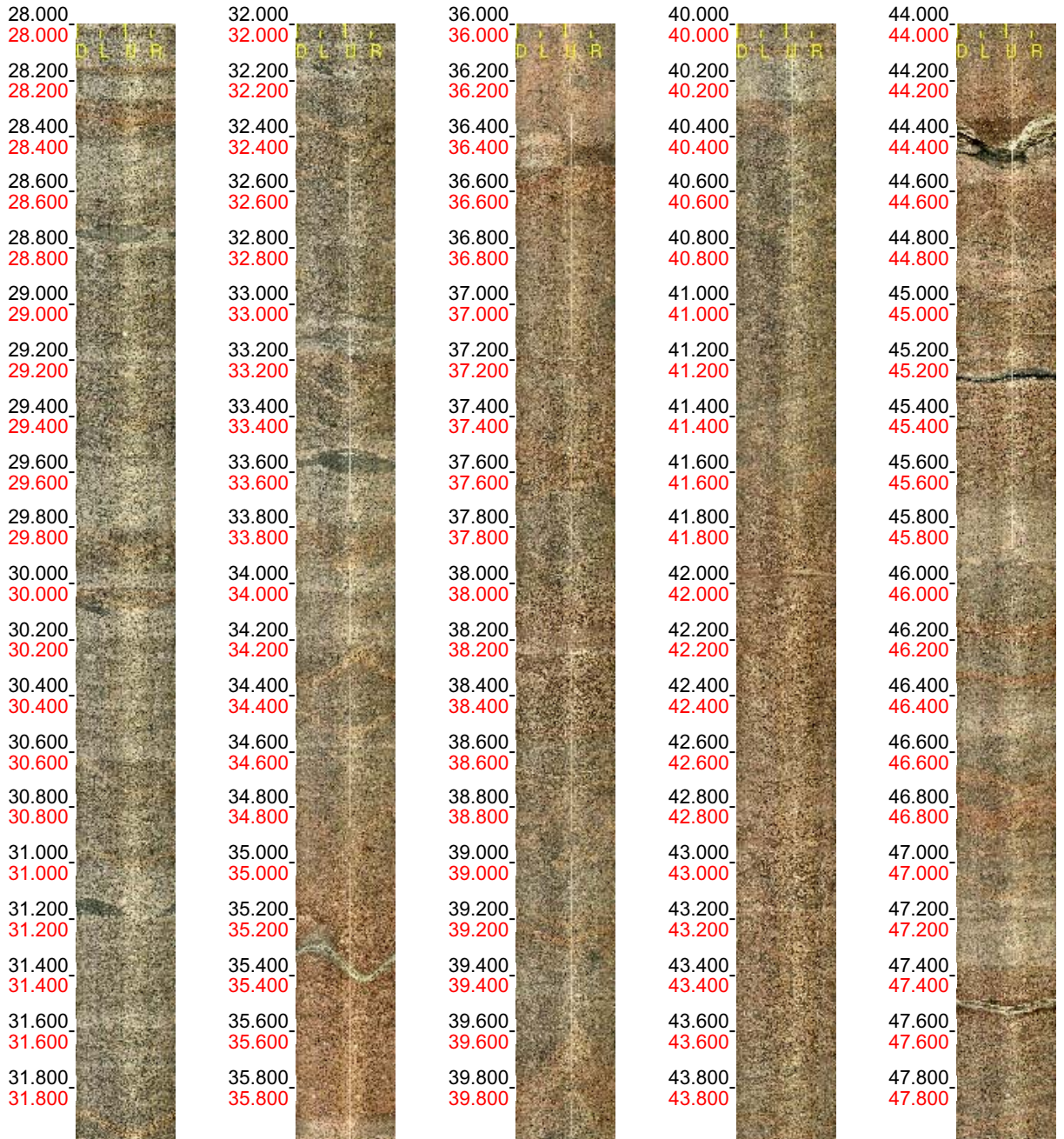
Scale: 1 : 20

Aspect: 150 %

2 (8)

Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 28.000 - 48.000 m
Azimuth: 354.1
Inclination: -59.7



Printed: 2006-04-27 14:57:32

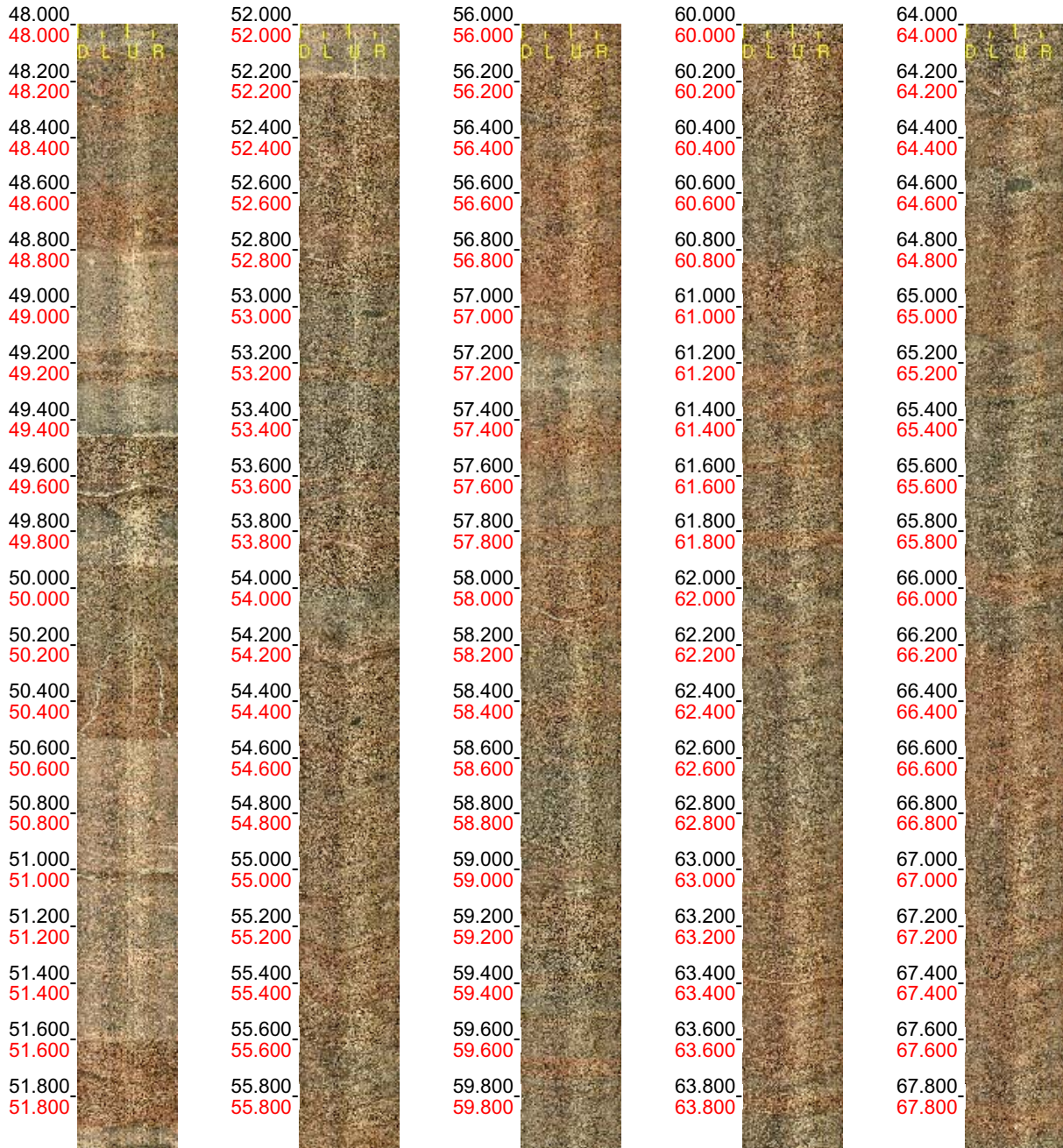
Scale: 1 : 20

Aspect: 150 %

3 (8)

Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 48.000 - 68.000 m
Azimuth: 354.7
Inclination: -59.4



Printed: 2006-04-27 14:57:32

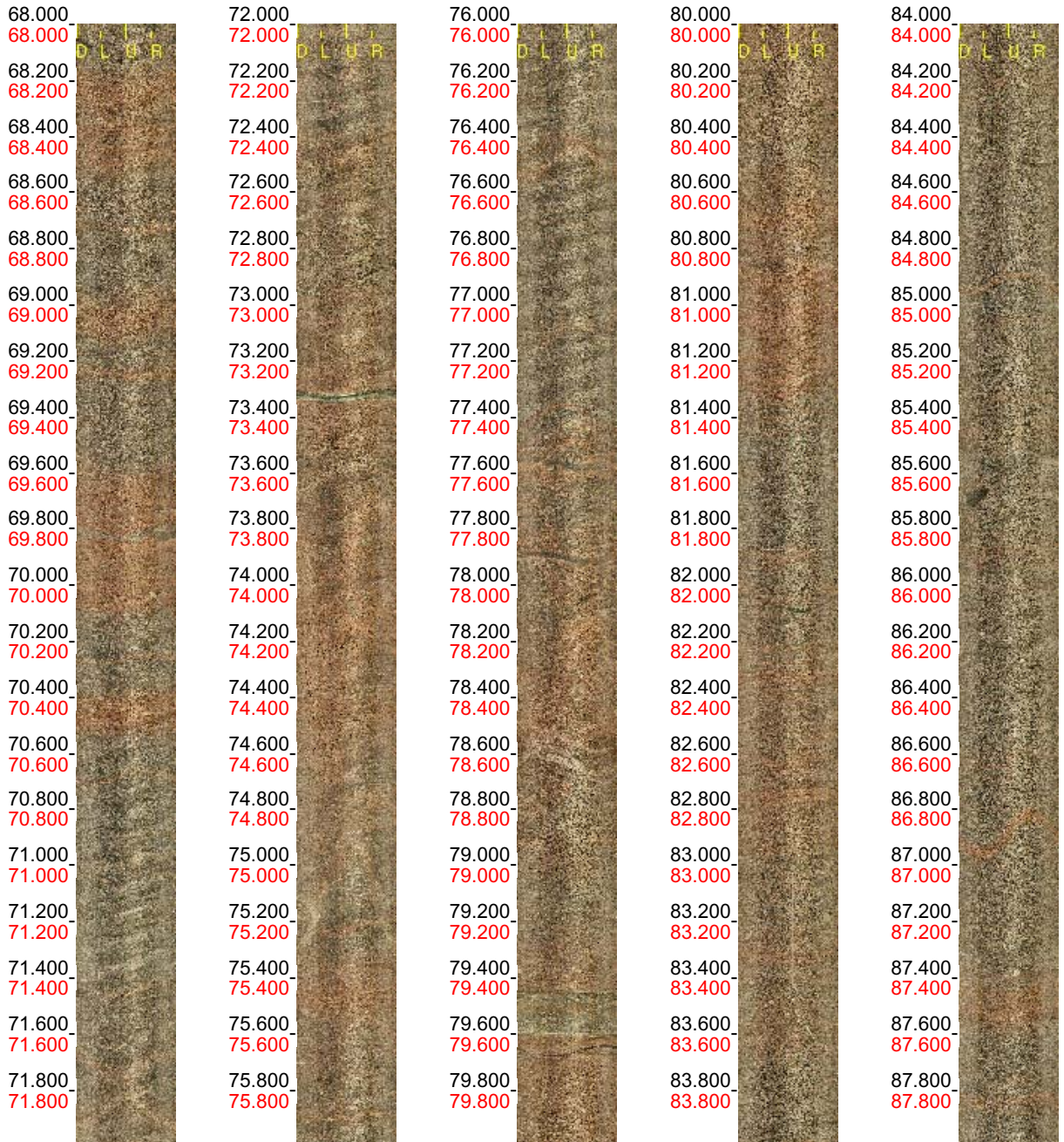
Scale: 1 : 20

Aspect: 150 %

4 (8)

Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 68.000 - 88.000 m
Azimuth: 355.9
Inclination: -59.1



Printed: 2006-04-27 14:57:32

Scale: 1 : 20

Aspect: 150 %

5 (8)

Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 88.000 - 108.000 m
Azimuth: 357.8
Inclination: -58.7



Printed: 2006-04-27 14:57:32

Scale: 1 : 20

Aspect: 150 %

6 (8)

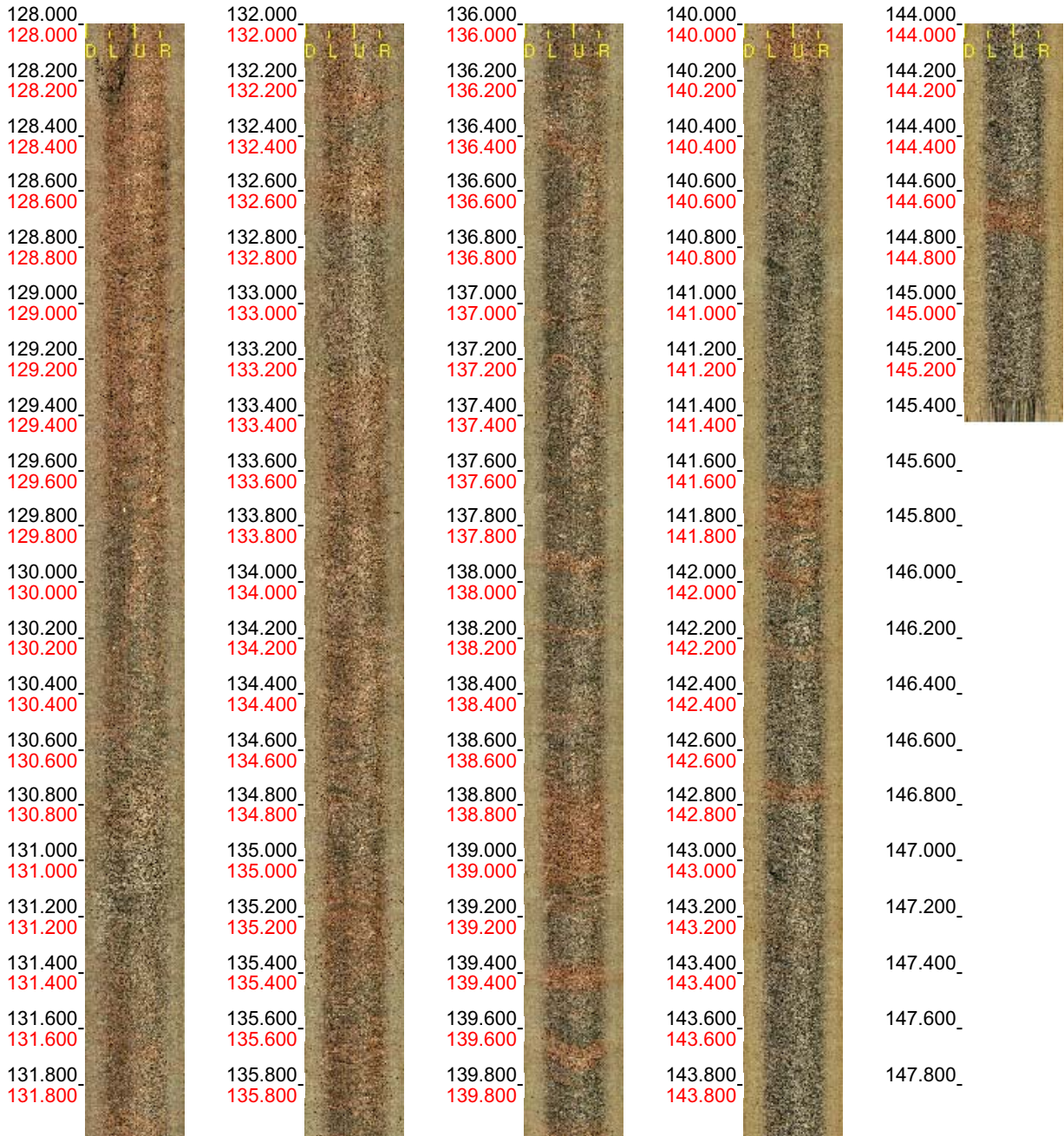
Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 108.000 - 128.000 m
Azimuth: 358.6
Inclination: -58.2



Borehole: KLX10C
Mapping: KLX10C_KJM_2

Depth range: 128.000 - 145.600 m
Azimuth: 0.3
Inclination: -57.7



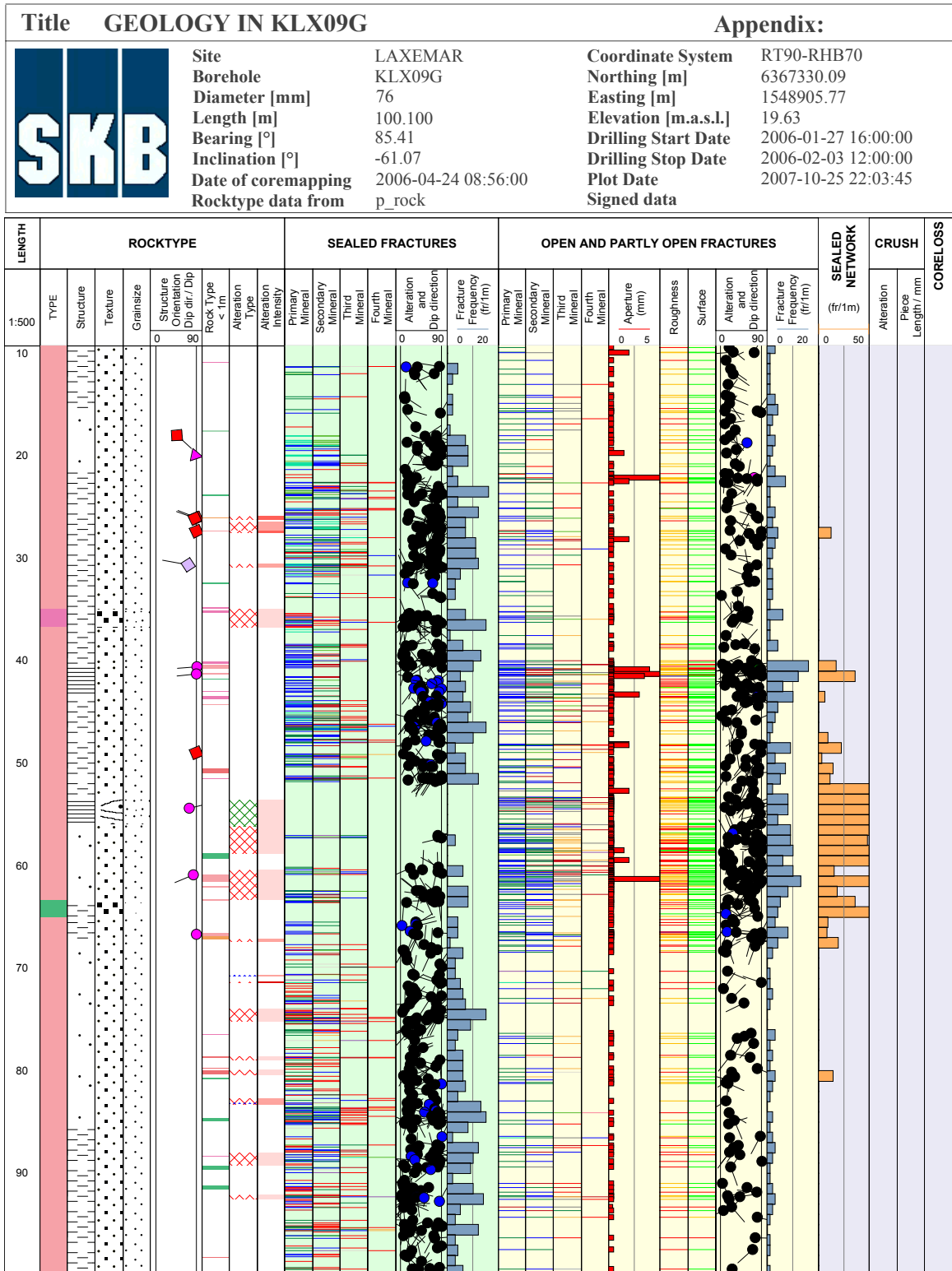
Printed: 2006-04-27 14:57:32

Scale: 1 : 20

Aspect: 150 %

8 (8)

WellCad diagram



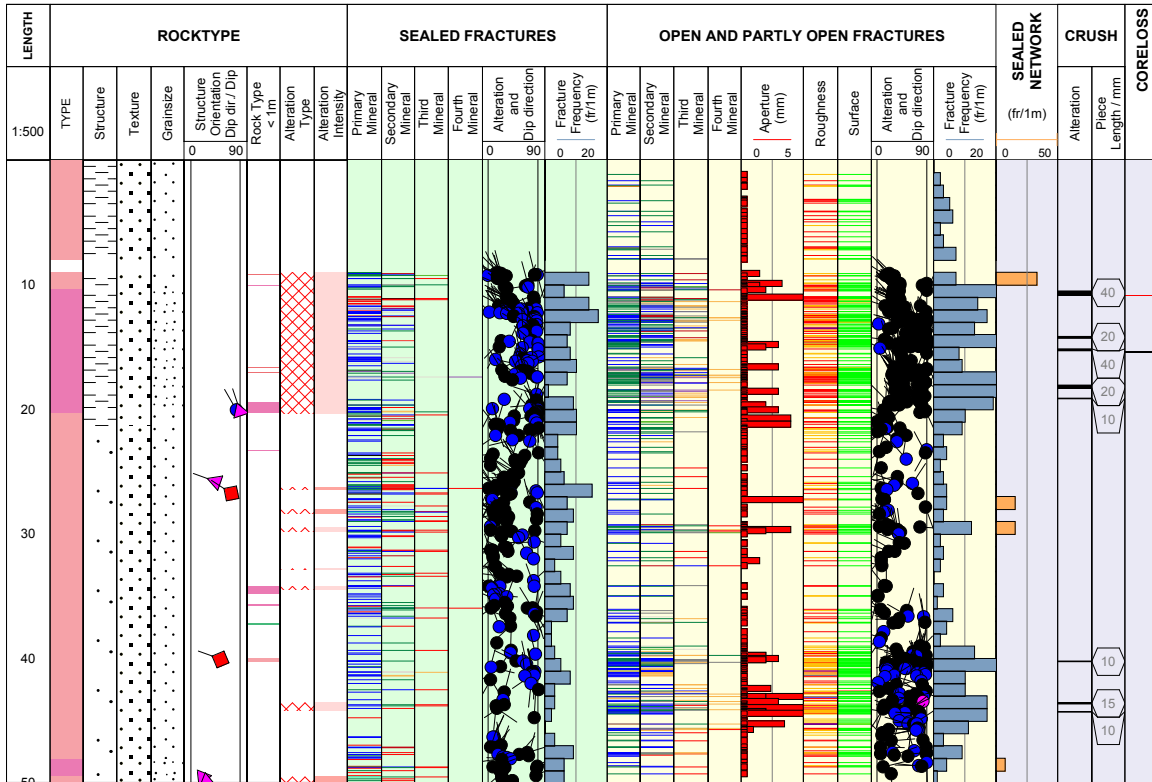
Title GEOLOGY IN KLX10B

Appendix:



Site LAXEMAR
Borehole KLX10B
Diameter [mm] 76
Length [m] 50.250
Bearing [°] 170.33
Inclination [°] -59.96
Date of coremapping 2006-04-12 17:24:00
Rocktype data from p_rock

Coordinate System RT90-RHB70
Northing [m] 6366316.49
Easting [m] 1548525.15
Elevation [m.a.s.l.] 18.15
Drilling Start Date 2006-02-08 16:35:00
Drilling Stop Date 2006-02-14 06:55:00
Plot Date 2007-10-25 22:03:45
Signed data



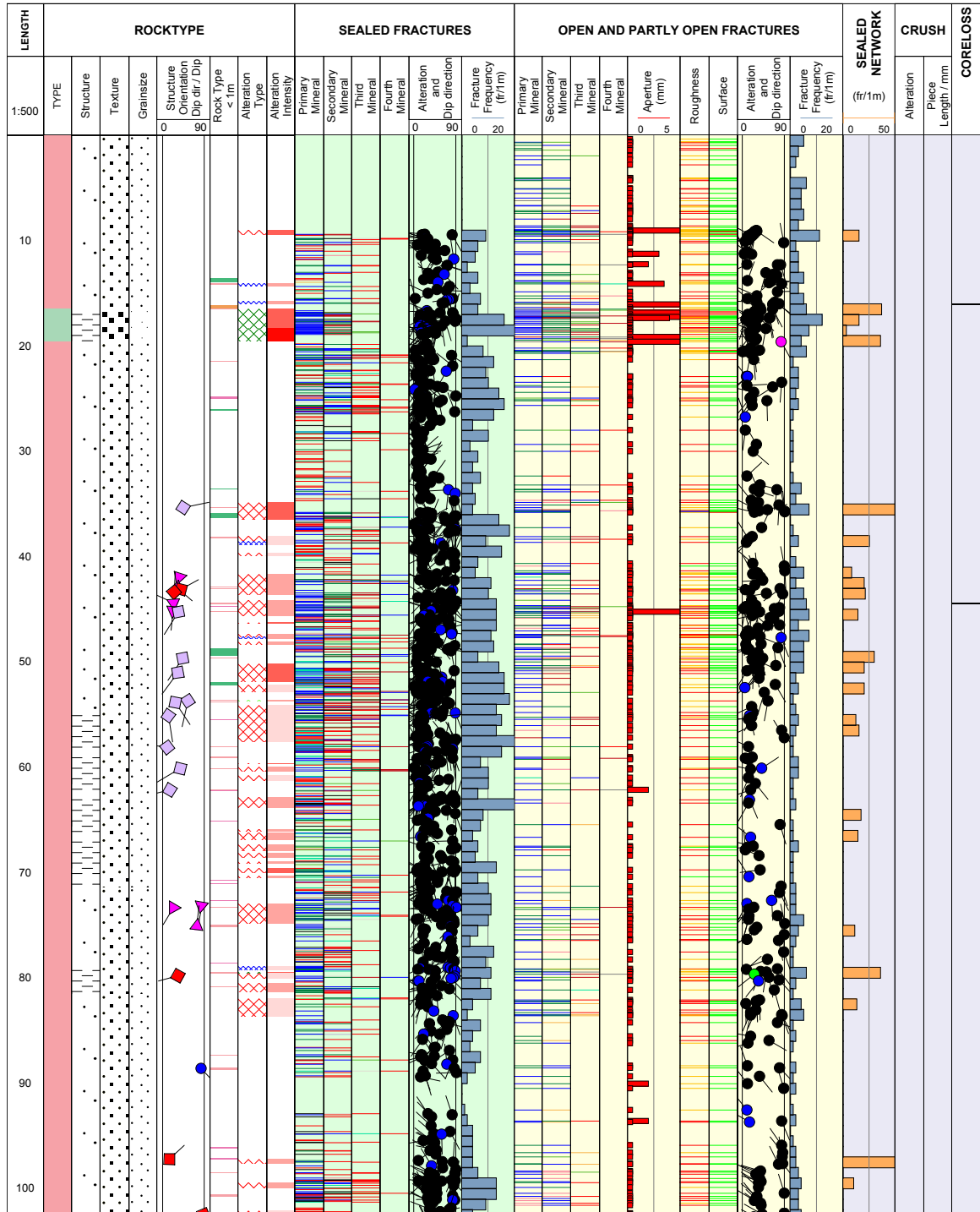
Title **GEOLOGY IN KLX10C**

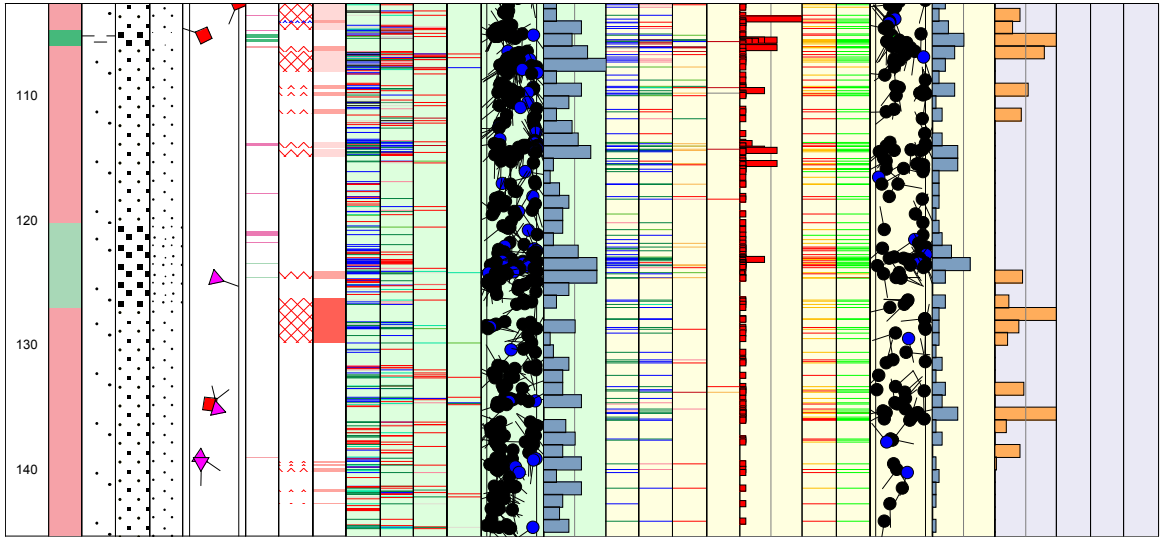
Appendix:



Site LAXEMAR
 Borehole KLX10C
 Diameter [mm] 76
 Length [m] 146.250
 Bearing [°] 352.43
 Inclination [°] -60.02
 Date of coremapping 2006-04-03 13:38:00
 Rocktype data from p_rock


Coordinate System RT90-RHB70
 Northing [m] 6366372.07
 Easting [m] 1548506.94
 Elevation [m.a.s.l.] 16.94
 Drilling Start Date 2006-02-15 14:38:00
 Drilling Stop Date 2006-02-28 07:22:00
 Plot Date 2007-10-25 22:03:45
 Signed data

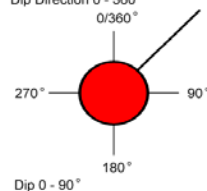




Legend to WellCad diagram

Title		LEGEND FOR LAXEMAR	KLX09G
		Site	LAXEMAR
		Borehole	KLX09G
	Plot Date	2007-10-25 22:03:45	
	Signed data		
<p>ROCKTYPE LAXEMAR</p> <ul style="list-style-type: none"> Äspö Diorite Dolerite Fine-grained Götemargranite Coarse-grained Götemargranite Fine-grained granite Pegmatite Granite Ävrö granite Quartz monzodiorite Diorite / Gabbro Fine-grained dioritoid Fine-grained diorite-gabbro Sulphide mineralization Sandstone Soil Ävrö quartz monzodiorite Ävrö granodiorite 			
<p>ROCK ALTERATION TYPE</p> <ul style="list-style-type: none"> Oxidized Chloritized Epidotized Weathered Tectonized Sericitized Quartz dissolution Silicification Argillization Albitization Carbonatization Saussuritization Steatitization Uralitization Laumontitization Fract zone alteration 			
<p>MINERAL</p> <ul style="list-style-type: none"> Epidote Flourite Hematite Calcite Chlorite Quartz Clay Minerals Prehnite 			
<p>STRUCTURE</p> <ul style="list-style-type: none"> Cataclastic Schistose Gneissic Mylonitic Ductile Shear Zone Brittle-Ductile Zone Veined Banded Massive Foliated Brecciated Lineated 		<p>STRUCTURE ORIENTATION</p> <ul style="list-style-type: none"> Cataclastic Bedded Gneissic Schistose Brittle-Ductile Shear Zone Ductile Shear Zone Lineated Banded Veined Brecciated Foliated Mylonitic 	
<p>TEXTURE</p> <ul style="list-style-type: none"> Hornfelsed Porphyritic Ophitic Equigranular Augen-Bearing Unequigranular Metamorphic 		<p>ROCK ALTERATION INTENSITY</p> <ul style="list-style-type: none"> No intensity Faint Weak Medium Strong 	
<p>GRAINSIZE</p> <ul style="list-style-type: none"> Aphanitic Fine-grained Fine to medium grained Medium to coarse grained Coarse-grained Medium-grained 		<p>ROUGHNESS</p> <ul style="list-style-type: none"> Planar Undulating Stepped Irregular 	
		<p>SURFACE</p> <ul style="list-style-type: none"> Rough Smooth Slickensided 	
		<p>CRUSH ALTERATION</p> <ul style="list-style-type: none"> Slightly Altered Moderately Altered Highly Altered Completely Altered Gouge Fresh 	
		<p>FRACTURE ALTERATION</p> <ul style="list-style-type: none"> Slightly Altered Moderately Altered Highly Altered Completely Altered Gouge Fresh 	
		<p>FRACTURE DIRECTION</p> <p>STRUCTURE ORIENTATION</p> <p>Dip Direction 0 - 360° 0/360°</p>  <p>Dip 0 - 90°</p>	

Title	LEGEND FOR LAXEMAR	KLX10B
	Site	LAXEMAR
	Borehole	KLX10B
	Plot Date	2007-10-25 22:03:45
	Signed data	

<p>ROCKTYPE LAXEMAR</p> <ul style="list-style-type: none"> Äspö Diorite Dolerite Fine-grained Götemargranite Coarse-grained Götemargranite Fine-grained granite Pegmatite Granite Ävrö granite Quartz monzodiorite Diorite / Gabbro Fine-grained dioritoid Fine-grained diorite-gabbro Sulphide mineralization Sandstone Soil Ävrö quartz monzodiorite Ävrö granodiorite <p>STRUCTURE</p> <ul style="list-style-type: none"> Cataclastic Schistose Gneissic Mylonitic Ductile Shear Zone Brittle-Ductile Zone Veined Banded Massive Foliated Brecciated Lineated <p>TEXTURE</p> <ul style="list-style-type: none"> Hornfelsed Porphyritic Ophitic Equigranular Augen-Bearing Unequigranular Metamorphic <p>GRAINSIZE</p> <ul style="list-style-type: none"> Aphanitic Fine-grained Fine to medium grained Medium to coarse grained Coarse-grained Medium-grained 	<p>STRUCTURE ORIENTATION</p> <ul style="list-style-type: none"> Cataclastic Bedded Gneissic Schistose Brittle-Ductile Shear Zone Ductile Shear Zone Lineated Banded Veined Brecciated Foliated Mylonitic 	<p>ROCK ALTERATION TYPE</p> <ul style="list-style-type: none"> Oxidized Chloritized Epidotized Weathered Tectonized Sericitized Quartz dissolution Silicification Argillization Albitization Carbonatization Saussuritization Steatitization Uralitization Laumontitization Fract zone alteration <p>ROCK ALTERATION INTENSITY</p> <ul style="list-style-type: none"> No intensity Faint Weak Medium Strong <p>ROUGHNESS</p> <ul style="list-style-type: none"> Planar Undulating Stepped Irregular <p>SURFACE</p> <ul style="list-style-type: none"> Rough Smooth Slickensided <p>CRUSH ALTERATION</p> <ul style="list-style-type: none"> Slightly Altered Moderately Altered Highly Altered Completely Altered Gouge Fresh 	<p>MINERAL</p> <ul style="list-style-type: none"> Flourite Hematite Calcite Chlorite Pyrite Clay Minerals Iron Hydroxide <p>FRACTURE ALTERATION</p> <ul style="list-style-type: none"> Slightly Altered Moderately Altered Highly Altered Completely Altered Gouge Fresh <p>FRACTURE DIRECTION</p> <p>STRUKTURE ORIENTATION</p> <p>Dip Direction 0 - 360° 0/360°</p>  <p>Dip 0 - 90°</p>
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Title	LEGEND FOR LAXEMAR	KLX10C
	Site Borehole Plot Date Signed data	LAXEMAR KLX10C 2007-10-25 22:03:45

<p>ROCKTYPE LAXEMAR</p> <ul style="list-style-type: none"> Äspö Diorite Dolerite Fine-grained Göttemargranite Coarse-grained Göttemargranite Fine-grained granite Pegmatite Granite Ävrö granite Quartz monzodiorite Diorite / Gabbro Fine-grained dioritoid Fine-grained diorite-gabbro Sulphide mineralization Sandstone Soil Ävrö quartz monzodiorite Ävrö granodiorite <p>STRUCTURE</p> <ul style="list-style-type: none"> Cataclastic Schistose Gneissic Mylonitic Ductile Shear Zone Brittle-Ductile Zone Veined Banded Massive Foliated Brecciated Lineated <p>TEXTURE</p> <ul style="list-style-type: none"> Hornfelsed Porphyritic Ophitic Equigranular Augen-Bearing Unequigranular Metamorphic <p>GRAINSIZE</p> <ul style="list-style-type: none"> Aphanitic Fine-grained Fine to medium grained Medium to coarse grained Coarse-grained Medium-grained 	<p>STRUCTURE ORIENTATION</p> <ul style="list-style-type: none"> Cataclastic Bedded Gneissic Schistose Brittle-Ductile Shear Zone Ductile Shear Zone Lineated Banded Veined Brecciated Foliated Mylonitic 	<p>ROCK ALTERATION TYPE</p> <ul style="list-style-type: none"> Oxidized Chloritized Epidotized Weathered Tectonized Sericitized Quartz dissolution Silicification Argillization Albitization Carbonatization Saussuritization Steatitization Uralitization Laumontitization Fract zone alteration <p>ROCK ALTERATION INTENSITY</p> <ul style="list-style-type: none"> No intensity Faint Weak Medium Strong <p>ROUGHNESS</p> <ul style="list-style-type: none"> Planar Undulating Stepped Irregular <p>SURFACE</p> <ul style="list-style-type: none"> Rough Smooth Slickensided <p>CRUSH ALTERATION</p> <ul style="list-style-type: none"> Slightly Altered Moderately Altered Highly Altered Completely Altered Gouge Fresh 	<p>MINERAL</p> <ul style="list-style-type: none"> Epidote Hematite Calcite Chlorite Quartz Clay Minerals Laumontite Prehnite <p>FRACTURE ALTERATION</p> <ul style="list-style-type: none"> Slightly Altered Moderately Altered Highly Altered Completely Altered Gouge Fresh <p>FRACTURE DIRECTION</p> <p>STRUKTURE ORIENTATION</p> <p>Dip Direction 0 - 360° 0/360°</p> <p>Dip 0 - 90°</p>
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A. In-data: Borehole length and diameter for KLX09G

Hole Diam T - Drilling: Borehole diameter

KLX09G, 2006-01-27 16:00:00 - 2006-02-03 12:00:00 (0.000 - 100.100 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
0.300	9.300	0.0960	HQ
9.300	100.100	0.0757	Corac N/3

Printout from SICADA 2006-04-24 09:52:23.

B. In-data: Borehole length and diameter for KLX10B

Hole Diam T - Drilling: Borehole diameter

KLX10B, 2006-02-08 16:35:00 - 2006-02-14 06:55:00 (0.000 - 50.250 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
0.300	9.000	0.0960	HQ
9.000	50.250	0.0757	Corac N/3

Printout from SICADA 2006-05-04 11:14:36.

C. In-data: Borehole length and diameter for KLX10C

Hole Diam T - Drilling: Borehole diameter

KLX10C, 2006-02-15 14:38:00 - 2006-02-28 07:22:00 (0.000 - 146.250 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
0.300	9.000	0.0960	HQ
9.000	146.250	0.0757	Corac N/3

Printout from SICADA 2006-04-03 10:10:32.

A. In-data: Borehole deviation data for KLX09G

SICADA - object_location

Idcode	Coord System	Northing (m)	Easting (m)	Elevation (m.a.s.l.)	Length (m)	Vertical Depth (m)	Inclination (degrees)	Bearing (degrees)	Inclination Uncert (degrees)	Bearing Uncert (degrees)	Radius Uncert (m)	Origin	Indat
KLX09G	RT90-RHB70	6367330.09	1548905.77	19.63	0.00	0.00	-61.08	85.41	0.020	1.169	0.00	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.21	1548907.22	17.00	3.00	2.63	-61.10	85.41	0.020	1.169	0.03	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.32	1548908.66	14.38	6.00	5.25	-61.09	85.83	0.020	1.169	0.06	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.42	1548910.11	11.75	9.00	7.88	-60.95	86.26	0.020	1.169	0.09	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.51	1548911.57	9.13	12.00	10.50	-60.91	86.68	0.020	1.169	0.12	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.59	1548913.03	6.51	15.00	13.12	-60.87	87.10	0.020	1.169	0.15	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.66	1548914.49	3.89	18.00	15.74	-60.75	87.53	0.020	1.169	0.18	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.72	1548915.95	1.27	21.00	18.36	-60.70	87.95	0.020	1.169	0.21	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.76	1548917.42	-1.34	24.00	20.97	-60.59	88.38	0.020	1.169	0.24	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.80	1548918.90	-3.95	27.00	23.58	-60.48	88.32	0.020	1.169	0.27	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.85	1548920.38	-6.56	30.00	26.19	-60.41	88.38	0.020	1.169	0.30	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.88	1548921.86	-9.17	33.00	28.80	-60.32	89.07	0.020	1.169	0.33	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.90	1548923.35	-11.78	36.00	31.41	-60.28	89.16	0.020	1.169	0.36	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.92	1548924.83	-14.38	39.00	34.01	-60.22	89.25	0.020	1.169	0.39	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.94	1548926.33	-16.98	42.00	36.61	-60.10	89.59	0.020	1.169	0.42	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.95	1548927.82	-19.58	45.00	39.21	-60.03	89.87	0.020	1.169	0.45	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.95	1548929.33	-22.18	48.00	41.81	-59.91	89.99	0.020	1.169	0.48	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.95	1548930.83	-24.78	51.00	44.40	-59.84	89.99	0.020	1.169	0.51	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.95	1548932.34	-27.37	54.00	47.00	-59.74	89.96	0.020	1.169	0.54	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.95	1548933.86	-29.96	57.00	49.59	-59.63	89.76	0.020	1.169	0.57	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.96	1548935.37	-32.54	60.00	52.17	-59.52	89.76	0.020	1.169	0.60	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.97	1548936.90	-35.13	63.00	54.76	-59.41	89.76	0.020	1.169	0.64	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.96	1548938.43	-37.71	66.00	57.34	-59.34	90.57	0.020	1.169	0.67	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.94	1548939.96	-40.29	69.00	59.92	-59.25	90.85	0.020	1.169	0.70	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.92	1548941.49	-42.87	72.00	62.50	-59.20	91.11	0.020	1.169	0.73	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.88	1548943.03	-45.44	75.00	65.07	-59.08	91.22	0.020	1.169	0.76	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.84	1548944.58	-48.01	78.00	67.64	-58.98	91.83	0.020	1.169	0.79	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.78	1548946.12	-50.58	81.00	70.21	-58.93	92.63	0.020	1.169	0.82	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.71	1548947.67	-53.15	84.00	72.78	-58.83	92.63	0.020	1.169	0.86	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.64	1548949.22	-55.72	87.00	75.35	-58.75	92.80	0.020	1.169	0.89	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.55	1548950.78	-58.28	90.00	77.91	-58.66	93.35	0.020	1.169	0.92	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.46	1548952.34	-60.84	93.00	80.47	-58.53	93.67	0.020	1.169	0.95	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.36	1548953.90	-63.40	96.00	83.03	-58.48	93.52	0.020	1.169	0.98	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.26	1548955.47	-65.96	99.00	85.59	-58.43	93.67	0.020	1.169	1.02	Measured	2007-02-06 08:25
KLX09G	RT90-RHB70	6367330.22	1548956.04	-66.90	100.10	86.52	-58.43	93.67	0.020	1.169	1.03	Measured	2007-02-06 08:25

Number of rows: 35.

Printout from SICADA 2007-10-26 10:54:25.

B. In-data: Borehole deviation data for KLX10B

SICADA - object_location

Idcode	Coord System	Northing (m)	Easting (m)	Elevation (m.a.s.l.)	Length (m)	Vertical Depth (m)	Inclination (degrees)	Bearing (degrees)	Inclination Uncert (degrees)	Bearing Uncert (degrees)	Radius Uncert (m)	Origin	Indat
KLX10B	RT90-RHB70	6366316.49	1548525.15	18.15	0.00	0.00	-59.97	170.32	0.066	1.638	0.00	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366315.00	1548525.41	15.56	3.00	2.59	-59.76	170.32	0.066	1.638	0.04	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366313.51	1548525.66	12.97	6.00	5.19	-59.74	170.04	0.066	1.638	0.09	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366312.02	1548525.93	10.38	9.00	7.78	-59.67	169.75	0.066	1.638	0.13	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366310.53	1548526.20	7.79	12.00	10.37	-59.61	169.46	0.066	1.638	0.17	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366309.04	1548526.48	5.20	15.00	12.95	-59.59	169.18	0.066	1.638	0.22	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366307.55	1548526.77	2.61	18.00	15.54	-59.56	168.89	0.066	1.638	0.26	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366306.06	1548527.07	0.03	21.00	18.12	-59.47	168.60	0.066	1.638	0.30	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366304.56	1548527.36	-2.56	24.00	20.71	-59.36	169.19	0.066	1.638	0.35	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366303.05	1548527.65	-5.14	27.00	23.29	-59.25	169.35	0.066	1.638	0.39	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366301.54	1548527.93	-7.71	30.00	25.86	-59.14	169.47	0.066	1.638	0.43	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366300.03	1548528.21	-10.29	33.00	28.44	-59.06	169.82	0.066	1.638	0.48	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366298.51	1548528.48	-12.86	36.00	31.01	-58.98	169.82	0.066	1.638	0.52	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366296.98	1548528.75	-15.43	39.00	33.58	-58.90	169.95	0.066	1.638	0.57	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366295.46	1548529.03	-18.00	42.00	36.15	-58.81	169.40	0.066	1.638	0.61	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366293.93	1548529.33	-20.56	45.00	38.71	-58.74	168.62	0.066	1.638	0.66	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366292.40	1548529.63	-23.12	48.00	41.28	-58.68	168.62	0.066	1.638	0.70	Measured	2007-02-06 08:26
KLX10B	RT90-RHB70	6366291.26	1548529.87	-25.05	50.25	43.20	-58.68	168.62	0.066	1.638	0.73	Measured	2007-02-06 08:26

Number of rows: 18.

Printout from SICADA 2007-10-26 10:57:37.

C. In-data: Borehole deviation data for KLX10C

SICADA - object_location

Idcode	Coord System	Northing (m)	Easting (m)	Elevation (m.a.s.l.)	Length (m)	Vertical (m)	Depth (m)	Inclination (degrees)	Bearing (degrees)	Inclination Uncert (degrees)	Bearing Uncert (degrees)	Radius Uncert (m)	Origin	Indat
KLX10C	RT90-RHB70	6366372.07	1548506.94	16.93	0.00	0.00		-60.03	352.43	0.046	0.734	0.00	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366373.56	1548506.74	14.34	3.00	2.60		-60.00	352.43	0.046	0.734	0.02	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366375.05	1548506.55	11.74	6.00	5.20		-59.89	352.77	0.046	0.734	0.04	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366376.54	1548506.37	9.14	9.00	7.79		-59.86	353.11	0.046	0.734	0.06	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366378.04	1548506.19	6.55	12.00	10.38		-59.86	353.45	0.046	0.734	0.08	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366379.53	1548506.02	3.96	15.00	12.98		-59.86	353.79	0.046	0.734	0.10	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366381.03	1548505.86	1.36	18.00	15.57		-59.86	354.13	0.046	0.734	0.12	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366382.53	1548505.71	-1.23	21.00	18.17		-59.86	354.47	0.046	0.734	0.13	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366384.03	1548505.57	-3.83	24.00	20.76		-59.81	354.47	0.046	0.734	0.15	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366385.53	1548505.42	-6.42	27.00	23.35		-59.78	354.35	0.046	0.734	0.17	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366387.04	1548505.27	-9.01	30.00	25.95		-59.74	354.35	0.046	0.734	0.19	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366388.54	1548505.12	-11.60	33.00	28.54		-59.67	354.35	0.046	0.734	0.21	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366390.05	1548504.98	-14.19	36.00	31.13		-59.66	354.54	0.046	0.734	0.23	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366391.56	1548504.83	-16.78	39.00	33.71		-59.59	354.54	0.046	0.734	0.25	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366393.07	1548504.69	-19.37	42.00	36.30		-59.53	354.70	0.046	0.734	0.27	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366394.59	1548504.55	-21.95	45.00	38.89		-59.52	354.70	0.046	0.734	0.29	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366396.11	1548504.41	-24.54	48.00	41.47		-59.45	354.79	0.046	0.734	0.31	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366397.63	1548504.27	-27.12	51.00	44.05		-59.42	354.98	0.046	0.734	0.33	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366399.15	1548504.14	-29.70	54.00	46.64		-59.37	354.97	0.046	0.734	0.35	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366400.67	1548504.01	-32.28	57.00	49.22		-59.31	355.08	0.046	0.734	0.37	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366402.20	1548503.88	-34.86	60.00	51.80		-59.24	355.22	0.046	0.734	0.39	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366403.73	1548503.75	-37.44	63.00	54.37		-59.17	355.40	0.046	0.734	0.41	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366405.26	1548503.63	-40.01	66.00	56.95		-59.11	355.77	0.046	0.734	0.43	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366406.80	1548503.53	-42.59	69.00	59.52		-59.06	356.23	0.046	0.734	0.45	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366408.34	1548503.42	-45.16	72.00	62.09		-59.03	356.23	0.046	0.734	0.47	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366409.88	1548503.32	-47.73	75.00	64.67		-58.95	356.31	0.046	0.734	0.49	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366411.43	1548503.23	-50.30	78.00	67.23		-58.90	356.43	0.046	0.734	0.51	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366412.98	1548503.13	-52.87	81.00	69.80		-58.83	356.76	0.046	0.734	0.53	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366414.53	1548503.05	-55.43	84.00	72.37		-58.77	357.09	0.046	0.734	0.55	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366416.09	1548502.98	-58.00	87.00	74.93		-58.72	357.89	0.046	0.734	0.57	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366417.64	1548502.93	-60.56	90.00	77.50		-58.66	358.16	0.046	0.734	0.59	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366419.20	1548502.88	-63.12	93.00	80.06		-58.60	358.20	0.046	0.734	0.61	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366420.77	1548502.83	-65.68	96.00	82.62		-58.47	358.31	0.046	0.734	0.63	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366422.34	1548502.79	-68.24	99.00	85.17		-58.42	358.46	0.046	0.734	0.65	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366423.91	1548502.74	-70.79	102.00	87.73		-58.36	358.50	0.046	0.734	0.67	Measured	2007-02-06 08:27

KLX10C	RT90-RHB70	6366425.48	1548502.70	-73.35	105.00	90.28	-58.31	358.50	0.046	0.734	0.69	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366427.06	1548502.67	-75.90	108.00	92.83	-58.24	358.77	0.046	0.734	0.71	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366428.64	1548502.63	-78.45	111.00	95.38	-58.16	358.80	0.046	0.734	0.73	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366430.23	1548502.60	-80.99	114.00	97.93	-58.07	358.89	0.046	0.734	0.75	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366431.82	1548502.59	-83.54	117.00	100.47	-57.97	359.99	0.046	0.734	0.77	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366433.41	1548502.60	-86.08	120.00	103.02	-57.92	0.81	0.046	0.734	0.79	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366435.00	1548502.62	-88.62	123.00	105.56	-57.81	0.96	0.046	0.734	0.81	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366436.60	1548502.64	-91.16	126.00	108.10	-57.78	0.74	0.046	0.734	0.83	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366438.20	1548502.66	-93.70	129.00	110.63	-57.68	0.27	0.046	0.734	0.85	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366439.81	1548502.67	-96.23	132.00	113.17	-57.63	0.27	0.046	0.734	0.87	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366441.42	1548502.67	-98.77	135.00	115.70	-57.58	359.84	0.046	0.734	0.89	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366443.03	1548502.67	-101.30	138.00	118.23	-57.52	0.54	0.046	0.734	0.91	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366444.64	1548502.69	-103.83	141.00	120.76	-57.42	0.32	0.046	0.734	0.93	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366446.26	1548502.70	-106.35	144.00	123.29	-57.38	0.42	0.046	0.734	0.95	Measured	2007-02-06 08:27
KLX10C	RT90-RHB70	6366447.47	1548502.70	-108.25	146.25	125.18	-57.38	0.42	0.046	0.734	0.97	Measured	2007-02-06 08:27

Number of rows: 50.

Printout from SICADA 2007-10-26 10:58:54.