

Report

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Boremap mapping of core drilled borehole KFR117–KFR121

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Abstract

This report presents the geological mapping of the core drilled boreholes KFR117–KFR121, drilled from the pier at SFR with the purpose to provide data for updating of the geological and hydrological model. The length of the individual boreholes KFR117–KFR120 is approximately 176 m, and KFR121 362 m.

The boreholes were mapped by the Boremap system, which integrates information from the drill core with an OPTV-image to calculate the position and orientation of the mapped structures.

The two dominating rock types in KFR117 and KFR119–KFR121 are medium- to coarse-grained pegmatite (rock code 101061) and fine- to medium-grained metagranite (rock code 101057). KFR118 is dominated by fine- to medium-grained granite (rock code 111058).

Subordinated rock types are felsic to intermediate volcanic rock (rock code 103076), amphibolite (rock code 102017) and fine- to medium-grained metagranitoid (rock code 101051).

In addition, rock occurrences (rock types < 1 m in borehole length) of veins, dykes and segregations occur frequently in all five boreholes.

The rock types in KFR117–KFR121 shows different degrees of deformation from faintly foliated pegmatite (rock code 101061) and granite (rock code 111058) to more intensely foliated metagranite (rock code 101057). The granite and metagranite also exhibit a linear component most evident in KFR120 and KFR121. There are two dominating orientations for the foliation in the five boreholes, one steeply dipping in ESE–WNW direction and one moderately dipping in NNE–SSW direction.

Alterations affects the boreholes in varying degrees. In KFR121 is 40 % of the borehole length affected by some kind of alteration. Least altered is KFR119 with only 1 % of the borehole length affected by alteration. Alterations that occur in all five boreholes are oxidation, chloritization, albitization and laumontitization.

The frequency for open fractures varies from 2.2 fractures/m in KFR119 to 4.1 fractures/m in KFR118. The frequency for sealed fractures is also lowest in KFR119 with 3.0 fractures/m and highest in KFR120 with 6.3 fractures/m.

The most common mineral fillings for both open and sealed fractures in KFR117–KFR121, but in varying proportions for the five boreholes, are calcite, chlorite, laumontite and oxidized walls.

The orientation of open fractures shows a pronounced set of subhorizontal to gently dipping fractures. This set is also visible for the sealed fractures, although not as pronounced. There are two additional sets of sealed fractures, striking in NNW–SSE and E–W direction, subvertical- and moderately dipping towards NE and S, respectively.

Sammanfattning

Denna rapport presenterar resultatet från Boremap-karteringen av kärnborrhålen KFR117–KFR121, borrade från piren vid SFR med syftet att komplettera den geologiska- och hydrologiska modellen. Längden på borrhålen KFR117–KFR120 är ca 176 m vardera och KFR121 är 362 m.

Borrhålen karterades med Boremapsystemet, vilket integrerar information från borkärnan med en OPTV-bild för att beräkna läge och orientering av de karterade strukturerna.

De två dominerande bergarterna i KFR117 och KFR119–KFR121 är medium- till grovkornig pegmatit (bergartskod 101061) och fin- till medelkornig metagranit (bergartskod 101057). KFR118 domineras av fin- till medelkornig granit (bergartskod 111058).

Övriga underordnade bergarter är felsisk- till intermediär metavulkanit (bergartskod 103076), amfibolit (bergartskod 102017) och fin- till medelkornig metagranitoid (bergartskod 101051).

Därutöver förekommer mindre bergartsförekomster (bergarter < 1 m i borrhållängd) frekvent i alla fem borrhål som ådror, gångar och segregeringar.

Bergarterna i KFR117–KFR121 visar olika grad av deformation, från mycket svagt folierad pegmatit (bergartskod 101061) och granit (bergartskod 111058) till mer intensivt folierad metagranit (bergartskod 101057). Graniten och metagraniten uppvisar även stänglighet, mest tydlig i KFR120 och KFR121. Det finns två dominerande orienteringar för foliationen i de fem borrhålen, en med brant stupning i OSO–VNV riktning, och en moderat stupande med riktning NNO–SSV.

Omvandlingar påverkar borrhålen i olika omfattning. I KFR121 är 40 % av borrhållängden påverkad av någon slags omvandling. KFR119 är minst omvandlat med endast 1 % av borrhållängden påverkad av omvandling. Omvandlingar som förekommer i samtliga fem borrhål är oxidation, kloritomvandling, albitisering och laumontitomvandling.

Frekvensen för öppna sprickor varierar från 2.2 sprickor/m i KFR119 till 4.1 sprickor/m i KFR118. Frekvensen för läkta sprickor är också som lägst i KFR119 med 3.0 sprickor/m och som högst i KFR120 med 6.3 sprickor/m.

De vanligaste förekommande sprickmineral för både öppna och läkta sprickor i KFR117–KFR121, men i varierande proportioner för de fem borrhålen, är kalcit, klorit, laumontit och oxiderade väggar.

Orienteringen av de öppna sprickorna visar ett tydligt set med subhorisontella- till svagt stupande sprickor. Detta set förekommer även för de läkta sprickorna, om än inte lika tydligt. Det finns två ytterligare set med läkta sprickor som stryker i en NNV–SSO och O–V riktning, som stupar mot NO, respektive S.

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1 Introduction

To create capacity for storage of demolition waste from the Swedish nuclear power plants, SKB will expand the existing repository of low- and intermediate-level waste, SFR. The expansion is planned in conjunction to the existing facility, located under the sea outside Stora Asphällan.

This report presents the result from mapping of the core drilled boreholes KFR117–KFR121, drilled from the pier at SFR, Figure 1-1. KFR117–KFR120 are approximately 176 m long each with a subvertical inclination towards NE for KFR117 and KFR120, and towards SW for KFR118 and 119. KFR121 is 362 m long with a moderate inclination towards SW.

The purpose of the boreholes is to complement the geological- and hydrological model with data, and in addition KFR121 will be instrumented for geohydrological and hydrochemical monitoring.

The boreholes were drilled during the period of April to June 2020 with subsequent logging by Optical Televiwer (OPTV).

Geological mapping with the Boremap system, integrating information from the drill core with the OPTV-image to calculate the position and orientation of mapped structures, was performed in the period of May to November 2020.

Table 1-1 presents technical information about the five boreholes.

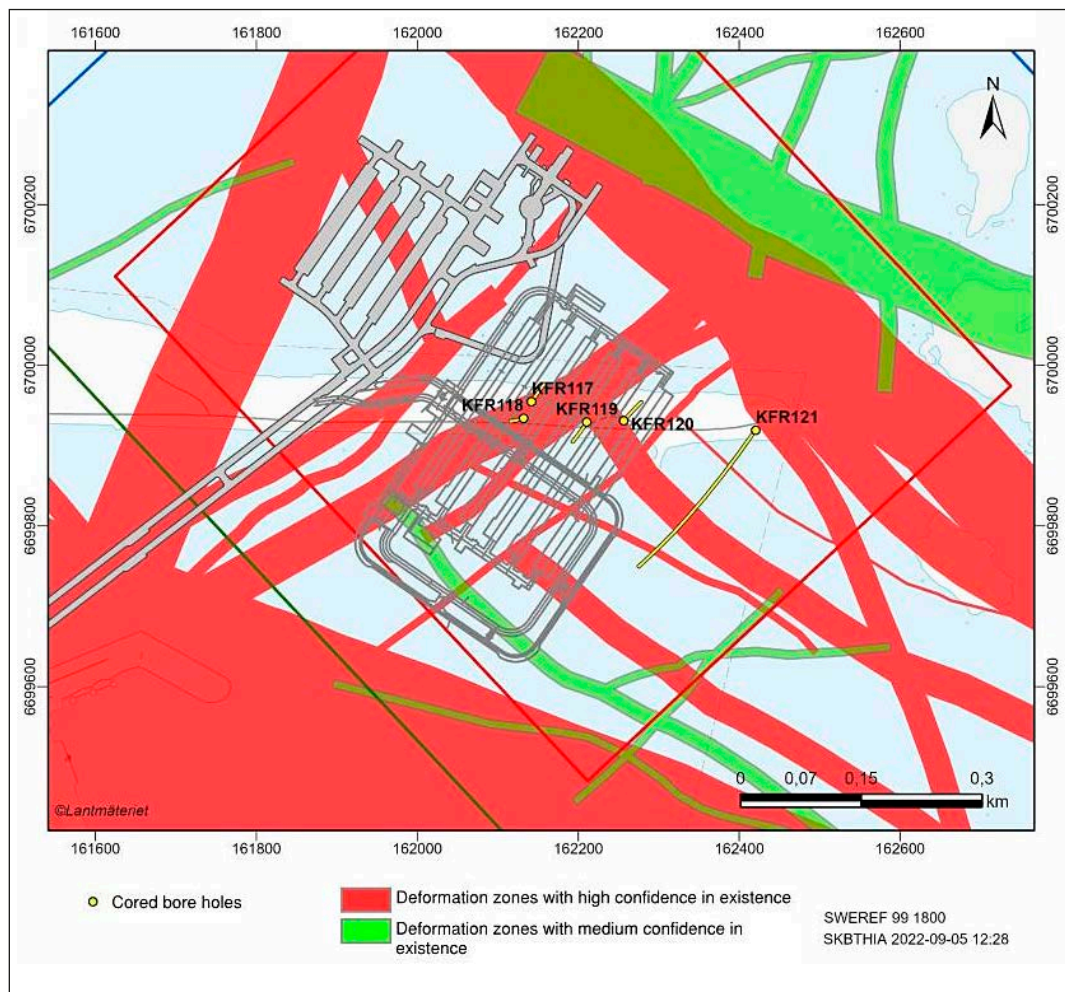


Figure 1-1. Surface projection of boreholes KFR117–KFR121. SFR1 and SFR3 are highlighted in light- and dark grey, respectively.

Table 1-1. Technical information of the boreholes KFR117–121.

KFR117	
Northing (m)	6699954.80 (SWEREF 99 18 00)
Easting (m)	162141.98 (SWEREF 99 18 00)
Elevation at top of casing (m)	2.44 (RH2000)
Bearing (°)	34.05
Inclination (°)	–80.59
Diameter (mm)	76
Length, core drilled part (m)	9.00–176,01
KFR118	
Northing (m)	6699934.01 (SWEREF 99 18 00)
Easting (m)	162132.41 8 (SWEREF 99 18 00)
Elevation at top of casing (m)	3.16 (RH2000)
Bearing (°)	236.00
Inclination (°)	–85.59
Diameter (mm)	76
Length, core drilled part (m)	12.00–175.48
KFR119	
Northing (m)	699929.31 (SWEREF 99 18 00)
Easting (m)	162210.71 (SWEREF 99 18 00)
Elevation at top of casing (m)	3.10 (RH2000)
Bearing (°)	210.48
Inclination (°)	–80.79
Diameter (mm)	76
Length, core drilled part (m)	9.00–176.47
KFR120	
Northing (m)	6699930.77 (SWEREF 99 18 00)
Easting (m)	162256.47 (SWEREF 99 00)
Elevation at top of casing (m)	3.19 (RH2000)
Bearing (°)	37.41
Inclination (°)	–79.88
Diameter (mm)	76
Length, core drilled part (m)	12.00–176.91
KFR121	
Northing (m)	6699919.24 (SWEREF 99 18 00)
Easting (m)	162420.29 (SWEREF 99 18 00)
Elevation at top of casing (m)	2.87 (RH2000)
Bearing (°)	215.97
Inclination (°)	–52.45
Diameter (mm)	76
Length, core drilled part (m)	40.50–362.53

2 Objective and scope

The purpose of the geological mapping is to document all structures and lithologies in KFR117–KFR121.

This report describes the data obtained from the Boremap mapping of the five drill cores, which was performed and documented in accordance with the controlling documents listed in Table 2-1.

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

Documents	Number	Version
Boremapkartering av KFR117–KFR121	AP SFK-20-004	1.0
Mätsystembeskrivning för Boremap	SKB MD 146.005, SKB MD 146.006, SKB MD 146.007	4.0 2.0 2.0
Metodbeskrivning för Boremapkartering	SKB MD 143.006	3.0
Nomenklatur vid Boremapkartering	SKB MD 143.008	1.0
Instruktion: Regler för bergarters benämningar vid platsundersökningen i Forsmark	SKB MD 132.005	1.0

3 Equipment

3.1 Description of equipment and interpretation tools

The core logging was performed with the mapping software Boremap v. 7.1. The bedrock and mineral standards used for surface mapping at the Forsmark investigation site are used to enable correlation with the surface geology. Measurements of orientation of planar structures (fractures, foliations, lithological contacts etc) are made on the linked OPTV-image of the borehole wall, and orientations of the structures are calculated by the Boremap system. Azimuth and inclination of the borehole and the borehole diameter are used as in-data for the orientation calculations.

Equipment used to facilitate the core mapping are folding rule, 10 % hydrochloric acid, hand lens, paint brush and water.

3.2 OPTV-image

Optical televiewer (OPTV) makes a digital scan of the borehole and provides a highly resolved and oriented image of the borehole wall in one plane (360°).

The horizontal resolution of the OPTV-images is 720 pixels along the borehole perimeter. The vertical resolution depends on the logging speed, but when exporting the images in the OPTV software to the file format used in Boremap (LGX.HED), the resolution becomes 1 pixel/mm.

Parts of the OPTV-files for KFR117–KFR121 are too dark for identification of thin fractures. Therefore, light-adjusted jpg-images generated by the OPTV-software, was simultaneously studied to be able to see all fractures. The jpg-images also have the original vertical resolution generated during logging, ranging between 0.4 and 0.6 mm.

The borehole images of KFR117–KFR121 are presented in Appendix 1 and information about the used OPTV-files are listed in Table 3-1.

Table 3-1. Information about the used OPTV-files.

KFR117	
OPTV-file	KFR117n200511_H_LGX.HED
Logging date	2020-05-11
From, recorded length (m)	1.55
To recorded length (m)	176.239
KFR118	
OPTV-file	KFR118n200525_H_LGX.HED
Logging date	2020-05-25
From, recorded length (m)	1.55
To, recorded length (m)	175.438
KFR119	
OPTV-file	KFR119n200526_H_LGX.HED
Logging date	2020-05-26
From, recorded length (m)	1.55
To, recorded length (m)	176.879
KFR120	
OPTV-file	KFR120ner 200818_H_LGX.HED
Logging date	2020-08-18
From, recorded length (m)	1.55
To, recorded length (m)	176.330
KFR121	
OPTV-file	KFR121 200817ner_H_LGX.HED
Logging date	2020-08-17
From, recorded length (m)	1.56
To, recorded length (m)	362.009

4 Execution

4.1 General

Boremap mapping of the core drilled boreholes KFR117–KFR121, was performed and documented according to activity plan AP SFK-20-004.

4.2 Preparations

The drill cores were disposed on roller tables in Geosigmas core mapping facility in Uppsala.

The length adjustment of the OPTV-image is based on clearly identifiable geological reference features as fractures and rock contacts, identified both in the OPTV-image (Appendix 1) and the core.

Background data necessary for calculations of structure orientations in Boremap include diameter and orientation of the boreholes. When starting a new mapping the id-code, azimuth and inclination of the borehole are directly imported from SICADA and the borehole diameter is manually entered in Boremap.

Orientations of fractures and structures, as well as apertures and widths wider than 0.5 mm, are measured in the OPTV-image.

4.3 Fracture definitions

Two types of fractures, broken and unbroken, are registered in Boremap depending on whether the core is split through the core axis or not. In the SICADA database fractures with apertures > 0 mm are registered as open, and fractures with apertures = 0 mm are registered as sealed, Figure 4-1.

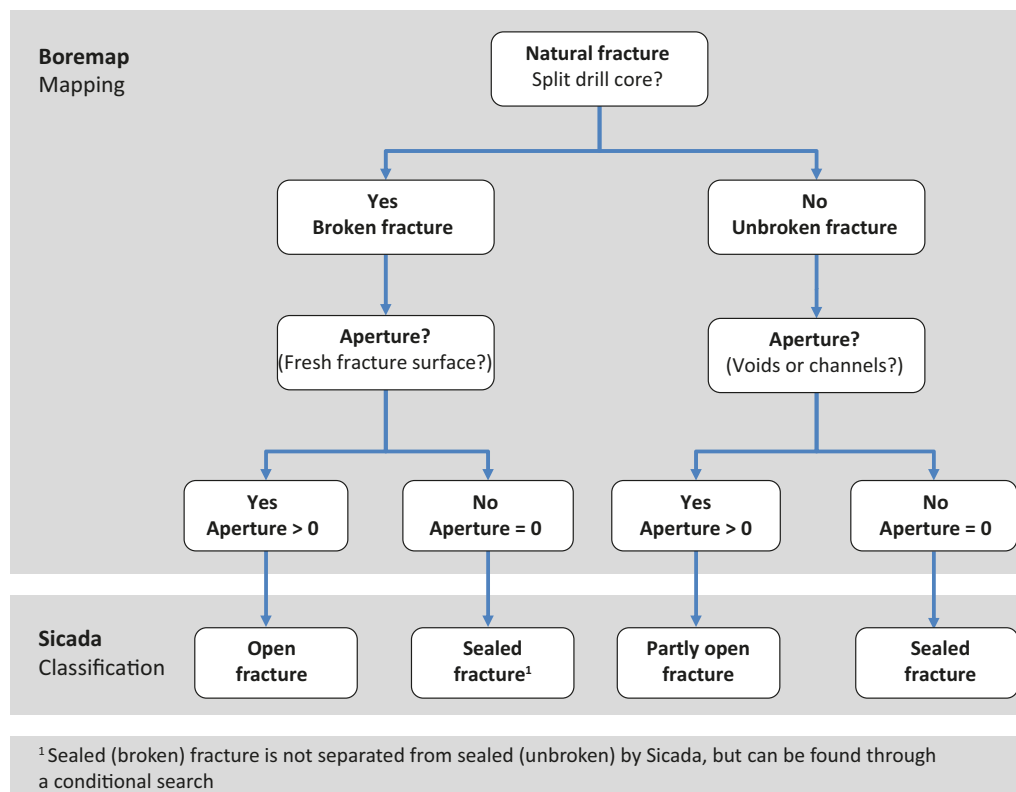


Figure 4-1. Connection between fracture concepts in Boremap and SICADA.

All fractures are described with their fracture minerals, width, aperture, roughness and alteration. To decide whether a fracture was open, partly open or sealed prior to drilling, the aperture confidence is expressed as “certain”, “probable” or “possible”. The confidence level depends on weathering of fracture surfaces, fit of the core pieces and if the fracture has a visible aperture in the OPTV-image.

Sealed networks are mapped in intervals where abundant sealed fractures makes it difficult to discern individual fractures, or if they are too many to map individually within a reasonable time. The sealed networks are mapped with the four dominant fracture orientations, the most common minerals, alteration and the average fracture distance.

Crush zones are accumulations of open fractures where the drill core cannot be reconstructed or has such a high fracture frequency that detailed mapping is not possible. Crush zones are mapped with the four dominant fracture orientations, most common minerals, joint roughness, joint alteration and alteration of the fracture with the lowest strength in the crush zone and the average length of the core pieces.

4.4 Data handling

The mapping of KFR117–KFR121 is performed with automatic synchronization with SKB’s database SICADA. When the mapping is completed it is quality checked by the operator, the “Check mapping” routine in Boremap and a reviewer.

The data from the reported activity are stored in SKB’s database SICADA and are also traceable by the Activity Plan number (AP SFK-20-004). Only data in the SICADA database are accepted for further interpretation and modelling. The data may be revised, if needed, but such revisions will not necessarily result in a revision of the P-report. However, the normal procedure is that major data revisions entail a revision of the P-report. Minor data revisions are normally presented as supplements, available at www.skb.se.

4.5 Non conformities

Core losses are registered in KFR118, KFR120 and KFR121, Table 4-1. The small core losses in KFR120 are small core pieces missing between two adjacent open fractures.

Table 4-1. Core losses in KFR118, KFR120 and KFR121.

Borehole	Core loss interval (m)	Length (m)
KFR118	77.773–77.859	0.086
KFR120	94.779–94.796	0.017
	96.506–96.523	0.017
	105.094–105.118	0.024
	111.941–111.951	0.010
	112.904–112.925	0.021
	145.704–145.712	0.008
KFR121	94.403–94.677	0.274
	144.441–144.540	0.099
	326.351–326.600	0.249
	326.951–327.250	0.299

Due to reaction with hydrochloric acid, calcite is detected even in very small amounts and run the risk of getting overestimated relative to other minerals.

5 Results

5.1 KFR117

Graphical presentations of the borehole data for KFR117–KFR121 are presented in WellCAD-plots in Appendix 2.

5.1.1 Lithology

The dominating rock types in KFR117 are 45 % medium- to coarse-grained pegmatite (rock code 101061), 35 % fine- to medium-grained metagranite (rock code 101057) and 15 % fine- to medium-grained granite (rock code 111058).

The pegmatite is texturally heterogenous with variable grain size, a reddish white to greyish red color and faintly foliated. Pegmatite also occurs frequently as veins throughout other rock types in the borehole.

The metagranite is generally fine- to medium-grained with elongated quartz and feldspars and thin streaks of biotite, but intervals with higher deformation and grain-size reduction are also observed. The color varies from greyish red to completely grey when altered by albitization. The metagranite have two intervals between 96 and 107 m with varying portions of muscovite replacing biotite in the foliation planes. Intervals with muscovite are registered in Boremap as sericitization.

The fine- to medium-grained granite (rock code 111058) is mapped in two intervals and is equigranular with a greyish red color and a massive to faintly foliated structure.

In addition, there is three intervals of fine-grained, weak to medium foliated felsic to intermediate volcanic rock (rock code 103076), and one interval of amphibolite (rock code 102017), rich in biotite and altered by chloritization.

Rock occurrences (rock types < 1 m in borehole length) of veins, dykes and segregations occupy 10 % of the logged drill core. Except for occurrences of the predominant rock types, granite (rock code 1058), quartz-dominated hydrothermal veins (rock code 8021) and aplite (rock code 1062) are registered in KFR117.

5.1.2 Ductile structures

The rock types in KFR117 shows different degrees of deformation. The pegmatite (rock code 101061) is faintly foliated and the metagranite (rock code 101057) is generally dominated by a medium foliation, but also a linear component most evident in the upper part of the borehole.

As shown in the stereographic projection in Figure 5-1, the foliation in KFR117 generally strikes in an E–W direction moderately dipping towards north or south.

5.1.3 Alterations

Different alterations are affecting 18 % (30.5 m) of KFR117, Table 5-1.

Oxidation is mapped in three intervals with higher fracture frequencies.

Muscovitization, mapped as sericitization, where muscovite replaces biotite in the foliation planes, is mapped in in two intervals between 96 and 107 m, and is affecting the metagranite (rock code 101057) and the felsic to intermediate volcanic rock (rock code 103076).

Chloritization is restricted to the amphibolites (rock code 102017) and albitization to the metagranite (rock code 101057) in contact with amphibolites.

The intervals of laumontization, argillization and carbonatization are all associated with the mapped brecciated zones.

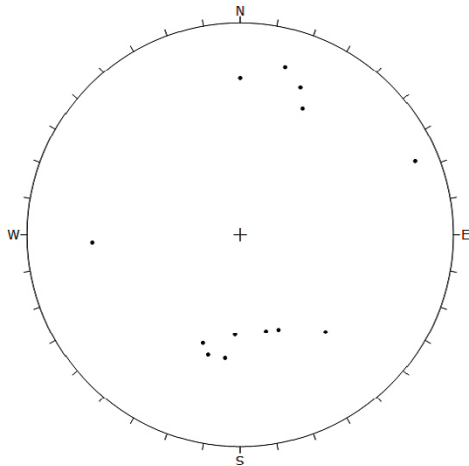


Figure 5-1. Orientation of poles to foliation planes ($n = 13$) in KFR117, plotted on lower hemisphere equal area projection.

Table 5-1. Alterations in KFR117.

Alterations	Total length (m)	Total length (%)
Oxidation	14.3	8.6
Muscovitization	6.2	3.7
Chloritization	5.4	3.2
Albitization	3.3	2.0
Laumontization	0.6	0.4
Argillization	0.4	0.3
Carbonatization	0.2	0.1

5.1.4 Fractures

The total number of open and sealed fractures in KFR117 are 576 and 761, respectively, and 35 fractures are partly open (sealed fractures with apertures > 0 mm). The resulting fracture frequency is 3.4 open fracture/meter and 4.6 sealed fracture/meter (including partly open fractures).

In Figure 5-2a and b the orientation of open and sealed fractures is plotted in stereographic projections. Both the open and sealed fractures have a set of subhorizontal fractures and an additional set, more prominent for the sealed fractures, striking with scattering in an E–W to ENE–WSW direction moderately dipping towards south and SSE.

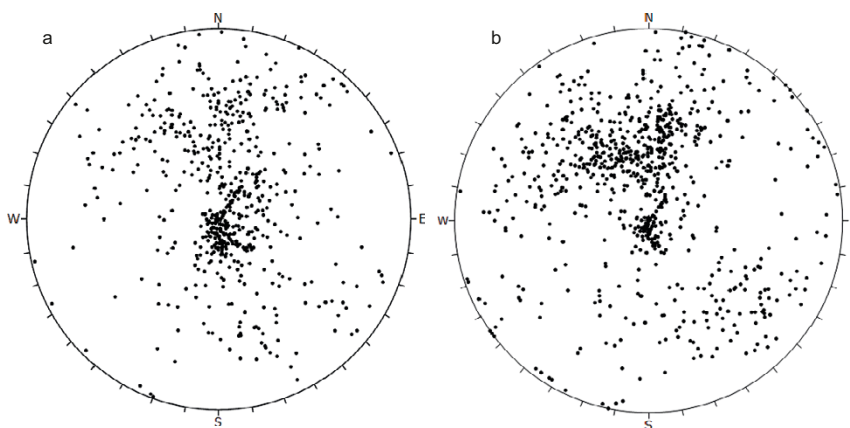


Figure 5-2. Orientation of poles to a) open ($n = 579$) and b) sealed and partly open fracture ($n = 763$) planes in KFR117, plotted on lower hemisphere equal area projection.

Two minor crushed intervals are registered in KFR117, Table 5-2. The OPTV-images of the two crushes are shown in Figure 5-3.

Table 5-2. Crushed intervals in KFR117.

Interval (m)	Minerals	Alteration
11.737–11.775	Calcite, clay minerals, chlorite	Moderately altered
145.938–146.037	Muscovite, calcite, clay minerals	Moderately altered

The different minerals detected in open and sealed fractures are presented in Table 5-3. The most common minerals in both types of fractures, but in different proportions, are calcite, chlorite, laumontite and oxidized walls.

Table 5-3. The different minerals and their representation in open and sealed fractures in KFR117.

Open	%	No	Mineral	Sealed	%	No	Mineral
	61.1	352	Calcite		60.1	439	Oxidized walls
	46.9	270	Chlorite		41.9	306	Calcite
	26.6	153	Laumontite		31.7	232	Laumontite
	24.3	140	Oxidized walls		16.8	123	Chlorite
	9.0	52	Hematite		9.3	68	No detectable mineral
	7.8	45	No detectable mineral		3.1	23	Hematite
	6.9	40	Muscovite		3.0	22	Quartz
	5.4	31	Polished walls		2.3	17	Adularia
	4.2	24	Asphalt		1.9	14	Muscovite
	4.0	23	Clay minerals		0.8	6	Zeolite
	2.1	12	Quartz		0.4	3	Asphalt
	1.4	8	Pyrite		0.3	2	Pyrite
	1.2	7	Adularia		0.1	1	Biotite
	0.2	1	White feldspar		0.1	1	Polished walls
					0.1	1	Clay minerals

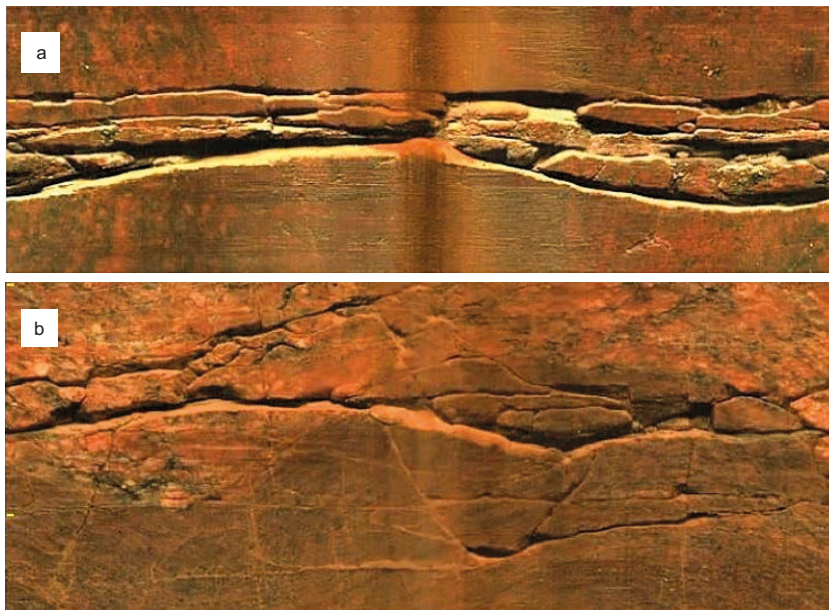


Figure 5-3. OPTV-images of the two crushed intervals in KFR117 at a) 11.737–11.775 m and b) 145.938–146.037 m.

Clay minerals are registered in 23 open fractures. An accumulation of clay fractures is observed just below the casing at 9–12 m, where one of the crush intervals is located, and at 70–72 m, an interval also partly altered by argillization.

The two widest fractures are located at 12.88 and 13.37 m, Figure 5-4, with apertures of 10 and 25 mm, respectively.

Two sealed networks are mapped with a total length of 0.85 m.

Thirteen brecciated intervals, mapped as fault rock, ranging from 1 to 100 cm, are registered in KFR117, Tabell 5-4. Figure 5-5 shows the brecciated interval at 70.293–71.299 m.

Table 5-4. Fault rock intervals in KFR117.

Interval (m)	Length (m)	Fault rock name
39.476–39.723	0.247	Breccia
42.438–43.061	0.623	Breccia
44.063–44.452	0.389	Breccia
44.944–44.956	0.012	Breccia
54.124–54.146	0.022	Breccia
55.322–55.361	0.039	Breccia
59.788–59.818	0.030	Breccia
70.293–71.299	1,006	Breccia
98.968–98.978	0.010	Breccia
143.496–143.636	0.140	Breccia
143.766–143.779	0.013	Breccia
144.537–144.792	0.255	Breccia
175.843–175.854	0.011	Breccia

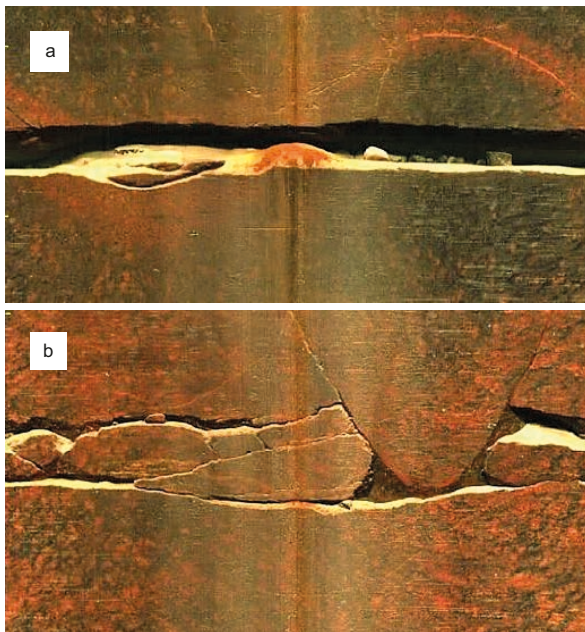


Figure 5-4. The two widest fractures in KFR117 at a) 12.88 and b) 13.37 m, with apertures of 10 and 26 mm, respectively.

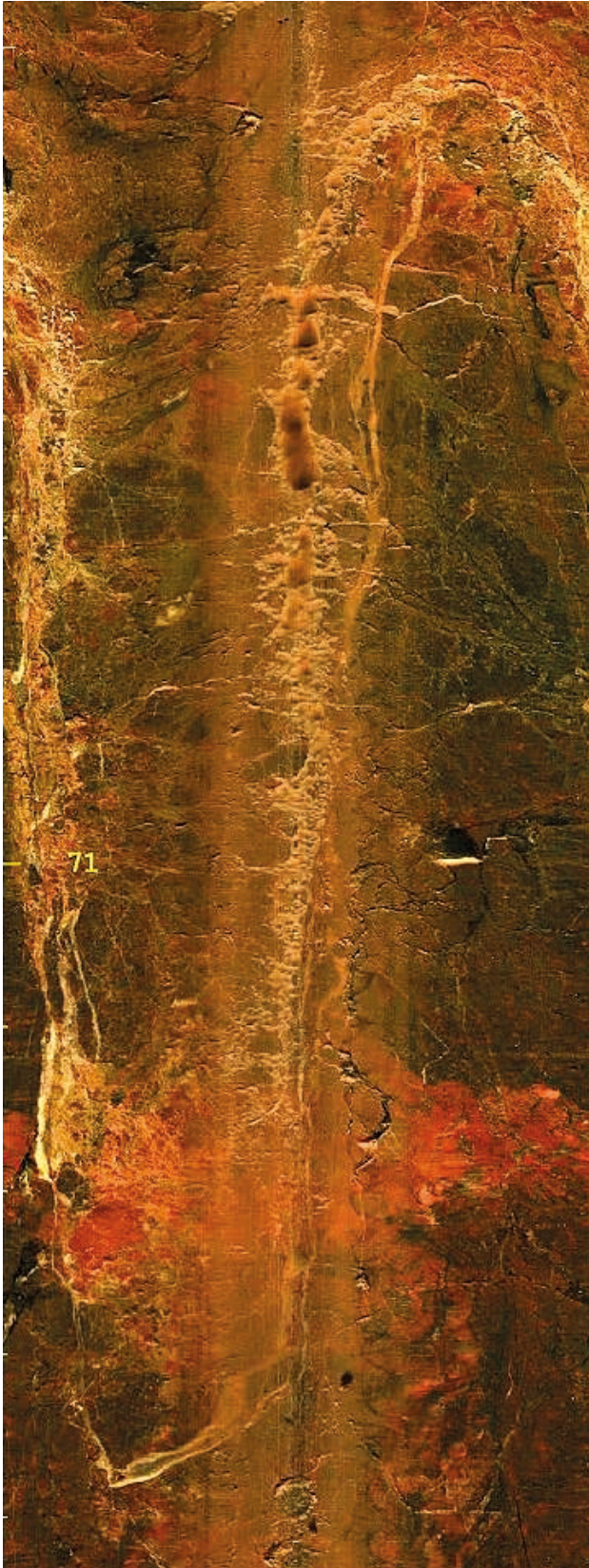


Figure 5-5. Brecciated fault rock in KFR117 at 70.293–71.299 m.

5.2 KFR118

5.2.1 Lithology

The dominating rock type in KFR118 is 75 % fine- to medium-grained granite (rock code 111058). In addition, 18 % medium- to coarse-grained pegmatite (rock code 101061) and 7 % fine- to medium-grained metagranite (rock code 101057) occur mainly in the upper and lower part of the borehole.

The granite is light red or greyish red with a foliated or lineated structure and equigranular texture.

Except for rock occurrences (rock types < 1 m in borehole length) of the predominant rock types in KFR118, granite (rock code 101058) and quartz-dominated hydrothermal veins (rock code 508021) forming veins, dykes and segregations in 9 % of the logged drill core.

5.2.2 Ductile structures

The dominant rock type in KFR118, fine- to medium-grained granite (rock code 111058) and the occurrences of metagranite (rock code 101057) exhibits both a lineated and foliated structure. The pegmatite (rock code 101061) is generally faintly foliated.

Figure 5-6 shows a stereographic projection of the foliation in KFR118, which generally strikes in a N-S to NNE-SSW direction with a moderately- to steep dip to E and SE.

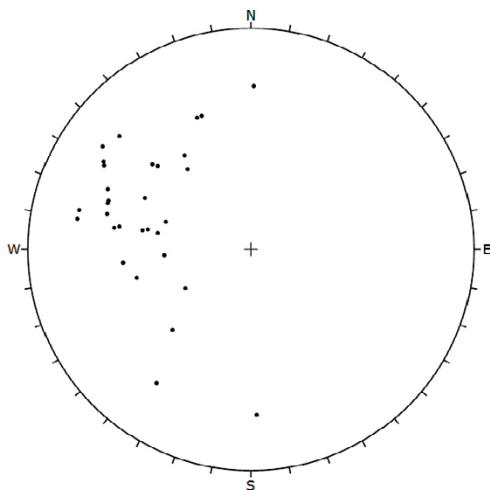


Figure 5-6. Orientation of poles to foliation planes ($n = 31$) in KFR118, plotted on lower hemisphere equal area projection.

5.2.3 Alterations

Alterations are affecting 7.5 % (12.2 m) of KFR118, Table 5-5, where the dominant alterations are argillization, oxidation and chloritization present as rims around fractures.

Additional minor alterations are laumontization, albitization and saussuritization.

Table 5-5. Alterations in KFR118.

Alterations	Total length (m)	Total length (%)
Argillization	5.1	3
Oxidation	3.4	2
Chloritization	2.2	1
Laumontization	0.7	0.4
Albitization	0.6	0.4
Saussuritization	0.1	0.1

5.2.4 Fractures

The total number of open and sealed fractures in KFR118 are 675 and 880, respectively, and 39 fractures are partly open (sealed fractures with apertures > 0 mm). The resulting fracture frequency is 4.1 open fractures/m and 5.4 sealed fractures/m.

In Figure 5-7a and b the orientation of open and sealed fractures is plotted in stereographic projections.

Both the open and sealed fractures show scattering in orientation, but three pronounced sets can be seen for both types of fractures. Most dominant for the open fractures is a subhorizontal set. Two additional sets, striking in a NW–SE and E–W direction, steeply- and moderately dipping towards NE and S, respectively, are prominent for both open and sealed fractures.

No crush is registered in KFR118.

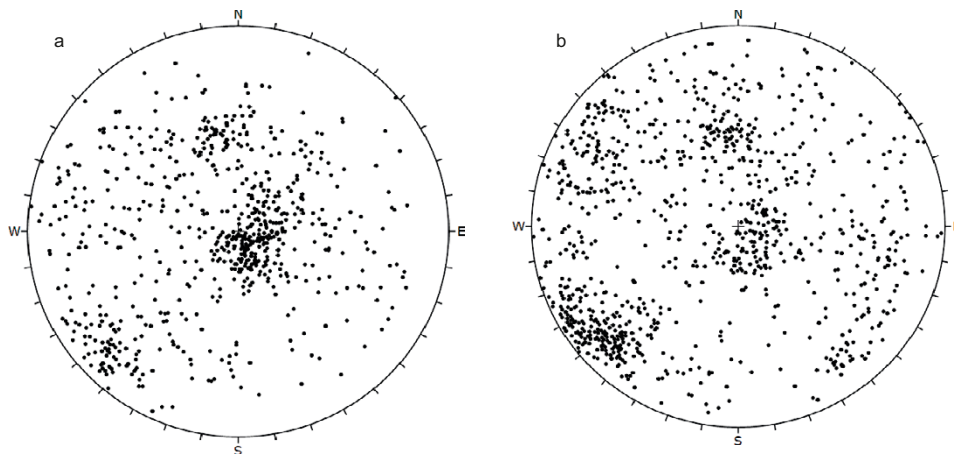


Figure 5-7. Orientation of poles to a) open ($n = 675$) and b) sealed and partly open fracture planes ($n = 919$) in KFR118, plotted on lower hemisphere equal area projection.

The different minerals detected in open and sealed fractures are presented in Table 5-6. The most common minerals for both open and sealed fractures in KFR118 are calcite, chlorite and laumontite, but in different proportions. Clay minerals are registered in 117 open fractures with an increase in the lower part of the borehole at 145–175 m.

Table 5-6. The different minerals and their representation in open and sealed fractures.

Open	%	No	Mineral	Sealed	%	No	Mineral
	76.6	517	Calcite		85.7	754	Calcite
	45.2	305	Chlorite		36.5	321	Laumontite
	29.3	198	Laumontite		11.5	101	Chlorite
	17.3	117	Clay minerals		11.3	99	Oxidized walls
	13.2	89	Hematite		5.9	52	Hematite
	8.3	56	Oxidized walls		1.1	10	No detectable minerals
	5.3	36	No detectable minerals		0.8	7	Clay minerals
	4.7	32	Muscovite		0.5	4	Muscovite
	4.3	29	Illite		0.1	1	Illite
	1.0	7	Pyrite		0.1	1	Quartz
	1.0	7	Talc		0.1	1	Zeolite
	0.6	4	Red feldspar				
	0.6	4	Quartz				
	0.4	3	Asphalt				
	0.4	3	Biotite				
	0.3	2	Zeolite				
	0.1	1	White feldspar				
	0.1	1	Iron hydroxide				

The widest fracture in KFR118 is located just below the casing at 12.12 m with an aperture of 11 mm, Figure 5-8.

Sealed networks are mapped in 48 intervals with a total length of 23.38 m. The most common filling is calcite, laumontite and hematite.



Figure 5-8. The widest fractures in KFR118 at 12.12 m, with an aperture of 11 mm.

Brecciated and cataclastic zones, mapped as fault rock, are mapped in 17 minor intervals in KFR118, ranging from 1 to 30 mm, Tabell 5-7. Figure 5-9 shows the brecciated- and cataclastic fault rock at 29.537–29.828 and 108.445–108.457 m, respectively.

Table 5-7. Fault rock intervals in KFR118.

Interval (m)	Length (m)	Fault rock name
29.537–29.828	0.291	Breccia
32.223–32.296	0.073	Breccia
53.519–53.649	0.13	Breccia
71.206–71.252	0.046	Breccia
77.470–77.509	0.039	Cataclastic
108.445–108.457	0.012	Cataclastic
112.191–112.241	0.05	Breccia
115.612–115.619	0.007	Cataclastic
135.571–135.579	0.008	Cataclastic
145.222–145.233	0.011	Cataclastic
148.302–148.310	0.008	Cataclastic
152.851–152.997	0.146	Breccia
160.388–160.395	0.007	Cataclastic
163.708–163.717	0.009	Cataclastic
165.452–165.462	0.01	Cataclastic
169.848–169.870	0.022	Cataclastic
169.896–169.908	0.012	Cataclastic

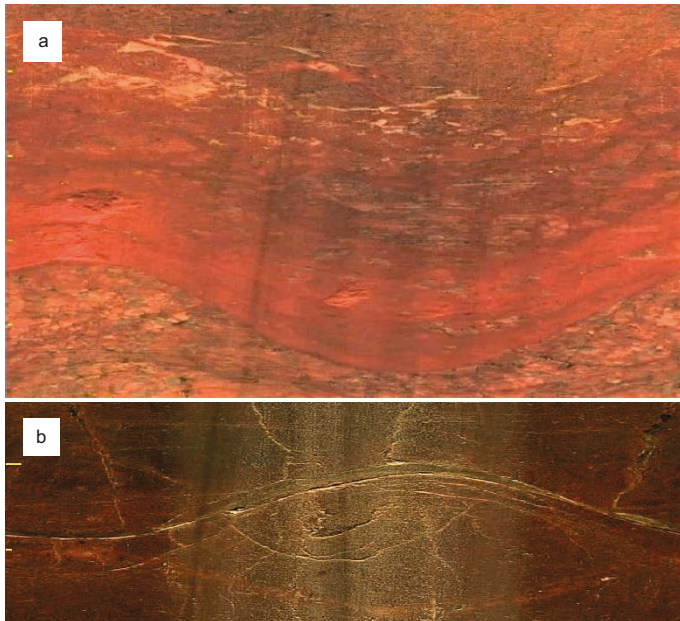


Figure 5-9. a) A brecciated fault rock at 29.537–29.828 m and b) cataclastic fault rock at 108.445–108.457 m in KFR118.

5.3 KFR119

5.3.1 Lithology

The dominating rock types in KFR119 is 61 % medium- to coarse-grained pegmatite (rock code 101061) and 25 % fine- to medium-grained metagranite (rock code 101057) in alternating intervals. In addition, there are 11 % fine- to medium-grained metagranitoid (rock code 101051) and 3 % fine- to medium-grained granite (rock code 111058).

The pegmatite is greyish- to pinkish red with a faint to weak deformation and heterogeneous texture, and the metagranite varies from pinkish grey to greyish red with a generally weak deformation.

Two intervals, with a total length of 18.3 m, of pinkish grey, fine- to medium-grained metagranitoid (rock code 101051) are mapped in the upper part of the borehole. The structure is massive to faintly foliated with an equigranular texture.

Fine- to medium-grained granite (rock code 111058) with a total length of 5.7 m are mapped in three short intervals in the second half of the borehole. The granite is greyish red exhibiting both lineation and foliation with an equigranular texture.

Rock occurrences (rock types < 1 m in borehole length) forming veins, dykes and segregations occupy 14 % of the logged drill core. Except for occurrences of the predominating rock types, granite (rock code 1058), amphibolite (rock code 102017) and aplite (rock code 1062) are registered in KFR119.

5.3.2 Ductile structures

The dominating rock types in KFR119 displays a generally faint to weak foliation. As shown in the stereographic projection in Figure 5-10 the foliation in KFR119 is striking, with some scattering, in a NE-SW direction, moderately dipping towards SE.

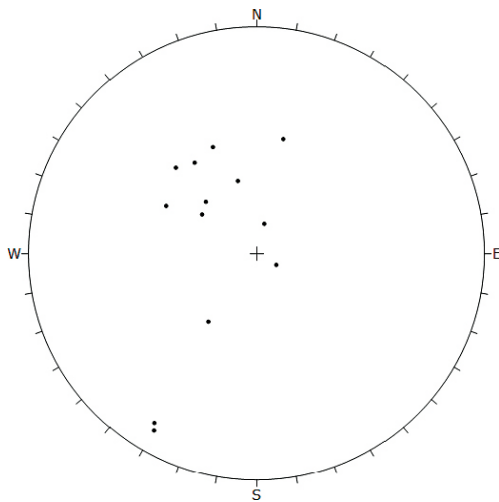


Figure 5-10. Orientation of poles to foliation planes ($n = 13$) in KFR119, plotted on lower hemisphere equal area projection.

5.3.3 Alterations

Only 1.1 % (1.9 m) of the borehole length in KFR119 is mapped with alterations, Table 5-8. These are mainly associated with brecciated zones, mapped as fault rock.

Table 5-8. Alterations in KFR119.

Alterations	Total length (m)	Total length (%)
laumontization	1.0	0.6
Albitization	0.4	0.2
Chloritization	0.4	0.2
Oxidation	0.1	0.1
Carbonatization	0.04	0.0

5.3.4 Fractures

The total number of open and sealed fractures in KFR119 are 365 and 485, respectively, and 15 fractures are partly open (sealed fractures with apertures > 0 mm). The resulting fracture frequency is 2.2 open fracture/meter and 3.0 sealed fracture/meter (including partly open fractures).

In Figure 5-11a and b the orientation of the open and sealed fractures is plotted in stereographic projections. A subhorizontal set is seen for both the open and sealed fractures. The sealed fractures have two additional sets, one with an E–W direction moderately dipping towards S, and one with an NNW–SSE direction and subvertical inclination.

No crushed zones are registered in KFR119.

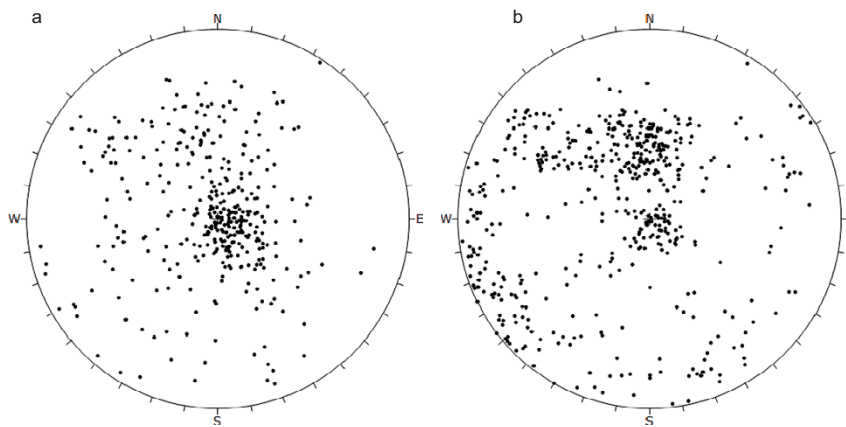


Figure 5-11. Orientation of poles to a) open ($n = 365$) and b) sealed ($n = 500$) fracture planes in KFR119, plotted on lower hemisphere equal area projection.

The different minerals detected in open and sealed fractures in KFR119 are presented in Table 5-9. The most common minerals in open fractures are calcite, chlorite and laumontite and in sealed fractures calcite, oxidized walls and laumontite. Only four fractures with clay minerals are registered in KFR119.

Table 5-9. The different minerals and their representation in open and sealed fractures in KFR119.

Open	%	No	Mineral	Sealed	%	No	Mineral
	73.7	269	Calcite		57.1	277	Calcite
	37.3	136	Chlorite		43.7	212	Oxidized walls
	21.6	79	Laumontite		28.2	137	Laumontite
	12.9	47	Muscovite		27.0	131	Chlorite
	11.5	42	Oxidized walls		6.6	32	No detectable mineral
	8.2	30	No detectable mineral		6.2	30	Quartz
	6.3	23	Hematite		2.9	14	Hematite
	3.8	14	Quartz		1.9	9	Muscovite
	2.7	10	Polished walls		1.4	7	Biotite
	2.5	9	Pyrite		1.2	6	Adularia
	1.1	4	Asphalt		0.2	1	Pyrite
	1.1	4	Clay minerals				
	0.5	2	White feldspar				
	0.5	2	Biotite				
	0.3	1	Talc				
	0.3	1	Zeolite				
	0.3	1	Red feldspar				
	0.3	1	Adularia				

Ten brecciated and one cataclastic zone, mapped as fault rock, are registered in KFR119, ranging in width from 1 to 36 cm, Table 5-11. Figure 5-12 shows the brecciated fault rock at 106.642–106.798 m.

Table 5-10. Fault rock intervals in KFR119.

Interval (m)	Length (m)	Fault rock name
70.393–70.421	0.028	Breccia
94.536–94.556	0.02	Breccia
98.258–98.308	0.05	Breccia
106.454–106.542	0.088	Breccia
106.642–106.798	0.156	Breccia
116.44–116.48	0.04	Breccia
120.773–120.784	0.011	Breccia
121.606–121.625	0.019	Breccia
164.747–164.769	0.022	Cataclastic
165.563–165.921	0.358	Breccia
169.638–169.675	0.037	Breccia

Twelve sealed networks are mapped in KFR119 with a total length of 10.93 m. The sealed network contributes with an additional c 650 sealed fractures, with oxidized walls, laumontite and calcite as the most common minerals.



Figure 5-12. The brecciated fault rock at 106.642–106.798 m in KFR119.

5.4 KFR120

5.4.1 Lithology

The two dominating rock types in KFR120 are 43 % medium- to coarse-grained pegmatite (rock code 101061) and 31 % fine- to medium-grained metagranite (rock code 101057). The two rock types are alternately occurring along the borehole. In addition, there is 14 % fine- to medium-grained granite (rock code 111058) and 11 % amphibolite (rock code 102017).

The pegmatite (rock code 101061) is light greyish white to red, faint to weakly foliated and with a nonequigranular texture.

The color of the metagranite (rock code 101057) is generally grey to reddish grey in the upper half of the borehole and greyish red in the lower half. The rock type exhibits a weak to medium foliation with intervals of rounded feldspar grains mapped as augenbearing, and larger feldspar grains in a more fine-grained groundmass mapped as porphyritic.

The fine- to medium-grained granite (rock code 111058) occur in four intervals and is greyish red with a lineated structure and equigranular texture.

Fine-grained, dark grey amphibolite (rock code 102017) with foliation of faint to weak intensity occurs in three intervals of KFR120.

Rock occurrences (rock types < 1 m in borehole length) forming veins, dykes and segregations occupy 17 % of the logged drill core. Mapped occurrences except for the predominant rock types in KFR120 are aplite (rock code 101058) and quartz-dominated hydrothermal veins (rock code 508021).

5.4.2 Ductile structures

The dominating rock types in KFR120, pegmatite (rock code 101061) and metagranite (rock code 101057), generally shows a faint to weak, and weak to medium intensity foliation, respectively. The foliation is plotted in the stereographic projection in Figure 5-13. Despite some scattering, one set striking in an ESE–WNW direction and dipping steeply to SSW, can be distinguished.

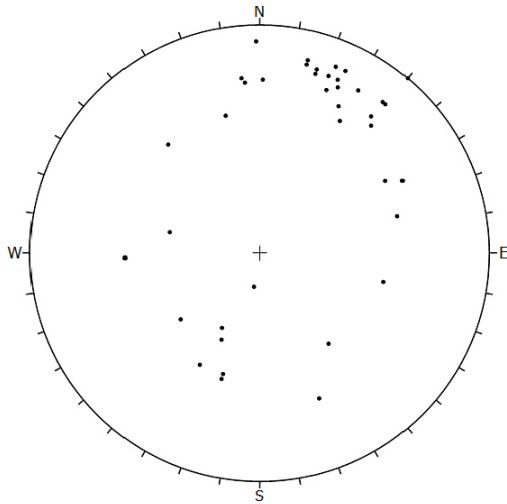


Figure 5-13. Orientation of poles to foliation planes ($n = 38$) in KFR120, plotted on lower hemisphere equal area projection.

5.4.3 Alteration

Different alterations are affecting 14.2 % (23.5 m) of KFR120, Table 5-11. The dominant alterations are albitization of the metagranite (rock code 101057) in contact with the amphibolites (rock code 102017) and oxidation.

Other minor alterations are muscovitization, mapped as sericitization, where muscovite replaces biotite in the foliation planes, argillization in three short intervals at 61.31–61.71, 111.46–11.80 and 169.84–170.34 m, chloritization of amphibolite and laumontization.

Table 5-11. Alterations in KFR120.

Alterations	Total length (m)	Total length (%)
Albitization	10.1	6
Oxidation	7.8	4.8
Muscovitization	2.8	1.7
Argillization	1.5	0.9
Chloritization	1.1	0.6
Laumontization	0.1	0.1
Saussuritization	0.03	< 0.0

5.4.4 Fractures

The total number of open and sealed fractures in KFR120 are 596 and 1045, respectively, and 10 fractures are partly open (sealed fractures with apertures > 0 mm). The resulting fracture frequency is 3.6 open fractures/m and 6.3 sealed fractures/m.

Figure 5-14a and b displays the orientation of open and sealed fractures in stereographic projections. The open fractures show one well-defined set with near horizontal or gently dipping fractures. This horizontal set is also seen for the sealed fractures along with a dominating set of E–W striking fractures moderately dipping towards S, one concentration of steeply dipping fractures in an extended N–S direction and one less pronounced set striking NW moderately dipping towards NE.

One crush is registered in KFR120 at 12.53–12.72 m. This interval is cased and re-drilled due to collapse of the borehole. No minerals were detected on the fracture surfaces, only a slight weathering.

The different minerals detected in open and sealed fractures are presented in Table 5-12. The most common minerals in open fractures are chlorite, calcite and laumontite and in sealed fractures oxidized walls, laumontite and calcite. Clay minerals are registered in 35 open fractures.

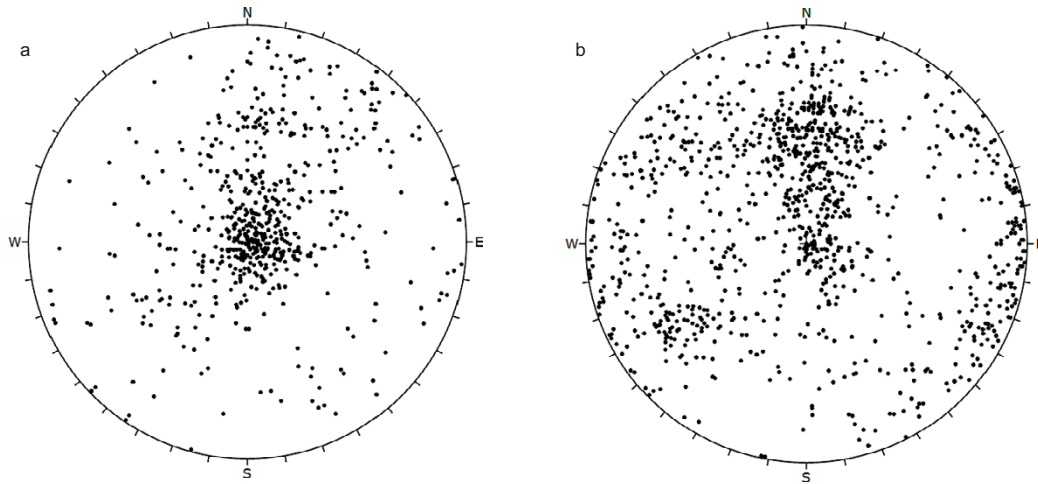


Figure 5-14. Orientation of poles to a) open ($n = 596$) and b) sealed and partly open fracture planes ($n = 1055$) in KFR120, plotted on lower hemisphere equal area projection.

Table 5-12. The different minerals and their representation in open and sealed fractures in KFR120.

Open	%	No	Mineral	Sealed	%	No	Mineral
	47.7	284	Chlorite	45.9	477	Oxidized walls	
	43.6	260	Calcite	38.7	402	Laumontite	
	19.6	117	Laumontite	36.0	374	Calcite	
	13.4	80	No detectable minerals	21.2	220	Chlorite	
	13.3	79	Muscovite	7.4	77	Hematite	
	10.9	65	Oxidized walls	4.8	50	Quartz	
	7.0	42	Hematite	4.6	48	No detectable minerals	
	5.9	35	Clay minerals	3.6	37	Muscovite	
	4.2	25	Quartz	0.6	6	Zeolite	
	2.7	16	Zeolite	0.3	3	Adularia	
	1.2	7	Biotite	0.2	2	Clay minerals	
	0.8	5	Adularia	0.2	2	Pyrite	
	0.7	4	Illite	0.2	2	Unknown mineral	
	0.5	3	Unknown mineral	0.1	1	Illite	
	0.3	2	Magnetite				
	0.2	1	Asphalt				

The widest fracture is located at 15.31 m with an aperture of 6 mm, Figure 5-15.



Figure 5-15. The widest fracture in KFR120 at 15.31 m, with an aperture of 6 mm.

In KFR120 72 sealed networks are mapped with a total length of 22.77 m. The most common minerals are oxidized walls, laumontite and calcite.

Nineteen brecciated and one cataclastic interval, mapped as fault rocks are registered in KFR120, Table 5-13. All fault rocks are very thin, ranging from a few millimeters up to c 8 centimeters. Figure 5-16 shows the brecciated fault rock at 61.346–61.428 m.

Table 5-13. Fault rock intervals in KFR120.

Interval (m)	Length (m)	Fault rock name
31.168–31.180	0.012	Breccia
61.346–61.428	0.082	Breccia
61.785–61.801	0.016	Breccia
62.003–62.025	0.022	Breccia
63.902–63.918	0.016	Breccia
73.207–73.220	0.013	Cataclasite
79.467–79.486	0.019	Breccia
86.954–86.982	0.028	Breccia
87.225–87.242	0.017	Breccia
88.801–88.820	0.019	Breccia
90.119–90.166	0.047	Breccia
112.025–112.039	0.014	Breccia
130.245–130.268	0.023	Breccia
139.201–139.209	0.008	Breccia
139.568–139.574	0.006	Breccia
139.584–139.595	0.011	Breccia
171.086–171.093	0.007	Breccia
171.141–171.147	0.006	Breccia
171.189–171.214	0.025	Breccia
171.252–171.265	0.013	Breccia



Figure 5-16. A brecciated fault rock at 61.346–61.428 m in KFR120.

5.5 KFR121

5.5.1 Lithology

The two dominating rock types in KFR121 is 50 % fine- to medium-grained metagranite (rock code 101057) and 36 % medium- to coarse-grained pegmatite (rock code 101061). Apart from a long interval of metagranite and pegmatite in the upper- and lower part of the borehole, the two rock types occur alternately along the borehole length. Pegmatite also occur abundantly as veins in other rock types.

The metagranite (rock code 101057) in KFR121 exhibit a higher degree of deformation compared to KFR117–120, with intervals of strong foliation and reduction of grain size. There are intervals with larger grains of quartz and feldspar giving the metagranite a porphyritic texture. The color generally varies from reddish grey to greyish red, but there are also completely grey intervals due to albitization in contact zones with amphibolites. Nearly all mapped metagranite is affected by alteration of some kind. In the borehole interval 50–200 m there are several intervals with varying portions of muscovite replacing biotite in the foliation planes. This is registered as the alteration sericitization in Boremap.

The pegmatites (rock code 101061) are generally texturally heterogeneous with variable grain-size and a faint foliation. In the interval 208–212 m the pegmatite has small cavities/vugs probably due to weathered mica mapped as argillization, and hematite in microfractures and grain boundaries, mapped as weak oxidation.

There are six intervals of amphibolitic rock (rock code 102017), ranging from 1.5 to 7.6 m in length. The amphibolites are fine-grained, partly with large proportions of biotite, and a color that varies from grey to more greenish grey for intervals altered by chloritization. The foliation is varying from faint to strong and is hard to discern in some of the most fine-grained parts. Garnets and coarse grains of magnetite and pyrite are observed in several of the intervals.

There is one interval of foliated, dark grey felsic- to intermediate metavolcanic rock (rock code 103076) with a length of 15.5 m at depth 258–274 m.

In addition, fine- to medium-grained granite (rock code 111058) and fine- to medium-grained meta-granitoid (rock code 101051) are mapped in one short interval each, 2.8 m and 1.9 m, respectively.

Rock occurrences (rock types < 1 m in borehole length) forming veins, dykes and segregations occupy 16 % of the logged drill core. Except for occurrences of the predominant rock types, quartz-dominated hydrothermal segregation (rock code 8021), granite (rock code 1058) and aplite (rock code 1062) are registered in KFR121.

5.5.2 Ductile structures

The foliation in KFR121 varies from generally faint in the pegmatite (rock code 101061) to medium and strong in the metagranite (rock code 101057), which also partially exhibits a distinct lineation.

Figure 5-17 shows the foliation in stereographic projection in KFR121, striking in an WNW–ESE direction with a subvertical inclination.

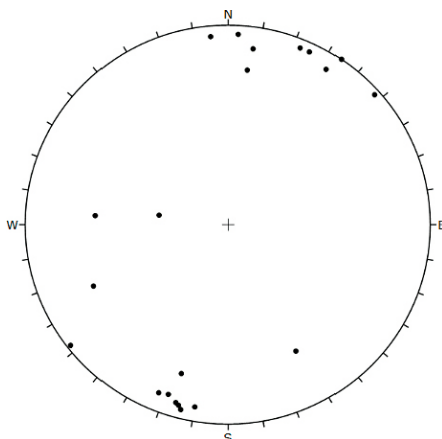


Figure 5-17. Orientation of poles to foliation planes ($n = 21$) in KFR121.

5.5.3 Alterations

Different alterations are affecting 40 % (127.5 m) of KFR121, Table 5-14.

The most abundant alteration is albitization mainly associated with occurrences of amphibolites (rock code 102017).

Intervals of oxidation, laumontization and carbonatization are associated with intervals of higher fracture frequencies or breccias.

Muscovitization, mapped as sericitization, where muscovite replaces biotite in the foliation planes in the metagranite (rock code 101057), and as abundant small flakes in the pegmatite (rock code 101061), is observed in the depth interval 50–200 m.

Chloritization, and two short intervals of steatitization, are restricted to occurrences of amphibolites (rock code 102017).

Argillization is mapped in five intervals. The longest interval at 208.05–211.40 m is a pegmatite with small cavities, probably due to weathered mica, mapped as argillization. Two additional longer intervals are located at 295.8–297.8 and 326.4–327.5 m, of which the latter is associated with a crush and a core loss.

Table 5-14. Alterations in KFR121.

Alterations	Total length (m)	Total length (%)
Albitization	45.6	14.2
Oxidation	26.2	8.1
Muscovitization	26.0	8.1
Laumontization	11.2	3.5
Chloritization	10.4	3.2
Argillization	7.2	2.2
Steatitization	0.7	0.2
Carbonatization	0.3	0.1

5.5.4 Fractures

The total number of open and sealed fractures in KFR121 are 959 and 1 806, respectively, and 24 fractures are partly open (sealed fractures with apertures > 0 mm). The resulting fracture frequency is 3.0 open fractures/m and 5.6 sealed fractures/m.

In Figure 5-18a and b the orientation of the open and sealed fractures is plotted in stereographic projections. The open fractures have a pronounced set of horizontal to gently dipping fractures, which set also is observable for the sealed fractures, although not as distinct. An additional set with steeply dipping fractures, observable for both open and sealed fractures, striking with scattering in a NW–SE direction.

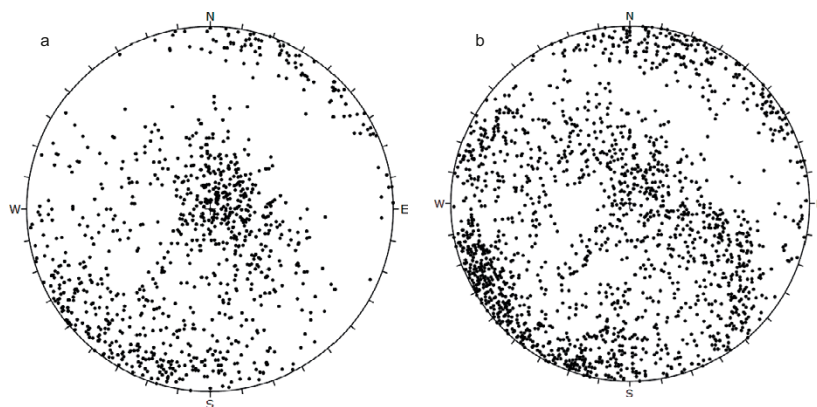


Figure 5-18. Orientations of poles to a) open ($n = 959$) and b) sealed fracture ($n = 1831$) planes in KFR121, plotted on lower hemisphere equal area projection.

Two crush zones are registered in KFR121, Table 5-15 and Figure 5-19. The most extensive crush occurs at 326.32–327.54 m and includes two core losses with a total length of 55 cm. The most fractured interval of this crush, between 326.96–327.22 m, is missing in the core loss. The mapped parameters are therefore partly estimated from the OPTV-image.

Table 5-15. Crush intervals in KFR121.

Interval (m)	Minerals	Alteration
289.83–290.00	Calcite, clay minerals, chlorite, iron hydroxide	Highly altered
326.32–327.54	Clay minerals, talc, laumontite, chlorite	Completely altered

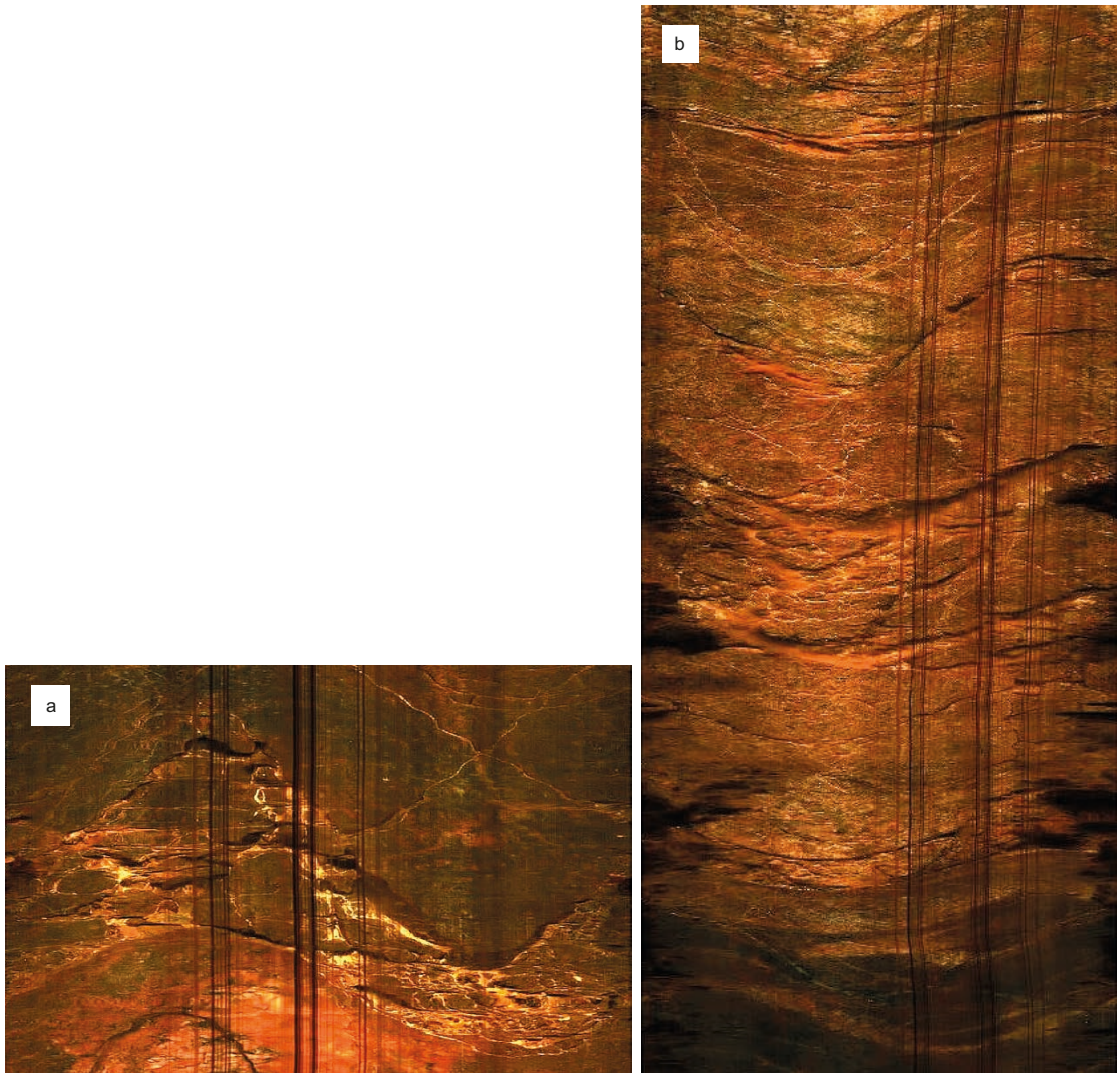


Figure 5-19. OPTV-images of the two crushed intervals in KFR121, a) at 289.83–290.00 m and b) at 326.32–327.54 m.

The different minerals detected in open and sealed fractures are presented in Table 5-16. The most common minerals in both types of fractures, but in different proportions, are calcite, chlorite, oxidized walls and laumontite.

Table 5-16. The different minerals and their representation in open and sealed fractures in KFR121.

Open	%	No	Mineral	Sealed	%	No	Mineral
	71.0	678	Calcite	71.4		1287	Oxidized Walls
	43.2	413	Chlorite	43.6		786	Calcite
	40.5	387	Oxidized walls	30.1		542	Laumontite
	32.8	313	Laumontite	10.1		182	Chlorite
	16.0	153	Hematite	7.4		133	Quartz
	11.0	105	Muscovite	3.1		55	Hematite
	10.4	99	Clay minerals	3.0		54	Bleached walls
	5.5	53	Iron hydroxide	2.6		47	Muscovite
	4.7	45	Quartz	1.6		29	No detectable mineral
	2.8	27	No detectable mineral	0.8		15	Pyrite
	2.1	20	Polished walls	0.8		15	Adularia
	2.0	19	Biotite	0.4		8	Clay Minerals
	1.8	17	Pyrite	0.4		8	Prehnite
	1.6	15	Talc	0.4		7	White Feldspar
	0.5	5	Adularia	0.3		5	Biotite
	0.5	5	Epidote	0.1		2	Asphalt
	0.4	4	Zeolite	0.1		2	Red Feldspar
	0.4	4	Prehnite	0.1		1	Epidote
	0.3	3	Asphalt				
	0.2	2	Illite				
	0.2	2	White feldspar				
	0.1	1	Chalcopyrite				
	0.1	1	Red feldspar				
	0.1	1	Bleached walls				

Clay minerals are observed in 99 open fractures along the whole borehole length and iron hydroxide in 53 open fractures, all below the borehole length 167 m. Borehole intervals with accumulations of clay minerals and iron hydroxide are presented in Table 5-17.

Table 5-17. Intervals with clay minerals and iron hydroxide in KFR121.

Borehole intervals with clay minerals (m)	Borehole intervals with iron hydroxide (m)
68–69	206–217
127–129	226–229
142–147	285–288
167–169	320–332
179–182	
210–217	
226–229	
291–296	
310–314	
320–323	
327–328	

Sealed network is mapped in 43 intervals with a total length of ca 64 m, with calcite, laumontite and oxidized walls as the most common minerals. The sealed networks contribute with an additional c 2200 sealed fracture.

Seven brecciated zones with a total length of 0.8 m, mapped as fault rock, are registered in KFR121, Table 5-18. Figure 5-20 shows the brecciated fault rock interval at 136 m.

Table 5-18. Fault rock intervals in KFR121.

Interval (m)	Length (m)	Fault rock name
94.202–94.297	0.095	Breccia
135.736–135.763	0.027	Breccia
136.026–136.117	0.091	Breccia
136.713–136.737	0.024	Breccia
291.794–291.881	0.087	Breccia
292.217–292.597	0.38	Breccia
302.951–303.044	0.093	Breccia

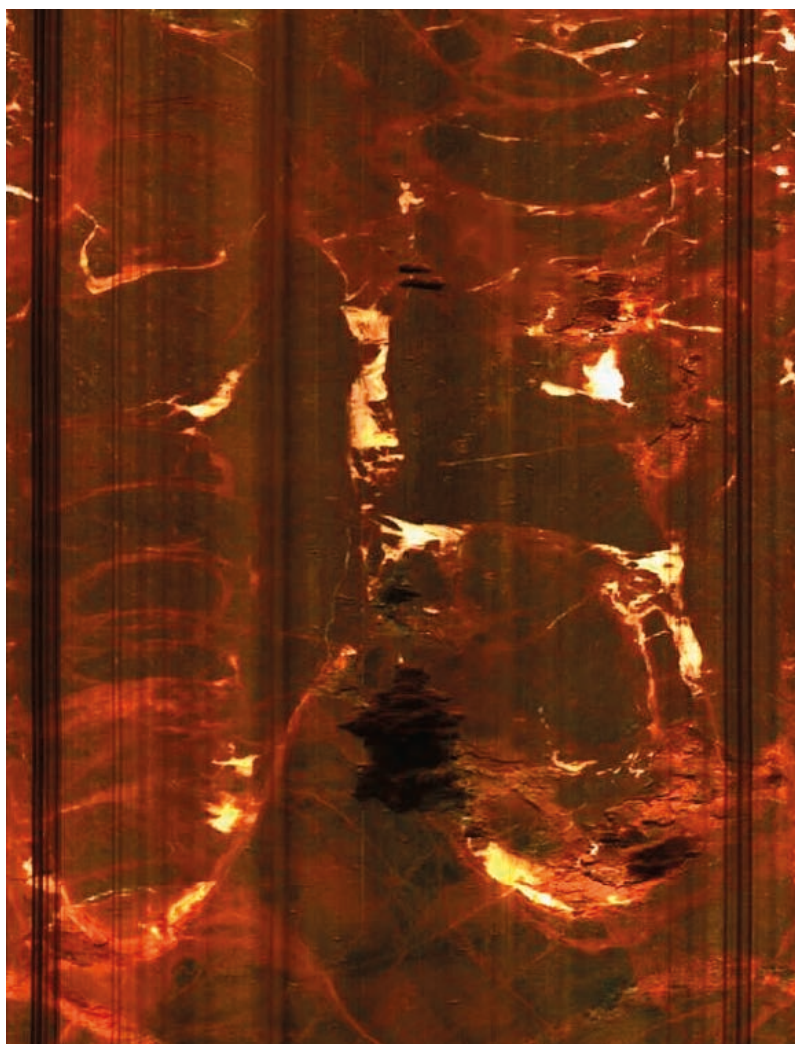


Figure 5-20. Brecciated fault rock interval at 136 m in KFR121.

Borehole image report

A1.1 KFR117

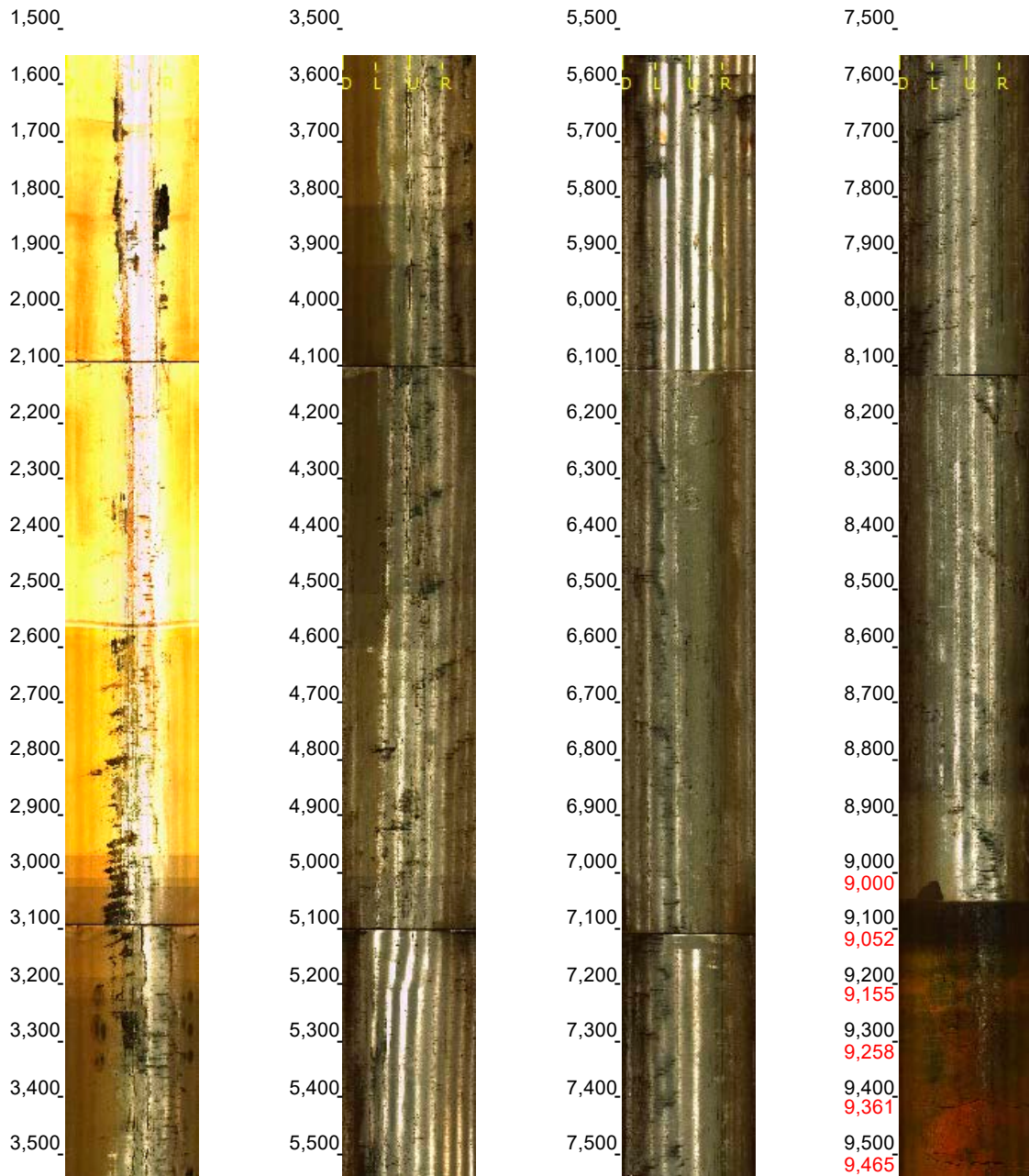
Borehole Name: KFR117
Mapping Name: KFR117
Mapping Range: 9,000 - 176,010 m
Diameter: 76,0 mm
Printed Range: 1,550 - 176,239
Pages: 23

Image File Information:

File: G:\SKB\bips\sicada\KFR117\KFR117n200511_H_LGX.HED
Date/Time: 2020-05-11
Start Depth: 1,550 m
End Depth: 176,239 m
Resolution: 1,00 mm/pixel (depth)
Orientation: Gravimetric
Image height: 174690 pixels
Image width: 720 pixels
Intrinsic angle: 180 degrees
LGX Version: 101
Locality:
Wellname:
Scan Direction: Down

Borehole: KFR117
Mapping: KFR117

Depth range: 1.550 - 9.550 m
Azimuth: 34.6
Inclination: -80.8



Printed: 2022-01-03 09:06:44

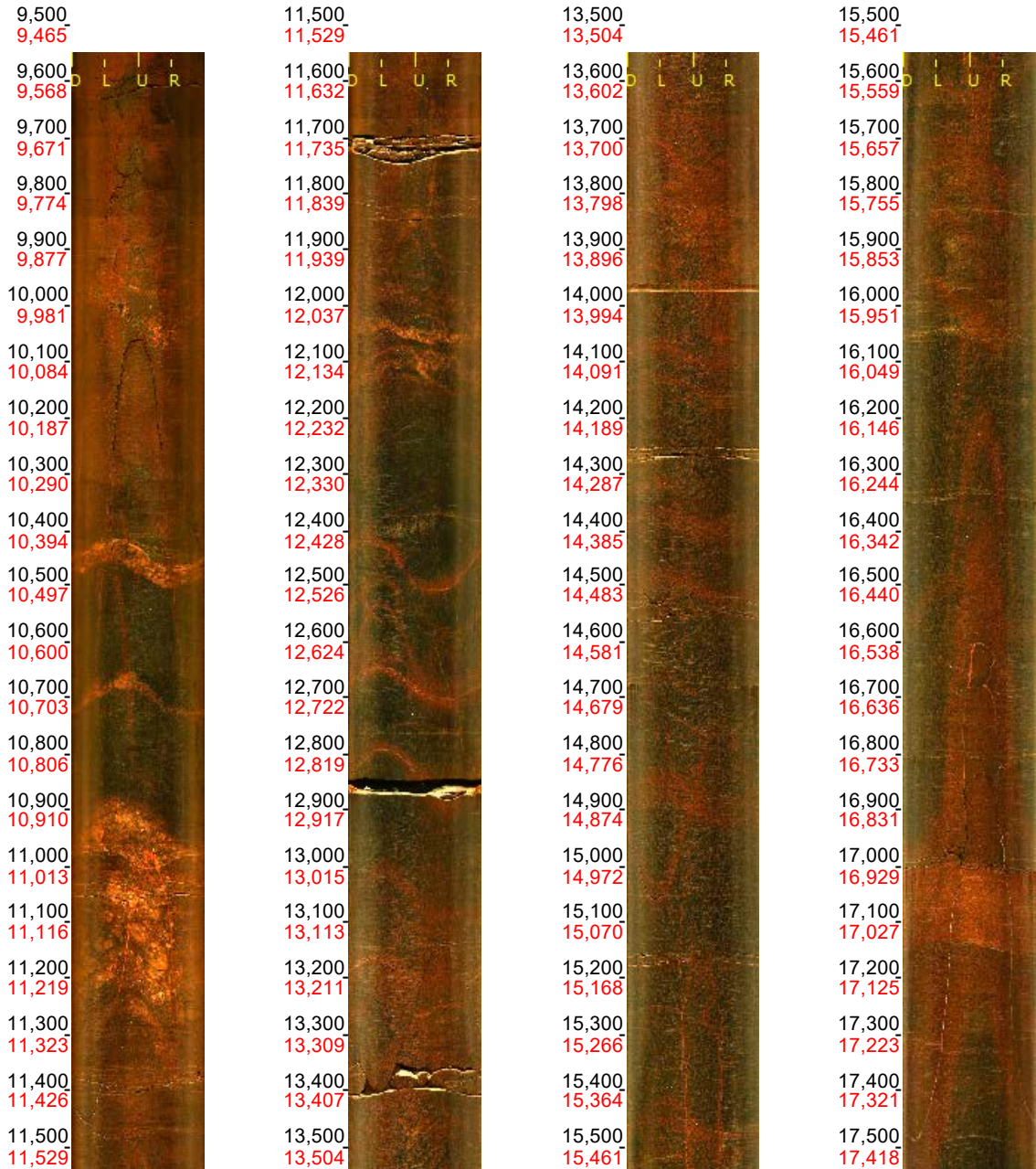
Scale: 1 : 10

Aspect: 100 %

2 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 9.550 - 17.550 m
Azimuth: 35.1
Inclination: -81.2



Printed: 2022-01-03 09:06:44

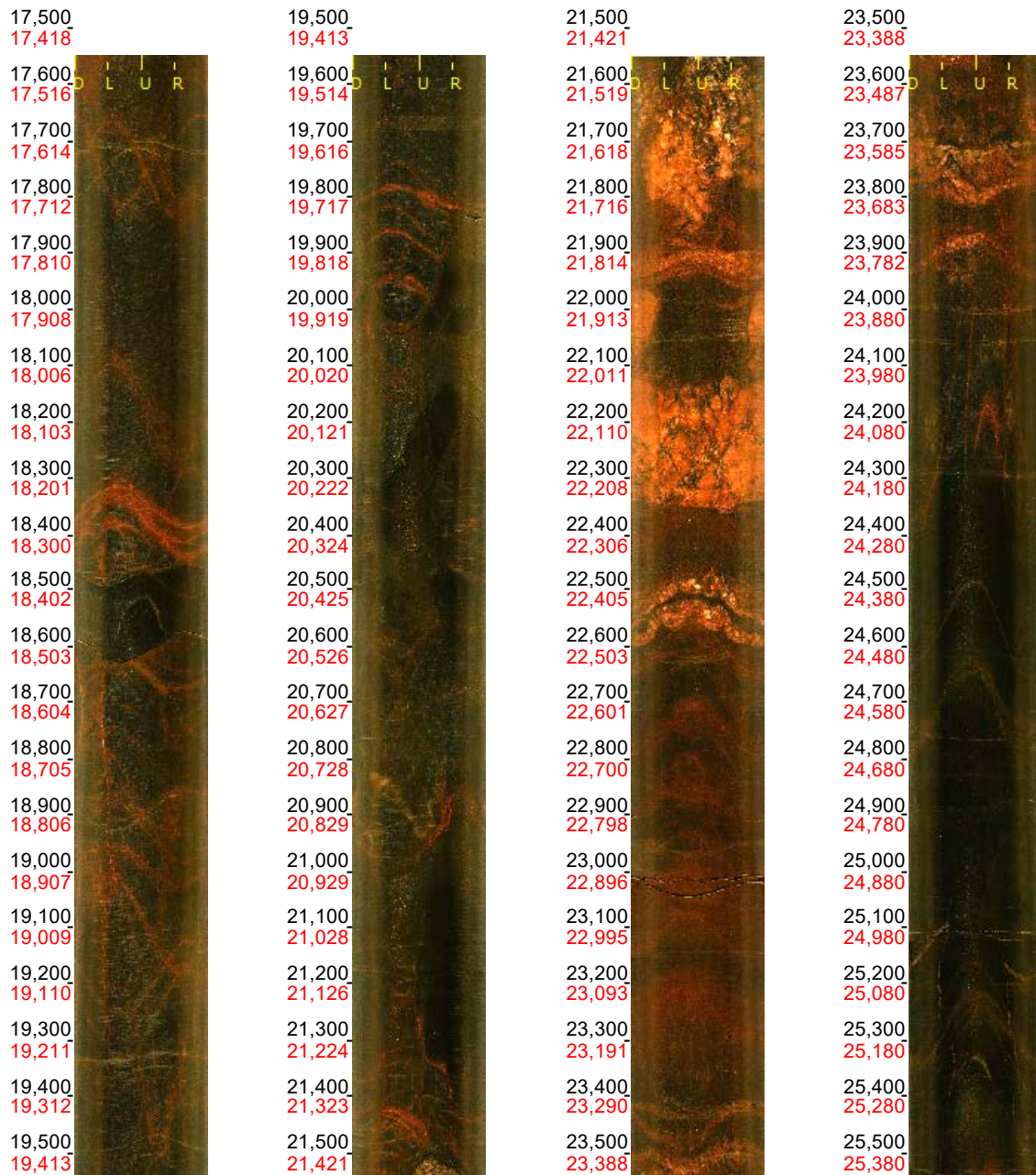
Scale: 1 : 10

Aspect: 100 %

3 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 17.550 - 25.550 m
Azimuth: 36.3
Inclination: -81.2



Printed: 2022-01-03 09:06:44

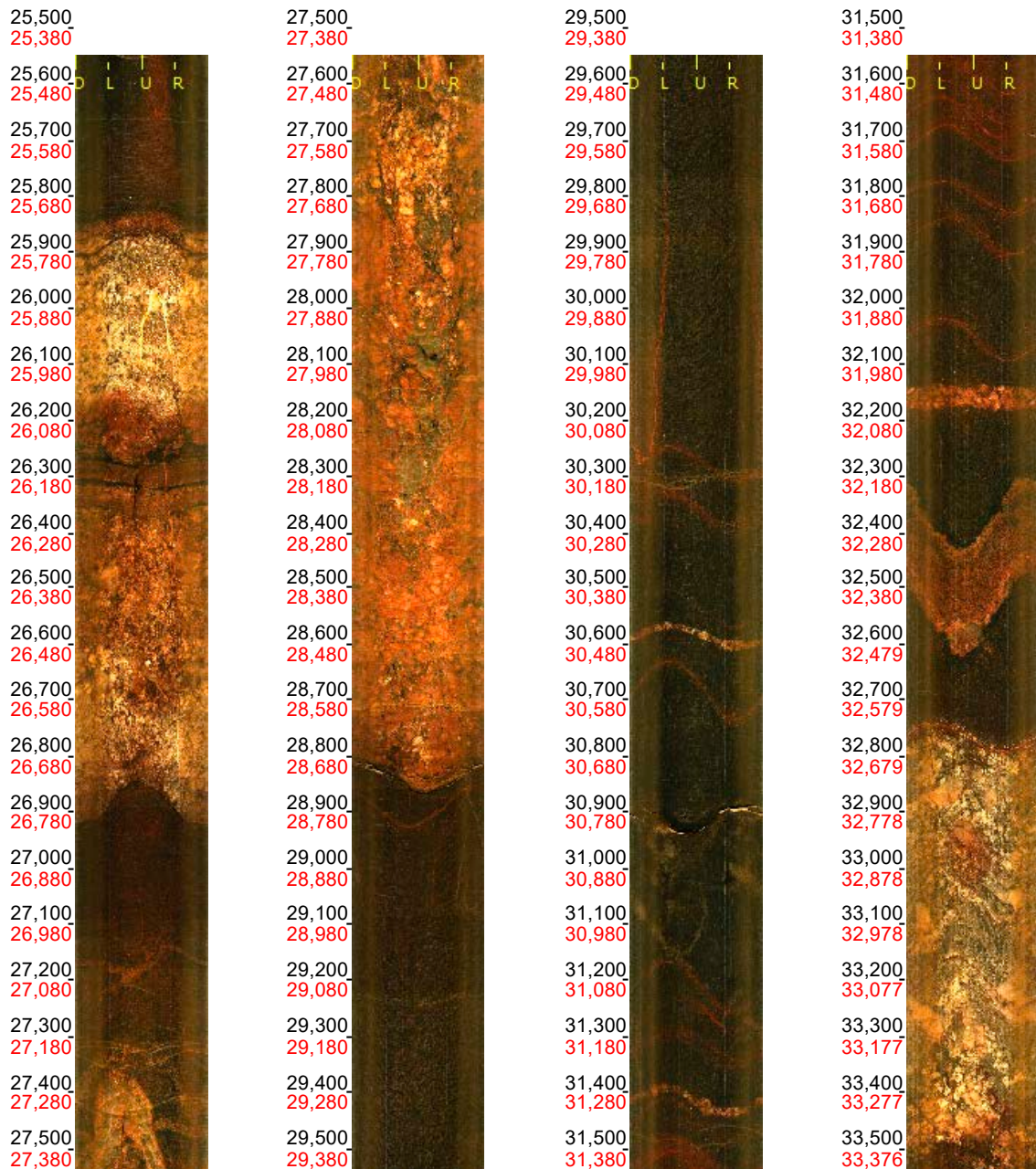
Scale: 1 : 10

Aspect: 100 %

4 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 25.550 - 33.550 m
Azimuth: 36.2
Inclination: -81.2



Printed: 2022-01-03 09:06:44

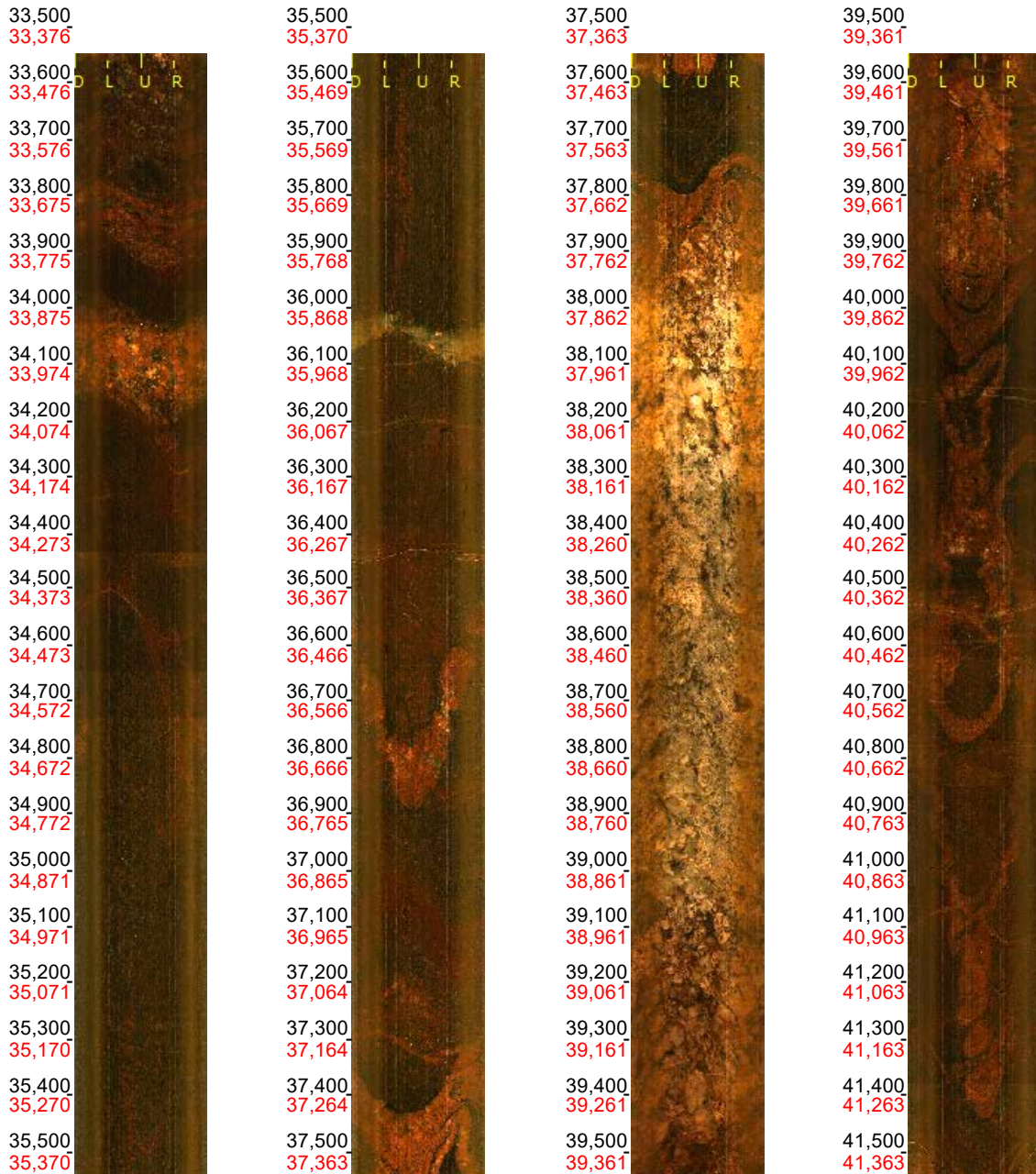
Scale: 1 : 10

Aspect: 100 %

5 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 33.550 - 41.550 m
Azimuth: 35.8
Inclination: -81.2



Printed: 2022-01-03 09:06:44

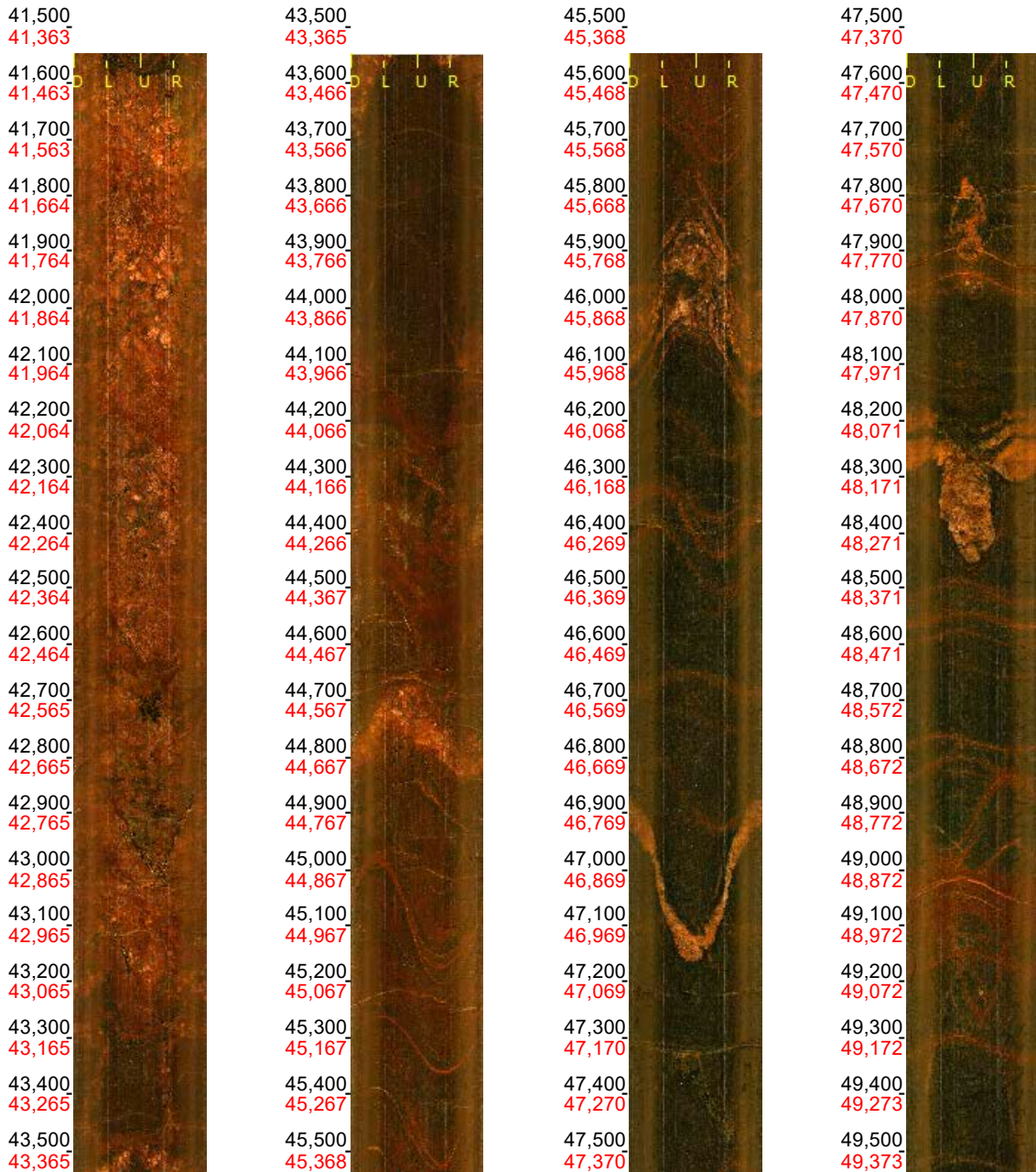
Scale: 1 : 10

Aspect: 100 %

6 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 41.550 - 49.550 m
Azimuth: 36.6
Inclination: -81.2



Printed: 2022-01-03 09:06:44

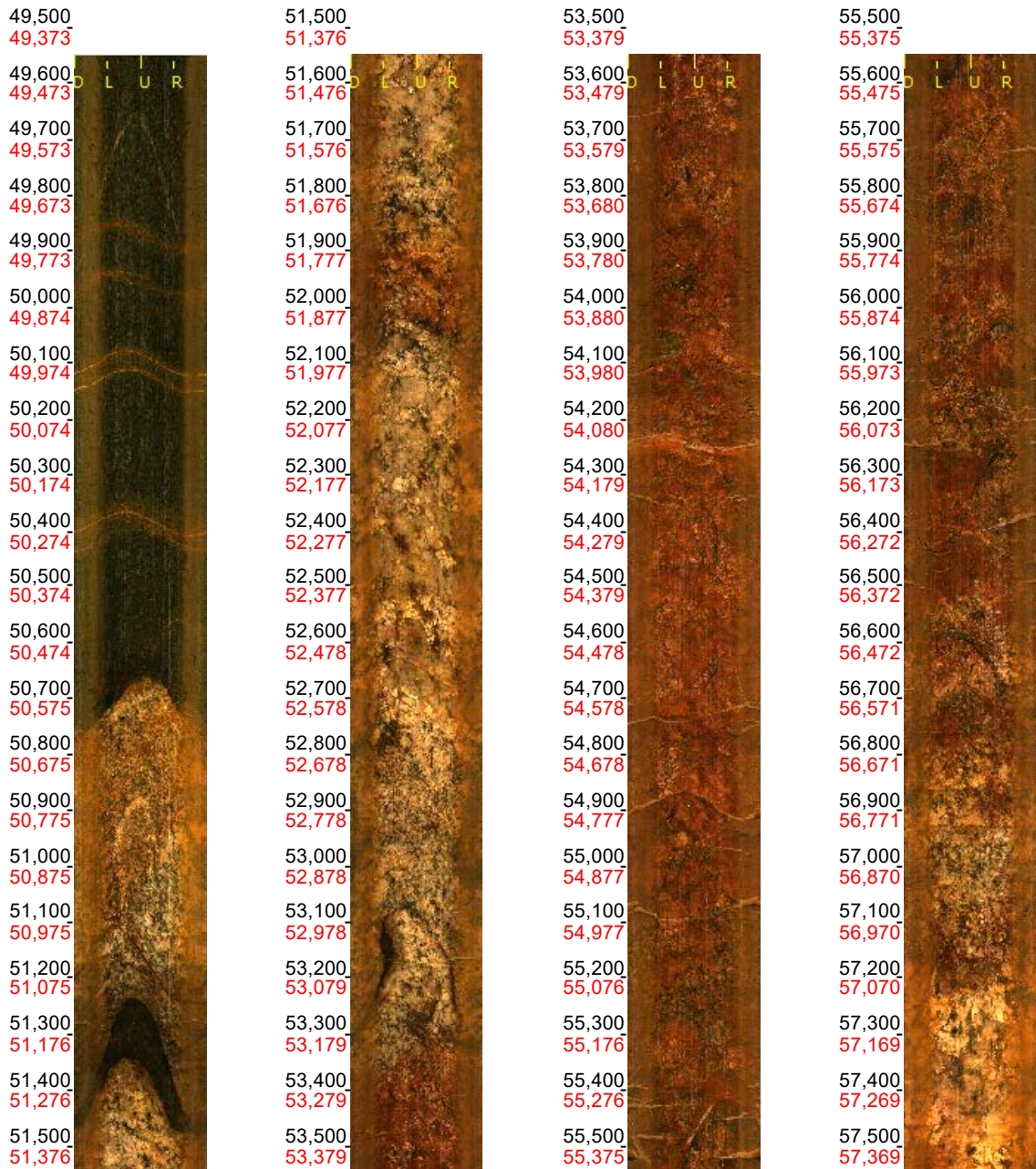
Scale: 1 : 10

Aspect: 100 %

7 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 49.550 - 57.550 m
Azimuth: 34.7
Inclination: -81.1



Printed: 2022-01-03 09:06:44

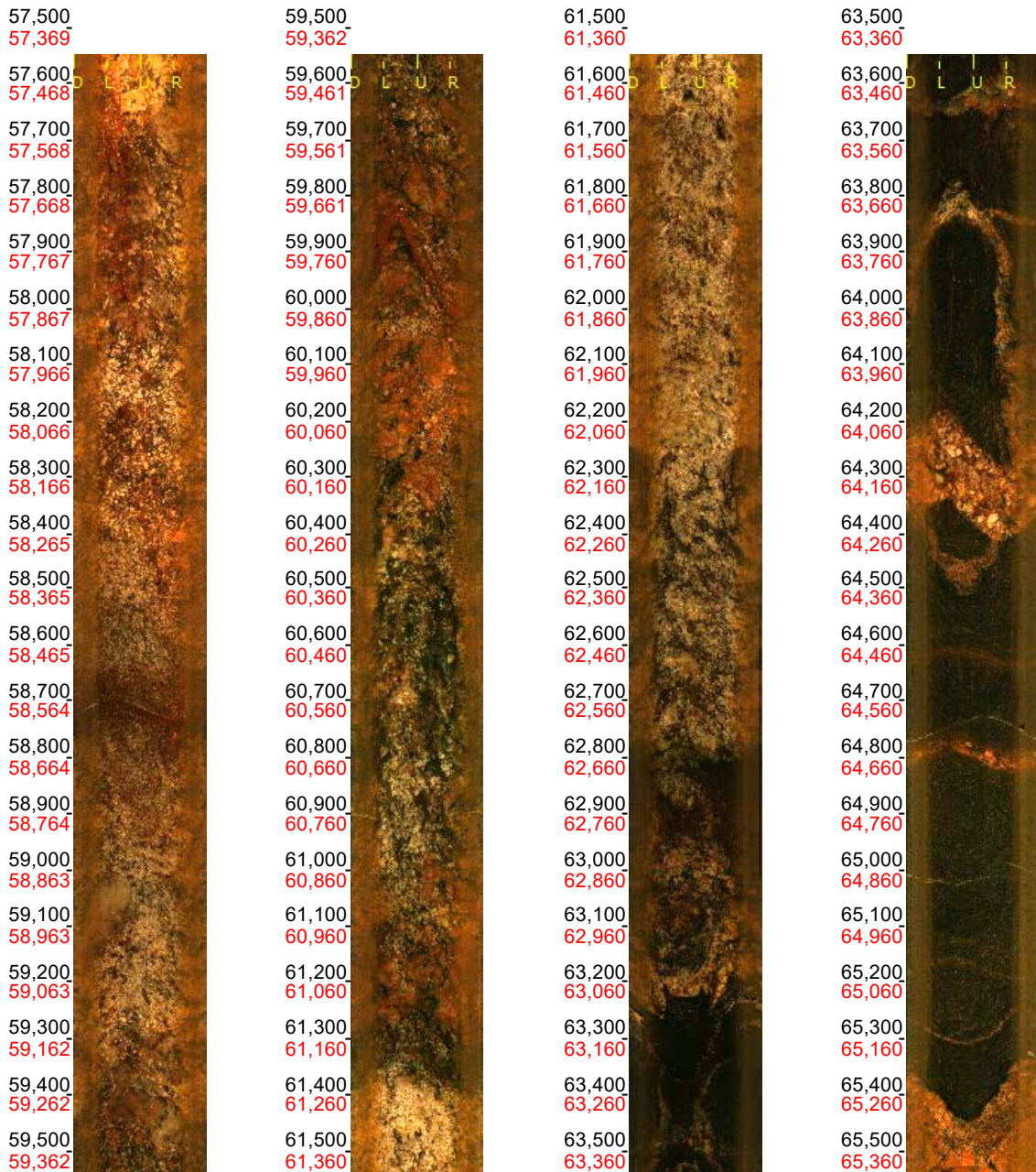
Scale: 1 : 10

Aspect: 100 %

8 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 57.550 - 65.550 m
Azimuth: 34.3
Inclination: -81.2



Printed: 2022-01-03 09:06:44

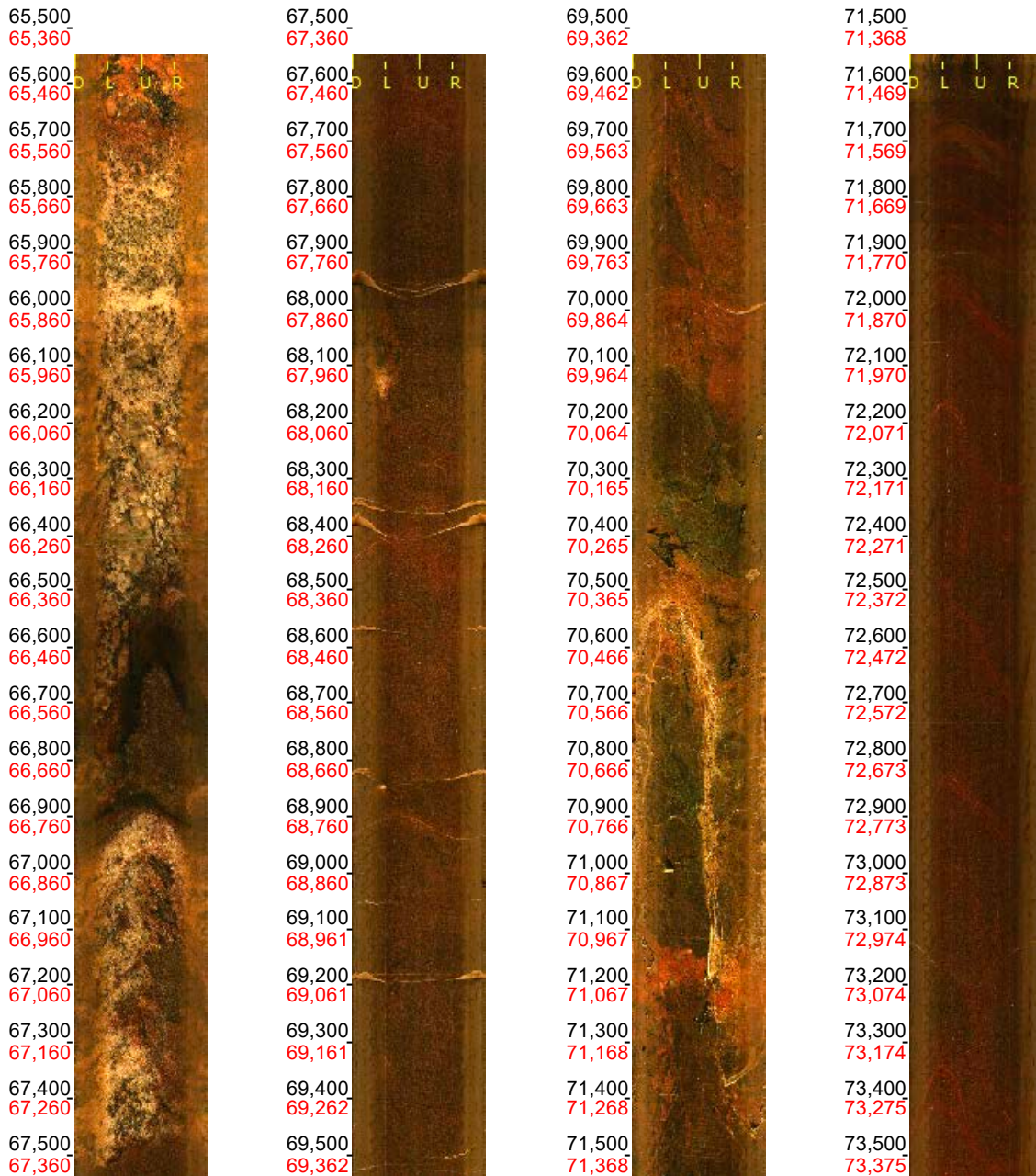
Scale: 1 : 10

Aspect: 100 %

9 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 65.550 - 73.550 m
Azimuth: 34.9
Inclination: -81.2



Printed: 2022-01-03 09:06:44

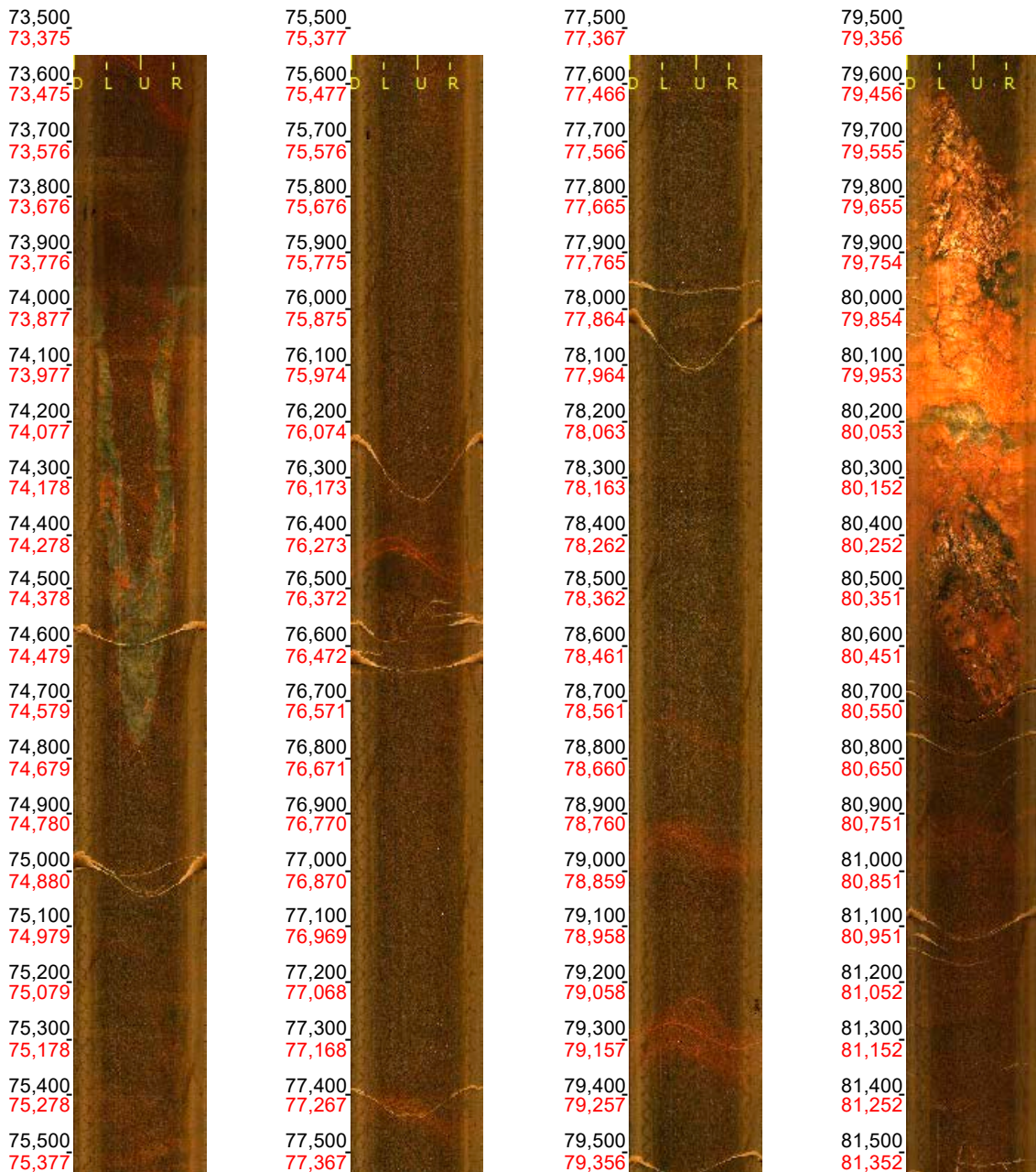
Scale: 1 : 10

Aspect: 100 %

10 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 73.550 - 81.550 m
Azimuth: 35.8
Inclination: -81.2



Printed: 2022-01-03 09:06:44

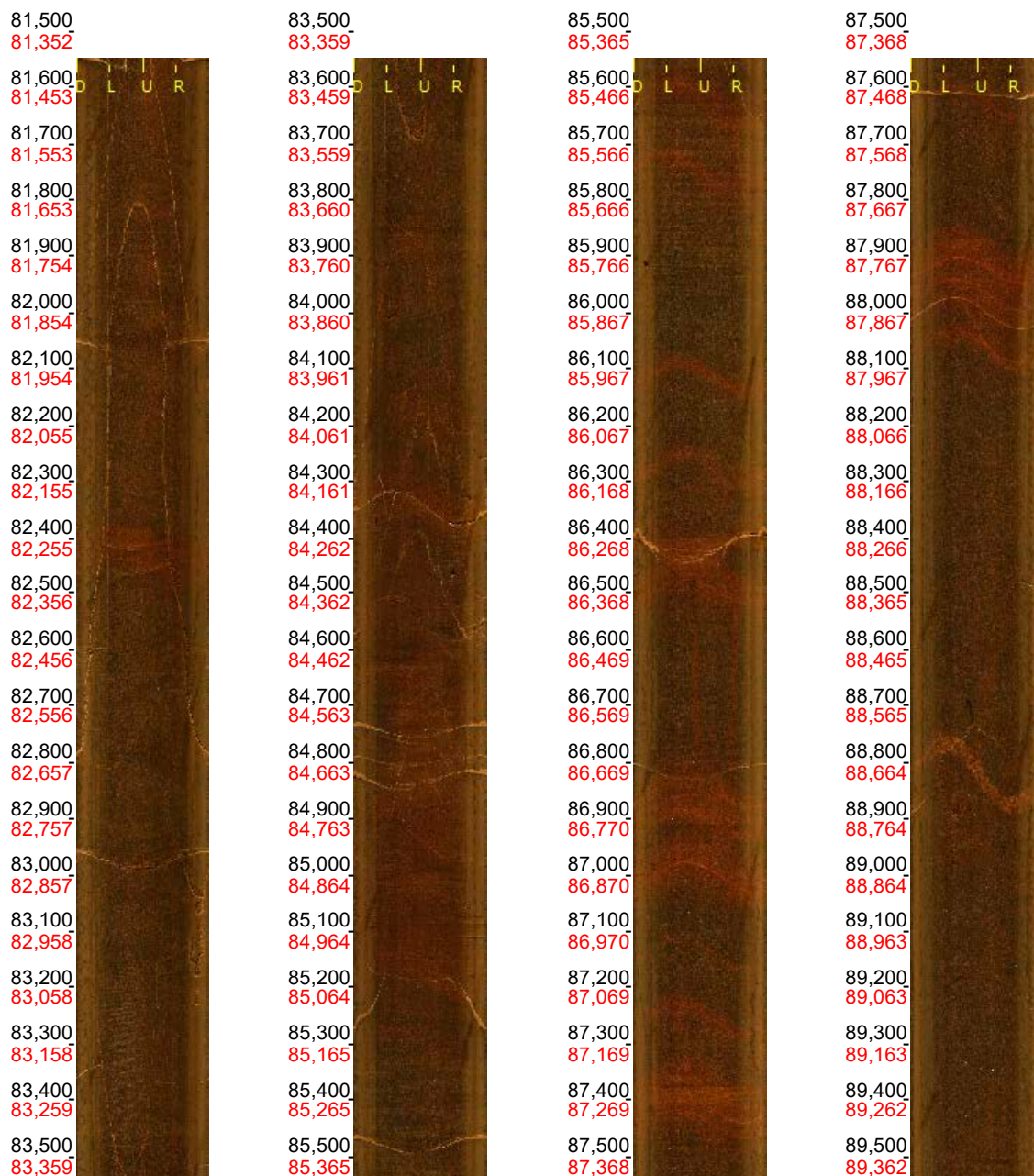
Scale: 1 : 10

Aspect: 100 %

11 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 81.550 - 89.550 m
Azimuth: 36.1
Inclination: -81.2



Printed: 2022-01-03 09:06:44

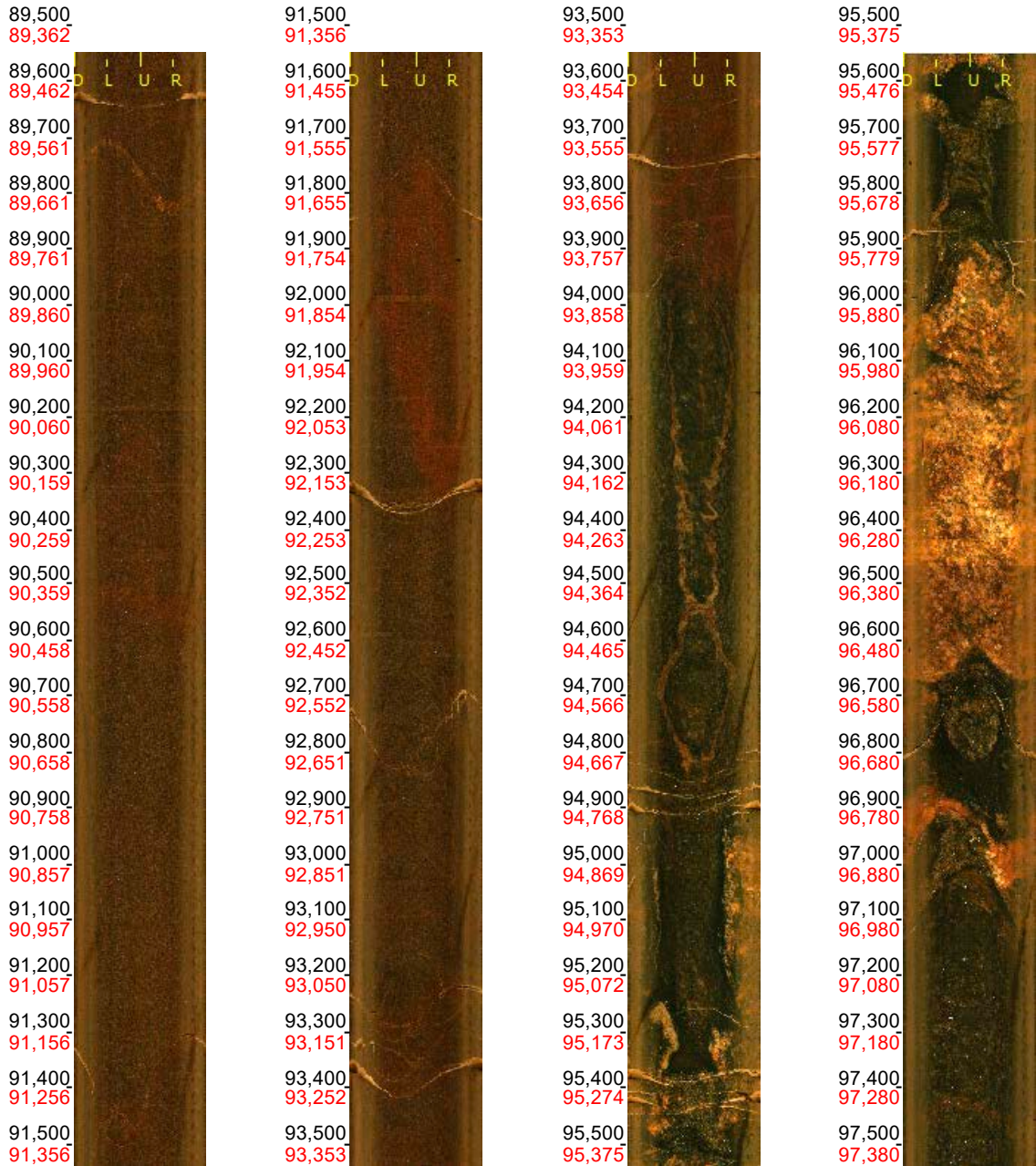
Scale: 1 : 10

Aspect: 100 %

12 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 89.550 - 97.550 m
Azimuth: 36.1
Inclination: -81.2



Printed: 2022-01-03 09:06:44

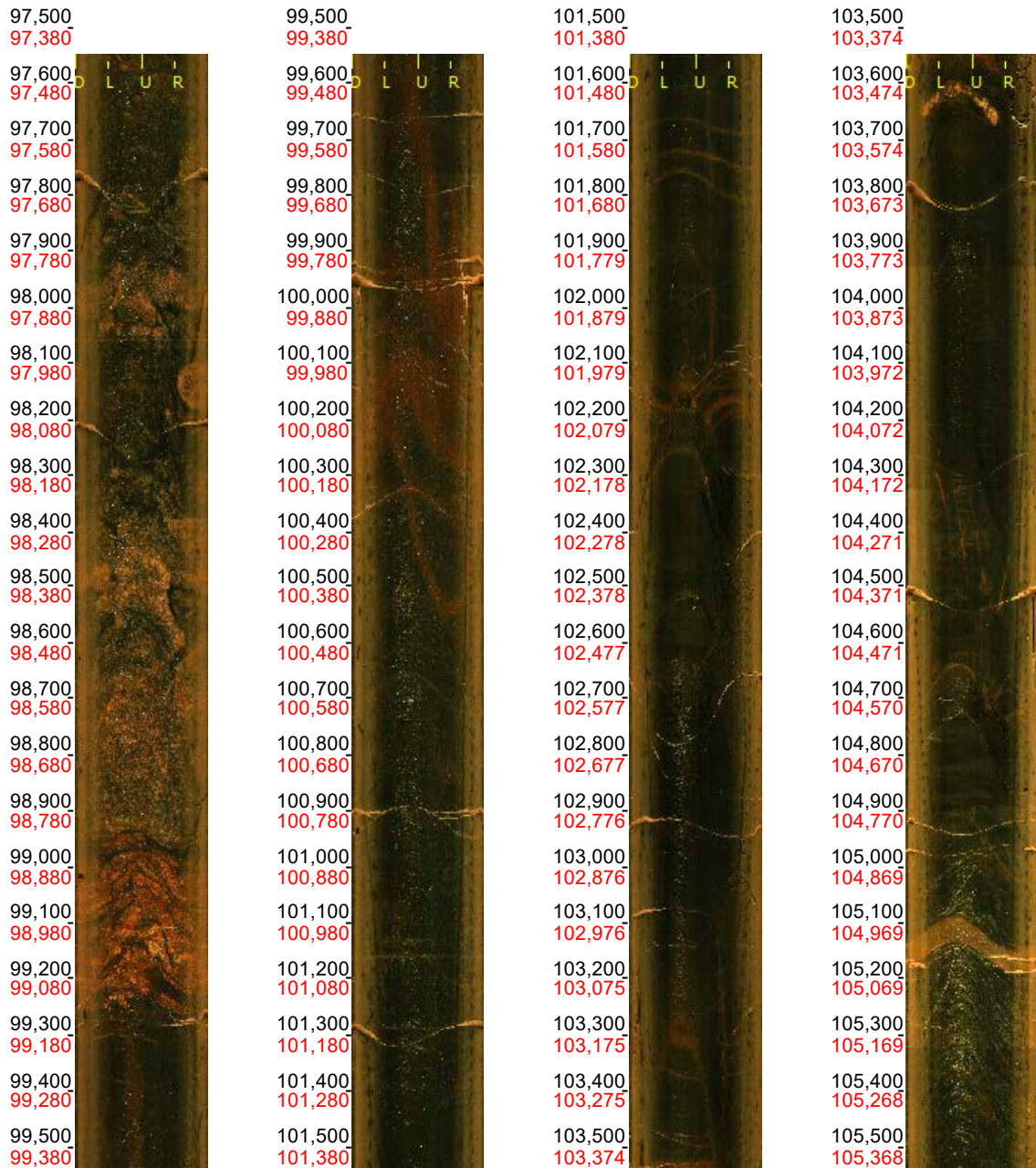
Scale: 1 : 10

Aspect: 100 %

13 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 97.550 - 105.550 m
Azimuth: 35.6
Inclination: -81.2



Printed: 2022-01-03 09:06:44

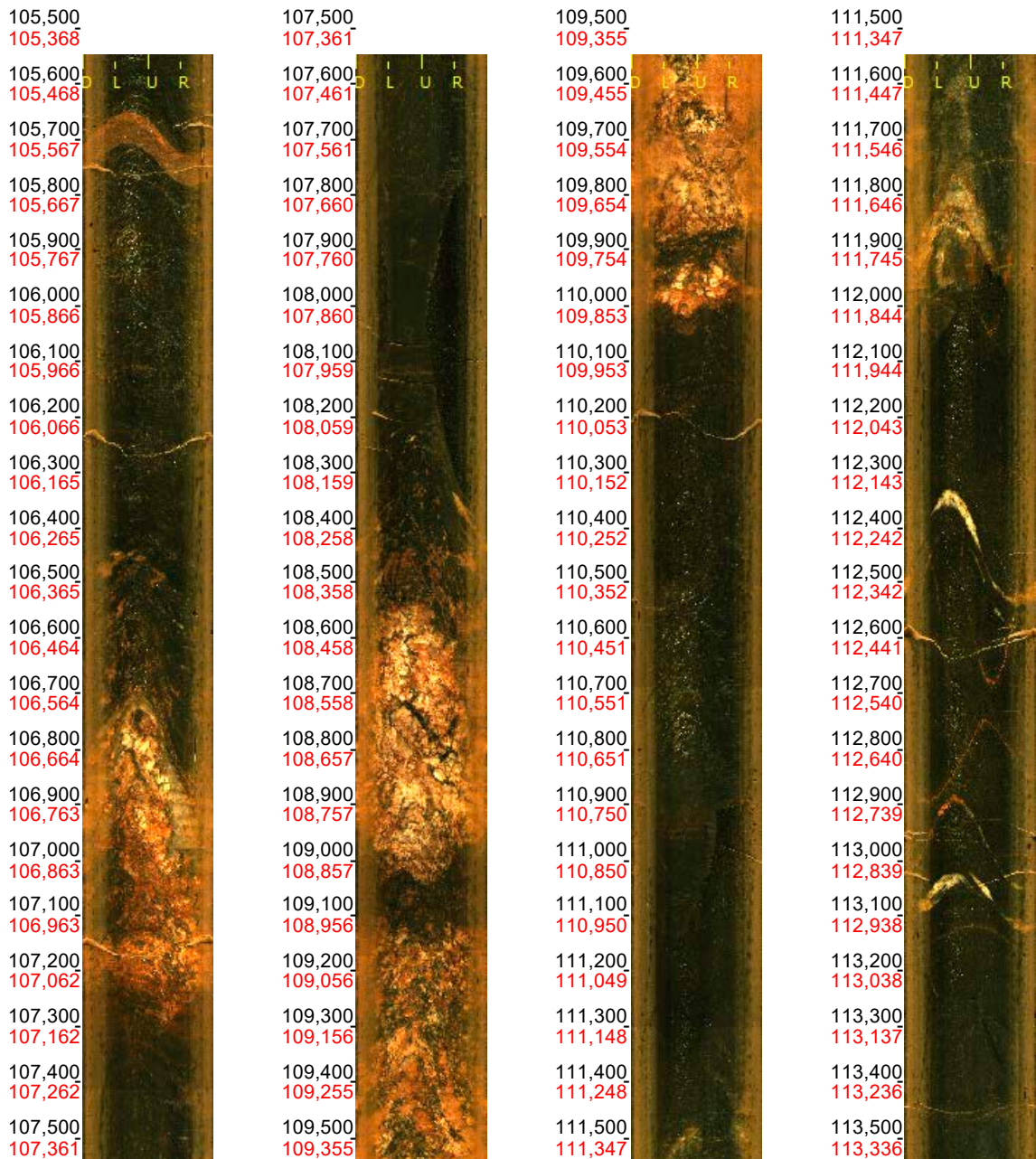
Scale: 1 : 10

Aspect: 100 %

14 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 105.550 - 113.550 m
Azimuth: 36.0
Inclination: -81.2



Printed: 2022-01-03 09:06:44

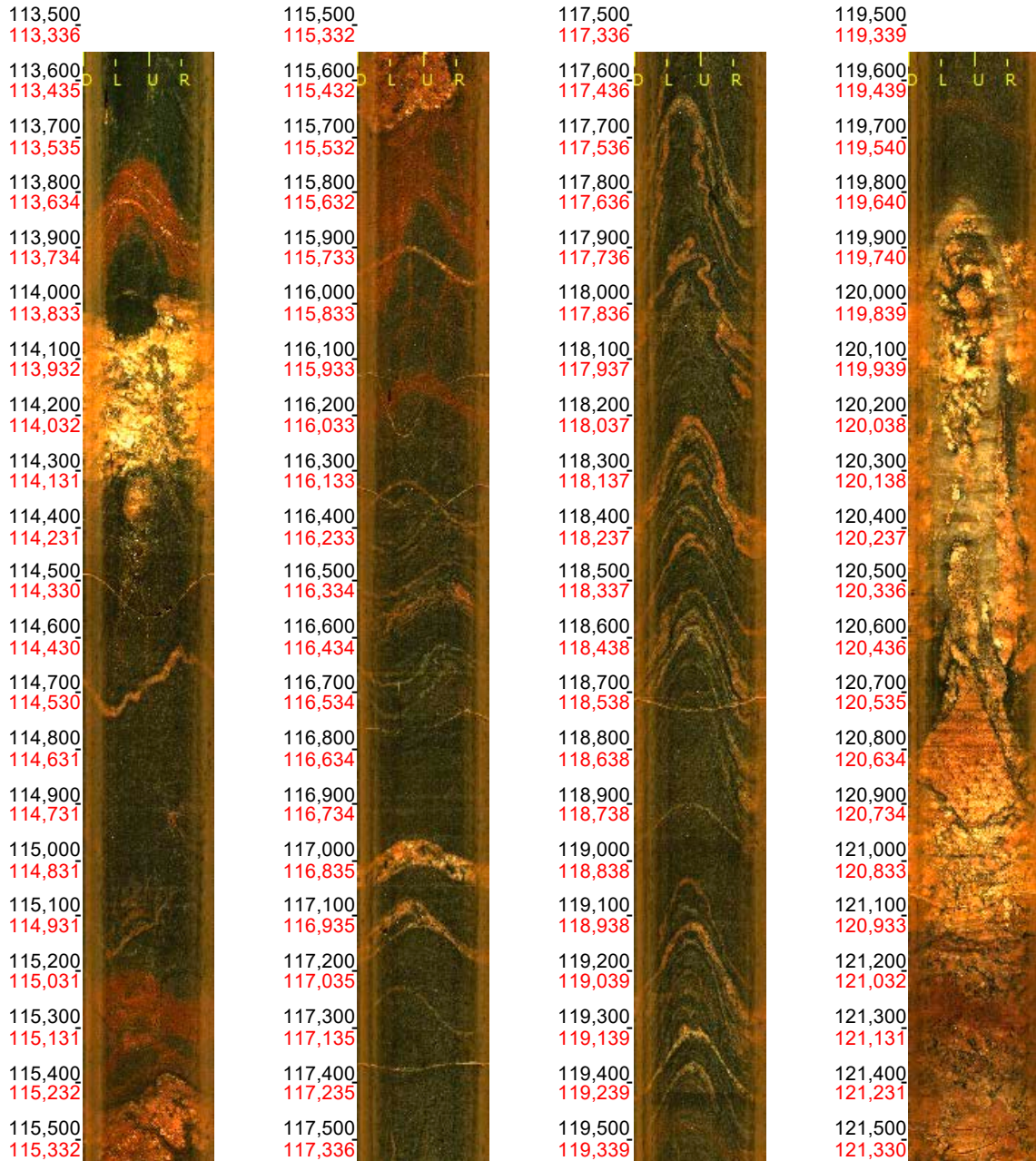
Scale: 1 : 10

Aspect: 100 %

15 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 113.550 - 121.550 m
Azimuth: 36.4
Inclination: -81.2



Printed: 2022-01-03 09:06:44

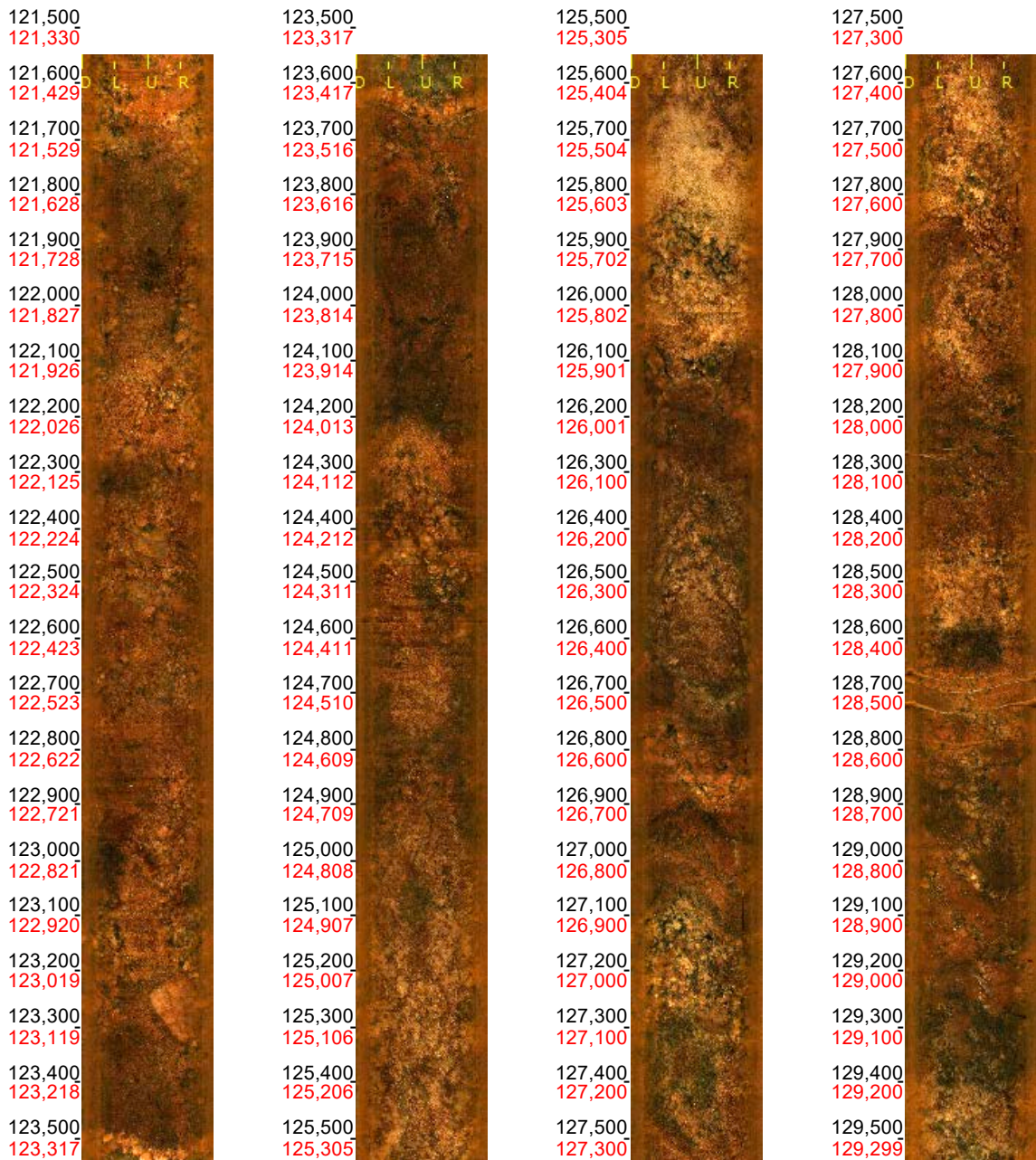
Scale: 1 : 10

Aspect: 100 %

16 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 121.550 - 129.550 m
Azimuth: 36.3
Inclination: -81.2



Printed: 2022-01-03 09:06:44

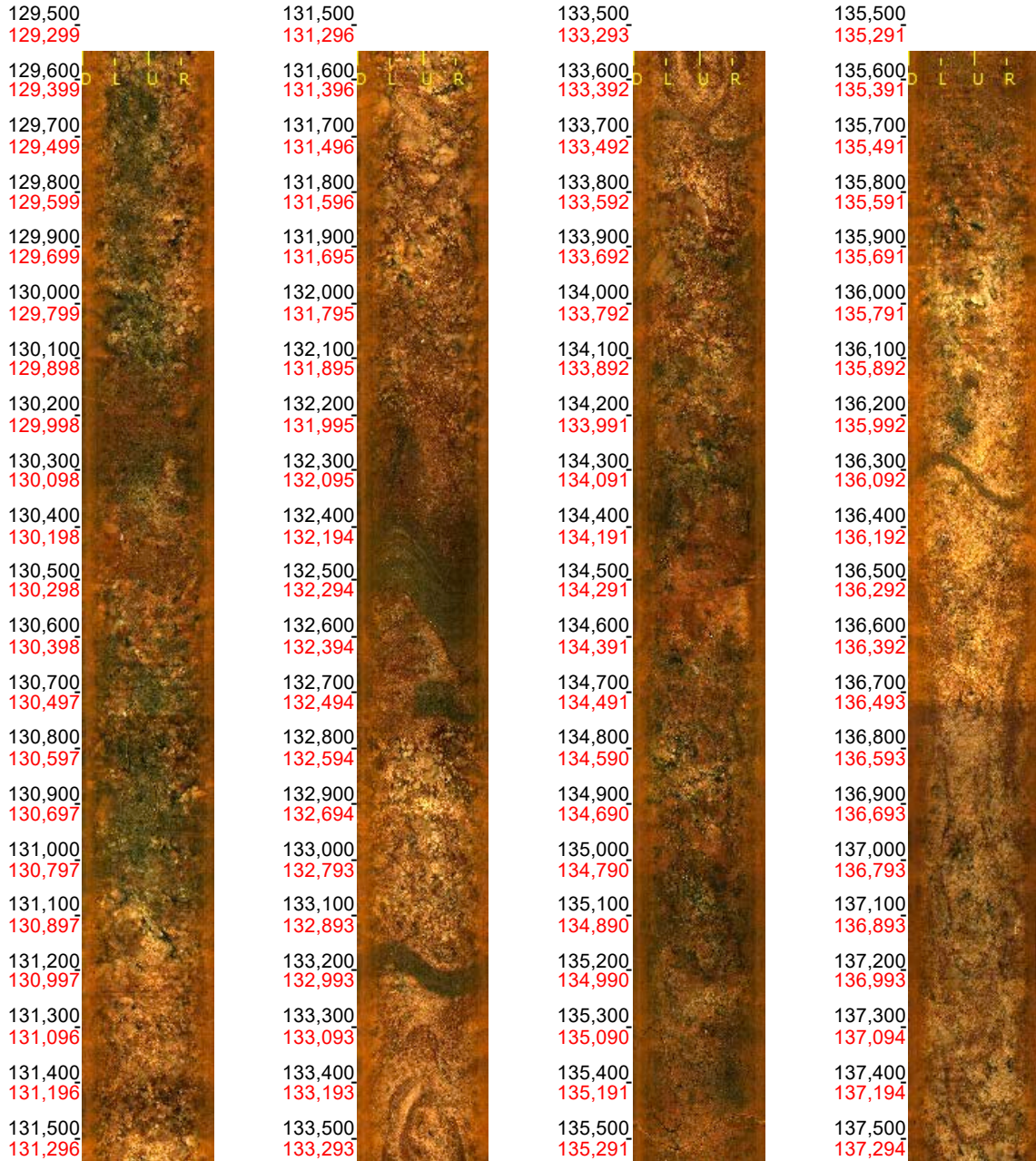
Scale: 1 : 10

Aspect: 100 %

17 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 129.550 - 137.550 m
Azimuth: 36.1
Inclination: -81.3



Printed: 2022-01-03 09:06:44

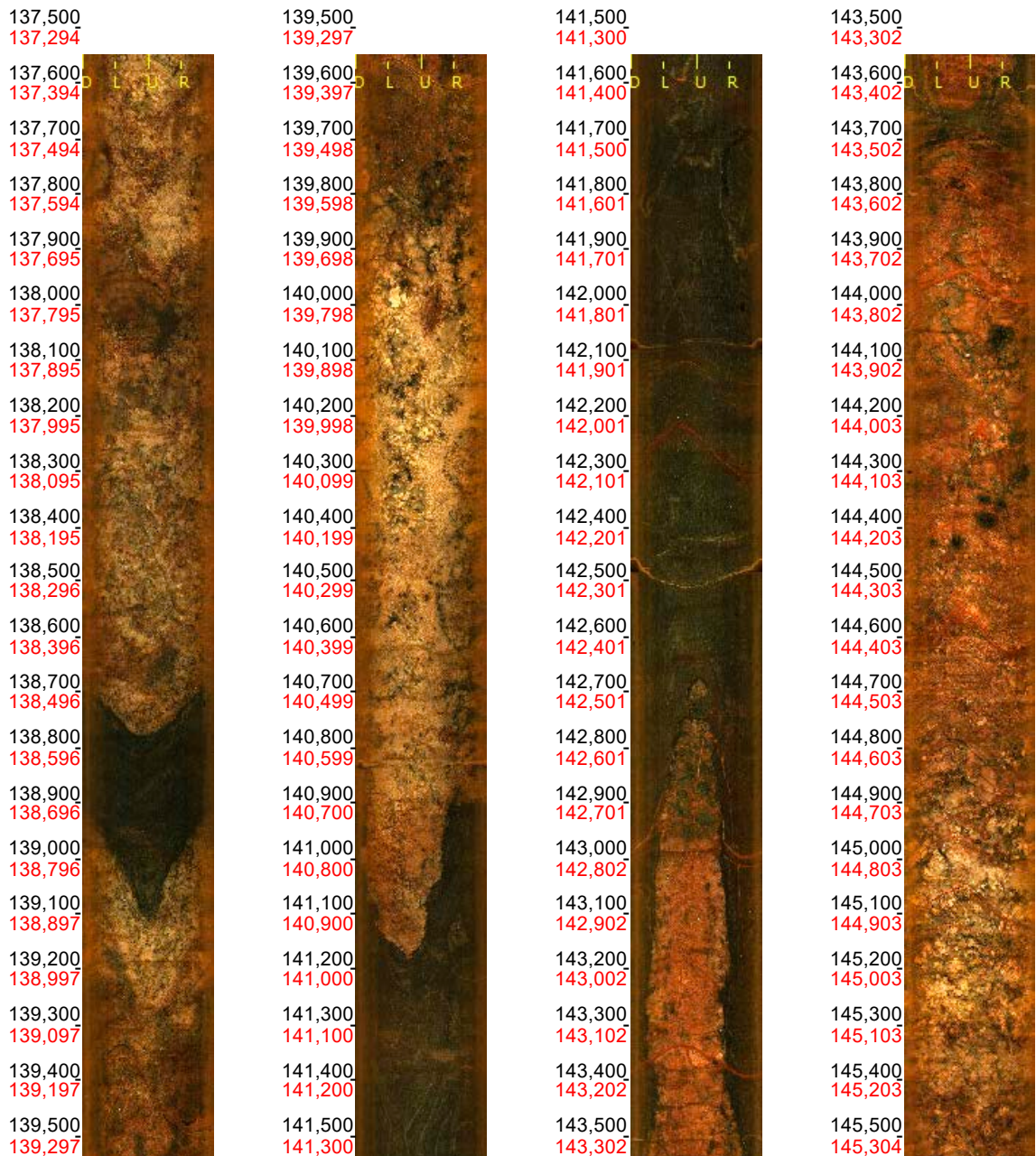
Scale: 1 : 10

Aspect: 100 %

18 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 137.550 - 145.550 m
Azimuth: 36.3
Inclination: -81.3



Printed: 2022-01-03 09:06:44

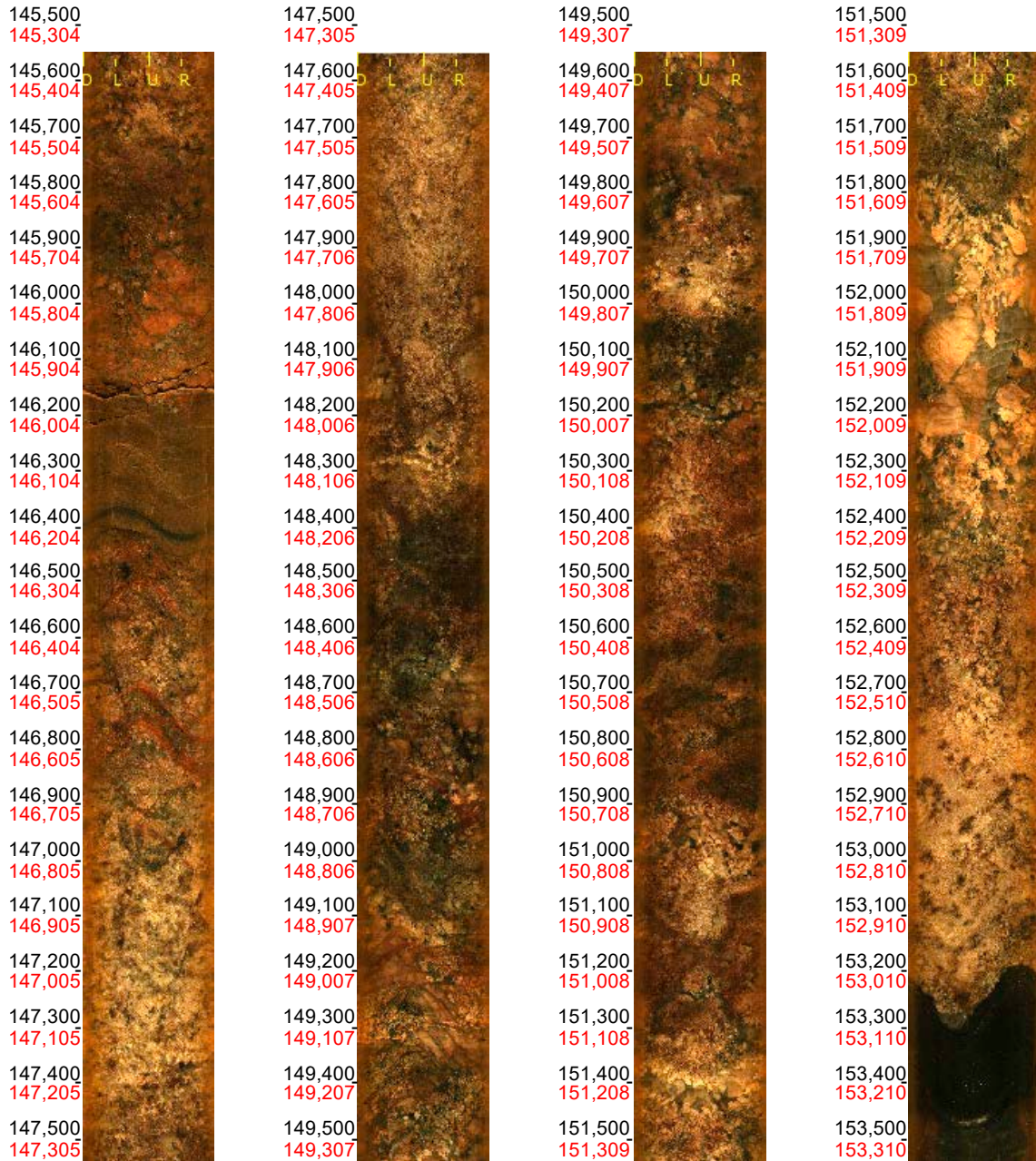
Scale: 1 : 10

Aspect: 100 %

19 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 145.550 - 153.550 m
Azimuth: 37.4
Inclination: -81.3



Printed: 2022-01-03 09:06:44

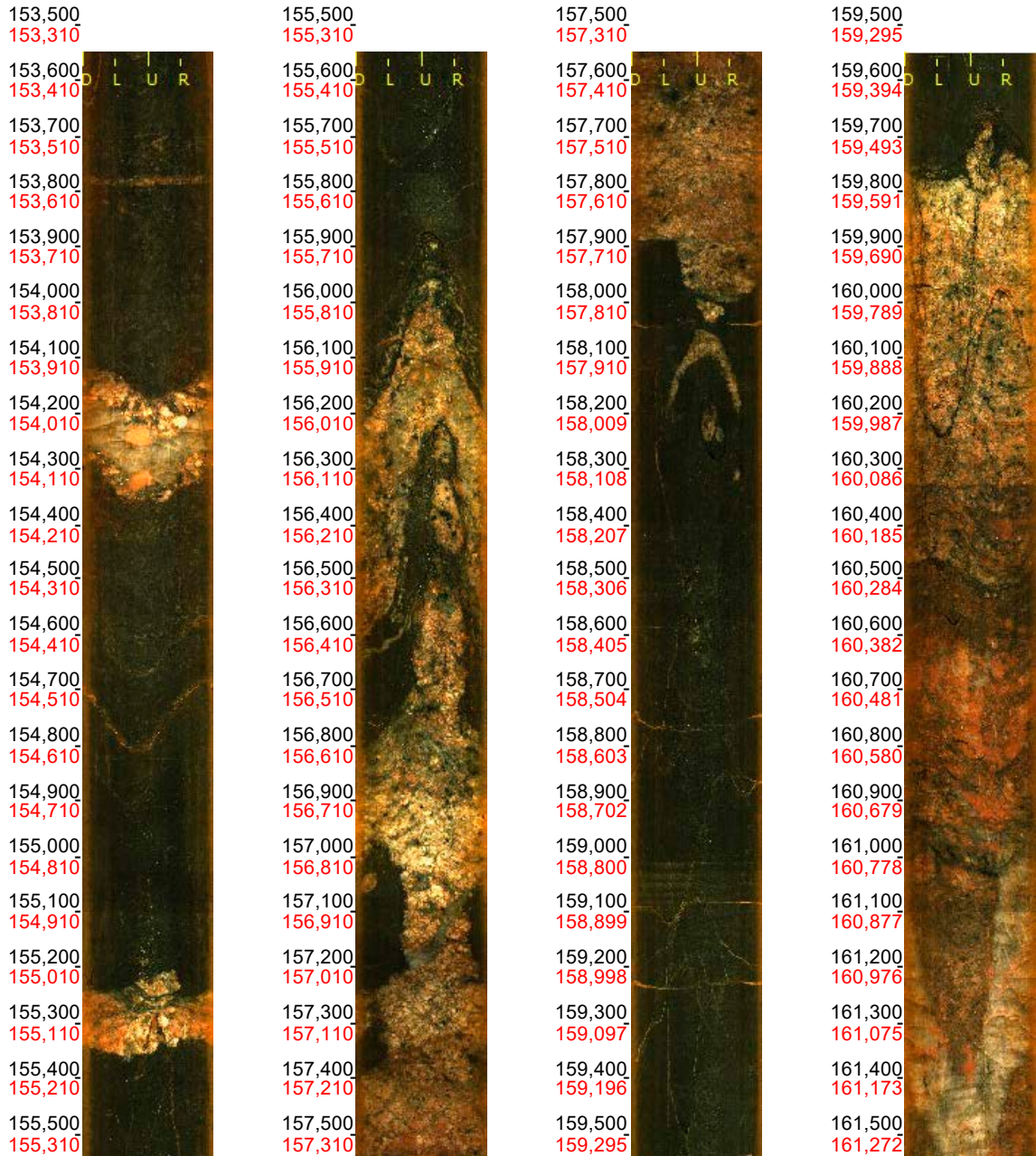
Scale: 1 : 10

Aspect: 100 %

20 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 153.550 - 161.550 m
Azimuth: 38.0
Inclination: -81.4



Printed: 2022-01-03 09:06:44

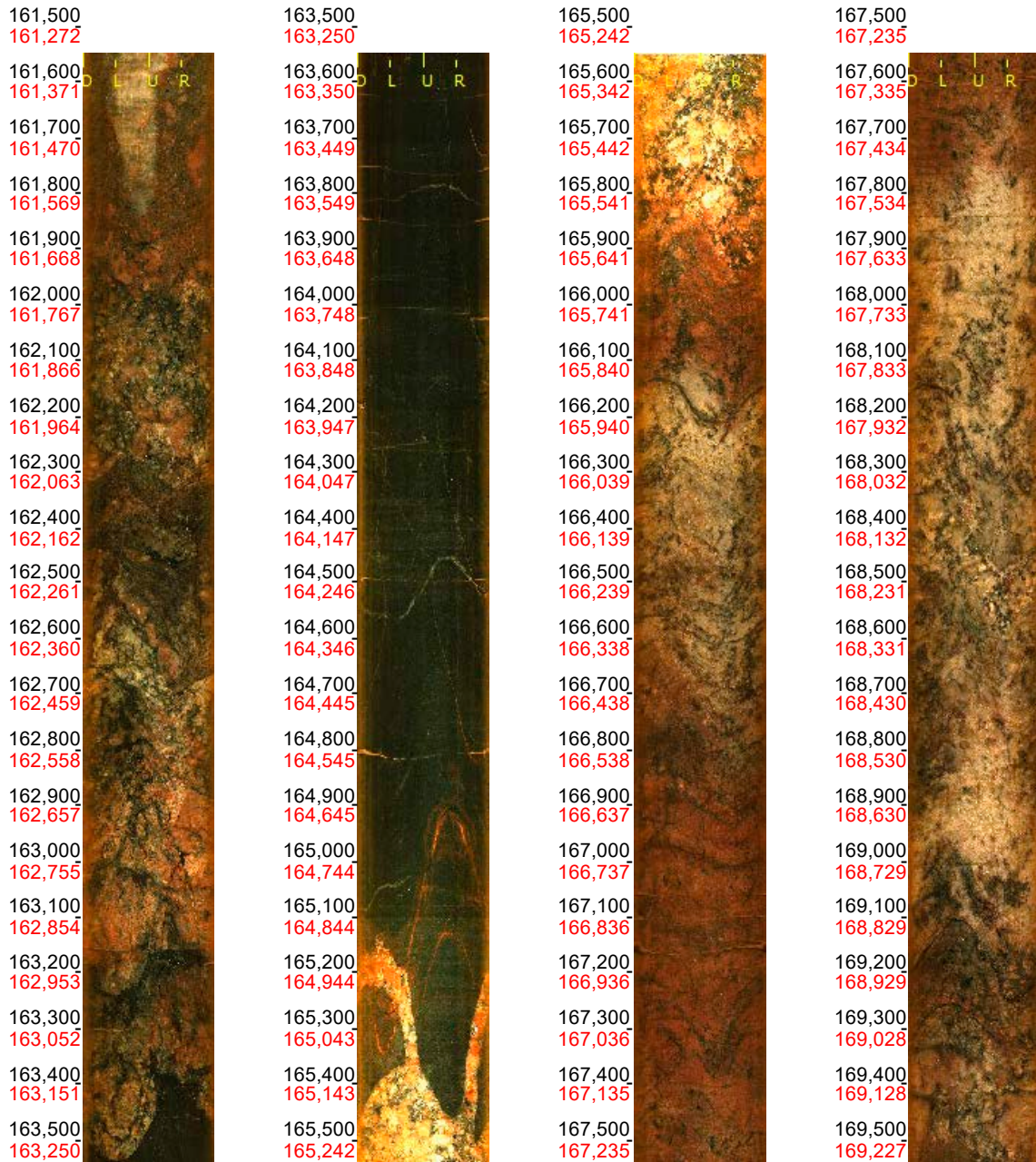
Scale: 1 : 10

Aspect: 100 %

21 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 161.550 - 169.550 m
Azimuth: 38.3
Inclination: -81.4



Printed: 2022-01-03 09:06:44

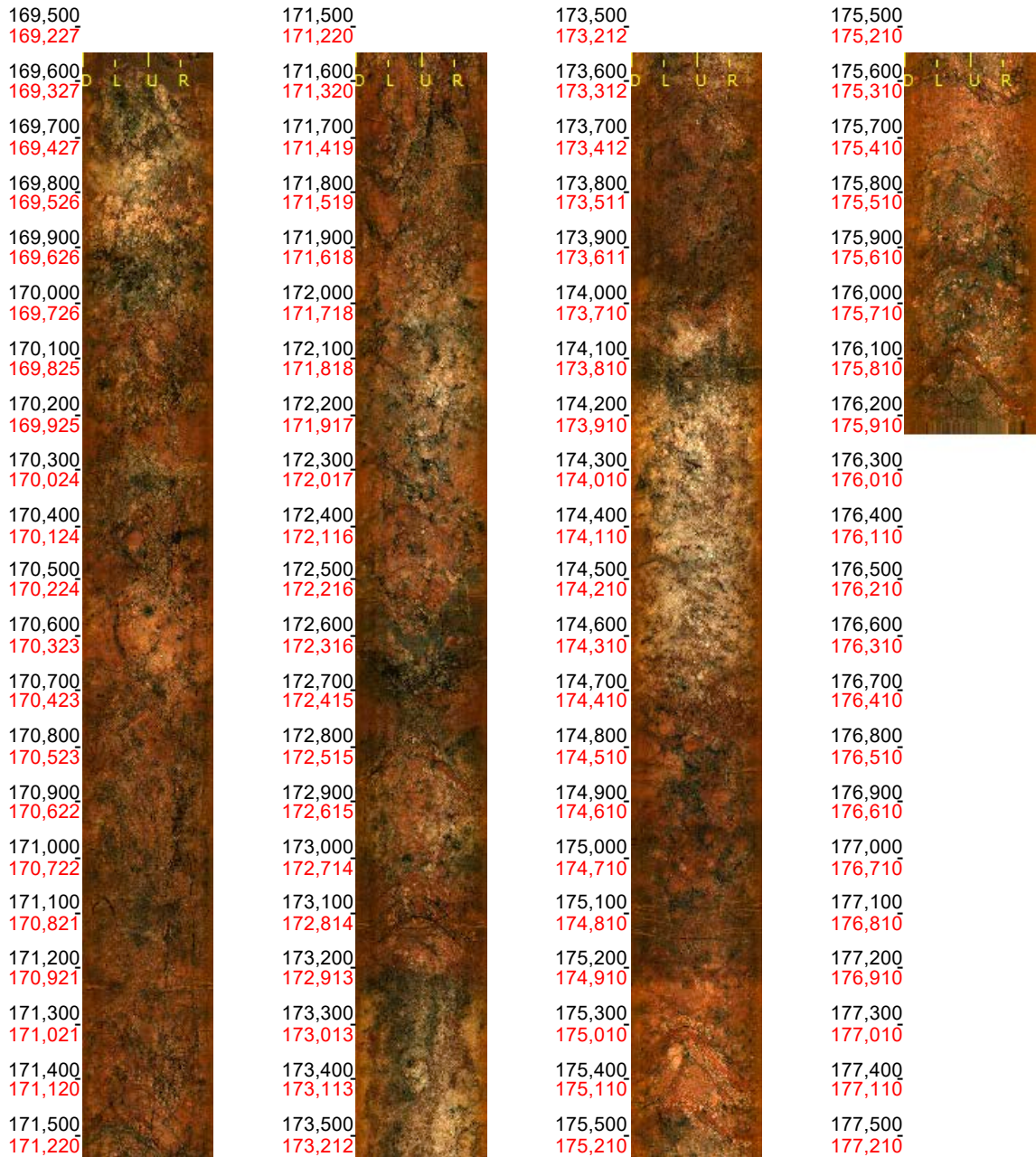
Scale: 1 : 10

Aspect: 100 %

22 (23)

Borehole: KFR117
Mapping: KFR117

Depth range: 169.550 - 176.239 m
Azimuth: 38.3
Inclination: -81.4



Printed: 2022-01-03 09:06:44

Scale: 1 : 10

Aspect: 100 %

23 (23)

A1.2 KFR118

Borehole Name: KFR118
Mapping Name: KFR118
Mapping Range: 12,000 - 175,480 m
Diameter: 76,0 mm
Printed Range: 1,550 - 175,439
Pages: 23

Image File Information:

File: G:\skb\bips\sicada\KFR118\KFR118n200525_H_LGX.HED
Date/Time: 2020-05-25
Start Depth: 1,550 m
End Depth: 175,439 m
Resolution: 1,00 mm/pixel (depth)
Orientation: Gravimetric
Image height: 173890 pixels
Image width: 720 pixels
Intrinsic angle: 180 degrees
LGX Version: 101
Locality:
Wellname: KFR118
Scan Direction: Down

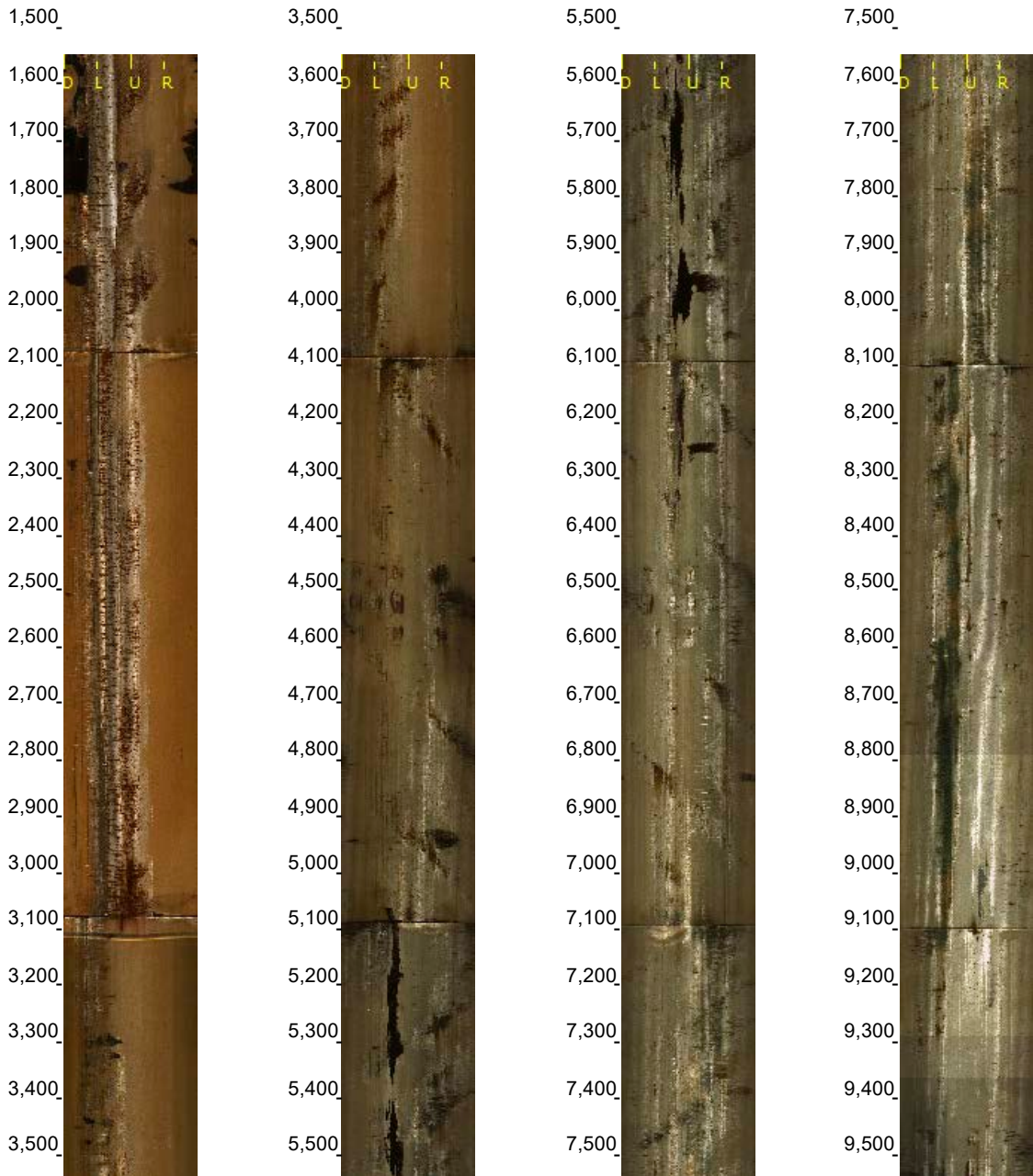
173,500
173,300

173,500
173,300

173,500
173,300

Borehole: KFR118
Mapping: KFR118

Depth range: 1.550 - 9.550 m
Azimuth: 0.0
Inclination: 0.0



Printed: 2022-01-03 09:27:51

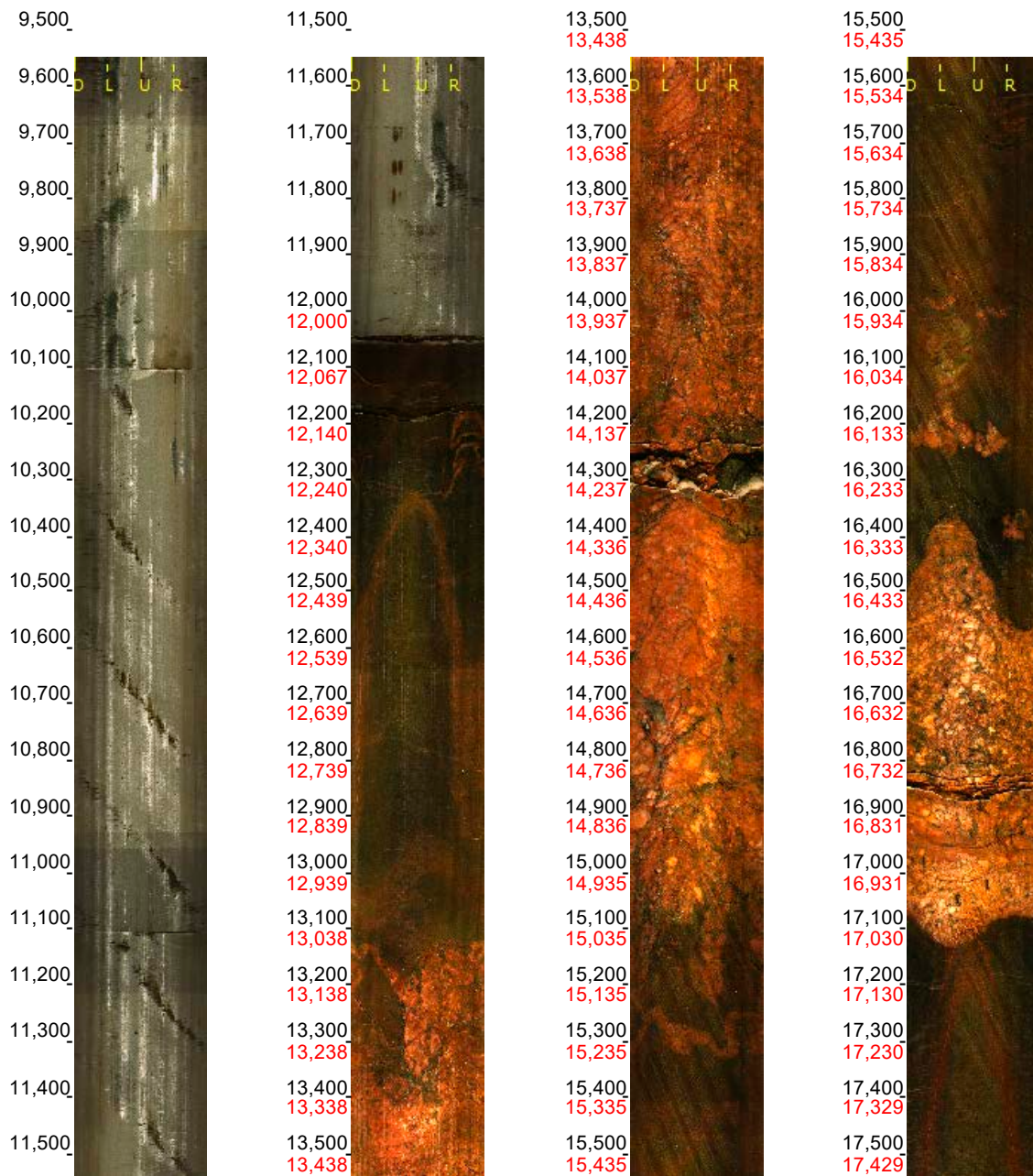
Scale: 1 : 10

Aspect: 100 %

2 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 9.550 - 17.550 m
Azimuth: 245.9
Inclination: -85.0



Printed: 2022-01-03 09:27:51

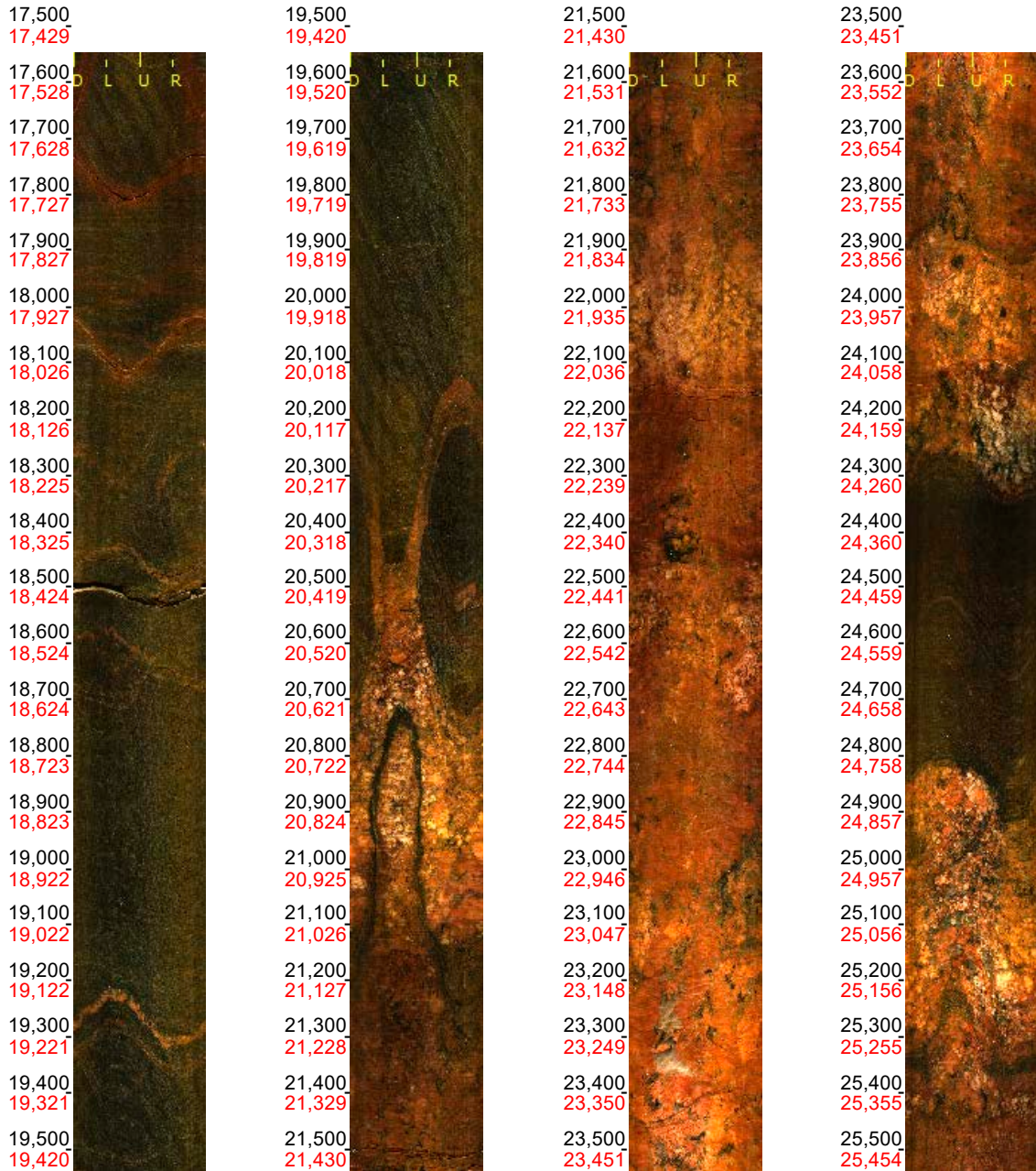
Scale: 1 : 10

Aspect: 100 %

3 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 17.550 - 25.550 m
Azimuth: 255.5
Inclination: -84.8



Printed: 2022-01-03 09:27:51

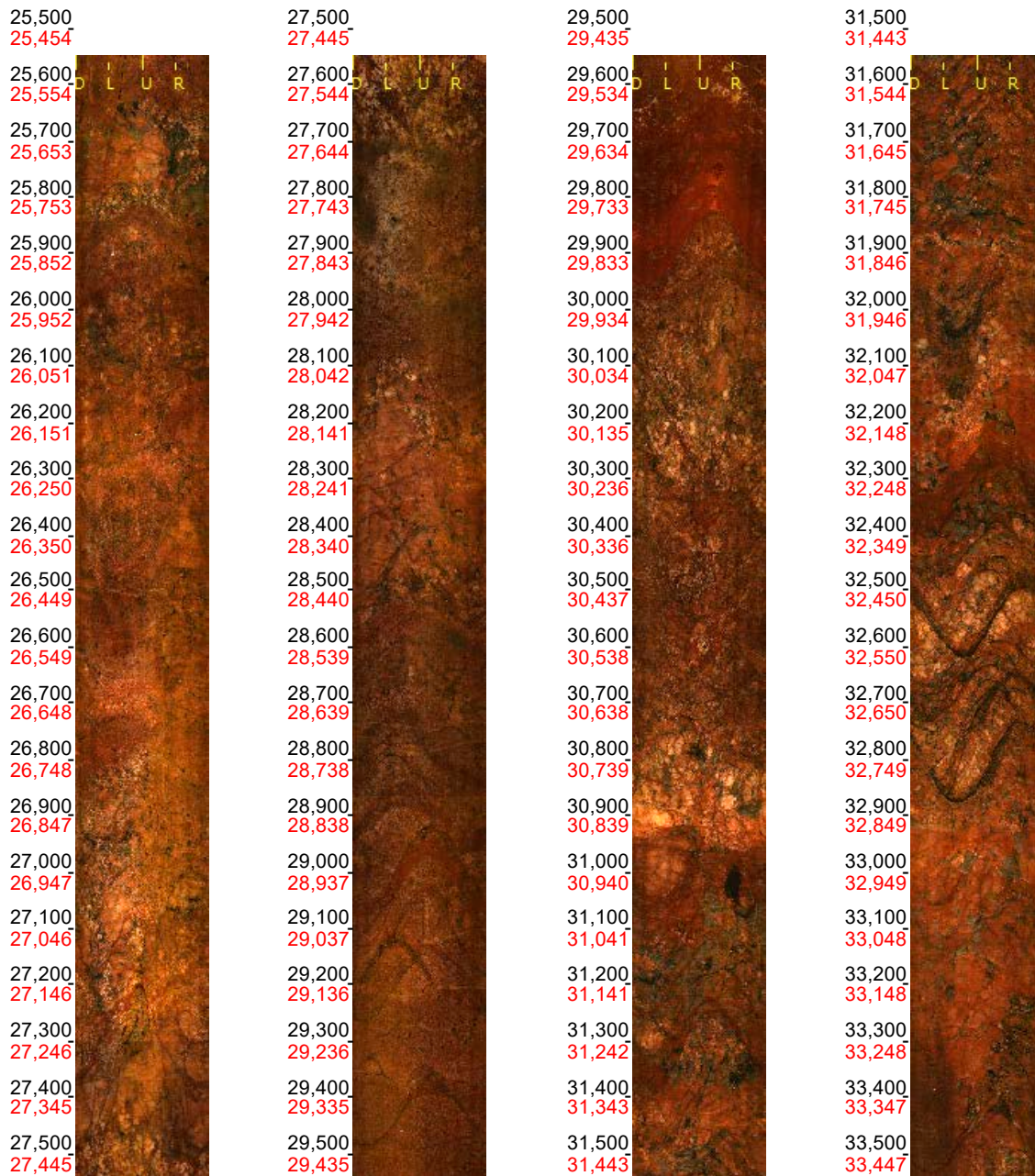
Scale: 1 : 10

Aspect: 100 %

4 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 25.550 - 33.550 m
Azimuth: 252.3
Inclination: -84.9



Printed: 2022-01-03 09:27:51

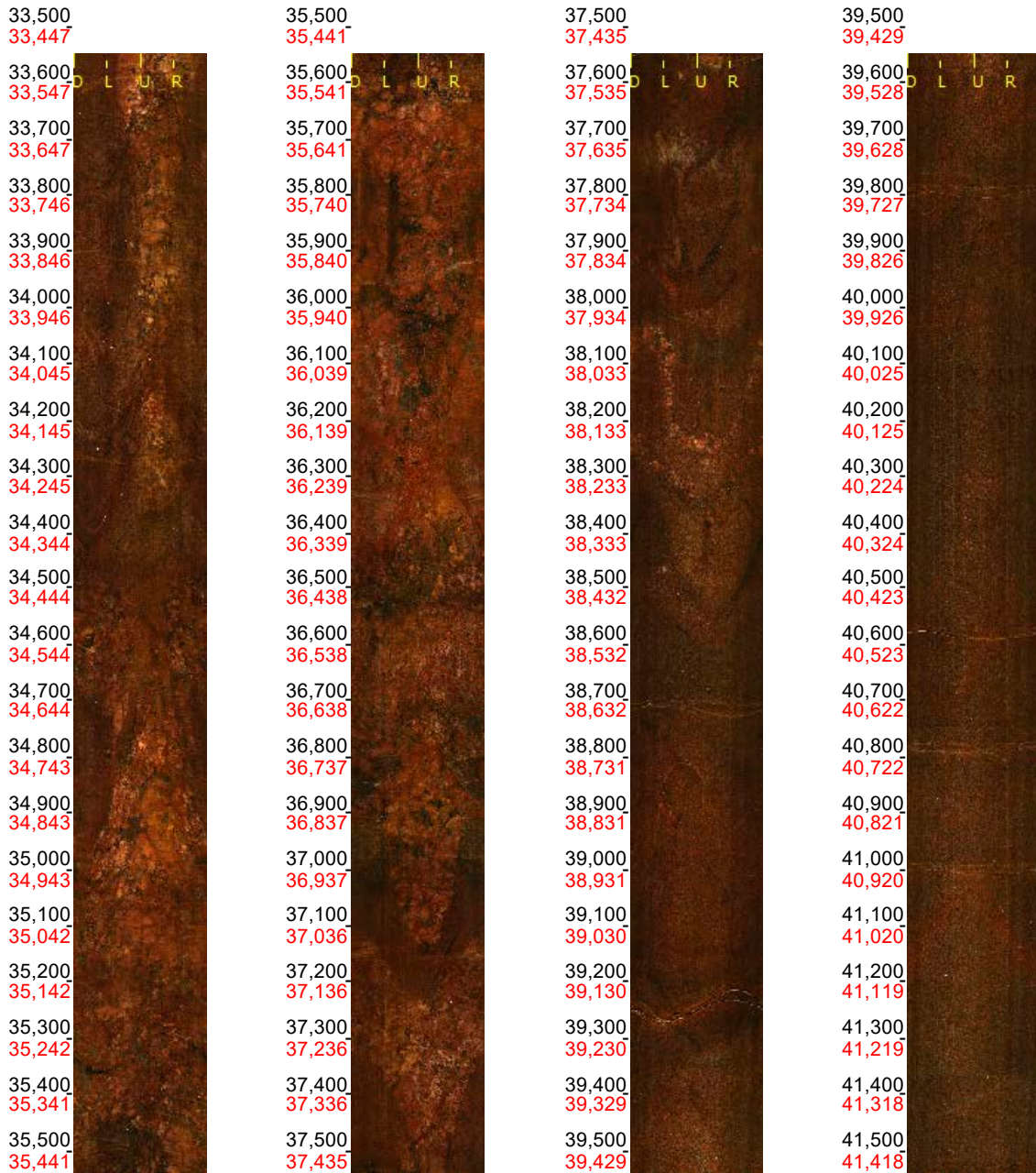
Scale: 1 : 10

Aspect: 100 %

5 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 33.550 - 41.550 m
Azimuth: 257.2
Inclination: -84.6



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

6 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 41.550 - 49.550 m
Azimuth: 257.5
Inclination: -84.6

41,500 41,418	43,500 43,418	45,500 45,419	47,500 47,420
41,600 41,517	43,600 43,518	45,600 45,519	47,600 47,520
41,700 41,617	43,700 43,618	45,700 45,619	47,700 47,620
41,800 41,717	43,800 43,718	45,800 45,719	47,800 47,720
41,900 41,817	43,900 43,818	45,900 45,819	47,900 47,821
42,000 41,917	44,000 43,918	46,000 45,919	48,000 47,921
42,100 42,017	44,100 44,018	46,100 46,019	48,100 48,022
42,200 42,117	44,200 44,118	46,200 46,119	48,200 48,122
42,300 42,217	44,300 44,218	46,300 46,219	48,300 48,223
42,400 42,317	44,400 44,318	46,400 46,319	48,400 48,324
42,500 42,417	44,500 44,418	46,500 46,419	48,500 48,424
42,600 42,517	44,600 44,518	46,600 46,519	48,600 48,525
42,700 42,618	44,700 44,618	46,700 46,619	48,700 48,625
42,800 42,718	44,800 44,719	46,800 46,720	48,800 48,726
42,900 42,818	44,900 44,819	46,900 46,820	48,900 48,827
43,000 42,918	45,000 44,919	47,000 46,920	49,000 48,927
43,100 43,018	45,100 45,019	47,100 47,020	49,100 49,028
43,200 43,118	45,200 45,119	47,200 47,120	49,200 49,128
43,300 43,218	45,300 45,219	47,300 47,220	49,300 49,227
43,400 43,318	45,400 45,319	47,400 47,320	49,400 49,326
43,500 43,418	45,500 45,419	47,500 47,420	49,500 49,425

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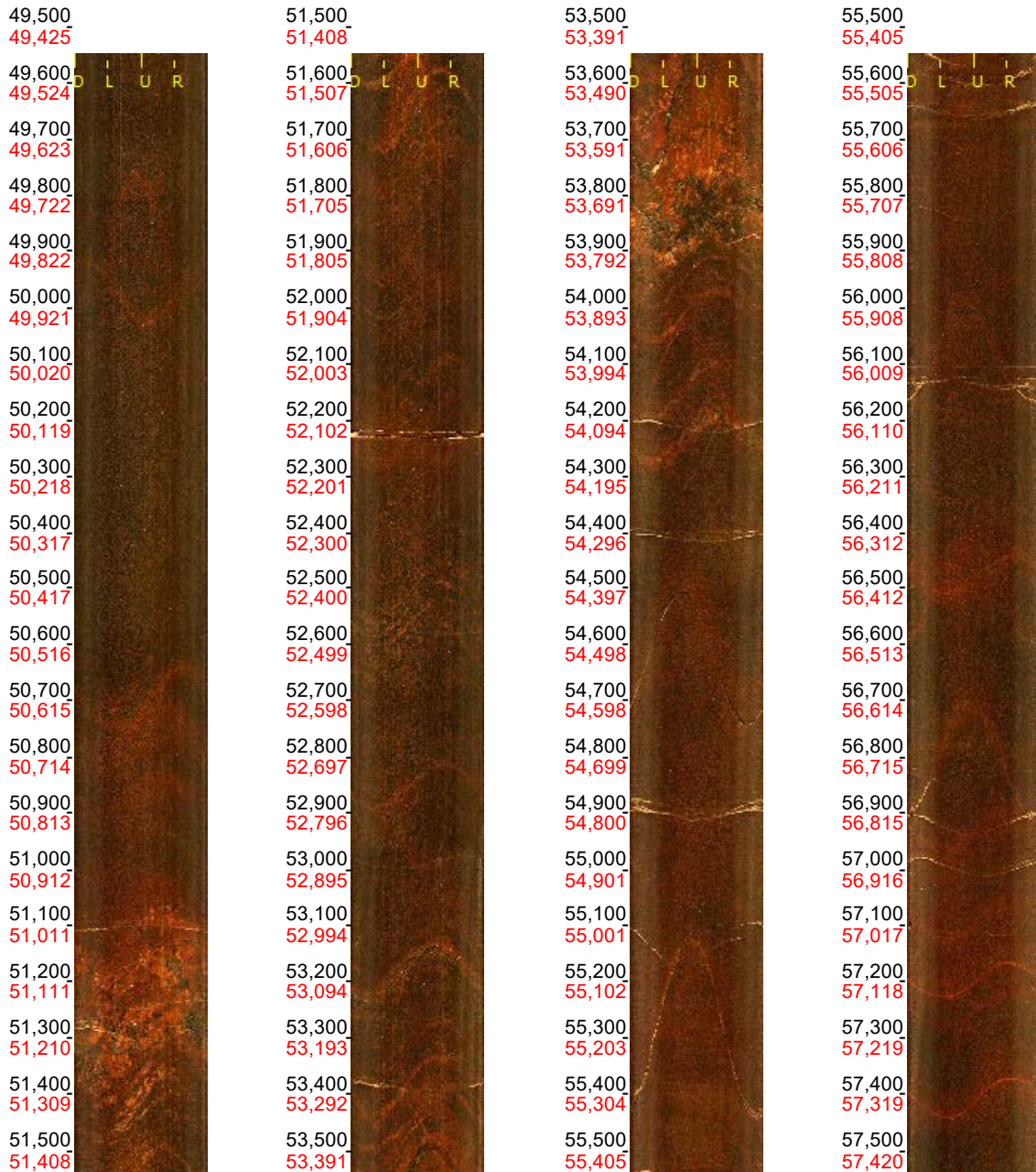
Scale: 1 : 10

Aspect: 100 %

7 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 49.550 - 57.550 m
Azimuth: 257.3
Inclination: -84.6



Printed: 2022-01-03 09:27:51

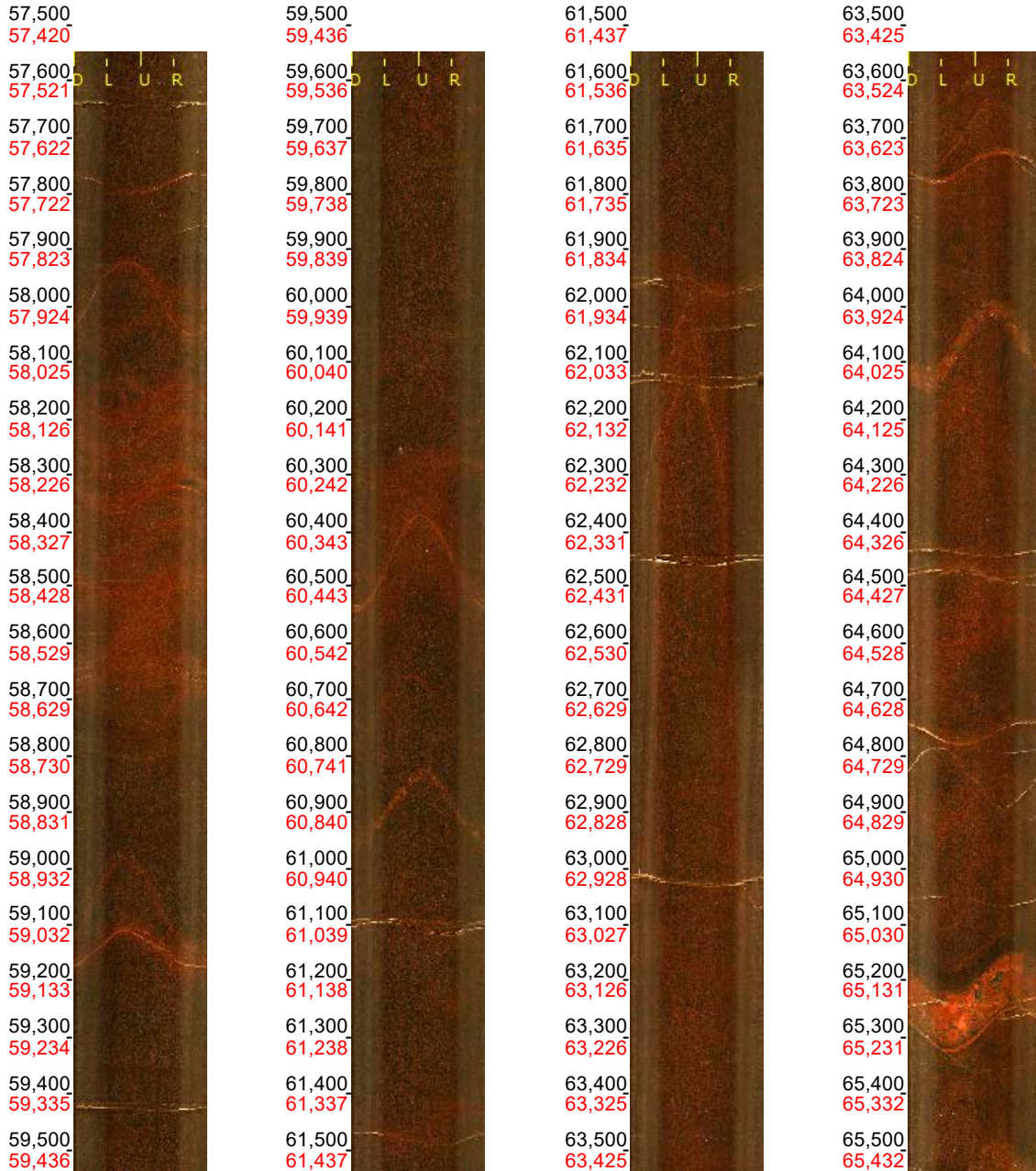
Scale: 1 : 10

Aspect: 100 %

8 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 57.550 - 65.550 m
Azimuth: 255.9
Inclination: -84.7



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

9 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 65.550 - 73.550 m
Azimuth: 256.9
Inclination: -84.7



Printed: 2022-01-03 09:27:51

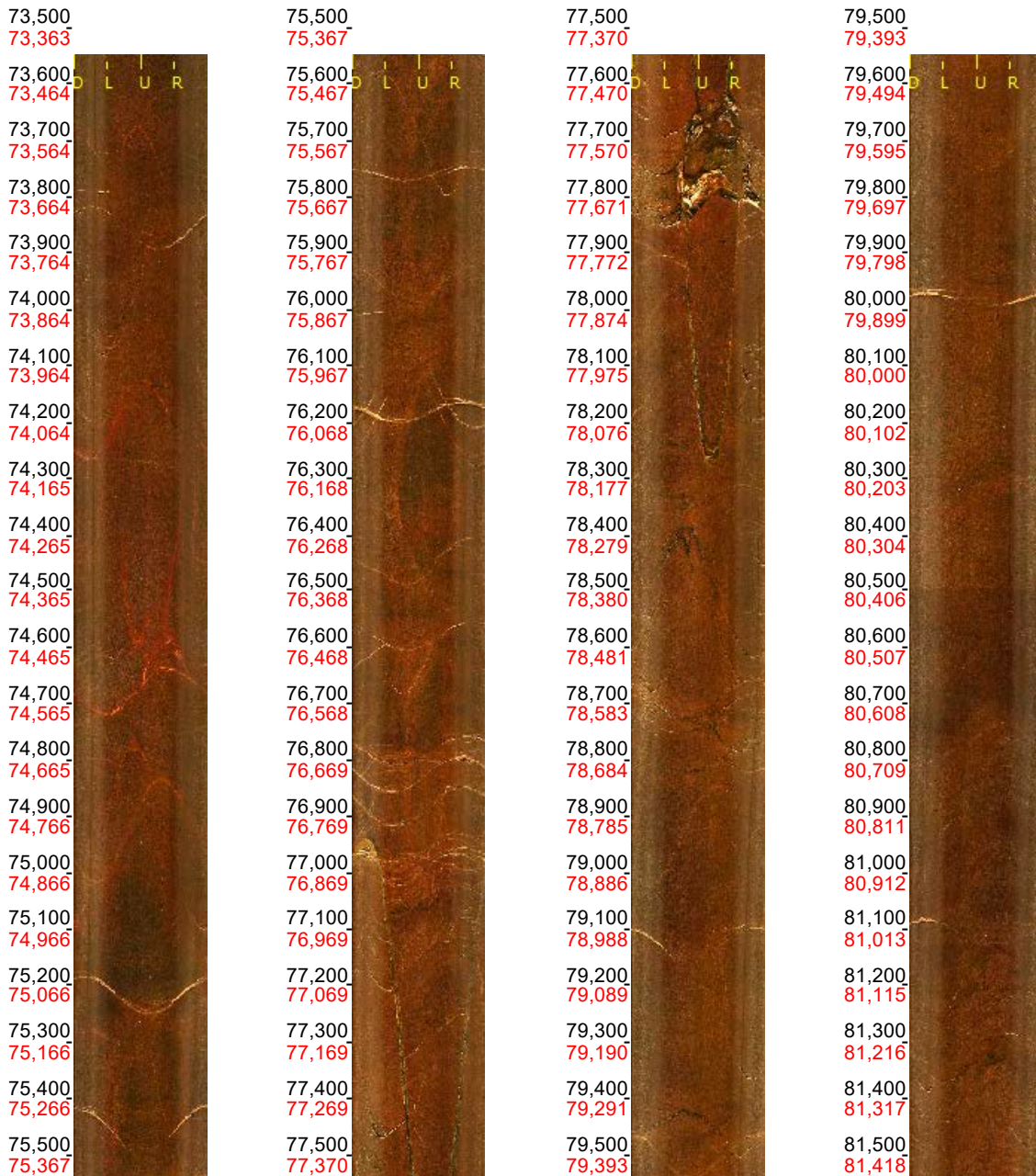
Scale: 1 : 10

Aspect: 100 %

10 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 73.550 - 81.550 m
Azimuth: 256.4
Inclination: -84.6



Printed: 2022-01-03 09:27:51

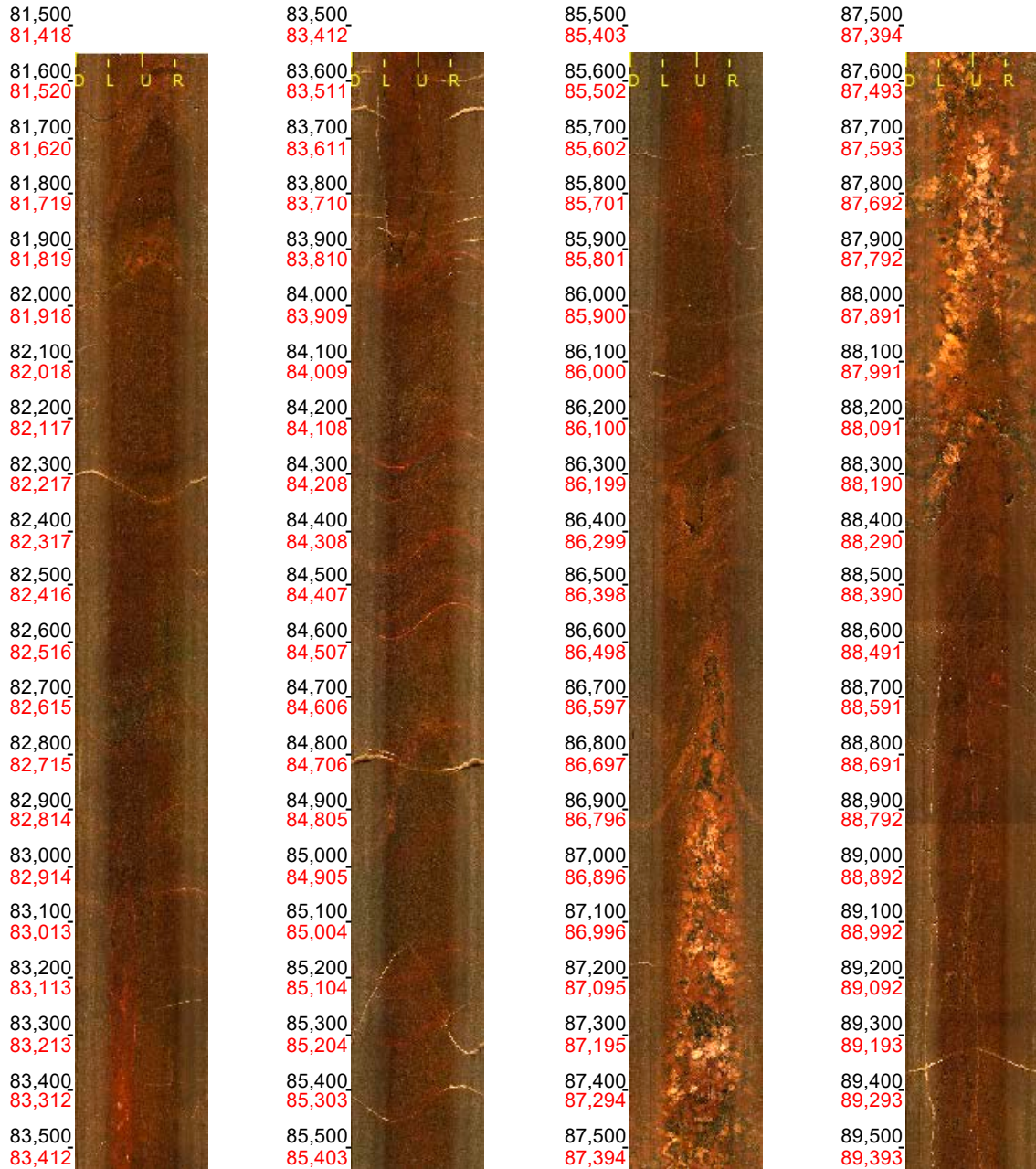
Scale: 1 : 10

Aspect: 100 %

11 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 81.550 - 89.550 m
Azimuth: 257.2
Inclination: -84.5



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

12 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 89.550 - 97.550 m
Azimuth: 256.9
Inclination: -84.4



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

13 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 97.550 - 105.550 m
Azimuth: 257.4
Inclination: -84.4

97,500 97,454	99,500 99,432	101,500 101,409	103,500 103,386
97,600 97,553	99,600 99,531	101,600 101,508	103,600 103,485
97,700 97,652	99,700 99,629	101,700 101,607	103,700 103,585
97,800 97,751	99,800 99,728	101,800 101,706	103,800 103,686
97,900 97,850	99,900 99,827	101,900 101,804	103,900 103,786
98,000 97,949	100,000 99,926	102,000 101,903	104,000 103,887
98,100 98,048	100,100 100,025	102,100 102,002	104,100 103,987
98,200 98,146	100,200 100,124	102,200 102,101	104,200 104,088
98,300 98,245	100,300 100,223	102,300 102,200	104,300 104,188
98,400 98,344	100,400 100,321	102,400 102,299	104,400 104,288
98,500 98,443	100,500 100,420	102,500 102,398	104,500 104,389
98,600 98,542	100,600 100,519	102,600 102,496	104,600 104,489
98,700 98,641	100,700 100,618	102,700 102,595	104,700 104,590
98,800 98,740	100,800 100,717	102,800 102,694	104,800 104,690
98,900 98,839	100,900 100,816	102,900 102,793	104,900 104,791
99,000 98,937	101,000 100,915	103,000 102,892	105,000 104,891
99,100 99,036	101,100 101,013	103,100 102,991	105,100 104,991
99,200 99,135	101,200 101,112	103,200 103,090	105,200 105,092
99,300 99,234	101,300 101,211	103,300 103,188	105,300 105,192
99,400 99,333	101,400 101,310	103,400 103,287	105,400 105,293
99,500 99,432	101,500 101,409	103,500 103,386	105,500 105,393

Printed: 2022-01-03 09:27:51

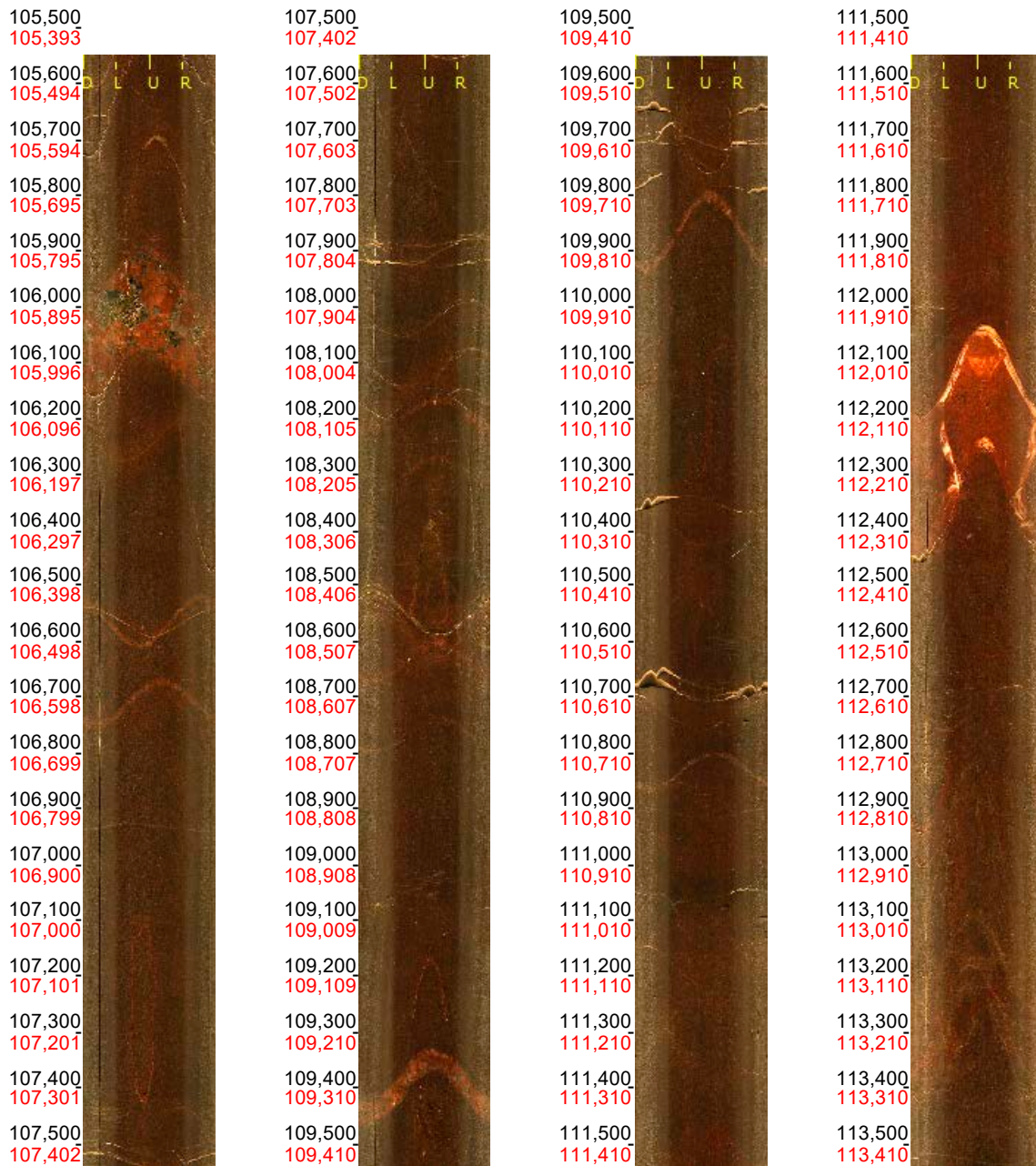
Scale: 1 : 10

Aspect: 100 %

14 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 105.550 - 113.550 m
Azimuth: 258.0
Inclination: -84.3



Printed: 2022-01-03 09:27:51

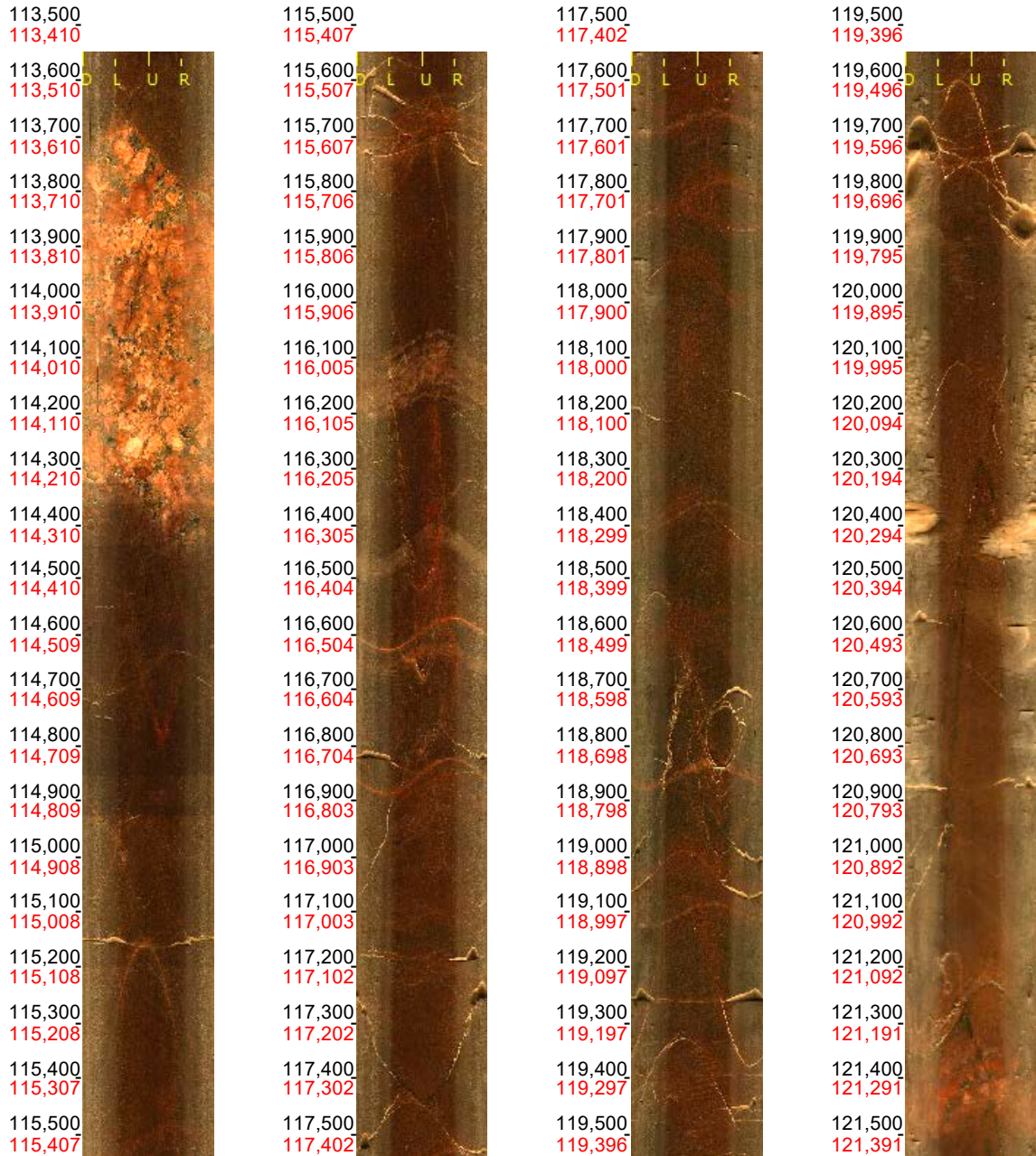
Scale: 1 : 10

Aspect: 100 %

15 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 113.550 - 121.550 m
Azimuth: 258.8
Inclination: -84.2



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

16 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 121.550 - 129.550 m
Azimuth: 258.8
Inclination: -84.2



Printed: 2022-01-03 09:27:51

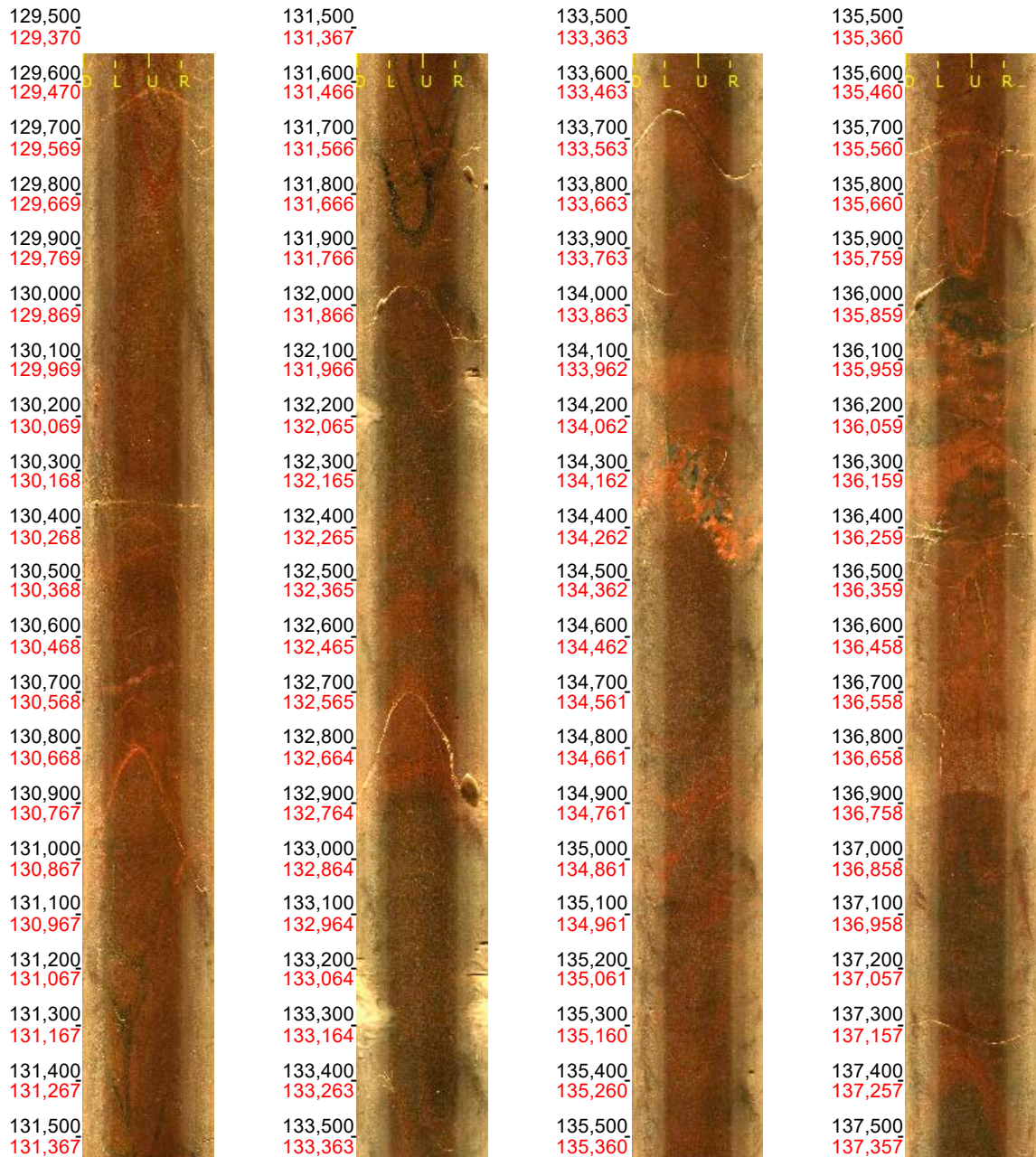
Scale: 1 : 10

Aspect: 100 %

17 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 129.550 - 137.550 m
Azimuth: 258.7
Inclination: -84.2



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

18 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 137.550 - 145.550 m
Azimuth: 259.2
Inclination: -84.2



Printed: 2022-01-03 09:27:51

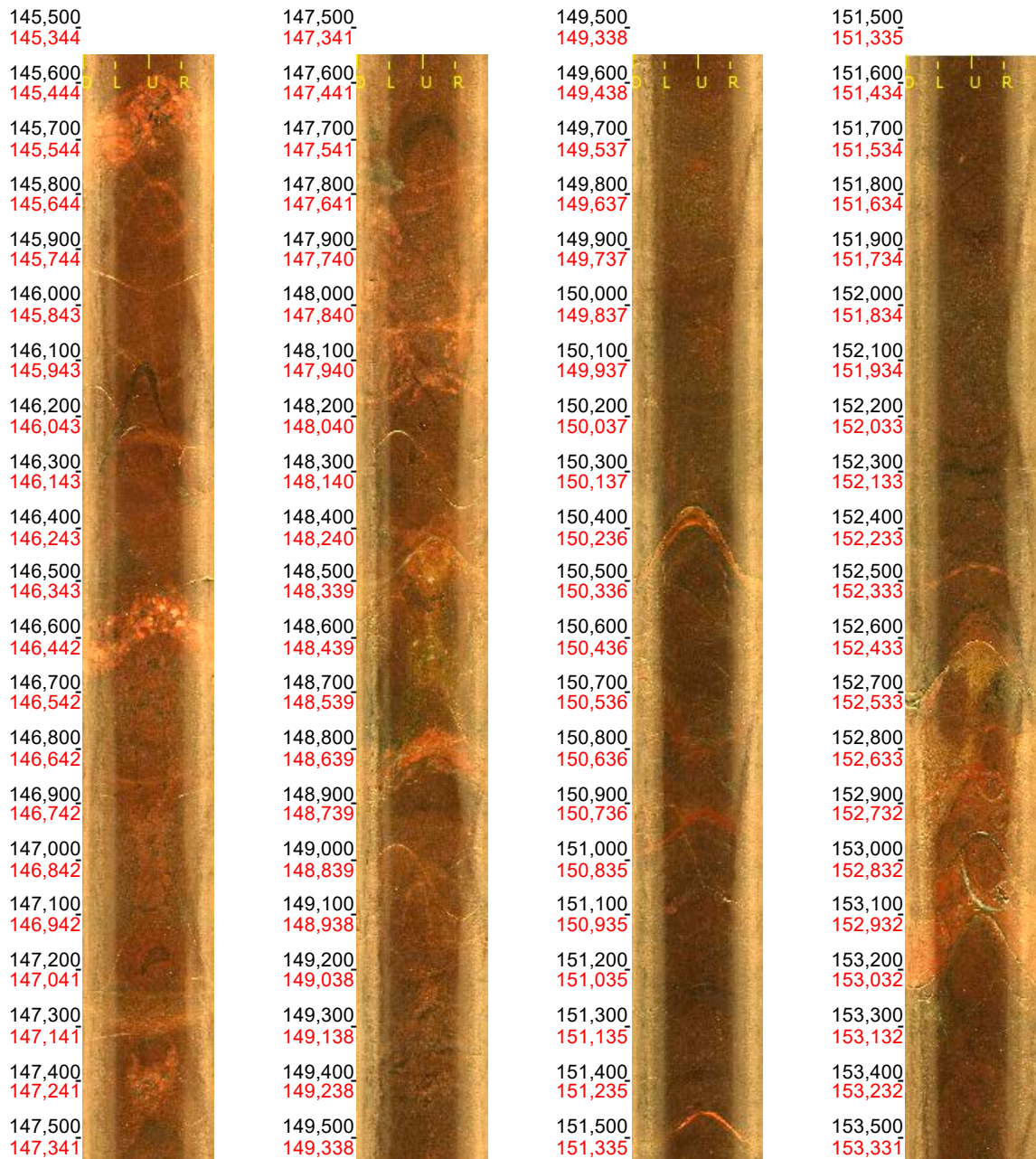
Scale: 1 : 10

Aspect: 100 %

19 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 145.550 - 153.550 m
Azimuth: 260.0
Inclination: -84.2



Printed: 2022-01-03 09:27:51

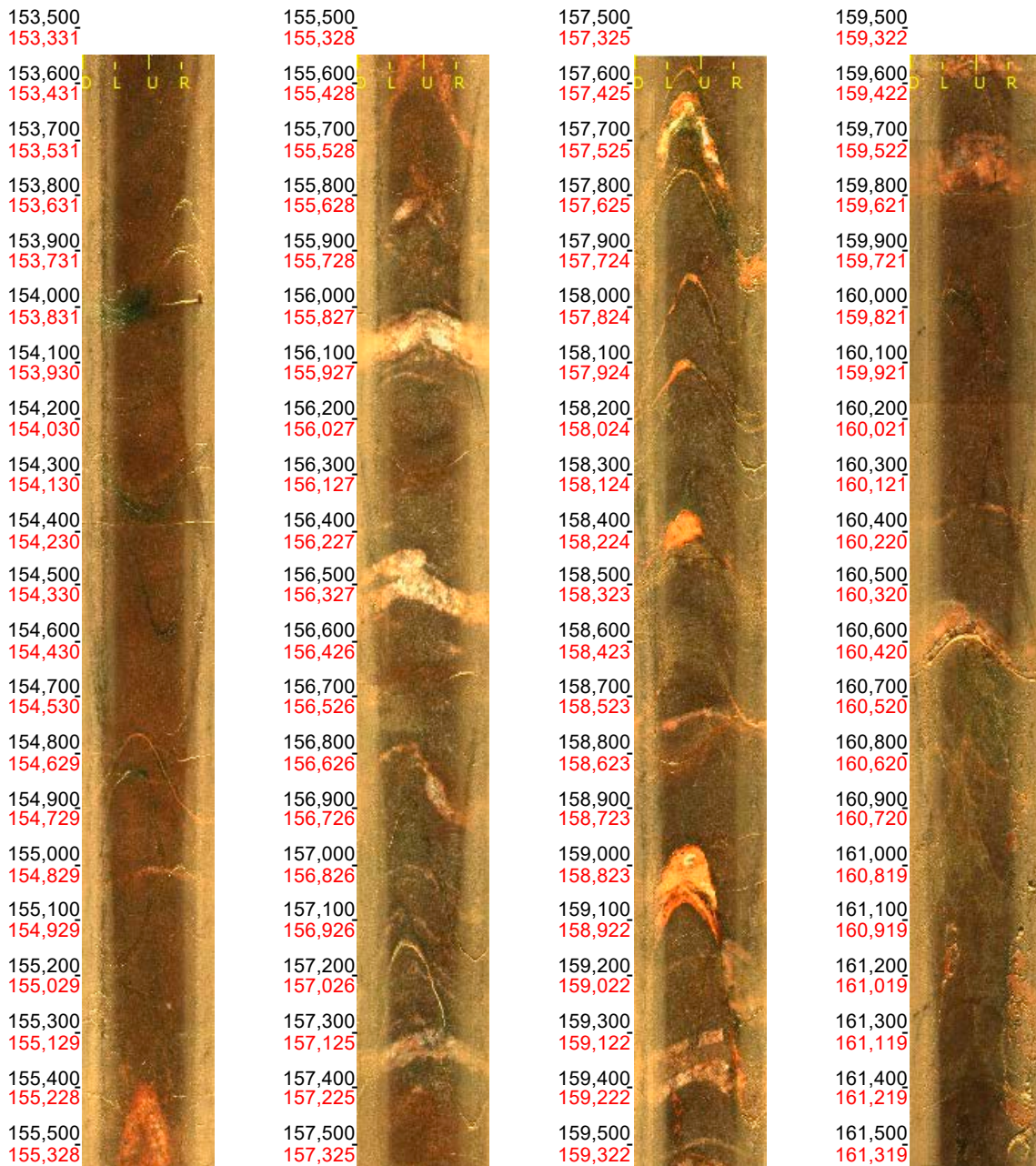
Scale: 1 : 10

Aspect: 100 %

20 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 153.550 - 161.550 m
Azimuth: 259.8
Inclination: -84.2



Printed: 2022-01-03 09:27:51

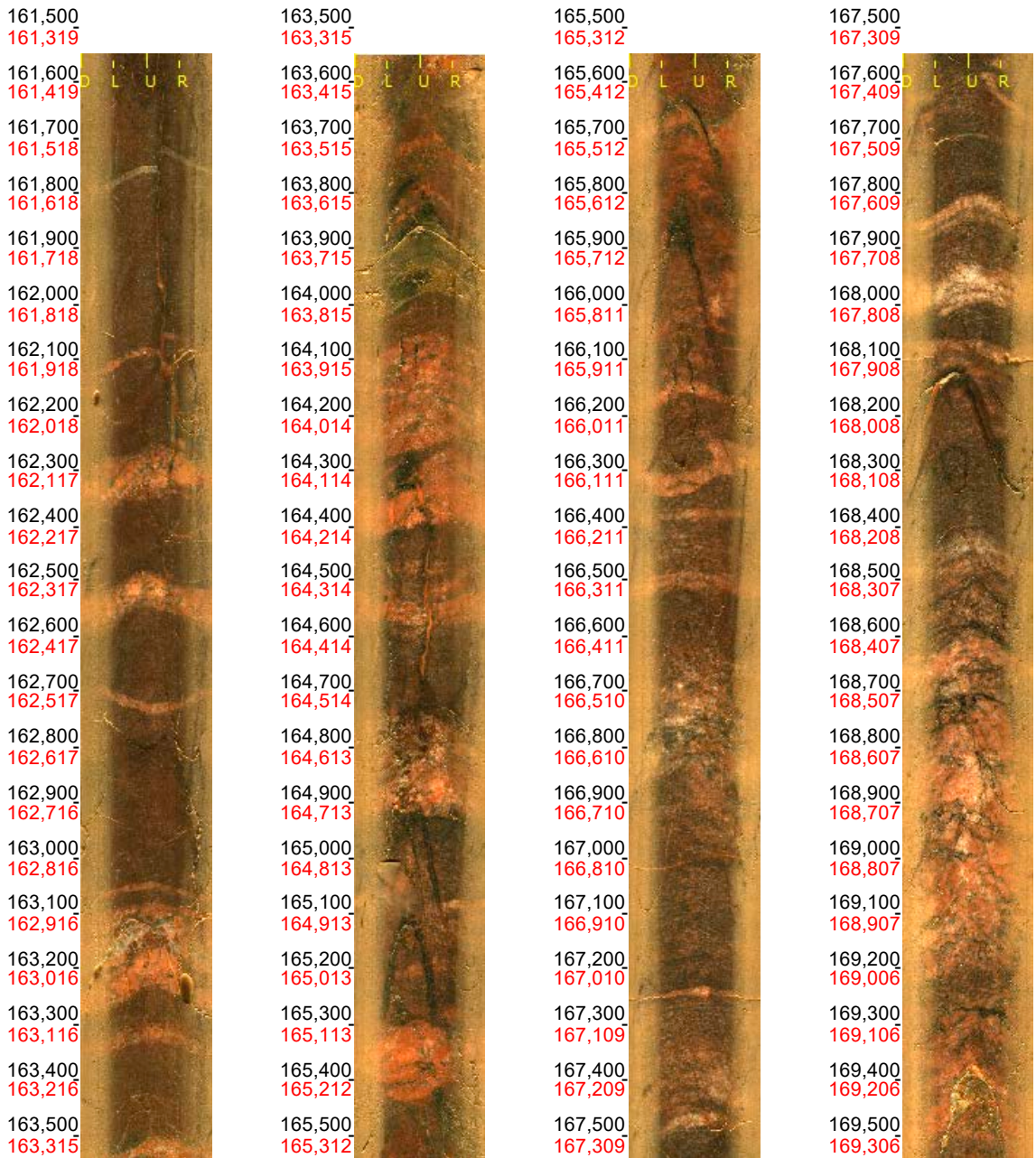
Scale: 1 : 10

Aspect: 100 %

21 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 161.550 - 169.550 m
Azimuth: 260.3
Inclination: -84.1



Printed: 2022-01-03 09:27:51

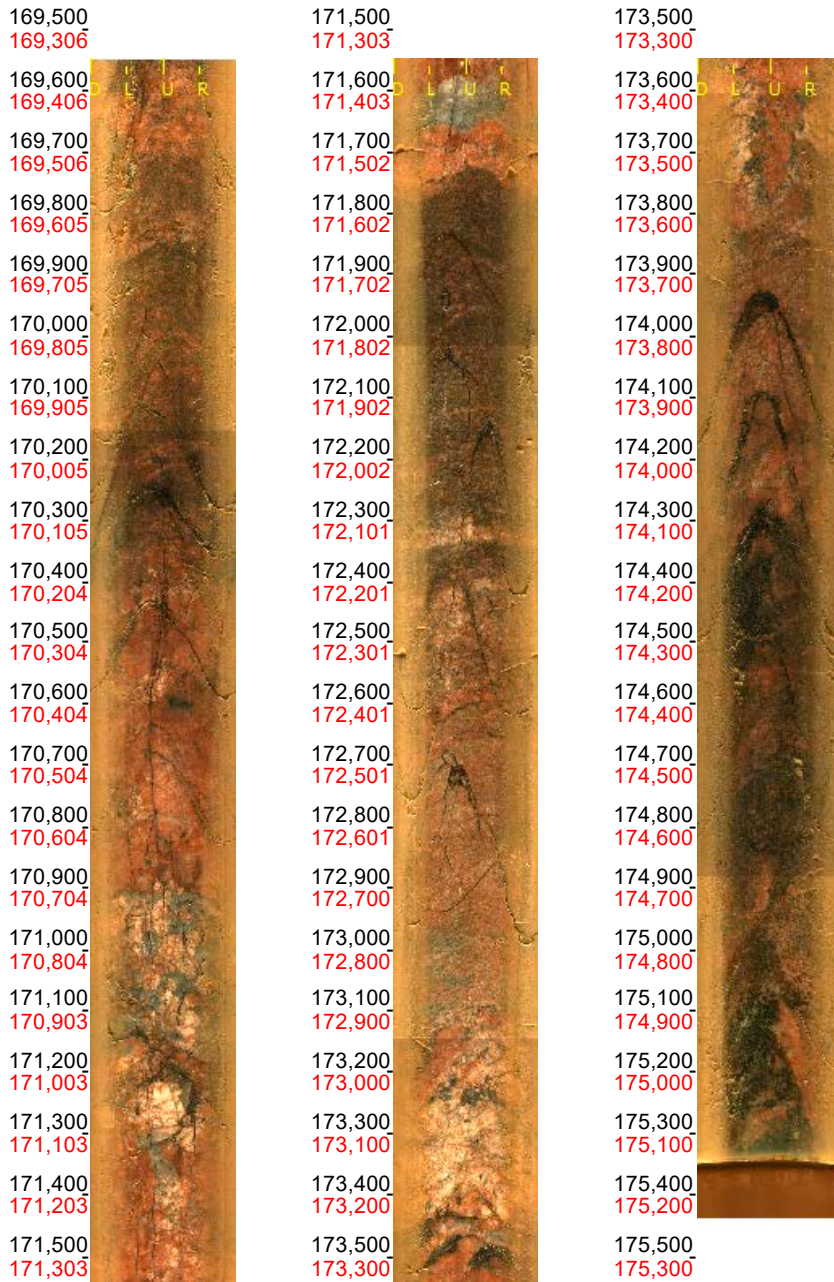
Scale: 1 : 10

Aspect: 100 %

22 (23)

Borehole: KFR118
Mapping: KFR118

Depth range: 169.550 - 175.439 m
Azimuth: 261.2
Inclination: -84.1



Printed: 2022-01-03 09:27:51

Scale: 1 : 10

Aspect: 100 %

23 (23)

A1.3 KFR119

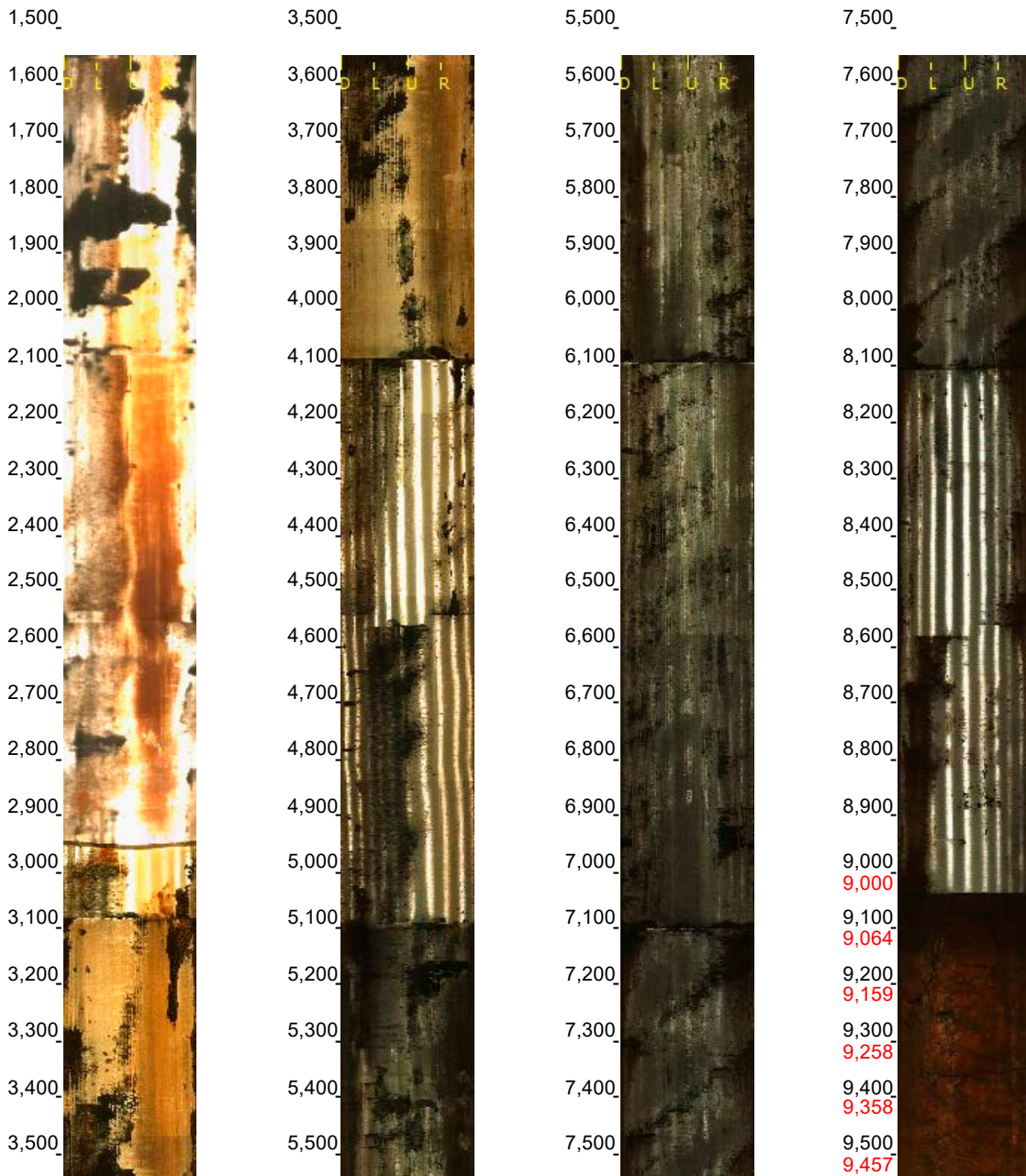
Borehole Name: KFR119
Mapping Name: KFR119
Mapping Range: 9,000 - 176,470 m
Diameter: 76,0 mm
Printed Range: 1,550 - 176,879
Pages: 23

Image File Information:

File: G:\SKB\bips\sicada\KFR119\KFR119n200526_H_LGX.HED
Date/Time: 2020-05-26
Start Depth: 1,550 m
End Depth: 176,879 m
Resolution: 1,00 mm/pixel (depth)
Orientation: Gravimetric
Image height: 175330 pixels
Image width: 720 pixels
Intrinsic angle: 180 degrees
LGX Version: 101
Locality:
Wellname: KFR119
Scan Direction: Down

Borehole: KFR119
Mapping: KFR119

Depth range: 1.550 - 9.550 m
Azimuth: 211.2
Inclination: -80.7



Printed: 2022-01-03 09:33:30

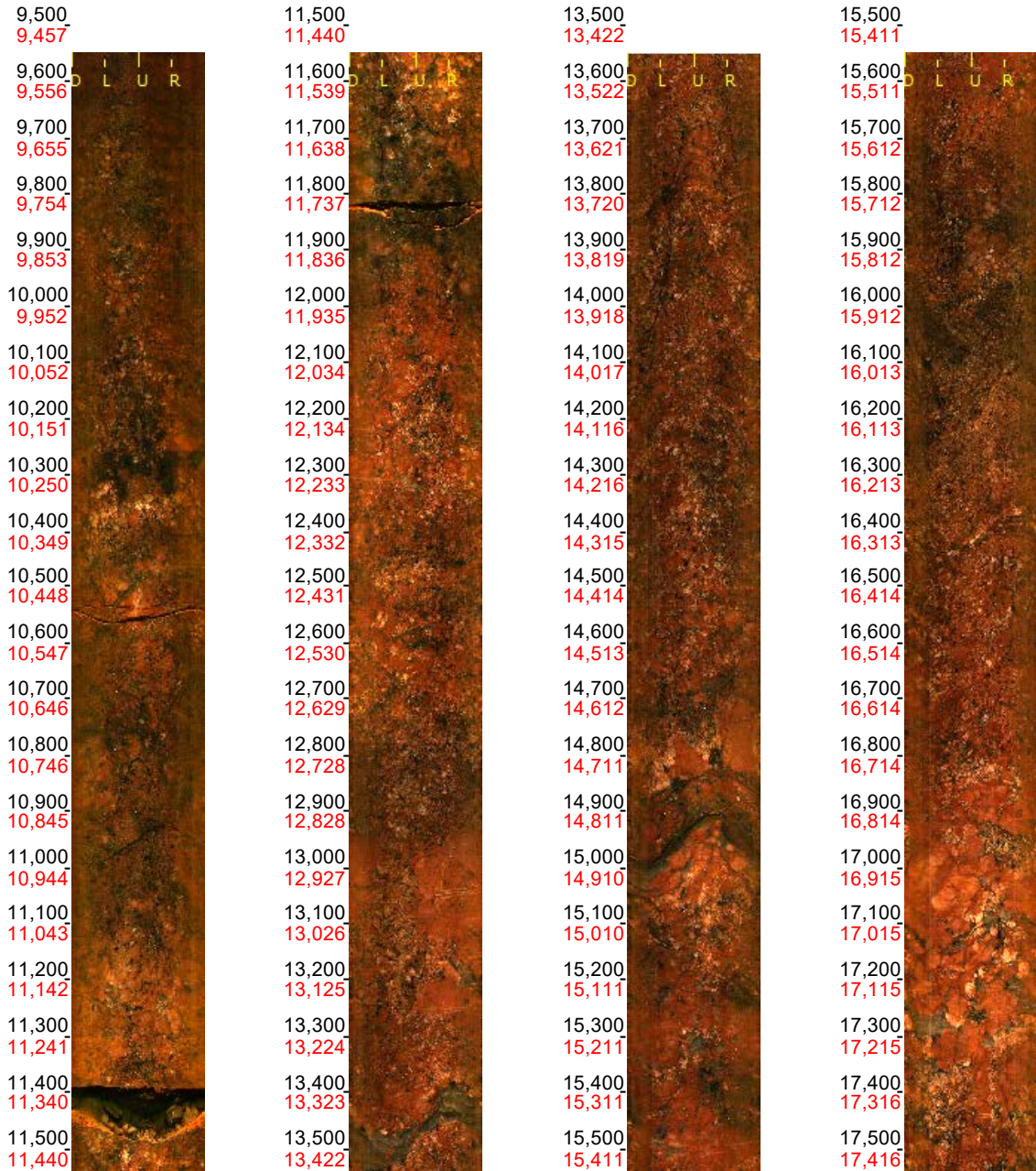
Scale: 1 : 10

Aspect: 100 %

2 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 9.550 - 17.550 m
Azimuth: 212.0
Inclination: -80.4



Printed: 2022-01-03 09:33:30

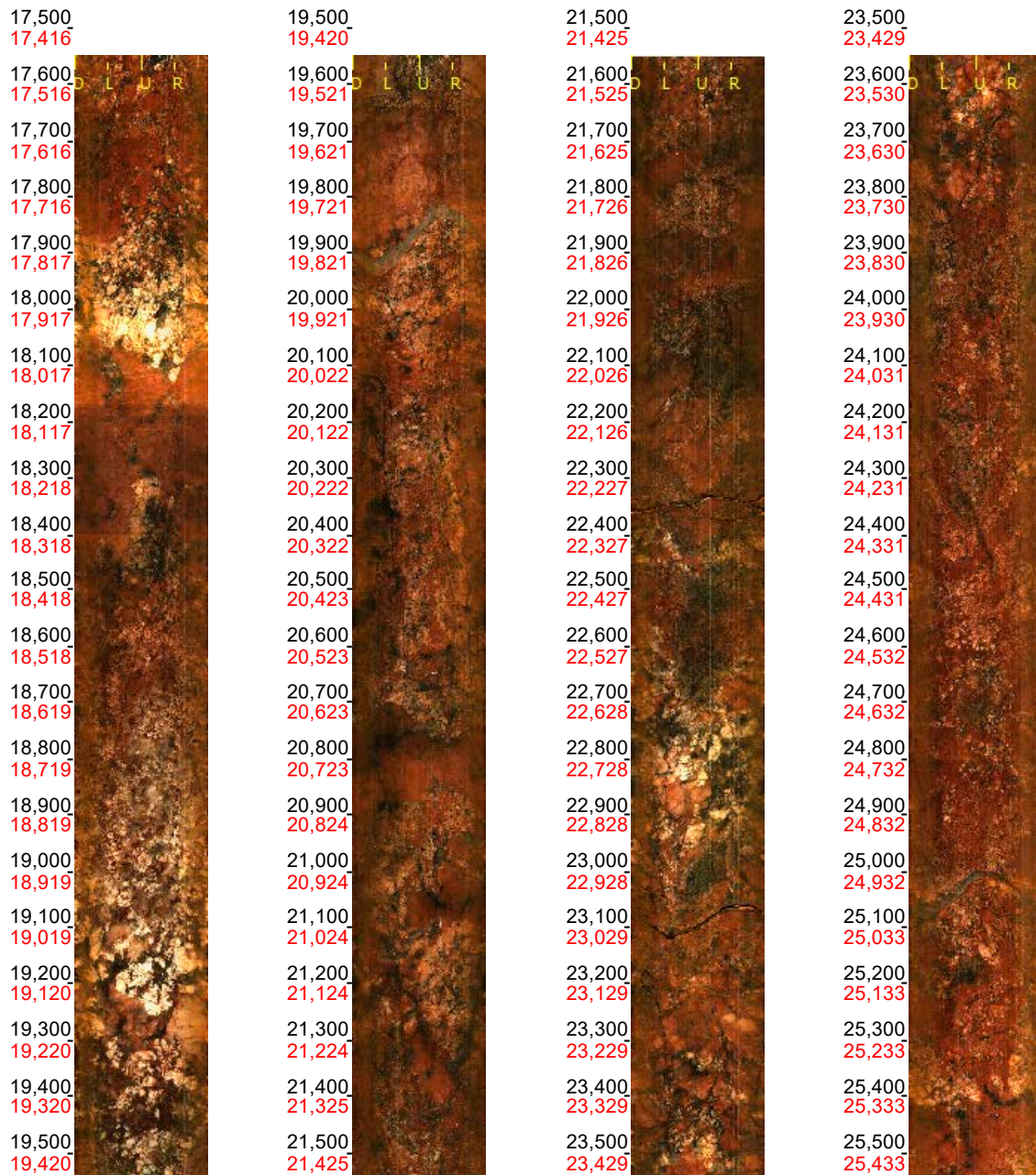
Scale: 1 : 10

Aspect: 100 %

3 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 17.550 - 25.550 m
Azimuth: 212.6
Inclination: -80.4



Printed: 2022-01-03 09:33:30

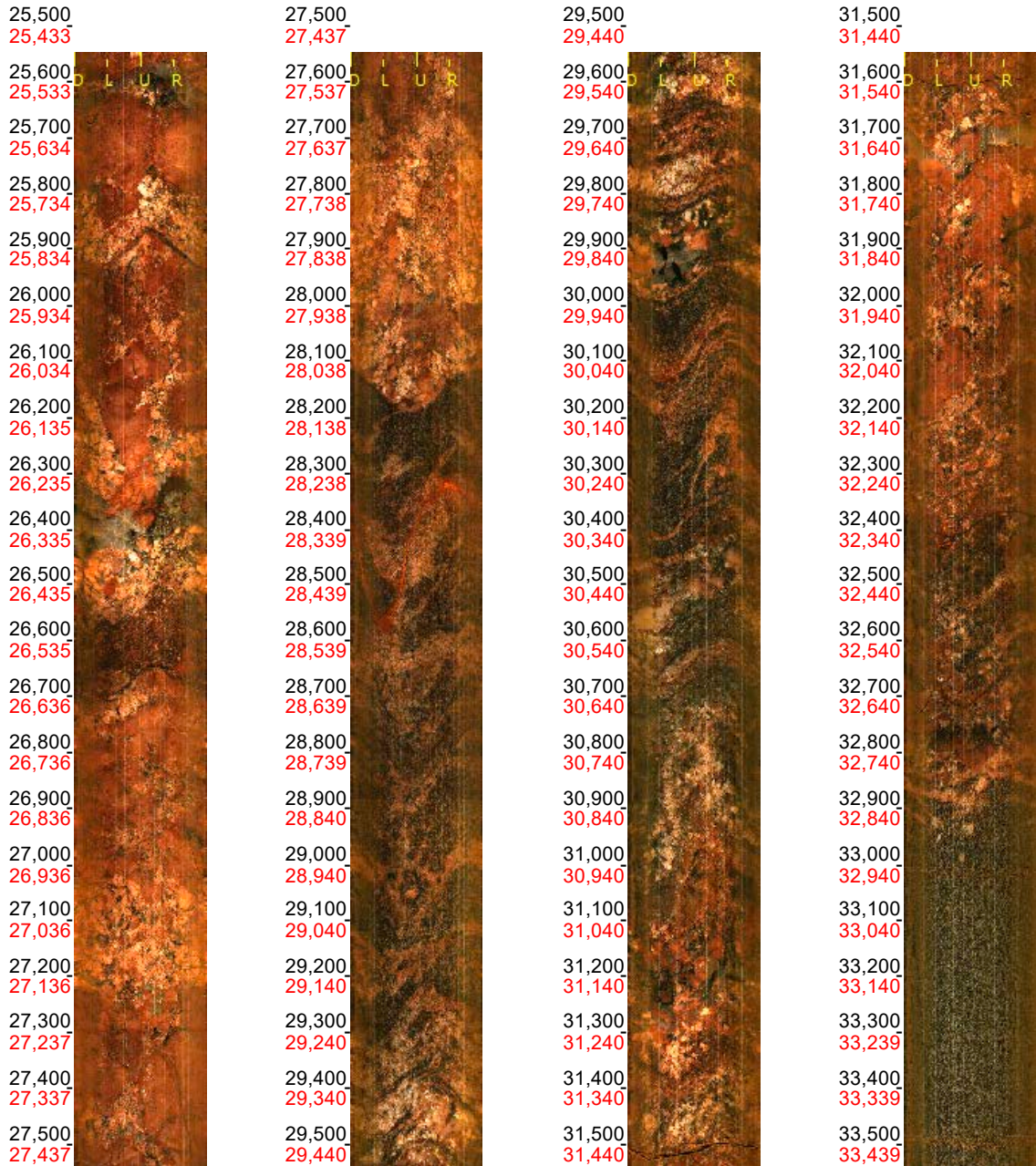
Scale: 1 : 10

Aspect: 100 %

4 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 25.550 - 33.550 m
Azimuth: 213.6
Inclination: -80.6



Printed: 2022-01-03 09:33:30

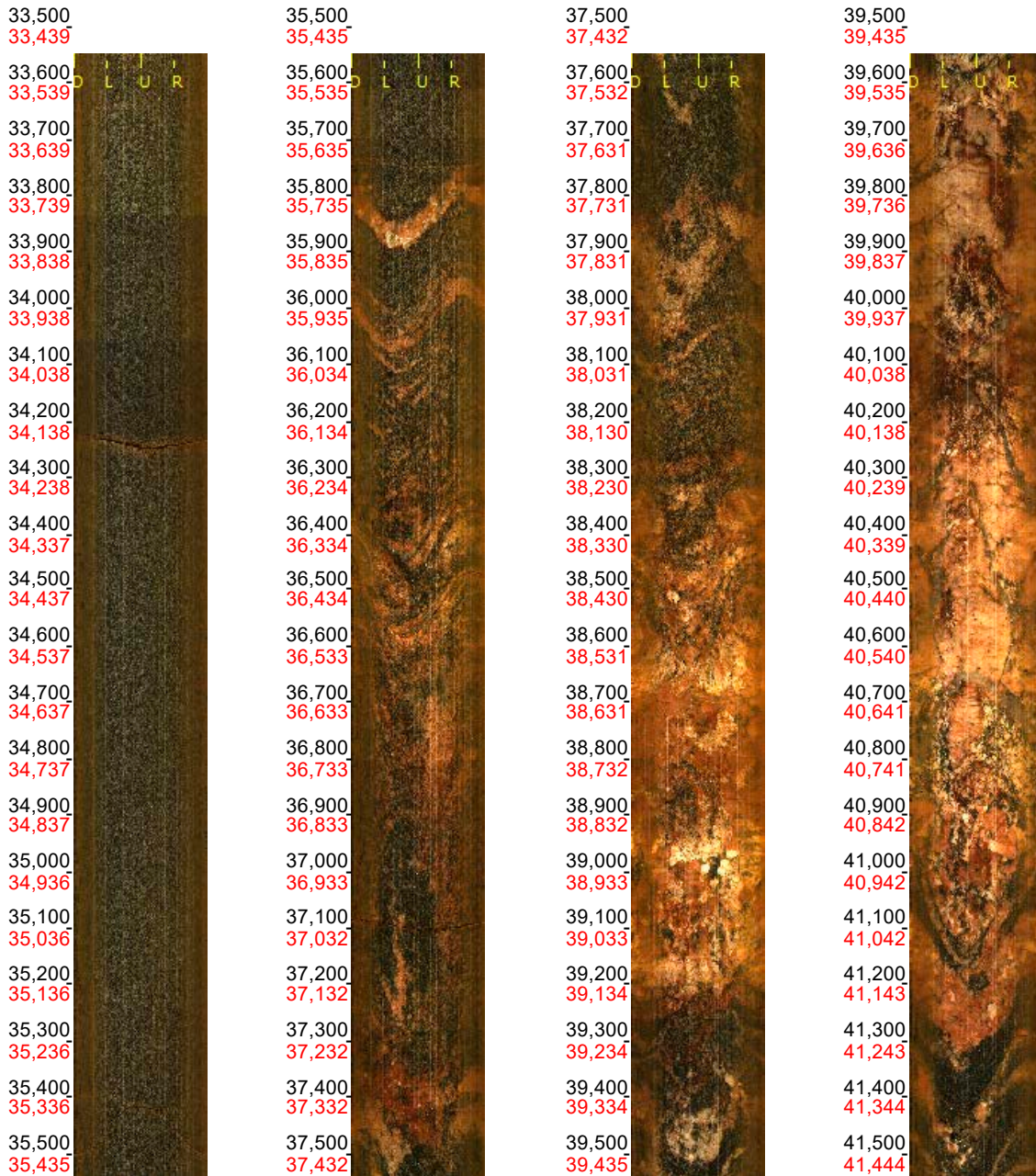
Scale: 1 : 10

Aspect: 100 %

5 (23)

Borehole: KFR119
 Mapping: KFR119

Depth range: 33.550 - 41.550 m
 Azimuth: 214.2
 Inclination: -80.5



Printed: 2022-01-03 09:33:30

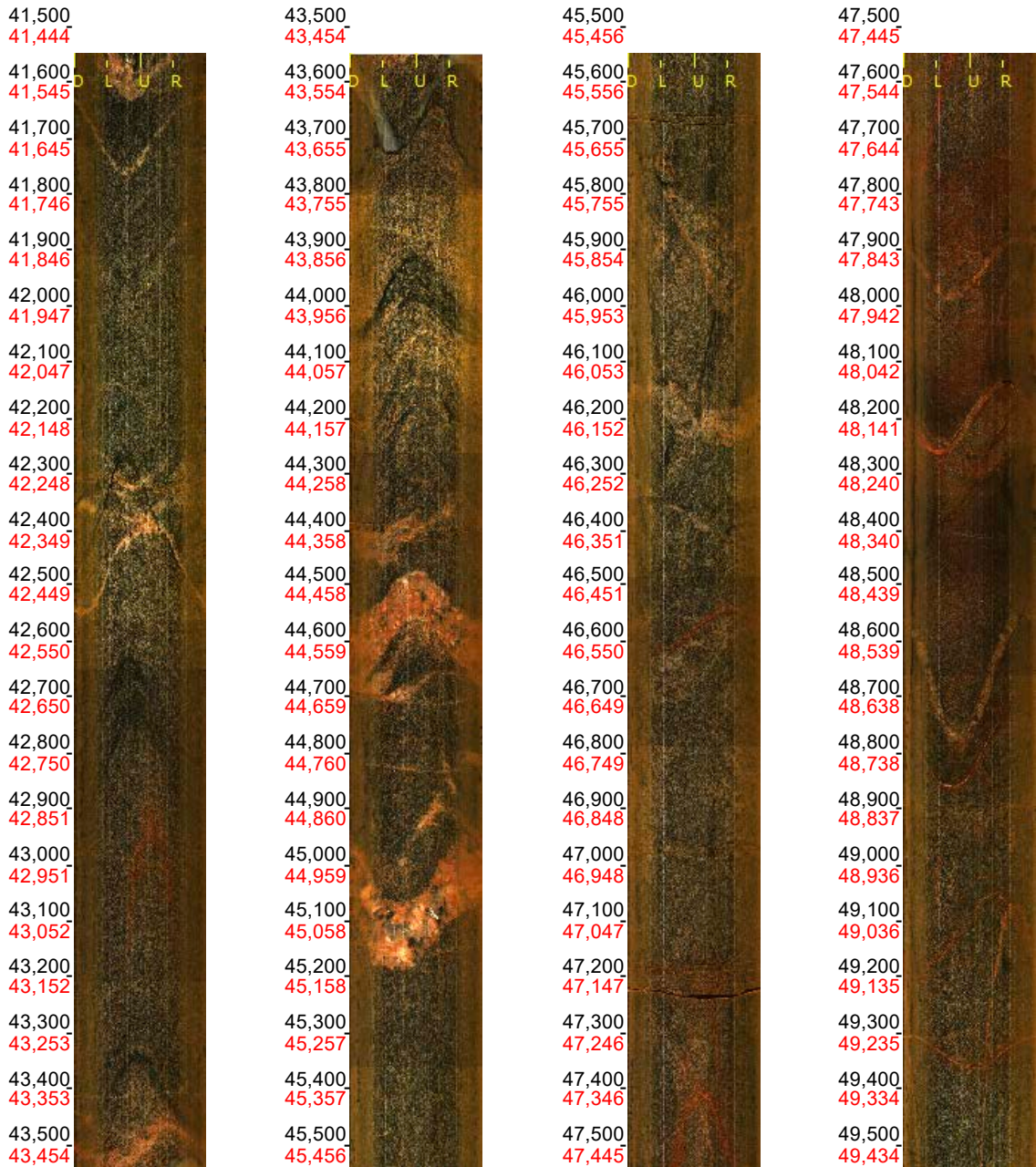
Scale: 1 : 10

Aspect: 100 %

6 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 41.550 - 49.550 m
Azimuth: 213.6
Inclination: -80.4



Printed: 2022-01-03 09:33:30

Scale: 1 : 10

Aspect: 100 %

7 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 49.550 - 57.550 m
Azimuth: 213.3
Inclination: -80.4



Printed: 2022-01-03 09:33:30

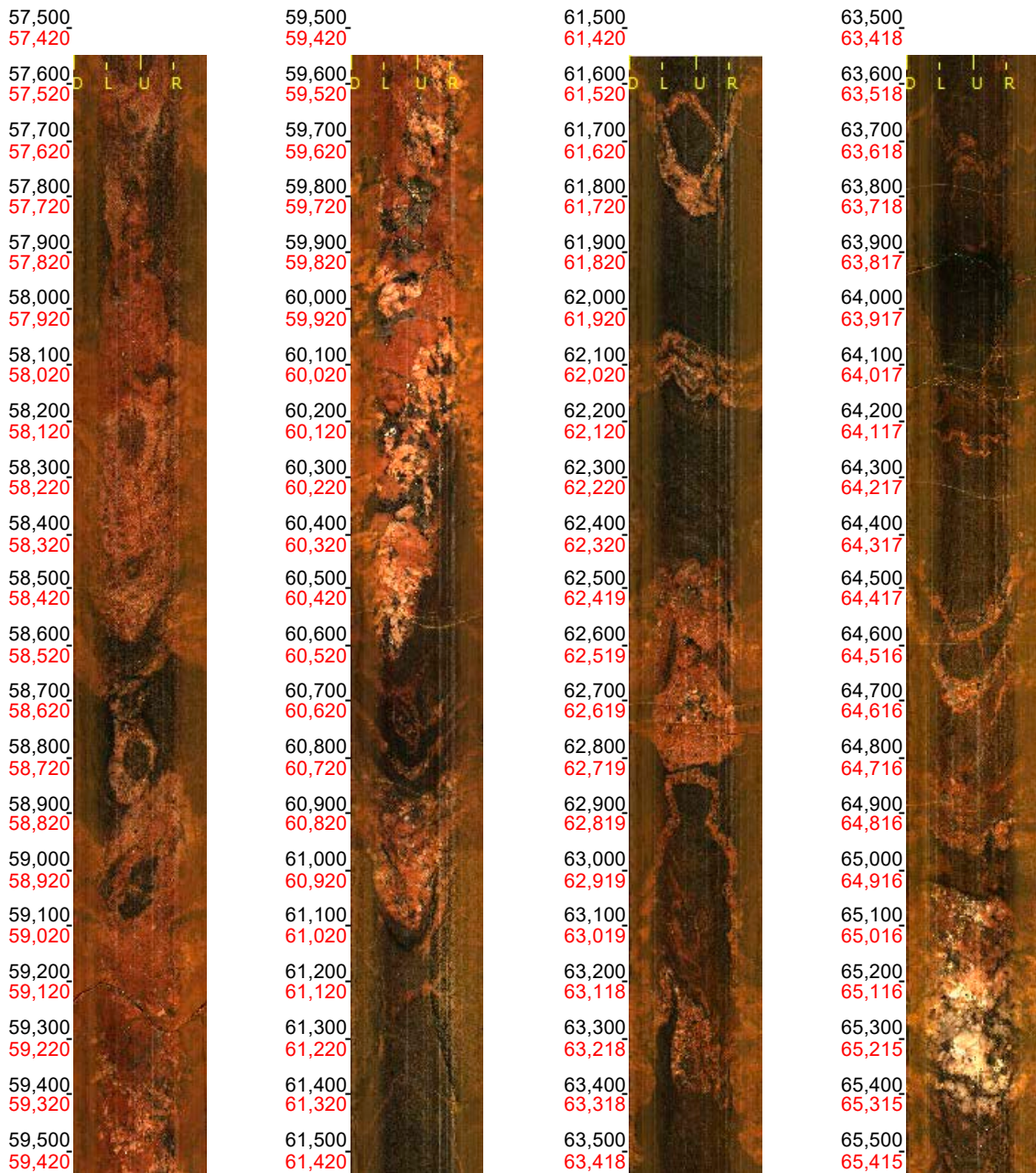
Scale: 1 : 10

Aspect: 100 %

8 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 57.550 - 65.550 m
Azimuth: 214.0
Inclination: -80.3



Printed: 2022-01-03 09:33:30

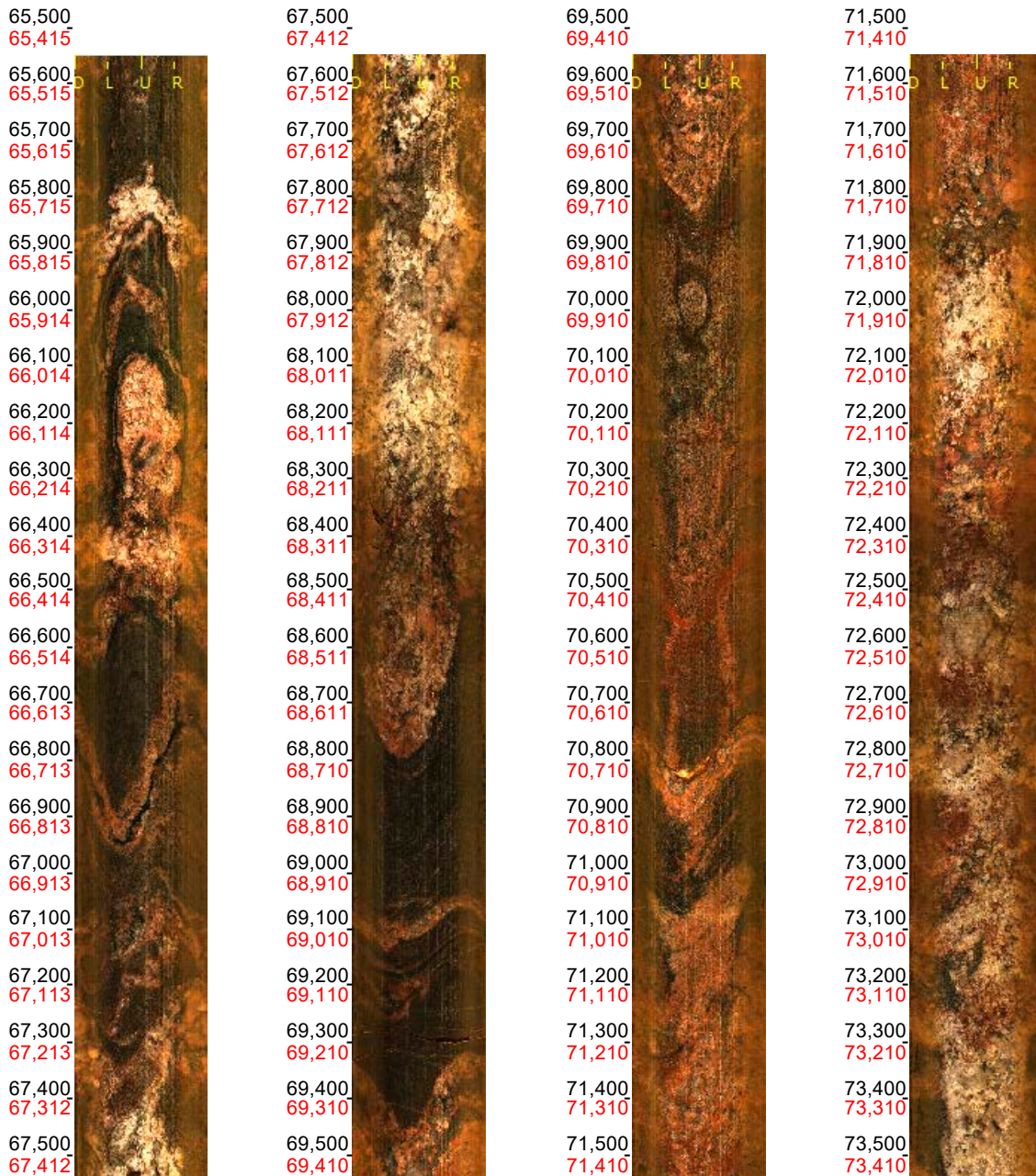
Scale: 1 : 10

Aspect: 100 %

9 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 65.550 - 73.550 m
Azimuth: 214.4
Inclination: -80.3



Printed: 2022-01-03 09:33:30

Scale: 1 : 10

Aspect: 100 %

10 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 73.550 - 81.550 m
Azimuth: 214.7
Inclination: -80.3



Printed: 2022-01-03 09:33:30

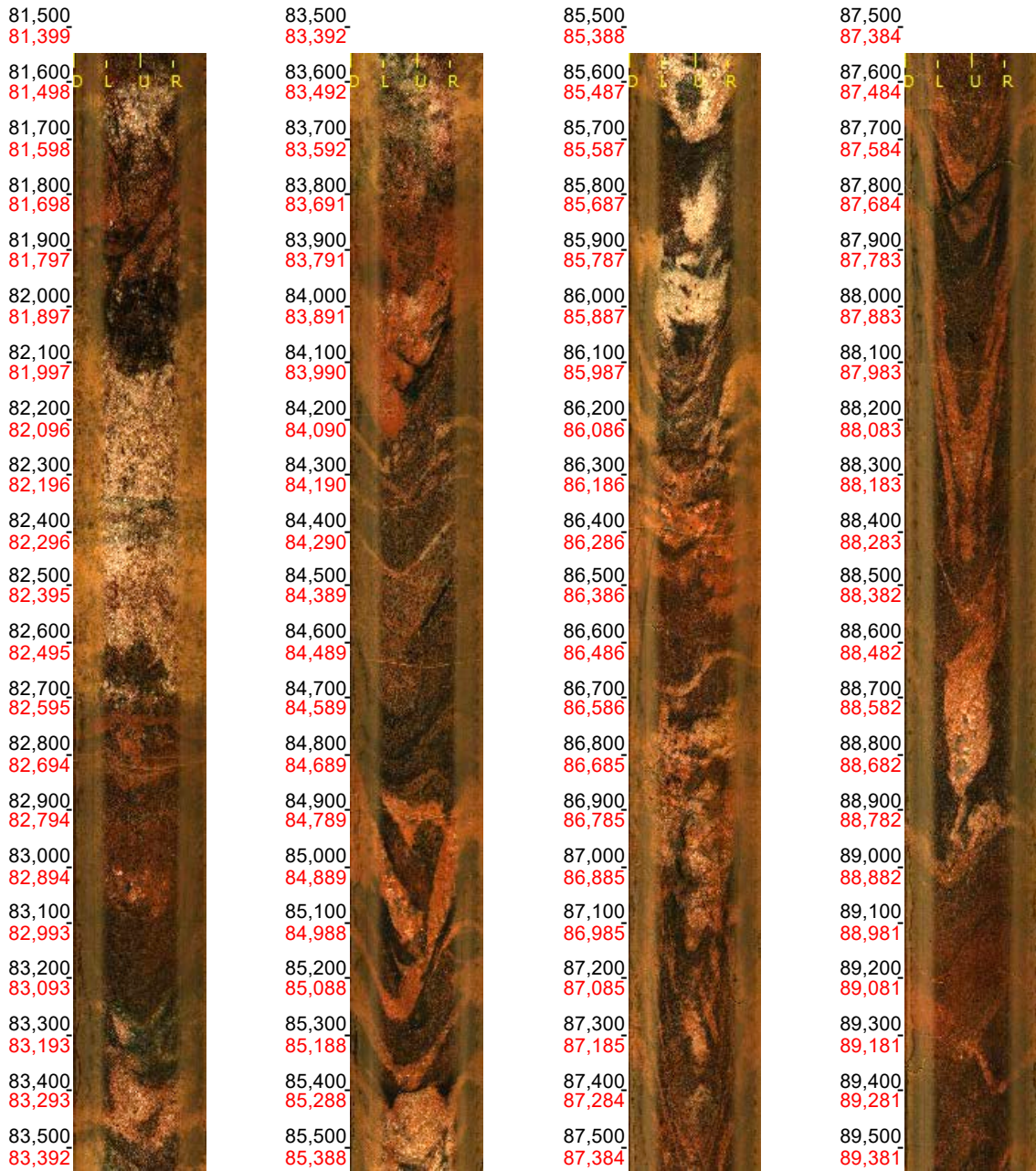
Scale: 1 : 10

Aspect: 100 %

11 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 81.550 - 89.550 m
Azimuth: 215.1
Inclination: -80.2



Printed: 2022-01-03 09:33:30

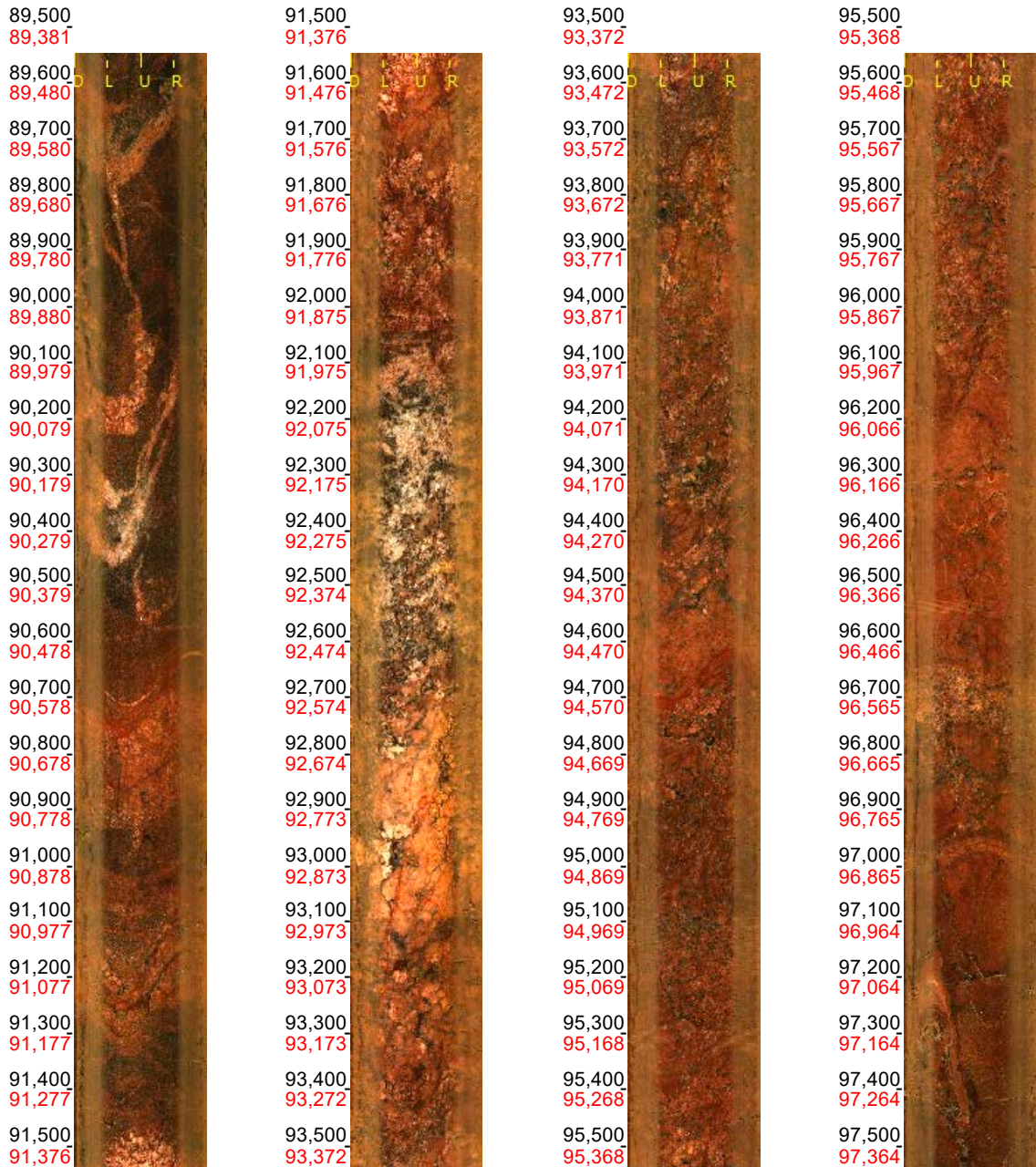
Scale: 1 : 10

Aspect: 100 %

12 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 89.550 - 97.550 m
Azimuth: 215.4
Inclination: -80.2



Printed: 2022-01-03 09:33:30

Scale: 1 : 10

Aspect: 100 %

13 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 97.550 - 105.550 m
Azimuth: 216.0
Inclination: -80.2



Printed: 2022-01-03 09:33:30

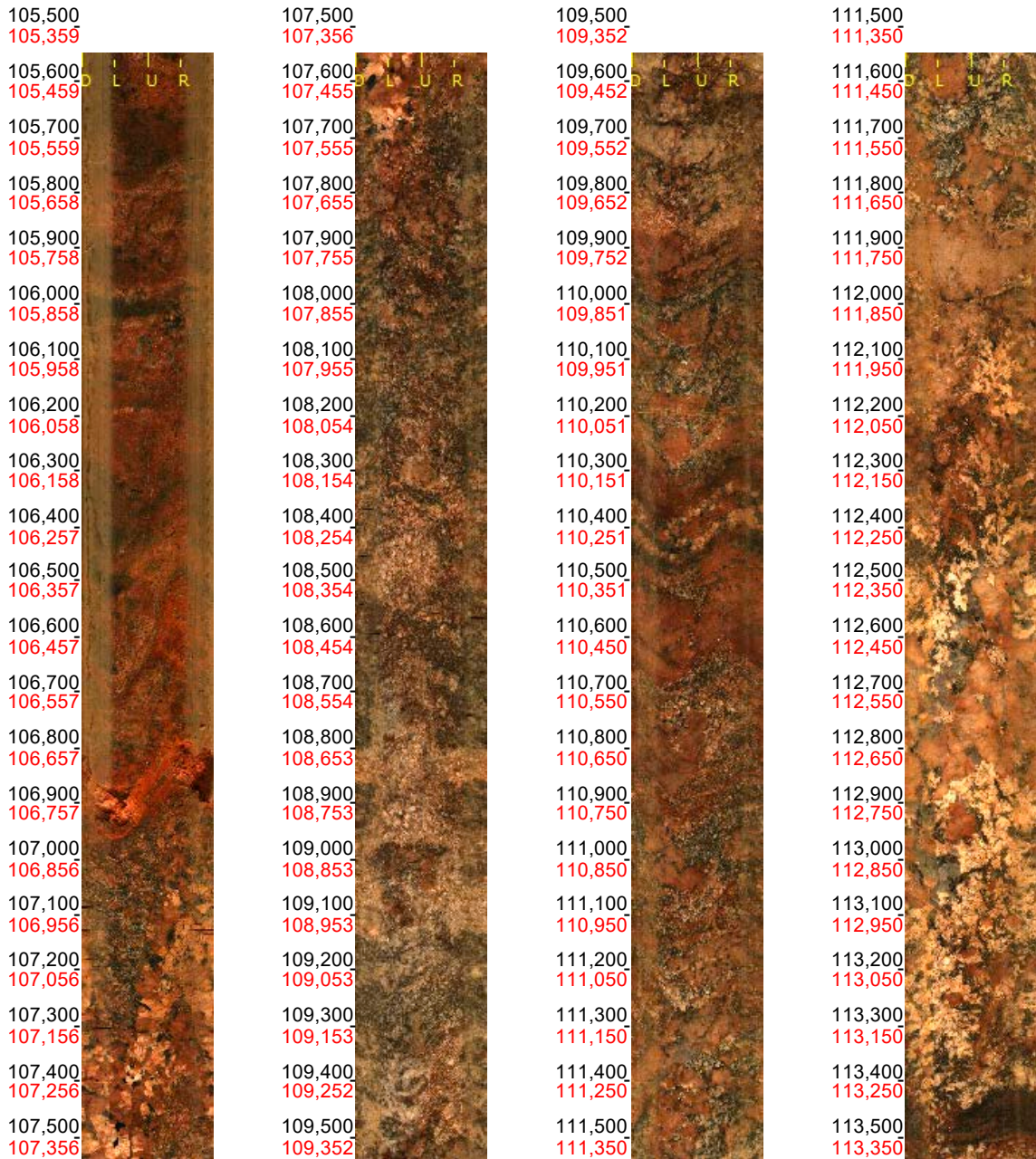
Scale: 1 : 10

Aspect: 100 %

14 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 105.550 - 113.550 m
Azimuth: 216.5
Inclination: -80.1



Printed: 2022-01-03 09:33:30

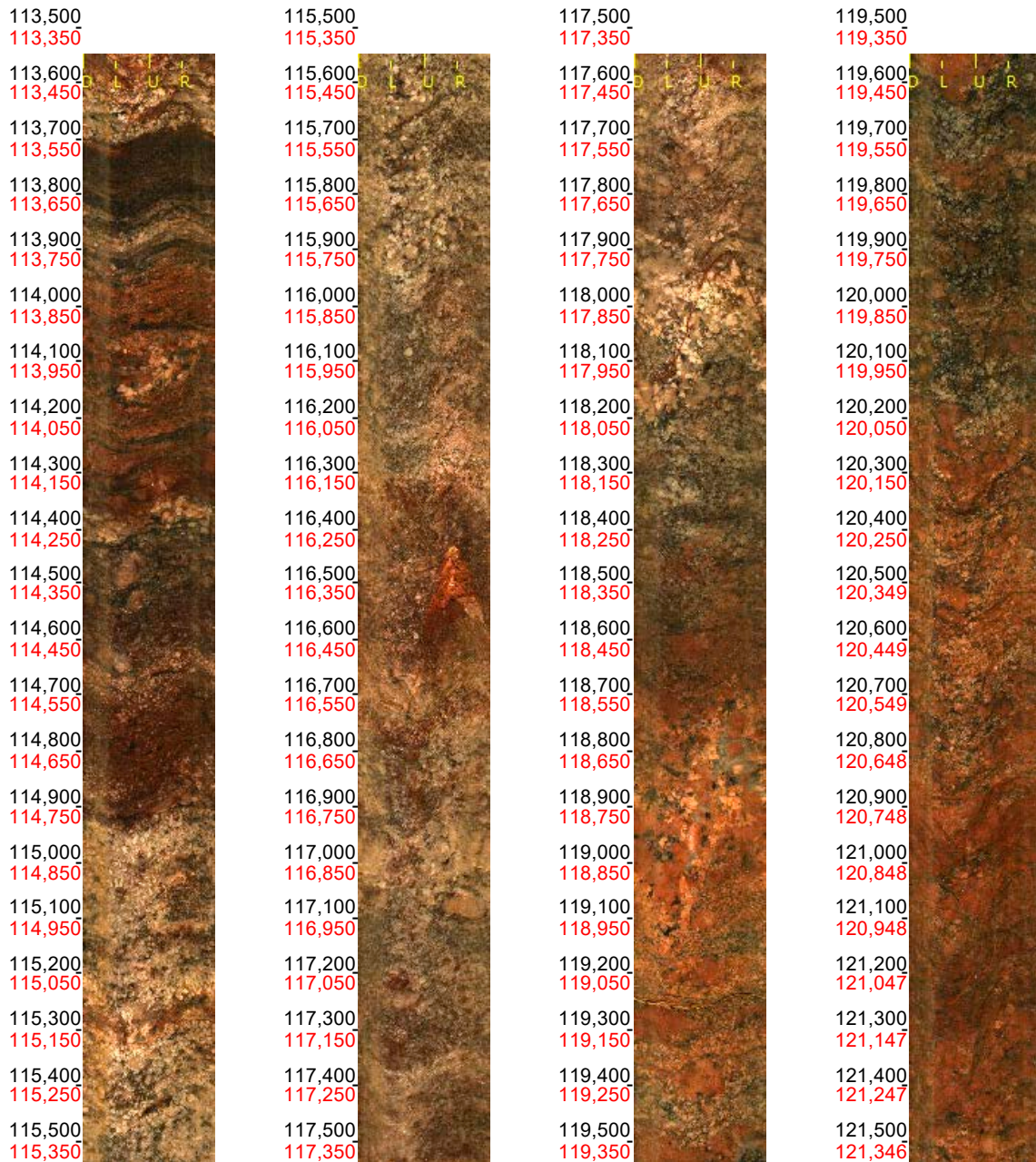
Scale: 1 : 10

Aspect: 100 %

15 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 113.550 - 121.550 m
Azimuth: 216.7
Inclination: -80.1



Printed: 2022-01-03 09:33:30

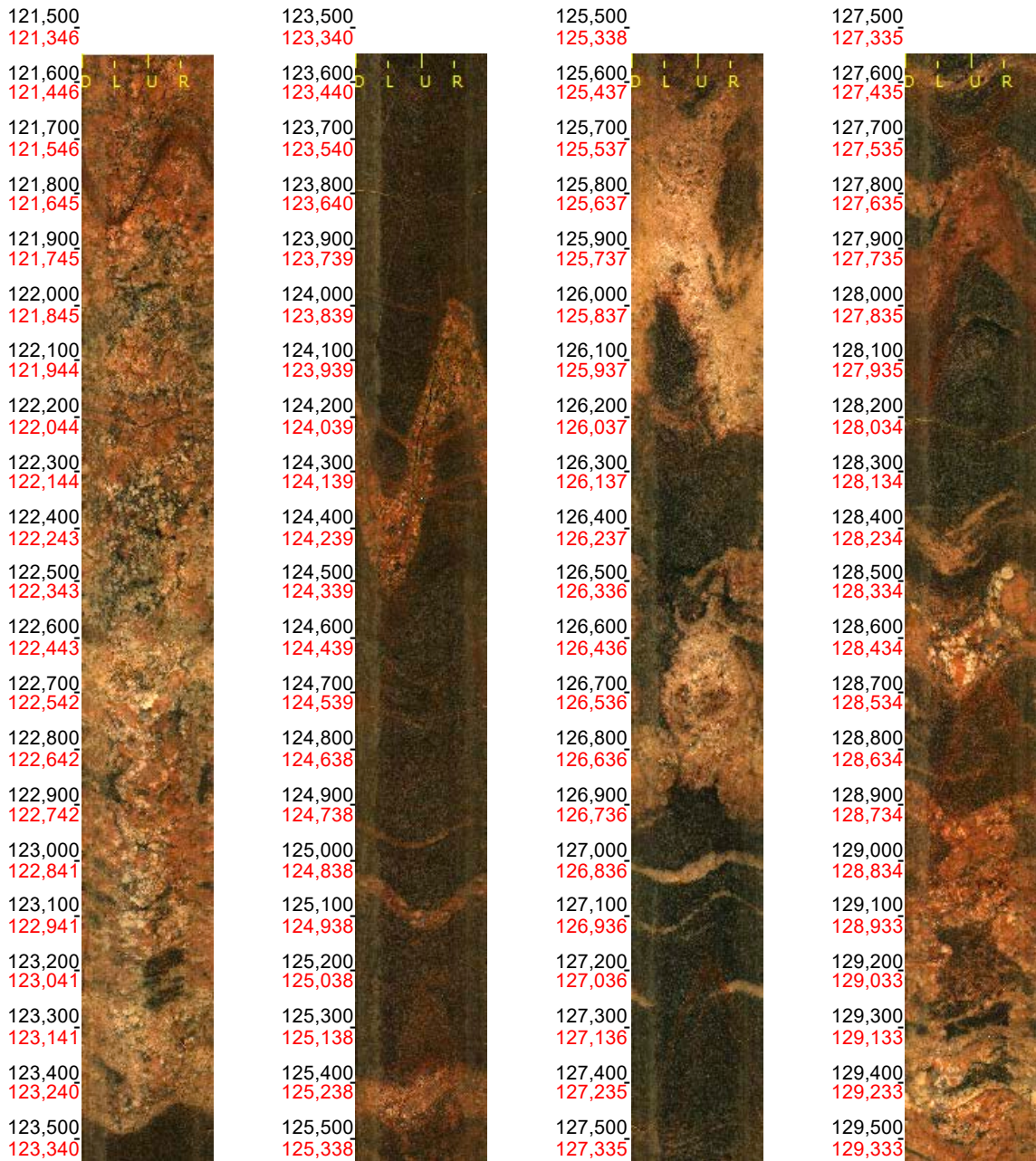
Scale: 1 : 10

Aspect: 100 %

16 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 121.550 - 129.550 m
Azimuth: 216.8
Inclination: -80.0



Printed: 2022-01-03 09:33:30

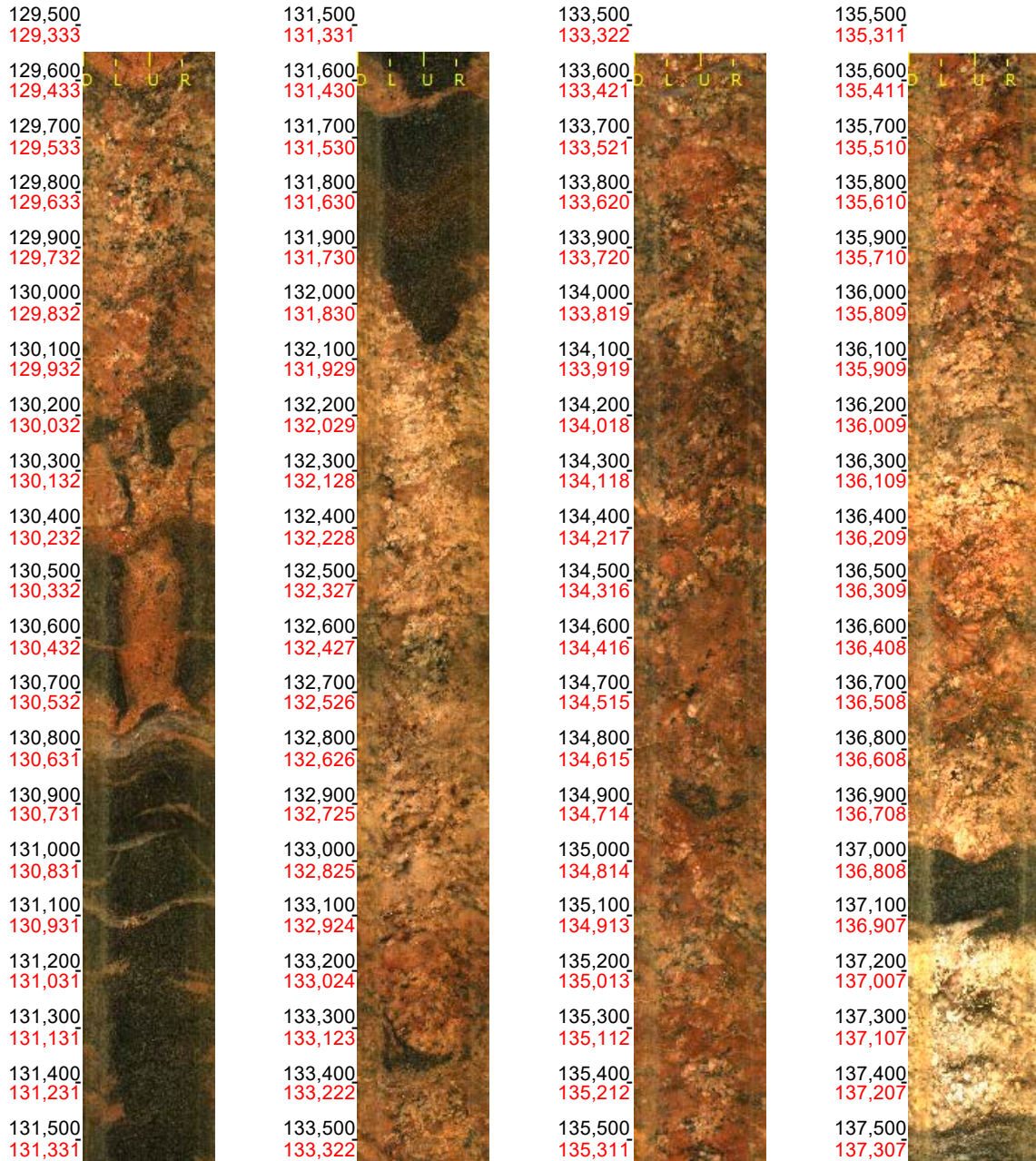
Scale: 1 : 10

Aspect: 100 %

17 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 129.550 - 137.550 m
Azimuth: 217.3
Inclination: -80.0



Printed: 2022-01-03 09:33:30

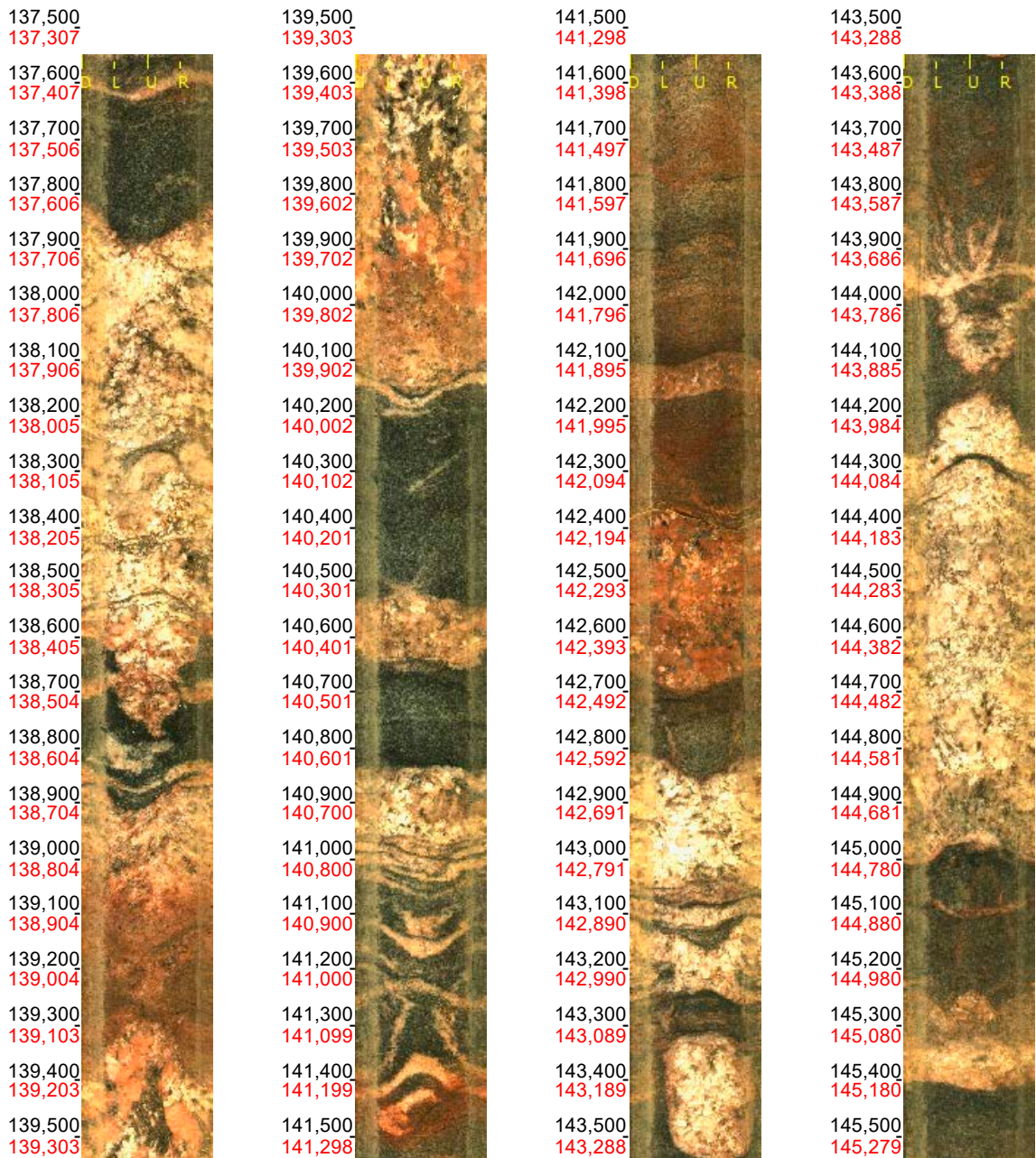
Scale: 1 : 10

Aspect: 100 %

18 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 137.550 - 145.550 m
Azimuth: 218.0
Inclination: -79.9



Printed: 2022-01-03 09:33:30

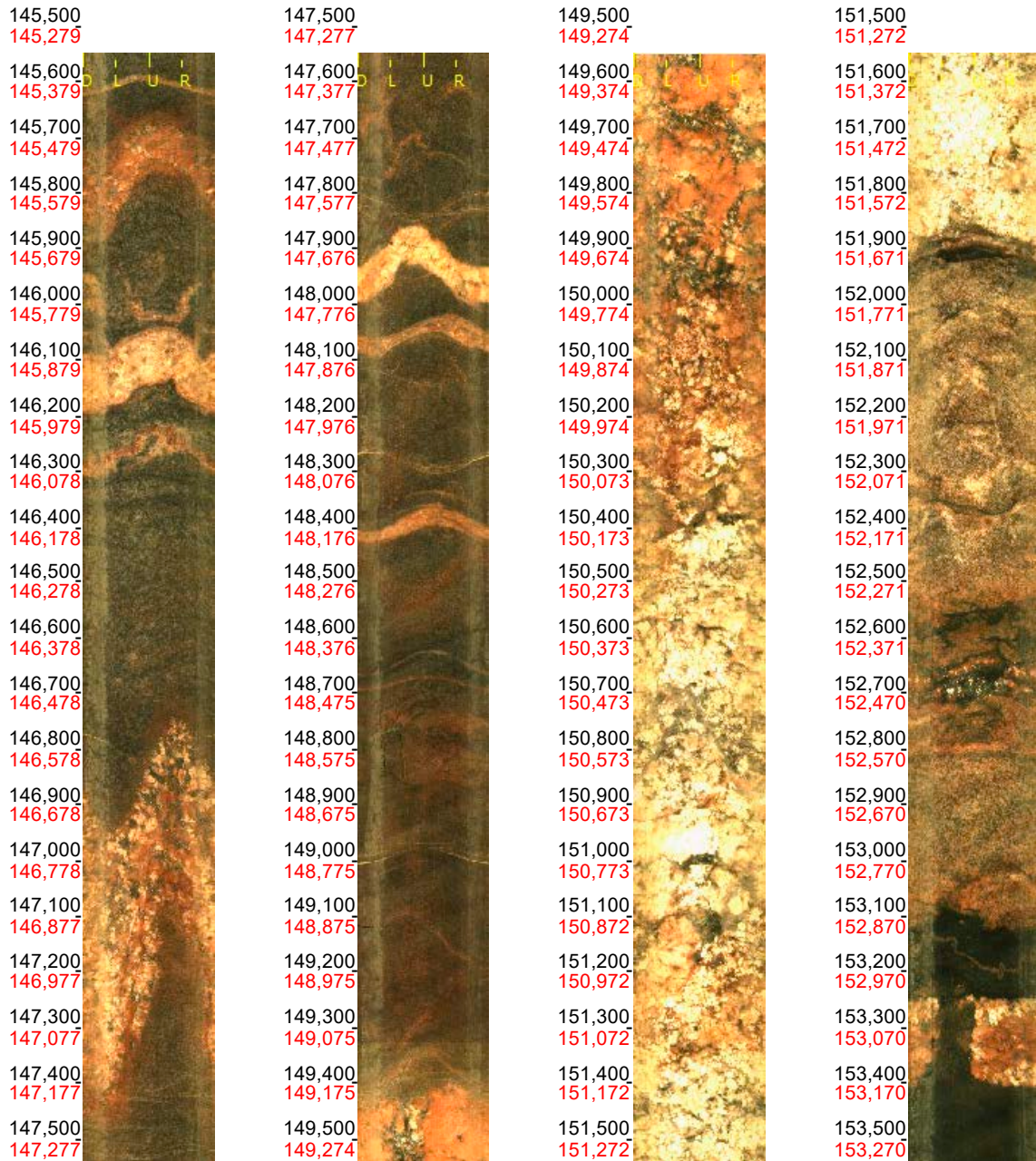
Scale: 1 : 10

Aspect: 100 %

19 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 145.550 - 153.550 m
Azimuth: 218.8
Inclination: -79.8



Printed: 2022-01-03 09:33:30

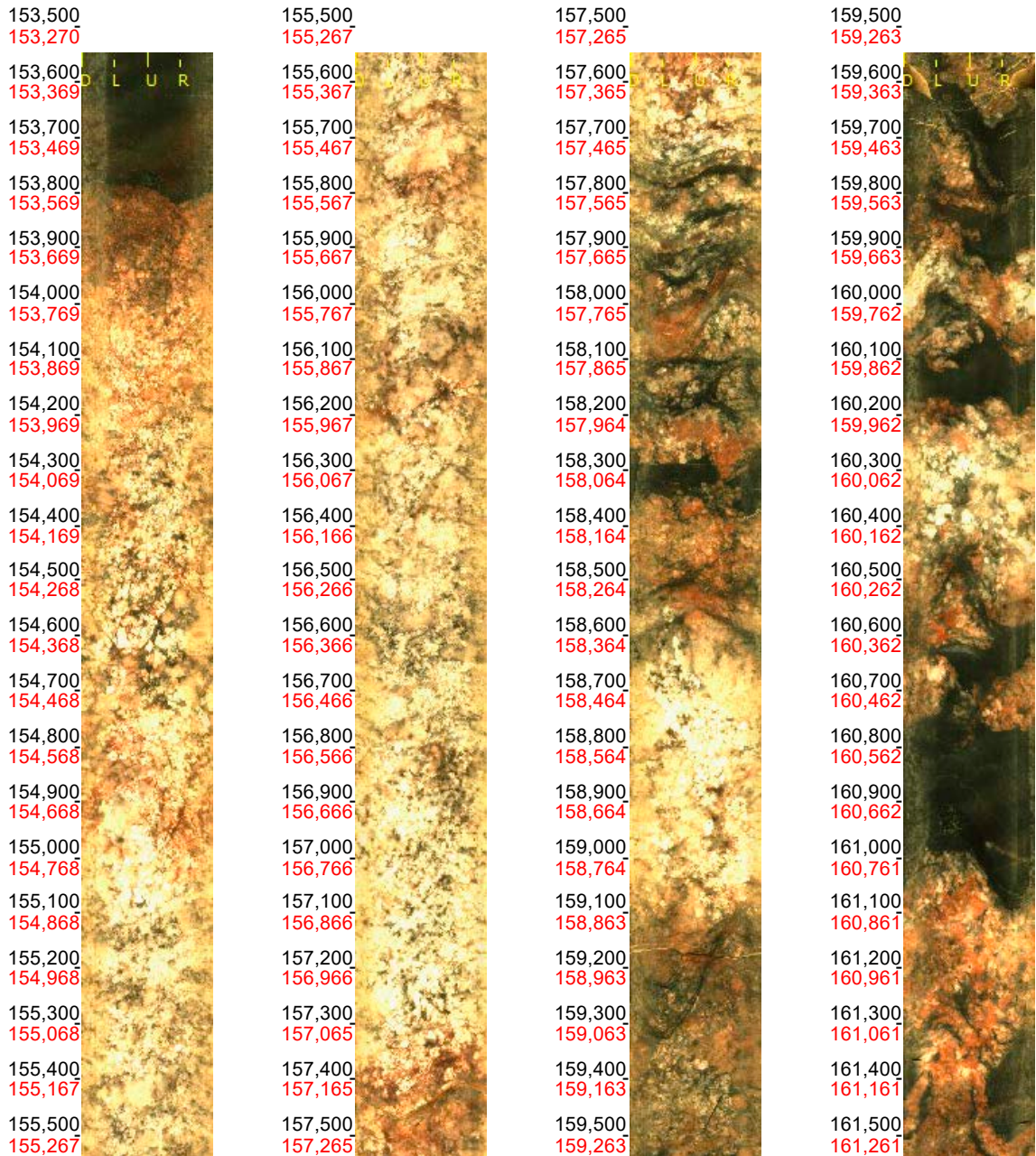
Scale: 1 : 10

Aspect: 100 %

20 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 153.550 - 161.550 m
Azimuth: 219.0
Inclination: -79.8



Printed: 2022-01-03 09:33:30

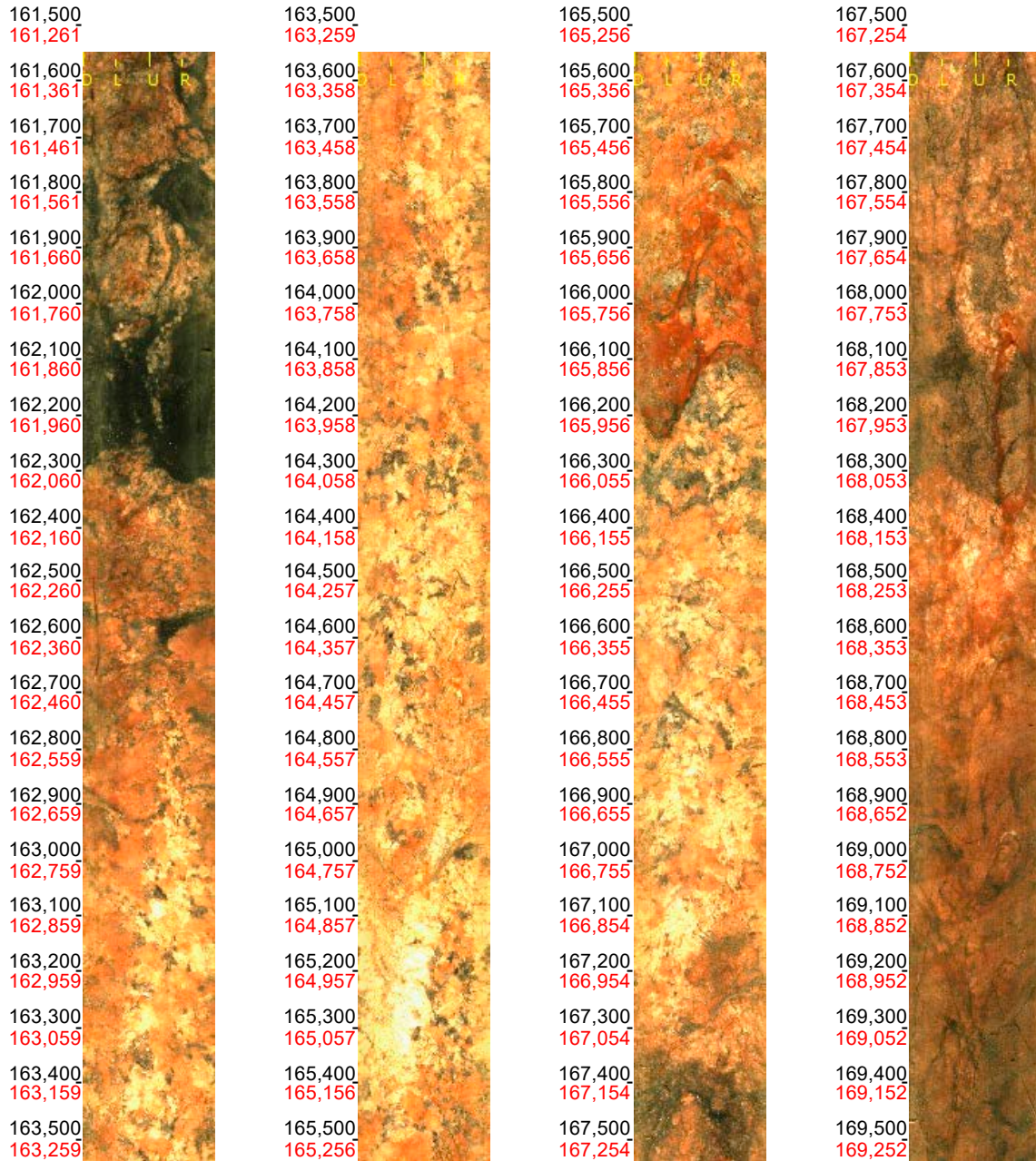
Scale: 1 : 10

Aspect: 100 %

21 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 161.550 - 169.550 m
Azimuth: 219.2
Inclination: -79.7



Printed: 2022-01-03 09:33:30

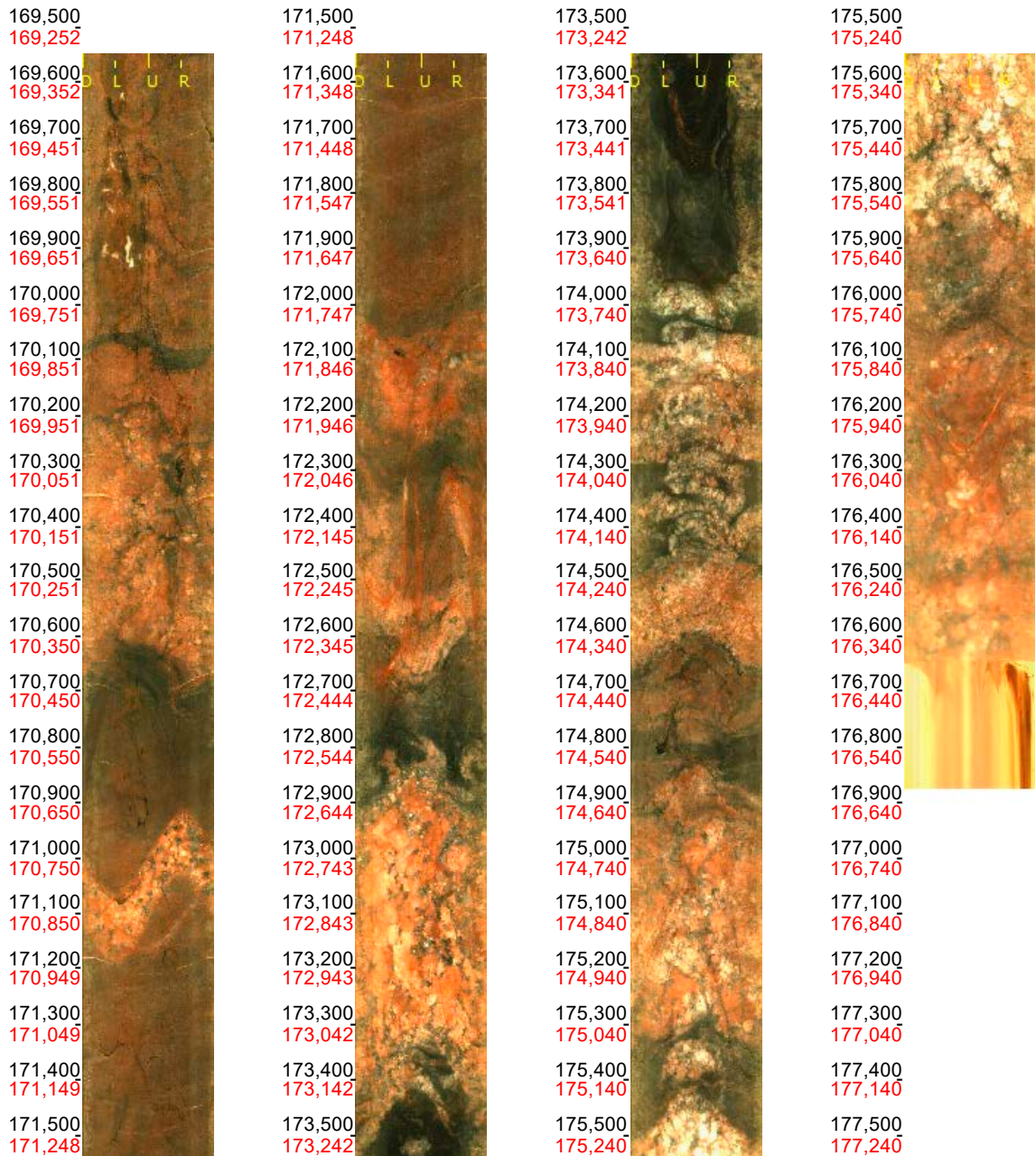
Scale: 1 : 10

Aspect: 100 %

22 (23)

Borehole: KFR119
Mapping: KFR119

Depth range: 169.550 - 176.879 m
Azimuth: 219.5
Inclination: -79.7



Printed: 2022-01-03 09:33:30

Scale: 1 : 10

Aspect: 100 %

23 (23)

A1.4 KFR120

Borehole Name: KFR120
Mapping Name: KFR120
Mapping Range: 12,000 - 176,880 m
Diameter: 76,0 mm
Printed Range: 1,550 - 176,330
Pages: 23

Image File Information:

File: G:\skb\bips\sicada\KFR120\KFR120ner 200818_H_LGX.HED
Date/Time: 2020-08-18
Start Depth: 1,550 m
End Depth: 176,330 m
Resolution: 1,00 mm/pixel (depth)
Orientation: Gravimetric
Image height: 174781 pixels
Image width: 720 pixels
Intrinsic angle: 180 degrees
LGX Version: 101
Locality:
Wellname: KFR120
Scan Direction: Down

Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

1 (23)

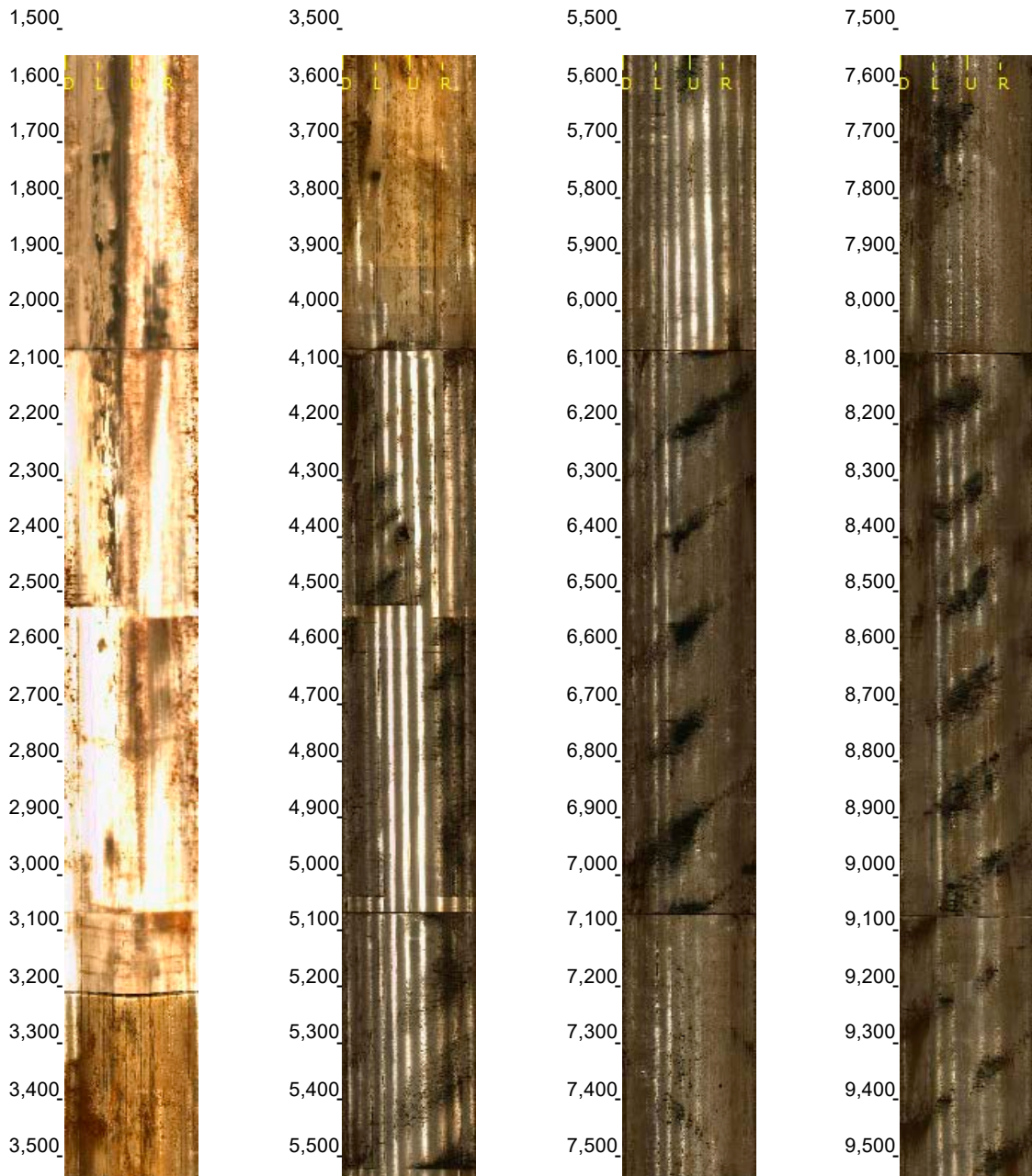
175,500
175,999

175,500
175,999

175,500
175,999

Borehole: KFR120
Mapping: KFR120

Depth range: 1.550 - 9.550 m
Azimuth: 0.0
Inclination: 0.0



Printed: 2022-01-03 09:37:58

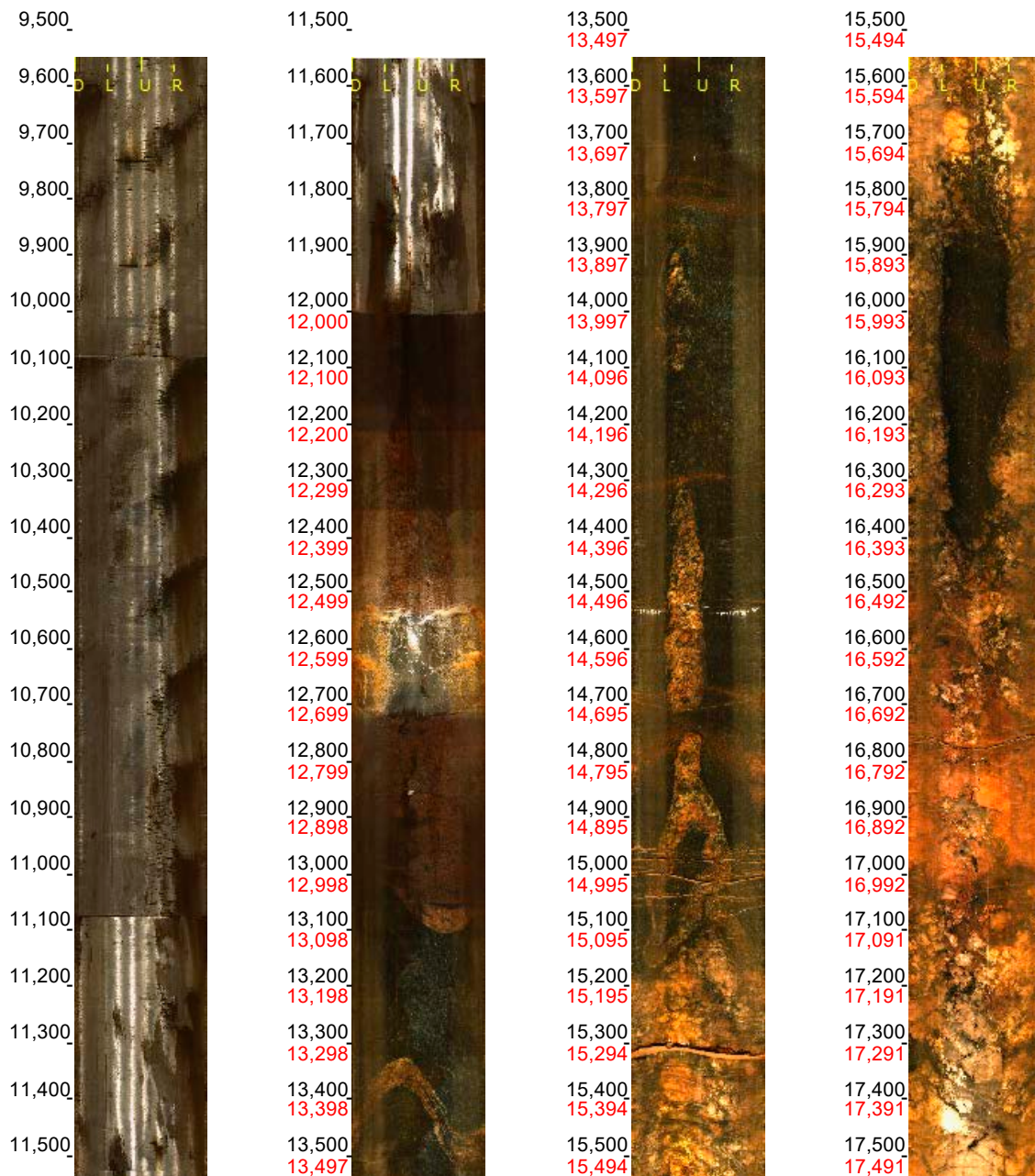
Scale: 1 : 10

Aspect: 100 %

2 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 9.550 - 17.550 m
Azimuth: 40.5
Inclination: -79.8



Printed: 2022-01-03 09:37:58

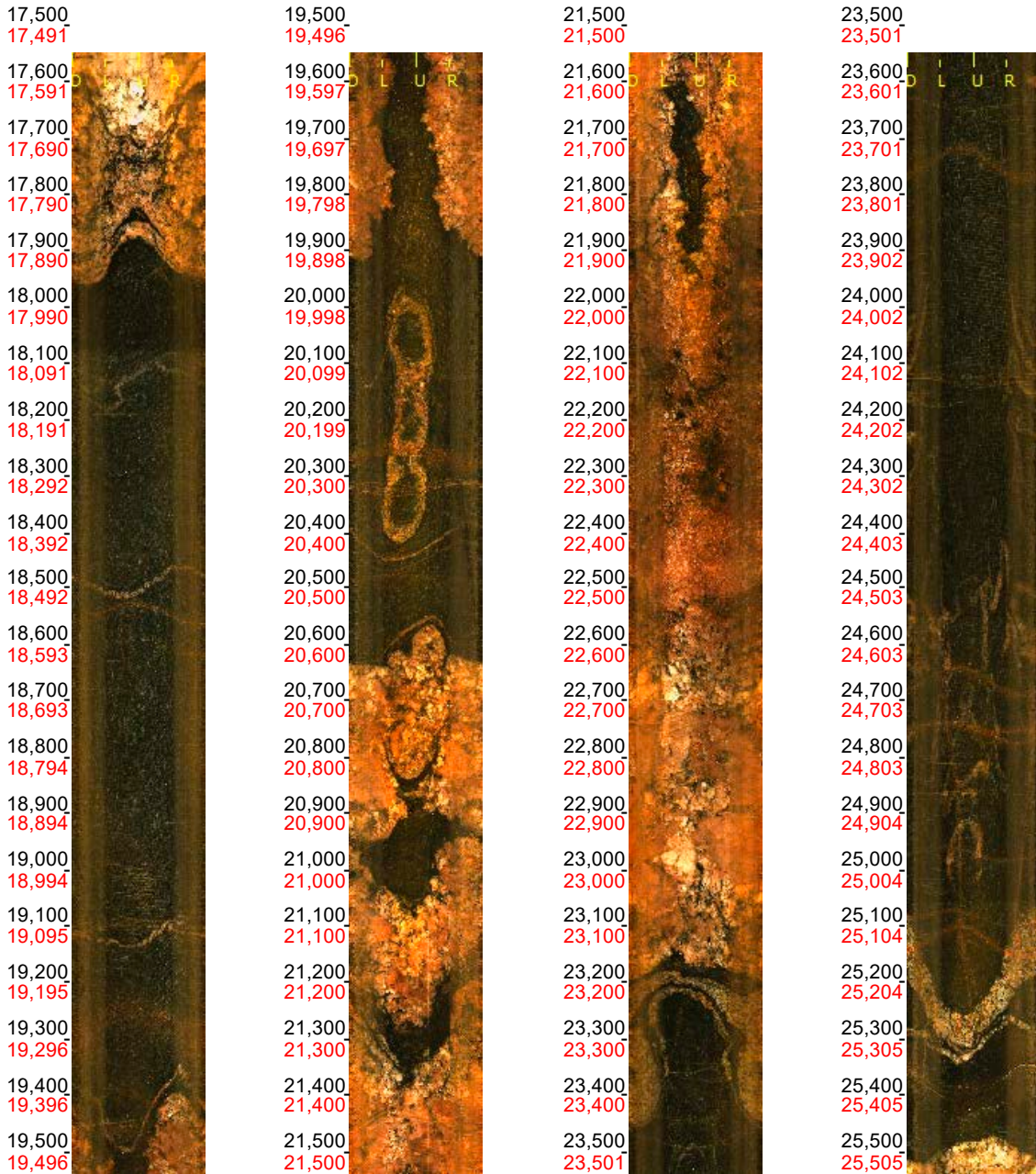
Scale: 1 : 10

Aspect: 100 %

3 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 17.550 - 25.550 m
Azimuth: 43.5
Inclination: -79.6



Printed: 2022-01-03 09:37:58

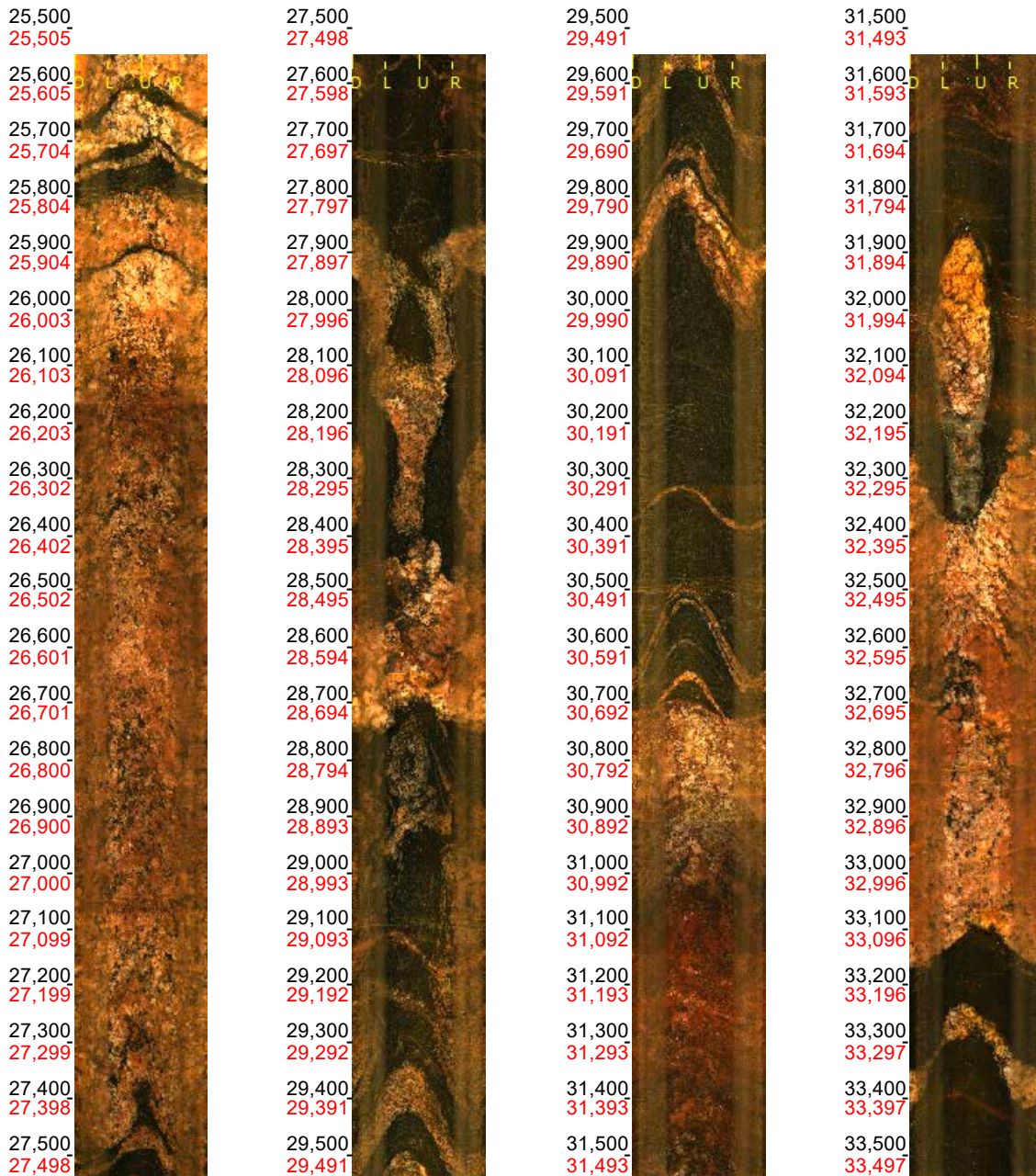
Scale: 1 : 10

Aspect: 100 %

4 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 25.550 - 33.550 m
Azimuth: 43.2
Inclination: -79.5



Printed: 2022-01-03 09:37:58

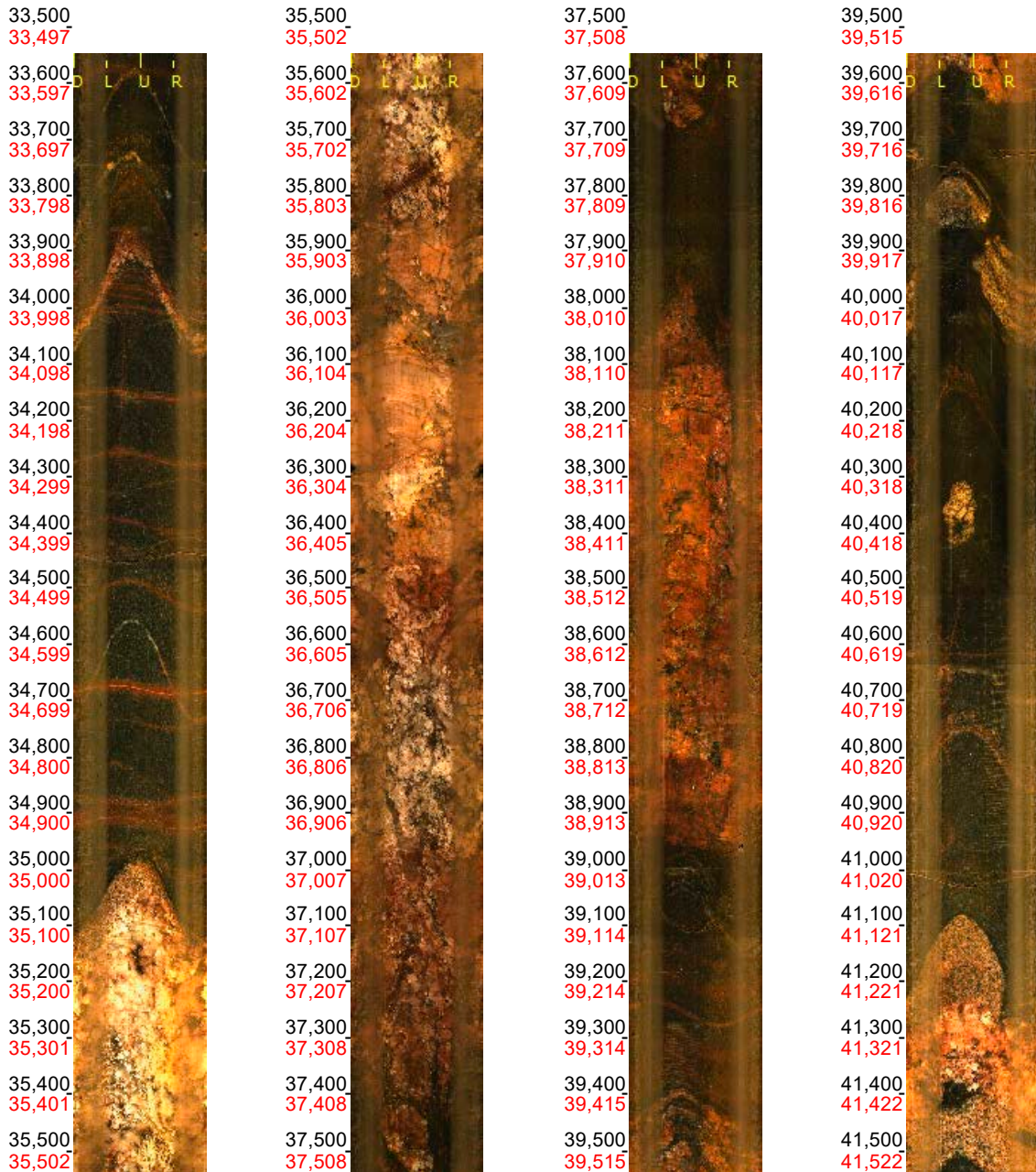
Scale: 1 : 10

Aspect: 100 %

5 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 33.550 - 41.550 m
Azimuth: 42.7
Inclination: -79.5



Printed: 2022-01-03 09:37:58

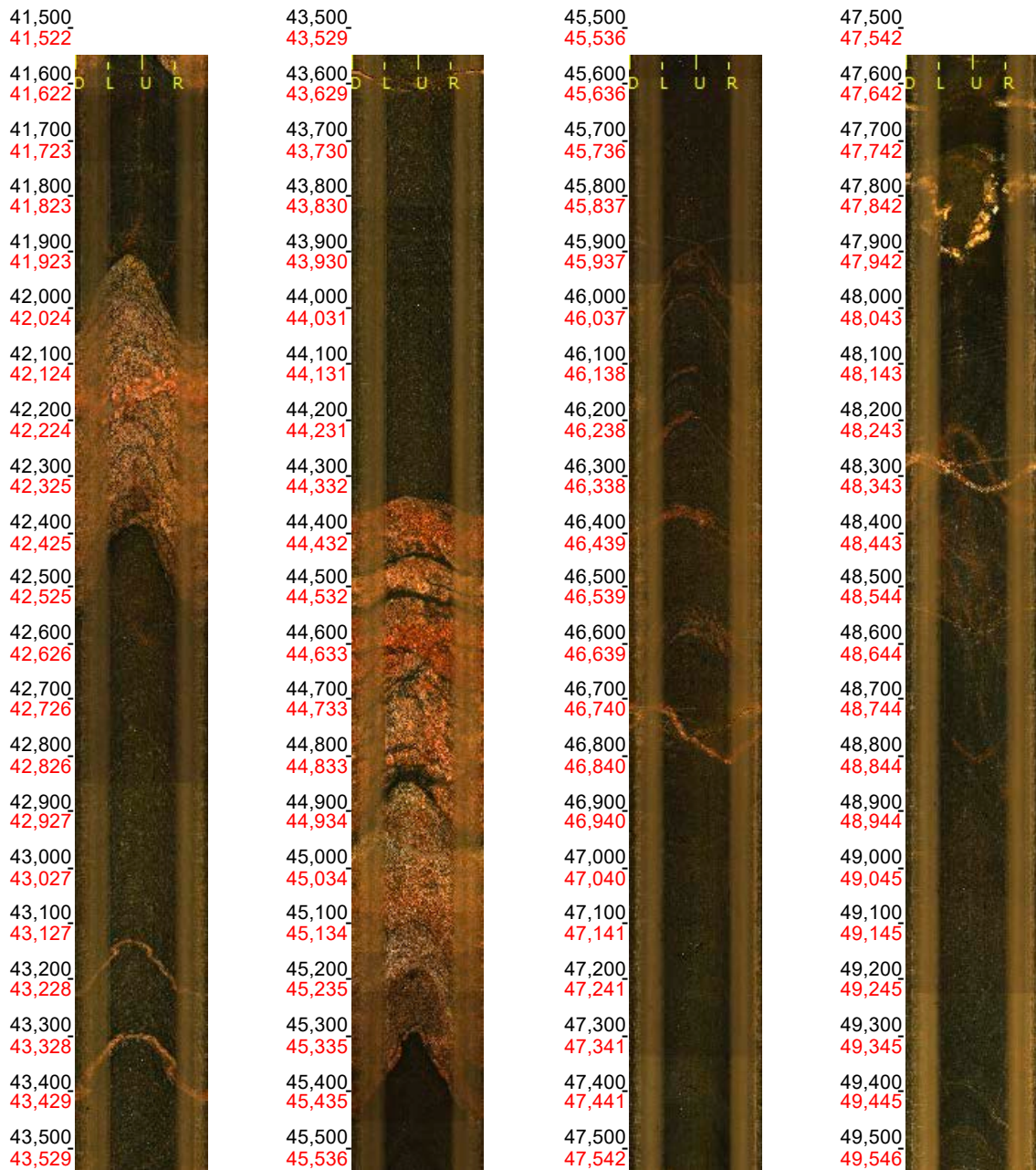
Scale: 1 : 10

Aspect: 100 %

6 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 41.550 - 49.550 m
Azimuth: 42.2
Inclination: -79.5



Printed: 2022-01-03 09:37:58

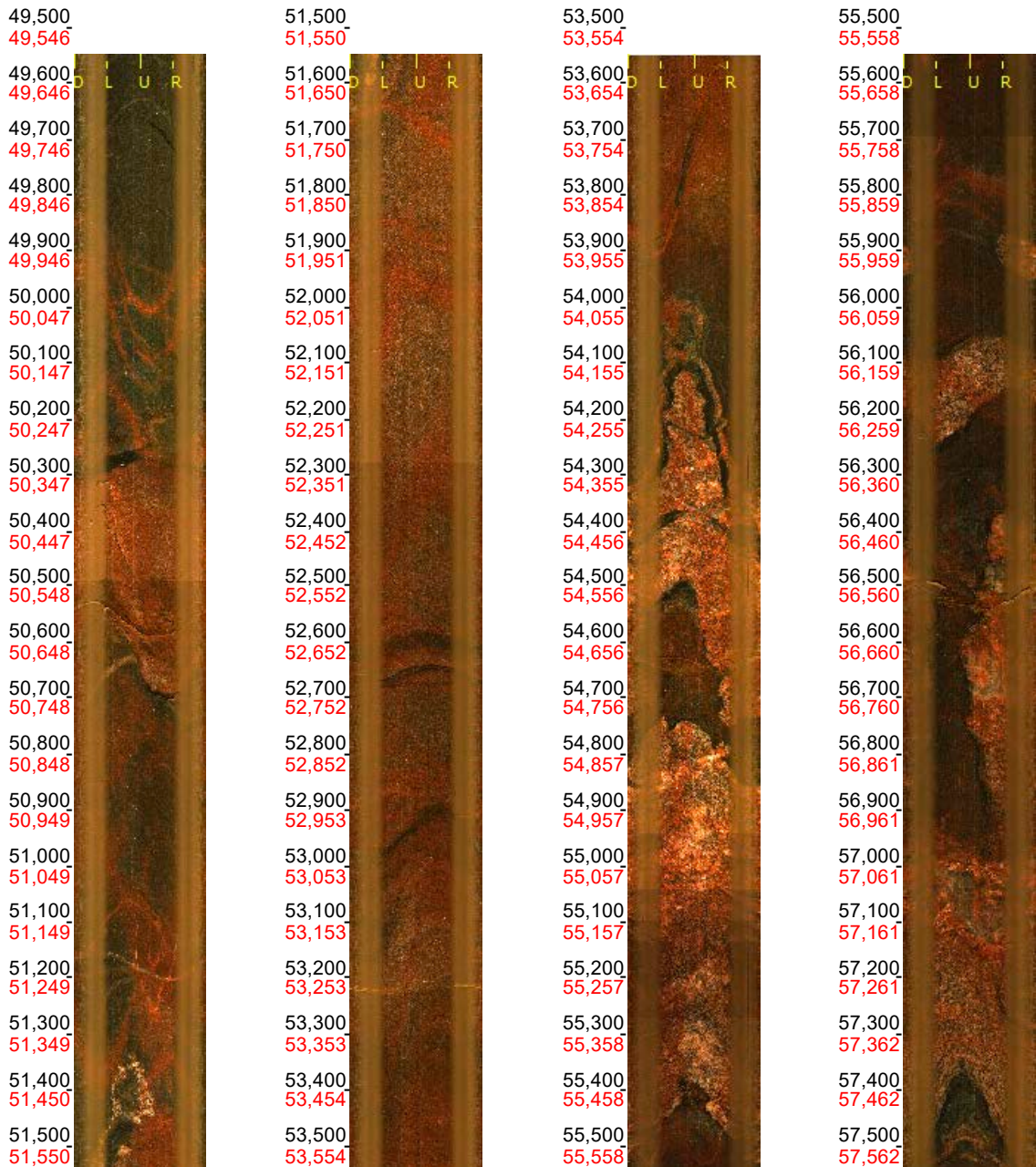
Scale: 1 : 10

Aspect: 100 %

7 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 49.550 - 57.550 m
Azimuth: 42.2
Inclination: -79.6



Printed: 2022-01-03 09:37:58

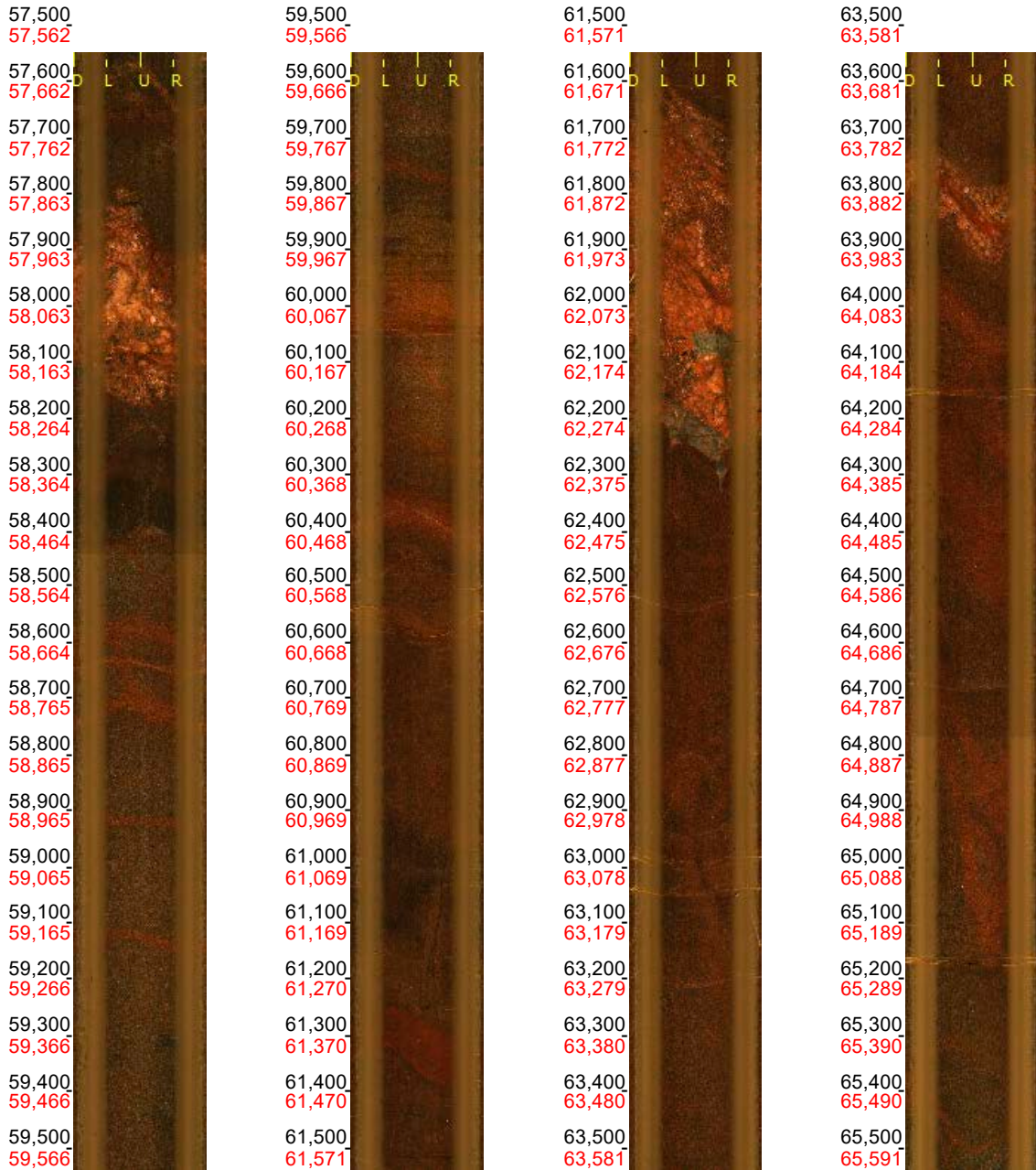
Scale: 1 : 10

Aspect: 100 %

8 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 57.550 - 65.550 m
Azimuth: 41.9
Inclination: -79.6



Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

9 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 65.550 - 73.550 m
Azimuth: 42.8
Inclination: -79.6



Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

10 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 73.550 - 81.550 m
Azimuth: 42.2
Inclination: -79.6



Printed: 2022-01-03 09:37:58

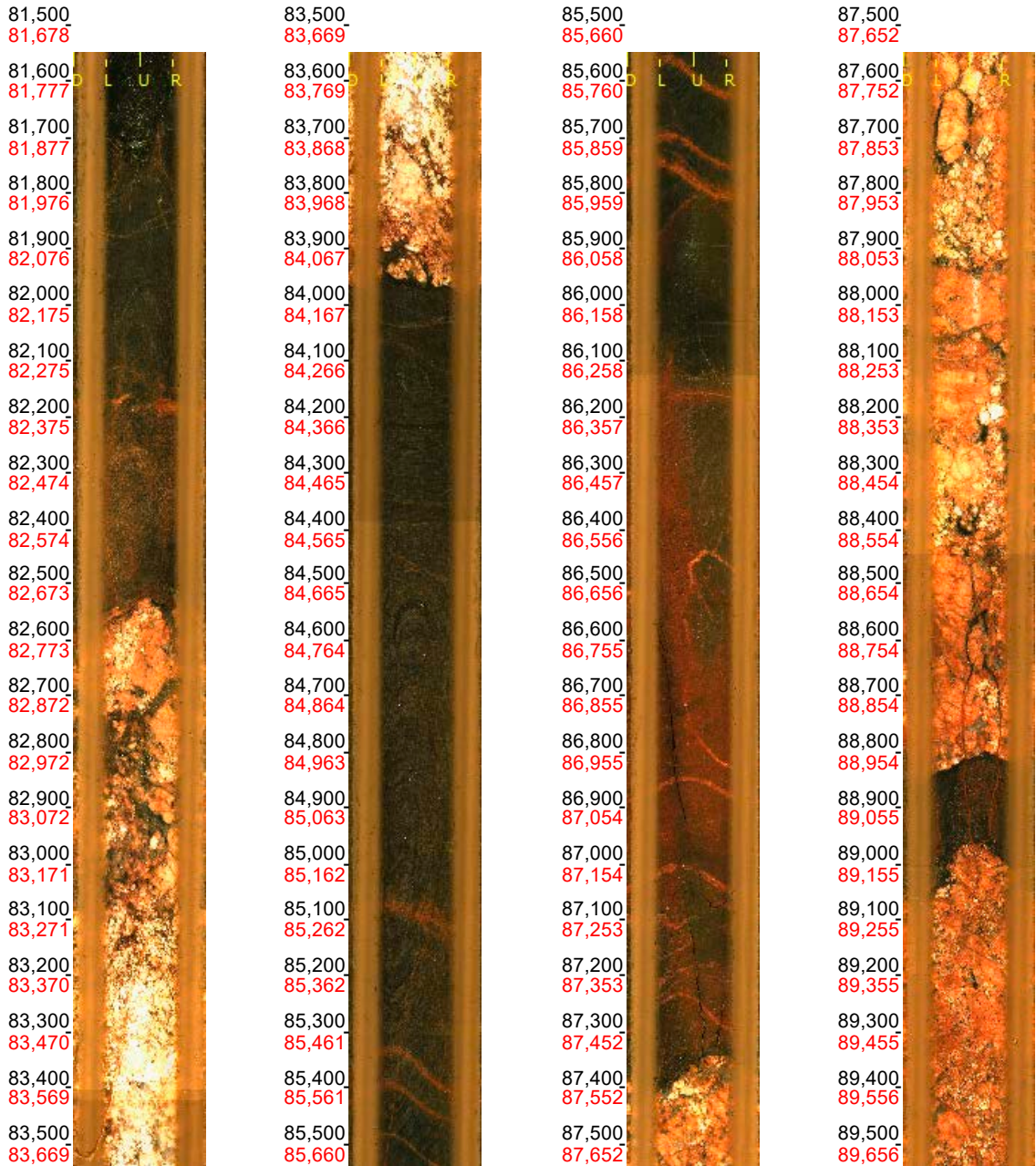
Scale: 1 : 10

Aspect: 100 %

11 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 81.550 - 89.550 m
Azimuth: 42.6
Inclination: -79.5



Printed: 2022-01-03 09:37:58

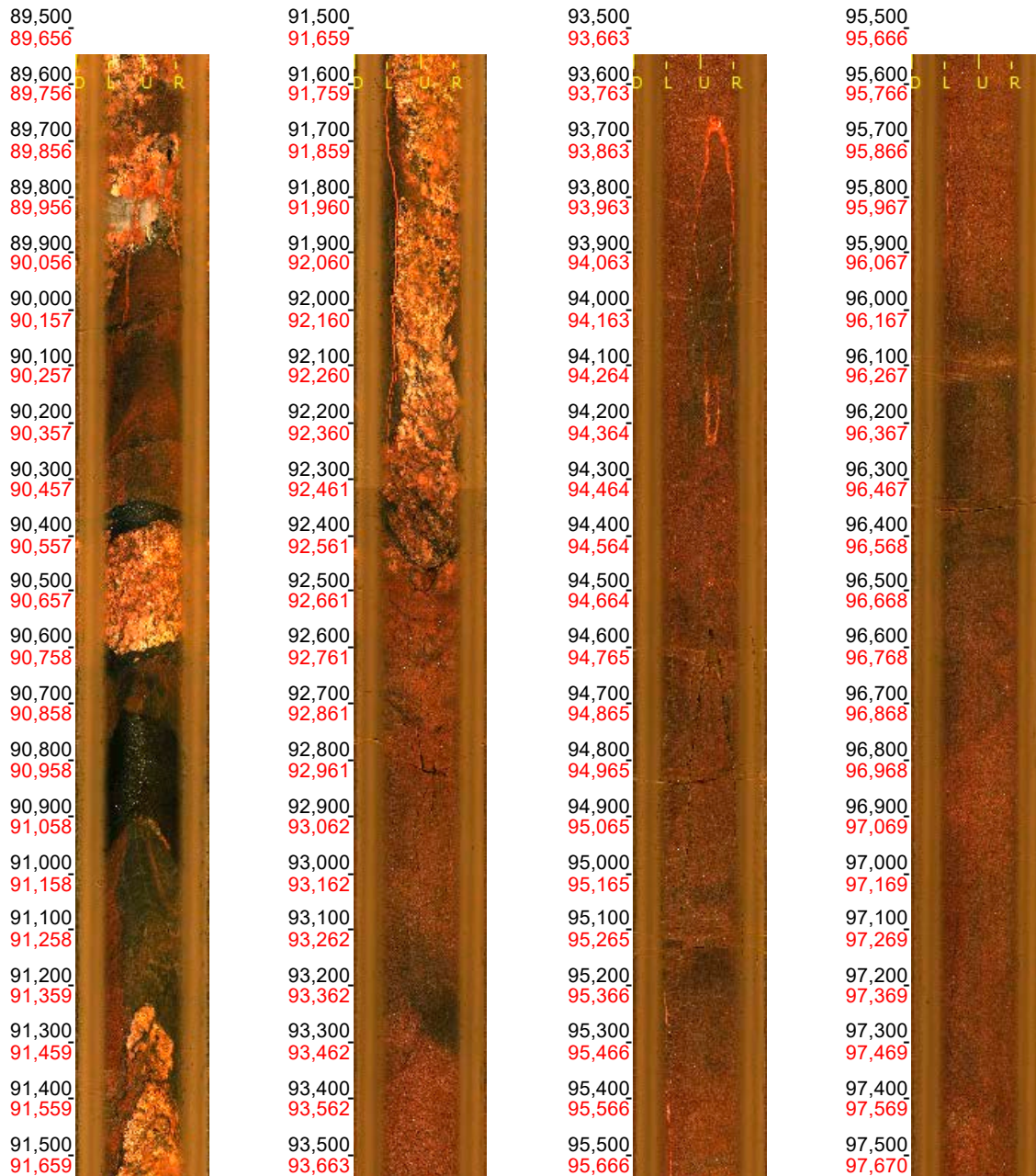
Scale: 1 : 10

Aspect: 100 %

12 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 89.550 - 97.550 m
Azimuth: 42.4
Inclination: -79.5



Printed: 2022-01-03 09:37:58

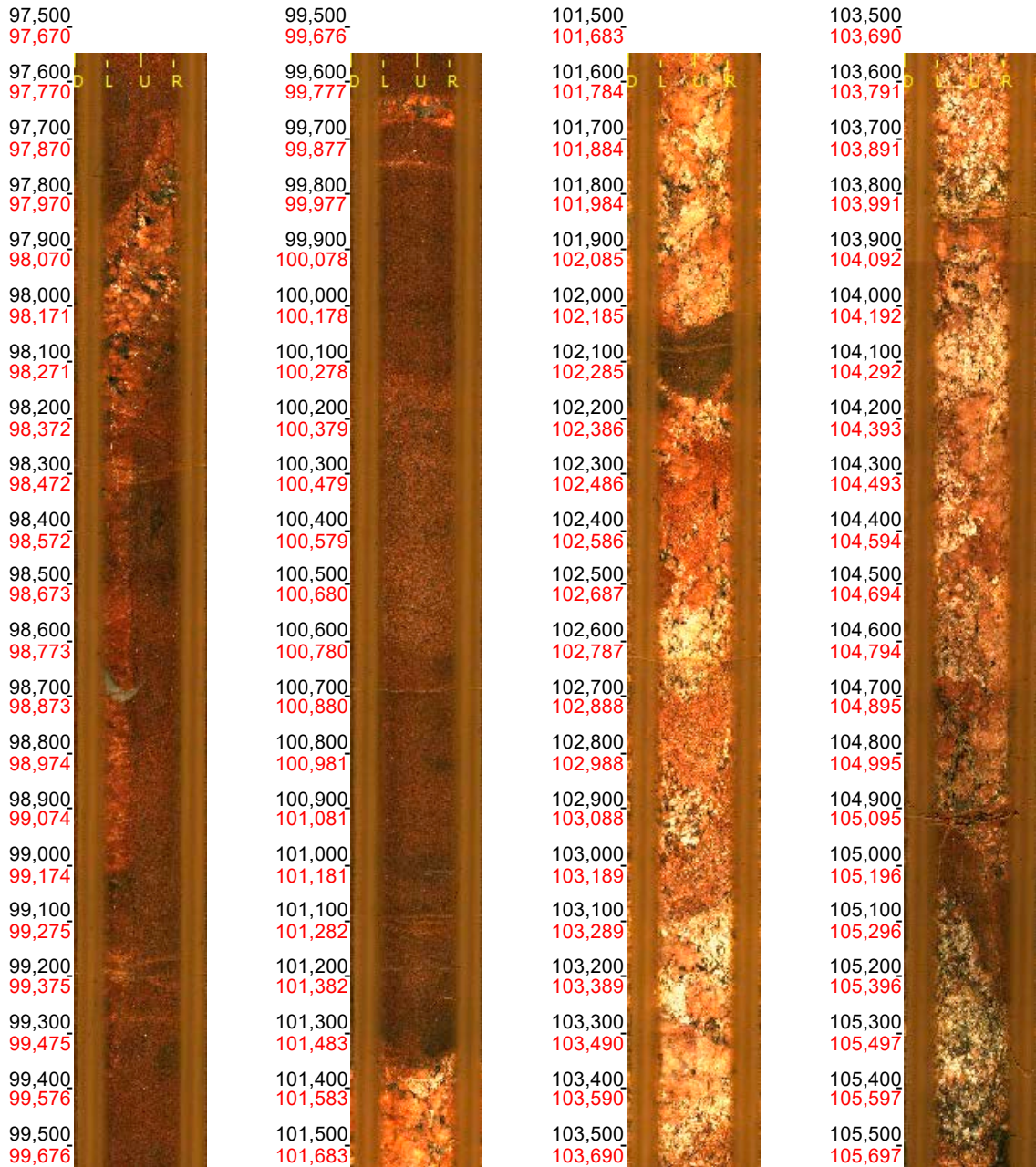
Scale: 1 : 10

Aspect: 100 %

13 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 97.550 - 105.550 m
Azimuth: 42.9
Inclination: -79.5



Printed: 2022-01-03 09:37:58

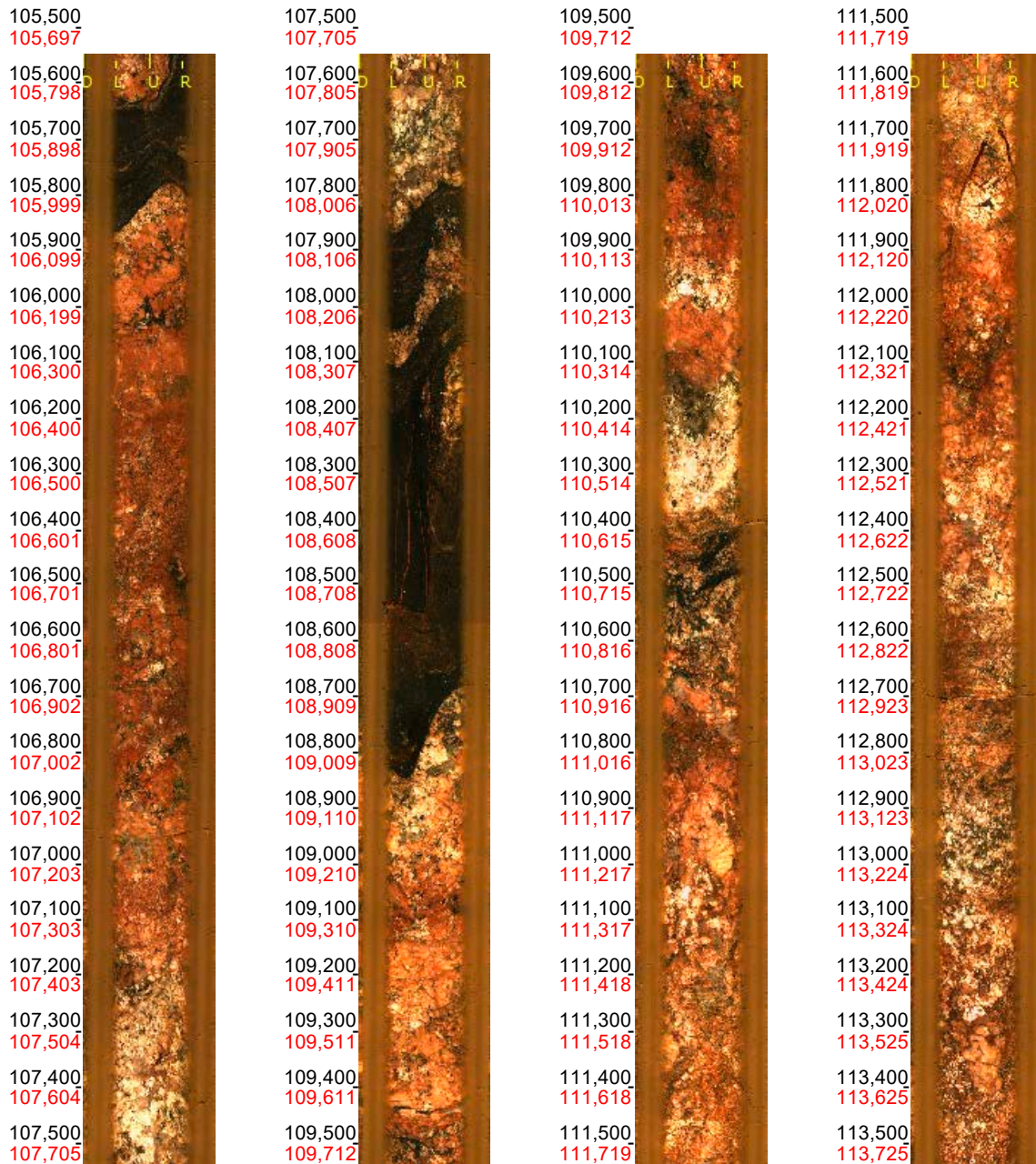
Scale: 1 : 10

Aspect: 100 %

14 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 105.550 - 113.550 m
Azimuth: 43.2
Inclination: -79.5



Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

15 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 113.550 - 121.550 m
Azimuth: 43.6
Inclination: -79.5



Printed: 2022-01-03 09:37:58

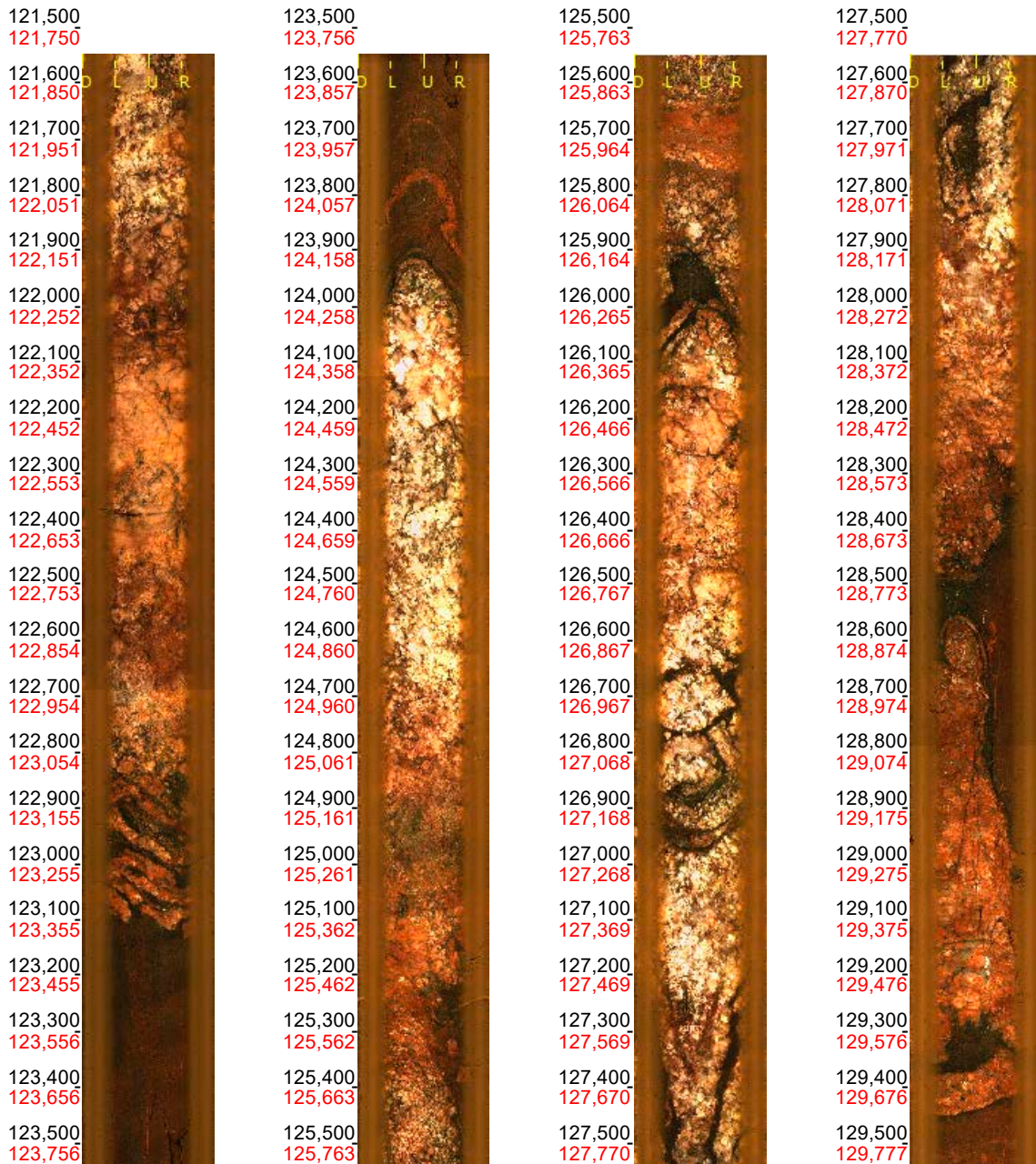
Scale: 1 : 10

Aspect: 100 %

16 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 121.550 - 129.550 m
Azimuth: 43.9
Inclination: -79.5



Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

17 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 129.550 - 137.550 m
Azimuth: 44.2
Inclination: -79.5



Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

18 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 137.550 - 145.550 m
Azimuth: 44.4
Inclination: -79.5



Printed: 2022-01-03 09:37:58

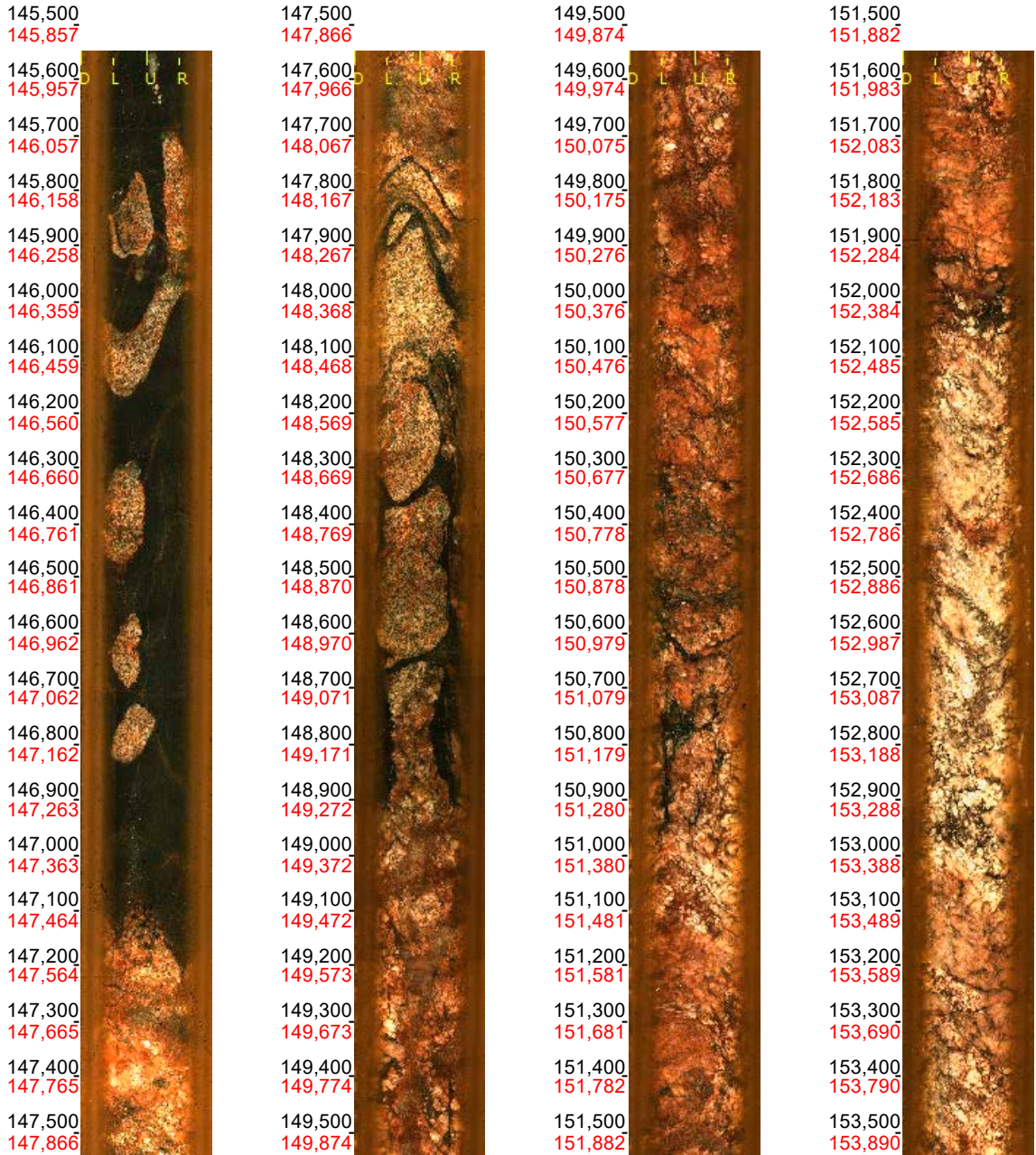
Scale: 1 : 10

Aspect: 100 %

19 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 145.550 - 153.550 m
Azimuth: 44.6
Inclination: -79.6



Printed: 2022-01-03 09:37:58

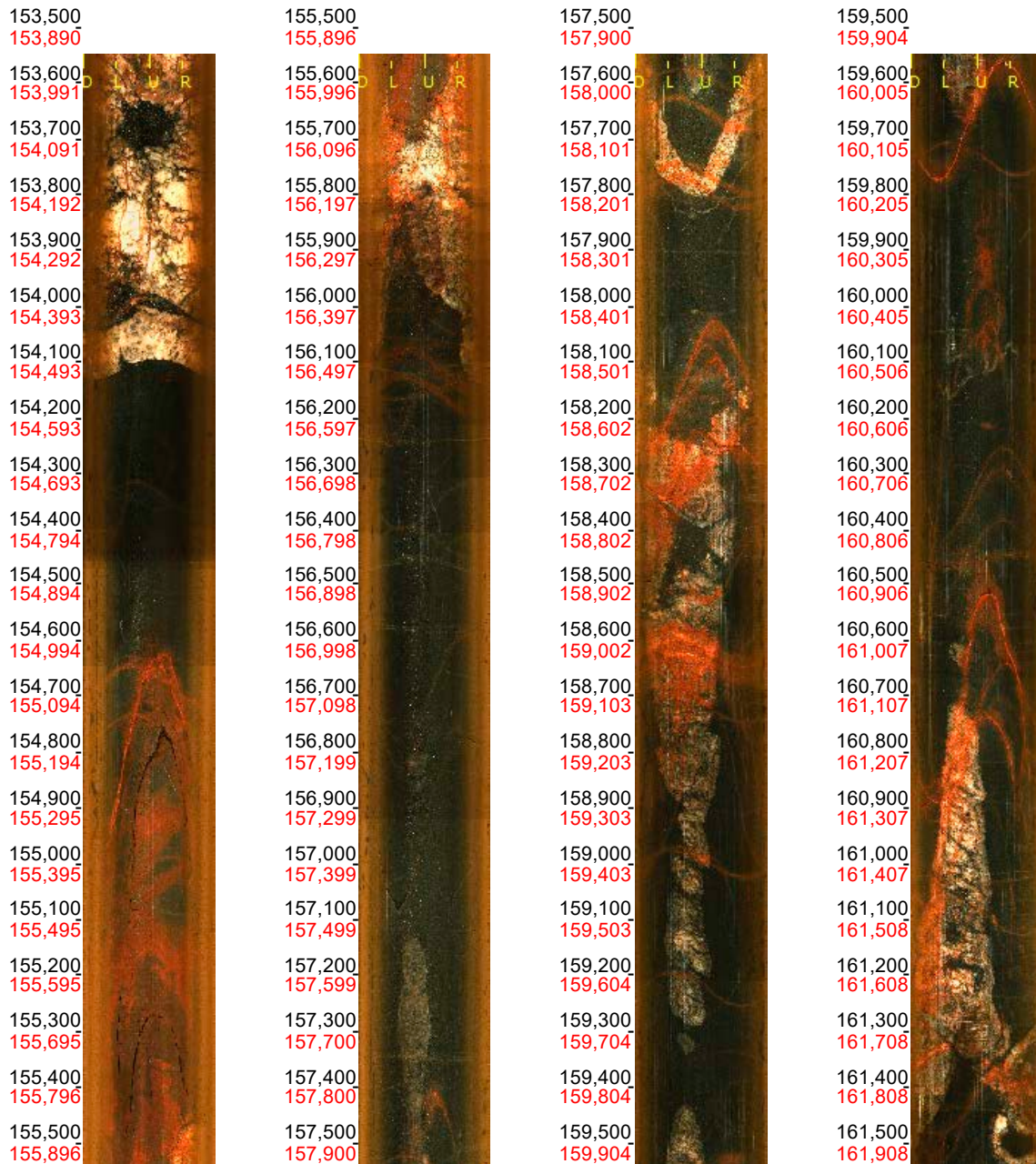
Scale: 1 : 10

Aspect: 100 %

20 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 153.550 - 161.550 m
Azimuth: 45.7
Inclination: -79.5



Printed: 2022-01-03 09:37:58

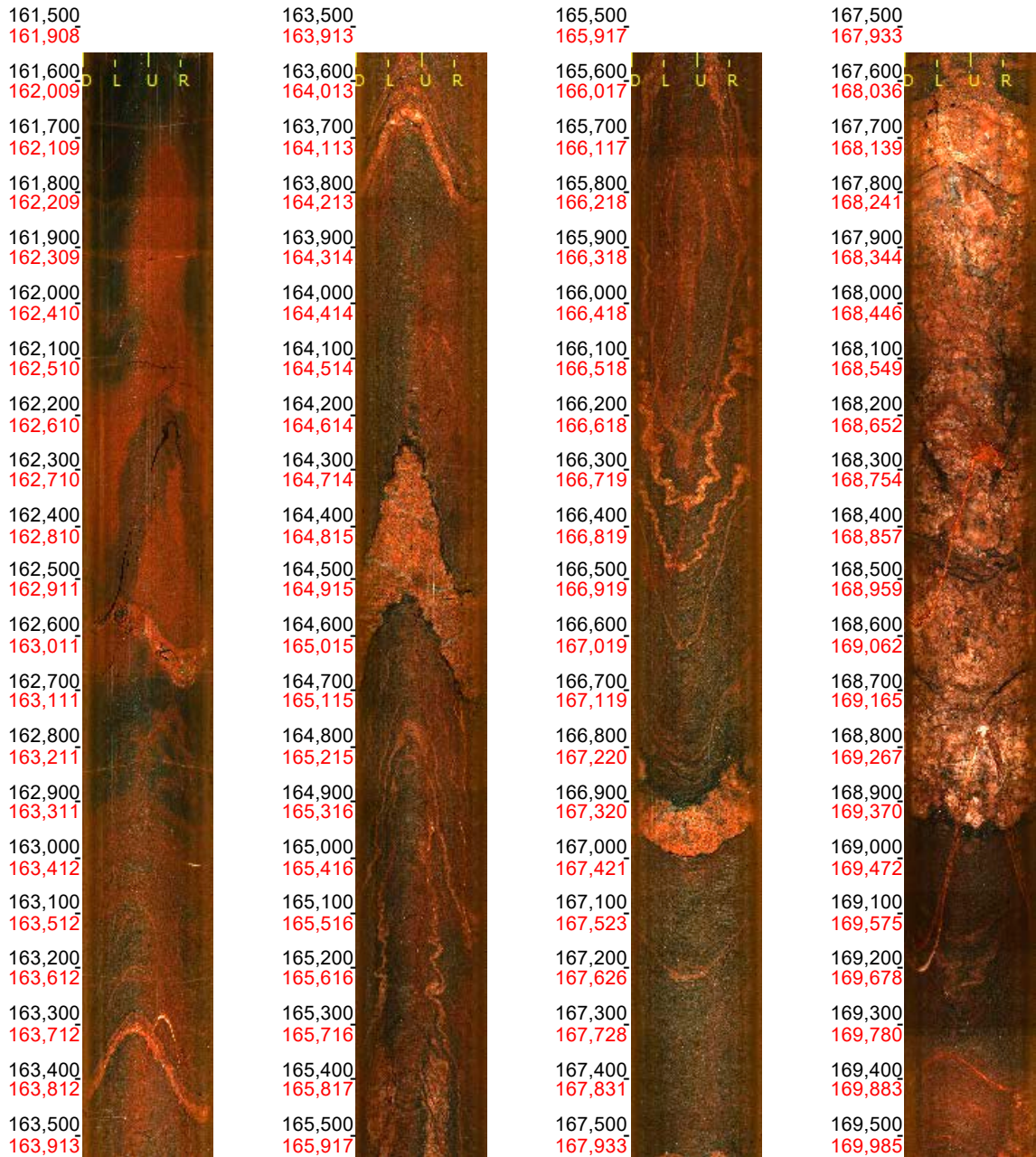
Scale: 1 : 10

Aspect: 100 %

21 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 161.550 - 169.550 m
Azimuth: 46.9
Inclination: -79.5



Printed: 2022-01-03 09:37:58

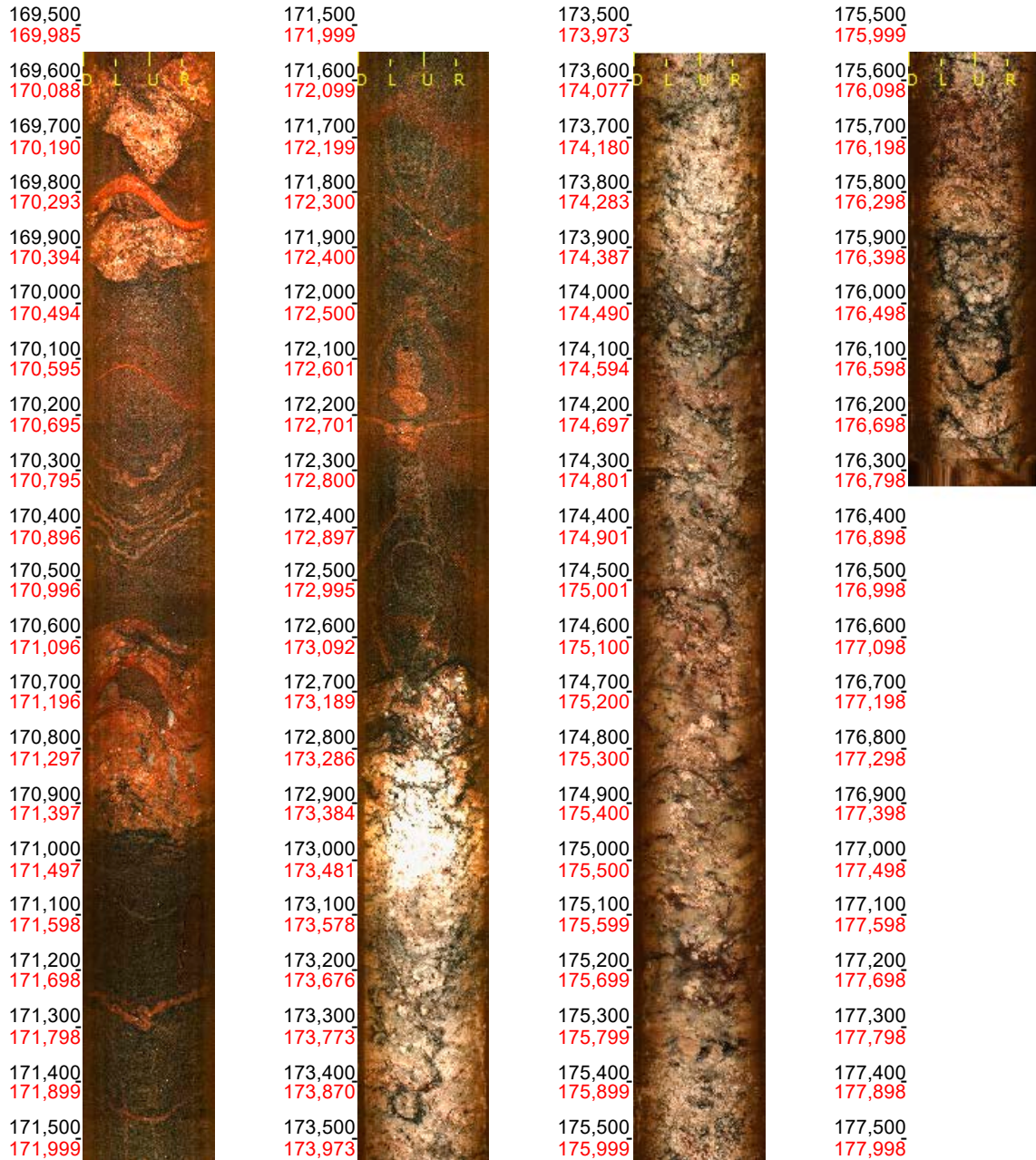
Scale: 1 : 10

Aspect: 100 %

22 (23)

Borehole: KFR120
Mapping: KFR120

Depth range: 169.550 - 176.330 m
Azimuth: 46.7
Inclination: -79.6



Printed: 2022-01-03 09:37:58

Scale: 1 : 10

Aspect: 100 %

23 (23)

A1.5 KFR121

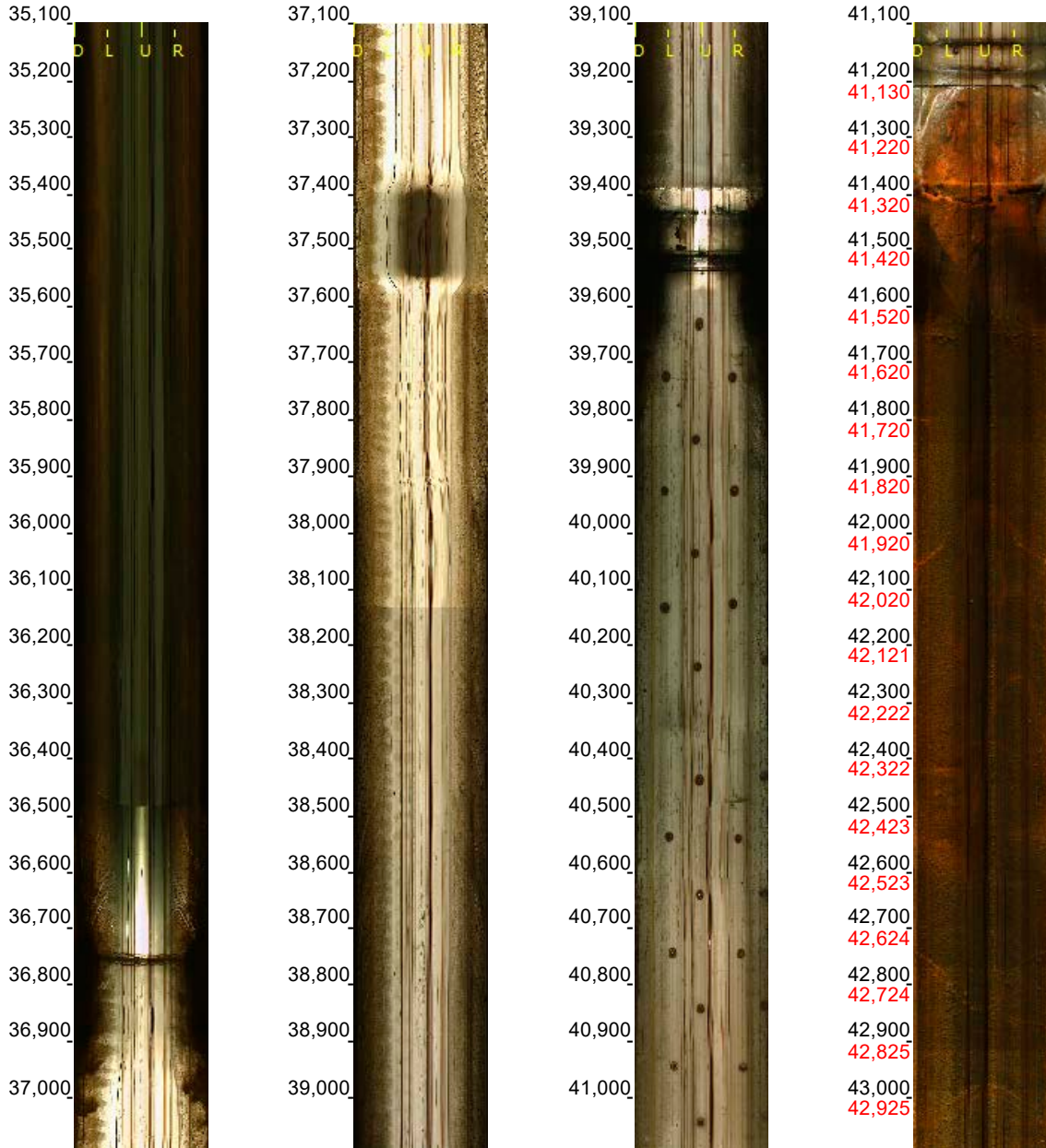
Borehole Name: KFR121
Mapping Name: KFR121
Mapping Range: 41,130 - 362,530 m
Diameter: 76,0 mm
Printed Range: 35,100 - 362,010
Pages: 42

Image File Information:

File: G:\skb\bips\sicada\KFR121\KFR121 200817ner_H_LGX.HED
Date/Time: 2020-08-17
Start Depth: 1,560 m
End Depth: 362,010 m
Resolution: 1,00 mm/pixel (depth)
Orientation: Gravimetric
Image height: 360451 pixels
Image width: 720 pixels
Intrinsic angle: 180 degrees
LGX Version: 101
Locality:
Wellname: KFR121
Scan Direction: Down

Borehole: KFR121
Mapping: KFR121

Depth range: 35.100 - 43.100 m
Azimuth: 216.5
Inclination: -51.7



Printed: 2022-01-03 10:02:22

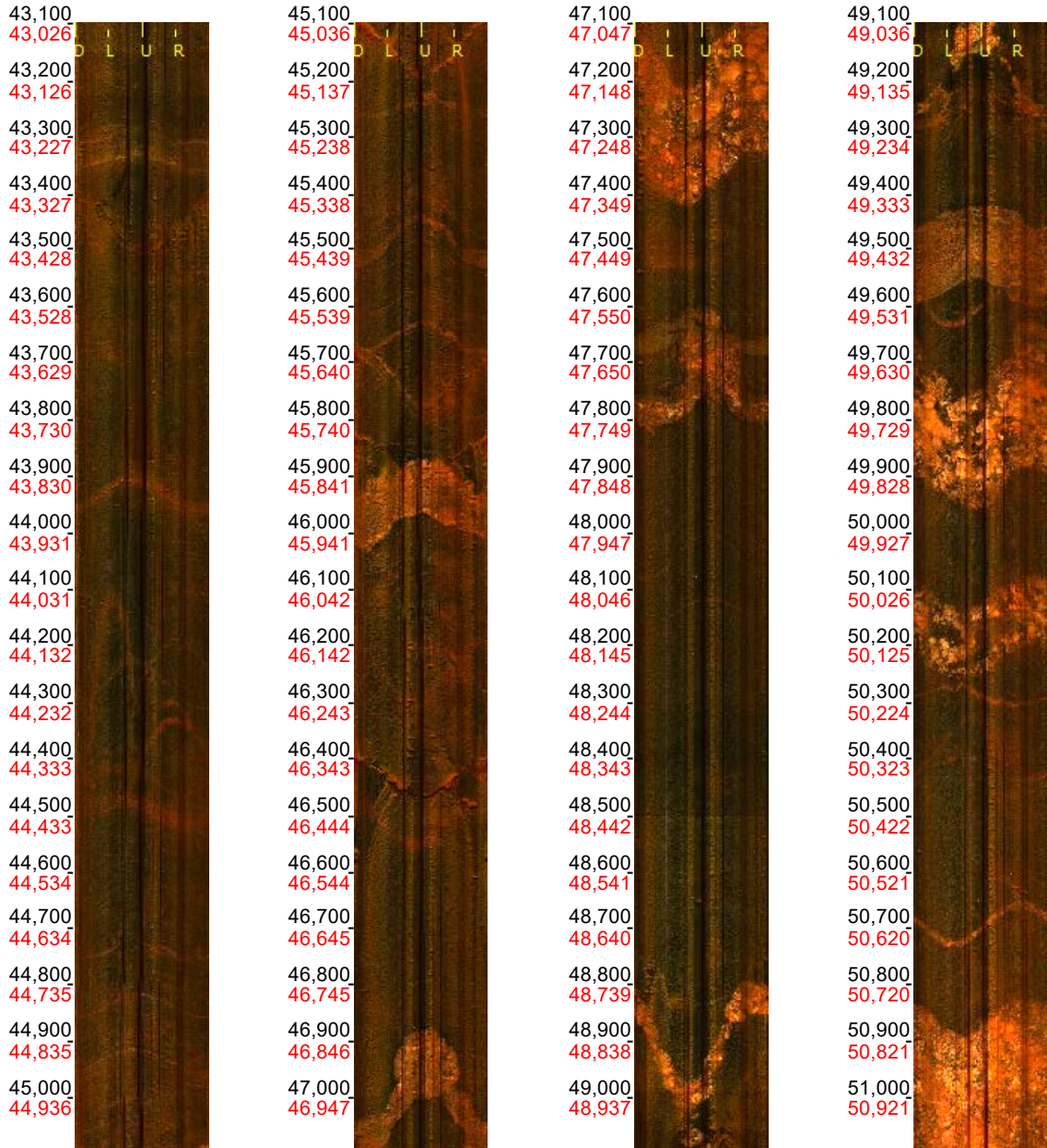
Scale: 1 : 10

Aspect: 100 %

2 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 43.100 - 51.100 m
Azimuth: 215.7
Inclination: -52.1



Printed: 2022-01-03 10:02:22

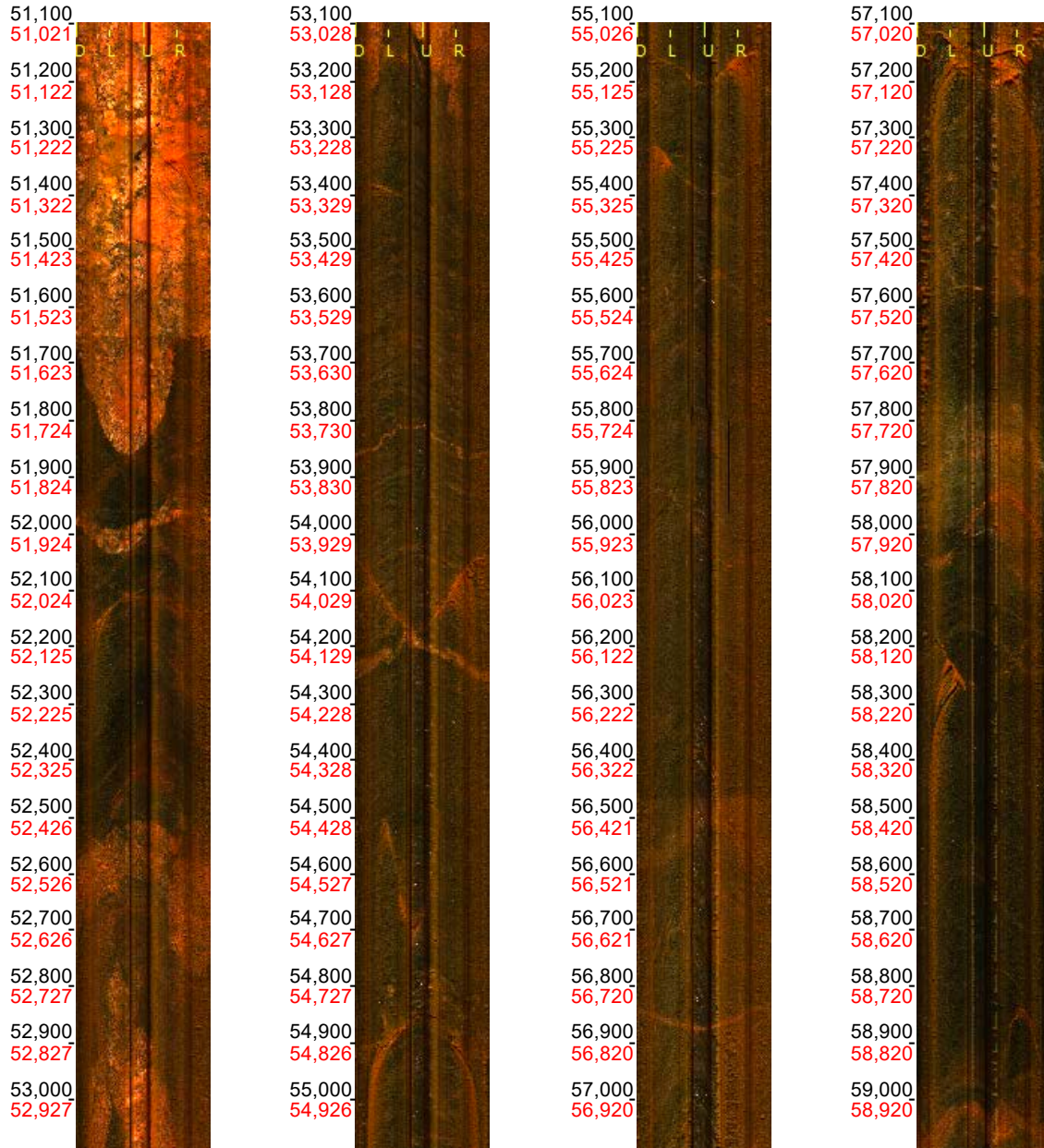
Scale: 1 : 10

Aspect: 100 %

3 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 51.100 - 59.100 m
Azimuth: 215.6
Inclination: -52.0



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

4 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 59.100 - 67.100 m
Azimuth: 216.0
Inclination: -51.9



Printed: 2022-01-03 10:02:22

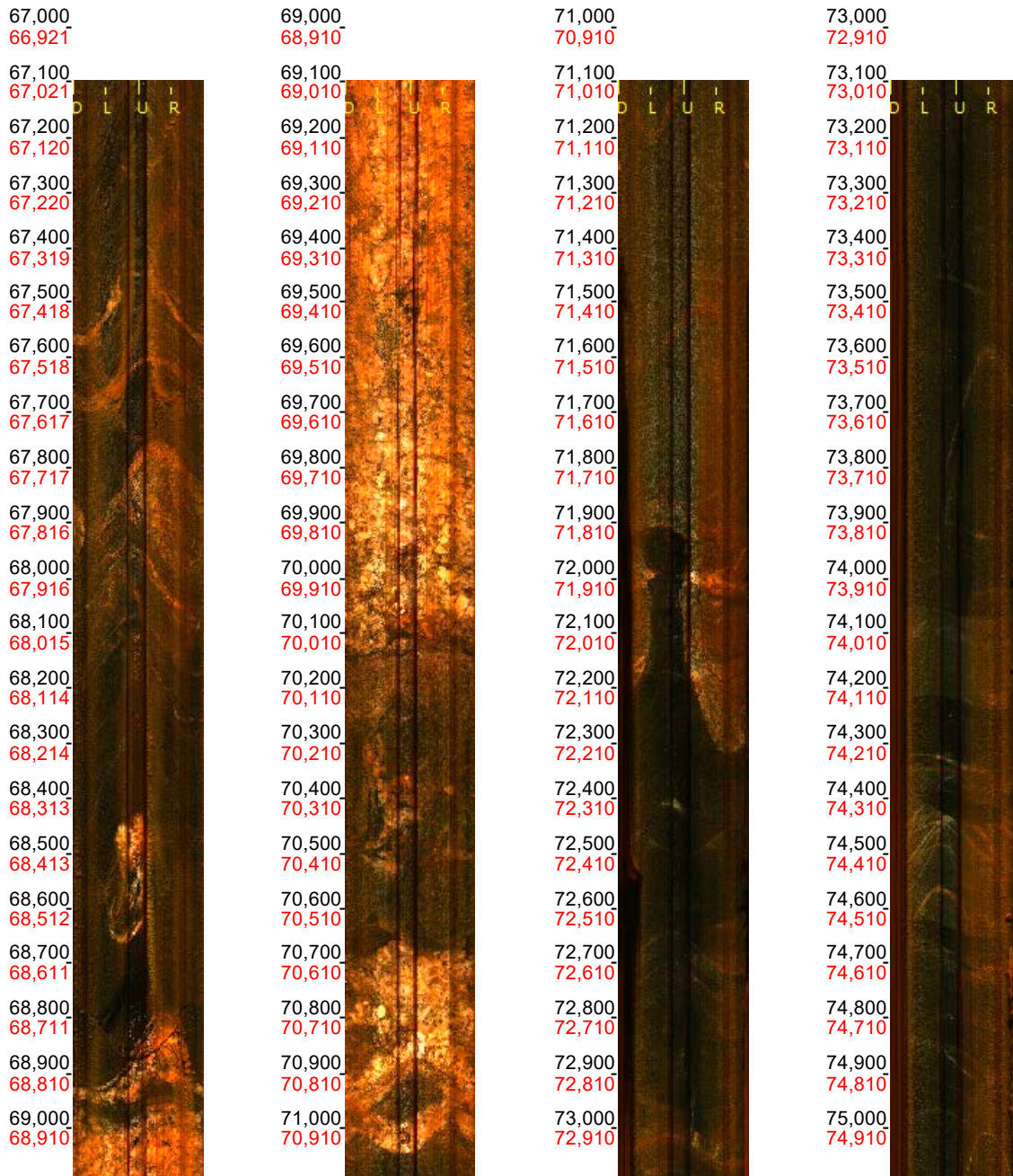
Scale: 1 : 10

Aspect: 100 %

5 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 67.100 - 75.100 m
Azimuth: 216.6
Inclination: -51.9



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

6 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 75.100 - 83.100 m
Azimuth: 216.8
Inclination: -51.9



Printed: 2022-01-03 10:02:22

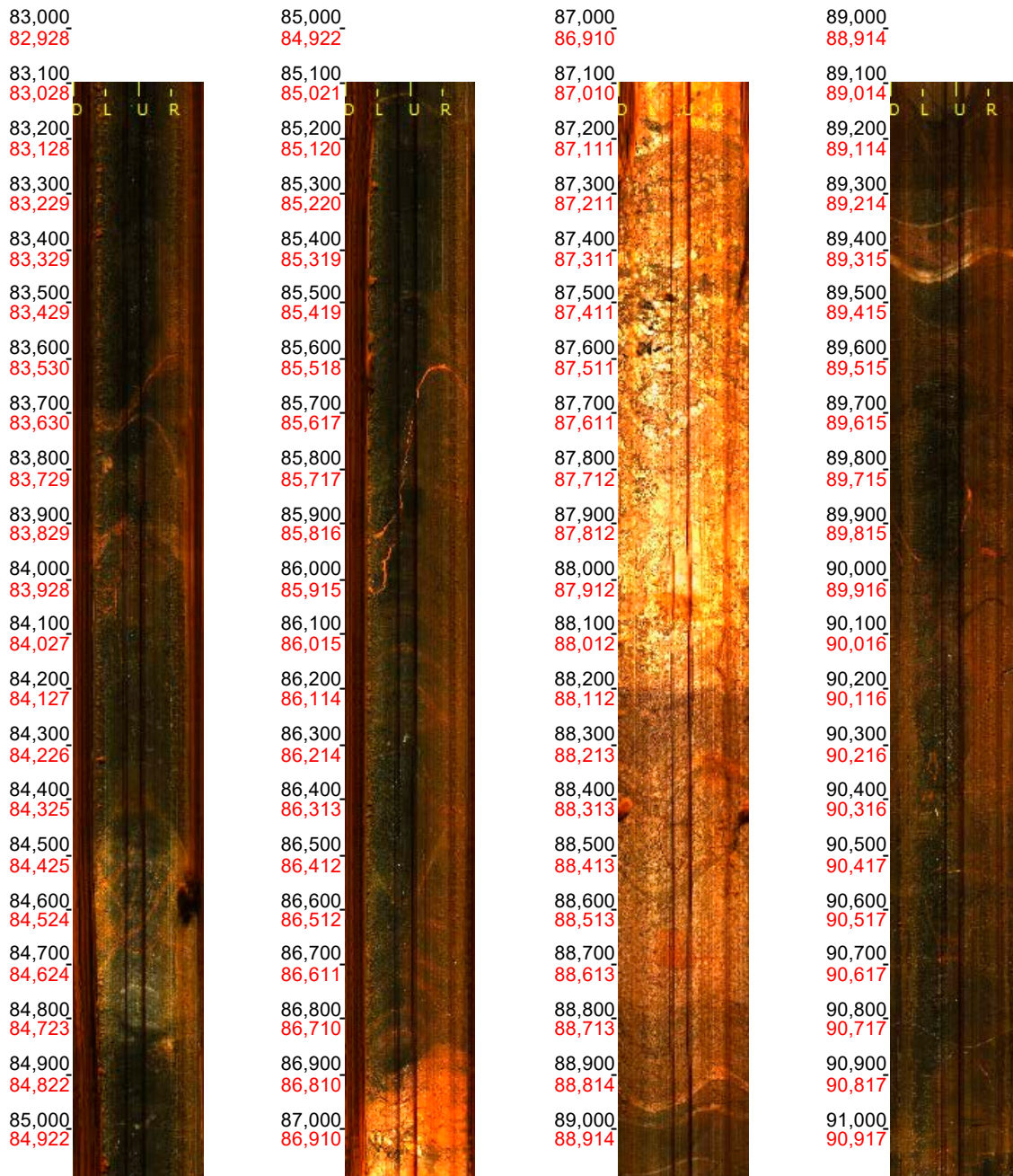
Scale: 1 : 10

Aspect: 100 %

7 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 83.100 - 91.100 m
Azimuth: 216.8
Inclination: -51.9



Printed: 2022-01-03 10:02:22

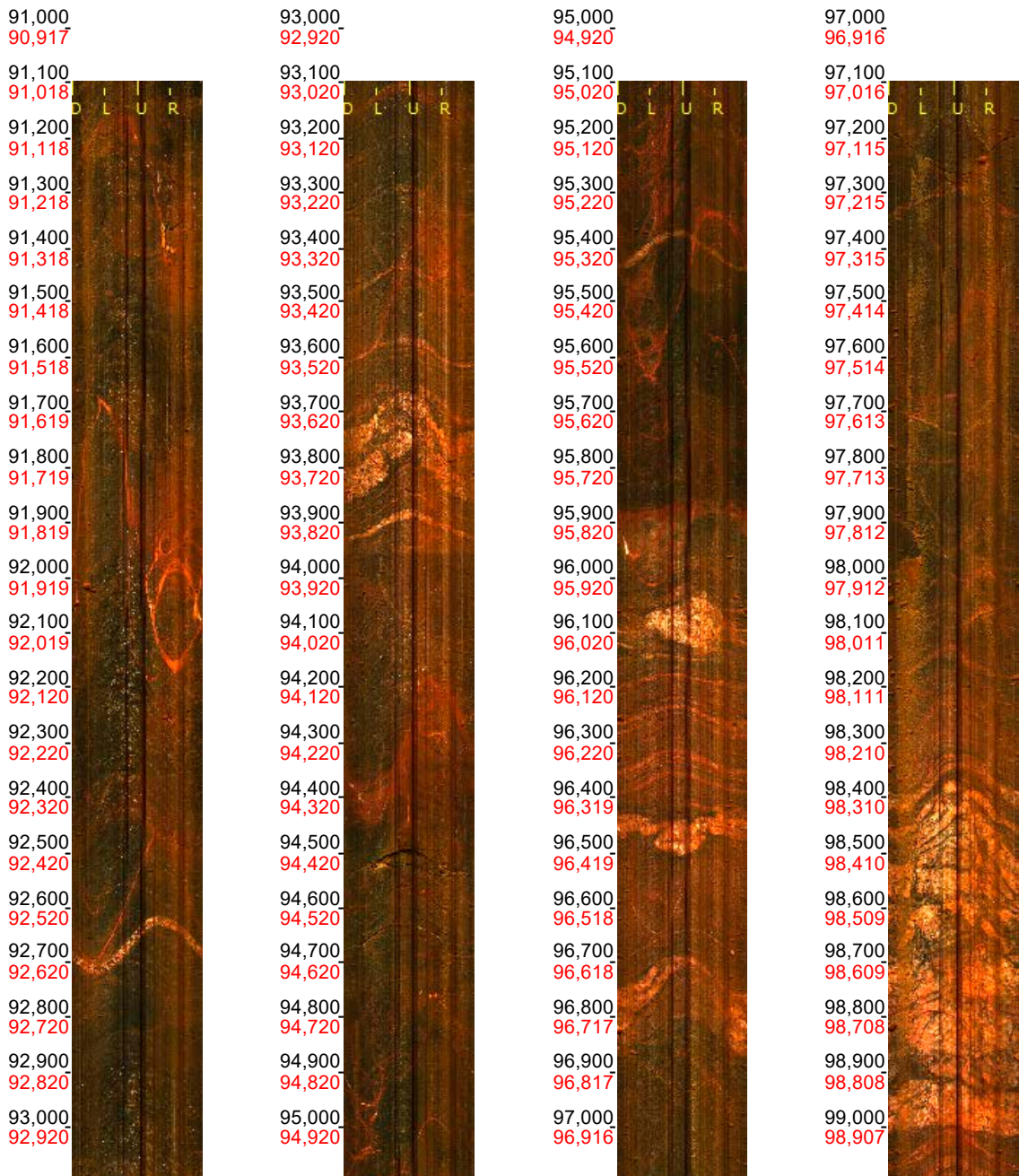
Scale: 1 : 10

Aspect: 100 %

8 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 91.100 - 99.100 m
Azimuth: 216.9
Inclination: -51.9



Printed: 2022-01-03 10:02:22

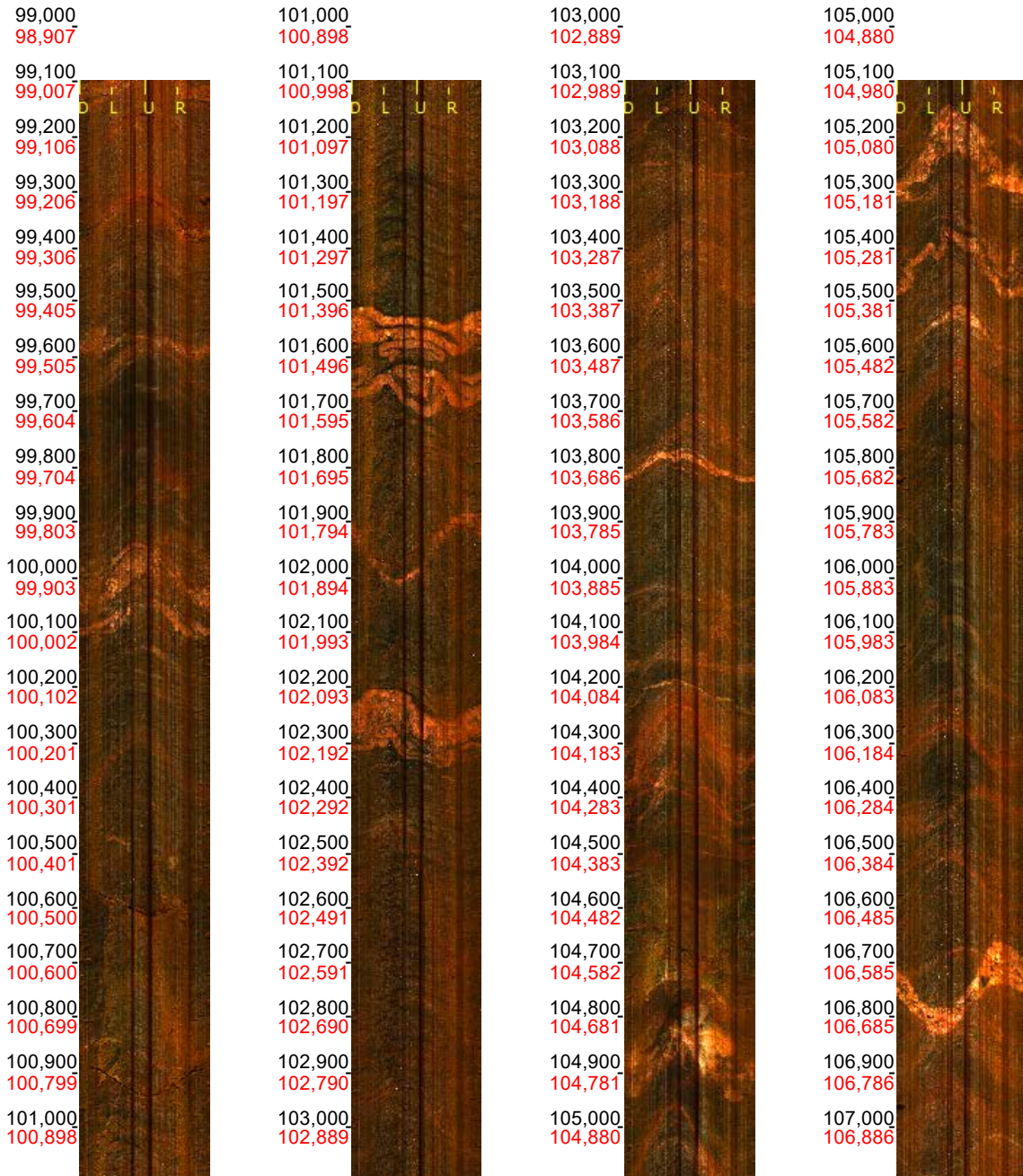
Scale: 1 : 10

Aspect: 100 %

9 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 99.100 - 107.100 m
Azimuth: 216.8
Inclination: -51.9



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

10 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 107.100 - 115.100 m
Azimuth: 216.9
Inclination: -52.0



Printed: 2022-01-03 10:02:22

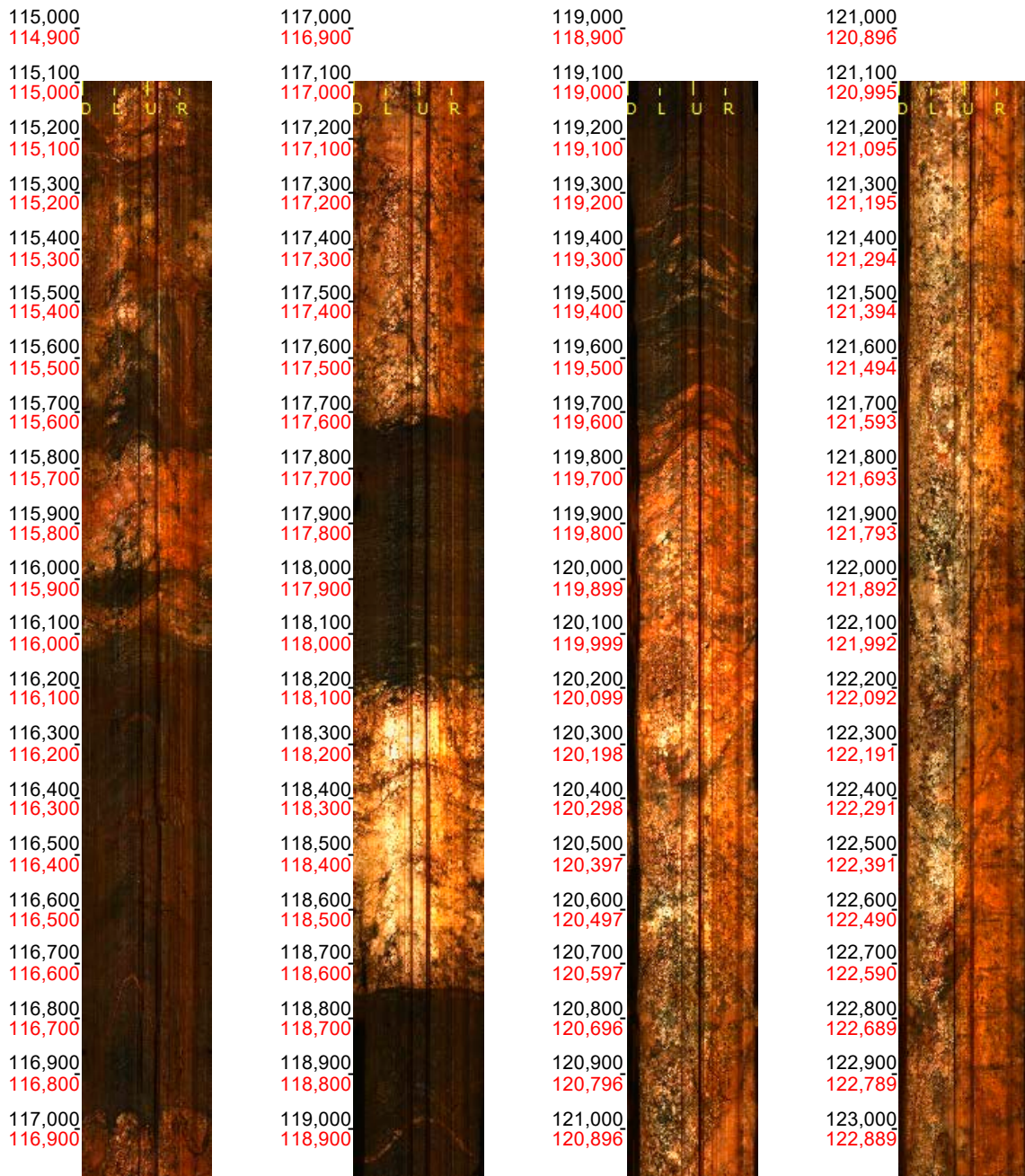
Scale: 1 : 10

Aspect: 100 %

11 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 115.100 - 123.100 m
Azimuth: 217.8
Inclination: -52.1



Printed: 2022-01-03 10:02:22

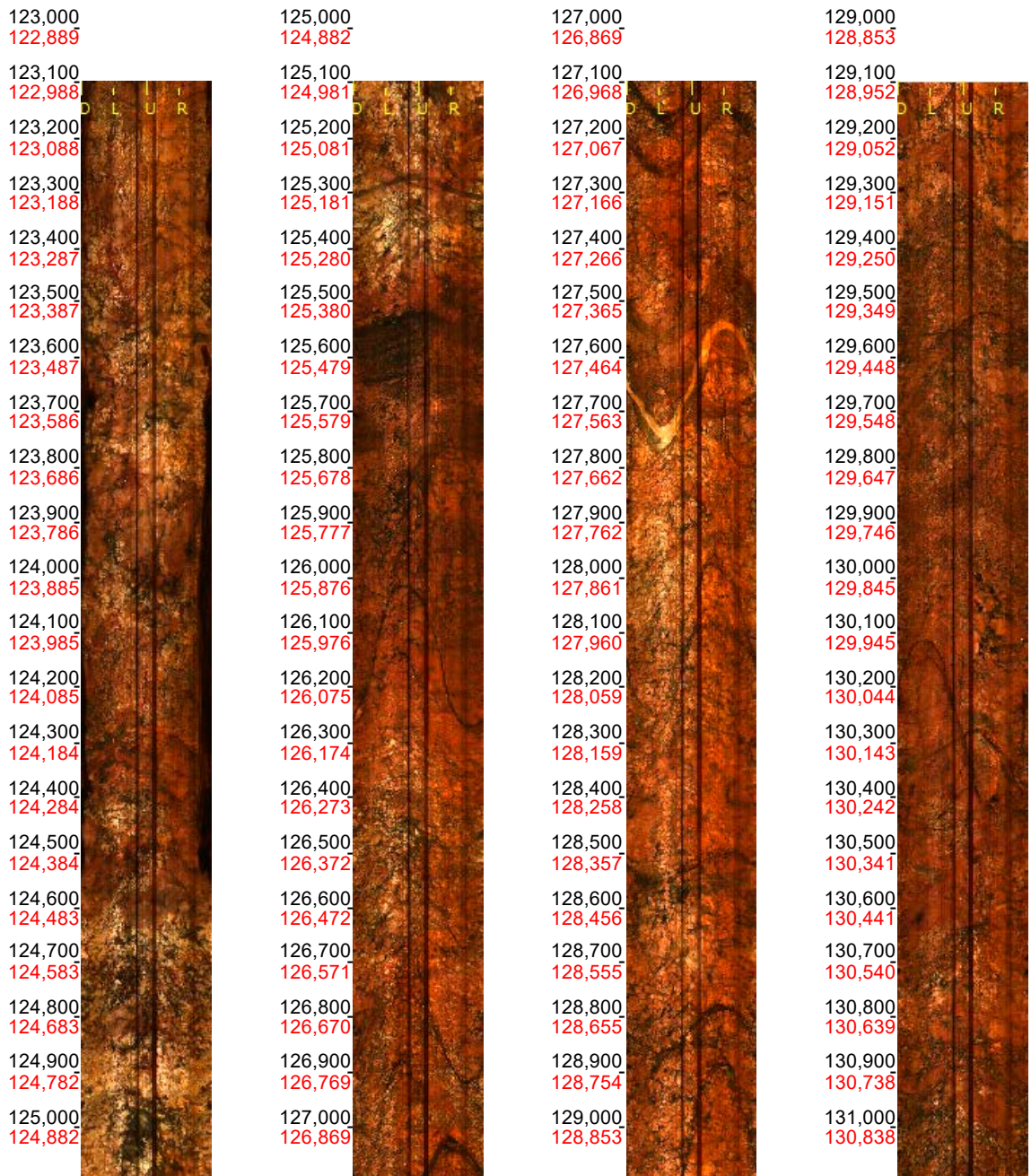
Scale: 1 : 10

Aspect: 100 %

12 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 123.100 - 131.100 m
Azimuth: 217.8
Inclination: -52.1



Printed: 2022-01-03 10:02:22

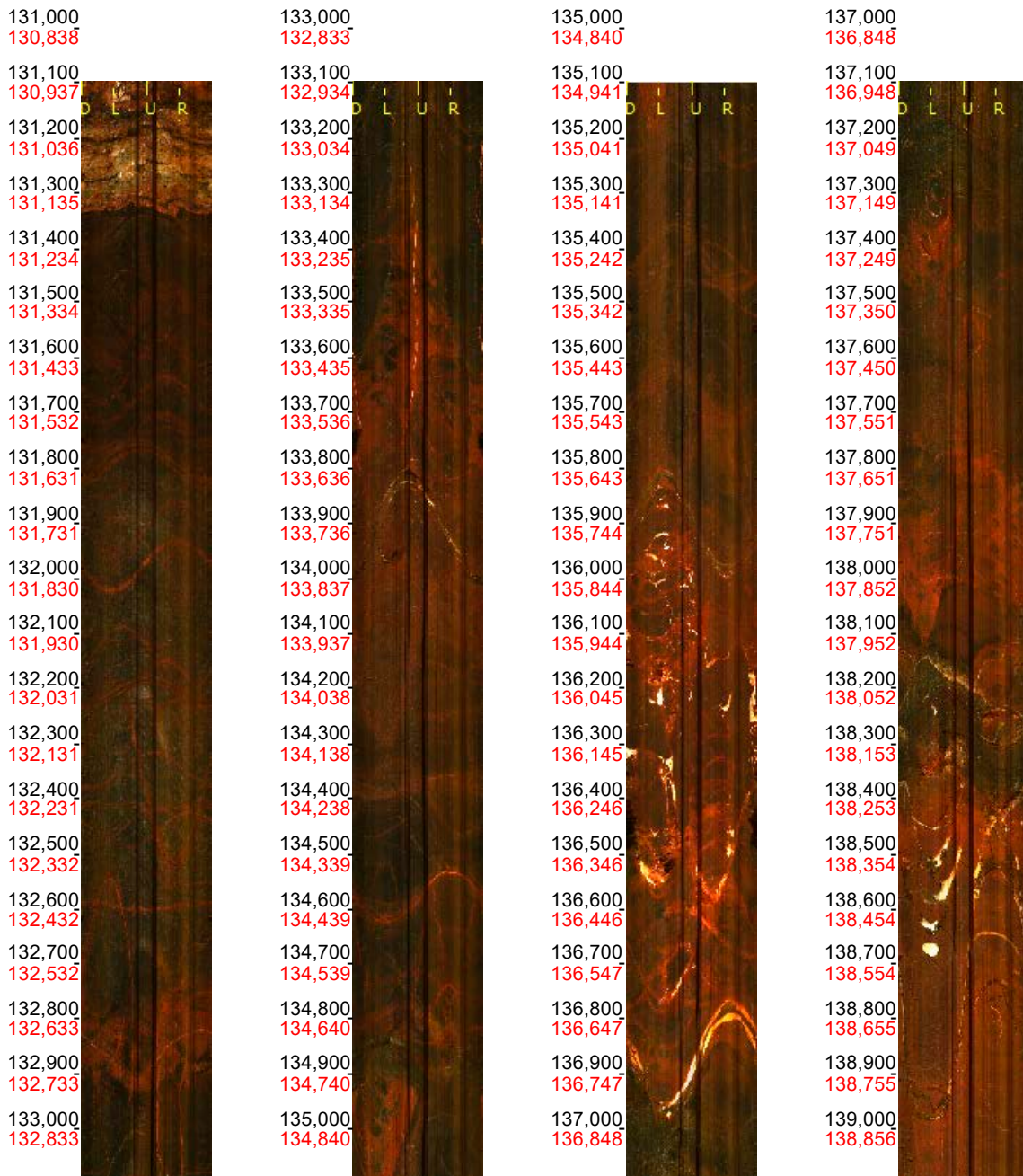
Scale: 1 : 10

Aspect: 100 %

13 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 131.100 - 139.100 m
Azimuth: 218.3
Inclination: -52.1



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

14 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 139.100 - 147.100 m
Azimuth: 218.6
Inclination: -52.0



Printed: 2022-01-03 10:02:22

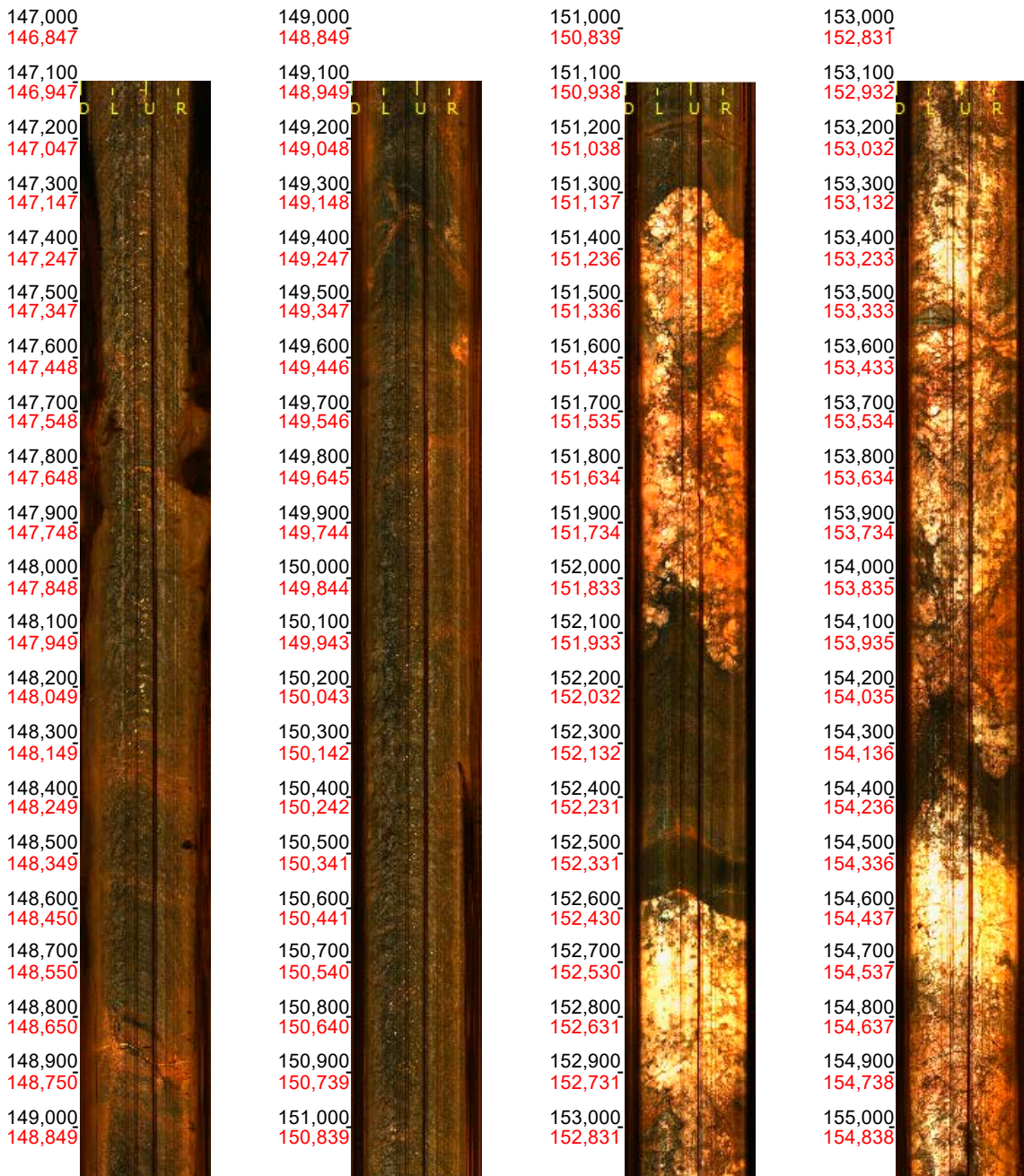
Scale: 1 : 10

Aspect: 100 %

15 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 147.100 - 155.100 m
Azimuth: 218.5
Inclination: -52.1



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

16 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 155.100 - 163.100 m
Azimuth: 218.4
Inclination: -52.0



Printed: 2022-01-03 10:02:22

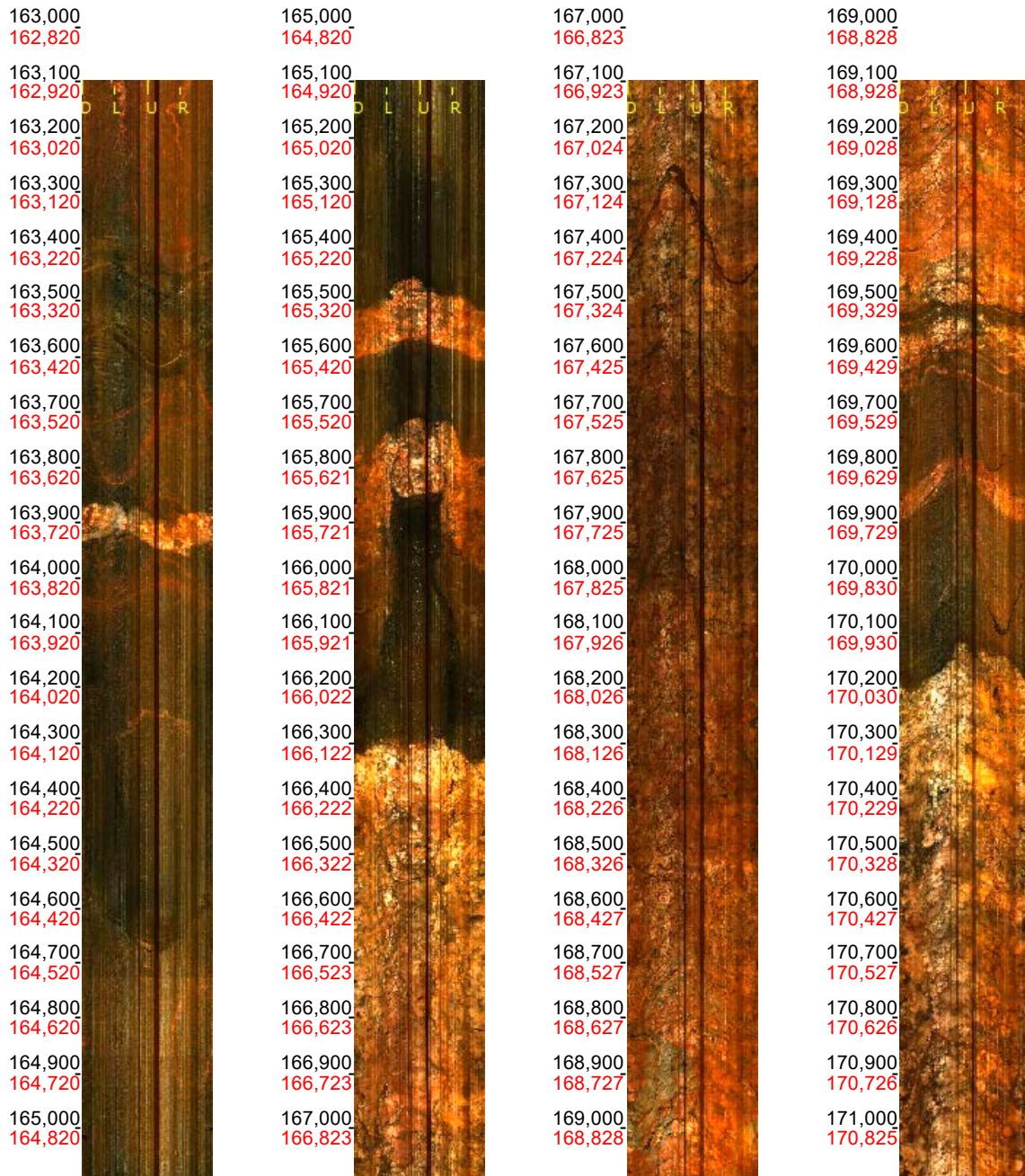
Scale: 1 : 10

Aspect: 100 %

17 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 163.100 - 171.100 m
Azimuth: 218.2
Inclination: -52.0



Printed: 2022-01-03 10:02:22

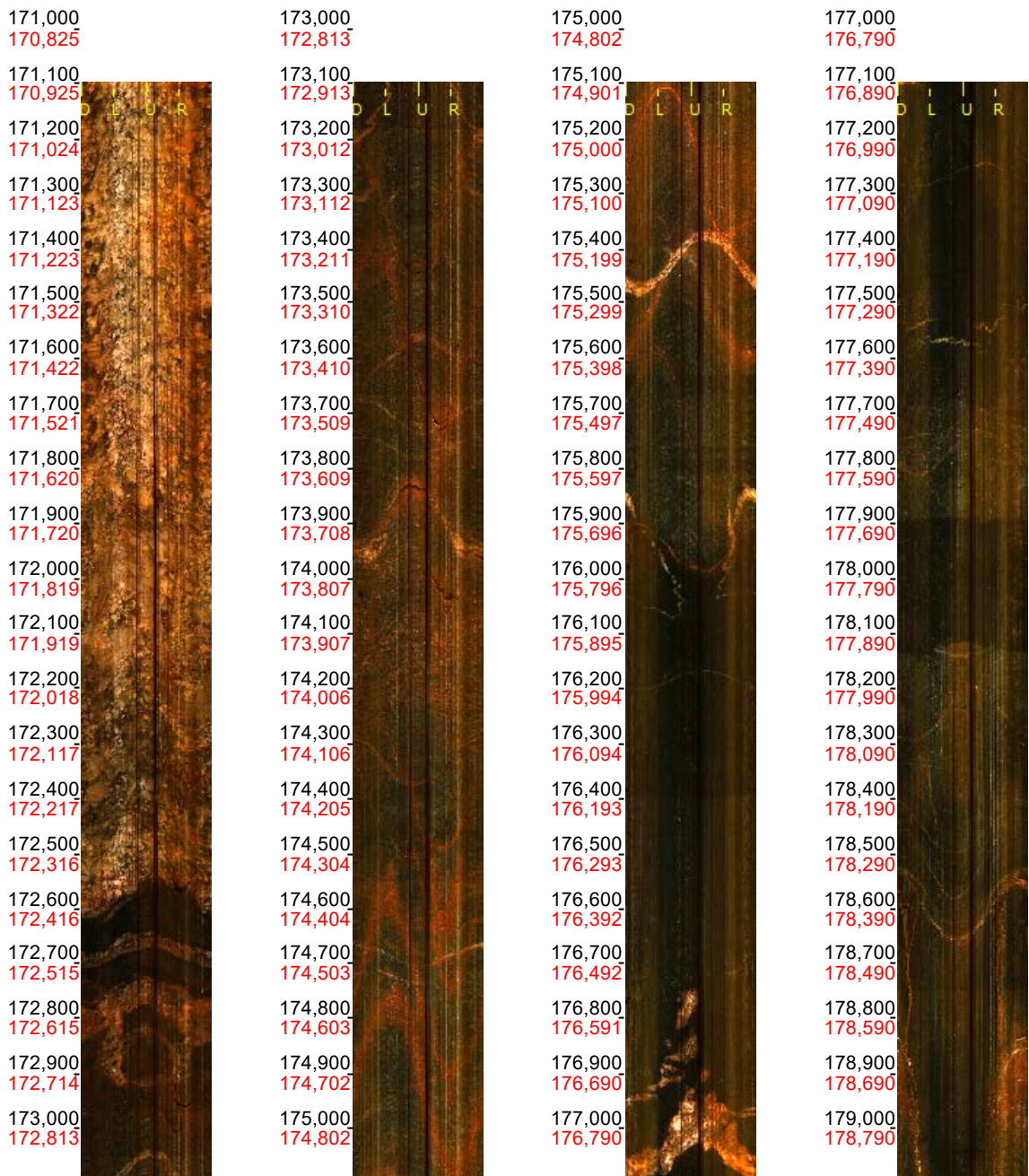
Scale: 1 : 10

Aspect: 100 %

18 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 171.100 - 179.100 m
Azimuth: 219.8
Inclination: -52.0



Printed: 2022-01-03 10:02:22

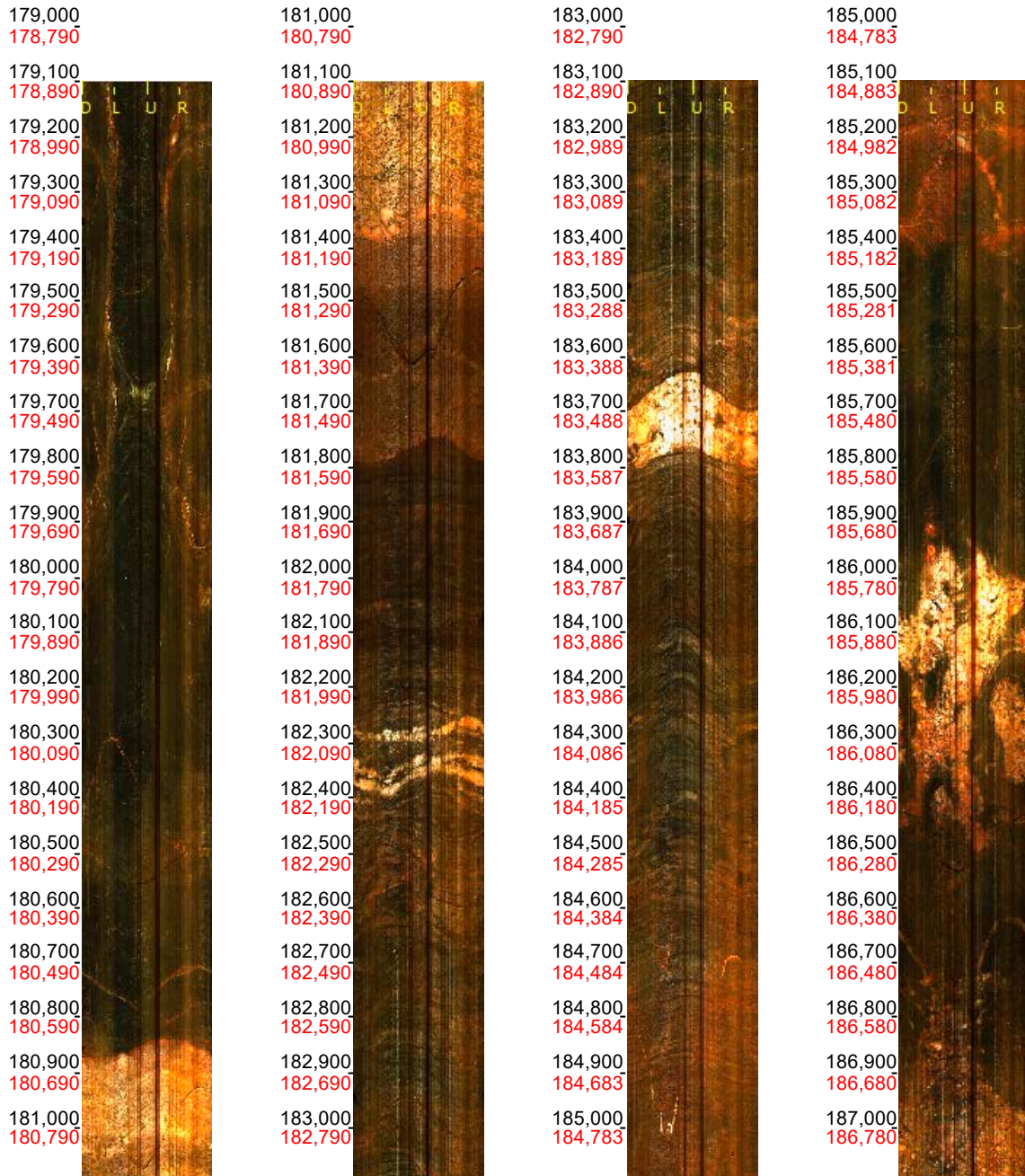
Scale: 1 : 10

Aspect: 100 %

19 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 179.100 - 187.100 m
Azimuth: 220.6
Inclination: -52.1



Printed: 2022-01-03 10:02:22

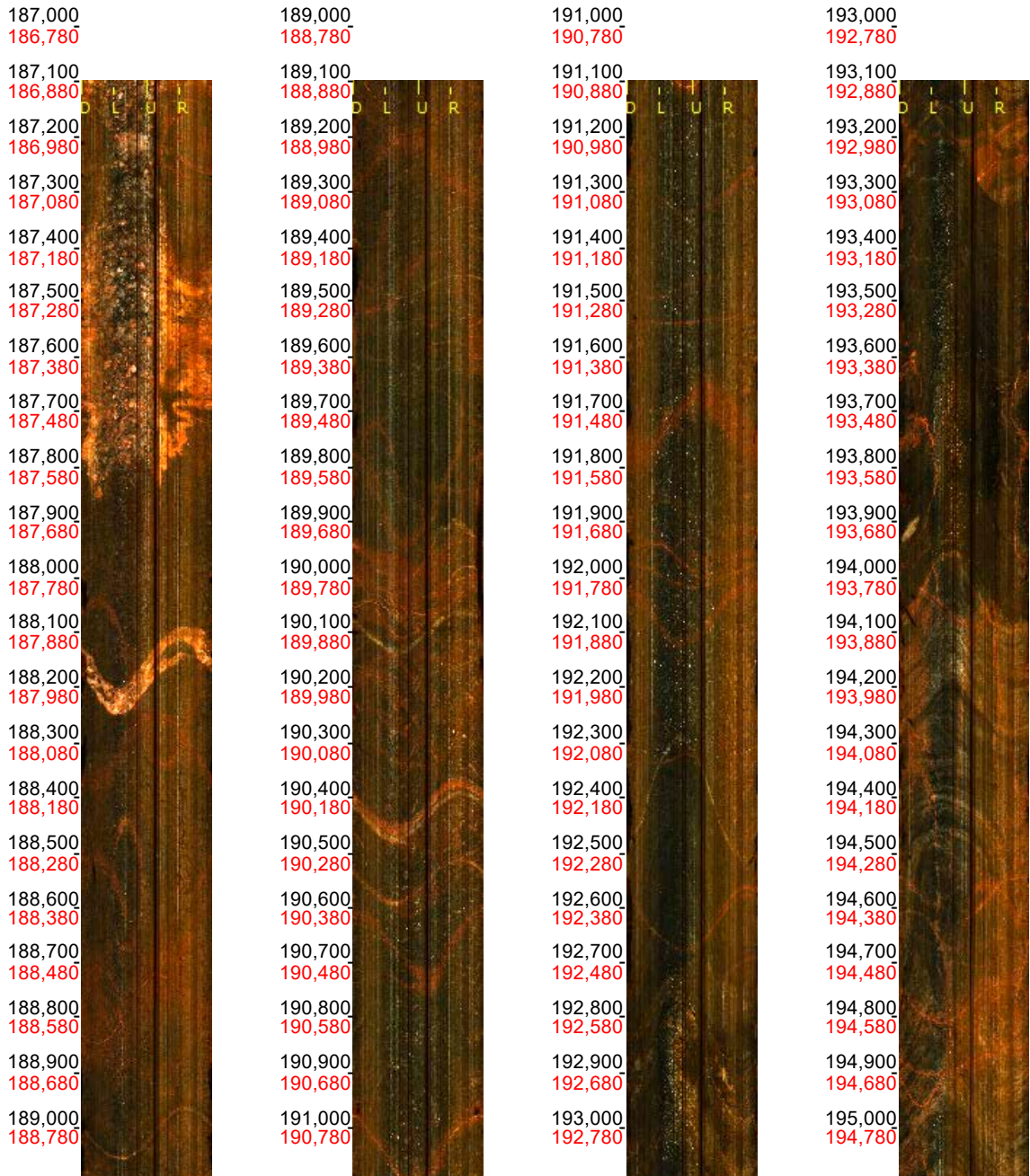
Scale: 1 : 10

Aspect: 100 %

20 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 187.100 - 195.100 m
Azimuth: 220.6
Inclination: -52.0



Printed: 2022-01-03 10:02:22

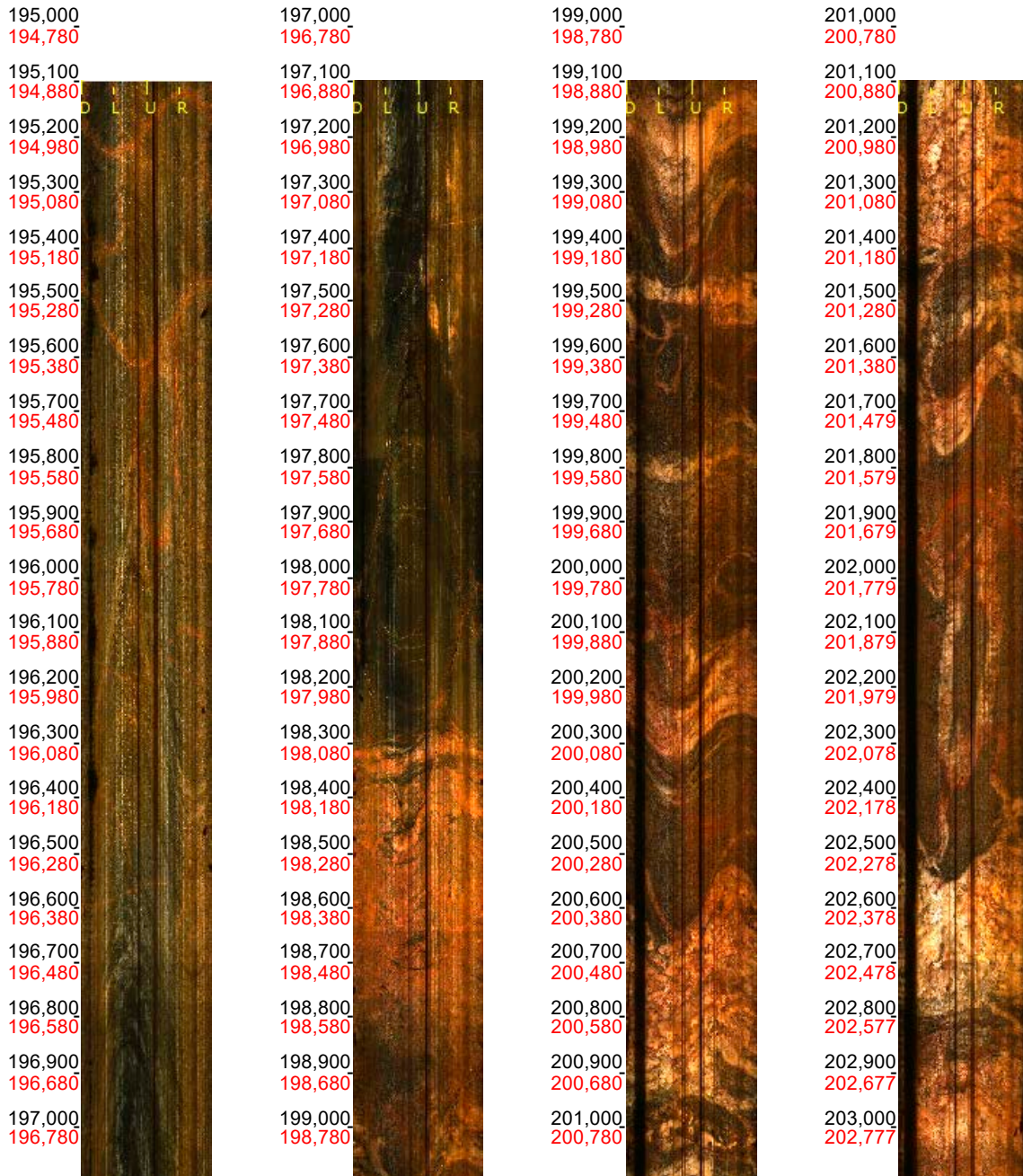
Scale: 1 : 10

Aspect: 100 %

21 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 195.100 - 203.100 m
Azimuth: 220.8
Inclination: -52.0



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

22 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 203.100 - 211.100 m
Azimuth: 220.9
Inclination: -51.9



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

23 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 211.100 - 219.100 m
Azimuth: 221.0
Inclination: -51.8



Printed: 2022-01-03 10:02:22

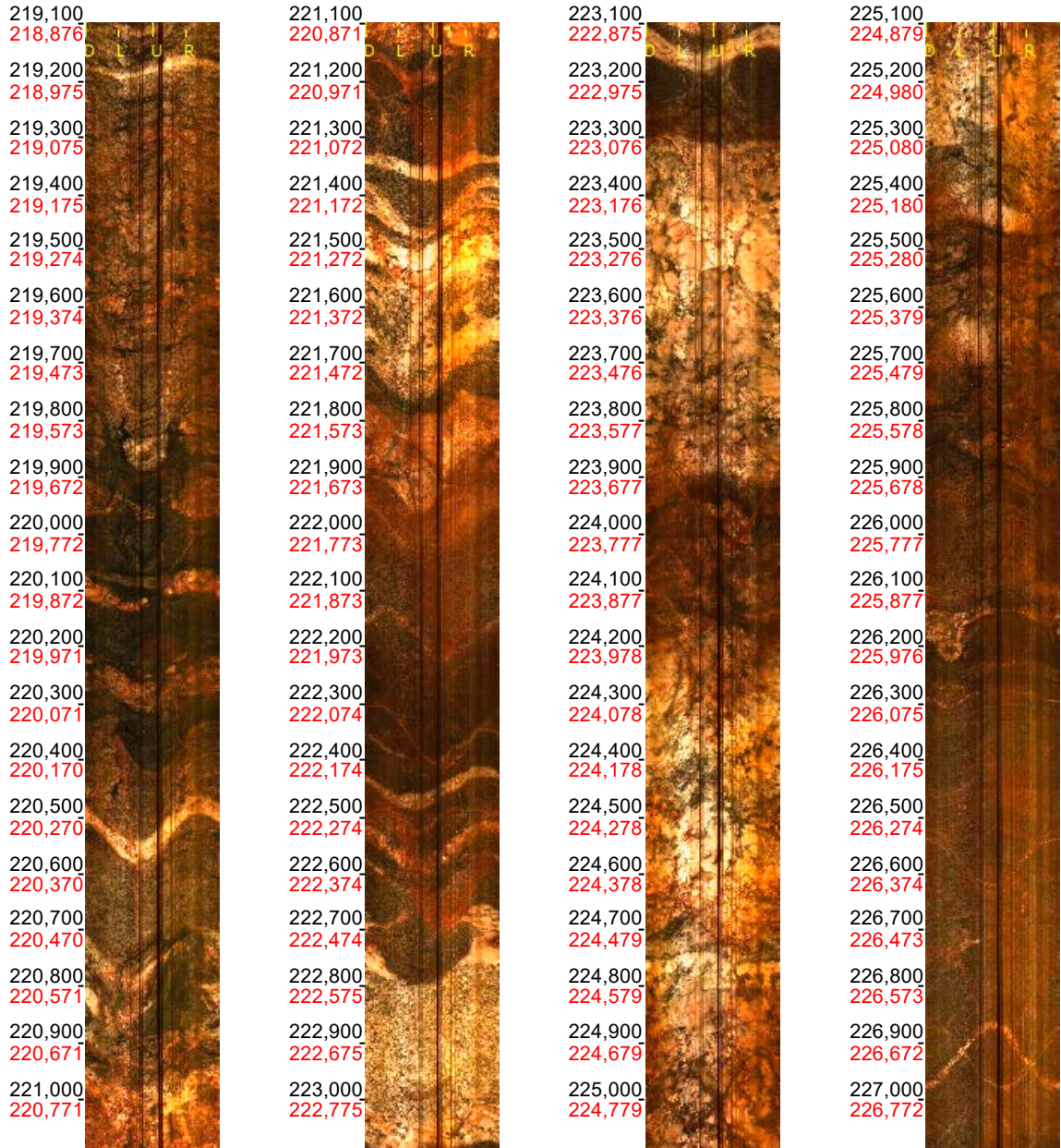
Scale: 1 : 10

Aspect: 100 %

24 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 219.100 - 227.100 m
Azimuth: 221.3
Inclination: -51.8



Printed: 2022-01-03 10:02:22

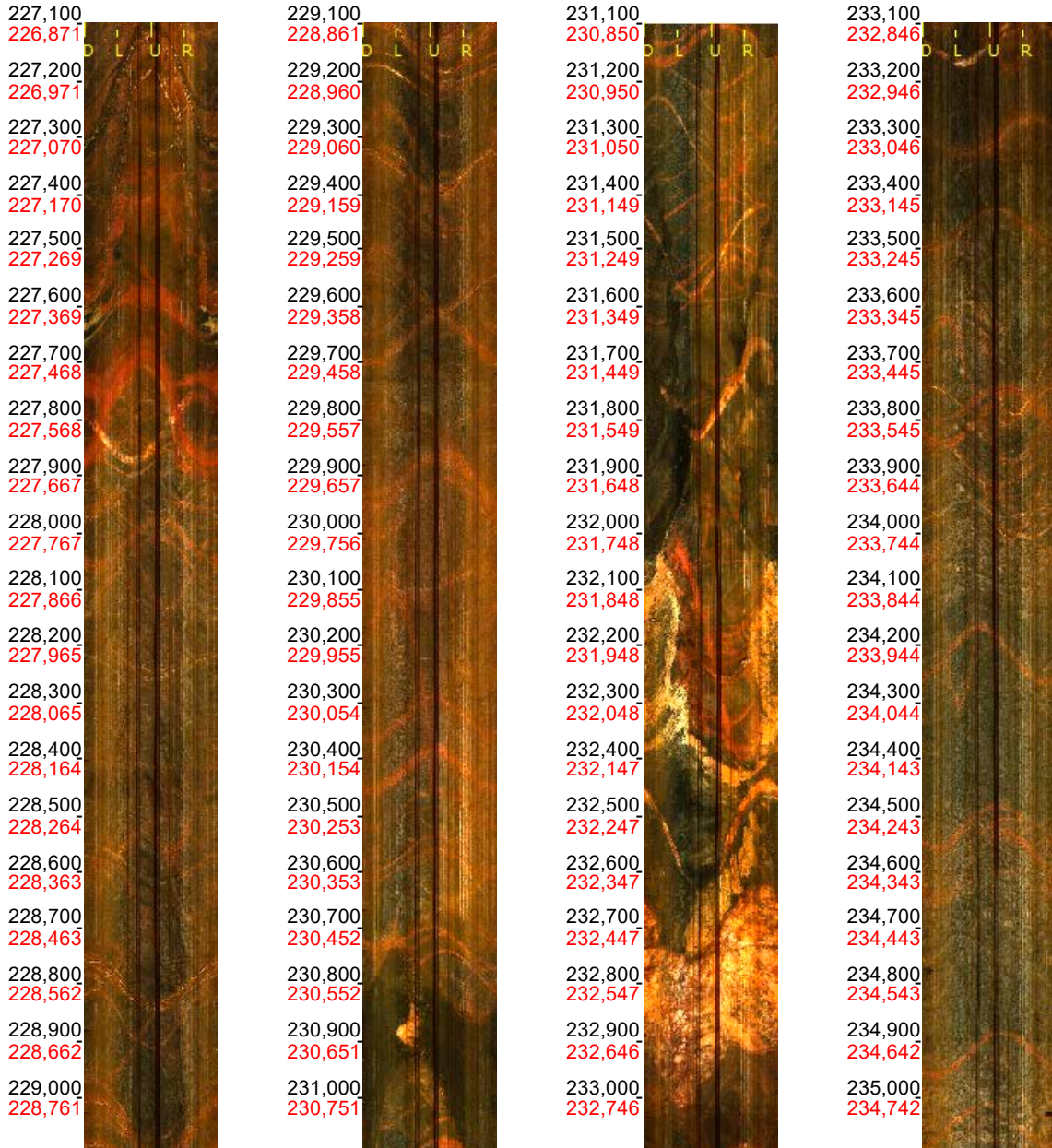
Scale: 1 : 10

Aspect: 100 %

25 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 227.100 - 235.100 m
Azimuth: 221.5
Inclination: -51.8



Printed: 2022-01-03 10:02:22

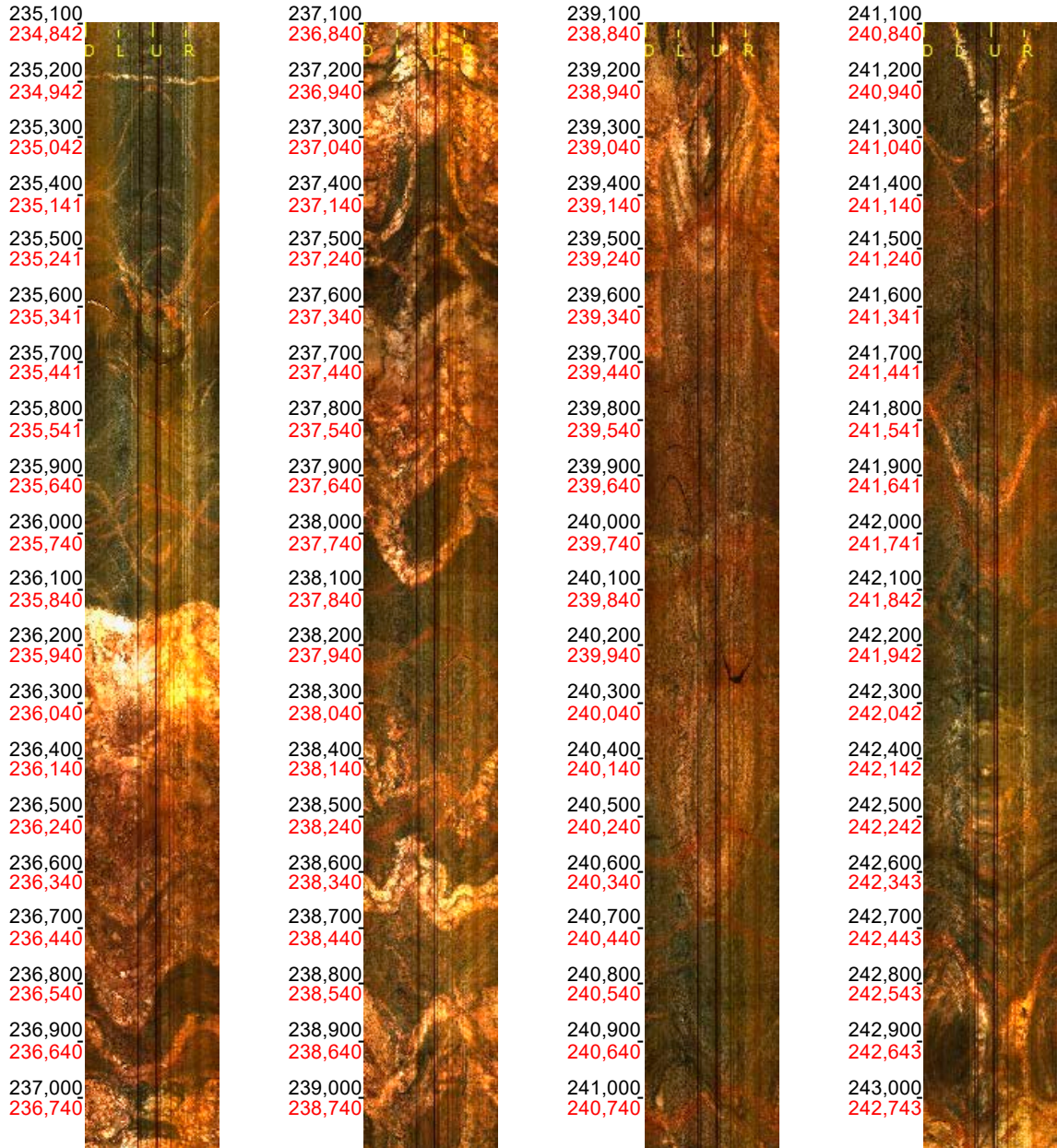
Scale: 1 : 10

Aspect: 100 %

26 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 235.100 - 243.100 m
Azimuth: 221.7
Inclination: -51.9



Printed: 2022-01-03 10:02:22

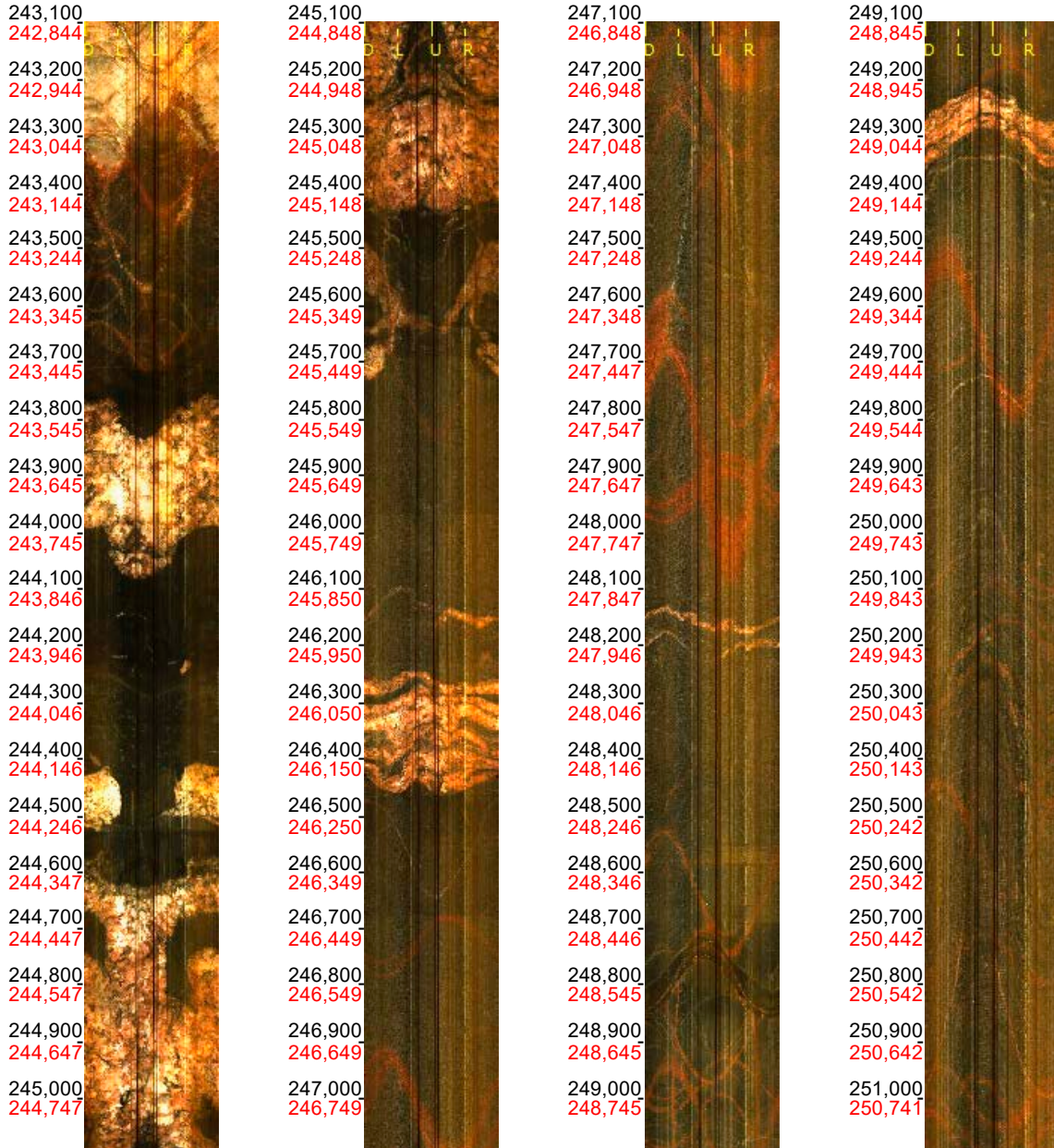
Scale: 1 : 10

Aspect: 100 %

27 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 243.100 - 251.100 m
Azimuth: 221.9
Inclination: -51.9



Printed: 2022-01-03 10:02:22

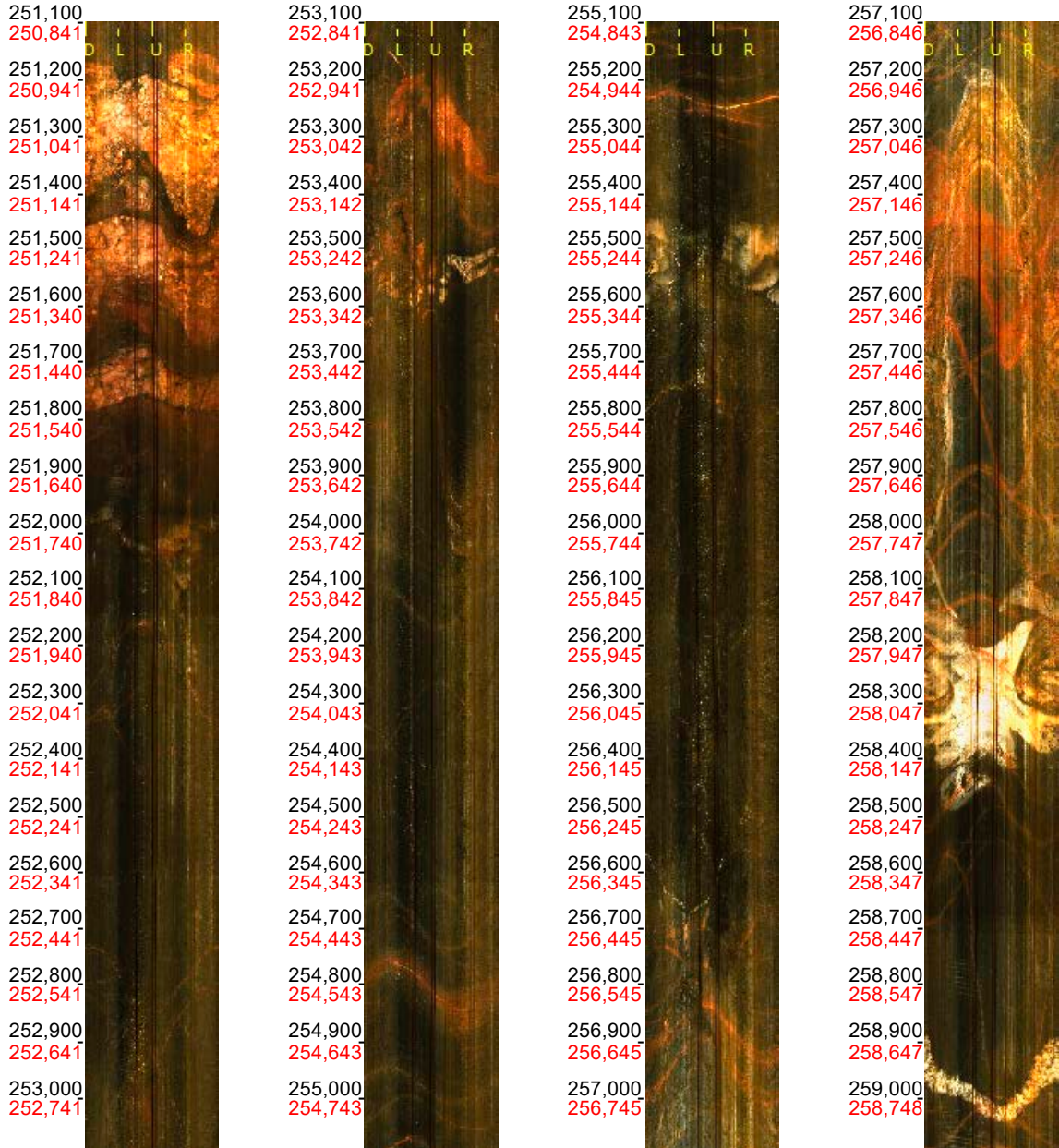
Scale: 1 : 10

Aspect: 100 %

28 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 251.100 - 259.100 m
Azimuth: 222.4
Inclination: -51.9



Printed: 2022-01-03 10:02:22

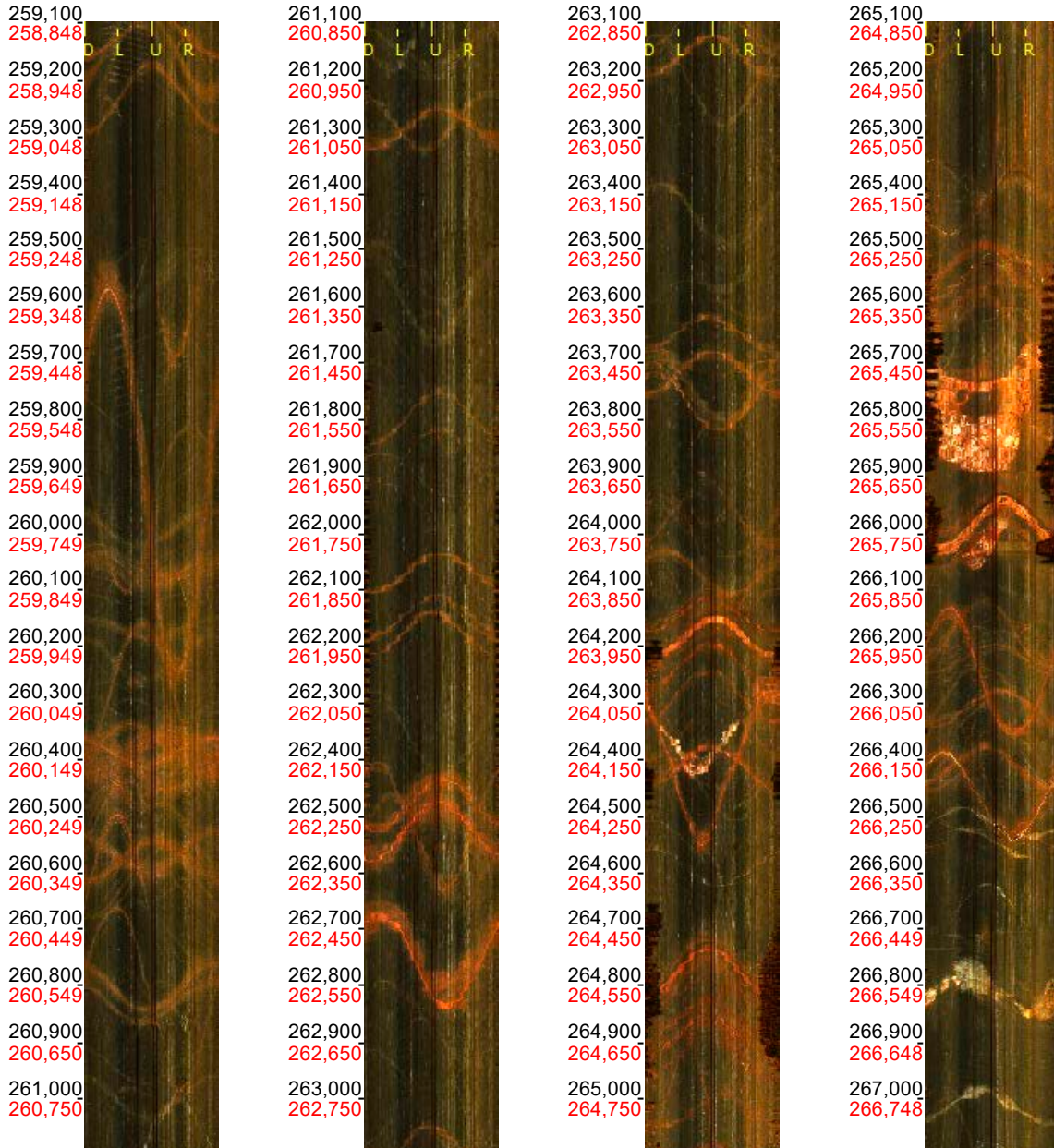
Scale: 1 : 10

Aspect: 100 %

29 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 259.100 - 267.100 m
Azimuth: 222.4
Inclination: -51.9



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

30 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 267.100 - 275.100 m
Azimuth: 223.2
Inclination: -51.9



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

Aspect: 100 %

31 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 275.100 - 283.100 m
Azimuth: 224.3
Inclination: -51.8



Printed: 2022-01-03 10:02:22

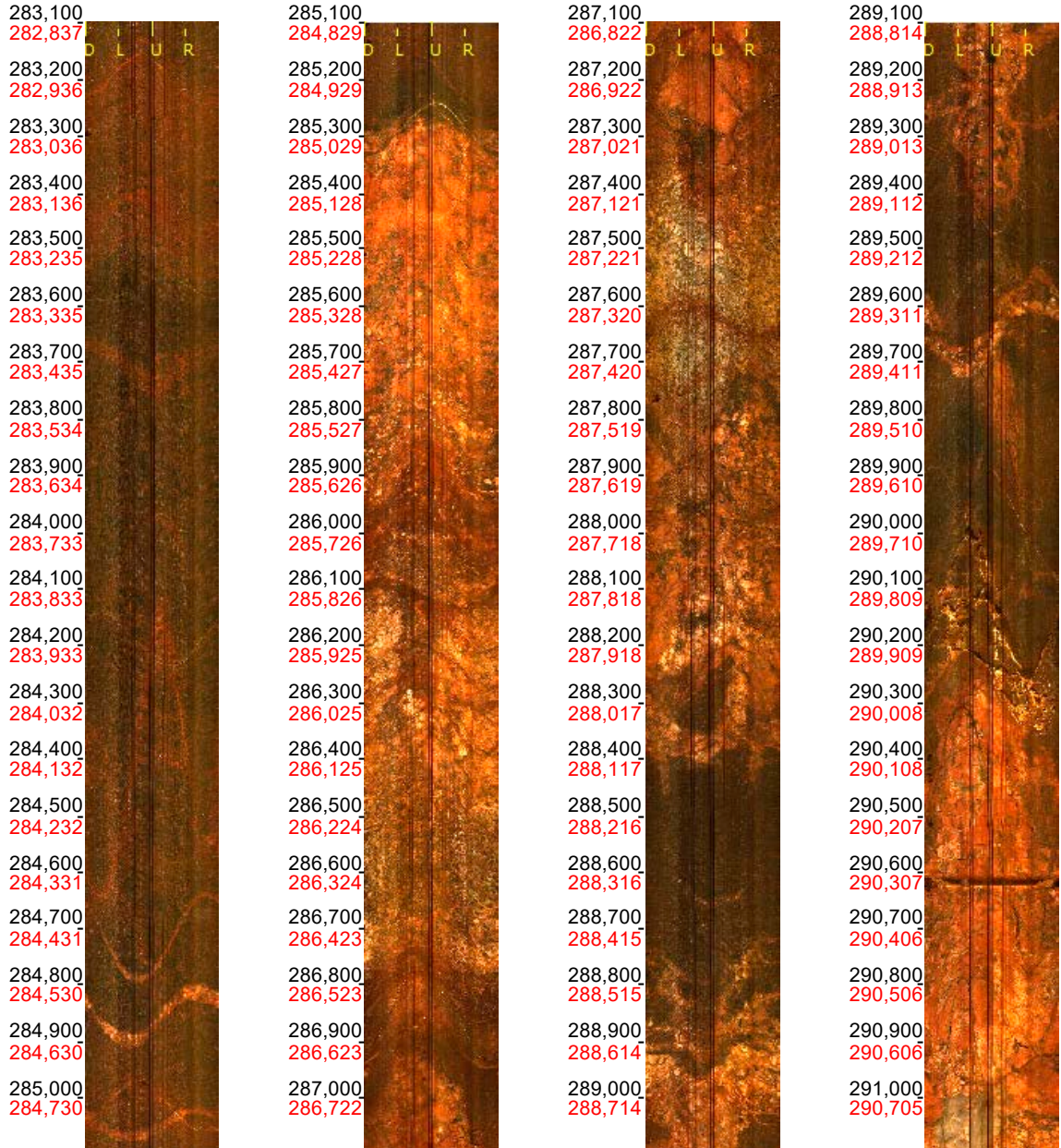
Scale: 1 : 10

Aspect: 100 %

32 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 283.100 - 291.100 m
Azimuth: 224.5
Inclination: -51.8



Printed: 2022-01-03 10:02:22

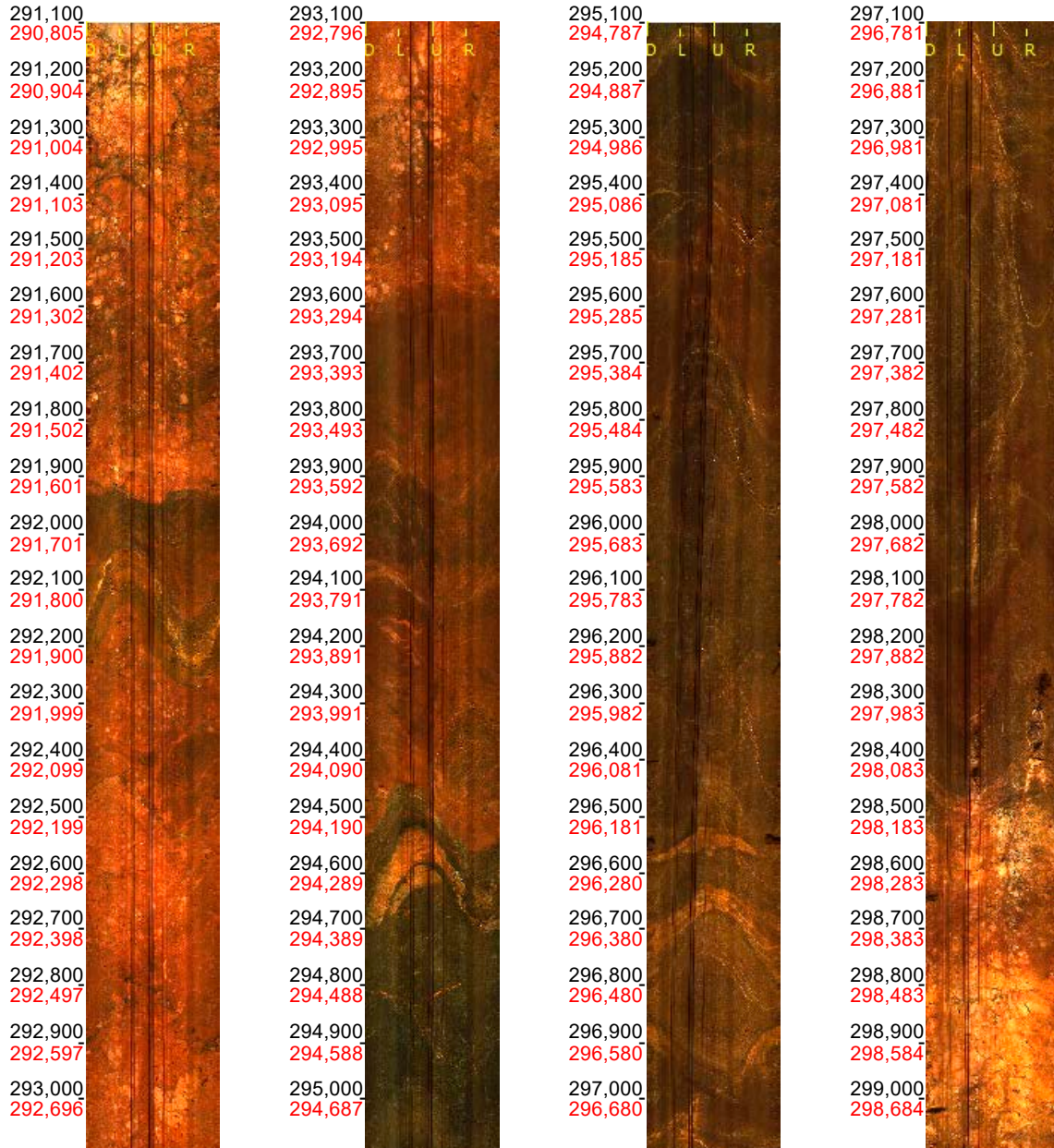
Scale: 1 : 10

Aspect: 100 %

33 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 291.100 - 299.100 m
Azimuth: 225.1
Inclination: -51.8



Printed: 2022-01-03 10:02:22

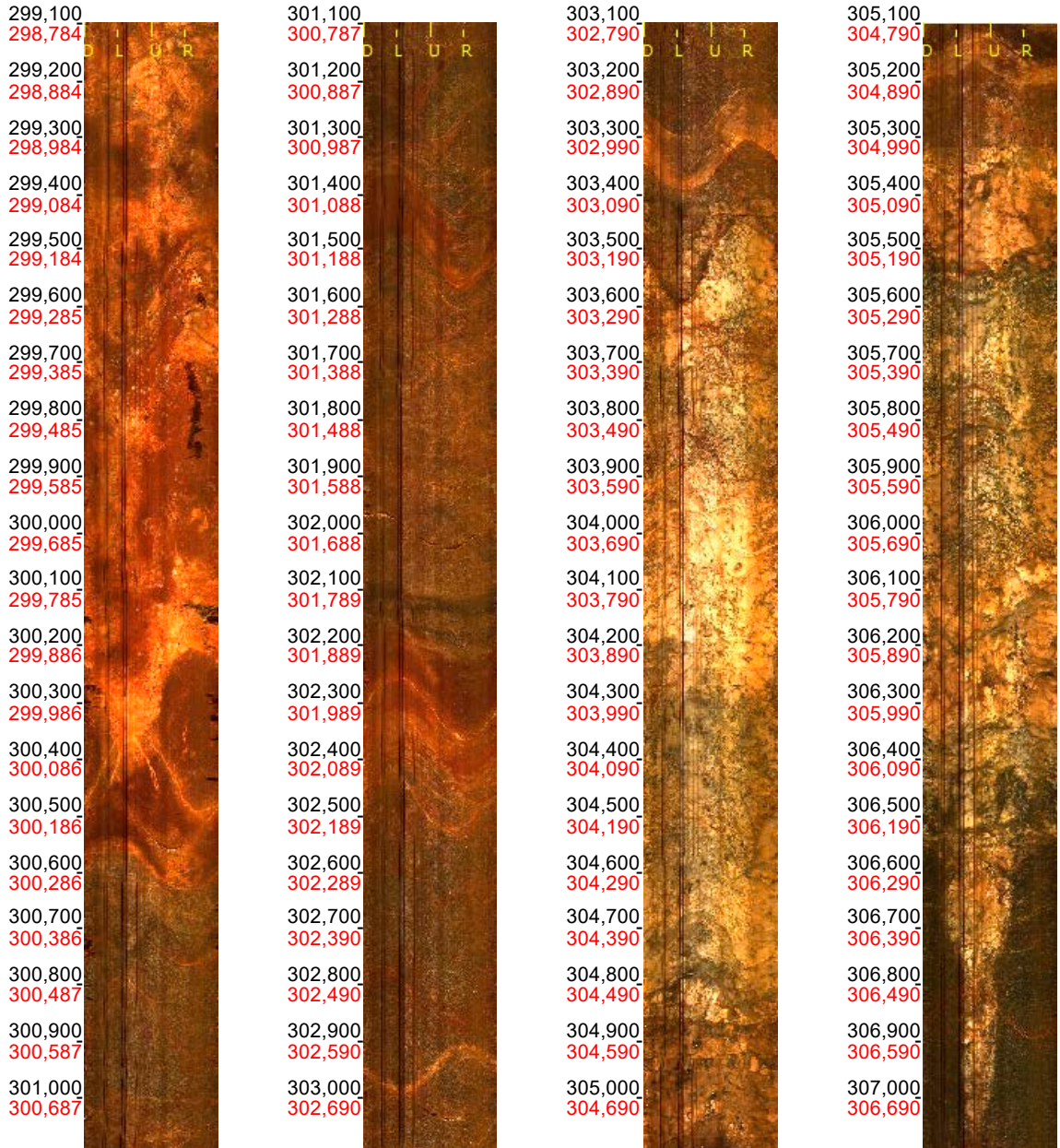
Scale: 1 : 10

Aspect: 100 %

34 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 299.100 - 307.100 m
Azimuth: 225.9
Inclination: -51.6



Printed: 2022-01-03 10:02:22

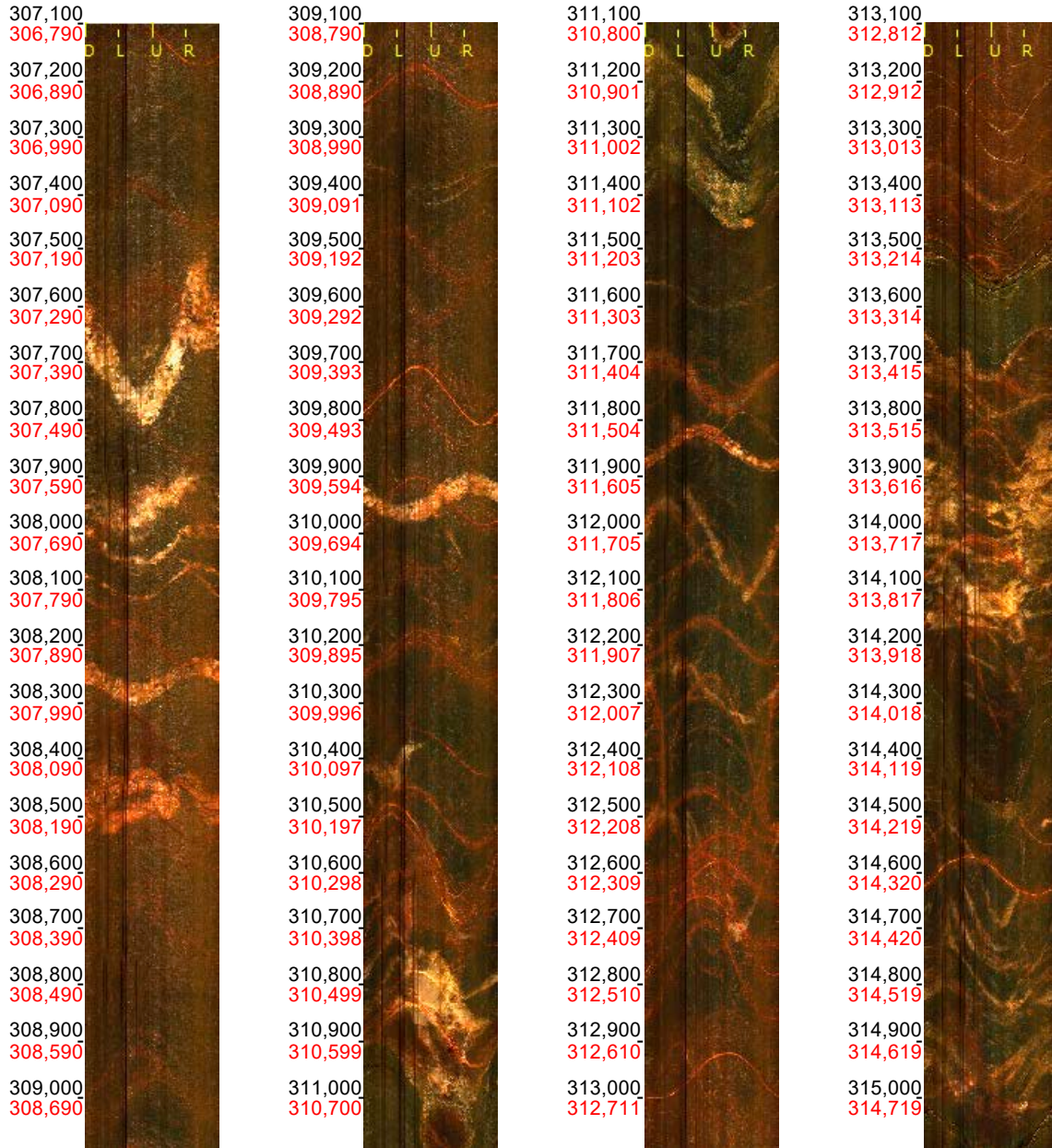
Scale: 1 : 10

Aspect: 100 %

35 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 307.100 - 315.100 m
Azimuth: 225.8
Inclination: -51.5



Printed: 2022-01-03 10:02:22

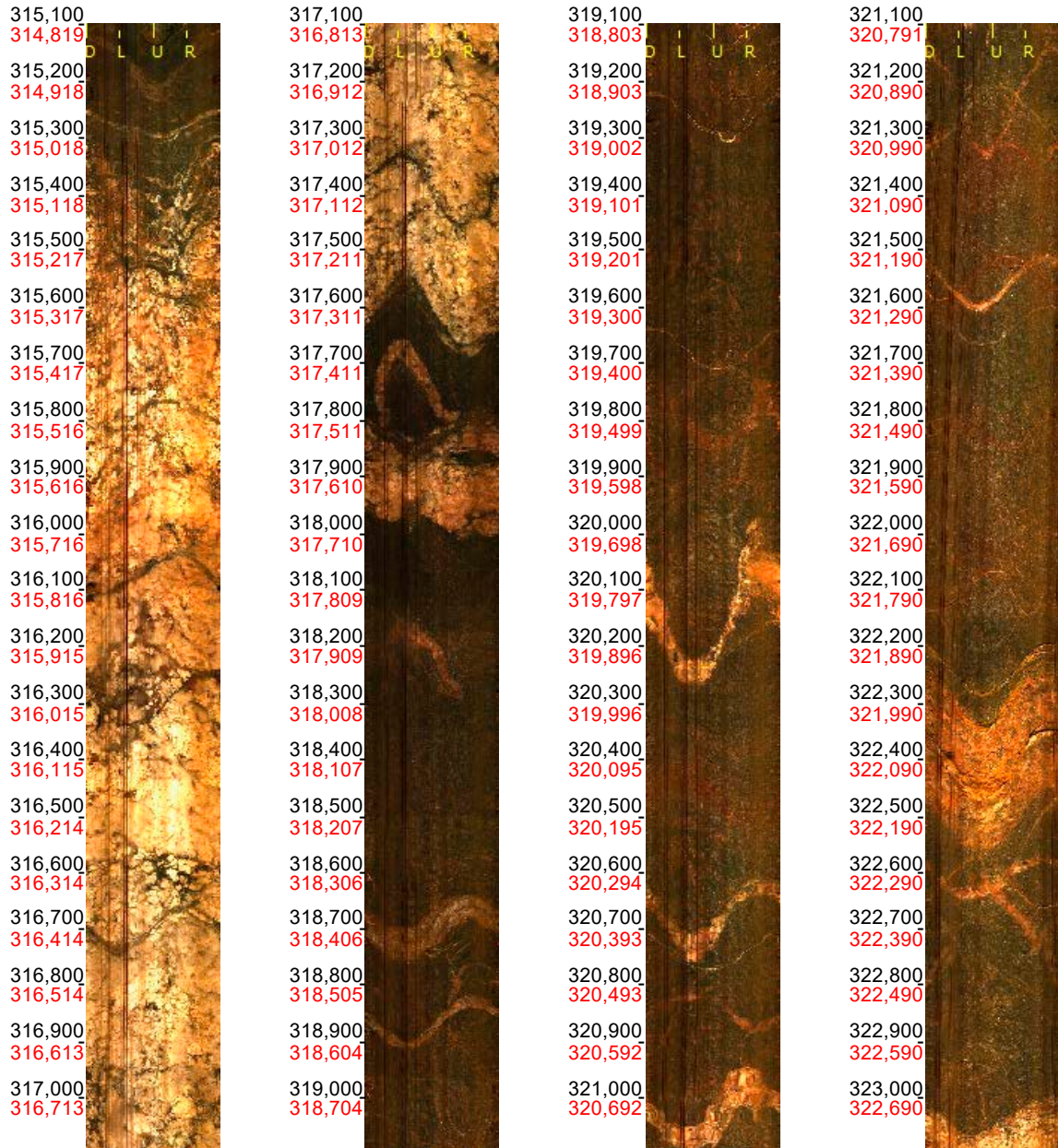
Scale: 1 : 10

Aspect: 100 %

36 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 315.100 - 323.100 m
Azimuth: 226.0
Inclination: -51.5



Printed: 2022-01-03 10:02:22

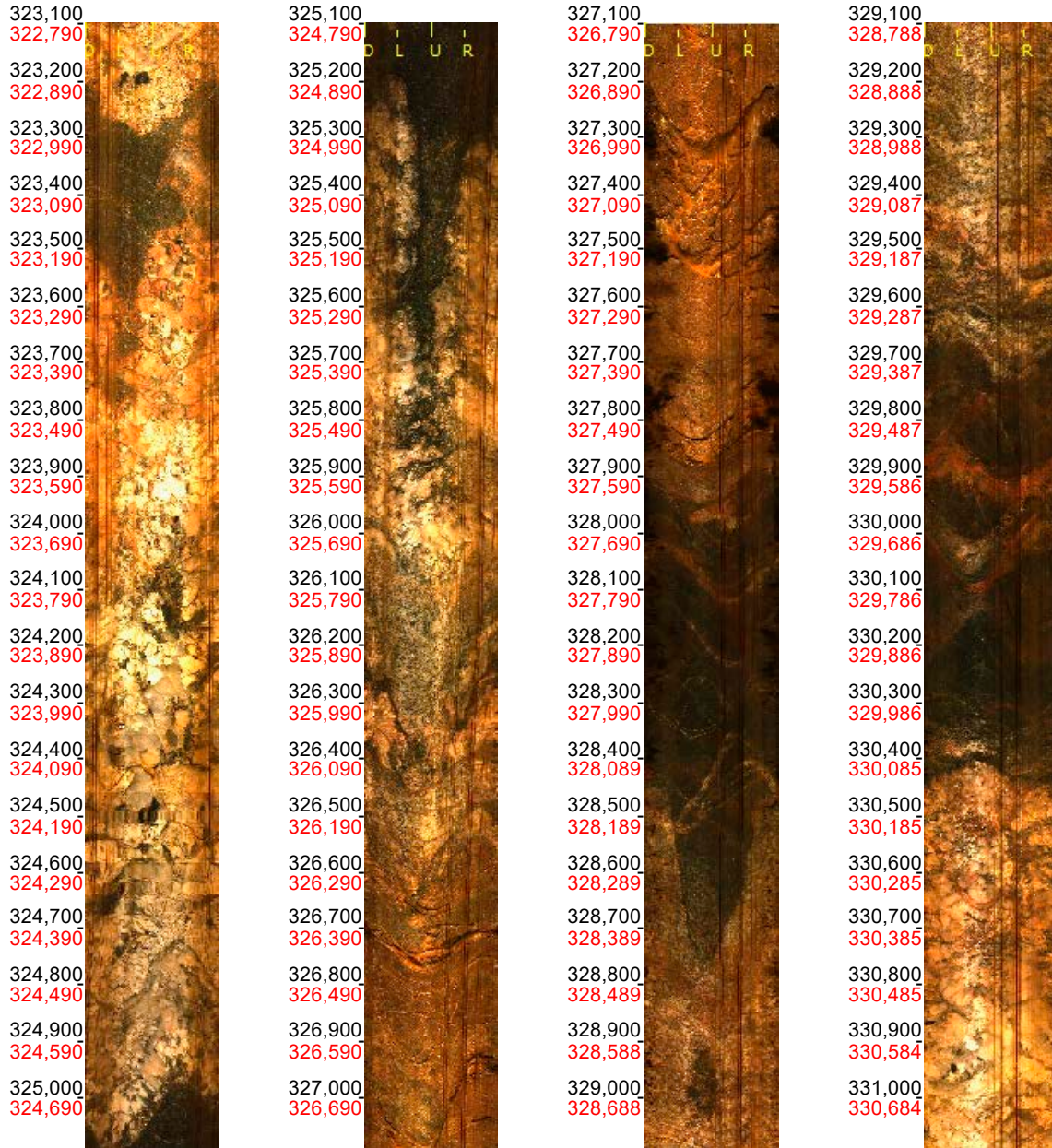
Scale: 1 : 10

Aspect: 100 %

37 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 323.100 - 331.100 m
Azimuth: 226.0
Inclination: -51.3



Printed: 2022-01-03 10:02:22

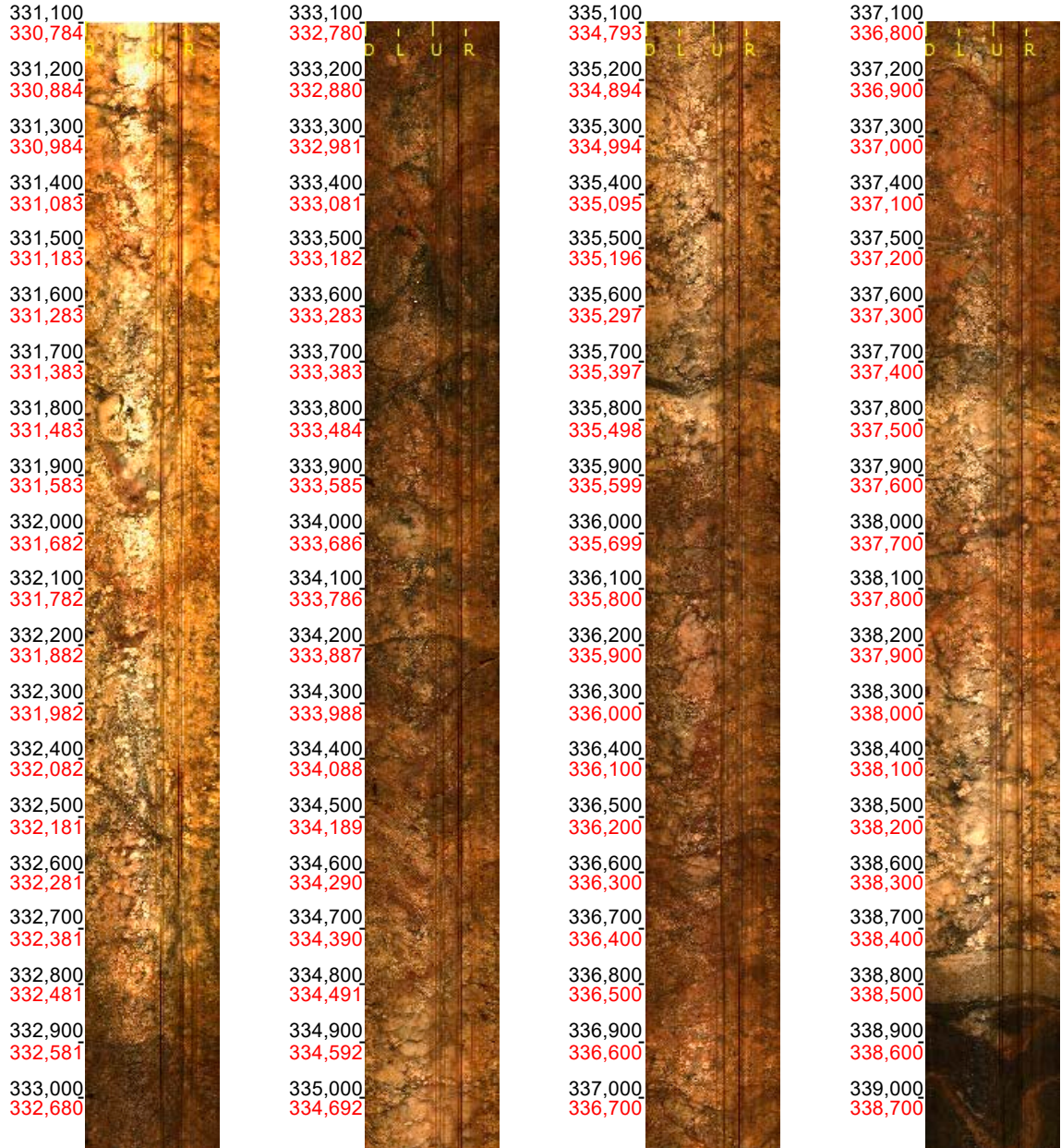
Scale: 1 : 10

Aspect: 100 %

38 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 331.100 - 339.100 m
Azimuth: 226.5
Inclination: -51.3



Printed: 2022-01-03 10:02:22

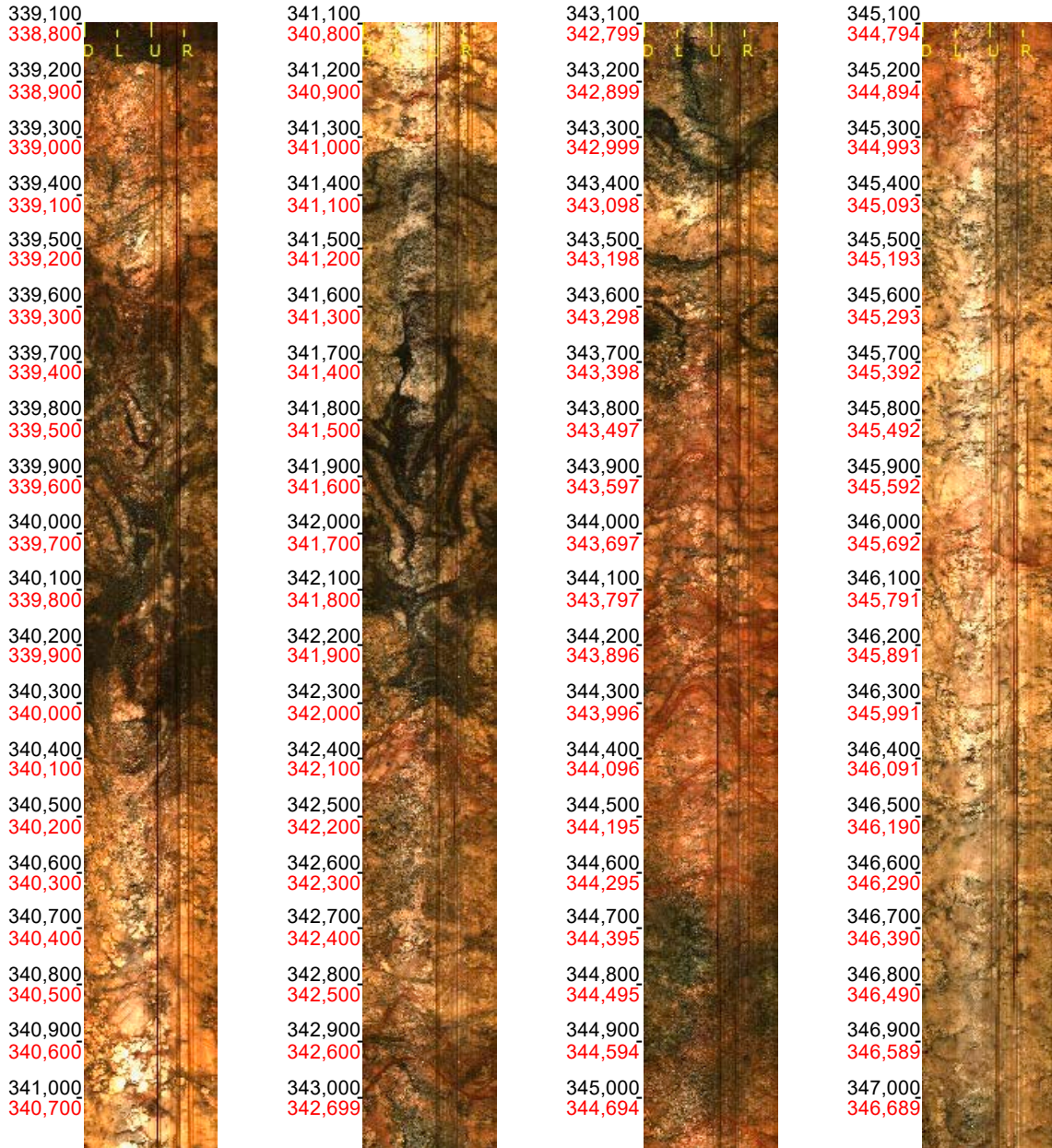
Scale: 1 : 10

Aspect: 100 %

39 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 339.100 - 347.100 m
Azimuth: 226.9
Inclination: -51.3



Printed: 2022-01-03 10:02:22

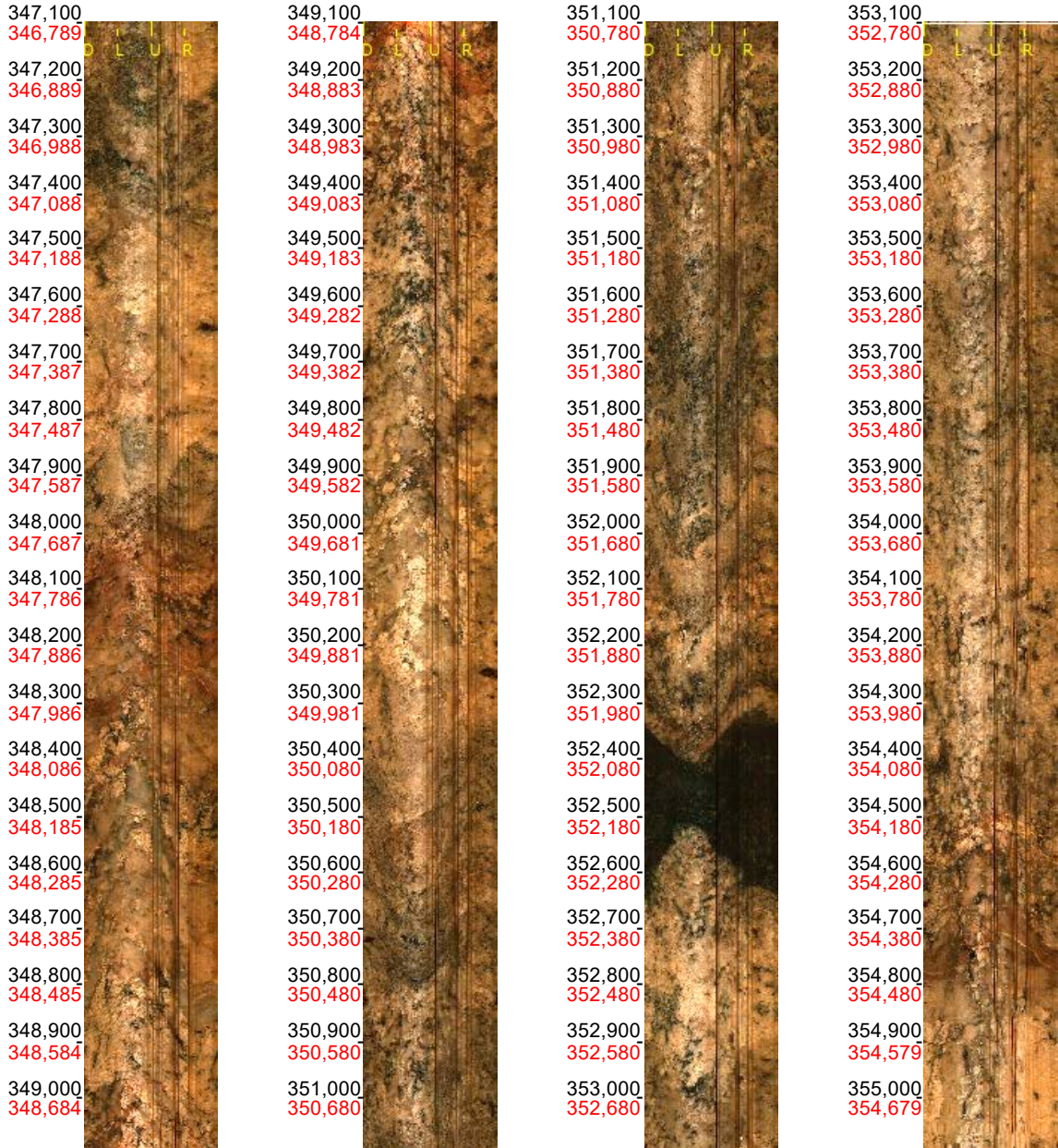
Scale: 1 : 10

Aspect: 100 %

40 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 347.100 - 355.100 m
Azimuth: 227.2
Inclination: -51.1



Printed: 2022-01-03 10:02:22

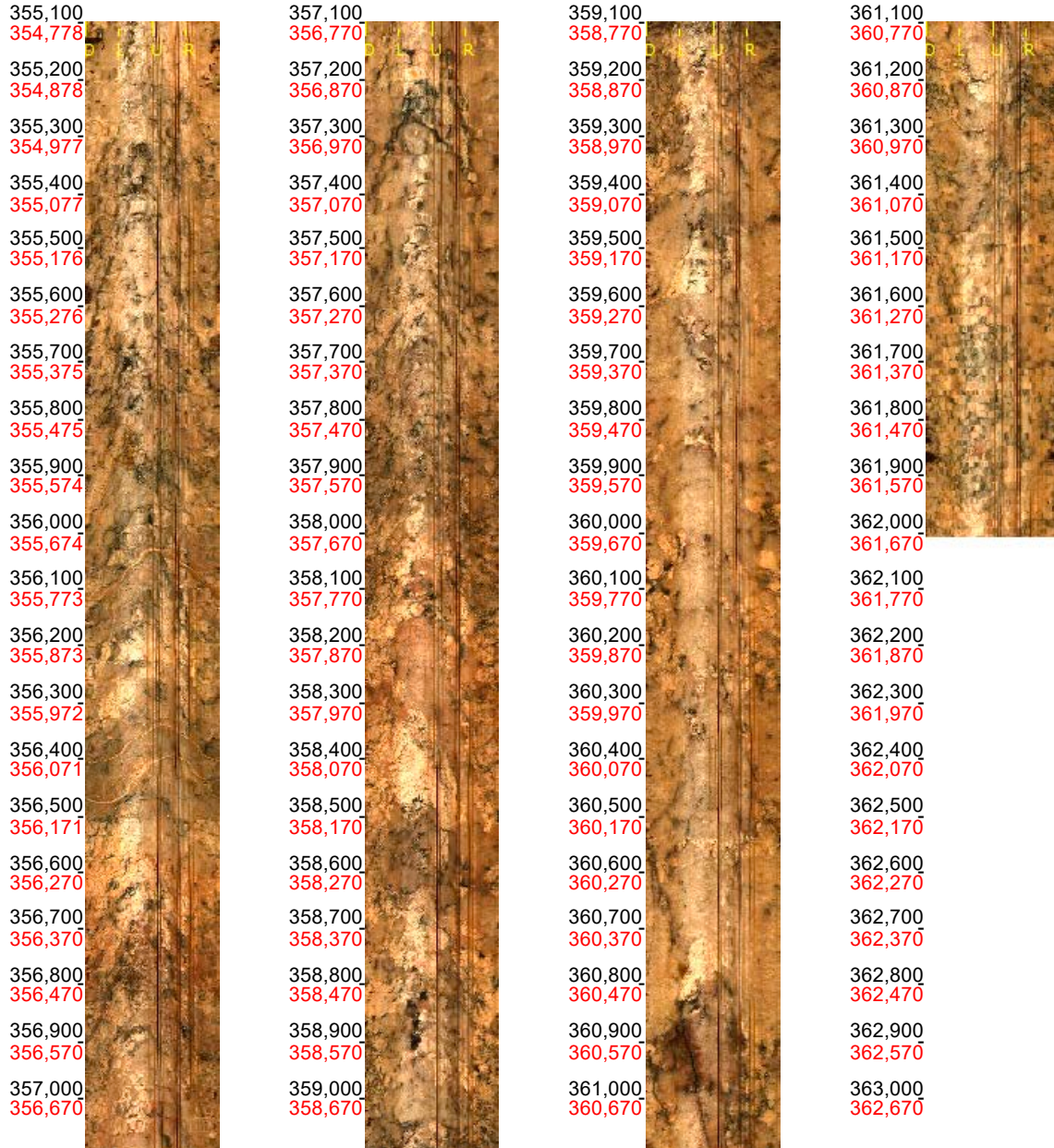
Scale: 1 : 10

Aspect: 100 %

41 (42)

Borehole: KFR121
Mapping: KFR121

Depth range: 355.100 - 362.010 m
Azimuth: 227.9
Inclination: -50.8



Printed: 2022-01-03 10:02:22

Scale: 1 : 10

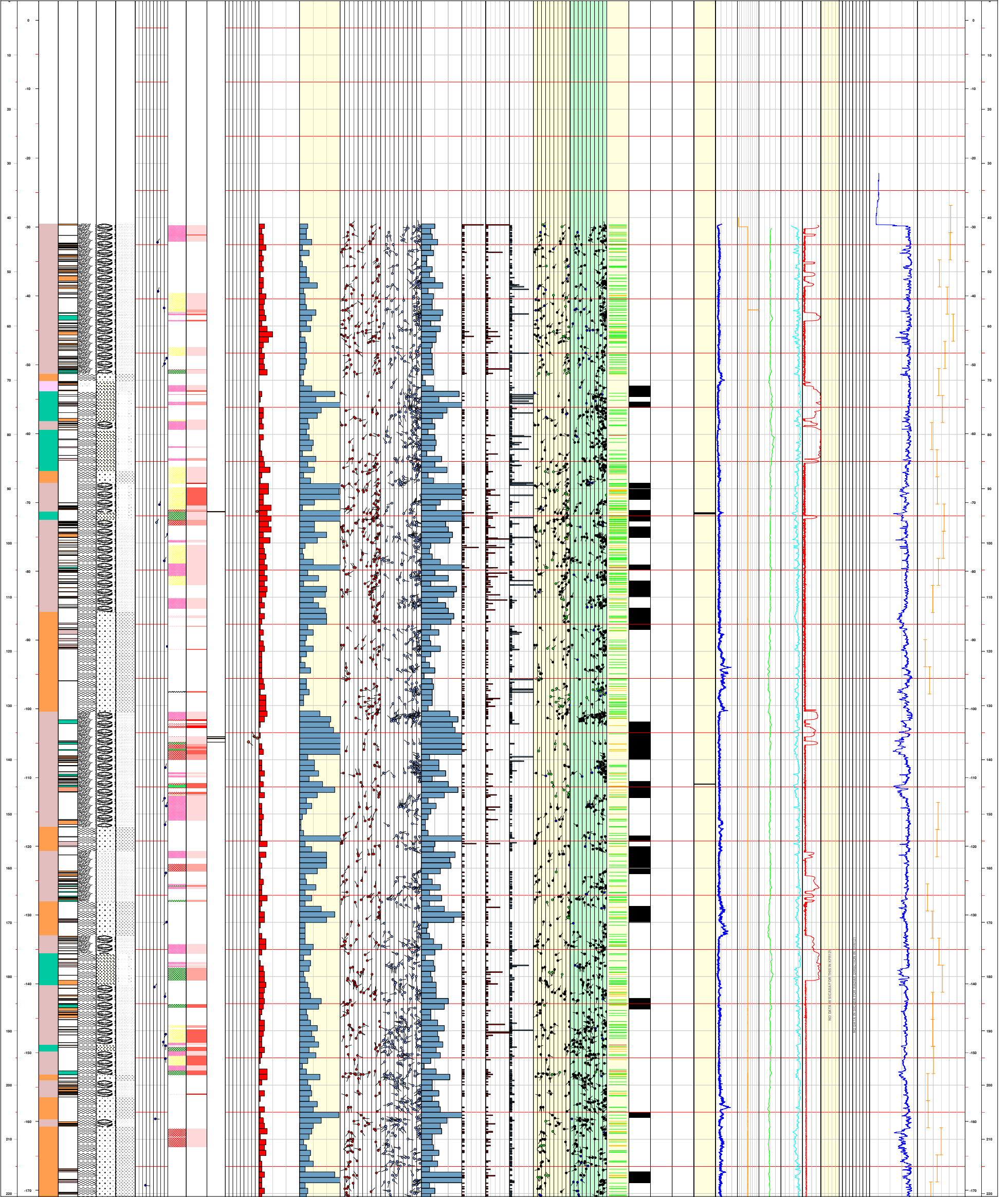
Aspect: 100 %

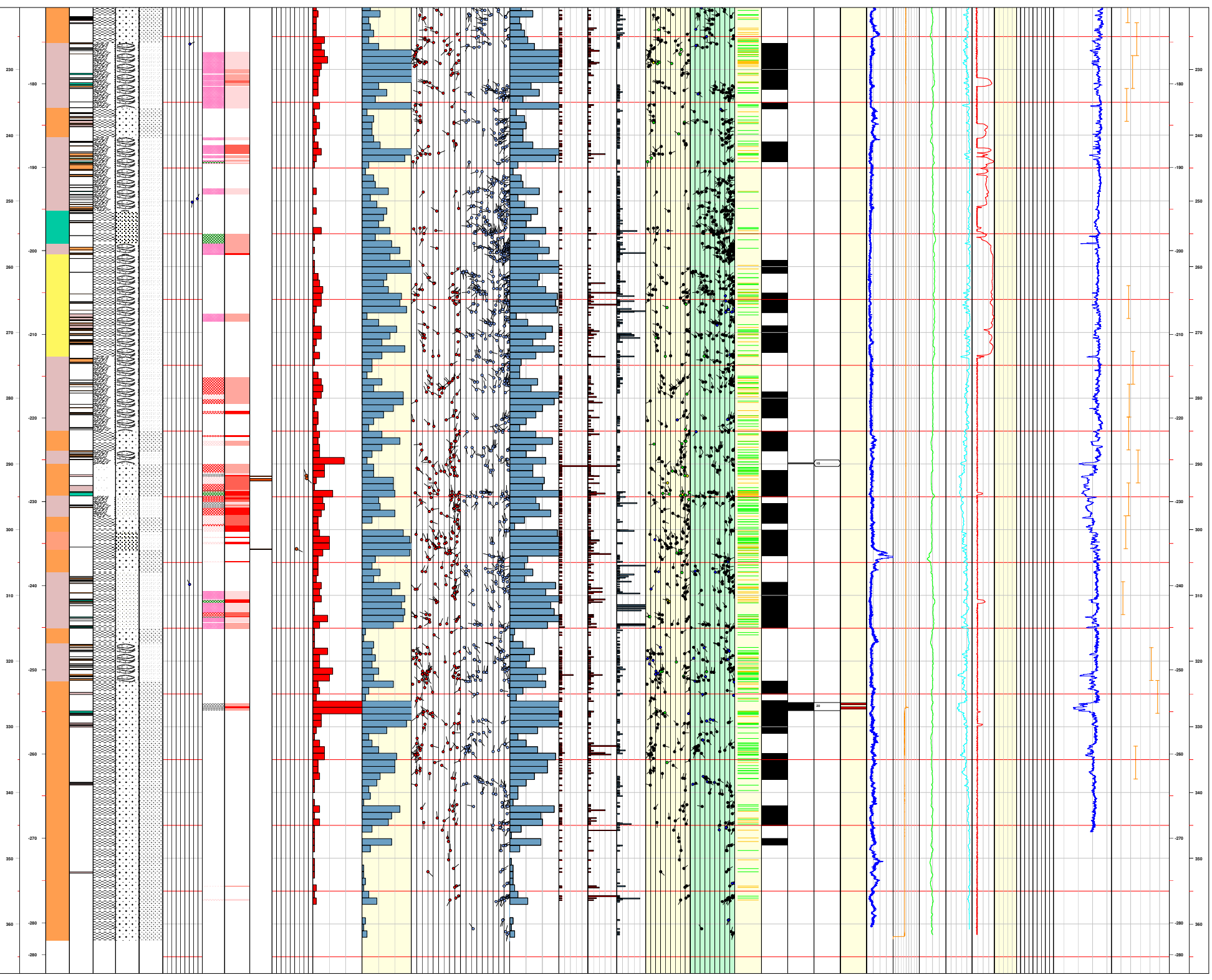
42 (42)

A2.5 KFR121

Title: GEOLOGICAL SINGLE-HOLE INTERPRETATION KFR121										Signed Data: OK	
	Site	FORSMARK - SFR	Bearing [°]	215.97	Inclination [°]	52.44	Database Calc Date	2022-02-14 02:01:34	Strike Reference	SWEREF 99 18 00 RH 2000	
	Borehole	KFR121	Coordinate System	SWEREF 99 18 00 RH 2000	Elevation [m.a.s.l.]	2.87	Plot Date	2022-02-14 14:59:14	Made by	PKM	
	Diameter [mm]	76	Northing [m]	669919.24	Drilling Start Date	2020-06-01 07:00:00	In Use	OK			
	Length [m]	362.530	Eastng [m]	162420.29	Drilling Stop Date	2020-06-16 15:00:00	Activity Type	GE064			

ROCK TYPE FORSMARK - SFR Granite, fine- to medium-grained Pegmatite, pegmatitic granite Granite, granodiorite and tonalite, metamorphic Amphibolite Felsic to intermediate volcanic rock, metamorphic	ROCK STRUCTURE Massive Foliated Linedated	FAULT ROCK ORIENTATION Breccia	ROCK GRANULITE Fine-grained Fine to medium grained Medium to coarse grained	ROCK STRUCTURE ORIENTATION Veined Foliated	FRACTURE ORIENTATION Open Scaled	ROCK ALTERATION Oxidized Chloritized Sericitized Argillization Albitization Carbonatization Neotitization Laumontization
ROCK OCCURRENCE Granite, fine- to medium-grained Pegmatite, pegmatitic granite Granite to granodiorite, metamorphic, med Amphibolite	FAULT ROCK Breccia	ROCK TEXTURE Porphyritic Equigranular Unequigranular Metamorphic	FRACTURE SURFACE Rough Smooth Slickensided	FRACTURE ALTERATION ORIENTATION	ROCK ALTERATION INTENSITY Faint Weak Medium Strong	DIP / DIRECTION Dip Direction 0 - 360°





SKB is responsible for managing spent nuclear fuel and radioactive waste produced by the Swedish nuclear power plants such that man and the environment are protected in the near and distant future.

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