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Oskarshamn site investigation

Boremap mapping of core drilled boreholes KSH03A and KSH03B

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April 2004

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Abstract

Borehole KSH03A is the third deep (c. 1000 m) cored borehole, drilled within the site investigation program in the Simpevarp area in 2003. The borehole is telescopic implying that the upper part, 0–100 m, is percussion drilled and has a larger diameter than the core drilled part. To cover up for the missing core for the uppermost 100 m another core drilled borehole, KSH03B, was drilled adjacent to KSH03A down to 100 m. In this report KSH03 refer to KSH03A plus KSH03B.

Rock types, alterations, fractures and other structures were studied using the drill core and BIPS-images and the information was documented in the software Boremap. All these data will be used in further interpretation of the bedrock conditions in the area down to a depth of 1000 m.

Principal lithologies and a pronounced weakness section in KSH03 make up a natural subdivision of the core into three sections. Section I, 0–190 m, is characterized by quartz monzodiorite. Section II, 190–300 m, is characterized by a pronounced section of weakness. Section III, 300–1000 m, is characterized by Ävrö granite. The contact between the quartz monzodiorite and the Ävrö granite is located to the weakness zone in section II at 270 m.

Section II is characterized by the highest frequencies of open fractures (interpreted) in KSH03, high joint alteration numbers, commonly occurring intervals with crush, almost continuous sealed fracture networks, abundance of shear structures and continuous oxidation. Breccias in KSH03 and the only mylonite in the borehole also occur in the weakness section. Another difference between section II and sections I and III is that section II lack foliation while this parameter occurs in section I and is almost continuous in section III.

The lengths of each section is not precise since several of the parameters characteristic for the weakness section occur in broad maxima covering much longer intervals than section II. These parameters thus do not suddenly occur at 190 m and disappear at 300 m. Such parameters are; oxidation which occurs continuously in the interval 25–360 m, shear structures which show a broad maximum in the interval 100–325 m and sealed fractures (interpreted) which show a broad maximum in the interval 0–400 m.

The oxidation peak at 30–60 m in the interval 25–360 m does not coincide with the weakness section, while the frequency peaks of all the other parameters occur within section II.

It is possible to divide section III into sub sections a, b and c, based on open fracture (interpreted) frequencies. Sub section III a, 300–570 m, has normal open fracture frequencies, sub section III b, 570–800 m, has very low open fracture (interpreted) frequencies and sub section III c, 800–1000 m, has normal open fracture (interpreted) frequencies.

As a curiosity three occurrences of sandstone in dm-scale occur within the weakness zone at 271–273 m.

Sammanfattning

Borrhål KSH03A är det tredje djupa (ca 1000 m) kärnborrhålet som borrats inom ramarna för platsundersökningarna i Simpevarp under 2003. Borrhålet är teleskopiskt, vilket betyder att de övre 100 m är hammarborrade och har en större diameter än den kärnborrade delen, 100–1000 m. För att komplettera de översta 100 m där borrkärna saknades, borrades ytterligare ett 100 m långt kärnborrhål, KSH03B, i omedelbar närhet av KSH03A.

Bergarter, omvandlingar, sprickor och andra strukturer studerades både i borrkärnan och BIPS-bilderna, samt dokumenterades i programmet Boremap. Dessa data kommer att ligga till grund för framtida tolkningar av bergets egenskaper i Simpevarpsområdet ner till 1000 m djup.

Huvudlitologierna och en mycket tydlig svaghetssektion i KSH03 utgör stommen för en uppdelning av KSH03 i tre sektioner.

Sektion I, 0–190 m, karakteriseras av kvartsmonzodiorit. Sektion II, 190–300 m, karakteriseras av en tydlig svaghetssektion. Sektion III, 300–1000 m karakteriseras av Ävrögranit. Kontakten mellan kvartsmonzodioriten och Ävrögraniten ligger på 270 m i svaghetsektionen i sektion II.

Sektion II karakteriseras av de högsta frekvenserna för öppna sprickor (tolkade) som finns i KSH03, av höga sprickomvandlingstal och av vanligt förekommande intervaller med kross. Skjuvstrukturer är vanligt förekommande och såväl läkta spricknätverk som oxidation täcker sektionen i hela dess längd. De breccior och den mylonit som förekommer i KSH03 uppträder också i svaghetssektionen i sektion II. En annan skillnad mellan sektion II och sektionerna I och III är att sektion II saknar foliation, en parameter som förekommer ställvis i sektion I och uppträder nästan genomgående i hela sektion III.

Längdmåtten som här angivits för varje sektion är inte exakta då ett flertal av de parametrar som är karakteristiska för svaghetssektionen i sektion II har breda maxima som täcker betydligt längre intervaller än denna sektion. Dessa parametrar uppträder således inte helt plötsligt vid längden 190 m liksom de inte slutar helt plötsligt vid längden 300 m. Dessa parametrar är; oxidation som förekommer kontinuerligt i intervallet 25–360 m, skjuvstrukturer med ett brett maximum i intervallet 100–325 m och läkta sprickor (tolkade) vilka uppvisar ett brett maximum i intervallet 0–400 m.

Oxidationsmaximum vid 30–60 m i intervallet 25–360 m sammanfaller inte med svaghetssektionen i sektion II medan maxima för övriga parametrars frekvenser sammanfaller med denna sektion.

Det är möjligt att dela upp sektion III i subsektionerna III a, III b och III c med utgångspunkt från frekvenserna för öppna sprickor (tolkade). Subsektion III a, 300–570 m, har normal frekvens av öppna sprickor (tolkade), subsektion III b, 570–800 m, har mycket låg frekvens av öppna sprickor (tolkade) och subsektion III, 800–1000 m, har normal frekvens av öppna sprickor (tolkade).

Tre några dm stora sandstensförekomster förekommer på 271–273 m djup i svaghetssektionen inom sektion II. Dessa utgör främmande inslag i litologin i KSH03.

Contents

1 Introduction

This document reports data gained by Boremap mapping of the core drilled, 1000 m deep, borehole KSH03A and the complementary borehole KSH03B (Figure 1-1).

Since 2002, SKB investigates two potential sites for a deep deposition of nuclear waste in the Swedish Precambrian basement at approximately 500 m depth. These places are Forsmark in northern Uppland and Simpevarp in eastern Småland. In order to make a preliminary evaluation of the rock mass down to a depth of about 1 km at these sites, SKB has initiated a drilling program using core drilled boreholes.

KSH03 includes two boreholes: KSH03A and KSH03B. KSH03A is telescopic, which means that the uppermost 100 m were drilled by percussion drilling followed by core drilling (100-1000 m). Since drill core is missing for the uppermost 100 m, another core drilled borehole, KSH03B, was drilled adjacent to KSH03A to cover up the interval 0-100 m. In this report both boreholes are referred to as KSH03. The borehole was drilled in 2003.

Detailed mapping of the drill cores is essential for a three dimensional understanding of the geology at depth. The Boremap mapping is based on the use of BIPS-images of the borehole wall and by the study of the drill core itself. The BIPS-images enable the study of orientations, since the Boremap software calculates strike and dip of planar structures such as foliations, rock contacts and fractures. Also the fracture apertures in the rock can be estimated. Important to keep in mind is that the mappings only represent the bedrock where this is intersected by the drill holes.

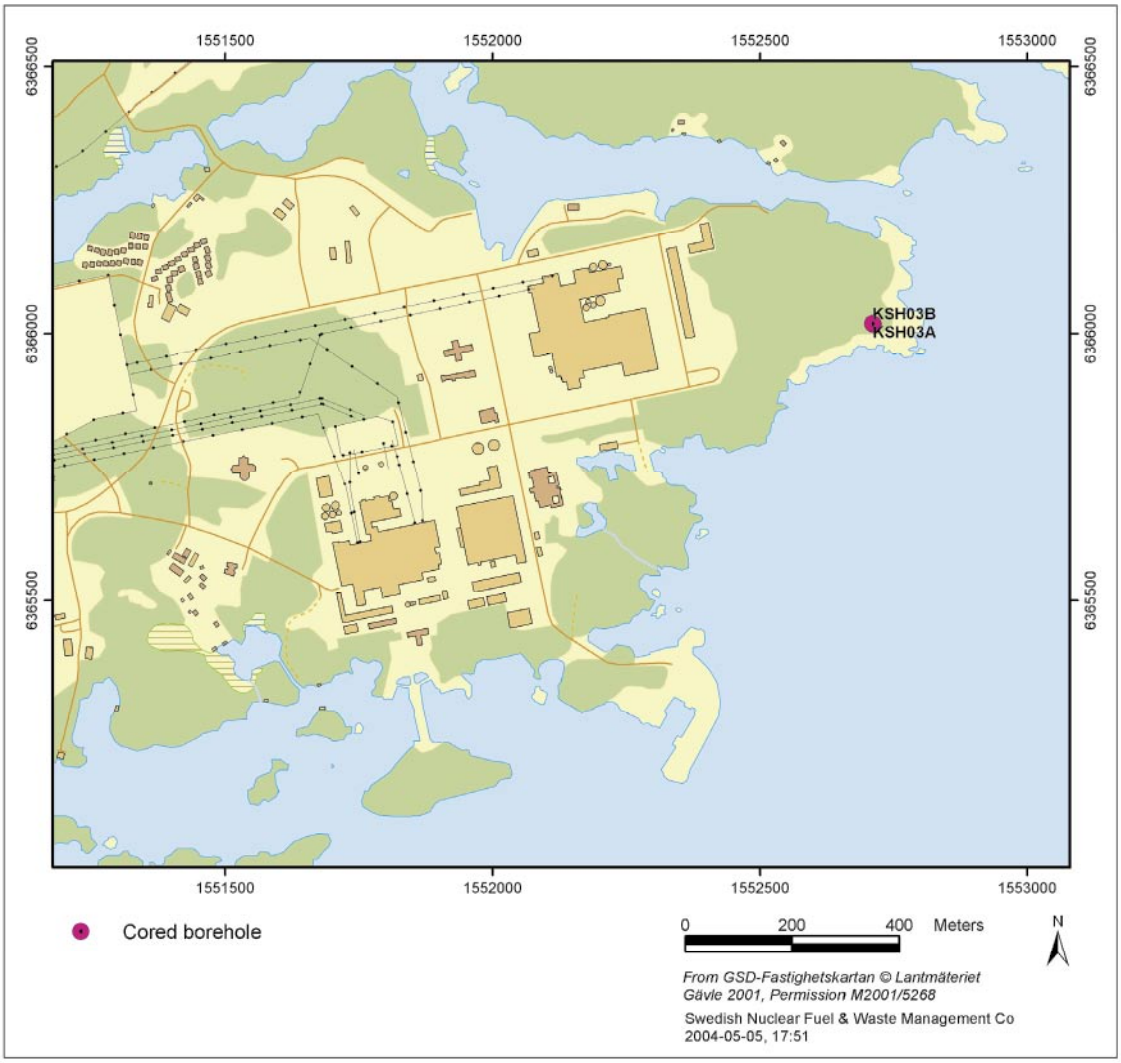


Figure 1-1. *Location of the core drilled borehole KSH03.*

2 Objective and scope

The principal aim of the mapping activities presented in this report is to obtain a detailed documentation of geological structures and lithologies intersecting borehole KSH03. Geological structures will be correctly orientated in space along the borehole. The results will serve as a platform for forthcoming investigations of the drill core, as well as various site descriptive modelling.

3 Equipment

3.1 Description of software

The mapping was performed in Boremap v. 3.3.4, loaded with the bedrock and mineral standards of SKB. The final data presentation was made using StereoNet, WellCad v. 3.2, and BIPS Image Print.

Boremap is a computerized system that unite orthodox core mapping with modern video mapping. Boremap is the brain of the system and deals with the mapping as well as the internal communication between programs. Boremap shows the video image from BIPS (Borehole Image Processing System) and extracts the geometrical parameters: length, width, strike and dip from the image.

3.2 Other equipment

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

3.3 BIPS-image video film sequences

The BIPS video film of KSH03 consists of four sequences. The first sequence covers the interval 9.98–99.81 m of KSH03B, while the others cover KSH03A. The second sequence covers the interval 101.48–598.23 m, the third sequence 600.06–978.75 m and the fourth sequence 951.81–997.31 m. The first three film sequences do not overlap and therefore BIPS-images are missing in the intervals 99.81–101.48 m (1.67 m) and 598.23–600.06 m (1.83 m). The third and fourth film sequences, however, do overlap. The interval 0–9.98 m is missing because the borehole was cased down to approximately 10 m.

3.4 BIPS-image video film quality

The main reasons why thinner fractures are visible or not in the BIPS-image are image resolution, image contrast and image quality.

3.4.1 BIPS-image resolution

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

3.4.2 BIPS-image contrast

Thicker fractures are always visible in both drill core and the BIPS-image. However, the visibility of thinner fractures depends strongly on the colour contrast between the fracture and the wall rock.

A light fracture in a dark rock is easily visible in the BIPS-image. A light fracture in a light rock might, however, be clearly visible in the drill core but not visible in the BIPS-image, especially if the fracture and wall rock have the same colour. The opposite is true for dark fractures.

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

3.4.3 BIPS-image quality

The BIPS-image quality was sometimes limited by disturbances such as:

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

Problems related to the video camera aperture and the enlargement of pixels are neglectable in KSH03.

Blackish coatings occurred now and then from 220 m to the end of the borehole at 1000 m. Blackish coatings were mostly not disturbing for the mapping except in rather short intervals, for example between 400–407 m.

The main disturbances for the BIPS-image quality in KSH03 are vertical bleached bands. These bands occur all through KSH03 and make it almost impossible to interpret the BIPS-image in the intervals 400–407 m and 978.75–999.16 m. Other intervals with acceptable to bad quality because of bleached bands were 9.98–59 m and 600–890 m. The bleaching got more intense in the lower part of the last interval between 750 m and 890 m.

The image quality is classified into four classes; good, acceptable, bad and very bad. With good quality means a more or less clear, easy to interpret image. With acceptable quality means that the image is not really good, but that the mapping can be performed without problems. An image with bad quality is somewhat difficult to interpret and an image with very bad quality cannot be interpreted and only extremely thick and outstanding fractures can eventually be mapped.

The BIPS-image quality was good to excellent only for about 40% of the borehole. The BIPS-image quality in KSH03 was as follows; 9.98–60 m acceptable to bad, 60–99.8 m good, 99.8–101.5 m no image, 101.5–220 m acceptable, 220–400 m good, 400–407 m extremely bad, 407–598.23 m good, 598.23–600.06 m no image, 600.06–890 m acceptable to bad, 890–978.75 m acceptable and 978.75–999.16 m very bad.

4 Execution

The Boremap-mapping of the telescopic drilled borehole KSH03 was performed and documented according to activity plan AP PS 400-03-088 (SKB, internal document) referring to the Method Description for Boremap mapping (SKB MD 143.006, v.1.0, SKB, internal controlling document).

KSH03 includes two boreholes, KSH03A and KSH03B. The first 100 m of KSH03A was drilled by percussion drilling and therefore no drill core was received. A core drilled borehole, KSH03B, was therefore drilled adjacent to KSH03A in order to get a representative core for the uppermost section. Borehole KSH03B covers the interval 9.98–100.86 m and borehole KSH03A covers the interval 100.50–1000.70 m. The two boreholes thus overlap, although the BIPS-images do not (see Chapter 3.3).

The drill cores were displayed on inclined roller tables and mapped in their entire length with the Boremap system at Simpevarp. The core mapping was carried out without any detailed geological knowledge of the area and without access to geophysical logs.

To maintain systematic judgements in the mapping, each geologist had the same task throughout the mapping. Vladislav Stejskal was responsible for handling the drill core and Jan Ehrenborg for the delineation of structures in the BIPS-image.

4.1 Preparations

Any depth registered in the BIPS-image deviates from the true depth in the borehole, a deviation which increases with depth. This problem was eliminated by adjusting the depth according to reference slots cut into the borehole every fiftieth meter (Appendix: 10). The level for each slot was measured in the BIPS-images and then adjusted to the correct level using the correct depth value in SICADA.

The orientations of the observations were adjusted to true space. Data necessary for this adjustment were borehole diameter and deviation; both collected from SICADA (Appendices: 8 and 9).

4.2 Execution of measurements

Concepts used during the Boremap mapping are defined in this chapter.

4.2.1 Fracture definitions

Definitions of different fracture types are found in “Nomenklatur vid Boremapkartering” by Larsson and Ståhle (PM, 2004-02-05 SKB, internal controlling document). Apertures for broken fractures have been mapped in accordance with the definitions in this PM.

In the mapping phase, fractures that have parted the core are mapped as “Broken” and fractures that have not parted the core, are mapped as “Unbroken”. All fractures are described with their fracture minerals and other characteristics, such as width and aperture. Visible apertures are measured down to 1 mm in the BIPS-image. Smaller apertures, which are impossible to see in the BIPS-image, are denoted a value of 0.5 mm. Core pieces with bad fit were characterized as “probable aperture” and fractures with a dull or altered surface as “possible aperture”.

All fractures in the SICADA database that possess apertures >0 mm, are interpreted as “Open” and fractures with apertures = 0 mm, are interpreted as “Sealed”. “Unbroken” fractures which possess apertures >0 mm, are interpreted as “Partly open” and are included in the “Open”-category. “Open” and “Sealed” fractures are finally frequency calculated and shown in the composite log (see Appendices 6 and 7).

4.2.2 Fracture alteration and joint alteration number

The joint alteration number is principally related with the thickness of, and the clay content in, a fracture. Thicker fractures rich in clay minerals therefore get joint alteration numbers 2–3. The absolute majority of fractures in KSH03, however, are very thin to extremely thin and rarely contain clay minerals and therefore get joint alteration numbers between 1 and 2.

A subdivision of fractures with joint alteration numbers between 1 and 2 was introduced to facilitate both the evaluation process for fracture alterations and the possibility to compare the alterations between different fractures in the boreholes. The subdivision is based on fracture mineralogy and was as follows: a) fracture wall alterations, b) fracture mineral fillings assumed to have been deposited from circulating water rich solutions and c) fracture mineral fillings most likely resulting from altered wall rock material.

Joint alteration number equal to 1

Fractures without mineral fillings but with fracture wall alterations were considered as alterations of the wall rock and not as fracture alteration minerals. Examples are fractures without mineral fillings but with red coloured oxidized fracture walls and/or dirty greenish coloured epidotized fracture walls. The joint alteration was classified as fresh for these fractures and the joint alteration number set to 1.

The minerals calcite, quartz, fluorite and zeolites like laumontite as well as sulphides were regarded as deposited by circulating water rich solutions in broken fractures and not as true fracture alteration minerals. The joint alteration number was thus set to 1 also for these minerals.

Joint alteration number equal to 1.5

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

Joint alteration numbers higher than 1.5

When the mineral fillings were thicker and contained a few mm thick bands of clay minerals, often together with minerals like epidote and chlorite, the joint alteration number was set to 2. In the extremely rare cases, when a fracture contains 5–10 mm thick clayey bands, together with epidote and chlorite, the joint alteration number is set to 3.

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

4.2.3 Mapping of broken fractures not visible in the BIPS-image

Not all fractures that cut the drill core are visible in the BIPS-images. Such fractures were orientated using the guide-line method, based on the following data:

- Absolute depth.
- Amplitude (measured along the drill core).The amplitude is the interval along a drill core which is cut by a fracture.
- Exact orientation of the fracture trace, measured on the drill core in relation to a close lying, well defined, geological structure visible in the BIPS-image.

The error of orientating fractures using the guide-line method is not known but an estimation using stereographic plots indicated that the error is most likely insignificant. Anyhow, the guide-line method is so far considered much better than only marking fractures that are non-visible in the BIPS-images as planes perpendicular to the borehole. The fractures in question are mapped as “non-visible in BIPS” and can therefore be separated from fractures visible in BIPS which have a more accurate orientation.

When using the guide-line method the difference between the 50 mm drill core diameter and the 76 mm borehole diameter must be considered. This difference result in displacements of the structures seen in the drill core compared with the structures seen in the BIPS-image which represents the borehole walls. This displacement is zero for structures that cut the drill core at right angle and successively becomes larger as the orientation of the structure approximates the direction of the drill core axis. This displacement always has to be corrected for, since displacements of a few cm are common even if they seldom reach 10 cm.

Orientation of fractures and other structures with the guide-line method is done in the following way: The first step in the guide-line method is to correct the amplitude of the fracture trace in the BIPS-image to the higher amplitude value. The second step is the correction of strike and dip. This is done by rotating the fracture trace in the BIPS-image relative to a feature with known orientation. The fracture is then located at the correct depth according to the depth measured on the drill core, relative to a feature that is visible both in drill core and BIPS-image.

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

The importance of orientating fractures that are not visible in the BIPS-images is highlighted by the fact that only 52% of the broken fractures and 87% of the unbroken fractures are visible in KSH03.

4.2.4 Definition of veins versus dikes

Veins and dykes were differentiated by the width. Veins were set to 0–20 cm wide and dykes 20–100 cm wide. Since the maximum width of rock occurrences is 100 cm wider dykes are mapped under the feature rock type.

4.2.5 Use of mineral codes

Extra mineral codes have been used as follows:

X1 yellowish green and soft mineral possibly clay, zeolite or mixture of both.

X6 the drill core is broken at right angle to the drill core and the broken surfaces have a polished appearance. This is believed to indicate that a sealed fracture broke up during drilling and where the two drill core parts have rotated against each other wearing away the mineral fill.

X7 broken fracture with a fresh appearance and no mineral fill.

X8 fractures with epidotized walls.

X9 sealed fractures visible in the BIPS-image but not in the drill core.

4.3 Data handling

The mapping was performed on-line on the SKB network, in order to obtain the best possible data security. Before every break (exceeding 15 minutes) a back-up was saved on the local disk.

The mapping was quality checked by a routine in Boremap before it was exported to and archived in SICADA. Personnel from SKB also performed spot test controls and regular quality revisions.

All primary data are stored in the SKB SICADA database under Field Note Number: Simpevarp 288. Only these data are to be used for further interpretation and modelling.

5 Results

The results of the Boremap mapping of KSH03 are principally found in the Appendices. The information in SICADA has been compressed to the size of an A4-sheet in the Geological Summary table, Appendix 1. The search paths for this table are presented in Appendix 2. Stereographic diagrams of the orientation of open fractures are presented in Appendix 3. The BIPS-images of KSH03A and KSH03B are shown in Appendices 4 and 5 and the corresponding WellCad diagrams in Appendices 6 and 7. In data, like borehole length and diameter, are presented in Appendices 8, 9 and 10.

5.1 Geological summary table, general description

The Geological Summary table (see Appendix 1) is an easy to read overview of the geological parameters mapped with the Boremap system. It also facilitates comparisons between Boremap information collected from different boreholes and is more objective than a pure descriptive summary of a borehole.

This Geological Summary table is the result of cooperation between Jan Ehrenborg from the mapping personnel at Simpevarp and Pär Kinnbom from PO (site investigation, Simpevarp). The aim was to make a standard form in handy A4-size, where all information is taken directly from the SICADA database by using simple and well defined search paths for each geological parameter (see Appendix 2).

The search paths cannot, however, yet be used in an automatic way and therefore the geological information has first been extracted from the SICADA database, then reworked on separate Excel-files and last presented in the Geological Summary table. At the moment it is only possible to extract the Rock Type and Alteration parameters directly from the SICADA database.

The main reason why the information in the SICADA database cannot be extracted automatically is the lack of a mathematical formula to calculate frequencies for different parameters. Such a formula will be added.

The need to rework the SICADA information on separate Excel-files exists because some information is written in the Comment field for individual observations in Boremap, and therefore has to be extracted manually. This problem is also being dealt with.

The Geological summary table is made up of 23 columns, each one representing a specific geological parameter. The geological parameters are presented as either intervals or frequencies. Intervals are calculated for parameters with a width ≥ 1 m and frequencies for parameters with a width < 1 m. Frequency information is treated as if it does not have any extension along the borehole axis. They are treated as point observations. It should be noted that parameters with a thickness of only 1 mm therefore has the same “value” as a similar parameter with a thickness of 999 mm since both are treated as point observations and used for frequency calculations.

5.1.1 Columns in the Geological Summary table

The Geological summary table includes the following 23 columns:

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

Column 2. *Rock Type/Grain size* is an interval column. Interval limits follows column 1. This column is identical with the WellCad presentation.

Column 3. *Rock Type/Texture* is an interval column. Interval limits follows column 1. This column is identical with the WellCad presentation.

Column 4. *Alteration/oxidation* is an interval column. No frequency column is presented for alteration/oxidation. The alteration/oxidation column is identical with the WellCad presentation.

Column 5. *Alteration/intensity* is an interval column. This column is identical with the WellCad presentation.

Column 6. *Rock Occurrence/Veins + Dykes < 1m wide* is a frequency column. This rock type column can be seen as the frequency complement to the rock type/lithology interval column. Only rock type sections narrower than 1 m can be described as rock occurrences in Boremap. Thicker rock type sections are mapped as rock type.

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

Column 8. *Structure/Brecciated < 1m wide* is a frequency column. Breccias <1m wide are mapped under rock occurrence in Boremap. Very narrow micro breccias along sealed/ natural fracture planes are generally not considered.

Column 9. *Structure/Brecciated ≥ 1m wide* is an interval column. Breccias >1m wide are mapped under rock type/structure in Boremap.

Column 10. *Structure/Mylonite < 1m wide* is a frequency column. Mylonites <1m wide are mapped under rock occurrence/structure in Boremap.

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

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

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

Column 14. *Sealed fractures (interpreted)/All* is a frequency column. This column includes all fractures interpreted as sealed with the Boremap system. It includes sealed fractures where the drill core is not broken as well as sealed fractures interpreted to have broken up artificially during/after drilling.

Column 15. *Sealed fractures (interpreted)/Broken fractures with aperture = 0* is a frequency column. This column includes sealed fractures interpreted to have broken up artificially during/after drilling.

Column 16. *Sealed fractures (interpreted)/Sealed Fracture Network < 1m wide* is a frequency column. The sealed fracture network parameter is the only parameter that is generally evaluated directly from observations of the drill core.

Column 17. *Sealed fractures (interpreted)/Sealed Fracture Network ≥ 1m wide* is an interval column.

Column 18. *Open fractures (interpreted)/All Aperture > 0* is a frequency column. This column includes all open fractures, both fractures that with certainty were open before drilling and fractures that probably or possibly were open before drilling.

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

Column 20. *Open fractures (interpreted)/Certain Aperture = 0.5 certain and > 0.5* is a frequency column. This column includes fractures that with certainty were open before drilling.

Column 21. *Open fractures (interpreted)/Joint alteration > 1.5* is a frequency column. This column show fractures with stronger joint alteration than normal. This parameter generally goes hand in hand with the location of lithologies with a more weathered appearance.

Column 22. *Open fractures (interpreted)/Crush < 1m* wide is a frequency column. This column includes shorter sections with crush.

Column 23. *Open fractures (interpreted)/Crush ≥ 1m* wide is an interval column. This column includes longer sections with crush.

5.2 Geological summary table, KSH03

The Geological Summary table for KSH03 is presented in Appendix 1. All length information in this chapter is taken from the Geological Summary table and therefore includes an error of 5–10 m.

The lithology in KSH03 is dominated by quartz monzodiorite in the interval 0–270 m and by Ävrö granite from 270 m and downwards. Thicker, often porphyritic, granites occur within the Ävrö granite in the intervals 440–540 m and 755–860 m.

Although thinner intervals with oxidation occur all through KSH03 intervals with continuous oxidation, occasionally rather strong, as well as veins and dykes, are closely related to the quartz monzodiorite and its contact with the Ävrö granite.

Shear structures are sparsely distributed throughout borehole KSH03, except in the interval 110–370 m. The highest anomaly of shear structures is located to the weakness section at 190–300 m.

Intervals with breccias are found almost exclusively in the quartz monzodiorite and are especially located to the weakness section at 190–300 m.

The only mylonite found in KSH03 occurs at 270 m.

Foliation structures are rather uncommon in the quartz monzodiorite and the section of weakness at 190–300 m. Foliation is, however, almost continuous in the Ävrö granite from 300 m and downwards.

The frequencies of sealed fractures (interpreted) and open fractures (interpreted) are higher in the monzodiorite than in the Ävrö granite. The highest frequencies occur in the weakness section 190–300 m.

The frequency of open fractures (interpreted) is low in the interval 500–800 m (approximate interval).

High joint alteration numbers are concentrated to two intervals in the quartz monzodiorite, 0–50 m and 200–275 m.

Intervals with crush occur almost exclusively in the interval 190–260 m.

A pronounced weakness section occurs at 190–300 m around the contact between the quartz monzodiorite and the Ävrö granite at 270 m. This section is outstanding in KSH03. It is weakly to faintly oxidized, rich in veins and shear structures, contains the thickest and strongest breccias as well as the only mylonite in KSH03. This weakness section contains the highest frequencies of sealed fractures (interpreted) and open fractures (interpreted) in KSH03, and the highest frequency of joint alteration numbers > 1.5, as well as the highest frequencies of crushed sections and sealed fracture networks.

Three small occurrences of sandstone occur at 271.59–271.88 m, 271.90–271.98 m and 272.37–272.46 m within the weakness section.

There is a strong uncertainty whether broken fractures were open before or during/after drilling. This is shown by columns 19 (Open fractures interpreted, uncertain) and 20 (Open fractures interpreted, certain) in the Geological Summary table for KSH03 (see Appendix 1). The reason for this is that the core has a tendency to break up along existing sealed fractures. It is probable that this problem is related to the geology in the Simpevarp peninsula and not a general problem for the Boremap mapping system.

5.3 Orientation of open fractures

Stereograms of open fractures for each 100 m interval in KSH03 are presented in Appendix 3. The stereographic information is from plane to pole plot data. Fracture orientation values are strike/dip values using the right hand rule.

The orientation for borehole KSH03A at ground level is 126.85/-59.44.

Open fractures not visible in BIPS were mapped as planes at right angle to the borehole. These fractures show up as a small artificial semicircular high anomaly maxima at right angle to the borehole in the stereographic plots (see Appendix 3, the interval 200–300 m). It should be noted that the location of this artificial maxima varies with depth because of the deviation of the borehole.

There is a general strong overrepresentation of open fractures cutting the borehole at high angles compared to fractures cutting the borehole at low angles. This results in artificially high anomaly values for fractures cutting the borehole at high angles and in distortion of anomaly shapes in the stereographic plots. These distortions show up as a tendency for anomalies to obtain a semi circular shape, effects that are stronger the longer the plotted depth interval. It is therefore not recommended to plot intervals longer than 100 m in the same stereogram.

A strong and very pronounced fracture set maximum occurs in the interval 200–300 m. This represents the weakness section that occurs in this interval. The intensity of this maximum is highlighted by the number of fractures plotted in this interval.

A WNW-striking open fracture set with moderate dip (50° dip) is the strongest maximum for open fractures in the interval 0–100 m. This orientation shows up again at 700 m and strike WNW-NW in the interval 700–1000 m.

Fractures striking NNE with steep dip (75°-85° dip) are rare but very weak maxima occur at 0–100 m, 500–800 m and 900–1000 m.

An E-striking fracture set with low dip (11°-25° dip) show high to very high maxima in KSH03. A clear maximum in the interval 0–200 m disappears in the interval 200–400 m partly because it is overprinted by the strong weakness section striking SW(-SSW) that is found in the interval 200–300 m. This fracture set appears again at 400 m where a strong maximum can be followed down to 800 m. Weakly developed fracture sets with low dip have SW-SSW orientations in the interval 800–900 m.

A SW-SSW-striking fracture set with moderate to steep dip (35°-80° dip) occurs throughout KSH03. The stereographic maximum to this fracture set coincide with the weakness section in the interval 200–300 m and is strong in the intervals 300–400 m, 600–700 m and 800–900 m.

6 Discussion

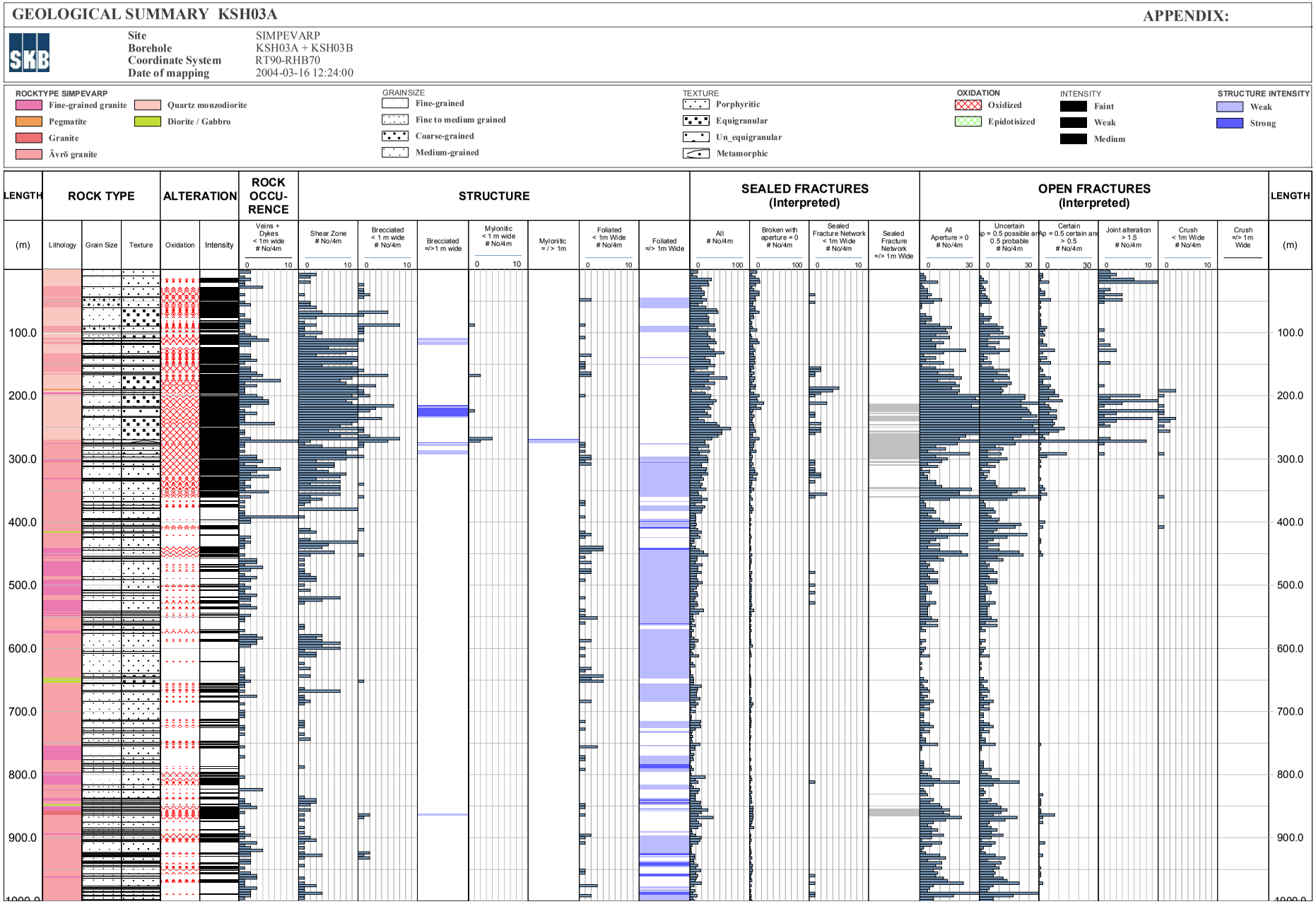
Fractures not visible in the BIPS-image were, if possible, mapped by using the “guide-line method”. If guiding structures were missing, these fractures were mapped as if they were oriented 90° towards the borehole axis, as a standard.

For the mapping of KSH03A, version 3.3.4 of Boremap was used. In this version broken fractures, alterations, etc can be mapped inside sealed fracture networks. This was not possible for the mapping of KSH01, KSH02, KAV01 and KAV02.

It is still not possible to map two crossing rock occurrences as Rock Occurrence. Therefore, when crossing rock occurrences have appeared in the drill core, one has been mapped as a rock occurrence and the other a structural feature. Rock occurrences mapped as structural features are commented “RO – type of rock occurrence – intensity (when needed) – width”. A more specific description of the rock occurrence was sometimes added after this standard comment.

Geological Summary table, KSH03

Appendix 1



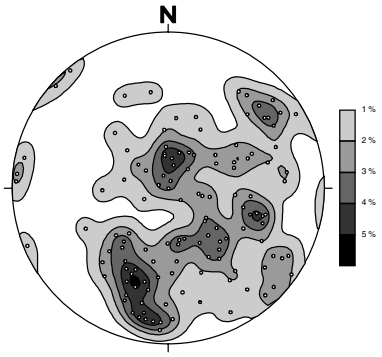
Appendix 2

Search paths for the Geological Summary table

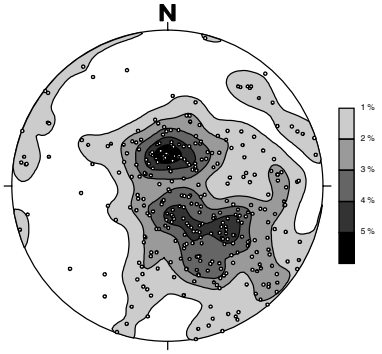
TABLE HEAD LINES		INFORMATION SOURCE				PRESENTATION
Head lines	**Sub head lines**	**Database**	**Varcode**	**First suborder**	**Second suborder**	**Interval/frequence**
Rock type	Lithology	SICADA	5	Sub 1		Interval
	Grain size	SICADA	5	Sub 5		Interval
	Texture	SICADA	5	Sub 6		Interval
Alteration	Oxidation	SICADA	7	Sub 1 = 700		Interval
		SICADA	7	Sub 2 = 101 and 102 = weak		Interval
			7	Sub 2 = 103 and 104 = strong		Interval
Rock occurrence	Vein + dyke	SICADA	31	Sub 1 = 2 and 18		Frequence
Structure	Shear zone	SICADA	31	Sub 1 = 0	Sub 4 = 41 and 42	Frequence
	Brecciated, < 1m wide	SICADA	31	Sub 1 = 0	Sub 4 = 7	Frequence
	Brecciated, >/= 1m wide	SICADA	5	Sub 3 = 7	Sub 4; 101 and 102 = weak	Interval
			5	Sub 3 = 7	Sub 4; 103 and 104 = strong	Interval
	Mylonite, < 1 m wide	SICADA	31	Sub 1 =0	Sub 4 = 34	Frequence
	Mylonite, >/= 1 m wide	SICADA	5	Sub 3 = 34	Sub 4; 101 and 102 = weak	Interval
			5	Sub 3 = 34	Sub 4; 103 and 104 = strong	Interval
	Foliation zone, < 1 m wide	SICADA	31	Sub 1 = 0	Sub 4 = 81	Frequence
	Foliation zone, >/= 1 m wide	SICADA	5	Sub 3 = 81	Sub 4; 101 and 102 = weak	Interval
			5	Sub 3 = 81	Sub 4; 103 and 104 = strong	Interval
Sealed fracture	All sealed fractures	SICADA	3	All		Frequence
	add broken sealed fractures	SICADA	2	SNUM 11= 0		Frequence
	Sealed (broken) fractures	SICADA	2	SNum 11 = 0		Frequence
	Sealed fracture network < 1 m wide	SICADA	32			Frequence
	Sealed fracture network>/=1m wide	SICADA	32			Interval
Open fractures	All, Aperture > 0	SICADA	2	SNum 11=/>0.5		Frequence
	Uncertain, Aperture = 0.5 possible	SICADA	2	SNum 11=0.5	Sub 12 = 3	Frequence
	and 0.5 probable	SICADA	2	SNum 11=0.5	Sub 12 = 2	Frequence
	Certain, Aperture = 0.5 certain	SICADA	2	SNum 11=0.5	Sub 12 = 1	Frequence
	and > 0.5	SICADA	2	SNum 11> 0.5	Sub 12 = 1 and 2 and 3	Frequence
	Joint alteration > 1.5	SICADA	2	SNum16 > 1.5		Frequence
	Crush < 1 m wide	SICADA	4			Frequence
	Crush >/= 1 m wide	SICADA	4			Interval

Appendix 3

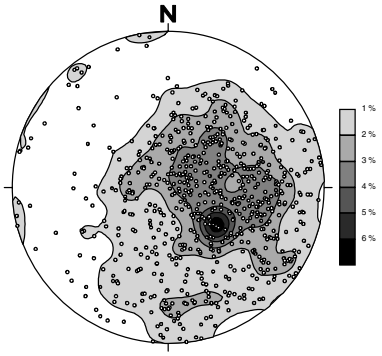
Stereographic projections of open fractures, KSH03



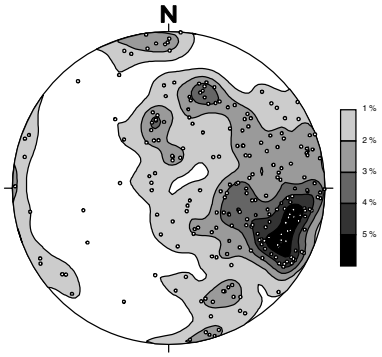
0 m -100 m (129 fractures)



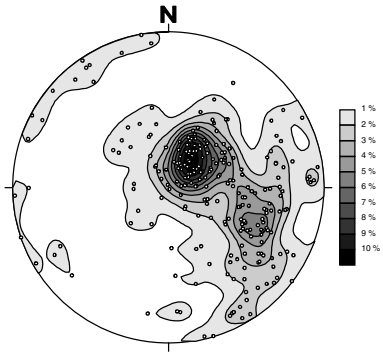
100 m -200 m (325 fractures)



200 m -300 m (731 fractures)

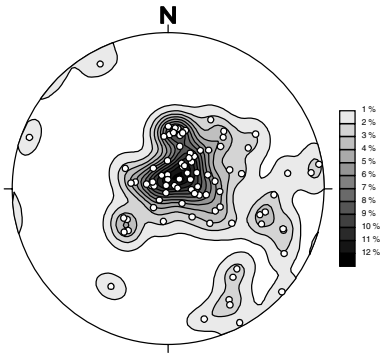


300 m -400 m (236 fractures)

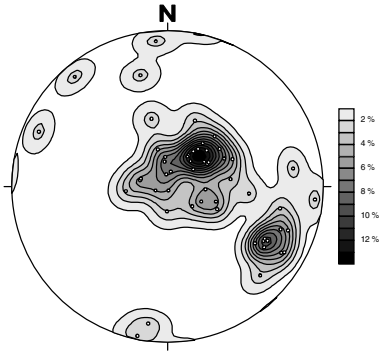


400 m -500 m (256 fractures)

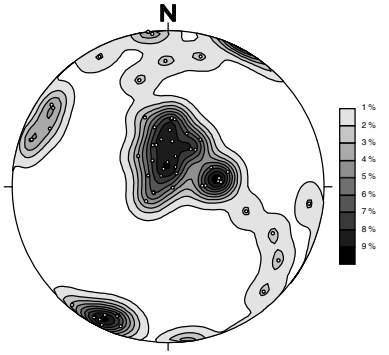
Stereograms of poles to open fractures with aperture in borehole KSH03, Schmidt´s Net, lower hemisphere, depth interval 0 m – 500 m.



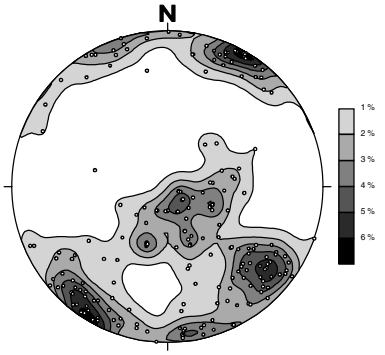
500 m -600 m (90 fractures)



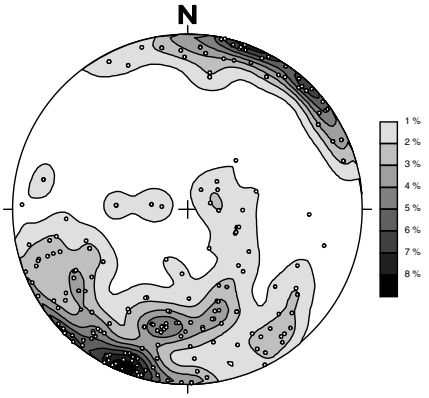
600 m -700 m (54 fractures)



700 m -800 m (61 fractures)



800 m -900 m (211 fractures)



900 m -1000 m (231 fractures)

Stereograms of poles to open fractures with aperture in borehole KSH03, Schmidt´s Net, lower hemisphere, depth interval 500 m – 1000 m.

Appendix 4

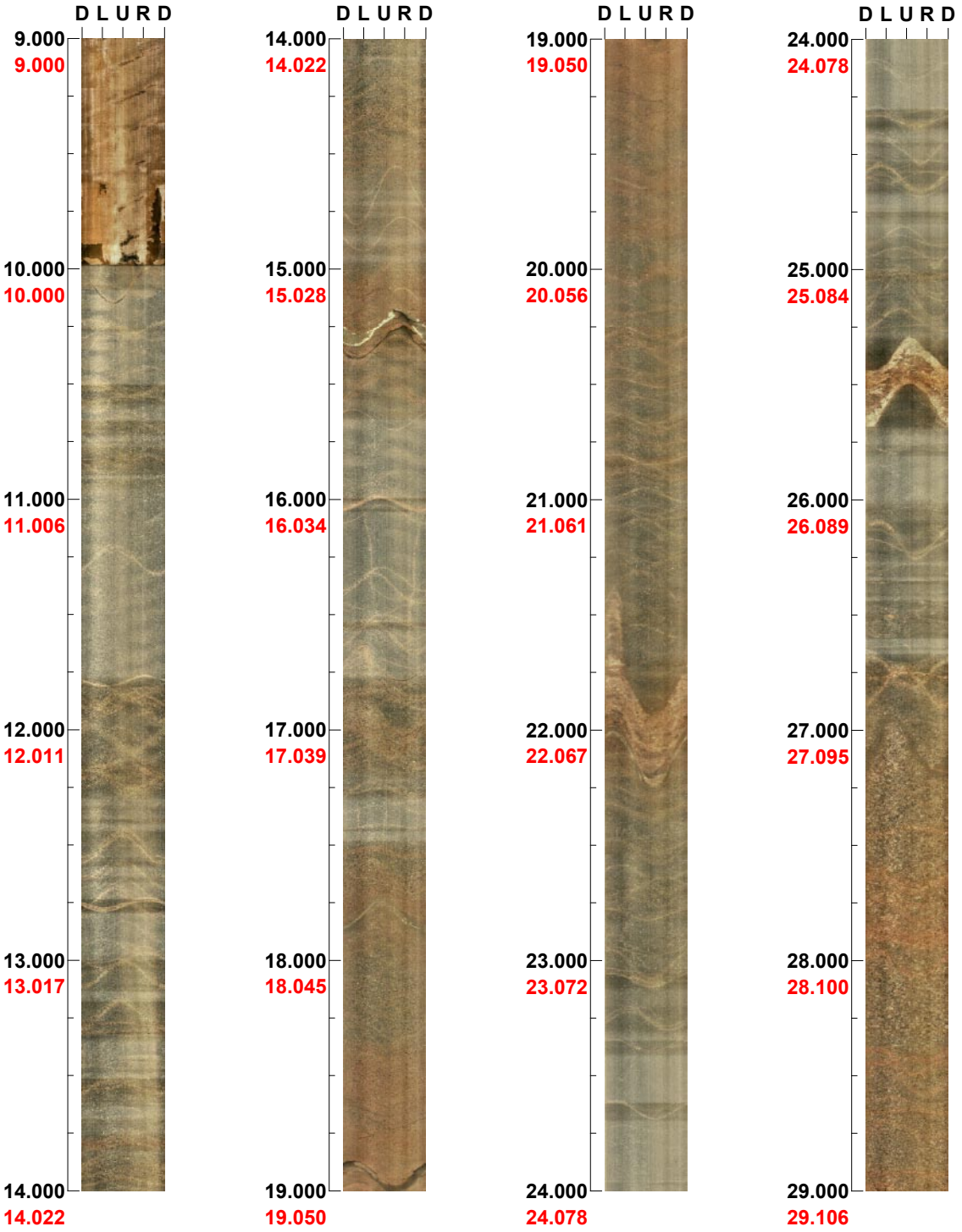
BIPS-images of KSH03B

Project name: Oskarshamn

Image file	**: c:\bips-b~1\ksh03\ksh03b.bip**
BDT file	**: c:\bips-b~1\ksh03\ksh03b~1.bdt**
Locality	**: Simpevarp**
Bore hole number	**: KSH03B**
Date	**: 03/12/11**
Time	**: 20:07:00**
Depth range	**: 9.000 - 99.865 m**
Azimuth	**: 128**
Inclination	**: -64**
Diameter	**: 76.0 mm**
Magnetic declination	**: 0.0**
Span	**: 4**
Scan interval	**: 0.25**
Scan direction	**: To bottom**
Scale	**: 1/25**
Aspect ratio	**: 150 %**
Pages	**: 5**
Color	**: +0 +0 +0**

Project name: Oskarshamn
Bore hole No.: KSH03B **Azimuth: 128** **Inclination: -64**

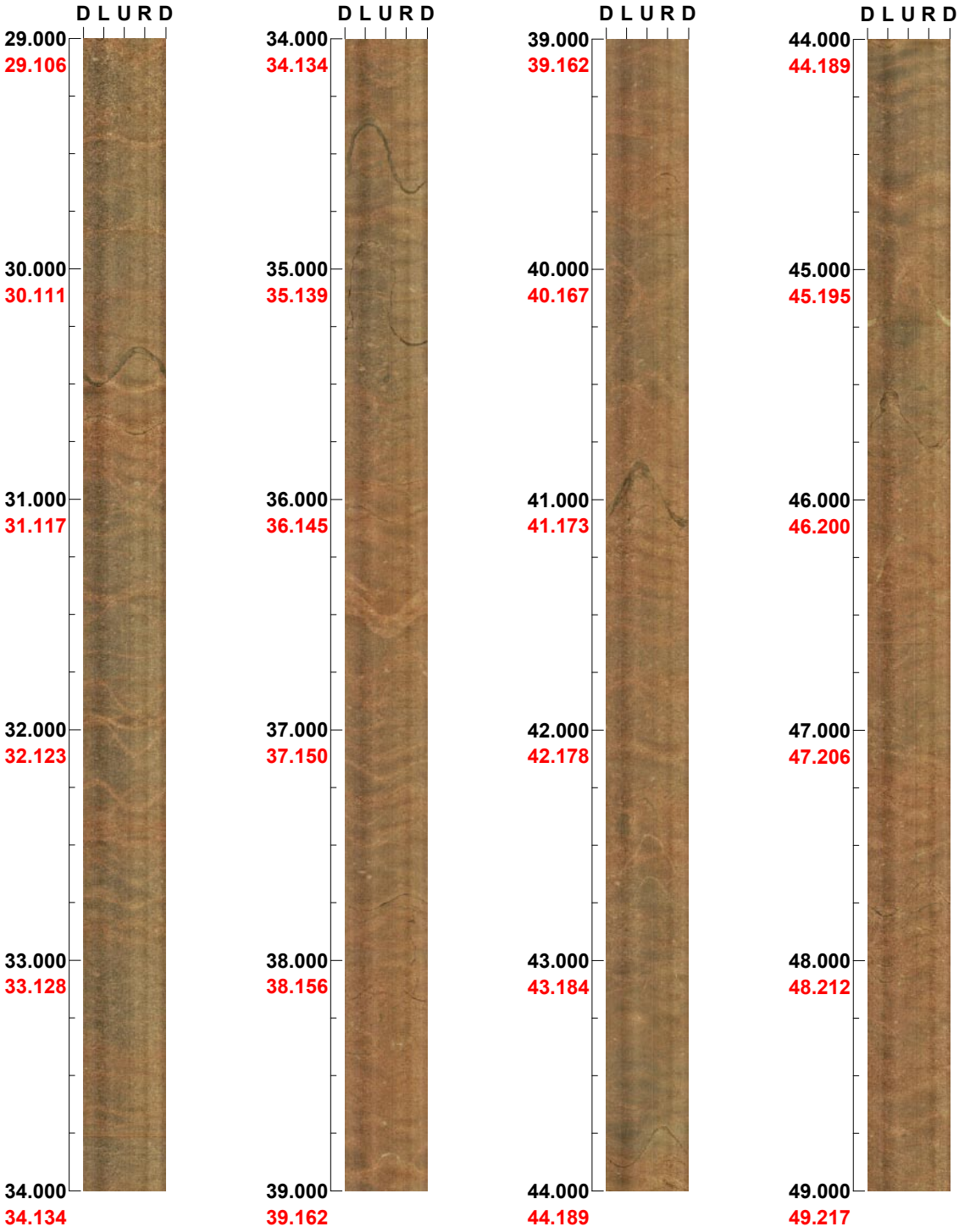
Depth range: 9.000 - 29.000 m



(1 / 5) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03B **Azimuth: 129** **Inclination: -64**

Depth range: 29.000 - 49.000 m



(2 / 5) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03B **Azimuth: 130** **Inclination: -64**

Depth range: 49.000 - 69.000 m

(3 / 5) **Scale: 1/25** **Aspect ratio: 150 %**

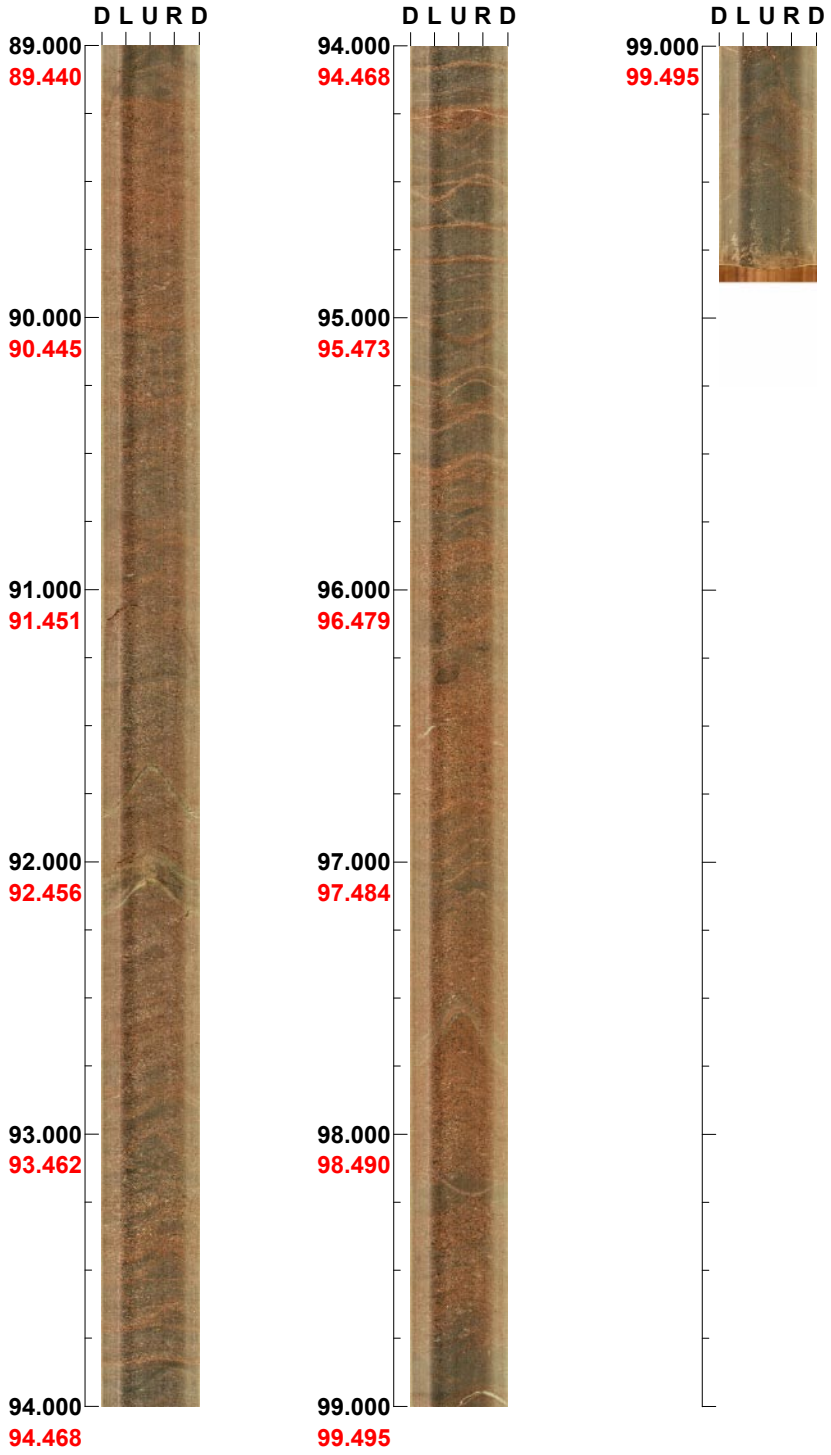
Project name: Oskarshamn
Bore hole No.: KSH03B **Azimuth: 131** **Inclination: -64**

Depth range: 69.000 - 89.000 m

(4 / 5) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03B **Azimuth: 132** **Inclination: -64**

Depth range: 89.000 - 99.865 m



(5 / 5) **Scale: 1/25** **Aspect ratio: 150 %**

Appendix 5

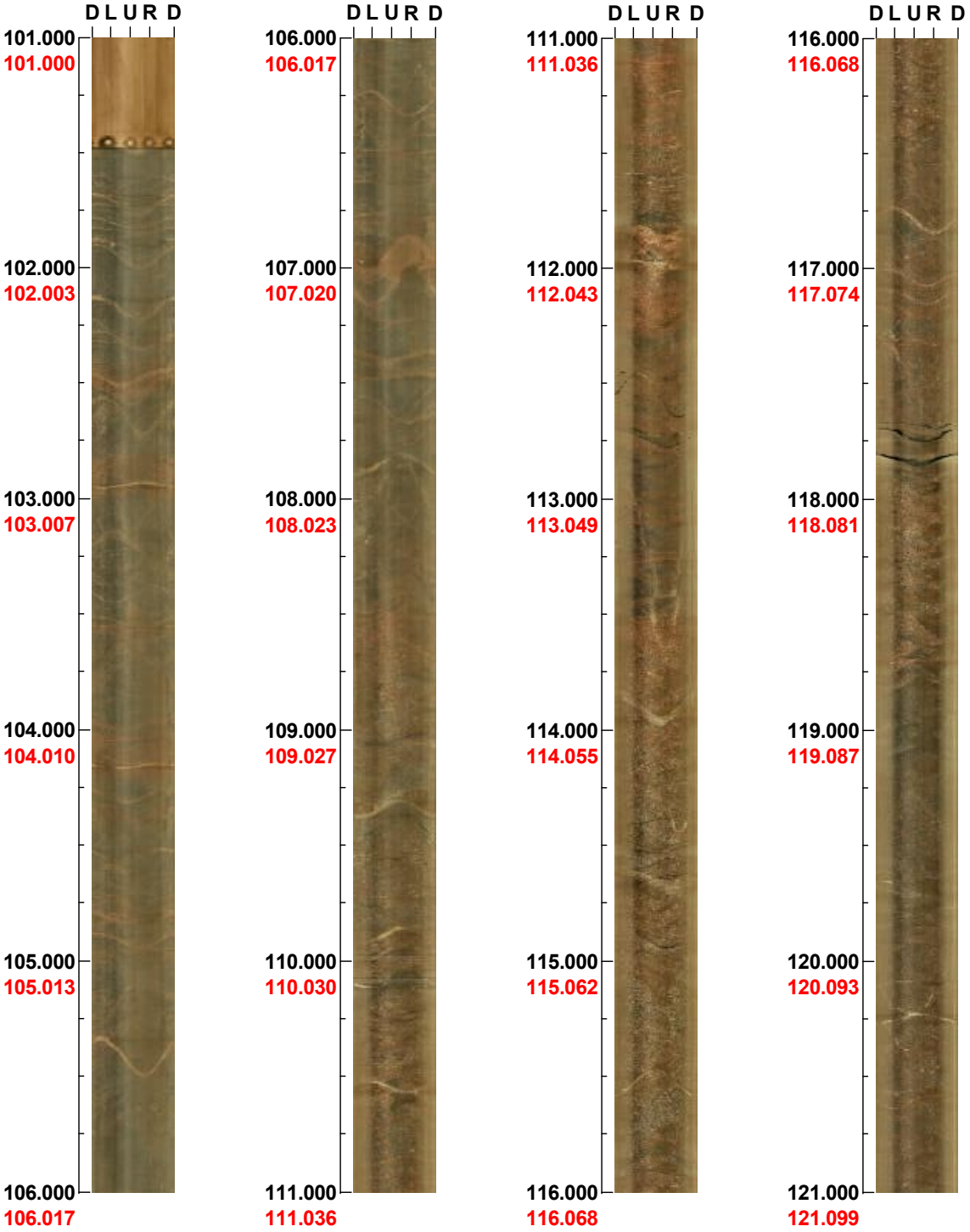
BIPS-images of KSH03A

Project name: Oskarshamn

Locality	**: Simpevarp**
Bore hole number	**: KSH03A**
Date	**: 03/12/10**
Time	**: 13:34:00**
Depth range	**: 101.000 - 599.010 m**
Azimuth	**: 123**
Inclination	**: -56**
Diameter	**: 76.0 mm**
Magnetic declination	**: 0.0**
Span	**: 4**
Scan interval	**: 0.25**
Scan direction	**: To bottom**
Scale	**: 1/25**
Aspect ratio	**: 150 %**
Pages	**: 25**
Color	**: +0 +0 +0**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 123** **Inclination: -56**

Depth range: 101.000 - 121.000 m



(1 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 123** **Inclination: -56**

Depth range: 121.000 - 141.000 m

(2 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 124** **Inclination: -57**

Depth range: 141.000 - 161.000 m

(3 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

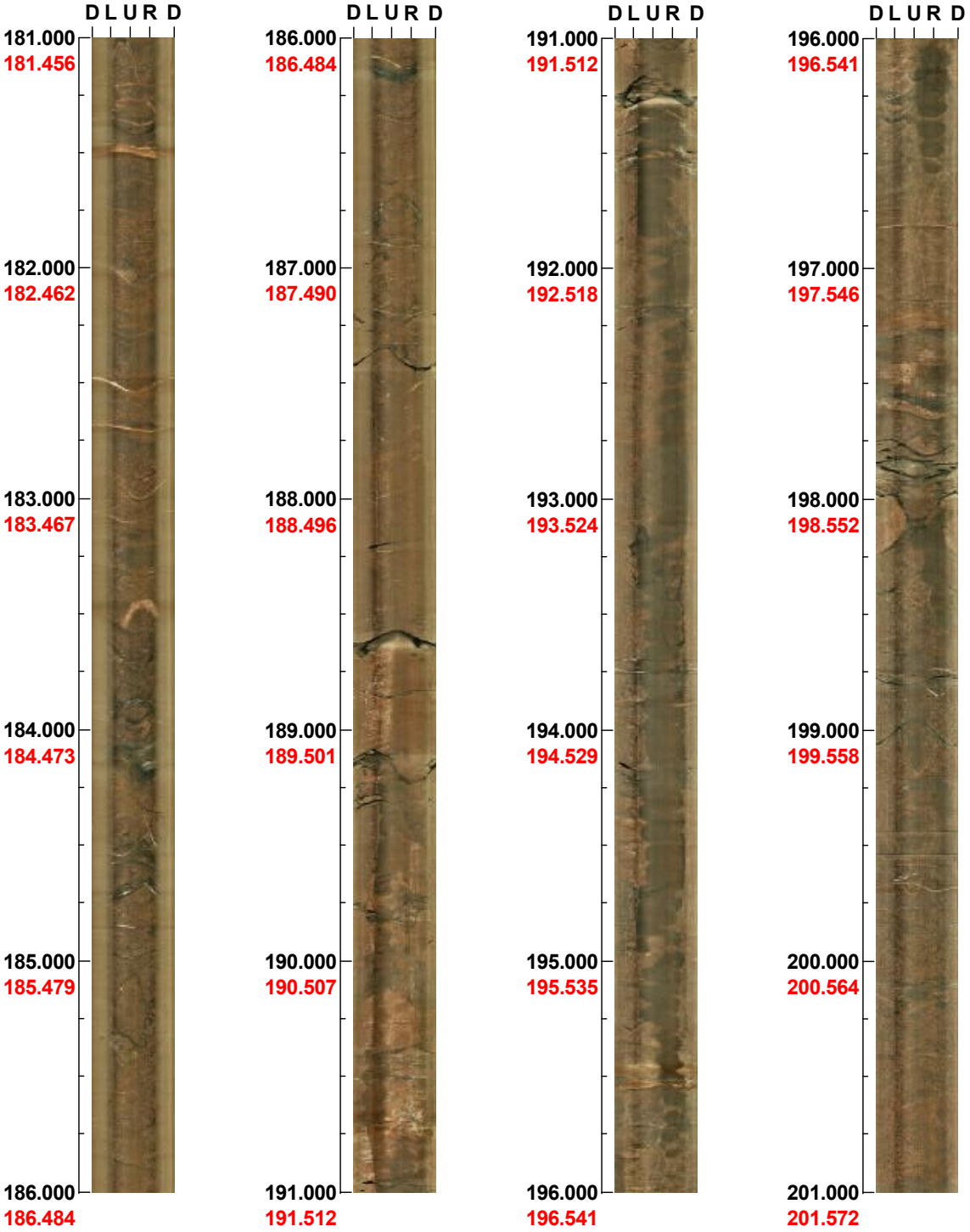
Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 125** **Inclination: -57**

Depth range: 161.000 - 181.000 m

(4 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 126** **Inclination: -57**

Depth range: 181.000 - 201.000 m



(5 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 127** **Inclination: -57**

Depth range: 201.000 - 221.000 m

(6 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 127** **Inclination: -57**

Depth range: 221.000 - 241.000 m

(7 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

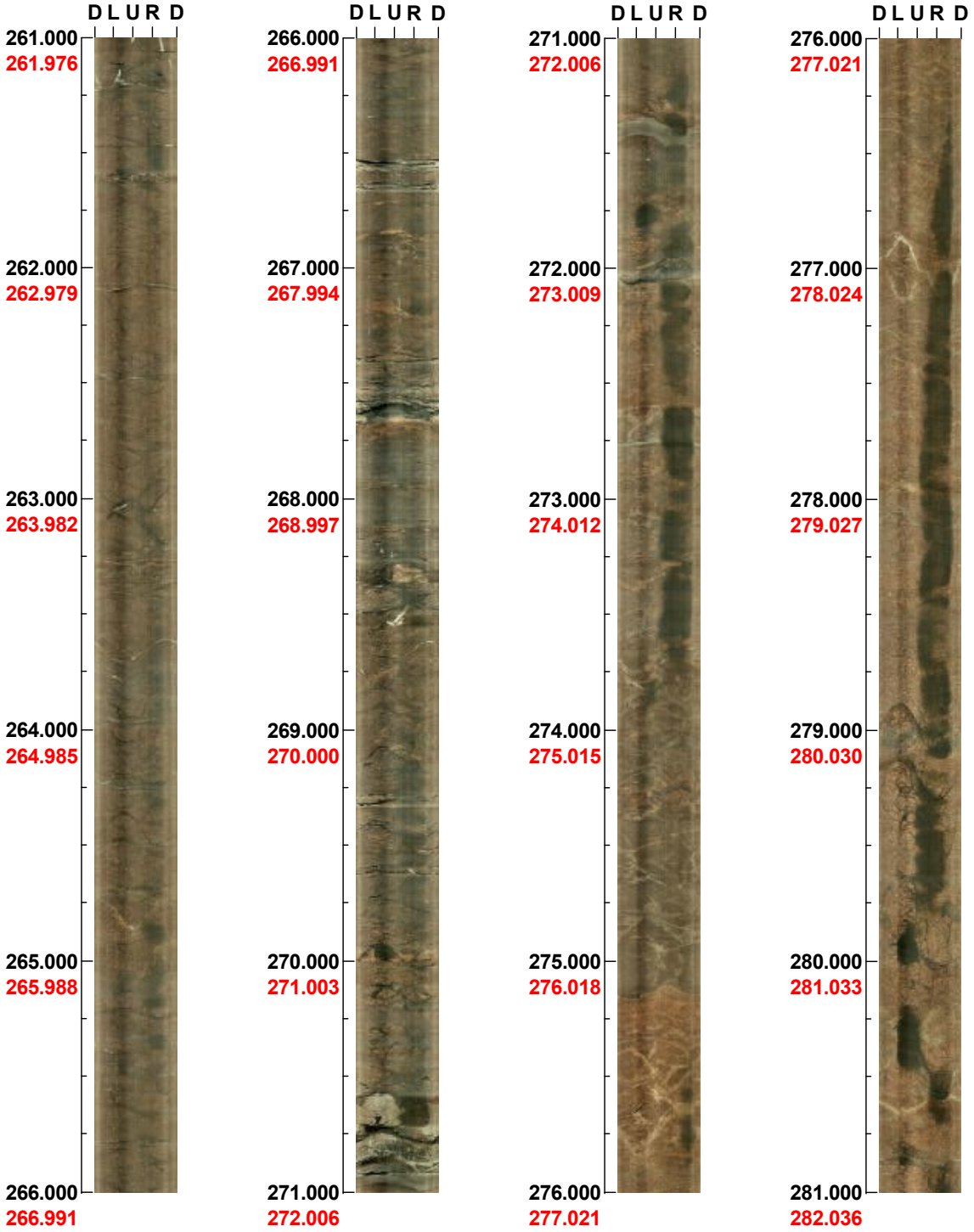
Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 127** **Inclination: -57**

Depth range: 241.000 - 261.000 m

(8 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 128** **Inclination: -57**

Depth range: 261.000 - 281.000 m



(9 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 128** **Inclination: -57**

Depth range: 281.000 - 301.000 m

(10 / 25) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 129** **Inclination: -57**

Depth range: 301.000 - 321.000 m

(11 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 131** **Inclination: -57**

Depth range: 321.000 - 341.000 m

(12 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 132** **Inclination: -57**

Depth range: 341.000 - 361.000 m

(13 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 134** **Inclination: -57**

Depth range: 361.000 - 381.000 m

(14 / 25) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 135** **Inclination: -57**

Depth range: 381.000 - 401.000 m

(15 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 137** **Inclination: -57**

Depth range: 401.000 - 421.000 m

(16 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 138** **Inclination: -58**

Depth range: 421.000 - 441.000 m

(17 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 140** **Inclination: -57**

Depth range: 441.000 - 461.000 m

(18 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 141** **Inclination: -57**

Depth range: 461.000 - 481.000 m

(19 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 143** **Inclination: -58**

Depth range: 481.000 - 501.000 m

(20 / 25) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 145** **Inclination: -58**

Depth range: 501.000 - 521.000 m

(21 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 146** **Inclination: -58**

Depth range: 521.000 - 541.000 m

(22 / 25) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 148** **Inclination: -58**

Depth range: 541.000 - 561.000 m

(23 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 149** **Inclination: -58**

Depth range: 561.000 - 581.000 m

(24 / 25) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 150** **Inclination: -57**

Depth range: 581.000 - 599.010 m

(25 / 25) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn

Locality	**: Simpevarp**
Bore hole number	**: KSH03A**
Date	**: 03/12/11**
Time	**: 08:28:00**
Depth range	**: 600.000 - 977.999 m**
Azimuth	**: 152**
Inclination	**: -58**
Diameter	**: 76.0 mm**
Magnetic declination	**: 0.0**
Span	**: 4**
Scan interval	**: 0.25**
Scan direction	**: To bottom**
Scale	**: 1/25**
Aspect ratio	**: 150 %**
Pages	**: 19**
Color	**: +0 +0 +0**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 152** **Inclination: -58**

Depth range: 600.000 - 620.000 m

(1 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 154** **Inclination: -58**

Depth range: 620.000 - 640.000 m

(2 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 155** **Inclination: -57**

Depth range: 640.000 - 660.000 m

(3 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 157** **Inclination: -57**

Depth range: 660.000 - 680.000 m

(4 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 158** **Inclination: -57**

Depth range: 680.000 - 700.000 m

(5 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 160** **Inclination: -57**

Depth range: 700.000 - 720.000 m

(6 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 162** **Inclination: -57**

Depth range: 720.000 - 740.000 m

(7 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 164** **Inclination: -56**

Depth range: 740.000 - 760.000 m

(8 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 167** **Inclination: -56**

Depth range: 760.000 - 780.000 m

(9 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 169** **Inclination: -55**

Depth range: 780.000 - 800.000 m

(10 / 19) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 171** **Inclination: -55**

Depth range: 800.000 - 820.000 m

(11 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 171** **Inclination: -54**

Depth range: 820.000 - 840.000 m

(12 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

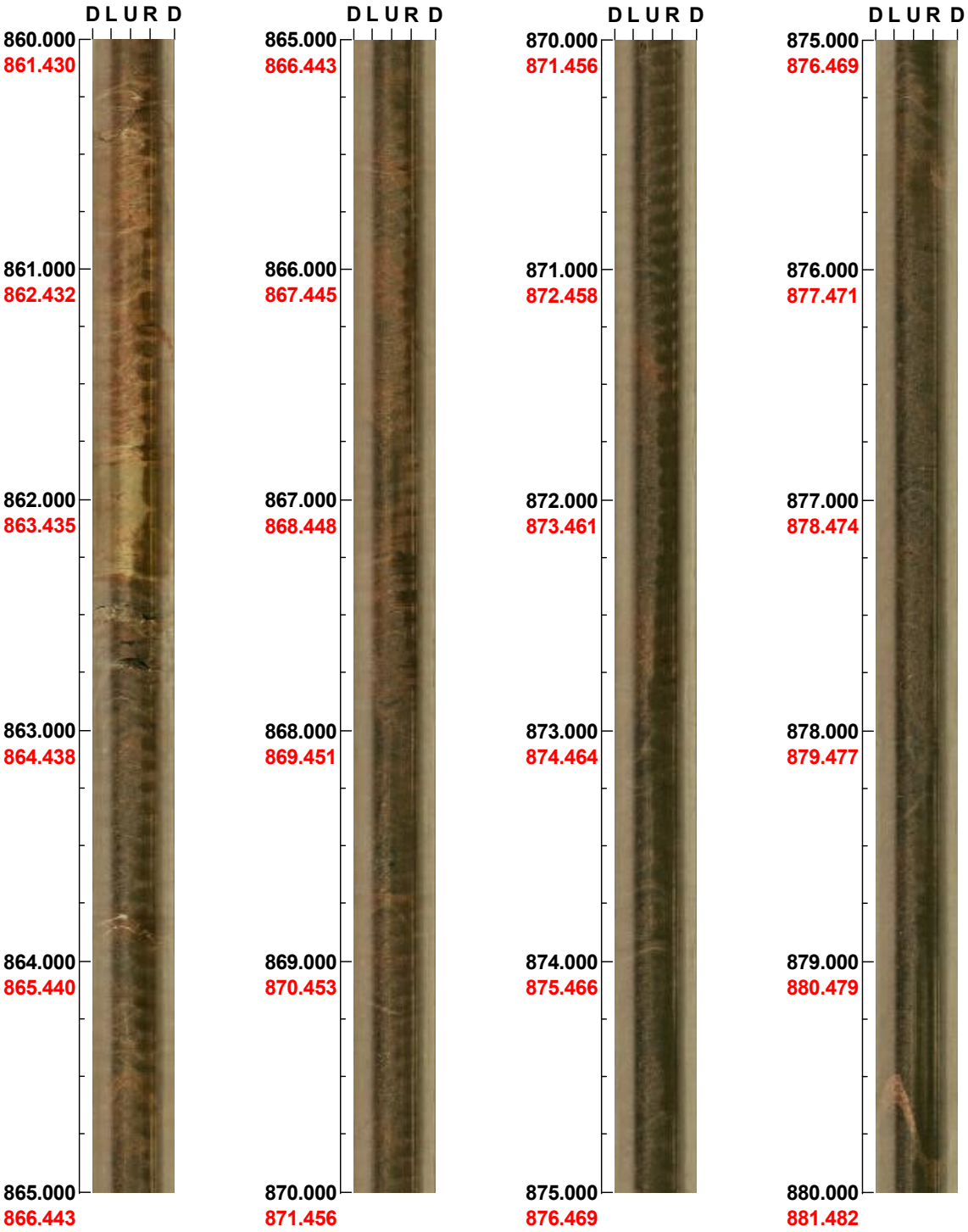
Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 173** **Inclination: -53**

Depth range: 840.000 - 860.000 m

(13 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 174** **Inclination: -52**

Depth range: 860.000 - 880.000 m



(14 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 175** **Inclination: -51**

Depth range: 880.000 - 900.000 m

(15 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 176** **Inclination: -50**

Depth range: 900.000 - 920.000 m

(16 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 177** **Inclination: -49**

Depth range: 920.000 - 940.000 m

(17 / 19) Scale: 1/25 **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 178** **Inclination: -48**

Depth range: 940.000 - 960.000 m

(18 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 179** **Inclination: -48**

Depth range: 960.000 - 977.999 m

(19 / 19) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn

Locality	**: Simpevarp**
Bore hole number	**: KSH03A**
Date	**: 03/12/11**
Time	**: 16:37:00**
Depth range	**: 950.000 - 997.306 m**
Azimuth	**: 178**
Inclination	**: -48**
Diameter	**: 76.0 mm**
Magnetic declination	**: 0.0**
Span	**: 4**
Scan interval	**: 0.25**
Scan direction	**: To bottom**
Scale	**: 1/25**
Aspect ratio	**: 150 %**
Pages	**: 3**
Color	**: +0 +0 +0**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 178** **Inclination: -48**

Depth range: 950.000 - 970.000 m

(1 / 3) **Scale: 1/25** **Aspect ratio: 150 %**

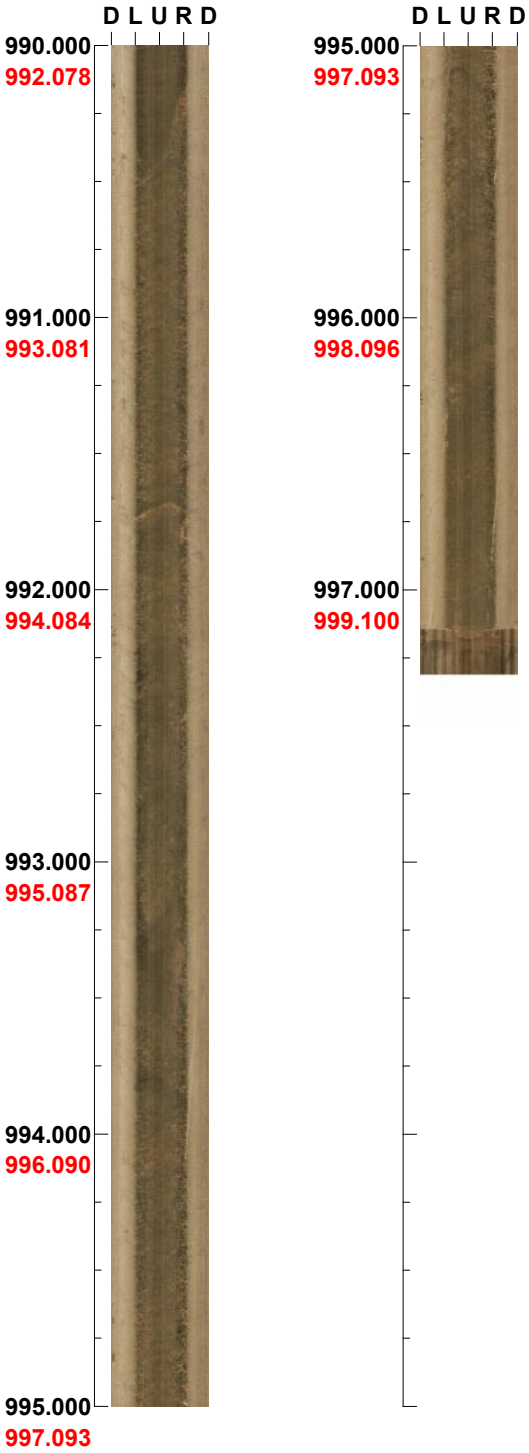
Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 179** **Inclination: -47**

Depth range: 970.000 - 990.000 m

(2 / 3) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Oskarshamn
Bore hole No.: KSH03A **Azimuth: 180** **Inclination: -46**

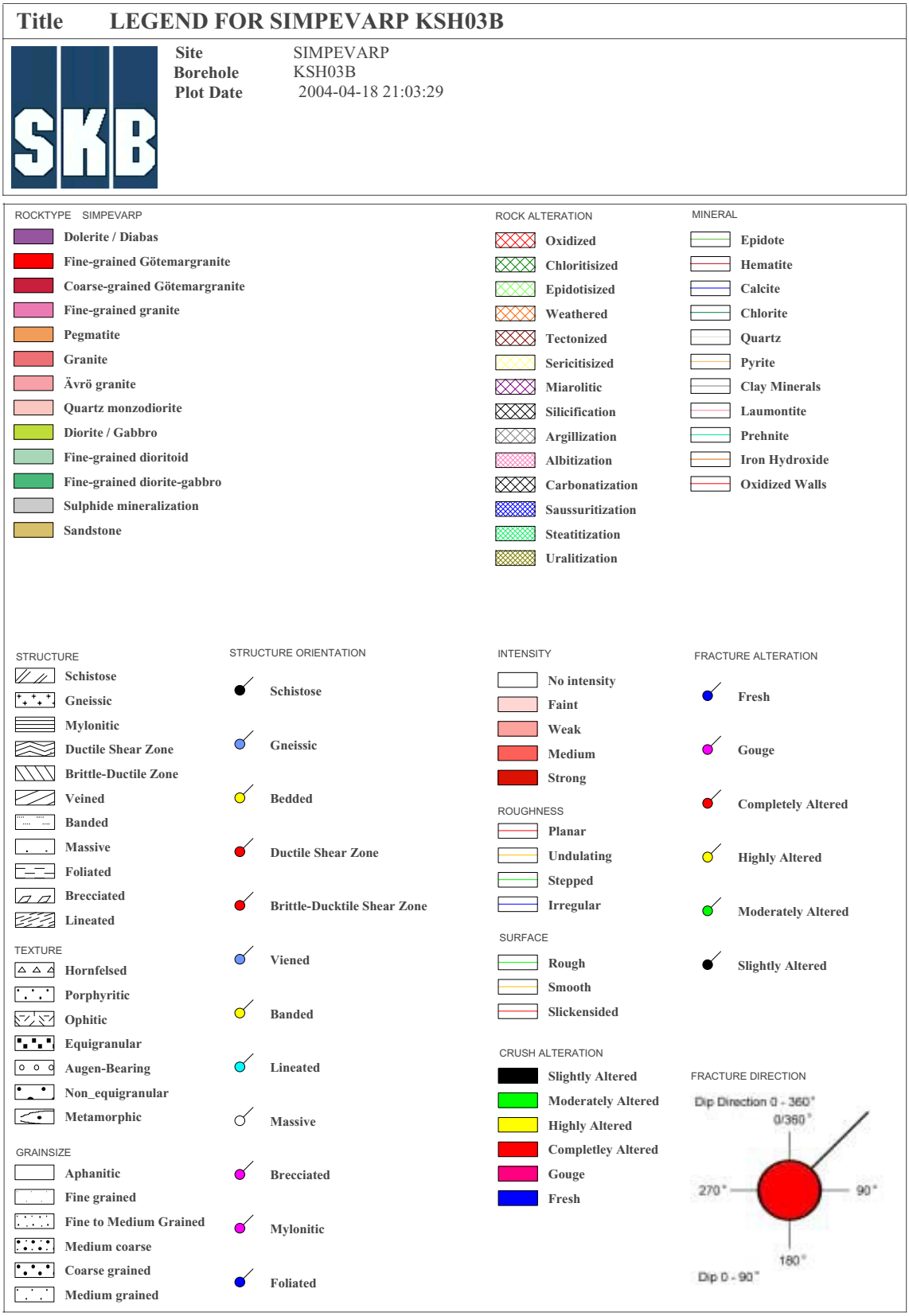
Depth range: 990.000 - 997.306 m



(3 / 3) **Scale: 1/25** **Aspect ratio: 150 %**

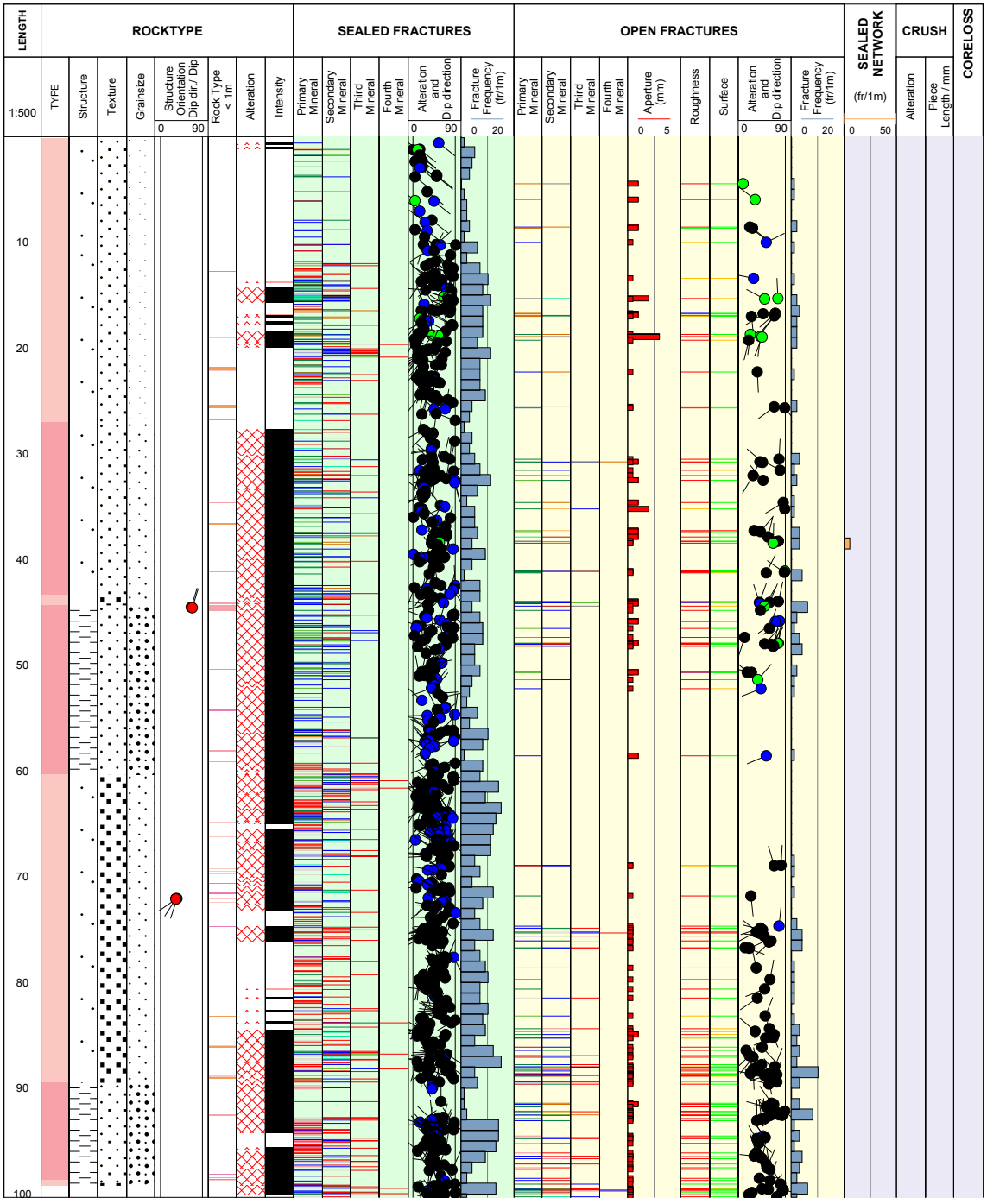
Appendix 6

WellCad diagram of KSH03B



Title

Site	SIMPEVARP	**Coordinate System**	RT90-RHB70
Borehole	KSH03B	**Northing [m]**	6366018.98
Diameter [mm]	76	**Easting [m]**	1552710.70
Length [m]	100.860	**Elevation [m.a.s.l.]**	4.08
Bearing [°]	128.54	**Drilling Start Date**	2003-11-21 10:50:00
Inclination [°]	-64.30	**Drilling Stop Date**	2003-11-26 20:20:00
Date of mapping	2004-03-16 13:18:00	**Plot Date**	2004-06-09 21:04:59
Rocktype data from	p_rock_XXXXX	**Fracture data from**	p_fract_core

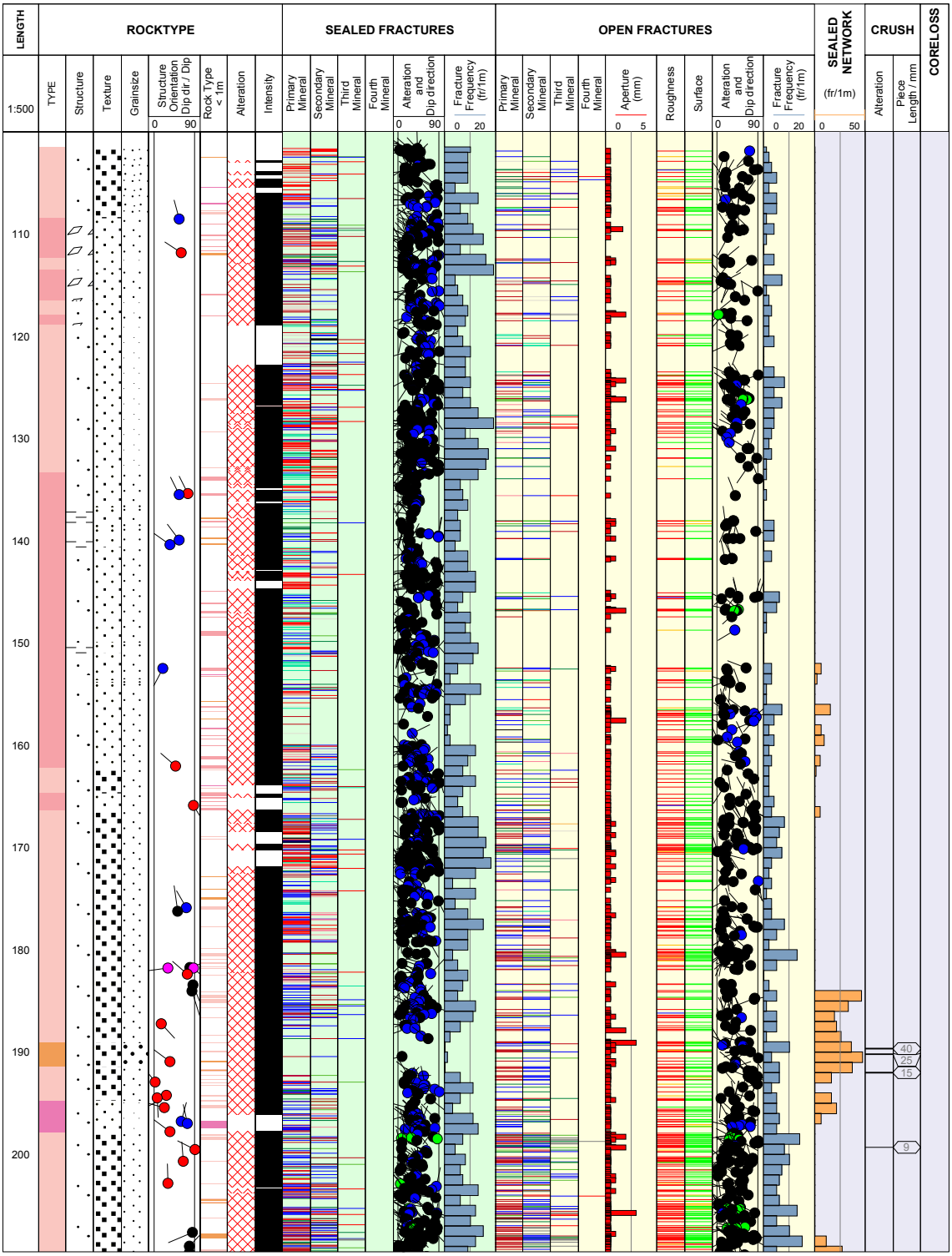


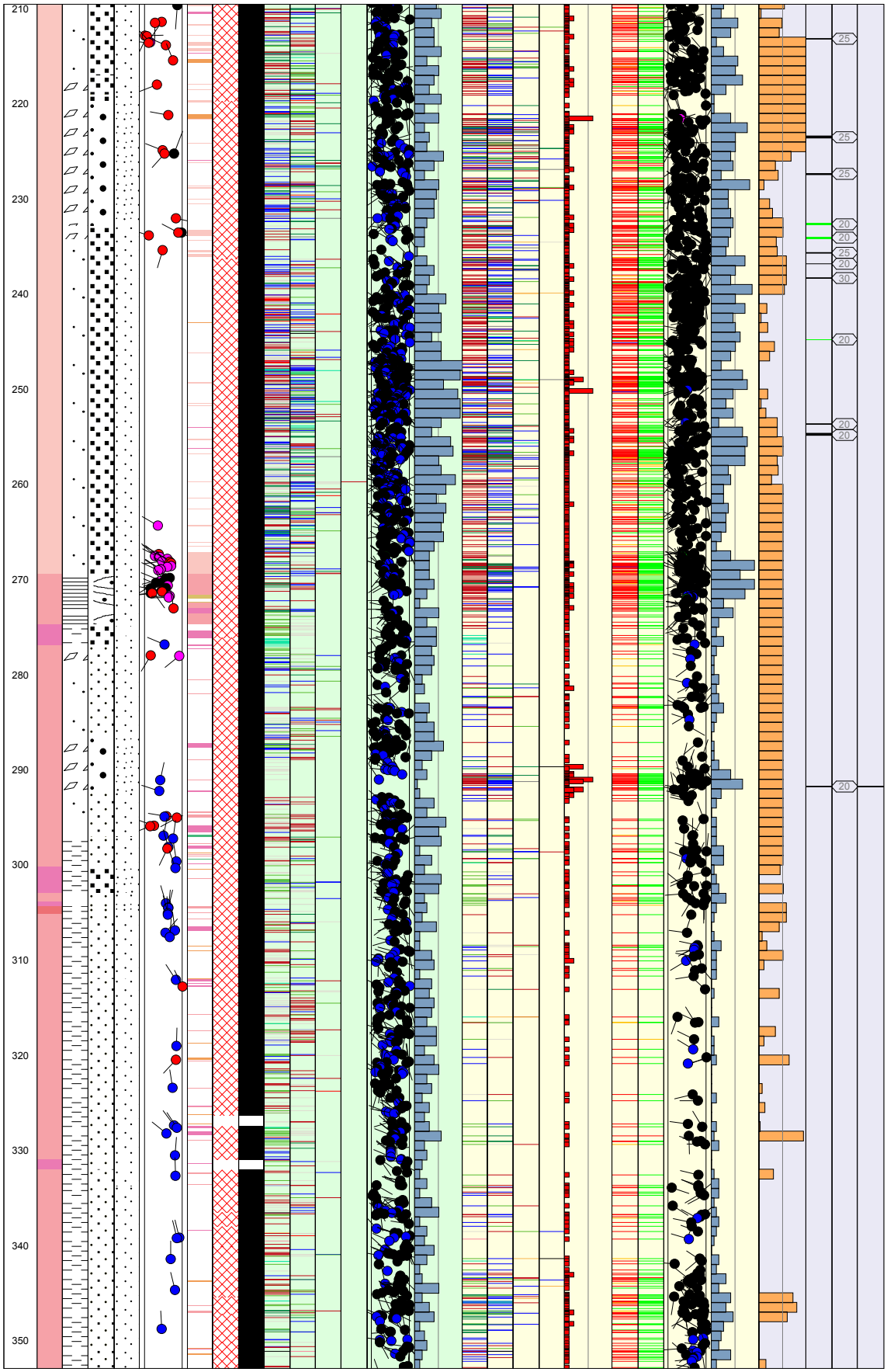
Appendix 7

WellCad diagram of KSH03A

Title

Site	SIMPEVARP	**Coordinate System**	RT90-RHB70
Borehole	KSH03A	**Northing [m]**	6366018.66
Diameter [mm]	76	**Easting [m]**	1552711.17
Length [m]	1000.700	**Elevation [m.a.s.l.]**	4.15
Bearing [°]	125.02	**Drilling Start Date**	2003-08-13 07:00:00
Inclination [°]	-59.09	**Drilling Stop Date**	2003-11-07 08:30:00
Date of mapping	2004-03-16 12:24:00	**Plot Date**	2004-06-09 21:04:59
Rocktype data from	p_rock_XXXXX	**Fracture data from**	p_fract_core

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20
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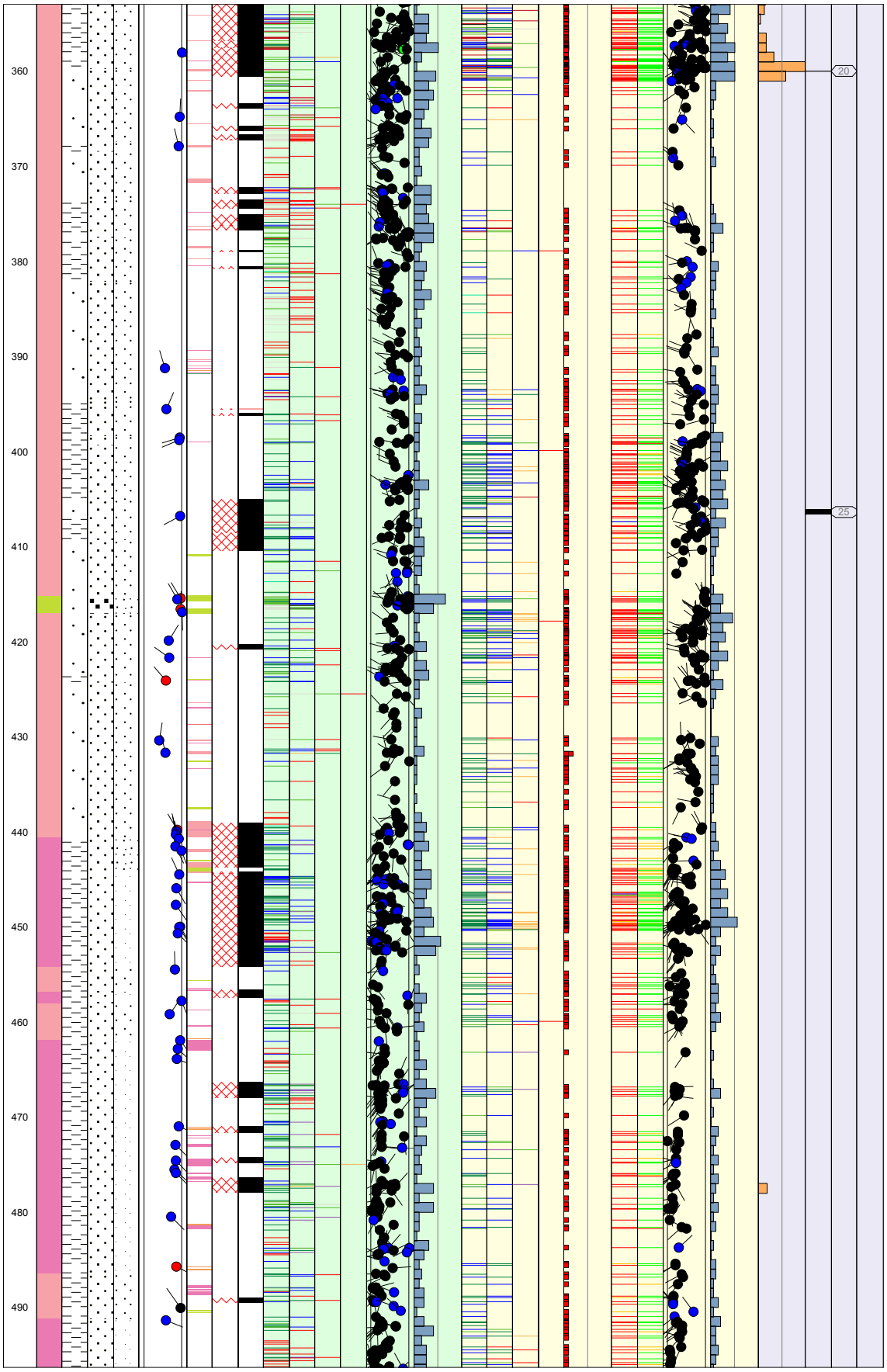
30
20
20
20
20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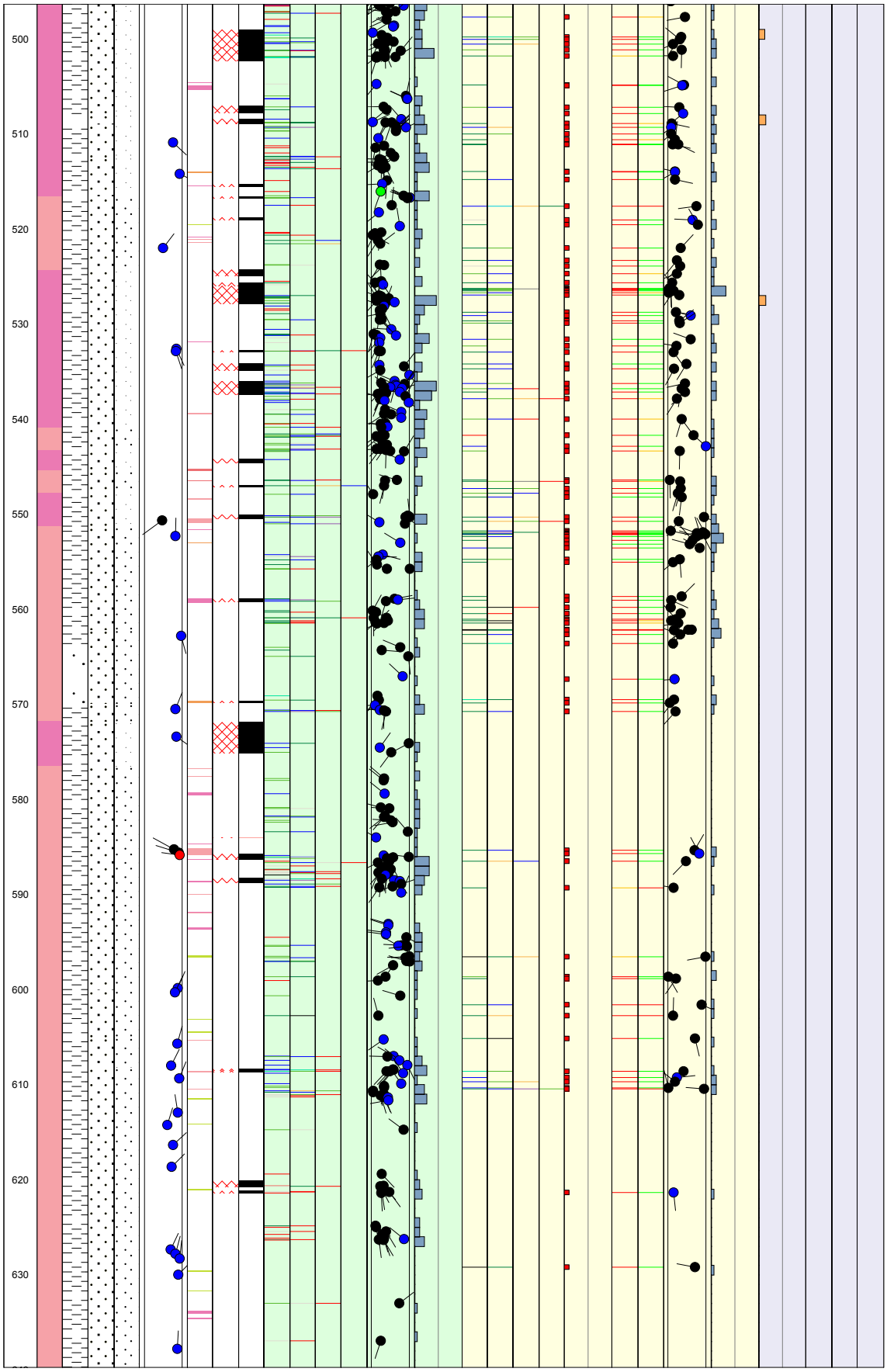
410
420
430
440
450
460
470
480
490
20
25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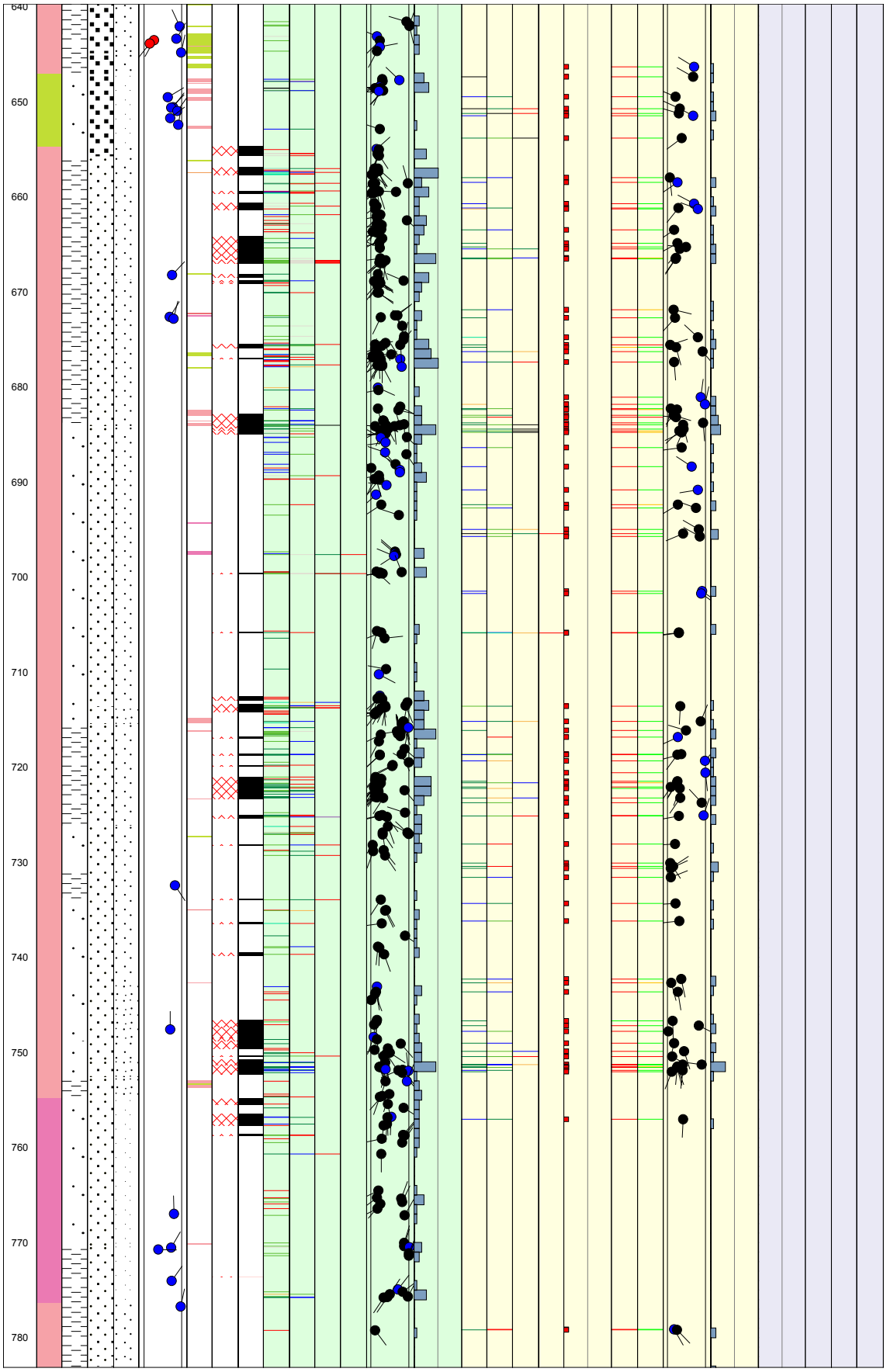
610
620
630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770
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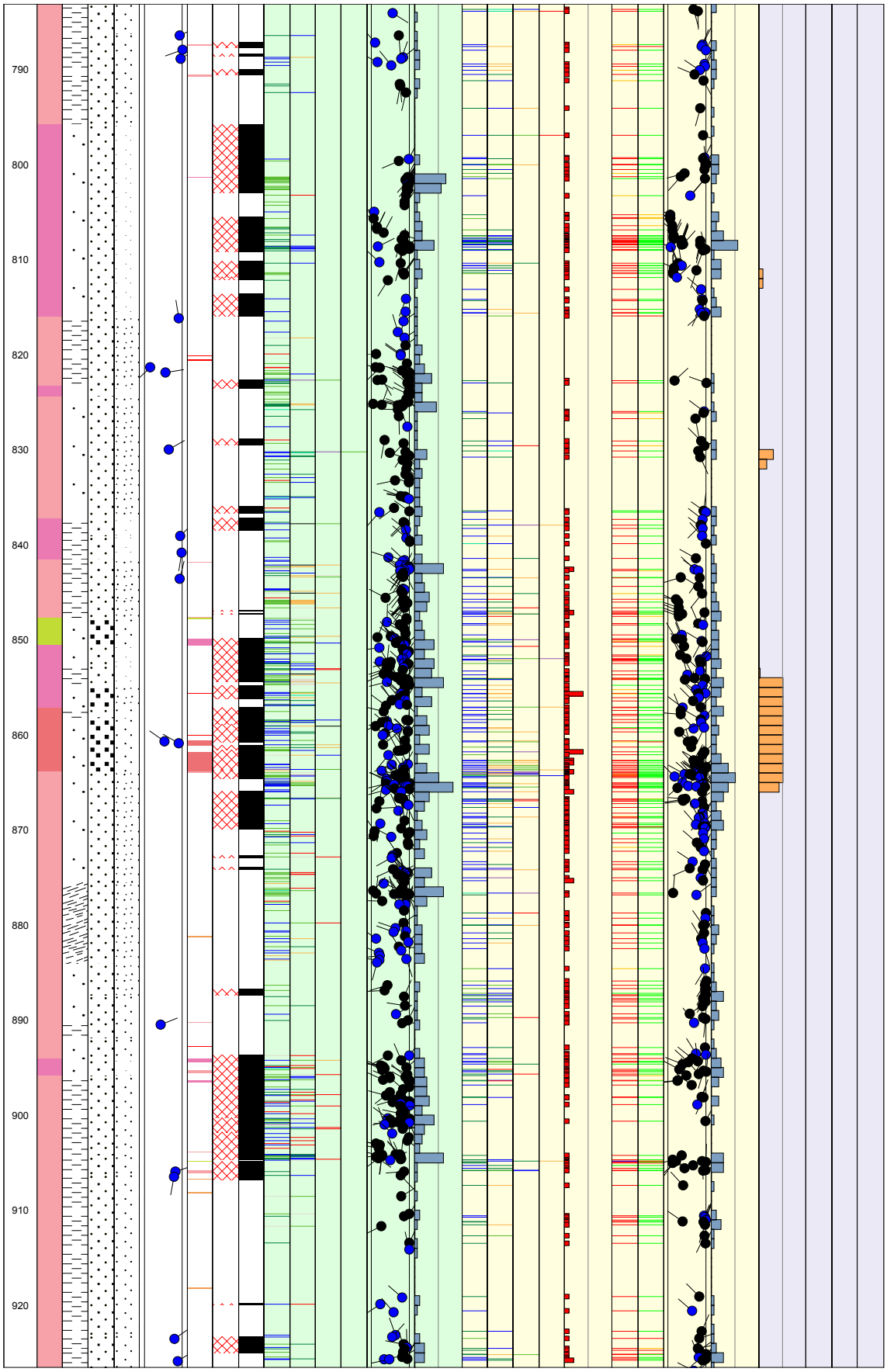
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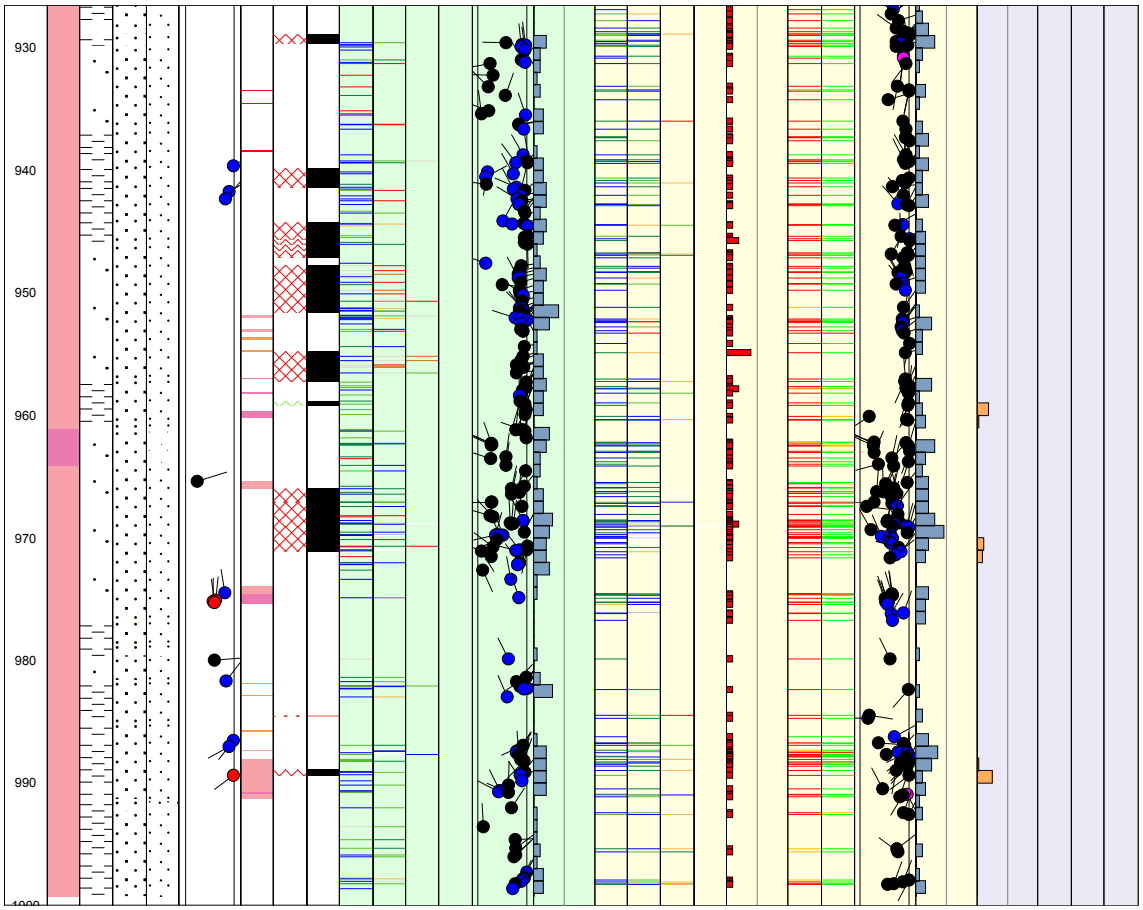
830
840
850
860
870
880
890
900
910
920


930
940
950
960
970
980
990

Appendix 8

In data: Borehole length and diameter for KSH03A and KSH03B

Hole Diam T - Drilling: Borehole diameter

KSH03B, 2003-11-21 10:50:00 - 2003-11-26 20:20:00 (0.000 - 100.860 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
0.000	10.000	0.096	HQ (Rymning)
10.000	100.860	0.076	N/3

Printout from SICADA 2004-03-18 14:33:30.

Hole Diam T - Drilling: Borehole diameter

KSH03A, 2003-09-11 12:45:00 - 2003-11-07 08:30:00 (101.400 - 1000.700 m)

Sub Secup (m)	Sub Seclow (m)	Hole Diam (m)	Comment
101.400	1000.700	0.076	Corac N3/50

Printout from SICADA 2004-03-18 14:30:19.

In data: Deviation data for KSH03A and KSH03B

Maxibor T - Borehole deviation: Maxibor

KSH03B, 2003-11-27 10:00:00 - 2003-11-27 12:00:00 (0.000 - 93.000 m)

Length (m)	Northing (m)	Easting (m)	Elevation (m)	Coord System	Inclination (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag
0.00	6366018.960	1552710.730	4.000	RT90-RHB70	-64.6900	128.0600	0.0000	0.0000	0.0000	
3.00	6366018.170	1552711.740	6.710	RT90-RHB70	-64.6900	128.1500	1.2800	0.0000	0.0000	
6.00	6366017.380	1552712.750	9.420	RT90-RHB70	-64.7600	128.2100	2.5700	0.0000	0.0000	
9.00	6366016.590	1552713.750	12.140	RT90-RHB70	-64.8200	128.3600	3.8400	0.0100	0.0000	
12.00	6366015.800	1552714.760	14.850	RT90-RHB70	-64.7800	128.5100	5.1200	0.0100	0.0100	
15.00	6366015.000	1552715.760	17.560	RT90-RHB70	-64.7400	128.6600	6.4000	0.0200	0.0200	
18.00	6366014.200	1552716.760	20.280	RT90-RHB70	-64.7100	128.8400	7.6800	0.0400	0.0200	
21.00	6366013.400	1552717.750	22.990	RT90-RHB70	-64.6600	128.9700	8.9600	0.0500	0.0200	
24.00	6366012.590	1552718.750	25.700	RT90-RHB70	-64.6300	129.0600	10.2400	0.0700	0.0200	
27.00	6366011.780	1552719.750	28.410	RT90-RHB70	-64.5800	129.2300	11.5300	0.1000	0.0200	
30.00	6366010.960	1552720.750	31.120	RT90-RHB70	-64.5500	129.3300	12.8200	0.1200	0.0100	
33.00	6366010.150	1552721.740	33.830	RT90-RHB70	-64.5200	129.4700	14.1100	0.1500	0.0000	
36.00	6366009.330	1552722.740	36.540	RT90-RHB70	-64.4900	129.6300	15.4000	0.1800	0.0000	
39.00	6366008.500	1552723.740	39.250	RT90-RHB70	-64.4600	129.8100	16.6900	0.2200	-0.0100	
42.00	6366007.680	1552724.730	41.950	RT90-RHB70	-64.4300	129.9500	17.9800	0.2600	-0.0300	
45.00	6366006.840	1552725.720	44.660	RT90-RHB70	-64.4200	130.0500	19.2700	0.3000	-0.0400	
48.00	6366006.010	1552726.710	47.370	RT90-RHB70	-64.4100	130.1900	20.5700	0.3400	-0.0500	
51.00	6366005.170	1552727.700	50.070	RT90-RHB70	-64.3900	130.4000	21.8600	0.3900	-0.0700	
54.00	6366004.330	1552728.690	52.780	RT90-RHB70	-64.3900	130.6600	23.1600	0.4500	-0.0800	
57.00	6366003.490	1552729.670	55.480	RT90-RHB70	-64.4100	130.8000	24.4500	0.5000	-0.1000	
60.00	6366002.640	1552730.660	58.190	RT90-RHB70	-64.3800	130.9500	25.7500	0.5700	-0.1100	
63.00	6366001.790	1552731.630	60.890	RT90-RHB70	-64.3600	131.1400	27.0400	0.6300	-0.1200	
66.00	6366000.940	1552732.610	63.600	RT90-RHB70	-64.3200	131.2900	28.3400	0.7000	-0.1400	
69.00	6366000.080	1552733.590	66.300	RT90-RHB70	-64.2800	131.4400	29.6400	0.7800	-0.1600	
72.00	6365999.220	1552734.570	69.000	RT90-RHB70	-64.2500	131.5900	30.9400	0.8500	-0.1800	
75.00	6365998.350	1552735.540	71.710	RT90-RHB70	-64.2300	131.7400	32.2400	0.9300	-0.2000	
78.00	6365997.490	1552736.510	74.410	RT90-RHB70	-64.2000	131.8800	33.5400	1.0200	-0.2200	
81.00	6365996.610	1552737.490	77.110	RT90-RHB70	-64.1600	132.0300	34.8400	1.1000	-0.2400	
84.00	6365995.740	1552738.460	79.810	RT90-RHB70	-64.1300	132.1400	36.1500	1.1900	-0.2700	
87.00	6365994.860	1552739.430	82.510	RT90-RHB70	-64.1100	132.3400	37.4500	1.2900	-0.2900	
93.00	6365993.080	1552741.360	87.900	RT90-RHB70	-64.0700	132.7500	40.0700	1.4900	-0.3500	

Printout from SICADA 2004-03-18 14:26:18.

Maxibor T - Borehole deviation: Maxibor

KSH03A, 2003-11-07 12:00:00 (0.000 - 996.000 m)

Length (m)	Northing (m)	Easting (m)	Elevation (m)	Coord System	Inclination (degrees)	Bearing (degrees)	Local A (m)	Local B (m)	Local C (m)	Extrapol Flag
0.00	6366018.640	1552711.170	-4.160	RT90-RHB70	-59.4400	126.8500	0.0000	0.0000	0.0000	
3.00	6366017.730	1552712.390	-1.580	RT90-RHB70	-59.3200	126.5800	1.5300	0.0000	0.0000	
6.00	6366016.810	1552713.620	1.000	RT90-RHB70	-59.1600	126.4600	3.0600	-0.0100	0.0100	
9.00	6366015.900	1552714.860	3.580	RT90-RHB70	-58.9600	126.3900	4.5900	-0.0200	0.0200	
12.00	6366014.980	1552716.100	6.150	RT90-RHB70	-58.8600	126.3500	6.1400	-0.0300	0.0500	
15.00	6366014.060	1552717.350	8.720	RT90-RHB70	-58.8400	126.2300	7.6900	-0.0400	0.0800	
18.00	6366013.140	1552718.600	11.280	RT90-RHB70	-58.7400	126.0900	9.2400	-0.0600	0.1100	
21.00	6366012.230	1552719.860	13.850	RT90-RHB70	-58.5300	126.0200	10.8000	-0.0800	0.1400	
24.00	6366011.310	1552721.130	16.410	RT90-RHB70	-58.3300	125.9600	12.3700	-0.1000	0.1900	
27.00	6366010.380	1552722.400	18.960	RT90-RHB70	-58.2500	125.8700	13.9400	-0.1300	0.2500	
30.00	6366009.460	1552723.680	21.510	RT90-RHB70	-58.3000	125.7000	15.5200	-0.1600	0.3100	
33.00	6366008.540	1552724.960	24.060	RT90-RHB70	-58.2900	125.5400	17.1000	-0.1900	0.3700	
36.00	6366007.620	1552726.250	26.620	RT90-RHB70	-58.1800	125.4000	18.6700	-0.2200	0.4300	
39.00	6366006.700	1552727.540	29.170	RT90-RHB70	-58.0900	125.3300	20.2500	-0.2600	0.5000	
42.00	6366005.790	1552728.830	31.710	RT90-RHB70	-58.0700	125.1900	21.8400	-0.3100	0.5700	
45.00	6366004.870	1552730.130	34.260	RT90-RHB70	-57.9800	125.0500	23.4300	-0.3500	0.6400	
48.00	6366003.960	1552731.430	36.800	RT90-RHB70	-57.8000	124.9100	25.0200	-0.4000	0.7100	
51.00	6366003.040	1552732.740	39.340	RT90-RHB70	-57.6600	124.8000	26.6100	-0.4600	0.8000	
54.00	6366002.130	1552734.060	41.880	RT90-RHB70	-57.5900	124.6800	28.2200	-0.5100	0.8900	
57.00	6366001.210	1552735.380	44.410	RT90-RHB70	-57.4400	124.5600	29.8200	-0.5700	0.9900	
60.00	6366000.300	1552736.710	46.940	RT90-RHB70	-57.2800	124.4600	31.4400	-0.6400	1.0900	
63.00	6365999.380	1552738.050	49.460	RT90-RHB70	-57.2100	124.3200	33.0600	-0.7100	1.2000	
66.00	6365998.460	1552739.390	51.980	RT90-RHB70	-57.1900	124.1500	34.6800	-0.7800	1.3200	
69.00	6365997.550	1552740.730	54.500	RT90-RHB70	-57.0800	124.0200	36.3000	-0.8500	1.4300	
72.00	6365996.640	1552742.080	57.020	RT90-RHB70	-56.9900	123.9000	37.9300	-0.9300	1.5600	
75.00	6365995.730	1552743.440	59.540	RT90-RHB70	-56.8700	123.8400	39.5600	-1.0200	1.6800	
78.00	6365994.810	1552744.800	62.050	RT90-RHB70	-56.8000	123.7600	41.2000	-1.1000	1.8200	
81.00	6365993.900	1552746.170	64.560	RT90-RHB70	-56.6200	123.7300	42.8400	-1.1900	1.9500	
84.00	6365992.980	1552747.540	67.070	RT90-RHB70	-56.4300	123.6400	44.4900	-1.2800	2.1000	
87.00	6365992.070	1552748.920	69.560	RT90-RHB70	-56.3900	123.4200	46.1500	-1.3800	2.2500	
90.00	6365991.150	1552750.310	72.060	RT90-RHB70	-56.3800	123.1500	47.8000	-1.4800	2.4100	
93.00	6365990.240	1552751.700	74.560	RT90-RHB70	-56.4100	122.9400	49.4600	-1.5800	2.5700	
96.00	6365989.340	1552753.090	77.060	RT90-RHB70	-56.4500	122.9200	51.1200	-1.7000	2.7200	
99.00	6365988.440	1552754.480	79.560	RT90-RHB70	-56.6300	122.9900	52.7700	-1.8100	2.8700	
102.00	6365987.540	1552755.870	82.070	RT90-RHB70	-56.7300	123.0500	54.4200	-1.9200	3.0200	
105.00	6365986.640	1552757.250	84.570	RT90-RHB70	-56.7700	123.1100	56.0600	-2.0300	3.1600	

108.00	6365985.750	1552758.620	87.080	RT90-RHB70	-56.7800	123.1500	57.7000	-2.1400	3.2900
111.00	6365984.850	1552760.000	89.590	RT90-RHB70	-56.7900	123.2400	59.3400	-2.2400	3.4300
114.00	6365983.950	1552761.370	92.100	RT90-RHB70	-56.8100	123.3300	60.9800	-2.3500	3.5700
117.00	6365983.040	1552762.750	94.610	RT90-RHB70	-56.8200	123.4600	62.6200	-2.4500	3.7000
120.00	6365982.140	1552764.120	97.130	RT90-RHB70	-56.8500	123.5700	64.2600	-2.5400	3.8400
123.00	6365981.230	1552765.480	99.640	RT90-RHB70	-56.8500	123.6900	65.9000	-2.6400	3.9700
126.00	6365980.320	1552766.850	102.150	RT90-RHB70	-56.8700	123.8300	67.5300	-2.7300	4.1000
129.00	6365979.410	1552768.210	104.660	RT90-RHB70	-56.8800	124.0300	69.1700	-2.8100	4.2300
132.00	6365978.490	1552769.570	107.170	RT90-RHB70	-56.9100	124.2000	70.8100	-2.9000	4.3700
135.00	6365977.570	1552770.920	109.690	RT90-RHB70	-56.9600	124.3200	72.4400	-2.9700	4.5000
138.00	6365976.650	1552772.270	112.200	RT90-RHB70	-57.0000	124.4500	74.0800	-3.0400	4.6300
141.00	6365975.720	1552773.620	114.720	RT90-RHB70	-57.0400	124.6500	75.7100	-3.1100	4.7500
144.00	6365974.800	1552774.960	117.240	RT90-RHB70	-57.0800	124.8400	77.3400	-3.1700	4.8800
147.00	6365973.860	1552776.300	119.750	RT90-RHB70	-57.1000	125.1500	78.9700	-3.2300	5.0000
150.00	6365972.930	1552777.630	122.270	RT90-RHB70	-57.1500	125.3300	80.6000	-3.2800	5.1200
153.00	6365971.990	1552778.960	124.790	RT90-RHB70	-57.2000	125.4900	82.2300	-3.3200	5.2400
156.00	6365971.040	1552780.280	127.310	RT90-RHB70	-57.2500	125.6400	83.8500	-3.3600	5.3600
159.00	6365970.100	1552781.600	129.840	RT90-RHB70	-57.2800	125.7400	85.4700	-3.4000	5.4700
162.00	6365969.150	1552782.920	132.360	RT90-RHB70	-57.3000	125.8000	87.1000	-3.4300	5.5900
165.00	6365968.200	1552784.230	134.890	RT90-RHB70	-57.2900	125.9200	88.7200	-3.4600	5.7000
168.00	6365967.250	1552785.550	137.410	RT90-RHB70	-57.3200	126.0300	90.3400	-3.4800	5.8100
171.00	6365966.300	1552786.860	139.940	RT90-RHB70	-57.3300	126.1900	91.9600	-3.5100	5.9200
174.00	6365965.340	1552788.160	142.460	RT90-RHB70	-57.3800	126.3700	93.5800	-3.5200	6.0300
177.00	6365964.380	1552789.470	144.990	RT90-RHB70	-57.4300	126.5800	95.1900	-3.5400	6.1400
180.00	6365963.420	1552790.760	147.520	RT90-RHB70	-57.4400	126.7300	96.8100	-3.5500	6.2400
183.00	6365962.450	1552792.060	150.040	RT90-RHB70	-57.4600	126.7200	98.4200	-3.5500	6.3500
186.00	6365961.490	1552793.350	152.570	RT90-RHB70	-57.4700	126.7000	100.0400	-3.5500	6.4500
189.00	6365960.520	1552794.640	155.100	RT90-RHB70	-57.4400	126.7200	101.6500	-3.5600	6.5600
192.00	6365959.560	1552795.940	157.630	RT90-RHB70	-57.3400	126.7700	103.2600	-3.5600	6.6600
195.00	6365958.590	1552797.240	160.160	RT90-RHB70	-57.2400	126.8000	104.8800	-3.5600	6.7700
198.00	6365957.620	1552798.540	162.680	RT90-RHB70	-57.1600	126.8500	106.5100	-3.5600	6.8900
201.00	6365956.640	1552799.840	165.200	RT90-RHB70	-57.1600	126.9200	108.1300	-3.5600	7.0000
204.00	6365955.660	1552801.140	167.720	RT90-RHB70	-57.1800	126.9200	109.7600	-3.5600	7.1200
207.00	6365954.690	1552802.440	170.240	RT90-RHB70	-57.2200	127.0100	111.3900	-3.5600	7.2400
210.00	6365953.710	1552803.740	172.760	RT90-RHB70	-57.2300	127.0300	113.0100	-3.5600	7.3600
213.00	6365952.730	1552805.030	175.290	RT90-RHB70	-57.2400	127.0300	114.6400	-3.5500	7.4700
216.00	6365951.750	1552806.330	177.810	RT90-RHB70	-57.2600	127.0200	116.2600	-3.5500	7.5900
219.00	6365950.780	1552807.620	180.330	RT90-RHB70	-57.2700	127.1000	117.8800	-3.5400	7.7000
222.00	6365949.800	1552808.920	182.860	RT90-RHB70	-57.3100	127.1200	119.5000	-3.5300	7.8200
225.00	6365948.820	1552810.210	185.380	RT90-RHB70	-57.3500	127.1300	121.1200	-3.5300	7.9300
228.00	6365947.840	1552811.500	187.910	RT90-RHB70	-57.3800	127.1700	122.7400	-3.5200	8.0400
231.00	6365946.870	1552812.790	190.430	RT90-RHB70	-57.4200	127.1900	124.3600	-3.5100	8.1500
234.00	6365945.890	1552814.070	192.960	RT90-RHB70	-57.4600	127.2100	125.9700	-3.5000	8.2500

237.00	6365944.910	1552815.360	195.490	RT90-RHB70	-57.5100	127.2600	127.5900	-3.4900	8.3600
240.00	6365943.940	1552816.640	198.020	RT90-RHB70	-57.5200	127.3300	129.2000	-3.4800	8.4600
243.00	6365942.960	1552817.920	200.550	RT90-RHB70	-57.5200	127.4800	130.8100	-3.4600	8.5600
246.00	6365941.980	1552819.200	203.080	RT90-RHB70	-57.5100	127.6200	132.4200	-3.4500	8.6600
249.00	6365941.000	1552820.480	205.610	RT90-RHB70	-57.5000	127.8100	134.0300	-3.4300	8.7600
252.00	6365940.010	1552821.750	208.140	RT90-RHB70	-57.5300	127.9500	135.6400	-3.4000	8.8600
255.00	6365939.020	1552823.020	210.670	RT90-RHB70	-57.5500	128.0200	137.2500	-3.3700	8.9600
258.00	6365938.030	1552824.290	213.210	RT90-RHB70	-57.5700	128.1200	138.8600	-3.3300	9.0600
261.00	6365937.040	1552825.560	215.740	RT90-RHB70	-57.5900	128.2200	140.4700	-3.3000	9.1600
264.00	6365936.040	1552826.820	218.270	RT90-RHB70	-57.5800	128.2900	142.0800	-3.2600	9.2500
267.00	6365935.040	1552828.080	220.800	RT90-RHB70	-57.5700	128.4500	143.6900	-3.2200	9.3500
270.00	6365934.040	1552829.340	223.340	RT90-RHB70	-57.6000	128.5700	145.3000	-3.1700	9.4500
273.00	6365933.040	1552830.600	225.870	RT90-RHB70	-57.6000	128.7100	146.9000	-3.1300	9.5400
276.00	6365932.040	1552831.850	228.400	RT90-RHB70	-57.6300	128.8300	148.5100	-3.0700	9.6400
279.00	6365931.030	1552833.100	230.940	RT90-RHB70	-57.6400	128.9000	150.1100	-3.0200	9.7300
282.00	6365930.020	1552834.350	233.470	RT90-RHB70	-57.6900	128.9000	151.7200	-2.9600	9.8200
285.00	6365929.010	1552835.600	236.000	RT90-RHB70	-57.7000	128.9300	153.3200	-2.9000	9.9200
288.00	6365928.010	1552836.850	238.540	RT90-RHB70	-57.6800	129.0000	154.9200	-2.8500	10.0100
291.00	6365927.000	1552838.090	241.080	RT90-RHB70	-57.6600	129.0800	156.5300	-2.7900	10.1000
294.00	6365925.990	1552839.340	243.610	RT90-RHB70	-57.6200	129.2400	158.1300	-2.7200	10.1900
297.00	6365924.970	1552840.580	246.140	RT90-RHB70	-57.6000	129.5000	159.7300	-2.6600	10.2800
300.00	6365923.950	1552841.820	248.680	RT90-RHB70	-57.6000	129.6900	161.3400	-2.5800	10.3800
303.00	6365922.920	1552843.060	251.210	RT90-RHB70	-57.6100	129.8900	162.9500	-2.5000	10.4700
306.00	6365921.890	1552844.290	253.740	RT90-RHB70	-57.6500	130.0700	164.5500	-2.4200	10.5700
309.00	6365920.860	1552845.520	256.280	RT90-RHB70	-57.6500	130.2600	166.1500	-2.3300	10.6600
312.00	6365919.820	1552846.750	258.810	RT90-RHB70	-57.6500	130.5000	167.7600	-2.2300	10.7500
315.00	6365918.780	1552847.970	261.350	RT90-RHB70	-57.6800	130.7100	169.3600	-2.1300	10.8400
318.00	6365917.730	1552849.180	263.880	RT90-RHB70	-57.7100	130.9100	170.9600	-2.0200	10.9300
321.00	6365916.680	1552850.400	266.420	RT90-RHB70	-57.7300	131.1700	172.5600	-1.9100	11.0200
324.00	6365915.630	1552851.600	268.950	RT90-RHB70	-57.7500	131.3400	174.1500	-1.7900	11.1000
327.00	6365914.570	1552852.800	271.490	RT90-RHB70	-57.7800	131.5500	175.7500	-1.6600	11.1900
330.00	6365913.510	1552854.000	274.030	RT90-RHB70	-57.8000	131.7500	177.3400	-1.5300	11.2700
333.00	6365912.440	1552855.190	276.570	RT90-RHB70	-57.8000	131.9100	178.9400	-1.3900	11.3500
336.00	6365911.380	1552856.380	279.110	RT90-RHB70	-57.8100	132.1500	180.5300	-1.2500	11.4300
339.00	6365910.300	1552857.570	281.650	RT90-RHB70	-57.8000	132.3800	182.1200	-1.1100	11.5100
342.00	6365909.220	1552858.750	284.180	RT90-RHB70	-57.7900	132.6800	183.7100	-0.9500	11.5900
345.00	6365908.140	1552859.920	286.720	RT90-RHB70	-57.8000	132.9700	185.3000	-0.7900	11.6700
348.00	6365907.050	1552861.090	289.260	RT90-RHB70	-57.7600	133.2300	186.8900	-0.6200	11.7500
351.00	6365905.960	1552862.260	291.800	RT90-RHB70	-57.7000	133.4500	188.4800	-0.4400	11.8200
354.00	6365904.850	1552863.420	294.330	RT90-RHB70	-57.6900	133.6800	190.0800	-0.2600	11.9100
357.00	6365903.750	1552864.580	296.870	RT90-RHB70	-57.7000	133.8600	191.6700	-0.0700	11.9900
360.00	6365902.630	1552865.740	299.410	RT90-RHB70	-57.7200	134.0200	193.2600	0.1300	12.0700
363.00	6365901.520	1552866.890	301.940	RT90-RHB70	-57.7100	134.2200	194.8500	0.3300	12.1500

366.00	6365900.400	1552868.040	304.480	RT90-RHB70	-57.7100	134.4300	196.4400	0.5400	12.2300
369.00	6365899.280	1552869.180	307.010	RT90-RHB70	-57.7100	134.7200	198.0300	0.7500	12.3100
372.00	6365898.150	1552870.320	309.550	RT90-RHB70	-57.7000	134.9700	199.6100	0.9700	12.3800
375.00	6365897.020	1552871.460	312.090	RT90-RHB70	-57.6800	135.2200	201.2000	1.1900	12.4600
378.00	6365895.880	1552872.590	314.620	RT90-RHB70	-57.7000	135.4800	202.7900	1.4300	12.5400
381.00	6365894.740	1552873.710	317.160	RT90-RHB70	-57.7100	135.7500	204.3700	1.6700	12.6100
384.00	6365893.590	1552874.830	319.690	RT90-RHB70	-57.7500	135.9700	205.9600	1.9100	12.6900
387.00	6365892.440	1552875.940	322.230	RT90-RHB70	-57.7800	136.1600	207.5400	2.1700	12.7600
390.00	6365891.290	1552877.050	324.770	RT90-RHB70	-57.8100	136.3700	209.1100	2.4300	12.8300
393.00	6365890.130	1552878.150	327.310	RT90-RHB70	-57.8300	136.5900	210.6900	2.6900	12.8900
396.00	6365888.970	1552879.250	329.850	RT90-RHB70	-57.8600	136.8000	212.2600	2.9600	12.9600
399.00	6365887.810	1552880.340	332.390	RT90-RHB70	-57.9000	136.9900	213.8400	3.2400	13.0200
402.00	6365886.640	1552881.430	334.930	RT90-RHB70	-57.9100	137.1300	215.4100	3.5200	13.0800
405.00	6365885.470	1552882.510	337.470	RT90-RHB70	-57.8900	137.2800	216.9700	3.8000	13.1400
408.00	6365884.300	1552883.600	340.010	RT90-RHB70	-57.9000	137.5000	218.5400	4.0900	13.2000
411.00	6365883.130	1552884.670	342.550	RT90-RHB70	-57.9300	137.6900	220.1100	4.3900	13.2500
414.00	6365881.950	1552885.750	345.090	RT90-RHB70	-57.9500	137.8600	221.6700	4.6900	13.3100
417.00	6365880.770	1552886.810	347.640	RT90-RHB70	-57.9500	138.0100	223.2400	4.9900	13.3600
420.00	6365879.580	1552887.880	350.180	RT90-RHB70	-57.9400	138.1900	224.8000	5.3000	13.4100
423.00	6365878.400	1552888.940	352.720	RT90-RHB70	-57.8900	138.4400	226.3600	5.6100	13.4600
426.00	6365877.200	1552890.000	355.260	RT90-RHB70	-57.8500	138.7900	227.9200	5.9300	13.5200
429.00	6365876.000	1552891.050	357.800	RT90-RHB70	-57.7900	139.1700	229.4800	6.2600	13.5700
432.00	6365874.790	1552892.100	360.340	RT90-RHB70	-57.7100	139.4500	231.0500	6.6000	13.6300
435.00	6365873.580	1552893.140	362.880	RT90-RHB70	-57.6600	139.6900	232.6100	6.9500	13.6800
438.00	6365872.350	1552894.180	365.410	RT90-RHB70	-57.6400	139.9100	234.1800	7.3100	13.7400
441.00	6365871.120	1552895.210	367.950	RT90-RHB70	-57.6200	140.1500	235.7400	7.6700	13.8000
444.00	6365869.890	1552896.240	370.480	RT90-RHB70	-57.6100	140.4100	237.3000	8.0400	13.8600
447.00	6365868.650	1552897.260	373.010	RT90-RHB70	-57.6100	140.7500	238.8700	8.4200	13.9200
450.00	6365867.410	1552898.280	375.550	RT90-RHB70	-57.6200	141.0100	240.4300	8.8000	13.9700
453.00	6365866.160	1552899.290	378.080	RT90-RHB70	-57.6300	141.3000	241.9800	9.2000	14.0200
456.00	6365864.900	1552900.300	380.610	RT90-RHB70	-57.6600	141.5800	243.5400	9.6000	14.0800
459.00	6365863.650	1552901.290	383.150	RT90-RHB70	-57.6900	141.8200	245.0900	10.0100	14.1200
462.00	6365862.390	1552902.280	385.680	RT90-RHB70	-57.7000	142.0700	246.6400	10.4200	14.1700
465.00	6365861.120	1552903.270	388.220	RT90-RHB70	-57.7100	142.3600	248.1900	10.8400	14.2100
468.00	6365859.850	1552904.250	390.760	RT90-RHB70	-57.7600	142.6000	249.7300	11.2700	14.2500
471.00	6365858.580	1552905.220	393.290	RT90-RHB70	-57.8100	142.8300	251.2700	11.7000	14.2900
474.00	6365857.310	1552906.190	395.830	RT90-RHB70	-57.8600	143.0500	252.8100	12.1400	14.3200
477.00	6365856.030	1552907.150	398.370	RT90-RHB70	-57.9000	143.3100	254.3400	12.5900	14.3500
480.00	6365854.750	1552908.100	400.910	RT90-RHB70	-57.9300	143.5400	255.8700	13.0400	14.3700
483.00	6365853.470	1552909.040	403.460	RT90-RHB70	-57.9700	143.8000	257.3900	13.5000	14.3900
486.00	6365852.190	1552909.980	406.000	RT90-RHB70	-57.9800	144.0400	258.9200	13.9600	14.4100
489.00	6365850.900	1552910.920	408.540	RT90-RHB70	-57.9800	144.3000	260.4400	14.4300	14.4300
492.00	6365849.610	1552911.850	411.090	RT90-RHB70	-57.9800	144.6000	261.9500	14.9100	14.4400

495.00	6365848.310	1552912.770	413.630	RT90-RHB70	-58.0100	144.8000	263.4700	15.3900	14.4500
498.00	6365847.010	1552913.680	416.170	RT90-RHB70	-58.0200	145.0100	264.9800	15.8800	14.4600
501.00	6365845.710	1552914.600	418.720	RT90-RHB70	-58.0200	145.2300	266.4900	16.3800	14.4700
504.00	6365844.410	1552915.500	421.260	RT90-RHB70	-58.0200	145.4600	268.0000	16.8800	14.4700
507.00	6365843.100	1552916.400	423.810	RT90-RHB70	-58.0300	145.7000	269.5000	17.3900	14.4700
510.00	6365841.790	1552917.300	426.350	RT90-RHB70	-58.0400	145.9700	271.0100	17.9000	14.4700
513.00	6365840.470	1552918.190	428.900	RT90-RHB70	-58.0500	146.2600	272.5100	18.4200	14.4700
516.00	6365839.150	1552919.070	431.440	RT90-RHB70	-58.0700	146.5100	274.0100	18.9500	14.4700
519.00	6365837.830	1552919.940	433.990	RT90-RHB70	-58.0600	146.6900	275.5000	19.4800	14.4600
522.00	6365836.500	1552920.810	436.540	RT90-RHB70	-57.9900	146.8400	276.9900	20.0200	14.4500
525.00	6365835.170	1552921.680	439.080	RT90-RHB70	-57.9500	147.0600	278.4900	20.5600	14.4400
528.00	6365833.830	1552922.550	441.620	RT90-RHB70	-57.9300	147.2600	279.9800	21.1100	14.4400
531.00	6365832.490	1552923.410	444.160	RT90-RHB70	-57.9000	147.5200	281.4700	21.6700	14.4300
534.00	6365831.150	1552924.270	446.710	RT90-RHB70	-57.9200	147.7500	282.9700	22.2300	14.4200
537.00	6365829.800	1552925.120	449.250	RT90-RHB70	-57.9500	147.9600	284.4500	22.8000	14.4100
540.00	6365828.450	1552925.960	451.790	RT90-RHB70	-57.9600	148.1800	285.9400	23.3700	14.4000
543.00	6365827.100	1552926.800	454.330	RT90-RHB70	-57.9700	148.3700	287.4200	23.9500	14.3800
546.00	6365825.750	1552927.640	456.880	RT90-RHB70	-57.9800	148.6300	288.9000	24.5400	14.3600
549.00	6365824.390	1552928.460	459.420	RT90-RHB70	-57.9600	148.8300	290.3800	25.1300	14.3400
552.00	6365823.030	1552929.290	461.960	RT90-RHB70	-57.9500	149.0300	291.8500	25.7200	14.3200
555.00	6365821.660	1552930.110	464.510	RT90-RHB70	-57.9500	149.2600	293.3300	26.3200	14.3000
558.00	6365820.290	1552930.920	467.050	RT90-RHB70	-57.9700	149.4900	294.8000	26.9300	14.2700
561.00	6365818.920	1552931.730	469.590	RT90-RHB70	-57.9900	149.7500	296.2700	27.5400	14.2400
564.00	6365817.550	1552932.530	472.140	RT90-RHB70	-58.0000	149.9500	297.7300	28.1600	14.2100
567.00	6365816.170	1552933.330	474.680	RT90-RHB70	-57.9700	150.1500	299.2000	28.7900	14.1700
570.00	6365814.790	1552934.120	477.220	RT90-RHB70	-57.9600	150.3400	300.6600	29.4100	14.1400
573.00	6365813.410	1552934.910	479.770	RT90-RHB70	-57.9300	150.5800	302.1200	30.0500	14.1000
576.00	6365812.020	1552935.690	482.310	RT90-RHB70	-57.9100	150.8500	303.5800	30.6900	14.0700
579.00	6365810.630	1552936.460	484.850	RT90-RHB70	-57.9100	151.0400	305.0300	31.3400	14.0300
582.00	6365809.230	1552937.240	487.390	RT90-RHB70	-57.9200	151.2100	306.4900	31.9900	13.9900
585.00	6365807.840	1552938.000	489.930	RT90-RHB70	-57.9100	151.4100	307.9400	32.6500	13.9500
588.00	6365806.440	1552938.770	492.480	RT90-RHB70	-57.9400	151.6000	309.3900	33.3100	13.9000
591.00	6365805.040	1552939.520	495.020	RT90-RHB70	-57.9600	151.8400	310.8300	33.9800	13.8600
594.00	6365803.630	1552940.270	497.560	RT90-RHB70	-57.9700	152.0800	312.2800	34.6500	13.8000
597.00	6365802.230	1552941.020	500.100	RT90-RHB70	-57.9800	152.2900	313.7100	35.3300	13.7500
600.00	6365800.820	1552941.760	502.650	RT90-RHB70	-57.9700	152.5200	315.1500	36.0100	13.6900
603.00	6365799.410	1552942.490	505.190	RT90-RHB70	-57.9600	152.7400	316.5800	36.7000	13.6400
606.00	6365797.990	1552943.220	507.730	RT90-RHB70	-57.9400	153.0700	318.0200	37.4000	13.5800
609.00	6365796.570	1552943.940	510.280	RT90-RHB70	-57.9200	153.3400	319.4500	38.1000	13.5100
612.00	6365795.150	1552944.660	512.820	RT90-RHB70	-57.9500	153.6400	320.8700	38.8100	13.4500
615.00	6365793.720	1552945.370	515.360	RT90-RHB70	-57.9800	153.8800	322.2900	39.5300	13.3800
618.00	6365792.300	1552946.070	517.910	RT90-RHB70	-57.9800	154.1000	323.7100	40.2500	13.3100
621.00	6365790.870	1552946.760	520.450	RT90-RHB70	-58.0000	154.3000	325.1200	40.9800	13.2300

624.00	6365789.430	1552947.450	522.990	RT90-RHB70	-57.9900	154.4900	326.530041.7100		13.1500
627.00	6365788.000	1552948.130	525.540	RT90-RHB70	-57.9800	154.6700	327.940042.4500		13.0700
630.00	6365786.560	1552948.820	528.080	RT90-RHB70	-57.9300	154.9200	329.350043.1900		12.9900
633.00	6365785.120	1552949.490	530.620	RT90-RHB70	-57.9400	155.1600	330.750043.9400		12.9100
636.00	6365783.670	1552950.160	533.170	RT90-RHB70	-57.9500	155.4000	332.160044.7000		12.8200
639.00	6365782.220	1552950.820	535.710	RT90-RHB70	-57.9300	155.6500	333.560045.4600		12.7300
642.00	6365780.770	1552951.480	538.250	RT90-RHB70	-57.9100	155.9000	334.950046.2200		12.6400
645.00	6365779.320	1552952.130	540.790	RT90-RHB70	-57.8900	156.2100	336.340047.0000		12.5500
648.00	6365777.860	1552952.770	543.330	RT90-RHB70	-57.8600	156.3900	337.730047.7800		12.4500
651.00	6365776.400	1552953.410	545.870	RT90-RHB70	-57.8300	156.6000	339.120048.5700		12.3600
654.00	6365774.930	1552954.050	548.410	RT90-RHB70	-57.8100	156.8600	340.510049.3600		12.2600
657.00	6365773.460	1552954.670	550.950	RT90-RHB70	-57.7800	157.0400	341.890050.1600		12.1600
660.00	6365771.990	1552955.300	553.490	RT90-RHB70	-57.7900	157.2600	343.280050.9600		12.0600
663.00	6365770.510	1552955.920	556.030	RT90-RHB70	-57.7300	157.4600	344.650051.7700		11.9600
666.00	6365769.030	1552956.530	558.560	RT90-RHB70	-57.6700	157.7000	346.030052.5900		11.8600
669.00	6365767.550	1552957.140	561.100	RT90-RHB70	-57.6400	158.0000	347.410053.4100		11.7500
672.00	6365766.060	1552957.740	563.630	RT90-RHB70	-57.6100	158.2200	348.780054.2400		11.6500
675.00	6365764.570	1552958.340	566.170	RT90-RHB70	-57.5500	158.4800	350.160055.0800		11.5400
678.00	6365763.070	1552958.930	568.700	RT90-RHB70	-57.5000	158.7100	351.530055.9200		11.4300
681.00	6365761.570	1552959.510	571.230	RT90-RHB70	-57.5000	158.9300	352.900056.7700		11.3300
684.00	6365760.070	1552960.090	573.760	RT90-RHB70	-57.4700	159.2000	354.260057.6300		11.2200
687.00	6365758.560	1552960.670	576.290	RT90-RHB70	-57.3900	159.4500	355.630058.4900		11.1000
690.00	6365757.040	1552961.230	578.820	RT90-RHB70	-57.3500	159.7500	356.990059.3600		10.9900
693.00	6365755.530	1552961.790	581.340	RT90-RHB70	-57.3700	160.0800	358.350060.2400		10.8800
696.00	6365754.000	1552962.340	583.870	RT90-RHB70	-57.3900	160.4100	359.700061.1300		10.7600
699.00	6365752.480	1552962.890	586.390	RT90-RHB70	-57.3500	160.7300	361.050062.0200		10.6300
702.00	6365750.950	1552963.420	588.920	RT90-RHB70	-57.3000	161.0300	362.390062.9200		10.5100
705.00	6365749.420	1552963.950	591.450	RT90-RHB70	-57.2800	161.3400	363.730063.8400		10.3800
708.00	6365747.880	1552964.470	593.970	RT90-RHB70	-57.2500	161.6600	365.070064.7500		10.2500
711.00	6365746.340	1552964.980	596.490	RT90-RHB70	-57.2000	161.9400	366.400065.6800		10.1100
714.00	6365744.800	1552965.480	599.010	RT90-RHB70	-57.1600	162.2400	367.730066.6100		9.9700
717.00	6365743.250	1552965.980	601.530	RT90-RHB70	-57.0600	162.6200	369.060067.5600		9.8300
720.00	6365741.690	1552966.460	604.050	RT90-RHB70	-57.0300	162.9100	370.380068.5100		9.6900
723.00	6365740.130	1552966.940	606.570	RT90-RHB70	-57.0400	163.2300	371.700069.4700		9.5500
726.00	6365738.570	1552967.410	609.090	RT90-RHB70	-57.0300	163.5500	373.010070.4400		9.4000
729.00	6365737.000	1552967.880	611.600	RT90-RHB70	-57.0000	163.9000	374.320071.4200		9.2500
732.00	6365735.430	1552968.330	614.120	RT90-RHB70	-56.9600	164.2000	375.630072.4000		9.0900
735.00	6365733.860	1552968.780	616.630	RT90-RHB70	-56.9000	164.5700	376.930073.3900		8.9300
738.00	6365732.280	1552969.210	619.150	RT90-RHB70	-56.8300	164.9900	378.220074.3900		8.7700
741.00	6365730.690	1552969.640	621.660	RT90-RHB70	-56.7800	165.3900	379.510075.4100		8.6100
744.00	6365729.100	1552970.050	624.170	RT90-RHB70	-56.7200	165.6800	380.800076.4300		8.4400
747.00	6365727.510	1552970.460	626.680	RT90-RHB70	-56.6700	165.9400	382.080077.4600		8.2700
750.00	6365725.910	1552970.860	629.180	RT90-RHB70	-56.5900	166.2300	383.360078.5000		8.0900

753.00	6365724.310	1552971.250	631.690	RT90-RHB70	-56.5000	166.5600	384.6400	79.5500	7.9200
756.00	6365722.700	1552971.640	634.190	RT90-RHB70	-56.4200	166.8600	385.9100	80.6100	7.7500
759.00	6365721.080	1552972.010	636.690	RT90-RHB70	-56.3300	167.1900	387.1800	81.6800	7.5700
762.00	6365719.460	1552972.380	639.180	RT90-RHB70	-56.2300	167.5300	388.4500	82.7500	7.3900
765.00	6365717.830	1552972.740	641.680	RT90-RHB70	-56.1400	167.8000	389.7200	83.8400	7.2100
768.00	6365716.200	1552973.100	644.170	RT90-RHB70	-56.0300	168.1600	390.9800	84.9400	7.0300
771.00	6365714.560	1552973.440	646.660	RT90-RHB70	-55.9200	168.5300	392.2400	86.0400	6.8500
774.00	6365712.910	1552973.770	649.140	RT90-RHB70	-55.7900	168.8300	393.4900	87.1600	6.6700
777.00	6365711.250	1552974.100	651.620	RT90-RHB70	-55.6500	169.1400	394.7500	88.2900	6.4900
780.00	6365709.590	1552974.420	654.100	RT90-RHB70	-55.5700	169.4500	396.0000	89.4300	6.3100
783.00	6365707.920	1552974.730	656.570	RT90-RHB70	-55.4900	169.7500	397.2500	90.5800	6.1200
786.00	6365706.250	1552975.030	659.050	RT90-RHB70	-55.4200	169.9800	398.4900	91.7300	5.9400
789.00	6365704.570	1552975.330	661.520	RT90-RHB70	-55.3500	170.1000	399.7400	92.9000	5.7500
792.00	6365702.890	1552975.620	663.980	RT90-RHB70	-55.2500	170.2500	400.9800	94.0600	5.5700
795.00	6365701.210	1552975.910	666.450	RT90-RHB70	-55.1700	170.4700	402.2200	95.2400	5.3900
798.00	6365699.520	1552976.200	668.910	RT90-RHB70	-55.0800	170.6900	403.4600	96.4200	5.2000
801.00	6365697.820	1552976.470	671.370	RT90-RHB70	-54.9100	170.9100	404.7000	97.6100	5.0200
804.00	6365696.120	1552976.750	673.830	RT90-RHB70	-54.7400	171.1000	405.9400	98.8100	4.8400
807.00	6365694.410	1552977.010	676.280	RT90-RHB70	-54.6100	171.2200	407.1800	100.0200	4.6600
810.00	6365692.690	1552977.280	678.720	RT90-RHB70	-54.5000	171.3800	408.4200	101.2300	4.4800
813.00	6365690.970	1552977.540	681.160	RT90-RHB70	-54.4100	171.5700	409.6600	102.4600	4.3100
816.00	6365689.240	1552977.800	683.600	RT90-RHB70	-54.2800	171.7100	410.9000	103.6800	4.1400
819.00	6365687.510	1552978.050	686.040	RT90-RHB70	-54.1600	171.8400	412.1400	104.9200	3.9700
822.00	6365685.770	1552978.300	688.470	RT90-RHB70	-54.0900	172.0000	413.3900	106.1600	3.8000
825.00	6365684.030	1552978.540	690.900	RT90-RHB70	-54.0000	172.1600	414.6300	107.4100	3.6400
828.00	6365682.280	1552978.780	693.330	RT90-RHB70	-53.9100	172.4000	415.8700	108.6600	3.4700
831.00	6365680.530	1552979.020	695.750	RT90-RHB70	-53.8000	172.5900	417.1100	109.9200	3.3000
834.00	6365678.770	1552979.250	698.170	RT90-RHB70	-53.7000	172.8000	418.3400	111.1900	3.1400
837.00	6365677.010	1552979.470	700.590	RT90-RHB70	-53.5900	173.1200	419.5800	112.4700	2.9700
840.00	6365675.240	1552979.680	703.010	RT90-RHB70	-53.4900	173.4000	420.8100	113.7600	2.8000
843.00	6365673.470	1552979.890	705.420	RT90-RHB70	-53.3900	173.6800	422.0300	115.0500	2.6400
846.00	6365671.690	1552980.080	707.830	RT90-RHB70	-53.2800	173.9300	423.2600	116.3600	2.4600
849.00	6365669.910	1552980.270	710.230	RT90-RHB70	-53.1400	174.1100	424.4800	117.6700	2.2900
852.00	6365668.120	1552980.460	712.630	RT90-RHB70	-52.9900	174.2600	425.7000	118.9900	2.1300
855.00	6365666.320	1552980.640	715.030	RT90-RHB70	-52.8800	174.4200	426.9200	120.3200	1.9600
858.00	6365664.520	1552980.810	717.420	RT90-RHB70	-52.7600	174.5600	428.1500	121.6600	1.8000
861.00	6365662.710	1552980.990	719.810	RT90-RHB70	-52.6200	174.6900	429.3700	123.0000	1.6300
864.00	6365660.900	1552981.160	722.190	RT90-RHB70	-52.5000	174.8600	430.5900	124.3500	1.4700
867.00	6365659.080	1552981.320	724.570	RT90-RHB70	-52.3900	175.0500	431.8100	125.7100	1.3100
870.00	6365657.260	1552981.480	726.950	RT90-RHB70	-52.2600	175.2100	433.0300	127.0700	1.1600
873.00	6365655.430	1552981.630	729.320	RT90-RHB70	-52.0800	175.3300	434.2500	128.4500	1.0000
876.00	6365653.590	1552981.780	731.690	RT90-RHB70	-51.9100	175.4000	435.4700	129.8300	0.8500
879.00	6365651.740	1552981.930	734.050	RT90-RHB70	-51.7600	175.5300	436.7000	131.2100	0.7100

882.00	6365649.890	1552982.070	736.400	RT90-RHB70	-51.6200	175.6400	437.9200	132.6100	0.5600
885.00	6365648.040	1552982.210	738.760	RT90-RHB70	-51.4900	175.7600	439.1500	134.0100	0.4200
888.00	6365646.170	1552982.350	741.100	RT90-RHB70	-51.3500	175.9100	440.3800	135.4200	0.2900
891.00	6365644.300	1552982.490	743.450	RT90-RHB70	-51.2100	176.1000	441.6100	136.8300	0.1500
894.00	6365642.430	1552982.610	745.780	RT90-RHB70	-51.1000	176.3100	442.8300	138.2600	0.0200
897.00	6365640.550	1552982.740	748.120	RT90-RHB70	-50.9700	176.5100	444.0600	139.6900	-0.1100
900.00	6365638.660	1552982.850	750.450	RT90-RHB70	-50.8400	176.7000	445.2800	141.1300	-0.2400
903.00	6365636.770	1552982.960	752.780	RT90-RHB70	-50.7200	176.7900	446.5000	142.5800	-0.3700
906.00	6365634.880	1552983.070	755.100	RT90-RHB70	-50.5700	176.8500	447.7300	144.0300	-0.5000
909.00	6365632.970	1552983.170	757.410	RT90-RHB70	-50.4200	176.9000	448.9500	145.4900	-0.6300
912.00	6365631.060	1552983.270	759.730	RT90-RHB70	-50.2700	177.0200	450.1800	146.9500	-0.7400
915.00	6365629.150	1552983.370	762.030	RT90-RHB70	-50.1000	177.1300	451.4100	148.4300	-0.8600
918.00	6365627.230	1552983.470	764.340	RT90-RHB70	-49.9500	177.3200	452.6400	149.9100	-0.9700
921.00	6365625.300	1552983.560	766.630	RT90-RHB70	-49.8300	177.5000	453.8600	151.4000	-1.0800
924.00	6365623.370	1552983.640	768.920	RT90-RHB70	-49.6900	177.6700	455.0900	152.8900	-1.1900
927.00	6365621.430	1552983.720	771.210	RT90-RHB70	-49.5400	177.7700	456.3200	154.4000	-1.3000
930.00	6365619.480	1552983.800	773.490	RT90-RHB70	-49.3600	177.8100	457.5400	155.9100	-1.4000
933.00	6365617.530	1552983.870	775.770	RT90-RHB70	-49.2200	177.8300	458.7700	157.4300	-1.5000
936.00	6365615.570	1552983.950	778.040	RT90-RHB70	-49.0700	177.8900	460.0100	158.9500	-1.5900
939.00	6365613.610	1552984.020	780.310	RT90-RHB70	-48.9600	177.9500	461.2400	160.4800	-1.6800
942.00	6365611.640	1552984.090	782.570	RT90-RHB70	-48.8100	178.0600	462.4800	162.0100	-1.7600
945.00	6365609.660	1552984.160	784.830	RT90-RHB70	-48.6700	178.1700	463.7200	163.5500	-1.8500
948.00	6365607.680	1552984.220	787.080	RT90-RHB70	-48.5400	178.3000	464.9600	165.1000	-1.9300
951.00	6365605.700	1552984.280	789.330	RT90-RHB70	-48.3900	178.4700	466.2000	166.6500	-2.0000
954.00	6365603.710	1552984.330	791.570	RT90-RHB70	-48.2700	178.6700	467.4300	168.2100	-2.0800
957.00	6365601.710	1552984.380	793.810	RT90-RHB70	-48.1400	178.8800	468.6700	169.7800	-2.1500
960.00	6365599.710	1552984.420	796.050	RT90-RHB70	-48.0100	179.0500	469.9000	171.3600	-2.2300
963.00	6365597.700	1552984.450	798.280	RT90-RHB70	-47.9100	179.2200	471.1300	172.9400	-2.3000
966.00	6365595.690	1552984.480	800.500	RT90-RHB70	-47.7800	179.3900	472.3600	174.5400	-2.3800
969.00	6365593.680	1552984.500	802.730	RT90-RHB70	-47.6500	179.5600	473.5800	176.1400	-2.4500
972.00	6365591.660	1552984.520	804.940	RT90-RHB70	-47.5200	179.7000	474.8100	177.7400	-2.5300
975.00	6365589.630	1552984.530	807.160	RT90-RHB70	-47.4000	179.8300	476.0300	179.3600	-2.6000
978.00	6365587.600	1552984.530	809.360	RT90-RHB70	-47.2300	179.9300	477.2500	180.9800	-2.6700
981.00	6365585.560	1552984.540	811.570	RT90-RHB70	-47.0700	180.0300	478.4800	182.6100	-2.7300
984.00	6365583.520	1552984.530	813.760	RT90-RHB70	-46.8900	180.1400	479.7000	184.2400	-2.8000
987.00	6365581.470	1552984.530	815.950	RT90-RHB70	-46.7100	180.2400	480.9300	185.8900	-2.8500
990.00	6365579.410	1552984.520	818.140	RT90-RHB70	-46.5000	180.3400	482.1500	187.5400	-2.9100
996.00	6365575.270	1552984.490	822.470	RT90-RHB70	-46.1900	180.4900	484.6100	190.8800	-2.9900

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Appendix 10

In data: Reference marks for length adjustments for KSH03A and KSH03B

Reference Mark T - Reference mark in drillhole

KSH03A, 2003-11-14 11:00:00 - 2003-11-14 15:30:00 (0.000 - 1000.700 m)

Bhlen (m)	Rotation Speed (rpm)	Start Flow (l/min)	Stop Flow (l/min)	Stop Pressure (bar)	Cutter Time (s)	Trace Detectable	Cutter Diameter (mm)	Comment
110.00	400.00	240	1000	34.0	67	Yes		
150.00	400.00	240	1000	40.0	82	Yes		
200.00	400.00	320	1000	37.0	100	Yes		
250.00	400.00	400	1000	36.0	76	Yes		
300.00	400.00	360	1000	36.0	125	Yes		
350.00	400.00	280	1000	42.0	107	Yes		
400.00	400.00	260	1000	42.0	88	Yes		
450.00	400.00	386	1000	42.0	103	Yes		
500.00	400.00	300	1000	42.0	99	Yes		
550.00	400.00	380	1000	46.0	94	Yes		
600.00	400.00	320	1000	44.0	150	Yes		
650.00	400.00	300	1000	44.0	81	Yes		
700.00	400.00	300	1000	46.0	96	Yes		
750.00	400.00	320	1000	46.0	140	Yes		
800.00	400.00	300	1000	46.0	102	Yes		
850.00	400.00	300	1000	46.0	105	Yes		
900.00	400.00	280	1000	48.0	110	Yes		
950.00	400.00	300	1000	48.0	120	Yes		

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