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Oskarshamn site investigation

Hydrochemical logging in KLX19A

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December 2006

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Abstract

Hydrochemical logging, also called tube sampling, has been performed in the core drilled borehole KLX19A. The method is a fast and simple sampling technique for obtaining information about the chemical composition of the water along an open borehole. The equipment consists of an approximately 1,000 m long polyamide tube divided into units of 50 m. An appropriate number of tube units can be used to suit the actual borehole length, in this case c. 800 m.

The water content in each tube unit constituted one sample. Every second sample, starting with the lowermost tube unit, was analysed according to SKB chemistry class 3 (isotope options excluded). Samples for isotope determination were collected at the time of sampling and stored in a freezer (^3H in a refrigerator); oxygen-18 ($\delta^{18}O$), deuterium (δ^2H), tritium (^3H), boron-10/boron-11 ratio ($^{10}B/^{11}B$), chlorine-37 ($\delta^{37}Cl$) and strontium-87/strontium-86 ratio ($^{87}Sr/^{86}Sr$) from odd-numbered tube units and sulphur-34 ($\delta^{34}S$), carbon-13 ($\delta^{13}C$) and carbon-14 (^{14}C) from even-numbered tube units. If these samples are analysed later, the results from the analyses will be reported in a separate report.

The drill water content remaining in the borehole after drilling was below 20% only for the upper four tube units analysed. The maximum drill water content was 67.7% in tube unit 740–790 m. The relative charge balance error did not exceed the acceptable limit of ± 5%, for any of the eight samples analysed.

Sammanfattning

Hydrokemisk loggning, även kallad slangprovtagning, har utförts i det kärnborrade borrhålet KLX19A. Metoden är snabb och enkel att använda för att erhålla information om den kemiska sammansättningen hos grundvattnet längs ett öppet borrhål. Utrustningen består av en cirka 1 000 m lång polyamidslang uppdelad i enheter om vardera 50 m. Lämpligt antal slangenheter kan användas för att anpassa längden till det aktuella borrhålets längd, i detta fall ca 800 m.

Innehållet i en slangenhet utgör ett prov. Varannan slangenhet, med start från den nedersta, analyserades enligt SKB kemiklass 3 (exklusive alla tillval). Prover för bestämning av isotoptillvalen togs ut vid provtagningstillfället och sparades i frys (^{3}H i kylskåp); syre-18 (δ^{18}O), deuterium (δ^{2}H), tritium (^{3}H), kvoten bor-10/bor-11 (^{10}B/^{11}B), klor-37 (δ^{37}Cl) och kvoten strontium-87/strontium-86 (^{87}Sr/^{86}Sr) ur udda enheter, svavel-34 (δ^{34}S), kol-13 (δ^{13}C) och kol-14 (^{14}C) ur jämna enheter. Om dessa prover analyseras senare kommer resultaten av dessa analyser att sammanfattas i en separat rapport.

Halten kvarvarande spolvatten i borrhålet efter avslutad borrning var under tjugo procent bara för de fyra översta analyserade slangenheterna. Den högsta uppmätta halten var på 67,7 % i slangenhet 740–790 m. Det relativa felet i jonbalansen översteg inte den acceptabla nivån av ± 5 % i något av de åtta analyserade proverna.

Contents

1 Introduction

This document reports the performance and results from the Hydrochemical logging in bore-hole KLX19A. The Hydrochemical logging is one of the activities performed within the site investigation at Oskarshamn /1, 2/. The work was carried out in accordance with activity plan AP PS 400-06-122. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents. The obtained data from the activity are reported to the database SICADA, where they are traceable by the activity plan number.

Borehole KLX19A is an 800.07 m long telescopic borehole, drilled within the site investigation in the Oskarshamn area. The percussion borehole HLX28 served as the source of flushing water for the drilling of KLX19A. The locations of KLX19A and HLX28 are shown in Figure 1-1.

The borehole KLX19A is not one of the so called SKB chemical type; see method descriptions MD 620.003 (Method description for drilling cored boreholes) and 610.003 (Method description for percussion drilling). The cleaning procedures of all equipment used in the borehole, during and after drilling, were performed according to level 1 in the cleaning instructions in MD 600.004 (Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning).

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

Activity plan	Number	Version
Hydrokemisk loggning i KLX19A	AP PS 400-06-122	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för hydrokemisk loggning	SKB MD 422.001	2.0
Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning	SKB MD 600.004	1.0

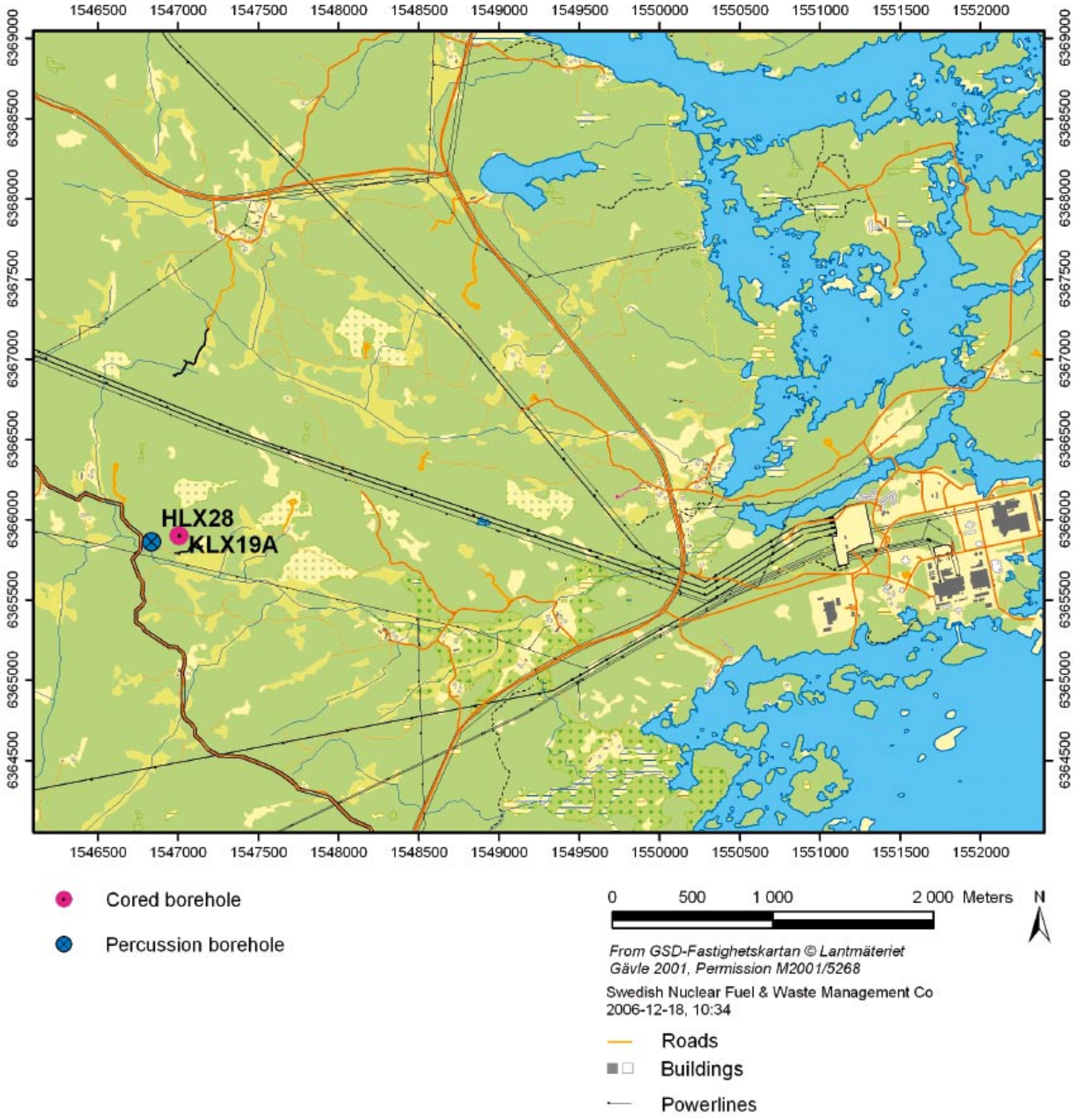

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Figure 1-1. *Location of the core drilled borehole KLX19A and the percussion borehole HLX28 within the site investigation in the Oskarshamn area.*

2 Objective and scope

Hydrochemical logging was performed in order to obtain an overview of the chemical composition of the water along the open borehole KLX19A. The technique used for sampling is fast and simple, also for boreholes of considerable lengths.

The analysis program was carried out according to SKB chemistry class 3 except for optional isotopes. Sample portions intended for isotope analyses were collected at the time of sampling. If these samples will be analysed, the results will be presented in a separate report.

3 Sampling equipment

For the Hydrochemical logging an approximately 800 m long polyamide tube, divided into units of 50 m, was used. The equipment is described in the method description, see Table 1-1.

A schematic picture of the equipment used for the Hydrochemical logging is shown in Figure 3-1. The tube units are connected using metal couplings and manual shut off valves. The external and internal diameters of the tube units are 10 and 8 mm, respectively. The first tube lowered down the borehole has a non-return valve at the bottom to prevent water outflow while lifting the tube units. At the lower end of the tube array, a weight is added in order to stretch the array and thereby prevent fastening.

The water content in each tube unit constitutes one sample, and the volume of each sample is approximately two and a half litres.

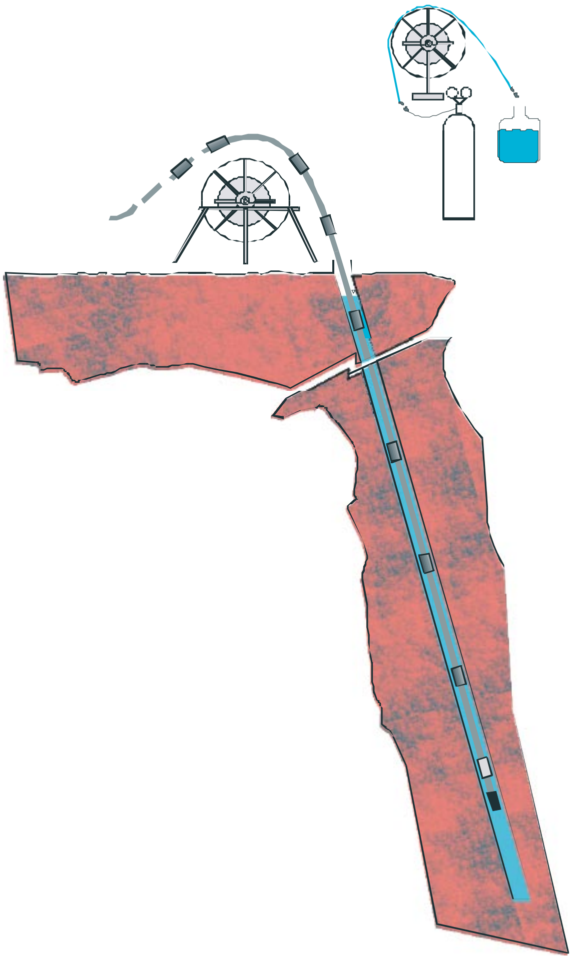

Figure 3-1. *Equipment for Hydrochemical logging in boreholes. At the lower end of the tube array there is a non-return valve and a weight connected. Each tube unit is 50 m long.*

4 Execution

4.1 Hydrochemical logging

The Hydrochemical logging in KLX19A was performed on October 18, 2006 according to the activity plan AP PS 400-06-122 and in compliance with the method description SKB MD 422.001 (cf. Table 1-1).

The equipment was lowered to a length of 790 m of borehole length, in order to avoid potential settled drilling debris at the bottom of the borehole, and thereby decrease the risk of fastening. The tubes were lowered down the borehole at a rate of about five m/minute. The lowering of the tube units started at 08:31 and the lifting of the tubes started at 12:46. The last tube unit was retrieved at 14:40. Pressurized nitrogen gas was used to empty the tube units and the water samples were portioned into sample bottles. Each tube unit represented one sample.

The ground water level measured before and after the Hydrochemical logging was 7.12 and 7.07 m, respectively, below top of casing. As the tube unit at the top of the tube array was lowered to 40 m of its length, the sampling resulted in a not completely filled tube unit.

4.2 Sample treatment and chemical analysis

An overview of sample treatment and analysis routines of the activity is given in Appendix 1.

An overview showing the samples obtained at the logging occasion is given in Table 4-1. Sample portions intended for isotope analyses were collected at the sampling occasion but not sent for analysis. These samples are stored in a freezer at SKB (except for the samples collected for ^{3}H analyses which are stored in a refrigerator). If these samples will be sent for analysis later, the results will be presented in a separate report. The data from the Hydrochemical logging are stored in the database SICADA. The SKB sample numbers are 11389–11404.

The uppermost tube unit was not completely filled, see Section 4.1. All other tube units seemed, by visual inspection, to be fully filled with sample water; only small bubbles of gas was observed during lifting. Due to the lack of water in the first tube unit, see above, only one archive sample was collected from the uppermost tube unit.

4.3 Data handling

The following routines for quality control and data management are generally applied for hydrogeochemical analysis data, irrespectively of sampling method or sampling object.

All analytical results were stored in the SICADA database. The applied hierarchy path "Hydrochemistry/Hydrochemical investigation/Analyses/Water in the database" contains two types of tables, raw data tables and primary data tables (final data tables).

Data from **basic water analyses** are inserted into raw data tables for further evaluation. The evaluation results in a final data set for each sample. These data sets are compiled in a primary data table named "water_composition". The evaluation is based on:

- Comparison of the results from different laboratories and/or methods. The analyses are repeated if a large disparity is noted (generally more than 10%).

Table 4-1. Overview of samples collected at the Hydrochemical logging in KLX19A. Filled cells represent collected samples. Striped (blue) filling represent samples sent for analyses, light (yellow) filling represent samples collected and stored in a freezer (^{3}H in a refrigerator) and dashed (purple) cells represent archive samples.

Sample information			Collected sample portions											Archive
Tube unit	Length [m]	SKB no.	Cond., pH, alk.	Major Comp.	Uranine	An-ions	^{3}H	δ ^{2}H δ^{18}O	δ^{37}Cl	^{10}B/ ^{11}B	^{87}Sr/ ^{86}Sr	δ^{34}S	δ^{13}C and ^{14}C	Filtered 2×250 mL
20	0 40	11389										🟨	🟨	ж
15	90	11390	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
14	140	11391										🟨	🟨	▨
13	190	11392	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
12	240	11393										🟨	🟨	▨
11	290	11394	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
10	340	11395										🟨	🟨	▨
9	390	11396	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
8	440	11397										🟨	🟨	▨
7	490	11398	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
6	540	11399										🟨	🟨	▨
5	590	11400	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
4	640	11401										🟨	🟨	▨
3	690	11402	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			
2	740	11403										🟨	🟨	▨
1	740 790	11404	▥	▥	▥	▥	🟨	🟨	🟨	🟨	🟨			

ж Only one archive sample due to lack of water in tube unit.

- Calculation of charge balance errors. Relative errors within ± 5% are considered acceptable (in surface waters ± 10%).

$$\text{Relative error (\%)} = 100 \times \frac{\sum \text{cations(equivalents)} - \sum \text{anions(equivalents)}}{\sum \text{cations(equivalents)} + \sum \text{anions(equivalents)}}$$

- General judgement of plausibility based on earlier results and experiences.

All results from **special analyses** of **trace metals** and **isotopes** are inserted directly into primary data tables. In cases where the analyses are repeated or performed by more than one laboratory, a "best choice" notation will indicate the results considered most reliable.

An overview of the data management is given in Figure 4-1.

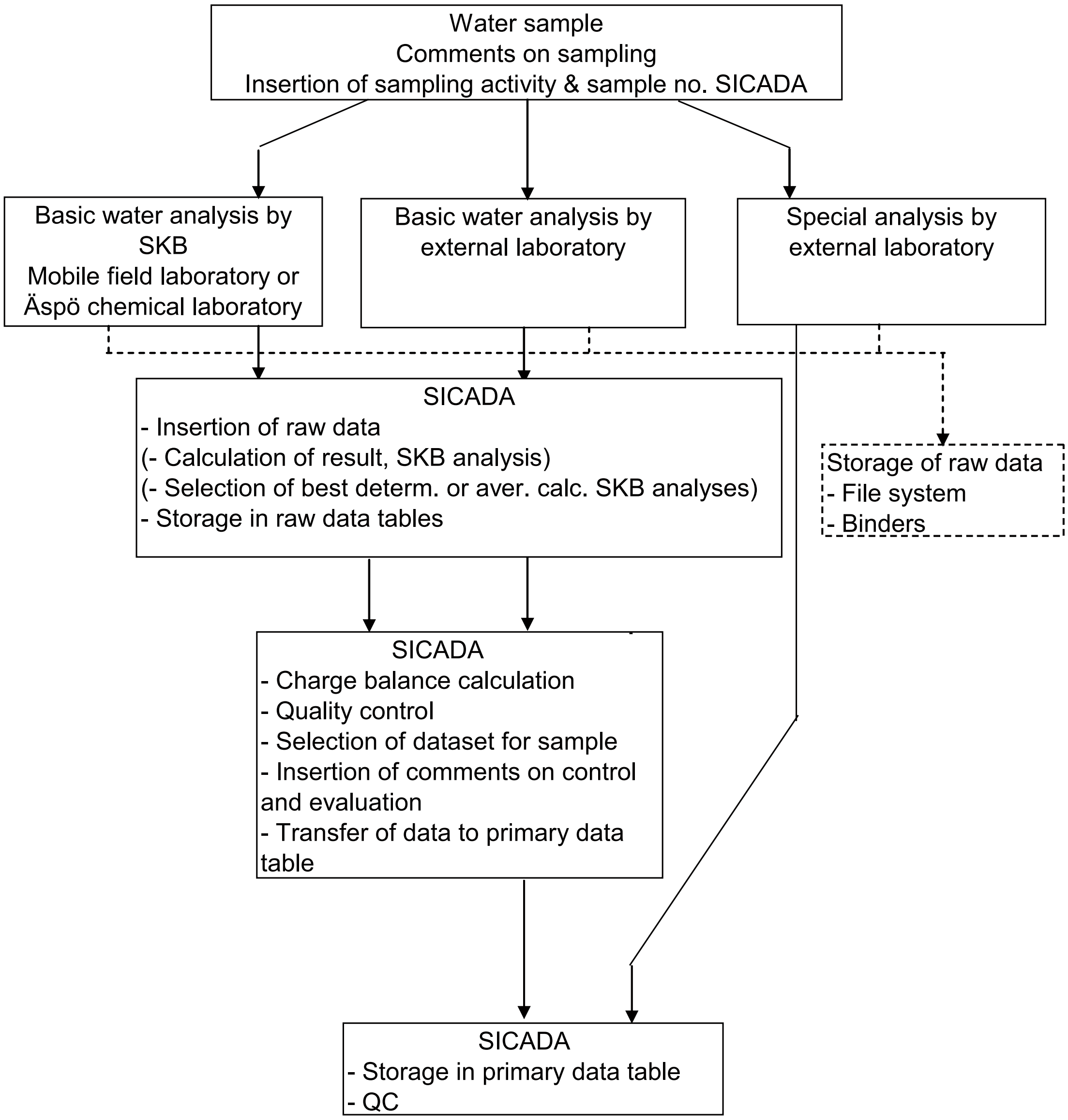

Figure 4-1. *Overview of data management for hydrogeochemical data.*

4.4 Nonconformities

The activity was performed without any deviations from the controlling documents for the activity that can affect the quality of data. Due to problems with lack of water in sampling tube number 20 (0–40 m), only one archive sample was collected from this tube unit.

5 Results

5.1 Analysis results

The results from the chemical analyses are presented in Appendix 2. The original results are stored in the primary data base (SICADA), and the data in this data base will be used for further interpretation (modelling).

Diagrams showing the drill water content and the electric conductivity along the borehole, at the time of the Hydrochemical logging, are presented in Figures 5-1 and 5-2. Results from analyses of pH, HCO_3^- and some of the major constituents (Na^+, Ca^+ and Cl^-) are shown in Figures 5-3 to 5-5, respectively. Sulphate (SO_4^{2-}) analysed by ion chromatography (IC) is compared with sulphate determined as total sulphur using inductively coupled plasma atomic emission spectrometry (ICP-AES) in Figure 5-6. Results are plotted for the mid-length of each tube unit.

5.2 Quality of the analyses

The charge balance errors give an indication of the quality and uncertainty of the analyses of major constituents. The relative charge balance errors were calculated for the selected sets of data, see Appendix 2. If the relative errors are within ± 5% they are considered acceptable. The errors did not exceed 5% for any of the eight analysed samples. This indicates that the analyses of the major components are consistent.

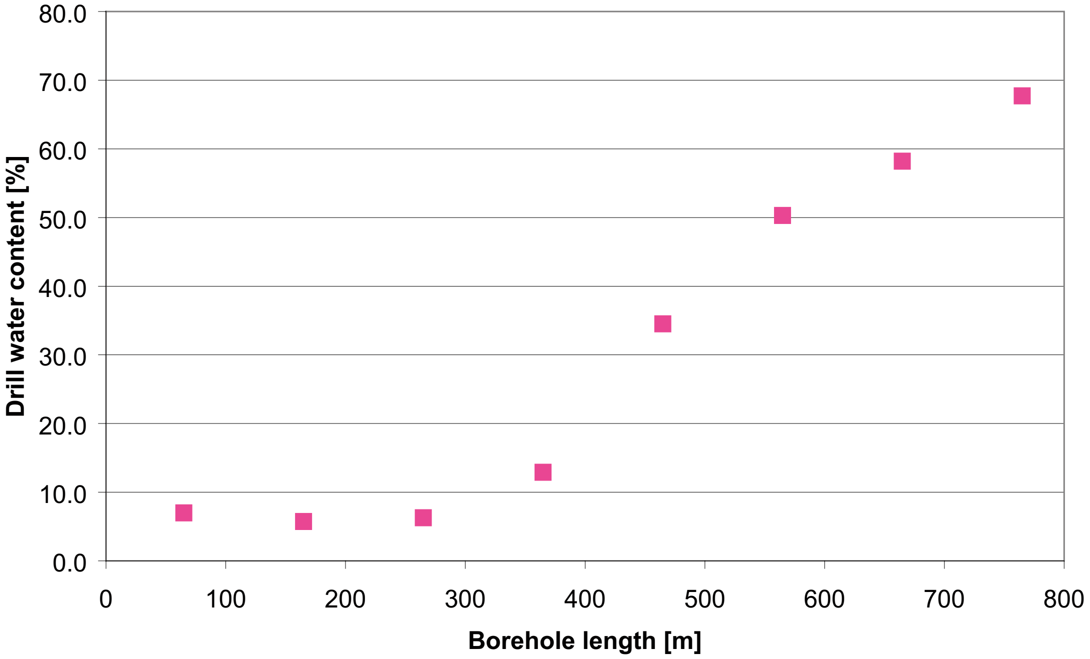

Figure 5-1. *Drill water content remaining at different borehole lengths at the time of the Hydrochemical logging in KLX19A.*

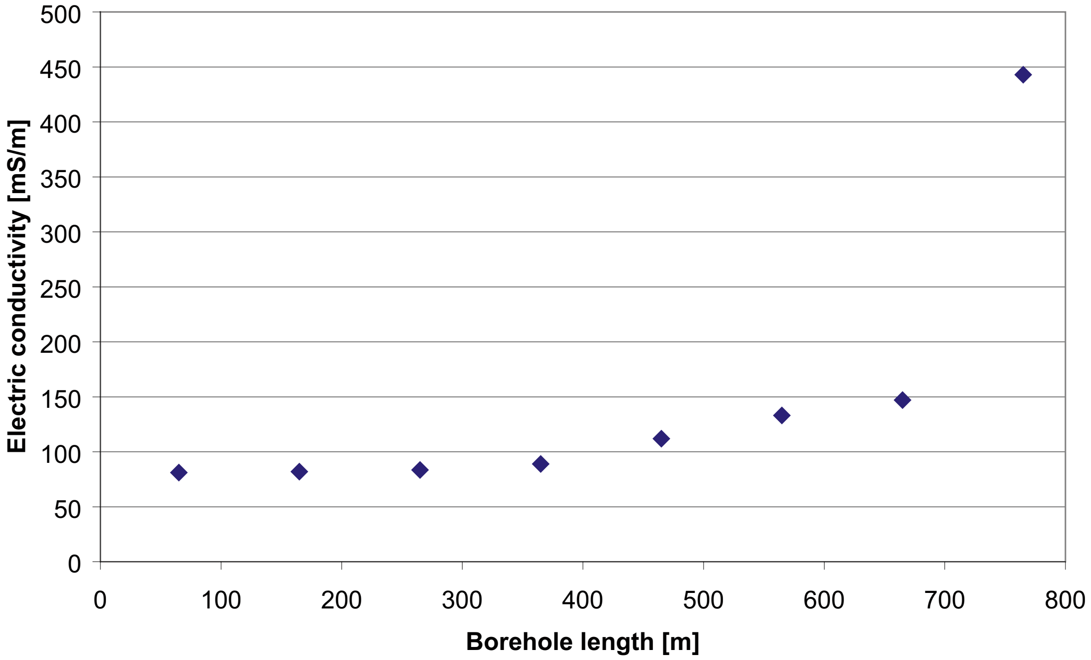

Figure 5-2. *Electric conductivity values obtained from the Hydrochemical logging in KLX19A.*

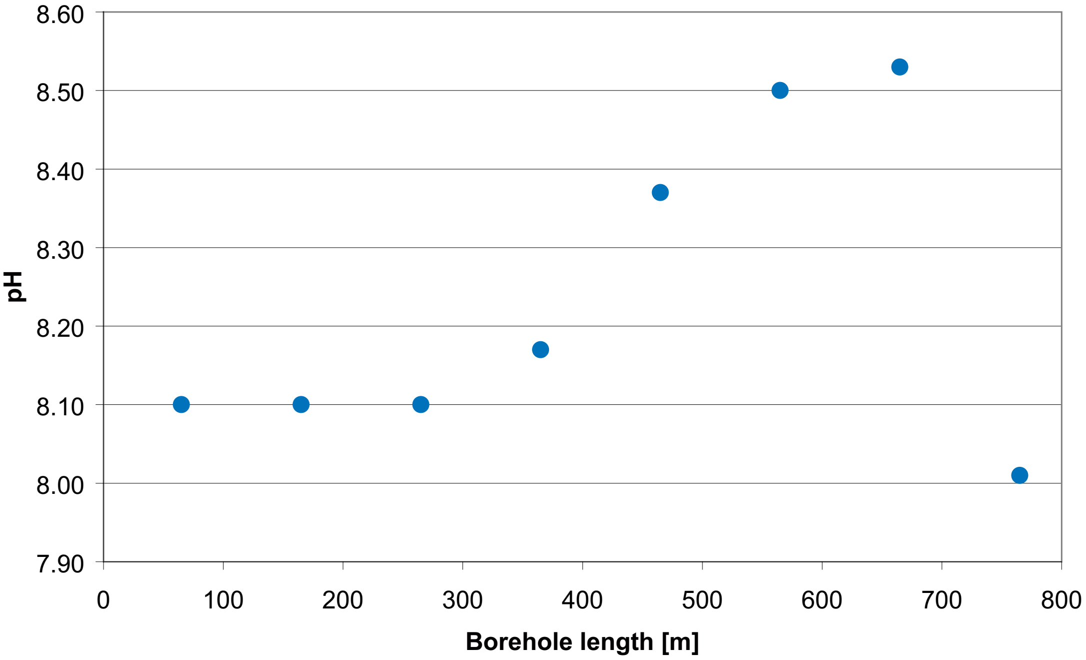

Figure 5-3. *Results from pH measurements obtained from the Hydrochemical logging in KLX19A.*

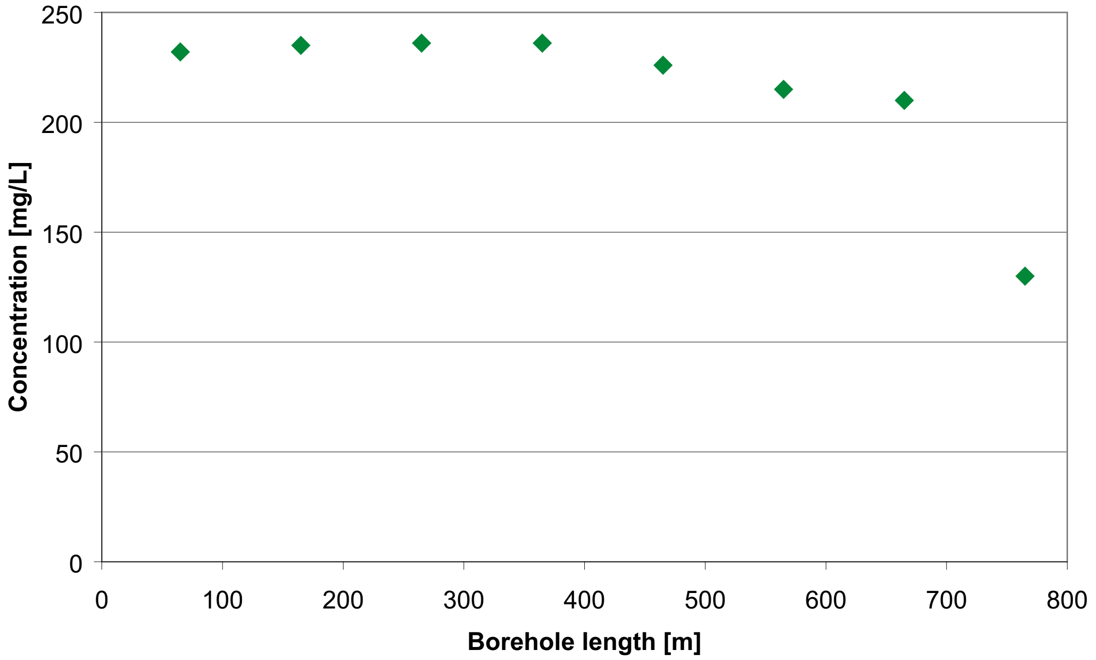

Figure 5-4. *Results from analysis of hydrogen carbonate (HCO_3^-) in water samples obtained from the Hydrochemical logging in KLX19A.*

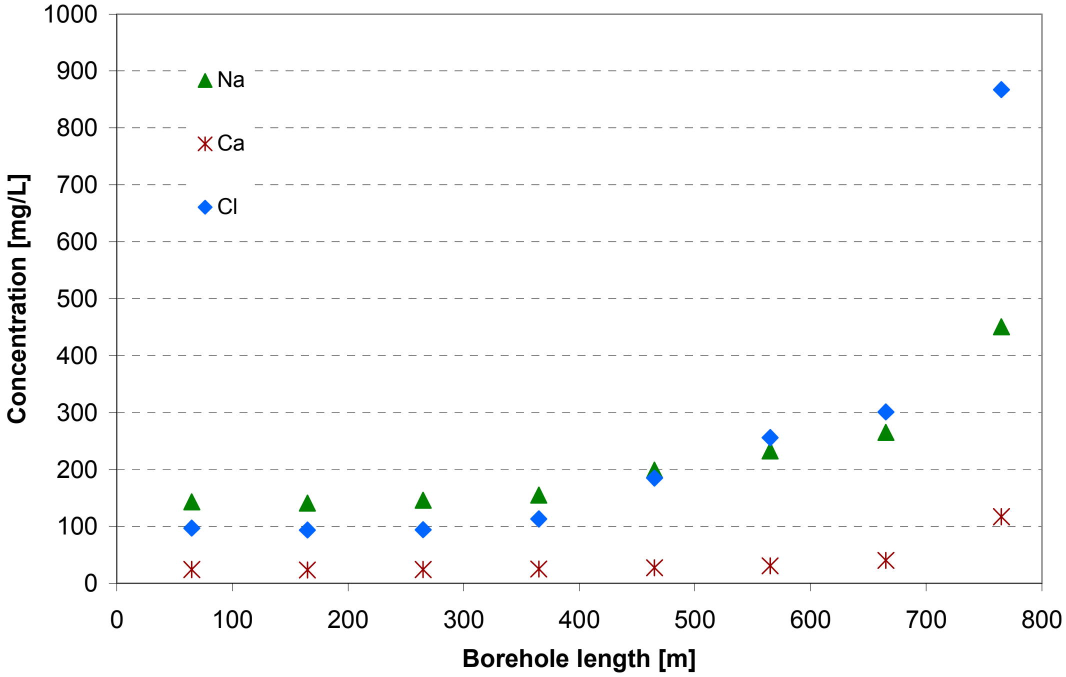

Figure 5-5. *Results from analysis of the constituents Na^+, Ca^{2+} and Cl^- in water samples obtained from the Hydrochemical logging in KLX19A.*

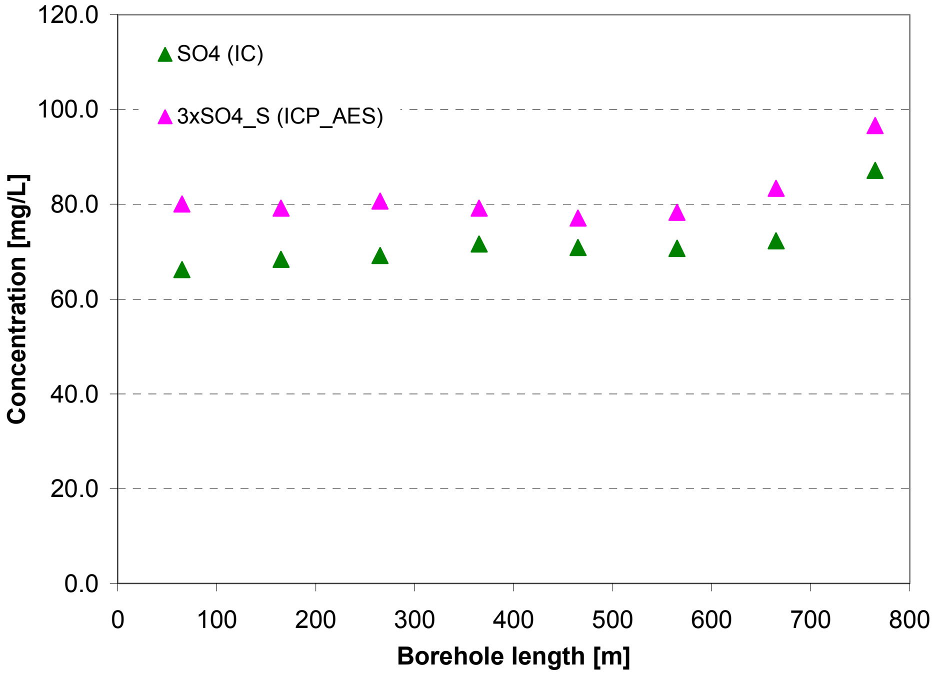

Figure 5-6. *Sulphate (IC) compared to total sulphur (ICP-AES), results from the Hydrochemical logging in KLX19A.*

6 Summary and discussions

The Hydrochemical logging of KLX19A was conducted successfully. The main results are summarized and discussed below.

- The amount of remaining drill water at the time of the Hydrochemical logging was generally high. Only in the upper four analysed tube units the drill water content was below 20%. The amount of remaining drill water increased with borehole length and reached the highest value of 67.7% in the tube unit representing 740–790 m.
- Due to the high remaining drill water content, the results can not be considered as representative for the water chemistry in the water bearing structures in the borehole, except for the water from the upper four analysed tube units (representing borehole length 40–390 m).
- In the four upper tube units (40–390 m) with drill water content below 20% the water composition is rather similar. The electric conductivity ranges from 81.1 to 89.0 mS/m to and the chloride concentration from 93.7 mg/L to 113.1 mg/L in these tube units.
- The general trend is that all analysed parameters (including drill water content) increase with increasing borehole length below 440 m. The exception is the hydrogen carbonate (HCO_3^-) concentration which instead decreases, and the pH-value which at first increases in the water from the seven upper tube units (40–690 m), but then has its lowest value from the tube unit 740–790 m.
- The charge balance error, giving an indication of the quality and uncertainty of the analyses, did not exceed the acceptable level (± 5%) in any of the samples. This indicates that the analyses of the major components are consistent. No results were considered unconfident, based on general trends.

7 References

/1/ **SKB, 2001.** Generellt genomförande program för platsundersökningar. SKB R 01-10, Svensk Kärnbränslehantering AB.

/2/ **SKB, 2005.** Platsundersökning Oskarshamn. Program för fortsatta undersökningar av berggrund, mark, vatten och miljö inom delområde Laxemar. SKB R-05-37, Svensk Kärnbränslehantering AB

Appendix 1

Sampling and analytical methods

Table A1-1. Sample handling routines and analytical methods.

Component group	Component/ element	Sample container (material)	Volume (mL)	Filtering	Preparation/ Conservation*	Analysis method	Analysis within – or delivery time to lab.
Anions 1.	HCO_3^- pH (lab) cond (lab)	Plastic	250	No	No	Titration Pot. meas, Cond. meas	The same day – maximum 24 hours
Anions 2	Cl^-, SO_4^{2-}, Br^-, F^-	Plastic	100	Yes (in connection with analysis)	No	Titration (Cl^-) IC (Cl^-, SO_4^{2-}, Br^-, F^-) ISE (F^-)	Not critical (month)
Cations, Si and S according to SKB class 3	Na, K, Ca, Mg, S(tot), Si(tot), Li, Sr	Plastic (at low conc. acid washed bottles)	100	Yes (not in the field)	Yes (not in the field, 1 mL HNO_3)	ICP-AES ICP-MS	Not critical (month)
Environmental isotopes	δ^2H, $\delta^{18}O$	Plastic	100	No	– –	MS	Not critical (month)
Tritium	^3H (enhanced.)	Plastic (dry bottle)	500	No	–	LSC	
Chlorine-37	$\delta^{37}Cl$	Plastic	500	No	–	ICP MS	Not critical (month)
Carbon isotopes	$\delta^{13}C$, pmC (^{14}C)	Plastic (fluorated)	100×2	No	–	(A)MS	A few days
Sulphur isotopes	$\delta^{34}S$	Plastic	500–1,000	No	–	Combustion, ICP MS	No limit
Strontium-isotopes	$^{87}Sr/^{86}Sr$	Plastic	100	No	–	TIMS	Days or Week
Boron isotopes	$^{10}B/^{11}B$	Plastic	100	Yes	Yes (1 mL HNO_3)	ICP–MS	No limit
Archive samples without acid	–	Plastic	250×2	Yes	No	–	Storage in freeze container

* Suprapur acid is used for conservation of samples.

Abbreviations and definitions:

IC	Ion Chromatograph.
ISE	Ion Selective Electrode.
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectrometry.
ICP-MS	Inductively Coupled Plasma Mass Spectrometry.
MS	Mass Spectrometry.
LSC	Liquid Scintillation Counting.
(A)MS	(Accelerator) Mass Spectrometry.
TIMS	Thermal Ionization Mass Spectrometer.

Table A1-2. Reporting limits and measurement uncertainties.

Component	Method	Reporting limits or range	Unit	Measurement uncertainty[2]	"Total" uncertainty[3]
HCO_3^-	Alkalinity titration	1	mg/L	4%	<10%
pH	Pot. meas.	–	–	5%	–
Cond.	Cond. meas.	0.02	mS/m	4%	–
Cl^-	Mohr- titration	> 70	mg/L	5%	< 10%
Cl^-	IC	1–100		6%	10%
SO_4^{2-}	IC	1	mg/L	10%	15%
Br^-	IC	0.2	mg/L	9%	20%
F^-	IC	0.1	mg/L	10%	20%
F^-	ISE	–		–	
Na	ICP	0.1	mg/L	4%	10%
K	ICP	0.4	mg/L	6%	15%
Ca	ICP	0.1	mg/L	4%	10%
Mg	ICP	0.09	mg/L	4%	10%
S(tot)	ICP	0.160	mg/L	21%	15%
Si(tot)	ICP	0.03	mg/L	4%	15%
Sr	ICP	0.002	mg/L	4%	15%
Li	ICP	0.2[1] 2	mg/L	10%	20%
δ^2H	MS	2	‰ SMOW[4]	1‰	–
$\delta^{18}O$	MS	0.1	‰ SMOW[4]	0.2‰	–
^3H	LSC	0.8 or 0.1	TU[5]	0.8 or 0.1	Correct order of size
$\delta^{37}Cl$	ICP MS	0.2‰° (20 mg/L)	‰ SMOC[6]	–	–
$\delta^{13}C$	A (MS)	–	‰ PDB[7]	–	–
pmC (^{14}C)	A (MS)	–	pmC[8]	–	–
$\delta^{34}S$	ICP MS	0.2‰	‰ CDT[9]	0.3‰	–
$^{87}Sr/^{86}Sr$	TIMS	–	No unit (ratio)[10]	–	–
$^{10}B/^{11}B$	ICP MS	–	No unit (ratio) [10]	–	–

1. Reporting limits at salinity ≤ 0.4% (520 mS/m) and ≤ 3.5% (3,810 mS/m) respectively.

2. Measurement uncertainty reported by consulted laboratory, generally 95% confidence interval.

3. Estimated total uncertainty by experience (includes effects of sampling and sample handling).

4. Per mille deviation[13] from SMOW (Standard Mean Oceanic Water).

5. TU = Tritium Units, where one TU corresponds to a Tritium/hydrogen ratio of 10^{-18} (1 Bq/L Tritium = 8.45 TU).

6. Per mille deviation[13] from SMOC (Standard Mean Oceanic Chloride).

7. Per mille deviation[13] from PDB (the standard PeeDee Belemnite).

8. The following relation is valid between pmC (percent modern carbon) and Carbon-14 age:
$pmC = 100 \times e^{(1,950-y-1.03t)/8,274)}$ where y = the year of the C-14 measurement and t = C-14 age.

9. Per mille deviation[13] from CDT (the standard Canyon Diablo Troilite).

10. Isotope ratio without unit.

Isotopes are often reported as per mill deviation from a standard. The deviation is calculated as:
$\delta^{y}I = 1{,}000\times(K_{sample}-K_{standard})/K_{standard}$, where K = the isotope ratio and ^{y}I = ^2H, ^{18}O, ^{37}Cl, ^{13}C or ^{34}S etc.

Appendix 2

Water composition

Compilation December 2006.

Idcode	Secup m	Seclow m	Sample no.	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br^- mg/L	F^- mg/L	Si mg/L	Fe mg/L	Mn mg/L	Li mg/L
KLX19A	0.00	40.00	11389	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	40.00	90.00	11390	–1.49	143	5.32	24.5	6.5	232	96.9	66.2	26.7	0.38	3.14	7.38	1.750	0.202	0.014
KLX19A	90.00	140.00	11391	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	140.00	190.00	11392	–1.82	141	5.39	23.8	6.6	235	93.7	68.4	26.4	0.39	3.26	7.47	1.790	0.216	0.013
KLX19A	190.00	240.00	11393	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	240.00	290.00	11394	–0.74	146	5.45	24.3	6.7	236	94.2	69.2	26.9	0.38	3.55	7.38	1.420	0.215	0.014
KLX19A	290.00	340.00	11395	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	340.00	390.00	11396	–1.05	155	5.55	25.3	6.5	236	113	71.6	26.4	0.50	3.33	6.82	1.070	0.186	0.015
KLX19A	390.00	440.00	11397	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	440.00	490.00	11398	–0.08	199	6.35	27.5	6.1	226	185	70.9	25.7	0.95	3.61	6.10	0.874	0.127	0.019
KLX19A	490.00	540.00	11399	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	540.00	590.00	11400	–0.90	233	7.18	30.9	6.0	215	256	70.7	26.1	1.45	3.85	5.57	0.437	0.100	0.023
KLX19A	590.00	640.00	11401	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	640.00	690.00	11402	1.54	265	7.68	40.3	6.7	210	301	72.3	27.8	1.53	3.48	5.09	0.297	0.094	0.022
KLX19A	690.00	740.00	11403	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	740.00	790.00	11404	–3.80	451	10.8	117	11.4	130	867	87.2	32.2	5.60	3.25	4.19	0.282	0.223	0.039

Continued.

Idcode	Secup m	Seclow m	Sample no.	Sr mg/L	pH	Drill_water %	ElCond mS/m	δ^2H dev SMOW	δ^{18}O dev SMOW	^{3}H TU	δ^{37}Cl dev SMOC	^{10}B/^{11}B no unit	^{87}Sr/^{86}Sr no unit	δ^{34}S dev CDT	δ^{13}C dev PDB
KLX19A	0.00	40.00	11389	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	40.00	90.00	11390	0.425	8.10	6.98	81.1	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	90.00	140.00	11391	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	140.00	190.00	11392	0.454	8.10	5.72	82.0	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	190.00	240.00	11393	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	240.00	290.00	11394	0.490	8.10	6.28	83.4	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	290.00	340.00	11395	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	340.00	390.00	11396	0.492	8.17	12.9	89.0	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	390.00	440.00	11397	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	440.00	490.00	11398	0.480	8.37	34.5	112	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	490.00	540.00	11399	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	540.00	590.00	11400	0.496	8.50	50.3	133	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	590.00	640.00	11401	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	640.00	690.00	11402	0.636	8.53	58.2	147	xxx	xxx	xxx	xxx	xxx	xxx	–	–
KLX19A	690.00	740.00	11403	–	–	–	–	–	–	–	–	–	–	xxx	xxx
KLX19A	740.00	790.00	11404	1.910	8.01	67.7	443	xxx	xxx	xxx	xxx	xxx	xxx	–	–

– = Not analysed.

xxx = Stored in freezer/refrigator.

ChargeBal % = Relative charge balance error %.