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Summary of hydrochemical conditions at Aberg, Beberg and Ceberg

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May 1998

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Keywords: groundwater chemistry, performance assessment, groundwater modelling, multivariate analysis, 3D visualisation, M3 modelling

ABSTRACT

One area of Performance Assessment (PA) studies is hydrochemistry, which can be used to provide input for the assessment of canister and buffer stability and to examine the possible transport of radionuclides from the emplaced waste packages through the host rock to the accessible environment. As a part of the safety analysis SR 97, three sites were examined, arbitrarily named Aberg, Beberg and Ceberg, each of which is based on data from previous site characterisation studies conducted by SKB.

The results of the study show that the selected reference waters at the repository depth have a different origin and composition not only reflecting the postglacial mixing events but also due to the prevailing hydrogeological conditions at these sites.

This report aims to evaluate and describe the following aspects:

- Identify the most typical and representative groundwaters found at the repository depth of 500m±100m.
- Trace the origin of the Aberg, Beberg and Ceberg groundwaters.
- Present salinity profiles and hydrochemical calculations in order to support hydrogeological flow path modelling.
- Visualise the sites in terms of dominating water types.

ABSTRACT (Swedish)

Hydrokemiska analyser är viktiga inom en säkerhetsanalys för ett djupförvar i berggrunden. Dessa analyser kan användas för att ta fram ingångsdata för bedömningen av kapselns och buffertens stabilitet samt för att undersöka den eventuella transporten av radionuklider från kapslarna genom berget till omgivningen. Inom ramen för SR 97 har tre fiktiva platser undersökts i föreliggande rapport: Aberg, Beberg och Ceberg. Analyserna baseras på data från tidigare platskarakteriseringsstudier utförda av SKB.

Resultaten visar att de valda referensvattnen på förvarsnivå har olika ursprung och sammansättning som dels beror på postglaciala blandningsföreteelser men även beror på de hydrogeologiska förhållanden som råder på respektive plats.

Avsikten med denna rapport är att utvärdera och beskriva följande aspekter:

- Identifiera de mest typiska och representativa grundvatten som hittats på djupförvarsnivån 500 m ±100 m.
- Spåra ursprunget för grundvattnen i Aberg, Beberg och Ceberg.
- Presentera salthaltsprofiler och hydrokemiska beräkningar för att stödja hydrogeologisk modellering.
- Illustrera de dominerande vattentyperna på respektive plats.

SUMMARY

The Swedish Nuclear Fuel and Waste Management Company (SKB) is responsible for the safe handling and disposal of nuclear wastes in Sweden. This responsibility includes conducting studies into the siting of a deep repository for high-level nuclear waste. The Safety Report for 1997 (SR 97) will present a performance assessment (PA) of the overall long-term safety of a deep repository at three hypothetical sites in Sweden. One area of these PA studies is hydrochemistry, which can be used to provide input for the assessment of canister and buffer stability and to examine the possible transport of radionuclides from the emplaced waste packages through the host rock to the accessible environment. The three hypothetical sites are named arbitrarily Aberg, Beberg and Ceberg, each of which is based on data from previous site characterisation studies conducted by SKB.

This report aims to evaluate and describe the following aspects:

- Identify the most typical and representative groundwaters found at the repository depth of 500m±100m.
- Trace the origin of the Aberg, Beberg and Ceberg groundwaters.
- Present salinity profiles and hydrochemical calculations in order to support hydrogeological flow path modelling.
- Visualise the sites in terms of dominating water types.

The major groundwater characteristics of these three sites have been evaluated. A general classification of the groundwater using standard methods was performed. A typical groundwater composition at the repository depth for each site was identified. These groundwaters were named reference waters. The origin of the groundwaters was traced using a new technique named M3. M3 is a Multivariate Mixing and Mass balance model for groundwater chemical modelling. The model can be used to trace the influence in terms of mixing portions (%) of e.g. meteoric water, sea water, and brine groundwater on the measured groundwater composition.

The results of the modelling show that the selected reference waters at the repository depth have a different origin and composition which not only reflect the postglacial events but are also due to the prevailing hydrogeological conditions.

At the repository depth at Aberg the reference water consists of a mixture of 30% meteoric water infiltrated during the past 3000 years, 30% glacial meltwater and 30% modern and old Baltic Sea water. 10% of the water is of an old (brine) type of groundwater, which has been isolated from the atmosphere for more than 1.5 Ma. Aberg has the highest salinity of the selected sites and the salinity increases with depth.

At the repository depth at Beberg two different reference waters have been identified, one fresh and one saline. The freshwater consists of 50% meteoric water, 30% glacial melt-water and 20% water (of marine origin)

with high microbial activity. The saline reference water consists of 30% meteoric water, 10% glacial water, 30% marine water and 20% brine. Beberg's salinity increases with depth but the salinity content is intermediate compared with the other two sites.

At the repository depth at Ceberg the reference water consists of 40% meteoric water, 30% glacial water, 20% water with a high biological activity and 10% water of a marine or brine origin. Ceberg has the lowest salinity of the selected sites.

In the Safety Assessment analysis an uncertainty of ±5% should be used for the groundwater. The uncertainty range covers most of the annual variation but also in-situ, at site, off-site and modelling errors affecting the original groundwater composition.

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1. AIM AND OBJECTIVES

The Swedish Nuclear Fuel and Waste Management Company (SKB) is responsible for the safe handling and disposal of nuclear wastes in Sweden. This responsibility includes conducting studies into the siting of a deep repository for high-level nuclear waste. The Safety Report for 1997 (SR-97) will present a performance assessment (PA) of the overall long-term safety of a deep repository at three hypothetical sites in Sweden. One component of these PA studies is hydrogeochemical modelling to examine the possible transport of radionuclides from the emplaced waste packages through the host rock to the accessible environment.

The three hypothetical sites are named arbitrarily Aberg, Beberg and Ceberg, each of which is based on data from previous site characterisation studies conducted by SKB. These are:

- Aberg, which is based on the Äspö Hard Rock Laboratory in southern Sweden;
- Beberg, which is based on investigations at Finnsjön, in central Sweden; and
- Ceberg, which is based on investigations at Gideå, in northern Sweden.

This report is one of many in support of SR 97. It is intended to provide modelling teams with groundwater parameters and conceptual models, which can be used in future PA related modelling. Specifically, this report:

- identifies the most typical and representative groundwaters found at the repository depth of 500m±100m,
- traces the origin of the Aberg, Beberg and Ceberg groundwaters,
- presents hydrochemical calculations in order to support hydrogeological flow path modelling,
- visualises the sites in terms of dominating water types.

Its primary objective is to provide consistent data sets and conceptual models so that the modelling results will be as comparable as possible. One limitation when comparing PA modelling studies from alternative sites is that the site characterisation studies and analyses of data are frequently conducted at different times for different goals. Although the bias and error of site investigations are never fully known, a consistent analysis of the data and presentation of conceptual models will at least help confine the differences to the sites themselves.

The groundwater parameters reported here are found in the SKB database, SICADA. Where appropriate, a new interpretative method (M3) was used to decode the paleohydrochemistry that describes the origin of the groundwater. The origin of the groundwater is a result of historical and present day hydraulic driving forces and groundwater rock interactions,

present day hydraulic driving forces and groundwater rock interactions, which have affected the measured groundwater composition. In Figure 1-1 a schematic illustration of the steps needed for constructing and using a groundwater chemical model is shown.

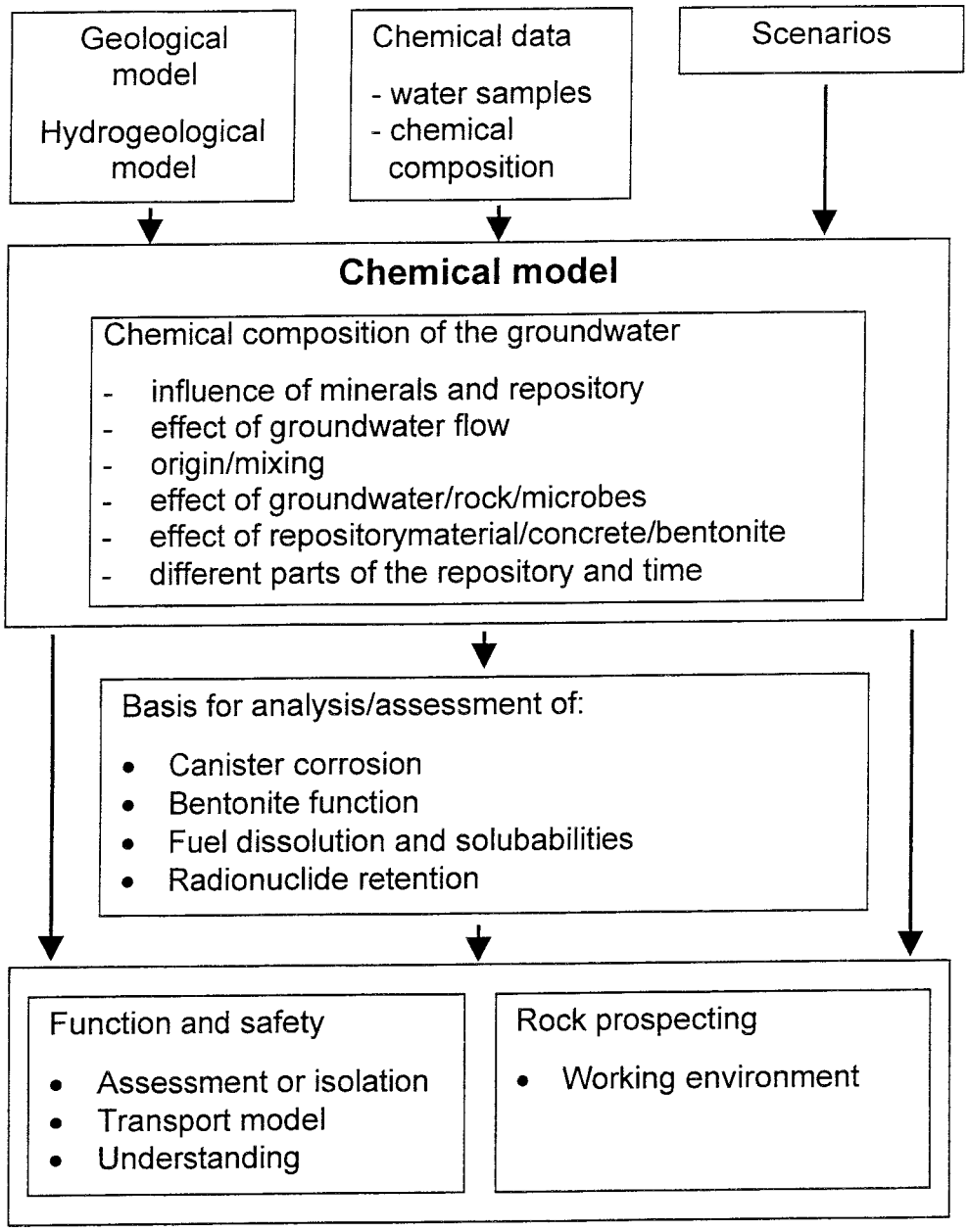

Figure 1-1. *A schematic illustration of the steps needed for constructing and using a groundwater chemical model (Andersson et al., 1997).*

2. INTRODUCTION

When comparing the three hypothetical sites, it is important to note that the site characterisation programmes at each data source are quite different. The three site characterisation studies were each carried out at different times, with different goals and equipment. These differences might bias the groundwater parameter and consequently bias the PA modelling studies.

Aberg uses data from the Äspö site, which is the most recently and thoroughly investigated site in the SKB programme. Data is abundant here, and of very good quality. This is mostly the result of the intensive site and regional scale investigations associated with the Äspö Hard Rock Laboratory (HRL), an international centre for research related to the disposal of nuclear wastes in fractured crystalline rock. The geological (e.g. Stanfors et al. 1992, 1993a,b, 1994), hydrogeological (e.g. Rhén et al., 1993, 1994; Rhén and Stanfors, 1993; Walker et al. 1997) and groundwater chemical data (e.g. Smellie and Laaksoharju, 1992; Laaksoharju et al. 1995, Laaksoharju and Wallin Eds., 1997) have been described in various SKB reports.

Beberg is based on Finnsjön, perhaps the second most investigated site in the SKB programme. Finnsjön has been the subject of two investigations, the first being the SKB site characterisation campaign (1977 to 1983) and the second being the Fracture Zone project (1985 to 1988). Like Äspö, Finnsjön's general regional information is relatively abundant. Geological, hydrogeological and groundwater chemical investigations have been summarised by Ahlbom and Tirén (1991); Walker et al. (1997).

The last site, Ceberg, is based on data taken from Gideå, where one of the oldest SKB site characterisation studies was performed. Although a great deal of data exists on Gideå, it is the least thoroughly investigated of the three sites. The availability of general geologic information at Gideå is limited relative to the Finnsjön and Äspö regions. Geological, hydrogeological and groundwater chemical investigations have been summarised by Ahlbom et al. (1983); Ahlbom et al. (1991); Walker et al. (1997). The modelled area at the different sites is shown in Figure 2-1 a, b and c. The groundwater chemical data used for Aberg, Begerg and Ceberg is summarised in Appendix 1.

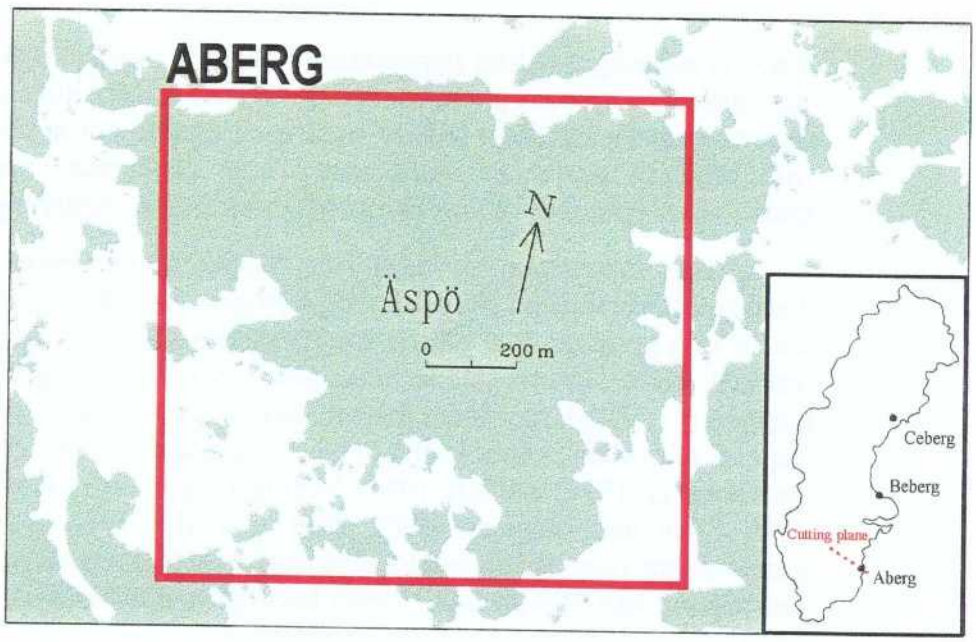

Figure 2-1a. *Location of the modelled area at the Aberg site. The inserted map shows the location of Aberg, Beberg and Ceberg. The cutting plane used in the modelling is shown in Figure 3-1.*

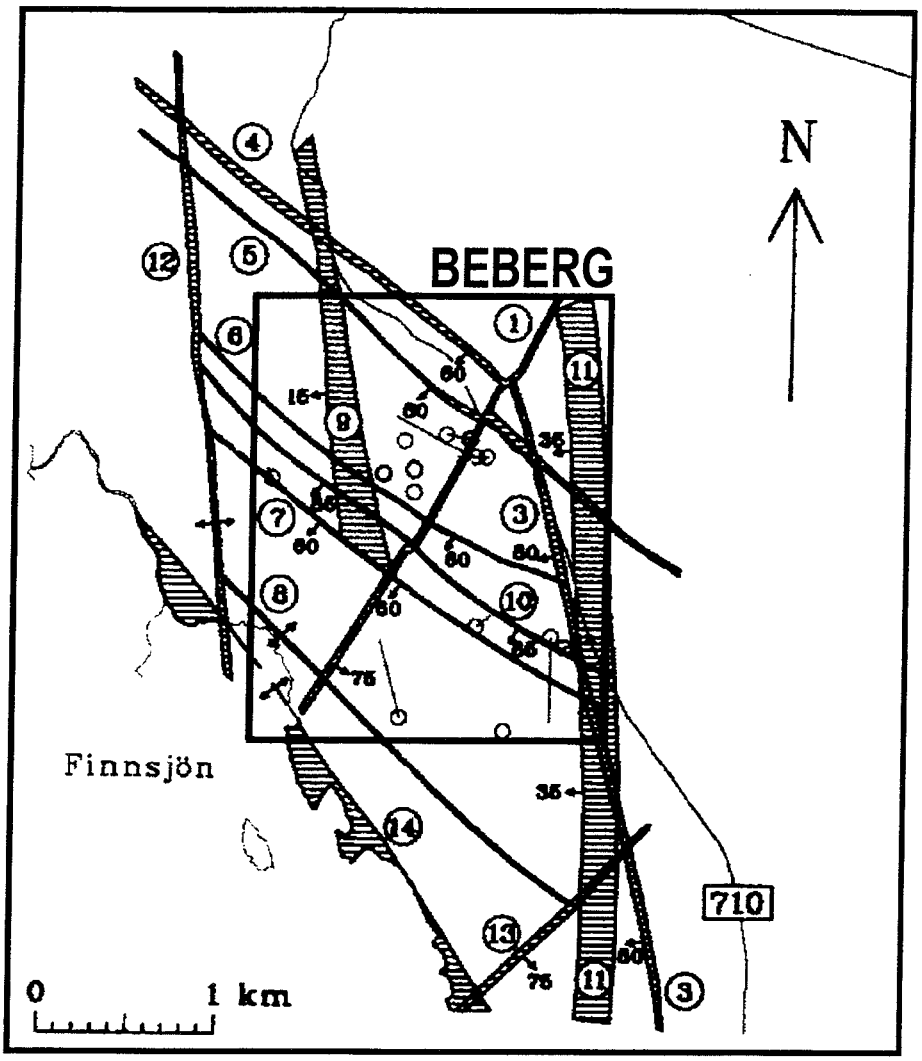

Figure 2-1b. *Location of the modelled area at the Beberg site and the major fracture zones.*

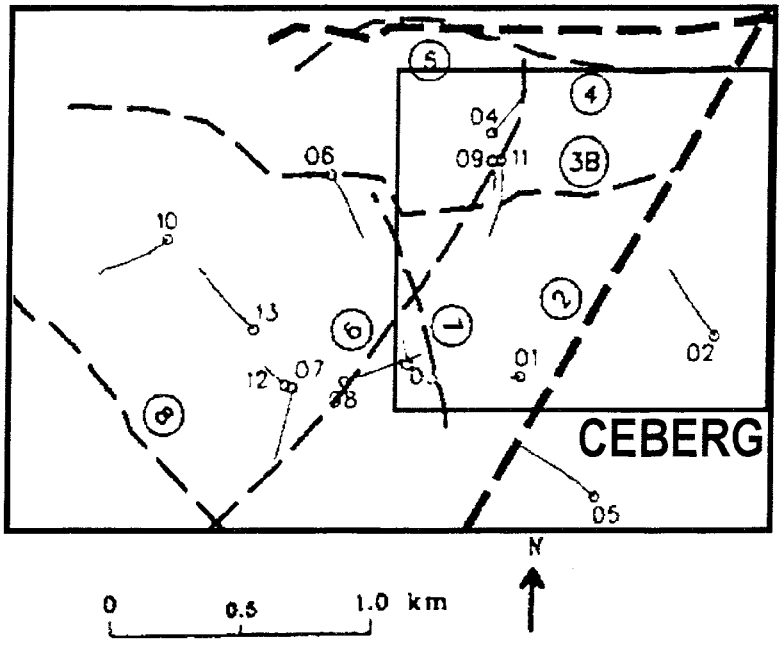

Figure 2-1c. *Location of the modelled area at the Ceberg site and the major fracture zones.*

Many known postglacial events have affected the groundwater composition at Aberg, Beberg and Ceberg. The following major events have been identified:

1. The continental ice melted and retreated and glacial meltwater was injected into the bedrock (>13000BP). At large depths (>800m) glacial meltwater was mixed with brine groundwater in the bedrock. At the interface a saline groundwater with a glacial signature was expected to be formed. A non-saline glacial water was present in the upper part of the bedrock.

2. The flushing out on the mainland started directly after deglaciation. However, since the Aberg, Beberg and Ceberg sites were below sea level the postglacial marine water affected the groundwater composition. The continuous land rise gradually elevated the sites to above sea level and the increased hydraulic driving force resulted in the flushing out and mixing of existing groundwater types. A mixture of glacial, brine, marine and meteoric groundwater could occur.

A conceptual model showing these events at the sites is shown in Figure 2-2. The uncertainty of the conceptual model increases with the modelled time. The largest uncertainties are therefore associated with the stage showing the injection of glacial meltwater into the basement. Data for shore level displacements have been extracted from e.g. Timje, 1983; Lundqvist,

1987; Påsse, 1996. The land rise elevated e.g. the highest part of Ceberg site 7200 BP and the lowest parts 5300 BP. There is an uncertainty of up to several thousand years when dating the influence from marine water .

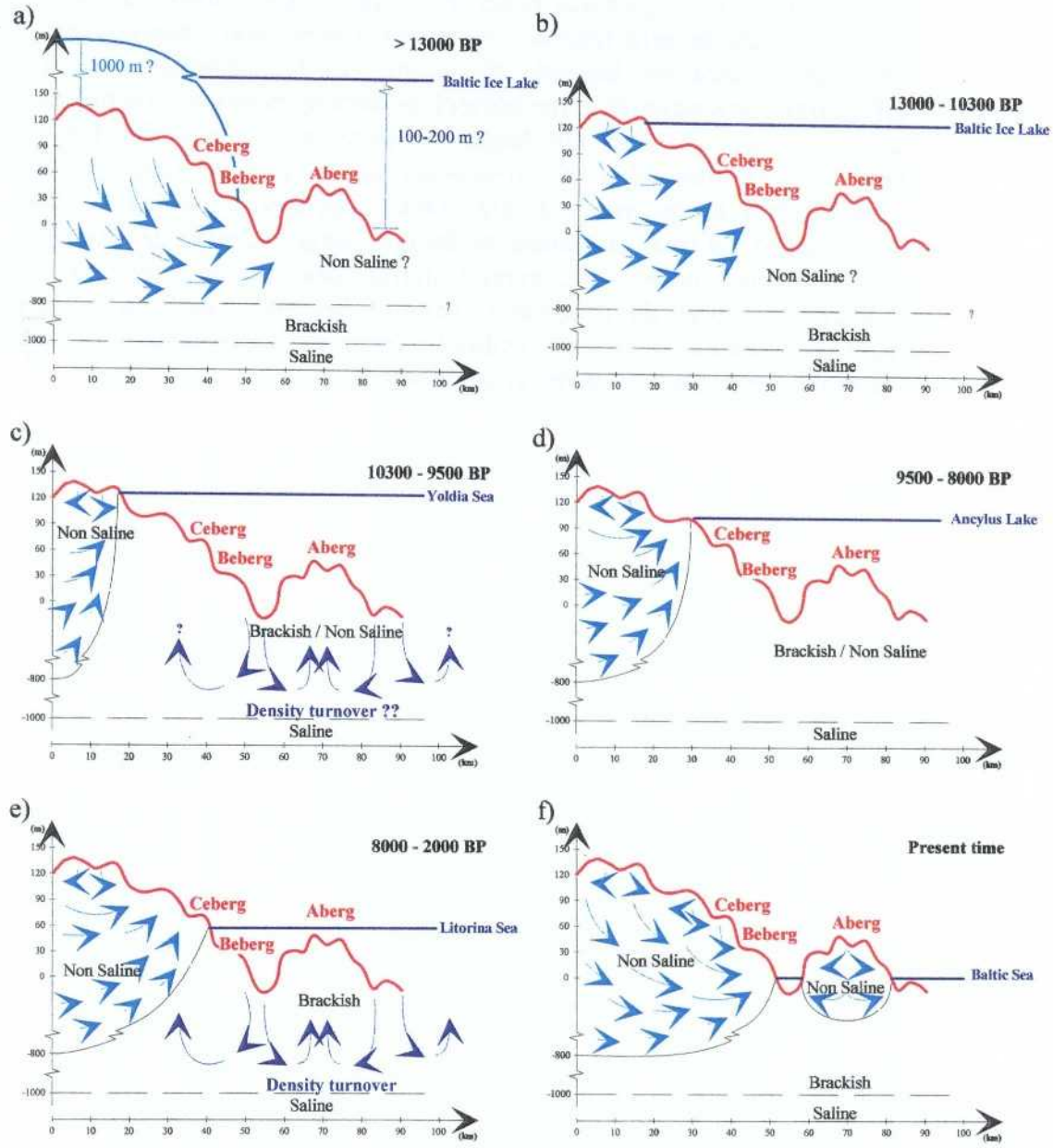

Figure 2-2. *A conceptual postglacial scenario at the Aberg, Beberg and Ceberg sites. Possible flow lines, density driven turnover, non-saline, brackish and saline water interfaces are shown a) Injection of Glacial meltwater into the basement. b) Baltic Ice Lake stage, c) Yoldia Sea stage, d) Ancylus Lake stage, e) Litorina Sea stage and f) present day situation. The orientation and length of the cutting plane is shown in the inserted map in Figure 2-1a. The uncertainty of the model increases with the modelled time.*

The complex groundwater history has resulted in complicated groundwater mixtures. It should be possible to detect traces of these events in the bedrock. The historical events may be traced to varying degrees in the different groundwaters. Groundwaters at large depths, in discharge areas, in fractures with a low permeability or with a high groundwater density can preserve historical signatures better than other waters which may be more affected by the present situation. At Aberg, Beberg and Ceberg where the seawater covered the bedrock, the salinity of the seawater could have affected the groundwater in the bedrock by density turnover. The higher the salinity of the sea water the deeper the penetration depth. The land rise resulted in the formation of a freshwater aquifer at these sites. The fresh water flushed out the traces of older waters. The depth to which the waters were flushed out was determined by the prevailing hydraulic driving forces. The hydraulic forces were highest during deglaciation. The land rise gradually increased the penetration depth of meteoric water until a certain depth was reached where the hydraulic force could not remove a denser water such as a brackish-saline groundwater.

3. MULTIVARIATE MIXING AND MASS BALANCE CALCULATIONS (M3)

3.1. METHOD DESCRIPTION

A simple model may not be able to trace the complex groundwater evolution at the Aberg, Beberg and Ceberg sites because the origin and evolution of the groundwater may have affected the element concentrations and isotope signatures in a complex way. Many variables are important for the understanding of the natural system. The information that these variables provide can be handled using multivariate techniques.

The origin and evolution of the groundwater can be described if the effect from mixing and reactions can be examined separately. In order to get such a separation a new method named Multivariate Mixing and Mass balance calculations (abbreviated to M3) was constructed (Laaksoharju et al., 1995; Laaksoharju and Skårman, 1995). The model consists of 3 steps where the first step is a standard principal component analysis, followed by mixing, and finally by mass balance calculations according to:

1. A standard multivariate technique called Principal Component Analysis (PCA) which is used for clustering data using the major components Cl, Ca, Na, Mg, K, SO_4 and HCO_3 in combination with the isotopes δ^2H, $\delta^{18}O$ and ^3H. PCA aims to describe as much of the information from the ten variables in the first equation (called the first principal component) as possible. As much as possible of the remaining information is described by the second principal component. The principal components are equations of linear combinations that describe most of the information in the data. The weights for the different variables in the equations are calculated automatically by the PCA. For the Aberg, Beberg and Ceberg data set the first two principal components can be used to describe 71% of the information in the data set. The third or fourth principal components generally do not contain useful information but this is dependent on the complexity of the examined data and the chosen variables. If the first two principal components contain most of the information, an x, y scatter plot can be drawn. The x is the equation for the first principal component and y the equation for the second principal component. The plot is named the M3 plot and is used to visualise the clustering of the data as well as to identify extreme waters. Extreme waters can be an end-member composition such as glacial meltwater or Litorina sea water (see Figure 3-1a and b). Lines are drawn between the extreme waters so that a polygon is formed. The polygon defines the observations, which can be described by the selected extreme waters. The groundwater composition of an observation inside the polygon is compared to the chosen extreme water compositions.

2. Mixing calculations are used to calculate the mixing portions. The mixing portions describe the contribution of the end-member to the observed water. The calculated mixing portion can be used to describe the current mixing situation and the origin of the groundwater. The

mixing portions are equal in distance to the selected end-members in the M3 plot (see Figure 3-1c). If one uses three defined reference points in the plane of the M3-plot it is possible to uniquely calculate the proportions of these at any other point within the triangle. However, in the hydrochemical system a minimum of five reference points is perhaps needed to describe the origin of the groundwater. Therefore it has been necessary to introduce a common reference point in the centre of the pentagon in order to uniquely calculate the mixing proportions of the five reference waters. The common reference point is placed in the position where all reference waters are present in a proportion of 20%. In this way all calculations can be based on three reference points and provide a unique solution (Laaksoharju et al., 1998). A mixing portion calculation of less than 10% is regarded as under the detection limit for the M3-method and is therefore uncertain.

3. Mass balance calculations are used to define the sources and sinks for different elements which deviate from the ideal mixing model used in the mixing calculations (see Figure 3-1d). The mixing portions are used to predict new values for the elements. No deviation from the measured value indicates that mixing can explain the element behaviour. A source or sink is due to mass balance reactions. The evolution of the groundwater can thus be described. This modelling step was not performed on SR 97 data since the mass balance calculations require site-specific M3 modelling to decrease the uncertainty. This was considered to be outside the scope of this report where only the overall groundwater composition of the three sites was compared.

The M3 model can describe the origin and evolution of the groundwater chemistry by means of the major mixing processes and mass balance reactions. It is important to note that the modelling is always relative to the selected reference waters or end-members. The modelling constraints can be changed depending on the selection of extreme waters. When, for example, a glacial end-member is used in the modelling the model describes what happened to the groundwater from the melting of the continental ice and when the water penetrated the glacial sediments and the bedrock and mixed with the deeper groundwater. The end-member composition can vary over time and this causes uncertainties in the modelling. Tests show that by varying the end-member composition the calculated mixing portions change, generally less than 10%. It is assumed that other uncertainties, such as groundwater from isolated fractures that are however interpreted as a result from multivariate mixing, are covered by the 10% uncertainty set for the mixing calculations. For a discussion concerning uncertainties in the measured values, sampling and modelling please see Appendix 2. It is important to note that the M3 model deals only with chemical information; no space or time constraints are included in the model.

Tests have been made to compare the predictive capability of the M3 code as well as standard univatiate and linear regression analyses. For these comparisons the Cl concentrations and the $\delta^{18}O$ values were predicted using the other constituents. The results give an error for the M3-model, which is three times smaller than the error for the other methods (Laaksoharju and Wallin (Eds.), 1997).

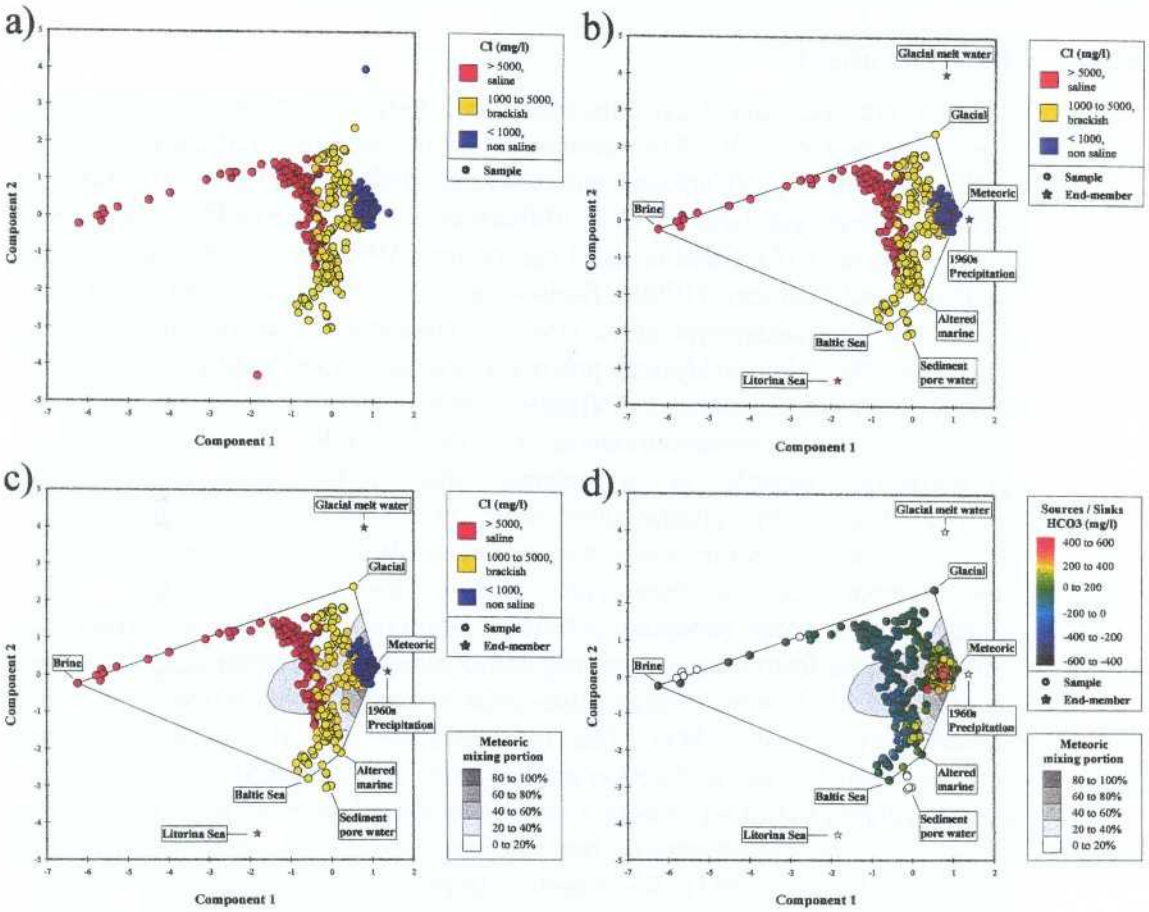

Figure 3-1. *Different steps in the M3 modelling; a) principal component analysis is used to obtain the maximum resolution of the data set, b) selection of extreme waters - the other groundwaters are compared to these, c) mixing calculations - portions of meteoric water are shown in the figure, d) mass balance calculations - the sources and sinks of e.g. carbonate are shown which cannot be accounted for by mixing. The groundwater samples in Figures a, b and c have been colour coded based on the Cl-content into saline, brackish and non-saline groundwater. The data is from Äspö HRL (Laaksoharju and Wallin (eds.), 1997).*

Back-propagation tests where 400 given mixtures of groundwaters were modelled using the M3 concept show that the accuracy of the mixing calculations is generally ±10.5% (Laaksoharju and Wallin (Eds.), 1997). Small errors in the prediction of conservative element behaviour may lead to large errors in the mass balance calculations. A low resolution may lead to difficulties in identifying the end-members and in correctly modelling the system.

3.2. DATA SELECTION FOR THE MODELLING

3.2.1. Data and quality

The groundwater analytical data from the Aberg, Beberg and Ceberg sites are extracted from SICADA (formerly GEOTAB), the SKB database, and earlier reports e.g. (Carlsson and Gidlund, 1983; Smellie and Wikberg, 1989; Ahlbom and Tirén (1991); Ahlbom et al. (1991); Smellie et al. 1985; Wikberg et al. 1983; Smellie and Laaksoharju (1992); Banwart et al. (1993); Wikberg and Banwart, (1994); Banwart ed. (1995) Nilsson (1995); Smellie et al. (1995); Laaksoharju et al. (1995); Laaksoharju and Skårman (1995); Tullborg 1997. The analytical protocols and analytical quality controls of the samples are described by Nilsson (1995). Many of these reports have addressed the representativeness of the samples. A representative groundwater sample is a sample that reflects the undisturbed hydrogeological and groundwater geochemistry in in-situ conditions. An unrepresentative sample is one that has been affected by in situ, on-line or on-site errors such as excessively high or low extraction pump rates, contamination from borehole activities, complex hydrological situations, contamination from tubes of varying compositions, air contamination, losses or uptake of CO_2, long storage times prior to analyses, analytical errors etc. (Laaksoharju et al. 1993). The representativeness of the groundwater samples from 14 sites in Sweden and Finland was compared by means of 18 quality-related variables. Aberg's score averaged 1 on a scale from 0-2, the highest of the investigated sites, Beberg scored 0.6 and Ceberg 0.8 (Laaksoharju et al. 1993). We therefore think that the groundwater samples from Aberg and Ceberg are generally representative although in some cases water extraction procedures can cause significant disturbance of the natural distribution of water types (Smellie et al. 1996). The waters from Beberg may have been affected by the borehole activities. For modelling as well as understanding the origin of the groundwater, the isotopes ($\delta^{18}O$, $\delta^{2}H$ and ^{3}H) are important. When doing further modelling only data containing these isotopes were considered. A total of more than 600 groundwater samples from the SICADA database were used in the subsequent modelling. In addition modelled or sampled end-member composition was included in the data set. For a detailed description please see the next chapter. The data is listed in Appendix 1.

3.2.2. Groundwater classification

The aim of classification is to simplify the information. A widely used classification of waters is based on Total Dissolved Solids (TDS). Salinity means essentially the same as TDS which is based on summing up the dissolved constituents. According to this classification *fresh* water is dilute potable water with a TDS content of maximum ~1000 mg/l (~600 Cl, mg/l); *brackish* water is non potable with a TDS content of ~1000-20000 mg/l (~600-12000 Cl, mg/l); and *saline* waters are waters with a salinity similar to or greater than the ocean sea water with a TDS content of ~35000 mg/l (~21000 Cl, mg/l). *Brine* water is a water with significantly more salinity than ocean seawater (Drever, 1988). To apply this classification system to

the SR 97 sites means that Aberg contains groundwater ranging from fresh water to Brine. Beberg contains fresh to brackish water and Ceberg contains only freshwater.

Piper plots (Piper, 1953) are widely used to present and classify major ion groundwater data. To show the distribution of the groundwater composition at SR 97 sites, standard trilinear Piper Plots were used based on modifications suggested by Davis and De Wiest (1967). The major variables used were Cl, Na, Ca, HCO_3, Mg, K and SO_4. In addition, a classification system developed by Morgan and Winner (1962) and Back (1966) was included in the plot. The water types were designated according to the domain in which they occur on the diagram segments (Figure 3-2).

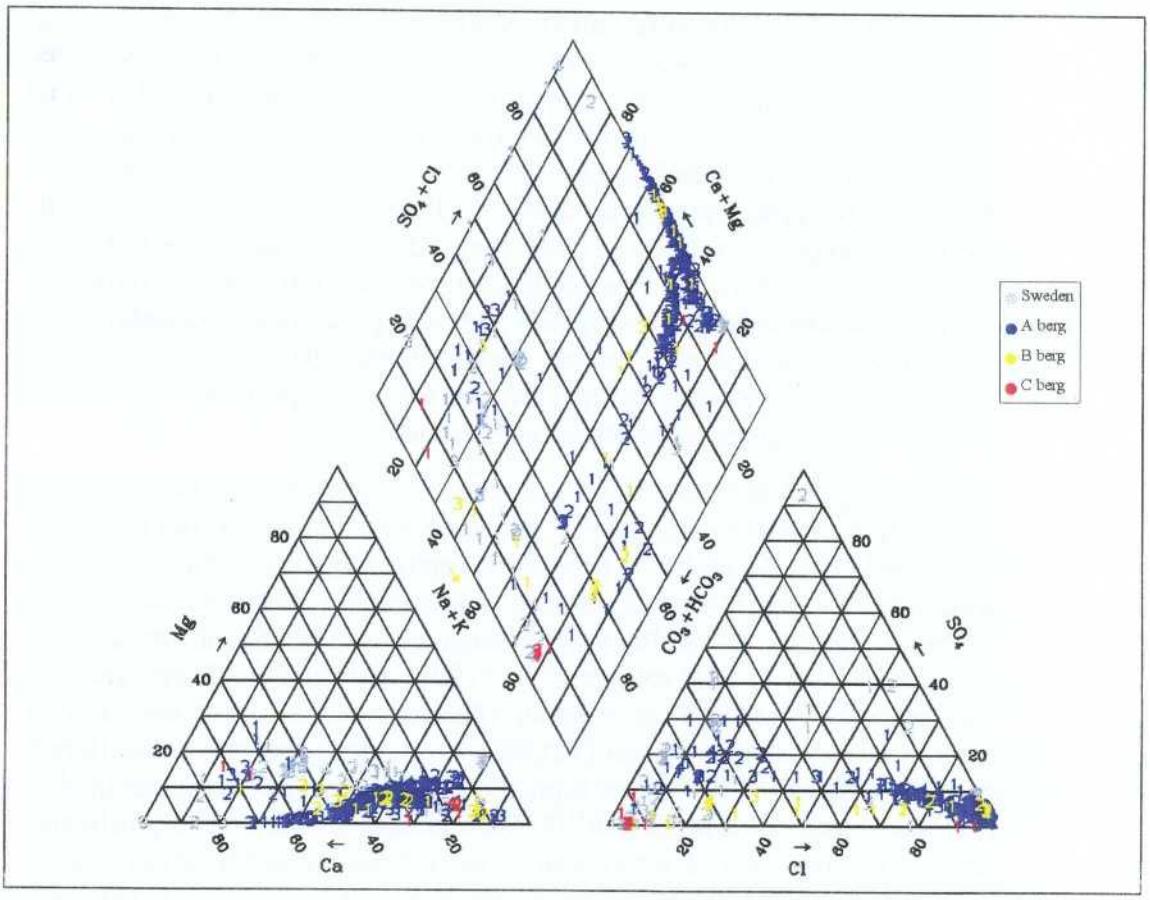

Figure 3-2. *Standard Piper Plot showing the main groundwater types for the Aberg, Ceberg and Beberg site groundwaters. The waters are classified according to the domain or field in which they occur on the diagram segments.*

The Piper Plot clearly demonstrates the large spread of groundwater composition with two distinct groupings: the first where the fresh and brackish groundwaters represent a sodium alternatively a calcium bicarbonate type; and the second, a calcium-chloride type of brine origin.

Similarities to these general groundwater patterns from the SR 97 sites have been described from other localities in Fennoscandia; from Hästholmen (Nordstrom, 1989) and more recently from Olkiluoto (Pitkänen et al., 1994). The plot indicates that there is an evolution and/or mixing trend from non-saline water through brackish water to saline water. Influence from the Baltic Sea is evident from some of the brackish data. The disadvantage with Piper plots is the higher resolution for the shallower waters than for the intermediate and deep groundwaters with the latter usually forming tight clusters. Important changes in some variables such as SO_4 may be masked by larger changes in other variables such as Cl.

3.2.3. Reference waters

For the PA modelling the reference waters were chosen from Aberg, Beberg and Ceberg. The following major criterion was used for the selected samples: *The reference water sample should be the best estimate reflecting the natural conditions at the repository depth of 500m±100m.* The depth criteria eliminated most of the samples and the choice was generally between 1-4 possible candidates. The candidate samples were examined in detail and principal component analysis (PCA) was used to compare the candidate samples in relation to other sampled groundwaters in Sweden (see Figure 3-3). The PCA plot is a useful tool for examining the variability and origin of the groundwater at different sites e.g. groundwater samples which plot close to the meteoric water contain more meteoric water (e.g. at Ceberg) compared to samples from another site which plot close to the brine end-member (i.e. deep groundwater samples at Aberg).

From Aberg KAS02:530-535m was chosen, from Beberg two reference waters BFI01:439-459m and KFI07:511-516 were chosen in order to gather the groundwater variability at repository depth at this site. From Ceberg the sample KGI04:404-407m was chosen. The complete analytical data for the reference samples, the quality scores compared with the Scandinavian mean values according to Laaksoharju et al. (1993) and the calculated saturation indexes using WATEQF in Netpath (Plummer et al. 1991) are listed in Table 3-1. The reference water (KAS02) from Aberg and one of the Beberg reference waters (BFI01) score higher than the Scandinavian mean quality. The other reference sample (KFI07) from Beberg and the Ceberg reference sample (KGI04) have a lower score than the Scandinavian mean quality. The drill water content is higher in the KGI04 sample. The KAS02 and BFI01 reflect the undisturbed conditions at 500m more accurately than samples KFI07 and KGI04 (for further discussion see Appendix 2).

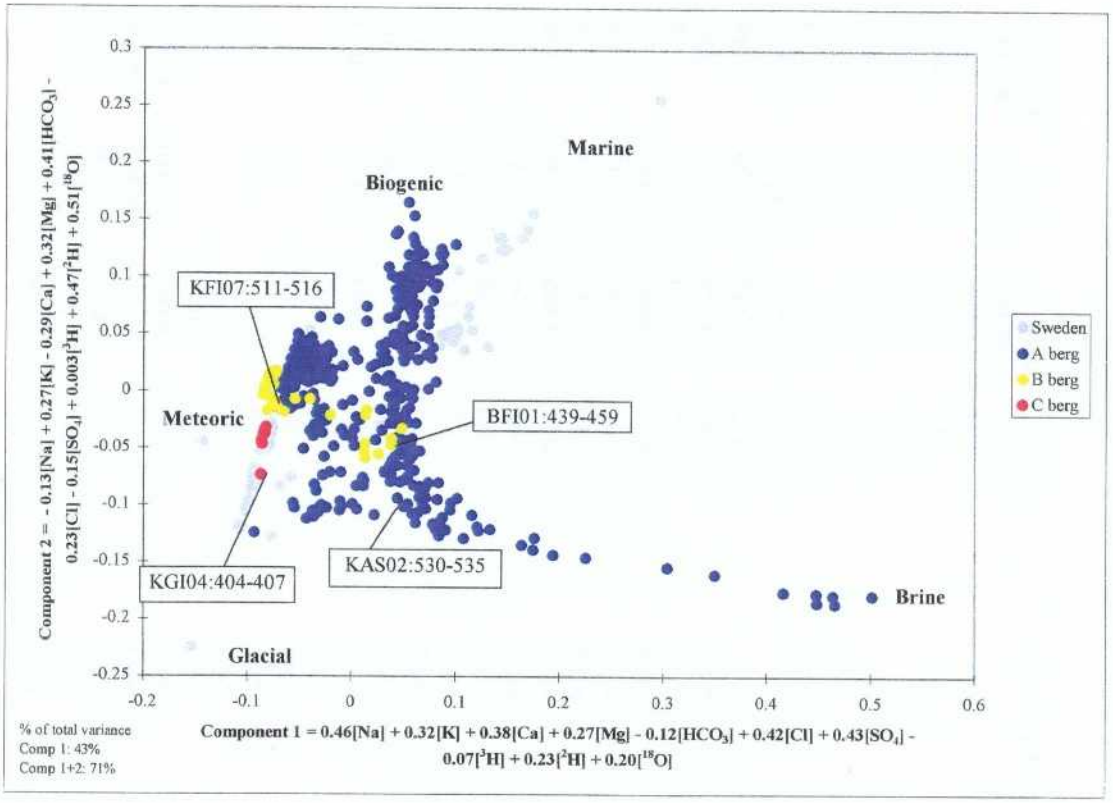

Figure 3-3. *PCA plot based on the major components, stable isotopes and tritium values from the Swedish SKB sites compared to data from Aberg, Beberg and Ceberg. The identified reference water samples at 500m±100m depth are tagged. The weight of the different elements is shown in the equations for the first and second principal component respectively. These two principal components together account for 71% of the variability, or the information in the data.*

Table 3-1. Complete analytical data for the reference samples from Aberg, Beberg and Ceberg together with the quality scores and the calculated saturation indexes.

Description of codes	Code in SICADA	Unit	Aberg	Beberg		Ceberg
Borehole identification code	**IDCODE**		**KAS02**	**BFI01**	**KFI07**	**KGI04**
Position of upper packer in borehole	SECUP	m	530	439	511	404
Position of lower packer in borehole	SECLOW	m	535	459.1	516	406.7
Vertical position of upper packer from the surface		m	528.2	435.8	507.8	384.3
Vertical position of lower packer from the surface		m	533.2	455.7	512.8	386.9
Vertical position of upper packer		masl	-520.5	-406.6	-474.9	-268.3
Vertical position of lower packer		masl	-525.5	-426.5	-479.9	-270.9
Date, day of measurement	DATE		880504	861027	801119	820704
Sample number	SAMPLE_NO		1432	1265	-478	194
Na	NA	mg/l	2100	1700	275	105
K	K	mg/l	8.1	13.0	2.0	1.9
Ca	CA	mg/l	1890	1650	142	21
Mg	MG	mg/l	42	110	17	1.1
HCO_3	HCO3	mg/l	10	47	278	18
Cl	CL	mg/l	6410	5500	555	178
SO_4	SO4	mg/l	560	370	49	0.1
Br	BR	mg/l	40	32		
F	F	mg/l	1.5	1.2	1.5	3.2
SiO_2 calculated as Si	SI	mg/l	4.1	5.4	5.6	4.7
Fe(II)	FEII	mg/l	0.24		1.80	0.05
Mn	MN	mg/l	0.29	0.82	0.13	0.01
Li	LI	mg/l	1.0	0.007		
Sr	SR	mg/l	35	21		
Dissolved organic carbon	DOC	mg/l	1.0		5.7	2.0
HS^-	S2	mg/l	0.15	0.01*		0.01*
I	I	mg/l		0.12		0.14
NO_2 calculated as N	NO2_N	mg/l	0.001*	0.005	0.010	0.001*
NO_3 calculated as N	NO3_N	mg/l	0.010*	0.005*	0.002*	0.009
NH_4 calculated as N	NH4_N	mg/l	0.03	0.35	0.09	0.012
PO_4 calculated as P	PO4_P	mg/l	0.005	0.005	0.040	0.008
^{238}U	U238	mBq/kg	3.19**	195.40		

*= Under the detection limit
**= Measured 950505
***= Oxidation during drilling
****= According toYJT-93-24 pp32-35 and SKB TR 92-10 and compared to the Scandinavian mean

Table 3-1. Continuing.

Description of codes	Code in SICADA	Unit	Aberg	Beberg		Ceberg
Borehole identification code	**IDCODE**		**KAS02**	**BFI01**	**KFI07**	**KGI04**
^{235}U	U235	mBq/kg	0.5**	9.1		
^{234}U	U234	mBq/kg	10.4**	365.9		
natural U		µg/l	3.86	19.3***	0.35	0.17
Th	TH	µg/l	0.022**	0.120		0.028
^{226}Ra	RA226	mBq/kg	0.224**	1		0.004
^{222}Rn	RN222	mBq/kg	67.4**	39.5		88.1
^{14}C (percent modern carbon)	PMC	%		34.40		
^{13}C	C13	‰ PDB		-9.9	-14.6	
^{14}C (age before present)	AGE_BP	year		8390	4440	
Age before present based on ^{14}C with correction of ^{13}C	AGE_BP_CORR	year		8640	4610	
D	D	SMOW	-97.2**	-88.7	-89.0	-99.4
Tr	TR	TU	8**	3*	8	8
^{18}O	O18	SMOW	-12.30**	-11.81	-11.90	-13.63
Representative Eh		**mV**	**-308**		**-250**	**-202**
Representative pH		**units**	**7.73**	**7.04**	**7.90**	**9.30**
Representative electrical conductivity		**mS/m**	**1890**	**1610**	**190**	**65.5**
Water flow at measurement	S_W_FLOW	l/min	0.118	0.060		0.098
Drill water content	DRILLW	%	0.19	0.02		11.03
Ionic strength			2.40E-1	2.10E-1	2.52E-2	6.19E-3
Total dissolved solids (TDS)		mg/l	11107	9457	1339	338
Quality Scores**			**0.86**	**0.63**	**-0.36**	**-0.15**
Calcite, saturation index		LOG IAP/K	-0.14	-0.20	0.71	0.11
Aragonite, saturation index		LOG IAP/K	-0.29	-0.36	0.55	-0.05
Dolomite, saturation index		LOG IAP/K	-1.69	-1.41	0.65	-0.91
Siderite, saturation index		LOG IAP/K	-1.80	-3.00	1.54	-0.27
Rhodochrosite, saturation index		LOG IAP/K	-1.51	-1.06	-0.002	-0.93
Strontianite, saturation index		LOG IAP/K	-1.36	-1.57		
Gypsum, saturation index		LOG IAP/K	-0.32	-0.50	-1.78	-4.99
Anhydrite, saturation index		LOG IAP/K	-0.56	-0.75	-2.03	-5.24
Celestite, saturation index		LOG IAP/K	-0.35	-0.69		
Hydroxyapatite, saturation index		LOG IAP/K	0.58	-2.79	0.90	1.44

*= Under the detection limit
**= Measured 950505
***= Oxidation during drilling
****= According toYJT-93-24 pp32-35 and SKB TR 92-10 and compared to the Scandinavian mean

Table 3-1. Continuing.

Description of codes	Code in SICADA	Unit	Aberg	Beberg		Ceberg
Borehole identification code	**IDCODE**		**KAS02**	**BFI01**	**KFI07**	**KGI04**
Fluorite, saturation index		LOG IAP/K	0.25	0.06	-0.32	-0.28
SiO_2 amorph, saturation index		LOG IAP/K	-1.01	-0.86	-0.88	-1.03
Chalcedony, saturation index		LOG IAP/K	-0.14	0.02	0.01	-0.15
Quartz, saturation index		LOG IAP/K	0.32	0.50	0.48	0.33
Talc, saturation index		LOG IAP/K	-1.26	-3.97	-0.62	3.96
Chrysotile, saturation index		LOG IAP/K	-4.48	-7.53	-4.15	0.74
Sepiolite, saturation index		LOG IAP/K	-3.06	-4.68	-2.47	0.54
Hematite, saturation index		LOG IAP/K	0.50	0.27	7.71	12.56
Goethite, saturation index		LOG IAP/K	-0.37	-0.34	3.37	5.79
Fe(OH)3 amorphous, saturation index		LOG IAP/K	-6.26	-6.23	-2.52	-0.10
Pyrite, saturation index		LOG IAP/K	5.87	7.88		9.90
FeS ppt, saturation index		LOG IAP/K	-0.10	-3.08		-0.09
Vivianite, saturation index		LOG IAP/K	-6.88	-11.87	1.17	-2.81
Pyrolusite, saturation index		LOG IAP/K	-28.75	-24.94	-25.47	-20.63
Hausmannite, saturation index		LOG IAP/K	-30.14	-28.46	-26.89	-18.53
Manganite, saturation index		LOG IAP/K	-13.42	-11.66	-11.44	-8.14
Pyrochroite, saturation index		LOG IAP/K	-5.62	-6.53	-5.49	-3.73
pCO_2, partial pressure		bar	-3.99	-2.60	-2.59	-5.28
H_2 gas, partial pressure		bar	-4.69	-10.01	-8.38	-11.46
Melanterite, saturation index		LOG IAP/K	-6.63	-7.89	-5.54	-9.96
K-Jarosite, saturation index		LOG IAP/K	-28.80	-27.03	-20.08	-22.01

*= Under the detection limit
**= Measured 950505
***= Oxidation during drilling
****= According toYJT-93-24 pp32-35 and SKB TR 92-10 and compared to the Scandinavian mean

3.3. SELECTION OF END MEMBERS FOR THE MODELLING

The selected end-members for the current modelling are shown in Figure 3-4 in relation to the sampled groundwaters at Aberg, Beberg and Ceberg. The ID codes for the chosen reference waters are shown. The end-members were selected so that the samples at Aberg, Beberg and Ceberg sites can be described. The criterion is defined as a sample inside the polygon that can be described by the selected end-members. The closer to the end-member a groundwater observation plots in PCA the more of that end-member the water contains. The reason for modelling all the sites simultaneously by using the same end-members is that the sites are believed to have undergone the same type of postglacial evolution (see section 2) where the selected end-members have participated in the groundwater formation. The comparison of the groundwater is also easier when using PCA, compared with many standard methods such as Piper plots. The SR 97 groundwater data seems to plot distinctively close to the Meteoric end-member for Ceberg. For Beberg a more complex mixing behaviour, following a Meteoric-Mixed trend including Marine, Glacial and Brine components, was observed. The Aberg water seems to be a result of end-member mixing including all end-members to a different degree.

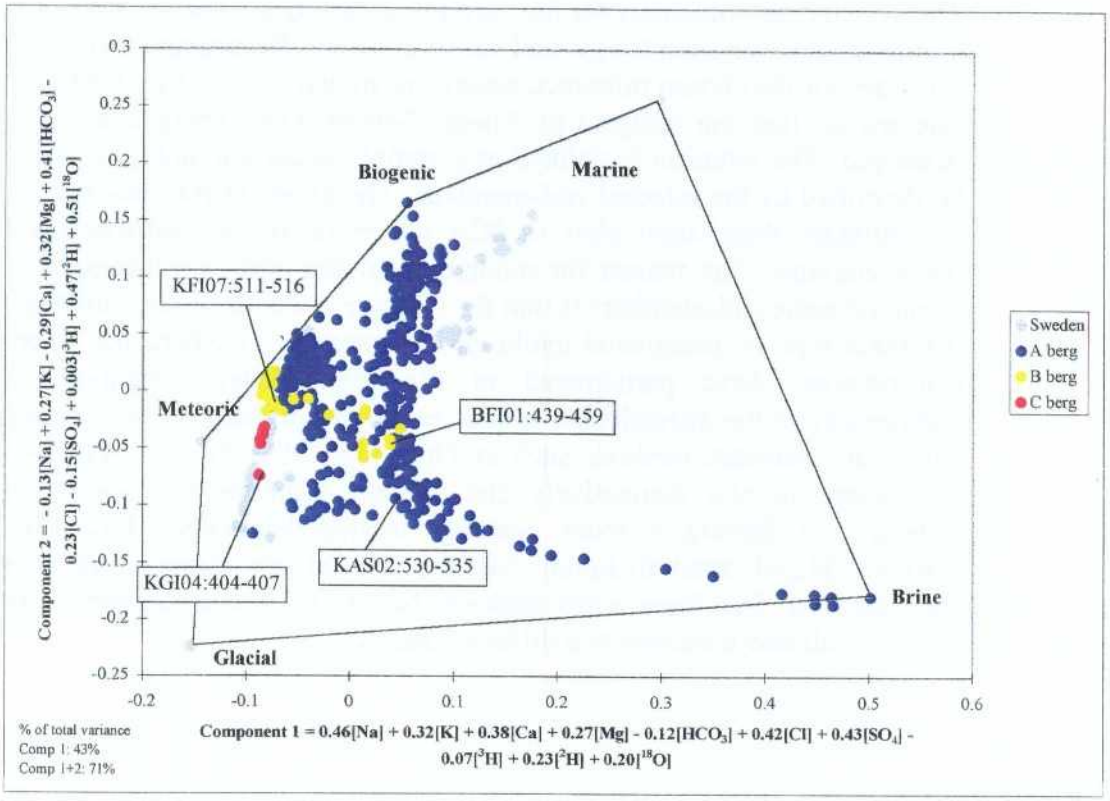

Figure 3-4. *PCA plot based on the major components, stable isotopes and tritium values from the Aberg, Beberg and Ceberg sites. The position of the selected end-members, Meteoric, Glacial, Biogenic, Marine and Brine are shown in relation to the sampled groundwaters. A polygon is drawn between the different end-members, and by definition the selected end-members can describe the observations within the polygon. The weight for the different elements is shown in the equations for the first and second principal component respectively. These two principal components together account for 71% of the variability, or the information in the data.*

The analytical data for the end-members are listed in Appendix 1. The selected end-members for Aberg, Beberg and Ceberg are:

- **Meteoric** water which represents a sampled Na-HCO_3 rainwater composition. The end-member represents an average 1960 *precipitation* composition with a high given tritium (2000 TU) content. This value is an estimate based on the modern tritium values measured at Äspö and taking into account the 12.43 years of half-life for tritium. The precipitation of 1960 could contain up to 3000 tritium units (Alley, 1993).

- **Glacial**, which is a measured glacial meltwater of a K-SO4 composition, sampled in Jostedalsbreen in Norway. The glacier is situated in crystalline bedrock and samples were taken from the glacial ice and the

meltwater following the glacial meltwater downstream for 36km. In order to reflect prevailing stable isotope values of the last glaciation, the following $\delta^{18}O$ = -21 SMOW and $\delta^{2}H$ = -158 SMOW were based on measured values ($\delta^{18}O$) in the calcite fracture fillings from different geological formations in Sweden (Tullborg and Larson, 1984). Groundwater with low $\delta^{18}O$ values which indicate cold climate recharge can be observed at Aberg today at various depths in the basement (Smellie and Laaksoharju, 1992).

- **Brine** end-member which represents the brine type of water found in KLX02:1631-1681m with a measured Cl of 47200 mg/l (Laaksoharju et al., 1995). Brines are waters with significantly higher salinity than Ocean sea water. The brine deep waters are stagnant waters with a measured ^{36}Cl age of 1.5 Ma. The brine water is in contact with the brackish groundwater systems rather than being a totally closed system. This contact may have taken place during the melting of the continental ice, natural influx or enhanced influx during drilling, hydrotesting or sampling. However, the samples at large depths have traces of tritium, indicating contact with the upper part of the aquifer (Laaksoharju et al., 1995). This may be attributed to a contamination of significantly younger waters in connection with the drilling operations.

- **Marine** end-member which represents *Litorina Sea* composition with a Cl concentration of 6100 mg/l based on analyses of microfossils from the marine sediments in southern Finland (Kankainen, 1986). Based on microfossil determination in the southern part of the Baltic Sea, concentrations up to 14000 mg/l Cl have been suggested (Winn et al., 1988). Mixing portion tests were performed where various possible Litorina Sea water concentrations were tested. The former concentration of 6100 mg/l gave the best fit with the measured Cl and $\delta^{18}O$ content for the current groundwaters. A similar Cl content was suggested by Sjöberg et al. 1984 based on measurements of interstatial water in postglacial black clays. The Litorina sea had a higher salinity (of almost a factor of two) compared to the modern Baltic Sea water composition.

- **Biogenic** end-member (SA1094A) which represents Baltic Sea water altered by bacterial sulphate reduction (Laaksoharju ed., 1995). The end-member is similar to the composition of the extracted marine *sediment pore water* (Landström et al., 1994). This water type was obtained in the HRL tunnel at Äspö below the marine sediments. The stable isotopes were not measured for the pore water and a test was performed where the samples were given Litorina as well as modern values. The position of the samples in Figure 3-4 did not change considerably. The pore water composition resembled a more modern Baltic Sea water composition than a Litorina sea water composition. In addition the hydrogeological modelling indicated that the modern sea could affect the sediments. Based on this knowledge the modern isotope values were kept in the modelling.

3.4. 3D VISUALISATION OF THE M3 CALCULATIONS

In order to visualise the distribution of Cl and the results of the mixing portion calculations of Meteoric, Glacial, Brine, Marine and Biogenic, a 3D interpolation was performed using Voxel Analyst by INTERGRAPH. The location of the modelled area is shown in Figure 2-1a,b,c. The groundwater observations used in the modelling are listed in Appendix 1.

3.4.1. 3D visualisation groundwater features at Aberg

The cutting planes for Aberg were chosen to show the distribution of the salinity and dominating water types rather than to reflect specific water-conducting structures. Two profile directions were chosen: a) N-S profile and b) E-W profile. The modelling is based solely on chemical information which can be used to support the 3-D understanding of groundwater flow through the site area. The calculated mixing portions are always relative to the selected end-members. The Cl distribution in portions of Meteoric, Glacial, Marine, Biogenic and Brine waters are shown in Figures (3-5 to 3-10).

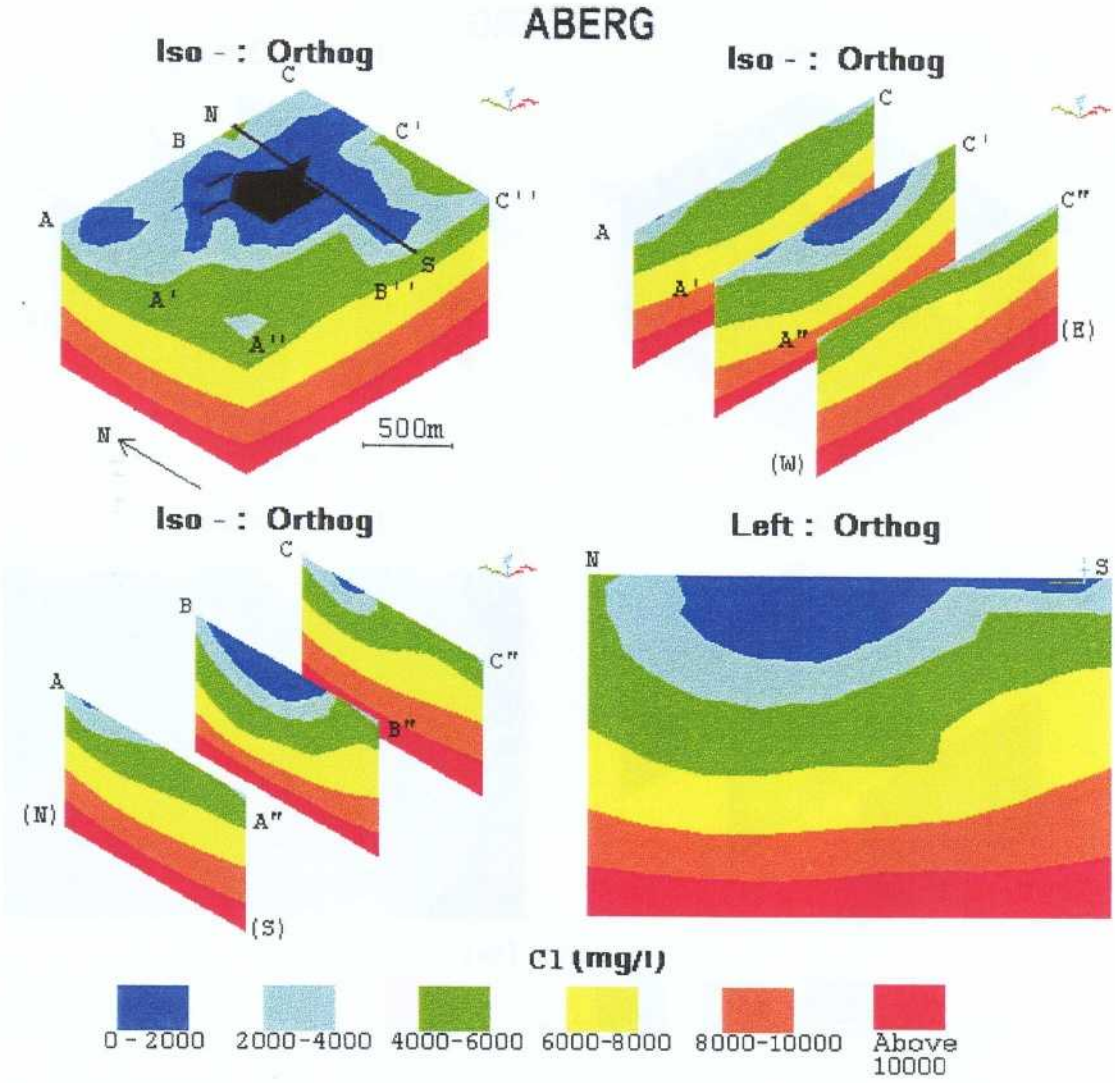

Figure 3-5. *The result of a 3D model of the Cl distribution at the Aberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1a.*

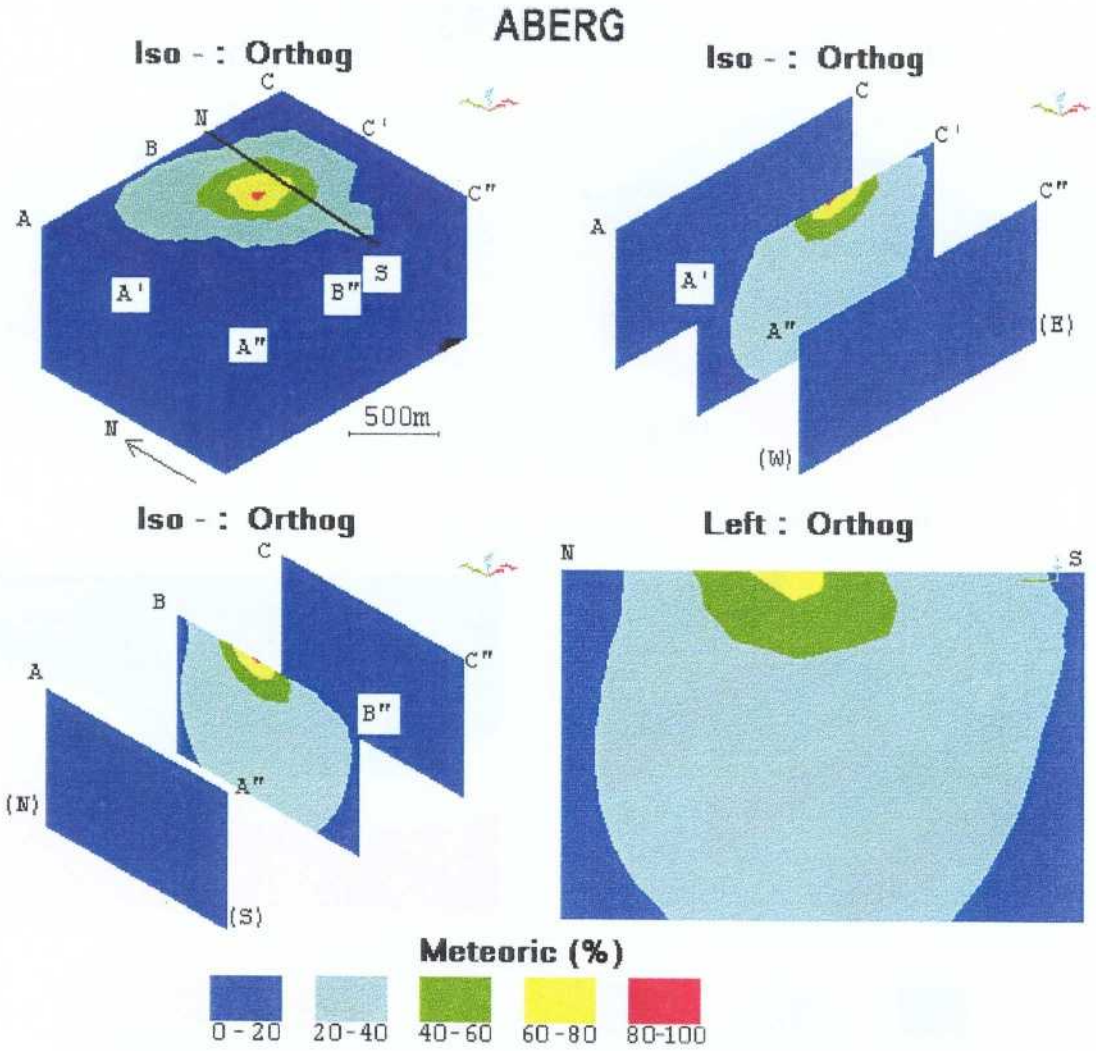

Figure 3-6. *The result of a 3D model of the M3 modelling of the Meteoric water (%) at the Aberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1a.*

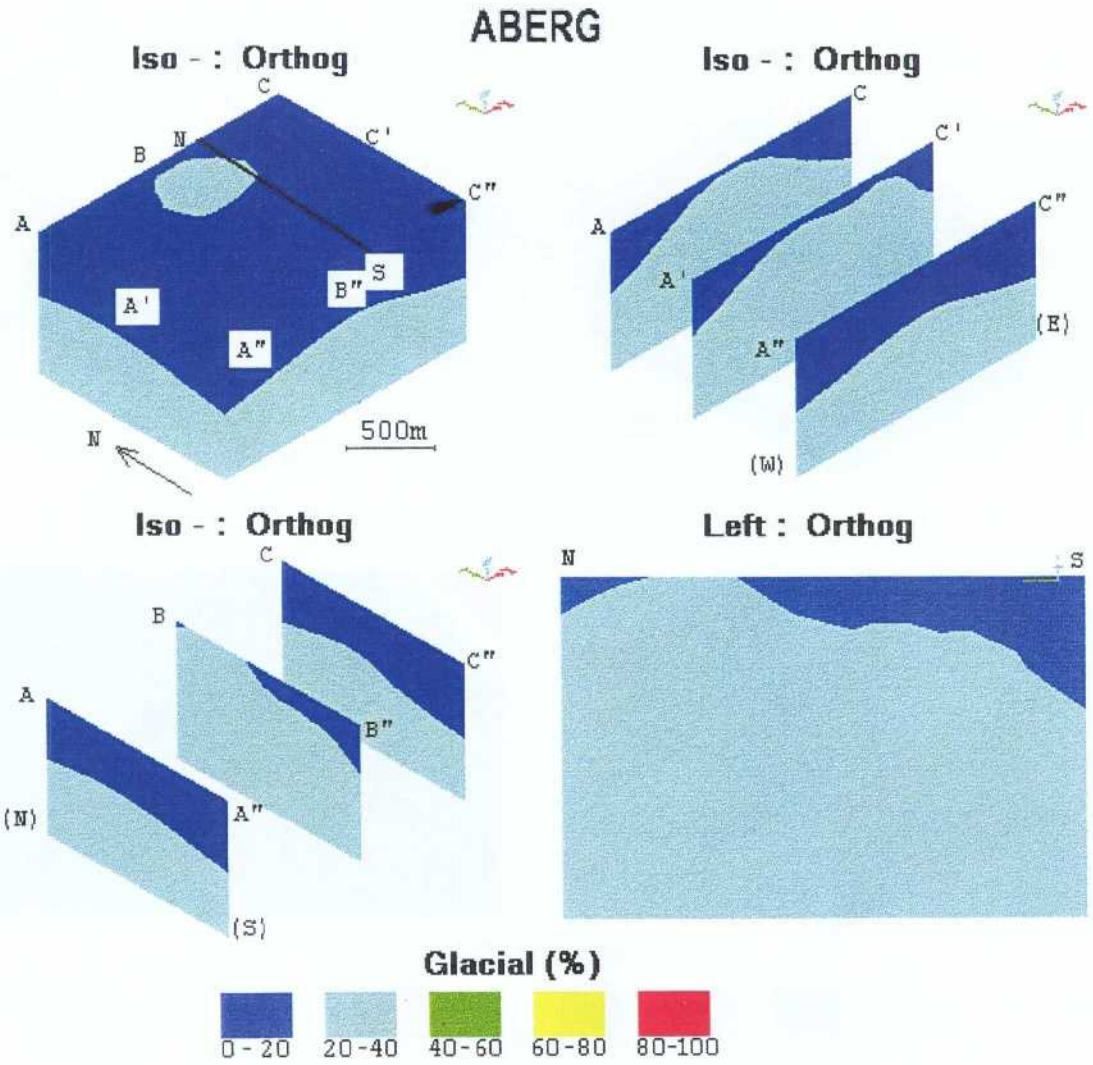

Figure 3-7. *The result of a 3D model of the M3 modelling of the Glacial water (%) at the Aberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1a.*

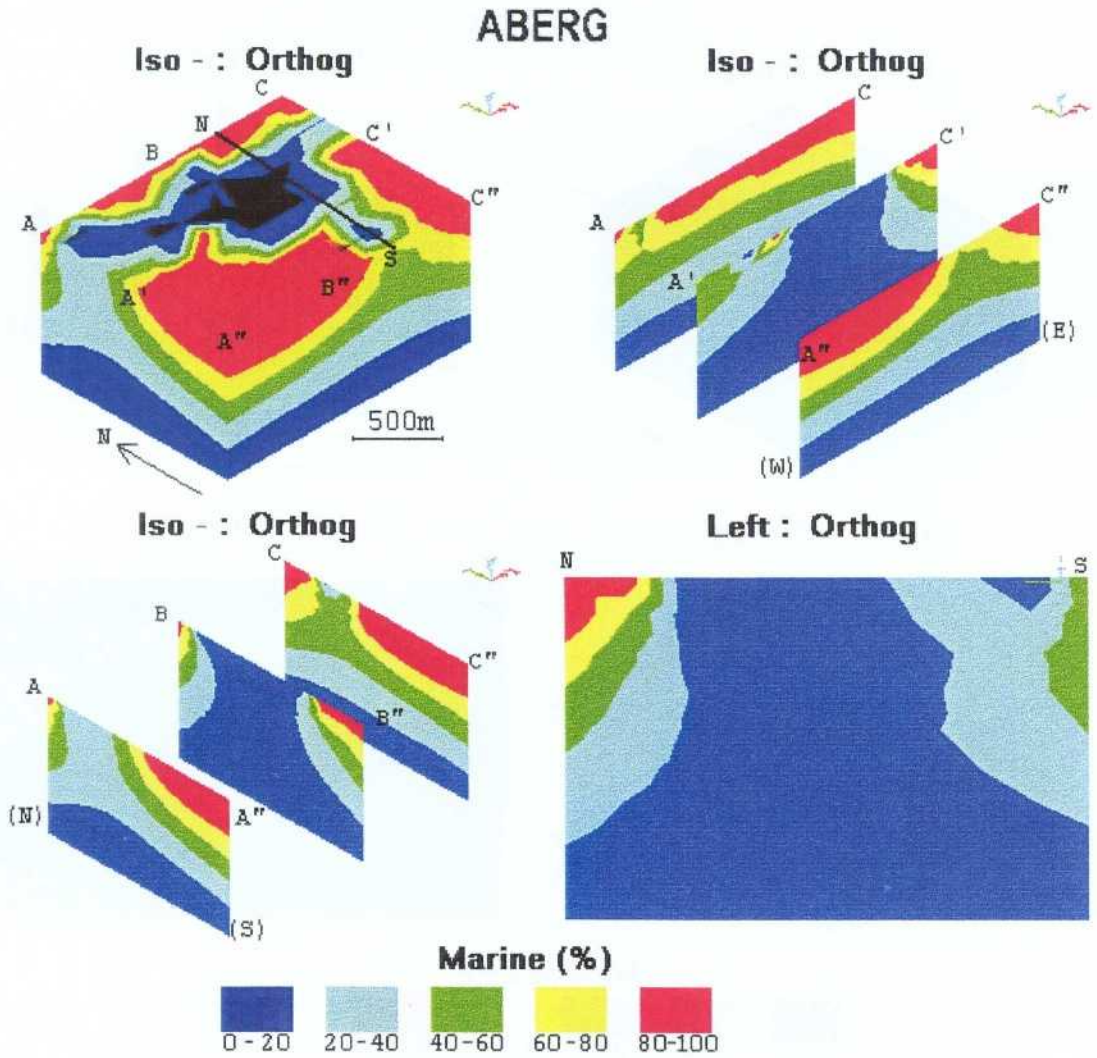

Figure 3-8. *The result of a 3D model of the M3 modelling of the Marine water (%) at the Aberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1a.*

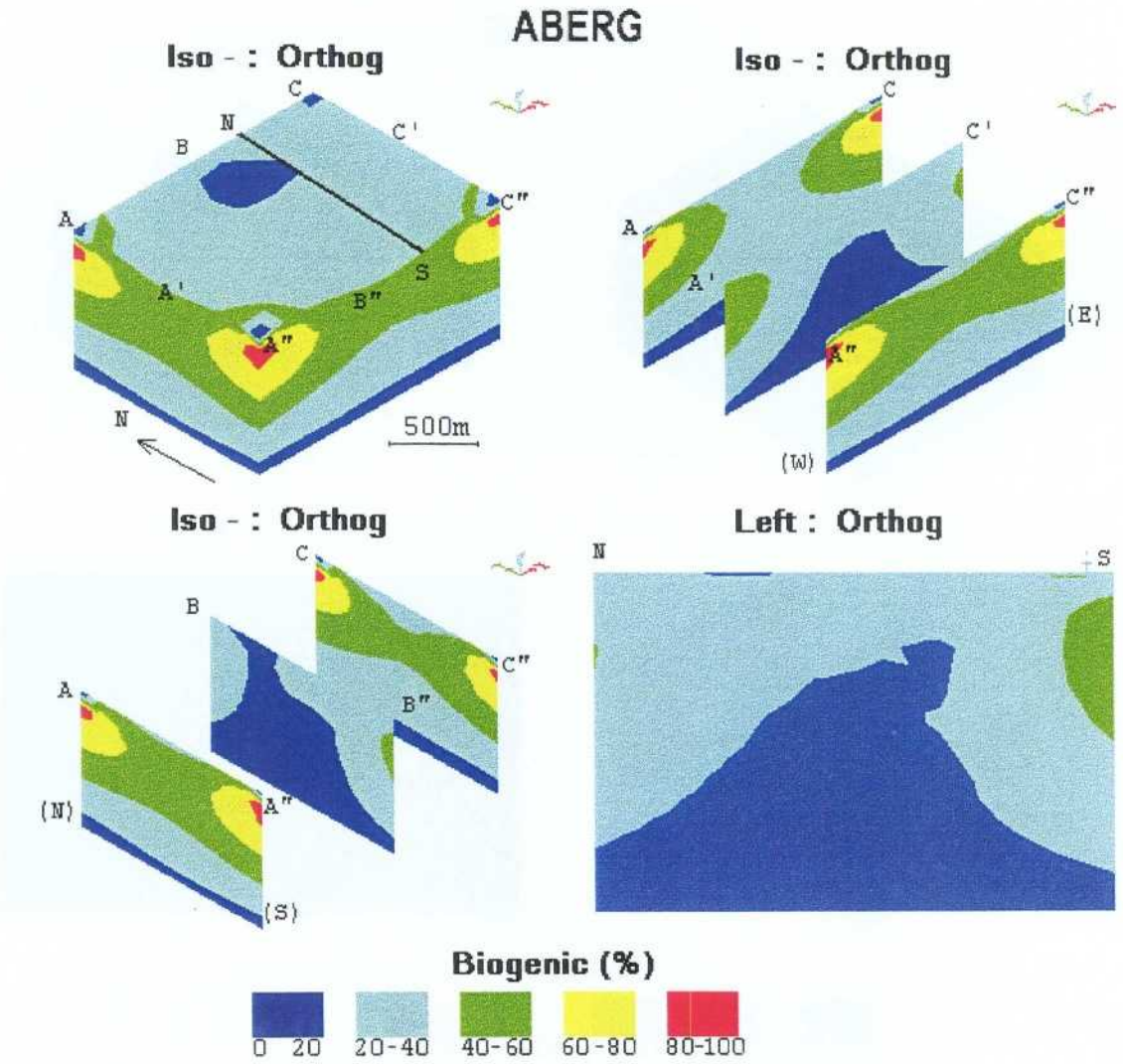

Figure 3-9. *The result of a 3D model of the M3 modelling of the Biogenic water (%) at the Aberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1a.*

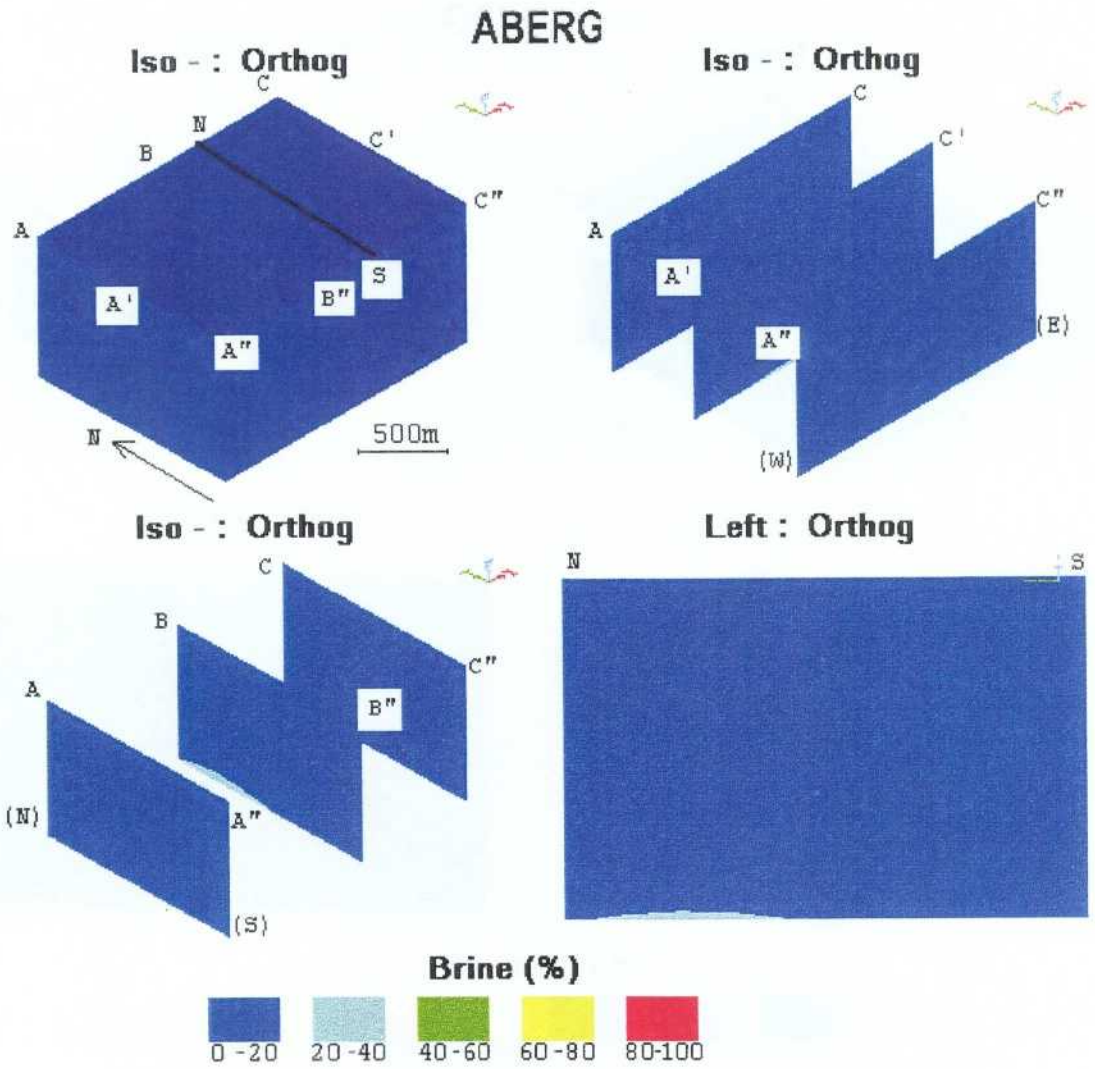

Figure 3-10. *The result of a 3D model of the M3 modelling of the Brine (%) at the Aberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1a.*

The results of the modelling of Aberg show that the Cl distribution can be described by a complex mixture of waters with different origins. At the reference water location (KAS02:530-535m) the measured groundwater composition is a result of mixing Meteoric water (31%) with Glacial (29%), Biogenic (15%), Brine (14%) and Marine (12%). The results of the mixing calculations for all observations are shown in Appendix 1.

3.4.2. 3D visualisation groundwater features at Beberg

The cutting planes for Beberg were chosen to show the distribution of the salinity and dominating water types rather than to reflect specific water-conducting structures. Two profile directions were chosen: a) N-S profile and b) E-W profile. The modelling is based solely on chemical information which can be used to support the 3-D understanding of groundwater flow through the site area. The calculated mixing portions are always relative to the selected end-members. The Cl distribution in portions of Meteoric, Glacial and Biogenic waters are shown in Figures (3-11 to 3-14).

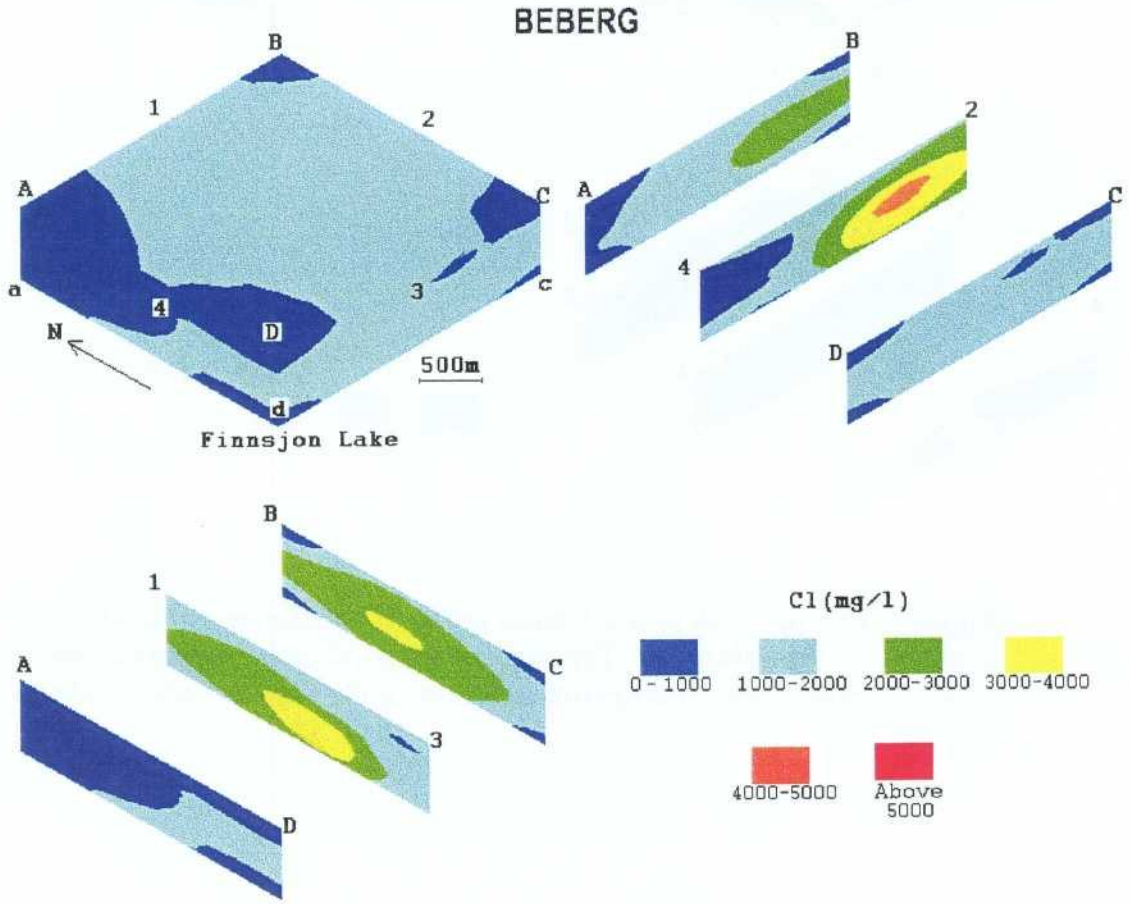

Figure 3-11. The result of a 3D model of the Cl distribution at the Beberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1b.

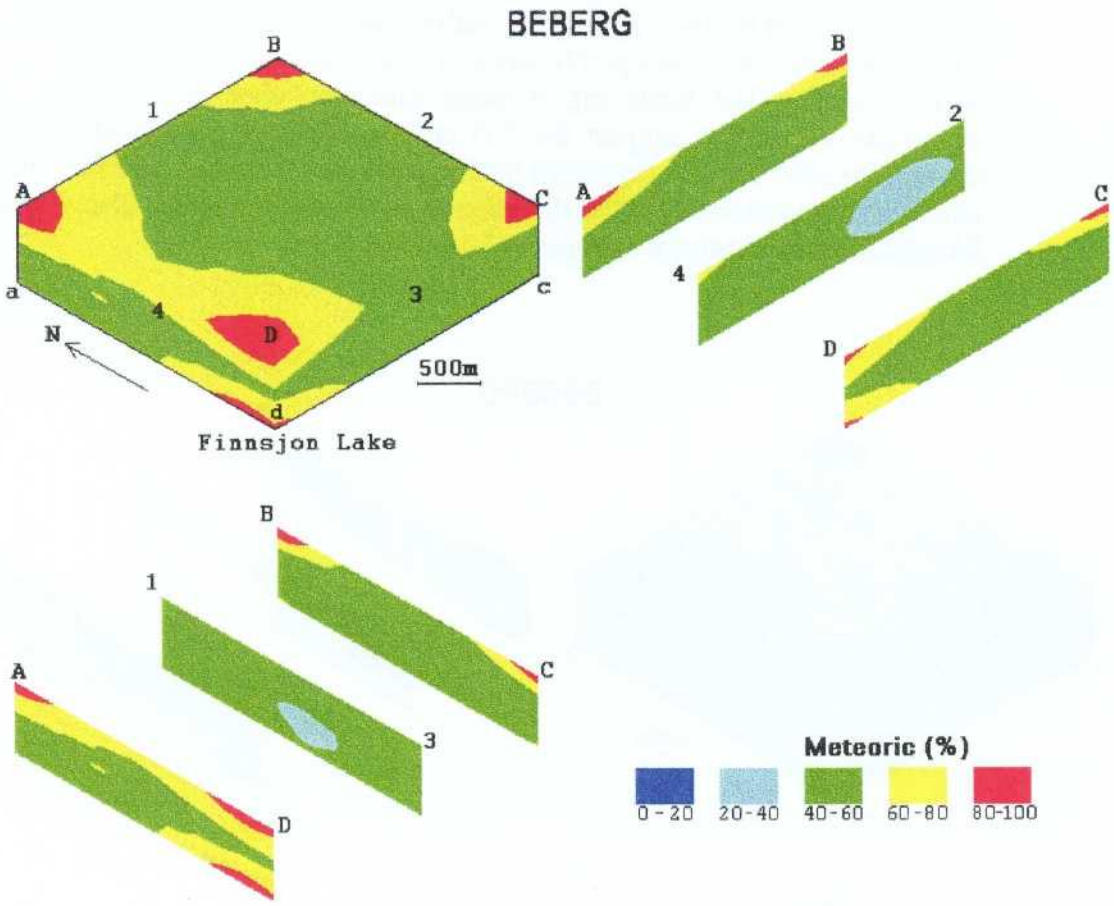

Figure 3-12. *The result of a 3D model of the M3 modelling of the Meteoric water (%) at the Beberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1b.*

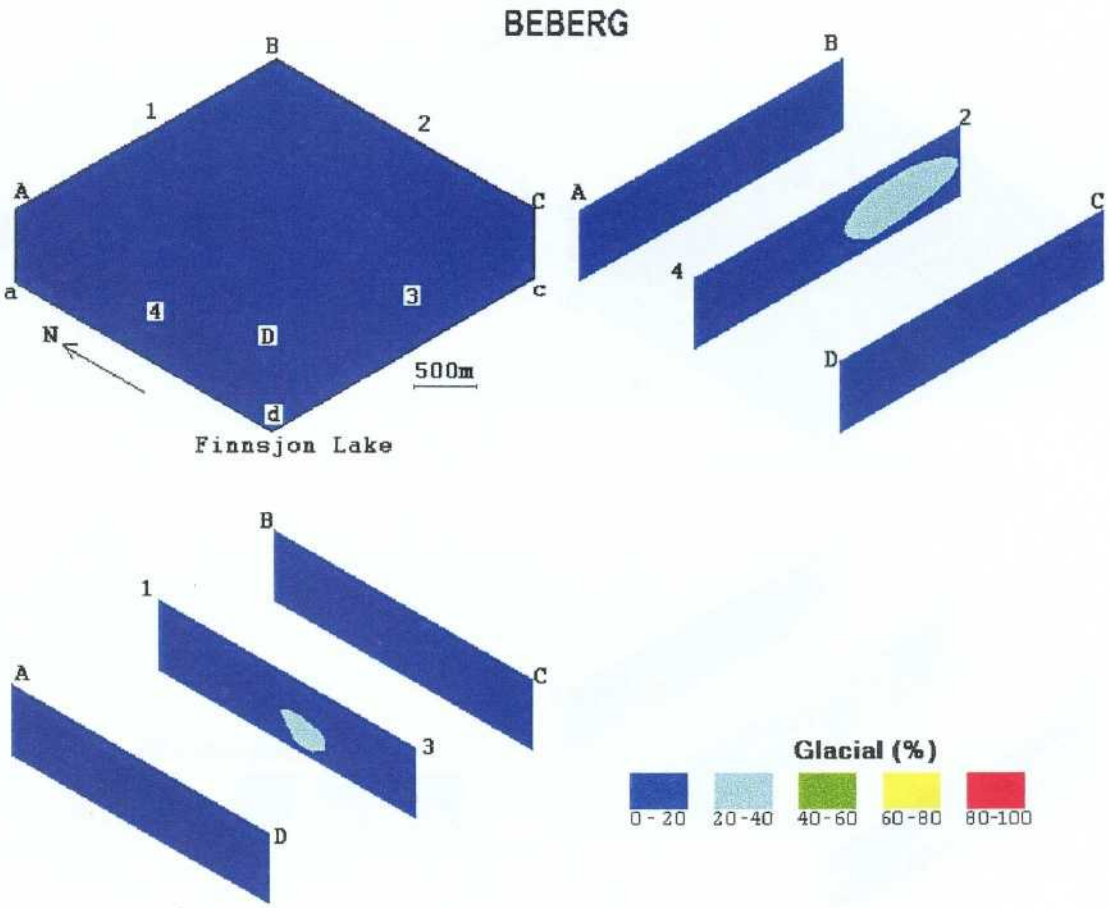

Figure 3-13. *The result of a 3D model of the M3 modelling of the Glacial water (%) at the Beberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1b.*

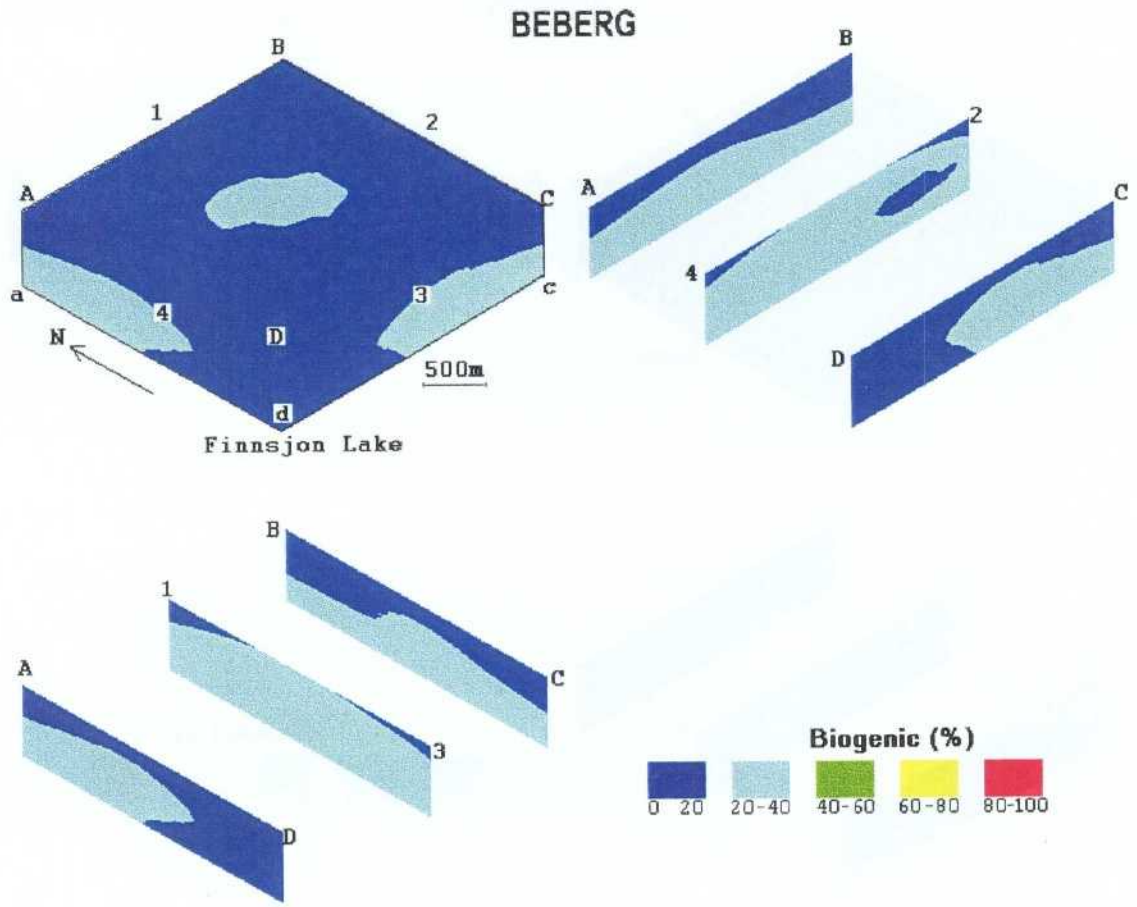

Figure 3-14. *The result of a 3D model of the M3 modelling of the Biogenic water (%) at the Beberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1b.*

The results of the modelling of Beberg show that the Cl distribution can be described by a complex mixture of waters with different origins. At the reference water location (BFI01:439-459m) the measured groundwater composition is a result of mixing Meteoric water (30%) with Glacial (26%), Biogenic (19%), Brine (16%) and Marine (10%). At the other reference water location (KFI07:511-516m) the measured groundwater composition is a result of mixing Meteoric water (50%) with Biogenic (22%), Glacial (15%), Marine (10%) and Brine (3%). A mixing portion calculation of less than 10% is regarded as under the detection limit of the M3-method and is therefore uncertain. The results of the mixing calculations for all observations are shown in Appendix 1.

3.4.3. 3D visualisation groundwater features at Ceberg

The cutting planes for Ceberg were chosen to show the distribution of the salinity and dominating water types rather than to reflect specific water-conducting structures. Since the available data for Ceberg was limited, only one profile in the direction NW-SE was chosen. The modelling is based solely on chemical information that can be used to support the 3-D understanding of groundwater flow through the site area. The calculated mixing portions are always relative to the selected end-members. The Cl distribution in portions of Meteoric and Glacial waters are shown in Figures (3-15 to 3-17).

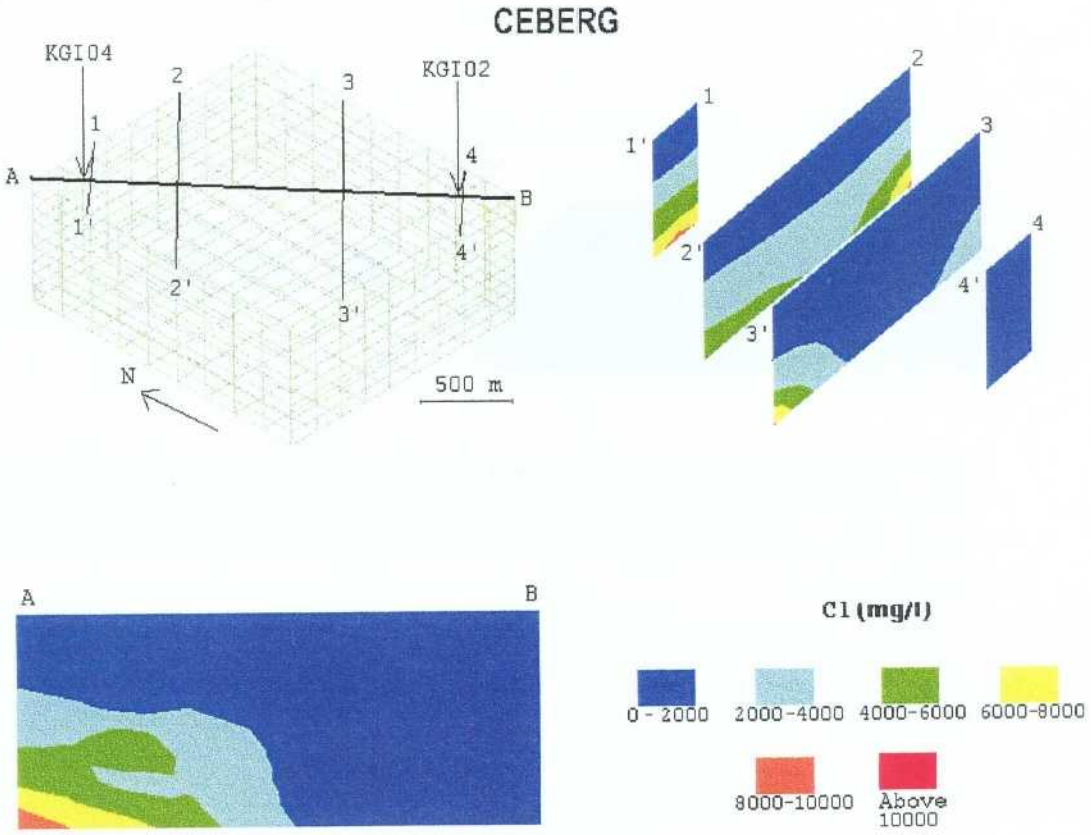

Figure 3-15. *The result of a 3D model of the Cl distribution at the Ceberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1c.*

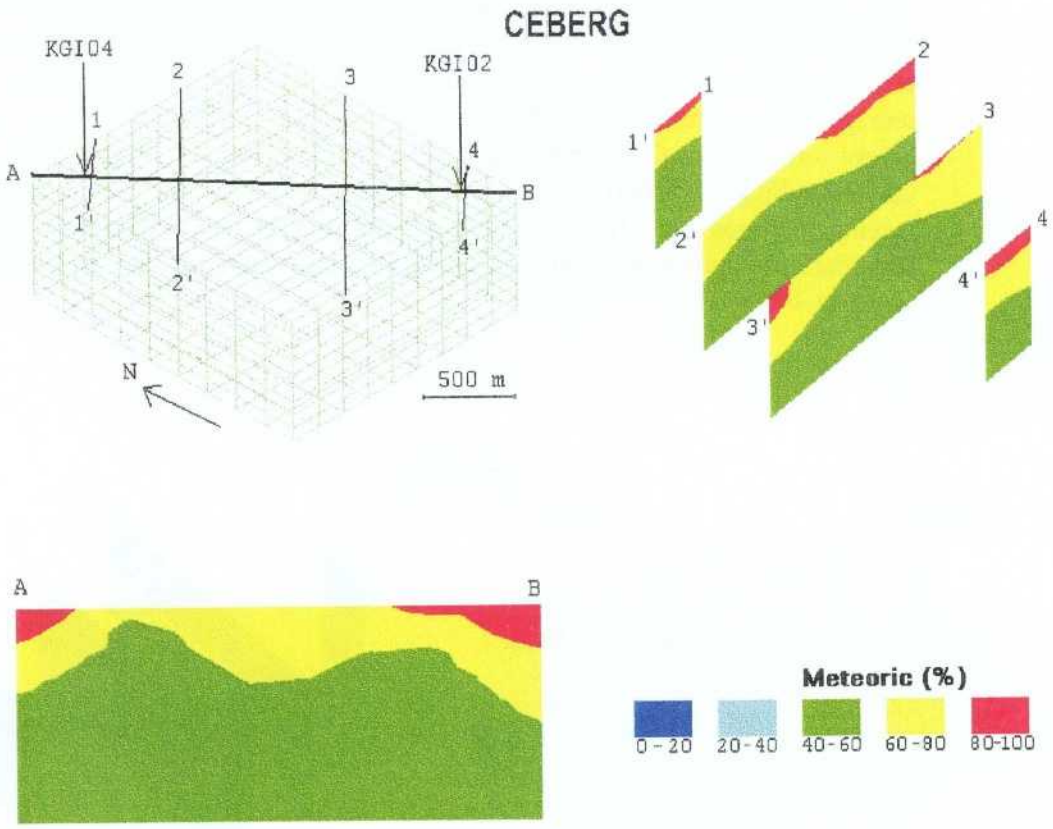

Figure 3-16. *The result of a 3D model of the M3 modelling of the Meteoric water (%) at the Ceberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1c.*

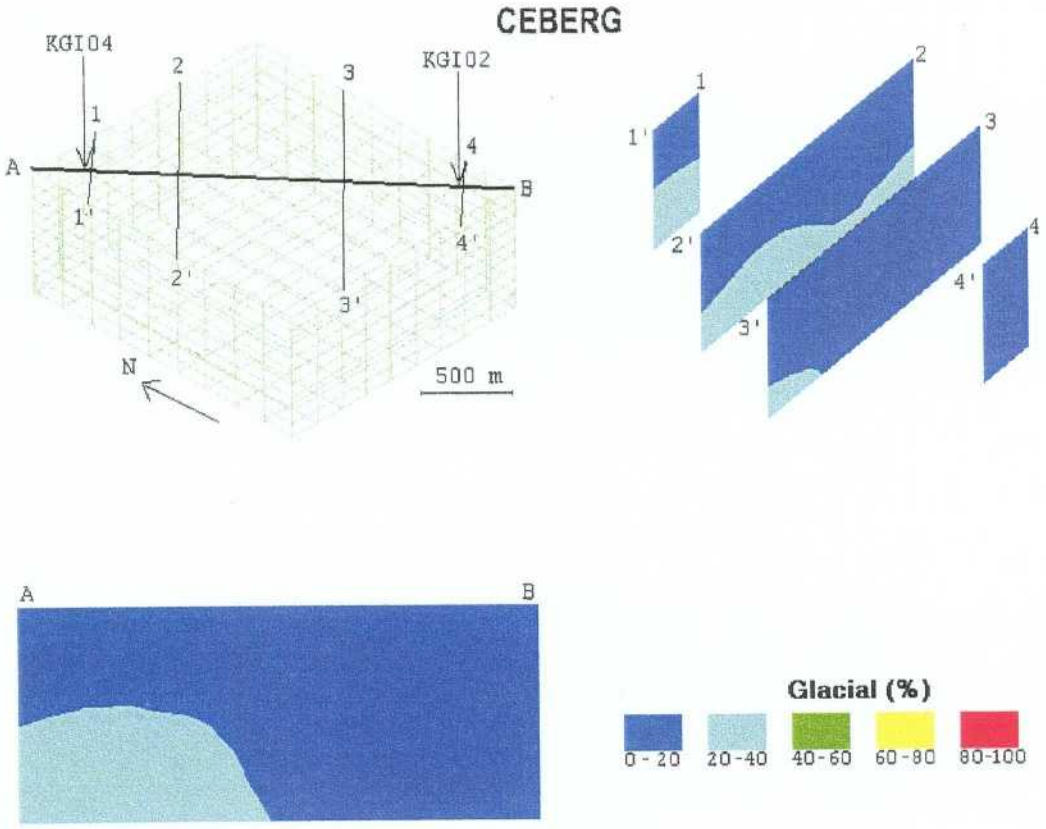

Figure 3-17. *The result of a 3D model of the M3 modelling of the Glacial water (%) at the Ceberg site. The location of the 2D cutting planes is shown in the 3D model. The geographical extension of the modelled area is shown in Figure 2-1c.*

The results of the modelling of Ceberg show that the Cl distribution can be described by a complex mixture of waters with different origins. At the reference water location (KGI04:404-407m) the measured groundwater composition is a result of mixing Meteoric water (43%) with Glacial (28%), Biogenic (17%) Marine (7%) and Brine (5%) waters. A mixing portion calculation of less than 10% is regarded as under the detection limit of the M3-method and is therefore uncertain. The results of the mixing calculations for all observations are shown in Appendix 1.

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REFERENCES

Ahlbom K, Albino B, Carlsson L, Nilsson G, Olsson O, Stenberg L, Timje H, 1983. Evaluation of the geological, geophysical and hydrogeological conditions at Gideå. SKB-KBS Technical Report 83-53, Stockholm, Sweden.

Ahlbom K, Andersson J-E, Nordqvist R, Ljunggren C, Tirén S, Voss C, 1991. Gideå study site. Scope of activities and main results. SKB Technical Report 91-51, Stockholm, Sweden.

Ahlbom K, Tirén S, 1991. Overview of geologic and geohydrologic conditions at the Finnsjön site and its surroundings. SKB Technical Report 91-08, Stockholm, Sweden.

Alley W M, 1993. Regioanl groundwater quality. ISBN 0-442-00937-2. Van Nostrand Reinhold, New York, USA.

Andersson J, Almén K-E, Ericsson L O, Fredriksson A, Karlsson F, Stanfors R, Ström A, 1997. Parametrar av betydelse att bestämma vid geovetenskaplig platsundersökning. SKB rapport R-97-03.

Back W, 1966. Hydrochemical facies and groundwater flow patterns in northern part of Atlantic Coastal Plain. US Geol. Surv. Prof. Paper 498-A.

Banwart S (ed), Laaksoharju M, Skårman C, Gustafsson E, Pitkänen P, Snellman M, Landström O, Aggeryd I, Mathiasson L, Sundblad B, Tullborg E-L, Wallin B, Pettersson C, Pedersen K, Arlinger J, Jahromi N, Ekendahl S, Hallbeck L, Degueldre C, Malmström M, 1995. Äspö Hard Rock Laboratory. The Redox Experiment in Block Scale. Final reporting of results from the three year project. SKB Progress Report PR 25-95-06, Stockholm, Sweden.

Banwart S, Gustafsson E, Laaksoharju M, Nilsson A-C, Tullborg E-L, Wallin B, 1993. The large scale Redox experiment: Redox processes in a Granitic coastal aquifer. SKB Progress Report PR 25-93-03, Stockholm, Sweden.

Carlsson L, Gidlund G, 1983. Evaluation of the hydrogeological conditions at Finnsjön. SKBF/KBS TR 83-56, Stockholm, Sweden.

Davis S N, De Wiest R J M, 1967. Hydrogeology, 2d Ed., John Wiley & Sons, New York, USA.

Drever J I, 1988. The geochemistry of natural waters. ISBN 0-13-351396-3. Prentice Hall, Inc., New Jersey, USA.

Freeze A, Cherry J, 1979. Groundwater. Prentice-Hall, Inc. Englewood Cliffs, New Jersey 07632. pp. 604.

Kankainen T, 1986. Loviisa power station final disposal of reactor waste. On the age and origin of groundwater from the rapakivi granite on the island

of Hästholmen. Nuclear Waste Commission of Finnish power Companies. Report YJT-86-29.

Laaksoharju M (ed.), Gustafson G, Pedersen K, Rhén I, Skårman C, Tullborg E-L, Wallin B, Wikberg P, 1995. Sulphate reduction in the Äspö HRL tunnel. SKB Technical Report 95-25, Stockholm, Sweden.

Laaksoharju M, Skårman C, 1995. Groundwater sampling and chemical characterisation of the HRL tunnel at Äspö, Sweden. SKB Progress Report 25-95-29, Stockholm, Sweden.

Laaksoharju M, Skårman C, Skårman E, 1998. Multivariate Mixing and Mass balance (M3) calculations, a new tool for decoding hydrogeochemical information. Submitted to Applied Geochemistry.

Laaksoharju M, Smellie J, Nilsson A-C, Skårman C, 1995. Groundwater sampling and chemical characterisation of the Laxemar deep borehole KLX02. SKB Technical Report TR 95-05, Stockholm, Sweden.

Laaksoharju M, Smellie J, Ruotsalainen P, Snellman M, 1993. An approach to quality classification of deep groundwaters in Sweden and Finland. A nuclear waste commission of Finnish power companies report YJT-93-24 and as a SKB Technical Report 92-10.

Laaksoharju M, Wallin B (eds), 1997. Evolution of the groundwater chemistry at the Äspö Hard Rock Laboratory. Proceedings of the second Äspö International Geochemistry Workshop, June 6-7, 1995. SKB International Cooperation Report ISRN SKB-ICR-91/04-SE. ISSN 1104-3210 Stockholm, Sweden.

Landström O, Aggeryd I, Marthiasson L, Sundblad B, 1994. Chemical composition of sediments from the Äspö area and interaction between the biosphere and geosphere. SKB Status Report AR 94-03, Stockholm, Sweden.

Lundqvist J, 1987. Beskrivning av jordartskarta över Västernorrlands län och förutvarande Fjällsö k:n. Sveriges Geologiska Undersökning, Ser. Ca, Nr. 55.

Morgan C O, Winner M D Jr, 1962. Hydrochemical facies in the 400 foot and 600 foot sands of the Baton Rouge Area, Louisiana. US Geol. Surv. Prof. Paper 450-B.

Nilsson A-C, 1995. Compilation of groundwater chemistry data from Äspö 1990-1994. SKB Progress Report PR 25-95-02, Stockholm, Sweden.

Nordstrom D K, 1989. Application of a cation exchange mass balance model to the interpretation of saline groundwater chemistry evolved from Holocene seawater entrapped in rapakivi granite at Hästholmen, Finland. Proceedings of the 6th International Symposium on Water-rock Interaction, Malvern 1989.

Piper A M, 1953. A graphic procedure in the geochemical interpretation of the water analyses. US Geological Survey, Water Res. Div. Ground Water Notes, Geochemistry no. 12.

Pitkänen P, Snellman M, Banwart S, Laaksoharju M, Leino-Forsman H, 1994. The Äspö Redox Experiment in Block Scale: testing end-members for mixing models. In: Banwart S (ed). Proceedings of The Äspö International Geochemistry Workshop, June 2-3 1994, Äspö Hard Rock Laboratory. SKB International Co-operation Report 94-13, B67-77, Stockholm, Sweden.

Plummer L N, Prestemon E C, Parkhurst D L, 1991. An interactive code (NETPATH) for modelling NET geochemical reactions along a flow path. US Geological Survey, Water-Resources Investigation Report 91-4078.

Påsse T, 1996. A mathematical model of the shore level displacement in Fennoscandia. SKB Technical Report TR 96-24, Stockholm, Sweden.

Rhén I, Bäckblom G (eds.), Gustafson G, Stanfors R, Wikberg P, 1997. Äspö HRL-Geoscientific evaluation 1997/2. Results from pre-investigations and detailed site characterisation. Summary report. SKB Technical Report TR 97-03, Stockholm, Sweden.

Rhén I, Danielsson P, Forsmark T, Gustafson G, Liedholm M, 1993. Äspö Hard Rock Laboratory. Geohydrological evaluation of the data from section 700-1475m. SKB Progress Report PR 25-93-06, Stockholm, Sweden.

Rhén I, Danielsson P, Forsmark T, Gustafson G, Liedholm M, 1994. Äspö Hard Rock Laboratory. Geohydrological evaluation of the data from section 2265-2874m. SKB Progress Report PR 95-94-20, Stockholm, Sweden.

Rhén I, Stanfors R, 1993. Passage through water-bearing fracture zones. Evaluation of investigations in fracture zones NE-1, EW-7 and NE-3, SKB Progress Report PR 25-92-18, Stockholm, Sweden.

Smellie J, Laaksoharju M, 1992. The Äspö Hard Rock Laboratory: final evaluation of the hydrogeochemical pre-investigations in relation to existing geological and hydraulic conditions. SKB Technical Report TR 92-31, Stockholm, Sweden.

Smellie J, Laaksoharju M, Snellman M, Ruotsalainen P, Wikberg P, 1996. Groundwater quality and sampling strategy based on experience derived from the Finnish and Swedish radioactive waste disposal programmes. SKB Technical Report in preparation.

Smellie J, Laaksoharju M, Wikberg P, 1995. Äspö, SE Sweden: A natural groundwater flow model derived from hydrogeochemical observations. Journal of Hydrogeology 172 (1995) 147-169.

Smellie J, Larsson N-Å, Wikberg P, Carlsson L, 1985. Hydrochemical investigations in crystalline bedrock in relation to existing hydraulic conditions: Experiences from the SKB test-sites in Sweden. SKB TR 85-11, Stockholm, Sweden

Smellie J, Wikberg P, 1989. Characterization of fracture zone 2, Finnsjön study site (in Ahlbom and Smellie (Eds.). SKB TR 89-19, Stockholm, Sweden.

Stanfors R, Gustafson G, Munier R, Olsson P, Stille H, Wikberg P, 1992. Evaluation of geological predictions in the access ramp 0-700m. SKB Progress Report PR 25-92-02, Stockholm, Sweden.

Stanfors R, Liedholm M, Munier R, Olsson P, Stille H, 1993a. Geological-structural evaluation of data from section 700-1475m. SKB Progress Report PR 25-93-05, Stockholm, Sweden.

Stanfors R, Liedholm M, Munier R, Olsson P, Stille H, 1993b. Äspö Hard Rock Laboratory. Geological-structural evaluation of data from tunnel section 1475-2265m. SKB Progress Report PR 25-93-10, Stockholm, Sweden.

Stanfors R, Liedholm M, Munier R, Olsson P, Stille H, 1994. Äspö Hard Rock Laboratory. Geological-structural evaluation of data from tunnel section 2265-2874m. SKB Progress report PR 25-94-19, Stockholm, Sweden.

Timje H, 1983. Hydrogeologiska undersökningar inom typområdet Gideå. SKBF/KBS Arbetsrapport AR 83-26, Stockholm, Sweden.

Tullborg E-L, 1997. Recognition of low-temperature processes in the Fennoscandian shield. Ph.D. thesis at Geologiska avdelningen, Institutionen för Geovetenskaper, Geovetarcentrum, Göteborgs Universitet, 41381 Göteborg.

Tullborg E-L, Larson S, 1984. $\delta^{18}O$ and $\delta^{13}C$ for limestones, calcite fissure infillings and calcite precipitates from Sweden. Geologiska Föreningens i Stockholm Förhandlingar, Vol. 106, Pt. 2, Stockholm, Sweden.

Walker D, Rhén I, Gurban I, 1997. SR 97: Summary of Hydrogeologic conditions at Aberg, Beberg and Ceberg. SKB report in preparation.

Wikberg P, Banwart S (eds.), 1994. Proceedings of the Äspö International Geochemistry Workshop, June 2-3, 1994, Äspö Hard Rock Laboratory. SKB International Cooperation Report ICR 94-13, Stockholm, Sweden.

Wikberg P, Grenthe I, Axelsen K, 1983. Redox conditions in groundwaters from Svartboberget, Gideå, Fjällveden and Kamlunge. SKBF/KBS TR 83-40, Stockholm, Sweden.

Winn K, Werner F, Erlenkeuser H, 1988. Hydrography of the Kiel Bay, Western Baltic during the Litorina Transgression. Meyniana, 40.

APPENDIX 1: DATA USED

Table 1: List of SICADA data used for the present modelling including ID codes, the chemical composition and the calculated mixing portions. The reference waters are shown in bold font. An observation with a calculated mixing portion of 1.00 means that the observation is an end-member and contains 100% of the end-member composition.

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	HA0982B	0	2.5	05/09/94	1557.1	21.0	427.9	125.2	225	3403.5	299.00	22.8	-54.5
Aberg	HA1327B	3.5	29.5	02/12/92	1850.0	12.0	778.0	158.0	277	4770.0	198.00	8.0	-59.2
Aberg	HA1327B	3.5	29.5	07/02/93	1860.0	11.0	746.0	155.0	280	4600.0	208.00	18.0	-57.5
Aberg	HA1327B	3.5	29.5	29/09/93	1790.0	12.3	674.0	153.0	265	4350.0	241.00	13.0	-54.5
Aberg	HA1327B	3.5	29.5	14/12/93	1760.0	13.7	684.0	157.0	259	4310.0	254.98	18.0	-50.6
Aberg	HA1749A	5.8	25	25/03/93	1260.0	13.0	726.5	65.9	116	3450.0	284.64	<4.2	-69.3
Aberg	HAS02	44	93	01/08/87	2320.0	26.0	818.0	217.0	227	5470.0	162.00	<1.0	-57.6
Aberg	HAS02	44	93	02/08/87	2250.0	28.0	741.0	244.0	219	5160.0	155.00	<1.0	-63.7
Aberg	HAS03	48	100	04/08/87	335.0	14.0	80.0	36.0	235	574.0	98.00	33.0	-76.4
Aberg	HAS03	48	100	05/08/87	336.0	12.0	87.0	39.0	235	608.0	104.00	35.0	-80.5
Aberg	HAS05	45	100	06/08/87	228.0	4.0	27.0	4.0	373	123.0	118.00	<1.0	-68.7
Aberg	HAS05	45	100	07/08/87	237.0	4.0	25.0	6.0	370	119.0	118.00	2.0	-73.8
Aberg	HAS06	40	100	07/08/87	254.0	3.0	44.0	11.0	271	280.0	96.00	24.0	-73.3
Aberg	HAS06	40	100	08/08/87	900.0	12.0	297.0	56.0	155	1760.0	283.00	11.0	-66.6
Aberg	HAS07	71	100	02/08/87	669.0	5.0	347.0	48.0	102	1650.0	122.00	<1.0	-81.2
Aberg	HAS07	71	100	03/08/87	656.0	5.0	361.0	55.0	106	1740.0	116.00	<1.0	-83.4
Aberg	HAS13	0	100	03/07/89	1880.0	32.8	1040.0	219.0	132	5070.0	136.00	1.2	-69.3
Aberg	HBH01	31	50.6	28/11/91	8.6	2.3	41.3	4.0	137	11.3	24.50	34.0	-67.3
Aberg	HBH01	31	50.6	28/02/92	487.0	6.7	257.0	37.6	222	1200.0	130.04	34.0	-74.7
Aberg	HBH01	31	50.6	23/04/92	494.0	5.9	224.0	34.8	237	1080.0	131.83	42.0	-74.7
Aberg	HBH01	31	50.6	21/05/92	482.0	5.8	211.0	34.3	243	1056.0	126.00	34.0	-75.8
Aberg	HBH01	31	50.6	26/06/92	441.0	5.0	180.0	30.2	260	932.0	130.00	17.0	-79.3
Aberg	HBH01	31	50.6	06/08/92	426.0	4.8	166.0	26.1	270	869.0	132.73	17.0	-78.3
Aberg	HBH01	31	50.6	04/09/92	434.0	6.4	169.0	26.8	280	843.0	142.00	25.0	-77.8
Aberg	HBH01	31	50.6	01/10/92	420.0	7.1	163.0	26.5	280	833.0	137.53	17.0	-78.1
Aberg	HBH01	31	50.6	28/10/92	421.0	5.7	162.0	27.0	286	812.0	134.00	17.0	-76.9
Aberg	HBH01	31	50.6	25/11/92	391.0	5.6	144.0	23.7	288	737.0	136.00	25.0	-76.7
Aberg	HBH01	31	50.6	02/12/92	390.0	5.7	144.0	22.8	291	739.0	138.00	9.3	-73.8
Aberg	HBH01	31	50.6	07/02/93	369.0	5.0	130.0	21.4	294	654.0	140.00	9.3	-72.4
Aberg	HBH01	31	50.6	11/03/93	361.0	3.7	120.0	19.9	291	610.0	128.00	15.0	-70.1
Aberg	HBH01	31	50.6	28/03/93	356.0	5.5	118.0	19.7	292	598.0	128.54	14.0	-68.0
Aberg	HBH01	31	50.6	16/05/93	321.0	4.3	108.0	21.3	299	519.0	129.00	22.0	-71.0
Aberg	HBH01	31	50.6	12/06/93	304.0	4.0	94.3	15.8	305	476.0	123.00	25.0	-75.1
Aberg	HBH01	31	50.6	06/07/93	312.0	5.0	98.2	16.8	311	484.0	125.00	14.0	-71.4

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	HBH01	31	50.6	16/08/93	349.0	5.1	115.0	19.1	309	461.0	104.75	22.0	-71.8
Aberg	HBH01	31	50.6	07/09/93	346.0	5.0	113.0	20.2	310	515.0	124.64	16.0	-73.2
Aberg	HBH01	31	50.6	21/09/93	348.0	5.0	115.0	20.5	311	529.0	125.84	26.0	-63.9
Aberg	HBH01	31	50.6	12/11/93	305.0	4.6	97.6	17.8	315	450.0	114.16	25.0	-67.8
Aberg	HBH01	31	50.6	11/08/94	260.5	3.3	82.1	14.3	311	352.0	105.02	14.4	-68.5
Aberg	HBH01	31	50.6	05/09/94	262.9	3.2	81.0	14.3	319	348.0	104.18	14.4	-68.6
Aberg	HBH02	0		11/09/91	11.5	2.3	15.4	1.9	63	5.0	13.18	59.0	-77.1
Aberg	HBH02	21	32.4	29/11/91	11.9	2.6	45.0	3.6	142	19.1	19.90	42.0	-72.9
Aberg	HBH02	21	32.4	28/02/92	21.1	1.7	34.5	3.2	137	13.5	24.27	42.0	-71.7
Aberg	HBH02	21	32.4	04/09/92	5.3	1.7	16.7	2.4	40	8.3	17.50	25.0	-61.6
Aberg	HBH02	21	32.4	28/10/92	6.2	1.3	20.8	3.4	70	10.4	18.40	17.0	-63.6
Aberg	HBH02	21	32.4	26/11/92	5.3	1.0	16.7	4.0	65	9.6	15.40	25.0	-70.8
Aberg	HBH02	21	32.4	02/12/92	5.5	1.0	17.1	3.1	53	10.6	16.20	20.0	-64.9
Aberg	HBH02	21	32.4	07/02/93	5.6	1.0	17.9	5.6	65	9.2	15.10	12.0	-65.6
Aberg	HBH02	21	32.4	17/03/93	5.4	1.1	16.3	2.2	64	10.3	15.19	23.0	-62.6
Aberg	HBH02	21	32.4	28/03/93	5.4	1.2	20.9	3.7	63	12.4	15.70	16.0	-62.5
Aberg	HBH02	21	32.4	12/06/93	6.2	1.4	25.9	3.2	74	12.8	20.90	18.0	-71.7
Aberg	HBH02	21	32.4	06/07/93	6.4	1.4	25.1	3.3	70	9.9	20.60	29.0	-66.0
Aberg	HBH02	21	32.4	16/08/93	6.7	1.4	27.5	3.3	77	7.8	18.67	20.0	-64.8
Aberg	HBH02	21	32.4	07/09/93	8.0	1.3	28.4	4.9	79	17.7	18.25	24.0	-65.7
Aberg	HBH02	21	32.4	12/11/93	6.4	1.2	21.4	2.8	55	12.1	17.77	37.0	-63.3
Aberg	HBH02	0		12/09/91	10.3	1.7	42.5	3.3	114	6.0	19.18	42.0	-72.9
Aberg	HBH05	11	22	28/10/92	15.4	2.6	38.4	4.0	137	11.2	23.00	25.0	-75.3
Aberg	HBH05	11	22	25/11/92	16.6	2.5	39.2	4.3	143	11.7	22.34	34.0	-75.8
Aberg	HBH05	11	22	12/06/93	19.2	3.0	38.5	3.8	162	12.0	21.50	22.0	-68.4
Aberg	HBH05	11	22	06/07/93	19.4	2.7	40.4	4.5	165	19.9	16.60	22.0	-65.1
Aberg	HBH05	11	22	12/11/93	25.4	2.6	42.6	8.8	172	27.6	36.55	24.0	-64.7
Aberg	KA0483A	40	90	12/03/91	1480.0	9.1	1250.0	132.0	42	4890.0	60.00	8.0	-85.9
Aberg	KA1639A	13.4	14.4	01/07/93	2005.0	6.8	1711.0	66.7	22	6290.0	434.45	5.1	-89.8
Aberg	KA1639A	13.4	14.4	10/08/93	1995.0	6.8	1723.0	67.6	25	6390.0	437.45	8.4	-91.2
Aberg	KA1639A	13.4	14.4	27/09/93	2113.0	6.8	1900.0	68.3	23	6950.0	485.00	<4.2	-90.2
Aberg	KA1639A	13.4	14.4	29/09/93	2218.0	8.2	1967.0	68.3	23	6960.0	479.39	<4.2	-89.1
Aberg	KA1639A	15.4	25.9	01/07/93	1670.0	6.3	773.0	38.8	15	4260.0	123.14	12.0	-107.6
Aberg	KA1639A	15.4	25.9	10/08/93	1626.0	6.0	733.0	41.0	17	4060.0	114.45	7.6	-110.9

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	KA1639A	15.4	25.9	27/09/93	1620.0	6.0	774.0	45.9	19	4230.0	130.00	<4.2	-107.1
Aberg	KA1750A	4.4	5.4	01/07/93	1907.0	7.4	1540.0	76.4	37	6310.0	431.45	<4.2	-89.6
Aberg	KA1750A	4.4	5.4	10/08/93	1986.0	6.9	1607.0	70.7	33	6030.0	434.45	5.1	-86.2
Aberg	KA1750A	4.4	5.4	27/09/93	2003.0	7.0	1630.0	69.0	31	6320.0	449.43	8.4	-80.0
Aberg	KA1750A	4.4	5.4	29/09/93	2062.0	7.8	1684.0	71.2	33	6230.0	461.41	<4.2	-83.5
Aberg	KA1755A	88		12/10/95	2682.1	9.3	3400.3	40.7	9	10407.2	640.30	8.5	-91.9
Aberg	KA2162B	0	76.71	15/03/93	2200.0	15.0	1260.0	166.0	102	5940.0	311.60	<4.2	-60.2
Aberg	KA2162B	0	122.77	17/03/93	2150.0	13.0	1330.0	153.0	116	5990.0	314.60	<4.2	-61.5
Aberg	KA2162B	0	179.96	21/03/93	2130.0	12.0	1420.0	126.0	96	6070.0	329.58	4.2	-73.5
Aberg	KA2512A	0	37.27	13/12/94	1877.0	10.0	903.0	117.0	196	4750.7	302.02	11.0	-63.8
Aberg	KA2858A	39.77	40.77	10/03/95	2630.0	9.7	3360.0	49.7	9	10300.0	577.00	<8.5	-96.6
Aberg	KA2862A	0	15.98	27/01/95	3230.0	13.6	4720.0	41.4	8	13300.0	666.00	<8.5	-90.8
Aberg	KA2862A	15.02	15.98	10/03/95	3160.0	13.6	4600.0	46.5	8	13200.0	667.00	<8.5	-91.3
Aberg	KA3005A	0	58.11	07/12/94	1730.0	12.5	1160.0	84.9	81	4870.0	288.00	15.2	-76.0
Aberg	KA3005A	36.93	37.93	10/03/95	1740.0	12.7	1310.0	85.6	57	5400.0	305.00	<8.5	-80.5
Aberg	KA3005A	44.78	45.78	11/04/96	1730.0	13.6	1191.4	82.5	93	4878.3	350.60	30.0	-75.5
Aberg	KA3010A	0	60.66	14/12/94	1820.0	15.5	1530.0	90.5	56	5770.0	315.00	<8.5	-80.3
Aberg	KA3010A	8.56	15.06	10/03/95	1890.0	15.1	1820.0	82.2	43	6600.0	336.00	<8.5	-87.9
Aberg	KA3067A	0	40.05	14/12/94	1720.0	11.8	1510.0	85.9	53	5650.0	307.00	<8.5	-81.2
Aberg	KA3067A	6.55	27.05	10/04/96	2374.3	12.7	2705.6	49.3	10	8584.9	426.30	14.0	-95.2
Aberg	KA3067A	28.05	29.55	10/03/95	1880.0	11.2	1950.0	66.6	26	6560.0	350.00	<8.5	-91.1
Aberg	KA3105A	0	68.95	16/12/94	1400.0	9.5	856.0	97.6	102	3960.0	243.00	22.0	-72.4
Aberg	KA3105A	22.51	24.51	10/03/95	1260.0	8.0	754.0	101.0	125	3520.0	217.00	<8.5	-73.5
Aberg	KA3110A	0	26.83	18/12/94	1590.0	26.0	585.0	131.0	164	3820.0	273.00	27.0	-60.7
Aberg	KA3110A	20.05	28.63	10/03/95	1600.0	20.0	656.0	133.0	161	3940.0	286.00	11.8	-64.3
Aberg	KA3191F	165	180	03/06/94	2128.5	9.5	1722.5	90.0	61	6691.8	368.00	12.7	-76.7
Aberg	KA3191F	193.9	208.9	04/06/94	2225.3	8.6	2093.1	64.3	29	7409.7	444.67	<8.4	-81.6
Aberg	KA3385A	0	34.18	11/01/95	2080.0	8.5	1861.0	60.5	10	6650.0	443.00	9.3	-79.3
Aberg	KA3385A	32.05	34.18	10/03/95	2090.0	8.4	1860.0	63.1	10	6710.0	450.00	<8.5	-81.8
Aberg	KAS02	202	214.5	11/01/89	1300.0	6.6	990.0	65.0	71	3820.0	106.00	0.3	-108.9
Aberg	KAS02	308	344	27/09/88	1710.0	8.8	1480.0	75.0	33	5360.0	291.00	<8.0	-99.8
Aberg	KAS02	309	345	19/08/92	1150.0	7.5	671.0	48.5	138	3250.0	200.00	8.0	-94.9
Aberg	KAS02	314	319	11/04/88	1700.0	9.0	1540.0	72.0	27	5340.0	270.00	8.0	-100.6
Aberg	KAS02	463	468	25/04/88	1800.0	8.1	1580.0	66.0	25	5440.0	290.00	8.0	-99.9

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	**KAS02**	**530**	**535**	**04/05/88**	**2100.0**	**8.1**	**1890.0**	**42.0**	**10**	**6410.0**	**560.00**	**8.0**	**-97.2**
Aberg	KAS02	800	854	19/08/92	2850.0	13.7	3310.0	30.1	25	10200.0	668.15	8.0	-99.7
Aberg	KAS02	802	924.04	20/09/88	2850.0	11.5	3690.0	31.0	7	11100.0	522.00	8.0	-96.8
Aberg	KAS02	860	924.04	31/01/89	3000.0	10.9	3830.0	31.0	11	11100.0	519.00	0.2	-96.8
Aberg	KAS03	129	134	21/02/89	613.0	2.4	162.0	21.0	61	1220.0	31.10	0.1	-124.8
Aberg	KAS03	196	222	10/08/88	1200.0	6.3	472.0	61.0	54	2850.0	31.89	8.0	-115.3
Aberg	KAS03	248	251	28/08/88	1290.0	6.5	490.0	58.0	53	2950.0	39.00	8.0	-118.1
Aberg	KAS03	347	373	16/08/88	1770.0	5.9	1400.0	40.0	12	5180.0	370.00	<8.0	-104.9
Aberg	KAS03	453	480	22/08/88	1550.0	6.2	1190.0	40.0	27	4600.0	300.00	<8.0	-109.6
Aberg	KAS03	533	626	19/08/92	1340.0	5.8	659.0	47.8	48	3360.0	167.40	8.0	-116.0
Aberg	KAS03	533	626	07/02/93	1340.0	5.8	800.0	42.8	49	3530.0	175.88	5.1	-111.2
Aberg	KAS03	533	626	16/05/93	1370.0	5.5	872.0	45.7	42	3840.0	198.05	<4.2	-108.3
Aberg	KAS03	533	626	16/08/93	1626.8	7.1	1263.8	44.3	33	4701.1	274.84	5.0	-105.8
Aberg	KAS03	533	626	07/09/93	1450.0	6.9	964.0	48.4	38	4230.0	212.43	<4.0	-108.5
Aberg	KAS03	533	626	12/04/94	1564.0	6.7	1162.0	48.4	38	4637.0	270.00	6.8	-106.3
Aberg	KAS03	609	623	03/09/88	1920.0	6.2	1740.0	38.0	11	5880.0	470.00	<8.0	-103.4
Aberg	KAS03	690	1002.06	08/09/88	2130.0	6.6	2670.0	45.0	11	8080.0	680.00	<8.0	-99.7
Aberg	KAS03	860	1002.06	15/03/89	3020.0	7.3	4380.0	49.5	11	12300.0	709.00	0.4	-96.4
Aberg	KAS04	226	235	17/04/89	382.0	2.4	91.0	6.2	222	508.0	180.00	4.3	-84.8
Aberg	KAS04	332	392	31/08/92	1060.0	8.0	597.0	24.9	69	2760.0	207.00	<8.0	-103.4
Aberg	KAS04	334	343	27/04/89	1180.0	6.1	740.0	30.0	69	3030.0	220.00	0.5	-99.6
Aberg	KAS04	440	480.98	03/04/89	1890.0	7.8	1660.0	61.0	21	5840.0	407.00	0.0	-92.3
Aberg	KAS05	320	380	01/09/92	1490.0	8.6	1070.0	53.5	97	4500.0	116.00	<8.0	-100.3
Aberg	KAS05	440	549.6	01/09/92	2270.0	7.7	2020.0	42.7	12	7290.0	576.00	8.0	-95.6
Aberg	KAS05	440	549.6	12/04/94	2450.0	10.0	2560.0	42.1	5	8402.0	534.00	8.4	-96.8
Aberg	KAS06	191	249	19/08/92	945.0	5.5	484.0	48.8	135	2450.0	117.00	8.0	-94.0
Aberg	KAS06	204	277	31/05/89	1230.0	7.4	893.0	82.0	89	3630.0	150.00	3.8	-94.3
Aberg	KAS06	304	377	07/06/89	1820.0	9.1	1490.0	119.0	49	5680.0	283.00	0.3	-77.8
Aberg	KAS06	389	406	14/06/89	2070.0	11.7	1410.0	153.0	64	5970.0	362.00	0.6	-69.2
Aberg	KAS06	431	500	19/08/92	2000.0	11.0	1280.0	126.0	52	5670.0	357.00	8.0	-77.7
Aberg	KAS06	439	602.17	21/06/89	2200.0	11.1	1570.0	130.0	50	6150.0	459.00	3.5	-70.8
Aberg	KAS07	191	290	31/08/92	971.0	8.1	522.0	39.3	167	2460.0	205.00	8.0	-87.1
Aberg	KAS07	191	290	06/09/93	1540.0	11.0	655.0	126.0	182	3810.0	347.56	24.0	-65.3
Aberg	KAS07	191	290	06/04/94	1479.0	10.8	559.0	125.0	335	3743.8	74.40	22.0	-65.4

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	KAS07	501	604	31/08/92	1940.0	9.8	1650.0	50.1	18	6060.0	486.00	25.0	-94.2
Aberg	KAS07	501	604	06/09/93	1980.0	10.2	1600.0	51.2	52	6120.0	452.43	9.0	-89.1
Aberg	KAS07	501	604	06/09/94	1890.0	9.5	1610.0	59.6	13	5960.0	446.00	12.7	-80.4
Aberg	KAS08	140	200	31/08/92	450.0	4.0	164.0	18.9	237	918.0	87.00	8.0	-89.4
Aberg	KAS08	503	601	31/08/92	2000.0	8.3	1670.0	64.3	27	6300.0	413.00	8.0	-84.3
Aberg	KAS08	503	601	06/04/94	2180.0	13.3	1522.0	144.8	63	6452.0	391.00	13.0	-73.8
Aberg	KAS09	116	150	01/09/92	1790.0	33.2	403.0	152.0	396	3820.0	228.00	25.0	-61.9
Aberg	KAS09	116	150	19/05/93	1770.0	40.0	291.0	148.0	264	3541.8	352.00	35.0	-56.2
Aberg	KAS09	116	150	06/09/93	1700.0	42.5	268.0	150.0	240	3390.0	362.54	10.0	-55.8
Aberg	KAS09	116	150	06/04/94	1628.0	38.0	219.0	144.8	206	3162.0	363.00	30.0	-58.8
Aberg	KAS09	116	150	06/09/94	1490.0	39.5	191.0	141.0	192	2930.0	364.00	38.0	-51.5
Aberg	KAS09	116		12/10/95	1465.1	33.9	198.9	139.7	175	2804.3	298.34	33.8	-56.7
Aberg	KAS12	234	277	01/09/92	1440.0	11.3	891.0	91.5	76	4220.0	171.00	8.0	-90.7
Aberg	KAS12	234	277	19/05/93	1460.0	12.0	880.0	84.4	103	4158.6	168.00	5.1	-86.1
Aberg	KAS12	234	277	07/09/93	1650.0	12.5	1070.0	107.0	61	4860.0	232.51	<4.0	-82.0
Aberg	KAS13	151	190	01/09/92	350.0	4.6	83.0	11.4	294	543.0	112.00	17.0	-83.4
Aberg	KAS13	191	220	01/09/92	894.0	10.9	408.0	44.2	188	2160.0	190.00	8.0	-92.2
Aberg	KAS14	131	138	07/04/94	1775.0	46.8	265.0	156.2	349	3403.5	350.00	29.0	-57.8
Aberg	KAS14	147	175	07/04/94	1766.0	47.4	271.0	154.8	328	3399.9	361.00	29.0	-56.6
Aberg	KBH02	240.25	372.85	25/08/93	1870.0	20.5	692.0	154.0	366	4320.0	212.73	14.0	-58.1
Aberg	KBH02	240.25	372.85	29/09/93	1850.0	19.4	647.0	158.0	354	4350.0	210.00	<4.0	-52.0
Aberg	KBH02	240.25	372.85	14/12/93	1800.0	21.0	638.0	160.0	340	4210.0	227.41	10.0	-52.4
Aberg	KR0012B	5	10.57	07/05/91	352.0	2.0	143.0	15.4	198	695.0	70.00	34.0	-82.1
Aberg	KR0012B	5	10.57	19/06/91	410.0	2.0	200.0	22.0	185	915.0	62.00	25.0	-83.2
Aberg	KR0012B	5	10.57	08/04/92	629.0	5.0	280.0	37.8	243	1360.0	133.63	25.0	-76.4
Aberg	KR0012B	5	10.57	22/04/92	604.0	4.9	268.0	37.7	245	1330.0	134.23	25.0	-77.3
Aberg	KR0012B	5	10.57	06/05/92	597.0	5.1	255.0	36.9	248	1290.0	131.23	34.0	-80.5
Aberg	KR0012B	5	10.57	20/05/92	591.0	5.2	252.0	37.2	250	1300.0	138.72	51.0	-77.6
Aberg	KR0012B	5	10.57	03/06/92	572.0	4.9	235.0	34.9	250	1270.0	125.00	34.0	-76.8
Aberg	KR0012B	5	10.57	26/06/92	540.0	4.7	213.0	31.9	260	1130.0	147.00	25.0	-77.5
Aberg	KR0012B	5	10.57	08/07/92	539.0	4.9	206.0	31.1	260	1110.0	140.00	17.0	-81.1
Aberg	KR0012B	5	10.57	21/07/92	527.0	4.6	206.0	31.1	270	1130.0	139.00	17.0	-79.7
Aberg	KR0012B	5	10.57	06/08/92	526.0	4.5	200.0	29.5	280	1070.0	141.00	8.0	-80.2
Aberg	KR0012B	5	10.57	18/08/92	522.0	4.5	196.0	29.6	280	1040.0	147.00	17.0	-80.5

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	KR0012B	5	10.57	03/09/92	516.0	5.5	195.0	28.5	280	1080.0	143.00	17.0	-78.3
Aberg	KR0012B	5	10.57	17/09/92	513.0	5.5	191.0	29.1	280	1000.0	132.00	17.0	-80.3
Aberg	KR0012B	5	10.57	30/09/92	510.0	7.0	187.0	28.0	280	1020.0	148.00	17.0	-79.4
Aberg	KR0012B	5	10.57	12/10/92	503.0	5.5	187.0	28.3	292	1010.0	133.00	17.0	-81.1
Aberg	KR0012B	5	10.57	28/10/92	497.0	5.0	186.0	27.9	292	970.0	176.00	17.0	-79.9
Aberg	KR0012B	5	10.57	10/11/92	486.0	4.8	178.0	27.1	296	934.0	140.00	25.0	-78.5
Aberg	KR0012B	5	10.57	24/11/92	478.0	5.3	171.0	25.7	301	918.0	141.42	17.0	-78.7
Aberg	KR0012B	5	10.57	02/12/92	475.0	5.0	168.0	22.9	299	932.0	150.00	10.0	-72.4
Aberg	KR0012B	5	10.57	10/12/92	471.0	5.0	159.0	21.7	302	888.0	148.00	<4.2	-72.3
Aberg	KR0012B	5	10.57	21/12/92	468.0	4.3	163.0	24.7	307	876.0	137.00	18.0	-72.4
Aberg	KR0012B	5	10.57	04/01/93	452.0	5.2	155.0	23.8	306	823.0	127.00	9.3	-72.9
Aberg	KR0012B	5	10.57	19/01/93	452.0	4.2	153.0	23.3	304	835.0	157.00	20.0	-72.9
Aberg	KR0012B	5	10.57	07/02/93	461.0	4.5	156.0	23.7	311	840.0	142.00	11.0	-71.9
Aberg	KR0012B	5	10.57	17/03/93	453.0	5.0	144.0	22.3	306	780.0	124.00	12.0	-68.1
Aberg	KR0012B	5	10.57	24/03/93	445.0	5.1	146.0	22.7	306	789.0	128.00	15.0	-69.2
Aberg	KR0012B	5	10.57	16/05/93	424.0	4.3	136.0	25.1	315	710.0	142.00	17.0	-72.0
Aberg	KR0012B	5	10.57	11/06/93	406.0	4.5	118.0	18.6	307	662.0	143.00	18.0	-75.1
Aberg	KR0012B	5	10.57	05/07/93	403.0	4.8	120.0	19.1	316	645.0	130.00	27.0	-74.1
Aberg	KR0012B	5	10.57	16/08/93	411.0	4.5	126.0	20.1	317	665.0	137.00	21.0	-74.1
Aberg	KR0012B	5	10.57	08/11/93	387.0	4.3	118.0	20.4	324	619.0	134.53	34.0	-69.6
Aberg	KR0012B	5	10.57	10/08/94	346.6	3.4	100.1	17.4	325	500.0	125.60	25.3	-68.1
Aberg	KR0012B	5	10.57	05/09/94	343.9	3.5	100.2	17.9	326	531.8	128.69	30.4	-67.9
Aberg	KR0012B	5		18/05/95	381.3	4.5	109.5	21.7	308	608.4	129.83	16.9	-68.8
Aberg	KR0012B	5		10/10/95	375.3	4.5	115.9	23.2	295	642.4	119.64	42.0	-66.7
Aberg	KR0013B	7.05	16.94	01/05/91	876.0	4.8	571.0	63.7	133	2500.0	83.00	17.0	-93.3
Aberg	KR0013B	7.05	16.94	08/04/92	986.0	4.7	535.0	71.5	237	2460.0	148.61	25.0	-78.5
Aberg	KR0013B	7.05	16.94	22/04/92	964.0	5.1	540.0	75.5	243	2450.0	146.81	17.0	-81.4
Aberg	KR0013B	7.05	16.94	06/05/92	926.0	4.5	502.0	70.3	245	2340.0	142.62	34.0	-77.8
Aberg	KR0013B	7.05	16.94	20/05/92	913.0	6.3	490.0	71.3	250	2340.0	148.61	34.0	-77.2
Aberg	KR0013B	7.05	16.94	03/06/92	888.0	6.4	466.0	65.7	260	2290.0	140.00	34.0	-78.9
Aberg	KR0013B	7.05	16.94	26/06/92	851.0	4.1	440.0	64.0	260	2150.0	136.00	25.0	-80.1
Aberg	KR0013B	7.05	16.94	08/07/92	848.0	4.0	433.0	61.9	270	2130.0	148.00	8.0	-80.0
Aberg	KR0013B	7.05	16.94	21/07/92	836.0	4.1	424.0	61.0	270	2110.0	149.00	8.0	-79.8
Aberg	KR0013B	7.05	16.94	06/08/92	821.0	4.0	413.0	58.2	280	2040.0	150.00	17.0	-80.6

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Aberg	KR0013B	7.05	16.94	18/08/92	831.0	4.0	413.0	58.8	280	2020.0	153.00	17.0	-80.0
Aberg	KR0013B	7.05	16.94	03/09/92	806.0	6.3	405.0	57.7	290	1990.0	148.00	17.0	-81.3
Aberg	KR0013B	7.05	16.94	17/09/92	802.0	4.9	398.0	59.1	290	1920.0	146.00	8.0	-81.1
Aberg	KR0013B	7.05	16.94	30/09/92	795.0	5.8	386.0	55.3	290	1900.0	146.00	17.0	-80.0
Aberg	KR0013B	7.05	16.94	12/10/92	776.0	4.7	378.0	55.0	299	1880.0	135.00	8.0	-81.9
Aberg	KR0013B	7.05	16.94	28/10/92	764.0	4.4	378.0	54.7	300	1840.0	148.00	17.0	-80.2
Aberg	KR0013B	7.05	16.94	10/11/92	749.0	4.0	365.0	52.7	299	1800.0	147.00	25.0	-80.1
Aberg	KR0013B	7.05	16.94	24/11/92	742.0	3.9	359.0	50.9	305	1750.0	145.00	25.0	-80.0
Aberg	KR0013B	7.05	16.94	02/12/92	793.0	4.6	384.0	51.9	293	1920.0	145.02	<4.2	-75.7
Aberg	KR0013B	7.05	16.94	10/12/92	745.0	4.5	360.0	48.0	307	1740.0	143.00	14.0	-74.6
Aberg	KR0013B	7.05	16.94	21/12/92	740.0	4.7	353.0	51.1	308	1740.0	137.00	5.9	-73.2
Aberg	KR0013B	7.05	16.94	04/01/93	734.0	4.6	343.0	50.6	309	1690.0	127.00	14.0	-74.6
Aberg	KR0013B	7.05	16.94	19/01/93	736.0	3.7	342.0	49.5	313	1680.0	146.00	14.0	-74.6
Aberg	KR0013B	7.05	16.94	07/02/93	743.0	4.0	347.0	50.5	310	1790.0	128.00	26.0	-72.7
Aberg	KR0013B	7.05	16.94	17/03/93	721.0	4.5	330.0	47.7	315	1650.0	123.00	9.3	-70.8
Aberg	KR0013B	7.05	16.94	24/03/93	751.0	4.7	351.0	51.6	305	1690.0	126.00	10.0	-67.9
Aberg	KR0013B	7.05	16.94	16/05/93	740.0	4.0	343.0	53.5	311	1690.0	134.00	19.0	-72.8
Aberg	KR0013B	7.05	16.94	11/06/93	735.0	4.2	328.8	49.8	307	1710.0	144.00	15.0	-75.9
Aberg	KR0013B	7.05	16.94	05/07/93	769.0	4.7	346.0	52.2	307	1720.0	148.00	47.0	-72.2
Aberg	KR0013B	7.05	16.94	16/08/93	830.6	4.5	384.0	57.0	297	1870.0	147.41	19.0	-75.8
Aberg	KR0013B	7.05	16.94	08/11/93	860.0	4.8	403.0	64.0	298	2010.0	153.41	24.0	-70.7
Aberg	KR0013B	7.05	16.94	10/08/94	784.8	4.1	339.3	56.5	289	1790.0	147.17	27.0	-68.7
Aberg	KR0013B	7.05	16.94	05/09/94	737.0	4.1	324.2	54.5	291	1737.2	147.98	21.1	-68.3
Aberg	KR0013B	7.05		18/05/95	715.7	4.2	308.5	52.2	273	1520.9	142.71	17.7	-69.8
Aberg	KR0013B	7.05		10/10/95	619.5	4.0	269.9	47.1	267	1458.9	125.53	71.0	-70.6
Aberg	KR0015B	19.82	30.31	07/05/91	1060.0	5.0	679.0	74.2	122	3050.0	89.00	17.0	-86.8
Aberg	KR0015B	19.82	30.31	08/04/92	578.0	3.2	247.0	30.6	342	1150.0	129.14	25.0	-81.9
Aberg	KR0015B	19.82	30.31	22/04/92	720.0	4.0	345.0	48.6	320	1500.0	146.81	25.0	-80.7
Aberg	KR0015B	19.82	30.31	06/05/92	641.0	3.7	296.0	40.4	327	1480.0	133.33	25.0	-81.1
Aberg	KR0015B	19.82	30.31	20/05/92	531.0	3.3	228.0	30.4	348	1140.0	129.44	42.0	-83.6
Aberg	KR0015B	19.82	30.31	03/06/92	504.0	3.1	207.0	26.5	360	1020.0	133.00	34.0	-78.9
Aberg	KR0015B	19.82	30.31	26/06/92	553.0	3.1	233.0	31.5	360	1120.0	138.00	17.0	-82.2
Aberg	KR0015B	19.82	30.31	08/07/92	558.0	3.5	238.0	32.4	370	1120.0	140.00	17.0	-82.4
Aberg	KR0015B	19.82	30.31	21/07/92	635.0	3.7	279.0	38.5	360	1300.0	144.00	17.0	-80.1

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	KR0015B	19.82	30.31	06/08/92	562.0	3.2	235.0	31.8	370	1130.0	141.00	17.0	-81.3
Aberg	KR0015B	19.82	30.31	18/08/92	562.0	3.2	229.0	31.1	370	1250.0	145.00	17.0	-82.3
Aberg	KR0015B	19.82	30.31	03/09/92	552.0	4.0	229.0	30.8	380	1120.0	146.00	25.0	-82.6
Aberg	KR0015B	19.82	30.31	17/09/92	589.0	4.1	245.0	35.2	380	1170.0	162.00	17.0	-80.6
Aberg	KR0015B	19.82	30.31	30/09/92	527.0	4.6	210.0	28.2	390	1040.0	145.00	17.0	-81.9
Aberg	KR0015B	19.82	30.31	12/10/92	520.0	3.7	205.0	27.9	393	1040.0	147.00	8.0	-68.2
Aberg	KR0015B	19.82	30.31	28/10/92	477.0	3.3	186.0	25.1	396	876.0	140.00	25.0	-82.3
Aberg	KR0015B	19.82	30.31	10/11/92	491.0	3.1	190.0	26.0	400	924.0	148.00	17.0	-81.0
Aberg	KR0015B	19.82	30.31	24/11/92	490.0	3.3	185.0	25.1	404	895.0	137.00	25.0	-81.4
Aberg	KR0015B	19.82	30.31	02/12/92	602.0	4.0	254.0	36.9	376	1270.0	145.00	8.4	-76.3
Aberg	KR0015B	19.82	30.31	10/12/92	487.0	3.5	190.0	23.2	400	895.0	139.00	11.0	-76.4
Aberg	KR0015B	19.82	30.31	21/12/92	488.0	3.8	185.0	25.7	403	895.0	165.00	15.0	-75.8
Aberg	KR0015B	19.82	30.31	04/01/93	499.0	3.8	189.0	26.4	404	901.0	142.00	14.0	-75.2
Aberg	KR0015B	19.82	30.31	19/01/93	496.0	3.0	187.0	26.8	408	878.0	126.00	21.0	-76.7
Aberg	KR0015B	19.82	30.31	07/02/93	455.0	3.0	169.0	22.6	415	792.0	122.00	17.0	-69.6
Aberg	KR0015B	19.82	30.31	17/03/93	458.0	3.5	168.0	22.6	415	760.0	120.00	8.4	-72.9
Aberg	KR0015B	19.82	30.31	25/03/93	481.0	3.7	179.0	25.1	417	755.0	131.83	13.0	-71.4
Aberg	KR0015B	19.82	30.31	16/05/93	404.0	2.8	146.0	23.1	427	646.0	120.00	7.6	-73.9
Aberg	KR0015B	19.82	30.31	11/06/93	511.0	3.8	189.0	27.3	415	805.0	134.00	19.0	-77.6
Aberg	KR0015B	19.82	30.31	05/07/93	403.4	3.2	141.0	19.1	409	729.0	129.00	19.0	-73.7
Aberg	KR0015B	19.82	30.31	08/11/93	566.0	3.9	210.0	32.9	389	1080.0	148.31	28.0	-71.7
Aberg	KR0015B	19.82	30.31	10/08/94	481.7	3.0	176.7	27.7	389	851.0	132.16	32.1	-69.7
Aberg	KR0015B	19.82	30.31	05/09/94	357.7	2.5	123.5	19.0	422	534.6	97.00	28.7	-69.2
Aberg	KR0015B	19.82		18/05/95	578.5	3.6	207.1	36.8	346	977.1	140.31	8.5	-70.8
Aberg	KR0015B	19.82		10/10/95	452.5	3.2	159.0	29.2	309	889.9	121.39	61.7	-71.8
Aberg	KXTT1	15	16	10/04/96	1768.9	14.1	1285.5	81.4	91	5084.0	343.25	16.0	-76.9
Aberg	KXTT2	11.55	13.55	11/04/96	1632.2	11.6	963.7	79.7	124	4389.1	326.92	39.0	-68.4
Aberg	KXTT2	14.55	15.55	12/04/96	1754.3	13.8	1263.3	80.8	91	5119.4	357.71	22.0	-78.4
Aberg	KXTT3	8.92	11.42	11/04/96	1621.3	12.1	947.3	79.9	130	4296.9	295.07	20.0	-73.4
Aberg	KXTT3	12.42	14.42	10/04/96	1775.9	14.3	1301.1	82.3	92	5091.1	347.00	24.0	-78.4
Aberg	KXTT4	11.92	13.92	11/04/96	1763.7	14.2	1253.8	81.5	98	5013.1	343.00	18.0	-78.6
Aberg	KXTT4	14.92	23.42	09/04/96	1731.7	14.1	1191.8	83.2	106	4920.9	329.82	25.0	-77.0
Aberg	SA0158A	6	19.7	09/06/94	852.8	15.5	239.9	104.2	245	1942.8	253.00	22.8	-63.1
Aberg	SA0205A	6	20	09/06/94	1475.8	16.4	511.8	135.0	197	3376.9	388.00	35.5	-57.3

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	SA0237B	6	20	09/06/94	1417.7	16.8	418.6	129.5	160	3173.0	356.00	30.4	-60.5
Aberg	SA0311A	5.7	19	09/06/94	1031.3	6.5	508.0	85.1	221	2655.4	200.00	10.1	-67.8
Aberg	SA0327B	5.7	19	09/06/94	1226.8	5.9	724.2	83.1	96	3453.1	177.00	<8.4	-81.6
Aberg	SA0435A	6	22	08/06/94	1094.6	4.0	509.9	71.2	220	2712.2	163.00	14.4	-71.4
Aberg	SA0452A	5.5	19.6	08/06/94	1464.0	4.8	770.1	107.3	134	3882.1	227.00	16.9	-68.5
Aberg	SA0468A	6	19.8	08/06/94	1543.1	6.0	782.7	118.7	129	4098.4	240.00	15.2	-66.8
Aberg	SA0813B	5.6	19.5	02/12/92	1700.0	21.0	364.0	123.0	481	3450.0	194.00	6.8	-59.8
Aberg	SA0813B	5.6	19.5	07/02/93	1670.0	19.0	317.0	124.0	420	3360.0	226.81	14.0	-58.2
Aberg	SA0813B	5.6	19.5	07/09/93	1660.0	20.0	325.0	127.0	326	3300.0	275.95	19.0	-57.6
Aberg	SA0813B	5.6	19.5	29/09/93	1640.0	19.1	310.0	124.0	317	3350.0	261.00	14.0	-50.4
Aberg	SA0813B	5.6	19.5	07/06/94	1578.0	11.9	322.1	121.1	302	3272.3	282.00	22.8	-53.7
Aberg	SA0813B	5.6	19.5	05/09/94	1572.7	20.3	318.1	120.8	292	3112.8	298.00	30.4	-53.7
Aberg	SA0813B	5.6		17/05/95	1551.0	17.5	282.3	124.3	311	3080.9	273.25	19.4	-53.2
Aberg	SA0813B	5.6		12/10/95	1470.9	16.2	279.8	114.8	318	2979.8	582.07	18.6	-58.9
Aberg	SA0850B	1	19.8	20/08/91	1920.0	18.0	1210.0	141.0	170	5440.0	90.49	6.8	-67.2
Aberg	SA0923A	6	20	02/12/92	1850.0	31.0	746.0	172.0	669	4500.0	90.00	4.2	-63.4
Aberg	SA0923A	6	20	07/02/93	1800.0	30.0	678.0	162.0	655	4310.0	127.64	8.4	-59.7
Aberg	SA0958B	5	19.7	23/06/93	1829.2	22.4	595.2	137.2	371	4087.9	243.00	8.4	-56.0
Aberg	SA0958B	5	19.7	26/08/93	1803.1	21.5	697.7	139.6	311	4310.0	225.28	14.0	-61.9
Aberg	SA0958B	5	19.7	28/09/93	1810.0	19.6	657.0	144.0	296	4260.0	241.00	14.0	-57.5
Aberg	SA0958B	5	19.7	07/06/94	1634.1	21.4	477.8	125.1	274	3641.0	303.00	22.8	-55.6
Aberg	SA0976B	1	10.5	15/10/91	2170.0	20.6	993.0	203.0	500	5590.0	58.73	14.0	-60.4
Aberg	SA1009B	6	19.5	28/06/93	1847.1	26.3	535.3	163.6	300	4125.6	250.00	5.1	-84.8
Aberg	SA1009B	6	19.5	25/08/93	1769.8	26.6	506.1	153.1	292	3984.1	250.00	15.0	-58.1
Aberg	SA1009B	6	19.5	28/09/93	1740.0	25.8	514.0	164.0	276	4080.0	252.00	8.0	-47.3
Aberg	SA1009B	6	19.5	08/06/94	1682.1	23.6	440.5	144.5	242	3672.9	304.00	12.7	-54.2
Aberg	SA1009B	6	19.5	05/09/94	1590.0	27.1	371.7	137.9	234	3390.0	313.00	36.3	-53.1
Aberg	SA1009B	6		17/05/95	1568.0	31.2	275.2	151.8	228	3385.8	352.35	20.3	-54.3
Aberg	SA1009B	6		12/10/95	1526.0	30.3	240.0	145.5	234	3045.4	330.34	24.5	-57.4
Aberg	SA1062B	6	20	23/04/92	2230.0	23.5	770.0	220.0	531	5320.0	100.67	8.0	-58.0
Aberg	SA1062B	6	20	02/12/92	1930.0	34.0	545.0	177.0	403	4350.0	187.00	9.3	-57.6
Aberg	SA1077A	6	20.4	23/04/92	2180.0	32.6	650.0	200.0	690	4890.0	127.34	17.0	-58.7
Aberg	SA1094A	4.5	20	23/04/92	2140.0	35.1	504.0	195.0	760	4490.0	111.46	17.0	-60.3
Aberg	SA1111B	6	19	23/04/92	2160.0	18.7	736.0	200.0	340	5130.0	110.86	25.0	-60.3

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	SA1210A	6	20.5	07/05/92	1980.0	30.5	572.0	208.0	540	4620.0	129.14	17.0	-61.5
Aberg	SA1210A	6	20.5	23/06/93	1770.3	45.1	255.7	152.4	309	3369.7	328.00	27.0	-55.4
Aberg	SA1210A	6	20.5	26/08/93	1728.0	45.4	272.4	150.2	278	3450.0	327.78	30.0	-53.9
Aberg	SA1210A	6	20.5	14/12/93	1760.0	47.3	246.0	171.0	256	3450.0	368.53	23.0	-49.6
Aberg	SA1210A	6	20.5	07/06/94	1661.0	27.0	226.7	147.6	264	3254.6	325.00	30.4	-52.4
Aberg	SA1229A	6	20.5	07/05/92	2170.0	11.2	1060.0	194.0	510	5590.0	100.97	17.0	-63.6
Aberg	SA1229A	6	20.5	23/06/93	1847.9	24.5	598.5	156.1	426	4210.9	208.27	16.0	-60.0
Aberg	SA1229A	6	20.5	24/08/93	1810.4	27.0	579.6	151.4	388	4105.5	209.67	14.0	-58.1
Aberg	SA1229A	6	20.5	28/09/93	1820.0	24.7	549.0	159.0	378	4140.0	216.00	14.0	-50.1
Aberg	SA1229A	6	20.5	07/06/94	1735.4	26.1	512.1	151.7	336	3928.2	243.00	16.9	-52.8
Aberg	SA1229A	6	20.5	05/09/94	1707.7	25.9	525.8	147.7	325	3687.1	242.00	27.0	-49.7
Aberg	SA1229A	6	20.5	07/09/94	1732.0	27.4	456.0	145.0	330	3871.5	224.00	16.9	-51.7
Aberg	SA1229A	6		18/05/95	1628.5	24.1	466.9	146.7	310	3674.7	247.64	15.2	-46.3
Aberg	SA1229A	6		11/10/95	1620.6	24.4	440.4	136.3	314	3481.5	224.35	23.7	-54.7
Aberg	SA1327B	6	20.3	15/10/92	1610.0	9.4	648.0	128.0	252	3920.0	225.00	17.0	-65.3
Aberg	SA1342B	0	20.3	16/06/92	1680.0	11.0	950.0	152.0	170	4730.0	148.31	5.9	-61.9
Aberg	SA1420A	6	50	14/08/92	1650.0	7.6	981.0	117.0	830	4610.0	200.00	<4.2	-86.6
Aberg	SA1420A	6	50	15/10/92	1540.0	10.2	715.0	123.0	170	3930.0	225.91	17.0	-72.0
Aberg	SA1420A	6	50	02/12/92	1610.0	11.0	760.0	126.0	202	4140.0	225.00	10.0	-68.8
Aberg	SA1420A	6	50	07/02/93	1550.0	14.0	482.0	129.0	226	3450.0	335.57	32.0	-55.5
Aberg	SA1420A	6	50	22/06/93	1484.2	9.7	487.9	124.5	215	3419.9	307.00	31.0	-59.0
Aberg	SA1420A	6	50	24/08/93	1539.0	15.8	485.0	127.4	212	3434.5	308.80	27.0	-57.6
Aberg	SA1420A	6	50	29/09/93	1600.0	13.7	480.0	139.0	214	3530.0	335.00	22.0	-52.5
Aberg	SA1420A	6	50	07/06/94	1426.5	15.7	395.8	116.8	206	3052.5	303.00	28.7	-57.0
Aberg	SA1420A	6	50	06/09/94	1441.8	18.2	368.7	125.2	199	2949.7	304.53	32.1	-50.5
Aberg	SA1420A	6		18/05/95	1347.5	20.5	284.4	135.8	199	2900.1	301.42	23.7	-60.3
Aberg	SA1420A	6		11/10/95	1334.4	20.3	247.4	129.4	204	2721.0	267.44	33.0	-58.4
Aberg	SA1614B	5.8	19.3	19/11/92	1570.0	8.3	1250.0	80.2	37	5160.0	308.00	8.0	-103.1
Aberg	SA1614B	5.8	19.3	22/06/93	1953.7	5.2	1710.4	65.9	32	6207.3	424.00	<4.2	-85.5
Aberg	SA1614B	5.8	19.3	24/08/93	1944.3	7.5	1516.2	84.5	67	5815.5	339.00	<4.0	-78.3
Aberg	SA1614B	5.8	19.3	28/09/93	1880.0	6.7	1390.0	90.8	81	5650.0	350.00	<4.0	-77.6
Aberg	SA1614B	5.8	19.3	06/06/94	1831.3	7.4	1207.0	98.3	109	5176.1	333.00	<8.4	-71.9
Aberg	SA1680A	0	16	13/10/92	606.0	5.9	171.0	26.9	237	1160.0	166.00	7.6	-77.4
Aberg	SA1680B	6	20	20/10/92	657.0	4.9	217.0	30.6	224	1560.0	178.00	17.0	-85.5

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Aberg	SA1680B	6	20	03/02/93	1100.0	10.0	583.0	63.3	137	2790.0	194.00	5.1	-83.8
Aberg	SA1693F	0	38.5	19/10/92	941.0	5.4	489.0	38.9	160	2400.0	219.00	<4.2	-90.3
Aberg	SA1696B	5.9	19.2	20/10/92	693.0	5.8	285.0	33.3	213	1560.0	169.00	5.1	-84.0
Aberg	SA1696B	5.9	19.2	19/11/92	1330.0	9.4	916.0	74.3	102	3910.0	266.00	8.0	-93.2
Aberg	SA1696B	5.9	19.2	22/06/93	1653.4	6.3	1195.8	73.3	68	4828.0	365.00	8.4	-85.6
Aberg	SA1696B	5.9	19.2	24/08/93	1817.0	8.9	1400.6	72.3	54	5498.8	419.00	<4.2	-82.8
Aberg	SA1696B	5.9	19.2	28/09/93	1880.0	8.0	1450.0	76.2	57	5690.0	428.00	7.0	-81.0
Aberg	SA1696B	5.9	19.2	06/06/94	1932.5	9.1	1740.4	71.4	89	6275.2	459.00	<8.4	-81.3
Aberg	SA1713A	5.8	20.1	22/10/92	960.0	14.0	602.0	26.4	25	2730.0	192.00	<4.2	-90.2
Aberg	SA1730A	5.6	20	03/02/93	1740.0	10.0	1420.0	64.8	39	5470.0	464.00	4.2	-91.6
Aberg	SA1730A	5.6	20	21/06/93	1944.4	6.1	1709.4	61.8	39	6062.5	459.00	12.0	-89.2
Aberg	SA1730A	5.6	20	24/08/93	2001.9	8.1	1860.8	59.0	40	6064.5	470.80	<4.0	-87.2
Aberg	SA1730A	5.6	20	28/09/93	2060.0	7.6	1830.0	65.4	32	6890.0	513.00	<4.0	-81.7
Aberg	SA1730A	5.6	20	06/06/94	2149.1	8.2	2160.0	54.2	45	7329.9	512.00	<8.4	-86.4
Aberg	SA1730A	5.6	20	07/09/94	2430.5	9.4	2793.3	48.6	31	8499.9	549.00	<8.4	-85.1
Aberg	SA1730A	5.6		18/05/95	2440.3	8.2	2755.1	53.5	32	8671.8	539.32	<8.5	-90.2
Aberg	SA1730A	5.6		11/10/95	2384.2	8.2	2616.5	56.4	36	8650.5	530.46	16.0	-88.8
Aberg	SA1742A	0	41.1	02/11/92	1300.0	8.4	968.0	41.5	71	3800.0	286.00	<4.2	-98.3
Aberg	SA1828B	5.8	20	19/11/92	1700.0	8.5	1290.0	92.2	43	5200.0	302.62	<4.2	-84.4
Aberg	SA1828B	5.8	20	16/02/93	1860.0	9.6	1250.0	118.0	72	5540.0	340.00	32.0	-71.1
Aberg	SA1828B	5.8	20	21/06/93	1909.2	8.0	1392.4	113.9	48	5849.7	387.00	4.2	-75.9
Aberg	SA1828B	5.8	20	26/08/93	1933.1	11.6	1493.5	107.8	49	6550.0	362.96	4.0	-80.1
Aberg	SA1828B	5.8	20	28/09/93	1930.0	10.0	1450.0	108.0	48	6010.0	376.00	<4.0	-71.4
Aberg	SA1828B	5.8	20	06/06/94	1861.5	11.7	1063.9	138.8	111	5123.0	251.00	8.4	-67.8
Aberg	SA1844B	0	20	01/12/92	1810.0	9.5	1220.0	113.0	62	5250.0	330.00	<4.2	-75.8
Aberg	SA1861A	3.6	20.2	07/12/92	1720.0	11.0	1050.0	112.0	79	4940.0	302.00	<4.2	-73.9
Aberg	SA2074A	6	38.7	17/06/93	1959.4	8.6	992.6	172.0	47	5282.5	305.00	5.9	-65.2
Aberg	SA2074A	6	38.7	28/09/93	1730.0	11.0	764.0	144.0	79	4670.0	277.00	7.0	-60.0
Aberg	SA2074A	6	38.7	07/06/94	1701.7	10.2	723.2	141.5	94	4275.6	275.00	<8.4	-63.3
Aberg	SA2074A	6	38.7	06/09/94	1521.7	10.3	627.0	126.4	103	3967.2	263.00	<8.4	-61.3
Aberg	SA2074A	6		18/05/95	1454.0	9.3	560.4	119.3	128	3414.1	261.87	<8.5	-66.3
Aberg	SA2074A	6		11/10/95	1425.0	9.1	510.1	111.8	140	3238.6	251.30	33.0	-65.1
Aberg	SA2109B	0	19.9	15/02/93	1730.0	17.0	884.0	107.0	67	4480.0	302.62	5.9	-64.5
Aberg	SA2142A	5.9	20	02/12/93	1720.0	25.0	581.0	128.0	127	3880.0	367.33	21.0	-56.2

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	SA2175B	5.8	20	13/12/93	2030.0	17.1	1100.0	172.0	94	5650.0	275.95	14.0	-61.1
Aberg	SA2175B	5.8	20	30/05/94	1959.5	15.3	1037.1	161.6	127	5442.0	267.00	<8.4	-62.0
Aberg	SA2240B	5.7	19.8	28/09/93	2150.0	17.1	1040.0	177.0	158	5560.0	258.00	<4.0	-60.7
Aberg	SA2240B	5.7	19.8	07/12/93	2110.0	17.5	1010.0	180.0	171	5460.0	253.48	5.9	-57.3
Aberg	SA2273A	5.8	20	30/11/93	2070.0	13.4	1110.0	172.0	146	5570.0	252.88	<4.2	-61.1
Aberg	SA2273A	5.8	20	27/05/94	1932.0	13.4	900.5	166.0	201	4998.9	218.00	<8.4	-60.5
Aberg	SA2273A	5.8	20	07/09/94	1911.1	14.4	848.6	165.3	205	4920.9	203.00	12.7	-56.7
Aberg	SA2273A	5.8		18/05/95	1866.0	12.4	852.2	151.1	182	4787.9	240.98	<8.5	-64.0
Aberg	SA2273A	5.8		11/10/95	1778.6	13.2	795.9	140.3	180	4346.5	241.66	20.3	-62.8
Aberg	SA2273B	5.8	20	30/11/93	1830.0	8.0	1280.0	136.0	104	5460.0	231.31	5.9	-75.8
Aberg	SA2273B	5.8	20	30/05/94	1761.7	7.8	1135.1	127.5	117	5105.2	196.00	<8.4	-71.3
Aberg	SA2289B	6	19.4	30/11/93	2040.0	12.0	1160.0	164.0	138	5570.0	251.98	10.0	-66.6
Aberg	SA2289B	6	19.4	30/05/94	1952.7	12.2	968.6	162.1	178	5167.3	219.00	<8.4	-60.8
Aberg	SA2322A	6	20.1	28/09/93	2170.0	8.6	1070.0	129.0	152	5340.0	227.00	<4.0	-66.0
Aberg	SA2322A	6	20.1	07/12/93	1910.0	9.8	998.0	139.0	165	5070.0	231.61	7.6	-62.9
Aberg	SA2322A	6	20.1	08/03/94	1924.0	11.6	1024.0	140.0	169	5353.0	223.00	8.4	-68.0
Aberg	SA2322A	6	20.1	27/05/94	1908.3	9.4	977.4	142.5	184	5034.3	213.00	8.4	-63.4
Aberg	SA2355B	5.9	20	08/03/94	1959.0	8.4	1634.0	68.7	23	6240.0	443.00	5.9	-83.1
Aberg	SA2583A	5.7	20	07/03/94	2099.0	8.3	1870.0	56.9	13	6647.0	508.00	<4.2	-85.9
Aberg	SA2583A	5.7	20	18/05/94	2170.0	8.5	1859.6	73.9	44	6895.6	492.00	5.9	-83.5
Aberg	SA2600A	5.8	19.4	07/03/94	2398.0	9.9	2541.0	52.0	17	8349.0	560.00	9.3	-93.7
Aberg	SA2600A	5.8	19.4	18/05/94	2171.1	7.6	1825.4	72.2	92	6718.3	498.00	4.2	-80.4
Aberg	SA2600A	5.8	19.4	06/09/94	2260.0	9.1	2180.0	65.0	37	7734.7	470.00	<8.4	-77.9
Aberg	SA2600A	5.8		17/05/95	2094.0	7.6	1499.0	90.7	90	6023.5	407.33	11.0	-70.4
Aberg	SA2600A	5.8		11/10/95	2140.2	7.6	1542.4	89.3	95	6183.0	382.12	11.0	-75.5
Aberg	SA2600B	5.8	19.2	07/03/94	2453.0	9.9	2681.0	49.0	13	8597.0	575.00	5.9	-94.3
Aberg	SA2634B	6	20.4	24/02/94	2273.0	10.2	1986.0	91.4	64	7197.0	414.00	18.0	-86.2
Aberg	SA2649A	5.8	19.85	24/02/94	2123.0	8.3	1715.0	76.1	39	6523.0	501.00	14.0	-82.7
Aberg	SA2663B	5.6	20.1	24/02/94	2447.0	10.0	2639.0	53.4	20	8686.0	589.00	4.2	-92.8
Aberg	SA2664A	5.8	20.4	24/02/94	2124.0	8.2	1753.0	75.1	39	6701.0	515.00	11.0	-83.4
Aberg	SA2681A	5.7	21.8	23/02/94	2139.0	8.1	1675.0	77.8	41	6523.0	486.00	15.0	-82.1
Aberg	SA2681B	5.6	17.3	23/02/94	2187.0	10.6	1772.0	114.0	64	6842.0	406.00	9.3	-80.4
Aberg	SA2703A	5.7	19.6	23/02/94	2694.0	11.0	3285.0	43.2	12	10140.0	659.00	10.0	-93.2
Aberg	SA2703A	5.7	19.6	17/05/94	2824.0	7.8	3581.3	40.3	12	10591.6	683.00	<4.2	-93.7

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	SA2718A	5.8	20.3	17/05/94	2707.2	7.9	3360.3	41.9	15	10148.4	648.00	<4.2	-93.8
Aberg	SA2734B	5.7	20.3	23/02/94	2071.0	8.5	1726.0	94.5	37	6490.0	436.00	10.0	-83.6
Aberg	SA2768A	6	20.3	14/02/94	2459.0	9.4	2904.0	55.1	11	9058.0	580.00	<4.2	-92.6
Aberg	SA2768B	5.9	19.8	14/02/94	2190.0	7.9	2226.0	70.3	14	7640.0	490.00	<4.2	-84.2
Aberg	SA2783A	5.8	19.9	14/02/94	2258.0	8.4	2363.0	59.6	14	8030.0	508.00	4.2	-88.3
Aberg	SA2783A	5.8	19.9	17/05/94	2347.6	9.1	2532.4	62.5	20	8411.2	523.00	9.3	-90.5
Aberg	SA2783A	5.8	19.9	07/09/94	2448.4	9.6	2813.0	57.9	18	9022.8	513.00	<8.4	-83.2
Aberg	SA2783A	5.8		23/05/95	2811.3	10.3	3661.9	53.3	14	10944.3	583.96	<8.5	-88.6
Aberg	SA2783A	5.8		25/10/95	2839.8	11.7	3712.7	50.1	18	10910.7	599.45	22.0	-90.0
Aberg	SA2834B	6	20.2	14/02/94	2522.0	10.7	2734.0	95.9	15	9094.0	571.00	<4.2	-86.8
Aberg	SA2880A	11.92	13.92	12/04/96	3156.4	13.6	4378.1	41.1	22	12956.3	625.34	17.0	-87.7
Aberg	SA2880A	11.92		25/10/95	2846.8	12.1	3812.5	46.4	30	11371.5	609.39	21.0	-84.5
Aberg	HAV04	35	100	25/07/87	215.0	4.0	14.0	3.0	300	108.0	76.00	8.0	-73.5
Aberg	HAV04	35	100	26/07/87	202.0	4.0	13.0	3.0	290	106.0	71.00	<1.0	-79.7
Aberg	HAV05	50	100	28/07/87	117.0	3.0	14.0	3.0	265	14.0	62.00	11.0	-71.8
Aberg	HAV05	50	100	29/07/87	144.0	3.0	12.0	2.0	271	15.0	97.00	<1.0	-67.1
Aberg	HAV06	73	100	30/07/87	107.0	2.6	9.7	1.0	231	22.0	45.00	<1.0	-73.4
Aberg	HAV06	73	100	31/07/87	127.0	1.6	11.0	1.4	228	36.0	71.00	<1.0	-70.1
Aberg	HAV07	69	100	29/07/87	135.0	2.0	18.0	2.0	258	63.0	68.00	<1.0	-71.2
Aberg	HAV07	69	100	30/07/87	139.0	2.0	21.0	2.0	257	73.0	69.00	2.0	-73.3
Aberg	KAV01	420	425	22/09/87	255.0	4.7	156.0	21.0	186	575.0	43.00	19.0	-78.6
Aberg	KAV01	522	531	25/08/87	750.0	7.4	440.0	42.0	81	1970.0	118.00	13.0	-80.3
Aberg	KAV01	558	563	03/06/87	1500.0	6.0	1100.0	60.0	42	4300.0	220.00	8.0	-86.2
Aberg	KAV01	635	743.6	22/04/87	3100.0	8.0	2900.0	31.0	9	9700.0	400.00	<3.0	-92.6
Aberg	HLX01	50	100	23/10/87	32.5	2.2	37.8	4.9	115	18.1	47.80	34.0	-81.0
Aberg	HLX01	50	100	24/10/87	137.0	2.9	10.7	2.1	232	42.3	59.10	25.0	-79.0
Aberg	HLX01	50	100	25/10/87	141.0	3.0	11.5	1.9	233	40.9	63.80	17.0	-79.0
Aberg	HLX03	25	100	05/11/87	76.0	5.1	15.0	3.9	210	11.0	21.00	25.0	-80.0
Aberg	HLX03	25	100	06/11/87	67.0	5.0	17.0	4.3	204	5.8	21.50	34.0	-80.0
Aberg	HLX06	45	100	01/11/87	56.1	2.8	24.5	4.9	219	5.7	8.70	17.0	-77.0
Aberg	HLX06	45	100	03/11/87	92.0	2.0	12.3	2.3	249	12.1	23.50	17.0	-77.0
Aberg	HLX07	20	100	04/11/87	170.0	5.2	27.5	6.1	151	215.0	72.00	25.0	-76.0
Aberg	HLX07	20	100	05/11/87	430.0	5.6	42.0	9.2	200	440.0	260.00	8.4	-78.0
Aberg	KLX01	272	277	08/12/88	1040.0	6.2	243.0	28.0	83	2050.0	48.00	8.0	-89.9

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	KLX01	456	461	23/11/88	860.0	6.1	223.0	18.0	78	1700.0	106.00	<8.0	-94.5
Aberg	KLX01	680	702.11	03/11/88	1680.0	7.1	1400.0	23.0	24	4870.0	351.00	<8.0	-102.1
Aberg	KLX01	680	702.11	01/11/89	1610.0	7.3	1330.0	24.0	24	4680.0	390.00	<8.0	-98.8
Aberg	KLX02	9	31	03/08/93	137.0	3.9	54.1	4.4	220	149.0	61.12	8.4	-74.4
Aberg	KLX02	31	81	03/08/93	134.0	3.9	45.7	4.3	202	146.0	58.13	5.9	-75.1
Aberg	KLX02	81	131	03/08/93	130.0	3.8	43.4	4.3	200	140.0	56.63	4.2	-74.6
Aberg	KLX02	131	181	03/08/93	120.0	3.7	39.3	4.3	200	123.0	52.43	11.8	-76.3
Aberg	KLX02	181	231	03/08/93	110.0	4.3	38.6	4.3	202	109.0	48.84	15.2	-76.1
Aberg	KLX02	231	281	03/08/93	97.4	3.5	33.8	4.3	202	82.5	43.74	12.7	-76.3
Aberg	KLX02	281	331	03/08/93	87.0	3.5	31.5	4.3	205	63.8	40.15	5.1	-75.9
Aberg	KLX02	315	321.5	10/02/94	111.0	3.1	24.0	4.6	223	73.0	43.00	5.9	-73.4
Aberg	KLX02	331	381	03/08/93	77.0	3.5	29.1	4.3	205	45.0	36.55	7.6	-75.4
Aberg	KLX02	335	340.8	08/11/93	206.0	3.1	36.0	5.9	201	235.0	84.00	13.0	-75.7
Aberg	KLX02	381	431	03/08/93	72.9	3.4	27.4	4.5	205	34.5	33.56	7.6	-76.4
Aberg	KLX02	431	481	03/08/93	69.5	3.4	26.2	4.6	204	28.0	32.06	8.4	-75.5
Aberg	KLX02	481	531	03/08/93	67.7	3.5	25.6	4.7	202	26.5	31.16	12.7	-76.2
Aberg	KLX02	531	581	03/08/93	67.3	3.5	25.3	4.7	198	26.2	30.56	16.1	-75.3
Aberg	KLX02	581	631	03/08/93	67.6	3.4	25.5	4.5	201	25.5	29.78	8.4	-76.5
Aberg	KLX02	631	681	03/08/93	67.4	3.4	25.3	4.5	200	28.0	29.75	8.4	-75.5
Aberg	KLX02	681	731	03/08/93	68.2	3.5	25.5	4.5	200	28.3	29.84	17.7	-76.0
Aberg	KLX02	731	781	03/08/93	67.6	3.4	25.9	4.5	209	28.0	29.96	19.4	-76.6
Aberg	KLX02	781	831	03/08/93	68.8	3.4	28.3	4.5	202	34.0	31.16	15.2	-75.5
Aberg	KLX02	798	803.8	23/11/93	288.0	4.5	123.0	10.6	111	548.0	105.00	8.4	-78.7
Aberg	KLX02	831	881	03/08/93	73.4	3.4	38.9	4.3	205	60.0	35.36	12.7	-75.1
Aberg	KLX02	881	931	03/08/93	103.0	3.4	82.6	4.5	202	175.0	48.24	11.0	-76.1
Aberg	KLX02	931	981	03/08/93	327.0	3.7	397.0	4.6	181	1080.0	125.54	13.5	-77.8
Aberg	KLX02	981	1031	03/08/93	1000.0	5.1	1340.0	4.7	126	3780.0	302.62	11.0	-81.5
Aberg	KLX02	1031	1081	03/08/93	2460.0	8.5	3590.0	4.0	53	9910.0	644.18	10.1	-84.5
Aberg	KLX02	1081	1131	03/08/93	3300.0	11.3	4820.0	3.2	24	13600.0	805.98	<4.2	-85.2
Aberg	KLX02	1090	1096.2	16/12/93	3800.0	10.4	5620.0	2.1	8	15800.0	1010.00	7.6	-78.6
Aberg	KLX02	1131	1181	03/08/93	3780.0	10.5	5720.0	2.5	13	16000.0	898.86	0.2	-83.7
Aberg	KLX02	1181	1231	03/08/93	3930.0	10.2	6110.0	2.2	12	16800.0	928.82	<4.2	-82.3
Aberg	KLX02	1231	1281	03/08/93	4190.0	12.0	6810.0	2.1	11	18500.0	949.80	<0.2	-80.7
Aberg	KLX02	1281	1331	03/08/93	4640.0	14.2	8000.0	2.6	11	21500.0	943.80	<4.2	-77.1

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Aberg	KLX02	1331	1381	03/08/93	5750.0	18.2	11000.0	2.2	10	29100.0	949.80	<0.2	-66.0
Aberg	KLX02	1381	1431	03/08/93	6520.0	20.5	12700.0	2.3	11	33100.0	955.79	<4.2	-60.2
Aberg	KLX02	1420	1705	17/01/94	8030.0	29.0	18600.0	2.7	9	45500.0	832.00	26.0	-47.4
Aberg	KLX02	1431	1481	03/08/93	7330.0	25.6	15800.0	2.6	12	39700.0	946.80	<0.2	-53.2
Aberg	KLX02	1481	1531	03/08/93	7740.0	30.6	17100.0	3.1	12	43300.0	925.83	<4.2	-49.4
Aberg	KLX02	1531	1581	03/08/93	7690.0	30.0	16900.0	2.9	11	43500.0	913.84	<0.2	-49.8
Aberg	KLX02	1581	1631	03/08/93	7860.0	34.2	17500.0	2.9	10	44800.0	913.84	<4.2	-48.1
Aberg	KLX02	1631	1681	03/08/93	8200.0	45.5	19200.0	2.1	14	47200.0	904.85	<0.2	-44.9
Beberg	BFI01	71	84	07/04/86	24.0	3.2	76.0	6.3	220	61.0	8.30	36.0	-88.2
Beberg	BFI01	169	177	05/05/86	420.0	6.1	170.0	24.0	250	830.0	102.00	5.0	-85.2
Beberg	BFI01	234	247	16/06/86	650.0	8.7	320.0	41.0	260	1500.0	140.00	3.0	-85.7
Beberg	BFI01	284	294	13/11/86	1700.0	14.0	1500.0	120.0	59	5200.0	370.00	<3.0	-89.0
Beberg	BFI01	335	385	11/09/86	1700.0	16.0	1500.0	140.0	61	5500.0	390.00	<3.0	-86.9
Beberg	**BFI01**	**439**	**459.1**	**27/10/86**	**1700.0**	**13.0**	**1650.0**	**110.0**	**47**	**5500.0**	**370.00**	**<3.0**	**-88.7**
Beberg	KFI01	206	211	09/10/80	44.0	2.5	59.0	7.5	314	10.0	1.00	38.0	-87.0
Beberg	KFI01	206	211	14/10/80	45.0	2.5	61.0	7.0	320	11.0	1.00	40.0	-88.0
Beberg	KFI01	206	211	21/10/80	50.0	2.7	60.0	7.0	322	13.0	1.00	50.0	-90.0
Beberg	KFI01	293	298	05/11/80	56.0	2.9	59.0	7.5	325	18.0	1.00	46.0	-88.0
Beberg	KFI01	293	298	11/11/80	88.0	2.8	50.0	6.5	350	37.0	1.00	40.0	-87.0
Beberg	KFI04	152	157	30/10/79	225.0	3.0	25.0	4.0	386	127.0	44.00	6.0	-80.4
Beberg	KFI04	152	157	04/12/79	225.0	3.1	24.0	5.5	390	133.0	48.00	7.0	-80.4
Beberg	KFI04	152	157	12/12/79	210.0	3.1	23.0	9.5	389	124.0	46.00	6.0	-83.0
Beberg	KFI04	247	252	17/01/80	215.0	3.0	40.0	7.0	360	200.0	40.00	10.0	-83.6
Beberg	KFI04	247	252	29/02/80	170.0	2.8	24.0	4.0	390	74.0	30.00	11.0	-81.0
Beberg	KFI04	368	373	26/04/80	165.0	2.8	22.0	4.0	397	72.0	25.00	13.0	-85.0
Beberg	KFI04	368	373	29/04/80	165.0	2.7	22.0	4.0	395	72.0	29.00	14.0	-85.0
Beberg	KFI04	534	539	07/05/80	165.0	2.9	22.0	4.0	395	75.0	29.00	13.0	-85.0
Beberg	KFI04	534	539	14/05/80	170.0	2.8	22.0	4.0	393	75.0	29.00	14.0	-85.0
Beberg	KFI04	534	539	21/05/80	170.0	2.8	22.0	4.0	393	75.0	19.00	10.0	-85.0
Beberg	KFI04	534	539	28/05/80	170.0	2.7	22.0	4.0	393	75.0	19.00	13.0	-85.0
Beberg	KFI05	205	210	29/01/80	1100.0	10.0	875.0	110.0	85	3400.0	325.00	7.0	-86.0
Beberg	KFI05	205	210	15/02/80	1100.0	9.4	900.0	110.0	83	3450.0	325.00	7.0	-86.0
Beberg	KFI05	297	302	17/04/80	1380.0	7.2	1500.0	70.0	39	4650.0	300.00	5.0	-88.0
Beberg	KFI05	384	389	21/05/80	1500.0	8.3	1790.0	100.0	44	5650.0	324.00	<3.0	-88.0

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Beberg	KFI07	123	128	02/09/80	94.0	1.4	36.0	5.5	333	23.0	7.00	13.0	-87.0
Beberg	KFI07	301	306	10/09/80	164.0	1.6	57.0	7.5	314	173.0	18.00	10.0	-87.0
Beberg	KFI07	301	306	08/10/80	390.0	2.9	114.0	18.0	233	665.0	71.00	3.0	-90.0
Beberg	KFI07	322	327	22/10/80	195.0	1.7	96.0	13.0	300	320.0	32.00	11.0	-88.0
Beberg	KFI07	322	327	28/10/80	224.0	1.8	107.0	16.0	292	380.0	35.00	11.0	-88.0
Beberg	KFI07	511	516	05/11/80	280.0	2.2	145.0	18.0	278	545.0	51.00	10.0	-89.0
Beberg	KFI07	511	516	11/11/80	275.0	2.1	149.0	14.0	277	555.0	47.00	11.0	-89.0
Beberg	**KFI07**	**511**	**516**	**19/11/80**	**275.0**	**2.0**	**142.0**	**17.0**	**278**	**555.0**	**49.00**	**8.0**	**-89.0**
Beberg	KFI09	182	187	11/03/85	950.0	7.0	370.0	49.0	162	2800.0	210.00	<3.0	-84.0
Beberg	KFI09	360	365	05/02/85	1600.0	8.0	1000.0	57.0	34	5100.0	320.00	<3.0	-89.9
Beberg	KFI09	360	365	06/02/85	1400.0	8.0	1000.0	57.0	33	5100.0	300.00	<3.0	-87.4
Ceberg	KGI02	178	180.7	24/05/82	50.0	2.3	10.0	2.6	161	4.8	1.00	3.0	-90.9
Ceberg	KGI02	178	180.7	07/06/82	48.0	2.2	10.0	2.7	161	4.1	0.60	3.0	-90.4
Ceberg	KGI02	328	330.7	20/06/82	49.0	2.2	9.5	2.4	163	4.7	0.50	<3.0	-90.1
Ceberg	KGI02	400	402.7	05/07/82	53.0	2.0	10.0	2.4	160	5.4	0.40	<3.0	-91.4
Ceberg	KGI02	544	546.7	20/07/82	51.0	2.2	9.5	2.3	160	5.0	0.10	<3.0	-89.5
Ceberg	KGI02	602	604.7	01/08/82	50.0	2.2	11.0	1.9	158	4.6	0.10	<3.0	-92.7
Ceberg	KGI04	96	98.7	07/06/82	11.0	2.5	33.0	4.4	141	1.5	3.90	36.0	-93.4
Ceberg	KGI04	222	224.7	20/06/82	49.0	0.9	9.0	1.0	133	7.9	0.30	5.0	-89.7
Ceberg	**KGI04**	**404**	**406.7**	**04/07/82**	**105.0**	**1.9**	**21.0**	**1.1**	**18**	**178.0**	**0.10**	**8.0**	**-99.4**
Ceberg	KGI04	512	514.7	18/07/82	5.0	2.7	30.0	4.3	121	2.2	8.00	49.0	-94.1
Ceberg	KGI04	616	618.7	17/08/82	145.0	3.0	58.0	1.5	50	260.0	0.10	10.0	-100.8
Sweden	KFJ02	342	344.7	13/09/82	26.0	2.3	19.0	3.3	144	8.0	10.00	19.0	-80.5
Sweden	KFJ02	483	485.7	27/09/82	33.0	2.6	21.0	3.4	170	8.0	0.20	3.0	-80.8
Sweden	KFJ02	605	607.7	11/10/82	130.0	1.0	12.0	0.8	83	170.0	0.20	<3.0	-102.9
Sweden	KFJ04	151	153.7	05/07/82	65.0	3.0	15.0	2.2	218	6.0	7.00	9.0	-81.8
Sweden	KFJ04	317	319.7	19/07/82	38.0	2.7	28.0	3.9	196	9.0	7.00	21.0	-82.6
Sweden	KFJ04	410	412.7	02/08/82	54.0	2.4	17.0	2.3	195	5.0	3.60	12.0	-81.6
Sweden	KFJ04	496	498.7	30/08/82	62.0	2.0	14.0	2.0	198	8.0	3.90	6.0	-84.7
Sweden	KFJ07	432	434.7	18/04/83	55.0	3.8	11.0	2.1	160	4.0	0.50	<3.0	-80.4
Sweden	KFJ07	432	434.7	21/04/83	48.0	3.9	11.0	2.1	160	3.0	0.50	<3.0	-80.3
Sweden	KFJ07	432	434.7	28/04/83	37.0	3.3	11.0	2.0	160	1.0	0.50	<3.0	-80.7
Sweden	KFJ07	432	434.7	05/05/83	37.0	3.1	11.0	2.0	160	3.0	1.10	<3.0	-80.2
Sweden	KFJ07	432	434.7	17/05/83	47.0	3.1	11.0	2.1	150	1.0	0.50	<3.0	-80.1

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Sweden	KFJ07	542	544.7	07/03/83	46.0	3.6	10.0	2.0	150	3.0	0.50	3.0	-81.4
Sweden	KFJ07	542	544.7	10/03/83	53.0	3.6	11.0	2.1	150	3.0	0.80	3.0	-81.2
Sweden	KFJ07	721	760	30/06/83	54.0	3.2	11.0	2.1	160	4.0	0.50	<3.0	-80.3
Sweden	KFJ07	721	760	07/07/83	52.0	3.0	11.0	2.0	190	4.0	0.50	<3.0	-80.6
Sweden	KFJ08	470	472.7	27/09/82	13.0	3.2	25.0	4.6	130	4.0	6.50	8.0	-79.3
Sweden	KFJ08	666	668.7	11/10/82	14.0	2.9	26.0	4.0	130	4.0	5.00	10.0	-77.8
Sweden	KFR01	44.5	62.3	15/04/86	1900.0	8.6	940.0	170.0	69	4100.0	300.00	<3.0	-88.1
Sweden	KFR01	44.5	62.3	15/05/86	1700.0	9.3	1200.0	180.0	71	4400.0	300.00	<3.0	-86.4
Sweden	KFR01	44.5	62.3	15/08/86	1700.0	8.8	1200.0	210.0	73	4100.0	340.00	<3.0	-88.3
Sweden	KFR01	44.5	62.3	17/09/86	800.0	9.7	490.0	65.0	74	4300.0	320.00	<3.0	-86.0
Sweden	KFR01	44.5	62.3	16/10/86	1500.0	16.0	1600.0	170.0	77	4200.0	490.00	<3.0	-88.2
Sweden	KFR01	44.5	62.3	16/02/87	1500.0	7.1	970.0	160.0	83	4200.0	350.00	<3.0	-88.0
Sweden	KFR10	87	108	18/03/86	1200.0	20.0	1650.0	400.0	80	5100.0	450.00	<3.0	-62.8
Sweden	KFR10	87	108	15/04/86	1800.0	19.0	1000.0	270.0	90	5400.0	400.00	<3.0	-63.0
Sweden	KFR10	87	108	15/05/86	1800.0	20.0	1500.0	250.0	88	5000.0	400.00	<3.0	-62.9
Sweden	KFR10	87	108	17/06/86	2000.0	21.0	1200.0	340.0	89	5100.0	440.00	<3.0	-66.1
Sweden	KFR10	87	108	15/08/86	1800.0	18.0	970.0	260.0	92	5000.0	430.00	<3.0	-69.0
Sweden	KFR10	87	108	15/10/86	1600.0	19.0	1400.0	250.0	98	5200.0	670.00	<3.0	-67.2
Sweden	KFR10	87	108	07/01/87	1500.0	16.0	1100.0	270.0	105	5000.0	450.00	3.0	-67.3
Sweden	KFR7A	48	74.7	18/03/86	1800.0	21.0	1250.0	330.0	87	5000.0	440.00	3.0	-67.0
Sweden	KFR7A	48	74.7	15/04/86	2300.0	20.0	930.0	260.0	94	4900.0	440.00	3.1	-65.5
Sweden	KFR7A	48	74.7	15/05/86	1900.0	20.0	1200.0	320.0	98	5000.0	420.00	3.0	-65.6
Sweden	KFR7A	48	74.7	17/06/86	2100.0	19.0	880.0	280.0	92	4900.0	480.00	3.1	-67.7
Sweden	KFR7A	48	74.7	15/08/86	2600.0	20.0	1200.0	340.0	98	5200.0	430.00	2.9	-69.1
Sweden	KFR7A	48	74.7	17/09/86	1100.0	44.0	760.0	180.0	96	5000.0	480.00	3.0	-69.6
Sweden	KFR7A	48	74.7	15/10/86	2500.0	28.0	1500.0	280.0	120	5000.0	670.00	3.0	-70.2
Sweden	KFR7A	48	74.7	10/03/87	1800.0	15.0	970.0	250.0	110	5000.0	460.00	3.0	-70.0
Sweden	KKA03	232	234.7	31/10/79	17.0	2.9	130.0	12.0	272	19.0	170.00	103.0	-59.6
Sweden	KKA03	232	234.7	28/11/79	19.0	2.8	129.0	7.5	271	21.0	160.00	99.0	-59.6
Sweden	KKA03	232	234.7	14/12/79	17.0	2.7	127.0	9.5	265	20.0	160.00	77.0	-59.0
Sweden	KKA04	226	228.7	18/03/80	53.0	3.1	75.0	18.0	293	37.0	118.00	58.0	-69.0
Sweden	KKA04	312	314.7	23/01/80	55.0	3.3	86.0	17.0	295	38.0	110.00	41.0	-67.6
Sweden	KKA04	312	314.7	30/01/80	55.0	3.2	85.0	15.0	290	37.0	110.00	48.0	-71.0
Sweden	KKA04	312	314.7	06/02/80	54.0	3.2	85.0	15.0	296	36.0	110.00	60.0	-71.0

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Sweden	KKA04	312	314.7	13/02/80	53.0	3.2	85.0	16.0	293	36.0	110.00	61.0	-70.0
Sweden	KKA04	397	399.7	20/02/80	57.0	3.3	78.0	17.0	295	37.0	110.00	60.0	-71.0
Sweden	KKA04	397	399.7	27/02/80	58.0	3.2	80.0	17.0	295	41.0	112.00	59.0	-71.0
Sweden	KKA04	397	399.7	05/03/80	58.0	3.2	80.0	17.0	295	41.0	112.00	58.0	-71.0
Sweden	KKA04	397	399.7	12/03/80	58.0	3.2	80.0	17.0	295	41.0	112.00	60.0	-71.0
Sweden	HKM20	146	182	12/04/83	8.7	1.6	11.0	2.4	59	11.0	2.00	28.0	-99.1
Sweden	HKM20	146	182	26/04/83	8.1	1.7	11.0	2.6	81	9.0	3.00	22.0	-99.8
Sweden	KKM03	123	125.7	24/01/83	5.7	1.2	13.0	2.8	65	2.5	4.00	49.0	-99.3
Sweden	KKM03	123	125.7	07/02/83	6.1	1.3	13.0	2.7	65	2.5	4.00	39.0	-100.1
Sweden	KKM03	445	447.7	20/12/82	4.8	1.8	13.0	3.1	62	3.0	6.00	56.0	-100.2
Sweden	KKM03	445	447.7	10/01/83	5.0	1.8	13.0	3.2	66	2.5	6.00	56.0	-100.1
Sweden	KKM08	238	240.7	06/06/83	0.8	0.2	2.0	0.6	8	0.5	5.00	30.0	-106.6
Sweden	KKM13	230	232.7	20/06/83	18.0	1.6	106.0	0.6	13	6.0	240.00	9.0	-99.8
Sweden	KKM13	514	516.7	09/05/83	19.0	5.8	145.0	3.9	23	11.0	300.00	28.0	-97.9
Sweden	KKM13	670	672.7	28/03/83	1.9	1.0	5.4	0.8	31	2.0	7.00	37.0	-98.9
Sweden	KKM13	670	672.7	12/04/83	1.4	0.8	3.5	0.7	8	5.0	5.00	39.0	-109.2
Sweden	KKM13	680	703	06/06/83	1.0	0.7	3.0	0.5	9	0.5	6.00	25.0	-110.3
Sweden	KKL01	406	563.95	27/06/85	48.0	0.9	14.4	2.3	80	48.0	1.30	6.5	-85.2
Sweden	KKL02	326	331	06/12/84	27.0	1.1	30.0	1.0	134	18.0	0.10	3.0	-88.8
Sweden	KKL02	741	746	06/11/84	41.0	1.5	16.0	1.0	99	25.0	0.11	13.0	-80.5
Sweden	KKL09	696	701	03/09/85	16.0	1.0	30.0	2.0	121	5.5	4.00	2.1	-85.4
Sweden	KKR01	103	105.7	28/08/78	39.0	3.2	40.0	8.0	223	15.0	4.20	<3.0	-78.0
Sweden	KKR01	103	105.7	08/09/78	40.0	3.1	40.0	8.0	224	15.0	4.20	<3.0	-78.0
Sweden	KKR01	103	105.7	19/09/78	39.0	3.2	40.0	8.0	224	15.0	3.60	<3.0	-78.0
Sweden	KKR01	103	105.7	25/09/78	40.0	3.1	40.0	9.0	224	15.0	3.60	<3.0	-78.0
Sweden	KKR01	264	266.7	30/07/78	57.0	3.3	30.0	8.0	231	25.0	2.70	<3.0	-77.0
Sweden	KKR01	264	266.7	09/08/78	57.0	3.1	28.0	8.5	231	25.0	2.70	<3.0	-77.0
Sweden	KKR01	264	266.7	15/08/78	58.0	3.1	27.0	9.0	231	25.0	3.60	<3.0	-77.0
Sweden	KKR01	264	266.7	24/08/78	57.0	3.3	28.0	9.5	227	23.0	1.50	<3.0	-77.0
Sweden	KKR01	406	408.7	30/05/78	235.0	3.2	25.0	8.5	210	260.0	36.00	<3.0	-79.0
Sweden	KKR01	406	408.7	06/06/78	250.0	3.3	29.0	8.5	215	280.0	40.00	<3.0	-79.0
Sweden	KKR01	406	408.7	13/06/78	250.0	3.3	29.0	8.0	215	280.0	39.00	<3.0	-79.0
Sweden	KKR01	406	408.7	22/06/78	250.0	3.2	29.0	7.5	215	280.0	38.00	<3.0	-79.0
Sweden	KKR01	491	493.7	03/07/78	80.0	3.7	22.0	6.5	222	44.0	9.60	<3.0	-83.0

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Sweden	KKR01	491	493.7	12/07/78	80.0	3.3	22.0	7.0	222	44.0	7.20	<3.0	-83.0
Sweden	KKR01	491	493.7	16/07/78	82.0	3.4	22.0	6.5	223	45.0	8.10	<3.0	-83.0
Sweden	KKR01	491	493.7	25/07/78	82.0	3.5	21.0	7.0	222	47.0	8.10	<3.0	-83.0
Sweden	KLJ01	237	500.6	10/03/88	11.3	1.5	7.7	1.2	44	0.8	4.40	8.0	-109.3
Sweden	KSV04	96	98.7	12/04/82	24.0	1.7	25.0	3.2	138	2.3	1.90	5.0	-90.0
Sweden	KSV04	376	378.7	26/04/82	40.0	0.8	13.0	1.7	127	9.0	0.80	<3.0	-95.3
Sweden	KSV04	430	432.7	10/05/82	35.0	0.9	17.0	2.0	130	8.0	1.20	<3.0	-95.0
Sweden	KSV04	630	632.7	24/05/82	35.0	0.7	17.0	1.9	126	7.0	0.80	<3.0	-95.4
Sweden	KSV05	160	162.7	12/10/82	20.0	1.1	19.0	1.2	114	2.4	3.00	33.0	-92.2
Sweden	KSV05	357	359.7	01/11/82	3.0	0.6	8.0	1.9	28	7.0	4.70	36.0	-90.8
Sweden	KSV05	615	617.7	22/11/82	3.0	0.6	8.0	1.3	50	7.0	4.80	37.0	-86.8
Sweden	KSV05	719	721.7	13/12/82	3.0	0.5	9.0	1.6	47	10.0	5.50	36.0	-86.0
Sweden	KTA01	496	498.7	05/09/83	3.9	1.0	6.2	1.4	32	2.0	6.90	145.0	-97.4
Sweden	KTA01	496	498.7	15/09/83	4.5	1.0	6.7	1.4	33	1.0	7.60	120.0	-101.2
Sweden	KTA01	496	498.7	19/09/83	3.9	0.9	6.7	1.4	32	1.0	6.20	123.0	-97.6
Sweden	KTA01	496	498.7	26/09/83	3.7	0.9	5.4	1.4	26	1.0	4.80	123.0	-98.7
Sweden	KTA01	496	498.7	27/09/83	3.7	1.0	5.3	1.4	30	1.0	5.20	160.0	-97.8
Sweden	KTA01	496	498.7	28/09/83	4.3	1.0	5.3	1.4	28	1.0	5.30	162.0	-97.5
Sweden	KTA01	496	498.7	29/09/83	4.5	1.0	5.6	1.4	31	1.0	5.30	121.0	-98.5
Sweden	KTA01	496	498.7	30/09/83	4.0	1.0	6.2	1.4	32	1.0	6.30	155.0	-98.7
Sweden	KTA01	496	498.7	01/10/83	4.3	1.0	6.4	1.3	32	1.0	6.40	99.0	-97.9
Sweden	KTA01	496	498.7	02/10/83	4.1	0.9	6.5	1.4	32	1.0	6.50	121.0	-98.6
Sweden	KTA01	496	498.7	03/10/83	4.1	0.9	6.4	1.4	31	1.0	7.00	158.0	-98.6
Sweden	KTA01	496	498.7	04/10/83	4.0	0.9	5.9	1.3	31	1.0	6.70	153.0	-98.0
Sweden	KTA01	654	700	08/08/83	4.8	1.3	7.9	1.1	25	1.0	5.80	129.0	-97.4
Sweden	KTA01	654	700	22/08/83	4.5	1.3	6.9	1.2	30	1.0	5.80	115.0	-97.1
Sweden	Rain old				0.4	0.3	0.2	0.1	12	0.2	1.41	0.0	-88.0
Sweden	Rain				0.4	0.3	0.2	0.1	12	0.2	1.41	22.0	-88.0
Sweden	Rain'60				0.4	0.3	0.2	0.1	12	0.2	1.41	2008.0	-88.0
Sweden	Glacial				0.2	0.4	0.2	0.1	0	0.5	0.50	0.0	-158.0
Sweden	1569_1				1190.0	5.8	297.0	37.1	112	2318.0	62.62	0.1	-125.7
Sweden	1569_2				110.0	1.8	33.8	3.5	12	219.0	10.40	0.1	-120.6
Sweden	PROV 1b			31/08/96	0.1	0.4	0.1	0.1	0	0.5	0.30	0.0	-102.0
Sweden	PROV 2b			31/08/96	0.2	0.4	0.2	0.1	0	0.5	0.50	0.0	-116.4

SITE	IDCODE	SECUP	SECLOW	DATE	NA	K	CA	MG	HCO3	CL	SO4	H3	H2
Sweden	PROV 3b			31/08/96	0.1	0.4	0.1	0.1	0	0.5	0.30	0.0	-99.6
Sweden	PROV 4b			01/09/96	0.1	0.4	0.2	0.1	0	0.5	0.56	0.0	-115.6
Sweden	PROV 5b			01/09/96	0.3	0.3	0.5	0.1	1	0.7	0.89	0.0	-110.8
Sweden	PROV 6b			01/09/96	713.2	26.3	26.3	85.6	11	1290.0	176.40	0.0	-102.8
Sweden	Litorina				3179.8	154.1	152.0	379.6	146	6100.0	527.26	0.0	-35.0
Sweden	PASSEA01			28/08/92	1960.0	95.0	93.7	234.0	90	3760.0	503.36	42.0	-53.3
Sweden	PASSEA01			17/05/93	1380.0	58.0	67.7	168.0	61	2670.0	383.51	26.0	-54.6
Sweden	PASSEA01			08/07/93	1810.0	69.0	88.8	215.0	84	3380.0	501.00	36.0	-50.7
Sweden	PASSEA02			17/05/93	1640.0	66.0	76.1	197.0	73	3160.0	434.45	38.0	-54.5
Sweden	PASSEA02			08/07/93	1810.0	69.0	88.0	212.0	83	3320.0	461.41	33.0	-50.8
Sweden	PASSEA03			17/05/93	1820.0	75.0	82.6	223.0	80	3540.0	491.38	29.0	-54.8
Sweden	PASSEA03			08/07/93	1920.0	64.0	91.0	227.0	84	3620.0	514.00	36.0	-52.3
Sweden	PASSEA04			18/05/93	2050.0	83.0	93.0	251.0	94	4030.0	548.30	40.0	-53.0
Sweden	PASSEA04			08/07/93	1990.0	66.0	94.0	234.0	89	3680.0	535.00	58.0	-53.6
Sweden	PASSEA05			18/05/93	2030.0	81.0	91.8	246.0	91	4100.0	536.32	30.0	-54.8
Sweden	PASSEA05			08/07/93	1935.0	73.0	90.0	231.0	84	3610.0	516.00	34.0	-54.1

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	HA0982B	0	2.5	05/09/94	-7.4	0.12	0.26	0.36	0.21	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	HA1327B	3.5	29.5	02/12/92	-7.5	0.13	0.26	0.36	0.20	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	HA1327B	3.5	29.5	07/02/93	-7.6	0.13	0.27	0.36	0.20	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	HA1327B	3.5	29.5	29/09/93	-7.4	0.12	0.26	0.36	0.21	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	HA1327B	3.5	29.5	14/12/93	-7.5	0.12	0.25	0.37	0.21	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	HA1749A	5.8	25	25/03/93	-10.9	0.22	0.30	0.25	0.16	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	HAS02	44	93	01/08/87	-7.5	0.12	0.23	0.36	0.23	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	HAS02	44	93	02/08/87	-7.8	0.12	0.23	0.36	0.23	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	HAS03	48	100	04/08/87	-10.8	0.14	0.41	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HAS03	48	100	05/08/87	-10.9	0.15	0.42	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HAS05	45	100	06/08/87	-9.8	0.04	0.51	0.39	0.05	0.01	Na-Ca-K	HCO3-Cl-SO4
Aberg	HAS05	45	100	07/08/87	-9.9	0.06	0.51	0.35	0.06	0.01	Na-Ca-K	HCO3-Cl-SO4
Aberg	HAS06	40	100	07/08/87	-10.2	0.11	0.48	0.29	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HAS06	40	100	08/08/87	-9.4	0.18	0.32	0.30	0.16	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	HAS07	71	100	02/08/87	-11.2	0.22	0.36	0.24	0.12	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	HAS07	71	100	03/08/87	-11.4	0.23	0.37	0.24	0.12	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	HAS13	0	100	03/07/89	-7.2	0.14	0.23	0.34	0.23	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	HBH01	31	50.6	28/11/91	-8.8	0.09	0.48	0.32	0.09	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH01	31	50.6	28/02/92	-10.0	0.16	0.39	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	23/04/92	-10.1	0.15	0.40	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	21/05/92	-10.3	0.15	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	26/06/92	-10.7	0.16	0.42	0.27	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	06/08/92	-10.3	0.15	0.43	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	04/09/92	-10.2	0.14	0.42	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	01/10/92	-9.7	0.13	0.42	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	28/10/92	-9.8	0.13	0.43	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	25/11/92	-9.6	0.12	0.43	0.30	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	02/12/92	-9.7	0.12	0.43	0.31	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	07/02/93	-9.7	0.12	0.43	0.31	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	11/03/93	-9.9	0.11	0.44	0.31	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	28/03/93	-10.0	0.11	0.43	0.32	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	16/05/93	-9.9	0.11	0.45	0.32	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	12/06/93	-9.9	0.11	0.46	0.30	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	06/07/93	-9.8	0.10	0.45	0.33	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	HBH01	31	50.6	16/08/93	-9.7	0.09	0.46	0.33	0.09	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	07/09/93	-9.5	0.10	0.45	0.33	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	21/09/93	-9.5	0.08	0.44	0.38	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	12/11/93	-9.5	0.08	0.46	0.36	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	11/08/94	-9.8	0.08	0.48	0.35	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH01	31	50.6	05/09/94	-9.8	0.08	0.48	0.35	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	HBH02	0		11/09/91	-10.2	0.15	0.47	0.24	0.10	0.03	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	29/11/91	-9.7	0.11	0.50	0.27	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	28/02/92	-10.0	0.11	0.49	0.26	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	04/09/92	-8.5	0.11	0.45	0.30	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	28/10/92	-7.9	0.10	0.46	0.33	0.10	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	26/11/92	-8.9	0.12	0.47	0.27	0.12	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	02/12/92	-8.0	0.11	0.46	0.31	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	07/02/93	-9.1	0.12	0.46	0.28	0.12	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	17/03/93	-9.9	0.12	0.46	0.27	0.12	0.03	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	28/03/93	-9.5	0.12	0.46	0.28	0.12	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	12/06/93	-9.4	0.13	0.47	0.26	0.11	0.03	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	06/07/93	-9.2	0.12	0.47	0.28	0.12	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	16/08/93	-8.6	0.11	0.46	0.30	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	07/09/93	-8.5	0.10	0.46	0.30	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	21	32.4	12/11/93	-9.1	0.12	0.46	0.28	0.12	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH02	0		12/09/91	-9.7	0.12	0.49	0.26	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH05	11	22	28/10/92	-9.6	0.11	0.49	0.26	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH05	11	22	25/11/92	-9.5	0.11	0.50	0.26	0.11	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH05	11	22	12/06/93	-9.9	0.10	0.49	0.29	0.10	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	HBH05	11	22	06/07/93	-8.8	0.07	0.49	0.35	0.07	0.01	Ca-Na-K	HCO3-Cl-SO4
Aberg	HBH05	11	22	12/11/93	-9.4	0.09	0.49	0.33	0.09	0.02	Ca-Na-K	HCO3-SO4-Cl
Aberg	KA0483A	40	90	12/03/91	-11.3	0.24	0.31	0.22	0.15	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1639A	13.4	14.4	01/07/93	-12.1	0.27	0.31	0.16	0.14	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1639A	13.4	14.4	10/08/93	-12.1	0.27	0.32	0.16	0.13	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1639A	13.4	14.4	27/09/93	-12.4	0.27	0.32	0.16	0.13	0.13	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1639A	13.4	14.4	29/09/93	-12.4	0.27	0.31	0.16	0.13	0.13	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1639A	15.4	25.9	01/07/93	-14.6	0.36	0.30	0.14	0.12	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1639A	15.4	25.9	10/08/93	-14.7	0.37	0.29	0.14	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	KA1639A	15.4	25.9	27/09/93	-14.2	0.35	0.30	0.15	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1750A	4.4	5.4	01/07/93	-11.5	0.26	0.31	0.17	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1750A	4.4	5.4	10/08/93	-11.4	0.26	0.30	0.18	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1750A	4.4	5.4	27/09/93	-11.6	0.26	0.30	0.18	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1750A	4.4	5.4	29/09/93	-11.4	0.26	0.30	0.18	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA1755A	88		12/10/95	-13.1	0.30	0.27	0.13	0.11	0.19	Ca-Na-K	Cl-SO4-HCO3
Aberg	KA2162B	0	76.71	15/03/93	-8.7	0.19	0.24	0.28	0.22	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA2162B	0	122.77	17/03/93	-8.9	0.19	0.24	0.27	0.21	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA2162B	0	179.96	21/03/93	-9.6	0.22	0.26	0.24	0.20	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA2512A	0	37.27	13/12/94	-8.1	0.17	0.27	0.30	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA2858A	39.77	40.77	10/03/95	-13.1	0.31	0.27	0.13	0.11	0.18	Ca-Na-K	Cl-SO4-HCO3
Aberg	KA2862A	0	15.98	27/01/95	-12.7	0.29	0.26	0.12	0.10	0.23	Ca-Na-K	Cl-SO4-HCO3
Aberg	KA2862A	15.02	15.98	10/03/95	-12.5	0.28	0.26	0.13	0.10	0.22	Ca-Na-K	Cl-SO4-HCO3
Aberg	KA3005A	0	58.11	07/12/94	-9.7	0.23	0.28	0.23	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3005A	36.93	37.93	10/03/95	-10.0	0.24	0.28	0.21	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3005A	44.78	45.78	11/04/96	-10.0	0.23	0.28	0.23	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3010A	0	60.66	14/12/94	-10.5	0.24	0.28	0.21	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3010A	8.56	15.06	10/03/95	-11.3	0.25	0.30	0.19	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3067A	0	40.05	14/12/94	-10.6	0.25	0.29	0.21	0.17	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3067A	6.55	27.05	10/04/96	-13.0	0.29	0.30	0.14	0.12	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	KA3067A	28.05	29.55	10/03/95	-11.7	0.27	0.31	0.17	0.14	0.11	Ca-Na-K	Cl-SO4-HCO3
Aberg	KA3105A	0	68.95	16/12/94	-9.4	0.20	0.30	0.26	0.17	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3105A	22.51	24.51	10/03/95	-8.7	0.19	0.30	0.28	0.17	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3110A	0	26.83	18/12/94	-7.7	0.14	0.25	0.34	0.21	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3110A	20.05	28.63	10/03/95	-9.2	0.17	0.27	0.30	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3191F	165	180	03/06/94	-10.4	0.24	0.28	0.21	0.17	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3191F	193.9	208.9	04/06/94	-11.2	0.25	0.29	0.18	0.15	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3385A	0	34.18	11/01/95	-10.4	0.25	0.29	0.19	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KA3385A	32.05	34.18	10/03/95	-10.5	0.25	0.29	0.19	0.16	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS02	202	214.5	11/01/89	-13.9	0.32	0.33	0.16	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS02	308	344	27/09/88	-12.7	0.28	0.33	0.16	0.13	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS02	309	345	19/08/92	-13.3	0.27	0.35	0.18	0.12	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS02	314	319	11/04/88	-12.3	0.28	0.33	0.16	0.13	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS02	463	468	25/04/88	-12.8	0.29	0.32	0.15	0.13	0.11	Na-Ca-K	Cl-SO4-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	**KAS02**	**530**	**535**	**04/05/88**	**-12.3**	**0.29**	**0.31**	**0.15**	**0.12**	**0.14**	**Na-Ca-K**	**Cl-SO4-HCO3**
Aberg	KAS02	800	854	19/08/92	-13.6	0.33	0.25	0.12	0.10	0.20	Ca-Na-K	Cl-SO4-HCO3
Aberg	KAS02	802	924.04	20/09/88	-13.0	0.32	0.26	0.13	0.10	0.19	Ca-Na-K	Cl-SO4-HCO3
Aberg	KAS02	860	924.04	31/01/89	-13.1	0.32	0.26	0.12	0.10	0.19	Ca-Na-K	Cl-SO4-HCO3
Aberg	KAS03	129	134	21/02/89	-15.8	0.43	0.30	0.15	0.07	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS03	196	222	10/08/88	-14.6	0.35	0.32	0.15	0.10	0.07	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS03	248	251	28/08/88	-14.5	0.36	0.32	0.15	0.11	0.07	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS03	347	373	16/08/88	-13.3	0.33	0.30	0.14	0.12	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	453	480	22/08/88	-13.6	0.34	0.30	0.14	0.12	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	533	626	19/08/92	-14.9	0.38	0.29	0.14	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	533	626	07/02/93	-14.6	0.36	0.30	0.14	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	533	626	16/05/93	-14.4	0.35	0.30	0.14	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	533	626	16/08/93	-13.9	0.34	0.30	0.14	0.12	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	533	626	07/09/93	-14.3	0.35	0.30	0.14	0.12	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	533	626	12/04/94	-13.6	0.33	0.31	0.15	0.12	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	609	623	03/09/88	-13.3	0.33	0.29	0.14	0.11	0.13	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS03	690	1002.06	08/09/88	-13.0	0.32	0.27	0.13	0.11	0.17	Ca-Na-K	Cl-SO4-HCO3
Aberg	KAS03	860	1002.06	15/03/89	-12.7	0.31	0.25	0.12	0.10	0.22	Ca-Na-K	Cl-SO4-HCO3
Aberg	KAS04	226	235	17/04/89	-11.0	0.19	0.42	0.24	0.11	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS04	332	392	31/08/92	-13.6	0.31	0.34	0.16	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS04	334	343	27/04/89	-13.0	0.29	0.34	0.16	0.12	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS04	440	480.98	03/04/89	-11.9	0.27	0.32	0.16	0.14	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS05	320	380	01/09/92	-13.3	0.29	0.34	0.16	0.13	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS05	440	549.6	01/09/92	-12.9	0.30	0.30	0.14	0.12	0.15	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS05	440	549.6	12/04/94	-13.0	0.31	0.29	0.14	0.11	0.16	Ca-Na-K	Cl-SO4-HCO3
Aberg	KAS06	191	249	19/08/92	-12.0	0.25	0.37	0.21	0.11	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS06	204	277	31/05/89	-10.9	0.25	0.33	0.21	0.14	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS06	304	377	07/06/89	-9.2	0.23	0.27	0.23	0.19	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS06	389	406	14/06/89	-7.4	0.20	0.24	0.27	0.22	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS06	431	500	19/08/92	-9.2	0.23	0.26	0.23	0.19	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS06	439	602.17	21/06/89	-8.2	0.21	0.24	0.25	0.20	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS07	191	290	31/08/92	-11.2	0.23	0.35	0.23	0.13	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS07	191	290	06/09/93	-8.1	0.17	0.27	0.31	0.19	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS07	191	290	06/04/94	-8.0	0.13	0.29	0.40	0.15	0.03	Na-Ca-K	Cl-HCO3-SO4

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	KAS07	501	604	31/08/92	-12.1	0.27	0.32	0.16	0.13	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS07	501	604	06/09/93	-11.3	0.26	0.30	0.18	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS07	501	604	06/09/94	-11.2	0.25	0.30	0.19	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS08	140	200	31/08/92	-11.5	0.19	0.44	0.23	0.10	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS08	503	601	31/08/92	-10.8	0.25	0.30	0.19	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS08	503	601	06/04/94	-9.2	0.22	0.25	0.24	0.20	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS09	116	150	01/09/92	-7.4	0.10	0.22	0.45	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS09	116	150	19/05/93	-7.1	0.10	0.23	0.39	0.24	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS09	116	150	06/09/93	-6.7	0.10	0.22	0.39	0.24	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS09	116	150	06/04/94	-7.1	0.12	0.23	0.37	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS09	116	150	06/09/94	-6.9	0.10	0.23	0.39	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS09	116		12/10/95	-7.0	0.11	0.25	0.37	0.22	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS12	234	277	01/09/92	-11.4	0.25	0.32	0.21	0.15	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS12	234	277	19/05/93	-11.2	0.24	0.32	0.22	0.15	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS12	234	277	07/09/93	-10.5	0.24	0.29	0.22	0.17	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS13	151	190	01/09/92	-11.1	0.14	0.47	0.25	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAS13	191	220	01/09/92	-11.9	0.24	0.36	0.23	0.12	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS14	131	138	07/04/94	-6.8	0.09	0.20	0.45	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAS14	147	175	07/04/94	-7.1	0.09	0.21	0.42	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KBH02	240.25	372.85	25/08/93	-7.2	0.11	0.24	0.41	0.20	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KBH02	240.25	372.85	29/09/93	-7.3	0.10	0.23	0.43	0.20	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KBH02	240.25	372.85	14/12/93	-7.3	0.10	0.23	0.42	0.20	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	07/05/91	-11.4	0.17	0.45	0.24	0.10	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	19/06/91	-11.5	0.19	0.44	0.24	0.10	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	08/04/92	-10.2	0.17	0.39	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	22/04/92	-10.2	0.17	0.39	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	06/05/92	-9.9	0.16	0.40	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	20/05/92	-10.3	0.16	0.40	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	03/06/92	-11.0	0.17	0.40	0.27	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	26/06/92	-10.2	0.16	0.40	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	08/07/92	-10.3	0.16	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	21/07/92	-10.4	0.16	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	06/08/92	-10.4	0.16	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	18/08/92	-10.4	0.16	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	KR0012B	5	10.57	03/09/92	-10.3	0.15	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	17/09/92	-9.8	0.14	0.42	0.29	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	30/09/92	-9.9	0.15	0.41	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	12/10/92	-9.8	0.14	0.42	0.29	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	28/10/92	-9.9	0.15	0.41	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	10/11/92	-9.7	0.13	0.43	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	24/11/92	-9.8	0.13	0.43	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	02/12/92	-9.8	0.13	0.42	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	10/12/92	-9.1	0.12	0.41	0.33	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	21/12/92	-9.7	0.12	0.43	0.31	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	04/01/93	-9.8	0.12	0.43	0.31	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	19/01/93	-9.8	0.12	0.42	0.30	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	07/02/93	-9.8	0.12	0.43	0.31	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	17/03/93	-9.9	0.11	0.43	0.33	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	24/03/93	-9.7	0.11	0.43	0.33	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	16/05/93	-9.9	0.11	0.43	0.32	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	11/06/93	-9.9	0.12	0.44	0.30	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	05/07/93	-9.9	0.11	0.45	0.31	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	16/08/93	-9.6	0.11	0.44	0.32	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	08/11/93	-9.6	0.09	0.44	0.35	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	10/08/94	-9.8	0.09	0.46	0.35	0.09	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5	10.57	05/09/94	-9.6	0.08	0.46	0.36	0.09	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5		18/05/95	-9.4	0.10	0.44	0.35	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0012B	5		10/10/95	-9.5	0.09	0.44	0.35	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	01/05/91	-11.4	0.24	0.37	0.23	0.11	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	08/04/92	-10.3	0.19	0.35	0.28	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	22/04/92	-10.4	0.19	0.35	0.28	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	06/05/92	-10.1	0.19	0.35	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	20/05/92	-10.1	0.18	0.35	0.29	0.14	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	03/06/92	-10.5	0.19	0.35	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	26/06/92	-10.4	0.19	0.36	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	08/07/92	-10.4	0.19	0.36	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	21/07/92	-10.3	0.19	0.36	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	06/08/92	-10.3	0.18	0.36	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	KR0013B	7.05	16.94	18/08/92	-10.3	0.18	0.36	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	03/09/92	-10.4	0.18	0.37	0.29	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	17/09/92	-9.9	0.17	0.37	0.30	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	30/09/92	-10.0	0.17	0.37	0.30	0.13	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	12/10/92	-9.9	0.17	0.38	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	28/10/92	-9.9	0.17	0.38	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	10/11/92	-9.8	0.16	0.38	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	24/11/92	-9.7	0.16	0.39	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	02/12/92	-9.9	0.16	0.37	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	10/12/92	-9.9	0.15	0.38	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	21/12/92	-9.9	0.15	0.38	0.31	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	04/01/93	-9.9	0.14	0.39	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	19/01/93	-9.9	0.15	0.39	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	07/02/93	-9.9	0.14	0.39	0.31	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	17/03/93	-10.0	0.13	0.39	0.31	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	24/03/93	-9.9	0.14	0.38	0.32	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	16/05/93	-9.9	0.14	0.39	0.31	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	11/06/93	-10.0	0.15	0.38	0.30	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	05/07/93	-9.8	0.14	0.38	0.31	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	16/08/93	-9.7	0.16	0.37	0.31	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	08/11/93	-9.8	0.16	0.36	0.32	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	10/08/94	-9.7	0.15	0.37	0.32	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05	16.94	05/09/94	-9.4	0.14	0.37	0.32	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05		18/05/95	-9.3	0.14	0.37	0.32	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0013B	7.05		10/10/95	-9.5	0.13	0.40	0.31	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	07/05/91	-11.6	0.23	0.35	0.23	0.13	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	08/04/92	-10.7	0.14	0.44	0.27	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	22/04/92	-10.6	0.16	0.40	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	06/05/92	-10.4	0.15	0.41	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	20/05/92	-10.5	0.13	0.45	0.27	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	03/06/92	-10.5	0.12	0.45	0.28	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	26/06/92	-10.6	0.13	0.44	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	08/07/92	-10.7	0.13	0.44	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	21/07/92	-10.8	0.14	0.42	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	KR0015B	19.82	30.31	06/08/92	-10.9	0.13	0.44	0.27	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	18/08/92	-10.6	0.13	0.44	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	03/09/92	-10.7	0.13	0.45	0.28	0.12	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	17/09/92	-10.2	0.13	0.43	0.29	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	30/09/92	-10.2	0.12	0.45	0.29	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	12/10/92	-7.9	0.05	0.42	0.47	0.05	0.01	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	28/10/92	-10.1	0.11	0.47	0.30	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	10/11/92	-10.3	0.11	0.46	0.30	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	24/11/92	-10.7	0.11	0.47	0.29	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	02/12/92	-10.1	0.12	0.43	0.31	0.12	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	10/12/92	-10.1	0.10	0.46	0.33	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	21/12/92	-10.1	0.10	0.45	0.33	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	04/01/93	-10.1	0.09	0.46	0.33	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	19/01/93	-10.2	0.09	0.47	0.33	0.09	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	07/02/93	-10.1	0.07	0.48	0.38	0.07	0.01	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	17/03/93	-10.1	0.07	0.48	0.36	0.07	0.01	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	25/03/93	-10.2	0.08	0.47	0.36	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	16/05/93	-9.9	0.06	0.50	0.38	0.06	0.01	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	11/06/93	-10.1	0.09	0.47	0.33	0.09	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	05/07/93	-10.1	0.07	0.49	0.35	0.07	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	08/11/93	-9.8	0.10	0.43	0.35	0.10	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	10/08/94	-9.8	0.08	0.46	0.37	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82	30.31	05/09/94	-9.7	0.02	0.53	0.44	0.02	0.00	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82		18/05/95	-9.6	0.11	0.42	0.34	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KR0015B	19.82		10/10/95	-9.7	0.11	0.44	0.32	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	KXTT1	15	16	10/04/96	-10.2	0.23	0.28	0.22	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KXTT2	11.55	13.55	11/04/96	-9.3	0.20	0.28	0.26	0.18	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KXTT2	14.55	15.55	12/04/96	-10.2	0.24	0.28	0.22	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KXTT3	8.92	11.42	11/04/96	-9.3	0.21	0.29	0.26	0.18	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	KXTT3	12.42	14.42	10/04/96	-10.2	0.24	0.28	0.22	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KXTT4	11.92	13.92	11/04/96	-10.1	0.23	0.28	0.22	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KXTT4	14.92	23.42	09/04/96	-9.9	0.23	0.28	0.23	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0158A	6	19.7	09/06/94	-8.8	0.14	0.31	0.35	0.17	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0205A	6	20	09/06/94	-7.6	0.14	0.26	0.34	0.21	0.05	Na-Ca-K	Cl-SO4-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	SA0237B	6	20	09/06/94	-8.2	0.16	0.27	0.32	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0311A	5.7	19	09/06/94	-9.3	0.17	0.32	0.31	0.16	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0327B	5.7	19	09/06/94	-10.0	0.22	0.32	0.24	0.15	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0435A	6	22	08/06/94	-9.7	0.18	0.34	0.30	0.14	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0452A	5.5	19.6	08/06/94	-8.9	0.19	0.30	0.28	0.17	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0468A	6	19.8	08/06/94	-9.0	0.19	0.29	0.28	0.18	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0813B	5.6	19.5	02/12/92	-7.5	0.10	0.22	0.52	0.13	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0813B	5.6	19.5	07/02/93	-7.5	0.10	0.24	0.47	0.16	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0813B	5.6	19.5	07/09/93	-7.0	0.11	0.25	0.41	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0813B	5.6	19.5	29/09/93	-7.3	0.11	0.24	0.43	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0813B	5.6	19.5	07/06/94	-7.2	0.11	0.26	0.39	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0813B	5.6	19.5	05/09/94	-7.2	0.11	0.25	0.40	0.20	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0813B	5.6		17/05/95	-6.8	0.11	0.24	0.43	0.18	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0813B	5.6		12/10/95	-7.5	0.14	0.25	0.35	0.21	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0850B	1	19.8	20/08/91	-8.3	0.16	0.27	0.31	0.20	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0923A	6	20	02/12/92	-7.9	0.06	0.13	0.73	0.07	0.01	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0923A	6	20	07/02/93	-7.7	0.05	0.13	0.74	0.07	0.01	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0958B	5	19.7	23/06/93	-7.5	0.11	0.24	0.41	0.20	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0958B	5	19.7	26/08/93	-7.7	0.12	0.26	0.36	0.21	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0958B	5	19.7	28/09/93	-7.4	0.12	0.26	0.37	0.21	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA0958B	5	19.7	07/06/94	-7.2	0.12	0.26	0.37	0.21	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA0976B	1	10.5	15/10/91	-7.4	0.09	0.20	0.52	0.16	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1009B	6	19.5	28/06/93	-11.1	0.19	0.28	0.28	0.18	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1009B	6	19.5	25/08/93	-7.3	0.11	0.25	0.38	0.22	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1009B	6	19.5	28/09/93	-7.3	0.10	0.23	0.41	0.22	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1009B	6	19.5	08/06/94	-7.3	0.12	0.25	0.37	0.22	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1009B	6	19.5	05/09/94	-7.3	0.11	0.25	0.38	0.22	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1009B	6		17/05/95	-6.7	0.10	0.23	0.38	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1009B	6		12/10/95	-7.0	0.11	0.24	0.38	0.22	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1062B	6	20	23/04/92	-7.7	0.08	0.18	0.55	0.16	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1062B	6	20	02/12/92	-7.3	0.09	0.20	0.48	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1077A	6	20.4	23/04/92	-7.5	0.04	0.08	0.78	0.08	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1094A	4.5	20	23/04/92	-7.3	0.00	0.00	1.00	0.00	0.00	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1111B	6	19	23/04/92	-7.7	0.11	0.25	0.39	0.21	0.04	Na-Ca-K	Cl-HCO3-SO4

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Aberg	SA1210A	6	20.5	07/05/92	-7.4	0.07	0.16	0.61	0.14	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1210A	6	20.5	23/06/93	-6.9	0.09	0.21	0.43	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1210A	6	20.5	26/08/93	-6.9	0.09	0.21	0.42	0.23	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1210A	6	20.5	14/12/93	-6.6	0.08	0.19	0.43	0.25	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1210A	6	20.5	07/06/94	-6.9	0.10	0.23	0.40	0.22	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1229A	6	20.5	07/05/92	-8.1	0.11	0.24	0.44	0.17	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6	20.5	23/06/93	-7.3	0.10	0.23	0.46	0.18	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6	20.5	24/08/93	-7.4	0.10	0.23	0.44	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6	20.5	28/09/93	-6.6	0.08	0.19	0.50	0.18	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6	20.5	07/06/94	-7.0	0.10	0.22	0.44	0.20	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6	20.5	05/09/94	-7.1	0.10	0.22	0.45	0.20	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6	20.5	07/09/94	-7.1	0.10	0.22	0.45	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6		18/05/95	-6.5	0.09	0.20	0.48	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1229A	6		11/10/95	-7.3	0.10	0.24	0.42	0.19	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1327B	6	20.3	15/10/92	-7.4	0.14	0.28	0.34	0.19	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1342B	0	20.3	16/06/92	-8.7	0.16	0.28	0.32	0.19	0.06	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1420A	6	50	14/08/92	-11.2	0.11	0.35	0.40	0.11	0.02	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1420A	6	50	15/10/92	-8.7	0.18	0.29	0.29	0.18	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	02/12/92	-8.5	0.17	0.28	0.31	0.18	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	07/02/93	-7.2	0.13	0.26	0.35	0.21	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	22/06/93	-7.5	0.14	0.28	0.34	0.19	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	24/08/93	-7.2	0.13	0.26	0.35	0.20	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	29/09/93	-7.0	0.12	0.26	0.36	0.21	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	07/06/94	-7.5	0.13	0.27	0.35	0.20	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6	50	06/09/94	-7.1	0.12	0.26	0.37	0.21	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6		18/05/95	-7.1	0.13	0.27	0.36	0.20	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1420A	6		11/10/95	-7.3	0.12	0.27	0.37	0.20	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1614B	5.8	19.3	19/11/92	-13.1	0.30	0.32	0.15	0.13	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1614B	5.8	19.3	22/06/93	-11.5	0.26	0.31	0.17	0.15	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1614B	5.8	19.3	24/08/93	-10.5	0.24	0.28	0.21	0.17	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1614B	5.8	19.3	28/09/93	-10.4	0.24	0.28	0.21	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1614B	5.8	19.3	06/06/94	-9.7	0.22	0.28	0.24	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1680A	0	16	13/10/92	-10.4	0.18	0.38	0.28	0.12	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1680B	6	20	20/10/92	-10.7	0.21	0.37	0.26	0.11	0.04	Na-Ca-K	Cl-HCO3-SO4

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Aberg	SA1680B	6	20	03/02/93	-10.8	0.22	0.33	0.24	0.14	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1693F	0	38.5	19/10/92	-12.0	0.25	0.36	0.21	0.12	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1696B	5.9	19.2	20/10/92	-11.0	0.21	0.37	0.26	0.12	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA1696B	5.9	19.2	19/11/92	-11.5	0.26	0.32	0.20	0.15	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1696B	5.9	19.2	22/06/93	-11.2	0.26	0.30	0.19	0.16	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1696B	5.9	19.2	24/08/93	-11.1	0.25	0.29	0.19	0.16	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1696B	5.9	19.2	28/09/93	-11.1	0.25	0.29	0.19	0.16	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1696B	5.9	19.2	06/06/94	-11.2	0.25	0.29	0.19	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1713A	5.8	20.1	22/10/92	-12.0	0.26	0.34	0.19	0.13	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6	20	03/02/93	-12.4	0.27	0.32	0.16	0.14	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6	20	21/06/93	-11.9	0.27	0.31	0.17	0.14	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6	20	24/08/93	-11.7	0.26	0.31	0.17	0.14	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6	20	28/09/93	-12.1	0.26	0.30	0.17	0.14	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6	20	06/06/94	-12.2	0.26	0.31	0.16	0.13	0.13	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6	20	07/09/94	-12.4	0.26	0.31	0.15	0.13	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6		18/05/95	-12.0	0.27	0.31	0.15	0.12	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA1730A	5.6		11/10/95	-12.1	0.27	0.31	0.15	0.13	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA1742A	0	41.1	02/11/92	-12.8	0.29	0.33	0.16	0.13	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1828B	5.8	20	19/11/92	-10.8	0.25	0.29	0.20	0.17	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1828B	5.8	20	16/02/93	-9.3	0.22	0.26	0.24	0.19	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1828B	5.8	20	21/06/93	-10.3	0.24	0.27	0.22	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1828B	5.8	20	26/08/93	-10.3	0.24	0.28	0.21	0.18	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1828B	5.8	20	28/09/93	-10.3	0.23	0.27	0.22	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1828B	5.8	20	06/06/94	-8.9	0.19	0.27	0.27	0.20	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1844B	0	20	01/12/92	-9.5	0.23	0.27	0.23	0.19	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA1861A	3.6	20.2	07/12/92	-9.2	0.21	0.27	0.25	0.19	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2074A	6	38.7	17/06/93	-8.5	0.20	0.25	0.27	0.21	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2074A	6	38.7	28/09/93	-8.4	0.18	0.26	0.29	0.20	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2074A	6	38.7	07/06/94	-8.5	0.18	0.27	0.29	0.20	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2074A	6	38.7	06/09/94	-8.4	0.17	0.27	0.30	0.19	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2074A	6		18/05/95	-8.7	0.18	0.29	0.29	0.18	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2074A	6		11/10/95	-8.4	0.17	0.29	0.31	0.18	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2109B	0	19.9	15/02/93	-8.2	0.19	0.26	0.28	0.20	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2142A	5.9	20	02/12/93	-7.2	0.15	0.24	0.33	0.22	0.06	Na-Ca-K	Cl-SO4-HCO3

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Aberg	SA2175B	5.8	20	13/12/93	-8.3	0.18	0.24	0.29	0.22	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2175B	5.8	20	30/05/94	-8.2	0.17	0.25	0.30	0.21	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2240B	5.7	19.8	28/09/93	-8.0	0.16	0.24	0.31	0.22	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2240B	5.7	19.8	07/12/93	-8.1	0.15	0.24	0.32	0.22	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2273A	5.8	20	30/11/93	-8.4	0.17	0.25	0.30	0.21	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2273A	5.8	20	27/05/94	-7.8	0.15	0.26	0.33	0.21	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2273A	5.8	20	07/09/94	-7.9	0.14	0.26	0.34	0.21	0.05	Na-Ca-K	Cl-HCO3-SO4
Aberg	SA2273A	5.8		18/05/95	-7.8	0.16	0.26	0.32	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2273A	5.8		11/10/95	-8.1	0.16	0.27	0.32	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2273B	5.8	20	30/11/93	-9.4	0.21	0.28	0.25	0.18	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2273B	5.8	20	30/05/94	-9.5	0.20	0.28	0.26	0.18	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2289B	6	19.4	30/11/93	-8.4	0.18	0.25	0.29	0.21	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2289B	6	19.4	30/05/94	-8.0	0.16	0.26	0.32	0.21	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2322A	6	20.1	28/09/93	-8.8	0.19	0.27	0.28	0.20	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2322A	6	20.1	07/12/93	-8.5	0.17	0.27	0.30	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2322A	6	20.1	08/03/94	-8.6	0.18	0.27	0.29	0.20	0.07	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2322A	6	20.1	27/05/94	-8.1	0.16	0.27	0.31	0.20	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2355B	5.9	20	08/03/94	-10.6	0.25	0.29	0.19	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2583A	5.7	20	07/03/94	-10.7	0.25	0.30	0.18	0.15	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2583A	5.7	20	18/05/94	-11.1	0.25	0.29	0.18	0.15	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2600A	5.8	19.4	07/03/94	-12.2	0.28	0.31	0.15	0.12	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2600A	5.8	19.4	18/05/94	-10.8	0.24	0.29	0.20	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2600A	5.8	19.4	06/09/94	-11.2	0.25	0.29	0.19	0.15	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2600A	5.8		17/05/95	-9.4	0.23	0.26	0.23	0.19	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2600A	5.8		11/10/95	-9.8	0.23	0.27	0.22	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2600B	5.8	19.2	07/03/94	-12.4	0.28	0.30	0.14	0.12	0.16	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2634B	6	20.4	24/02/94	-11.3	0.25	0.29	0.19	0.15	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2649A	5.8	19.85	24/02/94	-10.9	0.25	0.29	0.19	0.16	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2663B	5.6	20.1	24/02/94	-12.2	0.27	0.30	0.15	0.12	0.16	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2664A	5.8	20.4	24/02/94	-10.9	0.25	0.29	0.19	0.15	0.12	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2681A	5.7	21.8	23/02/94	-10.7	0.25	0.29	0.19	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2681B	5.6	17.3	23/02/94	-10.4	0.24	0.27	0.21	0.17	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2703A	5.7	19.6	23/02/94	-12.8	0.29	0.28	0.13	0.11	0.19	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2703A	5.7	19.6	17/05/94	-13.1	0.31	0.26	0.12	0.10	0.20	Ca-Na-K	Cl-SO4-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	SA2718A	5.8	20.3	17/05/94	-12.9	0.30	0.27	0.13	0.11	0.19	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2734B	5.7	20.3	23/02/94	-10.7	0.25	0.29	0.19	0.16	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	SA2768A	6	20.3	14/02/94	-12.9	0.29	0.29	0.14	0.12	0.17	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2768B	5.9	19.8	14/02/94	-11.8	0.26	0.30	0.17	0.14	0.13	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2783A	5.8	19.9	14/02/94	-12.2	0.27	0.31	0.15	0.13	0.14	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2783A	5.8	19.9	17/05/94	-12.1	0.27	0.31	0.15	0.13	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2783A	5.8	19.9	07/09/94	-12.2	0.26	0.30	0.16	0.13	0.15	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2783A	5.8		23/05/95	-12.0	0.26	0.30	0.14	0.12	0.18	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2783A	5.8		25/10/95	-12.5	0.28	0.29	0.14	0.11	0.19	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2834B	6	20.2	14/02/94	-12.3	0.26	0.30	0.16	0.13	0.16	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2880A	11.92	13.92	12/04/96	-12.3	0.27	0.28	0.13	0.11	0.21	Ca-Na-K	Cl-SO4-HCO3
Aberg	SA2880A	11.92		25/10/95	-12.1	0.26	0.30	0.14	0.12	0.18	Ca-Na-K	Cl-SO4-HCO3
Aberg	HAV04	35	100	25/07/87	-10.1	0.08	0.51	0.31	0.08	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	HAV04	35	100	26/07/87	-9.9	0.09	0.51	0.29	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	HAV05	50	100	28/07/87	-9.8	0.08	0.51	0.32	0.08	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HAV05	50	100	29/07/87	-9.8	0.08	0.49	0.33	0.08	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HAV06	73	100	30/07/87	-10.0	0.09	0.51	0.28	0.09	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HAV06	73	100	31/07/87	-10.2	0.10	0.49	0.28	0.10	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HAV07	69	100	29/07/87	-9.9	0.09	0.50	0.31	0.09	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HAV07	69	100	30/07/87	-10.2	0.10	0.51	0.28	0.10	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KAV01	420	425	22/09/87	-10.6	0.15	0.45	0.26	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KAV01	522	531	25/08/87	-10.9	0.22	0.36	0.24	0.12	0.05	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAV01	558	563	03/06/87	-11.7	0.26	0.32	0.19	0.15	0.08	Na-Ca-K	Cl-SO4-HCO3
Aberg	KAV01	635	743.6	22/04/87	-12.8	0.30	0.29	0.14	0.11	0.16	Na-Ca-K	Cl-SO4-HCO3
Aberg	HLX01	50	100	23/10/87	-10.9	0.17	0.47	0.23	0.10	0.03	Ca-Na-K	HCO3-SO4-Cl
Aberg	HLX01	50	100	24/10/87	-10.8	0.12	0.51	0.24	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HLX01	50	100	25/10/87	-10.9	0.12	0.50	0.24	0.11	0.03	Na-Ca-K	HCO3-SO4-Cl
Aberg	HLX03	25	100	05/11/87	-10.8	0.12	0.51	0.24	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HLX03	25	100	06/11/87	-10.9	0.12	0.51	0.24	0.10	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HLX06	45	100	01/11/87	-10.6	0.10	0.53	0.25	0.10	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HLX06	45	100	03/11/87	-10.6	0.09	0.54	0.26	0.09	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	HLX07	20	100	04/11/87	-10.5	0.15	0.45	0.26	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	HLX07	20	100	05/11/87	-10.8	0.20	0.37	0.27	0.12	0.04	Na-Ca-K	Cl-SO4-HCO3
Aberg	KLX01	272	277	08/12/88	-11.5	0.24	0.37	0.22	0.11	0.06	Na-Ca-K	Cl-HCO3-SO4

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Aberg	KLX01	456	461	23/11/88	-12.2	0.26	0.38	0.20	0.10	0.06	Na-Ca-K	Cl-SO4-HCO3
Aberg	KLX01	680	702.11	03/11/88	-13.3	0.33	0.30	0.14	0.12	0.11	Na-Ca-K	Cl-SO4-HCO3
Aberg	KLX01	680	702.11	01/11/89	-11.8	0.29	0.32	0.16	0.13	0.10	Na-Ca-K	Cl-SO4-HCO3
Aberg	KLX02	9	31	03/08/93	-9.9	0.11	0.48	0.28	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	31	81	03/08/93	-10.5	0.12	0.48	0.26	0.11	0.03	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	81	131	03/08/93	-10.7	0.13	0.48	0.26	0.11	0.03	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	131	181	03/08/93	-10.3	0.12	0.49	0.26	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	181	231	03/08/93	-10.4	0.12	0.49	0.26	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	231	281	03/08/93	-10.5	0.12	0.50	0.25	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	281	331	03/08/93	-10.5	0.11	0.50	0.25	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	315	321.5	10/02/94	-10.3	0.10	0.50	0.27	0.10	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	331	381	03/08/93	-10.7	0.11	0.50	0.25	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	335	340.8	08/11/93	-10.6	0.14	0.46	0.26	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Aberg	KLX02	381	431	03/08/93	-10.7	0.11	0.50	0.25	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	431	481	03/08/93	-10.6	0.11	0.51	0.25	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	481	531	03/08/93	-10.6	0.11	0.51	0.25	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	531	581	03/08/93	-10.6	0.11	0.50	0.25	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	581	631	03/08/93	-10.4	0.11	0.51	0.25	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	631	681	03/08/93	-10.4	0.11	0.50	0.26	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	681	731	03/08/93	-10.4	0.11	0.51	0.25	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	731	781	03/08/93	-10.5	0.11	0.51	0.25	0.11	0.02	Na-Ca-K	HCO3-SO4-Cl
Aberg	KLX02	781	831	03/08/93	-10.5	0.11	0.51	0.25	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	798	803.8	23/11/93	-10.9	0.20	0.41	0.25	0.11	0.04	Na-Ca-K	Cl-HCO3-SO4
Aberg	KLX02	831	881	03/08/93	-10.7	0.11	0.50	0.25	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	881	931	03/08/93	-10.4	0.12	0.49	0.26	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Aberg	KLX02	931	981	03/08/93	-10.7	0.19	0.41	0.26	0.11	0.04	Ca-Na-K	Cl-HCO3-SO4
Aberg	KLX02	981	1031	03/08/93	-11.3	0.25	0.33	0.20	0.14	0.07	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1031	1081	03/08/93	-11.9	0.27	0.30	0.14	0.12	0.17	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1081	1131	03/08/93	-12.1	0.28	0.26	0.12	0.10	0.24	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1090	1096.2	16/12/93	-11.7	0.26	0.24	0.11	0.09	0.29	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1131	1181	03/08/93	-12.0	0.28	0.23	0.11	0.09	0.29	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1181	1231	03/08/93	-12.0	0.28	0.22	0.10	0.09	0.31	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1231	1281	03/08/93	-11.9	0.28	0.20	0.10	0.08	0.34	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1281	1331	03/08/93	-11.4	0.26	0.19	0.09	0.08	0.38	Ca-Na-K	Cl-SO4-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Aberg	KLX02	1331	1381	03/08/93	-10.4	0.20	0.16	0.07	0.06	0.51	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1381	1431	03/08/93	-9.9	0.17	0.13	0.06	0.05	0.60	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1420	1705	17/01/94	-8.9						Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1431	1481	03/08/93	-9.5	0.11	0.04	0.02	0.02	0.80	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1481	1531	03/08/93	-9.8						Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1531	1581	03/08/93	-9.0	0.07	0.03	0.01	0.01	0.87	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1581	1631	03/08/93	-9.1	0.05	0.01	0.01	0.01	0.92	Ca-Na-K	Cl-SO4-HCO3
Aberg	KLX02	1631	1681	03/08/93	-8.9	0.00	0.00	0.00	0.00	1.00	Ca-Na-K	Cl-SO4-HCO3
Beberg	BFI01	71	84	07/04/86	-12.0	0.14	0.54	0.20	0.09	0.03	Ca-Na-K	HCO3-Cl-SO4
Beberg	BFI01	169	177	05/05/86	-11.6	0.18	0.43	0.25	0.11	0.04	Na-Ca-K	Cl-HCO3-SO4
Beberg	BFI01	234	247	16/06/86	-11.7	0.20	0.38	0.26	0.11	0.04	Na-Ca-K	Cl-HCO3-SO4
Beberg	BFI01	284	294	13/11/86	-11.8	0.25	0.29	0.19	0.16	0.10	Na-Ca-K	Cl-SO4-HCO3
Beberg	BFI01	335	385	11/09/86	-11.5	0.24	0.28	0.20	0.17	0.10	Na-Ca-K	Cl-SO4-HCO3
Beberg	**BFI01**	**439**	**459.1**	**27/10/86**	**-11.8**	**0.26**	**0.30**	**0.19**	**0.16**	**0.10**	**Na-Ca-K**	**Cl-SO4-HCO3**
Beberg	KFI01	206	211	09/10/80	-11.6	0.08	0.59	0.22	0.09	0.02	Ca-Na-K	HCO3-Cl-SO4
Beberg	KFI01	206	211	14/10/80	-11.6	0.08	0.60	0.22	0.08	0.02	Ca-Na-K	HCO3-Cl-SO4
Beberg	KFI01	206	211	21/10/80	-11.6	0.09	0.60	0.21	0.09	0.02	Ca-Na-K	HCO3-Cl-SO4
Beberg	KFI01	293	298	05/11/80	-11.6	0.08	0.60	0.22	0.08	0.02	Ca-Na-K	HCO3-Cl-SO4
Beberg	KFI01	293	298	11/11/80	-11.6	0.07	0.61	0.23	0.07	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	152	157	30/10/79	-11.3	0.06	0.58	0.28	0.06	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	152	157	04/12/79	-11.3	0.06	0.58	0.28	0.06	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	152	157	12/12/79	-11.3	0.07	0.58	0.27	0.07	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	247	252	17/01/80	-11.7	0.09	0.56	0.24	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	247	252	29/02/80	-11.5	0.05	0.61	0.27	0.05	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	368	373	26/04/80	-11.4	0.05	0.62	0.26	0.05	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	368	373	29/04/80	-10.9	0.04	0.62	0.28	0.04	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	534	539	07/05/80	-11.3	0.05	0.61	0.27	0.05	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	534	539	14/05/80	-11.5	0.06	0.61	0.26	0.06	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	534	539	21/05/80	-11.4	0.05	0.62	0.26	0.05	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI04	534	539	28/05/80	-11.6	0.06	0.62	0.25	0.06	0.01	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI05	205	210	29/01/80	-10.5	0.23	0.31	0.23	0.16	0.07	Na-Ca-K	Cl-SO4-HCO3
Beberg	KFI05	205	210	15/02/80	-10.9	0.24	0.31	0.22	0.16	0.08	Na-Ca-K	Cl-SO4-HCO3
Beberg	KFI05	297	302	17/04/80	-11.8	0.27	0.31	0.18	0.15	0.09	Ca-Na-K	Cl-SO4-HCO3
Beberg	KFI05	384	389	21/05/80	-12.2	0.26	0.31	0.18	0.15	0.10	Ca-Na-K	Cl-SO4-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Beberg	KFI07	123	128	02/09/80	-11.6	0.08	0.60	0.22	0.08	0.02	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI07	301	306	10/09/80	-11.8	0.11	0.56	0.21	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Beberg	KFI07	301	306	08/10/80	-11.7	0.18	0.46	0.22	0.10	0.04	Na-Ca-K	Cl-HCO3-SO4
Beberg	KFI07	322	327	22/10/80	-11.8	0.13	0.54	0.22	0.09	0.03	Na-Ca-K	Cl-HCO3-SO4
Beberg	KFI07	322	327	28/10/80	-11.8	0.13	0.52	0.22	0.10	0.03	Na-Ca-K	Cl-HCO3-SO4
Beberg	KFI07	511	516	05/11/80	-12.0	0.16	0.50	0.22	0.10	0.03	Na-Ca-K	Cl-HCO3-SO4
Beberg	KFI07	511	516	11/11/80	-11.9	0.16	0.50	0.22	0.10	0.03	Na-Ca-K	Cl-HCO3-SO4
Beberg	**KFI07**	**511**	**516**	**19/11/80**	**-11.9**	**0.15**	**0.50**	**0.22**	**0.10**	**0.03**	**Na-Ca-K**	**Cl-HCO3-SO4**
Beberg	KFI09	182	187	11/03/85	-11.6	0.23	0.35	0.23	0.13	0.06	Na-Ca-K	Cl-SO4-HCO3
Beberg	KFI09	360	365	05/02/85	-11.9	0.27	0.32	0.17	0.15	0.09	Na-Ca-K	Cl-SO4-HCO3
Beberg	KFI09	360	365	06/02/85	-11.1	0.26	0.31	0.19	0.16	0.09	Na-Ca-K	Cl-SO4-HCO3
Ceberg	KGI02	178	180.7	24/05/82	-12.6	0.18	0.51	0.18	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	KGI02	178	180.7	07/06/82	-12.6	0.18	0.52	0.18	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	KGI02	328	330.7	20/06/82	-12.6	0.18	0.51	0.19	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	KGI02	400	402.7	05/07/82	-12.7	0.19	0.51	0.18	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	KGI02	544	546.7	20/07/82	-12.4	0.18	0.51	0.19	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	KGI02	602	604.7	01/08/82	-12.7	0.19	0.51	0.18	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	KGI04	96	98.7	07/06/82	-12.9	0.20	0.51	0.17	0.08	0.04	Ca-Na-K	HCO3-SO4-Cl
Ceberg	KGI04	222	224.7	20/06/82	-12.6	0.19	0.51	0.18	0.08	0.04	Na-Ca-K	HCO3-Cl-SO4
Ceberg	**KGI04**	**404**	**406.7**	**04/07/82**	**-13.6**	**0.28**	**0.43**	**0.17**	**0.07**	**0.05**	**Na-Ca-K**	**Cl-HCO3-SO4**
Ceberg	KGI04	512	514.7	18/07/82	-12.9	0.21	0.50	0.17	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Ceberg	KGI04	616	618.7	17/08/82	-13.8	0.28	0.43	0.17	0.07	0.05	Na-Ca-K	Cl-HCO3-SO4
Sweden	KFJ02	342	344.7	13/09/82	-11.3	0.15	0.50	0.22	0.10	0.03	Na-Ca-K	HCO3-SO4-Cl
Sweden	KFJ02	483	485.7	27/09/82	-11.4	0.14	0.51	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ02	605	607.7	11/10/82	-14.1	0.28	0.45	0.16	0.07	0.04	Na-Ca-K	Cl-HCO3-SO4
Sweden	KFJ04	151	153.7	05/07/82	-11.5	0.12	0.53	0.22	0.10	0.03	Na-Ca-K	HCO3-SO4-Cl
Sweden	KFJ04	317	319.7	19/07/82	-11.5	0.13	0.53	0.22	0.09	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ04	410	412.7	02/08/82	-11.5	0.13	0.53	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ04	496	498.7	30/08/82	-11.7	0.14	0.53	0.21	0.09	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	432	434.7	18/04/83	-11.3	0.14	0.50	0.23	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	432	434.7	21/04/83	-11.3	0.14	0.50	0.23	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	432	434.7	28/04/83	-11.3	0.14	0.51	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	432	434.7	05/05/83	-11.2	0.14	0.51	0.23	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	432	434.7	17/05/83	-11.2	0.14	0.50	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Sweden	KFJ07	542	544.7	07/03/83	-11.4	0.15	0.50	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	542	544.7	10/03/83	-11.4	0.15	0.50	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	721	760	30/06/83	-11.4	0.14	0.51	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ07	721	760	07/07/83	-11.4	0.13	0.52	0.22	0.10	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KFJ08	470	472.7	27/09/82	-11.2	0.15	0.49	0.23	0.10	0.03	Ca-Na-K	HCO3-SO4-Cl
Sweden	KFJ08	666	668.7	11/10/82	-10.9	0.14	0.49	0.23	0.10	0.03	Ca-Na-K	HCO3-SO4-Cl
Sweden	KFR01	44.5	62.3	15/04/86	-12.3	0.25	0.29	0.20	0.17	0.09	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR01	44.5	62.3	15/05/86	-12.1	0.25	0.29	0.21	0.17	0.09	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR01	44.5	62.3	15/08/86	-11.5	0.24	0.28	0.21	0.18	0.09	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR01	44.5	62.3	17/09/86	-11.9	0.25	0.33	0.20	0.14	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR01	44.5	62.3	16/10/86	-12.0	0.24	0.28	0.20	0.17	0.10	Ca-Na-K	Cl-SO4-HCO3
Sweden	KFR01	44.5	62.3	16/02/87	-11.8	0.25	0.29	0.20	0.17	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	18/03/86	-9.1	0.15	0.20	0.32	0.25	0.08	Ca-Na-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	15/04/86	-9.1	0.17	0.22	0.29	0.23	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	15/05/86	-9.1	0.18	0.22	0.29	0.23	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	17/06/86	-8.6	0.17	0.20	0.30	0.25	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	15/08/86	-8.7	0.18	0.22	0.29	0.23	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	15/10/86	-9.1	0.18	0.21	0.28	0.23	0.10	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR10	87	108	07/01/87	-8.8	0.18	0.23	0.29	0.23	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	18/03/86	-9.6	0.18	0.21	0.29	0.24	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	15/04/86	-9.4	0.19	0.22	0.28	0.23	0.09	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	15/05/86	-9.5	0.17	0.21	0.29	0.24	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	17/06/86	-9.1	0.18	0.21	0.28	0.24	0.09	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	15/08/86	-9.2	0.17	0.20	0.29	0.24	0.09	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	17/09/86	-9.5	0.18	0.22	0.29	0.23	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	15/10/86	-9.5	0.17	0.20	0.28	0.24	0.11	Na-Ca-K	Cl-SO4-HCO3
Sweden	KFR7A	48	74.7	10/03/87	-9.0	0.19	0.23	0.28	0.22	0.08	Na-Ca-K	Cl-SO4-HCO3
Sweden	KKA03	232	234.7	31/10/79	-8.7	0.05	0.46	0.42	0.06	0.01	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA03	232	234.7	28/11/79	-8.7	0.05	0.46	0.42	0.05	0.01	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA03	232	234.7	14/12/79	-8.8	0.06	0.46	0.41	0.06	0.01	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	226	228.7	18/03/80	-10.0	0.07	0.50	0.34	0.08	0.02	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	312	314.7	23/01/80	-9.7	0.06	0.50	0.36	0.06	0.01	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	312	314.7	30/01/80	-9.5	0.07	0.50	0.35	0.07	0.01	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	312	314.7	06/02/80	-9.8	0.07	0.51	0.34	0.07	0.01	Ca-Na-K	HCO3-SO4-Cl

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Sweden	KKA04	312	314.7	13/02/80	-10.0	0.07	0.50	0.33	0.07	0.02	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	397	399.7	20/02/80	-9.9	0.07	0.50	0.34	0.07	0.01	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	397	399.7	27/02/80	-9.9	0.07	0.50	0.33	0.07	0.02	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	397	399.7	05/03/80	-9.9	0.07	0.50	0.33	0.07	0.02	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKA04	397	399.7	12/03/80	-9.9	0.07	0.50	0.33	0.07	0.02	Ca-Na-K	HCO3-SO4-Cl
Sweden	HKM20	146	182	12/04/83	-13.6	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	HKM20	146	182	26/04/83	-13.7	0.25	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKM03	123	125.7	24/01/83	-13.7	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKM03	123	125.7	07/02/83	-13.8	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKM03	445	447.7	20/12/82	-13.8	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKM03	445	447.7	10/01/83	-13.8	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKM08	238	240.7	06/06/83	-14.6	0.34	0.41	0.15	0.06	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKM13	230	232.7	20/06/83	-13.7	0.32	0.37	0.17	0.09	0.06	Ca-Na-K	SO4-HCO3-Cl
Sweden	KKM13	514	516.7	09/05/83	-13.5	0.30	0.37	0.18	0.10	0.06	Ca-Na-K	SO4-HCO3-Cl
Sweden	KKM13	670	672.7	28/03/83	-13.6	0.27	0.45	0.16	0.07	0.05	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKM13	670	672.7	12/04/83	-14.9	0.35	0.40	0.14	0.06	0.04	Ca-Na-K	
Sweden	KKM13	680	703	06/06/83	-15.0	0.36	0.39	0.14	0.06	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KKL01	406	563.95	27/06/85	-11.9	0.19	0.48	0.20	0.09	0.04	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKL02	326	331	06/12/84	-12.4	0.19	0.51	0.19	0.08	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKL02	741	746	06/11/84	-11.3	0.17	0.49	0.22	0.09	0.03	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKL09	696	701	03/09/85	-11.9	0.18	0.50	0.20	0.09	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKR01	103	105.7	28/08/78	-10.3	0.09	0.53	0.26	0.09	0.02	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKR01	103	105.7	08/09/78	-10.3	0.09	0.53	0.26	0.09	0.02	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKR01	103	105.7	19/09/78	-10.3	0.09	0.53	0.26	0.09	0.02	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKR01	103	105.7	25/09/78	-10.3	0.09	0.53	0.26	0.09	0.02	Ca-Na-K	HCO3-Cl-SO4
Sweden	KKR01	264	266.7	30/07/78	-10.4	0.09	0.53	0.27	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKR01	264	266.7	09/08/78	-10.4	0.09	0.53	0.27	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKR01	264	266.7	15/08/78	-10.4	0.09	0.53	0.27	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKR01	264	266.7	24/08/78	-10.4	0.09	0.53	0.27	0.09	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKR01	406	408.7	30/05/78	-10.7	0.13	0.49	0.25	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Sweden	KKR01	406	408.7	06/06/78	-10.7	0.13	0.48	0.25	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Sweden	KKR01	406	408.7	13/06/78	-10.7	0.13	0.48	0.25	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Sweden	KKR01	406	408.7	22/06/78	-10.7	0.13	0.48	0.25	0.11	0.03	Na-Ca-K	Cl-HCO3-SO4
Sweden	KKR01	491	493.7	03/07/78	-10.4	0.11	0.52	0.24	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4

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Sweden	KKR01	491	493.7	12/07/78	-10.4	0.11	0.53	0.24	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKR01	491	493.7	16/07/78	-10.4	0.11	0.53	0.24	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KKR01	491	493.7	25/07/78	-10.4	0.11	0.53	0.24	0.11	0.02	Na-Ca-K	HCO3-Cl-SO4
Sweden	KLJ01	237	500.6	10/03/88	-13.8	0.31	0.43	0.15	0.07	0.04	Na-Ca-K	HCO3-SO4-Cl
Sweden	KSV04	96	98.7	12/04/82	-12.5	0.19	0.51	0.18	0.08	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	KSV04	376	378.7	26/04/82	-13.2	0.21	0.51	0.16	0.07	0.04	Na-Ca-K	HCO3-Cl-SO4
Sweden	KSV04	430	432.7	10/05/82	-13.0	0.21	0.51	0.17	0.07	0.04	Na-Ca-K	HCO3-Cl-SO4
Sweden	KSV04	630	632.7	24/05/82	-13.1	0.21	0.51	0.16	0.07	0.04	Na-Ca-K	HCO3-Cl-SO4
Sweden	KSV05	160	162.7	12/10/82	-12.8	0.20	0.51	0.17	0.08	0.04	Na-Ca-K	HCO3-SO4-Cl
Sweden	KSV05	357	359.7	01/11/82	-12.6	0.23	0.47	0.18	0.08	0.05	Ca-Na-K	HCO3-Cl-SO4
Sweden	KSV05	615	617.7	22/11/82	-12.1	0.21	0.48	0.19	0.08	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	KSV05	719	721.7	13/12/82	-12.0	0.20	0.48	0.19	0.08	0.04	Ca-Na-K	HCO3-Cl-SO4
Sweden	KTA01	496	498.7	05/09/83	-13.6	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	15/09/83	-13.9	0.28	0.46	0.15	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	19/09/83	-13.7	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	26/09/83	-13.6	0.27	0.46	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	27/09/83	-13.6	0.26	0.47	0.15	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	28/09/83	-13.7	0.26	0.47	0.15	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	29/09/83	-13.8	0.27	0.46	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	30/09/83	-13.8	0.27	0.47	0.15	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	01/10/83	-13.8	0.27	0.46	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	02/10/83	-13.6	0.27	0.46	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	03/10/83	-13.8	0.27	0.47	0.15	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	496	498.7	04/10/83	-13.8	0.27	0.47	0.15	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	654	700	08/08/83	-13.7	0.27	0.46	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	KTA01	654	700	22/08/83	-13.6	0.26	0.47	0.16	0.07	0.04	Ca-Na-K	HCO3-SO4-Cl
Sweden	Rain old				-12.3	0.22	0.47	0.18	0.08	0.05	Na-K-Ca	HCO3-SO4-Cl
Sweden	Rain				-12.3	0.22	0.47	0.18	0.08	0.05	Na-K-Ca	HCO3-SO4-Cl
Sweden	Rain'60				-12.3	0.00	1.00	0.00	0.00	0.00	Na-K-Ca	HCO3-SO4-Cl
Sweden	Glacial				-21.0	1.00	0.00	0.00	0.00	0.00	K-Ca-Na	SO4-Cl-HCO3
Sweden	1569_1				-16.6	0.43	0.28	0.13	0.09	0.06	Na-Ca-K	Cl-HCO3-SO4
Sweden	1569_2				-15.5	0.42	0.34	0.14	0.06	0.04	Na-Ca-K	Cl-HCO3-SO4
Sweden	PROV 1b			31/08/96	-14.0	0.31	0.42	0.16	0.07	0.04	K-Na-Ca	Cl-SO4-HCO3
Sweden	PROV 2b			31/08/96	-15.8	0.42	0.35	0.13	0.06	0.04	K-Ca-Na	SO4-Cl-HCO3

SITE	IDCODE	SECUP	SECLOW	DATE	O18	Glacial	Meteoric	Biogenic	Marine	Brine	Cation	Anion
Sweden	PROV 3b			31/08/96	-13.7	0.29	0.43	0.16	0.07	0.05	K-Na-Ca	Cl-SO4-HCO3
Sweden	PROV 4b			01/09/96	-15.7	0.41	0.36	0.13	0.06	0.04	K-Ca-Na	SO4-Cl-HCO3
Sweden	PROV 5b			01/09/96	-15.1	0.37	0.38	0.14	0.06	0.04	Ca-K-Na	HCO3-SO4-Cl
Sweden	PROV 6b			01/09/96	-14.1	0.27	0.35	0.18	0.12	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	Litorina				-5.0	0.00	0.00	0.00	1.00	0.00	Na-K-Ca	Cl-SO4-HCO3
Sweden	PASSEA01			28/08/92	-5.9	0.09	0.15	0.31	0.38	0.06	Na-K-Ca	Cl-SO4-HCO3
Sweden	PASSEA01			17/05/93	-7.0	0.11	0.20	0.37	0.25	0.06	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA01			08/07/93	-6.0	0.10	0.17	0.35	0.32	0.06	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA02			17/05/93	-6.9	0.11	0.18	0.37	0.27	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA02			08/07/93	-6.0	0.10	0.18	0.36	0.31	0.06	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA03			17/05/93	-6.9	0.11	0.17	0.35	0.31	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA03			08/07/93	-6.5	0.11	0.17	0.35	0.30	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA04			18/05/93	-6.5	0.11	0.16	0.32	0.36	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA04			08/07/93	-6.7	0.11	0.17	0.34	0.30	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA05			18/05/93	-6.8	0.11	0.16	0.32	0.34	0.07	Na-Ca-K	Cl-SO4-HCO3
Sweden	PASSEA05			08/07/93	-7.0	0.11	0.17	0.34	0.31	0.07	Na-Ca-K	Cl-SO4-HCO3

APPENDIX 2: DATA UNCERTAINTIES

General

The groundwater data used in this report is based on field sampling campaigns performed by SKB in 1982-1984, the Finnsjön project, and the Äspö project from 1986 to 1995. The data has been extracted in February-March 1997 from the SKB database, SICADA. The measured data follows the field and analytical quality control assessed by SKB (Nilsson, 1995).

For the PA modelling four references waters were chosen from Aberg, Beberg and Ceberg. The reference water sample is a best estimate of the natural conditions at the repository depth of 500m±100m. The candidate samples were examined in detail and principal component analysis was used to compare the candidate samples in relation to other sampled groundwaters in Sweden.

In order to visualise, summarise, compare, describe the origin and calculate mixing portions M3 modelling was performed (Laaksoharju et al., 1995; Laaksoharju and Skårman, 1995). The modelling was done using the M3 computer code consisting of a standard principal component analysis followed by mixing calculations.

Use in SR 97

The selected reference waters are used in PA calculations. Reliable pH, Eh, redox and pH sensitive constituents, (like bicarbonate, iron and sulphide and radionuclide analogies) are of importance (Rhén & Bäckblom (eds.) 1997). In Rhén & Bäckblom (eds.) 1997 the following criteria based on expert knowledge concerning disturbances have been established:

- Major constituents, sodium, potassium, calcium, magnesium, bicarbonate, chloride and sulphate are unaffected by disturbances from drilling or contamination from other investigation methods, as long as the proportion of drilling or testing water can be analysed and corrected for. This criterion is fulfilled for all the reference samples except for KFI07 in Beberg which lacks information concerning drilling fluids.

- Trace elements and stable oxygen-18 and deuterium isotopes are reliable even with a content of up to 5% of drill flushing water. This criterion is fulfilled for all the reference waters except for KGI04 in Ceberg which contains 11% drilling fluids.

- pH sensitive trace elements, tritium and carbon-14 data are reliable only when contamination by drilling water or meteoric water entering through the borehole is less than 0.1%. This criterion is met for all the reference waters except for KGI04 in Ceberg.

- Eh and redox-sensitive elements are reliable when the electrode readings have stabilised and the Eh value can be interpreted. Normally several days of continuous pumping is needed with measurements of on-line flow through cells, and preferably downhole measurements of Eh and pH. This criterion was met for all the reference waters except for KFI01 in Beberg which lacks information.

The 3D visualisation of the Cl distribution and the M3 mixing calculations can be used to support hydrogeological flow modelling. The uncertainty of the modelling is 10% (Laaksoharju and Wallin (eds.) 1997).

Characterisation of Uncertainties

The following activities affect the groundwater data and add uncertainty to the interpretation; the drilling, sampling activities (e.g. water extraction rate, uplift of water, storage prior to analyses), analytical uncertainties and modelling uncertainties.

Quantification of uncertainties

The quantification of uncertainties caused by drilling, sampling activities, analytical and modelling uncertainties are in some cases straightforward (analytical uncertainties). In other cases one has to rely on estimates (e.g. the total effect from drilling activities). It can also be difficult to quantify the total effect from a disturbance since there is nothing to compare it with since no groundwater samples are available from totally undisturbed conditions prior to drilling. There is no systematics to compare e.g. disturbances from the water extraction rate and the effect from analytical disturbances. In order to try to quantify and compare the effects from uncertainties the following modelling was made.

We know that the annual variation of the groundwater level at Aberg is ±1 m. By applying the Ghyben-Herzberg relation (Freeze and Cherry, 1979) on the salinity (10000 mg/l, Cl) measured at Aberg this annual fluctuation of the groundwater level of ±1m correspond to a theoretical fluctuation of the non-saline/saline interface of ±80m. This means that during undisturbed conditions there is a potential force to move the water ±80m from the actual sampling depth. In reality the movement is much lower since the hydraulic properties of the rock generally hinder fast changes deep in the bedrock. The mixing processes in the fracture network generally also hinder the occurrence of a sharp non/saline interface in the bedrock. The Gyben-Herzberg relation can therefore be used only to indicate the maximum potential for change. For this modelling purpose the Gyben-Herzberg relation can be transformed to M3-mixing portions, which means that in the Aberg case a ±1 m annual fluctuation of the water changes the mixing portion of e.g. meteoric water by ±7%. If we state that the maximum uncertainty we can allow (from drilling, sampling, analyses and modelling)

should be within this annual fluctuation, the proportion of meteoric water can change by ±7% (or ±80m water column).

The uncertainty is estimated to be ±2% from drilling water contamination or ±2% from uncertainty in analyses. Both errors cause the same uncertainty concerning the representativity of the sampled water. In this case the error is ±23 m (2 / 6.86 · 80m) water column. A drilling water content of 7% results in an uncertainty of ±82 m which is more than the annual fluctuation and this makes the groundwater sample less representative of the sampled depth.

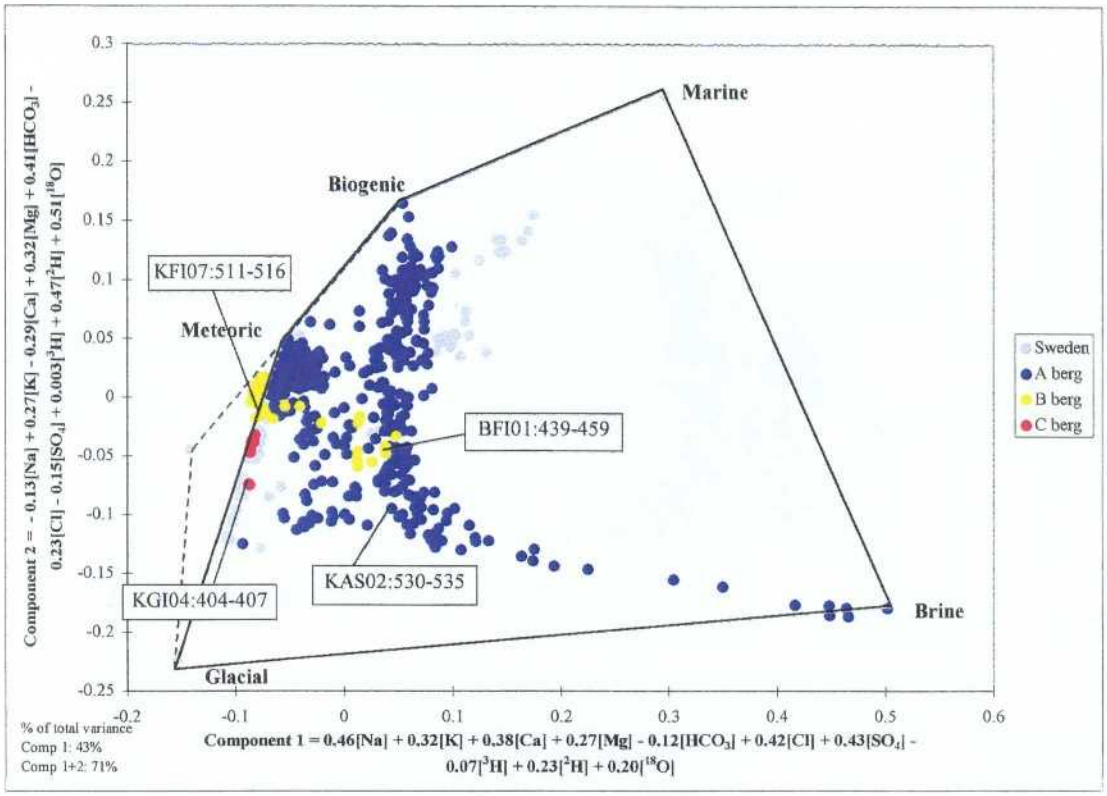
By applying the above formula the following calculations of the extent of possible uncertainties can be made for the reference sample from Aberg (KAS02:530m):

- Annual natural variation: ±7% or ±80 m water column.
- Drilling causes the major short-term disturbance of the groundwater. When drilling the KLX02 deep borehole the measurements show that the disturbance caused a movement of the non-saline/saline groundwater interface from a depth of 1000m down to 1600m (Laaksoharju et al., 1995). This means a disturbance of ±52% which is extreme in this case. Generally it is realistic to calculate with a short-term change of at least ±10% or ±117 m water column during drilling. The long-term effect and the remaining drilling are reflected in the drillwater analysis. For KAS02 the remaining effect is 0.2 % which means an uncertainty of ±0.1% or ±1.15m water column.
- By using packers placed at short distances as in KAS02 (upper packer at 530m and lower packer at 535m) the uncertainty is ±2.5m or ±0.2%. By using a long distance between the packers of say 100m the uncertainty is ±50 m water column or ±4.3%.
- The underpressure caused by pumping water at Aberg was generally 5 bars which resulted in an uncertainty of 50 m or ±25 m or ±2.2%. The positive effect of the short distances between the packers can therefore be diminished by the underpressure caused by pumping. At KLX02 extra care was taken to create an under pressure of 1 bar which caused a disturbance of ±0.45% or ±5m water column.
- Uplifting of water from great depth can cause disturbances in the form of long transport times up to 12 hours and disturbances from in-gassing or out-gassing of oxygen or carbon dioxide (Laaksoharju et al., 1995). These changes can cause precipitation of iron containing mineral phases as well as precipitation and co-precipitation of carbon containing phases. The maximum disturbance was modelled using the KAS02 reference water and altering the measured pH from 7.7 pH units to 7.2 pH units in order to simulate uptake of carbon dioxide from the atmosphere. The measured –300mv Eh was changed to +200mV to simulate storage of the sample prior to analysis. The speciation of the groundwater was calculated using WATEQF (Plummer et al. 1991). The calculation showed that the composition changed by 10%, which causes an uncertainty of ±5% or ±58m water column. At Aberg the error is much smaller since down hole in-situ pH and Eh measurements are made and

redox sensitive parameters are analysed at site or preserved for analysis. A realistic estimate is that the error from uplifting and storage is ±2% or ±23m water column.

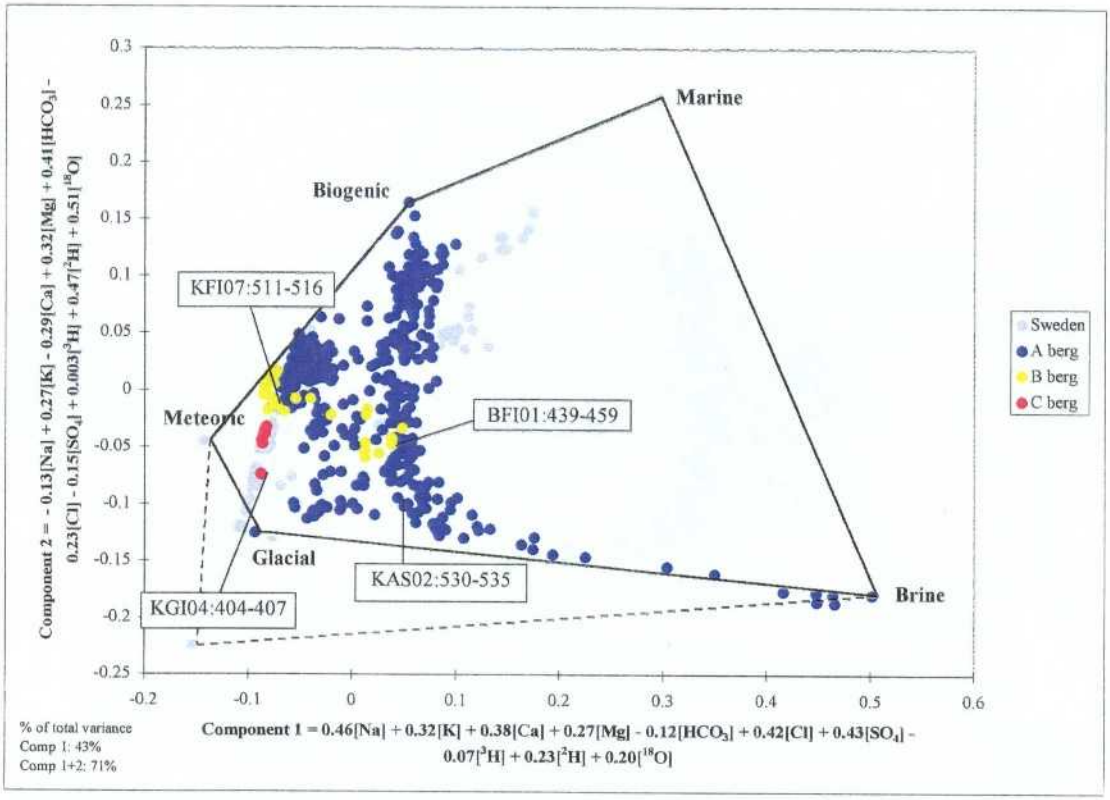
- The analytical uncertainties are reported to be in the order of 4-10% (Nilsson, 1995). The deviation can be in the order of ±2-5%, which transfers to an uncertainty of ±23-58m water column.

- The uncertainties of the groundwater models are seldom reported or even tested. M3 modelling can have severeral uncertanties which could be due to uncertanties in the measured values, conceptual uncertanties such as the measured groundwater not being a result of multi end-member mixing or the composition of the end-member being uncertain. The largest uncertanties are believed to be associated with uncertanties in the composition of end-members. The end-member composition forms the basis for the modelling and all other observations are compared to these compositions. The end-members can show a seasonal variation in the composition eg. precipitation in the winter and summer. The end-member composition becomes more uncertain the longer the modelled time; the composition of glacial meltwater is therefore more uncertain than that of modern precipitation. A test was performed in order to ascertain the maximum uncertainty of the M3 mixing calculations when changing the end-member composition. The originally selected end-members (as shown in Figure 3-4) were changed systematically to other possible extreme waters. The results of the test are shown graphically in Figure 1,2 and 3 and the the changes in % for the mixing portions of the end-members are listed in the tables. The avarage difference compared with the original model is listed. For the M3 model the average error is less than 10% which can be transferred to an uncertainty of ±5% or ±58m water column. A calculated mixing portion for eg. Aberg of 14% has an uncertainty of ±5% in absolute value. This means that the mixing portion of the Brine end-member can in fact be between 9% and 19%. This uncertainty is associated with the portions of different end-members present in the formation of the groundwater that M3 determines, and is not dependent on the uncertainty of chemical parameters such as Eh, or pH since these parameters are not included in the modelling. The reported analytical uncertainties of 4-10% for the major components do not change the uncertanty range of ±5% for the mixing calculations. The test has shown that the uncertainty in models using one water conservative element such as Cl can be several orders of magnitude larger (Laaksoharju and Wallin (eds.), 1997).



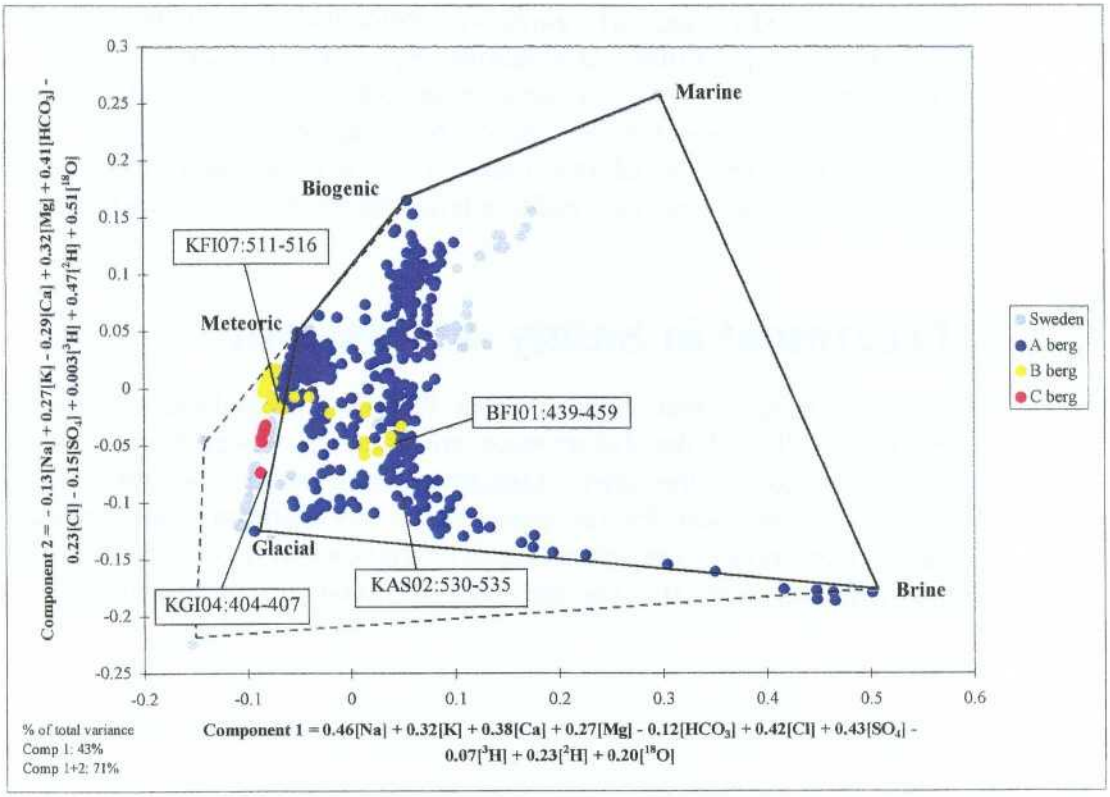
Brine (KLX02)	Glacial (Glacial)	Meteoric (KR0015B)	Biogenic (SA1094A)	Marine (Litorina)	Average
1.4 %	-7.4 %	-10.5 %	14.9 %	1.6 %	7 %

Figure 1: *The originally selected meteoric end-member as shown in Figure 3-4 was changed to another meteoric water composition (KROO15B). The results of the test are shown graphically in the above figure and the mean changes in the calculated mixing portions are listed in the table.*



Brine (KLX02)	Glacial (Prov 2B)	Meteoric (Rain 1960)	Biogenic (SA1094A)	Marine (Litorina)	Average
-0.2 %	-6.5 %	3.0 %	2.7 %	1.0 %	3 %

Figure 2: *The originally selected glacial end-member as shown in Figure 3-4 was changed to another glacial water composition (Prov, 2B). The results of the test are shown graphically in the above figure and the mean changes in the calculated mixing portions are listed in the table.*



Brine (KLX02)	Glacial (Prov 2B)	Meteoric (KR0015B)	Biogenic (SA1094A)	Marine (Litorina)	Average
0.9 %	-16.0	-5.3	17.8 %	2.5 %	8 %

Figure 3: *The originally selected meteoric and glacial end-members as shown in Figure 3-4 were changed to another meteoric and glacal water composition (KROO15B and Prov 2B). The results of the test are shown graphically in the above figure and the mean changes in the calculated mixing portions are listed in the table.*

Correlations

The above calculations are only indicative which means that the real uncertainties and correlations between the uncertainties can vary considerably from case to case. However, the above calculations do show that, using the criteria described above, a water which is representative for the sampling depth shows relatively little disturbance which is in good agreement with the discussion in Rhén & Bäckblom (eds.) 1997. The sensitivity for disturbances is determined in many cases by the prevailing hydrogeological conditions and the sampling depth. The risk is that the deeper the water and the lower the hydraulic conductivity, the larger the risk for disturbances. The calculations indicate that the positive effect from a low extraction rate can be lost if there is a long transport time up to the

surface, or through storage of the samples prior to analysis but it can be compensated for by in-situ measurements of Eh and pH. The uncertainties in the measured Eh and pH values will dramatically affect the outcome of groundwater equilibrium calculations e.g. one unit error in the pH calculation will give one unit error in the saturation index calculations of calcite. The under-saturated phase may appear over-saturated in the calculations. There is a risk that a relatively small uncertainty in one step of the sampling procedure may lead to a large uncertainty in the next step.

Treatment in Safety Assessment

The conclusion is that in most cases the SKB groundwaters reflect the sampled depth and the disturbances are generally lower than the natural annual variation. In the Safety Assessment analysis an uncertainty range of ±5% should be used for the groundwater composition. The uncertainty range covers most of the natural annual variation and in-situ, at site, off-site and modelling errors affecting the original groundwater composition.

List of SKB reports

Annual Reports

1977-78
TR 121
KBS Technical Reports 1 – 120
Summaries
Stockholm, May 1979

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TR 79-28
The KBS Annual Report 1979
KBS Technical Reports 79-01 – 79-27
Summaries
Stockholm, March 1980

1980
TR 80-26
The KBS Annual Report 1980
KBS Technical Reports 80-01 – 80-25
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The KBS Annual Report 1982
KBS Technical Reports 82-01 – 82-27
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TR 83-77
The KBS Annual Report 1983
KBS Technical Reports 83-01 – 83-76
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Stockholm, June 1984

1984
TR 85-01
Annual Research and Development Report 1984
Including Summaries of Technical Reports Issued during 1984. (Technical Reports 84-01 – 84-19)
Stockholm, June 1985

1985
TR 85-20
Annual Research and Development Report 1985
Including Summaries of Technical Reports Issued during 1985. (Technical Reports 85-01 – 85-19)
Stockholm, May 1986

1986
TR 86-31
SKB Annual Report 1986
Including Summaries of Technical Reports Issued during 1986
Stockholm, May 1987

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Including Summaries of Technical Reports Issued during 1987
Stockholm, May 1988

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Including Summaries of Technical Reports Issued during 1988
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SKB Annual Report 1989
Including Summaries of Technical Reports Issued during 1989
Stockholm, May 1990

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Including Summaries of Technical Reports Issued during 1991
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Including Summaries of Technical Reports Issued during 1992
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Including Summaries of Technical Reports Issued during 1994
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Including Summaries of Technical Reports Issued during 1995
Stockholm, May 1996

1996
TR 96-25
SKB Annual Report 1996
Including Summaries of Technical Reports Issued during 1996
Stockholm, May 1997

List of SKB Technical Reports 1998

TR 98-01
Global thermo-mechanical effects from a KBS-3 type repository. Summary report
Eva Hakami, Stig-Olof Olofsson, Hossein Hakami, Jan Israelsson
Itasca Geomekanik AB, Stockholm, Sweden
April 1998

TR 98-02
Parameters of importance to determine during geoscientific site investigation
Johan Andersson[1], Karl-Erik Almén[2], Lars O Ericsson[3], Anders Fredriksson[4], Fred Karlsson[3], Roy Stanfors[5], Anders Ström[3]
[1] QuantiSci AB
[2] KEA GEO-Konsult AB
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[4] ADG Grundteknik KB
[5] Roy Stanfors Consulting AB
June 1998