APPENDIX 1

NOMENCLATURE AND CLASSIFICATION ON FRACTURES AND FRACTURE ZONES

A1.1 NOMENCLATURE: DISCONTINUITY DOMAINS. FRACTURE ZONE - FRACTURE SWARMS - INCREASED FRACTURING

The nomenclature and classification according to *Bäckblom /1989/* treats aspects for use of nomenclature for site investigations and addresses how geological, geophysical, geohydrological results should be named. A special section is devoted to the uniqueness and completeness of investigations.

According to *Bäckblom /1989/* a fracture zone is a fracture zone - if only and only - if geological field evidence supports *zones* **with the characteristics that the intensity of natural fractures is at least two times higher than in surrounding rock**. Completely disintegrated and/or chemically altered rock is included in the definition of fracture zone.

The definition of fracture zone can be expanded by additional characteristics. A fracture zone can thus be 'a hydraulically conductive fracture zone' or a 'non-conductive fracture zone'.

During mapping in the tunnel it was found that this definition would, however, designate most fine-grained granites as fracture zones. Thus, it was necessary to add a tectonic/kinematic constraint to the definition of 'fracture zone' such as shearing, faulting and clay alteration. Sections in the tunnel with >5 fractures/m, with no obvious tectonic/kinematic influence were mapped as zones with 'increased fracturing'.

The term fracture swarm has also been used and is defined as a zone with relatively high fracture frequency, but not so high as a proper fracture zone */Wikberg et al, 1991/* with fractures essentially parallel to the orientation of the swarm boundary */Hermanson, 1995/*.

The term 'major fracture zone' was used for a feature more than about 5 m wide and extending several hundred metres. Features less than about 5 m and more than 0.1 m wide and of lesser extent were called 'minor fracture zones'.

Persistent, several metres long fractures mostly steep and estimated to be significant hydraulic conductors were called 'single open fractures'.

Classification : Discontinuity domains, level of reliability

A fracture zone is a more or less two-dimensional feature. Its extension and direction is 'certain' after investigations or measurements in several points.

To define a 'level of reliability' three separate definitions were used.

Possible is the lowest level of confidence. By additional studies the level of reliability can be raised to Probable or Certain.

Three basic cases were considered:

A Fracture zones expressed at surface, *Table A1-1*.
B Fracture zones not expressed at surface, *Table A1-2*.
C Fracture zones expressed at surface and in borehole(s) and/or underground caverns (tunnel(s) shaft(s), raise (s), *Table A1-3*.

Table A1-1 is applied to the early phase of investigations and in regions where drilling/tunnelling is not carried through.

Table A1-2 is applied to zones not observed at surface, whereas *Table A1-3* should be applied to zones that have both surface and sub-surface expressions.

Increased fracture intensity in *Tables A1-1, A1-2 and A1-3* is defined as a section where **the intensity of natural fractures is at least two times greater than in surrounding rock**.

Table A1-1. Zones observed at surface.

Reliability	**Observation***
Possible	Geophysical anomaly with extensiveness or increased fracture intensity in one outcrop.
Probable	Zone with increased fracture intensity in at least two outcrops reasonably close, or geophysical anomaly with increased fracture intensity in one outcrop.
Certain	Zone with unique characteristics between at least two fractured outcrops or exposed zone of increased fracture intensity.

* Statements on dip shall be substantiated by field evidence (i.e. dip measurements on exposed zone or geophysical measurements like VLF)

Table A1-2. Zones not observed at surface.

Reliability	Observation
Possible	Increased fracture intensity in a section of a core, interpolation between at least two boreholes with sections of increased fracture intensity.
Probable	Interpolated fracture zone with some additional unique characteristics observed (geophysical, hydrogeological, geological or geochemical) in two boreholes. Sections with increased fracture intensity in one borehole and one tunnel and with some additional unique characteristics observed.
Certain	Fracture zone with unique characteristics in three or more holes or fracture zone in two boreholes with (seismic or radar) connection in between. Sections with increased fracture intensity in two tunnels and with some additional unique characteristics observed.

Table A1-3. Zones observed at surface and in sub-surface.

Reliability	Observation
Possible	Lineament from surface investigations and geophysical anomaly (radar) in borehole.
Probable	Zone with increased fracture intensity at one outcrop interpolated with sections of increased fracture intensity in at least one borehole (tunnel) or other unique characteristics interpolated with section of increased fracture intensity in at least one borehole (tunnel) reasonably close.
Certain	Fracture zone at surface with observed direction of dip at surface and unique characteristics in at least two boreholes or tunnels.

APPENDIX 2

GEOHYDROLOGICAL DATA

A2.1 REGIONAL SCALE MODEL

Shore displacement.
Coordinates for hydraulic conductor domains.
Hydraulic conductivity of hydraulic rock mass domains -100 m scale.
Hydraulic conductivity presented for boreholes -10 m scale (Ävrö).

Explanation to Tables

Zonation

Upper level	: Vertical depth to upper part of interval.	(m)
Lower level	: Vertical depth to lower part of interval	(m)

Data for individual boreholes

Upper level	: Vertical depth to upper part of interval.	(m)
Lower level	: Vertical depth to lower part of interval.	(m)
Mean	: Exp_{10}(arithmetic mean of Log_{10} (K))	(K: m/s)
Median	: Exp_{10}(median of Log_{10} (K))	(K: m/s)
sLog10 K	: Standard deviation of Log_{10} (K))	(K: m/s)
Conf.lim.(xx%)	: Confidence limit for mean at confidence level xx	
X coordinate	: Northing in the Äspö coordinate system	(m)
Y coordinate	: Easting in the Äspö coordinate system	(m)
ET	: No data available	
"rock" hydraulic 2)	: Data based on samples outside the deterministic conductor domains ("zones" in Appendix	
"zones"	:Data based on samples interpreted to represent the deterministic hydraulic conductor domains.	

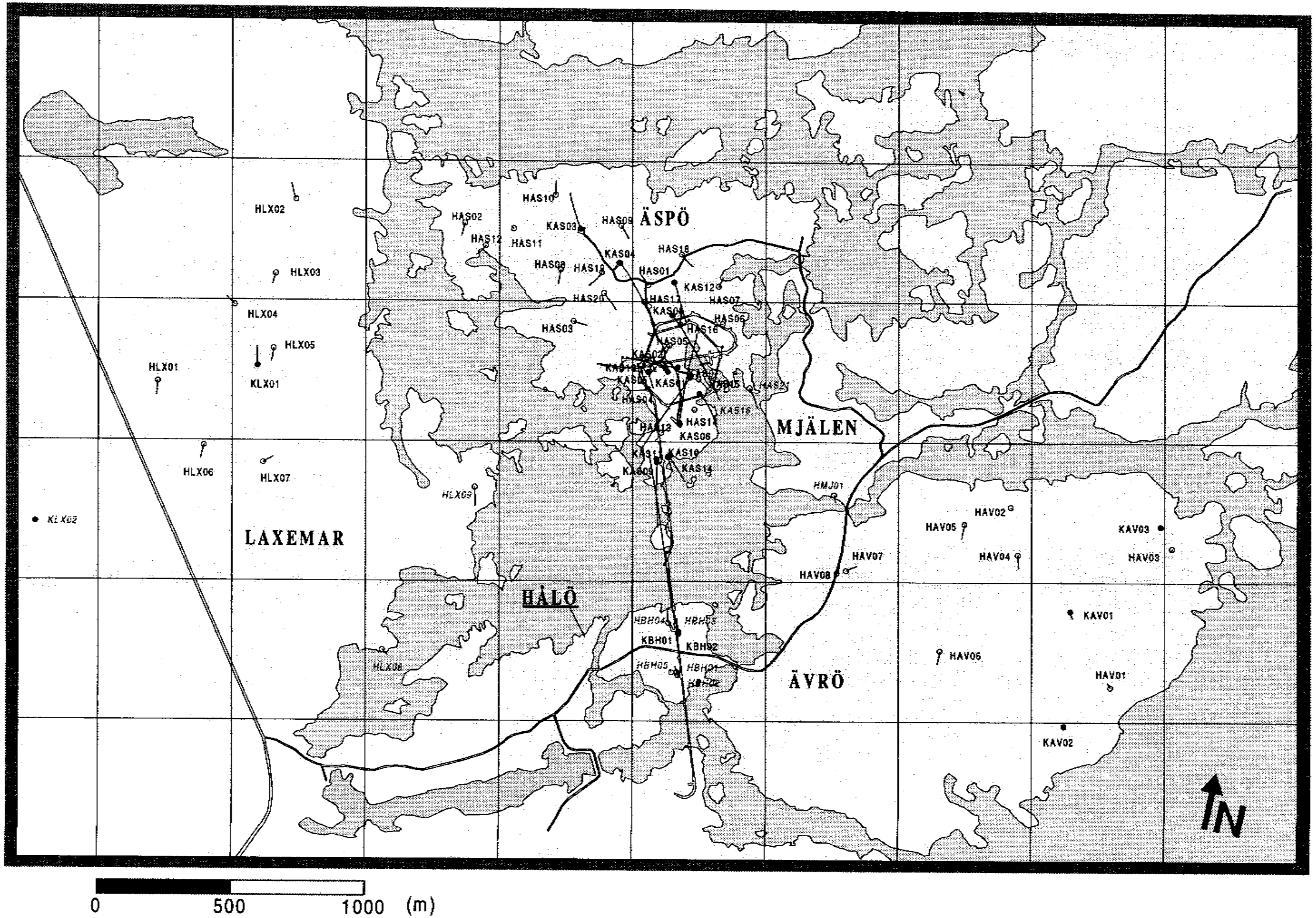


Figure A2-1. Plan over boreholes. Äspö coordinate system for lower left corner in figure:(Easting= -300, Northing= 5500), (m).

Table A2-1. Shore-displacement curve for Oskarshamn (Interpreted from figure 5-7 in *Björk and Svensson /1992/*. (years in $^{14}C_{years}$ $T_{1/2}$ = 5568).

Time (year BP)	**Level (m, RH70)**
0	0.00
-8000	15.31
-8250	15.66
-8500	16.71
-9000	19.49
-9200	20.88
-9350	27.84
-9500	25.06
-9600	18.45
-9900	25.06
-10100	27.15
-10300	34.45
-10301	58.47
-10950	69.61
-11050	73.78
-11900	87.70
-12150	98.14

Table A2-2. Structural model of the regional area. Coordinates of identified major structures. Coordinates correspond to start and end positions, crossings with other structures and direction changes. Coordinates given in the Äspö System.

Fracture zone id.no.	X-coordinate (m)	Y-coordinate (m)	Crossing
SFZ01	13380	-3190	Start
	12910	-1475	SFZ02
	12380	760	
	12000	2620	SFZ15
	11620	4760	SFZ10
	10950	8550	End
SFZ02	14250	-1095	Start
	12910	-1475	SFZ01
	11760	-1830	
	10640	-2050	
	9760	-2190	
	8905	-2380	
	8310	-2570	SFZ03
	7285	-3025	
	5335	-3571	
	4690	-3740	SFZ04
	3620	-3950	SFZ05
	2640	-4140	End
SFZ03	8785	-4140	Start
	8310	-2570	SFZ02
	8210	-1950	SFZ06
	8120	-1330	
	8070	1120	SFZ14
	8080	2670	SFZ13
	8080	2690	SFZ07
	8085	3000	
	8020	3710	SFZ12, SFZ10
	7900	5200	
	7930	5800	SFZ05
	8000	8330	End
SFZ04	3520	-5240	Start
	4690	-3740	SFZ02
	5285	-3050	
	5570	-2570	
	6670	-590	
	7160	200	
	7860	1095	SFZ14, End
SFZ05	2880	-5310	Start
	3620	-3950	SFZ02
	4300	-2670	
	5140	-1000	
	5285	-480	SFZ07, SFZ12
	5595	760	
	6000	2165	
	6810	3520	SFZ10
	6975	3810	SFZ11
	7340	4520	
	7930	5800	SFZ03, End

Table A2-2. continued.

Fracture zone id.no.	X-coordinate (m)	Y-coordinate (m)	Crossing
SFZ06	8210	-1950	SFZ03, Start
	8830	-760	
	9140	-50	SFZ13
	9360	715	
	9450	2285	SFZ15
	9740	4285	SFZ10
	9920	5595	
	10230	8330	End
SFZ07 (EW-1 on Äspö)*	2545	-3570	Start
	5285	-480	SFZ05
	6525	905	SFZ14
	6950	1215	
	7380	1665	
	8080	2690	SFZ03, End
SFZ08	3095	-70	Start
	2260	2380	SFZ09
	2190	2785	SFZ10
	1240	6545	End
SFZ09	1570	1165	Start
	2260	2380	SFZ08
	2525	2810	SFZ10
	4640	7240	End
SFZ10	1260	2670	Start
	2190	2785	SFZ08
	2525	2810	SFZ09
	6810	3520	SFZ05
	7000	3550	SFZ11
	8020	3710	SFZ03, SFZ12
	9740	4285	SFZ06
	11620	4760	SFZ01
	13000	5050	End
SFZ11	7160	2640	Start, SFZ12
	7000	3550	SFZ10
	6975	3810	SFZ05
	6165	7570	End
SFZ12 (NE-1)*	5285	-480	Start, SFZ05, SFZ07
	7070	2420	
	7160	2640	SFZ11
	8020	3710	SFZ03, SFZ10, End
SFZ13	9140	-50	Start, SFZ06
	8500	1230	SFZ14
	8070	1120	SFZ03, End
SFZ14	6525	905	Start, SFZ07
	7860	1095	SFZ04
	8070	2670	SFZ03
	8500	1230	SFZ13, End

* Designation of corresponding fracture zone in the structural model of the inner Äspö area.

Table A2-2. continued.

Fracture zone id.no.	X-coordinate (m)	Y-coordinate (m)	Crossing
SFZ15	9450	2285	Start, SFZ06
	12000	2620	SFZ01
	13430	2810	End

Table A2-3. Hydraulic conductivity of rock mass domains. Regional area. Data: SGU wells and Äspö HRL data. Test scale approximately 100m down to lower level -600 m and approximately 300 m below -600 m. (”rock”and “zones”).

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-200	264	1.3E-07	1.3E-07	0.96	1.7E-07	1.0E-07	1.2E-06	1.4E-08
-200	-400	30	2.0E-07	2.2E-07	0.65	3.5E-07	1.1E-07	8.9E-07	4.4E-08
-400	-600	9	2.6E-07	1.5E-07	0.79	1.0E-06	6.7E-08	1.6E-06	4.3E-08
-600	-2000	11	4.7E-08	3.2E-08	0.72	1.4E-07	1.6E-08	2.4E-07	9.1E-09
0	-2000	314	1.3E-07	1.3E-07	0.93	1.7E-07	1.1E-07	1.1E-06	1.6E-08

Table A2-4. Hydraulic conductivity presented for boreholes. Ävrö area. Test scale 10 m. (“rock” and “zones”).

Borehole	Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf. lim. (2.5 %)	Mean + st.dev	Mean - st.dev
KAV 01	20	710	69	3.8E-09	4.9E-09	1.59	9.0E-09	1.5E-09	1.4E-07	9.6E-11
KAV 03	10	230	22	3.2E-07	2.2E-07	1.39	1.3E-06	7.8E-08	8.0E-06	1.3E-08
KAV 01 & KAV 03			91	1.1E-08	1.3E-08	1.75	2.5E-08	4.7E-09	6.2E-07	2.0E-10

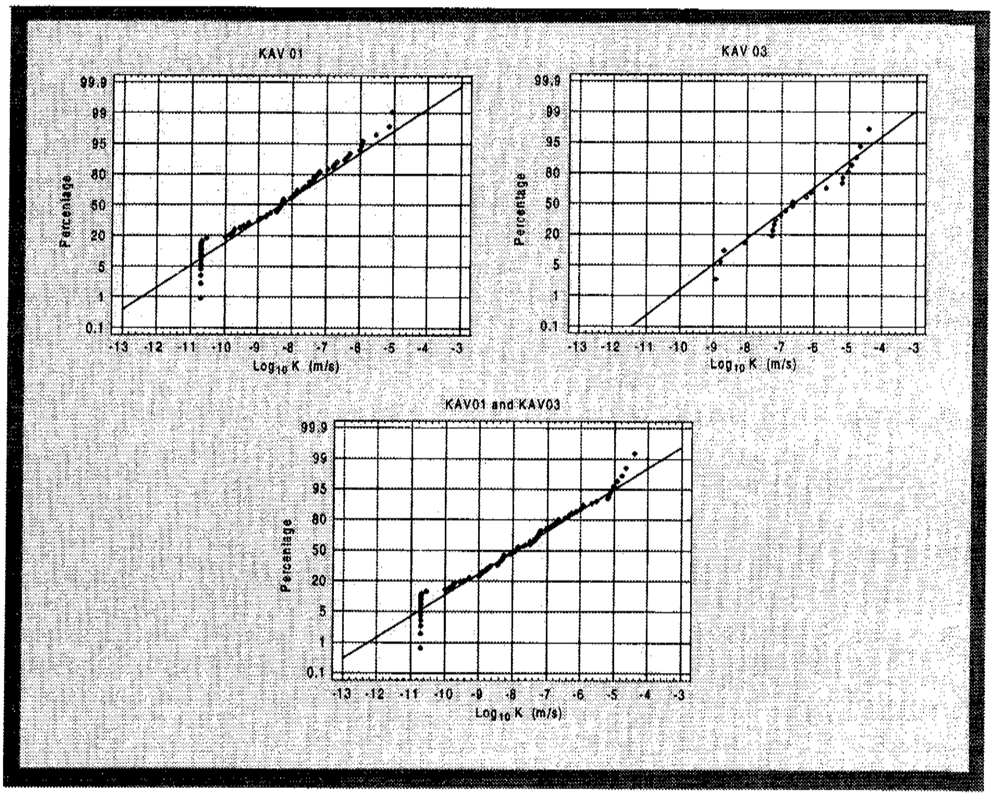


Figure A2-2. *Normal probability plots for Log10(K) based on data from KAV01 and KAV03 shown in Table A2-4. Ävrö area. Test scale 10 m.*

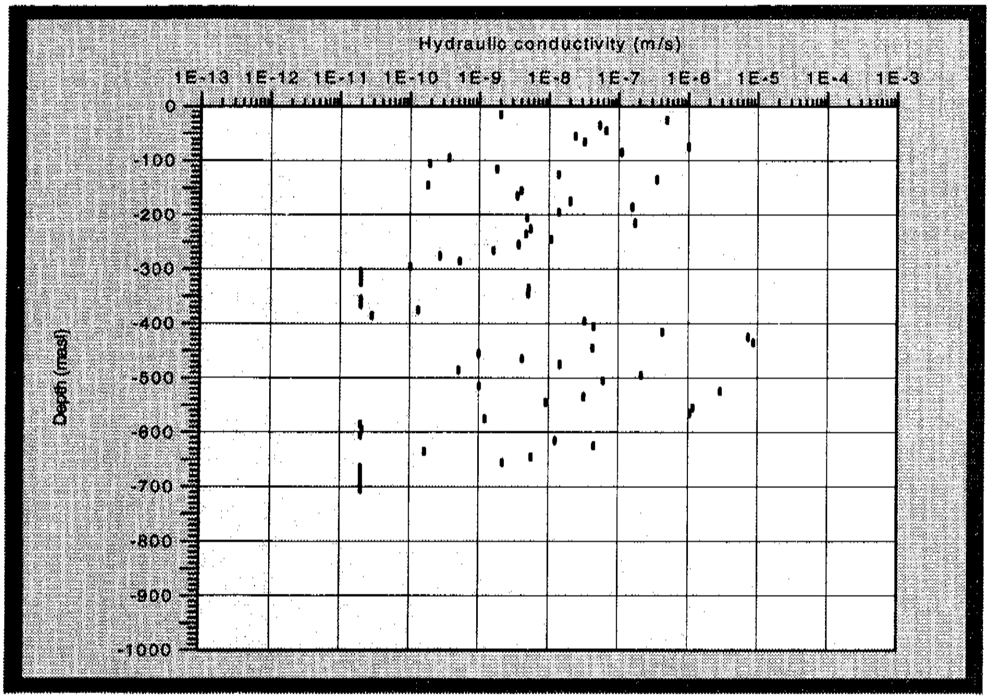


Figure A2-3. *Distribution of hydraulic conductivity in KAV01. Test scale 10 m.*

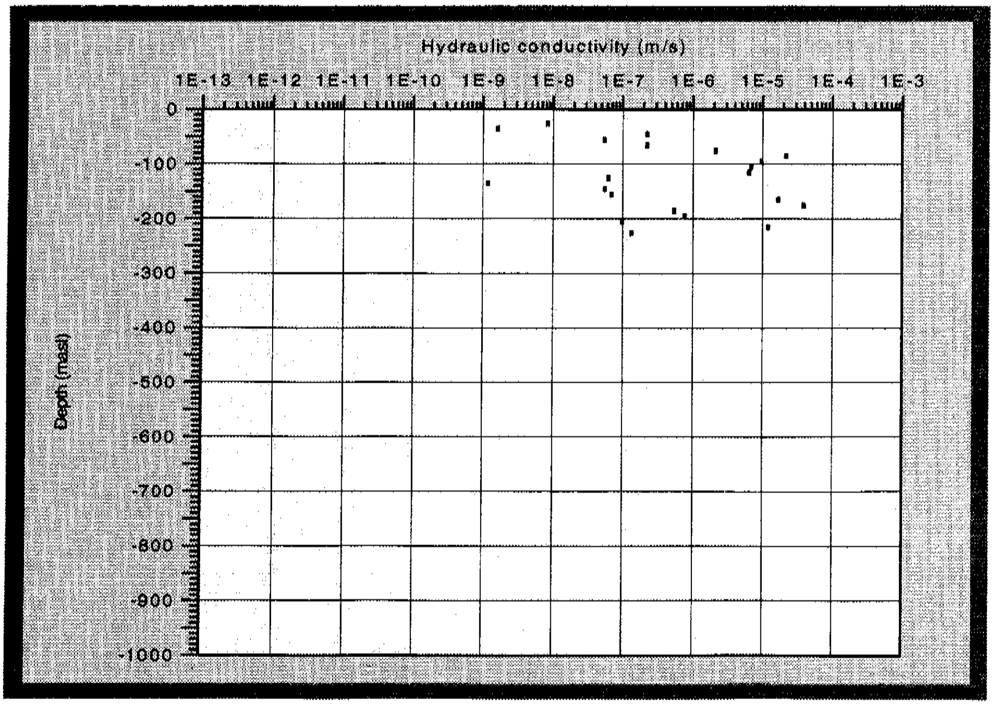


Figure A2-4. *Distribution of hydraulic conductivity in KAV03. Test scale 10 m.*

A2.2 SITE SCALE MODEL (Äspö and KLX01)

Coordinates hydraulic conductor domain.
Hydraulic properties of hydraulic conductor domain.
Hydraulic conductivity of rock mass domains -100 m scale.
Hydraulic conductivity presented for boreholes -30 m scale.
Hydraulic conductivity of rock mass domains -30 m scale.
Hydraulic conductivity presented for boreholes -3 m scale.
Hydraulic conductivity of rock mass domains -3 m scale.
Hydraulic conductivity of lithological units -3 m scale.
Hydraulic conductivity presented for probe holes, tunnel section 1400-3600, -15 m scale.
Data used for scaling of the effective hydraulic conductivity.
Water flow into the tunnel.
Salinity of water flowing into the tunnel.
Salinity of the ground water before excavation of the Äspö HRL tunnel.
RMR and E_d for tunnel section 1400-3600 m.

Explanation to Tables

Zonation

Upper level	: Vertical depth to upper part of interval.	(m)
Lower level	: Vertical depth to lower part of interval	(m)

Data for individual boreholes

Upper level	: Length along borehole to upper part of interval.	(m)
Lower level	: Length along borehole to lower part of interval.	(m)
Mean	: Exp_{10}(arithmetic mean of Log_{10} (K))	(K: m/s)
Median	: Exp_{10}(median of Log_{10} (K))	(K: m/s)
sLog10 K	: Standard deviation of Log_{10} (K))	(K: m/s)
Conf.lim.(xx%)	: Confidence limit for mean at confidence level xx If sample size < 7 the confidence limit for mean has not been plotted as the limits are considered uncertain.	
X coordinate	: Northing in the Äspö coordinate system.	(m)
Y coordinate	: Easting in the Äspö coordinate system.	(m)
ET	: No data available.	

"rock"	: Data based on samples outside the deterministic hydraulic conductor domains ("zones" in *Table A2-5*).
"zones" deterministic	:Data based on samples interpreted to represent the hydraulic conductor domains, shown in *Table A2-5*.

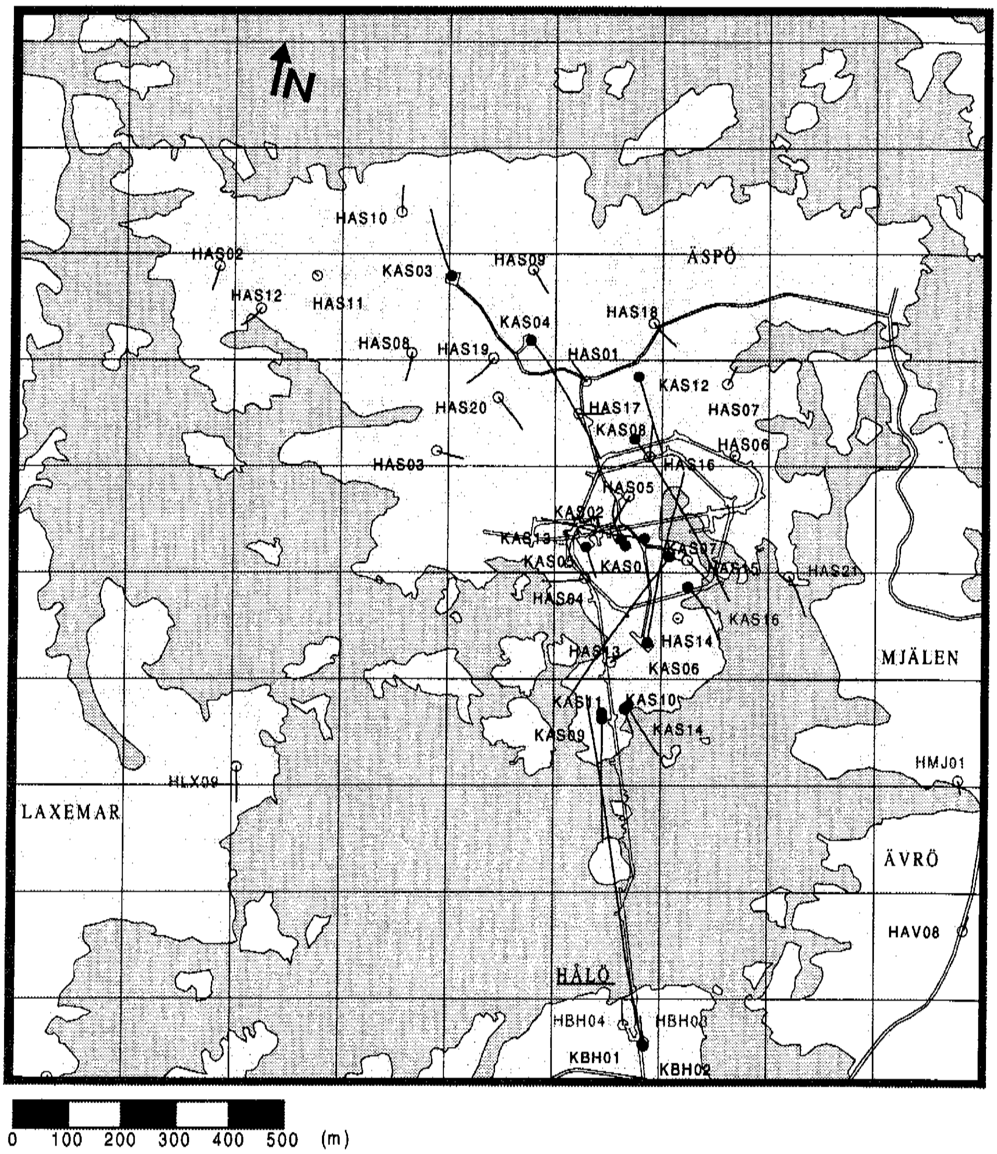


Figure A2-5. *Plan over boreholes. Äspö coordinate system for lower left corner in figure: (Easting=1000, Northing=6250), (m).*

Table A2-5. Location of hydraulic conductors. The hydraulic conductors are in this table approximated to planes. Assumed extension of each plane is discussed in *Table A2-6*. Coordinates for zones are given in the local Äspö-system. w = water bearing structure. p = predicted structure /*Wikberg et al, 1991*/. r = revised structure /*Stanfors et al, 1994*/. n= new structure. The conductors are illustrated in *Figure 6-31* and part of them schematically outlined in *Figure 4-19* and *4-27*.

Zone		X-coordinate (m)	Y-coordinate (m)	Z (masl)
$EW\text{-}1_r$	88°SE	7482.0	1811.5	0
		7698.3	2197.1	0
		7575.4	2000.0	-327.4
$EW\text{-}1_r$	78°SE	7433.6	1838.7	0
		7649.8	2224.3	0
		7500.0	2110.9	-369.5
$EW\text{-}3_r$	79°S	7093.0	2047.7	0
		7143.1	2289.2	0
		7010.0	2166.5	-542.2
$EW\text{-}7_r$	81°SE	6418.9	2023.7	0
		6504.7	2343.8	0
		6428.2	2200.0	-231.8
$NE\text{-}1_r$	70°NW	6807.6	1967.2	0
		7005.9	2350.7	0
		7135.2	2054.6	-689.1
$NE\text{-}1_r$	75°NW	6807.6	1967.2	0
		7005.9	2350.7	0
		7081.0	2082.6	-708.4
$NE\text{-}2_r$	77°SE	7038.5	1829.9	0
		7540.7	2194.8	0
		7250.0	2083.3	-349.4
$NE\text{-}3_r$	80°NW	6495.5	1984.3	0
		6650.7	2253.1	0
		6610.0	2094.7	-233.2
$NE\text{-}3_r$	70°NW	6499.7	1983.1	0
		6654.9	2251.9	0
		6650.0	2076.0	-221.9
$NE\text{-}4_r$	71°SE	6443.0	2016.6	0
		6569.3	2300.2	0
		6440.0	2197.9	-224.5
$NE\text{-}4_r$	78°SE	6448.8	2010.3	0
		6596.9	2283.1	0
		6480.0	2169.6	-232.2
$NW\text{-}1_{wp}$	30°NE	7882.0	1257.6	0
		7510.3	1600.0	0
		7934.5	1790.0	-246.6
$NNW\text{-}1_{wp}$	(vertical)	7538.9	2039.4	
		7151.9	2218.6	

Table A2-5. continued.

Zone		X-coordinate (m)	Y-coordinate (m)	Z (masl)
NNW-2_{wr}	(vertical)	7484.1	2134.6	
		7106.1	2300.2	
NNW-3_{wp}	(vertical)	7025.4	2143.6	
		6812.9	2136.9	
NNW-4_{wr}	85°NE	7391.8	2275.3	0
		7184.0	2301.7	0
		7300.0	2325.5	-436.7
NNW-5_{wp}	(vertical)	7394.1	1962.8	
		6421.1	2020.8	
NNW-6_{wp}	(vertical)	7058.1	2298.7	
		6529.1	2373.7	
NNW-7_{wn}	85°NE	7492.2	1967.6	0
		7129.2	2135.7	0
		7299.3	2074.7	-185
NNW-8_{wn}	(vertical)	8060	1540	-300
		7570	2030	-300
		8060	1540	-700
		7570	2030	-700

Table A2-6. Deterministic hydraulic structures to be used for ground water flow modelling. If the extension is not known of a zone at deeper levels and/or outside Äspö the zone is assumed to terminate at the model boundaries or at zones outside Äspö, if nothing else is said in the comments of the extension on the zone.

Zone	Comments on extension of the zone
EW-$1N_r$	This conductor explains some of the hydraulic responses in the upper part of KAS04 during some of the interference tests . The conductor is assumed to be in contact with NNW-8. Possibly there are several conductors causing the connectivity between KAS03 and KAS04 but so far it has not been possible to resolve these. The rock mass between EW-1N and EW-1S is partly low conductive perpendicular to these conductor.
EW-$1S_r$	This conductor explains some of the hydraulic responses in the E-W direction that was seen during the construction of the Äspö HRL. The conductors NNW-1, NNW-2 and NNW-4 are assumed to be in contact with EW-1S.
EW-3_r	The conductor is assumed to stop at NE-1 and SFZ14.
EW-7_r	The conductor is assumed to penetrate into and terminate at NE-4 to the west.
NE-1_r	In *Table A2-5* two dips are given which more or less gives the boundaries of the conductor at approximately Z = 180 m. The direction may be approximated with the average values of X, Y and Z for NE-1, 70°NW and NE-1, 75°NW.
NE-2_r	The conductor is assumed to intersect all NNW structures but terminate at EW-1, 78°SE and EW-3.

Table A2-6. continued.

NE-3_r	In *Table A2-5* two dips are given which more or less gives the boundaries of the conductor at approximately Z= -140 m. The direction may be approximated with the average values of X, Y and Z for NE-3, 80°NW and NE-3, 70°NW.
NE-4_r	In *Table A2-5* two dips are given which more or less gives the boundaries of the conductor at approximately Z = 110 m. The direction may be approximated with the average values of X, Y and Z for NE-4, 71°SE and NE-4, 78°SE.
NW-1_{wp}	The conductor is assumed to terminate to the south at EW-1N, 88°SE. This zone explains some of the hydraulic responses during some of the interference tests performed in KAS03. Possibly there are several conductors causing the connectivity between KAS03 and the percussion boreholes west of KAS03, but so far it has not been possible to resolve these. The conductor should be considered as possible.
NNW-1_{wp}	The conductor is assumed to terminate at EW-3 and EW-1S, 78°SE.
NNW-2_{wr}	The conductor is assumed to intersect EW-3 and terminates at NE-1 and EW-1S, 78°SE. The zone is in good contact with NE-1.
NNW-3_{wp}	The horizontal extension is assumed to limited by the coordinates given in *Table* A2-5. The extension towards the depth is badly known. The conductor should be considered as possible.
NNW-4_{wr}	The conductor intersects EW-3 and NE-2 and terminate at NE-1 and EW-1, 78°SE. The zone is in good contact with NE-1_r.
NNW-5_{wp}	The conductor intersect EW-3, NE-1, NE-2 and NE-3. The horizontal extension is limited to the north by the coordinates in *Table A2-5* and to the south the conductor terminates at NE-4. The conductor should be considered as possible.
NNW-6_{wp}	The conductor is assumed to intersect NE-1, NE-3 and NE-4 and terminate at NE-1 and EW-7. The conductor should be considered as possible.
NNW-7_{wn}	The conductor is considered possible and is assumed to terminate at EW-3 and EW-1S, 78°SE. The conductor is assumed to intersect the elevator shaft at level -185 m.
NNW-8_{wn}	New conductor not shown on figures. This conductor explains some of the hydraulic responses during some of the interference tests in KAS03. The conductor is considered possible and terminates at EW-1N, 88°SE and about 600 m to the North of EW-1N . The conductor intersects or is close to KAS03. Possibly there are several conductors causing the connectivity between KAS03 and KAS04 but so far it has not been possible to resolve these. The extension is assumed to be approximately within the coordinates given in Table A2-5.

Table A2-7. Interpreted hydrological properties of hydraulic conductors. Width estimated from mapping in the tunnel and interpreted intersections with boreholes. The value given should be considered as an approximative value. Transmissivity = T, Storativity = S, Flow porosity = n_e. Uncertain values or based on expert judgement within parenthesis. The widths of the zones are uncertain. Most likly the widths varies along the zones. See also *Table A2-8*.

Zone	Width (m)	T (m^2/s) $x \cdot 10^{-5}$	S (-) $x \cdot 10^{-5}$	n_e (%)	Comments
EW-1N_r	(30)	*	-	-	
EW-1S_r	(30)	*	-	-	
EW-3_r	15	*	-		Z = 0 to -300 m. There are tests in KAS06 and in the tunnel that indicate values approximately as the given. There are geological indications that the core of the zone should be low conductive, at least partly. The transmissivity given is therefore assumed to represent the outer part of the zone.
EW-3_r	(15)	0.05	-	-	Z < -300 m. Injection tests in KAS07 indicate low transmissivity where EW-3 is interpreted to intersect KAS07.
EW-7_r	(10)	*	-	-	
NE-1_r	30	*	2.6	0.7	Evaluation of a simple tracer test gave a range (depending on the concept for the flow field) of flow porosity of 0.06 % - 2.2 %. The evaluation of spread of the grout around the tunnel gave a range of flow porosity of 0.07 % - 1 %. */Rhén and Stanfors, 1993/.*
NE-2_r	5	*	-	-	The zone is possibly more transmissive at levels higher than Z -250 m.
NE-3_r	50	*	-	-	
NE-4_r	40	*	-	-	
NW-1_{wp}	(10)	*	-	-	
NNW-1_{wp}	(20)	*	0.5	-	
NNW-2_{wp}	(20)	*	0.2	0.34	Evaluation of LPT2 gave a range (depending on the concept for the flow field) of the flow porosity of 0.02 % - 0.1 %. */Rhén et al,. 1992/.*
NNW-3_{wp}	(20)	2	-	-	
NNW-4_{wr}	10	*	-	-	
NNW-5_{wp}	(20)	*	-	-	
NNW-6_{wp}	(20)	(1.4)	-	-	
NNW-7_{wn}	(20)	*	-	-	
NNW-8_{wn}	(20)	*	-	-	

* See *Table A2-8*.

Table A2-8. Transmissivity of hydraulic conductor domains based on results from hydraulic tests and interpreted intersections of the Äspö HRL tunnel and boreholes. The Äspö area. The hydraulic conductor domains are approximated as planar features generally reaching the surface. See also *Table A2-7*. (Due to calibration of a groundwater flow model some of the properties were changed in the model, see *Chapter 8*).

Zone (-)	Sample size (-)	Mean (m^2/s)	Median (m^2/s)	s (Log10 T) (-)	Conf.lim.(97.5 %) (m^2/s)	Conf.lim.(2.5 %) (m^2/s)	Mean + st.dev (m^2/s)	Mean - st.dev (m^2/s)
EW-1N	4	5.2E-07	1.5E-06	1.60	1.8E-04	1.5E-09	2.1E-05	1.3E-08
EW-1S	4	1.2E-05	2.2E-05	1.17	8.8E-04	1.7E-07	1.8E-04	8.1E-07
EW-3	4	1.7E-05	2.4E-05	0.54	1.2E-04	2.4E-06	5.9E-05	5.0E-06
EW-7	3	1.5E-05	6.8E-05	1.27	2.1E-02	1.0E-08	2.7E-04	7.8E-07
NE-1	16	2.2E-04	3.0E-04	0.51	4.2E-04	1.2E-04	7.2E-04	6.9E-05
NE-2	12	1.2E-07	4.1E-07	2.14	2.8E-06	5.3E-09	1.7E-05	8.8E-10
NE-3	9	3.2E-04	2.9E-04	0.46	7.2E-04	1.4E-04	9.2E-04	1.1E-04
NE-4	8	3.1E-05	3.0E-05	0.79	1.4E-04	6.8E-06	1.9E-04	5.0E-06
NNW-1	7	8.6E-06	1.1E-05	0.82	4.9E-05	1.5E-06	5.6E-05	1.3E-06
NNW-2	4	2.4E-05	5.6E-05	1.06	4.4E-03	1.3E-07	2.7E-04	2.1E-06
NNW-4	8	6.5E-05	1.5E-04	1.50	1.2E-03	3.6E-06	2.1E-03	2.1E-06
NNW-5	3	4.0E-06	2.0E-06	0.84	4.9E-04	3.3E-08	2.8E-05	5.9E-07
NNW-7	5	7.5E-06	4.8E-06	0.87	8.9E-05	6.3E-07	5.5E-05	1.0E-06
NNW-8	3	8.4E-06	1.0E-05	0.13	1.8E-05	4.1E-06	1.1E-05	6.3E-06
NW-1	3	4.1E-07	1.7E-07	1.08	2.0E-04	8.4E-10	5.0E-06	3.4E-08

Table A2-9. Statistics of transmissivity of hydraulic conductors shown in *Table A2-8*. Zonation. Äspö area.

Upper level	Lower level	Sample size	Mean	Median	s (Log10 T)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	18	4.9E-06	1.1E-05	1.36	2.3E-05	1.0E-06	1.1E-04	2.1E-07
-100	-200	28	9.9E-05	1.8E-04	0.93	2.3E-04	4.3E-05	8.4E-04	1.2E-05
-200	-300	19	1.3E-05	1.1E-05	1.26	5.4E-05	3.3E-06	2.4E-04	7.4E-07
-300	-400	16	1.8E-06	1.0E-05	2.36	3.3E-05	9.9E-08	4.2E-04	7.8E-09
-400	-500	10	1.0E-05	1.8E-05	1.20	7.2E-05	1.4E-06	1.6E-04	6.4E-07
-500	-600	ET	ET	ET	ET	ET	ET	ET	ET
-600	-700	ET	ET	ET	ET	ET	ET	ET	ET
-700	-800	ET	ET	ET	ET	ET	ET	ET	ET
0	-500	91	1.4E-05	3.1E-05	1.55	2.9E-05	6.5E-06	4.9E-04	3.9E-07

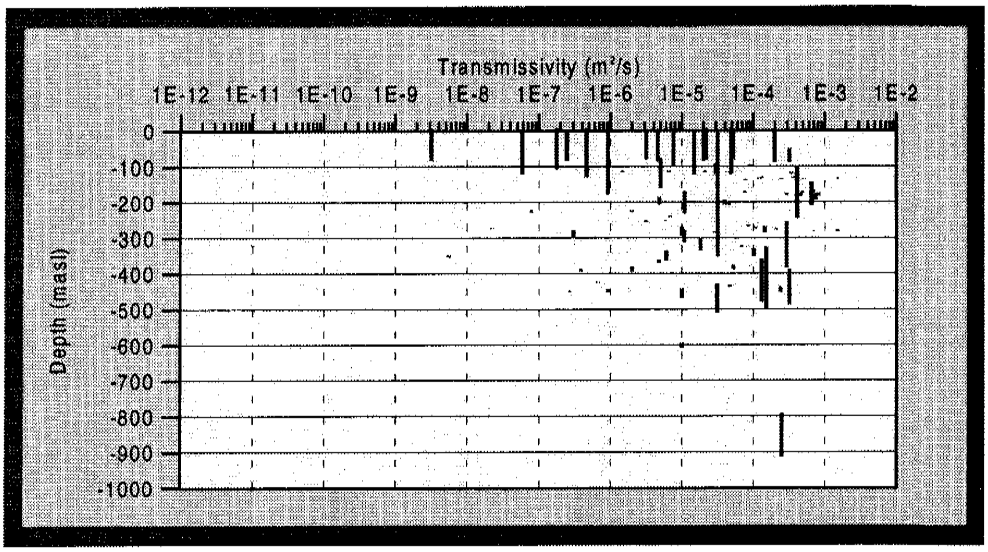


Figure A2-6. Distribution of transmissivities of hydraulic conductors shown in Table A2-8. Äspö area.

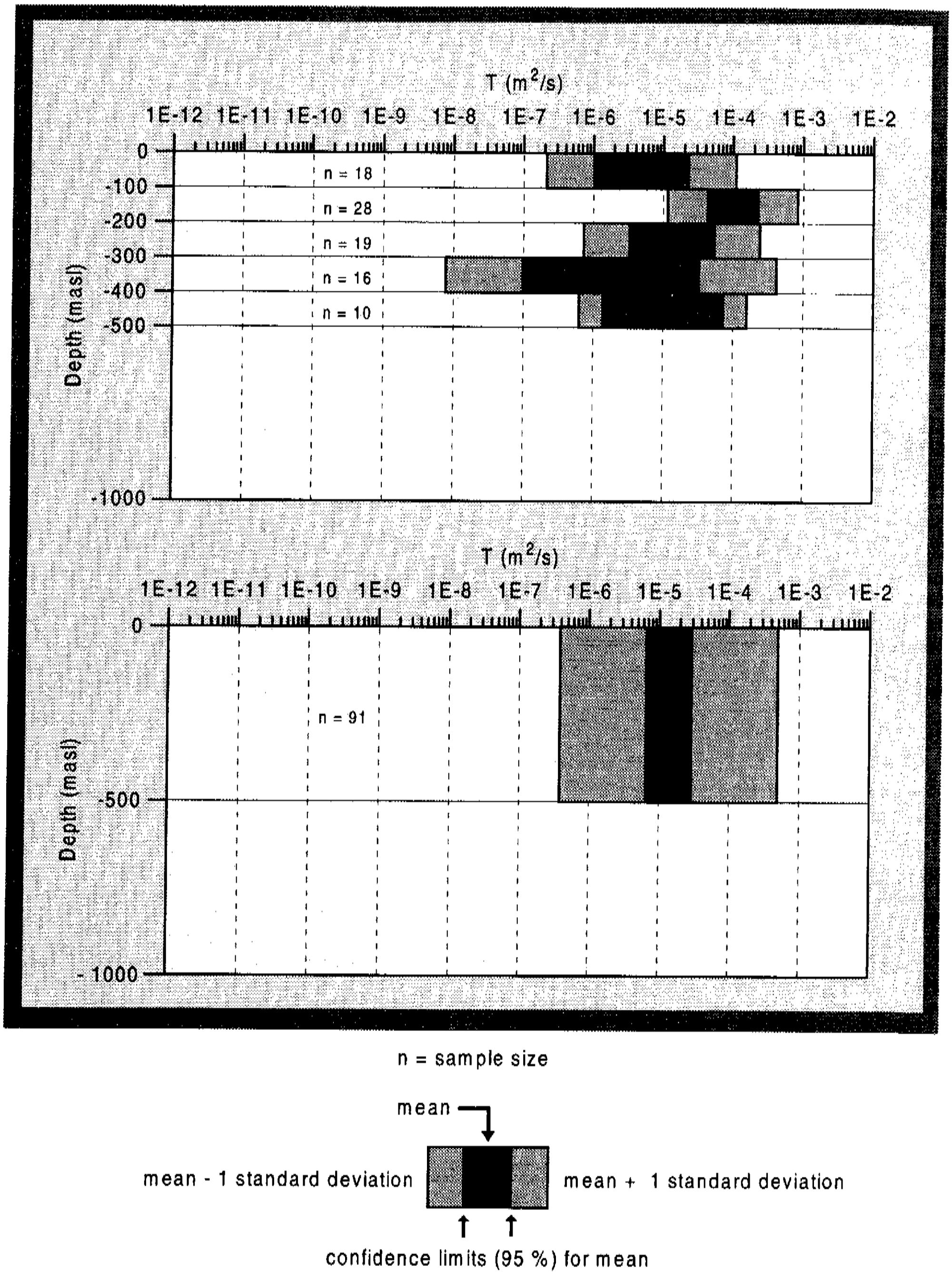


Figure A2-7. *Statistics of transmissivity of hydraulic conductors shown in Table A2-9. Zonation. Äspö area.*

Table A2-10. Hydraulic conductivity of rock mass domains. Äspö island. Test scale 50-200 m. Zonation."rock"and "zones". Tests in NE-1 and south of Äspö are not included in the data used.

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-200	36	2.2E-08	3.3E-08	1.09	5.2E-08	9.6E-09	2.8E-07	1.8E-09
-200	-400	25	1.4E-07	1.3E-07	0.62	2.5E-07	7.9E-08	5.8E-07	3.4E-08
-400	-600	8	2.3E-07	1.3E-07	0.83	1.1E-06	4.8E-08	1.6E-06	3.5E-08
-600	-1000	3	1.4E-07	8.6E-08	1.07	6.4E-05	3.1E-10	1.7E-06	1.2E-08
0	-1000	72	6.0E-08	7.4E-08	1.00	1.0E-07	3.5E-08	5.9E-07	6.0E-09

Table A2-11. Hydraulic conductivity of rock mass domains. Äspö island. Test scale 50-200 m. Zonation. "rock". Tests in NE-1 and south of Äspö are not included in the data used.

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-200	22	2.8E-08	2.6E-08	1.09	8.4E-08	9.1E-09	3.4E-07	2.2E-09
-200	-400	12	7.9E-08	9.1E-08	0.58	1.8E-07	3.4E-08	3.0E-07	2.1E-08
-400	-600	2	1.0E-07	1.0E-07	0.24	1.6E-05	6.4E-10	1.7E-07	5.7E-08
-600	-1000	1	1.6E-08	1.6E-08	0.00	ET	ET	1.6E-08	1.6E-08
0	-1000	37	4.1E-08	5.8E-08	0.92	8.3E-08	2.0E-08	3.4E-07	4.9E-09

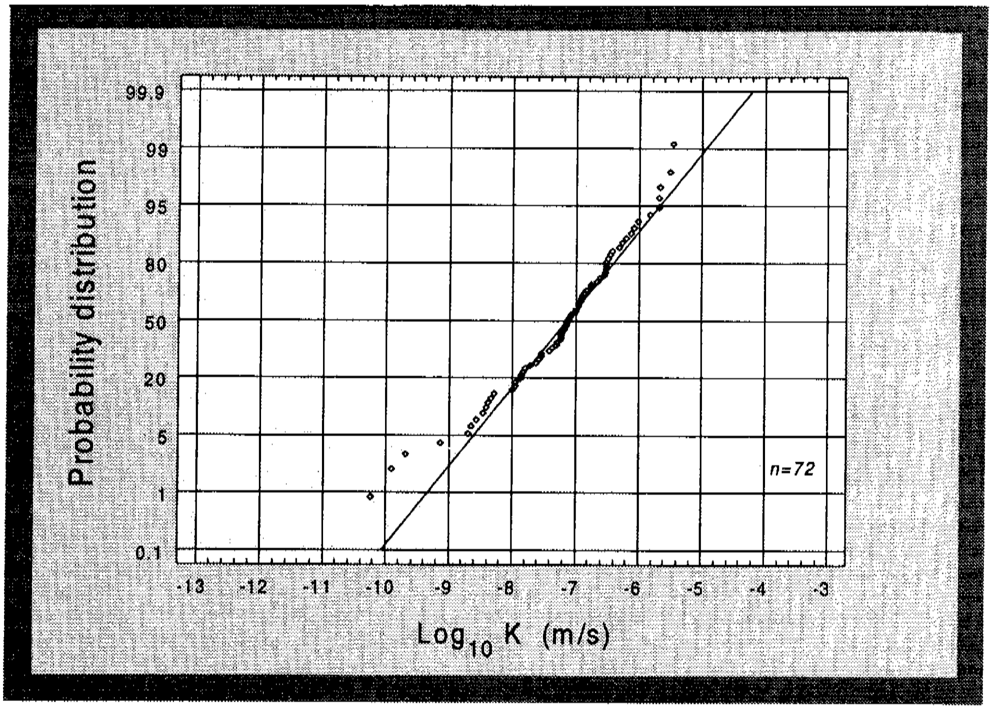


Figure A2-8. *Normal probability plots for Log10(K) based on data from Äspö island shown in Table A2-10. "rock" and "zones". Tests in NE-1 and south of Äspö are not included in the data used. Test scale 50-200 m.*

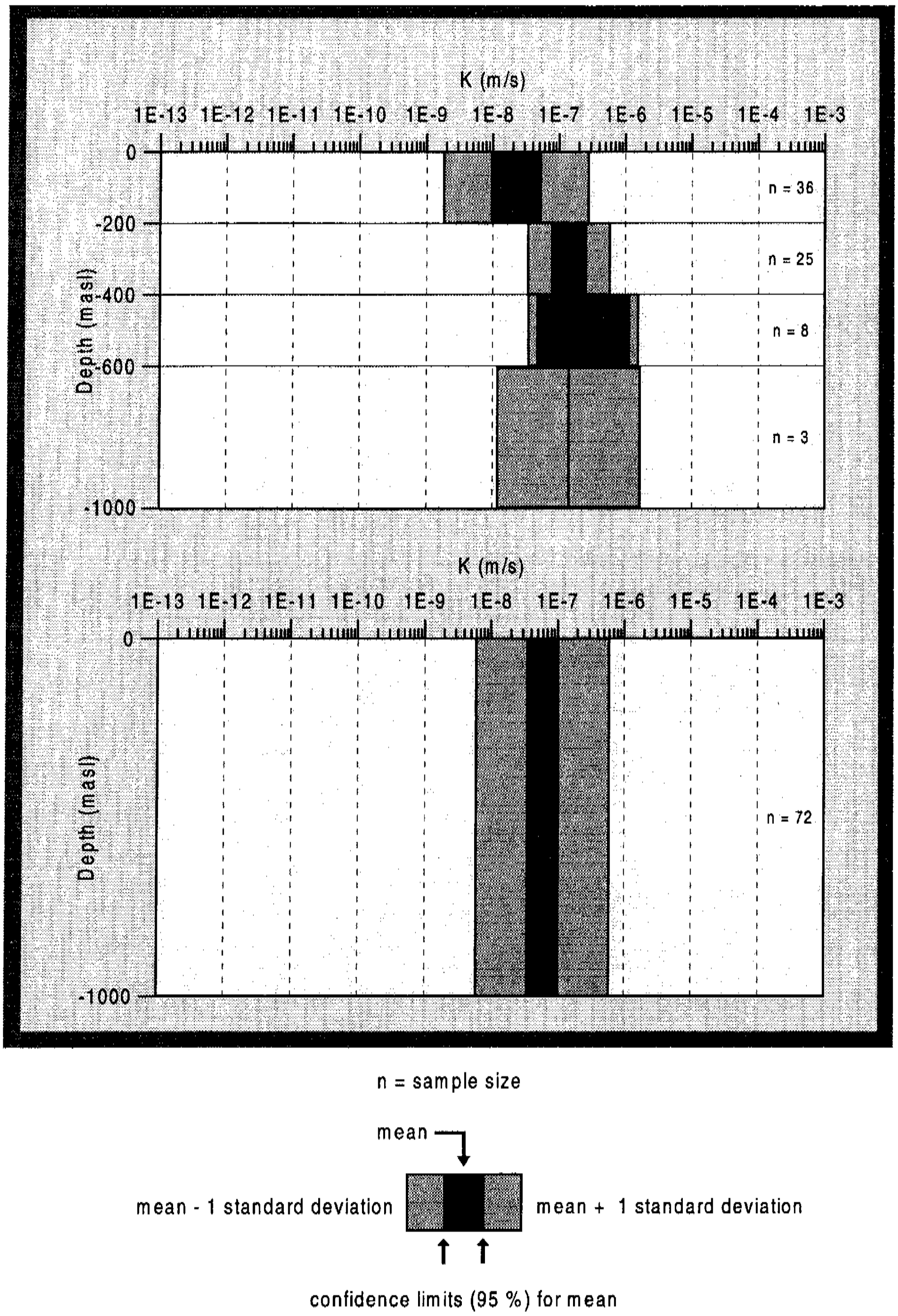


Figure A2-9. *Statistics of hydraulic conductivity shown in Table A2-10. Zonation. Äspö island. Test scale 50-200 m. "rock"and "zones". Tests in NE-1 and south of Äspö are not included in the data used.*

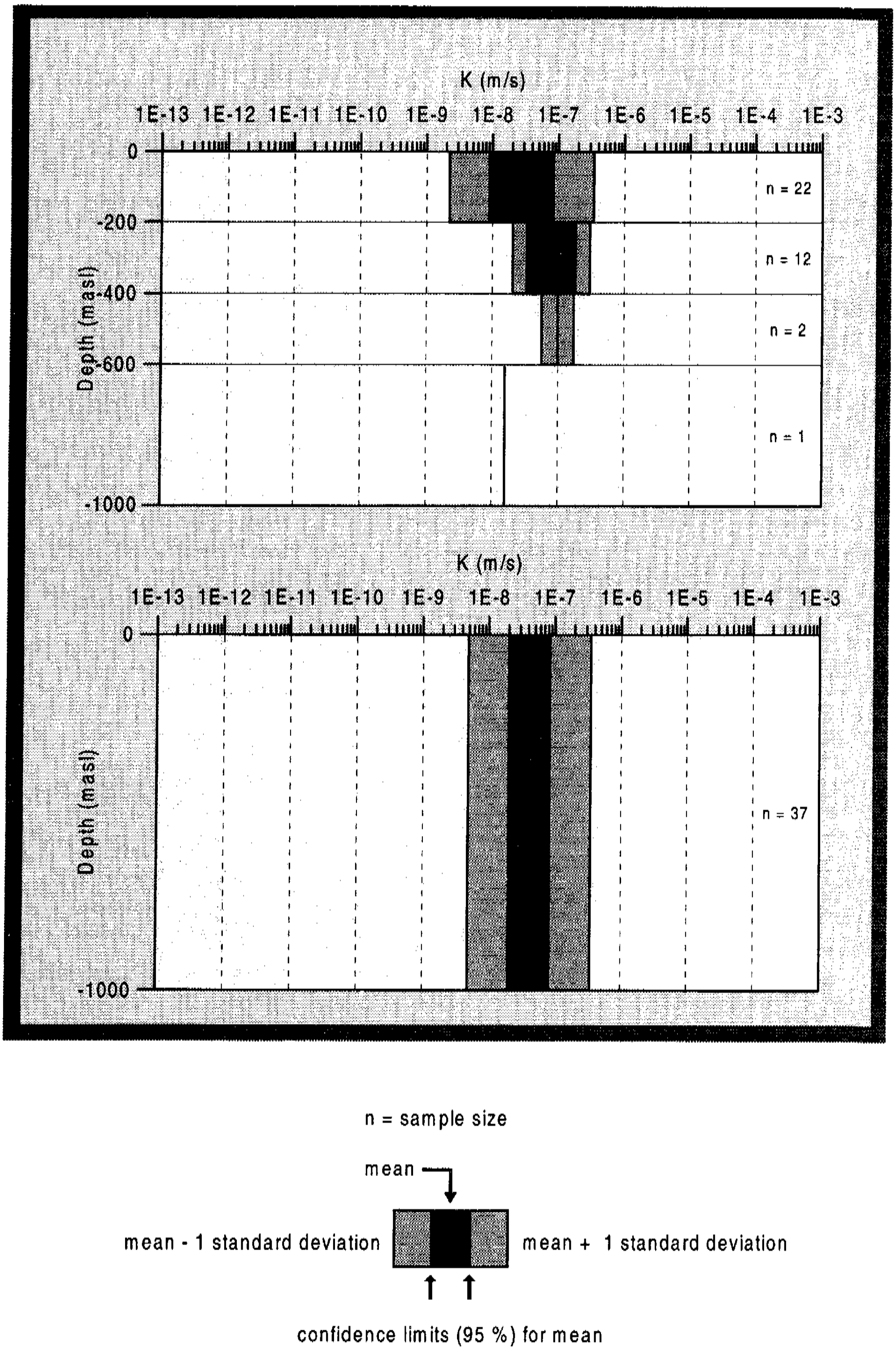


Figure A2-10. *Statistics of hydraulic conductivity shown in Table A2-11. Zonation. Äspö island. Test scale 50-200 m. "rock". Tests in NE-1 and south of Äspö are not included in the data used.*

Table A2-12. Hydraulic conductivity presented for boreholes. Äspö and Laxemar areas. Test scale 30 m.

Borehole	Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
KLX01	103	702.11	20	1.2E-09	9.8E-10	1.80	8.0E-09	1.7E-10	7.3E-08	1.8E-11
KAS02	102	812	24	5.6E-10	4.1E-10	1.44	2.3E-09	1.4E-10	1.5E-08	2.0E-11
KAS03	103	733	21	1.2E-08	1.3E-08	1.34	4.9E-08	3.0E-09	2.6E-07	5.6E-10

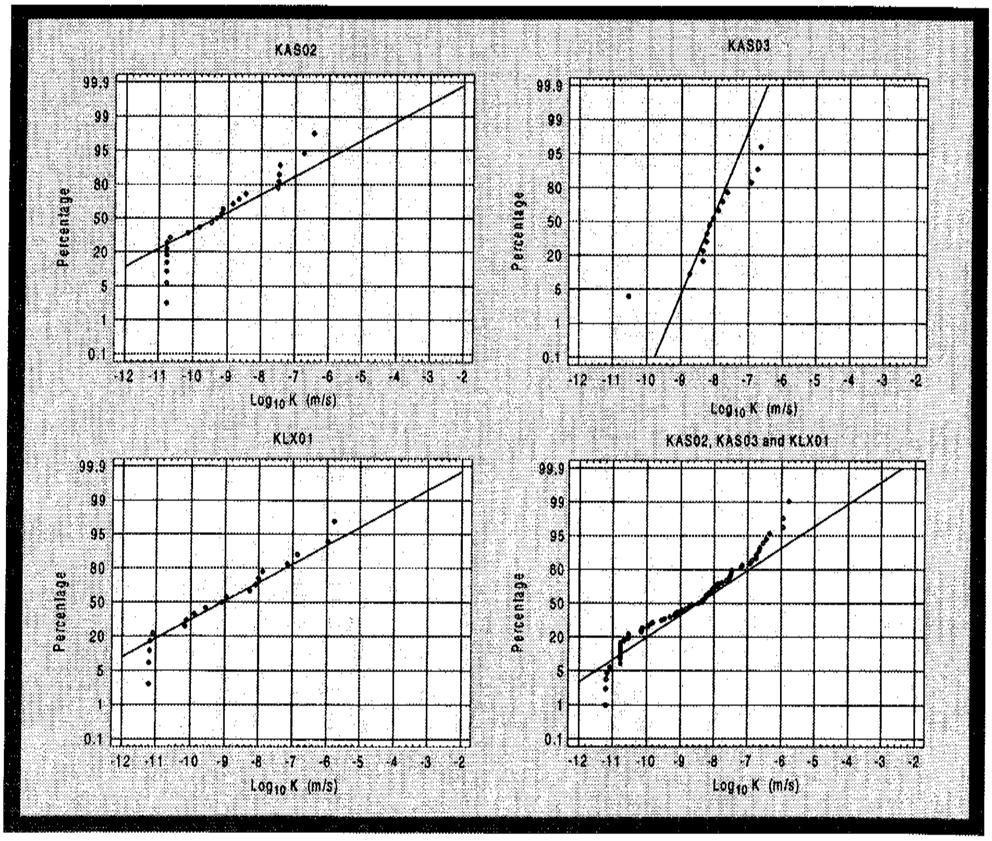


***Figure A2-11.** Normal probability plots for Log10(K) based on data from KLX01, KAS02 and KAS03 shown in Table A2-12. Test scale 30 m.*

Table A2-13. Hydraulic conductivity of rock mass domains. Äspö and Laxemar areas. Test scale 30 m. Zonation. (KLX01, KAS02, 03).

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	12	2.7E-09	2.2E-09	1.37	2.0E-08	3.7E-10	6.4E-08	1.2E-10
-200	-300	9	2.3E-09	4.5E-09	1.44	3.0E-08	1.8E-10	6.4E-08	8.5E-11
-300	-400	9	1.9E-09	5.8E-09	1.70	3.8E-08	9.3E-11	9.5E-08	3.8E-11
-400	-500	12	1.8E-09	5.7E-09	1.86	2.8E-08	1.2E-10	1.3E-07	2.5E-11
-500	-600	9	3.1E-10	3.0E-11	1.73	6.5E-09	1.4E-11	1.6E-08	5.7E-12
-600	-700	9	1.7E-08	2.8E-08	1.35	1.8E-07	1.6E-09	3.7E-07	7.6E-10
-700	-800	5	2.8E-10	1.1E-10	1.74	4.0E-08	2.0E-12	1.5E-08	5.2E-12
-100	-800	65	1.9E-09	3.5E-09	1.61	4.7E-09	7.5E-10	7.7E-08	4.6E-11

Table A2-14. Hydraulic conductivity of rock mass domains. Äspö area. Test scale 30 m. Zonation. (KAS02, 03).

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	8	2.2E-09	2.1E-09	1.25	2.4E-08	2.0E-10	3.8E-08	1.2E-10
-200	-300	6	2.6E-09	3.1E-09	1.14	4.0E-08	1.6E-10	3.5E-08	1.9E-10
-300	-400	6	1.2E-08	1.5E-08	1.46	3.9E-07	3.4E-10	3.3E-07	4.0E-10
-400	-500	8	1.4E-09	5.7E-09	1.66	3.5E-08	5.7E-11	6.5E-08	3.1E-11
-500	-600	6	8.5E-10	2.1E-10	1.86	7.6E-08	9.5E-12	6.1E-08	1.2E-11
-600	-700	6	1.5E-08	1.5E-08	1.68	8.9E-07	2.6E-10	7.3E-07	3.2E-10
-700	-800	5	2.8E-10	1.1E-10	1.74	4.0E-08	2.0E-12	1.5E-08	5.2E-12
-100	-800	45	2.3E-09	4.5E-09	1.53	6.8E-09	8.1E-10	8.0E-08	6.8E-11

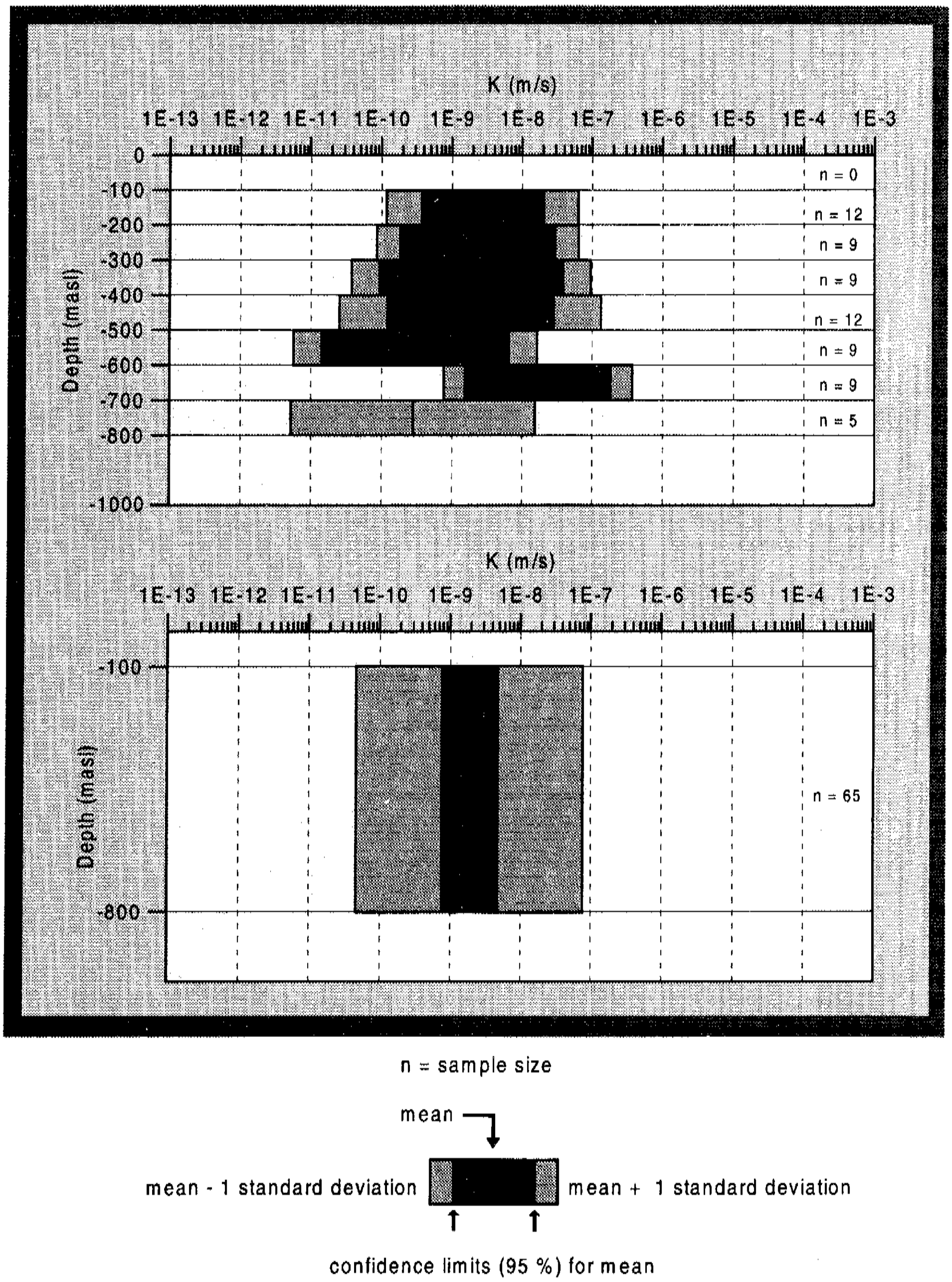


Figure A2-12. *Statistics of hydraulic conductivity shown in Table A2-13. Zonation. Äspö and Laxemar areas. Test scale 30 m.*

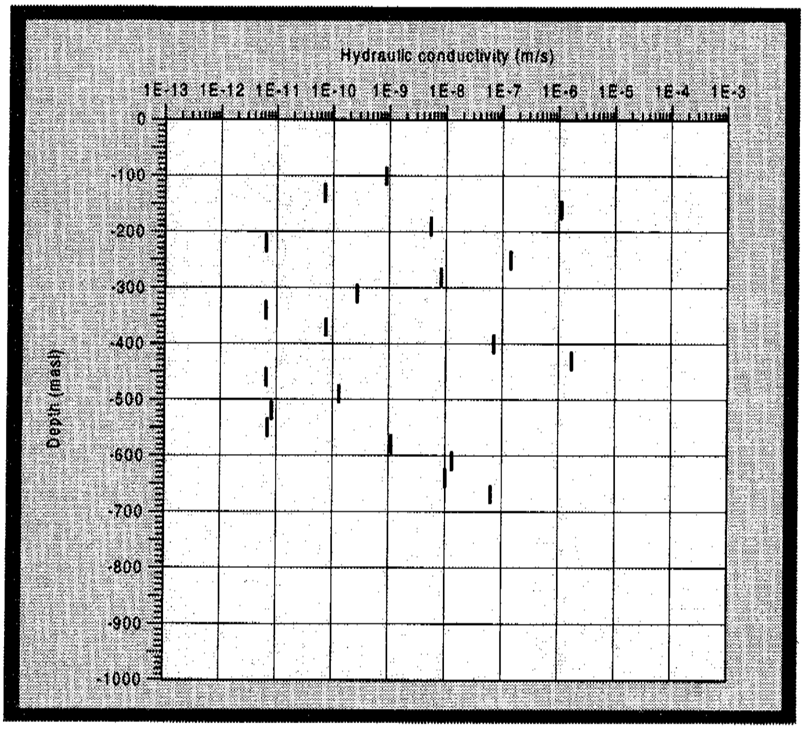


Figure A2-13. *Distribution of hydraulic conductivity in KLX01. Test scale 30 m.*

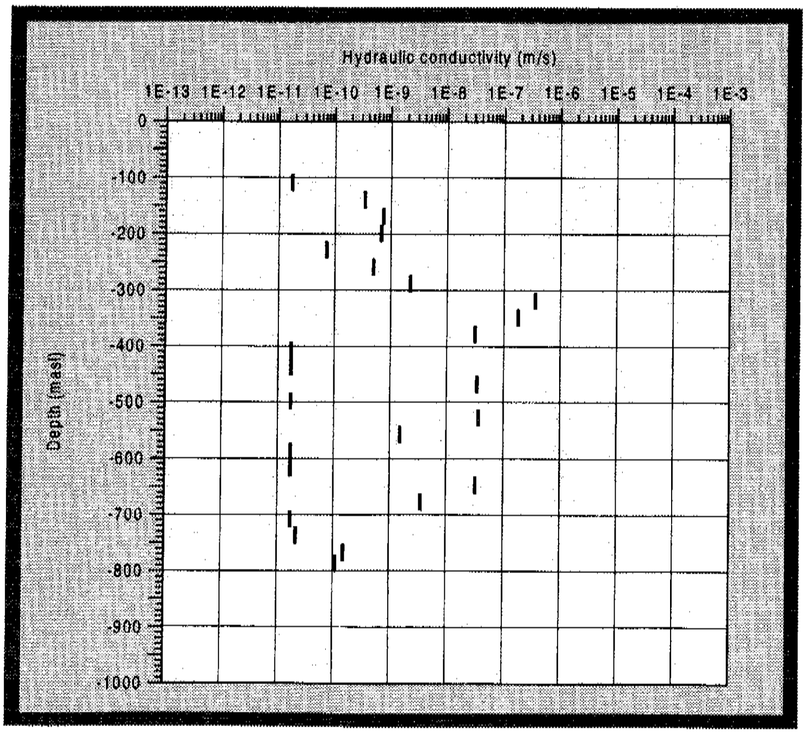


Figure A2-14. *Distribution of hydraulic conductivity in KAS02. Test scale 30 m.*

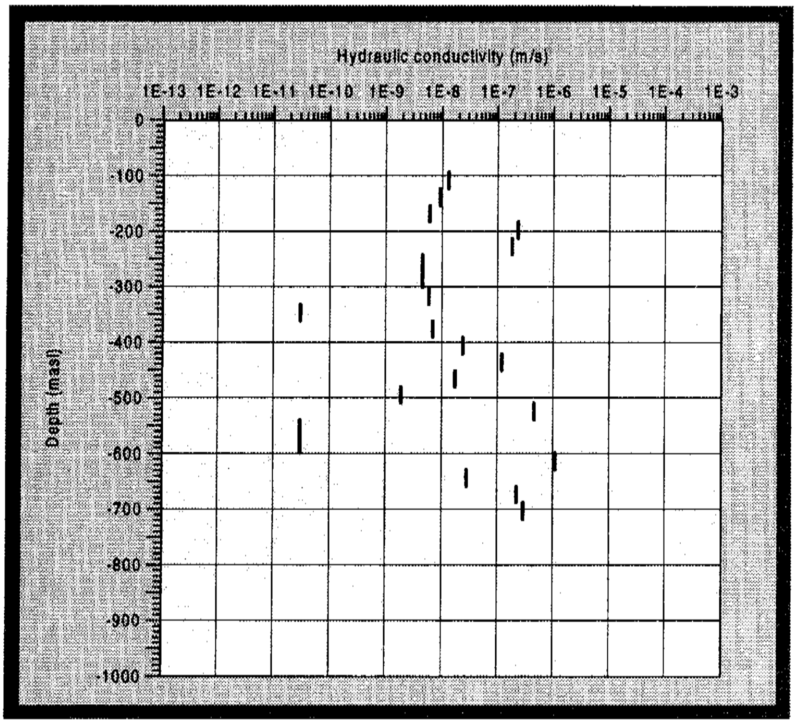


Figure A2-15. Distribution of hydraulic conductivity in KAS03. Test scale 30 m.

Table A2-15. Hydraulic conductivity presented for boreholes. Äspö and Laxemar areas. Test scale 3 m.

Borehole	Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf. lim. (97.5 %)	Conf. lim. (2.5 %)	Mean +st.dev	Mean - st.dev
KAS02	102	801	235	1.8E-10	1.1E-10	1.28	2.6E-10	1.2E-10	3.5E-09	9.4E-12
KAS03	103	550	150	2.9E-09	1.7E-09	1.48	5.0E-09	1.7E-09	8.7E-08	9.6E-11
KAS04	133	457	108	1.7E-08	7.6E-09	1.77	3.7E-08	7.9E-09	1.0E-06	2.9E-10
KAS05	157	541	128	3.1E-10	3.8E-11	1.93	6.7E-10	1.4E-10	2.6E-08	3.7E-12
KAS06	105	591	162	2.1E-09	6.0E-10	1.96	4.2E-09	1.0E-09	1.9E-07	2.3E-11
KAS07	106	592	163	1.0E-09	1.6E-10	1.65	1.8E-09	5.6E-10	4.6E-08	2.2E-11
KAS08	106	580	158	6.6E-10	2.1E-10	2.08	1.4E-09	3.1E-10	7.9E-08	5.5E-12
KLX01	106	691	198	3.5E-10	1.9E-10	1.12	5.0E-10	2.4E-10	4.6E-09	2.6E-11

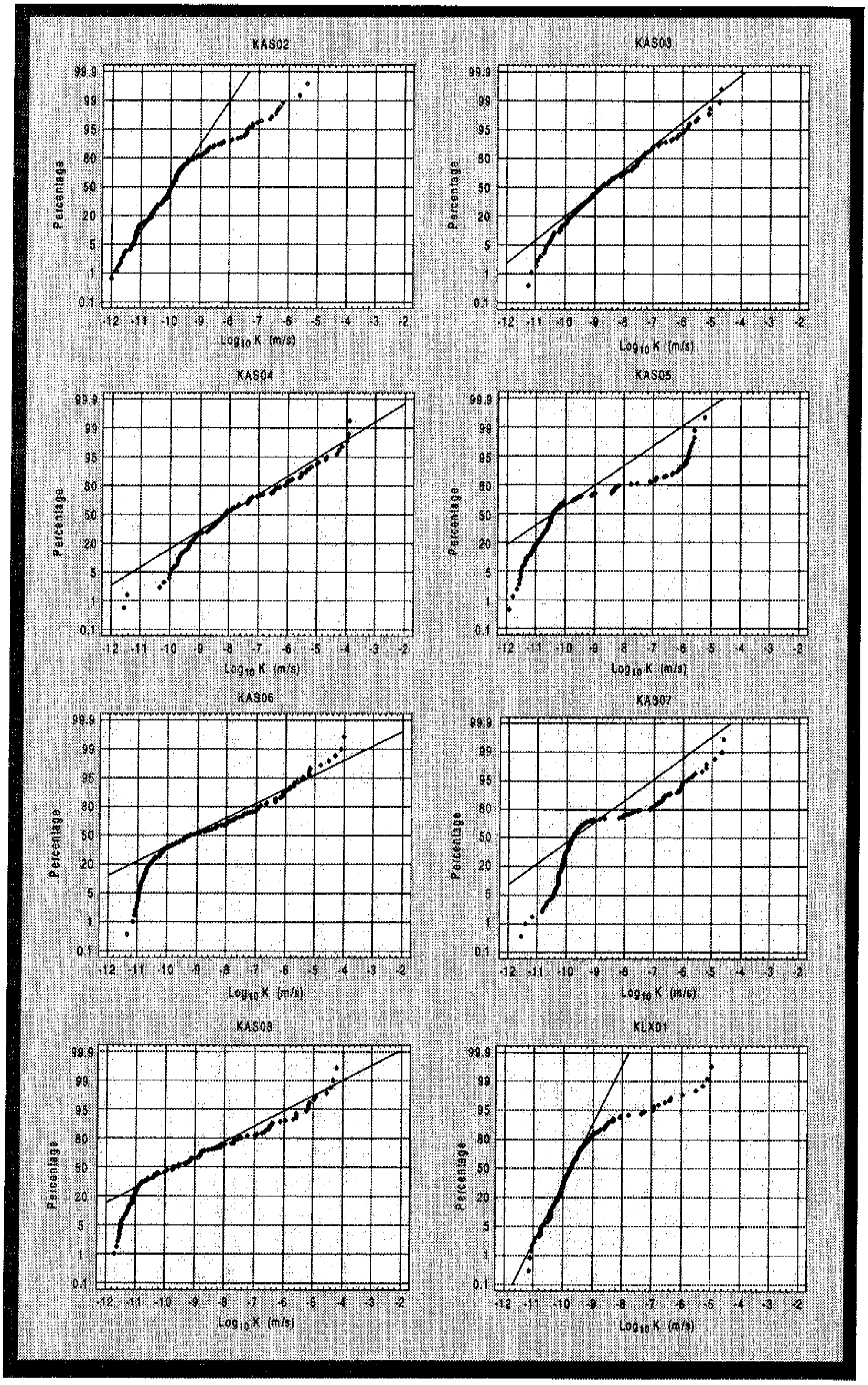


Figure A2-16. *Normal probability plots for Log10(K) based on data from KLX01 and KAS02-08. Test scale 3 m.*

Table A2-16. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KLX01-all data - "rock" and "zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	4	5.4E-10	2.5E-10	0.83	1.1E-08	2.6E-11	3.6E-09	8.0E-11
-100	-200	35	3.7E-10	2.0E-10	1.34	1.1E-09	1.3E-10	8.0E-09	1.7E-11
-200	-300	35	3.2E-10	1.9E-10	1.19	8.2E-10	1.2E-10	4.9E-09	2.0E-11
-300	-400	33	2.4E-10	1.6E-10	0.77	4.4E-10	1.3E-10	1.4E-09	4.0E-11
-400	-500	33	2.2E-10	8.8E-11	1.41	6.8E-10	6.8E-11	5.6E-09	8.4E-12
-500	-600	34	2.7E-10	2.3E-10	0.59	4.4E-10	1.7E-10	1.1E-09	7.1E-11
-600	-700	24	1.5E-09	6.8E-10	1.14	4.6E-09	5.0E-10	2.1E-08	1.1E-10
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	198	3.5E-10	1.9E-10	1.12	5.0E-10	2.4E-10	4.6E-09	2.6E-11

Table A2-17. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS03-"rock"and "zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf. lim. (2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	2	3.8E-11	3.8E-11	0.33	3.8E-08	3.9E-14	8.3E-11	1.8E-11
-100	-200	34	1.9E-09	1.3E-09	1.34	5.5E-09	6.3E-10	4.1E-08	8.5E-11
-200	-300	33	1.5E-09	1.8E-09	1.66	5.8E-09	3.9E-10	6.8E-08	3.3E-11
-300	-400	35	8.8E-09	1.9E-08	1.34	2.6E-08	3.1E-09	1.9E-07	4.0E-10
-400	-500	34	5.0E-09	1.8E-09	1.52	1.7E-08	1.5E-09	1.6E-07	1.5E-10
-500	-600	12	1.0E-09	5.4E-10	1.25	6.5E-09	1.7E-10	1.8E-08	5.8E-11
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	150	2.9E-09	1.7E-09	1.48	5.0E-09	1.7E-09	8.7E-08	9.6E-11

Table A2-18. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS03-"rock". (Due to calibration of a groundwater flow model some of the properties were changed in the model, see *Chapter 8*).

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf. lim. (2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	2	3.8E-11	3.8E-11	0.33	3.8E-08	3.9E-14	8.3E-11	1.8E-11
-100	-200	29	1.1E-09	1.1E-09	1.23	3.3E-09	3.8E-10	1.9E-08	6.5E-11
-200	-300	29	9.9E-10	1.8E-09	1.50	3.7E-09	2.7E-10	3.2E-08	3.1E-11
-300	-400	27	3.1E-09	3.1E-09	1.00	7.8E-09	1.3E-09	3.2E-08	3.1E-10
-400	-500	27	4.5E-09	1.2E-09	1.45	1.7E-08	1.2E-09	1.3E-07	1.6E-10
-500	-600	12	1.0E-09	5.4E-10	1.25	6.5E-09	1.7E-10	1.8E-08	5.8E-11
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	126	1.7E-09	1.1E-09	1.33	2.9E-09	1.0E-09	3.6E-08	8.1E-11

Table A2-19. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS03-"zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	5	3.7E-08	5.4E-08	1.31	1.6E-06	8.7E-10	7.6E-07	1.8E-09
-200	-300	4	3.0E-08	1.6E-07	2.36	1.7E-04	5.3E-12	7.0E-06	1.3E-10
-300	-400	8	2.9E-07	1.5E-07	1.27	3.3E-06	2.5E-08	5.4E-06	1.5E-08
-400	-500	7	7.4E-09	7.5E-09	1.86	3.8E-07	1.4E-10	5.3E-07	1.0E-10
-500	-600	0	ET	ET	ET	ET	ET	ET	ET
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	24	4.4E-08	5.1E-08	1.68	2.3E-07	8.6E-09	2.1E-06	9.2E-10

Table A2-20. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS04-"rock"and "zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	38	8.4E-09	3.6E-09	2.09	4.1E-08	1.7E-09	1.0E-06	6.8E-11
-200	-300	40	2.8E-08	3.0E-08	1.60	9.1E-08	8.6E-09	1.1E-06	7.0E-10
-300	-400	30	2.2E-08	7.6E-09	1.51	8.1E-08	6.0E-09	7.2E-07	6.8E-10
-400	-500	0	ET	ET	ET	ET	ET	ET	ET
-500	-600	0	ET	ET	ET	ET	ET	ET	ET
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	108	1.7E-08	7.6E-09	1.77	3.7E-08	7.9E-09	1.0E-06	2.9E-10

Table A2-21. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS04-"rock". (Due to calibration of a groundwater flow model some of the properties were changed in the model, see *Chapter 8*).

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	29	1.3E-08	3.7E-09	2.35	9.8E-08	1.6E-09	2.8E-06	5.6E-11
-200	-300	29	1.2E-08	8.6E-09	1.43	4.2E-08	3.4E-09	3.2E-07	4.4E-10
-300	-400	30	2.2E-08	7.6E-09	1.51	8.1E-08	6.0E-09	7.2E-07	6.8E-10
-400	-500	0	ET	ET	ET	ET	ET	ET	ET
-500	-600	0	ET	ET	ET	ET	ET	ET	ET
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	88	1.5E-08	5.8E-09	1.79	3.6E-08	6.2E-09	9.3E-07	2.4E-10

Table A2-22. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS04-"zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	9	2.3E-09	3.6E-09	0.71	8.2E-09	6.5E-10	1.2E-08	4.5E-10
-200	-300	11	2.6E-07	3.2E-07	1.69	3.6E-06	1.9E-08	1.3E-05	5.3E-09
-300	-400	0	ET	ET	ET	ET	ET	ET	ET
-400	-500	0	ET	ET	ET	ET	ET	ET	ET
-500	-600	0	ET	ET	ET	ET	ET	ET	ET
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
0	-800	20	3.1E-08	1.2E-08	1.68	1.9E-07	5.1E-09	1.5E-06	6.5E-10

Table A2-23. Hydraulic conductivity of rock mass domains. Site scale area. Test scale 3 m. Zonation. KAS02, 05-08-"rock"and "zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	20	1.3E-09	5.0E-10	1.74	8.2E-09	1.9E-10	7.0E-08	2.3E-11
-100	-200	170	5.9E-10	1.8E-10	1.79	1.1E-09	3.2E-10	3.7E-08	9.6E-12
-200	-300	188	4.2E-10	8.9E-11	1.72	7.3E-10	2.4E-10	2.2E-08	8.0E-12
-300	-400	190	4.8E-10	1.2E-10	1.85	8.8E-10	2.6E-10	3.4E-08	6.8E-12
-400	-500	170	1.6E-09	2.0E-10	2.08	3.4E-09	8.0E-10	2.0E-07	1.4E-11
-500	-600	43	5.9E-11	6.1E-11	0.95	1.2E-10	3.0E-11	5.3E-10	6.6E-12
-600	-700	34	3.4E-10	1.8E-10	1.02	7.9E-10	1.5E-10	3.6E-09	3.3E-11
-700	-800	30	1.2E-10	1.5E-10	0.53	1.9E-10	7.8E-11	4.1E-10	3.6E-11
0	-800	845	5.4E-10	1.3E-10	1.79	7.1E-10	4.1E-10	3.3E-08	8.7E-12

Table A2-24. Hydraulic conductivity of rock mass domains . Site scale area. Test scale 3 m. Zonation. KAS02, 05-08-"rock". (Due to calibration of a groundwater flow model some of the properties were changed in the model, see *Chapter 8*).

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	20	1.3E-09	5.0E-10	1.74	8.2E-09	1.9E-10	7.0E-08	2.3E-11
-100	-200	155	3.2E-10	1.2E-10	1.58	5.7E-10	1.8E-10	1.2E-08	8.5E-12
-200	-300	185	3.7E-10	8.8E-11	1.67	6.4E-10	2.1E-10	1.7E-08	7.8E-12
-300	-400	160	3.8E-10	1.0E-10	1.78	7.1E-10	2.0E-10	2.3E-08	6.2E-12
-400	-500	132	4.9E-10	1.2E-10	1.80	1.0E-09	2.4E-10	3.1E-08	7.8E-12
-500	-600	43	5.9E-11	6.1E-11	0.95	1.2E-10	3.0E-11	5.3E-10	6.6E-12
-600	-700	34	3.4E-10	1.8E-10	1.02	7.9E-10	1.5E-10	3.6E-09	3.3E-11
-700	-800	30	1.2E-10	1.5E-10	0.53	1.9E-10	7.8E-11	4.1E-10	3.6E-11
0	-800	759	3.4E-10	1.1E-10	1.63	4.4E-10	2.6E-10	1.4E-08	7.9E-12

Table A2-25. Hydraulic conductivity of rock mass domains . Site scale area. Test scale 3 m. Zonation. KAS02, 05-08-"zones".

Upper level	Lower level	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
0	-100	0	ET	ET	ET	ET	ET	ET	ET
-100	-200	15	3.0E-07	9.4E-07	1.62	2.4E-06	3.9E-08	1.3E-05	7.3E-09
-200	-300	3	1.1E-06	9.5E-07	0.71	6.6E-05	1.9E-08	5.8E-06	2.2E-07
-300	-400	30	1.8E-09	4.4E-10	2.11	1.1E-08	2.9E-10	2.3E-07	1.4E-11
-400	-500	38	1.1E-07	2.1E-07	1.96	4.8E-07	2.5E-08	9.9E-06	1.2E-09
-500	-600	0	ET	ET	ET	ET	ET	ET	ET
-600	-700	0	ET	ET	ET	ET	ET	ET	ET
-700	-800	0	ET	ET	ET	ET	ET	ET	ET
-100	-500	86	3.4E-08	5.9E-08	2.14	9.7E-08	1.2E-08	4.6E-06	2.5E-10

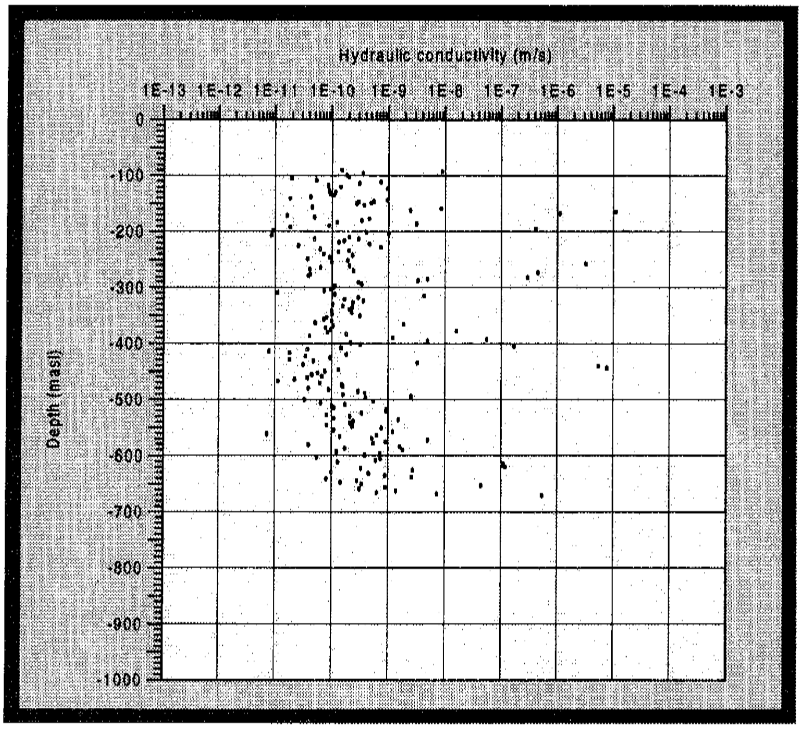


Figure A2-17. *Distribution of hydraulic conductivity in KLX01 "rock" and "zones". Test scale 3 m.*

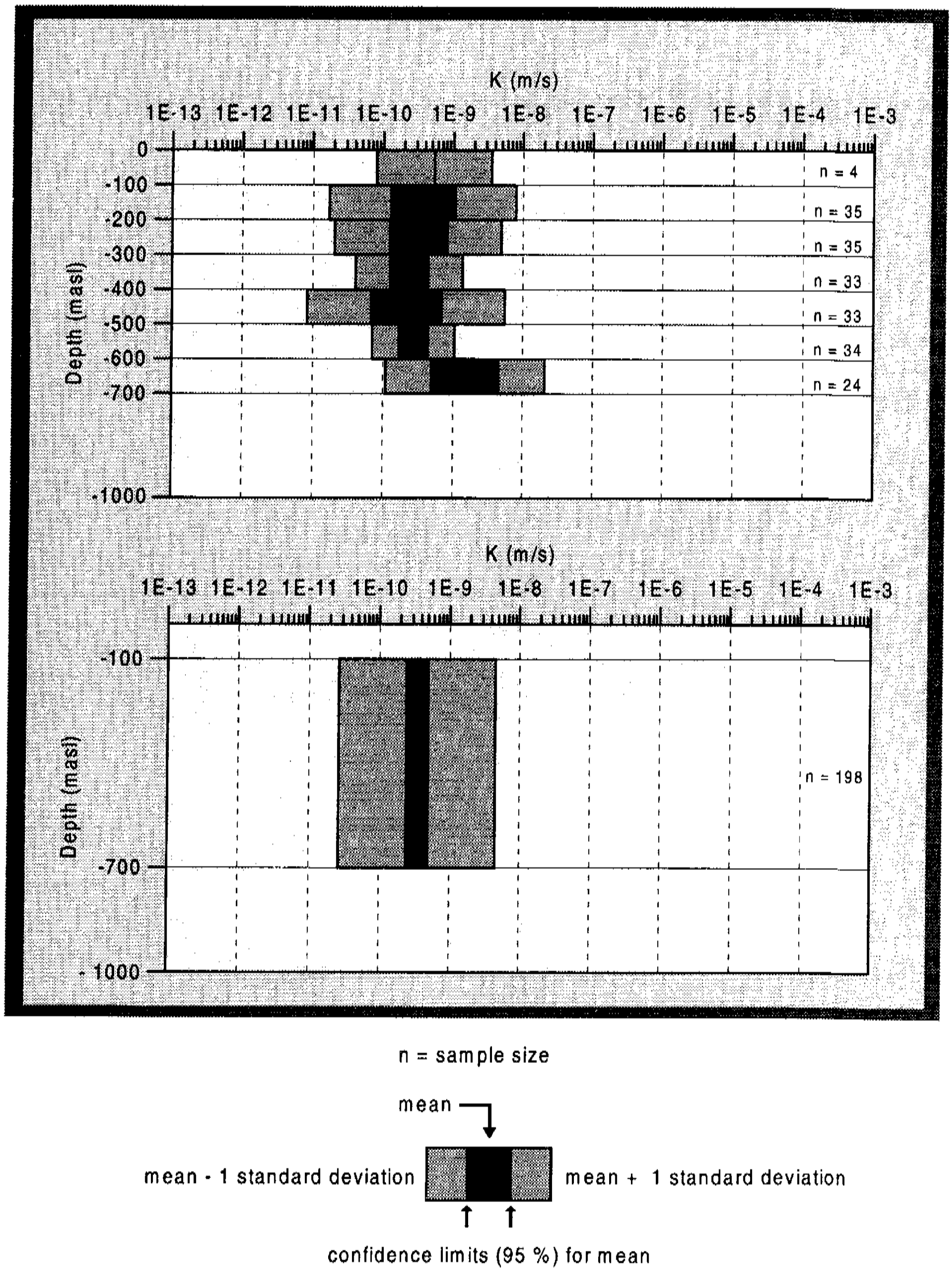


Figure A2-18. *Statistics of hydraulic conductivity in KLX01 "rock" and "zones". Zonation. Test scale 3 m.*

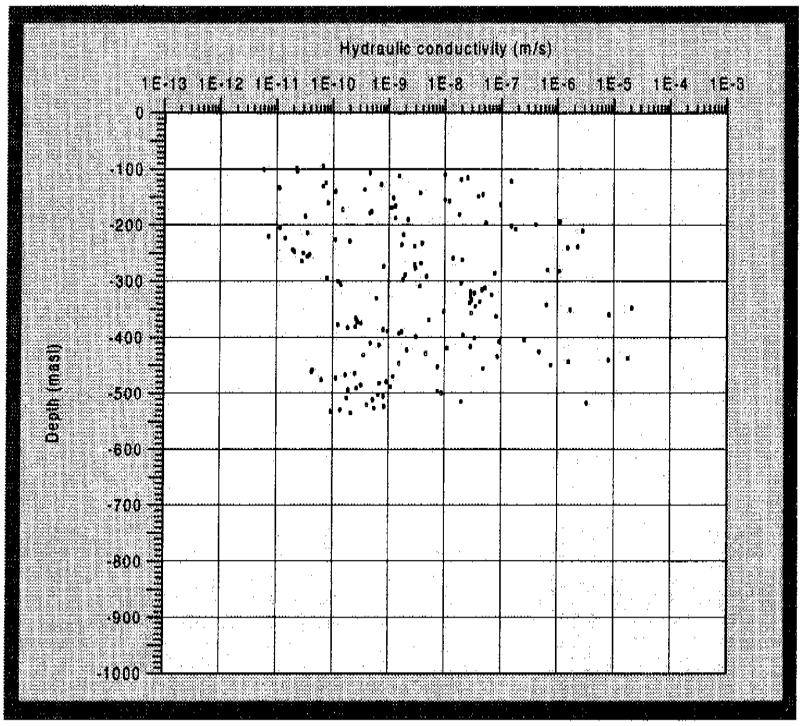


Figure A2-19. *Distribution of hydraulic conductivity in KAS03. Test scale 3 m."rock"and "zones".*

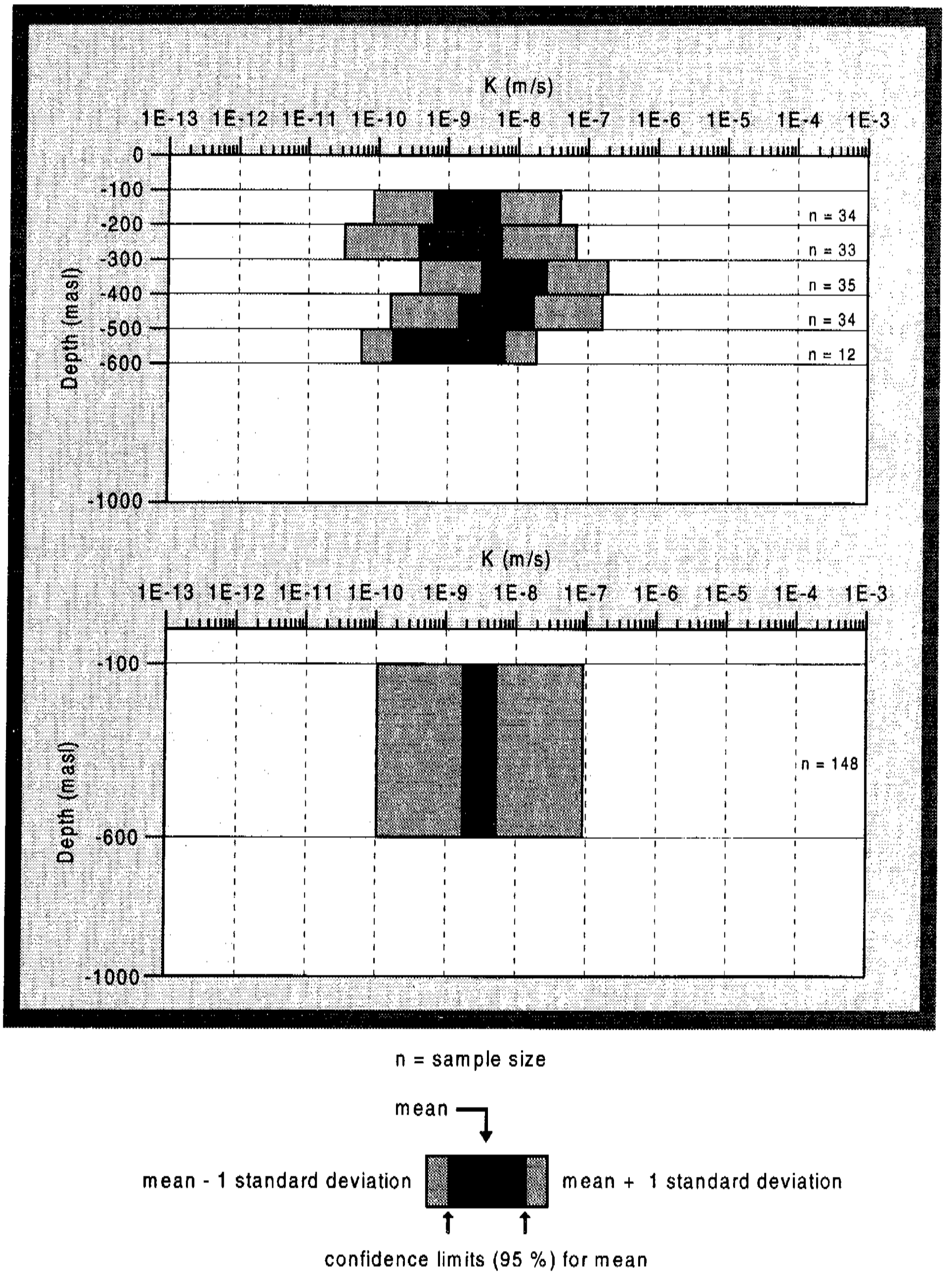


Figure A2-20. *Statistics of hydraulic conductivity in KAS03. Zonation. Test scale 3 m."rock"and "zones".*

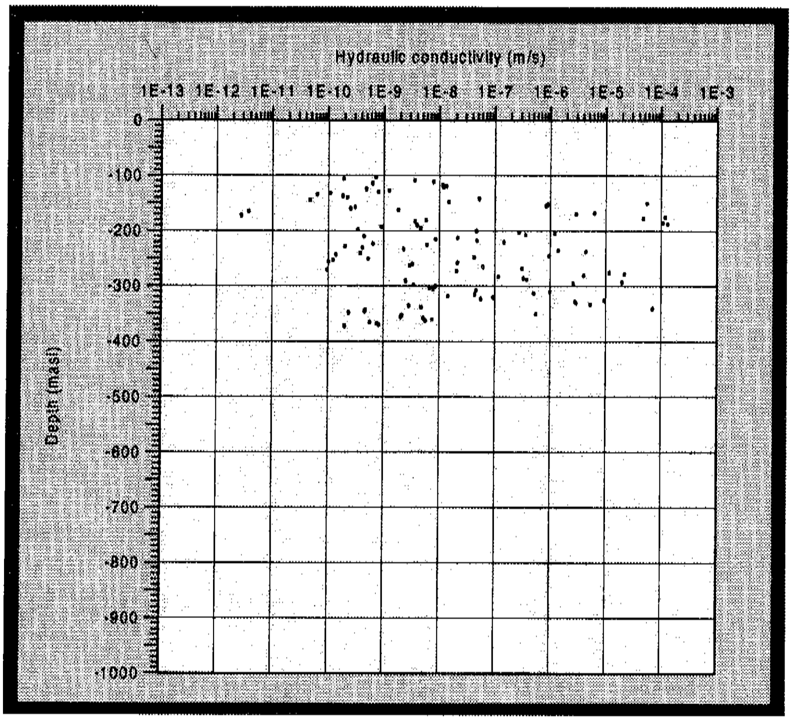


Figure A2-21. *Distribution of hydraulic conductivity in KAS04. Test scale 3 m."rock"and "zones".*

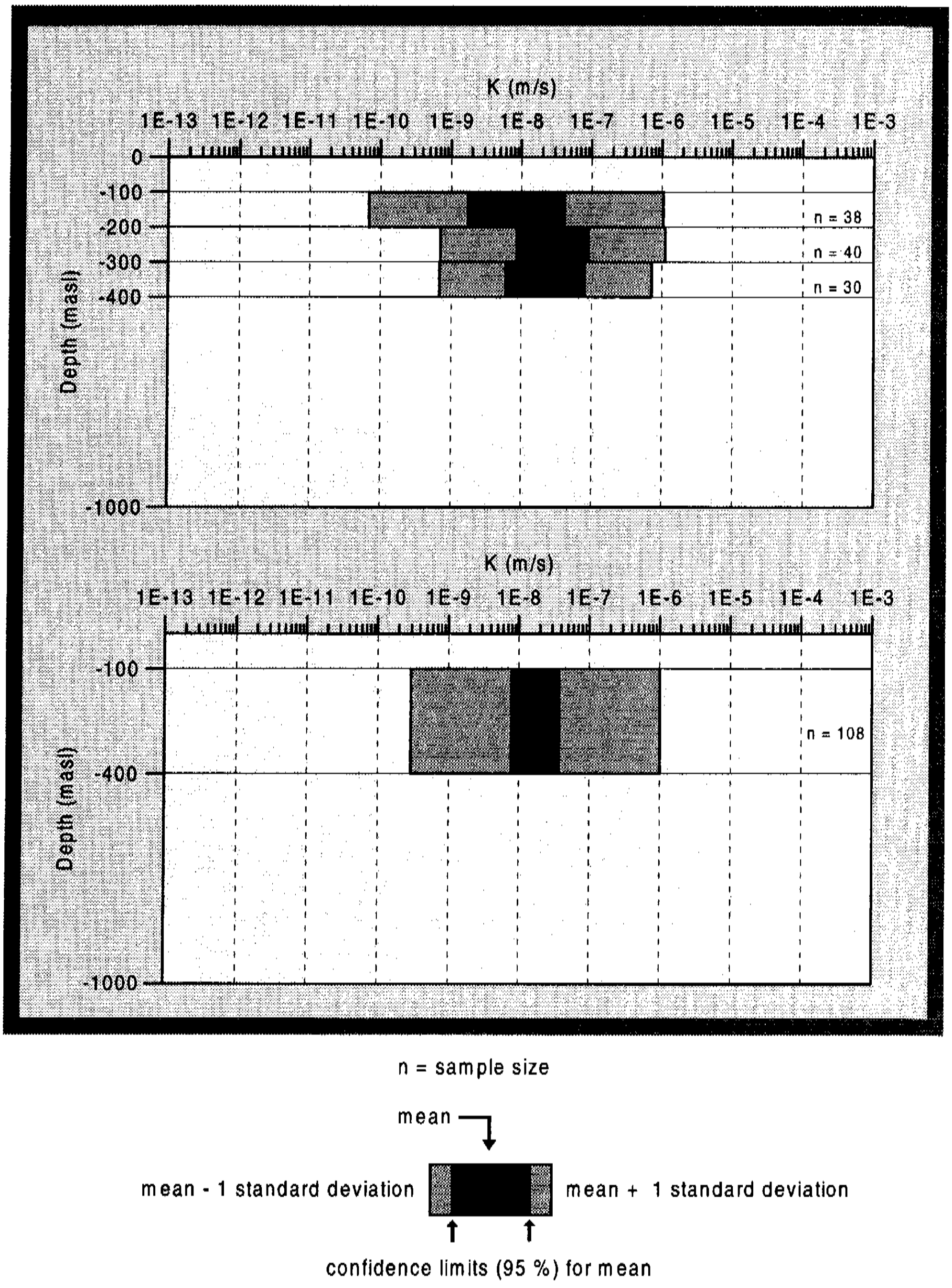


Figure A2-22. *Statistics of hydraulic conductivity in KAS04. Zonation. Test scale 3 m. "rock" and "zones".*

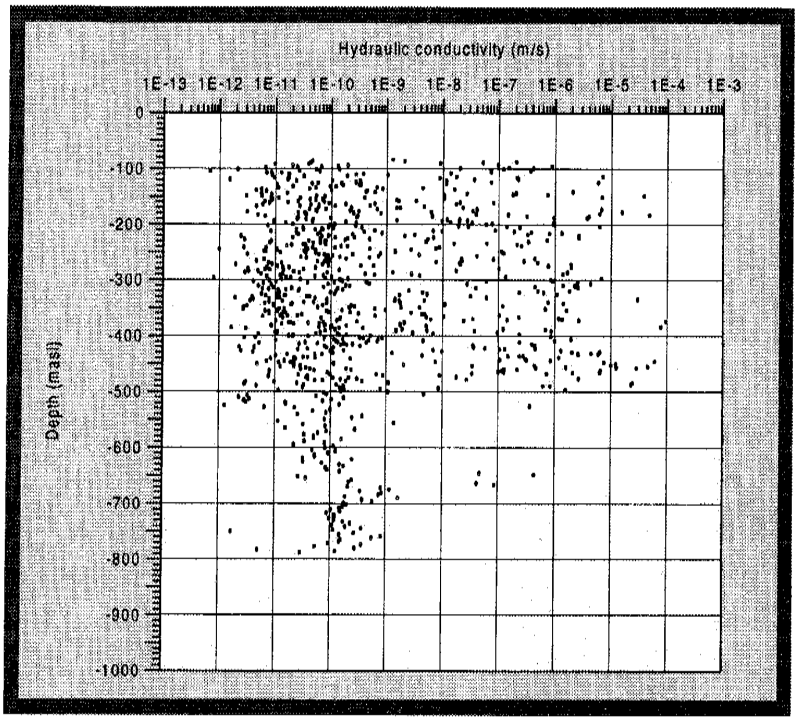


Figure A2-23. *Distribution of hydraulic conductivity in KAS02, 05-08. Test scale 3 m."rock"and "zones".*

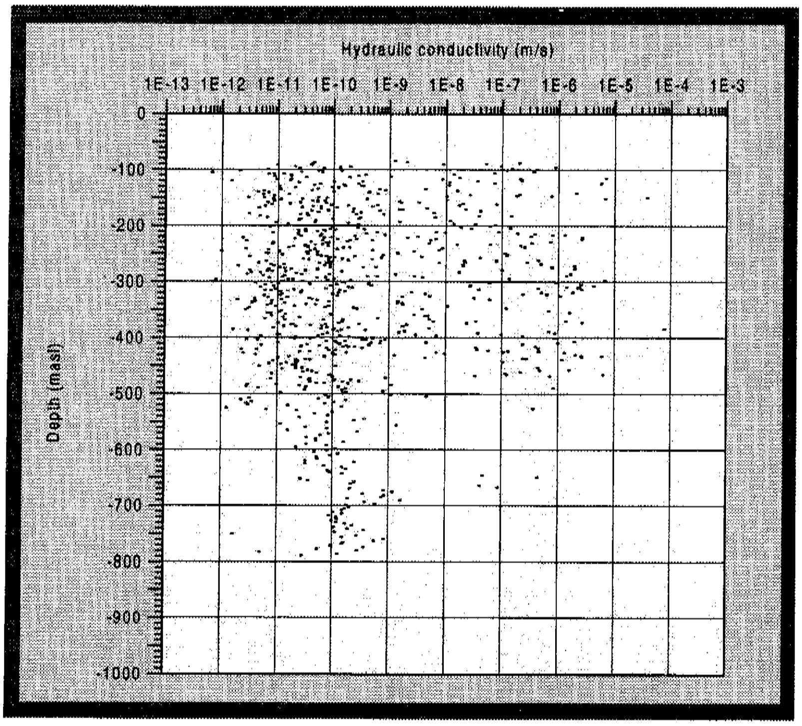


Figure A2-24. *Distribution of hydraulic conductivity in KAS02, 05-08. Test scale 3 m."rock" .*

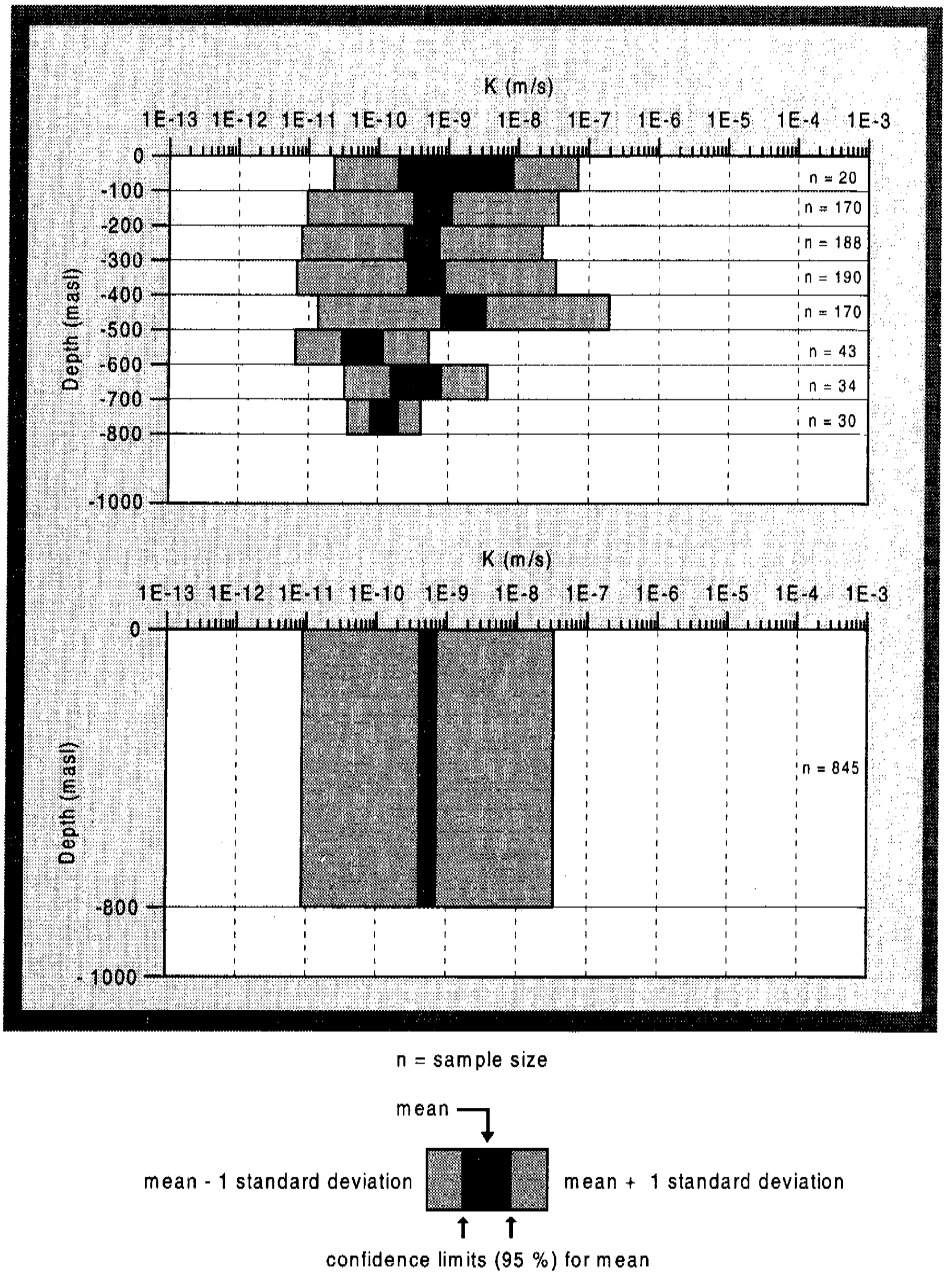


Figure A2-25. *Statistics of hydraulic conductivity in KAS02, 05-08. Zonation. Test scale 3 m. "rock" and "zones".*

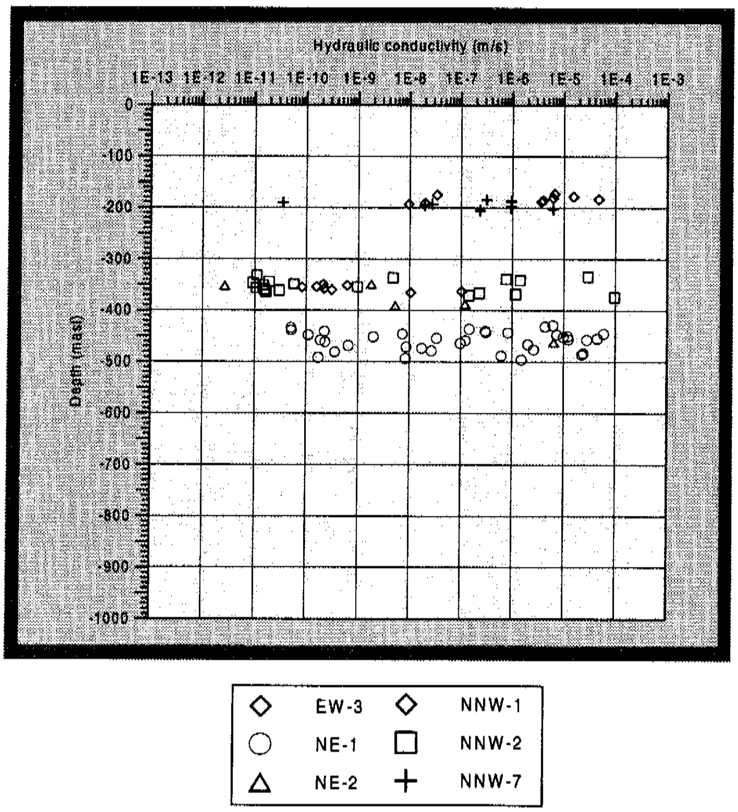


Figure A2-26. Distribution of hydraulic conductivity in KAS02, 05-08. Test scale 3 m. "zones".

Table A2-26. Hydraulic conductivity of lithological units. Test scale 3 m. KLX01, KAS02-08.

Rocktype	Sample size	Mean	Median	s (Log10 K)	Conf.lim.(97.5 %)	Conf.lim.(2.5 %)	Mean + st.dev	Mean - st.dev
Fine-grained granite	180	4.8E-09	2.8E-09	1.99	9.3E-09	2.4E-09	4.7E-07	4.9E-11
Småland-granite	287	1.2E-09	6.2E-10	1.72	1.8E-09	7.3E-10	6.1E-08	2.2E-11
Äspö-diorite	531	4.4E-10	1.2E-10	1.71	6.1E-10	3.1E-10	2.3E-08	8.5E-12
Greenstone	86	9.8E-10	3.0E-10	1.57	2.1E-09	4.5E-10	3.6E-08	2.7E-11
Mylonite	19	2.4E-08	5.2E-08	2.57	4.2E-07	1.4E-09	9.0E-06	6.6E-11

Table A2-27. Hydraulic conductivity of "rock", "zones" and "rock and zones" based on tests performed in probeholes in tunnel section 1400-3600 m. Test scale approximately 15 m.

Statistics of hydrogeological parameters from tests in probeholes. Zones = deterministic zones.

Sample	Upper chainage (m)	Lower chainage (m)	Sample size	Mean (m/s)	Median (m/s)	s (Log 10 K)	Conf. lim. 97.5 % (m/s)	Conf. lim. 2.5 % (m/s)	Mean + s (m/s)	Mean - s (m/s)
K_{rock}	1400	3600	156	1.5E-09	2.5E-09	2.09	3.2E-09	6.9E-10	1.8E-07	1.2E-11
K_{zone}	1400	3600	32	7.8E-08	1.3E-07	1.92	3.9E-07	1.6E-08	6.5E-06	9.4E-10
K_{tot}	1400	3600	188	2.9E-09	5.0E-09	2.16	5.9E-09	1.4E-09	4.2E-07	2.0E-11
K_{rock}	1400	2370	85	3.1E-09	4.4E-09	1.89	7.9E-09	1.2E-09	2.4E-07	4.0E-11
K_{zone}	1400	2370	21	3.5E-07	4.1E-07	1.51	1.7E-06	7.1E-08	1.1E-05	1.1E-08
K_{tot}	1400	2370	106	7.9E-09	7.5E-09	1.99	1.9E-08	3.3E-09	7.7E-07	8.0E-11
K_{rock}	2370	3600	71	6.1E-10	9.1E-10	2.27	2.1E-09	1.8E-10	1.1E-07	3.3E-12
K_{zone}	2370	3600	11	4.5E-09	1.8E-08	2.07	1.1E-07	1.8E-10	5.3E-07	3.9E-11
K_{tot}	2370	3600	82	8.0E-10	1.4E-09	2.25	2.5E-09	2.6E-10	1.4E-07	4.5E-12

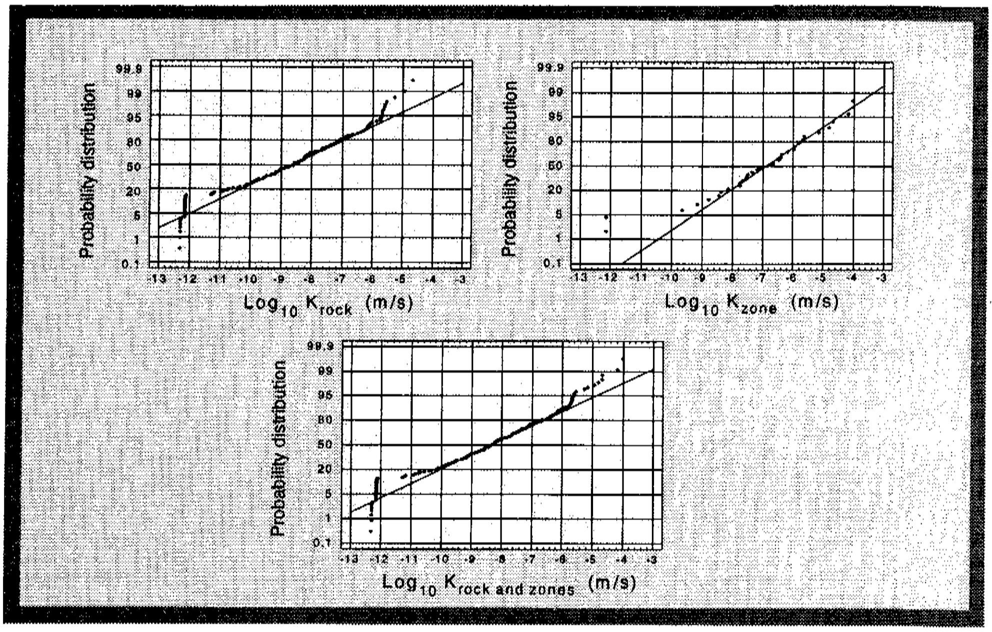


Figure A2-27. Normal probability plots for Log10(K) based on tests performed in probeholes in tunnel section 1400-3600 m for data shown in Table A2-27. Test scale approximately 15 m.

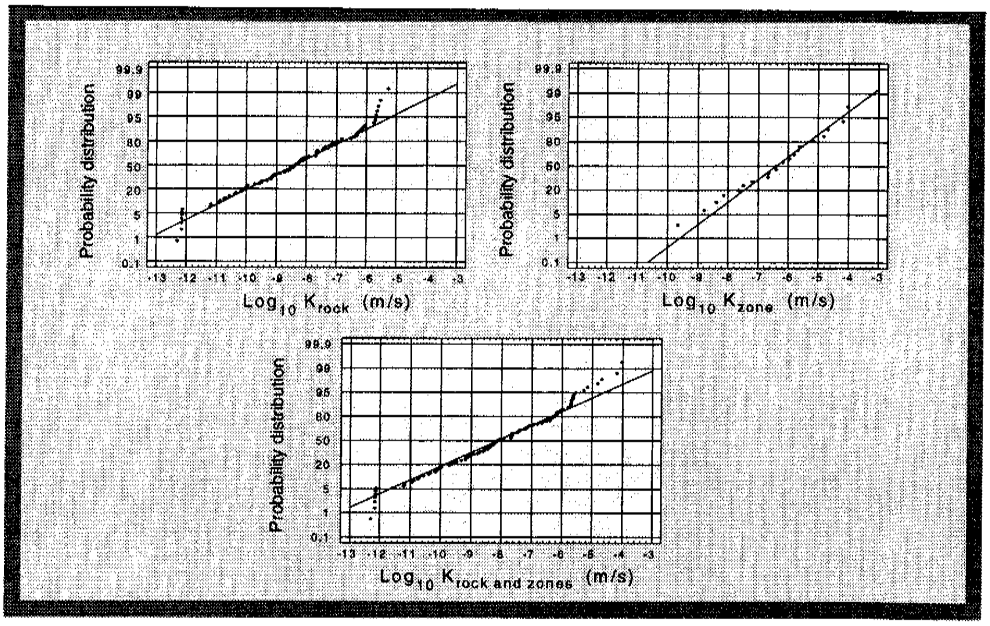


Figure A2-28. *Normal probability plots for Log10(K) based on tests performed in probeholes in tunnel section 1400-2370 m (approximately one spiral turn) for data shown in Table A2-27. Test scale approximately 15 m.*

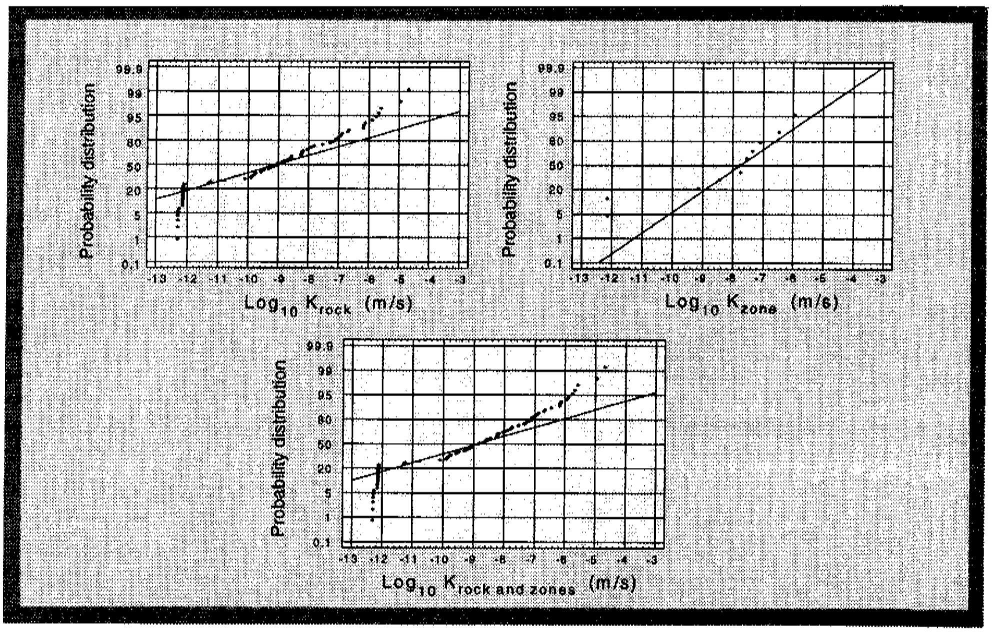


Figure A2-29. *Normal probability plots for Log10(K) based on tests performed in probeholes in tunnel section 2370-3600 m for data shown in Table A2-27. Test scale approximately 15 m.*

Table A2-28. Transmissivities for different directions of the probe holes in tunnel section 1400-3600 m. The strike of a plane perpendicular to the probe holes (in the Äspö coordinate system) was the base for assigning transmissivity to the sectors, see *Figure 6-50*.
Length of test section ≈15 m.
Log Ave T_{tot} = arithmetic mean of $\log_{10} T_{tot}$.
Ave T_{tot} = Exp_{10}(Log Ave T_{tot}).
s(Log_{10}T) = standard deviation of $Log_{10}T_{tot}$.
Up Quart and Low Quart = Upper and lower quartiles of the T-values in each section.
n = total number of values in a sector.

Sector	Centre of sector	Log Ave Ttot	Ave Ttot	s(Log10 T)	n
0-20	10	-7.16	6.9E-08	1.99	50
20-40	30	-8.69	2.0E-09	2.06	18
40-60	50	-8.47	3.4E-09	2.43	9
60-80	70	-8.16	6.9E-09	2.01	17
80-100	90	-7.19	6.5E-08	2.07	37
100-120	110	-6.80	1.6E-07	1.68	7
120-140	130	-6.08	8.2E-07	1.94	27
140-160	150	-7.04	9.1E-08	2.13	29
160-180	170	-7.91	1.2E-08	2.03	6
180-200	190	-7.16	6.9E-08	1.99	50
200-220	210	-8.69	2.0E-09	2.06	18
220-240	230	-8.47	3.4E-09	2.43	9
240-260	250	-8.16	6.9E-09	2.01	17
260-280	270	-7.19	6.5E-08	2.07	37
280-300	290	-6.80	1.6E-07	1.68	7
300-320	310	-6.08	8.2E-07	1.94	27
320-340	330	-7.04	9.1E-08	2.13	29
340-360	350	-7.91	1.2E-08	2.03	6

Sector	Centre of sector	Log Up Quart	Up Quart	Log Low quart	Low quart
0-20	10	-5.72	1.9E-06	-8.28	5.3E-09
20-40	30	-7.55	2.8E-08	-11.00	1.0E-11
40-60	50	-7.12	7.6E-08	-11.00	1.0E-11
60-80	70	-6.94	1.1E-07	-9.63	2.4E-10
80-100	90	-5.55	2.8E-06	-8.75	1.8E-09
100-120	110	-5.10	7.9E-06	-7.85	1.4E-08
120-140	130	-4.96	1.1E-05	-6.96	1.1E-07
140-160	150	-5.51	3.1E-06	-8.32	4.8E-09
160-180	170	-6.19	6.4E-07	-9.00	9.9E-10
180-200	190	-5.72	1.9E-06	-8.28	5.3E-09
200-220	210	-7.55	2.8E-08	-11.00	1.0E-11
220-240	230	-7.12	7.6E-08	-11.00	1.0E-11
240-260	250	-6.94	1.1E-07	-9.63	2.4E-10
260-280	270	-5.55	2.8E-06	-8.75	1.8E-09
280-300	290	-5.10	7.9E-06	-7.85	1.4E-08
300-320	310	-4.96	1.1E-05	-6.96	1.1E-07
320-340	330	-5.51	3.1E-06	-8.32	4.8E-09
340-360	350	-6.19	6.4E-07	-9.00	9.9E-10

Table A2-29. Data points used for the scale relation ships presented in Figure 6-37 and Table 6-13.

BH_no	BH_2	Scale	K_arit	Log_K_arit	K_geom	S_Log10_K	T_bh	Section	K_bh	K_avsK_bh	K_gvsK_bh	LogScale	LogKaKbh	LogKgKbh	LogKa	LogKg
1	KLX01	3	1.58E-07	-9.49	3.23E-10	1.11	7.99E-05	673.00	1.19E-07	1.33	0.00272	0.48	0.12	-2.57	-6.80	-9.49
2	KAS02	3	4.32E-08	-9.79	1.63E-10	1.24	2.20E-06	681.00	3.23E-09	13.38	0.05058	0.48	1.13	-1.30	-7.36	-9.79
3	KAS03	3	4.83E-07	-8.54	2.89E-09	1.48	1.07E-05	357.00	3.00E-08	16.10	0.09643	0.48	1.21	-1.02	-6.32	-8.54
4	KAS04	3	5.82E-06	-7.77	1.72E-08	1.77	2.40E-05	481.00	4.99E-08	116.55	0.34377	0.48	2.07	-0.46	-5.24	-7.77
5	KAS05	3	2.56E-07	-9.51	3.11E-10	1.93	2.30E-05	294.00	7.82E-08	3.27	0.00397	0.48	0.51	-2.40	-6.59	-9.51
6	KAS06	3	2.01E-06	-8.68	2.09E-09	1.96	1.83E-05	491.00	3.73E-08	53.89	0.05616	0.48	1.73	-1.25	-5.70	-8.68
7	KAS07	3	5.84E-07	-9.00	1.01E-09	1.65	4.24E-05	499.00	8.50E-08	6.87	0.01186	0.48	0.84	-1.93	-6.23	-9.00
8	KAS08	3	1.58E-06	-9.18	6.58E-10	2.08	2.00E-04	480.00	4.17E-07	3.78	0.00158	0.48	0.58	-2.80	-5.80	-9.18
1	KLX01	30	1.60E-07	-9.03	9.38E-10	1.80	7.99E-05	673.00	1.19E-07	1.35	0.00790	1.48	0.13	-2.10	-6.79	-9.03
2	KAS02	30	2.97E-08	-9.22	5.97E-10	1.47	2.20E-06	681.00	3.23E-09	9.19	0.18471	1.48	0.96	-0.73	-7.53	-9.22
3	KAS03	30	4.45E-08	-8.01	9.71E-09	0.96	1.07E-05	357.00	3.00E-08	1.48	0.32384	1.48	0.17	-0.49	-7.35	-8.01
5	KAS05	100	8.17E-09	-8.12	7.59E-09	0.24	2.30E-05	294.00	7.82E-08	0.10	0.09700	2.00	-0.98	-1.01	-8.09	-8.12
6	KAS06	100	2.57E-07	-6.83	1.46E-07	0.56	9.53E-05	491.00	1.94E-07	1.33	0.75351	2.00	0.12	-0.12	-6.59	-6.83
7	KAS07	100	8.31E-08	-7.22	6.04E-08	0.47	4.24E-05	499.00	8.50E-08	0.98	0.71096	2.00	-0.01	-0.15	-7.08	-7.22
8	KAS08	100	2.58E-07	-7.04	9.19E-08	0.78	2.00E-04	480.00	4.17E-07	0.62	0.22054	2.00	-0.21	-0.66	-6.59	-7.04
2	KAS02	681	3.23E-09	-8.49	3.2E-09	0.00	2.20E-06	681.00	3.23E-09	1.00	1.00000	2.83	0.00	0.00	-8.49	-8.49
3	KAS03	357	3.00E-08	-7.52	3.0E-08	0.00	1.07E-05	357.00	3.00E-08	1.00	1.00000	2.55	0.00	0.00	-7.52	-7.52
4	KAS04	481	4.99E-08	-7.30	5.0E-08	0.00	2.40E-05	481.00	4.99E-08	1.00	1.00000	2.68	0.00	0.00	-7.30	-7.30
5	KAS05	294	7.82E-08	-7.11	7.8E-08	0.00	2.30E-05	294.00	7.82E-08	1.00	1.00000	2.47	0.00	0.00	-7.11	-7.11
6	KAS06	491	3.73E-08	-7.43	3.7E-08	0.00	1.83E-05	491.00	3.73E-08	1.00	1.00000	2.69	0.00	0.00	-7.43	-7.43
7	KAS07	499	8.50E-08	-7.07	8.5E-08	0.00	4.24E-05	499.00	8.50E-08	1.00	1.00000	2.70	0.00	0.00	-7.07	-7.07
8	KAS08	480	4.17E-07	-6.38	4.2E-07	0.00	2.00E-04	480.00	4.17E-07	1.00	1.00000	2.68	0.00	0.00	-6.38	-6.38
1	KLX01	673	1.19E-07	-6.93	1.2E-07	0.00	7.99E-05	673.00	1.19E-07	1.00	1.00000	2.83	0.00	0.00	-6.93	-6.93

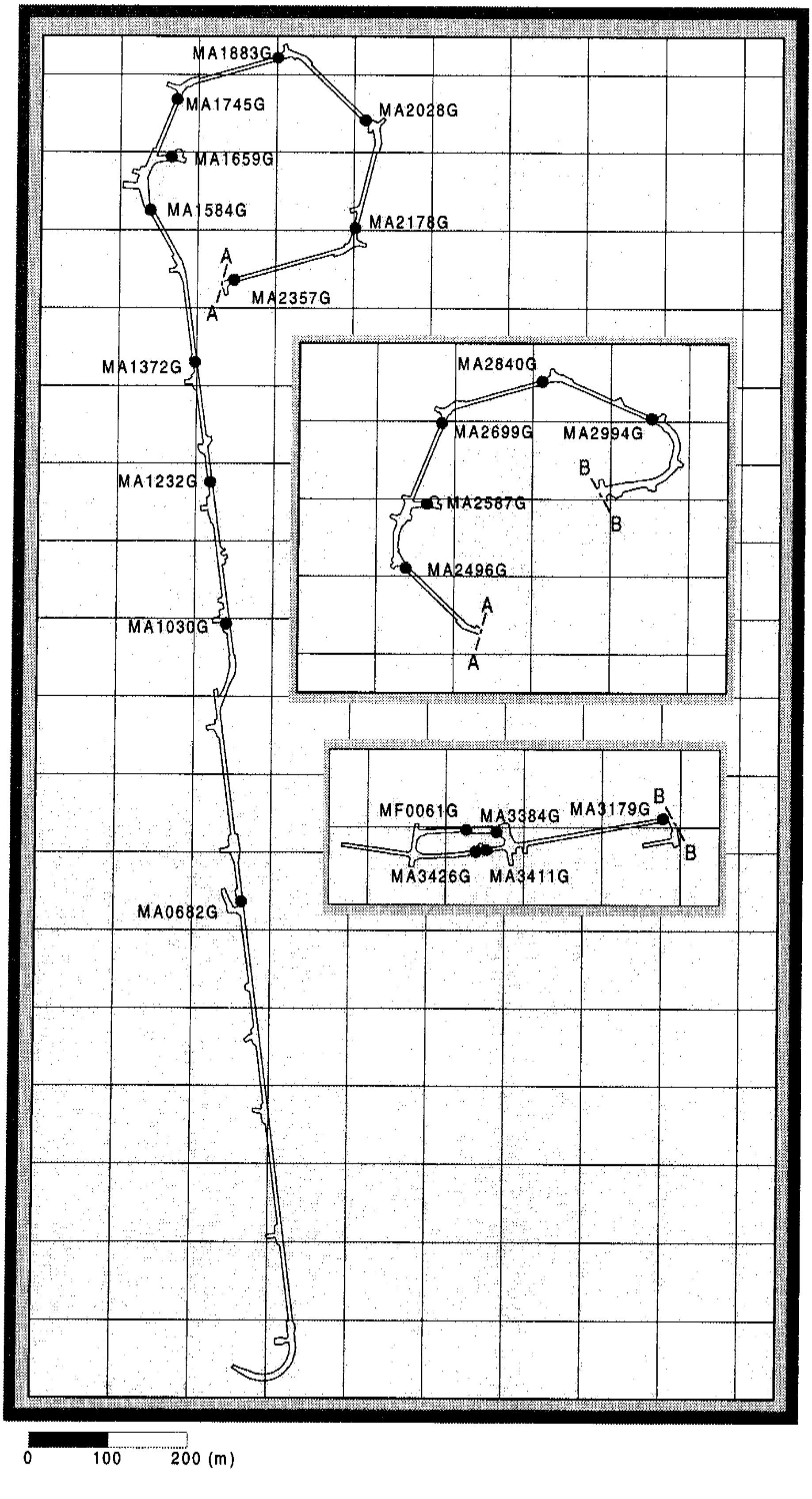


Figure A2-30. Plan over dams in the tunnel. The number in the name of the weir is the section in the tunnel where the dam is situated.

Table A2-30. **(Next page) Water flow into the tunnel. Monthly mean values. See *Rhén et al /1995/* for details concerning the flow measurements.**

Maxxxx:	**Weir No.**
Shaft 213:	**Flow section 0-213 m below sea surface.**
Shaft 333:	**Flow section 220-333 m below sea surface.**
Shaft 450:	**Flow section 340-450 m below sea surface.**

Month	MA682	MA1030	MA1232	MA1372	MA1584	Shaft 213	MA1659	MA1745	MA1883	MA2028	MA2178	MA2357	MA2496	Shaft 333	MA2587	MA2699	MA2840	MA2994	MA3179	Shaft 450	MA3384	MA3411	MA3426	MF0061	Tot inflow	Tot inflow-MA0682
	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)	(l/min)
MAY-91	70	0																							70	0
JUN-91	70	10																							80	10
JUL-91	70	60																							130	60
AUG-91	70	90																							160	90
SEP-91	70	100																							170	100
OCT-91	70	175																							245	175
NOV-91	70	325																							395	325
DEC-91	70	400	40																						510	440
JAN-92	70	400	120																						590	520
FEB-92	70	400	180	26																					676	606
MAR-92	70	400	185	181																					836	766
APR-92	70	400	185	270																					925	855
MAY-92	70	400	185	270																					925	855
JUN-92	70	437	185	360																					1052	982
JUL-92	70	473	185	450	2																				1180	1110
AUG-92	70	473	185	450	35																				1213	1143
SEP-92	70	473	185	450	65			4																	1247	1177
OCT-92	70	473	185	450	65	10		21																	1274	1204
NOV-92	70	473	185	450	65	130		30	11																1414	1344
DEC-92	70	473	185	450	65	200		30	29	5.9															1507.9	1437.9
JAN-93	70	473	185	450	65	205		30	30	29	1.8														1538.8	1468.8
FEB-93	70	473	185	450	65	246		30	30	35	28														1612	1542
MAR-93	70	473	185	450	65	261.5		30	30	35	48	12													1659.5	1589.5
APR-93	70	473	185	450	65	255		30	30	35	50	52	0.6												1695.6	1625.6
MAY-93	70	473	196	450	62.2	211		27	30	35	50	60	5.4			2.4									1672	1602
JUN-93	70	473	267	462	64.7	196		19	38	38	50	60	6			11.6									1755.3	1685.3
JUL-93	70	473	188	462	78.4	191		32	45	35	50	60	6			13									1703.4	1633.4
AUG-93	70	473	184	462	73.7	191		32	40	37	50	60	6			13									1691.7	1621.7
SEP-93	70	473	180	462	73	191		32	40	37	50	60	6			13									1687	1617
OCT-93	70	473	179	462	72.8	191		33.4	37.2	39	52	60.3	7.8			13									1690.5	1620.5
NOV-93	70	473	181	462	72.3	191		20.3	31.3	36.8	136	61.3	4.1			34.4									1773.5	1703.5
DEC-93	70	473	193	462	72.5	191		20.3	31.1	36.0	66.9	69.5	3.6	0		55.8	9								1753.7	1683.7
JAN-94	70	473	189	426	72.9	183		20.3	31.3	37.9	54.9	69	4.1	0		55.8	29	6.6							1722.7	1652.7
FEB-94	70	473	181	426	74.2	168		20.3	31.3	33.7	56.6	69.0	4.2	14.4		55.8	30	66	22.3						1795.9	1725.9
MAR-94	70	473	186	426	72	153		20.3	44.6	31.8	56.8	73.7	4.1	14.4		55.8	30	77	194						1982.5	1912.5
APR-94	62.5	473	185	426	75	138		20.3	36.5	29.9	49.6	72.5	3.8	14.4		55.8	30	77	200						1949.4	1886.9
MAY-94	62.5	445	166	426	72	123		20.3	30.2	28.1	48.0	75	4	14.4		55.8	39.7	77.8	200						1887.8	1825.3
JUN-94	62.5	445	163	426	70.4	108		20.3	30.1	28	49.1	76.2	4.4	14.4		55.8	34.7	77	200			3.1			1868.0	1805.5
JUL-94	62.5	445	167	426	70.1	102		20.3	29.7	28	49.1	74.6	4.2	14.4		55.8	27	76.6	200			56.8			1909.1	1846.6
AUG-94	62.5	445	171	426	72.3	92		19.3	29.7	27.9	47.4	73.5	4.1	14.4		55.8	27.4	76.2	200			57.3	3.57		1905.4	1842.9
SEP-94	62.5	445	165	426	70.5	80		19.3	29.7	27.9	47.4	73.5	3.2	14.4		55.8	27.4	76.2	197.0			57.3	26.5		1904.6	1842.1
OCT-94	62.5	445	165	400	70.5	80		19.3	29.7	31	47.4	95	3.2	14.4		55.8	27.4	76.2	191.1			57.3	27.7		1898.5	1836.0
NOV-94	62.5	445	160	400	98	80		19.3	29.7	31	47.4	92	2.5	14.4		55.8	31.5	79	185.1	0.1		57.3	27.7		1918.3	1855.8
DEC-94	62.5	445	160	400	147	80		18	29.7	31	47.4	85	3.3	14.4		55.8	31.5	79	179.1	2.7		57.3	27.7		1956.4	1893.9
JAN-95	62.5	445	160	400	138	80		18	29.7	31	47.4	85	3.5	14.4		55.8	31.5	72.5	173.2	5.8		57.3	27.7		1938.2	1875.7
FEB-95	62.5	445	160	400	135	80		19	29.7	31	47.4	85	3.5	14.4		55.8	31.5	72.5	167.2	8		57.3	27.7		1932.5	1870.0
MAR-95	62.5	445	160	400	135	75		19	40	31	47.4	85	3.5	14.4		55.8	23	72.5	161.3	8		57.3	27.7		1923.4	1860.9
APR-95	62.5	445	160	400	135	75		22	26.8	31	42	85	3.5	14.4		55.8	23	80	155.3	2.5		57.3	27.7		1903.8	1841.3
MAY-95	62.5	445	150	400	80		72	20	26.8	28.3	42	85	3.5	14.4		55.8	23	67	149.4	2.5		57.3	27.7		1812.1	1749.6
JUN-95	62.5	445	150	400	80		72	20	26.8	28.3	42	85	3		7	55.8	23	67	143.4	2.5		57.3	27.7		1798.2	1735.7
JUL-95	62.5	445	150	400	80		72	20	24	28.3	42	85	3		7	55.8	23	67	137.4		13.7	57.3	27.7		1800.7	1738.2
AUG-95	62.5	445	120	400	80		72	16	24	28.3	42	85	3		7	55.8	23	67	131.5		13.7	57.3	27.7		1760.8	1698.3
SEP-95	62.5	445	120	400	80		72	16	21.7	28.3	42	85	3		7	55.8	23	67	127.5		13.7	57.3	27.7	2.5	1757	1694.5
OCT-95	62.5	445	120	400	80		72	16	21.7	28.3	42	85	3		7	55.8	23	67	127.5		13.7	57.3	27.7	2.5	1757	1694.5
NOV-95	62.5	445	120	400	67		73	16	21.7	28.3	42	85	3		7	55.8	23	67	127.5		13.7	57.3	27.7	2.5	1745	1682.5
DEC-95	62.5	445	120	400	67		73	16	21.7	28.3	42	85	3		7	55.8	23	67	127.5		13.7	57.3	27.7	2.5	1745	1682.5

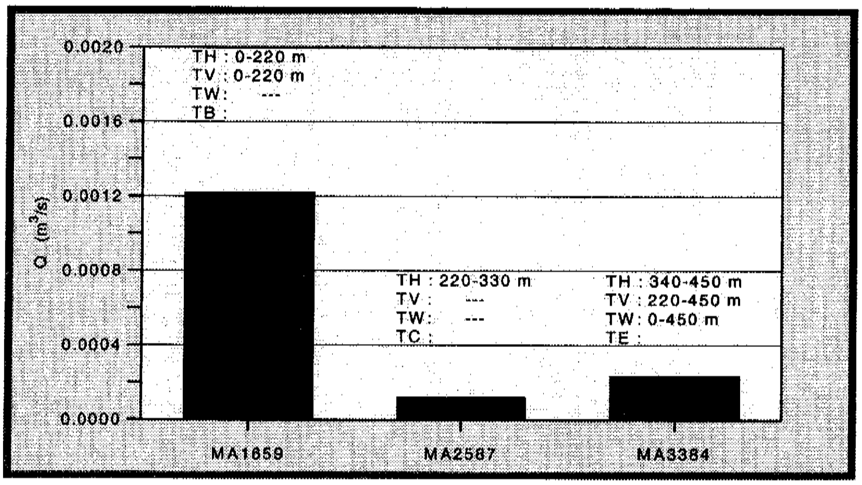


Figure A2-31. *Water flow into the shaft to the measurement sections. Monthly mean values, summer 1995. See Rhén et al /1995/ (PR 25-95-28) for details concerning the flow measurements.*
RAS01: TV = ventialtion shaft-in
RAS02: TW = Ventilation shaft-out
RAS03: TH = Elevator shaft
TV, TC, TE: Short tunnel sections connecting the shafts with the shaft-main tunnel.

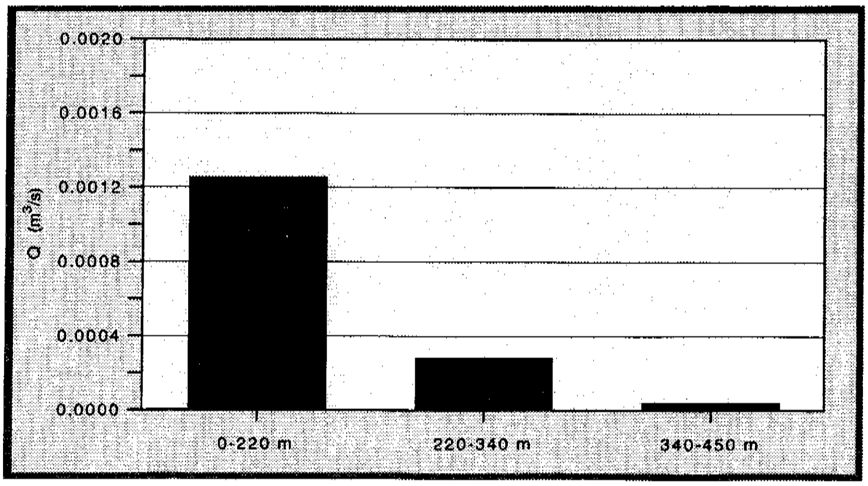


Figure A2-32. *Water flow into the tunnel- tranformed into depth intervals. Monthly mean values. See Table A2-31 and Rhén et al /1995/ (PR 25-95-28) for details concerning the flow measurements.*

Table 2-31. Suggested transformation of flow measurements in the shafts into depth intervals based on *Table 2-3* in *Appendix 2:4* in *Rhén et al /1995/ (PR 25-95-28).*
Flow rate measured at MA1659G = A1
Flow rate measured at MA2587G = A2
Flow rate measured at MA3384G = A3

Depth inteval (m)	**Flow rate**	**Estimate* for Nov. 1995** (l/min)	**Flow rate per m** ($m^3/(s \cdot m)$) $\cdot 10^{-6}$
0-220	A1 + 0.15 A3	75.1	5.7
220-340	A2 + 0.7 A3	16.6	2.3
340-450	A3 • 0.15	2.1	0.32

* based on *Table 2-1, Appendix 2:4* in *Rhén et al /1995/.*

Salinity of the water at the weirs

A few times water samples have been taken at the weirs. The composition is shown in *Table 3-32*. The salinity (S) of the water can be estimated at:

$$S = \frac{4.67 \cdot 10^{-3}}{0.741} \cdot C \qquad [g/l]$$

C = electrical conductivity of the water [mS/m]

Table A2-32. Water samples taken at the weirs.

Weir (No.)	Measurement Section Tunnel (m)	Date	Electrical Conductivity (mS/m)	pH	Cl (mg/l)
MA682G	0 - 682	930722	780	8.0	2850
		930729	810	8.0	2843
		930804	790	8.0	2801
		950201	811	8.0	
		950227	714		
		950314	800		
		950403	790	8.0	
MA1030G	682 - 1030	930723	1080	7.1	3850
		930729	1100	7.5	3329
		930804	1100	7.6	3836
		950201	1047	7.5	
		950227	1003		
		950314	1020	7.6	3379
		950403	1020	7.5	3366
		951106	969		
		951108	956		
		951110	971		
		951120	967		
		951204	965		
MA1232G	1030 - 1232	930722	1040	7.3	3545
		930729	1040	7.4	3517
		930804	1020	7.6	3531
		950201	1018	7.5	
		950227	992		
		950314	980	7.6	7177
		950403	980	7.5	3152
MA1372G	1232 - 1372	930722	1160	7.6	4105
		930729	1160	7.5	4077
		930804	1160	7.7	4070
		950201	1113	7.5	
		950227	1101		
		950314	1100	7.7	3613
		950403	1080	7.6	3613

Table A2-32. continued.

Weir (No.)	Measurement Section Tunnel (m)	Date	Electrical Conductivity (mS/m)	pH	Cl (mg/l)
MA1584G	1372 - 1584	930722	988	7.8	3304
		930729	1000	7.8	3396
		930804	980	7.8	3411
		950201	966	7.6	
		950227	931		
		950314	940	7.9	3031
		950403	900	7.8	2969
"MA1740G"	1370-1740	930729	1420	7.6	5077
MA1745G	1584 - 1745	930722	1300	7.7	4644
		950227	1559		
		950314	1600	7.6	5669
		950403	1580	7.5	5776
MA1883G	1745 - 1883	930722	1520	7.6	5467
		930804	1510	7.6	5119
		950201	1336	7.5	
		950227	1268		
		950314	1220		
		950403	1220	7.7	
MA2028G	1883 - 2028	930722	1020	7.9	3467
		930729	1020	7.9	3481
		930804	1260	7.7	4545
		950201	923	7.9	
		950227	858		
		950314	880		
		950403	890	7.8	
MA2178G	2028-2178	950201	975	7.5	
		950227	941		
		950314	920	7.8	3044
		950403	920	7.7	3053
MA2357G	2178-2357	950201	1453	7.4	
		950227	1431		
		950314	1420	7.8	4939
		950403	1380	7.7	4932
MA2496G	2357-2496	950227	1661		
		950314	1640		
		950403	1640	7.4	5804
MA2699G	2496-2699	950201	1659	6.9	
		950227	1703		
		950314	1740	7.6	6360
		950403	1740	7.4	6330

Table A2-32. continued.

Weir (No.)	**Measurement Section Tunnel** (m)	**Date**	**Electrical Conductivity** (mS/m)	**pH**	**Cl** (mg/l)
MA2840G	2699-2840	950201	2000	6.8	
		950227	2000		
		950314	2250	7.6	8707
		950403	2400		8977
MA2994G	2840-2994	950201	1744	6.8	
		950227	1707		
		950314	1720		
		950403	1740	7.5	
MA3384G	340-450	951106	1601		
		951108	1584		
		951110	1596		
		951120	1560		
		951204	1540		
MA3411G	3179-3411	951106	1929		
		951108	1882		
		951110	1898		
		951120	1867		
		951204	1887		
MA3426G	3426-3600	951106	1609		
		951108	1627		
		951110	1649		
		951120	1717		
		951204	1801		

Table A2-33. Salinity of the ground water - present day conditions before excavation of the Äspö HRL tunnel.

	SECUP (m)	SECLOW (m)	DEPTH (m)	Cl (mg/dm³)	S (g/dm³)
KLX01	272	277	274.5	2000	3.4
KLX01	456	461	458.5	1700	2.89
KLX01	680	702	691	4700	7.99
KLX01	830	841	835.5	9200	15.64
KLX01	910	921	915.5	11100	18.87
KLX01	999	1078	1038.5	12600	21.42
KLX02	9	31	20	149	0.2533
KLX02	31	81	56	146	0.2482
KLX02	81	131	106	140	0.238
KLX02	131	181	156	123	0.2091
KLX02	181	231	206	109	0.1853
KLX02	231	281	256	82.5	0.14025
KLX02	281	331	306	63.8	0.10846
KLX02	331	381	356	45	0.0765
KLX02	381	431	406	34.5	0.05865
KLX02	431	481	456	28	0.0476
KLX02	481	531	506	26.5	0.04505
KLX02	531	581	556	26.2	0.04454
KLX02	581	631	606	25.5	0.04335
KLX02	631	681	656	28	0.0476
KLX02	681	731	706	28.3	0.04811
KLX02	731	781	756	28	0.0476
KLX02	781	831	806	34	0.0578
KLX02	831	881	856	60	0.102
KLX02	881	931	906	175	0.2975
KLX02	931	981	956	1080	1.836
KLX02	981	1031	1006	3780	6.426
KLX02	1031	1081	1056	9910	16.847
KLX02	1081	1131	1106	13600	23.12
KLX02	1131	1181	1156	16000	27.2
KLX02	1181	1231	1206	16800	28.56
KLX02	1231	1281	1256	18500	31.45
KLX02	1281	1331	1306	21500	36.55
KLX02	1331	1381	1356	29100	49.47
KLX02	1381	1431	1406	33100	56.27
KLX02	1431	1481	1456	39700	67.49
KLX02	1481	1531	1506	43300	73.61
KLX02	1531	1581	1556	43500	73.95
KLX02	1581	1631	1606	44800	76.16
KLX02	1631	1681	1656	47200	80.24
KAS02	202	215	205	3840	6.528
	308	344	315	5300	9.01
	314	319	305	5340	9.078
	463	468	455	5450	9.265
	530	535	522	6370	10.829
	802	924	860	11000	18.7
	860	924	880	11100	18.87
KAS03	129	134	125	1230	2.091
	196	223	200	2900	4.93
	248	251	240	3000	5.1
	347	374	350	5180	8.806
	453	480	452	4600	7.82
	609	623	610	5880	9.996
	690	1002	833	8100	13.77
	860	1002	913	12300	20.91
KAS04	226	235	185	530	0.901
	334	343	277	3030	5.151
	440	481	376	5900	10.03
KAS06	204	277	200	3630	6.171
	304	377	284	5680	9.656
	389	406	331	5970	10.149
	439	602	432	6150	10.455

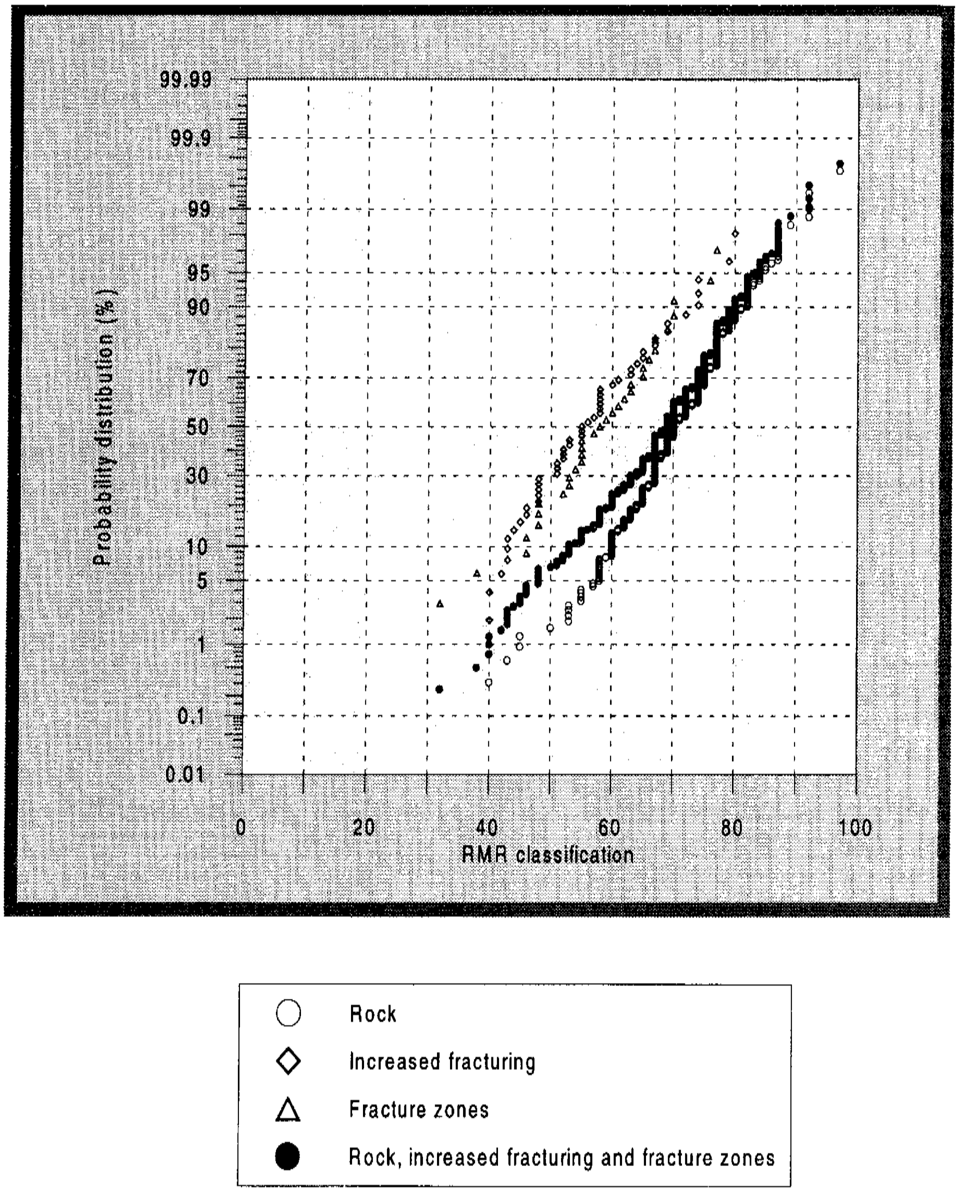


Figure A2-33. *Normal probability plots for RMR for tunnel section 1400-3600 m. RMR values for tunnel sections (approximately 4 m) classified in the classes "Rock", "Increased fracturing" and "Fracture zones" according to the geological documentation of the tunnel.*

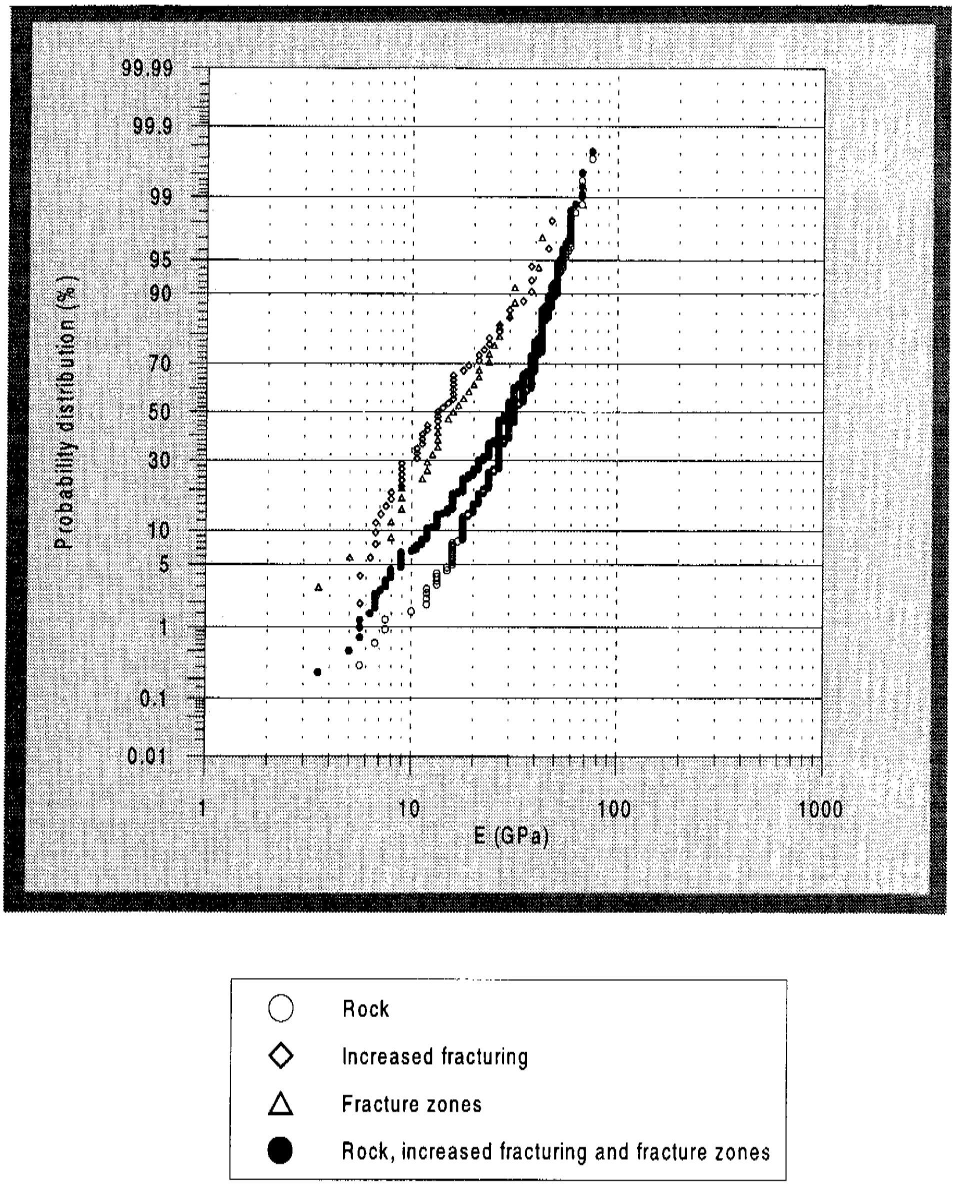


Figure A2-34. *Normal probability plots for deformation modulus (E_d) for tunnel section 1400-3600 m. E_d estimated from RMR in Figure A2-33 based on equation shown in Chapter 6.*

APPENDIX 3

HYDROCHEMISTRY DATA

A3.1 INFLUX OF DIFFERENT WATER TYPES INTO THE HRL TUNNEL WITH TIME

The influx in percentage terms of the Baltic Sea, Modified Baltic Sea, Shallow, Glacial and Deep Saline waters into the HRL tunnel is shown as a cross-section and from above over time. The data has been divided into experimental days where day 0 (1990-10-14) indicates the start of the tunnel construction, day 150 represents 1991-03-13, day 350 (1991-09-29), day 550 (1992-04-16), day 750 (1992-11-02) day 950 (1993-05-21), day 1150 (1993-12-07) and day 1350 represents 1994-06-25. Kriging */Henley, 1981; Fortner, 1992/* was used to interpolate between the observed data points. The boundary conditions used in the Kriging calculations for eg, Baltic Sea water was 0% at land surface and 100% at sea surface. The boundary conditions at 500 m depth were from the calculated mixing ratios in KAS02:533. The Baltic Sea water portion at this depth was 0%. For the mixing ratios, a sample collected closest to the actual experimental day was selected to represent that experimental day with a tolerance of ±100 days. In order to minimise possible methodology errors the mixing portions have been divided in steps of 20%.

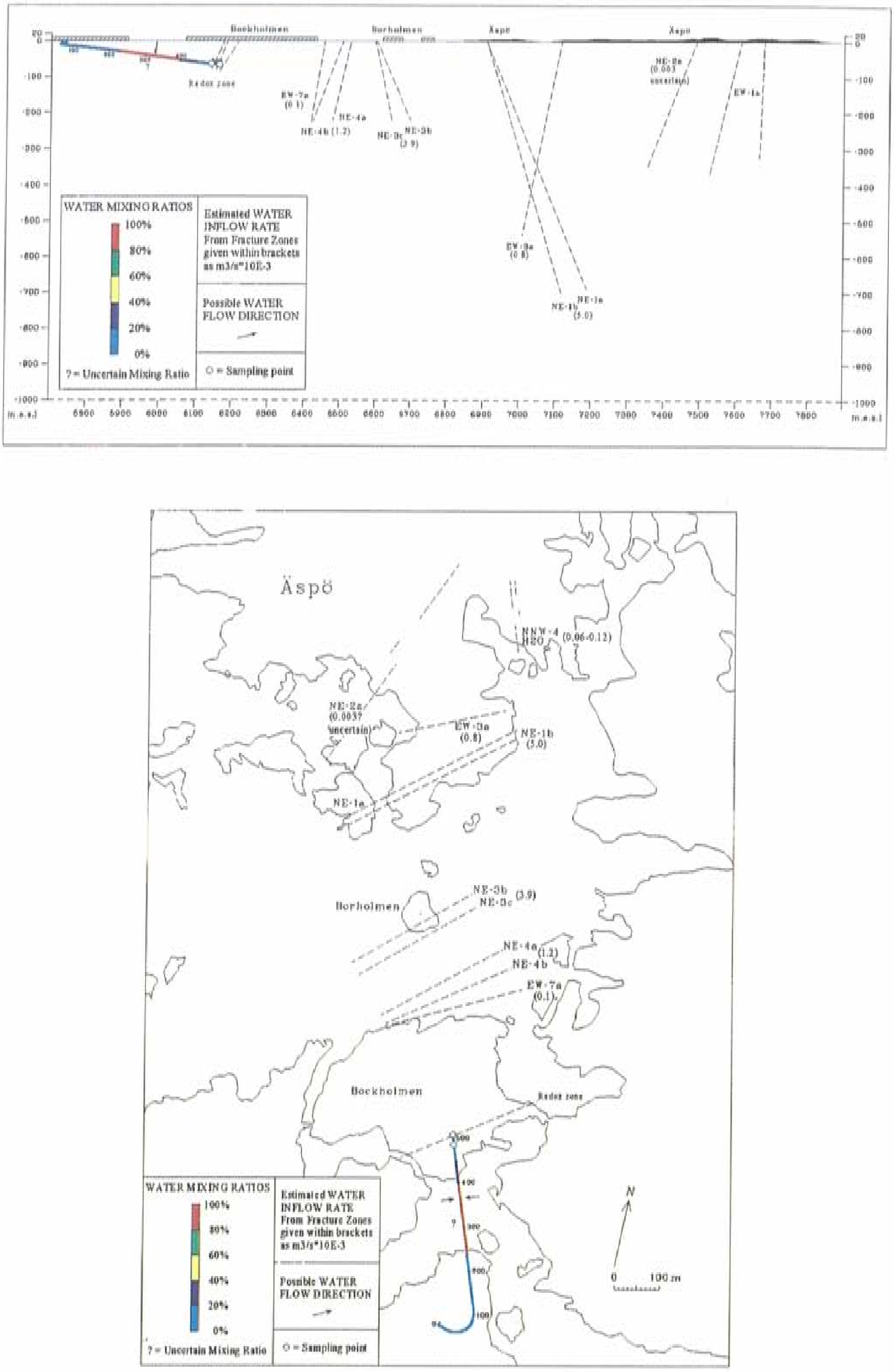
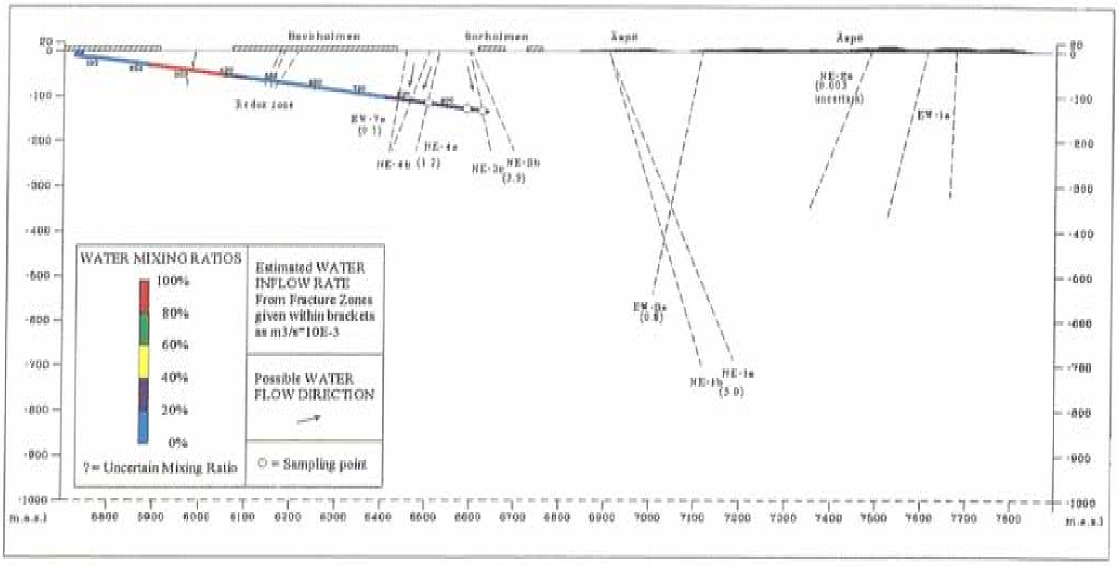


Figure A3-1. *Influx of Baltic Sea water, experimental day 150 (1991-03-13).*



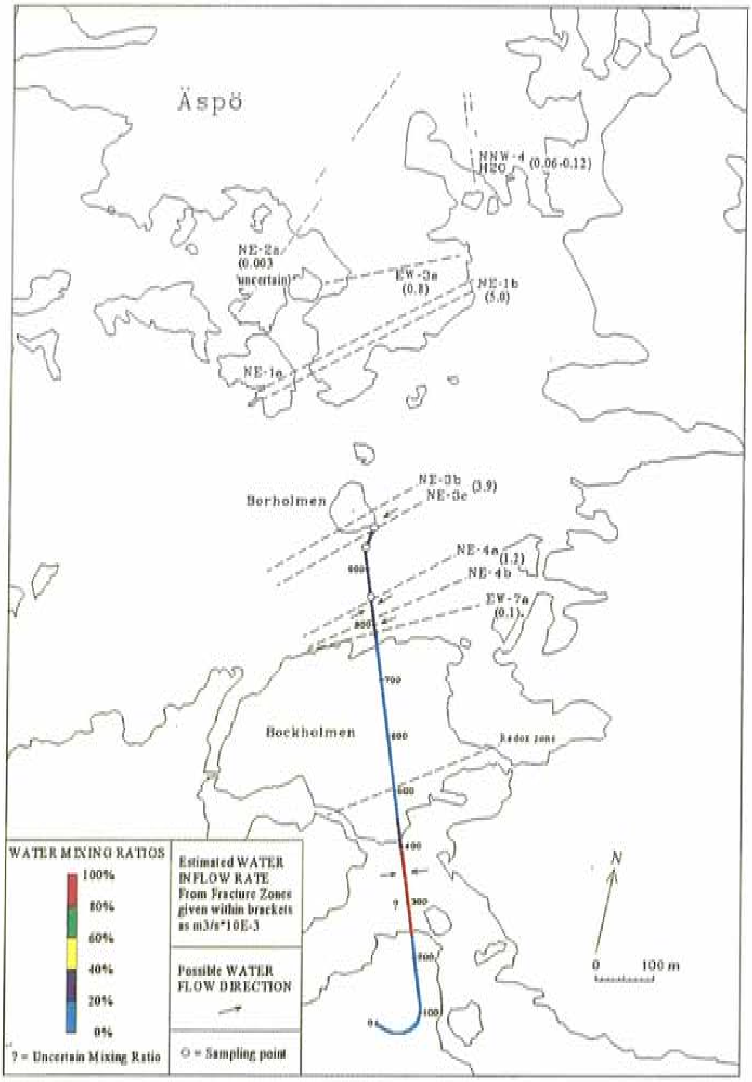
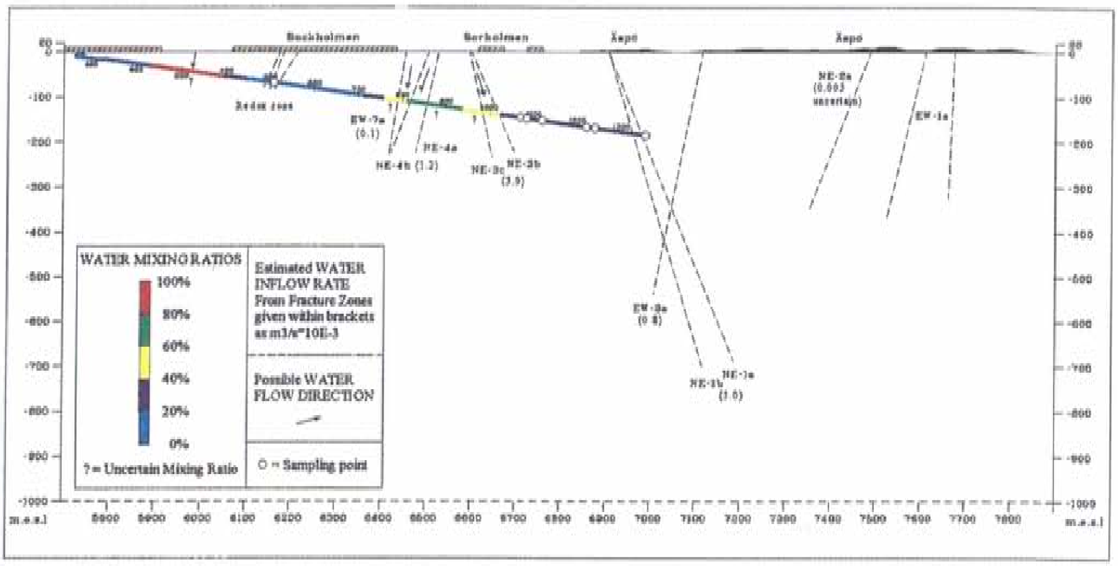


Figure A3-2. Influx of Baltic Sea water, experimental day 350 (1991-09-29).



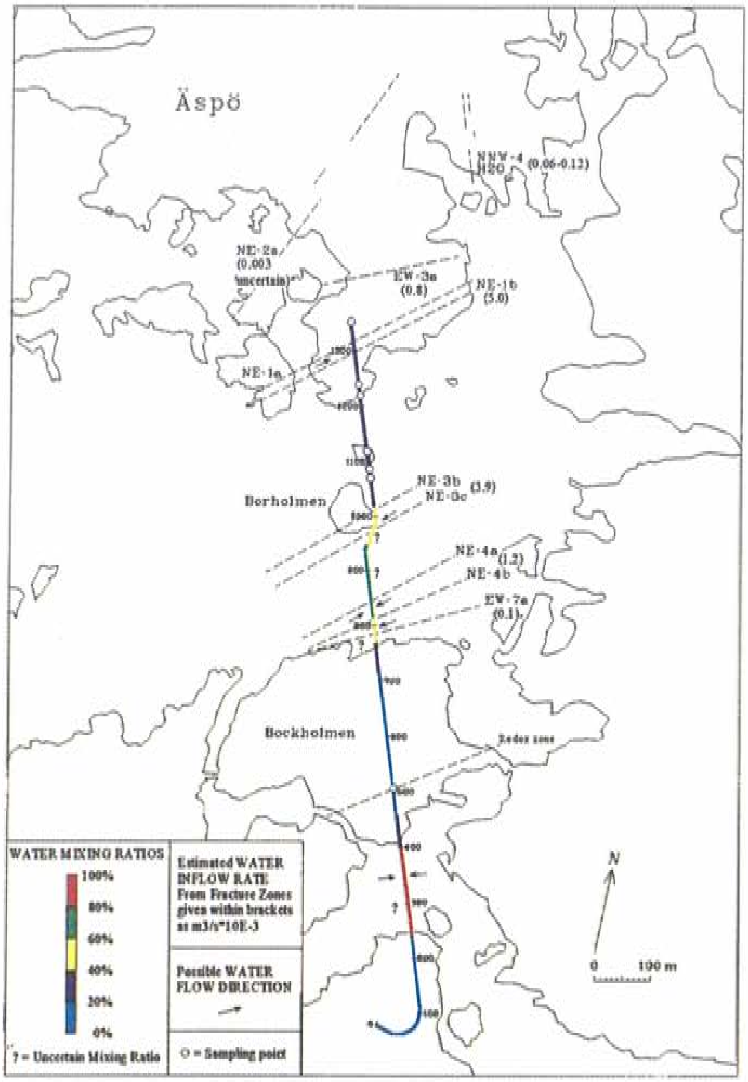
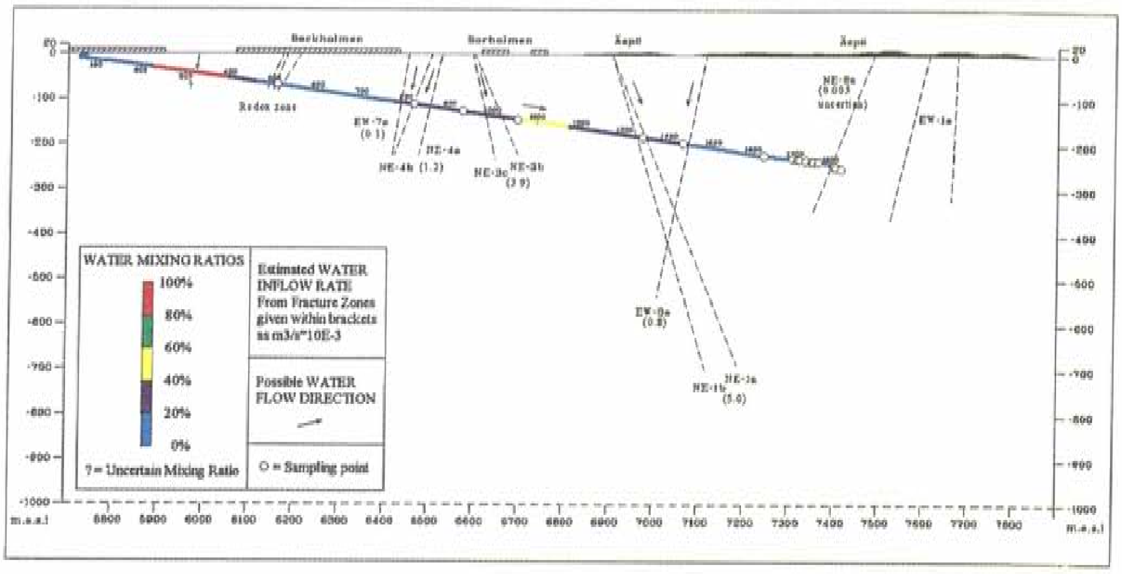


Figure A3-3. *Influx of Baltic Sea water, experimental day 550 (1992-04-16).*



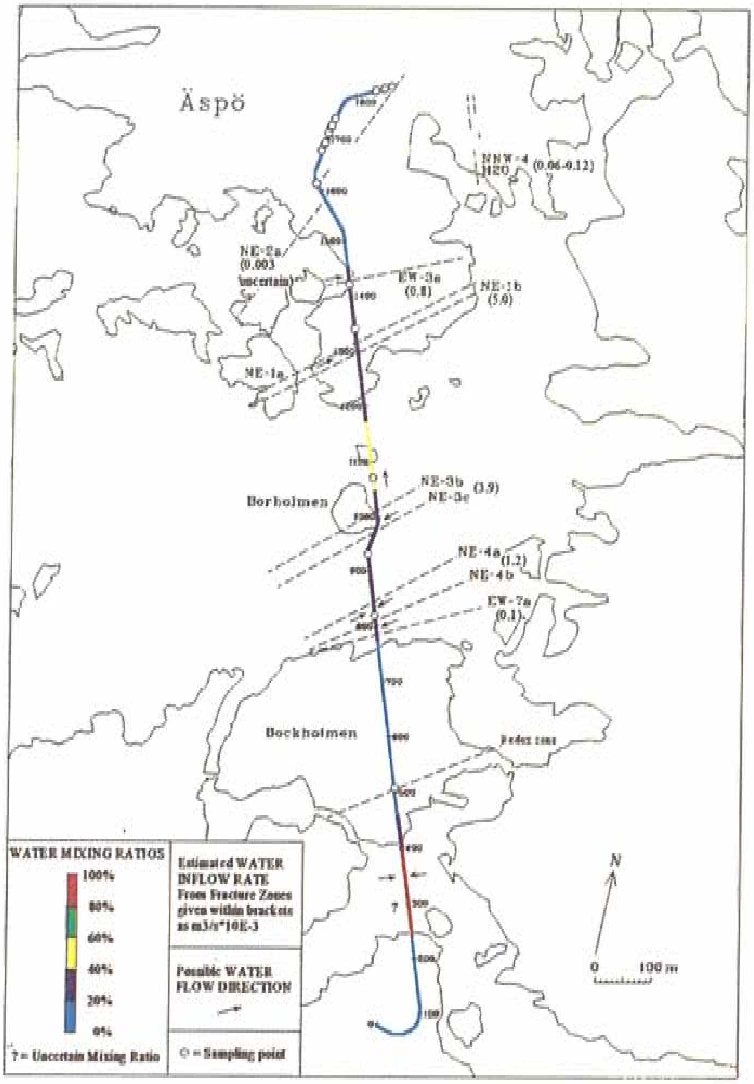
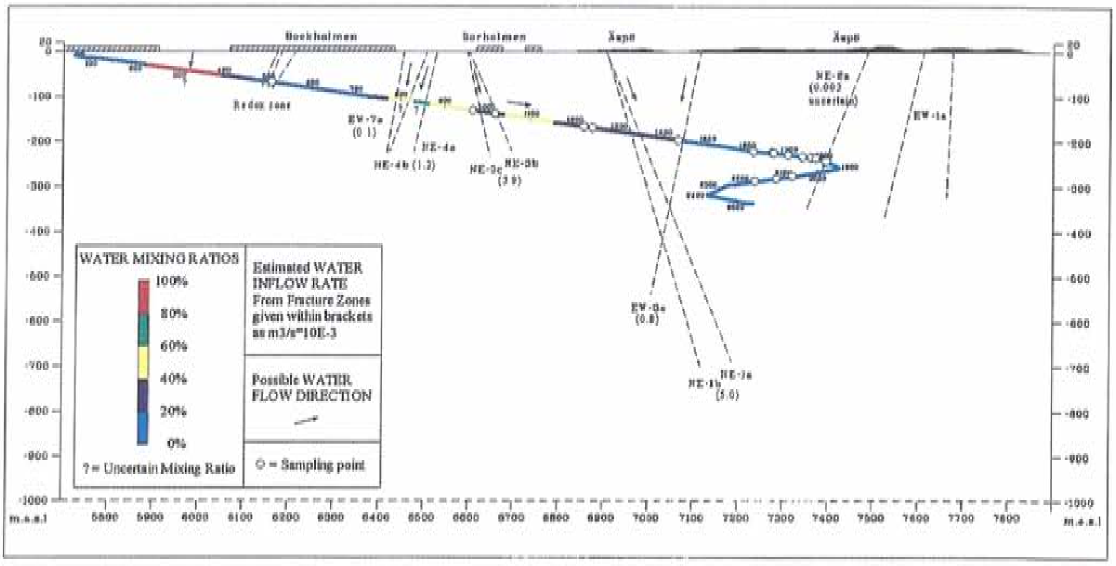


Figure A3-4. *Influx of Baltic Sea water, experimental day 750 (1992-11-02).*



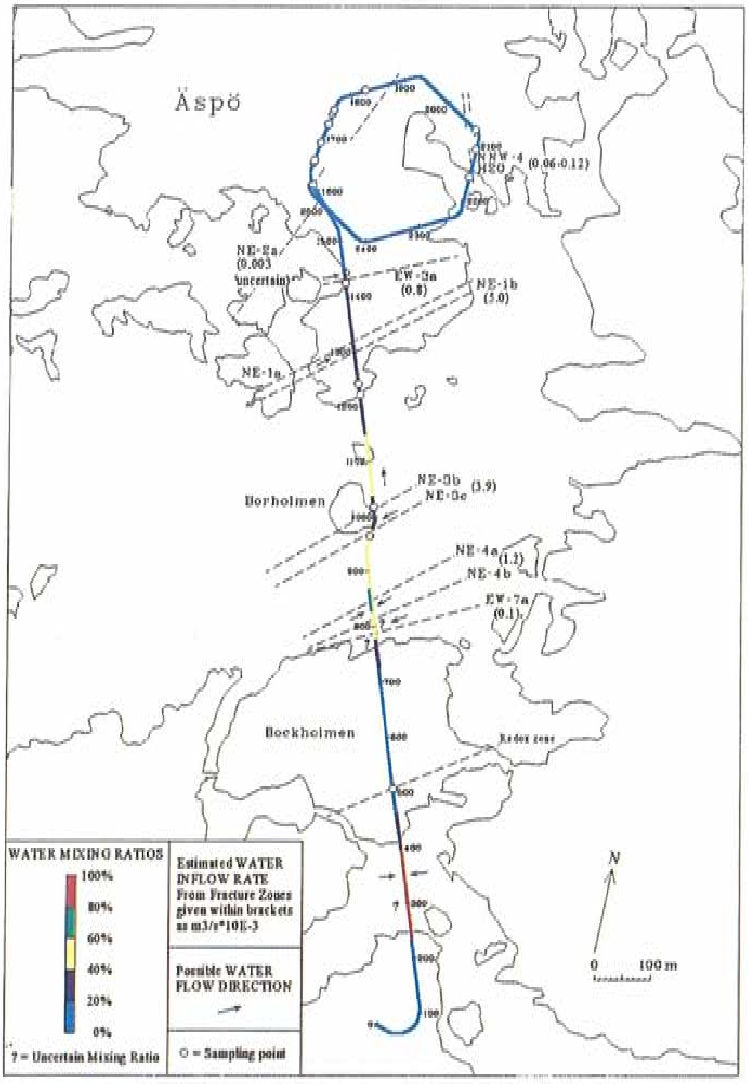


Figure A3-5. *Influx of Baltic Sea water, experimental day 950 (1993-05-21).*

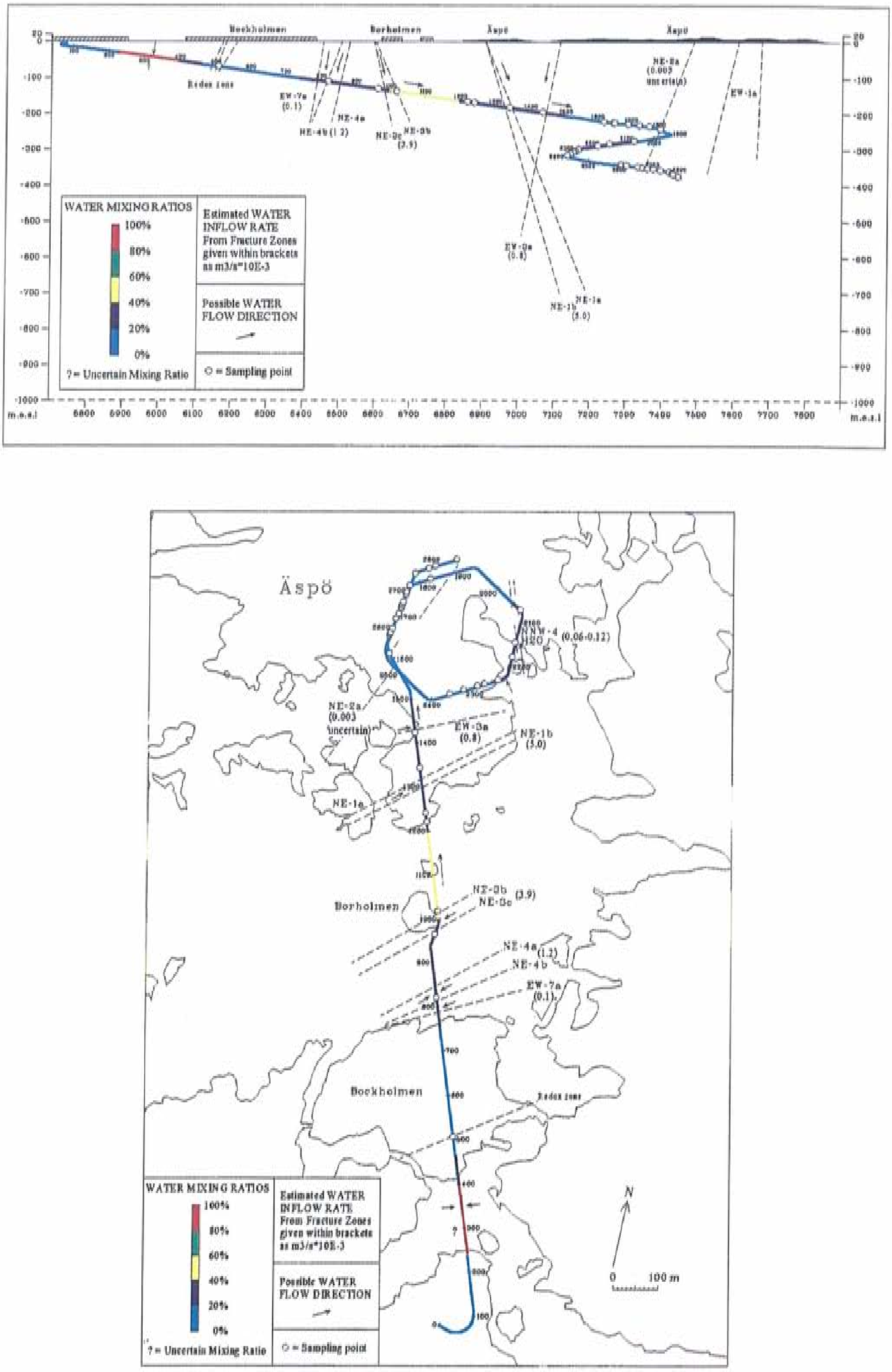
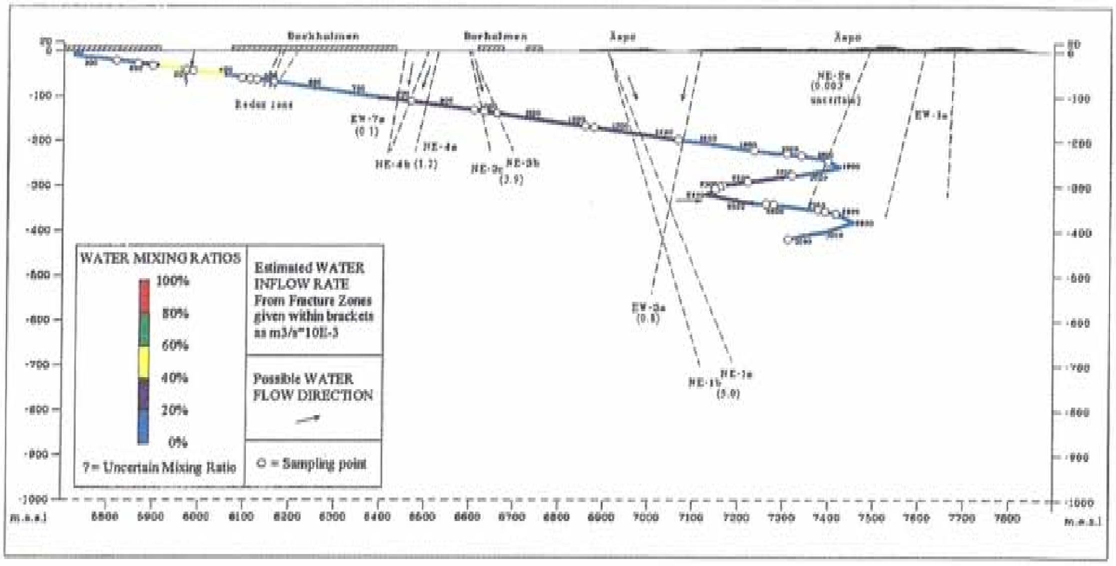


Figure A3-6. Influx of Baltic Sea water, experimental day 1150 (1993-12-07).



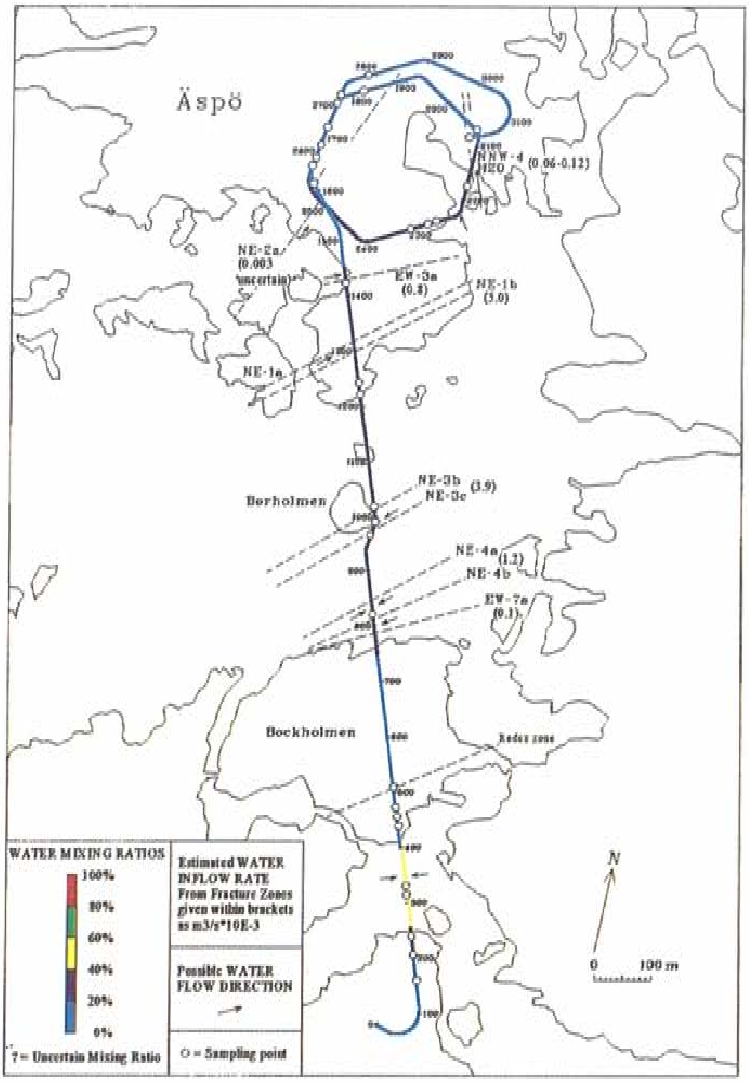
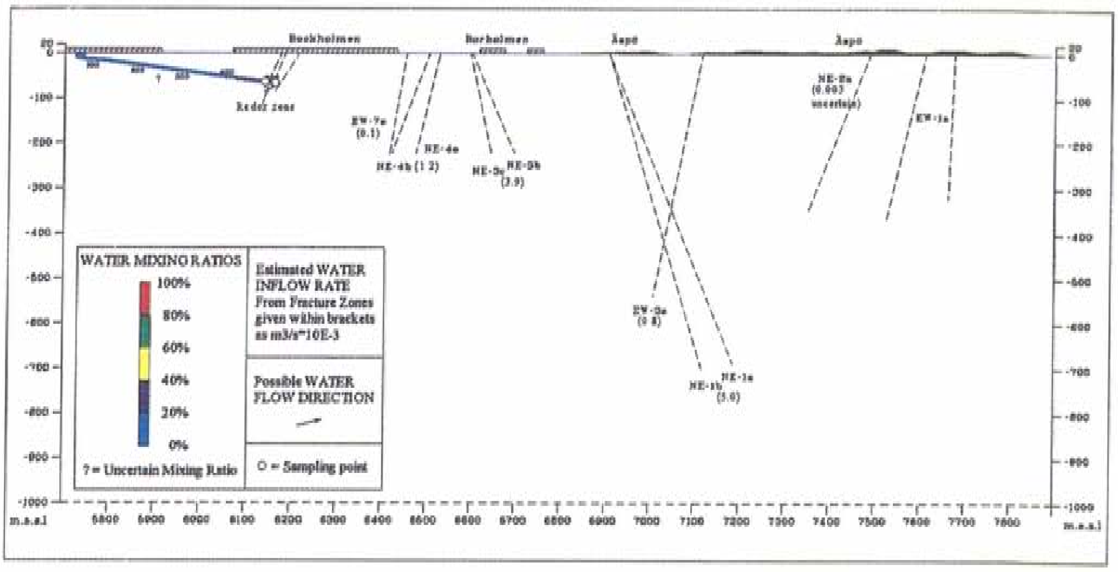


Figure A3-7. Influx of Baltic Sea water, experimental day 1350 (1994-06-25).



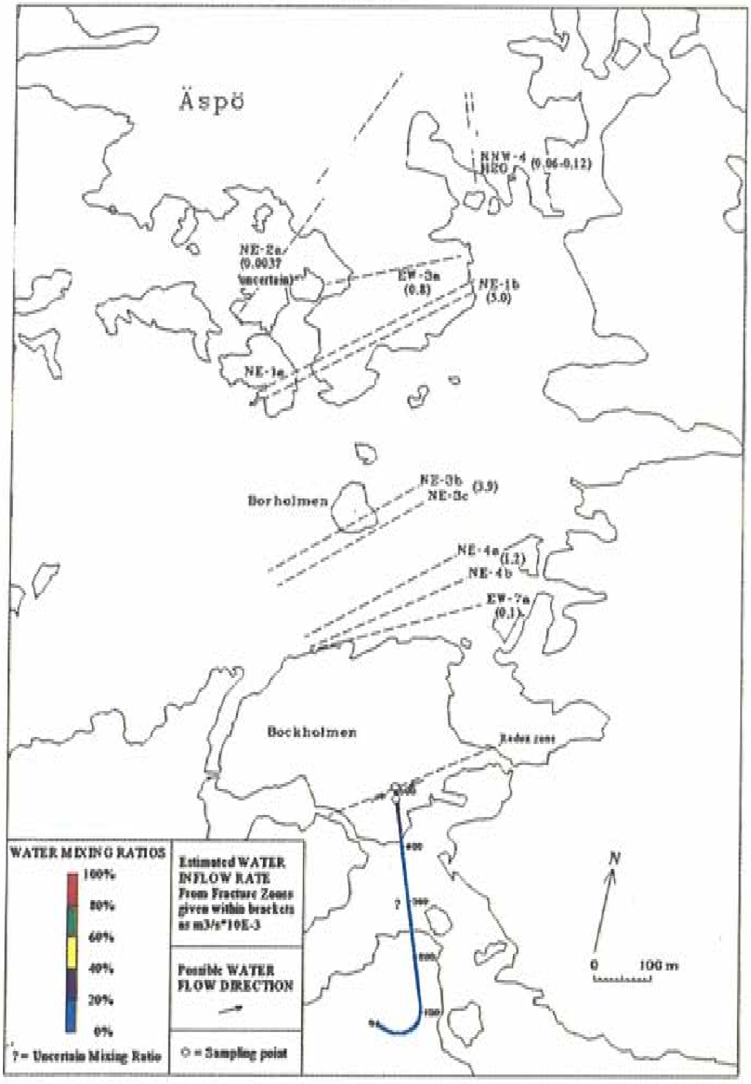
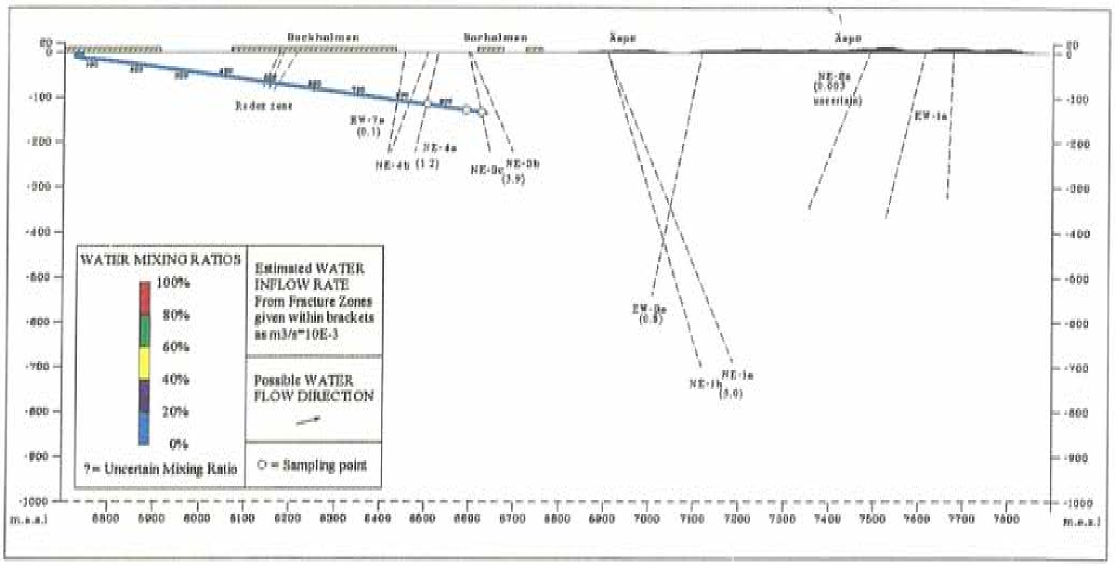


***Figure A3-8.** Influx of Glacial water, experimental day 150 (1991-03-13).*



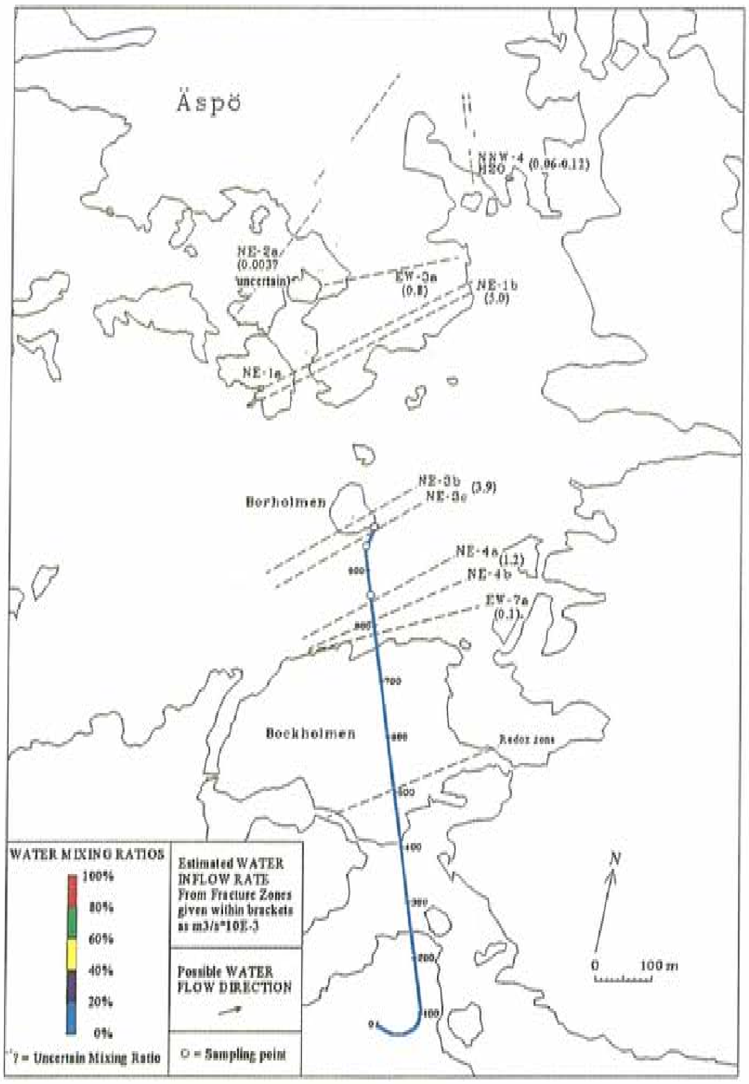
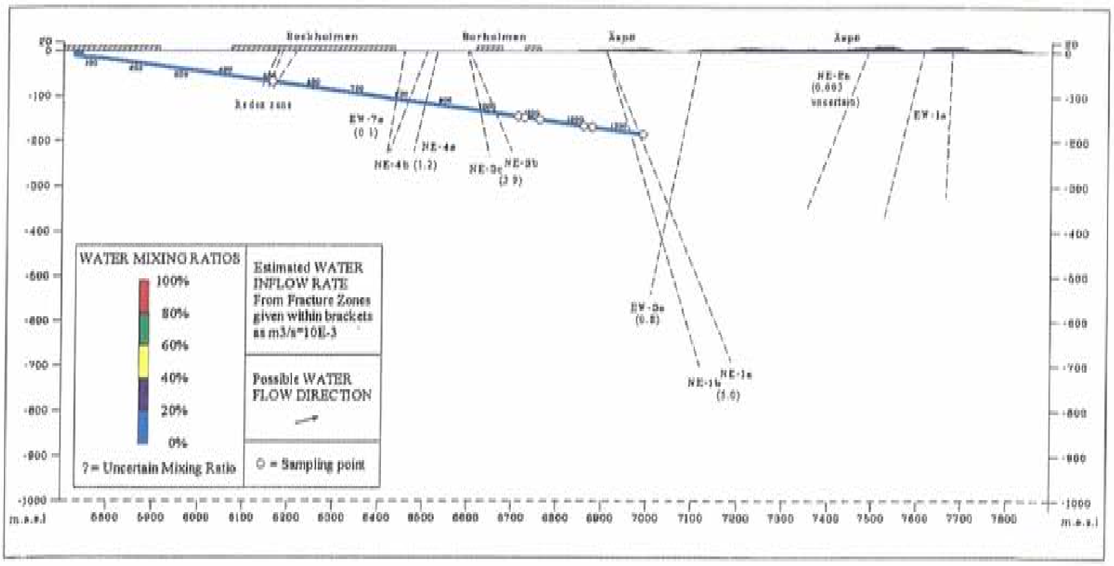


Figure A3-9. *Influx of Glacial water, experimental day 350 (1991-09-29).*



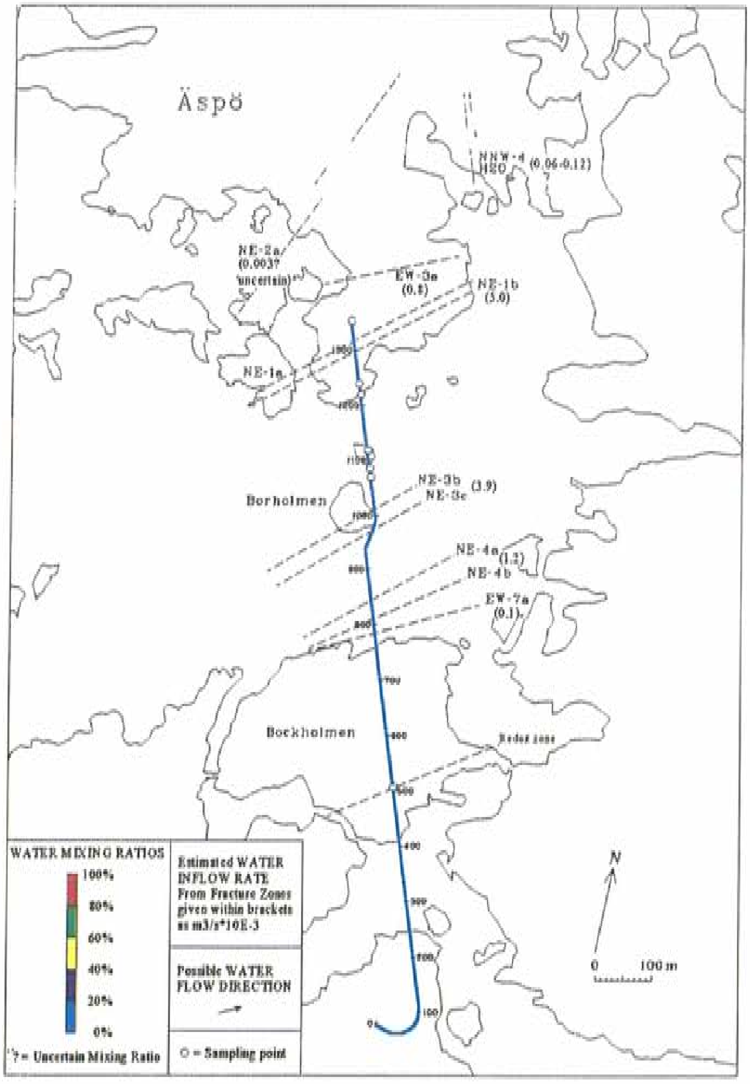
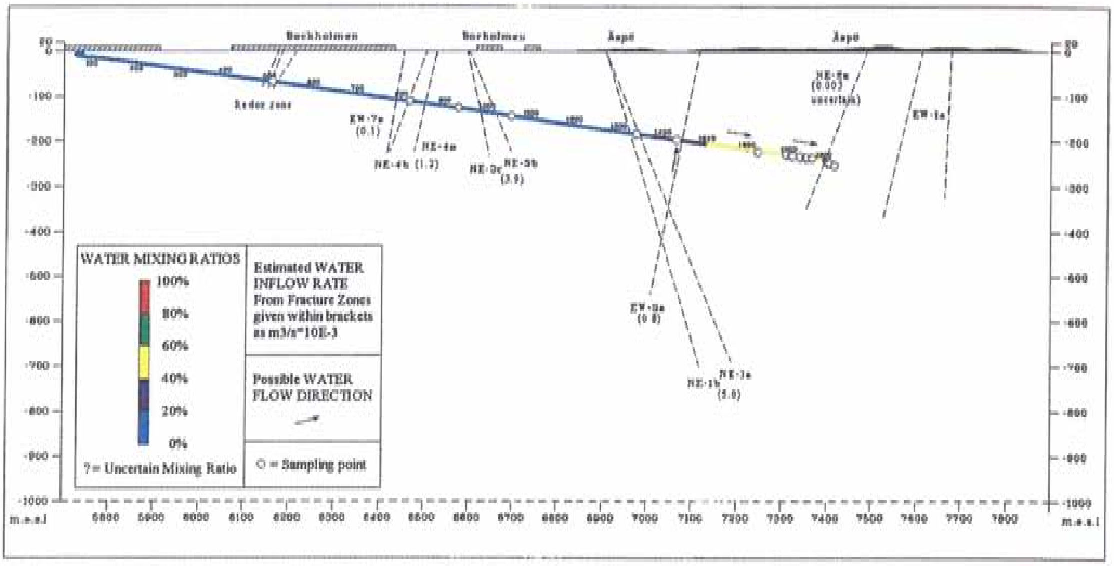


Figure A3-10. Influx of Glacial water, experimental day 550 (1992-04-16).



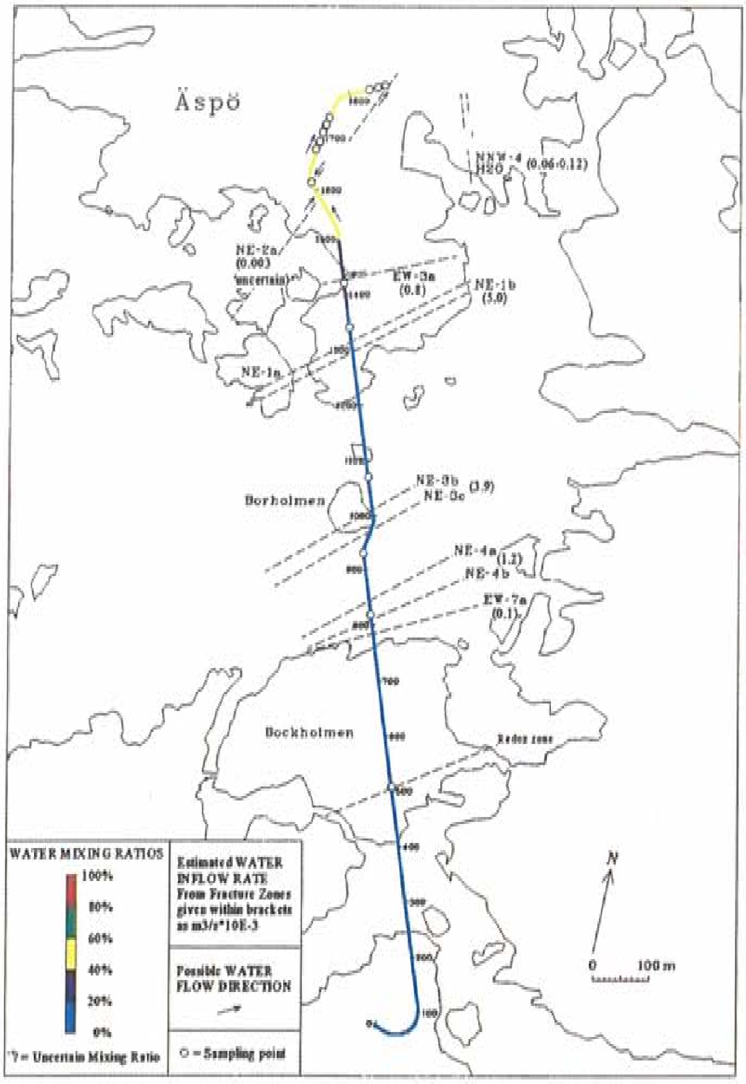
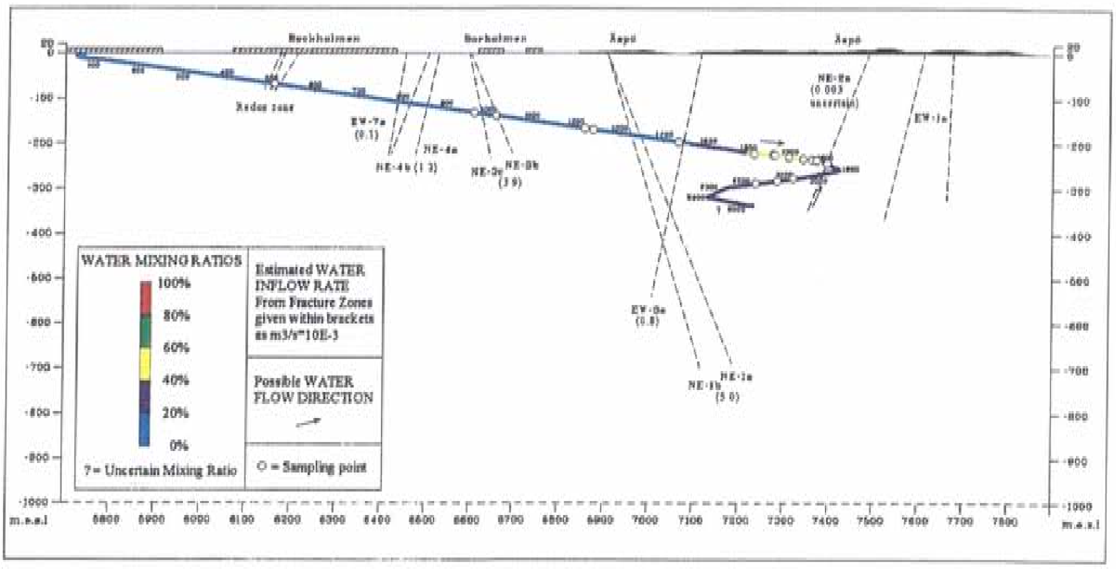


Figure A3-11*. Influx of Glacial water, experimental day 750 (1992-11-02).*



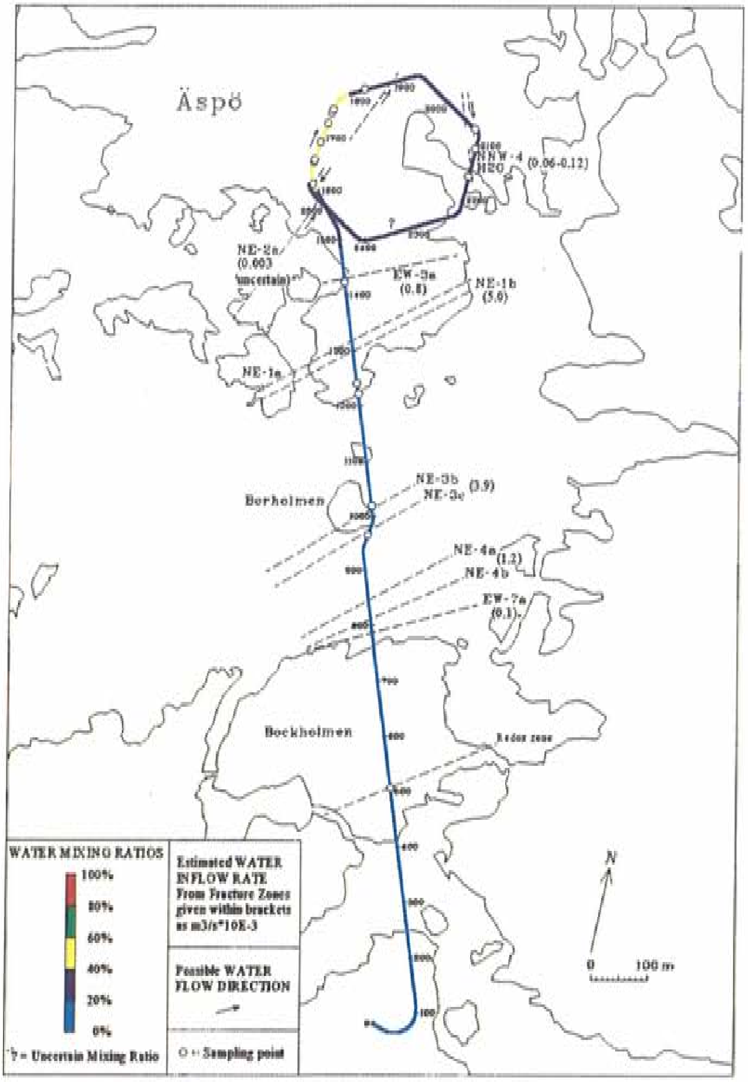
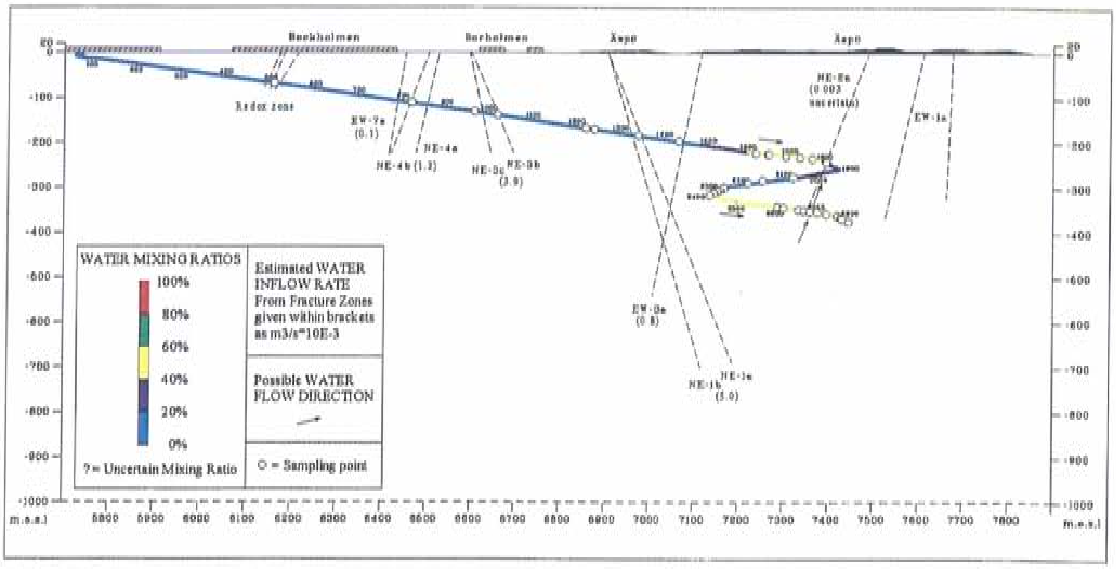


Figure A3-12. *Influx of Glacial water, experimental day 950 (1993-05-21).*



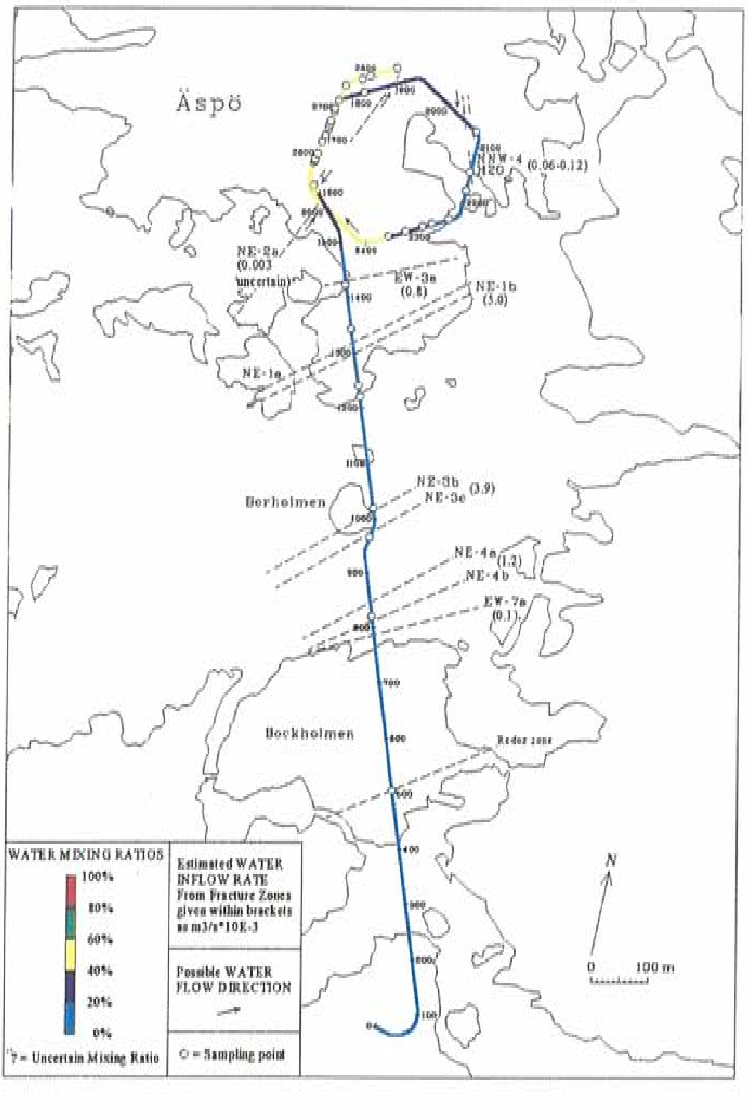
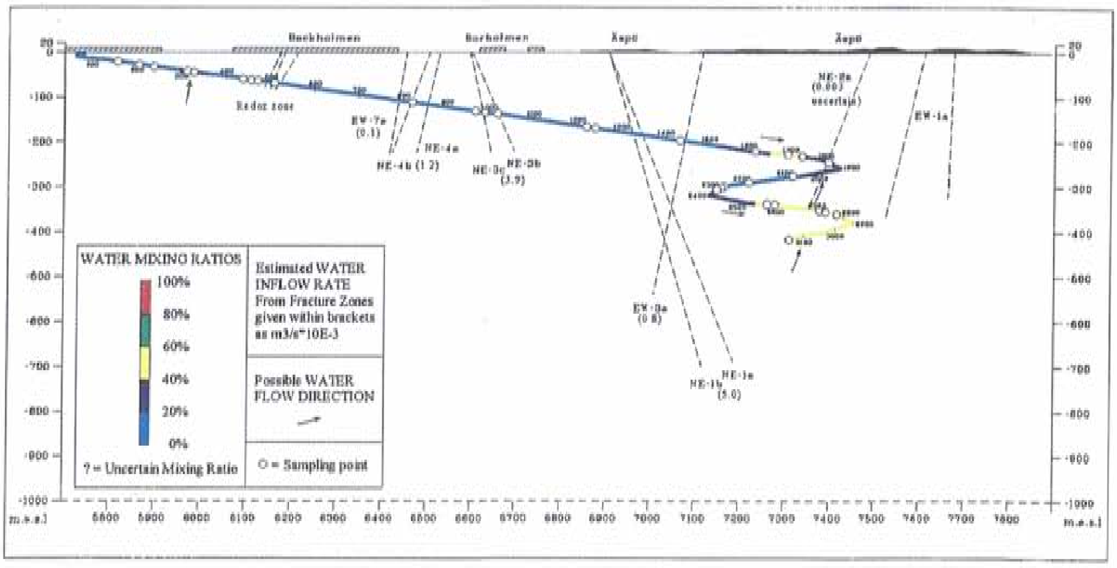


***Figure A3-13**. Influx of Glacial water, experimental day 1150 (1993-12-07).*



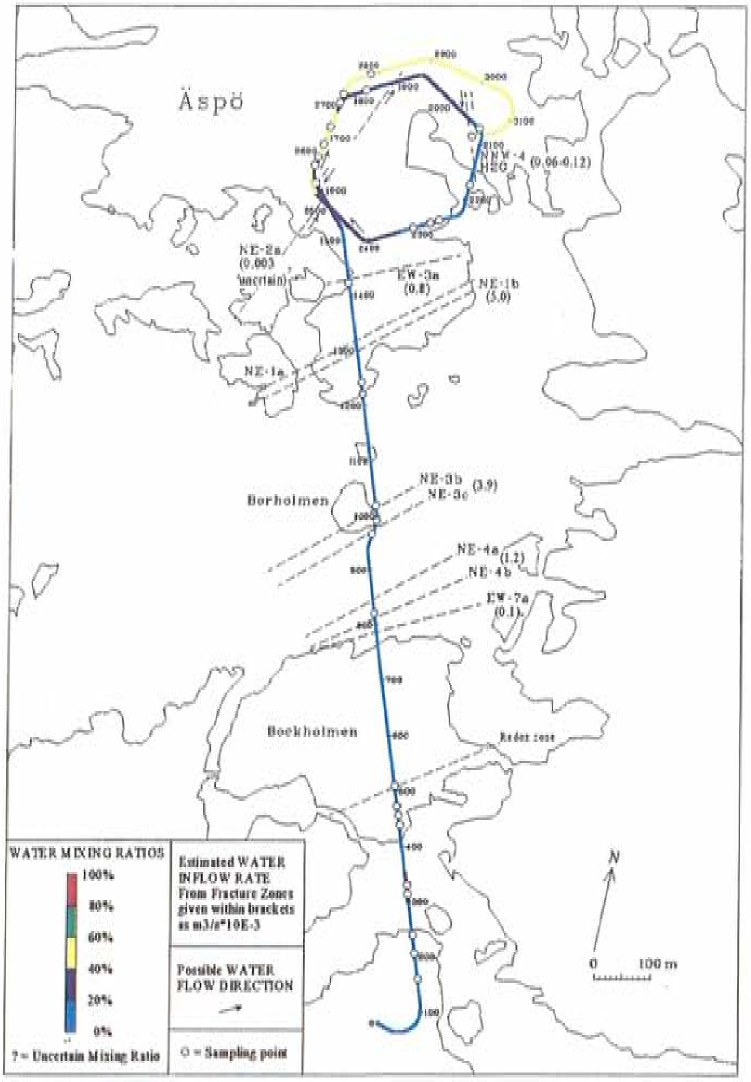
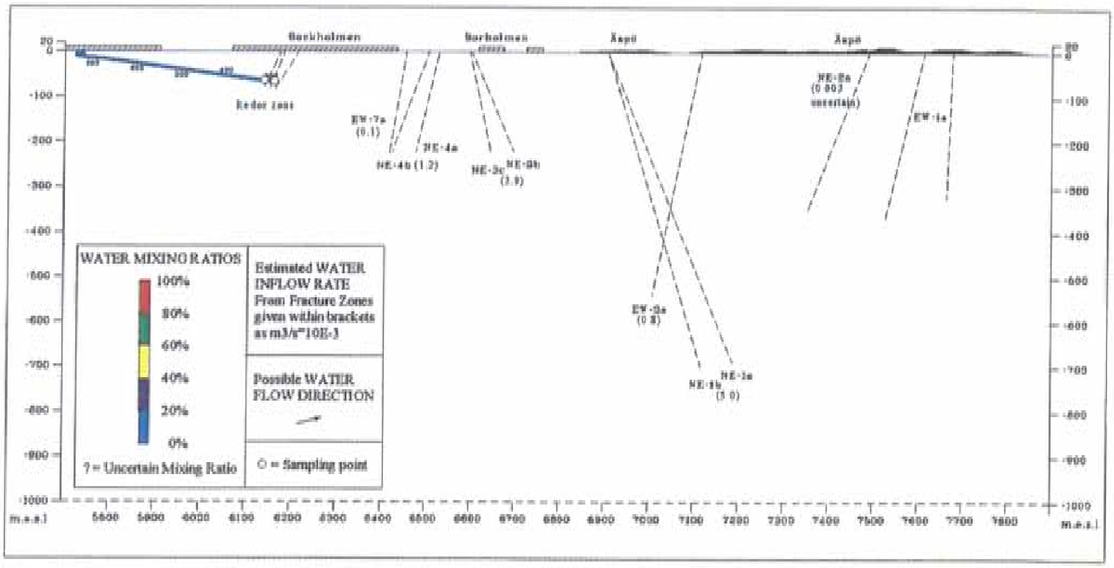


***Figure A3-14**. Influx of Glacial water, experimental day 1350 (1994-06-25).*



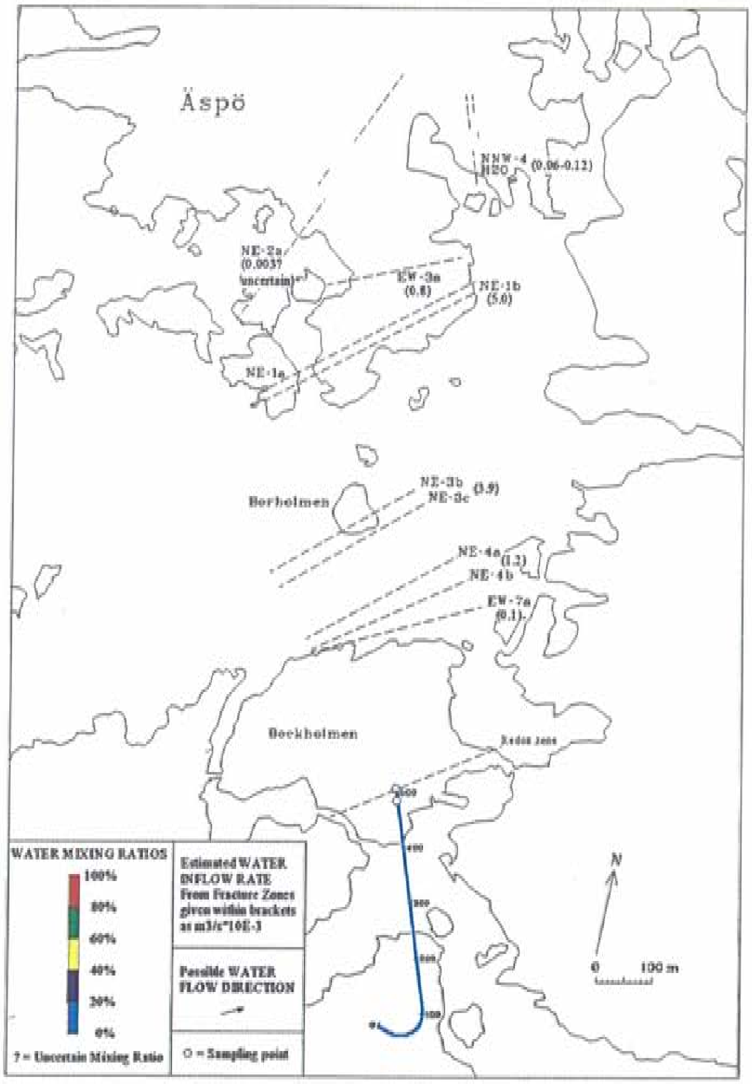


Figure A3-15*. Influx of Modified Baltic Sea water, experimental day 150 (1991-03-13).*

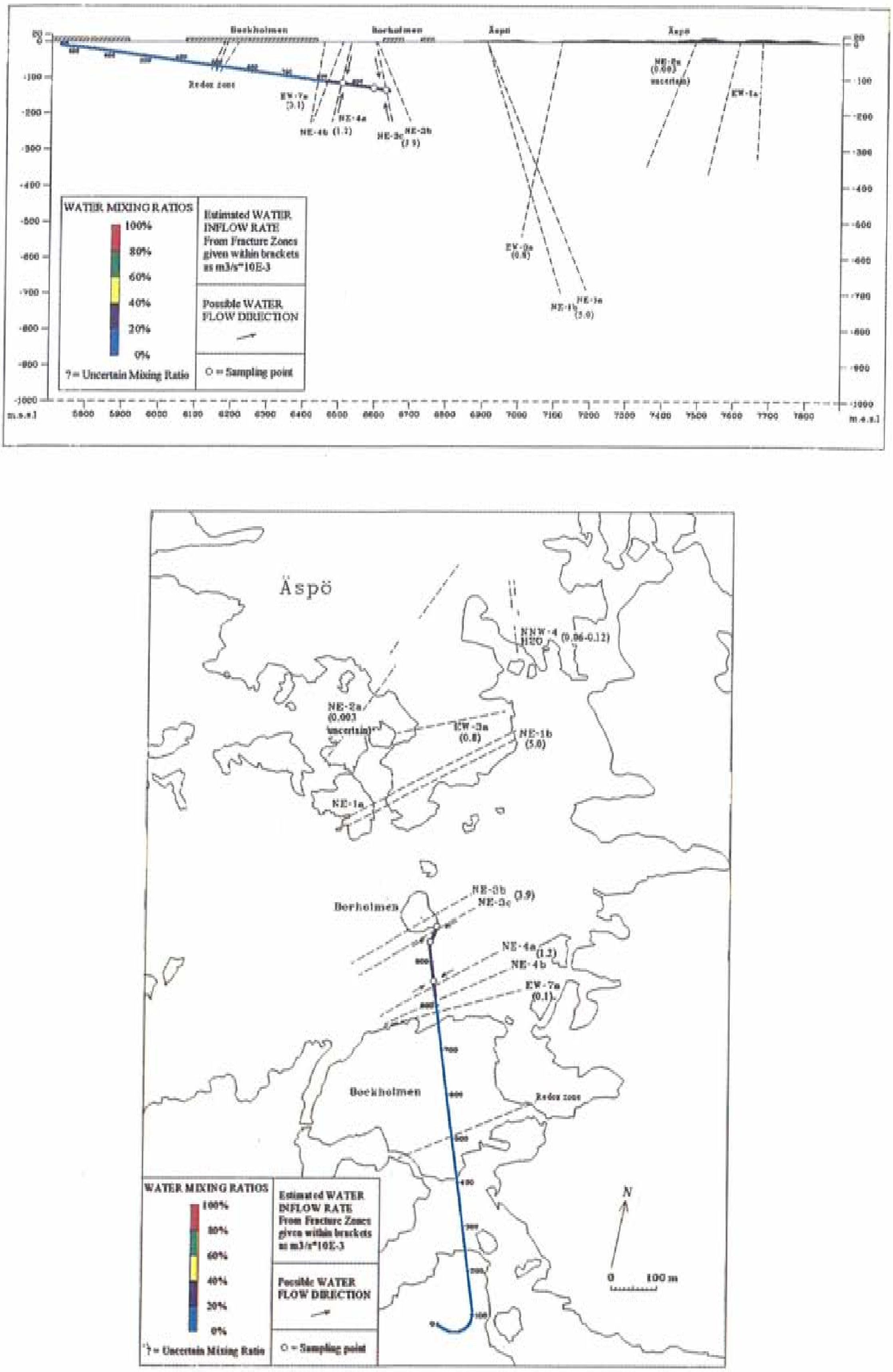
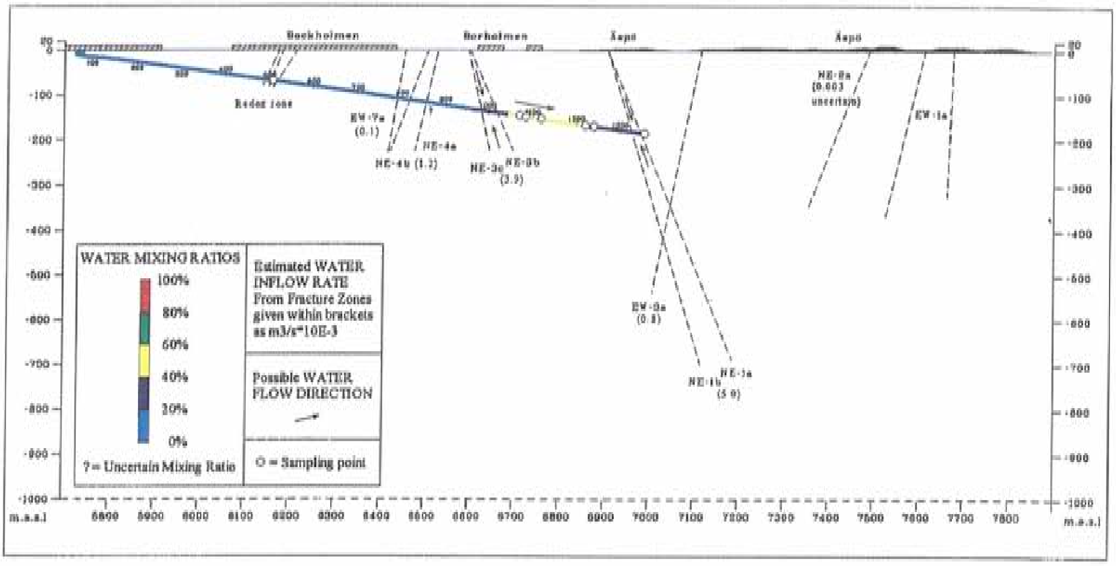


Figure A3-16. Influx of Modified Baltic Sea water, experimental day 350 (1991-09-29).



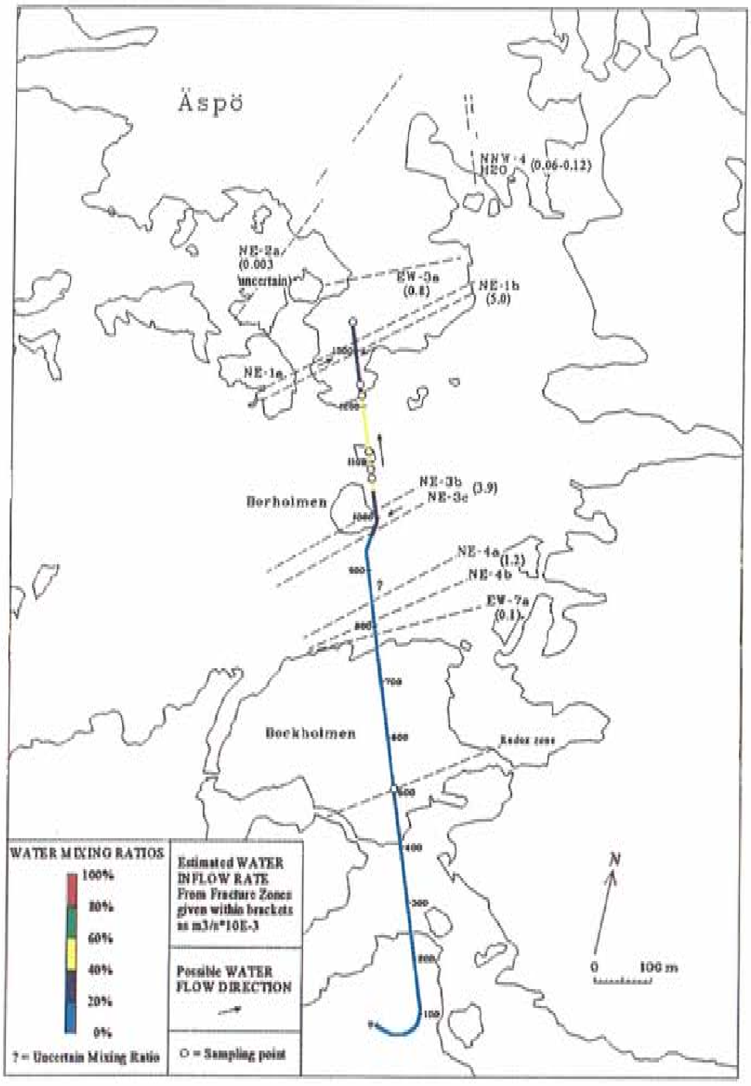
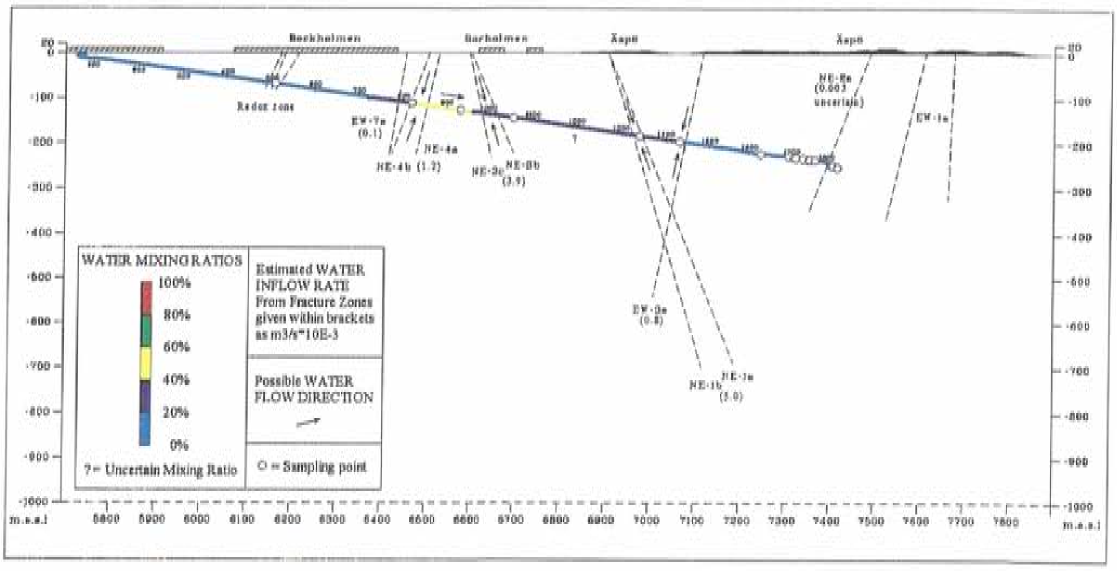


Figure A3-17*. Influx of Modified Baltic Sea water, experimental day 550 (1992-04-16).*



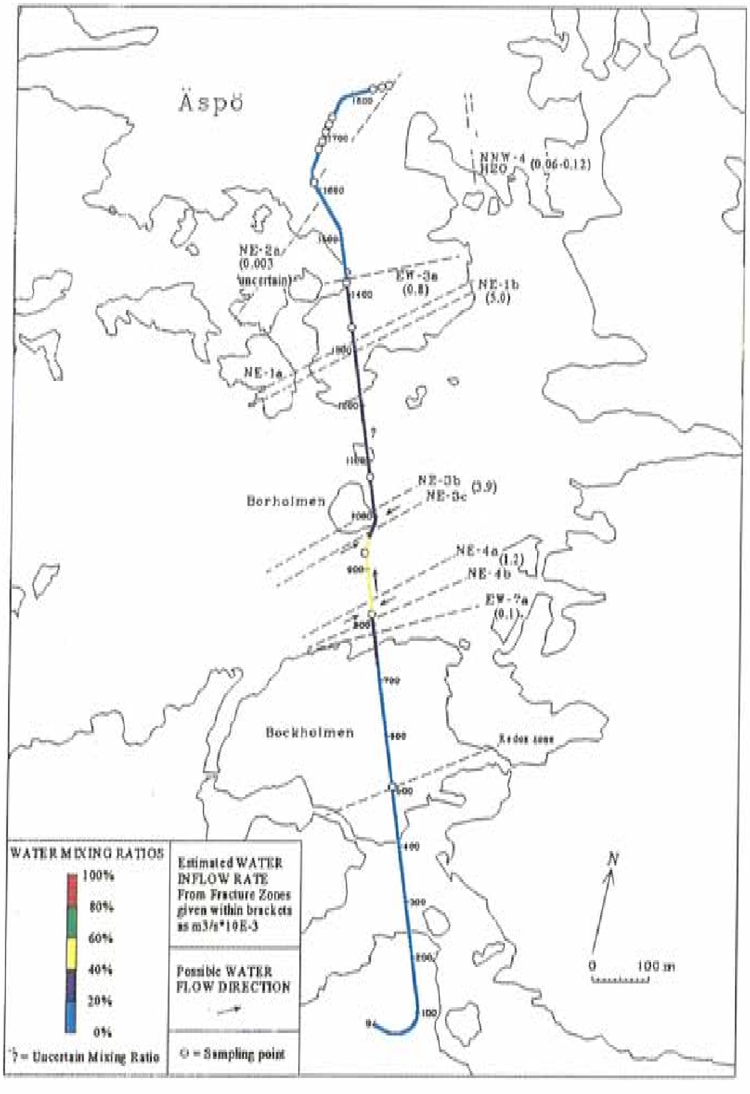
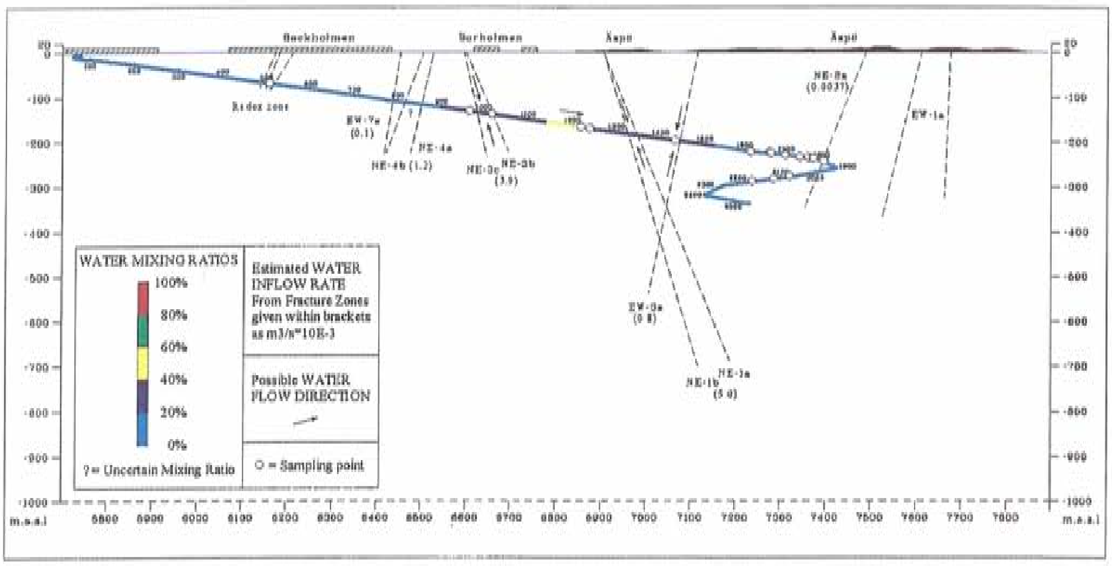


Figure A3-18. Influx of Modified Baltic Sea water, experimental day 750 (1992-11-02).



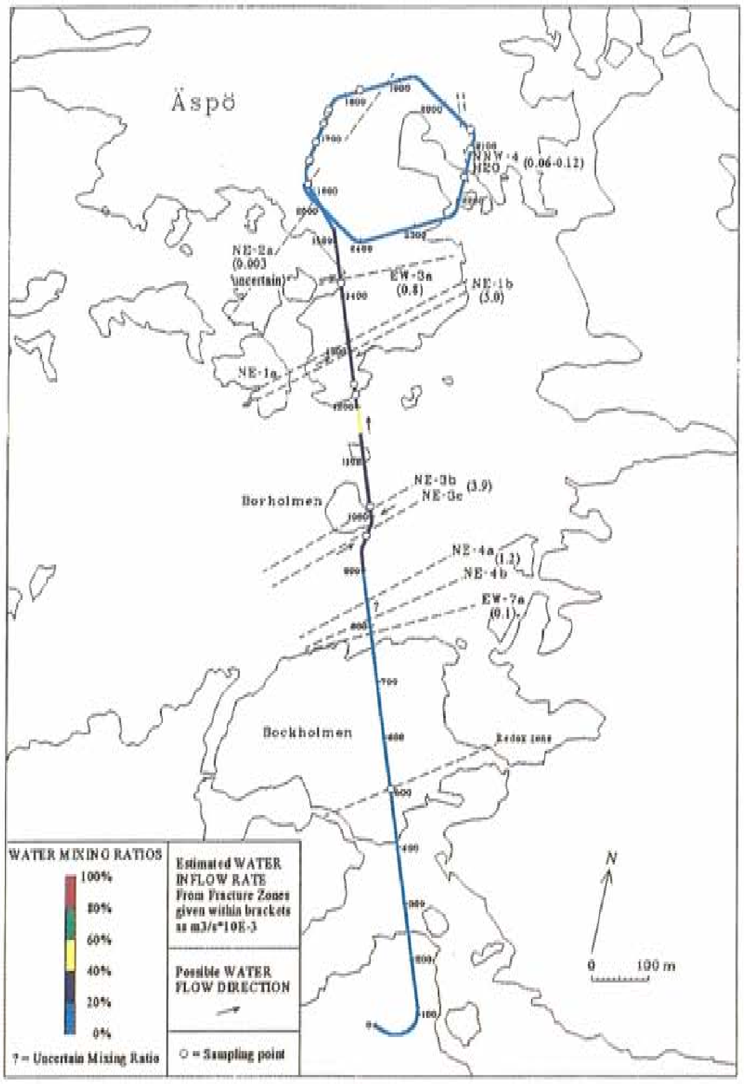
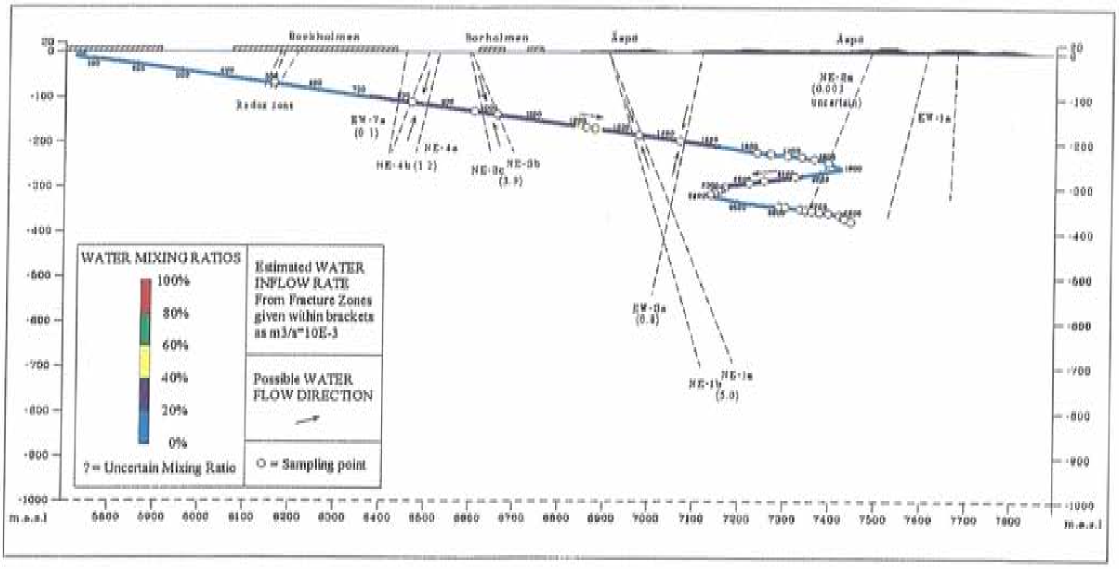


Figure A3-19*. Influx of Modified Baltic Sea water, experimental day 950 (1993-05-21).*



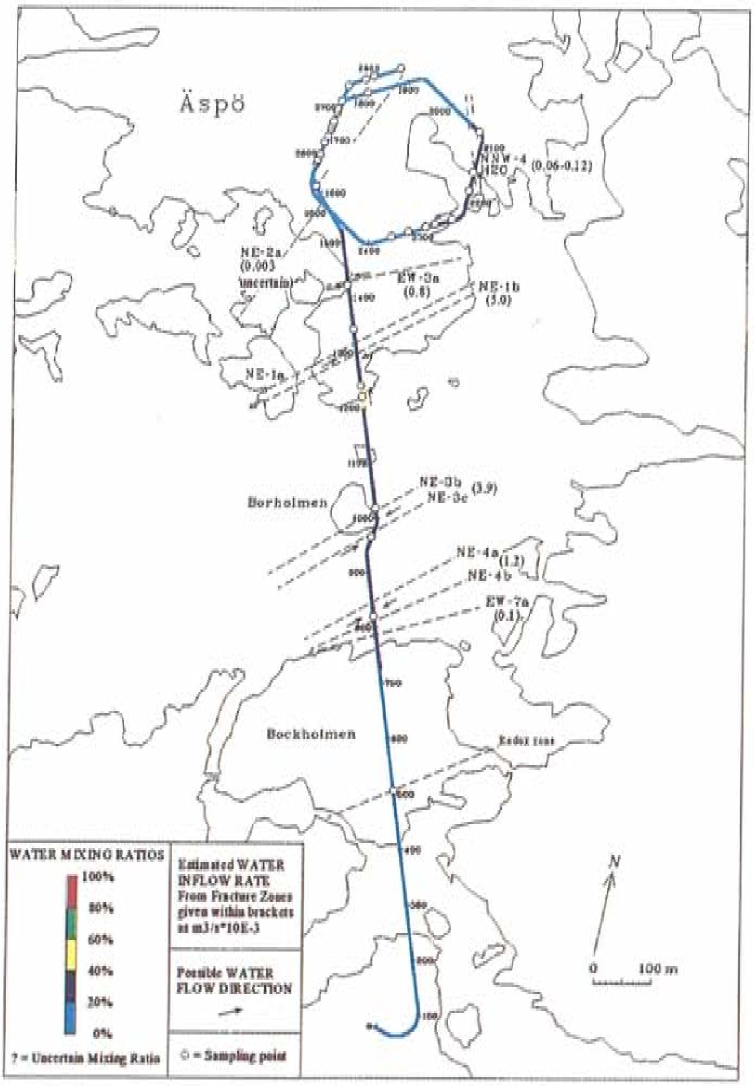
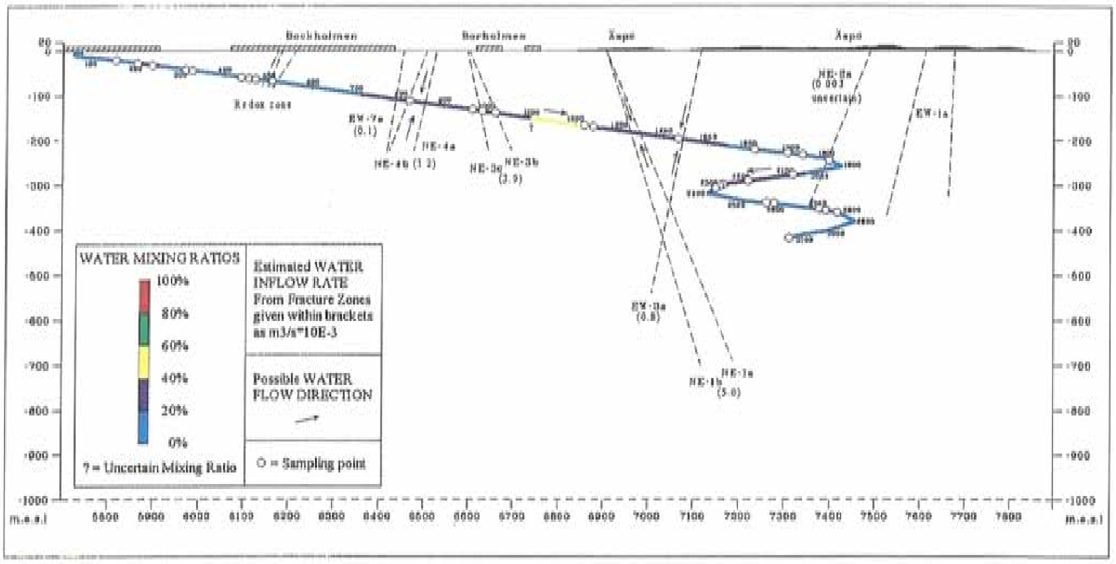


Figure A3-20. *Influx of Modified Baltic Sea water, experimental day 1150 (1993-12-07).*



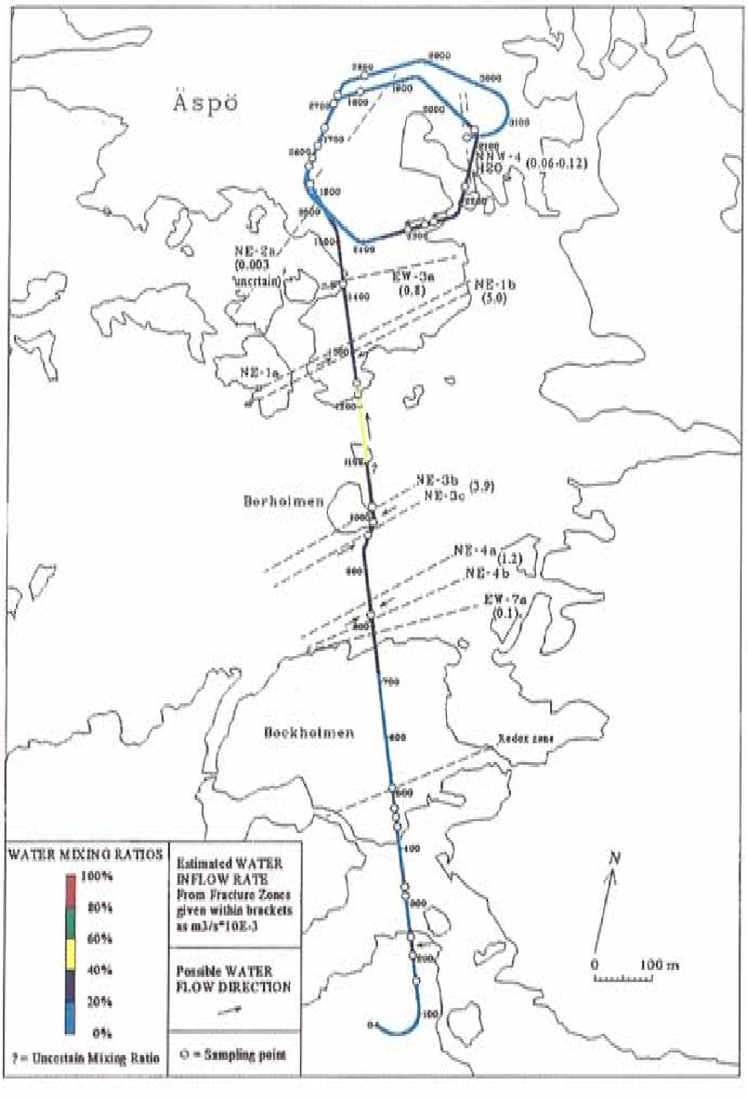
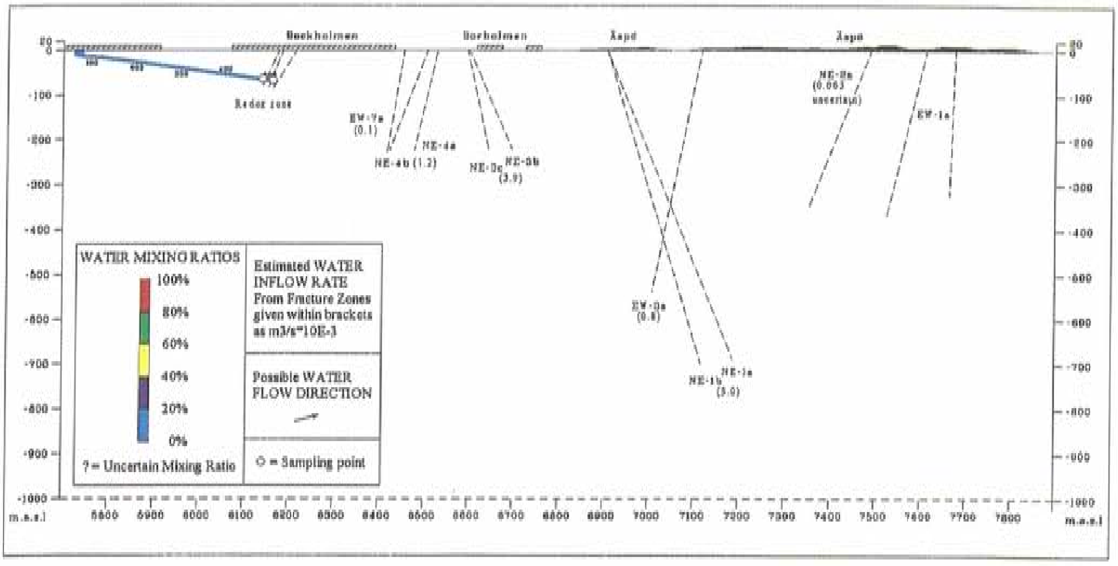


Figure A3-21*. Influx of Modified Baltic Sea water, experimental day 1350 (1994-06-25).*



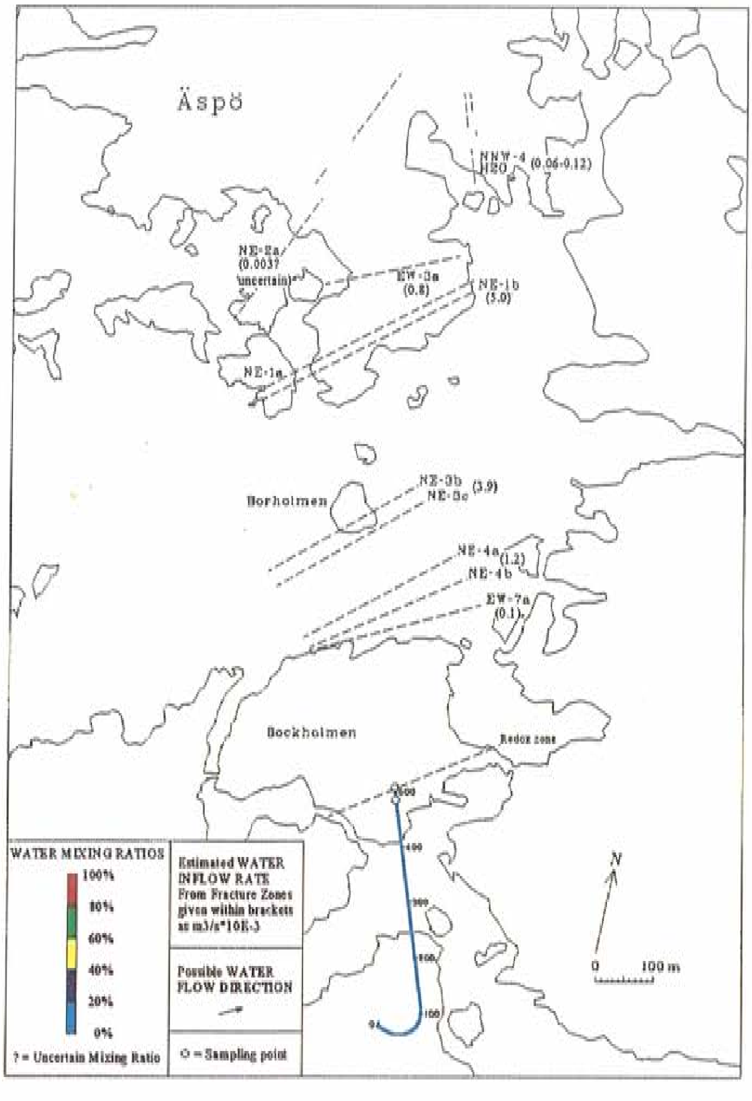


Figure A3-22. Influx of Deep Saline water, experimental day 150 (1991-03-13).

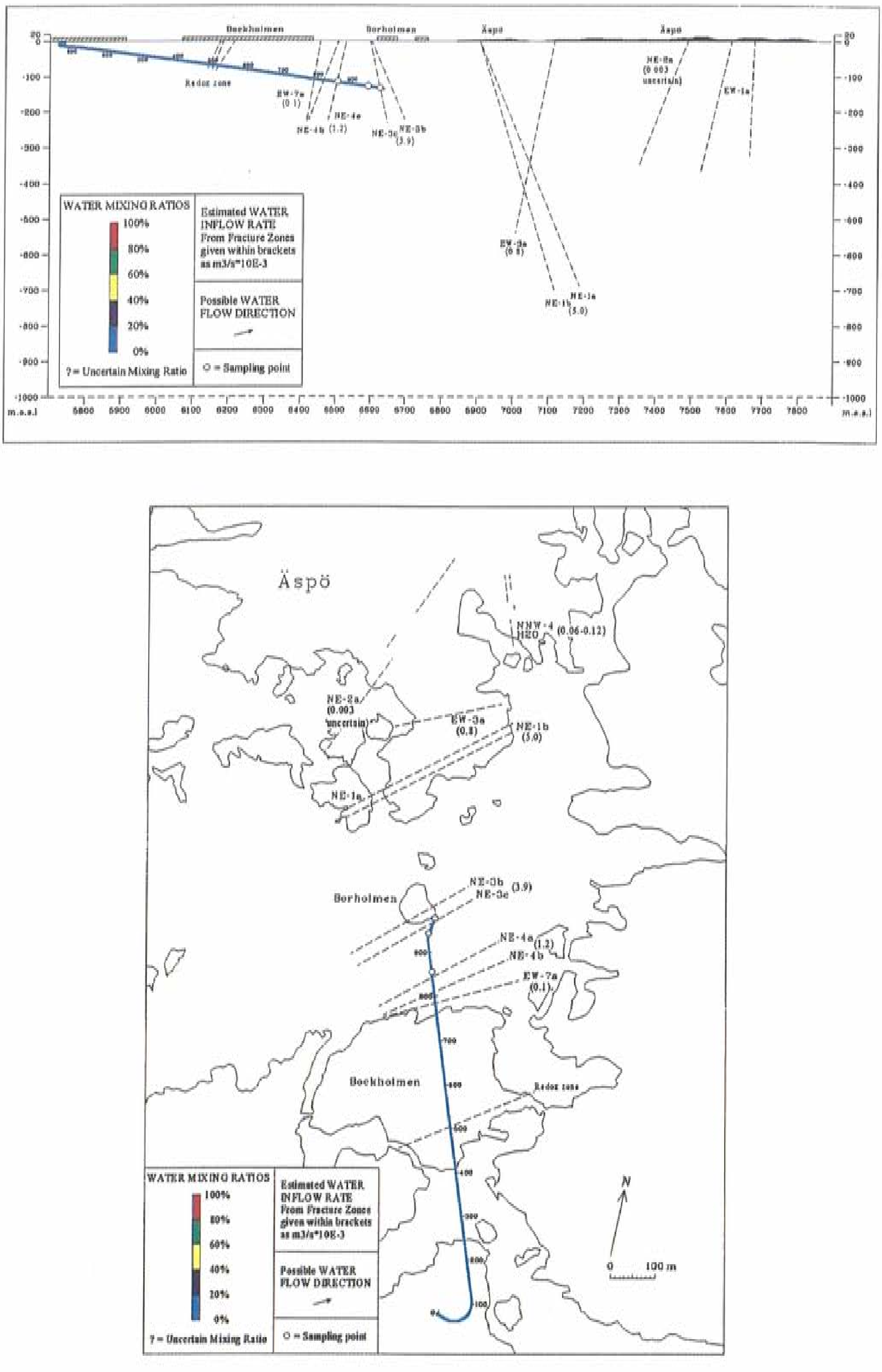
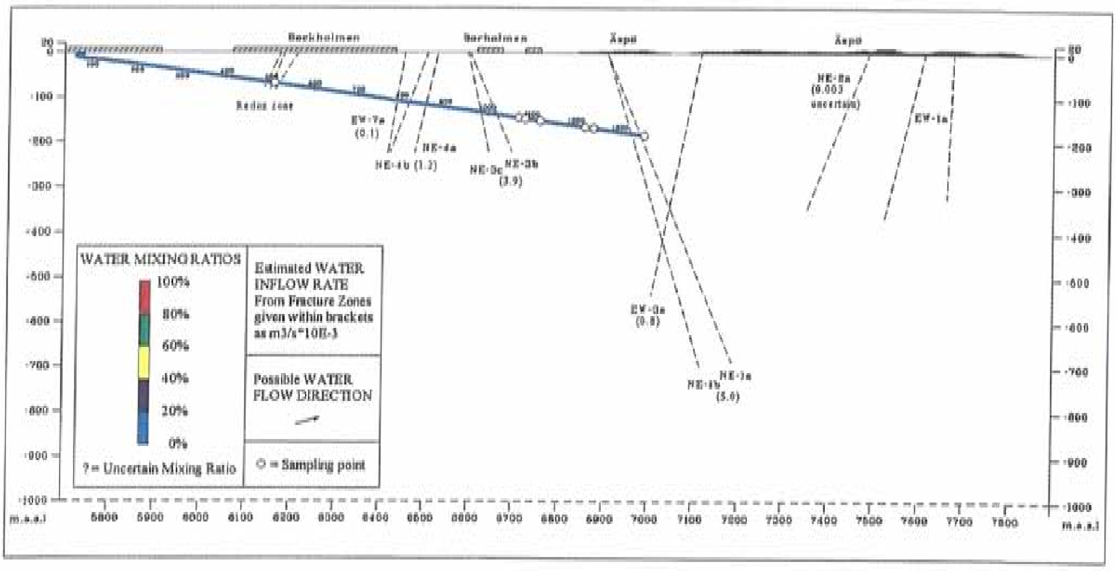


Figure A3-23. Influx of Deep Saline water, experimental day 350 (1991-09-29).



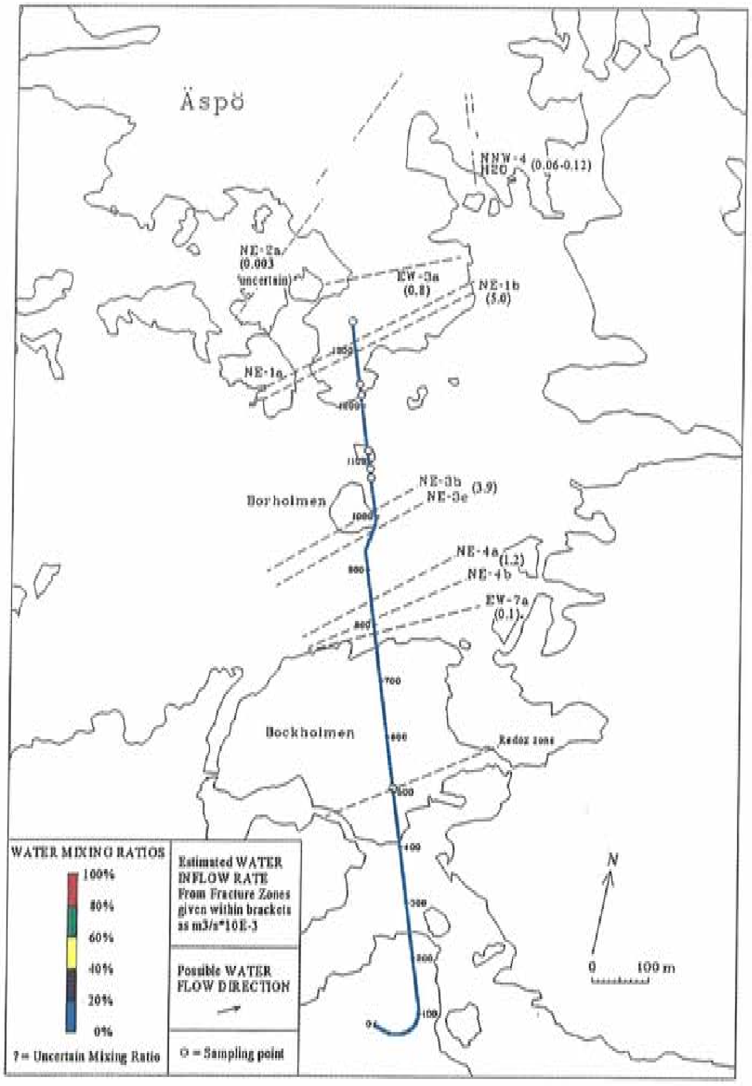
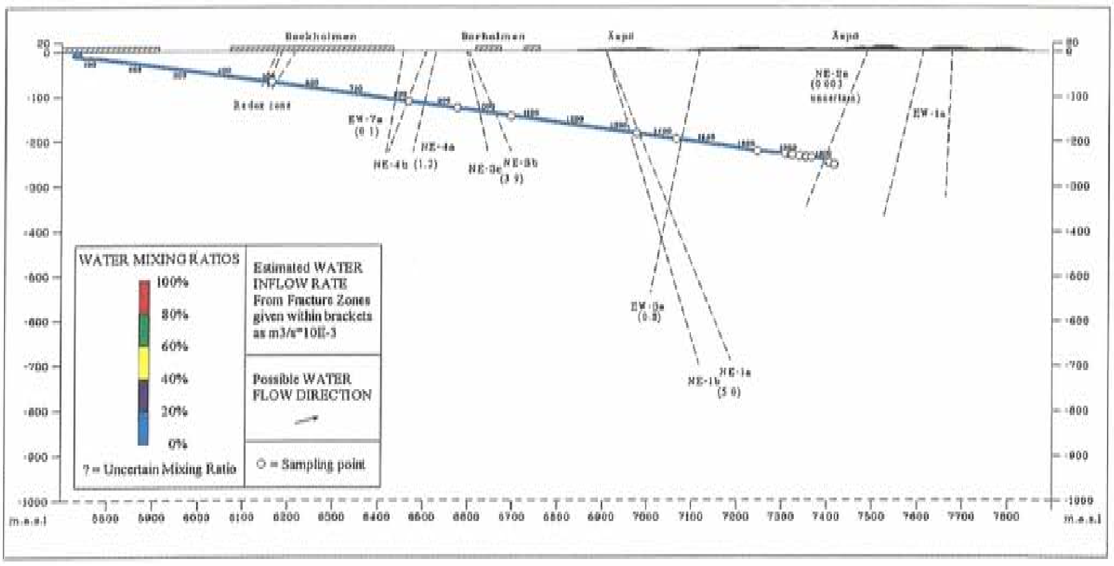


***Figure A3-24**. Influx of Deep Saline water, experimental day 550 (1992-04-16).*



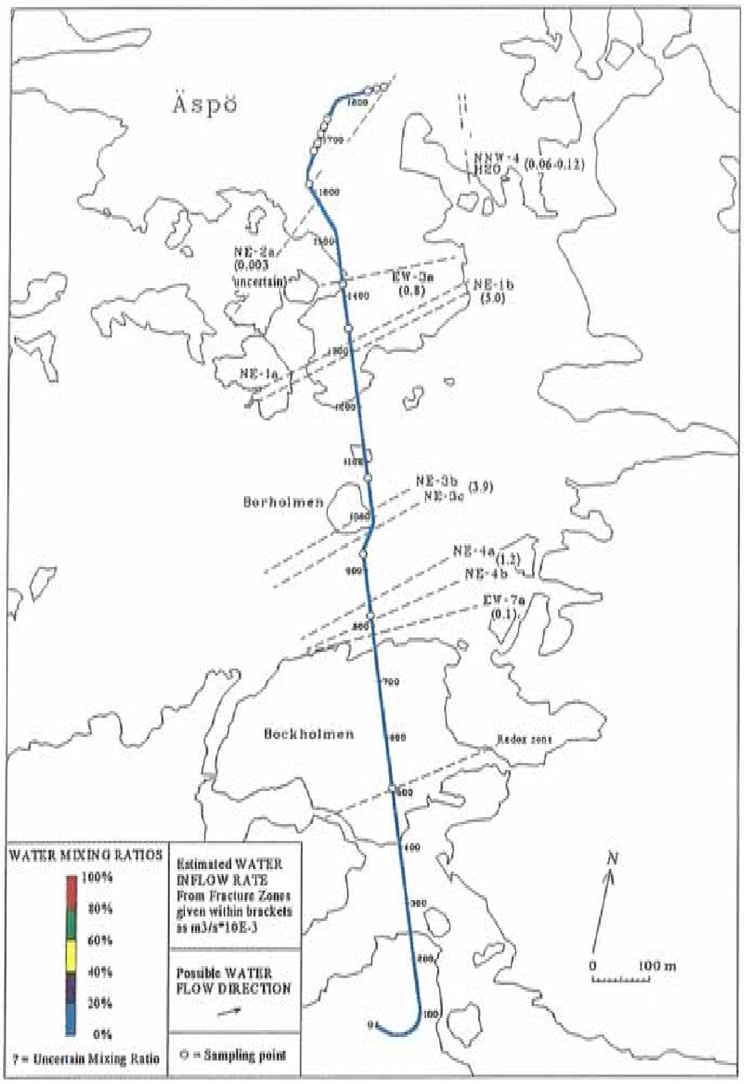
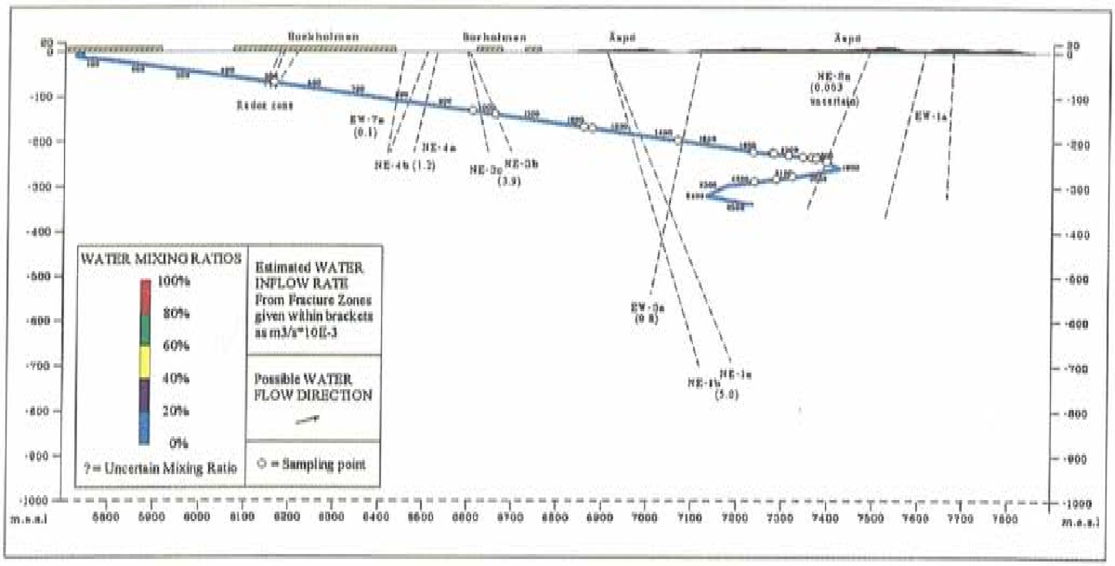


Figure A3-25. *Influx of Deep Saline water, experimental day 750 (1992-11-02).*



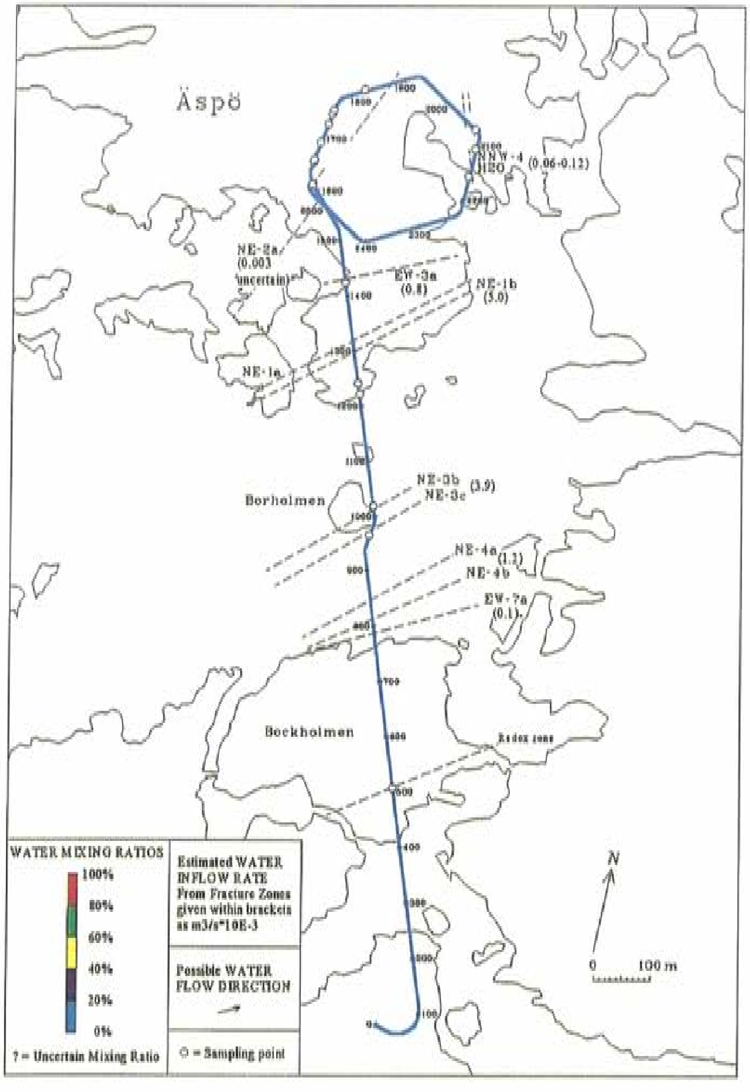


Figure A3-26. Influx of Deep Saline water, experimental day 950 (1993-05-21).

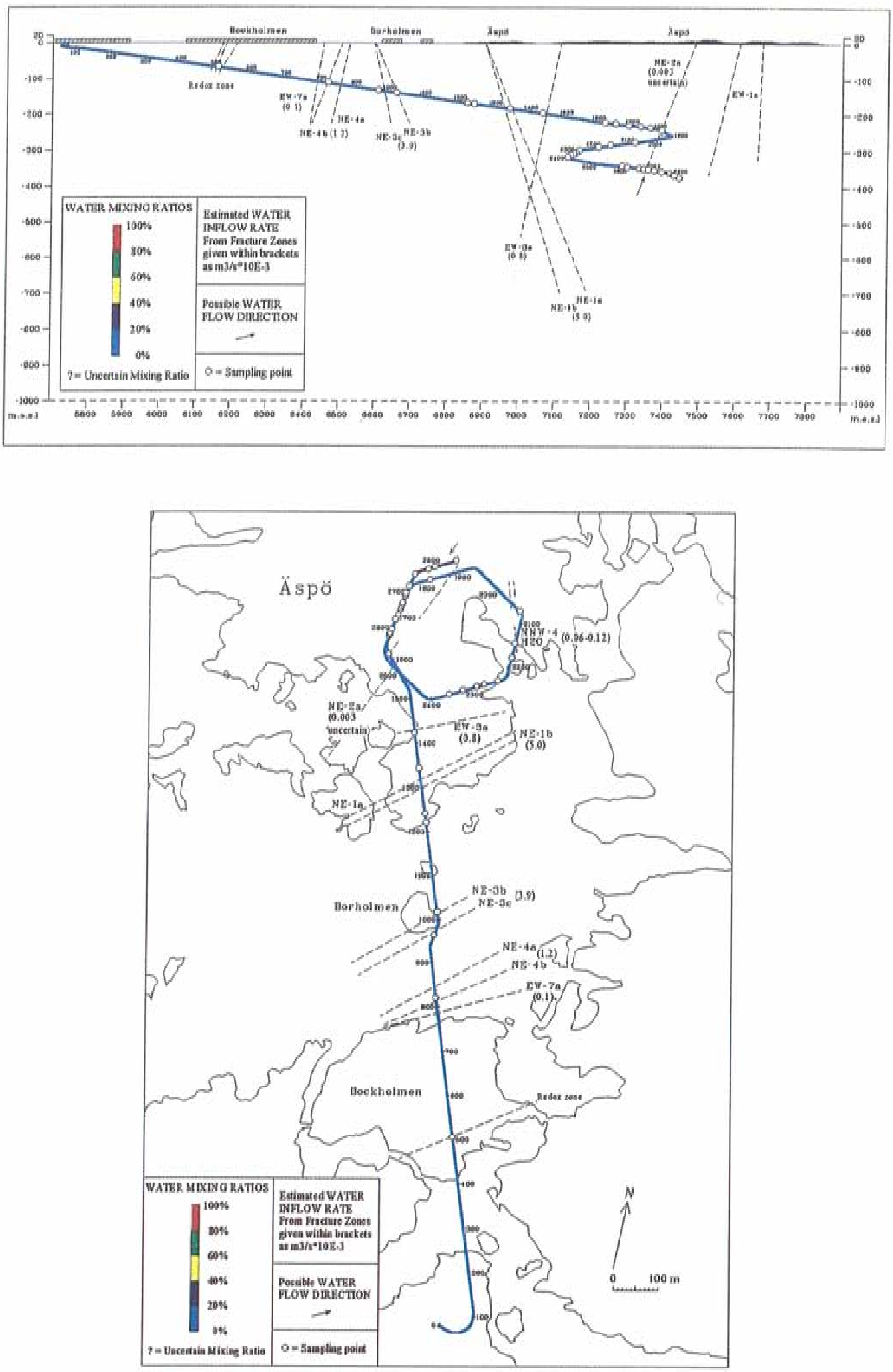
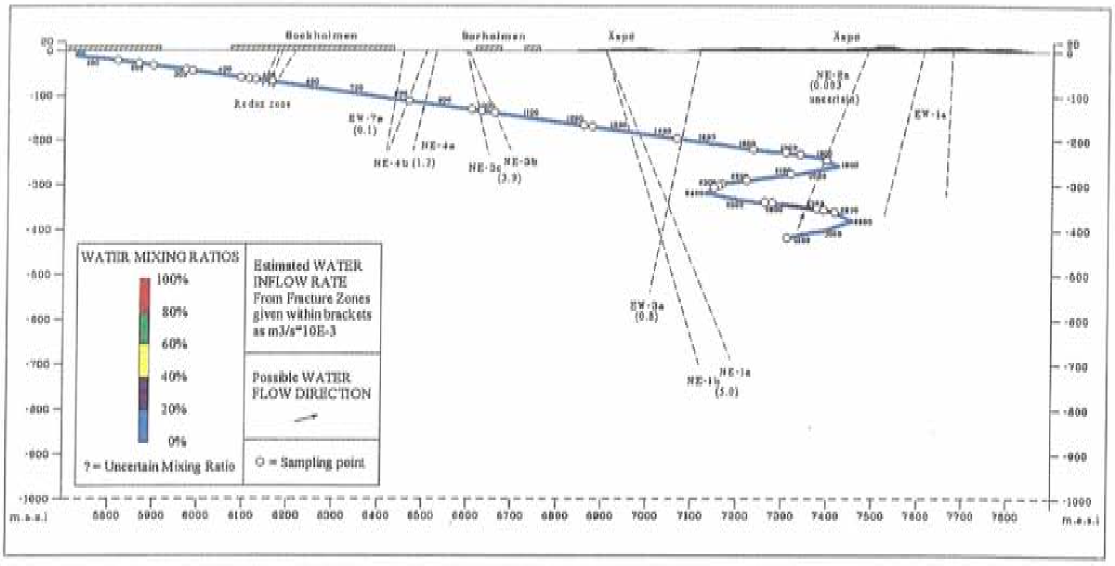


Figure A3-27. *Influx of Deep Saline water, experimental day 1150 (1993-12-07).*



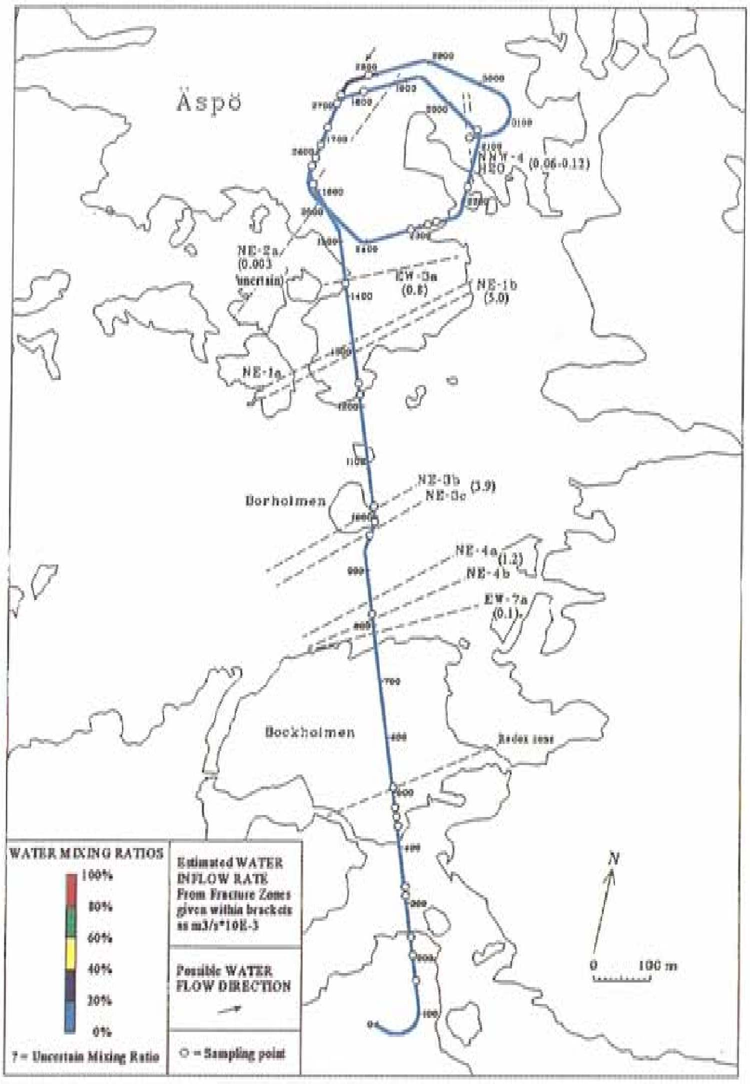


Figure A3-28. Influx of Deep Saline water, experimental day 1350 (1994-06-25).

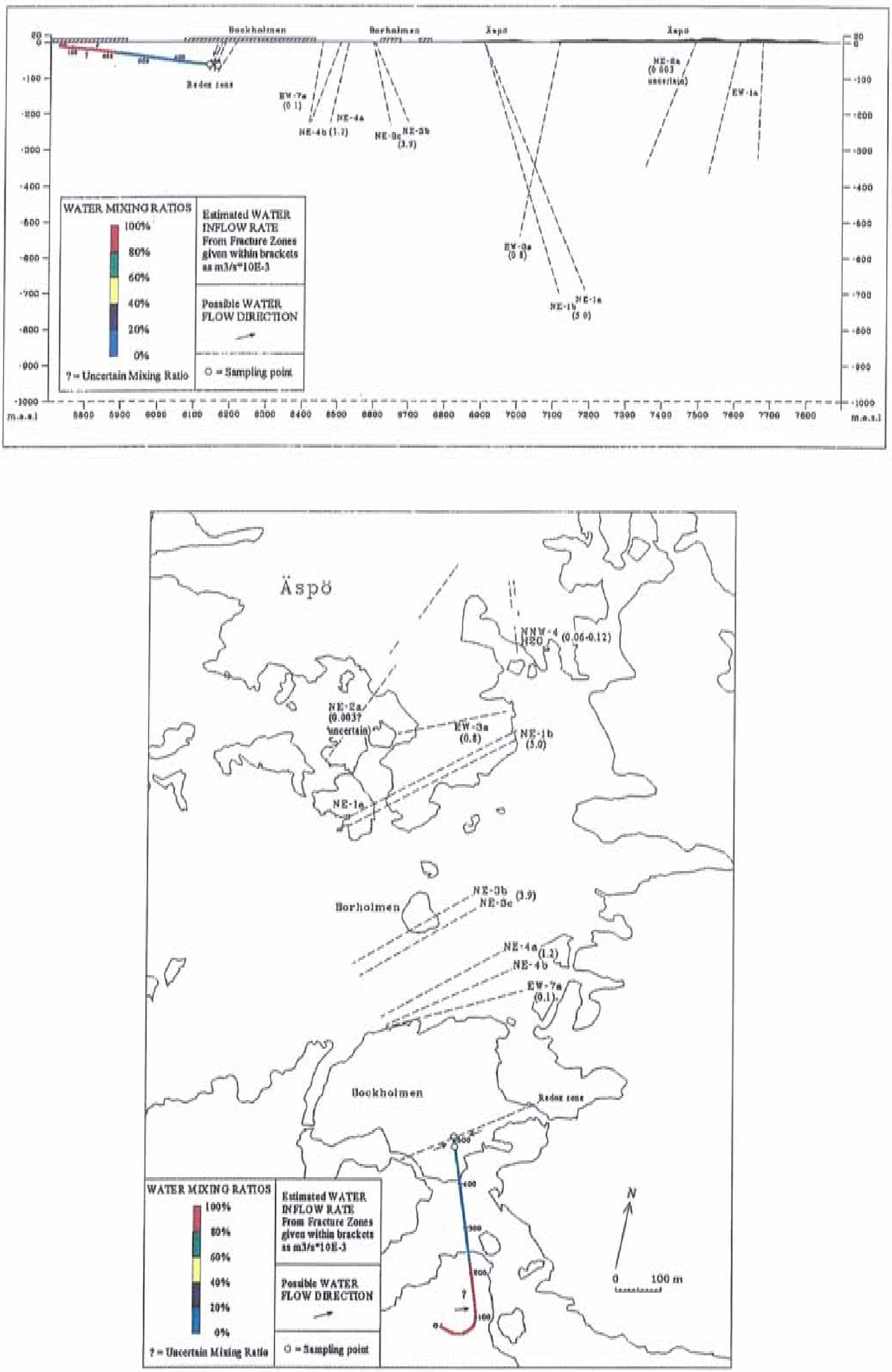


Figure A3-29. Influx of Shallow water, experimental day 150 (1991-03-13).

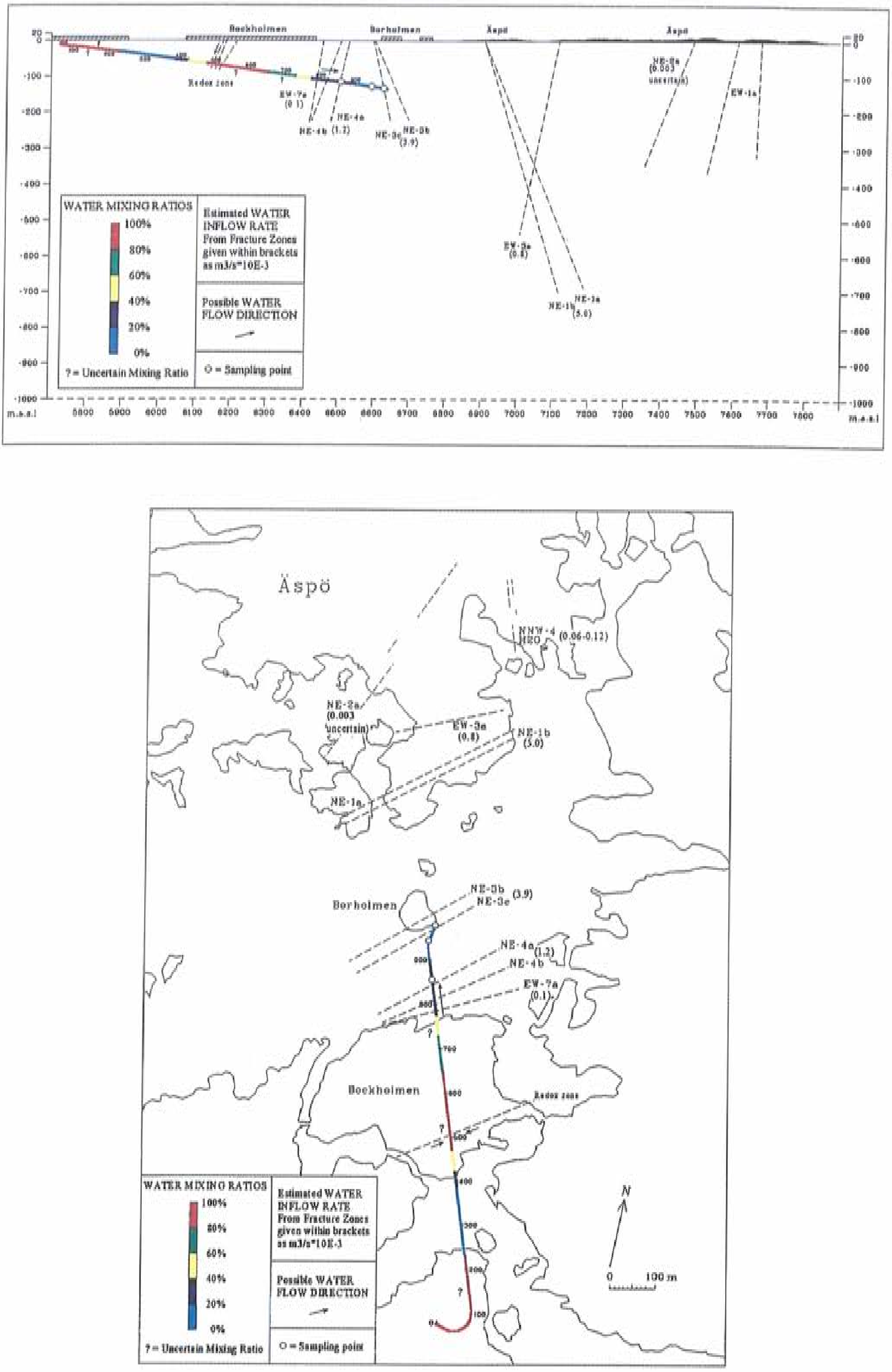
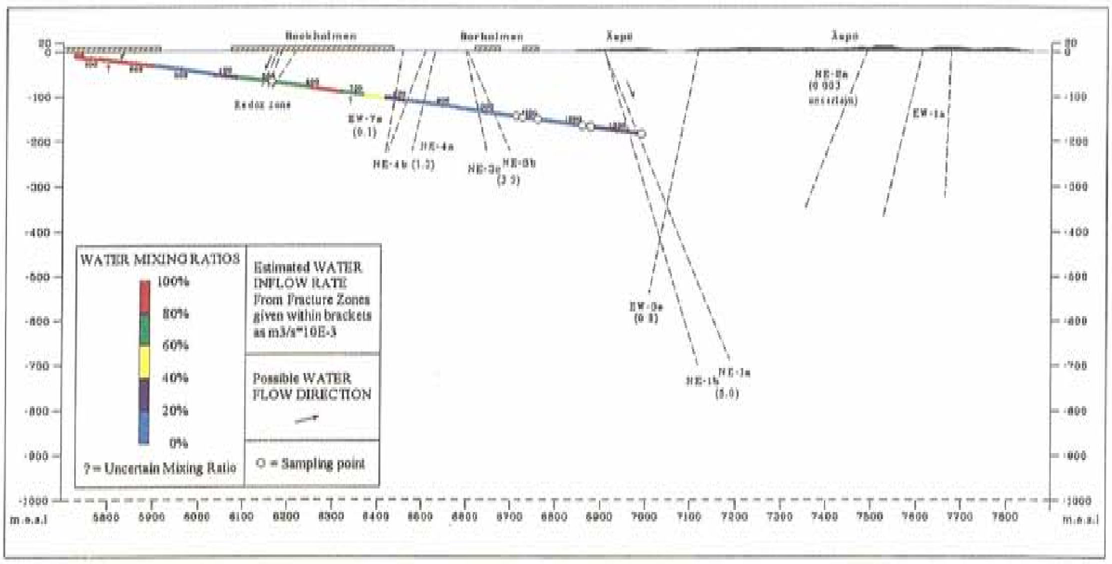


Figure A3-30. *Influx of Shallow water, experimental day 350 (1991-09-29).*



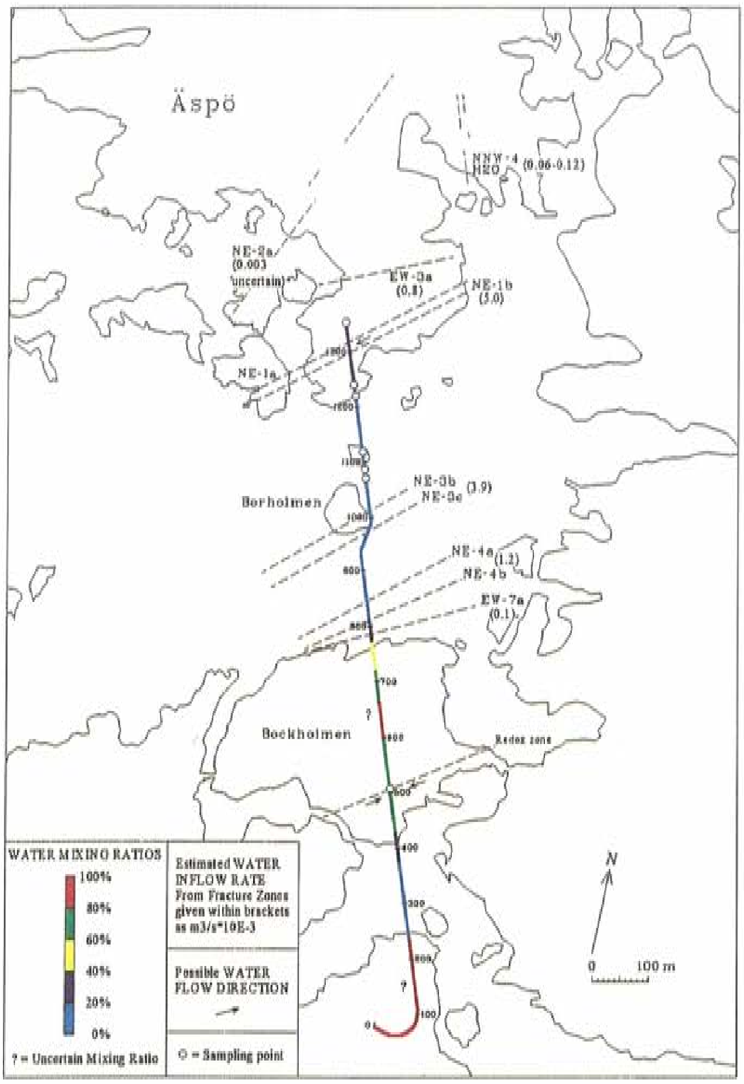
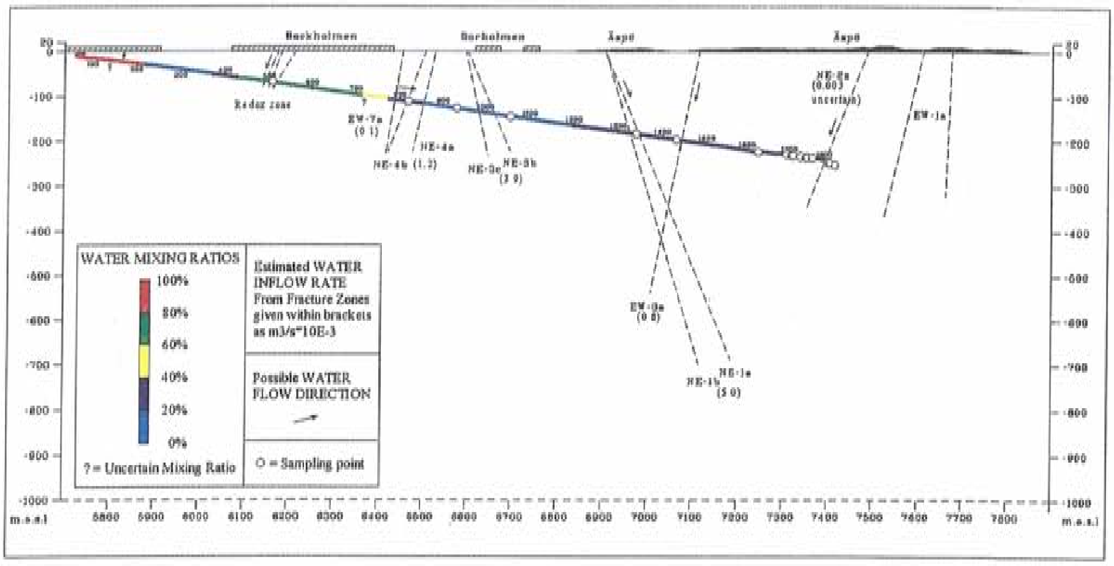


Figure A3-31. Influx of Shallow water, experimental day 550 (1992-04-16).



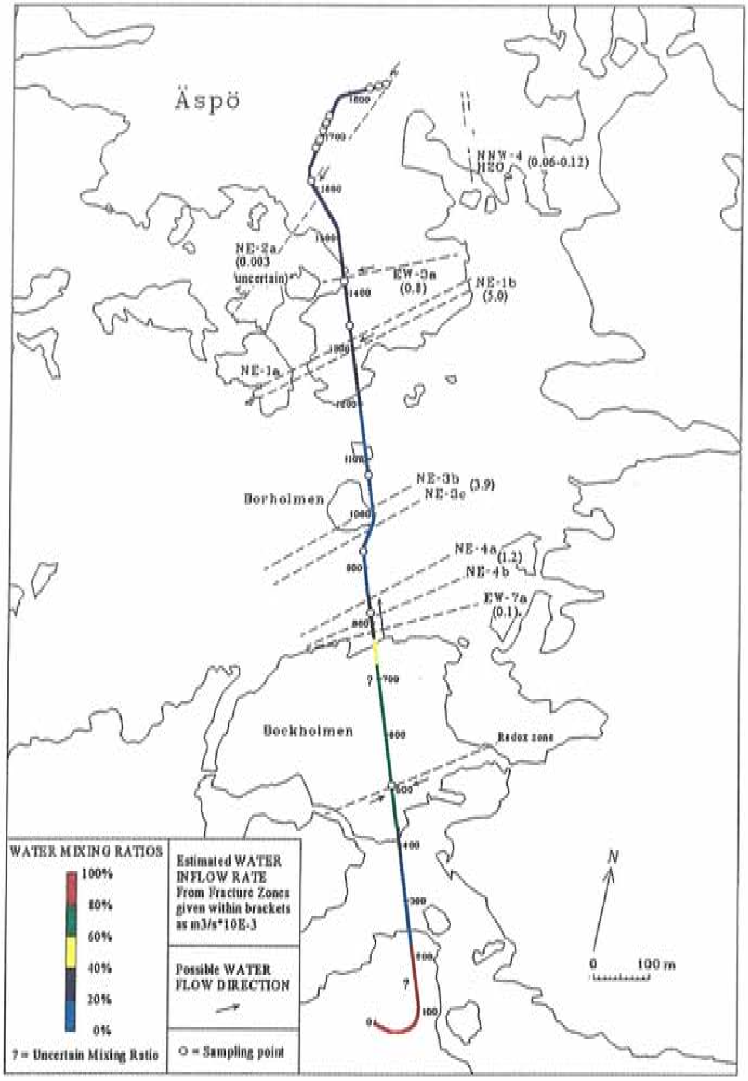
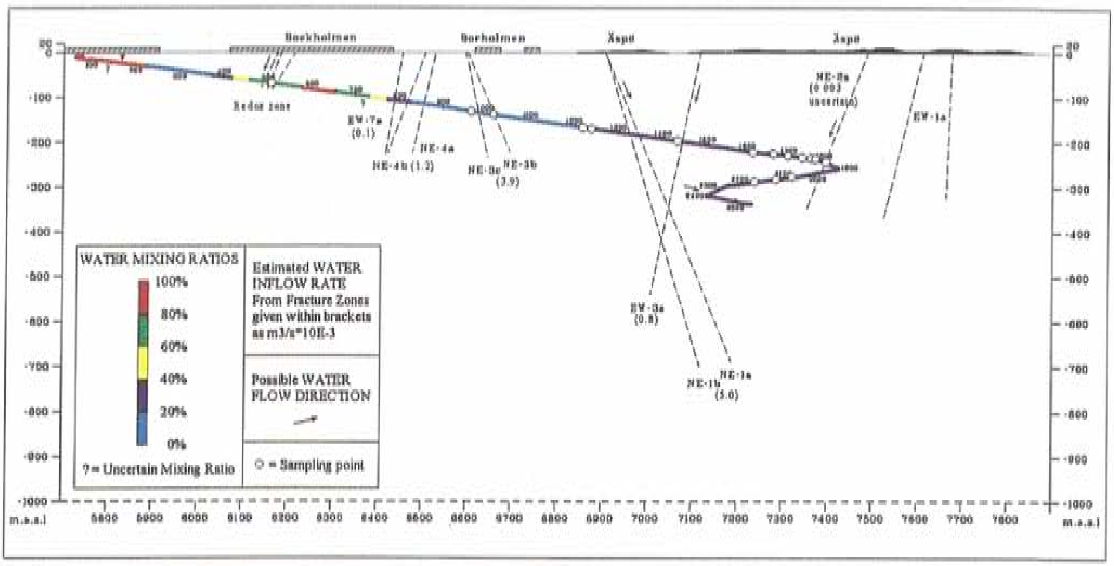


Figure A3-32. *Influx of Shallow water, experimental day 750 (1992-11-02).*



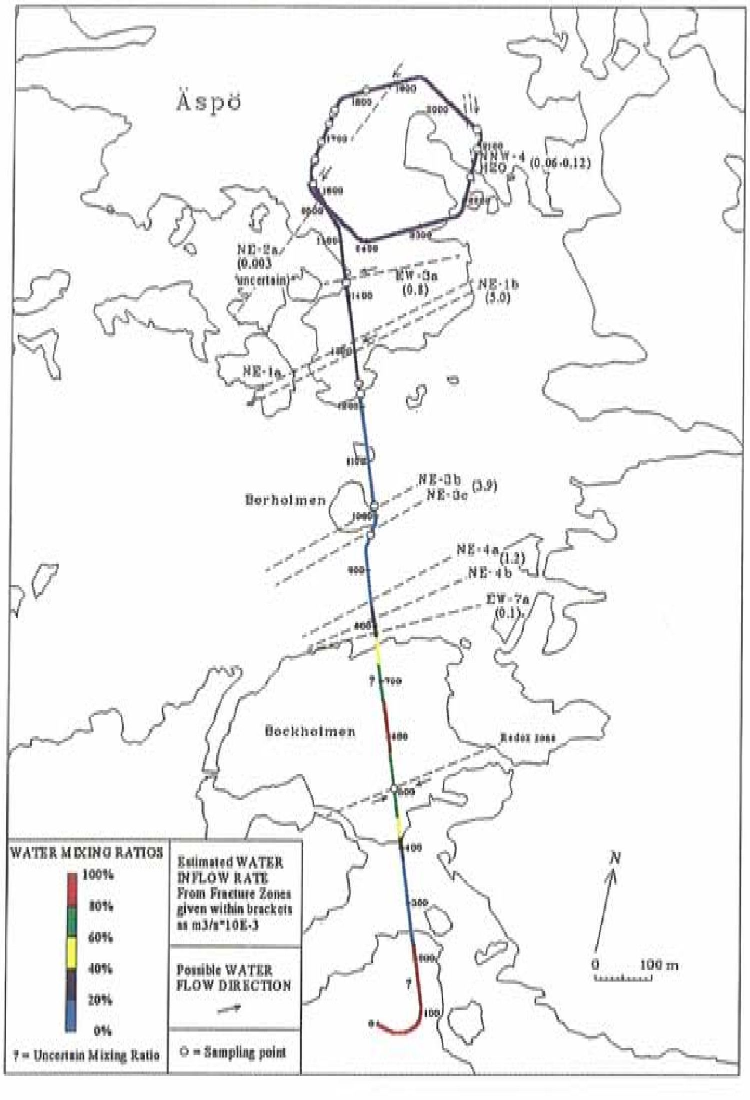


Figure A3-33. *Influx of Shallow water, experimental day 950 (1993-05-21).*

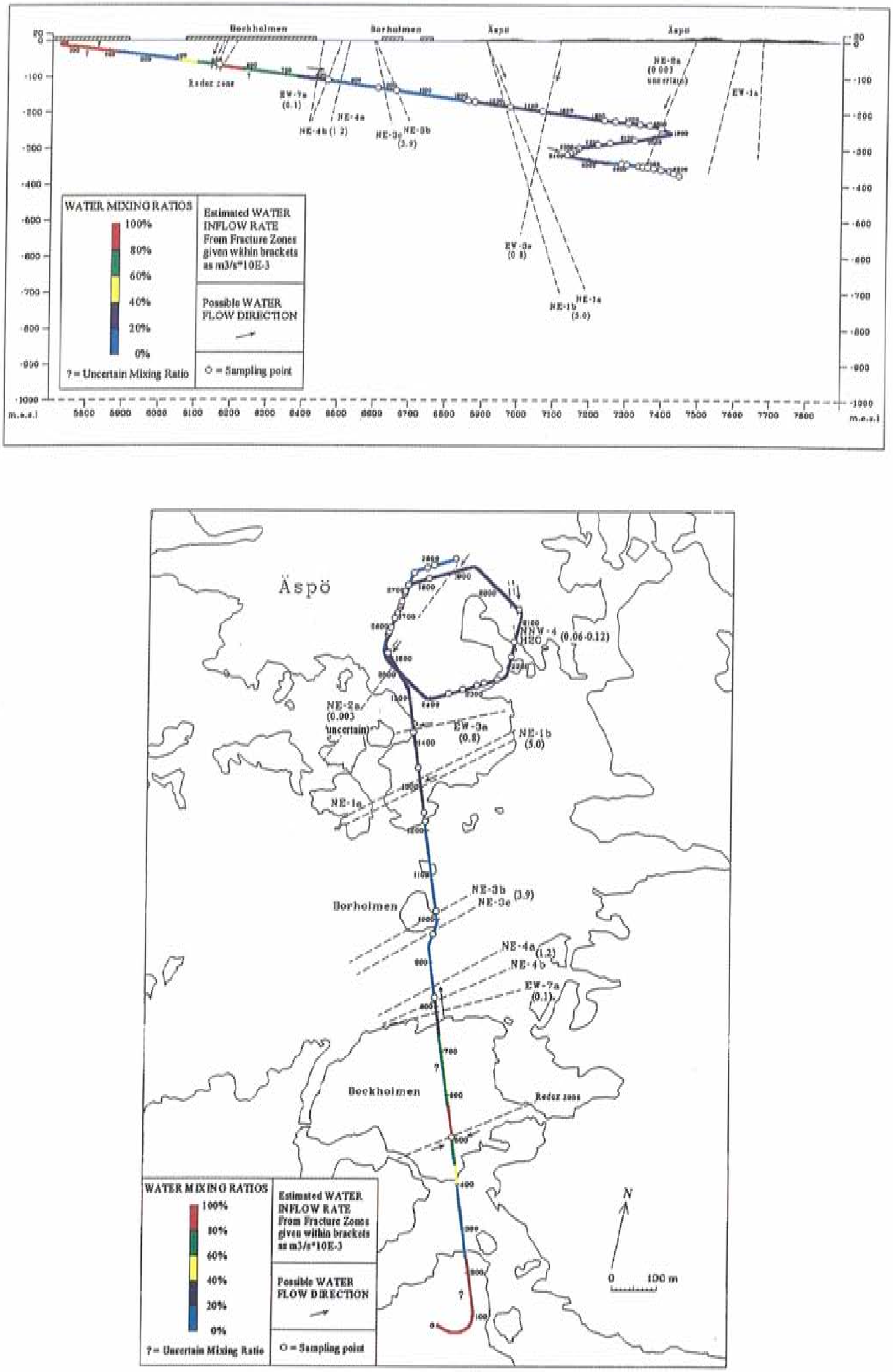
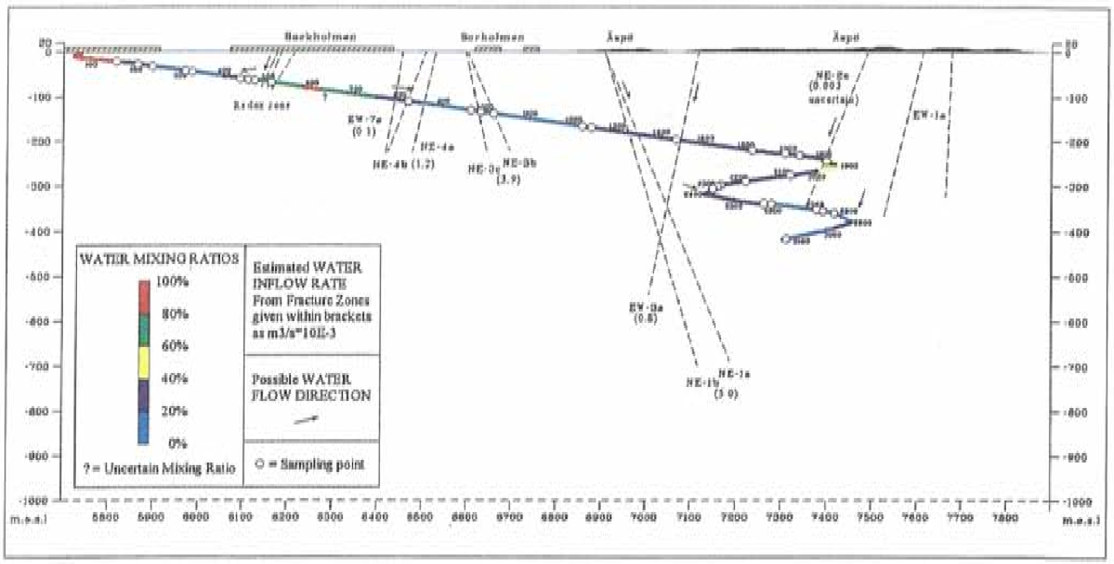


Figure A3-34. Influx of Shallow water, experimental day 1150 (1993-12-07).



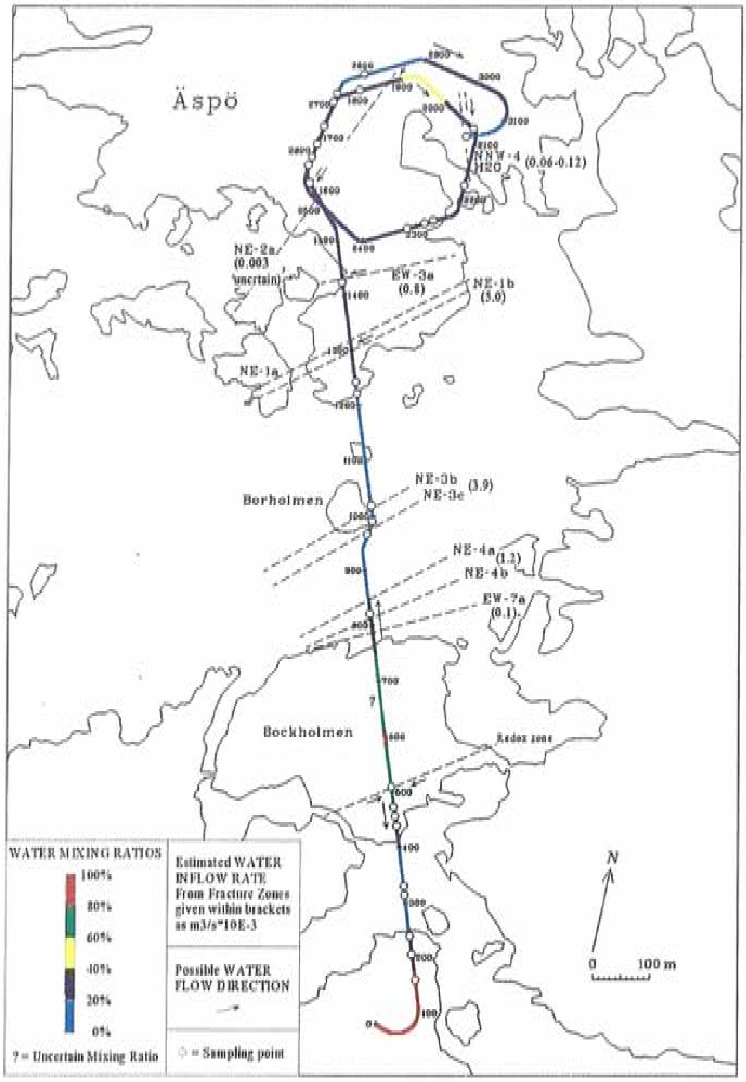


Figure A3-35. *Influx of Shallow water, experimental day 1350 (1994-06-25).*

A3.2 GROUNDWATER CHEMISTRY IN FRACTURE ZONES

The chemical composition of the groundwater, the saturation index of calcite and carbon dioxide, indication of sulphate reduction, in the different fracture zones (EW-3a, NE-4a,4b, NE-1a,1b, NE2a-1, NE2a-2, NE2a-3, NE-3b,3c, NNW-4H_2O-1, NNW-4H_2O-2,NNW-4H_2O-3) and in the Redox zone over time are listed. In fracture zones with no groundwater sampling boreholes, the boreholes ±100 m from the actual fracture zone were set to represent that fracture zone. If two borehole observations fall inside the range the observation closest to the fracture zone was selected. When the results are interpolated in space (±100 days) the accuracy decreases.

Fracture zone	Representing day (0=90-10-14)	ID code	Penetrating zone	Tunnel length (m)	Date	Inflow rate ($m^3/s*10E^{-3}$)	SNO	Na (mg/L)	K (mg/L)	Ca (mg/L)	Mg (mg/L)	HCO_3 (mg/L)	Cl (mg/L)	SO_4 (mg/L)
Redox zone	150	KR0012B	x	513	91-05-07			352.0	2.0	143.0	15.4	198	695.0	70.0
Redox zone	550	KR0012B	x	513	92-04-22		1940	604.0	4.9	268.0	37.7	245	1330.0	134.4
Redox zone	750	KR0012B	x	513	92-10-28		2026	497.0	5.0	186.0	27.9	292	970.0	176.0
Redox zone	950	KR0012B	x	513	93-05-16		2094	424.0	4.3	136.0	25.1	315	710.0	142.2
Redox zone	1150	KR0012B	x	513	93-11-08		2193	387.0	4.3	118.0	20.4	324	619.0	134.7
Redox zone	1350	KR0012B	x	513	94-08-10		2270	346.6	3.4	100.1	17.4	325	500.0	125.8
NE-4a,4b	350	SA0850B	x	850	91-08-20	0.1-1.2		1920.0	18.0	1210.0	141.0	170	5440.0	90.6
NE-4a,4b	750	SA0813B	x	813	92-12-02	0.1-1.2	2049	1700.0	21.0	364.0	123.0	481	3450.0	186.0
NE-4a,4b	1150	SA0813B	x	813	93-09-29	0.1-1.2	2190	1640.0	19.1	310.0	124.0	317	3350.0	274.5
NE-4a,4b	1350	SA0813B	x	813	94-06-07	0.1-1.2	2253	1578.0	11.9	322.1	121.1	302	3272.3	299.6
NE-3b,3c	350	SA0976B	x	976	91-10-15	3.9		2170.0	20.6	993.0	203.0	500	5590.0	58.8
NE-3b,3c	550	SA1062B		1062	92-04-23	3.9		2230.0	23.5	770.0	220.0	531	5320.0	100.8
NE-3b,3c	750	SA1062B		1062	92-12-02	3.9	2050	1930.0	34.0	545.0	177.0	403	4350.0	189.0
NE-3b,3c	950	SA0958B	x	958	93-06-23	3.9	2121	1829.2	22.4	595.2	137.2	371	4087.9	243.0
NE-3b,3c	1150	SA0958B	x	958	93-09-28	3.9	2181	1810.0	19.6	657.0	144.0	296	4260.0	239.4
NE-3b,3c	1350	SA0958B	x	958	94-06-07	3.9	2254	1634.1	21.4	477.8	125.1	274	3641.0	295.2
NE-1a,1b	550	SA1342B		1342	92-06-16	5.0		1680.0	11.0	950.0	152.0	170	4730.0	148.5
NE-1a,1b	750	HA1327B	x	1327	92-10-15	5.0	2023	1610.0	9.4	648.0	128.0	252	3920.0	225.0
NE-1a,1b	950	SA1229A		1229	93-06-23	5.0	2120	1847.9	24.5	598.5	156.1	426	4210.9	101.0
NE-1a,1b	1150	HA1327B	x	1327	93-12-15	5.0	2208	1760.0	13.7	684.0	157.0	259	4310.0	255.3
NE-1a,1b	1350	SA1229A		1229	94-06-07	5.0	2256	1735.4	26.1	512.1	151.7	336	3928.2	241.5
EW-3a	750	SA1420A	x	1420	92-10-15	0.8	2024	1540.0	10.2	715.0	123.0	170	3930.0	226.2
EW-3a	950	SA1420A	x	1420	93-06-22	0.8	2116	1484.2	9.7	487.9	124.5	215	3419.9	307.0
EW-3a	1150	SA1420A	x	1420	93-09-29	0.8	2183	1600.0	13.7	480.0	139.0	214	3530.0	331.8
EW-3a	1350	SA1420A	x	1420	94-06-07	0.8	2257	1426.5	15.7	395.8	116.8	206	3052.5	290.3
NE-2a-1	750	SA1614B		1614	92-11-19	0.003	2035	1570.0	8.3	1250.0	80.2	37	5160.0	296.4
NE-2a-1	950	SA1614B		1614	93-06-22	0.003	2117	1953.7	5.2	1710.4	65.9	32	6207.3	424.0
NE-2a-1	1150	SA1614B		1614	93-09-28	0.003	2184	1880.0	6.7	1390.0	90.8	81	5650.0	332.4
NE-2a-1	1350	SA1614B		1614	94-06-06	0.003	2249	1831.3	7.4	1207.0	98.3	109	5176.1	322.0
NE-2a-2	750	SA1828B	x	1828	92-11-19	0.003		1700.0	8.5	1290.0	92.2	43	5200.0	303.0
NE-2a-2	950	SA1828B	x	1828	93-06-21	0.003	2115	1909.2	8.0	1392.4	113.9	48	5849.7	362.9
NE-2a-2	1150	SA1828B	x	1828	93-09-28	0.003	2187	1930.0	10.0	1450.0	108.0	48	6010.0	362.7
NE-2a-2	1350	SA1828B	x	1828	94-06-06	0.003	2252	1861.5	11.7	1063.9	138.8	111	5123.0	259.9
NE-2a-3	1150	SA2583A		2583	94-03-07	0.003	2223	2099.0	8.3	1870.0	56.9	13	6647.0	462.0
NE-2a-3	1350	SA2583A		2583	94-05-18	0.003	2240	2170.0	8.5	1859.6	73.9	44	6895.6	442.6
NNW-4H_2O-1	950	SA2074A		2074	93-06-17	0.06-0.12	2113	1959.4	8.6	992.6	172.0	47	5282.5	299.0
NNW-4H_2O-1	1150	SA2074A		2074	93-09-28	0.06-0.12	2173	1730.0	11.0	764.0	144.0	79	4670.0	263.1
NNW-4H_2O-1	1350	SA2074A		2074	94-06-07	0.06-0.12	2258	1701.7	10.2	723.2	141.5	94	4275.6	270.9
NNW-4H_2O-2	950	SA2109B	x	2109	93-02-15	0.06-0.12		1730.0	17.0	884.0	107.0	67	4480.0	303.0
NNW-4H_2O-2	1150	SA2142A		2142	93-12-02	0.06-0.12	2202	1720.0	25.0	581.0	128.0	127	3880.0	367.8
NNW-4H_2O-2	1350	SA2175B		2175	94-05-30	0.06-0.12	2244	1959.5	15.3	1037.1	161.6	127	5442.0	261.6
NNW-4H_2O-3	1350	KA3191F		3191	94-06-04	0.06-0.12	2248	2225.3	8.6	2093.1	64.3	29	7409.7	445.2

Fracture zone	Representing day (0=90-10-14)	ID code	^3H (TU)	^2H (SMOW)	^{18}O (SMOW)	Fe(tot) (mg/L)	Fe^{2+} (mg/L)	DOC (mg/L)	pH (units)	Calcite (log IAP/KT)	Log pCO_2 (bar)	Indicator of sulphat reduction
Redox zone	150	KR0012B	34.0	-82.1	-11.4	0.200	0.200		7.8	0.49	-2.62	
Redox zone	550	KR0012B	25.0	-77.3	-10.2	0.287	0.291	12.0	7.7	0.66	-2.46	
Redox zone	750	KR0012B	17.0	-79.9	-9.9	0.218	0.216	14.0	7.7	0.60	-2.37	
Redox zone	950	KR0012B	17.0	-72.0	-9.9	0.186		18.0	7.5	0.32	-2.14	
Redox zone	1150	KR0012B	34.0	-69.6	-9.6	0.179		11.3	7.4	0.18	-2.03	
Redox zone	1350	KR0012B	31.3	-68.1	-9.8	0.189			7.3	0.02	-1.93	
NE-4a,4b	350	SA0850B	6.8	-67.2	-8.3				7.7	0.93	-2.70	
NE-4a,4b	750	SA0813B	6.8	-59.8	-7.5	6.330	6.330	8.3	7.3	0.53	-1.82	Bacteria
NE-4a,4b	1150	SA0813B	14.0	-50.4	-7.3				7.1	0.07	-1.82	
NE-4a,4b	1350	SA0813B	28.7	-53.7	-7.2				7.0	-0.05	-1.75	
NE-3b,3c	350	SA0976B	14.0	-60.4	-7.4				7.2	0.79	-1.75	GW
NE-3b,3c	550	SA1062B	8.0	-58.0	-7.7			11.0	7.3	0.83	-1.81	GW
NE-3b,3c	750	SA1062B	9.3	-57.6	-7.3	2.160	2.160	9.1	7.3	0.59	-1.91	Bacteria
NE-3b,3c	950	SA0958B	8.4	-56.0	-7.5	3.334	3.323		7.0	0.27	-1.68	
NE-3b,3c	1150	SA0958B	14.0	-57.5	-7.4				7.5	0.75	-2.24	
NE-3b,3c	1350	SA0958B	28.7	-55.6	-7.2				7.0	0.06	-1.80	
NE-1a,1b	550	SA1342B	5.9	-61.9	-8.7				7.3	0.44	-2.30	
NE-1a,1b	750	HA1327B	17.0	-65.3	-7.4	2.160	2.150		7.4	0.58	-2.21	Bacteria
NE-1a,1b	950	SA1229A	16.0	-60.0	-7.3	2.891		21.0	7.0	0.33	-1.62	GW
NE-1a,1b	1150	HA1327B	18.0	-50.6	-7.5	2.640	2.430	4.8	6.9	0.05	-1.76	
NE-1a,1b	1350	SA1229A	22.0	-52.8	-7.0				7.0	0.17	-1.72	
EW-3a	750	SA1420A	17.0	-72.0	-8.7	1.110	1.110		7.6	0.66	-2.57	
EW-3a	950	SA1420A	31.0	-59.0	-7.5	1.941	1.920		7.3	0.30	-2.18	
EW-3a	1150	SA1420A	22.0	-52.5	-7.0				7.3	0.29	-2.18	
EW-3a	1350	SA1420A	33.8	-57.0	-7.5				7.2	0.10	-2.10	
NE-2a-1	750	SA1614B	8.0	-103.1	-13.1			1.0	7.4	-0.01	-3.06	
NE-2a-1	950	SA1614B	4.2	-85.5	-11.5	0.309	0.298	1.0	7.6	0.22	-3.34	
NE-2a-1	1150	SA1614B	4.2	-77.6	-10.4			1.0	7.4	0.35	-2.73	
NE-2a-1	1350	SA1614B	8.4	-71.9	-9.7				7.2	0.22	-2.41	
NE-2a-2	750	SA1828B	4.2	-84.4	-10.8				7.4	0.06	-3.00	
NE-2a-2	950	SA1828B	4.2	-75.9	-10.3	0.865	0.848	1.0	7.4	0.12	-2.96	
NE-2a-2	1150	SA1828B	4.2	-71.4	-10.3			1.0	7.3	0.03	-2.87	
NE-2a-2	1350	SA1828B	8.4	-67.8	-8.9				7.2	0.18	-2.40	
NE-2a-3	1150	SA2583A	4.2	-85.9	-10.7	0.242	0.236	0.4	7.5	-0.25	-3.64	
NE-2a-3	1350	SA2583A	5.9	-83.5	-11.1	0.373			7.9	0.67	-3.51	
NNW-4H_2O-1	950	SA2074A	5.9	-65.2	-8.5	0.755	0.734	1.0	7.0	-0.45	-2.60	
NNW-4H_2O-1	1150	SA2074A	7.0	-60.0	-8.4			1.0	7.1	-0.20	-2.45	
NNW-4H_2O-1	1350	SA2074A	10.1	-63.3	-8.5				7.3	0.08	-2.55	
NNW-4H_2O-2	950	SA2109B	5.9	-64.5	-8.2				8.1	0.82	-3.49	
NNW-4H_2O-2	1150	SA2142A	21.0	-56.2	-7.2	0.881		3.4	7.4	0.23	-2.50	
NNW-4H_2O-2	1350	SA2175B	8.4	-62.0	-8.2	0.882			7.8	0.84	-2.92	
NNW-4H_2O-3	1350	KA3191F	8.4	-81.6	-11.2				7.3	-0.08	-3.11	

Fracture zone	Representing day (0=90-10-14)	ID code	Dominating ions	Cation:Anion	Glacial Influx	Deep Saline Influx	Baltic Sea Influx	Modified Baltic Influx	Shallow Influx
Redox zone	150	KR0012B	Cl-Na-HCO$_3$-Ca-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	20%	1%	2%	4%	73%
Redox zone	550	KR0012B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	17%	2%	7%	10%	64%
Redox zone	750	KR0012B	Cl-Na-HCO$_3$-Ca-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	18%	2%	6%	10%	63%
Redox zone	950	KR0012B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	9%	3%	5%	8%	75%
Redox zone	1150	KR0012B	Cl-Na-HCO$_3$-SO$_4$-Ca-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	1%	0%	7%	10%	81%
Redox zone	1350	KR0012B	Cl-Na-HCO$_3$-SO$_4$-Ca-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	1%	0%	7%	9%	82%
NE-4a,4b	350	SA0850B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	17%	11%	21%	23%	29%
NE-4a,4b	750	SA0813B	Cl-Na-HCO$_3$-Ca-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	9%	2%	24%	42%	23%
NE-4a,4b	1150	SA0813B	Cl-Na-HCO$_3$-Ca-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	9%	3%	29%	40%	20%
NE-4a,4b	1350	SA0813B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	7%	1%	23%	46%	23%
NE-3b,3c	350	SA0976B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	6%	3%	34%	42%	15%
NE-3b,3c	550	SA1062B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	6%	3%	37%	40%	13%
NE-3b,3c	750	SA1062B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	8%	4%	37%	38%	14%
NE-3b,3c	950	SA0958B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	11%	4%	32%	34%	18%
NE-3b,3c	1150	SA0958B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	12%	4%	32%	33%	18%
NE-3b,3c	1350	SA0958B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	8%	2%	27%	42%	20%
NE-1a,1b	550	SA1342B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	17%	10%	21%	23%	30%
NE-1a,1b	750	HA1327B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	15%	4%	24%	31%	25%
NE-1a,1b	950	SA1229A	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	7%	2%	27%	44%	20%
NE-1a,1b	1150	HA1327B	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	11%	4%	33%	35%	17%
NE-1a,1b	1350	SA1229A	Cl-Na-Ca-HCO$_3$-SO$_4$-K	Na-Ca-K:Cl-HCO$_3$-SO$_4$	6%	2%	32%	44%	16%
EW-3a	750	SA1420A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	23%	6%	23%	20%	29%
EW-3a	950	SA1420A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	11%	3%	23%	39%	25%
EW-3a	1150	SA1420A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	10%	3%	30%	37%	19%
EW-3a	1350	SA1420A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	9%	2%	22%	43%	25%
NE-2a-1	750	SA1614B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	65%	12%	6%	6%	10%
NE-2a-1	950	SA1614B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	51%	17%	9%	9%	15%
NE-2a-1	1150	SA1614B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	38%	14%	13%	13%	21%
NE-2a-1	1350	SA1614B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	30%	13%	15%	16%	26%
NE-2a-2	750	SA1828B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	45%	13%	11%	12%	19%
NE-2a-2	950	SA1828B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	36%	16%	13%	14%	22%
NE-2a-2	1150	SA1828B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	33%	16%	14%	14%	23%
NE-2a-2	1350	SA1828B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	19%	13%	17%	19%	32%
NE-2a-3	1150	SA2583A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	47%	18%	9%	10%	15%
NE-2a-3	1350	SA2583A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	45%	18%	10%	10%	16%
NNW-4H$_2$O-1	950	SA2074A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	17%	15%	18%	20%	30%
NNW-4H$_2$O-1	1150	SA2074A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	17%	12%	20%	22%	29%
NNW-4H$_2$O-1	1350	SA2074A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	18%	11%	20%	22%	30%
NNW-4H$_2$O-2	950	SA2109B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	18%	13%	18%	20%	31%
NNW-4H$_2$O-2	1150	SA2142A	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	14%	6%	37%	27%	16%
NNW-4H$_2$O-2	1350	SA2175B	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	15%	12%	22%	25%	26%
NNW-4H$_2$O-3	1350	KA3191F	Cl-Na-Ca-SO$_4$-HCO$_3$-K	Na-Ca-K:Cl-SO$_4$-HCO$_3$	45%	19%	10%	10%	16%

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