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Forsmark site investigation

Stratigraphical and analytical data from auger drillings and pits

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Geological Survey of Sweden

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Abstract

This report contains stratigraphical and analytical data of unconsolidated Quaternary deposits, especially till, from the Forsmark area. The stratigraphical descriptions, as well as a majority of the 63 samples analysed, derives from auger drillings performed with the main purpose to install ground water monitoring wells. Furthermore, samples were collected within the regular mapping of unconsolidated Quaternary deposits. The samples were analysed with respect to grain size distribution and calcium carbonate content.

In the western part of the investigated area, sandy till covers the surface. At several corings, the sandy till rests directly on the bedrock but a hard clayey till was observed beneath the sand till close to Lake Eckarfjärden. In the eastern part of the investigated area, boulder clay covers the surface and rest on top of a clayey sandy till. The till stratigraphy, as inferred from earlier studies, is complex in the area, especially in the transition zone between the two till types. Therefore, no general stratigraphy for the Forsmark region has been established.

The calcium carbonate content was high, m = 21 ± 7% with a trend of increasing values at higher clay content. One exception was a sample collected at 0.5 m depth in the south western part of the investigated area, i.e. the most elevated area where soil forming processes has been effective for some 2 000 years.

Sammanfattning

Denna rapport innehåller information om den stratigrafiska fördelningen av jordarter, framför allt morän, i Forsmarksområdet. Analyser av kornstorleksfördelning och kalkhalt har utförts på 63 prover som till största delen har insamlats i samband med en kampanj för att installera grundvattenrör. Rapporten inkluderar även prover som insamlats under den kvartärgeologiska karteringen, sommaren 2003.

I den västra delen av undersökningsområdet dominerar sandig morän i ytan. Flera borrningar har visat att denna moräntyp vilar direkt på berggrunden men en hård lerig morän påträffades vid borrningar nära Eckarfjärden. I den östra delen av området täcks ytan av moränlera som är deponerad ovanpå en lerig sandig morän.

Den tidigare uppfattningen om en komplex moränsammansättning i området har bekräftats i denna studie, speciellt i övergångszonen mellan sandig morän i väster och moränlera i öster. Någon generell lagerföljd kan därför inte etableras för Forsmarksområdet.

Kalkhalten i finfraktionen av de undersökta jordarterna var hög, m = 21 ± 7 % med något ökande värden med ökad lerhalt. Det enda undantaget var ett prov från 0,5 m djup från den syd västra delen av undersökningsområdet, dvs den högst belägna delen som befunnit sig över havsytan under ca 2 000 år och under den tiden påverkats av jordmånsbildande processer så som urlakning.

Contents

1 Introduction

This document reports results gained within the "Mapping of unconsolidated Quaternary deposits", one of the activities performed within the site investigation at Forsmark. The work was carried out in accordance with activity plan AP PF 400-02-12 and method description MD 131.001 (both SKB internal controlling documents). A majority of the stratigraphical descriptions and sampling were performed in connection with auger drillings to install groundwater monitoring wells and surface water level gauges in accordance with activity plan AP PF 400-02-31 and method description SKB MD 630.003. In Table 1-1 controlling documents for performing this activity are listed. Both activity plans and method descriptions are SKB's internal controlling documents. In Figure 1-1 the location of the samples analysed and the type of sampling method is showed.

The results from the analyses of grain size composition and calcium carbonate content, together with the description of the Quaternary deposits are stored in SICADA under Field note: Forsmark 153, Table 1-2.

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

Activity plan	Number	Version
Jordartskartering vid Forsmark, 2002–2003	AP PF 400-02-12	2.0
Method description	**Number**	**Version**
Metodbeskrivning för jordartskartering	SKB MD 131.001	1.0

Table 1-2. Data references.

Subactivity	Database	Identity number
Mapping of Quaternary deposits, stratigraphical and analytical data, 2003	SICADA	Field Note: Forsmark 153

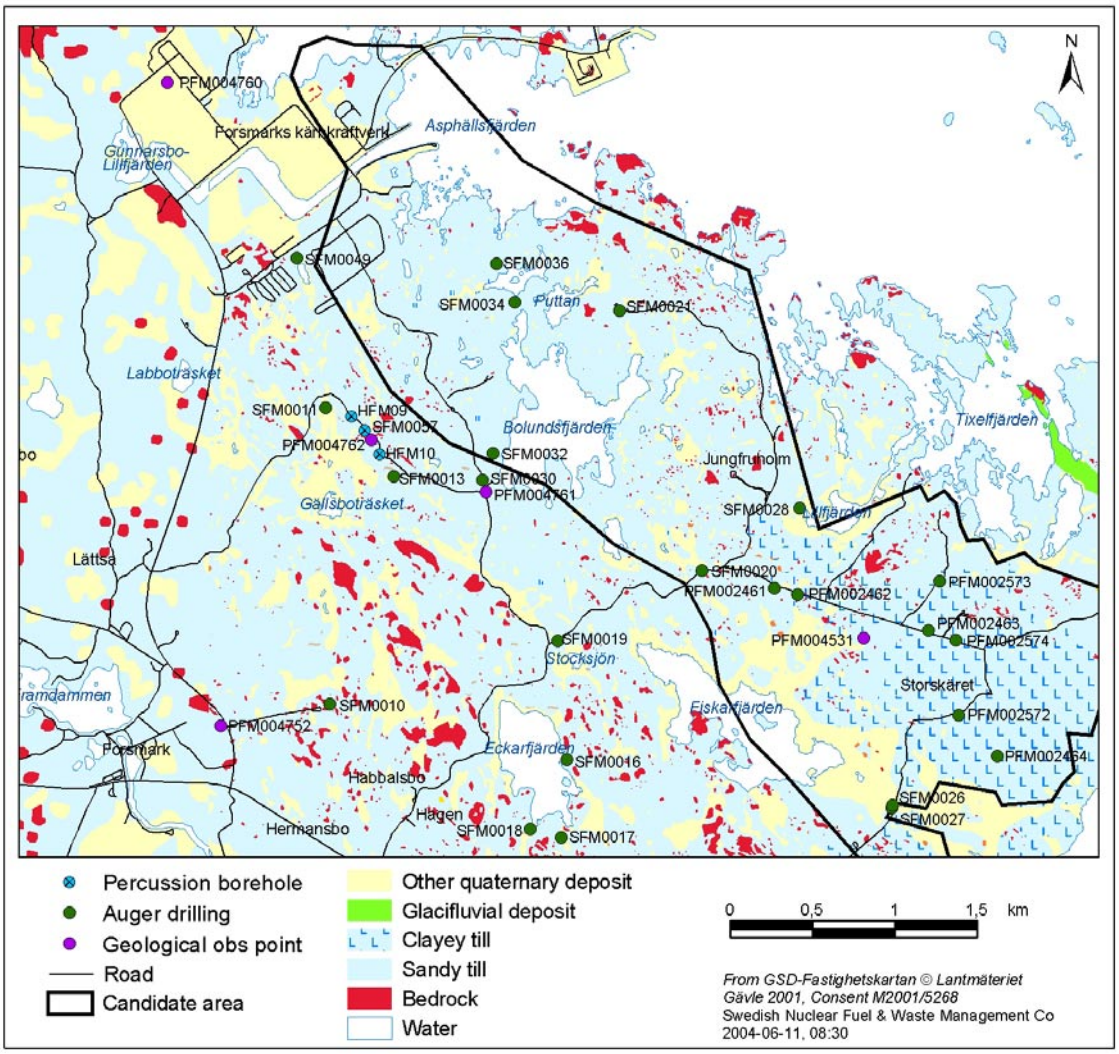

Figure 1-1. *Map showing the sites where Quaternary deposits have been analysed. The samples from the geological observation sites were collected during the regular mapping of the superficial Quaternary deposits. The samples retrieved using auger drilling mainly derives from the installation of groundwater monitoring wells. Three percussion bore holes were sampled as well.*

2 Objective and scope

The mapping of unconsolidated Quaternary deposits lasted during the field seasons 2002 and 2003. The investigations included regular mapping of the superficial Quaternary deposits, presented in a geological map /Sohlenius et al, 2004/. Analytical and stratigraphical data collected during the field season 2002 was reported by /Sohlenius and Rudmark, 2003/. Stratigraphical information of the till was investigated in machine cut trenches /Sundh et al, 2004/. Stratigraphical and analystical data from lake sediment in the Forsmark area have been described by /Hedenström, 2003, 2004/ as well as two peatlands /Fredriksson, 2004/.

The present report focus on stratigraphical and analytical data from corings performed at the installation of groundwater monitoring wells /Johansson, 2003/. Additionally, results from textural analyses of samples collected during the mapping of unconsolidated Quaternary deposits are reported /Sohlenius et al, 2004/. The locations of the sampling sites are given in Figure 1-1.

Laboratory analyses were carried out on 63 selected samples in order to characterise the physical properties of the unconsolidated Quaternary deposits, with a special focus on glacial till. The analytical data will be useful for the hydrogeological modelling and for the conceptual understanding of the Quaternary evolution of the area. The data will also serve as important input to a 3-dimensional model of the thickness and stratigraphical distribution of Quaternary deposits.

3 Equipment

3.1 Description of equipment

The majority of the drillings were performed using a track driven drilling rig, GeoMachine GM 100 GTT with a 8 bar Dynaset HKL 4100/8-113 air compressor (Figure 3-1) /Johansson, 2003/.

Five samples were collected from the surface, using a spade (Figure 3-2).

A total of 63 grain size analyses were performed by sieving and hydrometer methods /SIS, 1992a,b/. The $CaCO_3$ content was analysed using Passons apparatus /Thalme and Almén, 1975/. All analyses were performed at SWECO Geolab.

Figure 3-1. *The drilling rig Geo Machine GM 100 GTT was used for drilling and sampling. Nils Lindqvist and Mesgena Gebrezghi from Sweco VBB Viak was operating the drill rigg.*

Figure 3-2. *The samples collected from the mapping of the unconsolidated Quaternary deposits were obtained using a spade.*

4 Execution

4.1 General

During drillings, samples were collected approximately every metre, or in each lithological unit. The analyses were performed according to the method description for mapping of unconsolidated Quaternary deposits, SKB MD 131.001 (SKB internal controlling document). The drilling technique is described in the method description for drilling and sampling in soil, SKB MD 630.003 (SKB internal controlling document). The samples collected, together with a geotechnical description of the stratigraphy has previously been reported by /Johansson, 2003/.

4.2 Execution of field work

The auger drill retrieves a 1.5 m sample of the sediment, often till (Figure 4-1). The cores were cleaned using a knife to avoid contamination and samples were collected into a plastic container and stored until submitted to analyse (Figure 4-2). The litho-stratigraphy was described in the field after ocular inspection by a Quaternary geologist at a majority of the corings. At corings when no Quaternary geologist was present, the sampling was performed by the operating geotechnichan and later, the samples were inspected and described by a geologist.

Figure 4-1. *The auger drill collects a 1.5 m long sample of the unconsolidated Quaternary deposits. The picture shows a clayey till, coloured red by Palaeozoic limestone, located under 5.7 m sandy till at SFM0016.*

Figure 4-2. *The cores were cleaned using a knife and described and sampled into plastic containers. The picture shows a section of clayey till at Storskäret (PFM002464).*

4.3 Data handling/post processing

The location of point observations at the surface was determined with GPS and stored in SICADA (Field note: Forsmark 153). All the coring sites and geological observations were given unique id-numbers (SFM = bore hole in soil, HFM = percussion cored bore holes and PFM = point observation). The geological information connected to the id-numbers were stored in a data base for mapping of unconsolidated Quaternary deposits at the Geological Survey of Sweden (Jorddagboken, Version 5.4.3). The data were subsequently exported to SICADA (Field note: Forsmark 153). The subsamples collected and not analysed, and the dried residuals of analysed samples are stored at SKB (Forsmark).

The following data have been exported to SICADA:

- Stratigraphical information from boreholes SFM009–SFM0011, SFM0013–14, SFM0016–SFM0021, SFM0026–SFM0028, SFM0030–SFM0037, SFM0049.
- Results from grain size and $CaCO_3$ analyses from 63 samples.

4.4 Analyses and interpretations

Grain size analyses on material < 20 mm, were carried out on 63 samples at SWECO, Geolab in Stockholm. The grain size distribution of coarse material (20–0.063 mm) was determined by sieving while the finer material (< 0.063 mm) was analysed with a hydrometer. The content of $CaCO_3$ was determined (SWECO, Geolab) on the same 63 samples (grain sizes < 63 µm) using Passons apparatus /Talme and Almén, 1975/.

4.5 Nonconformities

Not applicable

5 Results

A summary of the stratigraphical descriptions obtained from the auger drillings is listed in Appendix 1. The analytical results from the grain size and calcium carbonate analyses are summarised in a table in Appendix 2. The complete geological descriptions together with the results from grain size analyses are stored in SICADA under Fiel note: Forsmark 153. Geotechnical descriptions with logged profiles and the location of the sub-sampling depths are presented separately /Johansson, 2003/.

5.1 Stratigraphical distribution of glacial till

A typical feature of the till from the Forsmark region is the high clay and calcite content. A majority (32) of the samples analysed were clayey till (6–15% clay) and additionally five samples were boulder clay, i.e. till with > 15% clay. 15 of the analysed samples were sandy till and five were gravely till.

In the geological map showing the unconsolidated Quaternary deposits, till covers c 75% of the surface /Sohlenius et al, 2004/. The till was sub-divided into three till areas based on the grain size composition, and the frequency of large boulders, in the surface (Figure 5-1). Area I is dominated by sandy till, Area II is clayey till and boulder clay and Area III is covered by high frequency of large boulders. All the observations and analyses included in this report are located within the first two till areas. Till area III is situated within the Kallriga nature reserve, hence no sampling has been conducted there.

A transect with simplified stratigraphical profiles represents three corings and one excavation from till area I is showed in Figure 5-2. The depth to bedrock is c 3–4 m and no stratification is observed within the till bed. The till is clayey sandy silty and at PFM004761 sandy at 0.5 m depth. At SFM0013, SFM0030 and SFM0032, a surface layer of sand and gravel was observed in the upper part of the profile. The upper unit represents wave washing of the top of the profile, due to beach processes in connection with the sub-recent shore displacement. In section SFM0013, a thin layer of clay is present between the sand and till. Similar occurrences of small, thin pockets of clay has frequently been observed within the mapping of superficial Quaternary deposits /Sohlenius et al, 2004/.

In the area south and east of Lake Eckarfjärden, situated within till area I, the till stratigraphy is more complex with a clayey till located beneath the sandy till. This is demonstrated e.g. at SFM0016 (Figure 4-1) where 5.7 m sandy till cover a dense and hard clayey till. A similar stratigraphy was observed by /Sundh et al, 2004/ in a machine cut trench north of Lake Gällsboträsket (PFM002581) where a sandy till covered a very hard, dark clayey till.

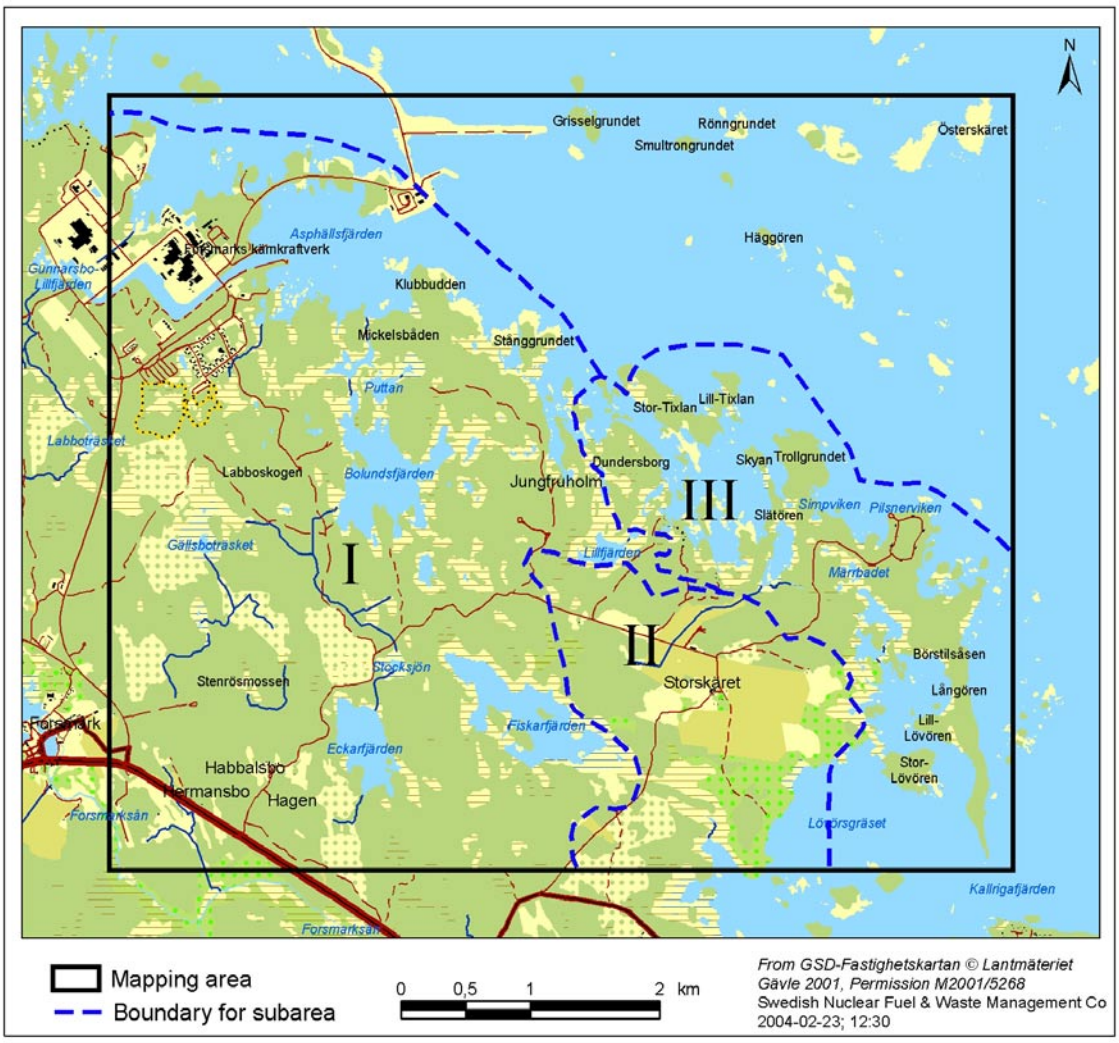

Figure 5-1. *Map showing till areas defined during the mapping of Quaternary deposits. Area I, sandy till, Area II, clayey till and Area III, high frequency of large boulders in the surface. All samples were collected from subareas I and II. /From Sohlenius et al, 2004/.*

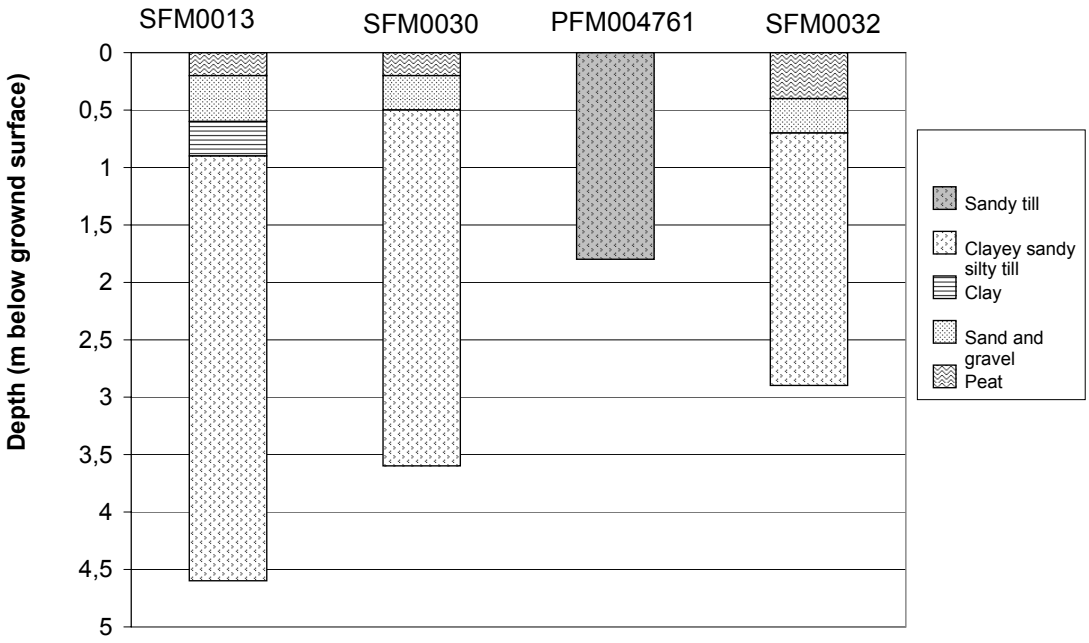

Figure 5-2. *Transect with simplified stratigraphical profiles from the area south west of Lake Bolundsfjärden, Figure 1-1. The information from PFM004761 is based on a machine cut trench. Bedrock was not reached at this site why the depth 1.8 m is a minimum value.*

In till area II, the depth to bedrock is generally greater than in till area I and the clay content is higher. The thickest cover of Quaternary deposits, as identified so far during the site investigations at Forsmark, is recorded at SFM0026, located south east of Lake Fiskarfjärden. The depth to bedrock at the coring site was 16 m. A steep and undulating bedrock topography is indicated by the results from the coring at SFM0027, situated c 20 m from SFM0026, where the depth to bedrock was only 7 m.

A transect from Storskäret area, with simplified stratigraphical profiles, is displayed in (Figure 5-3). In four of the corings, boulder clay was obtained in the surface, covering a coarser, clayey sandy till. This stratification was observed e.g. at PFM002463. Four samples were analysed from the profile and plotted together in the same diagram (Figure 5-4). The clay content in the upper two samples are 15% and 14 % while the sample from 7.2 m contains 6% clay and the bottommost sample, collected at 10.1 m depth, only contains 3% clay.

At PFM002574, the boulder clay was absent and depth to bedrock was only 1.8 m. This site is located close to bedrock outcrops at Drill site 3. hence a thinner till cover close to bedrock.

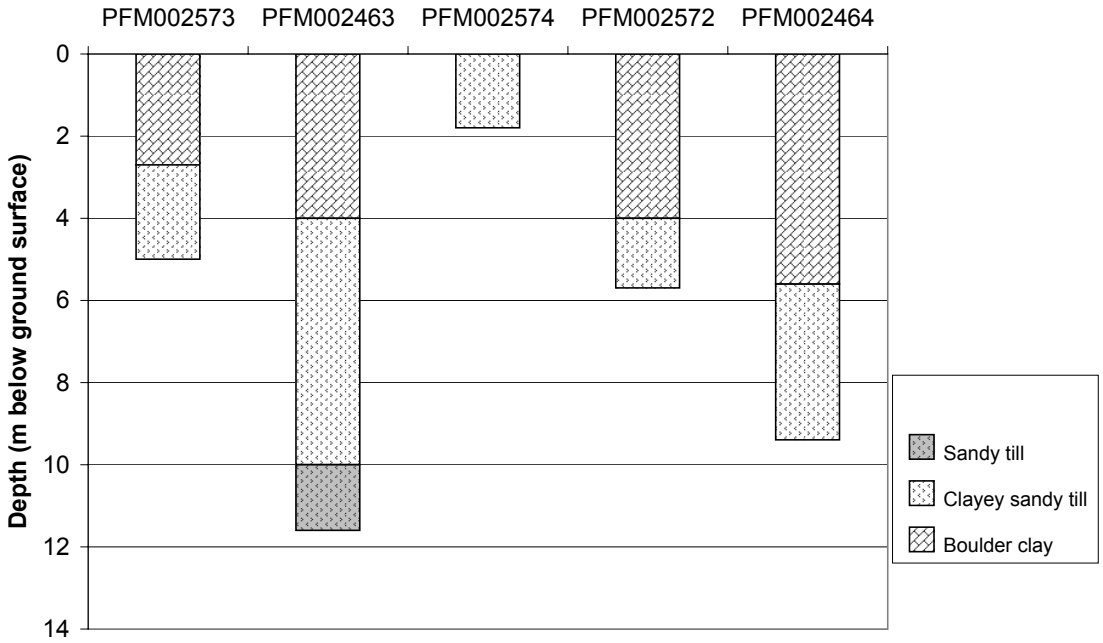

Figure 5-3. *Transect with simplified stratigraphical profiles from the eastern part of the investigated area. A consistent feature is that boulder clay is covering a coarser, sandy silty till.*

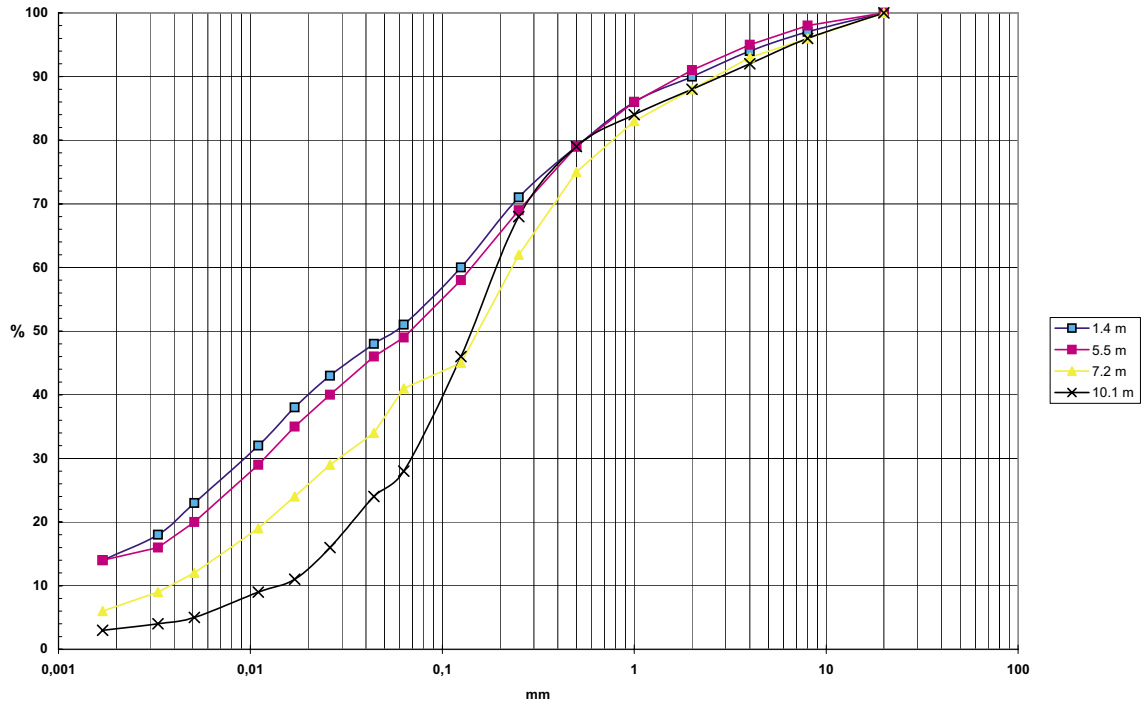

Figure 5-4. *Diagram showing grain size distribution curves for four samples collected at the profile PFM002463, located c 200 m SW of Drill site 3. The clay content is higher (c 15%) in the upper two samples.*

5.2 Calcium carbonate analyses

All together 63 samples were analysed regarding the $CaCO_3$ content in the fine fraction (Appendix 2). Generally the calcite content is high, the average was 21 ± 7% and only one sample had less then 8% calcite.

The minimum value was recorded at PFM004752 at 0.5 m depth, where only 1% $CaCO_3$ was recorded. The sample was collected in the southwestern part of the investigated area, close to the Church of Forsmark, i.e. in the most elevated area that has been above the sea level for c 2 000 years. Probably, the calcium carbonate has leached from the till as a result of soil forming processes. This is consistent to /Lundin et al, 2004/, who reported that calcium had leached from the upper part of the soil profiles at several sites. In other samples collected at corings (this report) as well as within the regular mapping of Quaternary deposits /Sohlenius and Rudmark, 2003/, the calcium carbonate content was high also in the surface (Figure 5-5).

The highest value, 33%, was recorded in the clayey sandy till at 9 m below ground surface at PFM002464. In Figure 5-6 the calcium carbonate content is plotted together with the clay content in the till. There is a positive correlation, however not very strong, between clay and calcium carbonate content.

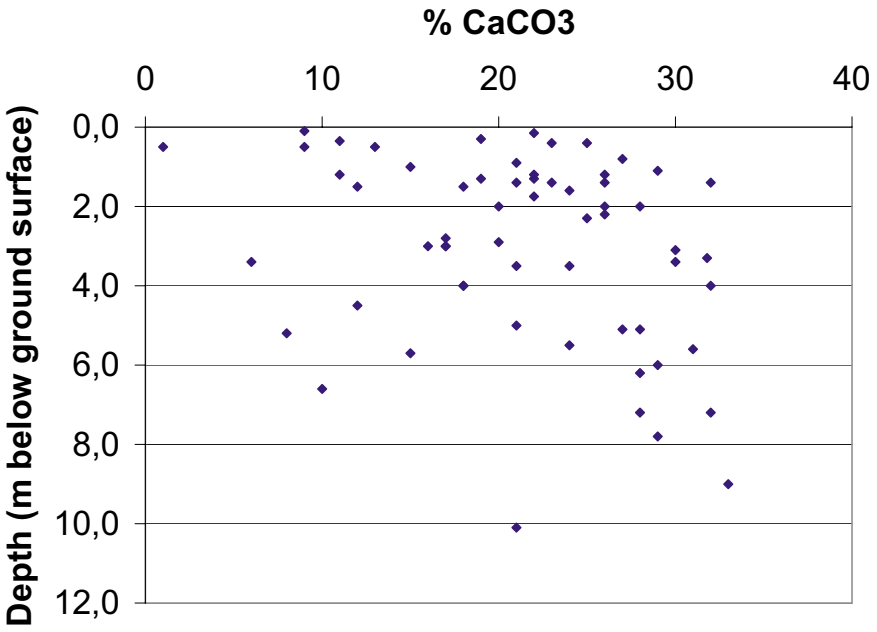

Figure 5-5. *Diagram showing the $CaCO_3$ content in the fine fraction of 63 samples collected in the Forsmark area and depth below ground surface.*

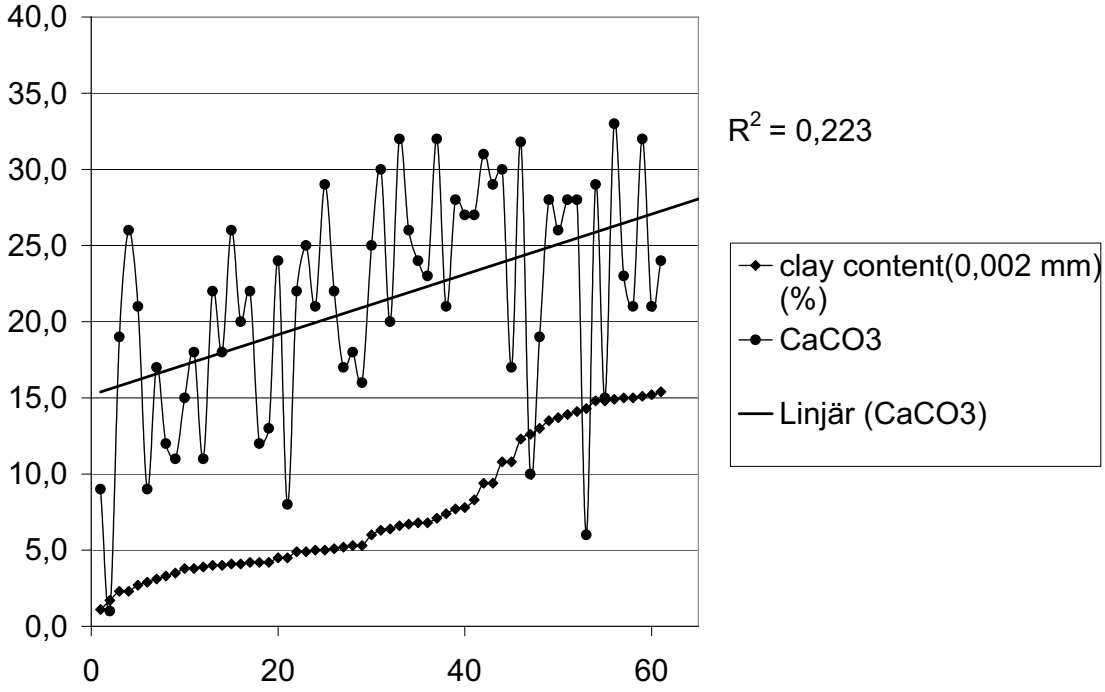

Figure 5-6. *Diagram showing the calcium carbonate versus clay content.*

6 Summary and discussion

As concluded in earlier reports /e.g. Sohlenius and Rudmark, 2003; Sundh et al, 2004/ the stratigraphical distribution of different till beds in the Forsmark area is complicated.

The initial geological maps showed that a clayey till covers the surface along the coast from northern Gräsö in the north to approximately the Norrtälje area in the south /Persson, 1992/. The clayey till in average is thicker than the sandy silty till and deposits other than till often are thin /Persson, 1985/. The results from the present study point to the same interpretation. The high clay and calcite content in the till emanates from erosion of Palaeozoic limestone, situated on the sea floor north of the Forsmark area. Investigations of microfossils in clayey till from the study area reviled high percentages of re-deposited pre-Quaternary fossils /Robertsson, 2004/.

Despite the flat upper surface of the Quaternary deposits in the Forsmark area, large variations in depth to bedrock have been documented. This was initially observed in the area with sandy till close to drill site 1, when several corings were located within a small area. The results from the present study show that the bedrock topography is also undulating in the area with clayey till in the surface, especially south east of Lake Fiskarfjärden. Erosion may have been one process to even out the upper surface of the regolith. /Lagerbäck et al, 2004/ and /Hedenström and Risberg, 2003/ reports post-glacial erosion until shortly before the area was isolated from the sea. Thin pockets of clay have been preserved at numerous locations, as well as accumulations of wave washed sand and gravel, which has contributed the flat ground surface. /Lagerbäck et al, 2004/ also points out that land slides are common on the flanks of the Börstil esker, which also may have a levelling effect.

The occurrence of a hard clayey till under sandy till, observed e.g. at SFM0016, may be the same lithological unit as earlier described from central Sweden, e.g. /Björnbom, 1979/ and from the Forsmark area by /Sundh et al, 2004/. The spatial distribution of this till unit within the investigated region is still not fully understood. This far, observations of the hard clayey till have been made in the north-western part of the Forsmark area, i.e. the prioritised area for the deep repository. Since the physical properties of the lithological unit differ from other till beds, a key question for the site investigation will be to determine the spatial extension of the hard clayey till.

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Appendix 1

Summary of stratigraphical descriptions based on field classifications together with the classifications based on laboratory analyses

idcode	layer no	Depth from	Depth to	Field classification	Lab classification
PFM002461	1	0,00	0,30	not classified	-
	2	0,30	1,00	gravelly diamicton	-
	3	1,00	2,40	clayey sandy silty diamicton	clayey sandy till
PFM002462	1	0,00	0,10	not classified	-
	2	0,10	0,30	sand	gravelly sand
	3	0,30	0,90	diamict clay	clayey sandy silty till
	4	0,90	1,90	clayey sandy silty diamicton	-
	5	1,90	2,90	sandy diamicton	sandy till
	6	2,90	3,70	sandy silty diamicton	-
PFM002463	1	0,00	0,30	not classified	-
	2	0,30	2,10	clayey diamicton, unspec.	boulder clay
	3	2,10	4,00	clayey diamicton, unspec.	-
	4	4,00	6,80	clayey sandy silty diamicton	clayey sandy silty till
	5	6,80	10,00	sandy silty diamicton	clayey sandy till
	6	10,00	11,60	sandy diamicton	sandy till
	7	11,60	12,50	bedrock fragment	-
PFM002464	1	0,00	1,80	clayey diamicton, unspec.	-
	2	1,80	5,60	clayey diamicton, unspec.	boulder clay
	3	5,60	6,00	stony sandy silty diamicton	clayey sandy silty till
	4	6,00	7,70	sandy silty diamicton	clayey sandy silty till
	5	7,70	8,80	sandy silty diamicton	clayey sandy silty till
	6	8,80	9,40	sandy silty diamicton	clayey sandy silty till
PFM002465	1	0,00	0,20	not classified	-
	2	0,20	0,50	sand	-
	3	0,50	1,50	clay	-
	4	1,50	2,60	clayey sandy silty diamicton	-
PFM002572	1	0,00	0,20	not classified	-
	2	0,20	4,00	clayey sandy silty diamicton	boulder clay
	3	4,00	5,70	sandy diamicton	clayey sandy till
	4	5,70	7,20	bedrock fragment	-
PFM002573	1	0,00	0,20	not classified	-
	2	0,20	2,70	clayey sandy silty diamicton	boulder clay
	3	2,70	5,00	sandy diamicton	clayey sandy till
	4	5,00	6,00	bedrock fragment	-
PFM002574	1	0,00	0,40	not classified	-
	2	0,40	1,80	sandy silty diamicton	clayey sandy silty till
	3	1,80	3,00	bedrock fragment	-
SFM0009	1	0,00	0,25	not classified	-

idcode	layer no	Depth from	Depth to	Field classification	Lab classification
	2	0,25	0,40	gravel	-
	3	0,40	1,20	diamict clay	-
	4	1,20	2,50	sandy diamicton	-
	5	2,50	3,70	bedrock fragment	-
SFM0010	1	0,00	0,20	peat	-
	2	0,20	1,40	sandy diamicton	clayey sandy silty till
	3	1,40	2,70	bedrock fragment	-
SFM0011	1	0,00	0,15	peat	-
	2	0,15	0,50	clay	-
	3	0,50	1,50	clayey sandy silty diamicton	-
	4	1,50	3,90	sandy diamicton	sandy till
	5	3,90	5,30	bedrock fragment	-
SFM0013	1	0,00	0,20	peat	-
	2	0,20	0,60	gravel	-
	3	0,60	0,90	clay	-
	4	0,90	4,60	sandy diamicton	-
	5	4,60	5,80	bedrock fragment	bedrock fragment
SFM0014	1	0,00	0,40	not classified	-
	2	0,40	1,95	silty sandy diamicton	-
	3	1,95	3,25	bedrock fragment	-
SFM0016	1	0,00	0,35	not classified	-
	2	0,35	0,80	sandy diamicton	sandy till
	3	0,80	4,50	silty sandy diamicton	sandy till
	4	4,50	5,70	sandy silty diamicton	sandy till
	5	5,70	7,20	silty diamikt clay	clayey sandy silty till, clayey sandy till
	6	7,20		bedrock fragment	-
SFM0017	1	0,00	0,90	not classified	-
	2	0,90	1,30	not classified	-
	3	1,30	2,50	sandy silty diamicton	gravelly till
	4	2,50	4,00	diamict clay	clayey sandy silty till
	5	4,00		bedrock fragment	-
SFM0018	1	0,00	0,70	not classified	-
	2	0,70	0,90	not classified	-
	3	0,90	1,05	not classified	-
	4	1,05	1,70	clay-silt (cohession)	-
	5	1,70	4,00	sandy silty diamicton	clayey sandy till
	6	4,00	4,60	siltig-gravelly diamicton	clayey gravelly till
	7	4,60		bedrock fragment	-
SFM0019	1	0,00	0,40	sandy gravel	-
	2	0,40	4,80	sandy diamicton	sandy till
	3	4,80	6,00	bedrock fragment	silty sand, bedrock
SFM0020	1	0,00	0,20	not classified	-
	2	0,20	0,50	coarse sand	-
	3	0,50	1,40	clay	-
	4	1,40	3,00	clayey sandy silty diamicton	clayey sandy till
	5	3,00		bedrock fragment	-
SFM0021	1	0,00	0,30	not classified	-
	2	0,30	1,90	sandy diamicton	clayey sandy till

idcode	layer no	Depth from	Depth to	Field classification	Lab classification
	3	1,90	3,60	bedrock fragment	-
SFM0026	1	0,00	0,20	peat	-
	2	0,20	0,60	sandy gravel	-
	3	0,60	0,80	not classified	-
	4	0,80	2,60	clay	-
	5	2,60	4,80	diamict clay	clayey sandy till
	6	4,80	16,00	clayey sandy silty diamicton	clayey sandy silty till
	7	16,00	17,60	bedrock fragment	-
SFM0027	1	0,00	0,20	peat	-
	2	0,20	0,50	clay	-
	3	0,50	7,00	clayey sandy silty diamicton	clayey sandy silty till
	4	7,00	8,80	bedrock fragment	-
SFM0028	1	0,00	0,20	peat	-
	2	0,20	1,00	not classified	-
	3	1,00	1,40	clay	-
	4	1,40	5,00	clayey sandy silty diamicton	clayey sandy till
	5	5,00	6,00	sandy diamicton	clayey sandy silty till
	6	6,00	7,10	clayey sandy silty diamicton	clayey sandy till
	7	7,10	8,10	bedrock fragment	-
SFM0030	1	0,00	0,20	not classified	-
	2	0,20	0,50	coarse sand	-
	3	0,50	3,60	clayey sandy silty diamicton	clayey sandy till
	4	3,60		bedrock fragment	-
SFM0032	1	0,00	0,40	not classified	-
	2	0,40	0,70	gravelly sand	-
	3	0,70	2,40	sandy silty diamicton	clayey sandy till
	4	2,40	2,90	diamikton, ospec.	-
	5	2,90		bedrock fragment	-
SFM0034	1	0,00	0,10	not classified	-
	2	0,10	0,60	sandy silty diamicton	clayey sandy till
	3	0,60	1,80	clayey sandy silty diamicton	sandy till
	4	1,80		bedrock fragment	-
SFM0036	1	0,00	0,20	not classified	-
	2	0,20	0,40	sandy gravelly diamicton	-
	3	0,40	1,90	sandy diamict clay	sandy till
	4	1,90		bedrock fragment	-
SFM0049	1	0,00	0,10	not classified	-
	2	0,10	1,30	gravel	-
	3	1,30	3,80	sandy diamicton	gravelly till
	4	3,80	4,90	bedrock fragment	-
SFM0051	1	0,00	5,50	sandy diamicton	-

Appendix 2

Summary of results from analyses of grain size distribution and $CaCO_3$ content

idcode	sample nr	secup (m)	seclow (m)	Quartenary deposit	CaCO3 (%)
PFM002461	1	1.1	1.4	Clayey sandy till	29
PFM002461	3	2.0	2.4	Clayey sandy till	28
PFM002462	1	0.1	0.3	Gravelly sand	9
PFM002462	2	0.3	0.5	Clayey sandy silty till	19
PFM002462	4	2.2	2.4	Sandy till	26
PFM002463	2	1.4	1.6	Boulder clay	32
PFM002463	6	5.1	5.5	Clayey sandy silty till	28
PFM002463	8	7.2	7.8	Clayey sandy till	32
PFM002463	12	10.1	10.8	Sandy till	21
PFM002464	4	3.5	3.9	Boulder clay	24
PFM002464	6	5.0	5.3	Boulder clay	21
PFM002464	7	5.6	5.9	Clayey sandy silty till	31
PFM002464	9	7.2	7.6	Clayey sandy silty till	28
PFM002464	11	7.8	8.2	Clayey sandy silty till	29
PFM002464	12	9.0	9.4	Clayey sandy silty till	33
PFM002572	2	1.4	1.7	Boulder clay	23
PFM002572	5	4.0	4.4	Clayey sandy till	32
PFM002572	6	5.1	5.7	Clayey sandy till	27
PFM002573	2	1.4	1.7	Boulder clay	21
PFM002573	4	3.4	3.7	Clayey sandy till	30
PFM002574	2	1.4	1.8	Clayey sandy silty till	26
SFM0010	1	0.8	1.3	Clayey sandy silty till	27
SFM0011	2	1.6	1.9	Sandy till	24
SFM0011	4	3.0	3.5	Sandy till	17
SFM0013	5	5.0	5.2	Gravel (bedrock fragments)	not analysed
SFM0013	6	5.3	5.6	Gravel (bedrock fragments)	not analysed
SFM0016	1	0.4	0.8	Sandy till	11
SFM0016	3	1.8	2.1	Sandy till	22
SFM0016	6	4.5	5.2	Sandy till	12
SFM0016	7	5.7	6.1	Clayey sandy silty till	15
SFM0016	8	6.6	7.2	Clayey sandy till	10
SFM0017	1	1.2	1.8	Gravelly till	11
SFM0017	2	1.3	2.5	Gravelly till	19
SFM0017	3	3.0	3.7	Clayey sandy silty till	17
SFM0018	1	2.9	3.5	Clayey sandy till	20
SFM0018	2	4.0	4.6	Clayey gravelly till	18
SFM0019	2	1.0	1.5	Sandy till	15
SFM0019	8	4.0	4.5	Sandy till	18
SFM0019	10	5.2	5.5	Silty sand (bedrock fragments)	8
SFM0020	3	2.3	2.8	Clayey sandy till	25
SFM0021	2	1.2	1.7	Clayey sandy till	26
SFM0026	2	3.4	3.8	Clayey sandy till	6
SFM0026	5	6.2	6.8	Clayey sandy silty till	28
SFM0027	3	3.3	3.7	Clayey sandy silty till	32
SFM0028	3	3.1	3.6	Clayey sandy till	30
SFM0028	5	5.5	6.0	Clayey sandy silty till	24
SFM0028	6	6.0	7.0	Clayey sandy till	29
SFM0030	3	2.8	3.4	Clayey sandy till	17
SFM0032	1	0.9	1.2	Clayey sandy till	21
SFM0034	1	0.2	0.5	Clayey sandy till	22

idcode	sample nr	secup (m)	seclow (m)	Quartenary deposit	CaCO3 (%)
SFM0034	3	1.3	1.6	Sandy till	22
SFM0036	1	0.4	1.2	Sandy till	25
SFM0049	1	1.5	2.5	Gravelly till (flushed sample)	12
PFM 004531	1	0.5	0.5	Sandy gravel	9
PFM 004752	1	0.5	0.5	Sandy till	1
PFM 004760	2	1.2	1.3	Sandy till	22
PFM 004761	1	0.5	0.6	Sandy till	13
PFM 004762	1	0.4	0.5	Clayey sandy till	23
HFM 009	3	2.0		Sandy till	20
HFM 009	6	3.5		Sandy silt	21
HFM 010	3	1.5		Gravelly till	18
SFM 0057	4	2.0		Gravelly till	26
SFM 0057	6	3.0		Clayey sandy till	16