DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2001/25

Evaluation of raw materials along Viking Cable cable route in Danish waters

Technical report to Viking Cable AS
March 2001

Jørgen O. Leth, Dennis Anthony
and Peter Konradi

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MINISTRY OF ENVIRONMENT AND ENERGY

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1. Introduction

Two power cables, the Viking Cable and the NorNed Cable, are planned connecting Norway and Germany and Norway the Netherlands. Due to the Danish legislation the raw material potential has to be assessed in the 200 m security zone on both sides along the cable prior to the establishment of the cable to ensure a sustainable exploitation of the raw materials in the Danish territorial waters.

On the instructions of Viking Cable AS The Geological Survey of Denmark and Greenland (GEUS) has carried out raw material investigations along the Viking Cable route in the Danish Sector. The result of the evaluation presented in this report is a registration of the amount and type of the raw materials.

2. The criteria

The criteria for the definition of raw materials follows the guidelines given by the National Forest and Nature Agency:

- The thickness of the raw materials (sand and gravel) must be at least 1 meter thick.
- The water depth must be at least 15 metres in the near coast area.
- The water depth is less than 40 metres.

The evaluation should describe the geology along the cable tracée, and if possible quantify the volume of raw materials in the commercial sense – which is expected to be tied up in the cable corridor.

The evaluation is as a rule based on investigations completed in relation to the project combined with the general knowledge on the raw material potential in the region.

3. Database

The database used for the evaluation is based on the report No. 33766.4 "Viking Cable/NorNed Kabel survey of the corridors – Survey Results" made by Fugro-Geoteam for STATNETT in 1996. The report includes the results from the offshore survey of the planned cable corridors for the Viking Cable, the NorNed Kabel and the EuroKabel. The surveys were performed between May 22nd and July 13th 1996.

After it has been decided to move the Viking Cable to the EuroKabel corridor a supplementary geotechnical project of this corridor has been completed by Fugro-Geoteam in June 2000 (Report No 34632.31). The purpose was to characterise ground conditions along the cable route for correlation with geophysical data. The results from this report have partly been included in the present evaluation.

Subsequently, the project has skipped the EuroKabel Project and decided to move the Viking Cable to the EuroKabel corridor. Therefore, the present evaluation has been based solely on the reports of the EuroKabel corridor survey.

Data available for the present raw material evaluation has been based on the interpretations from three parallel survey lines. The quality of the interpretations of the data is considered high.

The equipment utilised for the survey is side scan sonar, multibeam echo sounder and deep towed boomer (Sub-bottom profiler). Furthermore, the results from a series of geotechnical samples (PCPT, gravity cores, grab samples and vibrocores) and ROV investigations have been available.

4. Results

On the basis of the geological interpretations from the Fugro – Geoteam report presented in the alignment sheets and the text in the above-mentioned reports any information in relation to raw materials has been compiled. It has been possible to define three types of sand units based on the sediment type, the morphology and if possible the internal reflector configuration:

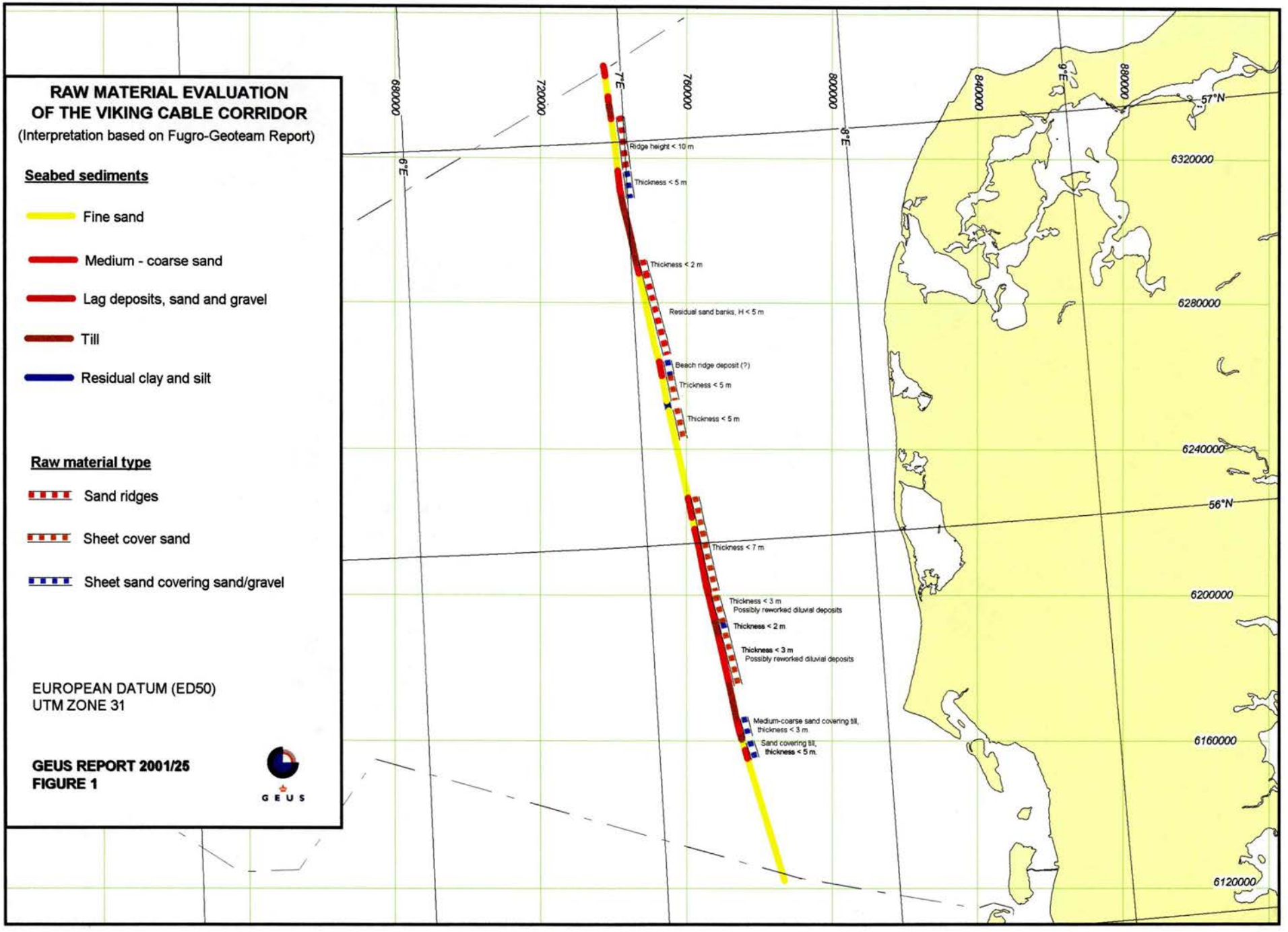
- Sheet cover sand covering coarse sand / gravel: Uniform layers of sand with no internal structures often with a wide extend. Typically related to the sub-cropping glacial deposit areas in the northern part (Little Fisher Bank/Turbot Bank) and southern part (West of Horns Reef) of the cable route. A valuable resource with a large content of coarse sand and gravel. Layer thickness up to 5 m.

- Sand ridges: Sand unit with maximum thickness in the centre and minimum thickness at the rim. The extend is in the kilometre scale. This type is by volume a major raw material source. The distribution is related to large sandbank accumulation of up to 10 m thickness. The value as a raw material, however, is doubtful due to the dominance of fine sand.

- Sheet cover sand: Uniform layers of sand thicker than 1 m with no internal structures and often with a wide extend. This resource is in the middle part of the Danish Sector dominated by fine sand. In the southern part the resource is dominated by medium to coarse sand possibly due to the reworking of meltwater deposits.

All areas characterised by one of the three sand unit types are concluded to be of potential raw material interest. It has not on the actual basis been possible to conclude anything on the distribution, volume and quality of the raw material. To do so further investigations are recommended.

The compiled results are presented in figure 1. The map shows the cable route in different colours, which refer to the seabed sediment type (see legend figure 1). Along the cable route signs referring to the three raw material types defined have indicated the areal distribution of potential raw materials.


RAW MATERIAL EVALUATION
OF THE VIKING CABLE CORRIDOR
(Interpretation based on Fugro-Geoteam Report)
Seabed sediments
Fine sand
Medium - coarse sand
Lag deposits, sand and gravel
Till
Residual clay and silt
Raw material type
Sand ridges
Sheet cover sand
Sheet sand covering sand/gravel
EUROPEAN DATUM (ED50)
UTM ZONE 31
GEUS REPORT 2001/25
FIGURE 1
GEUS
680000
720000
760000
800000
840000
880000
6°E
7°E
8°E
9°E
57°N
56°N
6320000
6280000
6240000
6200000
6160000
6120000
Ridge height < 10 m
Thickness < 5 m
Thickness < 2 m
Residual sand banks, H < 5 m
Beach ridge deposit (?)
Thickness < 5 m
Thickness < 5 m
Thickness < 7 m
Thickness < 3 m
Possibly reworked diluvial deposits
Thickness < 2 m
Thickness < 3 m
Possibly reworked diluvial deposits
Medium-coarse sand covering till,
thickness < 3 m
Sand covering till,
thickness < 5 m

5. Conclusion

On the basis of geological interpretations included in the Fugro-Geoteam Reports made for STATNETT in 1996 and 2000 GEUS has completed an preliminary evaluation of the raw material potential in the Viking Cable corridor in the Danish Sector. Three different types of resources have been defined and the areal distribution has been mapped together with the seabed sediment type (Figure 1).

In the northern part of the corridor the cable will cross the Little Fisher Bank/Turbot Bank areas dominated by outcropping/sub-cropping glacial deposits. From the present investigation an area of 'sheet sand covering sand and gravel' together with areas of 'sand ridges' have been recognised. From other investigations in the latter region and the neighbouring Jutland Bank area it is known that both types of potential raw material are widely distributed with huge total volumes which might be considered as alternative resource areas. However, no detailed raw material investigations and assessments of volume and quality have been completed so far.

Widespread areas of 'sheet cover sand' have been mapped in the middle part of the cable route. These deposits are concluded to be of minor interest due to the dominance of fine sand.

In the southern part widespread areas of 'sheet cover sand' and 'sheet cover sand covering sand and gravel' are present. It has not been possible to make any evaluation of the specific raw material in this region. But due to the presence of glacial deposits and meltwater deposits in the areas it is concluded that 'sand sheet cover' represents accumulations of reworked meltwater sand with some coarse sand and gravel accumulation in the surroundings of the outcropping glacial deposits. The raw material value of these deposits is expected to be considerable taking the water depth (25-35 m) into account.