TABLES WELL 17/10-1

Table 1 CASINGS

Diameter	Depth below KB m	Depth below KB ft
30"	161	529
20"	137	449
13 3/8"	426	1398
9 5/8"	1557	5109

Table 2 HOLE DEVIATION

Depth below KB m	Depth below KB ft	Degrees
287	942	1/2
786	2580	1/2
1036	3400	3/4
1250	4100	1
1689	5540	1/2
1865	6120	3/4
2079	6820	1
2316	7600	1
2429	7970	1 1/4
2679	8790	2
2946	9665	1
3170	10400	3/4
3444	11300	1/2
3505	11500	2

Table 3 a MUD PROGRAMME

Mud properties						Mud components
Depth below KB m	Depth below KB ft	Weight ppg	Funnel visc. sec.	Filt loss cm^3	Remarks	
161	529				Added 300 bbls viscous mud.	Drilled with sea water to 1412'. A Spersene/XP-20 sea water mud was used to 5129'. At 5129' mud weight was increaced to 13.0 ppg and viscosity to 72 sec to make logging possible. Then reduced to 9.5 ppg and 45 sec. After this hole conditions were better.
430	1412	9.4	100		Pumped 600 bbls viscous mud in 3 stages. Conditioned mud.	
1067	3500	9.5	40	9.0		
		9.5	45	3.5	Replaced mud in marine riser with sea water.	
1563	5129	13.0	72	2.6		
1689	5542	11.0	53	3.0		
1784	5853	11.2	61	3.4		
1873	6145	11.0	49	3.0		
2687	8799	11.5	48	4.6		
3249	10661	11.6	50	3.9		
3367	11048	11.9	60	7.9	Changed to salt saturated mud.	
3457	11342	11.6	54	6.2		
3553	11656	11.8	56	4.2		

Table 3 b MUD ADDITIVES

Function	Product*
Bactericides	(Lime), (Caustic Soda)
Calcium removers	Soda Ash, (My-Lo-Jel), (Caustic Soda)
Corrosion inhibitor	(Lime)
Defoamer	Magconol
Emulsifier	(Drilling Detergent)
Filtrate reducers	CMC, My-Lo-Jel, (XP-20), (Spersene), (Magcogel)
Flocculant	Salt
Lubricants	Bit Lube, (Lime)
pH control	Lime, Caustic Soda, (Soda Ash)
Shale control inhibitors	XP-20, (Salt), (Lime)
Surface active agent	Drilling Detergent
Thinners	Spersene, XP-20
Viscosifiers	Salt Gel, Magcogel, (CMC)
Weighting materials	Barytes, (Salt)

* Additives in parantheses signify a secondary function.

2.07 MUD DATA AND CHEMICAL CONSUMPTION

DEPTH INTERVAL	WEIGHT PPG	VISCOSITY SEC. M.F.	WATERLOSS CC API	FANNPROPERTIES APP VISC	PLASTIC VISC	YIELD PT	ALKALINITY PH	PF	SOLIDS %	Cl. ppm	$Ca^{++} + Mg^{++}$ ppm
0 - 529'	9.2	97	-	-	-	-	-	-	-	-	-
529' 1412'	9.4	100	-	-	-	-	-	-	-	-	-
1412' - 5129'	9.9	55	3.5	24	19	11	10.5	1.5	10	21.500	480
5129' - 8390'	11.0	48	3.2	22	17	11	9.3	.5	15	21.000	400
8390' - 11779'	11.6	53	3.6	35	31	8	11.	5.5	19	155.000	160

N O R S K E   S H E L L

CHEMICAL CONSUMPTION WELL 17/10-1

From 30/12/68 to 24/3/69

CHEMICALS		UNIT	TOTAL CONSUMPTION	UNIT COST $	TOTAL COST $
Barytes	bulk	MT	357	66.15	23,616
Salt gel	sacks	80 lbs	1218	4.67	5,688
Magconol (gel)	sacks	100 lbs	2531	3.25	8,226
Lime	sacks	56 lbs	108	1.875	203
Spersene	sacks	50 lbs	1856	9.38	17,409
XP-20	sacks	50 lbs	814	9.64	7,847
CMC L.V.	sacks	56 lbs	820	12.28	10,070
Caustic Soda	drums	50 kg	378	9.94	3,757
Soda Ash	sacks	50 kg	124	5.08	630
Drilling Detergent	drums	55 gal	30	242.00	7,260
Magconol	drums	55 gal	12	325.26	3,903
My-Lo-Gel	sacks	56 lbs	114	7.11	811
Salt	sacks	50 kg	3025	2.16	6,534
Bit Lube	drums	55 gal	35	126.39	4,424
Pipe Lax	drums	55 gal	1	375.00	375
TOTAL MUD CHEMICALS					100,753

DEPTH OF WELL	11779'
DAYS DRILLING	85
MUD COST/FT	$ 8.70
MUD COST/DAY	$ 1207
MUD CHEMICALS CONSUMED :	$ 100,753
CHEMICALS WASTED OR LOST :	$ 13,669
TOTAL CHEMICALS CONSUMED & LOST :	$ 116,244

Technical Service Report August 1973

RKTR 0254.73

SOURCE ROCK AND CARBONIZATION EVALUATION
WELL 17/10-1, NORWAY

by

K. Reiman & J.E.A.M. Dielwart

KONINKLIJKE/SHELL
EXPLORATIE EN PRODUKTIE LABORATORIUM
RIJSWIJK, THE NETHERLANDS

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WELL 17/10-1, NORWAY

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K. Reiman & J.E.A.M. Dielwart

Sponsor: **SIPM-EP/ A/S Norske Shell**

In co-operation with:

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Investigation

9.12.895

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Figure 1. Map showing location of the well
 2 Fixed-carbon content as a function of depth
 3. Fixed-carbon content histograms

Enclosure 1. Geochemical log

I. INTRODUCTION

Geochemical investigations have been carried out on a suite of samples from the well as mentioned on the title page.

These investigations have been carried out to evaluate the presence and quality of source-rock layers, to establish the trend in fixed-carbon content, and to indicate the zone of possible oil and/or gas generation at the location of the well.

II. EVALUATION OF SOURCE-ROCK PROPERTIES

a. Source-rock indications

These indications have been determined for the original samples and, for those showing a high source-rock indication, also after extraction with warm chloroform.

The results are given in the geochemical log (enclosure 1). For the location of the well see figure 1.

The bars on the geochemical log are an approximate measure of the organic-carbon content of the samples. The column on the left represents indication of the organic-carbon content of the untreated samples, while the column on the right shows the organic-carbon content of the samples after chloroform extraction.

Moderate to high indications obtained for the original samples may indicate genuine source-rock properties or migrated oil, or may be due to the presence of contaminants such as diesel oil used in the drilling fluid. To distinguish between the first possibility and the latter two, original samples with strong indications are remeasured after extraction with chloroform. Intervals or samples with high indications after extraction are investigated microscopically to ensure that the high values indicate genuine source-rock properties and are not due to contaminants insoluble in chloroform (such as walnut shells or other lost circulation material of an organic nature).

b. Type of organic matter

Knowledge of the type of organic matter is important because it is known that organic matter rich in hydrogen[1] (kerogen, kerogenous) is a precursor of oil. Organic matter poor in hydrogen (humic) yields only gas. The types of organic matter recognised range from kerogenous, through mainly kerogenous, mixture and mainly humic, to humic. In this order, the type indicates decreasing concentrations of hydrogen in the organic matter.

The type of organic matter was determined by gas chromatography[2] as well as by microscopic inspection. Organic matter of humic type is a precursor of gas. Organic matter of mainly humic type is also considered to be a precursor of gas; if sufficient quantities are present it may also yield oil. Organic matter of mixed type is a precursor of light oil (usually of a paraffinic nature) and gas. Organic matter of mainly kerogenous and kerogenous types are precursors of oil and gas.

The results have been included in the geochemical log.

III. MATURITY OF THE ORGANIC MATTER

a. General remarks and results

It is important to determine the effect of temperature on the organic matter present in source rocks, since the generation of oil and gas is closely connected with the influence of relatively high temperatures. The effect of temperature (or the degree of maturity) was established by determining the rank of constituent coal particles[3] by measurement of vitrinite reflectance[4-6]. Some 50 (maximum) reflectance measurements have been made for each sample, provided there was sufficient vitrinite present. The average value of these reflectances has been converted to fixed-carbon content (100 - volatile matter).

The results are plotted as function of depth in figure 2 in the form of fixed-carbon histograms. Any histogram that could not be accommodated on figure 2 is given in subsequent figures.

In general, the mode value of the histogram may or may not represent the true-layer fixed-carbon content (coal rank) of the stratum from which the sample is taken. The rank obtained from cuttings may have been influenced by vitrite from cavings. Alternatively, the rank may refer to reworked, resedimented or allochthonous vitrinite. However, it is probable that the coal rank obtained for samples with fixed-carbon histograms that have a rather sharp mode value does represent the true rank of the stratum from which the sample originates.

b. Compatible fixed-carbon content

The compatible fixed-carbon content (compatible FCC) is that which is in accordance with the present depth of burial and age of the formation in question. Knowledge of the compatible FCC is required to indicate the zone of possible oil generation (so-called cooking pot) [7,8].

The dashed line in figure 2 indicates the compatible FCC. If only a solid line is given, the compatible FCC coincides with the so-called true-layer fixed-carbon content (true-layer FCC).

The compatible FCC values 60 and 75 indicate the limits of the zone in which oil generation may take place. Oil source rocks located within these limits are expected to generate oil. The major gas generation takes place below the level indicated by the compatible FCC 75.

In those cases where it can be assumed that the strata are presently at their maximum depth of burial, the compatible FCC also indicates the predicted true-layer FCC.

c. True-layer fixed-carbon content

The true-layer fixed-carbon content (true-layer FCC) is the FCC that a humic coal would have when subjected to the same burial as the formation in question.

The solid line in figure 2 is considered to indicate the trend of the true-layer FCC. It is based on those FCC values that are believed to be realiable. In this connection, it can be remarked that the standard deviation in the FCC measurement, including the variability occurring in nature, is 4 FCC units. The shape of the line, that is the rate of increase as a function of FCC is based on accumulated experience.

If the area has been uplifted, in the sense that the strata were once at greater depth, the true-layer FCC is higher than the compatible FCC. Source rocks with a true-layer FCC between 60 and 75 are mature for oil. If these source rocks have been uplifted, the true layer FCC is incompatible.

Mature source rocks for oil have generated oil when the relevant strata have dropped below the level of the compatible FCC 60. Mature source rocks for oil lying outside the interval between the compatible FCC 60 and 75 levels are not expected to generate oil at present.

IV. DISCUSSION AND CONCLUSIONS

Interval 8300 - at least 11779 ft (Jurassic/Triassic ?) contains source rocks for oil (and gas).

The zone of possible oil generation or cooking pot at the location of well 17/10-1, as indicated by the levels of compatible FCC 60 and 75, is between 9700 ft and about 15500 ft.

The above indicates that the source rock for oil below 9700 ft is now in the oil generation phase.

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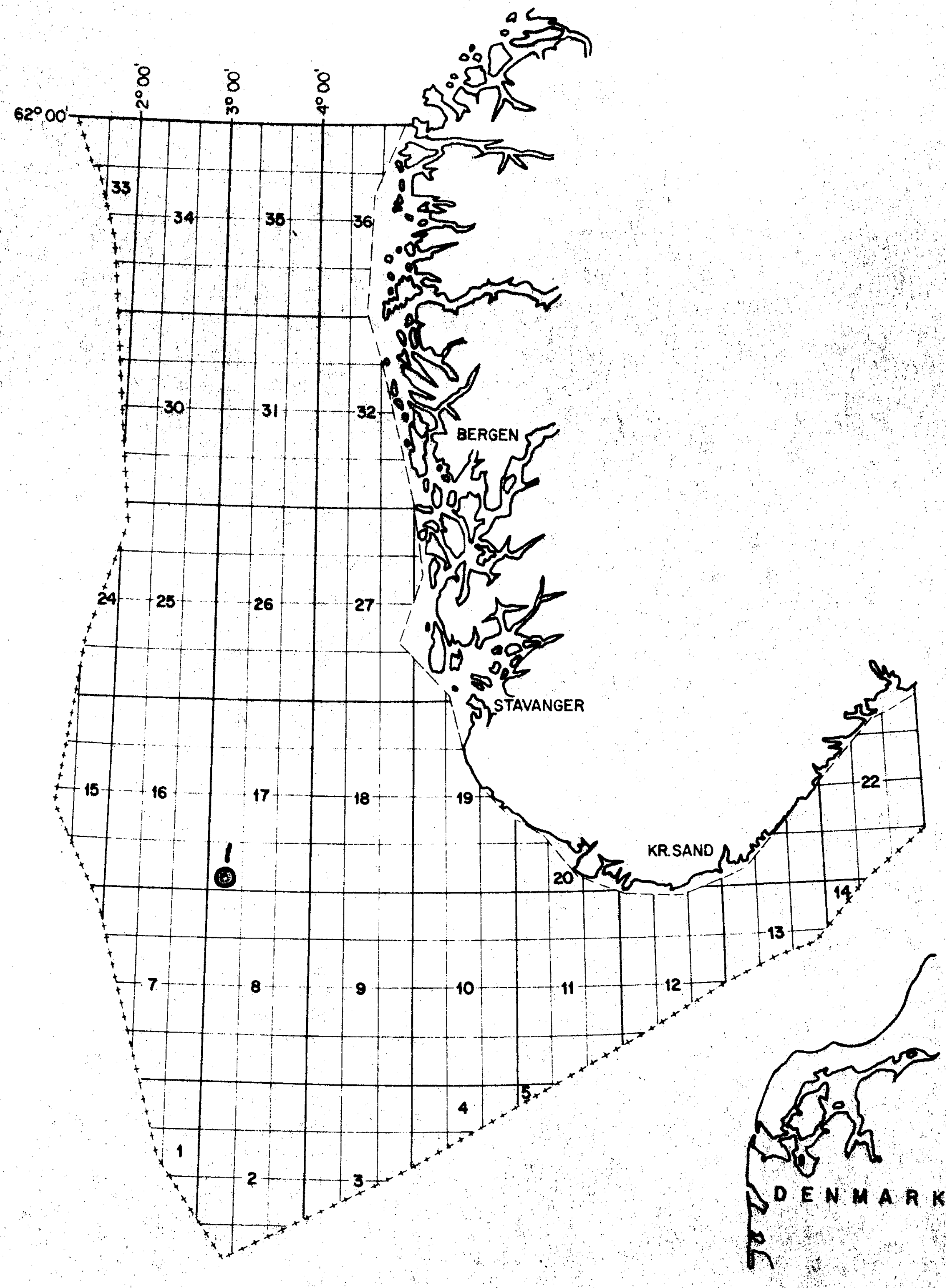
62° 00'
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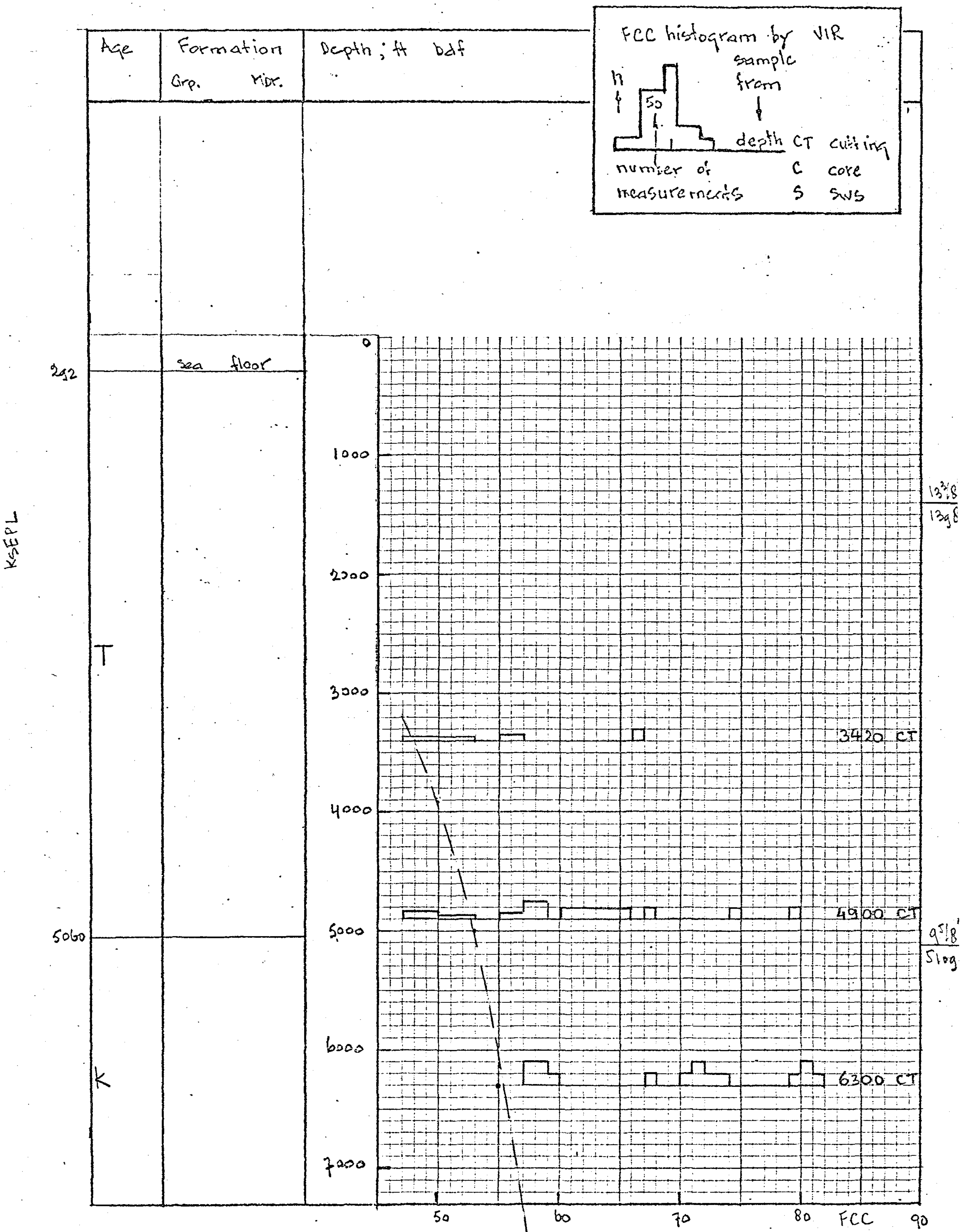
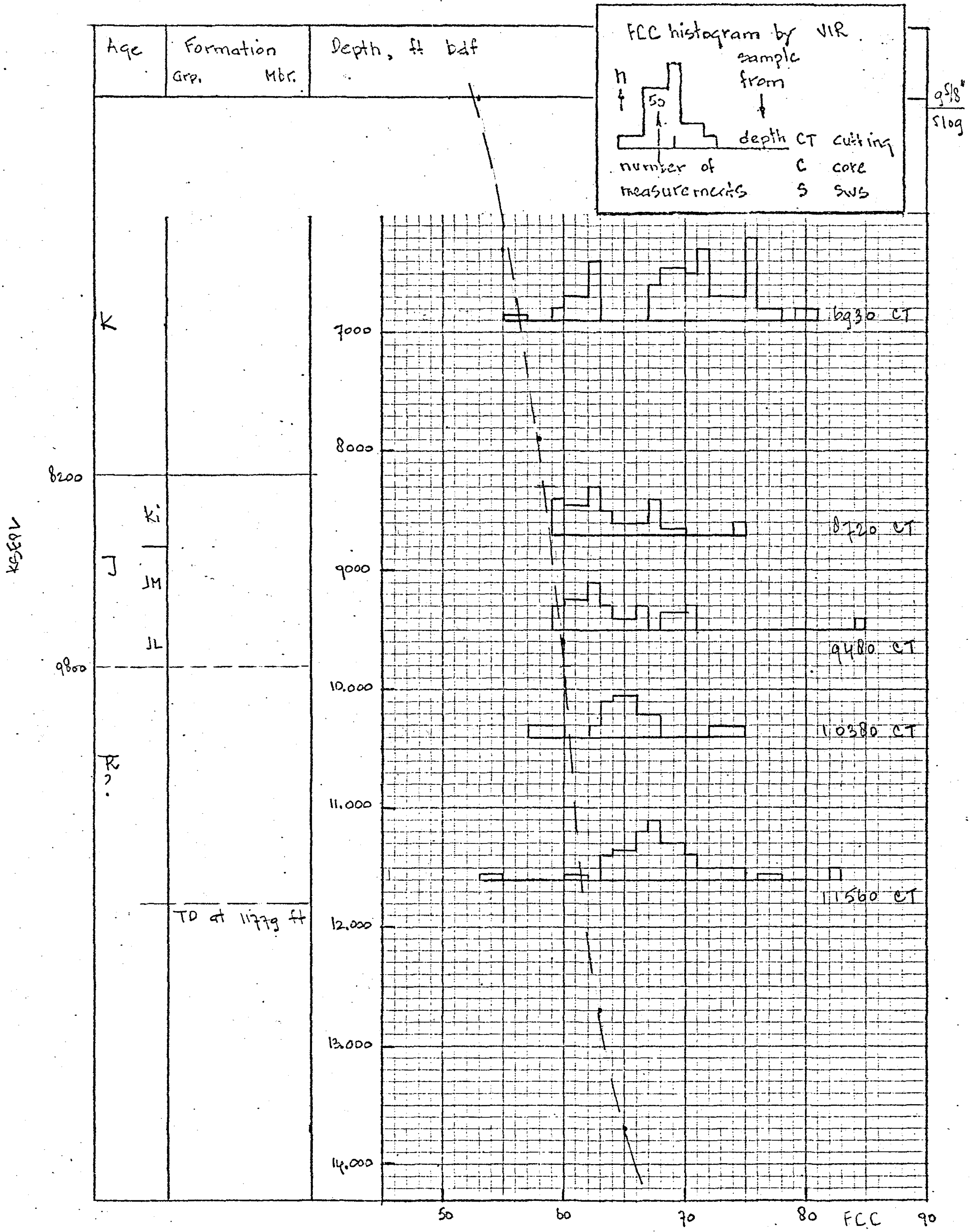
DENMARK

Fig. 1



FCC AS A FUNCTION OF DEPTH, WELL 17/10-1

FIG: 2a



FCC AS A FUNCTION OF DEPTH, WELL 17/10-1

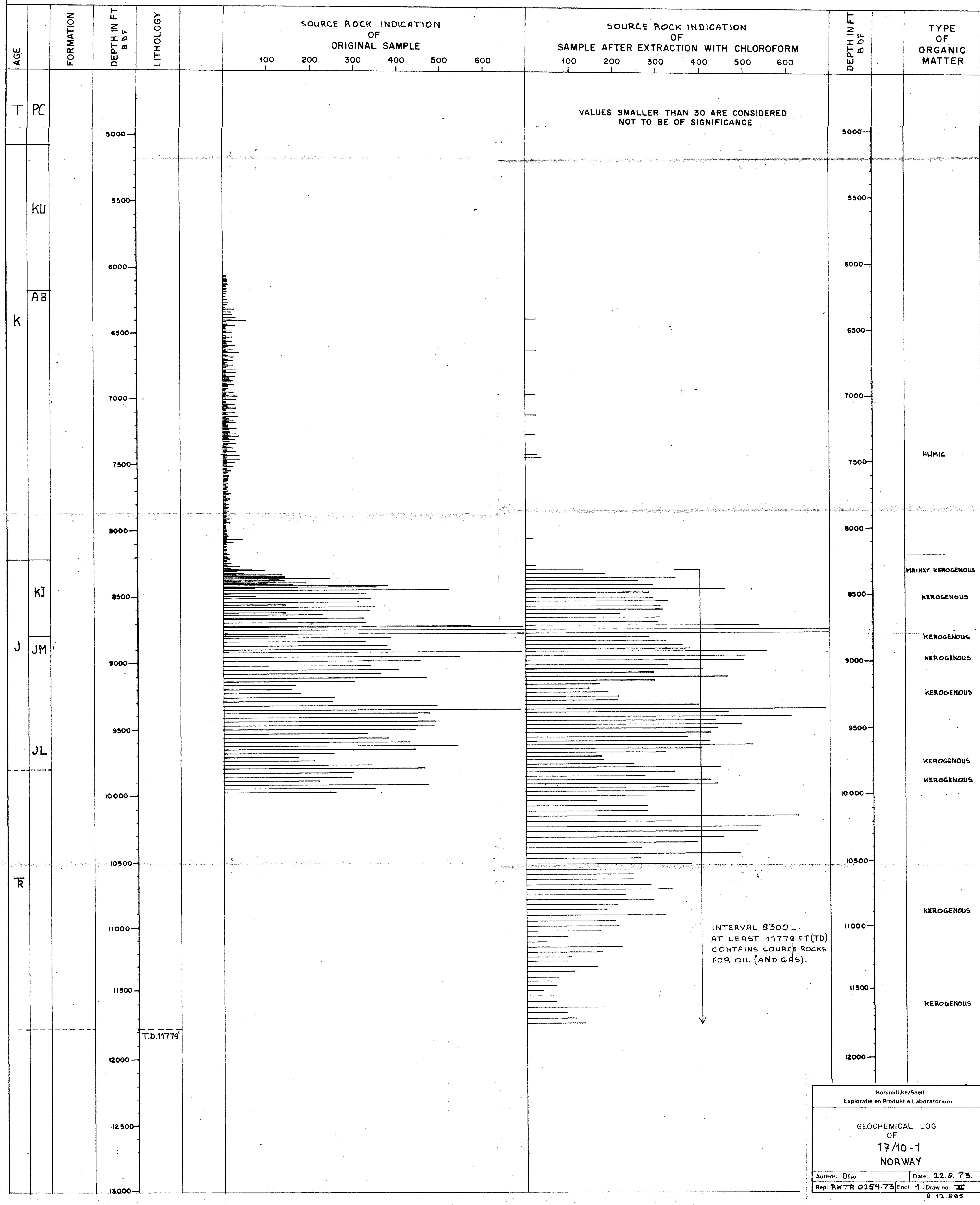
compatible DOM 75 at 15500 ft

FIG: 2b

GEOCHEMICAL LOG

WELL 17/10-1

SCALE 1:5000



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GEOCHEMICAL LOG
OF
17/10-1
NORWAY

Author: DIW	Date: 22.8.73.
Rep: RKTR 0254.73 Encl: 1	Draw.no: III

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