CLIENT/ OPPDRAGSGIVER

Statoil

RESPONSIBLE SCIENTIST/ PROSJEKTANSVARLIG

P.B. Hall

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DATE/ DATO	REPORT NO./RAPPORT NR.	NO. OF PAGES/ ANT.SIDER	NO OF ENCLOSURES/ ANT. BILAG
17.6.82	0-445	86	7

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REPORT TITLE/ TITTEL

Source Rock Analysis of Well 30/6-4

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SUMMARY/ SAMMENDRAG

The analysed section of well 30/6-4 (2350-2942m) was divided into 8 zones, based on lithology and light hydrocarbon analysis. After detailed analysis, Zones B, C and D (2415-2640m) is recognized as the major source rock section. Zones F (2715-2850m) and H (2875-2942m) also have promising source rock horizons.

The source rocks in Zones B, C and D are a) Dark grey and dark brown-grey claystones 2415-2475m which have immature type II kerogens with a good potential as source rocks for oil and gas. b) Dark grey siltstones/-claystones from 2505-2595m have immature mixed type II/III or type II kerogens with a good potential as source rocks for oil and gas. c) Black carbonaceous claystones and coal between 2595-2640m have immature/moderate mature kerogen type III with a good-rich potential as source rocks for gas and perhaps minor oil.

In Zone F and H grey-brown siltstones and claystones have mostly moderate mature type III kerogens with a poor-fair potential for gas. One section in Zone F from roughly 2790-2850m consists of mixed type II/-III kerogen with a good potential for gas and oil.

KEY WORDS/ STIKKORD

Source Rock Analysis | TOC/Rock-Eval | Saturates/Aromatics/Py-GC | Microscope Analysis

EXPERIMENTAL AND DESCRIPTION OF INTERPRETATION LEVELS

Headspace Gas Analysis

One ml. of the headspace gas from each of the cans was analysed gas chromatographically for light hydrocarbons. The results are shown in Table 1a. The canned samples were washed with temperated water on 4, 2, 1 and 0.125 mm sieves to remove drilling mud and thereafter dried at 35°C.

Occluded Gas

An aliquot of the 1-2 mm fraction of each sample before drying was crushed in water using an airtight ball mill, and one ml. of the headspace analysed chromatographically. The results are shown in Table 1b.

Total Organic Carbon (TOC)

Picked cuttings of the various lithologies in each sample was crushed in a centrifugal mill. Aliquots of the samples were then weighed into Leco crucibles and treated with hot 2N HCl to remove carbonate and washed twice with distilled water to remove traces of HCl. The crucibles were then placed in a vacuum oven at 50°C and evacuated to 20 mm Hg for 12 hrs. The samples were then analysed on a Leco E C 12 carbon analyser, to determine the total organic carbon (TOC).

Extractable Organic Matter (EOM)

From the TOC results samples were selected for extraction. Of the selected samples, approximately 100 gm of each was extracted in a flow through system (Radke et al,, 1978, Anal. Chem. 49, 663-665) for 10 min. using dichloromethane (DCM) as solvent. The DCM used as solvent was distilled in an all glass apparatus to remove contaminants.

Activated copper filings were used to remove any free sulphur from the samples.

After extraction, the solvent was removed on a Buchi Rotavapor and transferred to a 50 ml flask. The rest of the solvent was then removed and the amount of extractable organic matter (EOM) determined.

Chromatographic Separation

The extractable organic matter (EOM) was separated into saturated fraction, aromatic fraction and non hydrocarbon fraction using a MPLC system with hexane as eluant (Radke et al., Anal. Chem., 1980). The various fractions were evaporated on a Buchi Rotavapor and transferred to glassvials and dried in a stream of nitrogen. The various results are given in Table III-VI.

Gas Chromatographic Analyses

The saturated and aromatic hydrocarbon fractions were each diluted with n-hexane and analysed on a HP 5730 A gas chromatograph, fitted with a 25 m OV101 glass capillary column and an automatic injection system. Hydrogen (0.7 ml/min.) was used as carrier gas and the injection was performed in the split mode (1:20).

Vitrinite Reflectance

Vitrinite reflectance measurements of the samples, taken at various intervals, were done at IKU. The samples were mounted in Bakelite resin blocks; care being taken during the setting of the plastic to avoid temperatures in excess of 100°C. The samples were then ground, initially on a diamond lap followed by two grades of corundum paper. All grinding and subsequent polishing stages in the preparation were carried out using isopropyl alcohol as lubricant, since water leads to the swelling and disintegration of the clay fraction of the samples.

Polishing of the samples was performed on Selvyt cloths using three grades of alumina, 5/20, 3/50 and Gamma, followed by careful cleaning of the surface.

Reflectance determinations were carried out on a Leitz M.P.V. microphotometer under oil immersion, R.I. 1.518 at a wavelength of 546 nm.

The surface of the polished block was searched by the operator for suitable areas of vitrinitic material in the sediment. The reflectance of the organic particle was determined relative to optical glass standards of known reflectance. Where possible, a minimum of twenty individual particles of vitrinite was measured, although in many cases this number could not be achieved.

The samples were also analysed in UV light, and the colour of the fluorescing material determined. Below, a scale comparing the vitrinite reflectance measurements and the fluorescence measurements is given.

VITRINITE REFLECTANCE R.AVER. 546 NM 1516	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
% CARBON CONTENT DAF.	57	62	70	73	76	79	80.5	82.5	84	85.5
LIPTINITE FLUOR NM	725	750	790	820	840		860	890	940	
EXC. 400 nm BAR. 530 nm colour	G	$G/_Y$	Y	$Y/_O$	L.O	M.O.		D.O.	$O/_R$	R
zone	1	2	3	4	5	6		7	8	9

NOTE: Liptinite NM = Numerical measurements of overall spore colour and not peak fluorescence wavelength.

Relationship between liptinite fluorescence colour, vitrinite reflectance and carbon content is variable with depositional environment and catagenic history. The above is only a guide. Liptinite will often appear to process to deep orange colour and then fade rather than develop or O/R red shade. Termination of fluorescence is also variable.

Processing of Samples and Evaluation of Visual Kerogen

Crushed rock samples were treated with hydrochloric and hydrofluoric acids to remove the minerals. A series of microscopic slides contain strew mounts of the residue:

T-slide represents the total acid insoluble residue.
N-slide represents a screened residue (15 µ mesh).
O-slide contains palynodebris remaining after flotation ($ZnBr_2$) to remove heavy minerals.
X-slides contain oxidized residues, (oxidizing may be required to remove sapropel which embeds palynomorphs, or where high coalification prevents the identification of the various groups).

T and/or O slides are necessary to evaluate kerogen composition/-palynofacies which is closely related to sample lithology.

Screened or oxidized residues are normally required to concentrate the larger fragments, and to study palynomorphs (pollen, spores and dinoflagellates) and cuticles for paleodating and colour evaluation.

So far visual evaluation of kerogen has been undertaken from residues mounted in glycerine jelly, and studied by Leitz Dialux in normal light (halogene) using x10 and x63 objectives. By x63 magnification it is possible to distinguish single particles of diameters about 2 and, if required, to make a more refined classification of the screened residues (particles >15µ).

The colour evaluation is based on colour tones of spores and pollen (preferably) with supporting evidence from colour tones of other types of kerogen (woody material, cuticles and sapropel). These colours are dependant upon the maturity, but are also influenced by the paleo-environment (lithology of the rock, oxidation and decay processes). The colours and the estimated colour index of an individual sample may therefore differ from those of the neighbouring samples. The techniques in visual kerogen studies are adopted from Staplin (1969) and Burgess (1974).

In interpretation of the maturity from the estimated colour indices we follow a general scheme that is calibrated against vitrinite reflectance values (R_o).

Ro	0.45	0.6	0.9	1.0	1.3
colour index	2-	2	2+	3-	3
Maturity intervals	Moderate mature	Mature (oil window)			Condensate window

Rock-Eval Pyrolysis

100 mg crushed sample was put into a platinum crucible whose bottom and cover are made of sintered steel and analysed on a Rock-Eval pyrolyser.

Pyrolysis-Gas Chromatography (Py-GC)

Kerogen concentrates were prepared by treating whole crushed rock with HCl and HF. Solvent (MeOH and DCM) extracted kerogen concentrates were suspended in MeOH and microgram quantities were added to the platinum ribbon pyrolyser. the kerogens were flash pyrolysed in tandem with gas chromatography (Py-GC).

Instrumentation:
CDS Pyroprobe 120 interfaced to a Varian 3700 gas chromatograph via a glass lined stainless steel tubing (GLT). The capillary column was connected to the GLT via a splitter.

Pyrolysis conditions: 600^{o}C in nitrogen for 5 sec.
GC conditions:
Column: 25m OV-101 fused silica capillary. I.D. 0.20 mm.
Carrier gas: Nitrogen with inlet pressure 12 psi; 0.6 ml/min.
Oven program: 40^{o}C hold for 1 min; to 260^{o}C at 4^{o}C/min.
Split: 1:40.

RESULTS AND DISCUSSION

Light Hydrocarbon Analysis and Lithological Description

Based on variations in the light hydrocarbon composition and in the lithology, the analysed sequence (2350-2942 metres) was divided up into 8 zones:

A: 2350-2415m
B: 2415-2475m
C: 2475-2565m
D: 2565-2640m
E: 2640-2715m
F: 2715-2850m
G: 2850-2875m
H: 2875-2942m

Zone A: 2350-2415 metres. Lithology in this zone consists of green-grey and some red-brown claystones, and chalk limestones with an oil show in the limestone from 2350-2385m. Abundance of C_1-C_4 and C_5+ is very high in the limestone section, wetness is very high and iC_4/nC_4 is low. Below this limestone there is a decrease in wetness and an increase in iC_4/nC_4 ratio although the abundance of C_1-C_4 and C_5+ are still very high, in Zone B.

Zone B: 2420-2475 metres. Consists predominantly of dark grey, dark brown-grey claystone, with some grey, light claystones. Abundance of C_1-C_4 and C_5+ gases is very high (good) but probably generated in situ and is relatively immature, since the limestones above have a significantly lower iC_4/nC_4 ratio and higher wetness (90% in limestones cf. 40-60% in claystones).

Zone C: 2475-2565 metres. Consists of mostly grey claystones and with some brown limestones towards the top of the section and more dark grey claystones (silty and calcareous) towards the base. The top of the section is marked by a very large decrease in abundance of C_1-C_4 and C_5+ hydrocarbons (poor) with wetness increasing to 98% and iC_4/nC_4 value decreasing. Below 2505m, the abundance of C_1-C_4 and C_5+ hydrocarbons again increases (good), but wetness decreases and iC_4/nC_4

increases probably indicating gas generated in situ from dark grey silty claystones.

Zone D: 2565-2640 metres: Consists of a mixture of lithologies, including sandstones, limestones, coal and claystones. Two main claystone types can be distinguished, a dark grey, black, lustrous claystone and a waxy light brown, brown grey claystone (with abundant thin coal stringers). C_1-C_4 and C_5+ gas abundances remain as high as Zone C. Wetness is generally quite low probably due to an abundance of methane generated from coal. An increase in wetness towards the base of the zone is probably related to migrated hydrocarbons present in sandstones.

Zone E: 2640-2715 metres. Consists mostly of sandstone at top of the section and medium dark grey claystones below. C_1-C_4 and C_5+ gas abundance decrease.

Zone F: 2715-2850 metres. This zone consists mostly of calcareous silty claystones and siltstones and some calcareous sandstone. Generally the C_1-C_4 and C_5+ gas abundances are good and wetness is consistently high except; 1) between 2760-2775m where C_1-C_4 and C_5+ are low (marked by presence of cement in sample) 2) between 2790-2805m where wetness is low perhaps due to the presence of migrated C_1-C_4 hydrocarbon into a sandstone at this level.

Zone G: 2850-2875m. This zone is mostly sandstone and has slightly lower C_1-C_4 and C_5+ gas abundances than the zones immediately above and below.

Zone H: 2875-2942m. Consists mostly of silty claystones, some limestones and sandstones. C_1-C_4 and C_5+ abundances are good; the iC_4/nC_4 ratio is unchanged but wetness is lower in this zone which probably indicates light hydrocarbons generated from type III kerogen or coals.

Total Organic Carbon (TOC)

Generally the claystones which constituted more than 10% of a sample were analysed. Occasionally claystones of different colours were picked and analysed separately. Siltstones where prominent were picked

and analysed separately. Limestones were also picked and analysed in a few cases.

Zone A: 2350-2415 metres. Consists mostly of grey and green-grey with some red-brown claystones and cream-white, buff chalky limestones. The claystones have TOC values less than 1%, and one limestone also gave a TOC value less than 1%.

Zone B: 2420-2475 metres. The dark grey and dark grey-brown claystones in this zone have TOC values from 2.96-5.00% (rich). One limestone is this zone gave a TOC value of 0.79%.

Zone C: 2475-2565 metres. Silty, calcareous dark grey claystones grading to siltstones have TOC values varying from 2.95-7.03% (rich). Limestones and grey claystones in this zone have TOC values less than 1% (generally fair abundance).

Zone D: 2505-2640 metres. A limestone near the top of this zone has a TOC value of 0.75%. Three main dark grey claystone lithologies can be identified; a dark grey, lustrous, carbonaceous claystone, a light-medium grey brown, waxy claystone, and grey, medium grey silty claystone. The first has TOC values up to 20%, and the second has TOC values of 1-2% and the last has TOC values less than 1% (probably consists in part of caved material). The first two claystones are associated with coal stringers and a coal seam or seams.

Zone E: 2640-2715 metres. Medium to dark grey micaceous claystones below 2670 metres have TOC values decreasing from 3% at 2682.4m to 1.3% at 2715m.

Zone F: 2715-2850 metres. Two main argillaceous lithologies can be distinguished, grey and grey-green claystones and grey brown, calcareous silstones generally with fair to good TOC values (0.7-1.6%), but from 2790m to 2850 metres claystone/siltstones which vary from grey-brown to dark grey-brown have good-rich TOC values 1.89-2.59%. Sample M-2253 from 2730-2745m has some dark grey claystone with 4% TOC which in this very poor quality, small sample may consist wholly of caved material.

Zone G: 2850-2875 metres mostly sandstone.

Zone H: 2850-2875 metres. Silty claystones in this zone have good TOC values from 1.24-1.52%.

Extraction and Chromatographic Separation

Ten (10) samples were extracted and the extractable organic matter (EOM) was fractionated by MPLC into saturated and aromatic hydrocarbons and NSO compounds. The saturated and aromatic hydrocarbons were analysed by gas chromatography.

Saturated Hydrocarbons

Zone A: 2350-2415 metres. No samples were taken for extraction.

Zone B: 2415-2475 metres. Two samples were taken for extraction M-2233 and M-2234 2415-2430m and 2430-2445m. An additional sample from 2445-2460m was heavily contaminated with refined oil probably a lubricating oil fraction and is not discussed any further. Both samples have a rich abundance of extractable hydrocarbons and a good to rich abundance of hydrocarbons when normalised to TOC. The percentage of saturated hydrocarbons is fairly low (20%). The gas chromatograms of these two samples are similar and exhibit relatively smooth n-alkane distributions with front-end bias (maximum at nC_{15}). Both isoprenoids (b, pristane and c, phytane) and higher molecular weight material probably steranes and triterpanes from nC_{25}-nC_{35} are very prominent. The pattern of alkanes in these two gc traces is most characteristic of a type II marine kerogen which is relatively immature.

Zone C: 2475-2565m. Two samples were analysed from this zone, M-2239 (2505-2520m) and M-2241 (2535-2550m). They both have rich abundances of extractable hydrocarbons, and M-2239 has a rich abundance of hydrocarbons normalised to TOC (the other sample only fair-good). The percentage of saturated hydrocarbons is high in M-2239 (54%), and in M-2241 approximately the same as samples from Zone B (17%). The saturated hydrocarbon gc traces are similar to those from Zone B, however there are some differences. There is a slight increase in CPI

values and pristane/phytane ratios are slightly higher. The bimodal n-alkane distribution of M-2239 has maxima at nC_{15} and nC_{29}. The second maxima may however, be exaggerated because of oil contamination probably from a lubricating oil. The region between nC_{25}-nC_{35} also has a less complex mixture of resolved peaks, than in Zone B samples. The saturated hydrocarbon distributions probably indicate type II kerogens with a slightly larger input from terrestrial material.

Zone D: 2565-2640m. Two samples were analysed from this zone M-2245 (2695-2610m) and M-2246 (2610-2625m). They both have a rich abundance of extractable hydrocarbons, the first having a rich abundance of hydrocarbons normalised to TOC, the second a poor abundance. The percentage of aromatic hydrocarbons is also much higher in the first sample. The percentage of saturated hydrocarbons is low in both samples. The saturated hydrocarbon gc traces are similar, and quite different to those from Zone C. The n-alkane distributions range from nC_{13} to nC_{34} with a maximum at nC_{25} and a prominent odd n-alkane predominance (CPI=1.5). Pristane/phytane ratios are much higher than in zones B and C (5.6 and 7.5 compared to 1.6 and 2.3-2.5). The sterane/triterpane hump between nC_{25}-nC_{34} is also less prominent. These traces are characteristic of immature to moderate mature kerogens rich in terrestrial material.

Zone E: 2640-2715m. One sample was analysed from this zone, the sandstone from 2656 metres. The oil extracted from this sample is rich in saturated hydrocarbons (70%). The gc trace exhibits a smooth distribution from nC_{13}-nC_{35} with a maximum at nC_{16}. There is a prominent shoulder of n-alkanes from nC_{18}-nC_{29}, and an unresolved hump is prominent from nC_{16}-nC_{27}. This distribution may be considered as characteristic of an oil possibly derived from a kerogen with a significant input from terrestrial material (such as cuticles) and is unlikely to be derived from the source rocks directly above or below.

Zone F: 2715-2850m. Two samples were analysed from this zone M-2256 (2775-2790m) and M-2260 (2835-2850m). The latter although pre-washed with DCM, gives a saturated hydrocarbon pattern dominated by n-alkanes from nC_{25}-nC_{33} which is most probably derived from a refined oil contaminant. The former sample resembles in most characteristics the samples from zone C, with a good abundance of extractable

hydrocarbons, and is most probably derived from a similar kerogen type II or mixed type II/III kerogen, since the n-alkanes from nC_{18}-nC_{35} are more prominent than those in zone C.

Zone G: 2850-2875m. No samples were analysed from this zone.

Zone H: 2875-2942. One sample was analysed from this zone, M-2264 (2895-2910m). It has a good abundance of extractable hydrocarbons and a rich abundance normalised to TOC. Other characteristics are similar to M-2256 in zone F, with maxima at nC_{17} and nC_{27} with a strong n-alkane predominance (CPI=1.6) the low pristane/nC_{17} ratio probably indicates that some hydrocarbons have been generated from the kerogen. The branched alkane pattern and the prominent unresolved hump most closely resemble the oil from the 2656 metre sandstone. The overall saturated hydrocarbon pattern is characteristic for a mixed type II/III or type III kerogen of moderate maturity.

Aromatic Hydrocarbons

Zone B: The two samples from this zone have very similar distributions with the dominant aromatic compounds being alkyl naphthalenes (A,B,C) with a prominent region F due, most probably to aromatised steranes/-triterpanes.

Zone C: The two samples in this zone are very similar to each other, but have significant differences to the samples from zone B. The alkyl naphthalenes are less prominent and certain unidentified compounds X,Y,Z and Q are prominent. It is clear from this that the kerogen in the dark claystones in this section have some differences to those in zone B.

Zone D: The aromatic hydrocarbon distributions in the two samples from this zone are quite different. The first is probably contaminated with refined oil. The second sample is quite distinct from samples in zones B, but has similarities with zone C in that X,Y,Z and Q are prominent, although phenanthrene (P) and resolved components in area F are more prominent. The aromatic hydrocarbon pattern is possibly characteristic of an immature type III kerogen.

Zone E: The oil extracted from the sandstone core does not resemble any of the aromatics from the other samples. It is dominated by an unresolved hump in which the main unresolved compounds are phenanthrene (P) methyl phenanthrenes (D) and dimethyl phenanthrenes (E).

Zones F and H: The three samples from these two zones are very similar and are dominated by the alkyl napthalenes (B,C) phenanthrene (P) and have a prominent unresolved hump in region F.

One ratio has been calculated from the aromatics traces P/D (Phenanthrene/the sum of the methyl phenanthrenes) which can be used to characterise the different zones e.g.

Zone B: 0.27, 0.40
Zone C: 0.74, 0.46
Zone D: 0.71, 0.99
Zone E: 0.22 (the oil extracted from sandstone)
Zone F: 0.85, 1.07
Zone H: 1.31

Vitrinite Reflectance

Thirty samples were analysed, the results and discussion are given below:

M-2210: Shale and silt, Ro=0.40(19)
The sample has a moderate organic content dominated by bitumen wisps and stringers. There is a heavy bitumen staining over much of the sample. UV fluorescence shows a trace of yellow/orange spores.

M-2213: Silt, No Determination Possible
The sample contains no recognisable primary vitrinite but a moderate content of reworked vitrinite and inertinite and some bitumen wisps. Green/yellow and yellow fluorescence is seen from spores and yellow from bitumen.

M-2216: shale and silt, Ro=0.52(2)/N.D.P.?
This sample has a low organic content. Only two particles of possible primary vitrinite were located. These could be reworked. Confidence is

low. There are bitumen wisps and blobs. There is an abundant spore content which gives yellow and yellow/orange fluorescence.

M-2218: Silt, Ro=0.42(4)
The sample has a very low organic content which is dominated by bitumen wisps and blobs. There is a very wide range of values and the overall result is considered to be too high. There is a trace of spores fluorescing yellow/orange.

M-2221: Silt, Ro=0.34(10)
There is a low to moderate general organic content. Most of this is inertinite and bitumen. There is a moderate to heavy bitumen staining in places especially accompanying bitumen wisps. UV fluorescence shows a trace of yellow/orange spores.

M-2225: Silt and Shale, Ro=0.47(11)
There is a low to moderate organic content dominated by bitumen wisps. These are not heavily concentrated but small and numerous, occasionally accompanied by staining. UV fluorescence shows a low content of yellow/orange spores.

M-2228: Silt, Ro=0.45(9)
Low organic content dominated by inertinite and small particles with pitted surfaces. Occasional bitumen staining around the organic material. UV light shows a trace of yellow/orange spores.

M-3072: Shale, Ro=0.49(11)
The sample has a low to moderate organic content dominated by inertinite. There were no true stringers and the result is probably too high. One possible light orange spore fragment was seen in UV fluorescence.

M-2231: Shale, Ro=0.52(13)
There is a moderately abundant organic content dominated by inertinite. There are some bitumen wisps and a few vitrinite particles and wisps. The yellow/orange fluorescence from spores and the general appearance of the sample implies that the result may be high. The exinite content is low.

M-3073: Calcareous shale, Ro=0.44(20)
There is a low to moderate organic content with approximately equal abundances of inertinites and vitrinite. There is heavy bitumen staining especially where bitumen is interstitial in carbonate areas. UV fluorescence shows a low content of light orange spores.

M-2236: Calcareous shale, Ro=0.44(22)
The sample has a very high organic content with equal proportions of inertinite, vitrinite and bituminite. There is a very heavy bitumen staining and high interstitial bitumen concentration in places. The vitrinite data is bimodal possibly due to the effect of bitumen staining but the overall value appears to be of the right order for this sequence. UV light shows yellow and yellow/orange fluorescence from a low spore content.

M-3074: Calcareous (?) Shale, Ro=0.42(20)
The sample has a moderate organic content mainly as particulate material. Most stringers are almost degraded. There is some localised bitumen staining. There is a very good statistical distribution of values giving good confidence in the result. The yellow/orange spore fluorescence is also in good agreement. There is only a trace of exinite present.

M-2238: Calcareous Shale and Shale, Ro=0.44(20)
The sample is very rich in organic material. There is a high proportion of inertinite and bitumen wisps. Bitumen staining is locally very heavy. UV irradiation displays yellow/orange fluorescence from spores and carbonate fluorescence. There is only a trace of exinite.

M-2240: Shale, Ro=0.45(20)
The sample have a very high organic content mainly bitumen and inertinite. Bitumen staining is very heavy in places and there is a high concentration of bitumen wisps and smears. UV light shows a moderate content of light orange spores.

M-2242: Mixed shale and carbonate, Ro=0.46(20)
The sample has mixed lithologies and the organic content varies from poor-moderate to rich. Some areas have heavy bitumen staining and interstitial bitumen others have only small inertinite fragments.

There is a low to moderate content of spores which fluoresce yellow/-orange under UV irradiation.

M-2243: Mixed Shale and Calcareous shale, Ro=0.50(17)
The sample has a high organic content overall but it is very variable between the shale types. Some lithologies are very bitumen-rich whereas others have a high inertinite content. There is heavy bitumen staining in places. The sample is very similar to M-2242. UV light shows a moderate content of yellow/orange spores.

M-3076: Shale, Ro=0.54(21)
Organic material is moderately abundant with vitrinite the dominant component. There are large organic rich areas. Bitumen staining is moderately heavy in places. There are a few good vitrinite stringers (lower values, implying overall result may be high). UV light shows a trace of light orange spores.

M-3077: Shale, Ro=0.45(20)
There is a low to moderate organic content, dominantly vitrinite and bituminite. The organic material occurs mainly as large, thick stringers. Bitumen staining is locally heavy and there are a few bitumen wisps. UV light shows a trace of yellow/orange spores.

M-2246: Carbargillite, Coal, Shale, Ro=0.43(20)
The sample is very rich in all macerals. Most readings are from the carbargillite and coal. This sample is considered a good representative of the overall maturity despite the fact that a rich light orange spore content disagrees.

M-2247: Carbargillite and Shale, Ro=0.44(17)
The sample has a high organic content with equal abundances of inertinite, vitrinite and bituminite. There is some heavy bitumen staining and some good inertinite cell structures were noted. UV light shows a moderate content of light orange spores.

M-2248: Shale (with Carbonate), Ro=0.48(20)
The sample is rich in organic material, notably vitrinite and bituminite. Some areas have very high concentrations of bitumen wisps and

staining. UV light shows a low content of yellow/orange and light orange spores.

M-3069: Calcareous shale (sandy?), Ro=0.45(21)
There is a moderate organic content with inertinite dominant. There is very heavy bitumen staining associated with vitrinite/bituminite and pyrite aggregates which are common. UV light shows a low content of yellow/orange spores.

M-3079: Silty Shale, Ro=0.43(19)
Organic material is moderately abundant with inertinite as the main constituent. There are some very good vitrinite stringers. Bitumen wisps and staining are concentrated and heavy in places. Pyrite breakdown and formation of iron oxides could lead to an overestimation of the bituminite content. There is a trace to low content of light orange spores.

M-2253: Shale, Calcareous Shale, Silt, Ro=0.42(14)
The sample has a moderate organic content, mainly inertinite. It is a very mixed sample and the composition and quantity of organic material varies in the different lithologies. Some of the shale has bitumen and iron staining. There is a trace of yellow/orange spores.

M-2257: Shale and Carbonate, Ro=0.40(11)
The sample has a low to moderate organic content with bitumen wisps dominant. There is very heavy bitumen staining in places and the low content of measurable vitrinite may be affected by this (result slightly low?). The spore fluorescence varies - there are a few yellow ones and a moderate content of yellow/orange spores.

M-2259: Shale, Carbonate, Contaminants, Ro=0.43(14)
Disregarding obvious additives (trimacentes), there is a moderate organic content dominated by bitumen wisps and staining. There are a few good vitrinite wisps. UV light shows a moderate content of yellow spores but this seems low as a maturity indicator.

M-2261: Shale and Carbonate, Ro=0.44(20)
The sample has a moderate to high organic content mainly bitumen wisps. There is heavy bitumen staining locally and a high

concentration of bitumen wisps in the shale. UV light shows yellow/orange spores in low to moderate quantities.

M-2264: Carbonate, Shale, Contaminants, Ro=0.47(20)
The organic content is moderate and no one maceral dominates. It is a very bad sample with very varied particles. There is much rust and iron staining making assessment of bitumen staining difficult. A few good vitrinite stringers were located. There is a low to moderate content of yellow/orange spores and lime green resin and algae.

M-2265: Limestone and Shale, Ro=0.47(18)
The sample has a moderate organic content mainly inertinite (or gnarled reworked vitrinite) and bitumen. There are a few bitumen wisps. most vitrinite is particulate with only a few good stringers. There is a very good statistical distribution. There is a low content of yellow/orange spores.

M-2266: Limestone, Shale, Additives, Ro=0.47(20)
The organic content is lithologically defined. The shale has a moderate content whilst the limestone has a poor content. There is a high content of rust and additives. There is a high content of bitumen staining and wisps. UV light shows a low content of yellow/orange spores.

Analyses in Transmitted Light

The sedimentary organic matter of investigated interval, from 2415 to 2925m in this well, was represented by 23 samples, picked lithologies from 20 ditch cuttings, one sidewall core, and two conventional cores.

The following subdivision was possible on the basis of kerogen composition, colour and preservation of the organic remains. The colour probably partly is controlled by an oxidising environment and probably levels at 2715m and above are immature.

Interval 2415-45m immature 1/1+
Interval 2445-520m immature 1/1+
Interval 2520-65m immature 1/1+
Interval 2580/95 mature/? 1/1+, 2-/2

Interval 2595-2682.4 oxidised 2-/2, 1+/2-
Interval 2700/15m immature 1+/2-
Interval 2760-2925m immature 1+/2-

All intervals were dominated by terrestrial material, the dominant constituents being cuticles, pollen and spores beside woody material. The woody material includes vitrinite and semifusinite, as well as inertinite and fusinite. True amorphous material was subordinate although cysts from a marine environment were present throughout most of the section.

Crushed rock samples that had been subjected to extraction by an organic solvent (DCM) were compared with untreated samples to record the possible changes of the kerogen as seen in transmitted light. This special study included 6 cuttings samples and one of the core samples.

Comparisons of 2439/45m extracted and normal residues and core 2682.4m extracted and normal residues leads to the conclusion that extraction mainly affected the appearance of unstructured amorphous material including that evaluated as sapropelised cuticles. The organic residues had a more disperse appearance and aggregates were smaller with a less fluffy texture.

The five other extracted samples, 2445/60m, 2505/20m, 2535/50, 2835/50m, and 2895/910m, follow in sequence with the untreated samples and have been compared with the neighbouring samples. They contained generally smaller fragments, or more well dispersed material, than recorded in the untreated samples above and below. In samples 2835/50m and 2895/910m a possible explanation may be that we are dealing with an interval poor in organic matter, but the return at 2910/25m to the conditions of 2805/20m above has been taken to indicate that extraction in 2835/50m and 2895/910m resulted in the removal of sapropelised cuticular material.

The subdivison in intervals has been based on normal (nonextracted) samples, with support only from extracted samples.

2415/30m, 2430/45m, 2430/45m extr.) Loose pyritic aggregates of sapropelised cuticles and true amorphous material. Tasmanites and other cysts were recorded. The material seems poorly sorted.

Colour index: 1/1+ or 1+
Environment: Low energy, ?marine, close to vegetation of land plants. Stagnant bottom conditions.

2445/60m, 2475/90m, 2595/20m Poor interval with abundant acid insoluble minerals and abundant caved material.

We have only slight confidence in the results.
Colour index: 1/1+ or 1+
Environment: Probably marine.

2520/35m, 2535/50m, 2550m, 2550/65m Pyritic aggregates of poorly sorted material. Cuticles dominate together with semifusinite/-fusinite. Some true sapropel was observed. Palynomorphs include dinoflagellate cysts, Tasmanites and mainly pollen grains, but also spores at the 2550/65m level.

Colour index: 1/1+ to 1+/2-.
Environment: Marine, fairly close to vegetation of land plants, perhaps a stronger deltaic influx at the bottom of the interval. Restricted bottom conditions.

2580/95m Variable conditions with some oxidation. Fairly poor interval with ?indigenous Cretaceous/Jurassic cysts. Pyrite is very abundant.

Colour index: 2-/2 to high as a maturation index.
Environment: Marine, stagnant bottom conditions.

2595/610m, 2610/25m, 2625/40m, 2682.4m core Large aggregates of cuticular and woody material. True amorphous material seems subordinate. Spores dominate compared with pollen, and are well preserved and the assemblage has a Middle Jurassic affinity.

Colour index: 2-/, 1+/2-. The highest index is too high as a maturation index, and is probably due to an oxidative environment.

Environment: Close to vegetation of ferns/club mosses.

2700/15m Abundant coaly fragments. Woody material and cuticles dominate together with spores and pollen. True amorphous material and cysts are subordinate but include Jurassic/Cretaceous dinoflagellates. There is abundant pyrite.

Colour index: 1+/2-
Environment: An area with coal formation or reworking of older coals. Jurassic/Cretaceous cysts are suspected to represent caved lithologies.

2760/75m, 2775/90m, 2805/20m, 2835/50m, 2895/10 and 2910-25m Cuticles seem to be dominant in variably rich residues. Palynomorphs are well preserved and include an Early Jurassic assemblage (probably E. Toarcian or older material). The cuticles are sapropelised but there is also true amorphous material and Nannoceratopsis gracilis. The residues contain abundant pyrite framboids.

The presence of Botryococcus in 2895/910m may be due to a change in facies at this level and perhaps including the 2835/50m level above. But since both these samples have been extracted by DCM before the palynological preparation, we hesitate to draw conclusions from them. 2910/25 represents a return to the conditions of 2760-2820m.

Colour index: 1+/2-
Environment: Marine, restricted water circulation, stagnant bottom conditions, close to vegetation of land plants. Possibly a shallowing at 2835-2910m with stronger influx of fresh water.

Rock-Eval Pyrolysis

A total of twenty-nine samples from the analysed sequence were picked for Rock-Eval pyrolysis. The results are discussed below.

Zone A: One sample of limestone was analysed from this zone. It has a very high production index indicating the presence of migrated hydrocarbons. The kerogen type indigenous to the limestone is poor type III.

Zone B: Five samples from this zone were analysed. The first two samples from 2415-2445m have hydrogen indices characteristic of type II kerogens and low T_{max} and production index values which indicate immature kerogens which have not generated any hydrocarbons. The swc from 2435m contains type III kerogen. The two samples from 2460m and 2475m have hydrogen indices indicative of mixed type II/III kerogens. The data indicate immature type II or type II/III kerogens with a good potential as source rocks for oil and gas.

Zone C: Seven samples were analysed from this zone. Two samples, one grey, and the other dark grey claystone near the top of the zone (M-3074 and M-2238) have hydrogen indices characteristic of type III kerogen. Claystones/siltstones below 2505 metres have organic material with hydrogen indices characteristic of mixed type II/III kerogens which have low production index values (0.03-0.05) and low T_{max} values (422-429) indicative of immature kerogens. These kerogens have a good potential as source rocks for oil and gas.

Zone D: Six samples were analysed from this zone which includes a black carbonaceous claystones and coal(s). The hydrogen indices of these samples (<200) is typical for type III kerogen. The coal(s) and carbonaceous claystones have immature-moderate mature kerogens with a good-rich potential for gas and probably some light oil.

Zone E: Three samples were analysed from this zone which is dominated by sandstones. Claystones in this section have moderate mature type III kerogens with a fair potential as source rocks for gas.

Zone F, G and H: Seven samples were analysed from these zones. Siltstones and claystones from 2715-2795m have type III or poor type III kerogens with a poor-fair potential as source rocks for gas. From 2790-2850m (approximately) siltstones/claystones have hydrogen indices indicating mixed type II/III kerogens. T_{max} values of 430-434 indicates moderate maturity to 2850 metres. The increase to 440 around 2900 metres suggests that the sediments below 2900m are approaching the mature-oil window mature zone. The siltstones from 2790-2850m have a fair-good potential as source rocks for oil and gas. Otherwise claystones/siltstones with type III or poor type III kerogens have a poor-fair potential as gas source rocks.

Pyrolysis - Gas Chromatography

Ten samples of solvent-extracted kerogen concentrates were analysed by Py-GC. The instrumental conditions are discussed in the experimental section. The results are discussed below. Based on retention and mass spectrometric (MS) data from Py-GC and Py-GC-MS of other kerogens, peaks in the pyrograms were tentatively identified. The numbered peaks are n-alkene/n-alkane doublets of that carbon number. The n-alkanes have the shorter retention time. T=toluene; X=isomeric xylenes; I=indane; MeN=1- and 2- methyl naphthalene.

M-2234 (2430-2445m). The pyrogram shows an n-alkene/n-alkane homology ranging from C_7 to C_{27} with a moderate content of aromatics. Generally the pyrogram shows a type II kerogen fingerprint.

M-2235 and M-2239 (2445-60m, 2505-2620m). The pyrograms of these two samples are very similar showing an n-alkene/n-alkane homology ranging from C_7 to C_{27}. The abundance of aromatics is higher than in M-2234 indicating an higher input of terresterial derived material. the pyrograms show a mixed type II/III kerogen fingerprint.

M-2241 (2535-2550m). The pyrogram of this sample is very similar to M-2234, i.e. type II kerogen.

M-2245 (2595-2610m). The pyrogram is overall very similar to M-2234, i.e. type II kerogen, but the abundance of aromatics is higher in M-2245 and may be classified as a mixed type II/III kerogen. Coalified woody fragments in the kerogen concentrate can explain this higher aromaticity.

M-2246 (2610-2625m): The pyrogram shows an n-alkene/n-alkane homology ranging from C_7 to C_{27}. The aliphatic homology has a maximum around C_{19} indicating an input of plant waxes. The abundance of aromatics is relatively high, i.e. type III kerogen.

M-3069 (2682m): The pyrogram shows an n-alkene/n-alkane homology extending to nC_{27}. The abundance of aromatics is relative high, i.e. type III kerogen.

M-2256 (2775-2790m): The pyrogram is overall, very similar to M-2234; i.e. type II kerogen.

M-2260 (2835-2850m): The pyrogram is very similar to M-2235 and M-2239. The abundance of aromatics is lower in M-2260, i.e. type II kerogen.

M-2264 (2895-2910m): The pyrogram shows an n-alkene/n-alkane homology ranging from C_7 to C_{27}. (Note the change of sensitivity after C_9). By visual inspection it appears that the sample contains 10% coal additive. This explains the very high abundance of indane (I) and 1- and 2-Methylnaphthalene. Generally the pyrogram shows a mixed type II/III kerogen fingerprint.

DISCUSSION

The pyrolysis gas chromatogram traces can be correlated quite well with the different kerogen types as defined by the Rock-Eval pyrolysis data. Thus in Zone B sample M-2234 (2430-2445m) is dominated by the n-alkane/alkene homology, plus a few simple aromatic compounds such as Toluene (T) and Xylenes (X), characteristic of type II kerogen. In zones B and C, samples M-2235 (2445-2460m) and M-2239 (2505-2520m) there is a noticeable unresolved hump between nC_{12}-nC_{20}, and the n-alkane/alkene homology is less prominent. These two samples are mixed type II/III kerogens. The other sample from Zone C M-2241 (2535-2550m) is similar to the type II kerogen trace of M-2234 and the Rock-Eval data also suggests a type II kerogen.

The two samples from Zone D (M-2245 2595-2610m and M-2246, 2610-2625m) are type III kerogen from Rock-Eval data. In M-2246 it is evident that the major n-alkane/alkene homology is from nC_{15} to nC_{23}, and in both samples aromatic compounds dominate. These observations also roughly indicate a type III kerogen or perhaps an admixture of type III with some more lipid-rich source such as spores, cuticles and resins etc.

The organic matter in the core sample M-3069 (2682.4m) consists of type III kerogen from Rock-Eval data, shows a good correlation with the pyrolysis-gc trace, which is dominated by simple aromatics; the n-alkane/alkene homology is relatively minor.

Two samples from Zone F; M-2256 (2795-2790m) and M-2260 (2835-2850m) which are mixed type II/III kerogens, show similar characteristics in their pyrolysis gas chromatograms to the mixed type II/III kerogens from Zones B and C.

One sample from Zone H, M-2264 (2895-2910m) is a type III kerogen which is in accord with the pyrolysis gas chromatogram trace that is dominated by aromatic compounds with only a minor n-alkane/alkene homology.

CONCLUSIONS

The maturity of the analysed sequence of well 30/6-4 was based mainly on vitrinite reflectance, spore-fluorescence, spore coloration, and Rock-Eval T_{max} values. Richness of the sample was based on TOC and Rock-Eval pyrolysis with additional evidence being supplied by the abundance of light hydrocarbons and C_{15}+ extractable hydrocarbons. Source rock quality was based mainly on pyrolysis data; both Rock-Eval and pyrolysis gas chromatography, but also on kerogen examination in transmitted light.

Zone A, 2350-2415m: Consists of mostly grey and green-grey claystones with some chalky limestones (with an oil show in the limestones). TOC values in this zone are all less than 1%. Abundance of C_5+ hydrocarbons is very high in this zone and indicates abundant migrated hydrocarbons (high wetness, low iC_4/nC_4). Rock-Eval pyrolysis indicates poor type III kerogen. Vitrinite reflectance (~0.5% Ro), spore fluorescence yellow to yellow-orange and spore coloration (1/1+) and low T_{max} (<430) indicate an immature zone. The zone has a poor source rock potential, but has abundant migrated hydrocarbons as indicated by the very high C_5+ hydrocarbon abundances, and also by the high production index value in the limestone.

Zone B, 2415-2475m): Includes much dark grey claystones (up to 50% of sample) as well as some grey, medium dark grey claystones and some highly calcareous shales and/or argillaceous-limestones towards the base of the zone. The dark grey claystones are rich in TOC with values ranging from 2.96-5.08%. Vitrinite reflectance (~0.4%) and spore coloration and low Rock-Eval T_{max} indicate a zone which is immature. The light hydrocarbon distributions and compositions are markedly different to those in Zone A. However, light hydrocarbons are abundant, and are probably indigenous to the kerogens from the dark grey claystones. Rock-Eval petroleum potentials are high, particularly for the upper part of this zone. The kerogen types differ slightly, with type II kerogen between 2415-2445 metres, and mixed type II/III kerogens below this as indicated by Rock-Eval pyrolysis and pyrolysis-gas chromatography. The saturated and aromatic hydrocarbon gas chromatograms also suggest relatively immature type II kerogens. Kerogen examination in transmitted light indicates that samples from this zone

are rich in cuticles, tasmanites cysts and amorphous material. All the data indicates that the abundant dark grey claystones in this zone have a good-rich potential as source rocks for oil and gas.

Zone C, 2475-2565m: The top part of this zone 2475-2520m consists of much grey claystone and also medium to dark grey-brown calcareous claystones (grading to limestones) with TOC values varying from less than 1% for grey claystones up to 4% in dark grey-brown calcareous claystones/limestones. Below 2520 metres dark grey siltstones/claystones constitute 50% of the samples and have TOC values varying from 4-7% approximately. Vitrinite reflectance (~0.4%) and Rock-Eval T_{max} indicates an immature zone, but spore coloration indicates that moderate maturity has been reached towards the bottom of this zone. Whereas T_{max} values of 422-429, for type II kerogen indicate an immature zone.

The claystones from 2475-2520m have mostly type III kerogens based on Rock-Eval data. Below 2520m the siltstones/claystones vary slightly in hydrogen indices and generally consists of a variable mixture of type II and III kerogens based on Rock-Eval and pyrolysis gas chromatography. Examination of kerogens in transmitted light indicates, poor organic material with some cavings above 2520 metres, whereas below this level kerogens are rich in cuticles, and a variety of algal cysts and pollen grains and also inertinites. These observations clearly support the pyrolysis results. The dark grey claystones and siltstones from 2520-2565m have a good to rich potential as source rocks for oil and gas. Above this calcareous claystones have a fair potential as source rocks for gas.

Zone D and E, 2565-2715m: Includes a variety of different lithologies including sandstone, limestone, coal and three claystone types. The organic carbon-rich lithologies in this zone (besides the coal) are dark grey to black carbonaceous claystones, with TOC values up to 20% (although high values include coal stringers). The zone is moderate mature according to vitrinite reflectance (~0.5%) and spore fluorescence and coloration. Rock-Eval T_{max} values ~~are~~ show a wide variation from 427-439, but suggests a zone which is moderate mature. Pyrolysis work indicates that the kerogens in this section are predominantly type III, as does the examination of kerogen in transmitted light. The

dark carbonaceous claystones and the coal have a good to rich potential for gas and perhaps minor oil.

From light hydrocarbon analysis, wetness values are generally low in these two zones, and are probably mostly C_1-C_4 hydrocarbons derived from the coal and carbonaceous claystones. C_{15}^+ saturated and aromatic hydrocarbon gas chromatograms support a largely terrestrial input deposited in a non-marine environment (pristane/phytane >5). Saturated and aromatic hydrocarbon gc's are from an oil extracted from the sandstone core in Zone E, (2682.4m) does not have the characteristics of any of the gc's from claystone extracts. This oil probably represents material migrated from a more mature sediment section.

Zone F, G and H, 2715-2942m: This section consists mostly of silty claystones, siltstones and sandstones. TOC values vary roughly from 0.5-2.5%. The TOC-rich horizon (~2%) is from 2790-2850m in medium dark grey siltstones. Based on spore coloration, spore fluorescence and vitrinite reflectance the section is moderate mature. However, Rock-Eval T_{max} values show an increase to 440 at the base which suggests a maturity level approaching the oil window. For most of this section pyrolysis data indicates good type III kerogens in the darker argillaceous lithologies. However in the section from roughly 2790-2850m (the TOC-rich section), the kerogen type consist of a mixed type II/III. Kerogen examination in transmitted light indicates that sediment samples from 2760-2820m are also richest in cuticle, spore and algal remains. Saturated hydrocarbon gas chromatograms suggest a largely terrestrial input for this section (fairly high CPI, predominance of higher molecular weight n-alkanes pristane/phytane values greater than 2. These three zones have a fair potential as source rocks for gas except for siltstones between 2760-2850m (approximately) which have a good potential for oil and gas.

IKU

TABLE I a.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN HEADSPACE.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M2229	2340	12435	15191	34424	10656	24924	21356	97630	85195	87.26	.43
M2230	2355	7543	6613	22886	8350	22378	30733	67770	60227	88.87	.37
M2231	2370	5095	3023	9626	4612	12638	25173	34994	29899	85.44	.36
M2232	2385	11241	11373	36012	12285	31755	31705	102666	91425	89.05	.39
M2233	2430	21513	10104	5893	829	1420	874	39759	18246	45.89	.58
M2234	2445	39856	17376	10871	1593	2595	2321	72291	32435	44.87	.61
M2235	2460	116691	61185	47323	6705	10351	4393	242255	125564	51.83	.65
M2236	2475	132174	52627	32943	4409	6233	2804	228386	96212	42.13	.71
M2237	2490	O P E N		L I D .							
M2238	2505	O P E N		L I D .							
M2239	2520	52579	28579	20744	2838	4112	1275	108852	56273	51.70	.69
M2240	2535	15227	1101	793	1059	1714	364	19894	4667	23.46	.62
M2241	2550	47453	27099	16560	1220	2702	64	95034	47581	50.07	.45
M2242	2565	55171	26317	14197	1096	2100	524	98881	43710	44.20	.52
M2243	2580	37216	19326	13818	2090	3845	813	76295	39079	51.22	.54
M2244	2595	40096	27783	27675	5229	10794	6673	111577	71481	64.06	.48
M2245	2610	90988	39776	21460	1885	5156	3238	159265	68277	42.87	.37
M2246	2625	158276	56640	25737	1895	5283	2243	247831	89555	36.14	.36
M2247	2640	57734	68231	40197	6345	9805	4751	182312	124578	68.33	.65
M2248	2655	27547	11725	6454	1053	2086	3078	48865	21318	43.63	.50
M2249	2670	7743	3456	319	756	1686	2487	13960	6217	44.53	.45
M2250	2700	2224	2146	2273	360	653	351	7656	5432	70.95	.55
M2251	2715	2297	2339	3061	515	1050	590	9262	6965	75.20	.49
M2252	2730	24625	22776	33578	5586	12569	9550	99134	74509	75.16	.44
M2253	2745	37515	31754	57418	10341	24448	15114	161478	124143	76.90	.42

IKU

TABLE I b.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN CUTTINGS.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M2229	2340	258	1181	20705	19266	54656	230431	96066	95808	99.73	.35
M2230	2355	158	427	1935	3442	10760	75778	16722	16564	99.06	.32
M2231	2370	217	332	838	565	2321	67365	4273	4056	94.92	.24
M2232	2385	196	123	1208	2873	9176	126392	13576	13380	98.56	.31
M2233	2430	437	2997	9469	2120	5821	10554	20844	20407	97.90	.36
M2234	2445	25	145	294	17	58	1778	539	514	95.36	.29
M2235	2460	259	1032	4220	1222	2887	3374	9620	9361	97.31	.42
M2236	2475	478	2160	4558	976	2097	1800	10269	9791	95.35	.47
M2237	2490	133	713	2989	855	1934	2216	6624	6491	97.99	.44
M2238	2505	244	1428	4050	867	2144	2885	8733	8489	97.21	.40
M2239	2520	227	1494	5304	1240	3036	4245	11301	11074	97.99	.41
M2240	2535	186	1223	4464	1085	2804	3010	9762	9576	98.09	.39
M2241	2550	267	2684	7046	1371	3282	2063	14650	14383	98.18	.42
M2242	2565	440	3774	8836	1650	4372	2553	19072	18632	97.69	.38
M2243	2580	300	1376	4326	991	3288	2500	10281	9981	97.08	.30
M2244	2595	79	250	914	223	840	832	2306	2227	96.57	.27
M2245	2610	720	3691	4744	750	2337	1537	12242	11522	94.12	.32
M2246	2625	1119	5047	5478	832	2580	1517	15056	13937	92.57	.32
M2247	2640	5090	39934	38464	5537	11678	4718	100703	95613	94.95	.47
M2248	2655	382	2274	3903	823	2757	3462	10139	9757	96.23	.30
M2249	2670	183	681	1650	415	1586	2809	4515	4332	95.95	.26
M2250	2700	183	613	1905	494	1720	3183	4915	4732	96.28	.29
M2251	2715	178	319	1373	379	1566	1619	3815	3637	95.33	.24
M2252	2730	109	83	298	408	520	827	1418	1309	92.31	.78
M2253	2745	403	309	1642	442	2149	2864	4945	4542	91.85	.21

IKU

TABLE I c.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS (Ia + Ib).

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M2229	2340	12693	16372	55129	29922	79580	251787	193696	181003	93.45	.38
M2230	2355	7701	7040	24821	11792	33138	106511	84492	76791	90.89	.36
M2231	2370	5312	3355	10464	5177	14959	92538	39267	33955	86.47	.35
M2232	2385	11437	11496	37220	15158	40931	158097	116242	104805	90.16	.37
M2233	2430	21950	13101	15362	2949	7241	11428	60603	38653	63.78	.41
M2234	2445	39881	17521	11165	1610	2653	4099	72830	32949	45.24	.61
M2235	2460	116950	62217	51543	7927	13238	7767	251875	134925	53.57	.60
M2236	2475	132652	54787	37501	5385	8330	4604	238655	106003	44.42	.65
M2237	2490	133	713	2989	855	1934	2216	6623	6490	98.00	.44
M2238	2505	244	1428	4050	867	2144	2885	8732	8488	97.21	.40
M2239	2520	52806	30073	26048	4078	7148	5520	120153	67347	56.05	.57
M2240	2535	15413	2324	5257	2144	4518	3374	29656	14243	48.03	.47
M2241	2550	47720	29783	23606	2591	5984	2127	109684	61964	56.49	.43
M2242	2565	55611	30091	23033	2746	6472	3077	117953	62342	52.85	.42
M2243	2580	37516	20702	18144	3081	7133	3313	86576	49060	56.67	.43
M2244	2595	40175	28033	28589	5452	11634	7505	113883	73708	64.72	.47
M2245	2610	91708	43467	26204	2635	7493	4775	171507	79799	46.53	.35
M2246	2625	159395	61687	31215	2727	7863	3760	262887	103492	39.37	.35
M2247	2640	62824	108165	78661	11882	21483	9469	283015	220191	77.80	.55
M2248	2655	27929	13999	10357	1876	4843	6540	59004	31075	52.67	.39
M2249	2670	7926	4137	1969	1171	3272	5296	18475	10549	57.10	.36
M2250	2700	2407	2759	4178	854	2373	3534	12571	10164	80.85	.36
M2251	2715	2475	2658	4434	894	2616	2209	13077	10602	81.07	.34
M2252	2730	24734	22859	33876	5994	13089	10377	100552	75818	75.40	.46
M2253	2745	37918	32043	59261	10783	24598	17978	144623	106705	73.74	.41

IKU

TABLE I a.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN HEADSPACE.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M2254	2760	32200	30776	54667	8887	21356	14598	147886	115686	78.23	.42
M2255	2775	1968	1600	3798	771	1835	1309	9972	8004	80.26	.42
M2256	2790	23604	9573	15769	2629	6745	4177	58320	34716	59.53	.39
M2257	2805	90634	8414	19430	3006	7929	5531	129413	38779	29.97	.38
M2258	2820	13572	6371	11139	1962	5919	5461	38963	25391	65.17	.33
M2259	2835	11224	6659	19451	4285	12178	12774	53797	42573	79.14	.35
M2260	2850	21570	13047	19483	3525	8586	9407	66211	44641	67.42	.41
M2261	2865	7499	2752	4726	885	2346	2006	18208	10709	58.81	.38
M2262	2880	7516	2853	4363	833	2055	1724	17620	10104	57.34	.41
M2263	2895	4851	3398	5190	905	2217	268	16561	11710	70.71	.41
M2264	2910	158671	4161	12570	2477	5932	5164	183811	25140	13.68	.42
M2265	2925	118797	2309	9552	2177	4751	3041	137586	18789	13.66	.46
M2266	2940	23929	8392	20211	5222	11422	6190	69176	45247	65.41	.46
M2267	2955	88997	3637	19916	5557	12873	8366	130980	41983	32.05	.43

IKU

TABLE I b.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN CUTTINGS.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 --- nC4
M2254	2760	205	164	1417	571	2585	3559	4942	4737	95.85	.22
M2255	2775	103	125	1196	500	2230	3788	4154	4051	97.52	.22
M2256	2790	444	1369	7637	2726	11674	6265	23850	23406	98.14	.23
M2257	2805	3653	463	9449	3123	12405	13119	29093	25440	87.44	.25
M2258	2820	473	1557	6864	2233	11005	15700	22132	21659	97.86	.20
M2259	2835	448	42	536	340	1850	4574	3216	2768	86.07	.18
M2260	2850	207	376	3288	1323	6009	8083	11203	10996	98.15	.22
M2261	2865	775	210	2152	983	4985	11637	9105	8330	91.49	.20
M2262	2880	516	337	1894	696	3195	5526	6638	6122	92.23	.22
M2263	2895	633	501	2891	802	3100	2924	7927	7294	92.01	.26
M2264	2910	1104	178	1143	421	2018	3726	4864	3760	77.30	.21
M2265	2925	739	146	1194	354	1801	2028	4234	3495	82.55	.20
M2266	2940	309	91	655	162	1020	1168	2237	1928	86.19	.16
M2267	2955	324	39	275	93	628	129	1359	1035	76.16	.15

IKU

TABLE I c.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS (Ia + Ib).

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
12254	2760	32405	30940	56084	9458	23941	18157	152828	120423	78.80	.40
12255	2775	2071	1725	4994	1271	4065	5097	14126	12055	85.34	.31
12256	2790	24048	10942	23406	5355	18419	10442	82170	58122	70.73	.29
12257	2805	94287	8877	28879	6129	20334	18650	158506	64219	40.52	.30
12258	2820	14045	7928	18003	4195	16924	21161	61095	47050	77.01	.25
12259	2835	11672	6701	19987	4625	14028	17348	57013	45341	79.53	.33
12260	2850	21777	13423	22771	4848	14595	17490	77414	55637	71.87	.33
12261	2865	8274	2962	6878	1868	7331	13643	27313	19039	69.71	.25
12262	2880	8032	3190	6257	1529	5250	7250	24258	16226	66.89	.29
12263	2895	5484	3899	8081	1707	5317	3192	24488	19004	77.61	.32
M2264	2910	159775	4339	13713	2898	7950	8890	188675	28900	15.32	.36
M2265	2925	119536	2455	10746	2531	6552	5069	141820	22284	15.71	.39
M2266	2940	24238	8483	20866	5384	12442	7358	71413	47175	66.06	.43
M2267	2955	89321	3676	20191	5650	13501	8495	132339	43018	32.51	.42

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II

WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 3072	2354 m	0.64%	Claystone, medium grey
M 2230	2340-2355 m		60% Claystone, grey, green-grey, some mottled green-grey/purple, some red-brown, occasional medium to dark grey, partly pyritic 40% Limestone, white, buff, chalky, oil stained, occasional foram, some pyrite, gold fluorescence and white streaming - immediate cut in ultra-violet light
M 2231	2355-2370 m	0.76%	90% Claystone, grey, green-grey, light grey, rare red-brown, some purple 10% Limestone, as above
M 2232	2370-2385 m	0.88% 0.90%	70% Limestone, as above, some reddish-brown 30% Claystone, as above
M 2233	2415-2430 m	0.59% 4.85%	70% Claystone, grey, green-grey, occasional red-brown 25% Claystone, dark grey, some dark grey-brown, fissile, pyritic, some bands glauconitic, others micaceous. Some sandy lenses, coalified plant fragments, fish scale fragments 3% Limestone, as above 2% Pyrite
M 3073 SWC	2435 m	2.96%	Claystone, dark grey
M 2234	2430-2445 m	5.08% 0.94%	50% Claystone, dark grey as above 40% Claystone, grey, light grey, green-grey, occasional red-brown 5% Limestone, as above 3% Calcite 2% Pyrite
M 2235	2445-2460 m	3.77% 0.66%	50% Claystone, dark grey, dark brown-grey, dark grey, generally more micaceous, some silty and sandy 40% Claystone, grey, light grey, green-grey, some red-brown 5% Limestone, as above 3% Calcite 2% Pyrite (trace coal, mostly additive?, all lithologies oil stained)

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II

WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 2236	2460-2475 m	0.79%	40% Limestone, white, buff, light brown, some chalky, some argillaceous (dark)
		4.31%	30% Claystone, dark grey as above, some calcareous
		0.84%	30% Claystone, grey, light grey as above trace pyrite, all lithologies oil stained
17 M 3074 SWC	2484 m	2.95%	Claystone, dark-grey, silty
M 2237	2475-2490 m		60% Claystone, grey, grey-brown, orange-brown staining, trace red-brown
			20% Claystone, dark grey as above, silty, sandy and part calcareous grading to Limestone (20%), brown, grey-brown, mottled, argillaceous, dolomitic in part
		3.6%	
M 2238	2490-2505 m	1.20%	70% Claystone, mostly grey, medium grey, some green-grey, ~ 5% dark grey-brown, silty, micaceous, pyritic, sandy, calcareous, coky texture grading to
		0.14%	30% Limestone, brown to grey-brown, grey, sandy in part, argillaceous, dolomitic Sm.am. pyrite, quartz grains
M 2239	2505-2520 m	3.96%	20% Claystone/Siltstone, dark grey-brown, brown, grey-brown, sandy in part, micaceous, calcareous, grading to Limestone (40%), which is dolomitic in part
		0.16%	40% Claystone, grey, green-grey as above
M 2240	2520-2535 m	0.77%	50% Claystone, grey, medium grey
		4.08%	40% Claystone/Siltstone, dark grey, dark grey-brown, calcareous in part, micaceous in part, pyritic, slightly oil stained
			10% Limestone, brown, dolomitic as above trace coal, trace pyrite

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II
WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 2241	2535-2550 m	0.79%	50% Claystone, grey, medium grey, green-grey, slightly micaceous
		5.18%	50% Claystone/Siltstone, dark grey, dark grey-brown as above, grading in part to argillaceous silty limestone (10%) Sm.am. pyrite
M 3075 swc	2550 m	6.46%	Siltstone/Claystone, dark grey
M 2242	2550-2565 m	7.03%	50% Claystone/Siltstone, as above
		0.75%	50% Claystone, grey, as above
M 2243	2565-2580 m		80% Sand/Sandstone, medium grain, some coarse and fine, sub-angular to well rounded, oil stained
		3.93%	20% Claystone, siltstone dark grey, dark grey-brown, calcareous trace coal (mostly additive)
M 2244	2580-2595 m	0.75%	40% Limestone, off-white, brown pyritic in part 25% Claystone, grey, medium grey, slightly silty, green-grey, purple 20% Sandstone, as above 10% Claystone/Siltstone, dark-grey, brown, calcareous
M 3076 swc	2600 m	3.13%	Claystone, dark grey, grey-brown, lustrous
M 2245	2595-2610 m	0.72%	30% Claystone, grey, medium grey, silty in part
		20.74%	20% Claystone, dark grey, lustrous, fissile, woody fragments (coalified), pyritic
		1.01%	20% Claystone, light brown, medium grey-brown, waxy, with thin coaly stringers (pyrite-rich) 20% Sand/Sandstone, fine to medium grained, some coarse 10% Limestone, off-white Sm.am. coal, pyrite
M 3077 swc	2620 m	1.91%	Claystone, light brown, waxy texture, some thin coal stringers

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II

WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 2246	2610-2625 m	0.78% 10.03%	40% Claystone, grey, as above 40% Claystone, dark grey, lustrous, as above 10% Coal, bright 7% Claystone, light brown-grey, brown-grey, as above 3% Pyrite
M 2247	2625-2640 m	20.43%	50% Sandstone, white, v.fine-fine grained, subangular-subrounded 30% Claystone, dark grey, lustrous, as above 20% Coal
M 2248	2640-2655 m	4.00%	80% Sand/Sandstone, fine-medium grained quartz, well rounded-frosted grains, dull gold-fluorescence (~ 10%) slight white cut 20% Claystone, dark grey, lustrous, brown-grey, waxy, some grey Sm.am. coal
M 2249	2655-2670 m		100% Sandstone, medium to coarse grained quartz
M 3069 (K) Full core	2682.4 m	3.03	Claystone, medium to dark grey, coarse, micaceous (white mica)
M 3071 Full core	2689.7 m	1.48%	Claystone, medium to dark grey, micaceous (brown mica)
M 2250	2685-2700 m		100% Sandstone, as above, medium to coarse grained, subangular to subrounded, some very coarse, oil stained 5% Claystone, grey, grey-green, light grey 5% Coaly additive (poor quality sample small size)
M 3079 swc	2710 m	1.16%	Claystone, medium to dark grey

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II

WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 2251	2700-2715 m	1.26%	55% Claystone, grey, grey-green, light brown-grey, some dark grey-brown, silty in part 15% Siltstone, grey, whitish in part, sandy in part, slightly calcareous 5% Limestone, white, silty, sandy 2% Pyrite 3% Quartz grains 20% Coaly additive (small sample size)
M 2252	2715-2730 m	0.79% 0.64%	40% Claystone, grey, grey-green as above 55% Sandy Siltstone, light grey, grey-brown, fine grained, calcareous (grading to Limestone in part), glauconitic, trace oolites, micaceous and argillaceous in part 5% Pyrite (small sample size)
M 2253	2730-2745	1.01% 4.09%	70% Siltstone, grey, sandy, calcareous, glauconitic, grades in part to Sandstone (10%) and Limestone (10%) 30% Claystone, grey, some dark grey and dark grey-brown (very poor sample-cuttings very small)
M 2254	2745-2760 m		80% Sand/Sandstone, white, fine-medium grained, subangular to subrounded, calcareous cement, silty in part 20% Siltstone, as above Sm.am. pyrite
M 2255	2760-2775 m	1.61	60% Siltstone, as above, some silty claystone (~ 10%) grey to medium dark grey 40% Cement
M 2256	2775-2790 m	1.57%	80% Siltstone, light grey, grey, medium grey-brown, sandy, micaceous, calcareous in part, grading to Limestone (~ 10%) 20% Sandstone, fine grained, silty

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II

WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 2257	2790-2805 m	2.26%	30% Siltstone, as above, 30% clayey Siltstone, grey to medium dark grey 10% Sandstone, as above 30% Coaly additive
M 2258	2805-2820 m	2.59%	60% Claystone/Siltstone, light grey-brown to dark grey-brown, some sandy lenses, micaceous in part, calcareous in part, grading to Limestone (10%), silty, sandy 10% Sandstone, as above 30% Coaly additive, plus loose steel fragments
M 2259	2820-2835 m	1.89%	50% Silty claystone, light to medium grey-brown, sandy, grading to 30% Sandstone, a white, buff, very fine to fine grained, silty, calcareous grading to a grey, brown (dolomitic in part) - Limestone (10%) 20% Coaly additive
M 2260	2835-2850 m	2.01%	70% Silty Claystone, grey-brown, micaceous in part, slightly calcareous, slightly sandy 20% Siltstone, grey-brown, sandy, calcareous, grading to calcareous Sandstone as above 10% Coaly additive
M 2261	2850-2865 m	1.52%	50% Sandstone, white, light brown-grey, fine grained, calcareous Cement 30% Siltstone, as above 20% Coaly additive, plus lost circulation material
M 2262	2865-2880 m		90% Sandstone, white, light brown-grey, medium to coarse grained, subangular mostly, Calcite cemented 5% Siltstone, as above 5% Limestone, white, buff, sandy
M 2263	2880-2895 m		90% Sandstone, as above 5% Siltstone, as above 5% Limestone, as above

IKU

LITHOLOGY AND TOTAL ORGANIC CARBON MEASUREMENTS

TABLE NO.: II
WELL NO.: 30/6-4

Sample	Depth	TOC	Lithology
M 2264	2895-2910 m	1.52%	70% Silty Claystone, grey-brown, grey, slightly calcareous, micaceous, sandy in part (sandy lenses), pyritic 10% Sandstone, as above 10% Limestone, grey, brown, sandy inpart, dolomitic 10% Coaly additive
M 2265	2910-2925 m	1.45%	40% Silty Claystone, grey, grey-brown, brown, some micaceous, some calcareous, sandy 30% Sandstone, white, light grey-brown, very fine grained, silty, calcareous, glauconitic 30% Limestone, as above
M 2266	2925-2940 m	1.39%	60% Silty Claystone, as above 20% Sandstone, as above 20% Limestone, as above
M 2267	2940-2942 m	1.24%	80% Silty Claystone, light grey, grey-brown as above 20% Sandstone, as above

IKU

T A B L E : III

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	Rock Extr. (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
M2233	2430	12.6	40.5	7.3	7.6	14.9	25.6	4.9
M2234	2445	16.1	44.9	10.1	9.9	20.0	24.9	6.4
M2239	2520	9.7	8.9	4.8	3.3	8.1	.8	2.6
M2241	2550	17.7	25.4	4.4	5.0	9.4	16.0	4.3
M2245	2610	10.2	44.3	10.3	18.9	29.2	15.1	13.0
M2246	2625	8.2	48.6	7.5	1.7	9.2	39.4	18.1
M3068	2656	29.4	121.7	85.4	26.3	111.7	10.0	1.0
M2256	2790	20.1	8.4	2.3	2.3	4.6	3.8	1.7
M2260	2850	14.9	15.7	5.5	2.6	8.1	7.6	2.3
M2264	2910	9.5	6.7	1.9	1.8	3.7	3.0	1.5

IKU

T A B L E : IV

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC	Provemengde (gram)
M2233	2430	3214	579	603	1183	2032	12,6
M2234	2445	2789	627	615	1242	1547	16,1
M2239	2520	918	495	340	835	82	9,7
M2241	2550	1435	249	282	531	904	17,7
M2245	2610	4343	1010	1853	2863	1480	10,20
M2246	2625	5927	915	207	1122	4805	8,2
M3068	2656	4139	2905	895	3799	340	29,4
M2256	2790	418	114	114	229	189	20,1
M2260	2850	1054	369	174	544	510	14,9
M2264	2910	705	200	189	389	316	9,5

IKU

T A B L E : V

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
M2233	2430	65.6	11.8	12.3	24.1	41.5
M2234	2445	43.6	9.8	9.6	19.4	24.2
M2239	2520	35.3	19.0	13.1	32.1	3.2
M2241	2550	33.4	5.8	6.6	12.4	21.0
M2245	2610	33.4	7.8	14.3	22.0	11.4
M2246	2625	32.7	5.1	1.1	6.2	26.5
M3068	2656	413.9	290.5	89.5	379.9	34.0
M2256	2790	24.6	6.7	6.7	13.5	11.1
M2260	2850	45.8	16.0	7.6	23.6	22.2
M2264	2910	47.0	13.3	12.6	26.0	21.1

IKU

T A B L E : VI

COMPOSITION IN % OF THE MATERIAL EXTRACTED FROM THE ROCK

IKU-No	DEPTH (m)	Sat / EOM	Aro / EOM	HC / EOM	Sat / Aro	Non HC / EOM	HC / Non HC
M2233	2430	18.0	18.8	36.8	96.1	63.2	58.2
M2234	2445	22.5	22.0	44.5	102.0	55.5	80.3
M2239	2520	53.9	37.1	91.0	145.5	9.0	1012.5
M2241	2550	17.3	19.7	37.0	88.0	63.0	58.7
M2245	2610	23.3	42.7	65.9	54.5	34.1	193.4
M2246	2625	15.4	3.5	18.9	441.2	81.1	23.4
M3068	2656	70.2	21.6	91.8	324.7	8.2	1117.0
M2256	2790	27.4	27.4	54.8	100.0	45.2	121.1
M2260	2850	35.0	16.6	51.6	211.5	48.4	106.6
M2264	2910	28.4	26.9	55.2	105.6	44.8	123.3

IKU

TABLE VII

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

IKU No.	DEPTH (m)	PRISTANE / n-C17	PRISTANE / PHYTANE	CPI
M2233	2430	1.4	1.6	1.1
M2234	2445	1.7	1.6	.9
M2239	2520	1.2	2.3	1.2
M2241	2550	1.9	2.5	1.4
M2245	2610	2.1	5.6	1.5
M2246	2625	2.3	7.5	1.5
M3068	2656	.5	1.6	1.0
M2256	2790	1.1	2.7	1.4
M2260	2850	1.2	2.9	1.1
M2264	2910	.8	3.0	1.6

IKU

VITRINITE REFLECTANCE MEASUREMENTS

TABLE NO.: VIIIa

WELL NO. 30/6-4

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-2210	2010-2025	0.40(19)	Yellow/orange spores	Trace
M-2213	2055-2070	N.D.P.	Green/yellow and yellow spores	Low
M-2216	2100-2115	0.52(2)	Yellow and yellow/orange spores	Abundant
M-2218	2130-2145	0.42(4)	Yellow/orange spores	Trace
M-2221	2175-2220	0.34(10)	Yellow/orange spores	Trace
M-2225	2265-2280	0.47(11)	Yellow/orange spores	Trace
M-2228	2310-2325	0.45(9)	Yellow/orange spores	Trace
M-3072	2354	0.49(11)	Dubious low orange spore	Trace/Nil?
M-2231	2355-2370	0.52(13)	Yellow/orange spores	Low
M-3073	2435	0.44(20)	Low orange spores	Low
M-2236	2460-2475	0.44(22)	Yellow and yellow/orange spores	Low
M-3074	2484	0.42(20)	Yellow/orange spores	Trace
M-2238	2490-2505	0.44(20)	Yellow/orange spores and carbonate fluorescence	Trace
M-2240	2520-2535	0.45(20)	Low orange spores	Moderate
M-2242	2550-2565	0.46(20)	Yellow/orange spores	Low-moderate
M-2243	2565-2580	0.50(17)	Yellow/orange spores	Moderate
M-3076	2600	0.54(21)	Low orange spores	Trace
M-3077	2620	0.45(20)	Yellow/orange spores	Trace-low
M-2246	2610-2625	0.43(20)	Low orange spores	Abundant

IKU

VITRINITE REFLECTANCE MEASUREMENTS

TABLE NO.: VIIIa

WELL NO. 30/6-4

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-2247	2625-2640	0.44(17)	Low orange spores	Moderate
M-2248	2640-2655	0.48(20)	Yellow/orange and low orange spores	Low
M-3069	2682.4	0.45(21)	Yellow/orange spores	Low
M-3079	2710	0.43(19)	Low orange	Trace-low
M-2253	2730-2745	0.42(14)	Yellow/orange	Trace
M-2257	2790-2805	0.40(11)	Yellow and yellow/orange spores	Low and moderate
M-2259	2820-2835	0.43(14)	Yellow spores	Moderate
M-2261	2850-2865	0.44(20)	Yellow and yellow/orange spores	Low-moderate
M-2264	2895-2910	0.47(20)	Yellow/orange spores. Green resin and algae.	Low-moderate
M-2265	2910-2925	0.47(18)	Yellow/orange spores	Low
M-2266	2925-2940	0.47(20)	Yellow/orange spores	Low

IKU

VISUAL KEROGEN ANALYSIS

TABLE NO.: VIIIb

SECTION.: 30/6-4

Sample	Depth	Composition of residue	Particle size	Preservation-palynomorphs	Thermal maturation index	Remarks
M-2233	2415-30	Cut,W,WR!,P/Am,Cy	F-M-L	fair	1/1+, 1+	Pyritic loose aggregates of sapropelised cuticles and true amorphous material, Tasmanites.
M-M-2234	2430-45	Cut,W,WR!,P/Am,Cy	F-M-L	fair	1/1+, 1+	Resembles M-2233, even larger cuticular fragments.
M-2235	^{o}2445-60	^{o}Am/W,WR!	F-M	fair to poor		Aggregates of ?combined inorganic and organic matter. Some pyritic.
M-2237	2475-90	W,WR!,Cut,P/Am,Cy	F-M-L	fair to poor	1/1+, 1+	Tertiary pollen fragments. Pyrite and aggregates as 2430-45. Caved material suspected.

ABBREVATIONS

Am	amorphous	Cy	cysts, algae	W	woody material	F	fine
He	herbaceous	P	pollen grains	C	coal	M	medium
Cut	cuticles	S	spores	RI	reworked	L	large

R resin

* screened residue

^{o} extracted sample

038/M/jlh/1

IKU

VISUAL KEROGEN ANALYSIS

TABLE NO.: VIIIb

SECTION.: 30/6-4

Sample	Depth	Composition of residue	Particle size	Preservation-palynomorphs	Thermal maturation index	Remarks
M-2239	°2505-20	°Am/W,WR!	F-M	fair to poor		Finely disperse residue with pyrite and some other minerals.
M-2240	2520-35	Cut,W,WR!,P/Am	F-M-L	fair	1/1+,1+	Semifusinite/fusinite is abundant in poorly sorted material, mostly recorded in pyritic aggregates. Microforams.
M-2241	°2535-50	°W,Cut,WR!,P/Am,Cy	F-M-L	fair to poor	1/1+,1+	°More finely dispersed. Small aggregates.
	2550 swc	Cut,W,WR!,P,S/Am	F-M-L	fair to good	1/1+,1+	Large aggregates mainly of cuticular material. Less pyrite than above.

ABBREVATIONS

Am	amorphous	Cy	cysts, algae	W	woody material	F	fine
He	herbaceous	P	pollen grains	C	coal	M	medium
Cut	cuticles	S	spores	RI	reworked	L	large

R resin

° extracted sample

* screened residue

038/M/jlh/2

IKU

VISUAL KEROGEN ANALYSIS

TABLE NO.: VIIIb

SECTION.: 30/6-4

Sample	Depth	Composition of residue	Particle size	Preservation-palynomorphs	Thermal maturation index	Remarks
M-2242	2550-65	Cut,W,WR!,P,S/Am,Cy	F-M-L	fair to good	1/1+,1+/2-	Abundant Tasmanites, Callialasp. Large aggregates as above. Abundant semifusinite.
M-2244	2580-95	*W,WR!,R/Cy	F-M	fair to good	2-/2	Well disperse residue. Pyrite dominates. Abundant other minerals. Jurassic cysts in screened residues.
M-2245	2595-610	Cut,W,WR!,S,P/Am?	F-M-L	good	2-/2	Large aggregates of cuticles and semifusinite/fusinite. A middle Jurassic spore type of assemblage dominate.

ABBREVATIONS

Am	amorphous	Cy	cysts, algae	W	woody material	F	fine
He	herbaceous	P	pollen grains	C	coal	M	medium
Cut	cuticles	S	spores	RI	reworked	L	large

R resin

o extracted sample

* screened residue

038/M/jlh/3

IKU

VISUAL KEROGEN ANALYSIS

TABLE NO.: VIIIb

SECTION.: 30/6-4

Sample	Depth	Composition of residue	Particle size	Preservation-palynomorphs	Thermal maturation index	Remarks
M-2246	2610-25	Cut,W,WR!,S,P/Am	F-M-L	good	2-/2,2	Dense aggregates of cuticular and woody material. Proportions are difficult to evaluate. Vitrinite/fusinite/inertinite. Spores are relatively abundant.
M-2247	2625-40	W,Cut,C,S,P/Am	F-M-L	good	N.D.P.	As above but more of coaly/ woody substance.
M-3069 core	2682.4	W,Cut,WR!,P,S/Am,Cy	F-M-L	good	1+/2-	Tasmanites, Michystridium, in loose pyritic aggregates. Abundant semifusinite/fusinite, inertinite.
M-3069 core	°2682.4	W,Cut,WR!,P,S/Am,Cy	F-M-L	good	1+/2-	Less fluffy aggregates.

ABBREVATIONS

Am	amorphous	Cy	cysts, algae	W	woody material	F	fine
He	herbaceous	P	pollen grains	C	coal	M	medium
Cut	cuticles	S	spores	RI	reworked	L	large

R resin

° extracted sample

* screened residue

038/M/jlh/4

IKU

VISUAL KEROGEN ANALYSIS

TABLE NO.: VIIIb

SECTION.: 30/6-4

Sample	Depth	Composition of residue	Particle size	Preservation-palynomorphs	Thermal maturation index	Remarks
M-2251	2700-15	C,W,Cut,S,P/Am,Cy	F-M	variable	1+/2-	Jurassic/Cretaceous cysts are suspected to represent caved lithologies. Abundant pyrite.
M-2255	2760-75	Cut,W,P,S/Am,Cy	F-M	good	1+, 1+/2-	Some acid resistant minerals. Chasmatosporites spp. Nanno ceratopsis gracilis, abundant spherical bodies. Early Jurassic material mixed with younger deposits. Abundant pyrite.
M-2256	2775-90	Cut,P,S/Am,Cy	F-M-L	good	2-	As the sample above, but less caved material. Very rich in pyrite framboids.

ABBREVATIONS

Am	amorphous	Cy	cysts, algae	W	woody material	F	fine
He	herbaceous	P	pollen grains	C	coal	M	medium
Cut	cuticles	S	spores	RI	reworked	L	large

R resin

o extracted sample

* screened residue

038/M/jlh/5

IKU

VISUAL KEROGEN ANALYSIS

TABLE NO.: VIIIb

SECTION.: 30/6-4

Sample	Depth	Composition of residue	Particle size	Preservation-palynomorphs	Thermal maturation index	Remarks
M-2258	2805-20	Cut,P,S/Am,Cy	F-M-L	good	1+, 1+/2-	Aggregates fairly loose, very rich in pyrite. Tyttodiscus. Otherwise as the sample above.
M-2260	°2835-50	W,WR!,Cut,P,S/Am,Cy	F-M	good	1+/2-	Abundant pyrite. Aggregates of minerals and organic material of somewhat flaky structure.
M-2264	°2895-2910	W,WR!,Cut,P,S/Am,Cy	F-M	good	1+/2-	As above, Botryococcus, and increase in inertinite.
M-2265	2910-25	Cut,P,S,W,WR!/Am,Cy	F-M-L	good	1+/2-	Loose aggregates, rich in pyrite. Strong resemblance to 2805-20m.

ABBREVATIONS

Am	amorphous	Cy	cysts, algae	W	woody material	F	fine
He	herbaceous	P	pollen grains	C	coal	M	medium
Cut	cuticles	S	spores	RI	reworked	L	large

R resin

° extracted sample

* screened residue

038/M/jlh/6

IKU

TABLE IX

ROCK EVAL PYROLYSES

IKU No.	DEPTH (m)	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT S1+S2	PROD. INDEX S1/(S1+S2)	TEMP. max (C)
M2232	2385	1.81	.39	.74	.88	44	84	2.20	.82	420
		Ls								
M2233	2430	.51	22.93	.40	4.85	473	8	23.44	.02	424
		Clst	dk sy							
M3073	2435	.19	3.67	.46	2.96	124	16	3.86	.05	425
		SWC								
M2234	2445	.43	20.73	.41	5.08	408	8	21.16	.02	429
		Clst	dk sy							
M2235	2460	.42	11.57	.61	3.77	307	16	11.99	.04	427
		Clst	dk sy							
M2236	2475	.45	14.24	.55	4.31	330	13	14.69	.03	428
		Clst	dk sy							
M3074	2484	.36	4.22	.64	2.95	143	22	4.58	.08	433
		SWC								
M2238	2505	.15	.78	.35	1.20	65	29	.93	.16	439
		Clst	sy							
M2239	2520	.63	11.62	.55	3.96	293	14	12.25	.05	422
M2240	2535	.36	10.08	.33	4.08	247	8	10.44	.03	429
M3075	2550	.54	14.26	.46	6.46	221	7	14.80	.04	426
		SWC								
M2241	2550	.52	18.03	.36	5.18	348	7	18.55	.03	426
		Clst	sy	dk sy						
M2242	2565	.63	22.66	.50	7.03	322	7	23.29	.03	422
M2243	2580	.36	7.76	.60	3.93	197	15	8.12	.04	428
		Clst	dk sy							
M3076	2600	.30	3.16	.45	3.13	101	14	3.46	.09	432
		SWC								
M2245	2610	3.62	40.82	.70	20.74	197	3	44.44	.08	433
		Clst	dk sy							
M3077	2620	.19	2.30	.43	1.91	120	23	2.49	.08	435
		SWC								
M2246	2625	1.37	15.81	.47	10.03	158	5	17.18	.08	439
		Clst	dk sy							
M2247	2640	4.69	51.41	.64	20.43	252	3	56.10	.08	427
		Clst	dk sy							
M2248	2655	.55	5.27	.37	4.00	132	9	5.82	.09	437
		Clst	dk sy							
M3069	2682	1.34	4.14	.29	3.03	137	10	5.48	.24	430
		CORE								
M2251	2715	.06	.56	.83	1.26	44	66	.62	.10	434
		Clst	sy							
M2253	2745	.06	.32	.65	1.01	32	64	.38	.16	437
		Sltst	sy							
M2253	2745	.53	7.66	.61	4.09	187	15	8.19	.06	431
		Clst	dk sy							
M2256	2790	.33	5.51	.46	1.57	351	29	5.84	.06	432
		Clst	sy							

IKU

TABLE IX

ROCK EVAL PYROLYSES

IKU No.	DEPTH (m)	S1 — (%)	S2 (%)	S3 (%)	TOC (%)	HYDR. INDEX S2/TOC	OXYGEN INDEX S3/TOC	OIL OF GAS CONTENT S1+S2	PROD. INDEX S1/(S1+S2)	TEMP. max (C)
M2258	2820	.46	9.72	.49	2.59	375	19	10.18	.05	431
		Clst/Sltst, dk gy								
M2260	2850	.38	5.24	.66	2.01	261	33	5.62	.07	434
		Clst								
M2264	2910	.24	3.17	.72	1.52	209	47	3.41	.07	443
		Clst	sy							
M2265	2925	.25	1.98	.80	1.45	137	55	2.23	.11	440
		Clst	sy							

KEY TO GAS CHROMATOGRAMS

Saturated Hydrocarbons

a = nC_{17}

b = pristane

c = phytane

Aromatic Hydrocarbons

A = Methyl naphthalenes

B = Dimethyl naphthalenes

C = Tri- and other alkyl naphthalenes

P = Phenanthrene

D = Methylphenanthrenes

E = Dimethylphenanthrene

F = Compounds include aromatised steranes and triterpanes

X,Y,Z and Q = Unknowns

Pyrolysis Gas Chromatography

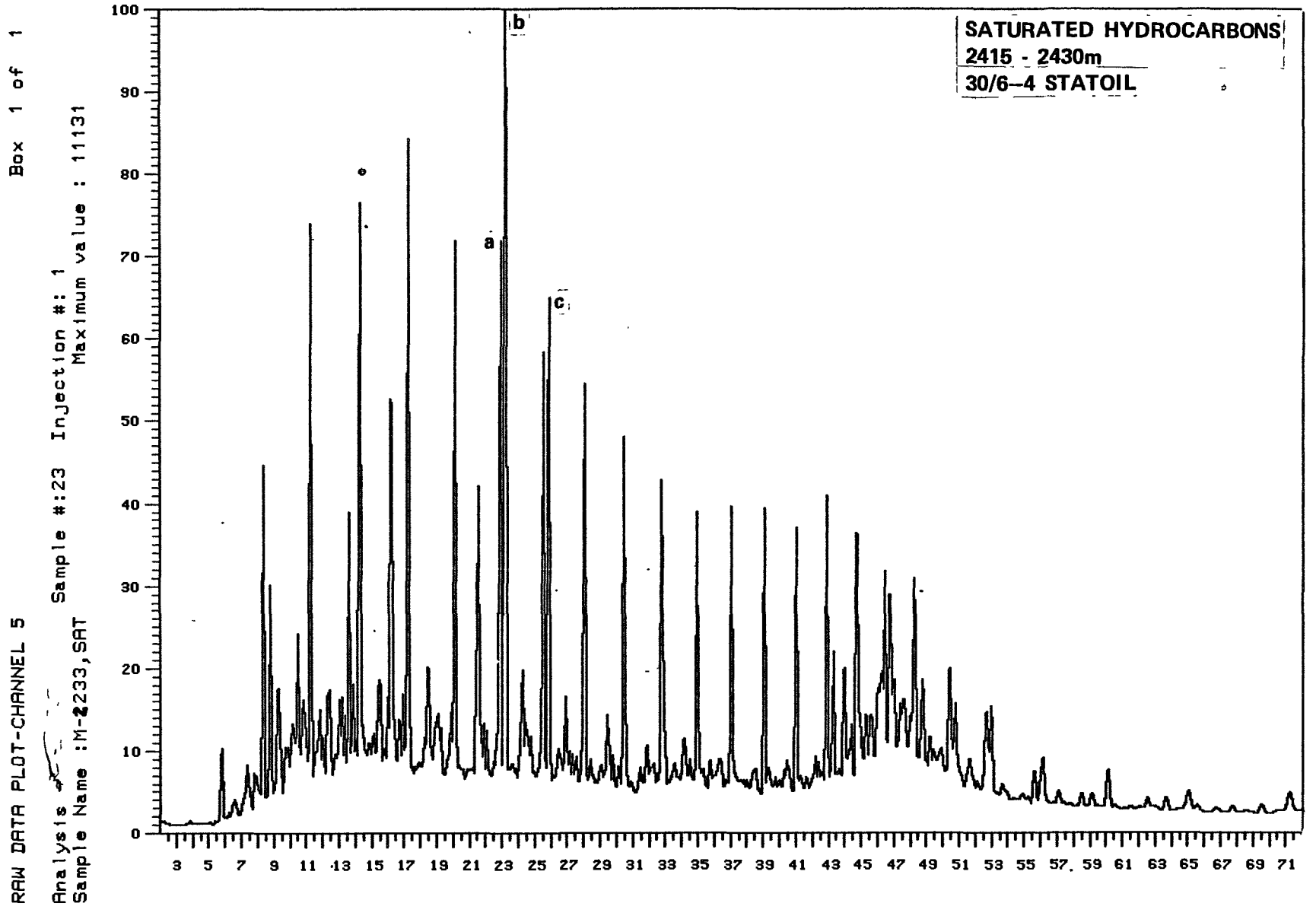
T = Toluene

X = Xylene

Pr = Pristene

MeN = Methyl naphthalenes

7,8,9 etc. = nC_7, nC_8, nC_9 alkanes etc.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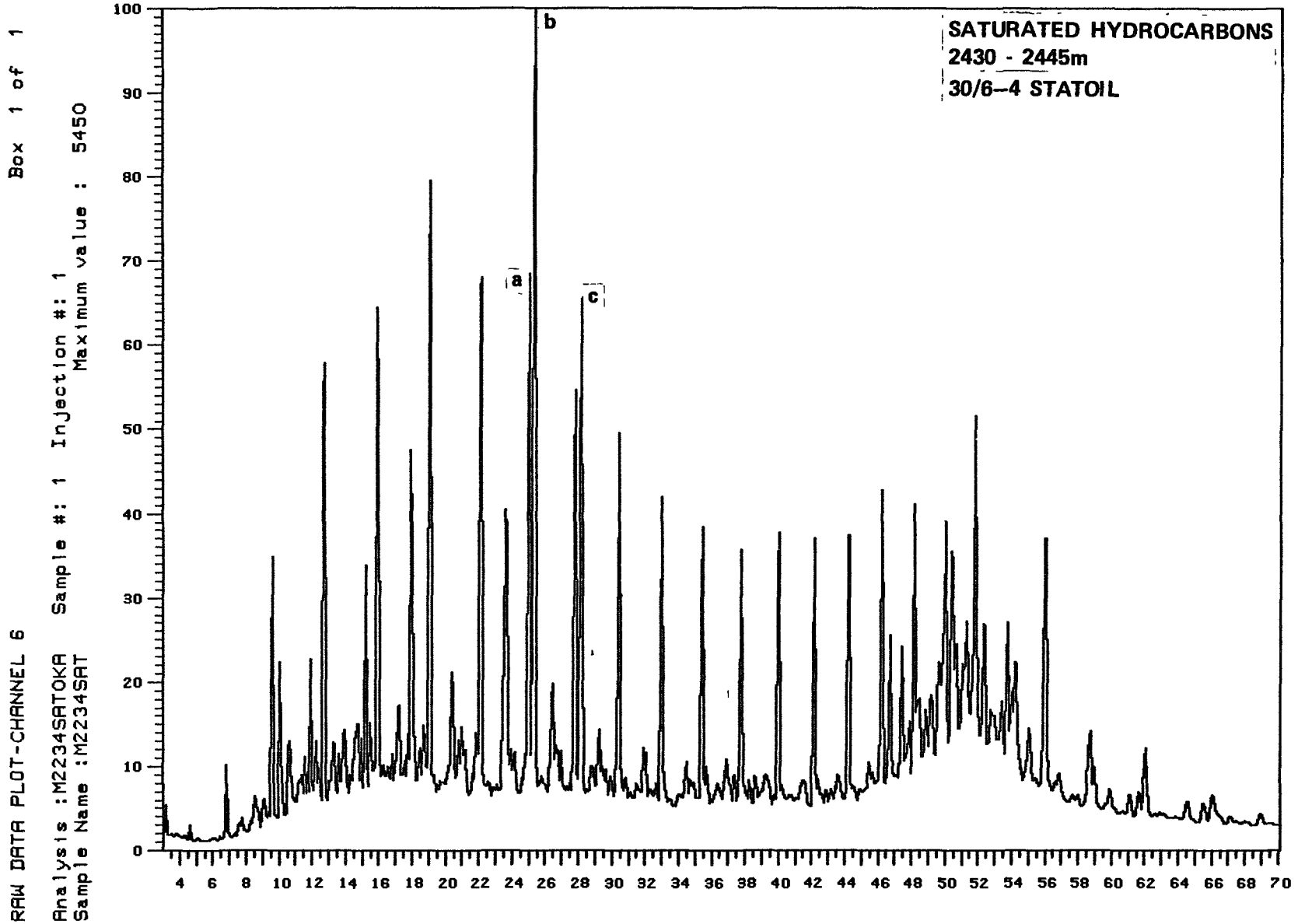
Analysis
Sample Name :M-2233,SAT
Sample #:23 Injection #: 1
Maximum value : 11131
SATURATED HYDROCARBONS
2415 - 2430m
30/6-4 STATOIL
a
b
c
100
90
80
70
60
50
40
30
20
10
0
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71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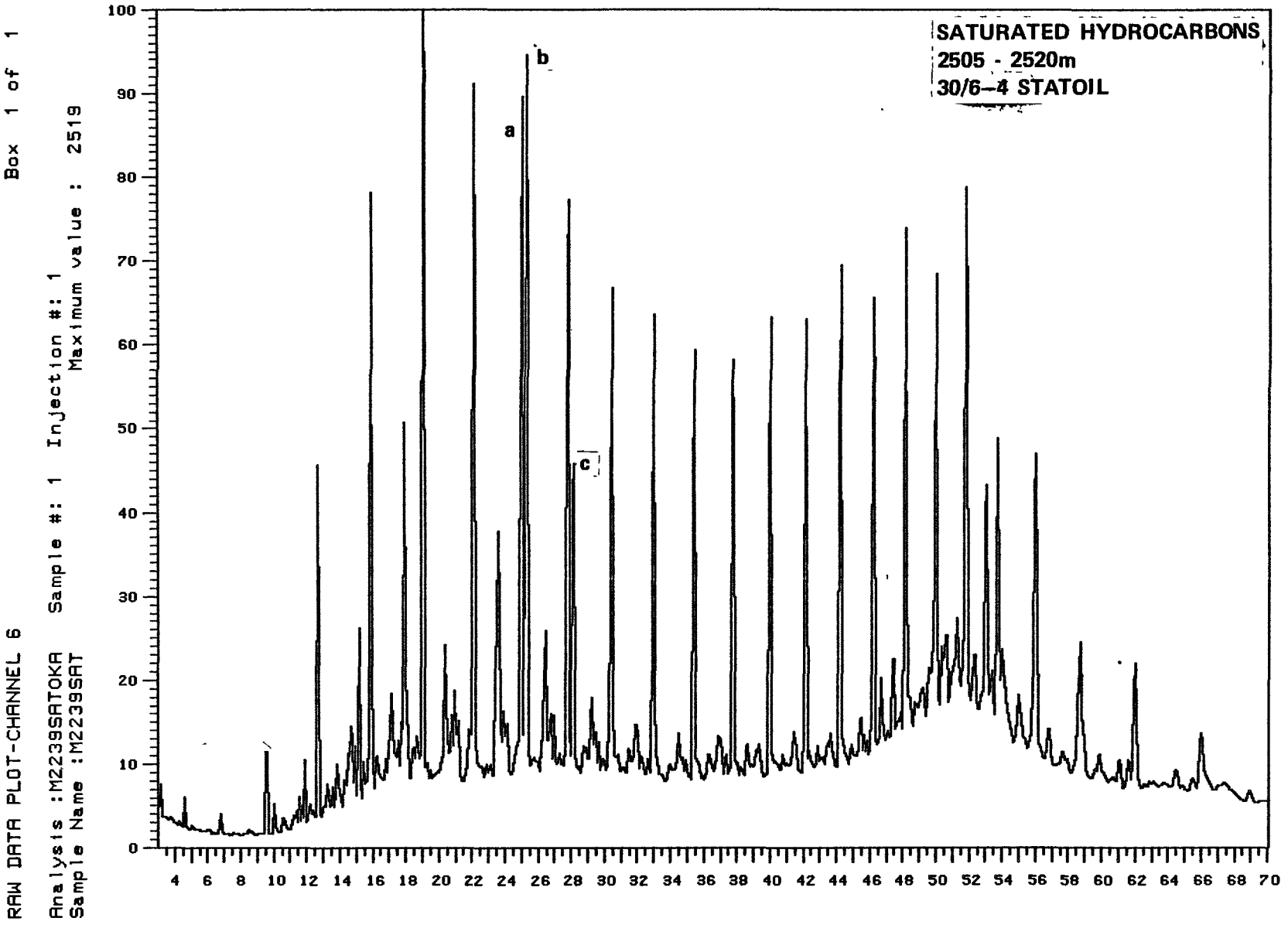
Box 1 of 1
Analysis :M2234SATOKA Sample #: 1 Injection #: 1
Sample Name :M2234SAT Maximum value : 5450
SATURATED HYDROCARBONS
2430 - 2445m
30/6-4 STATOIL
a
b
c
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70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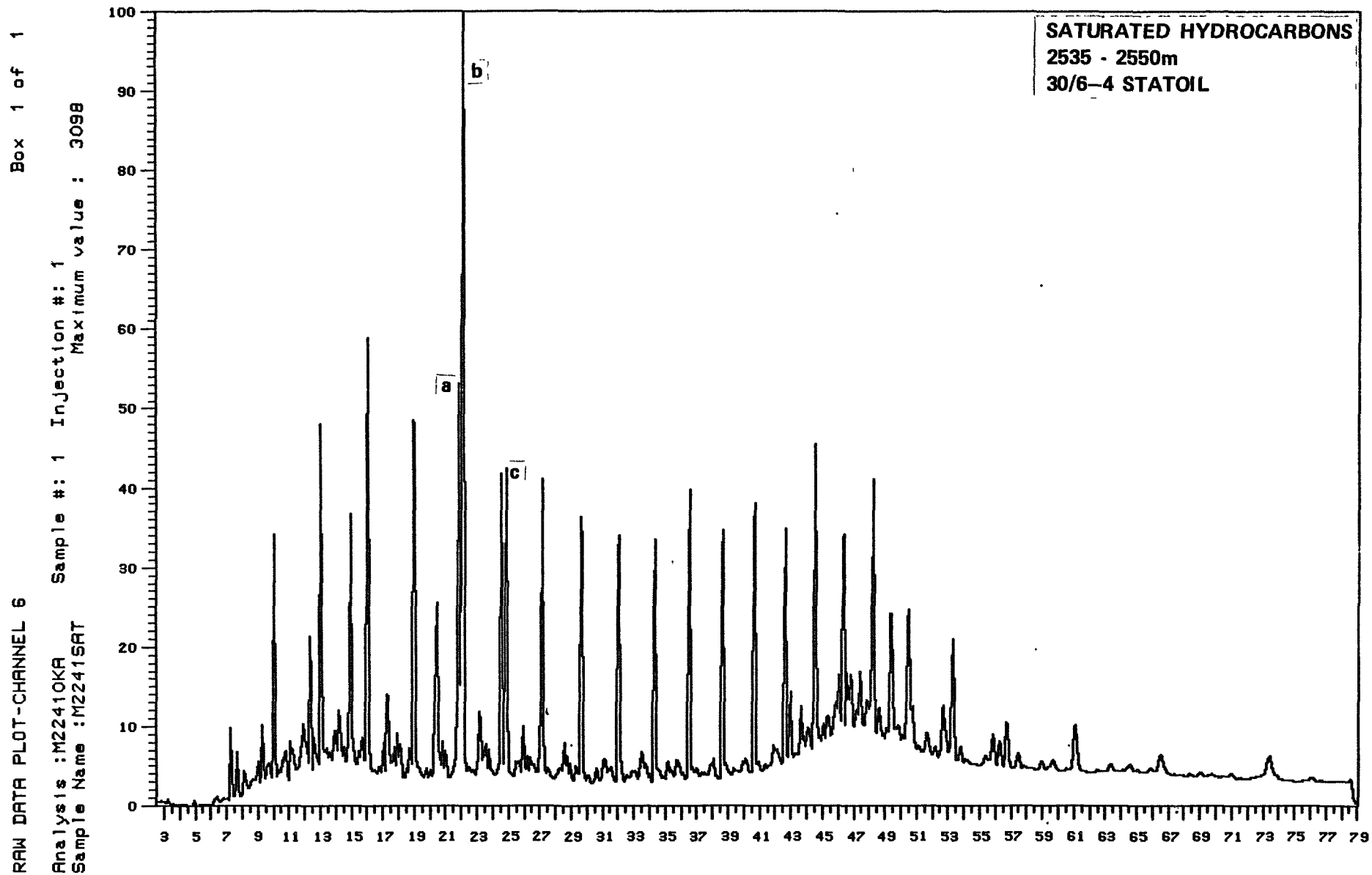
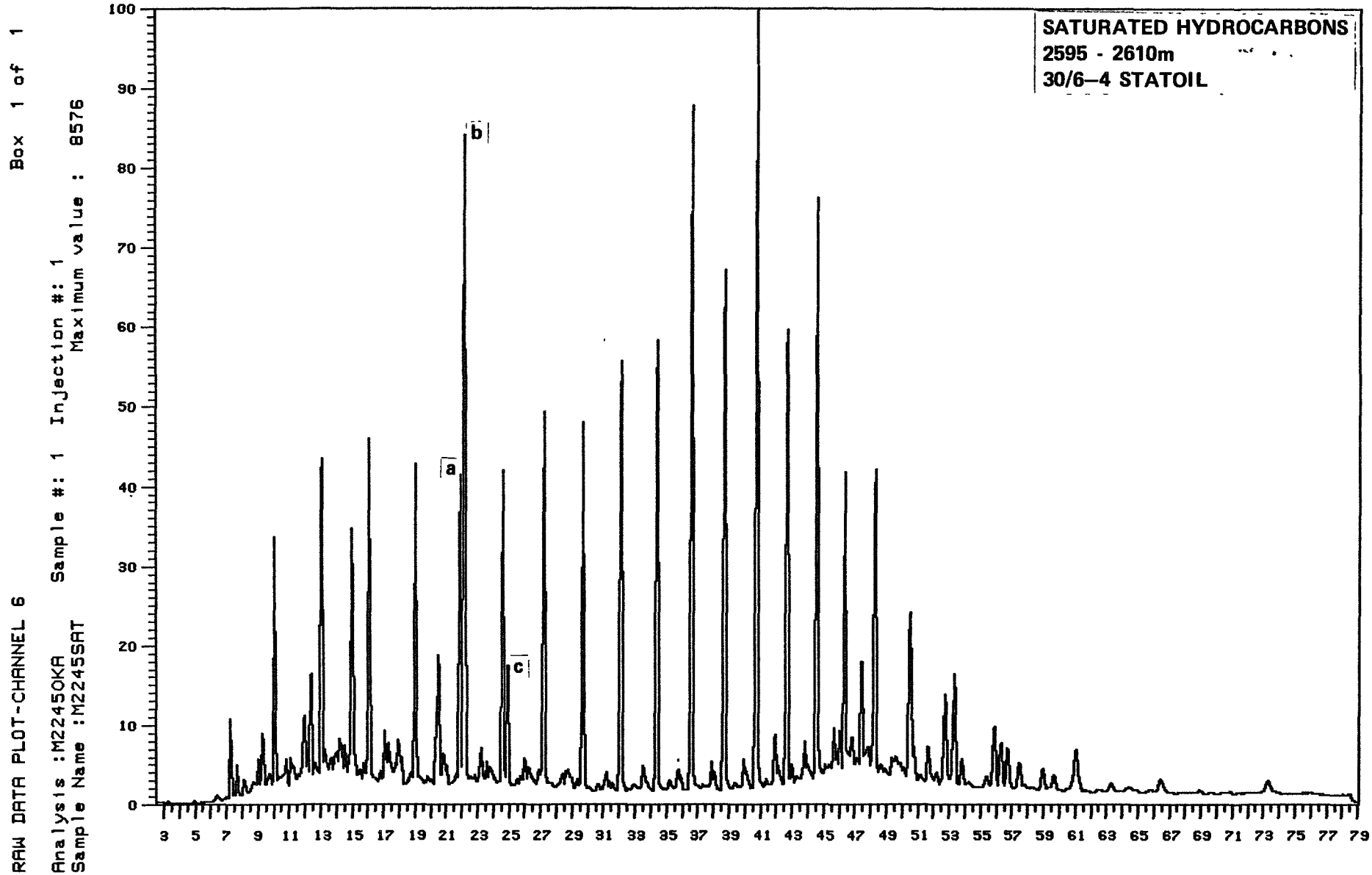
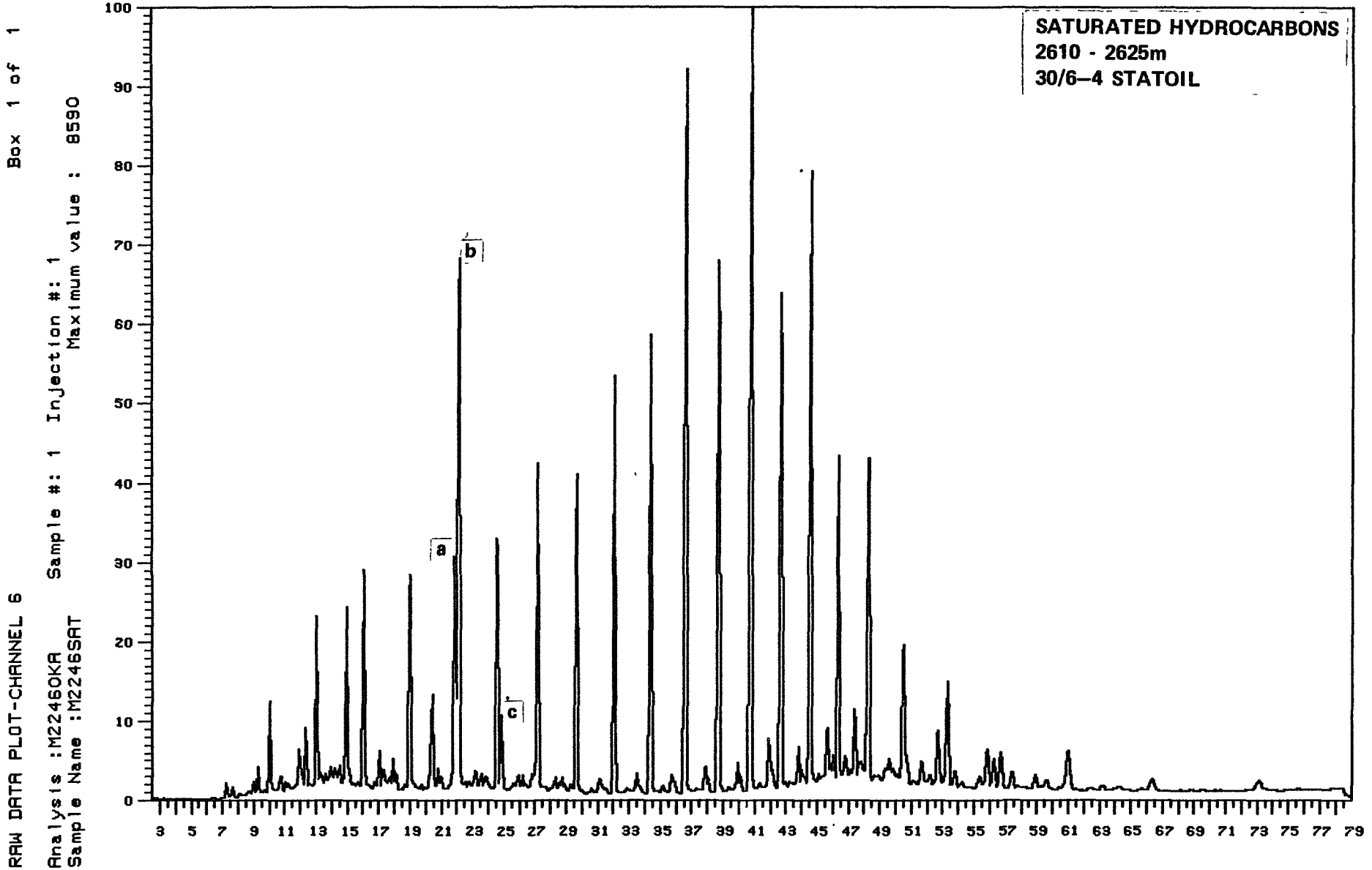
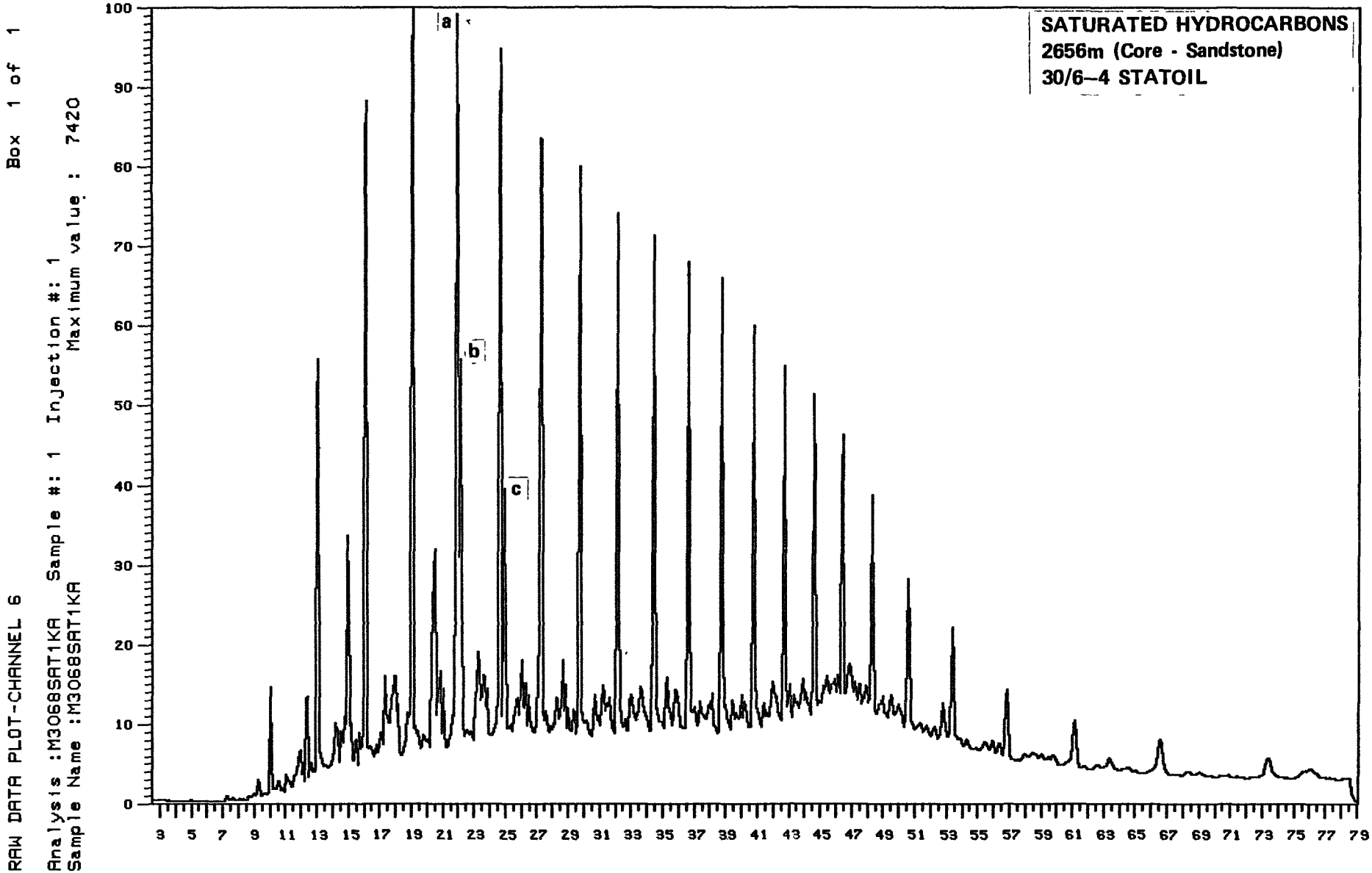
Box 1 of 1
Analysis :M2239SATOKA
Sample Name :M2239SAT
Sample #: 1 Injection #: 1
Maximum value : 2519
SATURATED HYDROCARBONS
2505 - 2520m
30/6-4 STATOIL
a
b
c
0
10
20
30
40
50
60
70
80
90
100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70


SATURATED HYDROCARBONS
2535 - 2550m
30/6-4 STATOIL
RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M22410KA
Sample Name :M2241SAT
Sample #: 1 Injection #: 1
Maximum value : 3098
a
b
c
0 10 20 30 40 50 60 70 80 90 100
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79


SATURATED HYDROCARBONS
2595 - 2610m
30/6–4 STATOIL
RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M2245OKA
Sample Name :M2245SAT
Sample #: 1 Injection #: 1
Maximum value : 8576
a
b
c
0
10
20
30
40
50
60
70
80
90
100
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79


SATURATED HYDROCARBONS
2610 - 2625m
30/6–4 STATOIL
RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M22460KA
Sample Name :M2246SAT
Sample #: 1 Injection #: 1
Maximum value : 8590
a
b
c
0 10 20 30 40 50 60 70 80 90 100
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79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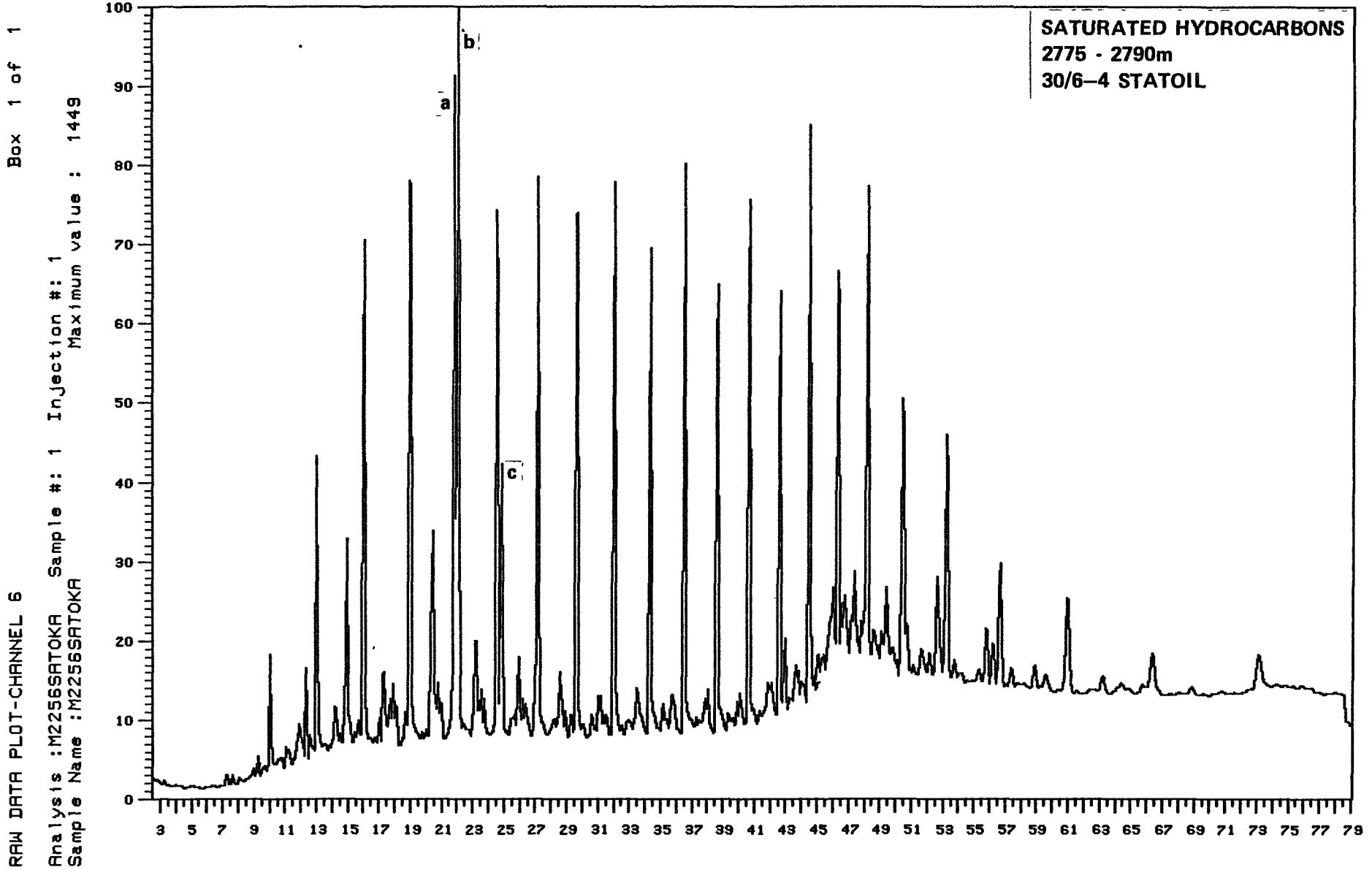
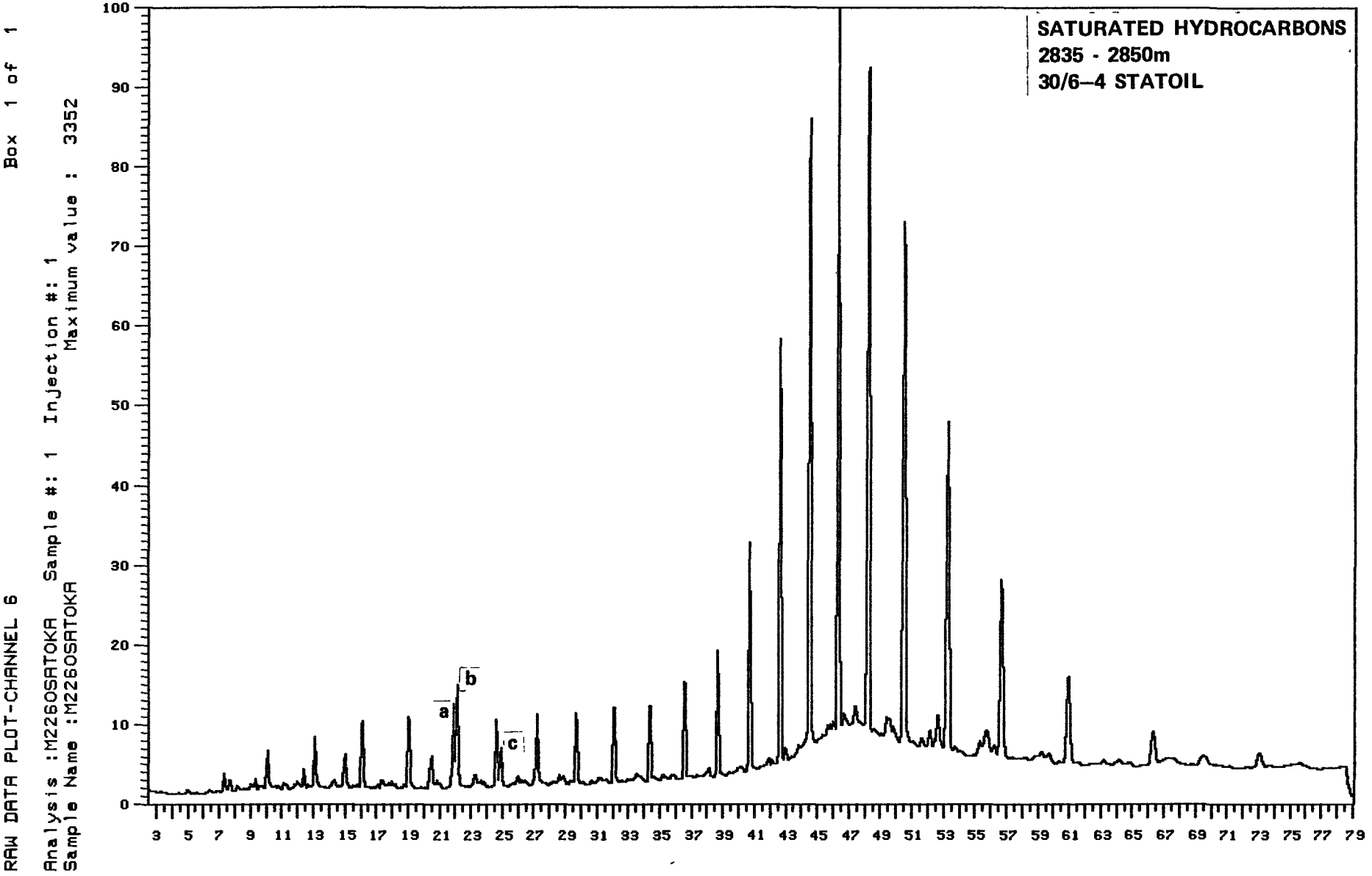
Box 1 of 1
Analysis :M3068SAT1KA Sample #: 1 Injection #: 1
Sample Name :M3068SAT1KA Maximum value : 7420
SATURATED HYDROCARBONS
2656m (Core - Sandstone)
30/6-4 STATOIL
a
b
c
0 10 20 30 40 50 60 70 80 90 100
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79


SATURATED HYDROCARBONS
2775 - 2790m
30/6–4 STATOIL
a
b
c
RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M2256SATOKA Sample #: 1 Injection #: 1
Sample Name :M2256SATOKA Maximum value : 1449
100
90
80
70
60
50
40
30
20
10
0
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79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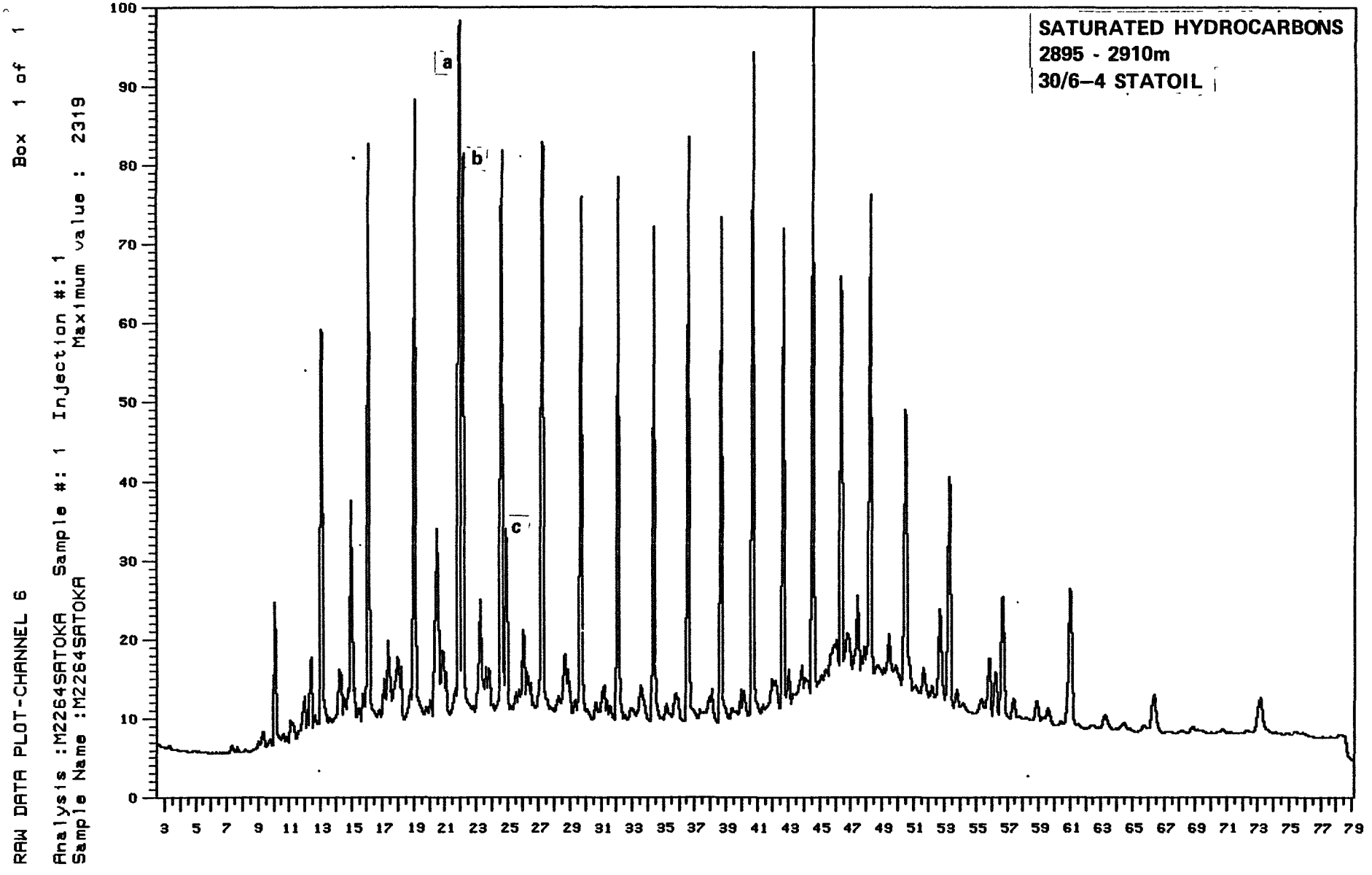
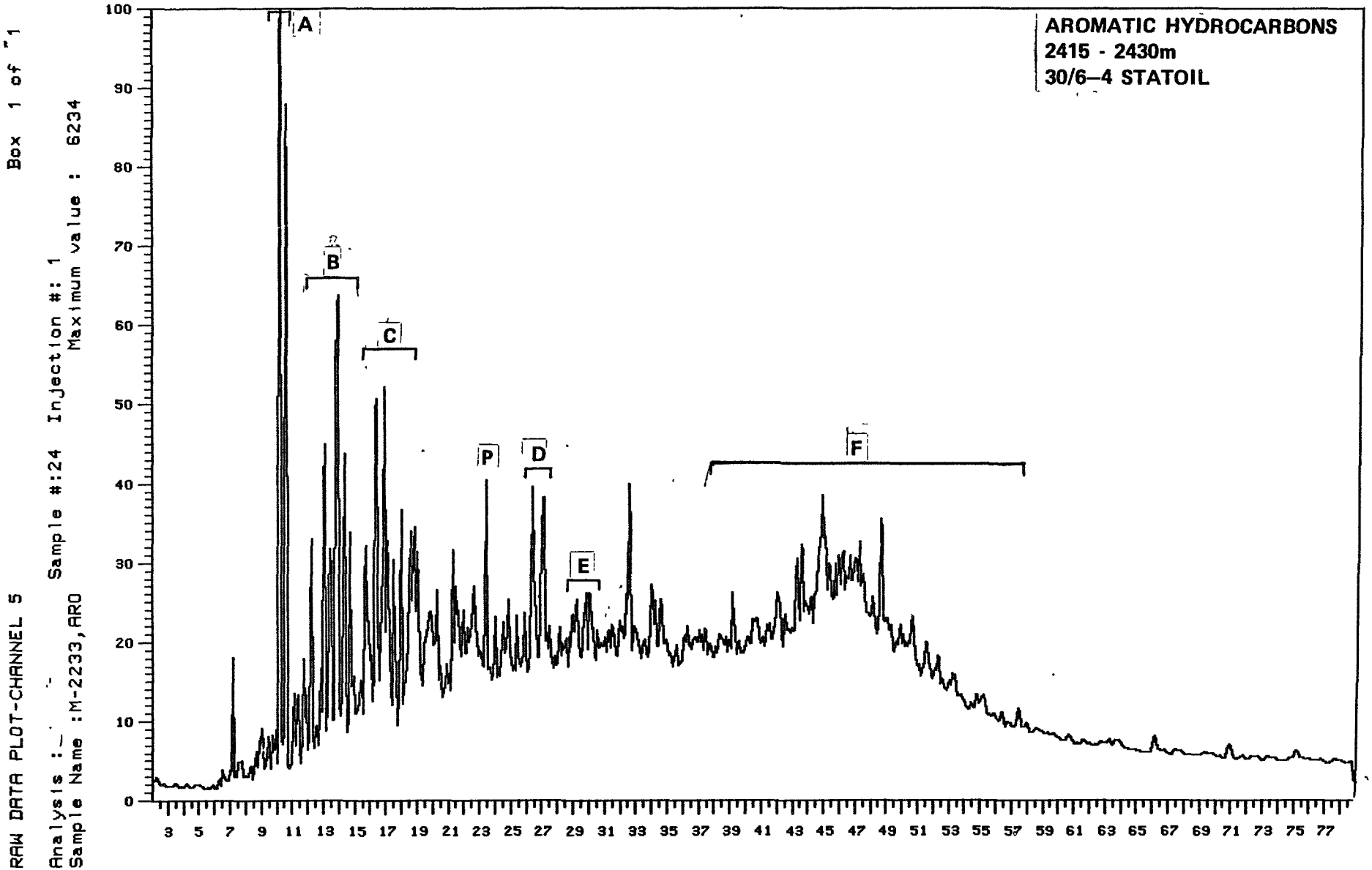
Box 1 of 1
Analysis :M2260SATOKA Sample #: 1 Injection #: 1
Sample Name :M2260SATOKA Maximum value : 3352
SATURATED HYDROCARBONS
2835 - 2850m
30/6–4 STATOIL
a
b
c
0 10 20 30 40 50 60 70 80 90 100
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79


SATURATED HYDROCARBONS
2895 - 2910m
30/6-4 STATOIL
a
b
c
RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M2264SATOKA Sample #: 1 Injection #: 1
Sample Name :M2264SATOKA Maximum value : 2319
0 10 20 30 40 50 60 70 80 90 100
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79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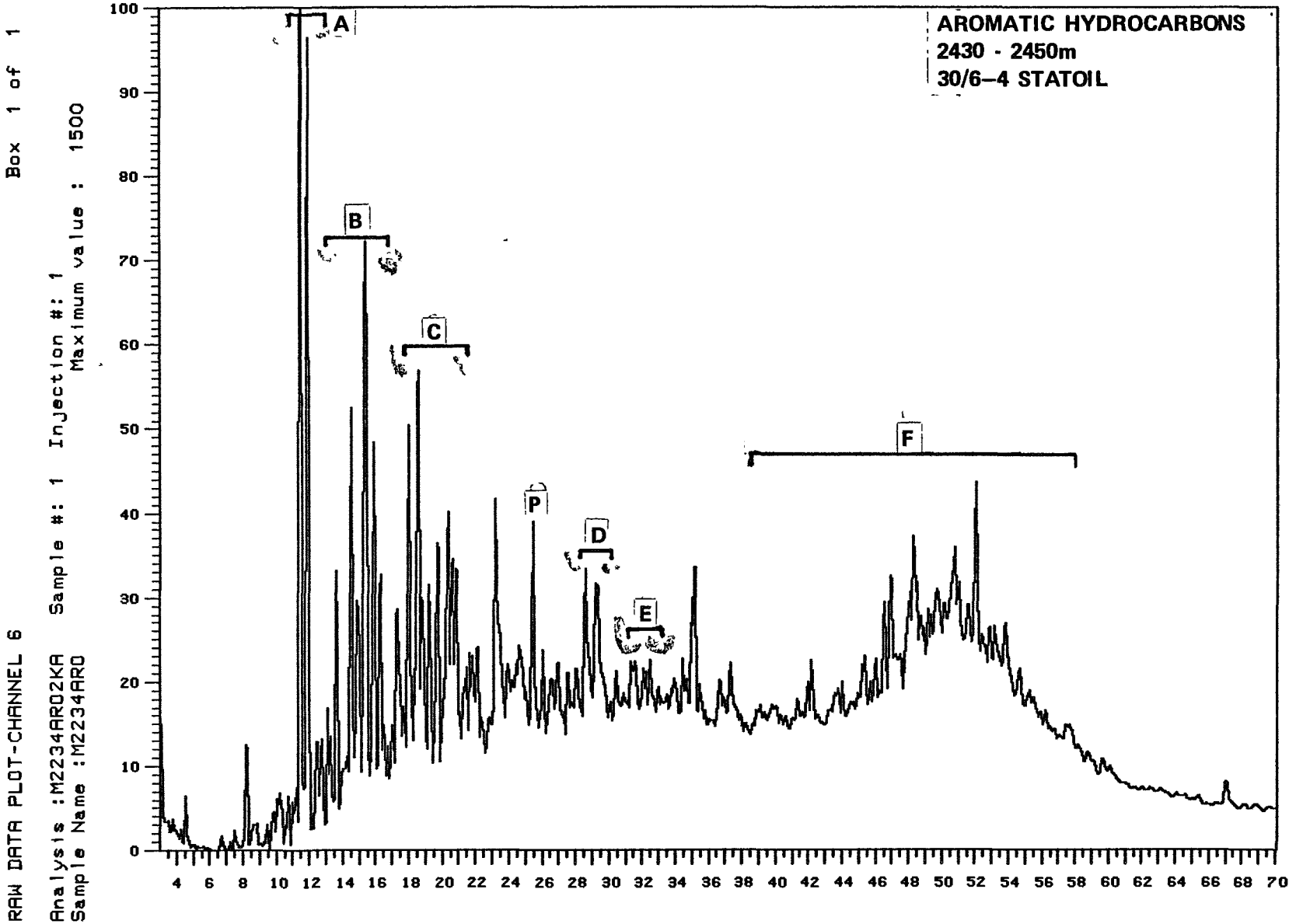
Box 1 of 1
Analysis :
Sample Name :M-2233,ARO
Sample #:24 Injection #: 1
Maximum value : 6234
AROMATIC HYDROCARBONS
2415 - 2430m
30/6–4 STATOIL
A
B
C
P
D
E
F
100
90
80
70
60
50
40
30
20
10
0
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77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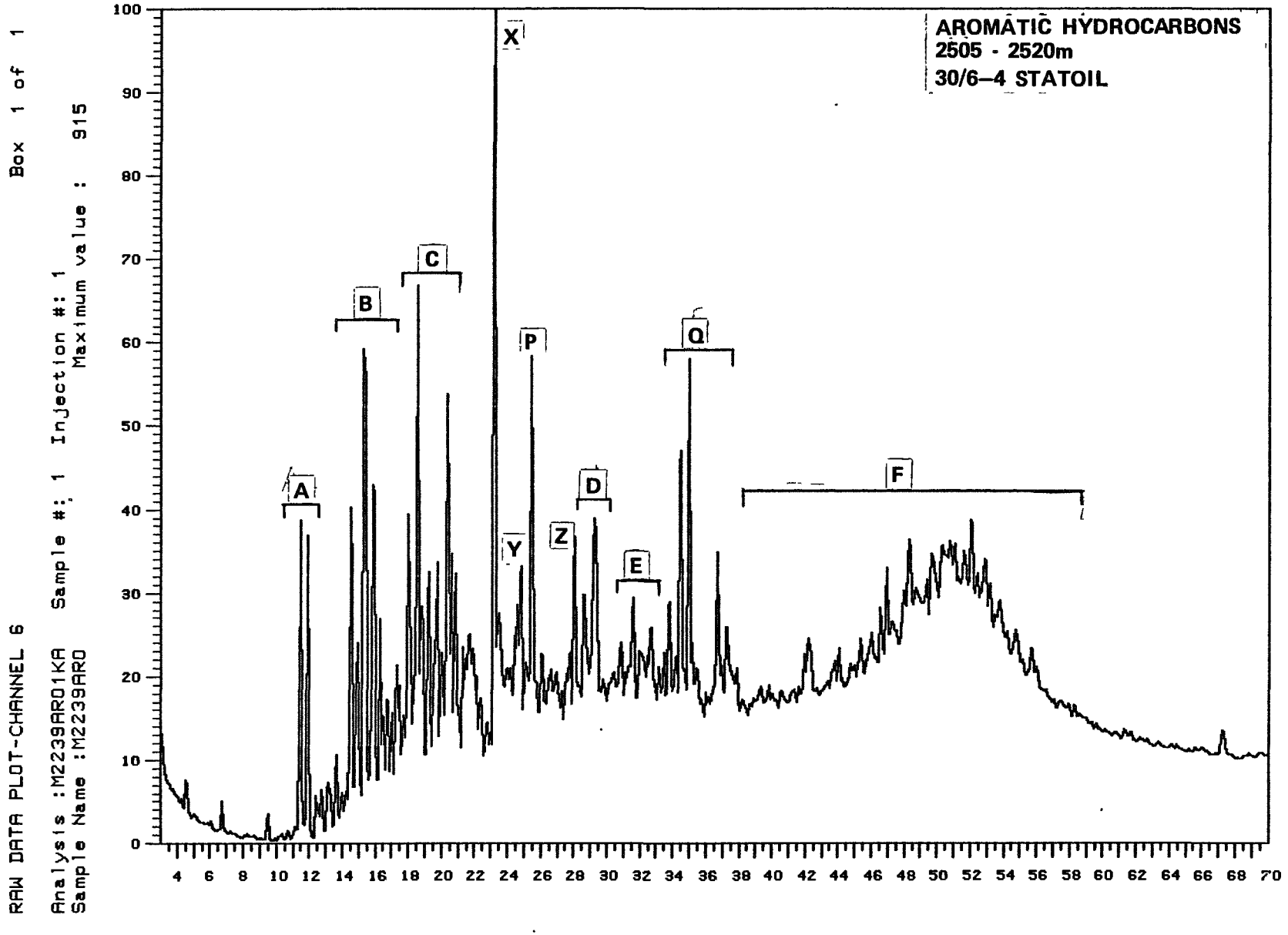
Box 1 of 1
Analysis :M2234AR02KA
Sample Name :M2234AR0
Sample #: 1 Injection #: 1
Maximum value : 1500
AROMATIC HYDROCARBONS
2430 - 2450m
30/6-4 STATOIL
A
B
C
P
D
E
F
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70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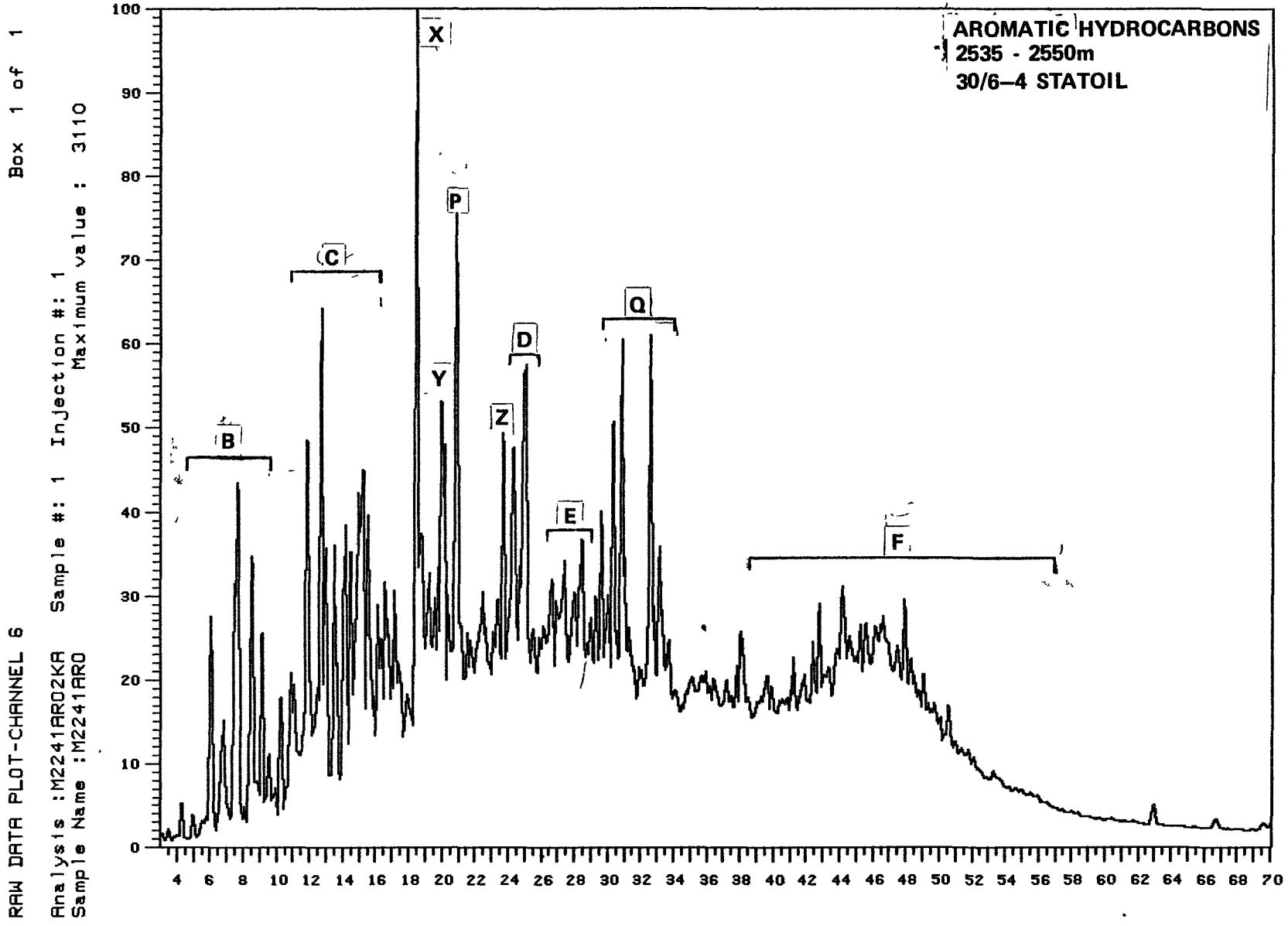
Analysis :M2239AR01KA Sample #: 1 Injection #: 1
Sample Name :M2239AR0 Maximum value : 915
AROMATIC HYDROCARBONS
2505 - 2520m
30/6–4 STATOIL
A
B
C
X
P
Y
Z
D
E
Q
F
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70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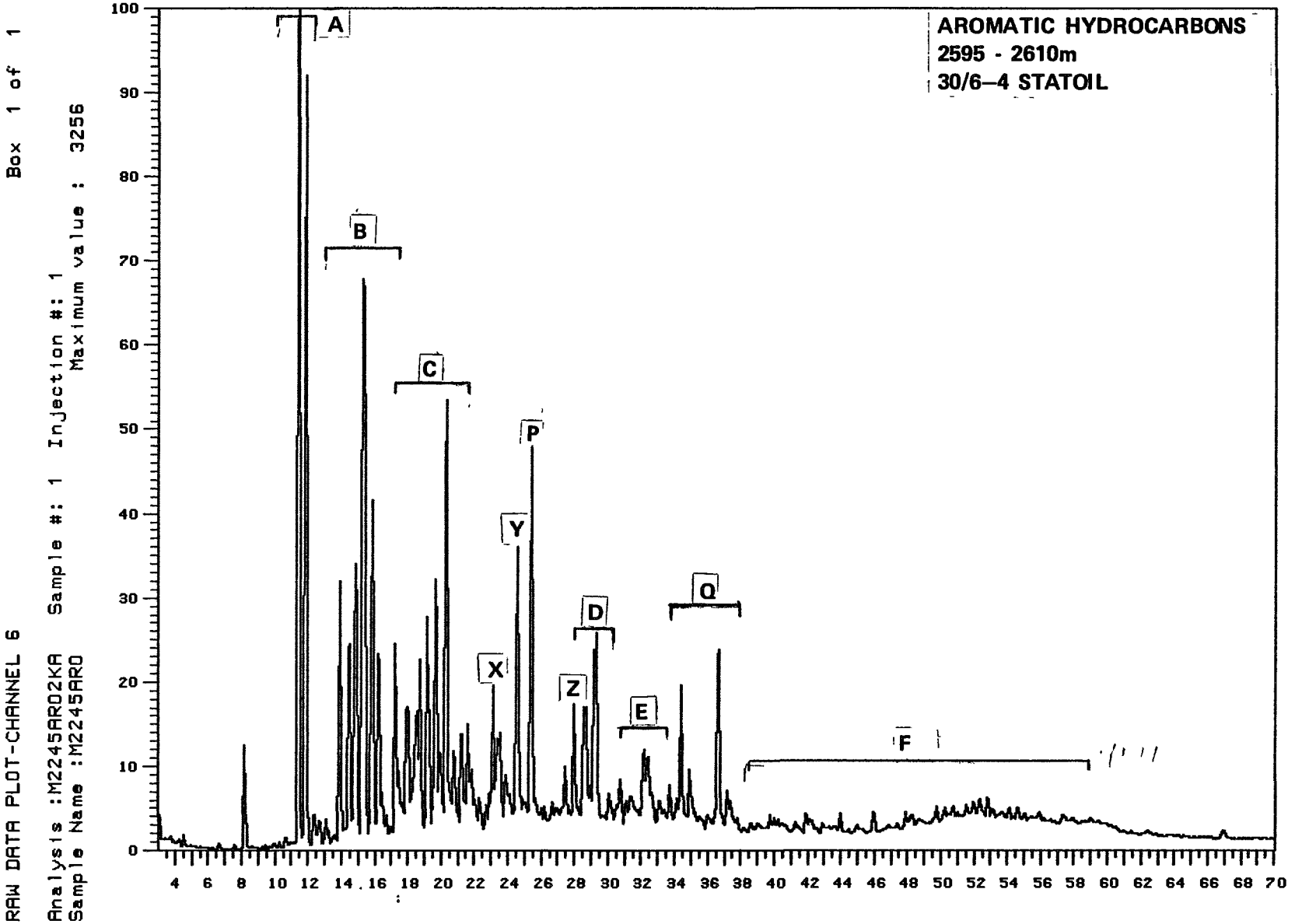
Box 1 of 1
Analysis :M2241AR02KA Sample #: 1 Injection #: 1
Sample Name :M2241AR0 Maximum value : 3110
AROMATIC HYDROCARBONS
2535 - 2550m
30/6–4 STATOIL
B
C
X
P
Y
Z
D
E
Q
F
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70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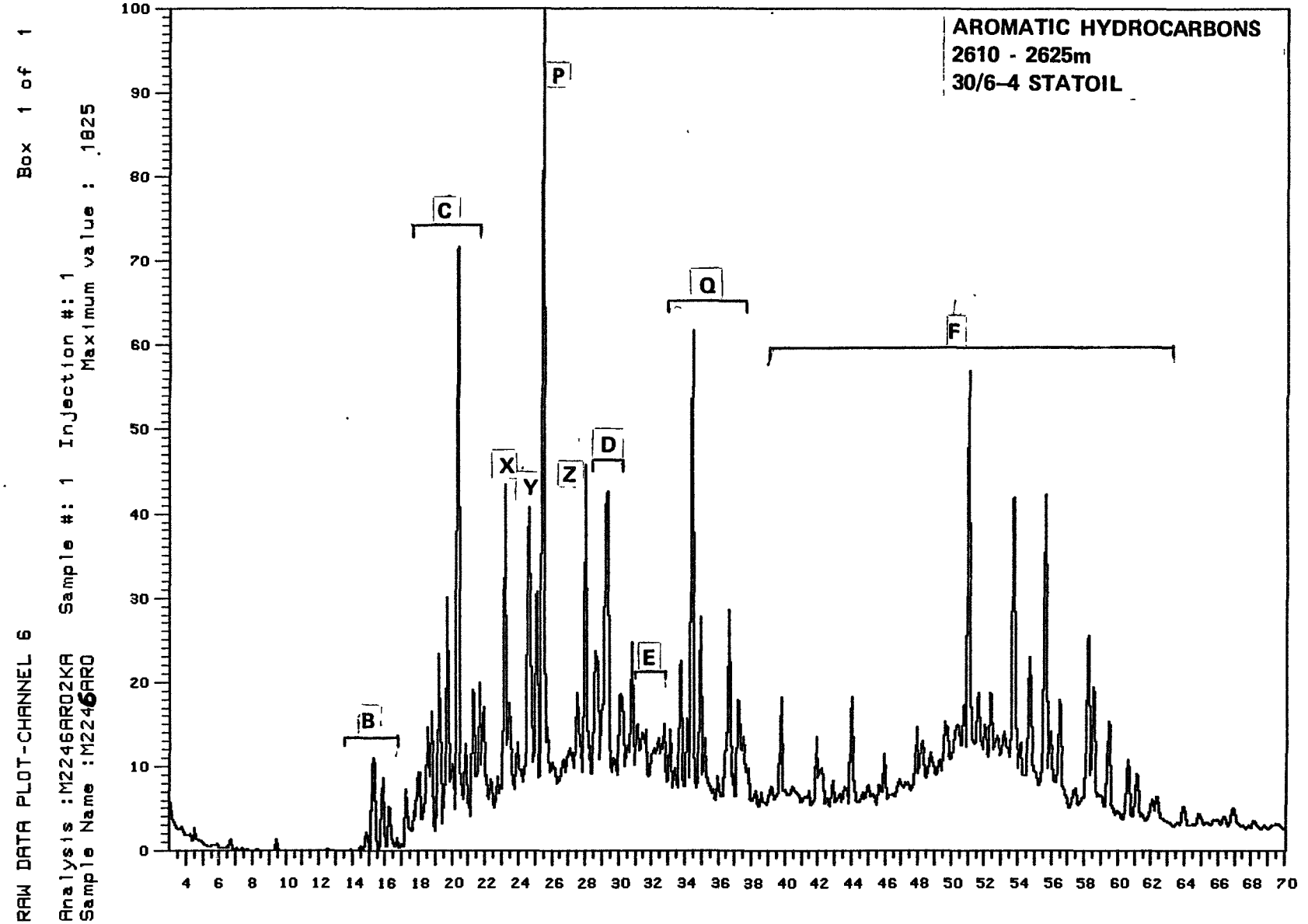
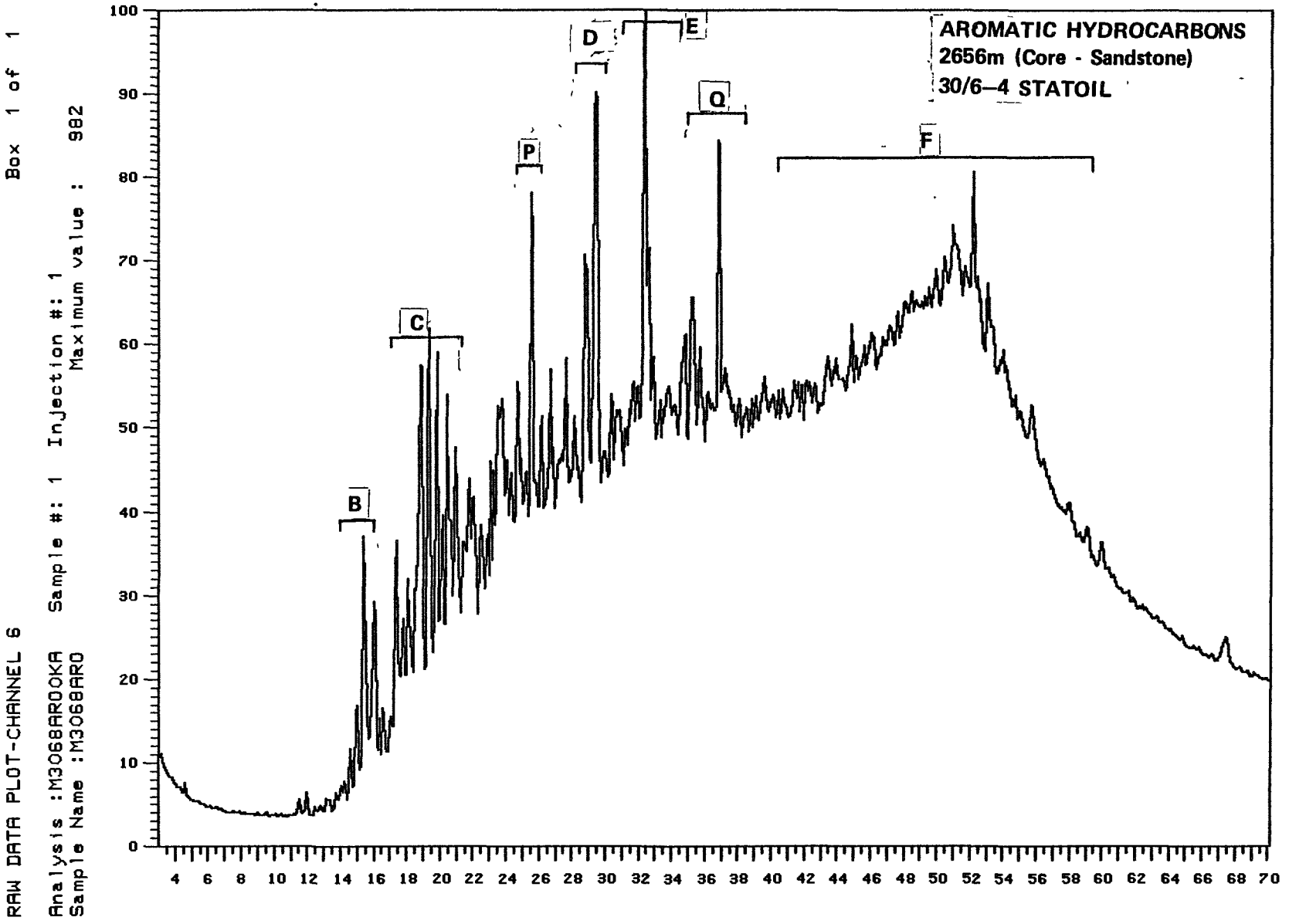
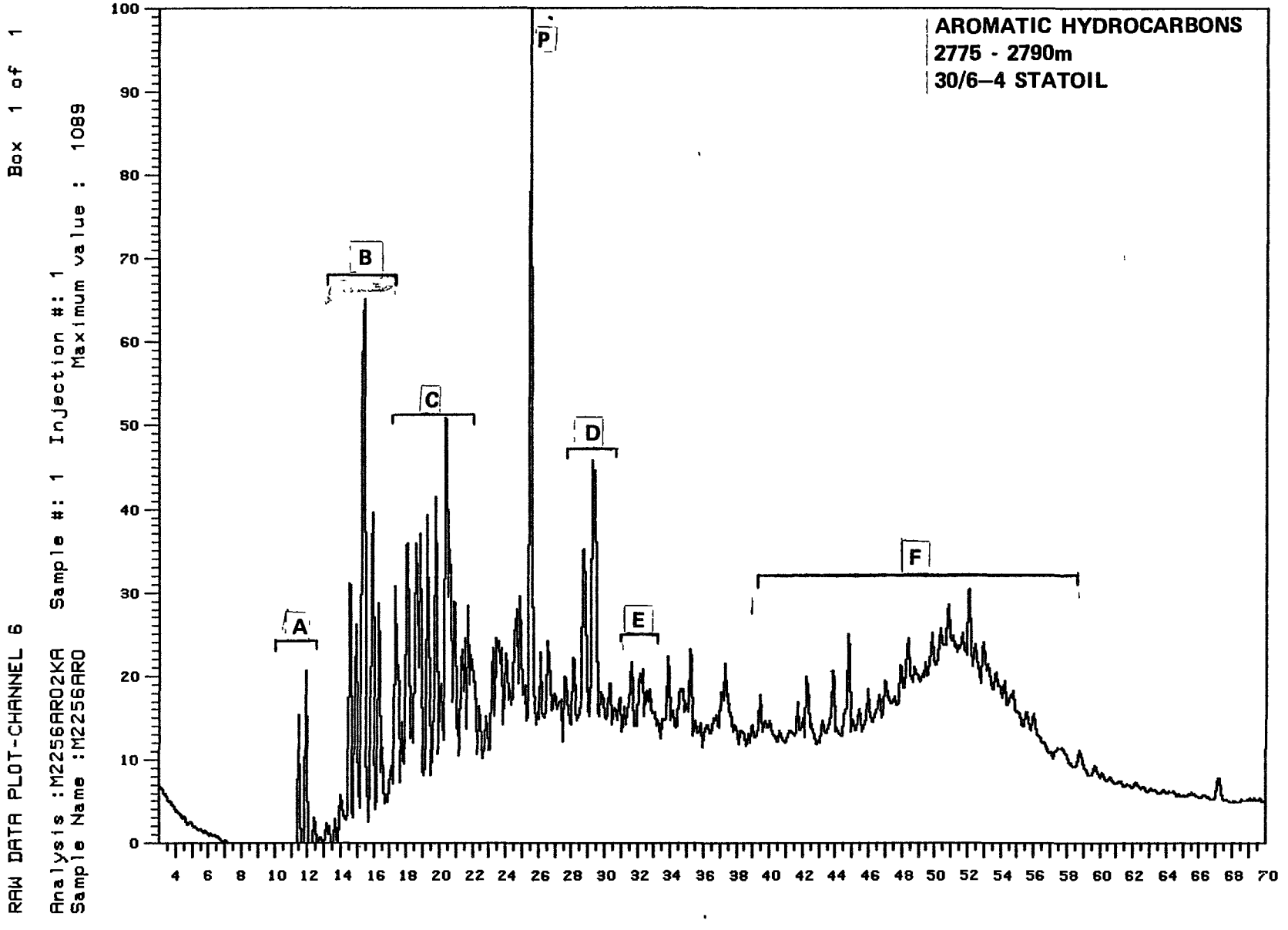
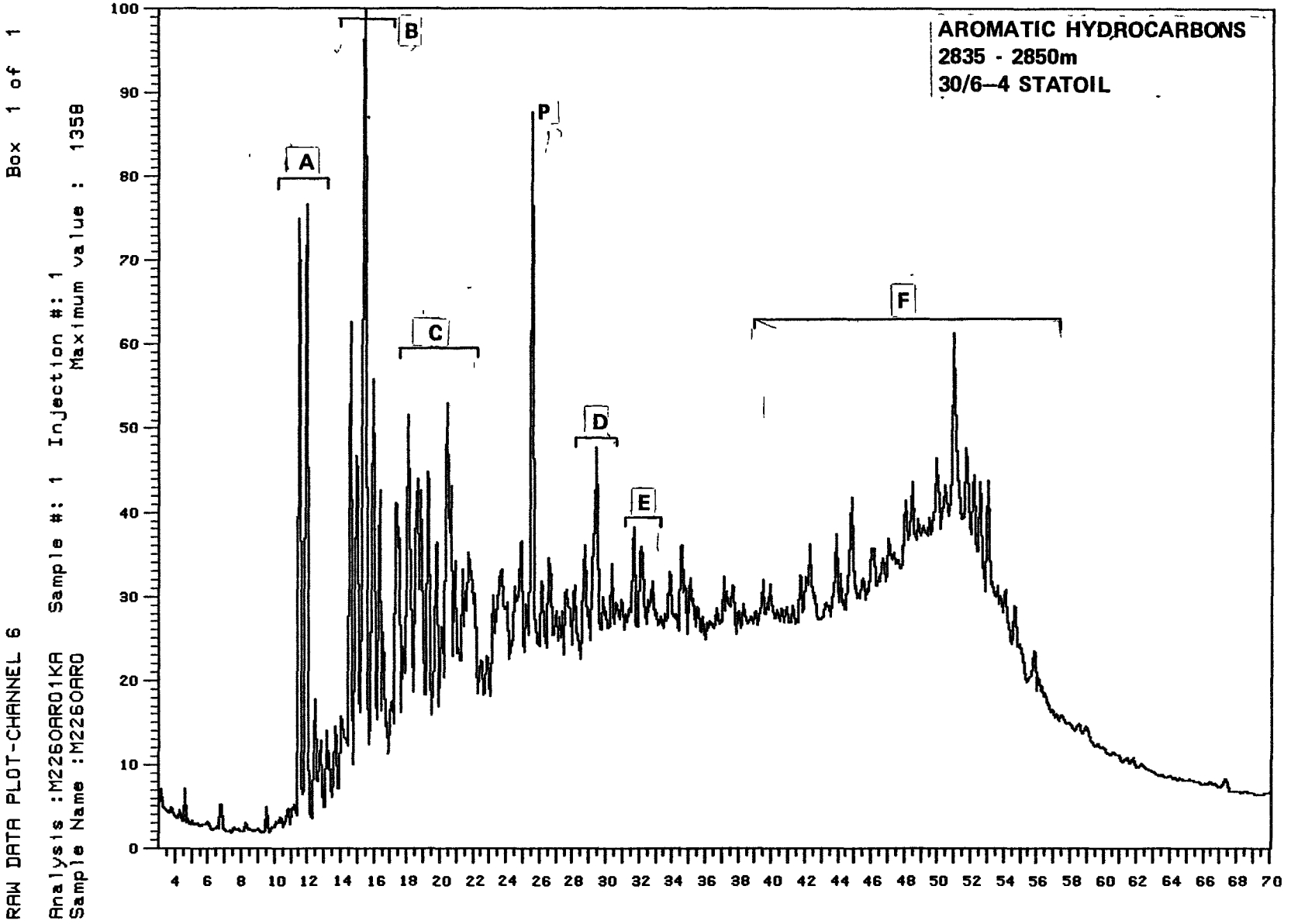
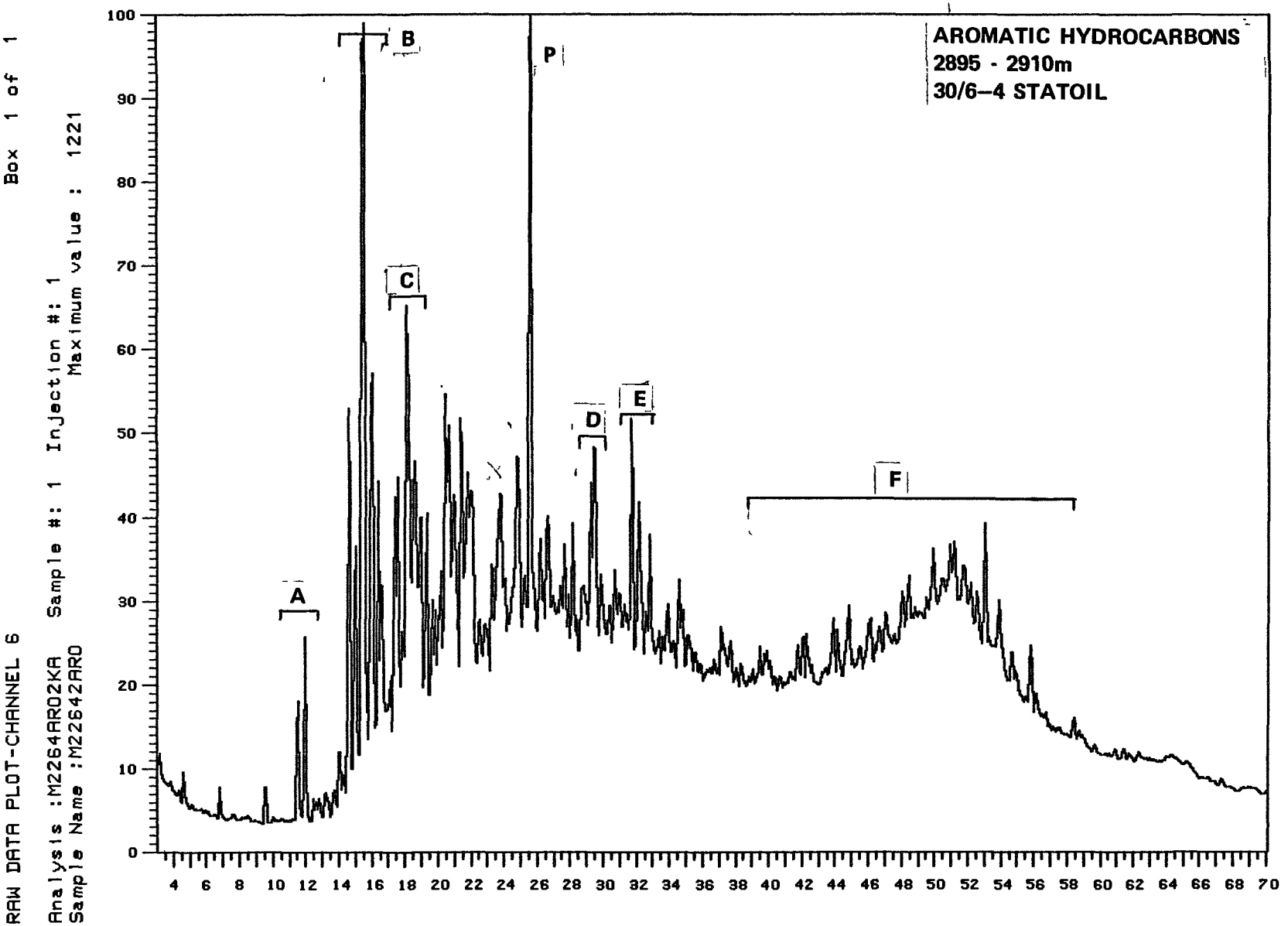
Box 1 of 1
Analysis :M2245AR02KA Sample #: 1 Injection #: 1
Sample Name :M2245AR0 Maximum value : 3256
AROMATIC HYDROCARBONS
2595 - 2610m
30/6–4 STATOIL
A
B
C
P
Y
X
D
Z
E
Q
F
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

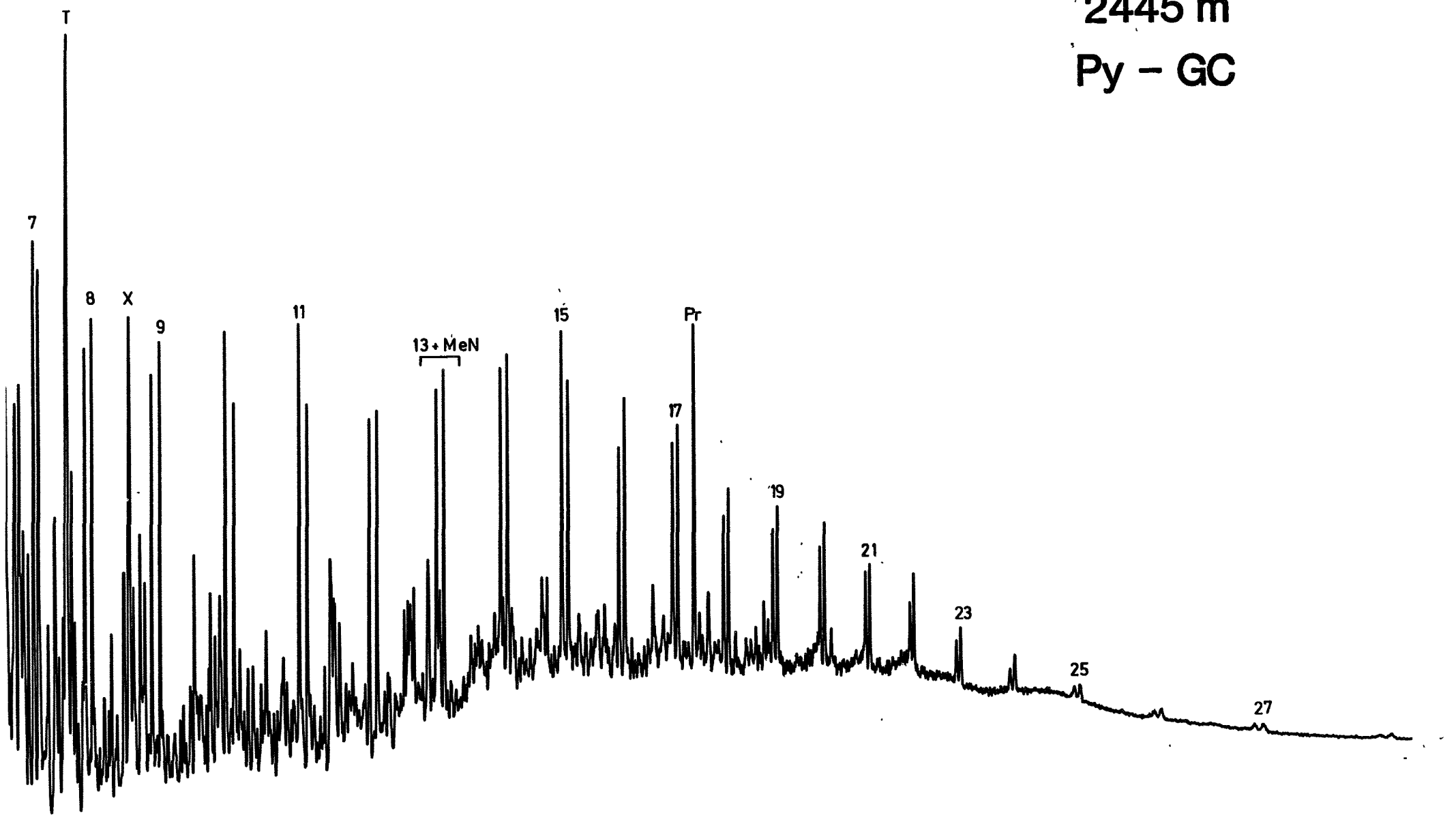

AROMATIC HYDROCARBONS
2610 - 2625m
30/6-4 STATOIL
RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M2246AR02KA
Sample Name :M2246AR0
Sample #: 1
Injection #: 1
Maximum value : 1825
B
C
P
X
Y
Z
D
E
Q
F
0
10
20
30
40
50
60
70
80
90
100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

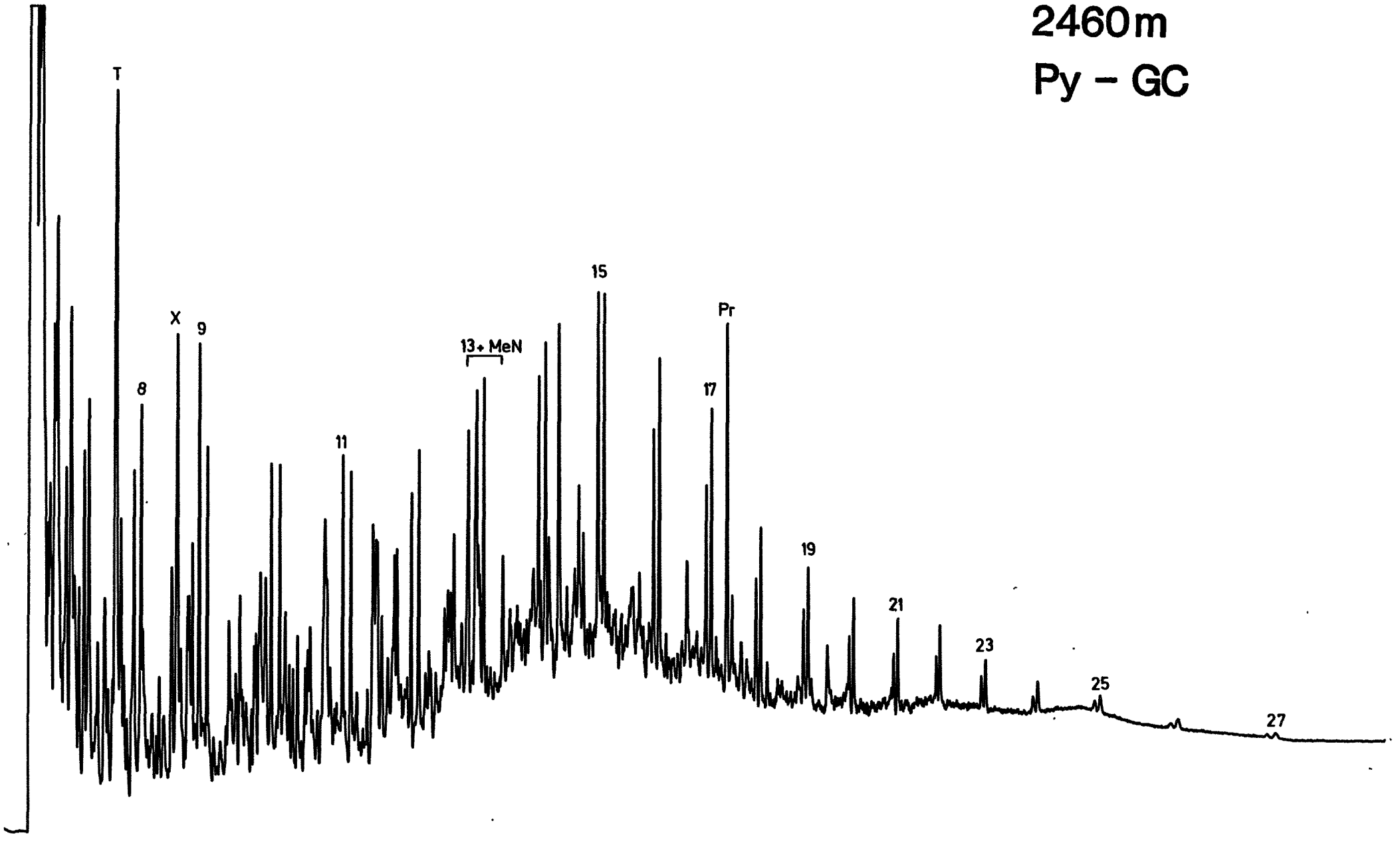

RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M3068AR0OKA
Sample Name :M3068AR0
Sample #: 1 Injection #: 1
Maximum value : 982
AROMATIC HYDROCARBONS
2656m (Core - Sandstone)
30/6–4 STATOIL
B
C
P
D
E
Q
F
0
10
20
30
40
50
60
70
80
90
100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

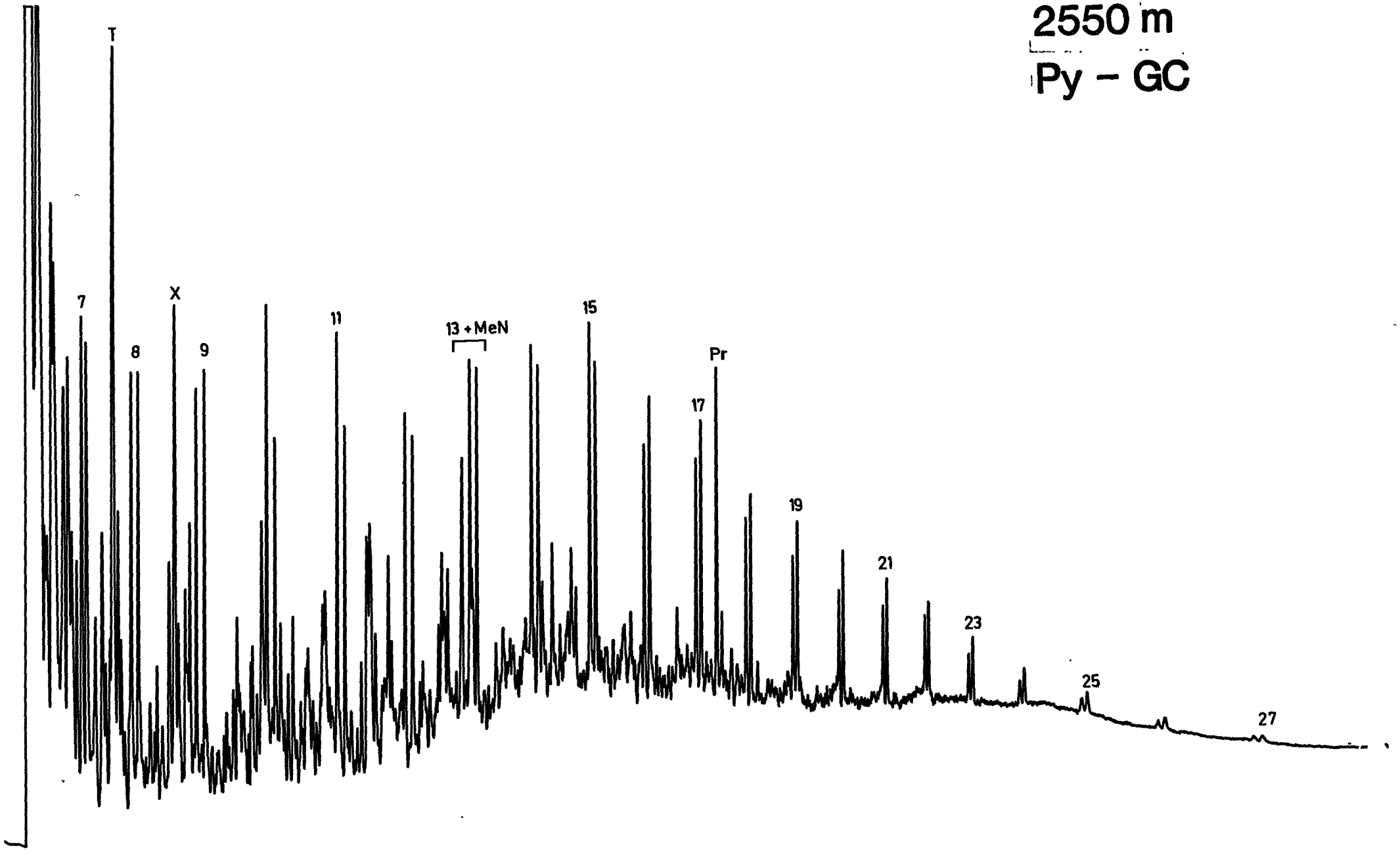

RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M2256AR02KA Sample #: 1 Injection #: 1
Sample Name :M2256AR0 Maximum value : 1089
AROMATIC HYDROCARBONS
2775 - 2790m
30/6–4 STATOIL
A
B
C
D
E
F
P
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

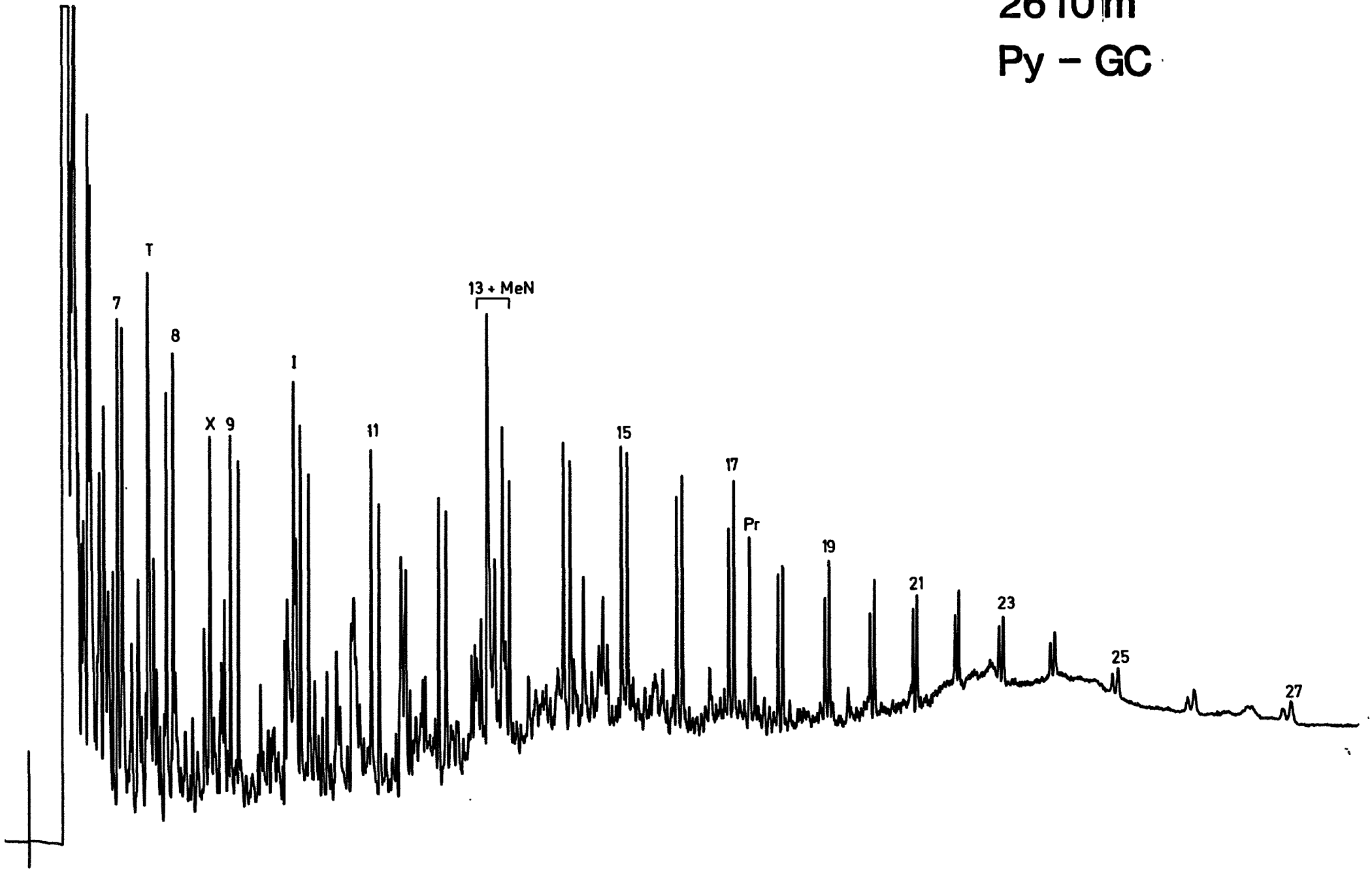

RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M226ARO1KA Sample #: 1 Injection #: 1
Sample Name :M226ARO Maximum value : 1358
AROMATIC HYDROCARBONS
2835 - 2850m
30/6-4 STATOIL
A
B
C
D
E
F
P
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

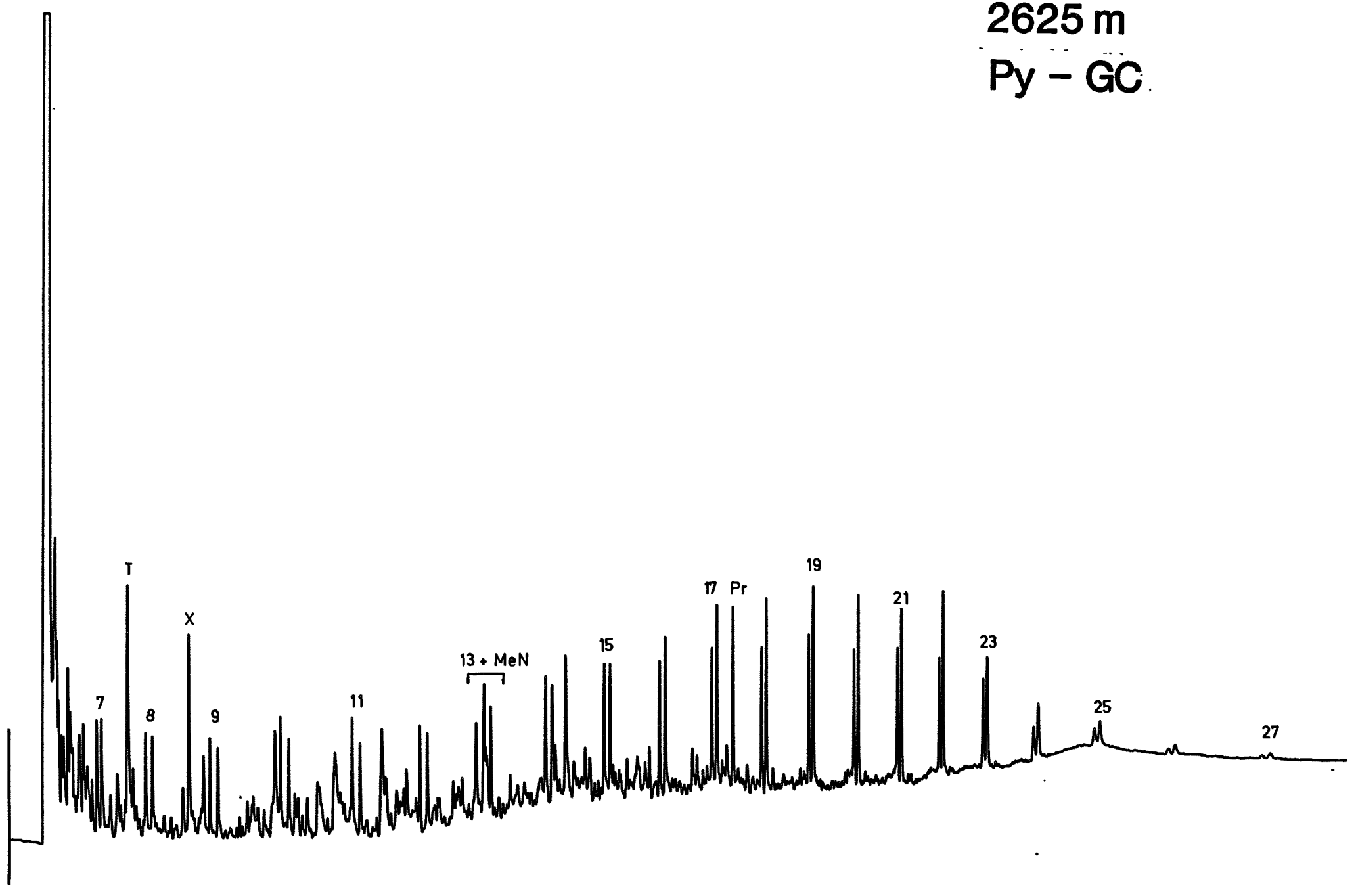

RAW DATA PLOT-CHANNEL 6
Box 1 of 1
Analysis :M2264AR02KA Sample #: 1 Injection #: 1
Sample Name :M22642AR0 Maximum value : 1221
AROMATIC HYDROCARBONS
2895 - 2910m
30/6-4 STATOIL
A
B
C
P
D
E
F
0 10 20 30 40 50 60 70 80 90 100
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

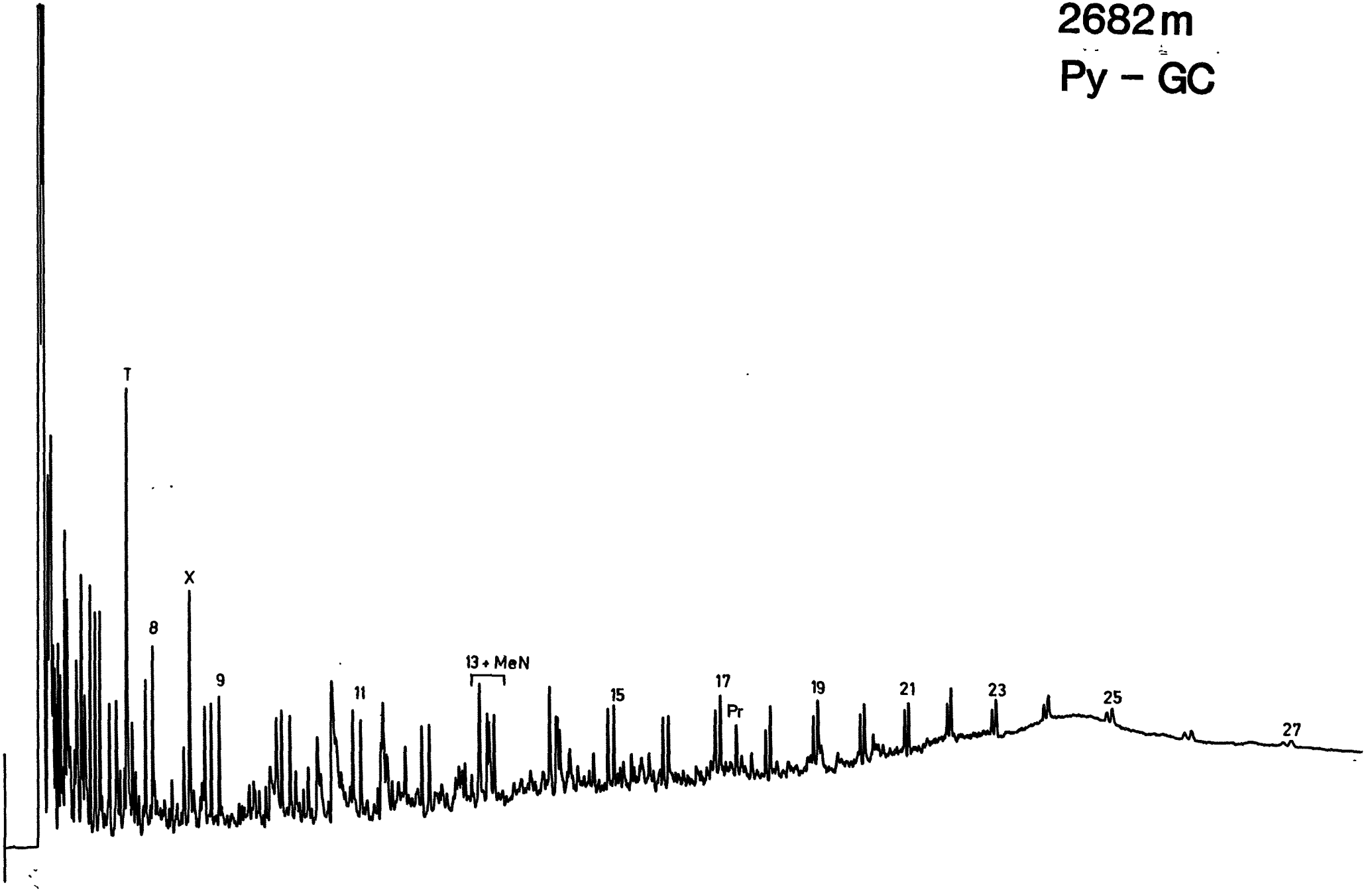

2445 m
Py – GC
T
7
8
X
9
11
13 + MeN
15
Pr
17
19
21
23
25
27

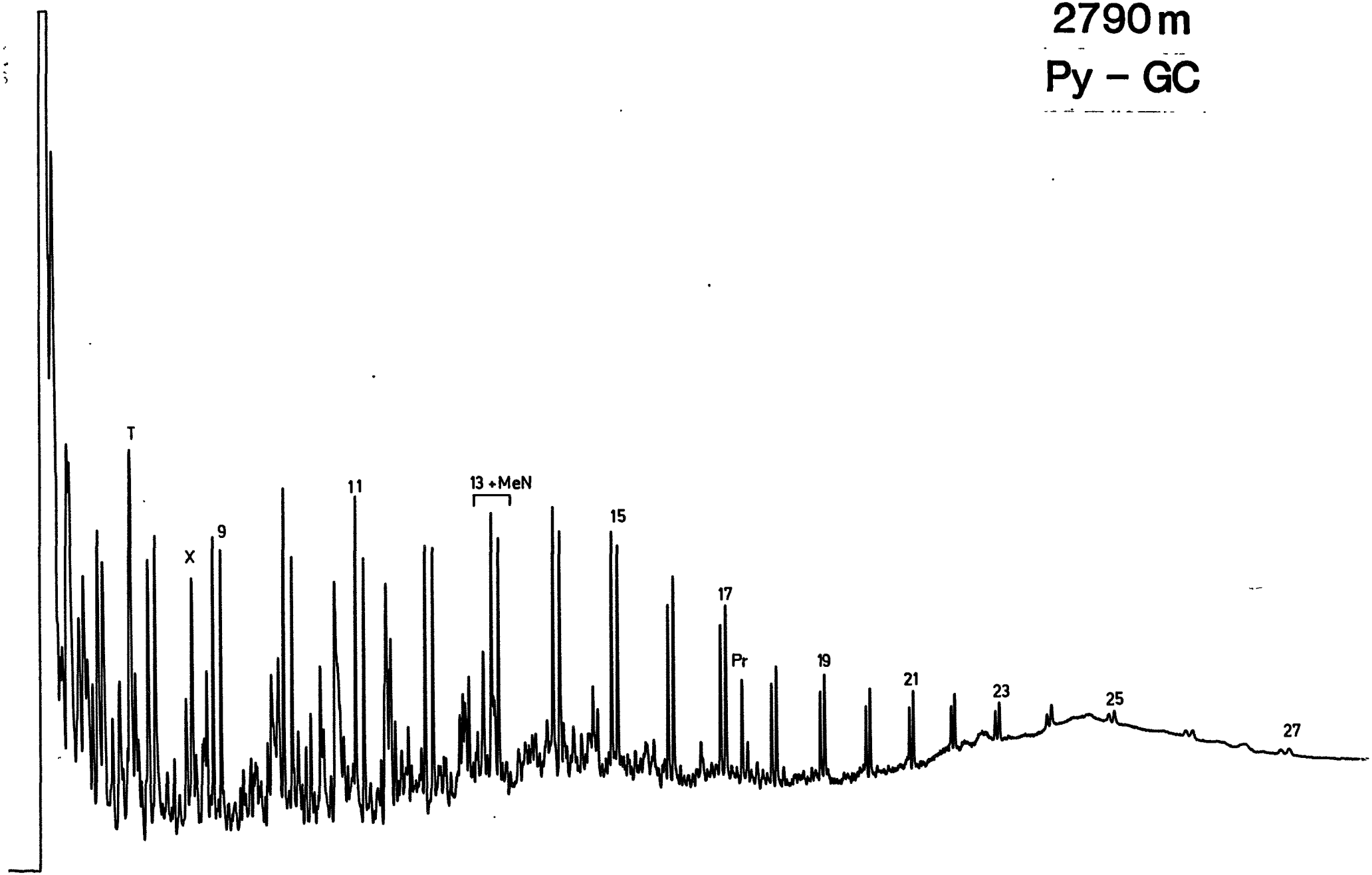

2460m
Py - GC
T
8
X
9
11
13+ MeN
15
17
Pr
19
21
23
25
27

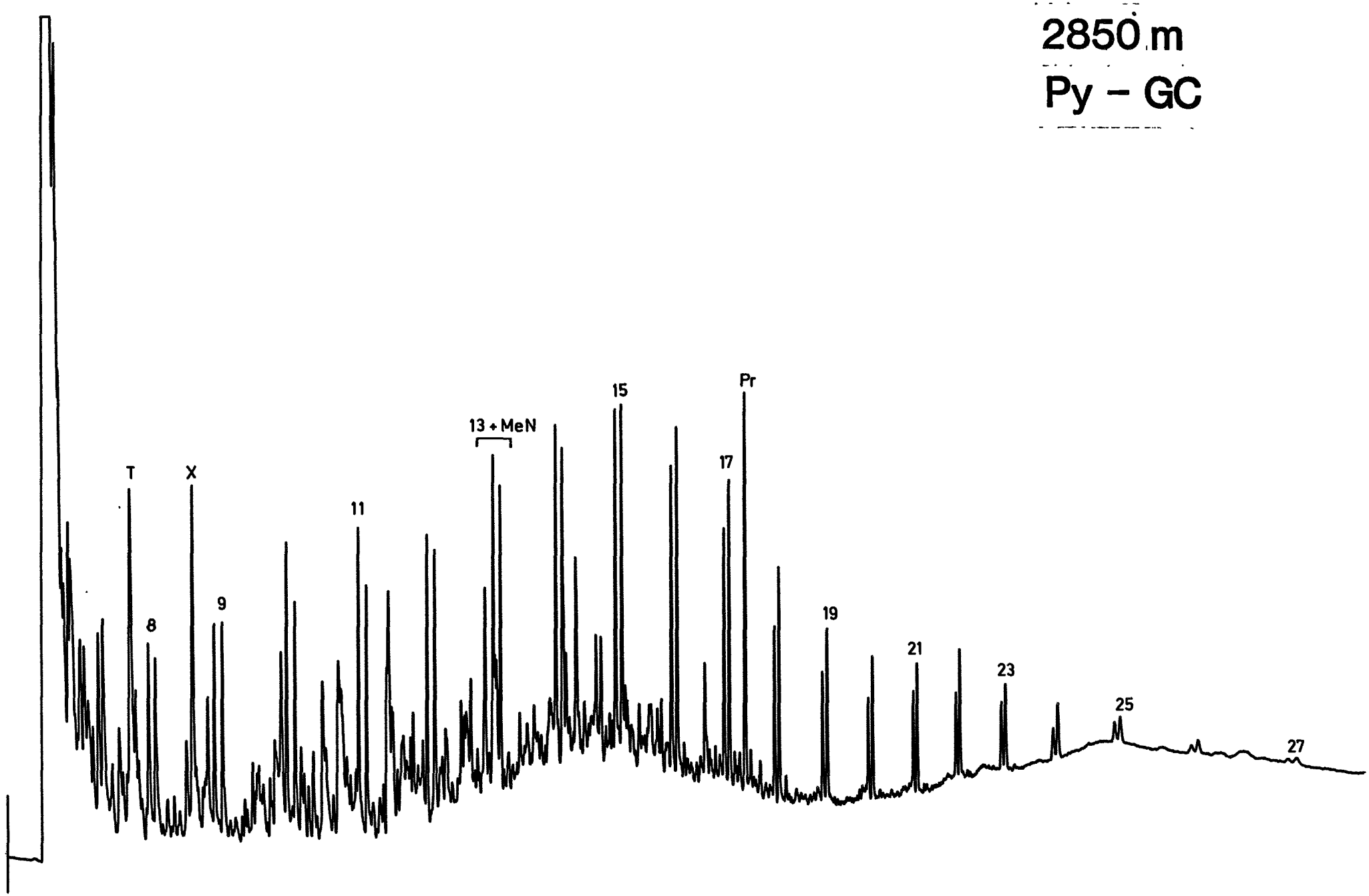

2550 m
Py – GC
T
7
8
X
9
11
13 + MeN
15
17
Pr
19
21
23
25
27

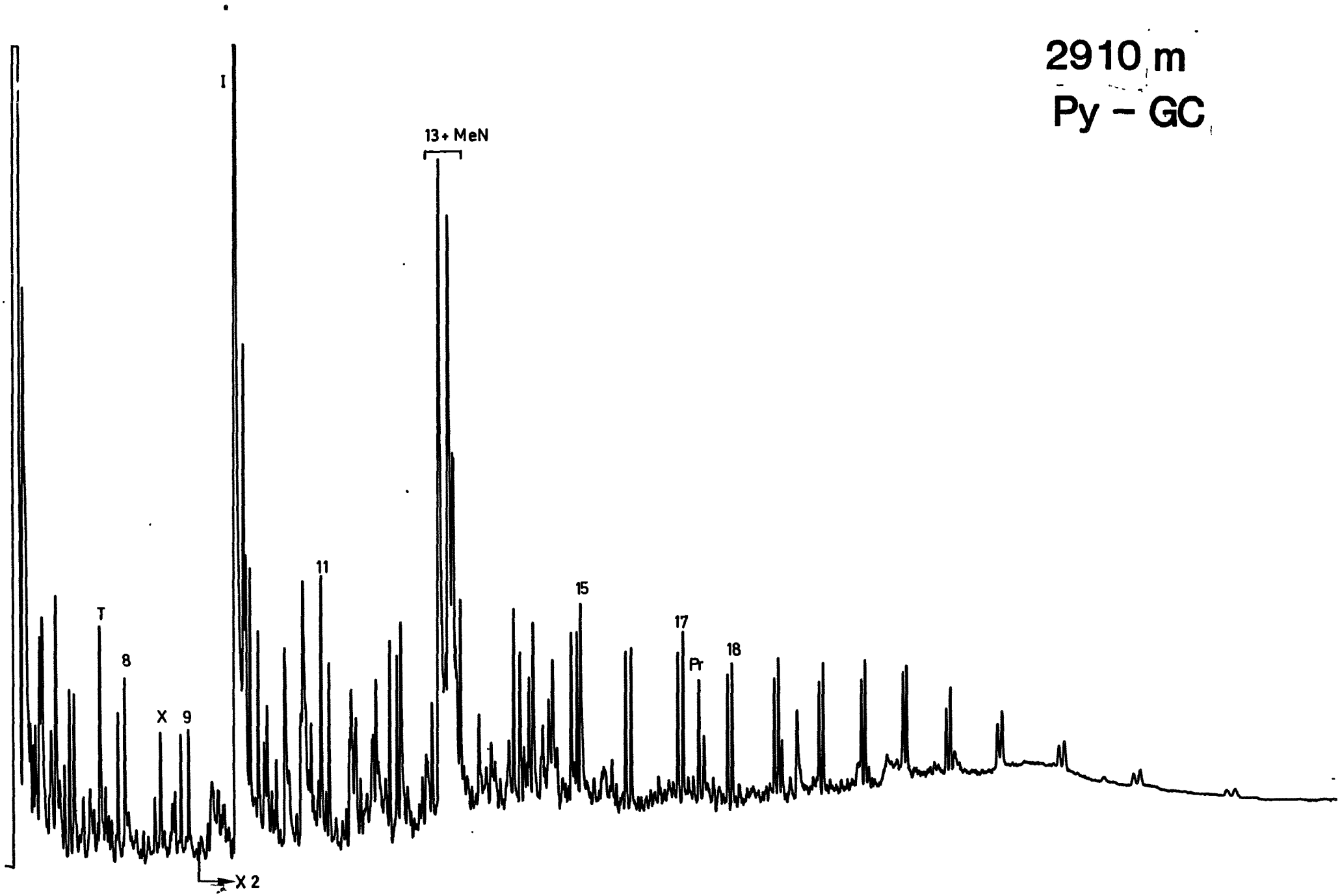

2610 m
Py – GC
7
T
8
X
9
1
11
13 + MeN
15
17
Pr
19
21
23
25
27


2625 m
Py – GC
7
T
8
X
9
11
13 + MeN
15
17
Pr
19
21
23
25
27


2682 m
Py – GC
T
8
X
9
11
13 + MeN
15
17
Pr
19
21
23
25
27


2790 m
Py – GC
T
X
9
11
13 + MeN
15
17
Pr
19
21
23
25
27


2850 m
Py – GC
T
X
8
9
11
13 + MeN
15
17
Pr
19
21
23
25
27


2910 m
Py – GC
I
13+MeN
11
15
17
Pr
18
T
8
X
9
X 2

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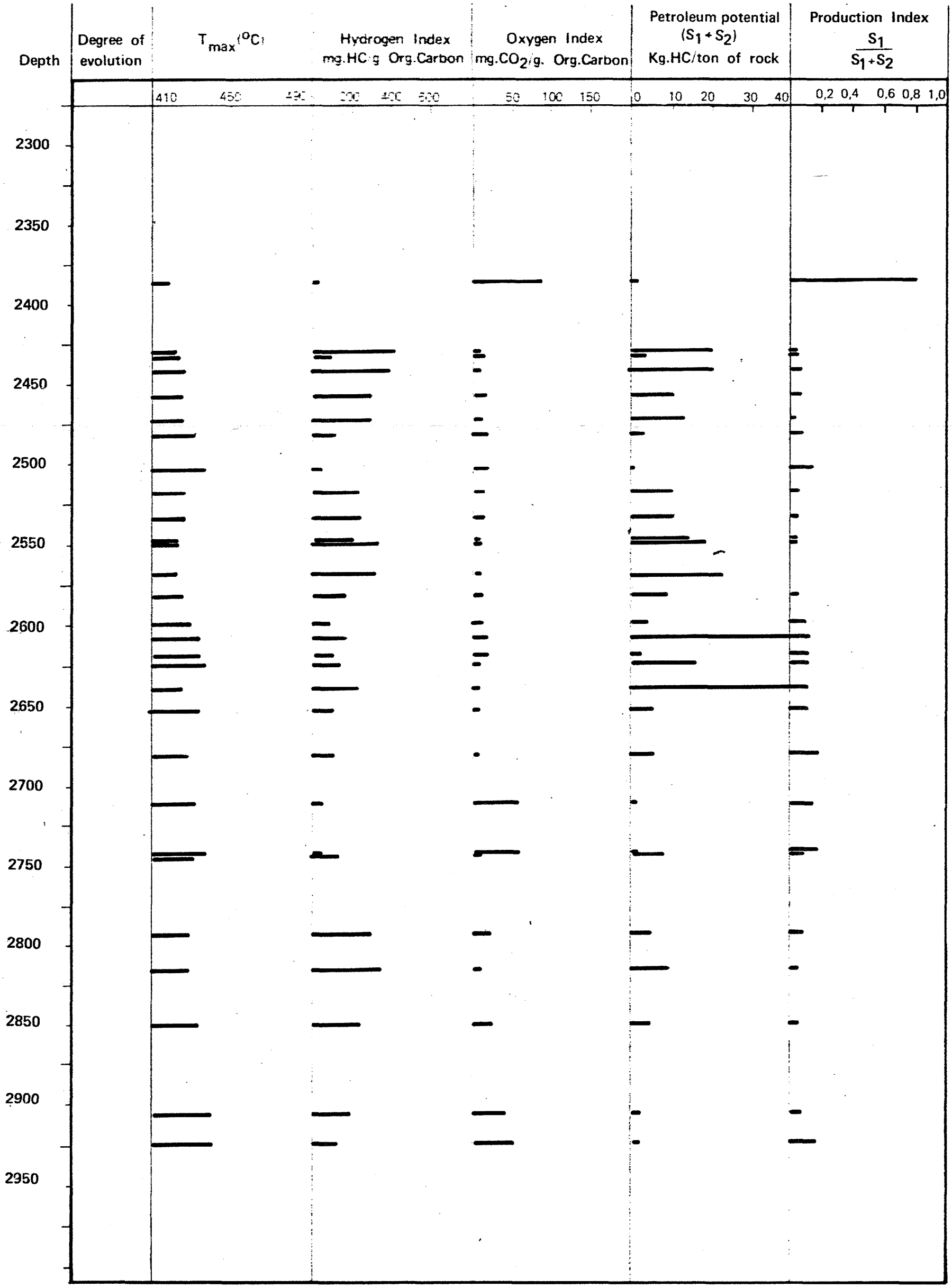
ROCK-EVAL PYROLYSIS

Well no.: 30/6-4
Company: STATOIL



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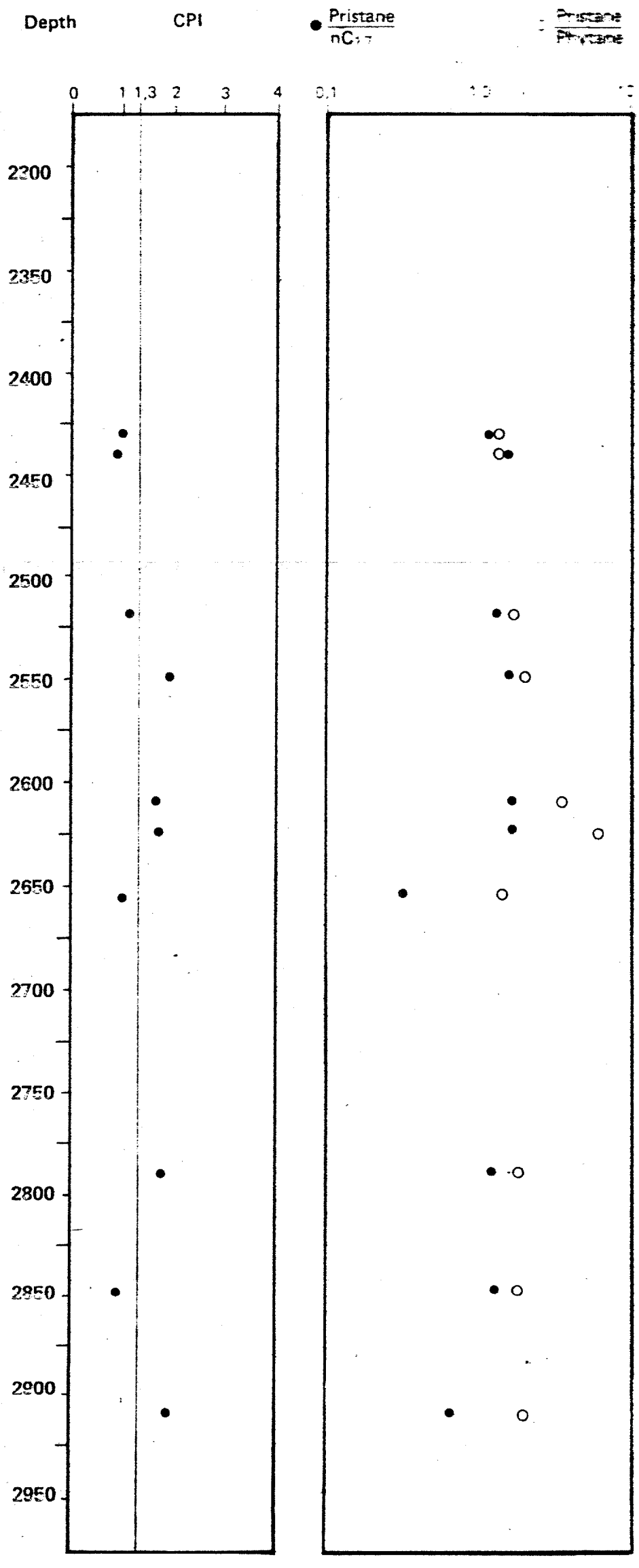
C_{15}^{-} SATURATED HYDROCARBONS
Presentation of Analytical Data

Well no: 30/6--4
Company: STATOIL



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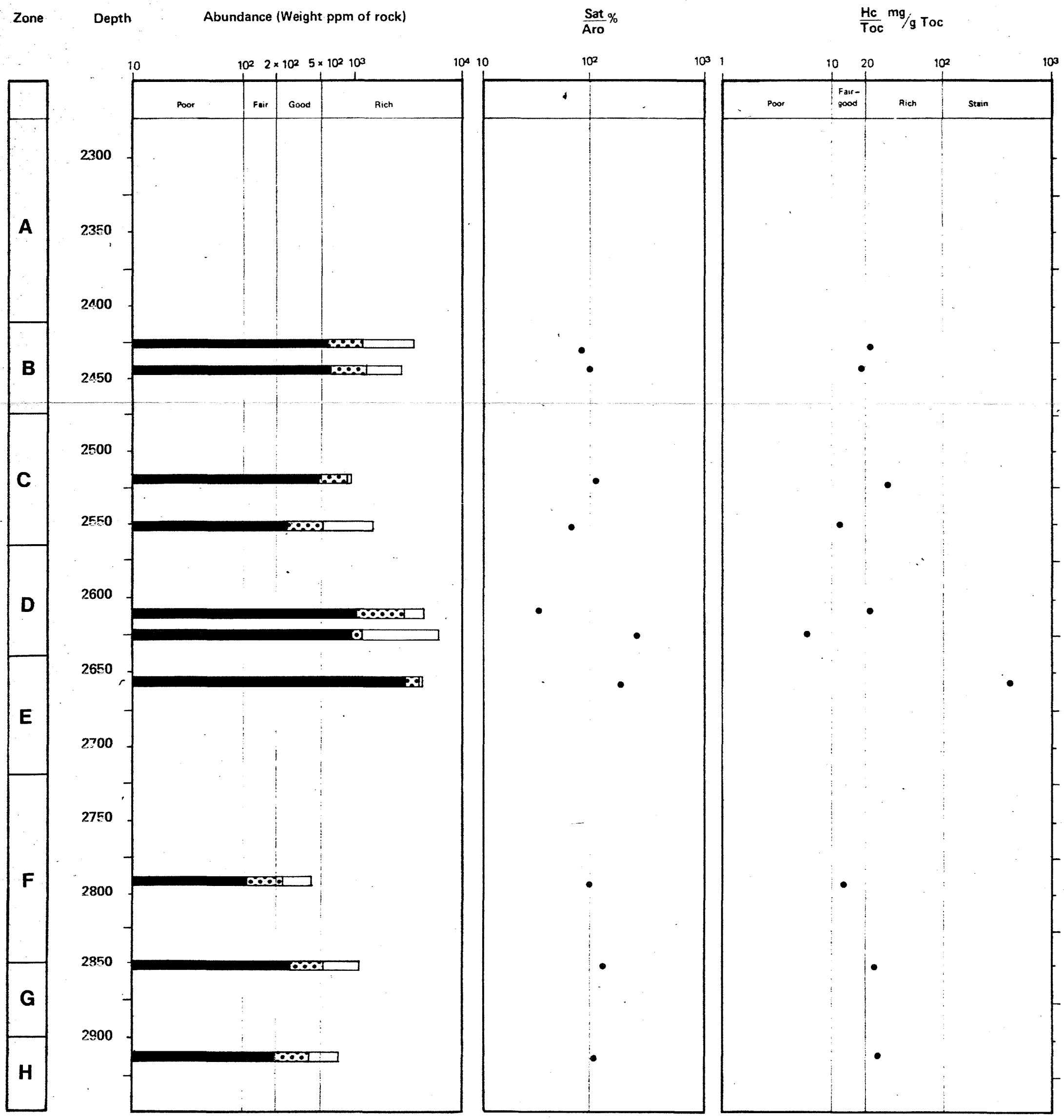
C_{15}^{+} HYDROCARBONS
Presentation of Analytical Data

Well no: 30/6–4
Company: STATOIL



Sat. Aro. NSO Asp

Sat: Saturated Hydrocarbons
Aro: Aromatic Hydrocarbons
Asp: Asphaltenes

TOC: Total Organic Carbon
HC: Hydrocarbons
NSO: Nitrogen, Sulphur and Oxygen containing compounds

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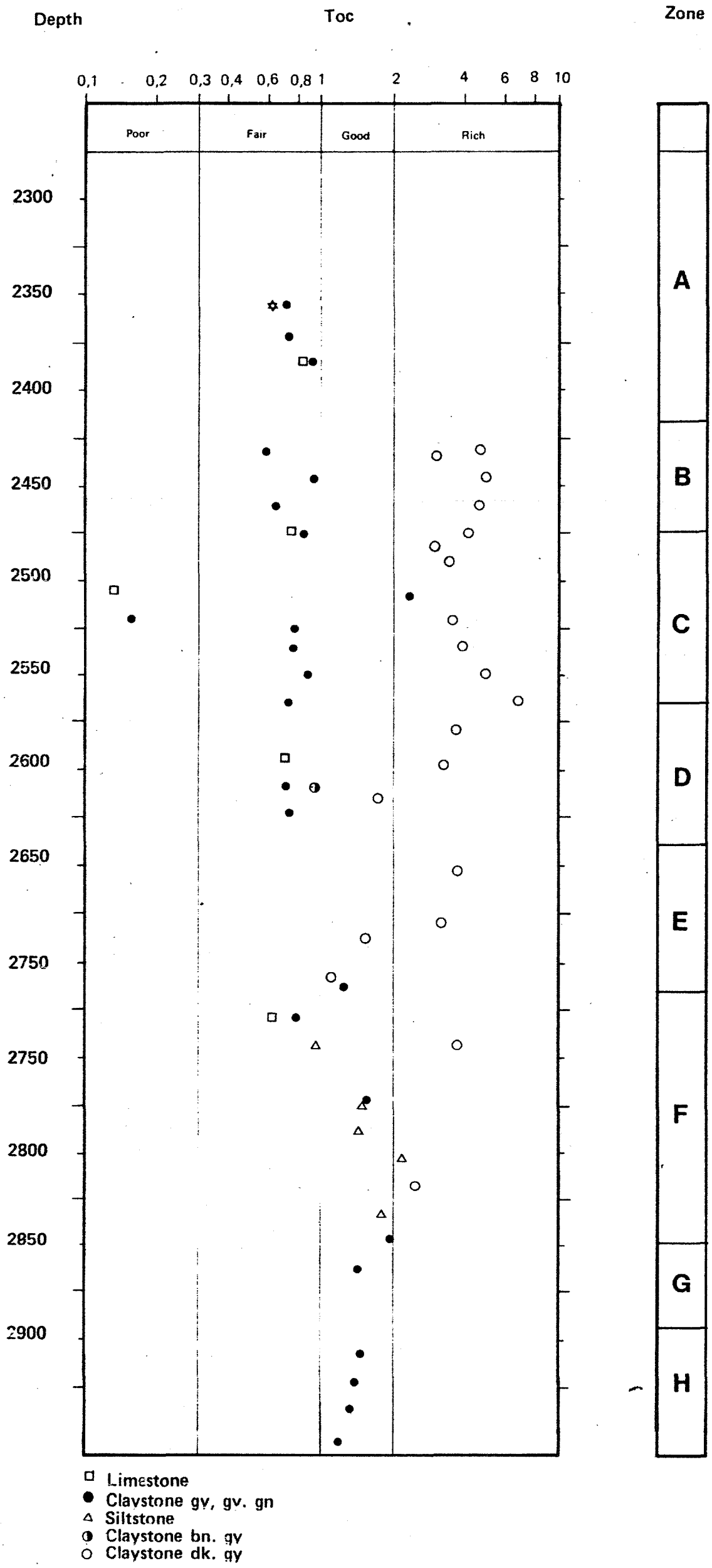
TOTAL ORGANIC CARBON (TOC)

Presentation of Analytical Data

Well no: 30/6-4
Company: STATOIL



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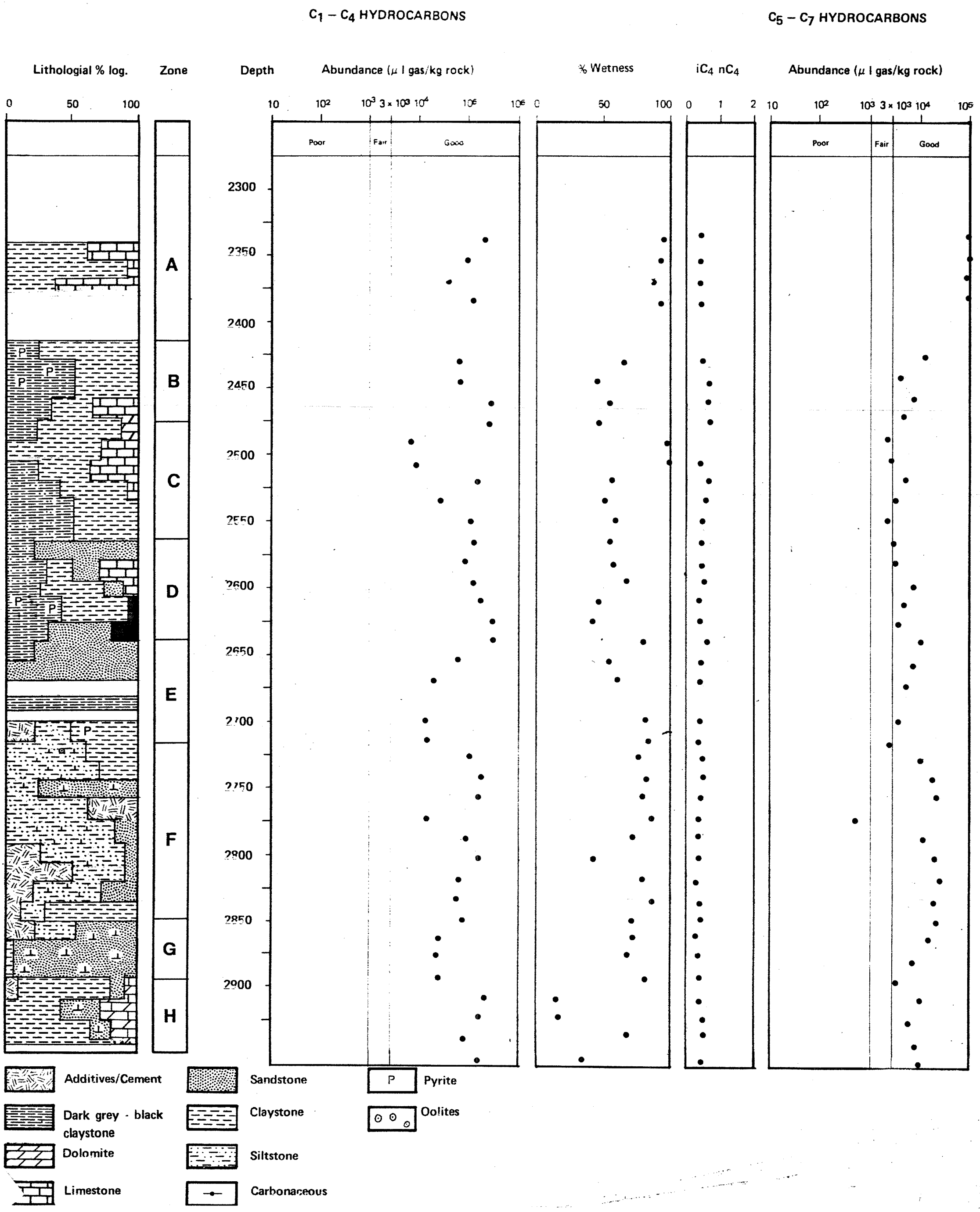
$C_1 - C_7$ HYDROCARBONS
Presentation of Analytical Data

Well no: 30/6–4
Company: STATOIL



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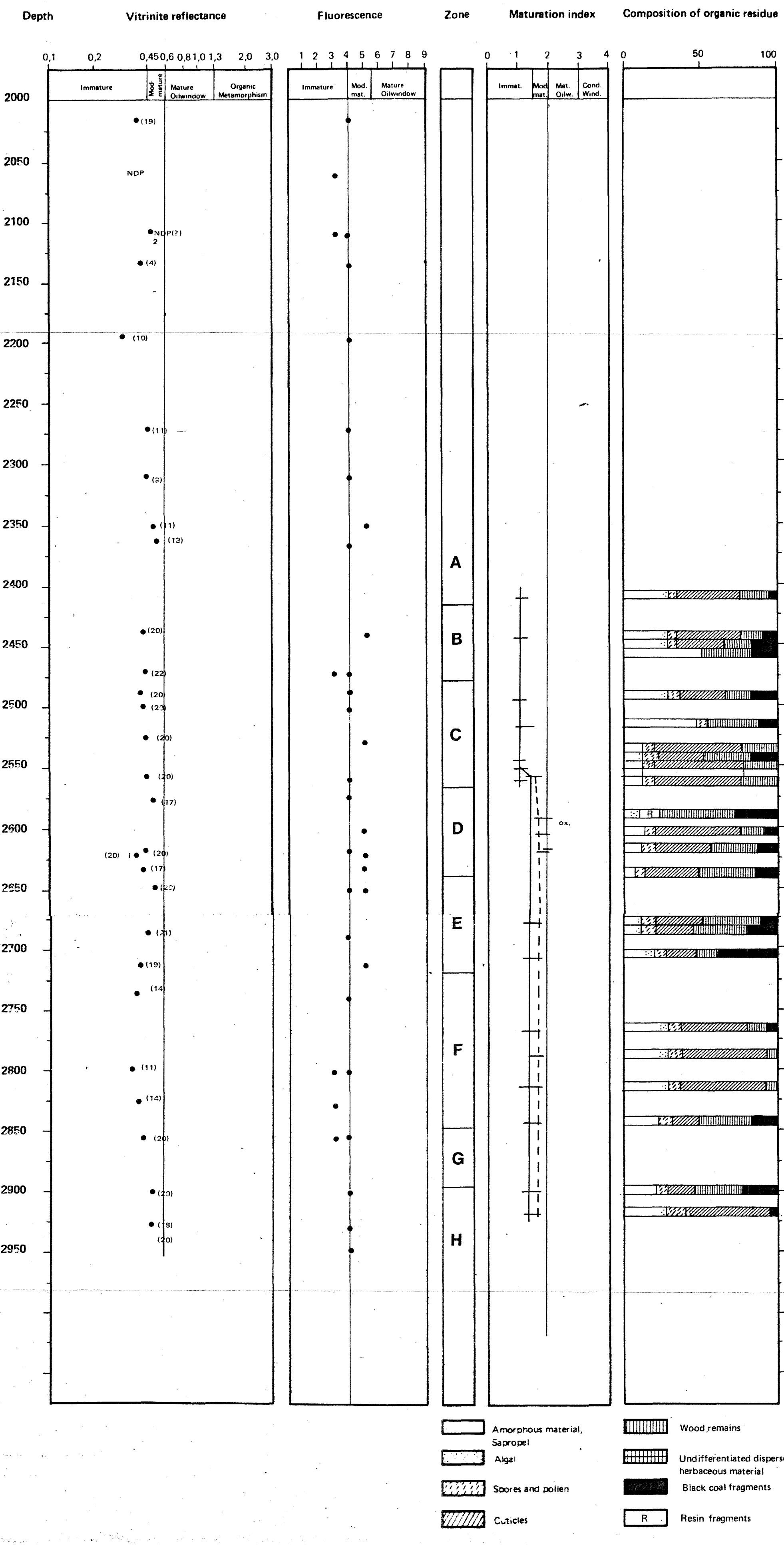
MATURATION

Well no: 30/6--4
Company: STATOIL

VISUAL KEROGEN

COLORATION AND COMPOSITION OF ORGANIC RESIDUE



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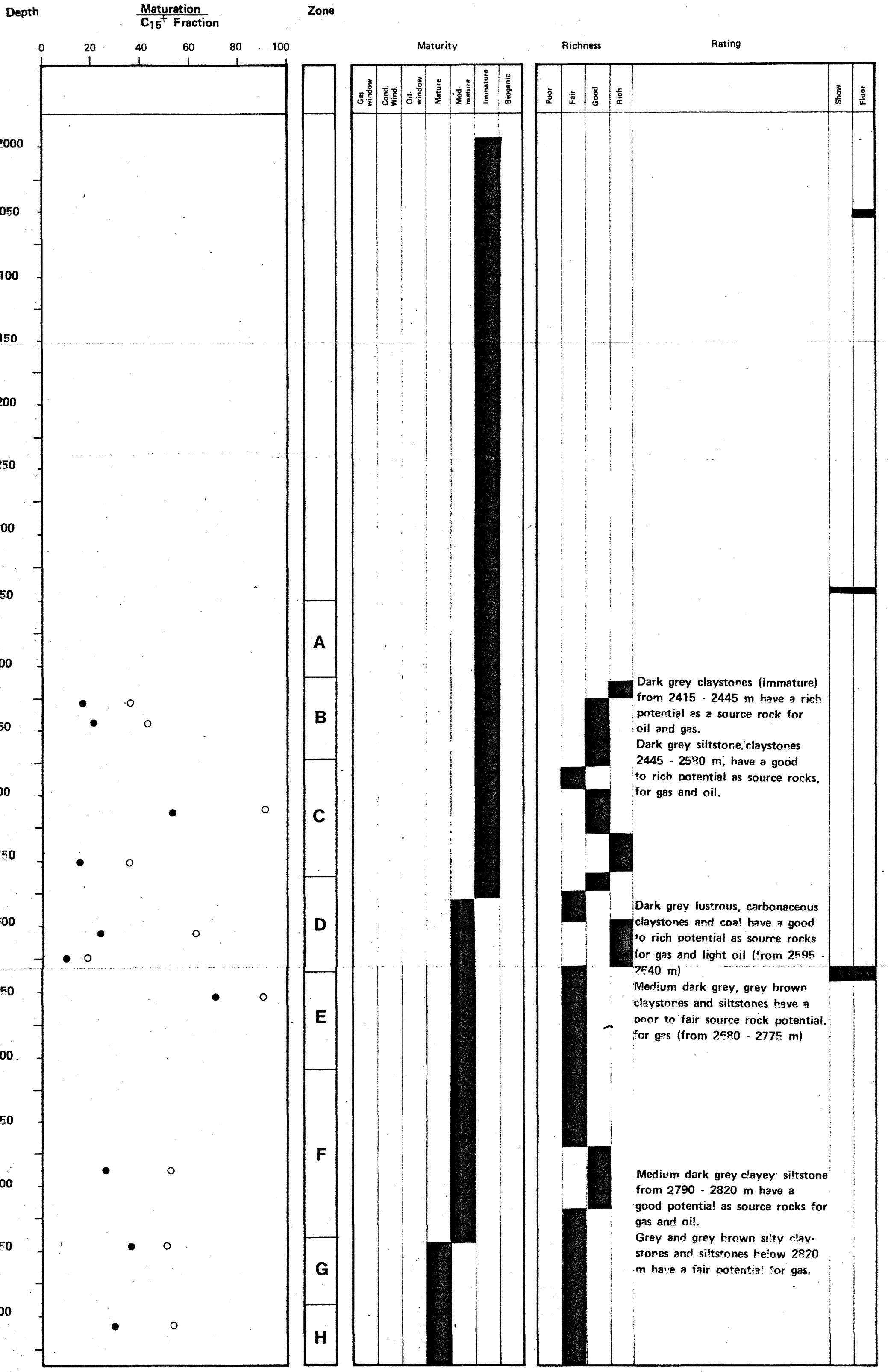
INTERPRETATION DIAGRAM

Well no: 30/6–4
Company: STATOIL

SUMMARY OF SOURCE POTENTIAL



Sat: Saturated Hydrocarbons
HC: Hydrocarbons
EMO: Exstactable Organic Matter