GEOCHEMICAL ANALYSIS REPORT

WELL NOCS 30/6-11

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Generation of hydrocarbons appears to have started in parts of the Viking Gp. as well as in the Brent Gp. and Drake Fm. Mostly gas and heavy oil seems to be generated in the Brent Gp. and Drake Fm., as would be expected from these strongly terrestrially affected source rocks.

Migrated hydrocarbons appear to be present in the Etive Fm. conglomerate and possibly also in the Amundsen/Burton Fm. The hydrocarbons in the Etive Fm. appear to have a maturity comparable to about 1.0% Ro and to be sourced from an Upper Jurassic source rock, while those in the Amundsen/Burton Fms. appear to be more mature, possibly corresponding to about 1.3 % Ro and to be sourced from a strongly terrestrially influenced source rock. The identification of the latter hydrocarbons is tentative, due to the severe contamination of the samples.

INTRODUCTION

Well NOCS 30/6-11 is situated immediately north of the Oseberg field in the Norwegian sector of the North Sea. The total drilled depth is 4001 m. The well is located at 60°43'28.95''N and 02°44'42.00''E at a water depth of 121 m. Elevation of Kelly Bushing (KB) was 25 m. All depths are relative to KB unless otherwise specified. Samples were collected between 2350 m and 4001 m from the Norwegian Petroleum Directorate in Stavanger. A total of 166 samples was collected, washed (only the cuttings samples) and described. The analysed section of the well is from 2350 m to 3995 m with sampling intervals of 5 to 30 m for the cuttings samples and variable intervals for the core-chip samples. A careful selection of suitable samples was made for screening analyses (i.e. TOC and Rock-Eval analyses). Fifty-nine samples were selected for this analysis, and from the data obtained the samples were chosen for follow-up analyses.

These were as follows:

Thermal extraction - pyrolysis - gas chromatography	15 samples
Extraction, MPLC fractination, saturated and aromatic hydrocarbon gas chromatography	8 samples
Vitrinite reflectance microscopy	11 samples
Visual kerogen analysis	8 samples
Isotope analysis of C15+ fractions	3 samples
Gas chromatography - Mass spectrometry	4 samples

Tables listing in detail the samples analysed and the results are located in Appendix 1. The following stratigraphic information is taken from NPD Well Data Summary Sheets Volume 14.

Tertiary	
Montrose Group	2333 - 2351 m
Maureen Formation	2333 - 2351 m
Cretaceous	
Shetland Group	2351 - 3260 m
Jurassic	
Viking Group	3260 - 3351 m
Draupne Formation	3260 - 3264 m
Heather Formation	3264 - 3351 m
Brent Group	3351 - 3561 m
Ness Formation	3351 - 3459 m
Etive Formation	3459 - 3561 m
Dunlin Group	3561 - 3892.5 m
Drake Formation	3561 - 3752.5 m
Cook Formation	3752.5 - 3768.5 m
Amundsen/Burton Formation	3768.5 - 3892.5 m
Statfjord Formation	3892.5 - 4001 m
Total Depth	4001 m

LITHOLOGY AND TOTAL ORGANIC CARBON CONTENT

One hundred and sixty-six samples were described and fifty-nine of these were analysed for TOC content. Figure 1 shows the variation in TOC over the analysed interval of the well plotted with a generalised lithological column. A similar TOC versus the observed lithology is shown in Enclosure 1. The TOC data are listed in Tables 1 and 2, while the lithology description can be found in Table 1.

<u>Tertiary</u> (146 - 2351 m)

Montrose Group (2333 - 2351 m)

Maureen Formation (2333 - 2351 m)

One sample was decribed from this formation. It consists of a light greyish marl. It has a fair TOC content (0.70 %).

<u>Cretaceous</u> (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Thirty-one samples were described from this group. It consists of light grey marls at the top grading to medium grey, calcareous claystones around 2550 m. In the section from 2920 m to 3130 m, the cuttings are strongly thermally altered due to turbodrilling. Most likely the lithology is still dominated by medium grey claystone in this section but due to the "turbodrilling" their appearance is strongly altered and the section is simply described as consisting of "turbodrilled fragments" (trbfrags). Towards the base of the formation the claystone becomes silty. Occasionally pinkish/ reddish limestone is present.

Six samples were analysed for TOC content from this group, one marl, four claystones and one of the indurated cuttings samples (termed "Other" in the lithology table). The clay-stones and the marl have a fair to good TOC content (0.86 to 1.14 %). The indurated cuttings sample also has a fair TOC content, but only about half of that of the other samples (0,50 %). Clearly this sample has been strongly affected by the drilling technology used.

Jurassic (3260 - 4001 m,TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

No samples were collected from this formation due to the very limited thickness of this bed. It is however suspected that the core chip sample from 3266 m (described below) is rather from the Draupne Fm. than the Heather Fm.

Heather Formation (3264 - 3351 m)

Fourteen samples were described from this formation. One of the samples was a core-chip sample (from 3266 m), the others are cuttings samples. The dominant in-situ lithology seems to be a medium grey to green grey, silty, claystone. This con-trasts strongly to the core chip sample which consists of a dusky yellowish brown claystone. A dusky yellowish brown to brown grey siltstone is also present at up to 20 % in some of the samples and dominates the basal sample.

Eleven of the samples were analysed for TOC content, the dusky yellowish brown claystone of the core-chip sample, two of the siltstones and eight of the medium to green grey claystones. The dusky yellowish brown claystone sample has a good TOC content of 1.31 %. The two siltstone samples also have good TOC contents (1.70 and 1.82 %). The medium grey to green grey claystones have generally a fair TOC content but range fair to good (0.55 to 1.18 %, but mostly around 0.5 %). The highest TOC values of the formation appear to occur at the top and at the base.

Brent Group (3351 - 3561.5 m)

Ness Formation (3351 - 3459 m)

Twenty samples were described from this formation, two of these were core-chip samples, the others cuttings samples. The formation is dominated by interbedded siltstone, claystone and sandstone. The siltstone is concentrated towards the top, the claystone is concentrated in the interval 3290 - 3450 m. Minor amounts of coal are also present.

Ten samples were analysed for TOC content from this formation. Two siltstones (of which one is a core-chip sample), four sandstones (of which also one is a core-chip sample) and four claystones. The siltstone sample at the top of the formation has a rich TOC content of 2.55 % and seems to be similar in type to that found at the base of the Heather Fm. The siltstone sample at the base of the Ness Fm. has a good TOC content of 1.38 %. Of the sandstone samples three have similar TOC contents ranging 0.11 to 0.25 %. The fourth sandstone sample has a very high TOC content, for a sandstone sample, of 1.17 %. This high TOC content is probably due to inclusion of coal particles in the sandstone sample. The four claystones can be divided in two groups. The one medium to green grey claystone has a fair TOC content of

0.76 %. This claystone is suspiciously similar to the claystones found in the Heather Fm. and it is strongly suspected that it is caved from the Heather Fm. The three other claystone samples are brown grey to brown black and they all have rich TOC contents (4.16 to 9.34 %).

Etive Formation (3459 - 3561 m)

Twenty-five samples were described from this formation, eight of them core-chip samples and the others cuttings samples. The very top of the formation is dominated by a conglomerate bed (or a very coarse, unsorted sandstone). The rest of the formation is dominated by a white to light grey sandstone, with variable grain size. It is partly loose, partly well cemented. Claystone of various colours is dominant in many of the cutting samples in the upper part of the formation, but the similarity with the claystones (and siltstones) of the Heather Fm. and Ness Fm. above, plus the fact that the upper part of the Etive Fm. was cored, make one very suspicious that these claystones are caved. Minor amounts of coal are also observed, possibly they are also caved.

Ten samples were analysed for TOC content for this formation, one conglomerate and nine sandstone samples. No claystones or coal samples were analysed as they are believed to be caved. All the samples have fairly low TOC contents in the range 0.04 to 0.25 %, mostly below 0.10 %.

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

Thirty samples were described from this formation. The dominant lithologies are sandstone and siltstone. The formation is also strongly affected by additives/contamination such as coal-like additive (lignosulphonate ?), cement, "black-magic"/grease etc. Generally sandstone seems to dominate in the upper part, while siltstone tends to dominate in the lower part. Occasionally claystone stringers are also present.

Nine samples were analysed for TOC content from this formation. Four are sandstone samples, four are siltstone samples and one is a claystone sample. The sandstone samples have TOC contents ranging 0.06 to 0.32 %. The siltstones all have good TOC contents (1.18 to 1.68 %), while the claystone sample has a rich TOC content (2.23 %).

Cook Formation (3752.5 - 3768.5 m)

Three sample were described from this formation, two core-chip samples and one cuttings sample. The cuttings sample is completely dominated by contaminants of various types. The two core-chip samples consist of sandy siltstone. The two siltstone samples were analysed for TOC content. They have quite different TOC contents, the upper sample having a fair TOC content of 0.59 %; the lower having a good TOC content of 1.87 %.

Amundsen/Burton Formation (3768.5 - 3892.5 m)

Thirty-six samples were described from this formation, one core-chip sample, the others cuttings samples. The upper part of the formation, down to about 3840 m is dominated by siltstone. From about 3840 m and down, the formation is dominated by cemented sandstone.

Six samples were analysed for TOC content from this formation, four siltstones (of which one core-chip sample) and two sandstone samples. All the siltstone samples have good TOC contents (1.11 to 1.45 %). The sandstone samples have TOC contents ranging 0.20 to 0.30 %.

Statfjord Formation (3892.5 - 4001,TD m)

Nineteen samples were described from this formation, these being dominated by loose sandstone. Four of the samples were analysed for TOC content, these ranging 0.05 to 0.12 %, i.e. poor.

ROCK-EVAL ANALYSIS

Fifty-nine samples were analysed. The data are listed in Table 2. Production index is plotted in Figure 2, Tmax in Figure 3 and Tmax versus hydrogen index in Figure 4. Rock-Eval data is plotted versus the observed lithology in Enclosure 1.

Kerogen Type and Richness
(Hydrogen Index, Oxygen Index and Petroleum Potential)

Tertiary (146 - 2351 m)

Montrose Group (2333 - 2351 m)

Maureen Formation (2333 - 2351 m)

One sample was analysed from this formation. It has a hydrogen index of 69 mg HC/g TOC and an oxygen index of 133 mg CO_2/g TOC, indicating that it contains kerogen type IV. It has a poor petroleum potential (1.2 mg HC/g rock). If this sample is representative for the Maureen Fm., then it does not have any potential for generation of oil or gas.

Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Six samples were analysed here, all but one of these being marls/claystones (the "other" is considered to be a clay-stone). The marls/claystones have hydrogen indices in the range 14 to 91 mg HC/g TOC and oxygen indices in the range

54 to 206 mg CO_2/g TOC. These data indicate that the samples contain kerogen type IV. These six samples have poor to fair petro-leum potentials (0.3 to 3.2 mg HC/g rock). The relatively high petroleum potentials of some of the samples are thought to be due to migrated hydrocarbons or contamination. See later discussion.

The Shetland Group is not considered to have any potential for generation of oil or gas.

<u>Jurassic</u> (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

No samples were analysed from this formation. See discussion in lithology chapter.

Heather Formation (3264 - 3351 m)

Eleven samples were analysed from this formation. The upper sample is a dusky yellowish brown claystone core-chip sample. It has a hydrogen index of 422 mg HC/g TOC and an oxygen index of 15 mg CO_2/g TOC. It has a good petroleum potential. This one sample appears to have a good potential for generation of oil.

All the medium grey to green-grey claystone samples, except the uppermost cuttings sample, have hydrogen indices in the range 39 to 58 mg HC/g TOC and oxygen indices in the range 46 to 188 mg CO_2/g TOC suggesting that the samples contain mostly kerogen type IV. They all have poor petroleum poten-tials (0.03 to 0.07 mg HC/g rock). This lithology is not considered to have any potential for generation of oil or gas.

The uppermost (medium grey) claystone sample has a hydrogen index of 159 mg HC/g TOC and an oxygen index of 41 mg CO_2/g TOC, indicating that it contains kerogen type III. It has a fair petroleum potential (2.9 mg HC/g rock). It might have a fair potential for generation of predominantly gas.

The upper siltstone sample has a hydrogen index of 70 mg HC/g TOC and an oxygen index of 111 mg CO_2/g TOC, indicating that it contains kerogen type IV or III. It has a fair petroleum potential (2.1 mg HC/g rock). The sample appears to have at best a fair potential for generation of predominantly gas.

The lower siltstone sample has a hydrogen index of 236 mg HC/g TOC and an oxygen index of 35 mg CO_2/g TOC, indicating that it contains kerogen type II. It has a fair petroluem potential (5.4 mg HC/g rock). The sample appears to have a fair potential for generation of oil.

For the Heather Fm. generally, it can be said that the major lithology which dominates, except for the very upper and very lower part of the formaton, does not have and has never had any potential for generation of oil and gas. The very upper part of the formation has at present a good potential for oil generation, but probably originally had a rich potential for oil generation. The very lower part of the formation has likewise presently a fair potential for oil generation, but also probably originally had a rich (possibly only good) potential for generation of oil. These originally rich sections of the Heather Fm. are only thought to make up 5 to 10 m (and more probably 10 than 20 m) at the top and bottom of the formation, i.e. they make up only 10 to 20 m of the 87 m thick Heather Fm.

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

Ten samples were analysed from this formation, two core-chip samples and eight cuttings samples. Two of the samples are siltstone samples (of which one is a core-chip). The siltstone sample at the top of the formation has a hydrogen index of 195 mg HC/g TOC and an oxygen index of 24 mg CO_2/g TOC, which indicates kerogen type II/III. It has a good petroleum potential (6.5 mg HC/g rock). The sample is very similar to the base of the Heather Fm. and it is thought that it originally had a rich potential for generation of oil and gas. The siltstone sample at the base of the formation (the core-chip sample) has a hydrogen index of 43 mg HC/g TOC and an oxygen index of 5 mg CO_2/g TOC, indicating kerogen type IV. The sample has a poor petroleum potential (0.7 mg HC/g rock). The sample has not, and has never had, any potential for hydrocarbon generation.

One of the analysed samples was a medium grey to green-grey claystone (probably caved from the Heather Fm.). This has a hydrogen index of 41 mg/HC/G TOC and an oxygen index of 50 mg CO_2/g TOC, indicating that it contains kerogen type IV. It has a poor petroleum potential (0.4 mg HC/g rock). The sample has not, and has never had, any potential for hydrocarbon generation.

Three of the analysed samples from this formation were brown-grey to brown-black claystones, these being from the lower half of the Ness Fm. They have hydrogen indices in the range 163 to 176 mg HC/g TOC and oxygen indices in the range 5 to 9 mg HC/g TOC, indicating that they contain kerogen type II/III. They have good to rich petroleum potentials (7.4 to 18.5 mg HC/g rock). These claystones are believed to originally have had a rich potential for generation of oil and gas.

The last four analysed samples from this formation are sandstones, concentrated in the upper half of the formation. They contain variable amounts of organic material probably as inclusions of coal particles.

Generally the very upper part of the Ness Fm. (1 or 2 m) originally had rich potential for generation of oil and gas and still has a good potential. This is alos the case for claystones in the lower half of the formation. This latter source rock interval is much thicker than that at the top of the formation. It is probably not massive, but could have a combined thickness of up to 30 m which makes it one of the most prolific source rock intervals in this well.

Etive Formation (3459 - 3561 m)

Ten sample were analysed from this formation, all of them being sandstones or conglomerate without any source rock potential.

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

Nine samples were analysed from this formation, one of them a claystone, four sandstones and four siltstones. The claystone has a hydrogen index of 185 mg HC/g TOC and an oxygen index of 9 mg CO_2/g TOC, suggesting that the sample contains kerogen type II/III. The claystone presently has a fair petroleum potential (5.0 mg HC/g rock). The potential was probably originally good to rich for oil and gas.

The three uppermost of the analysed siltstones have hydrogen indices ranging from 104 to 123 mg HC/g TOC and oxygen indices ranging from 24 to 30 mg CO_2/g TOC, indicating that they contain kerogen type III. They have fair petroleum potentials (2.3 to 3.8 mg HC/g rock). They had probably originally a good potential for generation of mostly gas.

The fourth siltstone sample (the lowermost one) has a hydrogen index of 31 mg HC/g TOC an an oxygen index of 75 mg CO_2/g TOC, indicating that it contains kerogen type IV. It has a poor petroleum potential (1.0 mg HC/g rock). The sample has never had any potential for hydrocarbon generation.

The last four analysed samples from this formation are sandstone samples and they do not have any source rock potential.

Generally for the Drake Fm. it seems that thin claystone beds (a few meters at most) at the middle of the formation are believed to originally have had a rich to good potential for generation of oil and gas. Thicker sections of siltstones (some tens of meters) around the claystone are believed to have originally had good potential for generation of mainly gas.

Cook Formation (3752.5 - 3768.5 m)

Two samples were analysed from this formation, both being siltstone core-chip samples. The uppermost of the two samples has a hydrogen index of 61 mg HC/g TOC and an oxygen index of 276 mg CO_2/g TOC, indicating that it contains kerogen type IV. It has a poor petroleum potential (0.5 mg HC/g rock). The sample has probably never had any significant potential for hydrocarbon generation. The lowermost sample has a hydrogen index of 170 mg HC/g TOC and an oxygen index of 22 mg CO_2/g TOC, indicating that it contains kerogen type II/III. It has a fair petroleum potential (4.0 mg

HC/g rock). It is believed to have originally had a good potential for generation of oil and gas.

Generally the Cook Fm. seems to have had a variable hydrocarbon potential, with the lower part a good potential for hydrocarbon generation, while the upper part has never had any potential. The results must be interpreted with caution as only two samples were analysed from this formation.

Amundsen/Burton Formation (3768.5 - 3892.5 m)

Six samples were analysed from this formation, two sandstones and four siltstones. The sandstone samples have fairly low TOC values and fairly low contents of free hydrocarbons and kerogen. They do not have any source rock potential. The four siltstone samples have hydrogen indices ranging 54 to 123 mg HC/g TOC and oxygen indices ranging 22 to 54 mg CO_2/g TOC, indicating that the samples contain kerogen type III to IV. Kerogen type IV is found only in the lowermost of the samples. The samples have poor to fair petroleum potentials (1.5 to 2.4 mg HC/g rock).

Generally the upper part of the Amundsen/Burton Fm. is believed to have had a good potential for generation of mainly gas.

Statfjord Formation (3892.5 - 4001 m, TD)

Four samples were analysed from this formation, all being sandstones. All of the samples have fairly low TOC values and fairly low contents of free hydrocarbons and kerogen. They do not have any source rock potential.

Generation and Migration
(Production Index, S1/(S1+S2))

As can be seen from Figure 2 and Table 2, most of the samples have high production indices and many of the samples also have fairly high contents of free hydrocarbons (S1). This is unusual for uncontaminated wells. It is therefore strongly suspected that the well is severly contaminated by the use of oil-based mud or hydrocarbon additives. See also later discussion in thermal extraction and extraction chapters. Due to the severe contamination it is not possible to identify any zones of migrated hydrocarbons based on the Rock-Eval data in this well.

The contamination also partly masks the potential in-situ generation of hydrocarbons. However the Viking Gp. clay-stones and at least some of the siltstones in the Dunlin Gp. appear to contain in-situ generated hydrocarbons, although the values are probably exaggerated by the contami-nation. The production index values for the Ness Fm. clay-stones are very low and this could indicate that this is not quite so prolific a source rock as that indicated by the hydrogen index and petroleum potential data.

Maturity (Tmax)

Many of the samples in this well are strongly affected by contamination and yield spurious Tmax data. However, an attempt was made to use the "best" data and to compile a maturity trend. Figure 3 shows the Tmax data and an inter-preted line for the maturity based on samples containing kerogen type II/III. According to this proposed maturity gradient the well enters the oil window (0.6 % Ro) at about 3000 m, peak oil generation (0.8 % Ro) at about 3300 m and the base of the oil window (1.0 % Ro) at about 3900 m.

THERMAL EXTRACTION - GAS CHROMATOGRAPHY

Fifteen samples were analysed by thermal extraction gas chromatography. Typical thermal extract chromatograms are shown in Figures 5a - d. No post Cretaceous samples were analysed.

Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Two samples were analysed, one marl and one claystone. The chromatograms of these two samples are virtually identical. They are totally dominated by compounds in the C12 to C19 range. The range of the hydrocarbons together with the indicated high maturity (low pristane/nC17 ratio) suggests that these hydrocarbons are entirely due to contamination with refined hydrocarbon products, e.g. due to the use of oil-based drilling mud.

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

No samples were analysed from this formation.

Heather Formation (3264 - 3351 m)

Two samples were analysed, one siltstone and one claystone. The chromatograms of the two samples are almost identical. The chromatograms are dominated by hydrocarbons in the nC12 to nC19 range of similar type and maturity to those found in the Shetland Gp. The samples are thought to be severely affected by the use of oil-based drilling mud or other contamination of hydrocarbon additives. A tail of higher hydrocarbons (nC20 - 22) exists as well and this could possibly represent other, in-situ generated, hydrocarbons. See Figure 5a.

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

Three samples were analysed from this formation, one sandstone cuttings sample, one claystone cuttings sample and one sandstone core-chip sample.

The sandstone cuttings sample has a chromatogram very similar to those from the Shetland Gp., i.e. totally dominated by hydrocarbon contaminants. The claystone sample also appears to be affected by the same contaminants, but in addition the chromatograms shows that the sample contains abundant aromatic compounds and also some heavy molecular weight compounds in the nC19+ range. This indicates the presence of hydrocarbons derived from a terrestrial source rock, i.e. that the sample contain some in-situ generated hydrocarbons. See also discussion in pyrolysis chapter.

The sandstone core-chip sample has a very different chromatogram. It is dominated by hydrocarbons in the nC15+ range eluting on top of a large unresolved hump. The sample seems to be fairly unaffected by the hydrocarbon contaminants. See

Figure 5b. The pattern is typical of samples containing residual oil. It is possible that light hydrocarbons might have been flushed out of the sample during drilling/washing of the sample.

Etive Formation (3459 - 3561 m)

Two samples were analysed from this formatiom, both core-chip samples. One of the samples is of conglomerate (or very coarse, unsorted, sandstone) at the top of the formation, the other being of sandstone.

The conglomerate sample has a chromatogram similar to that of the sandstone core-chip sample from the Ness Fm., although the hydrocarbons in the conglomerate sample are even heavier. It also contains residual oil. See Figure 5c.

The Etive Fm. sandstone sample has a chromatogram that indicates that it is strongly affected by hydrocarbon contaminants. It does however, also contain hydrocarbons in the nC19+ range, which indicates that other, migrated hydrocarbons are present in addition. These migrated hydrocarbons do not have such a heavy average molecular weight as those in the conglomerate sample and the Ness Fm. sandstone sample, but it cannot be excluded that this is an effect of the difference in grainsize between the three samples such that they contain the same type of migrated sandstones in reality.

In summary it appears that the zone from about 3450 m (in the Ness Fm.) to about 3470 m (in the Etive Fm.) contains migrated hydrocarbons, possibly of a residual type.

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

Two cutting samples were analysed from this formation, one being a sandstone sample, the other a siltstone sample. The chromatograms are dominated by the same type of hydrocarbon additives as that seen in the Shetland Gp. samples. The siltstone sample also appears to contain some hydrocarbons in the nC19+ range and these might represent in-situ generated hydrocarbons.

Cook Formation (3752.5 - 3768.5 m)

One siltstone sample was analysed from this formation. The chromatogram of the sample is dominated by hydrocarbons in the nC13 to nC28 range, i.e. the same range as for the residual oils in the Ness/Etive Fms. However, the hydrocarbons in the Cook Fm. sample lack the large unresolved hump found in the chromatograms of the other two samples. See Figure 5d. It is possible that the hydrocarbons found in the Cook Fm. siltstone could be at least partly generated in-situ. See discussion in the pyrolysis chapter.

Amundsen/Burton Formation (3768.5 - 3892.5 m)

Two cutting samples were analysed from this formation, one siltstone and one sandstone. The chromatograms of both samples are dominated by the same type of hydrocarbon additives as that found in the Shetland Gp. The siltstone samples in addition contain a tail of higher molecular weight hydrocarbons which indicates that some other hydrocarbons are present as well, probably generated in-situ.

Statfjord Formation (3892.5 - 4001 m)

One sample was analysed from this formation, a sandstone core-chip sample. The chromatogram of this sample is dominated by hydrocarbons in the nC14 to nC21 range, these being similar to those found in the Shetland Gp. except that the pristane/nC17 (and generally the isoprenoid contents) are much higher, indicating a much lower maturity. It is suspected that the sample contains other additives which are responsible for this effect. No naturally occurring hydrocarbons appear to be present.

Generally this well is severely contaminated by the use of oil based mud and/or other hydrocarbon-containing additives.

PYROLYSIS - GAS CHROMATOGRAPHY

Fifteen samples were analysed. Typical pyrograms can be seen in Figures 6a - d and a pyrolysis products triangle in Figure 7. Pyrolysis GC data are listed in Table 3. No Post Cretaceous samples were analysed.

Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Two samples were analysed, one marl and one claystone. The pyrograms are very similar and are dominated by aromatic compounds and phenols, which are derived from these poor, terreginous kerogen dominated source rocks. These have only a small potential for mostly gaseous hydrocarbons and at present have a low maturity.

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

No samples were analysed from this formation.

Heather Formation (3264 - 3351 m)

Two samples were analysed, one siltstone and one claystone. The latter is a core-chip sample. The two pyrograms are very similar. They are dominated by alkene/alkane doublets, but alkane peaks are also fairly abundant as is prist-1-ene. The samples appear to contain terrestrially influenced marine source rocks (kerogen type II/III) that are well mature. See Figure 6a. The two samples appear to be more similar than is indicated by the Rock-Eval data, but more terrestrially influenced than is indicated by the Rock-Eval data. It is important to keep in mind that these two samples represent the very best source rocks of the Heather Fm. and that the bulk of the formation has a much poorer potential for hydrocarbon generation. It is also possible that the upper of the samples (the claystone sample) should rather be considered to belong to the Draupne Fm. than the Heather Fm. Figure 7 shows that the Heather Fm. samples have some potential for mixed gas and oil generation (about even predominance of all three compound groups).

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

Three samples were analysed from this formation, one sandstone cuttings sample, one claystone cuttings sample and one sandstone core-chip sample. All three samples have pyrograms dominated by gaseous compounds. The claystone sample is in addition especially dominated by aromatic compounds. These features are typical for pyrolysis products of terrestrial organic material. The sandstone core-chip sample also contains abundant single alkene peaks which are due to pyrolysation of the asphaltenes from the residual oil in this sample. None of the samples appear to have any significant source rock potential.

Etive Formation (3459 - 3561 m)

Two samples were analysed from this formation, both of them core-chip samples. One of the samples is a conglomerate. The pyrogram of this sample resembles that of the Ness Fm. sandstone core-chip samples, with abundant single alkene peaks indicating pyrolysation of asphaltenes from the residual oil in these samples. See Figure 6b. The other sample from the Etive Fm. is virtually barren of pyrolysable material.

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

Two samples were analysed from this formation, both cuttings samples. The sandstone sample contains little pyrolysable organic material, most of which generates only gaseous and aromatic compound products. The sample probably contains some coal fragments which yield these. It does not have any potential for hydrocarbon generation of importance. The siltstone sample is also dominated by gaseous products and aromatic compounds are prominent. However, in addition this sample contains some alkene/alkane doublets. The sample appears to contain well-mature strongly terrestrially influenced organic material but with a slight contribution from marine organic material as well. The sample has mainly a potential for gas generation. See Figure 6c.

Cook Formation (3752.5 - 3768.5 m)

One siltstone sample was analysed from this formation. The pyrogram of this sample is dominated by alkene/alkane doublets. Excess of heavy molecular weight n-alkanes is thought to be due to retention of heavy molecular weight hydrocarbons (as was previously demon-strated to be present in the sample). See Figure 6d. The prist-1-ene peak is possibly more prominent than would be expected in a pure marine source rock (kerogen type II) and it is suggested that the sample contains a mainly marine, but terrestrially influenced source rock (kerogen type II/III). The sample has a potential for generation of oil and gas. It is unusual to find such pyrolysis products in samples from the Cook Fm.

Amundsen/Burton Formations (3768.5 - 3892.5 m)

Two samples were analysed from these formations, one sandstone and one siltstone sample. The siltstone sample has a pyrogram with dominant aromatic peaks and a relatively large prist-1-ene peak. The sample contains terrestrial organic material (kerogen type III) and it is thought to have a potential for mainly gas generation. The sandstone sample is virtually barren of pyrolysable products and does not have any source rock potential.

Statfjord Formation (3892.5 - 4001 m, TD)

One sample was analysed, a sandstone sample. The pyrogram of this sample shows that it contains virtually no pyrolysable material and that it definitely does not have any source rock potential.

The potential source rocks for oil in this well are concentrated at the top and base of the Heather Fm. and in the Cook Fm. The other analysed sections of the wells having any source rock potential whatsoever have potentials mainly for gas. The potential of (parts ?) of the Cook Fm. as a source rock for oil is very unusual. This cannot be due to caving as the analysed sample is a core-chip sample. Unfortunately insufficient was available for further detailed analysis of this sample. The potential might be explained by the high proportion of reworked material present in the sample. See visual kerogen composition chapter.

EXTRACTION DATA

Eight samples were extracted, fractionated and the hydrocarbons analysed by gas chromatography. The data are listed in Tables 4a-e, 5 and 6. The data are plotted in Enclosure 2. The chromatograms are shown in Appendix 4. Typical saturated chromatograms are shown in Figures 8a - d and saturated ratios are plotted in Enclosure 3. Typical aromatic chromatograms in Figures 9 a -d.

As previously discussed in the text, it appears that the samples from this well are severely affected by hydrocarbon additives. Hence the quantification of the extractables from the samples should be treated with caution.

Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Two samples were extracted from the Shetland Gp., one marl (from 2500 m) and one claystone (from 2890 m). Both samples have rich contents of extractable organic material (2041 and 2500 ppm) and of extractable hydrocarbons (1746 and 1876 ppm). This data does however only reflect that the samples are full of hydrocarbon additives, most likely due to the use of oil-based mud. This can also be seen by the saturated to aromatic hydrocarbon ratio which is very high (about 7 to 1).

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

No samples were analysed due to lack of material.

Heather Formation (3264 - 3351 m)

Two samples were extracted, one claystone and one siltstone. The samples have rich contents of extractable organic material (3944 and 2688 ppm) and rich contents of extractable hydrocarbons (2982 and 1774 ppm). The samples contain about two to three times as much hydrocarbons as non-hydrocarbons, which indicates that the samples are well mature. The samples contain about twice the amount of saturated than aromatic hydrocarbons, which is common for the Heather Fm. and reflects the predominantly marine but terrestrially influenced nature of the formation. However, these two samples are also thought to be severely affected by the use of oil-based mud and hence the contents of in-situ generated hydrocarbons as suggested by the above numbers are exaggerated. The samples are however thought to be relatively less affected than the Shetland Gp. samples. Normalised against TOC the samples have fair contents of extractable material (91.31 and 93.66 mg EOM/g TOC) and rich contents of extractable hydrocarbons (69.04 and 61.82 mg HC/g TOC).

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

Two samples were extracted here , one claystone cuttings sample and one sandstone core-chip sample. The claystone sample has a rich content of extractable organic material (19909 ppm) and a rich content of extractable hydrocarbons (3727 ppm). The samples contain much more non-hydrocarbons than hydrocarbons. This is due to the extremely high asphaltene content (11818 ppm) of the sample. It contains about equal amounts of aromatic and saturated compounds. The sample is somewhat affected by the use of oil-based mud (about as much affected as the Heather Fm. samples). The most striking feature of the sample is the very high asphaltene content. It is highly unlikely that the asphaltenes are derived naturally from the claystone and it is strongly suspected that it is due to contamination by some additive (grease, "black magic", etc.). Normalised against TOC the claystone sample has a (very) rich content of extractable hydrocarbons (3263.79 mg EOM/g TOC) and of extractable hydrocarbons (611.93 mg HC/g TOC). This strenghtens the suspicion that the sample is contaminated.

The sandstone sample has good content of extractable organic material (1815 ppm) and of extractable hydrocarbons (1604 ppm). It contains about seven times as much hydrocarbons as non-hydrocarbons and about three times as much saturated as aromatic hydrocarbons. These values are not unusual for well-mature migrated hydrocarbons. However, the sample is probably also affected somewhat by the use of oil-based mud. Normalised against TOC the sample has a rich content of extractable hydrocarbons (412.70 mg EOM/g TOC) and of extractable hycrocarbons (364.55 mg HC/g TOC).

Etive Formation (3459 - 3561 m)

One sample was extracted from this formation, a conglomerate core-chip sample. The sample has a good content of extractable organic material (1795 ppm) and a rich content of extractable hydrocarbons (1604 ppm). The sample contains about seven times as much hydrocarbons as non-hydrocarbons and about four times as much saturated as aromatic compounds. These values are not unusual for well-mature migrated hydrocarbons. The sample is not thought to be severely affected by the use of oil-based mud. See later discussion. Normalised against TOC the sample has a rich content of extractable organic material (460.42 mg EOM/g TOC) and of extractable hydrocarbons (400.52 mg HC/g TOC).

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

No samples were extracted from this formation.

Cook Formation (3752.5 - 3768.5 m)

No samples were extracted from this formation.

Amundsen/Burton Formation (3768.5 - 3892.5 m)

One sample was analysed here, a sandstone cuttings sample. The sample has good content of extractable organic material (1034 ppm) and a rich content of extractable hydrocarbons (603 ppm). The sample contains about equal amounts of hydrocarbons and non-hydrocarbons and about six times the amount of saturated compounds as that of aromatic hydrocarbons. The sample is believed to be strongly affected by the use of oil-based mud. Normalised against TOC the sample has a rich content of extractable organic material (206.90 mg EOM/g TOC) and a rich content of extractable hydrocarbons (120.69 mg HC/g TOC).

Saturated Hydrocarbons

Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Two samples were analysed, one marl and one claystone sample. The two samples have almost identical chromatograms and saturated ratio values. The chromatograms show that the samples contain hydrocarbons almost exclusively in the nC13 to nC19 range. The calculated ratios indicate that the hydrocarbons are well-mature and derived from a "marine" source-rock. The narrow distribution of the hydrocarbons are typical of a distillation "cut". Distillates are also expected to be "mature" and derived from "marine" sources. The two samples are totally dominated by oil-based drilling mud or other hydrocarbon additives.

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

No samples were analysed due to lack of material.

Heather Formation (3264 - 3351 m)

The two analysed samples, both the claystone core-chip sample and the siltstone cuttings sample, have similar saturated chromatograms. See Figure 8a for a typical example. The chromatograms show that the same distillation "cut" as that in the Shetland Gp. samples affects these samples. However, in addition the samples contain hydrocarbons in the nC19+ range which are not due to the use of oil-based mud. These hydrocarbons are thought to be generated in-situ. Also a proportion of the hydrocarbons in the nC13 to nC19 range is thought to have been generatedd in-situ. This is reflected in the calculated ratios involving compounds in this range. They indicate a slightly lower maturity than the figures for the Shetland Gp. (eg. the pristane/nC17 ratios are higher for the Heather Fm. samples). The ratios are however, not suitable for making estimates of true maturity or sedimentary conditions.

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

Two samples were analysed here, one claystone cuttings sample and one sandstone core-chip sample. The samples have very different chromatograms. However, both chromatograms show that the samples are affected by the use of oil-based mud. See Figure 8b and 8c. The chromatogram of the claystone sample (Figure 8b) is very similar to those of the Heather Fm. samples (e.g. Figure 8a). The calculated ratios are also similar. The rock appears to have a similar potential (althought this is difficult to quantify due to the use of oil-based mud) to that of the Heather Fm. In fact they are so similar that the Ness Fm. cuttings sample might be affected by caved material from the Heather Fm. An alternative is that the Ness Fm. in this well has a transitional contact with the Heather Fm.

The chromatogram of the sandstone sample is very different (see Figure 8c). The heavy molecular weight hydrocarbons are more dominant, together with an unresolved hump. This sample is also thougth to be affected by the use of oil-based mud and the calculated ratios are hardly reliable for assessing the maturity or source-type of the hydrocarbons. The sample is thought to contain migrated hydrocarbons, probably of a residual type, althought it cannot be excluded that light molecular weight hydrocarbons might have been removed from the sample before it could be analysed, i.e. that it could originally have contained "live" oil.

Etive Formation (3459 - 3561 m)

One sample was analysed from this formation, a conglomerate core-chip sample. The chromatogram of this sample is dominted by heavy molecular weight n-alkanes. See Figure 8d. Hydrocarbons with this composition can be termed "residual oil" since they would not flow under normal temperature and pressure conditions. However, it is possible that the light molecular weight compounds could have been lost during drilling/storage before the analysis was performed, i.e. it is possible that the sample originally contained "live" oil. The sandstone sample from the Ness Fm. and this Etive Fm. conglomerate probably contain the same type of migrated hydrocarbons although the chromatograms are somewhat diffe-rent (compare Figure 8c and 8d). The calculated saturated ratios for the Etive Fm. sample are probably more reliable than those of any of the other samples, but it is still likely that they are affected by the use of oil-based mud and hence not very reliable for assessing maturity or type of source rock for the hydrocarbons.

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

No samples were analysed from this formation.

Cook Formation (3752.5 - 3768.5 m)

No samples were analysed from this formation.

Amundsen/Burton Formation (3768.5 - 3892.5 m)

The one analysed sandstone sample here has a saturated chromatogram which resembles those from the Shetland Gp. with most of the hydrocarbons in the nC13 to nC19 range. However, the sample contains much more isoprenoids, which indicate that the hydrocarbons have a lower maturity, and the chromatograms show a tail of heavy molecular weight hydrocarbons. It is suggested that the sample is strongly affected by the use of oil-based mud (the "cut" of nC13 to nC19 hydrocarbons) but that it is also affected by migrated hydrocarbons (the heavy molecular weight "tail") and by other contaminants such as lignosulphonate (which could be responsible for the high isoprenoid content). Due to these mixed sources of hydrocarbons the ratios are not reliable for assessing the maturity or the source of the hydrocarbons.

Aromatic Hydrocarbons

Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Two samples were analysed from this group, one marl and one claystone. The two samples have very similar FID aromatic chromatograms and also similar FPD aromatic chromatograms. The FID chromatograms are dominated by a large unresolved hump and by unidentified peaks. These featueres are thought to be due to the use of oil-based mud. No naturally occuring hydrocarbons are thought to be represented. The aromatic hydrocarbon ratios suggest a maturity close to 0.7 to 0.8 % Ro which is the maturity expected for distillates. The ratios indicate two different maturities. The 4/1 methyldibenzothiophene ratio indicates a maturity close to peak oil (0.8 % Ro) while the dimethylnaphthalene ratios indicate a low maturity. It is suggested that small amounts of immature hydrocarbons are present in addition to the contaminants.

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Heather Formation (3264 - 3351 m)

The two analysed samples here have aromatic FID chromatograms that are somewhat different. The claystone sample (see Figure 9a) contains abundant napthalene compounds in addition to phenanthrene compounds. The siltstone sample lacks the naphthalene compounds (see Figure 9b). The abundance of naphthalene compounds in the claystone sample indicates that this sample is more oil/condensate prone than the siltstone sample. The claystone sample is a well-mature marine source rock. The aromatic compounds might be somewhat affected by the oil-based mud, but the difference between the Shetland Gp. samples and the Heather Fm. samples indicates that the Heather Fm. aromatic compounds are not affected to the same degree as the saturated compounds. This would also be expected as oil-based drilling muds are usually depleted in aromatic compounds. The MPI indices for these two samples indicate a maturity corresponding to close to 0.7 % Ro. This fits fairly well with the observed rock maturities and hence supports the conclusion that the Heather Fm. has generated hydrocarbons in-situ. The FPD aromatic chromatograms of the two samples show that the 4/1-methyldibenzothiophene ratios are between 2 and 10, indicating a maturity between 0.6 % and 0.8 % Ro, i.e. the hydrocarbons present in the Heather Fm. appear to be generated in-situ, having a maturity within the oil window (greater than 0.6 % Ro), but pre-peak oil (0.8 % Ro). Note that the previous discussion shows that only the very top and base of the Heather Fm. contains good source rocks.

Brent Group (3351 - 3561 m)

Etive Formation (3351 - 3561 m)

Two samples were analysed from the Etive Fm., one claystone cuttings sample and one sandstone core-chip sample. The FID aromatic chromatogram of the claystone sample is very similar to that of the claystone sample from the Heather Fm., also the calculated ratios based on the FID chromatogram are very similar. The FPD aromatic chromatogram is however different. While the Heather Fm. samples contain 4-methyldibenzothiophene as the largest peak followed by dibenzothiophene and 1-methyldibenzothiophene, the Ness Fm. sample contains dibenzothiophene as the largest peak followed by 4-methyldibenzothiophene and 2+3-dibenzothiophene. All in all the Ness Fm. sample appears more mature than the Heather Fm. sample. It is suggested that the Ness Fm. sample probably has a maturity very close to peak oil generation (0.8 % Ro). The difference in the FPD chromatograms seems to make it less likely that the Ness Fm. claystone is caved from the Heather Fm.

The sandstone core-chip sample has an FID aromatic chromatogram (see Figure 9c) dominated by phenanthrene compounds. It cannot be excluded that naphthalene compounds have been lost before analysis could take place. At present the sample is considered to contain a residual oil. The MPI indices indicate a maturity comparable to about 1.0 % Ro. The hydrocarbons are more mature that the rock at this depth and they must have migrated in to the sandstone from a very mature source rock. The FPD aromatic chromatogram indicates that few sulphur compounds are present and the calculated sulphur aromatic ratios are not considered to be very reliable.

Etive Formation (3459 - 3561 m)

One sample was analysed from this formation, a conglomerate core-chip sample. The sample has an FID aromatic chromatogram very similar to that of the Ness Fm. sandstone sample (compare Figure 9c and 9d). The samples seem to be very similar also in other aspects. The Ness and Etive Fms. clastic rocks appear to contain the same type of residual migrated hydrocarbons, which have a maturity comparable to 1.0% Ro.

Dunlin Group (3561 - 3892.5 m)

Amundsen/Burton Formation (3768.5 - 3892.5 m)

The one analysed sandstone sample from this formation has a very "dirty" FID aromatic chromatogram dominated by unidentified compounds. The chromatograms are thought to represent only contaminants. The FPD aromatic chromatogram shows that the sample is barren of sulphur compounds.

VITRINITE REFLECTANCE

Nineteen cuttings samples were analysed from the interval 1600 m to 3890 m in the NOCS 30/6-11 well. A vitrinite reflectance versus depth plot is shown in Figure 10 and thermal maturity data are listed in Table 7. All vitrinite reflectance histograms are presented in Appendix 2.

The nine upper samples (1600 m - 2770 m) have low to trace amounts of phytoclasts. Generally only a low number of readings could be made, if any at all. Inertinite particles dominate, except in the uppermost sample which contains 40 % vitrinite. Bitumen staining is moderate in the uppermost sample, mostly light in the other eight. This is also the case for bitumen wisps. The spores fluorescense yellow-orange and yellow in all the samples where this can be assessed.

The lower ten samples (3266 m - 3890 m) have a very variable phytoclast contents ranging low to rich. The number of readings that could be made was variable, but generally higher than for the upper nine samples. Inertinite dominates in most of the samples, but up to 70 % vitrinite was found locally. The bitumen staining was very variable, ranging from only traces to rich. It is believed that strong bitumen staining has depressed the readings at least for the samples from 3266 m, 3302 m and 3382 m. In other samples populations were selcted in such a way as to avoid the problem of staining as much as possible. The content of bitumen wisps follows the bitumen staining. The spore fluorescence yellow-orange to moderately orange (and dark orange) where any fluorescence could be detected.

The vitrinite reflectance appears to indicate a higher maturity than the spore fluorescence colours. Based on the vitrinite reflectance data the well appears to enter the oil window (0.6 % Ro) at about 2750 m and reach peak oil generation (0.8 % Ro) at approximately 3450 m. The peak oil generation based on vitrinite reflectance is similar to that indicated by the spore fluorescence colour, which is about 3400 m. The base of the oil window cannot be assessed on the basis of these data.

VISUAL KEROGEN COMPOSITION

Eight samples from well NOCS 30/6-11 were optically examined, these being from the interval 2680 m to 3815 m. The detailed kerogen compositions are listed in Table 8 while Figure 11 shows a triangular plot of the gross compositions. Note that this plot does not take into account the nature of the liptinite fraction, i.e. whether reworked or otherwise, which has a considerable effect on the potential of the kerogen. Maturity data (Spore Colour Index) is included in Table 7. Enclosure 4 shows various thermal maturity data from the well.

Kerogen Typing

Upper Cretaceous (2351 - 3260 m)

Shetland Group (2351 - 3260 m)

Two samples of medium grey shale/claystone were examined from this interval at 2680 m and 2890 m. Despite having good TOC contents these samples yielded very little organic material for visual kerogen studies. Even after repeated attempts there was insufficient material for reliable assessment of the maceral proportions. The organic matter recovered consists of fine-grained reworked and oxidized marine liptinite together with reworked vitrinite and inertinite. Such assemblages have little potential for the generation of significant hydrocarbons.

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Heather Formation (3264 - 3351 m)

Two samples of dusky yellow-brown and brownish-gray to dusky yellow-brown shale/siltstone were examined from core-chips at 3266 m and cuttings at 3347 m respectively. Both samples contain strongly dominant liptinite (70 - 80 %), mainly as algal amorphinite and moderate to poorly preserved algal shreds with subordinate liptodetrinite (abundant in the lower sample), spores, cuticle and only traces of dino-flagellates. Only trace accessory vitrinite is present while inertinite occurs in accessory to abundant amonuts (10 - 30 %).

These samples suggest the pyritic Heather Fm. shales to have a significant terrestrial influence, but the abundance of algae makes them moderately good source rocks for mainly oil. In the case fo the lower sample, the abundance for reworked material will lessen this potential, perhaps to that for mainly gaseous hydrocarbons.

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

One sample of medium grey siltstone was examined from this interval from core-chips at 3458.20 m. This contained only accessory (10 %) liptinite, overwhelmingly as cuticle with subordinate amorphinite, liptodetrinite, spores and algae. Vitrinite is strongly dominant as coarse-grained clasts of woody material which is commonly bitumen-stained. This being locally quite strong. Only accessory inertinite occurs in the sample.

Such kerogen composition is considered to be at best a moderate source for gaseous hydrocarbons.

Dunlin Group (3561 - 3892.5 m)

Drake Formation (3561 - 3752.5 m)

One sample of greyish brown to dusky yellow-brown siltstone was examined from this interval at 3640 m. This contained a very high liptinite content (90 %), most of this however being as reworked material but with a significant content of poorly preserved shreds of algae and cuticle. Spores and dinoflagellates are subordinate, while oxidation of the clasts is common.

Only accessory vitrinite is present, mainly as reworked clasts, while there occurs only trace inertinite.

The rich potential of this gross composition is considerably reduced by the high proportion of reworked material, such that the potential of this siltstone was probably moderate for mainly gaseous hydrocarbons.

Cook Formation (3752.5 - 3768.5 m)

One sample of light brownish grey siltstone was examined from a core-chip sample at 3762.20 m. This has a similar strongly abundant liptinite content (70 %) where liptodetrinite and spores are dominant, with subordinate cuticle and algae and traces of bituminite. Moderately abundant vitrinite (20 %) and accessory inertinite (10 %) are also present.

Again the outwardly good potential of this siltstone from the high liptinite content may be reduced by the high proportion of reworked material present, possibly to that of mainly gaseous hydrocarbons. However the maturity at this level (well into the oil window) may well be responsible for fluorescence depression such that some of the degraded matter may have originally had good potential. It is concluded that the Cook Fm. siltstone could have had a moderate potential for mixed oil/gas to mainly gaseous hydrocarbons.

Amundsen/Burton Formation (3766.5 - 3892.5 m)

One sample of brownish grey to dusky yellow-brown siltstone was examined from this interval at 3815 m. This again contained strongly dominant liptinite (80 %) with a high proportion of reworked clasts. Spores, cuticle and algae are subordinate, while traces of bituminite are also present. Vitrinite is present in accessory/significant amounts (15 %) while only minor (5 %) inertodetrinite occurs.

This kerogen composition has a much degraded potential due to the high liptodetrinite content. The present potential is also lower due to the high maturity at this level. The original potential of this siltstone is considered to have been moderate for mainly gaseous hydrocarbons.

Thermal Maturity
(Spore Colour Index, Spore Flourescence)

The SCI data suggests the well NOCS 30/6-11 to be moderately mature in the Shetland Gp. (2680 m) though this is based on a limited number of available spores, becoming mature by the Heather Fm. (3266 m). The underlying part of the well is mature to well-mature. The linear regression line for the

SCI data, which is a rather limited set, suggest the top of the oil window (SCI 6.0) to occur around 3370 m for type II kerogen.

ISOTOPE ANALYSIS OF C15+ FRACTIONS

Three samples were analysed for carbon isotope composition, one claystone sample from the Heather Fm. (core-chip sample from 3266 m), one claystone sample from the Ness Fm. (cuttings sample from 3440 m) and one conglomerate sample from the Etive Fm. (core-chip sample from 3464.65 m).

Figure 12a shows a crossplot of the $\delta^{13}C$ isotope values of saturated versus aromatic hydrocarbons and Figure 12b shows the Galimov plots of the $\delta^{13}C$ isotopic values of the various fractions from the extracted material of the samples. All data are listed in Tables 9a and 9b in Appendix 1.

The isotope values of the three analysed samples differ somewhat. The two samples from the Heather and Ness Fms. are known to be contaminated. This will make them appear more "marine" and more mature than they actually are. The contamination will most strongly affect the saturated compounds, and to a lesser degree the other compounds. The Etive Fm. sample hydrocarbons (almost uncontaminated) appear to be derived from a marine source rock. The NSO and asphaltene compounds have roughly similar values for all three samples. Generally the isotope composition of the Etive Fm. sample seems to be more similar to the Heather Fm. sample than to the Ness Fm. sample, although no definite conclusions can be made on the basis of these data.

The calculated canonical variable (CV) and Figure 12a are taken from : Sofer, Z. (1984) Stable carbon isotope compositions of crude oils: Application to source depositional environments and petroleum alteration. Bull. Am. Ass. Pet. Geol. Vol. 68, No. 1, pp 31-49.

GAS CHROMATOGRAPHY - MASS SPECTROMETRY

Four samples were analysed for biomarkers, one claystone sample from the Heather Fm. (core-chip sample from 3266 m), one claystone sample from the Ness Fm. (cuttings sample from 3440 m), one conglomerate sample from the Etive Fm. (core-chip sample from 3464.65 m) and one sandstone sample from the Amundsen/Burton Fm. (cuttings sample from 3867 m). The data is listed in Tables 10a to 10i. Typical fragmentograms are shown in Figures 13a - i.

Viking Group (3260 - 3351 m)

Heather Formation (3264 - 3351 m)

Saturated Hydrocarbons

Terpanes

The M/Z 163 fragmentogram shows that steranes are fairly abundant in the Heather Fm. indicating that the hydrocarbons in the sample have been generated in a marine source rocks. The 25,28,30 trisnorhopane/moretane can not be seen to be present. See Figure 13a. The M/Z 177 fragmentogram also shows that steranes are fairly abundant and that αβ norhopane is much more abundant than βα norhopane indicating that the hydrocarbons are fairly mature.

The M/Z 191 fragmentogram shows that the the Tm/Ts ratio is below unity (0.76). This fits well with the sample having an oil window maturity and being a marine source rock. The fragmentogram is similar to other fragmentograms, for this study, for Upper Jurassic source rocks from the North Viking Graben area. See Figure 13b. It is also similar to the fragmentogram for the Etive Fm. migrated hydrocarbons, althought the latter has features indicating that these are more mature. See Figure 13c. The calculated ratios reflecting maturity (such as J1/(J1+J2) or (D+F)/(C+F)) indicate an oil window maturity. Bisnorhopane is almost absent in the samples, which is possibly due to the oil window maturity of the samples.

The M/Z 205, 370, 384, 398, 412 and 426 fragmentograms were used for peak identification and support the above discussion.

Steranes

The M/Z 149 fragmentogram shows that steranes in the C_{27}- to C_{30} range are abundant. The M/Z 189 and 259 fragmentograms show that diasteranes are abundant in the samples indicating a high maturity.

The M/Z 217 fragmentogram shows that C_{27}-diasteranes are more abundant than C29-diasteranes, indicating that it is a marine source rock. See Figure 13d for an example. Diasteranes appear to be much more prominent than the regular steranes, indicating the high maturity (oil window) of the samples. The most prominent peak is the a-peak, which represent 20S $\beta\alpha$ diacholestane. The M/Z 218 fragmentogram shows that some regular C_{27} and C_{28} (also C_{29}) steranes are present.

The molecular ions M/Z 372, 386, 400 and 414 were also examined to identify the above mentioned compounds and the observations made on these support the previous observations.

Aromatic Hydrocarbons

Alkyl Benzenes

The M/Z 106 fragmentogram is dominated by two homologous series of compounds, which are about equally prominent. They also have a very prominent peak at around 46 minutes retention time. The M/Z 134 fragmentogram shows a broad distribution of peaks, and is similar to that of the Etive Fm. sample.

Naphthalenes

The M/Z 142 fragmentogram shows that the 2-methylnaphthalene peak is smaller than the 1-methylnaphthalene peak indicating a maturity equivalent to pre-peak oil generation, probably in the upper part of the oil window. The M/Z 156 fragmentogram shows that the 2,6 + 2,7 dimethylnaphthalene peak is equal to the 1,4 + 1,5 + 2,3 peak. The M/Z 170 fragmentogram gives the impression that the Heather Fm. sample is less mature than the Etive Fm. sample.

Phenanthrenes

The M/Z 178 fragmentogram shows that only phenanthrene is present in the samples. The M/Z 192 fragmentogram shows that the 2- and 3-methylphenanthrene peaks are much lower than the 9- and 1-methylphenanthrene peaks. This is contrary to that found for the Etive Fm. sample, indicating that the Heather Fm. sample is much less mature than the latter sample. The M/Z 206 and 220 fragmentograms again seem to indicate the same difference in maturity.

Dibenzothiophenes

The M/Z 198 fragmentogram is different to the Etive Fm. sample, again indicating a much higher maturity for the Etive Fm. sample than for the Heather Fm. sample. The relative height of the 2+3-dibenzothiophene peak is slightly lower than that of the 1-dibenzothiophene peak in the Heather Fm. sample, indicating that the maturity is not past peak oil generation (0.8 % Ro). The M/Z 212 fragmenrogram also demonstrates the difference in maturity between the two samples.

Aromatic Steranes

The M/Z 231 fragmentogram shows that the Heather Fm. sample is different from those of the other analysed samples from this well, but most similar to the Amundsen/Burton Fm. sample. This can also be seen from the calculated ratios (see Table 10f). The M/Z 253 fragmentogram shows the same. The monoaromatic ratios also show this (see Table 10e).

The calculated aromatisation of the steranes (see Table 10g) can only be calculated for ratio 1 and indicates that the maturity is similar for the Heather Fm. sample and the Ness Fm. samples and that these two samples have a much lower maturity than the Etive Fm. and Amundsen/Burton Fm. samples.

Ness Formation (3351 - 3459 m)

Saturated Hydrocarbons

Triterpanes

The M/Z 163 fragmentogram shows that relatively few steranes are present indicating that the sample is strongly terrestrially influenced. The C- and E- peaks are dominant ($\alpha\beta$ norhopane and $\alpha\beta$ hopane), but the B-peak (17 α trisnorhopane or Tm) is also fairly prominent. This can also be seen from the M/Z 177 fragmentogram.

The M/Z 191 fragmentogram is different from that of the Heather Fm., especially in that it has a very prominent B-peak (17 α trisnorhopane or Tm) and a much smaller A-peak (18 α trisnorneohopane or Ts). The observations seems to indicate that the hydrocarbons in the sample are derived from a strongly terrestrially influenced source rock. They are probably generated in-situ. The calculated triterpane ratios indicate that the sample has an oil window maturity, i.e. a similar maturity to that of the Heather Fm. sample. The slightly larger X-peak could indicate a slightly higher maturity for the Ness Fm. sample than for the Heather Fm. sample, but the difference is not great. The M/Z 205 fragmentogram demonstrates that the 22S and 22R $\alpha\beta$ homohopanes are more dominant in the Ness Fm. sample than in the Heather Fm. sample.

The M/Z 370, 384, 398, 412 and 426 fragmentograms were used for peak identification and support the above discussion.

Steranes

The M/Z 149 fragmentogram shows that the samples contain much less of steranes than the previously discussed sample and that C29 compounds are relatively more common. It also shows a group of unidentified peaks with a retention time of about 42 minutes. These are strongly suspected to be contaminants. The M/Z 189 and 259 fragmentograms show that C_{29}-diasteranes are the dominant compounds, especially the 20S $\beta\alpha$ 24 ethyldiacholestane.

The M/Z 217 fragmentogram also shows the dominance of the C29- diacholestanes, but it also shows that C_{29}- regular steranes are farly prominent. This relatively high content of C_{29}- compounds, indicates that the hydrocarbons are derived from an almost purely terrestrial source rock. This is in contradiction to, for example, the isotope data. However, the isotope data are believed to be much more strongly affected by contamination in this well. See previous discussion. The dominace of the diasteranes indicate a high maturity (oil window maturity). The calculated sterane ratios indicate a maturity similar to that of the Heather Fm. sample. The M/Z 218 fragmentogram also shows the relative absence of C27- steranes in the Ness Fm. sample.

The molecular ions M/Z 372, 386, 400 and 414 were also examined to identify the above mentioned compounds and the observations made on these support the previous observations.

Aromatic Hydrocarbons

Alkyl Benzenes

The M/Z 106 fragmentogram is dominated by two homologous series of compounds, which are about equally prominent. The prominent peak around 46 minutes retention time found in the Heather Fm. sample is however almost absent. The M/Z 134 fragmentogram is different to that from the Heather Fm. and shows only a limited number of peaks.

Naphthalenes

The M/Z 142 fragmentogram shows that the 2-methylnaphthalene peak is larger than 1-methylnaphthalene peak, indicating a maturity around peak oil generation, more mature than for the Heather Fm. sample. The M/Z 156 fragmentogram shows that the 2,6 + 2,7 dimethylnaphthalene peak is higher than the 1,4 + 1,5 + 2,3 peak, indicating a higher maturity than for the Heather Fm. sample but less than for the Etive and Amundsen/Burton Fms. samples. The M/Z 170 fragmentogram gives the same impression.

Phenanthrenes

The M/Z 178 fragmentogram shows that phenanthrene is the only identifiable compound present. The M/Z 192 fragmentogram is similar to that for the Heather Fm. sample, indicating a maturity not past peak oil generation. The M/Z 206 and 220 fragmentograms are however somewhat different and seem to indicate a slightly higher maturity than for the Heather Fm. sample.

Dibenzothiophenes

The M/Z 198 fragmentogram shows that the relative height of the 2+3-dibenzothiophene peak is much greater than that of 1-dibenzothiophene and that the 4-dibenzothiophene peak is about five times as large as the 1-dibenzothiophene peak. This indicates that the maturity is close to peak oil generation (0.8 % Ro). The M/Z 212 fragmentogram can be generally said to represent a crossing between the Heather Fm. and the Etive Fm. samples.

Aromatic Steranes

The M/Z 231 fragmentogram is very different to that for the Heather Fm. The early eluting compounds dominate totally and most of the peaks are unidentified. The difference can also bee seen from the calculated ratios (see Table 10f). The M/Z 253 fragmentogram is also different to that of the Heather Fm. sample. Unidentified peaks eluting between and after the identified peaks dominate the fragmentogram. The monoaromatic ratios could not be calculated for this sample.

The calculated aromatisation of the steranes (see Table 10g) indicates that the maturity is slightly higher for the Ness Fm. sample than for the Heather Fm. sample, although Ratio 2 could not be calculated.

Etive Formation (3459 - 3561 m)

The M/Z 163 fragmentogram has a weak signal but shows that steranes are fairly abundant in the Etive Fm., indicating that the sample contains hydrocarbons from a marine source rock. The 25,28,30 trisnorhopane/moretane cannot be seen to be present. See Figure 13e for an example. The M/Z 177 fragmentogram has a weak signal and also shows that steranes are fairly abundant and that αβ norhopane is much more abundant than βα norhopane, indicating that the hydrocarbons are fairly mature.

The M/Z 191 fragmentogram shows that the Tm/Ts ratio is below unity (0.83). This fits well with the sample having an oil window maturity and genesis in a marine source rock, probably very similar to the Heather Fm. of this well, although the Etive Fm. sample has features indicating that it is more mature than the latter. Se Figure 13c. The calculated ratios reflecting maturity (such as J1/(J1+J2) or (D+F)/(C+F)) indicate an oil window maturity. The ratios have reached equilibrium suggesting that the maturity of the hydrocarbons are well within the oil window. Bisnorhopane is almost absent in the samples, which is possibly due to the oil window maturity of the samples.

The M/Z 205, 370, 384, 398, 412 and 426 fragmentograms were used for peak identification and support the above discussion.

Steranes

The M/Z 149 fragmentogram has a weak signal but shows that steranes in the C_{27}- to C_{30} range are abundant. The M/Z 189 and 259 fragmentograms show that diasteranes are abundant in the samples, indicating a high maturity.

The M/Z 217 fragmentogram shows that C_{27}-diasteranes are more abundant than C29-diasteranes, indicating that the hydrocarbons were generated from a marine source rock. See Figure 13f. Diasteranes appear to be much more prominent than the regular steranes, indicating the high maturity (oil window) of the samples. The most prominent peak is the a-peak, which represents 20S βα diacholestane. The M/Z 218 fragmentogram shows that some regular C_{27} and C_{28} steranes are present as well as regular C_{29} steranes. The calculated ratios for this sample indicate a maturity well into the oil window and this fits well with the previous observations indicating a maturity comparable to about 1.0 % Ro.

The molecular ions M/Z 372, 386, 400 and 414 were also examined to identify the above mentioned compounds and the observations made on these support the previous observations.

Aromatic Hydrocarbons

Alkyl Benzenes

The M/Z 106 fragmentogram is dominated by two homologous series of compounds, which are about equally prominent. It also has a prominent peak at around 46 minutes retention time. The M/Z 134 fragmentogram shows a broad distribution of peaks, similar to that of the Heather Fm. sample.

Naphthalenes

The M/Z 142 fragmentogram shows that the 2-methylnaphthalene peak is larger than the 1-methylnaphthalene peak indicating a maturity past peak oil generation but within the oil window. The M/Z 156 fragmentogram shows that the 2,6 + 2,7 dimethylnaphthalene peak is larger than the 1,4 + 1,5 + 2,3 peak, again indicating that the hydrocarbons have a fairly high maturity. The M/Z 170 fragmentogram gives the impression that the Etive Fm. sample is more mature than the Heather Fm. sample.

Phenanthrenes

The M/Z 178 fragmentogram shows that only phenanthrene is present in the samples. The M/Z 192 fragmentogram shows that the 2- and 3- methylphenanthrene peaks are much higher than the 9- and 1- methylphenanthrene peaks. This contradicts that found for the Heather Fm. sample, indicating that the Etive Fm. sample is much more mature than the latter sample. The M/Z 206 and 220 fragmentograms again seem to indicate the same difference in maturity.

Dibenzothiophenes

The M/Z 198 fragmentogram is different to that of the Heather Fm. sample, again indicating a much higher maturity for the Etive Fm. sample than for the Heather Fm. sample. The relative hight of the 2+3-dibenzothiophene peak is much higher than of the 1-dibenzothiophene, indicating that the maturity is past peak oil generation (0.8 % Ro). The M/Z 212 fragmenrogram also demonstrates the difference in maturity between the two samples.

Aromatic Steranes

The M/Z 231 fragmentogram shows that the sample is dominated by the early eluting peaks. This is very different to the Heather Fm. sample but this feature is thought to be mainly a maturation effect. This difference can also bee seen from the calculated ratios (see Table 10f). The M/Z 253 fragmentogram shows the same strong relative dominance of the early eluting peaks. The monoaromatic ratios shows this difference (see Table 10e).

The calculated aromatisation of the steranes (see Table 10g) can only be calculated for ratio 1 and indicates that the maturity is much higher than for the Heather Fm. and Ness Fm. samples and that these two samples have a much lower maturity than the Etive Fm. and Amundsen/Burton Fm. samples.

Dunlin Group (3561 - 3892.5 m)

Amundsen/Burton Formation (3768.5 - 3892.5 m)

The M/Z 163 fragmentogram shows that steranes are present but not abundant. This could indicate that the hydrocarbons are derived from less marine source rock(s) than that which the Etive Fm. migrated hydrocarbons reflect. The 25,28,30 trisnorhopane/moretane can not be seen to be present. See Figure 13g. One peculiarity with the M/Z 163 fragmentogram is that demethylated hopanes are abundant. These compounds are often taken as an indication of biodegradation. The M/Z 177 fragmentogram shows that tricyclic terpanes and demethylated hopanes are abundant. This is also usually taken as an indication of biodegradation, but they could also possibly be abundant due to high maturity of the hydrocarbons. The $\alpha\beta$ norhopane is much more abundant than $\beta\alpha$ norhopane indicating that the hydrocarbons are well mature.

The M/Z 191 fragmentogram shows that the the Tm/Ts ratio is above unity (1.41). The ratio is however thought to be affected by the abundant tricylic terpanes and demethylated hopanes. Se Figure 13h. As previously discussed these compounds are usually taken as indicators of severe biodegradation. However, the sample is at a depth much greater than that at which biodegradation can occour. It is suggested that the observed compounds are rather at least partly due to thermal alteration of the hydrocarbons. The hydrocarbons are known to have a high maturity, at least comparable to 1.0% Ro. It is possible that the samples could also have been somewhat biodegraded before they migrated into this sandstone. The sample was also earlier demonstrated to be severely contaminated. It can not be completely excluded that the observed compounds are due to this contamination, but such an effect of contamination is not previously observed. The calculated ratios reflecting maturity (such as J1/(J1+J2) or (D+F)/ (C+F)) indicate an oil window maturity. The ratios have reached equilibrium and it suggests that the maturity of the hydrocarbons is well within the oil window. Bisnorhopane is almost absent in the samples, which is possibly due to the oil window maturity of the samples.

The M/Z 205, 370, 384, 398, 412 and 426 fragmentograms were used for peak identification and support the above discussion.

Steranes

The M/Z 149 fragmentogram shows that steranes in the C_{27}-C_{30} range are present, but not very abundant. The M/Z 189 and 259 fragmentograms show that diasteranes are relatively abundant in the samples, indicating a high maturity.

The M/Z 217 fragmentogram shows that C_{27}-diasteranes are as abundant as the C29-diasteranes, indicating that the hydrocarbons come from a terrestrially influenced, marine source rock. See Figure 13i. Diasteranes appear to be more prominent than the regular steranes, indicating the high maturity (oil window) of the samples. However, regular C_{27} steranes are also fairly abundant. This could indicate an additional, more marine and less mature source. Possibly this could be the oil-based drilling mud (it is highly likely this will have a chemical maturity less than 1.0 % Ro). The M/Z 218 fragmentogram shows that some regular C_{27} and C_{28} steranes are present as well as regular C_{29} steranes. The calculated ratios for this sample indicate a maturity in the oil window and this fits fairly well with the previous observations indicating a maturity comparable to about 1.0 % Ro.

The molecular ions M/Z 372, 386, 400 and 414 were also examined to identify the above mentioned compounds and the observations made on these support the previous observations.

Aromatic Hydrocarbons

Alkyl Benzenes

The M/Z 106 fragmentogram is dominated by two homologous series of compounds, which are about equally prominent. The fragmentogram is very similar to that of the Ness Fm. sample. M/Z 134 fragmentogram shows a narrow distribution of peaks, and it also resembles that of the Ness Fm. sample.

Naphthalenes

The M/Z 142 fragmentogram shows that the 2-methylnaphthalene peak is larger than the 1-methylnaphthalene peak indicating a maturity past peak oil generation but within the the oil window. The M/Z 156 fragmentogram shows that the 2,6 + 2,7 dimethylnaphthalene peak is larger than the 1,4 + 1,5 + 2,3 peak, again indicating that the hydrocarbons have a fairly high maturity. The M/Z 170 fragmentogram gives the impression that the sample has about the same maturity as the Etive Fm. sample.

Phenanthrenes

The M/Z 178 fragmentogram shows that only phenanthrene is present in the samples. The M/Z 192 fragmentogram shows that the 2- and 3-methylphenanthrene peaks are about equal to the 9- and 1-methylphenanthrene peaks. This seems to indicate a "turningpoint". It is known that the MPI index (which is based on the methylphenanthrenes) stops increasing and starts decreasing at a maturity of approximately 1.3 % Ro. It is hence suggested that the maturity of the hydrocarbons in the Amundsen/Burton Fm. has reached a similar maturity, i.e. that the hydrocarbons have a maturity of approximately 1.3 % Ro, i.e. the top of the dry gas zone. Alternatively it could be due to contamination from the (less mature) drilling mud. The M/Z 206 and 220 fragmentograms seem to indicate a high maturity.

Dibenzothiophenes

The M/Z 198 fragmentogram shows that the relative height of the 2+3-dibenzothiophene peak is about the same as that of the 1-dibenzothiophene peak, indicating a maturity close to peak oil generation (0.8 % Ro). This could possibly be due to staining from the drilling mud. The M/Z 212 fragmentogram also seems to demonstrate a similar maturity.

Aromatic Steranes

The M/Z 231 fragmentogram shows that the sample has dominant early eluting peaks, although the later eluting peaks are also prominent. This is more similar to the Heather Fm. sample than to the other analysed samples. This similarity can also be seen from the calculated ratios (see Table 10f). The M/Z 253 fragmentogram shows the same resemblance to the Heather Fm. sample. The monoaromatic ratios also show this similarity (see Table 10e).

The calculated aromatisation of the steranes (see Table 10g) can only be calculated for ratio 1 and indicates that the maturity is much higher than for the Heather Fm. and Ness Fm. samples and that it has a maturity similar to the Etive Fm. sample.

Summary

The Heather Fm. sample seems to contain an oil window mature marine source rock (close to, but probably not past peak oil). This source rock (which might actually be better regarded as the Draupne Fm.) is very similar to the dominating marine Upper Jurassic source rock found in most of this areas of the North Sea.

The Ness Fm. sample has features indicating that it is much more terrestrially influenced than the Heather Fm. It is probably also more strongly affected by contamination. The terrestrially influenced hydrocarbons of the Ness Fm. are believed to be generated in-situ.

The Etive Fm. conglomerate sample contains a very well mature (comparable to about 1.0 % Ro) suite of migrated hydrocarbons. These appear to be derived from a marine source rock, probably of similar type to that in the Heather Fm. sample from this well, although being much more mature.

The Amundsen/Burton Fm. sandstone sample shows data which are confusing and difficult to interpret. The sample seems to be severly affected by contamination. It is tentatively suggested that in addition to contaminants the sample contains highly mature (comparable to about 1.3 % Ro ?) migrated hydrocarbons derived from a strongly terrestrially influenced source rock (somewhat similar to the Ness Fm. of this well ?, but much more mature).

CONCLUSIONS

The following conclusions have been made based on the analyses performed on samples from this well :

Source Rock Potential

None of the Post-Jurassic sections of the well have any source rock potential.

Jurassic (3260 - 4001 m, TD)

Viking Group (3260 - 3351 m)

Draupne Formation (3260 - 3264 m)

As the Draupne Fm. is very thin in this well, not enough material was available that could be ascribed with certainty to the Draupne Fm. for any assessment of the petroleum potential to be performed.

Heather Formation (3264 - 3351 m)

Most of this formation has no significant petroleum potential. About ten meters combined thickness, partly at the very top and partly at the base, have a rich potential for oil and gas generation. The formation is within the oil window, but most of it probably has a maturity close to peak oil generation.

Brent Group (3351 - 3561 m)

Ness Formation (3351 - 3459 m)

The very upper part of this formation (1 or 2 meters) originally had a rich potential for generation of oil and gas, i.e. very similar to the base of the Heather Fm. Thicker beds at the base (about 30 m combined thickness) originally have had a rich potential for generation of mainly gas. The middle part of the formation has probably never had any potential for hydrocarbon generation.

Etive Formation (3459 - 3561 m)

No potential for hydrocarbon generation.

Dunlin Group (3561 - 3892 m)

Drake Formation (3561 - 3752.5 m)

Some tens of meters of this formation originally had a good (rich in one place) potential for generation of mostly gas. The potential seems to has been very variable and parts of the formation do not have any potential for hydrcarbon generation.

Cook Formation (3752.5 - 3768.5 m)

The lower part of the formation appears to have had a good potential for mainly gas generation, while the upper part has probably never had any source rock potential.

Amundsen/Burton Formation (3768.5 - 3892.5 m)

The very upper part resembles the lower part of the Cook Fm. The lower part of the Amundsen/Burton Fm. has probably never had any source rock potential.

Statfjord Formation (3892.5 - 4001 m, TD)

No source rock potential.

Generation and Migration

Generation of hydrocarbons appears to have commenced in parts of the Viking Gp. as well as in the Brent Gp. and Drake Fm. Mostly gas and heavy oil seems to be generated in the Brent Gp. and Drake Fm., as would be expected from these strongly terrestrially influenced source rocks.

The Jurassic section of the well appears to be strongly affected by contaminants which makes the assessment of the presence of migrated hydrocarbons difficult. Migrated hydrocarbons appear to be present in the Etive Fm. conglomerate and possibly also in the Amundsen/Burton Fm. The hydrocarbons in the Etive Fm. appear to have a maturity comparable to about 1.0% Ro, while those in the Amundsen/ Burton Fm. appear to be more mature, possibly corresponding to about 1.3 % Ro. The identification of the latter hydrocarbons is tentative.

Maturity

Based mainly on vitrinite reflectance, but with due consideration of Tmax, chemical and visual kerogen data, it is suggested that the well is imature to moderately mature down to at least 2750 m. The top of the oil window (0.6 % Ro) appears to be entered between 2750 m and 3000 m. It is difficult to find the exact top due to severely thermally altered ("turbodrilled") cuttings in this section of the well. Peak oil generation is reached around the base of the Heather Fm., between 3300 m and 3450 m. It is suggested that peak oil (0.8 % Ro) is most likely reached close to 3350 m. The base of the oil window (1.0 % Ro) appears to be reached (based mainly on Tmax data) at around 3900 m.

Correlation

The richest source rock of the Heather Fm. is very similar (based on GC-MS) to the dominant Upper Jurassic shales of the North Sea and is thought to represent this rich source rock. The Ness Fm. is a much more terrestrially influenced source rock, but it still has some potential for generation of hydro-carbons. See discussion above.

Hydrocarbons found in the Etive Fm. conglomerate are thought to be derived from a marine source rock and generated at a maturity comparable to about 1.0 % Ro. The source rock is probably of the same type as the Heather Fm. in this well (albeit more mature), i.e. the hydrocarbons are derived from well mature Upper Jurassic shales.

Hydrocarbons found in the Amundsen/Burton Fm. sandstones are severely affected by contamination. It is tentatively suggested that the hydrocarbons are derived from a strongly terrestrially affected, highly mature (comparable to about 1.3 % Ro ?) source rock, which could possibly be similar to the Ness Fm. of this well.

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LEGEND FOR FIGURES:

TOC versus Depth

Production Indices versus Depth

Tmax versus Depth

+ Shale/Claystone
x Siltstones
o Coals
▷ Carbonates
◇ Sandstones
⊠ Anhydrite
⊕ Marls
□ Bulk

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Figure 1 Client: VARIOUS

TOC Data for Well NOCS 30/6–11

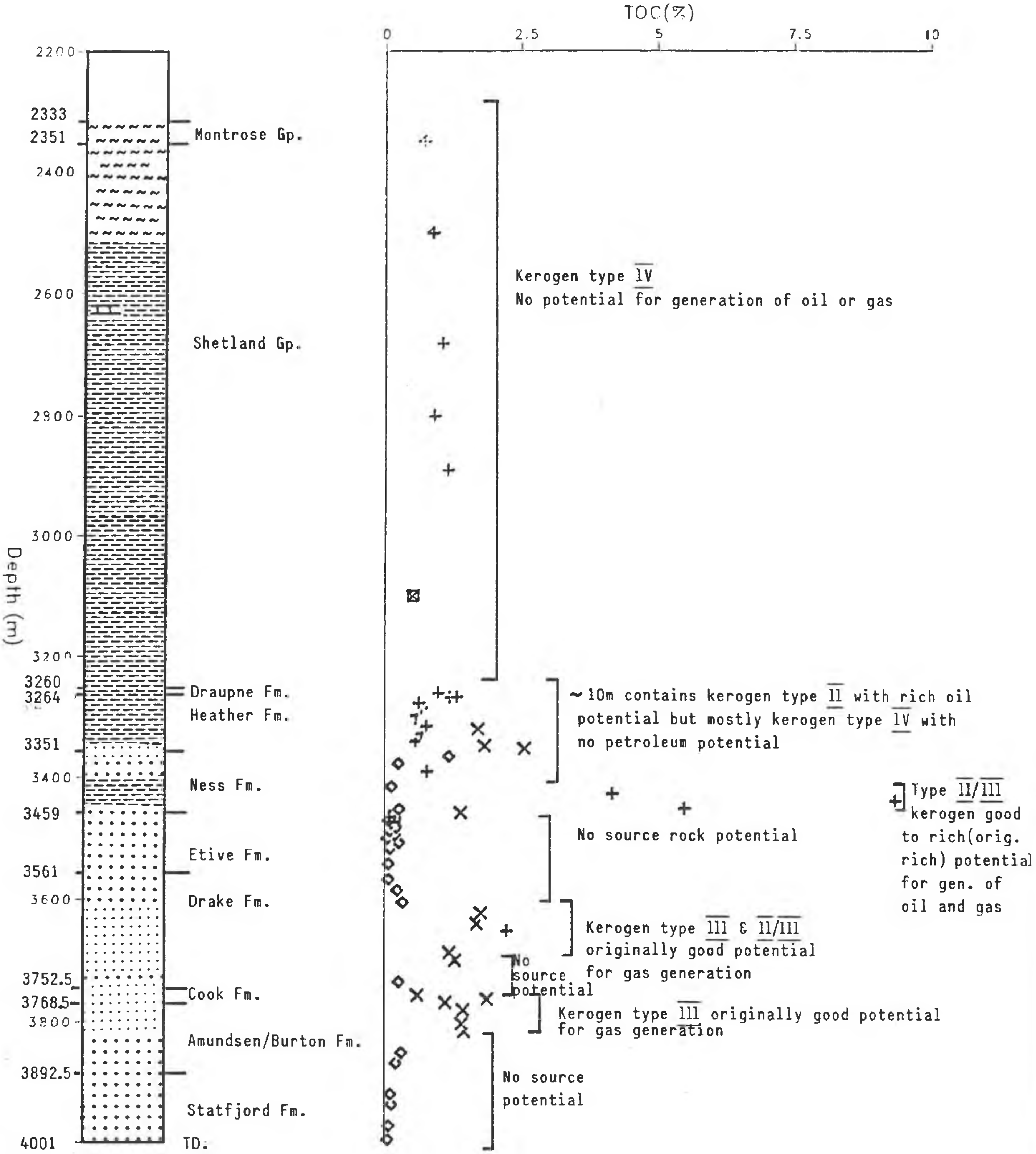

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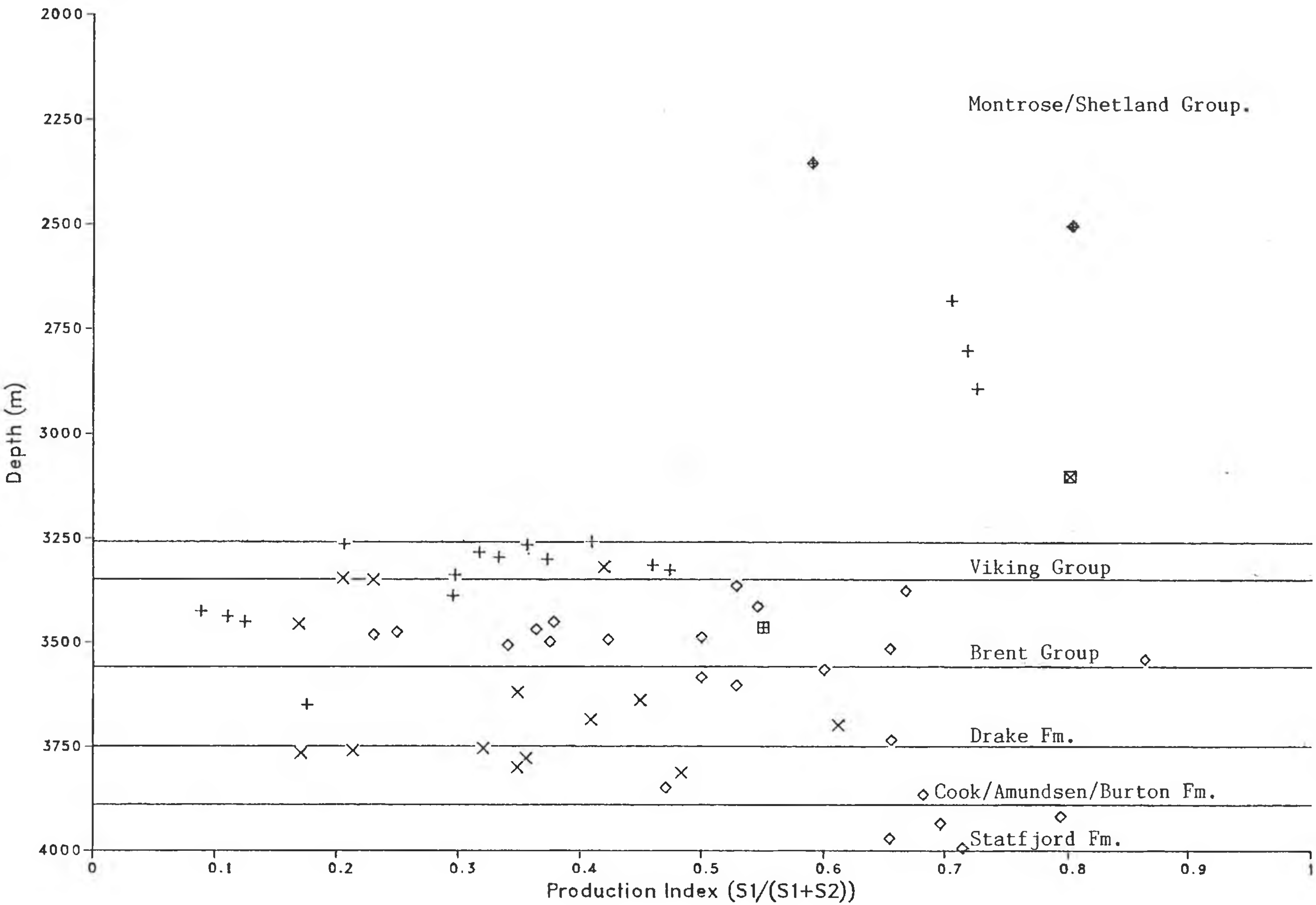
Figure: 2

Production Index Data for Well NOCS 30/6-11

Client: VARIOUS



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Tmax Data for Well NOCS 30/6–11

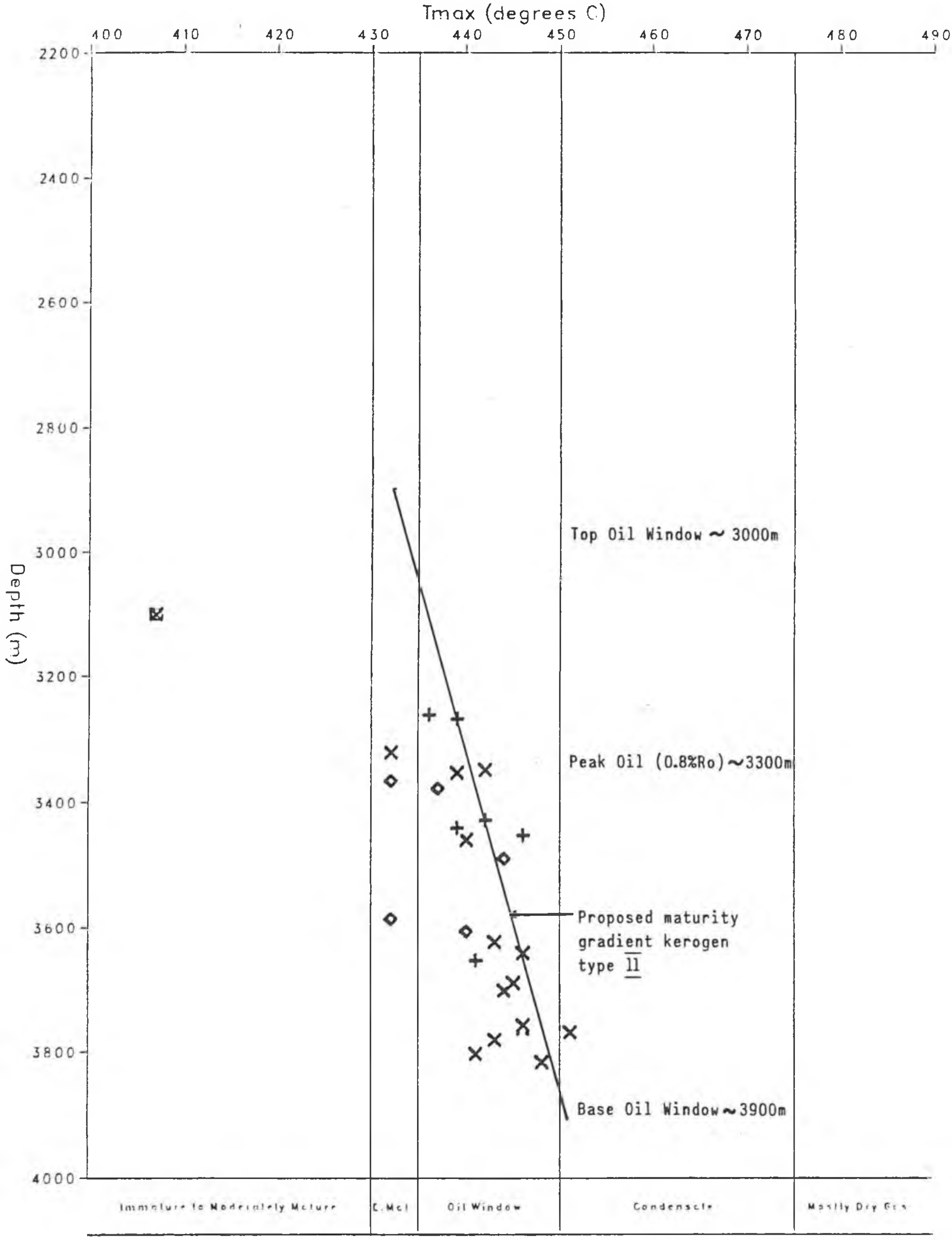
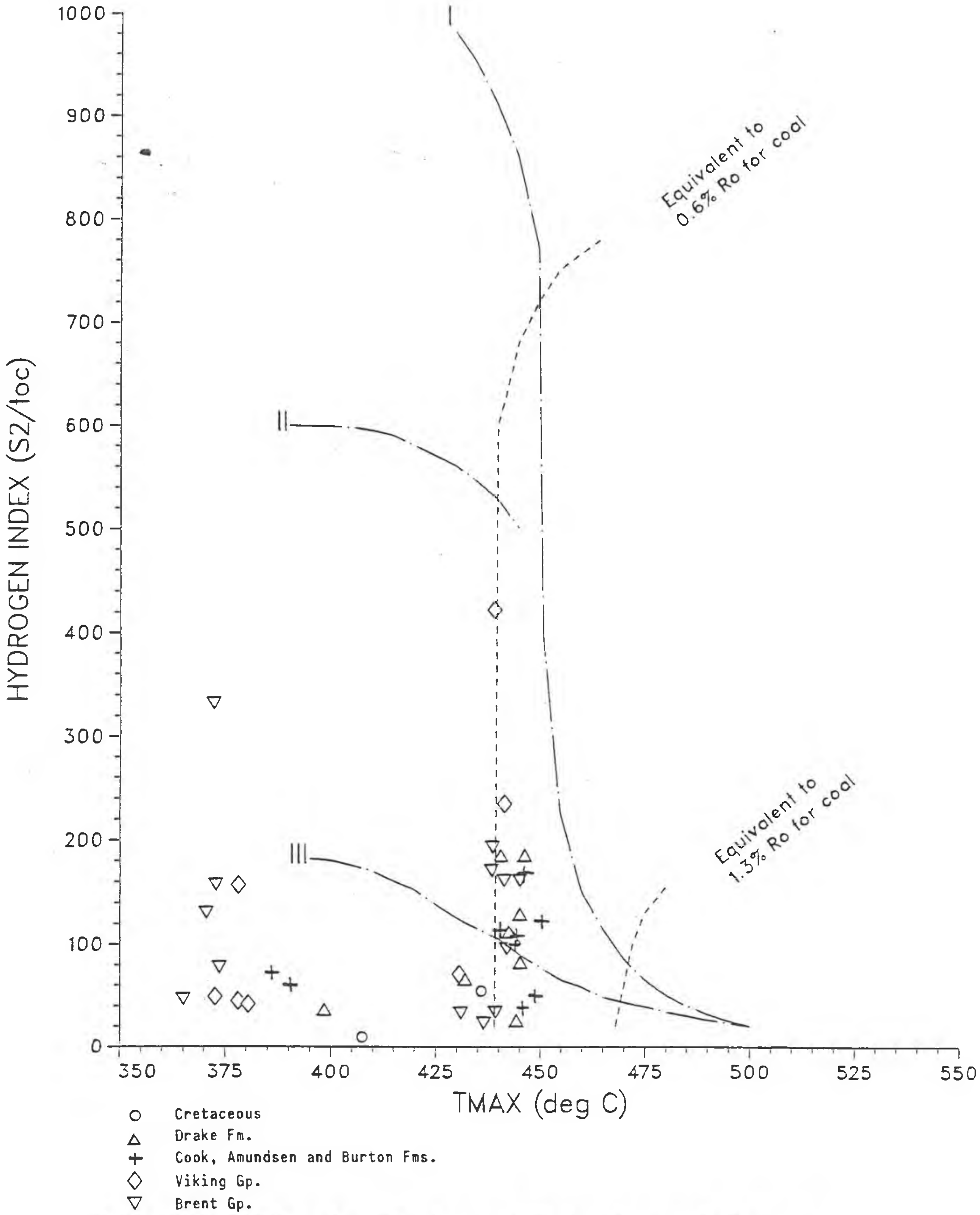
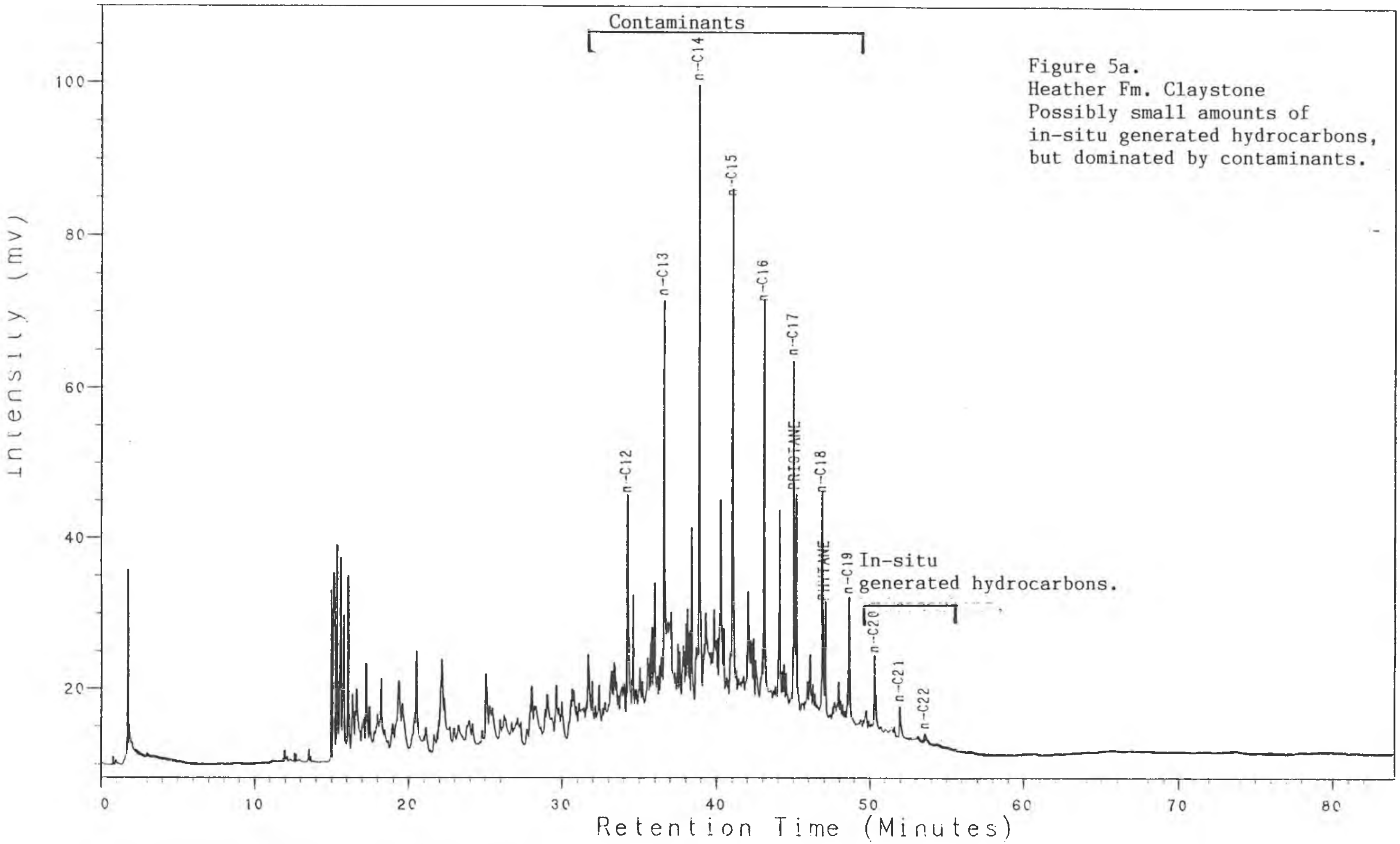


Figure 4 : Hydrogen Index v.s. Tmax values
Well NOCS 30/6-11



Analysis D160033IB 26, 1, 1 30/6-11, 3266.00m



WELL NOCS 30/6-11 3266.00m ccp
THERMAL EXTRACTION GC (S1)
Clst:dsk y brn

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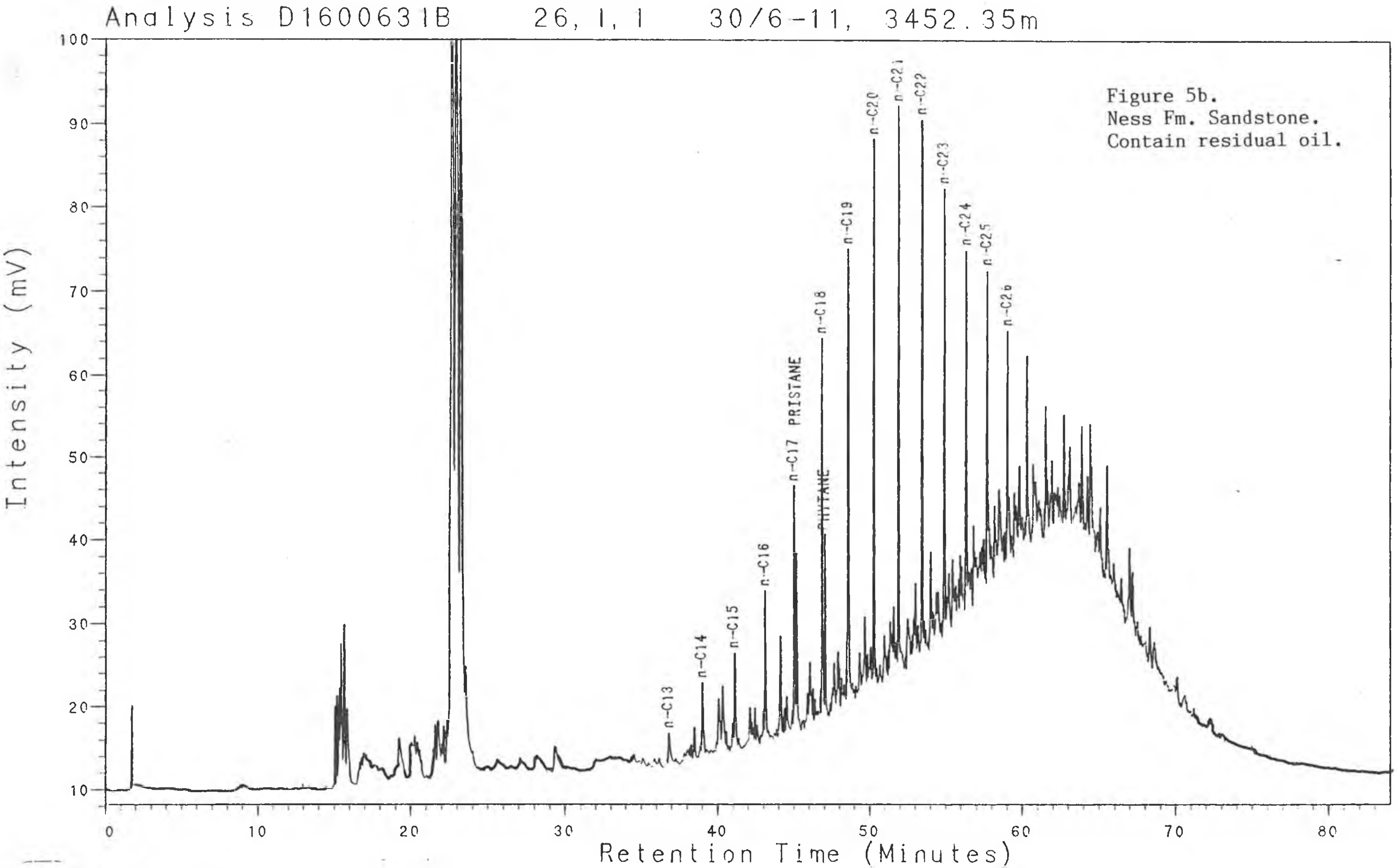

WELL NOCS 30/6-11 3452.35m ccp
THERMAL EXTRACTION GC (S1)
Sst:lt gy to lt y brn

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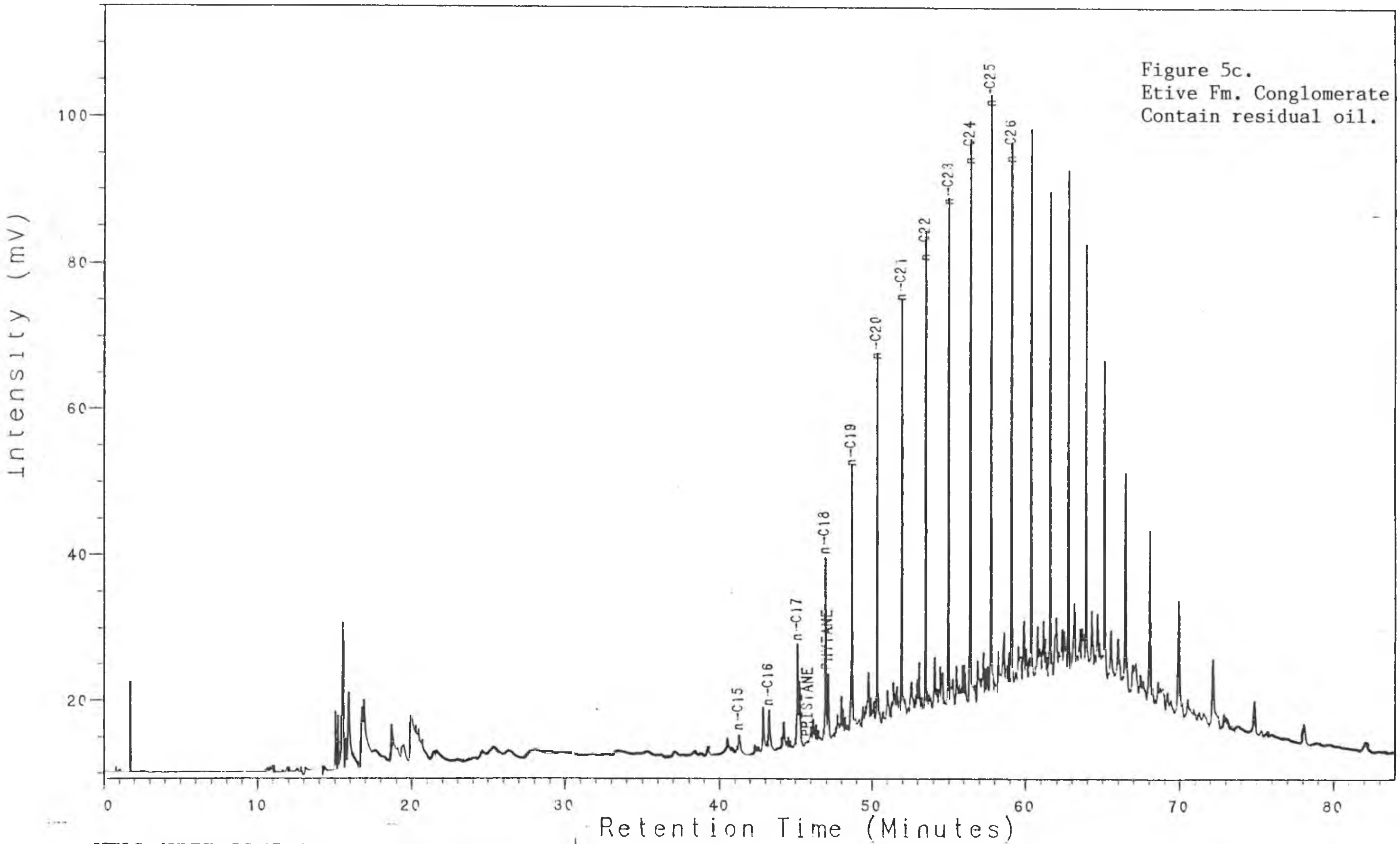
Analysis D1600661B 26, 1, 1 30/6-11, 3464.65m



WELL NOCS 30/6-11 3464.65m ccp
THERMAL EXTRACTION GC (S1)
Congl: lt y brn

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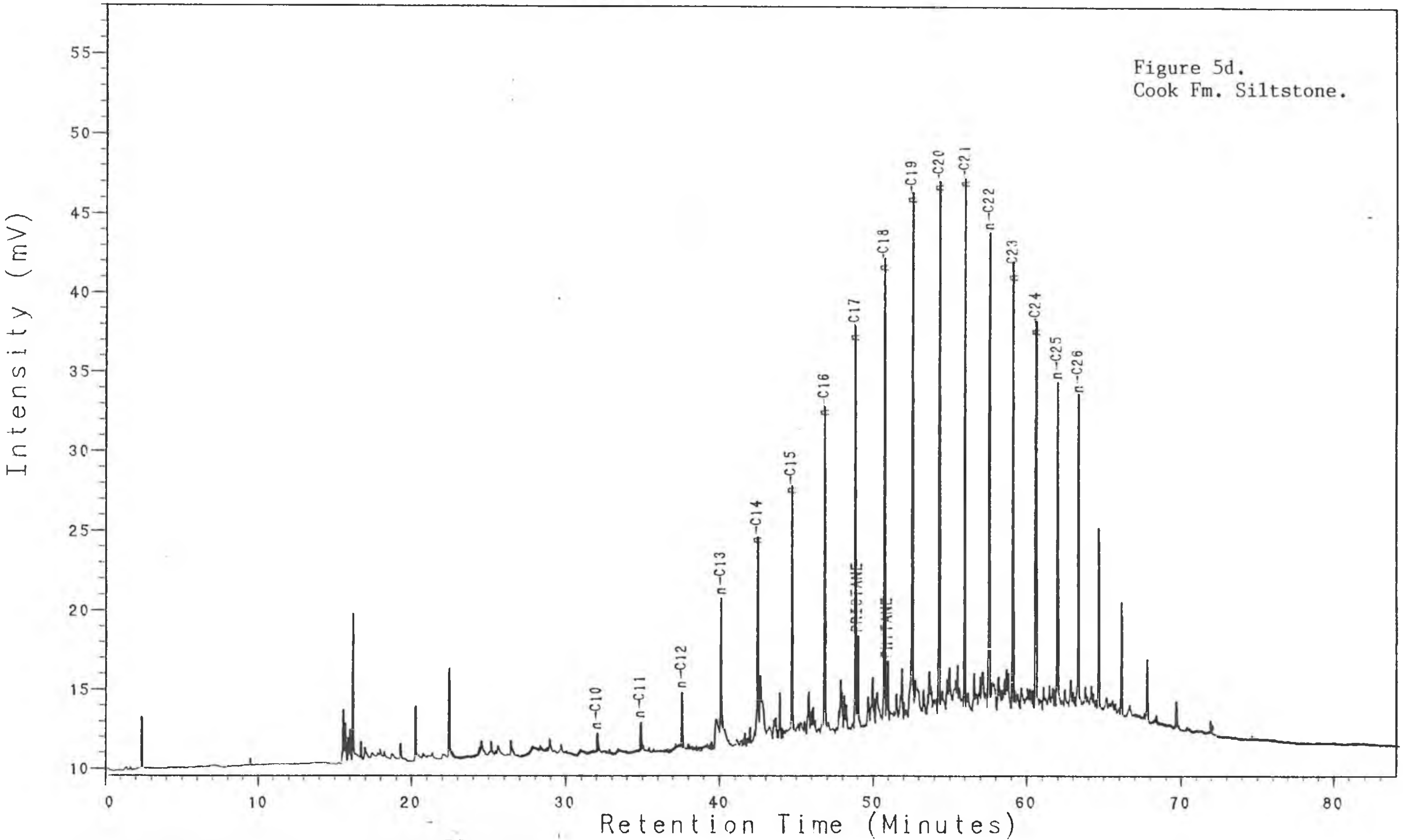
Analysis PD1601651 26, 1, 1 30/6-11, 3762.20m



WELL NOCS 30/6-11 3762.20m ccp
THERMAL EXTRACTION GC (S1)
Sltst:lt brn gy

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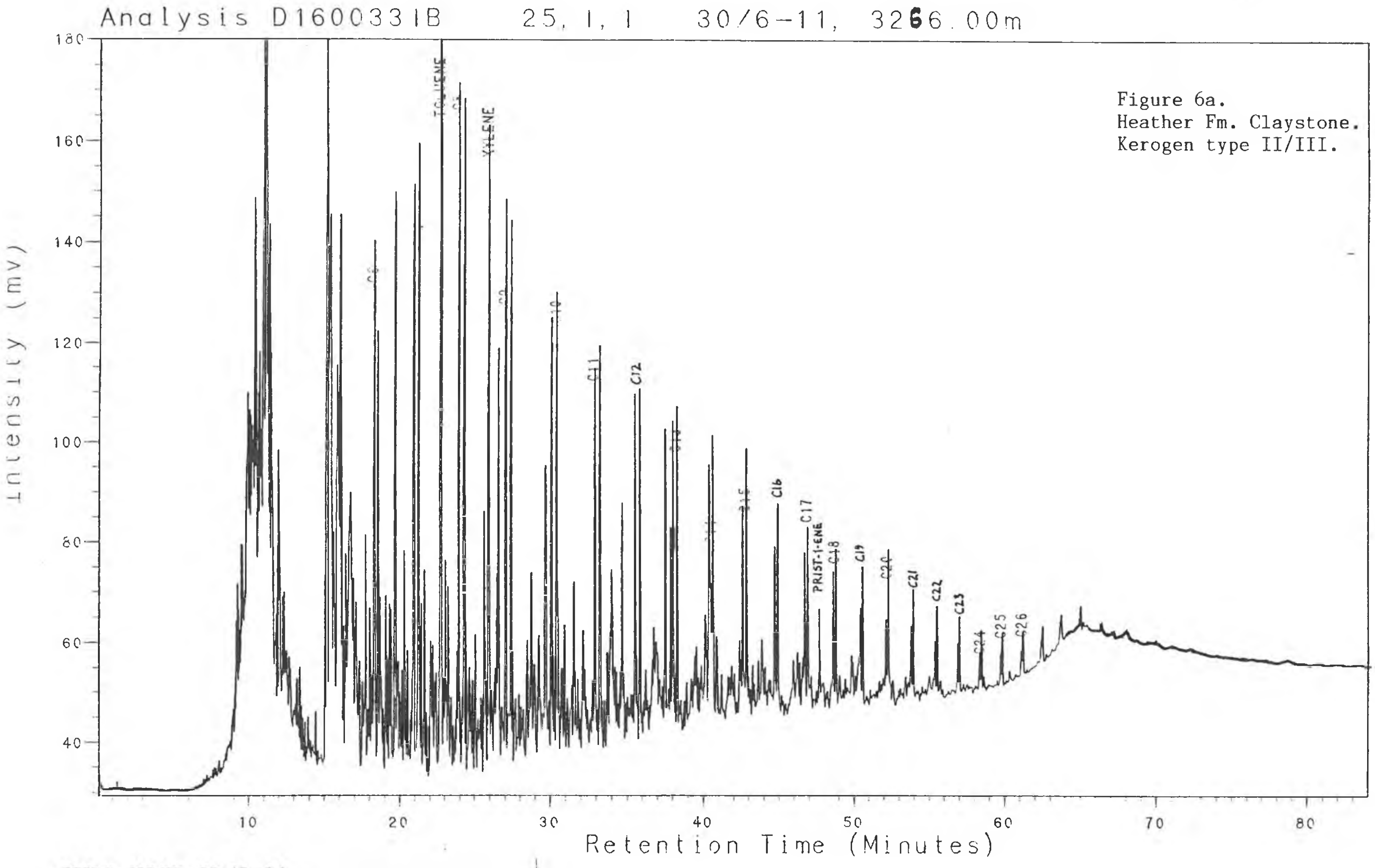
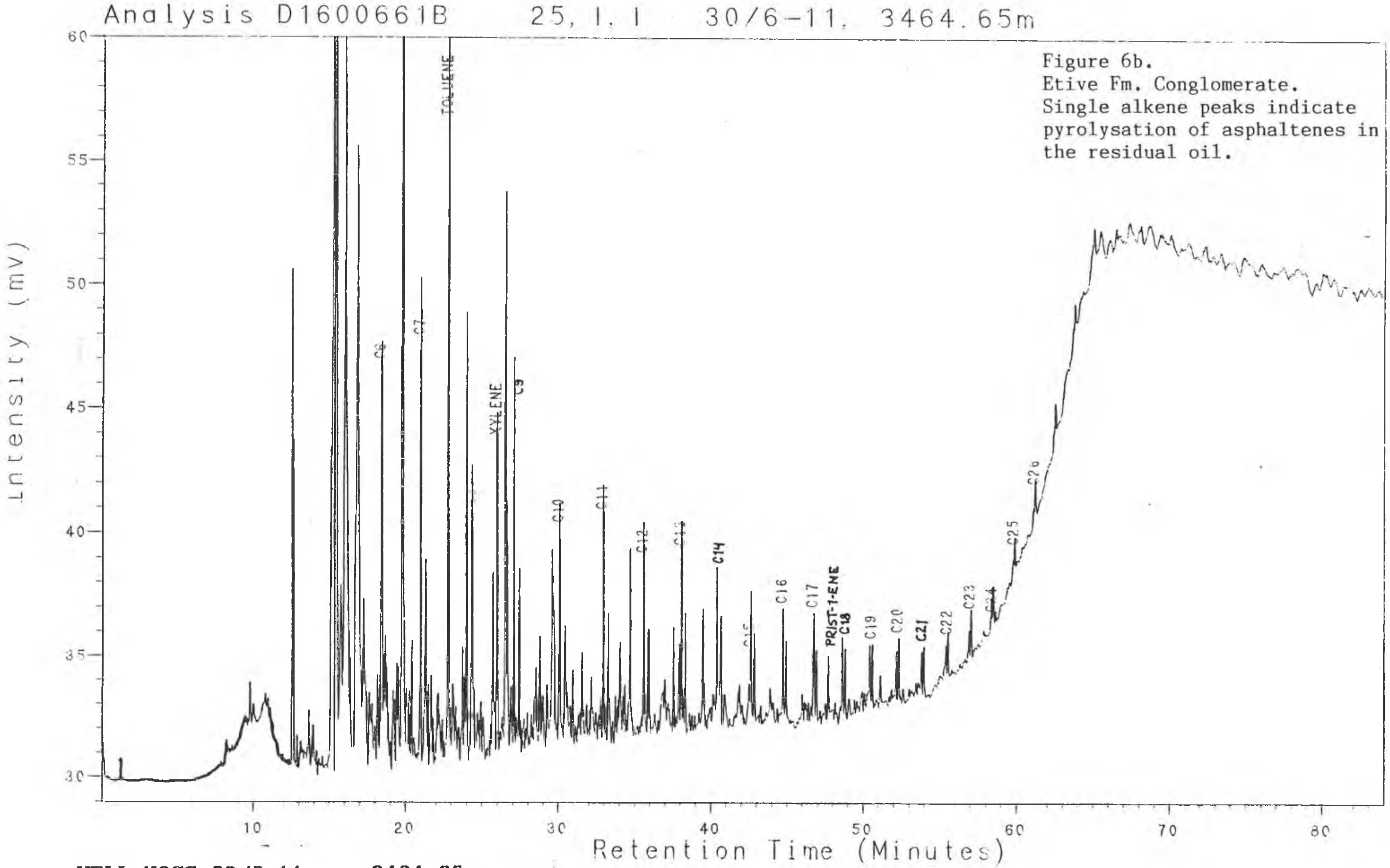


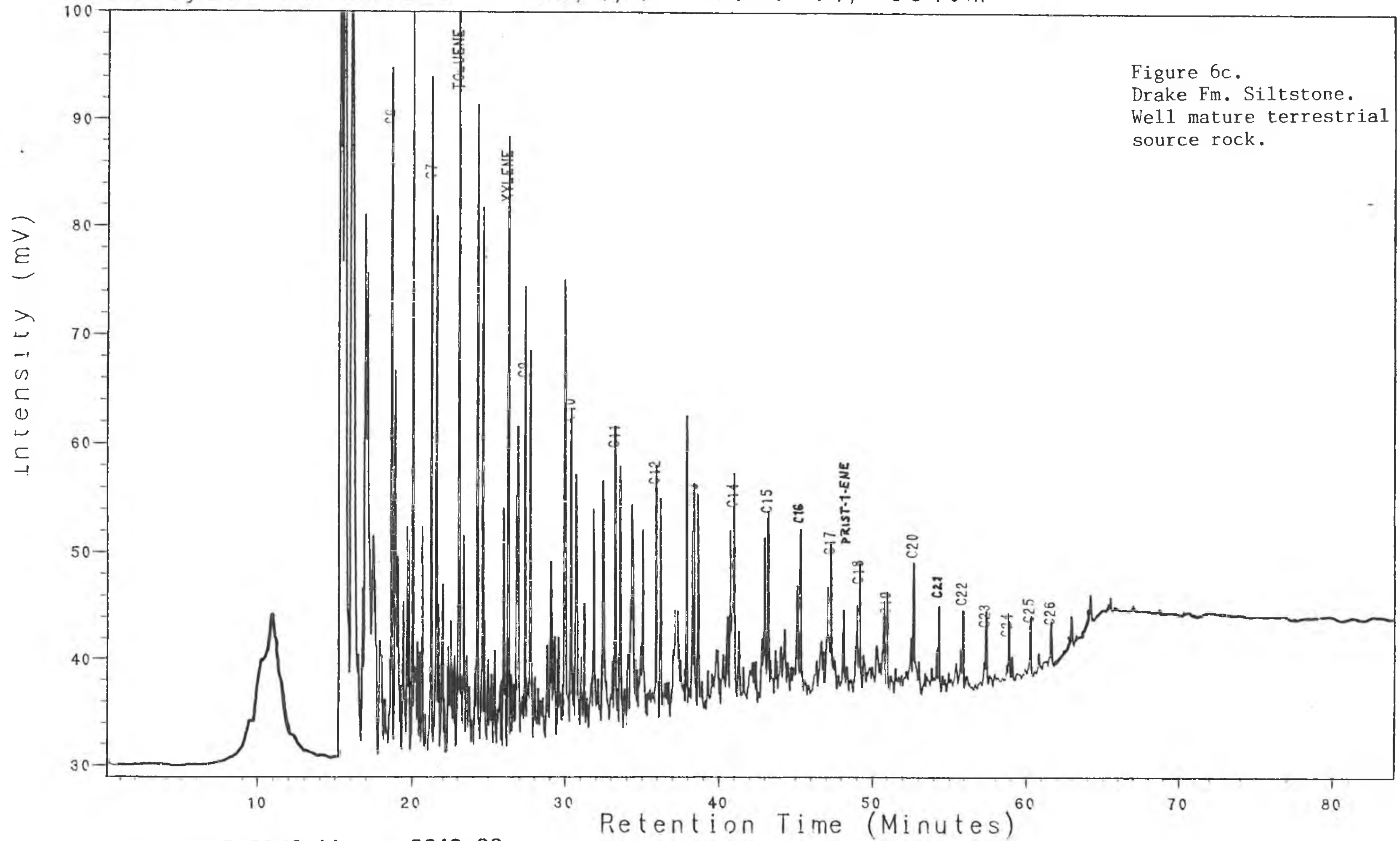
WELL NOCS 30/6-11 3266.00m ccp
PYROLYSIS GC (S2)
Clst:dsk y brn



WELL NOCS 30/6-11 3464.65m ccp
PYROLYSIS GC (S2)
Congl:lt y brn

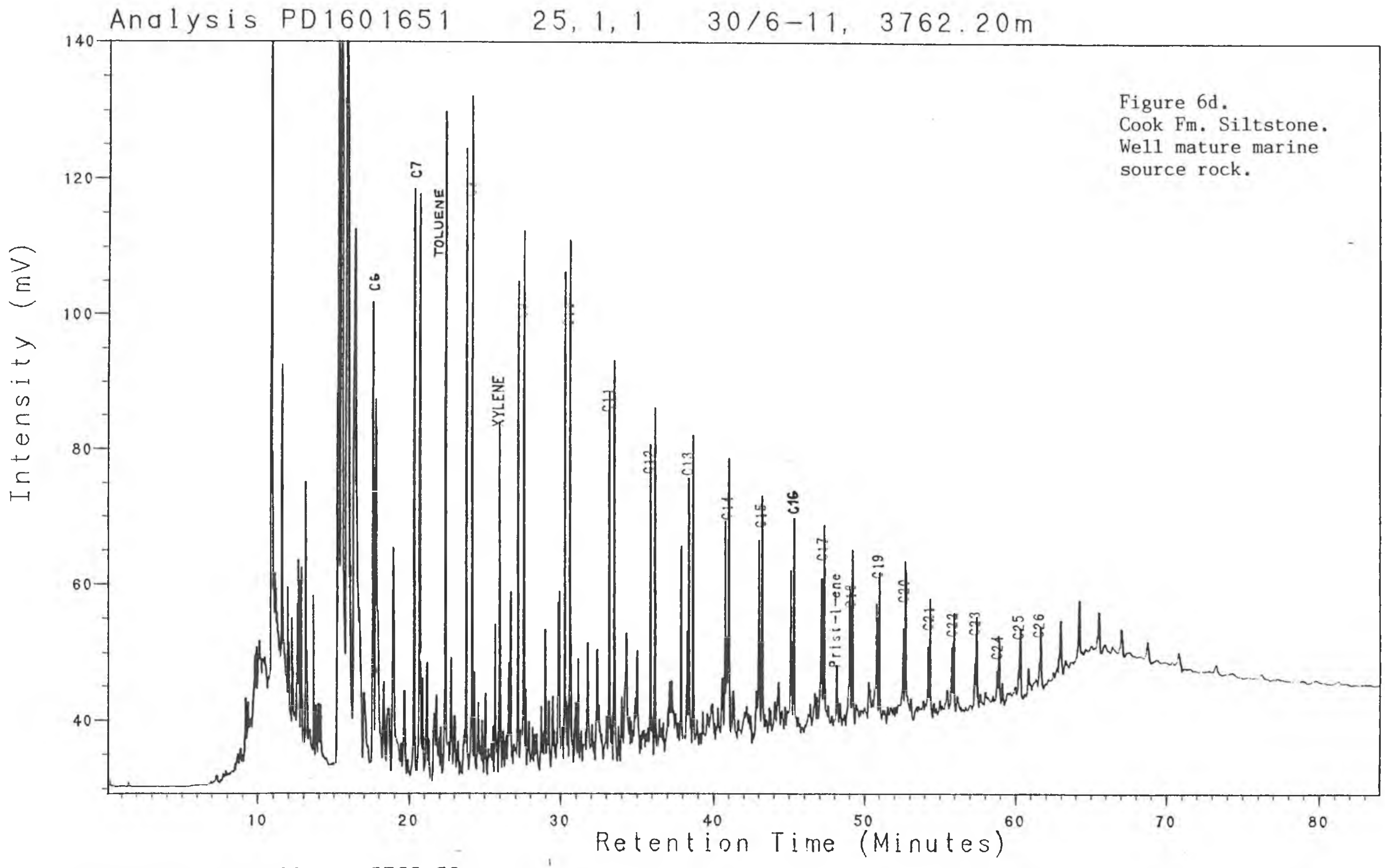
GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

Analysis PD1601022 25, 1, 1 30/6-11, 3640m



WELL NOCS 30/6-11 3640.00m
PYROLYSIS GC (S2)
Sltst:gy brn to dsk y brn

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S



WELL NOCS 30/6-11 3762.20m ccp
PYROLYSIS GC (S2)
Sltst:lt brn gy

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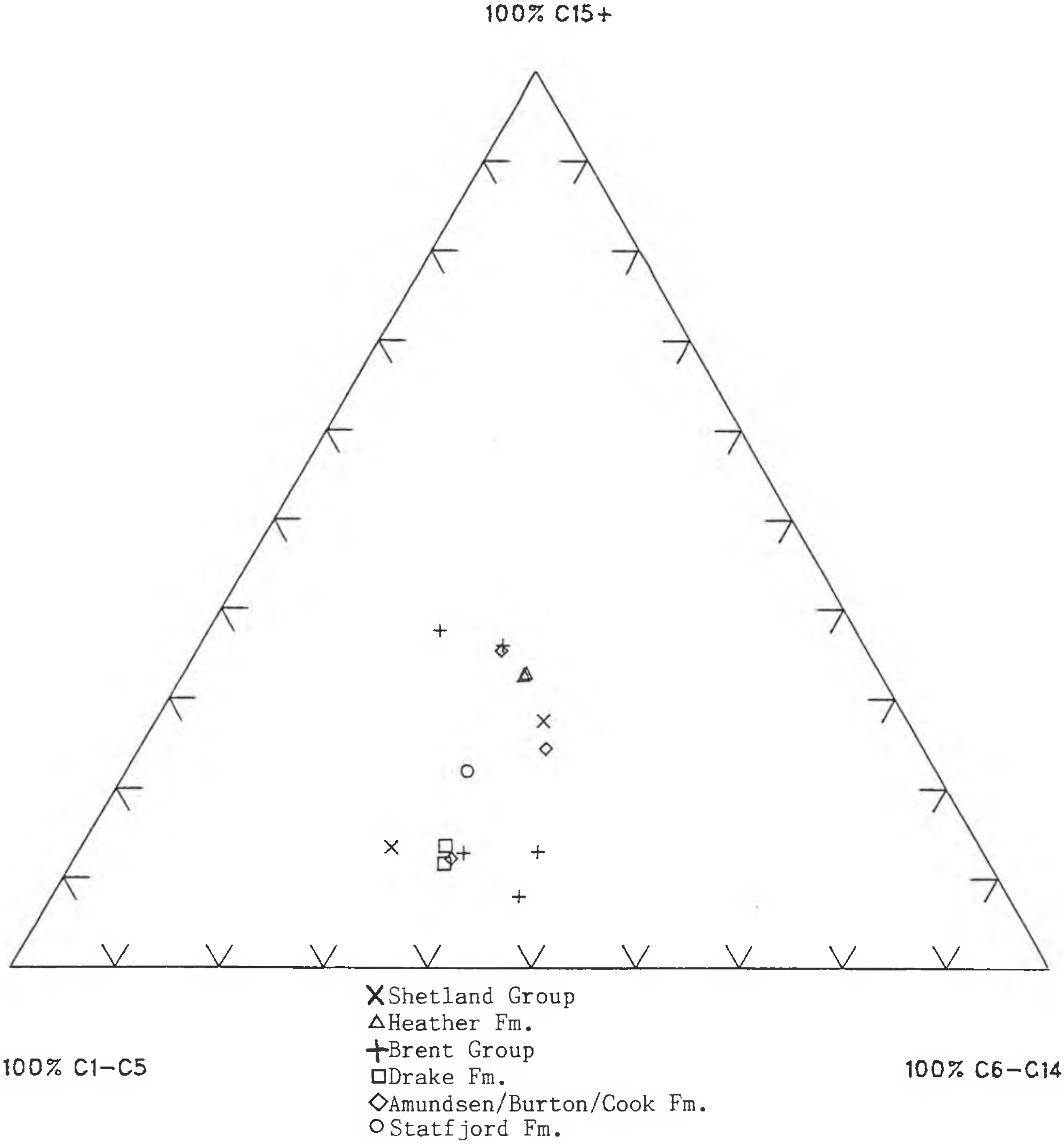
Figure 7 : Pyrolysis GC Composition

Well NOCS 30/6-11



Analysis SC2453266 5, 1, 1 30/6-11 3266m

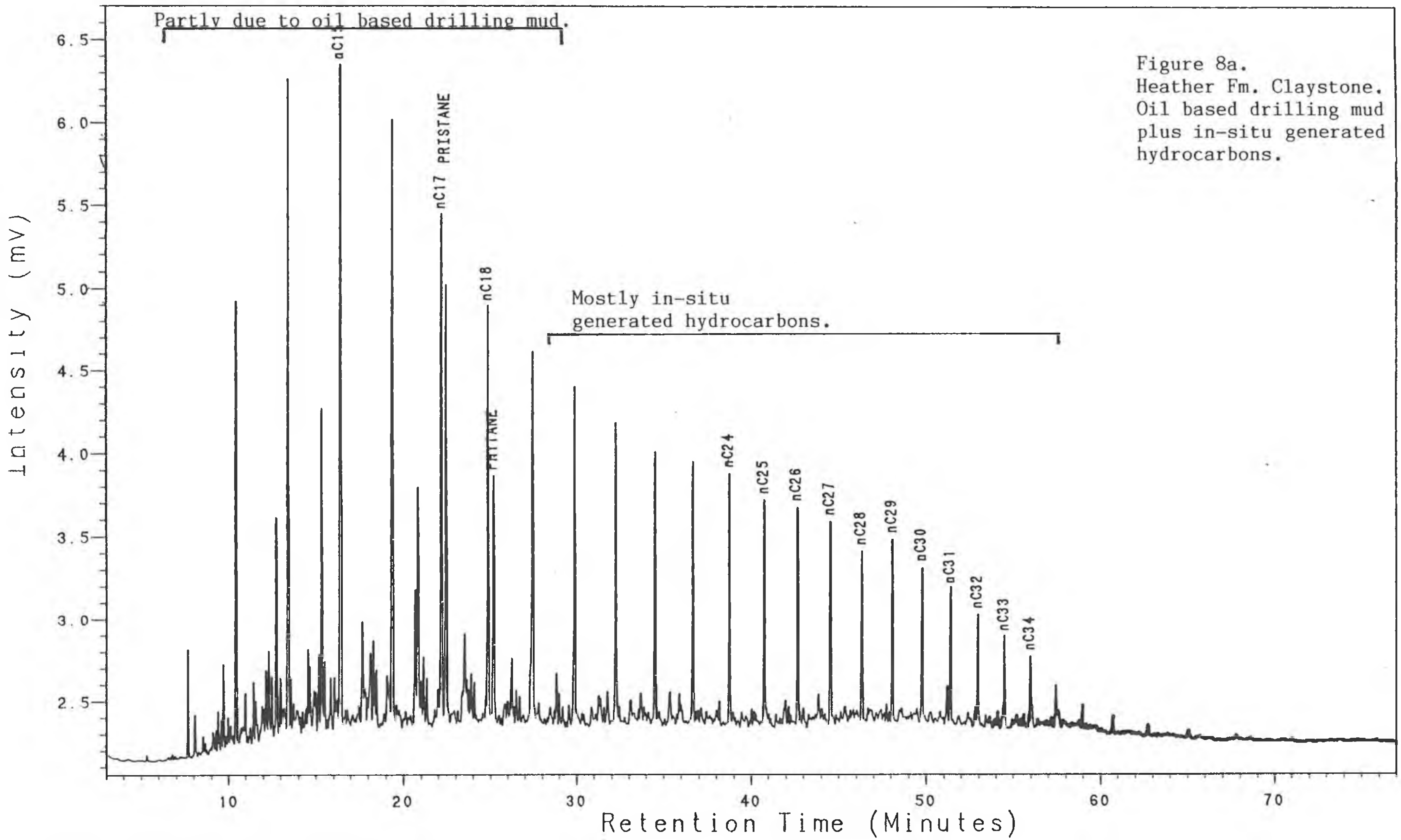


Figure 8a.
Heather Fm. Claystone.
Oil based drilling mud
plus in-situ generated
hydrocarbons.

WELL NOCS 30/6-11 3266m ccp
SATURATED GC
Clst:dsk y brn

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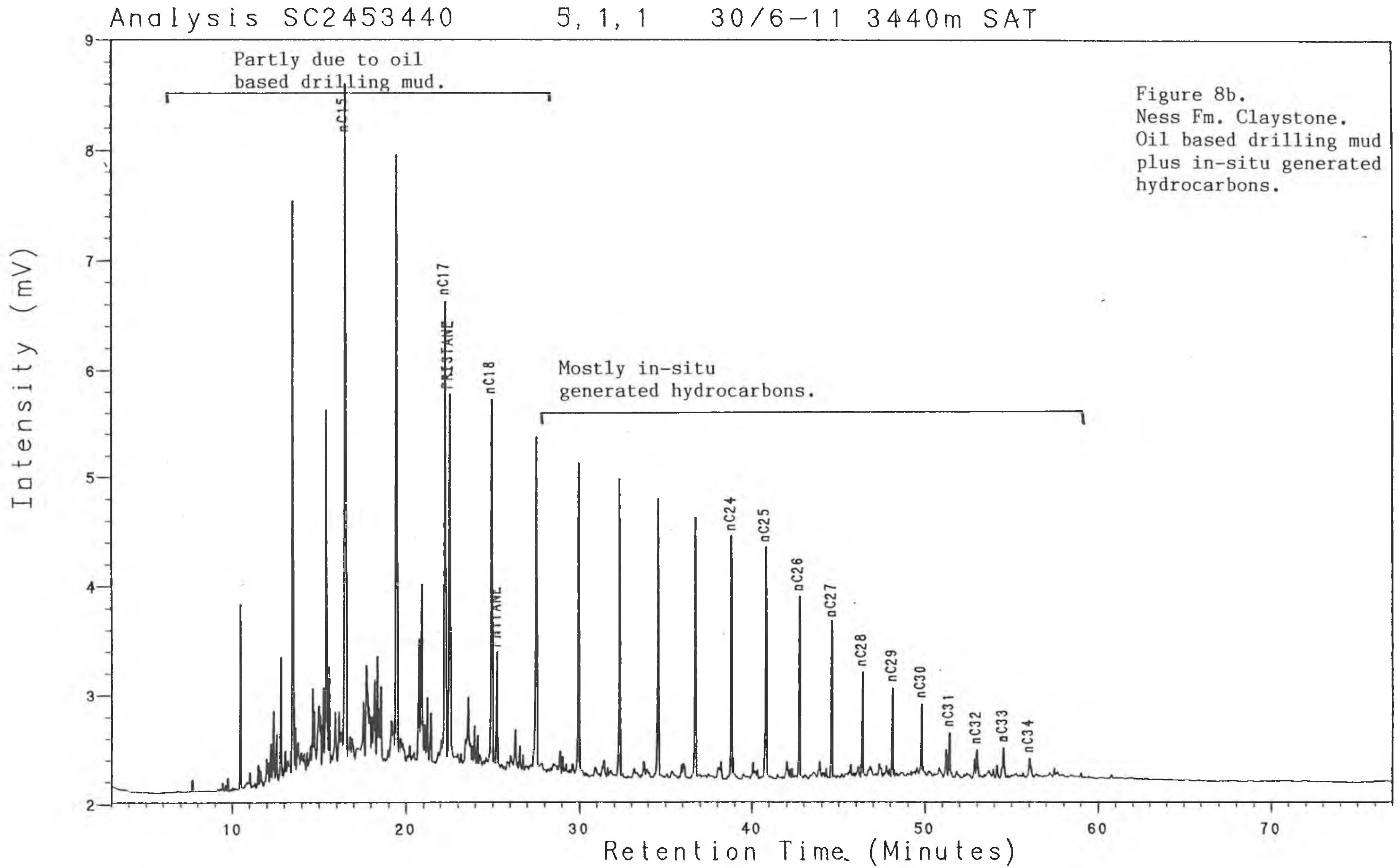

WELL NOCS 30/6-11 3440m
SATURATED GC
Clst:brn gy to brn blk

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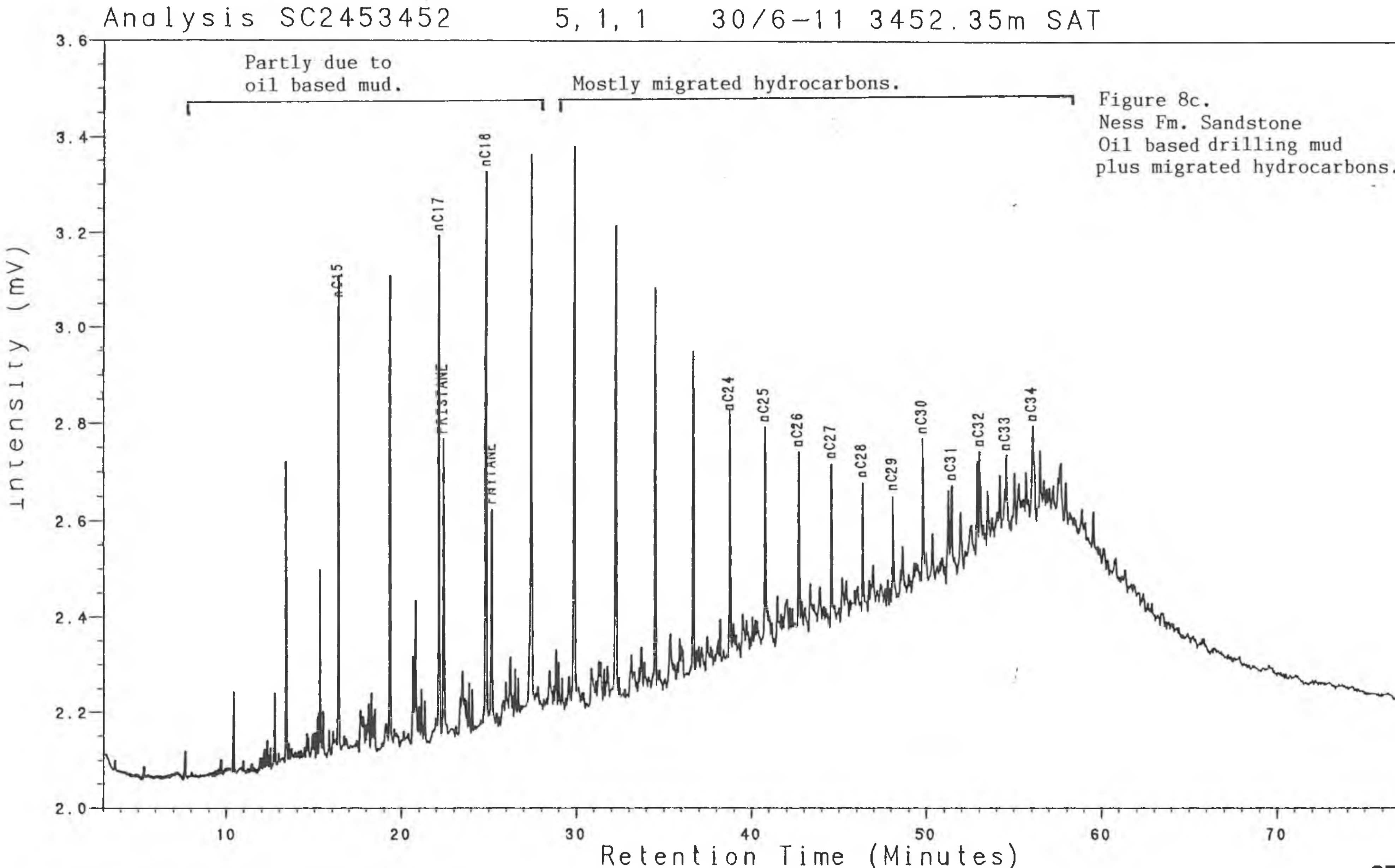
GEOCHEMICAL LABORATORIES OF NORWAY A/S



WELL NOCS 30/6-11 3452.35m ccp
SATURATED GC
Sst:lt gy to lt y brn

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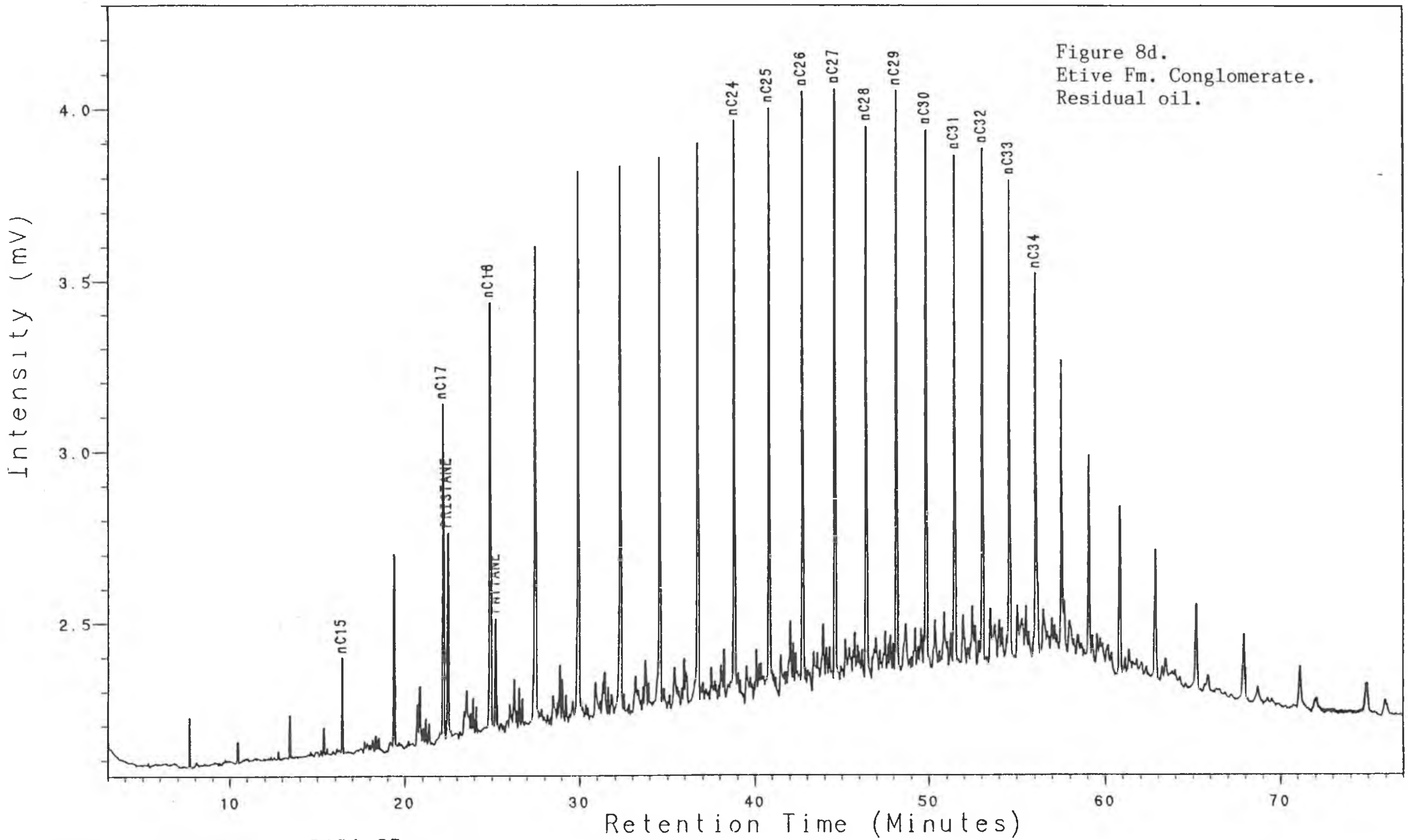
Analysis SC2453464 5, 1, 1 30/6-11 3464.25m SAT



WELL NOCS 30/6-11 3464.65m ccp
SATURATED GC
Congl:lt y brn

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Analysis AC4023266 8, 1, 1 30/6-11 3266m ARO

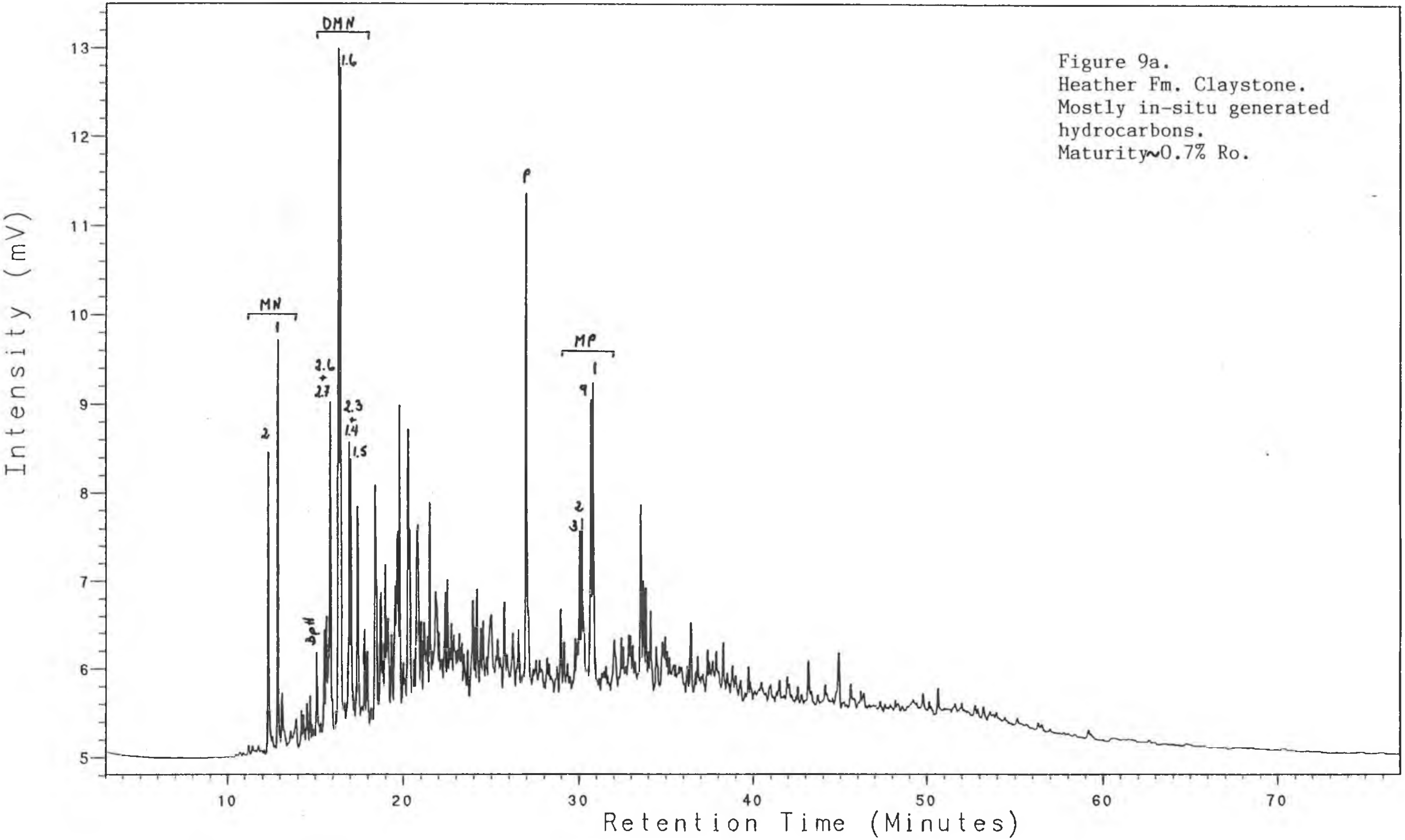
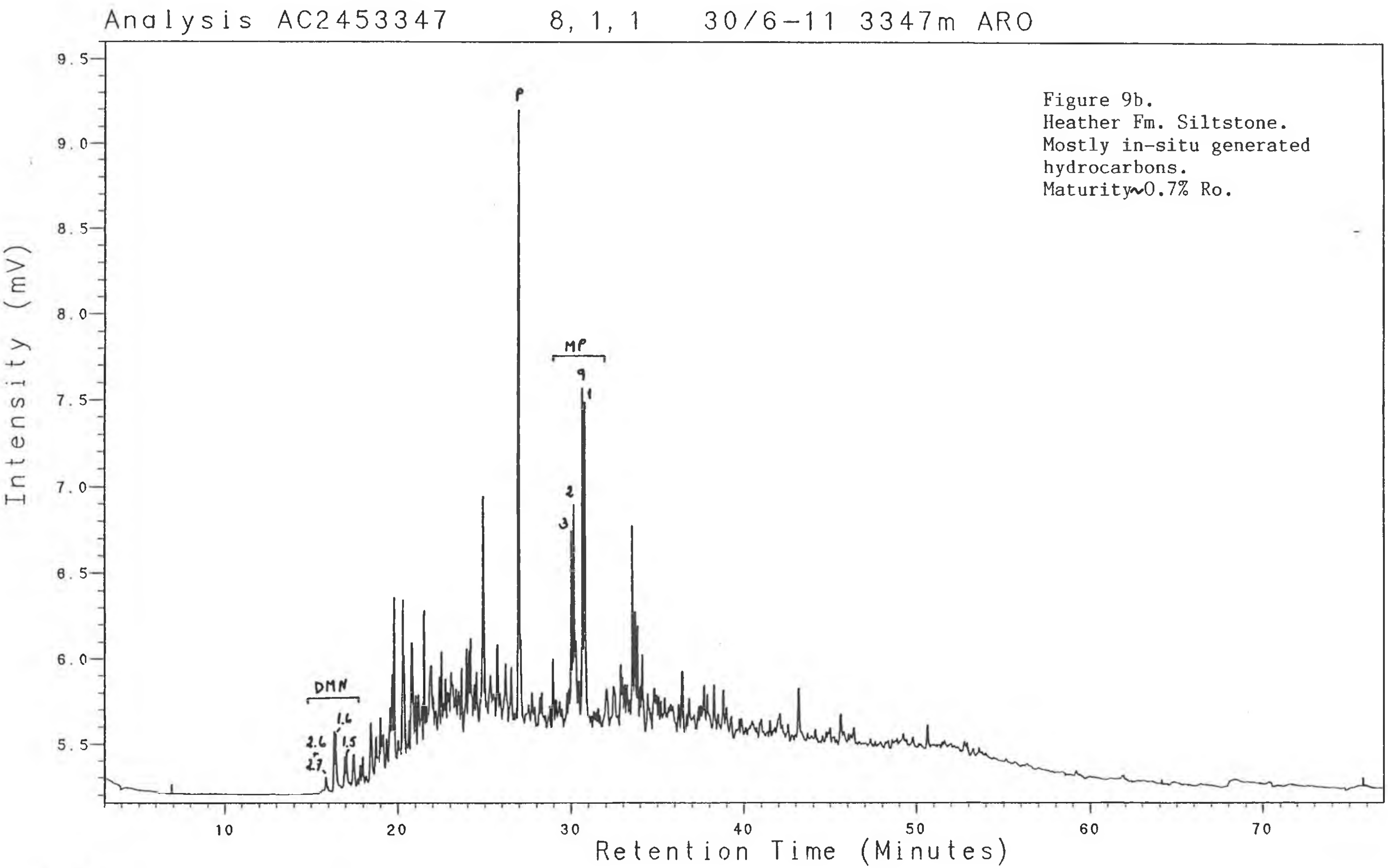


Figure 9a.
Heather Fm. Claystone.
Mostly in-situ generated
hydrocarbons.
Maturity~0.7% Ro.

WELL NOCS 30/6-11 3266m ccp
AROMATIC GC (FID)
Clst:dsk y brn

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S



WELL NOCS 30/6-11 3347m
AROMATIC GC (FID)
Sltst:brn gy to dsk y brn

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

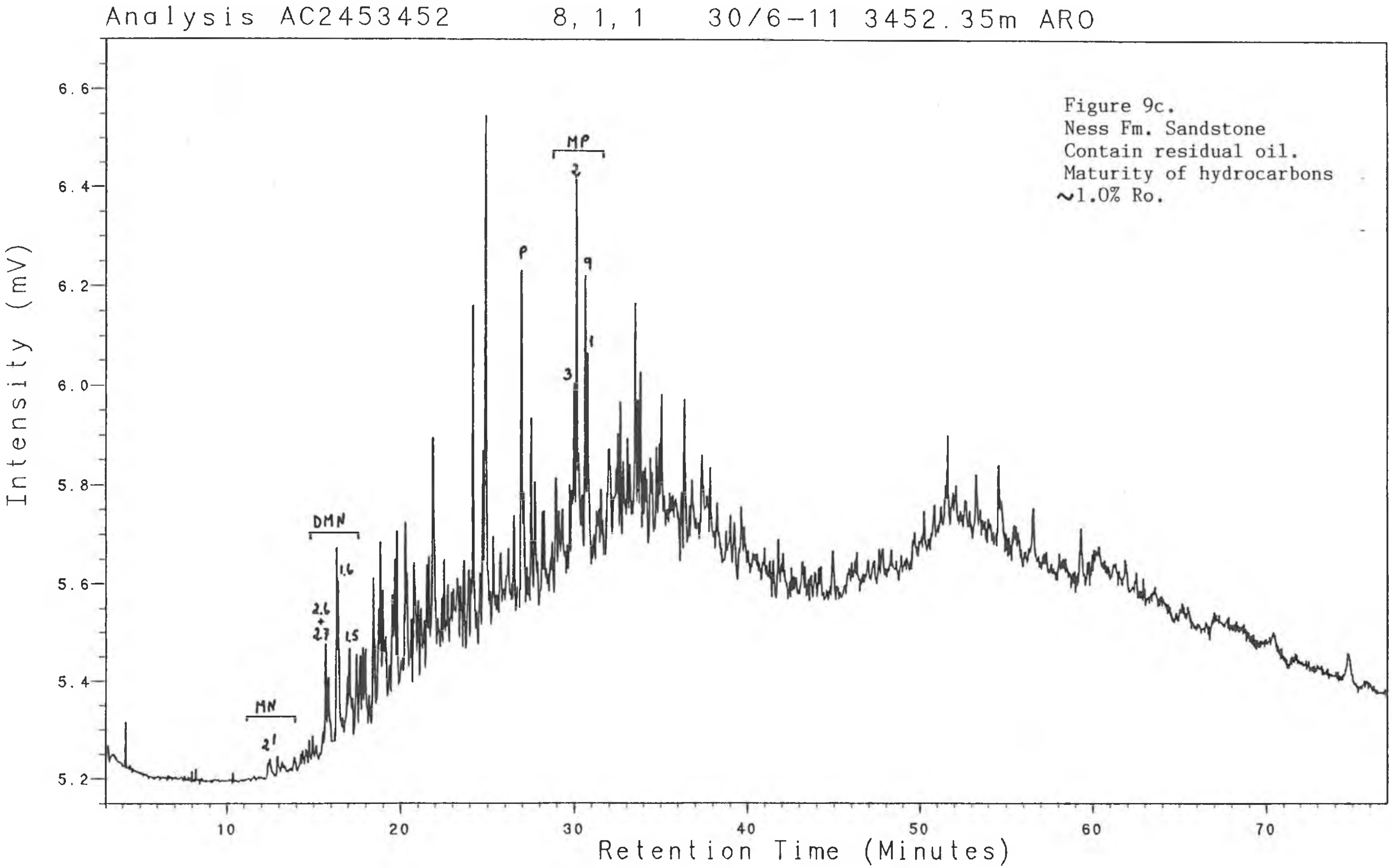
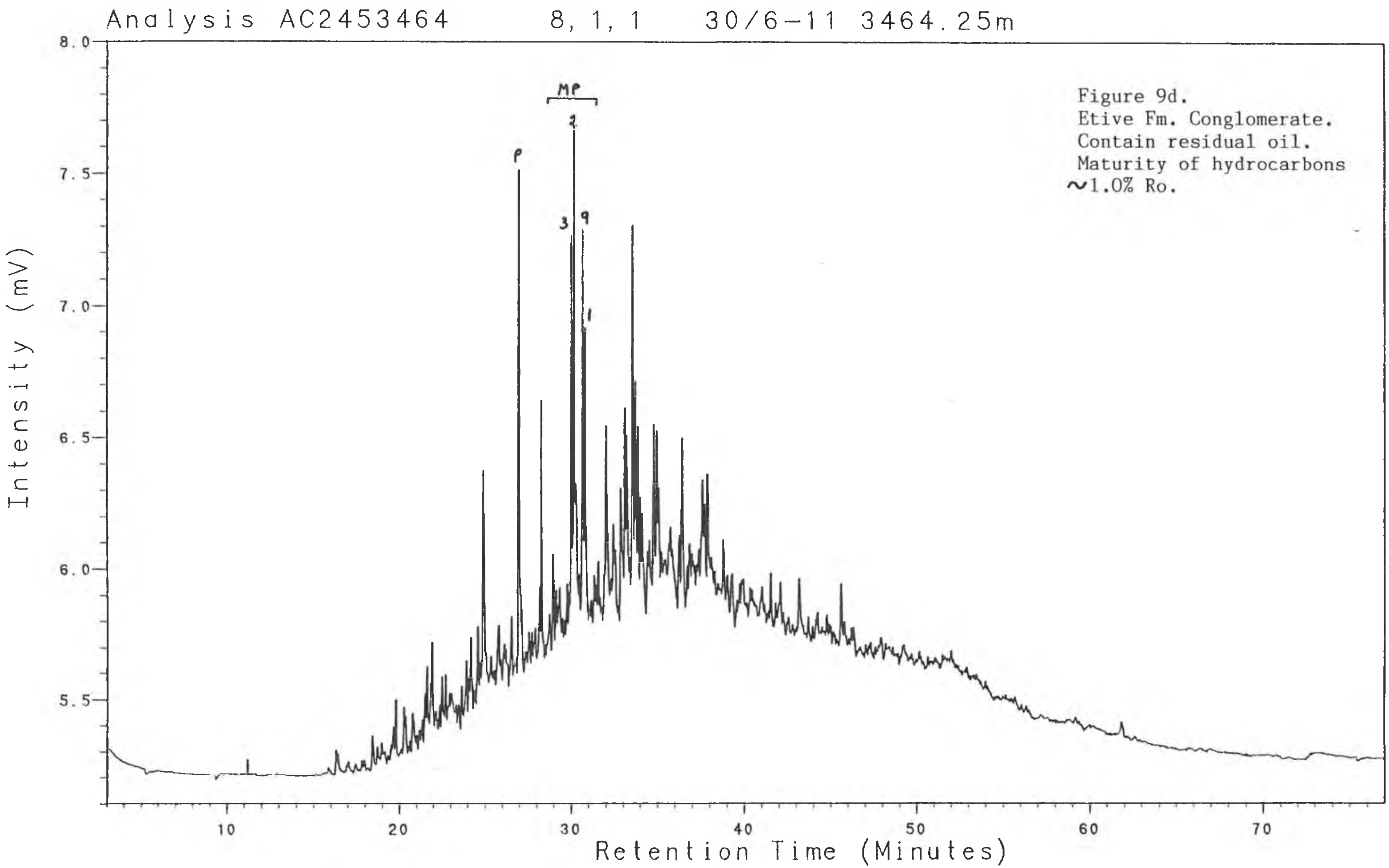


Figure 9c.
Ness Fm. Sandstone
Contain residual oil.
Maturity of hydrocarbons
~1.0% Ro.

WELL NOCS 30/6-11 3452.35m ccp
AROMATIC GC (FID)
Sst:lt gy to lt y brn

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S



WELL NOCS 30/6-11 3464.65m ccp
AROMATIC GC (FID)
Congl:lt y brn

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Figure 10: Vitrinite Reflectance versus Depth
Well NOCS 30/6–11

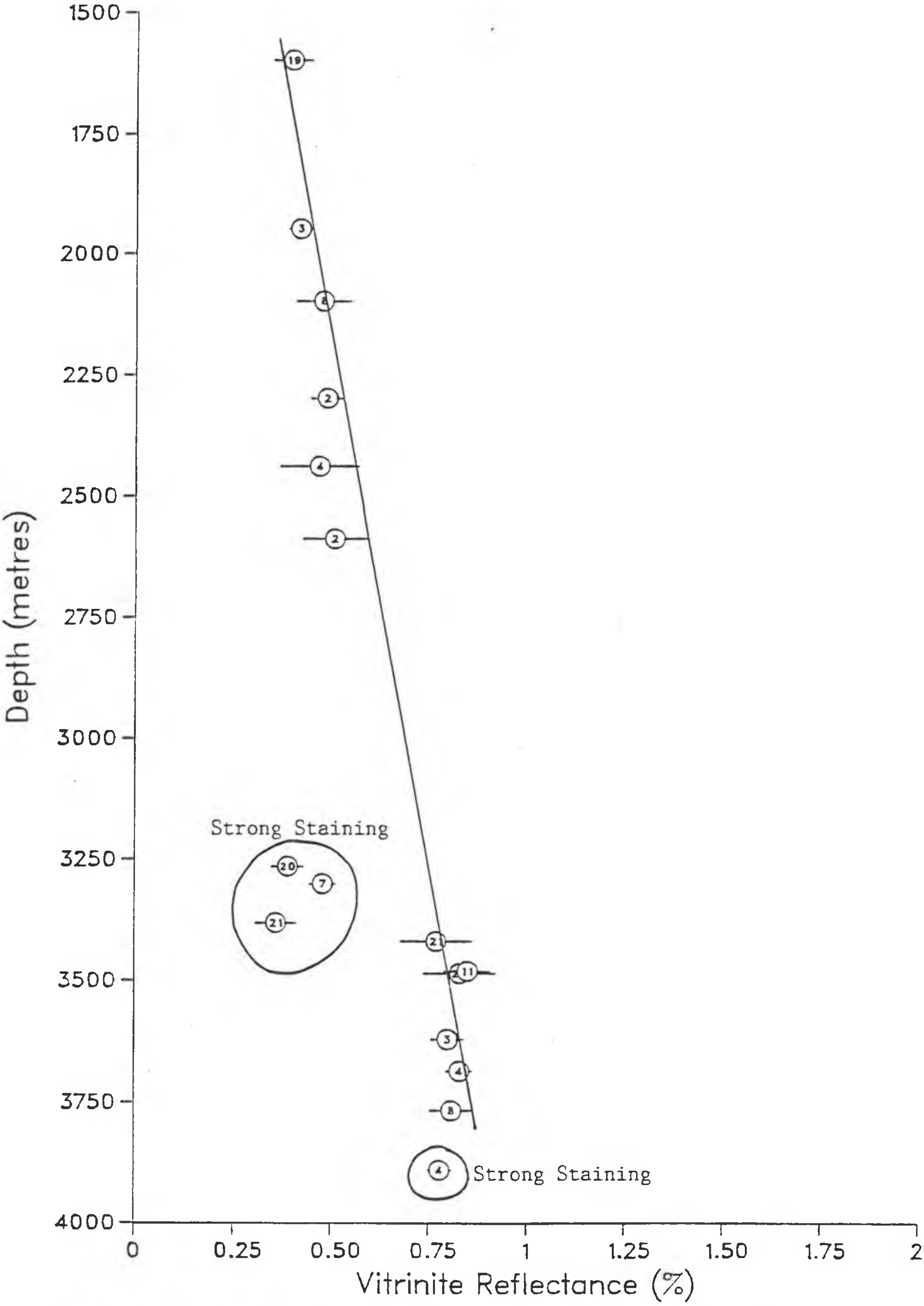

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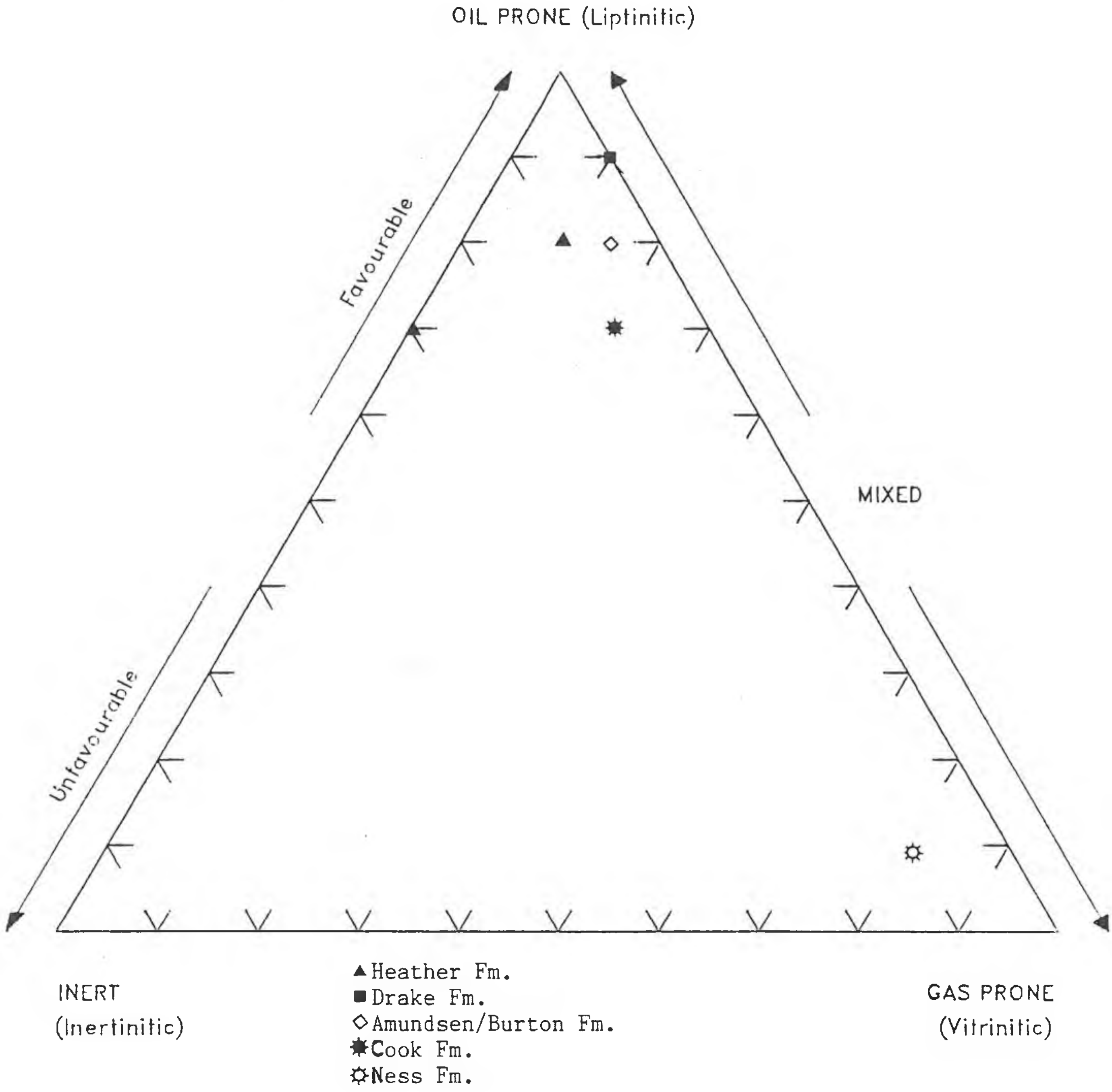
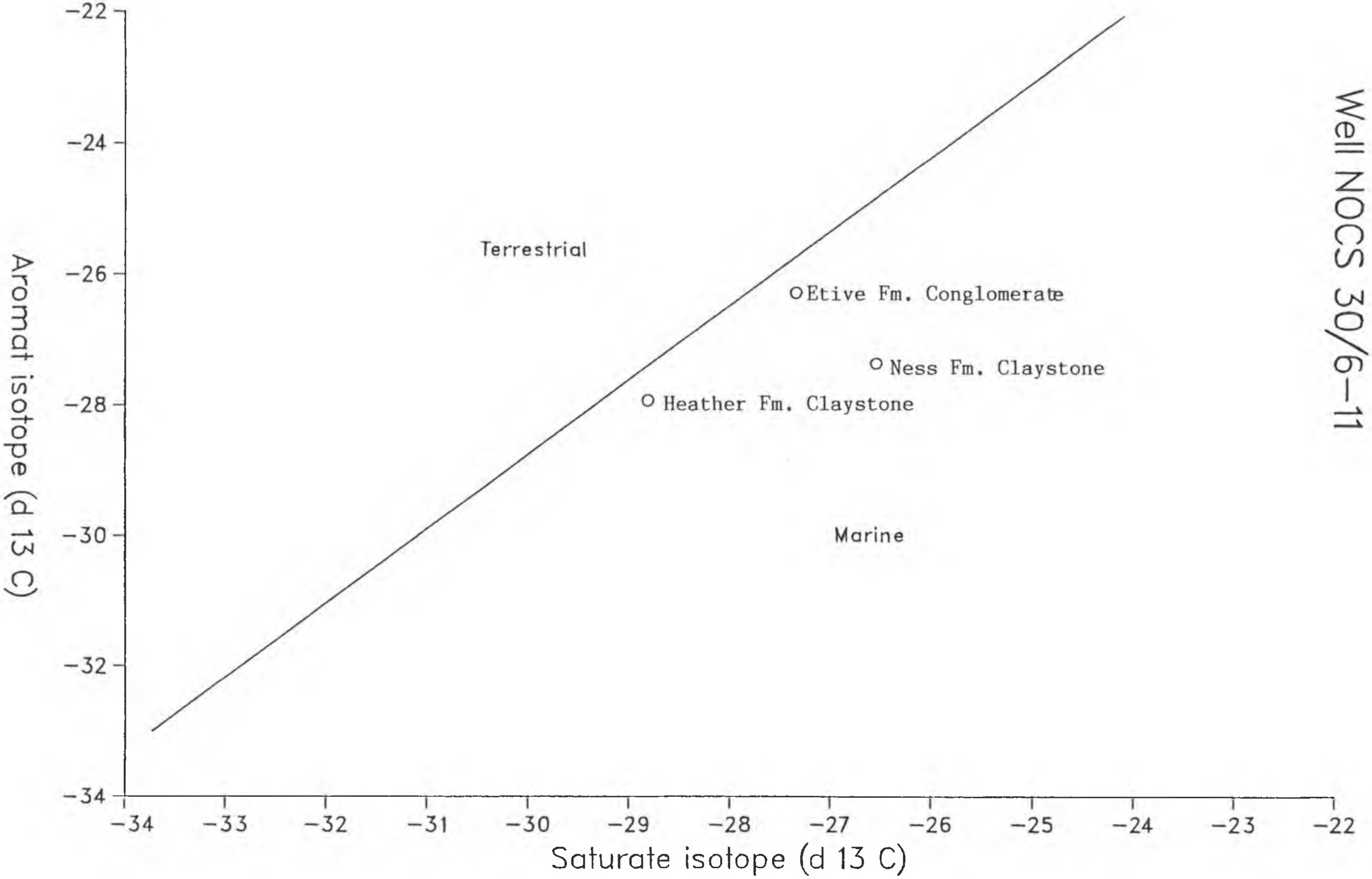
Figure 11: Kerogen Composition and Potential Hydrocarbon Products

Well NOCS 30/6-11





Well NOCS 30/6-11

Figure 12a Aromatic v.s. saturate isotope values

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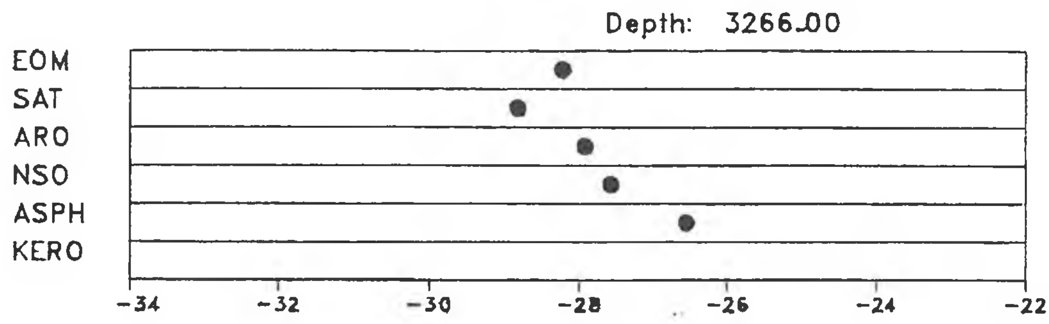
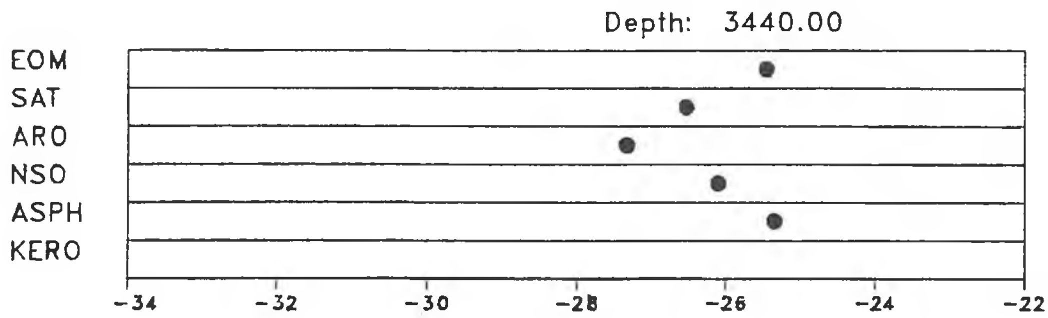
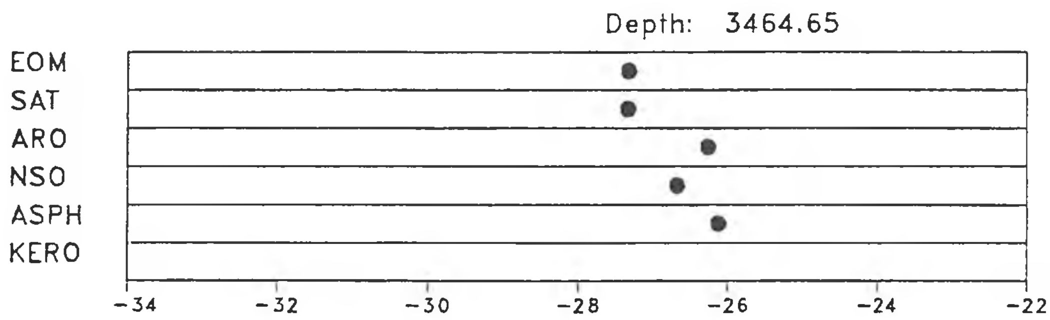
Figure 12b 13C/12C isotope ratios. Galimov plot.
Well NOCS 30/6-11







SDANGOLA 1-MAR-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 1 Injection 1 Group 1 Mass 163.1485
Text:WELL 30/6-11, 3266M, SATURATED FRACTION

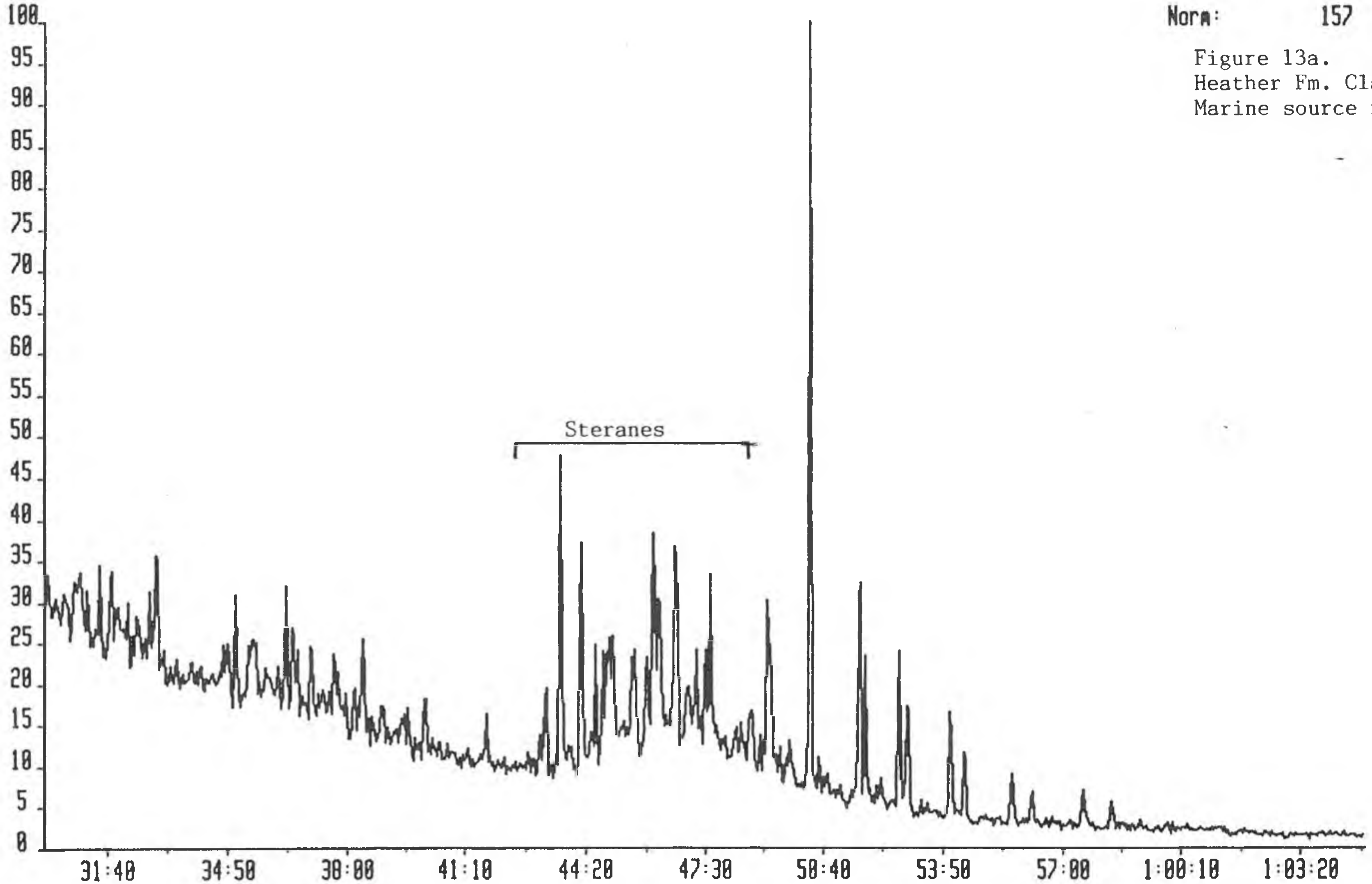


Figure 13a.
Heather Fm. Claystone.
Marine source rock.

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

SOANGOLA 1-MAR-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:WELL 30/6-11, 3266M, SATURATED FRACTION

Norm: 861

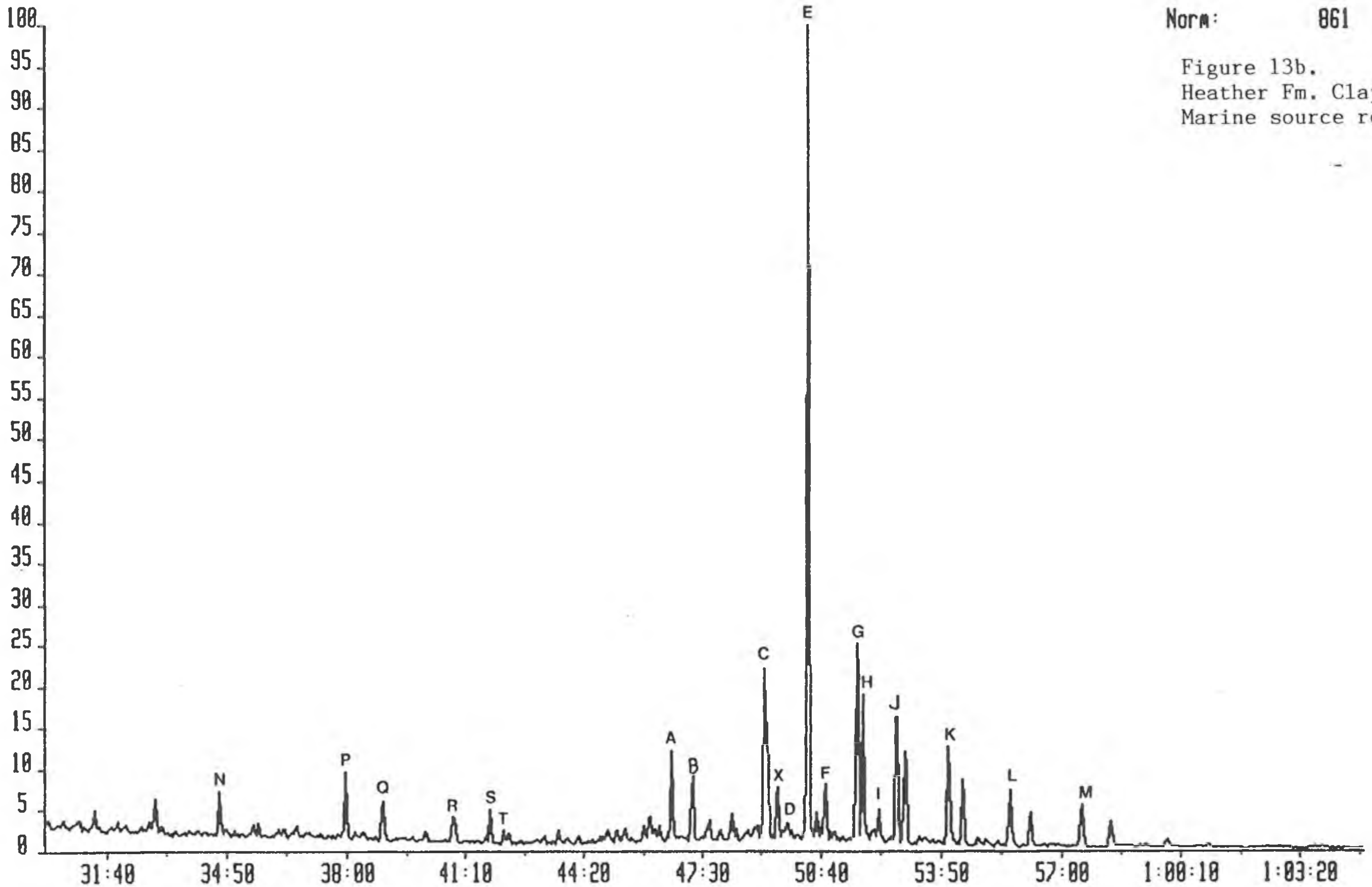


Figure 13b.
Heather Fm. Claystone.
Marine source rock.

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

SCANGOLA 28-FEB-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 11 Injection 1 Group 1 Mass 191.1000
Text:WELL 30/6-11, 3464.25M, SATURATED FRACTION

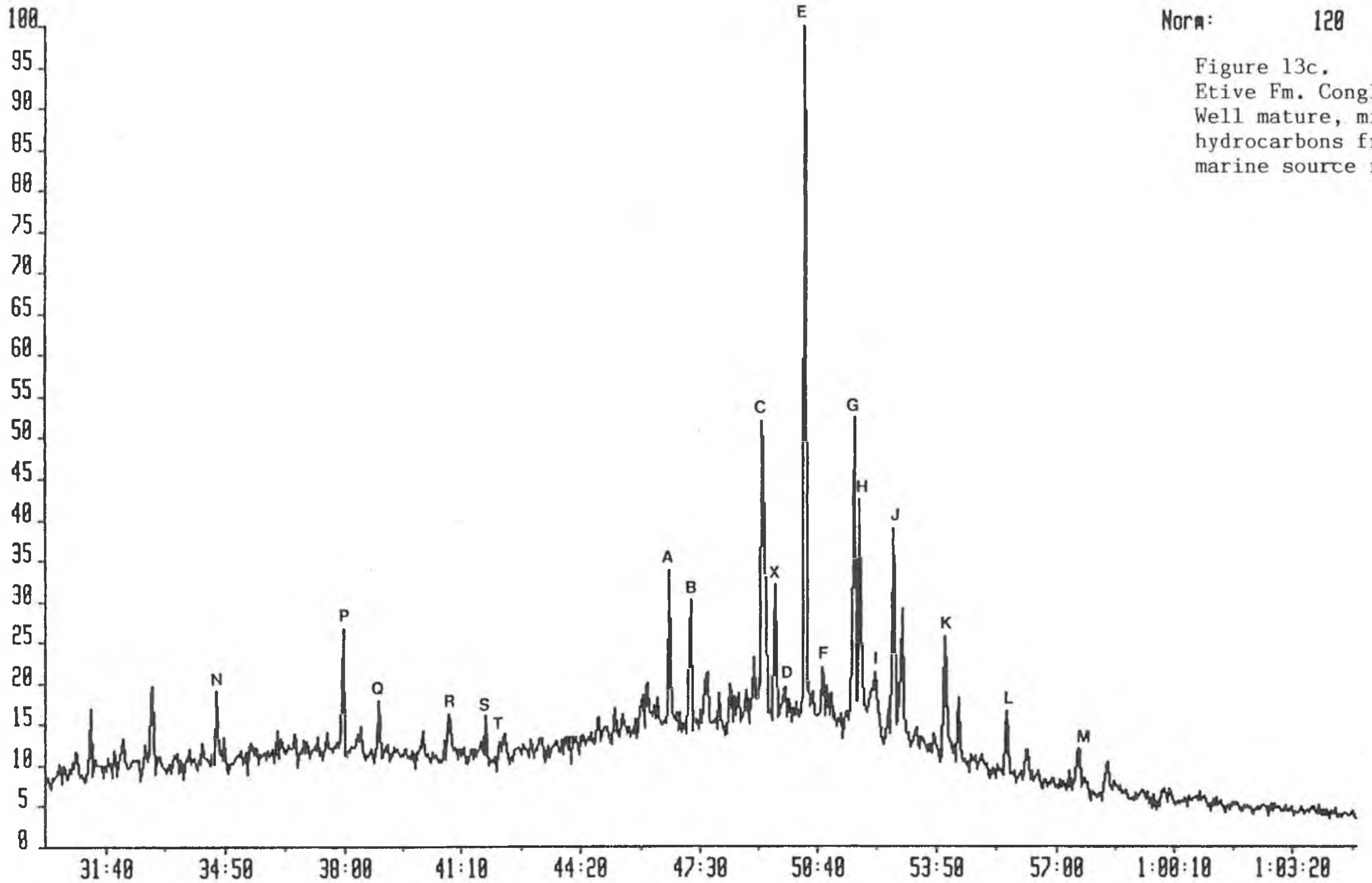


Figure 13c.
Etive Fm. Conglomerate
Well mature, migrated
hydrocarbons from a
marine source rock.

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GEOCHEMICAL LABORATORIES OF NORWAY A/S

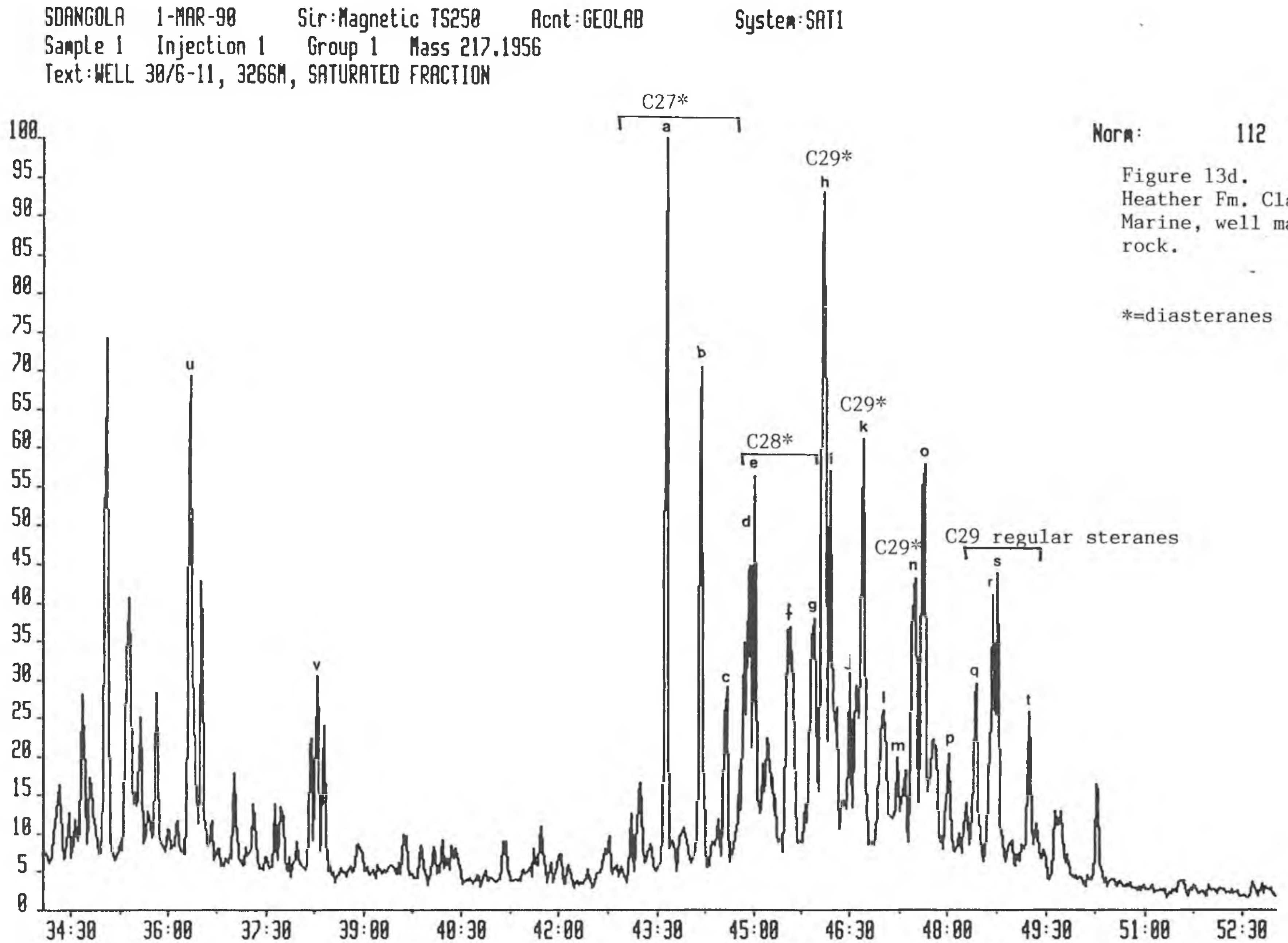


Figure 13d.
Heather Fm. Claystone.
Marine, well mature source rock.

*=diasteranes

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

SCANGOLA 20-FEB-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 11 Injection 1 Group 1 Mass 163.1405
Text:WELL 30/6-11, 3464.25M, SATURATED FRACTION

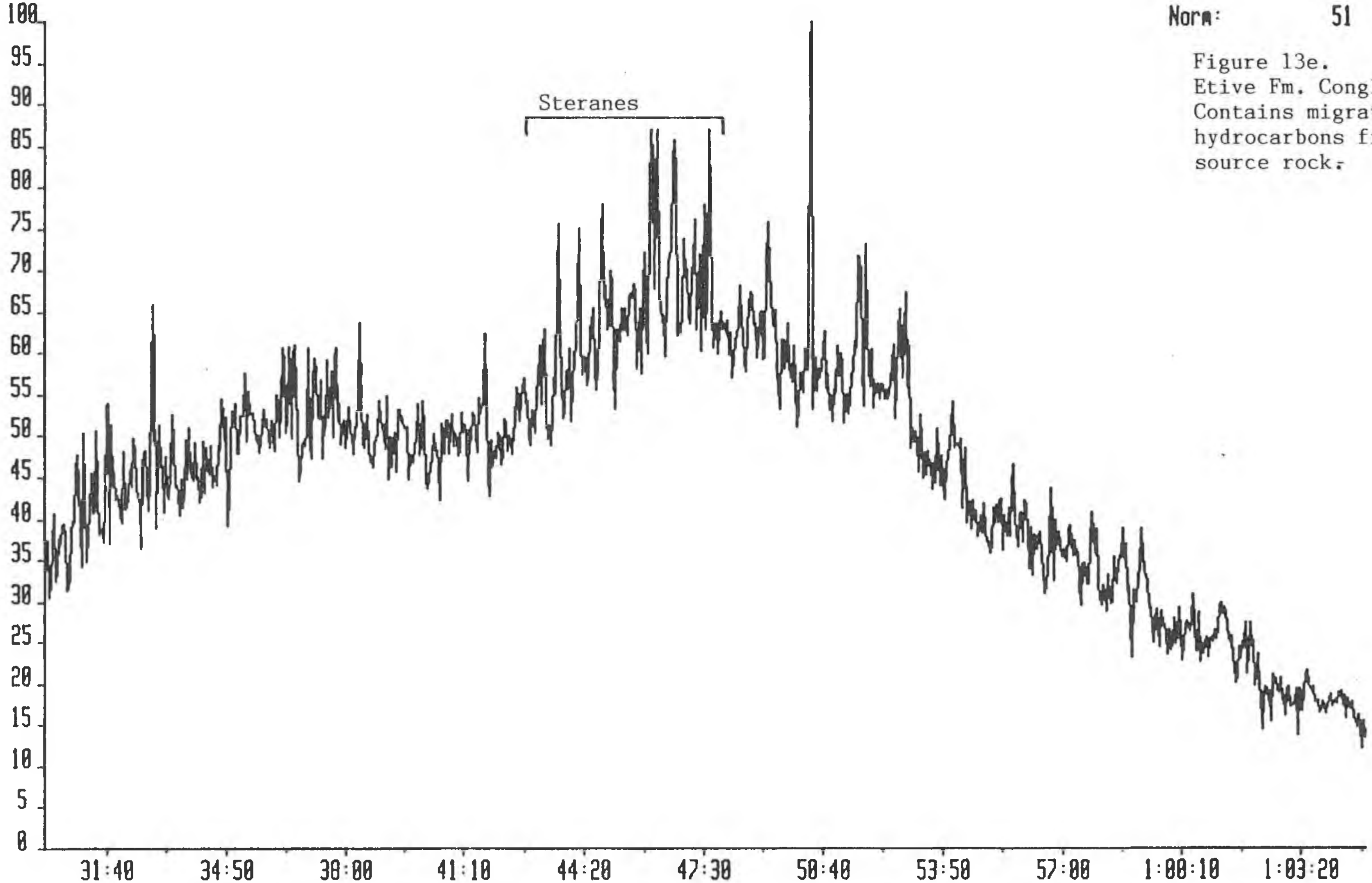


Figure 13e.
Etive Fm. Conglomerate.
Contains migrated
hydrocarbons from a marine
source rock.

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

SCANGOLA 28-FEB-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 11 Injection 1 Group 1 Mass 217.1956
Text:WELL 30/6-11, 3464.25M, SATURATED FRACTION

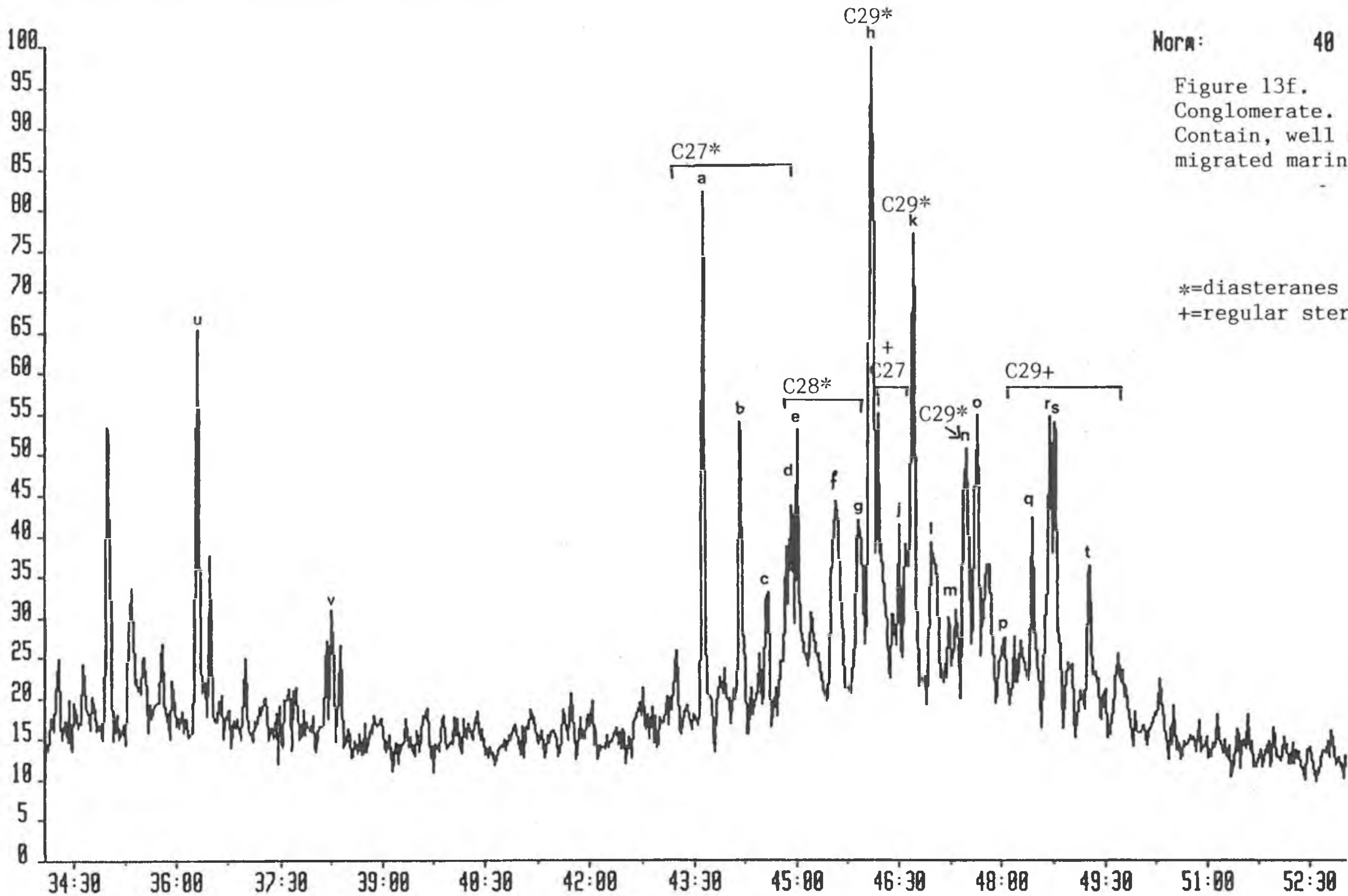


Figure 13f.
Conglomerate.
Contain, well mature,
migrated marine hydrocarbons

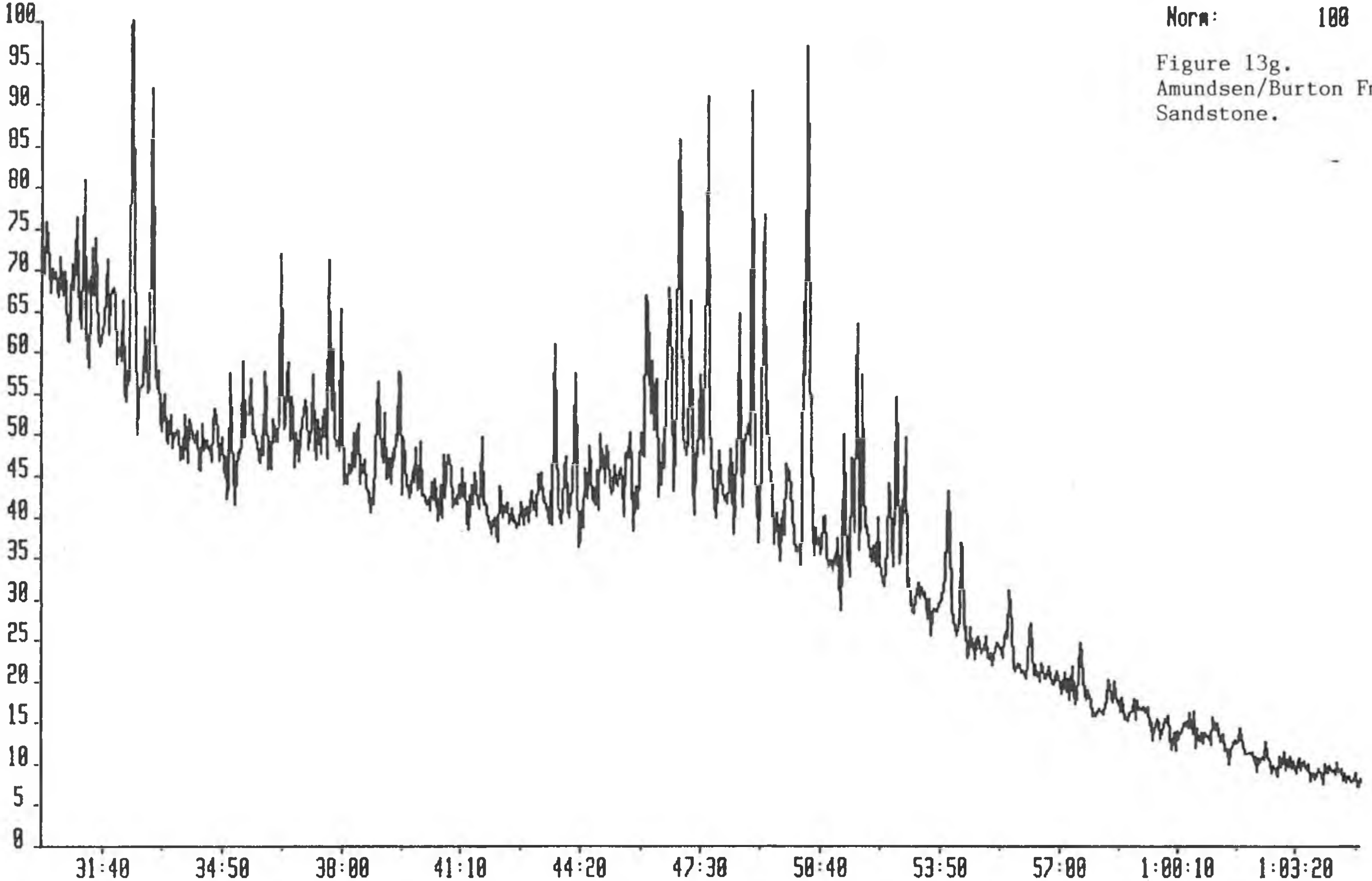
*=diasteranes
+=regular steranes

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

SCANGOLA 28-FEB-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 12 Injection 1 Group 1 Mass 163.1485
Text:WELL 30/6-11, 3067M, SATURATED FRACTION

Norm: 100

Figure 13g.
Amundsen/Burton Fm.
Sandstone.



GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

SCANGOLA 28-FEB-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 12 Injection 1 Group 1 Mass 191.1000
Text:WELL 30/6-11, 3067M, SATURATED FRACTION

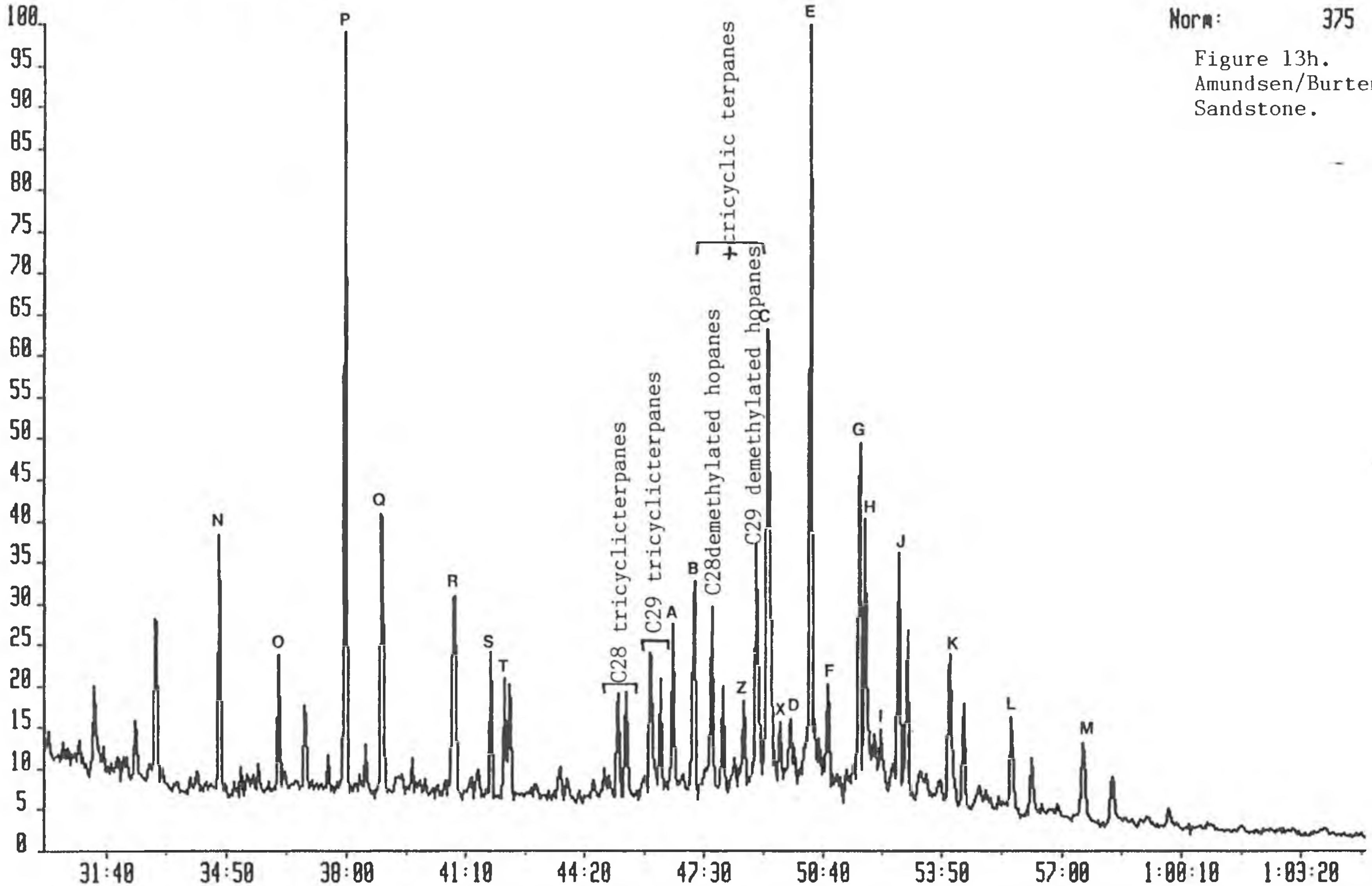


Figure 13h.
Amundsen/Burten Fm.
Sandstone.

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

SCANGOLA 28-FEB-90 Sir:Magnetic TS250 Acnt:GEOLAB System:SAT1
Sample 12 Injection 1 Group 1 Mass 217.1956
Text:WELL 30/6-11, 3067M, SATURATED FRACTION

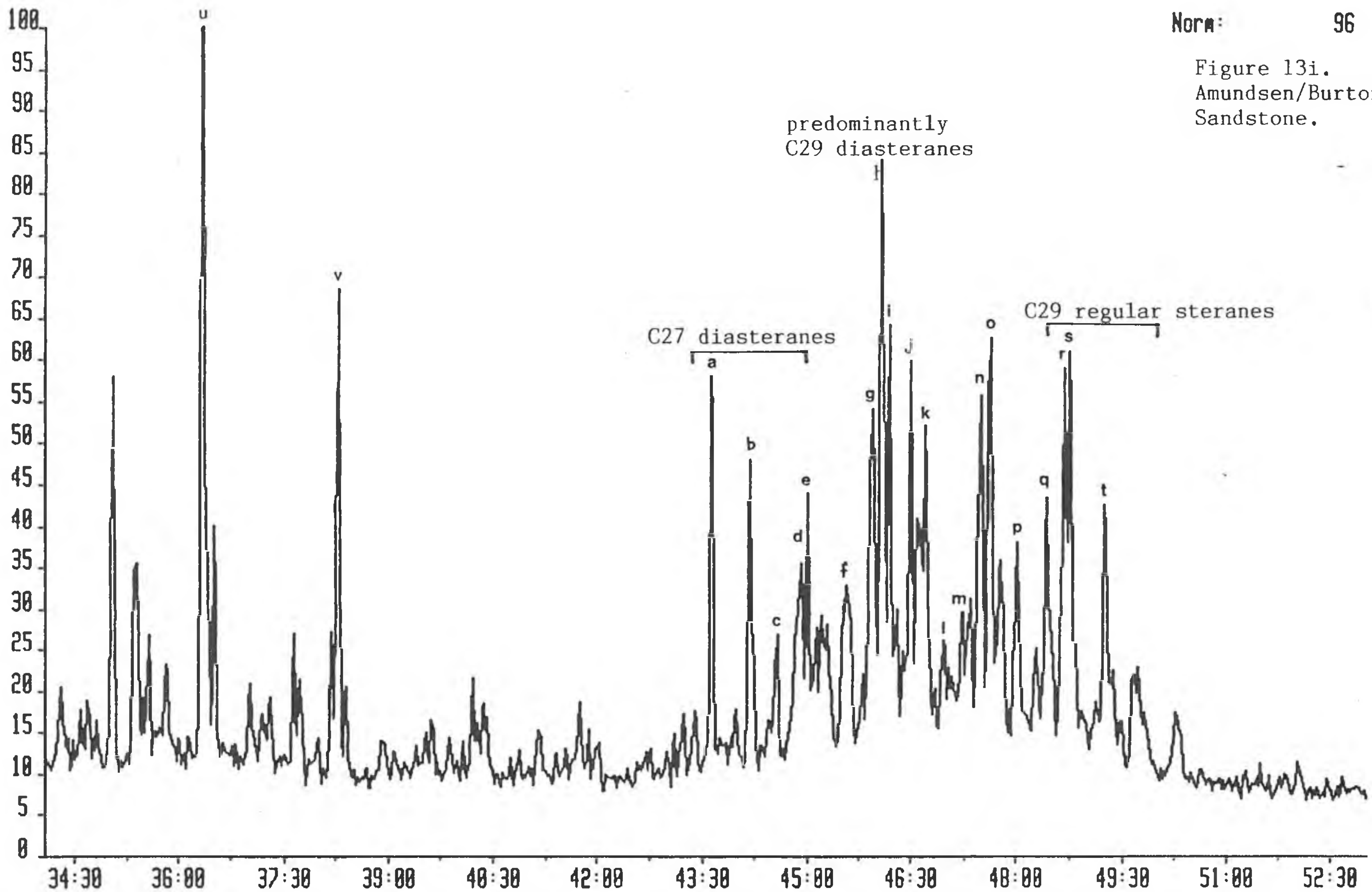


Figure 13i.
Amundsen/Burton Fm.
Sandstone.

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Table 1.: Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
1490.00				Hrdl		Tertiary		0168
			100			Sh/Clst: ol gy, slt		0168-1L
1550.00				Hrdl		Tertiary		0169
			100			Sh/Clst: ol gy, slt		0169-1L
1600.00				Hrdl		Tertiary		0170
			100			Sh/Clst: ol gy, slt		0170-1L
1650.00				Hrdl		Tertiary		0171
			100			Sh/Clst: ol gy		0171-1L
1700.00				Hrdl		Tertiary		0172
			100			Sh/Clst: gn gy to ol gy		0172-1L
1750.00				Hrdl		Tertiary		0173
			100			Sh/Clst: gn gy to ol gy		0173-1L
1800.00				Hrdl		Tertiary		0174
			100			Sh/Clst: gn gy to ol gy		0174-1L

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Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
1855.00				Hrdl		Tertiary		0175
			100	Sh/Clst: gn gy to ol gy				0175-1L
1910.00				Hrdl		Tertiary		0176
			100	Sh/Clst: gn gy to ol gy				0176-1L
1950.00				Hrdl		Tertiary		0177
			100	Sh/Clst: gn gy to ol gy				0177-1L
			tr	Sh/Clst: red brn				0177-2L
2000.00				Hrdl		Tertiary		0178
			90	Sh/Clst: gn gy to ol gy				0178-1L
			10	Sh/Clst: red brn, calc				0178-2L
2050.00				Hrdl		Tertiary		0179
			90	Sh/Clst: red brn, calc				0179-2L
			10	Sh/Clst: gn gy to ol gy to lt ol gy, slt				0179-1L
2100.00				Rogl	Bald	Tertiary		0180
			90	Sh/Clst: gn gy to ol gy to lt ol gy, slt				0180-1L
			10	Sh/Clst: red brn, calc				0180-2L
2150.00				Rogl	Sele	Tertiary		0181
			100	Sh/Clst: m gy				0181-1L

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GEOCHEMICAL LABORATORIES OF NORWAY A.S

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
2200.00				Rogl	Sele	Tertiary		0182
			100	Sh/Clst: lt ol gy to m gy				0182-1L
2250.00				Rogl	List	Tertiary		0183
			100	Sh/Clst: lt ol gy to m gy				0183-1L
2300.00				Rogl	List	Tertiary		0184
			100	Sh/Clst: m gy				0184-1L
2350.00				Mont	Maur	Palaeocene		0001
		0.70	100	Marl : lt gy, slt				0001-1L
			tr	Ca : w to gy pi				0001-2L
			tr	Cont : prp				0001-3L
2350.00				Mont	Maur	Tertiary		0185
			100	Sh/Clst: m gy				0185-1L
2380.00				Shet		U.Cretaceous		0106
			90	Marl : lt gy				0106-1L
			10	Ca : w to gy pi				0106-2L
2410.00				Shet		U.Cretaceous		0107
			100	Marl : lt gy				0107-1L
			tr	Ca : w to gy pi				0107-2L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology	Frm	Age / Lithology description	Trb	Sample
2440.00				Shet		U.Cretaceous		0002
			95	Marl		: lt gy, slt		0002-1L
			5	Cont		: prp		0002-3L
			tr	Ca		: w to gy pi		0002-2L
2470.00				Shet		U.Cretaceous		0003
			60	Marl		: lt gy, slt		0003-1L
			40	Cont		: prp, dd		0003-3L
			tr	Ca		: w to gy pi		0003-2L
2500.00				Shet		U.Cretaceous		0004
		0.86	70	Marl		: lt gy, slt		0004-1L
			30	Cont		: prp, dd		0004-3L
			tr	Ca		: w to gy pi		0004-2L
2530.00				Shet		U.Cretaceous		0005
			70	Marl		: lt gy to m gy		0005-1L
			30	Cont		: prp, dd		0005-3L
			tr	Ca		: w to gy pi		0005-2L
2560.00				Shet		U.Cretaceous		0006
			90	Sh/Clst		: lt gy to m gy, calc		0006-1L
			10	Cont		: prp, dd		0006-3L
			tr	Ca		: w to gy pi		0006-2L
2590.00				Shet		U.Cretaceous		0007
			75	Sh/Clst		: m gy, calc		0007-1L
			25	Cont		: prp, dd		0007-3L
			tr	Ca		: w to gy pi		0007-2L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology	Frm	Age / Lithology description	Trb	Sample
2620.00				Shet		U.Cretaceous		0008
			80	Ca		: gy pi to gy red		0008-3L
			15	Cont		: prp, dd		0008-2L
			5	Sh/Clst		: m gy, calc		0008-1L
2650.00				Shet		U.Cretaceous		0009
			50	Sh/Clst		: m gy, calc		0009-1L
			50	Cont		: dd		0009-2L
			tr	Ca		: gy pi to gy red		0009-3L
2680.00				Shet		U.Cretaceous		0010
		1.04	75	Sh/Clst		: m gy, calc		0010-1L
			25	Cont		: dd		0010-2L
			tr	Ca		: gy pi to gy red		0010-3L
2710.00				Shet		U.Cretaceous		0011
			80	Sh/Clst		: m gy, calc		0011-1L
			20	Cont		: dd		0011-2L
			tr	Ca		: gy pi to gy red		0011-3L
2740.00				Shet		U.Cretaceous		0012
			80	Sh/Clst		: m gy		0012-1L
			20	Cont		: dd		0012-2L
			tr	Ca		: w to pl y brn		0012-3L
2770.00				Shet		U.Cretaceous		0013
			90	Sh/Clst		: m gy		0013-1L
			10	Cont		: dd		0013-2L
			tr	Ca		: w to pl y brn		0013-3L

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Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology description	Frm	Age	Trb	Sample
2800.00				Shet		U.Cretaceous		0014
		0.89	80	Sh/Clst: m gy				0014-1L
			20	Cont : prp, dd				0014-2L
			tr	Ca : w to pl y brn				0014-3L
2830.00				Shet		U.Cretaceous		0015
			70	Sh/Clst: m gy				0015-1L
			30	Cont : st, prp, dd, tar-ad				0015-2L
			tr	Ca : w to pl y brn				0015-3L
2860.00				Shet		U.Cretaceous		0016
			80	Sh/Clst: m gy				0016-1L
			20	Cont : st, prp, dd, tar-ad				0016-2L
			tr	Ca : w to pl y brn				0016-3L
2890.00				Shet		U.Cretaceous		0017
		1.14	75	Sh/Clst: m gy				0017-1L
			15	Other : m gy to drk gy, trbofgs				0017-4L
			10	Ca : w to pl y brn				0017-3L
			tr	Cont : prp, dd				0017-2L
2920.00				Shet		U.Cretaceous		0018
			55	Other : m gy to drk gy, trbofgs				0018-4L
			45	Sh/Clst: m gy				0018-1L
			tr	Cont : prp, dd				0018-2L
			tr	Ca : w to pl y brn				0018-3L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology description	Frm	Age	Trb	Sample
2950.00				Shet		U.Cretaceous		0019
			90	Other : m gy to drk gy, trbofgs				0019-4L
			10	Sh/Clst: m gy				0019-1L
			tr	Cont : prp, dd				0019-2L
			tr	Ca : w to pl y brn				0019-3L
2980.00				Shet		U.Cretaceous		0020
			100	Other : m gy to drk gy, trbofgs				0020-4L
			tr	Sh/Clst: m gy				0020-1L
			tr	Cont : prp, dd				0020-2L
			tr	Ca : w to pl y brn				0020-3L
3010.00				Shet		U.Cretaceous		0021
			85	Other : m gy to drk gy, trbofgs				0021-4L
			15	Sh/Clst: m gy				0021-1L
			tr	Cont : prp, dd				0021-2L
			tr	Ca : w to pl y brn				0021-3L
3040.00				Shet		U.Cretaceous		0022
			100	Other : m gy to drk gy, trbofgs				0022-4L
			tr	Sh/Clst: m gy				0022-1L
			tr	Cont : prp, dd				0022-2L
			tr	Ca : w to pl y brn				0022-3L
3070.00				Shet		U.Cretaceous		0023
			100	Other : m gy to drk gy, trbofgs				0023-4L
			tr	Sh/Clst: m gy				0023-1L
			tr	Cont : prp, dd				0023-2L
			tr	Ca : w to pl y brn				0023-3L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
3100.00				Shet		U.Cretaceous		0024
		0.50	90	Other		: m gy to drk gy, trbofgs		0024-4L
			10	Sh/Clst		: m gy		0024-1L
			tr	Cont		: prp, dd		0024-2L
			tr	Ca		: w to pl y brn		0024-3L
3130.00				Shet		U.Cretaceous		0025
			90	Other		: m gy to drk gy, trbofgs		0025-4L
			10	Sh/Clst		: m gy		0025-1L
			tr	Cont		: prp, dd		0025-2L
			tr	Ca		: w to pl y brn		0025-3L
3160.00				Shet		U.Cretaceous		0026
			90	Sh/Clst		: m gy		0026-1L
			5	Cont		: prp, dd		0026-2L
			5	Other		: m gy to drk gy, trbofgs		0026-4L
			tr	Ca		: w to pl y brn		0026-3L
3190.00				Shet		U.Cretaceous		0027
			95	Sh/Clst		: m gy		0027-1L
			5	Cont		: prp		0027-2L
			tr	Ca		: w to pl y brn		0027-3L
			tr	Other		: m gy to drk gy, trbofgs		0027-4L
3220.00				Shet		U.Cretaceous		0028
			95	Sh/Clst		: m gy		0028-1L
			5	Cont		: Coal-ad, prp		0028-2L
			tr	Ca		: lt gy		0028-3L
			tr	Other		: m gy to drk gy, trbofgs		0028-4L

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Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type	TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
3250.00					Shet		U.Cretaceous		0029
				85	Sh/Clst:		m gy, calc, slt		0029-1L
				10	S/Sst :		w to lt gy, calc, cem		0029-4L
				5	Cont :		Coal-ad, prp		0029-2L
				tr	Ca :		lt gy, s		0029-3L
3260.00					Shet		U.Cretaceous		0030
			0.96	85	Sh/Clst:		m gy, calc, slt, mic		0030-1L
				10	S/Sst :		w to lt gy, calc, cem		0030-4L
				5	Cont :		Coal-ad, prp		0030-2L
				tr	Ca :		lt gy, s		0030-3L
3266.00		ccp			Viki	Heat	U.Jurassic		0033
			1.31	100	Sh/Clst:		dsk y brn, slt, mic		0033-1L
3267.00					Viki	Heat	U.Jurassic		0031
			1.18	85	Sh/Clst:		m gy, calc, slt, mic		0031-1L
				10	Cont :		prp, tar-ad		0031-2L
				5	Ca :		w to lt or, s		0031-3L
				tr	S/Sst :		w to lt gy, calc, cem		0031-4L
				tr	Sh/Clst:		drk gy to dsk y brn, slt, mic		0031-5L
3272.00					Viki	Heat	U.Jurassic		0032
				95	Sh/Clst:		m gy to gn gy, slt, mic		0032-1L
				5	Sltst :		dsk y brn, mic		0032-4L
				tr	Cont :		prp		0032-2L
				tr	Ca :		w to lt or, s		0032-3L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Cvd	Type TOC%	%	Grp / Lithology description	Frm	Age	Trb	Sample
3277.00				Viki	Heat	U.Jurassic		0034
		0.61	95	Sh/Clst: m gy to gn gy, slt, mic				0034-1L
			5	Sltst : dsk y brn, mic				0034-4L
			tr	Cont : prp				0034-2L
			tr	Ca : w to lt or, s				0034-3L
3285.00				Viki	Heat	U.Jurassic		0035
		0.66	75	Sh/Clst: m gy to gn gy, slt, mic				0035-1L
			25	Sltst : dsk y brn, mic				0035-4L
			tr	Cont : prp				0035-2L
			tr	Ca : w to lt or, s				0035-3L
3290.00				Viki	Heat	U.Jurassic		0036
			95	Sh/Clst: m gy to gn gy, slt, mic				0036-1L
			5	Sltst : dsk y brn, mic				0036-4L
			tr	Cont : prp				0036-2L
			tr	Ca : w to lt or, s				0036-3L
3297.00				Viki	Heat	U.Jurassic		0037
		0.56	95	Sh/Clst: m gy to gn gy, slt, mic				0037-1L
			5	Sltst : dsk y brn, mic				0037-4L
			tr	Cont : prp				0037-2L
			tr	Ca : w to lt or, s				0037-3L
3302.00				Viki	Heat	U.Jurassic		0038
		0.55	90	Sh/Clst: m gy to gn gy, slt, mic				0038-1L
			10	Sltst : dsk y brn, mic				0038-4L
			tr	Cont : prp				0038-2L
			tr	Ca : w to lt or, s				0038-3L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3307.00				Viki Heat U.Jurassic		0039
			60	Sh/Clst: m gy to gn gy, slt, mic		0039-1L
			20	Cont : prp, tar-ad		0039-2L
			15	Sltst : dsk y brn, mic		0039-4L
			5	Ca : w to lt or, s		0039-3L
3315.00				Viki Heat U.Jurassic		0040
		0.75	85	Sh/Clst: m gy to gn gy, slt, mic		0040-1L
			10	Cont : Coal-ad, prp, dd		0040-2L
			5	Sltst : dsk y brn, mic		0040-4L
			tr	Ca : w to lt or, s		0040-3L
3320.00				Viki Heat U.Jurassic		0041
			60	Sh/Clst: m gy to gn gy, slt, mic		0041-1L
		1.70	20	Sltst : brn gy, calc		0041-5L
			15	Cont : Coal-ad, prp, dd		0041-2L
			5	Sltst : dsk y brn to brn blk, carb, mic		0041-4L
			tr	Ca : w to lt or, s		0041-3L
3327.00				Viki Heat U.Jurassic		0042
		0.66	60	Sh/Clst: m gy to gn gy, slt, mic		0042-1L
			20	Sltst : brn gy, calc		0042-5L
			15	Cont : Coal-ad, prp, dd		0042-2L
			5	Sltst : dsk y brn to brn blk, carb, mic		0042-4L
			tr	Ca : w to lt or, s		0042-3L
3332.00				Viki Heat U.Jurassic		0043
			100	No Mat.		0043-1L

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Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Cvd	Type TOC%	%	Grp / Frm / Age / Lithology description	Trb	Sample
3340.00				Viki Heat U.Jurassic		0044
		0.55	75	Sh/Clst: m gy to gn gy, slt, mic		0044-1L
			10	Cont : prp, dd		0044-2L
			10	Sltst : brn gy, calc		0044-5L
			5	Sltst : dsk y brn to brn blk, carb, mic		0044-4L
			tr	Ca : w to lt or, s		0044-3L
3347.00				Viki Heat U.Jurassic		0045
		1.82	100	Sltst : brn gy to dsk y brn, s, mic		0045-4L
			tr	Sh/Clst: m gy to gn gy, slt, mic		0045-1L
			tr	Cont : Coal-ad, prp		0045-2L
			tr	Ca : w to lt or, s		0045-3L
3352.00				Bren Ness M.Jurassic		0046
		2.55	85	Sltst : brn gy to dsk y brn, s, mic		0046-3L
			15	Sh/Clst: m gy to gn gy, slt, mic		0046-1L
			tr	Cont : Coal-ad, prp		0046-2L
3357.00				Bren Ness M.Jurassic		0047
			100	Sltst : brn gy to dsk y brn, s, mic		0047-3L
			tr	Sh/Clst: m gy to gn gy, slt, mic		0047-1L
			tr	Cont : Coal-ad, prp		0047-2L
3365.00				Bren Ness M.Jurassic		0048
		1.17	70	S/Sst : lt y brn, l		0048-4L
			15	Sltst : brn gy to dsk y brn, s, mic		0048-3L
			10	Cont : Coal-ad, prp		0048-2L
			5	Sh/Clst: m gy to gn gy, slt, mic		0048-1L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3370.00				Bren Ness M.Jurassic		0049
			90	S/Sst : lt y brn, l		0049-4L
			5	Cont : Coal-ad, prp		0049-2L
			5	Sltst : brn gy to dsk y brn, s, mic		0049-3L
			tr	Sh/Clst: m gy to gn gy, slt, mic		0049-1L
3377.00				Bren Ness M.Jurassic		0050
		0.24	95	S/Sst : lt gy to lt y brn, cem, l		0050-4L
			5	Sltst : brn gy to dsk y brn, s, mic		0050-3L
			tr	Sh/Clst: m gy to gn gy, slt, mic		0050-1L
			tr	Cont : Coal-ad, prp		0050-2L
			tr	Coal : blk		0050-5L
3382.00				Bren Ness M.Jurassic		0051
			70	S/Sst : lt gy to lt y brn, l		0051-4L
			30	Sh/Clst: brn blk, carb		0051-6L
			tr	Sh/Clst: m gy to gn gy		0051-1L
			tr	Cont : Coal-ad, prp		0051-2L
			tr	Sltst : brn gy to dsk y brn		0051-3L
			tr	Coal : blk		0051-5L
3390.00				Bren Ness M.Jurassic		0052
		0.76	100	Sh/Clst: m gy to gn gy		0052-1L
			tr	Cont : Coal-ad, prp		0052-2L
			tr	Sltst : brn gy to dsk y brn		0052-3L
			tr	S/Sst : lt gy to lt y brn, l		0052-4L
			tr	Coal : blk		0052-5L
			tr	Sh/Clst: brn blk, carb		0052-6L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3395.00				Bren Ness M.Jurassic		0053
			70	Sh/Clst: m gy to gn gy		0053-1L
			25	Sh/Clst: brn blk, carb		0053-4L
			5	S/Sst : lt gy to lt y brn, l		0053-2L
			tr	Coal : blk		0053-3L
3400.00				Bren Ness M.Jurassic		0054
			65	Sh/Clst: m gy to gn gy		0054-1L
			20	S/Sst : lt y brn, cem, l		0054-2L
			15	Sh/Clst: brn gy to brn blk, carb		0054-4L
			tr	Coal : blk		0054-3L
3407.00				Bren Ness M.Jurassic		0055
			55	Sh/Clst: m gy to gn gy		0055-1L
			25	S/Sst : lt y brn, cem, l		0055-2L
			20	Sh/Clst: brn gy to brn blk, carb		0055-4L
			tr	Coal : blk		0055-3L
3415.00				Bren Ness M.Jurassic		0056
		0.11	50	S/Sst : lt y brn, cem, l		0056-2L
			30	Sh/Clst: brn gy to brn blk, carb		0056-4L
			20	Sh/Clst: m gy to gn gy		0056-1L
			tr	Coal : blk		0056-3L
3420.00				Bren Ness M.Jurassic		0057
			75	Sh/Clst: brn gy to brn blk, carb		0057-4L
			15	Coal : blk, cly		0057-3L
			10	S/Sst : lt y brn, cem, l		0057-2L
			tr	Sh/Clst: m gy to gn gy		0057-1L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Frm / Age / Lithology description	Trb	Sample
3427.00				Bren Ness M.Jurassic		0058
		4.16	85	Sh/Clst: brn gy to brn blk, carb		0058-4L
			10	S/Sst : lt y brn, cem, l		0058-2L
			5	Coal : blk, cly		0058-3L
			tr	Sh/Clst: m gy to gn gy		0058-1L
3432.00				Bren Ness M.Jurassic		0059
			90	Sh/Clst: brn gy to brn blk, carb		0059-4L
			5	S/Sst : lt y brn, cem, l		0059-2L
			5	Coal : blk, cly		0059-3L
			tr	Sh/Clst: m gy to gn gy		0059-1L
3440.00				Bren Ness M.Jurassic		0060
		9.34	85	Sh/Clst: brn gy to brn blk, carb		0060-4L
			15	Coal : blk, cly		0060-3L
			tr	Sh/Clst: m gy to gn gy		0060-1L
			tr	S/Sst : lt y brn, cem, l		0060-2L
			tr	Cont : fib		0060-5L
3445.00				Bren Ness M.Jurassic		0061
			75	Sh/Clst: brn gy to brn blk, carb		0061-4L
			20	S/Sst : lt y brn to w, cem, l		0061-2L
			5	Coal : blk, cly		0061-3L
			tr	Sh/Clst: m gy to gn gy		0061-1L
			tr	Cont : fib		0061-5L
3452.00				Bren Ness M.Jurassic		0062
		5.48	65	Sh/Clst: brn gy to brn blk, carb		0062-4L
			30	S/Sst : lt y brn to w, cem, l		0062-2L
			5	Coal : blk, cly		0062-3L
			tr	Sh/Clst: m gy to gn gy		0062-1L
			tr	Cont : prp, fib		0062-5L

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GEOCHEMICAL LABORATORIES OF NORWAY A S

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type / TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3452.35		ccp		Bren Ness M.Jurassic		0063
		0.25	100	S/Sst : lt gy to lt y brn		0063-1L
3457.00				Bren Ness M.Jurassic		0064
			40	S/Sst : lt y brn to w, l		0064-2L
			25	Sh/Clst: m gy to gn gy		0064-1L
			20	Coal : blk, cly		0064-3L
			15	Sh/Clst: brn gy to brn blk, carb		0064-4L
			tr	Cont : prp, fib		0064-5L
3458.20		ccp		Bren Ness M.Jurassic		0065
		1.38	100	Sltst : m gy, s, mic, lam		0065-1L
3464.65		ccp		Bren Etiv M.Jurassic		0066
		0.17	100	Congl : lt y brn		0066-1L
3465.00				Bren Etiv M.Jurassic		0067
	cvd		70	Sh/Clst: m gy to gn gy		0067-1L
			15	S/Sst : lt y brn to w, l		0067-2L
	cvd		10	Sh/Clst: brn gy to brn blk, carb		0067-4L
	cvd		5	Coal : blk, cly		0067-3L
			tr	Cont : prp, fib		0067-5L
3470.00				Bren Etiv M.Jurassic		0068
	cvd		75	Sh/Clst: m gy to gn gy		0068-1L
			10	S/Sst : lt y brn to w, l		0068-2L
	cvd		10	Sh/Clst: brn gy to brn blk, carb		0068-4L
	cvd		5	Coal : blk, cly		0068-3L
			tr	Cont : Coal-ad, prp, tar-ad		0068-6L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3470.50		ccp		Bren Etiv M.Jurassic		0069
		0.06	100	S/Sst : w to lt gy, cem		0069-1L
3476.15		ccp		Bren Etiv M.Jurassic		0163
		0.10	100	S/Sst : lt gy, cem		0163-1L
3477.00				Bren Etiv M.Jurassic		0070
			50	S/Sst : lt y brn to w, l		0070-2L
	cvd		35	Sh/Clst: m gy to gn gy		0070-1L
	cvd		10	Sh/Clst: brn gy to brn blk, carb		0070-4L
	cvd		5	Coal : blk, cly		0070-3L
			tr	Cont : prp		0070-5L
3482.00				Bren Etiv M.Jurassic		0071
	cvd		80	Sh/Clst: m gy to gn gy		0071-1L
	cvd		20	Sh/Clst: brn gy to brn blk		0071-4L
			tr	S/Sst : lt y brn to w, l		0071-2L
	cvd		tr	Coal : blk, cly		0071-3L
			tr	Cont : tar-ad		0071-5L
3482.50		ccp		Bren Etiv M.Jurassic		0072
		0.20	100	S/Sst : m gy, slt, mic, cem		0072-1L
3487.00				Bren Etiv M.Jurassic		0073
	cvd		65	Sh/Clst: m gy to gn gy		0073-1L
	cvd		30	Sh/Clst: brn gy to brn blk		0073-4L
			5	S/Sst : lt y brn to w, cem		0073-2L
	cvd		tr	Coal : blk, cly		0073-3L
			tr	Cont : prp		0073-5L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3488.40		ccp		Bren Etiv M.Jurassic		0074
		0.08	100	S/Sst : lt gy, crs, cem		0074-1L
3492.00				Bren Etiv M.Jurassic		0075
	cvd		55	Sh/Clst: m gy to gn gy		0075-1L
	cvd		30	Sh/Clst: brn gy to dsk y brn		0075-4L
			15	S/Sst : lt y brn to w, l		0075-2L
	cvd		tr	Coal : blk, cly		0075-3L
			tr	Cont : prp		0075-5L
3494.50		ccp		Bren Etiv M.Jurassic		0076
		0.17	100	S/Sst : w to lt gy, crs, cem		0076-6L
3500.00				Bren Etiv M.Jurassic		0077
	cvd		65	Sh/Clst: m gy to gn gy		0077-1L
	cvd		15	Sh/Clst: brn gy to dsk y brn		0077-3L
			10	S/Sst : lt y brn to w, l		0077-2L
			10	Cont : prp, tar-ad		0077-4L
3500.10		ccp		Bren Etiv M.Jurassic		0078
		0.04	100	S/Sst : w to lt gy, crs, cem		0078-1L
3505.00				Bren Etiv M.Jurassic		0079
	cvd		40	Sh/Clst: m gy to gn gy		0079-1L
			35	S/Sst : lt y brn to w, l		0079-2L
			15	Cont : prp, tar-ad		0079-4L
	cvd		10	Sh/Clst: brn gy to dsk y brn		0079-3L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Frm / Age / Lithology description	Trb	Sample
3508.00		ccp		Bren Etiv M.Jurassic		0080
		0.25	100	S/Sst : w to lt gy, crs, cem		0080-1L
			tr	Cont : dd		0080-2L
3512.00				Bren Etiv M.Jurassic		0081
			80	S/Sst : lt y brn to w, l		0081-2L
			15	Cont : prp, tar-ad		0081-4L
	cvd		5	Sh/Clst: m gy to gn gy		0081-1L
	cvd		tr	Sh/Clst: brn gy to dsk y brn		0081-3L
3517.00				Bren Etiv M.Jurassic		0082
		0.09	90	S/Sst : lt gy, l		0082-2L
	cvd		5	Sh/Clst: m gy to gn gy		0082-1L
			5	Cont : Mica-ad		0082-4L
			tr	Sh/Clst: brn gy to dsk y brn		0082-3L
3525.00				Bren Etiv M.Jurassic		0083
			100	S/Sst : lt gy, l		0083-2L
			tr	Sh/Clst: m gy to gn gy		0083-1L
			tr	Sh/Clst: brn gy to dsk y brn		0083-3L
			tr	Cont : Mica-ad		0083-4L
3530.00				Bren Etiv M.Jurassic		0084
			100	S/Sst : w to lt gy, l		0084-2L
			tr	Sh/Clst: m gy to gn gy		0084-1L
			tr	Sh/Clst: brn gy to dsk y brn		0084-3L
			tr	Cont : Mica-ad		0084-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3535.00				Bren Etiv M.Jurassic		0085
			100	S/Sst : w to lt gy, cem, l		0085-2L
			tr	Sh/Clst: m gy to gn gy		0085-1L
			tr	Sh/Clst: brn gy to dsk y brn		0085-3L
			tr	Cont : Mica-ad		0085-4L
3542.00				Bren Etiv M.Jurassic		0086
		0.06	100	S/Sst : w to lt gy, cem, l		0086-2L
			tr	Sh/Clst: m gy to gn gy		0086-1L
			tr	Sh/Clst: brn gy to dsk y brn		0086-3L
			tr	Cont : Mica-ad		0086-4L
3550.00				Bren Etiv M.Jurassic		0087
			100	S/Sst : w to lt gy, cem, l		0087-2L
			tr	Sh/Clst: m gy to gn gy		0087-1L
			tr	Sh/Clst: brn gy to dsk y brn		0087-3L
			tr	Cont : Mica-ad		0087-4L
3555.00				Bren Etiv M.Jurassic		0088
			100	S/Sst : w to lt gy, cem, l		0088-2L
			tr	Sh/Clst: m gy to gn gy		0088-1L
			tr	Sh/Clst: brn gy to dsk y brn		0088-3L
			tr	Cont : Mica-ad		0088-4L
3560.00				Bren Etiv M.Jurassic		0089
			100	S/Sst : w to lt gy, cem, l		0089-2L
			tr	Sh/Clst: m gy to gn gy		0089-1L
			tr	Sh/Clst: brn gy to dsk y brn		0089-3L
			tr	Cont : Mica-ad		0089-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3567.00				Dunl Drak L.Jurassic		0090
		0.06	90	S/Sst : w to lt gy, cem, l		0090-2L
			5	Sh/Clst: m gy to gn gy		0090-1L
			5	Sh/Clst: brn gy to dsk y brn		0090-3L
			tr	Cont : prp		0090-4L
3572.00				Dunl Drak L.Jurassic		0091
			90	S/Sst : w to lt gy, cem, l		0091-2L
			5	Sh/Clst: m gy to gn gy		0091-1L
			5	Sh/Clst: brn gy to dsk y brn		0091-3L
			tr	Cont : prp		0091-4L
3580.00				Dunl Drak L.Jurassic		0092
			75	S/Sst : w to lt gy, cem, l		0092-2L
			20	Cont : Coal-ad, prp		0092-4L
			5	Sh/Clst: brn gy to dsk y brn		0092-3L
			tr	Sh/Clst: m gy to gn gy		0092-1L
3585.00				Dunl Drak L.Jurassic		0093
		0.22	95	S/Sst : lt gy to m gy, slt, mic, cem, l		0093-2L
			5	Cont : st, Coal-ad, prp		0093-4L
			tr	Sh/Clst: m gy to gn gy		0093-1L
			tr	Sh/Clst: brn gy to dsk y brn		0093-3L
3592.00				Dunl Drak L.Jurassic		0094
			90	S/Sst : brn gy to m gy, slt, mic, cem, l		0094-2L
			10	Sltst : brn gy to gy brn, mic		0094-3L
			tr	Sh/Clst: m gy to gn gy		0094-1L
			tr	Cont : Coal-ad, prp		0094-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp Frm Age / Lithology description	Trb	Sample
3597.00				Dunl Drak L.Jurassic		0095
			60	S/Sst : brn gy to m gy, slt, mic, cem, l		0095-2L
			25	Cont : Coal-ad, prp, fib, tar-ad		0095-4L
			15	Sltst : brn gy to gy brn, mic		0095-3L
			tr	Sh/Clst: m gy to gn gy		0095-1L
3605.00				Dunl Drak L.Jurassic		0096
		0.32	70	S/Sst : brn gy to gy brn, w, slt, mic, cem		0096-2L
			20	Sh/Clst: m gy to gn gy		0096-1L
			10	Sltst : gy brn, mic		0096-3L
			tr	Cont : prp		0096-4L
3610.00				Dunl Drak L.Jurassic		0097
			55	Sltst : gy brn to dsk y brn, s, mic		0097-3L
			40	S/Sst : brn gy to gy brn, w, slt, mic, cem		0097-2L
			5	Sh/Clst: m gy to gn gy		0097-1L
			tr	Cont : prp		0097-4L
3617.00				Dunl Drak L.Jurassic		0098
			80	Sltst : gy brn to dsk y brn, s, mic		0098-3L
			20	S/Sst : brn gy to gy brn, w, slt, mic, cem		0098-2L
			tr	Sh/Clst: m gy to gn gy		0098-1L
			tr	Cont : Coal-ad, prp		0098-4L
3622.00				Dunl Drak L.Jurassic		0099
		1.76	100	Sltst : gy brn to dsk y brn, s, mic		0099-3L
			tr	Sh/Clst: m gy to gn gy		0099-1L
			tr	S/Sst : brn gy to gy brn, w, slt, mic, cem		0099-2L
			tr	Cont : Coal-ad, prp		0099-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
3630.00				Dunl	Drak	L.Jurassic		0100
			75	Sltst		: gy brn to dsk y brn, s, mic		0100-3L
			15	S/Sst		: brn gy to gy brn, w, slt, mic, cem		0100-2L
			10	Cont		: Coal-ad, prp		0100-4L
			tr	Sh/Clst		: m gy to gn gy		0100-1L
3635.00				Dunl	Drak	L.Jurassic		0101
			60	S/Sst		: brn gy, mic, cem, l		0101-1L
			35	Cont		: st, Coal-ad, prp		0101-3L
			5	Sltst		: gy brn to dsk y brn, s, mic		0101-2L
3640.00				Dunl	Drak	L.Jurassic		0102
		1.68	50	Sltst		: gy brn to dsk y brn, s, mic		0102-2L
			40	S/Sst		: brn gy, mic, cem, l		0102-1L
			10	Cont		: Coal-ad, prp		0102-3L
3647.00				Dunl	Drak	L.Jurassic		0103
			50	S/Sst		: brn gy, l		0103-1L
			50	Cont		: st, Coal-ad, prp, fib		0103-3L
			tr	Sltst		: gy brn to dsk y brn, s, mic		0103-2L
3652.00				Dunl	Drak	L.Jurassic		0104
		2.23	100	Sh/Clst		: brn gy to dsk y brn		0104-1L
3657.00				Dunl	Drak	L.Jurassic		0105
			100	Cont		: cem, prp		0105-3L
			tr	S/Sst		: brn gy, l		0105-1L
			tr	Sltst		: gy brn to dsk y brn, s, mic		0105-2L
			tr	Sh/Clst		: brn gy to dsk y brn		0105-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology	Frm	Age / description	Trb	Sample
3662.00				Dunl	Drak	L.Jurassic		0108
			60	Cont		: cem, prp		0108-3L
			40	Sltst		: gy brn to drk gy, mic		0108-2L
			tr	S/Sst		: brn gy, l		0108-1L
			tr	Sh/Clst		: brn gy to dsk y brn		0108-4L
3670.00				Dunl	Drak	L.Jurassic		0109
			100	Cont		: cem, prp		0109-3L
			tr	S/Sst		: brn gy, l		0109-1L
			tr	Sltst		: gy brn to drk gy, mic		0109-2L
			tr	Sh/Clst		: brn gy to dsk y brn		0109-4L
3675.00				Dunl	Drak	L.Jurassic		0110
			100	Cont		: cem, prp		0110-3L
			tr	S/Sst		: brn gy, l		0110-1L
			tr	Sltst		: gy brn to drk gy, mic		0110-2L
			tr	Sh/Clst		: brn gy to dsk y brn		0110-4L
3680.00				Dunl	Drak	L.Jurassic		0111
			100	Cont		: cem, prp, tar-ad		0111-3L
			tr	S/Sst		: brn gy, l		0111-1L
			tr	Sltst		: gy brn to drk gy, mic		0111-2L
			tr	Sh/Clst		: brn gy to dsk y brn		0111-4L
3687.00				Dunl	Drak	L.Jurassic		0112
		1.18	75	Sltst		: gy brn to drk gy, mic		0112-2L
			25	Cont		: cem, prp, tar-ad		0112-3L
			tr	S/Sst		: brn gy, l		0112-1L
			tr	Sh/Clst		: brn gy to dsk y brn		0112-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology	Frm / description	Age	Trb	Sample
3692.00				Dunl	Drak	L.Jurassic		0113
			50	Sltst	: lt brn gy to brn gy, s, mic			0113-2L
			50	Cont	: Coal-ad, prp, tar-ad			0113-3L
			tr	S/Sst	: brn gy, l			0113-1L
			tr	Sh/Clst	: brn gy to dsk y brn			0113-4L
3700.00				Dunl	Drak	L.Jurassic		0114
		1.28	80	Sltst	: lt brn gy to brn gy, s, mic			0114-2L
			20	Cont	: Coal-ad, prp			0114-3L
			tr	S/Sst	: brn gy, l			0114-1L
			tr	Sh/Clst	: brn gy to dsk y brn			0114-4L
3705.00				Dunl	Drak	L.Jurassic		0115
			60	Sltst	: lt brn gy to brn gy, s, mic			0115-2L
			40	Cont	: st, Coal-ad, prp			0115-3L
			tr	S/Sst	: brn gy, l			0115-1L
			tr	Sh/Clst	: brn gy to dsk y brn			0115-4L
3710.00				Dunl	Drak	L.Jurassic		0116
			65	Cont	: st, Coal-ad, prp, fib			0116-3L
			35	Sltst	: lt brn gy to brn gy, s, mic			0116-2L
			tr	S/Sst	: brn gy, l			0116-1L
			tr	Sh/Clst	: brn gy to dsk y brn			0116-4L
3717.00				Dunl	Drak	L.Jurassic		0117
			55	Cont	: st, Coal-ad, prp, fib			0117-3L
			45	Sltst	: lt brn gy to brn gy, s, mic			0117-2L
			tr	S/Sst	: brn gy, l			0117-1L
			tr	Sh/Clst	: brn gy to dsk y brn			0117-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology description	Frm	Age	Trb	Sample
3722.00				Dunl	Drak	L.Jurassic		0118
			50	Sltst : lt brn gy to brn gy, s, mic				0118-2L
			50	Cont : Coal-ad, prp, fib, tar-ad				0118-3L
			tr	S/Sst : brn gy, l				0118-1L
			tr	Sh/Clst: brn gy to dsk y brn				0118-4L
3730.00				Dunl	Drak	L.Jurassic		0119
			75	Cont : st, Coal-ad, prp, fib, tar-ad				0119-3L
			25	Sltst : lt brn gy to brn gy, s, mic				0119-2L
			tr	S/Sst : brn gy, l				0119-1L
			tr	Sh/Clst: brn gy to dsk y brn				0119-4L
3735.00				Dunl	Drak	L.Jurassic		0120
		0.25	65	S/Sst : lt y brn to drk y brn, l				0120-1L
			35	Cont : st, Coal-ad, prp, fib, tar-ad				0120-3L
			tr	Sltst : lt brn gy to brn gy, s, mic				0120-2L
			tr	Other : pyr				0120-4L
3742.00				Dunl	Drak	L.Jurassic		0121
			90	Cont : st, Coal-ad, prp, fib, tar-ad				0121-3L
			10	Sltst : lt brn gy to brn gy, s, mic				0121-2L
			tr	S/Sst : lt y brn to drk y brn, l				0121-1L
			tr	Other : pyr				0121-4L
3756.45		ccp		Dunl	Cook	L.Jurassic		0164
		0.59	100	Sltst : dsk brn, s, mic				0164-1L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Cvd	Type TOC%	%	Grp / Lithology	Frm	Age / description	Trb	Sample
3762.00				Dunl	Cook	L.Jurassic		0122
			100	Cont		: st, Coal-ad, prp, fib, tar-ad		0122-3L
			tr	S/Sst		: lt y brn to drk y brn, l		0122-1L
			tr	Sltst		: lt brn gy to brn gy, s, mic		0122-2L
			tr	Other		: pyr		0122-4L
3762.20	ccp			Dunl	Cook	L.Jurassic		0165
		1.87	100	Sltst		: lt brn gy, s, mic		0165-1L
3767.00				Dunl	A/b	L.Jurassic		0123
			100	Cont		: st, Coal-ad, prp, fib, tar-ad		0123-3L
			tr	S/Sst		: lt y brn to drk y brn, l		0123-1L
			tr	Sltst		: lt brn gy to brn gy, s, mic		0123-2L
			tr	Other		: pyr		0123-4L
3768.00	ccp			Dunl	A/b	L.Jurassic		0166
		1.11	100	Sltst		: dsk y brn to brn blk, mic		0166-1L
3772.00				Dunl	A/b	L.Jurassic		0124
			90	Cont		: st, Coal-ad, prp, fib, tar-ad		0124-3L
			10	Sltst		: lt brn gy to brn gy, st, mic		0124-2L
			tr	S/Sst		: lt y brn to drk y brn, l		0124-1L
			tr	Other		: pyr		0124-4L
3780.00				Dunl	A/b	L.Jurassic		0125
		1.43	80	Sltst		: brn gy to dsk y brn, mic		0125-2L
			20	Cont		: cem, prp, fib		0125-3L
			tr	S/Sst		: w, cem		0125-1L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology description	Frm	Age	Trb	Sample
3785.00				Dunl	A/b	L.Jurassic		0126
			50	Sltst : brn gy to dsk y brn, mic				0126-2L
			50	Cont : cem				0126-3L
			tr	S/Sst : w, cem				0126-1L
3790.00				Dunl	A/b	L.Jurassic		0127
			85	Sltst : brn gy to dsk y brn, mic				0127-2L
			15	Cont : cem				0127-3L
			tr	S/Sst : w, cem				0127-1L
3797.00				Dunl	A/b	L.Jurassic		0128
			75	Sltst : brn gy to dsk y brn, mic				0128-2L
			25	Cont : cem, prp, fib				0128-3L
			tr	S/Sst : w, cem				0128-1L
3802.00				Dunl	A/b	L.Jurassic		0129
		1.41	70	Sltst : brn gy to dsk y brn, cly, mic				0129-2L
			30	Cont : cem, prp, fib				0129-3L
			tr	S/Sst : w, cem				0129-1L
3810.00				Dunl	A/b	L.Jurassic		0130
			55	Sltst : brn gy to dsk y brn, cly, mic				0130-2L
			45	Cont : cem, prp, fib				0130-3L
			tr	S/Sst : w, cem				0130-1L
3815.00				Dunl	A/b	L.Jurassic		0131
		1.45	85	Sltst : brn gy to dsk y brn, cly, mic				0131-2L
			15	Cont : cem, prp, dd, fib				0131-3L
			tr	S/Sst : w, cem				0131-1L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp / Lithology	Frm	Age / Lithology description	Trb	Sample
3822.00				Dunl	A/b	L.Jurassic		0132
			95	Sltst		: brn gy to dsk y brn, s, mic		0132-2L
			5	Cont		: cem, prp, dd, fib		0132-3L
			tr	S/Sst		: w, calc, cem		0132-1L
3827.00				Dunl	A/b	L.Jurassic		0133
			80	Sltst		: brn gy to dsk y brn, s, mic		0133-2L
			15	S/Sst		: w to lt or, calc, cem		0133-1L
			5	Cont		: prp, dd		0133-3L
3832.00				Dunl	A/b	L.Jurassic		0134
			75	Sltst		: brn gy to dsk y brn, mic		0134-2L
			15	S/Sst		: w to lt or, calc, cem		0134-1L
			10	Cont		: cem, prp, dd		0134-3L
3837.00				Dunl	A/b	L.Jurassic		0135
			55	Sltst		: brn gy to dsk y brn, mic		0135-2L
			30	S/Sst		: w to lt or, calc, cem		0135-1L
			15	Cont		: prp, dd		0135-3L
3845.00				Dunl	A/b	L.Jurassic		0136
			80	S/Sst		: w to lt or, calc, mic, cem		0136-1L
			10	Sltst		: brn gy to dsk y brn, mic		0136-2L
			10	Cont		: prp		0136-3L
3850.00				Dunl	A/b	L.Jurassic		0137
		0.30	90	S/Sst		: w to lt or, calc, mic, cem		0137-1L
			10	Cont		: prp		0137-3L
			tr	Sltst		: brn gy to dsk y brn, mic		0137-2L

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
3857.00				Dunl	A/b	L.Jurassic		0138
			70	S/Sst		: w to lt or, calc, mic, cem, l		0138-1L
			20	Cont		: prp, fib		0138-3L
			10	Sltst		: brn gy to dsk y brn, mic		0138-2L
3862.00				Dunl	A/b	L.Jurassic		0139
			90	S/Sst		: w to lt or, calc, mic, cem, l		0139-1L
			5	Sltst		: brn gy to dsk y brn, mic		0139-2L
			5	Cont		: prp, fib		0139-3L
3867.00				Dunl	A/b	L.Jurassic		0140
		0.20	95	S/Sst		: w to lt or to lt gy, calc, mic, cem		0140-1L
			5	Cont		: prp, fib		0140-3L
			tr	Sltst		: brn gy to dsk y brn, mic		0140-2L
3875.00				Dunl	A/b	L.Jurassic		0141
			85	S/Sst		: w to lt or to lt gy, calc, mic, cem		0141-1L
			15	Sltst		: brn gy to dsk y brn, mic		0141-2L
			tr	Cont		: prp, fib		0141-3L
3882.00				Dunl	A/b	L.Jurassic		0142
			55	S/Sst		: w to lt or to lt gy, calc, mic, cem		0142-1L
			30	Sltst		: brn gy to dsk y brn, mic		0142-2L
			15	Cont		: prp, fib		0142-3L

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A S

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Depth Cvd	Type TOC%	%	Grp	Frm	Age / Lithology description	Trb	Sample
3890.00				Dunl	A/b	L.Jurassic		0143
			50	Cont		: Coal-ad, prp, fib, tar-ad		0143-3L
			40	Sltst		: brn gy to dsk y brn, mic		0143-2L
			10	Sh/Clst		: lt gy to m gy		0143-4L
			tr	S/Sst		: w to lt or to lt gy, calc, mic, cem		0143-1L
3895.00					Stat	L.Jurassic		0144
			100	S/Sst		: w, l		0144-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0144-2L
			tr	Cont		: Mica-ad		0144-3L
3902.00					Stat	L.Jurassic		0145
			100	S/Sst		: w, l		0145-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0145-2L
			tr	Cont		: Mica-ad		0145-3L
3907.00					Stat	L.Jurassic		0146
			100	S/Sst		: w to lt or brn, l		0146-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0146-2L
			tr	Cont		: Mica-ad		0146-3L
3912.00					Stat	L.Jurassic		0147
			100	S/Sst		: w to lt or brn, l		0147-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0147-2L
			tr	Cont		: Mica-ad		0147-3L
			tr	Coal		: blk		0147-4L

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth Int	Cvd	Type TOC%	%	Grp / Frm / Age / Lithology description		Trb	Sample
3920.00					Stat L.Jurassic		0148
		0.10	100	S/Sst	: w to lt or brn, l		0148-1L
			tr	Sltst	: brn gy to dsk y brn, mic		0148-2L
			tr	Cont	: Mica-ad		0148-3L
			tr	Coal	: blk		0148-4L
3927.00					Stat L.Jurassic		0149
			100	S/Sst	: w to lt or brn, l		0149-1L
			tr	Sltst	: brn gy to dsk y brn, mic		0149-2L
			tr	Cont	: Coal-ad		0149-3L
3932.00					Stat L.Jurassic		0150
			100	S/Sst	: w to lt or brn, cem, l		0150-1L
			tr	Sltst	: brn gy to dsk y brn, mic		0150-2L
			tr	Cont	: Coal-ad		0150-3L
3937.00					Stat L.Jurassic		0151
		0.12	95	S/Sst	: w to lt or brn, cem, l		0151-1L
			5	Cont	: st, Coal-ad, prp		0151-3L
			tr	Sltst	: brn gy to dsk y brn, mic		0151-2L
3945.00					Stat L.Jurassic		0152
			100	S/Sst	: w to lt or brn, cem, l		0152-1L
			tr	Sltst	: brn gy to dsk y brn, mic		0152-2L
			tr	Cont	: Coal-ad, prp, tar-ad		0152-3L
3950.00					Stat L.Jurassic		0153
			100	S/Sst	: w to lt or brn, cem, l		0153-1L
			tr	Sltst	: brn gy to dsk y brn, mic		0153-2L
			tr	Cont	: Coal-ad, prp		0153-3L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth (Int)	Depth (Cvd)	Type TOC%	%	Grp / Lithology	Frm	Age / Lithology description	Trb	Sample
3957.00					Stat	L.Jurassic		0154
			100	S/Sst		: w to lt or brn, l		0154-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0154-2L
			tr	Cont		: Coal-ad, prp		0154-3L
3962.00					Stat	L.Jurassic		0155
			95	S/Sst		: w to lt or brn, l		0155-1L
			5	Coal		: blk		0155-4L
			tr	Sltst		: brn gy to dsk y brn, mic		0155-2L
			tr	Cont		: Coal-ad, prp		0155-3L
3967.00					Stat	L.Jurassic		0156
			95	S/Sst		: w to lt or brn, l		0156-1L
			5	Sltst		: brn gy to dsk y brn, mic		0156-2L
			tr	Cont		: Coal-ad, prp		0156-3L
			tr	Coal		: blk		0156-4L
3972.00					Stat	L.Jurassic		0157
		0.07	100	S/Sst		: w to lt or brn, l		0157-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0157-2L
			tr	Cont		: Coal-ad, prp, tar-ad		0157-3L
			tr	Coal		: blk		0157-4L
3977.00					Stat	L.Jurassic		0158
			100	S/Sst		: w, l		0158-1L
			tr	Sltst		: brn gy to dsk y brn, mic		0158-2L
			tr	Cont		: Coal-ad, prp		0158-3L
			tr	Coal		: blk		0158-4L

Table 1 : Lithology description for well NOCS 30/6-11

Depth unit of measure: m

Depth	Type		Grp	Frm	Age	Trb	Sample
Int Cvd	TOC%	%	Lithology description				
3982.00				Stat	L.Jurassic		0159
		100	S/Sst : w, l				0159-1L
		tr	Sltst : brn gy to dsk y brn, mic				0159-2L
		tr	Cont : Coal-ad, prp				0159-3L
		tr	Coal : blk				0159-4L
3987.00				Stat	L.Jurassic		0160
		100	S/Sst : w, l				0160-1L
		tr	Sltst : brn gy to dsk y brn, mic				0160-2L
		tr	Cont : Coal-ad, prp				0160-3L
		tr	Coal : blk				0160-4L
3995.00				Stat	L.Jurassic		0161
	0.05	85	S/Sst : w, l				0161-1L
		10	Sh/Clst: dsk y brn, mic				0161-2L
		5	Coal : blk				0161-4L
		tr	Cont : Coal-ad, prp				0161-3L
4001.00				Stat	L.Jurassic		0162
		90	S/Sst : w, l				0162-1L
		5	Sh/Clst: dsk y brn, mic				0162-2L
		5	Coal : blk				0162-4L
		tr	Cont : Coal-ad, prp				0162-3L

Table 2 : Rock-Eval table for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	S1	S2	S3	S2/S3	TOC	HI	OI	PP	PI	Tmax	Sample
2350.00	cut	Marl : lt gy	0.69	0.48	0.93	0.52	0.70	69	133	1.2	0.59	-	0001-1L
2500.00	cut	Marl : lt gy	1.69	0.42	1.19	0.35	0.86	49	138	2.1	0.80	-	0004-1L
2680.00	cut	Sh/Clst: m gy	2.27	0.95	1.38	0.69	1.04	91	133	3.2	0.70	319	0010-1L
2800.00	cut	Sh/Clst: m gy	1.35	0.53	1.83	0.29	0.89	60	206	1.9	0.72	326	0014-1L
2890.00	cut	Sh/Clst: m gy	1.43	0.54	0.80	0.68	1.14	47	70	2.0	0.73	322	0017-1L
3100.00	cut	Other : m gy to drk gy	0.28	0.07	0.47	0.15	0.50	14	94	0.3	0.80	407	0024-4L
3260.00	cut	Sh/Clst: m gy	0.34	0.49	0.52	0.94	0.96	51	54	0.8	0.41	436	0030-1L
3266.00	ccp	Sh/Clst: dsk y brn	1.44	5.53	0.20	27.65	1.31	422	15	7.0	0.21	439	0033-1L
3267.00	cut	Sh/Clst: m gy	1.04	1.88	0.48	3.92	1.18	159	41	2.9	0.36	378	0031-1L
3277.00	cut	Sh/Clst: m gy to gn gy	0.15	0.27	0.28	0.96	0.61	44	46	0.4	0.36	372	0034-1L
3285.00	cut	Sh/Clst: m gy to gn gy	0.13	0.28	0.37	0.76	0.66	42	56	0.4	0.32	381	0035-1L
3297.00	cut	Sh/Clst: m gy to gn gy	0.11	0.22	0.36	0.61	0.56	39	64	0.3	0.33	-	0037-1L
3302.00	cut	Sh/Clst: m gy to gn gy	0.19	0.32	0.39	0.82	0.55	58	71	0.5	0.37	337	0038-1L
3315.00	cut	Sh/Clst: m gy to gn gy	0.34	0.40	0.45	0.89	0.75	53	60	0.7	0.46	332	0040-1L
3320.00	cut	Sltst : brn gy	0.86	1.19	1.88	0.63	1.70	70	111	2.1	0.42	432	0041-5L

Table 2 : Rock-Eval table for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	S1	S2	S3	S2/S3	TOC	HI	OI	PP	PI	Tmax	Sample
3327.00	cut	Sh/Clst: m gy to gn gy	0.27	0.30	0.31	0.97	0.66	45	47	0.6	0.47	328	0042-1L
3340.00	cut	Sh/Clst: m gy to gn gy	0.11	0.26	0.65	0.40	0.55	47	118	0.4	0.30	378	0044-1L
3347.00	cut	Sltst : brn gy to dsk y brn	1.11	4.29	0.63	6.81	1.82	236	35	5.4	0.21	442	0045-4L
3352.00	cut	Sltst : brn gy to dsk y brn	1.49	4.97	0.62	8.02	2.55	195	24	6.5	0.23	439	0046-3L
3365.00	cut	S/Sst : lt y brn	0.47	0.42	1.12	0.38	1.17	36	96	0.9	0.53	432	0048-4L
3377.00	cut	S/Sst : lt gy to lt y brn	0.14	0.07	0.26	0.27	0.24	29	108	0.2	0.67	437	0050-4L
3390.00	cut	Sh/Clst: m gy to gn gy	0.13	0.31	0.38	0.82	0.76	41	50	0.4	0.30	374	0052-1L
3415.00	cut	S/Sst : lt y brn	0.06	0.05	0.14	0.36	0.11	45	127	0.1	0.55	339	0056-2L
3427.00	cut	Sh/Clst: brn gy to brn blk	0.66	6.76	0.23	29.39	4.16	163	6	7.4	0.09	442	0058-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	2.05	16.47	0.46	35.80	9.34	176	5	18.5	0.11	439	0060-4L
3452.00	cut	Sh/Clst: brn gy to brn blk	1.29	9.03	0.48	18.81	5.48	165	9	10.3	0.13	446	0062-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	0.51	0.84	0.26	3.23	0.25	336	104	1.4	0.38	373	0063-1L
3458.20	ccp	Sltst : m gy	0.12	0.59	0.07	8.43	1.38	43	5	0.7	0.17	440	0065-1L
3464.65	ccp	Congl : lt y brn	0.33	0.27	0.52	0.52	0.17	159	306	0.6	0.55	371	0066-1L
3470.50	ccp	S/Sst : w to lt gy	0.04	0.07	0.05	1.40	0.06	117	83	0.1	0.36	344	0069-1L

Table 2 : Rock-Eval table for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	S1	S2	S3	S2/S3	TOC	HI	OI	PP	PI	Tmax	Sample
3476.15	ccp	S/Sst : lt gy	0.05	0.15	0.13	1.15	0.10	150	130	0.2	0.25	348	0163-1L
3482.50	ccp	S/Sst : m gy	0.03	0.10	0.13	0.77	0.20	50	65	0.1	0.23	365	0072-1L
3488.40	ccp	S/Sst : lt gy	0.08	0.08	0.36	0.22	0.08	100	450	0.2	0.50	444	0074-1L
3494.50	ccp	S/Sst : w to lt gy	0.11	0.15	0.42	0.36	0.17	88	247	0.3	0.42	375	0076-6L
3500.10	ccp	S/Sst : w to lt gy	0.03	0.05	0.15	0.33	0.04	125	375	0.1	0.38	335	0078-1L
3508.00	ccp	S/Sst : w to lt gy	0.16	0.31	0.50	0.62	0.25	124	200	0.5	0.34	371	0080-1L
3517.00	cut	S/Sst : lt gy	0.17	0.09	0.17	0.53	0.09	100	189	0.3	0.65	-	0082-2L
3542.00	cut	S/Sst : w to lt gy	0.19	0.03	0.06	0.50	0.06	50	100	0.2	0.86	327	0086-2L
3567.00	cut	S/Sst : w to lt gy	0.09	0.06	0.06	1.00	0.06	100	100	0.2	0.60	-	0090-2L
3585.00	cut	S/Sst : lt gy to m gy	0.15	0.15	0.20	0.75	0.22	68	91	0.3	0.50	432	0093-2L
3605.00	cut	S/Sst : brn gy to gy brn, w	0.28	0.25	0.20	1.25	0.32	78	63	0.5	0.53	440	0096-2L
3622.00	cut	Sltst : gy brn to dsk y brn	0.98	1.83	0.43	4.26	1.76	104	24	2.8	0.35	443	0099-3L
3640.00	cut	Sltst : gy brn to dsk y brn	1.69	2.07	0.45	4.60	1.68	123	27	3.8	0.45	446	0102-2L
3652.00	cut	Sh/Clst: brn gy to dsk y brn	0.88	4.12	0.20	20.60	2.23	185	9	5.0	0.18	441	0104-1L
3687.00	cut	Sltst : gy brn to drk gy	0.94	1.36	0.35	3.89	1.18	115	30	2.3	0.41	445	0112-2L

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Table 2 : Rock-Eval table for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	S1	S2	S3	S2/S3	TOC	HI	OI	PP	PI	Tmax	Sample
3700.00	cut	Sltst : lt brn gy to brn gy	0.63	0.40	0.96	0.42	1.28	31	75	1.0	0.61	444	0114-2L
3735.00	cut	S/Sst : lt y brn to drk y brn	0.19	0.10	0.27	0.37	0.25	40	108	0.3	0.66	395	0120-1L
3756.45	ccp	Sltst : dsk brn	0.17	0.36	1.63	0.22	0.59	61	276	0.5	0.32	446	0164-1L
3762.20	ccp	Sltst : lt brn gy	0.86	3.17	0.42	7.55	1.87	170	22	4.0	0.21	446	0165-1L
3768.00	ccp	Sltst : dsk y brn to brn blk	0.28	1.36	0.26	5.23	1.11	123	23	1.6	0.17	451	0166-1L
3780.00	cut	Sltst : brn gy to dsk y brn	0.85	1.54	0.32	4.81	1.43	108	22	2.4	0.36	443	0125-2L
3802.00	cut	Sltst : brn gy to dsk y brn	0.85	1.59	0.38	4.18	1.41	113	27	2.4	0.35	441	0129-2L
3815.00	cut	Sltst : brn gy to dsk y brn	0.73	0.78	0.79	0.99	1.45	54	54	1.5	0.48	448	0131-2L
3850.00	cut	S/Sst : w to lt or	0.16	0.18	0.29	0.62	0.30	60	97	0.3	0.47	390	0137-1L
3867.00	cut	S/Sst : w to lt or to lt gy	0.30	0.14	0.16	0.88	0.20	70	80	0.4	0.68	386	0140-1L
3920.00	cut	S/Sst : w to lt or brn	0.23	0.06	0.09	0.67	0.10	60	90	0.3	0.79	-	0148-1L
3937.00	cut	S/Sst : w to lt or brn	0.23	0.10	0.14	0.71	0.12	83	117	0.3	0.70	315	0151-1L
3972.00	cut	S/Sst : w to lt or brn	0.17	0.09	0.02	4.50	0.07	129	29	0.3	0.65	343	0157-1L
3995.00	cut	S/Sst : w	0.10	0.04	0.01	4.00	0.05	80	20	0.1	0.71	-	0161-1L

Table 3 : Pyrolysis GC Data (S2 peak) as Percentage of Total Area for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	C1	C2-C5	C6-C14	C15+	S2 from Rock-Eval	Sample
2500.00	cut	Marl : lt gy	26.98	24.45	34.98	13.59	0.42	0004-1L
2680.00	cut	Sh/Clst: m gy	25.77	26.84	35.83	11.57	0.95	0010-1L
3266.00	ccp	Sh/Clst: dsk y brn	20.75	13.70	32.85	32.71	5.53	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	19.21	14.86	33.03	32.90	4.29	0045-4L
3365.00	cut	S/Sst : lt y brn	12.60	34.60	44.87	7.93	0.42	0048-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	15.50	18.84	29.17	35.97	16.47	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	22.33	20.55	44.17	12.94	0.84	0063-1L
3464.65	ccp	Congl : lt y brn	14.19	35.93	37.11	12.76	0.27	0066-1L
3508.00	ccp	S/Sst : w to lt gy	6.19	33.96	22.22	37.62	0.31	0080-1L
3605.00	cut	S/Sst : brn gy to gy brn, w	10.21	46.53	29.84	13.42	0.25	0096-2L
3640.00	cut	Sltst : gy brn to dsk y brn	6.58	28.54	37.34	27.53	2.07	0102-2L
3762.20	ccp	Sltst : lt brn gy	14.66	20.63	29.31	35.40	3.17	0165-1L
3802.00	cut	Sltst : brn gy to dsk y brn	16.41	19.93	39.20	24.46	1.59	0129-2L
3867.00	cut	S/Sst : w to lt or to lt gy	20.79	30.82	36.26	12.13	0.14	0140-1L

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Table 3 : Pyrolysis GC Data (S2 peak) as Percentage of Total Area for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	C1	C2-C5	C6-C14	C15+	S2 from Rock-Eval	Sample
3995.00	cut	S/Sst : w	6.45	38.75	32.81	21.99	0.04	0161-1L

Table 4 a: Weight of EOM and Chromatographic Fraction for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	Rock Extracted (g)	EOM (mg)	Sat (mg)	Aro (mg)	Asph (mg)	NSO (mg)	HC (mg)	Non-HC (mg)	TOC(e) (%)	Sample
2500.00	cut	Marl : lt gy	3.9	7.9	5.7	1.1	0.4	0.7	6.8	1.1	0.81	0004-1L
2890.00	com	Composite sample - see table 4 e	1.8	4.6	3.0	0.4	0.1	1.1	3.5	1.1	0.94	0167-0B
3266.00	ccp	Sh/Clst: dsk y brn	5.8	22.8	11.6	5.6	1.5	4.1	17.2	5.6	4.32	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	0.9	2.5	1.0	0.6	0.4	0.5	1.6	0.9	2.87	0045-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	1.1	21.9	2.0	2.0	13.0	4.8	4.1	17.8	0.61	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	7.9	14.4	9.6	3.1	0.1	1.6	12.7	1.7	0.44	0063-1L
3464.65	ccp	Congl : lt y brn	6.8	12.3	8.6	2.1	0.8	0.8	10.7	1.6	0.39	0066-1L
3867.00	cut	S/Sst : w to lt or to lt gy	1.7	1.8	0.9	0.2	0.2	0.6	1.0	0.8	0.50	0140-1L

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Table 4 b: Concentration of EOM and Chromatographic Fraction (wt ppm rock) for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	EOM	Sat	Aro	Asph	NSO	HC	Non-HC	Sample
2500.00	cut	Marl : lt gy	2041	1467	279	103	191	1746	294	0004-1L
2890.00	com	Composite sample - see table 4 e	2500	1630	244	54	570	1875	624	0167-0B
3266.00	ccp	Sh/Clst: dsk y brn	3944	2013	968	259	702	2982	961	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	2688	1129	645	430	483	1774	913	0045-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	19909	1863	1863	11818	4363	3727	16181	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	1815	1210	393	12	199	1604	211	0063-1L
3464.65	ccp	Congl : lt y brn	1795	1255	306	116	116	1562	233	0066-1L
3867.00	cut	S/Sst : w to lt or to lt gy	1034	517	86	114	316	603	431	0140-1L

Table 4 c: Concentration of EOM and Chromatographic Fraction (mg/g TOC(e)) for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	EOM	Sat	Aro	Asph	NSO	HC	Non-HC	Sample
2500.00	cut	Marl : lt gy	252.02	181.20	34.45	12.76	23.61	215.65	36.37	0004-1L
2890.00	com	Composite sample - see table 4 e	265.96	173.45	26.02	5.78	60.71	199.47	66.49	0167-0B
3266.00	ccp	Sh/Clst: dsk y brn	91.31	46.62	22.43	6.01	16.26	69.04	22.27	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	93.66	39.34	22.48	14.99	16.86	61.82	31.85	0045-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	3263.79	305.51	305.51	1937.41	715.35	611.03	2652.76	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	412.70	275.13	89.42	2.87	45.28	364.55	48.15	0063-1L
3464.65	ccp	Congl : lt y brn	460.42	321.92	78.61	29.95	29.95	400.52	59.89	0066-1L
3867.00	cut	S/Sst : w to lt or to lt gy	206.90	103.45	17.24	22.99	63.22	120.69	86.21	0140-1L

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Table 4 d: Composition of material extracted from the rock (%) for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	Sat / EOM	Aro / EOM	Asph / EOM	NSO / EOM	HC / EOM	Non-HC / EOM	Sat / Aro	HC / Non-HC	Sample
2500.00	cut	Marl : lt gy	71.90	13.67	5.06	9.37	85.57	14.43	525.93	592.98	0004-1L
2890.00	com	Composite sample - see table 4 e	65.22	9.78	2.17	22.83	75.00	25.00	666.67	300.00	0167-0B
3266.00	ccp	Sh/Clst: dsk y brn	51.05	24.56	6.58	17.81	75.61	24.39	207.86	310.07	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	42.00	24.00	16.00	18.00	66.00	34.00	175.00	194.12	0045-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	9.36	9.36	59.36	21.92	18.72	81.28	100.00	23.03	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	66.67	21.67	0.69	10.97	88.33	11.67	307.69	757.14	0063-1L
3464.65	ccp	Congl : lt y brn	69.92	17.07	6.50	6.50	86.99	13.01	409.52	668.75	0066-1L
3867.00	cut	S/Sst : w to lt or to lt gy	50.00	8.33	11.11	30.56	58.33	41.67	600.00	140.00	0140-1L

Table 4 e: List of composite samples appearing in the extraction tables for well NOCS 30/6-11

Depth unit of measure: m

NOTE: Depths shown in tables 4 a to d correspond to the composite samples' lower depth.

Upper depth	Lower depth	Typ	Sample	Depth	Typ	Lithology	Sample
2680.00	2890.00	com	0167-0B is composed of:	2680.00	cut	Sh/Clst: m gy, calc	0010-1L
				2800.00	cut	Sh/Clst: m gy	0014-1L
				2890.00	cut	Sh/Clst: m gy	0017-1L

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Table 5 : Saturated Hydrocarbon Ratios for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	Pristane / nC17	Pristane / Phytane	Pristane + Phytane / nC17 + nC18	Phytane / nC18	CPI	Sample
2500.00	cut	Marl : lt gy	0.68	1.64	0.68	0.69	1.14	0004-1L
2890.00	com	bulk	0.60	1.79	0.58	0.54	1.05	0167-0B
3266.00	ccp	Sh/Clst: dsk y brn	0.86	1.79	0.74	0.59	1.12	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	0.89	2.72	0.68	0.42	1.13	0045-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	0.80	3.07	0.58	0.32	1.15	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	0.60	1.38	0.49	0.39	0.92	0063-1L
3464.65	ccp	Congl : lt y brn	0.62	1.82	0.42	0.26	1.06	0066-1L
3867.00	cut	S/Sst : w to lt or to lt gy	1.03	2.97	0.81	0.50	1.09	0140-1L

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Table 6 : Aromatic Hydrocarbon Ratios for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	MNR	DMNR	BPhR	2/1MP	MPI1	MPI2	Rc	DBT/P	4/1MDBT	(3+2) /1MDBT	Sample
2500.00	cut	Marl : lt gy	-	0.58	-	1.24	0.56	0.62	0.74	0.46	7.96	0.88	0004-1L
2890.00	com	bulk	0.67	0.83	0.13	1.14	0.64	0.70	0.78	0.39	10.80	0.92	0167-0B
3266.00	ccp	Sh/Clst: dsk y brn	0.74	1.23	0.14	0.57	0.46	0.48	0.68	0.11	9.94	0.61	0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	-	0.41	-	0.70	0.50	0.53	0.70	0.13	3.64	0.80	0045-4L
3440.00	cut	Sh/Clst: brn gy to brn blk	0.94	1.54	0.31	0.65	0.56	0.66	0.74	0.18	7.92	3.01	0060-4L
3452.35	ccp	S/Sst : lt gy to lt y brn	-	1.36	-	1.84	1.05	1.41	1.03	0.12	2.99	1.05	0063-1L
3464.65	ccp	Congl : lt y brn	-	-	-	1.69	1.12	1.24	1.07	0.07	-	-	0066-1L
3867.00	cut	S/Sst : w to lt or to lt gy	-	-	-	-	-	-	0.40	-	-	-	0140-1L

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Table 7 : Thermal Maturity Data for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	Vitrinite Reflectance (%)	Number of Readings	Standard Deviation	Spore Fluorescence Colour	SCI	Tmax (°C)	Sample
1600.00	cut	bulk	0.40	19	0.05	4	-	-	0170-0B
1800.00	cut	bulk	NDP	-	-	4	-	-	0174-0B
1950.00	cut	bulk	0.42	3	0.03	4	-	-	0177-0B
2100.00	cut	bulk	0.48	8	0.07	4	-	-	0180-0B
2300.00	cut	bulk	0.49	2	0.04	4	-	-	0184-0B
2440.00	cut	bulk	0.47	4	0.10	4	-	-	0002-0B
2590.00	cut	bulk	0.51	2	0.08	4	-	-	0007-0B
2680.00	cut	bulk	NDP	-	-	NDP	-	-	0010-0B
2680.00	cut	Sh/Clst: m gy	-	-	-	-	4.5(??)	319	0010-1L
2770.00	cut	bulk	NDP	-	-	0	-	-	0013-0B
2890.00	cut	Sh/Clst: m gy	-	-	-	-	5.0(??)	322	0017-1L
3266.00	ccp	bulk	0.39	20	0.04	4+5	-	-	0033-0B
3266.00	ccp	Sh/Clst: dsk y brn	-	-	-	-	6.0	439	0033-1L
3302.00	cut	bulk	0.48	7	0.03	5	-	-	0038-0B

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Table 7 : Thermal Maturity Data for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	Vitrinite Reflectance (%)	Number of Readings	Standard Deviation	Spore Fluorescence Colour	SCI	Tmax (°C)	Sample
3347.00	cut	Sltst : brn gy to dsk y brn	-	-	-	-	5.5-6.0	442	0045-4L
3382.00	cut	bulk	0.36	21	0.05	0	-	-	0051-0B
3420.00	cut	bulk	0.77	21	0.09	5-7	-	-	0057-0B
3458.20	ccp	Sltst : m gy	-	-	-	-	6.0-6.5	440	0065-1L
3482.00	cut	bulk	0.85	11	0.06	0	-	-	0071-0B
3487.00	cut	bulk	0.83	20	0.09	5+6	-	-	0073-0B
3622.00	cut	bulk	0.80	3	0.04	5+6	-	-	0099-0B
3640.00	cut	Sltst : gy brn to dsk y brn	-	-	-	-	6.5	446	0102-2L
3687.00	cut	bulk	0.83	4	0.03	0	-	-	0112-0B
3762.20	ccp	Sltst : lt brn gy	-	-	-	-	6.5-7.0	446	0165-1L
3768.00	ccp	bulk	0.81	8	0.05	6	-	-	0166-0B
3815.00	cut	Sltst : brn gy to dsk y brn	-	-	-	-	7.0(??)	448	0131-2L
3890.00	cut	bulk	0.78	4	0.03	0	-	-	0143-0B

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Table 8 : Visual Kerogen Composition Data for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	LIPT %	Amor L	Lip Det	Sp/Pol	Cuticl	Resin	Algae	Dinofl	Acrit	Bit L	INERT %	Fusin	SemFus	IntDet	Micrin	Sclero	Bit I	VITR %	Tellin	Collin	VitDet	Amor V	Bit V	Sample
2680.00	cut	Sh/Clst: m gy	NDP										NDP							NDP						0010-1L
2890.00	cut	Sh/Clst: m gy	NDP										NDP							NDP						0017-1L
3266.00	ccp	Sh/Clst: dsk y brn	70	**	*	*	*		**	*			30	*						TR	*		*			0033-1L
3347.00	cut	Sltst : brn gy to dsk y brn	80	**	**	*			**	*			10			*				10	*		**			0045-4L
3458.20	ccp	Sltst : m gy	10	*	*	*	**		*				10			*				80	*					0065-1L
3640.00	cut	Sltst : gy brn to dsk y brn	90		**	*	**		**	*			TR			*				10	*		**			0102-2L
3762.20	ccp	Sltst : lt brn gy	70		**	**	*		*			*	10	*	*					20	*		*			0165-1L
3815.00	cut	Sltst : brn gy to dsk y brn	80		**	*	*		*			*	5			*				15			*			0131-2L

Table 9a : Tabulation of carbon isotope data for EOM/EOM - fractions or Oils for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology	EOM/Oil	Saturated	Aromatic	NSO	Asphaltenes	Kerogen	Sample
3266.00	ccp		-28.22	-28.81	-27.92	-27.57	-26.55	-	0033-1L
3440.00	cut		-25.50	-26.54	-27.34	-26.10	-25.35	-	0060-4L
			* -25.42		* -28.07				
3464.65	ccp		-27.33	-27.34	-26.26	-26.68	-26.12	-	0066-1L

* Rerun

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Table 9b : Tabulation of cv values from carbon isotope data for well NOCS 30/6-11

Depth unit of measure: m

Depth	Typ	Lithology		Saturated	Aromatic	cv value	Interpretation	Sample
3266.00	ccp			-28.81	-27.92	-0.74	Marine	0033-1L
3440.00	cut			-26.54	-27.34	-5.20	Marine	0060-4L
3464.65	ccp			-27.34	-26.26	-0.78	Marine	0066-1L

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Table 10A: Variation in Triterpane Distribution (peak height) for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	B/A	B/B+A	B / B+E+F	C/E	C/C+E	X/E	Z/E	Z/C	Z/Z+E	Q/E	E/E+F	C+D / C+D+E+F	D+F/C+E	J1 / J1+J2%	Sample
3266.00	Sh/Clst	0.76	0.43	0.08	0.24	0.19	0.07	-	-	-	0.05	0.93	0.19	0.08	58.16	0033-1
3440.00	Sh/Clst	5.06	0.84	0.23	0.56	0.36	0.14	0.01	0.02	0.01	0.02	0.90	0.36	0.11	58.60	0060-4
3464.65	Congl	0.83	0.45	0.15	0.44	0.31	0.18	0.03	0.07	0.03	0.09	0.95	0.31	0.07	60.56	0066-1
3867.00	S/Sst	1.41	0.59	0.22	0.69	0.41	0.07	0.12	0.17	0.10	0.41	0.89	0.40	0.11	58.96	0140-1

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Table 10B: Variation in Sterane Distribution (peak height) for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	Ratio1	Ratio2	Ratio3	Ratio4	Ratio5	Ratio6	Ratio7	Ratio8	Ratio9	Ratio10	Sample
3266.00	Sh/Clst	0.84	57.49	77.49	1.14	0.75	0.45	0.31	0.63	1.35	4.05	0033-1
3440.00	Sh/Clst	0.52	47.55	72.35	0.20	0.73	0.18	0.15	0.57	0.91	2.49	0060-4
3464.65	Congl	0.80	53.80	81.99	0.68	0.81	0.35	0.23	0.69	1.16	4.93	0066-1
3867.00	S/Sst	0.53	48.01	76.42	0.85	0.77	0.51	0.40	0.62	0.92	3.12	0140-1

Ratio1: a / a + j
Ratio2: q / q + t * 100%
Ratio3: 2(r + s)/(q + t + 2(r + s)) * 100%
Ratio4: a + b + c + d / h + k + l + n
Ratio5: r + s / r + s + q
Ratio6: u + v / u + v + q + r + s + t
Ratio7: u + v / u + v + i + m + n + q + r + s + t
Ratio8: r + s / q + r + s + t
Ratio9: q / t
Ratio10: r + s / t

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Table 10C: Raw GCMS triterpane data (peak height) for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	p	q	r	s	t	a	b	z	c	Sample
3266.00	Sh/Clst	42.79	27.41	23.54	22.51	8.36	63.10	47.82	0.00	125.48	0033-1
3440.00	Sh/Clst	57.44	29.80	20.83	211.41	7.78	80.99	410.06	11.06	675.00	0060-4
3464.65	Congl	10.71	6.76	3.89	2.90	1.41	15.98	13.26	2.38	32.63	0066-1
3867.00	S/Sst	216.99	95.47	83.61	44.32	38.36	51.11	72.10	26.93	161.79	0140-1

Depth	Lithology	x	d	e	f	g	h	i	j1
3266.00	Sh/Clst	35.30	12.99	533.12	38.80	149.14	107.95	24.52	98.12
3440.00	Sh/Clst	163.66	66.89	1208.28	133.91	557.22	393.19	73.26	338.91
3464.65	Congl	13.09	2.75	73.80	4.23	31.34	21.75	3.37	21.34
3867.00	S/Sst	16.36	13.09	233.23	29.77	114.80	98.35	23.29	77.07

Depth	Lithology	j2	k1	k2	l1	l2	m1	m2
3266.00	Sh/Clst	70.58	75.91	50.54	47.03	27.88	37.22	21.69
3440.00	Sh/Clst	239.40	127.12	89.16	64.23	43.64	18.79	10.35
3464.65	Congl	13.90	12.24	7.49	6.57	3.96	4.57	3.92
3867.00	S/Sst	53.64	53.60	35.77	32.51	21.45	29.52	18.00

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Table 10D: Raw GCMS sterane data (peak height) for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	u	v	a	b	c	d	e	f	g	Sample	h	i	j	k	l	m	n	o	p	q	r	s	t
3266.00	Sh/Clst	52.56	19.02	71.29	51.99	16.82	33.79	59.91	28.70	27.56	0033-1	74.79	37.75	13.23	45.40	0.00	0.00	32.61	38.60	9.12	18.58	26.66	28.97	13.74
3440.00	Sh/Clst	39.10	19.88	21.14	12.19	4.38	14.48	21.34	25.54	22.41	0060-4	107.46	33.92	19.29	85.60	30.99	0.00	39.95	28.57	9.92	54.11	75.54	73.38	59.69
3464.65	Congl	12.72	4.01	16.99	10.58	3.09	7.51	8.60	8.18	7.08	0066-1	24.85	18.47	4.23	17.30	6.15	0.00	7.57	7.18	1.64	5.17	10.71	11.17	4.44
3867.00	S/Sst	69.04	33.99	31.35	25.73	7.29	17.70	19.16	15.43	27.61	0140-1	45.21	30.29	27.38	24.44	5.09	0.00	22.38	25.16	16.42	18.21	28.86	32.62	19.72

Table 10E: Variation in Monoaromatic Sterane Distribution for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	Ratio1	Ratio2	Ratio3	Ratio4	Sample
3266.00	Sh/Clst	0.45	0.32	0.30	0.26	0033-1
3440.00	Sh/Clst	-	-	-	-	0060-4
3464.65	Congl	0.71	0.50	0.50	0.41	0066-1
3867.00	S/Sst	0.44	-	0.24	0.14	0140-1

Ratio1: A1 / A1 + E1
Ratio2: B1 / B1 + E1
Ratio3: A1 / A1 + E1 + G1
Ratio4: A1+B1 / A1+B1+C1+D1+E1+F1+G1+H1+I1

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Table 10F: Variation in Triaromatic Sterane Distribution for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	Ratio1	Ratio2	Ratio3	Ratio4	Ratio5	Sample
3266.00	Sh/Clst	0.74	0.69	0.45	0.46	0.58	0033-1
3440.00	Sh/Clst	0.93	0.90	0.80	0.78	0.91	0060-4
3464.65	Congl	0.82	0.85	0.62	0.57	0.71	0066-1
3867.00	S/Sst	0.73	0.67	0.35	0.37	0.45	0140-1

Ratio1: a1 / a1 + g1
Ratio2: b1 / b1 + g1
Ratio3: a1 + b1 / a1 + b1 + c1 + d1 + e1 + f1 + g1
Ratio4: a1 / a1 + e1 + f1 + g1
Ratio5: a1 / a1 + d1

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Table 10G: Aromatisation of Steranes for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	Ratio1	Ratio2	Sample
3266.00	Sh/Clst	0.24	1.00	0033-1
3440.00	Sh/Clst	0.30	1.00	0060-4
3464.65	Congl	0.58	1.00	0066-1
3867.00	S/Sst	0.52	1.00	0140-1

Ratio1: $\frac{C1+D1+E1+F1+G1+H1+I1}{C1+D1+E1+F1+G1+H1+I1 + c1+d1+e1+f1+g1}$

Ratio2: g1 / g1 + I1

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Table 10H: Raw GCMS monoaromatic sterane data (peak height) for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	a1	b1	c1	d1	e1	f1	g1	h1	i1	Sample
3266.00	Sh/Clst	40.68	23.69	38.68	20.65	50.59	11.38	44.08	22.61	0.00	0033-1
3440.00	Sh/Clst	0.00	0.00	0.00	4.67	1.31	3.20	4.68	0.81	0.00	0060-4
3464.65	Congl	12.75	5.36	3.12	5.32	5.29	1.52	7.55	2.79	0.00	0066-1
3867.00	S/Sst	5.12	0.00	3.48	7.46	6.47	0.00	9.54	5.28	0.00	0140-1

Table 10I: Raw GCMS triaromatic sterane data (peak height) for Well NOCS 30/6-11

Depth unit of measure: m

Depth	Lithology	a1	b1	c1	d1	e1	f1	g1	Sample
3266.00	Sh/Clst	286.00	217.39	68.68	204.33	148.18	91.11	99.37	0033-1
3440.00	Sh/Clst	82.13	58.62	3.50	8.05	12.96	4.17	6.37	0060-4
3464.65	Congl	13.86	16.86	2.94	5.61	4.50	2.73	3.02	0066-1
3867.00	S/Sst	9.29	7.02	3.00	11.29	5.88	6.45	3.42	0140-1

Vitrinite Reflectance Histogram

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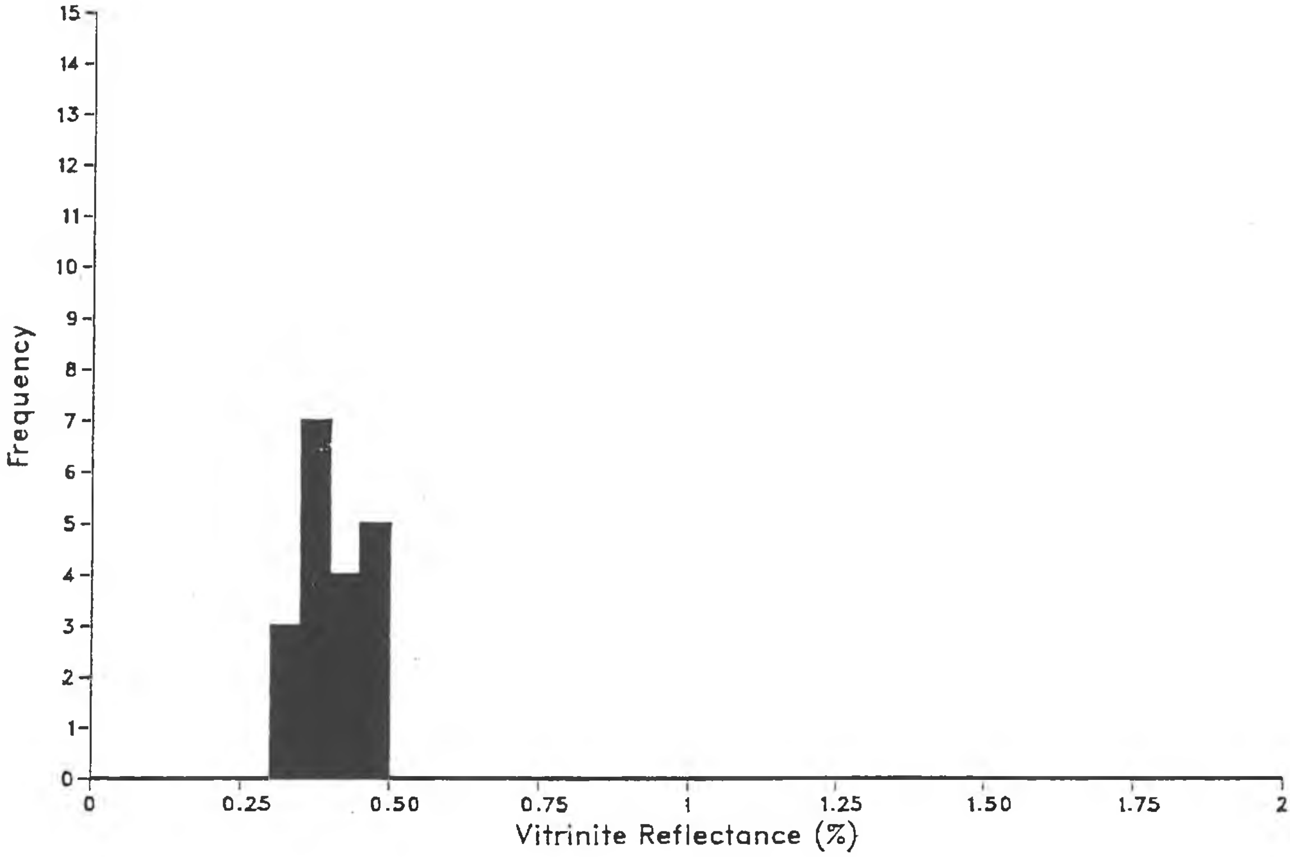
Well: NOCS 30/6-11
Depth: 1600.00(m)
Sample: 170- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.300 to 0.500):	0.40	0.05	19

Readings:

0.310	0.320	0.321	0.350	0.360	0.361	0.380	0.390	0.391	0.392
0.410	0.411	0.412	0.420	0.450	0.451	0.452	0.460	0.470	

Vitrinite Reflectance Histogram

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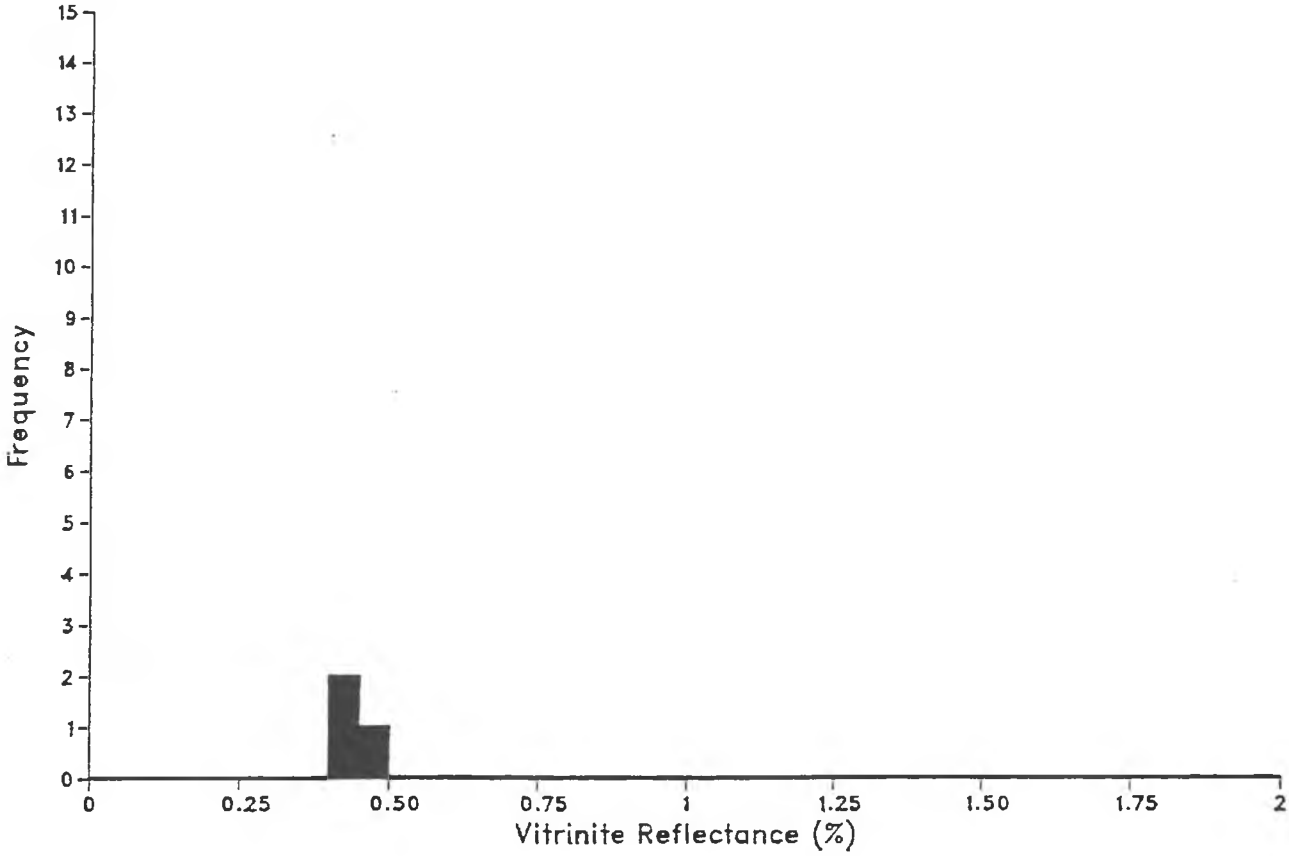
Well: NOCS 30/6-11
Depth: 1950.00(m)
Sample: 177- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.400 to 0.450):	0.42	0.03	3

Readings:

0.400 0.420 0.450

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Vitrinite Reflectance Histogram

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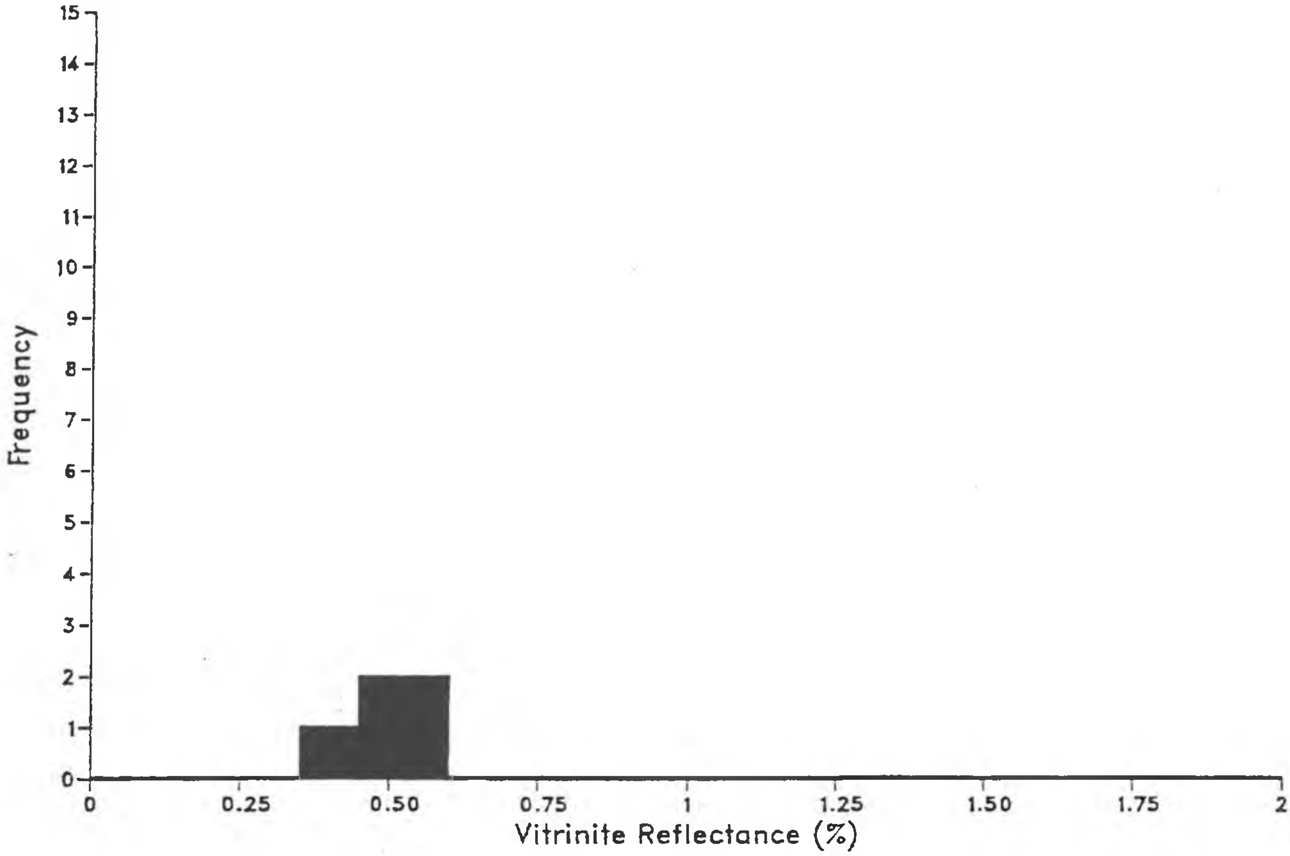
Well: NOCS 30/6-11
Depth: 2100.00(m)
Sample: 180- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.350 to 0.600):	0.48	0.07	8

Readings:

0.380 0.410 0.450 0.460 0.500 0.520 0.550 0.570

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Vitrinite Reflectance Histogram

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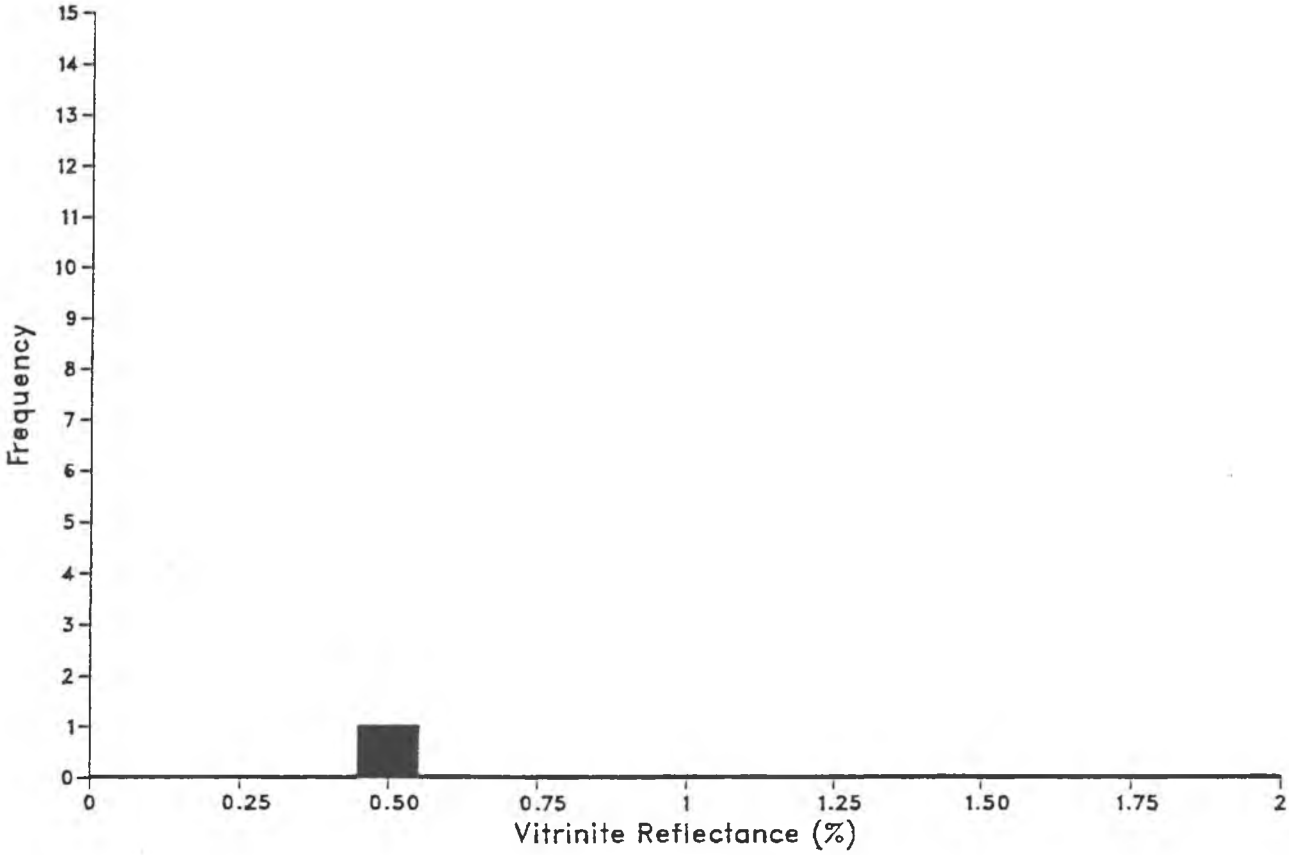
Well: NOCS 30/6-11
Depth: 2300.00(m)
Sample: 184- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.450 to 0.550):	0.49	0.04	2

Readings:

0.460 0.520

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Vitrinite Reflectance Histogram

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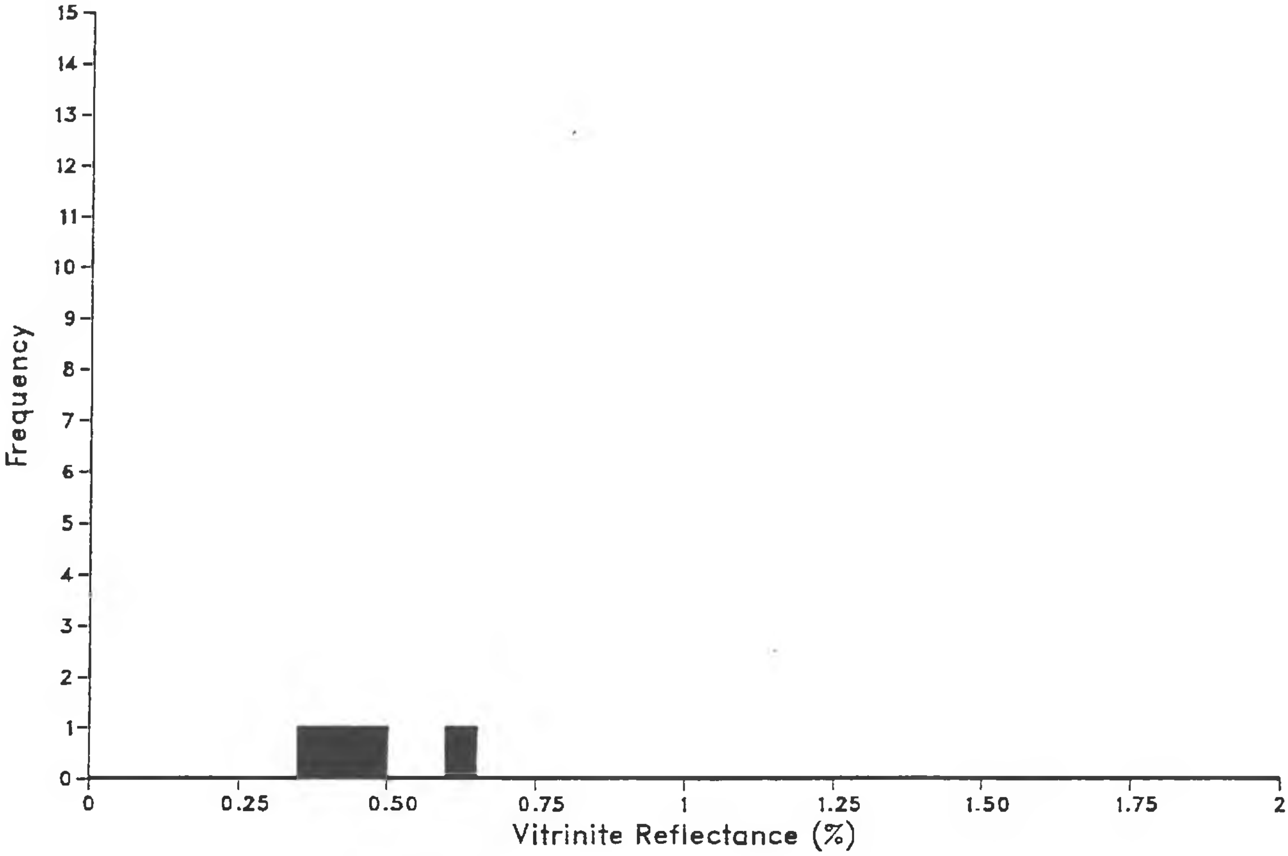
Well: NOCS 30/6-11
Depth: 2440.00(m)
Sample: 2- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.350 to 0.600):	0.47	0.10	4

Readings:

0.390 0.400 0.480 0.600

Vitrinite Reflectance Histogram

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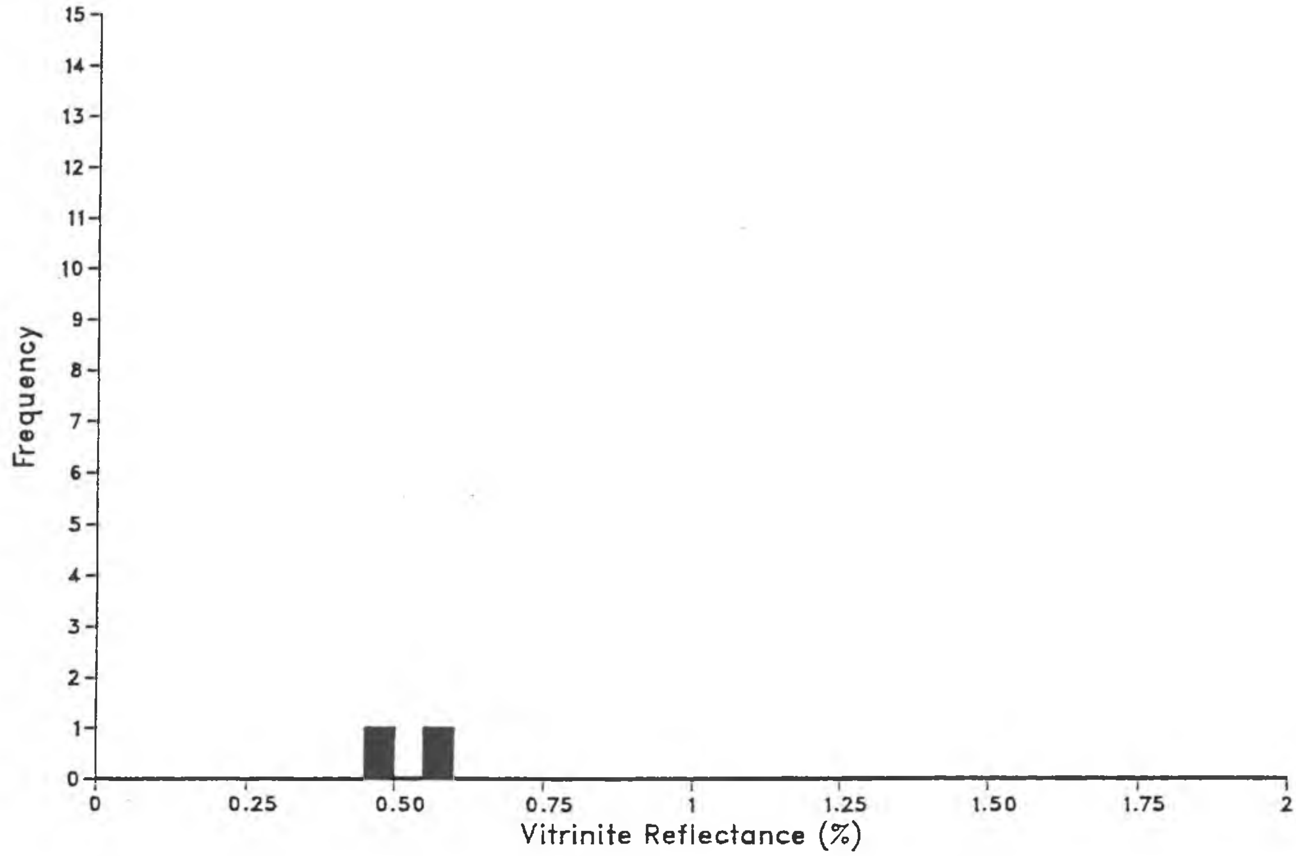
Well: NOCS 30/6-11
Depth: 2590.00(m)
Sample: 7- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.450 to 0.600):	0.51	0.08	2

Readings:

0.450 0.570

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Vitrinite Reflectance Histogram

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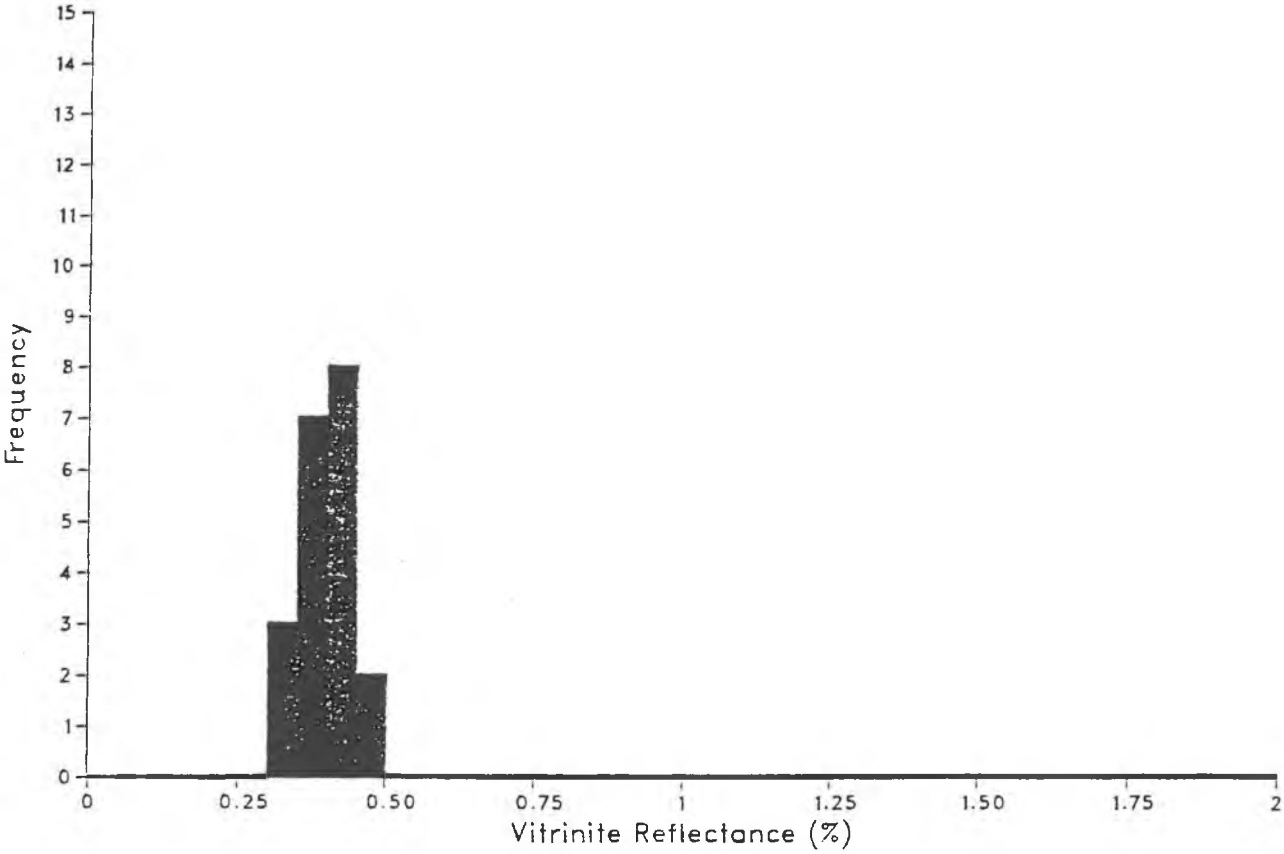
Well: NOCS 30/6-11
Depth: 3266.00(m)
Sample: 33- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.310 to 0.471):	0.39	0.04	20

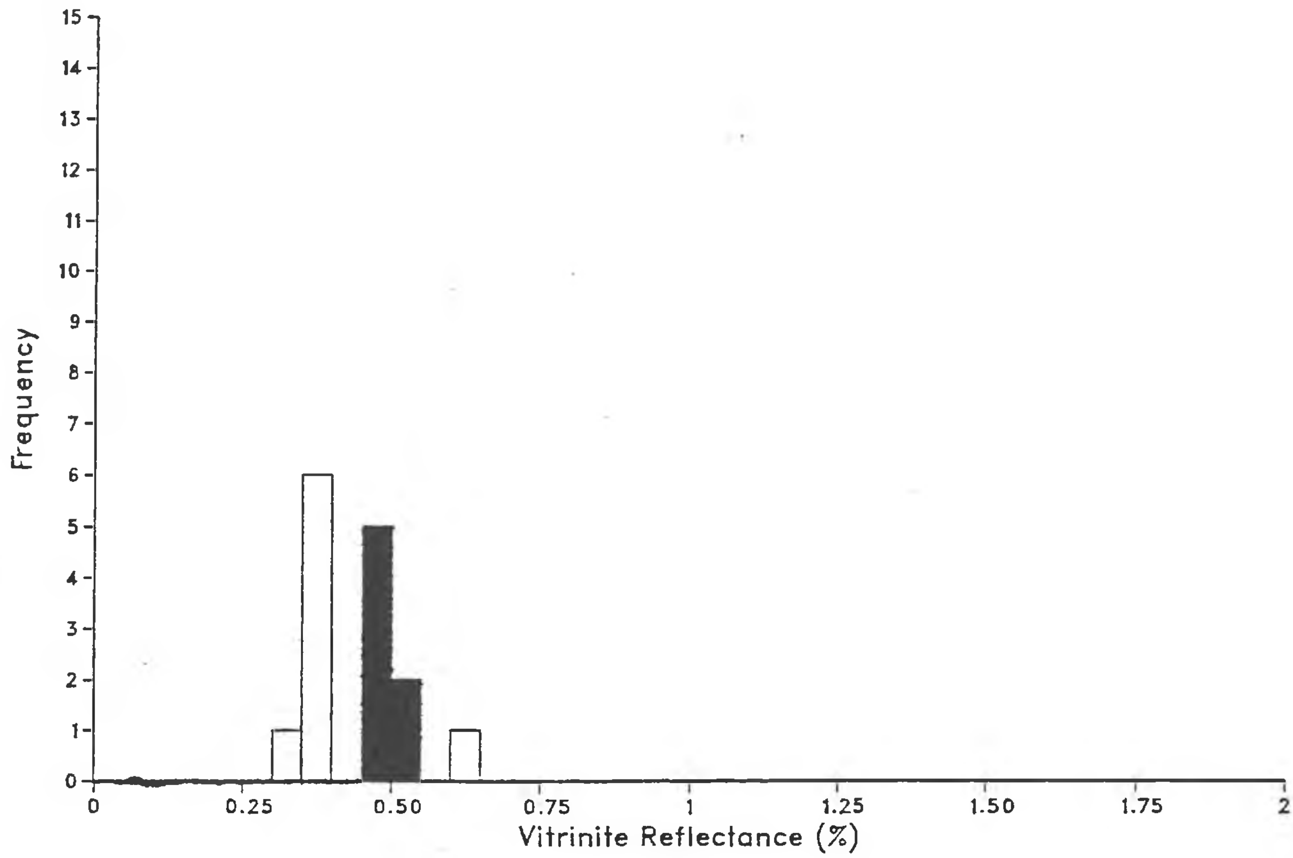
Readings:

0.310	0.320	0.340	0.350	0.351	0.352	0.360	0.380	0.381	0.390
0.400	0.401	0.410	0.411	0.412	0.420	0.421	0.430	0.460	0.470

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3302.00(m)
Sample: 38- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.449 to 0.551):	0.48	0.03	7
Population Two (from 0.300 to 0.440):	0.36	0.03	7
Population Three (from 0.559 to 0.611):	0.61	0.00	1

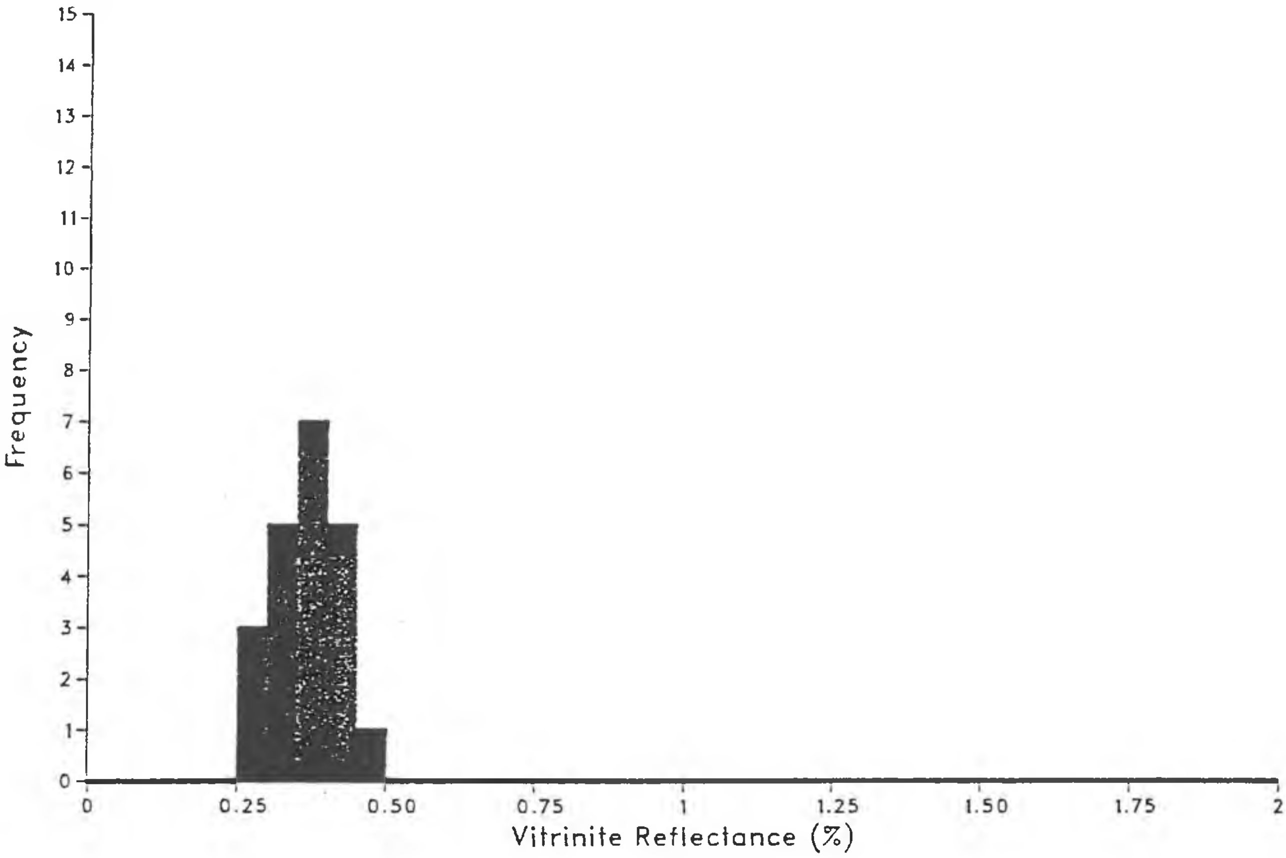
Readings:

0.320	0.350	0.351	0.370	0.371	0.390	0.391	0.450	0.451	0.460
0.480	0.490	0.520	0.530	0.610					

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3382.00(m)
Sample: 51- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.290 to 0.471):	0.36	0.05	21

Readings:

0.290	0.291	0.292	0.300	0.301	0.310	0.330	0.331	0.360	0.361
0.370	0.380	0.390	0.391	0.392	0.410	0.411	0.420	0.421	0.440
0.470									

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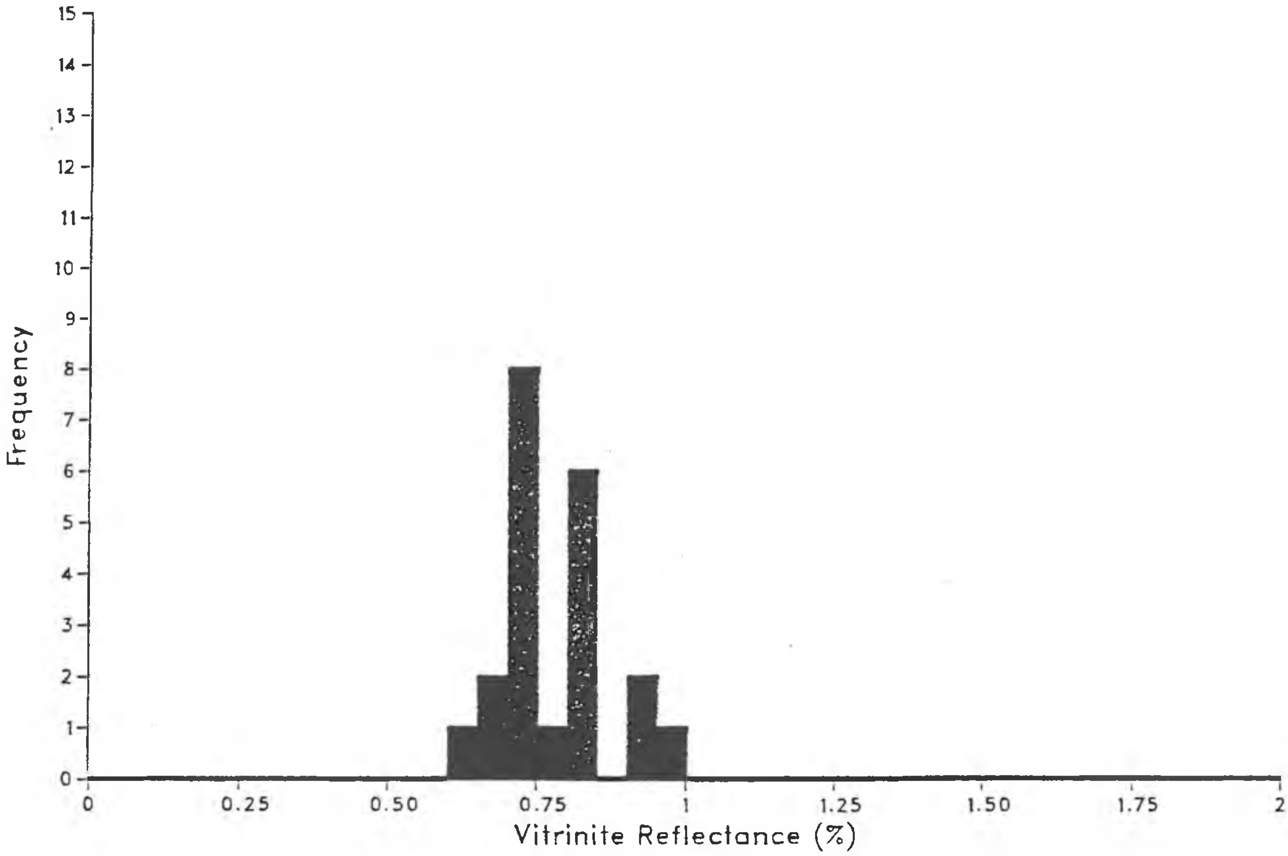
Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A/S

Well: NOCS 30/6-11
Depth: 3420.00(m)
Sample: 57- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.600 to 0.971):	0.77	0.09	21

Readings:

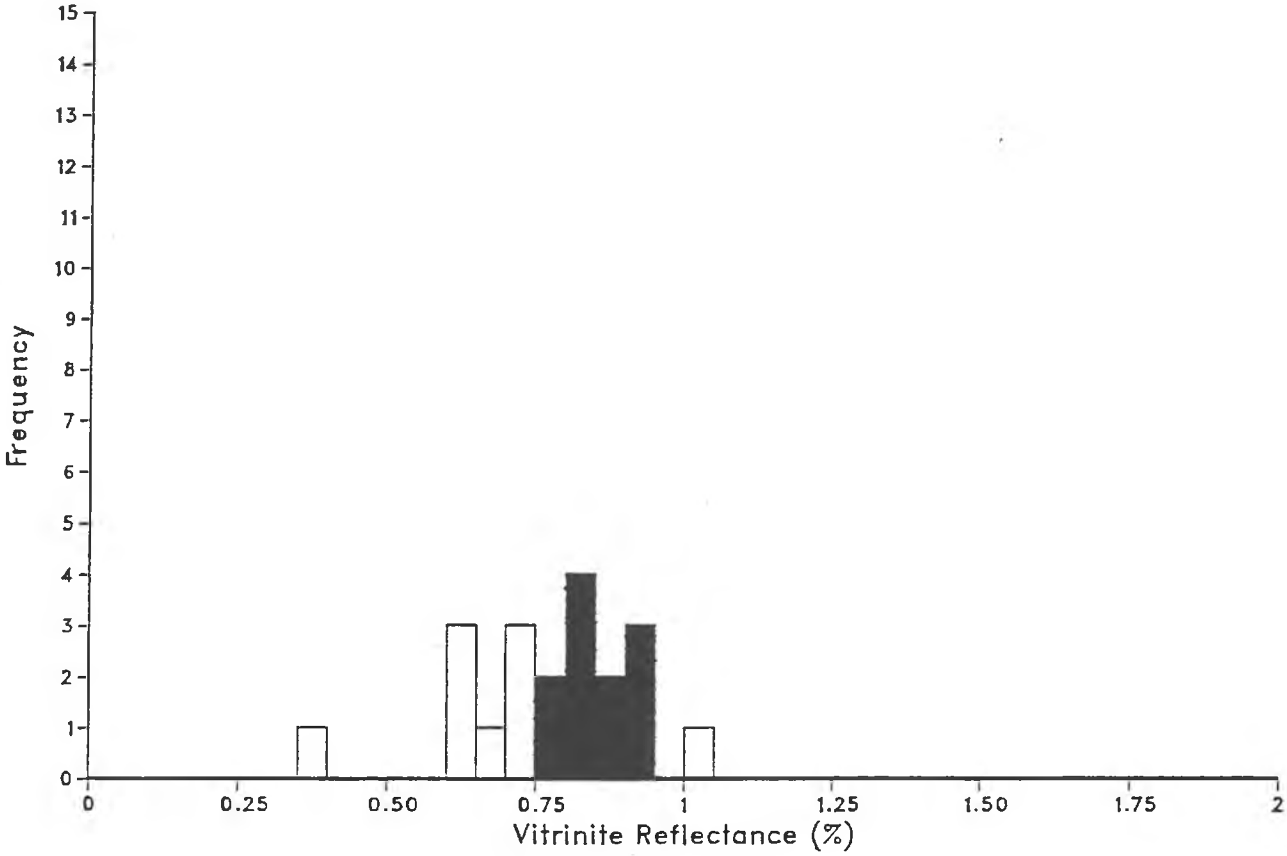
0.600	0.660	0.680	0.700	0.701	0.710	0.711	0.720	0.740	0.741
0.742	0.780	0.800	0.801	0.810	0.830	0.831	0.832	0.910	0.930
0.970									

GEOLAB NOR a/s — Geochemical Laboratories of Norway

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3482.00(m)
Sample: 71- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.751 to 0.951):	0.85	0.06	11
Population Two (from 0.350 to 0.750):	0.63	0.12	8
Population Three (from 0.952 to 1.100):	1.02	0.00	1

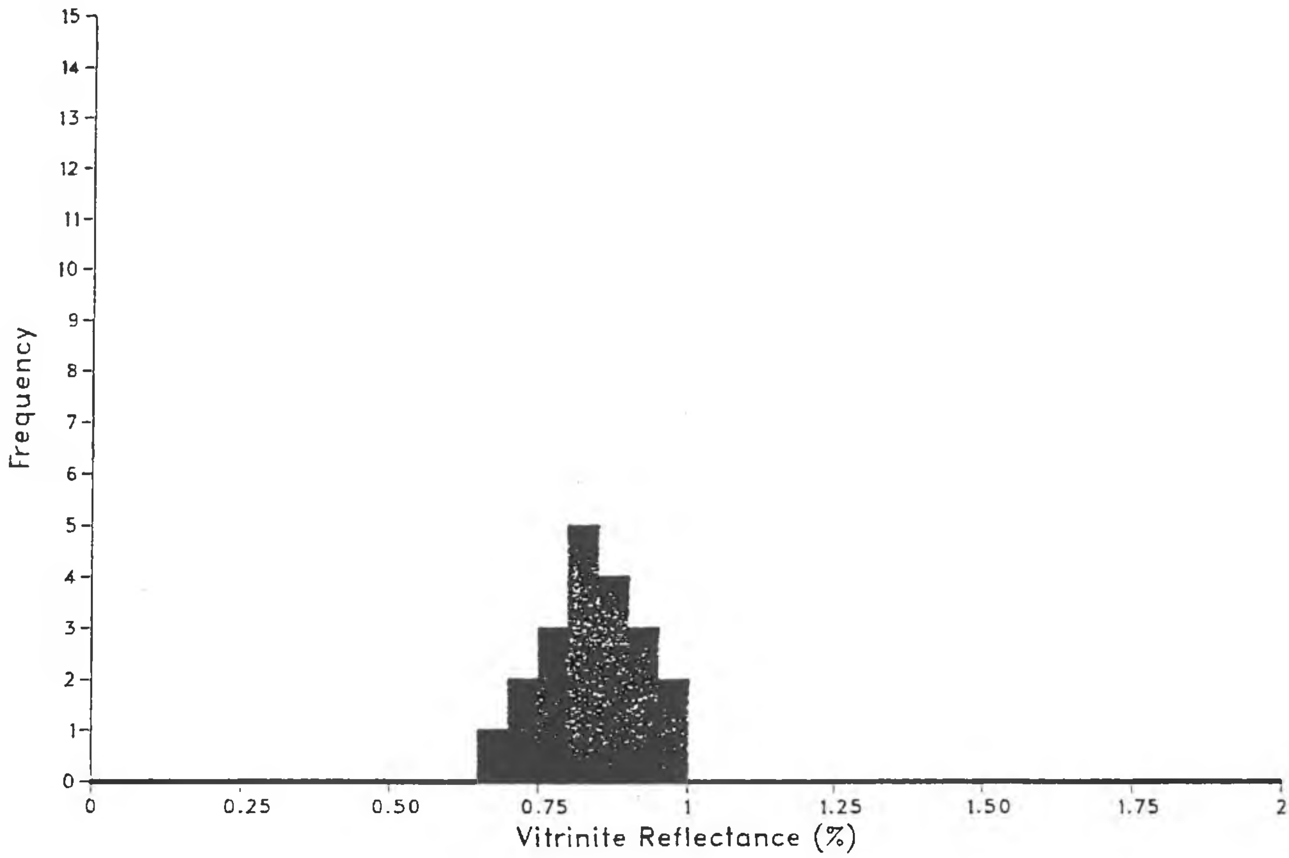
Readings:

0.360	0.600	0.620	0.630	0.680	0.710	0.730	0.740	0.770	0.780
0.800	0.801	0.820	0.840	0.870	0.880	0.900	0.910	0.940	1.020

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3487.00(m)
Sample: 73- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.670 to 0.981):	0.83	0.09	20

Readings:

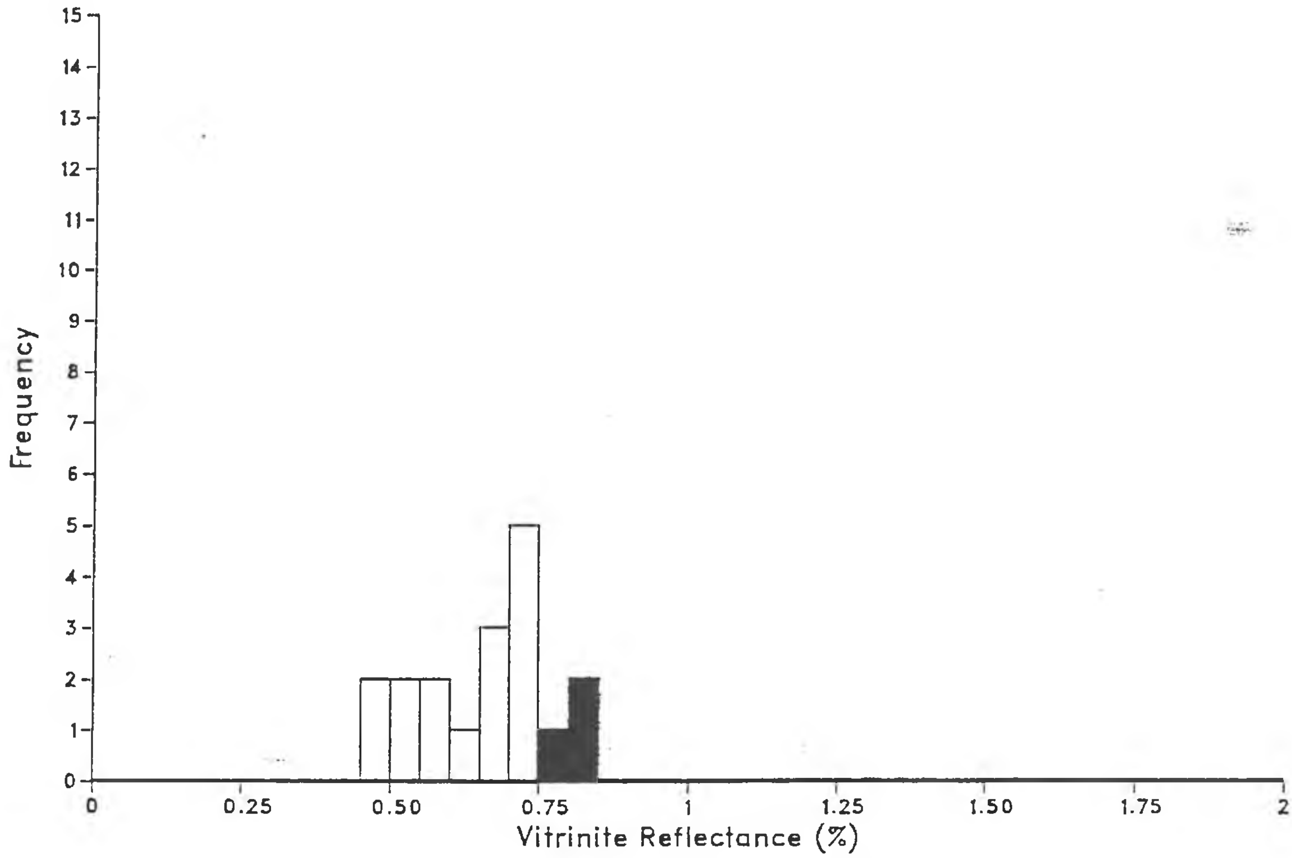
0.670	0.700	0.730	0.750	0.760	0.791	0.800	0.810	0.811	0.820
0.840	0.860	0.861	0.880	0.881	0.900	0.910	0.940	0.970	0.980

GEOLAB NOR a/s — Geochemical Laboratories of Norway

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A S

Well: NOCS 30/6-11
Depth: 3622.00(m)
Sample: 99- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.751 to 0.851):	0.80	0.04	3
Population Two (from 0.460 to 0.750):	0.63	0.10	16

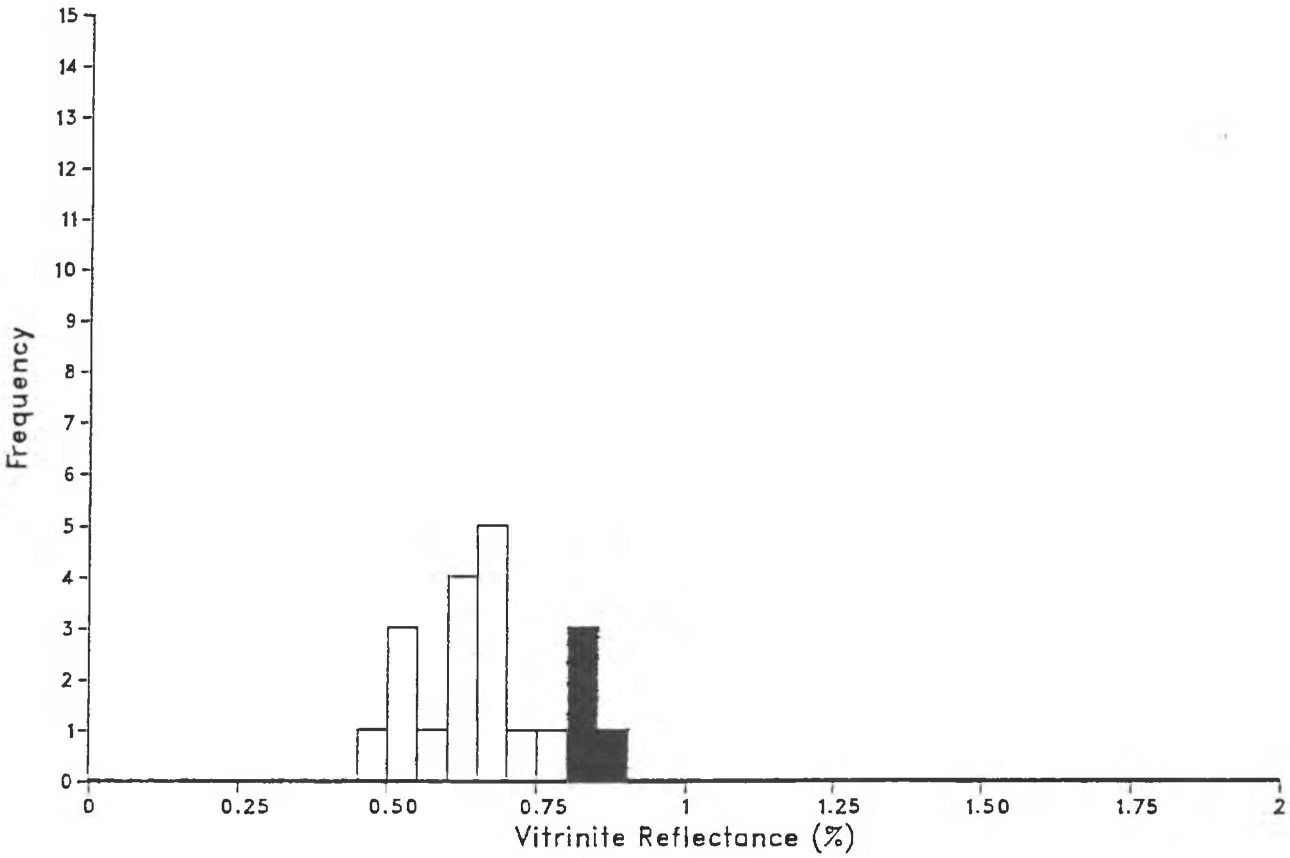
Readings:

0.460	0.480	0.530	0.540	0.550	0.570	0.630	0.670	0.680	0.690
0.700	0.701	0.720	0.730	0.731	0.750	0.760	0.810	0.840	1.150

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3687.00(m)
Sample: 112- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.799 to 0.900):	0.83	0.03	4
Population Two (from 0.470 to 0.798):	0.62	0.08	16

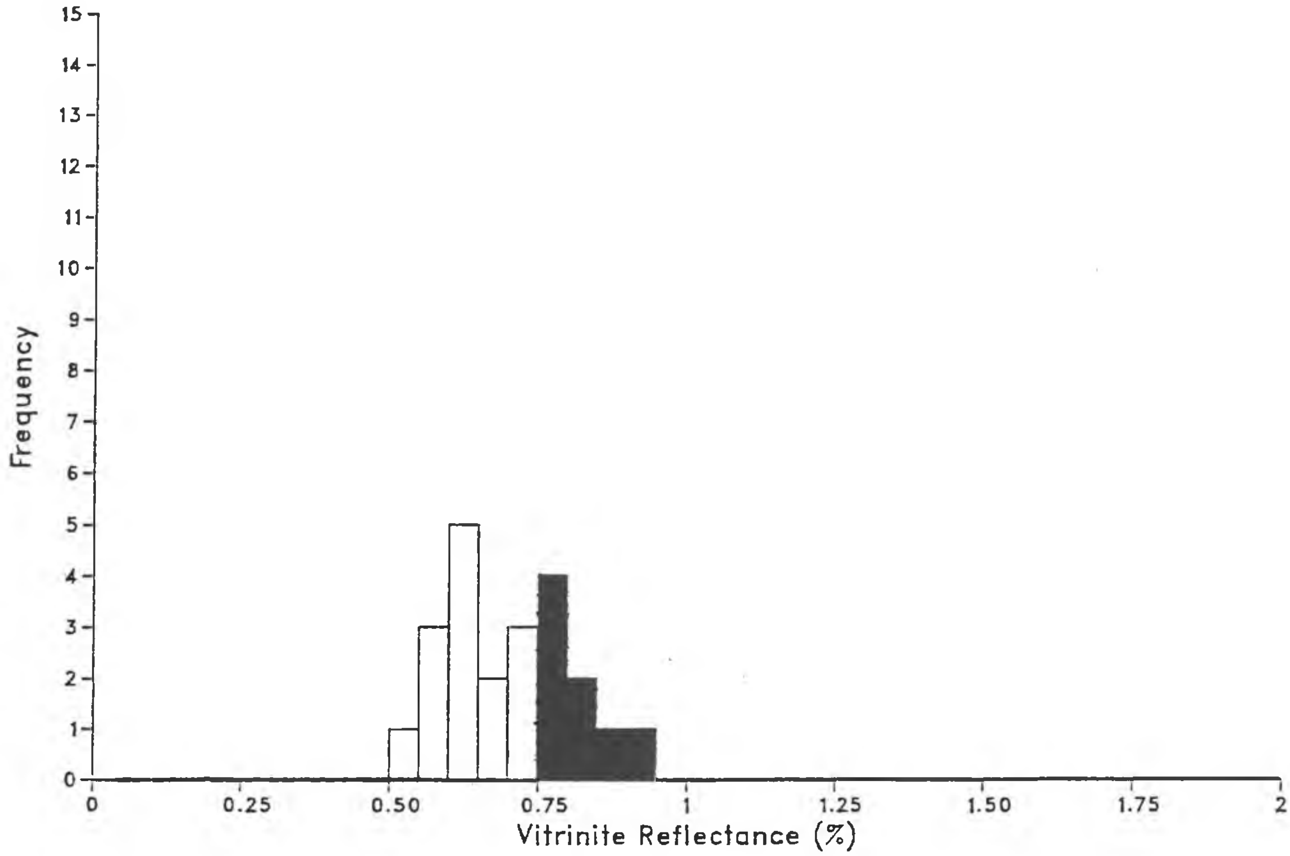
Readings:

0.470	0.530	0.531	0.540	0.550	0.600	0.640	0.641	0.650	0.660
0.661	0.670	0.680	0.690	0.710	0.760	0.800	0.801	0.830	0.870

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3768.00(m)
Sample: 166- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.749 to 0.921):	0.81	0.05	8
Population Two (from 0.530 to 0.748):	0.64	0.07	14

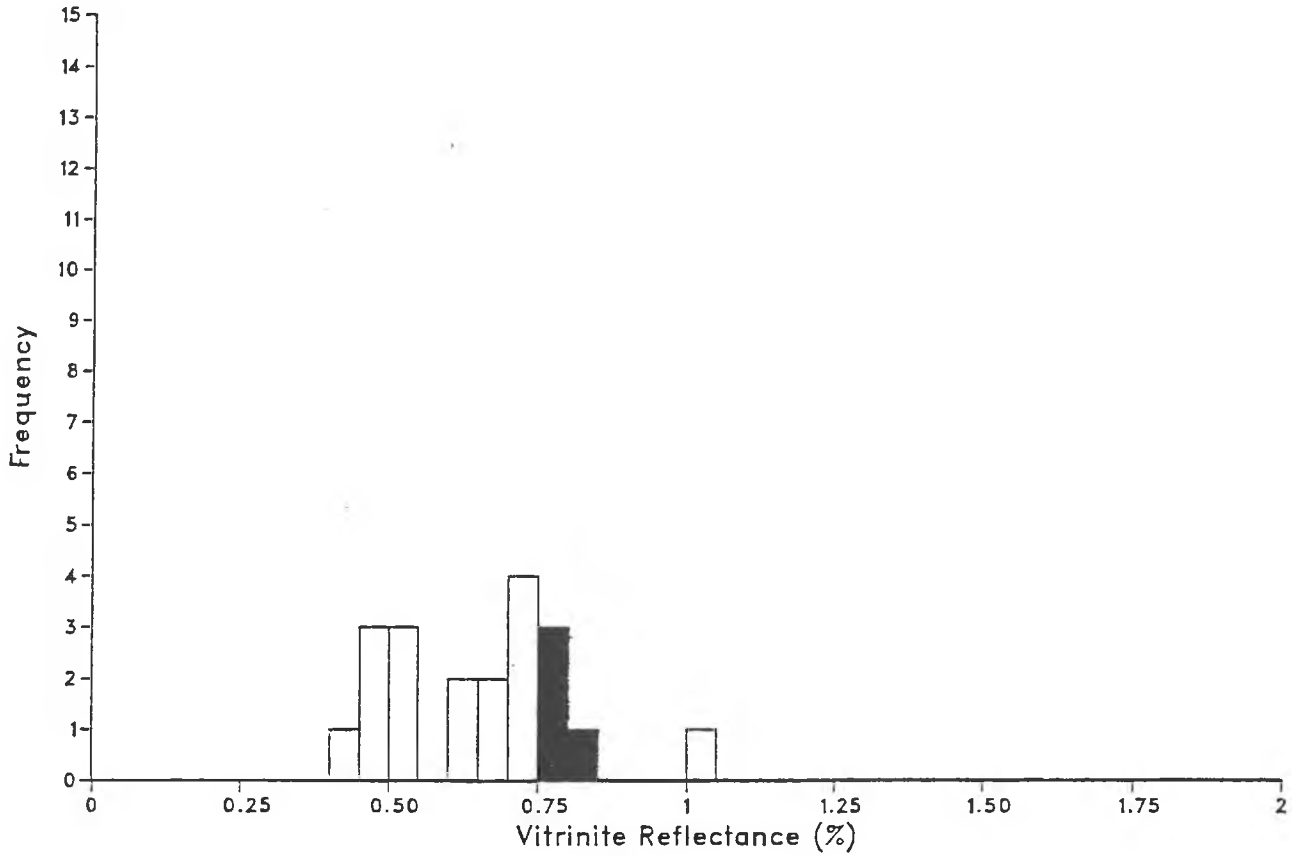
Readings:

0.530	0.560	0.561	0.562	0.620	0.621	0.630	0.631	0.650	0.660
0.680	0.720	0.730	0.740	0.750	0.780	0.781	0.790	0.810	0.820
0.850	0.920								

Vitrinite Reflectance Histogram

GEOLAB NOR
GEOCHEMICAL LABORATORIES OF NORWAY A.S

Well: NOCS 30/6-11
Depth: 3890.00(m)
Sample: 143- 0b



Statistics:	Mean	St.Dev.	n
Indigenous Population (from 0.749 to 0.851):	0.79	0.03	4
Population Two (from 0.420 to 0.550):	0.48	0.03	7
Population Three (from 0.551 to 0.748):	0.67	0.04	8
Population Four (from 1.000 to 1.021):	1.02	0.00	1

Readings:

0.420	0.460	0.470	0.490	0.500	0.510	0.520	0.610	0.611	0.660
0.670	0.700	0.710	0.711	0.720	0.750	0.780	0.790	0.820	1.020