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SUMMARY/ SAMMENDRAG

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Summary

The analysed sequence (1700-4336m) was divided into 12 zones.

Zone A,B,C,D (1700-3090m). Claystones are dominant; minor contributions of limestone and sands. Immature with poor to fair potential as source rock for gas. Possible migrated hydrocarbons in section 2410-2640m.

Zone E (3090-3300m) Moderate mature organic rich carbonaceous claystones (Kimmeridge) with rich potential as source rocks for gas and (probably) heavy, paraffinic oil.

Zone F (3300-3400m). Mainly sandstones (Heather Formation). Also claystones (Lower Heather Shale), mature/oil-window with rich potential for oil and gas.

Zone G (3400-3670m). Dark claystones increasingly silty and carbonaceous with depth. Mature with rich potential for oil and gas - the oil mainly paraffinic especially in section 3500-3550m.

Zone H,I,J (3670-4060m). Sandstone, including Brent and Dunlin. Coals in section 3700-3850m. No source rock potential. Analysis affected by mud additive (lignite).

Zone K (4060-4180m). Grey claystone + occasional coals. Oil window maturity but poor to fair potential as source rock for gas.

Zone L (4180-4336m). Sandstone (Statfjord Formation) dominant + thin coals. Oil window maturity but little potential as source rock. No indications of free hydrocarbons in sand.

EXPERIMENTAL AND DESCRIPTION OF INTERPRETATION LEVELS

Headspace Gas Analysis

Wet cuttings samples were supplied in sealed cans and one ml. of the headspace gas from each of the cans was analysed for light hydrocarbons using gas chromatography. The results are shown in Table 1a. The canned samples were washed on 4mm, 2mm, 1mm and 0.125 mm sieves using temperate water to remove drilling mud, and thereafter dried at 35°C.

Occluded gas analysis

A small amount of the 1-2 mm fraction was removed before drying and was crushed in water a gas-tight ball mill. One ml. of the headspace gas was then analysed by gas chromatography. Results are given in table 1b.

Total Organic Carbon (TOC)

Picked cuttings of the various lithologies comprising over 10% in each sample were crushed in a centrifugal mill. Aliquots of the samples were then weighed into Leco crucibles and treated with hot 2N HCl to remove carbonate, and washed twice with distilled water to remove traces of HCl. The crucibles were then placed in a vacuum oven at 50°C and evacuated to 20 mm Hg for 12 hrs. The total organic carbon (TOC) content of the dried samples was determined using a Leco EC12 carbon analyser.

Extractable Organic Matter (EOM)

Samples were selected for extraction on the basis of TOC results. Approximately 100 gm of powdered rock was extracted in a flow through system (Radke et al., 1978, Anal. Chem. 49, 663-665) for 10 min. using dichloromethane (DCM) as solvent. The DCM used was of organic geochemical grade and blank analyses showed the occurrence of negligible amounts of contaminating hydrocarbons.

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

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

Chromatographic Separation

The extractable organic matter (EOM) was separated into a saturated fraction, an aromatic fraction and a non-hydrocarbon fraction by MPLC with hexane as eluant (Radke et al., Anal. Chem., 1980). The hexane was reduced by evaporation using a Buchi Rotavapor and the sample was transferred to glassvials. Remaining hexane was removed by evaporation in a stream of nitrogen and the various fractions were weighed. Results are given in Tables III-VI.

Gas Chromatographic Analyses

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

Vitrinite Reflectance

Samples from various depths were taken for vitrinite reflectance measurements. The analysis of all samples was undertaken at IKU but some duplicate samples were sent for vitrinite reflectance measurements to Geoconsultants, Newcastle-upon-Tyne. The samples were mounted in Bakelite resin blocks; care being taken during the setting of the plastic to avoid temperatures in excess of 100°C. The samples were then ground, initially on a diamond lap followed by two grades of corundum paper. All grinding and subsequent polishing stages in the preparation were carried out using isopropyl alcohol as lubricant, since water leads to the swelling and disintegration of the clay fraction of the samples.

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

Reflectance determinations were carried out on a Leitz M.P.V. micro-photometer under oil immersion, R.I. 1.518 at a wavelength of 546 nm. The field measured was usually of the order of 2 micron diameter.

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

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

VITRINITE REFLECTANCE R.AVER. 546 NM	0.20 1516	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
% CARBON CONTENT DAF.	57	62	70	73	76	79	80.5	82.5	84	85.5
LIPTINITE FLUOR NM	725	750	790	820	840	860	890	940		
EXC. 400 nm BAR. 530 nm colour	G	G/ _γ	-Y	Y/ ₀	L.0	M.0.	D.0.	O/ _R	R	
zone	1	2	3	4	5	6	7	8	9	

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

Relationship between liptinite fluorescence colour, vitrinite reflectance and carbon content is variable with depositional

environment and catagenic history. The above is only a guide. Liptinite will often appear to process to deep orange colour and then fade rather than develop O/R red shade. Termination of fluorescence is also variable.

Processing of Samples and Evaluation of Visual Kerogen

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

T-slide represents the total acid insoluble residue.

N-slide represents a screened residue (15 mesh).

O-slide contains palynodebris remaining after flotation ($ZnBr_2$) to remove heavy minerals.

X-slides contain oxidized residues, (oxidizing may be required to remove sapropel which embeds palynomorphs, or where high coalification prevents the identification of the various groups).

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

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

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

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

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

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

Rock-Eval Pyrolysis

100 mg crushed sample was weighed into a platinum crucible the base and cover of which are made of sintered steel, and analysed on a Rock-Eval pyrolyser. Results are given in Table IX.

RESULTS AND DISCUSSION

LIGHT HYDROCARBON ANALYSIS AND LITHOLOGY

On the basis of light hydrocarbon analysis and lithology the sequence analysed (1700-4336m) was divided into twelve zones:

- A: 1700-2140m
- B: 2140-2410m
- C: 2410-2640m
- D: 2640-3090m
- E: 3090-3300m
- F: 3300-3400m
- G: 3400-3670m
- H: 3670-3840m
- I: 3840-3970m
- J: 3970-4060m
- K: 4060-4210m
- L: 4210-4336m

Zone A; 1700-2140m: The upper section of this zone (1700-1820m) consists predominately of grey, brownish grey and greenish grey silty claystones with minor contributions from tuff and sandstones. The silty claystones grade into calcareous light grey/brownish grey claystones to the base of the zone, and Limestones and Marls comprise on increasingly greater proportion of the cuttings.

Of the light hydrocarbons, only methane was detected and is probably diagenetic rather than catagenic.

Zone B; 2140-2410m: Soft grey claystones are the dominant lithology in this zone. They grade from silty to slightly silty, and from calcareous to slightly calcareous. Limestones, marls and sand comprise only a minor proportion.

Methane again is the main light hydrocarbon present, although in some samples, small amounts of higher molecular weight gases were detected. The origin is therefore mostly diagenetic with some evidence for minor catagenic origin.

Zone C; 2410-2640m: The grey silty claystones of zone B give way to more sandy, calcareous claystones in this zone. Sandstones comprise an increasingly greater proportion of the cuttings, reaching up to 40% at 2550-2580m. Siderite, sideritic silts and limestones are present in smaller quantities.

The abundance of C_1-C_4 and $C_5 +$ hydrocarbons shows a marked increase and may reflect the occurrence of migrated hydrocarbons especially associated with the sandstone.

Zone D; 2640-3090 m: Grey, silty claystones were dominant, these becoming more sandy towards 2800-2900m where sandstones comprised up to 35% of the cuttings. Below this section, the sandstones are replaced by limestones and the claystones again become more silty. At the base of the zone, sandy limestones are the predominant lithology (Turonian Marl), with silty claystones comprising only 35% of the cuttings.

The abundance of C_1-C_4 hydrocarbons ranged from poor in the upper part of the zone (silty, sandy claystones) to fair in the lower section. Gas wetness showed a gradual increase with increasing depth, the most marked increase being associated with the limestone - rich section (2980-3090m). This suggests the occurrence of migrated hydrocarbons in this section and is supported by a slight increase in $C_5 +$ hydrocarbons.

Zone E; 3090-3300m: This zone consists of dark grey, slightly carbonaceous, non-calcareous claystones (Kimmeridge Fm) with a high TOC content. The dark grey claystones tend to become more sandy, calcareous and lighter grey at the base of this zone (3270m (Heather Shale?)), where they are accompanied by an increasing amount of fine calcareous sandstone (top of the Heather Sand).

The increase in abundance of C_1-C_4 and $C_5 +$ hydrocarbons noted at the base of zone D, continues throughout this zone and may be described as rich. Gas wetness is high, while $iC_4:nC_4$ is low, indicating the hydrocarbons to be mature and produced in situ.

Zone F; 3300-3400m: A fine dark grey/light grey calcareous sandstone (the Heather Sand) is dominant in the upper section of this zone 3300-3360m, and is accompanied by sandy, silty, dark grey/brownish grey calcareous claystones. The content of dark grey carbonaceous claystone increases (the Lower Heather Shales) with increasing depth as the content of the sand decreases towards the base of the zone.

The abundance of C_1-C_4 and $C_5 +$ hydrocarbons is good and gas wetness is high, indicating the occurrence of migrated hydrocarbons within the sand and/or the occurrence of mature hydrocarbons produced in the claystone.

Zone G; 3400-3670m: Dark grey and greyish brown slightly calcareous and occasionally silty claystones dominate this zone. The claystone becomes more carbonaceous with increasing depth from ca. 3580m to the base of this zone at 3670m. Limestones and sand are present as minor contributions throughout the section. Higher TOC values appear to be associated with the dark grey claystone. Mud additives - mica and walnut shells - and cement are apparent in several samples from this zone and their occurrence may be related to the sidetracking operation.

The abundance of C_1-C_4 is variable but good throughout the zone. Gas wetness is high (approaching 100%) and shows a gradual increase with increasing depth and the iC_4/nC_4 ratio is low indicating the presence of mature hydrocarbons. The abundance of $C_5 +$ hydrocarbons is good throughout the zone and gives maximum values in the section 3430-3580m. From 3580m to the zone base at 3670m there is a marked decrease in $C_5 +$ abundance which correlates with a transition from silty claystones to carbonaceous claystones.

The results for C_1-C_4 abundance and gas wetness show a good agreement in samples obtained before and after sidetracking. The results for C_5+ abundance show a marked and consistent discrepancy.

Zone H; 3670-3840m: Sandstones of the Brent formation are dominant in this zone and grade from medium-coarse to fine. Brown staining was noted in many samples. Grey and dark grey, silty and sandy claystone comprised ca. 10% of the cuttings (?cavings). Coal was observed in many samples from this zone and comprised ca. 70% of the material sampled

from 3730-3760m. Vitrinite reflectance data indicates most of the coal to be indigenous.

The abundance of C_1-C_4 hydrocarbons is good while that of the C_5+ shows a decrease (cf. claystones in zone G) to fair. Gas wetness shows a marked decrease to ca. 30%, corresponding to the occurrence of the coal.

Zone I; 3840-3970m: The medium to fine, brown-stained sandstones found in zone H continue throughout zone I as the Dunlin formation. The content of coal is reduced to less than 10% (?caved) and that of the silty claystones remains fairly constant at ca. 10-25%.

C_1-C_4 abundance is good, but lower than that for the coal containing zone H, and $C_5 +$ abundance remains fair. $iC_4:nC_4$ ratios decrease to ca. 0.2 indicating mature hydrocarbons. Gas wetness shows an increase towards the base of the zone and correlates with a decrease in coal content.

Zone J; 3970-4060m: This zone is comprised mainly of coal (70-90%) but vitrinite reflectance data indicates this to be lignite and is not indigenous (ie., it is mud additive). The real lithology is therefore assumed to be the fine, white and brown-stained sandstone also found in zones H and I. A clay and grey shale make a minor contribution at the base of this zone.

The abundance of C_1-C_4 hydrocarbons decreases from good to fair, and gas wetness is seen to increase to a maximum of ca. 70% at 4000m, whereafter it decreases to ca. 30%.

Owing to the high content of mud additive in samples from this zone it is difficult to draw meaningful conclusions.

Zone K; 4060-4210m: A grey, silty claystone dominates this zone. The white and brown-stained fine sand found in the overlying zones, continue to appear as a minor contribution but show an increase with increasing depth. Coals comprise a minor proportion of the samples from 4120m to the zone base, some of this material probably being mud additive.

Abundance of C_1-C_4 hydrocarbons is good in this zone and correlates with a dominance of claystone; values decrease to fair where the sand

occurs. Gas wetness shows a marked decrease in relation to values found in the overlying sandstone, and $iC_4:nC_4$ ratios are below the limit of detection.

Zone L; 4210-4336m: Consists mainly of white and brown-stained fine sandstones (Statfjord Formation) with occasional coals (up to 40%; some lignite mud additive) and a minor contribution from claystones. A black shale is noted (10%) in the section 4240-4270m. The base of the zone is marked by a dominance of shale (80%).

Abundance of C_1-C_4 hydrocarbons is poor to fair throughout most of the zone but shows a marked increase corresponding with the appearance of the shale at 4330-4336m. Gas wetness increases to a maximum at 4250m and thereafter decreases. Abundance of C_5 + light hydrocarbons is poor to fair.

TOTAL ORGANIC CARBON

Zones A, B, C and D: (1700-3090m). The dominant lithology in these zones is claystone with a fair abundance of organic carbon (0.6-1%). Higher TOC values (ca.1%) were consistently associated with the silty claystone/sandstone sequences in zone C. Organic carbon values in this range are typical for Cretaceous sediments in the North Sea. The limestones in zone A (1900-2150m) and zone D (2910-3080) were analysed and found to have TOC values between 0.2 and 0.4%; they are therefore rated as having a poor potential as source rocks for hydrocarbons.

Zone E: (3090-3300m). The dark grey claystones which dominate this zone were found to have organic carbon values of 4-6% and the entire zone can be classified as having a rich potential as source rocks for hydrocarbons.

Zone F: (3300-3400m). The claystones in the upper part of this zone have organic carbon values similar to those in zone E, although they decrease slightly with increasing depth to approximately 2% at the base of the zone (3400m).

Zone G: (3400-3670m). Claystones are again dominant; the organic carbon values of the upper part of the zone are in the range 2-3%. A sharp increase to values of 4% was registered towards the base of the zone (3560-3670m) corresponding with an increase in siltiness. The marls and limestones in this zone have significantly higher values than those found in zone A and D, with TOC values of 0.6-0.8%.

Zone H,I: (3670-3970m). Mainly sandstone with some claystone. Samples of the claystone were found to have TOC values of 3-4%.

Zone J: (3970-4060m). Cuttings samples from this zone were comprised mainly of additives. Sidewall cores from this zone were found to have TOC values of 0.2-0.6%.

Zone K: (4060-4210m). Claystones dominate this zone and are found to have organic carbon values in the range 1-2% for both sidewall cores and cutting samples.

Zone L: (4210-4336m). The samples from this zone were of very poor quality. The sidewall cores, which were sandstones, have TOC values of approximately 0.3%.

ROCK-EVAL' PYROLYSIS

Zones A,B,C and D: (1700-3090m). A total of twenty-seven samples from these four zones were analysed. The samples generally have low hydrogen indices and high oxygen indices typical of a poor kerogen type III. The low T_{\max} values show the analysed zones to be immature. All the analysed samples have a poor petroleum potential. The production indices are high for most of the samples in zone A and D indicating these samples to contain free hydrocarbon (migrated or contamination). The figures for the production index may be distorted due to the relatively low S_2 peak and the very low S_1 peak.

Zone E: (3090-3300m). Seven samples from this zone were pyrolysed. The samples between 3120/3210m have high hydrogen and low oxygen indices. The hydrogen indices are somewhat low for kerogen type II at this level of maturity and it is probably a mixture of kerogen type II and III. The production index values are low and the section has a rich potential for paraffinic oil and gas. In the section from 3210m to the zone base at 3300m, the results are more variable. Hydrogen index values show a marked decrease indicative of an increased contribution of kerogen type III. Production index is still generally low and this section may be described as having a fair to good source rock potential, mainly for gas.

Zone F: (3300-3400m). Twelve samples from this zone were analysed. In the section 3300-3330m the samples contain a mixture of kerogen types II and III, and have a fair to good potential as a source rock, mainly for gas. The dark grey claystones in this section contain a greater proportion of type II material than the brown-grey claystones and have a slightly greater potential as source rock for oil. In the section 3330-3400m the hydrogen index values are generally lower, indicating mainly type III kerogen, the section having a fair potential for gas. T_{\max} values indicate immature to mature.

Zone G: (3400-3670m). In the upper section of this zone (3400-3530m) the hydrogen index values show a gradual increase, indicating an increase in type II kerogen. T_{\max} values indicate a mature source and the low production index and fair hydrocarbon potential suggest this section to have a good potential as source rock for oil and gas. The

section 3510-3520/3550m has a very high content of kerogen type II and has a good to rich potential as source rock for paraffinic oil and gas. Hydrogen index values show a gradual decrease with increasing depth, indicating a decrease in type II kerogen content, and the production index increases. The section 2530-3670m can therefore be described as having a good potential for oil and gas, but increasingly gas as the depth increases.

Zone H: (3670-3840m). Three samples from this zone were pyrolysed and all were found to contain kerogen type II + III on the basis of the hydrogen and oxygen indices. All the samples have a fair/good petroleum potential mainly for gas. The T_{\max} values indicate the zone to be mature.

Zone I: (3840-3970m). Three samples from this zone were analysed and gave results similar to those from zone H, although an increase in production index with increasing depth was noted, indicating a reduced potential as source rock.

Zone J: (3970-4060m). No samples were analysed from this zone, they were mainly mud additive material.

Zone K: Three samples from zone K were analysed and all found to have very low T_{\max} values; this may be due either to mud additives or to the occurrence in the samples of high abundances of asphaltenes, which will distort the results. The pyrolysis data indicate kerogen type III.

Zone L: Four samples were analysed and gave results similar to those found in zone K.

A number of sidewall cores, mainly from zones J-L, were analysed and clearly show the kerogen to be type III. The high production indices for some of the samples indicating the occurrence of free hydrocarbons, especially in the section 3970-4075m.

EXTRACTION AND CHROMATOGRAPHIC SEPARATION

A total of twenty-seven cuttings samples were extracted. The saturated and the aromatic hydrocarbons were analysed by capillary gas chromatography.

Zone A: (1700-2140m). One sample, 1740-1780m, from this zone was extracted and found to have a poor/fair abundance of extractable hydrocarbons. This is in good agreement with the low extractability found for the organic carbon normalized values, Table V. The ratio between saturated and aromatic hydrocarbons (Sat/Aro, Table VI) is above 1 in this sample.

The gas chromatogram (gc) of the saturated hydrocarbons shows a bimodal distribution ($C_{\max} = nC_{18}, nC_{29}$) indicating at least two possible sources. The lower molecular weight (m.wt.) distribution is smooth and the isoprenoid to n-alkane ratio is low, indicating mature hydrocarbons. This conflicts with maturity data (vitrinite reflectance, visual kerogen) and suggests contamination from migrated hydrocarbons and/or mud additives eg., diesel oil. The higher m.wt. distribution is typical of cuticular or algal material, the occurrence of which in large proportions is indicated by visual kerogen analysis.

Zones B and C: (2140-2640m). No samples were taken for extraction.

Zone D: (2640-3090m). One sample, 2910-2940m, from this zone was extracted and found to have a fair abundance of extractable hydrocarbons in good agreement with the extractability found when normalized to organic carbon. The Sat/Aro ratio is slightly higher than in the sample from zone A.

The distribution of saturated hydrocarbons is approx. unimodal ($C_{\max} = nC_{15}$) with a slight 'shoulder' at nC_{25} . The smooth lower m.wt. distribution (CPI=1.1) suggests a moderate mature source of marine origin and a probable type II kerogen. The 'shoulder' indicates a minor contribution from cuticular or type III kerogen.

Zone E: (3090-3300m). Four samples from this zone were extracted and all were found to have a rich abundance of extractable hydrocarbons.

The organic carbon normalized values show a lower extractability. The reason for this discrepancy is most probably the low maturity; A low maturity kerogen will release less hydrocarbons than one of a higher maturity resulting in a lower extractability per gram of organic carbon (kerogen). The samples show a decreasing Sat/Aro ratio with increasing depth indicating an increasing percentage of marine kerogen with increasing depth.

The n-alkane distributions are similar throughout this zone and range from unimodal ($C_{max}=nC_{15}/nC_{17}$) to bimodal, with the additional $C_{max}=nC_{25}/nC_{27}$. The higher m.wt. distribution shows a slight odd carbon number preference and is typical for moderate mature hydrocarbons from type III (?cuticular) kerogen. The lower m.wt. distribution is dominant in all samples, although the relative proportion of the two distributions varies. The total distributions are typical of moderate mature hydrocarbons from a mixed source - mainly type II+III and some type III kerogens, the relative contributions being variable. Triterpanes are noted in the samples from 3150-3240m which correlates with a large input of cuticula as determined by visual kerogen analysis.

Zone F: (3300-3400m). Three samples from this zone were extracted. The sample from 3310-3320m is found to have a fair abundance of extractable hydrocarbons while the samples from 3340-50m and 3380-90m are found to have a good abundance of extractable hydrocarbons. The extractability when normalized to organic carbon is, however, far lower. This is probably due to the low maturity as described for zone E. The ratio of Sat/Aro is very high for the sample from 3310-20m; this may be due to experimental error arising from the very low yields from this sample. The gas chromatograms of the saturated hydrocarbon fractions show distinct differences.

The n-alkane distributions in the samples from 3310-3320m and 3340-3350m are similar to each other and to the distributions described for zone E - namely a basically unimodal distribution with a 'shoulder' at nC_{27} . A mixed source of (mainly) kerogen type II and (subordinate) type III is indicated. The relative increase in amount of higher m.wt. n-alkanes (with a slight odd carbon number preference) correlates with an increase in cuticular material. The distribution of

higher m.wt. n-alkanes in the sample from 3370-3380m differs from that described above in that it shows no carbon number preference. This indicates the presence of contamination.

Zone G: (3400-3670m). A total of ten samples from this zone were extracted and all were found to have a rich abundance of extractable hydrocarbons. As in zones E and F, the organic carbon normalized values give a lower values for extractability, probably due to the low maturity.

The gc's of the saturated hydrocarbons are similar to those described for zones E and F ie., predominantly a unimodal ($C_{max} = nC_{15} - nC_{17}$) smooth distribution with a variable 'shoulder' at ca. nC_{25}/nC_{27} . The distributions are typical of mature/well mature hydrocarbons and the source material is indicated to be mainly type II+III kerogen with some contribution from type III. The contribution from the higher m.wt. distribution decreases gradually with increasing depth and there is an associated decrease in the CPI. This may be due to an increase in maturity and/or a reduction in the input of kerogen type III - sourced material.

Zone H: (3670-3840m). Two samples, 3730-3760m and 3820-3850m, from this zone were extracted. The sample from 3730-60m has a very high abundance of extractable organic matter; this is mainly non-hydrocarbons and is typical for coal. The sample from 3820-50m has a fair abundance of extractable hydrocarbons. The organic carbon normalized extraction values are far lower, possibly because the coal has not reached a sufficient maturity level for the generation of significant amounts of hydrocarbons.

The gas chromatograms of the saturated hydrocarbon fractions in these two samples are significantly different. The sample from 3730-3760m has a smooth n-alkane distribution with almost equal amounts of $nC_{14} - nC_{25}$. This could indicate that the coal is mainly sporonite. The sample from 3820-50m has a gas chromatogram similar to those found in zone G with a shoulder in the $nC_{25} - nC_{27}$ region. The Sat/Aro ratio is significantly different for the two samples indicating together with the rest of the

extraction data, significantly different kerogen generating the hydrocarbons.

Zone I: (3840-3970m). One sample, 3940-3970m, from this zone was extracted and found to have a rich abundance of extractable hydrocarbons in good agreement with the organic carbon normalized values.

The gas chromatogram of the saturated hydrocarbon fraction shows a unimodal n-alkane distribution ($C_{\max} = nC_{17}$) and a low isoprenoid to n-alkane ratio typical of well mature hydrocarbons. The occurrence of an unresolved complex mixture in the sterane/triterpane region suggests an input from terrestrial material. The low pristane/phytane ratio indicates the occurrence of well-mature (?migrated) hydrocarbons.

Zone J: One sample 3970-4000m from this zone was extracted and found to have a rich abundance of extractable hydrocarbons. The amount of organic carbon is high for this sample and the organic carbon normalized extractability value is low, probably due to immaturity.

The distribution of alkanes is bimodal; a low m.wt. smooth distribution centred around nC_{17} , and a higher m.wt. distribution ($C_{\max} = nC_{27}$) with a marked odd carbon number dominance. Two sources are indicated. The lower m.wt. distribution is typical of mature hydrocarbons. The higher m.wt. distribution is typical of immature hydrocarbons from a land-derived type III kerogen i.e., a coal. The higher m.wt. hydrocarbons are most probably derived from the lignite used as mud additive in this section.

Zone K: (4060-4210m). Samples from 4060-4090m and 4120-4150m were extracted and found to have a good and a rich abundance of extractable hydrocarbons, respectively. The organic carbon normalized extractability is slightly lower, indicating that the kerogen in the sample still has not reached its peak of hydrocarbon generation.

The saturated hydrocarbons in each sample occurred as a bimodal distribution ($C_{\max} = nC_{17}$ and nC_{27}). The lower m.wt. distribution was smooth, with a low ratio of isoprenoids: n-alkanes, typical of

well-mature hydrocarbons (kerogen type II). In the sample from 4060-4090m, the higher m.wt. alkanes showed a marked odd carbon-number preference typical of relatively immature hydrocarbons from type III kerogen. Triterpanes are also present. It is suggested that these higher m.wt. hydrocarbons are either contaminants (lignite, mud additive) present in a smaller amount than in the sample from 3970-4000m, or they may be indigerous (coal). At this maturity level, the hydrocarbons from a type III kerogen should show a smoother distribution, more resembling that found in the sample from 4120-4150m - although even in this sample the occurrence of contamination cannot be ruled out.

Zone L: (4210-4336m). Samples from 4180-4210m and 4330-4336m were extracted and found to have a rich and a good abundance of extractable hydrocarbons, respectively. The extractability is reversed when the extraction results are normalized to organic carbon. Both the samples have very high Sat/Aro ratios.

The saturated hydrocarbons from the lowermost sample show a distribution similar to that from the 3970-4000m section and suggest a dual origin - namely, well-mature hydrocarbons from a type II kerogen, and immature hydrocarbons, probably contaminant from the lignite mud additive. The gc of the saturates from 4180-4210m shows a partially resolved complex mixture (carbon number range C₁₉-C₃₃) superimposed on a lower m.wt. distribution typical of well mature hydrocarbons and described previously. The partially resolved mixture suggests contamination with pipe dope and/or the sample has been severely oxidised or weathered.

AROMATICS FRACTION

Zone A; 1740-1780m. A relatively high content of phenanthrene and methyl phenanthrenes in comparison with the alkyl naphthalenes indicates a contribution of organic material from mainly type II and III kerogen. The higher amounts of the second doublet of the methyl phenanthrene isomers and the occurrence of higher molecular weight compounds, which may be aromatised steranes/triterpanes, indicates the organic matter to be of low maturity. The series of unknown peaks at 'X' may be derived from a contaminant source.

Zone D; 2910-2940m: The alkyl naphthalenes comprise a greater proportion of the total aromatics in the one sample analysed although the contribution from phenanthrene and methyl phenanthrenes remains high indicating a mixture of type II and type II + III kerogens as source material. The methyl phenanthrenes ratio indicates a low maturity. The group of compounds ascribed to contamination (X) in zone A are still present but in a relatively lower proportion.

Zone E; 3090-3120m, 3150-3170m, 3210-3240m and 3270-3300m: The naphthalene/alkyl naphthalenes dominate the aromatics fraction throughout this zone. The relative amount of phenanthrene/methyl phenanthrene is variable but lower, indicating the organic matter to be probably derived from a mixture of type II with some type II + III. There is a general relative increase with depth of the first of the methyl phenanthrene peaks, indicating an increase in maturity in this zone. The abundance of compounds in the region (12) also decreases with increasing depth. (An interesting feature of this zone is the relative increase in abundance of compound (11) up to ca. 3240m, whereafter it shows a decline).

Zone E/F; 3310-3320m: The aromatics fraction of this sample is in marked contrast with those previously described. Phenanthrene and the methyl phenanthrenes dominate the chromatogram and would normally indicate an immature/med. mature source of kerogen type II + III or type III.

Zone F; 3340-3350m, 3370-3380m, 3400-3410m: After the unusual nature of the aromatics fraction from 3310-3320m, the distribution of aromatics

from this zone revert to being similar to those in the upper part of zone E. Relative abundances of naphthalenes and phenanthrenes indicate the source material to be a mixture of type II and type II + III, with a slightly increased contribution from type II + III in the section 3370-3380m. This correlates with an increased vitrinite content in this section, and the observation of 'pyritized wood fragments'.

Zone G; 3430-3440m, 3470-3480m, 3490, 3520m, 3640-3670m, 3510-3520m, 3550-3560m, 3550-3580m, 3620-3630m, 3640-3670m: Again, type II and type II + III kerogens are indicated on the source material throughout this zone. The variations in this mixture are minor until 3640m, where there is a marked increase in the phenanthrene components, indicative of an increased contribution from type II + III kerogens and/or mud additive. (The homology in region (12) of the aromatics chromatogram from 3430-3440m is probably due to contamination).

The sample from 3550-3580m shows an increased abundance of phenanthrene/methyl phenanthrene and an apparent decrease in maturity compared to samples from above and below this section. This is possibly due to lignite present as mud additive.

Zone H; 3730-3760m, 3820-3850m: In the sample from 3730-3760m, type II and type II + III kerogens are indicated as source material. Maturity, as manifest by the methyl phenanthrene ratios, shows a slight increase. The sample from 3820-3850m apparently contains material derived from an increased contribution of type II + III material and is of a lower maturity. This observation is probably due to the occurrence of a low rank coal or lignite mud additive. The homology in region (12) of the chromatogram is also due to contamination.

Zone I; 3940-3970m: The one sample from this zone contains aromatic hydrocarbons typical of those sourced from type II and type II + III kerogens. There is a marked increase in the contribution of type II and III material in relation to samples from zone H; this corresponds to the presence of coal, possibly mud additive. The ratio of the methyl phenanthrenes shows drastic changes, indicative of a sudden increase in maturity. This is possibly due to the presence of a migrated oil; the true maturity (on the basis of methyl phenanthrene ratio) of the oil would be 'depressed' by the negative contribution

from the lignite. The occurrence of a hump or partially resolved complex mixture in region (12) indicates the occurrence of monoaromatised compounds which again reflects the presence of coaly material.

Zone J; 3970-4000m: The phenanthrenes show an even greater dominance in this sample, reflecting the input of lignite mud additive. The methyl phenanthrenes ratio indicates a very high maturity and is probably due to a migrated oil. The occurrence of lignite (ie. immature type III kerogen) is very recognisable by the presence of monoaromatised triterpanes in region (12) of the chromatogram.

Zone K; 4060-4090m, 4120-4150m, 4180-4210m: The phenanthrenes are dominant in all samples from this zone although there is an increase in abundance of naphthalenes in the sample from 4180-4210m. Type II and II + III (mainly) are the indicated source kerogens. The methyl phenanthrenes ratio indicates the zone to be mature.

Zone L; 4330-4336m: The occurrence of coal/lignite is again suggested by the high content of phenanthrenes (4,6) and aromatised triterpanes (region 12). The aromatic hydrocarbons are mainly derived from type II + III kerogens.

EXAMINATION IN REFLECTED LIGHT

The vitrinite reflectance measurements show a relatively uniform gradient down to approximately 3400m. Samples from the section 3430-3750m have R_o values lower than those just above 3430m. This apparent decrease is probably due to the presence of bitumen which normally lowers the vitrinite reflectance value. The sample from 3730-60m is a coal and it is believed that the reflectance value of 0.65% is correct for this level. It will be noted that the R_o value for the coal from 3730-3760m is higher than that for vitrinite in the shale from the same depth.

A total of forty-five samples were analysed in white and ultraviolet reflected light. Each sample is described and information from the analysis, i.e. vitrinite reflectance values and fluorescence colours is given below.

K-9047: 1740-1780m: Shale and sandstone, $R_o=0.39(20)$

The sample has a moderate organic content. Vitrinite and bitumen dominate and there are good stringers of both. There is heavy bitumen staining in some shale lithologies. UV light shows green/yellow and yellow fluorescence from spores which occur in trace amounts.

K-9050: 1860-1900m: Shale and drilling mud, $R_o=0.34(2)$ and $0.63(1)$.

The sample has a very low organic content with a few bitumen wisps and staining. The higher result is from one rounded, isolated particle and is considered reworked. UV light shows a low content of spores fluorescing green/yellow.

K-9054: 2020-2060m: Shale and drilling mud, $R_o=0.50(5)$.

The sample has a low to moderate organic content but this is dominated by highly reflecting reworked material and inertinite. All of the material could be reworked. UV light shows only one low orange spore.

K-9058: 2160-2190m: Shale and silt. No Determination Possible.

The sample has a low organic content, mainly vitrinite. However, this is all thought to be reworked material ($R_o=0.70$) as no true stringers were located and all organic material was particulate. There is no fluorescing material.

K-9063: 2310-2340m: Shale and silt. No Determination Possible.

The sample has a moderate organic content but this is all thought to be reworked material ($R_o=0.70$) as it is all particulate. There is no fluorescence under UV irradiation.

K-9067: 2430-2460m: Shale, $R_o=0.46(9)$

There is a low to moderate organic content dominated by inertinite and particles of reworked material. There are relic stringers but these are degraded and unmeasurable. One mid orange spore was recorded under UV irradiation.

M-267: 2550-2580m: Shale, $R_o=0.63(4)$

The sample has a moderate organic content dominated by inertinite and reworked material. There are no true stringers and the results obtained are from the lowest reflecting particles but are still probably reworked. There is no fluorescence.

M-271: 2670-2700m: Shale and carbonate. No Determination Possible.

The sample has a low to moderate content of reworked organic material.

M-275: 2790-2820m: Shale and carbonate. $R_o=0.53(8)$

There is a moderate content of gnarled organic material (almost all inertinite and reworked particulate vitrinite). The result is probably too high. There is no fluorescence.

M-279: 2910-2940m: Shale, $R_o=0.51(1)$, $0.86(11)$ and $1.14(4)$

This is a very bad sample. There is a moderate organic content although most of it is degraded inertinite and reworked material. Distinction between primary and reworked material is very difficult. There is probably only one good vitrinite particle (lowest result). UV irradiation showed no fluorescence.

M-385: 3060-3090m: Mixed muds and shale, $R_o=0.48(3)$

There is a moderate content of reworked material in the mud/clay lithologies and a low content in the shale. Measurements are taken from the shale. There is a trace of low orange fluorescing spores.

M-388: 3150-3170m: Shale, $R_o=0.56(22)$

This sample is rich in organic material with vitrinite and bituminite dominant and only a few inertinite fragments. There is heavy bitumen staining in places. UV light shows yellow/orange and low orange fluorescence from a moderate spore content.

M-493: 3210-3240m: Shale, $R_o=0.50(21)$

The sample has a high organic content which is mainly vitrinite but there is also a high bituminite content and heavy bitumen staining. Most of the material is particulate and gnarled. There is a high content of mid orange spores.

M-495: 3270-3300m: Shale (calcareous), $R_o=0.54(20)$

The sample is rich in organic material which is mainly particulate. There is a high concentration of interstitial bitumen in calcareous areas and some bitumen staining. There is a high content of low orange spores and a few mid orange.

M-497: 3310-3320m: Carbonate and shale, $R_o=0.52(21)$

The sample has a rich organic content. There are some very thick vitrinite stringers. Bitumen and bitumen staining is concentrated around interstitial carbonate in the more calcareous shales. The bitumen has a reflectance of 0.35-0.4%. There is a moderate to high content of mid orange spores with some low orange ones in the silty patches.

M-499: 3330-3340m: Limestone and shale, $R_o=0.50(20)$

Organic material is very abundant and is mainly vitrinite and bituminite. There is heavy bitumen staining especially around interstitial bitumen in carbonate areas. There is a trace of possible low orange spores.

M-503: 3380-3390m: Limestone and shale, $R_o=0.62(20)$

The sample has a high organic content with some bitumen staining. The shale sections contain some good stringers which give the lowest values (0.5%) and are probably a better indication of the maturity. There is a trace of mid orange spores.

M-507: 3420-3430m: Limestone and shale, $R_o=0.56(7)$

There is a moderate organic content but this is mainly bitumen. Most of the organics are degraded to leave black outlines. The shale sec-

tions have less organic material than shales above. There are moderately abundant low orange spores.

M-586: 3450-3460m: Shale and carbonate, $R_o=0.46(20)$

There is a moderate organic content that is bitumen stained. The bitumen staining is locally heavy and the bitumen itself has a reflectance of 0.3%. There is a low content of low orange spore fragments.

M-589: 3480-3490m: Shale and mud, $R_o=0.47(8)$

There is a low organic content consisting mainly of bitumen and vitrinite. There is some associated bitumen staining. There is a low content of low orange spores.

M-1722: 3490-3520m: Shale (some carbonate), $R_o=0.48(14)$

There is a low to moderate organic content dominated by inertinite. Some good vitrinite stringers are located. There is some bitumen and associated staining. UV light shows a trace of low orange spores.

M-591: 3500-3510m: Shale, $R_o=0.46(12)$

The sample has a low organic content which is mainly particulate with only a few good stringers. There is little inertinite. Bitumen staining is present but is thinner than in previous samples. UV light shows yellow and yellow/orange spores in abundance.

M-593: 3520-3530m: Shale and carbonate, $R_o=0.50(9)$

The sample has a low organic content, mainly reworked material especially in the clay sections. Most material is particulate and gnarled. There is moderate local bitumen staining. There are abundant yellow/orange spores.

M-596: 3550-3570m: Shale and clay, $R_o=0.53(9)$

This is a bad sample (high proportion of contaminants). It has a low to moderate organic content consisting mainly of inertinite and reworked material. Measurements are from small gnarled particles as no stringers were located. There is moderate bitumen staining. UV light shows a trace of yellow/orange spores.

M-1724: 3550-3580m: Shale and carbonate, $R_o=0.49(18)$

The sample has a moderate organic content of inertinite, vitrinite and bituminite. Bitumen staining is heavy in places. There are some good vitrinite wisps (Ro 0.45%). UV light shows a trace of low orange spores.

M-599: 3580-3590m: Shale, Ro=0.50(5)

There is a low organic content chiefly consisting of inertinite and reworked material. It is almost all particulate with few measurable stringers. The sample is heavily contaminated with paint and rust. UV light shows fluorescence from spores (low orange) and bitumen.

M-602: 3610-3620m: Shale, Ro=0.56(21)

There is a moderate organic content, mainly gnarled inertinites. There is a moderate bitumen staining in places. UV light shows yellow/orange fluorescence from spores and low orange from bitumen.

M-1726: 3610-3640m: Shale and carbonate, Ro=0.53(20)

There is a moderate to high organic content, mainly inertinite. It is very pyritic and there is iron staining along with bitumen staining. There are a few good stringers. Lignite additive is noted. UV light shows possible mid orange spores.

M-605: 3640-3650m: Shale, Ro=0.55(20)

The sample is rich in organic material but this is mainly particulate reworked vitrinite or inertinite. There are a few good stringers and localised moderate to heavy bitumen staining. There is one dubious mid orange spore.

M-1727: 3640-3670m: Shale, Ro=0.49(16)

Organic material is moderately abundant but this is mainly in the form of inertinite and reworked material. Rust and iron oxides are ubiquitous. UV light shows possible mid orange spore traces.

M-607: 3660-3670m: Mixed shales, Ro=0.55(10)

The sample is rich in organic material but this is heavily dominated by inertinite and reworked material. There is a very high inertinite content and a low content of clean true vitrinite. Some bitumen staining is noted. There is a trace of low orange spores.

M-3080: 3730-3760m: Sandstone, shale, carbargillite and coal!,
Ro=0.60(20)

Organic material is very abundant. It is dominated by inertinite and semi-fusinite. Reflectance varies considerably with lithology (shales are lower than the coal). A trace of deep orange spores are seen under UV irradiation.

M-3081: 3760-3820m: Shale, sandstone, limestone, silt, Ro=0.60(18)

The sample has a moderate to high organic content that is lithologically dependent. There are some good stringers and some bitumen staining. There is some coal of high reflectance that is reworked or additive. There is a trace of low orange and mid orange spores and some carbonate fluorescence.

M-3083: 3820-3850m: Shale and carbonate, Ro=0.55(20)

The sample is rich in organic material. There are some good stringers in the shale and a high bitumen content in the carbonate but inertinite dominates overall. There is a mid orange indistinct fluorescence.

M-3085: 3880-3910m: Shale, Ro=0.59(12)

There is a moderate to high organic content but this is dominantly inertinite and hence there is a low content of measurable material. Only one mid orange fluorescing particle was located.

M-3087: 3940-3970m: Shale and carbonate, Ro=0.62(18)

The organic content is moderate, mainly inertinite and vitrinite. There are some good vitrinite and bituminite wisps and some bitumen staining. UV light shows a trace of mid orange spores.

M-3088c: 3970-4000m: Lignite, Ro=0.41(20)

This is additive or caved material and at this depth is useless as a maturity indicator. Green, green/yellow and yellow fluorescence agrees with a low rank additive origin.

M-3091: 4060-4090m: Silt. No Determination Possible.

There is only a trace of inertinite present. No fluorescence.

M-3092: 4090-4120m: Silt and carbonate. No Determination Possible.

There is only a trace of inertinite. There is no organic fluorescence.

M-3093: 4120-4150m: Silt. No Determination Possible.

There is no organic material. Fluorescence is dull green from minerals.

M-3094: 4150-4180m: Silt, carbonate, rust, additives. No Determination Possible.

M-3095: 4180-4210m: Silt, carbonate, shale, rust, additives, $R_o=0.64(5)$

There is a low organic content in the carbonate and shale only. This could be unrepresentative as these lithologies occur in least quantities. Some bitumen staining is seen. One bright orange hydrocarbon speck is seen under UV irradiation.

M-3097: 4240-4270m: Silt, carbonate, shale, additives, $R_o=0.65(4)$

Only the shale contains organic material and as this is scarce it could be unrepresentative. There is carbonate fluorescence but no exinite.

M-3100: 4330-4336m: Silt, sandstone, lignite, shale, $R_o=0.78(2)$

Only one shale fragment contains organic material. The low content makes the value questionable. There is no fluorescence.

Sample M-3080 (3730-3760m) was picked and reanalysed as it has a high coal content:-

M-3080: Picked carbargillite and coal, $R_o=0.65(20)$

There is a very high content of inertinite and semi fusinite which may mean that the result is too high. Fluorescence is seen from mid orange spores, orange algae and green residue.

INVESTIGATION IN TRANSMITTED LIGHT

The interval from 1740/80m to 4336m of well 35/8-2 has been evaluated on the basis of 40 samples, picked lithologies considered as representative for the actual depths.

Deposits above 3340m are considered to be immature.

The well has been subdivided into the following intervals:

1740/80-2020/60m:	immature marine rapid sedimentation
2160/90-3060/90m:	immature marine rapid sedimentation
3120/50-3270/300m:	immature marine close to vegetation
3310/20-	?immature shallow
3330/40-3660/70m:	immature/mature close to vegetation some marine influence
3670-4336m:	near shore, ?marine at intervals, coal formation in the area or reworking of coaly layers.

A main division seems possible between an uppermost marine interval of poor lithologies, a richer interval between 3120m and 3760m and a poor interval from 3670/3760m to 4336m. The interval from 3330m to 3670m seems the more interesting due to the coappearance of richer deposits and maturities on the boundary of the oil window.

1740/80m: The pyritic residue is dominated by cuticular matter and Tertiary pollen together with small vitrinite fragments. Fungi (represented by spores and hyphae) evidently were active during the decay. True amorphous material (sapropel) seems subordinate. The palynomorphs are well preserved.

Colour index: 1/1+

Environment of deposition: Stagnant bottom condition in a low energy marine area close to vegetation.

1860/900 and 2020/60m: The residues are small, but otherwise resemble the richer one described above. Amorphous material, evaluated as true sapropel, seems dominant and the dinoflagellate cysts are well preserved.

Colour index: 1/1+, 2, 2/2+ (some oxidation)

Environment: Marine ?fairly high sedimentation rate and low organic content.

2160/90, 2310/40, 2430/60, 2550/80m: The residues are small with variable pyrite content. They consist of true amorphous material as dominant, or equally important compared with woody material. The cuticles seem poorly preserved, very thin and have an etched appearance. Fungi (represented by hyphae and spores) seem to have been active during the decay process. Loose aggregates and etched vitrinite fragments are common. The palynomorphs observed are fairly well preserved, mostly of Early Tertiary affinity. The rare Cretaceous cysts observed, probably represent reworked lithologies in these samples or, if indigenous, the Tertiary material has been caved into this interval.

Colour index: 1+/2-, 2-

Environment: Marine area with some carbonate sedimentation.

2670/700, 2790/820, 2910/40, 3060/90m: Woody material is dominant in these small pyritic residues and comprises mainly vitrinite. The amount of inertinite shows a slight increase compared with the above interval. The palynomorphs are fairly well preserved. As above, we cannot exclude the possibility that the individual residues have been derived from more than one lithology.

Colour index: 1+/2-, 2-

Environment: Marine, restricted/anoxic bottom conditions.

3120/50, 3150/70, 3210/40, 3270/300m: The pyritic residues are rich in sapropelised cuticles recorded together with vitrinite particles and subordinate sapropel as aggregates. The aggregates are fairly dense and also embed Mesozoic pollen and tasmanitids.

Colour index: 1/1+, 1+/2-, 2-/2

Environment: Close to vegetation, a marine or restricted marine environment with stagnant bottom conditions.

3310/20, 3380/40m: The residues are distinguished from the interval described above by an increased component of vitrinite,

semifusinite/fusinite, and inertinite. Some acid resistant minerals are present. Palynomorphs are fairly well preserved. Loose aggregates.

Colour index: 2-/2

Environment: Marine, a fairly high energy area.

3340, 3380/90, 3420/30, 3450/60, 3480/90, 3500/10, 3520/30, 3520, 3550/60, 3550(x2), 3580/90, 3580, 3610, 3610/20, 3640, 3640/50, 3660/70m: Pyritic aggregates of sapropelised cuticles, degraded woody material (mainly vitrinite) and subordinate true sapropel. The aggregates vary from fairly loose and fluffy to dense with flaky texture. The cuticles are fragmented and poorly preserved. The palynomorphs are mostly poorly preserved but the exines (wall material) are of variable thickness and colours are probably influenced by the lithology.

Colour index: -2/2, 2, 2+

Environment: Low energy area with stagnant bottom conditions and close to vegetation. Some marine influx at periods.

3670, 3760, 3970, 4180, 4210, 4336m: Small residues mainly of land-derived plant material. Woody material dominates, together with cuticles at 3970m and above, alone in the very small residues below 3970m.

Colour index: 2/2+ (for material from an oxidative environment).

Environment: A fairly high energy area with some reworking/oxidation, close to vegetation. Local coal formation or reworking of coaly layers. Some fresh water influx (Botryococcus colonies at 4210m).

CONCLUSIONS

The maturity of the analysed sequence (1700-4336m) from the well 35/8-2 is based mainly on vitrinite reflectance, spore colouration and T_{\max} values from Rock-Eval pyrolysis. The richness of the sample is based on TOC and Rock-Eval pyrolysis with additional evidence from the abundance of light hydrocarbons and C_{15}^+ extractable hydrocarbons. Source rock quality is based mainly on pyrolysis and visual kerogen examination with support from the gas chromatographic results.

Zones A,B,C and D; (1700-3090m): Claystones are dominant throughout this sequence, becoming increasingly silty with increasing depth. Minor contributions of limestones are present in zones A and D, while sandstones are found in zone C. TOC values for the claystones range from ca. 0.6% to 1%, the higher values being associated with the grey silty/sandy claystones common in zone C. The limestones in zone A and zone D (the Turonian Marl) have low TOC values.

The organic matter is mainly amorphous, with variable contributions of herbaceous material, inertinite and cuticles (the latter especially in the top of zone A (1750m)), deposited in an oxidising environment. A mixture of poor type III kerogen (dominant) and type II + III is indicated by Rock-Eval data. The high content of cuticles at 1750m is not reflected in the Rock-Eval data; this is common in North Sea Cretaceous sediments and is due to extensive sapropelisation of terrestrial material, giving a potential only for gas. T_{\max} values indicate all zones to be immature; vitrinite reflectance measurements indicate immature in zone A grading to moderate mature in zone D.

A high production index in some samples suggests the presence of introduced hydrocarbons i.e., migrated or mud additive. The occurrence of migrated hydrocarbons is suggested by the light hydrocarbon analyses, especially in samples from zone C (2410-2640m).

The entire sequence can be described as having a poor to fair potential as a source rock for gas.

Zone E; (3090-3300m). Dark grey, organic rich (TOC=4-6%) carbonaceous claystones (of the Kimmeridge Formation) dominate this zone. The claystone becomes siltier and more sandy with increasing depth (the Heather Shale), giving a corresponding decrease in TOC values. Sandstones of the Heather Formation occur towards the base of the zone. The organic matter is comprised mainly of cuticles (especially in the upper claystones) with some amorphous and herbaceous material. The presence of cuticles is also indicated by the gc's of the saturated and aromatic hydrocarbons. Rock-Eval data indicates a mixture of type II and III kerogen, but hydrogen index values are high, especially in the upper section. The potential as source rock oil and gas is rich, the high cuticle content probably giving a heavy, paraffinic oil. Maturity based on T_{max} values is moderate.

Zone F; (3300-3400m). This zone consists mainly of sandstones (the Heather Sand) and dark grey and brown-grey claystones. The claystones (Lower Heather Shale) have high TOC values similar to those in zone E, decreasing slightly with increasing depth. Visual kerogen indicates a high content of herbaceous material with some amorphous and cuticle content.

Rock-Eval data indicates mainly type II kerogen for the dark grey claystones and type II + III kerogen for the brown-grey claystones. The zone is considered to be moderate mature, bordering oil window maturity, and the claystones can be described as having a rich potential for gas (brown-grey claystones) or oil + gas (dark grey claystones in the upper section).

Zone G; (3400-3670m). Dark grey and grey-brown claystones dominate this zone. The claystones become increasingly silty with increasing depth and are carbonaceous towards the base of the zone. Both claystones have similar TOC content (ca. 2-3%), and the limestones and marls appearing as a minor contribution throughout the section have a lower value (ca.1%).

The organic matter is mainly mixed cuticular and herbaceous material; the Rock-Eval data indicate type II and III kerogens, with an increased proportion of type II in the claystones of the upper section (to 3560m). T_{max} values indicate a mature zone, although vitrinite

reflectance measurements suggest a lower maturity - probably due to the influence of bitumen staining.

Source rock potential is rich for oil and gas, the oil being mainly paraffinic, especially in the 3500-3550m section.

Zone H, I; (3670-3970m). These zones are comprised mainly of sandstones from the Brent and Dunlin Formation, with coals appearing mainly between 3700m and 3850m. Silty claystones with TOC values of 3-4% make a minor contribution throughout the section.

The zone is mature and the coal has a rich potential as a source rock for gas. Rock-Eval data suggests the occurrence of free hydrocarbons in the upper part of the sandstone. The sandstone has no potential as a source rock for hydrocarbons.

Zone J; (3970-4060m). Mud additives (lignite) were predominant in samples from the zone. The real lithology is probably a continuation of the sandstone found in zones H and I.

Zone K; (4060-4180m). A grey claystone with a TOC value in the range 1.-1.6% is dominant in this zone. Coals are occasionally present. Kerogen type as indicated by Rock-Eval pyrolysis is type III; visual kerogen analysis indicates herbaceous material to be dominant. The zone has an oil window maturity and can be considered as having a poor to fair potential as a source rock for gas.

Zone L; (4180-4336m). A white sandstone, occasionally brown-stained, comprises the dominant lithology (the Statfjord Formation). The thin coals found in zone K, continue into this zone which is terminated in a shale. TOC values are low, except for the anomalous occurrence of a black shale between 4240m and 4270m having a TOC value of 3%. At least some of the coal is probably mud additive. The zone is probably of oil-window maturity but the sandstone has little or no potential as a hydrocarbon source rock. There are no indications of free hydrocarbons in the sandstone.

TABULATED DATA
AND
ANALYTICAL RESULTS

TABLE I a.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 --- nC4	I
K9046	1740	281						282				I
K9047	1780	1089						1091				I
K9048	1820	1383						1384				I
K9049	1860	887						888				I
K9050	1900	580						580				I
K9051	1940	1973						1973				I
K9052	1980	771						772				I
K9053	2020	783						783				I
K9054	2060	1644						1646				I
K9055	2100	2877						2879				I
K9056	2140	423	44					468	45	9.53		I
K9057	2156	748						749				I
K9058	2190	227	74	19	14	13		346	119	34.43	1.10	I
K9059	2220	153						154				I
K9060	2250	148						148				I
K9061	2280	178		20				198	20	10.26		I
K9062	2310	346	55	30	18			449	103	22.96		I
K9063	2340	357						358				I
K9064	2370	237		23	17		70	277	40	14.38		I
K9065	2400	244						245				I
K9066	2430	624		84	65			774	149	19.32		I
K9067	2460	826	118	131	35	45	113	1156	329	28.51	.78	I
K9068	2490	635	73	85	81		43	873	238	27.31		I
K9069	2520	963	175	119	171	118	95	1547	584	37.73	1.45	I
M266	2550	1243	187	131	61	126	62	1748	504	28.85	.48	I

TABLE I a.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M496	3310	9708	14592	24054	3160	8076	5593	59590	49882	83.71	.39
M497	3320	8585	3682	2514	234	547	491	15562	6977	44.83	.43
M498	3330	3777	1350	1373	191	526	794	7217	3440	47.67	.36
M499	3340	15209	4995	2975	365	715	1070	24259	9050	37.31	.51
M500	3350	8414	4627	3475	319	1059	395	17894	9480	52.98	.30
M501	3370	13130	8199	67916	540	1774	1081	91559	78429	85.66	.30
M502	3380	14258	7092	4948	363	922	374	27583	13325	48.31	.39
K503	3390	12803	7820	6594	480	1312	543	29010	16207	55.87	.37
K504	3400	3320	2879	3797	305	965	551	11266	7946	70.53	.32
M505	3410	5661	5149	9711	923	3640	2214	25084	19423	77.43	.25
M506	3420	11324	12041	22099	1908	7196	3565	54567	43244	79.25	.27
M507	3430	10144	11994	24469	2136	9723	7111	58466	48322	82.65	.22
M584	3440	96	164	482	86	374	1122	1200	1105	92.02	.23
M585	3450	7937	8717	18672	2050	8658	7167	46033	38096	82.76	.24
M586	3460	6386	4802	9402	936	3921	3038	25447	19061	74.91	.24
M587	3470	4077	3415	8788	1153	5405	6845	22837	18761	82.15	.21
M588	3480	4736	3834	9138	960	4273	3228	22941	18206	79.36	.22
M589	3490	3777	2836	6958	801	3858	3659	18231	14453	79.28	.21
M590	3500	3718	2512	6124	684	3105	2548	16144	12426	76.97	.22
M591	3510	3918	5280	12334	1139	5146	3751	27816	23898	85.92	.22
M592	3520	8983	6589	10140	844	3784	3084	30339	21357	70.39	.22
M593	3530	652	1322	4611	543	2620	2340	9749	9097	93.31	.21
M594	3540	738	840	3978	597	2946	3274	9099	8361	91.89	.20
M595	3550	1527	1337	2707	285	1279	1141	7136	5609	78.60	.22
M596	3560	2443	2403	6326	792	3621	3568	15585	13142	84.33	.22

TABLE I a.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M597	3570	7560	4483	9124	1015	4048	2907	26229	18670	71.18	.25
M598	3580	3042	2212	4792	498	2061	1660	12605	9563	75.87	.24
M599	3590	676	492	982	108	391	333	2648	1972	74.48	.28
M600	3600	1367	1230	1867	171	541	359	5175	3808	73.58	.32
M601	3610	4202	3751	4376	344	1143	777	13816	9614	69.58	.30
M602	3620	6618	4090	3655	272	759	369	15393	8775	57.01	.36
M603	3630	6993	4399	3368	237	627	299	15624	8631	55.24	.38
M604	3640	3589	2159	1494	110	257	184	7609	4020	52.84	.43
M605	3650	3785	2951	2269	170	449	401	9624	5839	60.67	.38
M606	3660	6899	3292	1611	106	244	124	12152	5252	43.22	.43
M607	3670	4259	3346	1738	122	264	143	9729	5470	56.22	.46

TABLE I a.

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

Samples taken after sidetracking

WEL- No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM		WET- NESS (%)	iC4 ---	nC4
								C1-C4	C2-C4			
13097	4270	512	200	76		27	369	815	303	37.18	.00	
13098	4300	806	271	61		10	93	1148	342	29.79	.00	
13099	4330	3253	650	108		12	56	4023	770	19.14	.00	
13100	4336	9299	3255	812	37	118	458	13521	4222	31.23	.31	

TABLE I b.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 --- nC4	I
M267	2580	85		62	54	55	272	257	172	66.99	.98	I
M268	2610	76		42	33	33	43	184	108	58.70	1.00	I
M269	2640	82						83				I
M270	2670											I
M271	2700	48						48				I
M272	2730											I
M273	2760	57						57				I
M274	2790	76		69	26	24		196	119	61.00	1.07	I
M275	2820	69		78	33	30	32	210	141	67.07	1.12	I
M276	2850	58		103	43	36		239	182	75.93	1.22	I
M277	2880											I
M278	2910	58		110	41	35		244	187	76.42	1.17	I
M279	2940	266		118	62	41	98	488	222	45.55	1.50	I
M280	2970			52			32	53	53	99.12		I
M281	3000			51	22	20	27	93	93	99.70	1.06	I
M383	3030											I
M384	3060	106	47	282	59	169	161	663	557	84.07	.35	I
M385	3090	95	166	1364	273	1480	1802	3379	3284	97.19	.18	I
M386	3120	695	3753	24763	4973	29523	37385	63707	63012	98.91	.17	I
M387	3150	3552	12369	56214	7867	45078	42456	125081	121529	97.16	.17	I
M388	3170	97700	11779	50474	6446	35402	28320	201800	104101	51.59	.18	I
M389	3210	3519	13470	61692	9598	43605	35669	131883	128364	97.33	.22	I
M493	3240	2439	9997	40653	6656	23062	19046	82807	80368	97.06	.29	I
M494	3270	521	1814	246	796	1104		4481	3960	88.37	.72	I
M495	3300		161	100				262	262	99.88		I

TABLE I b.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M496	3310	932	1692	6016	4734	9066	5863	22439	21507	95.85	.52
M497	3320	1951	3474	5317	548	2852	3492	14142	12191	86.20	.19
M498	3330	841	762	1956	317	1641	4676	5516	4675	84.75	.19
M499	3340	1692	3096	3909	430	1816	4005	10943	9251	84.54	.24
M500	3350	642	779	1673	189	1017	1545	4300	3658	85.07	.19
M501	3370	3009	4477	8608	856	3816	2831	20766	17757	85.51	.22
M502	3380	528	922	1972	188	964	2805	4574	4046	88.45	.20
M503	3390	2066	2185	4345	466	2251	2271	11313	9247	81.74	.21
M504	3400	1018	751	2494	323	1774	3112	6360	5342	83.99	.18
M505	3410	1053	967	3540	650	3760	8477	9969	8916	89.44	.17
M506	3420	1605	846	4599	874	5032	11358	12955	11350	87.61	.17
M507	3430	1310	946	6273	1199	7022	14981	16749	15439	92.18	.17
M584	3440	293	652	6882	1652	9744	39712	19223	18930	98.47	.17
M585	3450	404	947	8075	1633	9792	55072	20851	20447	98.06	.17
M586	3460	331	753	7684	1442	8864	43661	19073	18742	98.27	.16
M587	3470	213	523	3170	685	4713	38703	9304	9091	97.71	.15
M588	3480	218	20095	2151	4918	3165	31369	30548	30330	99.29	1.55
M589	3490	458	781	5586	1241	8095	61364	16159	15702	97.17	.15
M590	3500	18	400	69	307	1080	1603	1873	1855	99.05	.28
M591	3510	455	2350	14705	2813	15911	1100634	36234	35779	98.74	.18
M592	3520	565	3034	15263	2676	14950	92189	36488	35923	98.45	.18
M593	3530	564	1158	8163	1980	11887	81467	23753	23188	97.62	.17
M594	3540	330	426	3135	905	5928	70630	10723	10393	96.92	.15
M595	3550	298	4221	11354	1693	9411	68955	26977	26679	98.89	.18
M596	3560	249	2638	9883	1765	9942	67274	24476	24228	98.98	.18

TABLE I b.

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

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4
I	No.	(m)							C1-C4	C2-C4	NESS	---
I											(%)	nC4
I												
I	M597	3570	632	1852	8059	1663	9401	80798	21606	20974	97.08	.18
I	M598	3580	1985	25	189	726	19	5982	2944	959	32.58	8.39
I	M599	3590	984	2909	10969	2039	10645	74422	27546	26562	96.43	.19
I	M600	3600	399	2700	9838	1503	7667	33142	22107	21708	98.19	.20
I	M601	3610	413	3843	13731	1721	8316	22846	28024	27611	98.53	.21
I	M602	3620	495	6313	16377	1861	7740	22693	32787	32292	98.49	.24
I	M603	3630	731	8497	18659	1921	7275	21348	37084	36353	98.03	.26
I	M604	3640	658	6787	13796	1357	4973	14418	27570	26913	97.61	.27
I	M605	3650	323	4903	10535	1028	3536	9431	20326	20003	98.41	.29
I	M606	3660	1173	11038	13509	1174	3641	10683	30535	29362	96.16	.32
I	M607	3670	411	7201	10131	913	2905	6427	21562	21151	98.09	.31

TABLE I b.



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

Samples taken after sidetracking

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4	I
11722	3520	129	133	20	119	111	791	512	383	74.80	1.07	I
11723	3550	1669	2223	11246	2560	14213	10921	31911	30242	94.77	.18	I
11724	3580	1211	1310	6168	1382	8051	10086	18122	16911	93.32	.17	I
11725	3610	824	1288	6066	1097	5962	3726	15237	14413	94.59	.18	I
11726	3640	1210	4090	11091	1374	5455	2381	23220	22010	94.79	.25	I
11727	3670	2644	4966	7053	883	3229	2362	18775	16131	85.92	.27	I
11728	3700	49168	23622	11617	2391	5569	7903	92367	43199	46.77	.43	I
11729	3730	119610	56487	24541	4257	10590	11716	215485	95875	44.49	.40	I
13080	3760	Not determined (CAPS)										I
13081	3790	125087	73814	2085	1922	3217	1638	206125	81038	39.31	.60	I
13082	3820	74764	39966	13325	1428	2163	1062	131646	56882	43.21	.66	I
13083	3850	1351	2333	1978	237	874	2267	6773	5422	80.05	.27	I
13084	3880	2222	3647	2665	348	1331	3441	10213	7991	78.24	.26	I
13085	3910	3152	1963	1022	114	420	1115	6671	3519	52.75	.27	I
13086	3940	1350	1255	1328	240	1130	4069	5303	3953	74.54	.21	I
13087	3970	O P E N L I D .										I
13088	4000	84	71	65		57	576	277	193	69.68	.00	I
13089	4030	490	110	167	40	168	1211	975	485	49.74	.24	I
13090	4060	1570	204	166		140	2573	2080	510	24.52	.00	I
13091	4090	7548	1106	365		186	1873	9205	1657	18.00	.00	I
13092	4120	11555	1397	325		151	1794	13428	1873	13.95	.00	I
13093	4150	4660	489	243		160	1701	5552	892	16.07	.00	I
13094	4180	1388	133	116		73	474	1710	322	18.83	.00	I
13095	4210	598	123	125		86	560	932	334	35.84	.00	I
13096	4240	700	111	360	80	324	1237	1575	875	55.56	.25	I

TABLE I b.

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

Samples taken after sidetracking

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM		WET-NESS (%)	iC4	
								C1-C4	C2-C4		---	nC4
13097	4270	86	65			35	530	186	100	53.76	.00	
13098	4300	209	82	70		44	351	405	196	48.40	.00	
13099	4330	1693	986	386	43	143	500	3251	1558	47.92	.30	
13100	4336	8816	1716	699		202	1148	11433	2617	22.89	.00	

TABLE I c.

CONCENTRATION (u1 Gas / kg Rock) OF C1 - C7 HYDROCARBONS (Ia + Ib).

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 --- nC4	I
K9046	1740	281						283				I
K9047	1780	1090						1092				I
K9048	1820	1383						1385				I
K9049	1860	887						889				I
K9050	1900	580						581				I
K9051	1940	1973						1974				I
K9052	1980	772						773				I
K9053	2020	783						784				I
K9054	2060	1645	1				1	1647	2	.12		I
K9055	2100	2878	1	1	1	1	1	2881	3	.10		I
K9056	2140	424	45					469	45	9.68		I
K9057	2156	748	1	1	1	1	1	751	2	.33	1.00	I
K9058	2190	265	74	19	14	13		385	120	31.14	1.10	I
K9059	2220	195						196				I
K9060	2250	192						193				I
K9061	2280	208		20				229	21	9.15		I
K9062	2310	384	55	30	18			488	104	21.27	7.97	I
K9063	2340	399	1				1	401	2	.47	1.00	I
K9064	2370	306		23	17		71	347	41	11.70	8.78	I
K9065	2400	297	1				1	299	2	.54		I
K9066	2430	687	40	132	65		365	925	238	25.69		I
K9067	2460	888	212	161	73	45	151	1379	491	35.64	1.62	I
K9068	2490	679	107	122	120		77	1028	349	33.95		I
K9069	2520	998	175	160	222	167	241	1723	725	42.06	1.33	I
M266	2550	1295	187	174	119	180	226	1954	659	33.73	.66	I

TABLE I c.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4	I
M267	2580	1727	26	198	133	83	368	2167	440	20.30	1.61	I
M268	2610	1124	23	114	70	49	86	1380	256	18.52	1.43	I
M269	2640	381	4	24	15	6		429	48	11.28	2.33	I
M270	2670	442	6	45				494	52	10.51		I
M271	2700	457	15	46				519	61	11.83		I
M272	2730	278	5	31				314	36	11.56		I
M273	2760	103						104				I
M274	2790	679	18	146	26	24	1	894	215	24.01	1.07	I
M275	2820	1105	34	242	90	30	32	1501	395	26.35	2.99	I
M276	2850	857	30	260	97	36	1	1280	422	33.01	2.71	I
M277	2880	418	25	121	44	13		621	203	32.66	3.49	I
M278	2910	1162	36	324	112	54		1687	524	31.10	2.07	I
M279	2940	499	9	176	80	48	98	812	313	38.55	1.68	I
M280	2970	2574	913	663	138	62	58	4350	1775	40.82	2.21	I
M281	3000	599	285	329	86	58	38	1357	758	55.85	1.49	I
M383	3030	249	187	291	55	64		845	596	70.54	.86	I
M384	3060	330	238	609	102	252	188	1531	1200	78.41	.40	I
M385	3090	6229	4749	9698	1217	5099	4491	26992	20763	76.92	.24	I
M386	3120	47835	39676	86566	10259	53324	50797	237659	189825	79.87	.19	I
M387	3150	47786	33736	83773	9633	53686	46984	228615	180829	79.10	.18	I
M388	3170	154367	41899	89814	9110	47429	34899	342618	188251	54.94	.19	I
M389	3210	35797	34546	93280	12517	53362	41083	229502	193705	84.40	.23	I
M493	3240	50677	48053	91537	11951	37743	27422	239961	189284	78.88	.32	I
M494	3270	64653	48681	54132	5725	13723	6377	186915	122262	65.41	.42	I
M495	3300	6148	7500	10046	1174	2978	2139	27845	21698	77.92	.39	I

TABLE I c.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M496	3310	10640	16284	30069	7893	17142	11455	82028	71389	87.03	.46
M497	3320	10536	7157	7831	782	3399	3983	29705	19168	64.53	.23
M498	3330	4618	2112	3329	507	2167	5470	12733	8115	63.73	.23
M499	3340	16901	8091	6885	794	2531	5074	35202	18301	51.99	.31
M500	3350	9056	5407	5148	508	2076	1940	22194	13138	59.20	.24
M501	3370	16140	12676	76524	1396	5590	3912	112325	96186	85.63	.25
M502	3380	14786	8014	6920	551	1885	3179	32157	17371	54.02	.29
K503	3390	14869	10005	10940	946	3563	2814	40323	25454	63.13	.27
K504	3400	4339	3630	6291	628	2739	3663	17626	13287	75.38	.23
M505	3410	6714	6115	13251	1574	7399	10691	35053	28339	80.85	.21
M506	3420	12928	12887	26697	2782	12228	14924	67523	54594	80.85	.23
M507	3430	11454	12940	30742	3335	16745	22092	75215	63761	84.77	.20
M584	3440	389	816	7364	1737	10118	40835	20424	20035	98.09	.17
M585	3450	8341	9663	26747	3682	18450	62239	66884	58543	87.53	.20
M586	3460	6717	5555	17086	2378	12785	46700	44520	37804	84.91	.19
M587	3470	4290	3938	11958	1838	10118	45547	32142	27852	86.65	.18
M588	3480	4954	23930	11289	5878	7438	34597	53489	48536	90.74	.79
M589	3490	4235	3617	12544	2041	11953	65023	34390	30155	87.69	.17
M590	3500	3736	2912	6193	991	4185	4151	18017	14281	79.26	.24
M591	3510	4373	7630	27038	3952	21057	104385	64050	59677	93.17	.19
M592	3520	9548	9624	25403	3519	18734	95273	66828	57280	85.71	.19
M593	3530	1216	2480	12774	2523	14508	83807	33502	32285	96.37	.17
M594	3540	1068	1266	7113	1501	8874	73904	19822	18754	94.61	.17
M595	3550	1825	5558	14062	1978	10690	70096	34113	32288	94.65	.19
M596	3560	2691	5041	16209	2557	13563	70842	40061	37370	93.28	.19

TABLE I c.

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

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
M597	3570	8191	6335	17182	2677	13449	83705	47835	39643	82.88	.20
M598	3580	5027	2236	4981	1224	2080	7641	15549	10522	67.67	.59
M599	3590	1660	3401	11950	2147	11035	74755	30193	28534	94.50	.19
M600	3600	1767	3929	11705	1674	8208	33501	27283	25516	93.52	.20
M601	3610	4615	7593	18107	2065	9459	23623	41840	37225	88.97	.22
M602	3620	7113	10403	20032	2133	8499	23061	48180	41067	85.24	.25
M603	3630	7724	12895	22027	2158	7902	21647	52708	44983	85.35	.27
M604	3640	4246	8947	15290	1467	5229	14602	35179	30933	87.93	.28
M605	3650	4108	7854	12804	1198	3986	9832	29950	25842	86.28	.30
M606	3660	8073	14331	15119	1280	3884	10807	42687	34614	81.09	.33
M607	3670	4670	10547	11869	1035	3170	6570	31291	26621	85.08	.33

TABLE I c.



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

Samples taken after sidetracking

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4	I
11722	3520	8517	5748	11738	1171	4834	3546	32008	23491	73.39	.24	I
11723	3550	2564	2764	12930	2756	15147	11739	36161	33597	92.91	.18	I
11724	3580	4385	2895	9519	1748	9605	11243	28152	23767	84.42	.18	I
11725	3610	3846	3275	9116	1354	6934	4355	24525	20679	84.32	.20	I
11726	3640	5311	6069	12843	1495	5809	2607	31527	26216	83.15	.26	I
11727	3670	15336	10215	10001	1118	3742	2735	40412	25076	62.05	.30	I
11728	3700	49848	23699	11687	2412	5614	8139	93260	43412	46.55	.43	I
11729	3730	217645	94918	40484	7717	12224	15260	372988	155343	41.65	.63	I
13080	3760	244599	38636	6818	685	705	905	291443	46844	16.07	.97	I
13081	3790	260260	90933	5350	2239	3532	1983	362314	102054	28.17	.63	I
13082	3820	187003	55793	16445	1760	2464	1340	263465	76462	29.02	.71	I
13083	3850	33146	7337	4250	548	1358	3136	46639	13493	28.93	.40	I
13084	3880	43068	8531	5307	755	2016	4357	59677	16609	27.83	.37	I
13085	3910	69874	7028	2538	319	728	1572	80487	10613	13.19	.44	I
13086	3940	6909	1950	1715	303	1256	4292	12133	5224	43.06	.24	I
13087	3970	O P E N		L I D .								I
13088	4000	1389	2322	210	21	117	994	4059	2670	65.78	.18	I
13089	4030	823	262	250	40	197	1425	1572	749	47.65	.20	I
13090	4060	2083	507	301		179	2766	3070	987	32.15	.00	I
13091	4090	8981	1507	507		228	2203	11223	2242	19.98	.00	I
13092	4120	13132	1740	443		191	2386	15506	2374	15.31	.00	I
13093	4150	5269	602	295		186	2086	6352	1083	17.05	.00	I
13094	4180	1640	184	138		82	578	2044	404	19.77	.00	I
13095	4210	991	209	167		102	767	1469	478	32.54	.00	I
13096	4240	822	165	397	80	324	1631	1788	966	54.03	.25	I

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

Samples taken after sidetracking

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
13097	4270	598	265	76		62	899	1001	403	40.26	.00
13098	4300	1015	353	131		54	444	1553	538	34.64	.00
13099	4330	4946	1636	494	43	155	556	7274	2328	32.00	.28
13100	4336	18115	4971	1511	37	320	1606	24954	6839	27.41	.12

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
K-9046	1700-1740	1,28	45% Claystone, silty, grey, brownish grey, pyritic, micromicaceous 5% Claystone, grey, dark grey 5% Claystone, redish brown 45% Sand/Sandstone, fine-medium, some coarse, subangular-subrounded Abn. Pyrite, Claystone, greenish Sm.am. Tuff/tuffaceous claystone; Glauconite; Lignite/Coal; Claystone, light brownish grey with sponge spicules.
K-9047	1740-1780	1,09 1,18	60% Claystone, silty, as above 20% Tuff/tuffaceous Claystone, dark bluish grey, grainy texture, occ. as laminae in Claystones, occ. sandy 7% Claystone, redish brown 3% sideritic Limestone?, yellowish brown, hard 10% Sand/Sandstone, as above Abn. Pyrite Sm.am. as above + Siderite, sucrosic
K-9048	1780-1820	1,10 0,95	75% Claystone, occ. silty, grey/greyish brown, greenish grey, some subfissile 15% Tuff, as above 5% Claystone, redish brown 5% Sand, medium-coarse, subrounded, clear, some yellow Abn. Pyrite Sm.am. as above
K-9049	1820-1860	0,87	90% Claystone, grey, greenish grey, light brownish grey 7,5% Tuff, as above 2,5% Claystone, redish brown Abn. Claystone, sandy, light grey, calcareous, with some sponge spicules Sm.am. as above + Sand/Sandstone
K-9050	1860-1900	0,71	95% Claystone, as above 5% Tuff, as above Sm.am. as above + Claystone, redbrown
K-9051	1900-1940	0,95	92% Claystone, as above, calcareous, occ. sandy 5% Limestone, greyish white 3% Sand/Sandstone, fine, subangular, some coarse Sm.am. as above

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
K-9052	1940-1980	0,65	95% Claystone, grey, light brownish grey, occ. very calcareous and grading to Marl 5% Limestone, white, greyish white Sm.am. Sand, medium, subangular-subrounded; Pyrite; Glauconite, dark green, no fissures; Foraminifera (small forms)
K-9053	1980-2020	0,81 0,60 0,33	63% Claystone, grey, brownish grey, greenish grey 10% Marl/Claystone, light grey 25% Limestone, white, light brownish white, occ. chalky 2% Pyrite Abn. Glauconite Sm.am. as above + Claystone, redbrown
K-9054	2020-2060	0,82 0,38	86% Claystone, as above 10% Limestone, as above 4% Sand/Sandstone, fine, medium, glauconitic, calcareous, hard Sm.am. as above
K-9055	2060-2100	0,67 0,35	80% Claystones, as above 2% silty Claystone, light brown, micaceous, with sponge spicules, occ. glauconitic 15% Limestone, as above 3% Sand/Sandstone, occ. clayey, glauconitic Sm.am. as above + ?Siderite
K-9056	2100-2140	0,75 0,33	70% Claystone, as above 5% Calystone, redish brown 3% Claystone, light brown, glauconitic with spicules 5% Marl, pale redish brown 15% Limestone, as above 2% Sand/Sandstone, as above Abn. Foraminifera; Pyrite Sm.am. as above
K-9057	2140-2156	0,64 0,31 0,32	65% Claystone, grey 10% Claystone, redish brown 10% Marl, pale redish brown, as above 10% Limestone, as above 5% Sand/Sandstone, as above Obs. Claystone, black, lustrous, non-calcareous Sm.am. Pyrite; Glauconite; Foraminifera

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
K-9058	2160-2190	0,68	100% Claystone, silty, grey, greenish grey, light brownish grey, some redish brown, calcareous Sm.am. Marl; Limestone; pyrite; Siderite?
K-9059	2190-2220	0,56	95% Claystone, silty, as above 5% Claystone, light brownish white, slightly calcareous
K-9060	2220-2250	0,50	95% Claystone, slightly silty, predominantly grey, calcareous 5% Claystone, light brownish white, brown
K-9061	2250-2280	0,60	90% Claystone, silty, grey slightly calcareous 10% Claystone, light brownish white, brown, as above Sm.am. Limestone, white
K-9062	2280-2310	0,66	95% Clay, grey, dark grey, very soft 5% Claystone, light brown, ?sideritic Sm.am. Sandstone, fine, calcareous, glauconitic
K-9063	2310-2340	0,64	92% Claystone, grey, soft, calcareous 5% ?sideritic Claystone, as above 2% Sandstone, as above, very calcareous 1% Limestone, white, glauconitic
K-9064	2340-2370	0,61	90% Claystone, silty, grey, soft 7% ?sideritic Claystone, as above 3% sandy Limestone, glauconitic Sm.am. Sandstone, Pyrite
K-9065	2370-2400	0,59	95% Claystone, silty, grey, slightly micaceous, calcareous 5% ?Siderite Sm.am. Pyrite
K-9066	2400-2430	0,74	97% silty Claystone, grey, occasionally sandy (fine, very fine) calcareous, some slightly glauconitic 3% Siltstone, ?sideritic, brown, yellowish brown Sm.am. Sandstone, greyish white, clayey, glauconitic, calcareous

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
K-9067	2430-2460	0,94	65% silty, sandy Claystone, grey, as above 30% Sandstone, grey, light greyish white, as above, grading to a silty, sandy Claystone. 5% sideritic Siltstone, as above Sm.am. Limestone; Pyrite; core chips
K-9068	2460-2490	0,86	65% silty, sandy Claystone, grey, as above 30% sideritic Siltstone, as above Sm.am. as above
K-9069	2490-2520	1,02	72% silty, sandy Claystone, grey, slightly calcareous 25% Sandstone, as above 3% Siderite, sideritic Siltstone, as above Sm.am. as above
M-266	2520-2550	1,00	As above
M-267	2550-2580	0,75	55% silty, sandy Claystone, as above, often interbedded with Sandstone, whitish grey, fine, glauconitic 40% Sandstone, greyish white, white, as above 5% Siderite Sm.am. Claystone, light grey, calcareous, very calcareous
M-268	2580-2610	0,92	As above Obs. Claystone, greenish grey
M-269	2610-2640	0,73	65% Claystone, occasionally silty, sandy, grey, as above 30% Sandstone, as above 5% Siderite, as above Sm.am. as above
M-270	2640-2670	0,64	90% Claystone, as above, some slightly pyritic 7% Sandstone, as above 3% Siderite, as above
M-271	2670-2700	0,61	90% Claystone, grey, as above 5% Sandstone, as above 5% Siderite/sideritic Limestone
M-272	2700-2730	0,59	As above

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-273	2730-2760	0,65	97% Claystone, grey, as above 3% Siderite
M-274	2760-2790	0,13	97% silty, sandy Claystone, grey, occasionally glauconitic 3% Siderite Sm.am. Pyrite
M-275	2790-2820	0,78	as above
M-276	2820-2850	0,81	85% silty, sandy Claystone, as above, increase in sand content 12% Sandstone, light grey, greyish white, calcareous, glauconitic 3% Siderite
M-277	2850-2880	0,77	as above, increase in Glauconite content, ob. the Claystones Sm.am. Claystone, greyish white; Limestone, white
M-278	2880-2910	0,80	60% silty, sandy Claystone, grey, as above 35% Sandstone, fine, clayey, as above 5% Claystone, greyish white, calcareous
M-279	2910-2940	1,10	90% silty, sandy Claystone, grey, variable silt and sand content, occasionally glauconitic, slightly micaceous 5% Limestone, as above 3% Sandstone, as above 2% Claystone, light grey, as above
M-280	2940-2970	0,80	90% silty Claystone, occasionally sandy, grey, partly marly 8% Sandstone, greyish white, fine, glauconitic, calcareous, hard 2% Limestone, as above Sm.am. Claystone, light grey
M-281	2970-3000	0,86 0,17 0,09	65% silty Claystone, grey, as above 15% Limestone, light greyish white, glauconitic 15% Limestone, white, soft 5% Sandstone, as above

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-383	3000-3030	0,15	40% Limestone, sandy, greyish white, glauconitic, micaceous
		0,34	20% Marl, light grey, soft
		0,71	5% Limestone, white 35% silty Claystone, grey as above
M-384	3030-3060	0,55	90% silty Claystone, grey, light grey very calcareous 10% sandy Limestone, white Sm.am. Marl
M-385	3060-3090	0,77	95% Claystone, grey, light grey, very calcareous, marly 5% Claystone, grey, dark grey, calcareous, subfissile Obs. Claystone, greenish grey
M-386	3090-3120	4,40	90% Claystone, dark grey, non calcareous, micaceous, slightly lustrous, subfissile 8% Limestone, white, occasionally pyritic 2% Marl/Claystone, light grey
M-387	3120-3150	6,37	100% Claystone, dark grey, as above Sm.am. Limestone, as above
M-388	3150-3170	5,75	100% Claystone, dark grey, micaceous, slightly carbonaceous, non calcareous, hard Sm.am. Limestone; Claystone/Marl; Pyrite
M-389	3170-3210	5,96	99% Claystone, as above, increase in mica content 1% Limestone, white Sm.am. Sandstone, very micaceous, calcareous, loose
M-493	3210-3240	6,26	96% Claystone, dark grey, dark brownish grey, carbonaceous, occasionally sandy 4% Sandstone, greyish white, fine, micaceous, slightly calcareous, clayey Obs. Shell fragment
M-494	3240-3270	4,67	85% Claystone, as above, increase in Mica and organic material 15% Sandstone, as above
M-495	3270-3300	3,41	70% Claystone, dark grey-grey, becoming sandy and lighter grey
		0,44	30% clayey Sandstone, often very calcareous, micaceous Sm.am. Sand, medium, subangular-subrounded

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology	
M-496	3300- 3310	3,37	30% Claystone, sandy, silty, dark grey-grey, as above	
		2,52	35% Claystone, grey, brownish grey, calcareous, soft	
			35% Sandstone, fine, medium, subangular, dark grey, greyish white, occasionally, carbonaceous, micaceous, calcareous, often hard	
M-497	3310- 3320	4,10	32% silty, sandy Claystone, dark grey, as above	
		2,96	12% Claystone, grey, brownish grey, as above	
			3% Claystone, greenish grey, occasionally pyritic, non-calcareous	
			3% sandy Limestone, white, loose	
50%	Sand/Sandstone, as above			
M-498	3320- 3330	4,15	15% Claystone, silty, sandy, dark grey, as above	
		0,53	5% Claystone, grey, non-calcareous	
			15% sandy Limestone, as above	
65%	Sand/Sandstone, as above			
M-499	3330- 3340	4,77	15% Claystone, silty, sandy, as above	
			3% Claystone, grey, as above	
			2% sandy Limestone, white	
			80% Sand/Sandstone, coarse, medium, subangular, brownish white	
M-500	3340- 3350	4,61	40% Claystone, dark grey, carbonaceous, non-calcareous, slightly calcareous	
			2% Claystone, grey, non-calcareous	
			3% sandy Limestone, white	
			55% Sand/Sandstone, light brownish grey, medium, coarse, some very coarse, mostly subangular, calcareous	
M-501	3360- 3370	3,07	45% Claystone, dark grey, as above	
			10% Claystone, brownish grey, dolomitic?	
			5% Claystone, light grey, very calcareous	
			40% Sandstone, greyish white, medium, coarse, angular-subangular, clear	
			Sm.am.	Sand, very coarse, coarse, subrounded, etched surface
M-502	3370- 3380	2,82	60% Claystone, dark grey, as above	
			10% Claystone, brownish grey, as above	
			5% Claystone, light grey, calcareous	
			25% Sandstone, as above	
			Sm.am.	Sand, as above
			Obs.	pyritized wood fragments

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-503	3380-3390	2,53	70% Claystone, dark grey, as above 10% Claystone, brownish grey, as above 20% Sandstone, as above Sm.am. as above; Limestone, white
M-504	3390-3400	2,12 0,73	65% Claystone, dark grey, grey, as above 10% Claystone, brownish grey, light brown, calcareous 10% Limestone, dark brownish grey, hard 10% Sandstone/Sand, as above
M-505	3400-3410	2,04 0,76	80% Claystone, dark grey, grey, as above 12% Claystone/Marl, light brownish grey, as above 5% Limestone, brownish 3% Sandstone, as above Sm.am. Limestone, white; Claystone, greenish grey; Pyrite
M-506	3410-3420	1,32 0,65	80% Claystone, dark grey, greyish brown, as above 15% Marl/Limestone, light brown-grey 5% Limestone, brown, hard Sm.am. as above; Lignite/Coal
M-507	3420-3430	2,24 0,71	80% Claystone, dark grey, greyish brown, as above 15% Marl/Limestone, light brownish grey 5% Limestone, brown, as above Sm.am. as above
M-584	3430-3440	2,58	97% Claystone, silty, greyish brown, grey, slightly calcareous, slightly micaceous, pyritic (small framboidal grains) 3% Dolomite, brown, hard Sm.am. Limestone, greyish white
M-585	3440-3450	2,02	96% Claystone, silty, grey, slightly micaceous, as above 4% Dolomite, as above 1% Claystone, light brownish grey, calcareous Sm.am. Pyrite; Claystone, greenish grey Obs. Lignite/Coal
M-586	3450-3460	2,51	92% Claystone, silty, grey, dark grey, some slightly brownish grey, as above 5% Marl/Limestone, light brownish white 3% Dolomite, as above Sm.am. Pyrite; Sand, fine, medium, subangular, clear; Claystone, light grey, greenish grey

**IKU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Depth (m)	TOC	Lithology
M-587	3460-3470	2,22	87% Claystone, silty grey, dark grey, as above 2% Marl/Limestone, as above 3% Claystone, greenish grey, calcareous, subfissile 5% Sandstone, greyish white, medium, sub-angular, clear, calcareous, slightly micaceous 3% Dolomite, brown, hard Sm.am. as above
M-588	3470-3480	2,68	87% Claystone, silty, dark brownish grey, grey, as above 8% Dolomite, dark brown, light brown, hard 5% Limestone, greyish white Sm.am. Pyrite; Claystone, greenish grey Obs. Wood fragments
M-589	3480-3490	2,25	90% Claystone, occasionally silty, dark grey, grey, greyish brown 3% Dolomite, dark brown, hard 7% Limestone, greyish white, as above Obs. Sandstone, greyish white, medium, calcareous
M-590	3490-3500	2,72	90% Claystone, occasionally silty, dark grey, grey 7% Limestone, greyish white, white, as above 3% Claystone, light greyish brown, slightly calcareous Sm.am. Claystone, greenish grey; Sand/Sandstone, as above
M-591	3500-3510	2,73	95% Claystone, occasionally silty, slightly micaceous, non-calcareous, often slightly pyritic 3% Limestone, dark brown, hard 2% Claystone, light brownish grey Sm.am. Limestone, white; Claystone, greenish grey; Sandstone, as above
M-592	3510-3520	5,40	90% Claystone, occasionally silty, dark grey, brownish grey, occasionally subfissile as above 5% Limestone, dark brown, subfissile 3% Claystone, greenish grey 2% Claystone, light brownish grey Sm.am. Limestone; Sandstone; Pyrite

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-593	3520-3530	3,08	95% Claystone, occasionally silty, dark grey-grey, grey, as above 3% Limestone, dark brown, hard 2% Limestone, greyish white Sm.am. Claystone, light greyish brown
M-594	3530-3540	2,03	35% Cement 62% Claystone, occasionally silty, dark grey, grey, as above 3% Limestone, dark brown, hard Sm.am. Claystone, greenish grey
M-595	3540-3550	2,47 2,23	5% Mica (additive) 10% Nut Shells 3% Cement 5% Limestone, dark brown, hard 67% Claystone, occasionally silty, brownish grey, grey, soft 10% Claystone, occasionally silty, dark grey, grey, often slightly micaceous, pyritic
M-596	3550-3560	2,41	97% Claystone, occasionally silty, grey slightly brownish grey, same dark grey, grey, as above 3% Limestone, dark brown, as above Sm.am. Mica (additive); Pyrite; Sand/Sandstone, greyish white, medium; Claystone, light brown
M-597	3560-3570	1,92	95% Claystone, as above 5% Limestone, dark brown, brown, hard Sm.am. as above
M-598	3570-3580	2,12 0,78	80% Claystone, as above, occasionally lustrous 17% Limestone, dark brown 3% Limestone, light brownish white Sm.am. Cement; core chips, Mica (additive)
M-599	3580-3590	2,20	95% Claystone, brownish grey-grey, occasionally silty, some micaceous and carbonaceous 5% Limestone, dark brown, brown, as above Sm.am. as above and Limestone, light brownish grey
M-600	3590-3600	2,44	97% Claystone, as above 3% Limestone, as above Sm.am. as above

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-601	3600-3610	2,77 0,61	90% Claystone, as above 10% Limestone, white silty-sand, soft brownish white
M-602	3610-3620	3,10	95% Claystone, occasionally silty, dark grey, greyish brown, some micaceous, carbonaceous, subfissile 5% Limestone, light brownish white, sandy, often soft Sm.am. as above
M-603	3620-3630	3,18	95% Claystone, as above 5% Limestone, silty, sandy, as above Sm.am. as above
M-604	3630-3640	3,46	98% Claystone, grey, dark grey, some brownish grey, as above 2% Limestone, as above Sm.am. as above
M-605	3640-3650	3,11	95% Claystone, as above 3% Claystone, light brown, calcareous 2% Limestone, as above Sm.am. as above, some increase in the Pyrite content
M-606	3650-3660	3,46	95% Claystone, as above 2% Limestone, as above 1% Sand, medium, angular, subangular, sub-rounded, clear 2% Claystone, light brown, very calcareous Sm.am. Limestone, brown, hard; Pyrite; Core Chips; Mica (additive)
M-607	3660-3670	4,23	93% Claystone, dark grey, grey, brownish grey, as above 3% Sand, as above 1% Pyrite 2% Limestone, light brownish white, soft occasionally clayey Sm.am. as above
M-1722	3490-3520	4,46	95% Claystone, occasionally silty, grey-brownish grey, slightly micaceous, partly pyritic, slightly carbonaceous, slightly calcareous, some observed with a waxy appearance 5% Limestone/Marl, light brownish grey NB! Some of the fragments are stained with ?oil, ?diesel

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-1723.	3520-3550	3,11 4,59	50% Claystone, grey, brownish grey, as above 25% Claystone, dark grey, lustrous, mica- ceous, pyritic (very fine-grained framboidal pyrite), occasionally slightly sandy 20% Limestone/Marl, as above 5% Dolomite/Siderite, dark brown, pyritic, hard Abn. Coal/Lignite, soft Obs. Sand, fine, medium, subangular NB! Stained, as above
M-1724	3550-3580	2,34	80% Claystone, occasionally, silty, mica- ceous, subfissile, partly calcareous, pyritic (fine-grained) 5% Dolomite, as above 5% Marl?/Limestone, as above 10% Lignite ?additive and Coal Sm.am. Sand, fine, subangular NB! Stained as above
M-1725	3580-3610	2,71	65% Claystone, grey, dark grey, micaceous 5% Limestone, as above 20% Sand, fine, clear, white, angular- subangular, occasionally with etched surface, good sorting 8% Lignite/Coal, as above 2% Dolomite, dark brown, hard
M-1726	3610-3640	3,96	95% Claystone, grey, dark grey, silty, slightly micaceous, ?carbonaceous, pyritic, slightly calcareous 3% Sand, as above 2% Coal/Lignite, as above Sm.am. Limestone/Dolomite; Claystone, brown- ish grey NB! Some staining of fragments
M-1727	3640-3670	4,30	95% Claystone, grey, dark grey, silty, occasionally carbonaceous and lustrous, occasionally very pyritic (fine-grained) 3% Dolomite, dark brown 2% Sand, as above, but somewhat coarse Sm.am. Limestone; Coal; core chips, Pyrite

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-1728	3670-3700		95% Sand/Sandstone, clear, greyish white, medium, coarse, grey, clayey (?kaolinitic) micaceous, with small amounts of coal/lignite 5% silty/sandy Claystone, grey, dark grey, as above
M-1729	3700-3730		70% Sand/Sandstone, medium, coarse, fine, as above 20% Coal/Lignite 10% Claystone, silty and sandy, as above
M-3080	3730-3760	3,39	70% Coal 20% Sandstone (fine-grained) brown 10% Clay (sandy) Occ. metal
M-3081	3760-3790	2,79	50% Sandstone (brown staining) 30% Coal 20% Clay, Quartz and metal
M-3082	3790-3820		70% white Sandstone, often stained brown medium coarse 25% Coal 5% silty Clay some metal (drill + pyrite)
M-3083	3820-3850	3,92	80% Sandstone white, grey, medium, coarse 15% Clay, silt 5% Coal metal, brown (oil?) stains
M-3084	3850-3880		90% Sandstone, coarse-white, fine, brown 5% Claystone, silt 5% Coal drill metal, Pyrite
M-3085	3880-3910	2,05	70% Sandstone, fine, brown 20% silty Clay 5% Coal Rest = Quartz; Pyrite, drill metal, brown staining
M-3086	3910-3940		90% brown Sandstone and white Sand 7% Claystone 3% Coal brown staining, drill metal
M-3087	3940-3970	0,95	80% brown Sandstone and white Quartz 15% Claystone and silt 5% Coal, Pyrite etc., brown staining

**KU**

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-3088	3970-4000		90% Coal 10% Sandstone, brown and white
M-3089	4000-4030		90% Coal 10% white Sandstone, trace brown
M-3090	4030-4060		70% Coal 20% Sandstone, white and brown stained 10% Clay, rusted metal etc.
M-3091	4060-4090	1,39	90% grey Shale, Clay 5% white Sandstone 5% brown Sandstone, rust, metal, fibres
M-3092	4090-4120	1,57	90% Clay and silt 10% Sandstone, white, brown stained Paint, rust, fibre
M-3093	4120-4150	1,12	90% grey Claystone 5% Sandstone, white and brown 5% Coal trace rust, fibres etc.
M-3094	4150-4180	1,63	60% Clay 20% Sandstone, mainly white 20% Coal
M-3095	4180-4210	2,45	70% grey Clay 25% white and brown Sand and Sandstone 5% Coal
M-3096	4210-4240		80% white-brown Sandstone 15% Coal 5% Clay (ooliths) Mica, rust, fibres
M-3097	4240-4270	3,02	90% Sand (brown stains) 10% black Shale Mica, rust
M-3098	4270-4300	43,90	80% white Sandstone 15% Coal 5% Clay Rust, Mica, fibres, brown staining (rust?)



KU

Lithology and Total Organic Carbon measurements

TABLE NO.: II
WELL NO.: 35/8-2

Sample	Meters	TOC	Lithology
M-3099	4300-4330	48,35	50% Sandstone 45% Coal 5% Clay metal, rust
M-3100	4330-4336	0,80	80% Shale 10% white and brown Sandstone 10% Coal

T A B L E : III

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

I	:	:	Rock	:	:	:	:	Non	:	I
I	IKU-No	DEPTH	Extr.	EOM	Sat.	Aro.	HC	HC	TOC	I
I	:	:	:	:	:	:	:	:	:	I
I	:	(m)	(g)	(mg)	(mg)	(mg)	(mg)	(mg)	(%)	I
I	:	:	:	:	:	:	:	:	:	I
I	M1722	3520	13.9	57.8	27.2	9.4	36.6	21.2	3.7	I
I	M1724	3580	15.8	33.3	10.3	5.0	15.3	18.0	3.2	I
I	M1727	3670	13.0	23.1	5.0	2.9	7.9	15.2	3.0	I
I	M3080	3760	13.9	195.5	5.8	6.6	12.4	183.1	34.5	I
I	M3083	3850	15.1	11.5	1.8	.5	2.3	9.2	21.0	I
I	M3087	3970	15.4	66.6	23.8	10.2	34.0	32.6	2.5	I
I	M3088	4000	9.7	68.4	31.0	5.5	36.5	31.9	28.0	I
I	M3091	4090	14.2	9.3	2.9	1.6	4.5	4.8	1.5	I
I	M3093	4150	9.6	11.0	4.2	1.7	5.9	5.1	1.5	I
I	M3095	4210	8.4	44.8	3.8	1.1	4.9	39.9	1.6	I
I	M3100	4336	10.0	17.5	3.1	.6	3.7	13.8	.8	I

Samples taken after sidetracking

T A B L E : I V

CONCENTRATION OF EDM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

I	I	I	I	I	I	I	I	I	I
I	IKU-No	DEPTH	EOM	Sat.	Aro.	HC	Non	HC	I
I		(m)							I
I									I
I	M9047	1780	144	59	45	104	40		I
I	M279	2940	171	92	64	156	15		I
I	M386	3120	3570	1125	826	1951	1619		I
I	M388	3170	4787	1409	1126	2536	2251		I
I	M493	3240	3455	767	904	1671	1785		I
I	M495	3300	1503	339	416	755	748		I
I	M497	3320	1547	91	35	127	1420		I
I	M500	3350	709	205	188	393	316		I
I	M502	3380	586	154	154	308	277		I
I	M505	3410	749	295	230	524	224		I
I	M584	3440	1357	464	347	812	545		I
I	M588	3480	1550	520	482	1002	549		I
I	M592	3520	3081	1147	798	1945	1136		I
I	M596	3560	1038	590	304	895	144		I
I	M603	3620	1646	655	303	958	688		I
I	M607	3670	1034	302	184	486	548		I

T A B L E : IV

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

I	:	:	:	:	:	:	:	:	I
I	IKU-No	DEPTH	EOM	Sat.	Aro.	HC	Non	HC	I
I	:	:	:	:	:	:	:	:	I
I	:	(m)	:	:	:	:	:	:	I
I	:	:	:	:	:	:	:	:	I
I	M1722	3520	4161	1958	677	2635	1526		I
I	:	:	:	:	:	:	:	:	I
I	M1724	3580	2108	652	316	968	1139		I
I	:	:	:	:	:	:	:	:	I
I	M1727	3670	1777	385	223	608	1169		I
I	:	:	:	:	:	:	:	:	I
I	M3080	3760	14065	417	475	892	13173		I
I	:	:	:	:	:	:	:	:	I
I	M3083	3850	760	119	33	152	608		I
I	:	:	:	:	:	:	:	:	I
I	M3087	3970	4330	1547	663	2211	2120		I
I	:	:	:	:	:	:	:	:	I
I	M3088	4000	7052	3196	567	3763	3289		I
I	:	:	:	:	:	:	:	:	I
I	M3091	4090	655	204	113	317	338		I
I	:	:	:	:	:	:	:	:	I
I	M3093	4150	1145	437	177	614	531		I
I	:	:	:	:	:	:	:	:	I
I	M3095	4210	5346	453	131	585	4761		I
I	:	:	:	:	:	:	:	:	I
I	M3100	4336	1745	309	60	369	1376		I
I	:	:	:	:	:	:	:	:	I

Samples taken after sidetracking

T A B L E : V

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TDC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
M9047	1780	12.5	5.2	3.9	9.1	3.5
M279	2940	15.6	8.4	5.8	14.2	1.4
M386	3120	81.1	25.6	18.8	44.3	36.8
M388	3170	83.2	24.5	19.6	44.1	39.1
M493	3240	55.2	12.3	14.4	26.7	28.5
M495	3300	50.1	11.3	13.9	25.2	24.9
M497	3320	51.6	3.0	1.2	4.2	47.3
M500	3350	16.5	4.8	4.4	9.1	7.3
M502	3380	23.4	6.2	6.2	12.3	11.1
M505	3410	36.7	14.4	11.3	25.7	11.0
M584	3440	52.6	18.0	13.5	31.5	21.1
M588	3480	57.9	19.4	18.0	37.4	20.5
M592	3520	57.1	21.2	14.8	36.0	21.0
M596	3560	43.1	24.5	12.6	37.1	6.0
M603	3620	51.8	20.6	9.5	30.1	21.6
M607	3670	24.4	7.1	4.3	11.5	13.0

T A B L E : V

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TDC)

I	:	:	:	:	:	:	:	:	I
I	IKU-No	DEPTH	EOM	Sat.	Aro.	HC	HC	Non	I
I	:	:	:	:	:	:	:	:	I
I	:	(m)	:	:	:	:	:	:	I
I	:	:	:	:	:	:	:	:	I
I	M1722	3520	114.0	53.7	18.5	72.2	41.8		I
I	M1724	3580	65.0	20.1	9.8	29.9	35.2		I
I	M1727	3670	60.0	13.0	7.5	20.5	39.5		I
I	M3080	3760	40.8	1.2	1.4	2.6	38.2		I
I	M3083	3850	3.6	.6	.2	.7	2.9		I
I	M3087	3970	174.6	62.4	26.7	89.1	85.5		I
I	M3088	4000	25.2	11.4	2.0	13.5	11.8		I
I	M3091	4090	42.3	13.2	7.3	20.4	21.8		I
I	M3093	4150	76.8	29.3	11.9	41.2	35.6		I
I	M3095	4210	342.7	29.1	8.4	37.5	305.2		I
I	M3100	4336	218.1	38.6	7.5	46.1	172.0		I

Samples taken after sidetracking

T A B L E : VI

COMPOSITION IN % OF THE MATERIAL EXTRACTED FROM THE ROCK

IKU-No	DEPTH	Sat	Aro	HC	Sat	Non HC	HC
(m)	EOM	EOM	EOM	Aro	EOM	Non HC	Non HC
M9047	1780	41.1	31.4	72.4	131.0	27.6	262.7
M279	2940	53.8	37.2	91.0	144.4	9.0	1015.4
M386	3120	31.5	23.1	54.7	136.1	45.3	120.5
M388	3170	29.4	23.5	53.0	125.1	47.0	112.7
M493	3240	22.2	26.2	48.4	84.9	51.6	93.6
M495	3300	22.6	27.6	50.2	81.7	49.8	100.9
M497	3320	5.9	2.3	8.2	260.0	91.8	8.9
M500	3350	28.9	26.5	55.5	109.1	44.5	124.6
M502	3380	26.3	26.3	52.6	100.0	47.4	111.1
M505	3410	39.3	30.7	70.0	128.2	30.0	233.7
M584	3440	34.2	25.6	59.8	133.6	40.2	148.8
M588	3480	33.5	31.1	64.6	108.0	35.4	182.6
M592	3520	37.2	25.9	63.1	143.8	36.9	171.2
M596	3560	56.8	29.3	86.2	193.9	13.8	622.3
M603	3620	39.8	18.4	58.2	216.4	41.8	139.2
M607	3670	29.2	17.8	47.0	164.5	53.0	88.7

T A B L E : VI

COMPOSITION IN % OF THE MATERIAL EXTRACTED FROM THE ROCK

I	:	:	Sat	:	Aro	:	HC	:	Sat	:	Non HC	:	HC	I
I	IKU-No	:	DEPTH	:	---	:	---	:	---	:	---	:	---	I
I	:	:	EOM	:	EOM	:	EOM	:	Aro	:	EOM	:	Non HC	I
I	:	:	(m)	:	:	:	:	:	:	:	:	:	:	I
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M1722	:	3520	:	47.1	:	16.3	:	63.3	:	289.4	:	36.7	172.6
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M1724	:	3580	:	30.9	:	15.0	:	45.9	:	206.0	:	54.1	85.0
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M1727	:	3670	:	21.6	:	12.6	:	34.2	:	172.4	:	65.8	52.0
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3080	:	3760	:	3.0	:	3.4	:	6.3	:	87.9	:	93.7	6.8
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3083	:	3850	:	15.7	:	4.3	:	20.0	:	360.0	:	80.0	25.0
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3087	:	3970	:	35.7	:	15.3	:	51.1	:	233.3	:	48.9	104.3
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3088	:	4000	:	45.3	:	8.0	:	53.4	:	563.6	:	46.6	114.4
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3091	:	4090	:	31.2	:	17.2	:	48.4	:	181.2	:	51.6	93.8
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3093	:	4150	:	38.2	:	15.5	:	53.6	:	247.1	:	46.4	115.7
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3095	:	4210	:	8.5	:	2.5	:	10.9	:	345.5	:	89.1	12.3
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I
I	M3100	:	4336	:	17.7	:	3.4	:	21.1	:	516.7	:	78.9	26.8
I	:	:	:	:	:	:	:	:	:	:	:	:	:	I

Samples taken after sidetracking

TABLE VII

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

I	IKU No.	DEPTH (m)	PRISTANE n-C17	PRISTANE PHYTANE	CPI	I
I						I
I	M9047	1780	.8	1.5	1.2	I
I	M279	2940	.9	2.0	1.1	I
I	M386	3120	1.0	1.6	1.0	I
I	M388	3170	1.1	2.0	1.1	I
I	M493	3240	1.2	2.3	1.2	I
I	M495	3300	.8	2.9	1.1	I
I	M497	3320	.6	2.6	1.1	I
I	M500	3350	.8	2.5	1.1	I
I	M502	3380	1.0	3.6	1.1	I
I	M505	3400	.7	3.2	1.1	I
I	M584	3440	.7	3.7	1.1	I
I	M588	3480	.8	3.8	1.1	I
I	M592	3520	.5	3.0	1.1	I
I	M596	3560	.5	1.8	1.1	I
I	M603	3630	.7	3.5	1.2	I
I	M607	3670	.7	3.6	1.1	I
I						I
I						I
I	After sidetracking					I
I	M1722	3520	.5	2.8	1.1	I
I	M1724	3580	.6	2.5	1.2	I
I	M1727	3670	.6	2.0	1.1	I
I	M3080	3760	.9	4.2	1.0	I
I	M3083	3850	.6	1.6	1.3	I
I	M3087	3970	.4	1.2	.8	I
I	M3088	4000	.4	1.3	3.3	I
I						I

**KU**

Vitrinite Reflectance measurements

TABLE NO.: VIII A
WELL NO.: 35/8-2

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
K-9047	1740-1780	0.39(20)	Green/yellow and yellow spores	Trace
K-9050	1860-1900	0.34(2), 0.63(1)	Green/yellow spores	Low
K-9054	2020-2060	0.50(5)	Low orange spores	Trace
K-9058	2160-2190	N.D.P.	Nil	Nil
K-9063	2310-2340	N.D.P.	Nil	Nil
K-9067	2430-2460	0.46(9)	Mid orange spores	Trace
M-267	2550-2580	0.63(4)	Nil	Nil
M-271	2670-2700	N.D.P.	Nil	Nil
M-275	2790-2830	0.53(8)	Nil	Nil
M-279	2910-2940	0.51(1), 0.86(11) 1.14(4)	Nil	Nil
M-385	3060-3090	0.48(3)	Low orange spores	Trace
M-388	3150-3170	0.56(22)	Yellow/orange and low orange spores	Moderate
M-493	3210-3240	0.50(21)	Mid orange spores	High
M-495	3270-3300	0.54(20)	Low orange and mid orange spores	High
M-497	3310-3320	0.52(21)	Mid orange and low orange spores	Moderate-high
M-499	3330-3340	0.50(20)	Low orange spores(?)	Trace(?)
M-503	3380-3390	0.62(20)	Mid orange spores	Trace

**KU**

Vitrinite Reflectance measurements

TABLE NO.: VIIIA
WELL NO.: 35/8-2

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-507	3420-3430	0.56(7)	Low orange spores	Moderate
M-586	3450-3460	0.46(20)	Low orange spore fragments(?)	Low
M-589	3480-3490	0.47(8)	Low orange spores	Low
M-1722	3490-3520	0.48(14)	Low orange spores	Trace
M-591	3500-3510	0.46(12)	Yellow and yellow/orange spores	High
M-593	3520-3530	0.50(9)	Yellow/orange spores	High
M-596	3550-3560	0.53(9)	Yellow/orange spores(?)	Trace(?)
M-1724	3550-3580	0.49(18)	Low orange spores	Trace
M-599	3580-3590	0.50(5)	Low orange spores and bitumen	Low
M-602	3610-3620	0.56(21)	Yellow/orange spores and low orange bitumen	Trace
M-1726	3610-3640	0.53(20)	Mid orange spores(?)	Trace(?)
M-605	3640-3650	0.55(20)	Mid orange spore(?)	Trace(?)
M-1727	3640-3670	0.49(16)	Mid orange spores(?)	Trace(?)
M-607	3660-3670	0.55(10)	Low orange spores(?)	Trace(?)
M-3080	3730-3760	0.60(20)	Deep orange spores and carbonate fluorescence	Trace
M-3080c (coal)	3730-3760	0.65(20)	Mid orange spores, orange algae(?), green resins(?)	Moderate-high
M-3081	3760-3790	0.60(18)	Low orange and mid orange spores and carbonate fluorescence	Trace

**KU**

Vitrinite Reflectance measurements

TABLE NO.: VIII A

WELL NO.: 35/8-2

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-3083	3820-3850	0.55(20)	Mid orange indistinct fluorescence	Nil
M-3085	3880-3910	0.59(12)	Mid orange spore	Trace
M-3087	3940-3990	0.62(18)	Mid orange spores	Trace
M-3088c (coal)	3970-4000	0.41(20) (Additive?)	Green, green/yellow and yellow spores	Moderate-high
M-3091	4060-4090	N.D.P.	Nil	Nil
M-3092	4090-4120	N.D.P.	Dull green minerals?	Nil
M-3093	4120-4150	N.D.P.	Dull green minerals	Nil
M-3094	4150-4180	N.D.P.	Nil	Nil
M-3095	4180-4210	0.64(5)	Bright orange from hydrocarbon speck	Nil
M-3097	4240-4270	0.65(4)	Carbonate fluorescence	Nil
M-3100	4330-4336	0.78(2)	Nil	Nil

**IKU**

Visual Kerogen Analysis

TABLE NO.: VIII B
 WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
K-9047	1740-1780	Cut,W,P,S,WR!/Am,Cy	F-M-L	good	1/1+	Early Tertiary pollen dominate. Abundant cuticles. Pyrite framboids. Fungi (spores and hyphae). Very small vitrinite fragments.
K-9050	1860-1900	?Am,Cy/Cut,P,W,WR!	F(M-L)	good	1/1+	Poor residue partly as above, partly darker colours, Early Tertiary cysts.
K-9054	2020-2060	Am,Cy/W,P,WR!	F(M-L)	good	1/1+, 2, 2/2+	As above.
K-9058	2160-2190	W,WR!,Cut,P/Am,Cy	F-M-L	good	1+/2-, 2	Thin cuticles, poorly preserved with adhering tricolporates. Fungi (hyphae and spores).

ABBREVIATIONS

Am Amorphous
He Herbaceous
Cut Cuticles

Cy Cysts, algae
P Pollen grains
S Spores

W Woody material
C Coal
R! Reworked.

F Fine
M Medium
L Large

**IKU**

Visual Kerogen Analysis

TABLE NO.: VIII B
 WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
K-9063	2310-2340	W,WR!,Cut/Am,Cy	F-M-L	good	1+2-, 2	
K-9067	2430-2460	W,WR,Cut/Am,Cy	F-(M)	fair	1+2-, 2-/2, 2+	Some aggregates and etched vitrinite. <u>Odontochitina</u> . Small vitrinite particles.
M-267	2550-2580	Am,Cy/W,WR!,P	F-(M)	fair	1+2-, 2-/2, 2/2+	Loose aggregates of amorphous material embedding mostly Early Tertiary cysts, thin walled but with dull colours. Rare Cretaceous spores. Variable colouring.
M-271	2670-2700	Am,Cy/W,WR!,P	F-(M)	fair	1+2-	Increase in etched vitrinite. Otherwise as above.

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**IKU**

Visual Kerogen Analysis

TABLE NO.: VIII B
 WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-275	2790-2820	W,WR!,P/Am,Cy	F-(M)	fair to good	1+/2-, 2-	Caved material suspected. Minerals. Increase in inertinite and pyrite content. Cysts are of variable preservation. ?An oxidative environment with reworking.
M-279	2910-2940	W,WR!,P,S/Am,Cy	F-(M)	fair to good	2-/2, 2	As above a poor residue.
M-385	3060-3090	W,WR!/Am,Cy	F(M)	good	1/1+, 1+/2-	As the above samples 2790-2940. Abundant etched vitrinite. Abundant pyrite framboids.

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 S Spores

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 R! Reworked

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 M Medium
 L Large



Visual Kerogen Analysis

TABLE NO.: V III B
WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-387	3120-3150	Cut,W,P,S,WR!/Am,Cy	F-M-L	fair	1/1+, 1+/2-	<u>Tasmanities</u> , <u>Cerebrop. macrov.</u> Aggregates mainly of sapropelised cuticle. Abundant pyrite.
M-388	3150-3170	Cut,W,P,S,WR!/Am,Cy	F-M-L	fair to poor	1+/2-, 2-/2	Fairly dense aggregates, composition as above.
M-493	3210-3240	Cut,W,P,S,WR!/Am,Cy	F-M-L	fair to poor	2-/2	Fairly dense aggregates.
M-495	3270-3300	W,Cut,WR!,P/Am,Cy	F-M-L	fair	2-/2	Pyritic aggregates looser than in 3120-3240, with a larger component of vitrinite and semi-fusinite/fusinite, inertinite.

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L Large

**IKU**

Visual Kerogen Analysis

TABLE NO.: VIII B

WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-497	3310-3320	W,WR!,P,Cut/Am,Cy	F(-M)	fair	2-/2	Small residue, relatively richer in vitrinite and inertinite than the samples above, and very rich in pyrite framboids. Some acid resistant minerals.
M-499	3330-3340	W,WR!,Cut,P/Am,Cy	F-M-L	fair to good	2	Loose aggregates of mixed land plant remains. Semi-fusinite is striking together with vitrinite and reworked woody material.
M-503	3380-3390	W,WR!,Cut,P/Am,Cy	F-M-L	fair to good	2	Loose strongly pyritic aggregates.

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 P Pollen grains
 S Spores

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 L Large



Visual Kerogen Analysis

TABLE NO.: VIII B
WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-507	3420-3430	Cut,W,P,S/Am,Cy	F-M-L	fair to good	2	Loose pyritic aggregates of sapropelised land plants, mainly cuticles and vitrinite.
M-586	3450-3460	Cut,W,P/Am,Cy	F-M-L	fair to poor	2	Stronger aggregates, but pyritic and composition as above. Perhaps an increase in vitrinite.
M-589	3480-3490	Cut,W,P,WR!/Am	F-M	poor	2-/2, 2	Loose aggregates mostly of finely fragmented former structured material. Embedded abundant pyrite framboids. Small vitrinite particles.

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**IKU**

Visual Kerogen Analysis

TABLE NO.: V 111 B

WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-591	3500-3510	Cut,W,P,WR!/Am	F-M	poor to fair	2-/2, 2	As 3480-90m
M-593	3520-3530	Cut,W,P,WR!/Am	F-M	poor to fair	2-/2, 2+	As above.
M-1722	3520	Cut,W,P,WR!/Am	F-M-L	poor to fair	2-/2, 2+	Denser more pyritic aggregates than in the above interval. Richer in pollen.
M-596	3550-3560	Cut,W,P,S/Am	F-M-L	poor	2-/2, 2+	Increase in spores compared with 3520-30m. Variable colours. Strong decay.

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Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-1723	3550 clst.dk. gy.	Cut,W,P,S,WR!/Am	F-M-L	fair to poor	2/2+	Smaller residue, different preservation. Increase in vitrinite, some of it is etched. Pyrite framboids.
M-1723	3550	Cut,W,P,S,WR!/Am	F-M-L	poor	2-/2, 2	
M-599	3580- 3590	Cut,W,P,S,WR!/Am	F-M	poor	2-/2, 2+	Small residue. Colours are very variable. Composition as 3550-60m.
M-1724	3580	Cut,W,P,WR!/Am,Cy	F-M-L	poor to fair	2-/2, 2+	Small residue increase in fair sized vitrinite fragments. Pyrite framboids.

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Cut Cuticles

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C Coal
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L Large

**IKU**

Visual Kerogen Analysis

TABLE NO.: VIII B
 WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-602	3610-3620	W,Cut,WR!,P/Am	F-M-L	poor	2, 2/2+	Dispersed material or aggregates with abundant pyrite. Spropelised material (cuticles) and etched vitrinite fragments. Acid resistant minerals. Fungi.
M-1726	3640	Cut,W,WR!,P,S/Am	F-M-L	poor	2-/2, 2+	Aggregates with flaky structured or spropelised structured material (cuticles).
M-605	3640-3650	Cut,W,P,WR!/Am,Cy	F-M-L	poor to fair	2, 2/2+	Pyritic sample. Thin strongly spropelised remains. Fungal activity (hyphae).

ABBREVIATIONS

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 Cut Cuticles

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 P Pollen grains
 S Spores

W Woody material
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 R! Reworked

F Fine
 M Medium
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Visual Kerogen Analysis

TABLE NO.: VIII B
WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-607	3660-3670	W,WR!,Cut,P/Am,Cy	F-(M)	poor	2, 2/2+	Aggregates with flaky structure. Vitrinite dominates woody matter but there is also semifusinite.
M-1727	3670	W,WR!,Cut,P,S/Am	F-M-L	poor	2-/2, 2	Semifusinite/fusinite is the dominant woody group.
M-3080	3760	W,WR!,Cut,P,S/Am	F-M-L	poor	2-/2, 2/2+	Aggregates; stronger more variable colouring. More of reworked/oxidised woody material than in the interval above.
M-3087	3970	*W,WR!,Cut,P,R	M-L	poor	2/2+, 2+	*Only tough fragments of cuticles and woody material from an oxidative environment.

ABBREVIATIONS

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Cut Cuticles

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S Spores

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Visual Kerogen Analysis

TABLE NO.: VIII B
WELL NO.: 35/8-2

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-3094	4180	*W,WR!,Cut,R,S,P	M-L	poor to good	2/2+	*Bright coloured woody/coaly material, mainly vitrinite and semifusinite dominates. Spores relatively abundant. <u>Tasmanitids</u> . Resin.
M-3095	4210	*W,WR!,Cut,S,R/B,Am	M-L	poor to fair	2/2+	* <u>Botryococcus</u> is abundant. Resemblance with 4180m some amorphous dark aggregates.
M-3100	4336	*W,WR,S,R,Cut/Am	F-M-L	good	2/2+, 2+	*Well preserved spores. Large coaly fragments. Some amorphous dark aggregates.

ABBREVIATIONS

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Cut Cuticles

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P Pollen grains
S Spores

W Woody material
C Coal
R! Reworked

F Fine
M Medi
L Large

TABLE IX

ROCK EVAL PYROLYSES

IKU No.	DEPTH (m)	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT S1+S2	PROD. INDEX S1+S2	TEMP. max (C)
M383	3030	.12	.16	.63	.71	23	89	.28	.43	432
		Clst								
M385	3090	.15	.55	.86	.77	71	112	.70	.21	432
		Clst								
M386	3120	1.56	17.42	.51	4.40	396	12	18.98	.08	429
M387	3150	2.79	21.68	.70	6.37	340	11	24.47	.11	427
M388	3170	2.90	21.05	.52	5.75	366	9	23.95	.12	430
M389	3210	2.97	21.69	.48	5.96	364	8	24.66	.12	431
M493	3240	2.35	15.80	.66	6.26	252	11	18.15	.13	432
M494	3270	1.80	7.85	1.03	4.67	168	22	9.65	.19	433
M495	3300	1.15	4.83	2.68	3.41	142	79	5.98	.19	436
M496	3310	1.16	6.11	1.17	3.37	181	35	7.27	.16	435
		Clst	dk sy							
M496	3310	1.04	2.81	4.86	2.52	112	193	3.85	.27	438
		Clst	bn-sy							
M497	3320	1.63	10.14	1.04	4.10	247	25	11.77	.14	433
		Clst								
M497	3320	1.05	1.00	2.32	2.46	41	94	2.05	.51	439
		Clst	bn-sy							
M498	3330	1.40	9.03	.95	4.15	218	23	10.43	.13	433
		Clst								
M499	3340	.38	.77	.50	4.77	16	10	1.15	.33	438
M500	3350	1.27	4.08	.78	4.61	89	17	5.35	.24	437
M501	3370	.77	2.96	.60	3.07	96	20	3.73	.21	434
M502	3380	.61	2.42	.32	2.82	86	11	3.03	.20	436
M503	3390	.54	1.96	.49	2.53	77	19	2.50	.22	436
M504	3400	.67	1.81	.52	2.12	85	25	2.48	.27	436
		Clst								
M505	3410	.63	3.88	.20	2.04	190	10	4.51	.14	435
		Clst	dk sy							
M505	3410	.24	.18	4.63	.76	24	609	.42	.57	440
		Clst								
M506	3420	.80	2.85	.89	1.32	216	67	3.65	.22	432
		Clst								
M507	3430	1.01	3.76	1.11	2.24	168	50	4.77	.21	433
		Clst								
M584	3440	.93	5.87	.37	2.58	228	14	6.80	.14	437

TABLE IX

ROCK EVAL PYROLYSES

IKU No.	DEPTH (m)	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT	PROD. INDEX S1	TEMP. max (C)
M585	3450	.71	4.03	.64	2.02	200	32	4.74	.15	441
M586	3460	.89	5.79	.37	2.51	231	15	6.68	.13	442
M587	3470	.78	4.31	.65	2.22	194	29	5.09	.15	444
M588	3480	1.01	7.43	.48	2.68	277	18	8.44	.12	439
M589	3490	.76	4.70	1.22	2.25	209	54	5.46	.14	441
M590	3500	1.20	6.60	1.46	2.72	243	54	7.80	.15	438
M591	3510	1.18	7.23	.70	2.73	265	26	8.41	.14	439
M592	3520	2.45	23.34	.86	5.40	432	16	25.79	.09	438
M593	3530	1.22	9.17	1.39	3.08	298	45	10.39	.12	437
M594	3540	.73	3.88	2.09	2.03	191	103	4.61	.16	443
M595	3550	1.16	7.05	1.03	2.47	285	42	8.21	.14	438
M595	3550	.74	4.06	1.54	2.23	182	69	4.80	.15	440
M596	3560	1.06	5.59	.72	2.41	232	30	6.65	.16	436
M597	3570	.74	2.72	.46	1.92	142	24	3.46	.21	438
M598	3580	.76	3.53	.69	2.12	167	33	4.29	.18	439
M599	3590	.92	4.34	.51	2.20	197	23	5.26	.17	439
M600	3600	.86	3.33	1.20	2.44	136	49	4.19	.21	436
M601	3610	.97	4.59	.80	2.77	166	29	5.56	.17	437
M602	3620	.86	2.18	1.26	3.10	70	41	3.04	.28	440
M603	3630	1.03	3.46	1.62	3.18	109	51	4.49	.23	437
M604	3640	.99	2.68	1.87	3.46	77	54	3.67	.27	440
M605	3650	.72	1.94	1.52	3.11	62	49	2.66	.27	441
M606	3660	.84	3.10	1.63	3.46	90	47	3.94	.21	439
M607	3670	.86	3.01	2.64	4.23	71	62	3.87	.22	441

TABLE IX
ROCK EVAL PYROLYSES

IKU No.	DEPTH (m)	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT	PROD. INDEX	TEMP. max
									S1	S1+S2
M1722	3520	2.61	18.20	.49	4.46	408	11	20.81	.13	441
M1723	3550	2.58	23.33	.68	4.59	508	15	25.91	.10	441
M1723	3550	Clst	dk sy	.87	3.11	215	28	7.92	.16	438
M1724	3580	1.04	4.42	1.20	2.34	189	51	5.46	.19	439
M1725	3610	1.21	6.35	.94	2.71	234	35	7.56	.16	440
M1726	3640	1.47	4.68	1.44	3.96	118	36	6.15	.24	438
M1727	3670	1.34	5.36	2.71	4.30	125	63	6.70	.20	444
M3080	3760	1.12	4.27	1.28	3.39	126	38	5.39	.21	444
M3081	3790	.81	2.81	2.93	2.79	101	105	3.62	.22	446
M3083	3850	1.13	4.12	1.80	3.92	105	46	5.25	.22	443
M3085	3910	.79	2.25	.92	2.05	110	45	3.04	.26	442
M3087	3970	.73	1.38	.76	.95	145	80	2.11	.35	440
M3091	4090	.28	.61	.62	1.39	44	45	.89	.31	409
M3092	4120	.51	.98	.61	1.57	62	39	1.49	.34	408
M3093	4150	.43	.85	.68	1.12	76	61	1.28	.34	418
M3094	4180	1.42	1.99	1.72	1.63	122	106	3.41	.42	423
M3095	4210	1.97	4.11	2.73	2.48	166	110	6.08	.32	419
M3097	4270	.91	5.40	2.63	3.02	179	87	6.31	.14	424
M3100	4336	.33	1.15	1.05	.80	144	131	1.48	.22	426

Samples taken after sidetracking

TABLE IX
ROCK EVAL PYROLYSES

I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT	PROD. INDEX S1	TEMP. max (C)
I	No.	(m)				(%)			S1+S2	S1+S2	
I	M4720	3958	.29	.66	.50	.68	97	74	.95	.31	445
I	M4721	3971	.09	.06	.36	.17	35	212	.15	.60	431
I	M4722	3995.5	.28	.32	.25	.46	70	54	.60	.47	463
I	M4723	4020.5	.22	.06	.54	.19	32	284	.28	.79	295
I	M4724	4049.5	.22	.15	.68	.35	43	194	.37	.59	382
I	M4725	4075.5	.33	.24	.52	.36	67	144	.57	.58	433
I	M4726	4088.5	.63	1.13	.45	1.59	71	28	1.76	.36	456
I	M4727	4121.5	.81	1.85	.52	1.90	97	27	2.66	.30	455
I	M4728	4147.5	.50	.83	.46	.86	97	53	1.33	.38	444
I	M4729	4185.5	.34	.34	.65	.59	58	110	.68	.50	452
I	M4730	4200.5	.24	.53	.57	.60	88	95	.77	.31	434
I	M4731	4227.5	.08	.15	.49	.32	47	153	.23	.35	393
I	M4732	4268.5	.31	.70	1.43	.45	156	318	1.01	.31	405
I	M4733	4276.5	.30	1.10	1.25	.49	224	255	1.40	.21	409
I	M4734	4310	.15	.32	.60	.26	123	231	.47	.32	406
I	M4735	4328.5	.22	.48	.67	.28	171	239	.70	.31	458
I	M4736	4330.5	.13	.61	.65	.39	156	167	.74	.18	455

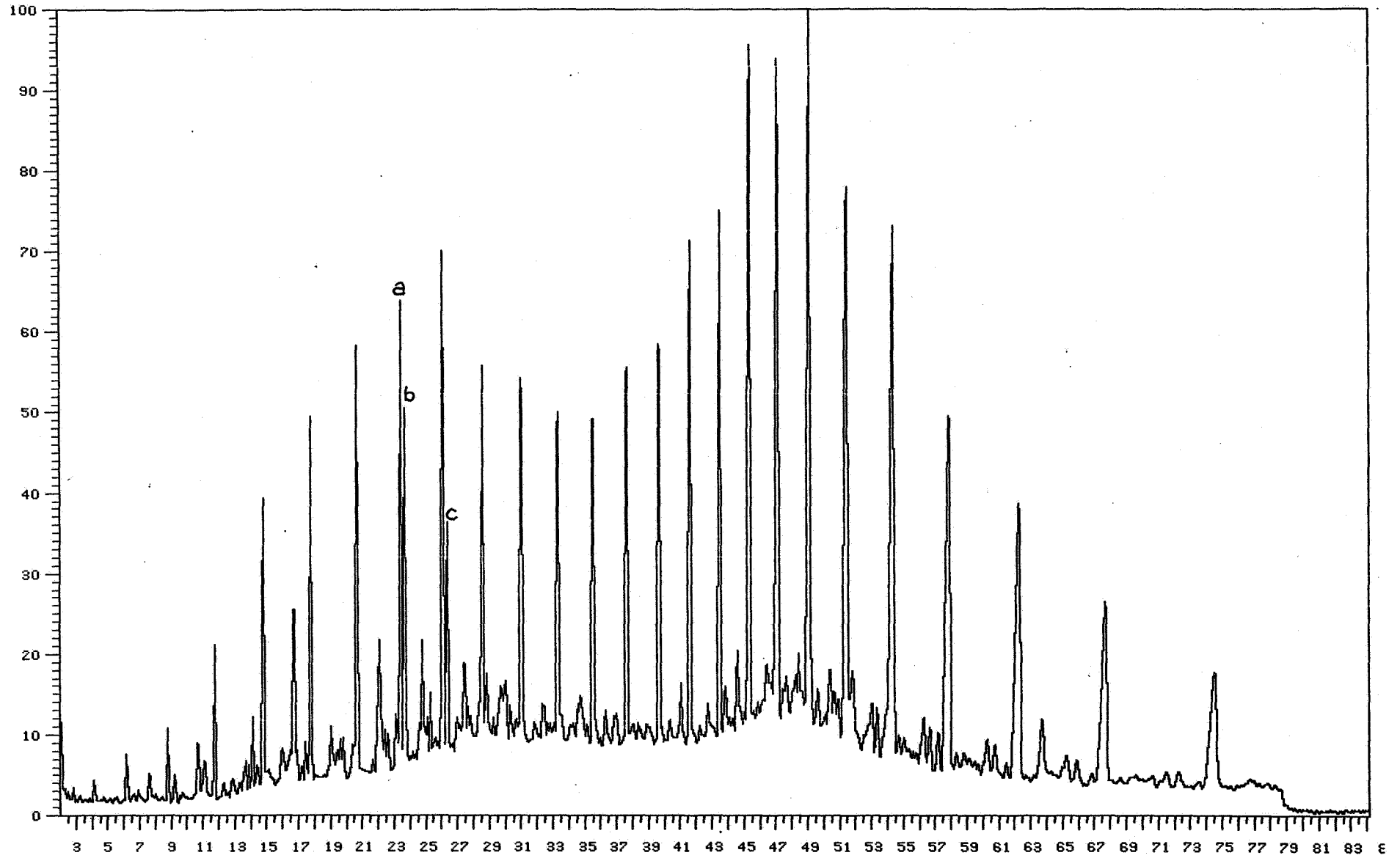
Sidewall core samples

GAS CHROMATOGRAPHIC ANALYSIS
SATURATED HYDROCARBONS

Key: a = nC₁₇
 b = pristane
 c = phytane

Analysis : M9047SATOTV Sample #: 1 Injection #: 1
Sample Name : GULF,K-9047,SAT Maximum value : 9361

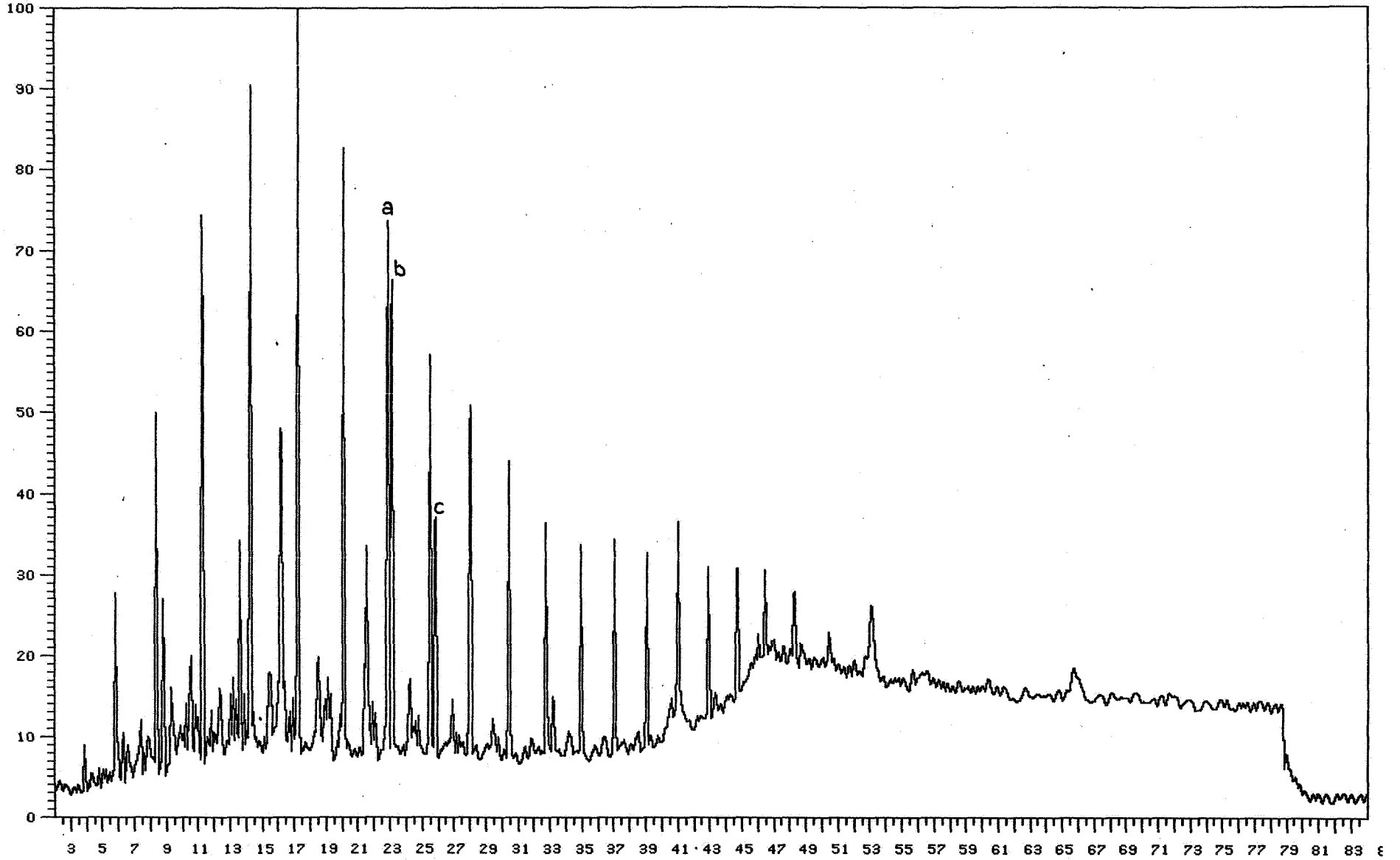
SATURATED HYDROCARBONS 1740-1780 M



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF2TV Sample #: 1 Injection #: 1
Sample Name : M-279, SAT Maximum value : 2486

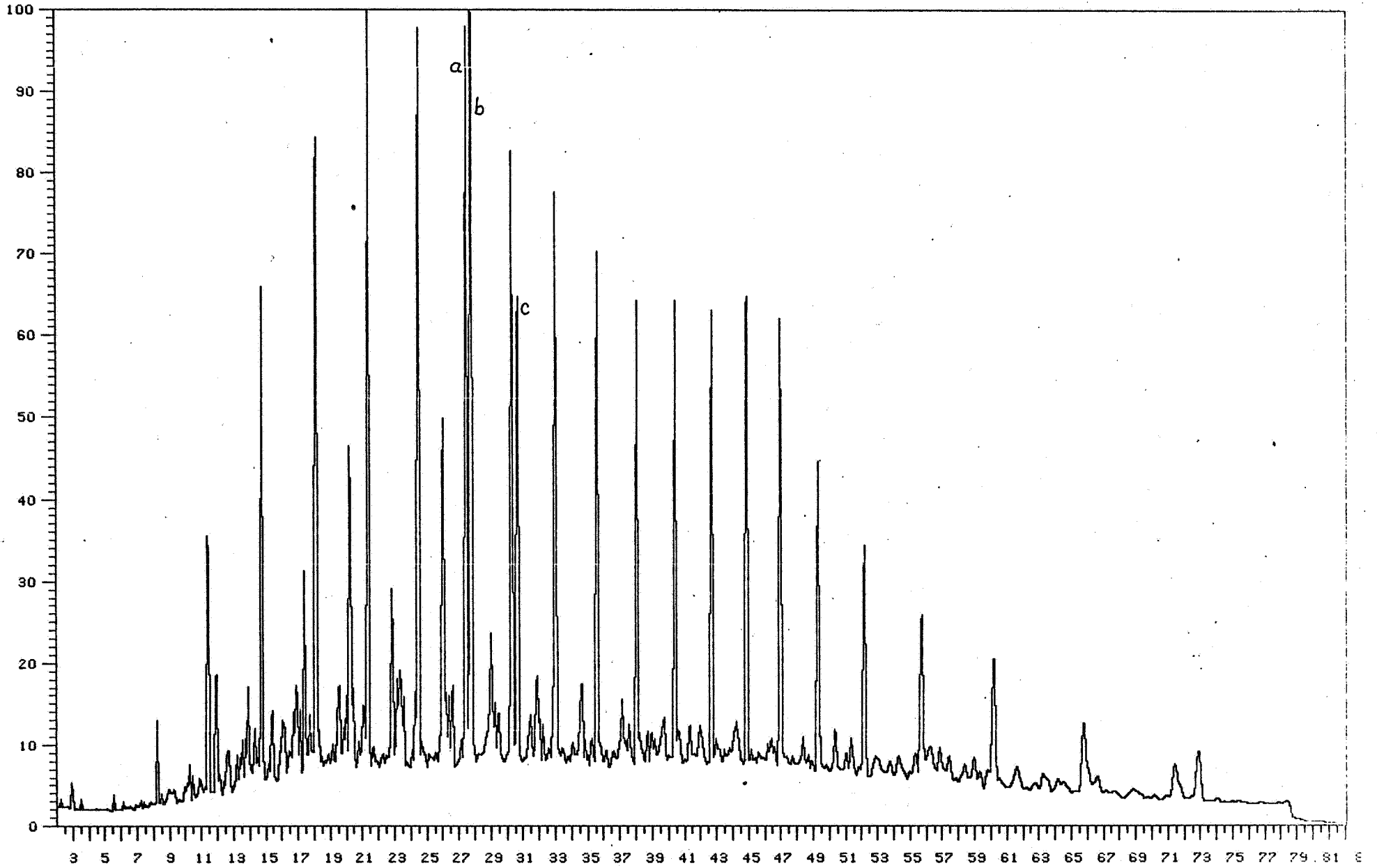


3090 - 3120 m

Box 1 of 1

RAW DATA PLOT-CHANNEL 6

Analysis : M386SAT0TV Sample #: 1 Injection #: 1
Sample Name : M-386,SAT Maximum value : 4012



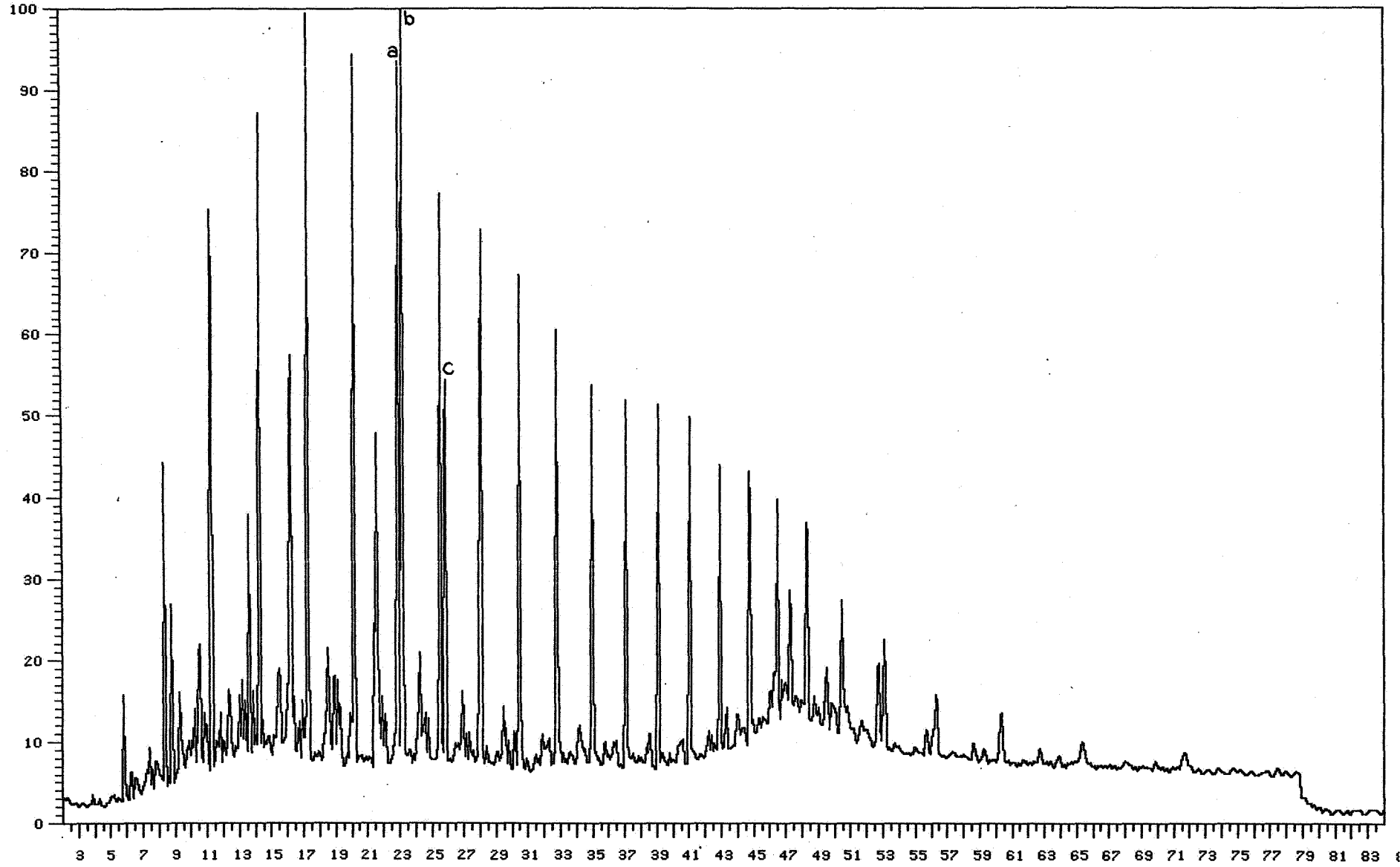
SATURATED HYDROCARBONS

3150-3170M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-388, SAT
Sample #: 2 Injection #: 1
Maximum value.: 5034

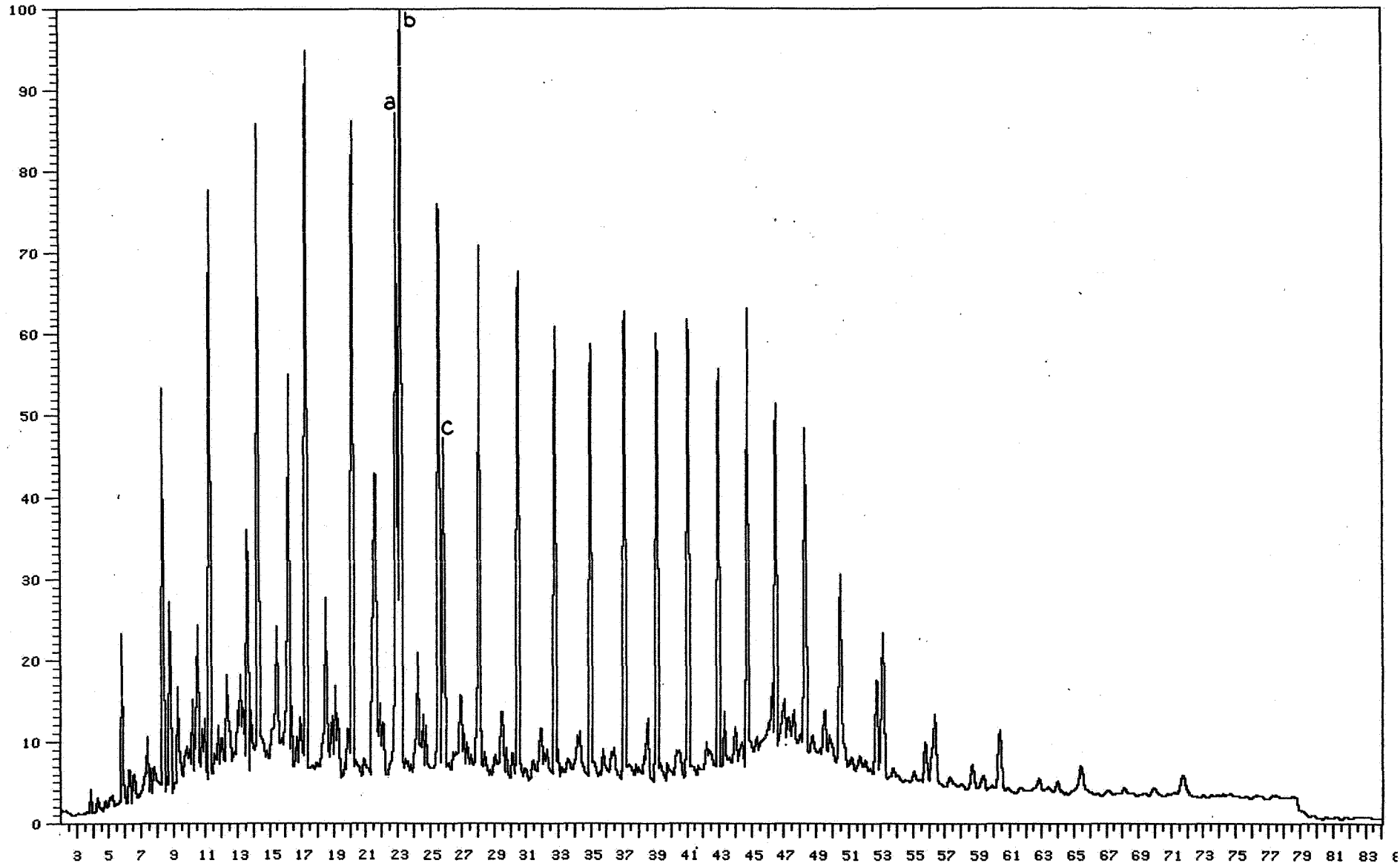


SATURATED HYDROCARBONS

3210-3240 M

RAW DATA PLOT-CHANNEL 5 Box 1 of 1

Analysis : GULF3TV Sample #: 3 Injection #: 1
Sample Name : M-493, SAT Maximum value : 9631



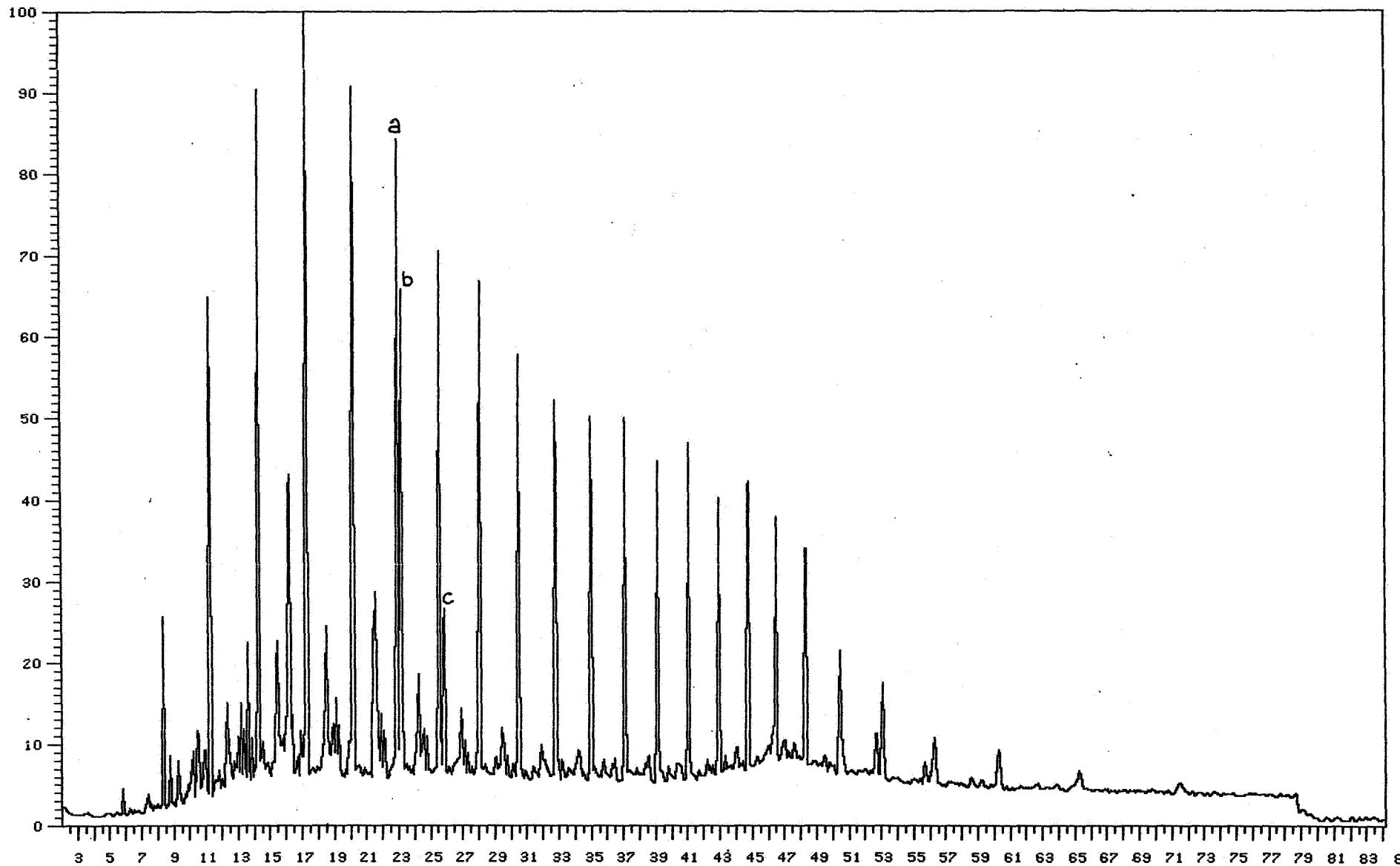
SATURATED HYDROCARBONS

3270-3300 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

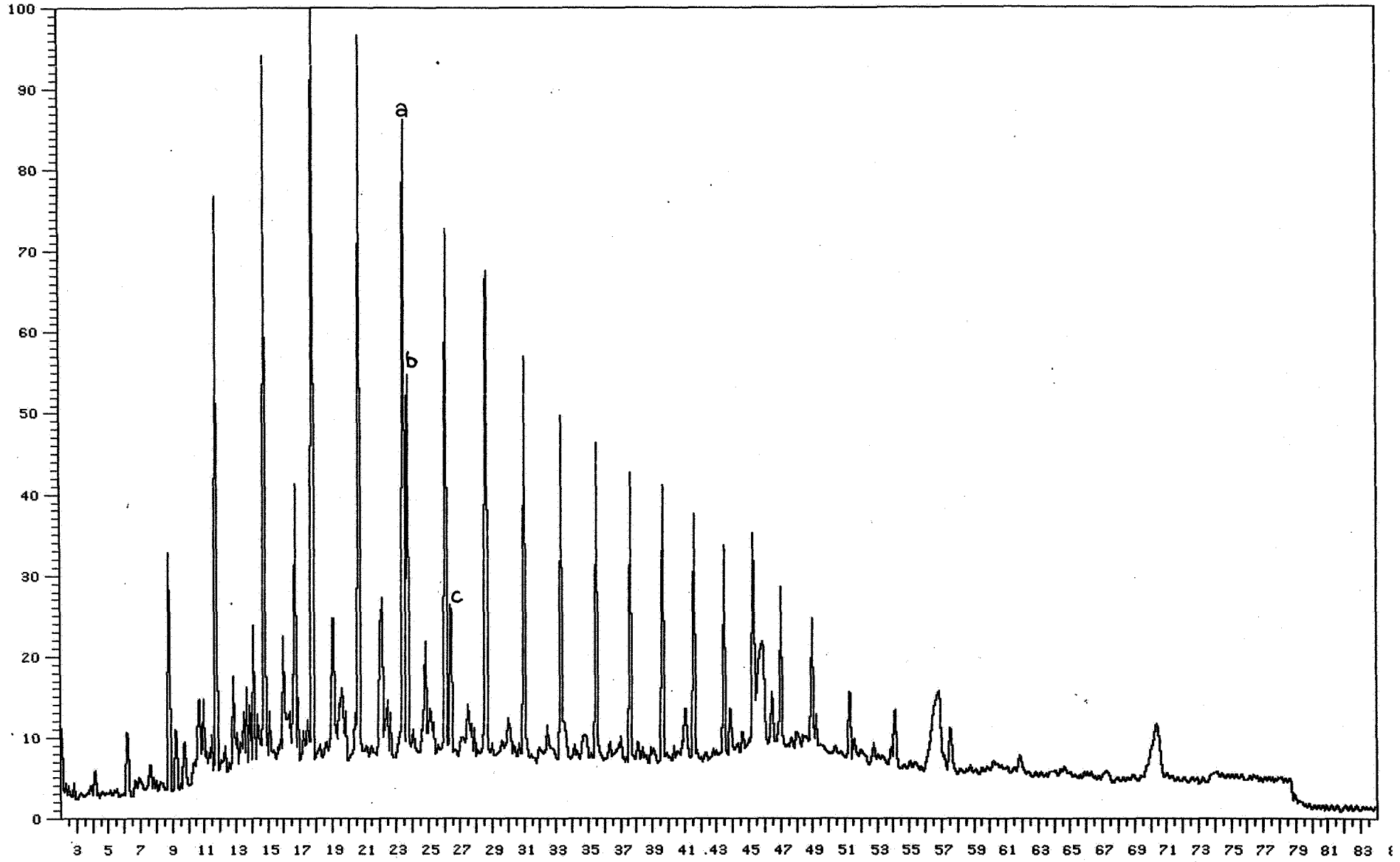
Analysis : GULF3TV
Sample #: 4 Injection #: 1
Sample Name : M-495,SAT
Maximum value : 7322



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF5TV
Sample Name : M-497, SAT
Sample #: 1 Injection #: 1
Maximum value : 5449



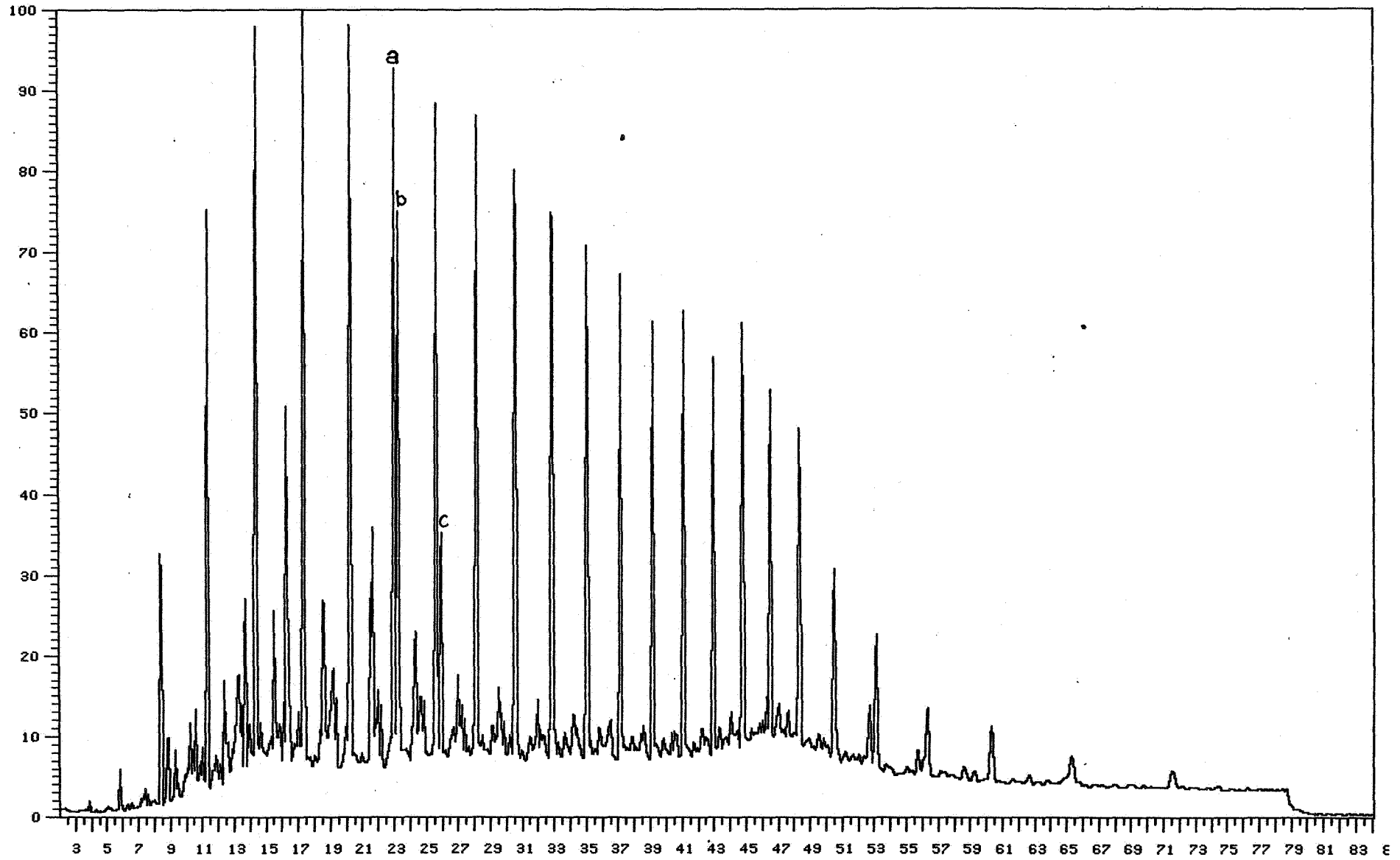
SATURATED HYDROCARBONS

3340-3350 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

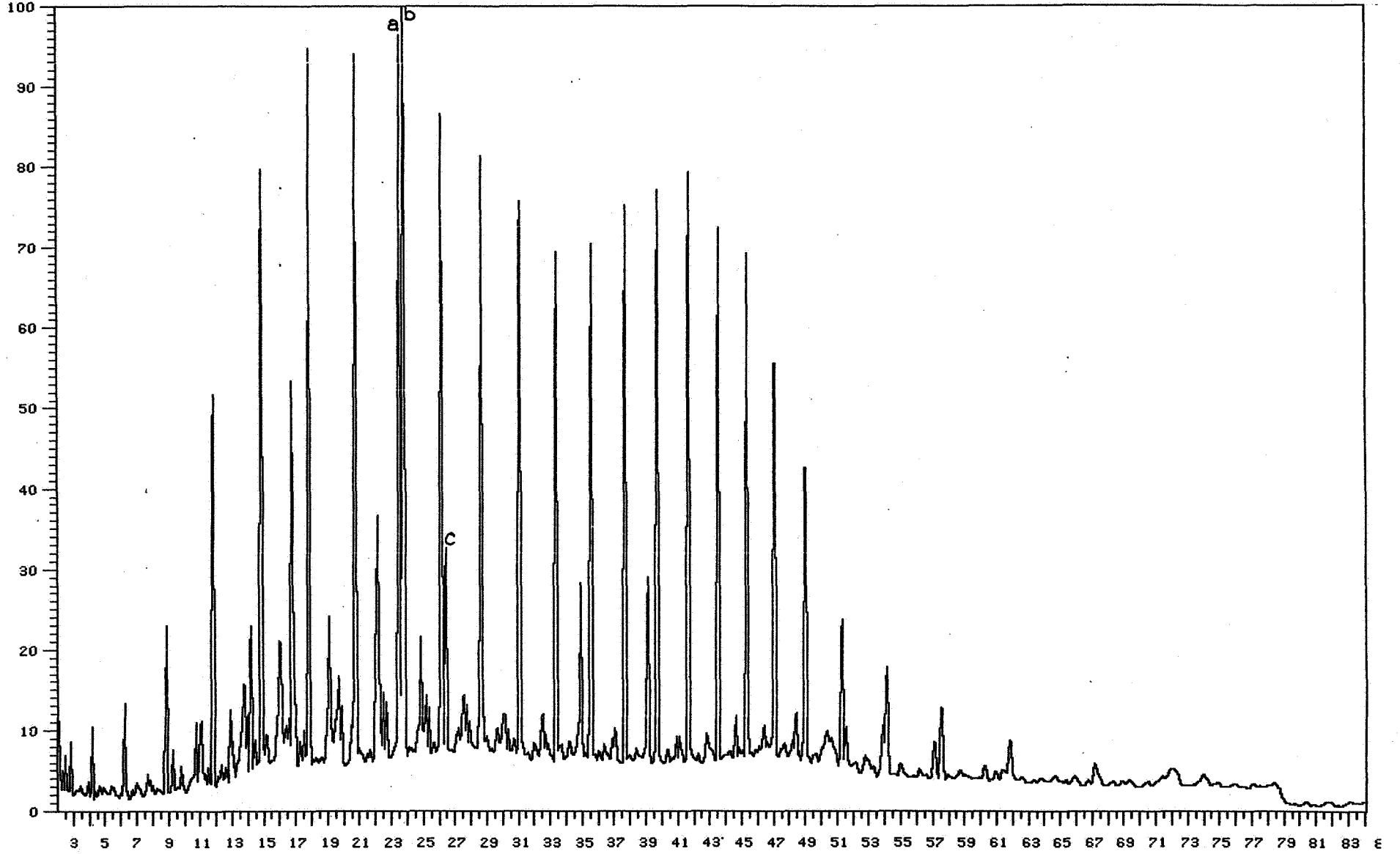
Analysis : GULF2TV
Sample #: 6 Injection #: 1
Sample Name : M-500, SAT
Maximum value : 11149



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF5TV Sample #: 2 Injection #: 1
Sample Name : M-502,SAT Maximum value : 7329



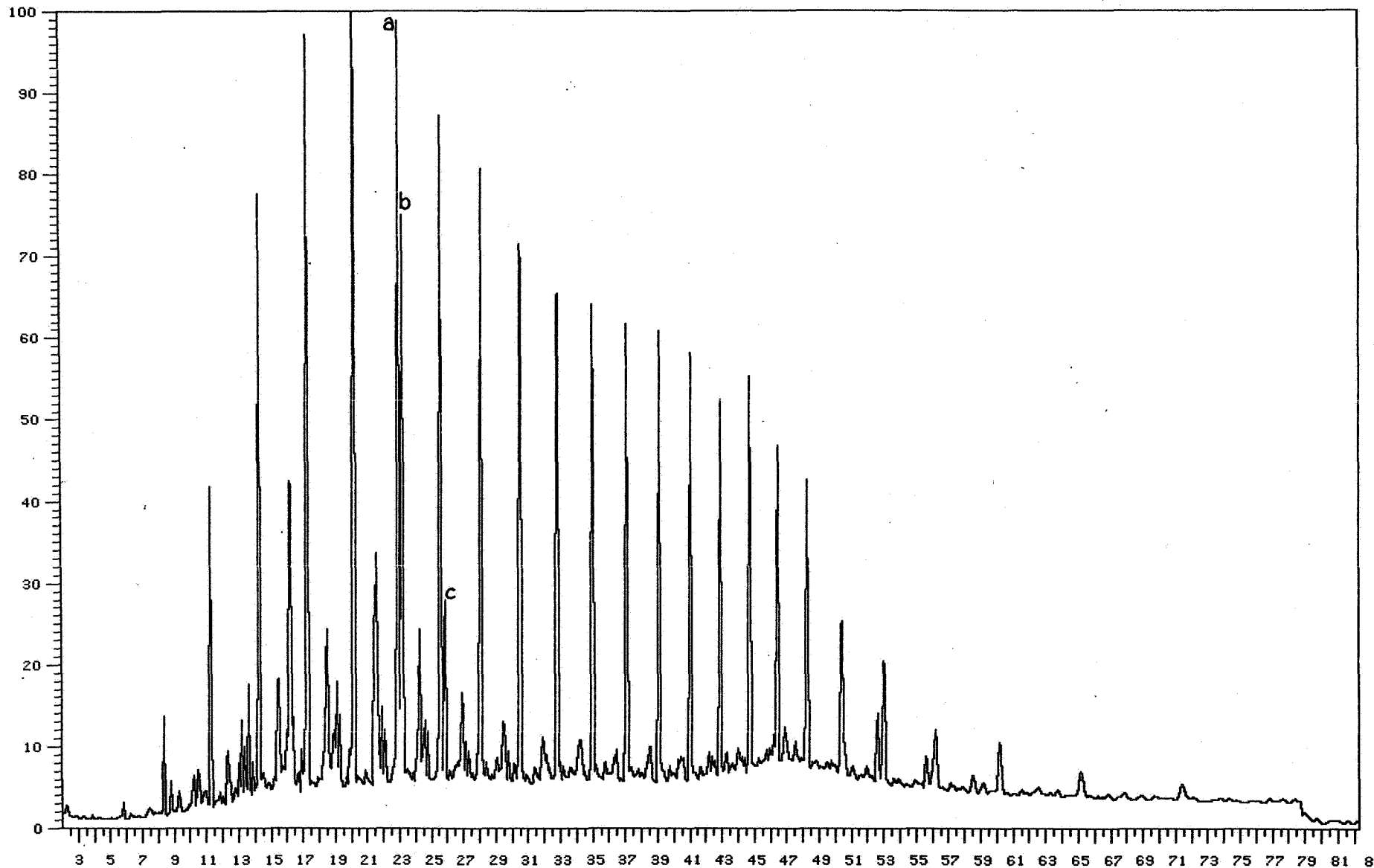
SATURATED HYDROCARBONS

3400-3410 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample #: 5 Injection #: 1
Sample Name : M-505,SAT
Maximum value : 8010



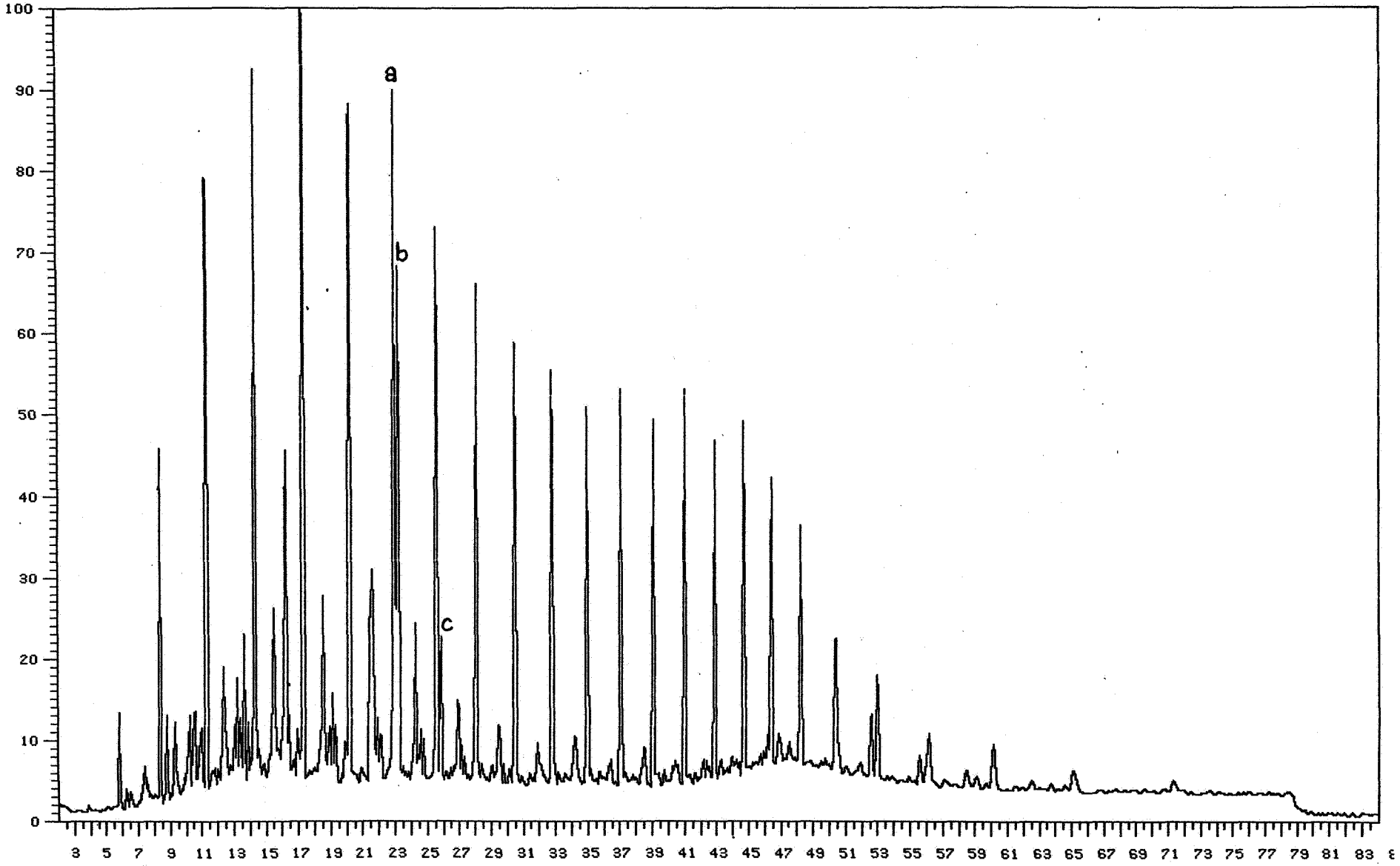
SATURATED HYDROCARBONS

3430-3440 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #: 6 Injection #: 1
Sample Name : M-584,SAT Maximum value : 8196



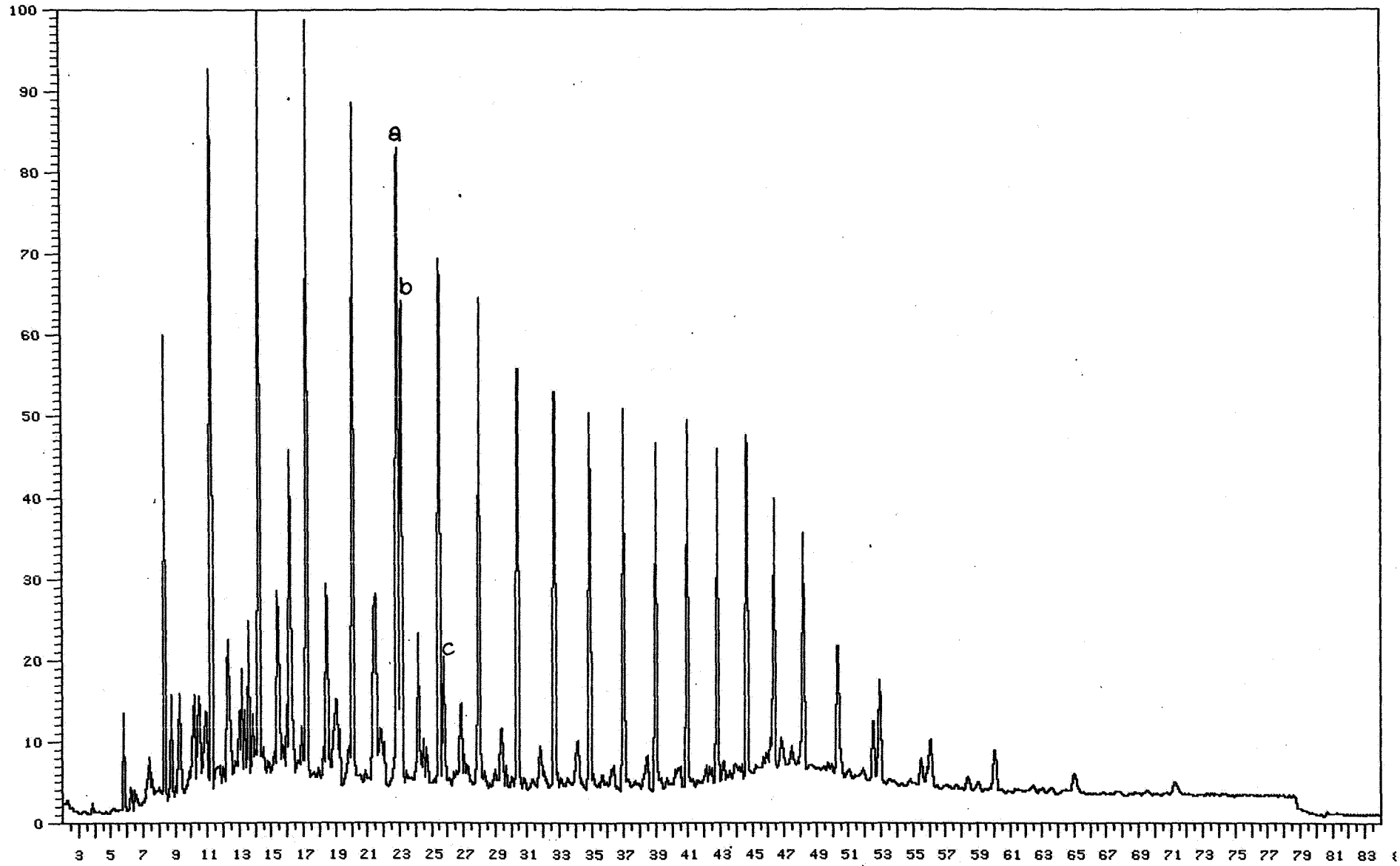
SATURATED HYDROCARBONS

3470-3480 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-588,SAT
Sample #: 7 Injection #: 1
Maximum value : 8557



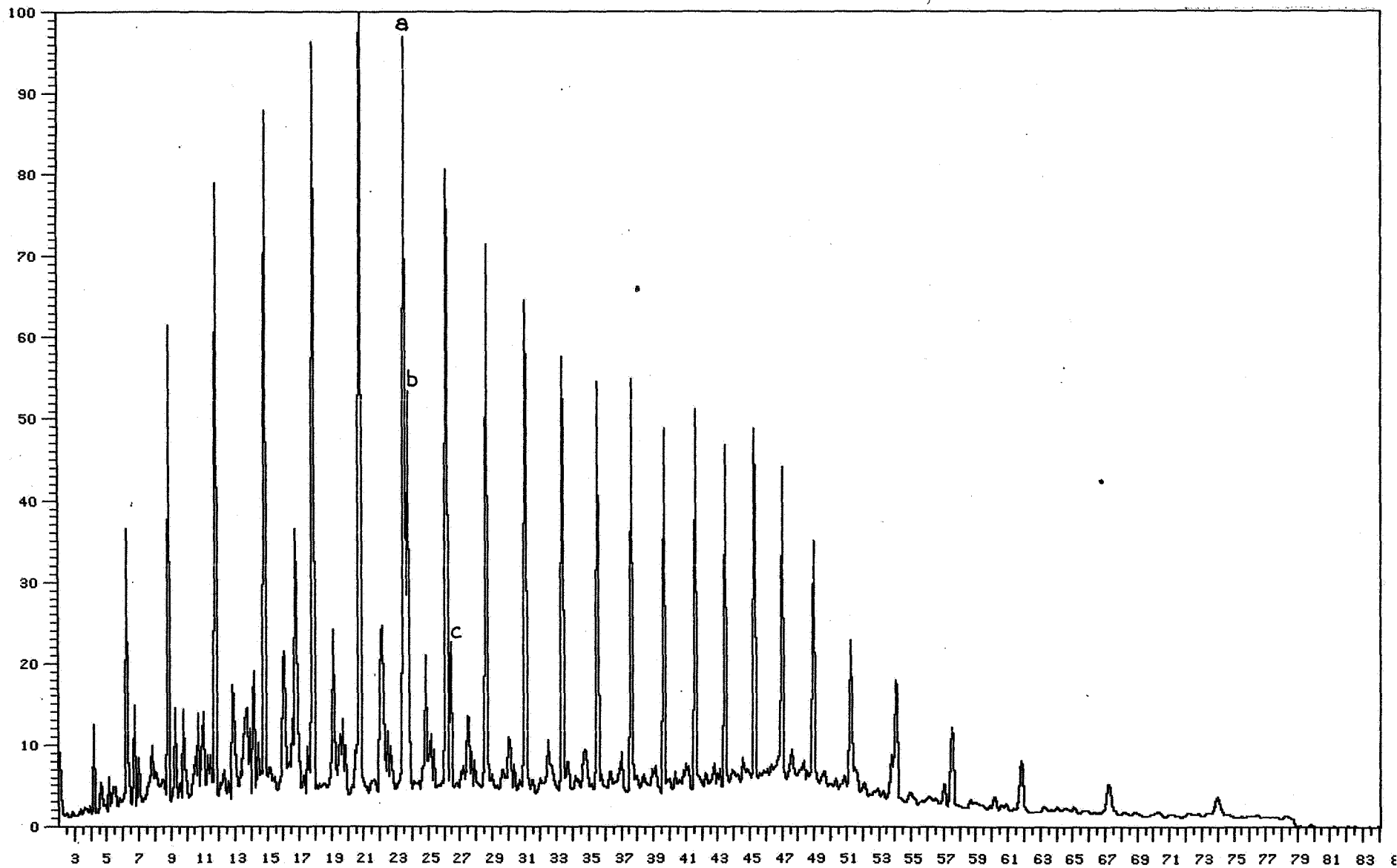
SATURATED HYDROCARBONS

3490-3520 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 1 Injection #: 1
Sample Name : M-1722,SAT Maximum value : 9477



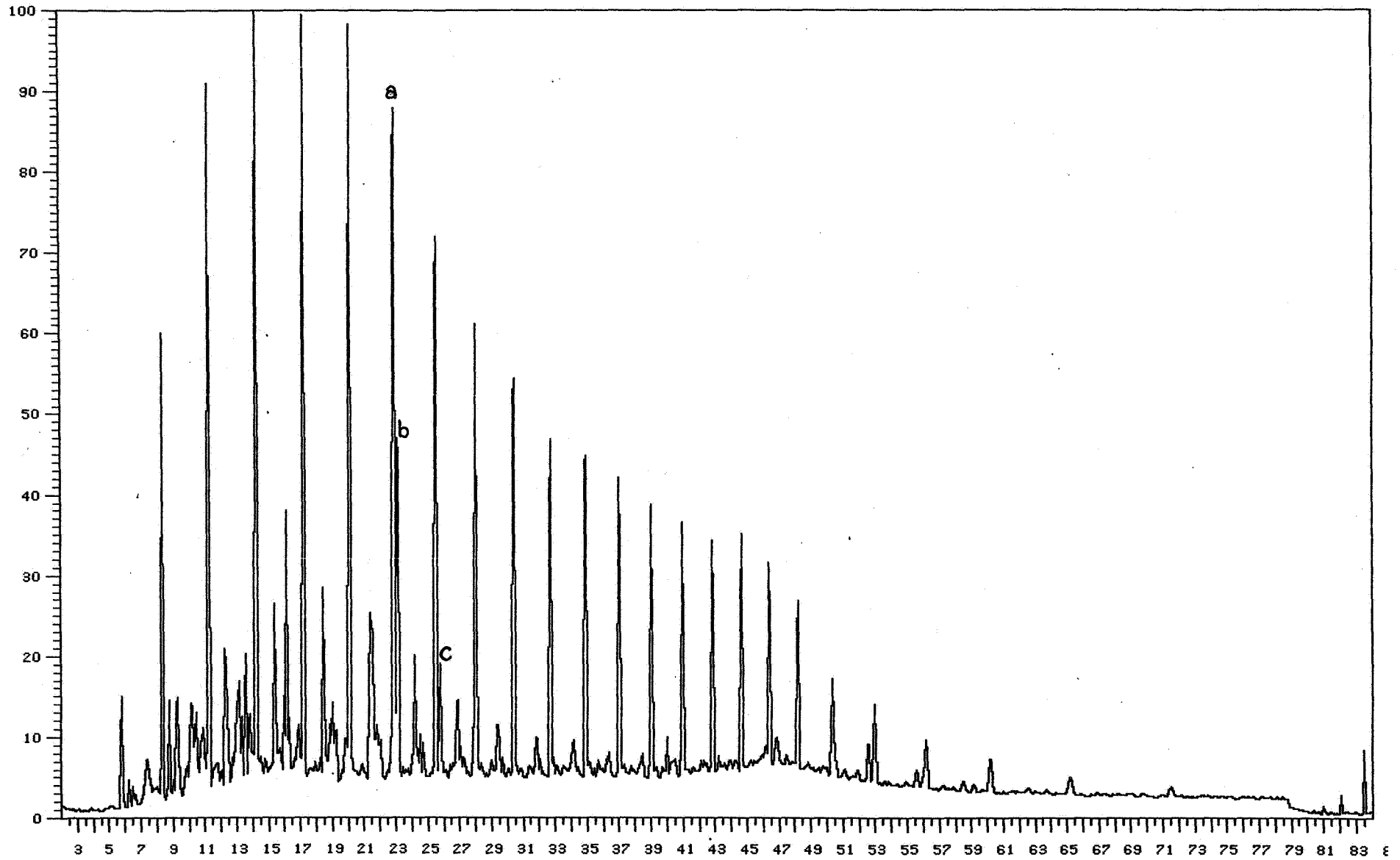
SATURATED HYDROCARBONS

3510-3520 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-592,SAT
Sample #: 8 Injection #: 1
Maximum value : 11503



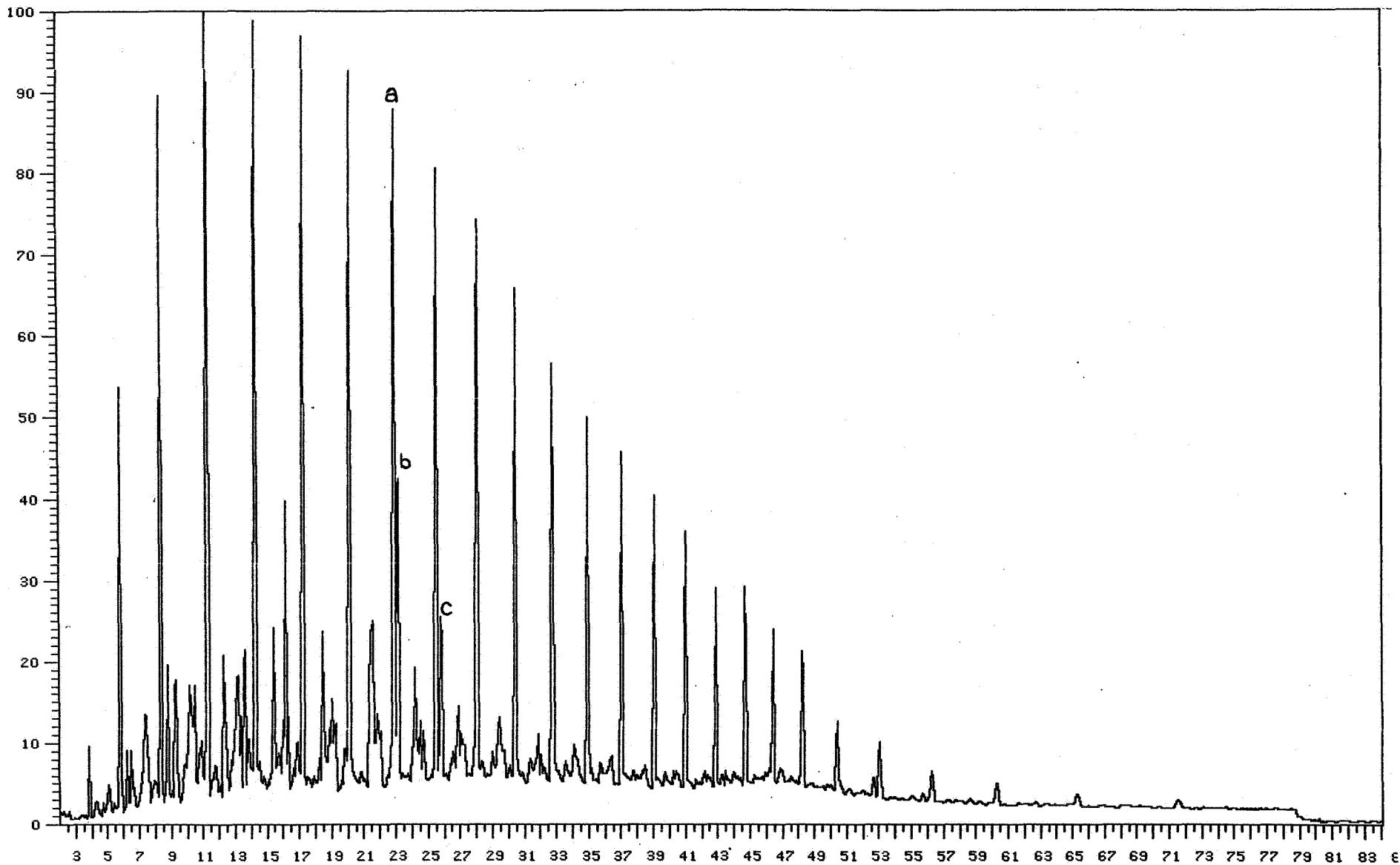
SATURATED HYDROCARBONS

3550-3560 M

Box 1 of 1

RAW DATA PLOT - CHANNEL 5

Analysis : GULF3TV Sample #: 9 Injection #: 1
Sample Name : M-596, SAT Maximum value : 14228



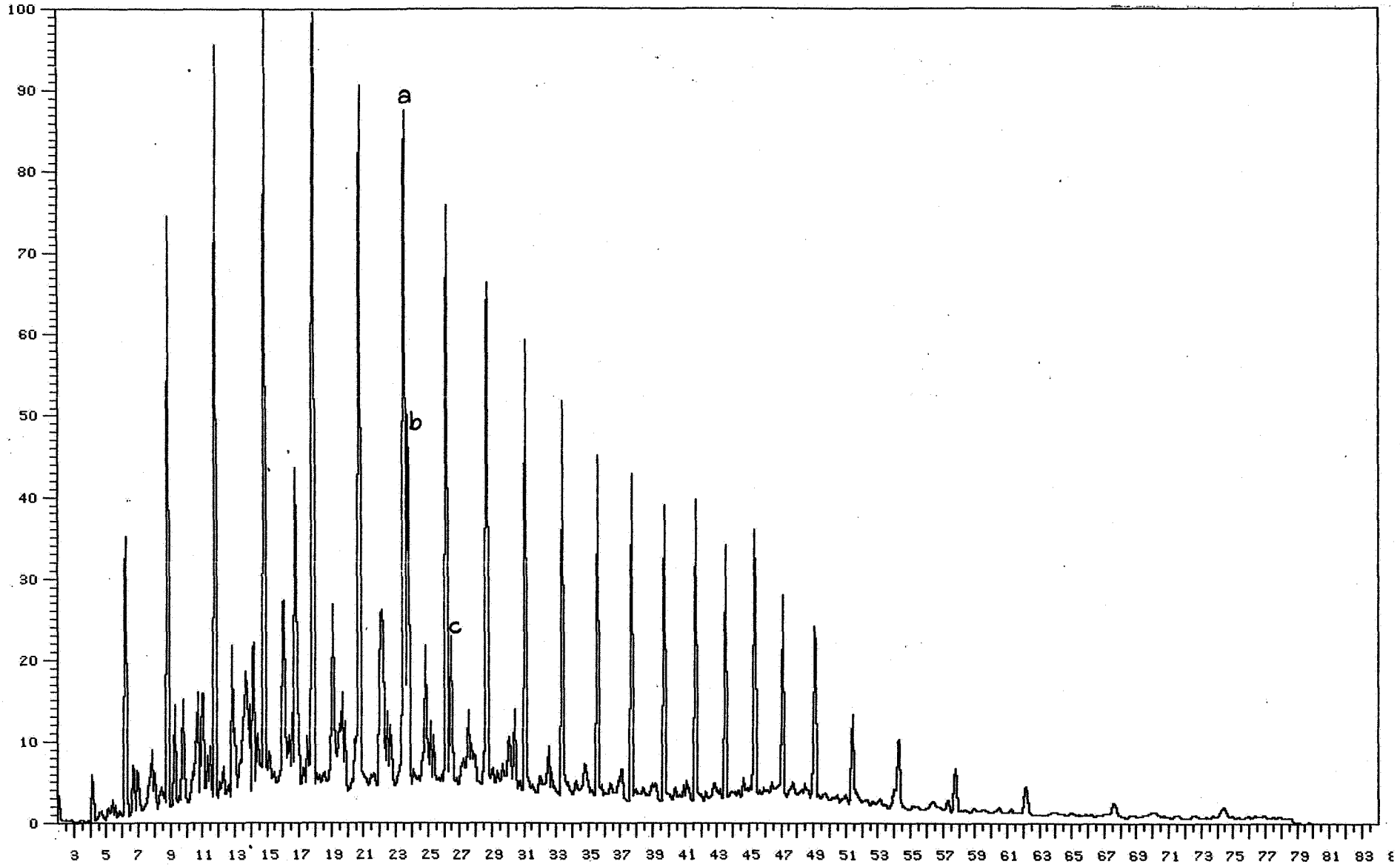
SATURATED HYDROCARBONS

3550-3580 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 2 Injection #: 1
Sample Name : M-1724, SAT Maximum value : 14469



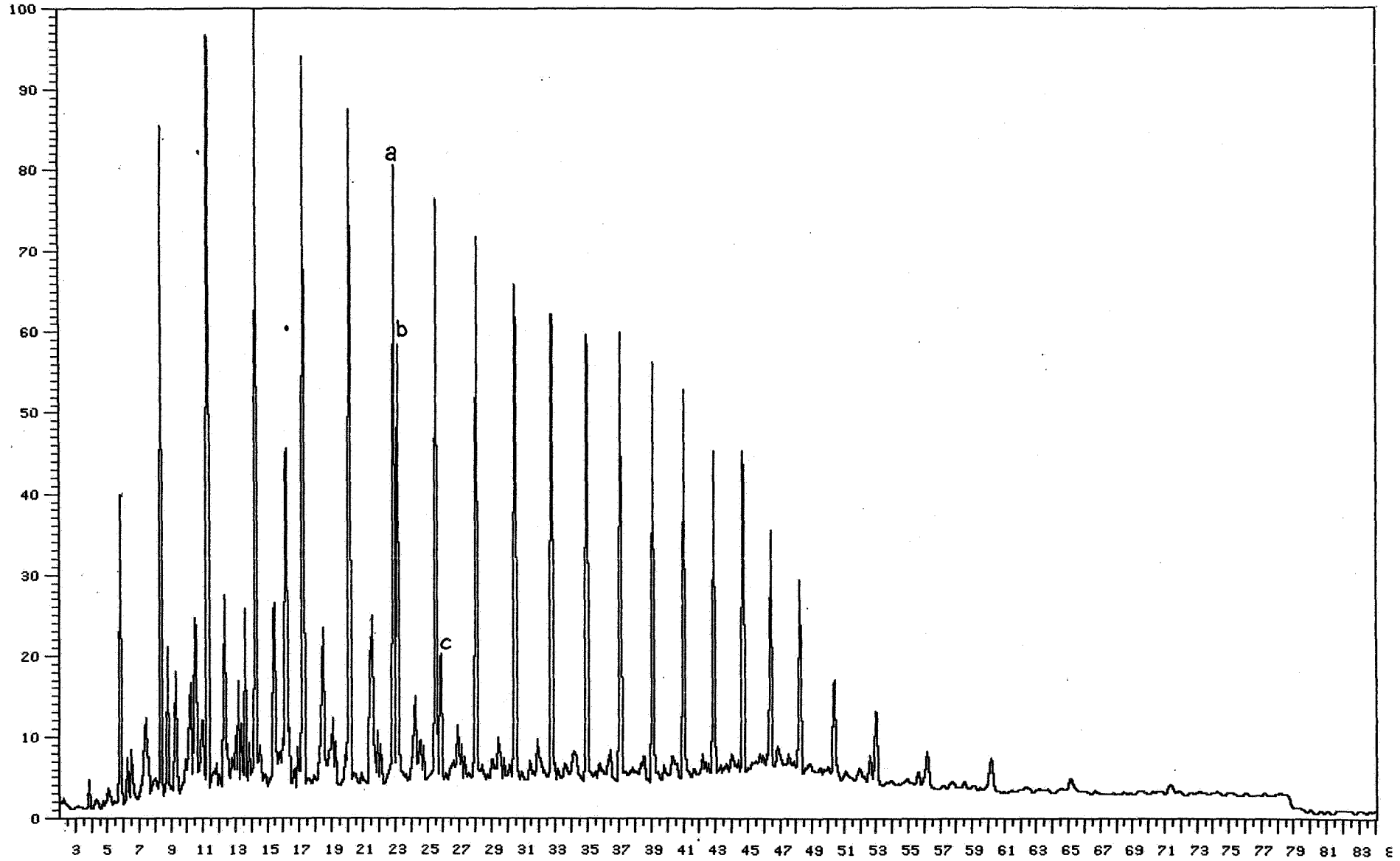
SATURATED HYDROCARBONS

3620-3630 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

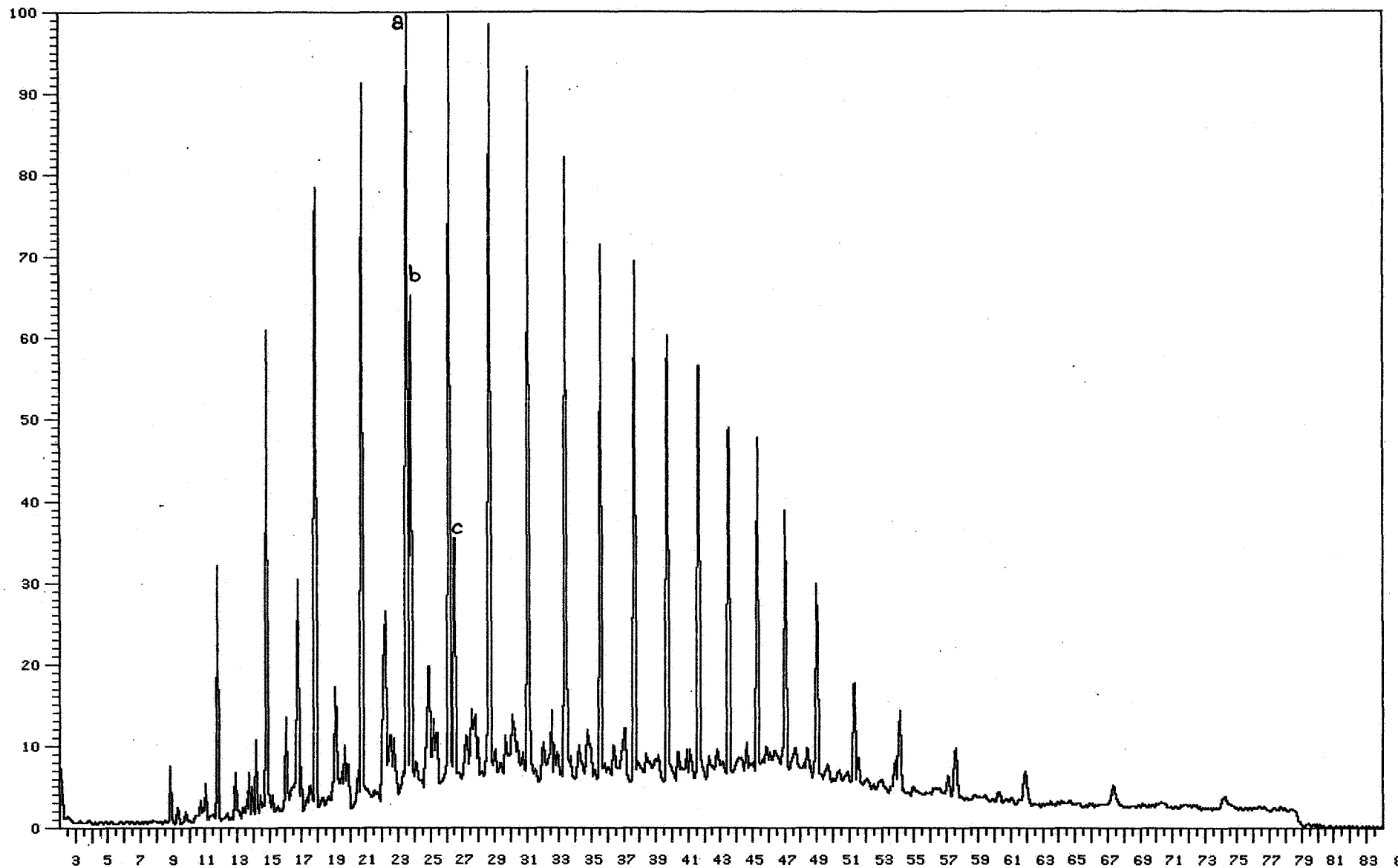
Analysis : GULF3TV Sample #: 10 Injection #: 1
Sample Name : M-603, SAT Maximum value : 8707



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 3 Injection #: 1
Sample Name : M-1727,SAT Maximum value : 8305



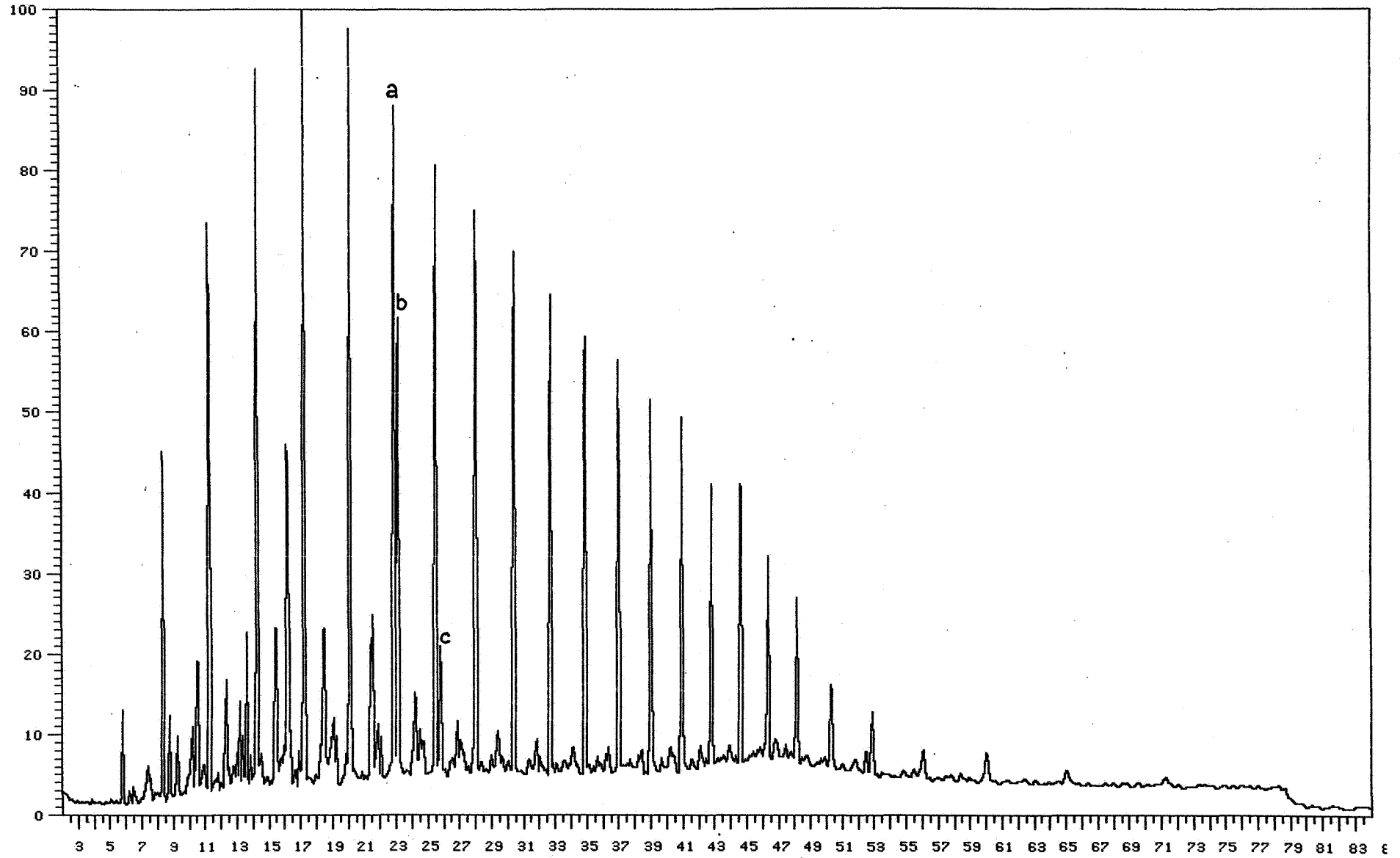
SATURATED HYDROCARBONS

3660-3670 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #: 11 Injection #: 1
Sample Name : M-607, SAT Maximum value : 7578



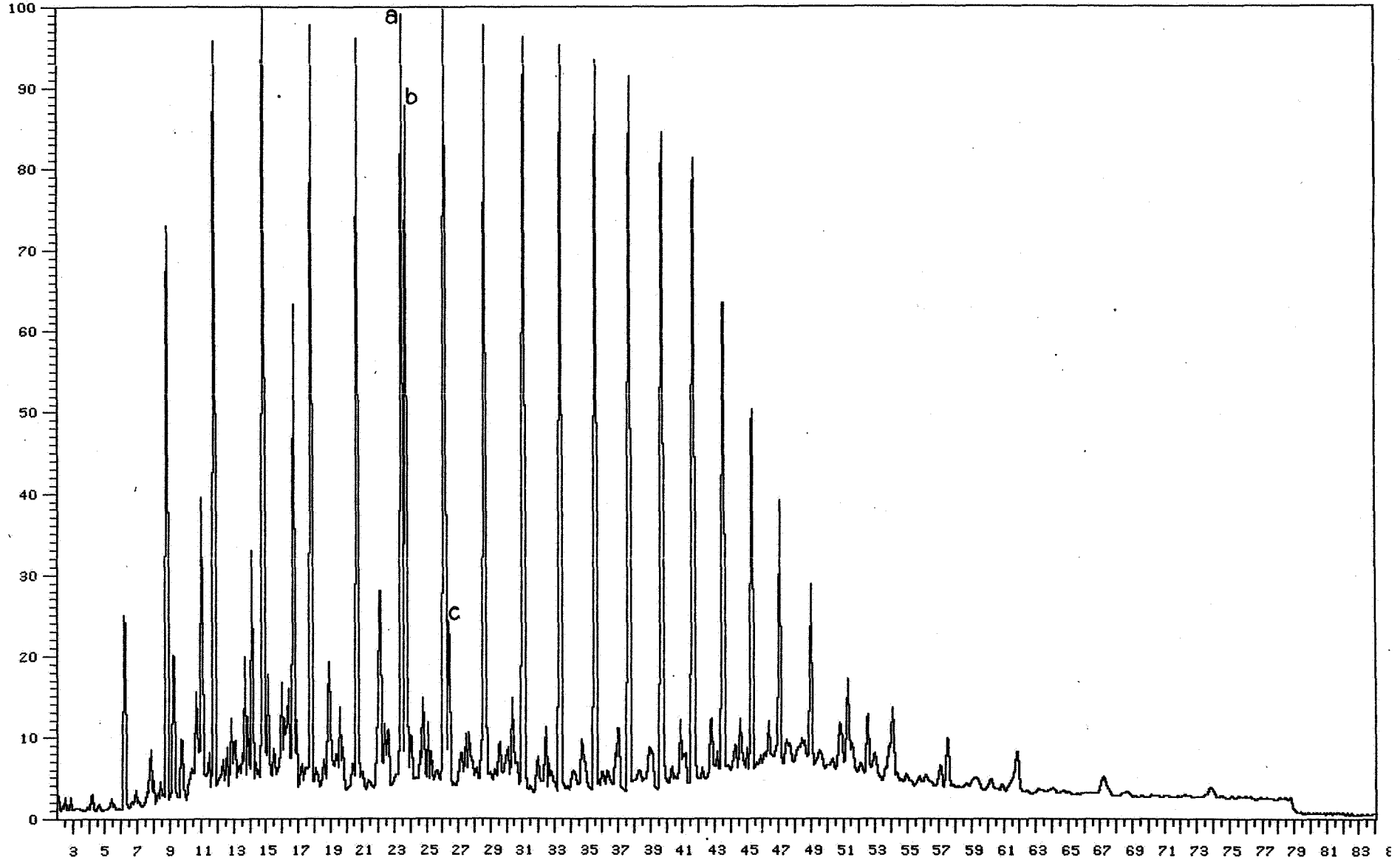
SATURATED HYDROCARBONS

3730-3760 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

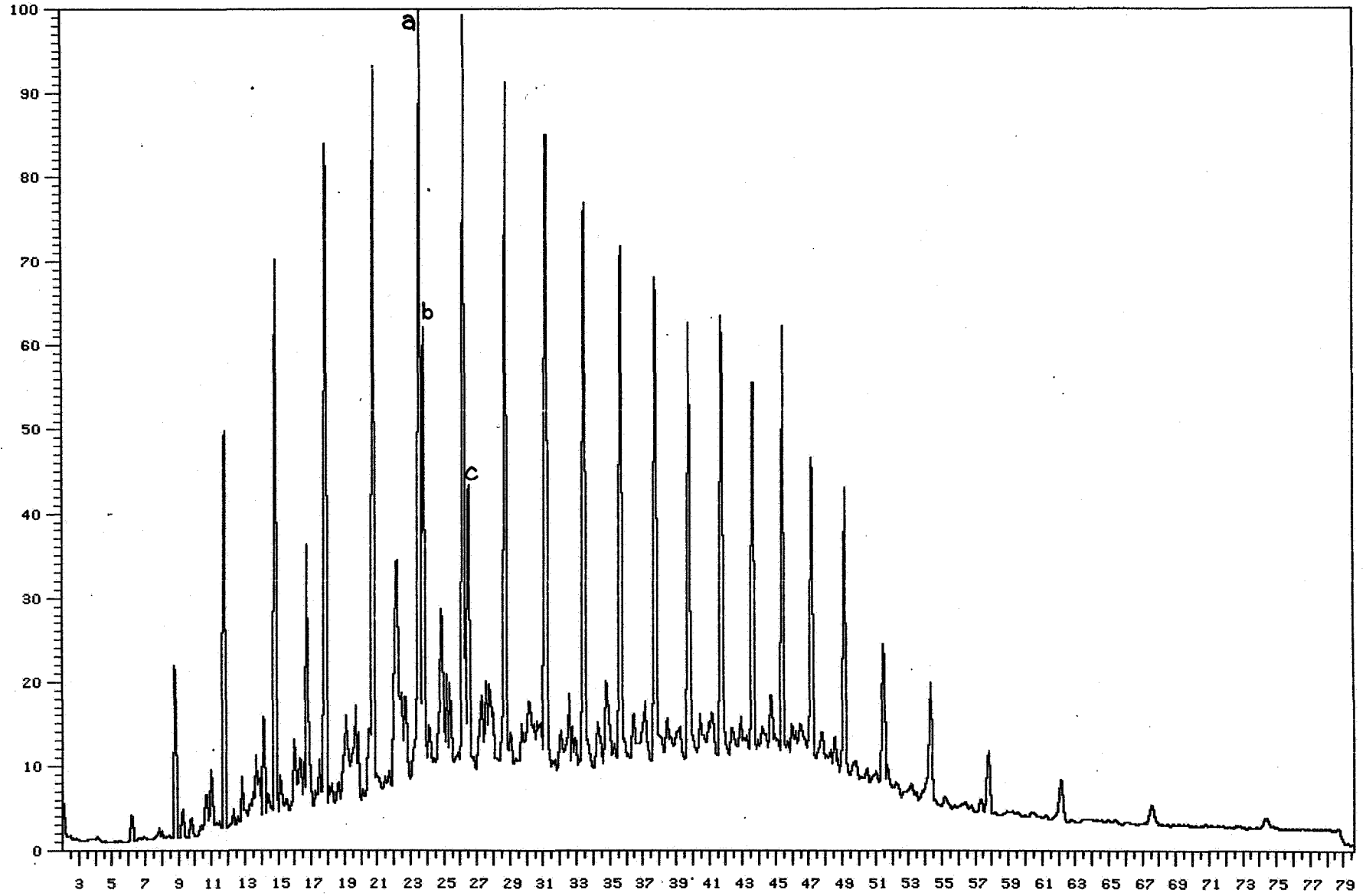
Analysis : JRM1TV Sample #: 1 Injection #: 1
Sample Name : M-3080,SAT Maximum value : 15403



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : M3083SATOTV Sample #: 1 Injection #: 1
Sample Name : GULF, M-3083, SAT Maximum value : 15631



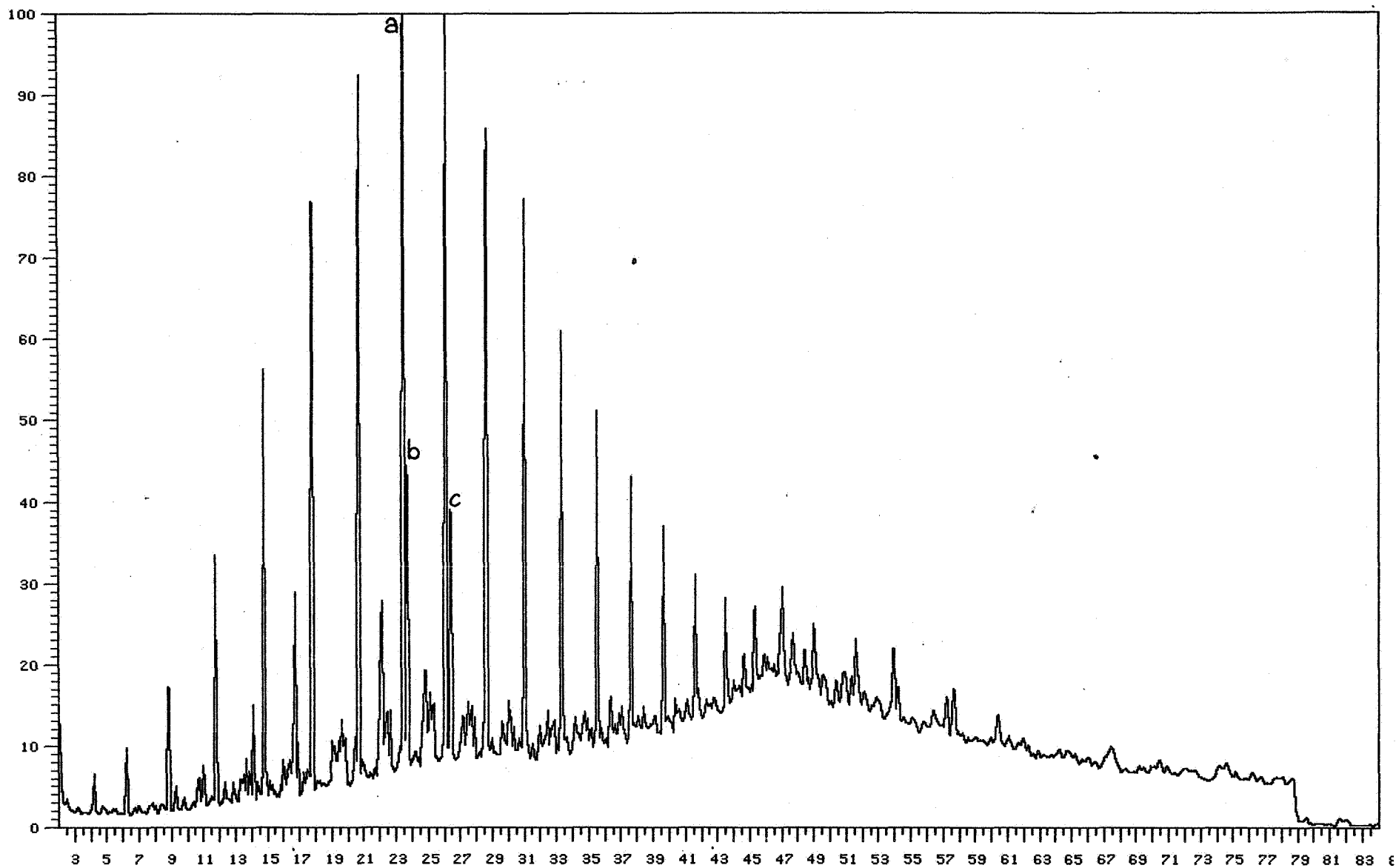
SATURATED HYDROCARBONS

3940-3970 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 5 Injection #: 1
Sample Name : M-3087, SAT Maximum value : 4935



SATURATED HYDROCARBONS

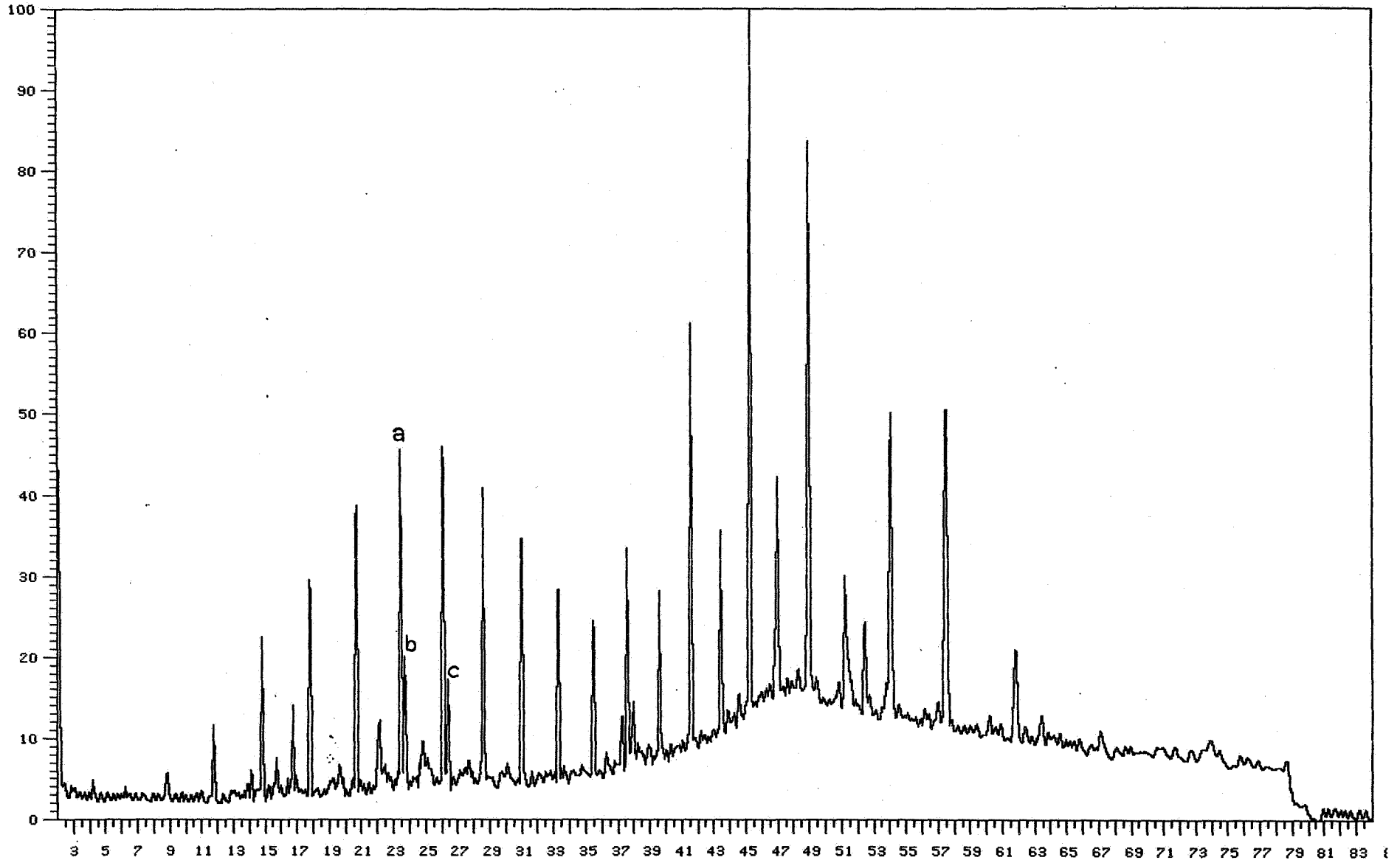
3970-4000 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 6 Injection #: 1

Sample Name : M-3088,SAT Maximum value : 3300



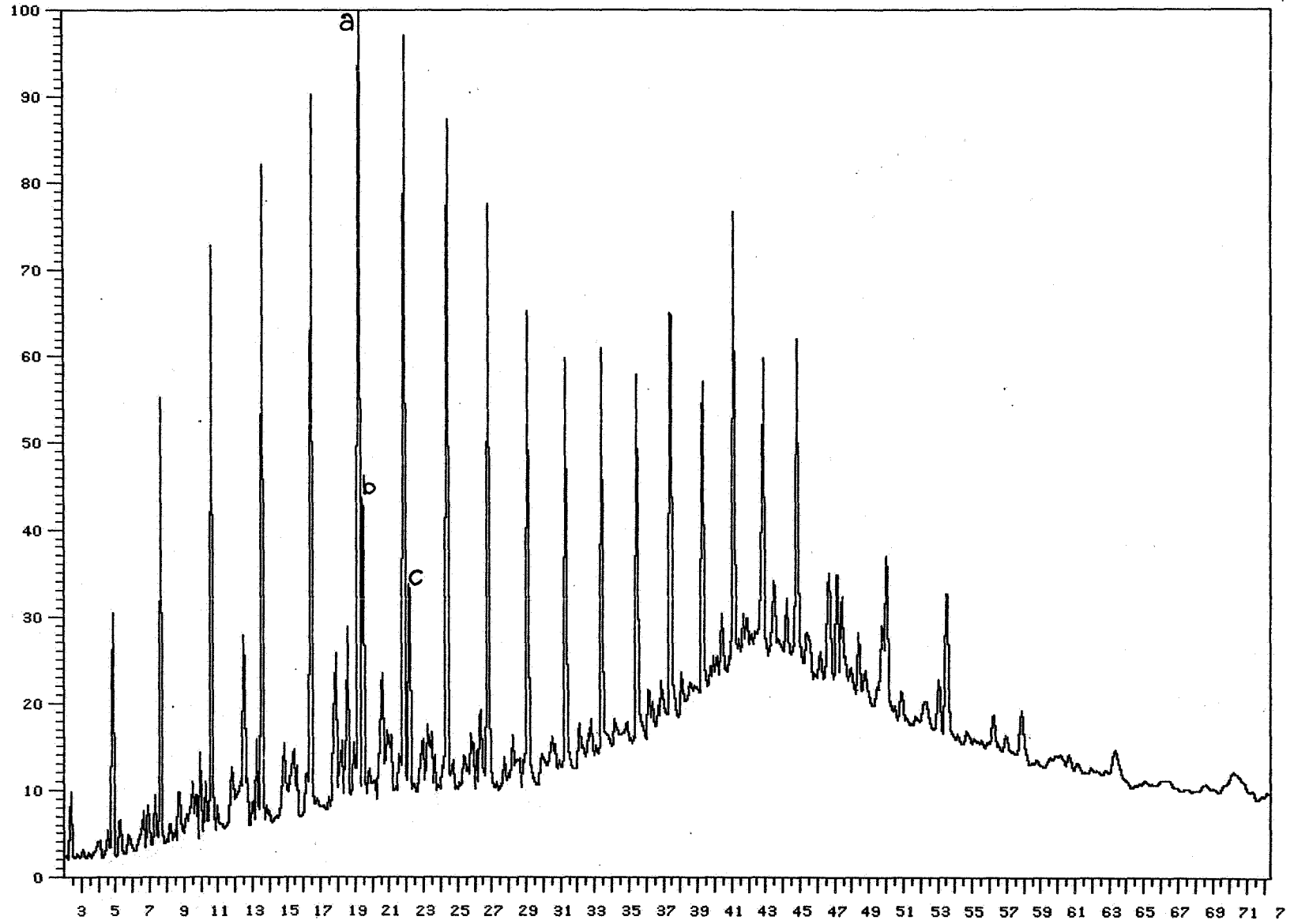
SATURATED HYDROCARBONS

4060-4090 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : M3091SATOTV Sample #: 1 Injection #: 1
Sample Name : GULF, M-3091, SAT Maximum value : 5406



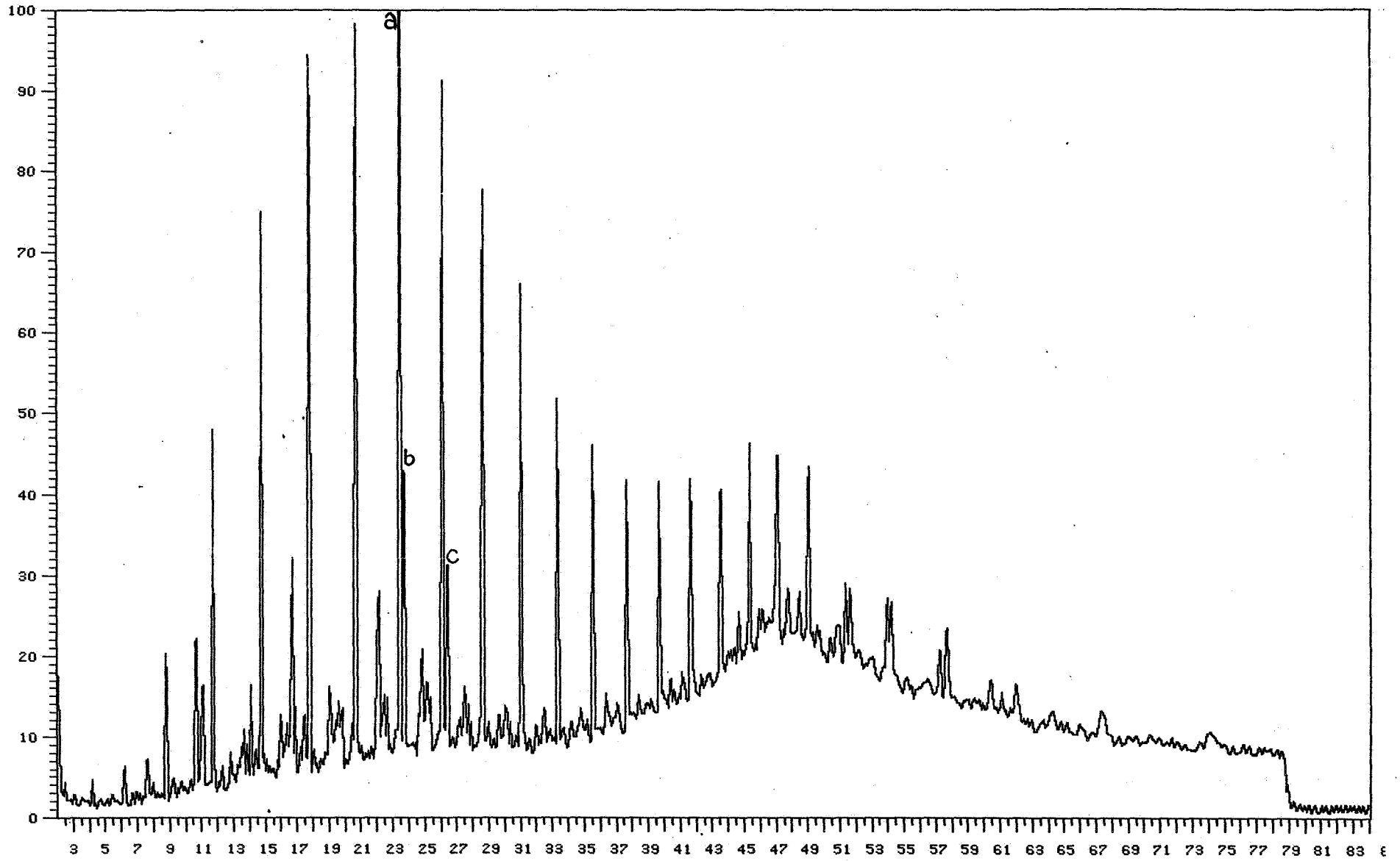
SATURATED HYDROCARBONS

4120-4150 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV
Sample #: 7 Injection #: 1
Sample Name : M-3093,SAT
Maximum value : 3709



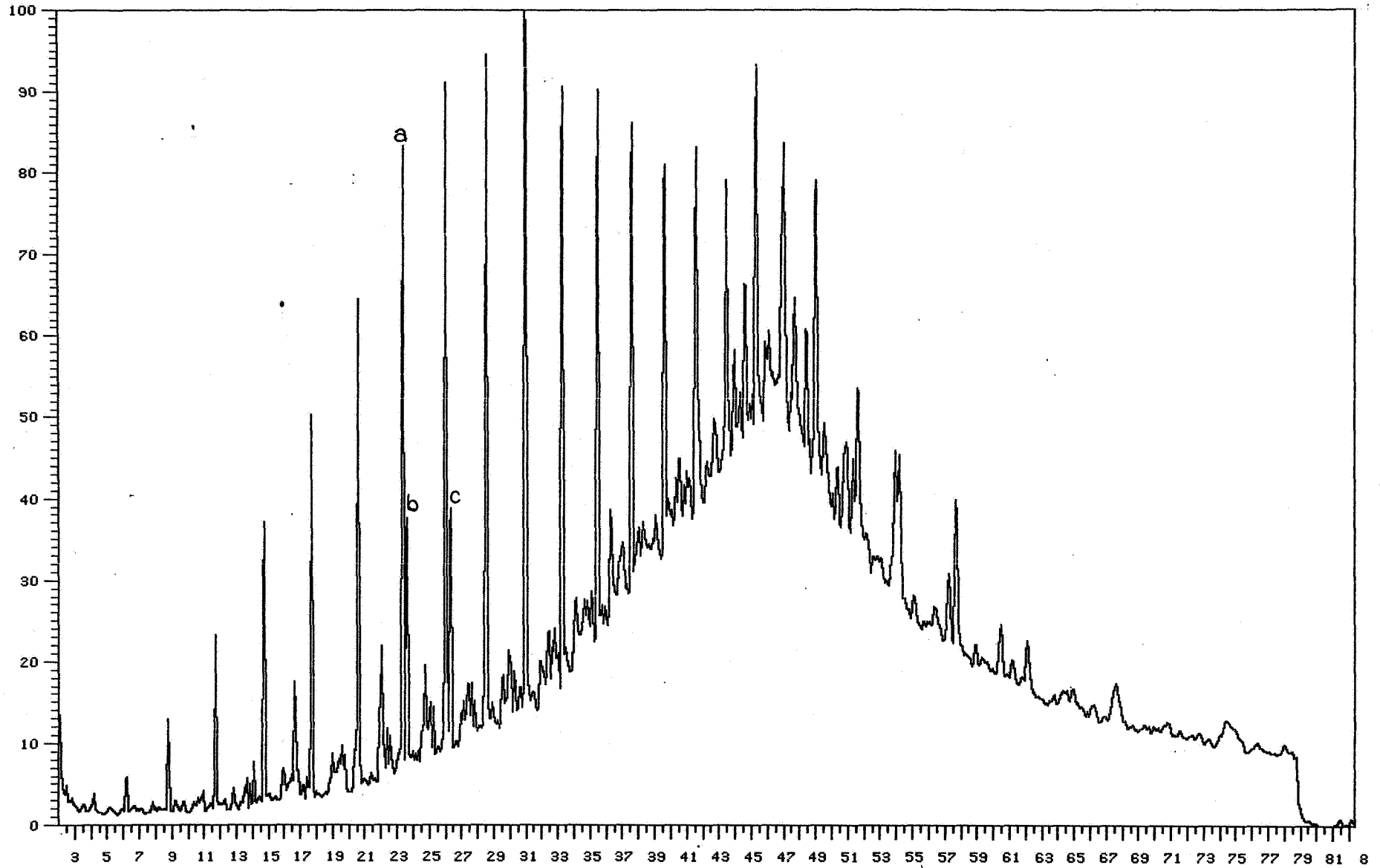
SATURATED HYDROCARBONS

4180-4210 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

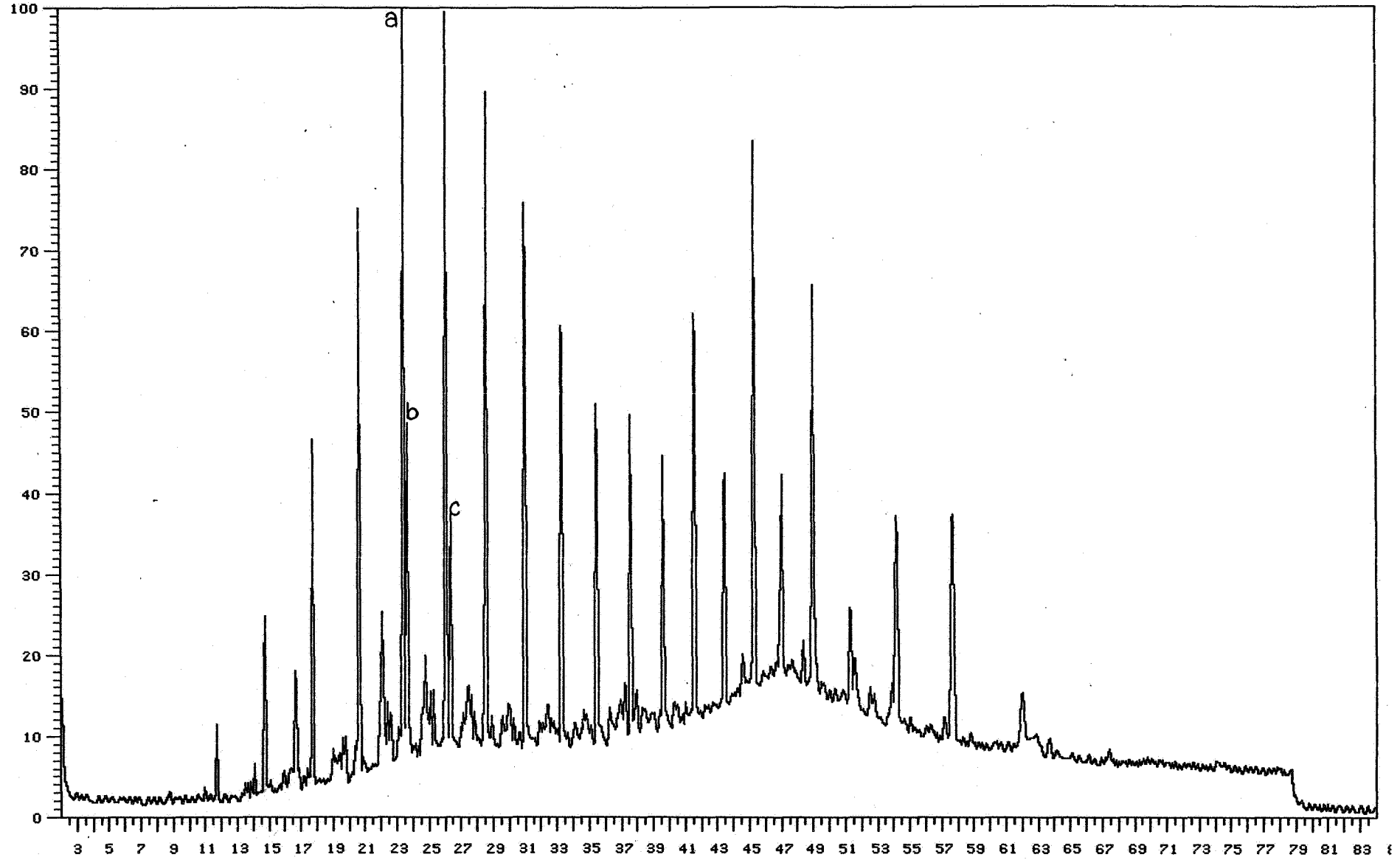
Analysis : GULF4TV Sample #: 8 Injection #: 1
Sample Name : M-3095, SRT Maximum value : 5149



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF5TV Sample #: 3 Injection #: 1
Sample Name : M-3100, SAT Maximum value : 4179



GAS CHROMATOGRAPHIC ANALYSIS**AROMATIC HYDROCARBONS**

- Key:
- 1 = naphthalene
 - 2 = methyl naphthalenes
 - 4 = phenanthrene
 - 6 = methyl phenanthrenes - each of the two peaks is in fact a doublet. Immature samples are usually indicated by a higher amount of the second peak relative to the first. An increase in maturity is accompanied by a relative increase in the first of the peaks.
 - 12 = includes aromatized steranes and triterpanes, and mono-aromatized compounds in general. Their dominant occurrence indicates low maturity.

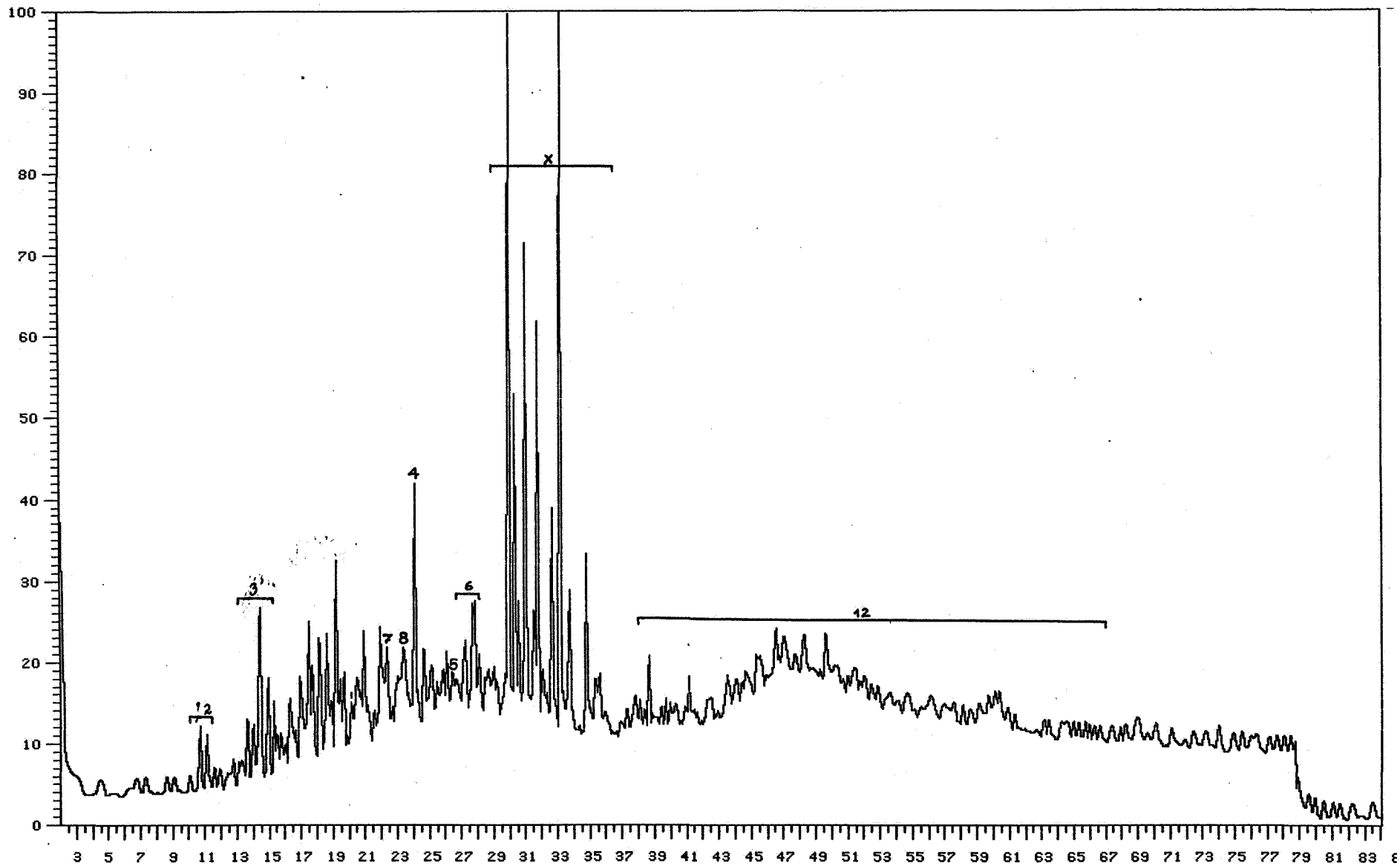
AROMATIC HYDROCARBONS

1740-1780 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

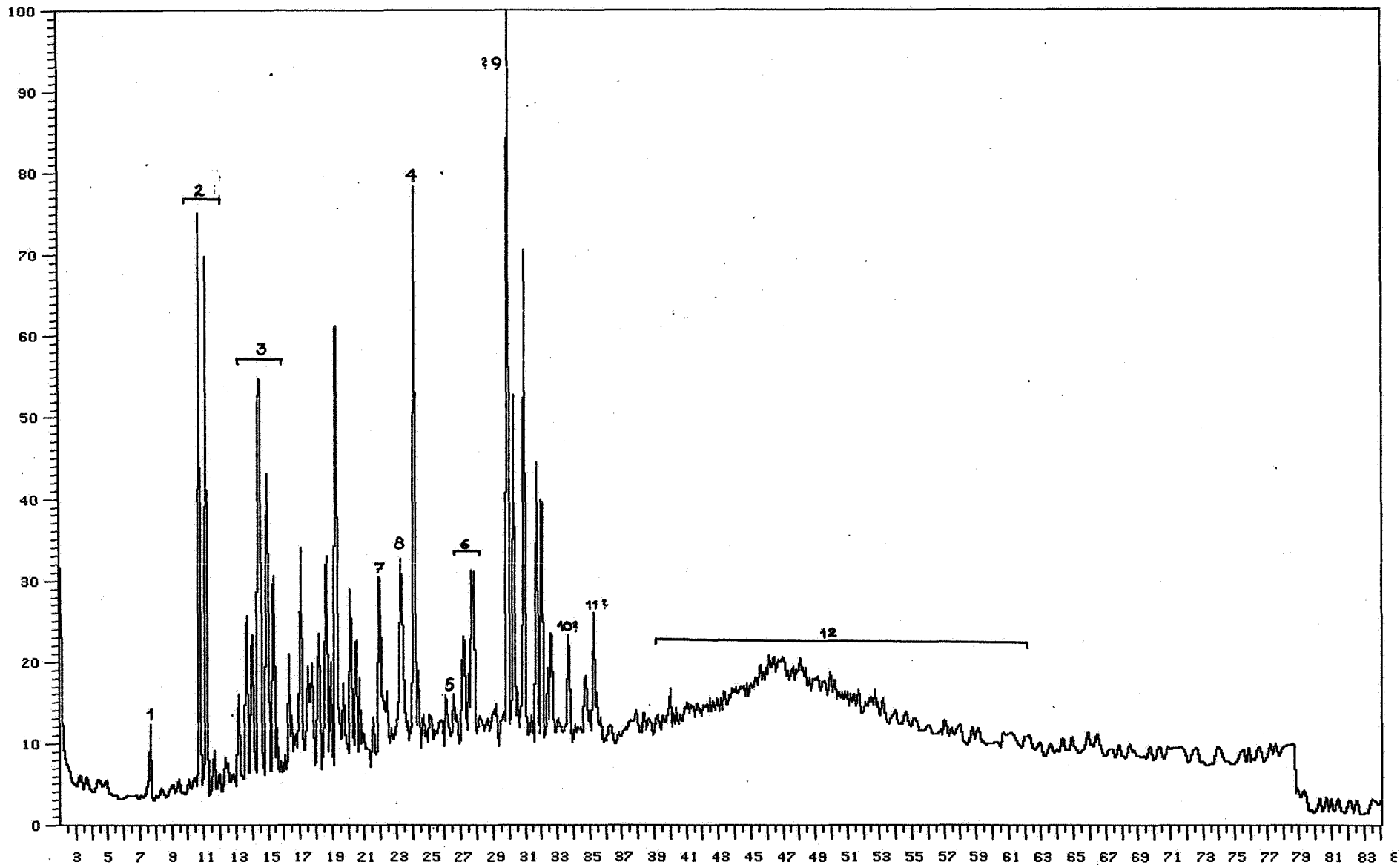
Analysis : GULF5TV Sample #: 4 Injection #: 1
Sample Name : K-9047,ARO Maximum value : 1763



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF5TV
Sample Name : M-279,ARO
Sample #: 5 Injection #: 1
Maximum value : 2167



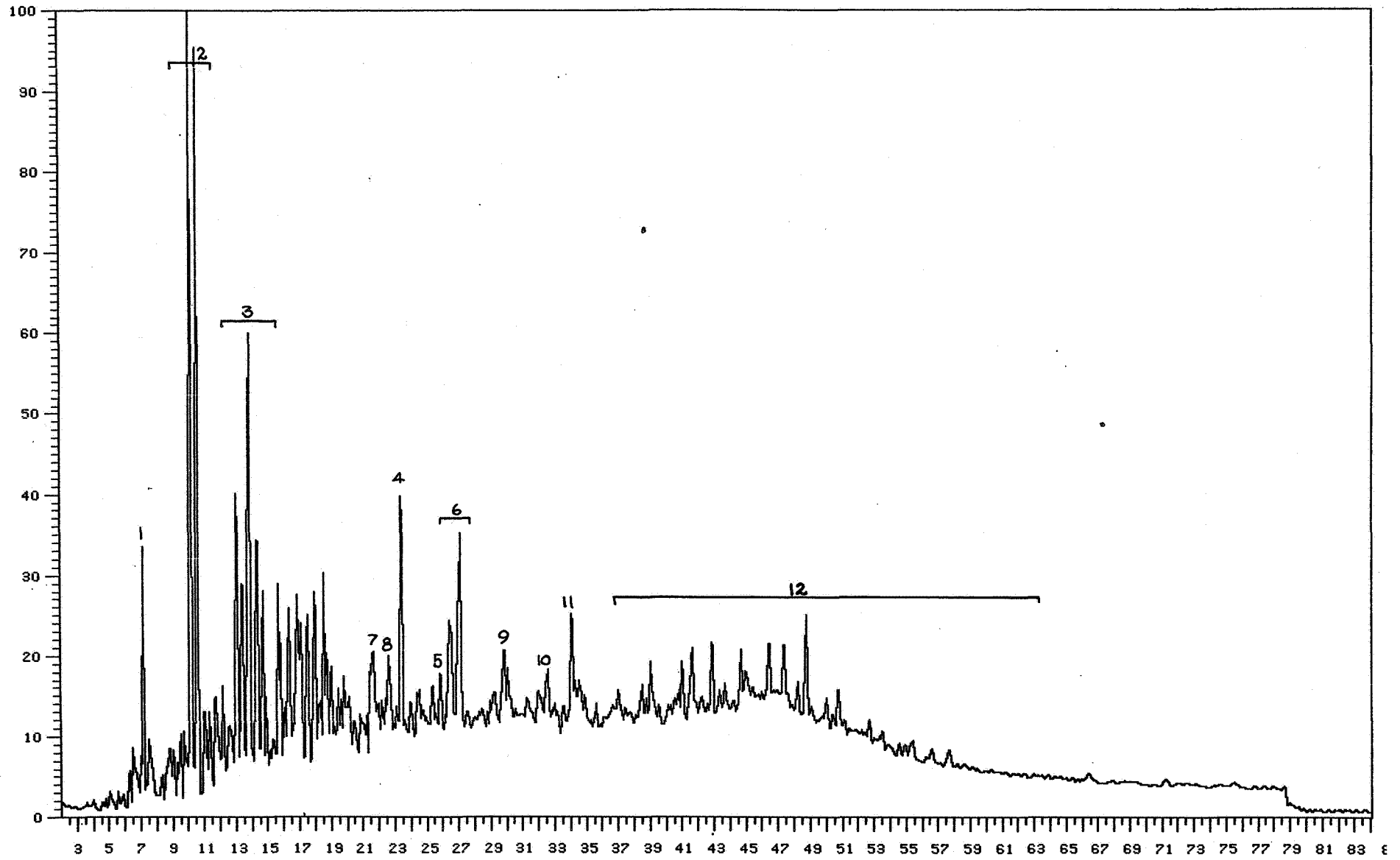
AROMATIC HYDROCARBONS

3090-3120 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-386,ARD
Sample #: 12 Injection #: 1
Maximum value : 8204



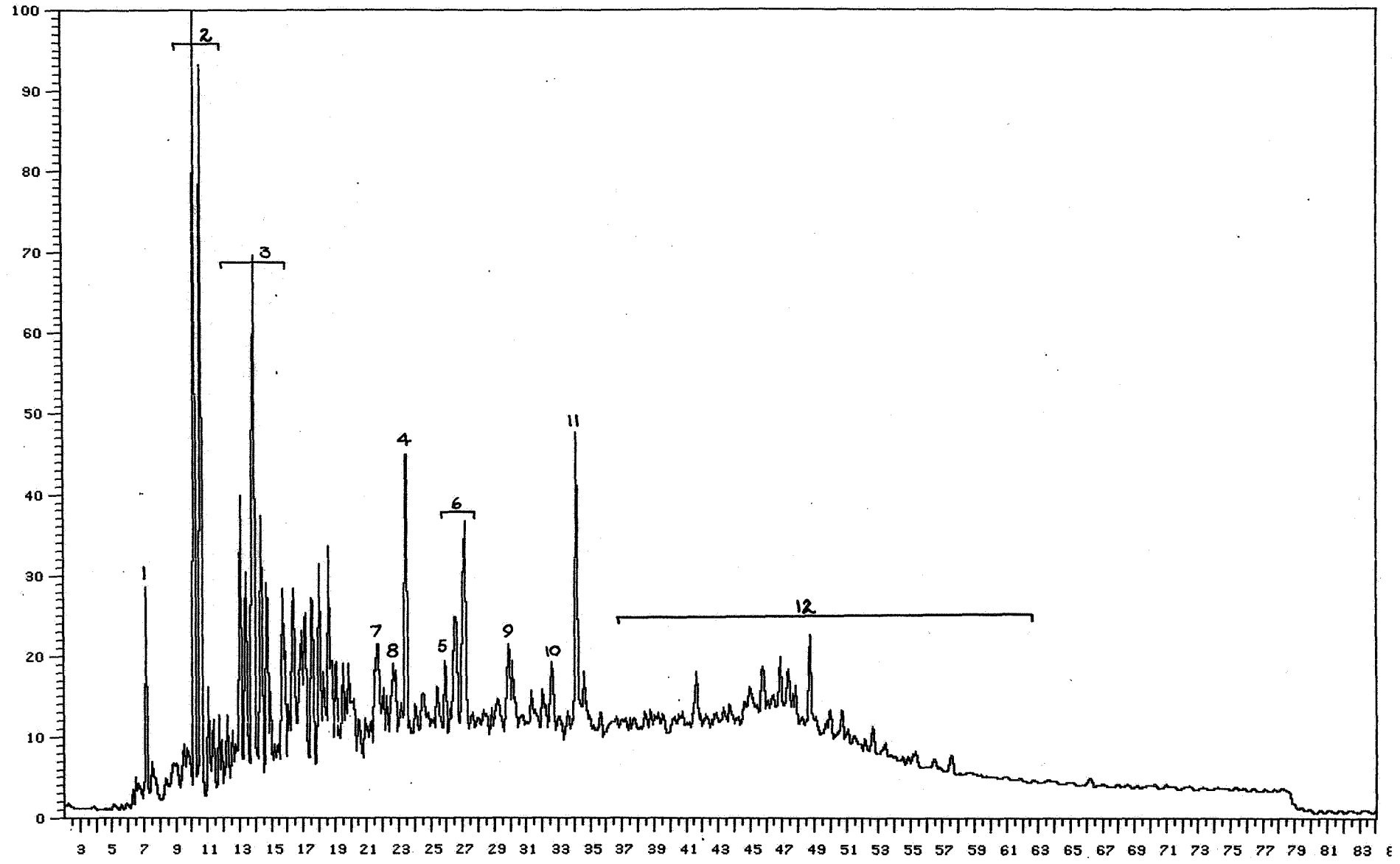
AROMATIC HYDROCARBONS

3150-3170 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #:13 Injection #: 1
Sample Name : M-388,ARO Maximum value : 9280



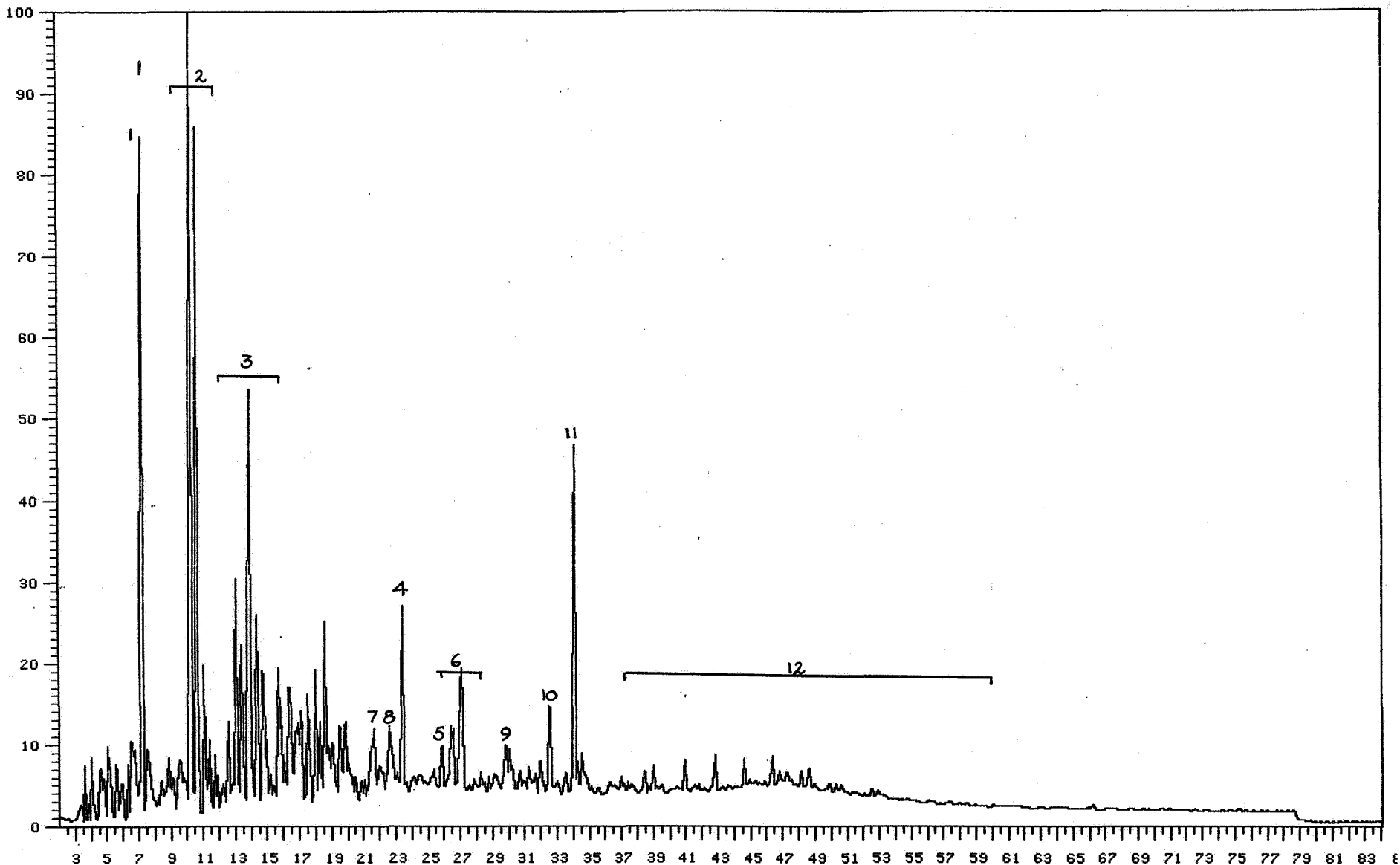
AROMATIC HYDROCARBONS

3210-3240 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-493,ARO
Sample #: 14 Injection #: 1
Maximum value : 15975



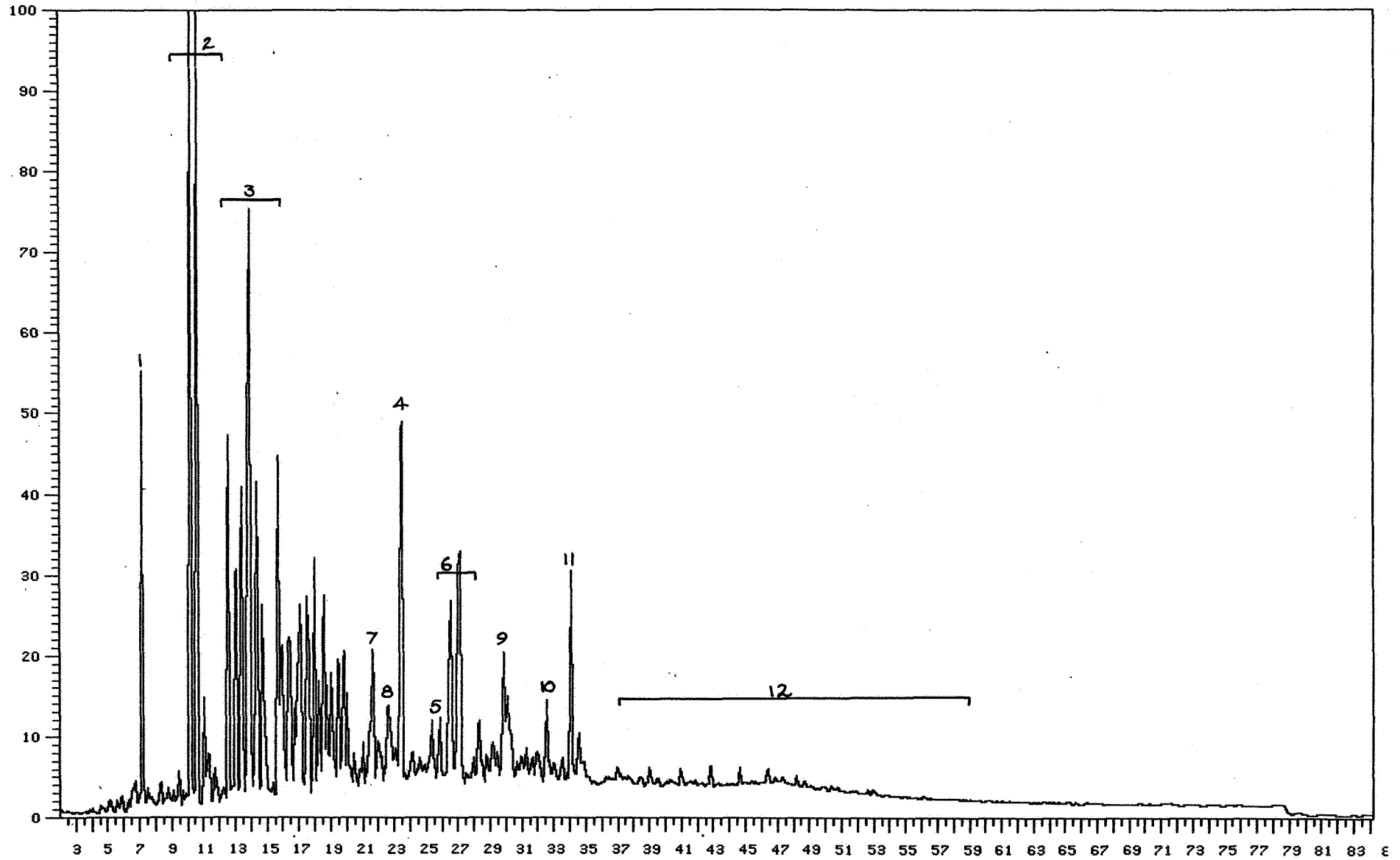
AROMATIC HYDROCARBONS

3270-3300 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #: 15 Injection #: 1
Sample Name : M-495, ARO Maximum value : 16383



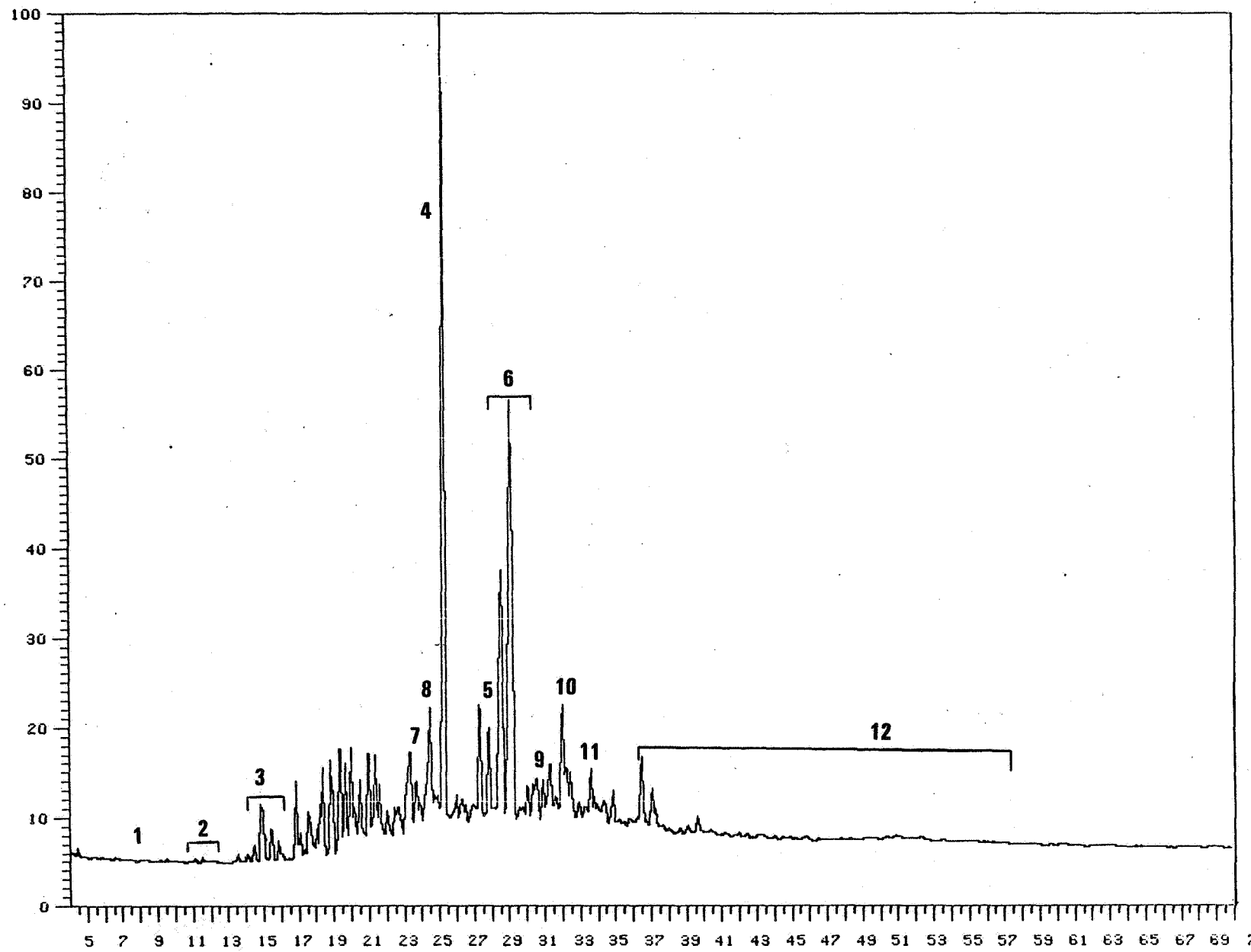
AROMATIC HYDROCARBONS

3310 - 3320 m

Box 1 of 1

RAW DATA PLOT-CHANNEL 3

Analysis : M497AR00BB Sample #: 1 Injection #: 1
Sample Name : M-497,ARO Maximum value : 1253



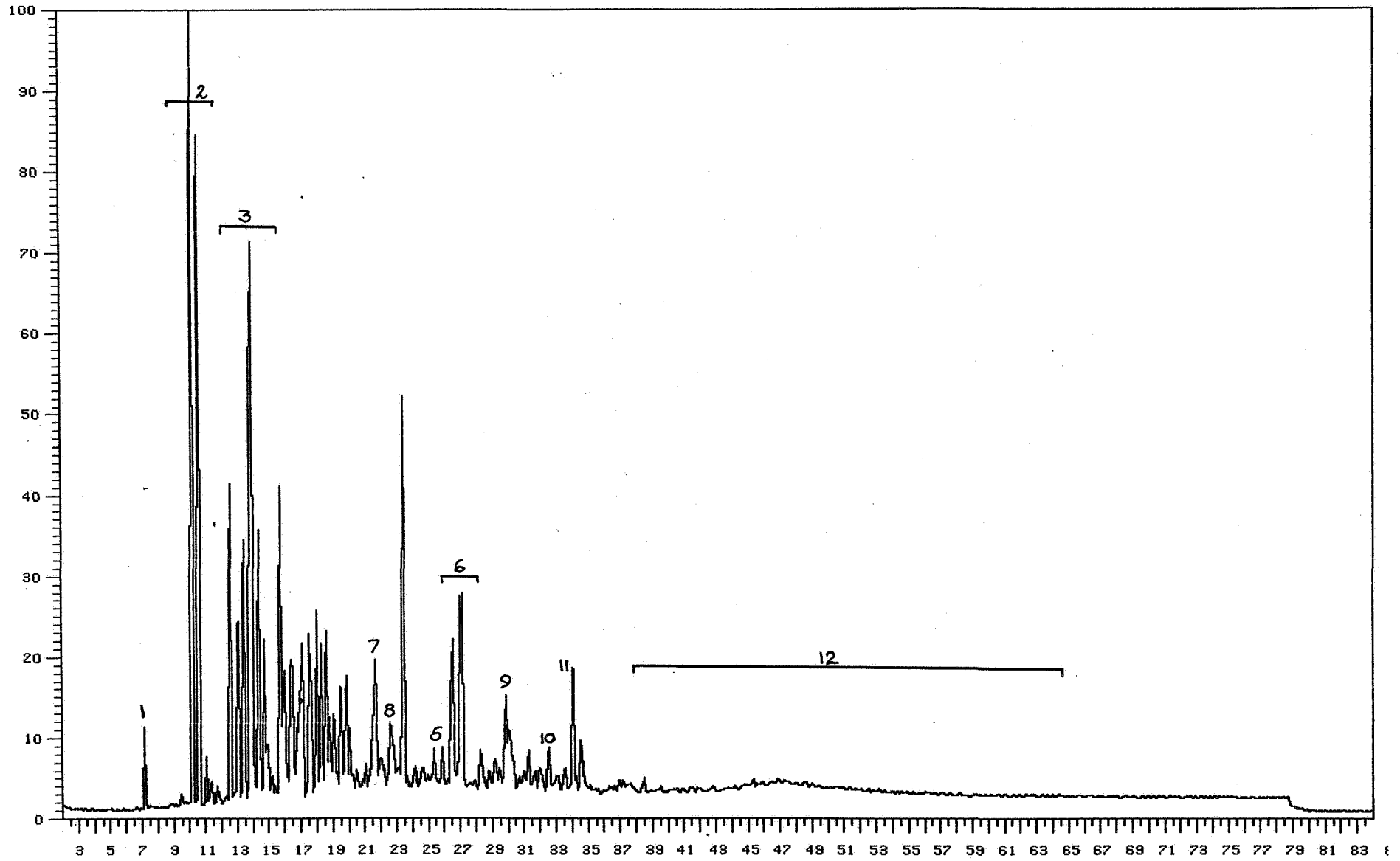
AROMATIC HYDROCARBONS

3340-3350 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

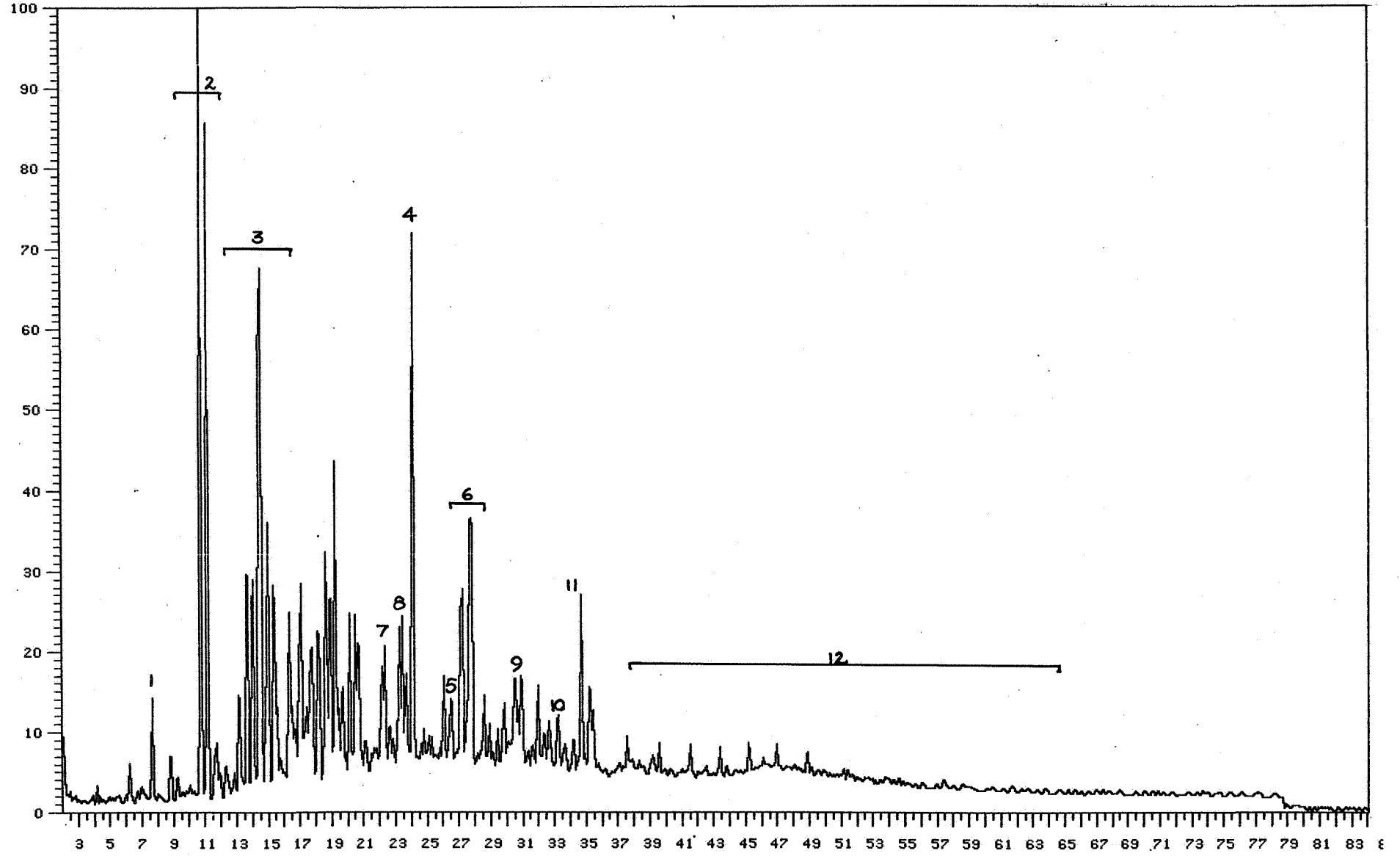
Analysis : GULF3TV
Sample Name : M-500, ARD
Sample #: 16 Injection #: 1
Maximum value : 9479



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

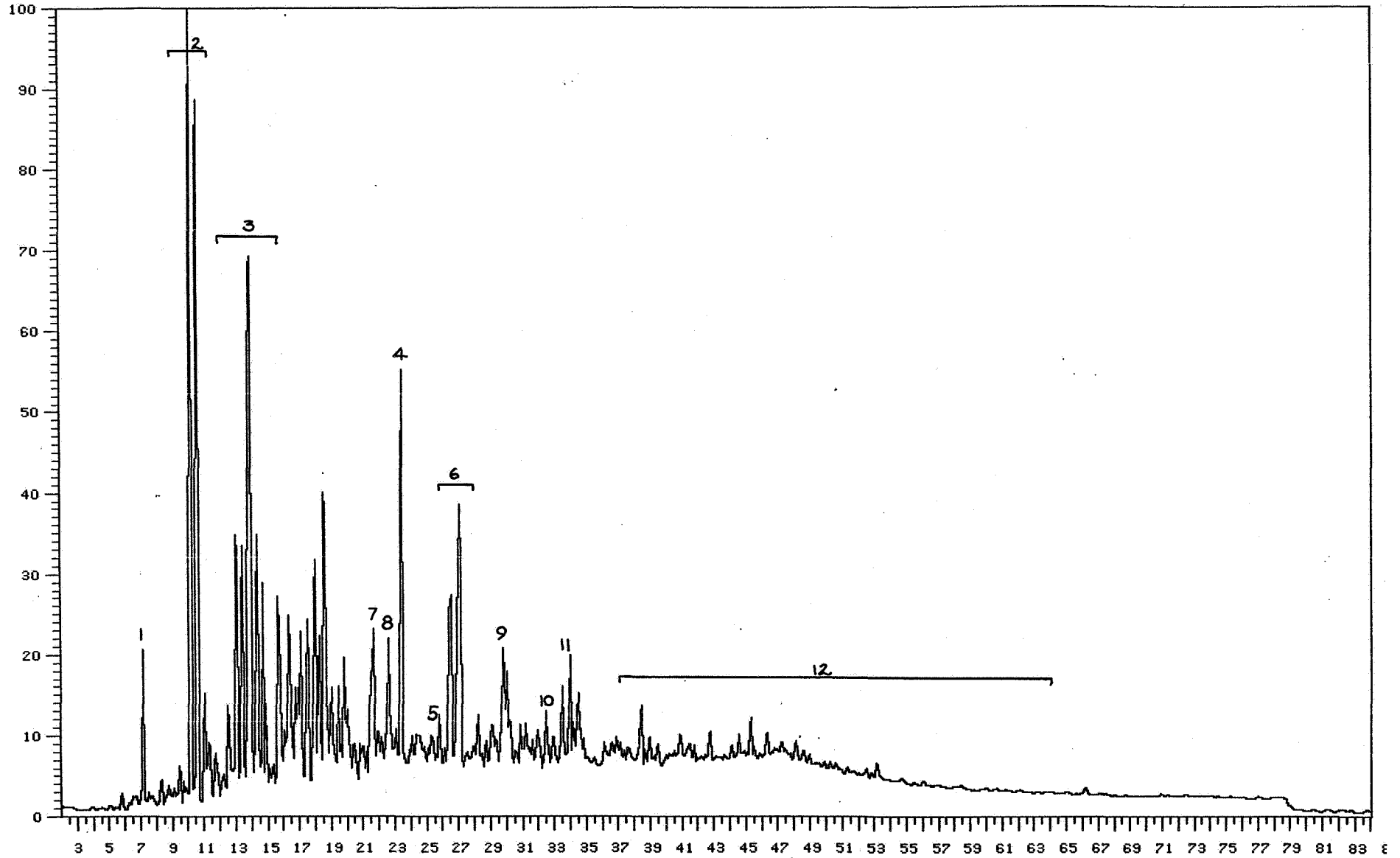
Analysis : GULF5TV Sample #: 6 Injection #: 1
Sample Name : M-502,ARO Maximum value : 6912



Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-505,ARO
Sample #: 17 Injection #: 1
Maximum value : 12010



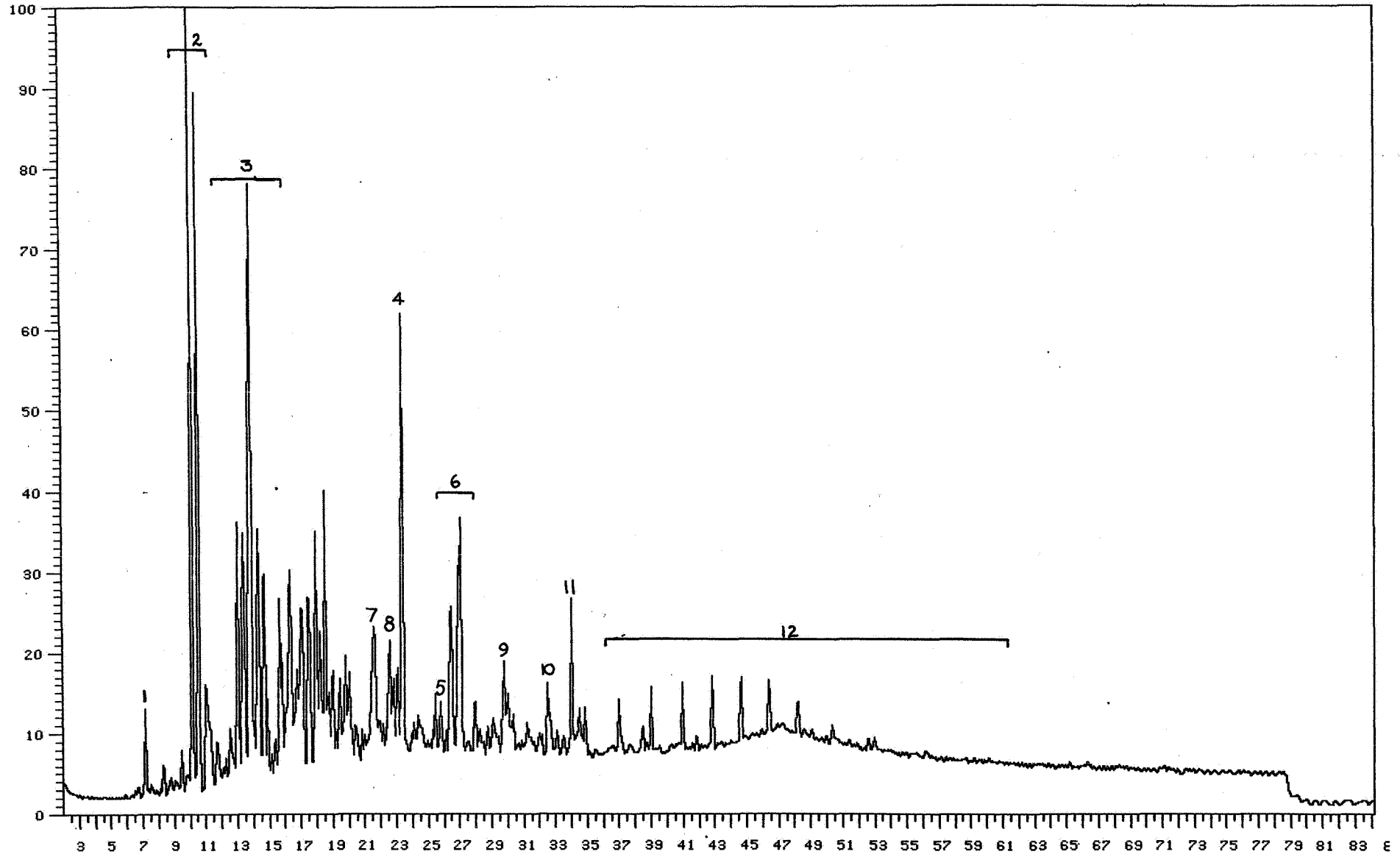
AROMATIC HYDROCARBONS

3430-3440 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-584, ARO
Sample #: 18 Injection #: 1
Maximum value : 4916



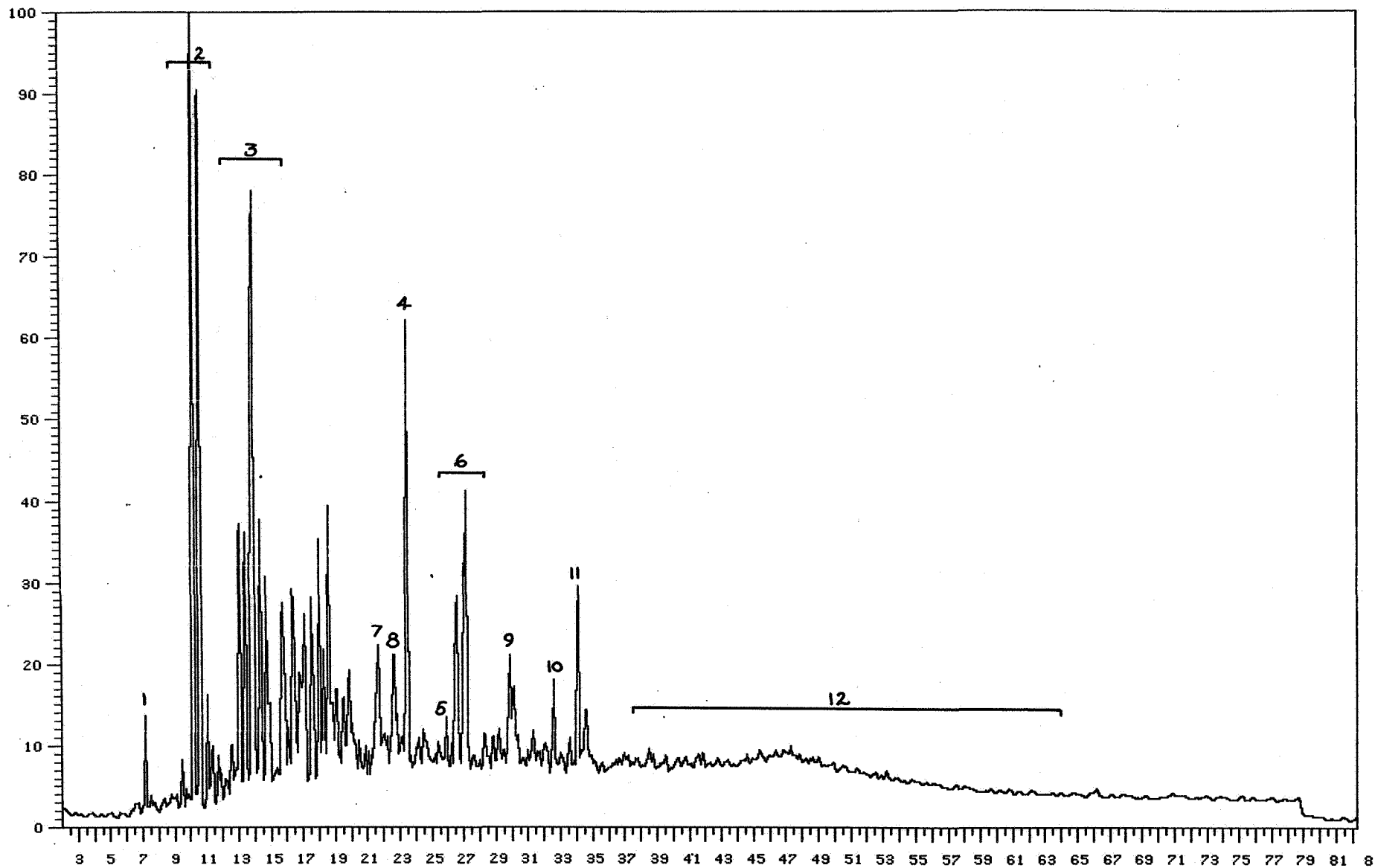
AROMATIC HYDROCARBONS

3470-3480 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV
Sample Name : M-588,ARO
Sample #: 19 Injection #: 1
Maximum value : 7563



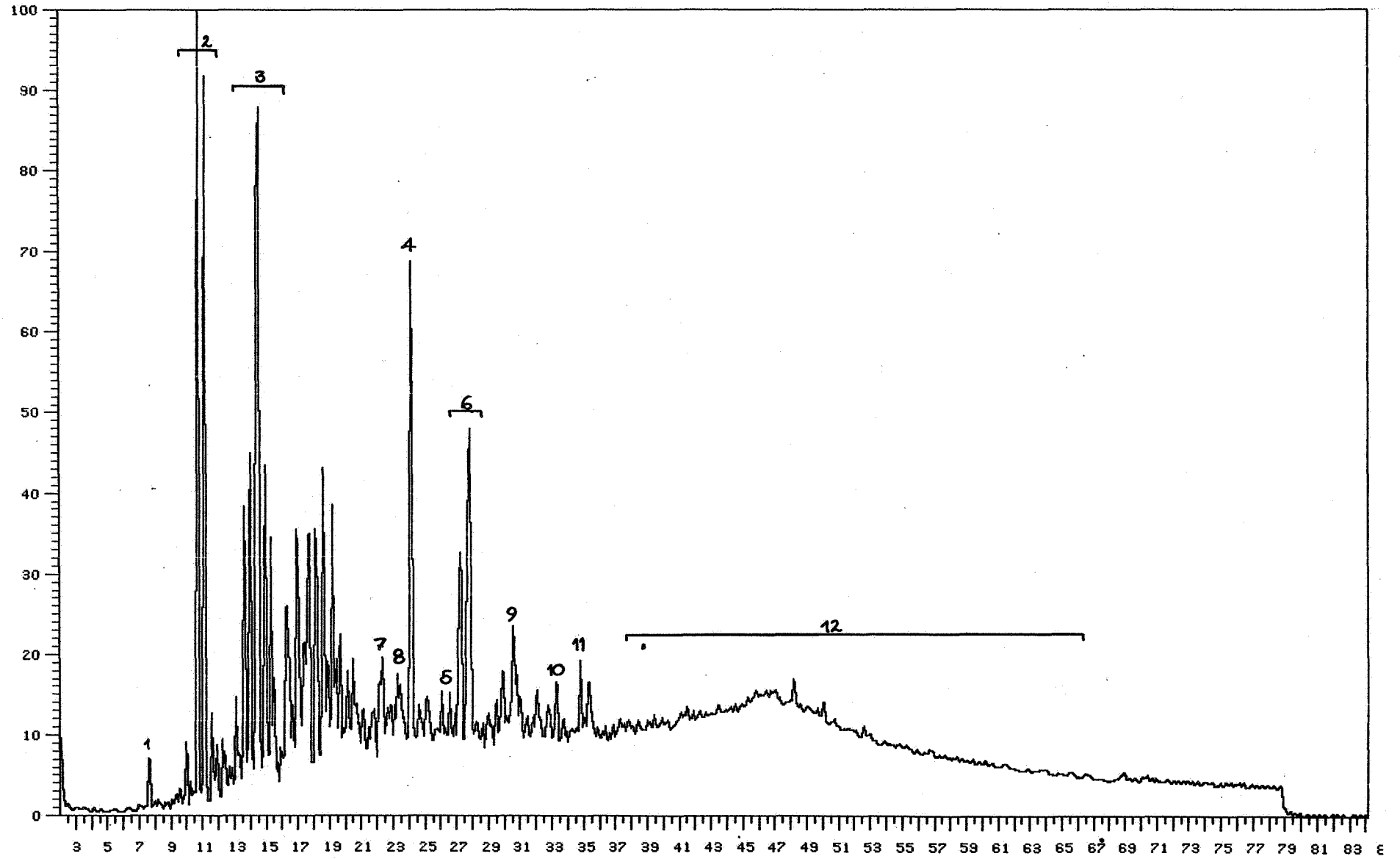
AROMATIC HYDROCARBONS

3490-3520 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV
Sample Name : M-1722,ARO
Sample #: 9 Injection #: 1
Maximum value : 7953



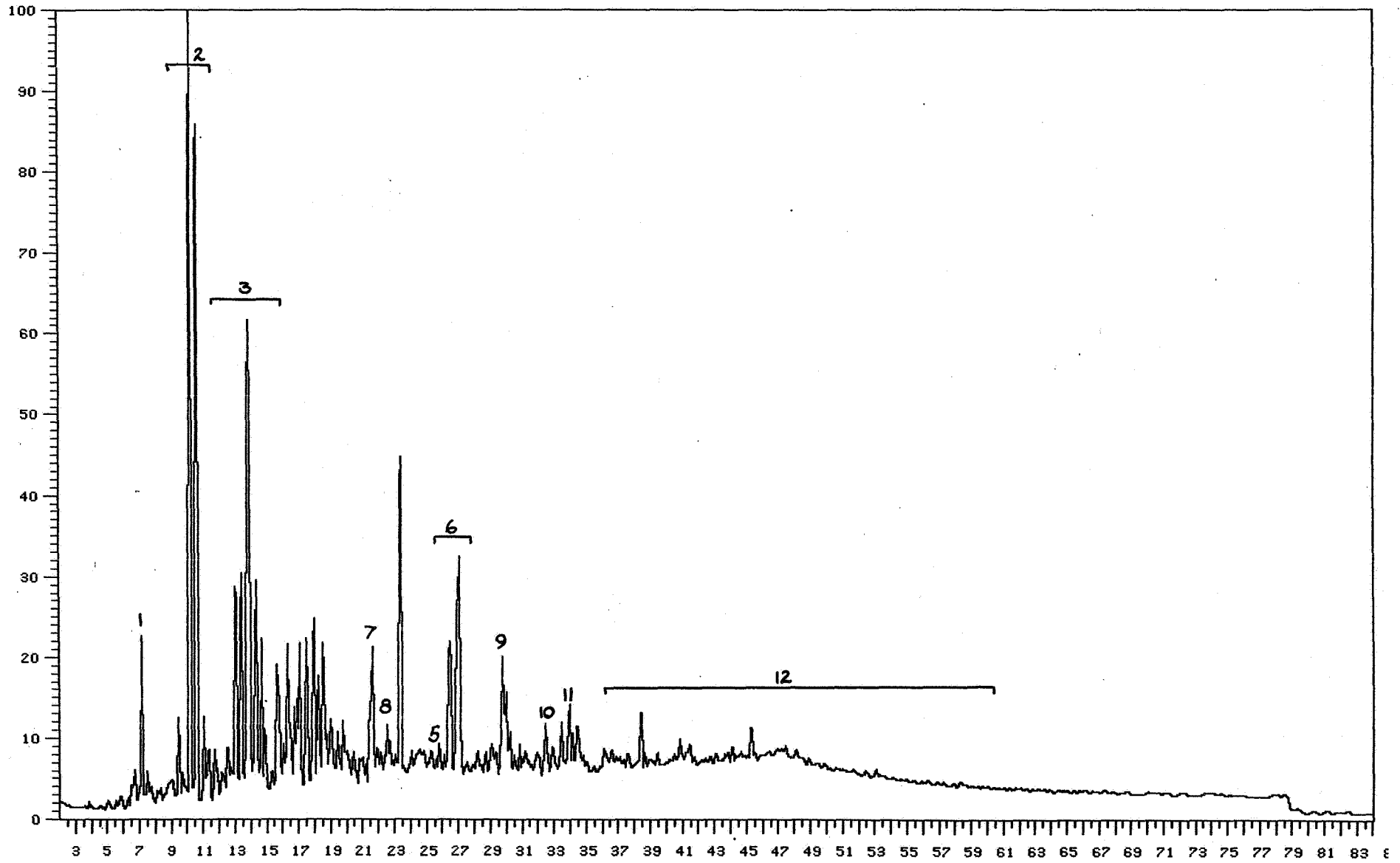
AROMATIC HYDROCARBONS

3510-3520 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #: 20 Injection #: 1
Sample Name : M-592,ARO Maximum value : 8969



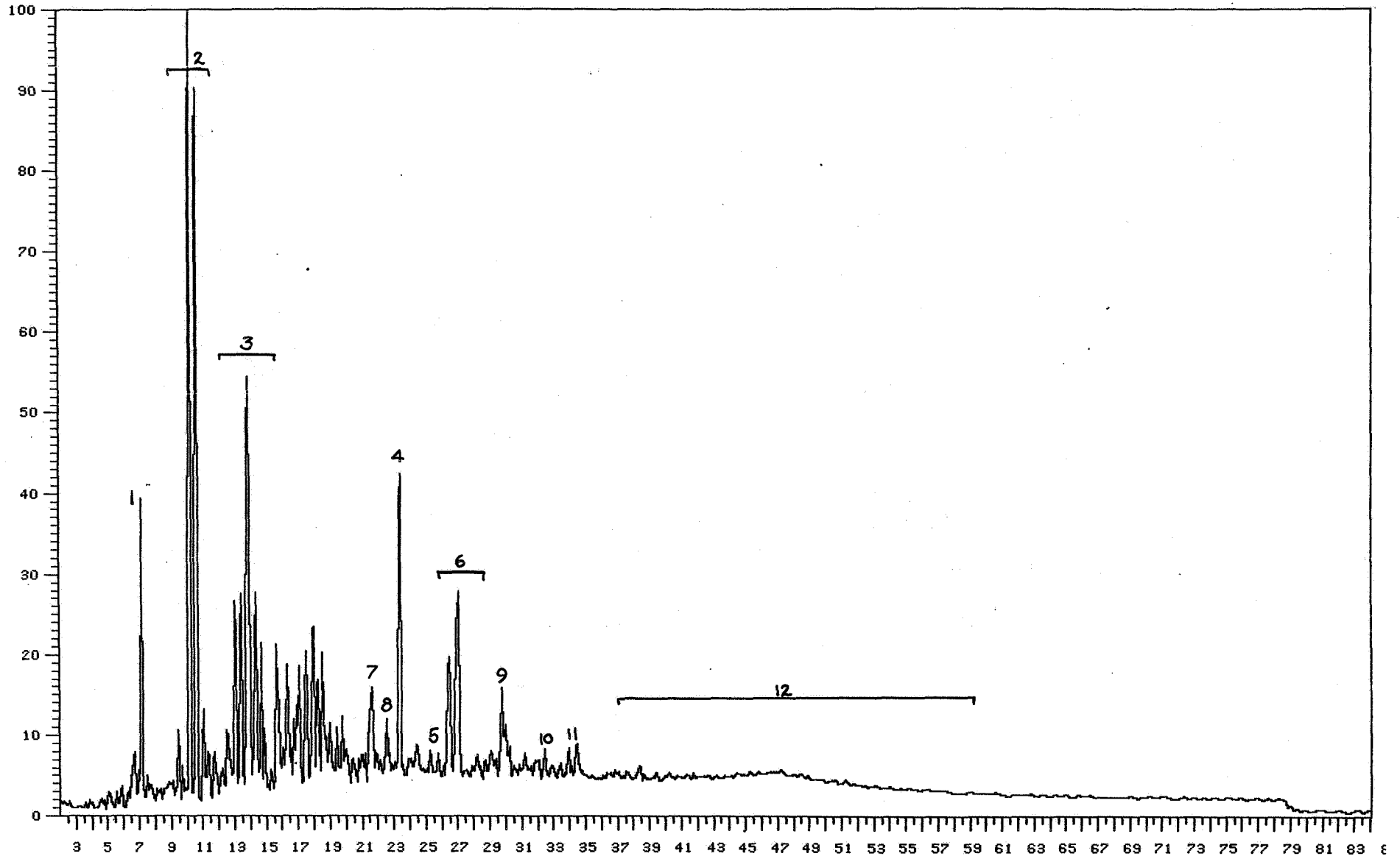
AROMATIC HYDROCARBONS

3550-3560 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #: 21 Injection #: 1
Sample Name : M-596,ARO Maximum value : 12162



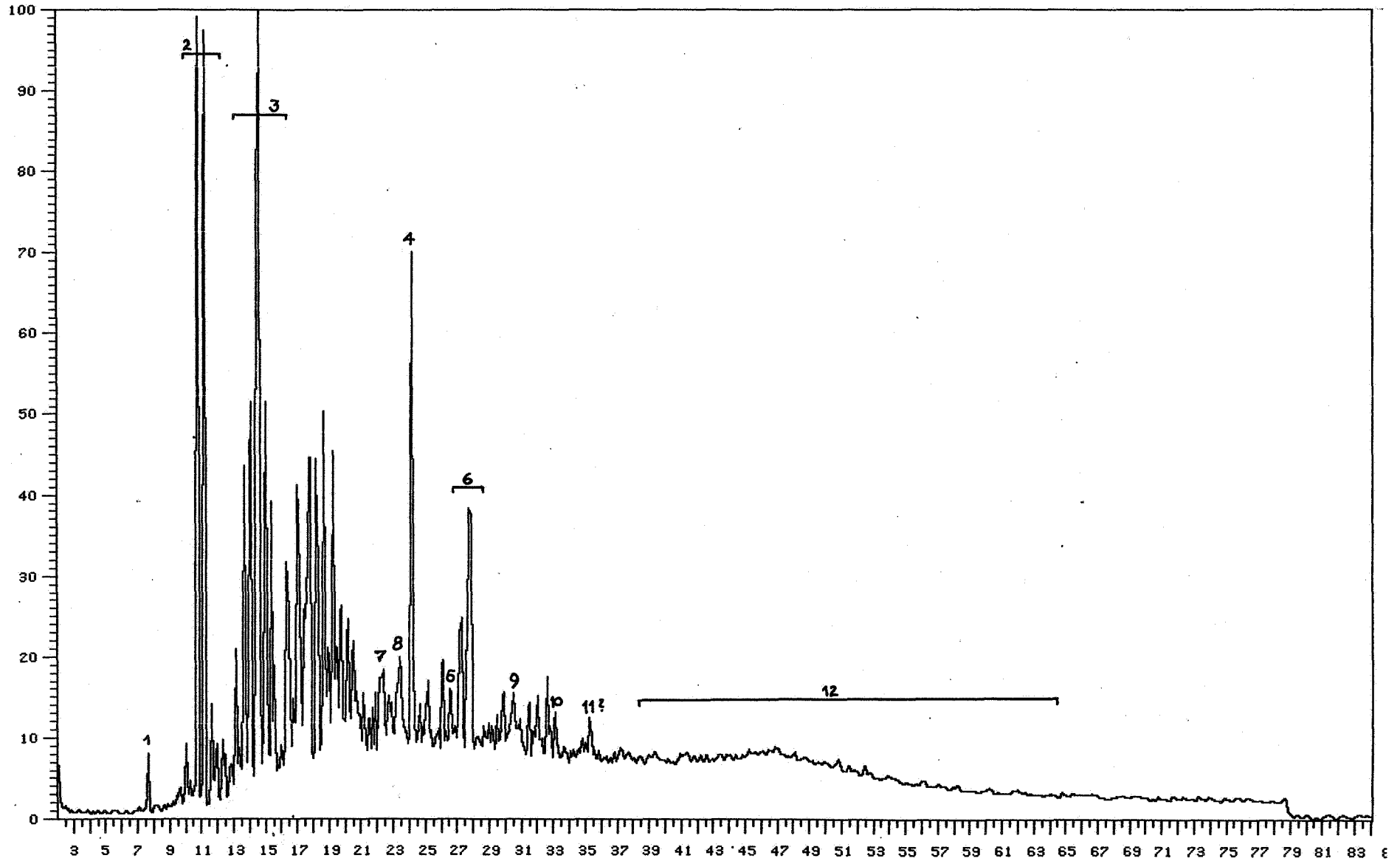
AROMATIC HYDROCARBONS

3550-3580 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 10 Injection #: 1
Sample Name : M-1724,ARO Maximum value : 10653



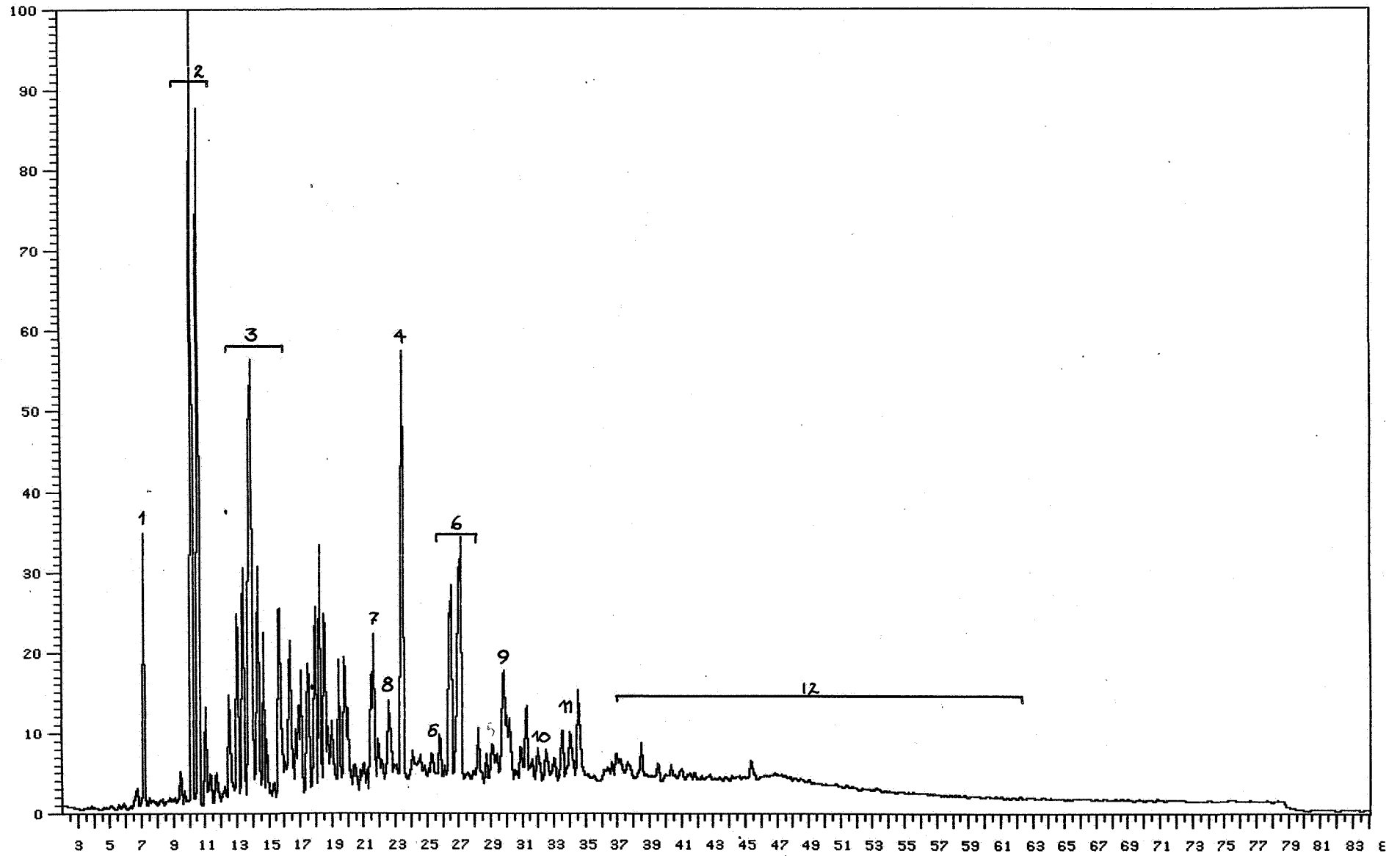
AROMATIC HYDROCARBONS

3620-3630 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF3TV Sample #: 22 Injection #: 1
Sample Name : M-603, AR0 Maximum value : 16367



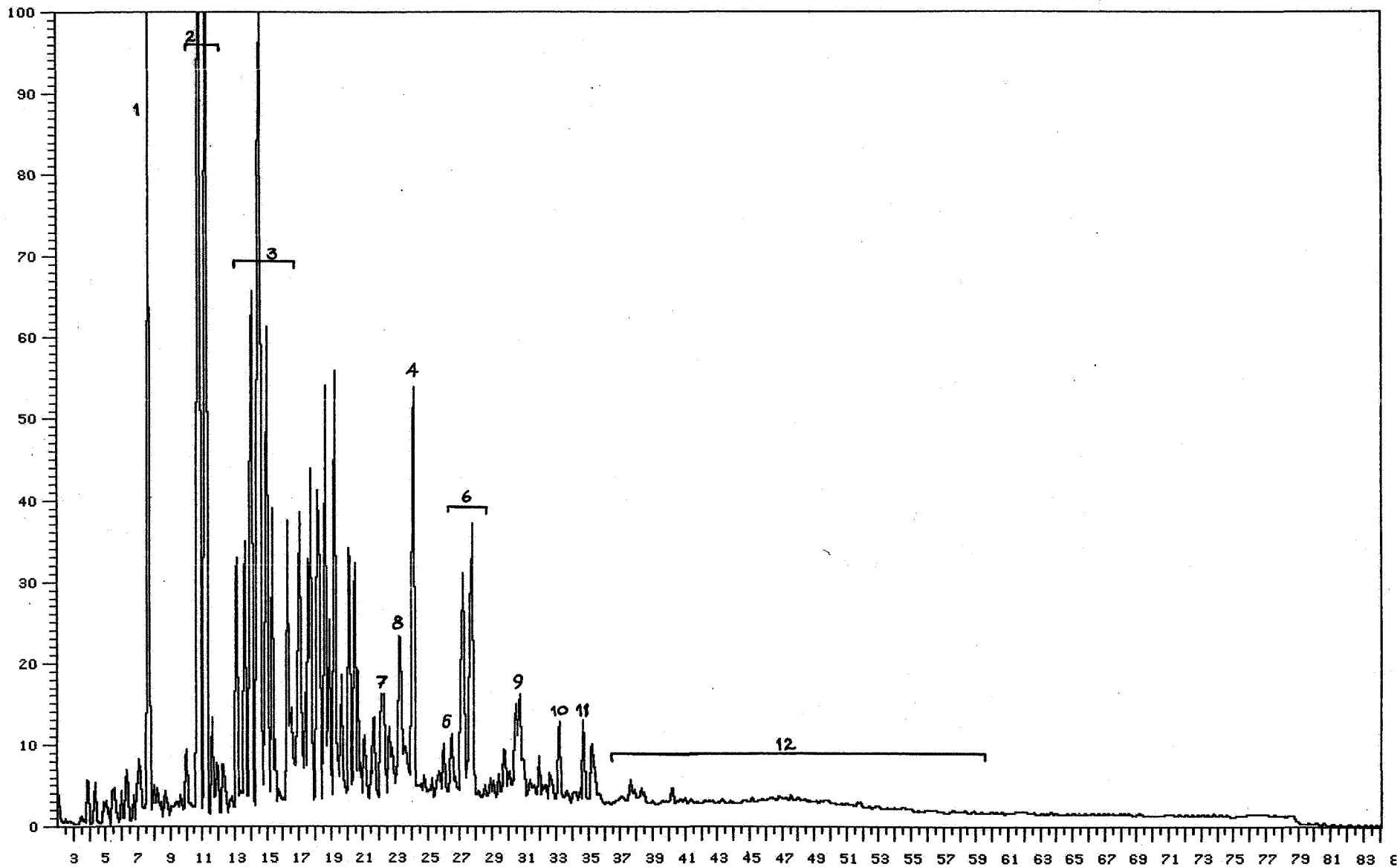
AROMATIC HYDROCARBONS

3730-3760 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 11 Injection #: 1
Sample Name : M-3080,ARO Maximum value : 16383



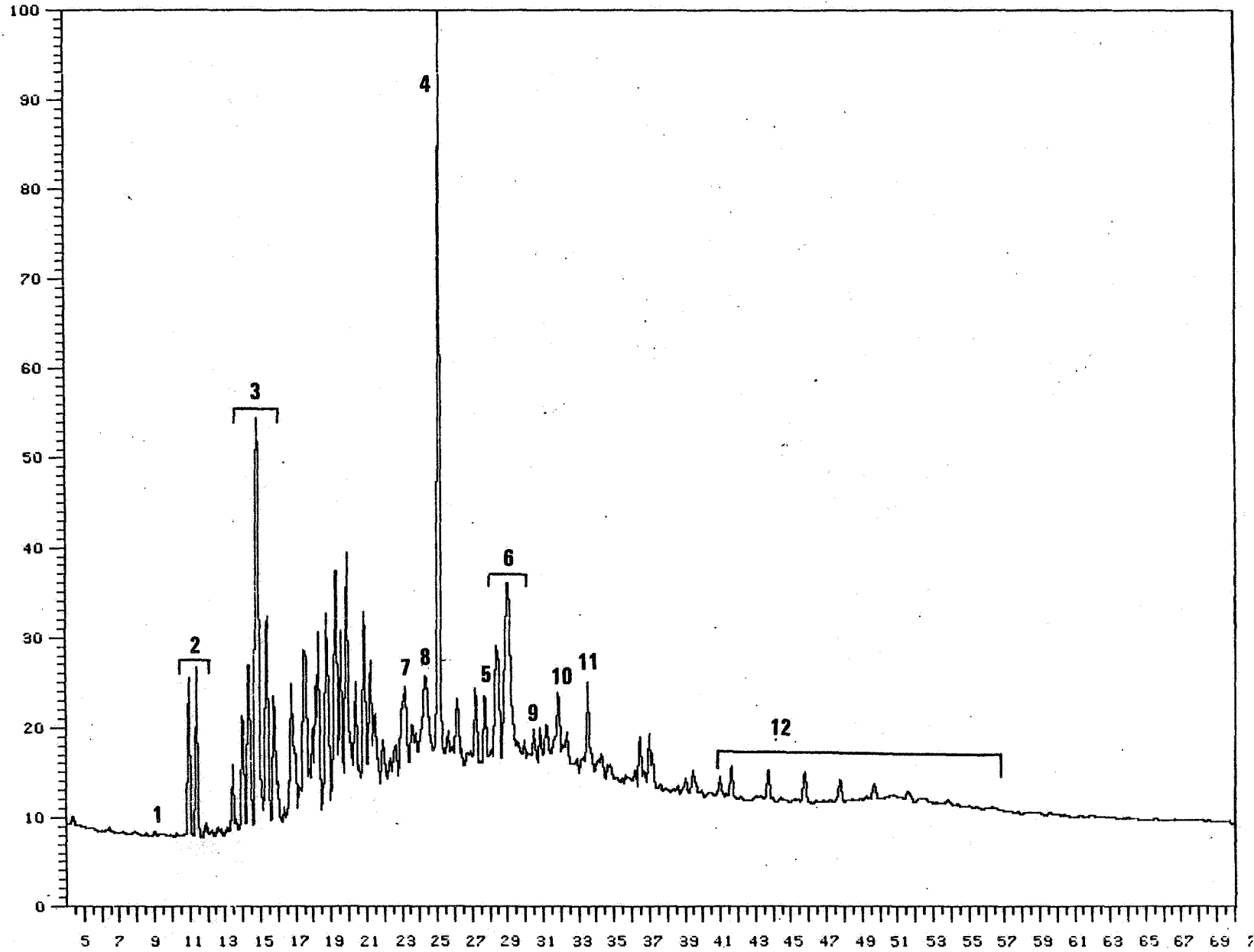
AROMATIC HYDROCARBONS

3640 - 3670m

Box 1 of 1

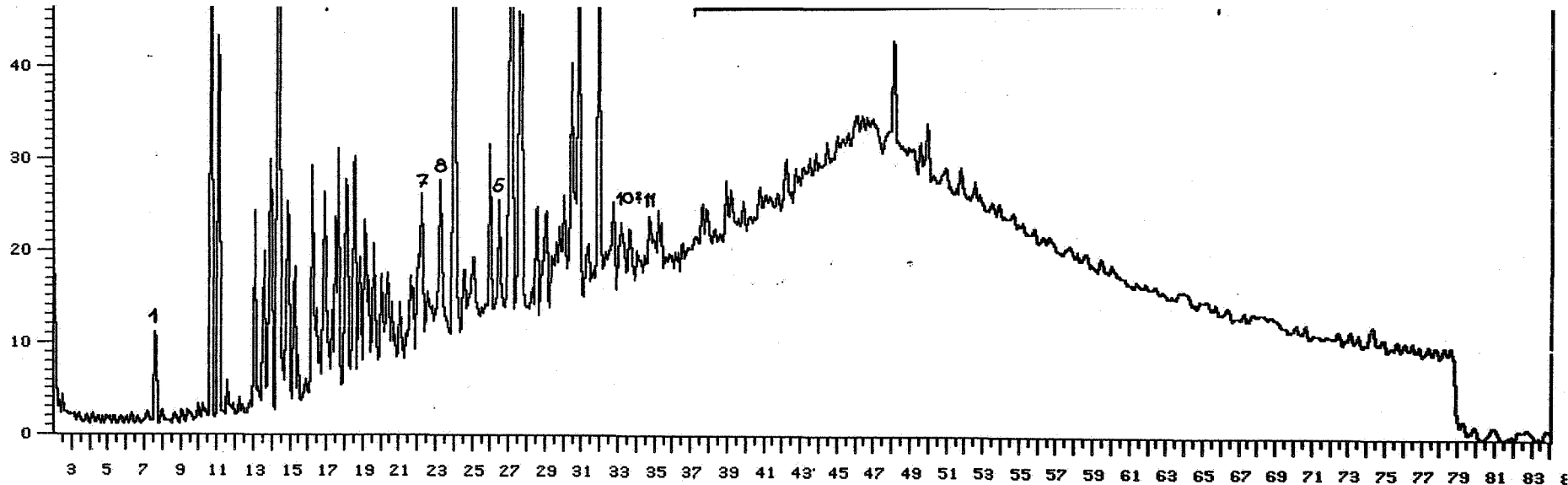
RAW DATA PLOT-CHANNEL 3

Analysis: M1727AR00BB Sample #: 1 Injection #: 1
Sample Name: M-1727,ARO Maximum value: 917



RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 12
Sample Name : M-3087, ARO



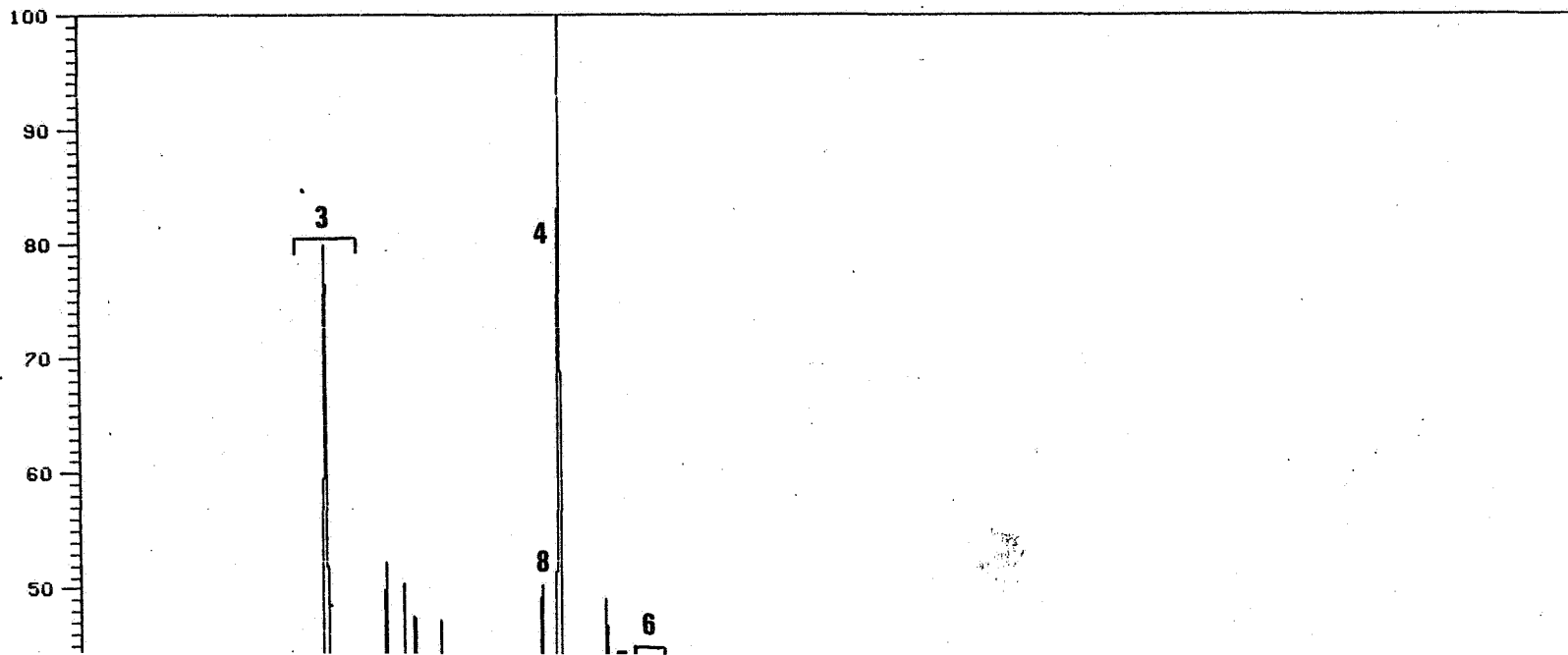
AROMATIC HYDROCARBONS

3820 - 3850 m

Box 1 of 1

Injection #: 1

Maximum value : 929

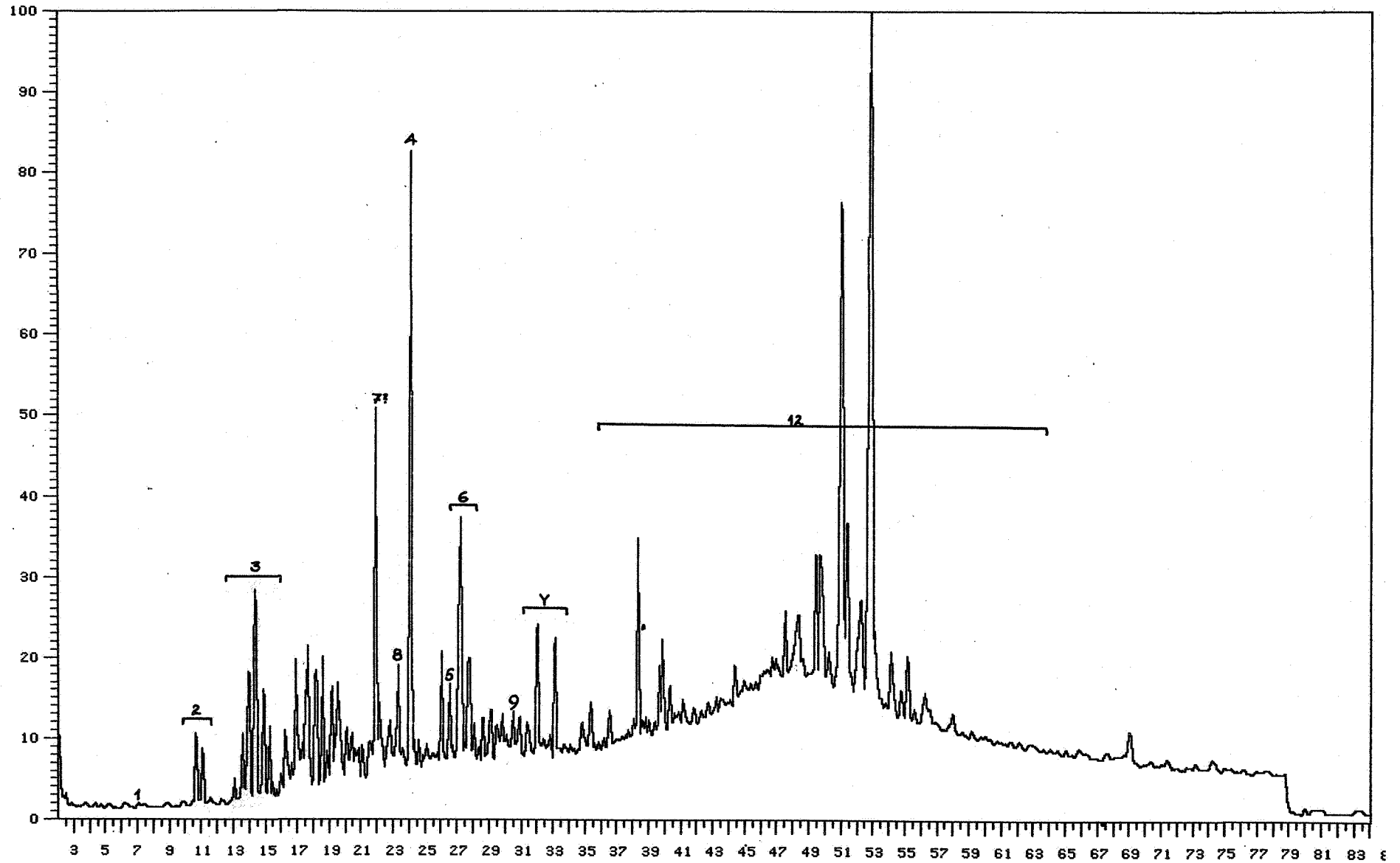


AROMATIC HYDROCARBONS
3970-4000 M

Box 1 of 1

RAW DATA PLOT-CHANNEL 5

Analysis : GULF4TV Sample #: 13 Injection #: 1
Sample Name : M-3088, ARO Maximum value : 6733



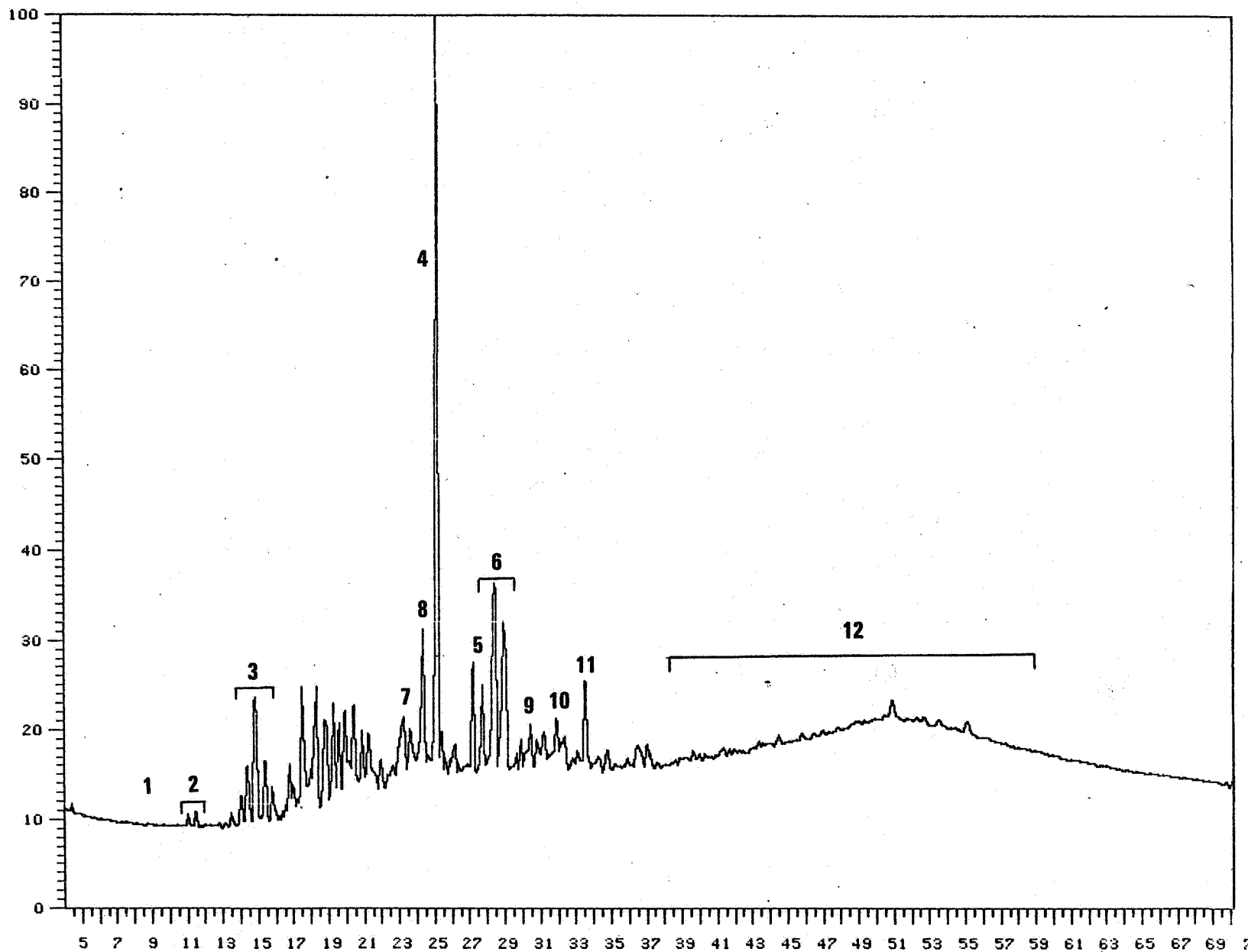
AROMATIC HYDROCARBONS

4120 - 4150m

Box 1 of 1

RAW DATA PLOT-CHANNEL 3

Analysis : M3093AR00BB Sample #: 1 Injection #: 1
Sample Name : M-3093,ARO Maximum value : 738



AROMATIC HYDROCARBONS

4180 - 4210 m

Box 1 of 1

RAW DATA PLOT-CHANNEL 3

Analysis : M3095AR00BB Sample #: 1 Injection #: 1
Sample Name : M-3095,ARO Maximum value : 888

