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EXXON PRODUCTION RESEARCH COMPANY

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10 JUNI 1983

REGISTRERT

OLJEDIREKTORATET

WELL 16/7-4 OFFSHORE NORWAY:  
HYDROCARBON SOURCE ANALYSES

Report by:  
R. E. Metter

Sample Handling and Analyses by:

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GeoChem Laboratories  
Geo-Strat Inc.

Research Application Report

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Esso Expro Norway

**EXXON** PRODUCTION RESEARCH COMPANY  
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RESERVOIR EVALUATION DIVISION

M.A. ROGERS  
MANAGER

May 13, 1983

BA 83-6315-1  
10 JUNI 1983  
REGISTRERT  
OLJEDIREKTORATET

Mr. J. D. Hedberg  
Esso Exploration and Production Norway Inc.  
Postboks No. 560  
4001 Stavanger, Norway

Attention: Mr. S. Horvik

Transmitted are six copies of our report EPR.99ES.83 entitled "Well 16/7-4 Offshore Norway: Hydrocarbon Source Analyses" by R. E. Metter.

The analytical results included in the report were requested in a September 22, 1982 Telex from J. G. Barrier of Esso Europe, who referred to Esso Exploration and Production Norway TJO No. 72376. Charges for the work have been billed through our EPR Job No. 17628.

Potentially good but mostly immature sources of oil and gas are present in the section above 2,200 meters. The top of the mature zone appears to lie within an organically lean, nonsource section of carbonates and red beds below 2,220 meters, where maturity indicators are scanty or completely lacking.

Gas accumulations which were tested at roughly 2,320 meters and 2,591 meters appear to have migrated in from elsewhere, and are not indigenous to the particular samples that we analyzed from this well. The gas could have come from either equivalent, more mature beds or from units not penetrated in this well. We are currently analyzing samples from these two horizons and will give our interpretations in a later report.

If you have questions regarding these results please let us know.

M. A. ROGERS

By

  
J. P. Shannon, Jr.

REM:sp

Attachment

c: Mr. R. M. Meek  
Mr. C. R. Evans

10 JUNI 1983  
**REGISTRERT**  
OLJEDIREKTORATET

EXXON PRODUCTION RESEARCH COMPANY

WELL 16/7-4 OFFSHORE NORWAY:  
HYDROCARBON SOURCE ANALYSES

R. E. Metter

Reservoir Evaluation Division

May 1983

EPR.99ES.83

Charges for this work were specifically authorized by Esso Exploration and Production Norway Inc., and are not covered by production research agreements with Exxon Production Research Company.

WELL 16/7-4 OFFSHORE NORWAY:  
HYDROCARBON SOURCE ANALYSES

R. E. Metter

SUMMARY AND CONCLUSIONS

Thirty-one canned cuttings samples from the interval 1,320-2,780 meters were analyzed routinely for hydrocarbon source characteristics. The results are presented in Tables 1 through 8 and in Figures 1 through 18.

The data can be interpreted as follows:

<u>Approximate Depth (meters)</u>	<u>Maturity</u>	<u>Richness</u>	<u>Source Type When Mature</u>
1,320-1,940	Immature	Good	Oil, Gas
1,940-2,100	"	Fair	Gas, Liquids, Oil
2,100-2,220	Transitional	Good	Oil, Gas
2,220-2,520?	"	Very Poor	Nonsource
2,520?-2,780	Mature?	"	Nonsource

The top of the mature zone is not well defined because it apparently occurs in a lean, nonsource interval which is nearly barren of our usual maturity indicators. Kerogen alteration data (TAI values) suggest the entire section is immature (Figure 1) and so do pyrolyses "T-Max" data (Table 6). Vitrinite reflectance data suggest that the mature zone is reached above 2,200 meters (Figure 18). The beds below 2,220 meters are so lean in organic matter that indigenous hydrocarbons are too scanty to provide reliable criteria of maturation.

We understand that gas with liquids was recovered in DST's of the intervals 2,320-2,340 meters and 2,590-2,597 meters. Our data strongly suggest that the gas is not indigenous to the beds immediately around the well bore, although equivalent strata in a different basin position may be the source.

This work was requested in a Telex dated September 22, 1982 from J. G. Barrier of Esso Europe. Samples arrived in December 1982. Charges for the work have been billed to Esso Exploration and Production Norway, TJO No. 72376 through our EPR Nob No. 17628.

PROCEDURES

1. C<sub>1</sub>-C<sub>4</sub> - Thirty-one canned cuttings samples were analyzed (Table 1). Compositions and concentrations of hydrocarbon gases in the air spaces above the cuttings in the sample cans were determined by gas chromatography. Similar data were obtained on gases released from standard mixtures of cuttings and tap water after two minutes of agitation in a Waring blender. Combined results on the "air space gas" plus the "cuttings gas" were calculated for each sample. The data were plotted graphically to show vertical variations in total gas (C<sub>1</sub>-C<sub>4</sub>) and a graphical plot was also made of the percent "wet gas" in total gas (Figure 1).

2. C<sub>4</sub>-C<sub>7</sub> and T.O.C. - While still wet, chips were "picked" from washed cuttings samples for further analyses (Table 2). We attempted to pick chips of reasonably uniform fine-grained lithologies from the heterogeneous mixtures of cuttings in the original samples. Our routine gas chromatographic procedures were used for determining their light gasoline (C<sub>4</sub>-C<sub>7</sub>) content. The total organic carbon was determined with a commercial Leco Carbon Analyzer after carbonate was first removed from the samples by use of HCl. These results are given in Tables 2, 3 and 8, and they are plotted graphically in Figure 1.
3. Visual kerogen - Visual kerogen characteristics by transmitted light were determined on 25 of the "picked" cuttings samples (Table 4). Determinations were made with a palynological microscope utilizing transmitted light through dispersed organic matter on standard slide mounts. The organic matter was separated from the samples by removing rock matrix materials with HF and HCl. The descriptions were based on the so-called "Staplin" nomenclature. In Table 4 many of the kerogens are shown to contain high percentages of "indeterminate fines". Chemical and lithologic data were used to aid in making our "Best Guesses" as to what the fines probably include.
4. Heavy (C<sub>15</sub>+) Hydrocarbons - Eight gross cuttings samples were analyzed for C<sub>15</sub>+ compounds. The samples were Soxhlet-extracted with a 9:1 benzene-methanol mixture. After the extracts were deasphalted with excess pentane, the pentane-solubles of three of the samples were analyzed by liquid column chromatography (Table 5). Separations by liquid chromatography were also made of the remaining five pentane-soluble samples but these were too small for meaningful weighings of individual fractions. Gas chromatograms were obtained on all of the heavy saturate fractions (Figures 2-9).
5. Rock-Eval Pyrolysis - Portions of the rock powders used for six of the T.O.C. analyses were analyzed by standard Rock-Eval pyrolysis (Table 6).
6. Vitrinite R<sub>O</sub> - Eight samples were sent to Geo-Strat, Inc. of Houston for vitrinite reflectance measurements (Figures 10 through 17). Whole-rock fragments in epoxy plug mounts were used for the measurements.

## DISCUSSION

The upper immature Tertiary interval from 1,320 to 1,560 meters is potentially a very good oil source, but we haven't seen anywhere in the North Sea area to date where equivalent beds appear to have generated significant amounts of hydrocarbons. The interval 1,560-1,940 is also a good source, although a bit more gas prone, but the same comments as above apply to this interval also. Gray shales just above the chalks, roughly from the interval 2,100-2,200 meters, are also good potential oil sources, and they apparently have generated some "early maturity" hydrocarbons; however, this zone possibly could also contain migrated hydrocarbons since it is essentially a seal above the chalky beds.

Esso Norway requested (prior to drilling) that fairly comprehensive detailed analyses be carried out on samples from below 2,400 meters, and that all routine analyses be run on every sample from below 2,000 meters. Unfortunately, the samples from below 2,220 meters proved to be lean and inappropriate for the most part for complete suites of analyses.

C1-C4 HYDROCARBON ANALYSES - AIR SPACE AT TOP OF CANS

		GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)								
SPL NO	R DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS					WET GAS			
										M	E	P	IB	NB	E	P	IB	NB
76205A	0 1320	5406.72	66.14	59.59	30.46	11.82	168.01	5574.73	3.0138	97.	1.	1.	1.	0.	40.	35.	18.	7.
76205C	0 1380	8455.81	94.40	86.56	53.15	10.84	244.95	8700.75	2.8152	97.	1.	1.	1.	0.	39.	35.	22.	4.
76205E	0 1440	6176.77	53.04	46.85	20.48	5.48	125.85	6302.62	1.9968	98.	1.	1.	0.	0.	43.	37.	16.	4.
76205G	0 1500	6071.18	79.40	80.47	34.02	14.01	207.90	6279.08	3.3110	97.	1.	1.	1.	0.	38.	39.	16.	7.
76205I	0 1560	3502.61	60.72	60.31	26.26	9.76	157.05	3659.66	4.2914	95.	2.	2.	1.	0.	39.	38.	17.	6.
76205K	0 1620	5111.83	102.71	83.28	32.10	14.45	232.54	5344.37	4.3511	95.	2.	2.	1.	0.	44.	36.	14.	6.
76205M	0 1680	6373.78	123.89	86.93	27.90	14.05	252.77	6626.55	3.8145	97.	2.	1.	0.	0.	49.	34.	11.	6.
76205O	0 1740	5396.68	118.86	72.69	24.46	10.98	226.99	5623.67	4.0363	97.	2.	1.	0.	0.	52.	32.	11.	5.
76205Q	0 1800	3105.40	84.90	57.37	17.07	6.50	165.84	3271.24	5.0696	94.	3.	2.	1.	0.	51.	35.	10.	4.
76205S	0 1860	1020.80	51.80	71.25	29.00	13.09	165.14	1185.94	13.9248	87.	4.	6.	2.	1.	31.	43.	18.	8.
76206A	0 1920	1240.87	38.06	54.00	21.09	9.18	122.33	1363.20	8.9737	90.	3.	4.	2.	1.	31.	44.	17.	8.
76206C	0 1980	1191.55	41.20	30.96	9.60	5.14	86.90	1278.45	6.7973	94.	3.	2.	1.	0.	47.	36.	11.	6.
76206E	0 2040	733.67	37.61	24.56	9.60	6.72	78.49	812.16	9.6643	90.	5.	3.	1.	1.	48.	31.	12.	9.
76206G	0 2100	1544.19	135.13	59.20	15.36	14.72	224.41	1768.60	12.6886	87.	8.	3.	1.	1.	60.	26.	7.	7.
76206I	0 2160	2366.40	471.29	345.80	39.80	42.43	899.32	3265.72	27.5382	73.	14.	11.	1.	1.	53.	38.	4.	5.
76206K	0 2220	371.20	68.22	269.71	124.95	206.72	669.60	1040.80	64.3351	35.	7.	26.	12.	20.	10.	40.	19.	31.
76206L	0 2250	47.05	15.46	36.81	17.44	28.48	98.19	145.24	67.6053	32.	11.	25.	12.	20.	16.	37.	18.	29.
76206M	0 2280	74.24	16.79	31.42	8.44	13.33	69.98	144.22	48.5231	51.	12.	22.	6.	9.	24.	45.	12.	19.
76206D	0 2340	11.46	1.68	7.26	3.26	5.17	17.37	28.83	60.2497	40.	6.	25.	11.	18.	10.	41.	19.	30.
76206P	0 2370	56.92	6.31	8.00	2.61	2.92	19.84	76.76	25.8468	75.	8.	10.	3.	4.	32.	40.	13.	15.
76206R	0 2430	72.16	5.17	7.03	2.30	2.38	16.88	89.04	18.9577	80.	6.	8.	3.	3.	31.	41.	14.	14.
76206S	0 2460	26.42	3.76	5.58	2.20	3.24	14.78	41.20	35.8738	64.	9.	14.	5.	8.	25.	38.	15.	22.
76206T	0 2490	26.07	2.83	2.41	0.65	1.48	7.37	33.44	22.0395	79.	8.	7.	2.	4.	38.	33.	9.	20.
76207A	0 2520	53.46	7.77	18.07	6.18	11.89	43.91	97.37	45.0960	55.	8.	19.	6.	12.	18.	41.	14.	27.
76207B	0 2550	902.45	265.71	860.26	617.14	964.36	2707.47	3609.92	75.0008	25.	7.	24.	17.	27.	10.	32.	23.	35.
76207C	0 2580	1432.42	478.07	1705.07	1079.47	1751.68	5014.29	6446.71	77.7806	22.	7.	26.	17.	28.	10.	34.	22.	34.
76207E	0 2640	610.53	138.65	162.63	48.42	81.42	431.12	1041.65	41.3882	58.	13.	16.	5.	8.	32.	38.	11.	19.
76207F	0 2670	58.44	12.49	17.36	5.17	11.83	46.85	105.29	44.4961	56.	12.	16.	5.	11.	27.	37.	11.	25.
76207G	0 2700	23.51	2.72	2.94	1.39	3.92	10.97	34.48	31.8155	68.	8.	9.	4.	11.	25.	27.	13.	35.
76207H	0 2730	7.01	0.83	1.08	0.42	1.16	3.49	10.50	33.2381	67.	8.	10.	4.	11.	24.	31.	12.	33.
76207J	0 2780	60.15	3.26	3.30	0.79	2.34	9.69	69.84	13.8745	86.	5.	5.	1.	3.	34.	34.	8.	24.

\*B\* = CUTTINGS NOT ANALYZED

\*C\* = AIR SPACE GAS NOT RUN

\*BC\* = NO ANALYSES RUN

## C1-C4 HYDROCARBON ANALYSES - CUTTINGS ONLY

SPL NO	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)					GAS COMPOSITION (PERCENT)								
			METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M E P IB NB	WET GAS E P IB NB				
76205A	0	1320	3514.80	52.72	93.94	72.00	23.20	241.86	3756.66	6.4382	93.	1.	3.	2.	1.	22.38.30.10.
76205C	0	1380	3306.00	35.52	66.60	66.00	17.85	185.97	3491.97	5.3256	94.	1.	2.	2.	1.	19.36.35.10.
76205E	0	1440	3145.92	46.62	84.37	63.00	23.20	217.19	3363.11	6.4580	93.	1.	3.	2.	1.	21.39.29.11.
76205G	0	1500	2192.40	27.75	64.69	51.00	24.99	168.43	2360.83	7.1343	93.	1.	3.	2.	1.	16.39.30.15.
76205I	0	1560	2296.80	45.79	99.00	63.00	33.91	241.70	2538.50	9.5213	91.	2.	4.	2.	1.	19.41.26.14.
76205K	0	1620	6472.80	119.32	192.66	97.50	62.47	471.95	6944.75	6.7958	93.	2.	3.	1.	1.	25.41.21.13.
76205M	0	1680	3619.20	705.96	118.12	44.25	30.34	898.67	4517.87	19.8914	79.16.	3.	1.	1.		79.13. 5. 3.
76205O	0	1740	5846.40	144.30	178.59	56.25	35.70	414.84	6261.24	6.6255	93.	2.	3.	1.	1.	35.42.14. 9.
76205Q	0	1800	3201.60	119.32	165.94	48.00	26.77	360.03	3561.63	10.1086	90.	3.	5.	1.	1.	33.47.13. 7.
76205S	0	1860	1566.00	47.17	172.97	97.50	66.94	384.58	1950.58	19.7162	81.	2.	9.	5.	3.	12.46.25.17.
76206A	0	1920	1270.20	31.91	95.62	51.00	35.70	214.23	1484.43	14.4318	87.	2.	6.	3.	2.	15.44.24.17.
76206C	0	1980	2401.20	31.91	46.41	18.75	15.62	112.69	2513.89	4.4827	95.	1.	2.	1.	1.	28.41.17.14.
76206E	0	2040	1670.40	30.52	42.19	20.25	24.99	117.95	1788.35	6.5954	94.	2.	2.	1.	1.	26.36.17.21.
76206G	0	2100	1287.60	196.47	218.25	78.00	121.38	614.10	1901.70	32.2922	69.10.11.	4.	6.			32.35.13.20.
76206I	0	2160	2227.20	444.00	742.50	78.00	121.38	1385.88	3613.08	38.3573	62.12.21.	2.	3.			32.53. 6. 9.
76206K	0	2220	974.40	29.97	279.00	195.00	514.08	1018.05	1992.45	51.0954	48.	2.	14.	10.	26.	3.27.19.51.
76206L	0	2250	870.00	11.10	36.00	21.75	54.00	122.85	992.85	12.3735	88.	1.	4.	2.	5.	9.29.18.44.
76206M	0	2280	1218.00	12.76	39.37	16.50	37.48	106.11	1324.11	8.0137	92.	1.	3.	1.	3.	12.37.16.35.
76206O	0	2340	791.70	2.77	9.84	6.75	15.17	34.53	826.23	4.1792	96.	0.	1.	1.	2.	8.28.20.44.
76206P	0	2370	1174.50	2.77	4.50	2.62	4.91	14.80	1189.30	1.2444	100.	0.	0.	0.	0.	19.30.18.33.
76206R	0	2430	835.20	2.22	5.62	3.00	5.80	16.64	851.84	1.9534	98.	0.	1.	0.	1.	13.34.18.35.
76206S	0	2460	1148.40	2.77	3.09	1.50	3.12	10.48	1158.88	0.9043	100.	0.	0.	0.	0.	26.29.14.31.
76206T	0	2490	887.40	1.66	1.91	0.90	2.50	6.97	894.37	0.7793	100.	0.	0.	0.	0.	24.27.13.36.
76207A	0	2520	1280.64	8.32	22.95	12.45	35.34	79.06	1359.70	5.8145	93.	1.	2.	1.	3.	11.29.16.44.
76207B	0	2550	1287.60	177.60	878.40	835.20	1627.92	3519.12	4806.72	73.2125	27.	4.	18.	17.	34.	5.25.24.46.
76207C	0	2580	2157.60	235.32	1674.00	2136.00	5540.64	9585.96	11743.56	81.6274	18.	2.	14.	18.	48.	2.17.22.59.
76207E	0	2640	1078.80	84.91	146.25	70.50	153.51	455.17	1533.97	29.6727	69.	6.	10.	5.	10.	19.32.15.34.
76207F	0	2670	1211.04	15.54	34.65	19.20	45.70	115.09	1326.13	8.6786	92.	1.	3.	1.	3.	14.30.17.39.
76207G	0	2700	5359.20	11.10	9.45	5.40	18.21	44.16	5403.36	0.8172	100.	0.	0.	0.	0.	25.21.12.42.
76207H	0	2730	1085.76	5.99	7.65	3.00	8.57	25.21	1110.97	2.2692	97.	1.	1.	0.	1.	24.30.12.34.
76207J	0	2780	4941.60	0.44	3.15	2.10	5.71	11.40	4953.00	0.2301	100.	0.	0.	0.	0.	4.28.18.50.

\*B\* = CUTTINGS NOT ANALYZED

\*C\* = AIR SPACE GAS NOT RUN

\*BC\* = NO ANALYSES RUN

C1-C4 HYDROCARBON ANALYSES - CUTTINGS AND AIR SPACE

		GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)							GAS COMPOSITION (PERCENT)									
SPL NO	R DEPTH	METHANE	ETHANE	PROPANE	IBUTANE	NBUTANE	WET	TOTAL	WET/TOTAL	TOTAL GAS				WET GAS				
		C1	C2	C3	IC4	C4	C2-C4	C1-C4	PERCENT	M	E	P	IB	NB	E	P	IB	NB
76205A	0 1320	8921.52	118.86	153.53	102.46	35.02	409.87	9331.39	4.3924	96.	1.	2.	1.	0.	29.	37.	25.	9.
76205C	0 1380	11761.81	129.92	153.16	119.15	28.69	430.91	12192.72	3.5342	97.	1.	1.	1.	0.	30.	35.	28.	7.
76205E	0 1440	9322.69	99.66	131.22	83.48	28.68	343.04	9665.72	3.5490	97.	1.	1.	1.	0.	29.	39.	24.	8.
76205G	0 1500	8263.58	107.15	145.16	85.02	39.00	376.33	8639.91	4.3557	96.	1.	2.	1.	0.	28.	39.	23.	10.
76205I	0 1560	5799.41	106.51	159.31	89.26	43.67	398.75	6198.16	6.4333	93.	2.	3.	1.	1.	27.	40.	22.	11.
76205K	0 1620	11584.63	222.03	275.94	129.60	76.92	704.49	12289.12	5.7326	94.	2.	2.	1.	1.	32.	39.	18.	11.
76205M	0 1680	9992.98	829.85	205.05	72.15	44.39	1151.44	11144.42	10.3320	90.	7.	2.	1.	0.	72.	18.	6.	4.
76205O	0 1740	11243.08	263.16	251.28	80.71	46.68	641.83	11884.91	5.4004	95.	2.	2.	1.	0.	41.	39.	13.	7.
76205Q	0 1800	6307.00	204.22	223.31	65.07	33.27	525.87	6832.87	7.6962	93.	3.	3.	1.	0.	39.	43.	12.	6.
76205S	0 1860	2586.80	98.97	244.22	126.50	80.03	549.72	3136.52	17.5264	82.	3.	8.	4.	3.	18.	44.	23.	15.
76206A	0 1920	2511.07	69.97	149.62	72.09	44.88	336.56	2847.63	11.8189	88.	2.	5.	3.	2.	21.	45.	21.	13.
76206C	0 1980	3592.75	73.11	77.37	28.35	20.76	199.59	3792.34	5.2629	94.	2.	2.	1.	1.	37.	39.	14.	10.
76206E	0 2040	2404.07	68.13	66.75	29.85	31.71	196.44	2600.51	7.5539	92.	3.	3.	1.	1.	35.	34.	15.	16.
76206G	0 2100	2831.79	331.60	277.45	93.36	136.10	838.51	3670.30	22.8458	76.	9.	8.	3.	4.	40.	33.	11.	16.
76206I	0 2160	4593.60	915.29	1088.30	117.80	163.81	2285.20	6878.80	33.2209	67.	13.	16.	2.	2.	40.	48.	5.	7.
76206K	0 2220	1345.60	98.19	548.71	319.95	720.80	1687.65	3033.25	55.6383	44.	3.	18.	11.	24.	6.	33.	19.	42.
76206L	0 2250	917.05	26.56	72.81	39.19	82.48	221.04	1138.09	19.4220	82.	2.	6.	3.	7.	12.	33.	18.	37.
76206M	0 2280	1292.24	29.55	70.79	24.94	50.81	176.09	1468.33	11.9925	88.	2.	5.	2.	3.	17.	40.	14.	29.
76206O	0 2340	803.16	4.45	17.10	10.01	20.34	51.90	855.06	6.0697	94.	1.	2.	1.	2.	9.	33.	19.	39.
76206P	0 2370	1231.42	9.08	12.50	5.23	7.83	34.64	1266.06	2.7360	97.	1.	1.	0.	1.	26.	36.	15.	23.
76206R	0 2430	907.36	7.39	12.65	5.30	8.18	33.52	940.88	3.5626	96.	1.	1.	1.	1.	22.	38.	16.	24.
76206S	0 2460	1174.82	6.53	8.67	3.70	6.36	25.26	1200.08	2.1048	97.	1.	1.	0.	1.	26.	34.	15.	25.
76206T	0 2490	913.47	4.49	4.32	1.55	3.98	14.34	927.81	1.5455	100.	0.	0.	0.	0.	31.	30.	11.	28.
76207A	0 2520	1334.10	16.09	41.02	18.63	47.23	122.97	1457.07	8.4395	92.	1.	3.	1.	3.	13.	33.	15.	39.
76207B	0 2550	2190.05	443.31	1738.66	1452.34	2592.28	6226.59	8416.64	73.9795	26.	5.	21.	17.	31.	7.	28.	23.	42.
76207C	0 2580	3589.02	713.39	3379.07	3215.47	7292.32	14600.25	18190.27	80.2641	20.	4.	19.	18.	40.	5.	23.	22.	50.
76207E	0 2640	1689.33	223.56	308.88	118.92	234.93	886.29	2575.62	34.4107	65.	9.	12.	5.	9.	25.	35.	13.	27.
76207F	0 2670	1269.48	28.03	52.01	24.37	57.53	161.94	1431.42	11.3132	88.	2.	4.	2.	4.	17.	32.	15.	36.
76207G	0 2700	5382.71	13.82	12.39	6.79	22.13	55.13	5437.84	1.0138	100.	0.	0.	0.	0.	25.	22.	12.	41.
76207H	0 2730	1092.77	6.82	8.73	3.42	9.73	28.70	1121.47	2.5591	97.	1.	1.	0.	1.	24.	30.	12.	34.
76207J	0 2780	5001.75	3.70	6.45	2.89	8.05	21.09	5022.84	0.4199	100.	0.	0.	0.	0.	18.	31.	14.	37.

\*B\* = CUTTINGS NOT ANALYZED

\*C\* = AIR SPACE GAS NOT RUN

\*BC\* = NO ANALYSES RUN



## CUTTINGS GAS SUMMARY

SAMPLE NO.	DEPTH	TOTAL C1-C4	% WET	% C3+	C3+/C1	C2/C1
76205A	1320	9331.	4.	3.	0.03	0.01
76205C	1380	12193.	3.	2.	0.03	0.01
76205E	1440	7666.	3.	2.	0.03	0.01
76205G	1500	8640.	4.	3.	0.03	0.01
76205I	1560	6198.	7.	5.	0.05	0.02
76205K	1620	12289.	6.	4.	0.04	0.02
76205M	1680	11144.	10.	3.	0.03	0.08
76205O	1740	11885.	5.	3.	0.03	0.02
76205Q	1800	6833.	7.	4.	0.05	0.03
76205S	1860	3137.	18.	15.	0.17	0.04
76206A	1920	2848.	12.	10.	0.11	0.03
76206C	1980	3792.	6.	4.	0.04	0.02
76206E	2040	2601.	8.	5.	0.05	0.03
76206G	2100	3670.	24.	15.	0.18	0.12
76206I	2160	6879.	33.	20.	0.30	0.20
76206K	2220	3033.	56.	53.	1.18	0.07
76206L	2250	1138.	18.	16.	0.21	0.03
76206M	2280	1468.	12.	10.	0.11	0.02
76206O	2340	855.	6.	5.	0.06	0.01
76206P	2370	1266.	3.	2.	0.02	0.01
76206R	2430	941.	4.	3.	0.03	0.01
76206S	2460	1200.	3.	2.	0.02	0.01
76206T	2490	928.	0.	0.	0.01	0.00
76207A	2520	1457.	8.	7.	0.08	0.01
76207B	2550	8417.	74.	69.	2.64	0.20
76207C	2580	18190.	81.	77.	3.87	0.20
76207E	2640	2576.	35.	26.	0.39	0.13
76207F	2670	1431.	12.	10.	0.11	0.02
76207G	2700	5438.	0.	0.	0.01	0.00
76207H	2730	1121.	3.	2.	0.02	0.01
76207J	2780	5023.	0.	0.	0.00	0.00

TABLE 2

DESCRIPTIONS OF "PICKED" SAMPLES  
(Lith. by Hahn; TOC by Sikirica)

Depth (meters)	EPR No.	Gross Lithology	GSA Color Code	Total Organic Carbon (%)
1,320	76205-A	Shale, pale yellowish brown, v. sl. calc.	10YR 6/4	2.52
1,380	-C	Shale, lt. yellowish brown, silty, v. sl. calc.	10YR 5/2	2.48
1,440	-E	Shale, dk. brownish gray, mod. calc.	5YR 3/1	3.12
1,500	-G	Shale, lt. yellowish brown, silty, sl. calc.	10YR 5/2	2.22
1,560	-I	Shale, yellowish gray, foss.	5Y 7/4	1.84
1,620	-K	Shale, lt. yellowish gray, silty, sl. calc.	5Y 7/1	1.55
1,680	-M	As above, foss., noncalc.	5Y 7/1	1.49
1,740	-O	As above.	5Y 7/1	1.82
1,800	-Q	Shale, lt. olive gray.	5Y 6/1	2.02
1,860	-S	Shale, lt. yellowish brown.	10YR 5/2	1.66
1,920	76206-A	Shale, med. olive gray.	5Y 5/1	1.62
1,980	-C	Shale, greenish gray to med. greenish gray.	5GY 6/1-5/1	.41
2,040	-E	As above.	5GY 6/1-5/1	.44
2,100	-G	Shale, med. dk. gray to med. gray.	N4-N5	.84
2,160	-I	Shale, med. gray.	N5	1.35
2,220	-K	As above.	N5	.50
2,250	-L	Chalk, white to pinkish white.	N9-5YR 9/1	.09
2,280	-M	As above.	N9-5YR 9/1	.05
2,340	-O	Shale, greenish gray.	5GY 6/1	.33
2,370	-P	Limestone, white to v. lt. gray, chalky.	N9-N8	.11
2,430	-R	Chalky limestone, pinkish gray.	5YR 8/1	.10
2,460	-S	As above, plus lt. brownish gray calc. shale	5YR 8/1; 5YR 6/1	.12
2,490	-T	Shale, olive gray to lt. olive gray, dolomitic.	5Y 4/1-6/1	.14
2,520	76207-A	Shale, greenish gray, dolomitic.	5GY 6/1	.18
2,550	-B	Shale, grayish red.	10R 4/2	.06
2,580	-C	Shale, greenish gray, mod. calc.	5GY 6/1	.16
2,640	-E	Mixture of red beds, gray shales, chalk, siltstone; sand-sized grains.	-	.17
2,670	-F	As above, plus quartz grains, reddish.	-	.09
2,700	-G	As above.	-	.18
2,730	-H	As above, plus med. reddish gray shale.	5GY 5/1	.06
2,780	-J	Mixture, mostly fine quartz sand.	-	.03

TABLE 3

LIGHT GASOLINES (C<sub>4</sub>-C<sub>7</sub>) - SUMMARY\*  
(Erney)

Depth (meters)	EPR No.	Total Organic Carbon %	Total C <sub>4</sub> -C <sub>7</sub> (ppm)	Correlation Ratios				
				C <sub>1</sub> /C <sub>2</sub>	A/D <sub>2</sub>	C <sub>1</sub> /D <sub>2</sub>	CH/MCP	n-Pent/i-Pent
1,320	76205-A	2.52	0.	-	-	-	-	-
1,380	-C	2.48	0.	-	-	-	-	-
1,440	-E	3.12	0.	-	-	-	-	-
1,500	-G	2.22	0.	-	-	-	-	-
1,560	-I	1.84	0.	-	-	-	-	-
1,620	-K	1.55	2.2	.68	8.64	8.55	.15	.48
1,680	-M	1.49	1.6	.84	5.78	9.81	.13	.92
1,740	-O	1.82	3.1	.72	11.27	11.26	.13	.01
1,800	-Q	2.02	2.6	.83	6.85	7.86	.14	.03
1,860	-S	1.66	1.3	.99	7.97	7.24	.15	.62
1,920	76206-A	1.62	2.7	.74	9.90	8.91	.15	.51
1,980	-C	.41	.8	1.63	37.23	20.75	.39	.78
2,040	-E	.44	.9	1.25	19.96	12.77	.33	.85
2,100	-G	.84	12.8	.35	1.42	4.08	.10	.57
2,160	-I	1.35	17.8	.37	2.58	6.18	.09	.52
2,220	-K	.50	10.7	1.38	9.86	23.23	.93	1.12
2,250	-L	.09	.6	2.41	11.42	13.17	.96	1.33
2,280	-M	.05	.0	-	-	-	-	-
2,340	-O	.33	2.4	1.63	11.58	16.74	.92	1.29
2,370	-P	.11	0.	-	-	-	-	-
2,430	-R	.10	0.	-	-	-	-	-
2,460	-S	.12	0.	-	-	-	-	-
2,490	-T	.14	0.	-	-	-	-	-
2,520	76207-A	.18	0.	-	-	-	-	-
2,550	-B	.06	0.	-	-	-	-	-
2,580	-C	.16	1.1	5.02	1.71	5.04	.57	4.09
2,640	-E	.17	0.	-	-	-	-	-
2,670	-F	.09	0.	-	-	-	-	-
2,700	-G	.18	0.	-	-	-	-	-
2,730	-H	.06	0.	-	-	-	-	-
2,780	-J	.03	0.	-	-	-	-	-

\*See Table 8 for detailed analyses.

TABLE 4  
VISUAL KEROGEN CHARACTERISTICS  
(Morgan)

Depth (meters)	EPR No.	Total Organic Carbon (%)	Kerogen Alteration (TAI)	Confidence in TAI (10 max.)	Types of Kerogen (%)*							Kerogen Source Rating		
					Al?	Al	IF	H	W	C	M	Maturity	Richness	Type When Mature
1,320	76205-A	2.52	1+	3	-	70	30(Al)	-	tr	-	-	Immature	Good	Oil
1,380	-C	2.48	1+	5	-	60	30(Al)	tr	tr	tr	-	"	"	Oil
1,440	-E	3.12	1+	3	-	60	40(Al)	-	tr	-	-	"	Rich	Oil
1,500	-G	2.22	1+	5	-	60	20(Al)	tr	10	tr	-	"	Good	Oil
1,560	-I	1.84	1+	5	-	60	30(Al)	tr	tr	-	-	"	"	Oil
1,620	-K	1.55	1+	5	10	-	50(Al,H,W)	tr	30	tr	tr	"	"	Gas,Liquids
1,680	-M	1.49	1+	5	10	-	40(Al,H,W)	tr	40	tr	-	"	"	Gas,Liquids
1,740	-O	1.82	1+	5	10	-	70(W,H,Al)	tr	10	tr	tr	"	"	Gas,Oil
1,800	-Q	2.02	1+	5	10	-	70(W,H,Al)	-	20	tr	-	"	"	Gas,Oil
1,860	-S	1.66	1+	5	tr	-	70(Al,W,H)	tr	20	tr	-	"	"	Gas,Liquids
1,920	76206-A	1.62	1+	5	-	-	70(Al,W,H)	tr	20	tr	-	"	"	Gas,Liquids
1,980	-C	.41	1+	5	10	-	30(Al,W)	20	20	10	10	"	Poor	(Gas,Oil)
2,040	-E	.44	1+	5	-	20	20(W)	10	20	20	10	"	Marginal	Gas,Oil
2,100	-G	.84	1+	5	-	60	tr	10	10	tr	10	"	Fair	Oil
2,160	-I	1.35	1+	5	-	30	30(Al)	20	10	10	-	"	Good	Oil
2,220	-K	.50	1+	5	10	-	20(W)	tr	40	20	tr	"	Marginal	(Gas,Liquids)
2,250	-L	.09	1+ to 2-	3	20	60	-	tr	10	tr	-	"	Very Poor	Nonsource
2,340	-O	.33	2	3	-	-	-	-	50	40	tr	"	Poor	(Gas)
2,430	-R	.10	1+	5	-	10	-	10	60	10	tr	"	Very Poor	Nonsource
2,490	-T	.14	1+	4	-	-	-	-	60	40	-	"	"	"
2,520	76207-A	.18	3-(?)	1	-	-	-	-	30	70	-	"(?)	"	"
2,550	-B	.06	2-	3	60	-	-	-	tr	30	-	"	"	"
2,640	-E	.17	2-	3	10	-	-	tr	60	30	-	"	"	"
2,730	-H	.06	2-	3	tr	-	-	-	50	40	-	"	"	"
2,780	-J	.03	1+	5	-	-	-	tr	60	30	tr	"	"	"

\*Al? - Questionable Algal; Al - Algal; IF - Indeterminate Fines; H - Herbaceous; W - Woody; C - Coaly; M - Microplankton; tr - traces; (W,H) - Best guess as to IF (Metter).

TABLE 5  
HEAVY (C<sub>15+</sub>) SOLUBLE ORGANIC MATTER  
(Sikirica)

<u>Depth (meters)</u>	1,860	1,980	2,160	2,220	2,340	2,370	2,490	2,520
<u>EPR No.</u>	76205-S	76206-C	76206-I	76206-K	76206-O	76206-P	76206-T	76207-A
<u>Total Organic Carbon (%)</u>	1.72	.67	1.34	.53	.31	.13	.15	.17
<u>Soluble Organic Matter (ppm)</u>	744	144	463	98	188	90	126	81
<u>Composition of S.O.M. (%)</u>								
Saturates*	6.7	-	8.6	-	27.1	-	-	-
Aromatics	8.3	-	12.8	-	17.6	-	-	-
Eluted NSO's	38.2	-	26.8	-	22.3	-	-	-
Noneluted NSO's	2.8	-	3.6	-	0.0	-	-	-
Asphaltenes	44.0	43.1	48.2	54.4	33.0	48.6	44.9	63.3
<u>Hydrocarbons</u>								
ppm of rock	112	< 80	99	< 40	84	< 40	< 60	< 30
% of T.O.C.	.7	-	.7	-	2.7	-	-	-
Saturates/Aromatics	.8	-	.7	-	1.6	-	-	-
<u>C<sub>15+</sub> Source Rating</u>								
Richness	Good	Poor	Good	Very Poor	Poor	Very Poor	Very Poor	Very Poor
Maturity	Immature	Immature	Immature	Immature	Immature			?
Type	Oil, Gas	Oil, Gas	Oil, Gas	Nonsource	Oil, Gas	Nonsource	Nonsource	Nonsource

\*See Figures 2-9 for gas chromatograms of saturates.

TABLE 6  
 PYROLYSIS BY ROCK-EVAL, 16/7-4  
 (GeoChem Labs)

<u>Depth (meters)</u>	<u>EPR No.</u>	<u>Total Organic Carbon (%)</u>	<u>S1*</u>	<u>S2*</u>	<u>S3*</u>	<u>S2/S3</u>	<u>H Index</u>	<u>O Index</u>	<u>T-Max (°C)</u>
1,680	76205-M	1.49	.04	1.64	.33	5.0	110	22	428
1,800	-Q	2.02	.06	2.07	.42	4.9	102	20	428
1,920	76206-A	1.62	.06	1.89	.39	4.8	116	24	431
2,160	-I	1.35	.03	1.57	.34	4.6	116	25	429
2,220	-K	.50	.02	.06	.17	.4	12	34	-
2,340	-O	.33	.02	.12	.58	.2	36	175	397

\*mg/gm of rock.

TABLE 7  
VITRINITE REFLECTANCE  
(Geo-Strat)

<u>Depth (meters)</u>	<u>EPR No.</u>	<u>Population* No.</u>	<u>No. of Readings</u>	<u>R<sub>o</sub> Min.</u>	<u>R<sub>o</sub> Max.</u>	<u>R<sub>o</sub> Ave. (%)</u>
1,320	76205-A	Total	24	.25	.76	.44
1,440	-E	(1)	9	.25	.48	.37
1,560	-I	(1)	12	.24	.42	.32
1,740	-O	Total	4	.30	.57	.47
1,860	-S	Total	10	.37	1.08	.71
		(1)	4	.37	.51	.44
		(2)	3	.65	.82	.75
1,920	76206-A	Total	2	.74	.92	.83
2,040	-E	(1)	4	.58	.68	.61
		(2)	2	1.22	1.44	1.33
2,220	-K	Total	11	.60	1.14	.85
		(1)	9	.60	.95	.79
		(2)	2	1.11	1.14	1.13

\*See Figures 10-17 for histograms of data and for population identifications, and Figure 18 for summary profile.

**TABLE 8**  
**DETAILED ANALYSES OF LIGHT GASOLINES (C<sub>4</sub>-C<sub>7</sub>)**  
**(Erney)**

76205K OFF. NORWAY ESSO 16/7-4 1620M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	91.2	4.14
ETHANE	0.0		1T2-DMCP	42.9	1.94
PROPANE	37.4		3-EPENT	0.0	0.00
IBUTANE	75.9	3.44	224-TMP	0.0	0.00
NBUTANE	63.2	2.87	NHEPTANE	162.9	8.29
1PENTANE	309.1	14.02	1C2-DMCP	21.2	0.96
NPENTANE	147.1	6.67	MCH	224.7	10.19
22-DMB	15.3	0.69			
CPENTANE	24.4	1.11			
23-DMB	31.2	1.42			
2-MP	224.9	10.20			
3-MP	51.5	2.33			
NHEXANE	159.3	7.22			
MCP	266.2	12.07			
22-DMP	0.0	0.00			
24-DMP	5.4	0.24			
223-TMB	6.8	0.31			
CHEXANE	40.5	1.84			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	73.6	3.34			
23-DMP	30.0	1.36			
3-MHEX	39.6	1.80			
1C3-DMCP	78.4	3.56			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS	
ALL COMP	2242.		C1/C2	0.68
GASOLINE	2205.		A /D2	8.64
NAFTHENES	789.	35.80	C1/D2	8.55
C6-7	1263.	57.26	CH/MCP	0.15
			PENT/IPENT.	0.48

76205M OFF. NORWAY ESSO 16/7-4 1680M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	71.2	4.56
ETHANE	0.0		1T2-DMCP	59.0	3.77
PROPANE	3.9		3-EPENT	0.0	0.00
IBUTANE	10.2	0.65	224-TMP	0.0	0.00
NBUTANE	14.2	0.91	NHEPTANE	147.3	9.43
1PENTANE	44.9	2.87	1C2-DMCP	32.2	2.06
NPENTANE	41.2	2.64	MCH	321.8	20.59
22-DMB	3.5	0.22			
CPENTANE	12.3	0.79			
23-DMB	16.9	1.08			
2-MP	125.7	8.04			
3-MP	35.9	2.30			
NHEXANE	101.2	6.48			
MCP	229.7	14.70			
22-DMP	0.0	0.00			
24-DMP	5.1	0.33			
223-TMB	4.3	0.40			
CHEXANE	31.0	1.98			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	69.1	4.42			
23-DMP	31.3	2.00			
3-MHEX	43.0	2.75			
1C3-DMCP	109.5	7.01			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS	
ALL COMP	1567.		C1/C2	0.84
GASOLINE	1563.		A /D2	5.78
NAFTHENES	867.	55.47	C1/D2	9.81
C6-7	1258.	80.49	CH/MCP	0.13
			PENT/IPENT.	0.92

76205O OFF. NORWAY ESSO 16/7-4 1740M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	90.3	2.93
ETHANE	0.0		1T2-DMCP	36.3	1.18
PROPANE	364.6		3-EPENT	0.0	0.00
IBUTANE	320.6	10.41	224-TMP	0.0	0.00
NBUTANE	616.8	20.03	NHEPTANE	208.3	6.76
1PENTANE	285.5	9.27	1C2-DMCP	26.4	0.86
NPENTANE	3.0	0.10	MCH	269.8	8.76
22-DMB	11.6	0.38			
CPENTANE	33.9	1.10			
23-DMB	37.6	1.22			
2-MP	282.5	9.17			
3-MP	57.7	1.87			
NHEXANE	189.2	6.14			
MCP	328.6	10.67			
22-DMP	0.0	0.00			
24-DMP	5.5	0.18			
223-TMB	7.2	0.23			
CHEXANE	41.3	1.34			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	86.0	2.79			
23-DMP	33.6	1.09			
3-MHEX	35.3	1.15			
1C3-DMCP	72.6	2.36			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS	
ALL COMP	3444.		C1/C2	0.72
GASOLINE	3079.		A /D2	11.27
NAFTHENES	899.	29.20	C1/D2	11.26
C6-7	1430.	46.45	CH/MCP	0.13
			PENT/IPENT.	0.01

76205Q OFF. NORWAY ESSO 16/7-4 1800M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	97.7	3.80
ETHANE	0.0		1T2-DMCP	113.9	4.43
PROPANE	6.6		3-EPENT	0.0	0.00
IBUTANE	45.0	1.75	224-TMP	0.0	0.00
NBUTANE	227.0	8.83	NHEPTANE	275.6	10.71
1PENTANE	149.9	5.83	1C2-DMCP	41.8	1.62
NPENTANE	4.3	0.17	MCH	384.5	14.95
22-DMB	3.6	0.14			
CPENTANE	13.2	0.51			
23-DMB	35.9	1.39			
2-MP	280.7	10.91			
3-MP	63.1	2.45			
NHEXANE	177.8	6.91			
MCP	241.6	9.39			
22-DMP	0.0	0.00			
24-DMP	12.7	0.49			
223-TMB	8.7	0.34			
CHEXANE	33.3	1.29			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	102.8	3.99			
23-DMP	62.6	2.43			
3-MHEX	66.2	2.57			
1C3-DMCP	130.3	5.07			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS	
ALL COMP	2581.		C1/C2	0.83
GASOLINE	2572.		A /D2	6.85
NAFTHENES	1056.	41.07	C1/D2	7.86
C6-7	1750.	68.01	CH/MCP	0.14
			PENT/IPENT.	0.03



TABLE 8 - PAGE 2

76205S OFF. NORWAY ESSO 16/7-4 1860M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	52.7	3.94
ETHANE	0.0		1T2-DMCP	34.6	2.59
PROPANE	36.9		3-EPENT	0.0	0.00
IBUTANE	7.8	0.58	224-TMP	0.0	0.00
NBUTANE	40.0	2.99	NHEPTANE	179.4	13.42
IPENTANE	127.9	9.57	1C2-DMCP	16.3	1.22
NPENTANE	79.8	5.97	MCH	166.8	12.48
22-DMB	2.5	0.19			
CPENTANE	8.3	0.62			
23-DMB	16.5	1.23			
2-MP	145.1	10.85			
3-MP	33.8	2.53			
NHEXANE	104.1	7.79			
MCP	107.5	8.04			
22-DMP	0.0	0.00			
24-DMP	6.6	0.49			
223-TMB	3.8	0.28			
CHEXANE	16.0	1.20			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	74.7	5.59			
23-DMP	29.2	2.18			
3-MHEX	35.6	2.66			
1C3-DMCP	48.3	3.61			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	1374.		C1/C2 0.99
GASOLINE	1337.		A /D2 7.97
NAPHTHENES	450.	33.69	C1/D2 7.24
C6-7	876.	65.48	CH/MCP 0.13
			PENT/IPENT, 0.62

76206A NORWAY 16/7-4 1920M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	90.8	3.41
ETHANE	0.0		1T2-DMCP	44.9	1.69
PROPANE	85.7		3-EPENT	0.0	0.00
IBUTANE	144.7	5.43	224-TMP	0.0	0.00
NBUTANE	143.8	5.40	NHEPTANE	222.6	8.36
IPENTANE	407.9	15.32	1C2-DMCP	24.9	0.93
NPENTANE	209.5	7.66	MCH	257.4	9.67
22-DMB	8.4	0.31			
CPENTANE	20.2	0.76			
23-DMB	35.6	1.34			
2-MP	266.3	10.00			
3-MP	56.4	2.12			
NHEXANE	187.4	7.04			
MCP	264.7	9.94			
22-DMP	0.0	0.00			
24-DMP	5.7	0.21			
223-TMB	6.9	0.26			
CHEXANE	39.6	1.49			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	72.2	2.71			
23-DMP	38.0	1.43			
3-MHEX	41.4	1.56			
1C3-DMCP	73.9	2.78			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	2749.		C1/C2 0.74
GASOLINE	2663.		A /D2 9.90
NAPHTHENES	816.	30.66	C1/D2 8.91
C6-7	1370.	51.46	CH/MCP 0.15
			PENT/IPENT, 0.51

76206C NORWAY 16/7-4 1980M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	5.9	0.71
ETHANE	0.0		1T2-DMCP	4.2	0.51
PROPANE	45.4		3-EPENT	0.0	0.00
IBUTANE	65.5	7.98	224-TMP	0.0	0.00
NBUTANE	73.3	8.92	NHEPTANE	104.2	12.69
IPENTANE	120.4	14.66	1C2-DMCP	0.0	0.00
NPENTANE	93.5	11.39	MCH	40.0	4.87
22-DMB	4.6	0.56			
CPENTANE	9.0	1.09			
23-DMB	10.6	1.29			
2-MP	66.8	8.14			
3-MP	12.8	1.56			
NHEXANE	79.7	9.71			
MCP	47.5	5.79			
22-DMP	0.0	0.00			
24-DMP	0.0	0.00			
223-TMB	0.0	0.00			
CHEXANE	18.6	2.27			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	43.9	5.35			
23-DMP	10.3	1.26			
3-MHEX	4.9	0.60			
1C3-DMCP	5.4	0.66			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	866.		C1/C2 1.63
GASOLINE	821.		A /D2 37.23
NAPHTHENES	130.	15.89	C1/D2 20.75
C6-7	365.	44.41	CH/MCP 0.39
			PENT/IPENT, 0.78

76206E NORWAY 16/7-4 2040M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	6.2	0.71
ETHANE	0.0		1T2-DMCP	6.7	0.77
PROPANE	62.2		3-EPENT	0.0	0.00
IBUTANE	49.2	5.69	224-TMP	0.0	0.00
NBUTANE	80.8	9.35	NHEPTANE	109.1	12.63
IPENTANE	105.7	12.23	1C2-DMCP	0.0	0.00
NPENTANE	89.5	10.36	MCH	54.5	6.30
22-DMB	1.9	0.22			
CPENTANE	12.5	1.45			
23-DMB	9.5	1.10			
2-MP	68.6	7.93			
3-MP	16.6	1.93			
NHEXANE	80.5	9.31			
MCP	72.7	8.41			
22-DMP	0.0	0.00			
24-DMP	1.3	0.15			
223-TMB	0.0	0.00			
CHEXANE	24.3	2.81			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	42.5	4.92			
23-DMP	11.2	1.30			
3-MHEX	9.5	1.10			
1C3-DMCP	11.6	1.34			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	927.		C1/C2 1.25
GASOLINE	864.		A /D2 19.96
NAPHTHENES	188.	21.80	C1/D2 12.77
C6-7	430.	49.75	CH/MCP 0.33
			PENT/IPENT, 0.85

TABLE 8 - PAGE 3

76206G NORWAY 16/7-4 2100H

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	528.2	4.13
ETHANE	0.0		1T2-DMCP	1221.5	9.54
PROPANE	141.4		3-EPENT	0.0	0.00
IBUTANE	253.8	1.98	224-TMP	0.0	0.00
NBUTANE	489.7	3.83	NHEPTANE	334.9	2.62
IPENTANE	1265.0	9.88	1C2-DMCP	591.4	4.62
NPENTANE	715.9	5.59	MCH	1542.1	12.05
22-DMB	3.8	0.03			
CPENTANE	190.5	1.49			
23-DMB	80.4	0.63			
2-MP	549.9	4.30			
3-MP	502.1	3.92			
NHEXANE	336.0	2.62			
MCP	2551.2	19.93			
22-DMF	0.0	0.00			
24-DMF	10.2	0.08			
223-TMB	0.0	0.00			
CHEXANE	255.1	1.99			
33-DMF	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	133.7	1.04			
23-DMF	136.5	1.07			
3-MHEX	473.8	3.70			
1C3-DMCP	635.9	4.97			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	12943.		C1/C2 0.35
GASOLINE	12802.		A /D2 1.42
NAFTHENES	7516.	58.71	C1/D2 4.08
C6-7	6750.	68.35	CH/MCP 0.10
			PENT/IPENT. 0.57

76206I NORWAY 16/7-4 2160H

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	1024.9	5.76
ETHANE	0.0		1T2-DMCP	806.2	4.53
PROPANE	1463.8		3-EPENT	0.0	0.00
IBUTANE	849.2	4.77	224-TMP	0.0	0.00
NBUTANE	1518.1	8.53	NHEPTANE	529.1	2.97
IPENTANE	2077.8	11.67	1C2-DMCP	573.0	3.22
NPENTANE	1085.1	6.10	MCH	1925.0	10.81
22-DMB	3.7	0.02			
CPENTANE	258.7	1.45			
23-DMB	128.8	0.72			
2-MP	796.3	4.47			
3-MP	611.3	3.43			
NHEXANE	476.0	2.67			
MCP	3240.0	18.20			
22-DMF	0.0	0.00			
24-DMF	19.6	0.11			
223-TMB	0.0	0.00			
CHEXANE	276.9	1.56			
33-DMF	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	210.0	1.18			
23-DMF	176.4	0.99			
3-MHEX	390.1	2.19			
1C3-DMCP	823.4	4.63			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	19264.		C1/C2 0.37
GASOLINE	17800.		A /D2 2.58
NAFTHENES	8928.	50.16	C1/D2 6.18
C6-7	10471.	58.82	CH/MCP 0.09
			PENT/IPENT. 0.52

76206K NORWAY 16/7-4 2220H

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	134.9	1.27
ETHANE	0.0		1T2-DMCP	143.0	1.34
PROPANE	120.8		3-EPENT	0.0	0.00
IBUTANE	407.4	3.82	224-TMP	0.0	0.00
NBUTANE	1403.0	13.17	NHEPTANE	174.6	1.64
IPENTANE	1735.7	16.29	1C2-DMCP	47.4	0.45
NPENTANE	1941.3	18.23	MCH	901.7	8.47
22-DMB	23.0	0.22			
CPENTANE	126.2	1.19			
23-DMB	100.7	0.95			
2-MP	609.7	5.72			
3-MP	322.2	3.03			
NHEXANE	564.8	5.49			
MCP	869.7	8.17			
22-DMF	0.0	0.00			
24-DMF	5.3	0.05			
223-TMB	1.7	0.02			
CHEXANE	806.7	7.57			
33-DMF	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	80.0	0.75			
23-DMF	56.1	0.53			
3-MHEX	77.0	0.72			
1C3-DMCP	99.9	0.94			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	10773.		C1/C2 1.38
GASOLINE	10652.		A /D2 9.86
NAFTHENES	3129.	29.38	C1/D2 23.23
C6-7	3983.	37.39	CH/MCP 0.93
			PENT/IPENT. 1.12

76206L NORWAY 16/7-4 2250H

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	2.4	0.40
ETHANE	0.0		1T2-DMCP	7.9	1.35
PROPANE	15.4		3-EPENT	0.0	0.00
IBUTANE	16.4	2.61	224-TMP	0.0	0.00
NBUTANE	47.4	8.46	NHEPTANE	41.2	7.05
IPENTANE	59.7	10.21	1C2-DMCP	0.0	0.00
NPENTANE	79.3	13.57	MCH	64.1	10.98
22-DMB	2.1	0.35			
CPENTANE	3.5	0.60			
23-DMB	5.5	0.94			
2-MP	48.5	8.30			
3-MP	27.1	4.63			
NHEXANE	65.6	11.23			
MCP	35.3	6.05			
22-DMF	0.0	0.00			
24-DMF	0.0	0.00			
223-TMB	0.0	0.00			
CHEXANE	34.0	5.82			
33-DMF	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	25.0	4.28			
23-DMF	2.5	0.43			
3-MHEX	9.3	1.60			
1C3-DMCP	5.4	0.92			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	599.		C1/C2 2.41
GASOLINE	584.		A /D2 11.42
NAFTHENES	153.	26.13	C1/D2 13.17
C6-7	293.	50.12	CH/MCP 0.96
			PENT/IPENT. 1.33

TABLE 8 - PAGE 4

762060 NORWAY 16/7-4 2340M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	14.7	0.61
ETHANE	0.0		1T2-DMCP	34.4	1.43
PROPANE	24.8		3-EPENT	0.0	0.00
IBUTANE	10.7	0.44	224-TMP	0.0	0.00
NBUTANE	116.6	4.84	NHEPTANE	97.5	4.05
IPENTANE	352.1	14.42	1C2-DMCP	10.3	0.43
NPENTANE	454.7	18.38	MCH	275.0	11.42
22-DMB	7.1	0.30			
CPENTANE	19.5	0.81			
23-DMB	28.6	1.19			
2-MP	197.1	8.19			
3-MP	99.7	4.14			
NHEXANE	224.7	9.33			
MCP	206.6	8.58			
22-DMP	0.0	0.00			
24-DMP	4.0	0.16			
223-TMB	0.0	0.00			
CHEXANE	190.6	7.92			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	0.0	0.00			
23-DMP	16.8	0.70			
3-MHEX	27.8	1.16			
1C3-DMCP	19.7	0.82			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	2433.		C1/C2 1.63
GASOLINE	2408.		A /D2 11.58
NAPHTHENES	771.	32.00	C1/D2 16.74
C6-7	1122.	46.59	CH/MCP 0.92
			PENT/IPENT. 1.29

76207C NORWAY 16/7-4 2580M

	TOTAL PPB	NORM PERCENT		TOTAL PPB	NORM PERCENT
METHANE	0.0		1T3-DMCP	9.1	0.34
ETHANE	0.0		1T2-DMCP	31.8	2.93
PROPANE	26.4		3-EPENT	0.0	0.00
IBUTANE	8.0	0.73	224-TMP	0.0	0.00
NBUTANE	23.0	2.11	NHEPTANE	105.6	9.70
IPENTANE	8.8	0.81	1C2-DMCP	0.0	0.00
NPENTANE	36.0	3.31	MCH	329.4	30.27
22-DMB	0.5	0.04			
CPENTANE	0.9	0.08			
23-DMB	7.4	0.68			
2-MP	101.2	9.30			
3-MP	47.3	4.35			
NHEXANE	48.9	4.49			
MCP	37.5	3.44			
22-DMP	0.0	0.00			
24-DMP	22.4	2.06			
223-TMB	0.0	0.00			
CHEXANE	21.2	1.95			
33-DMP	0.0	0.00			
11-DMCP	0.0	0.00			
2-MHEX	105.6	9.70			
23-DMP	40.8	3.75			
3-MHEX	90.4	8.31			
1C3-DMCP	12.5	1.15			

	TOTALS PPB	NORM PERCENT	SIG COMP RATIOS
ALL COMP	1115.		C1/C2 5.02
GASOLINE	1088.		A /D2 1.71
NAPHTHENES	442.	40.66	C1/D2 5.04
C6-7	835.	78.59	CH/MCP 0.57
			PENT/IPENT. 4.09

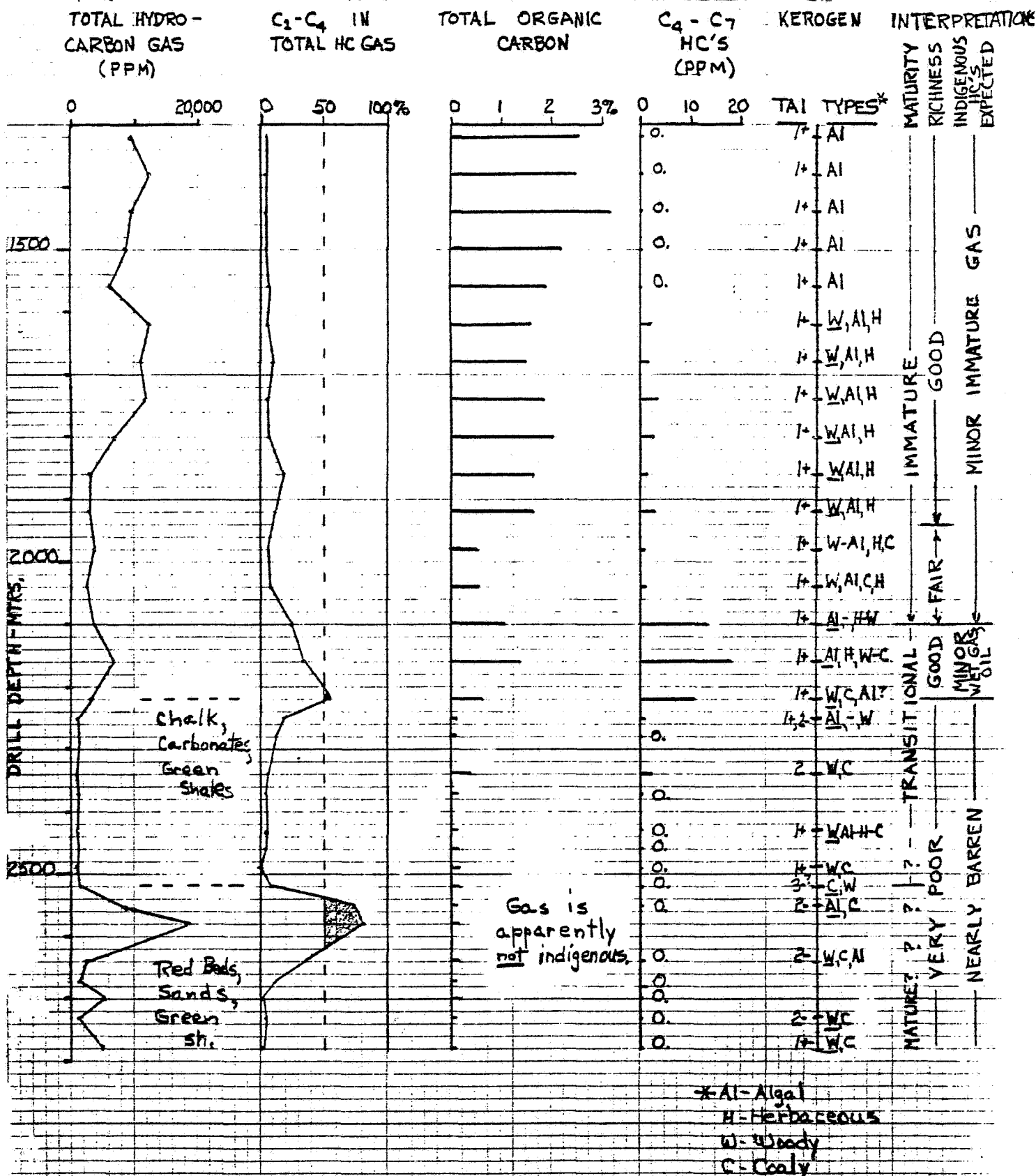


Fig. 1 Geochemical Profiles, 16/7-4

EPR#762055 SATURATE

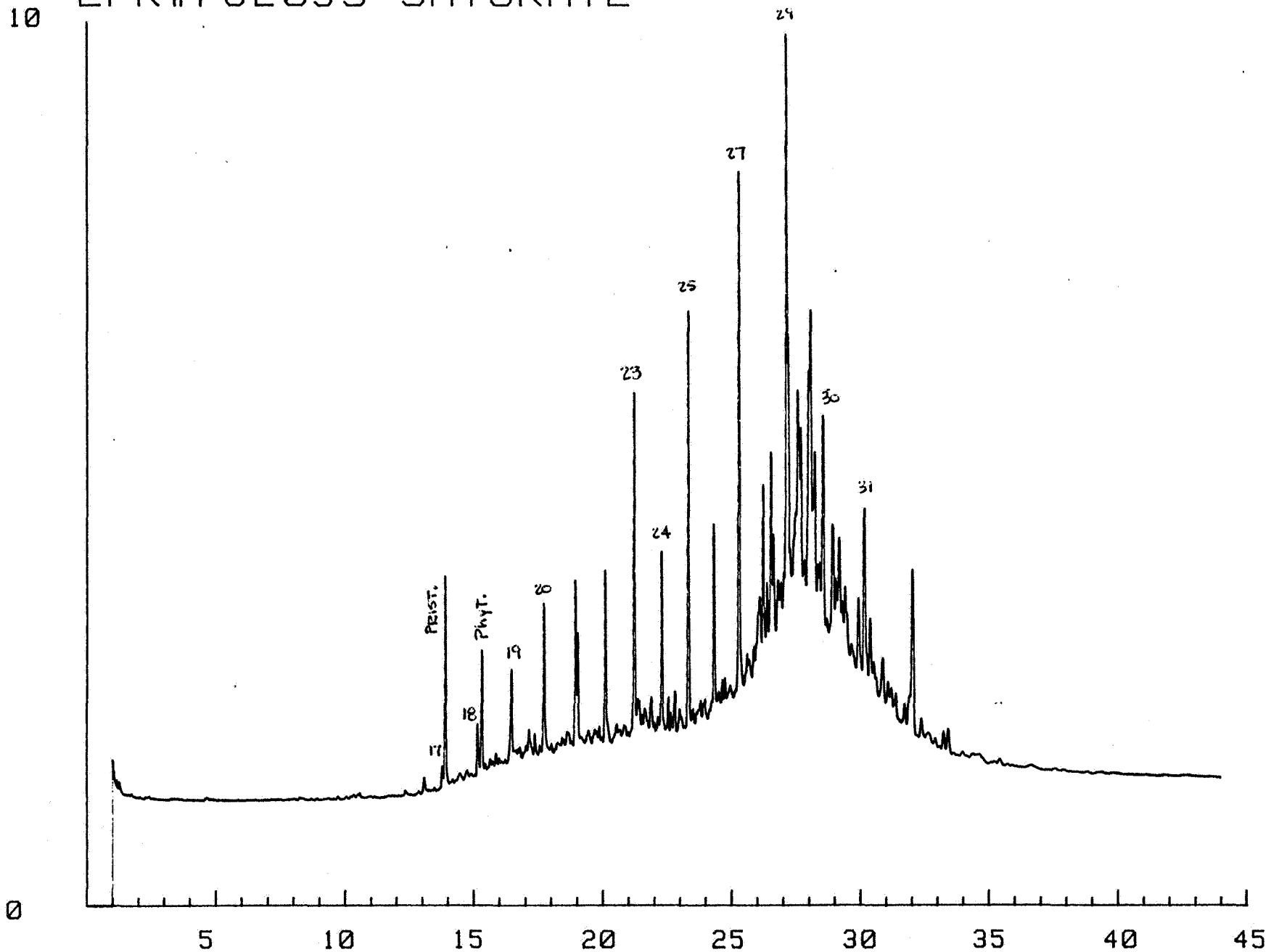


FIGURE 2 - CUTTINGS EXTRACT, 1,860 meters.

EPR#76206C SATURATE

15

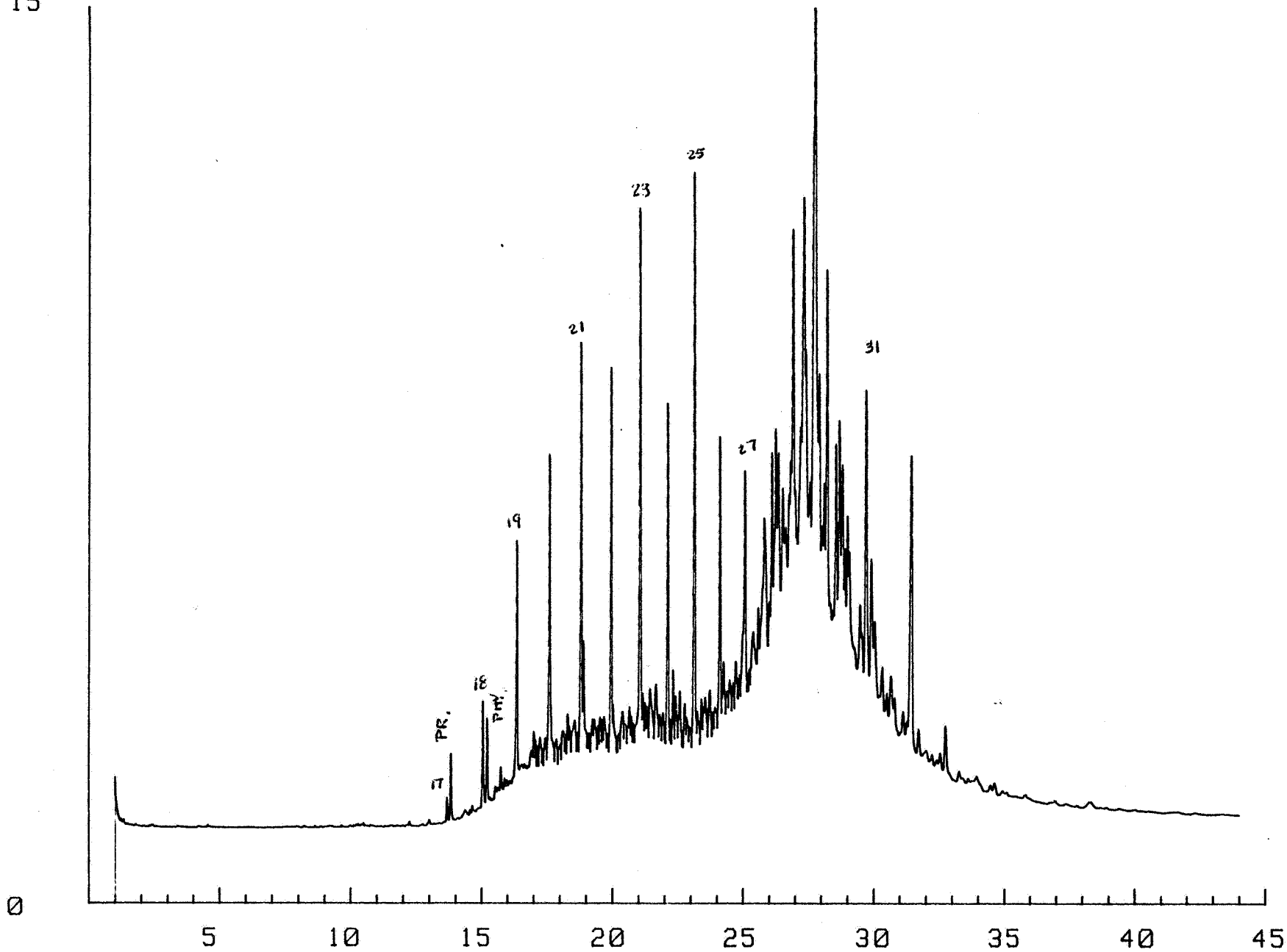


FIGURE 3 - CUTTINGS EXTRACT, 1,980 meters.

EPR#76206I SATURATE

20

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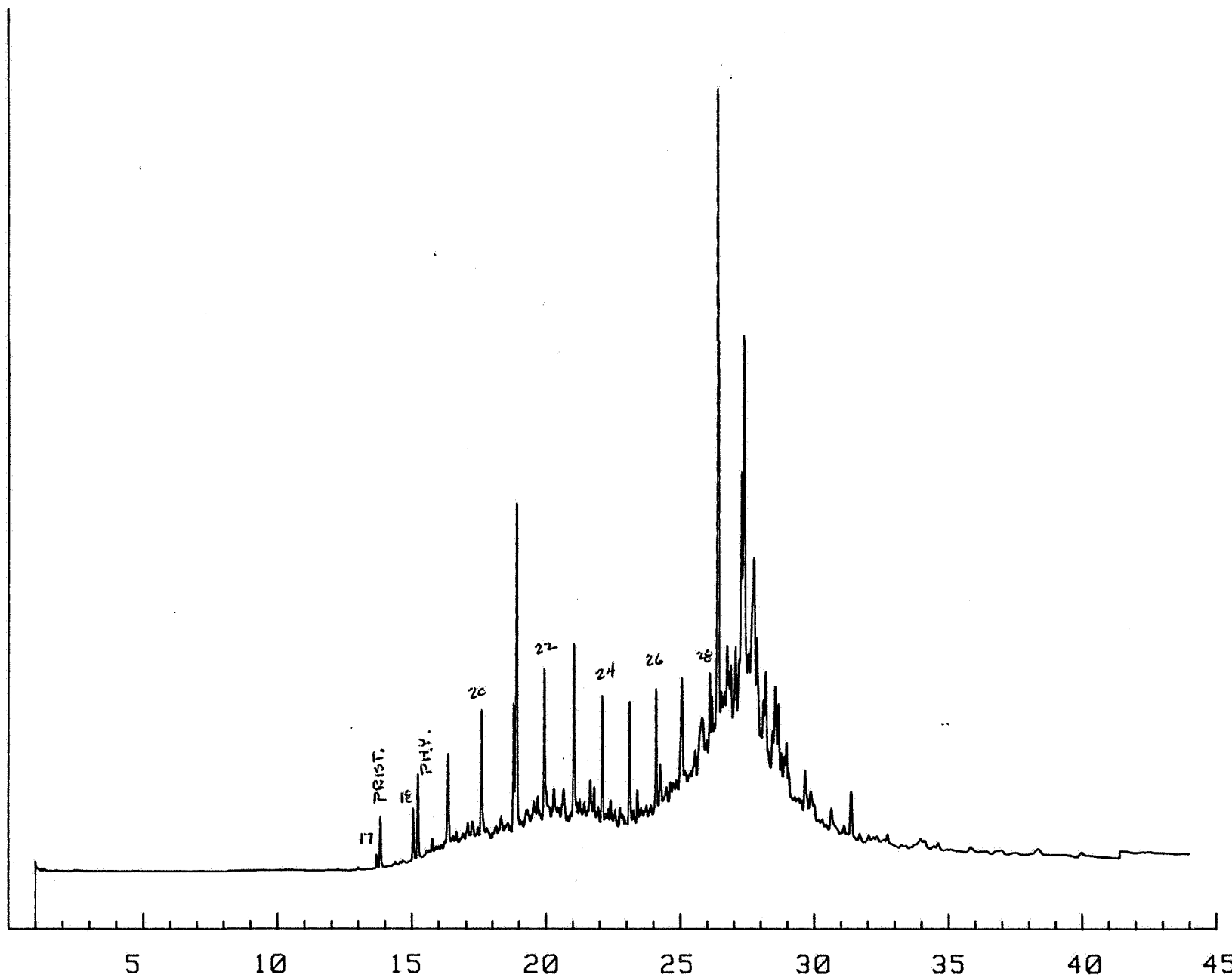


FIGURE 4 - CUTTINGS EXTRACT, 2,160 meters.

# EPR#76206K HYDROCARBONS

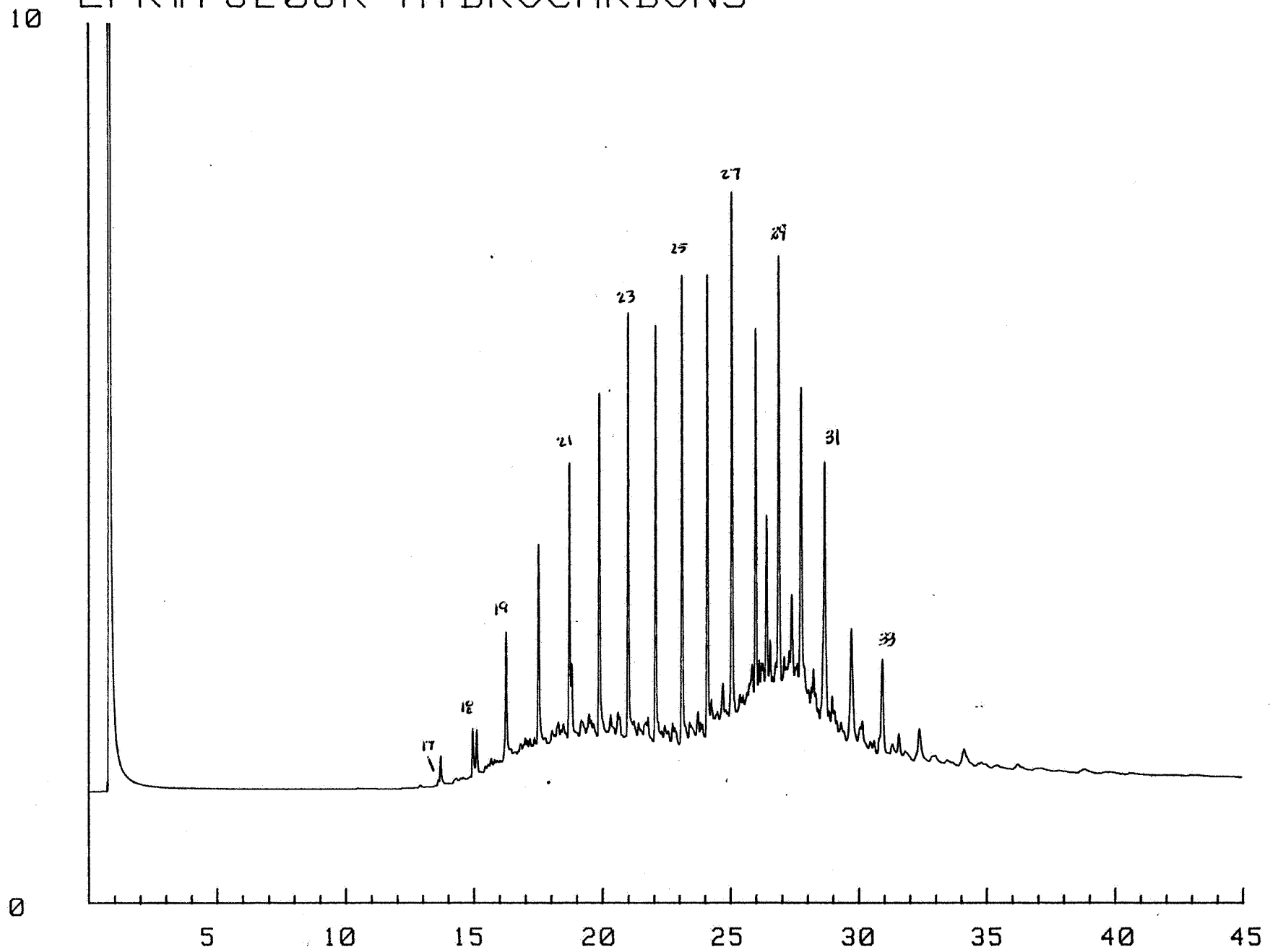


FIGURE 5 - CUTTINGS EXTRACT, 2,220 meters.



EPR#762060 SATURATE

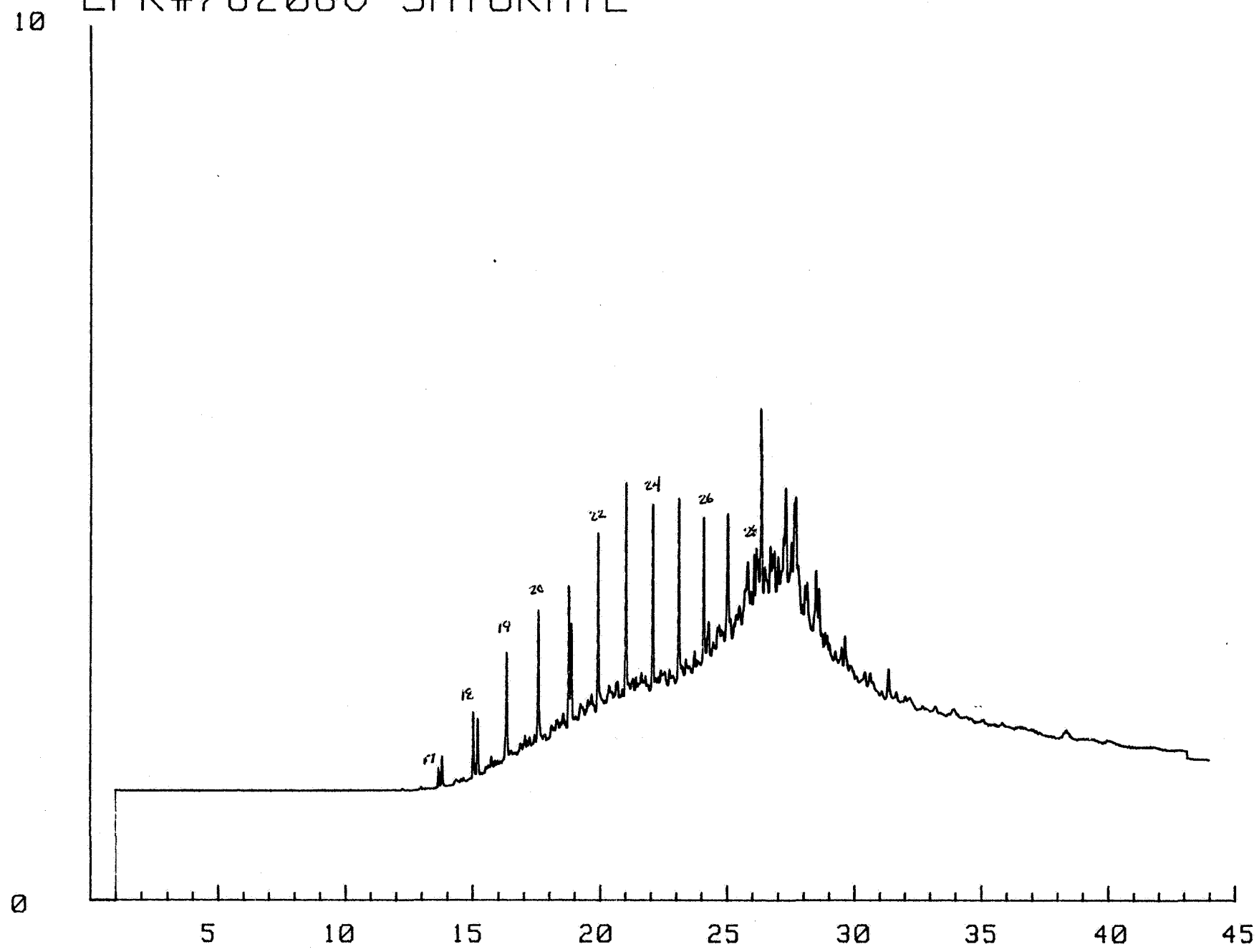


FIGURE 6 - CUTTINGS EXTRACT, 2,340 meters.

EPR#76206P HYDROCARBONS

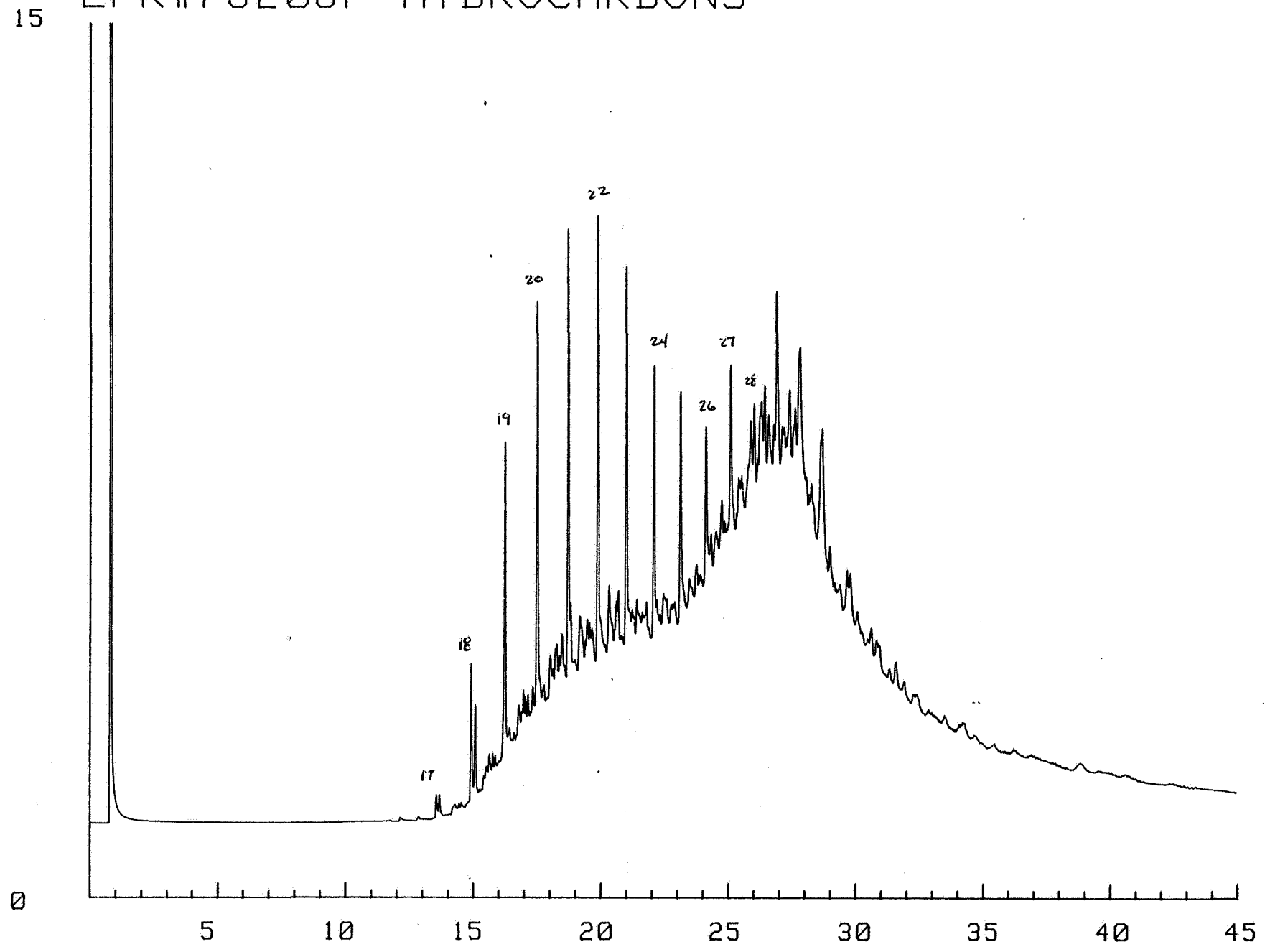


FIGURE 7 - CUTTINGS EXTRACT, 2,370 meters.

EPR#76206T HYDROCARBONS

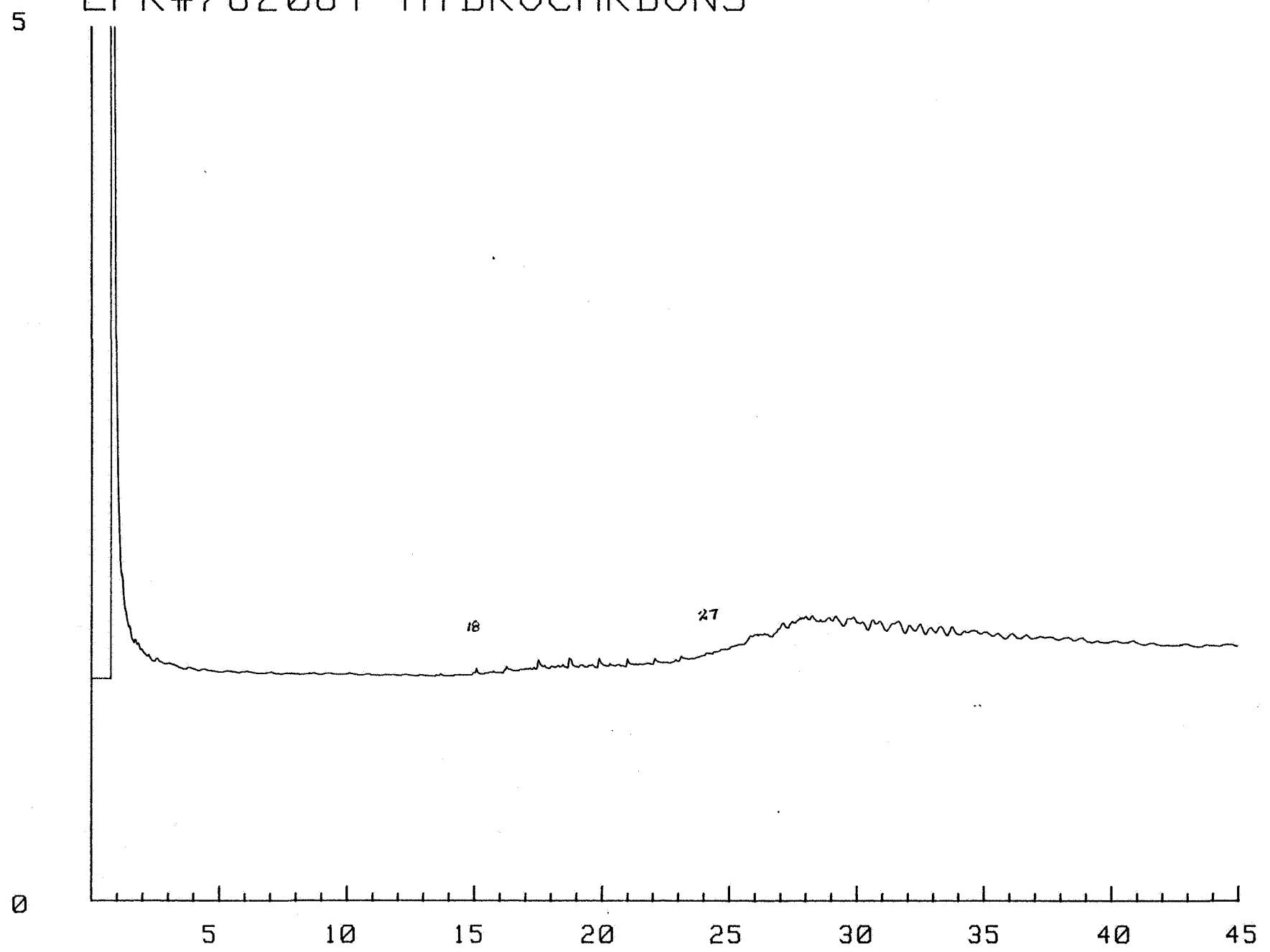


FIGURE 8 - CUTTINGS EXTRACT, 2,490 meters.

EPR#76207A HYDROCARBONS

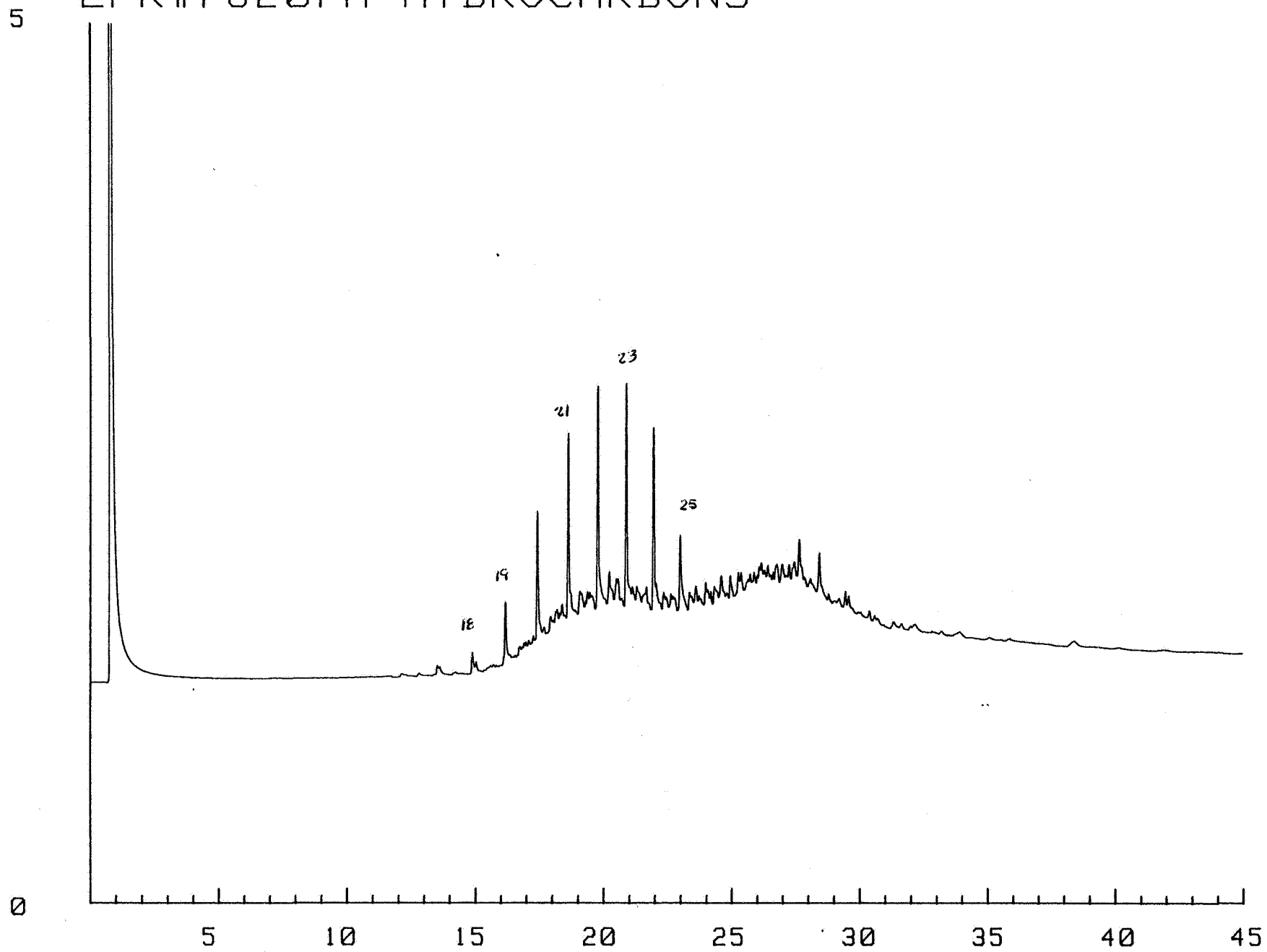


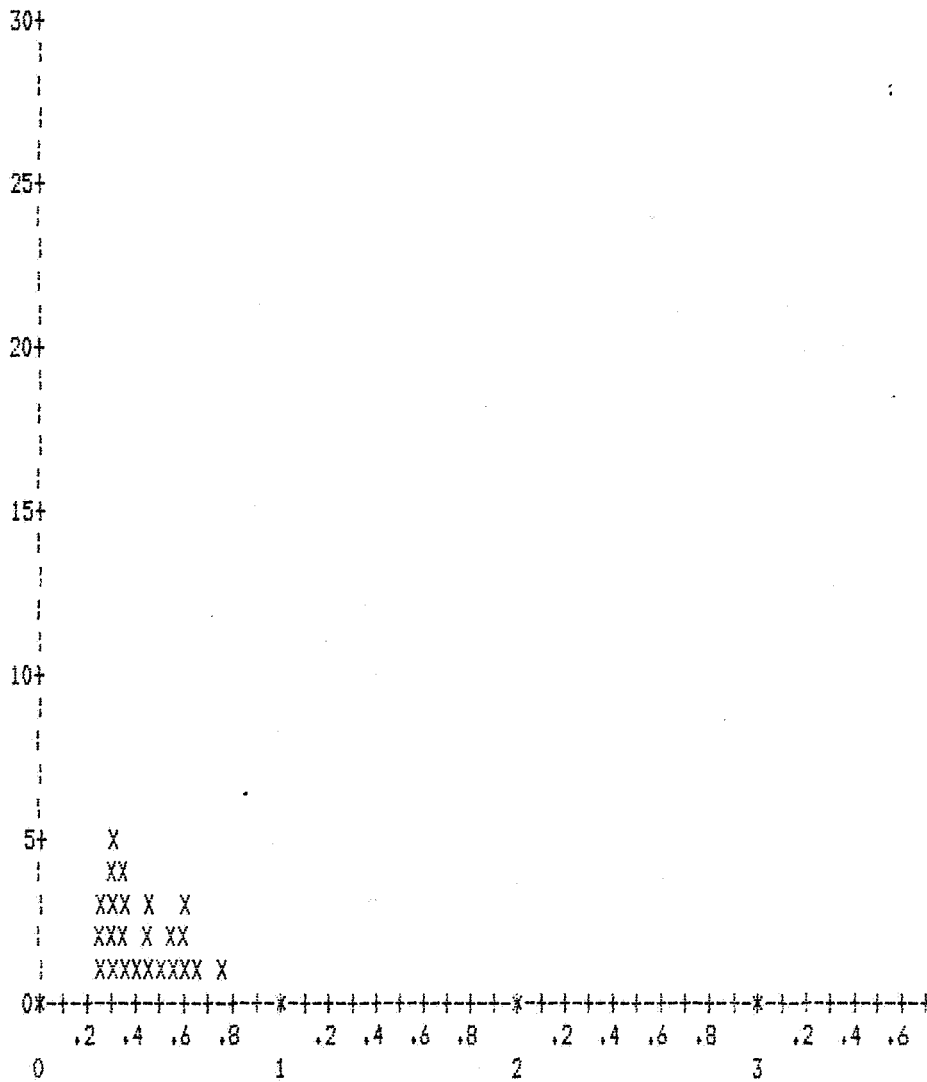
FIGURE 9 - CUTTINGS EXTRACT, 2,520 meters.

CLIENT..... EXXON  
 DEPTH/SAMPLE NO., 76205 A  
 LOCATION..... UNKNOWN  
 ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-1  
 TYPE OF SAMPLE..... CTGS.  
 DATE..... 1-24-83  
 NO. OF OBSERVATIONS, 24

STANDARD %Ro START: 1.01 FINISH: 1.02

REFLECTANCE DATA: MIN, 0.25 MAX, 0.76 AVG, 0.44 STD. DEV, 0.15



VITRINITE REFLECTANCE HISTOGRAM - %Ro

POP.# 1 TOTAL CTS. 13 MIN. 0.25 MAX. 0.41 AVG. 0.32 STD. DEV. 0.05  
 POP.# 2 TOTAL CTS. 10 MIN. 0.45 MAX. 0.67 AVG. 0.56 STD. DEV. 0.08  
 POP.# 3 TOTAL CTS. 1 MIN. 0.76 MAX. 0.76 AVG. 0.76 STD. DEV. 0.00

ARE

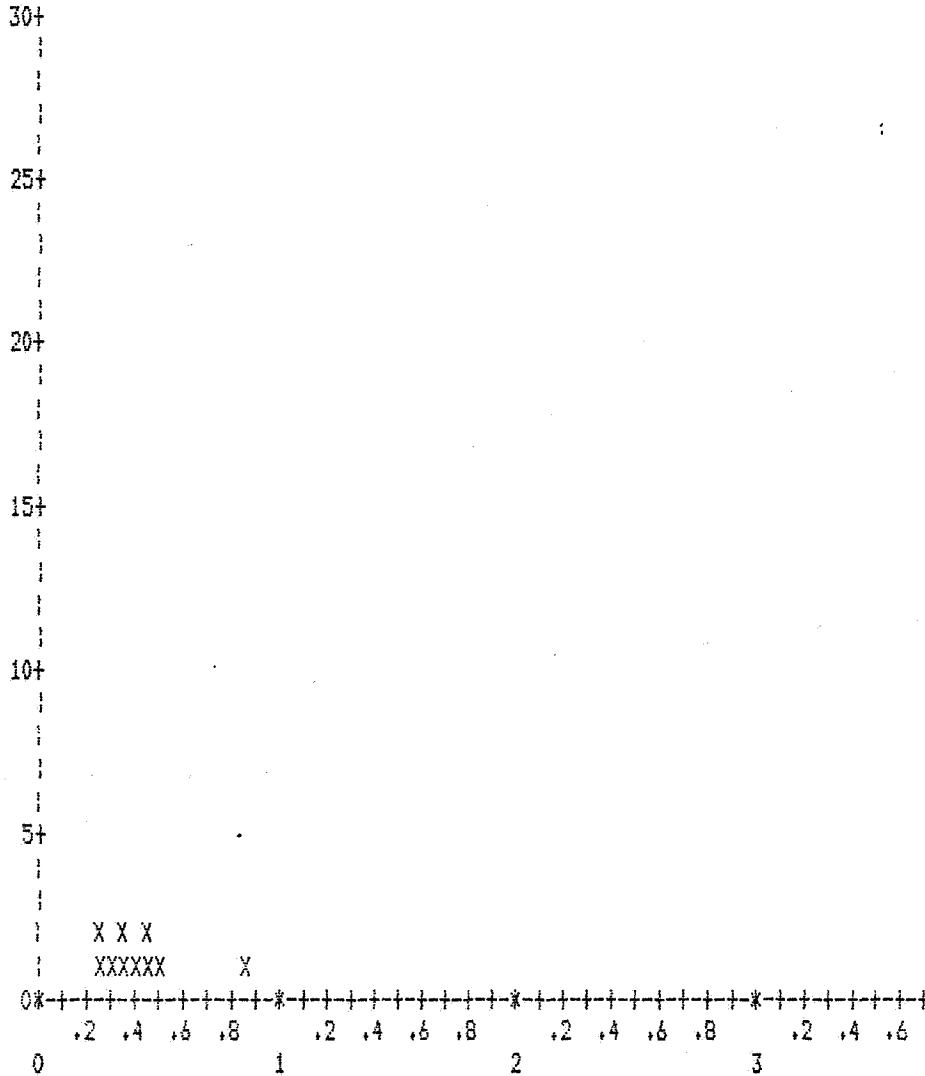
FIGURE 10 - CUTTINGS, 1,320 meters

CLIENT..... EXXON  
 DEPTH/SAMPLE NO., 76205 E  
 LOCATION..... UNKNOWN  
 ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-2  
 TYPE OF SAMPLE..... CTGS.  
 DATE..... 1-24-83  
 NO. OF OBSERVATIONS, 10

STANDARD  $ZR_0$  START: 1.02 FINISH: 1.02

REFLECTANCE DATA: MIN. 0.25 MAX. 0.85 AVG. 0.43 STD. DEV. 0.17



VITRINITE REFLECTANCE HISTOGRAM -  $ZR_0$

POP. # 1 TOTAL CTS. 8 MIN. 0.25 MAX. 0.48 AVG. 0.37 STD. DEV. 0.08

POP. # 2 TOTAL CTS. 1 MIN. 0.85 MAX. 0.85 AVG. 0.85 STD. DEV. 0.00

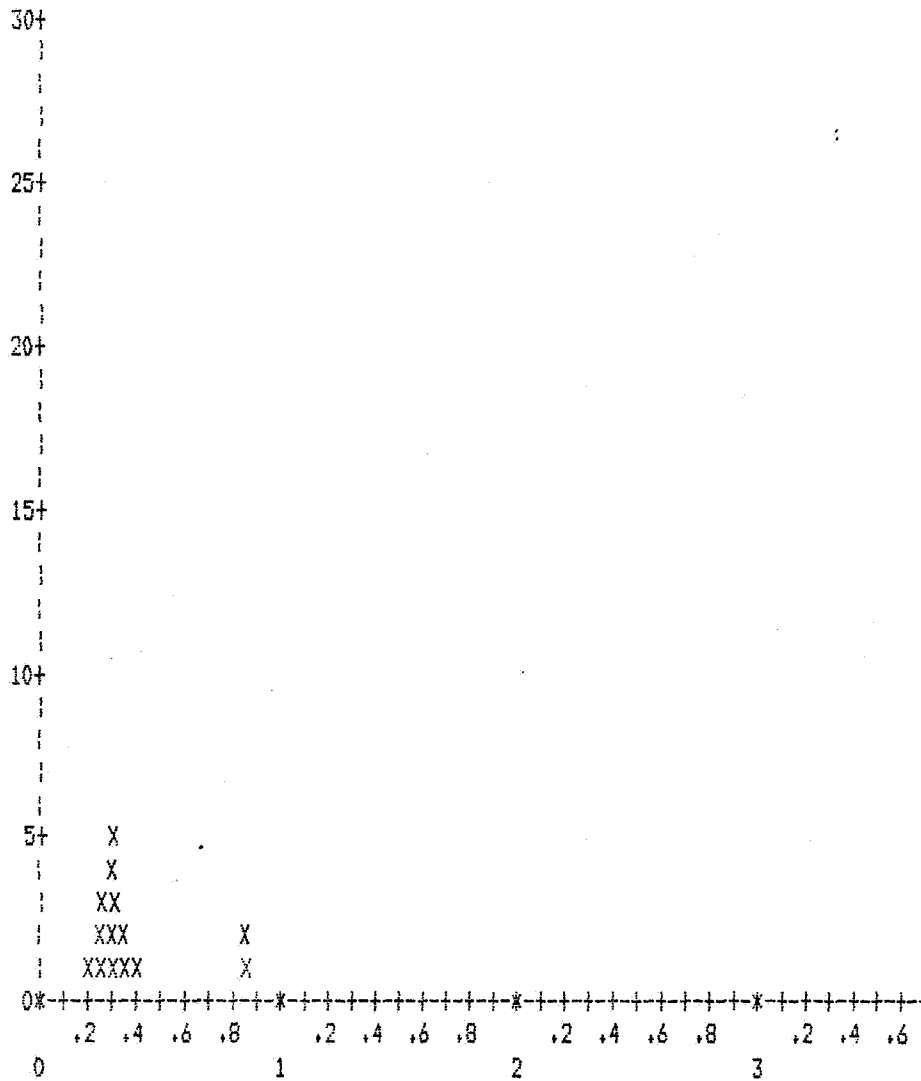
FIGURE 11 - CUTTINGS, 1,440 meters

CLIENT..... EXXON  
 DEPTH/SAMPLE NO., 76205 I  
 LOCATION..... UNKNOWN  
 ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-3  
 TYPE OF SAMPLE..... CTGS.  
 DATE..... 1-24-83  
 NO. OF OBSERVATIONS, 14

STANDARD ZRo START: 1.01 FINISH: 1.02

REFLECTANCE DATA: MIN. 0.24 MAX. 0.87 AVG. 0.39 STD. DEV. 0.21



VITRINITE REFLECTANCE HISTOGRAM - ZRo

POP.# 1 TOTAL CTS. 12 MIN. 0.24 MAX. 0.42 AVG. 0.32 STD. DEV. 0.05

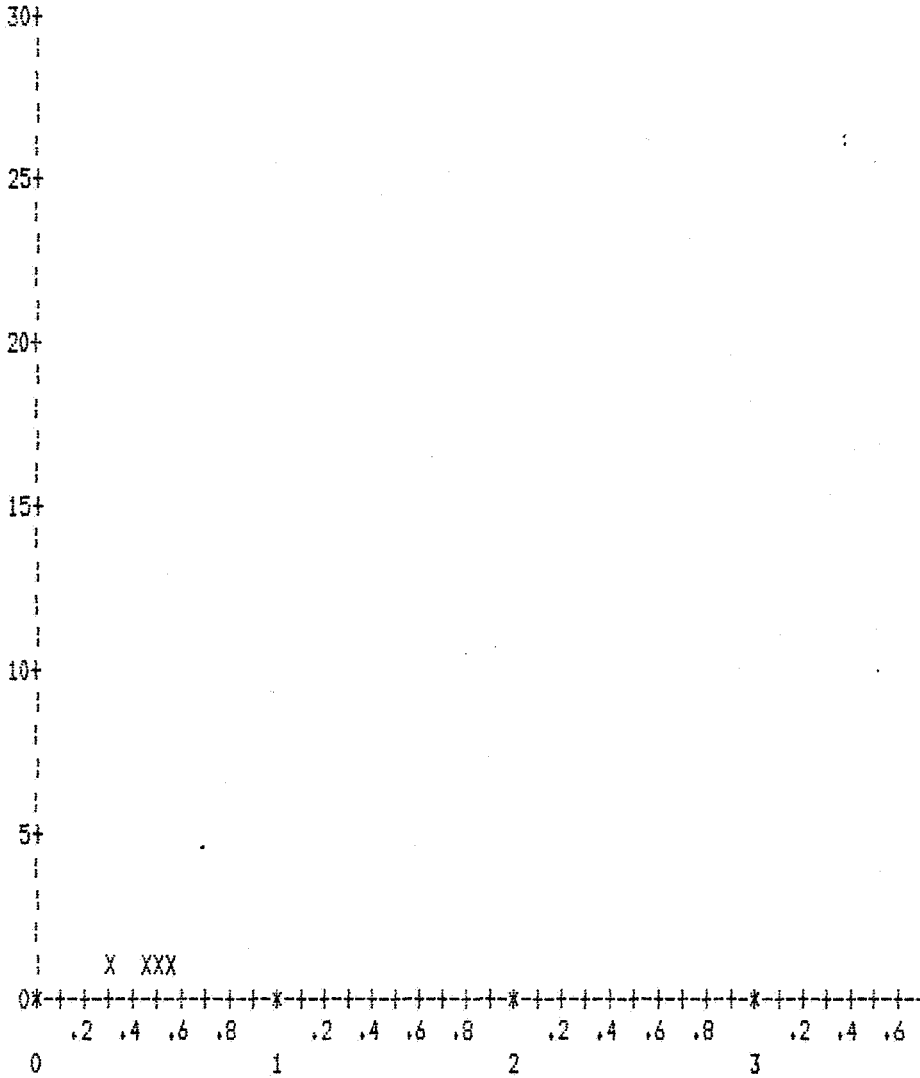
POP.# 2 TOTAL CTS. 2 MIN. 0.86 MAX. 0.87 AVG. 0.87 STD. DEV. 0.01

FIGURE 12 - CUTTINGS, 1,560 meters

CLIENT..... EXXON                    FILE NAME..... E-598-4  
 DEPTH/SAMPLE NO., 76205 0            TYPE OF SAMPLE..... CTGS.  
 LOCATION..... UNKNOWN                DATE..... 1-24-83  
 ANALYST..... K. W. SCHWAB            NO. OF OBSERVATIONS, 4

STANDARD %R<sub>o</sub>    START: 1.02    FINISH: 1.02

REFLECTANCE DATA: MIN. 0.30    MAX. 0.57    AVG. 0.47    STD. DEV. 0.12



VITRINITE REFLECTANCE HISTOGRAM - %R<sub>o</sub>

POP. # 1    TOTAL CTS. 1    MIN. 0.30    MAX. 0.30    AVG. 0.30    STD. DEV. 0.00

POP. # 2    TOTAL CTS. 3    MIN. 0.47    MAX. 0.57    AVG. 0.53    STD. DEV. 0.05

FIGURE 13 - CUTTINGS, 1,740 meters

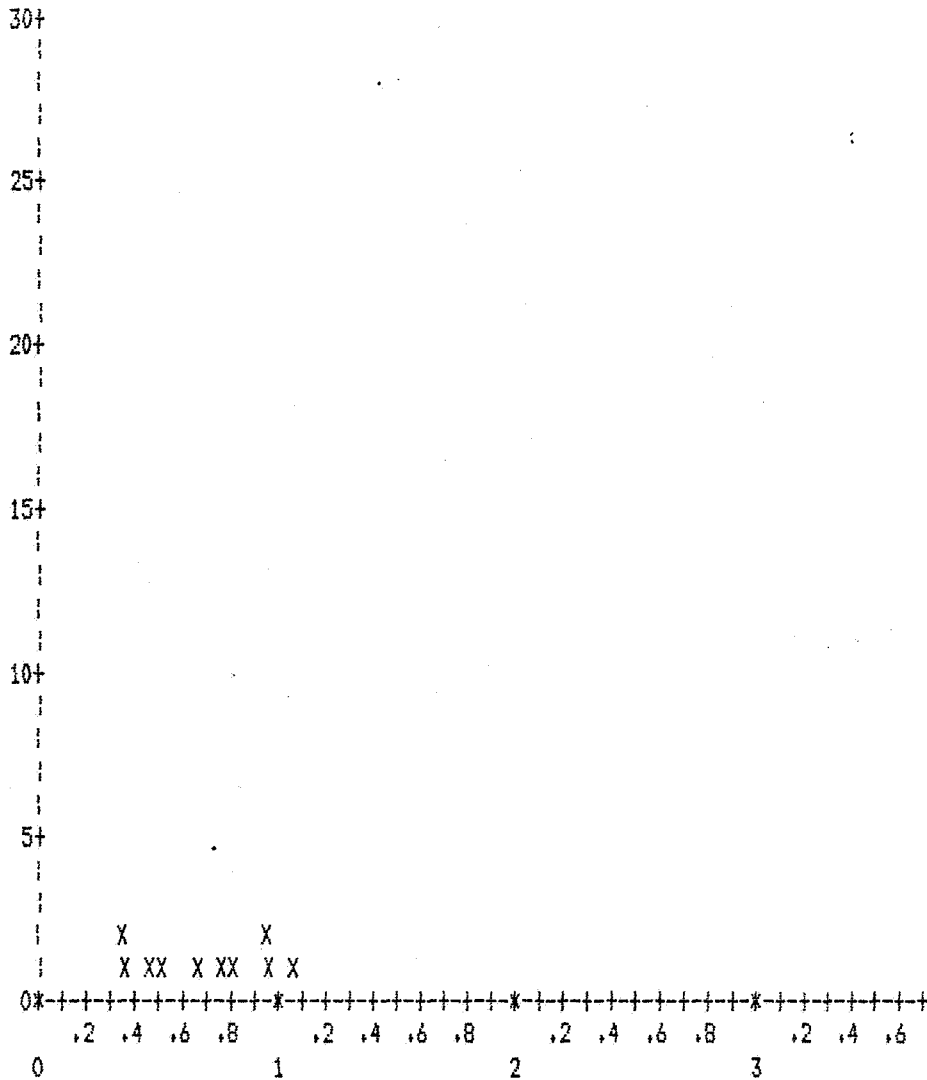


CLIENT..... EXXON  
 DEPTH/SAMPLE NO., 76205 S  
 LOCATION..... UNKNOWN  
 ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-5  
 TYPE OF SAMPLE..... CTGS.  
 DATE..... 1-24-83  
 NO. OF OBSERVATIONS, 10

STANDARD  $ZR_D$  START: 1.02 FINISH: 1.02

REFLECTANCE DATA: MIN. 0.37 MAX. 1.08 AVG. 0.71 STD. DEV. 0.27



VITRINITE REFLECTANCE HISTOGRAM -  $ZR_D$

POP.# 1 TOTAL CTS. 4 MIN. 0.37 MAX. 0.51 AVG. 0.44 STD. DEV. 0.07  
 POP.# 2 TOTAL CTS. 3 MIN. 0.65 MAX. 0.82 AVG. 0.75 STD. DEV. 0.09  
 POP.# 3 TOTAL CTS. 3 MIN. 0.99 MAX. 1.08 AVG. 1.02 STD. DEV. 0.05

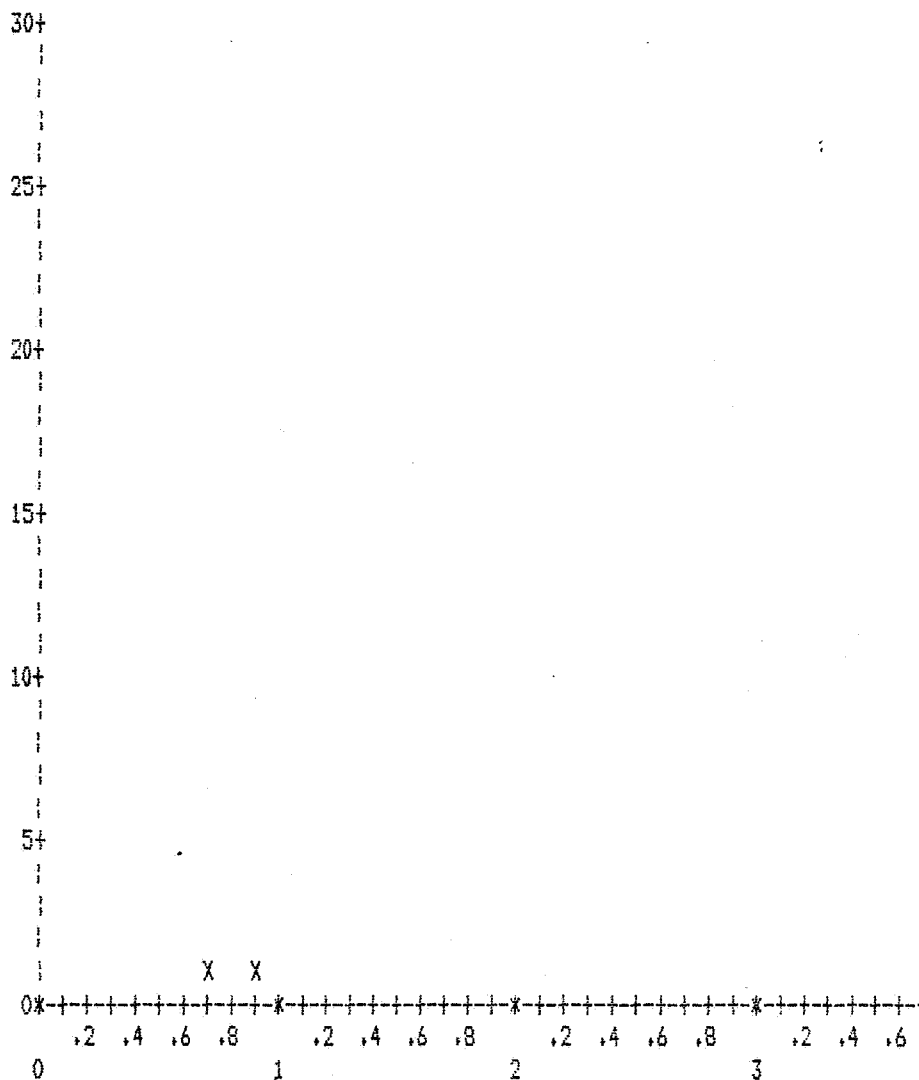
FIGURE 14 - CUTTINGS, 1,860 meters

CLIENT..... EXXON  
DEPTH/SAMPLE NO.. 76206 A  
LOCATION..... UNKNOWN  
ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-6  
TYPE OF SAMPLE..... CTGS.  
DATE..... 1-24-83  
NO. OF OBSERVATIONS. 2

STANDARD ZRo START: 1.02 FINISH: 1.02

REFLECTANCE DATA: MIN. 0.74 MAX. 0.92 AVG. 0.83 STD. DEV. 0.13



VITRINITE REFLECTANCE HISTOGRAM - ZRo

POP.# 1 TOTAL CTS. 1 MIN. 0.74 MAX. 0.74 AVG. 0.74 STD. DEV. 0.00

POP.# 2 TOTAL CTS. 1 MIN. 0.92 MAX. 0.92 AVG. 0.92 STD. DEV. 0.00

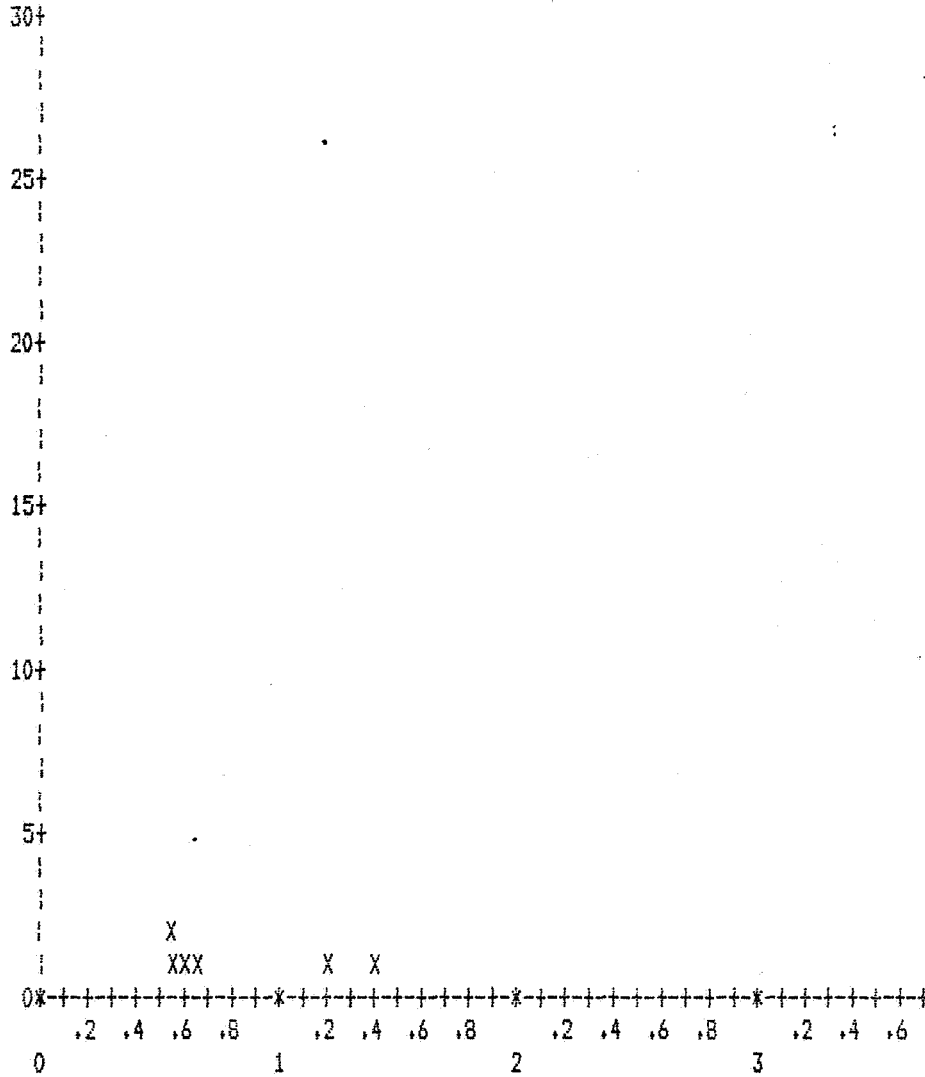
FIGURE 15 - CUTTINGS, 1,920 meters

CLIENT..... EXXON  
DEPTH/SAMPLE NO.. 76206 E  
LOCATION..... UNKNOWN  
ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-7  
TYPE OF SAMPLE..... CTGS.  
DATE..... 1-24-83  
NO. OF OBSERVATIONS, 6

STANDARD ZRo START: 1.01 FINISH: 1.02

REFLECTANCE DATA: MIN. 0.58 MAX. 1.44 AVG. 0.85 STD. DEV. 0.38



VITRINITE REFLECTANCE HISTOGRAM - ZRo

POP.# 1 TOTAL CTS. 4 MIN. 0.58 MAX. 0.68 AVG. 0.61 STD. DEV. 0.05

POP.# 2 TOTAL CTS. 2 MIN. 1.22 MAX. 1.44 AVG. 1.33 STD. DEV. 0.16

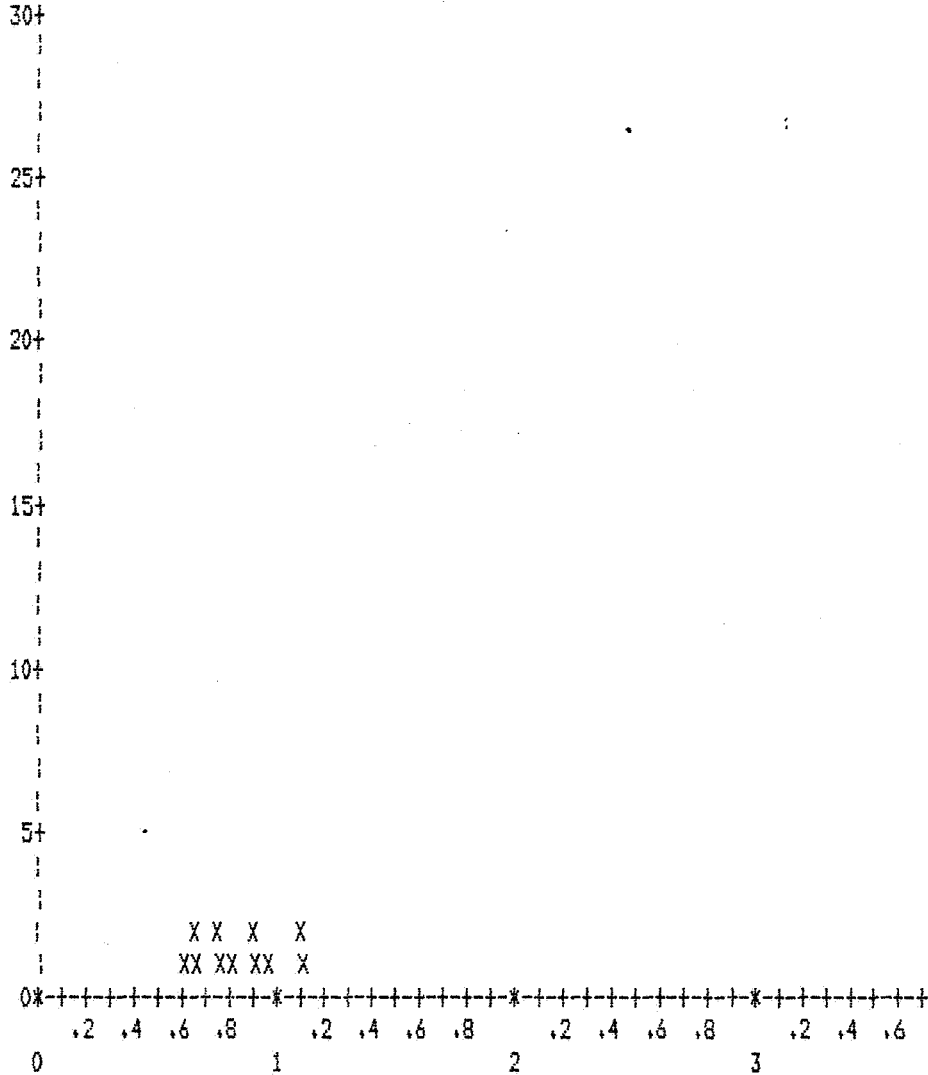
FIGURE 16 - CUTTINGS, 2,040 meters

CLIENT..... EXXON  
DEPTH/SAMPLE NO., 76206 K  
LOCATION..... UNKNOWN  
ANALYST..... K. W. SCHWAB

FILE NAME..... E-598-8  
TYPE OF SAMPLE..... CTGS.  
DATE..... 1-24-82  
NO. OF OBSERVATIONS, 11

STANDARD ZRo START: 1.02 FINISH: 1.00

REFLECTANCE DATA: MIN. 0.60 MAX. 1.14 AVG. 0.85 STD. DEV. 0.17



VITRINITE REFLECTANCE HISTOGRAM - ZRo

POP. # 1 TOTAL CTS. 9 MIN. 0.60 MAX. 0.95 AVG. 0.79 STD. DEV. 0.12

POP. # 2 TOTAL CTS. 2 MIN. 1.11 MAX. 1.14 AVG. 1.13 STD. DEV. 0.02

FIGURE 17 - CUTTINGS, 2,220 meters

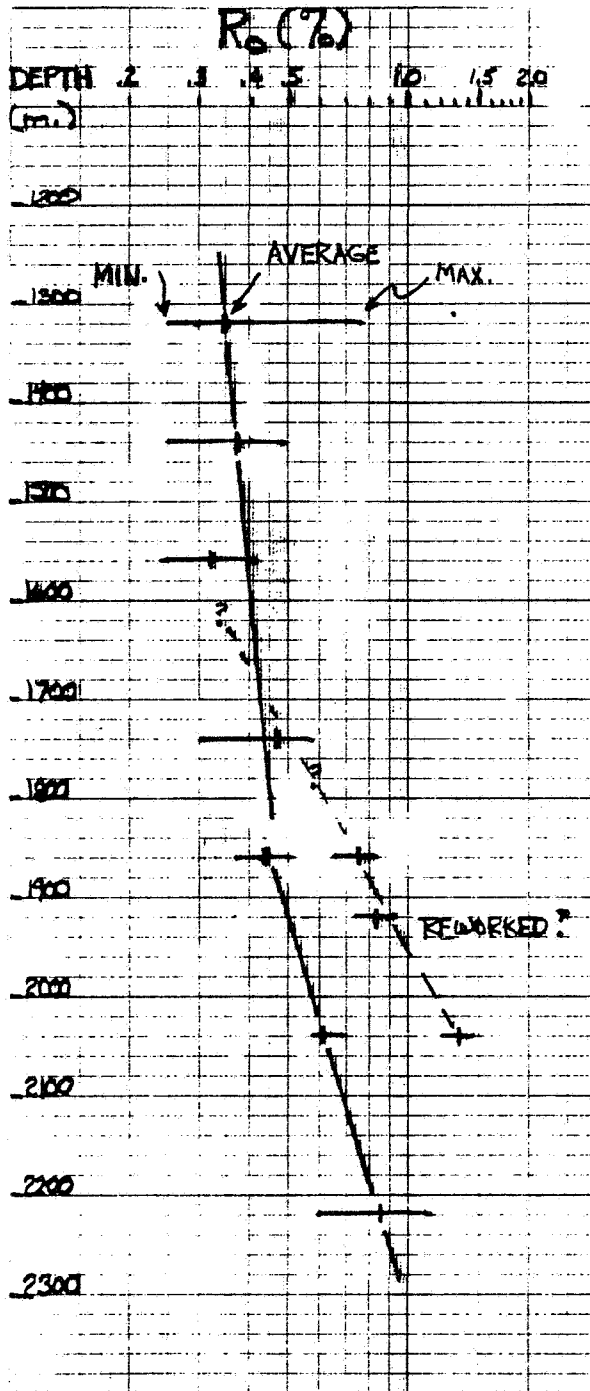


FIGURE 18 - VITRINITE REFLECTANCE PROFILE, 16/7-4 SHALE CUTTINGS  
 (See Figures 10-17 for histograms on individual samples)