ATTACHMENT 4

VIC-P17

W788

GIPPSLAND BASIN

OMEO NO. 1

ANALYSIS OF FLUID AND SOURCE ROCK STUDIES

BY

AMDEL

PG/191/83

BOX 2 OF 3

ATTACHMENT 4: ANALYSES OF FLUIDS AND SOURCE ROCK STUDIES BY AMDEL

CONTENTS

SECTION 1

SOURCE ROCK EVALUATION, OMEO No.1, VIC/P-17, GIPPSLAND BASIN

Australian Aquitaine Petroleum Pty. Ltd

F3/422/0-4790/83 July, 1983

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19 July 1983

F3/422/0
4790/83

Australian Aquitaine Petroleum Pty. Ltd.,
99 Mount Street,
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Attention: Mr Frank Brophy

REPORT F4790/83

YOUR REFERENCE:	Transmittals 11834 (11/3/83) and 9675 (22/4/83)
MATERIAL:	Cuttings
LOCALITY:	OMEO No.1
IDENTIFICATION:	Interval 2160-3369 metres
DATE RECEIVED:	14/3/83 and 26/4/83
WORK REQUIRED:	Total organic carbon, Rock-Eval pyrolysis, Vitrinite reflectance, Description of dispersed organic matter (20 samples). Solvent extraction, Liquid chromatography of extract, Gas chromatography of saturates (5 samples). Interpretation.

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1. INTRODUCTION

Total organic carbon and Rock-Eval pyrolysis data on twenty cuttings samples from 2160-3369 metres depth in Omeo-1, together with some preliminary interpretative comments, were communicated by telex to F. Brophy on 22 March, 1983. This report formally presents the aforementioned data, and incorporates the results of additional analytical work, as follows:

1. Measurement of vitrinite reflectance (20 samples);

2. Description of dispersed organic matter (20 samples); and

3. C_{15+} extract analysis (5 samples).

The above information is used to assess the hydrocarbon generating potential (maturity, organic richness, kerogen type) of the units sampled (Lakes Entrance Formation, Latrobe Group, Strzelecki Group: Table 1), and to establish the possible sources of the 'oil shows' encountered in Omeo-1 (McKirdy, 1983).

2. ANALYTICAL PROCEDURE

2.1 Sample Preparation

Cuttings samples (as received) were ground in a Siebtechnik mill for 20-30 secs.

2.2 Total Organic Carbon (TOC)

Total organic carbon was determined by digestion of a known weight (2-10 g) of powdered rock in 50% HCl to remove carbonates, followed by combustion in oxygen in the induction furnace of a Leco IR-12 Carbon Determinator and measurement of the resultant CO_2 by infra-red detection.

2.3 Rock-Eval Analysis

A 100 mg portion of powdered rock was analysed by the Rock-Eval pyrolysis technique (Girdel IFP-Fina Mark 2 instrument; operating mode, Cycle 1).

2.4 C_{15+} Extractable Organic Matter (EOM)

Powdered rock (30-70 g) was extracted with azeotropic chloroform/methanol (87:13) in a Soxhlet apparatus for 24 hours. Removal of solvent by careful rotary evaporation gave the C_{15+} EOM.

Asphaltenes were precipitated from the EOM with petroleum ether (IP method 143/57), and the asphaltene-free fraction separated into saturated hydrocarbons, aromatic hydrocarbons and polar compounds (resins) by liquid chromatography on 20 parts activated alumina under 80 parts activated silica gel. The saturates were eluted with petroleum ether, the aromatics with petroleum ether/methylene chloride (91:9), and the resins with methanol/ methylene chloride (65:35) followed by methanol.

The saturated hydrocarbons were examined by gas chromatography using the following instrumental parameters:

Gas chromatograph:	Perkin Elmer Sigma 2 fitted with Grob injector.
Column:	25 m x 0.33 m fused silica, SGE QC3/BP1
Detector:	FID

Injector and detector temperature:	280°C
Carrier gas:	H_2 at 9 psi
Column temperature:	60°C for 3 mins, then 4° per minute to 275°C and held at 275° until all peaks eluted.
Quantitation:	Relative concentrations of individual normal and isoprenoid alkanes obtained by measurement of peak areas above naphthene hump.

2.5 Organic Petrology

Representative portions of each rock (crushed to -14+35 BSS mesh) were obtained with a sample splitter and then mounted in cold setting Astic resin using a 2.5 cm diameter mould. Each block was ground flat using diamond impregnated laps and carborundum paper. The surface was then polished with aluminium oxide and finally magnesium oxide.

Reflectance measurements on vitrinite phytoclasts, were made with a Leitz MPV1.1 microphotometer fitted to a Leitz Ortholux microscope and calibrated against synthetic standards. All measurements were taken using oil immersion (n = 1.518) and incident monochromatic light (wavelength 546 nm) at a temperature of 24±1°C. Fluorescence observations were made on the same microscope utilizing a 3 mm BG3 excitation filter, a TK400 dichroic mirror and a K510 suppression filter.

3. RESULTS

TOC and Rock-Eval data for the 20 cuttings samples analysed are listed in Table 2. The variation of T_{max}, production index ($S_1/S_1 + S_2$), TOC, potential yield ($S_1 + S_2$) and hydrogen index with depth is illustrated in Figures 1A and 1B. Figures 2-4 are cross plots of hydrogen index versus T_{max} which demonstrate kerogen type and maturity.

Vitrinite reflectance (VR) data are given in Table 3. Dispersed organic matter (DOM) descriptions are summarised in Tables 4 and 5. Histograms of the reflectance measurements and extended descriptions of the DOM for each sample may be found in Appendices 1 and 2, respectively. The types of DOM present in selected samples are illustrated in Plates 1-10. Figure 5 is a depth-reflectance profile for Omeo-1.

C_{15+} extract data on five samples high-graded by TOC and Rock-Eval analyses are presented in Tables 6-10, Figures 6-10 (saturates chromatograms), and Figures 11-15 (*n*-alkane profiles). Figure 16 compares the pristane/*n*-heptadecane and phytane/*n*-octadecane ratios of the rock extracts with those of the 'oil shows' analysed by McKirdy (1973a, b).

Table 11 is a summary of cuttings gas (C_1-C_4) data for Omeo-1 (BMR, 1983).

4. DISCUSSION

4.1 Maturity

Vitrinite reflectance data (Fig. 5) indicate that the Omeo-1 well section above 2720 metres is immature (VR <0.5%). This accords with high isobutane/*n*-butane ratios (i-C_4/n-C_4 >>1) in cuttings gas from this part of the sequence (Table 11). Maturation levels appropriate for the early generation of light naphthenic oil and/or condensate from resinite-rich DOM (VR = 0.45-0.6% Snowdon and Powell, 1982) have been attained by Latrobe Group sediments between 2540 and 3000 metres depth. The latter depth is also the threshold for significant gas generation from terrigenous Type III kerogen (Monnier *et al.*, 1983). The top of the oil window for resinite-poor, woody-herbaceous DOM (VR = 0.7%) coincides with the top of the Strzelecki Group at 3195 metres depth.

Figure 5 clearly shows that the rank gradient increases with depth, from 0.25% VR km^{-1} through the Gurnard Formation and Latrobe Clastics to *ca*. 0.7% VR km^{-1} in the Strzelecki Group. Kantsler *et al*. (1978) noted a similar feature in the depth-reflectance profiles of three inshore wells (Snapper-1, Tuna-1 and Marlin-1) located along the northern margin of the basin deep province.

The T_{max} profile (Fig.1A) reveals a similar (albeit less clear-cut) downhole increase in organic maturity. Below 2750 metres depth T_{max} values are consisently higher than 430°C, equivalent to VR = 0.5% in Type III kerogen (Figs. 2-4). The fact that DOM in siltstone from 3369 metres comprises mostly asphaltic bitumen (Table 4 and 5, Appendix 2) accounts for its low T_{max} value (Clementz, 1979).

Although primarily maturation-dependent, the Rock-Eval production index is sensitive also to the presence of migrated hydrocarbons. The anomalously high production indices (PI = 0.16-0.17) obtained from siltstones of the Gurnard Formation and Latrobe Clastics (at 2224 m, 2317 m and 2371 m in Fig. 1A) are probably due to migrated hydrocarbons. Such non-indigenous hydrocarbons might also explain the high wet gas content (C_2-C_4 = 44-59%) of cuttings gas between 2270 and 2420 metres depth in Omeo-1 (Table 11). However, the correspondingly high isobutane/*n*-butane ratios of the Gurnard Formation (i-C_4/n-C_4 = 1.7-3.7) contrast with the much lower values of the Latrobe Clastics (i-C_4/n-C_4 = 0.90-0.95) and demonstrate that only the latter unit is likely to contain allochthonous gaseous hydrocarbons.

The trends evident in the three cuttings gas parameters, total C_1-C_4, wet gas content, and isobutane/*n*-butane ratio (Table 11), reflect the dual influences of progressive thermal maturation and changing organic facies with increasing depth in the Omeo-1 sequence. For example, coal-rich intervals (inferred from high C_1-C_4 yields at the top and base of the Undifferentiated Latrobe) are characterised by low wet gas values (C_2-C_4 <20% of C_1-C_4) and high isobutane/*n*-butane ratios (i-C_4/n-C_4 = 1-2).

4.2 Source Richness

With only one exception the Omeo-1 cuttings samples analysed have TOC contents in the range 0.5-15% (Table 2, Fig. 1B). Values in excess of TOC = 1.5% are common. Three of these richer samples have fair source richness, indicated by potential hydrocarbon yields (S_1+S_2) of 2-6 kg/tonne (Fig.1B), whereas the remainder possess good to very good source richness, as follows:

Formation	Depth (m)	TOC (%)	S_1+S_2 (kg/tonne)
Latrobe Clastics	2401*	4.10	10.1
Undifferentiated Latrobe	2455*	3.54	9.3
	2569*	2.74	6.8
	2656*	14.7	51.3
	3063	10.8	26.3
	3087	3.86	8.4
	3162	3.12	7.1
Strzelecki Group	3309	5.75	11.3
	3369**	2.44	9.1

* lacks adequate maturity to be an effective source rock

** siltstone containing asphaltic bitumen

Consistently high cuttings gas yields (C_1-C_4 >8000 ppm : Table 11) for the intervals 2510-2692 metres (top Undifferentiated Latrobe) and 2971-3360 metres (base Undifferentiated Latrobe/top Strzelecki) likewise indicate good to very good source richness.

4.3 Source Quality and Kerogen Type

Hydrogen indices in the range HI = 53-347 (Figs. 1B) suggest that these rocks contain organic matter of humic Type III, tending to inertinitic Type IV, composition (Figs. 2-4). Optical examination confirmed the presence of woody-herbaceous DOM and coal (Tables 4 and 5; Appendix 2).

Low hydrogen indices (HI <150) generally correlate with dry gas-prone, inertinite-rich DOM in siltstones. The high percentage of exinite in the DOM of the two Gurnard Formation samples (Table 4) actually comprises (?) migrated bitumen (Table 5).

Latrobe Group samples with hydrogen index values in excess of HI = 200 contain marginally mature, oil-prone Type III organic matter. This organic matter, present as coal (chiefly clarite, clarodurite and duroclarite) and DOM in shale, is rich in vitrinite (20-70%) and exinite (15-30%). The major exinites are resinite, sporinite, cutinite and fluorinite.

At the maturation levels attained by sediments of the Undifferentiated Latrobe Group in Omeo-1 (VR = 0.4-0.7%), resinite and fluorinite are potential sources of so-called immature naphthenic oil and/or condensate (Connan and Cassou, 1980; Snowdon and Powell, 1982). However, the abundance of these labile exinites (at best, *ca.* 1% by volume of cuttings from 2401 metres) probably is too low to produce significant quantities of liquid hydrocarbons. According to Snowdon and Powell (*op.cit.*, p.786), "samples with 10% resinite would be classed as excellent source rocks.....".

Sediments of the Strzelecki Group lie below the top of the oil window for resinite-poor, woody-herbaceous organic matter (VR = 0.7%). However, with the possible exception of coal from 3309 metres depth (HI = 174; V = 60%, E = 25%), none of the samples examined has any oil-source potential. Despite its high hydrogen index (HI = 347), siltstone from 3369 metres is not a source rock; migrated asphaltic bitumen constitutes the bulk of the DOM (Table 4).

The high pristane/phytane ratios (pr/ph = 5.0-8.6) of the C_{15+} EOM isolated from selected cuttings samples (Tables 6-10) are consistent with the terrigenous origin of the associated kerogen. Pristane/*n*-heptadecane ratios decrease systematically with increasing depth in the sequence, being very high (pr/n-C_{17} = 1.4-6.1) in the immature to marginally mature Latrobe samples (VR = 0.46-0.68%) but much lower (pr/n-C_{17} = 0.68-0.85) in the mature Strzelecki samples (VR = 0.78-0.83%) (Fig. 16). Accordingly the C_{15+} alkane distributions of the latter samples (Figs. 9, 10, 14, 15) are more oil-like than those of the Latrobe extracts (Figs. 6-8, 11-13). In all but one of the extracted cuttings samples, coal is the major organic-rich rock type. This fact, together with the immaturity of the Latrobe samples, accounts for their uniformly low hydrocarbon yields (15-21 mg/g TOC; 8-18% of EOM). The higher hydrocarbon yield of siltstone from 3369-3372 metres in the Strzelecki Group (67 mg/g TOC; 10% of EOM) is directly attributable to its staining by asphaltic bitumen. Notwithstanding their low content of extractable C_{15+} hydrocarbons, coals *per se* are now considered to have significant potential for the generation and efficient expulsion of liquid hydrocarbons over the rank range, VR = 0.7-1.5% (Durand and Paratte, 1983).

4.4 Oil-Source Correlations

Petroleum-like hydrocarbons with high pristane/phytane ratios (pr/ph = 4-8) are present at several levels within the Omeo-1 well sequence, as follows:

Stratigraphic Unit	Depth (metres)	Sample	Pr/Ph	Reference
Undiff. Latrobe	2918-2939	Formation water extract	4.1-4.7	McKirdy (1973b)
Strzelecki Group	3125	" "	5.4-5.9	"
	3369-3372	Bitumen-stained siltstone	5.9	This report
	3379	Mud extract	6.6-7.6	McKirdy (1983a)

Note: petroleum ether extracts of the pipe dope and Soltex used during the drilling of Omeo-1 gave chromatograms (not shown) which bear no resemblance to these 'oil shows'.

The superficial similarity of the 'oil shows' to the more mature C_{15+} extracts isolated from Omeo-1 cuttings is illustrated in Figure 16. However, confirmation of the possible existence of three oil families (McKirdy, 1983b), and the establishment of definitive oil-to-source correlations, requires comparative GC-MS analysis of the steranes and polycyclic terpanes in the 'oil shows' and the oil-prone carbonaceous shales and coals identified herein.

5. CONCLUSIONS

1. The top of the oil generation window for resinite-poor terrigenous organic matter (VR = 0.7%) coincides with the contact between the Latrobe Group and the underlying Strzelecki Group at 3195 metres depth in Omeo-1. Undifferentiated Latrobe sediments in the interval 2540-3000 metres are sufficiently mature (VR = 0.45-0.6%) for the genesis of immature oil and condensate from land plant resin and essential oil precursors (resinite, fluorinite). Gas generation commences at 3000 metres (VR = 0.6%).

2. Coals and carbonaceous shales of the Latrobe Group (2400-2695 m, 3030-3180 m) and Strzelecki Group (3210-3310 m) contain oil-prone Type III organic matter rich in vitrinite (20-70%) and exinite (15-30%). Bulk cuttings samples from these intervals have hydrogen indices (HI = 175-320 mg hydrocarbons/g TOC) and potential hydrocarbon yields (S_1+S_2 = 7-51 kg/tonne) characteristic of good to very good oil source rocks.

3. Although thermally labile resinite commonly is present as the major exinite maceral in these rock types within the Latrobe Group, its abundance is insufficient to impart significant source potential for immature oil and condensate.

4. 'Oil shows' at 2918-2939 metres, 3125 metres, 3369-3372 metres and 3379 metres depth in Omeo-1 originated from terrigenous organic matter similar to that present in the samples of Undifferentiated Latrobe and Strzelecki Group sediments analysed in this study. However, the available geochemical data do not provide an answer to the question of whether or not these 'oil shows' formed *in situ*. GC-MS analyses of both the 'oils' and cuttings extracts are necessary before precise correlations, based on sterane and terpane distributions, can be attempted.

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TABLE 1: FORMATION TOPS, OMEO-1

	Depth (metres, K.B.)
Lakes Entrance Formation	1882
Latrobe Group - Gurnard Formation	2188
- Latrobe Clastics	2348
- Undifferentiated Latrobe	?2450
Strzelecki Group	3195
Total Depth	3379

TABLE 2

AMDEL

ROCK-EVAL PYROLYSIS

Client AQUITAINE

Well OMEO-1

DEPTH	T MAX	S1	S2	S3	PI	S2/S3	PC	TOC	HI	OI
2160.00	438	0.08	0.97	4.06	0.08	0.23	0.08	0.69	141	588
2224.00	431	0.08	0.42	3.27	0.16	0.12	0.04	0.52	81	629
2317.00	427	0.09	0.43	4.07	0.17	0.10	0.04	0.81	53	502
2371.00	431	0.05	0.26	2.34	0.17	0.11	0.02	0.36	72	650
2401.00	439	0.43	9.68	1.93	0.04	5.01	0.84	4.10	236	47
2455.00	434	0.35	8.95	1.61	0.04	5.55	0.77	3.54	253	45
2503.00	437	0.25	4.84	5.36	0.05	0.90	0.42	2.78	174	192
2569.00	435	0.33	6.45	1.46	0.05	4.41	0.56	2.74	235	53
2656.00	424	4.76	46.52	1.10	0.09	42.29	4.27	14.70	316	7
2752.00	433	0.19	1.08	0.48	0.15	2.25	0.10	0.79	137	61
2784.00	438	0.28	2.48	0.93	0.10	2.66	0.23	1.54	161	60
3032.00	439	0.28	1.03	0.50	0.22	2.06	0.10	0.99	104	51
3063.00	440	1.76	24.58	0.75	0.07	32.77	2.19	10.80	229	7
3087.00	437	0.54	7.83	0.54	0.06	14.50	0.69	3.86	202	14
3162.00	434	0.54	6.58	0.29	0.08	22.68	0.59	3.12	210	9
3219.00	444	0.11	0.85	0.90	0.11	0.94	0.08	1.11	77	81
3249.00	448	0.32	2.54	0.52	0.11	4.88	0.23	1.71	148	30
3309.00	443	1.27	10.01	1.05	0.11	9.53	0.94	5.75	174	18
3351.00	445	0.15	0.75	0.23	0.17	3.26	0.07	1.03	73	22
3369.00	432	0.60	8.46	0.73	0.07	11.58	0.75	2.44	347	30

KEY TO ROCK-EVAL PYROLYSIS DATA SHEET

	PARAMETER	SPECIFICITY
T max	position of S_2 peak in temperature program (^{o}C)	Maturity/Kerogen type
S_1	kg hydrocarbons (extractable)/tonne rock	Kerogen type/Maturity/Migrated oil
S_2	kg hydrocarbons (kerogen pyrolysate)/tonne rock	Kerogen type/Maturity
S_3	kg CO_2 (organic)/tonne rock	Kerogen type/Maturity *
$S_1 + S_2$	Potential Yield	Organic richness/Kerogen type
PI	Production Index ($S_1/S_1 + S_2$)	Maturity/Migrated Oil
PC	Pyrolysable Carbon (wt. percent)	Organic richness/Kerogen type/Maturity
TOC	Total Organic Carbon (wt. percent)	Organic richness
HI	Hydrogen Index (mg h'c (S_2)/g TOC)	Kerogen type/Maturity
OI	Oxygen Index (mg CO_2(S_3)/g TOC)	Kerogen type/Maturity *

*Also subject to interference by CO_2 from decomposition of carbonate minerals.

TABLE 3: VITRINITE REFLECTANCE MEASUREMENTS, OMEO-1

Sample	Depth (m)	Mean Maximum Reflectance (%)	Standard Deviation	Range	Number of Determinations
1	2160	0.38	0.03	0.35-0.42	4
2	2224	-	-	-	-
3	2317	-	-	-	-
4	2371	0.38	0.05	0.31-0.47	23
5	2401	0.44	0.04	0.35-0.53	41
6	2455	0.45	0.03	0.39-0.53	40
7	2503	0.44	0.04	0.36-0.53	44
8	2569	0.46	0.03	0.39-0.53	37
9	2656	0.50	0.03	0.44-0.58	44
10	2752	0.49	0.01	0.47-0.51	11
11	2784	0.53	0.01	0.51-0.55	5
12	3032	0.59	0.04	0.53-0.69	20
13	3063	0.66	0.05	0.57-0.74	39
14	3087	0.68	0.05	0.59-0.75	36
15	3162	0.68	0.03	0.61-0.75	39
16	3219	0.75	0.07	0.65-0.93	22
17	3249	0.74	0.03	0.69-0.79	18
18	3309	0.76	0.05	0.66-0.93	40
19	3351	0.79	0.05	0.72-0.95	20
20	3369	-	-	-	-

TABLE 4: PROPORTIONS OF INERTINITE, VITRINITE AND EXINITE IN ORGANIC MATTER, OMEO-1

Sample	Depth (m)	Percentage of Organic Matter		
		Inertinite	Vitrinite	Exinite
1	2160	30	<1	70
2	2224	10	-	90
3	2317	40	-	60
4	2371	30	60	10
5	2401	10	60	30
6	2455	10	70	20
7	2503	15	65	20
8	2569	50	35	15
9	2656	40	35	25
10	2752	70	15	15
11	2784	70	10	20
12	3032	70	5	25
13	3063	50	30	20
14	3087	60	20	20
15	3162	10	70	20
16	3219	70	10	20
17	3249	80	10	10
18	3309	15	60	25
19	3351	80	10	10
20	3369	10	-	90

TABLE 5: ORGANIC MATTER TYPE AND ABUNDANCE, OMEO-1

Sample	Depth (m)	Relative Maceral Group Volumes	Extimated Volume of O.M.	Extimated Volume of Exinite	Exinite Macerals
1	2160	E > I >> V	∿0.5	ra	bmen, sp
2	2224	E > I	∿0.5	ra	bmen
3	2317	E > I	0.5-1%	ra-spa	bmen
4	2371	V > I > E	<0.5	tr	sp, lipto
5	2401	V > E >> I *I > V > E	5-10%	Co	res, sp, lipto, cut, sub, p
6	2455	I > E > V *V > E	∿5%	spa-Co	res, sp, cut, lipto
7	2503	V > I ≧ E *I > V ≧ E	5-10%	spa	res, cut, sp, sub, phyto
8	2569	I > V > E *I ≧ V > E	∿5%	spa	sp, cut, res, lipto, sub, t
9	2656	I >> E > V *V ≧ I > E	>30%	Co	sp, cut, lipto, res, ?fluor
10	2752	I >> V ≧ E	<0.5%	ra	bmen, sp, res
11	2784	I > E > V	<0.5%	ra-vr	cut, res, sp, lipto, sub, t
12	3032	I > E >> V	<0.5%	vr	sp, cut, res, lipto
13	3063	*I > V > E E ≧ I > V	10-15%	spa-Co	res, sp, fluor, cut, lipto
14	3087	I >> E ≧ V I ≧ E > V *I > V > E	10-15%	ra-sp	sp, cut, fluor, res
15	3162	*V > E > I	5-10%	sp	fluor, cut, exs, res, sp
16	3219	I > E > V *I	1-2%	vr	cut, sp
17	3249	I >> E ≧ V	1-2%	ra	cut, lipto, res, sp
18	3309	*V > E > I I > E > V	10-20%	ra-sp	cut, res, sp, fluor, bmen
19	3351	I >> E ≧ V	0.5-1%	ra	cut, lipto, sp
20	3369	E > I	15-20%	Ab	bmen, sp, cut, lipto

KEY

V	Vitrinite
I	Inertinite
E	Exinite
*	Coals
Ab	Abundant
Co	common
spa	sparse
ra	Rare
vr	Very rare
sp	Sporinite
cut	Cutinite
res	Resinite
sub	Suberinite
lipto	Liptodetrinite
fluor	Fluorinite
exs	Exsudatinite
bmen	Bitumen
thuc	Thucholite
phyto	Phytoplankton

TABLE 6

SOURCE ROCK ANALYSIS

WELL: OMEO NO.1

SAMPLE: 2656-2659 M
TYPE OF SAMPLE: CUTTINGS

total organic carbon	14.1 %
weight of sample extracted	78.5 g
weight of eom	2491.6 mg
extracted organic matter	31740 ppm
eom as fraction of toc	225.1 mg/g

ANALYSIS OF EXTRACTED ORGANIC MATTER, (%)

ASPHALTENES	60.8
SATURATES	4.5
AROMATICS	4.0
RESINS	30.7

N-ALKANE DISTRIBUTION OF SATURATES

C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%
12	.0	17	3.8	22	6.7	27	8.9	32	1.0
13	.6	18	4.1	23	7.1	28	6.5	33	1.1
14	1.5	19	5.6	24	7.3	29	6.8	34	.0
15	2.5	20	5.2	25	8.4	30	3.1	35	.0
16	3.1	21	5.8	26	8.1	31	2.7	36	.0

ISOPRENOID DISTRIBUTION IN SATURATES

pristane	23.01 %
phytane	4.58 %

pristane/phytane ratio	5.02
pristane/c-17 ratio	6.11
phytane/c-18 ratio	1.13

CARBON PREFERENCE INDEX (C-23 TO C-33):

C.P.I. = 1.28

TABLE 7

SOURCE ROCK ANALYSIS

WELL: OMEO NO.1

SAMPLE: 3063-3066 M
TYPE OF SAMPLE: CUTTINGS

total organic carbon	11.6 %
weight of sample extracted	65.42 g
weight of eom	1043.2 mg
extracted organic matter	15946 ppm
eom as fraction of toc	137.5 mg/g

ANALYSIS OF EXTRACTED ORGANIC MATTER, (%)

ASPHALTENES	61.1
SATURATES	6.3
AROMATICS	4.4
RESINS	28.2

N-ALKANE DISTRIBUTION OF SATURATES

C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%
12	.0	17	5.3	22	6.5	27	7.1	32	1.5
13	.6	18	5.5	23	6.3	28	4.6	33	1.9
14	2.1	19	6.2	24	6.7	29	5.1	34	.8
15	3.4	20	5.7	25	7.1	30	2.9	35	.5
16	4.1	21	6.6	26	5.8	31	3.6	36	.0

ISOPRENOID DISTRIBUTION IN SATURATES

pristane	10.7 %
phytane	1.24 %

pristane/phytane ratio	8.64
pristane/c-17 ratio	2.04
phytane/c-18 ratio	.23

CARBON PREFERENCE INDEX (C-23 TO C-33):

C.P.I. = 1.38

TABLE 8

SOURCE ROCK ANALYSIS

WELL: OMEO NO.1

SAMPLE: 3159-3162 M
TYPE OF SAMPLE: CUTTINGS

total organic carbon	2.14 %
weight of sample extracted	76.97 g
weight of eom	258.8 mg
extracted organic matter	3362 ppm
eom as fraction of toc	157.1 mg/g

ANALYSIS OF EXTRACTED ORGANIC MATTER, (%)

ASPHALTENES	65.5
SATURATES	5.8
AROMATICS	4.6
RESINS	24.1

N-ALKANE DISTRIBUTION OF SATURATES

C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%
12	.0	17	7.6	22	6.3	27	4.7	32	.6
13	1.3	18	8.8	23	5.7	28	3.0	33	.9
14	4.0	19	8.5	24	5.1	29	2.9	34	.0
15	6.4	20	7.7	25	5.2	30	1.6	35	.0
16	7.4	21	6.8	26	4.0	31	1.5	36	.0

ISOPRENOID DISTRIBUTION IN SATURATES

pristane	10.52 %
phytane	1.67 %

pristane/phytane ratio	6.31
pristane/c-17 ratio	1.39
phytane/c-18 ratio	.19

CARBON PREFERENCE INDEX (C-23 TO C-33):

C.P.I. = 1.36

TABLE 9

SOURCE ROCK ANALYSIS

WELL: OMEO NO.1

SAMPLE: 3309-3312 M
TYPE OF SAMPLE: CUTTINGS

total organic carbon	3.66 %
weight of sample extracted	68.14 g
weight of eom	297.5 mg
extracted organic matter	4366 ppm
eom as fraction of toc	119.3 mg/g

ANALYSIS OF EXTRACTED ORGANIC MATTER, (%)

ASPHALTENES	47.4
SATURATES	10.5
AROMATICS	7.2
RESINS	35.0

N-ALKANE DISTRIBUTION OF SATURATES

C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%
12	.0	17	8.7	22	7.1	27	2.5	32	.4
13	1.8	18	10.5	23	6.3	28	1.5	33	.6
14	4.7	19	9.1	24	4.7	29	1.6	34	.0
15	7.6	20	8.5	25	4.5	30	1.0	35	.0
16	8.3	21	7.4	26	2.5	31	.9	36	.0

ISOPRENOID DISTRIBUTION IN SATURATES

pristane	7.39 %
phytane	1.44 %

pristane/phytane ratio	5.12
pristane/c-17 ratio	.85
phytane/c-18 ratio	.14

CARBON PREFERENCE INDEX (C-23 TO C-33):

C.P.I. = 1.43

TABLE 10

SOURCE ROCK ANALYSIS

WELL: OMEO NO.1

SAMPLE: 3369-3372 M
TYPE OF SAMPLE: CUTTINGS

total organic carbon	3.5 %
weight of sample extracted	50.37 g
weight of eom	1367.2 mg
extracted organic matter	27143 ppm
eom as fraction of toc	775.5 mg/g

ANALYSIS OF EXTRACTED ORGANIC MATTER, (%)

ASPHALTENES	54.4
SATURATES	5.8
AROMATICS	2.8
RESINS	37.0

N-ALKANE DISTRIBUTION OF SATURATES

C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%	C-NO.	%
12	.0	17	13.4	22	6.7	27	1.4	32	.2
13	.1	18	13.1	23	5.3	28	.8	33	.4
14	2.1	19	11.9	24	3.2	29	.8	34	.0
15	7.1	20	10.1	25	3.0	30	.4	35	.0
16	10.2	21	8.0	26	1.3	31	.4	36	.0

ISOPRENOID DISTRIBUTION IN SATURATES

pristane	9.14 %
phytane	1.56 %

pristane/phytane ratio	5.86
pristane/c-17 ratio	.68
phytane/c-18 ratio	.12

CARBON PREFERENCE INDEX (C-23 TO C-33):

C.P.I. = 1.55

TABLE 11: CUTTINGS GAS DATA, OMEO-1*

Depth m	Stratigraphic Unit	Total C_1-C_4 ppm v/v	Wet Gas %	i-C_4/n-C_4
2030	Lakes Entrance Fm.	1004	20.2	2.35
2060		1048	27.6	2.20
2120		866	38.2	2.88
2150		496	29.9	2.93
2180		595	38.2	3.07
2210	Gurnard Fm.	30692	0.4	3.68
2240		1932	11.5	4.62
2270		1072	52.8	3.71
2300		496	59.1	3.62
2330		854	58.7	1.74
2360	Latrobe Clastics	1647	58.7	0.92
2390		3109	57.9	0.90
2420		1425	44.4	0.95
2450	Undifferentiated Latrobe	7656	27.5	2.67
2510		9507	11.8	3.30
2540		7894	26.0	1.55
2570		14104	18.4	1.63
2600		48795	18.1	1.41
2630		17260	13.4	1.18
2660		33420	10.9	1.70
2692		38504	14.0	1.36
2719		11	21.6	0.75
2730		1757	65.3	0.69
2752		6696	23.7	0.93
2766		1175	38.6	0.58
2779		2817	53.9	0.74
2790		3833	55.1	0.74
2820		1645	59.8	0.61
2839		1482	48.9	0.76
2850		3081	29.2	0.77
2872		4997	20.1	1.05
2880		332	27.3	0.71
2910		659	39.9	0.60
2911		3418	20.4	1.02
2940		768	44.8	0.60
2941		3460	19.2	0.95
2970		4066	29.2	1.16
2971		18989	6.8	1.14
3000		1481	24.2	0.80
3030		58642	7.6	1.29
3060		64856	7.9	1.35
3108		87269	2.3	1.14
3120		63863	7.5	1.79
3150		85784	8.0	1.58
3180		16244	10.6	1.43
3210	Strzelecki Group	9700	9.8	1.64
3240		12796	18.4	2.05
3270		9868	16.2	2.71
3300		10549	14.3	2.28
3330		5597	29.0	1.79
3360		9028	24.1	1.79

* From BMR (1983)

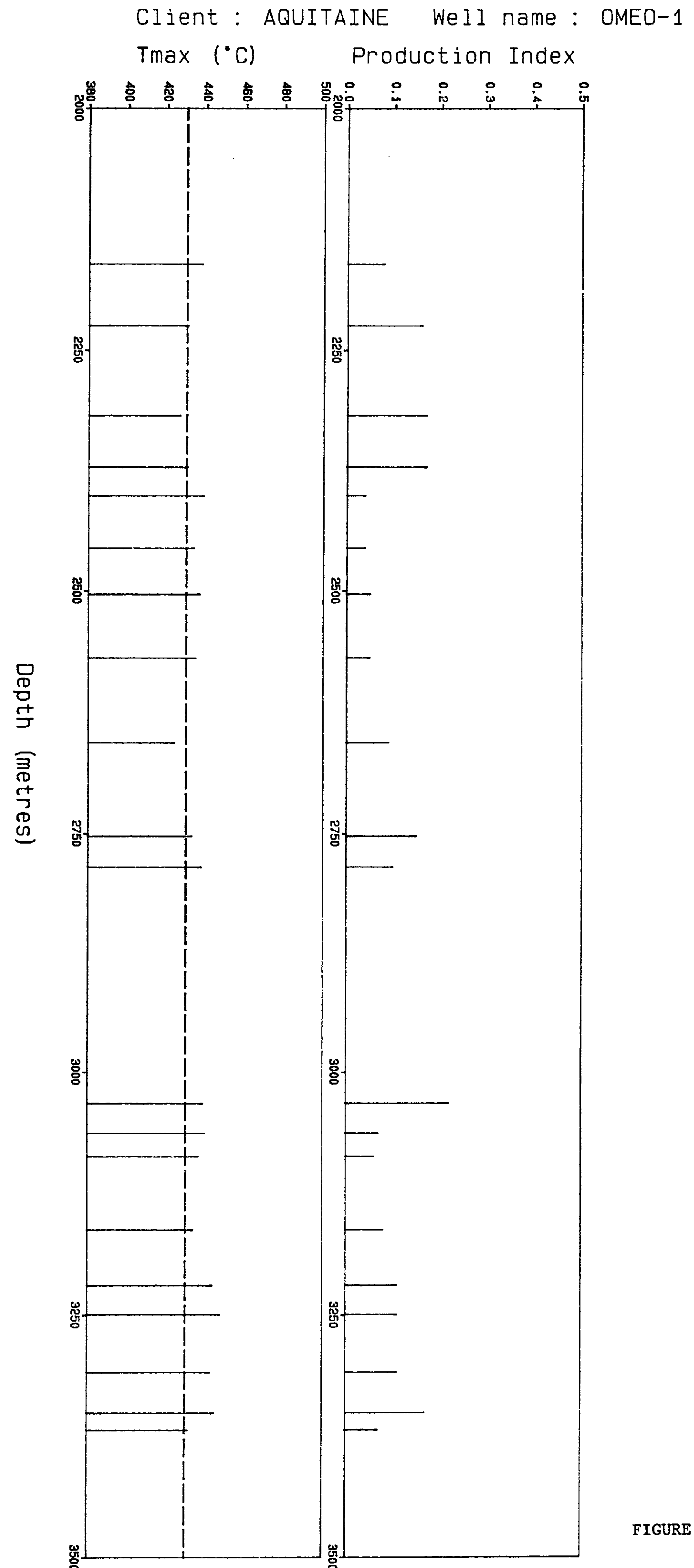

Client : AQUITAINE Well name : OMEO-1
Tmax (°C)
Production Index
380
400
420
440
460
480
500
0.0
0.1
0.2
0.3
0.4
0.5
2000
2250
2500
2750
3000
3250
3500
Depth (metres)

FIGURE 1A

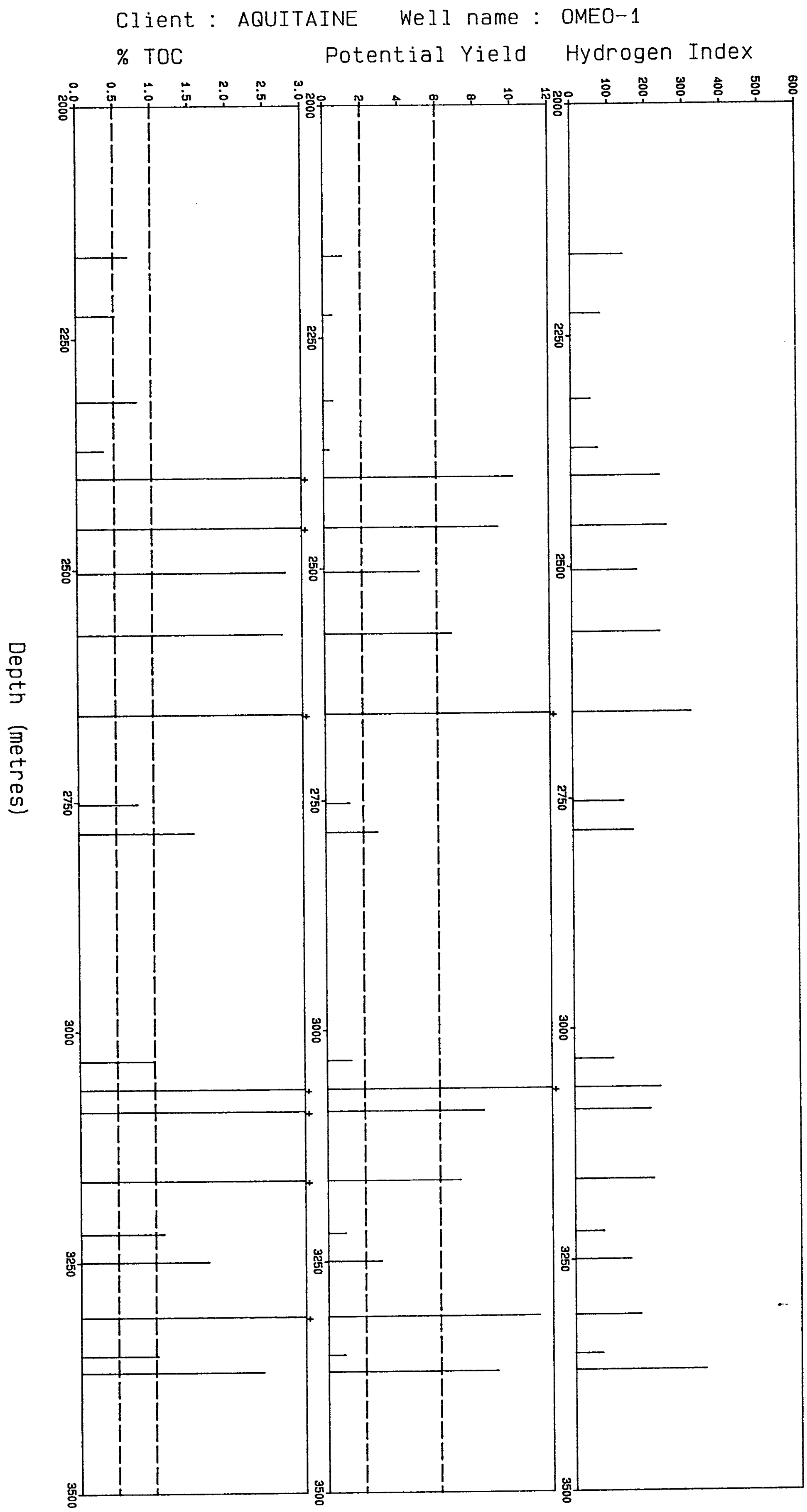
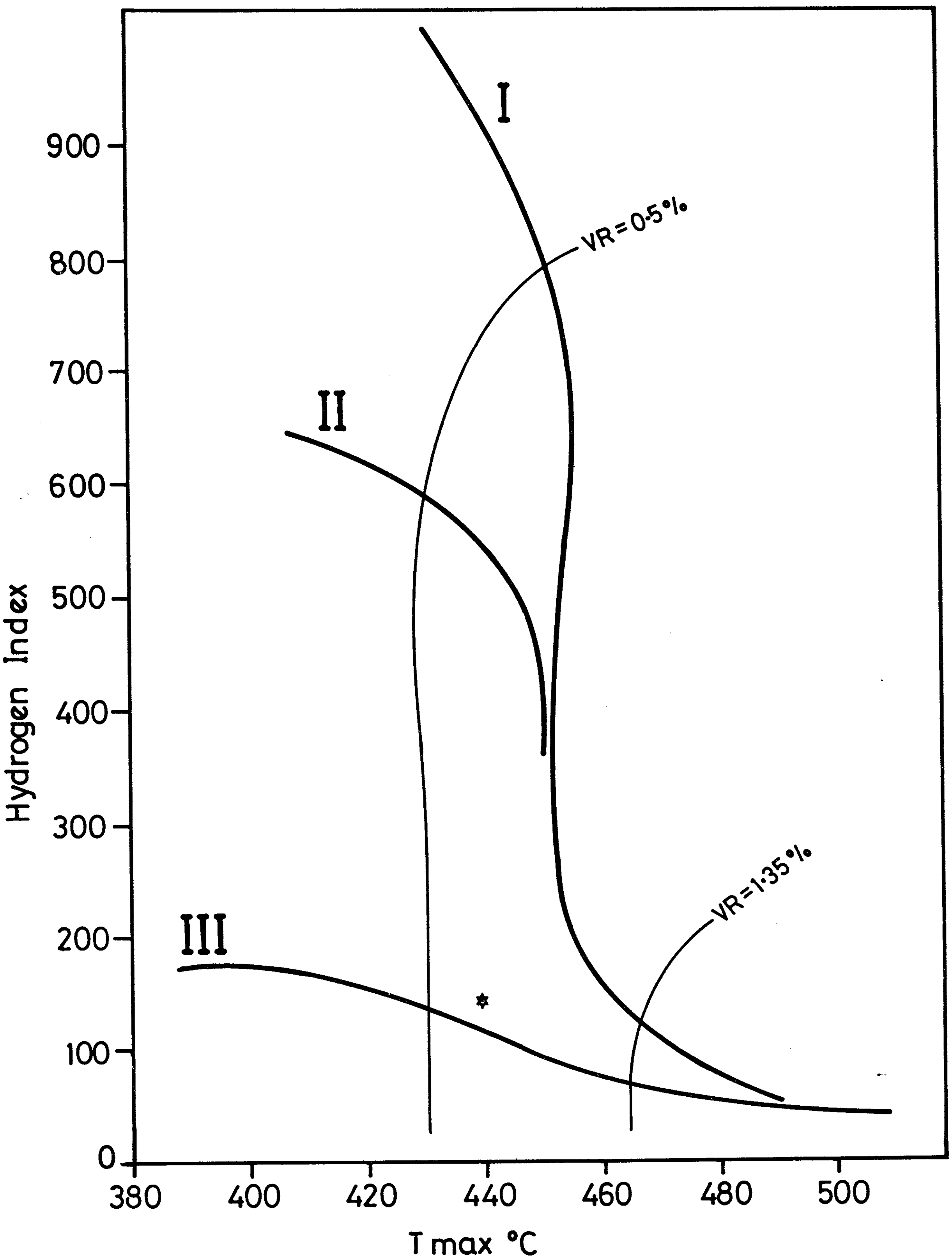

Client : AQUITAINE Well name : OMEO-1
% TOC
Potential Yield
Hydrogen Index
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0 2 4 6 8 10 12
0 100 200 300 400 500 600
2000 2250 2500 2750 3000 3250 3500
Depth (metres)

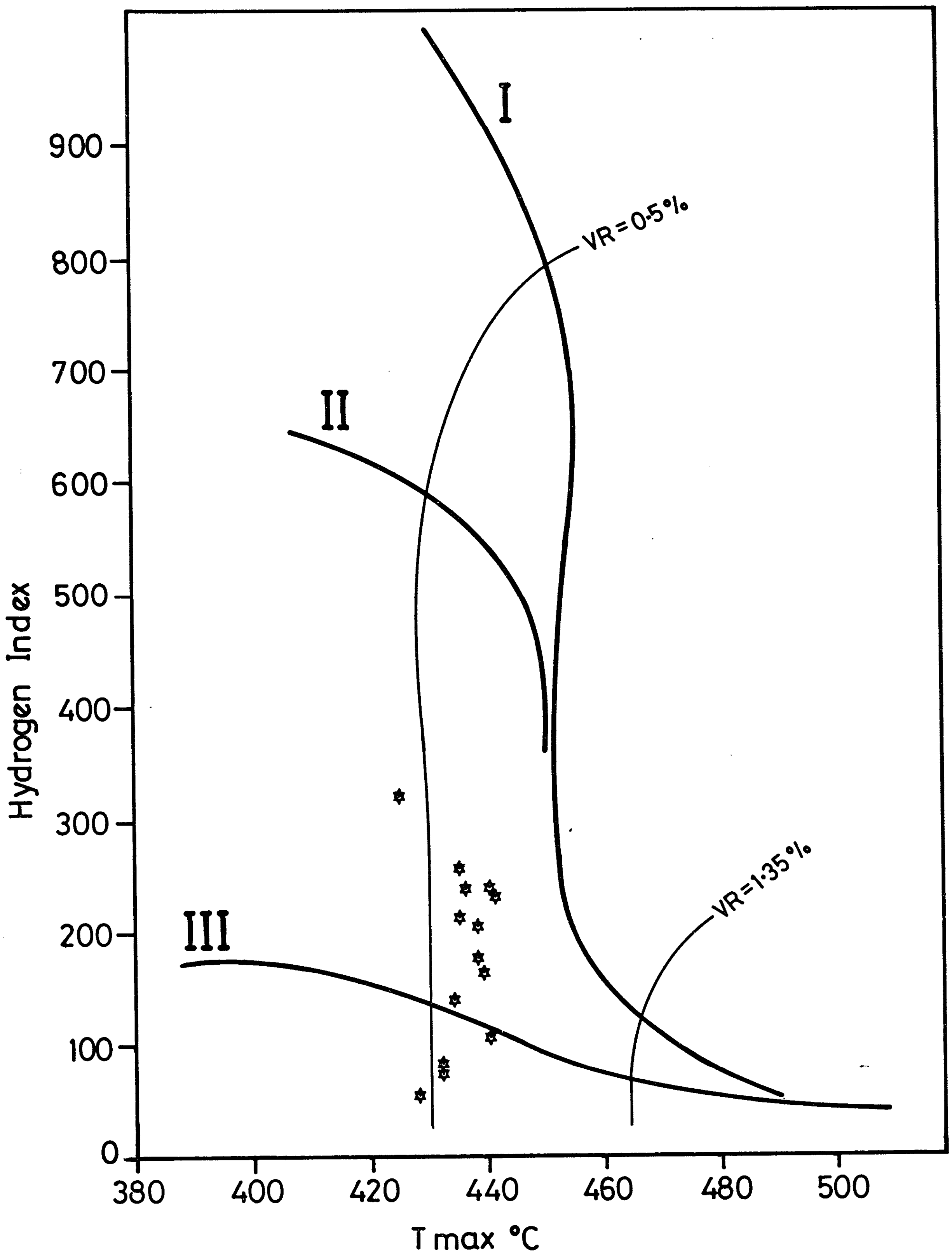
FIGURE 1B

Client : AQUITAINE
Well name : OMEO-1
Interval : Lakes Entrance Formation



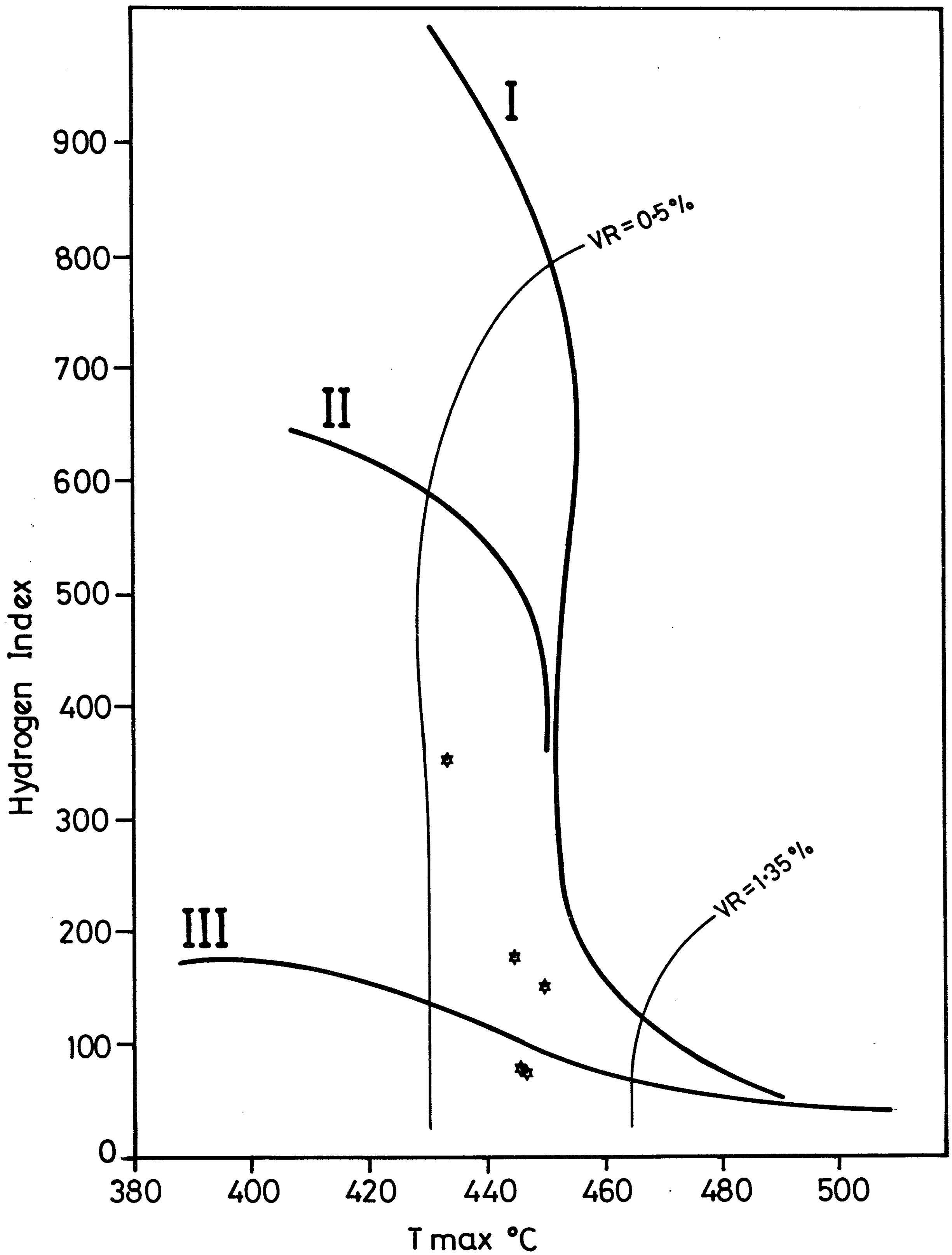
FIGURE

Client : AQUITAINE
Well name : OMEO-1
Interval : Latrobe Group



FIGURE

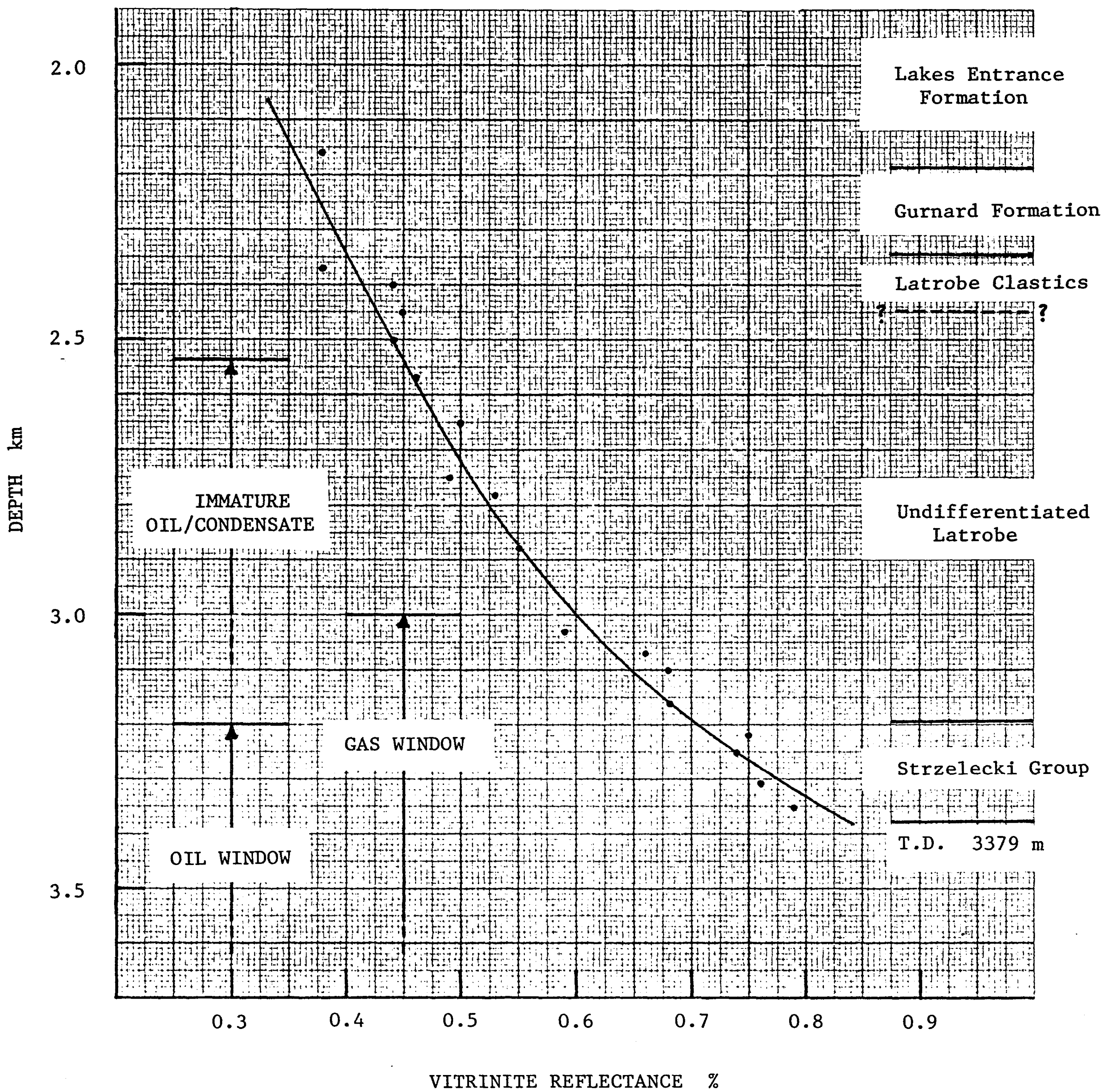
Client : AQUITAINE
Well name : OMEO-1
Interval : Strzelecki Group



FIGURE

FIGURE 5

DEPTH - REFLECTANCE PROFILE
OMEO-1



amdel

FIGURE 6

OMEO No.1
CUTTINGS: 2656–2659 m
SATURATES

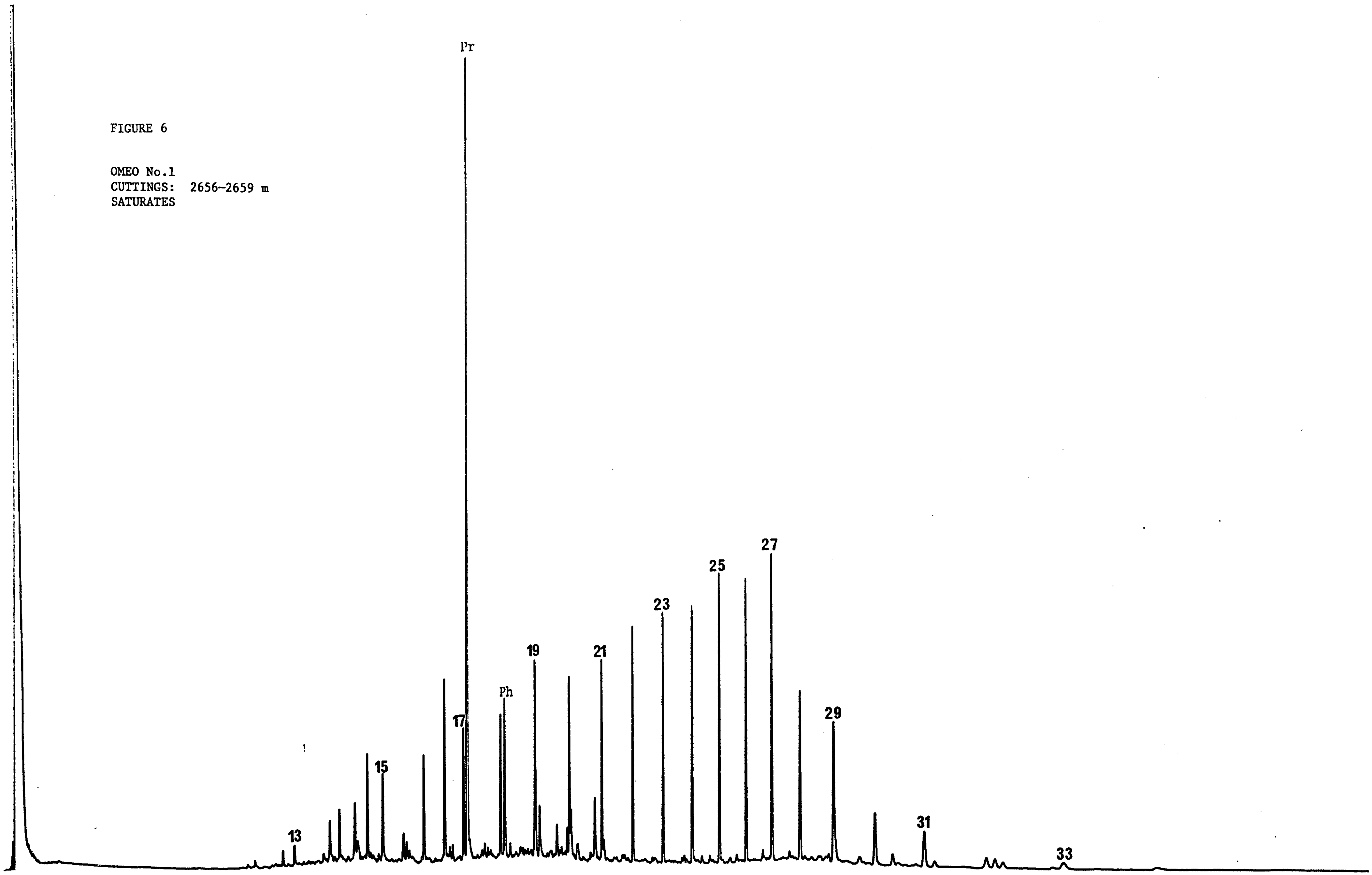
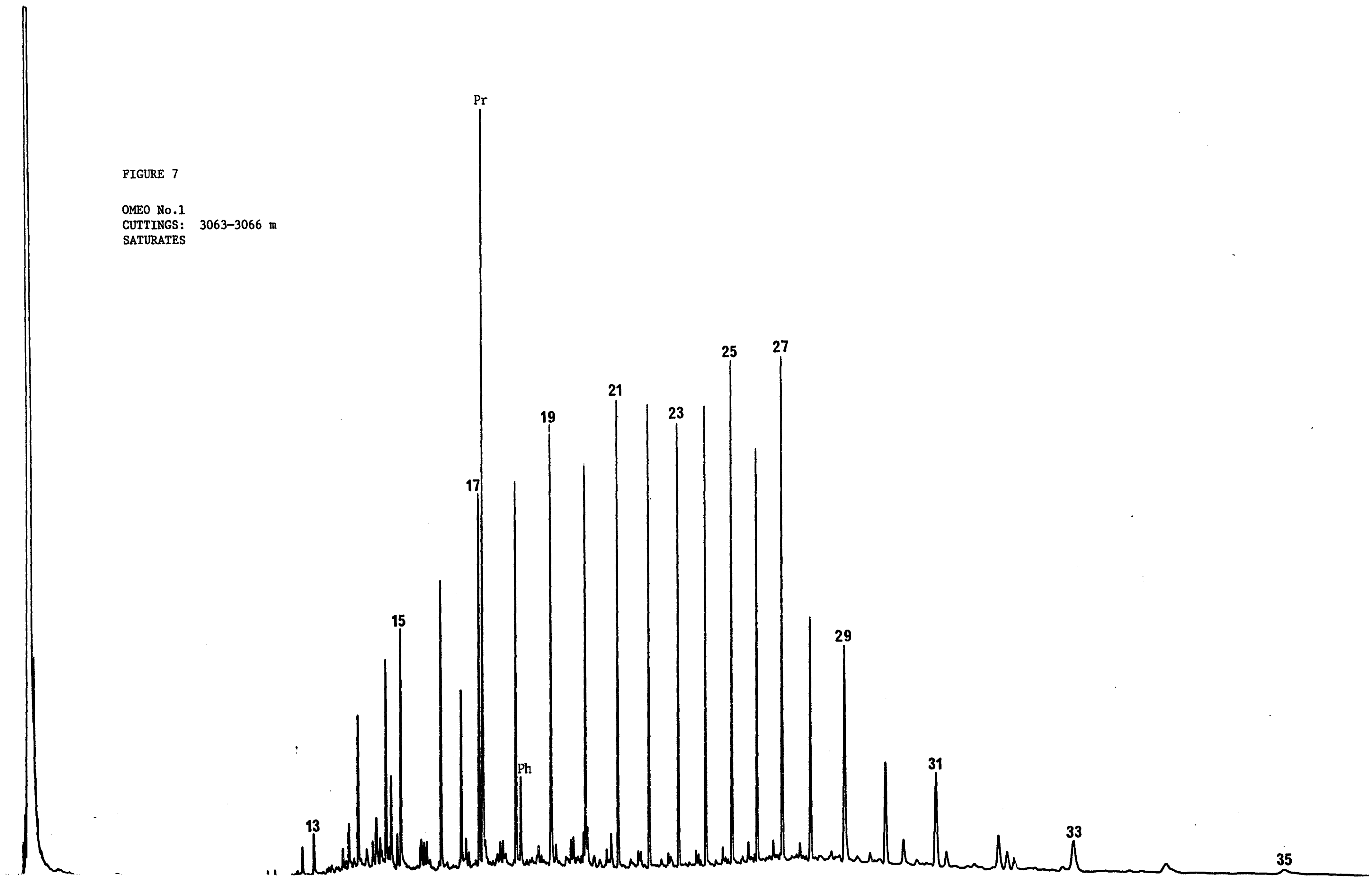


FIGURE 7

OMEO No.1
CUTTINGS: 3063-3066 m
SATURATES



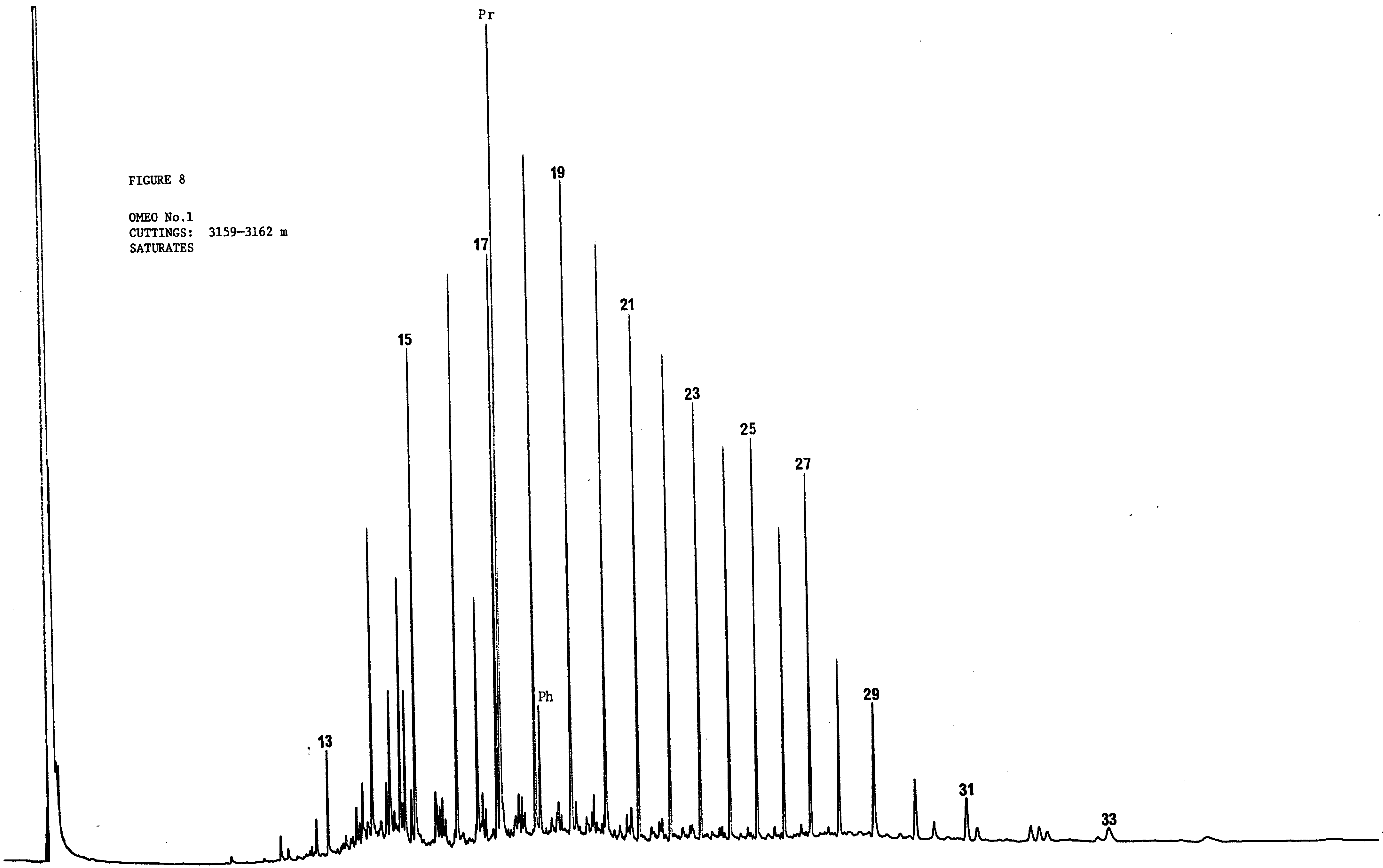
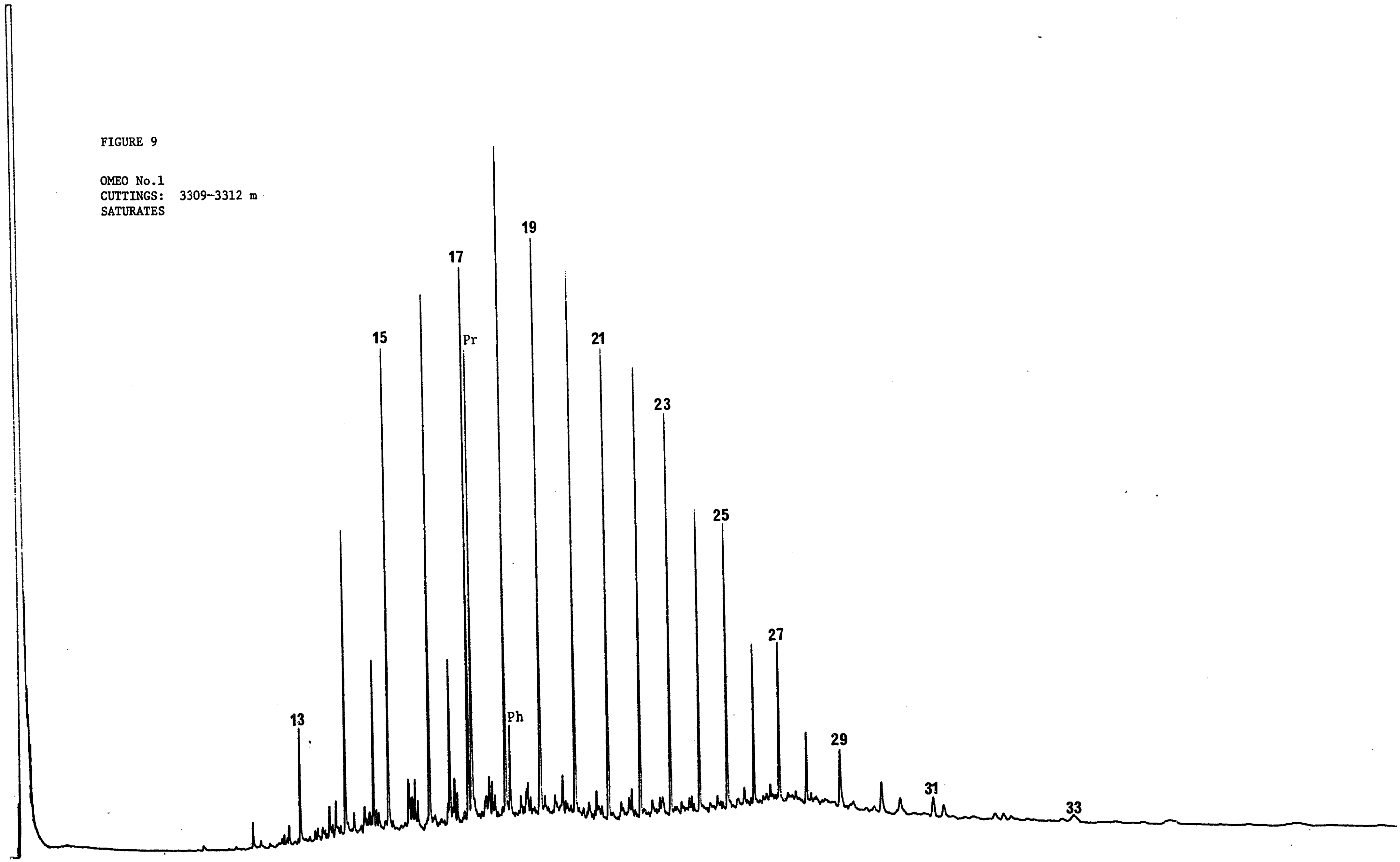


FIGURE 8

OMEO No.1
CUTTINGS: 3159–3162 m
SATURATES

FIGURE 9

OMEO No.1
CUTTINGS: 3309-3312 m
SATURATES



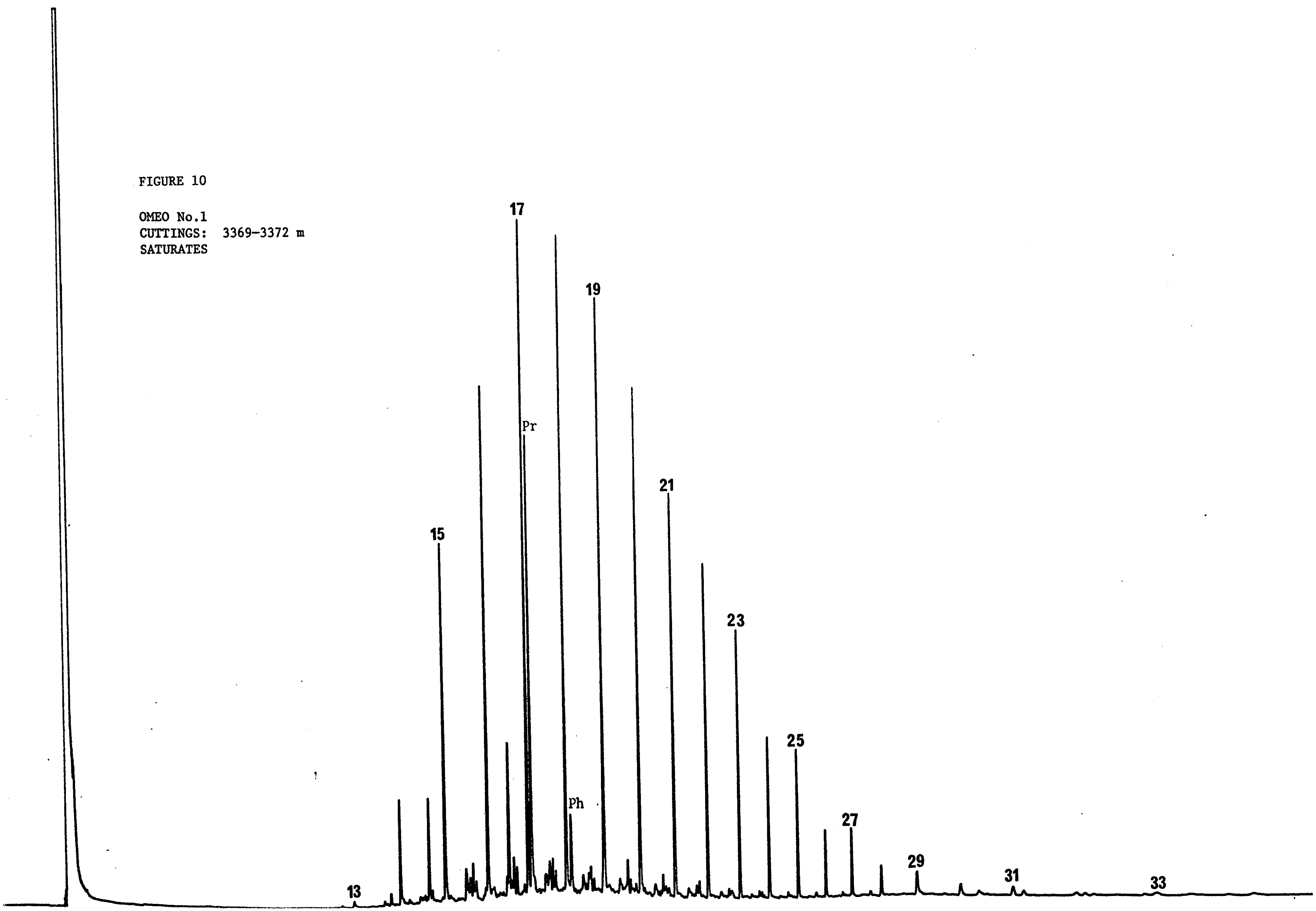


FIGURE 10

OMEO No.1
CUTTINGS: 3369-3372 m
SATURATES

FIGURE 11

OMEO NO.1
2656-2659 M

HISTOGRAM OF N-ALKANE DISTRIBUTION OF SATURATES

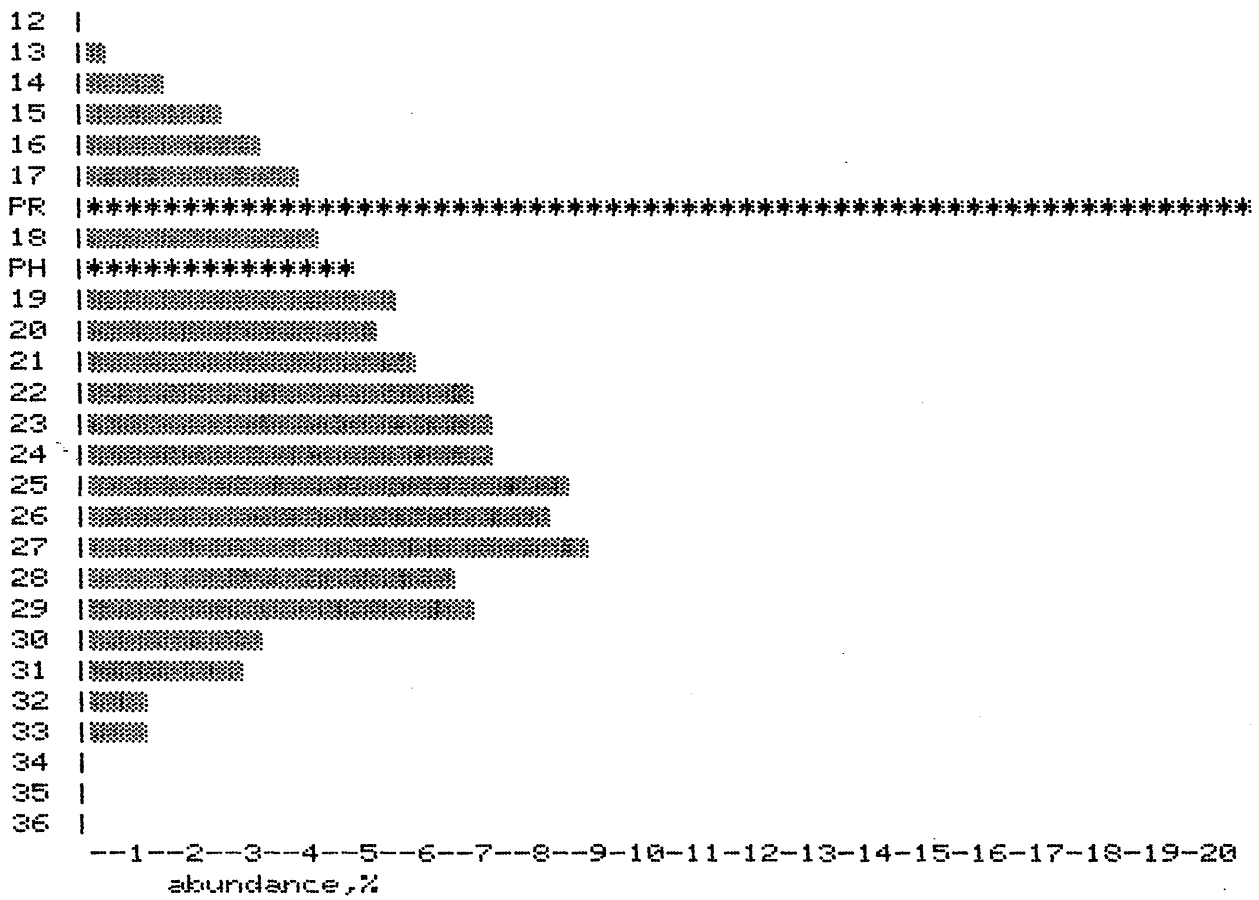


FIGURE 12

OMEO NO.1
3063-3066 M

HISTOGRAM OF N-ALKANE DISTRIBUTION OF SATURATES

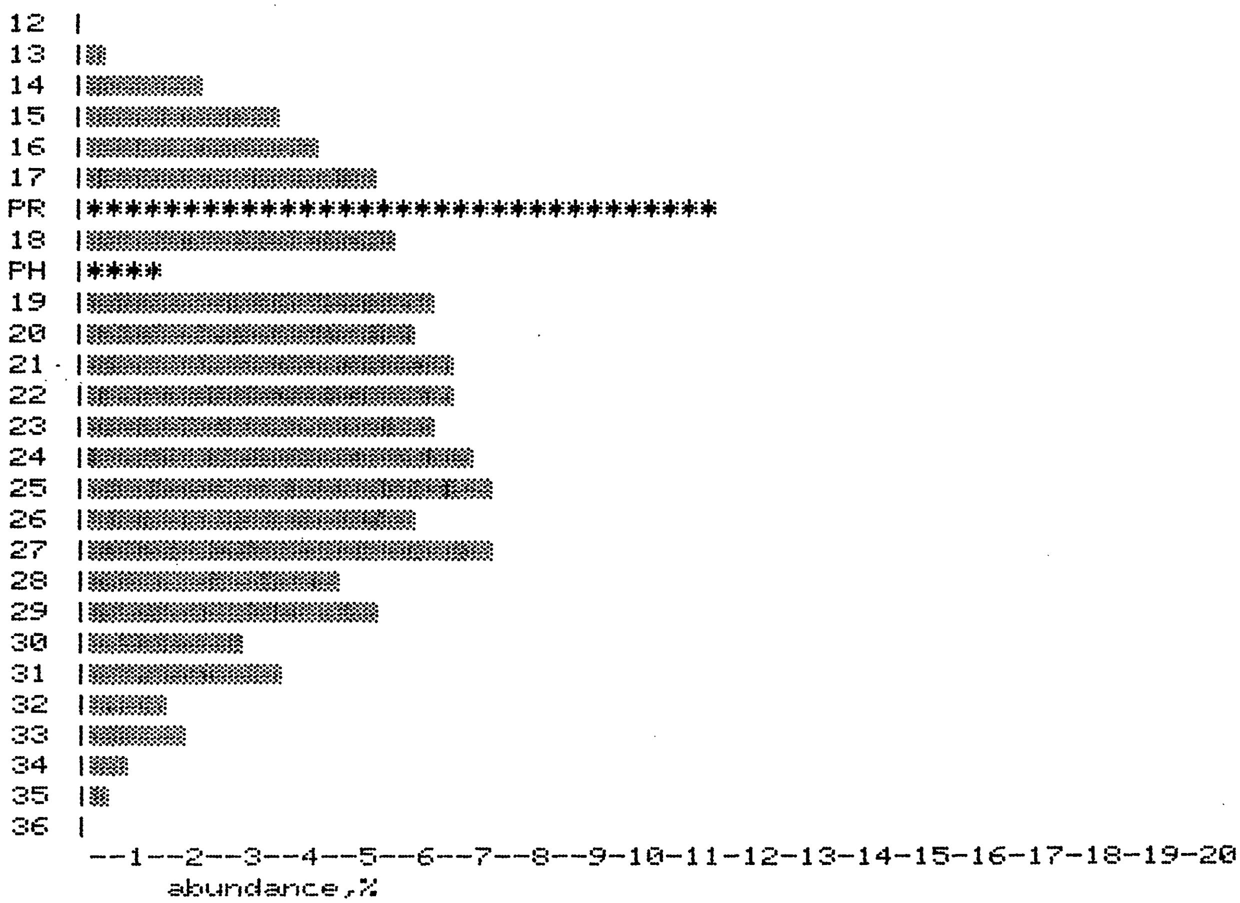


FIGURE 13

OMEO NO.1
3159-3162 M

HISTOGRAM OF N-ALKANE DISTRIBUTION OF SATURATES

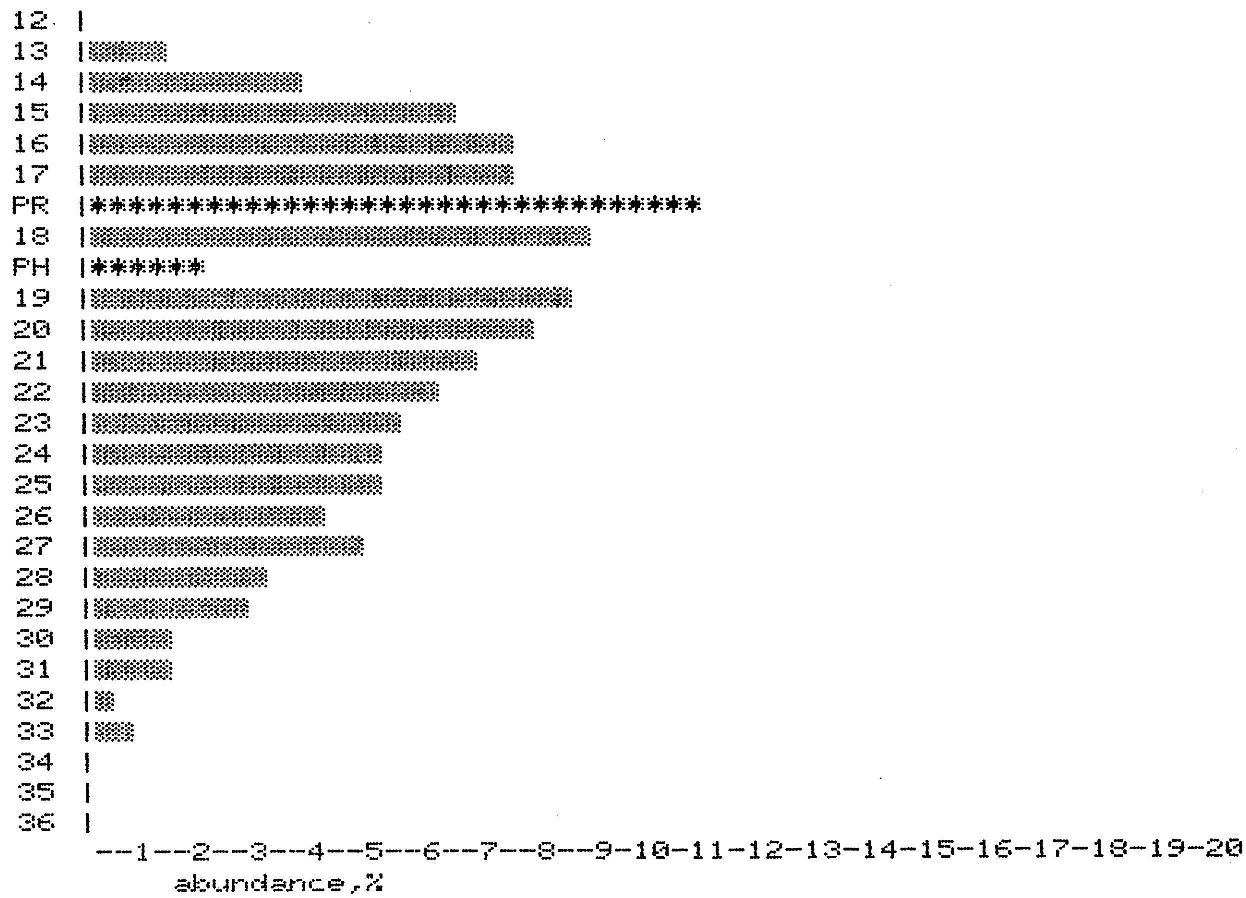


FIGURE 14

OMEO NO.1
3309-3312 M

HISTOGRAM OF N-ALKANE DISTRIBUTION OF SATURATES

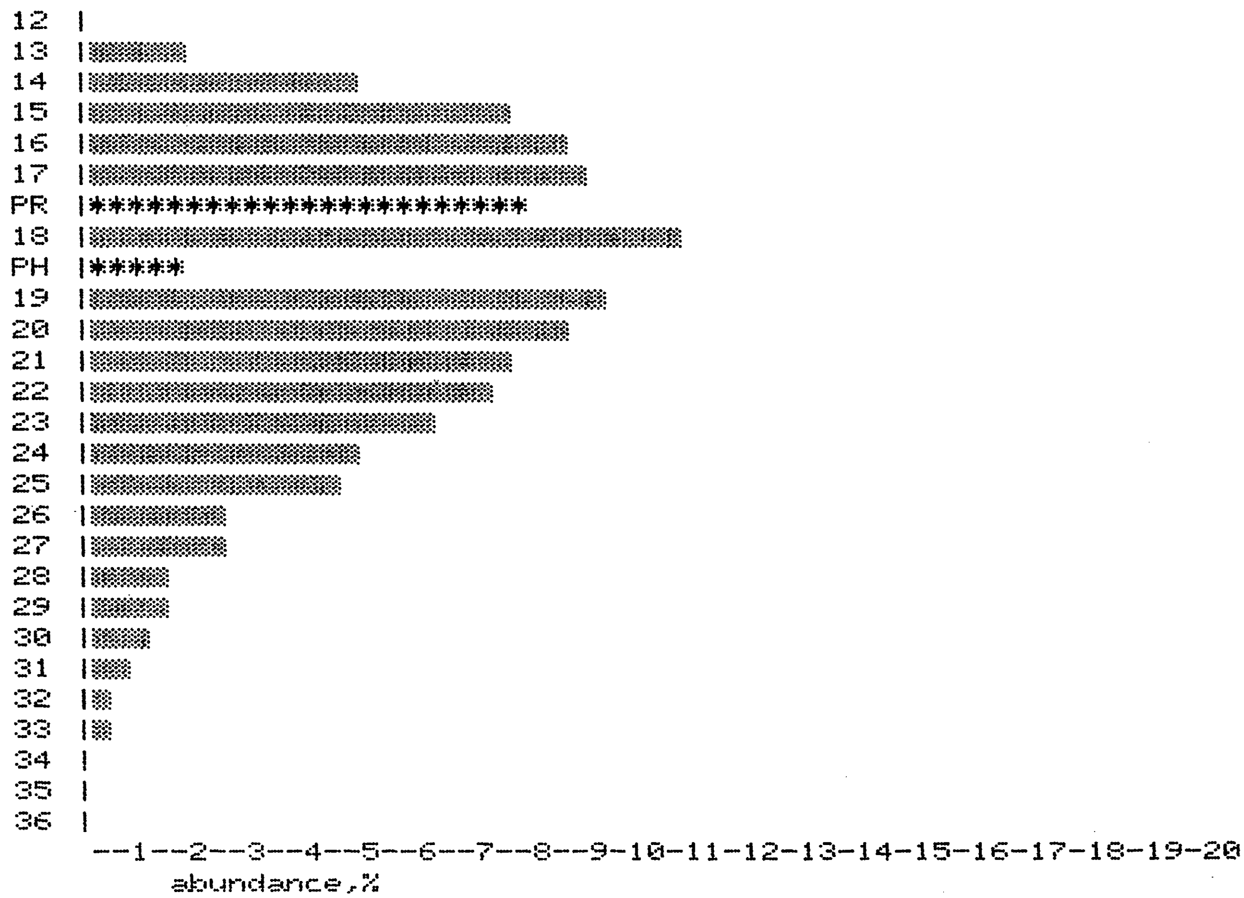


FIGURE 15

OMEO NO.1
3369-3372 M

HISTOGRAM OF N-ALKANE DISTRIBUTION OF SATURATES

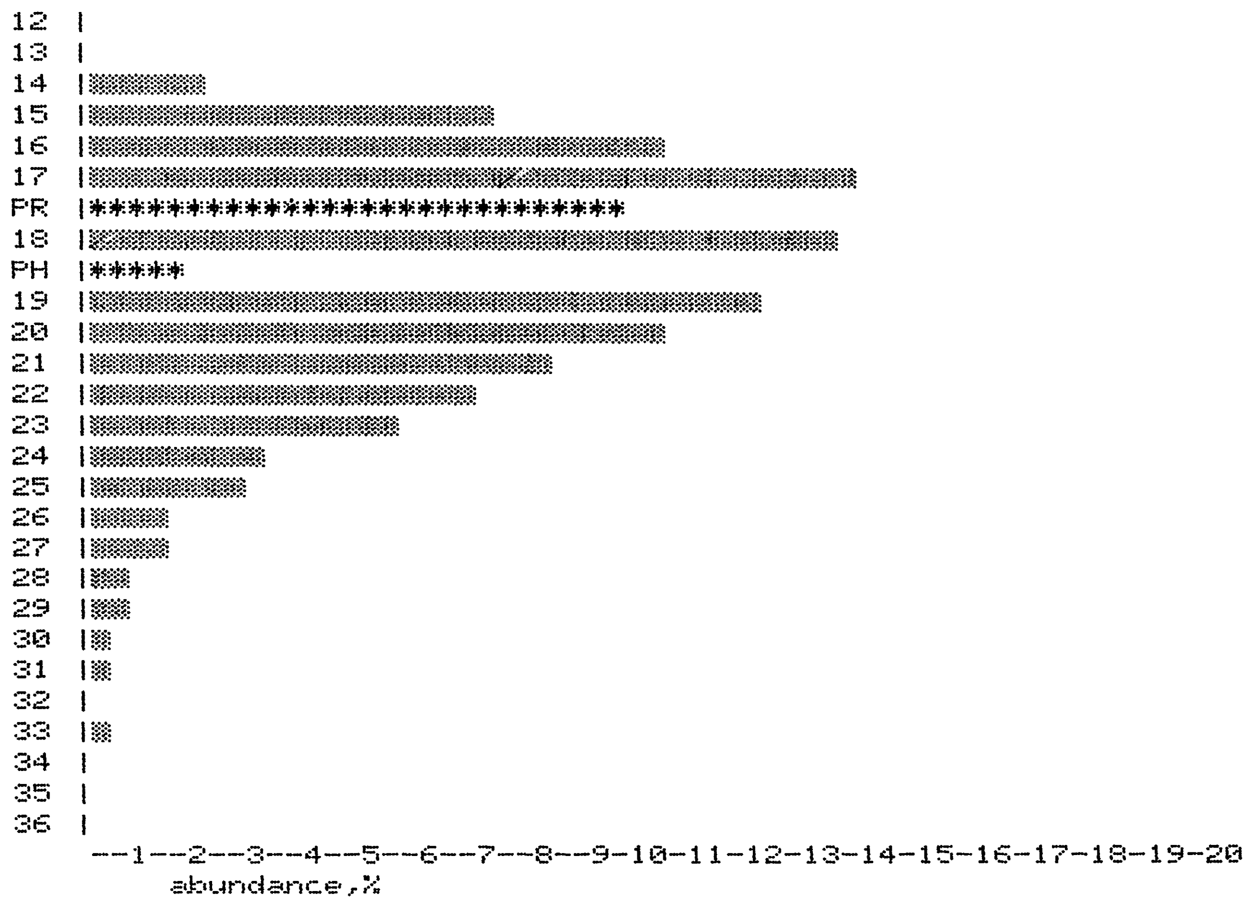
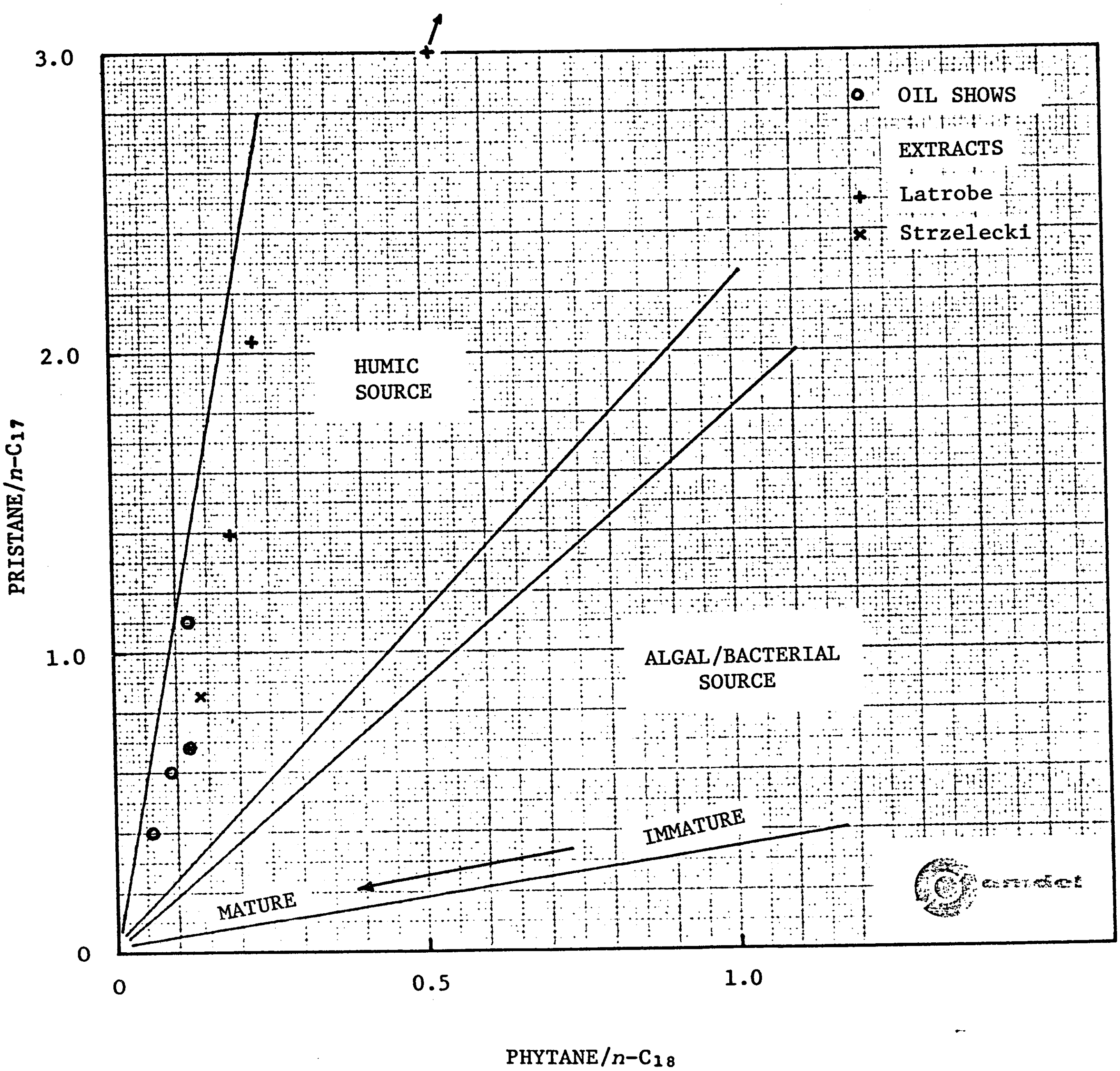


FIGURE 16

SOURCE AND MATURITY OF OIL
SHOWS AND ROCK EXTRACTS
OMEO-1



[based on Connan and Cassou, 1980, fig.12

APPENDIX 1

HISTOGRAMS OF VITRINITE REFLECTANCE MEASUREMENTS, OMEO-1

OMEO NO. 1

2160 M

SORTED LIST
.35 .37 .38 .42
Number of values = 4

MEAN OF VALUES .38
STD DEVIATION .025

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
35  |*
36  |
37  |*
38  |*
39  |
40  |
41  |
42  |*
```

OMEO NO. 1

2371 M

SORTED LIST
.31 .31 .32 .33 .34 .34 .35 .35 .35 .36 .36 .36 .37 .38 .39 .4
.4 .4 .42 .44 .45 .46 .47
Number of values = 23

MEAN OF VALUES .377
STD DEVIATION .046

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
31   |**
32   |*
33   |*
34   |**
35   |***
36   |***
37   |*
38   |*
39   |*
40   |***
41   |
42   |*
43   |
44   |*
45   |*
46   |*
47   |*
```

OMEO NO. 1

2401 M

SORTED LIST
.35 .37 .38 .39 .39 .4 .4 .4 .41 .41 .41 .42 .42 .42 .42 .42 .4
3 .43 .43 .43 .43 .43 .44 .44 .44 .45 .45 .45 .45 .46 .46 .46 .4
7 .47 .47 .47 .48 .5 .51 .52 .53
Number of values = 41

MEAN OF VALUES .437
STD DEVIATION .039

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
35  |*
36  |
37  |*
38  |*
39  |**
40  |***
41  |***
42  |*****
43  |******
44  |***
45  |****
46  |***
47  |****
48  |*
49  |
50  |*
51  |*
52  |*
53  |*
```

OMEO NO. 1

2455 M

SORTED LIST

```
 .39  .4  .41  .41  .41  .42  .42  .43  .43  .43  .44  .44  .44  .44  .44  .45
.45  .45  .45  .45  .45  .45  .45  .46  .46  .46  .46  .47  .47  .47  .47  .48
.48  .48  .48  .48  .49  .49  .51  .53
Number of values =  40
```

MEAN OF VALUES .452
STD DEVIATION .029

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
39  |*
40  |*
41  |***
42  |**
43  |***
44  |*****
45  |********
46  |****
47  |****
48  |*****
49  |**
50  |
51  |*
52  |
53  |*
```

OMEO NO. 1

2503 M

SORTED LIST
.36 .37 .39 .39 .4 .4 .4 .41 .41 .41 .41 .42 .42 .42 .43 .43 .4
3 .44 .44 .44 .44 .44 .44 .44 .45 .45 .45 .45 .45 .46 .46 .46 .4
6 .47 .47 .48 .48 .49 .49 .5 .5 .5 .52 .53
Number of values = 44

MEAN OF VALUES .443
STD DEVIATION .038

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
36   |*
37   |*
38   |
39   |**
40   |***
41   |****
42   |***
43   |***
44   |*******
45   |*****
46   |****
47   |**
48   |**
49   |**
50   |***
51   |
52   |*
53   |*
```

OMEO NO.1

2569 M

SORTED LIST
.39 .4 .41 .42 .42 .43 .43 .43 .43 .44 .44 .44 .45 .45 .45 .46
.46 .46 .46 .46 .46 .47 .47 .47 .48 .48 .48 .48 .49 .49 .49 .5 .
5 .51 .52 .52 .53
Number of values = 37

MEAN OF VALUES .461
STD DEVIATION .034

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
39   |*
40   |*
41   |*
42   |**
43   |****
44   |***
45   |***
46   |******
47   |***
48   |****
49   |***
50   |**
51   |*
52   |**
53   |*
```

OMEO NO.1

2656 M

SORTED LIST
.44 .44 .45 .46 .47 .47 .47 .47 .47 .48 .48 .48 .48 .48 .49 .49
.49 .49 .49 .49 .49 .5 .5 .5 .5 .5 .5 .51 .51 .51 .51 .51 .51
.51 .52 .52 .52 .52 .53 .54 .54 .55 .56 .58
Number of values = 44

MEAN OF VALUES .498
STD DEVIATION .029

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
44   |**
45   |*
46   |*
47   |*****
48   |*****
49   |*******
50   |******
51   |*******
52   |****
53   |*
54   |**
55   |*
56   |*
57   |
58   |*
```

OMEO NO. 1

2752 M

SORTED LIST
.47 .47 .48 .48 .49 .5 .5 .5 .5 .5 .51
Number of values = 11

MEAN OF VALUES .491
STD DEVIATION .013

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
47   |**
48   |**
49   |*
50   |*****
51   |*
```

OMEO NO. 1

2784 M

SORTED LIST
.51 .52 .53 .54 .55
Number of values = 5

MEAN OF VALUES .53
STD DEVIATION .014

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
51   |*
52   |*
53   |*
54   |*
55   |*
```

OMEO NO. 1

3032 M

SORTED LIST
.53 .53 .54 .55 .56 .56 .57 .57 .57 .59 .59 .59 .61 .61 .61 .63
.65 .65 .66 .69
Number of values = 20

MEAN OF VALUES .593
STD DEVIATION .044

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
53  |**
54  |*
55  |*
56  |**
57  |***
58  |
59  |***
60  |
61  |***
62  |
63  |*
64  |
65  |**
66  |*
67  |
68  |
69  |*
```

OMEO NO.1

3063 M

SORTED LIST
.57 .57 .58 .58 .59 .6 .61 .62 .62 .62 .62 .63 .63 .63 .64 .64
.64 .65 .66 .66 .66 .66 .67 .67 .67 .67 .68 .68 .69 .7 .7 .71 .7
1 .72 .72 .73 .73 .74 .74
Number of values = 39

MEAN OF VALUES .657
STD DEVIATION .048

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
57   |**
58   |**
59   |*
60   |*
61   |*
62   |****
63   |***
64   |***
65   |*
66   |****
67   |****
68   |**
69   |*
70   |**
71   |**
72   |**
73   |**
74   |**
```

OMEO NO. 1

3087 M

SORTED LIST
.59 .6 .61 .62 .62 .63 .63 .64 .64 .65 .65 .66 .66 .67 .67 .67
.67 .67 .68 .69 .69 .7 .7 .7 .71 .71 .72 .72 .72 .73 .73 .74 .74
.75 .75 .75
Number of values = 36

MEAN OF VALUES .68
STD DEVIATION .045

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
59   |*
60   |*
61   |*
62   |**
63   |**
64   |**
65   |**
66   |**
67   |*****
68   |*
69   |**
70   |***
71   |**
72   |***
73   |**
74   |**
75   |***
```

OMEO NO. 1

3162 M

SORTED LIST
.61 .62 .62 .62 .63 .64 .65 .65 .66 .66 .66 .66 .66 .67 .67 .67
.67 .67 .67 .68 .68 .68 .68 .68 .69 .69 .69 .69 .69 .7 .7 .7 .7
1 .71 .72 .73 .73 .74 .75
Number of values = 39

MEAN OF VALUES .677
STD DEVIATION .033

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
61   |*
62   |***
63   |*
64   |*
65   |**
66   |*****
67   |******
68   |*****
69   |*****
70   |***
71   |**
72   |*
73   |**
74   |*
75   |*
```

OMEO NO. 1

3219 M

SORTED LIST
.65 .66 .66 .69 .69 .69 .69 .7 .7 .72 .72 .73 .74 .75 .77 .78 .
8 .82 .83 .84 .85 .93
Number of values = 22

MEAN OF VALUES .746
STD DEVIATION .072

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
65  |*
66  |**
67  |
68  |
69  |****
70  |**
71  |
72  |**
73  |*
74  |*
75  |*
76  |
77  |*
78  |*
79  |
80  |*
81  |
82  |*
83  |*
84  |*
85  |*
86  |
87  |
88  |
89  |
90  |
91  |
92  |
93  |*
```

OMEO NO. 1

3249 M

SORTED LIST
.69 .7 .7 .71 .72 .72 .73 .73 .74 .74 .74 .75 .75 .76 .77 .77 .
78 .79
Number of values = 18

MEAN OF VALUES .738
STD DEVIATION .028

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
69   |*
70   |**
71   |*
72   |**
73   |**
74   |***
75   |**
76   |*
77   |**
78   |*
79   |*
```

OMEO NO. 1

3309 M

SORTED LIST
.66 .68 .69 .71 .71 .71 .72 .72 .73 .73 .73 .74 .74 .74 .75 .75
.75 .75 .75 .75 .75 .75 .76 .76 .76 .76 .76 .76 .76 .77 .77 .77
.78 .8 .81 .84 .84 .88 .88 .93
Number of values = 40

MEAN OF VALUES .76
STD DEVIATION .053

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
66   |*
67   |
68   |*
69   |*
70   |
71   |***
72   |**
73   |***
74   |***
75   |********
76   |*******
77   |***
78   |*
79   |
80   |*
81   |*
82   |
83   |
84   |**
85   |
86   |
87   |
88   |**
89   |
90   |
91   |
92   |
93   |*
```

OMEO NO. 1

3351 M

SORTED LIST
.72 .73 .74 .76 .77 .77 .77 .77 .77 .78 .78 .79 .79 .79 .8 .81
.82 .83 .88 .95
Number of values = 20

MEAN OF VALUES .791
STD DEVIATION .05

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
72   |*
73   |*
74   |*
75   |
76   |*
77   |*****
78   |**
79   |***
80   |*
81   |*
82   |*
83   |*
84   |
85   |
86   |
87   |
88   |*
89   |
90   |
91   |
92   |
93   |
94   |
95   |*
```

APPENDIX 2

DISPERSED ORGANIC MATTER DESCRIPTIONS,

OMEO-1

Sample 1: Depth 2160 metres

These cuttings comprise siltstone containing rare dispersed organic matter. The majority of this organic matter is bitumen which is slightly micrinitised in places. The bitumen generally has a moderate to dull orange fluorescence but in places fluoresces a bright yellow. Sporinite (moderate yellow to moderate orange and dull orange fluorescence) is present in very rare to trace amounts.

The overall volume of organic matter in this siltstone is approximately 0.5%. Exinite comprises approximately 80% of the organic matter, with inertinite making up the remaining 20%.

Sample 2: Depth 2224 metres

This sample consists of sandy siltstone. Bitumen of two distinct types is the only organic matter present. The majority of the bitumen has a moderate yellow to moderate orange and dull orange fluorescence. This bitumen fills pores and cavities in the siltstone. The second bitumen has a bright yellow-green to bright yellow fluorescence and is generally interstitial to the larger mineral grains in the sand laminae of the siltstone.

Sample 3: Depth 2317 metres

The majority of these cuttings are bitumen-bearing siltstone which is similar to that found in sample 2. The bitumens in this siltstone have fluorescence characteristics very similar to those of the bitumens in sample 2. Approximately 10-15% of the cuttings comprises carbonate fragments which contain no dispersed organic matter.

The overall volume of organic matter in this sample is approximately 0.5%. Exinite (bitumen) comprises about 60% of this organic matter, and inertinite the remaining 40%.

Sample 4: Depth 2371 metres

This sample consists chiefly of siltstone in which organic matter is rare to absent. Vitrinite is more abundant than inertinite, which is more abundant than exinite. Sandstone cuttings occupy approximately 5-10% of the sample, but contain no organic matter. Carbonate, likewise containing no dispersed organic matter, accounts for less than 5% of the cuttings.

Exinite is present in trace amounts. The exinite macerals represented are sporinite (moderate yellow fluorescence) and liptodetrinite (moderate orange fluorescence).

The overall volume of organic matter in this sample is again estimated to be 0.5%. The approximate maceral percentages are vitrinite 60%, inertinite 30%, and exinite 10%.

Sample 5: Depth 2401 metres

These cuttings consist chiefly of siltstone (80-85%). Organic matter (rare inertinite) is present in only about 5% of these siltstone fragments. Carbonaceous shale makes up approximately 5-10% of the sample. In these shales vitrinite is more abundant than exinite which is much more abundant than inertinite. Sandstone grains (barren) comprise approximately 5% of the sample. Coals account for less than 5% of the cuttings. These coals are a mixture of durites and inertites.

Exinite is common in this sample and is present mostly in the carbonaceous shale. The exinite macerals present in order of abundance are resinite (bright green to bright yellow-green and moderate yellow to moderate orange and dull orange fluorescence), sporinite (moderate yellow to moderate orange fluorescence), liptodetrinite (moderate orange fluorescence), suberinite (dull orange fluorescence), cutinite (moderate orange fluorescence) and ?phytoplankton (bright yellow fluorescence). Resinite and sporinite are common in these cuttings whereas liptodetrinite is sparse. Suberinite and cutinite are rare. ?Phytoplankton occur in trace amounts.

The overall volume of organic matter in these cuttings is approximately 10-15%. Vitrinite comprises approximately 60% of the organic matter, with exinite (approximately 30%) and inertinite (10%) comprising the remainder.

Sample 6: Depth 2455 metres

This sample consists chiefly of sandstone which is devoid of organic matter. Siltstone occupies approximately 10-15% of the cuttings. Organic matter (rare to sparse) is present in the siltstones. Inertinite is more abundant than exinite, which is slightly more abundant than vitrinite. Approximately 5% of the cuttings are coals. These coals are clarites.

Exinite is sparse to common in this sample. The exinite macerals present in order of abundance are resinite (bright yellow-green to bright yellow and moderate yellow to moderate orange fluorescence), sporinite (bright yellow and moderate yellow to moderate orange fluorescence), cutinite (moderate orange to dull orange fluorescence) and liptodetrinite (moderate yellow to moderate orange fluorescence). Resinite is sparse in this sample and is slightly more abundant than sporinite and cutinite. Liptodetrinite is rare.

The overall volume of organic matter in these cuttings is estimated to be approximately 5%. Vitrinite comprises approximately 70% of the organic matter, exinite approximately 20%, and inertinite the remaining 10%.

Sample 7: Depth 2503 metres

These cuttings comprise mostly siltstone which contains rare to sparse dispersed organic matter. In this siltstone vitrinite is more abundant than inertinite which is slightly more abundant than exinite. Sandstone makes up approximately 5-10% of the sample, but contains no dispersed organic matter. Coal cuttings occupy approximately 5-10% of the sample. The coal microlithotypes present are clarodurite, duroclarite and durite. A few coals contain abundant exinite. The richest of these coals contains approximately 30% exinite, 60% of which is resinite. Carbonaceous shale is a minor component (5% of the cuttings). In the shale vitrinite is more abundant than exinite which is slightly more abundant than inertinite. Carbonate fragments comprise approximately 1-2% of the cuttings but contain no dispersed organic matter.

Exinite is sparse in this sample. The exinite macerals present are sporinite (moderate yellow to moderate orange fluorescence), resinite (bright yellow to bright orange and moderate to dull orange fluorescence), cutinite (moderate orange fluorescence), suberinite (dull orange fluorescence) and phytoplankton (bright yellow fluorescence). Sporinite is sparse, whereas resinite and cutinite are rare. Suberinite is very rare and phytoplankton is present only in trace amounts.

The overall volume of organic matter in this sample is estimated to be approximately 5-10%. Vitrinite comprises approximately 65% of this organic matter. Exinite comprises approximately 20% of the organic matter, and inertinite the remaining 15%.

Sample 8: Depth 2569 metres

These cuttings consist chiefly of siltstone. Organic matter is absent to sparse in this siltstone, but where present inertinite is more abundant than vitrinite which is more abundant than exinite. Sandstone and carbonaceous shale each occupy approximately 5% of the cuttings. The former contains no dispersed organic matter. In the shale inertinite is more abundant than vitrinite which is more abundant than exinite. Coal comprises approximately 5% of the cuttings. Most of the coals are duroclarites and clarodurites. However, some clarite grains are also present. The exinite macerals in some coals are slightly micrinitised.

Exinite is sparse in these cuttings. The exinite macerals present are sporinite (moderate yellow to moderate orange fluorescence), cutinite (moderate yellow to moderate orange fluorescence), resinite (bright yellow-green to bright yellow and bright orange fluorescence and moderate to dull orange fluorescence), liptodetrinite (moderate orange fluorescence), suberinite (no fluorescence) and thucholite (dull orange fluorescence). Cutinite, resinite and liptodetrinite are rare, and slightly less abundant than sporinite. Suberinite and thucholite occur in trace amounts.

The overall volume of organic matter in this sample is an estimated 5%. Inertinite comprises approximately 50% of this organic matter, vitrinite approximately 35%, and exinite approximately 15%.

Sample 9: Depth 2656 metres

The majority of these cuttings are coals, chiefly duroclarites and clarodurites, although some clarite is also present. Exinite is generally abundant (up to 30%) in these coals. Siltstone with sparse dispersed organic matter occupies approximately 10-20% of the sample; sandstone devoid of organic matter, 5-10%; and carbonaceous shale approximately 5%. The shales contain abundant organic matter in which vitrinite is more abundant than inertinite, which is more abundant than exinite.

Exinite is common in this sample. The exinite macerals present in order of abundance are sporinite (moderate yellow to moderate orange fluorescence), cutinite (moderate yellow to moderate orange fluorescence), sporinite (moderate orange fluorescence), resinite (bright yellow-green to bright yellow and bright orange, and moderate to dull orange fluorescence) and ?fluorinite (bright green fluorescence). Vitrinite in some coal grains displays a dull orange fluorescence.

The overall volume of organic matter in this sample is quite high (>30%) due mainly to the abundance of coal. Approximately 40% of this organic matter is inertinite. Vitrinite comprises approximately 35% of the organic matter and exinite the remaining 25%.

Sample 10: Depth 2752 metres

The majority of these cuttings consist of sandstone which contains no dispersed organic matter. Siltstone fragments occupy approximately 5-10% of the sample and generally contain sparse dispersed organic matter. In the siltstone inertinite is much more abundant than vitrinite which is slightly more abundant than exinite.

Exinite is rare in this sample. The exinite macerals present are bitumen (moderate to dull orange fluorescence), sporinite (moderate orange fluorescence) and resinite (bright orange fluorescence).

The overall volume of organic matter in this sample is estimated to be 0.5%. Approximately 70% of this organic matter is inertinite. Vitrinite and exinite occur in approximately equal amounts and comprise the remaining 30% of the organic matter.

Sample 11: Depth 2784 metres

These cuttings are similar to sample 10 and consist chiefly of sandstone with no dispersed organic matter. Siltstone with sparse dispersed organic matter comprises approximately 10-15% of the cuttings. In the siltstone inertinite is more abundant than exinite which is more abundant than vitrinite.

Exinite is rare to very rare in this sample. The exinite macerals present are cutinite (moderate yellow to moderate orange fluorescence), resinite (bright yellow to bright orange and dull orange fluorescence), sporinite (moderate yellow to moderate orange fluorescence), liptodetrinit (moderate orange fluorescence), suberinite (dull orange fluorescence) and bitumen (dull orange fluorescence).

The overall volume of organic matter in this sample is less than 0.5%. The organic matter comprises 70% inertinite, 20% exinite and 10% vitrinite.

Sample 12: Depth 3032 metres

The majority of these cuttings consist of sandstone which contains no dispersed organic matter. Siltstone grains with sparse dispersed organic matter occupy approximately 5-10% of the sample. In these grains inertinite is more abundant than exinite which is much more abundant than vitrinite. A few clarite and fusite fragments were found in this sample.

Exinite is very rare in these cuttings. The exinite macerals present are sporinite (moderate yellow to moderate orange fluorescence), cutinite (moderate yellow to moderate orange fluorescence), resinite (bright yellow to bright orange fluorescence) and liptodetrinite (moderate orange fluorescence). Sporinite, cutinite, resinite and liptodetrinite are very rare.

The overall volume of organic matter in these cuttings is approximately 0.5%. Inertinite comprises approximately 60% of this organic matter, exinite 35%, and vitrinite the remaining 5%.

Sample 13: Depth 3063 metres

The majority of these cuttings are sandstone fragments which contain no dispersed organic matter. However, coals occupy 10-20% of these cuttings. The coals are mostly durites and clarites which are rich in resinite and fluorinite, although some inertinite grains are also present. Exinite is abundant in these coals and on average occupies approximately 10% of their volume. Some coal grains contain up to 30-40% exinite. Carbonaceous shale comprises approximately 5-10% of the sample. In the shale exinite is slightly more abundant than inertinite which is more abundant than vitrinite.

Exinite is sparse to common in this sample. The exinite macerals present are sporinite (moderate to dull orange fluorescence), resinite (dull orange fluorescence and markedly micrinitised) fluorinite (bright yellow-green to bright yellow fluorescence), cutinite (moderate to dull orange fluorescence) and liptodetrinite (moderate orange fluorescence). Sporinite and resinite are sparse and slightly more abundant than fluorinite. Cutinite and liptodetrinite are rare.

Much of the inertinite in this sample is only of slightly higher reflectance than the vitrinite. The reflectance of the inertinite ranges from 0.8 to 1.0%.

The overall volume of organic matter in these cuttings is estimated to be approximately 10-20%. Inertinite comprises approximately 50% of this organic matter, vitrinite 30%, and exinite the remaining 20%.

Sample 14: Depth 3087 metres

The majority of these cuttings are sandstone which is devoid of dispersed organic matter. Carbonaceous shale forms approximately 20-30% of the sample. In these shale fragments inertinite is slightly more abundant than exinite which is more abundant than vitrinite. Siltstone (5-10% of the sample) generally contains sparse dispersed organic matter. In the siltstone inertinite is much more abundant than exinite which is slightly more abundant than vitrinite. Coal grains, mostly inertite, comprise approximately 5-10% of the sample. However, durites and clarites are also present. A few carbonate grains with rare inertinite are present.

Exinite is rare to sparse in these cuttings. The exinite macerals represented are sporinite (moderate yellow to moderate orange fluorescence), cutinite (moderate yellow to moderate orange fluorescence), fluorinite (bright yellow to bright yellow-orange fluorescence and resinite (moderate orange fluorescence). Sporinite is rare to sparse and cutinite is rare. Fluorinite is very rare and resinite is present in trace amounts.

The overall volume of organic matter in this sample is approximately 10-15 Inertinite comprises approximately 60% of this organic matter, with the remainder consisting of approximately equal proportions of vitrinite and exinite.

Sample 15: Depth 3162 metres

These cuttings consist chiefly of sandstone with no dispersed organic matter. Coals occupy approximately 5-10% of the sample. The coals are duroclarites and clarites. A few fragments of carbonaceous shale are also present. In the shale inertinite is slightly more abundant than exinite which is more abundant than vitrinite. However, this shale is thought to be cavings from a stratigraphically higher unit.

Exinite is sparse in this sample. The exinite macerals present in order of abundance are fluorinite (bright yellow-green to bright yellow, bright orange and moderate orange fluorescence), cutinite (moderate to dull orange fluorescence), exsudatinite (moderate to dull orange fluorescence), resinite (no fluorescence) and sporinite (dull orange fluorescence). Cutinite, exsudatinite, resinite and sporinite are rare and slightly less abundant than fluorinite. The fluorinite is partly soluble in the immersion oil.

The overall volume of organic matter in this sample is estimated to be 5-10%. Approximately 70% of this organic matter is vitrinite. Exinite comprises approximately 20% of the organic matter and inertinite the remaining 10%.

Sample 16: Depth 3219 metres

This sample is similar to the previous six samples in that it consists chiefly of sandstone devoid of dispersed organic matter. Siltstone containing sparse dispersed organic matter makes up approximately 5-10% of these cuttings. In this rock type inertinite is more abundant than exinite which is more abundant than vitrinite. Carbonate grains with rare inertinite occupy approximately 5% of the sample. A few carbonaceous shale and coal grains are also present. These grains occupy approximately 1% of the sample volume. In them inertinite is more abundant than exinite which is more abundant than vitrinite.

Exinite is very rare in these cuttings. The exinite macerals present are cutinite (moderate to dull orange fluorescence) and sporinite (moderate orange fluorescence). Sporinite is slightly more abundant than cutinite which is very rare.

The overall volume of organic matter in these cuttings is estimated to be approximately 1-2%. Inertinite comprises approximately 70% of this organic matter, exinite 20%, and vitrinite the remaining 10%.

Sample 17: Depth 3249 metres

These cuttings consist chiefly of siltstone with sparse to common dispersed organic matter. In these siltstones inertinite is much more abundant than exinite which is slightly more abundant than vitrinite. Sandstone with no dispersed organic matter accounts for approximately 10-20% of these cuttings. Caved coal and carbonaceous shale comprise only 1-2% of the sample. In these lithotypes inertinite is more abundant than exinite which is more abundant than vitrinite. A few carbonate grains are present but these contain no dispersed organic matter.

Exinite is rare in these cuttings. The exinite macerals present are cutinite (moderate to dull orange fluorescence), liptodetrinite (moderate yellow to moderate orange fluorescence), ?resinite (moderate to dull orange fluorescence) and sporinite (moderate orange fluorescence) Cutinite is rare, whereas liptodetrinite, resinite and sporinite are very rare.

The overall volume of organic matter in this sample is estimated to be 1-2%. Approximately 80% of this organic matter is inertinite. Vitrinite and exinite occur in similar amounts and comprise the remaining 20% of the organic matter.

Sample 18: Depth 3309 metres

These cuttings are mostly sandstone which contains no dispersed organic matter. Coal grains containing abundant exinite occupy 10-20% of the sample. The majority of these coals are clarites and vitrites. However, some duroclarite grains are also present. On average the coals contain 3-5% exinite by volume. Siltstone grains occupy approximately 5% of this sample and contain sparse dispersed organic matter. In the siltstone inertinite is much more abundant than exinite which is slightly more abundant than vitrinite. A few carbonaceous shale grains are also present. In these shales inertinite is more abundant than exinite which is more abundant than vitrinite.

Exinite is rare to sparse in these cuttings and is present mostly in the coals. The exinite macerals in order of abundance are cutinite (moderate orange to dull orange fluorescence), resinite (dull orange to dull brown fluorescence), sporinite (moderate orange to dull orange fluorescence), fluorinite (bright green to bright yellow fluorescence) and bitumen (dull orange to dull brown fluorescence). Cutinite, resinite and sporinite are rare, whereas fluorinite and bitumen are very rare. The resinite occurring in this sample is markedly micrinitised.

The overall volume of organic matter in these cuttings is approximately 10-15%, approximately 60% of which is vitrinite. Exinite comprises approximately 25% of the organic matter and inertinite the remaining 15%.

Sample 19: Depth 3351 metres

The majority of these cuttings are siltstone which contain sparse dispersed organic matter. Inertinite is much more abundant than exinite which is slightly more abundant than vitrinite. Sandstone lacking dispersed organic matter occupies approximately 20-30% of this sample.

Exinite is rare in these cuttings. The exinite macerals present are liptodetrinite (moderate orange fluorescence), cutinite (moderate orange fluorescence) and sporinite (moderate orange fluorescence). Liptodetrinite and cutinite are rare, whereas sporinite is very rare.

The overall volume of organic matter in these cuttings is an estimated 0.5-1%. Approximately 80% of this organic matter is inertinite. Vitrinite and exinite each comprise approximately 10% of the organic matter.

Sample 20: Depth 3369 metres

This sample consists of siltstone which contains sparse dispersed organic matter. In this siltstone exinite is much more abundant than inertinite. Sandstone comprises approximately 5% of the sample but it contains no dispersed organic matter. Approximately 15-20% of this sample is an asphaltic bitumen. This bitumen occurs as grain coatings and also appears to fill microfractures and cracks in t siltstone.

The bitumen generally has a dull orange to dull brown fluorescence. However, small ovoids of bitumen with bright yellow-green to bright yellow fluorescence are commonly enclosed in the former bitumen. Sporinite (dull orange fluorescence), cutinite (dull orange to dull brown fluorescence) and liptodetrinite (dull orange fluorescence) are very rare and occur in the siltstone.

The overall volume of organic matter in this sample is estimated to be approximately 15-20%. Inertinite comprises approximately 10% of the organic matter in this sample; the remainder is asphaltic bitumen.

DISCUSSION

The discrepancies between previously reported reflectance data (Watson, 1982, 1983) and the depth-reflectance profile shown in text Figure 5 are attributable to the presence of reflective bitumens which were originally misidentified as vitrinite.

Extensive micrinitisation of the exinites in samples from below 2650 metres depth implies that oil generation has taken place. Bitumens in samples 1-3, 10, 18 and 20 are oil-derived, and therefore indicate migration of oil within or into the Omeo-1 sequence.

PLATES

A series of ten plates are included to illustrate some of the types of organic matter present in these samples. All plates were printed from 35 mm photomicrographs taken using an objective with a nominal magnification of 32 or 50. Field dimensions are shown for each print. All photomicrographs are taken in oil immersion and using either reflected light mode or fluorescence mode as marked.

In some prints fluorescence colours and intensities have been altered by the printing process and the limited latitude of the original transparencies.

5 PAGES OF COLOUR MICROPHOTOGRAPHS

PLATES 1-10

PE906909

This is an enclosure indicator page.
The enclosure PE906909 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906909 has the following characteristics:

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CONTAINER_BARCODE = PE906207
NAME = Photomicrographs
BASIN = GIPPSLAND
PERMIT = VIC/P17
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Photomicrographs, Plate 1 & 2 (from attachment 4 to WCR) for Omeo-1
REMARKS = 2 photographs on the one page
DATE_CREATED =
DATE_RECEIVED = 11/08/83
W_NO = W788
WELL_NAME = OMEO-1
CONTRACTOR = AMDEL
CLIENT_OP_CO = AUSTRALIAN AQUATAINE PTY LTD

(Inserted by DNRE - Vic Govt Mines Dept)

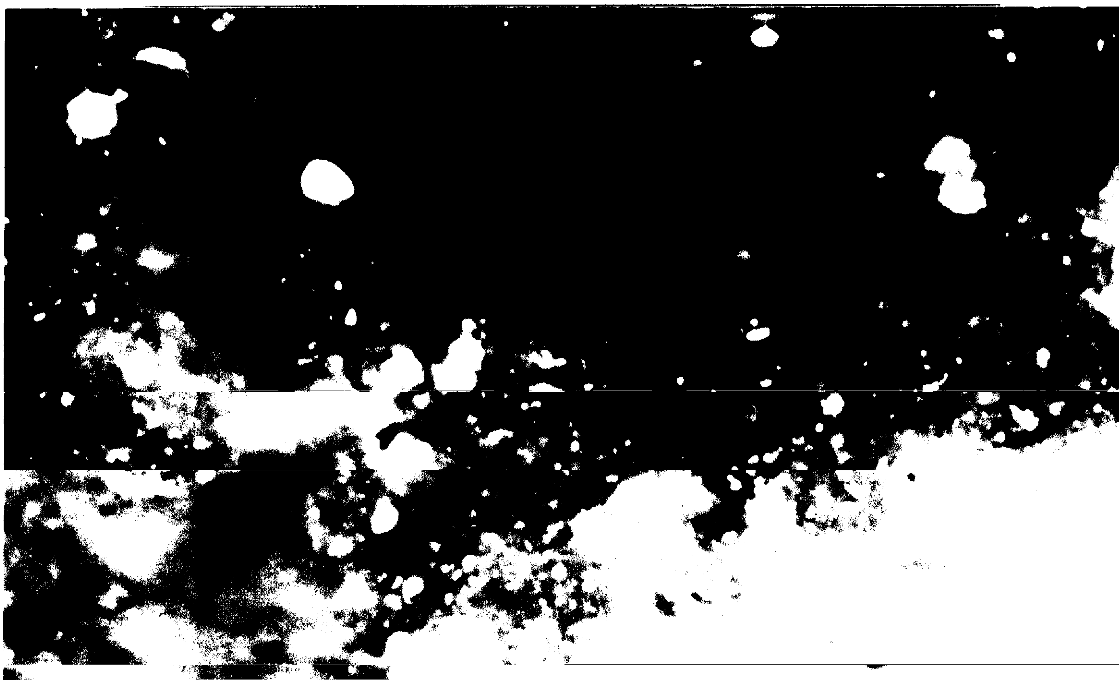

PLATE 1: 2160 metres Reflected Light

This plate shows asphaltic bitumen (dark brown) and oil (very pale brown) occurring in a sandy siltstone.

Field Dimensions 0.26 mm x 0.18 mm

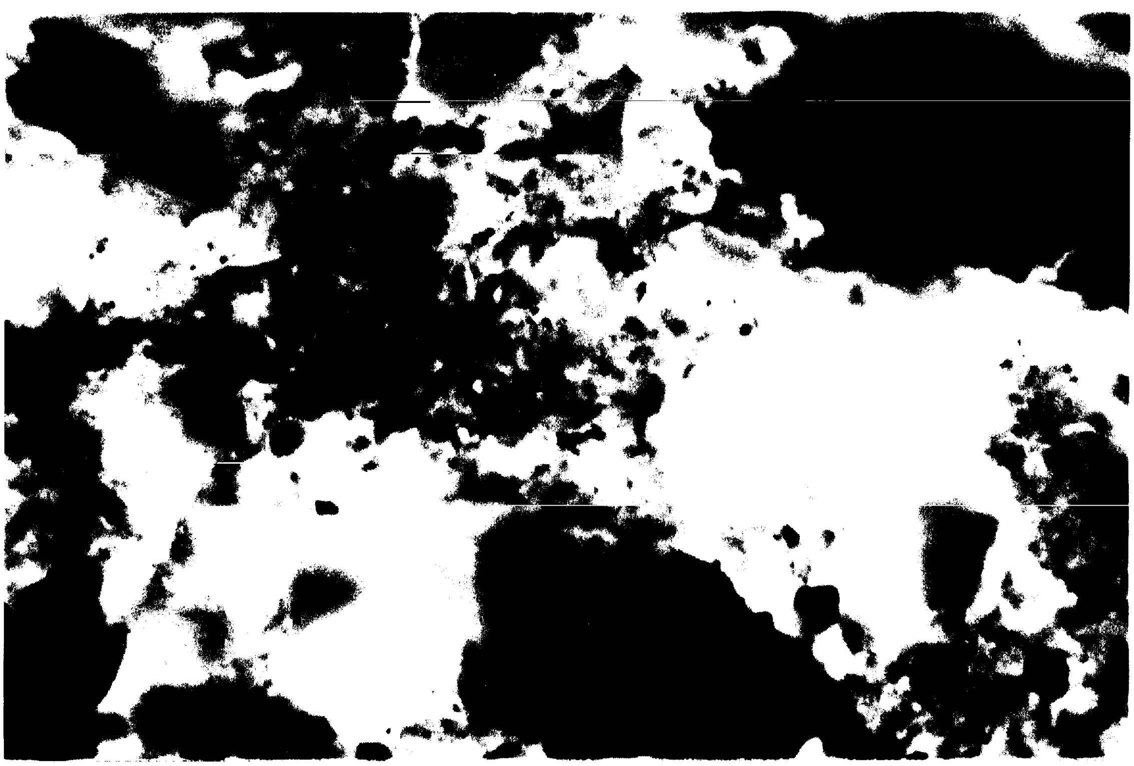

PLATE 2: 2160 metres Fluorescence Mode

This is the same field as Plate 1 in fluorescence mode illustrating the moderate orange fluorescence of the asphaltic bitumen and the bright yellow-green fluorescence of the oil.

Field Dimensions 0.26 mm x 0.18 mm

PE906910

This is an enclosure indicator page.
The enclosure PE906910 is enclosed within the container PE906207 at this location in this document.

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SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Photomicrographs, Plate 3 & 4 (from attachment 4 to WCR) for Omeo-1
REMARKS =	2 photographs on the one page
DATE_CREATED =	
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUATAINE PTY LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PLATE 3: 2401 metres Reflected Light

This plate shows an exinite-rich coal. Exinite (dark brown) is associated with vitrinite (grey) and inertinite (white, bottom right).

Field Dimensions 0.26 mm x 0.18 mm

PLATE 4: 2401 metres Fluorescence Mode

This is the same field as Plate 3 in fluorescence mode illustrating the bright yellow fluorescence of the resinite and sporinite in this coal.

Field Dimensions 0.26 mm x 0.18 mm

PE906911

This is an enclosure indicator page.
The enclosure PE906911 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906911 has the following characteristics:

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CONTAINER_BARCODE =	PE906207
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BASIN =	GIPPSLAND
PERMIT =	VIC/P17
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SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Photomicrographs, Plate 5 & 6 (from attachment 4 to WCR) for Omeo-1
REMARKS =	2 photographs on the one page
DATE_CREATED =	
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUATAINE PTY LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PLATE 5: 2656 metres Reflected Light

This plate shows an exinite-rich clarite containing common sporinite, cutinite and resinite.

Field Dimensions 0.26 mm x 0.18 mm

PLATE 6: 2656 metres Fluorescence Mode

This is the same field as Plate 5 in fluorescence mode illustrating the fluorescence colours and intensities of the exinites in this sample.

Field Dimensions 0.26 mm x 0.18 mm

PE906912

This is an enclosure indicator page.
The enclosure PE906912 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906912 has the following characteristics:

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CONTAINER_BARCODE = PE906207
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BASIN = GIPPSLAND
PERMIT = VIC/P17
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Photomicrographs, Plate 7 & 8 (from attachment 4 to WCR) for Omeo-1
REMARKS = 2 photographs on the one page
DATE_CREATED =
DATE_RECEIVED = 11/08/83
W_NO = W788
WELL_NAME = OMEO-1
CONTRACTOR = AMDEL
CLIENT_OP_CO = AUSTRALIAN AQUATAINE PTY LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PLATE 7: 3162 metres Reflected Light

This plate shows fluorinite and exsudatinite (black) occurring in a resinite (dark grey)-rich clarite. Vitrinite in this plate is light grey.

Field Dimensions 0.26 mm x 0.18 mm

PLATE 8: 3162 metres Fluorescence Mode

This plate is the same field as Plate 7 illustrating the bright yellow fluorescence of the fluorinite and the very dull orange fluorescence of the resinite in this clarite.

Field Dimensions 0.26 mm x 0.18 mm

PE906913

This is an enclosure indicator page.
The enclosure PE906913 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906913 has the following characteristics:

ITEM_BARCODE =	PE906913
CONTAINER_BARCODE =	PE906207
NAME =	Photomicrographs
BASIN =	GIPPSLAND
PERMIT =	VIC/P17
TYPE =	WELL
SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Photomicrographs, Plate 9 & 10 (from attachment 4 to WCR) for Omeo-1
REMARKS =	2 photographs on the one page
DATE_CREATED =	
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUATAINE PTY LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PLATE 9: 3369 metres Reflected Light

This plate illustrates how the asphaltic bitumen occurs along cracks in this siltstone.

Field Dimensions 0.43 mm x 0.29 mm

PLATE 10: 3369 metres Fluorescence Mode

This is the same field as Plate 9 in fluorescence mode illustrating the moderate to dull orange fluorescence of the bitumen and the bright yellow-green fluorescence of oil globules trapped in this asphaltic bitumen.

Field Dimensions 0.43 mm x 0.29 mm

2

SECTION 2

HYDROCARBONS IN LATROBE GROUP FORMATION WATERS, OMEO No.1, VIC/P-17, GIPPSLAND BASIN

Australian Aquitaine Petroleum Pty. Ltd

F3/422/0-4264/83 & 4593/83   July, 1983

The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide 79 1662
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7 July 1983

F3/422/0
4264/83
4593/83

Australian Aquitaine Petroleum Pty. Ltd.,
99 Mount Street,
NORTH SYDNEY NSW 2060

Attention: Mr Frank Brophy

REPORT F4264/83 & F4593/83

YOUR REFERENCE:	Telephone calls from F. Brophy on 7 February 1983 and 2 March 1983.
MATERIAL:	Water samples
LOCALITY:	OMEO No.1
IDENTIFICATION:	DST 1, 2918-2939 m; RFT, 3125 m
DATE RECEIVED:	11 February and 2 March, 1983
WORK REQUIRED:	Pentane extraction of hydrocarbons. Analysis by gas chromatography. Interpretation.

Investigation and Report by: Dr David M. McKirdy
Analysis by: Mr Paul Marty

Chief - Fuel Section: Dr Brian G. Steveson
Manager, Mineral and Materials Sciences Division: Dr William G. Spencer

Brian G Steveson

for Brian S. Hickman
Managing Director

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1. INTRODUCTION

Water samples recovered during DST 1 (2918-2939 m) and an RFT (3125 m) of the Latrobe Group in Omeo-1 were received for hydrocarbon analysis (Table 1). The hydrocarbons extracted from these formation waters are compared with an oil sample from Bream-4A (RFT 2, 1944 m) (Table 1), and with previously analysed hydrocarbons in a bottoms-up mud sample from the Strzelecki Group (3379 m) in Omeo-1 (McKirdy, 1983).

2. PROCEDURE

The water was solvent-extracted with n-pentane. After careful removal of solvent by evaporation to near dryness in a stream of dry nitrogen, the crude extract was redissolved in methylene chloride and analysed by gas chromatography using the following instrumental parameters:

Gas chromatograph: Perkin Elmer Sigma 115 GC system.

Column: SGE 25 x 0.33 mm vitreous silica, QC3/BP1

Injector and detector temperature: 280°C

Detector: FID

Carrier gas: H_2 at 4 psi

Column temperature: 30°C for 1 min., then 2°/min to 50°C and 7°/min to 270°C.

Quantitation: relative concentrations of individual hydrocarbons obtained by integration of peak areas.

3. RESULTS AND DISCUSSION

Gas chromatograms of the pentane extracts of the four water samples are shown in Figures 1-4. Figure 5 is a whole-oil chromatogram of the Bream-4A oil.

The hydrocarbons isolated from the water samples occupy the range C_6-C_{31}. They are characterised by:

(1) moderate to high concentrations of low-molecular-weight aromatics (benzene, toluene, ethylbenzene and the xylenes);

(2) moderate to high concentrations of C_3-alkylbenzenes, C_4-alkylbenzenes, naphthalene, methylnaphthalenes and dimethylnaphthalenes;

(3) high pristane/phytane ratios (pr/ph = 4.1-5.9);

(4) intermediate pristane/n-heptadecane ratios (pr/n-C_{17} = 0.37-0.60) and low phytane/n-octadecane ratios (ph/n-C_{18} = 0.06-0.10); and

(5) C_{12+} n-alkane distributions with a maximum at C_{14} (DST 1, 2918-2939 m) or C_{23} (RFT, 3125 m) and no predominance of odd over even-carbon-numbered homologues.

The DST 1 extracts are especially enriched in aromatic hydrocarbons (and also unidentified naphthenes) in the C_9-C_{18} range (Figs. 1 and 2).

Features (1) and (2) are to be expected in view of the higher aqueous solubility of aromatic hydrocarbons (Price, 1976; Milner *et al.*, 1977). They provide strong evidence for the contention that the formation water at both tested levels of the Latrobe Group has been in contact with pooled or migrating oil.

Features (3) and (4) are consistent with the derivation of the hydrocarbons from non-marine oil of similar composition to the Bream-4A crude (Fig. 5). However, there are significant differences between the DST 1 and RFT (3125 m) extracts (Table 1). The noticeably higher aromatics content, the higher mean 2, 6, 10-trimethyltridecane/pristane ratio (TMTD/pr = 0.98), and the lower wax content ($\underline{n}$-C_{23+} = 22%) of the DST 1 hydrocarbons suggest that they may have been sequestered from a mature condensate rather than an oil.

Hydrocarbons present in mud and mud filtrate recovered from 3379 metres depth in the Strzelecki Group at Omeo-1 (McKirdy, 1973), although of similar overall chracter to the Latrobe Group shows, do have somewhat higher pristane/phytane ratios (pr/ph = 6.6-7.6). Therefore, if the petroleum-like hydrocarbons found in water samples from 2918-2939 metres, 3125 metres and 3379 metres depth in Omeo-1 constitute *bona fide* evidence of their contact with oil (or condensate), then it is reasonable to infer the existence of three discrete oil accumulations in the vicinity of this well. This conclusion must be regarded as tentative, however, until the question of possible contamination of the water samples (e.g. by mud additives) has been addressed, and more detailed biomarker studies of the Omeo-1 'oil shows' have been completed.

The composition of gas recovered with the Omeo-1 RFT (3125 m) water sample (viz. CH_4 = 91-92%, CO_2 = 1.8% (mean), N_2 = 0.8% (mean); C_1/C_1-C_4 = 0.95, $\underline{i}$-$C_4/\underline{n}$-C_4 = 1.10 : Marty, 1983) is reasonably compatible with BMR cuttings gas data from this interval (viz C_1/C_1-C_4 = 0.93, $\underline{i}$-$C_4/\underline{n}$-C_4 = 1.79). Both gases are dry, consistent with their probable *in situ* derivation from coals within the lower Latrobe Group (3000-3195 m), although their $\underline{i}$-$C_4/\underline{n}$-C_4 ratios are possibly a little high for the interpolated rank of these coals (VR = 0.6-0.7% : McKirdy and Watson, 1983). In sediments containing woody-herbaceous Type III kerogen, cuttings gas $\underline{i}$-$C_4/\underline{n}$-C_4 ratios >1 generally are associated with vitrinite reflectance values in the range VR <0.6% (Monnier *et al.*, 1983).

5. CONCLUSIONS AND RECOMMENDATION

1. Petroleum-like hydrocarbons are present in formation water samples recovered during DST 1 (2918-2939 m) and an RFT (3125 m) of the Latrobe Group in Omeo-1. The enrichment of the hydrocarbons in aromatic compounds suggests that the waters have been in contact with oil or condensate.

2. The C_{12}+ hydrocarbon distribution of the RFT samples is similar to that of a typical waxy paraffinic crude oil, whereas the DST 1 hydrocarbons are more condensate-like. High pristane/phytane ratios (DST 1, pr/ph = 4.5; RFT, pr/ph ≈ 5-6) are indicative of an ultimate derivation from terrigenous woody-herbaceous organic matter. In the case of the RFT hydrocarbons, their mean pristane/phytane ratio is almost identical to those of top-Latrobe oils from the nearby Bream-4A and Dolphin-1 wells.

3. The previously reported higher pristane/phytane ratios of the hydrocarbons found in mud and mud filtrates from 3379 metres depth in the underlying Strzelecki Group (pr/ph = 6-8) suggest the possible existence of a third oil family in the Omeo-1 area. However, definitive oil correlations can be made only on the basis of detailed GC-MS analyses, which have yet to be undertaken.

4. When DST or RFT waters are submitted for hydrocarbon analysis, it is recommended that all drilling mud additives in use at the time of sampling also be screened for their hydrocarbon content, in order to facilitate the recognition of contaminated samples.

6. REFERENCES CITED

MARTY, P., 1983. Gas analyses, Omeo No.1. *AMDEL Report F4539/83 for Australian Aquitaine Petroleum Pty. Ltd.*

McKIRDY, D.M., 1983. Hydrocarbons in mud and mud filtrates, Omeo No.1, VIC/P-17, Gippsland Basin. *AMDEL Report F4077/83 for Australian Aquitaine Petroleum Pty. Ltd.,*

McKIRDY, D.M., and WATSON, B.L., 1983. Source-rock evaluation, Omeo No.1, VIC/P-17, Gippsland Basin. *AMDEL Report F4790/83 for Australian Aquitaine Petroleum Pty. Ltd.,* (in preparation).

MILNER, C.W.D., ROGERS, M.A., and EVANS, C.R., 1977. Petroleum transformations in reservoirs. *J. Geochem. Explor.,* 7, 101-153.

PHILP, R.P., and GILBERT, T.D., 1980. Application of computerized gas chromatography-mass spectrometry to oil exploration in Australia. *APEA J.,* 20(1), 221-228.

PRICE, L.C., 176. Aqueous solubility of petroleum as applied to its origin and primary migration. *Bull. Amer. Assoc. Petrol. Geol.,* 60. 213-244.

TABLE 1: COMPARISON OF LATROBE GROUP HYDROCARBONS, OMEO-1, WITH TWO GIPPSLAND BASIN OILS

Sample	Bulk Composition				$C_{12}+$ Alkane Distribution								
	Saturates %	Aromatics %	Polars %	Asphaltenes %	Pr / n-C_{17}	Ph / n-C_{18}	TMTD / Pr	Np / Pr	Pr / Ph	n-Alkane Profile: Maximum	n-Alkane Profile: $C_{23}+$ %	n-Alkane Profile: OEP C_{25}	n-Alkane Profile: OEP C_{27}
Omeo-1, 2918-2939 m													
DST 1 (0812 hrs) water extract	n.d.	n.d.	n.d	n.d.	0.51	0.10	0.77	0.39	4.7	(?)14	22	n.d.	n.d.
DST 1 (0816 hrs) water extract	n.d.	n.d.	n.d.	n.d.	0.60	0.09	1.2	0.37	4.1	14	n.d.	n.d.	n.d.
Omeo-1, 3125 m													
RFT (upper chamber) water extract	n.d.	n.d.	n.d.	n.d.	0.37	0.06	0.72	0.38	5.9	23	38	n.d.	n.d.
RFT (lower chamber) water extract	n.d.	n.d.	n.d.	n.d.	0.39	0.06	0.89	0.37	5.4	23	38	n.d.	n.d.
Bream-4A, 1944 m													
paraffinic oil	n.d.	n.d.	n.d.	n.d.	0.68	0.12	0.65	0.35	5.5	n.d.	n.d.	n.d.	n.d.
Dolphin-1, 1216 m													
*naphthenic oil	n.d.	n.d.	n.d.	n.d.	-	-	0.36	0.42	5.1	n.d.	n.d.	n.d.	n.d.
Parameter					1	2	3	4	5	6	7	8	9

*Biodegraded; hydrocarbon ratios measured from Figure 6b of Philp and Gilbert (1980).

KEY TO HYDROCARBON ANALYSIS DATA SHEET

Individual Compounds

TMTD	2,6,10-trimethyltridecane (C_{16} regular isoprenoid)
np	norpristane (C_{18} regular isoprenoid)
n-C_{17}	normal heptadecane
pr	pristane (C_{19} regular isoprenoid)
n-C_{18}	normal octadecane
ph	phytane (C_{20} regular isoprenoid)
C_{23}+	percent waxy alkanes in total n-alkanes
OEP	odd-even predominance (Scalan & Smith, 1970)
n.d.	Not determined

Parameter Specificity

1.	Maturity/Source/Biodegradation
2.	Maturity/Source/Biodegradation
3.	Maturity
4.	Source/Maturity
5.	Source/Maturity
6.	Source/Maturity
7.	Source/Maturity
8, 9.	Maturity/Source
-	Concentration of component(s) too low for reliable quantitation

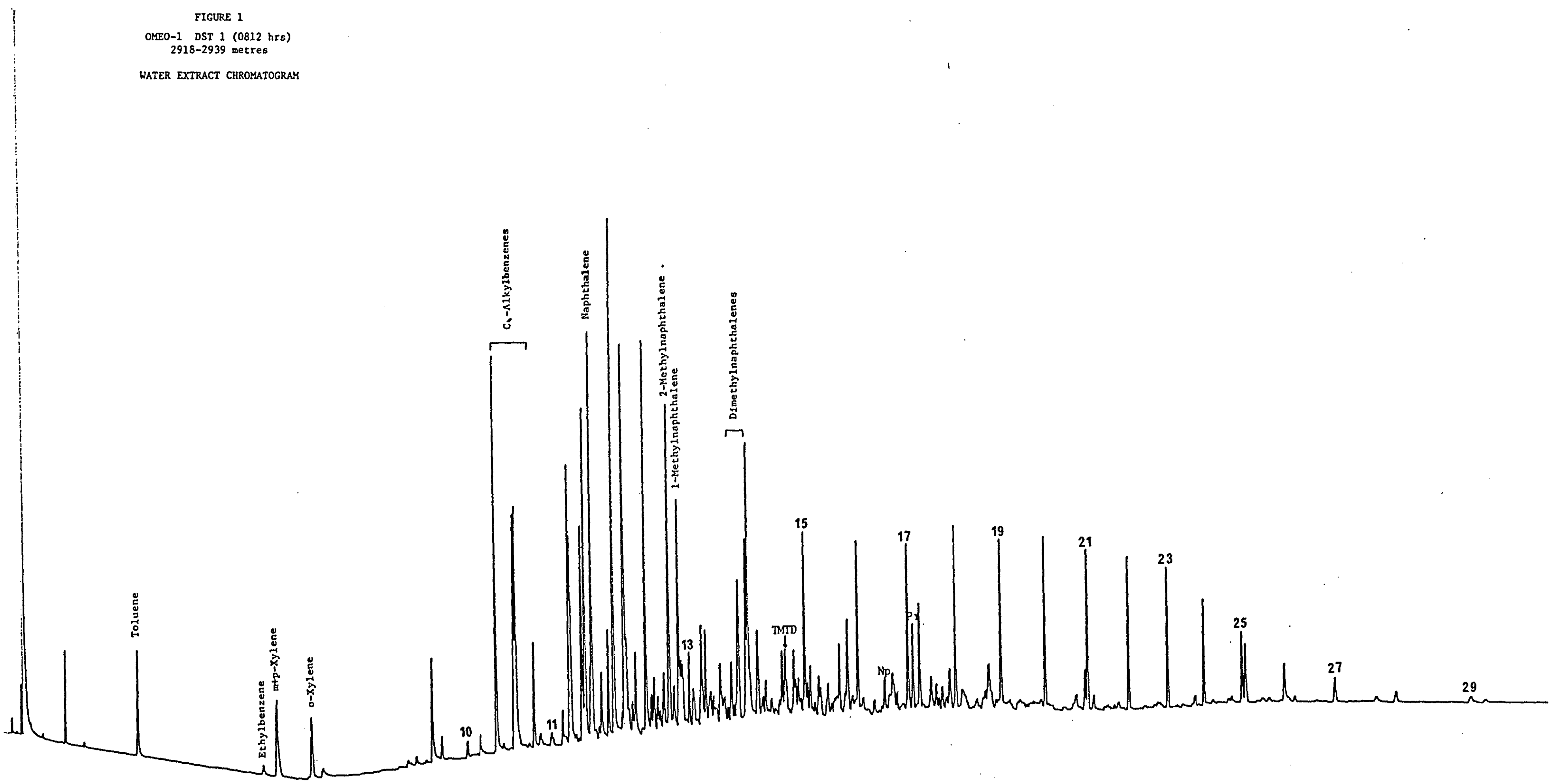


FIGURE 1

OMEO-1 DST 1 (0812 hrs)
2918-2939 metres

WATER EXTRACT CHROMATOGRAM

FIGURE 2

OMEO-1 DST 1 (0816 hrs)
2918-2939 metres

WATER EXTRACT CHROMATOGRAM

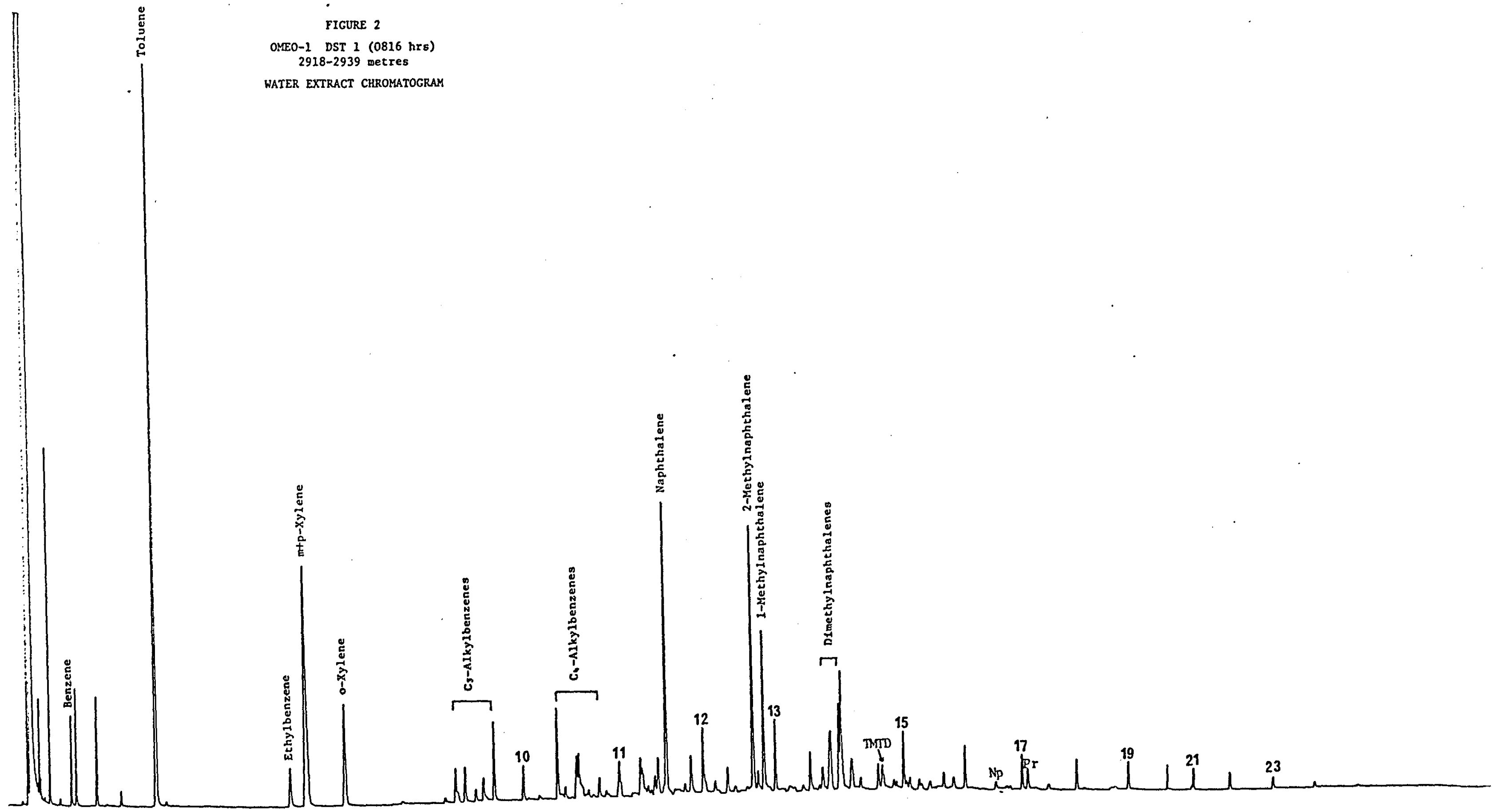


FIGURE 3
OMEO-1 RFT (UPPER CHAMBER)
3125 metres
WATER EXTRACT CHROMATOGRAM

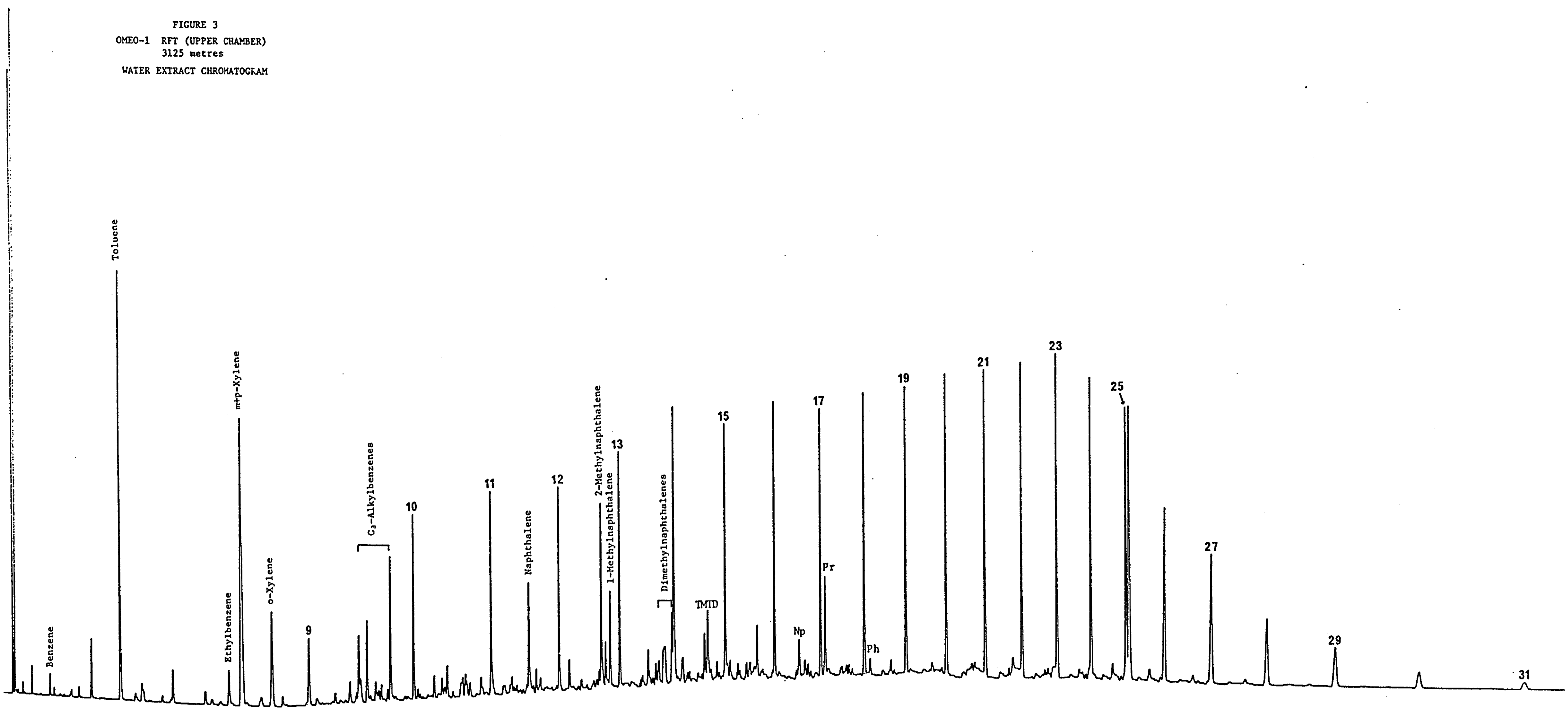
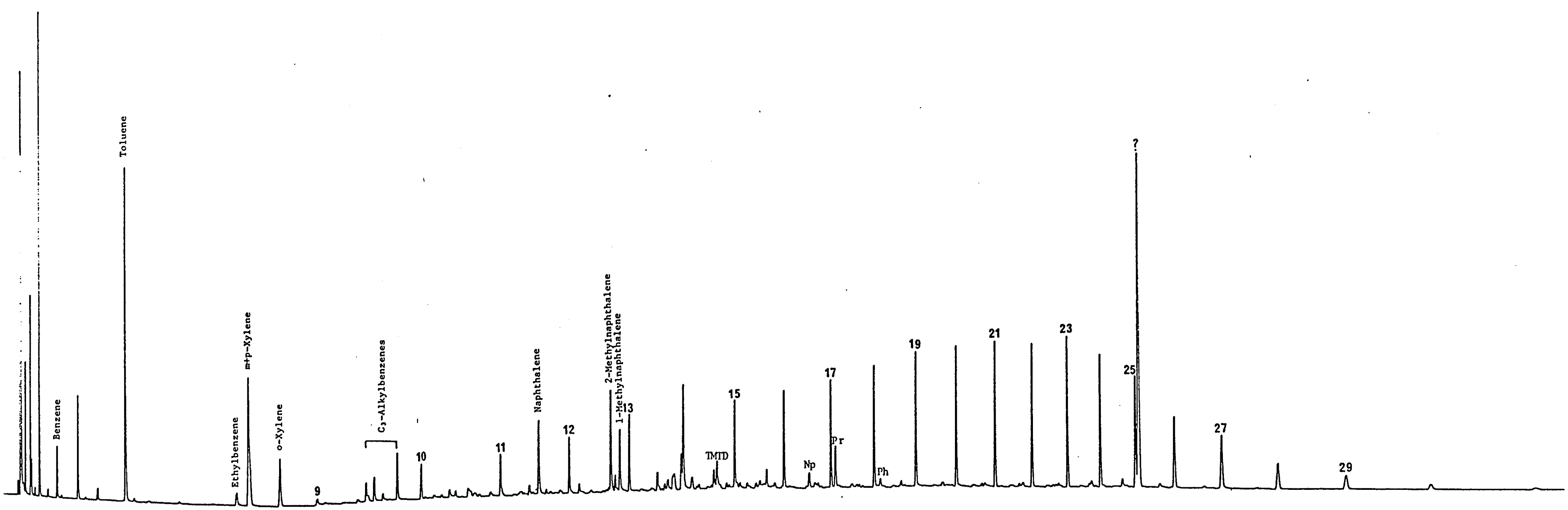


FIGURE 4
OMEO-1 RFT (LOWER CHAMBER)
3125 metres
WATER EXTRACT CHROMATOGRAM



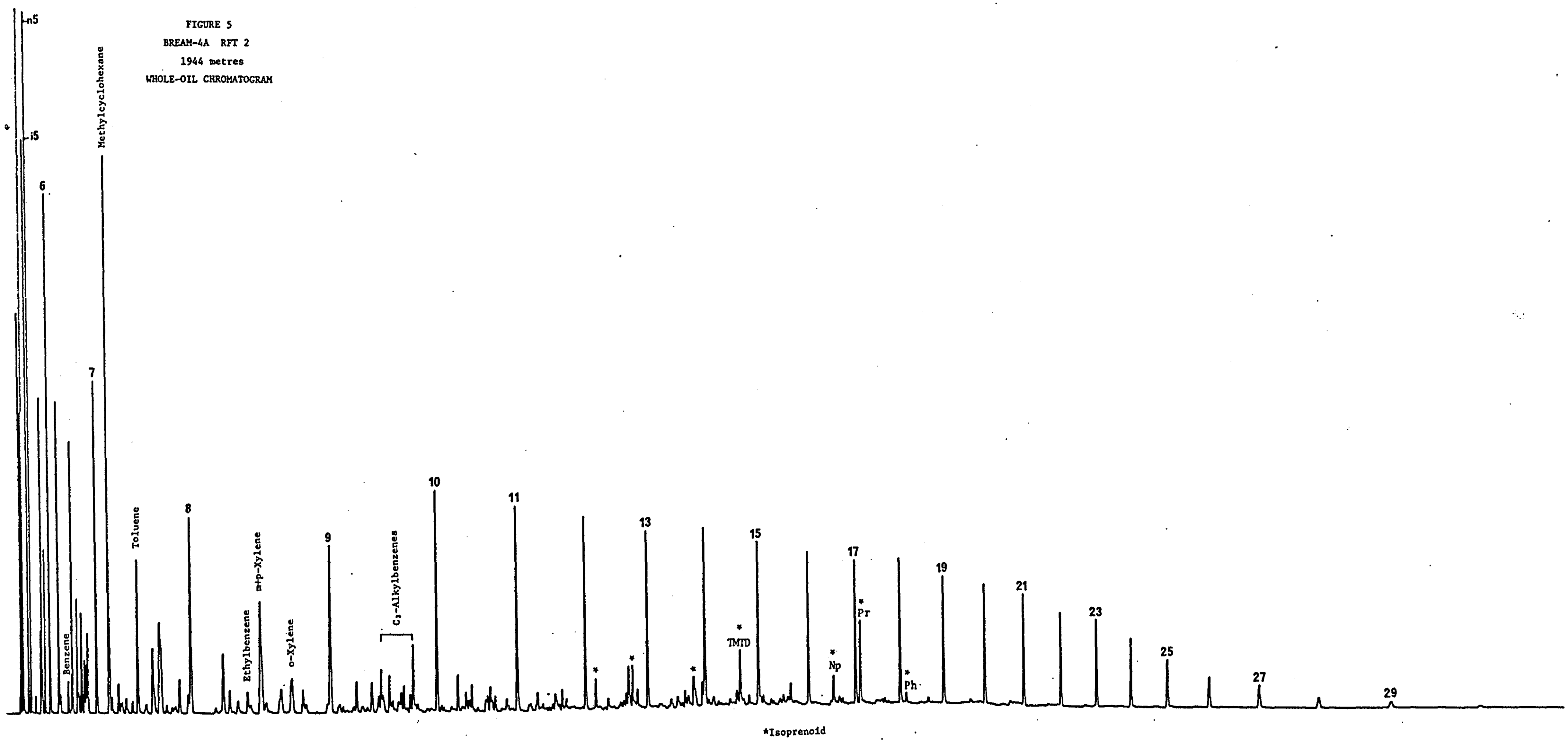


FIGURE 5
BREAM-4A RFT 2
1944 metres
WHOLE-OIL CHROMATOGRAM

3

SECTION 3

OMEO NO.1

VITRINITE REFLECTANCE, DISPERSED ORGANIC
MATTER DESCRIPTIONS AND TOTAL
ORGANIC CARBON ANALYSES

Australian Aquitaine Petroleum Pty. Ltd.

F3/422/0-3445/83 December 1982

The Australian Mineral Development Laboratories

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15 December 1982

F3/422/0
3445/83

Australian Aquitaine Petroleum Pty. Ltd.,
Elf Aquitaine Centre,
99 Mount Street,
NORTH SYDNEY NSW 2060

Attention: Dr F. Brophy

REPORT F3445/83

YOUR REFERENCE:	5471:52:KL:efm
MATERIAL:	Three cutting samples
LOCALITY:	OMEO No.1
IDENTIFICATION:	As marked
DATE RECEIVED:	10 December 1982
WORK REQUIRED:	Vitrinite reflectance, dispersed organic matter descriptions and total organic carbon analyses.

Investigation and Report by: Brian Watson

Chief - Fuel Section: Dr Brian G. Steveson
Manager, Mineral and Materials Sciences Division: Dr William G. Spencer

for Norton Jackson
Managing Director

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1. INTRODUCTION

Three samples from Omeo No.1 were forwarded from Australian Aquitaine Petroleum Pty. Ltd for organic analyses. This report contains vitrinite reflectance determinations, descriptions of dispersed organic matter and total organic carbon analyses.

2. EXPERIMENTAL METHODS

A representative portion of each sample was separated using a sample splitter and then mounted in cold setting astic resin in a 2.5 cm round mold. The block was ground flat using diamond impregnated laps and carborundum papers. This surface was then polished with aluminium oxide and finally with magnesium oxide.

Reflectance measurements were taken using a Leitz MPV1.1 microphotometer fitted to a Leitz Ortholux microscope and calibrated against synthetic standards. All measurements were taken in oil immersion (n = 1.518) using incident monochromatic light with a wavelength of 546 nm at a temperature of 23±1°C. Fluorescence observations were made using the same microscope utilizing a 3 mm BG3 exitation filter, a TK400 Dichroic mirror and a K510 suppression filter.

The mean maximum reflectance measurements taken on huminite are listed below.

3. REFLECTANCE MEASUREMENTS

Depth (m)	Reflectance (%)	Standard Deviation	Range	Number of Measurements
2848	0.43	0.04	0.37-0.53	34
2851	0.43	0.04	0.36-0.50	29
2956	0.49	0.05	0.39-0.58	36

4. DISPERSED ORGANIC MATTER DESCRIPTIONS

Sample 1: Depth 2848 metres

This sample consists chiefly of sandstone. Organic matter is generally absent from these grains. However, approximately 5% of the sandstone contains rare inertinite. Siltstone grains with rare to sparse dispersed organic matter occupy approximately 20-30% of the sample. In this siltstone inertinite is more abundant than vitrinite which is more abundant than exinite.

Exinite is rare in this sample and is present only in the siltstone. The exinite macerals present in order of abundance are sporinite (bright yellow fluorescence), resinite (bright yellow fluorescence), ?dinoflagellate/acritarchs (bright yellow-green fluorescence) and cutinite (moderate yellow-orange fluorescence). Sporinite is rare in the sample whereas resinite and dinoflagellate/acritarchs are very rare. Cutinite is present in trace amounts.

Sample 2: Depth 2851 metres

This sample also consists chiefly of sandstone. No organic matter was found in this sandstone. Siltstone grains occupy approximately 15-20% of the sample and generally contain sparse to common dispersed organic matter. In these siltstone grains inertinite is more abundant than huminite which is slightly more abundant than exinite. Approximately one-third of the siltstone contains only rare organic matter. In these grains inertinite is slightly more abundant than huminite and exinite is generally absent.

Exinite is rare in this sample overall and is present only in the siltstone with sparse to common dispersed organic matter. The exinite macerals present in order of abundance are sporinite (bright yellow and moderate orange fluorescence), cutinite (bright yellow and moderate yellow-orange fluorescence), liptodetrinite (bright yellow fluorescence) and resinite (bright yellow-green fluorescence). Sporinite, cutinite and liptodetrinite are rare in the sample and resinite is present in trace amounts.

Sample 3: Depth 2956 metres

This sample is similar to the other two Omeo samples in that it consists chiefly of sandstone. Organic matter is generally rare in this sandstone and inertinite is slightly more abundant than vitrinite. Siltstone occupies approximately 5-10% of the sample volume and contains sparse dispersed organic matter. In this siltstone inertinite is more abundant than huminite which is slightly more abundant than exinite. Duroclarite grains occupy approximately 1-2% of the sample and contain abundant exinite.

Exinite is rare in the sample but is common in the siltstone and duroclarite grains. The exinite macerals present in order of abundance are sporinite (bright yellow and moderate yellow to moderate orange fluorescence), cutinite (bright yellow and moderate orange fluorescence), resinite (bright yellow green fluorescence), ?exsudatinite (dull orange fluorescence) and bitumen (dull orange fluorescence). Sporinite, cutinite and resinite are rare in the sample whereas exsudatinite and bitumen are present in trace amounts.

5. DISCUSSION

Table 1 illustrates the relative abundances of the maceral groups in each of the samples. The table also shows the total organic carbon values, the abundance of exinite and the types of exinites present in each sample. Reflectance data presented in histogram form follows Table 1.

The reflectance data indicates that the sequence is sufficiently mature to generate oil below approximately 3000 metres. However, the small number of samples limits the accuracy and precision of the reflectance versus depth profile. A larger number of samples from a range of deeper depths would provide a much more reliable and relevant reflectance versus depth profile.

The three samples studied are slightly immature and therefore are unlikely to generate significant quantities of hydrocarbons. However, some oil may be generated from the resinite in the sample from 2856 metres. Exsudatinite in this sample is primary oil and is direct evidence of hydrocarbon generation.

At greater depths these samples would have markedly higher source rock potentials.

TABLE 1: ORGANIC MATTER TYPE AND ABUNDANCE

Depth m	Relative Maceral Group Volumes	Total Organic Carbon,%	Estimated Volume of Exinite	Exinite Macerals
2848	I > V > E	0.45	**	sp, res, ?D/A, cut
2851	I > V ≧ E I > V	0.51	**	sp, cut, lipto, res.
2856	I > V ≧ E *V > E ≧ I	0.56	**	sp, cut, res, ?exs, bmen

Key

V	Vitrinite
I	Inertinite
E	Exinite
sp	Sporinite
res	Resinite
cut	Cutinite
D/A	Dinoflagellate/Acritarch
liptodet	Liptodetrinite
bmen	Bitumen
exs	Exsudatinite
*	Coal grains
**	Rare

OMEO NO. 1

2848 M

SORTED LIST
.37 .39 .39 .39 .39 .39 .39 .4 .4 .4 .4 .41 .41 .41 .42 .42 .4
.43 .43 .43 .43 .44 .44 .45 .46 .47 .47 .48 .48 .49 .5 .51 .52
.53
umber of values = 34

mEAN OF VALUES .434
STD DEVIATION .042

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
37   |*
38   |
39   |******
40   |****
41   |***
42   |**
43   |*****
44   |**
45   |*
46   |*
47   |**
48   |**
49   |*
50   |*
51   |*
52   |*
53   |*
```

OMEO NO. 1

2851 M

SORTED LIST
.36 .37 .37 .38 .38 .39 .39 .4 .4 .41 .41 .42 .42 .43 .43 .44 .
4 .44 .45 .45 .45 .45 .46 .47 .48 .48 .49 .49 .5
umber of values = 29

EAN OF VALUES .429
TD DEVIATION .039

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
36   |*
37   |**
38   |**
39   |**
40   |**
41   |**
42   |**
43   |**
44   |***
45   |****
46   |*
47   |*
48   |**
49   |**
50   |*
```

OMEO NO. 1

2956 M

SORTED LIST
.39 .39 .41 .43 .44 .44 .44 .47 .47 .47 .48 .48 .48 .48 .48 .48
.48 .48 .49 .49 .5 .5 .5 .52 .52 .52 .53 .54 .54 .55 .55 .55 .5
.57 .58 .58
umber of values = 36

EAN OF VALUES .494
TD DEVIATION .049

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
39  | **
40  |
41  | *
42  |
43  | *
44  | ***
45  |
46  |
47  | ***
48  | ********
49  | **
50  | ***
51  |
52  | ***
53  | *
54  | **
55  | ***
56  | *
57  | *
58  | **
```

The Australian Mineral Development Laboratories

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In reply quote:

amdel

15 February 1983

F3/422/0
4091/83

Australian Aquitaine Petroleum Pty. Ltd.,
PO Box 725,
NORTH SYDNEY NSW 2060

Attention: Dr Frank Brophy

REPORT F4091/83

YOUR REFERENCE:	Transmittal 009876
MATERIAL:	One side wall core sample
LOCALITY:	OMEO No.1
IDENTIFICATION:	3361 m
DATE RECEIVED:	2 February 1983
WORK REQUIRED:	Vitrinite Reflectance, Dispersed Organic Matter Description and Total Organic carbon Determinations

Investigation and Report by: Brian Watson

Chief - Fuel Section: Dr Brian G. Steveson
Manager, Mineral and Materials Sciences Division: Dr William G. Spencer

for Norton Jackson
Managing Director

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1. INTRODUCTION

One sample from Omeo No.1 was forwarded from Australian Aquitaine Petroleum Pty. Limited for organic analyses. This report contains a vitrinite reflectance determination, description of dispersed organic matter and total organic carbon analysis.

2. EXPERIMENTAL METHODS

A representative portion of each sample was separated using a sample splitter and then mounted in cold setting astic resin in a 2.5 cm round mould. The block was ground flat using diamond impregnated laps and carborundum papers. This surface was then polished with aluminium oxide and finally with magnesium oxide.

Reflectance measurements were taken using a Leitz MPV1.1 microphotometer fitted to a Leitz Ortholux microscope and calibrated against synthetic standards. All measurements were taken in oil immersion (n = 1.518) using incident monochromatic light with a wavelength of 546 nm at a temperature of 23±1°C. Fluorescence observations were made using the same microscope utilizing a 3 mm BG3 exitation filter, a TK400 Dichroic mirror and a K510 suppression filter.

The mean maximum reflectance measurements were taken on huminite and are listed below.

3. REFLECTANCE MEASUREMENTS

Mean Maximum Reflectance	Standard Deviation	Range	Number of Determinations
0.45	0.06	0.35-0.57	18

4. DESCRIPTION OF DISPERSED ORGANIC MATTER

Sample 1: Depth 3361 m

This side wall core consists of a poorly cemented fine grained sandstone containing sparse to common dispersed organic matter. In this sandstone inertinite is much more abundant than exinite which is more abundant than vitrinite. Most of the organic material present in this sandstone appears to be reworked coal grains. The reflectance of the majority of this material ranges from 0.7 to 0.85%. The reworked fragments are generally quite angular indicating that transportation of the grains was minimal. Although these grains consist almost entirely of inertinite and contain sparse to common exinite, it appears that they have been erroded from a vitrinite rich coal and oxidised during transportation and/or redeposition.

Exinite is rare to sparse in this sandstone. The exinite macerals present are oil derived bitumen (bright green to bright yellow fluorescence), sporinite (moderate orange fluorescence) and cutinite (moderate orange fluorescence). Oil derived bitumens are rare to sparse in this sample and are slightly more abundant than sporinite. Cutinite is very rare.

The overall volume of organic matter in this sample is estimated to be approximately 1-2%.

Total Organic carbon = 0.85%

5. DISCUSSION

Table 1 is a histogram of the reflectance data taken from this sample. A reflectance verses depth diagram including data previously reported to Australian Aquitaine Petroleum Pty. Limited in December 1982 (Omeo No.1, Vitrinite Reflectance, Dispersed Organic Matter Description and Total Organic Carbon Analysis: Watson, B) was sketched. This diagram indicates that the vitrinite reflectance determination of the sample from 2956 m may have been influenced by reworked material. Alternatively the reflectance value for the sample from 3361 m may be slightly low due to the scarcity of vitrinite in the sample. Cuttings samples from a wider range of depths would provide a much more reliable reflectance versus depth profile.

The presence of oil derived bitumen in this sample indicates the accumulation of minor quantities of hydrocarbons. The fluorescence colour of this oil derived bitumen ranges from green to yellow but is thought to be derived from the one oil source.

TABLE 1

OMEO NO. 1

3361 M

SORTED LIST
.35 .36 .38 .42 .42 .44 .44 .44 .45 .45 .45 .45 .46 .48 .5 .53
.55 .57
Number of values = 18

MEAN OF VALUES .452
STD DEVIATION .057

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
35   | *
36   | *
37   |
38   | *
39   |
40   |
41   |
42   | **
43   |
44   | ***
45   | ****
46   | *
47   |
48   | *
49   |
50   | *
51   |
52   |
53   | *
54   |
55   | *
56   |
57   | *
```

APPENDIX 3

PROPORTIONS OF VITRINITE, EXINITE AND INERTINITE IN PERCH NO.1, GURNARD No.1 AND OMEO No.1

Depth (ft)	% O.M.		
	Vitrinite	Exinite	Inertinite
Perch No.1			
3822-3825	∿95	∿5	<1
4170-4180	∿75	∿6	∿20
4410-4420	∿60	∿10	∿30
4800-4810	∿65	∿10	∿25
5500-5530	∿65	∿20	∿15
6350-6360	∿65	∿20	∿15
6730-6740	∿ 5	∿10	∿85
6680-6890			
7170-7180	∿50	∿20	∿30
7670-7680	∿50	∿20	∿30
8200-8210	∿45	∿15	∿40
8250-8260			
8726-8731	∿15	∿10	∿80
4300-4310	∿15	∿10	∿80
Gurnard No.1			
7350-7360	∿ 3	∿ 2	∿95
7720-7730	∿60	∿15	∿25
8320-8330	∿55	∿10	∿35
8760-8770	∿55	∿ 5	∿40
9050-9060	∿55	∿10	∿35
9580-9590	∿50	∿ 5	∿45
9710-9720	∿40	∿ 5	∿55
Omeo No.1 - Depth (m)			
2848	∿20	∿10	∿70
2851	∿30	∿10	∿60
2856	∿30	∿25	∿45
3361	∿ 5	∿15	∿80

4

SECTION 4

5671.51

The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide 79 1662
Telex AA 82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

24th January, 1983.

F3/422/0
3854/83

Australian Aquitane Petroleum Pty. Ltd.,
Elf Aquitane Centre,
99 Mount Street,
NORTH SYDNEY NSW 2060

Attention: Dr. Frank Brophy

REPORT F3854/83

YOUR REFERENCE:	Order no: 830125
MATERIAL:	Water
IDENTIFICATION:	OMEO No. 1
DATE RECEIVED:	17th January, 1983.
WORK REQUIRED:	Headspace analysis and solvent extraction.

Investigation and Report by: Dr. B. Mooney, P. Marty.

Chief - Fuel Section: Dr. Brian Steveson

Manager, Mineral and Materials Sciences Division: Dr. William G. Spencer

Brian Steveson.

for Norton Jackson
Managing Director

sg

Pilot Plant: Osman Place
Thebarton S.A.,
Telephone 43 8053
Branch Laboratories:
Perth W.A.
Telephone 325 7311
Melbourne Vic.
Telephone 645 3093

JOB NO: 3854/83

CLIENT: AUSTRALIAN AQUITANE PTY. LIMITED

SAMPLES: Four waters

RESULTS OF ANALYSIS (Headspace analysis)

The air above the water in each sample container was analysed for hydrocarbons by gas chromatography.

RUN 1 2849.8 m 1st OPENED LOWER CHAMBER

Methane	11,000 microlitres per litre (ppm)
Ethane	500
Propane	75
Butanes	55
Pentanes	75
Hexanes	160
Heptanes plus higher hydrocarbons	1,500

RUN 1 2849.8 m 2nd OPENED UPPER CHAMBER

Methane	42,500 microlitres per litre
Ethane	2,000
Propane	260
Butanes	95
Pentanes	110
Hexanes	320
Heptanes plus higher hydrocarbons	2,200

RESULTS OF ANALYSIS cont/d

RUN 2 2952.0 m 1st OPENED LOWER CHAMBER

Methane	31,900 microlitres per litre
Ethane	1,100
Propane	140
Butanes	20
Pentanes	5
Hexanes	20
Heptanes plus higher hydrocarbons	590

RUN 2 2952.0 m 2nd OPENED UPPER CHAMBER

Methane	15,800 microlitres per litre
Ethane	850
Propane	110
Butanes	15
Pentanes	10
Hexanes	25
Heptanes plus higher hydrocarbons	390

RESULTS OF ANALYSIS (Solvent Extraction of the Water Samples)

The samples were extracted with n-Pentane and this extract was concentrated and then analysed by gas chromatography. All four chromatograms show a normal-alkane pattern typical of an oil. This oil may be natural or refined. The chromatograms also show some large non-alkane peaks which may be due to drilling additives or plasticisers in the plastic used to seal the sample containers.

PE906208

This is an enclosure indicator page.
The enclosure PE906208 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906208 has the following characteristics:

ITEM_BARCODE = PE906208
CONTAINER_BARCODE = PE906207
NAME = Pentane Extract Chromatograph
BASIN = GIPPSLAND
PERMIT = VIC/P17
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Pentane Extract Chromatograph, Run 1, Lower Chamber, 2849.8m,(enclosure from attachment 4 to WCR) Omeo-1
REMARKS =
DATE_CREATED = 31/07/83
DATE_RECEIVED = 11/08/83
W_NO = W788
WELL_NAME = OMEO-1
CONTRACTOR = AMDEL
CLIENT_OP_CO = AUSTRALIAN AQUITAINE PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

PE906209

This is an enclosure indicator page.
The enclosure PE906209 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906209 has the following characteristics:

ITEM_BARCODE =	PE906209
CONTAINER_BARCODE =	PE906207
NAME =	Pentane Extract Chromatograph
BASIN =	GIPPSLAND
PERMIT =	VIC/P17
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Pentane Extract Chromatograph, Run 1, Upper Chamber, 2849.8m,(enclosure from attachment 4 to WCR) for Omeo-1
REMARKS =	
DATE_CREATED =	31/07/83
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUITAINE PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

PE906210

This is an enclosure indicator page.
The enclosure PE906210 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906210 has the following characteristics:

ITEM_BARCODE =	PE906210
CONTAINER_BARCODE =	PE906207
NAME =	Pentane Extract Chromatograph
BASIN =	GIPPSLAND
PERMIT =	VIC/P17
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Pentane Extract Chromatograph, Run 2, Lower Chamber, 2952.0m,(enclosur from attachment 4 to WCR) for Omeo-1
REMARKS =	
DATE_CREATED =	31/07/83
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUITAINE PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

PE906211

This is an enclosure indicator page.
The enclosure PE906211 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906211 has the following characteristics:

ITEM_BARCODE =	PE906211
CONTAINER_BARCODE =	PE906207
NAME =	Pentane Extract Chromatograph
BASIN =	GIPPSLAND
PERMIT =	VIC/P17
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Pentane Extract Chromatograph, Run 2, Upper Chamber, 2952.0m,(enclosure from attachment 4 to WCR) for Omeo-1
REMARKS =	
DATE_CREATED =	31/07/83
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUITAINE PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

SECTION 5

5

The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide 79 1662
Telex AA 82520

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correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

3 March 1983

F3/422/0
4539/83

Australian Aquitaine Pty. Ltd.,
Elf Aquitaine Centre,
99 Mount Street,
NORTH SYDNEY NSW 2060

Attention: Mr F. Brophy

REPORT F4539/83

MATERIAL:	Gas
IDENTIFICATION:	OMEO No.1
DATE RECEIVED:	25 February 1983
WORK REQUIRED:	R1/1

Investigation and Report by: Paul Marty

Chief - Fuel Section: Dr Brian G. Steveson
Manager, Mineral and Materials Sciences Division: Dr William G. Spencer

for Norton Jackson
Managing Director

cah

Pilot Plant: Osman Place
Thebarton S.A.,
Telephone 43 8053
Branch Laboratories:
Perth W.A.
Telephone 325 7311
Melbourne Vic.
Telephone 645 3093

AMDEL GAS ANALYSIS SERVICE

OMEO NO.1
LOWER CHAMBER
R.F.T. AT 3125 M
-

GAS	MOL %
OXYGEN PLUS ARGON	<.01
NITROGEN	.88
HYDROGEN	.03
HELIUM	< .01
CARBON DIOXIDE	.99
METHANE	92.15
ETHANE	4.00
PROPANE	1.10
I-BUTANE	.23
N-BUTANE	.21
I-PENTANE	.08
N-PENTANE	.06
HEXANES	.10
HEPTANES	.06
OCTANES AND HIGHER	.09

CALCULATED GAS DENSITY
(AIR =1): .613

CALORIFIC VALUE (15.6 DEG C, 760 MM HG):

GROSS: 1063 BTU/CU.FT (39.6 MJ/CU.M)
NETT: 960 BTU/CU.FT (35.77 MJ/CU.M)

AMDEL GAS ANALYSIS SERVICE

OMEO NO.1
UPPER CHAMBER
R.F.T. AT 3125 M

GAS	MOL %
OXYGEN PLUS ARGON	<.01
NITROGEN	.69
HYDROGEN	< .01
HELIUM	< .01
CARBON DIOXIDE	2.65
METHANE	91.00
ETHANE	3.80
PROPANE	1.05
I-BUTANE	.22
N-BUTANE	.20
I-PENTANE	.08
N-PENTANE	.05
HEXANES	.08
HEPTANES	.07
OCTANES AND HIGHER	.13

CALCULATED GAS DENSITY
(AIR =1): .627

CALORIFIC VALUE (15.6 DEG C, 760 MM HG):

GROSS: 1047 BTU/CU.FT (38.99 MJ/CU.M)
NETT: 945 BTU/CU.FT (35.22 MJ/CU.M)

SECTION 6

6

Copy 2 of 2
of invoice
No, 3512
4/3/83
$620-00

HYDROCARBONS IN MUD AND MUD FILTRATES,
OMEO NO.1, VIC-P-17, GIPPSLAND BASIN

Australian Aquitaine Petroleum Pty. Ltd

F3/422/0-4077/83 February 1983

The Australian
Mineral Development
Laboratories

emington Street, Frewville,
South Australia 5063
Phone Adelaide 79 1662
Telex AA 82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

3 March 1983

F3/422/0
4077/83

Australian Aquitaine Petroleum Pty. Ltd.,
99 Mount Street,
NORTH SYDNEY NSW 2060

Attention: Mr Frank Brophy

REPORT F4077/83

YOUR REFERENCE:	Telex No.1140 dated 1/2/83 from M. Barbe
MATERIAL:	Mud and mud filtrates
LOCALITY:	OMEO No.1
IDENTIFICATION:	Bottoms up mud sample, 3379 m.
DATE RECEIVED:	1 February, 1983
WORK REQUIRED:	Pentane extraction of hydrocarbons and analysis by gas chromatography. Interpretation

Investigation and Report by: Dr David M. McKirdy

Analysis by: Mr Paul Marty

Chief - Fuel Section: Dr Brian G. Steveson
Manager, Mineral and Materials Sciences Division: Dr William G. Spencer

for Norton Jackson
Managing Director

Pilot Plant: Osman Place
Thebarton S.A.,
Telephone 43 8053
Branch Laboratories:
Perth W.A.
Telephone 325 7311
Melbourne Vic.
Telephone 645 3093

1. INTRODUCTION

The bottomsup sample from 3379 m depth in Omeo-1 comprised mud and two mud filtrates (A & B).

2. PROCEDURE

The mud and two water samples were solvent-extracted with n-pentane. After careful removal of solvent by rotary evaporation, the crude extracts were redissolved in methylene chloride and analysed by gas chromatography using the following instrumental parameters:

Gas chromatograph: Perkin Elmer Sigma 115 GC system.

Column: SGE 25 x 0.33 mm vitreous silica, QC3/BP1

Injector and detector temperature: 280°C

Detector: FID

Carrier gas: H_2 at 4 psi

Column temperature: 30°C for 1 min., then 2°/min to 50°C and 7°/min to 270°C.

Quantitation: relative concentrations of individual hydrocarbons obtained by integration of peak areas.

3. RESULTS AND DISCUSSION

Gas chromatograms of the hydrocarbons extracted from the mud and two mud filtrates are shown in Figures 1-3. Figure 4 is a solvent blank for n-pentane.

The level of impurities in the extraction solvent is unacceptably high (Fig. 4), and this batch of pentane has since been discarded. However, the contamination does not interfere with the following interpretation.

The C_{12}+ hydrocarbon distribution of the mud extract (Fig. 1) is typical of a mature light oil or condensate moderately rich in isoprenoid alkanes. The high pristane/phytane ratio (pr/ph = 6.6) suggests an origin from higher plant-derived woody-herbaceous organic matter (Powell and McKirdy, 1975), as do the pristane/n-heptadecane and phytane/n-octadecane ratios (pr/n-C_{17} = 0.68; ph/n-C_{18} = 0.12). The extract, on the basis of these alkane parameters, is similar to the Mackerel-1 oil (Table 1), although its TMTD/pristane ratio (TMTD/pr = 1.1) is much higher than that of the oil. This latter feature indicates that the hydrocarbons comprising the mud extract have undergone appreciable thermal cracking. The biodegraded Tuna-3 oil (Table 1) has a similarly high TMTD/pristane ratio (TMTD/pr = 1.5), but its pristane/phytane ratio (pr/pr = 3.6) is significantly lower than that of the Omeo-1 mud extract.

The hydrocarbons isolated from the mud filtrates (Figs 2 and 3) are characterised by:

(1) a very high concentration of low-molecular weight aromatics (benzene, toluene, ethylbenzene and the xylenes);

(2) a high proportion of compounds other than n-alkanes (probably naphthenes) in the C_9-C_{13} range; and

(3) a C_{12}+ n-alkane distribution with a maximum at C_{23} and a predominance of odd over even carbon-numbered homologues in the C_{23}+ range.

Features (1) and (2) are not unexpected in view of the solubility of aromatics and naphthenes in water (Milner *et al.*, 1977, p.122). They indicate that the water has been in contact with pooled oil or hydrocarbons such as those extracted from the mud. The high pristane/phytane ratio of mud filtrate B (pr/ph = 7.6 : Table 1) is certainly consistent with their derivation from a Gippsland Basin oil (Powell and McKirdy, 1975).

A similar explanation cannot be advanced for feature (3), however, because for an homologous series of hydrocarbons like the n-alkanes, solubility decreases with increasing carbon number. Furthermore, no odd/even predominance is displayed by the mud extract n-alkanes. Thus, the higher-molecular-weight ($\sim C_{20}$+) n-alkanes in the mud filtrates must have had a different origin. Without knowledge of the mud additives used during the drilling of Omeo-1, we are unable to suggest what this might be. It is possible that these hydrocarbons represent contamination from the plastic containers in which the samples were submitted.

4. CONCLUSIONS

Petroleum-like hydrocarbons are present in the mud and mud filtrates recovered from 3379 metres depth in Omeo-1. In common with non-biodegraded paraffinic oils found elsewhere in the Gippsland Basin, these hydrocarbons have high pristane/phytane ratios.

5. REFERENCES

MILNER, C.W.D., ROGERS, M.A., and EVANS, C.R., 1977. Petroleum transformations in reservoirs. *J. Geochem. Explor.*, 7, 101-153.

PHILP, R.P., and GILBERT, T.D., 1980. Application of computerized gas chromatography-mass spectrometry to oil exploration in Australia. *APEA J.*, 20(1), 221-228.

POWELL, T.G., and McKIRDY, D.M., 1975. Geologic factors controlling crude oil composition in Australia and Papua, New Guinea. *AAPG Bulletin*, 59, 1176-1197.

TABLE 1: COMPARISON OF OMEO-1 HYDROCARBONS WITH TWO GIPPSLAND BASIN OILS

Sample	Bulk Composition				$C_{12}+$ Alkane Distribution								
	Saturates %	Aromatics %	Polars %	Asphaltenes %	$\frac{Pr}{n\text{-}C_{17}}$	$\frac{Ph}{n\text{-}C_{18}}$	$\frac{TMTD}{Pr}$	$\frac{Np}{Pr}$	$\frac{Pr}{Ph}$	n-Alkane Profile: Maximum	$C_{23}+$ %	OEP C_{25}	OEP C_{27}
Omeo-1 3379 m mud extract	n.d.	n.d.	n.d.	n.d.	0.68	0.12	1.1	0.38	6.6	14	n.d.	n.d.	n.d.
Omeo-1 3379 m mud filtrate B	n.d.	n.d.	n.d.	n.d.	1.1	0.12	0.47	0.26	7.6	23	n.d.	n.d.	n.d.
*Mackeral-1 paraffinic oil	n.d.	n.d.	n.d.	n.d.	0.64	0.11	0.49	0.31	6.1	n.d.	n.d.	n.d.	n.d.
*Tuna-3 naphthenic oil	n.d.	n.d.	n.d.	n.d.	5.8	1.9	1.5	0.48	3.6	n.d.	n.d.	n.d.	n.d.

* Hydrocarbon ratios measured from Figure 6a of Philp and Gilbert (1980).

PE906212

This is an enclosure indicator page.
The enclosure PE906212 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906212 has the following characteristics:

ITEM_BARCODE = PE906212
CONTAINER_BARCODE = PE906207
NAME = Mud Extract Chromatograph
BASIN = GIPPSLAND
PERMIT = VIC/P17
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Mud Extract Chromatograph, Figure-1, (enclosure from attachment 4 to WCR)Omeo-1, 3379m
REMARKS =
DATE_CREATED = 31/07/83
DATE_RECEIVED = 11/08/83
W_NO = W788
WELL_NAME = OMEO-1
CONTRACTOR = AMDEL
CLIENT_OP_CO = AUSTRALIAN AQUITAINE PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

PE906213

This is an enclosure indicator page.
The enclosure PE906213 is enclosed within the container PE906207 at this location in this document.

The enclosure PE906213 has the following characteristics:

ITEM_BARCODE = PE906213
CONTAINER_BARCODE = PE906207
NAME = Mud Filtrate A Chromatograph
BASIN = GIPPSLAND
PERMIT = VIC/P17
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Mud Filtrate A Chromatograph,Figure 2,(enclosure from attachment 4 to WCR) for Omeo-1, 3379m
REMARKS =
DATE_CREATED = 31/07/83
DATE_RECEIVED = 11/08/83
W_NO = W788
WELL_NAME = OMEO-1
CONTRACTOR = AMDEL
CLIENT_OP_CO = AUSTRALIAN AQUITAINE PETROLEUM

PE906214

This is an enclosure indicator page.
The enclosure PE906214 is enclosed within the container PE906207 at this location in this document.

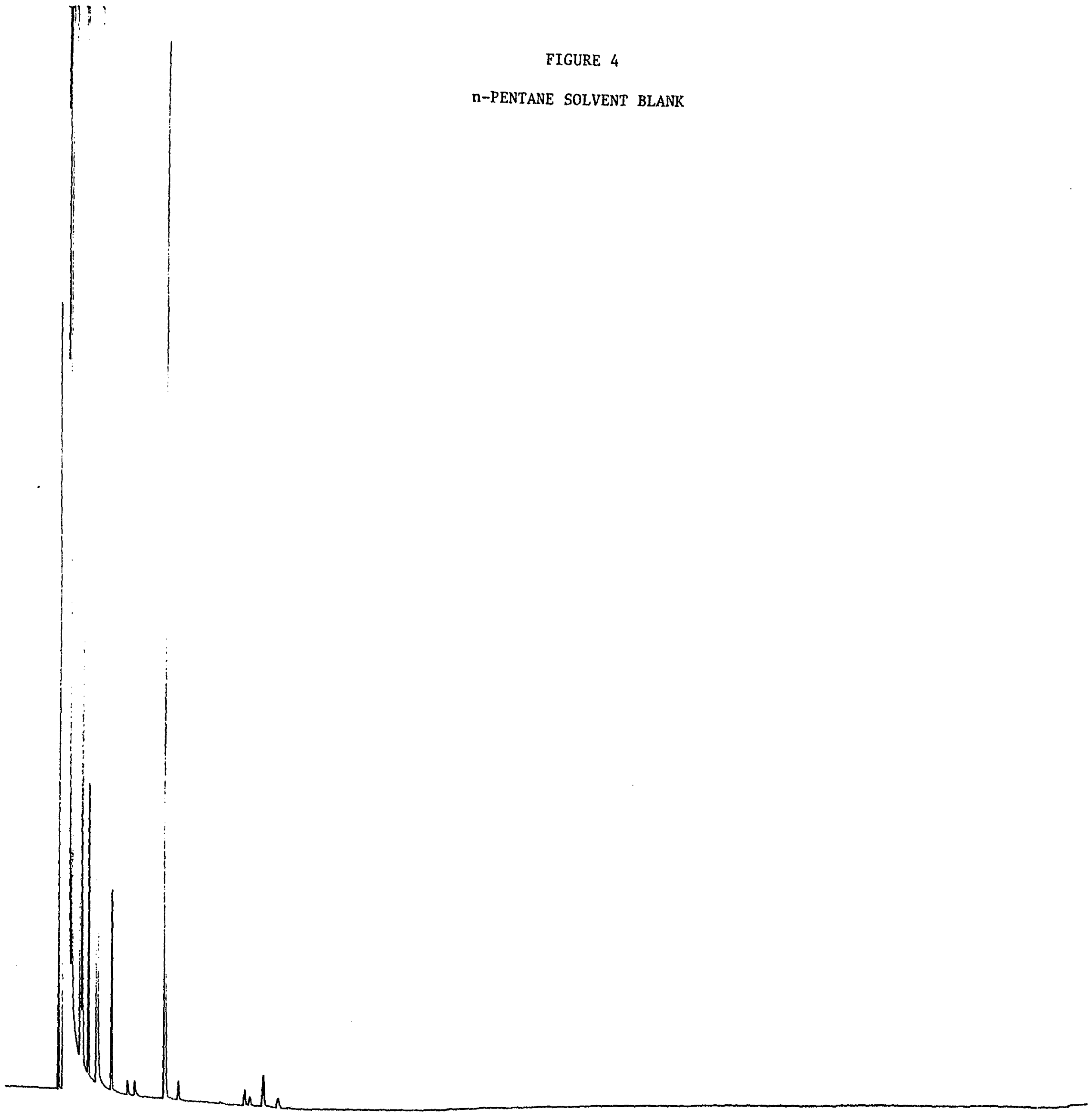
The enclosure PE906214 has the following characteristics:

ITEM_BARCODE =	PE906214
CONTAINER_BARCODE =	PE906207
NAME =	Mud Filtrate B Chromatograph
BASIN =	GIPPSLAND
PERMIT =	VIC/P17
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Mud Filtrate B Chromatograph,Figure 3,(enclosure from attachment 4 to WCR) Omeo-1, 3379m
REMARKS =	
DATE_CREATED =	31/07/83
DATE_RECEIVED =	11/08/83
W_NO =	W788
WELL_NAME =	OMEO-1
CONTRACTOR =	AMDEL
CLIENT_OP_CO =	AUSTRALIAN AQUITAINE PETROLEUM

(Inserted by DNRE - Vic Govt Mines Dept)

FIGURE 4

n-PENTANE SOLVENT BLANK



SECTION 7

7

WATER ANALYSIS REPORT AMDEL COMPUTER SERVICES

SAMPLE ID. 3379A 4525/83

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L	DERIVED AND OTHER DATA	
				CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C	22185.
CATIONS				TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
CALCIUM	(CA)	925.0	46.2	A. BASED ON E.C.	
MAGNESIUM	(MG)	455.0	37.4	B. CALCULATED (HCO3=CO3)	16297.
SODIUM	(NA)	4500.0	195.8	C. RESIDUE ON EVAP. AT 180 DEG. C	
POTASSIUM	(K)	135.0	3.5		
ANIONS				TOTAL HARDNESS AS CACO3	4182.
HYDROXIDE	(OH)	0.	0.0	CARBONATE HARDNESS AS CACO3	767.
CARBONATE	(CO3)	0.	0.0	NON-CARBONATE HARDNESS AS CACO3	3415.
BICARBONATE	(HCO3)	936.	15.3	TOTAL ALKALINITY AS CACO3	767.
SULPHATE	(SO4)	2050.	42.7	FREE CARBON DIOXIDE (CO2)	
				SUSPENDED SOLIDS	
CHLORIDE	(CL)	7767.	219.0	SILICA (SIO2)	
				BORON (B)	
NITRATE	(NO3)	< 4.	0.1		

TOTALS AND BALANCE | UNITS

CATIONS (ME/L)	282.8	DIFF = 5.7		REACTION - PH	6.7
ANIONS (ME/L)	277.1	SUM = 559.9		TURBIDITY (JACKSON)	
				COLOUR (HAZEN)	
DIFF*100 / SUM =	1.0 %			SODIUM TO TOTAL CATION RATIO (ME/L)	69.2 %

REMARKS

OMEO #1 BOTTOMS UP
3379M A
VERY LOW VISCOSITY
FORMATION FLUIDS ?

NAME- AUSTRALIAN AQUITAINE
ADDRESS-P O BOX 725
NORTH SYDNEY

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 25/2/83

WATER ANALYSIS REPORT   AMDEL COMPUTER SERVICES

SAMPLE ID. 3379B   4525/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	1250.0	62.4
MAGNESIUM	(MG)	535.0	44.0
SODIUM	(NA)	5000.0	217.5
POTASSIUM	(K)	160.0	4.1
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	724.	11.9
SULPHATE	(SO4)	3000.	62.5
CHLORIDE	(CL)	9055.	255.4
NITRATE	(NO3)	< 4.	0.1

TOTALS AND BALANCE

CATIONS (ME/L) 328.0   DIFF = 1.8
ANIONS (ME/L) 329.7   SUM = 657.7

DIFF*100.
--------- = 0.3 %
SUM

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 25563.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	19360.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	5323.
CARBONATE HARDNESS AS CACO3	594.
NON-CARBONATE HARDNESS AS CACO3	4729.
TOTAL ALKALINITY AS CACO3	594.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	6.3
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO (ME/L) 66.3 %

REMARKS

OMEO #1 BOTTOMS UP 3379M B
30 MINS AFTER LOW VISCOSITY
FORMATION FLUIDS

NAME- AUSTRALIAN AQUITAINE   HUNDRED- :   WATER CUT-
ADDRESS-P O BOX 725   SECTION-   WATER LEVEL-
NORTH SYDNEY   HOLE NO-   DEPTH HOLE-
SUPPLY-
DATE COLLECTED   SAMPLE COLLECTED BY-
DATE RECEIVED 25/2/83

WATER ANALYSIS REPORT AMDEL COMPUTER SERVICES

SAMPLE ID. MUD 4525/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	225.0	11.2
MAGNESIUM	(MG)	290.0	23.8
SODIUM	(NA)	11600.0	504.6
POTASSIUM	(K)	325.0	8.3
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	1031.	34.4
BICARBONATE	(HCO3)	254.	4.2
SULPHATE	(SO4)	6600.	137.4
CHLORIDE	(CL)	13902.	392.0
NITRATE	(NO3)	< 4.	0.1

TOTALS AND BALANCE

CATIONS (ME/L) 548.0 DIFF = 20.0
ANIONS (ME/L) 568.0 SUM = 1116.0

DIFF*100. / SUM = 1.8 %

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C 33219.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	34102.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	1755.
CARBONATE HARDNESS AS CACO3	208.
NON-CARBONATE HARDNESS AS CACO3	1547.
TOTAL ALKALINITY AS CACO3	1926.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	11.2
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO (ME/L) 92.1 %

REMARKS

OMEO #1 BOTTOMS UP MUD SAMPLE 3379M WIPER FLUID WHILST LOGGING

NAME- AUSTRALIAN AQUITAINE
ADDRESS-P O BOX 725
NORTH SYDNEY

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 25/2/83

DIVIDER PAGE

WATER ANALYSIS REPORT   AMDEL COMPUTER SERVICES

SAMPLE ID. 2849 UPPER   4525/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	75.0	3.7
MAGNESIUM	(MG)	102.0	8.4
SODIUM	(NA)	14500.0	630.8
POTASSIUM	(K)	440.0	11.3
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	866.	14.2
SULPHATE	(SO4)	2950.	61.4
CHLORIDE	(CL)	19489.	549.6
NITRATE	(NO3)	2000.	32.3

TOTALS AND BALANCE

CATIONS (ME/L) 654.1   DIFF = 3.3

ANIONS (ME/L) 657.5   SUM = 1311.6

DIFF*100. / SUM = 0.3 %

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C 45014.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	39982.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	607.
CARBONATE HARDNESS AS CACO3	607.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	709.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	8.3
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	96.4 %

REMARKS

2ND OPENED UPPER CHAMBER
RUN 1

NAME- AUSTRALIAN AQUITAINE
ADDRESS-P O BOX 725
NORTH SYDNEY

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 25/2/83

WATER ANALYSIS REPORT　　　　AMDEL COMPUTER SERVICES

SAMPLE ID. 2849 LOWER　　4525/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	93.0	4.6
MAGNESIUM	(MG)	83.0	6.8
SODIUM	(NA)	14750.0	641.6
POTASSIUM	(K)	430.0	11.0
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	45.	1.5
BICARBONATE	(HCO3)	826.	13.5
SULPHATE	(SO4)	3030.	63.1
CHLORIDE	(CL)	19783.	557.7
NITRATE	(NO3)	2000.	32.3

TOTALS AND BALANCE

CATIONS (ME/L) 664.1　DIFF = 4.2

ANIONS (ME/L) 668.3　SUM = 1332.4

DIFF*100 / SUM = 0.3 %

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C　46014.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	40620.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	574.
CARBONATE HARDNESS AS CACO3	574.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	752.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	8.5
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	96.6 %

REMARKS

1ST OPENED LOWER CHAMBER
RUN 1

NAME- AUSTRALIAN AQUITAINE　HUNDRED-　WATER CUT-

ADDRESS-P O BOX 725　SECTION-　WATER LEVEL-

NORTH SYDNEY　HOLE NO-　DEPTH HOLE-

SUPPLY-

DATE COLLECTED　SAMPLE COLLECTED BY-

DATE RECEIVED 25/2/83

WATER ANALYSIS REPORT

AMDEL COMPUTER SERVICES

SAMPLE ID. 2952 LOWER 4525/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	87.0	4.3
MAGNESIUM	(MG)	53.0	4.4
SODIUM	(NA)	12900.0	561.1
POTASSIUM	(K)	410.0	10.5
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	63.	2.1
BICARBONATE	(HCO3)	715.	11.7
SULPHATE	(SO4)	2530.	52.7
CHLORIDE	(CL)	17532.	494.4
NITRATE	(NO3)	1000.	16.1

TOTALS AND BALANCE

CATIONS (ME/L) 580.3 DIFF = 3.3
ANIONS (ME/L) 577.0 SUM = 1157.4

DIFF*100.
-------- = 0.3 %
SUM

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 42841.

	MILLIGRAMS PER LITRE MG/L
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	34927.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	435.
CARBONATE HARDNESS AS CACO3	435.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	692.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	8.7
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	96.7 %

REMARKS

2ND OPENED LOWER CHAMBER
RUN 2

NAME- AUSTRALIAN AQUITAINE
ADDRESS-P O BOS 725
NORTH SYDNEY

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 25/2/83

WATER ANALYSIS REPORT   AMDEL COMPUTER SERVICES

SAMPLE ID. 2952 UPPER   4525/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	102.0	5.1
MAGNESIUM	(MG)	53.0	4.4
SODIUM	(NA)	10800.0	469.8
POTASSIUM	(K)	390.0	10.0
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	44.	1.5
BICARBONATE	(HCO3)	968.	15.9
SULPHATE	(SO4)	2000.	41.6
CHLORIDE	(CL)	14804.	417.5
NITRATE	(NO3)	1500.	24.2

TOTALS AND BALANCE

CATIONS (ME/L) 489.2   DIFF = 11.4
ANIONS (ME/L) 500.7   SUM = 989.9

DIFF*100
-------- = 1.2 %
SUM

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 35907.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	30170.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	473.
CARBONATE HARDNESS AS CACO3	473.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	867.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	8.4
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO (ME/L) 96.0 %

REMARKS

2ND OPENED UPPER CHAMBER
RUN 2

NAME- AUSTRALIAN AQUITAINE
ADDRESS-P O BOX 725
NORTH SYDNEY

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 25/2/83

WATER ANALYSIS REPORT AMDEL COMPUTER SERVICES

SAMPLE ID. OMEO 1 A 4593/83

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	60.0	3.0
MAGNESIUM	(MG)	0.6	0.1
SODIUM	(NA)	11150.0	485.0
POTASSIUM	(K)	210.0	5.4
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	1052.	17.2
SULPHATE	(SO4)	5250.	109.3
CHLORIDE	(CL)	13365.	375.9
NITRATE	(NO3)	<4.	0.1

TOTALS AND BALANCE

CATIONS (ME/L) 493.4 DIFF = 10.0

ANIONS (ME/L) 503.5 SUM = 996.9

DIFF*100.
--------- = 1.0 %
SUM

DERIVED AND OTHER DATA	MILLIGRAMS PER LITRE MG/L
CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C 35135.	
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	30556.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	152.
CARBONATE HARDNESS AS CACO3	152.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	862.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	7.4
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	98.3 %

REMARKS

NO DISTINGUISHING SAMPLE MARKS SAMPLE LABELLED "A" BY AMDEL
LOWER CHAMBER 3125 M RFT
OMEO 1

NAME- AUSTRALIAN AQUITAINE
ADDRESS-

HUNDRED-
SECTION
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 2/3/83

WATER ANALYSIS REPORT — AMDEL COMPUTER SERVICES

SAMPLE ID. OMEO 1 B   4593/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	63.0	3.1
MAGNESIUM	(MG)	0.1	0.0
SODIUM	(NA)	11250.0	489.4
POTASSIUM	(K)	205.0	5.2
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	997.	16.3
SULPHATE	(SO4)	5300.	110.3
CHLORIDE	(CL)	13314.	375.4
NITRATE	(NO3)	[illegible]4.	0.1

TOTALS AND BALANCE

CATIONS (ME/L) 497.[illegible]   DIFF = 4.4
ANIONS (ME/L) 502.[illegible]   SUM = 1000.0

DIFF*100.
-------- = 0.4 %
SUM

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C   35135.

	MILLIGRAMS PER LITRE MG/L
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	30626.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	158.
CARBONATE HARDNESS AS CACO3	158.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	817.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	7.2
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	98.3 %

REMARKS

NO DISTINGUISHING SAMPLE MARKS SAMPLE LABELLED "B" BY AMDEL
LOWER CHAMBER 3125 M RFT
OMEO 1

NAME- AUSTRALIAN AQUITAINE   HUNDRED-   WATER CUT-
ADDRESS   SECTION-   WATER LEVEL-
HOLE NO-   DEPTH HOLE-
SUPPLY-
DATE COLLECTED   SAMPLE COLLECTED BY-
DATE RECEIVED 2/3/83

WATER ANALYSIS REPORT — AMDEL COMPUTER SERVICES

SAMPLE ID. RFT 4593/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALLIUM	(CA)	65.0	3.2
MAGNESIUM	(MG)	0.7	0.1
SODIUM	(NA)	11300.0	491.5
POTASSIUM	(K)	203.0	5.2
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	985.	16.1
SULPHATE	(SO4)	5150.	107.2
CHLORIDE	(CL)	13365.	376.9
NITRATE	(NO3)	20.	0.3

TOTALS AND BALANCE

CATIONS (ME/L) 500.0 DIFF = 0.5
ANIONS (ME/L) 500.6 SUM = 1000.6

DIFF*100. / SUM = 0.1 %

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 34354.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	30587.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	165.
CARBONATE HARDNESS AS CACO3	165.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	807.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	6.7
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	98.3 %

REMARKS

UPPER CHAMBER 3125 M RFT
OMEO 1

NAME- AUSTRALIAN AQUITAINE
ADDRESS
HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-
WATER CUT-
WATER LEVEL-
DEPTH HOLE-
DATE COLLECTED
DATE RECEIVED 2/3/83

DIVIDER PAGE

WATER ANALYSIS REPORT — AMDEL COMPUTER SERVICES

SAMPLE ID. 4 — 4264/83

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	250.0	12.5
MAGNESIUM	(MG)	80.0	6.6
SODIUM	(NA)	7100.0	308.9
POTASSIUM	(K)	310.0	7.9
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	2262.	37.1
SULPHATE	(SO4)	1760.	36.6
CHLORIDE	(CL)	8693.	245.1
NITRATE	(NO3)	250.	4.0

TOTALS AND BALANCE

CATIONS (ME/L) 335.8 DIFF = 12.9

ANIONS (ME/L) 322.9 SUM = 658.7

DIFF*100. / SUM = 2.0 %

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C 27207.

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	19555.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	953.
CARBONATE HARDNESS AS CACO3	953.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	1854.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	7.2
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	92.0 %

REMARKS

OMEO # 1 08.12 HRS

NAME- AQUITAINE
ADDRESS-SYDNEY

DATE COLLECTED
DATE RECEIVED 11/2/83

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

Of [illegible] mud circulation
OMEO · of telex of 22/2/83

WATER ANALYSIS REPORT AMDEL COMPUTER SERVICES

SAMPLE ID. 5 4264/83

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	380.0	19.0
MAGNESIUM	(MG)	200.0	16.4
SODIUM	(NA)	6700.0	291.4
POTASSIUM	(K)	315.0	8.1
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	3561.	58.4
SULPHATE	(SO4)	1560.	32.5
CHLORIDE	(CL)	8066.	227.5
NITRATE	(NO3)	250.	4.0

TOTALS AND BALANCE

CATIONS (ME/L) 334.9 DIFF = 12.6
ANIONS (ME/L) 322.3 SUM = 657.2

DIFF*100. / SUM = 1.9 %

DERIVED AND OTHER DATA	
CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C 24890.	
TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	19222.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	1772.
CARBONATE HARDNESS AS CACO3	1772.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	2919.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	
	UNITS
REACTION - PH	7.2
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	87.0 %

REMARKS

OMEO # 1 08.16 HRS

NAME- AQUITAINE
ADDRESS-SYDNEY

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED
DATE RECEIVED 11/2/83

WATER ANALYSIS REPORT　　　　AMDEL COMPUTER SERVICES

SAMPLE ID. DST 1 #4　　　4593/83

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	350.0	17.5
MAGNESIUM	(MG)	100.0	8.2
SODIUM	(NA)	7000.0	304.5
POTASSIUM	(K)	300.0	7.7
ANIONS			
HYDROXIDE	(OH)	0.	0.0
CARBONATE	(CO3)	0.	0.0
BICARBONATE	(HCO3)	2356.	38.6
SULPHATE	(SO4)	1950.	40.6
CHLORIDE	(CL)	8741.	246.5
NITRATE	(NO3)	< 4.	0.1

TOTALS AND BALANCE

CATIONS (ME/L) 337.9　　DIFF = 12.1
ANIONS (ME/L) 325.8　　SUM = 663.6

DIFF*100.
------- = 1.8 %
SUM

DERIVED AND OTHER DATA	
CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C	25240.
TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE MG/L
A. BASED ON E.C.	
B. CALCULATED (HCO3=CO3)	19603.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	1285.
CARBONATE HARDNESS AS CACO3	1285.
NON-CARBONATE HARDNESS AS CACO3	<1
TOTAL ALKALINITY AS CACO3	1931.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	
	UNITS
REACTION - PH	7.5
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	90.1 %

REMARKS

OMEO #1　*Upper Chamber*

NAME- AUSTRALIAN AQUITAINE　　HUNDRED　　WATER CUT-
ADDRESS　　SECTION-　　WATER LEVEL-
HOLE NO-　　DEPTH HOLE-
SUPPLY-
DATE COLLECTED　　SAMPLE COLLECTED BY-
DATE RECEIVED 2/3/83

Nº 14

The Australian Mineral Development Laboratories
Flemington Street, Frewville, South Australia 5063
Phone Adelaide 79 1662
Telex AA 82520
Please address all correspondence to
P.O. Box 114 Eastwood SA 5063
In reply quote:

amdel

NATA CERTIFICATE

3/442/0 - AC 4042/83

10 February 1983

The Manager,
Australian Aquitaine Petroleum Pty. Ltd.,
P.O. Box 725,
NORTH SYDNEY N.S.W. 2060

REPORT AC 4042/83

YOUR REFERENCE: Con. Note AP 961712

IDENTIFICATION: As listed

DATE RECEIVED: 28 January 1983

ANALYSIS

SAMPLE MARK	RESISTIVITY @ 25°C ohm.m	T.D.S. @ 180°C grammes/L
Mud Filtrate 2985	0.200	116.6
Method:	Q1/2/7	Q4/1

D.K. Rowley
Manager
Analytical Chemistry Division

D.G. Bowditch
for Norton Jackson
Managing Director

A/c. Checked | V. 619727
Cheque

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