WCR VOL 2

REMORA-1

(W959)

ESSO EXPLORATION AND PRODUCTION
AUSTRALIA INC.

W959. REMORA-1. W.C.R. Vol 2.

WELL COMPLETION REPORT

REMORA-1

VOLUME 2

INTERPRETED DATA

GIPPSLAND BASIN
VICTORIA

ESSO AUSTRALIA LIMITED

Compiled by: G.F.BIRCH

SEPTEMBER 1987

REMORA-1

WELL COMPLETION REPORT

VOLUME 2

(Interpreted Data)

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Doc. 2807L/1

GEOLOGICAL DISCUSSION

Introduction

Remora-1 was drilled by Esso Exploration & Production Australia Inc. on the crest of a low side rollover located immediately south of a major E-W bounding fault in north central Gippsland Basin. The well was drilled to confirm hydrocarbons in fault-sealed closure west of the Sunfish Discovery on the same trend. Encouraging hydrocarbon shows and reasonable porosity at the proposed T.D. (2800mSS) resulted in the well being deepened to 2939mSS. The well terminated below a 66m thick igneous section in overpressured sands.

Stratigraphy

Predicted and drilled formation/horizon depths are given in the table below.

Formation/Horizon Tops	Predicted Depth	Drilled Depth	
	(mSS)	(mSS)	(mKB)
SEASPRAY GROUP (seafloor)	59	57.4	79.4
LATROBE GROUP	2068	2062	2084
Base Turrum Formation	2124	2163	2185
L. balmei Seismic Marker	2183	2180	2202
T. longus Seismic Marker	2562	2560	2582
TOTAL DEPTH	2800	2939	2961

Remora-1 penetrated 2004.6m of limestones, calcareous siltstones and claystones of the Miocene to Oligocene Seaspray Group. Although no micropalaeontology was carried out on the Seaspray Group, the base of this formation is considered to be Miocene as suggested by palynological assemblages and from stratigraphic associations with nearby Marlin-4 and Turrum-1 wells.

The Latrobe Group has been eroded by the Marlin Channel which is partially filled with 101m of Turrum Formation sediments. Calcarenites and calcisiltites at the top of the Turrum Formation contain minor glauconite, pyrite, fragments of foraminifera and echinoderm spines. These sediments become more quartzose and glauconitic with depth and minor constituents are coal, carbonaceous material, pyrite and calcareous fragments. Towards the base of the Turrum Formation the sediments again become more calcareous and the glauconite content decreases. The age of the Turrum Formation is Middle to Late Eocene (Lower to Middle *N. asperus*).

An unconformity separates the Turrum Formation from 176m of Lower L. balmei sediments (Paleocene) - P. asperopolus, M. diversus and Upper L. balmei Early Eocene-Paleocene sediments are not present. The Lower L. balmei below the channel comprises mainly shales with thin interbedded sands similar to Sunfish-1 and -2. Sands tend to increase towards the base of the Lower L. balmei, but most of the thicker sands are dolomitized. Sandstones are predominanly fine grained with minor pyrite, carbonaceous material and carbonate cement. Shales and siltstones are slightly calcareous or micaceous. Subordinate coals are also present.

The T. longus (Maastrichtian) interval (457m) at Remora-1 comprises alternating shales and sandstones with minor coal. Sandstones are predominantly medium to coarse grained and become thicker and more blocky towards the bottom of the section. They are strongly bound with silica and carbonate cement, or occur as loose and friable aggregates. Some sandstones towards the top of the T. longus interval are dolomitized.

The T. lilliei (Campanian) aged section comprises 61m of thin alternating sandstones and shales overlying 66m of igneous rock. Although palynological data are not definative, the base of the T. lilliei is placed at the bottom of a thick intersection of igneous rock because of a similar stratigraphic relationship existing at other wells along this trend. The top 10 to 15m of this section contains carbonaceous and siliceous calcilutites and calcisiltites with minor glauconite and pyrite. Sandstones are predominantly medium grained with assessory pyrite, opaque minerals and glauconite. The rock is friable with loosely bound grains, but occasional silica and dolomite cement and clay matrix result in a hard, indurated fabric.

Fourteen metres of N. senectus-aged (Campanian) sandstones and siltstones were penetrated below the igneous rock. The sandstones are fine to medium grained, micaceous and friable and the siltstones are carbonaceous, indurated and clay-rich.

Lower L. balmei, T. longus, T. lilliei and N. senectus sediments are interpreted to represent coastal plain palaeoenvironments.

Sunfish-1 penetrated 86m of P. mawsonii (Coniacian-Turonian) shale below a thin N. senectus and T. apoxyexinus (Santonian) section at the base of the well and Sunfish-2 terminated in T. apoxyexinus sediments. Although Remora-1 was drilled deeper (by about 200 to 300m) than the Sunfish wells, it penetrated a younger stratigraphic section. This is due to marked thickening of the T. longus interval on the downside of the major NW-SE fault separating the Sunfish and Remora locations.

Structure

The Remora structure is the result of a combination of extensional and compressional deformation, as well as erosion. It is located at the intersection of a major east-west basin-bounding fault and a subsidiary NW-SE orientated fault. The prospect consists of two crests; a northern culmination located immediately south of the main fault and a south-eastern crest close to the subsidiary fault. Remora-1 was located on the northern crest.

The east-west fault is part of the main basin-forming fault system which extends in en echelon fashion across the basin at the southern boundary of the Strzelecki Terrace. In this region it is a normal, down to the south growth fault with displacement varying from 120 to 280m. Growth on this major fault has been continuous to the deepest mappable horizon (T. longus). This deformation is probably related to Otway Rift extensional tectonics coincident with initiation of the basin during the Early-Late Cretaceous.

The subsidiary fault is also a normal, down to the west growth fault with displacements of 140 to 380m. Numerous, less persistent faults with smaller displacements have the same orientation as the subsidiary fault and these form the predominant structural fabric of the region. Although less extensive, these faults commonly persist with depth and are frequently mappable from above the Lower L. balmei to below the T. longus biostratigraphic zones. These faults are related to a second, later extensional phase, possibly associated with the Tasman Rift during the Late Cretaceous/Early Tertiary.

Remora-1 is located above the Marlin Channel, a major NW-SE trending erosional feature. Its eastern flank appears to be controlled by the subsidiary fault lying between Remora-1 and the Sunfish wells. The channel was probably eroded over several transgressive/regressive cycles and active sedimentation only commenced from Lower N. asperus. The Channel is cut into Lower L. balmei (Early Palaeocene) strata and is partially filled with Lower and Middle N. asperus (Late Eocene) calcareous sediments with Lakes Entrance Formation providing the remaining infill (Enclosures 1 and 2).

Late Eocene to Oligocene compression was the final major structural event affecting the Remora-1 region. This event caused reversal on the major E-W basin - bounding fault in the Remora-1 and Sunfish regions and resulted in fault-independent downside closure at these two localities. Differential compression along the length of the bounding fault at Remora produced closure in the east-west sense.

Hydrocarbons

Numerous, thin isolated hydrocarbon accumulations were penetrated by Remora-1. A total of 79.5m of gas sands and 41.5m of oil sands were intersected in the 877m of Latrobe Group penetrated by the well. A further 2m of undifferentiated oil/gas was also encountered. These hydrocarbons are distributed over the full Latrobe section with no obvious stratigraphic preference and no relationship of gas/oil distribution with depth. Assessment of hydrocarbon systems is severely hampered by a sparsity of water pressure data.

Six gas sands, one oil sand and two undifferentiated gas/oil sands were intersected within the lower L. balmei section (2185 to 2361mKB). The sands vary between 0.5 and 6.5m thick; porosities are between 13% and 19% and water saturations range from 31% to 81%. Pressure data allow the oil sand and the three overlying gas sands to be part of a single hydrocarbon system. If valid, this system would have a 75m column which would extend to the mapped structural spill point. The remaining three sands in the Lower L. balmei are separate systems.

The T. longus section contains the majority of the hydrocarbon sands. Sixteen gas and ten oil sands were encountered between 2361 and 2818mKB. Pressure data suggest that the upper two gas sands between 2401 and 2441mKB belong to the same system. An overlying untested gas sand (2397.5-2399.25mKB) is probably also part of this system. Based on a single water pressure datum deeper in the section (2547mKB) and an average basin water gradient, this system would have a gas column of 54m. The system with the highest hydrocarbon potential occurs between 2618.0 and 2678.5mKB where two gas sands and four oil sands are interpreted to belong to the same system. Pressure data indicate an OWC at 2738mKB which would result in a hydrocarbon column of 120m. A GOC is inferred from pretests at 2648mKB giving a 90m oil column. The average porosity and water saturation over the total hydrocarbon column is 14% and 41%, respectively. The remaining twelve gas sands and five oil sands are, as far as can be determined, thin isolated systems with short columns.

Untested oil is interpreted from log data below the igneous intersection in poor porosity N. senectus sands between 2949.5 and 2960.0mKB.

Seal

Top seal within the Latrobe Group is provided by a repetitive succession of coastal plain sequences which are demonstratable seals in both the Sunfish wells and Remora-1. Even in the lower more sandy T. longus and T. lilliei section intraformational shales provide viable seals as evidenced by the many hydrocarbon reservoirs throughout this interval. Igneous rocks near the bottom of the well have provided an additional reliable top seal to hydrocarbons as similar rocks have done in the adjacent Sunfish Discovery.

Fault seal along the major E-W bounding fault, the subsidiary NW-SE fault and the numerous similarily orientated intraprospect faults is the critical factor controlling the size of this discovery. For the Lower L. balmei oil/gas reservoir to have a 75m column would require sealing along the E-W fault north of the well. Similarily, the 120m column inferred for the T. longus oil/gas reservoir would also require the north bounding fault to seal for a considerable distance (1.5 km) along strike. These results would suggest that the north bounding fault provides an inconsistent seal with depth. Due to the complexity of faulting and the numerous intersections with the major E-W fault, it is likely that any one of these intersections may cause leakage which is depth-variable. Similar inconsistences occur at the Sunfish discovery. The major NW-SE fault does not however appear to fault-seal the northern Remora accumulation.

GEOPHYSICAL DISCUSSION

The mapping of the Remora Structure was carried out using the G80S Sunfish 3D migrated data with a line spacing of 75 metres.

The Latrobe Group horizons mapped pre-drill were : the top of Latrobe Group, Base of Turrum Formation, Base of an intra-Latrobe Group Channel, Lower M. diversus, lower L. balmei and T. longus seismic horizons. Although all these horizons were used in the depth conversion process, only the Top of Latrobe Group, Base of Turrum Formation, Lower L. balmei and T. longus horizons were intersected at the well location.

Depth conversion to the Top of Latrobe was carried out using modelled Vnmo and Conversion Factor fields derived from G80S and G80A velscan data and well data from Sunfish-1 and Sunfish-2. The Top of Latrobe Group was intersected 6 metres high to prediction, representing an error of 0.3%. After correcting for the actual as opposed to the called location, the residual error of 2 metres was corrected by adjusting the Vnmo CF map.

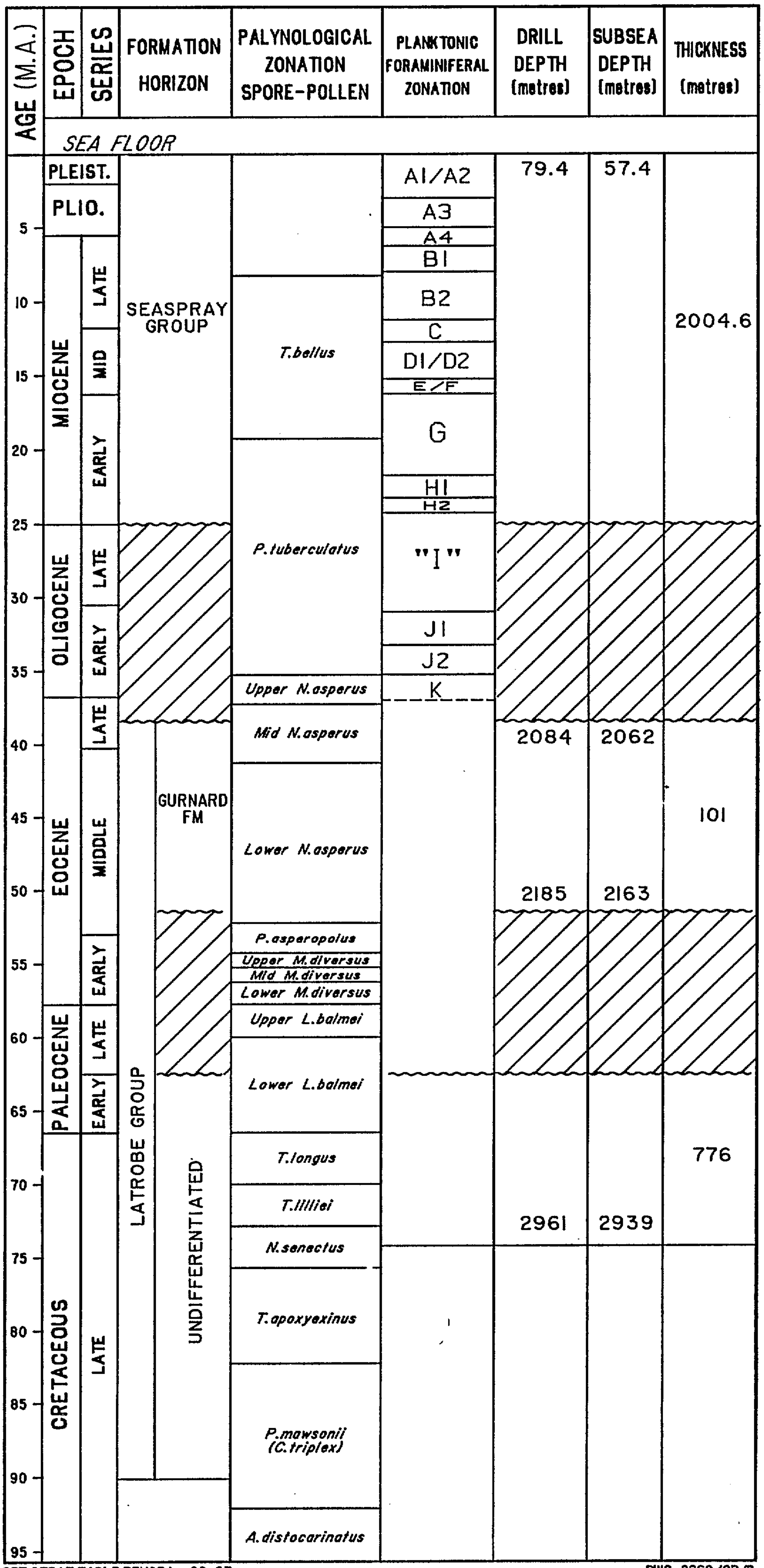
The depth conversion to the Base of Turrum Formation was achieved by isopaching down from the top of Latrobe Group using a constant interval velocity derived from Turrum-1. The Base of Turrum Formation was intersected 39 metres low to prediction. The major cause of this error was due to the seismic response of the Base of Turrum Formation being represented not by the leading zero crossing of a black but rather half a cycle lower (see Appendix 5 - zero-phase synthetic). The remaining error can be attributed to a slight increase in interval velocity from 3312 m/sec at Turrum-1 to 3339 m/sec calculated at Remora-1 from sonic data alone.

The depth conversions to all other intra-Latrobe horizons were carried out by successively isopaching down from each overlying seismic horizon using hand contoured Dix interval velocity grids and time weighted average conversion factors derived from Sunfish-1 and Sunfish-2. Both the Lower L. balmei and the T. longus seismic horizons were intersected within the correct palynological intervals.

FIGURES

FIGURES

REMORA-1
STRATIGRAPHIC TABLE



DFT.STRAT.TABLE.REMORA 09-87 DWG. 2368/OP/2

APPENDIX 1

APPENDIX-1

PALYNOLOGICAL ANALYSIS OF REMORA-1
GIPPSLAND BASIN

by

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Esso Australia Ltd. September, 1987
Palaeontology Report 1987/9

2754L:1

INTERPRETED DATA

INTRODUCTION

Thirty-five sidewall core and four cuttings samples were examined for spore-pollen and dinoflagellates. Selected samples were also examined for kerogen type and thermal alteration index. Oxidized organic yields are mostly moderate to high while preservation is generally poor. Recorded spore-pollen diversity is mostly moderate. Dinoflagellate diversity is moderate to high in the Turrum Formation and overlying Seaspray Group, while only one sample from the underlying undifferentiated Latrobe Group contained dinoflagellates.

Lithological units and palynological zones from the base of the Seaspray Group to T.D. are summarized below. Interpretative data with zone identifications and confidence ratings are recorded in Table-1 and basic data on residue yields, preservation and diversity are recorded in Table-2. The occurrences and relative frequencies of spore-pollen and dinoflagellate species are tabulated on the accompanying range chart. Kerogen data for 30 samples are recorded in Table-3.

SUMMARY

AGE	UNIT/FACIES	ZONE	DEPTH (mKB)
Oligocene-Miocene	Seaspray Group	*P. tuberculatus*	2065.0-2080.0
— UNCONFORMITY —	— 2084.0m —		
Late Eocene	Turrum	Middle *N. asperus*	2088.0-2115.0
Middle Eocene	Formation	Lower *N. asperus*	2119.0-2182.0
— UNCONFORMITY —	— 2185.0m —		
Paleocene	Latrobe Group	Lower *L. balmei*	2194.5-2338.8
Maastrichtian	(undifferentiated	Upper *T. longus*	2369.0-2572.5
Maastrichtian	sands, shales	Lower *T. longus*	2581.0-2756.0
Campanian	coals and	*T. lilliei*	2790.0-2859.0
Campanian	volcanics)	*N. senectus*	2947.0-2958.5
	— T.D. 2961.0m —		

GEOLOGICAL COMMENTS

1. The Turrum Formation in Remora-1 is bounded by significant unconformities. The top of the formation has probable Miocene Lakes Entrance Formation unconformably overlying Late Eocene, while at the base Middle Eocene overlies Paleocene.

2. The Turrum Formation displays increasing marine influence from the bottom to the top of the formation. The indicators are the increase in glauconite and carbonate in the sidewall cores and the increase in the abundance and diversity of dinoflagellates (Table-2). The exception to this trend are the sidewall cores at 2101m and 2119m which exhibit low dinoflagellate diversity a result of low palynomorph recoveries. The increase in marine indicators is a result of either or both a combination of decreasing sedimentation rates or increasing water depth during deposition of the Turrum Formation.

3. The Lower and Middle N. asperus Zones in Remora-1 are represented in the Turrum Formation by different average shale response on the gamma ray log and are separated by a distinct log break at 2116.5m. A log break separating these zones in the Gurnard Formation is usually found in other wells where palynological control is adequate. This log break probably represents the 39.5 million year sequence boundary (see Haq et al., 1987) and has the potential to give a more detailed correlation between the Turrum and Gurnard Formations. Other log breaks in the Turrum Formation in Remora-1 are noted at 2142m and 2172.5m, however these cannot be related confidently to palynomorph assemblage changes or sequence boundaries.

4. Erosion by the Marlin Channel at the Remora-1 location has removed approximately 300m of Late Paleocene to Early Eocene undifferentiated Latrobe Group sediments prior to deposition of the Turrum Formation. This estimate of missing section is based on a comparison to the thickness of this interval in Sunfish-1 and 2.

5. The datum approximating the Cretaceous/Tertiary boundary recognized on log character in other wells from more marine environments in the Gippsland Basin cannot be located in the coastal plain facies found in Remora-1.

6. The volcanics intersected between 2885 to 2946m separate the T. lilliei and N. senectus Zones and are time equivalent with volcanics located in other parts of the northeastern Gippsland Basin. It is not possible to demonstrate with the poor palynological data available from this part of Remora-1 whether any section is missing related to erosion associated with the breakup unconformity proposed by Lowry (1987).

BIOSTRATIGRAPHY

The zone boundaries have been established using the criteria of Stover & Partridge (1973) and Helby et al. (1987). The author citations for most of the spore-pollen species recorded can be sourced from either these publications or references cited therein. The exception are species followed by "ms" indicating manuscript names. Author citations for dinoflagellates can be found in Lentin & Williams (1985).

Nothofagidites senectus Zone: 2947.0-2958.5 metres.

The two samples assigned to this zone gave very limited, poorly preserved assemblages. The presence of N. senectus confirms an age no older than this zone, however given the poor assemblages from these samples the section could belong to the younger T. lilliei Zone. The sidewall core at 2954.0m identified as a possible altered volcanic rock gave a moderate yield of organic material and rare spores and pollen, indicating the lithology is a tuff or a reworked volcanic sandstone.

Tricolporites lilliei Zone: 2790-2859 metres.

The sidewall core at 2859m is assigned to the T. lilliei Zone on the presence of Triporopollenites sectilis, frequent Gambierina rudata and a single poorly preserved and tentatively identified specimen of Tricolporites lilliei. The three cuttings samples between 2790 to 2822m were only given a cursory examination to confirm their age as N. senectus Zone or younger.

Lower Tricolpites longus Zone: 2581-2756 metres.

The base of the Lower T. longus Zone is picked on the oldest occurrence of T. longus and Tetracolporites verrucosus following the revised zone definition for the T. longus Zone given by Helby et al. (1987). Both species first occur at 2756m. The samples from this zone are dominated by Gambierina rudata, Nothofagidites senectus, Phyllocladidites mawsonii and Latrobosporites spp. The eponymous zone species and other characteristic T. longus Zone species are rare.

Upper Tricolpites longus Zone: 2369-2572.8 metres.

The base of the Upper T. longus Zone is picked on the oldest occurrence of Stereisporites (Tripunctisporis) sp. found at 2572.5m. In general this species is rare. The samples from this zone also display frequent to abundant Gambierina spp. and more frequent occurrence and greater diversity of accessory species typical of the T. longus Zone. From amongst these latter species the youngest occurrences of Proteacidites clinei ms, P. otwayensis ms and Quadraplanus brossus are used to pick the top of the zone at 2369m. This last sample also contains the only occurrence of dinoflagellates below the base of the Turrum Formation.

Lower Lygistepollenites balmei Zone: 2194.5-2338.8 metres

Although most samples from this zone gave reasonable yields of organic residue the concentration and diversity of the spore-pollen assemblages were low and preservation is poor. The base of the zone is picked at 2338.8m in an assemblage of moderate diversity which lacks T. longus Zone indicator species. The top of the zone, picked at 2194.5m on the common occurrence of Lygistepollenites balmei, is readily distinguished from the overlying Turrum Formation assemblages on the absence of dinoflagellates.

Lower Nothofagidies asperus Zone: 2119-2182 metres.

The base of this zone is readily picked by the oldest occurrence of Middle Eocene dinoflagellates and the marked change in the spore-pollen assemblage across the unconformity at the base of the Turrum Formation. Key spore-pollen species supporting this zone assignment are limited but include Nothofagidites falcatus at 2173.8m and 2139m, plus Proteacidites recavus and Tricolpites simatus both at 2139m. The dinoflagellates in general are more definitive and based on the occurrence of the nominate species enable the recognition of the following zones:

Deflandrea heterophlycta Zone: 2119m
Areosphaeridium diktyoplokus Zone: 2133.9-2182m

Middle Nothofagidites asperus Zone: 2088-2115 metres.

Each of the three samples in this zone gave poor assemblages of spores and pollen. The zone is thus identified with poor confidence on the presence of the dinoflagellate species Alisocysta ornatum at 2088m and Schematophora speciosus at 2115m. Elsewhere these dinoflagellates are characteristic of the Middle N. asperus Zone.

Proteacidites tuberculatus Zone: 2065-2080 metres.

The frequent occurrence of the spore Cyatheacidites annulatus in two low yield samples enable a good confidence zone pick. Although there is no supporting foraminiferal analysis the frequent occurrence of C. annulatus and the associated dinoflagellates overall suggest a Miocene rather than an Oligocene age for the base of the Seaspray Group.

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TABLE 1: SUMMARY OF INTERPRETATIVE DATA FOR REMORA-1

SAMPLE TYPE	DEPTH	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONF. RATING	COMMENTS
SWC 60	2065.0m	P. tuberculatus		0	Frequent Cyatheacidites annulatus
SWC 59	2080.0m	P. tuberculatus		0	Frequent Cyatheacidites annulatus
SWC 58	2088.0m	Middle N. asperus		2	
SWC 57	2101.0m	Indeterminate			Insufficient yield for determination
SWC 56	2115.0m	Middle N. asperus		2	
SWC 55	2119.0m	Lower N. asperus	D. heterophlycta	1	
SWC 54	2133.9m	Lower N. asperus	A. diktyoplokus	1	
SWC 53	2139.0m	Lower N. asperus	A. diktyoplokus	1	Common O. centrocarpum
SWC 52	2152.0m	Lower N. asperus	A. diktyoplokus	1	Dominated by A. diktyoplokus
SWC 51	2173.8m	Lower N. asperus	A. diktyoplokus	1	
SWC 50	2182.0m	Lower N. asperus	A. diktyoplokus	1	Palynomorph concentration low.
SWC 49	2194.5m	Lower L. balmei		1	Common L. balmei
SWC 48	2200.2m	Lower L. balmei		2	
SWC 47	2202.2m	Lower L. balmei		2	Common L. balmei.
SWC 46	2204.4m	Indeterminate			
SWC 44	2245.5m	Lower L. balmei		1	
SWC 42	2308.0m	Indeterminate			
SWC 40	2338.8m	Lower L. balmei		1	
SWC 39	2369.0m	Upper T. longus		1	Trichodinium hirsutum only dino.
SWC 37	2396.5m	Indeterminate			

TABLE 1: SUMMARY OF INTERPRETATIVE DATA FOR REMORA-1

SAMPLE TYPE	DEPTH	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONF. RATING	COMMENTS
SWC 36	2426.3m	Upper *T. longus*		1	Abundant *Gambierina*
SWC 35	2460.0m	Upper *T. longus*		1	Common *Gambierina*
SWC 34	2464.0m	Indeterminate			
SWC 33	2483.5m	Upper *T. longus*		1	Frequent *Gambierina*
SWC 31	2557.0m	Upper *T. longus*		1	Frequent *Gambierina*
SWC 29	2572.5m	Upper *T. longus*		1	Common *Gambierina*
SWC 28	2581.0m	Lower *T. longus*		2	Common *Gambierina*
SWC 26	2612.8m	Lower *T. longus*		2	Common *Gambierina*
SWC 24	2641.0m	Indeterminate			
SWC 21	2716.0m	Lower *T. longus*		1	Abundant *N. senectus*
SWC 19	2749.5m	Indeterminate			Barren of fossils
SWC 18	2756.0m	Lower *T. longus*		1	
Cuttings	2790-95m	*T. lilliei*		3	
Cuttings	2805-10m	*T. lilliei*		3	
Cuttings	2820-22m	*T. lilliei*		3	
SWC 10	2859.0m	*T. lilliei*		2	Common *N. senectus*
SWC 4	2947.0m	*N. senectus*		2	Abundant *N. senectus*
SWC 2	2954.0m	Indeterminate			Fossils confirm SWC not volcanic
SWC 1	2958.5m	*N. senectus*		2	

PALYNOLOGY DATA SHEET

BASIN: GIPPSLAND　　ELEVATION: KB: 22.0m　GL: -57.4m

WELL NAME: REMORA-1　　TOTAL DEPTH: 2916.0 (Schl.)

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	*T. pleistocenicus*										
	M. lipsis										
	C. bifurcatus										
	T. bellus										
PALEOGENE	*P. tuberculatus*	2065	0				2080	0			
	Upper *N. asperus*										
	Mid *N. asperus*	2088	2				2115	2			
	Lower *N. asperus*	2119	1				2182	1			
	P. asperopolus										
	Upper *M. diversus*										
	Mid *M. diversus*										
	Lower *M. diversus*										
	Upper *L. balmei*										
	Lower *L. balmei*	2194.5	1				2338.8	1			
LATE CRETACEOUS	Upper *T. longus*	2369	1				2572.5	1			
	Lower *T. longus*	2581	2				2756	1			
	T. lilliei	2790	3				2859	2			
	N. senectus	2947	2				2958.5	2			
	T. apoxyexinus										
	P. mawsonii										
	A. distocarinatus										
EARLY CRET.	*P. pannosus*										
	C. paradoxa										
	C. striatus										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: Depths in metres.
D. heterophylycta Dino. Zone 2119m (Rtg 1)
A. diktyoplokus Dino. Zone 2133.9-2182m (Rtgs 2)

CONFIDENCE RATING:
- O: SWC or Core, Excellent Confidence, assemblage with zone species of spores, pollen and microplankton.
- 1: SWC or Core, Good Confidence, assemblage with zone species of spores and pollen or microplankton.
- 2: SWC or Core, Poor Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.
- 3: Cuttings, Fair Confidence, assemblage with zone species of either spores and pollen or microplankton, or both.
- 4: Cuttings, No Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: A.D. Partridge　　DATE: July 1987

DATA REVISED BY:　　DATE:

BASIC DATA

TABLE-2: BASIC DATA
KEROGEN SUMMARY
TABLE-3: KEROGEN DATA

TABLE-2: SUMMARY OF BASIC PALYNOLOGY DATA FOR REMORA-1

SAMPLE TYPE	DEPTH	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE-POLLEN DIVERSITY	DINOFLAGELLATES ABUNDANCE	NO. SPECIES
SWC 60	2065.0m	Calc. claystone	Low	Fair	Moderate	Common	9+
SWC 59	2080.0m	Calc. claystone	Low	Poor	Moderate	Common	5+
SWC 58	2088.0m	Glauc. silty sst.	Moderate	Poor-fair	Moderate	Common	10+
SWC 57	2101.0m	Glauc. sdy siltst.	Very low	Poor-fair	Low	Rare	4+
SWC 56	2115.0m	Glauc. slty sst.	Low	Poor-fair	Moderate	Common	14+
SWC 55	2119.0m	Glauc. sdy slst.	Very low	Fair-good	Moderate	Frequent	8+
SWC 54	2133.9m	Glauc. slty sst.	Low	Fair	Moderate	Frequent	10+
SWC 53	2139.0m	Silty glauc. sst.	High	Fair-good	High	Frequent	11+
SWC 52	2152.0m	Silty carb. sst.	Moderate	Poor	Low	Common	4+
SWC 51	2173.8m	Mica. siltst.	High	Poor-fair	Moderate	Frequent	5+
SWC 50	2182.0m	V. fine mica. sst.	Moderate	Poor	Low	Rare	4
SWC 49	2194.5m	V. fine carb. sst.	Moderate	Poor	Moderate		
SWC 48	2200.2m	Mica. siltst.	High	Poor	Low		
SWC 47	2202.2m	Qtz sst.	Low	Very poor	Low		
SWC 46	2204.4m	Pyr. qtz. sst.	Very low	Poor	Low		
SWC 44	2245.5m	Mica. sltst.	High	Poor	Moderate		
SWC 42	2308.0m	Mica. qtz sst.	Moderate	Poor	Low		
SWC 40	2338.8m	Mica. qtz slst.	High	Fair	Moderate		
SWC 39	2369.0m	Mica. shale	High	Fair	High	Very rare	1
SWC 37	2396.5m	Mica. shale	Low	Poor	Very low		
SWC 36	2426.3m	Mica. shale	High	Poor	Moderate		
SWC 35	2460.0m	Carb. slst.	Moderate	Poor-fair	Moderate		

TABLE-2: SUMMARY OF BASIC PALYNOLOGY DATA FOR REMORA-1

SAMPLE TYPE	DEPTH	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE-POLLEN DIVERSITY	DINOFLAGELLATES ABUNDANCE	NO. SPECIES
SWC 34	2464.0m	Grey slst.	Low	Very poor	Very low		
SWC 33	2483.5m	Sdy slst.	High	Fair	Moderate		
SWC 31	2557.0m	Mica. shale	High	Poor-fair	Moderate		
SWC 29	2572.5m	Shale	High	Fair	Moderate		
SWC 28	2581.0m	Shale	Moderate	Poor	Moderate		
SWC 26	2612.8m	Sdy slst.	Moderate	Poor	Moderate		
SWC 24	2641.0m	Carb. shale	Moderate	Poor-fair	Low		
SWC 21	2716.0m	Sdy carb. slst	High	Poor	Moderate		
SWC 19	2749.5m	Carb. sst.	Moderate	Poor	Barren		
SWC 18	2756.0m	Siltstone	Moderate	Poor-fair	Moderate		
Cuttings	2790-95m		Moderate	Poor	Low		
Cuttings	2805-10m		High	Poor	Moderate		
Cuttings	2820-22m		High	Poor	Moderate		
SWC 10	2859.0m	Carb. sltst.	Moderate	Poor	Moderate		
SWC 4	2947.0m	Carb. sltst.	Moderate	Poor	Moderate		
SWC 2	2954.0m	Volcanic tuff?	Moderate	Poor	Low		
SWC 1	2958.5m	Slty sst.	Moderate	Poor	Low		

DIVERSITY

Low = less than 10 species

Moderate = 10 to 30 species

High = more than 30 species

KEROGEN SUMMARY

The results of kerogen analysis of 30 samples to assist geochemical analysis of maturation and source potential are presented in Table-3.

The thermal maturation indicies follow the scheme of F.L. Staplin (1977: Interpretation of maturation history from colour of particulate organic matter - A review. Palynology vol. 1, p. 9-18). The kerogen classification scheme is a slightly modified version of the scheme proposed by Th. C. Masran & S.A.J. Pocock (1981: The classification of plant-derived particulate organic matter in sedimentary rocks. In Organic Maturation Studies and Fossil Fuel Exploration, J. Brooks (editor), Academic Press Inc. (London) Ltd. p. 145-175).

LEGEND TO TABLE-3

TAI = Thermal Alteration Index

KEROGEN (Particulate organic matter types) expressed as percentages

Amorphous	=	1.1 (undifferentiated) + 1.2 (grey amorphous)
Structured aqueous	=	2.1 (algae) + 2.2 (dinoflagellates/acritarchs)
Biodegraded terrestrial	=	3.0
Spore-pollen	=	4.0
Structured terrestrial	=	5.1 (laminar) + 5.2 (cellular) + 5.3 (semi opaque)
Inert	=	6.1 (opaque) + 6.2 (meta-opaque)
Indeterminate organic fines	=	7.0 (expressed as decimal fraction of total organic matter but excluded from percentage count)

OIL PRONE = sum of categories 1.0 to 4.0

TABLE 3: KEROGEN ANALYSIS REMORA-1, GIPPSLAND BASIN

SAMPLE	DEPTH (m)	TAI	1.1	2.2	3.0	4.0	5.1	5.2	5.3	6.1	7.0	% OIL PRONE
SWC 60	2065.0	1.9	10	3	10	2			25	50	0.10	25
SWC 59	2080.0	2.0	15	5	20				20	40	0.05	40
SWC 58	2088.0	2.1	56	2	20	2			10	10	0.05	80
SWC 56	2115.0	2.1	40		30	tr			20	10	0.10	70
SWC 55	2119.0	2.1	10		10	2			73	5	0.05	22
SWC 54	2133.9	2.0	80		10				8	2	0.05	90
SWC 52	2152.0	2.0	5	2	22	1			60	10	0.05	30
SWC 51	2173.8	2.0	20		60				15	5	0.25	80
SWC 50	2182.0	2.0	20		68	tr			10	2	0.20	88
SWC 49	2194.5	2.0	5		15	tr			60	20	0.10	20
SWC 48	2200.5	1.9	5		43	2			30	20	0.10	50
SWC 47	2202.5	2.1				1			69	30	0.01	1
SWC 44	2245.5	2.0	10		60		5		15	10	0.20	70
SWC 42	2308.0	2.0	3		25			22	25	25	0.02	28
SWC 40	2338.8	2.0	40		30	tr			15	15	0.20	70
SWC 39	2369.0	2.0	15		60	tr			20	5	0.25	75
SWC 37	2396.5	2.1	15		5				60	40	0.10	20
SWC 36	2426.3	2.1			20	5			55	20	0.10	25
SWC 33	2483.5	2.0	20		65				5	10	0.25	85
SWC 29	2572.5	2.1	30		37	3	5		5	20	0.20	70
SWC 28	2581.0	2.0	35		40	5			15	5	0.25	80
SWC 26	2612.8	2.0			20	5			50	25	0.05	25
SWC 24	2641.0	2.1	10		50	tr			13	27	0.20	60
SWC 21	2716.0	2.1	5		40	5	25		10	15	0.20	50
SWC 19	2749.5		2		10				80	8	0.10	12
SWC 18	2756.0	2.1	5		80	tr			10	5	0.25	85
SWC 10	2859.0	2.1	5		73	2			15	5	0.20	80
SWC 4	2947.0	2.1	22		65	1		5	5	2	0.20	88
SWC 2	2954.0	2.2	15		60	tr			20	5	0.25	75
SWC 1	2958.5	2.3	50		28	2			15	5	0.20	80

PE900460

This is an enclosure indicator page.
The enclosure PE900460 is enclosed within the container PE902212 at this location in this document.

The enclosure PE900460 has the following characteristics:

ITEM_BARCODE = PE900460
CONTAINER_BARCODE = PE902212
NAME = Palynological Range Chart
BASIN = GIPPSLAND
PERMIT = VIC/P1
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Palynological Range Chart for Remora-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W959
WELL_NAME = REMORA-1
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX - 2

APPENDIX 2

APPENDIX 2

QUANTITATIVE LOG ANALYSIS

REMORA-1

QUANTITATIVE LOG ANALYSIS

Interval: 2170 - 2690MDKB

Analyst : L. J. Finlayson

Date : June, 1987

REMORA-1

QUANTITATIVE LOG ANALYSIS

Remora-1 wireline logs have been analysed for effective porosity and water saturation over the interval 2170-2690m KB. Analysis was carried out using a reiterative technique which incorporates hydrocarbon correction to the porosity logs, density-neutron cross-plot porosities, a Dual Water saturation relationship, and convergence on a preselected grain density window by shale volume adjustment.

Logs Used

LLD, RHOB, NPHI, GR, DT.

Log Quality

All logs seem to be of reasonable quality, however some caution is suggested with regard to the calculated porosities and water saturations near TD as sticky hole conditions have caused some deterioration in log quality. A shift of -0.015 has been applied to the NPHI curve to normalise it to the RHOB curve in clean water bearing quartz sands. This shift may be caused by "stand-off" of the CNT from the borehole wall.

Analysis Parameters

a	1	
m	2	
n	2	
Apparent Shale Density (RHOBSH)	2.60 gm/cc	(2170-2800m)
" " " "	2.65 gm/cc	(2800-2960m)
Apparent Neutron Porosity (NPHISH)	0.30	(2170-2800m)
" " " "	0.20	(2800-2960m)
Rsh	20 ohm.m	(2170-2800m)
"	30 ohm.m	(2800-2960m)
Grain density - lower limit	2.65 gm/cc	
Grain density - upper limit	2.67 gm/cc	
Mud Filtrate Density (RHOF)	1.01 gm/cc	
Bottom Hole Temperature	100° C	

Shale Volume

An initial estimate of VSH was taken from the Gamma Ray.

$$X = \frac{GR - GRmin}{GRmax - GRmin} \qquad - 1$$

$$VSH = 1.7 - \quad 3.38 - (X + 0.7)^2$$

where the following GRmin and GRmax were used:

2170-2190m, GRmin = 30 API units, GRmax = 100 API units
2190-2789m, GRmin = 25 API units, GRmax = 120 API units
2789-2960m, GRmin = 25 API units, GRmax = 100 API units

Total Porosities

Total porosity was initially calculated from a density-neutron logs using the following algorithms:

$$h = 2.71 - RHOB + NPHI\,(RHOF - 2.71) \qquad -2$$

if h is greater than 0, then

$$\text{apparent matrix density, } RHOMa = 2.71 - h/2 \qquad -3$$

if h is less than 0, then

$$\text{apparent matrix density, } RHOMa = 2.71 - 0.64h \qquad -4$$

$$\text{Total porosity: } PHIT = \frac{RHOMa - RHOB}{RHOMa - RHOF} \qquad -5$$

where RHOB = bulk density in gms/cc
NPHI = neutron porosity in limestone porosity units.
RHOF = fluid density (1.01 gms.cc)

Free Formation Water (Rw) and Bound Water (Rwb) Resistivities

Free water resistivity was derived by calculating total porosities and Rwa over the logged interval. Free formation water resistivity (Rw) was taken from the clean, water sand Rwa. Bound water resistivity (Rwb) is calculated from the input shale resistivity value, Rsh.

A Rw equivalent to a salinity of 60,000 ppm NaCleg was used above 2200mKB and 15,000 ppm NaCleg below.

Water Saturations

Water saturations were determined from the Dual Water model which uses the following relationship:

$$\frac{1}{Rt} = SwT^{n} * \frac{PHIT^{m}}{aRw} + SwT^{(n-1)}\ \frac{Swb * PHIT^{m}}{a}\ \frac{1}{Rwb} - \frac{1}{Rw} \qquad -6$$

or

$$\frac{1}{Rxo} = SxoT^{n} * \frac{PHIT^{m}}{aRmf} + SxoT^{(n-1)}\ \frac{Swb * PHIT^{m}}{a}\ \frac{1}{Rwb} - \frac{1}{Rmf} \qquad -7$$

where: SwT and SxoT are "total" water saturations

$$\text{and Swb (bound water saturation)} = \frac{VSH * PHISH}{PHIT} \qquad -8$$

where: PHISH = total porosity in shale derived from density-neutron cross-plot.

with $a = 1$
$m = 2$
$n = 2$

Hydrocarbon correction to the porosity logs utilised the following algorithms:

$$RHOB.HC = RHOB(raw) + 1.07\ PHIT\ (1-SxoT)\ [(1.11-0.15P)RHOF - 1.15RHOH] \quad -9$$

$$NPHI.HC = NPHI(raw) + 1.3\ PHIT\ (1-SxoT)\ \frac{RHOF(1-P)-1.5RHOH + 0.2}{RHOF(1-P)} \quad -10$$

where P = mud filtrate salinity in parts per unity
RHOF = mud filtrate density
RHOH = hydrocarbon density
RHOB.HC = hydrocarbon corrected bulk density
NPHI.HC = hydrocarbon corrected neutron porosity

The calculated "grain density" was derived by removing the shale component from the rock using the following algorithms:

$$RHOBSC = \frac{RHOB.HC - VSH * RHOBSH}{1 - VSH} \quad -11$$

$$NPHISC = \frac{NPHI.HC - VSH * NPHISH}{1 - VSH} \quad -12$$

The shale corrected density and neutron values were then entered into the cross-plot algorithms (equations 2, 3 and 4) to derive grain density (RHOG).

If calculated RHOG fell inside the specified grain density window, then PHIE and Swe were calculated as follows:

$$PHIE = PHIT - VSH * PHISH \quad -13$$

$$Swe = 1 - \frac{PHIT}{PHIE} (1-SwT) \quad -14$$

if VSH was greater than 60%, then Swe was set to 1 and PHIE set to zero.

If calculated RHOG fell outside the specified grain density window, the VSH was adjusted appropriately and the process repeated.

Coals and volcanics were edited for an output of VSH = 0, PHIE = 0 and Swe = 1.

Comments

1. A number of hydrocarbon zones have been identified in Remora-1. These have been summarised in a Summary of Results table, listed and displayed as a depth plot.

2. Some caution is suggested with regard to thin and/or low porosity sands as water saturation calculations and fluid identification can be difficult in such zones.

LJF/38141/83-87

REMORA-1

SUMMARY OF RESULTS

Interval Evaluated: 2170m to 2690m KB

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Content
2172.50-2173.50	1.0	0.75	0.192±0.04	0.887	Water
2175.25-2176.50	1.0	0.75	0.204±0.02	0.838	Water
2183.25-2186.00	2.75	2.0	0.142±0.02	1.000	Water
2204.00-2205.75	1.75	1.50	0.149±0.02	0.766	Oil/Gas?
2233.00-2234.50	1.5	1.0	0.133±0.01	0.812	Gas
2248.00-2255.00	7.0	6.5	0.193±0.04	0.312	Gas
2268.50-2278.00	9.5	5.5	0.168±0.05	0.462	Gas
2309.00-2310.00	1.0	0.5	0.156±0.03	0.795	Oil/Gas?
2317.50-2323.50	6.0	5.5	0.178±0.02	0.544	Oil
2328.50-2334.00	5.5	4.75	0.190±0.03	0.326	Gas
2343.00-2344.00	1.0	1.0	0.139±0.02	0.353	Gas
2355.50-2361.00	5.5	5.0	0.191±0.03	0.419	Gas
2382.50-2383.75	1.25	0.5	0.152±0.02	0.483	Gas
2397.50-2399.25	1.75	1.5	0.128±0.02	0.590	Gas
2401.50-2404.00	2.5	2.5	0.158±0.03	0.383	Gas
2431.00-2442.00	11.0	8.75	0.176±0.03	0.328	Gas
2452.50-2459.00	6.5	5.5	0.149±0.04	0.492	Gas
2465.00-2467.00	2.0	1.0	0.125±0.02	0.635	Gas
2481.50-2482.50	1.0	0.75	0.126±0.01	0.681	Gas
2491.50-2496.50	5.0	4.25	0.175±0.01	0.478	Gas
2499.50-2501.00	1.5	0.75	0.165±0.02	0.654	Gas
2509.50-2514.00	4.5	0.75	0.129±0.01	1.000	Water
2517.50-2519.00	1.5	1.0	0.150±0.03	0.791	Water
2545.50-2549.00	3.5	2.25	0.179±0.02	1.000	Water
2563.50-2564.75	1.25	0.5	0.125±0.01	0.586	Gas
2582.50-2589.50	7.0	5.75	0.137±0.02	0.676	Oil
2593.00-2597.00	4.0	3.5	0.143±0.02	1.000	Water
2602.50-2604.50	2.0	1.75	0.157±0.02	1.000	Water
2608.00-2609.00	1.0	0.25	0.108±0.01	0.712	Gas
2618.00-2623.25	5.25	4.0	0.138±0.03	0.414	Gas

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Content
2628.25-2639.00	10.75	9.75	0.141±0.02	0.372	Gas
2646.50-2648.25	1.75	1.5	0.115±0.01	0.591	Oil
2649.25-2653.75	4.5	4.5	0.142±0.02	0.421	Oil
2655.00-2663.00	8.0	7.0	0.144±0.02	0.416	Oil
2668.00-2670.00	2.0	1.5	0.107±0.01	0.648	Oil
2674.50-2678.50	4.0	3.75	0.147±0.01	0.482	Oil
2686.00-2689.00	3.5	1.0	0.116±0.01	0.627	Gas?
2694.00-2705.00	11.0	9.5	0.130±0.02	0.483	Gas
2731.00-2738.50	7.5	5.5	0.133±0.02	0.334	Gas
2748.50-2751.00	2.5	2.0	0.139±0.02	0.453	Oil
2757.00-2758.00	1.0	0.75	0.123±0.02	0.615	Oil
2765.50-2769.00	3.5	2.5	0.130±0.01	0.553	Oil
2772.50-2774.50	2.30	1.75	0.140±0.03	0.549	Oil
2774.75-2776.50	1.75	1.75	0.135±0.03	0.735	Water
2782.00-2787.00	5.0	4.25	0.128±0.01	0.940	Water
2796.50-2799.50	2.75	2.0	0.140±0.02	0.747	Water
2800.50-2816.50	16.0	14.75	0.148±0.02	0.920	Water
2834.50-2839.50	5.0	4.0	0.131±0.02	0.885	Water
2846.00-2851.50	5.5	5.5	0.146±0.02	0.885	Water
2853.50-2854.50	0.75	0.75	0.170±0.01	0.814	Water
2949.50-2952.00	2.5	2.0	0.125±0.01	0.398	Oil
2955.00-2960.00	5.0	3.0	0.122±0.02	-	Oil

* Net Thickness, Porosity Average and Swe Average refer to zones with calculated porosities in excess of 10%.

\- No water saturation calculation is possible as the first reading of the LLD curve is above this sand.

APPENDIX 3

APPENDIX 3

APPENDIX 3

GEOCHEMICAL REPORT

GEOCHEMICAL REPORT
REMORA-1 WELL, GIPPSLAND BASIN
AUSTRALIA

by

B.J. Burns

Sample handling and Analyses by:

- H. Schiller) ESSO AUSTRALIA LTD.
- M. Sparke)

Esso Australia Ltd. 1/9/87

Geochemical Report

2819L:1

LIST OF ILLUSTRATIONS

REMORA-1

INTRODUCTION

Canned cuttings and side-wall cores from the Remora-1 well Gippsland Basin were analysed for their geochemical characteristics in order to determine the hydrocarbon source potential of the drilled section. Canned cuttings were recovered at 15-metre intervals from 2015m KB to total depth (T.D.) at 2961m KB.

Alternate 15-metre intervals were analyzed for headspace C_{1-4} hydrocarbon gases. Selected sidewall cores were analyzed for total organic carbon (TOC), Rock-Eval pyrolysis yields and kerogen elemental analysis. Visual kerogen descriptions were carried out by A.D. Partridge of Esso Australia Ltd.

Two oils recovered from wireline testing were analyzed for API gravity, whole oil gas chromatography, and biomarker GCMS. In addition, the di- and tri-aromatic fractions were separated and analysed by gas chromatography.

The results of these analyses are listed in Tables 1 through 8 and graphically displayed in Figures 1 through 10.

Discussion of Results and Interpretations

Richness

C_{1-4} headspace cuttings gas yields (Table 1, Figure 1a) are poor to fair throughout the Turrum Fm. and good to very good in the Latrobe Group sediments. If indigenous, these yields are considered indicative of the hydrocarbon source potential of the sedimentary section. The "good" hydrocarbon source rating of the Latrobe section is in general supported by the TOC yields (Table 2, Fig. 2) which show that while the Turrum and lower L. balmei sections have less than 1% T.O.C., the T. longus - T. lilliei - N. senectus section has TOC's consistantly above 1.5% and up to a maximum of 5%.

The Rock-Eval pyrolysis yields recorded in Table 3a confirm the moderate to good source potential of the Latrobe sediments particularly in the section below 2559m.

Hydrocarbon Type

Wet gas (C_{2-4}) yields (Figure 1b) for the Latrobe Group sediments average only about 20% of the total headspace (C_{1-4}) gas for the section below 2250m. If indigenous, these yields indicate that only wet gas would be sourced by the section. The higher 'wet' fraction for the shallow Turrum section is coincident with the marked decrease in total gas and so is not interpreted as an oil-prone source.

The Hydrogen Indicies (HI) recorded in Table 3b and plotted against Tmax in Figure 3 indicate that although Type III gas-prone kerogens predominate in the samples analyzed, a few Latrobe Group samples of Late Cretaceous age do contain Type II-III oil-prone material with Hydrogen Indicies over 200.

Atomic H/C and atomic O/C (* approximate) ratios for kerogens from the Latrobe Group sediments are recorded in Table 4b and plotted on the modified Van Krevelen diagram in Figure 4. As with the HI data, the atomic ratios indicate a predominance of Type III gas-prone kerogen throughout the section, though some intermediate Type II-III oil prone material appears in the Lower T. longus - T. lilliei - N. senectus interval and one very oil prone sample is seen in the Upper T. longus at 2483.5m.

Together these results confirm the potential of the organic-rich portions of the Latrobe Group sediments to yield mainly wet gas and minor oil when they become mature.

* The atomic O/C ratio is approximate since the oxygen content is determined by difference, and the sulphur content which may be up to a few percent was not determined.

Maturity

Tmax measurements (Table 3a) show a slight increase with depth but indicate that the entire section penetrated is still immature for significant hydrocarbon generation. This is supported by the Thermal Alteration Indicies of the kerogens (Table 5) which range from 1.9 to 2.3.

Oil Analyses

The two recovered oil samples from RFT 5/54 at 2319m and RFT 2/51 at 2651.2m have API gravities of 39.8^{0} and 38.1^{0} respectively (Table 6). Their "whole oil" chromatograms (Figure 5) show an overall dominance of the C_{15-29} components and relatively low content of gasoline/kerosene range hydrocarbons. The deeper sample at 2651.2m has slightly more of the C_{20-27} n-alkanes but both oils are typical of early to peak generation from terrestrial kerogen. The two oils do exhibit different distributions of sulphur bearing components as seen in the top chromatographic traces of Figures 6 and 7 in which the FPD detector is only responding to sulphur components. At this stage we do not understand the significance of these sulphur variations but it most likely represents an environmental condition involving sulphate reducing bacteria.

The oils were further separated into saturate and aromatic fractions and the saturate fraction was analysed by GC-MS for standard biomarker components. The aromatic fractions were analysed by capilliary gas chromatography to identify the principal di- and tri-aromatic components. From these data various biomarker ratios dealing with maturity and source information have been determined and summarised in Table 7.

The maturity at which the oils were generated can be estimated from several maturity sensitive biomarker ratios listed in Table 7. The sterane C_{29} 20S/(20S+20R) ratios of 0.55 and 0.59 for the oils from 2319.0m and 2651.2m respectively indicate that this isomerisation has reached equilibrium and hence the maturity is <u>greater</u> than R_v=0.7. The iso-sterane ratio C_{29} IS/(IS+RS) is useful at these higher maturity levels and indicates maturities of approx. R_v=0.85 for both oils.

An additional maturity estimate can be made from the 3-ring aromatics (Fig. 8) namely the Methylphenanthrene Index (MPI) (Table 7). This ratio was developed by Radke and Welte (1981) and has been applied successfully to other Gippsland oils (Burns et al, 1987). The Remora oil at 2319.0m has an indicated maturity of R_v=0.85 while the deeper oil at 2651.2m is slightly more mature at R_v=0.89. These maturity values are in very good agreement with those derived from the steranes.

Information regarding the nature of the kerogen from which the oils were derived comes from several sources.

a) The predominance of high molecular weight paraffins, particularly in the oil at 2657.2m (Fig. 5), indicate terrestrial high plant input, eg. cuticular matter.

b) The dominance of the C_{29} sterane (in m/e 218) over the C_{27} and C_{28} steranes (Table 1) supports the higher plant input.

c) The pristane/phytane (Pr/Ph) ratios for both oils are $>$ 6.0 indicating a relatively more oxidising environment typical of terrestrial source rocks.

d) The shallow oil at 2319m has a much greater content of Retene in the tri-aromatic fraction compared to the 2651.2m oil (Fig. 8) and since Retene is believed to be derived mainly from resinous material it indicates a possible minor subdivision of the oils based on variations of resin input into the source areas. Other resin indicators such as Cadalene and Agathalene (Fig. 9) do not show any significant increase in either oil suggesting a fairly specific input of retene-rich material into the 2319.0m oil.

CONCLUSIONS

1. The Latrobe Group shales below 2559m constitute fair to good source rocks with the potential to generate both gas and oil. However the entire section down to TD (2961m) is immature for significant oil generation.

2. Oils recovered from RFT's at 2319m and 2651.2m have been generated from terrestrial organic matter at equivalent maturity levels of R_v=0.85-0.89.

3. There is evidence of some variation in the resin biomarkers between the two oils which is most likely reflecting some minor localised contributions and variations in the source rock.

References

Radke, M. and Welte, D.H. 1981. The Methylphenanthrene Index (MPI): a maturity parameter based on aromatic hydrocarbons. In Advances in Organic Geochemistry, 1983. pp.504-512.

Burns, B.J., Bostwick, T.R. and Emmett, J.K. 1987. Gippsland Terrestrial Oils - Recognition of Compositional variations due to Maturity and Biodegradation effects. APEA Journal Vol. 27 pp.73-85.

Table 1. C1-4 HYDROCARBON ANALYSIS 14:22 MONDAY, AUGUST 31, 1987

BASIN=GIPPSLAND WELL=REMORA 1

SAMP_NO	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE 1C4	NBUTANE NC4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOT M	TOT E	TOT P	TOT IB	TOT NB	WET E	WET P	WET IB	WET NB
78096 A	2030.00	71	52	96	56	34	238	309	77	23	17	31	18	11	22	40	24	14
78096 C	2060.00	772	232	351	142	122	847	1619	52	48	14	22	9	8	27	41	17	14
78096 E	2090.00	30	35	109	66	89	299	329	91	9	11	33	20	27	12	36	22	30
78096 G	2120.00	26	17	100	73	165	355	381	93	7	4	26	19	43	5	28	21	46
78096 I	2150.00	1224	517	465	87	101	1170	2394	49	51	22	19	4	4	44	40	7	9
78096 K	2180.00	70	128	201	40	52	421	491	86	14	26	41	8	11	30	48	10	12
78096 M	2210.00	1420	515	219	40	51	825	2245	37	63	23	10	2	2	62	27	5	6
78096 O	2240.00	3058	714	332	57	76	1179	4237	28	72	17	8	1	2	61	28	5	6
78096 Q	2260.00	408	189	132	31	73	425	833	51	49	23	16	4	9	44	31	7	17
78096 S	2290.00	1405	328	164	30	33	555	1960	28	72	17	8	2	2	59	30	5	6
78096 U	2320.00	23770	5066	917	88	97	6168	29938	21	79	17	3	0	0	82	15	1	2
78096 W	2350.00	12851	1659	448	45	54	2206	15057	15	85	11	3	0	0	75	20	2	2
78096 Y	2380.00	5587	1161	315	49	55	1580	7167	22	78	16	4	1	1	73	20	3	3
78097 A	2410.00	13448	1480	438	58	57	2033	15481	13	87	10	3	0	0	73	22	3	3
78097 C	2440.00	14108	1513	425	59	68	2065	16173	13	87	9	3	0	0	73	21	3	3
78097 E	2475.00	979	387	190	31	40	648	1627	40	60	24	12	2	2	60	29	5	6
78097 G	2505.00	7304	1028	352	29	63	1472	8776	17	83	12	4	0	1	70	24	2	4
78097 I	2535.00	16944	3774	1009	113	123	5019	21963	23	77	17	5	1	1	75	20	2	2
78097 K	2565.00	15466	2343	694	81	86	3204	18670	17	83	13	4	0	0	73	22	3	3
78097 M	2595.00	4181	617	212	46	32	907	5088	18	82	12	4	1	1	68	23	5	4
78097 O	2625.00	11635	1080	229	29	35	1373	13008	11	89	8	2	0	0	79	17	2	3
78097 Q	2655.00	2557	394	158	35	34	621	3178	20	80	12	5	1	1	63	25	6	5
78097 S	2685.00	5625	596	190	24	29	839	6464	13	87	9	3	0	0	71	23	3	3
78097 U	2715.00	8681	1681	576	36	34	2327	11008	21	79	15	5	0	0	72	25	2	1
78097 W	2745.00	1062	189	70	15	17	291	1353	22	78	14	5	1	1	65	24	5	6
78097 Y	2775.00	8431	840	202	33	31	1106	9537	12	88	9	2	0	0	76	18	3	3
78098 A	2805.00	2420	459	147	25	28	659	3077	21	79	15	5	1	1	70	22	4	4
78098 C	2835.00	1140	261	94	15	19	389	1529	25	75	17	6	1	1	67	24	4	5
78098 E	2865.00	5582	986	375	61	87	1509	7091	21	79	14	5	1	1	65	25	4	6
78098 G	2895.00	880	265	169	46	39	519	1399	37	63	19	12	3	3	51	33	9	8
78098 I	2925.00	1141	194	129	48	48	419	1560	27	73	12	8	3	3	46	31	11	11
78098 K	2955.00	6122	815	327	75	103	1320	7442	18	82	11	4	1	1	62	25	6	8

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Table 2.

TOTAL ORGANIC CARBON REPORT

BASIN - GIPPSLAND
WELL - REMORA 1

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	TOC%	AN	TOC%	AN	CO3%	DESCRIPTION
78095 H	2065.00	P. TUBERCULATUS	SEASPRAY GROUP	1	0.48		0.00	1	16.44	GY SLTST,MICA,V CALC
78095 G	2080.00	P. TUBERCULATUS	SEASPRAY GROUP	1	0.42		0.00	1	22.67	GY SLTST,V CALC
78095 E	2101.00	M.N. ASPERUS	TURRUM	1	0.46		0.00	1	19.58	GRN-BRN SLTST,SDY,CALC
78095 C	2119.00	L.N. ASPERUS	TURRUM	1	0.42		0.00	1	34.87	BRN SLTST,SDY,GLAUC,CALC
78094 Y	2173.80	L.N. ASPERUS	TURRUM	1	1.35		0.00	1	3.94	BRN-GY SLTST,MICA,CALC
78094 V	2200.50	L.L. BALMEI	LATROBE GROUP	1	0.17		0.00	1	6.01	GY SLTST,MICA
78094 S	2213.50	L.L. BALMEI	LATROBE GROUP	1	0.78		0.00	1	4.99	GY SLTST,MICA
78094 R	2245.50	L.L. BALMEI	LATROBE GROUP	1	0.76		0.00	1	5.64	GY SLTST,MICA
78094 N	2338.80	L.L. BALMEI	LATROBE GROUP	1	0.93		0.00	1	5.25	GY SLTST,QTZ,MICA
78094 M	2369.00	U.T. LONGUS	LATROBE GROUP	1	5.64		0.00	1	11.43	DK GY SH,MICA,SL CALC
78094 L	2396.50	U.T. LONGUS	LATROBE GROUP	1	0.46		0.00	1	6.25	GY SH,QTZ,MICA,SL CALC
78094 K	2426.30	U.T. LONGUS	LATROBE GROUP	1	1.04		0.00	1	3.91	GY SH,QTZ,MICA
78094 G	2525.50	U.T. LONGUS	LATROBE GROUP	1	1.84		0.00	1	4.21	GY SLTST,CARB,QTZ,MICA
78094 F	2557.00	U.T. LONGUS	LATROBE GROUP	1	4.06		0.00	1	5.65	DK GY SH,QTZ,MICA
78094 D	2572.50	U.T. LONGUS	LATROBE GROUP	1	1.24		0.00	1	2.78	GY SH,QTZ
78094 C	2581.00	L.T. LONGUS	LATROBE GROUP	1	3.98		0.00	1	4.52	GY SH, QTZ
78094 A	2612.80	L.T. LONGUS	LATROBE GROUP	1	1.54		0.00	1	6.39	GY SLTST,SDY,QTZ
78093 Y	2641.00	L.T. LONGUS	LATROBE GROUP	1	1.65		0.00	1	3.24	GY SH,CARB IN PART
78093 W	2680.70	L.T. LONGUS	LATROBE GROUP	1	2.17		0.00	1	3.25	GY SH,QTZ
78093 V	2716.00	L.T. LONGUS	LATROBE GROUP	1	5.71		0.00	1	3.67	BRN SLTST,SDY,CARB,QTZ
78093 P	2787.20	T. LILLIEI	LATROBE GROUP	1	1.51		0.00	1	3.05	BRN SLTST,SDY,QTZ
78093 O	2821.00	T. LILLIEI	LATROBE GROUP	1	1.56		0.00	1	3.18	BRN SH,CARB,QTZ,SL CALC
78093 L	2865.00	T. LILLIEI	LATROBE GROUP	1	1.94		0.00	1	6.84	BRN SLTST,CARB,QTZ,CALC
78093 I	2947.00	N. SENECTUS	LATROBE GROUP	1	1.99		0.00	1	16.95	BRN SLTST,CARB,QTZ,CALC

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Table 3a. ROCKEVAL ANALYSES

BASIN - GIPPSLAND
WELL - REMORA 1

REPORT A - PYROLYZABLE CARBON

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	TMAX	S1	S2	S3	PI	S2/S3	PC	COMMENTS
78094 Y	2173.80	CRSW	L.N. ASPERUS	419	0.09	1.20	0.23	0.07	5.21	0.11	
78094 M	2369.00	CRSW	U.T. LONGUS	429	0.92	10.36	0.44	0.08	23.40	0.94	
78094 K	2426.30	CRSW	U.T. LONGUS	422	0.11	0.62	0.18	0.14	3.42	0.06	
78094 G	2525.50	CRSW	U.T. LONGUS	431	0.19	1.37	0.22	0.12	6.22	0.13	
78094 F	2557.00	CRSW	U.T. LONGUS	431	0.45	4.72	0.30	0.09	15.62	0.43	
78094 D	2572.50	CRSW	U.T. LONGUS	428	0.36	2.53	0.21	0.12	11.82	0.24	
78094 C	2581.00	CRSW	L.T. LONGUS	430	1.62	10.31	0.56	0.14	18.31	0.99	
78094 A	2612.80	CRSW	L.T. LONGUS	424	0.41	1.70	0.34	0.19	5.06	0.18	
78093 Y	2641.00	CRSW	L.T. LONGUS	430	0.51	3.09	0.35	0.14	8.86	0.30	
78093 W	2680.70	CRSW	L.T. LONGUS	432	0.54	3.79	0.36	0.13	10.59	0.36	
78093 V	2716.00	CRSW	L.T. LONGUS	434	1.40	11.86	0.50	0.11	23.67	1.10	
78093 P	2787.20	CRSW	T. LILLIEI	429	0.31	2.00	0.31	0.13	6.44	0.19	
78093 O	2821.00	CRSW	T. LILLIEI	429	0.61	4.22	0.37	0.13	11.47	0.40	
78093 L	2865.00	CRSW	T. LILLIEI	431	1.12	4.41	0.47	0.20	9.46	0.46	
78093 I	2947.00	CRSW	N. SENECTUS	431	0.89	5.45	0.45	0.14	12.15	0.53	

PI=PRODUCTIVITY INDEX PC=PYROLYZABLE CARBON TC=TOTAL CARBON HI=HYDROGEN INDEX OI=OXYGEN INDEX

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Table 3b. ROCKEVAL ANALYSES

REPORT B - TOTAL CARBON, H/O INDICES

BASIN - GIPPSLAND
WELL - REMORA 1

SAMPLE NO.	DEPTH	SAMPLE TYPE	FORMATION	TC	HI	OI	HI/OI	COMMENTS
78094 Y	2173.80	CRSW	TURRUM	1.35	89	6	13.89	
78094 M	2369.00	CRSW	LATROBE GROUP	5.64	184	16	11.25	
78094 K	2426.30	CRSW	LATROBE GROUP	1.04	60	10	5.91	
78094 G	2525.50	CRSW	LATROBE GROUP	1.84	74	10	7.15	
78094 F	2557.00	CRSW	LATROBE GROUP	4.06	116	11	10.42	
78094 D	2572.50	CRSW	LATROBE GROUP	1.24	204	29	7.03	
78094 C	2581.00	CRSW	LATROBE GROUP	3.98	259	41	6.35	
78094 A	2612.80	CRSW	LATROBE GROUP	1.54	111	27	4.14	
78093 Y	2641.00	CRSW	LATROBE GROUP	1.65	187	31	6.02	
78093 W	2680.70	CRSW	LATROBE GROUP	2.17	175	25	7.00	
78093 V	2716.00	CRSW	LATROBE GROUP	5.71	208	24	8.49	
78093 P	2787.20	CRSW	LATROBE GROUP	1.51	132	21	6.44	
78093 O	2821.00	CRSW	LATROBE GROUP	1.56	271	39	6.92	
78093 L	2865.00	CRSW	LATROBE GROUP	1.94	227	58	3.94	
78093 I	2947.00	CRSW	LATROBE GROUP	1.99	274	45	6.13	

PI=PRODUCTIVITY INDEX PC=PYROLYZABLE CARBON TC=TOTAL CARBON HI=HYDROGEN INDEX OI=OXYGEN INDEX

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Table 4a.

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - REMORA 1

SAMPLE NO.	DEPTH	SAMPLE TYPE	--- ELEMENTAL % (ASH FREE) ---						COMMENTS
			N%	C%	H%	S%	O%	ASH%	
78095 D	2115.00	KEROGEN	2.09	70.55	5.11	0.00	22.26	7.99	
78095 B	2133.90	KEROGEN	2.68	59.19	4.51	0.00	33.62	23.50	HIGH ASH
78095 A	2139.00	KEROGEN	1.91	65.31	5.14	0.00	27.64	14.06	HIGH ASH
78094 Z	2152.00	KEROGEN	1.00	48.50	3.87	0.00	46.63	6.75	
78094 Y	2173.80	KEROGEN	1.47	70.87	5.62	0.00	22.05	10.65	HIGH ASH
78094 X	2182.00	KEROGEN	1.25	70.61	5.56	0.00	22.58	13.54	HIGH ASH
78094 W	2194.50	KEROGEN	0.94	79.06	4.44	0.00	15.56	1.65	
78094 R	2245.50	KEROGEN	0.43	67.85	4.81	0.00	26.92	1.85	
78094 P	2308.00	KEROGEN	0.73	73.85	4.60	0.00	20.82	7.33	
78094 N	2338.80	KEROGEN	0.75	75.72	4.95	0.00	18.59	10.43	HIGH ASH
78094 M	2369.00	KEROGEN	1.36	77.53	5.41	0.00	15.70	5.15	
78094 L	2396.50	KEROGEN	1.12	77.75	3.90	0.00	17.23	6.49	
78094 K	2426.30	KEROGEN	1.26	76.99	5.15	0.00	16.60	33.20	HIGH ASH
78094 J	2460.00	KEROGEN	0.97	79.97	5.07	0.00	13.98	3.44	
78094 I	2464.00	KEROGEN	1.33	73.81	5.45	0.00	19.41	8.70	
78094 H	2483.50	KEROGEN	0.41	79.83	8.19	0.00	11.57	6.86	
78094 F	2557.00	KEROGEN	1.57	79.71	4.94	0.00	13.77	3.73	
78094 D	2572.50	KEROGEN	0.86	76.88	5.24	0.00	17.02	7.81	
78094 C	2581.00	KEROGEN	1.40	81.35	6.52	0.00	10.73	8.29	
78094 A	2612.80	KEROGEN	0.76	38.57	3.07	0.00	57.61	5.07	
78093 Y	2641.00	KEROGEN	1.32	80.61	5.73	0.00	12.34	7.75	
78093 V	2716.00	KEROGEN	1.51	80.03	6.48	0.00	11.98	7.16	
78093 T	2749.50	KEROGEN	1.28	80.55	5.74	0.00	12.42	3.73	
78093 S	2756.00	KEROGEN	1.69	78.86	5.99	0.00	13.46	6.07	
78093 C	2795.00	KEROGEN	1.53	72.44	5.19	0.00	20.84	4.51	
78093 D	2810.00	KEROGEN	0.85	42.58	3.74	0.00	52.83	7.40	
78093 E	2822.00	KEROGEN	0.95	46.43	3.92	0.00	48.70	7.80	
78093 M	2859.00	KEROGEN	1.39	79.44	6.48	0.00	12.68	8.93	
78093 I	2947.00	KEROGEN	1.16	51.07	4.46	0.00	43.30	6.31	
78093 G	2954.00	KEROGEN	2.05	81.47	5.72	0.00	10.75	3.02	
78093 F	2958.50	KEROGEN	1.49	80.36	6.27	0.00	11.89	9.98	

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Table 4b.

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - REMORA 1

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
78095 D	2115.00	KEROGEN	M.N. ASPERUS	TURRUM	0.87	0.24	0.03	
78095 B	2133.90	KEROGEN	L.N. ASPERUS	TURRUM	0.91	0.43	0.04	HIGH ASH
78095 A	2139.00	KEROGEN	L.N. ASPERUS	TURRUM	0.94	0.32	0.03	HIGH ASH
78094 Z	2152.00	KEROGEN	L.N. ASPERUS	TURRUM	0.96	0.72	0.02	
78094 Y	2173.80	KEROGEN	L.N. ASPERUS	TURRUM	0.95	0.23	0.02	HIGH ASH
78094 X	2182.00	KEROGEN	L.N. ASPERUS	TURRUM	0.95	0.24	0.02	HIGH ASH
78094 W	2194.50	KEROGEN	L.L. BALMEI	LATROBE GROUP	0.67	0.15	0.01	
78094 R	2245.50	KEROGEN	L.L. BALMEI	LATROBE GROUP	0.85	0.30	0.01	
78094 P	2308.00	KEROGEN	L.L. BALMEI	LATROBE GROUP	0.75	0.21	0.01	
78094 N	2338.80	KEROGEN	L.L. BALMEI	LATROBE GROUP	0.78	0.18	0.01	HIGH ASH
78094 M	2369.00	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.84	0.15	0.02	
78094 L	2396.50	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.60	0.17	0.01	
78094 K	2426.30	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.80	0.16	0.01	HIGH ASH
78094 J	2460.00	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.76	0.13	0.01	
78094 I	2464.00	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.89	0.20	0.02	
78094 H	2483.50	KEROGEN	U.T. LONGUS	LATROBE GROUP	1.23	0.11	0.00	
78094 F	2557.00	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.74	0.13	0.02	
78094 D	2572.50	KEROGEN	U.T. LONGUS	LATROBE GROUP	0.82	0.17	0.01	
78094 C	2581.00	KEROGEN	L.T. LONGUS	LATROBE GROUP	0.96	0.10	0.01	
78094 A	2612.80	KEROGEN	L.T. LONGUS	LATROBE GROUP	0.95	1.12	0.02	
78093 Y	2641.00	KEROGEN	L.T. LONGUS	LATROBE GROUP	0.85	0.11	0.01	
78093 V	2716.00	KEROGEN	L.T. LONGUS	LATROBE GROUP	0.97	0.11	0.02	
78093 T	2749.50	KEROGEN	L.T. LONGUS	LATROBE GROUP	0.86	0.12	0.01	
78093 S	2756.00	KEROGEN	L.T. LONGUS	LATROBE GROUP	0.91	0.13	0.02	
78093 C	2795.00	KEROGEN	T. LILLIEI	LATROBE GROUP	0.86	0.22	0.02	
78093 D	2810.00	KEROGEN	T. LILLIEI	LATROBE GROUP	1.05	0.93	0.02	
78093 E	2822.00	KEROGEN	T. LILLIEI	LATROBE GROUP	1.01	0.79	0.02	
78093 M	2859.00	KEROGEN	T. LILLIEI	LATROBE GROUP	0.98	0.12	0.02	
78093 I	2947.00	KEROGEN	N. SENECTUS	LATROBE GROUP	1.05	0.64	0.02	
78093 G	2954.00	KEROGEN	N. SENECTUS	LATROBE GROUP	0.84	0.10	0.02	
78093 F	2958.50	KEROGEN	N. SENECTUS	LATROBE GROUP	0.94	0.11	0.02	

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Table 5.

KEROGEN REPORT

BASIN - GIPPSLAND
WELL - REMORA1

SAMPLE NO.	DEPTH	TAI	Particulate Organic Matter Types 1.1	1.2	2.1	2.2	3.0	4.0	5.1	5.2	5.3	6.1	6.2	7.0	% OIL PRONE
78095 H	2065.00	1.9	10.0	.0	.0	3.0	10.0	2.0	.0	.0	25.0	50.0	.0	10.0	25.0
78095 G	2080.00	2.0	15.0	.0	.0	5.0	20.0	.0	.0	.0	20.0	40.0	.0	5.0	40.0
78095 F	2088.00	2.1	56.0	.0	.0	2.0	20.0	2.0	.0	.0	10.0	10.0	.0	5.0	80.0
78095 D	2115.00	2.1	40.0	.0	.0	.0	30.0	.0	.0	.0	20.0	10.0	.0	10.0	70.0
78095 C	2119.00	2.1	10.0	.0	.0	.0	10.0	2.0	.0	.0	73.0	5.0	.0	5.0	22.0
78095 B	2133.90	2.0	80.0	.0	.0	.0	10.0	.0	.0	.0	8.0	2.0	.0	5.0	90.0
78094 Z	2152.00	2.0	5.0	.0	.0	2.0	22.0	1.0	.0	.0	60.0	10.0	.0	5.0	30.0
78094 Y	2173.80	2.0	20.0	.0	.0	.0	60.0	.0	.0	.0	15.0	5.0	.0	25.0	80.0
78094 X	2182.00	2.0	20.0	.0	.0	.0	68.0	.0	.0	.0	10.0	2.0	.0	20.0	88.0
78094 W	2194.50	2.0	5.0	.0	.0	.0	15.0	.0	.0	.0	60.0	20.0	.0	10.0	20.0
78094 V	2200.50	1.9	5.0	.0	.0	.0	43.0	2.0	.0	.0	30.0	20.0	.0	10.0	50.0
78093 U	2202.50	2.1	.0	.0	.0	.0	.0	1.0	.0	.0	69.0	30.0	.0	1.0	1.0
78094 R	2245.50	2.0	10.0	.0	.0	.0	60.0	.0	5.0	.0	15.0	10.0	.0	20.0	70.0
78094 P	2308.00	2.0	3.0	.0	.0	.0	25.0	.0	.0	22.0	25.0	25.0	.0	5.0	28.0
78094 N	2338.80	2.0	40.0	.0	.0	.0	30.0	.0	.0	.0	15.0	15.0	.0	20.0	70.0
78094 M	2369.00	2.0	15.0	.0	.0	.0	60.0	.0	.0	.0	20.0	5.0	.0	25.0	75.0
78094 L	2396.50	2.1	15.0	.0	.0	.0	5.0	.0	.0	.0	60.0	20.0	.0	10.0	20.0
78094 K	2426.30	2.1	.0	.0	.0	.0	20.0	5.0	.0	.0	55.0	20.0	.0	10.0	25.0
78094 H	2483.50	2.0	20.0	.0	.0	.0	65.0	.0	.0	.0	5.0	10.0	.0	25.0	85.0
78094 D	2572.50	2.1	30.0	.0	.0	.0	37.0	3.0	5.0	.0	5.0	20.0	.0	20.0	70.0
78094 C	2581.00	2.0	35.0	.0	.0	.0	40.0	5.0	.0	.0	15.0	5.0	.0	25.0	80.0
78094 A	2612.80	2.0	.0	.0	.0	.0	20.0	5.0	.0	.0	50.0	25.0	.0	5.0	25.0
78093 Y	2641.00	2.1	10.0	.0	.0	.0	50.0	.0	.0	.0	13.0	27.0	.0	20.0	60.0
78093 V	2716.00	2.1	5.0	.0	.0	.0	40.0	5.0	25.0	.0	10.0	15.0	.0	20.0	50.0
78093 T	2749.50	.0	2.0	.0	.0	.0	10.0	.0	.0	.0	80.0	8.0	.0	10.0	12.0
78093 S	2756.00	2.1	5.0	.0	.0	.0	80.0	.0	.0	.0	10.0	5.0	.0	25.0	85.0
78093 M	2859.00	2.1	5.0	.0	.0	.0	73.0	2.0	.0	.0	15.0	5.0	.0	20.0	80.0
78093 I	2947.00	2.1	22.0	.0	.0	.0	65.0	1.0	.0	5.0	5.0	2.0	.0	20.0	88.0
78093 G	2954.00	2.2	15.0	.0	.0	.0	60.0	.0	.0	.0	20.0	5.0	.0	25.0	75.0
78093 F	2958.50	2.3	50.0	.0	.0	.0	28.0	2.0	.0	.0	15.0	5.0	.0	20.0	80.0

OIL PRONE = SUM OF 1.0 THRU 4.0
AMORPHOUS = 1.1 - UNDIFFERENTIATED + 1.2 - AMORPHOUS/GREY
STRUCT. AQUEOUS = 2.1 - ALGAE + 2.2 - DINOFLAGELLATES/ACRITARCHS
BIODEG. TERR. = 3.0 - BIODEGRADED TERRESTRIAL
SPORE/POLLEN = 4.0 - SPORE/POLLEN
STRUCT. TERR. = 5.1 - LAMINAR + 5.2 - CELLULAR + 5.3 - SEMI-OPAQUE
INERT = 6.1 - OPAQUE + 6.2 - META-OPAQUE
INDET. FINES = 7.0 - INDETERMINATE FINES
TAI = THERMAL ALTERATION INDEX

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Table 6. OIL - API GRAVITY, POUR POINT & SULFUR %

BASIN - GIPPSLAND
WELL - REMORA 1

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	API GRAVITY	POUR POINT	SULFUR %	COMMENTS
78093 B	2319.00	L.L. BALMEI	LATROBE GROUP	1	39.80			
78093 A	2651.20	L.T. LONGUS	LATROBE GROUP	1	38.10			

Table 7. Biomarker Ratios, Remora-1 oils

	RFT 5 2319m	RFT 2 2651.2m
MATURITY PARAMETERS		
Sterane C_{29} 20S/(20S+20R)	0.55	0.59
Estimated R_V	0.70	0.70
Sterane C_{29} 1S/(IS+RS)	0.54	0.56
Estimated R_V	0.85	0.85
Hopane C_{32} 22S/(22S+22R)	0.62	0.59
Methylphenanthrene Index (tri-aromatics)	0.75	0.81
R_V calc. (MPI)	0.85	0.89
SOURCE PARAMETERS		
Pristane/Phytane	6.38	6.00
Sterane C_{27}: C_{28}:C_{29}	22:24:54	19:22:54

2819L:7

Table 8. CHROMATOGRAPHY SUMMARY

NUMBER	SAMPLE	PCT RES/EXT	NORMALIZED TO 100% RES OR EXT SAT	ARO	NSO	S	N-EL	ASPH	I+L	INSOL AND LOSS FREE BASIS SAT	ARO	NSO	S	N-EL	ASPH
93907A	Remora-1 2319m	79.5115	74.0	13.7	4.0	0.0	4.5	2.0	1.8	75.4	14.0	4.1	0.0	4.6	2.0
93907B	Remora-1 2651.2m	81.6673	78.2	16.4	3.6	0.0	0.0	1.7	0.0	78.2	16.4	3.6	0.0	0.0	1.7

Table 8. CHROMATOGRAPHY SUMMARY

NUMBER	SAMPLE	PCT RES/EXT	NORMALIZED TO 100% RES OR EXT SAT	ARO	NSO	S	N-EL	ASPH	I+L	INSOL AND LOSS FREE BASIS SAT	ARO	NSO	S	N-EL	ASPH
93907A	Remora-1 2319m	79.5115	74.0	13.7	4.0	0.0	4.5	2.0	1.8	75.4	14.0	4.1	0.0	4.6	2.0
93907B	Remora-1 2651.2m	81.6673	78.2	16.4	3.6	0.0	0.0	1.7	0.0	78.2	16.4	3.6	0.0	0.0	1.7

Figure 1a.

C_{1-4} CUTTINGS GAS LOG

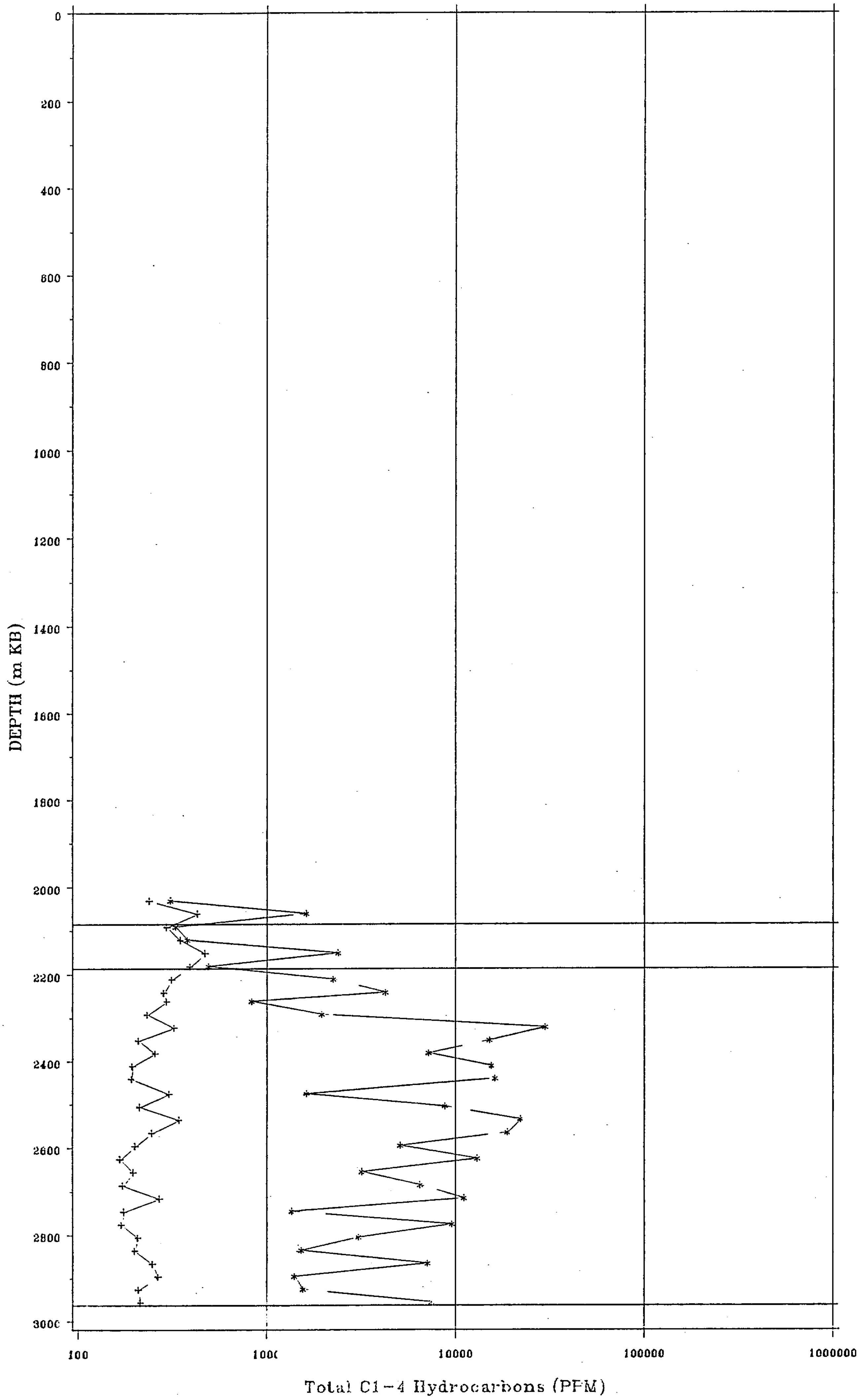


Figure 1b.

C_{1-4} CUTTINGS GAS LOG

REMORA 1

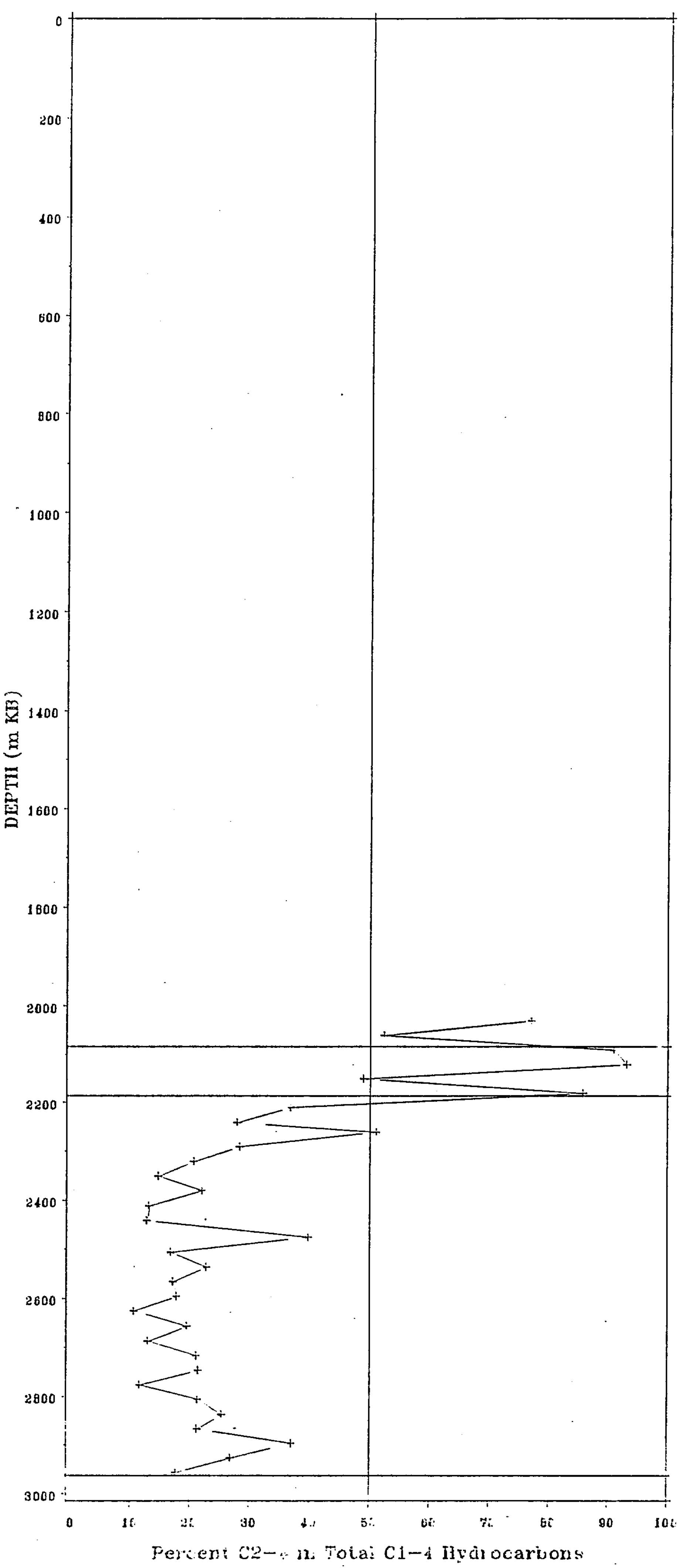
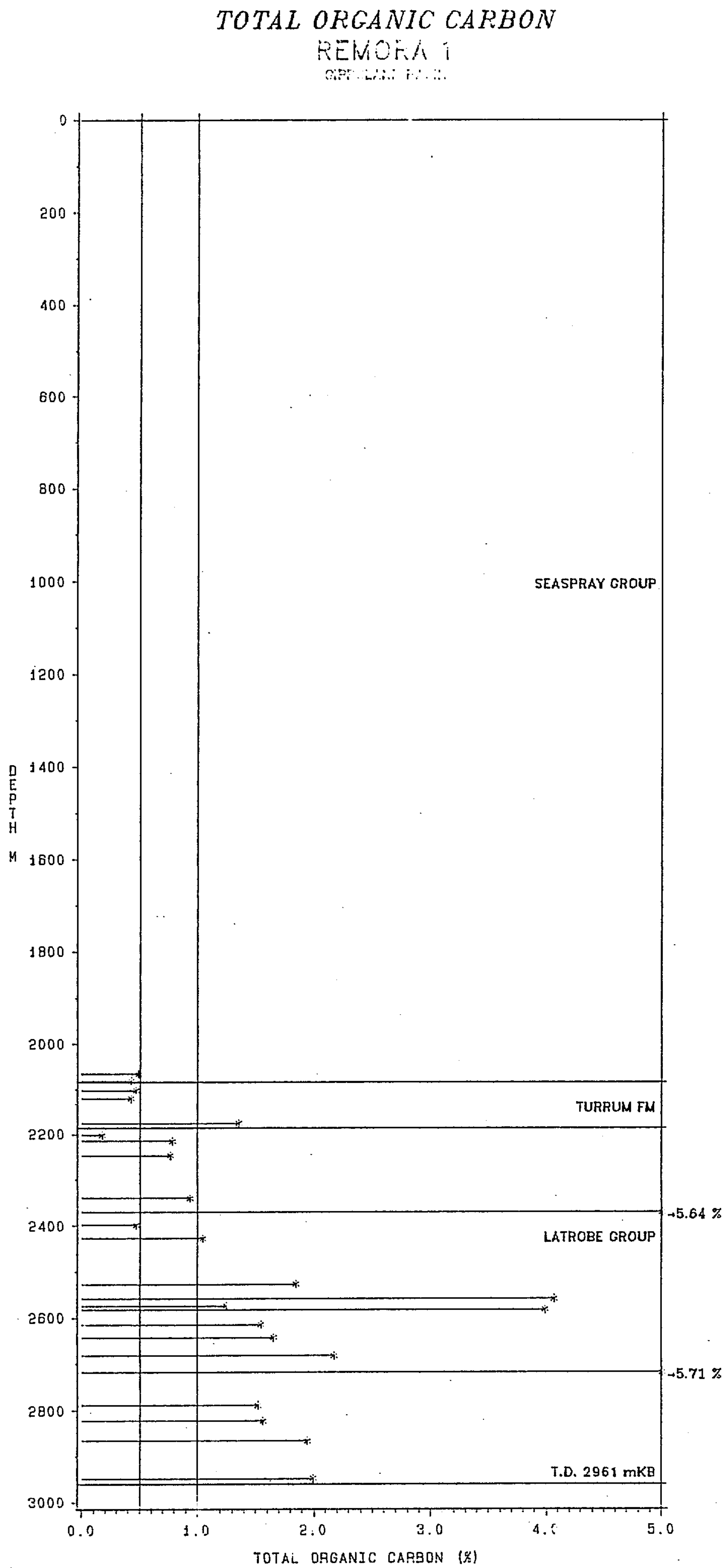


Figure 2.

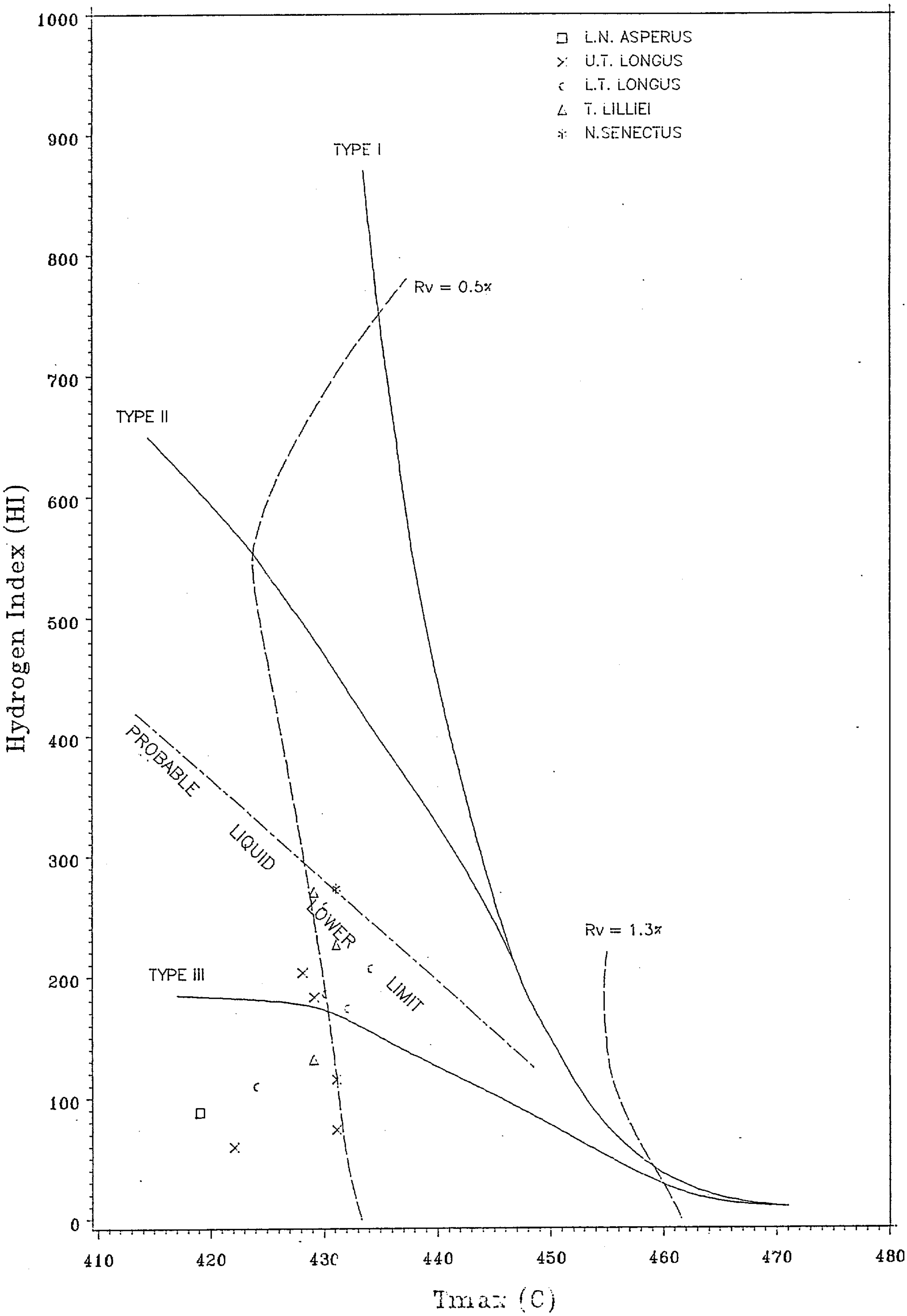


TOTAL ORGANIC CARBON
REMORA 1
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
DEPTH M
SEASPRAY GROUP
TURRUM FM
LATROBE GROUP
→5.64 %
→5.71 %
T.D. 2961 mKB
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORGANIC CARBON (%)

Figure 3.

ROCKEVAL MATURATION PLOT

REMORA 1
GIPPSLAND BASIN



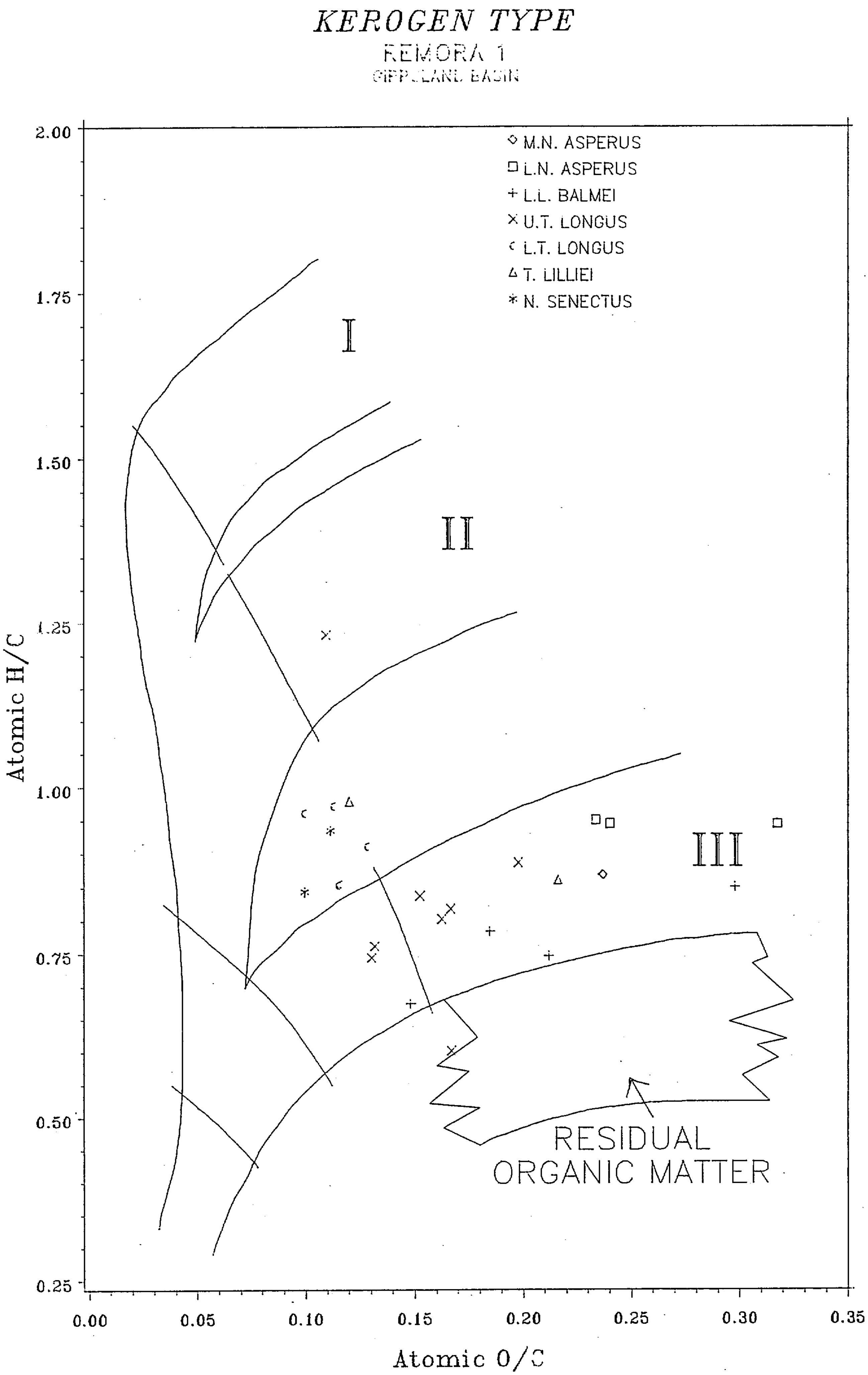

KEROGEN TYPE
REMORA 1
GIPPSLAND BASIN
M.N. ASPERUS
L.N. ASPERUS
L.L. BALMEI
U.T. LONGUS
L.T. LONGUS
T. LILLIEI
N. SENECTUS
I
II
III
RESIDUAL ORGANIC MATTER
Atomic H/C
Atomic O/C
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35

Figure 5.

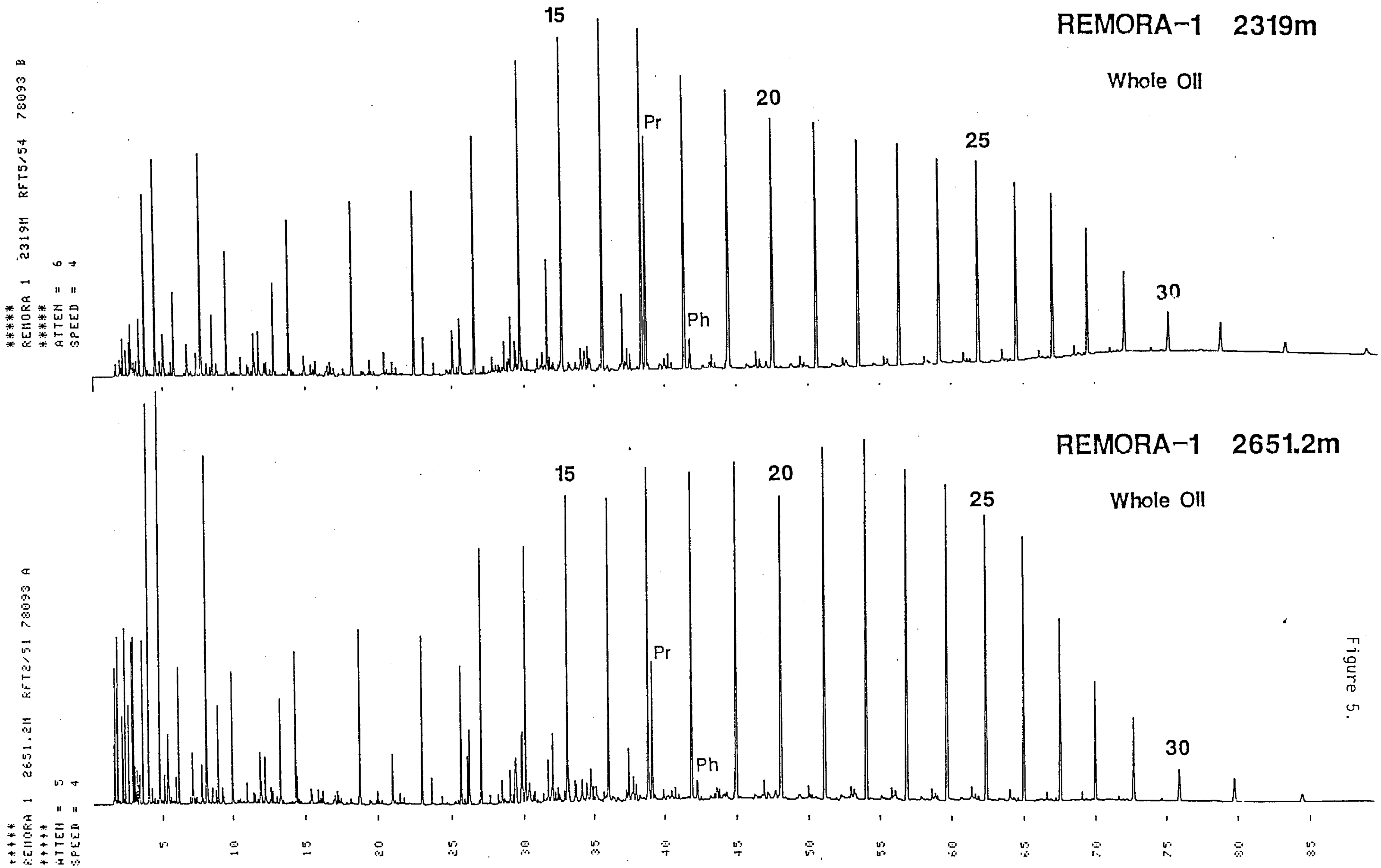
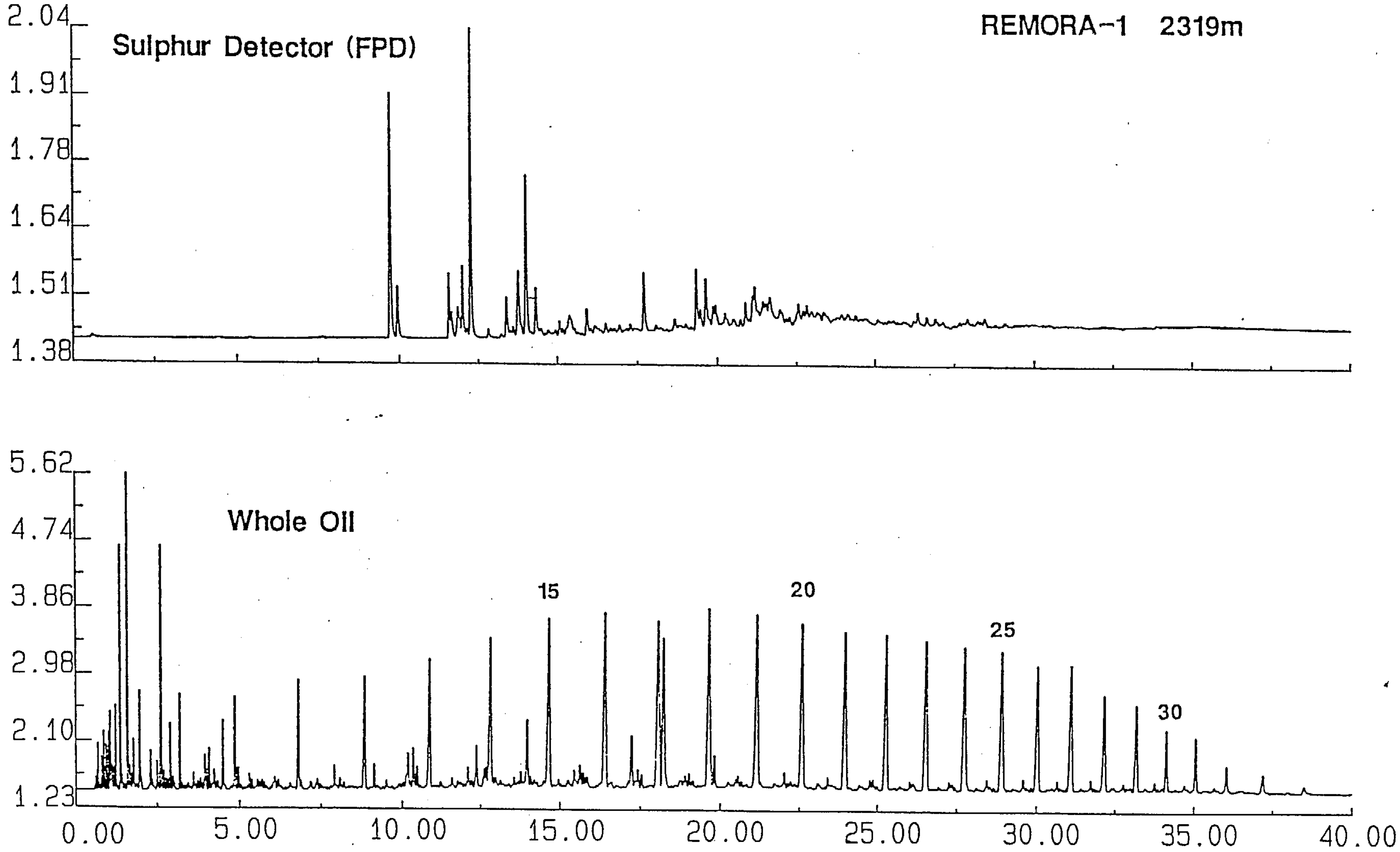


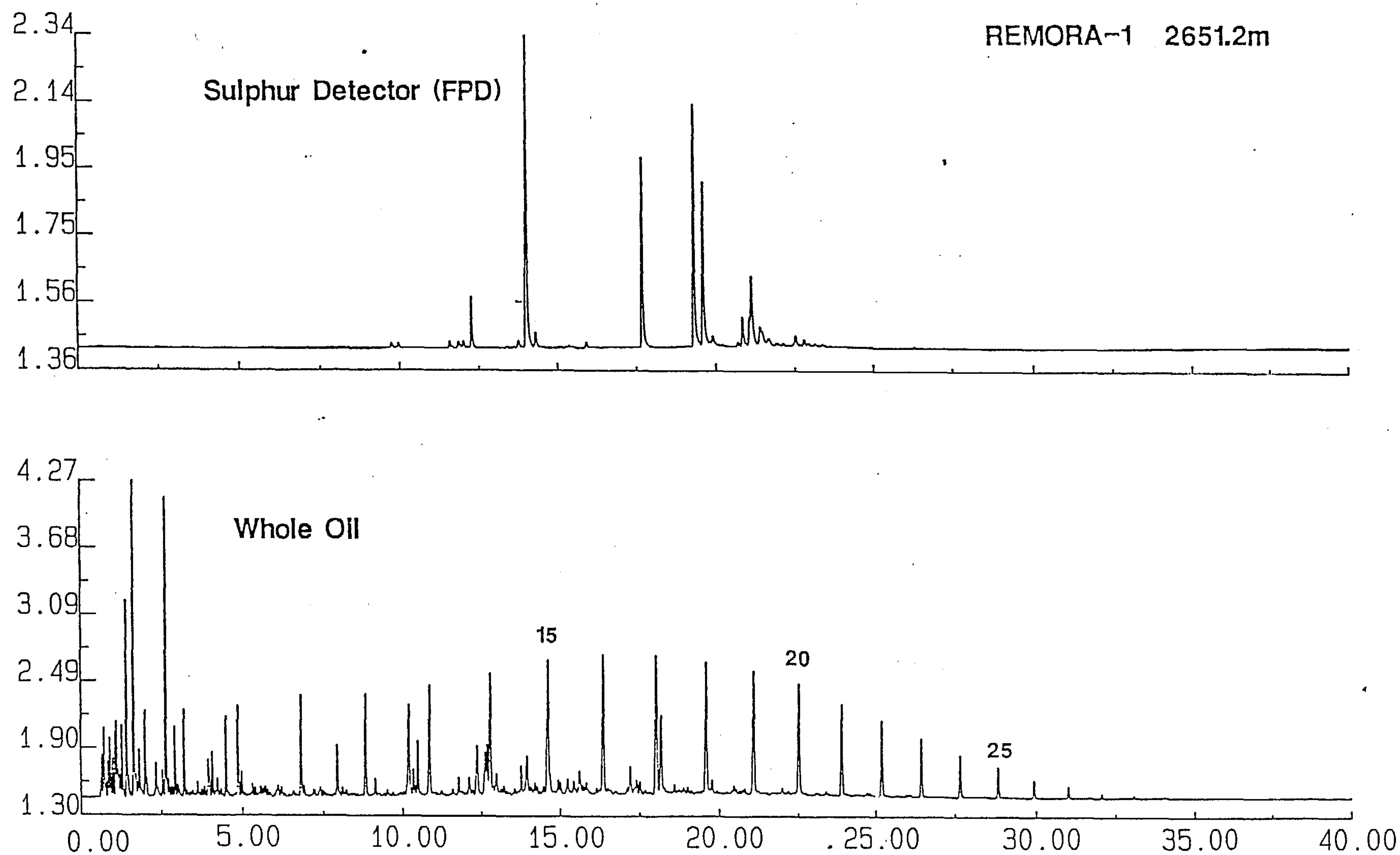
Figure 5.

Figure 6.



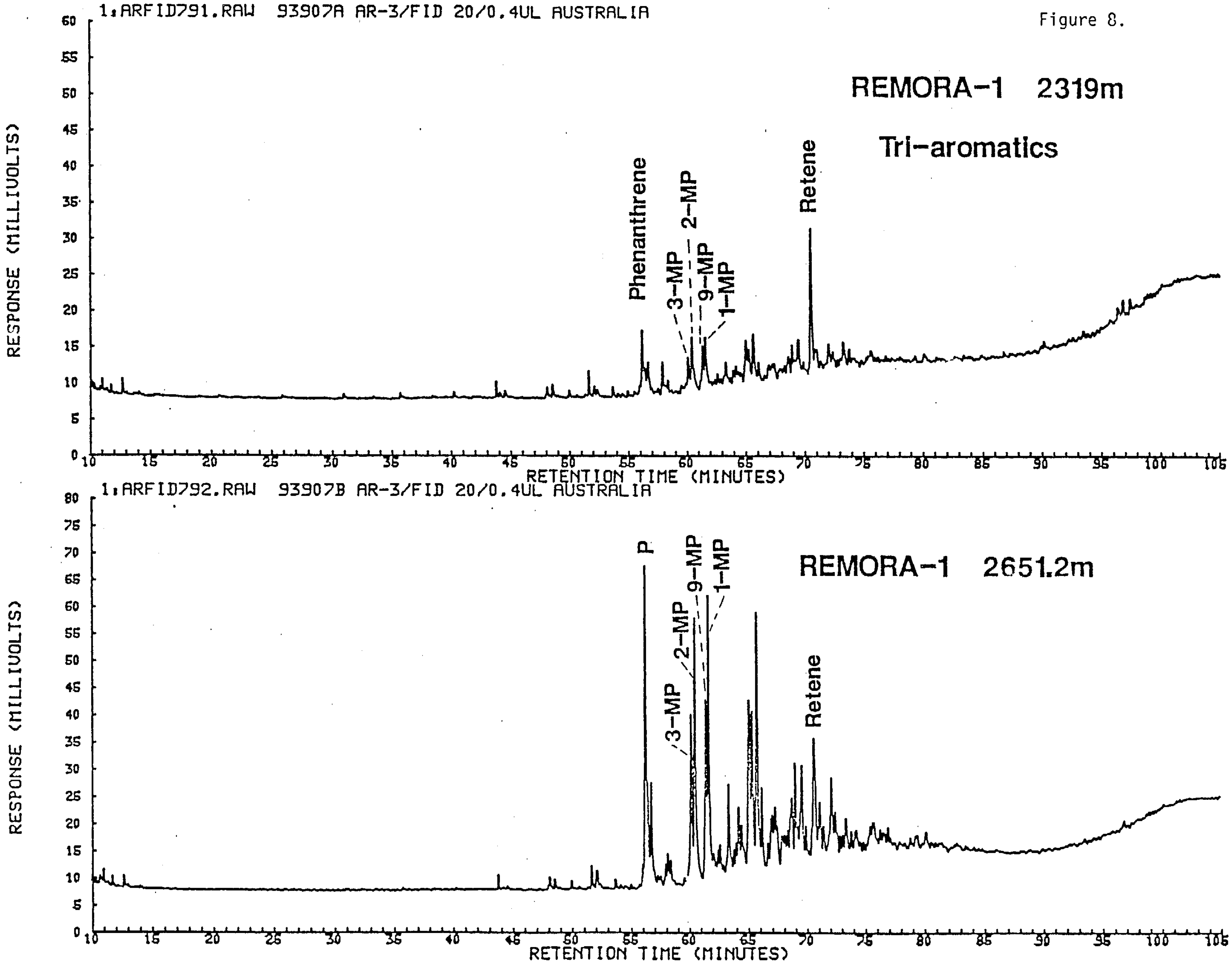
Top: CLWO_SU_W93907A (0.0- 40.0)
Bottom: CLWO_HY_W93907A (0.0- 40.0)

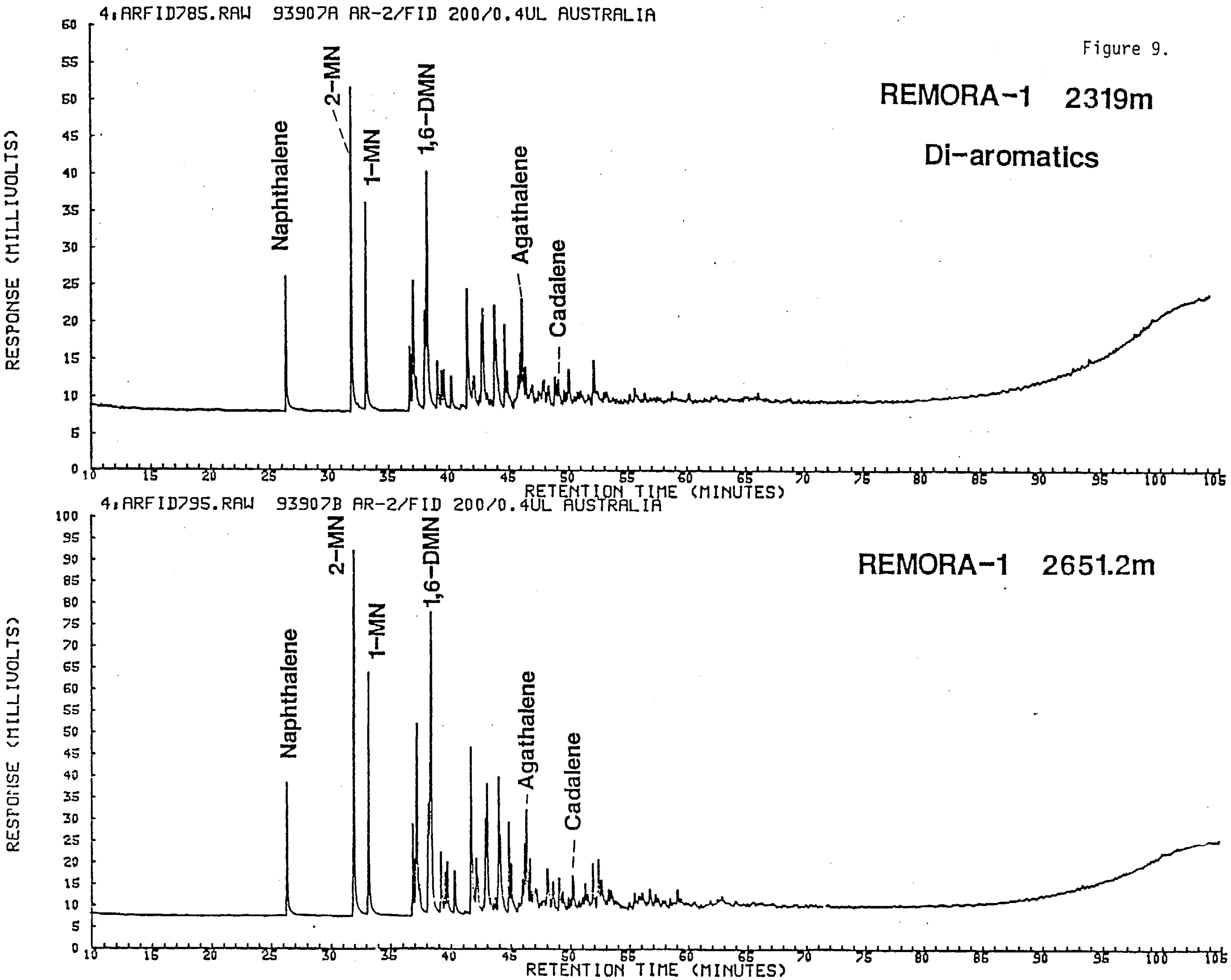
Figure 7.



Top: CLWO_SU_W93907B (0.0- 40.0)
Bottom: CLWO_HY_W93907B (0.0- 40.0)

Figure 8.


1:ARFID791.RAW 93907A AR-3/FID 20/0.4UL AUSTRALIA
REMORA-1 2319m
Tri-aromatics
Phenanthrene
3-MP
2-MP
9-MP
1-MP
Retene
RESPONSE (MILLIVOLTS)
RETENTION TIME (MINUTES)
1:ARFID792.RAW 93907B AR-3/FID 20/0.4UL AUSTRALIA
REMORA-1 2651.2m
P
3-MP
2-MP
9-MP
1-MP
Retene
RESPONSE (MILLIVOLTS)
RETENTION TIME (MINUTES)



4,ARFID785.RAW 93907A AR-2/FID 200/0.4UL AUSTRALIA
REMORA-1 2319m
Di-aromatics
Naphthalene
2-MN
1-MN
1,6-DMN
Agathalene
Cadalene
RESPONSE (MILLIVOLTS)
RETENTION TIME (MINUTES)
4,ARFID795.RAW 93907B AR-2/FID 200/0.4UL AUSTRALIA
REMORA-1 2651.2m
Naphthalene
2-MN
1-MN
1,6-DMN
Agathalene
Cadalene
RESPONSE (MILLIVOLTS)
RETENTION TIME (MINUTES)

Figure 9.

PE603616

This is an enclosure indicator page.
The enclosure PE603616 is enclosed within the container PE902212 at this location in this document.

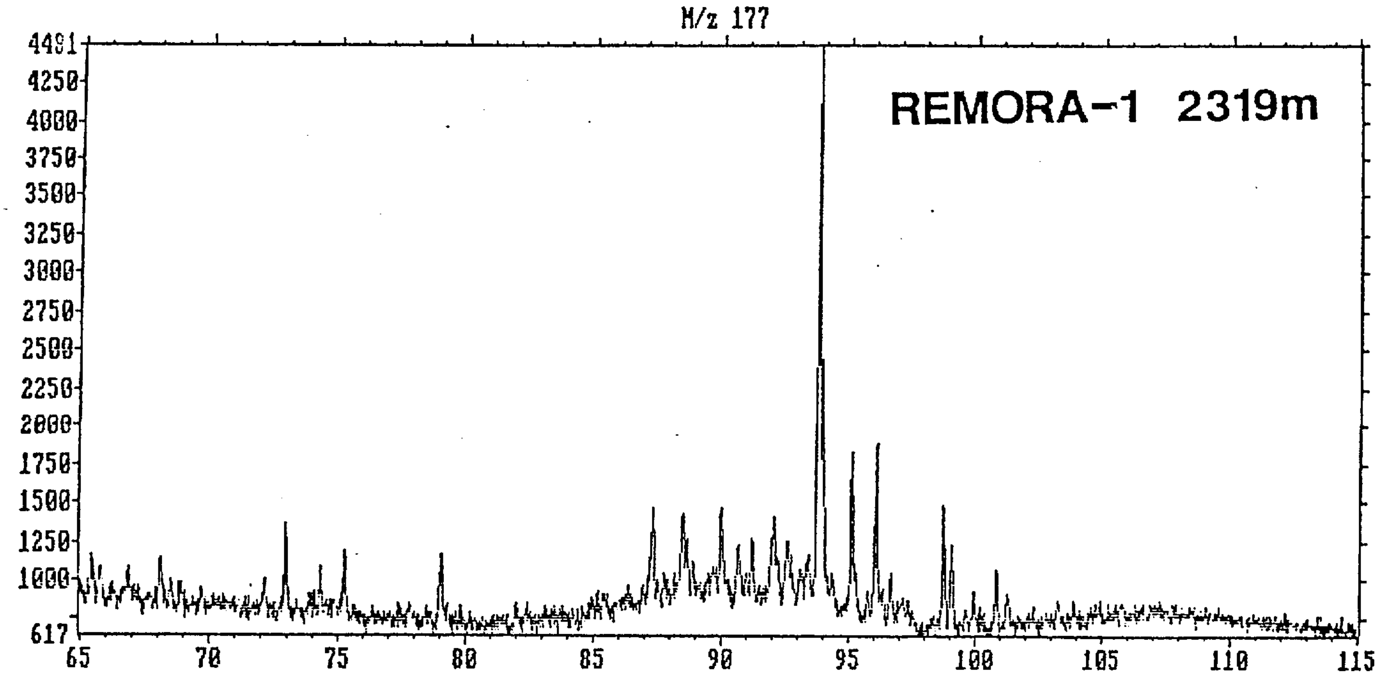
The enclosure PE603616 has the following characteristics:

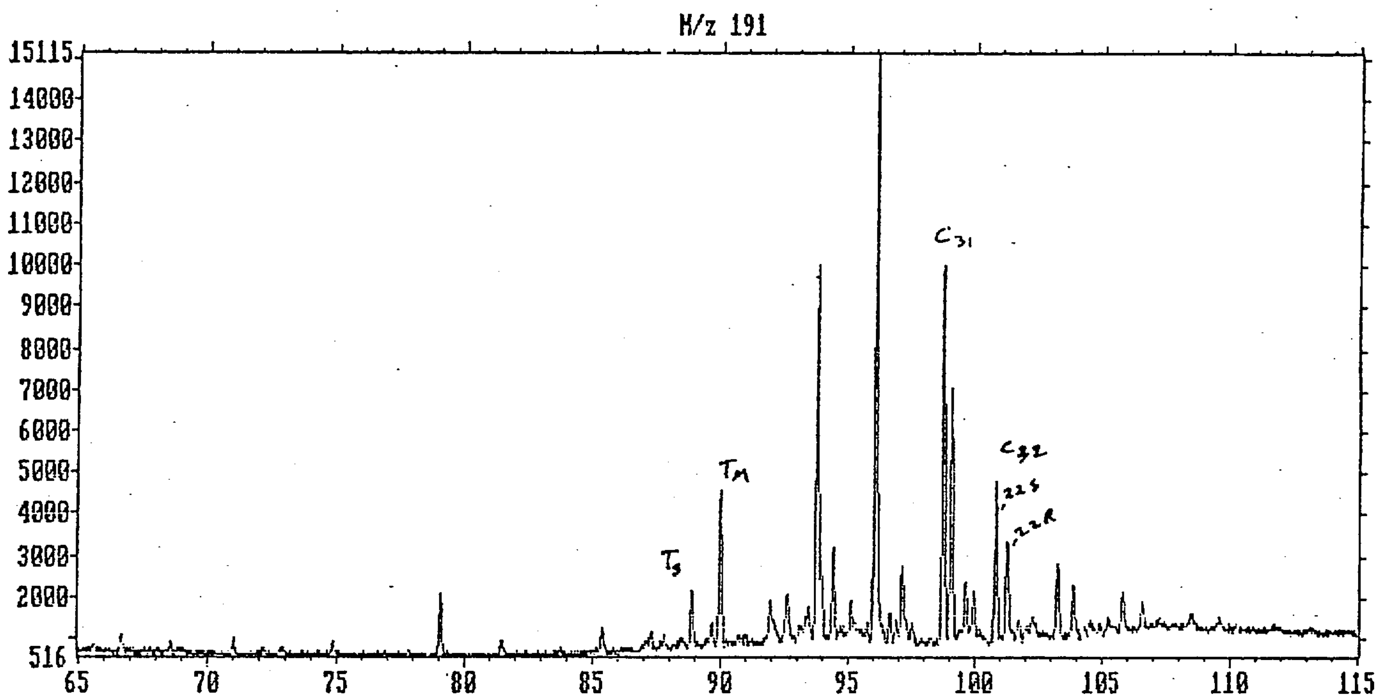
ITEM_BARCODE =	PE603616
CONTAINER_BARCODE =	PE902212
NAME =	Geochemical Profile
BASIN =	GIPPSLAND
PERMIT =	VIC/P1
TYPE =	WELL
SUBTYPE =	WELL_LOG
DESCRIPTION =	Composite Geochemical Profile for Remora-1
REMARKS =	
DATE_CREATED =	1/09/87
DATE_RECEIVED =	18/12/87
W_NO =	W959
WELL_NAME =	REMORA-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

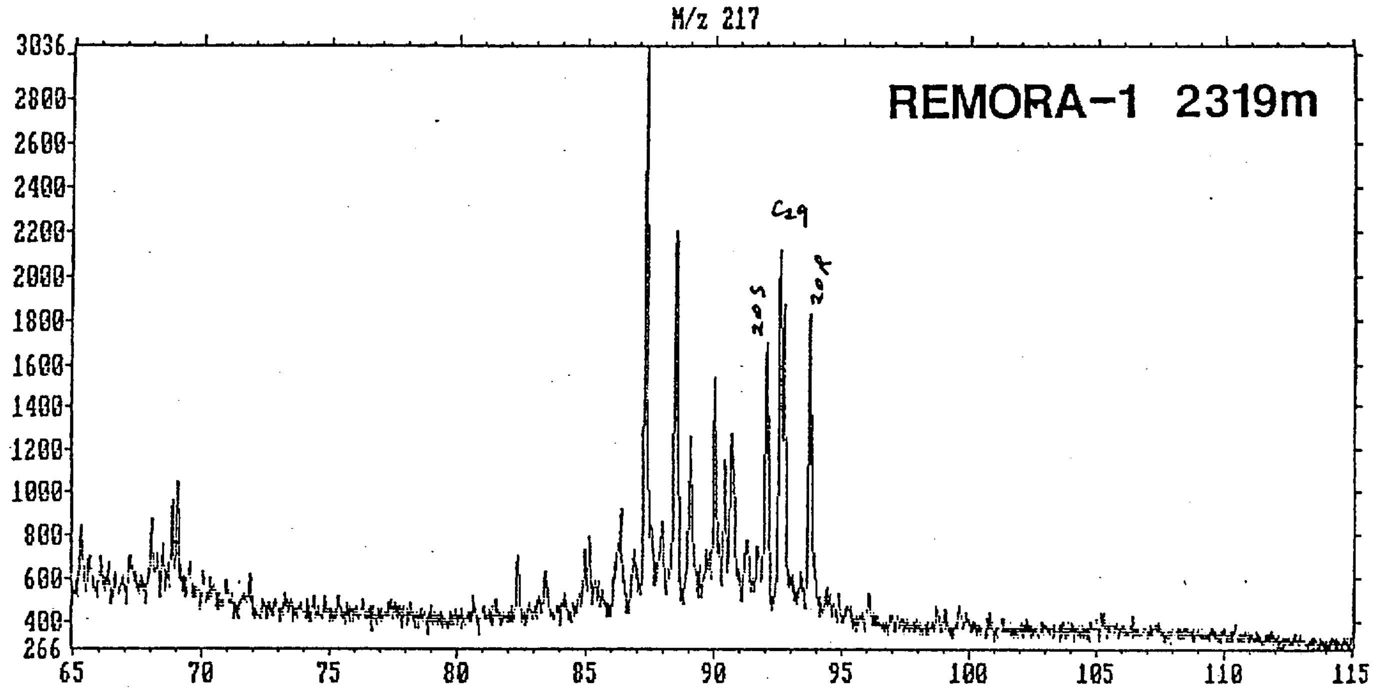
APPENDIX 1.

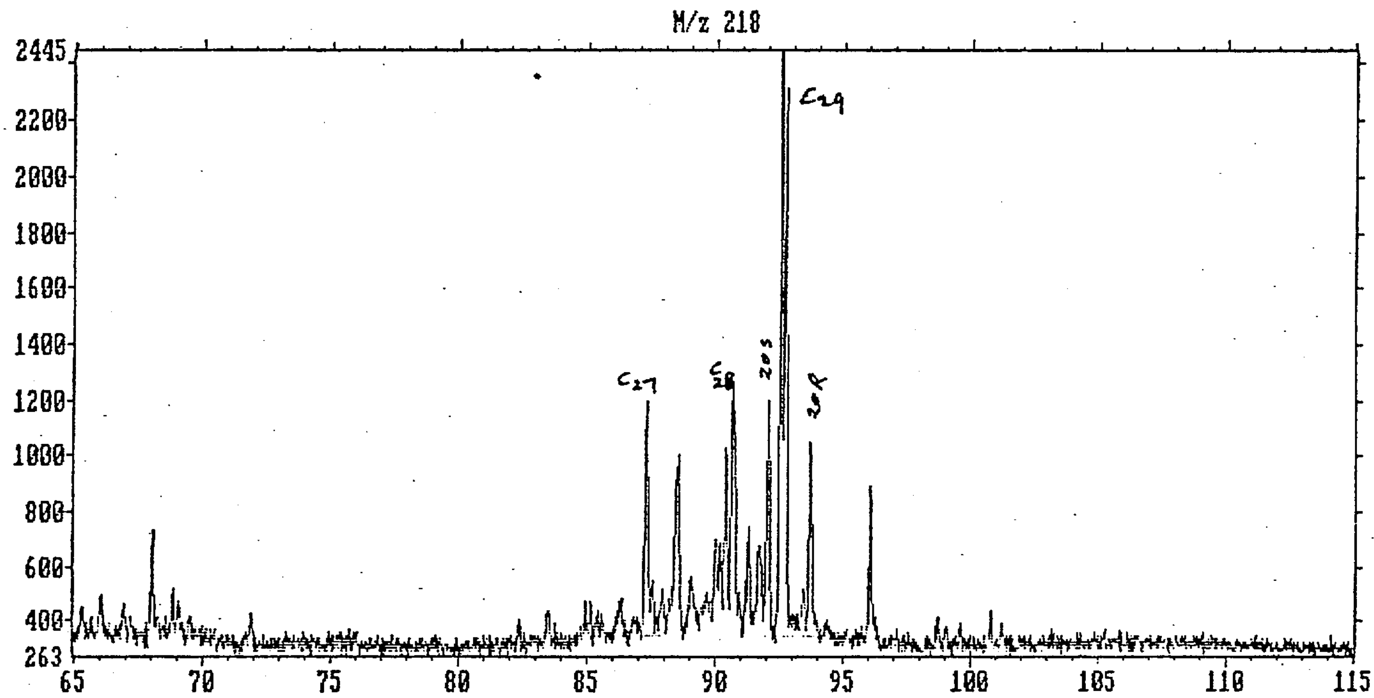
2819L



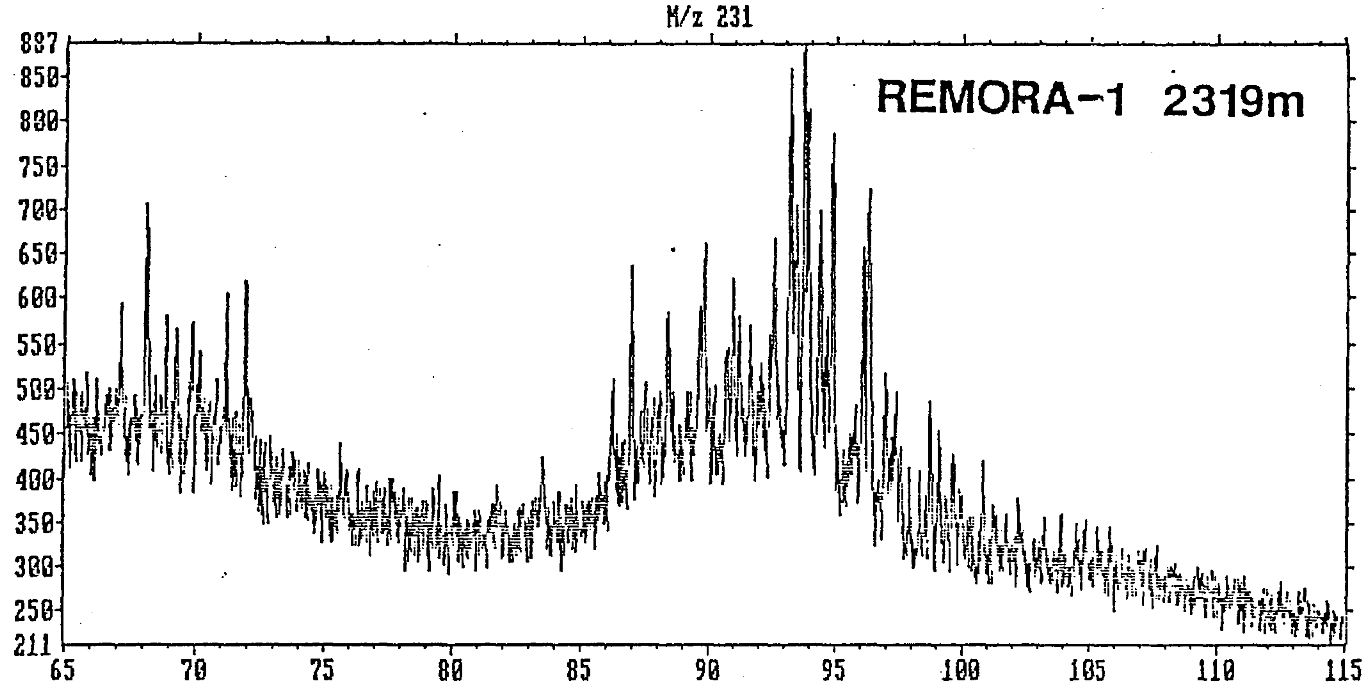


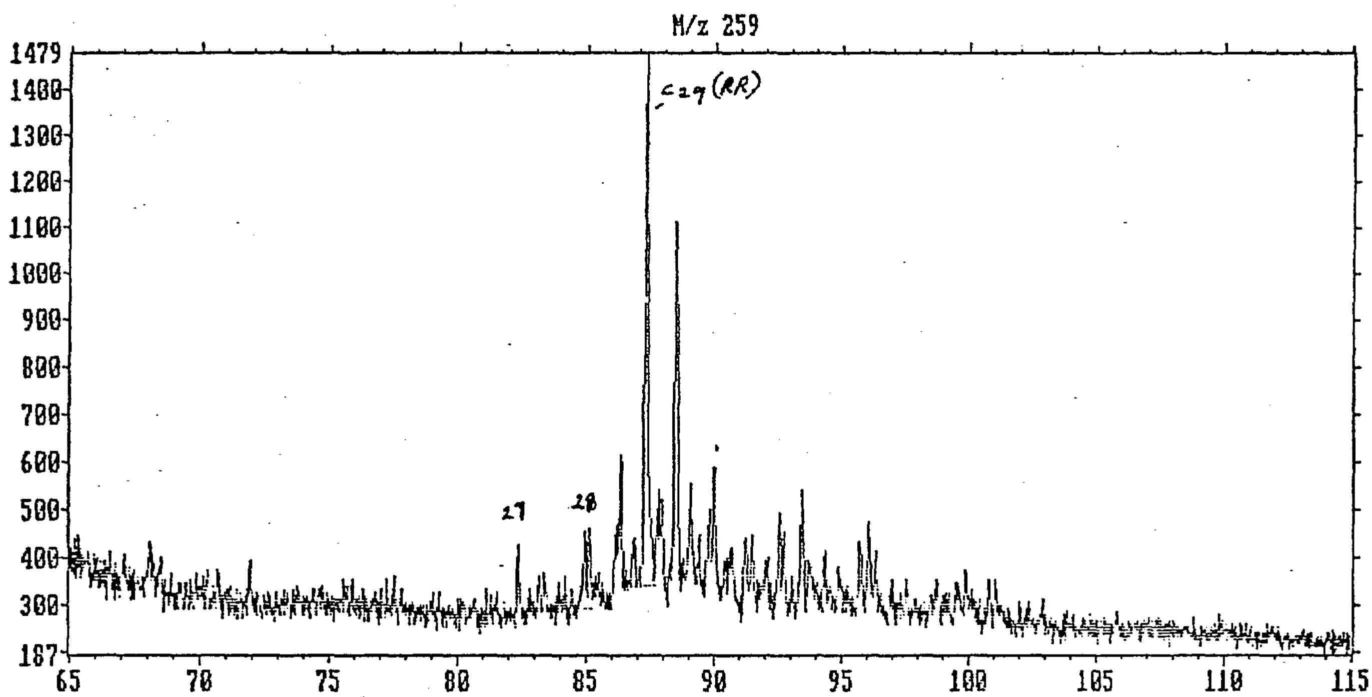
93907A
4201 scans acquired on 3 Jun,1987 at 09:49:26. Rate = 1 seconds/scan
93907A UN, SAT(oil)Australia, Gippsland Basin, Remora No. 1, 2319 m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument



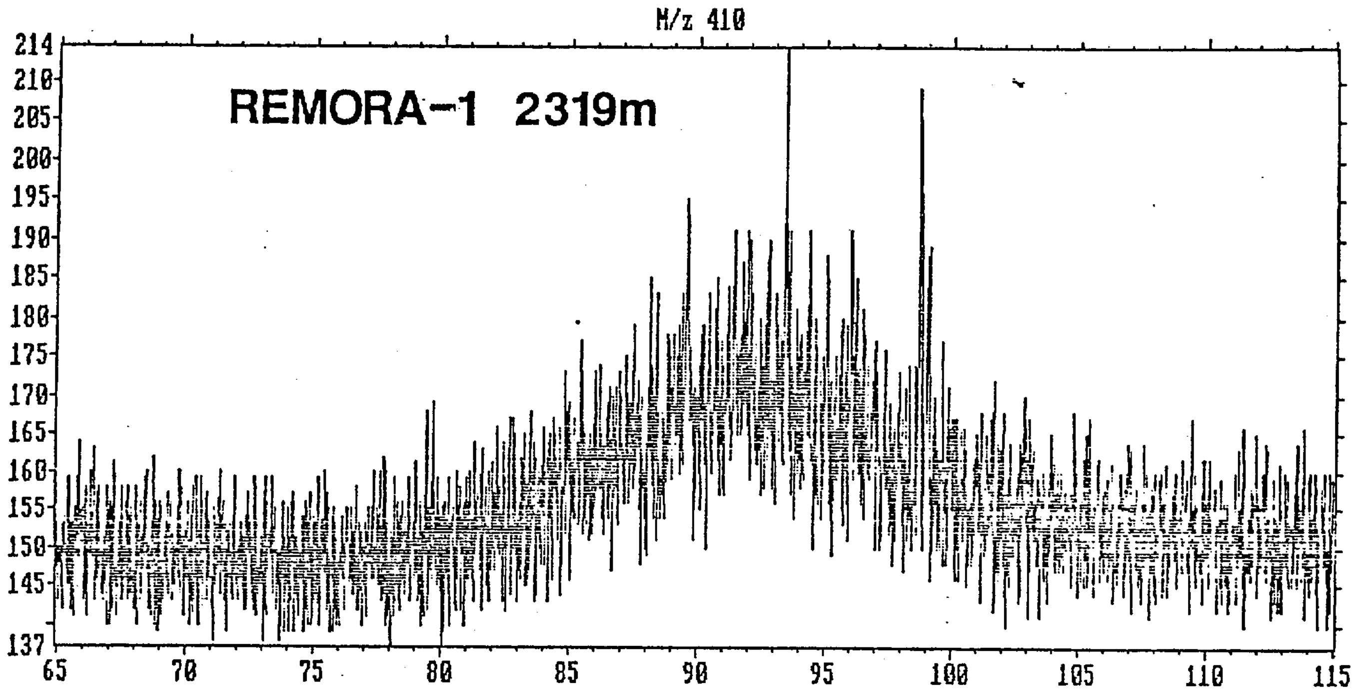


93907A
4201 scans acquired on 3 Jun,1987 at 09:49:26. Rate = 1 seconds/scan
93907A UN, SAI(oil)Australia, Gippsland Basin, Remora No. 1, 2319m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument

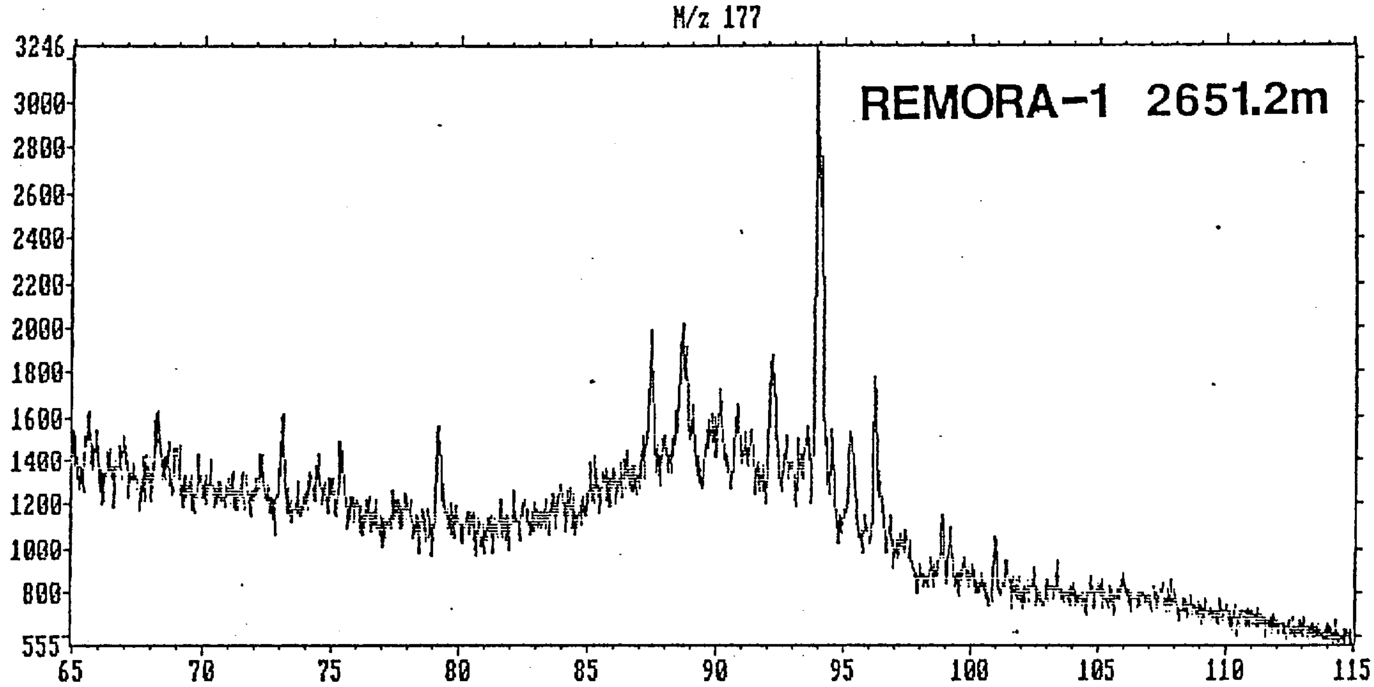


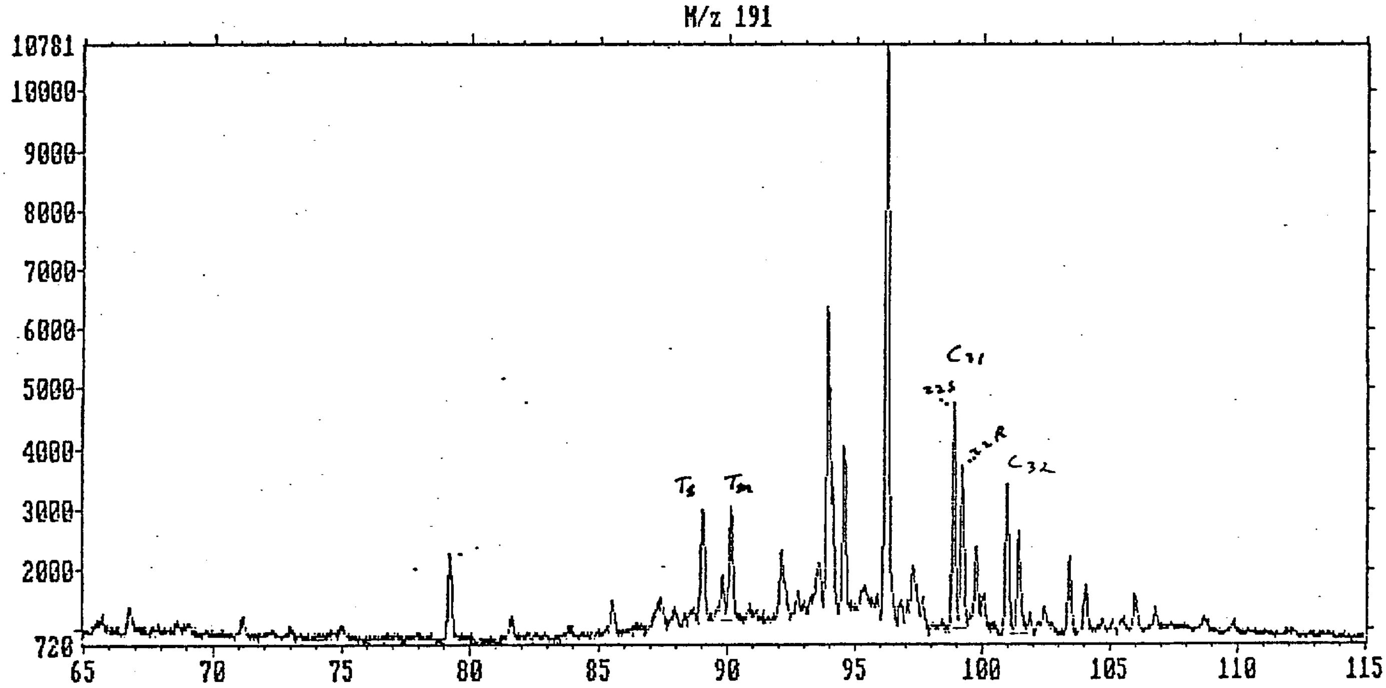


93907A
4201 scans acquired on 3 Jun,1987 at 09:49:26. Rate = 1 seconds/scan
93907A UN, SAI(oil)Australia, Gippsland Basin, Remora No. 1, 2319 m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument

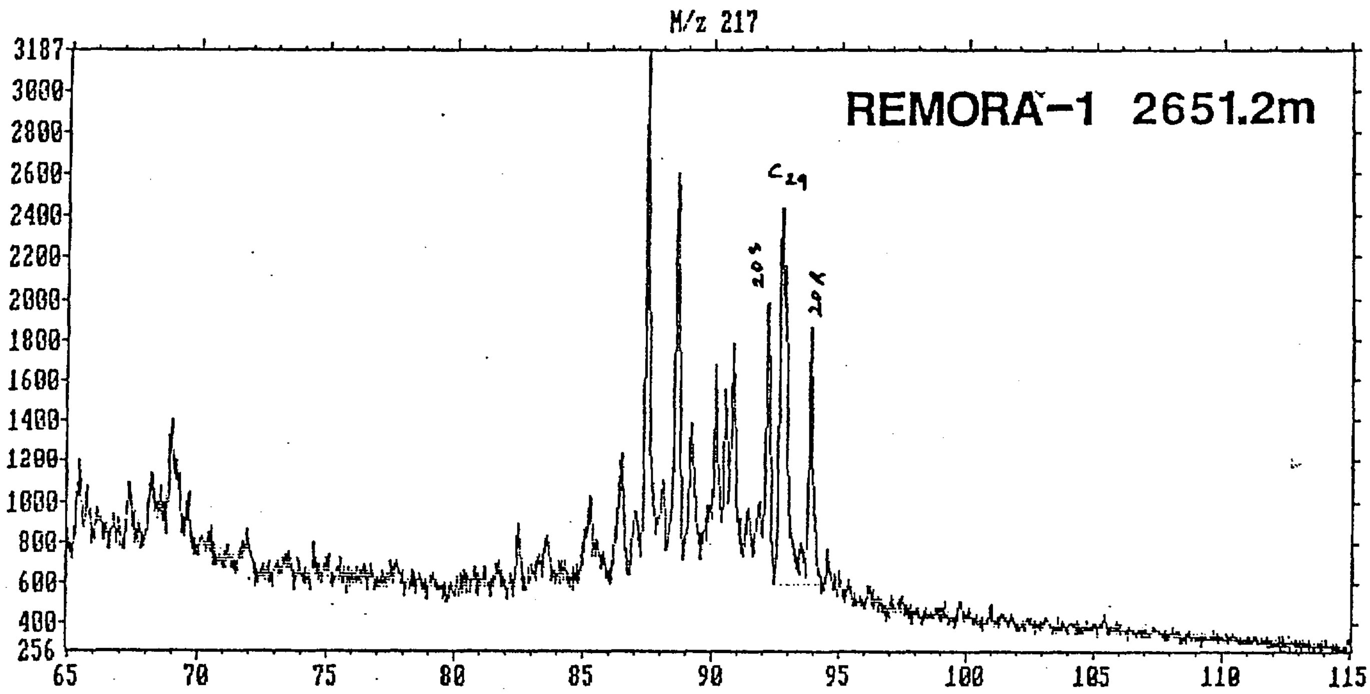


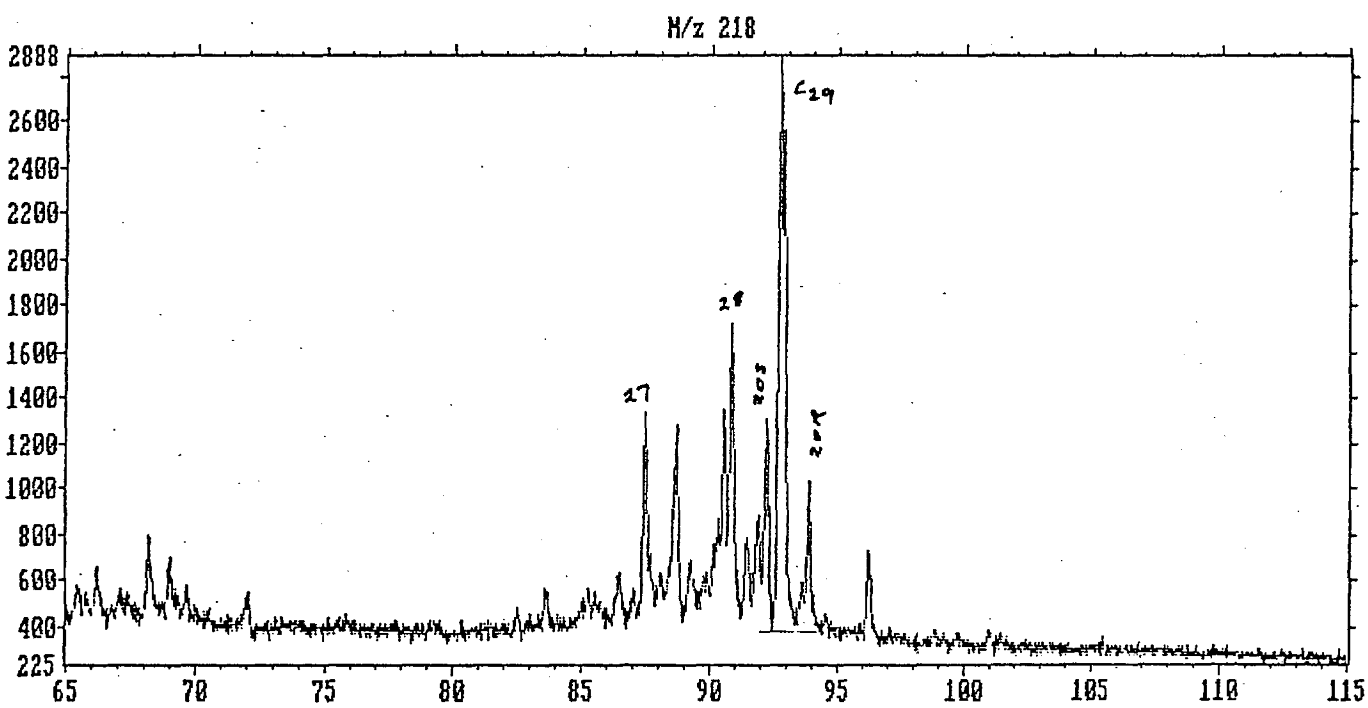
93907A
4201 scans acquired on 3 Jun,1987 at 09:49:26. Rate = 1 seconds/scan
93907A UN, SAI(oil)Australia, Gippsland Basin, Remora No. 1, 2319m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument



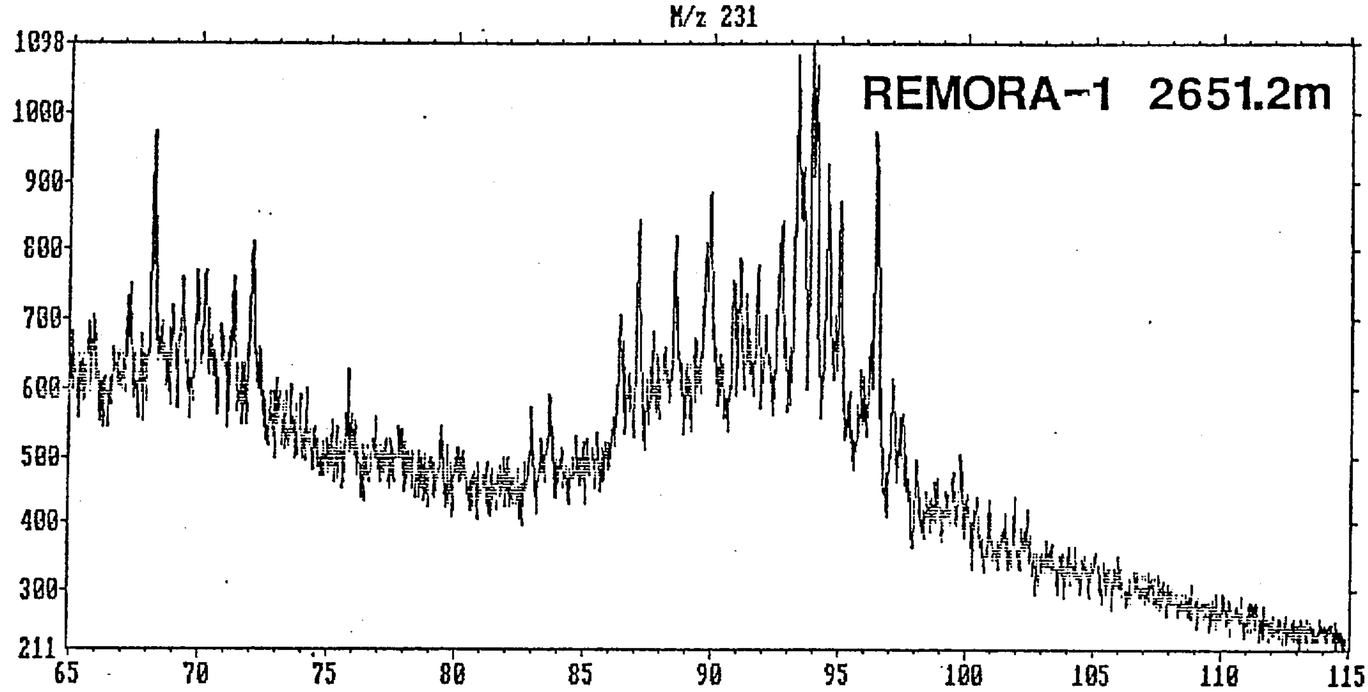


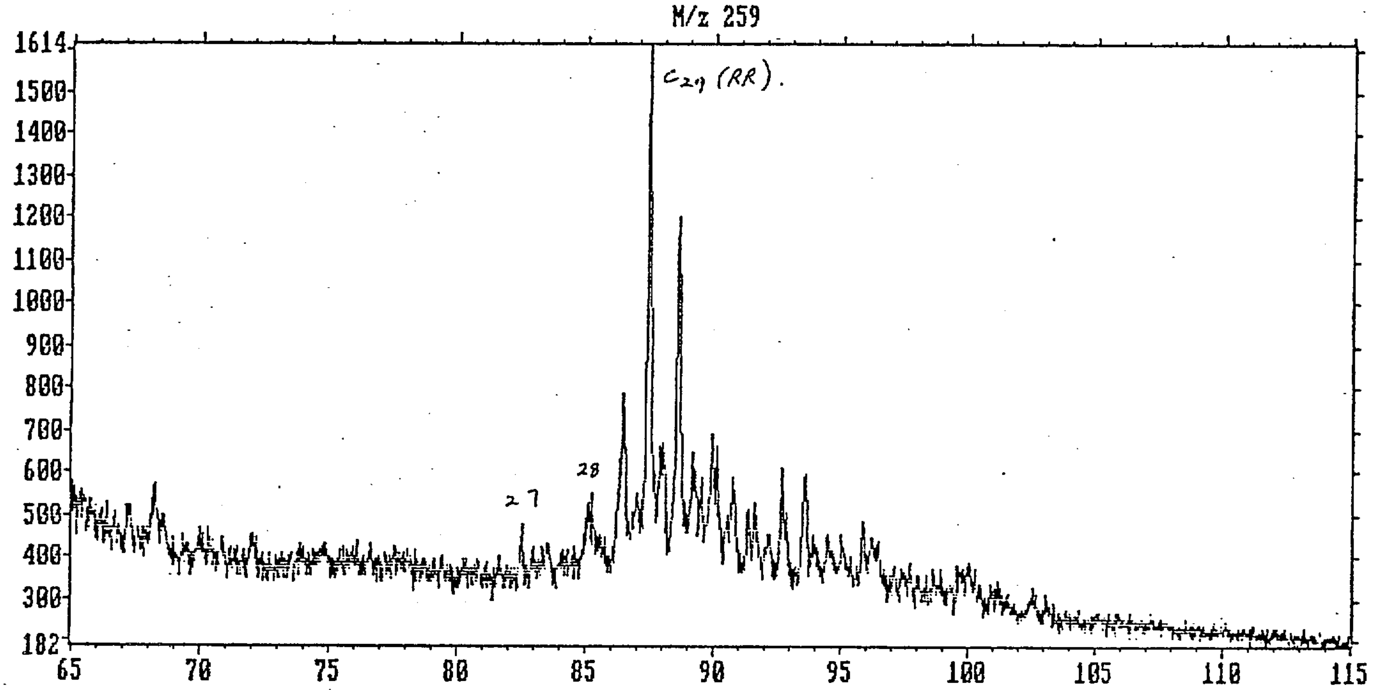
93907B
4201 scans acquired on 3 Jun,1987 at 12:28:12. Rate = 1 seconds/scan
93907B UN, SAT(oil)Australia, Gippsland Basin, Remora No. 1, 2651.2 m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument



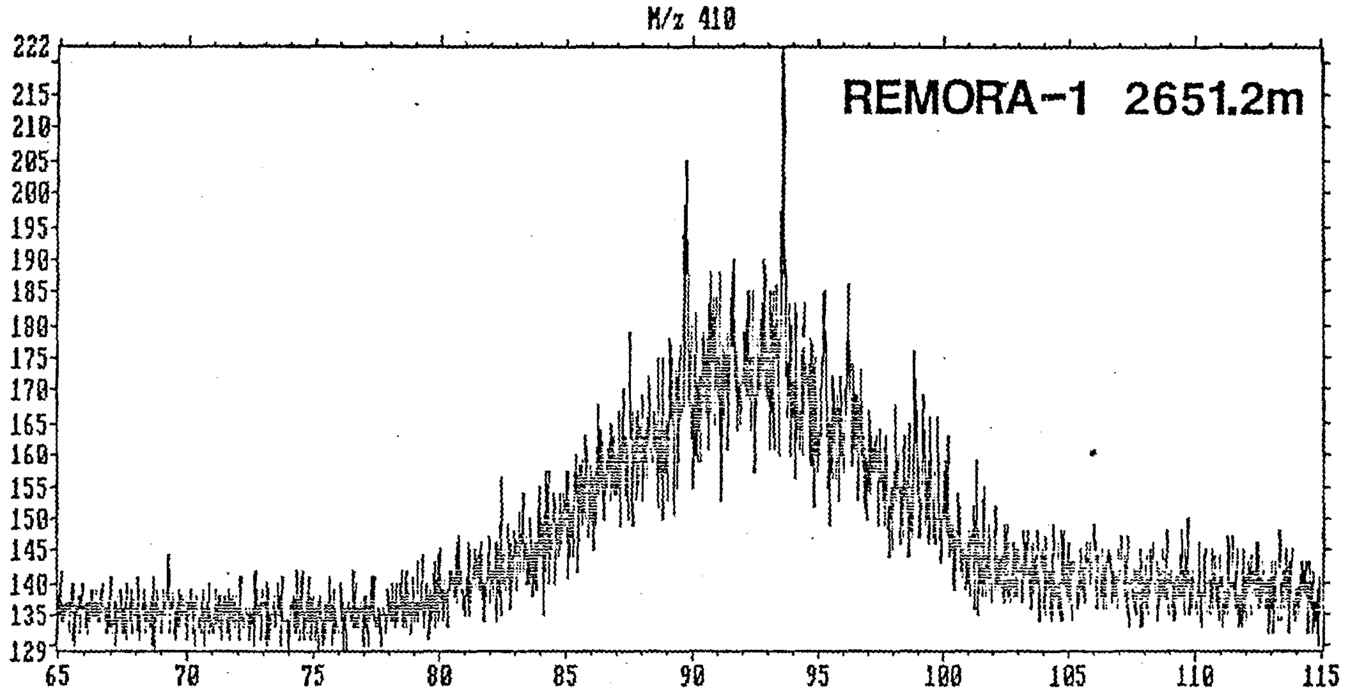


93907B
4201 scans acquired on 3 Jun,1987 at 12:28:12. Rate = 1 seconds/scan
93907B UN, SAI(oil)Australia, Gippsland Basin, Remora No. 1, 2651.2m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument





93907B
4201 scans acquired on 3 Jun,1987 at 12:28:12. Rate = 1 seconds/scan
93907B UN, SAT(oil)Australia, Gippsland Basin, Remora No. 1, 2651.2m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument



93907B
4201 scans acquired on 3 Jun,1987 at 12:28:12. Rate = 1 seconds/scan
93907B UN, SAI(oil)Australia, Gippsland Basin, Remora No. 1, 2651.2m
20000 ng, 6 millisecond integration, averaging 21 times
EI/CI Instrument

APPENDIX 4

APPENDIX 4

APPENDIX 4

WIRELINE TEST REPORT

ATTACHMENT 1

REMORA-1 RFT SURVEY DATA

RUNS 1-7 INCLUSIVE

(2640F:2-5)

REMORA-1 RFT REPORT

SUMMARY

A series of RFT tests consisting of seven runs were made in the Remora-1 exploration well. All seven runs were made on 10-13 May, 1987, after drilling the $12^1/4$ inch hole to 2822m KB (2800m SS). The main objectives of these tests were to investigate oil and gas shows indicated on mudlogs or by log interpretations in sands between the interval 2122m KB (2100m SS) and 2822m KB (2800 SS). Results from this RFT program confirmed log interpretations that the Intra-Latrobe sands 2317.5-2323.5m KB (2295.5-2301.5m SS) and 2649.25-2653.75m KB (2625.25-2631.75m SS) were oil bearing and 2268.5-2278.0m KB (2246.5-2256.0m SS) and 2694.0-2705.0m KB (2672.0-2683.0m SS) were gas bearing.

RESULTS AND DISCUSSION

Run 1 consisted of 46 pretests taken with the Hewlett-Packard gauge over the interval between 2173.0m KB (2141m SS) and 2802.0m KB (2780.0m SS). Of the 46 pretests attempted, 35 were successful in providing formation pressures, 6 were tight tests and 5 were seal failures. Run numbers 2 to 6 were sample runs consisting of a 6 gallon (22.8 litres) lower main chamber and a 1 gallon (3.8 litres) segregated chamber run with the Hewlett-Packard gauge. Run number 7 was a sample run consisting of a 12 gallon (45.4 litres) lower main chamber and a $2^3/4$ gallon (10.4 litres) segregated chamber run with the Schulumberger RFT strain gauge. Run numbers 2 and 5 with seats located at 2651.2m KB (2629.2m SS) and 2319m KB (2297m SS) respectively recovered significant quantities of waxy oil. Run numbers 4, 6 and 7 with seats located at 2696.5m KB (2674.5m SS), 2276.8m KB (2254.8m SS) and 2703m KB (2681m SS) respectively recovered significant quantities of gas with minor condensate shows. Run number 3 with seat located at 2677.5m KB (2655.5m SS) recovered mainly mud filtrate and small amount of very dark brown oil scum with bright, pale yellow fluorescence. Full details of data collected in this program are given in Remora Well Completion Report Volume 1. The main results which are illustrated in Figures 1 to 5 are:

(a) The presence of oil in the 6m gross sand interval 2317.5-2323.5m KB (2295.5-2301.5m SS) indicated by logs was confirmed by the recovery of 17.5 litres of 35° API gravity oil in RFT run number 5 with the seat located at 2319m KB (2297m SS). Pressure data indicated the sand was drawndown by 23 psi relative to the original Gippsland Aquifer pressure.

(b) The presence of oil in the 4.5m gross sand interval 2649.25-2653.75m KB (2627.25-2631.75m SS) indicated by logs was confirmed by the recovery of 5.5 litres of 33.5° API gravity oil in RFT run number 2 with the seat located at 2651.2m KB (2629.2m SS).

The presence of oil in the 4m gross sand interval 2674.5-2678.5m KB (2652.5-2656.5m SS) indicated by logs was established by the recovery of small amount of very dark oil scum with bright, pale-yellow fluorescence in RFT run number 3 with the seat located at 2677.5m KB (2655.5m SS).

Pressure data measured in the interval 2600-2750m KB (2578-2728m SS) indicated a gross oil column of 94m with interpreted GOC at 2647m KB (2625m SS) and OWC at 2741m KB (2719m SS) assuming a water gradient of 1.42 psi/m extrapolated from the nearest pretest water seat 1/27 located at 2593.2m KB (2571.2m SS). This represents a "maximum case" since any shift in the water line to the right effectively reduces the oil column. It is common in Gippsland for the water line to shift to the right with increasing depth due to decreasing drawdown (due to Gippsland production) with increasing depth. Measured oil gradient within the 94m gross oil column was 1.0 psi/m. Measured gas gradient immediately above interpreted GOC of 2647m KB within the interval 2628.25-2639.0m KB (2606.25-2617.0m SS) was 0.29 psi/m (0.088 psi/ft).

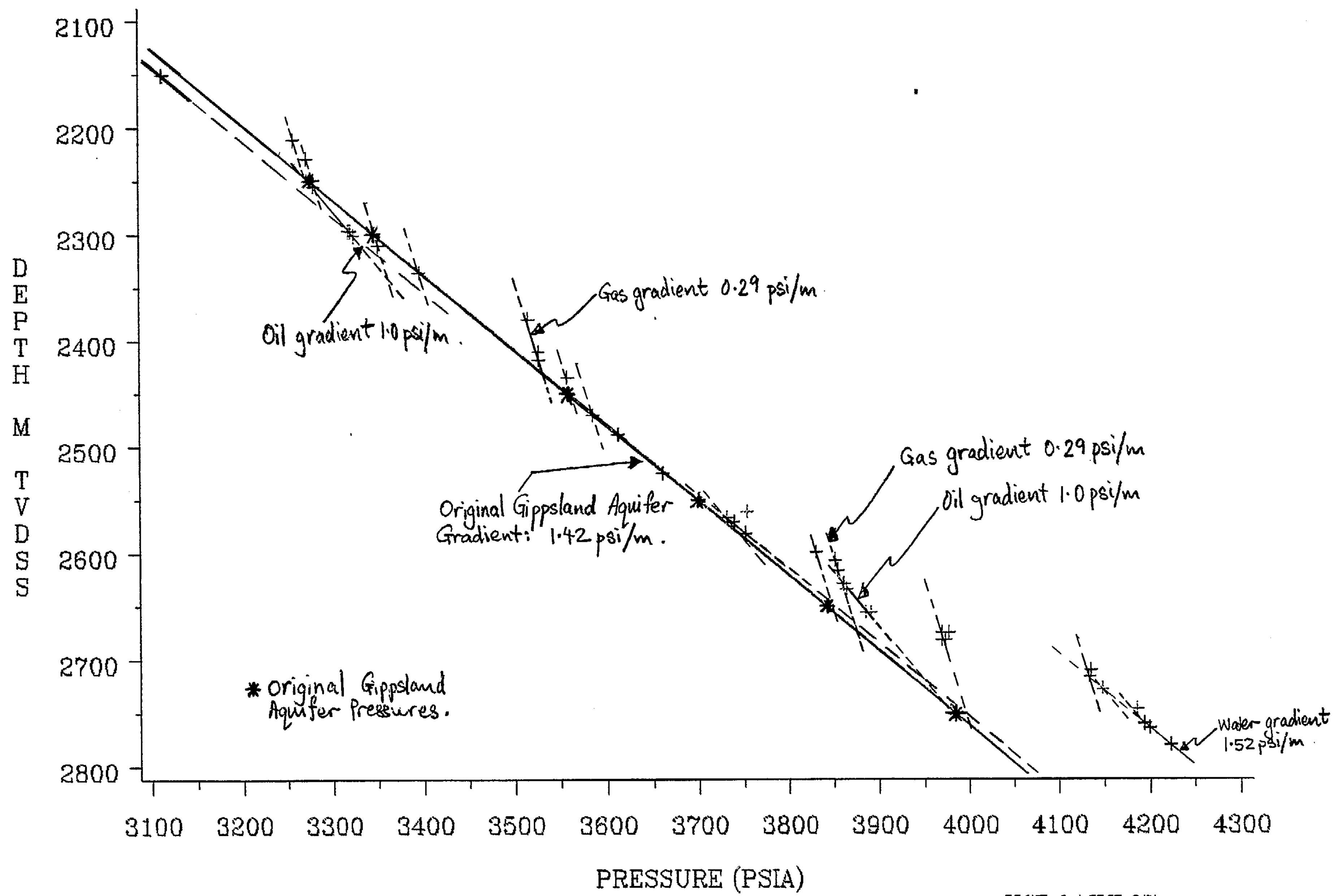
(c) The presence of gas in the 9.5m gross sand interval 2268.5-2278.0m KB (2246.5-2256m SS) indicated by logs was confirmed by the recovery of 2.9 cubic metres (102.1 cubic feet) of gas in RFT run number 6 with seat located at 2276.8m KB (2254.8m SS).

(d) The presence of gas in the 11m gross sand interval 2694.0-2705.0m KB (2672.0-2683.0m SS) indicated by logs was confirmed by the recovery of 0.8 cubic metres (27.2 cubic feet) and 1.2 cubic metres (43.2 cubic feet) of gas in RFT run numbers 4 and 7 with seats located at 2696.5m KB (2674.5m SS) and 2703m KB (2681m SS) respectively.

(e) The water gradient established in sands below 2700m KB (2678m SS) was 1.52 psi/m and was abnormally pressured relative to the original Gippsland aquifer pressures.

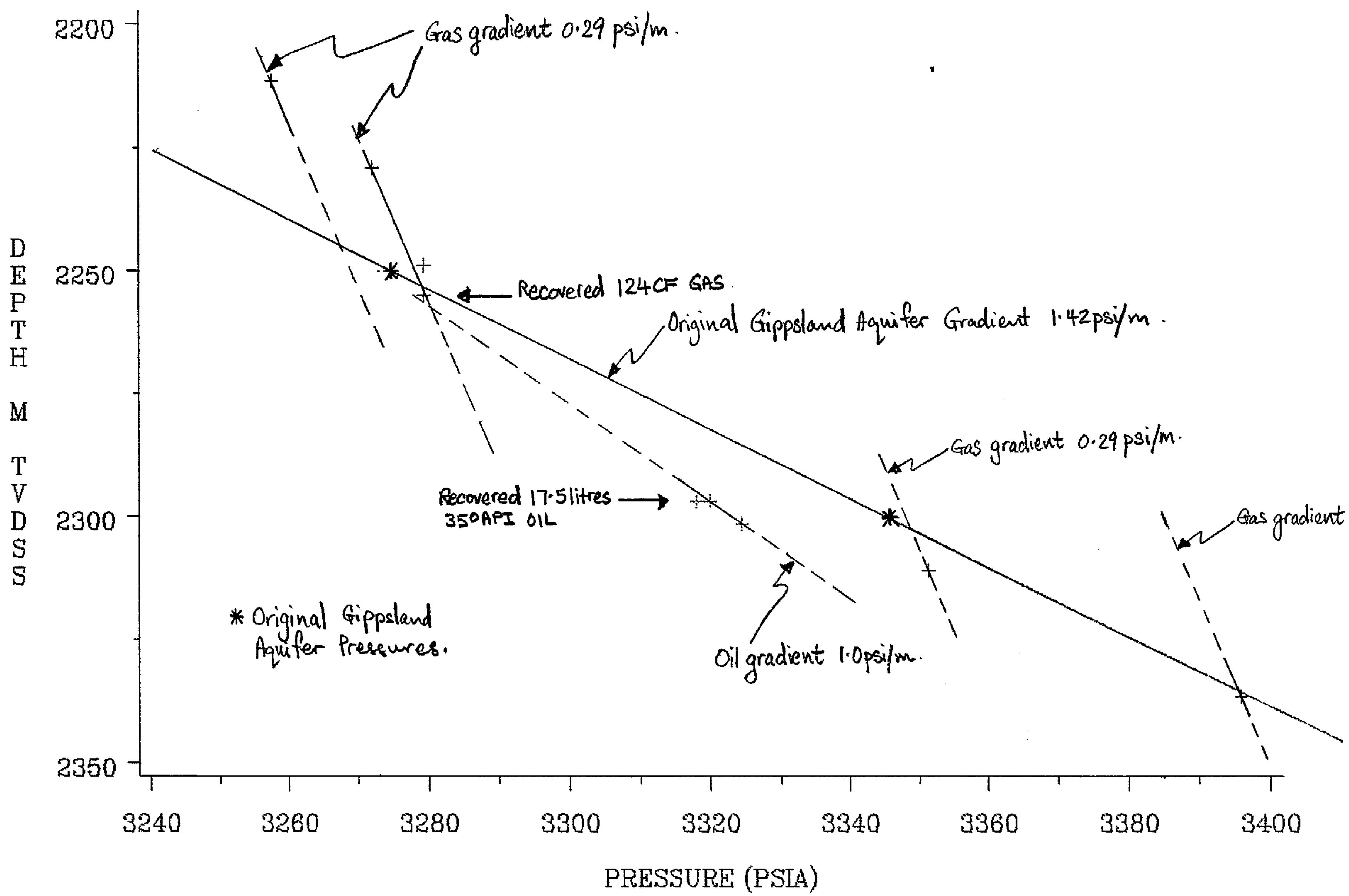
(f) The sands in the interval 2100-2325m KB (2078-2303m SS) were slightly drawndown relative to the original Gippsland aquifer pressures due to the effect of nearby Intra-Latrobe production from Snapper and Tuna fields.

FIG 1: REMORA-1 RFT SURVEY 2100-2800M SS



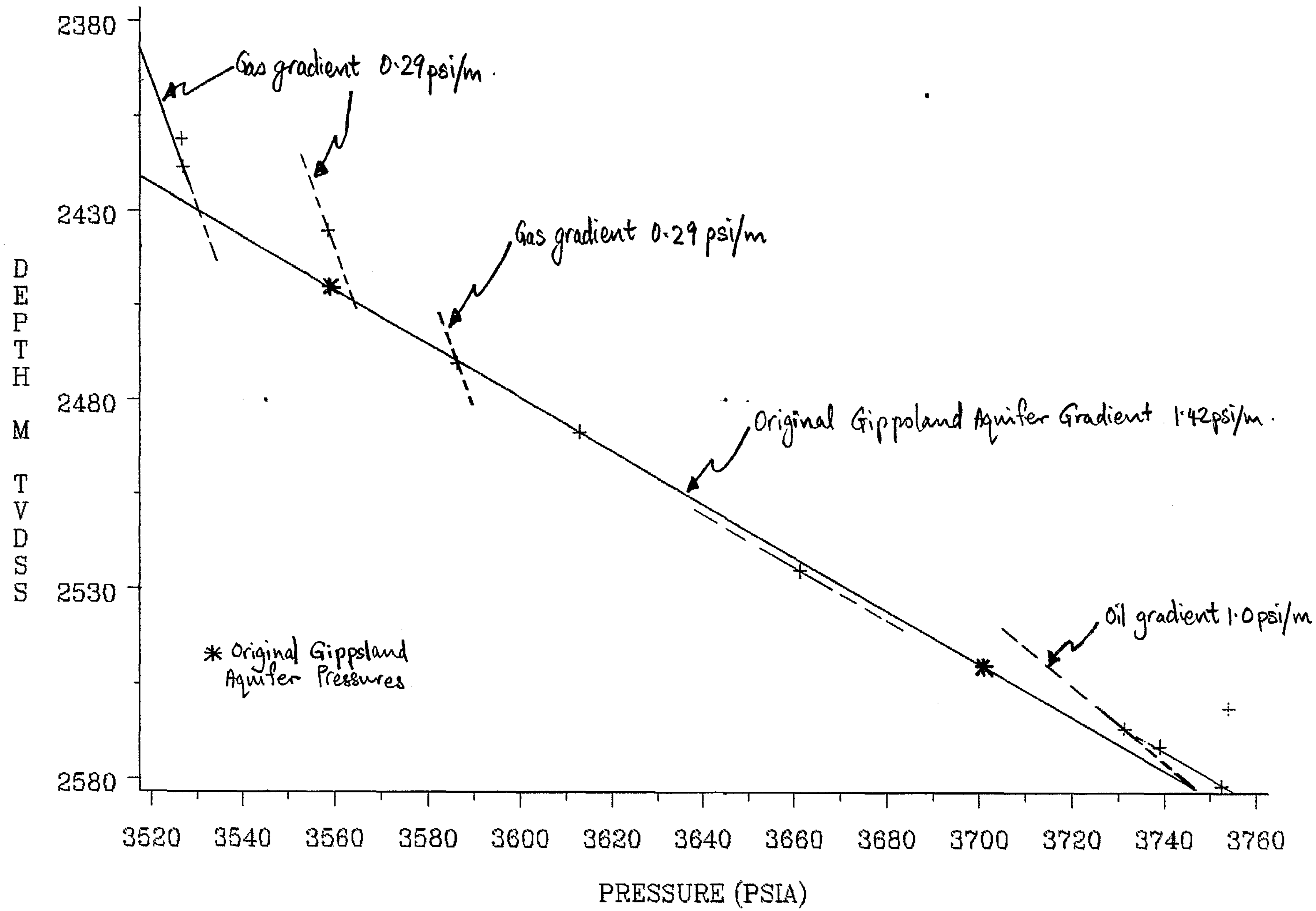
KST 24JUL87

FIG 2 : REMORA-1 RFT SURVEY 2200-2350M SS



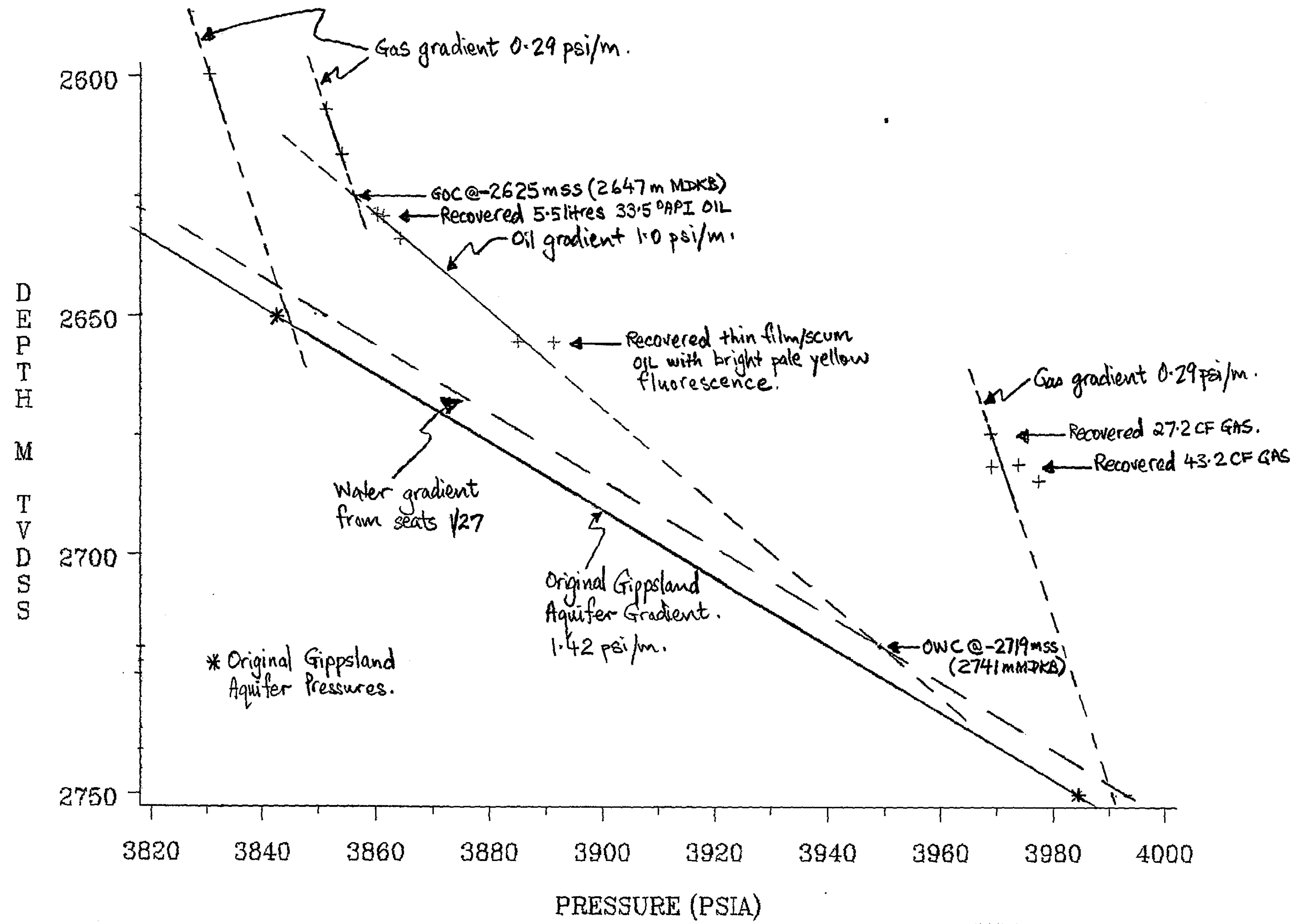
KST 24JUL87

FIG 3 : REMORA-1 RFT SURVEY 2380-2580M SS



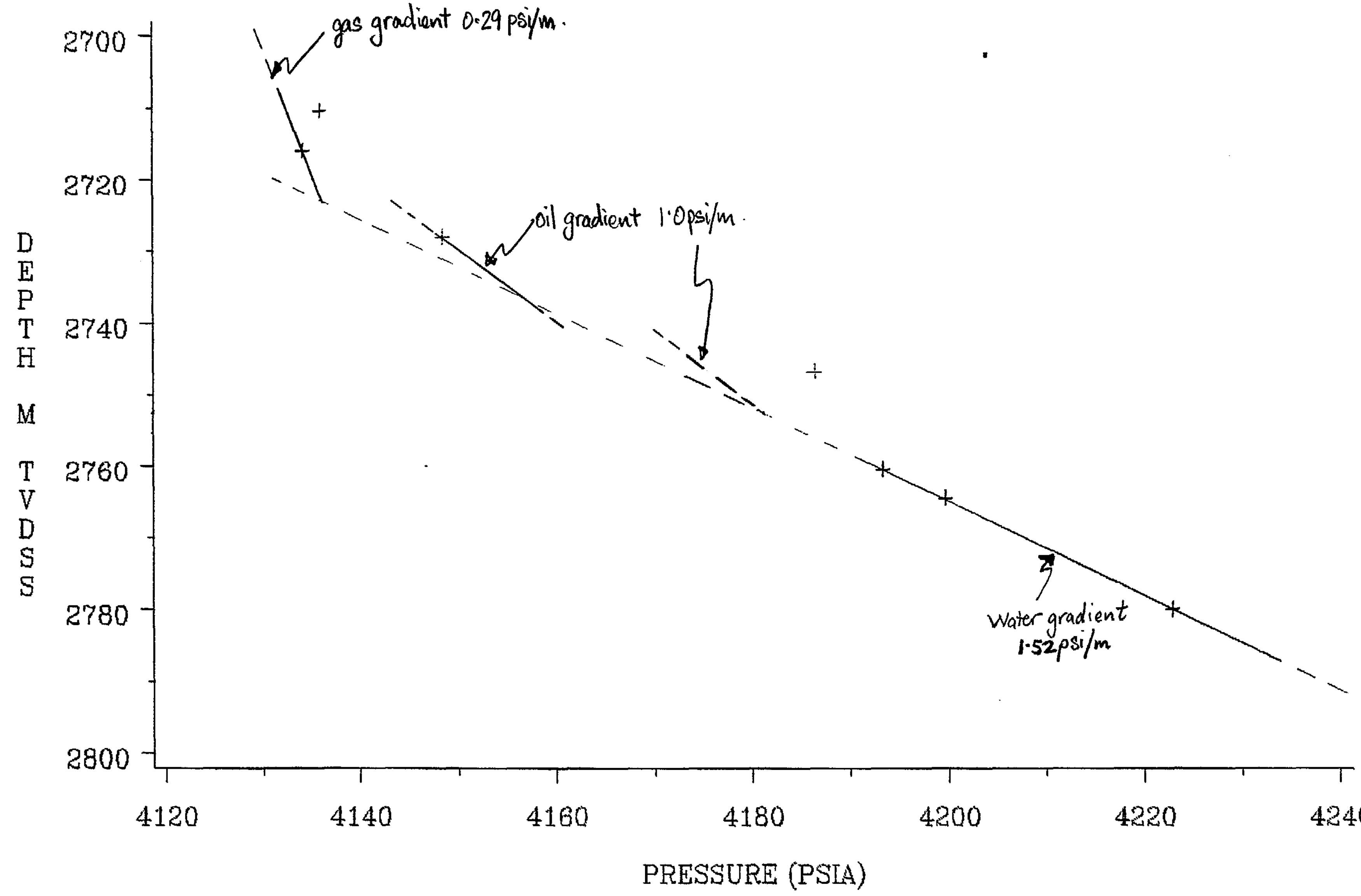
KST 24JUL87

FIG 4 : REMORA-1 RFT SURVEY 2600-2750M SS



KST 30JUL87

FIG 5 : REMORA-1 RFT SURVEY 2700-2800M SS



KST 24JUL87

APPENDIX 5

APPENDIX 5

SYNTHETIC SEISMIC TRACE

REMORA-1

Total Depth	:	2961 metres KB.
K.B.	:	22 metres.
Water Depth	:	57 metres.
Polarity	:	Trough on trace represents an acoustic impedance increase.
Pulse Types & Frequencies	:	Pulse 1 - Minimum phase, 1st derivative Gaussian 20 Hz. Pulse 2 - Zero phase, 2nd derivative Gaussian 25 Hz.
Sample Interval	:	4 metres.
Checkshot Correction	:	No*.

* Note : The checkshots present on this synthetic seismogram are interpretative only as no survey was shot. Checkshot 1 and 2 are thought to be accurate, representing sea floor and top of Latrobe Group respectively. The time-depth pair of checkshot 3 provides a reasonable tie of the deep high amplitude events with the seismic data.

Doc. 2827L/2

PE902213

This is an enclosure indicator page.
The enclosure PE902213 is enclosed within the container PE902212 at this location in this document.

The enclosure PE902213 has the following characteristics:

ITEM_BARCODE = PE902213
CONTAINER_BARCODE = PE902212
NAME = Synthetic Seismogram
BASIN = GIPPSLAND
PERMIT =
TYPE = WELL
SUBTYPE = SYNTH_SEISMOGRAM
DESCRIPTION = Synthetic Seismogram
REMARKS =
DATE_CREATED = 4/09/87
DATE_RECEIVED = 18/12/87
W_NO = W956
WELL_NAME = Remora-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 6

APPENDIX 6

PETROGRAPHIC REPORT

amdel
technology and enterprise
Amdel Limited - Inc. in S.A.

Amdel
31 Flemington Street,
Frewville, S.A. 5063

Telephone: (08) 372 2700

Address all correspondence to:
P.O. Box 114,
Eastwood, S.A. 5063

Telex: AA82520
Facsimile: (08) 79 6623

8 September 1987

F 3/178/0
F 6916/88

Esso Australia Limited
GPO Box 4047
SYDNEY NSW 2001

Attention: Mr A.J. Mebberson

REPORT F 6916/88

YOUR REFERENCE: 61:GB/mmc

MATERIAL: Core samples

LOCALITY: REMORA-1

IDENTIFICATION: 1-6

WORK REQUIRED: Petrography and geochronology

Investigation and Report by: Dr Brian G. Steveson

Manager, Petroleum Services Section: Dr Brian G. Steveson

for Dr William G. Spencer
General Manager
Applied Sciences Group

cap

The rock samples described in this report were recovered from the junk basket at 2904.5m KB

Six unlabelled rock samples were received from Remora-1 for petrography and assessment of suitability for K-Ar dating.

The rocks are similar to each other and will be described as a group.

A visual estimate of the mineral proportions is as follows:

Constituent	Sample and TS Number					
	C49250	C49251	C49252	C49253	C49254	C49255
	1	2	3	4	5	6
Groundmass						
Feldspar	40*	75*	40	40	45	55
Calcite	50	2	40	45	25	40
Opaques	3	3	10	2	15	5
Microphenocrysts						
Olivine	10	7	7	7	15	3
Amygdales	–	15	2	2	–	1

*Feldspar is represented by pseudomorphs in these samples.

The rocks may all be described as basalt; fresher samples (3, 4 and 5) show a flow alignment of plagioclase laths in the groundmass and are clearly extrusive and it seems likely that all six samples are lavas.

Original microphenocrysts are now represented by pseudomrophs of secondary minerals: Typical 6-sided outlines and curved loci of alteration are characteristic of olivine and permit positive identification, even though no olivine remains in the rock. For the most part, olivine has been replaced by a dense aggregate of carbonate and opaques (goethite/limonite) but there are some instances of patches of secondary silica within the pseudomorphs. All the rocks show a tendency towards a glomeroporphyritic texture.

In samples 1 and 2 the principal constituent of the groundmass is a colourless, low-birefringence mineral which forms extremely finely granular aggregates. This could be kaolinite or, possibly, quartz. The pattern of fine-grained opaques associated with this mineral outlines the original plagioclase laths now pseudomorphed by the ?kaolinite. These pseudomorphs in 1 and 2 and the fresh, clean plagioclase laths in 3-6 are up to 0.2 mm in length mainly, although they tend to be somewhat larger in sample 6. In samples 3-5 the laths show a flow orientation but in the other samples have a decussate arrangement.

Carbonate is present as irregular, ragged but equant crystals with a wide size range up to about 0.2 to 0.3 mm. Commonly the crystal shapes are determined by adjacent plagioclase crystals. Opaque and semi-opaque ferruginous phases are widely disseminated granules. Some of this material may also be sphene (especially in sample 5).

Sample 2 contains large amygdales filled, in most cases, with fine-grained spherically oriented quartz. Other amygdales contain granular quartz or carbonate.

In brief, therefore these are extensively altered olivine basalts of extrusive origin. The abundance of carbonate unfortunately renders them unsuitable for K-Ar geochronology.

ENCLOSURES

ENCLOSURES

PE902214

This is an enclosure indicator page.
The enclosure PE902214 is enclosed within the container PE902212 at this location in this document.

The enclosure PE902214 has the following characteristics:

ITEM_BARCODE = PE902214
CONTAINER_BARCODE = PE902212
NAME = Geological Cross Section A-A1
BASIN = GIPPSLAND
PERMIT =
TYPE = WELL
SUBTYPE = CROSS_SECTION
DESCRIPTION = Geological Cross Section A-A1
REMARKS =
DATE_CREATED = 1/08/97
DATE_RECEIVED = 18/12/87
W_NO = W956
WELL_NAME = Remora-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902216

This is an enclosure indicator page.
The enclosure PE902216 is enclosed within the container PE902212 at this location in this document.

The enclosure PE902216 has the following characteristics:

ITEM_BARCODE = PE902216
CONTAINER_BARCODE = PE902212
NAME = Structure Map Lower L.balmei Seismic Horizon
BASIN = GIPPSLAND
PERMIT =
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Structure Map Lower L.balmei Seismic Horizon, Most Likely Case (enclosure from WCR) for Remora-1
REMARKS =
DATE_CREATED = 1/08/97
DATE_RECEIVED = 18/12/87
W_NO = W956
WELL_NAME = Remora-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902217

This is an enclosure indicator page.
The enclosure PE902217 is enclosed within the container PE902212 at this location in this document.

The enclosure PE902217 has the following characteristics:

```
     ITEM_BARCODE = PE902217
CONTAINER_BARCODE = PE902212
             NAME = Structure Map Top of Latrobe group
            BASIN = GIPPSLAND
           PERMIT =
             TYPE = SEISMIC
          SUBTYPE = HRZN_CONTR_MAP
      DESCRIPTION = Structure Map Top of Latrobe group,
                    Most Likely Case (enclosure from WCR)
                    for Remora-1
          REMARKS =
     DATE_CREATED = 1/08/97
    DATE_RECEIVED = 18/12/87
             W_NO = W956
        WELL_NAME = Remora-1
       CONTRACTOR = ESSO
     CLIENT_OP_CO = ESSO
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE906274

This is an enclosure indicator page.
The enclosure PE906274 is enclosed within the container PE902212 at this location in this document.

The enclosure PE906274 has the following characteristics:

ITEM_BARCODE = PE906274
CONTAINER_BARCODE = PE902212
NAME = Structure Map - Lower L.balmei
BASIN = GIPPSLAND
PERMIT = VIC/P1
TYPE = SEISMIC
SUBTYPE = HRZN_CNTR_MAP
DESCRIPTION = Structure Map of Lower L.balmei Seismic Horizon (most likely case)
REMARKS = Taken from Post Drill Assessment Report
DATE_CREATED = 30/09/87
DATE_RECEIVED = 11/07/88
W_NO = W959
WELL_NAME = REMORA-1
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE902218

This is an enclosure indicator page.
The enclosure PE902218 is enclosed within the container PE902212 at this location in this document.

The enclosure PE902218 has the following characteristics:

ITEM_BARCODE = PE902218
CONTAINER_BARCODE = PE902212
NAME = Structure Map T Longus Seismic Marker
BASIN = GIPPSLAND
PERMIT =
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Structure Map T Longus Seismic Marker, Most Likely Case (enclosure from WCR) for Remora-1
REMARKS =
DATE_CREATED = 1/08/97
DATE_RECEIVED = 18/12/87
W_NO = W956
WELL_NAME = Remora-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE601092

This is an enclosure indicator page.
The enclosure PE601092 is enclosed within the container PE902212 at this location in this document.

The enclosure PE601092 has the following characteristics:

ITEM_BARCODE = PE601092
CONTAINER_BARCODE = PE902212
NAME = Well Completion Log
BASIN = GIPPSLAND
PERMIT =
TYPE = WELL
SUBTYPE = COMPLETION_LOG
DESCRIPTION = Well Completion Log
REMARKS =
DATE_CREATED = 29/05/87
DATE_RECEIVED = 18/12/87
W_NO = W956
WELL_NAME = Remora-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE603617

This is an enclosure indicator page.
The enclosure PE603617 is enclosed within the container PE902212 at this location in this document.

The enclosure PE603617 has the following characteristics:

ITEM_BARCODE = PE603617
CONTAINER_BARCODE = PE902212
NAME = Mud Log
BASIN = GIPPSLAND
PERMIT = VIC/P1
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Mud Log for Remora-1
REMARKS =
DATE_CREATED = 21/05/87
DATE_RECEIVED = 9/11/87
W_NO = W959
WELL_NAME = REMORA-1
CONTRACTOR = SCHLUMBERGER/ANADRILL
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)