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WCR VOL 2

SNAPPER-5 (W912)

ESSO EXPLORATION AND PRODUCTION
AUSTRALIA INC.

112 pages
8 enclosures

WELL COMPLETION REPORT
SNAPPER-5

VOLUME II
INTERPRETIVE DATA

GIPPSLAND BASIN
VICTORIA

ESSO AUSTRALIA LIMITED

Compiled by: G.H.RODER

FEBRUARY.1986

SNAPPER-5

WELL COMPLETION REPORT

VOLUME 2

(Interpretative Data)

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(5678f)

GEOLOGICAL AND GEOPHYSICAL ANALYSIS

1. SUMMARY WELL PROGNOSIS

FORMATION/HORIZON Tops	(m KB) Pre-Drill	(m KB) Post-Drill
Top of Latrobe (N-1.0)	1290	1292.0
Top Coarse Clastics (N-1.1)	1321	1329.5
N-1 GOC	1403	1402.5
N-1 OWC	1411	1410.5
P.asperopolus seismic marker (N-1.4)	1453	1446.0
Upper M.diversus seismic marker (N-1.9)	1604	1606.0
L-1 coal (below upper L.balmei seismic marker)	1852	1845.5

2. INTRODUCTION

The Snapper Field lies 30km off the Gippsland Coast in 55m of water, in southern Vic/L10. The field contains gas and oil reserves in a Top of Latrobe accumulation (the N-1 reservoirs), with deeper oil and gas accumulations in the intra-Latrobe (the M, L and T reservoirs). Current Snapper 'A' Platform production is of the N-1 oil and gas, and intra-Latrobe oil from the 'L' (L.balmei) reservoirs.

Snapper-5 was proposed primarily to explore the intra-Latrobe M and L sands on the south-western flank block for deeper pool oil accumulations, on the basis of a theory of hydrocarbon migration from the south into the fault block, and fault seal precluding intra-Latrobe oil from the Snapper-3/Snapper-4 fault wedge.

The secondary objective of the well was as a delineation well on the western flank of the Snapper field to test the Top of Latrobe N-1.1 and N-1.2 sand quality, and the thickness of the oil column within the N-1.2 on this western flank.

Snapper-5 was drilled from July 2, 1985 to August 5, 1985 to a total depth of 2990 mkB. The well had been programmed to drill to 2521 mkB, but encouragement during drilling the intra-Latrobe resulted in the well being deepened. The well confirmed the presence of the Top of Latrobe oil column within the N-1.2 unit, and established by RFT sampling and logging a minimum oil column thickness of 6m, with a possible column thickness based on log and pressure interpretation, of 8m. In the intra-Latrobe Snapper-5 encountered a number of separate hydrocarbon zones, with proven oil sands in what are interpreted to be six separate systems, between 1702 mkB and 1846 mkB. Below that depth the well encountered several gas sands.

3. DRILLING HISTORY

The Snapper Field was discovered in June, 1968 by the exploration well Snapper-1 (T.D. 3755m KB) and confirmed by the drilling of the Snapper-2 (T.D. 3051m KB) and Snapper-3 (T.D. 3211m KB) delineation wells in 1969 and 1970. All three wells encountered the major N-1 gas and oil reservoir at the top of the Latrobe Group. Snapper-1 and 2 also encountered thin gas bearing and some oil bearing sands dispersed throughout the Paleocene and Upper Cretaceous section.

Because the adjacent Barracouta and Marlin fields were able to meet gas market demand through the 1970's, development drilling did not commence until March 1981, and production commenced in July 1981. Twenty-one development wells have been drilled from the 27 slot Snapper A platform. The vertical platform well Snapper A-21, was drilled to a depth of 3282m KB as an exploration well to evaluate the sands below the N-1 reservoir. The well encountered numerous oil and gas bearing sands within Paleocene and Upper Cretaceous sediments and resulted in the discovery of the L-1 oil reservoir in the Upper L. balmei zone. Other significant intra-Latrobe Group oil discoveries were made during the drilling of the exploration portion of the A-6 and A-8 development wells.

Snapper-4 was drilled in July 1983 to a T.D. of 2821m KB. This well delineated the central western portion of the Snapper field, and explored for hydrocarbons in the intra-Latrobe in the Snapper-3 fault wedge without marked success.

Snapper-5 tested the N-1 and intra-Latrobe 1.4 km SW of Snapper-4 in July/August 1985. The well discovered intra-Latrobe oil between 1702 mkB and 1846 mkB and further delineated the N-1 oil and gas reservoir. Snapper-5 drilled to a TD of 2990 mkB.

4. STRUCTURE

The Snapper structure at the Top of Latrobe level is an elongate ENE-WSW anticline with four way dip closure, with a spill point towards the Whiting feature to the west. (Enclosure 2). Faulting of the structure is mainly on a NW-SE trend, with a few almost EW trending faults. The faults are mostly normal faults, steeply dipping down to the SW with fault block tilting and some evidence of syn-depositional movement. High angle reverse movement has occurred on EW trending faults particularly in the north-eastern corner of the field. The longest of these reverse faults has been referred to as the "Snapper Fault", and is thought to have formed in response to basin wide compression following deposition of the Latrobe Group sediments.

The intra-Latrobe structure conforms approximately with the Top of Latrobe elongate anticlinal form. However, in the intra-Latrobe the NW-SE faults across the field are better developed laterally and have greater vertical displacements increasing with depth from Top of Latrobe. (Enclosures 1 and 5).

Snapper-5 was located on the western flank of the Snapper Field so as to be in a position to delinate and test the N-1 oil zone on this flank in the N-1.1/N-1.2 units, and to be near crestal for the intra-latrobe in the south-western flank fault block (Enclosure 5). The intra-latrobe of this fault block was previously untested.

5. STRATIGRAPHY

(i) Top of Latrobe

The Top of Latrobe Group N-1 reservoir is divided into 10 mappable units, labelled the N-1.0 through to N-1.9. In the first instance, the subdivision is based on fieldwide correlation and seismic mapping of three prominent surfaces, viz, the Top of Latrobe Unconformity (top of the N-1.0 or Gurnard Formation), top of the N-1.4 coal unit (the *P. asperopolus* seismic marker), and top of the N-1.9 coal unit (Upper *M. diversus* seismic marker). Shales and minor coals separate the intervening fluvial-deltaic sandstone reservoir units. The largely non-net N-1.0 unit (the Gurnard Formation) is separated from the underlying N-1.1 "coarse clastics" by a regional unconformity. The Gurnard is characterised by a generally low net/gross ratio and the presence of glauconite. Although the separating shales and coals within the N-1 sequence might offer potential intra-formational seals, faulting of the structure has established communication between the sandstone reservoir units, as is evidenced by the interpreted fieldwide GOC.

(ii) Intra-Latrobe

The intra-Latrobe Snapper units consist predominantly of lensing fluvial channel sandstones and shales. Correlation of these units across one kilometre or so and within a single fault block may be possible (for example in portions of the stratigraphic sequence in the central northern fault block penetrated by Snapper A-21 and A-8), but is often not possible, especially over greater distances and between adjacent fault blocks. This is largely due to the irregular and impersistent nature of the lithological units as would be expected in a fluvial environment of deposition, with rapid lateral shifts in local depositional influences.

A further factor contributing to the lack of large scale correlation of intra-Latrobe units, particularly between adjacent fault blocks, is the syn-depositional movement on the faults. The major NW-SE fault separating Snapper-1 from Snapper-3 and 4, for example, shows 15 metres of thickening of intra-Latrobe Upper L. balmei (above L-1 horizon) to mid M. diversus (approximately N-1.9 horizon) section.

6. RESERVOIR, HYDROCARBONS AND SEAL

(i) Top of Latrobe

The Top of Latrobe oil and gas accumulation occurs in the N-1 sands. The Lakes Entrance Formation and in parts the Gurnard Formation (N-1.0) provide the seal with a projected spill point at the saddle on the western edge of the structure towards Whiting-1.

Snapper-5 intersected a gross gas column below the Top of Latrobe surface of 110.5m, containing an interpreted 61.25 m of net gas sand. Average porosity of the net sand over the interval is 25%, with average water saturation of 20%.

In the western flank of the Snapper structure the thin N-1 oil column is largely confined to the N-1.1 and N-1.2 units. Snapper-5 intersected the N-1 oil leg in a stratified N-1.2 section, and by RFT sampling proved a minimum gross oil column of 6m. The log interpreted minimum column thickness is 6.75 m gross, with 2.75m net oil in sands of average porosity 21% and water saturation of 26%. The oil water contact is interpreted to have been intersected at 1410.75 mkB (-1490 mss), coincident with the field wide average OWC. A thin coal/shale between low proved gas and high provided oil means that the maximum gross N-1 oil leg in Snapper-5 could be 8m thick.

(ii) Intra-Latrobe

Beneath the N-1, Snapper-5 discovered six separate intra-Latrobe oil reservoirs in this down thrown southwestern fault block in the M units, and in excess of thirty gas reservoir systems in the M and L units, seemingly confirming the pre-drill model of hydrocarbon migration from the south and an interpreted element of fault seal along the normal growth fault separating Snapper-5 from Snapper-3 and 4. The oil discoveries in the Snapper-5 M units occur in sands between 1702 mkB and 1846 mkB, in what are interpreted to be six separate hydrocarbon systems based on the RFT pretest pressure data (Appendix 6). These reservoirs are tabulated below.

RESERVOIR	INTERVAL (mkB)	NET THICKNESS (M)	INTERSECTED CONTACT (mkB)
M-1.10	1702.50-1704.50	1.75 (OIL)	-
M-1.20	1708.25-1714.5	2.50 (OIL)	-
M-1.30	1716.25-1717.25	1.0 (OIL)	OWC 1717.25
M-2.20	1761.00-1765.75	3.00 (GAS)	GOC 1764.50
		1.25 (OIL)	
M-2.30	1786.00-1791.00	1.50 (GAS)	GOC 1788.0
		3.0 (OIL)	
M-2.70	1836.75-1845.25	6.50 (OIL)	OWC 1845.25

(Other lesser oil sands above and below these units (Appendix 3) have not been given reservoir nomenclature because they have high water saturations).

Snapper-5 intersected gas-oil contacts in two of these oil systems, at 1764.5 mkB (-1743.5 mSS) and 1788.0 mkB (-1767 mSS) (Appendix 3 and Enclosure 7), and an oil-water contact at 1845.25 mkB (-1824.25 mSS). A further possible oil-water contact is interpreted in the well from the logs at 1717.25 mkB (-1696.25 mSS), but this contact is at variance with a possible oil water contact for this reservoir interpreted from pressure data approximately 10m deeper (Appendix 5). Gas-water contacts intersected in Snapper-5 are interpreted at 1754.4 mkB (-1733.4 mSS) and 1833.0 mkB (-1812.0 mSS). Below 1850 mkB hydrocarbons are interpreted for a number of separate reservoir systems based on log, sidewall core, and pressure data. These are mainly gas systems as intersected in this well, with minor oil sands with high water saturations at 1853.75-1855.0 mkB and 2635.0-2640.0 mkB. Only one gas-water contact is intersected by Snapper-5 in these systems, interpreted to be at 2589.0 mSS.

Snapper-5 was programmed to drill to a total depth of 2521 mkB. Continued encouragement from logging within the intra-Latrobe section below the N-1 units resulted in the well being deepened to a total depth of 2990 mkB. At this depth hydrocarbon sands with high log interpreted water saturations (Sw = 50% - 70% range) were encountered, the net sand sections having porosities in the 10%-14% range.

The total net hydrocarbon sand thickness below the N-1 column is 130.75 m, of which 21.75 m net sand is interpreted to be oil bearing, 106.25 m net sand is interpreted to be gas bearing, and the remaining 2.75 m net sand is identified as being either gas or oil bearing.

The intra-Latrobe hydrocarbon reservoirs are interpreted to be top and base sealed by interbedded shales. A component of fault seal against the major normal faults north-east of Snapper-5 is interpreted to exist based on the occurence of intra-Latrobe hydrocarbons in this Snapper-5 fault block, but absence of significant hydrocarbons in the Snapper-3/Snapper-4 block. It is interpreted that, considering the depositional environment of the intra-Latrobe, and the lensing and truncated nature of the interpreted fluvial channel and point-bar sands in which the hydrocarbon occurs, that seal by sand pinch-out or shale-out, limiting the lateral continuity of the reservoirs, is important.

7. GEOPHYSICAL SUMMARY

Four seismic markers have been mapped in depth over the Snapper field. They are the top of Latrobe Group which corresponds to the top of the N-1.0 unit (Gurnard Formation), a P. asperopolus seismic marker (N-1.4), an upper M. diversus seismic marker (N-1.9) and an upper L. balmei seismic marker. Depth conversion was effected by smoothing the stacking velocities to each of these horizons and converting to average velocity using conversion factors determined from the available well control.

A major geophysical consideration was to ensure the continuity of the major fault that seperates the Snapper-5 block from the Snapper-3/Snapper-4 fault wedge to the north. Reasonable certainty can be placed on the mapping of this fault with the good seismic data coverage (reprocessed G77A and G82B lines) over the field.

The predicted formation tops matched the post-drill results quite closely with the top of Latrobe being 2 metres deep, the P. asperopolus seismic marker 7 metres high and the upper M. diversus seismic marker 2 metres deep to prediction. The upper L. balmei marker cannot be correlated to a lithological unit in the well logs and is a difficult event to map accurately. However, the L-1 coal situated just below the marker was found to be 6.5 metres high to prediction.

FIGURES

LOCALITY MAP
SNAPPER-5

SCALE 1:250 000

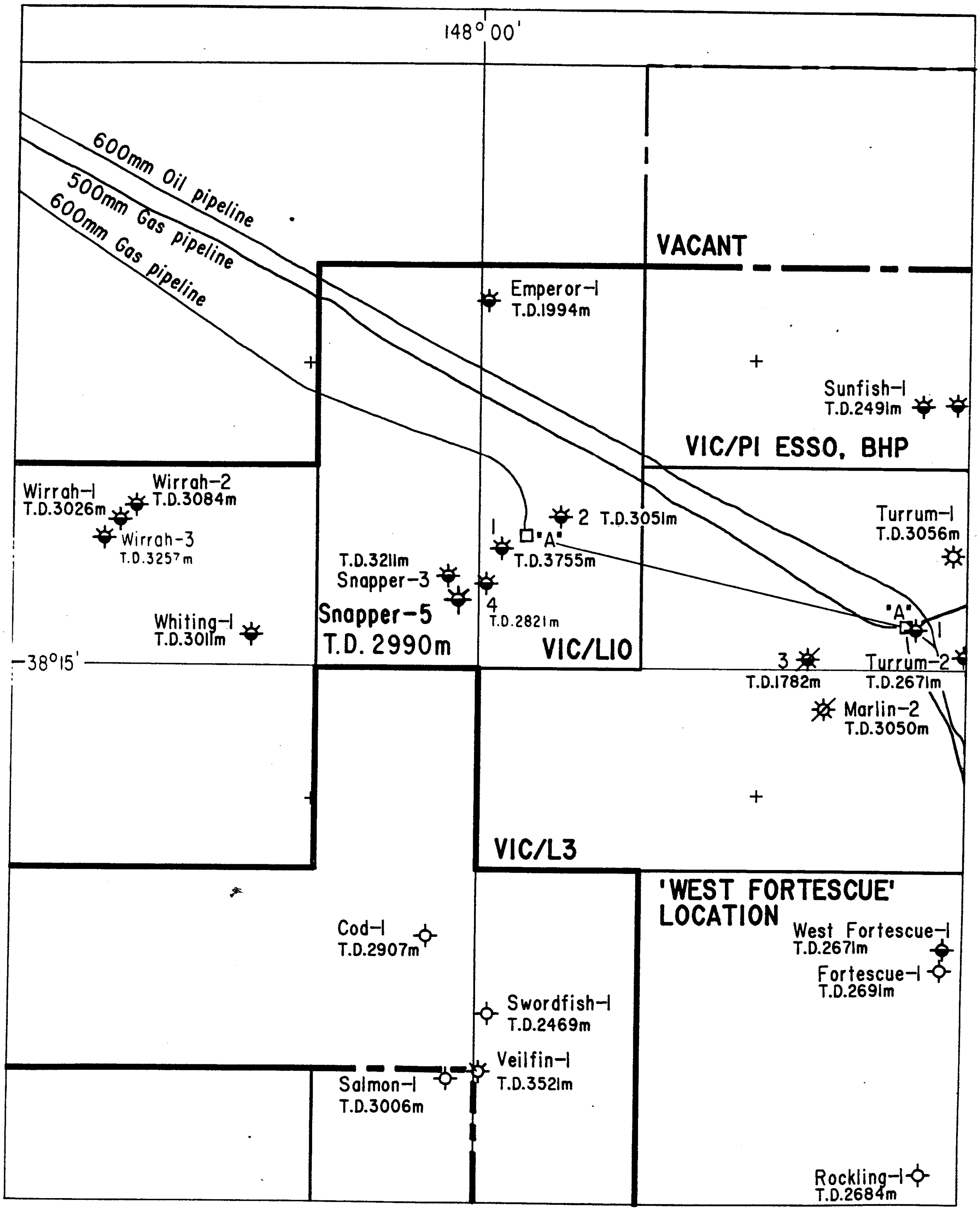
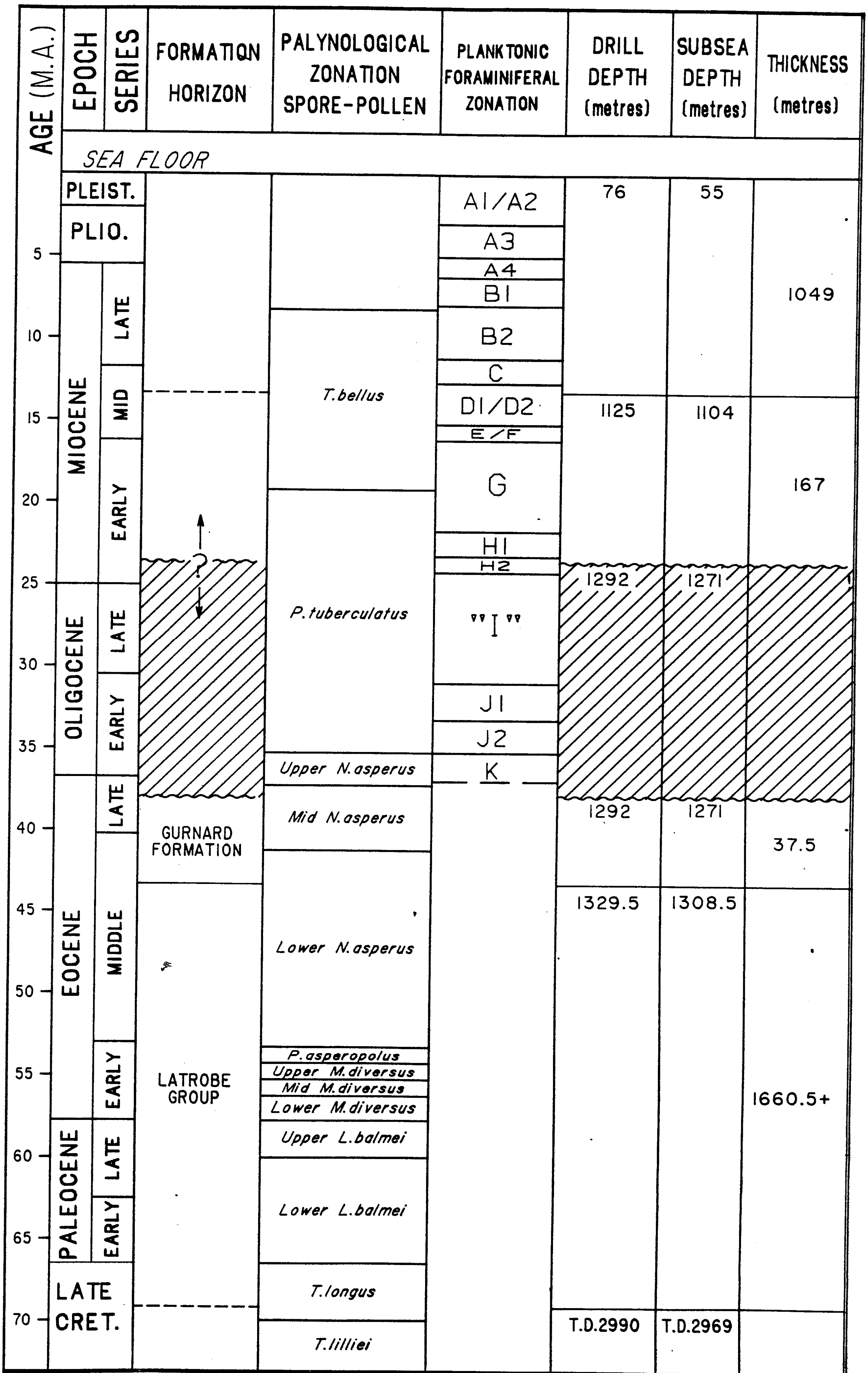


Fig 1

Dwg 2314 /OP/1

SNAPPER-5
STRATIGRAPHIC TABLE



DFT.SNAPPER5.STRAT 12-85

DWG. 2310/OP/2

Fig. 2

ENCLOSURES

PE905079

This is an enclosure indicator page.
The enclosure PE905079 is enclosed within the container PE905078 at this location in this document.

The enclosure PE905079 has the following characteristics:

ITEM_BARCODE =	PE905079
CONTAINER_BARCODE =	PE905078
NAME =	Structural Cross-Section
BASIN =	GIPPSLAND
PERMIT =	VIC/L10
TYPE =	SEISMIC
SUBTYPE =	HRZN_CNTR_MAP
DESCRIPTION =	Schematic Structural Cross-Section for Snapper-5
REMARKS =	
DATE_CREATED =	30/09/85
DATE_RECEIVED =	1/05/86
W_NO =	W912
WELL_NAME =	SNAPPER-5
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE905080

This is an enclosure indicator page.
The enclosure PE905080 is enclosed within the container PE905078 at this location in this document.

The enclosure PE905080 has the following characteristics:

ITEM_BARCODE =	PE905080
CONTAINER_BARCODE =	PE905078
NAME =	Structure Map - Top Latrobe
BASIN =	GIPPSLAND
PERMIT =	VIC/L10
TYPE =	SEISMIC
SUBTYPE =	HRZN_CNTR_MAP
DESCRIPTION =	Structure Map - Top of Latrobe Group (Top of N-10 unit)
REMARKS =	
DATE_CREATED =	30/09/85
DATE_RECEIVED =	1/05/86
W_NO =	W912
WELL_NAME =	SNAPPER-5
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

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PE905081

This is an enclosure indicator page.
The enclosure PE905081 is enclosed within the container PE905078 at this location in this document.

The enclosure PE905081 has the following characteristics:

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CONTAINER_BARCODE = PE905078
NAME = Structure Map - P.asperopolous
BASIN = GIPPSLAND
PERMIT = VIC/L10
TYPE = SEISMIC
SUBTYPE = HRZN_CNTR_MAP
DESCRIPTION = Structure Map - P.asperopolous Seismic Marker (Top N-14)
REMARKS =
DATE_CREATED = 30/09/85
DATE_RECEIVED = 1/05/86
W_NO = W912
WELL_NAME = SNAPPER-5
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE905082

This is an enclosure indicator page.
The enclosure PE905082 is enclosed within the container PE905078 at this location in this document.

The enclosure PE905082 has the following characteristics:

ITEM_BARCODE = PE905082
CONTAINER_BARCODE = PE905078
NAME = Structure Map - M.diversus
BASIN = GIPPSLAND
PERMIT = VIC/L10
TYPE = SEISMIC
SUBTYPE = HRZN_CNTR_MAP
DESCRIPTION = Structure Map - Upper M.diversus Seismic Marker
REMARKS =
DATE_CREATED = 30/09/85
DATE_RECEIVED = 1/05/86
W_NO = W912
WELL_NAME = SNAPPER-5
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE905083

This is an enclosure indicator page.
The enclosure PE905083 is enclosed within the container PE905078 at this location in this document.

The enclosure PE905083 has the following characteristics:

ITEM_BARCODE =	PE905083
CONTAINER_BARCODE =	PE905078
NAME =	Structure Map - L.balmei
BASIN =	GIPPSLAND
PERMIT =	VIC/L10
TYPE =	SEISMIC
SUBTYPE =	HRZN_CNTR_MAP
DESCRIPTION =	Structure Map - Upper L.balmei Seismic Marker
REMARKS =	
DATE_CREATED =	30/09/85
DATE_RECEIVED =	1/05/86
W_NO =	W912
WELL_NAME =	SNAPPER-5
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603643

This is an enclosure indicator page.
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The enclosure PE603643 has the following characteristics:

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CONTAINER_BARCODE =	PE905078
NAME =	Well Completion Log
BASIN =	GIPPSLAND
PERMIT =	VIC/L10
TYPE =	WELL
SUBTYPE =	COMPLETION_LOG
DESCRIPTION =	Well Completion Log for Snapper-5
REMARKS =	
DATE_CREATED =	5/08/85
DATE_RECEIVED =	1/05/86
W_NO =	W912
WELL_NAME =	SNAPPER-5
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603644

This is an enclosure indicator page.
The enclosure PE603644 is enclosed within the container PE905078 at this location in this document.

The enclosure PE603644 has the following characteristics:

ITEM_BARCODE = PE603644
CONTAINER_BARCODE = PE905078
NAME = Mud Log
BASIN = GIPPSLAND
PERMIT = VIC/L10
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Mud (Grapholog) Log for Snapper-5
REMARKS =
DATE_CREATED = 29/07/85
DATE_RECEIVED = 6/01/86
W_NO = W912
WELL_NAME = SNAPPER-5
CONTRACTOR = CORE LABORATORIES AUSTRALIA LTD
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 1

APPENDIX 1

MICRO PALAEONTOLOGICAL ANALYSIS

APPENDIX-1

FORAMINIFERAL ANALYSIS

OF SNAPPER-5, GIPPSLAND BASIN

by

M.J. HANNAH

Esso Australia Ltd.
Palaeontology Report: 1986/8

February, 1986

2145L

INTRODUCTION:

Nine sidewall cores have been examined for foraminifera. Of these only the shallowest two contain planktonic foraminifera.

The top of the Latrobe Group lies between SWC 100 at 12 93.9 m and SWC 101 at 1 290.0 m. The oldest datable sediments from the Lakes Entrance Formation are Zone G (Early-Middle Miocene) in age.

GEOLOGICAL COMMENTS

The lithology of the washed residues of all the samples examined has been noted and is listed below.

Two significant lithological breaks occur in the section.

(a) Between SWC's 98 and 99 (1309.0 and 1297.9 m respectively) where a sand dominated lithology gives way, upsection, to a glauconitic shale. This glauconitic unit, although rich in glauconite, is not typical Gurnard Formation lithology. Samples from the Gurnard Formation normally contain 80-90% glauconite far more than is recorded in Snapper-5.

(b) The top of Latrobe Group, between 1293.9 m and 1290.0 m is marked by the incoming of carbonates typical of the Lakes Entrance Formation.

BIOSTRATIGRAPHY

EARLY-MIDDLE MIOCENE (ZONE G): 1290.0 - 1285.0 metres.

The presence of Globigerinoides trilobus without Globigeninoides sicanus in these two samples is sufficient for a Zone G assignment.

Sidewall core 101 at 1290.0 m contained a moderately diverse, reasonably well preserved fauna including Globoquadrina dehiscens, Globigerina venezuelana and Globigerina woodi woodi.

Sidewall core 102 at 1285.0 m on the other hand produced a poorly preserved fauna mainly due to recrystalization. Globorotalids are reasonably common and include Globorotalia miozea and Globorotalia mayeri.

TABLE-1

DATA SUMMARY SNAPPER 5

DEPTH (metres)	SWC	YIELD	PRESERVATION	ZONE	AGE	LITHOLOGY (from washed residues)
1285.0	102	Moderate	Poor	G	Early-Mid Miocene	Recrystalized carbonate.
1290.0	101	High	Good	G	Early-Mid Miocene	Carbonate.
1293.0	100	V.Low	Poor	?	?	Glauconitic shale with large amount pelletal glauconite some ferruginized. Rare benthonic foraminifera.
1297.9	99	Barren				Glauconitic shale.
1309.0	98	Barren				Medium-fine grained quartz sand.
1315.9	97	Barren				Medium-fine grained quartz sand.
1325.9	96	Barren				Medium-fine grained quartz sand.
1329.1	95	Barren				Medium-fine grained quartz sand.
1341.0	93	Barren				Medium-fine grained quartz sand.

APPENDIX 2

APPENDIX 2

PALYNOLOGICAL ANALYSIS

APPENDIX-2

PALYNOLOGICAL ANALYSIS
SNAPPER-5, GIPPSLAND BASIN

by

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Palaeontology Report 1986/9
2143L

February 21, 1986

INTERPRETATIVE DATA

INTRODUCTION

Fifty-two sidewall core samples were processed and examined for spore-pollen and dinoflagellates. Organic residue yields were moderate to high in siltstones and shales but low in sandstones. Preservation is poor in the Late Cretaceous and early Paleocene but improves to become generally fair to good in the younger, shallower Paleocene and Eocene. Recorded spore-pollen diversity is generally low to moderate in the poorly preserved samples, but is moderate to high in those that are better preserved. Dinoflagellate diversity is generally low and they only give limited support to the ages determined from the spore-pollen assemblages.

Lithological units and palynological zones from the base of the Lakes Entrance Formation to T.D. are summarised below. Interpretative data with zone identifications and confidence ratings are recorded in Table-1 and basic data on residue yield, preservation and diversity are recorded in Table-2. Counts of key species or species groups from selected samples are given in Table-3. The occurrence of spore-pollen and dinoflagellate species are tabulated on the accompanying range chart.

SUMMARY

AGE	UNIT/FACIES	ZONE	DEPTH(m)
Early Miocene	Lakes Entrance Fm.	*P. tuberculatus*	1285.0-1290.0
—— UNCONFORMITY ——	——1292.9 m——		
Late Eocene	Gurnard Fm. "upper unit"	Middle *N. asperus*	1293.9-1297.9
	——1299.0 m——		
Middle Eocene	Gurnard Fm. "lower unit"	Lower *N. asperus*	1309.0-1329.1
	——1329.5 m——		
Middle Eocene	Latrobe Group "coarse clastics"	Lower *N. asperus*	1332.0-1430.0
Early Eocene		*P. asperopolus*	1495.9
Early Eocene		Upper *M. diversus*	1507.9-1566.9
Early Eocene		Middle *M. diversus*	1669.9
Early Eocene		Lower *M. diversus*	1685.3-1848.6
Paleocene		Upper *L. balmei*	1854.1-2049.9
Paleocene		Lower *L. balmei*	2073.5-2597.5
Maastrichtian		Upper *T. longus*	2653.0-2757.0
Maastrichtian		Lower *T. longus*	2871.4-2960.0
	——T.D. 2990.0 m——		

GEOLOGICAL COMMENTS

1. Attention is drawn to igneous rocks identified within the Lower L. balmei Zone in Whiting-1 (approx. 2640-60 m), Whiting-2 (approx. 2810-2890 m), and the Snapper field wells Snapper-1 (approx. 2080-2180 m) and Snapper A-21 (approx. 1970-90 m). It is suggested, that, because of their equivalent stratigraphic position within the lower part of the Lower L. balmei Zone these igneous rocks represent basic volcanic flows of Paleocene age rather than younger intrusions. They may be present in Snapper-5 even though they have not been recognised in the cuttings or on the electric logs. It is noted that palynomorphs between 2458.4 m and T.D. are consistently poorly preserved and partially carbonised.

2. Sidewall cores 67 and 63, at 1803.0 m and 1848.6 m respectively may have been accidently swapped, as the sequence appears "out-of-order". See discussion under Lower M. diversus Zone for further detail.

3. The P. asperopolus and Upper M. diversus Zones occupy a particularly sandy interval of the Latrobe Group between the distinctive, thick coals at 1396.5-1405.0 m and 1606.0-1621.5 m. No samples from either coal were analysed. In contrast the Lower M. diversus Zone is characterised by relatively thinly interbedded sands, shales and coals.

4. The Gurnard Formation between 1292.0 m to 1329.5 m can be divided into an upper glauconitic unit (1292.0 to 1299.0 m) of Late Eocene (Middle N. asperus Zone) age, and a lower siltstone unit, with only accessory glauconite (1299.0 to 1329.5 m) of Middle Eocene (Lower N. asperus Zone) age.

5. Palynological age dating of the base of the Lakes Entrance Formation as the Middle (or younger) subdivision of the P. tuberculatus Zone supports the evidence of the foraminiferal age dating for a substantial time break at the top of the Latrobe Group. The complete Oligocene is likely to be missing at the unconformity between the Lakes Entrance and Gurnard Formation at Snapper-5.

BIOSTRATIGRAPHY

The zone boundaries have been established using the criteria of Stover & Evans (1973), and subsequent proprietary revisions.

Lower Tricolpites longus Zone: 2871.4-2960.0 metres.

The three samples from this interval are poorly preserved and non-diagnostic. They are assigned to the Lower T. longus Zone with low confidence ratings mainly on the lack of any noticable increase in abundance of Nothofagidites spp. which is diagnostic of the underlying T. lilliei Zone. This is supported by stratigraphical considerations of the limited section penetrated below confident Upper T. longus Zone samples, and by comparison with the adjacent Snapper-3 and Whiting-1 wells.

Upper Tricolpites longus Zone: 2653.0-2757.0 metres.

The base of this zone is picked at the oldest sample with Stereisporites (Tripunctisporis) punctatus, and the top of the zone at the youngest occurrence of the species Tricolpites longus and Quadraplanus brossus. Preservation is poor and diversity is mostly low. A single dinoflagellate identified at 2710.0 m is the only suggestion of marine influence in this interval.

Lower Lygistepollenites balmei Zone: 2073.5-2597.5 metres.

Although moderate amounts of organic residue were obtained from samples over this interval, palynomorph diversity was generally low and preservation consistently poor. As is usually the case the zone is recognised by the absence of indicator species for the underlying or overlying zones, rather than by forms restricted to the zone. A marine sample occurs at the base of the zone and is dominated by Areoligera senonensis. It is a low diversity assemblage and cannot be referred to any of the dinoflagellate zones recognised within the Latrobe Group even though its stratigraphical position suggests a correlation to the Trithyrodinum evittii Zone. Occurrences at 2248.1 m and 2099.0 m of Malvacipollis subtilis are anomalously old.

Upper Lygistepollenites balmei Zone: 1854.1 to 2049.9 metres.

The zone is recognised with poor confidence from the oldest occurrence of Malvacipollis diversus at 2049.9 m, and with good confidence from the oldest occurrence of Proteacidites grandis in the highest sample at 1854.1 m. A low diversity dinoflagellate suite at 2049.9 m referable to the Apectodinium homomorphum Zone supports this age assignment.

Lower Malvacepollis diversus Zone: 1685.3-1848.6 metres.

The base of the zone is taken at 1848.6 m in a sample containing frequent M. diversus without associated L. balmei Zone indicator species. The overlying sample at 1834.5 m contains a high diversity spore pollen assemblage which is assigned to the zone with high confidence, associated with a moderately diverse dinoflagellate assemblage referable to the Apectodinium hyperacanthum Zone. The sample immediately above at 1803.0 m, is anomalous as it contains frequent Lugistepollenites balmei and Australopollis obscurus and no typical M. diversus Zone indicator species. Samples with infrequent L. balmei are known from the Lower M. diversus Zone from other wells in the Gippsland Basin (e.g. Nannaygai-1). However, in this case it is possible that the samples at 1848.6 m and 1803.0 m have been swapped, either when taken out of the sidewall core gun or later when being prepared in the laboratory. This interpretation must be considered as normally the A. hyperacanthum Zone occurs in the basal sample of the Lower M. diversus Zone. The spore-pollen assemblage at 1834.5 m is typical of assemblages from the A. hyperacanthum Zone as it contains Protecidites pachypolus (the oldest and selective occurrence of it disjunct range), Spinozonocolpites prominatus of mangrove affinities (see Partridge, 1976) and the normally rare species at this level; Anacolosidites acutullus, Myrtaceoipollenites australis and Schizocolpus marlinensis. Samples higher in the zone samples are of lower diversity, and marine influence is restricted to samples at 1685.5 m (rare specimens of Deflandrea dartmooria) and 1740.9 m (a moderate diversity assemblage with frequent Glaphyrocysta retiintexta). Neither sample can be referred to named dinoflagellate zones.

Middle Malvacipollis diversus Zone: 1666.9 metres.

This zone is represented by a single sample which is dominated by spores. The species Crassiretitriletes vanraadshoovenii, Cyathidites splendens, Laevigatosporites ovatus and Polypodiaceoisporites varus ms are particularly common. Polycolpites esobalteus is the most frequent angiosperm pollen. The sample is assigned to the Middle M. diversus Zone based on the rare occurrence of Proteacidites tuberculiformis.

Upper Malvacipollis diversus Zone: 1507.9-1566.9 metres.

The oldest occurrence of Myrtaceidites tenuis at 1566.9 m is taken as the base of the Upper M. diversus Zone. This is supported by the oldest occurrence of Proteacidites pachypolus at 1546.0 m in the upper part of its disjunct range. P. pachypolus has a frequency of 2-3% in the upper two samples in the zone (see Table 3).

Proteacidites asperopolus Zone: 1495.9 metres.

The zone is represented by a single sample with a combined frequency of 5% for P. pachypolus plus P. asperopolus. The oldest occurrences of Conbaculites apiculatus, Santalumidites cainozoicus and the eponymous species also support this zone assignment. The sample also contains a limited dinoflagellate suite (13% of total palynomorph count) dominated by the species Homotryblium tasmaniense. The identified dinoflagellates do not allow correlation with any of the named dinoflagellate zones recognised in the Latrobe Group.

Lower Nothofagidites asperus Zone: 1309.0 to 1430.0 metres.

The highest occurrence of Myrtaceidites tenuis in the underlying P. asperopolus Zone and a significant increase in percentage of Nothofagidites spp. (from 4-12% to 17%) is the basis for selecting the base of the zone at 1430.0 m. The top of the zone is taken at the highest occurrence of P. pachypolus as this species occurs only sporadically in the overlying Middle subdivision in the Gippsland Basin. Dinoflagellates recorded in the upper part of the zone are of low diversity (1-5 species). Samples at 1325.9 m and 1332.0 m contain frequent Areospharidium diktyoplokus and are therefore tentatively referred to the Middle Eocene A. diktyoplokus Zone. In view of the low diversity these samples may overlap with the younger D. heterophycta Zone.

Middle Nothofagidites asperus Zone: 1293.9-1297.9 metres.

Two samples are assigned to this zone with low confidence. Residue and fossil yields were low and as a consequence diversity was low to moderate. The presence of Dryadopollis (al. Tricolporites) retequetrus at 1293.9 m suggests an age no older than the middle part of the zone. Unfortunately all spore-pollen recorded from this sample extend into younger zones, and this suggests a possible Upper N. asperus Zone assignment. A Middle N. asperus Zone age, however, is preferred on the basis of the associated dinoflagellates viz; Vozzhennikova extensa, Baltispheridium nudum, Corrudinium corrugatum ms and large specimens of Spiniferites ramosus, all of which are more characteristic of the Middle rather than the Upper subdivision. The lower sample at 1297.9 m is no younger than the Middle N. asperus Zone, based on the presence of Proteacidites adenanthoides and P. leightonii. The presence of an undescribed acritarch (code named LEOS or Fromea leos) suggests an age no older than the Middle subdivision.

Proteacidites tuberculatus Zone: 1285.0-1290.0 metres.

The two samples are assigned to the informal Middle or Upper subdivisions of the P. tuberculatus Zone on the presence of Foveotriletes lacunosus in both samples. Other indicator species are Foveotriletes crater in the lower sample and the grass pollen Monoporites media in the higher sample.

REFERENCES

PARTRIDGE, A.D., 1976. The geological expression of eustacy in the Early Tertiary of the Gippsland Basin. APEA J. 16, 73-79.

STOVER, L.E. & PARTRIDGE, A.D., 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, Southeastern Australia. Proc. R. Soc. Vict. 85, 237-86

TABLE I : SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA FOR SNAPPER-5

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	CONFIDENCE RATING	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 102	1285.0m	P. tuberculatus	1			
SWC 101	1290.0m	P. tuberculatus	1			
SWC 100	1293.9m	Middle N. asperus	2	(V. extensa)		
SWC 99	1297.9m	Middle N. asperus	2			
SWC 98	1309.0m	Lower N. asperus	2			
SWC 97	1315.9m	Lower N. asperus	2			
SWC 96	1325.9m	Lower N. asperus	1	A. diktyoplokus	1	Anomalous P. rectomarginis
SWC 95	1329.1m	Lower N. asperus	1			
SWC 94	1332.0m	Lower N. asperus	1	A. diktyoplokus	1	
SWC 93	1341.0m	Lower N. asperus	2			
SWC 92	1358.5m	Lower N. asperus	1			P. recavus frequent
SWC 91	1380.0m	Lower N. asperus	1			
SWC 90	1430.0m	Lower N. asperus	2			
SWC 89	1468.5m	Indeterminate				
SWC 88	1495.9m	P. asperopolus	1	(H. tasmaniense)		P. pachypolus/asperopolus 5%
SWC 87	1507.9m	Upper M. diversus	1			P. pachypolus 2%
SWC 86	1546.0m	Upper M. diversus	1			P. pachypolus 3%
SWC 85	1566.9m	Upper M. diversus	1			Oldest M. tenuis
SWC 81	1666.9m	Middle M. diversus	1			Dominated by spores
SWC 80	1685.3m	Lower M. diversus	1	(D. dartmooria)		
SWC 78	1701.9m	Lower M. diversus	1			
SWC 74	1740.9m	Lower M. diversus	1	(G. retiintexta)		
SWC 70	1770.8m	Lower M. diversus	1			Laevigatosporites spp. 39%
SWC 68	1781.0m	Lower M. diversus	2			
SWC 67	1803.0m	(L. balmei)	(2)			
SWC 65	1834.5m	Lower M. diversus	0	A. hyperacanthum	1	P. pachypolus present

TABLE I : SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA FOR SNAPPER-5 cont'd.

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	CONFIDENCE RATING	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 63	1848.6m	Lower M. diversus	2			M. diversus frequent
SWC 62	1854.1m	Upper L. balmei	1			
SWC 61	1873.0m	L. balmei	2			
SWC 57	1939.5m	L. balmei	2			Cyathidites splendens dominant.
SWC 56	1969.0m	Upper L. balmei	2			
SWC 54	2024.0m	Upper L. balmei	2			A. obscurus, L. balmei common
SWC 52	2049.9m	Upper L. balmei	2	A. homomorphum	1	
SWC 51	2073.5m	Lower L. balmei	2			
SWC 49	2099.0m	Lower L. balmei	1			Australopollis obscurus common
SWC 47	2160.5m	Lower L. balmei	1			
SWC 45	2218.0m	L. balmei	2			
SWC 44	2248.1m	Lower L. balmei	2			
SWC 32	2458.4m	L. balmei	2			Highest noticable palyno. carbonisation
SWC 31	2462.0m	Lower L. balmei	2			Proteacidites spp. dominant
SWC 27	2524.0m	Barren				
SWC 25	2559.9m	Lower L. balmei	1			
SWC 24	2597.5m	Lower L. balmei	1	(A. senonensis)		
SWC 19	2653.0m	Upper T. longus	1			
SWC 16	2689.0m	Upper T. longus	1			
SWC 13	2710.0m	Indeterminate				
SWC 12	2723.6m	Upper T. longus	2			
SWC 11	2753.4m	Indeterminate				
SWC 10	2757.0m	Upper T. longus	1			
SWC 6	2871.4m	Lower T. longus	2			Phyllocladidites mawsonii frequent
SWC 3	2926.4m	Indeterminate				
SWC 1	2960.0m	Lower T. longus	2			

PALYNOLOGY DATA SHEET

BASIN: GIPPSLAND — ELEVATION: KB: 21.0m GL: -56.0m

WELL NAME: SNAPPER-5 — TOTAL DEPTH: 2990.0m

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA					LOWEST DATA				
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	*T. pleistocenicus*										
	M. lipsis										
	C. bifurcatus										
	T. bellus										
	P. tuberculatus	1285.0	1				1290.0	1			
PALEOGENE	Upper *N. asperus*										
	Mid *N. asperus*	1293.9	2				1297.9	2			
	Lower *N. asperus*	1309.0	2	1325.9	1		1430.0	2	1380.0	1	
	P. asperopolus	1495.9	0				1495.9	0			
	Upper *M. diversus*	1507.9	1				1566.9	1			
	Mid *M. diversus*	1666.9	1				1666.9	1			
	Lower *M. diversus*	1685.3	1				1848.6	2	1834.5	0	
	Upper *L. balmei*	1854.1	1				2049.9	1			
	Lower *L. balmei*	2073.5	2	2099.0	1		2597.5	1			
LATE CRETACEOUS	Upper *T. longus*	2653.0	1				2757.0	1			
	Lower *T. longus*	2871.4	2				2960.0	2			
	T. lilliei										
	N. senectus										
	T. apoxyexinus										
	P. mawsonii										
	A. distocarinatus										
EARLY CRET.	*P. pannosus*										
	C. paradoxa										
	C. striatus										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: DINOFLAGELLATE ZONES

A. diktyoplokus 1329.0m (1) to 1341.0m (1)

A. hyperacanthum 1834.5m (0)

A. homomorphum 2073.5m (1)

CONFIDENCE RATING:
- 0: 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: ALAN D. PARTRIDGE — DATE: February 20, 1986

DATA REVISED BY: — DATE:

BASIC DATA

TABLE - 2: BASIC DATAS

TABLE - 3: COUNTS OF KEY ELEMENTS OF POLLEN SUM

TABLE 2 : SUMMARY OF BASIC PALYNOLOGICAL DATA FOR SNAPPER-5

SAMPLE NO.	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE-POLLEN DIVERSITY	DINOFLAGELLATES YIELD	DINOFLAGELLATES NO. SPECIES
SWC 102	1285.0m	Calc. clayst	High	Fair-good	Moderate	Low	5
SWC 101	1290.0m	Calc. clayst	Very low	Fair	Moderate	Moderate	3
SWC 100	1293.9m	Siltstone	Low	Poor-fair	Moderate	Moderate	11
SWC 99	1297.9m	Glauc. siltst.	Low	Fair	Moderate	Low	4
SWC 98	1309.0m	Siltstone	Poor	Low			
SWC 97	1315.9m	Siltstone	Low	Fair	Low	Low	2
SWC 96	1325.9m	Siltstone	High	Poor-good	Moderate	Moderate	4
SWC 95	1329.1m	Carb. sandst.	Moderate	Fair	High	Very low	1
SWC 94	1332.0m	Carb. sandst.	Moderate	Fair-good	Moderate	Moderate	5
SWC 93	1341.0m	Siltstone	Low	Fair	Low		
SWC 92	1358.5m	Siltstone	High	Good	High		
SWC 91	1380.0m	Siltstone	High	Poor-fair	High		
SWC 90	1430.0m	Carb. sandst.	High	Fair-good	High	Very low	2
SWC 89	1468.5m	Siltstone	Very low	Very poor	Barren		
SWC 88	1495.9m	Siltstone	High	Fair-good	High	Moderate	5
SWC 87	1507.9m	Claystone	High	Good	Moderate		
SWC 86	1546.0m	Shale	High	Good	High		
SWC 85	1566.9m	Siltstone	High	Poor-good	High		
SWC 81	1666.9m	Claystone	Moderate	Fair	Moderate		
SWC 80	1685.3m	Carb. sandst.	Low	Poor-fair	Moderate	Very low	1
SWC 78	1701.9m	Coally siltst.	Moderate	Fair	Moderate		
SWC 74	1740.9m	Siltstone	High	Fair	Moderate	Low	5
SWC 70	1770.8m	Claystone	High	Fair	Moderate		
SWC 68	1781.0m	Claystone	Low	Fair	Low		
SWC 67	1803.0m	Claystone	Low	Fair	Low		
SWC 65	1834.5m	Siltstone	High	Poor-fair	High	Moderate	6

TABLE 2 : SUMMARY OF BASIC PALYNOLOGICAL DATA FOR SNAPPER-5 (cont'd

SAMPLE NO.	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE-POLLEN DIVERSITY	DINOFLAGELLATES YIELD	NO. SPECIES
SWC 63	1848.6m	Carb. shale	High	Fair	Moderate		
SWC 62	1854.1m	Sandstone	Low	Fair-good	Low	(Contaminated?)	
SWC 61	1873.0m	Siltstone	Moderate	Fair	Low		
SWC 57	1939.5m	Siltstone	Moderate	Fair	Low		
SWC 56	1969.0m	Siltstone	Moderate	Fair-good	Moderate		
SWC 54	2024.0m	Siltstone	Moderate	Fair-good	Moderate		
SWC 52	2049.9m	Carb. shale	Moderate	Poor	Moderate	Moderate	2
SWC 51	2073.5m	Shale	Moderate	Fair	Moderate		
SWC 49	2099.0m	Siltstone	High	Fair-good	High		
SWC 47	2160.5m	Siltstone	Moderate	Fair	Moderate		
SWC 45	2218.0m	Claystone	Moderate	Poor	Low	Very low	1
SWC 44	2248.1m	Siltstone	High	Good	Moderate		
SWC 32	2458.4m	Siltstone	Moderate	Poor	Low		
SWC 31	2462.0m	Siltstone	Low	Poor	Low		
SWC 27	2524.0m	Sandstone	Moderate	Very poor	Barren		
SWC 25	2559.9m	Siltstone	Low	Poor	Low		
SWC 24	2597.5m	Siltstone	Moderate	Poor	Low	Low	2
SWC 19	2653.0m	Siltstone	Moderate	Poor	Low		
SWC 16	2689.0m	Carb. shale	Moderate	Poor	Low		
SWC 13	2710.0m	Siltstone	Moderate	Poor	Very low	Very low	1
SWC 12	2723.6m	Shale	Moderate	Poor	Moderate		
SWC 11	2753.4m	Siltstone	Moderate	Poor	Low		
SWC 10	2757.0m	Carb. shale	Moderate	Poor	Moderate		
SWC 6	2871.4m	Carb. shale	Moderate	Very poor	Low		
SWC 3	2926.4m	Siltstone	Low	Very poor	Very low		
SWC 1	2960.0m	Siltstone	Moderate	Very poor	Low		

TABLE-3

Counts of Key elements of pollen sum from selected samples in Snapper-5

DEPTH	MP%	S	G	P	1	2	3	4	5	6	7
1430.0m		13	23	64	4	1	2	21	17	1	12
1495.9m	13	11	8	81	3	3	1	20	12	5	19
1507.9m		25	41	34	2	16	X	10	7	2	2
1546.0m		6	54	40	X	4	40	4	4	3	9
1770.8m		46	33	21	39	3	X	1	3	-	2
2689.0m		40	28	32	19	-	-	-	-	-	18

MP% = Percentage of dinoflagellates relative to spore-pollen

S = Total spores %
G = Total gymnosperm %
A = Total angiosperm %

1 = % *Laevigatosporites* spp.
2 = % *Gleicheniidites* spp.
3 = % *Dilwynites* spp. & *Araucariacites australis*
4 = % *H. harrisii* (= *Casuarina* pollen)
5 = % *Nothofagidites* spp.
6 = % *P. pachypolus* & *P. asperopolus*
7 = % all *Proteacidites* spp.

X = less than 1%

2143L

PE900486

This is an enclosure indicator page.
The enclosure PE900486 is enclosed within the container PE905078 at this location in this document.

The enclosure PE900486 has the following characteristics:

ITEM_BARCODE = PE900486
CONTAINER_BARCODE = PE905078
NAME = Palynological Range Chart
BASIN = GIPPSLAND
PERMIT = VIC/L10
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Palynological Range Chart for Snapper-5
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W912
WELL_NAME = SNAPPER-5
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 3

APPENDIX 3

QUANTITATIVE LOG ANALYSIS

SNAPPER-5

QUANTITATIVE LOG ANALYSIS

Interval: 1292 - 2970m KB

Analyst : A.N. Boston

Date : August, 1985

SNAPPER-5 QUANTITATIVE LOG ANALYSIS

Snapper-5 wireline logs have been analysed for effective porosity and water saturation over the interval 1292m - 2970m KB. Analysis was carried out over the logged section using a reiterative technique which incorporates hydrocarbon correction to the porosity logs, density-neutron crossplot porosities, a Dual Water saturation relationship and convergence on a preselected grain density window by shale volume adjustment. For the interval 1292-1333m KB, VSH was estimated using the PEF curve. In gas bearing zones, 1333-1403m KB and 1670-2970m KB, VSH was determined using the Gamma Ray, elsewhere it was estimated using density-neutron separation.

Logs Used

LLD, LLS (DLTE); MSFL (SRTC); RHOB (LDTC); NPHI (CNTH); CAL; GR; BHC.

The MSFL and neutron porosity log were corrected for borehole and environmental effects. The borehole corrected MSFL was used with the LLD and LLS to derive Rt and invasion diameter logs.

Log Quality

The logs appear to be of reasonable quality both visually and from calibration data with one notable exception. The LDT log is of decreasing quality from Suite 2 to 4. This problem is seen both on the DRHO curve which becomes increasingly negative in water sands and shales, and in the quality of the short spacing detector (QSS curve) which drifts outside its tolerance of $\pm.025$ for the Suite 4 log. Schlumberger have been made aware of this problem. For the purposes of this analysis, density values have been used as is.

Analysis Parameters

a	1
m	2
n	2
Grain Density - lower limit	2.65 gm/cc
Grain Density - upper limit	2.67 gm/cc
Mud Filtrate Density (RHOF)	1.005 gm/cc
Bottom Hole Temperature	92.2° C (LDT Suite 4)

Depth Interval (m)	RHOBSH (gm/cc)	NPHISH (gm/cc)	RSH (ohm-m)
1292 - 1333	2.55	0.41	6
1333 - 1615	2.50	0.36	20
1615 - 1670	2.52	0.27	12
1670 - 1970	2.60	0.33	10
1970 - 2490	2.60	0.30	15
2490 - 2970	2.65	0.27	55

Depth Interval (m)	U min	U max	GR min	GR max
	(Barns/Unit Volume)		(API units)	
1292 - 1333	6	25		
1333 - 1403			30	90
1670 - 2490			40	160
2490 - 2970			30	140

Shale Volume

A. 1292 - 1333m

An initial estimate of VSH was calculated from the PEF curve as gas bearing "hot" sands occur in this interval.

$$VSHU = \frac{U - Umin}{Umax - Umin} \qquad - 1$$

where $U = RHOE \, . \, Pe$

$$= \frac{RHOB + 0.1883}{1.0704} \, . \, Pe$$

B. 1333 - 1403m, 1670 - 2610.5m, 2611.5 - 2970m

Where gas bearing sands occur, VSH was calculated from the Gamma Ray.

$$VSHGR = \frac{GR - GR\,min}{GRmax - GRmin} \qquad - 2$$

C. 1403 - 1670m, 2610.5 - 2611.5m

VSH was estimated from density-neutron separation.

$$VSHDN = \frac{NPHI - \frac{2.65 - RHOB}{1.65}}{NPHISH - \frac{2.65 - RHOBSH}{1.65}} \qquad - 3$$

Total Porosities

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

$$h = 2.71 - RHOB + NPHI\,(RHOF - 2.71) \qquad - 4$$

if h is greater than 0, then

apparent matrix density, $RHOMa = 2.71 - h/2$ - 5

if h is less than 0, then

apparent matrix density, $RHOMa = 2.71 - 0.64h$ - 6

Total porosity: $PHIT = \frac{RHOMa - RHOB}{RHOMa - RHOF}$ - 7

where RHOB = bulk density in gms/cc
NPHI = environ. corrected neutron porosity in limestone porosity units.
RHOF = fluid density (1.005 g/cc)

Density readings were badly effected by washed out hole over the intervals 1512-1519m and 2872.5-2893m. Total Porosity calculated from density-neutron logs and from the sonic log (Hunt-Raymer transform) was too high. In these intervals, a reasonable estimate of true density was obtained where the hole was in good condition and Total Porosity was then calculated as outlined above.

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

Apparent water resistivity (Rwa) was derived as follows:

$$Rwa = Rt * PHIT^{m} \quad (m = 2) \qquad - 8$$

Free formation water resistivity (Rw) was taken from the clean, water sand Rwa. Bound water resistivity (Rwb) was calculated from the input shale resistivity value (RSH) read directly from the Rt log.

A salinity of 20,000 ppm NaCleq. was used for hydrocarbon zones above 2478m consistent with salinities in other Snapper wells (Snapper Field Log Analysis, D.J. Henderson, 1984) and water sands in the interval 1885.25-2478m KB.

High resistivities and low calculated salinities in water sands between 1411m and 1670m indicate flushing by fresh water. Below 1670m to 1885.25m KB, a transition zone occurs with calculated salinities in water sands of less than 20,000 ppm NaCleq.

For the interval 2514.5-2990m KB, a salinity of 25,000 ppm NaCleq. was used calculated from the SP log and from a water sand at 2520m KB.

Listed below are the selected salinities.

Depth Interval (m)	Salinity (ppm NaCleq.)
1292.00 - 1411.00	20,000
1411.00 - 1418.00	3,000
1418.00 - 1424.00	1,700
1424.00 - 1456.00	1,400
1456.00 - 1468.00	3,000
1468.00 - 1546.00	3,500
1546.00 - 1622.00	5,000
1622.00 - 1670.00	4,000
1670.00 - 1723.00	20,000
1723.00 - 1725.00	15,000
1725.00 - 1734.00	20,000
1734.00 - 1737.00	15,000
1737.00 - 1754.50	20,000
1754.50 - 1757.00	15,000
1757.00 - 1833.00	20,000
1833.00 - 1834.00	15,000
1834.00 - 1845.25	20,000
1845.25 - 1846.25	15,000
1846.25 - 1867.75	20,000
1867.75 - 1869.75	15,000

Depth Interval (m)	Salinity (ppm NaCleq.)
1869.75 - 1879.75	20,000
1879.75 - 1885.25	18,000
1885.25 - 2478.00	20,000
2478.00 - 2485.00	30,000
2485.00 - 2514.50	20,000
2514.50 - 2990.00	25,000

Water Saturations

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

$$\frac{1}{Rt} = \left(SwT^{n} * \frac{PHIT^{m}}{aRw}\right) + SwT^{(n-1)}\left[\frac{Swb * PHIT^{m}}{a}\left(\frac{1}{Rwb} - \frac{1}{Rw}\right)\right] \quad -9$$

or

$$\frac{1}{Rxo} = \left(SxoT^{n} * \frac{PHIT^{n}}{aRmf}\right) + SxoT^{(n-1)}\left[\frac{Swb * PHIT^{m}}{a}\left(\frac{1}{Rwb} - \frac{1}{Rmf}\right)\right] \quad -10$$

where: SwT and SxoT are "total" water saturations

and Swb (bound water saturation) $= \frac{VSH * PHISH}{PHIT}$ -11

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

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

Hydrocarbon Corrections

Hydrocarbon correction to the porosity logs utilised the following algorithms:

$$RHOBHC = RHOB(raw) + 1.07\ PHIT\ (1-SxoT)\ [(1.11-0.15P)RHOF - 1.15RHOH] \quad -12$$

$$NPHIHC = NPHI(raw) + 1.3\ PHIT\ (1-SxoT)\left[\frac{RHOF(1-P)-1.5RHOH + 0.2}{RHOF(1-P)}\right] \quad -13$$

where: P = mud filtrate salinity in parts per unity
RHOF = mud filtrate density
RHOH = hydrocarbon density (0.70 gm/cc for oil, 0.25 gm/cc for gas)
RHOBHC = hydrocarbon corrected density
NPHIHC = hydrocarbon corrected neutron

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

$$RHOBSC = \frac{RHOBHC - VSH * RHOBSH}{1 - VSH} \quad -14$$

$$NPHISC = \frac{NPHIHC - VSH * NPHISH}{1 - VSH} \quad -15$$

The shale corrected density and neutron values were then entered into the cross-plot algorithms (equations 4, 5 and 6) to derive grain density (RHOG).

SNAPPER #5

SUMMARY OF RESULTS

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Content
1292.00 - 1402.50	110.50	61.25	0.251 ± 0.06	0.202 ± 0.05	Gas
1404.00 - 1410.75	6.75	2.75	0.214 ± 0.06	0.256 ± 0.06	Oil OWC @ 1410.75
1410.75 - 1411.50	0.75	0.75	0.248 ± 0.01	0.966	Water
1419.75 - 1421.75	2.00	2.00	0.314 ± 0.07	1.010	Water
1427.75 - 1433.25	5.50	4.50	0.209 ± 0.05	1.004	Water
1441.75 - 1444.75	3.00	3.00	0.296 ± 0.03	1.051	Water
1458.25 - 1462.75	4.50	4.50	0.270 ± 0.03	0.977	Water
1469.75 - 1494.75	25.00	17.25	0.213 ± 0.06	0.982	Water
1501.75 - 1507.25	5.50	5.50	0.270 ± 0.04	1.022	Water
1511.00 - 1531.50	20.50	18.00	0.256 ± 0.04	0.991	Water
1547.25 - 1562.75	15.50	15.50	0.296 ± 0.03	1.000	Water
1568.00 - 1573.75	5.75	5.50	0.285 ± 0.04	1.061	Water
1577.00 - 1605.25	28.25	28.25	0.269 ± 0.03	1.008	Water
1624.50 - 1638.50	14.00	13.75	0.275 ± 0.04	0.966	Water
1648.25 - 1664.50	16.25	15.00	0.283 ± 0.04	1.053	Water
1680.00 - 1681.25	1.25	1.00	0.189 ± 0.06	0.403 ± 0.08	Gas
1684.25 - 1685.50	1.25	0.50	0.145 ± 0.01	0.633 ± 0.10	Oil
1690.25 - 1691.50	1.25	0.50	0.183 ± 0.05	0.528 ± 0.09	Oil
1692.75 - 1694.00	1.25	1.00	0.150 ± 0.02	0.659 ± 0.10	Oil
1702.50 - 1704.50	2.00	1.75	0.192 ± 0.04	0.298 ± 0.07	Oil
1708.25 - 1709.00	0.75	0.75	0.167 ± 0.02	0.526 ± 0.09	Oil
1710.75 - 1711.50	0.75	0.75	0.171 ± 0.03	0.459 ± 0.09	Oil
1713.25 - 1714.50	1.25	1.00	0.217 ± 0.07	0.371 ± 0.08	Oil
1716.25 - 1717.25	1.00	1.00	0.286 ± 0.04	0.421 ± 0.09	Oil OWC @ 1717.25
1717.25 - 1717.50	0.25	0.25	0.133 ± 0.05	0.807	Water
1734.50 - 1736.25	1.75	1.00	0.146 ± 0.02	1.089	Water
1749.50 - 1754.50	5.00	2.00	0.175 ± 0.03	0.361 ± 0.08	Gas GWC @ 1754.4
1754.50 - 1756.25	1.75	1.75	0.280 ± 0.04	0.751	Residual Oil
1761.00 - 1764.50	3.50	3.00	0.199 ± 0.03	0.296 ± 0.07	Gas GOC @ 1764.50
1764.50 - 1765.75	1.25	1.25	0.259 ± 0.02	0.306 ± 0.07	Oil
1777.75 - 1780.00	2.25	0.50	0.169 ± 0.02	0.490 ± 0.09	Gas
1786.00 - 1788.00	2.00	1.50	0.176 ± 0.05	0.507 ± 0.09	Gas GOC @ 1788.00
1788.00 - 1791.00	3.00	3.00	0.216 ± 0.05	0.538 ± 0.10	Oil

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

$$PHIE = PHIT - VSH * PHISH \qquad -16$$

$$Swe = 1 - \frac{PHIT}{PHIE} (1-SwT) \qquad -17$$

If VSH was greater than 0.60, Swe was set to 1.

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

Comments

1. Over the analysed interval, RHOB, VSH, PHIE, SWE, SXOE have been set to values of 1, 0, 0, 1, 1 respectively for all coals and carbonaceous shales.

2. Bridging of the hole occured at 1538.25-1547m KB. Log analysis was not possible over this interval.

3. A "hot" sand occurs at 2294-2297m KB. For this interval, VSH GR was estimated from values in the surrounding sand. Calculated porosities were lower than indicated by a successful RFT (No. 13, Seat 95) at 2296.5m KB. High values of RHOB are consistent with the presence of a heavy mineral. Porosity was re-calculated using a grain density window of 2.67-2.70 g/cc.

4. VSH was calculated from density-neutron separation for the interval 2610.5-2611.5m KB because of a streak of a dense mineral (probably pyrite) in a clean, low gamma ray sand.

5. Below 2660m KB, it is not possible to determine whether hydrocarbon zones are oil or gas bearing except where sidewall core information is available.

6. RFT results at 2700.3m KB (water recovered with 1042 DPM tritium) suggest this sand would be water productive.

7. Low resistivities at 2531.0-2532.0m, 2610.5-2611.5m, 2622.5-2623.5m, and 2635.5-2636.5m KB lead to the high water saturations calculated in these zones and are due to the presence of a conductivity mineral (probably pyrite). They probably do not reflect the presence of hydrocarbon-water contacts.

8. Anomalously low water saturations at 2876-2879m and 2880-2882m KB are calculated in zones of high resistivity which reflect low porosities in dolomitized sandstone.

9. Attached is an interpretation and listing of results plus a Porosity/Saturation depth plot and a Porosity/Depth crossplot.

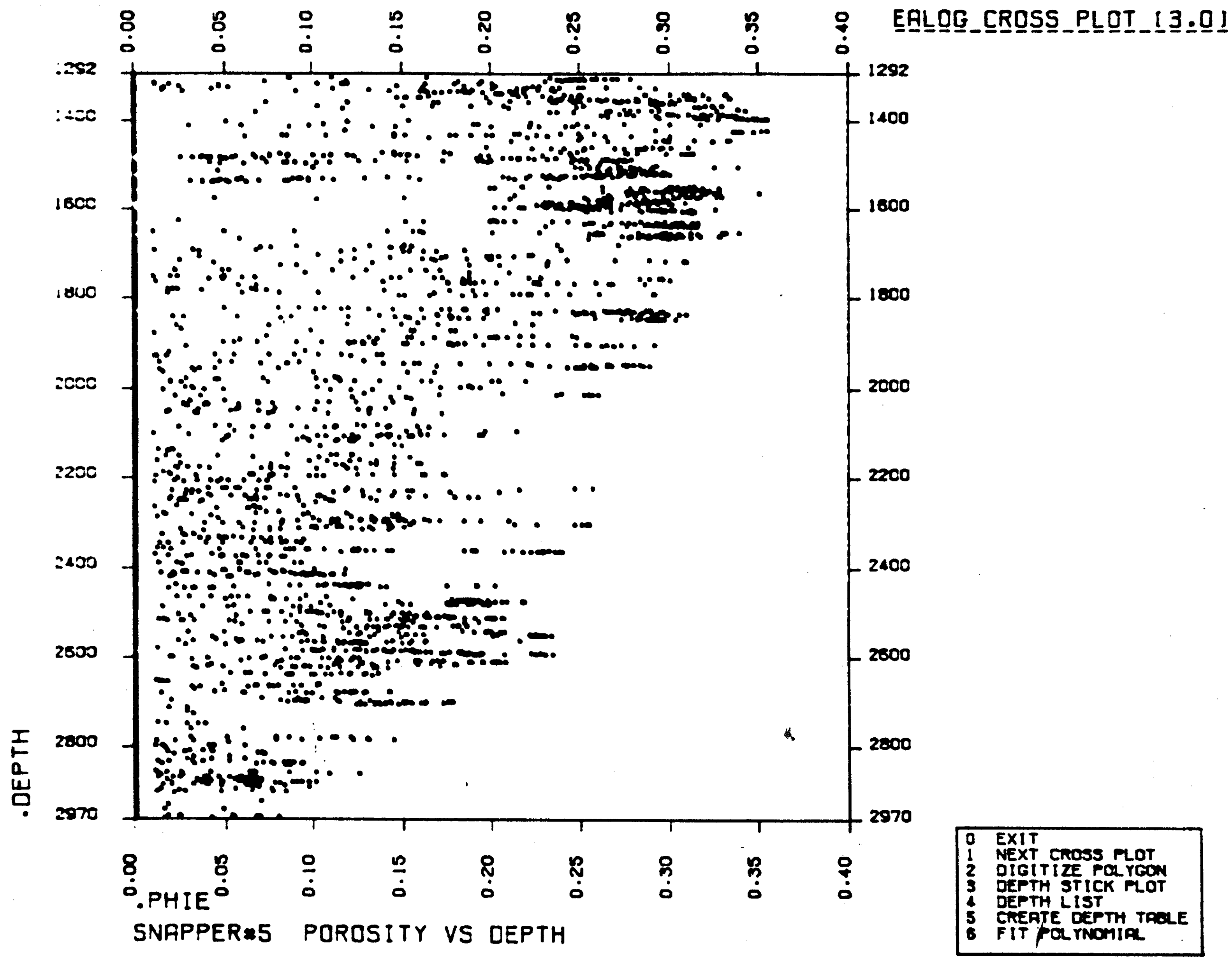
SUMMARY OF RESULTS (CON'T)

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Content
1819.50 - 1833.00	13.50	12.75	0.240 ± 0.06	0.412 ± 0.09	Gas GWC @ 1833.00
1833.00 - 1834.00	1.00	1.00	0.257 ± 0.05	0.972	Water
1836.75 - 1845.25	8.50	6.50	0.228 ± 0.06	0.487 ± 0.09	Oil OWC @ 1845.25
1845.25 - 1845.50	0.25	0.25	0.300 ± 0.01	0.958	Water
1853.75 - 1855.00	1.25	1.25	0.172 ± 0.40	0.638 ± 0.10	Oil
1868.00 - 1869.50	1.50	1.00	0.161 ± 0.02	0.982	Water
1880.75 - 1885.00	4.25	3.75	0.193 ± 0.03	1.006	Water
1893.75 - 1902.50	8.75	7.50	0.189 ± 0.06	0.214 ± 0.06	Gas
1922.25 - 1925.75	3.50	1.00	0.123 ± 0.10	0.436 ± 0.09	Gas
1940.00 - 1951.50	11.50	8.50	0.240 ± 0.04	0.224 ± 0.06	Gas
1960.50 - 1961.50	1.00	0.75	0.147 ± 0.03	0.879	Water
1974.25 - 1975.25	1.00	0.50	0.109 ± 0.01	0.682 ± 0.10	?Gas
1979.50 - 1983.75	4.25	2.25	0.155 ± 0.04	0.349 ± 0.08	Gas
1993.50 - 1995.75	2.25	1.75	0.170 ± 0.03	0.333 ± 0.08	Gas
1999.50 - 2001.25	1.75	0.50	0.121 ± 0.01	0.609 ± 0.10	?Gas
2010.00 - 2012.00	2.00	2.00	0.223 ± 0.04	0.314 ± 0.07	Gas
2018.50 - 2019.25	0.75	0.75	0.143 ± 0.02	0.614 ± 0.10	?Gas
2027.25 - 2028.75	1.50	0.75	0.120 ± 0.02	0.512 ± 0.09	?Gas
2043.00 - 2044.00	1.00	0.25	0.136 ± 0.10	0.641 ± 0.10	?Gas
2045.75 - 2047.00	1.25	0.75	0.128 ± 0.02	0.600 ± 0.10	?Gas
2052.25 - 2053.75	1.50	0.75	0.142 ± 0.03	0.369 ± 0.08	Gas
2080.25 - 2083.00	2.75	1.50	0.131 ± 0.02	0.446 ± 0.09	Gas
2084.00 - 2084.75	0.75	0.50	0.139 ± 0.03	0.368 ± 0.08	Gas
2092.25 - 2093.25	1.00	0.75	0.180 ± 0.03	0.384 ± 0.08	Gas
2100.75 - 2104.75	4.00	3.50	0.147 ± 0.03	0.336 ± 0.08	Gas
2106.75 - 2107.50	1.25	0.50	0.138 ± 0.01	0.647 ± 0.10	?Gas
2113.00 - 2115.25	2.25	1.25	0.119 ± 0.01	0.819	Water
2124.75 - 2125.75	1.00	1.00	0.132 ± 0.02	1.045	Water
2189.50 - 2194.75	5.25	2.00	0.142 ± 0.03	1.063	Water
2226.50 - 2229.50	3.00	1.50	0.135 ± 0.02	1.026	Water
2236.75 - 2241.25	4.50	2.00	0.150 ± 0.03	0.883	Water
2249.25 - 2251.50	2.25	1.00	0.118 ± 0.01	0.931	Water
2281.00 - 2281.75	0.75	0.25	0.146 ± 0.01	0.634 ± 0.10	?Gas
2284.75 - 2285.75	1.00	0.50	0.132 ± 0.01	0.485 ± 0.09	Gas
2290.00 - 2297.00	7.00	6.25	0.143 ± 0.03	0.213 ± 0.06	Gas
2299.25 - 2303.50	4.25	2.50	0.192 ± 0.06	0.246 ± 0.06	Gas
2307.75 - 2310.50	2.75	2.00	0.125 ± 0.02	0.540 ± 0.10	Gas

SUMMARY OF RESULTS (CON'T)

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Content
2312.50 - 2314.00	1.50	0.75	0.126 ± 0.02	0.505 ± 0.09	Gas
2357.50 - 2365.75	8.25	6.00	0.182 ± 0.05	0.333 ± 0.08	Gas
2436.00 - 2443.00	7.00	5.75	0.132 ± 0.03	0.860	Water
2470.25 - 2477.25	7.00	5.50	0.187 ± 0.02	0.957	Water
2478.75 - 2479.75	1.00	1.00	0.164 ± 0.03	0.695	Residual Hydrocarbon
2479.75 - 2483.50	3.75	3.50	0.181 ± 0.02	0.979	Water
2497.50 - 2502.75	5.25	3.50	0.133 ± 0.02	0.998	Water
2505.75 - 2514.25	8.50	7.00	0.170 ± 0.03	0.929	Water
2515.00 - 2522.00	7.00	3.00	0.147 ± 0.02	1.035	Water
2528.00 - 2534.00	6.00	5.50	0.147 ± 0.02	0.526 ± 0.09	Gas
2541.50 - 2544.25	2.75	2.00	0.185 ± 0.02	0.206 ± 0.05	Gas
2547.00 - 2555.25	8.25	6.50	0.188 ± 0.04	0.226 ± 0.06	Gas
2561.25 - 2570.25	9.00	6.00	0.132 ± 0.02	0.386 ± 0.08	Gas
2581.00 - 2594.50	13.50	12.25	0.163 ± 0.04	0.190 ± 0.05	Gas
2600.00 - 2603.75	3.75	1.25	0.116 ± 0.01	0.632 ± 0.10	?Gas
2606.50 - 2610.00	3.50	2.75	0.158 ± 0.02	0.420 ± 0.09	Gas GWC @ 2610.00
2610.00 - 2612.75	2.75	2.50	0.170 ± 0.04	0.755	Water
2616.25 - 2617.75	1.50	1.25	0.155 ± 0.03	0.577 ± 0.10	?Gas
2619.75 - 2624.25	4.50	1.75	0.124 ± 0.01	0.721	Water
2635.50 - 2640.00	4.50	2.50	0.120 ± 0.01	0.591 ± 0.10	Oil
2662.00 - 2664.00	2.00	0.50	0.102 ± 0.01	0.557 ± 0.10	Hydrocarbon
2676.75 - 2681.25	4.50	2.50	0.125 ± 0.01	0.580 ± 0.09	Gas
2691.00 - 2691.75	0.75	0.25	0.108 ± 0.01	0.694 ± 0.10	Hydrocarbon
2696.00 - 2706.00	10.00	7.25	0.145 ± 0.02	0.652	Residual Oil
2781.00 - 2782.50	1.50	0.50	0.114 ± 0.01	0.546 ± 0.10	Hydrocarbon
2785.00 - 2786.50	1.50	1.00	0.126 ± 0.01	0.536 ± 0.09	Hydrocarbon
2860.75 - 2864.00	3.25	0.50	0.111 ± 0.01	0.336 ± 0.08	Hydrocarbon

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



EALOG CROSS PLOT [3.0]
0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40
1292
1400
1600
1800
2000
2200
2400
2600
2800
2970
.DEPTH
.PHIE
SNAPPER*5 POROSITY VS DEPTH
0 EXIT
1 NEXT CROSS PLOT
2 DIGITIZE POLYGON
3 DEPTH STICK PLOT
4 DEPTH LIST
5 CREATE DEPTH TABLE
6 FIT POLYNOMIAL

January, 1986

ADDENDUM TO SNAPPER-5 LOG ANALYSIS

Nine Snapper-5 sidewall cores which showed fluorescence were submitted for "total extract" chromatograms. Paraffinic, mature, oily hydrocarbons were extracted from all of the sidewalls at 1685.3m, 1693.3m, 1708.9m, 1711.2m, 1854.1m, 2636.4m, 2700m, 2701.5m and 2886m KB (T.R. Bostwick Memo, 7th January, 1986).

The "shallow" set of extracts in the interval 1685-1855m KB, confirm the log interpretation of oil in reservoirs at these depths.

On the basis of extracts from sidewalls at 2636.4m, 2700m, 2701.5m and 2886m KB, associated reservoirs probably contain oil. However, log porosities of 10-15%, water saturations of 55-70%, and water recovery on RFT at 2700.3m KB (No. 23/157) suggest these sands may be water productive.

24511

PE603645

This is an enclosure indicator page.
The enclosure PE603645 is enclosed within the container PE905078 at this location in this document.

The enclosure PE603645 has the following characteristics:

ITEM_BARCODE = PE603645
CONTAINER_BARCODE = PE905078
NAME = Quantitative Log Analysis
BASIN = GIPPSLAND
PERMIT = VIC/L10
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Quantitative Log Analysis for Snapper-5
REMARKS =
DATE_CREATED = 31/08/85
DATE_RECEIVED = 1/05/86
W_NO = W912
WELL_NAME = SNAPPER-5
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 4

APPENDIX 4

GEOCHEMICAL REPORT

GEOCHEMICAL REPORT

SNAPPER-5 WELL, GIPPSLAND BASIN

WESTERN AUSTRALIA

by

T.R. Bostwick

Sample handling and Analyses by:

- D.M. Hill)	
- D.M. Ford)	
- J. McCardle)	ESSO AUSTRALIA LTD.
- H. Schiller)	
- M.A. Sparke)	
- A.C. Cook	University of Wollongong

Esso Australia Ltd.
Geochemical Report

3/3/86

2124L

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WHOLE OIL GAS CHROMATOGRAMS

Appendix

SNAPPER 5

INTRODUCTION

Canned cuttings and side-wall cores from the Snapper-5 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 225m KB to total depth (T.D.) at 2990m 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, kerogen isolation and elemental analysis, kerogen descriptions and vitrinite reflectance. Visual kerogen analysis was performed by M.J. Hannah of Esso Australia Ltd., and vitrinite reflectance measurements were made by A.C. Cook of Wollongong University.

Nine of the Snapper-5 sidewall cores which showed fluorescence were treated with heptane to extract any hydrocarbons present. The extracted materials were analyzed by whole oil gas chromatography.

Fifteen oils/condensates recovered during production testing were analyzed for API gravity and whole oil gas chromatography.

The results of these analyses are listed in Tables 1 through 6 and graphically displayed in Figures 1 through 29.

Discussion of Results and Interpretations

Richness

C_{1-4} headspace cuttings gas yields (Table 1, Figure 1) are poor to fair in the Gippsland Limestone Fm., fair in the Lakes Entrance 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, Figure 2) except in the Gurnard member (of the Latrobe formation) which is rated as poor. The distribution of organic-rich Latrobe Group source rocks is however not uniform as organic-lean rocks are interspersed with the organic-rich sediments. This is especially true of the Early Eocene and Paleocene sediments. The Early Paleocene and Late Cretaceous sediments are essentially organic-rich.

The Rock-Eval pyrolysis yields recorded in Table 3 illustrate the variability of the source potential of the Latrobe sediments. The best potential is seen in shales and siltstones of Middle Eocene (1380m KB), Early Eocene (1546m KB), Paleocene (1848.6m KB, 2073.5m KB, 2160.5m KB, and 2559.9m KB) and Late Cretaceous (2757m KB and 2871.4m KB) ages where S_2 yields exceed 6 mg/gm. Interspersed between these good source rocks are sediments of moderate (S_2=2-6 mg/gm), and poor (S_2=0-2mg/gm) potential.

Hydrocarbon Type

Wet gas (C_{2-4}) yields (Figure 1b) for the Latrobe Group sediments average about 30% of the total headspace (C_{1-4}) gas in the Mid-Eocene and Early Eocene sediments, and 20% in the Paleocene and Late Cretaceous. If indigenous these yields indicate that oil and gas/condensate would be the hydrocarbon types sourced by the section.

The hydrogen indicies (HI) recorded in Table 3b and plotted against TMAX in Figure 3 indicate that although Type III gas-prone kerogen predominate in the samples analyzed, a few Latrobe Group samples of Early Eocene, Paleocene and Late Cretaceous age do contain Type II oil-prone material.

Atomic H/C and atomic O/C (* approximate) ratios for 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 Type II oil prone material appears present in certain Early Eocene, Paleocene and Late Cretaceous samples.

Together these results confirm the potential of the organic-rich portions of the Latrobe Group sediments to yield gas and oil/condensate where mature.

Maturity

The vitrinite reflectance data (Table 5) when plotted (Figure 5) show a reasonable downhole gradient which may be represented by the interpreted best fit line shown. Thus at 2550m KB (Ro = 0.75) and deeper the drilled section is most likely fully mature. Between 2250m KB (Ro = 0.65) and 2550m KB the maturity of the section is rated as transitional (i.e. early 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.

TMAX measurements (Table 3a) are also a useful indicator of maturity. Although there are some anomalies, in general TMAX increases with depth. Based on the observed trend, the mature window is entered in the 2073-2559.9m KB interval which is not inconsistent with the Ro data.

Thermal alteration indicies (TAI) determined for selected samples (Table 6) confirm that the section is immature to 2248.1m KB (TAI=2.1) and fully mature (TAI=2.3) by 2689m KB. This interpretation is also compatible with maturity interpretations from the other data types.

Extractable Hydrocarbons

Nine (9) Snapper-5 sidewall cores which showed fluorescence were treated with heptane to extract any hydrocarbons present. Table 6 lists the descriptions of the extracted material, and "total extract" chromatograms are shown in Figures 6 through 14. The near absence of light (C_{1-15}) hydrocarbons in the chromatograms is a result of evaporation during the extraction process. The chromatograms show the extracts to be very paraffinic, mature oily hydrocarbons with high pristane/phytane (Pr/Ph) ratios and a slight odd-over-even carbon preference similar to the terrestrially sourced, high wax oils in Gippsland.

The chromatograms of the 5 "shallow" extracts (1685.3m KB, 1693.3m KB, 1708.9m KB, 1711.2m KB and 1854.1m KB) show maxima in the C_{15-20} range with a moderate component of waxy hydrocarbons in the C_{20-30} range. Gippsland oils with similar C_{15}+ patterns have API gravities between 40^o and 50^o (e.g. Seahorse-1 (1541m KB) - 47.52^o, Flounder-4 (2531.7m KB) - 40.19^o). It is therefore probable that the reservoirs associated with these side-wall cores might contain oil with similar geochemical characteristics. Since these mature hydrocarbons occur within an immature section, it is obvious that they have migrated from a more mature source interval.

The extracts at 2636.4m KB, 2700m KB, 2701.5m KB and 2886m KB show maxima in the C_{22-28} range resembling the medium gravity ($34.66 - 39.71^o$) Wirrah 3 oils. Since these extracts occur within the mature window it is probable they have most likely been generated "yesterday" from adjacent organic rich sediments. Thus the reservoirs associated with these sidewall cores may also contain medium gravity oils.

Liquid Hydrocarbons

Twenty three (23) liquids recovered from RFTs were analysed for API gravities, and fifteen of them for whole oil gas chromatography. The API gravities are listed in Table 1.

Except for the samples recovered by RFT 16/102 which are water, the liquids are either medium gravity oils or light oils. Interestingly, at 2309.5m an orange coloured light oil (47.3^{o} API) was recovered from the 10.4 lt chamber whereas a dark coloured medium gravity oil (43.1^{o} API) was found in the 22.7 lt chamber.

The whole oil gas chromatograms of the oils (Figures 15 through 29) have patterns that are consistent with their API gravities. The medium gravity oils show maxima in the C_{14-20} range with a moderate component of waxy hydrocarbons in the C_{20-30} range. These resemble the "shallow" extracts discussed earlier. The light oils have chromatograms which peak in the gasoline range (C_{4-10}) fraction and have essentially a minor C_{20}+ fraction.

All of the chromatograms are quite paraffinic and show a high pristane (Pr) content relative to phytane (Ph). These are typical indicators of a source that is from a terrestrial environment. The land-plant origin of the oils is also indicated by the odd-over-even carbon preference seen in the chromatigrams of the medium gravity oils.

The different oil gravities are believed to be a function of maturity differences, with the light oils coming from a source at a higher maturity level relative to that of the medium gravity oils. Since maturity for the terrestrial organic matter in this section most likely occurs around 2550m KB and deeper, all of the recovered hydrocarbons must have migrated to their present locations from more mature locations.

Conclusions

1. The sedimentary section encountered by Snapper-5 is immature to 2250m KB, early mature between 2250m KB and 2550m KB, and fully mature from 2550m KB to T.D. at 2990m KB.

2. Organic-rich sediments within the Latrobe group have good potential to source oil and gas where mature.

3. The hydrocarbon liquids recovered during production testing (RFTs) have migrated to their present locations in the immature section. These light and medium gravity oils are very paraffinic and have been sourced from hydrogen-rich, terrestrial organic matter.

4. The mature oily hydrocarbons extracted from sediments below 2550m KB have most likely been sourced from the adjacent organic rich shales.

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ESSO AUSTRALIA LTD.

TABLE 1

C1-C4 HYDROCARBON ANALYSES

REPORT A - HEADSPACE GAS

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS) METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	GAS COMPOSITION (PERCENT) TOTAL GAS M	TOTAL GAS E	TOTAL GAS P	TOTAL GAS IB	TOTAL GAS NB	WET GAS E	WET GAS P	WET GAS IB	WET GAS NB
77874 A	240.00	5	2	2	0	0	4	9	44.44	56.	22.	22.	0.	0.	50.	50.	0.	0.
77874 C	300.00	10	0	4	0	0	4	14	28.57	71.	0.	29.	0.	0.	0.	100.	0.	0.
77874 E	360.00	30	4	3	0	0	7	37	18.92	81.	11.	8.	0.	0.	57.	43.	0.	0.
77874 G	420.00	140	14	13	0	3	30	170	17.65	82.	8.	8.	0.	2.	47.	43.	0.	10.
77874 I	480.00	444	8	0	0	0	8	452	1.77	98.	2.	0.	0.	0.	100.	0.	0.	0.
77874 K	540.00	773	32	6	0	0	38	811	4.69	95.	4.	1.	0.	0.	84.	16.	0.	0.
77874 M	600.00	1321	88	14	0	0	102	1423	7.17	93.	6.	1.	0.	0.	86.	14.	0.	0.
77874 O	660.00	2102	197	29	8	4	238	2340	10.17	90.	8.	1.	0.	0.	83.	12.	3.	2.
77874 Q	720.00	2432	173	37	10	5	225	2657	8.47	92.	7.	1.	0.	0.	77.	16.	4.	2.
77874 S	780.00	5479	559	155	36	19	769	6248	12.31	88.	9.	2.	1.	0.	73.	20.	5.	2.
77874 U	815.00	10186	328	169	55	28	580	10766	5.39	95.	3.	2.	1.	0.	57.	29.	9.	5.
77874 W	845.00	12152	446	134	37	15	632	12784	4.94	95.	3.	1.	0.	0.	71.	21.	6.	2.
77874 Y	890.00	11890	585	195	162	80	1022	12912	7.92	92.	5.	2.	1.	1.	57.	19.	16.	8.
77875 A	950.00	19073	327	162	79	41	609	19682	3.09	97.	2.	1.	0.	0.	54.	27.	13.	7.
77875 C	1010.00	11839	490	302	155	87	1034	12873	8.03	92.	4.	2.	1.	1.	47.	29.	15.	8.
77875 E	1055.00	11049	686	204	80	44	1014	12063	8.41	92.	6.	2.	1.	0.	68.	20.	8.	4.
77875 G	1130.00	10260	735	297	80	60	1172	11432	10.25	90.	6.	3.	1.	1.	63.	25.	7.	5.
77875 I	1175.00	8469	615	354	77	65	1111	9580	11.60	88.	6.	4.	1.	1.	55.	32.	7.	6.
77875 K	1205.00	11136	524	181	36	26	767	11903	6.44	94.	4.	2.	0.	0.	68.	24.	5.	3.
77875 M	1235.00	18622	544	387	78	98	1107	19729	5.61	94.	3.	2.	0.	0.	49.	35.	7.	9.
77875 O	1265.00	19037	885	645	153	248	1931	20968	9.21	91.	4.	3.	1.	1.	46.	33.	8.	13.
77875 Q	1295.00	15990	1058	964	235	441	2698	18688	14.44	86.	6.	5.	1.	2.	39.	36.	9.	16.
77875 S	1325.00	55959	29745	16927	2209	3168	52049	108008	48.19	52.	28.	16.	2.	3.	57.	33.	4.	6.
77875 U	1355.00	234657	122241	60063	8358	11607	202269	436926	46.29	54.	28.	14.	2.	3.	60.	30.	4.	6.
77875 W	1385.00	157970	89267	43984	5980	9269	148500	306470	48.45	52.	29.	14.	2.	3.	60.	30.	4.	6.
77875 Y	1430.00	86703	30061	21614	3683	4948	60306	147009	41.02	59.	20.	15.	3.	3.	50.	36.	6.	8.
77876 A	1460.00	118494	50528	14777	1304	1350	67959	186453	36.45	64.	27.	8.	1.	1.	74.	22.	2.	2.
77876 C	1490.00	41836	14051	6505	861	1115	22532	64368	35.00	65.	22.	10.	1.	2.	62.	29.	4.	5.
77876 E	1520.00	23508	6929	3924	718	964	12535	36043	34.78	65.	19.	11.	2.	3.	55.	31.	6.	8.
77876 I	1580.00	21	12	5	0	0	17	38	44.74	55.	32.	13.	0.	0.	71.	29.	0.	0.
77876 K	1610.00	78535	35522	11181	1094	1305	49102	127637	38.47	62.	28.	9.	1.	1.	72.	23.	2.	3.
77876 M	1640.00	103894	44447	10959	855	1006	57267	161161	35.53	64.	28.	7.	1.	1.	78.	19.	1.	2.
77876 O	1670.00	62319	27453	6481	504	564	35002	97321	35.97	64.	28.	7.	1.	1.	78.	19.	1.	2.
77876 Q	1700.00	105721	44623	10975	1026	1284	57908	163629	35.39	65.	27.	7.	1.	1.	77.	19.	2.	2.
77876 S	1730.00	69354	19188	4141	373	502	24204	93558	25.87	74.	21.	4.	0.	1.	79.	17.	2.	2.
77876 U	1760.00	57755	27269	7357	710	846	36182	93937	38.52	61.	29.	8.	1.	1.	75.	20.	2.	2.
77876 W	1790.00	26287	10973	2622	289	356	14240	40527	35.14	65.	27.	6.	1.	1.	77.	18.	2.	2.
77876 Y	1820.00	118291	53211	13737	1224	1480	69652	187943	37.06	63.	28.	7.	1.	1.	76.	20.	2.	2.
77877 A	1850.00	53487	22371	5111	511	642	28635	82122	34.87	65.	27.	6.	1.	1.	78.	18.	2.	2.
77877 C	1880.00	30718	11534	2487	363	346	14730	45448	32.41	68.	25.	5.	1.	1.	78.	17.	2.	2.
77877 E	1910.00	50003	17648	3718	409	474	22249	72252	30.79	69.	24.	5.	1.	1.	79.	17.	2.	2.
77877 G	1940.00	73057	21826	4196	290	350	26662	99719	26.74	73.	22.	4.	0.	0.	82.	16.	1.	1.
77877 I	1970.00	38041	13816	2604	272	293	16985	55026	30.87	69.	25.	5.	0.	1.	81.	15.	2.	2.
77877 K	2000.00	126816	35796	7601	905	986	45288	172104	26.31	74.	21.	4.	1.	1.	79.	17.	2.	2.
77877 M	2030.00	62007	19959	3038	228	183	23408	85415	27.41	73.	23.	4.	0.	0.	85.	13.	1.	1.
77877 O	2060.00	66527	14538	3532	383	383	18836	85363	22.07	78.	17.	4.	0.	0.	77.	19.	2.	2.
77877 Q	2090.00	35851	11654	1666	170	128	13618	49469	27.53	72.	24.	3.	0.	0.	86.	12.	1.	1.

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ESSO AUSTRALIA LTD.

TABLE 1 CONT'D

C1-C4 HYDROCARBON ANALYSES

REPORT A - HEADSPACE GAS

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS) METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	GAS COMPOSITION (PERCENT) TOTAL GAS M	E	P	IB	NB	WET GAS E	P	IB	NB
77877 S	2120.00	44023	3426	299	13	6	3744	47767	7.84	92.	7.	1.	0.	0.	92.	8.	0.	0.
77877 U	2150.00	54892	15113	1956	300	94	17463	72355	24.14	76.	21.	3.	0.	0.	87.	11.	2.	1.
77877 W	2180.00	65715	11991	2689	368	154	15202	80917	18.79	81.	15.	3.	0.	0.	79.	18.	2.	1.
77877 Y	2210.00	188577	32844	7159	1520	633	42156	230733	18.27	82.	14.	3.	1.	0.	78.	17.	4.	2.
77878 A	2240.00	84693	16190	3856	638	374	21058	105751	19.91	80.	15.	4.	1.	0.	77.	18.	3.	2.
77878 C	2270.00	133870	28436	5015	804	327	34582	168452	20.53	79.	17.	3.	0.	0.	82.	15.	2.	1.
77878 I	2360.00	68518	12385	2293	287	163	15128	83646	18.09	82.	15.	3.	0.	0.	82.	15.	2.	1.
77878 K	2390.00	87548	17917	3061	441	244	21663	109211	19.84	80.	16.	3.	0.	0.	83.	14.	2.	1.
77878 M	2420.00	26202	5188	1078	180	74	6520	32722	19.93	80.	16.	3.	1.	0.	80.	17.	3.	1.
77878 O	2450.00	34507	8378	1497	205	88	10168	44675	22.76	77.	19.	3.	0.	0.	82.	15.	2.	1.
77878 Q	2480.00	22457	3032	690	97	67	3886	26343	14.75	85.	12.	3.	0.	0.	78.	18.	2.	2.
77878 S	2510.00	32747	4552	1001	155	83	5791	38538	15.03	85.	12.	3.	0.	0.	79.	17.	3.	1.
77878 U	2540.00	39051	13449	2686	262	220	16617	55668	29.85	70.	24.	5.	0.	0.	81.	16.	2.	1.
77878 W	2570.00	76781	13371	2893	180	216	16660	93441	17.83	82.	14.	3.	0.	0.	80.	17.	1.	1.
77878 Y	2600.00	46288	8004	2242	196	259	10701	56989	18.78	81.	14.	4.	0.	0.	75.	21.	2.	2.
77879 A	2630.00	39817	8037	1867	140	199	10243	50060	20.46	80.	16.	4.	0.	0.	78.	18.	1.	2.
77879 C	2660.00	38149	8640	2092	215	274	11221	49370	22.73	77.	18.	4.	0.	1.	77.	19.	2.	2.
77879 E	2690.00	8167	2225	505	43	53	2826	10993	25.71	74.	20.	5.	0.	0.	79.	18.	2.	2.
77879 G	2735.00	47376	4840	1103	71	83	6097	53473	11.40	89.	9.	2.	0.	0.	79.	18.	1.	1.
77879 I	2750.00	31926	6715	2910	282	406	10313	42239	24.42	76.	16.	7.	1.	1.	65.	28.	3.	4.
77879 M	2810.00	79173	9740	3894	396	691	14721	93894	15.68	84.	10.	4.	0.	1.	66.	26.	3.	5.
77879 O	2840.00	18328	3572	1523	124	223	5442	23770	22.89	77.	15.	6.	1.	1.	66.	28.	2.	4.
77879 Q	2870.00	94476	17400	7918	701	1388	27407	121883	22.49	78.	14.	6.	1.	1.	63.	29.	3.	5.
77879 S	2900.00	14229	2912	2009	225	436	5582	19811	28.18	72.	15.	10.	1.	2.	52.	36.	4.	8.
77879 U	2930.00	70430	15665	10886	1130	1850	29531	99961	29.54	70.	16.	11.	1.	2.	53.	37.	4.	6.
77879 W	2960.00	41519	8515	5155	495	843	15008	56527	26.55	73.	15.	9.	1.	1.	57.	34.	3.	6.
77879 Y	2990.00	89927	19275	11271	1246	2054	33846	123773	27.35	73.	16.	9.	1.	2.	57.	33.	4.	6.

ESSO AUSTRALIA LTD.

TOTAL ORGANIC CARBON REPORT

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	TOC%	AN	TOC%	AN	TOC%	DESCRIPTION
77825 O	1293.90	LATE EOCENE	LATROBE GP/GURNARD FM	1	.58					BRN SLTST, MICA, V CALC
77825 N	1309.00	LATE EOCENE	LATROBE GP/GURNARD FM	1	.37					M DK GRY-RUST BRN SLTST
77825 M	1341.00	MIDDLE EOCENE	LATROBE GROUP	1	3.66					BRN SLTST
77825 F	1380.00	MIDDLE EOCENE	LATROBE GROUP	1	4.31					BRN RED SLTST, CARB
77825 D	1468.50	EARLY EOCENE	LATROBE GROUP	1	.20					LT-M LT GRY SLTST
77825 C	1495.90	EARLY EOCENE	LATROBE GROUP	1	3.72					BRN SLTST, MICA
77825 A	1546.00	EARLY EOCENE	LATROBE GROUP	1	8.27					OL GRY SH
77824 Y	1575.90	EARLY EOCENE	LATROBE GROUP	1	.18					LT GRY SLTST,CARB FLECKS
77824 W	1647.00	EARLY EOCENE	LATROBE GROUP	1	.26					LT GRY CLYST
77824 S	1701.90	EARLY EOCENE	LATROBE GROUP	1	2.16					M GRY-BRN GRY SLTST,COAL
77824 P	1721.00	EARLY EOCENE	LATROBE GROUP	1	.87					PALE BRN CLYST
77824 L	1759.40	EARLY EOCENE	LATROBE GROUP	1	.31					LT GRY CLYST
77824 K	1770.80	EARLY EOCENE	LATROBE GROUP	1	.77					PALE BRN CLYST
77824 G	1818.40	EARLY EOCENE	LATROBE GROUP	1	.10					M LT GRY CLYST
77824 D	1848.60	PALEOCENE	LATROBE GROUP	1	4.52					M DK GY SH, CARB
77824 B	1873.00	PALEOCENE	LATROBE GROUP	1	.22					LT-M LT GY SLTST,SL CARB
77823 Z	1920.00	PALEOCENE	LATROBE GROUP	1	.30					YEL GY SLTST,CARB FLECKS
77823 W	1969.00	PALEOCENE	LATROBE GROUP	1	1.14					M LT GRY SLTST, CARB
77823 U	2024.00	PALEOCENE	LATROBE GROUP	1	.42					LT GRY SLTST,ARGILL,CARB
77823 S	2049.90	PALEOCENE	LATROBE GROUP	1	3.60					M DK-DK GRY SH,CARB
77823 R	2073.50	PALEOCENE	LATROBE GROUP	1	10.51					BRN GRY SH
77823 Q	2081.00	PALEOCENE	LATROBE GROUP	1	.76					M LT GRY SLTST, CARB LAM
77823 P	2099.00	PALEOCENE	LATROBE GROUP	1	.69					PALE BRN SLTST,CARB,MICA
77823 J	2129.40	PALEOCENE	LATROBE GROUP	1	.51					LT - M LT GRY SLTST, QTZ
77823 N	2160.50	PALEOCENE	LATROBE GROUP	1	5.82					M DK-DK GY SLTST
77823 M	2187.00	PALEOCENE	LATROBE GROUP	1	.51					M-LT GY CLYST
77823 L	2218.00	PALEOCENE	LATROBE GROUP	1	.32					LT GY CLYST
77823 K	2248.10	PALEOCENE	LATROBE GROUP	1	2.11					GY-RED SLTST,CARB,MICA
77823 H	2313.10	PALEOCENE	LATROBE GROUP	1	1.51					M-LT GY SLTST,CARB LAM
77823 G	2347.40	PALEOCENE	LATROBE GROUP	1	3.49					BRN GY SH
77823 F	2385.40	PALEOCENE	LATROBE GROUP	1	2.84					M-DK GY SH
77823 E	2403.90	PALEOCENE	LATROBE GROUP	1	1.58					LT-M GY SLTST,LAM
77823 D	2414.90	PALEOCENE	LATROBE GROUP	1	.23					LT GY SLTST,CARB,ARGILL
77823 C	2423.90	PALEOCENE	LATROBE GROUP	1	3.76					M DK GY-BRN GY SLTST
77822 Z	2462.00	PALEOCENE	LATROBE GROUP	1	.65					LT-M GY SLTST
77822 V	2559.90	PALEOCENE	LATROBE GROUP	1	9.01					M-DK GY SLTST,COAL LAM
77822 U	2597.50	PALEOCENE	LATROBE GROUP	1	2.52					M-DK GY SLTST,DOLOMITE
77822 R	2653.00	PALEOCENE	LATROBE GROUP	1	2.87					GY SLTST,CARB
77822 Q	2669.20	PALEOCENE	LATROBE GROUP	1	1.30					GY SLTST,V ARGILL
77822 O	2689.00	LATE CRETACEOUS	LATROBE GROUP	1	3.95					BRN GY SH,CARB,COAL LAM
77822 L	2710.00	LATE CRATACEOUS	LATROBE GROUP	1	1.63					M-DK GY SLTST,CARB
77822 K	2723.60	LATE CRETACEOUS	LATROBE GROUP	1	2.88					M-DK GY SH,SL CARB
77822 J	2753.40	LATE CRETACEOUS	LATROBE GROUP	1	1.98					M-DK GY SLTST,CARB
77822 I	2757.00	LATE CRETACEOUS	LATROBE GROUP	1	3.61					OL GY SH,CARB
77822 H	2817.40	LATE CRETACEOUS	LATROBE GROUP	1	1.19					M-DK GY SLTST,CARB
77822 G	2863.80	LATE CRETACEOUS	LATROBE GROUP	1	.84					M GY SLTST,V ARGILL
77822 F	2871.40	LATE CRETACEOUS	LATROBE GROUP	1	3.76					M DK GRY-DK GRY SH,CARB

TOTAL ORGANIC CARBON REPORT

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	TOC%	AN	TOC%	AN	TOC%	DESCRIPTION
77822 D	2899.50	LATE CRETACEOUS	LATROBE GROUP	1	1.66					M-DK GY SLTST,CARB,MICA
77822 C	2926.40	LATE CRETACEOUS	LATROBE GROUP	1	3.12					DK GY SLTST,CARB
77822 B	2946.90	LATE CRETACEOUS	LATROBE GROUP	1	1.50					LT-M GY SLTST,CARB,QTZ
77822 A	2960.00	LATE CRETACEOUS	LATROBE GROUP	1	1.92					LT-M GY SLTST,CARB

ROCK EVAL ANALYSES

BASIN - GIPPSLAND
WELL - SNAPPER 5

REPORT A - SULPHUR & PYROLYZABLE CARBON

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	TMAX	S1	S2	S3	PI	S2/S3	PC	COMMENTS
77825 D	1293.9	SWC	LATE EOCENE	376.	.01	.03	.39	.17	.07	.00	
77825 H	1341.0	SWC	MIDDLE EOCENE	413.	.63	5.55	1.05	.10	5.31	.51	
77825 F	1380.0	SWC	MIDDLE EOCENE	417.	1.29	9.41	1.16	.12	8.13	.89	
77825 C	1495.9	SWC	EARLY EOCENE	418.	.71	4.57	1.04	.13	4.38	.44	
77825 A	1546.0	SWC	EARLY EOCENE	423.	1.37	25.80	1.85	.05	13.96	2.25	
77824 S	1701.9	SWC	EARLY EOCENE	426.	.93	4.08	.68	.19	6.04	.42	
77824 P	1721.0	SWC	EARLY EOCENE	420.	.57	.84	.58	.40	1.44	.12	
77824 K	1770.8	SWC	EARLY EOCENE	427.	.29	1.02	.62	.22	1.64	.11	
77824 D	1848.6	SWC	PALEOCENE	435.	1.56	16.71	.88	.09	18.95	1.52	
77823 W	1969.0	SWC	PALEOCENE	434.	.32	1.64	.56	.16	2.93	.16	
77823 S	2049.9	SWC	PALEOCENE	430.	.51	2.74	.90	.16	3.04	.27	
77823 R	2073.5	SWC	PALEOCENE	435.	1.82	37.92	1.83	.05	20.69	3.30	
77823 Q	2081.0	SWC	PALEOCENE	436.	.22	.25	.59	.46	.44	.04	
77823 P	2099.0	SWC	PALEOCENE	436.	.22	.26	.59	.46	.44	.04	
77823 O	2129.4	SWC	PALEOCENE	441.	.24	.20	.25	.54	.81	.04	
77823 N	2160.5	SWC	PALEOCENE	431.	.70	7.35	.89	.09	8.26	.67	
77823 M	2187.0	SWC	PALEOCENE	429.	.23	.37	.18	.38	2.05	.05	
77823 K	2248.1	SWC	PALEOCENE	439.	.58	2.42	.58	.19	4.17	.25	
77823 H	2313.1	SWC	PALEOCENE	433.	.52	1.39	.36	.27	3.82	.16	
77823 G	2347.4	SWC	PALEOCENE	431.	.64	4.33	.63	.13	6.92	.41	
77823 F	2385.4	SWC	PALEOCENE	441.	.59	2.95	.76	.17	3.89	.29	
77823 E	2403.9	SWC	PALEOCENE	430.	.28	.77	.36	.27	2.16	.09	
77823 C	2423.9	SWC	PALEOCENE	433.	.57	2.80	.68	.17	4.11	.28	
77822 Z	2462.0	SWC	PALEOCENE	457.	.35	.34	.58	.51	.59	.06	
77822 V	2559.9	SWC	PALEOCENE	436.	2.41	17.88	.99	.12	17.98	1.68	
77822 U	2597.5	SWC	PALEOCENE	438.	.73	2.17	.56	.25	3.87	.24	
77822 R	2653.0	SWC	PALEOCENE	440.	.61	2.06	.29	.23	7.20	.22	
77822 Q	2669.2	SWC	PALEOCENE	441.	.57	1.63	.62	.26	2.62	.18	
77822 O	2689.0	SWC	LATE CRETACEOUS	440.	1.52	5.61	.47	.21	11.98	.59	
77822 L	2710.0	SWC	LATE CRATACEOUS	448.	.40	1.04	.38	.28	2.76	.12	
77822 K	2723.6	SWC	LATE CRETACEOUS	439.	1.02	5.70	.12	.15	49.33	.56	
77822 J	2753.4	SWC	LATE CRETACEOUS	442.	.73	1.38	.13	.34	10.71	.17	
77822 I	2757.0	SWC	LATE CRETACEOUS	442.	1.27	6.18	.30	.17	20.84	.62	
77822 H	2817.4	SWC	LATE CRETACEOUS	433.	.81	.59	.78	.58	.76	.11	
77822 G	2863.8	SWC	LATE CRETACEOUS	429.	.51	.31	.21	.62	1.46	.07	
77822 F	2871.4	SWC	LATE CRETACEOUS	445.	.86	8.01	.23	.10	34.50	.74	
77822 D	2899.5	SWC	LATE CRETACEOUS	440.	.75	.94	.36	.44	2.60	.14	
77822 C	2926.4	SWC	LATE CRETACEOUS	449.	.78	2.00	.20	.28	10.19	.23	
77822 B	2946.9	SWC	LATE CRETACEOUS	443.	1.52	.59	.34	.72	1.72	.18	
77822 A	2960.0	SWC	LATE CRETACEOUS	420.	.43	.32	.47	.57	.69	.06	

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

TABLE 3b

ROCK EVAL ANALYSES

BASIN - GIPPSLAND
WELL - SNAPPER 5

REPORT B - TOTAL CARBON,H/O INDICES

SAMPLE NO.	DEPTH	SAMPLE TYPE	FORMATION	TC	HI	OI	HI/OI	COMMENTS
77825 O	1293.9	SWC	LATROBE GP/GURNARD FM	.58	5.	67.	.07	
77825 H	1341.0	SWC	LATROBE GROUP	3.66	152.	29.	5.31	
77825 F	1380.0	SWC	LATROBE GROUP	4.31	218.	27.	8.13	
77825 C	1495.9	SWC	LATROBE GROUP	3.72	123.	28.	4.38	
77825 A	1546.0	SWC	LATROBE GROUP	8.27	312.	22.	13.96	
77824 S	1701.9	SWC	LATROBE GROUP	2.16	189.	31.	6.04	
77824 P	1721.0	SWC	LATROBE GROUP	.87	97.	67.	1.44	
77824 K	1770.8	SWC	LATROBE GROUP	.77	132.	80.	1.64	
77824 D	1848.6	SWC	LATROBE GROUP	4.52	370.	20.	18.95	
77823 W	1969.0	SWC	LATROBE GROUP	1.14	144.	49.	2.93	
77823 S	2049.9	SWC	LATROBE GROUP	3.60	76.	25.	3.04	
77823 R	2073.5	SWC	LATROBE GROUP	10.51	361.	17.	20.69	
77823 Q	2061.0	SWC	LATROBE GROUP	.76	34.	77.	.44	
77823 P	2099.0	SWC	LATROBE GROUP	.76	34.	77.	.44	
77823 O	2129.4	SWC	LATROBE GROUP	.51	39.	48.	.81	
77823 N	2160.5	SWC	LATROBE GROUP	5.82	126.	15.	8.26	
77823 M	2187.0	SWC	LATROBE GROUP	.51	72.	35.	2.05	
77823 K	2248.1	SWC	LATROBE GROUP	2.11	115.	27.	4.17	
77823 H	2313.1	SWC	LATROBE GROUP	1.51	92.	24.	3.82	
77823 G	2347.4	SWC	LATROBE GROUP	3.49	124.	18.	6.92	
77823 F	2385.4	SWC	LATROBE GROUP	2.84	104.	27.	3.89	
77823 E	2403.9	SWC	LATROBE GROUP	1.58	49.	23.	2.16	
77823 C	2423.9	SWC	LATROBE GROUP	3.76	74.	18.	4.11	
77822 Z	2462.0	SWC	LATROBE GROUP	.65	53.	89.	.59	
77822 V	2559.9	SWC	LATROBE GROUP	9.01	198.	11.	17.98	
77822 U	2597.5	SWC	LATROBE GROUP	2.52	86.	22.	3.87	
77822 R	2653.0	SWC	LATROBE GROUP	2.87	72.	10.	7.20	
77822 Q	2669.2	SWC	LATROBE GROUP	1.30	125.	48.	2.62	
77822 O	2689.0	SWC	LATROBE GROUP	3.95	142.	12.	11.98	
77822 L	2710.0	SWC	LATROBE GROUP	1.63	64.	23.	2.76	
77822 K	2723.6	SWC	LATROBE GROUP	2.88	198.	4.	49.33	
77822 J	2753.4	SWC	LATROBE GROUP	1.98	70.	7.	10.71	
77822 I	2757.0	SWC	LATROBE GROUP	3.61	171.	8.	20.84	
77822 H	2817.4	SWC	LATROBE GROUP	1.19	50.	66.	.76	
77822 G	2863.8	SWC	LATROBE GROUP	.84	37.	25.	1.46	
77822 F	2871.4	SWC	LATROBE GROUP	3.76	213.	6.	34.50	
77822 D	2899.5	SWC	LATROBE GROUP	1.66	56.	22.	2.60	
77822 C	2926.4	SWC	LATROBE GROUP	3.12	64.	6.	10.19	
77822 B	2946.9	SWC	LATROBE GROUP	1.50	40.	23.	1.72	
77822 A	2960.0	SWC	LATROBE GROUP	1.92	17.	24.	.69	

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

23/12/85

ESSO AUSTRALIA LTD.

TABLE 4a

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	SAMPLE TYPE*	N%	C%	H%	S%	O%	ASH%	COMMENTS
			ELEMENTAL % (ASH FREE)						
77825 K	1325.90	SWC	0.93	66.58	5.02	0.00	27.48	7.12	SMALL SAMPLE
77825 I	1332.00	SWC	1.12	64.82	4.97	0.00	29.08	8.29	SMALL SAMPLE
77825 G	1358.50	SWC	0.60	63.14	4.33	0.00	31.93	9.54	
77825 F	1380.00	SWC	0.73	68.50	5.21	0.00	25.56	6.51	
77825 E	1430.00	SWC	0.79	67.66	5.11	0.00	26.43	6.90	
77825 B	1507.90	SWC	0.20	72.19	7.59	0.00	20.02	13.22	V SMALL SAMPLE,HIGH ASH
77824 Z	1566.90	SWC	1.49	67.16	5.45	0.00	25.90	9.19	
77824 U	1685.30	SWC	1.12	72.36	5.48	0.00	21.05	4.13	
77824 O	1740.90	SWC	0.89	68.86	4.38	0.00	25.87	11.25	HIGH ASH
77823 U	2024.00	SWC	0.91	77.60	5.61	0.00	15.89	8.53	SMALL SAMPLE
77823 R	2073.50	SWC	0.90	74.60	6.58	0.00	17.92	1.48	
77823 P	2099.00	SWC	0.88	78.11	6.23	0.00	14.79	13.31	HIGH ASH
77823 N	2160.50	SWC	0.79	73.11	4.72	0.00	21.38	7.47	
77823 K	2248.10	SWC	1.02	79.40	5.59	0.00	13.99	9.53	
77823 A	2458.40	SWC	1.00	84.47	5.22	0.00	9.31	5.22	
77822 W	2524.00	SWC	1.02	83.53	4.84	0.00	10.62	2.80	
77822 V	2559.90	SWC	1.15	79.91	5.34	0.00	13.60	6.61	
77822 U	2597.50	SWC	1.26	80.91	5.05	0.00	12.78	7.49	
77822 R	2653.00	SWC	1.48	84.13	4.39	0.00	10.00	5.57	
77822 O	2689.00	SWC	1.29	80.47	5.78	0.00	12.46	2.26	
77822 L	2710.00	SWC	1.13	82.61	4.85	0.00	11.41	1.16	
77822 K	2723.60	SWC	1.20	83.33	6.17	0.00	9.30	5.34	
77822 J	2753.40	SWC	1.15	85.23	4.50	0.00	9.12	1.54	
77822 F	2871.40	SWC	0.83	74.71	5.71	0.00	18.76	1.91	
77822 C	2926.40	SWC	1.15	85.54	5.05	0.00	8.26	6.01	
77822 A	2960.00	SWC	1.28	89.47	4.81	0.00	4.44	5.38	

17/02/86 TABLE 4b

ESSO AUSTRALIA LTD.

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
77825 K	1325.90	SWC	LATE EOCENE	LATROBE GP/GURNARD FM	.90	.31	.01	SMALL SAMPLE
77825 I	1332.00	SWC	MIDDLE EOCENE	LATROBE GROUP	.92	.34	.01	SMALL SAMPLE
77825 G	1358.50	SWC	MIDDLE EOCENE	LATROBE GROUP	.82	.38	.01	
77825 F	1380.00	SWC	MIDDLE EOCENE	LATROBE GROUP	.91	.28	.01	
77825 E	1430.00	SWC	MIDDLE EOCENE	LATROBE GROUP	.91	.29	.01	
77825 B	1507.90	SWC	EARLY EOCENE	LATROBE GROUP	1.26	.21	.00	V SMALL SAMPLE, HIGH ASH
77824 Z	1566.90	SWC	EARLY EOCENE	LATROBE GROUP	.97	.29	.02	
77824 U	1685.30	SWC	EARLY EOCENE	LATROBE GROUP	.91	.22	.01	
77824 O	1740.90	SWC	EARLY EOCENE	LATROBE GROUP	.76	.28	.01	HIGH ASH
77823 U	2024.00	SWC	PALEOCENE	LATROBE GROUP	.87	.15	.01	SMALL SAMPLE
77823 R	2073.50	SWC	PALEOCENE	LATROBE GROUP	1.06	.18	.01	
77823 P	2099.00	SWC	PALEOCENE	LATROBE GROUP	.96	.14	.01	HIGH ASH
77823 N	2160.50	SWC	PALEOCENE	LATROBE GROUP	.78	.22	.01	
77823 K	2248.10	SWC	PALEOCENE	LATROBE GROUP	.85	.13	.01	
77823 A	2458.40	SWC	PALEOCENE	LATROBE GROUP	.74	.08	.01	
77822 W	2524.00	SWC	PALEOCENE	LATROBE GROUP	.69	.10	.01	
77822 V	2559.90	SWC	PALEOCENE	LATROBE GROUP	.80	.13	.01	
77822 U	2597.50	SWC	PALEOCENE	LATROBE GROUP	.75	.12	.01	
77822 R	2653.00	SWC	PALEOCENE	LATROBE GROUP	.63	.09	.02	
77822 O	2689.00	SWC	LATE CRETACEOUS	LATROBE GROUP	.86	.12	.01	
77822 L	2710.00	SWC	LATE CRATACEOUS	LATROBE GROUP	.70	.10	.01	
77822 K	2723.60	SWC	LATE CRETACEOUS	LATROBE GROUP	.89	.08	.01	
77822 J	2753.40	SWC	LATE CRETACEOUS	LATROBE GROUP	.63	.08	.01	
77822 F	2871.40	SWC	LATE CRETACEOUS	LATROBE GROUP	.92	.19	.01	
77822 C	2926.40	SWC	LATE CRETACEOUS	LATROBE GROUP	.71	.07	.01	
77822 A	2960.00	SWC	LATE CRETACEOUS	LATROBE GROUP	.64	.04	.01	

23/12/85

ESSO AUSTRALIA LTD.

TABLE 5

VITRINITE REFLECTANCE REPORT

BASIN - GIPPSLAND
WELL - SNAPPER 5

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	MAX RV	FLUORESCENCE	COUNTS	MACERAL TYPE
77824 Y	1575.90	EARLY EOCENE	LATROBE GROUP	5	0.00		0	NO E
77824 E	1846.70	PALEOCENE	LATROBE GROUP	5	0.54	YEL-DULL OR	34	V>I>E,COAL
77823 F	2385.40	PALEOCENE	LATROBE GROUP	5	0.67	GRN YEL-OR	27	I>E>V,DOM ABUNDANT
77822 R	2653.00	PALEOCENE	LATROBE GROUP	5	0.75	YEL-BRN	30	I>V>E,DOM ABUNDANT
77822 A	2960.00	LATE CRETACEOUS	LATROBE GROUP	5	1.03	YEL-DULL OR	10	I>V>E,DOM ABUNDANT

KERUGEN REPORT

BASIN - GIPPSLAND
WELL - SNAPPER 5

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
77825 A	1546.00	1.9	*	.0	.0	.0	.0	75.0	5.0	.0	10.0	10.0	.0	.0	*	5.0	*	80.0
77824 D	1848.60	2.1	*	.0	.0	.0	.0	55.0	10.0	.0	20.0	10.0	5.0	.0	*	5.0	*	65.0
77823 R	2073.50	2.0	*	.0	.0	.0	.0	80.0	.0	.0	10.0	10.0	.0	.0	*	10.0	*	80.0
77823 K	2248.10	2.1	*	5.0	.0	.0	.0	65.0	5.0	.0	15.0	10.0	.0	.0	*	5.0	*	75.0
77823 A	2458.40	2.2	*	.0	.0	.0	.0	15.0	5.0	5.0	15.0	20.0	40.0	.0	*	5.0	*	20.0
77822 V	2559.90	.0	*	.0	.0	.0	.0	55.0	.0	.0	20.0	15.0	10.0	.0	*	5.0	*	55.0
77822 O	2689.00	2.3	*	.0	.0	.0	.0	40.0	5.0	.0	30.0	20.0	5.0	.0	*	.0	*	45.0
77822 K	2723.60	2.3	*	.0	.0	.0	.0	20.0	10.0	.0	40.0	20.0	10.0	.0	*	.0	*	30.0
77822 P	2871.50	.0	*	.0	.0	.0	.0	85.0	.0	.0	5.0	5.0	5.0	.0	*	10.0	*	85.0
77822 A	2960.00	2.3	*	.0	.0	.0	.0	5.0	5.0	.0	10.0	60.0	20.0	.0	*	.0	*	10.0

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

+0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000+

+0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000+

TABLE 7

SNAPPER-5 - EXTRACTS

SWC No.	DEPTH m KB	YIELD	DESCRIPTIONS
80	1685.3	lean	Pale yellow waxy liquid +
79	1693.3	good	Pale yellow waxy liquid +
77	1708.9	lean	Pale yellow waxy liquid +
76	1711.2	good	Yellow waxy liquid
62	1854.1	good	Yellow-orange waxy liquid
20	2636.4	lean	Yellow-orange waxy liquid +
15	2700	good	Orange-brown liquid
14	2701.5	good	Yellow-orange liquid
5	2886	good	Yellow waxy liquid +

+ solidifies at room temperature

2053L/11

OIL - API GRAVITY, POUR POINT & SULFUR %

BASIN - GIPPSLAND
WELL - SNAPPER 5

TABLE 8

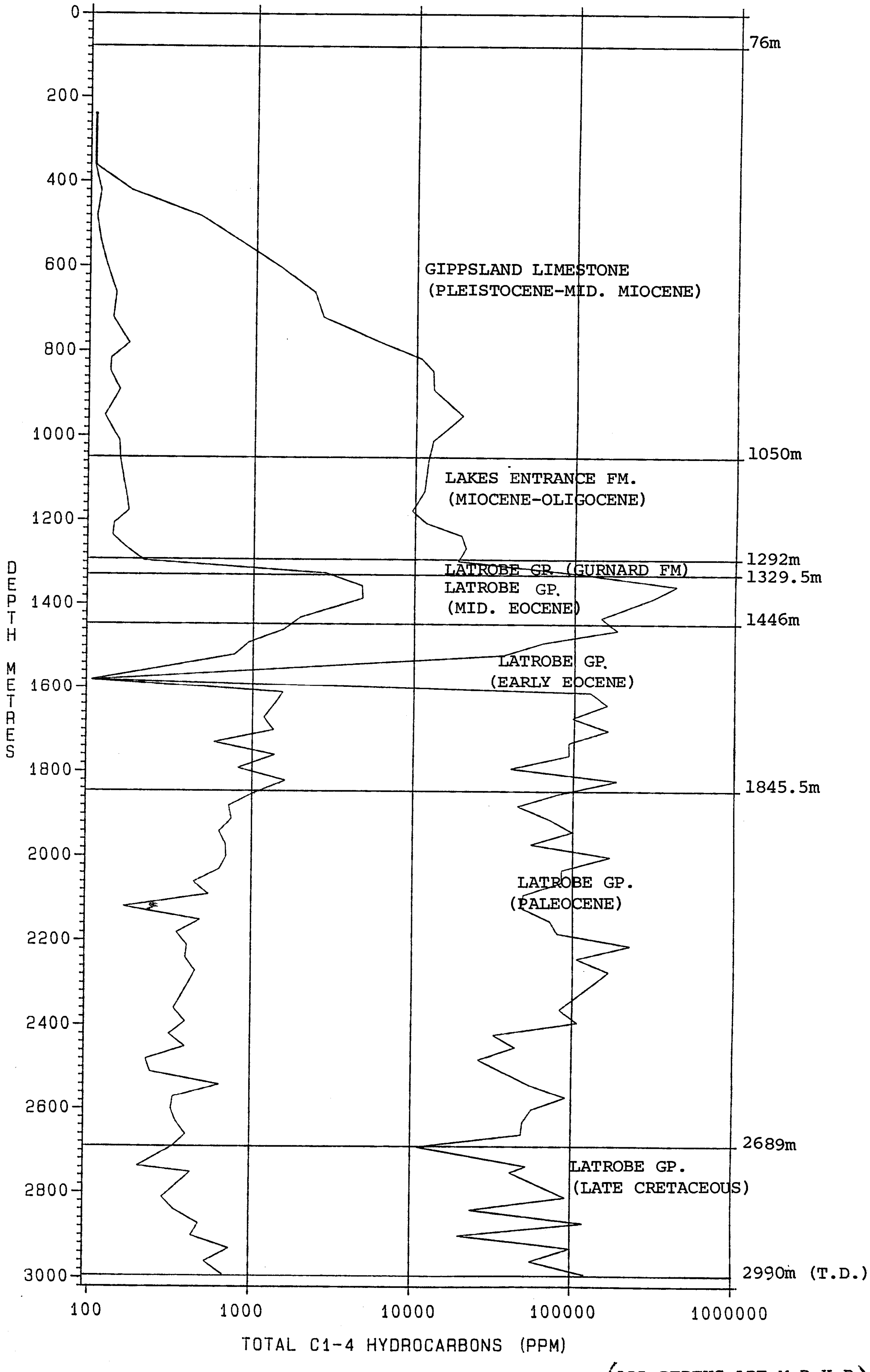
SAMPLE NO.	DEPTH	AGE	FORMATION	AN	API GRAVITY	POUR POINT	SULFUR %	COMMENTS
77891 A	1680.90	EARLY EOCENE	LATROBE GROUP	1	47.82			10.4 L CHAMBER,RFT18/112
77891 B	1702.70	EARLY EOCENE	LATROBE GROUP	1	38.86			22.7 L CHAMBER,RFT:11/93
77891 C	1716.50	EARLY EOCENE	LATROBE GROUP	1	41.42			10.4 L CHAMBER,RFT:10/92
77891 Q	1716.50	EARLY EOCENE	LATROBE GROUP	1	41.50			22.7 L CHAMBER,RFT:10/92
77891 D	1751.70	EARLY EOCENE	LATROBE GROUP	1	45.86			22.7 L CHAMBER,RFT21/115
77891 E	1765.20	EARLY EOCENE	LATROBE GROUP	1	41.55			10.4 L CHAMBER,RFT 8/89
77891 R	1765.20	EARLY EOCENE	LATROBE GROUP	1	42.31			22.7 L CHAMBER,RFT:8/89
77891 F	1787.50	EARLY EOCENE	LATROBE GROUP	1	50.80			22.7 L CHAMBER,RFT20/114
77891 G	1789.20	EARLY EOCENE	LATROBE GROUP	1	41.65			10.4 L CHAMBER,RFT:7/88
77891 S	1789.20	EARLY EOCENE	LATROBE GROUP	1	43.65			22.7 L CHAMBER,RFT:7/88
77891 T	1833.50	EARLY EOCENE	LATROBE GROUP	1	4.98			22.7 L CHAMBER,RFT16/102
77891 H	1833.50	EARLY EOCENE	LATROBE GROUP	1	5.75			10.4 L CHAMBER,RFT16/102
77891 U	1837.00	EARLY EOCENE	LATROBE GROUP	1	38.67			22.7 L CHAMBER,RFT17/104
77891 I	1837.00	EARLY EOCENE	LATROBE GROUP	1	41.06			10.4 L CHAMBER,RFT17/104
77891 J	1844.00	EARLY EOCENE	LATROBE GROUP	1	42.61			22.7 L CHAMBER,RFT:6/87
77891 K	1993.80	PALEOCENE	LATROBE GROUP	1	49.84			10.4 L CHAMBER,RFT15/100
77891 L	2053.00	PALEOCENE	LATROBE GROUP	1	51.03			10.4 L CHAMBER,RFT19/113
77891 W	2053.00	PALEOCENE	LATROBE GROUP	1	51.13			22.7 L CHAMBER,RFT19/113
77891 M	2102.40	PALEOCENE	LATROBE GROUP	1	49.93			10.4 L CHAMBER,RFT:14/96
77891 X	2102.40	PALEOCENE	LATROBE GROUP	1	50.14			22.7 L CHAMBER,RFT:14/96
77891 N	2296.50	PALEOCENE	LATROBE GROUP	1	45.04			10.4 L CHAMBER,RFT:13/95
77891 O	2309.50	PALEOCENE	LATROBE GROUP	1	43.13			22.7 L CHAMBER,RFT:12/94
77891 P	2309.50	PALEOCENE	LATROBE GROUP	1	47.30			10.4 L CHAMBER,RFT:12/94

Figure 1a

C_{1-4} CUTTINGS GAS LOG

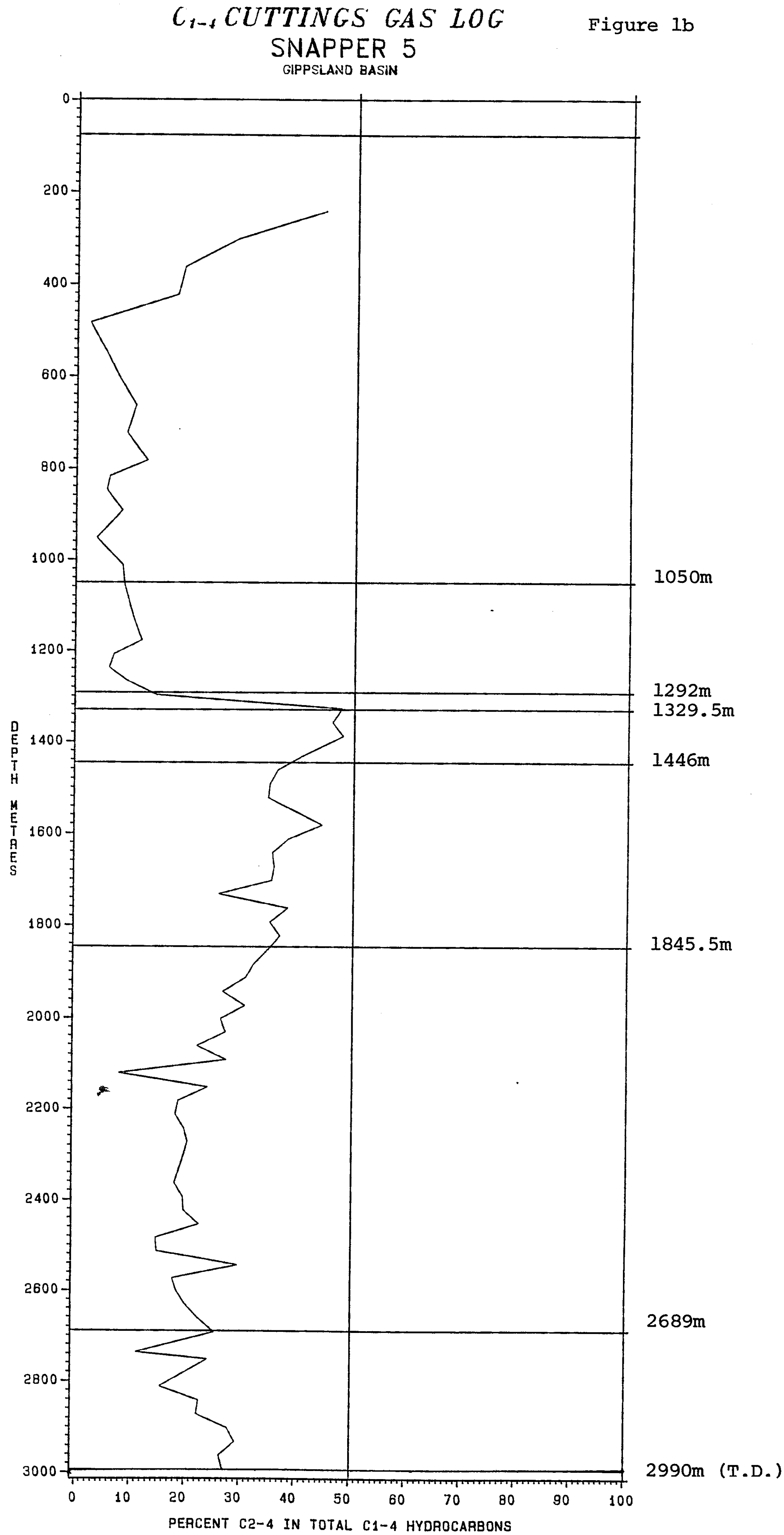
SNAPPER 5

GIPPSLAND BASIN



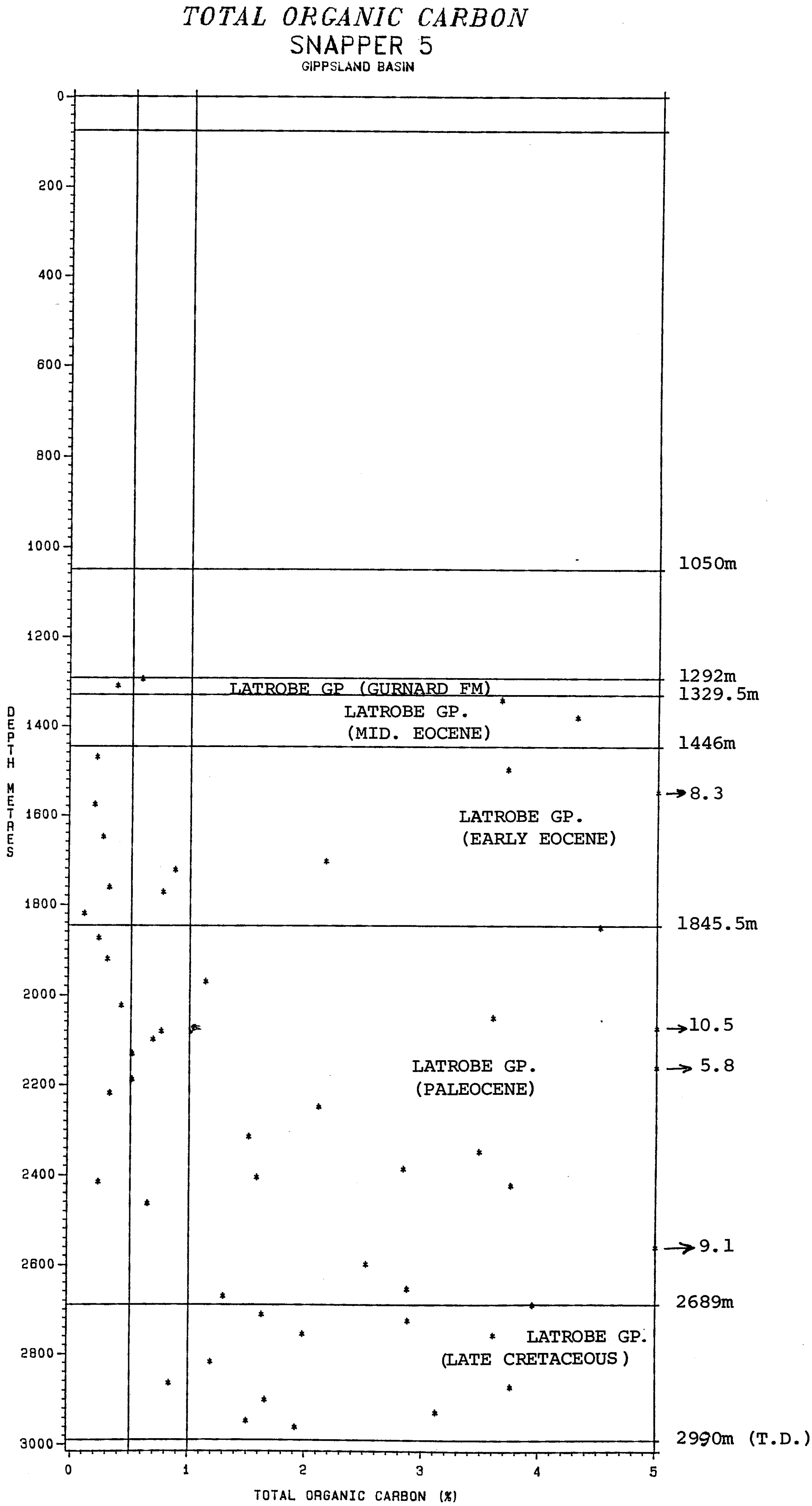
(ALL DEPTHS ARE M.D.K.B.)

Figure 1b



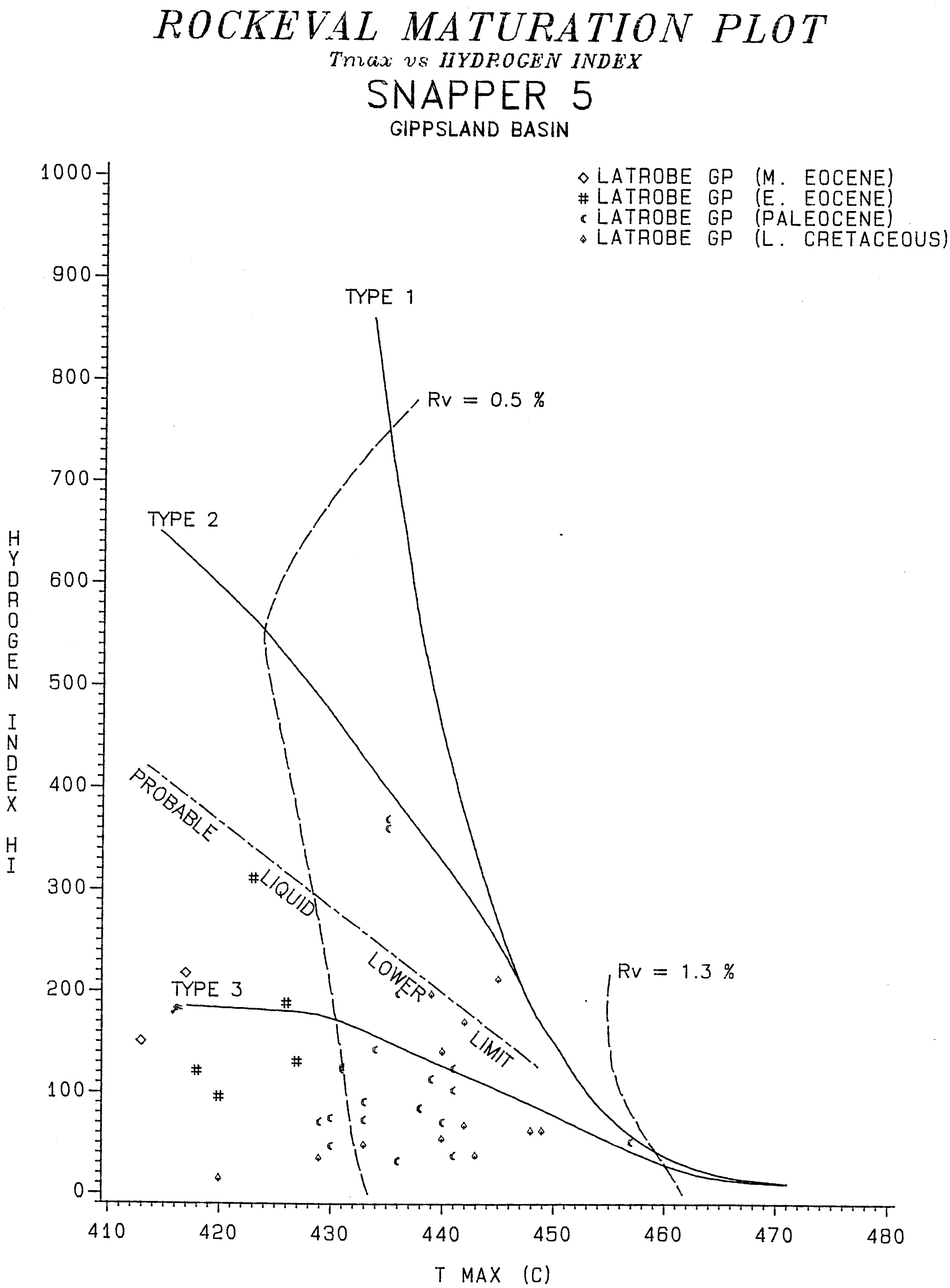
(All depths are M.D.K.B.)

Figure 2



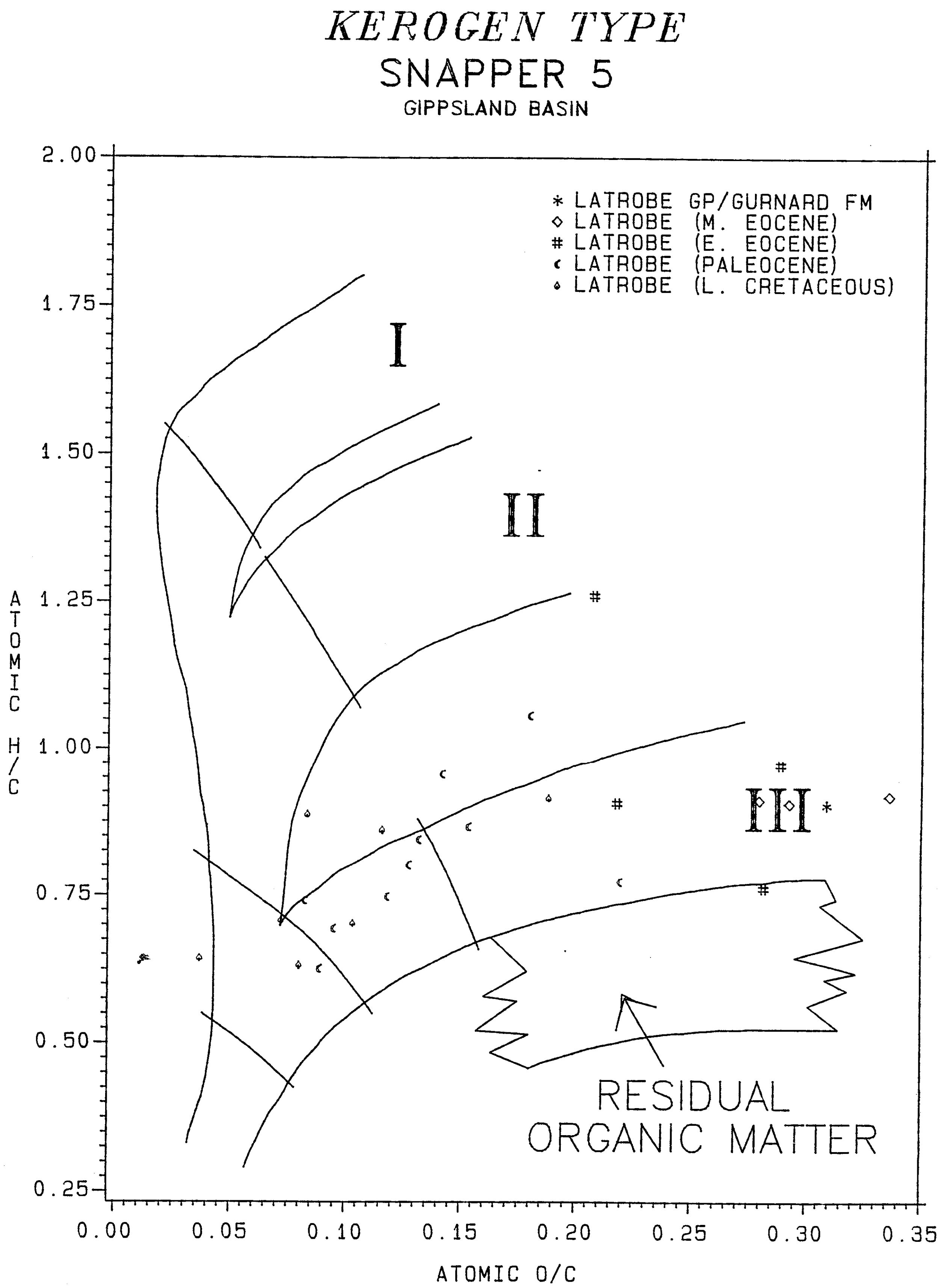
(All depths are M.D.K.B.)

Figure 3



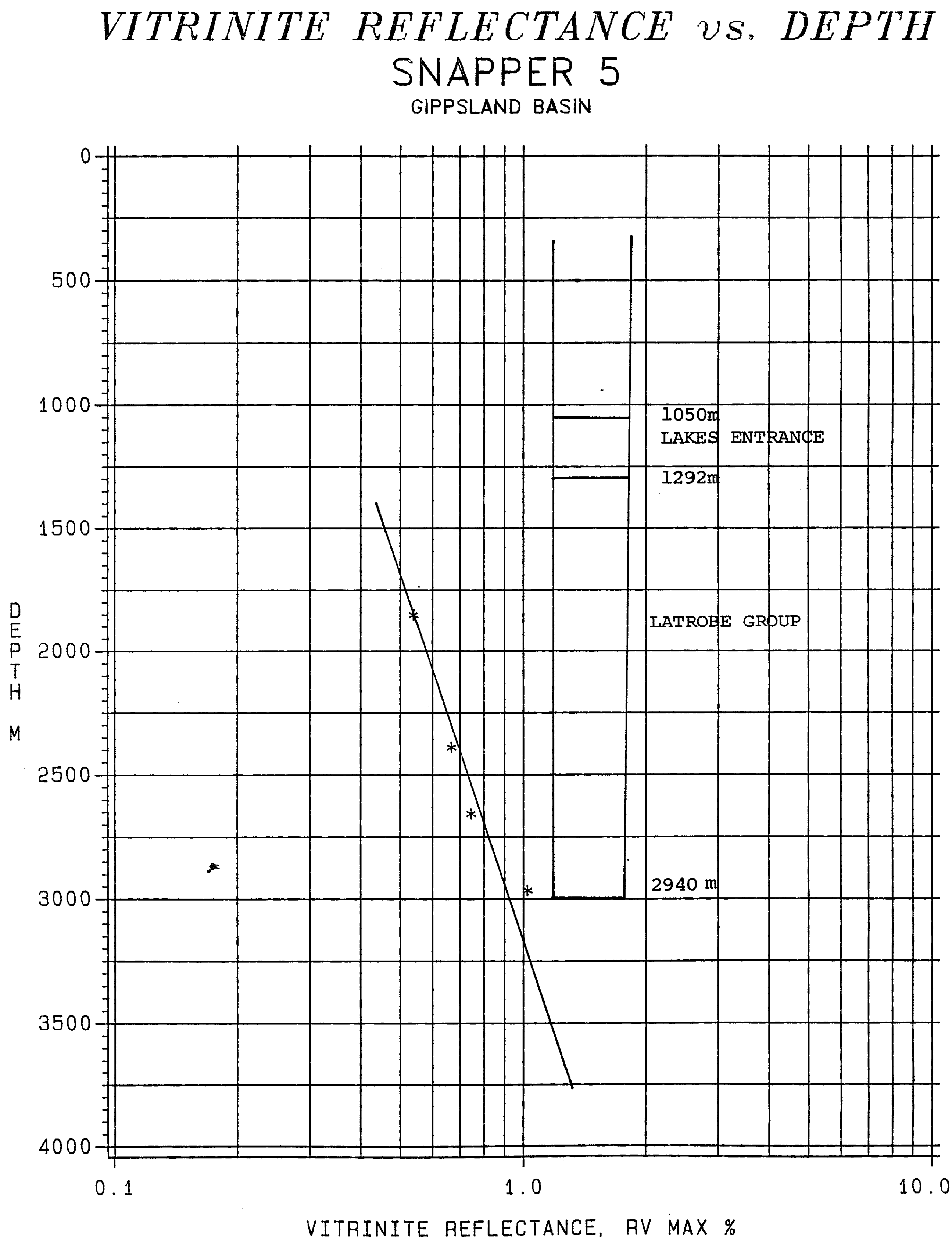
ROCKEVAL MATURATION PLOT
Tmax vs HYDROGEN INDEX
SNAPPER 5
GIPPSLAND BASIN
◇ LATROBE GP (M. EOCENE)
LATROBE GP (E. EOCENE)
LATROBE GP (PALEOCENE)
LATROBE GP (L. CRETACEOUS)
TYPE 1
TYPE 2
TYPE 3
Rv = 0.5 %
Rv = 1.3 %
PROBABLE LIQUID LOWER LIMIT
HYDROGEN INDEX HI
T MAX (C)
1000
900
800
700
600
500
400
300
200
100
0
410
420
430
440
450
460
470
480

Figure 4



KEROGEN TYPE
SNAPPER 5
GIPPSLAND BASIN
* LATROBE GP/GURNARD FM
◇ LATROBE (M. EOCENE)
LATROBE (E. EOCENE)
‹ LATROBE (PALEOCENE)
◦ LATROBE (L. CRETACEOUS)
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



(All depths are M.D.K.B.)

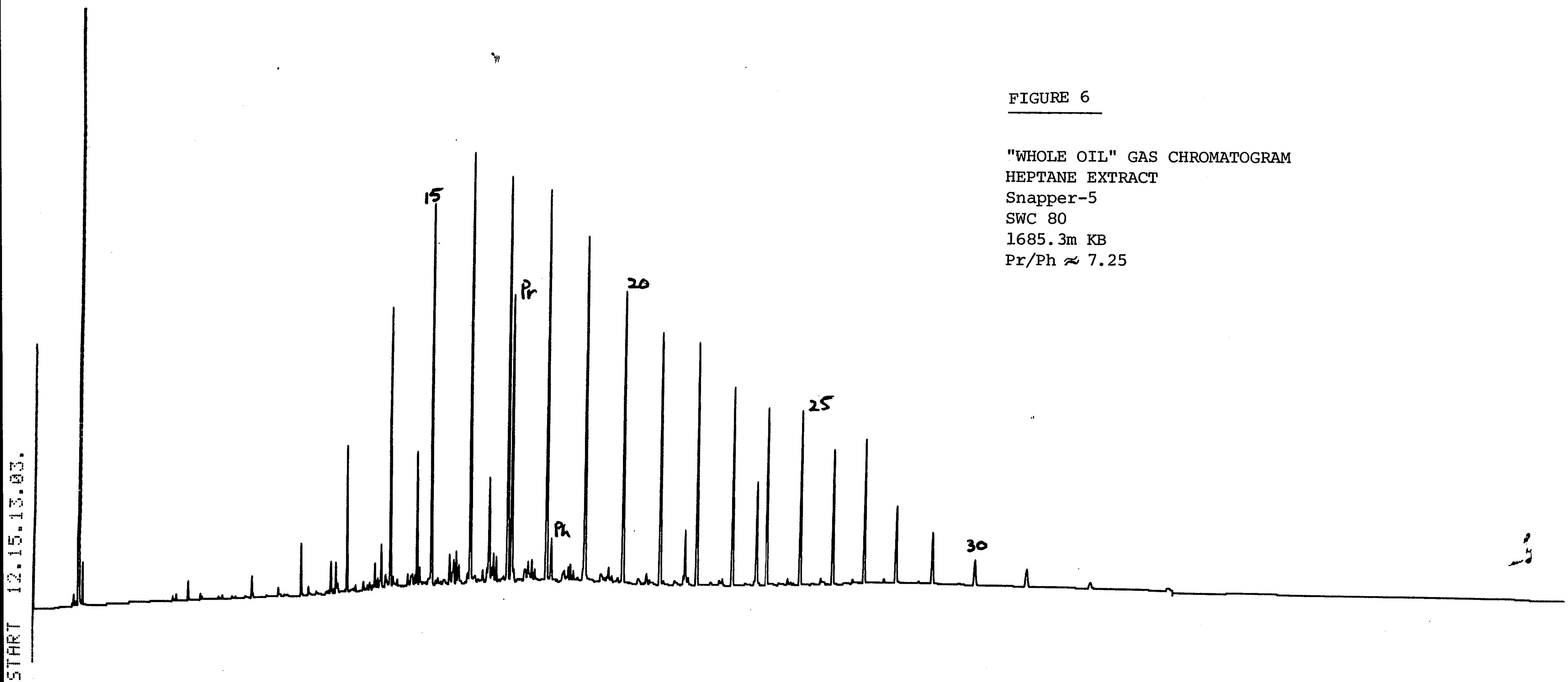


FIGURE 6

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 80
1685.3m KB
Pr/Ph ≈ 7.25

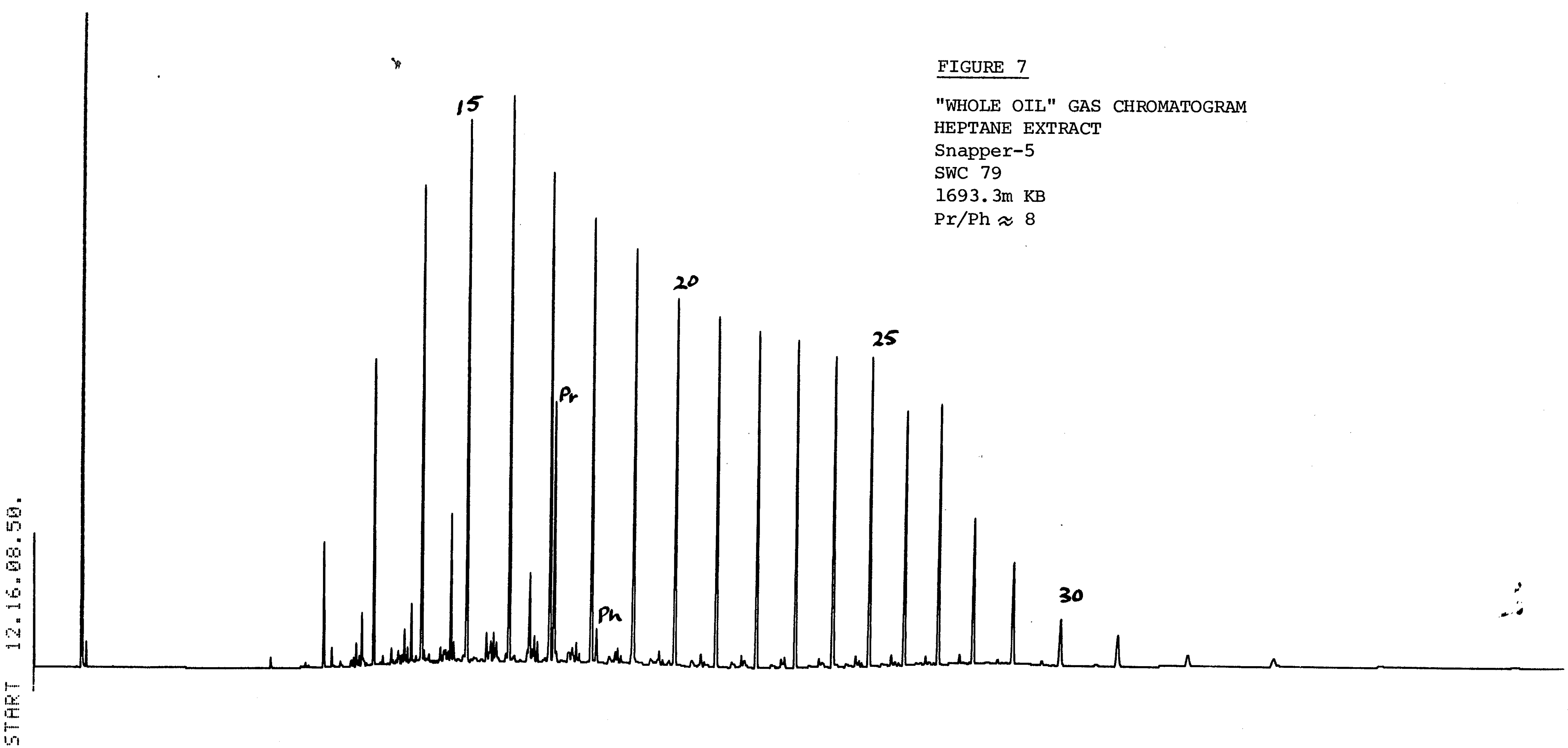


FIGURE 7

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 79
1693.3m KB
Pr/Ph ≈ 8

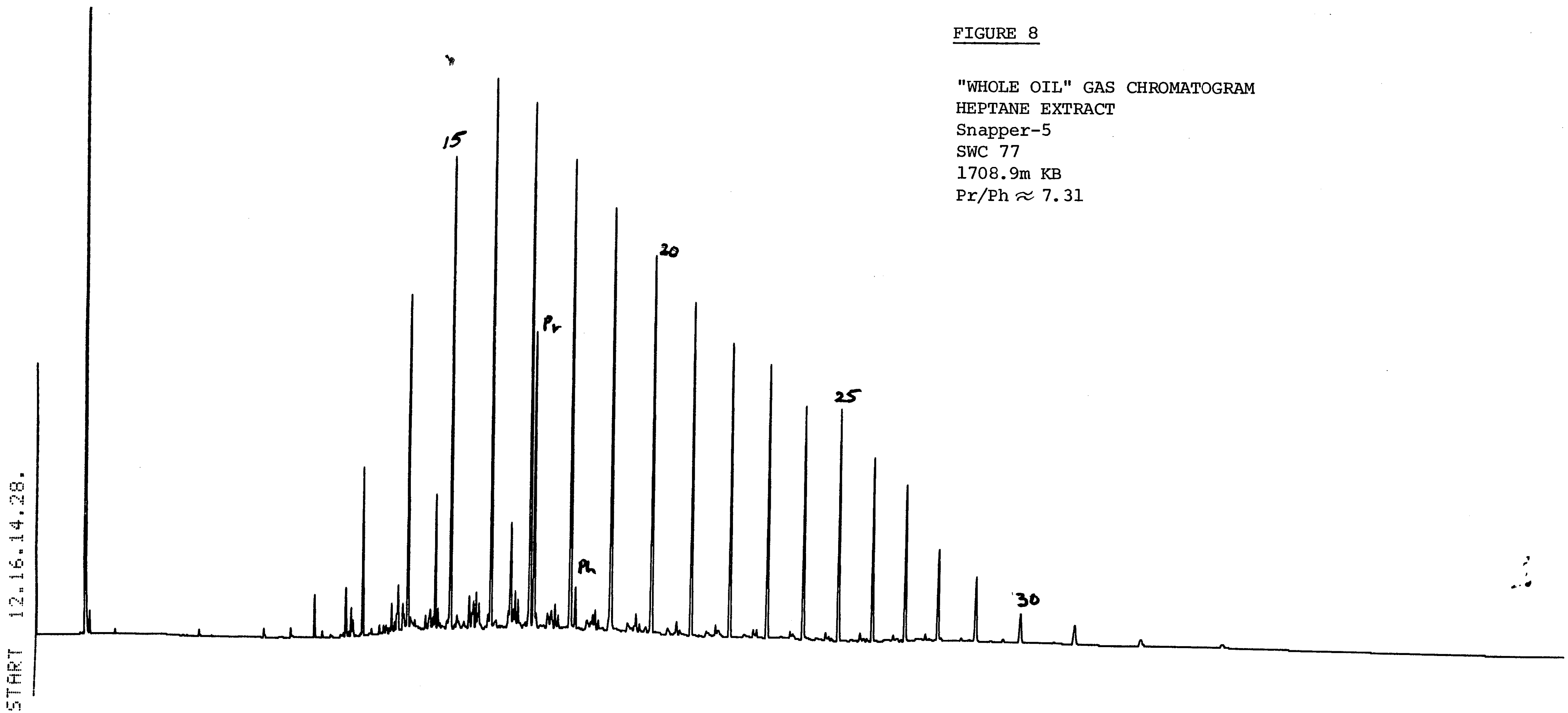


FIGURE 8

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 77
1708.9m KB
Pr/Ph ≈ 7.31

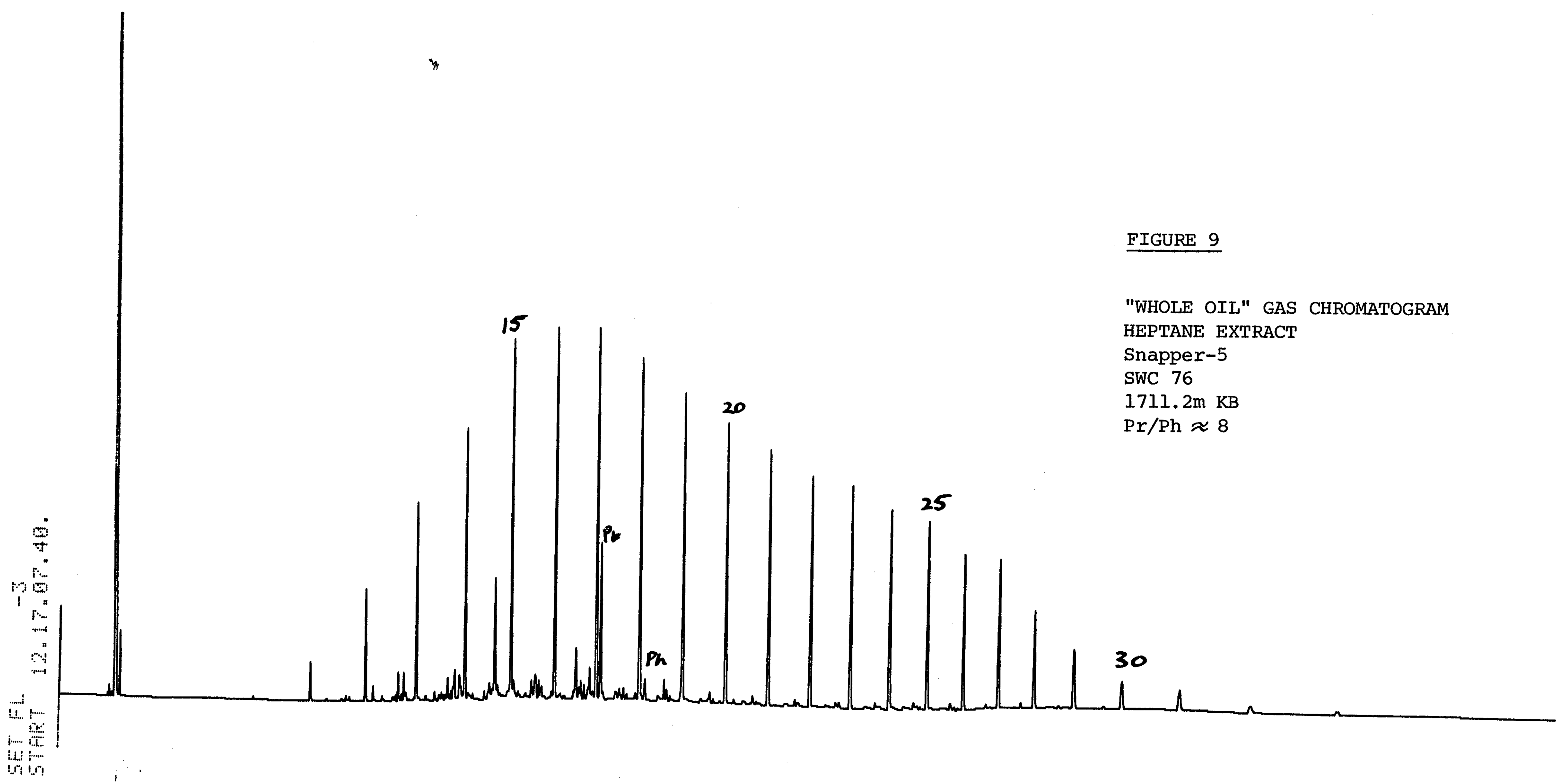


FIGURE 9

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 76
1711.2m KB
Pr/Ph ≈ 8

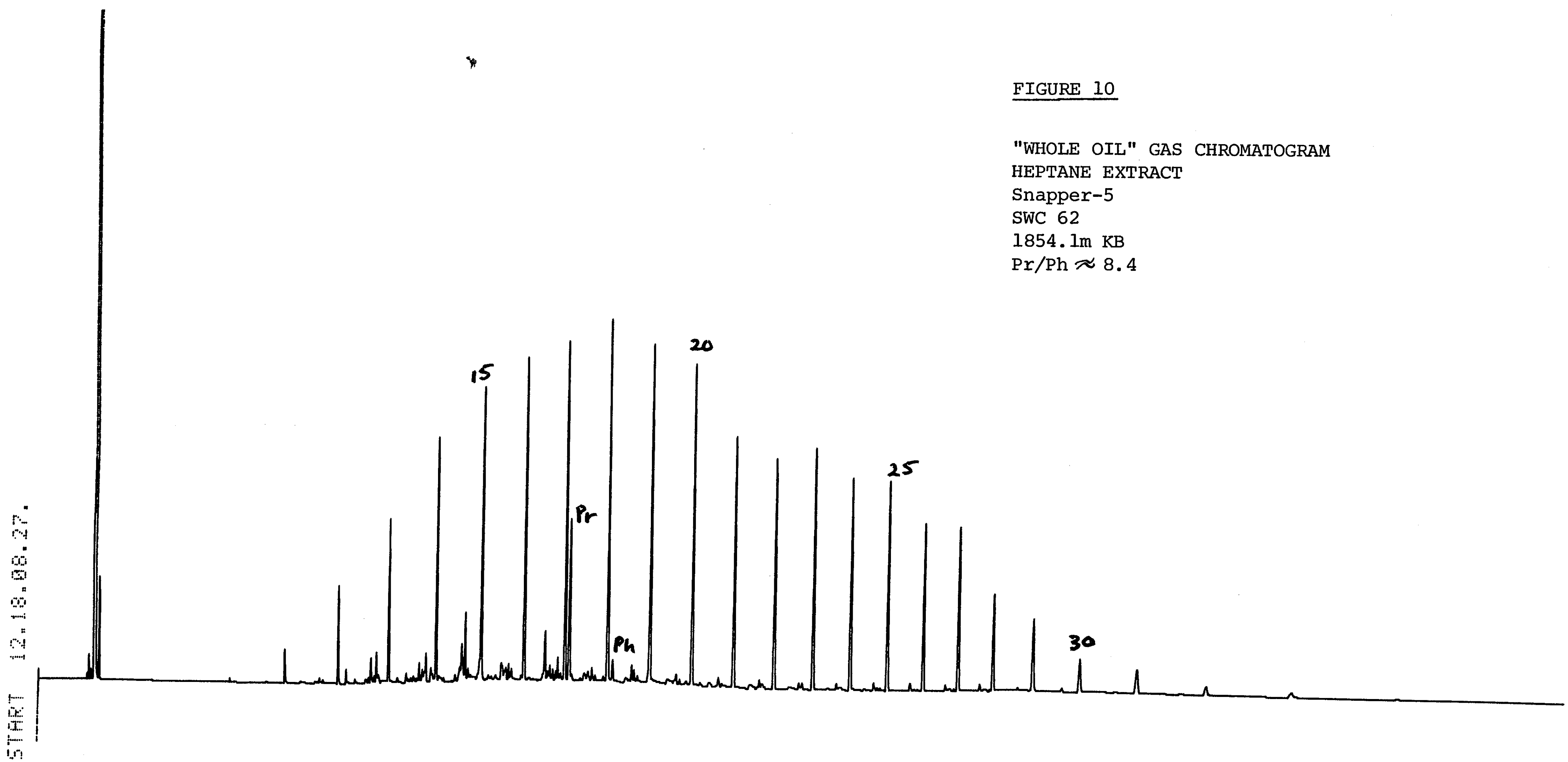


FIGURE 10

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 62
1854.1m KB
Pr/Ph ≈ 8.4

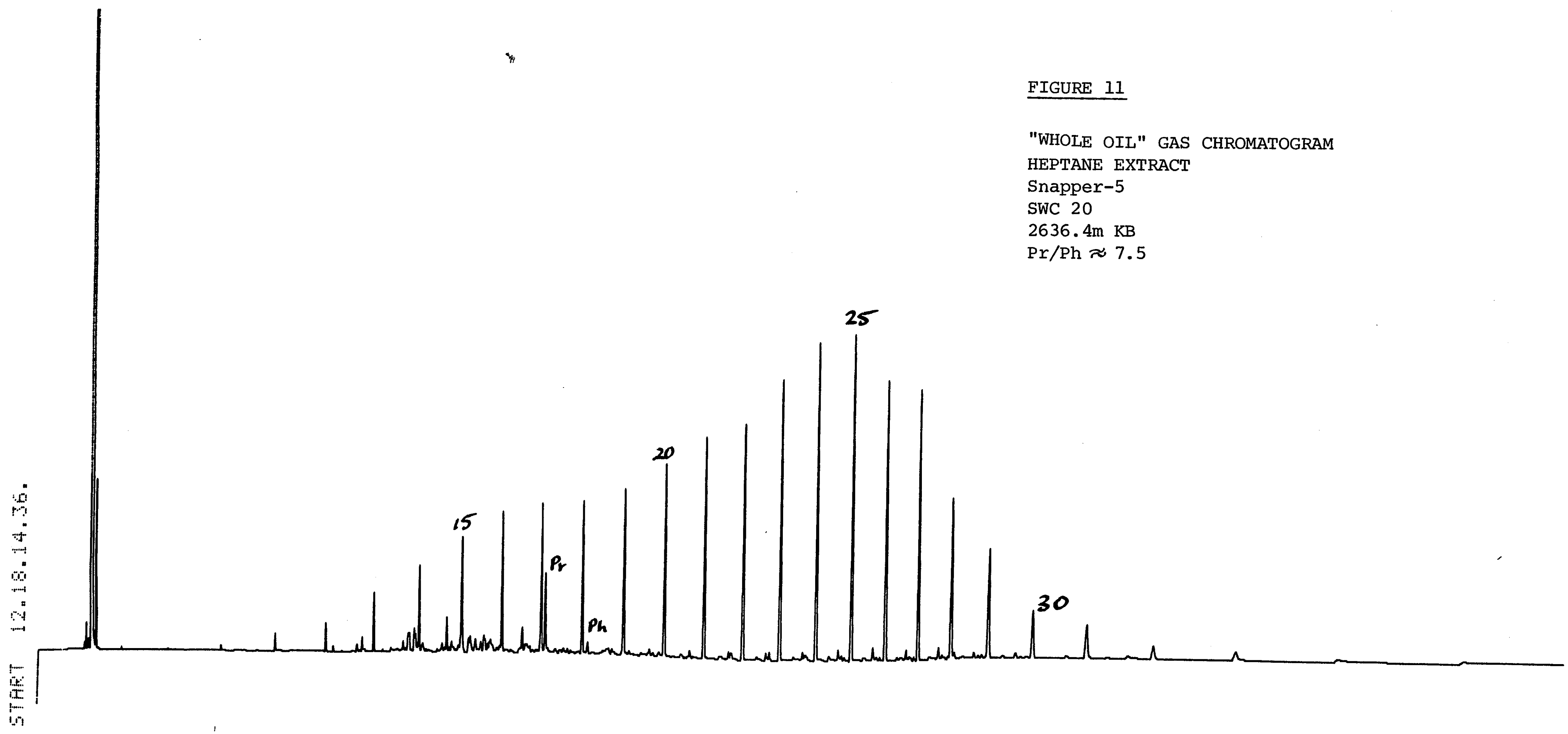


FIGURE 11

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 20
2636.4m KB
Pr/Ph ≈ 7.5

FIGURE 12

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 15
2700.0m KB
Pr/Ph ≈ 8

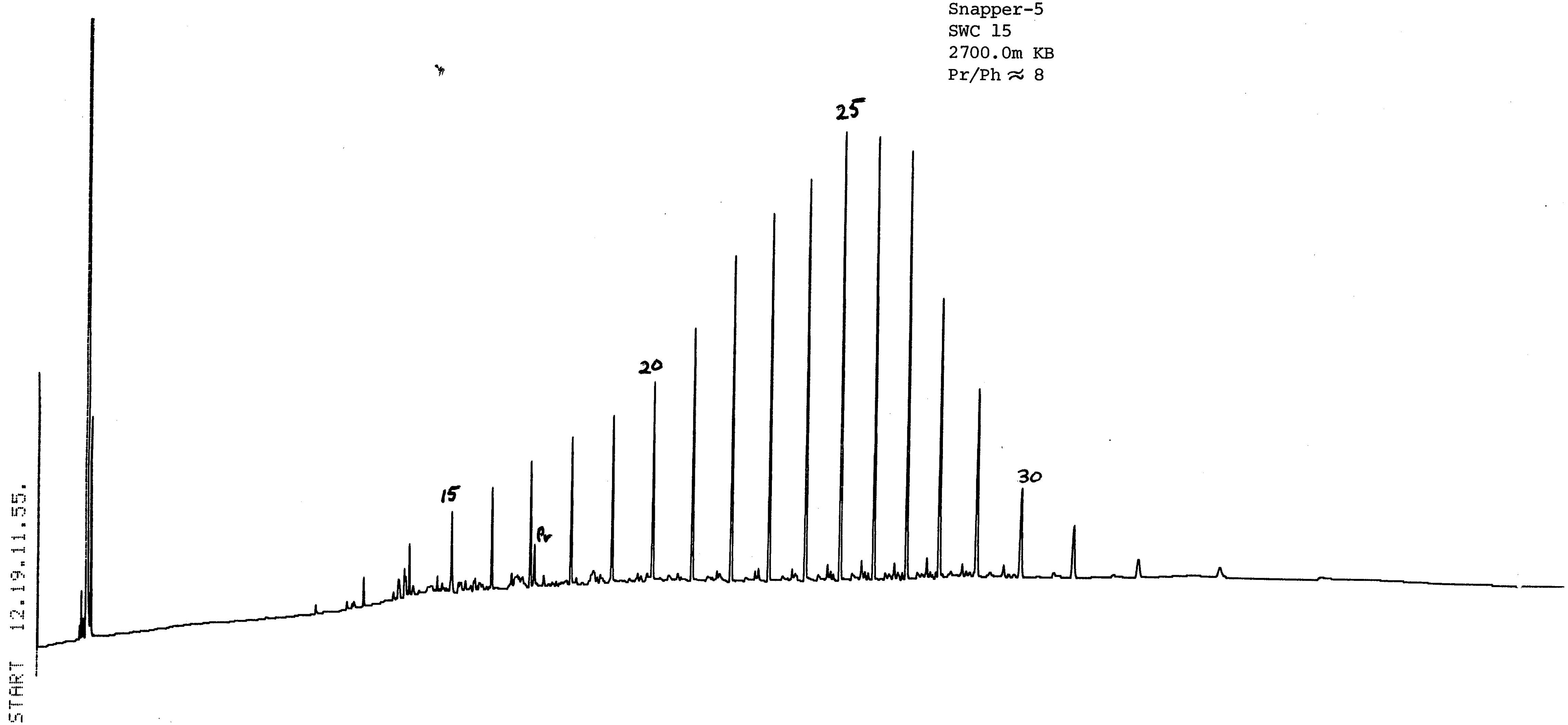


FIGURE 13

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC
2701.5m KB
Pr/Ph 5.3

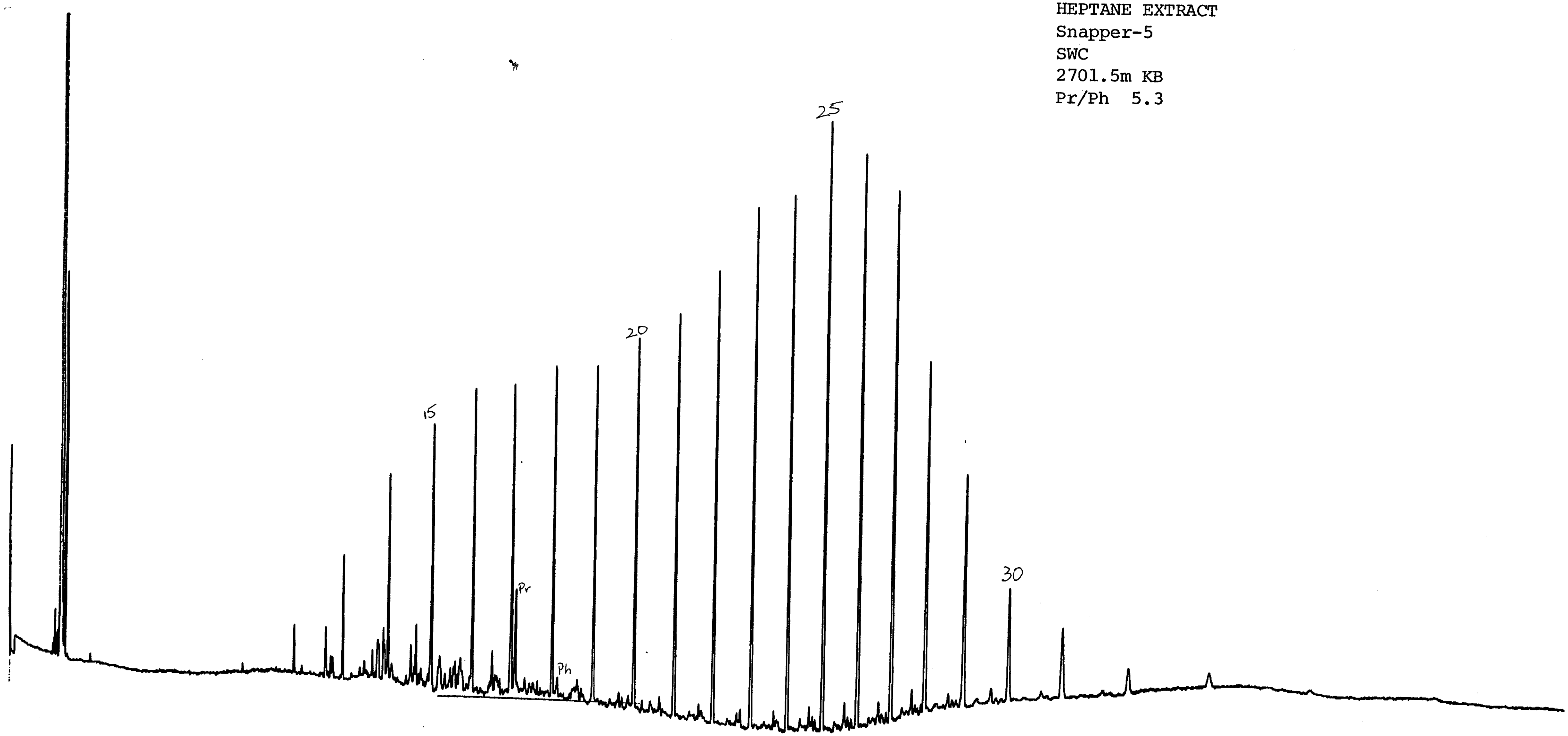


FIGURE 14

"WHOLE OIL" GAS CHROMATOGRAM
HEPTANE EXTRACT
Snapper-5
SWC 5
2886.0m KB
Pr/Ph ≈ 5.2

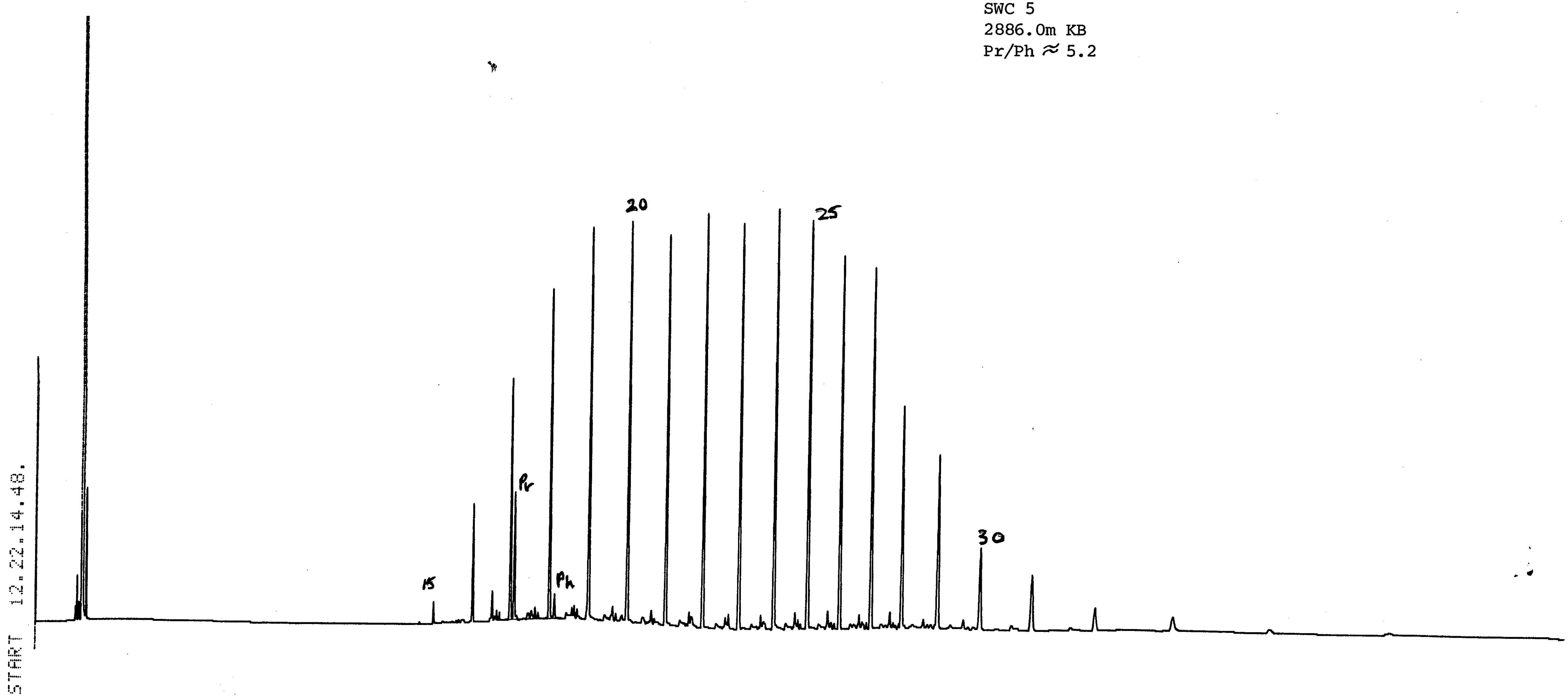
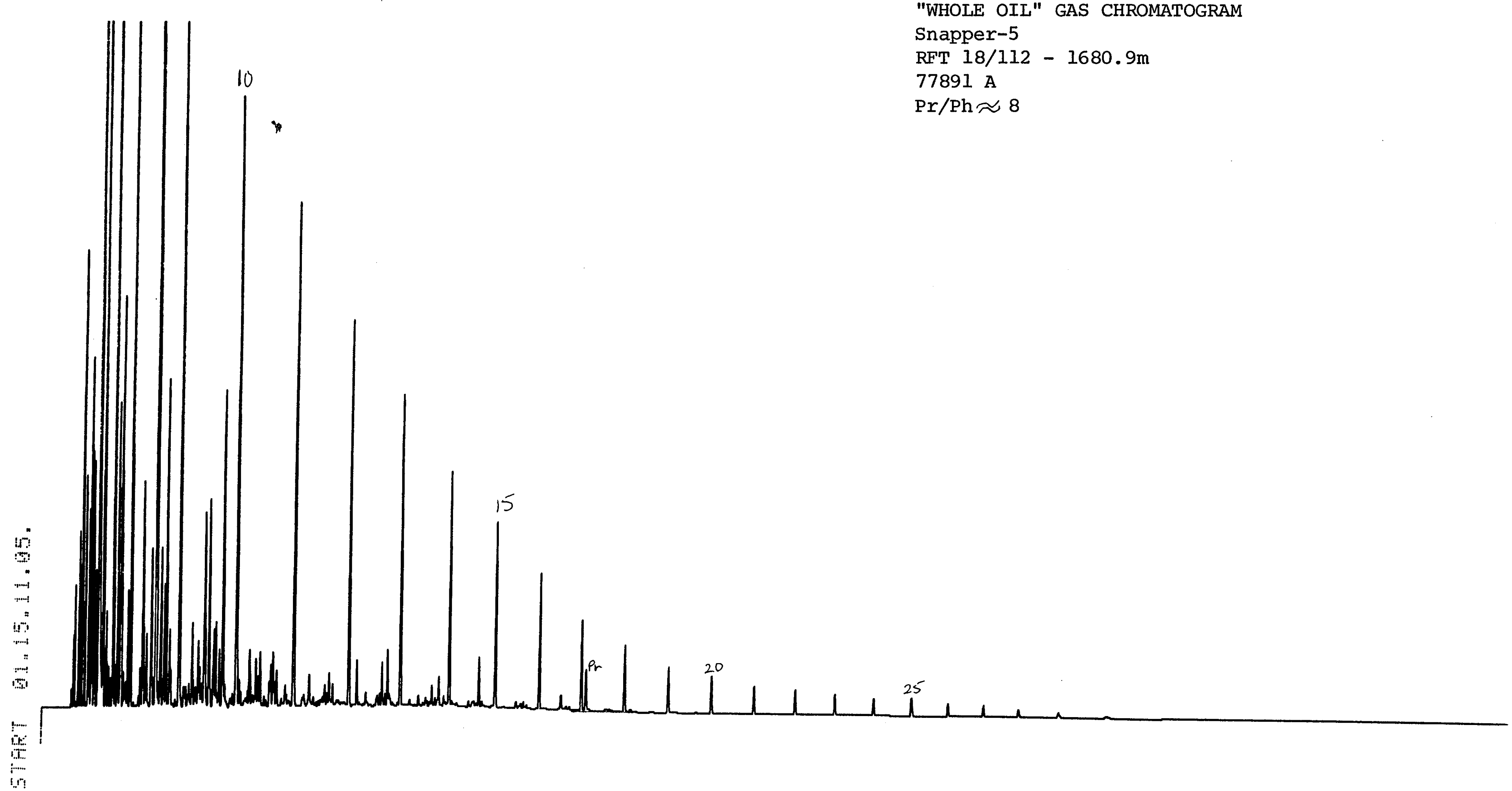


FIGURE 15

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 18/112 - 1680.9m
77891 A
Pr/Ph ≈ 8



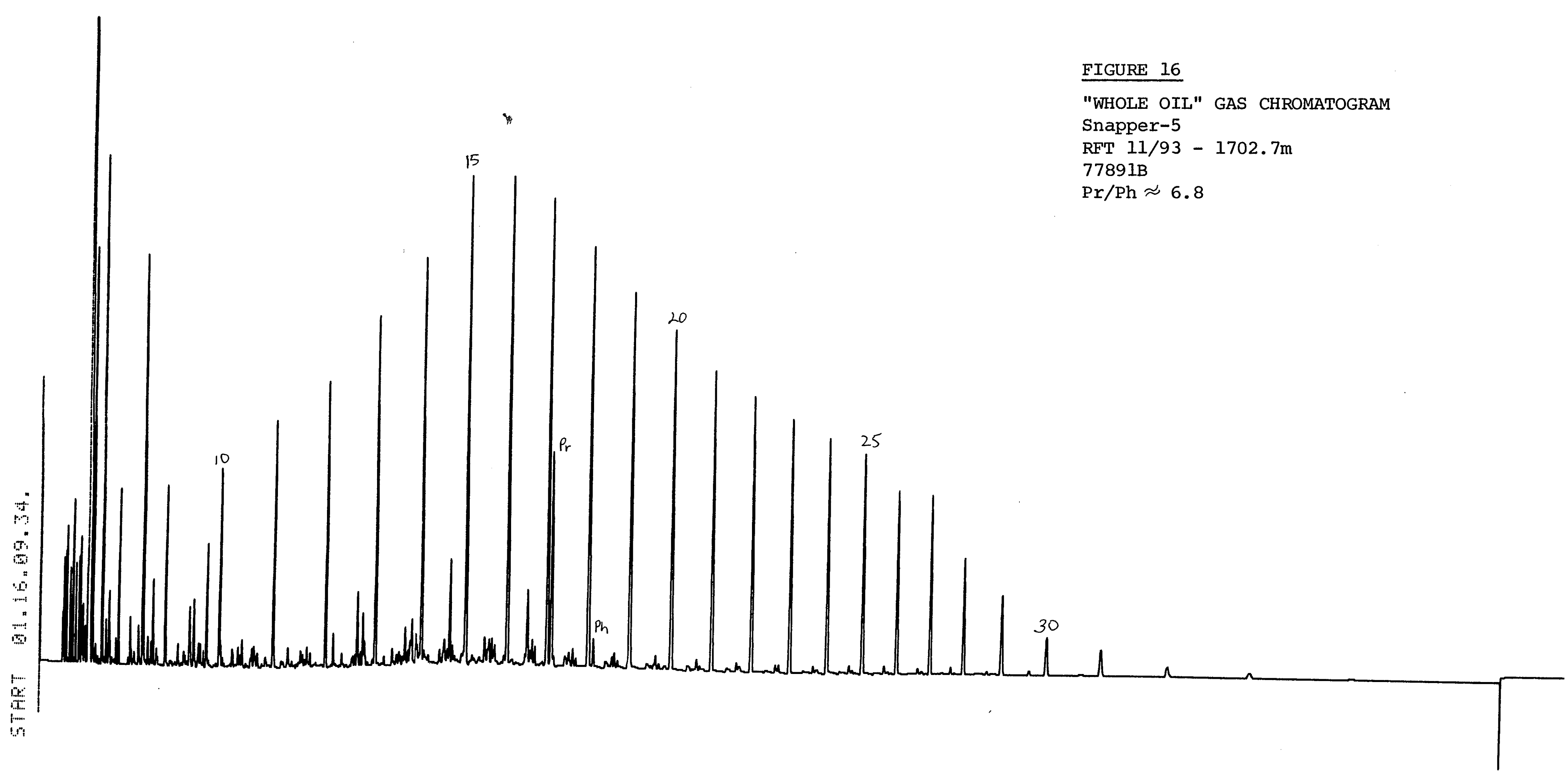


FIGURE 16

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 11/93 - 1702.7m
77891B
Pr/Ph ≈ 6.8

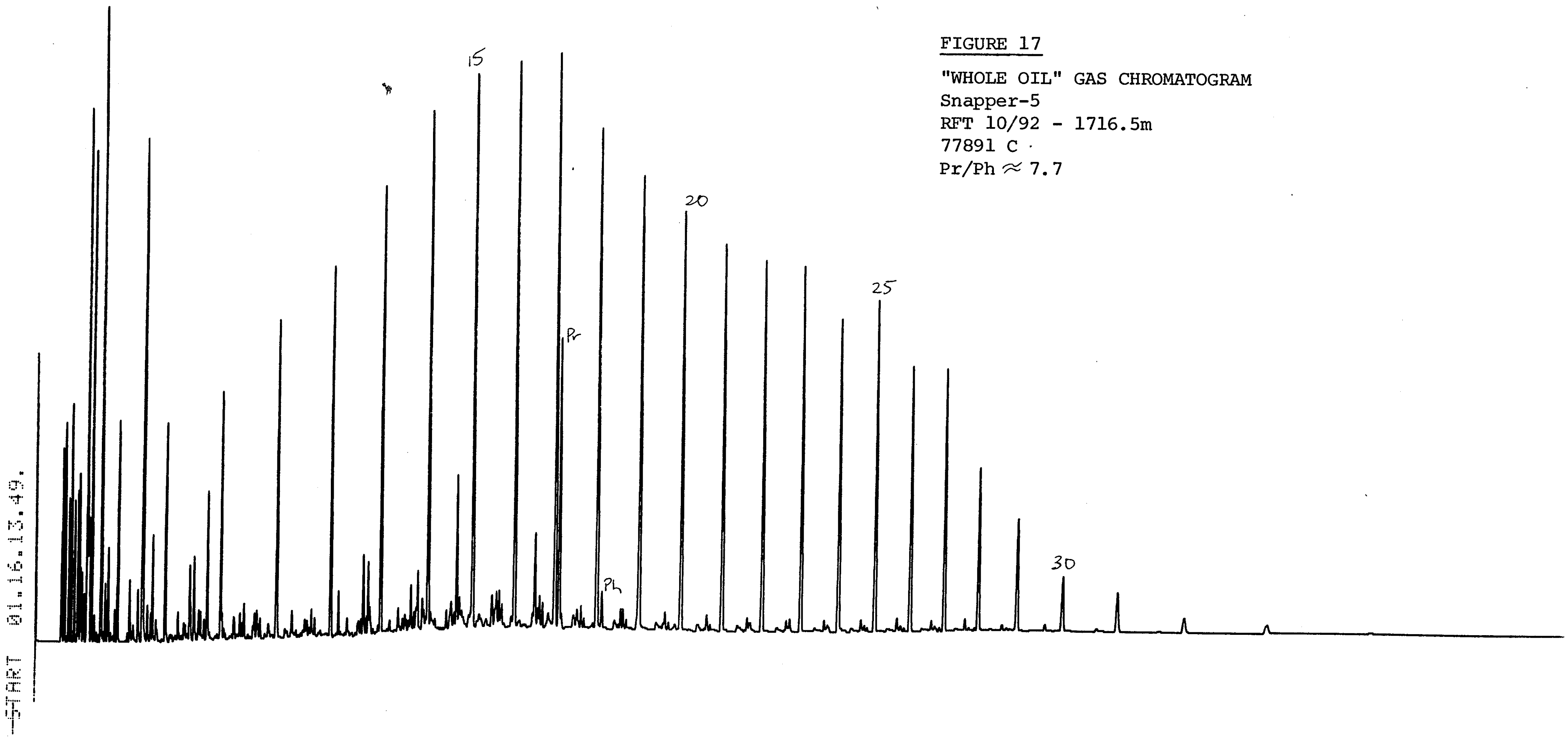


FIGURE 17

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 10/92 - 1716.5m
77891 C
Pr/Ph ≈ 7.7

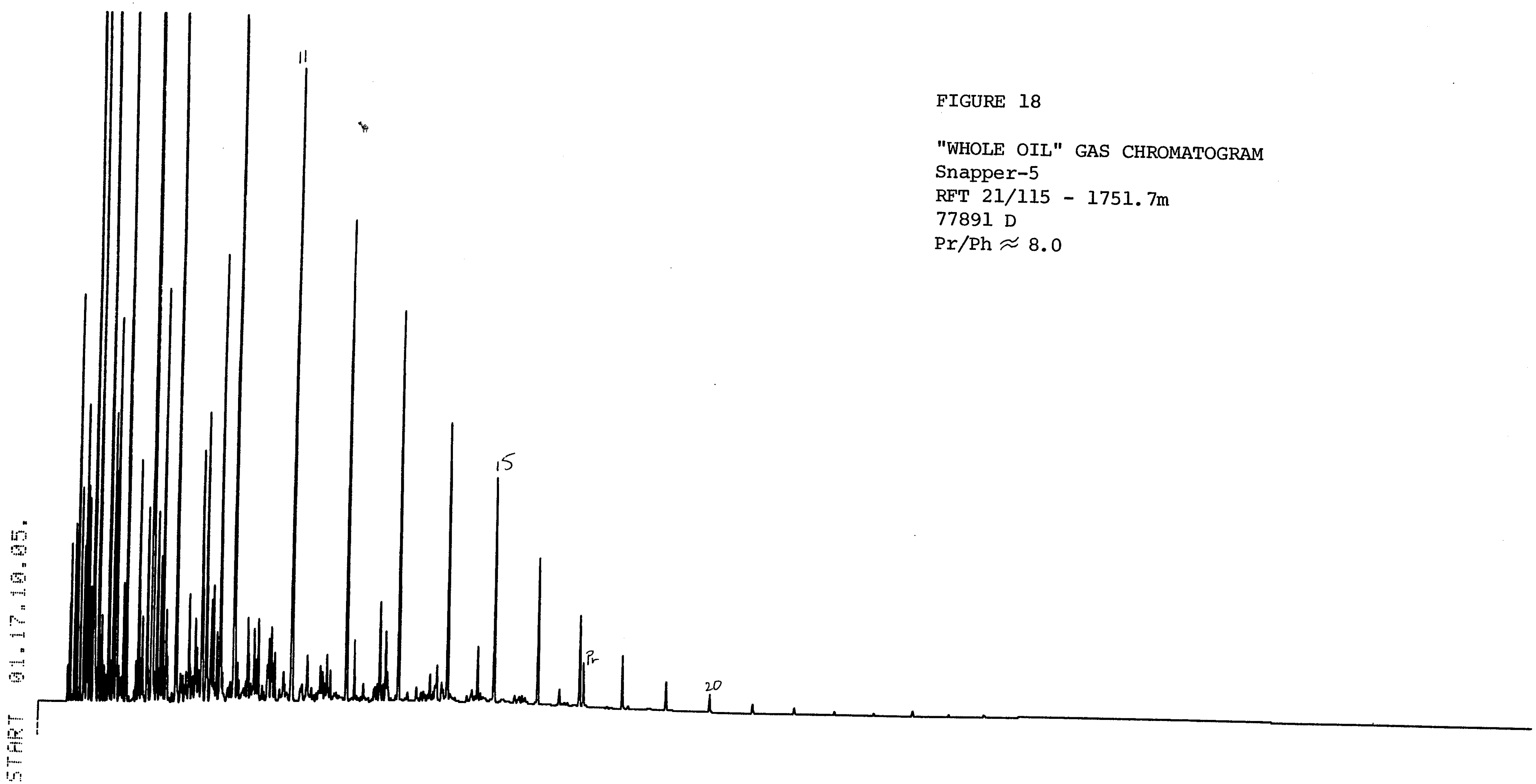


FIGURE 18

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 21/115 - 1751.7m
77891 D
Pr/Ph ≈ 8.0

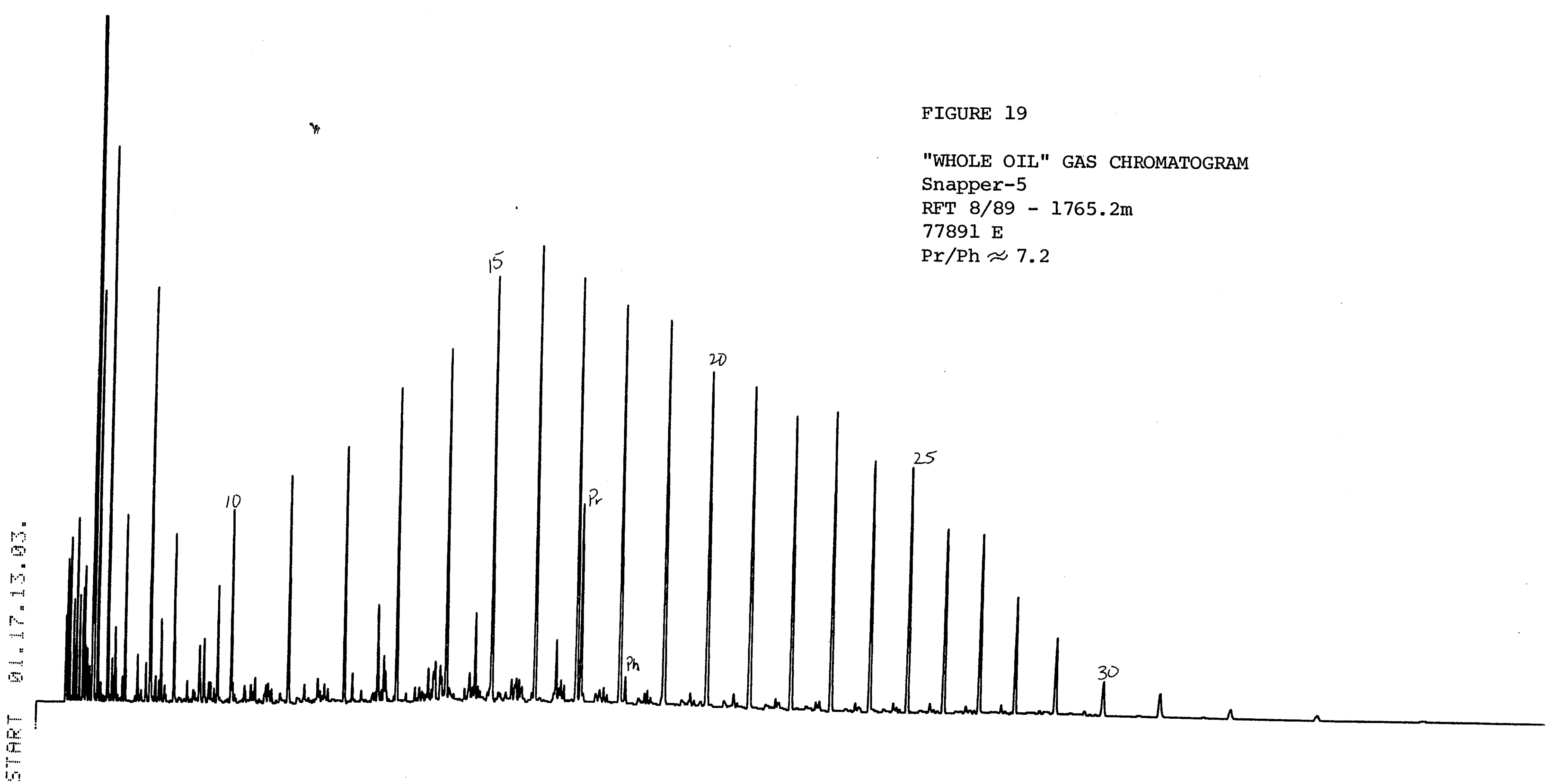


FIGURE 19

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 8/89 - 1765.2m
77891 E
Pr/Ph ≈ 7.2

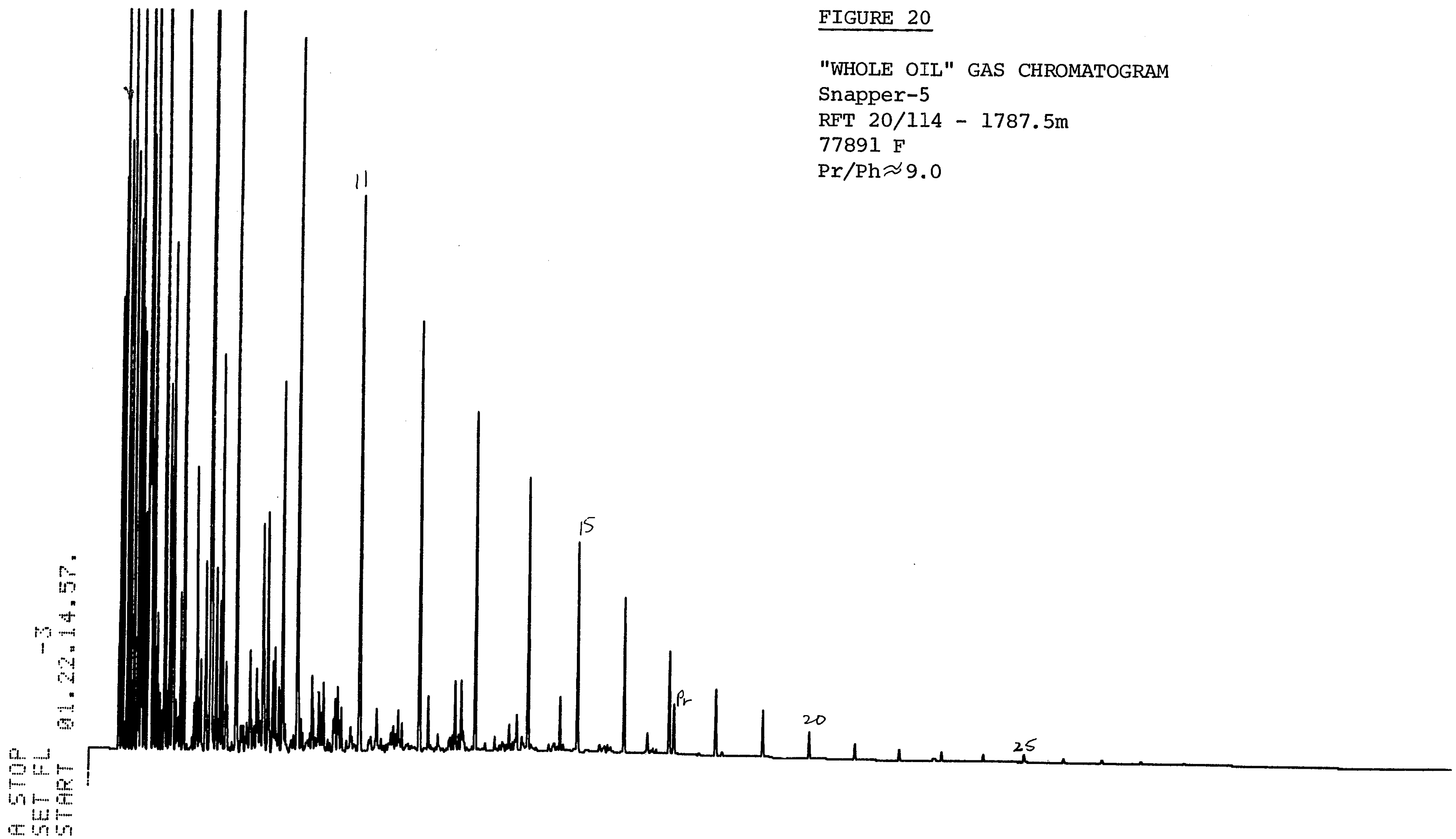


FIGURE 20

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 20/114 - 1787.5m
77891 F
Pr/Ph≈9.0

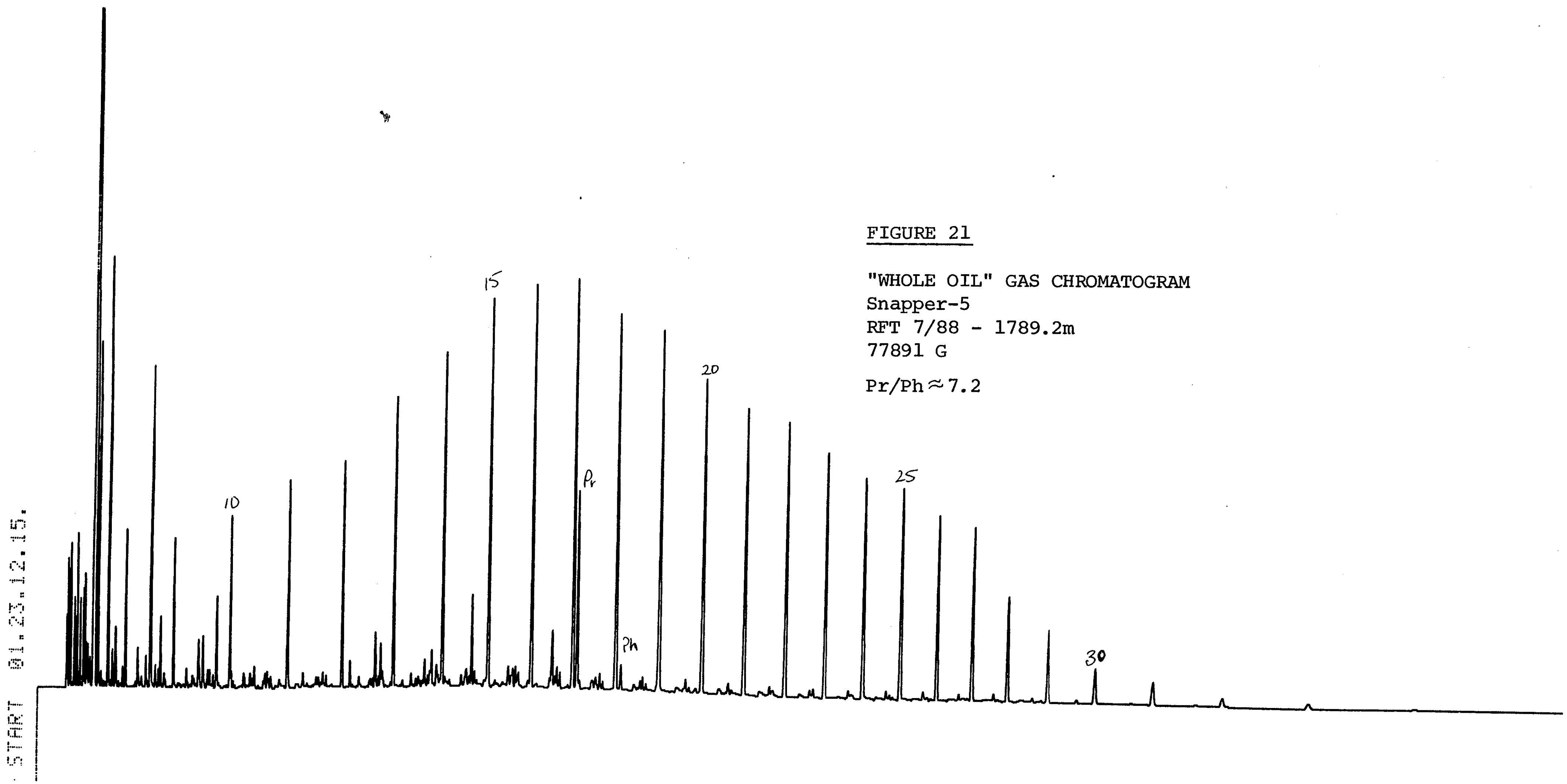


FIGURE 21

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 7/88 - 1789.2m
77891 G

Pr/Ph ≈ 7.2

FIGURE 22

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 17/104 - 1837m
77891 I
Pr/Ph ≈ 6.2

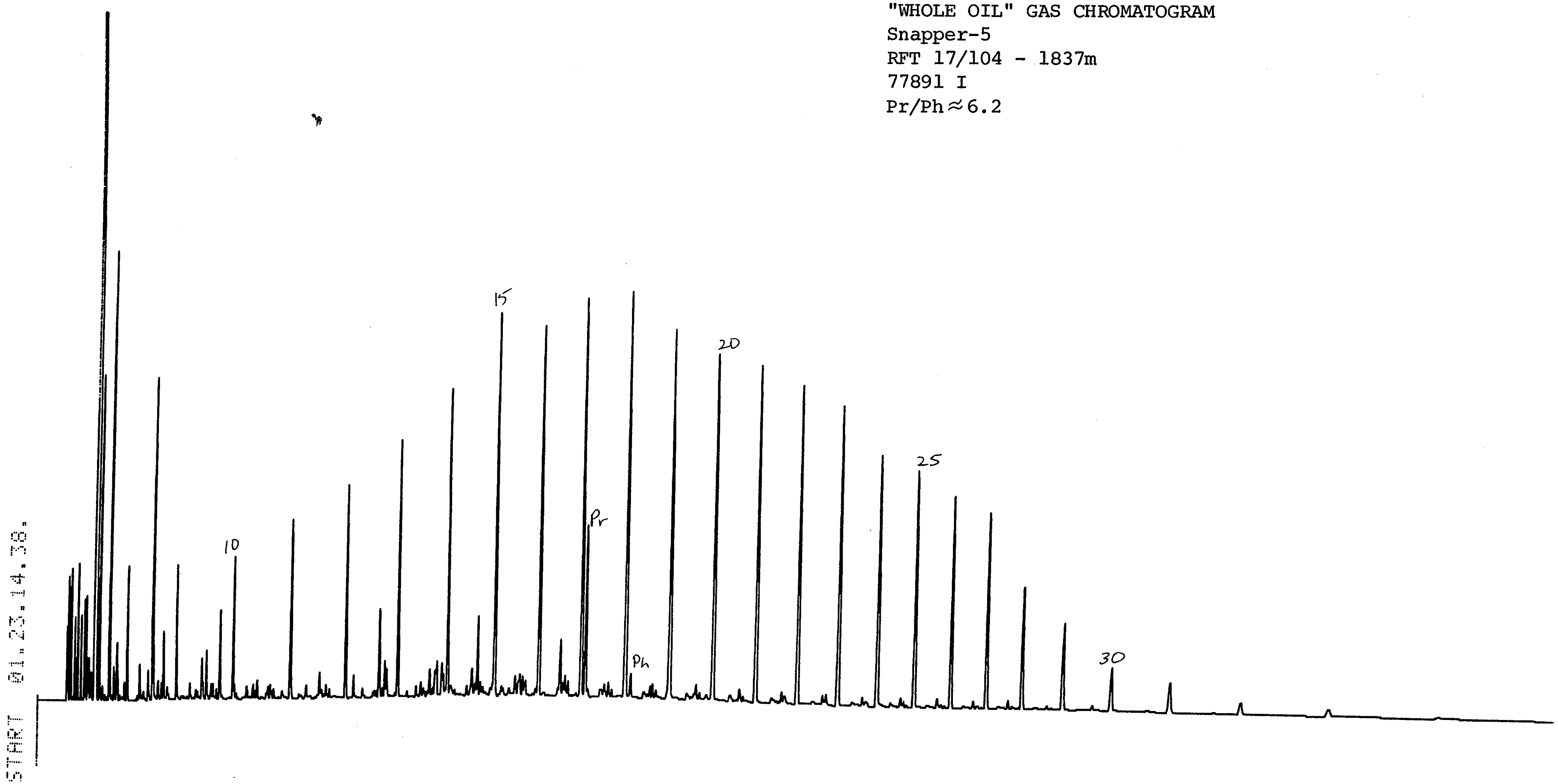
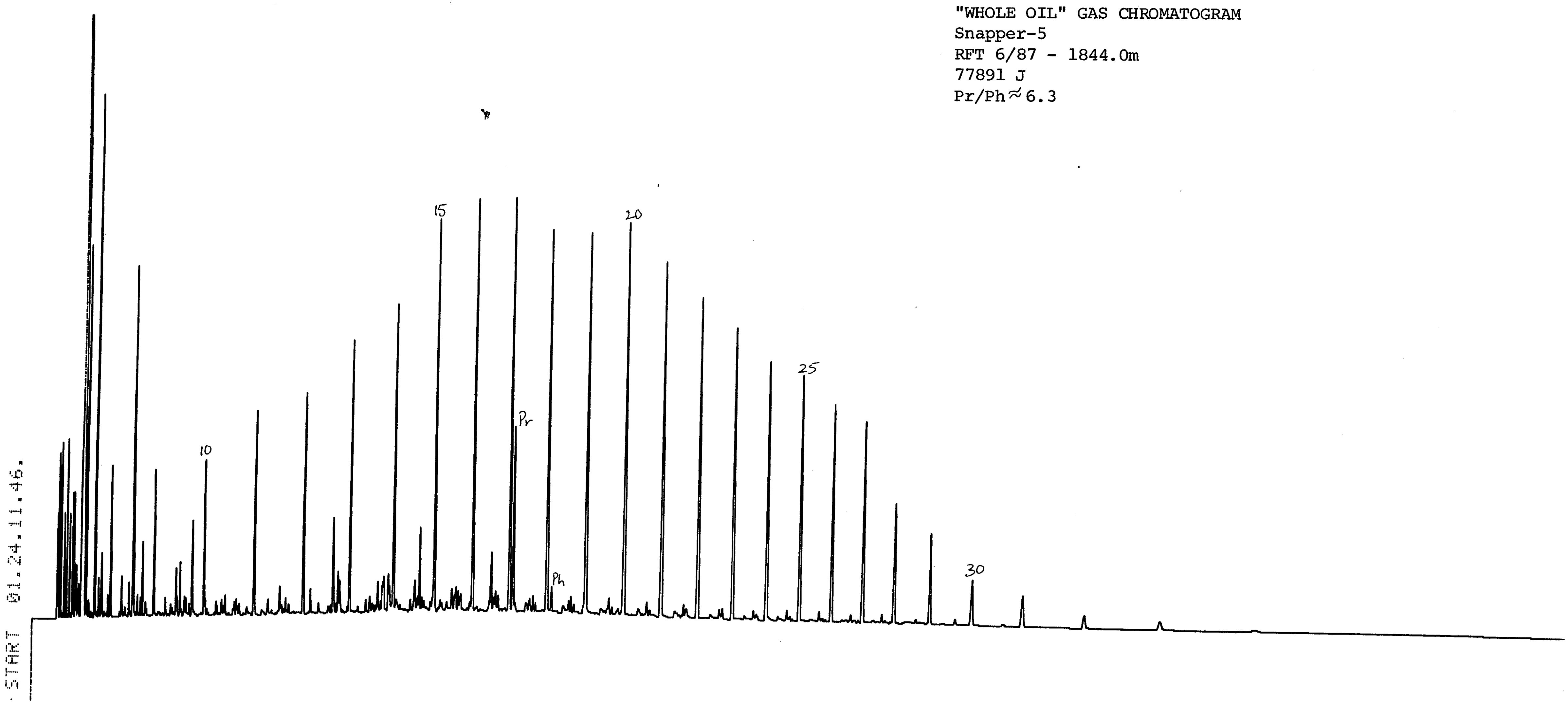


FIGURE 23

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 6/87 - 1844.0m
77891 J
Pr/Ph ≈ 6.3



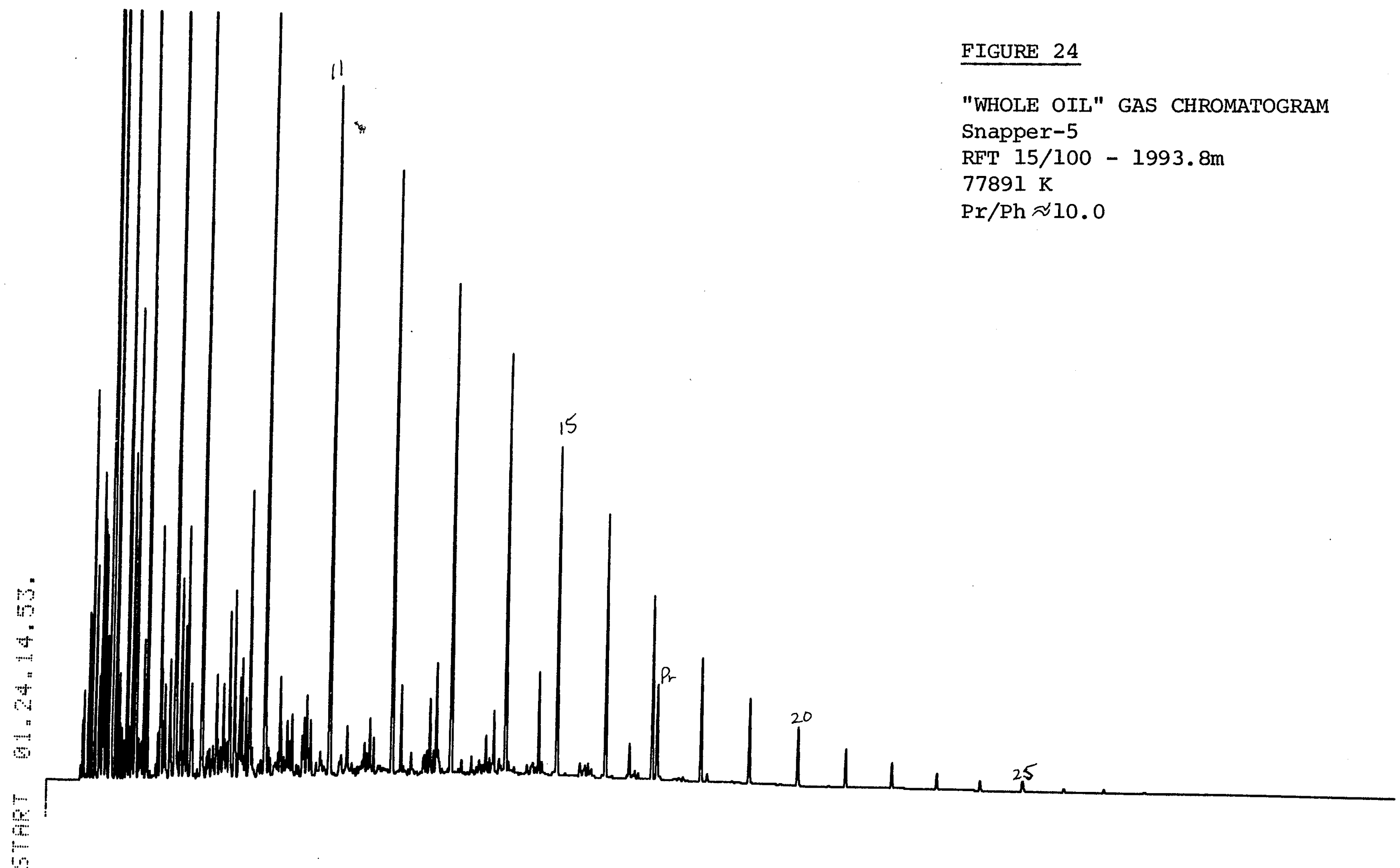


FIGURE 24

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 15/100 - 1993.8m
77891 K
Pr/Ph ≈10.0

FIGURE 25

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 19/113 - 2053m
77891 L
Pr/Ph ≈15.0

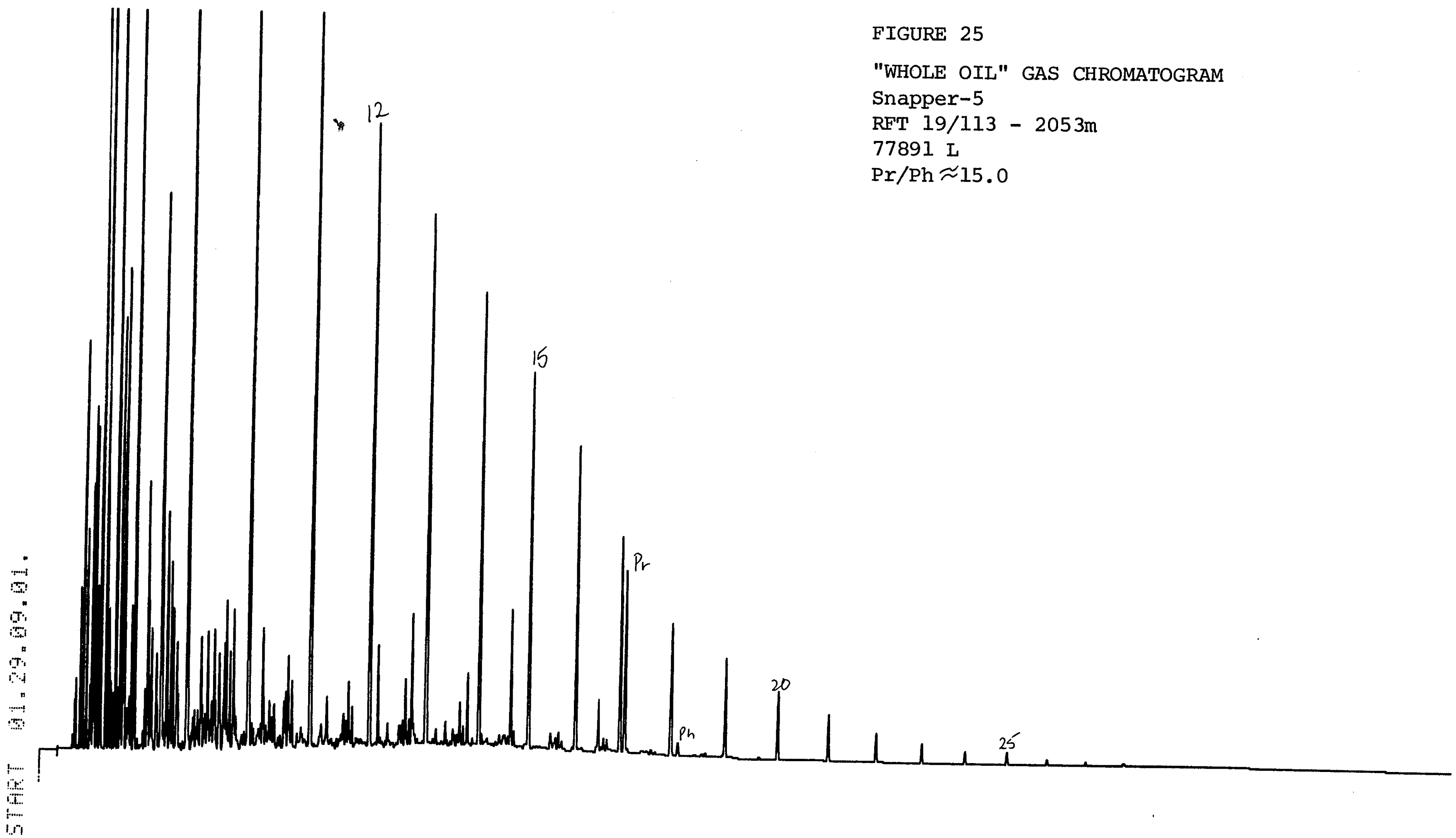
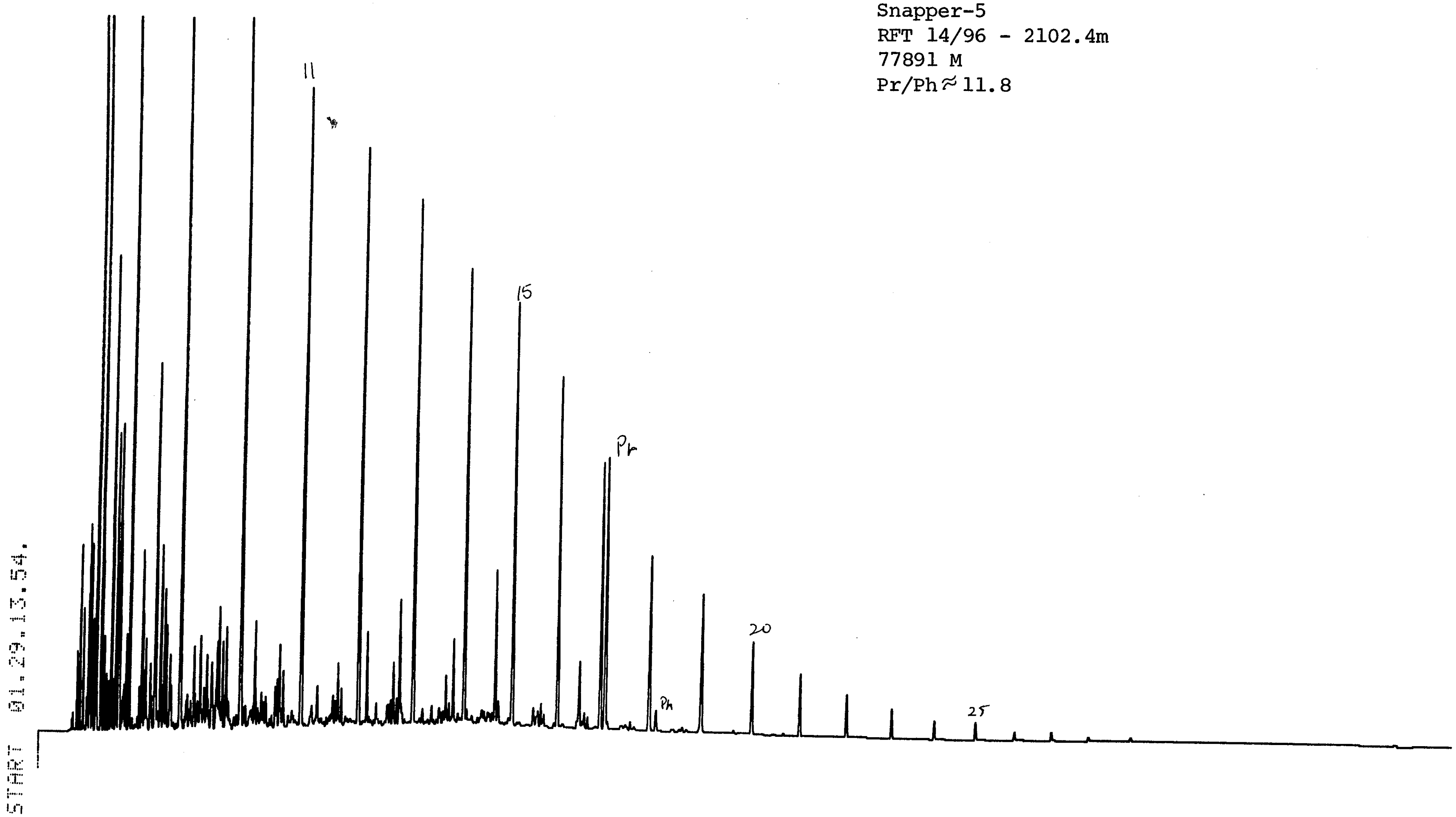


FIGURE 26

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 14/96 - 2102.4m
77891 M
Pr/Ph ≈ 11.8



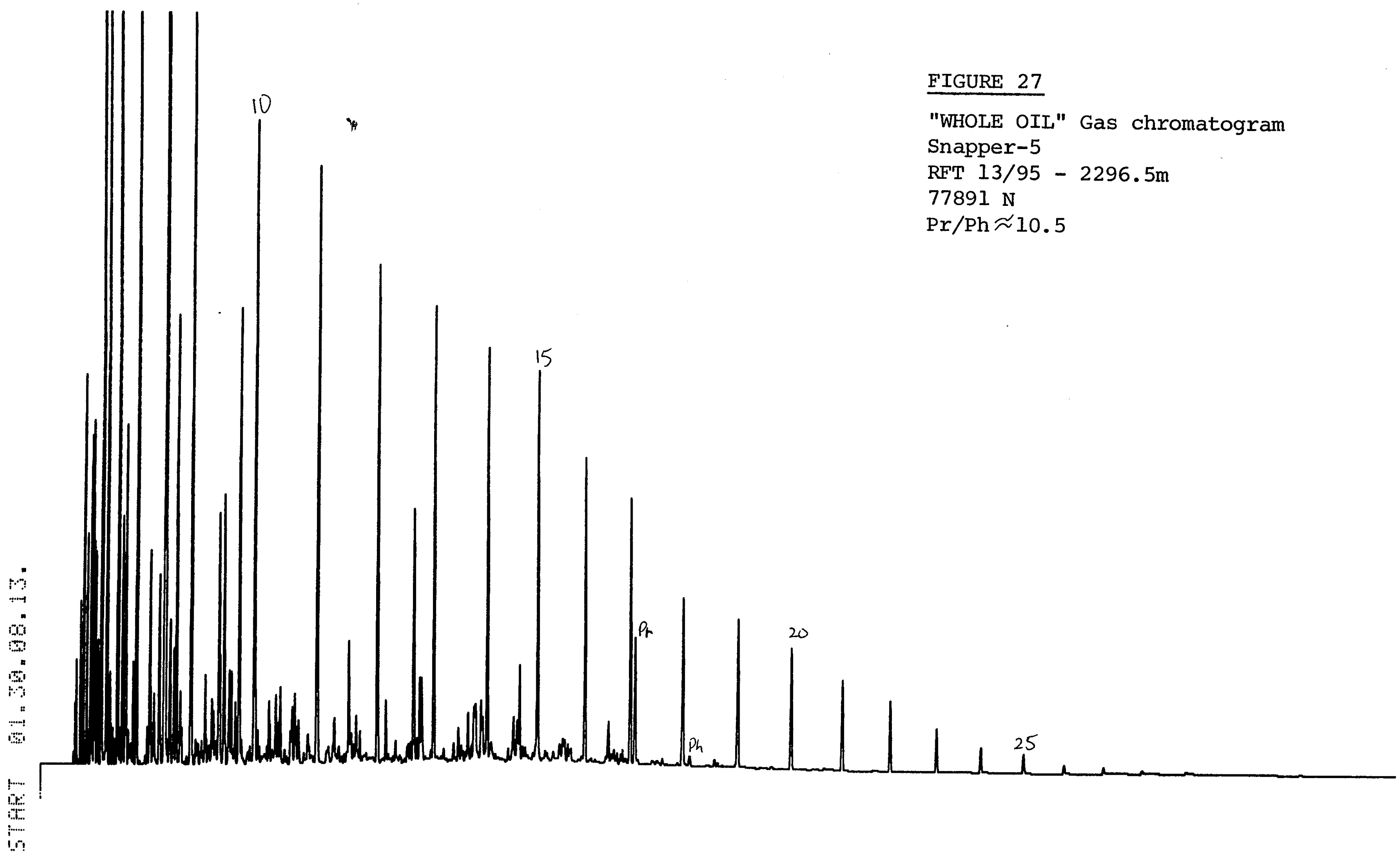


FIGURE 27

"WHOLE OIL" Gas chromatogram
Snapper-5
RFT 13/95 - 2296.5m
77891 N
Pr/Ph≈10.5

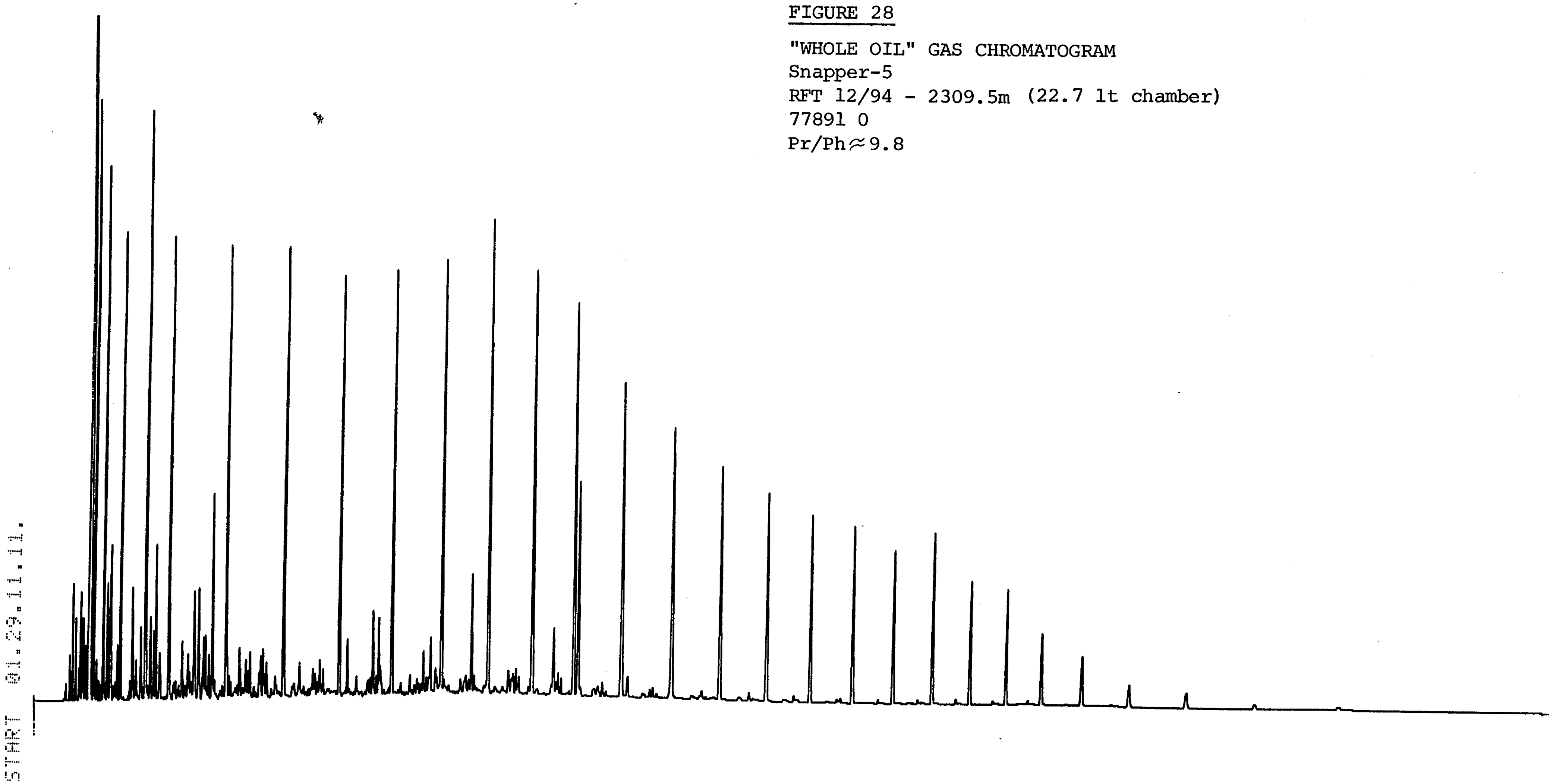
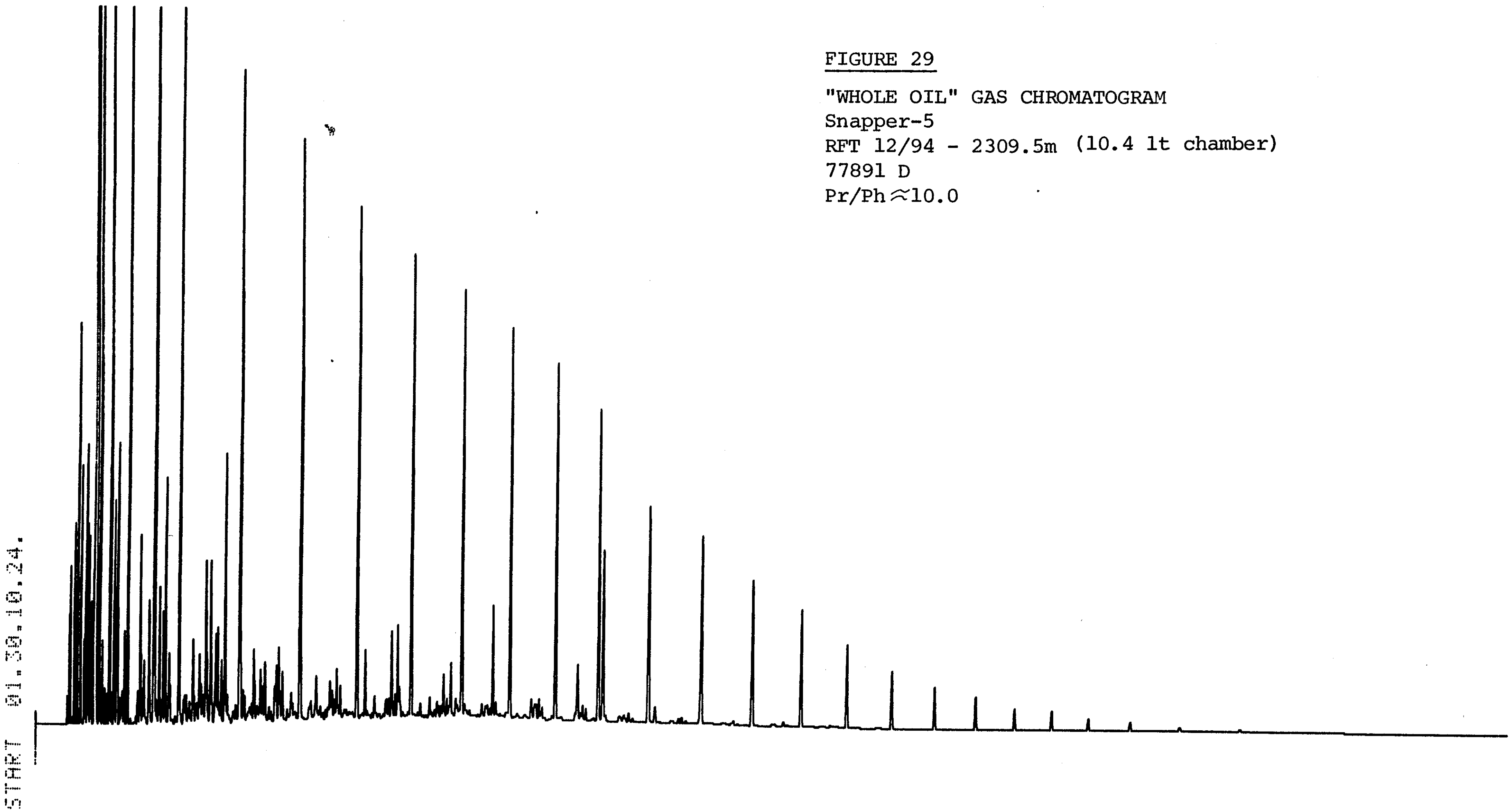


FIGURE 28

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 12/94 - 2309.5m (22.7 lt chamber)
77891 0
Pr/Ph≈9.8

FIGURE 29

"WHOLE OIL" GAS CHROMATOGRAM
Snapper-5
RFT 12/94 - 2309.5m (10.4 lt chamber)
77891 D
Pr/Ph≈10.0



APPENDIX 1

Detailed Vitrinite Reflectance and Exinite
Fluorescence Data - Report by A.C. Cook

SNAPPER NO. 5

KK No.	Esso No.	Depth m	$\bar{R}_v$ max %	Range R_v max %	N	Exinite fluorescence (Remarks)
x3306	77824 Y	1575.9	-	-	-	No exinite. (Siltstone. No dom present. Pyrite sparse.)
x3307	77824 E	1846.7	0.54	0.46-0.59	34	Abundant liptodetrinite, yellow to yellow orange, abundant cutinite, yellow orange to orange, common sporinite, yellow orange to orange, common suberinite, dull orange, sparse fluorinite, green. (Coal, V>I>E. Duroclarite>clarite>vitrite> clarodurite>inertite. Very weak oil cut from vitrite. Pyrite sparse. Clay abundant.)
x3308	77823 F	2385.4 $\bar{R}_I$	0.67 1.20	0.57-0.75 0.96-1.69	27 6	Sparse sporinite, yellow to yellow orange, sparse cutinite and liptodetrinite, yellow to dull orange, rare resinite, greenish yellow to yellow, rare bitumen, yellow. (Siltstone. Dom abundant, I>E>V. All macerals common. Vitrinite shows brown to dull orange fluorescence. Sparse droplets of greenish yellow oil present in sandy siltstone. Oil cut from siltstone. Carbonate and pyrite sparse.)
x3309	77822 R	2653.0 $\bar{R}_I$	0.75 1.37	0.64-0.88 0.92-1.82	30 5	Sparse sporinite, yellow to orange, sparse cutinite and liptodetrinite, yellow to dull orange, rare resinite, yellow, rare suberinite, dull orange to brown. (Siltstone>>coal. Coal common, V>>E. Vitrite. Dom abundant, I>V>E. Inertinite abundant, vitrinite common to abundant, exinite sparse. Vitrinite shows dull orange to brown fluorescence. Sparse droplets of greenish yellow fluorescing oil present in sandy siltstone. Carbonate and pyrite sparse.)
x3310	77822 A	2960 $\bar{R}_I$	1.03 1.73	0.81-1.15 1.33-2.25	10 10	Rare sporinite, cutinite and liptodetrinite, yellow to dull orange, rare ?suberinite, orange to dull orange. (Siltstone. Dom abundant, I>V>E. Inertinite abundant, vitrinite sparse, exinite rare. Vitrinite shows dull orange fluorescence. Semifusinite shows brown fluorescence. Carbonate and pyrite sparse.)

APPENDIX 5

<u>APPENDIX 5</u>

RFT REPORT

SNAPPER-5 RFT REPORT

P.R. ETTEMA

August 1985

(4165f)

SNAPPER-5 RFT REPORT

SUMMARY

This report documents the interpretation of the Snapper-5 RFT data for the N-1 and Intra-Latrobe gas and oil accumulations intersected by this well.

The primary objective of the well was to explore the Intra-Latrobe M and L sands in the south-western fault block for deep oil. The secondary objective was the delineation of the N-1 oil column on the western flank; in particular to test the N-1 sand quality and the thickness of the N-1 column.

The following is a brief summary of the gas and oil accumulations interpreted from the well logs and confirmed by RFT pressure and sample data:

1. N-1 (Gas/Oil)

   A 2.75m net oil sand in the interval 1381.5-1389.5m SS with an estimated maximum oil column of 8m and an overlying gas cap of 60m net sand and 111m column.

2. M-1.10, M-1.20, M-1.30 (Oil)

   Three independent oil systems in the interval 1681-1697m SS with net sands of 1.8m, 2.5m and 1.0m and estimated oil columns of 32m, 37m and 10m respectively.

3. M-2.20, M-2.30 (Gas/Oil)

   Two independent gas/oil systems in the interval 1740-1770m SS with net sands of 4.0m and 4.3m, estimated oil columns of 26m and 22m and each with an overlying gas cap.

4. M-2.70 (Oil)

   A 6.5m net oil sand in the interval 1815-1829m SS with an estimated oil column of 8m.

5. Gas Sands

   Twenty independent gas systems in the inverval 1728-2661m with a total of 96.5m of net gas sands and gas columns varying between 4 and 65m. This summary does not include a number of gas systems with net sands of less than 1.0m. In addition to these non-associated gas reservoirs, the associated gas caps in the M-2.20 and M-2.30 reservoirs contain a further 4.5m net sand.

Note that the RFT interpreted OWCs and GWCs are dependent on the position of the corresponding water line. There is uncertainty in the quoted contacts because of the water line shifting with depth particularly with the deeper zones, encountered below about 1850m SS.

(4165f:2)

RESULTS

The results of these tests are documented in the following attachments:

Table 1A: Oil Accumulations Confirmed by RFT.
1B: Gas Accumulations Confirmed by RFT.
2: RFT Pretests.
3: RFT Sample Data.

Figure 1: RFT Plots Overview
2: N-1
3: M-1.10, M-1.20, M-1.30
4: M-2.20, M-2.30
5: M-2.70

DISCUSSION

The following is a discussion of the oil accumulations given in Table 1A and is best read with the well logs and the RFT plots of Figures 2 to 5.

1. N-1 (Gas/Oil); Figure 2

A GOC at 1381.5m SS and an OWC at 1389.5m SS are interpreted from RFT pressure data. The OWC is seen on the resistivity log and confirmed by RFT sample 4/18 at 1389.5m SS which recovered gas, oil and formation water in both chambers. The GOC is in doubt. RFT sample 2/16 at 1381.5m SS and immediately above a coal recovered 164ft^3 of gas and no oil. The logs provide no useful GOC information. It is concluded that the GOC is close to 1381.5m SS although there is a possibility it lies between 1 and 1.5m deeper. Note that pretest 7 was taken in a siltstone and is probably supercharged.

2. M-1.10, M-1.20, M-1.30 (Oil); Figure 3

RFT pressure data indicates that the oil sands in the interval 1681-1697m SS make up three independent hydraulic systems with separate OWCs. Pretests (77), (75 and 76) and (74) identify the M-1.10, M-1.20 and M-1.30 respectively with subsequent check pretests 146 to 149 confirming these pressures.

Using an oil gradient of 1.0 psi/m and assuming the water line through pretests 72 and 73 is valid for these oil accumulations gives interpreted OWCs at 1713.5m, 1724.0m and 1705.0m SS and corresponding oil columns of 32m, 37m and 10m. Samples 10/92 and 11/93 at the top and bottom of this interval both recovered oil and confirmed the log interpreted fluid content of the rock.

3. M-2.20, M-2.30, (Gas/Oil); Figure 4

RFT pretest 69 at 1743.3m SS and 68 at 1767.0m SS were both taken at log interpreted GOCs which indicated two independent gas/oil systems with separate OWCs. Sample 8/89, immediately below pretest 69, recovered gas and oil and confirmed the gas/oil interpretation. Samples 20/114 and 7/88 were respectively above and below pretest 68 and confirmed the gas-on-oil log interpretation.

OWCs have been interpreted from RFT pressure data at 1769.0m and 1789.0m SS with corresponding oil columns for the M-2.20 and M-2.30 of 26m and 22m respectively. The OWCs have been estimated by extrapolating a 1.0m oil gradient from pretests 68 and 69 to a water line which passes through pretests 62, 65, 72 and 73. It is concluded that this was the best water line to use in estimating the OWCs even though pretest 70 (in water) lies above this water line and is 8m above pretest 69.

4. M-2.70 (Oil); Figure 5

Pretest 62 was taken at the log interpreted OWC at 1824.0m SS. Pretest 63 lies on a 1.0 psi/m oil gradient from the OWC while pretest 64 was supercharged and lies to the right of this oil gradient. Samples 6/87 at 1823.0m SS and 17/104 at 1816.0m SS both recovered oil confirming the fluid content of the rock.

TABLE 1A

SNAPPER-5

OIL ACCUMULATIONS CONFIRMED BY RFT

Accumulation	Depth Interval[2] in Snapper-5 (mSS)	GOC (mSS)	OWC (mSS)	Oil Column[1] (m)	Net Sand[2] (m)	Comments
N-1	1381.5 - 1389.5	1381.5	1389.5	8	2.75	)GOC from RFT,)OWC from RFT)and logs.
M-1.10	1681.25 - 1683.5	-	1713.5	32	1.8	)
M-1.20	1687.25 - 1693.5	-	1724.0	37	2.5	)OWC from RFT
M-1.30	1695.25 - 1696.5	-	1705.0	10	1.0	)
M-2.20	1740.5 - 1745.0	1743.3	1769.0	26	4.0	)GOC from logs)
M-2.30	1765.3 - 1770.0	1767.0	1789.0	22	4.3	)OWC from RFT
M-2.70	1815.7 - 1829.5	-	1824.0	8	6.5	)OWC from RFT

Notes: 1. Oil column is measured from the RFT interpreted OWC to the top of the Snapper-5 interval if the GOC was not intersected..

2. Depth intervals and net sands are preliminary and subject to amendment.

(4165f:5)

TABLE 1B

SNAPPER-5

GAS ACCUMULATIONS CONFIRMED BY RFT

RFT Pretests	Depth Interval in Snapper-5 (mSS) [2]	GWC (mSS)	Gas Column (m) [1]	Net/Gross Sand (m/m) [2]	Basis for GWC	Water Pretests for RFT GWC [3]
71,70	1728.5 - 1733.5	1733.5	5	2.0/5.0	Logs	-
65,66,67	1798.5 - 1812.0	1812	14	12.75/13.5	Logs	-
58,59	1872.75 - 1881.5	1922	49	7.5/8.75	RFT	54,60
55,56	1919.0 - 1930.5	1934	15	8.5/11.5	RFT	54,60
53	1958.5 - 1962.75	1974	16	2.25/4.25	RFT	38,60
52	1972.5 - 1974.75	1981	9	1.75/2.25	RFT	38,60
51	1989.0 - 1991.0	2006	17	2.0/2.0	RFT	38,60
44,45,46	2059.25 - 2063.75	- [4]	-	2.0/3.5	-	-
40,41	2079.75 - 2083.75	2087	5	3.5/4.0	Logs	-
28,29	2269.0 - 2276.0	2298	29	6.25/7.0	RFT	35,37
27	2278.25 - 2282.5	2300	22	2.50/4.25	RFT	35,37
26	2286.75 - 2289.5	2301	14	2.0/2.75	RFT	35,37
23,24	2336.5 - 2344.75	2358	22	6.0/8.25	RFT	19,21
141,142	2507.0 - 2513.0	2572	65	5.5/6.0	RFT	133
140	2520.5 - 2523.25	2580	60	2.0/2.75	RFT	133
139	2526.0 - 2534.25	2584	58	6.5/8.25	RFT	133

(4165f:6)

..... /2

TABLE 1B (Continued)

SNAPPER-5

GAS ACCUMULATIONS CONFIRMED BY RFT

RFT Pretests	Depth Interval in Snapper-5 (mSS) [2]	GWC (mSS)	Gas Column (m) [1]	Net/Gross Sand (m/m) [2]	Basis for GWC	Water Pretests for RFT GWC [3]
137,138	2540.25 - 2549.25	2552	12	6.0/9.0	RFT	133
135,136	2560.0 - 2573.5	2590	30	12.25/13.50	RFT	133
133,134	2585.5 - 2589.0	2589	4	2.75/3.5	RFT	133
128	2655.75 - 2660.75	2675	19	2.50/4.50	RFT	126

Notes:

1. Gas column is measured from the interpreted GWC to the top of the Snapper-5 interval.
2. Depth intervals and net sands are preliminary and subject to amendment.
3. These pretests are used to draw a water line from which an estimate of GWC can be made. The water line varies with depth and the listed pretests are our best estimate of the correct line to use for each gas accumulation.
4. Pretests 44,45 and 46 were supercharged. They are included here for completeness although no GWC can be interpreted.
5. This table does not include the gas caps associated with M-2.20 and M-2.30 oil accumulations.

FIGURE 1 OVERVIEW

SNAPPER-5 RFT SURVEY

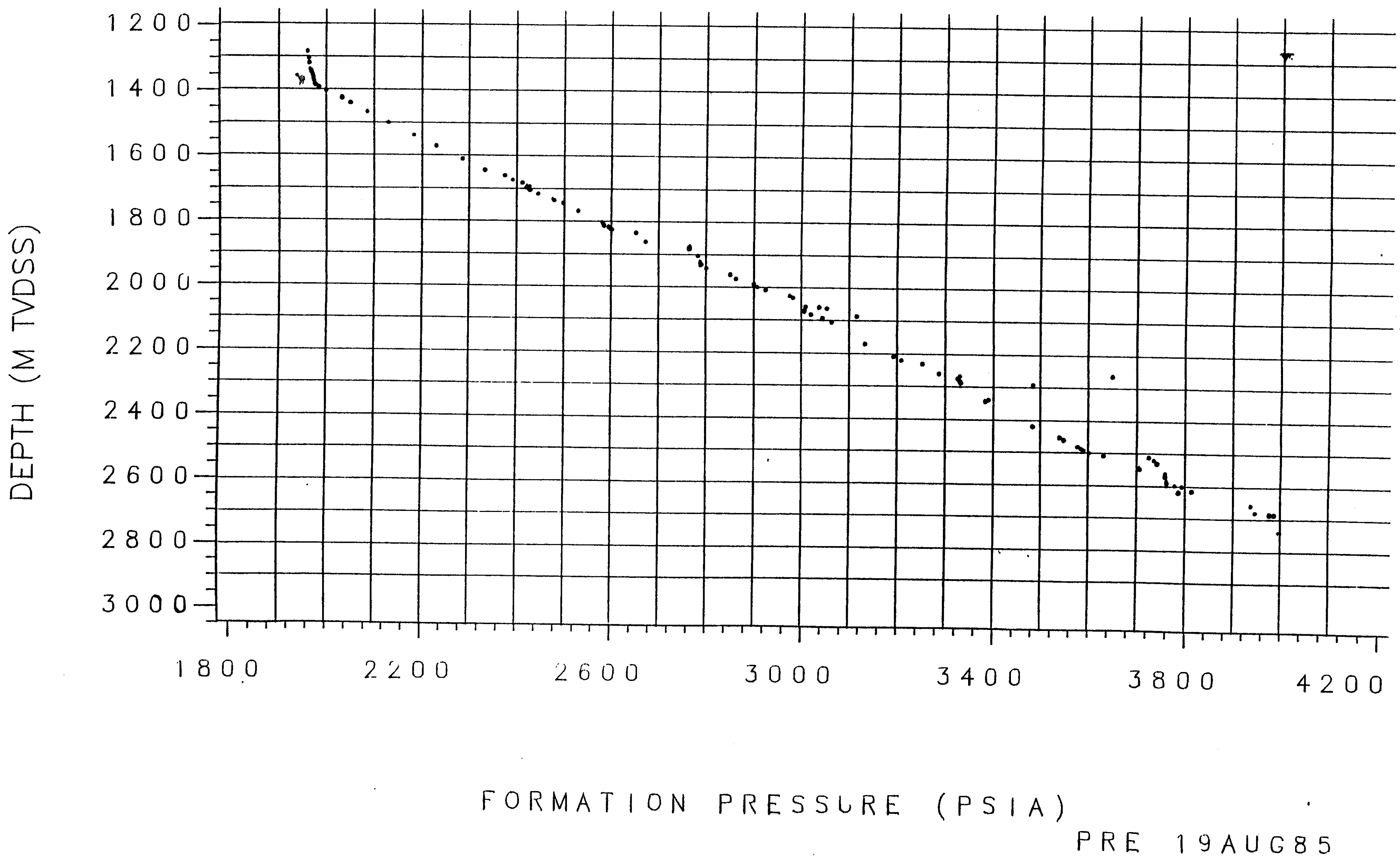
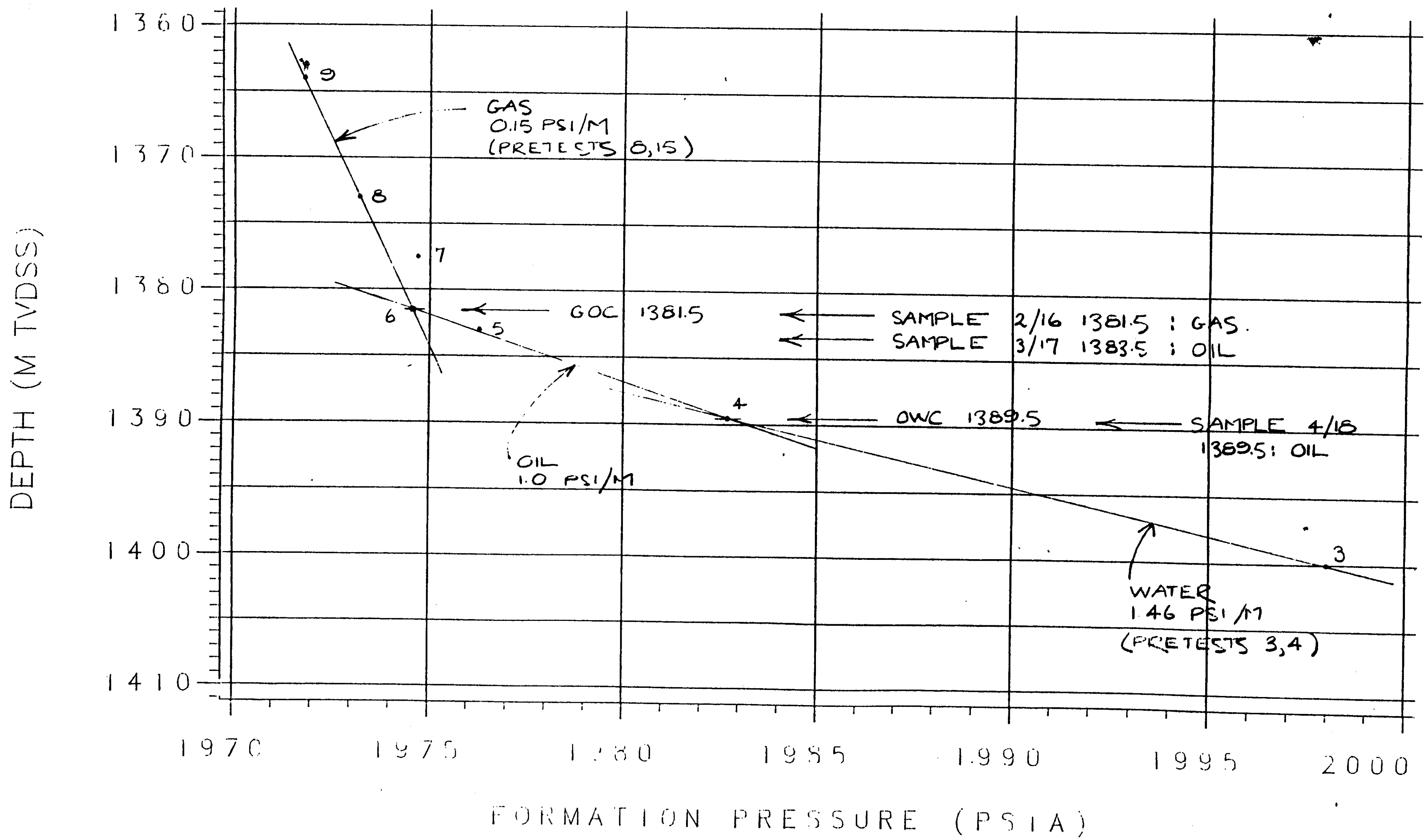


FIGURE 2 N-1 (GAS/OIL)

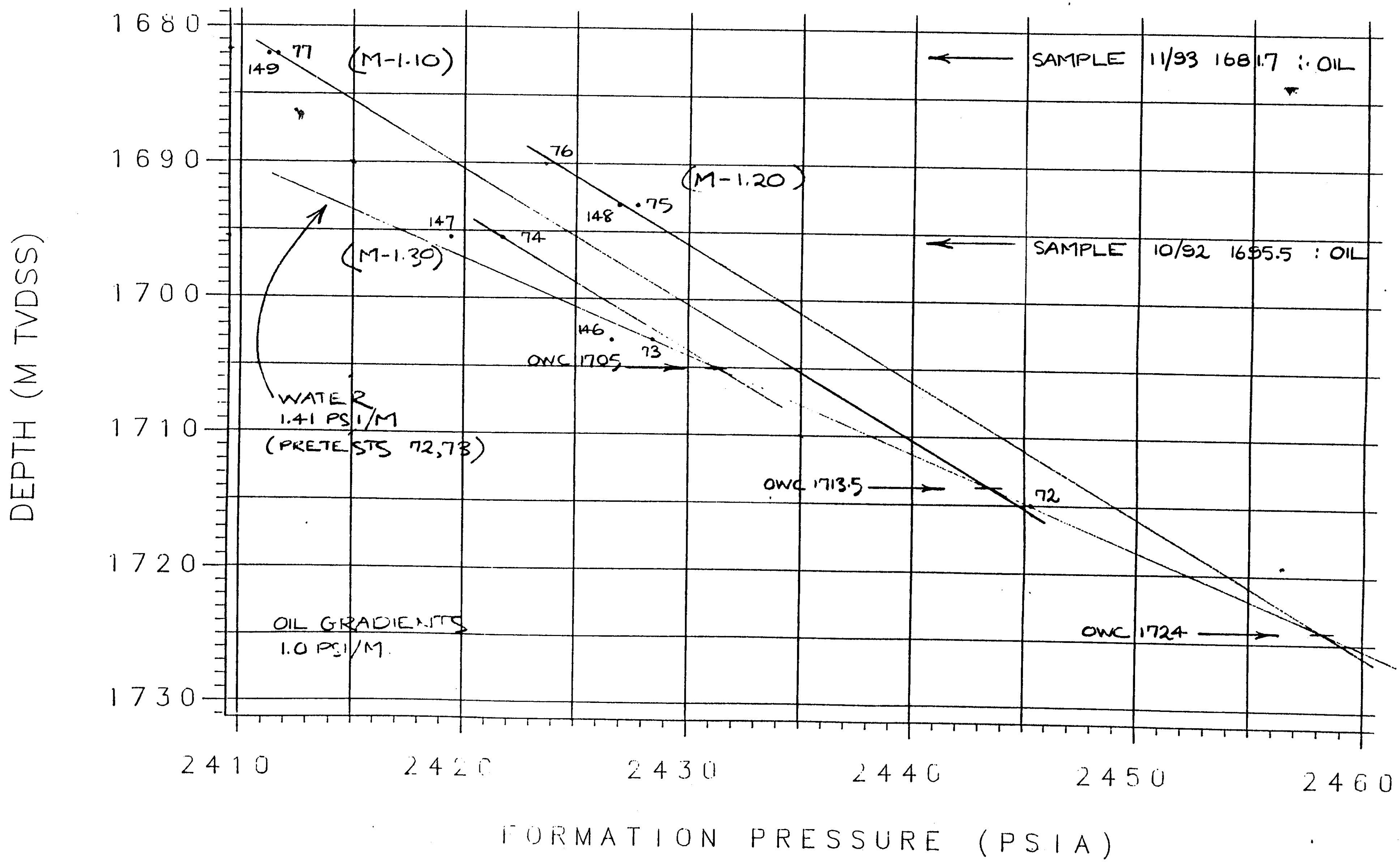
SNAPPER-5 RFT SURVEY



PRE 28AUG85

FIGURE 3 M-1.10/1.20/1.30 (OIL)

SNAPPER-5 RFT SURVEY



PRE 19AUG85

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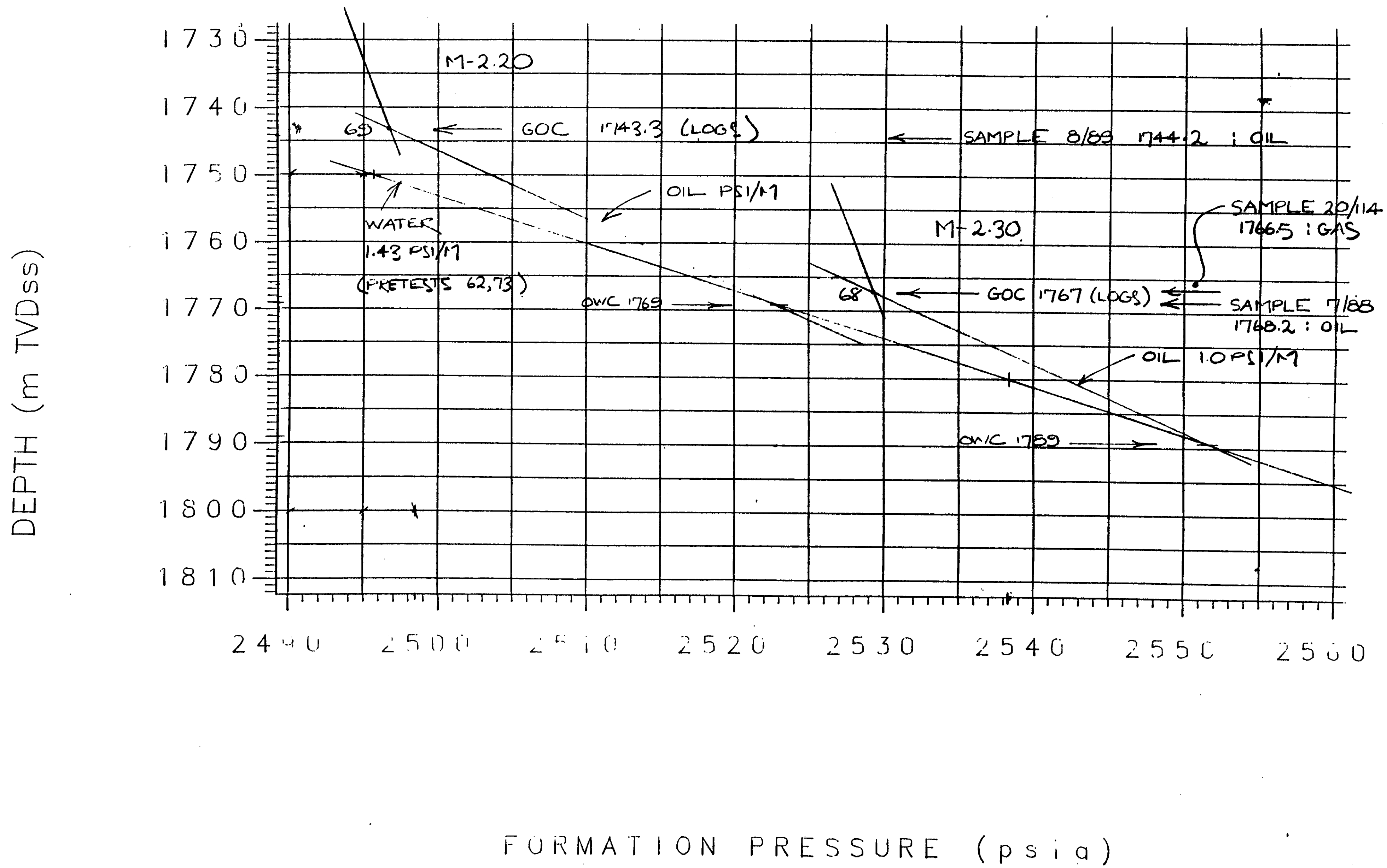
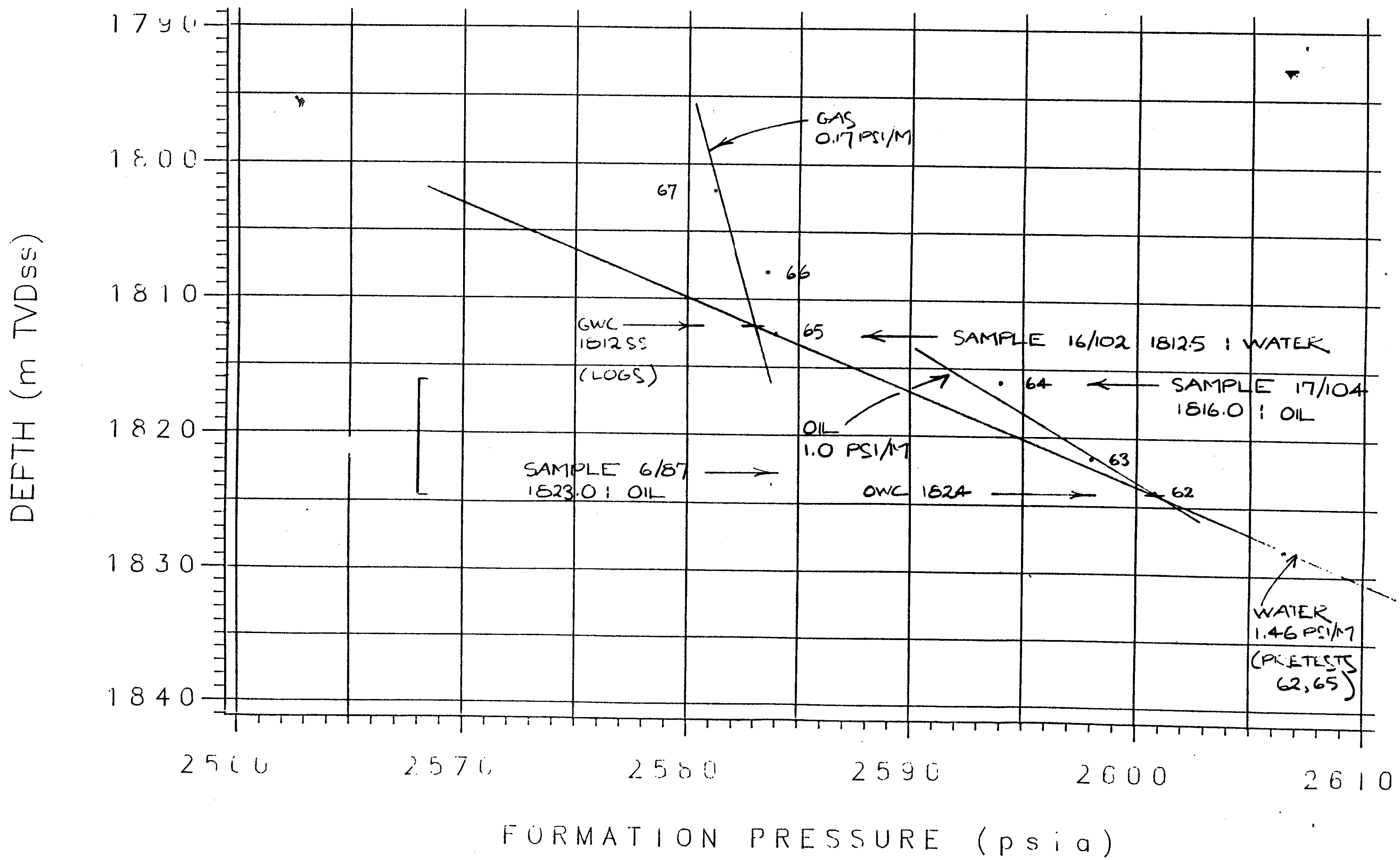
SNAPPER-5 RFT SURVEY



PRE 8AUG85

SNAPPER-5 RFT SURVEY



PRE 8AUG85

PROJECT: PRE   MEMBER: SN5DASH   DATE: 85/09/11   SN5DASH
LIBRARY: PLOT   LEVEL: 01.14   TIME: 15:55
TYPE: DATA   USERID: PRE   PAGE: 01 OF 04

START
COL ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

15 SNAPPER-5 RFT PRETESTS
15 ----------------------

22 TABLE 2
22 -------

START COL	RFT SEAT	DEPTH (M SS)		PRESSURE (PSIA)		COMMENTS (SEE KEY BELOW)
6	1	1438.0	0	2048.6	1	V
6	2	1422.0	0	2031.7	1	V
6	3	1400.0	0	1998.0	1	V
6	4	1389.5	0	1982.7	1	V
6	5	1383.0	0	1976.3	1	V
6	6	1381.5	0	1974.6	1	V
6	7	1377.5	0	1974.7	1	SC?
6	8	1373.0	0	1973.2	1	V
6	9	1364.0	0	1971.8	1	V
5	10	1354.0	0	1970.8	1	V
5	11	1343.5	0	1968.5	1	V
5	12	1336.0	0	1967.2	1	V
5	13	1317.0	0	1964.2	1	V
5	14	1302.0	0	1963.0	1	V
5	15	1281.0	0	1960.2	1	V
5	16	1381.5	0	1974.2	1	S
5	17	1383.5	0	1976.5	1	S
5	18	1389.5	0	1981.8	1	S
5	19	2461.0	0	3547.9	1	V
5	20	2453.0	0	3538.7	1	V
5	21	2419.5	0	3481.9	1	V
5	22	2394.0	0	0000.0	1	T
5	23	2344.0	0	3381.1	1	V
5	24	2339.0	0	3388.1	1	SC
5	25	2292.5	0	3483.3	1	SC
5	26	2288.0	0	3330.5	1	V
5	27	2281.5	0	3327.7	1	V
5	28	2276.0	0	3323.8	1	V
5	29	2270.5	0	3328.9	1	SC?
5	30	2264.5	0	0000.0	1	SF
5	31	2264.4	0	3648.8	1	SC
5	32	2260.5	0	3236.0	1	SC?
5	33	2230.5	0	0000.0	1	T
5	34	2230.0	0	3251.8	1	SC?
5	35	2219.5	0	3208.3	1	V
5	36	2208.0	0	3192.5	1	V
5	37	2169.5	0	3131.8	1	V
5	38	2104.5	0	3061.8	1	V
5	39	2092.5	0	3043.3	1	V
5	40	2086.0	0	3114.8	1	SC
5	41	2081.5	0	3019.0	1	V
5	42	2072.0	0	0000.0	1	T
5	43	2071.3	0	3004.8	1	V

START COL	----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8					
5	44	2063.5	0	3052.3	1	SC
5	45	2060.0	0	3036.4	1	SC
5	46	2059.3	0	3007.5	1	SC?
5	47	2032.0	0	2981.2	1	V
5	48	2025.5	0	2974.8	1	V
5	49	2007.5	0	2925.2	1	V
5	50	1998.0	0	2907.8	1	V
5	51	1990.0	0	2900.5	1	V
5	52	1973.0	0	2863.1	1	V
5	53	1960.0	0	2850.7	1	V
5	54	1940.5	0	2800.6	1	V
5	55	1929.5	0	2789.4	1	V
5	56	1922.0	0	2788.2	1	V
5	57	1903.0	0	2783.2	1	V
5	58	1881.0	0	2764.5	1	V
5	59	1874.0	0	2765.6	1	SC?
5	60	1861.0	0	2671.7	1	V
5	61	1833.0	0	2651.7	1	V
5	62	1824.0	0	2600.8	1	V
5	63	1821.5	0	2598.0	1	V
5	64	1816.0	0	2594.0	1	V
5	65	1812.5	0	2584.0	1	V
5	66	1808.0	0	2583.6	1	V
5	67	1802.0	0	2531.2	1	V
5	68	1767.0	0	2529.3	1	V
5	69	1743.0	0	2496.7	1	V
5	70	1734.5	0	2479.3	1	V
5	71	1730.5	0	2476.7	1	V
5	72	1715.0	0	2445.3	1	V
5	73	1703.0	0	2428.4	1	V
5	74	1695.5	0	2421.7	1	V
5	75	1693.0	0	2427.7	1	V
5	76	1690.0	0	2423.6	1	V
5	77	1682.0	0	2411.6	1	V
5	78	1672.5	0	2392.0	1	V
5	79	1659.6	0	2375.5	1	V
5	80	1643.0	0	2333.4	1	V
5	81	1609.0	0	2286.1	1	V
5	82	1569.0	0	2231.2	1	V
5	83	1536.0	0	2184.2	1	V
5	84	1497.0	0	2130.4	1	V
5	85	1461.0	0	0000.0	1	T
5	86	1465.0	0	2085.6	1	V
5	87	1823.0	0	2601.0	1	S
5	88	1768.2	0	2528.0	1	S
5	89	1744.2	0	2496.7	1	S
5	90	1734.5	0	2479.4	1	S
5	91	1695.7	0	2427.4	1	SA,T
5	92	1695.5	0	2421.0	1	S
5	93	1681.7	0	2409.5	1	S
5	94	2288.5	0	3333.0	1	S
5	95	2275.5	0	3331.0	1	S
5	96	2081.4	0	3021.5	1	S
5	97	1973.0	0	2862.9	1	SA,T

START COL ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

5	98	1973.0	0	0000.0	1	SF
5	99	1973.0	0	0000.0	1	SF
4	100	1971.8	0	2862.5	1	S
4	101	1812.5	0	2585.1	1	SA,SF
4	102	1812.5	0	2580.5	1	S
4	103	1816.3	0	2594.1	1	SA,T
4	104	1816.0	0	2594.1	1	S
4	105	1672.5	0	2390.6	1	T
4	106	1672.3	0	2390.3	1	SA,T
4	107	1672.1	0	2383.2	1	T
4	108	1672.6	0	2385.9	1	T
4	109	1672.7	0	2387.9	1	T
4	110	1663.5	0	2373.3	1	SA,T
4	111	1660.1	0	2373.4	1	SA,T
4	112	1659.9	0	2371.4	1	S
4	113	2032.0	0	2979.9	1	S
4	114	1766.5	0	2524.7	1	S
4	115	1730.7	0	2474.9	1	S
4	116	2843.0	0	0000.0	1	T,SF
4	117	2842.8	0	0000.0	1	T
4	118	2843.0	0	0000.0	1	T
4	119	2761.0	0	0000.0	1	T
4	120	2684.0	0	3976.5	1	V,OP?
4	121	2461.0	0	3547.2	1	V
4	122	2481.5	0	3577.5	1	V
4	123	2843.0	0	0000.0	1	T
4	124	2761.0	0	0000.0	1	T
4	125	2684.0	0	3986.5	1	V,OP?
4	126	2679.0	0	3946.1	1	V,OP?
4	127	2683.5	0	3976.2	1	V,OP?
4	128	2657.5	0	3937.3	1	V,OP?
4	129	2619.0	0	3785.5	1	V?
4	130	2615.5	0	3813.5	1	V,OP?
4	131	2600.9	0	3792.8	1	V,OP?
4	132	2596.5	0	3779.2	1	V
4	133	2590.8	0	3762.3	1	V
4	134	2585.7	0	3762.0	1	V
4	135	2571.5	0	3758.4	1	V
4	136	2562.0	0	3759.0	1	SÇ?
4	137	2549.0	0	3706.1	1	V
4	138	2543.0	0	3705.6	1	V
4	139	2531.0	0	3742.2	1	V
4	140	2521.5	0	3736.1	1	V
4	141	2512.5	0	3724.9	1	V?
4	142	2508.0	0	3631.1	1	V?
4	143	2500.5	0	3602.4	1	V
4	144	2492.0	0	3590.3	1	V
4	145	2487.5	0	3585.5	1	V
4	146	1703.0	0	2426.6	1	V
4	147	1695.5	0	2419.4	1	V
4	148	1693.0	0	2426.9	1	V
4	149	1682.0	0	2411.2	1	V
4	150	2823.0	0	0000.0	1	SF
4	151	2843.0	0	0000.0	1	SF

START
COL ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8

START COL						
4	152	2642.8	0	4723.6	1	T
4	153	2761.0	0	4279.1	1	T
4	154	2664.0	0	3947.4	1	T
4	155	2679.0	0	0000.0	1	T
4	156	2679.0	0	3946.4	1	SA,T
4	157	2679.3	0	3943.5	1	S
4	158	2615.5	0	0000.0	1	SF
4	159	2615.5	0	0000.0	1	SF
4	160	2615.6	0	3822.8	1	SA,T
4	161	2616.0	0	0000.0	1	T
4	162	2615.9	0	3803.7	1	SA,T
4	163	2615.4	0	3786.4	1	SA,T
4	164	2616.2	0	3799.0	1	SA,T
4	165	2618.8	0	3785.4	1	S

4	COMMENT KEY:	V	VALID
18		S	SAMPLE
18		SA	SAMPLE ATTEMPTED
18		T	TIGHT
18		SF	SEAL FAILURE
18		SC	SUPERCHARGED
18		OP	OVERPRESSURED

TABLE 3

SNAPPER-5 RFT SAMPLES

RFT No.	Depth[1,2] (mSS)	Temp. (°C)	Chamber Size (L)	Choke Size (mm)	Fill Time (min)	Sample SI Pressure (psia)	Sample Surface Pressure (psig)	Sample Contents: Gas (ft^3)	Sample Contents: Oil (L)	Sample Contents: Water (L)	Sample Contents: Cond. (L)	Oil Description: API @ 15°C	Oil Description: Pour Point (°C)	Water Type	Cond. API @ 15°C
2/16	1381.5	66.3[1]	45.4	0.76	14	1974.2	1500	163.6	-	0.8	0.3	-	-	Form	65
			10.4	1.02	3	1974.2	1450	36.2	-	0.1	0.1	-	-	Form	-
3/17	1383.5	66.5[1]	45.4	0.76	15	1976.5	1400	83.0	42.5	-	-	39.5	22	-	-
			10.4	1.02	3	1976.4	1200	21.2	8.5	-	-	44.3	21	-	-
4/18	1389.5	66.9[1]	45.4	0.76	15	1981.8	1200	81.7	35	5	-	44.3	19.2	Form	-
			10.4	1.02	4	1981.8	1150	26.2	6	2	-	43.7	19.7	Form	-
6/87	1823.0	85.6	22.7	0.76	2	2599	1500	49.6	22	-	-	39	24	-	-
			10.4	0.76	3	2600	-	Preserved Chamber RFS-AD1220							
7/88	1768.2	82.2	22.7	0.76	3	2535	1450	49.0	21.5	-	-	40.1	24	-	-
			10.4	0.76	1	2537	1370	29.8	10.0	-	-	41.0	24	-	-
8/89	1744.2	82.7	22.7	0.76	15[2]	2501	1500	31.2	18.5	-	-	38.1	25	-	-
			10.4	0.76	5	2505	1380	17.5	8.0	-	-	40.2	24.5	-	-
9/90	1734.5	83.5	22.7	0.76	1	2487	600	1.4	-	23	-	-	-	Form	-
			10.4	0.76	0.5	2489	450	0.9	-	9.8	-	-	-	Form	-
10/92[3]	1695.5	82.9	22.7	0.76	2	2428	1310	20.1	11.8	9.8	-	40.5	24	Filt.	-
			10.4	0.76	1	2429	1350	17.4	6.8	2.0	-	41.4	24.5	Filt.	-
11/93	1681.7	82.5	22.7	0.76	1	2416	1100	9.0	3.3	18.8	-	37.7	23.5	Filt.	-
			3.8	0.51	3	2417	-	Preserved Chamber RFS-AD1116							
12/94	2288.5	91.4	22.7	0.76	53	3346	2200	51.5	Film	12.8	-	-	-	Filt.	-
			10.4	0.76	55	3352	1950	47.8	-	2.0	Scum	-	-	Filt.	-

(4165f:8)

..... /2

TABLE 3 (Continued)

SNAPPER-5 RFT SAMPLES

RFT No.	Depth (mSS)[12]	Temp. (°C)	Chamber Size (L)	Choke Size (mm)	Fill Time (min)	Sample SI Pressure (psia)	Sample Surface Pressure (psig)	Sample Contents: Gas (ft^3)	Oil (L)	Water (L)	Cond. (L)	Oil Description: API @ 15°C	Pour Point (°C)	Water Type	Cond. API @ 15°C
13/95	2275.5	89.2	22.7	0.76	49[4]	-[5]	2000	70	-	9.8	Tr	-	-	Filt.	-
			10.4	0.76	33	3335	1875	48.4	-	1.8	Scum	-	-	Filt.	-
14/96	2081.4	88.7	22.7	0.76	3	3026	2000	112.4	-	3.0	Scum	-	-	Filt.	-
			10.4	0.76	2	3028	1775	51.4	-	0.8	Scum	-	-	Filt.	-
15/100[6]	1972.8	88.6	22.7	0.76	3	2868	1825	41.3	-	15.0	Scum	-	-	Filt.	-
			10.4	0.76	2	2870	1725	40.6	-	2.3	Scum	-	-	Filt.	45.9
16/102[7]	1812.5	84.3	22.7	0.76	2	2590	600	1.4	-	27	Tr	-	-	Filt.	-
			10.4	0.76	4	2594	500	1.0	-	10	Tr	-	-	Filt.	-
17/104[8]	1816.0	87.2	22.7	0.76	60	2598	900	3.2	0.5	18.5	-	39.8	27	Filt.	-
			10.4	0.76	30	2588	400	4.7	1.5	3.3	-	40.6	27	Filt.	-
18/112[9]	1659.9	79.2	22.7	0.76	3	2378	1550	24.2	-	17	Scum	-	-	Filt.	-
			10.4	0.76	3	2381	1500	41.1	-	1.5	0.01	-	-	Filt.	45.6
19/113	2032.0	95.1	22.7	0.76	4	2982	1825	33.1	-	5.4	0.05	-	-	Filt.	51.1
			10.4	0.76	3	2989	1675	47.1	-	1.0	Scum	-	-	Filt.	-
20/114	1766.5	85.6	22.7	0.76	23	2534	1700	96.7	-	1.7	0.08	-	-	Filt.	-
			3.8	0.51	2	2534	-	Preserved Chamber RFS-ADI123							
21/115	1730.7	84.3	22.7	0.76	5	2482	1670	77.2	-	6.0	0.05	-	-	Filt.	61.6
			3.8	0.51	3	2486	1625	16.1	-	0.5	Scum	-	-	Filt.	-
23/157[10]	2679.3	110.7	45.4	0.76	13	3962	400	3.7	-	42.5	-	-	-	Form.	-
			3.8	0.51	2	3962	300	Tr	-	3.5	-	-	-	Form.	-
24/165[11]	2618.8	101.3	45.4	0.76	3	3815	100	0.4	-	34.0	-	-	-	Filt.	-
			10.4	0.76	-	-	-	-	-	-	-	-	-	-	-

(4165f:9)

TABLE 3

Notes:

1. Temperatures are from pretests 1/6, 1/5 and 1/4 at the same depths.
2. Estimate of fill time.
3. First sample attempt at 1695.7m SS was abandoned because of tight formation. The 22.7 litre container was opened for 20 minutes at this depth.
4. Both the 22.7 litre and the 10.4 litre containers were closed early because of slow fill.
5. No sample S.I. pressure was recorded for the 22.7 litre container. The corresponding pressure for the 10.4 litre container was taken before it had stabilised.
6. RFT 15/97 at 1973.0m SS was abandoned after opening the 22.7 litre container because of very slow pressure recovery. RFT's 15/98 and 15/99 were abandoned because of seal failure.
7. RFT 16/101 had a seal failure while sampling to the 22.7 litre container. RFT 16/102 consequently found mud in that chamber.
8. RFT 17/103 at 1816.3m SS was abandoned because of slow pressure recovery during sampling to the 22.7 litre container. The fill times for RFT 17/104 are estimated.
9. RFT's 18/105 to 18/111 were attempts to sample around 1672.5m SS, 1663.5m SS and 1660.1m SS. All attempts were unsuccessful because of tight formation. The 22.7 litre container was opened during RFT's 18/106, 18/110 and 18/111.
10. RFT's 23/150 to 23/156 were attempts to sample around 2843.0m SS, 2761.0m SS, 2684.9m SS and 2679.3m SS. Again, all attempts were unsuccessful because of tight formation. The 22.7 litre container was opened during RFT's 23/155 and 23/156.
11. RFT's 24/158 to 24/164 were attempts to sample around 2615.5m SS. The 22.7 litre container was opened in RFT's 24/160, 24/162 to 24/164.
12. KB to SS is -21m.