W930

WCR vol. 2
Kipper -1
(W930)

WELL COMPLETION REPORT
KIPPER-1
INTERPRETED DATA
VOLUME 2

GIPPSLAND BASIN
VICTORIA

ESSO AUSTRALIA LIMITED

Compiled by: M.FITTALL

FEBRUARY 1987

KIPPER 1

WELL COMPLETION REPORT

VOLUME 2

(Interpretative Data)

CONTENTS

1. Geological and Geophysical Analysis

FIGURES

1. Stratigraphic Table

APPENDICES

1. Micropalaeontological Analysis
2. Palynological Analysis
3. Quantitative Log Analysis
4. Wireline Test Report
5. Geochemical Report
6. Synthetic Seismic Trace
7. Production Test Report
8. Petrography Report
9. Dipmeter Analysis Report

ENCLOSURES

1. Geological Cross Section (Dwg. No. 2340/OP/9)
2. Top of Coarse Clastics Structure Map (Dwg. No. 2340/OP/13)
3. Base of Post-Volcanics Structure Map (Dwg. No. 2351/OP/8a)
4. Top of S-1 Gas Structure Map (Dwg. No. 2351/OP/10a)
5. Well Completion Log

Doc. 2525L/1

GEOLOGICAL AND GEOPHYSICAL ANALYSIS

PROGNOSIS (KB = 21 ASL)

Formation/Horizon	Pre-Drill Depth (mSS)	Post-Drill Depth (mSS)
SEASPRAY GROUP	95	94
LATROBE GROUP	1413.0	1398.5 +21 = MKB.
Top of "coarse clastics"		1438.0
Intra-Campanian seismic marker	1862.0	
Top of Volcanics		1872.0
Base of Volcanics		1968.0
Top of Strzelecki Group	2058.0	
TOTAL DEPTH	2100.0	2854.0

INTRODUCTION

Kipper-1 was the second well drilled by Esso Australia Ltd. as part of the farmin by EEPA and BHPPA into permit VIC/P19 in the north-eastern part of the Gippsland Basin. The well drilled a fault-dependent closure located on the lowside of a NW-SE trending fault.

Kipper-1 successfully tested the secondary target of a small anticlinal closure at the top of the Latrobe Group, where a small oil accumulation was discovered in Early to Mid Eocene age sediments. The well also successfully tested the primary intra-Latrobe fault-seal dependent target, where three small oil accumulations were discovered in latest Cretaceous sediments, and the major Kipper gas field discovered in Late Cretaceous sediments.

GEOLOGICAL DISCUSSION

Stratigraphy (Figure 1; Enclosure 1; Appendix 1,2)

Kipper-1 penetrated 1304.5m of Miocene to Pliocene Seaspray Group, consisting of limestone and calcareous siltstone/claystone. The base of the Seaspray Group is Early Miocene in age (H1 foraminiferal zone).

The Seaspray Group unconformably overlies 17.5m of Gurnard Formation consisting of glauconitic pyritic burrowed siltstone which has been heavily oxidised. The Gurnard Formation is of Mid Eocene age (Lower N. asperus palynological zone), and represents a condensed shallow marine sequence of sedimentation.

The Gurnard Formation unconformably overlies 22.0m of similar unoxidised sediments of Early Eocene age (P. asperopolus palynological zone). These Flounder Formation sediments represent marine infilling of the N-N-E flank of the Tuna-Flounder Channel complex.

The Flounder Formation unconformably overlies the remaining Latrobe Group sediments of Late Cretaceous to Early Eocene age (P. mawsonii to Lower M. diversus palynological zones). The Early Paleocene(Lower L. balmei) to Early Eocene (Lower M. diversus) sequence consists of shales and coals with minor sandstones which are interpreted to have been deposited in a coastal plain environment. Some marine influence near the top is indicated by a coarsening-up sandy sequence between 1480mKB and 1495mKB, and marine dinoflagellate occurrences.

The shaley and coaly Lower L. balmei section overlies a regressive nearshore sand and transgressive marine shale sequence. This latest Cretaceous (top of T. longus) marine transgression is recorded throughout much of the Gippsland Basin. The remainder of the Upper T. longus section consists of interbedded sandstones, siltstones and shales which are interpreted to have been deposited in a flood-plain environment.

The Upper T. longus sequence overlies a 96m thick section of volcanic material interpreted to be extrusive in origin based on its widespread occurrence interpreted from seismic data. Also, vitrinite reflectance and TAI measurements from geochemical analyses suggest the volcanics have not had any heating effects on the immediately underlying and overlying sediments, and therefore support an extrusive origin for the volcanics rather than the alternative intrusive origin. This volcanic material is thought to have been extruded during T. lilliei time based on N. senectus sediments below the volcanics and a poor T. lilliei age dating near the top of volcanics. It appears the Lower T. longus section is not present, and thought to represent a hiatus in deposition on top of the volcanic material at this location.

The volcanics overlie a Late Cretaceous (T. apoxyexinus to N. senectus) sequence consisting dominantly of sandstones with minor siltstone and shales which are interpreted to have been deposited in a fluvial/flood plain environment. Occasional marine influences are indicated by occurrences of marine dinoflagellates, especially over the interval 2487.5mKB to 2192.0mKB. A log break at the base of this section at 2279mKB suggests a possible unconformable contact. Palynological evidence also suggests a minor unconformity higher in the section between the T. apoxyexinus to N. senectus sequences.

The above sandy sequence overlies a distinctive very thick sequence of shales and occasional sands of Late Cretaceous (P. mawsonii/C. triplex) age. This section is informally named the "Kipper Formation". This sequence is interpreted to have been deposited in a lacustrine environment on the basis of the very uniform and regular bedding shown in the lower part of the sequence by the dipmeter, indicating a low energy environment of deposition. Some restricted marine influence is indicated by palynological data. This early Latrobe Group sequence has been deposited during the rift phase development of the Gippsland Basin. A plate tectonic reconstruction during this time would indicate the Gippsland Basin is not likely to have been exposed to an open marine setting. Therefore, an alternative deep marine environment of deposition for the "Kipper Shale" is not favoured. A similar thick shale sequence of comparable age, showing the same distinctive regular dipmeter pattern was encountered in Wirrah-2 in the northwestern part of the Gippsland Basin. A similar thick shale sequence of comparable age was encountered in Tuna-1, to the west of Kipper-1. P. mawsonii age sediments, which are sandier than in the above wells, are interpreted to have been drilled in Hammerhead-1, to the east of Kipper-1.

Structure and Seal (Enclosures 2-5)

The Kipper structure is a dominantly fault-dependent closure located on the lowside of a NW-SE trending normal fault. The structure is interpreted to have formed as the result of a late compressive event inverting this normal fault, as indicated by structuring at the top of the Latrobe Group level, and from interpretation of seismic data. This late compressive event is clearly indicated to the north by the Leatherjacket, Wahoo and Flathead structures.

Interpretation of the seismic horizons mapped pre-drill has been revised by post-drill interpretation. The top of Latrobe Group was penetrated 14.5m high to prediction (See Prognosis). The marker picked as the top of Latrobe Group is now interpreted to correspond to the base of the Gurnard Formation. The pre-drill Intra-Campanian Marker is now interpreted as the top of the volcanics. This horizon was penetrated 10m low to the predicted Intra-Campanian Marker. The pre-drill top of Strzélecki Group marker is thought to represent an event near the top of the S-1 gas accumulation; the Strzelecki Group was not penetrated by Kipper-1.

Examination of the processed dipmeter shows a possible fault plane at 2554mKB where a marked change in dip pattern occurs (Appendix 9). It is not clear from seismic interpretation if Kipper-1 drilled the fault bounding the structure. Palynological data does not have sufficient resolution to indicate missing P. mawsonii section. On the basis of the dipmeter interpretation, Kipper-1 drilled a fault with orientation and displacement direction similar to the bounding fault. However, it is not clear if the fault drilled is a major fault, or a minor synthetic fault.

The top of Latrobe Group oil accumulation (P-1) is sealed by the overlying calcareous sediments of the Seaspray Group, whereas the three Upper T. longus oil accumulations (T-1,2,3) are top-sealed by intra-Latrobe Group shales. The P-1 and T-1 zones are thought to be trapped in the small independent closures mapped, while the T-2 and T-3 zones are thought to include a minor component of fault-seal provided by the juxtaposed shaley Latrobe Group section.

The S-1 gas accumulation is top-sealed by the overlying volcanics. Closure is not mapped at the Base of Volcanics level on the highside of the fault, so the S-1 gas cannot be contained in a valid trap if the fault leaks. No fault independent closure is mapped at the Base of Volcanics level on the lowside of the fault, so therefore the S-1 gas is trapped by a sealing fault. Two alternative fault-seal mechanisms are possible. The emplacement and subsequent alteration of impermeable volcanic material in the fault plane may provide a mechanism for sealing the fault. Alternatively, it is possible that impermeable "Kipper Formation" shale or Strzelecki Group could be juxtaposed against the reservoir across the fault plane. Interpretation of either of these geometries is possible from the seismic data.

<u>Reservoir and Hydrocarbons</u> (Appendices 3, 4, 5 & 7)

Kipper-1 discovered 20.0m gross of oil shows (from 1425.0mKB) in cuttings and cores 1-3, reservoired in the poor quality Gurnard Formation and <u>P</u>. <u>asperopolus</u> units at the top of the Latrobe Group. Detailed log analysis indicates only 2.8m within the <u>P</u>. <u>asperopolus</u> unit can be considered net oil sand (referred to as the P-1 oil zone), with a free OWC at 1445.0mKB which is consistent with shows noted in Core 3. The P-1 zone is calculated to have an average porosity of 21% and an average oil saturation of 42%, which is regarded as a low estimate because an RFT sample taken at 1437.7mKB recovered 18.0 litres of oil with an API gravity of 46.6^{o}. Geochemical analysis of this oil suggests it has undergone mild biodegradation.

Kipper-1 discovered a 3.8m gross oil column (3.5m net) in an Upper <u>T</u>. <u>Longus</u> sand, from 1735.3mKB to 1739.0mKB (hence referred to as the T-1 oil zone). An OWC was not seen for this T-1 zone, but RFT pressure data suggests the total column is not much larger than encountered. Log analysis calculates an average porosity of 21% and an average oil saturation of 48%. An RFT sample taken at 1736.5mKB recovered 40.0 litres of 34.7^{o}API oil, which is an unusually low gravity for the Gippsland Basin and is due to a larger component than usual of napthenic hydrocarbons in the oil.

Kipper-1 discovered a 17.0m gross oil column (11.0 net) in Upper <u>T</u>. <u>longus</u> sands, from 1797.5mKB to an interpreted OWC at 1814.5mKB. RFT pressure data is not conclusive but is not inconsistent with this OWC. Log analysis calculates an average porosity of 22% and an average oil saturation of 56% for this T-2 oil zone. An RFT sample taken at 1801.4mKB recovered 28.0 litres of 52.8^{O}API oil.

Kipper-1 discovered a further 16.5m gross oil column (10.0m net) in Upper *T. longus* sands, from 1822.5mKB to an OWC at 1839.0mKB. RFT pressure data is also not conclusive but is not inconsistent with this OWC. Log analysis calculates an average porosity of 21% and an average Sw of 40% for this T-3 oil zone. An RFT sample taken at 1823.2mKB recovered 34.5 litres of 45.0°API oil. Two thin water sands separate the T-2 and T-3 oil sands.

The distribution of the above four oil zones throughout the stratigraphic section, and the variation in API gravities suggest that each accumulation has been generated at slightly different levels of maturation, and have taken different migration pathways to the respective reservoirs.

Kipper-1 discovered a 290m gross gas column (191.8m net) over the interval 1989.0mKB to 2279.0mKB, reservoired in *T. apoxyexinus* and *N. senectus* sands, hence referred to as the S-1 gas accumulation. A basal contact to the gas column was not seen. The overall net:gross of the S-1 gas zone is 66%. The upper 211m has an average porosity of 18% with a corresponding average gas saturation of 80%, while the lower 79m has an average porosity of 14% with a corresponding gas saturation of 75%. Permeabilities of 500-1000md are interpreted from data collected during the production test which was conducted in the top of the reservoir. A petrographic examination of several sidewall core thin sections taken throughout the S-1 reservoir suggests that the poorer porosities towards the base are due to a higher proportion of rock fragments and depositional matrix, rather than diagenetic cements (Appendix 8). The two examples studied from the poor quality section are poorly sorted conglomeratic sandstones. Also, authigenic kaolinite clay is present throughout the reservoir.

Several RFT samples were taken throughout the S-1 gas column, recovering wet gas and condensate with API gravities which decrease from 52.7° to 39.9° towards the base of the gas. Analysis of gas samples by Corelab, shows the gas to contain 10-18% CO_2. RFT pressure data shows the gas forms a single hydraulic system with a maximum pore pressure of 9.7ppg MWE at the top and interprets a deepest possible GWC at 2312mKB (-2291m), giving a total potential 326m gross gas column. This interpretation assumes the uphole water gradient and no downdip oil-leg. However, a downdip oil-leg could be present. Compositional analyses of gas samples indicate the gas has sufficient "wet" components to support a downdip oil-leg. Also, PVT analysis of a gas sample from 2028.4mKB shows the dewpoint pressure is similar to the reservoir pressure, suggesting the gas is close to saturation at the top of the reservoir. This is not inconsistent with the presence of a downdip oil-leg.

Production Test No.1 was performed over the interval 2005mKB to 2013mKB, and flowed gas at 24.5 MSCF/D through a 1" choke. The condensate yield was 21.4 STB/MSCF of 54.6°API condensate, which is similar to the moderate condensate yields encountered by RFT sampling.

Log analysis indicates Kipper-1 discovered 13.8m gross (11.0m net) gas-bearing sands over the interval 2440.0mKB to 2469.8mKB. These sands have average porosities of 13% to 17% and average gas saturations of 17% to 28%, and therefore are interpreted to be water productive. A further 6.0m gross (2.8m net) gas sands are interpreted over the interval 2437.0mKB to 2579.3mKB, with average porosities of 10% to 15% and gas saturations of 37% to 61%. These sands are thin and interpreted to be isolated accumulations, possibly stratigraphically trapped.

Kipper-1 encountered two thin abnormally pressured sands between 2832mKB (-2811m) and 2848mKB (-2827m), with a pore pressure of 9.8ppg MWE. Gas and a trace of possible oil was recovered by RFT from the lower sand, which is calculated to have an average porosity of 14% and an average gas saturation of 72%. These sands did not give any liquid hydrocarbon shows during drilling and are interpreted to be gas productive. The possible oil has a measured API gravity of 39.3°, and may be a mixture of condensate and waxy oil. These deep hydrocarbons are thought to have a significant stratigraphic trap component based on the mild overpressure, and are probably not very extensive. The presence of these deep hydrocarbons suggest further hydrocarbon potential may exist deep in the Kipper structure, if adequate reservoir is present.

Geochemical analysis of cuttings samples indicate the Latrobe Group has fair to good source potential above the volcanics, with average TOC's of about 1%. The Latrobe Group below the volcanics, particularly the thick shaley "Kipper Formation", has very good source potential with TOC's averaging 2%, and is indicated to be gas and probably condensate prone. Geochemical analyses also suggest the Latrobe Group is mature below approximately 2300mKB in Kipper-1. The P and T oil zones are interpreted to have been sourced from Latrobe Group sediments above the volcanics which would be mature further out (and deeper) in the Gippsland Basin, and to have migrated updip into the Kipper structure. The S-1 gas is interpreted to have been sourced from the underlying shaley "Kipper Formation" which is presently mature in the vicinity of the Kipper location.

GEOPHYSICAL DISCUSSION

Seismic coverage in the area of the Kipper Prospect is provided by the G81A, S81A and G85A surveys, forming a regular grid of lines with approximately 0.5km spacing. The bulk of the coverage is provided by the S81A and G85A surveys.

Each data set has been used in this latest interpretation. Migrated versions of S81A lines are available over the Kipper Prospect and all G85A lines have been migrated. Character ties between each survey are usually fair to good. A lag adjustment of +12 msec. is required to be added to the data recorded by Shell to tie the Esso data.

Data quality varies vertically down the section. It is good above the top of the intra-Latrobe volcanics, with the top of the Latrobe Group manifested as a well developed continuous trough. Data quality degrades to poor below the interpreted top of the volcanics.

Three seismic horizons have been interpreted. These are the Top of Latrobe Group, the Base of the Post-Volcanics section (top of volcanics, where present) and the Base of Volcanics. Kipper-1 was used as the tie point for each of these horizons.

Hand smoothed Vnmo maps and conversion factors from Kipper-1 were used to convert the Top of Latrobe Group and Base of Post-Volcanics time maps to depth. The depth to Base of Volcanics was calculated using the interval velocity of the volcanics determined by the Kipper-1 velocity survey.

The velocity data base was prepared using the velocity analyses used to process both G85A and S81A surveys. These analyses were generated every 0.5km for the G85A survey, and 1.0km spacing for the S81A survey. This velocity field was intersected with the time files for both the Top of Latrobe Group and Base of Post-Volcanics seismic horizons. These maps were then hand smoothed, digitised and merged with the appropriate line files for depth calculations. The smoothed velocity maps reflected the gross structural configuration, showing a regular increase in velocity with depth, which is modified by the Kipper structure and associated faults.

Conversion factors for each of these horizons were calculated using the time-velocity pairs and depths at Kipper-1. The average velocities calculated were within 1% and 2% of the average velocities from the Kipper-1 velocity survey to the Top of Latrobe Group and Base of Post-Volcanics horizons respectively.

<u>Top of Latrobe Group</u> (Enclosure 2)

The top of the Latrobe Group was penetrated 14.5m high to prediction. The pre-drill pick is now interpreted to represent the base of the Gurnard Formation. The depth map shows only slight modifications in configuration compared to the time structure map. The configuration of a south westerly trending regional nose, which has the structuring associated with the Kipper accumulation, remains intact. A small closure is mapped which is associated with the crest of the structure and which controls the small oil accumulation found in the upper Latrobe Group at Kipper-1.

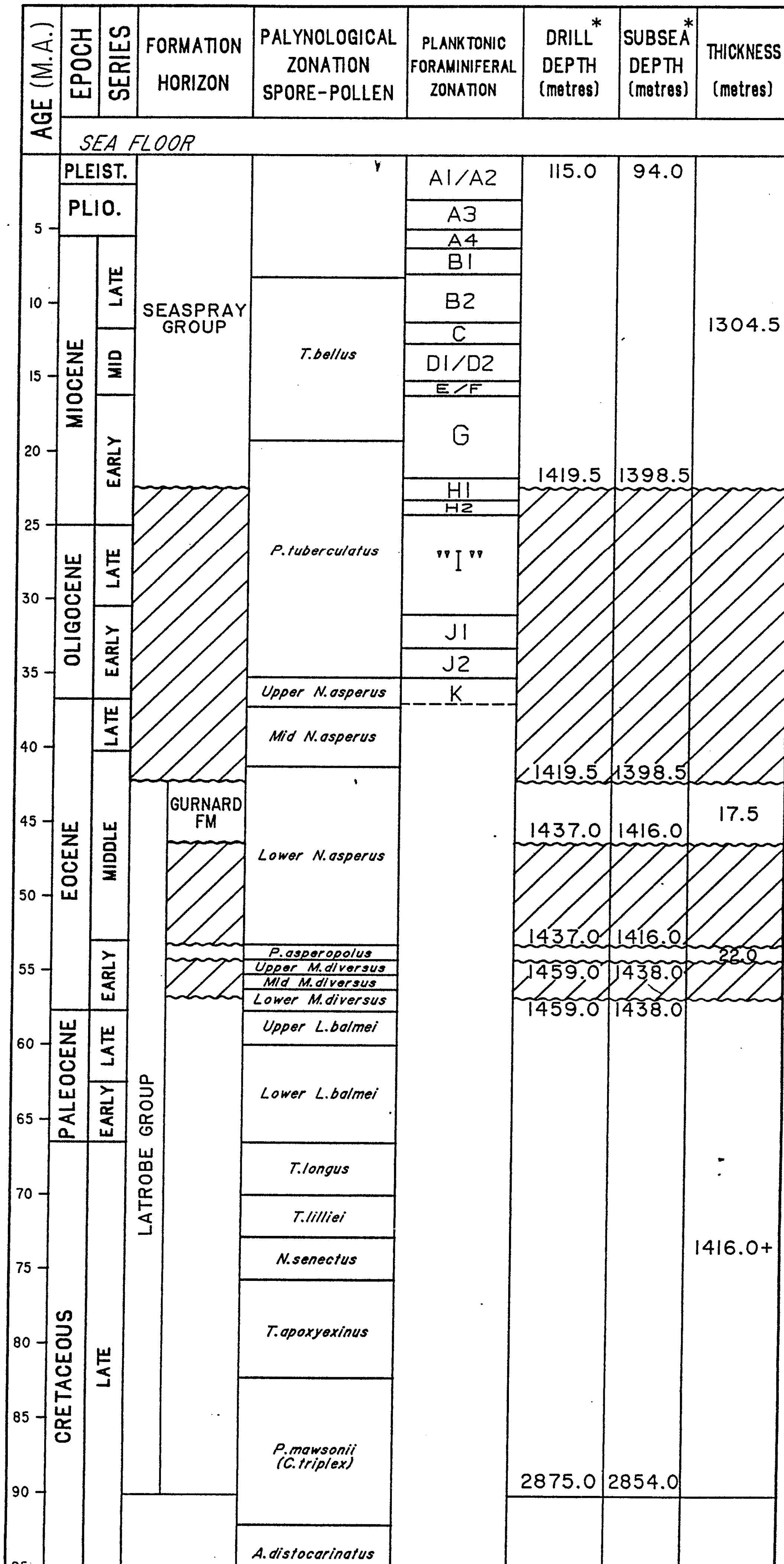
<u>Base of Post-Volcanics</u> (Enclosure 3)

The pre-drill Intra-Campanian marker is now interpreted to represent the top of the volcanics, which was penetrated 10m low to prediction. The depth map is only slightly different configuration from the equivalent time map.

<u>Base of Volcanics</u> (Enclosure 4)

The map represents the top of the Kipper S-1 gas reservoir. It shows the reservoir is top sealed by the volcanics and its northern limit is controlled by the Kipper Fault.

KIPPER-1
STRATIGRAPHIC TABLE



DFT.KIPPER.STRAT.TABLE 11-86

DWG. 2340/OP/8

Appendix 1

APPENDIX 1

MICROPALEONTOLOGICAL ANALYSIS

FORAMINIFERAL ANALYSIS - KIPPER-1
GIPPSLAND BASIN

by
M.J. Hannah

ESSO AUSTRALIA LTD.
PALAEONTOLOGY REPORT NO. 16 / 1986 APRIL 1986

2236L

INTRODUCTION:

Five washed residues from near the top of the Latrobe Group in Kipper-1 have been examined and their foraminiferal assemblages noted.

Sidewall cores 110 and 1418.0m and 111 at 1412.0m contained reasonable foraminiferal assemblages, the remainder were barren.

TOP OF LATROBE GROUP:

The top of the Latrobe group lies between sidewall core 110 at 1418.0m and sidewall core 111 at 1412.0m and is marked, upsection, by a change from a glauconite dominated sand to a recrystallised carbonate. A significant unconformity and/or condensed section occurs between these two samples: sidewall core 100 being dated as Late Eocene/Early Oligocene and sidewall core 111 being assigned an Early Miocene age.

BIOSTRATIGRAPHY:

ZONE K. Late Eocene-Early Oligocene SWC 110 at 1418.0m

The K zonal determination is based on the identification of Globigerina linaperta, Globorotalia postcretacea and Globigerina angiporoides. The absence of Globigerinathaeka index means that an Early Oligocene age for the sample can not be ruled out.

The assemblage recovered was moderately diverse but poorly preserved, the yield, however, was good.

Zone H-1 - Early Miocene; SWC 111 at 1412.5.

The zonal assignment of sidewall core 111 is made difficult by both reworking and contamination. The H-1 determination is based on the presence of Globorotaia miozea and Globigerina woodi connecta without Globigerinoides trilobus.

Reworked into this assemblage is Globorotalia postcretacea and Globigerina linaperta, both Late Eocene/Early Oligocene species. The presence of the Late Miocene species Globorotalia pandus is considered to be due to down-hole contamination.

The assemblage obtained was of moderate yield and fair preservation.

DEPTH (M)	SWC NO.	PLANKTONIC MICROFOSSIL YIELD	PRESERVATION	ZONE	AGE	LITHOLOGY
1464.0m	107	Barren		-	Indeterminate	fine grained quartz sand, micaceous.
1457.0	108	Barren		-	Indeterminate	fine grained quartz sand
1421.0	109	Barren		-	Indeterminate	shaly fine quartz sand, abundant oxidized glauconite
1418.0	110	Good	poor	K	Late Eocene - Oligocene	fine quartz sand, highly glauconitic
1412.0	111	Moderate	fair	H1	Early Miocene	Recrystallized carbonate

DATA SUMMARY KIPPER-1

Appendix 2

APPENDIX 2

PALYNOLOGICAL ANALYSIS

APPENDIX-2

PALYNOLOGICAL ANALYSIS OF KIPPER-1, GIPPSLAND BASIN

by

N. Marshall
and
A.D. Partridge

Esso Australia Ltd
Palaeontology Report 1986/18

September, 1986

2431L

INTERPRETATIVE DATA SECTION

INTRODUCTION

SUMMARY TABLE

GEOLOGICAL COMMENTS

BIOSTRATIGRAPHY

REFERENCES

TABLE-1: INTERPRETATIVE DATA

PALYNOLOGY DATA SHEET

One hundred and six samples, comprising 67 sidewall cores, 21 conventional cores and 18 cuttings samples from Kipper-1 were processed and examined for spore-pollen and dinoflagellates. Only 11 samples were barren. Residue yield was generally moderate, while preservation was poor to fair below the volcanics at 1893-1989m and generally fair to good above them. Similarly, in the Late Cretaceous section below the volcanics diversity is generally low for both spore-pollen and dinoflagellates, while in the latest Cretaceous to Tertiary above the volcanics diversity, although variable is better.

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-3. The occurrence of spore-pollen and dinoflagellate species are tabulated on the accompanying three range charts.

SUMMARY TABLE
KIPPER-1

AGE	UNIT	SPORE-POLLEN / KEY MICROPLANKTON ZONES ZONES	DEPTH (m)
Oligocene- Miocene	Seaspray Group 1419.5m	P. tuberculatus	1412.5
Middle Eocene	Gurnard Fm. 1435.0m	Lower N. asperus/A. diktyoplokus	1427.6-1433.4
Early	Flounder Formation 1461.0m	P. asperopolus	1436.2-1454.4
Early Eocene Early Eocene Paleocene Paleocene Paleocene Maastrichtian Maastrichtian Campanian	Latrobe Group (coarse clastics) 1893.0m	Lower M. diversus Lower M. diversus/A.hyperacanthum Upper L. balmei Lower L. balmei Lower L. balmei/T. evittii Upper T. longus/M. druggii Upper T. longus T. lilliei	1478.0-1486.0 1493.0 1506.0-1562.5 1603.0-1646.0 1727.0 1733.5 1760.0-1855.0 *1895.0
	Volcanics 1989.0m		
Campanian- Santonian	Latrobe Group (coarse clastics) 2279.0m	N. senectus T. apoxyexinus	1995.0-2080.0 2135.0-2196.5
Santonian- Turonian	Kipper Formation TD. 2875.0m	P. mawsonii	2296.5-2862.0

* Pick for T. lilliei Zone is based on cuttings sample.

GEOLOGICAL COMMENTS

1. The lowest 600 metres of section in Kipper-1 is composed predominantly of carbonaceous siltstones and shales (based on sidewall core descriptions) and has a consistent log character. As such it is recognised as a discrete lithological unit referred to as the Kipper Formation of the Latrobe Group. The whole unit is assigned to the *P. mawsonii* Zone which has an age range of Turonian to just into the base of the Santonian (Helby, Morgan & Partridge, in press). Low diversity microplankton assemblages composed of dinoflagellates, acritarchs and algae suggest a restricted marine influence. Some lithological support for this interpretation is indicated by the presence of limestone or carbonate in the formation as sampled by sidewall core at 2756.5m.

2. A moderately diverse microplankton assemblage occurs in the *T. apoxyexinus* Zone over the interval 2187.5-2192.0m and is referred to the informal *Chatangiella perforata* Zone. The assemblage is more diverse than indicated by the few species recorded on the range chart, as many of the microplankton could not be adequately named. Attention is drawn to this zone because it may have significance to the source potential or as a correlation horizon in the deeper parts of the Latrobe Group.

3. Kipper-1 has probably the thickest and best sampled sequence for palynological analysis of the Santonian to Turonian interval in the Gippsland Basin. Overall the composition of the spore-pollen assemblages from the *P. mawsonii* and *T. apoxyexinus* Zones are very similar. Although the distinct log break at the top of the Kipper Formation lies at the boundary between the two zones and may represent an unconformity it is not possible to demonstrate from the palynology whether any section is missing.

4. Predrill the top of the Strzelecki Group was predicted at 2079mKB. This is equivalent to the boundary between the *N. senectus* and *T. apoxyexinus* Zones. Although there is no obvious lithological change on the electric logs there may be an unconformity between the zones. Both the *P. mawsonii* and *T. apoxyexinus* Zones contain restricted marine microplankton assemblages which are not recognised in the overlying *N. senectus* Zone, indicating a shift in facies. Further the lack of key species in the *T. apoxyexinus* Zone suggest that it may represent only the lower portion of that zone. These broad palynological differences suggest some Santonian section may be missing in Kipper-1.

5. The 96 metres of volcanics(?) in Kipper-1 is tightly controlled by the palynological age dating. If extrusive, the volcanics are Campanian.

6. The Cretaceous/Tertiary boundary in Kipper-1 are picked at 1731.5m between the M. druggii and T. evittii dinoflagellate Zones (Helby, Morgan & Partridge in press).

7. The Latrobe Group coarse clastic facies of sands, shales and coals extends into the Early Eocene Lower M. diversus Zone; a sequence similar to the adjacent Tuna-3. The Upper and Middle M. diversus Zones and possibly part of the Lower M. diversus Zone are missing at unconformity at the top of the coarse clastics. This erosional event on the north-north-eastern flank of the Tuna-Flounder Channel is likely to be latest Upper M. diversus Zone in age.

8. All samples analysed from cores-2 and 3 are from the P. asperopolus Zone and are typical of assemblages from the Flounder Formation. Similarly the samples from core-1 are all Lower N. asperus Zone and typical of assemblages from the Gurnard Formation. Assuming core depths are correct the palynology data favours a log pick for the base of the Gurnard Formation at 1434.0 or 1435.0m.

9. A significant unconformity also occurs at the top of the Latrobe with Early Miocene Seaspray Group resting on probable Middle Eocene Gurnard Formation.

The zone boundaries have been established for Tertiary zones using the criteria of Stover & Partridge (1973), and subsequent proprietary revisions, and follows Helby, Morgan & Partridge (in press) for Cretaceous zones.

Phyllocladidites mawsonii Zone: 2296.5 - 2862.0 metres

This zone is a new name proposed by Helby, Morgan & Partridge (in press) for the Clavifera triplex Zone of Dettmann & Playford (1969). The zone has been renamed and the original definition modified because the spore C. triplex has not proved a reliable indicator species. The base of the zone is defined, and recognised in Kipper-1, by the oldest occurrence of P. mawsonii. The oldest occurrence of Proteacidites spp. is an associate indicator for the base of the zone, while the youngest occurrence of Appendicisporites distocarinatus and youngest consistent occurrence of Cyatheacidites tectifera are used to pick the top of the zone. Helby, Morgan & Partridge (in press, fig. 33) also show the youngest consistent occurrence of Interulobites intraverrucatus as occurring within the P. mawsonii Zone. In Kipper-1 the occurrence of this spore is sporadic and it ranges into the base of the overlying zone. The discredited zone indicator Clarifera triplex was only recorded in the highest sample at 2296.5m. Sporadic acritarchs, dinoflagellates and algal bodies occurring in the Kipper Formation are of no age significance.

Tricolporites apoxyexinus Zone: 2135.0 - 2196.5 metres

The base of the zone is defined by the oldest occurrence of Tricolporites apoxyexinus Partridge (in press). Unfortunately, this species was not recorded in Kipper-1, and in general is rare in the Gippsland Basin. Instead a local base to the zone is taken at the oldest occurrence of Tricolpites labrum (manuscript name), albeit with lower confidence. The oldest occurrences of Lygistepollenites florinii (which normally first occurs in the upper part of the P. mawsonii Zone) at 2245.5m, Tricolpites sabulosus and Larobosporites amplus also support this zone assignment. The sidewall core at 2187.5m gave a moderate concentration and moderate yield of microplankton suggesting a significant marine incursion in the Santonian. The interval 2187.5-2192.0m is referred to the informal Chatangiella perforata dinoflagellate Zone. Neither the species nor the zone have yet been described.

Nothofagidites senectus Zone: 1995.0 - 2080.0 metres

The N. senectus Zone is identified from two low yielding sidewall core samples and six cuttings samples. Although the exact limits of the zone may be uncertain the better assemblages obtained from the cuttings samples confirm the presence of approximately 100 metres of this zone in Kipper-1. The Zone is characterised by consistent Nothofagidites senectus in association with Tricolpites labrum and T. sabulosus.

Tricolporites lilliei Zone: 1895 - 1900 metres (cuttings).

The cuttings sample at 1895-1900m assigned with poor confidence to the T. lilliei Zone is considered to represent the maximum age of the sediments immediately above the top of the volcanics at 1893m. The spore-pollen assemblage is considered to be slightly caved rather than derived from the volcanic interval. A T. lilliei Zone age is preferred on the presence of Tricolporites lilliei and Tricolpites labrum. A younger T. longus Zone age is however still possible.

Upper Tricolpites longus Zone: 1733.5 - 1855.0 metres.

The base of this zone is picked with low confidence at the oldest occurrence of the spore Stereisporites (Tripunctisporis) punctatus in cuttings at 1850-1855m. A pick of higher confidence based on the same spore is from core-5 at 1832.5m. The top of the zone is picked at 1735.5m on the youngest occurrence of Quadraplanus brossus. The latter sample is also assigned to the Manumiella druggii Zone on the presence of several specimens of that species.

Lower Lygistepollenites balmei Zone: 1603.0 - 1727.0 metres.

The Lower L. balmei Zone is recognized by its overall assemblage characteristics, particularly the consistent presence of L. balmei, Australopollis obscurus and Gambierina rudata. Confidence in the pick of the base of the zone is increased by the presence of dinoflagellates including Trithyrodinium evittii the key species of the basal Danian T. evittii Zone. The top of the zone is chosen with lower confidence at the highest productive sample below the oldest occurrences of key Upper L. balmei Zone species.

Upper Lygistepollenites balmei Zone: 1506.0 - 1562.5 metres

Two samples are assigned to this zone on the basis of the oldest occurrences of Proteacidites annularis, Malvacipollis subtilis and Proteacidites incurvatus. The bottom sample is also assigned to the Apectodinium homomorphum Zone on the presence of that dinoflagellate.

Lower Malvacipollis diversus Zone: 1478.0 - 1493.0 metres

The base of the zone is represented by a substantial assemblage change and key spore-pollen and dinoflagellates characteristic of the condensed section or transgression at the Apectodinium hyperacanthum dinoflagellate Zone. Most notable is the mangrove palm pollen Spinozonocolpites prominatus (see Partridge, 1976) and the pantropically distributed spore Crassiretitriletes vanraadshoovenii. Other important spore-pollen are Intratriporopollenites notabilis, Cupanieidites orthoteichus and common Malvacipollis diversus. Samples at 1478.0m and 1486.5m have poorer assemblages but are still assigned to the Lower M. diversus Zone on the prominence of M. diversus. The sample at 1464.0m cannot be assigned confidently to a zone on the basis of the assemblage it contains. It is however very likely to still lie in the Lower M. diversus Zone as it lies below the highest coal within the well at 1461-1462m, and is therefore undoubtedly below the base of the Tuna-Flounder Channel.

Proteacidites asperopolus Zone: 1436.2 - 1454.4 metres.

All samples from cores-2 and 3 are referrable to the P. asperopolus Zone. Key and consistently occurring species, in order of importance for diagnosing this zone are: Conbaculites apiculatus, Santalumidites cainozoicus, Proteacidites asperopolus, P. pachypolus and Myrtaceidites tenuis. Two additional important but rare pollen are Clavastephanocolporites meleosus at 1440.44m and Bombacacidites bombaxoides at 1438.0m. Microplankton are generally present in only low concentrations and moderate diversity but they do support the Early Eocene age. The important zone fossil Kisselovia thompsonae was only found in the one sample at 1440.44m. The sporadic occurrence of this important dinoflagellate is typical of wells in the northern end of the Tuna-Flounder Channel. It is considered likely that the 24 metres of Flounder Formation can all be referred to the K. thompsonae Zone.

Lower Nothofagidites asperus Zone: 1427.6 - 1433.4 metres

The three samples from core-1 yielded similar assemblages referrable to both the Lower N. asperus spore-pollen Zone and Areosphaeridium diktyoplokus dinoflagellate Zone. No attempt was made to record the full spore-pollen suite because of the definitive associated dinoflagellates and acritarchs. Therefore diagnostic pollen are restricted to Proteacidites recavus at 1433.4m and Gothanipollis bassensis at 1427.6m. The most important microplankton are Areosphaeridium diktyoplokus and Tritonites tricornus (manuscript name).

Proteacidites tuberculatus Zone: 1412.5 metres

The occurrence of the spore Foveotriletes lucunosus and a moderately diverse dinoflagellate assemblage suggests a correlation with the middle or upper subdivision of the zone (Stover & Partridge, 1973, p. 243). The palynology is consistent with the Early Miocene H1 foraminiferal zone reported by Hannah (1986).

REFERENCES

DETTMANN, M.E. & PLAYFORD, G., 1969. Palynology of the Australian Cretaceous: a review. In Stratigraphy and Palaeontology: Essays in Honour of Dorothy Hill, K.S.W. Campbell, ed., Aust. Nat. Univ. Press Canberra, 174-210.

HANNAH, M.J., 1986. Foraminiferal analysis, Leatherjacket-1 Gippsland Basin. Esso Australia Ltd. Paleo. Rept. 1986/14.

HELBY, R., MORGAN, R. & PARTRIDGE, A.D., in press. A palynological zonation of the Australian Mesozoic. Mem. Ass. Australas. Palaeontols 4.

PARTRIDGE, A.D., in press. Tricolporites apoxyexinus sp. nov., nominate species for a Late Cretaceous spore-pollen zone in Australia. Mem. Ass. Australas. Palaeontols 4.

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 FROM KIPPER-1

SAMPLE TYPE	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 111	1412.5	P. tuberculatus		1	Foveotriletes lucunosus present
Core-1	1427.6	Lower N. asperus	A. diktyoplokus	0	Tritonites tricornus present
Core-1	1430.7	Lower N. asperus	A. diktyoplokus	1	
Core-1	1433.4	Lower N. asperus	A. diktyoplokus	0	Tirtonites tricornus present
Core-2	1436.2	P. asperopolus		1	Depth to top of Core-2 uncorrected
Core-2	1436.6	P. asperopolus		2	
Core-2	1437.0	P. asperopolus		2	
Core-2	1437.5	Indeterminate			Virtually barren
Core-2	1437.72	P. asperopolus		2	
Core-2	1438.0	P. asperopolus		1	Bombacacidites bombaxoides present
Core-2	1438.6	Inderterminate			Sample barren
Core-2	1439.0	Indeterminate			Virtually barren
Core-2	1440.44	P. asperopolus	K. thompsonae	0	
Core-2	1442.8	Indeterminate			
Core-2	1444.5	P. asperopolus		1	
Core-2	1445.4	P. asperopolus		2	
Core-3	1449.8	P. asperopolus		1	
Core-3	1453.8	P. asperopolus		1	
Core-3	1454.4	P. asperopolus		1	
SWC 108	1457.5	Indeterminate			Sample barren
SWC 107	1464.0	Indeterminate	Indeterminate		

TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA FROM KIPPER-1

SAMPLE TYPE	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 106	1478.0	Lower *M. diversus*		2	
SWC 105	1486.5	Lower *M. diversus*		2	Dominated by semi opque kerogen
SWC 104	1493.0	Lower *M. diversus*	*A. hyperacanthum*	0	
SWC 103	1506.0	Upper *L. balmei*		1	
SWC 100	1562.5	Upper *L. balmei*	*A. homomorphum*	2	
SWC 99	1576.6	Indeterminate			Virtually barren
SWC 98	1603.0	Lower *L. balmei*		2	
SWC 96	1646.0	Lower *L. balmei*		2	
SWC 92	1727.0	Lower *L. balmei*	*T. evittii*	0	
SWC 91	1733.5	Upper *T. longus*	*M. druggii*	0	
SWC 90	1743.0	Indeterminate			Barren
SWC 89	1760.0	Upper *T. longus*		1	
Cuttings	1765-70	Upper *T. longus*		3	Common *S.* (*Tripunctisporis*) *punctatus*
SWC 87	1797.0	Indeterminate			Virtually barren
SWC 86	1805.0	Upper *T. longus*		1	
Cuttings	1825-30	Upper *T. longus*		4	
Core-5	1832.5	Upper *T. longus*		1	
Core-5	1835.0	Upper *T. longus*		2	Freq. *T. lilliei*
Core-5	1840.6	Upper *T. longus*		2	
Cuttings	1850-55	Upper *T. longus*		3	Some contamination
Cuttings	1875-80	Indeterminate			

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA FROM KIPPER-1

SAMPLE TYPE	DEPTH (m)	SPORE-POLLEN ZONE	DIONFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 84	1872.0	Indeterminate			
Cuttings	1885-90	Indeterminate			Contamination high
Cuttings	1895-1900	T. lilliei		4	
SWC 60	1990.0	Indeterminate			Barren
Cuttings	1995-2000	N. senectus		3	
SWC 58	1998.0	N. senectus		2	
Cuttings	2000-2005	N. senectus		3	
SWC 57	2008.0	N. senectus		2	Contaminated from T. longus Zone
Cuttings	2015-20	N. senectus		3	
SWC 56	2025.0	Indeterminate			Barren
Cuttings	2045-50	N. senectus		3	
Cuttings	2050-55	N. senectus		3	
SWC 54	2052.0	Indeterminate			
Cuttings	2075-80	N. senectus		4	
Cuttings	2085-90	Indeterminate			
SWC 53	2088.0	Indeterminate			
SWC 79	2095.0	Indeterminate			Barren
Cuttings	2135-40	T. apoxyexinus		3	
SWC 49	2143.0	Indeterminate			Virtually barren
SWC 47	2155.0	T. apoxyexinus		2	
SWC 43	2187.5	T. apoxyexinus	Ch. perforata	2	
SWC 42	2192.0	T. apoxyexinus	Ch. perforata	2	

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA FROM KIPPER-I

SAMPLE TYPE	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 41	2196.5	T. apoxyexinus		2	
SWC 40	2209.5	Indeterminate			Barren
SWC 37	2234.0	T. apoxyexinus-P. mawsonii			
SWC 36	2245.5	T. apoxyexinus-P. mawsonii			
SWC 32	2296.5	P. mawsonii		2	
SWC 78	2307.0	Indeterminate			
SWC 31	2320.0	P. mawsonii		1	
SWC 30	2342.5	P. mawsonii		1	
SWC 77	2357.0	Indeterminate			
SWC 76	2381.0	Indeterminate			
SWC 27	2396.0	P. mawsonii		1	
SWC 75	2408.0	P. mawsonii		2	
SWC 74	2420.0	P. mawsonii		1	
SWC 25	2442.0	Indeterminate			
SWC 24	2451.0	P. mawsonii		1	
SWC 73	2460.0	P. mawsonii		1	
SWC 72	2483.0	P. mawsonii		1	
SWC 71	2493.0	P. mawsonii		2	Freq. algal remains
SWC 21	2500.0	P. mawsonii		2	
SWC 70	2519.0	P. mawsonii		2	

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA FROM KIPPER-I

SAMPLE TYPE	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENTS
SWC 19	2538.0	Indeterminate			
SWC 18	2559.0	P. mawsonii		2	
SWC 69	2581.5	P. mawsonii		2	
SWC 16	2601.0	Indeterminate			
Cuttings	2605-10	Indeterminate			
SWC 15	2617.0	P. mawsonii		1	
SWC 68	2635.5	P. mawsonii		2	
SWC 12	2661.0	P. mawsonii		1	Mud contamination
Cuttings	2685-90	P. mawsonii		3	Common algal remains
SWC 66	2686.0	P. mawsonii		2	Abundant algal remains
SWC 10	2697.0	P. mawsonii		2	
SWC 9	2709.0	P. mawsonii		2	
SWC 65	2730.0	P. mawsonii		1	
Cuttings	2730-35	Indeterminate			Quick scan only
Cuttings	2735-40	P. mawsonii		3	Significant contamination
SWC 7	2756.5	Indeterminate			
SWC 6	2773.0	Indeterminate			
SWC 64	2794.0	P. mawsonii		2	Common algae cysts
SWC 63	2805.0	Indeterminate			
SWC 62	2824.0	Indeterminate			
SWC 3	2839.0	P. mawsonii		1	
SWC 1	2862.0	P. mawsonii		1	

PALYNOLOGY DATA SHEET

BASIN: GIPPSLAND — ELEVATION: KB: +21m GL: -94m(MSL)

WELL NAME: KIPPER-1 — TOTAL DEPTH: 2875.0m

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
	T. pleistocenicus										
	M. lipsis										
NEOGENE	*C. bifurcatus*										
	T. bellus										
	P. tuberculatus						1412.5	1			
	Upper *N. asperus*										
	Mid *N. asperus*										
	Lower *N. asperus*	1427.6	0				1433.4	0			
	P. asperopolus	1436.2	1				1454.4	1			
PALEOGENE	Upper *M. diversus*										
	Mid *M. diversus*										
	Lower *M. diversus*	1478.0	2				1493.0	0			
	Upper *L. balmei*	1506.0	1				1562.5	2			
	Lower *L. balmei*	1603.0	2				1727.0	0			
	Upper *T. longus*	1733.5	0				1855.0	3	1832.5	1	
	Lower *T. longus*										
LATE CRETACEOUS	*T. lilliei*	1895.0	4				1895.0	4			
	N. senectus	1998.0	2				2080.0	4			
	T. apoxyexinus	2135.0	3	2155.0	2		2196.5	2			
	P. mawsonii	2296.5	2	2320.0	1		2862.0	1			
	A. distocarinatus										
	P. pannosus										
	C. paradoxa										
EARLY CRET.	*C. striatus*										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: All depths in metres. Volcanics interval: 1893-1989m
Dinoflagellate Zones: A. diktyoplokus 1427.6-1433.4m,
K. thompsonae 1440.4m, A. hyperacanthum 1493.0m,
A. homomorphum 1562.0m, T. evittii 1727.0m, M. druggii 1733.5m

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

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

DATA RECORDED BY: N. MARSHALL — DATE: JUNE 30, 1986

DATA REVISED BY: A.D. PARTRIDGE — DATE: JULY 29, 1986

BASIC DATA SECTION

TABLE-2: SUMMARY OF BASIC DATA

THREE PALYNOMORPHY DISTRIBUTION CHARTS

2431L:15

TABLE 2: SUMMARY OF BASIC PALYNOLOGICAL DATA FOR KIPPER-I

SAMPLE TYPE	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE POLLEN DIVERSITY	MICROPLANKTON YIELD	MICROPLANKTON NO. SPECIES	SAMPLE CODE
SWC III	1412.5	Calc. clayst.	Very low	Good	Low	Moderate	7+	77921N
Core-I	1427.6	Glauc. sandst.	Moderate	Fair	High	Low	4+	77934S
Core-I	1430.7	Glauc. sandst.	Moderate	Fair-good	Moderate	Moderate	7+	77934T
Core-I	1433.4	Glauc. sandst.	High	Good	High	Moderate	7+	77934U
Core-2	1436.2	Silty sandst.	Moderate	Poor	Low	Low	3	77934A
Core-2	1436.6	Silty sandst.	Low	Poor	Low	Low	3	77934B
Core-2	1437.0	Silty sandst.	Moderate	Poor-fair	Moderate	Low	5	77934C
Core-2	1437.5	Silty sandst.	Very low	Poor	Very low			77934D
Core-2	1437.72	Silty sandst.	Moderate	Poor-good	Moderate	Moderate	7	77934E
Core-2	1438.0	Silty sandst.	Moderate	Good	Moderate	Low	I	77934F
Core-2	1438.6	Silty sandst.	Barren					77934G
Core-2	1439.0	Silty sandst.	Very low	Poor	Very low			77934H
Core-2	1440.44	Sandstone	Moderate	Fair	Low	Low	2	77934I
Core-2	1442.8	Sandstone	Moderate	Fair	Moderate	Low	I	77934J
Core-2	1444.5	Silty sandst.	Moderate	Fair-good	High	Moderate	4+	77934K
Core-2	1445.4	Silty sandst.	High	Fair-good	High	Moderate	5+	77934L
Core-3	1449.8	Siltstone	High	Fair-good	High	Low	2	77934V
Core-3	1453.8	Siltstone	High	Fair-good	High	Low	4	77934W
Core-3	1454.4	Siltstone	High	Good	High	Low	4	77934X
SWC 108	1457.5	Sandstone	Barren					77934X
SWC 107	1464.0	Carb. sandst.	Low	Good	Low			77921J

TABLE 2: SUMMARY OF BASIC PALYNOLOGICAL DATA FOR KIPPER-I

SAMPLE TYPE	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE POLLEN DIVERSITY	MICROPLANKTON YIELD	MICROPLANKTON NO. SPECIES	SAMPLE CODE
SWC 106	1478.0	Coal	High	Very good	Moderate			77921I
SWC 105	1486.5	Silty. glauc. sandst.	High	Fair	Low	Low	1+	77921H
SWC 104	1493.0	Glauc. sandst.	Low	Fair	High	Low	4	77921G
SWC 103	1506.0	Siltstone	Low	Good	Moderate			77921F
SWC 100	1562.5	Siltstone	Moderate	Good	Moderate	Low	3	77921C
SWC 99	1579.6	Sandstone	Very low	Poor	Very low			77921B
SWC 98	1603.0	Coaly shale	Low	Good	Moderate			77921A
SWC 96	1646.0	Shale	High	Good	Moderate			77920Y
SWC 92	1727.0	Sandy siltst.	Low	Good	Moderate	Low	3	77920V
SWC 91	1733.5	Sandy siltst.	Low	Good	Moderate	Low	2	77920V
SWC 90	1743.0	Pyritic sandst.	Barren					77920T
SWC 89	1760.0	Siltstone	Moderate	Good	Moderate			77920S
Cuttings	1765-70		High	Good	High			77930I
SWC 87	1797.0	Sandstone	Very low	Poor	Very low			77920R
SWC 86	1805.0	Silty sandst.	High	Fair-good	High	Low	2	77920Q
Cuttings	1825-30		Moderate	Fair	Moderate			77930J
Core-5	1832.5		Moderate	Good	Moderate			77934M
Core-5	1835.0		Moderate	Good	Moderate			77934N
Core-5	1840.6		Moderate	Good	Moderate			77934R
Cuttings	1850-55		Moderate	Good	Moderate			77930K
Cuttings	1875-80		Moderate	Fair	Moderate			77930L

TABLE 2: SUMMARY OF BASIC PALYNOLOGICAL DATA FOR KIPPER-1

SAMPLE TYPE	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE POLLEN DIVERSITY	MICROPLANKTON YIELD	MICROPLANKTON NO. SPECIES	SAMPLE CODE
SWC 84	1872.0	White sandstone	Low	Poor-fair	Low			77920P
Cuttings	1885.90		Low	Fair-good	Moderate			77930M
Cuttings	1895-1900		Moderate	Fair-good	Moderate			77930N
SWC 60	1990.0	Sandstone	Barren					77919U
Cuttings	1995-2000		Moderate	Fair	Moderate			77930A
SWC 58	1998.0	Sandstone	Low	Fair-good	Moderate			77919S
Cuttings	2000-2005		Moderate	Fair-good	Low			77930B
SWC 57	2008.0	Sandstone	Low	Fair	Low			77919R
Cuttings	2015-20		Moderate	Fair	Low			77930C
SWC 56	2025.0	Sandstone	Barren					77930Q
Cuttings	2045-50		Low	Fair-good	Moderate			77919D
Cuttings	2050-55		Moderate	Fair	Low			77930E
SWC 54	2052.0	Silty Sandst.	Low	Poor	Very low			779190
Cuttings	2075-80		Moderate	Poor	Low			77930F
Cuttings	2085-90		Low	Fair	Low			77930G
SWC 53	2088.0	Siltstone	Low	Fair	Low			77919N
SWC 79	2095.0	Pyritic sandst.	Barren					77920N
Cuttings	2135-40		High	Fair	Moderate			77930H
SWC 49	2143.0	Shale	Low	Poor	Low			77919J
SWC 47	2155.0	Carb. siltstone	Moderate	Fair-good	Moderate			77919H
SWC 43	2187.5	Carb. siltstone	High	Fair-good	High	Moderate	6+	779190
SWC 42	2192.0	Carb. siltstone	Moderate	Poor-fair	Low	Low	2+	77919C

TABLE 2: SUMMARY OF BASIC PALYNOLOGICAL DATA FOR KIPPER-1

SAMPLE TYPE	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE POLLEN DIVERSITY	MICROPLANKTON YIELD	MICROPLANKTON NO. SPECIES	SAMPLE CODE
SWC 41	2196.5	Carb. siltstone.	Moderate	Fair-good	Moderate			77919B
SWC 40	2209.5	Shale	Barren					77919A
SWC 37	2234.0	Silty shale	Low	Fair	Low	Very low	1	77918X
SWC 36	2245.5	Sandstone	Moderate	Fair-good	Moderate	Very low	2	77918W
SWC 32	2296.5	Siltstone	Moderate	Fair	Low	Low	1	77918S
SWC 78	2307.0	Sandy siltstone	Moderate	Fair	Very low			77920M
SWC 31	2320.0	Siltstone	Moderate	Poor-fair	Low	Low	1	77918R
SWC 30	2342.5	Carb. Siltstone	Moderate	Fair-good	Low			77918Q
SWC 77	2357.0	Sandstone	Moderate	Poor	Low			77920L
SWC 76	2381.0	Carb. sandstone	Moderate	Fair	Low			77920K
SWC 27	2396.0	Carb. siltstone	Moderate	Fair	Moderate			77918P
SWC 75	2408.0	Carb. siltstone	Moderate	Fair	Low			77920J
SWC 74	2420.0	Carb. shale	Moderate	Fair-good	Low	Low	2+	77920I
SWC 25	2442.0	Carb. siltstone	Low	Fair	Low			77918O
SWC 24	2451.0	Shale	Moderate	Fair-good	Moderate	Low	1	77918N
SWC 73	2460.0	Carb. siltst.	Moderate	Poor-fair	Low			77920H
SWC 72	2483.0	Siltstone	Moderate	Fair	Low			77920G
SWC 71	2493.0	Siltstone	Moderate	Fair	Low	Low	2+	77920F
SWC 21	2500.0	Shale	Low	Fair	Low			77918M
SWC 70	2519.5	Siltstone	Moderate	Poor-fair	Low	Low	1	77920E

TABLE 2: SUMMARY OF BASIC PALYNOLOGICAL DATA FOR KIPPER-I

SAMPLE TYPE	DEPTH (m)	LITHOLOGY	RESIDUE YIELD	PRESERVATION	SPORE POLLEN DIVERSITY	MICROPLANKTON YIELD	MICROPLANKTON NO SPECIES	SAMPLE CODE
SWC 19	2538.0	Carb. shale	Low	Poor-fair	Low	Low	2	77918L
SWC 18	2559.0	Carb. shale	Moderate	Fair	Moderate	Low	1	77918K
SWC 69	2581.5	Siltstone	Low	Poor	Low			77920D
SWC 16	2601.0	Carb. siltstone	Low	Fair	Low			77918J
Cuttings	2605-10		Moderate	Fair	Low	Low	2	77919P
SWC 15	2617.0	Carb. siltstone	Moderate	Fair	Low			77918I
SWC 68	2635.5	White sandstone	Low	Fair	Low			77920C
SWC 12	2661.0	Calc. siltstone	Moderate	Poor-Fair	Moderate	Low	2	77918G
Cuttings	2685-90		Moderate	Fair	Low	Low	2	77917R
SWC 66	2686.0	Carb. shale	Moderate	Good	Low	Moderate	3	77920A
SWC 10	2697.0	Shale	Moderate	Fair	Low	Low	3	77918F
SWC 9	2709.0	Carb. siltstone	Moderate	Fair	Moderate	Low	1	77918E
SWC 65	2730.0	Carb. siltstone	Low	Fair	Low			77919Z
Cuttings	2730-35		Moderate	Poor-Fair	Low			77917S
Cuttings	2735-40		Low	Poor-Fair	Low			77917T
SWC 7	2756.5	Limestone	Moderate	Poor	Low			77918D
SWC 6	2773.0	Siltstone	Moderate	Poor	Low			77918C
SWC 64	2794.0	Carb. shale	Moderate	Fair-good	Moderate	Moderate	2	77919Y
SWC 63	2805.0	Carb. shale	Moderate	Poor	Low	Low	1	77919X
SWC 62	2824.0	Siltstone	Moderate	Fair	Low			77919W
SWC 3	2839.0	Sandy siltstone	Moderate	Fair	Moderate	Low	2	77918B
SWC 1	2862.0	Sandy siltstone	Moderate	Poor-fair	Moderate	Low	1	77918A

Appendix 3

APPENDIX 3

QUANTITATIVE LOG ANALYSIS

KIPPER-1

QUANTITATIVE LOG ANALYSIS

Interval: 1419.5 - 2850.0m KB

Analyst : A.N. Boston

Date : April, 1986

KIPPER-1 QUANTITATIVE LOG ANALYSIS

SUMMARY

Kipper-1 wireline logs have been analysed for effective porosity and effective water saturation over the interval 1419.5m - 2850.0m 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.

In Kipper-1 a major gas accumulation was discovered over the interval 1989-2279m KB. It has a net thickness of 191.75 metres of sandstone with an average porosity of 17.2% and an average water saturation of 24.8%.

In addition, four oil zones occur over the gross intervals 1419.5-1445.0m, 1735.25-1739.00m, 1797.50-1814.50m, 1822.50-1839.00m KB. The first interval within poor quality sandstone/siltstone of the Gurnard Formation and P.asperus zone has approximately 2.8m of net sand with 20.7% porosity and 58.3% water saturation, based on high density 1.2" data. These values are subject to the results of core analysis. The other oil zones occur in good quality sands with net thicknesses, average porosities and average water saturations of 3.5m, 20.7%, 52.4%; 11m, 21.8%, 43.9% and 10m, 20.8%, 39.9% respectively.

A summary of log analysis results for major hydrocarbon zones are given in Table 1, while Table 2 lists results for individual hydrocarbon sands. Table 3 gives log analysis results for sands interpreted as water bearing.

WIRELINE LOGGING AND QUALITY CONTROL

The following wireline logs were run over the analysed interval:

Suite 2: 1370.0 - 2128.3m KB

DLTE-MSFL-GR } "Super-combo" tool
LDTC-CNTH-GR-AMS } Logs run together.

Suite 3: 1980.0 - 2862.2m KB

DLTE-MSFL-GR } "Super-combo" tool
LDTC-CNTH-GR-AMS } Logs run together.
SDT-DITE-GR (832.0-2860.4m KB)

A knuckle joint was run between the DLT and the LDT in the "super-combo" tool string. The DLT had a 1-1/2" standoff while no standoff was used with the LDT. Raw data was processed using CP28.4 software for the "super-combo" tool and CP27.896 for the SDT-DITE-GR.

The suite 3 density-neutron and resistivity logs were noted to be .75m off depth when compared to those of suite 2. These two suites were first depth aligned then merged before log analysis began. A depth aligned composite tape has been requested from Schlumberger.

The DLTE-MSFL-GR log is generally of good quality for both suite 2 and suite 3. In saline water sands from 1460m to 1850m KB an unusual profile occurs with LLS < LLD < MSFL. The profile was corrected when the environmental corrections for these logs were carried out.

The LDTC-CNTH-GR log is also of good quality. Spectrum quality ratios for the LDT all lie within one standard deviation of their ideal values and the QLS and QSS lie within tolerance of $\pm$0.025 except where adversely effected by washouts or coals.

The DITE Phasor Dual Induction Tool was run for comparison with the Dual Laterolog Tool (DLTE). It was run in combination with the SDT with 1.5" standoff. In saline water sands the phasor induction reads slightly lower resistivities than the dual laterolog (1500-1750m KB). In high resistivity zones (1989-2200m KB) the phasor induction exhibits a poor response with the ILD peaking at values greater than 2000 ohm.m. In these zones ILM < SFL < ILD generally which is a anomalous profile and is not corrected by phasor processing. The SFL reads very close to the LLD values at moderate and high resistivities (10-1000 ohm.m) and is probably a better reading of the true resistivity in these zones. The phasor dual induction tool seems to be little improvement over the standard dual induction and its response is much poorer and less reliable than that of the dual laterolog in high resistivity zones.

LOG ANALYSIS

The following logs were used in the log analysis:

LLD	(Deep Laterolog)
LLS	(Shallow Laterolog)
MSFL	(Micro Spherically Focussed Log)
RHOB	(Density Log)
NPHI	(Neutron Porosity Log)
CALI	(Caliper Log)
GR	(Gamma-ray Log)
LDTL	(Long spaced sonic log)

The LLD, LLS, MSFL, NPHI logs were corrected for borehole and environmental effects using the latest 1985 Schlumberger correction charts. The borehole corrected LLD, LLS and MSFL were combined to derive Rt and depth of invasion logs using chart Rint-9 from 1985 Schlumberger chartbook.

Coals and carbonaceous shales and volcanics (1897.5-1989m KB) were eliminated from the log analysis by setting the density log (RHOB) over these intervals to one. A first approximation of formation salinities was carried out using PHIT, from density-neutron crossplot, and Rt in Archie's equation to derive Rwa. A initial estimate of VSH was derived from density-neutron separation and shale parameters picked from the logs. RHOB (coal corrected), NPHI (borehole corrected), Rt, MSFL (borehole corrected), salinity and the initial VSH estimate were input into a reiterative program using the Dual-Water model to calculate PHIE (effective porosity), SWE (effective water saturation), SXOE (effective water saturation of flushed zone), and VSH (volume of shale). The values of input parameters and equations used in these calculations are set out below.

Analysis Parameters

	Suite 2	Suite 3
TD	2139.5m KB	2873.5m KB
Water Depth + KB	116m	116m
Bit Size	12.25"	12.25"
Mud Weight	10.5 ppg	10.4 ppg
a	1	1
m	2	2
n	2	2
Grain Density - lower limit	2.65 gm/cc	2.65 gm/cc
Grain Density - upper limit	2.67 gm/cc	2.67 gm/cc
Dry Shale Density	2.80 gm/cc	2.80 gm/cc
Mud Filtrate Density	1.005 gm/cc	1.005 gm/cc
Hydrocarbon Density (RHOH)	0.70 gm/cc for oil sands 0.25 gm/cc for gas sands	0.70 gm/cc for oil sands 0.25 gm/cc for gas sands
Bottom Hole Temperature	71° C	82° C
Sea Bottom Temperature	10° C	10° C
Rm	0.123 ohmm @ 71° C	0.102 ohmm @ 82° C
Rmf	0.090 ohmm @ 71° C	0.082 ohmm @ 82° C
Rmc	0.160 ohmm @ 71° C	0.195 ohmm @ 82° C

Shale Parameters

Depth Interval (m KB)	RHOBSH (gm/cc)	NPHISH	RSH (ohm-m)
1419.50 - 1458.75	2.60	0.42	2
1458.75 - 1989.00	2.50	0.33	6
1989.00 - 2850.00	2.60	0.27	17

Apparent Formation Salinities

Depth Interval (mKB)	Salinity (ppm NaClequiv.)
1419.50 - 1458.75	30,000
1458.75 - 1574.00	40,000
1574.00 - 2320.00	45,000
2320.00 - 2850.00	40,000

Shale Volume

An initial estimate of VSH was calculated from density-neutron separation:

$$VSH = \frac{NPHI - \frac{2.65 - RHOB}{1.65}}{NPHISH - \frac{2.65 - RHOBSH}{1.65}} \qquad - 1$$

Total Porosity

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

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

if h is greater than 0, then

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

if h is less than 0, then

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

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

where RHOB = coal corrected bulk density in gms/cc
NPHI = environ. corrected neutron porosity in limestone porosity units.
RHOF = fluid density

Free Water Salinity

Apparent free water salinities are calculated using the following relationships:

$$Rw = \frac{Rt * PHIT^m}{a} \qquad - 6$$

$$\text{Salinity (ppm)} = \left[\frac{300{,}000}{Rw\ (Ti + 7) - 1}\right]^{1.05} \quad -7$$

where Ti = formation temperature in °F.

Bound Water Resistivities (Rwb) and Saturation of Bound Water (Swb)

Rwb and Swb were calculated using the following relationships:

$$Rwb = \frac{RSH * PHISH^{m}}{a} \quad -8$$

where PHISH = total porosity in shale from density-neutron crossplots.
RSH = Rt in shales.

$$Swb = \frac{VSH * PHISH}{PHIT} \quad -9$$

Water Saturations

Water saturations were determined from the Dual Water model using the following relationships:

$$\frac{1}{Rt} = SwT^{n} * \frac{PHIT^{m}}{aRw} + SwT^{(n-1)}\left[\frac{Swb * PHIT^{m}}{a}\left(\frac{1}{Rwb} - \frac{1}{Rw}\right)\right] \quad -10$$

and

$$\frac{1}{Rxo} = SxoT^{n} * \frac{PHIT^{m}}{aRmf} + SxoT^{(n-1)}\left[\frac{Swb * PHIT^{m}}{a}\left(\frac{1}{Rwb} - \frac{1}{Rmf}\right)\right] \quad -11$$

where SwT = total saturation in the virgin formation
SxoT = total saturation in the flushed zone
Rmf = resistivity of mud filtrate
n = saturation exponent

Hydrocarbon Corrections

Hydrocarbon corrections to the density and neutron logs were made using the following relationships:

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

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

where RHOBHC = hydrocarbon corrected RHOB
NPHIHC = hydrocarbon corrected NPHI
RHOH = hydrocarbon density
P = mud filtrate salinity in parts per unity

Grain Density

Grain density (RHOG) was calculated from the hydrocarbon corrected density and neutron logs using the following relationships:

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

$$NPHIC = \frac{PHINHC - VSH * NPHISH}{1 - VSH} \quad -15$$

and equations 2, 3 and 4 are then used to compute RHOG.

The calculated grain density was then compared to the upper and lower limits of the grain densities and if it fell within the limits, effective porosity (PHIE) and effective saturation (Swe) were calculated as follows:

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

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

If the calculated grain density fell outside the limits, VSH was adjusted in appropriate increments and PHIT, SwT, SxoT and RHOG recalculated.

COMMENTS ON LOG ANALYSIS

1. Bad-hole affected the density log over the following intervals: 1560-1561m, 1602.75-1604.25m, 1645.75-1647.00m, 1649.25-1650.50m, 1654.00-1656.00m, 1790.00-1792.00m, 2341.50-2343.00m, 2400.00-2401.50m KB. In these zones a reasonable estimate of the true density reading was made from surrounding intervals before log analysis was carried out. Within hydrocarbon zones affected by washout, over the intervals 1989-1994m and 2833-2837m KB, porosity was calculated using the sonic log and the Hunt-Raymer transform. A matrix transit time of 215 usec/m was used. This value was determined by plotting PHIE vs. ΔT for clean water bearing sands and fitting a best fit line.

2. The salinity profile used for this well is consistent with apparent formation salinities calculated in clean water sands above and below hydrocarbon zones. 45,000 ppm is somewhat high for the Gippsland Basin.

3. Over the interval 1989-2279m KB, in gas bearing sandstone a hydrocarbon density of .35 g/cc was used. The MSFL reads values close to those of mud filtrate (Sxo = 100%) over much of this interval. To ensure sufficient gas correction, the MSFL was not used in the analysis and a "Z factor" of .2 was used instead. Over the upper part of the gas reservoir within good porosity sandstone, some mud invasion seems to have occurred. The PEF reaches values above 4 and in some cases goes off scale. Density values are affected with density porosity reduced in the intervals 2004-2009m, 2031-2034m, 2035-2038m and 2042-2045m KB. In these zones density values were estimated based on values in surrounding sands with similar gamma rays and resistivities.

4. Over the interval 1400-1460m KB, the LDTC-CNTH-GR and DLTE-MSFL-GR logs were recorded with a 1.2" sample rate at a logging speed of about 900 ft./hour. Comparison of the raw logs indicates that the high density sampling is slightly better at resolving thin good porosity beds at 1438m KB though the amount of noise on the logs is also increased. The porosities calculated using the 1.2" and 6" data, figures 1 and 2 respectively, over this interval are on average similar though the 1.2" data has better bed resolution. The water saturations calculated using the 1.2" data are slightly lower, though they are still high, Sw = 58.3% for a zone which recovered clean oil (RFT 6/37 @ 1437.7m KB). Table 1 shows a comparison of 1.2" and 6" data over the zone 1419.5-1445.00m KB. An oil-water contact was noted in cores at 1445m KB. In general average porosities are slightly higher and average water saturations slightly lower for the 1.2" data. Because of the high calculated water saturations for porosities above 10%, a saturation cutoff is necessary to determine net pay. Cutoffs of 10% porosity and 65% water saturation for the 1.2" data gives a net of 2.8m at 20.7% porosity and 58.3% water saturation. These are our best estimates at present but are preliminary pending the results of core analysis which should give a better estimate of net pay. Figure 3 shows the 1.2" density-neutron data displayed at 1:100 scale with the HDT pad one resistivity shown in the depth track. Zones of low resistivity correspond to sands (yellow) and confirm the interpretation of net sand using the density-neutron.

5. A listing by quarter metre intervals of all input and output parameters used in the log analysis follows. A similar listing of the 1.2" data is attached for the interval 1419.5-1450m KB.

KIPPER #1 - LOG ANALYSIS RESULTS

TABLE 1

MAJOR HYDROCARBON ZONES

Depth Interval (m MDKB)	Gross Thickness (m)	* Net Thickness (m)	*Average Porosity (%)	*Average Sw (%)	Fluid Type
1419.50 - 1445.00	25.50	1.50[1]	19.7[1]	60.9[1]	Oil
1419.50 - 1445.00	25.50	6.50[2]	18.5[2]	71.0[2]	Oil
1419.50 - 1445.00	25.50	2.80[3]	20.7[3]	58.3[3]	Oil
1419.50 - 1445.00 EFFECTIVE OWC @ 1442.75 FREE OWC @ 1445.00	25.50	8.00[4]	18.9[4]	69.0[4]	Oil
1735.25 - 1739.00	3.75	3.50	20.7	52.4	Oil
1797.50 - 1814.50 POSSIBLE OWC @ 1814.50	17.00	11.00	21.8	43.9	Oil
1822.50 - 1839.00 OWC @ 1839.00	16.50	10.00	20.8	39.9	Oil
1989.00 - 2200.00	211.00	144.50	18.2	19.6	Gas
2200.00 - 2279.00	79.00	47.25	14.0	40.7	Gas
1989.00 - 2279.00	290.00	191.75	17.2	24.8	Gas
2843.50 - 2848.50	5.00	4.50	14.3	27.7	Gas

* For PHIE > .1

[1] For PHIE > .1 Swe < .65 6.0" Data

[2] For PHIE > .1 Swe < .80 6.0" Data

[3] For PHIE > .1 Swe < .65 1.2" Data
(Preliminary best estimates)

[4] For PHIE > .1 Swe < .80 1.2" Data

32951/28

KIPPER #1 TABLE 2

SUMMARY OF RESULTS FOR HYDROCARBON SANDS

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Type
1419.50 - 1445.00	25.50	2.80 [1]	.207 ± .030 [1]	.583 ± .10 [1]	Oil
Effective OWC @ 1442.75m KB					
Free OWC @ 1445.00m KB					
1735.25 - 1739.00	3.75	3.50	.207 ± .027	.524 ± .09	Oil
1797.50 - 1803.50	6.00	5.75	.228 ± .046	.386 ± .08	Oil
1809.00 - 1814.50	5.25	5.00	.207 ± .052	.498 ± .09	Oil
Possible OWC @ 1814.50m KB					
1822.50 - 1823.50	1.00	0.75	.214 ± .023	.422 ± .09	Oil
1827.25 - 1839.00	11.75	9.25	.208 ± .047	.397 ± .08	Oil
OWC @ 1839m KB					
1989.50 - 1994.75	5.25	5.00	.191 ± .034	.187 ± .05	Gas
1996.00 - 1997.75	1.75	0.75	.110 ± .010	.364 ± .08	Gas
1998.75 - 2001.25	2.50	1.00	.155 ± .016	.277 ± .07	Gas
2002.25 - 2017.00	14.75	13.75	.214 ± .052	.131 ± .04	Gas
2017.75 - 2023.50	5.75	5.50	.183 ± .027	.151 ± .04	Gas
2025.75 - 2046.50	20.75	20.25	.189 ± .025	.126 ± .04	Gas
2048.00 - 2051.50	3.50	2.75	.166 ± .021	.175 ± .05	Gas
2053.75 - 2083.00	29.50	24.50	.184 ± .029	.173 ± .05	Gas
2084.00 - 2087.25	3.25	2.75	.171 ± .014	.237 ± .06	Gas
2090.75 - 2092.25	1.50	1.50	.186 ± .039	.228 ± .06	Gas
2097.25 - 2101.75	4.50	4.00	.197 ± .031	.193 ± .05	Gas
2103.50 - 2108.75	5.25	5.25	.205 ± .029	.168 ± .05	Gas
2109.75 - 2119.50	9.75	9.25	.191 ± .027	.181 ± .05	Gas
2120.50 - 2121.25	0.75	0.50	.147 ± .005	.292 ± .07	Gas
2122.50 - 2127.00	4.50	3.50	.182 ± .024	.251 ± .06	Gas
2128.50 - 2138.50	10.00	9.25	.176 ± .023	.208 ± .05	Gas
2147.50 - 2155.25	7.75	7.75	.153 ± .019	.271 ± .07	Gas
2156.50 - 2169.00	12.50	11.25	.157 ± .025	.251 ± .06	Gas
2171.25 - 2172.25	1.00	1.00	.139 ± .012	.426 ± .09	Gas
2173.50 - 2175.25	1.75	1.75	.163 ± .029	.248 ± .06	Gas
2176.75 - 2187.25	10.50	7.25	.167 ± .028	.278 ± .07	Gas
2189.25 - 2191.75	2.50	2.25	.203 ± .022	.310 ± .07	Gas
2195.00 - 2198.75	3.75	3.75	.178 ± .014	.283 ± .07	Gas
2206.75 - 2208.50	1.75	0.75	.120 ± .012	.549 ± .10	Gas
2212.50 - 2217.50	5.00	4.25	.152 ± .034	.382 ± .08	Gas

KIPPER #1 TABLE 2 (Cont.)

SUMMARY OF RESULTS FOR HYDROCARBON SANDS

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average	Fluid Type
2218.25 - 2234.75	16.50	14.25	.139 ± .016	.375 ± .08	Gas
2235.75 - 2246.00	10.25	9.25	.146 ± .022	.356 ± .08	Gas
2248.25 - 2261.25	13.00	11.50	.132 ± .017	.405 ± .09	Gas
2262.25 - 2263.50	1.25	0.50	.132 ± .010	.575 ± .10	Gas
2264.75 - 2265.50	0.75	0.25	.105 ± .010	.539 ± .10	Gas
2267.00 - 2278.75	11.75	6.50	.145 ± .022	.529 ± .09	Gas
2444.00 - 2450.75	6.75	6.25	.172 ± .024	.831 ± .09	Water Productive
2453.25 - 2459.50	6.25	4.25	.149 ± .025	.715 ± .09	Water Productive
2469.00 - 2469.75	0.75	0.50	.129 ± .016	.733 ± .09	Water Productive
2473.00 - 2476.50	3.50	2.00	.153 ± .025	.633 ± .10	Gas
2575.25 - 2575.75	0.50	0.50	.114 ± .003	.392 ± .08	Gas, Possibily Tight
2577.25 - 2579.25	2.00	0.25	.102 ± .005	.472 ± .09	Gas, Possibly Tight
2833.50 - 2836.25	2.75	2.75	.117 ± .005	.311 ± .07	Gas, Possibly Tight
2843.50 - 2848.50	5.00	4.50	.143 ± .013	.277 ± .07	Gas

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

1 Net Thickness, Porosity Average and Swe Average refer to zones with calculated porosities in excess of 10% and water saturations less than 65% using 1.2" log data.

KIPPER #1 TABLE 3

SUMMARY OF RESULTS FOR WATER SANDS

Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average
1445.00 - 1456.50	11.50	7.50	.142 ± .022	0.957
1459.50 - 1460.50	1.00	1.00	.286 ± .009	1.032
1463.25 - 1469.25	6.00	5.25	.212 ± .059	0.948
1471.00 - 1475.50	4.50	3.00	.259 ± .038	0.959
1481.25 - 1492.50	11.25	10.50	.210 ± .055	0.991
1509.75 - 1510.75	1.00	0.75	.150 ± .010	0.896
1516.00 - 1519.50	3.50	3.50	.193 ± .033	0.960
1523.00 - 1528.25	5.25	3.00	.194 ± .044	0.930
1532.50 - 1533.75	1.50	1.00	.226 ± .056	1.033
1537.75 - 1540.50	2.75	2.00	.212 ± .057	1.070
1548.50 - 1554.75	6.25	5.00	.196 ± .044	0.961
1567.00 - 1573.50	6.50	6.25	.217 ± .047	0.939
1577.00 - 1579.00	2.00	1.00	.266 ± .015	1.045
1581.50 - 1583.50	2.00	2.00	.211 ± .038	1.000
1588.75 - 1595.50	6.75	4.50	.199 ± .036	0.966
1599.00 - 1601.00	2.00	2.00	.241 ± .030	0.999
1612.50 - 1622.25	9.75	8.50	.220 ± .038	0.978
1627.25 - 1630.25	3.00	2.75	.217 ± .040	0.962
1634.25 - 1638.75	4.50	2.75	.184 ± .040	0.943
1657.25 - 1658.50	1.50	1.50	.195 ± .040	1.027
1668.25 - 1669.75	1.50	1.25	.163 ± .030	0.950
1675.00 - 1677.25	2.25	2.25	.233 ± .030	0.965
1686.50 - 1687.50	1.00	0.75	.225 ± .019	0.985
1689.25 - 1728.00	38.75	36.50	.218 ± .033	1.044
1744.00 - 1755.25	11.25	8.50	.208 ± .048	1.057
1762.50 - 1765.00	2.50	1.50	.189 ± .026	0.976
1766.50 - 1768.00	1.50	1.00	.197 ± .028	0.998
1774.00 - 1783.00	9.00	8.75	.196 ± .051	0.946
1784.00 - 1786.25	2.25	2.25	.236 ± .048	0.941
1814.50 - 1814.75	0.25	0.25	.187 ± .047	0.791
1816.00 - 1818.00	2.00	1.50	.180 ± .028	0.919
1839.25 - 1851.75	12.50	11.00	.199 ± .044	0.965
1853.25 - 1856.50	3.25	2.25	.211 ± .050	1.064

KIPPER #1 TABLE 3 (Cont.)

SUMMARY OF RESULTS FOR WATER SANDS

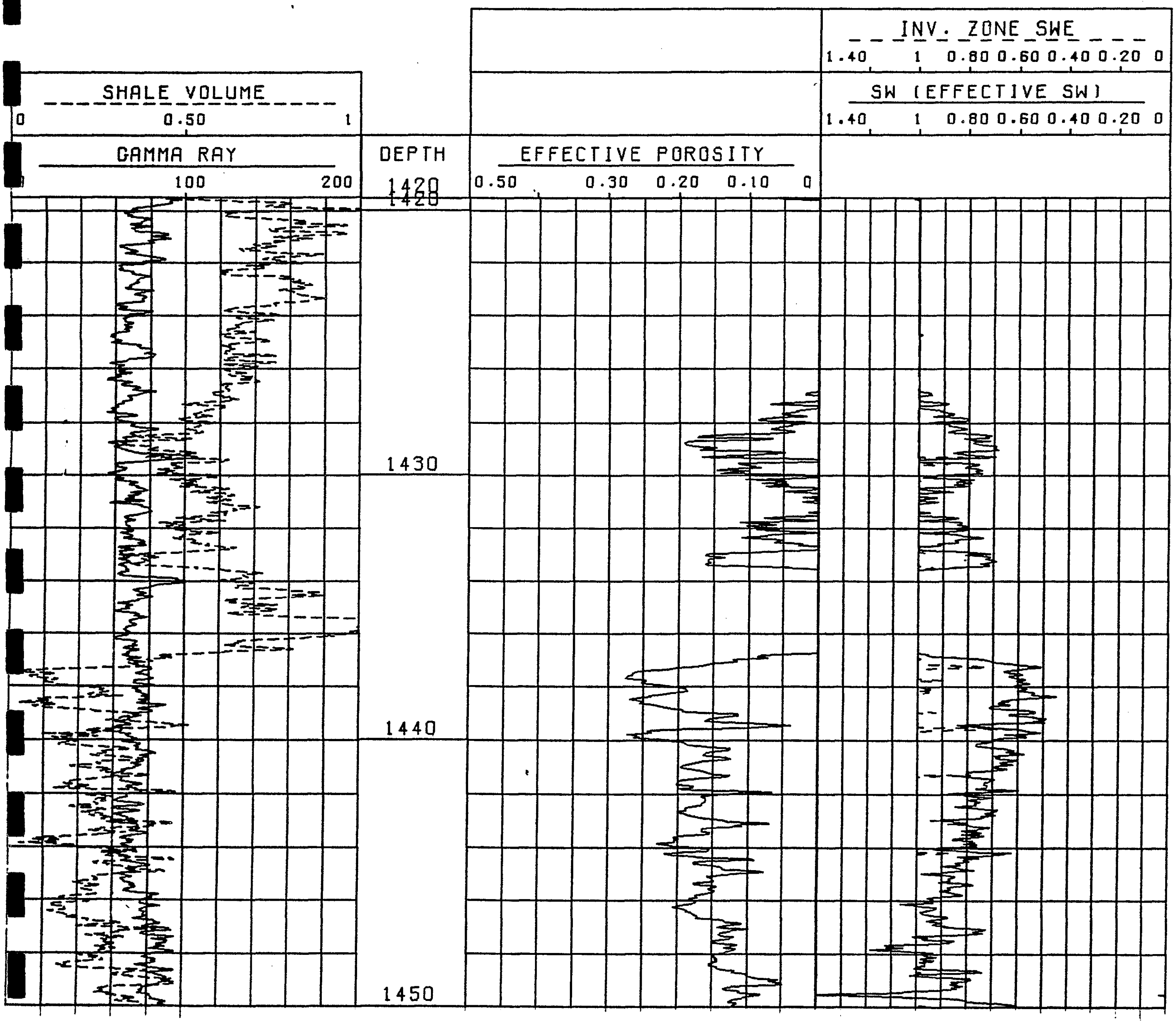
Depth Interval (m KB)	Gross Thickness (m)	* Net Thickness (m)	*Porosity Average	* Swe Average
1858.50 - 1870.25	11.75	10.00	.204 ± .034	0.982
1872.50 - 1882.50	10.00	9.25	.206 ± .026	1.036
1883.25 - 1893.00	9.75	9.00	.183 ± .043	1.060
2336.00 - 2337.25	1.25	0.50	.109 ± .003	0.956
2338.75 - 2340.50	1.75	0.75	.120 ± .009	0.943
2362.50 - 2371.25	8.75	1.75	.125 ± .021	0.907
2385.00 - 2393.50	8.50	3.00	.126 ± .019	0.960

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

KIPPER-1

LOG ANALYSIS (H.DEN)

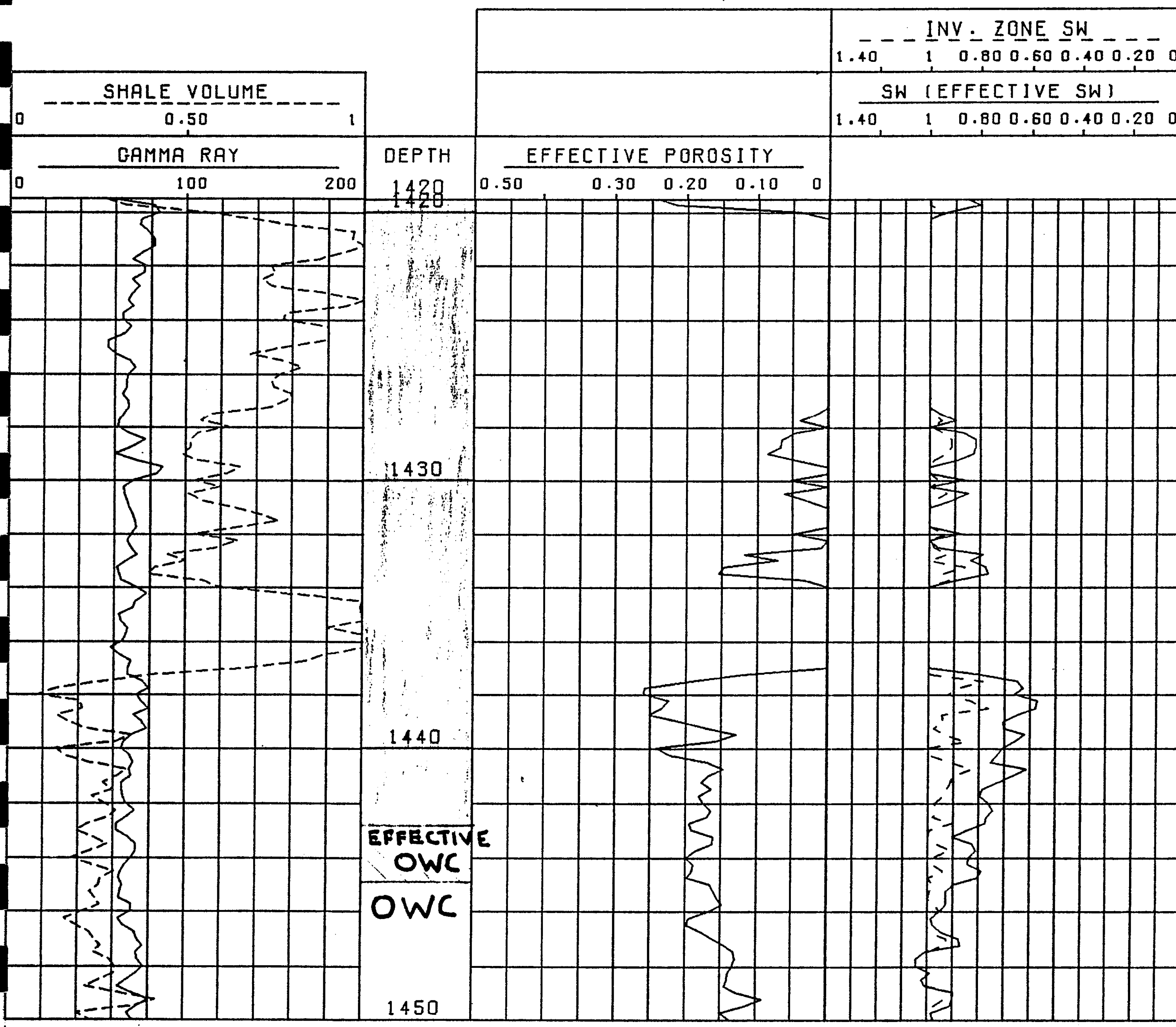
SCALE=1:200.0
DEPTHS IN METRES



KIPPER-1

LOG ANALYSIS(6"DATA)

SCALE=1:200.0
DEPTHS IN METRES



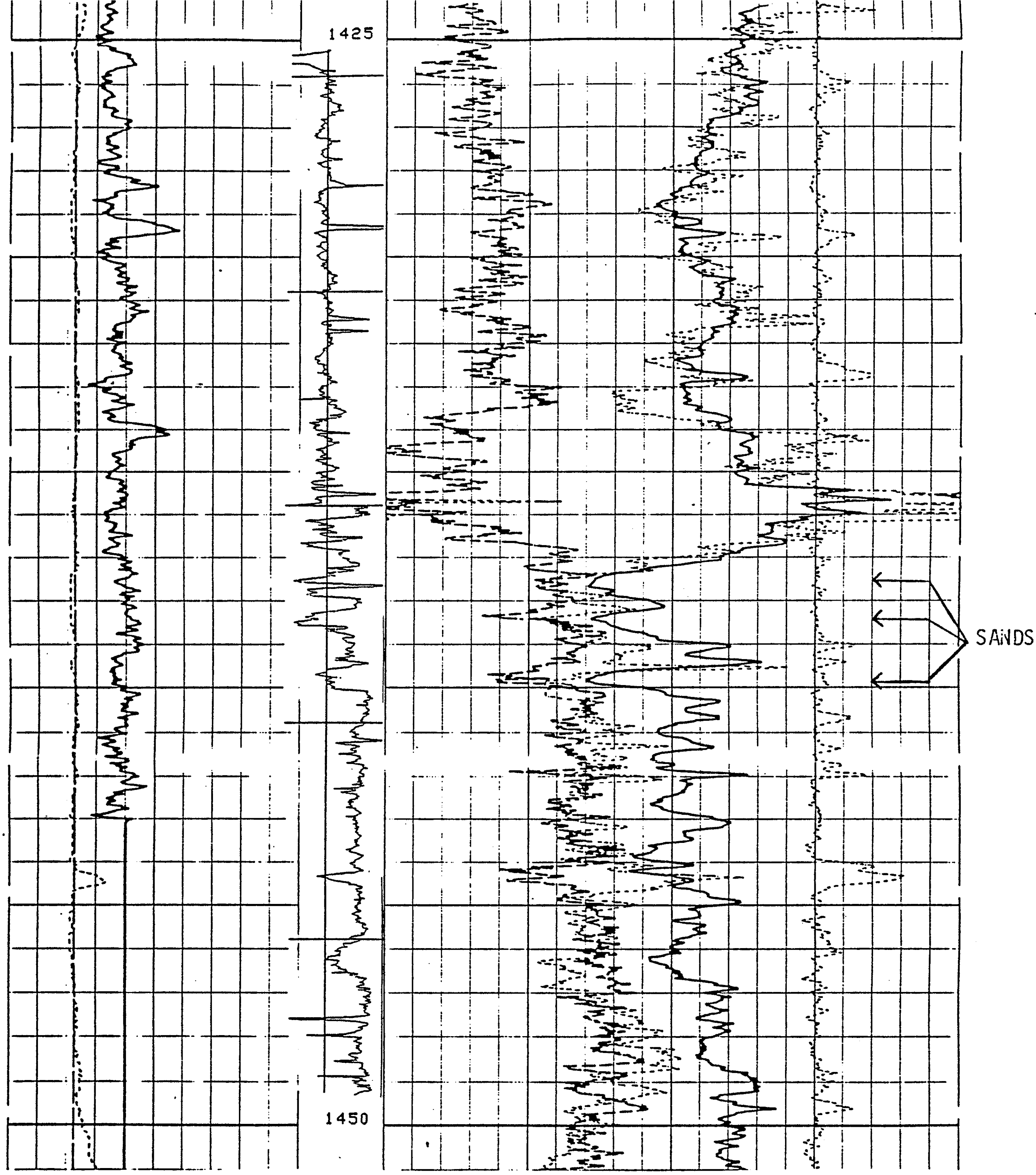


FIGURE 3 : LDTC-CNTH-GR at 1:100 SCALE 1.2" SAMPLING WITH HDT PAD 1 RESISTIVITY IN DEPTH TRACK

PE603402

This is an enclosure indicator page.
The enclosure PE603402 is enclosed within the container PE906050 at this location in this document.

The enclosure PE603402 has the following characteristics:

ITEM_BARCODE = PE603402
CONTAINER_BARCODE = PE906050
NAME = Composite Log Analysis
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Quantitative Log Analysis(enclosure from WCR vol.2) for Kipper-1 containing gamma ray shale volume porosity and SW.
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 27/02/1987
W_NO = W930
WELL_NAME = KIPPER-1
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

Appendix 4

APPENDIX 4

WIRELINE TEST REPORT

KIPPER-1 RFT SURVEY REPORT

MARCH 17 - 18, 1986
MARCH 29 - 30, 1986

K.J. Fagg
May, 1986.

(0378F)

KIPPER-1 RFT SURVEYS

SUMMARY

RFT surveys were run in the Kipper-1 well on March 17-18 and March 29-30, 1986. As a result of the surveys, the following conclusions have been drawn:

1. Based on pressure data, there is no reason to believe that the Top of Latrobe and T oil zones extend below the logged contacts or low oil depths.

2. The gas zone beneath the volcanics is in one hydraulic system with no significant change in gas gradient through the column.

3. Based on the average aquifer gradient above the volcanics, the gas column could potentially extend to 2291 m ss (2312 m KB).

4. The deepest section of the well at 2845.5m KB is overpressured.

PROGRAM

A total of 64 seats were attempted during the 4 days of RFT surveys in the Kipper-1 well, 52 for pretests only and 12 for samples. 17 seats were aborted due to seal failure or the formation being tight.

There were 16 valid pretests done in the oil and water zones in the Top of Latrobe and T-1 through T-3 sands above the volcanics. A further 16 valid pretests were done in the major gas zone. Four pretests were taken in the water sands below the gas zone and one pretest was taken in the deepest gas sand in the well just above TD.

Ten samples were taken of which 9 were preserved. Four oil samples were preserved. One sample was taken from each of the oil zones - Top of Latrobe, T-1, T-2 and T-3. Five gas samples were preserved. Four samples were taken from the main gas zone and one sample was taken in the gas sand at the bottom of the well.

Further details are available in the attached pretest and sampling data sheets.

INTERPRETATION

1. Oil Zones

It was not possible to accurately estimate the oil gradient or the OWC depths for the Top of Latrobe and T oil zones because there were insufficient reliable data points. The calculated OWCs from the RFT results did not differ significantly from the log-interpreted OWCs considering the uncertainties in the calculated values.

The two oil zones of most interest, the T-2 and T-3, appeared to have good permeability.

As measured on the rig, the oil sample taken in the T-2 sand had an API gravity of 53° and a GOR of 793 ft^3/bbl, and the T-3 sample had an API gravity of 43° and a GOR of 337 ft^3/bbl.

An average water gradient of 1.46 psi/m was calculated from the water points above the volcanics. At 1700 m KB, there was a 22 psi drawdown compared to the original Gippsland aquifer gradient. The calculated water gradient of 1.46 psi/m is higher than the average Gippsland aquifer gradient of 1.42 psi/m which suggests that the drawdown due to production was declining with depth.

2. Gas Zones

The two sets of pretests taken in this zone closely correlated although taken around 12 days apart. The results clearly indicate that there is only one pressure system through the gas zone with a pressure gradient of 0.279 psi/m. This measured gradient will provide a cross check on the laboratory measured gas density when available.

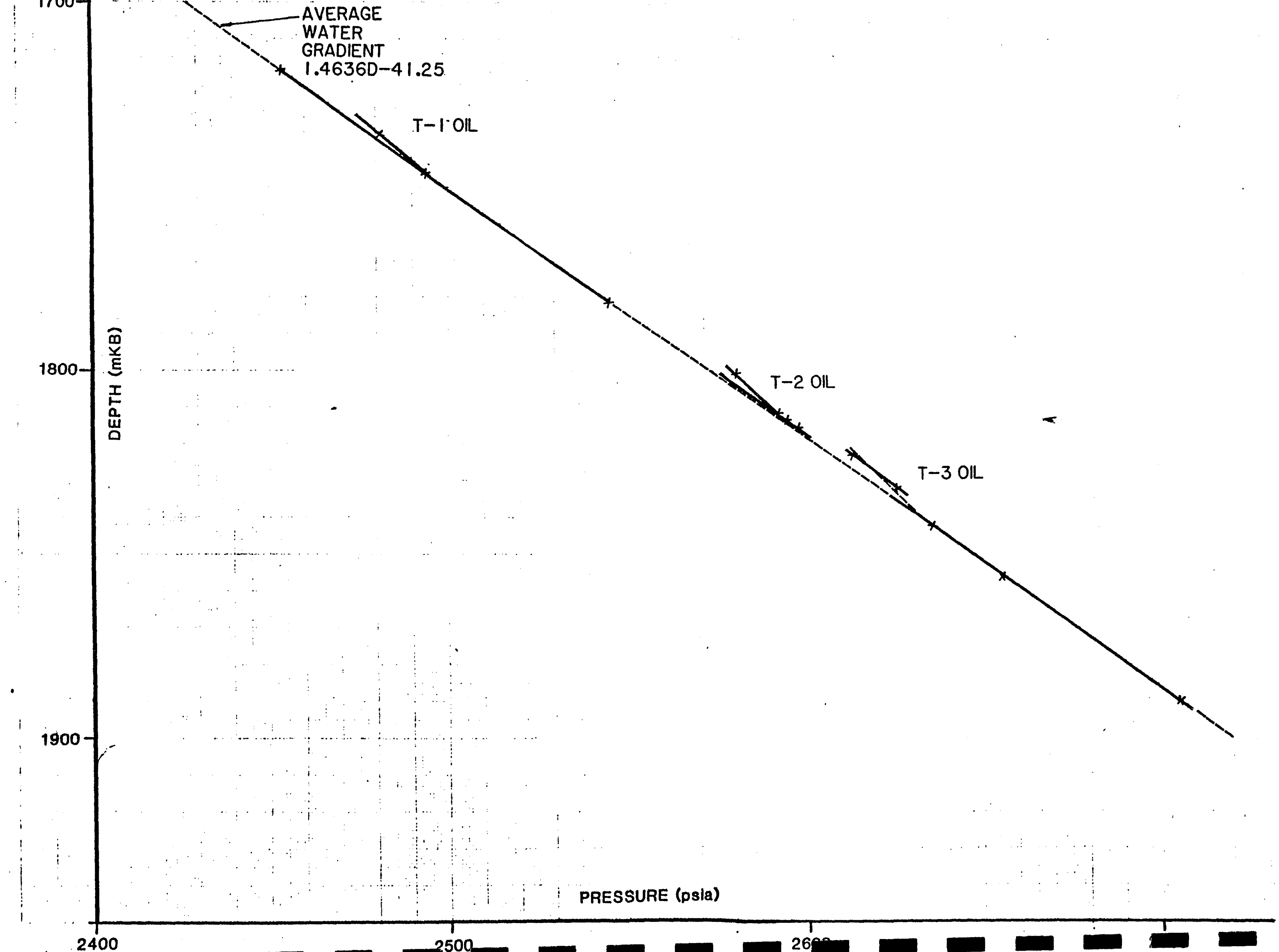
A valid water gradient could not be established below the lowest proved gas. Although four points were taken, it appears some of them were supercharged and/or were in the transition zone into overpressure. The deepest likely GWC was calculated by extrapolating the average water gradient from above the volcanics. This resulted in a deepest contact of 2312 m KB. If the original Gippsland aquifer gradient had been used rather than the extrapolated measured gradient, there would only have been a couple of metres difference in the calculated contact depth. Therefore it is believed the stated value of 2312m KB is representative.

The pretest in the lowest gas zone in the well just above TD at 2845.5 m KB indicated the zone was overpressured at 9.8 ppg.

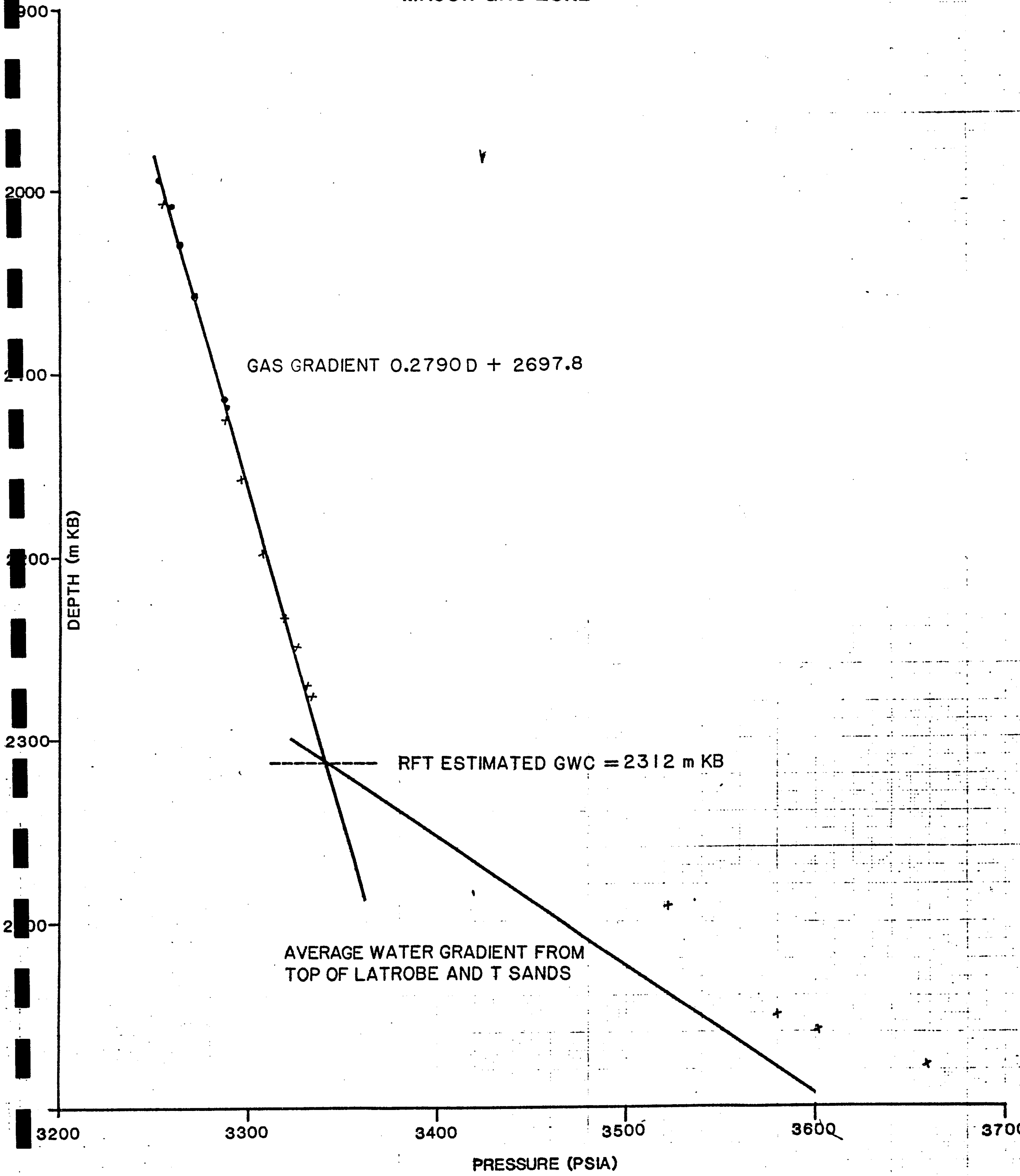
As measured on the rig, the gas samples had a high CO_2 content from around 7 to 15%. There was no indication of H_2S.

(0378F:66-67)

RFT PRESSURE SURVEY
T OIL ZONES



KIPPER-1 RFT PRESSURE SURVEY
MAJOR GAS ZONE



Appendix 5

APPENDIX 5

GEOCHEMICAL REPORT

GEOCHEMICAL REPORT
KIPPER-1 WELL, GIPPSLAND BASIN
AUSTRALIA

by

B.J. BURNS

Sample handling and Analyses by:

- D. Ford)
- J. Johnston)
- H. Schiller) ESSO AUSTRALIA LTD.
- M. Sparke)

Esso Australia Ltd.
Geochemical Report

12th September, 1986

2451L

CONTENTS

INTRODUCTION

DISCUSSION OF RESULTS

CONCLUSIONS

LIST OF TABLES

1. C_{1-4} Headspace Cuttings Gas Data
2. Total Organic Carbon Report
3a. Rockeval pyrolysis report - yields
3b. Rockeval pyrolysis report - ratios
4. Kerogen H/C and O/C Atomic ratios
5. Vitrinite Reflectance data.
6. Thermal Alteration Index of kerogens.
7. Gas Composition - RFT 2/32 2028.4m
8. API gravity & G.O.R. oils and condensates

LIST OF FIGURES

1a. C_{1-4} Headspace Cuttings Gas Log
1b. Percent C_{2-4} 'Wet' Gas Log
2. Total Organic Carbon vs Depth Plot
3. Rockeval Plot, HI vs Tmax
4. H/C vs O/C Atomic Ratios - Modified Van Krevelen plot
5. Vitrinite reflectance vs Depth.
6. Rockeval Plot, Tmax vs Depth
7. Whole oil chromatogram - RFT 6/37, 1437.7m
8. Whole oil chromatogram - RFT 5/36, 1736.5m
9. Whole oil chromatogram - RFT 4/34, 1801.4m
10. Whole oil chromatogram - RFT 3/33, 1823.2m
11. Whole oil chromatogram - RFT 2/32, 2028.4m
12. Whole oil chromatogram - RFT 12/64, 2157.0m
13. Whole oil chromatogram - RFT 11/63, 2221.5m
14. Whole oil chromatogram - RFT 10/62 2269.5m
15. Whole oil chromatogram - RFT 8/59 2845.5m

KIPPER-1

INTRODUCTION

Canned cuttings and sidewall cores from the Kipper-1 well, Gippsland Basin, were analysed for their geochemical characteristics in order to determine the source potential and maturity of the penetrated section. Composite canned cuttings were recovered at 15 metre intervals from 260mKB to total depth (TD) at 2875mKB. Alternate 15 metre intervals from 1190m were analysed for headspace C_{1-4} hydrocarbon gases. Selected sidewall cores were analysed for total organic carbon (TOC), Rockeval pyrolysis yields, kerogen elemental analysis and vitrinite reflectance. The vitrinite reflectance measurements were made by A.C. Cook of Kieraville Konsultants.

Oil samples were recovered on wireline tests from four zones above the volcanics encountered in the well. Five condensates were recovered along with gas in RFT's from the main gas column below the volcanics. The deepest condensate sample at 2845.5m is from an interpreted gas sand but it also has some characteristics suggesting an "oily" composition. All of these samples were analysed for API gravity and by gas chromatography.

Results are set out in Tables 1-8 and/or plotted graphically in Figures 1-15.

DISCUSSION OF RESULTS

Richness

C_{1-4} headspace cuttings gas yields (Table 1, Figure 1) are fair-good in the Gippsland Limestone and Lakes Entrance Formations and very good-excellent throughout the Latrobe section indicating its better source potential. However the gas has only about 20-40% "wet" C_{2-4} components (Figure 1b) which indicates that the shales are currently only generating some wet gas. The increase in "wet" components from 1810-1870m corresponds to the oil zone at 1797-1837m and is reflecting the presence of these hydrocarbons. It is interesting to note that the shallowest oil zone at 1420-1449m (Top Latrobe) has a much smaller gas anomaly on the cuttings log (max C_{1-4} = 8833ppm) than the deeper oil at 1797-1837m. The different response to the two oil zones is a function of their level of gas saturation with the oil recovered at 1437.7m having an estimate GOR of 215 cu ft/bbl while the 1801.4m oil has a GOR of 793.3m cu ft/bbl. The main gas zone below the volcanics at 1989m is also reflected by an increase in the total gas readings. The high gas readings from 1520-1690m are not associated with any reservoired hydrocarbons but rather correspond to the presence of numerous thin coaly beds observed over that interval.

The Total Organic Carbon (TOC) values for shales of the Latrobe section above the volcanics are fair-good, averaging about 1% (Table 2, Figure 2). However, below the volcanics the Upper Cretaceous Latrobe Group (Campanian/Santonian) and the newly named Kipper Formation (Santonian/Turonian) have rich TOC's averaging 2.0% and would constitute a very good source.

Hydrocarbon Type

The Rockeval pyrolysis yields (Table 3a,3b) for the Kipper Formation unfortunately indicate that the organic matter is mainly gas prone with only poor S_2 yields (below 2mg/gm rock) and correspondingly low Hydrogen Indices (below 100). This is shown graphically in the HI vs Tmax plot, Figure 3, where all of the Kipper Formation samples plot as Type III kerogen. This poor oil rating is supported by the analysis of the kerogen for Atomic H/C and O/C ratios* (Table 4). In the modified Van Krevelen plot, Figure 4, the Kipper Formation kerogens consistantly plot as gas prone Type III organic matter. In this well, the only samples with potential for oil generation appear to be in the Eocene and perhaps Paleocene section.

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

Maturity

Vitrinite reflectance (Table 5, Figure 5) show an immature section down to 1727m and a mature section from 2420 to Total Depth. Unfortunately an intermediate sample at 2221.5m contained no vitrinite to indicate whether a simple gradient exists between all the points or whether there should be two different gradients above and below the volcanics with the deeper samples being partly "cooked" by heat associated with the volcanics. A careful inspection of the Thermal Alteration Index of kerogens above and below the volcanics shows no heating effect on the overlying sediments with a TAI of 2.3 as close as 5m above the top of the volcanics and 10m below (Table 6). This indicates that they are part of an extrusive flow and not an intruded sill. Below the volcanics, the TAI's show a small increase to 2.4 and this level of maturation persists down to T.D. There is no indication of any local heating event associated with the deeper part of the Upper Cretaceous section.

Rockeval Tmax data (Table 3a, Figure 6) show an increasing trend with depth with a top of maturation at about 2300m and peak maturity about 2800m which is in good agreement with the vitrinite data. This mature window is shallower in the Kipper area than in the more central parts of the basin, possibly in part due to a higher general heat flow associated with the presence of volcanics at depth.

Gas and Liquid Hydrocarbons

The composition of the Kipper-1 gas from RFT 2/32 2028.4m is shown in Table 7. In addition to the hydrocarbons, the gas has a fairly high carbon dioxide content (10.4%). Similar CO_2 contents have been seen previously in other intra Latrobe reservoirs but the exact origin is not known. [A gas sample has been sent for isotopic analysis of the hydrocarbons and the carbon dioxide but results are not available at the time of writing this report]. The CO_2 may be related to the intrusion of the volcanics or to the normal thermal destruction of organic matter at depth.

When normalised to remove CO_2 and N_2, the "wet" C_2+ fraction of the gas comprises 13% of the total hydrocarbons. This degree of "wetness" permits the possibility of an oil log existing down-dip in equilibrium with the gas, but it is not proof of such a relationship.

The liquids recovered from RFT wireline tests comprised 4 oils, 4 condensates (from the main gas reservoir) and one other deep condensate that has some oily characteristics. The depths and API gravities are listed in Table 8 and the 'whole oil' chromatograms are shown in Figures 7-15.

The 'whole oil' chromatograms of the 1736.5m, 1801.4m and 1823.2m oils are relatively similar (Figs. 8-10) with a predominance of lighter hydrocarbons below C_{15} and only a small secondary hump around C_{23} with a slight O/E preference still evident from C_{25}-C_{30}. However the 1736.5m oil has a larger background 'hump' of naphthenic or aromatic hydrocarbons in the C_{13-20} range and this is the cause of the lower API gravity of the 1736.5m oil (34.7^o) relative to the 1801.8m oil (52.8^o).

The shallowest oil at 1437.7m (Fig. 7) has a different n-alkane composition to the three deeper oils. It has a more irregular distribution with a maximum in the gasoline range and two lesser maxima at C_{16} and C_{24-25}. More obviously, the pristane peak is dominant over the adjacent n-alkanes. These features are believed to be due to mild bacterial degradation of the 1437.7m oil rather than any differences in source or maturity. Bacteria have

The deepest recovered sample from RFT 8/59 at 2845.5m has the appearance of a very light oil with a definite green-brown colour. Its API gravity of 39.3^o is compatible with both the oils and condensates encountered higher in the section. The whole oil chromatogram, Figure 15, shows a distinctive bimodal distribution around the C_{8-10} range and also at C_{25}, and could be explained as a mixture of condensate with a minor amount of waxy oil. The RFT recovery was 225.2 cu ft of gas and only a scum of oil so the reservoir is clearly a gas sand but it may also contain a low level of oil saturation.

CONCLUSIONS

1. The newly identified Kipper Formation of Upper Cretaceous Santonian/Turonian age has very good TOC's averaging 2% but all of it seems gas (and possibly condensate) prone.

2. Top of maturity at the Kipper-1 location is at approximately 2300m and the section below this is fully mature at T.D.

3. The four oil zones above the volcanics contain light waxy oil. The sample at 1736.5m has an unusually low API gravity relative to the other oils.

4. Mild biodegradation has affected the shallowest oil at 1437.7m but has not extended any further into the section.

5. The main Kipper-1 gas contains over 10% CO_2. The hydrocarbon composition has sufficient 'wet' components to allow the possibility of an oil leg being present down-dip.

6. The volcanics encountered from 1893-1989m show no cooking effect on the overlying organic matter and are most likely extrusives.

FIGURE 1a.

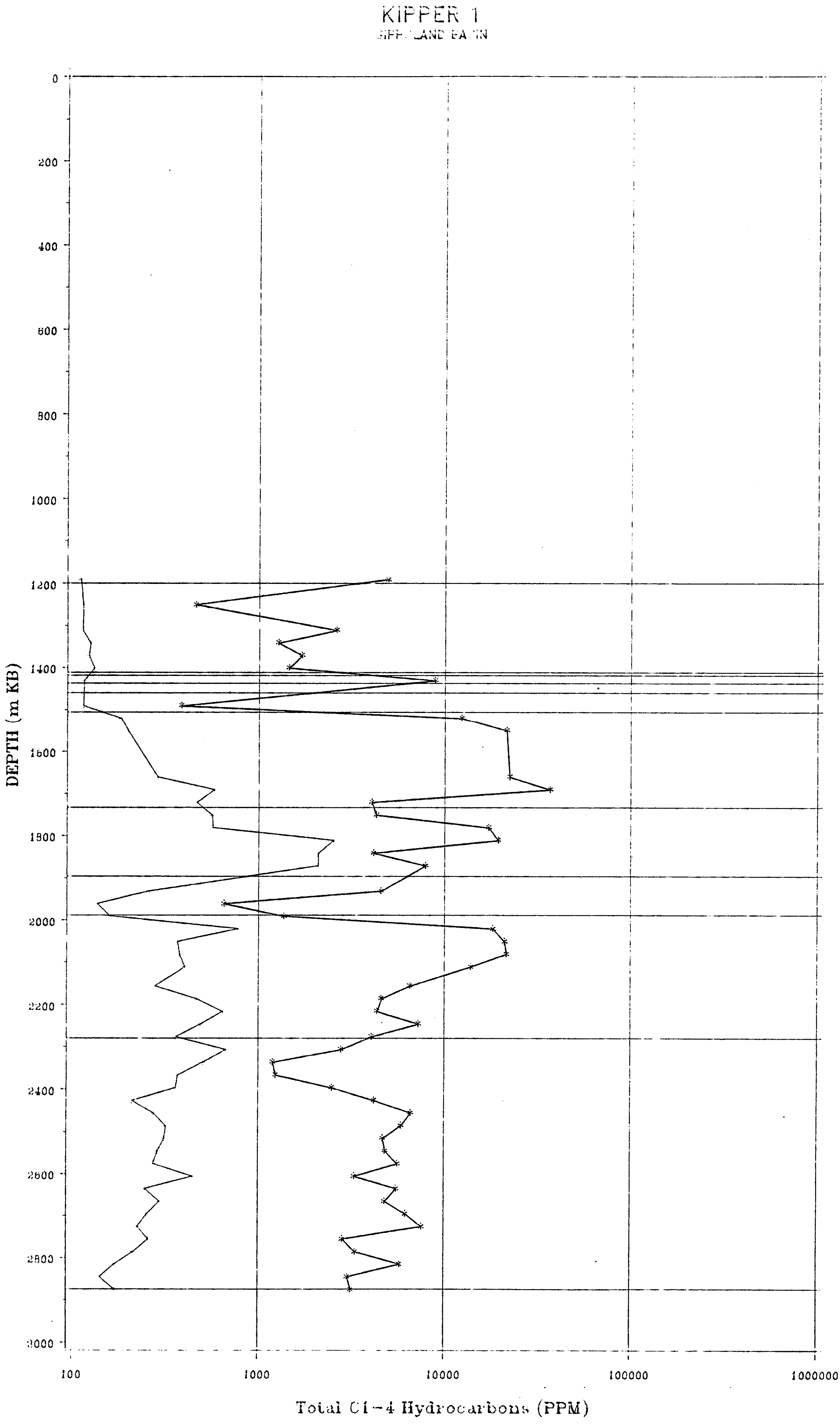

KIPPER 1
GIPPSLAND BASIN
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
DEPTH (m KB)
100
1000
10000
100000
1000000
Total C1-4 Hydrocarbons (PPM)

FIGURE 1b.

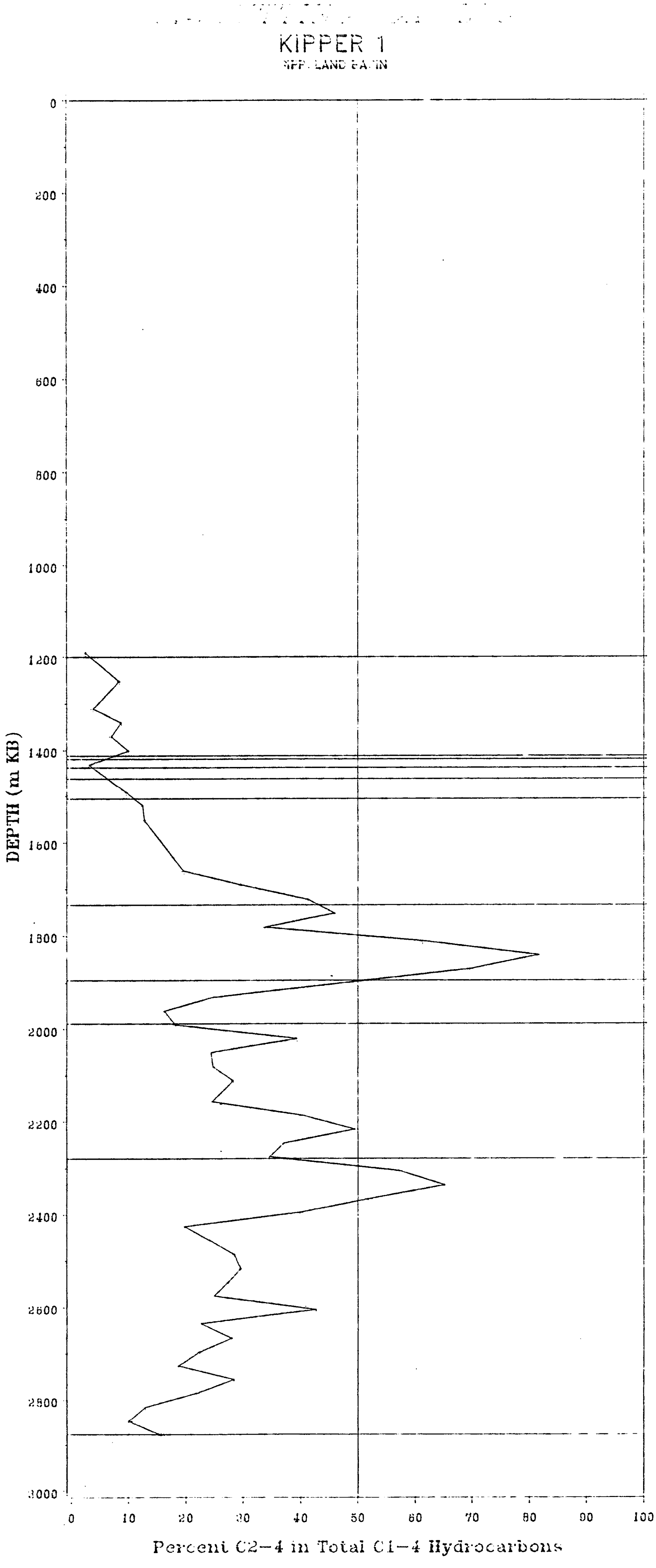
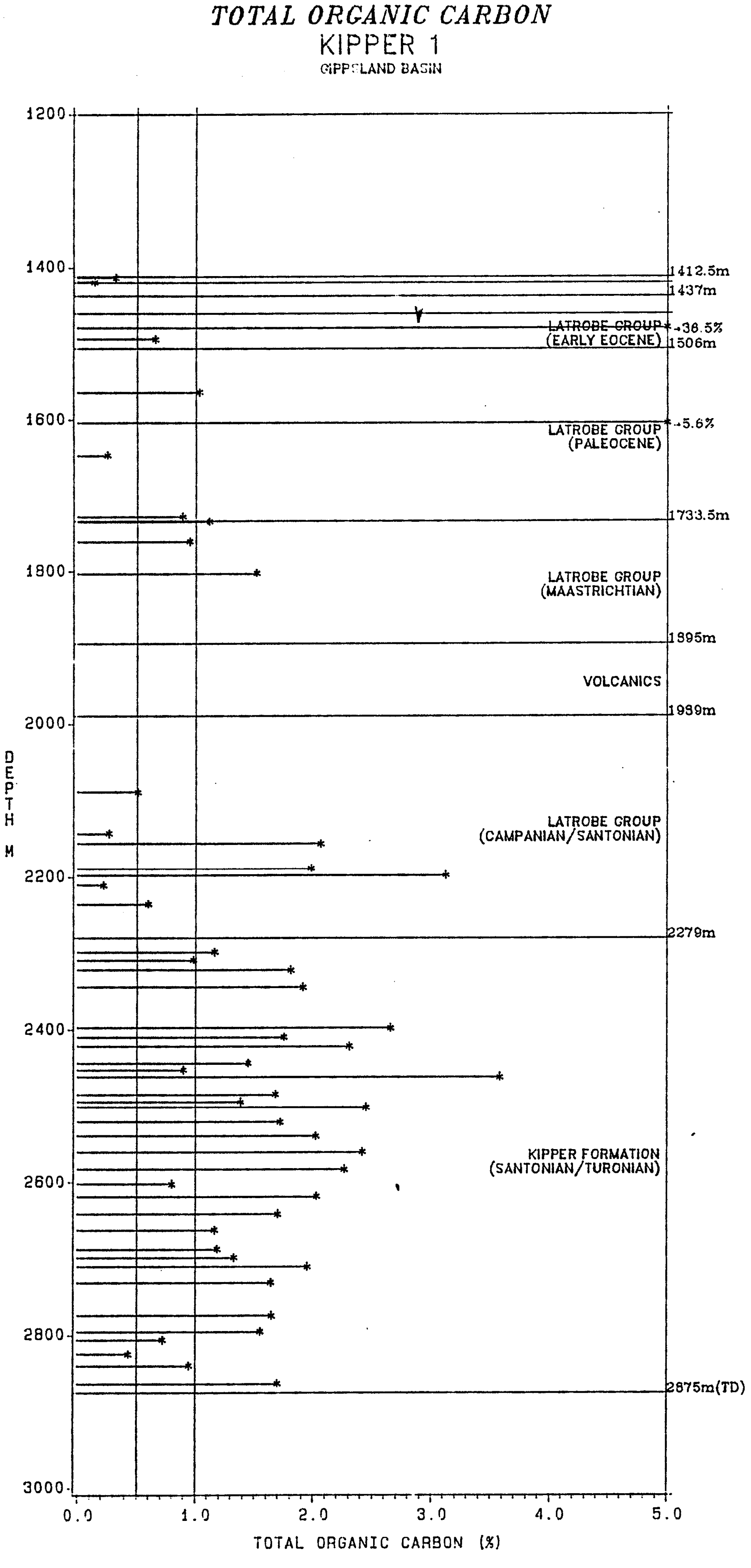

KIPPER 1
GIPPSLAND BASIN
DEPTH (m KB)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
0
10
20
30
40
50
60
70
80
90
100
Percent C2-4 in Total C1-4 Hydrocarbons

FIGURE 2

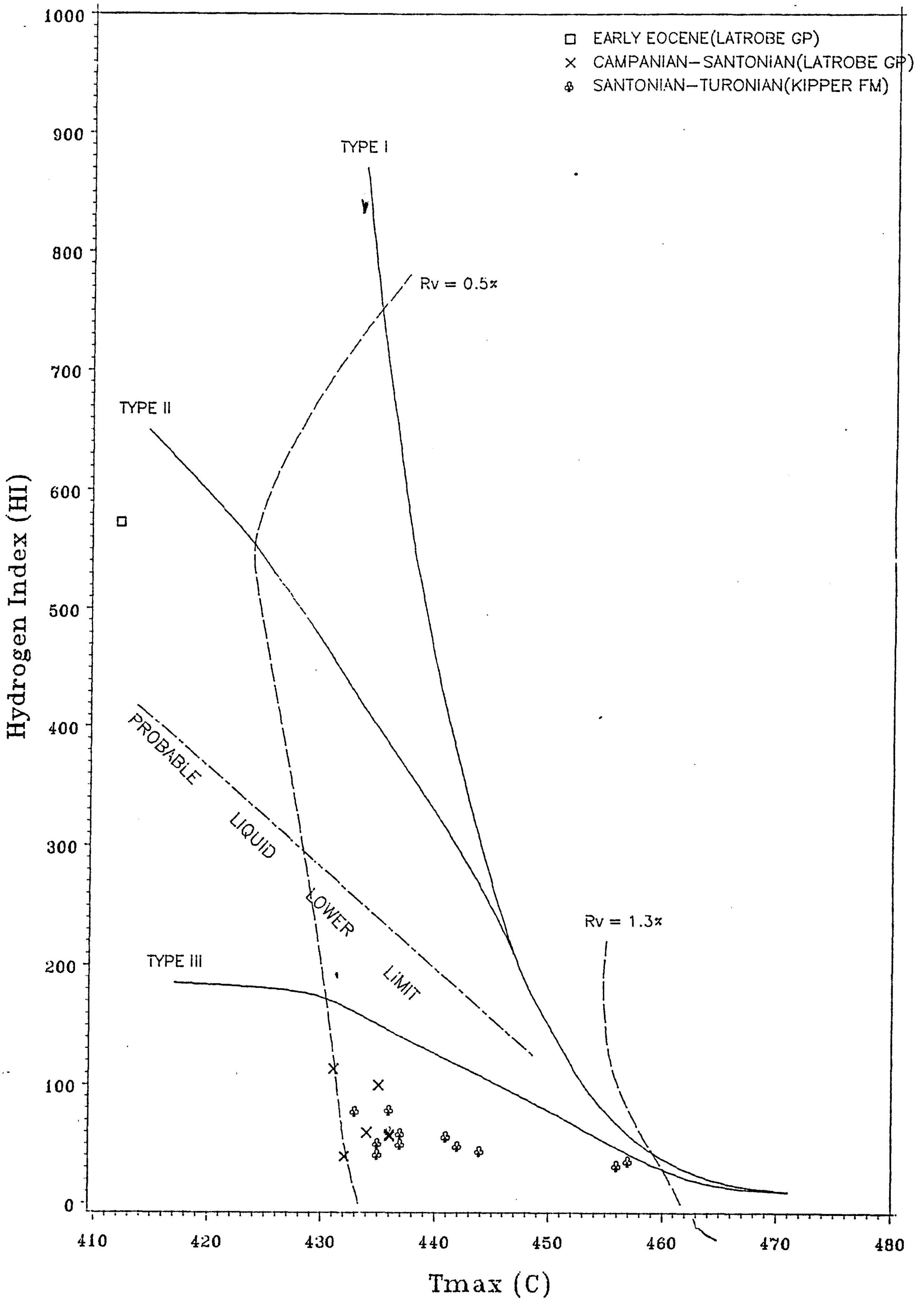


TOTAL ORGANIC CARBON
KIPPER 1
GIPPSLAND BASIN
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
DEPTH M
1412.5m
1437m
LATROBE GROUP
(EARLY EOCENE)
→36.5%
1506m
→5.6%
LATROBE GROUP
(PALEOCENE)
1733.5m
LATROBE GROUP
(MAASTRICHTIAN)
1895m
VOLCANICS
1989m
LATROBE GROUP
(CAMPANIAN/SANTONIAN)
2279m
KIPPER FORMATION
(SANTONIAN/TURONIAN)
2875m(TD)
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORGANIC CARBON (%)

ROCKEVAL MATURATION PLOT

KIPPER 1

GIPPSLAND BASIN



KEROGEN TYPE

KIPPER 1

GIPPSLAND BASIN

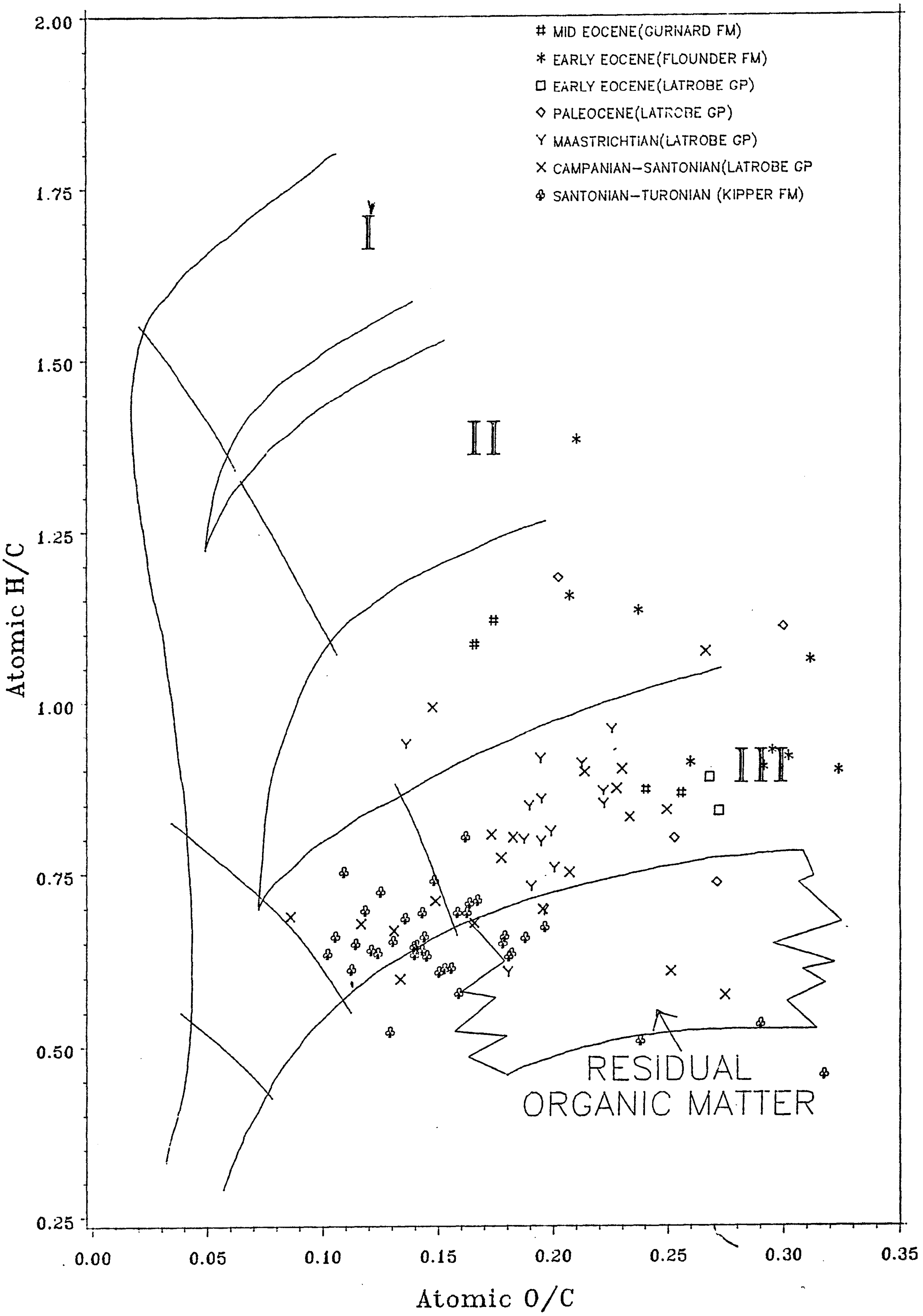
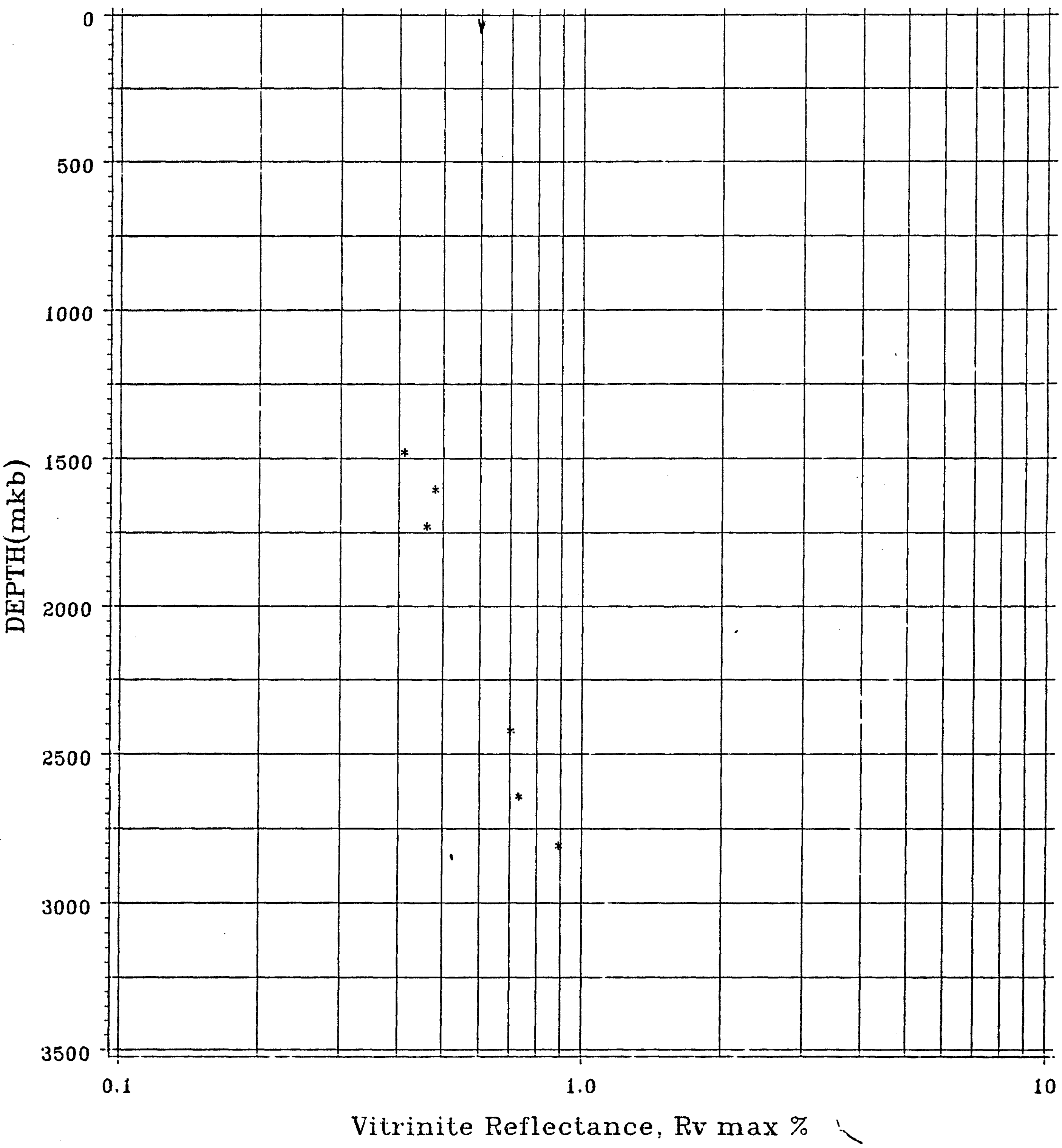
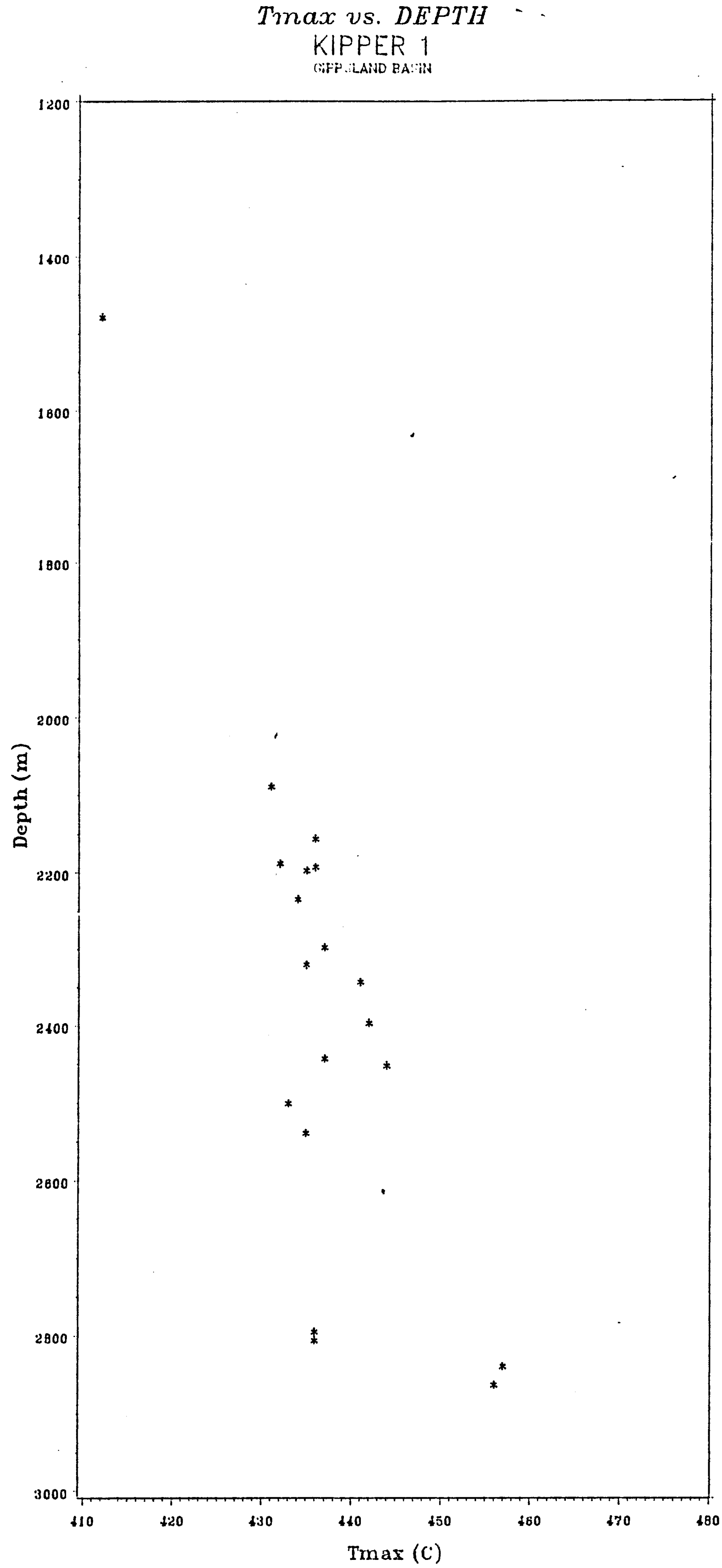


FIGURE 5.

VITRINITE REFLECTANCE VS. DEPTH
KIPPER 1
GIPPSLAND BASIN





Tmax vs. DEPTH
KIPPER 1
GIPPSLAND BASIN
Depth (m)
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
410
420
430
440
450
460
470
480
Tmax (C)

WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 6/37 1437.7 m 46.6° API

FIGURE 7.

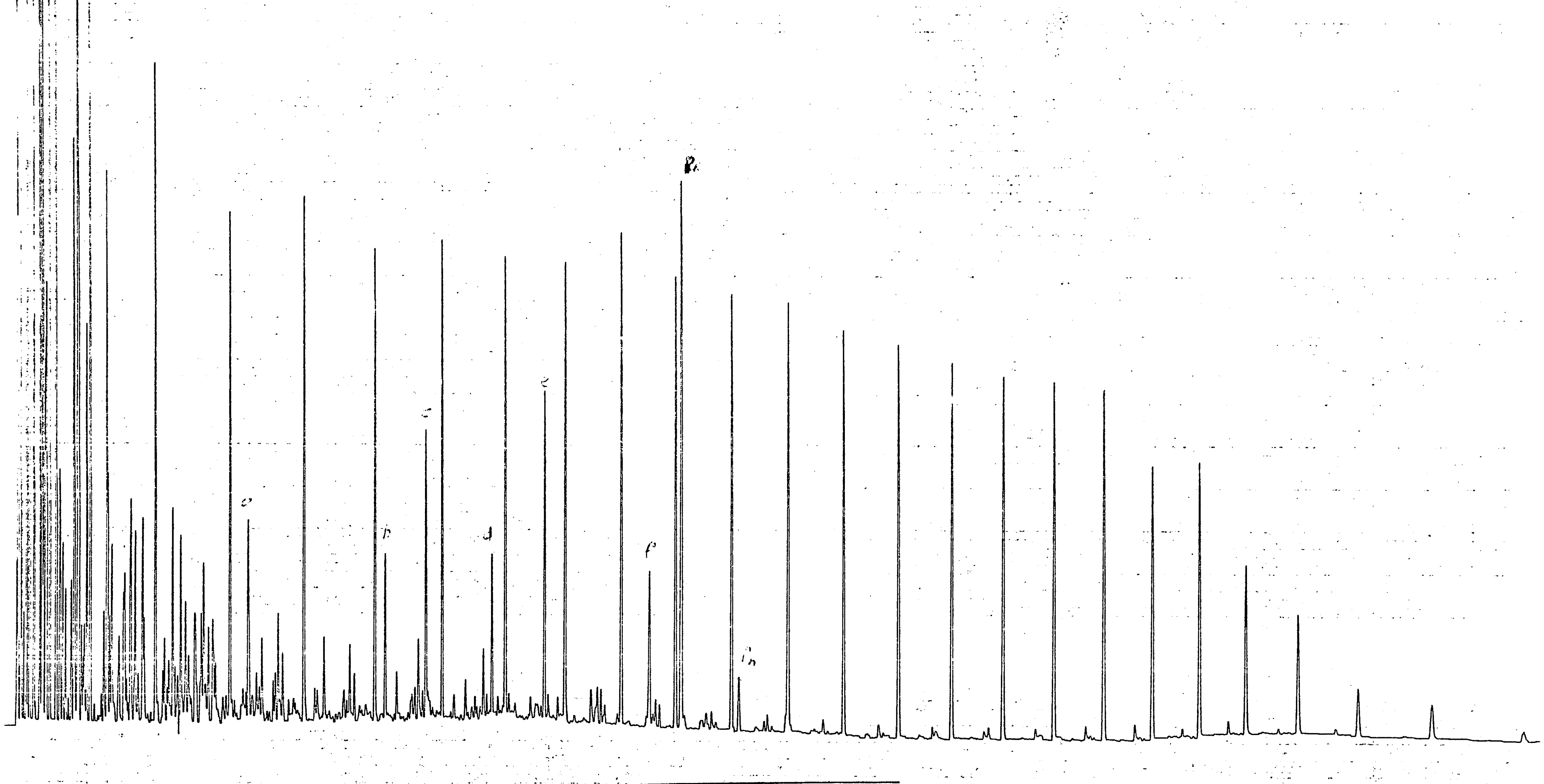


Figure 8. WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 5 1736.5m 34.7° API

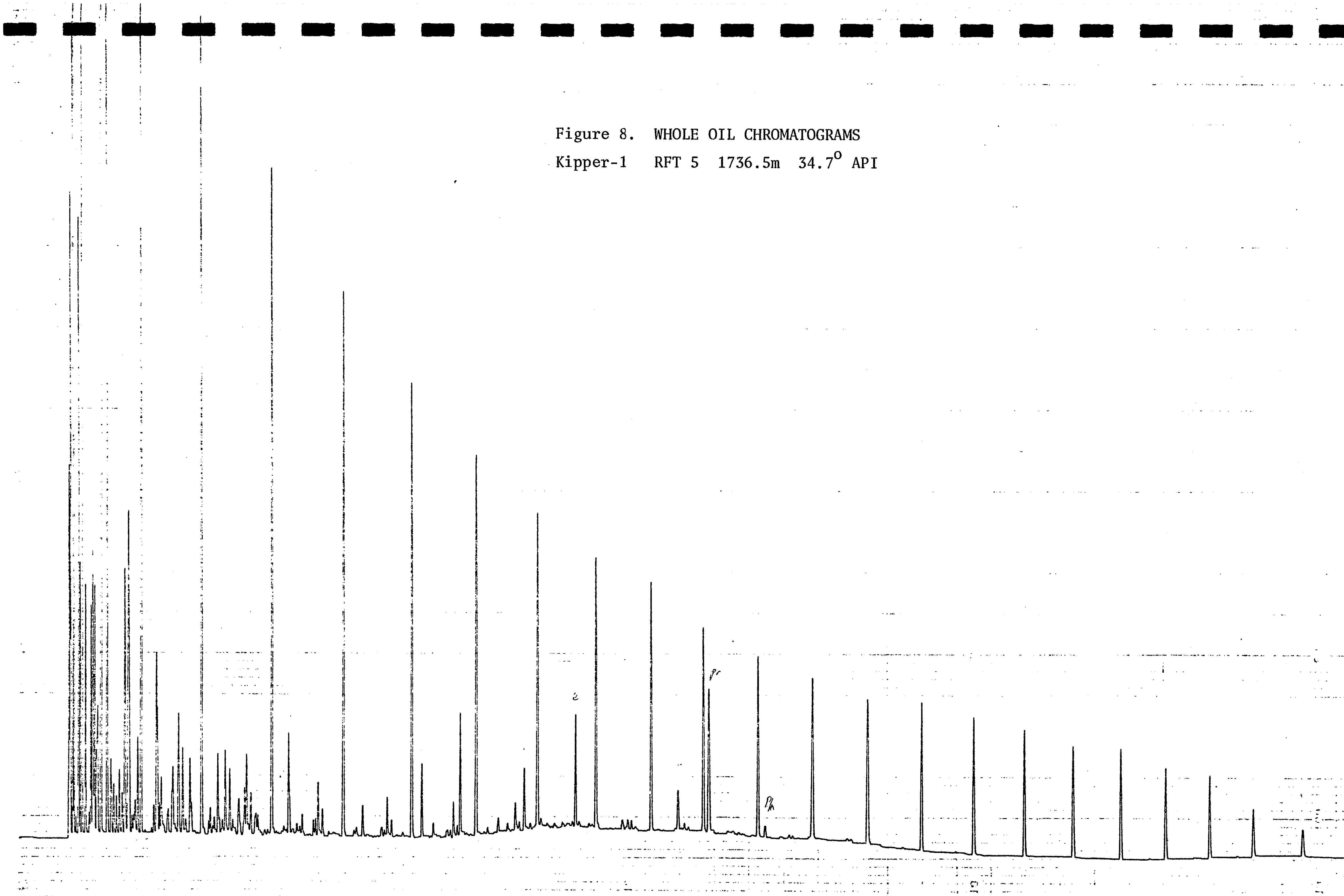


Figure 9. WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 4/34 1801.4 m

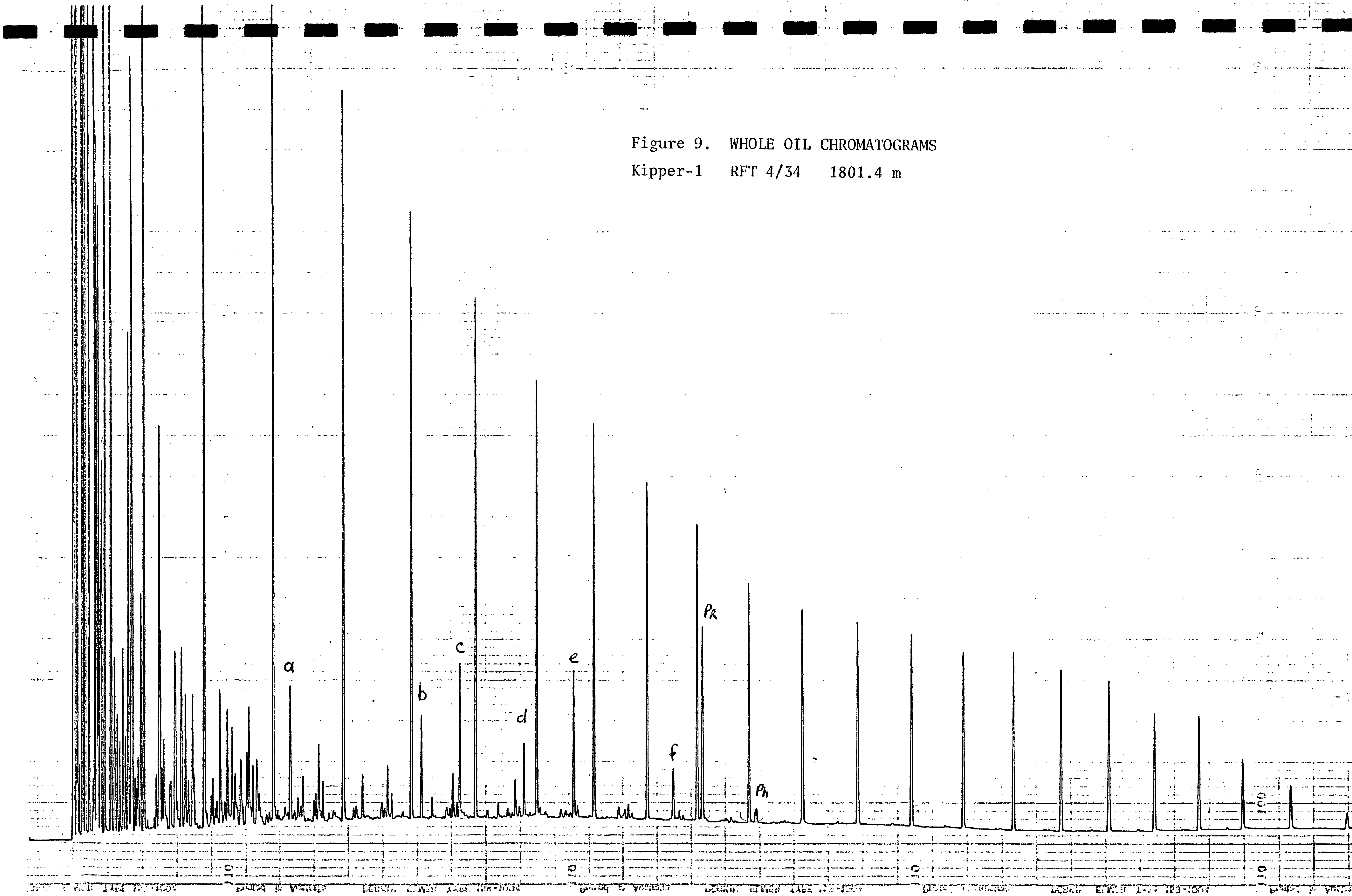


Figure 10. WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 3/33 1823.2 m 45.0^{o} API

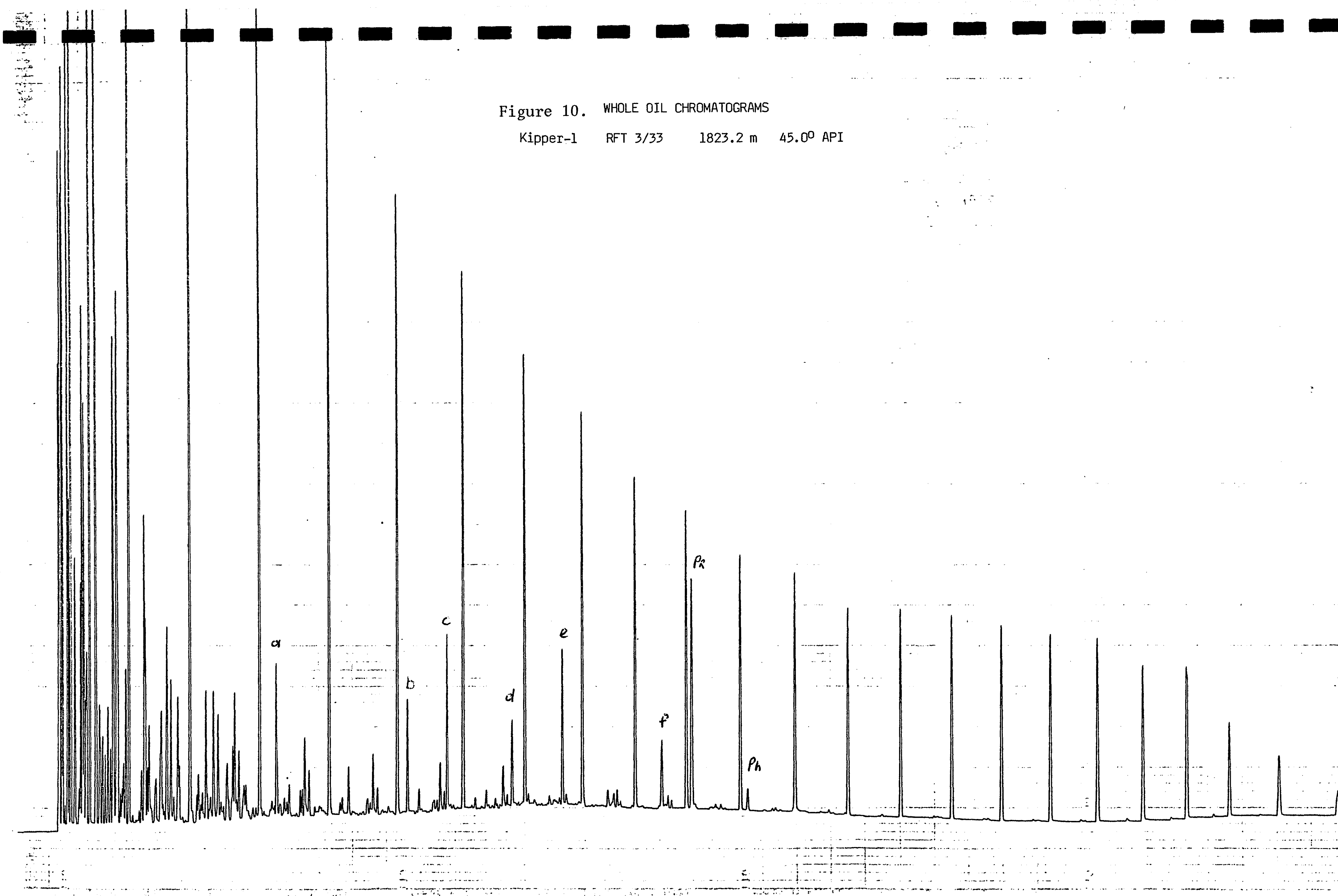


Figure 11. WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 2/32 2028.4 m 52.7° API

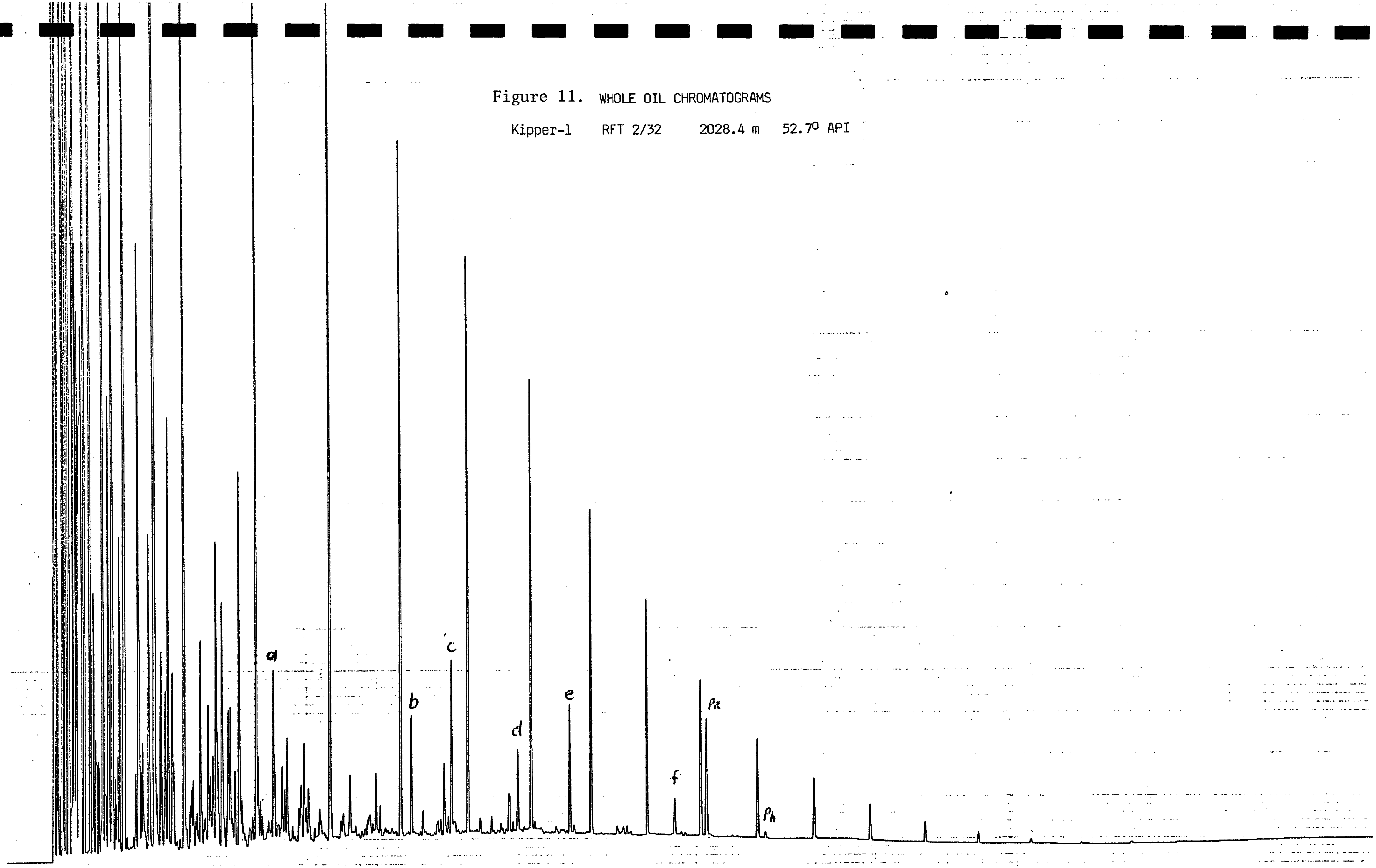


Figure 12. WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 12/64 2157.0 m 48.7^{o} API

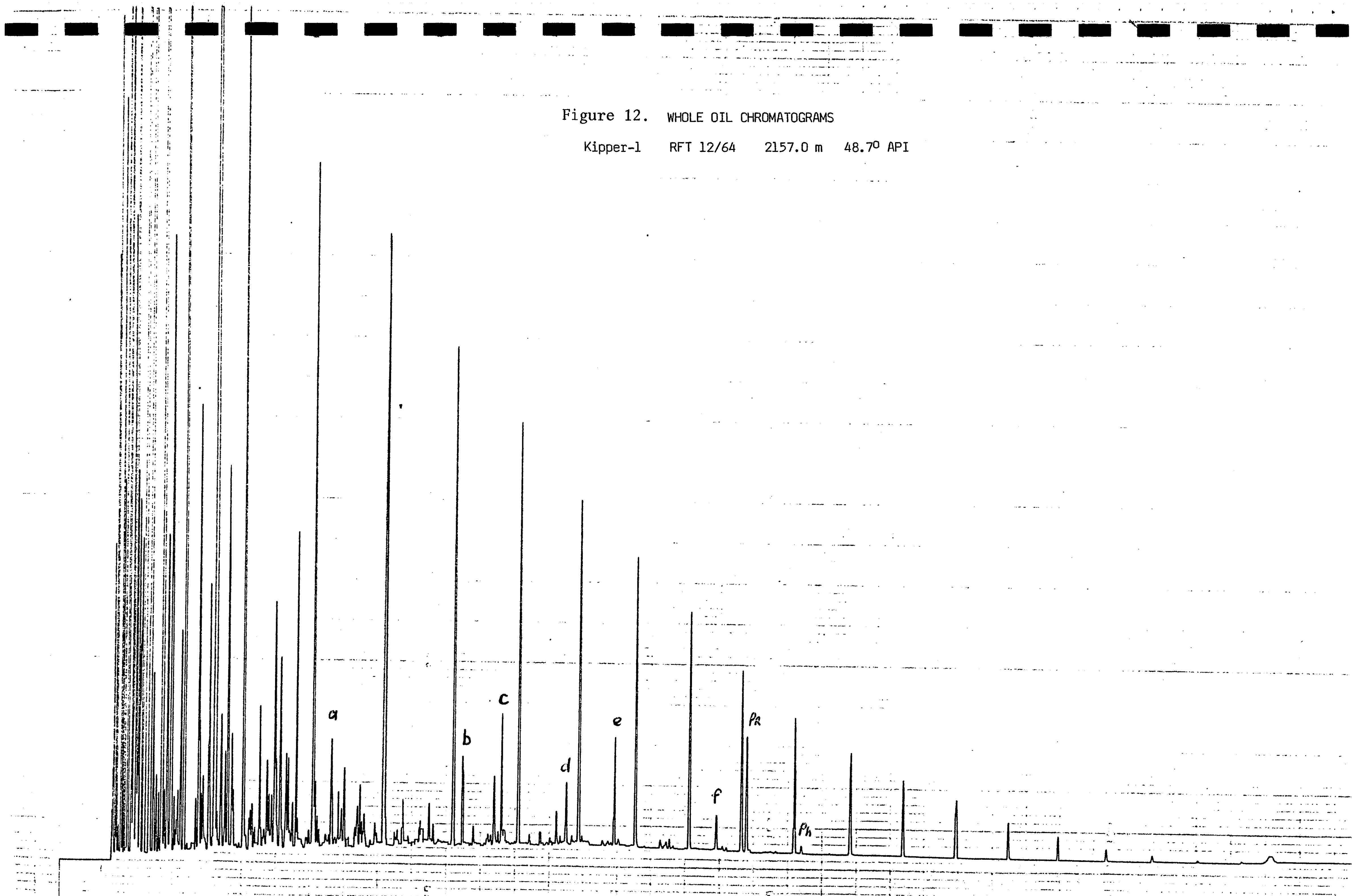
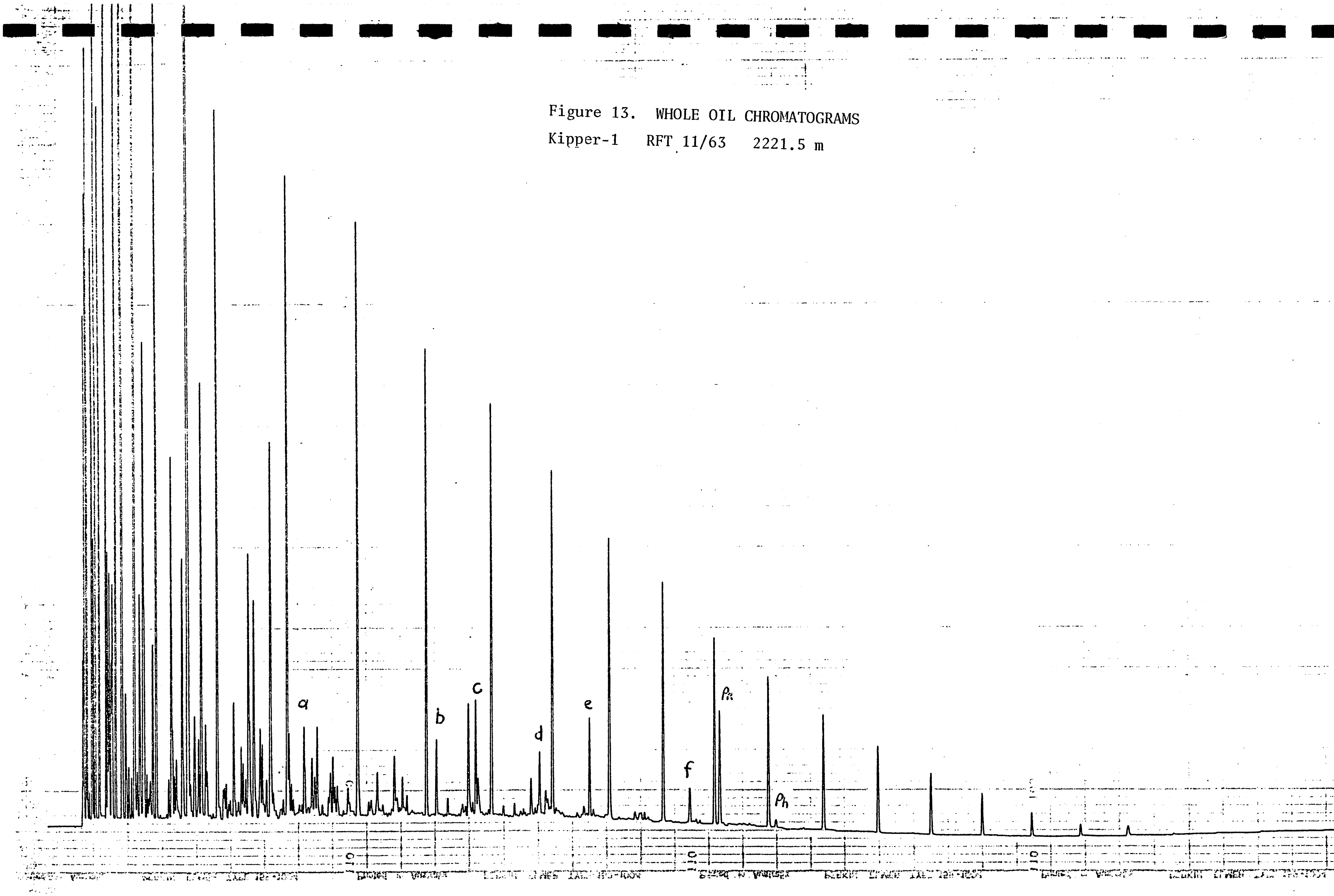


Figure 13. WHOLE OIL CHROMATOGRAMS

Kipper-1 RFT 11/63 2221.5 m



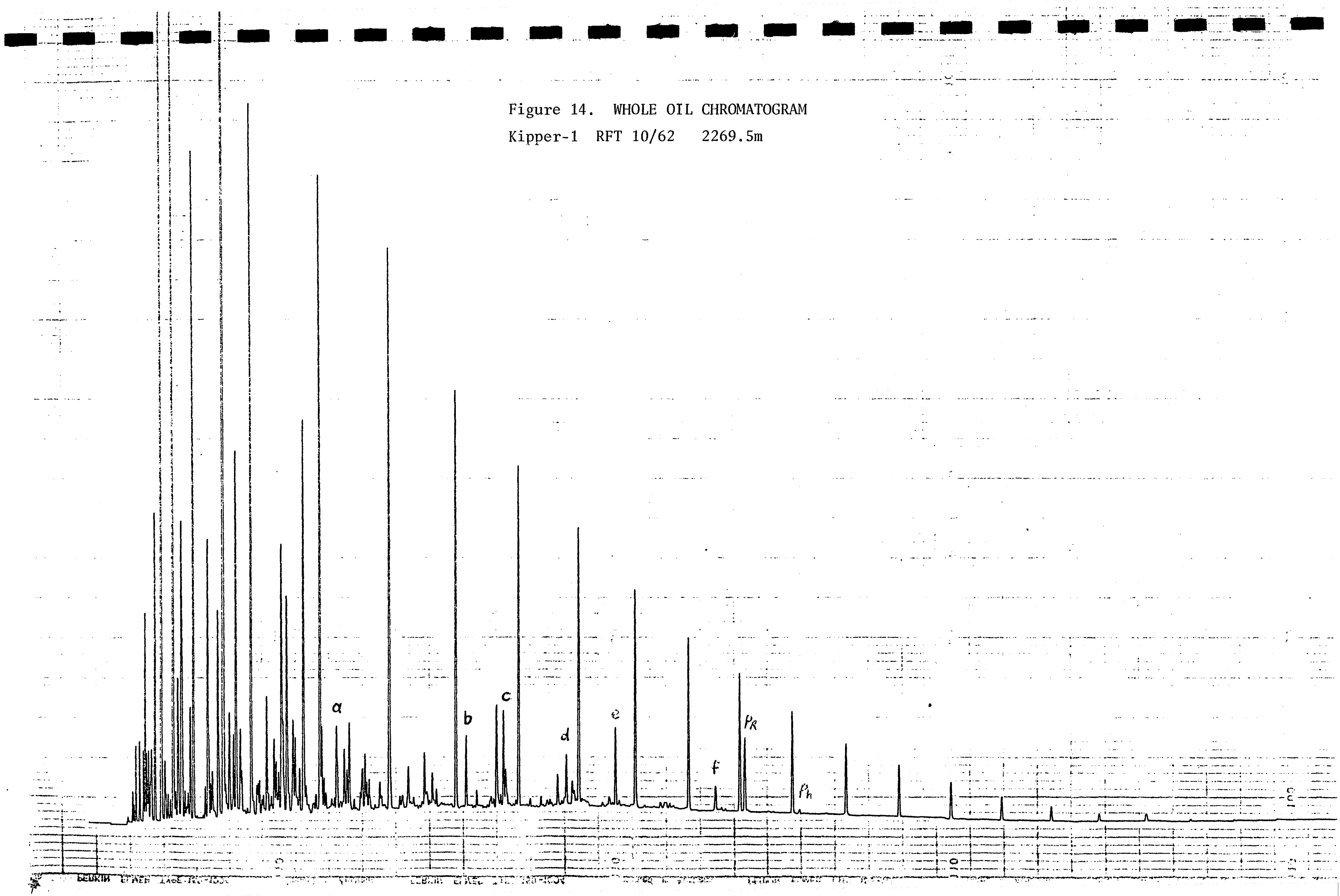


Figure 14. WHOLE OIL CHROMATOGRAM
Kipper-1 RFT 10/62 2269.5m

Figure 15. WHOLE OIL CHROMATOGRAM

Kipper-1 RFT 8/59 2845.5 m

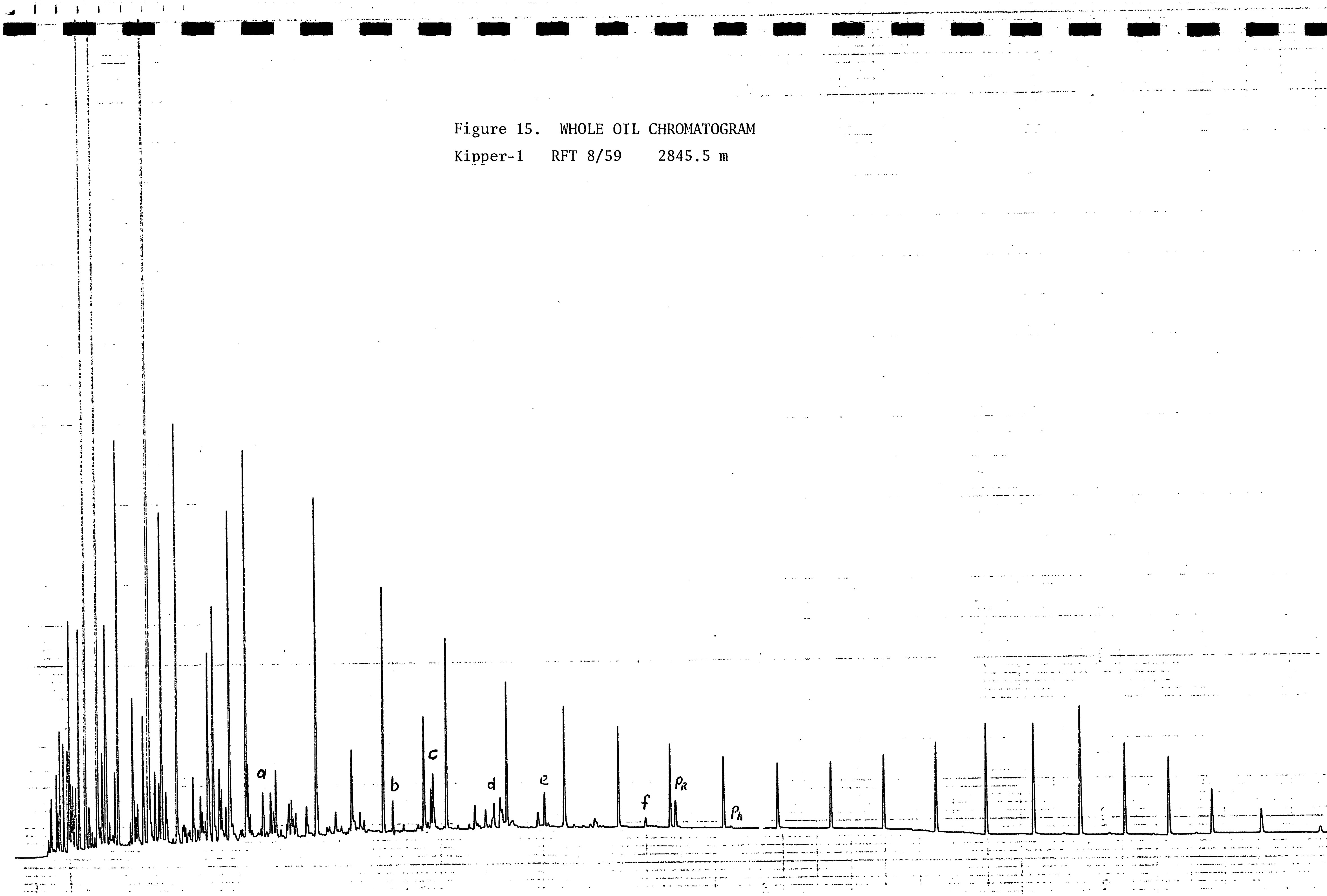


TABLE 1

C1-C4 HYDROCARBON ANALYSES

REPORT A - HEADSPACE GAS

BASIN - GIPPSLAND
WELL - KIPPER 1

		GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)								
SAMPLE NO.	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M	E	P	IB	NB	WET GAS E	P	IB	NB
77944 A	1190.00	4814	38	42	25	18	123	4937	2.49	98.	1.	1.	1.	0.	31.	34.	20.	15.
77944 C	1250.00	419	14	15	7	3	39	458	8.52	91.	3.	3.	2.	1.	36.	38.	18.	8.
77944 E	1310.00	2517	41	36	15	9	101	2618	3.86	96.	2.	1.	1.	0.	41.	36.	15.	9.
77944 G	1340.00	1155	38	44	18	12	112	1267	8.84	91.	3.	3.	1.	1.	34.	39.	16.	11.
77944 I	1370.00	1575	48	40	17	14	119	1694	7.02	93.	3.	2.	1.	1.	40.	34.	14.	12.
77944 K	1400.00	1302	31	37	35	44	147	1449	10.14	90.	2.	3.	2.	3.	21.	25.	24.	30.
77944 M	1430.00	8560	52	60	74	87	273	8833	3.09	97.	1.	1.	1.	1.	19.	22.	27.	32.
77944 Q	1490.00	345	29	6	1	1	37	382	9.69	90.	8.	2.	0.	0.	78.	16.	3.	3.
77944 S	1520.00	10718	1331	165	25	16	1537	12255	12.54	87.	11.	1.	0.	0.	87.	11.	2.	1.
77944 U	1550.00	18795	2319	377	43	25	2764	21559	12.82	87.	11.	2.	0.	0.	84.	14.	2.	1.
77945 C	1660.00	17957	3404	854	72	59	4389	22346	19.64	80.	15.	4.	0.	0.	78.	19.	2.	1.
77945 E	1690.00	25905	7259	3679	0	0	10938	36843	29.69	70.	20.	10.	0.	0.	66.	34.	0.	0.
77945 G	1720.00	2375	960	559	67	92	1678	4053	41.40	59.	24.	14.	2.	2.	57.	33.	4.	5.
77945 I	1750.00	2316	1130	849	0	0	1979	4295	46.08	54.	26.	20.	0.	0.	57.	43.	0.	0.
77945 K	1780.00	11427	3661	1697	220	248	5826	17253	33.77	66.	21.	10.	1.	1.	63.	29.	4.	4.
77945 M	1810.00	7496	4831	4624	1121	1337	11913	19409	61.38	39.	25.	24.	6.	7.	41.	39.	9.	11.
77945 O	1840.00	755	1444	1256	307	367	3374	4129	81.71	18.	35.	30.	7.	9.	43.	37.	9.	11.
77945 Q	1870.00	2389	2050	2178	511	747	5486	7875	69.66	30.	26.	28.	6.	9.	37.	40.	9.	14.
77945 S	1900.00	0	0	0	0	0	0	0	.00	0.	0.	0.	0.	0.	0.	0.	0.	0.
77945 U	1930.00	3419	664	321	57	89	1131	4550	24.86	75.	15.	7.	1.	2.	59.	28.	5.	8.
77945 W	1960.00	545	47	36	9	14	106	651	16.28	84.	7.	6.	1.	2.	44.	34.	8.	13.
77945 Y	1990.00	1122	126	76	19	29	250	1372	18.22	82.	9.	6.	1.	2.	50.	30.	8.	12.
77946 A	2020.00	10984	3222	2514	554	854	7144	18128	39.41	61.	18.	14.	3.	5.	45.	35.	8.	12.
77946 C	2050.00	15900	2822	1563	294	446	5125	21025	24.38	76.	13.	7.	1.	2.	55.	30.	6.	9.
77946 E	2080.00	16252	2959	1603	308	473	5343	21595	24.74	75.	14.	7.	1.	2.	55.	30.	6.	9.
77946 G	2110.00	9886	2458	1096	146	206	3906	13792	28.32	72.	18.	8.	1.	1.	63.	28.	4.	5.
77948 F	2155.00	4905	979	455	69	88	1591	6496	24.49	76.	15.	7.	1.	1.	62.	29.	4.	6.
77946 J	2185.00	2717	1041	583	92	122	1838	4555	40.35	60.	23.	13.	2.	3.	57.	32.	5.	7.
77946 L	2215.00	2178	1346	611	79	101	2137	4315	49.52	50.	31.	14.	2.	2.	63.	29.	4.	5.
77946 N	2245.00	4544	1699	722	121	142	2684	7228	37.13	63.	24.	10.	2.	2.	63.	27.	5.	5.
77946 P	2275.00	2649	947	359	42	56	1404	4053	34.64	65.	23.	9.	1.	1.	67.	26.	3.	4.
77946 R	2305.00	1191	1018	444	71	59	1592	2783	57.20	43.	37.	16.	3.	2.	64.	28.	4.	4.
77946 T	2335.00	415	509	221	33	15	778	1193	65.21	35.	43.	19.	3.	1.	65.	28.	4.	2.
77946 V	2365.00	597	450	149	31	15	645	1242	51.93	48.	36.	12.	2.	1.	70.	23.	5.	2.
77946 X	2395.00	1497	740	211	29	13	993	2490	39.88	60.	30.	8.	1.	1.	75.	21.	3.	1.
77946 Z	2425.00	3356	625	156	29	22	832	4188	19.87	80.	15.	4.	1.	1.	75.	19.	3.	3.
77947 B	2455.00	5006	1255	282	36	27	1600	6606	24.22	76.	19.	4.	1.	0.	78.	18.	2.	2.
77947 D	2485.00	4180	1254	316	57	47	1674	5854	28.60	71.	21.	5.	1.	1.	75.	19.	3.	3.
77947 F	2515.00	3283	983	293	64	46	1386	4669	29.69	70.	21.	6.	1.	1.	71.	21.	5.	3.
77947 H	2545.00	3504	886	317	68	51	1322	4826	27.39	73.	18.	7.	1.	1.	67.	24.	5.	4.
77947 J	2575.00	4226	1048	282	37	32	1399	5625	24.87	75.	19.	5.	1.	1.	75.	20.	3.	2.
77947 L	2605.00	1883	1030	303	49	28	1410	3293	42.82	57.	31.	9.	1.	1.	73.	21.	3.	2.
77947 N	2635.00	4281	951	256	31	16	1254	5535	22.66	77.	17.	5.	1.	0.	76.	20.	2.	1.
77947 P	2665.00	3446	1000	282	40	26	1348	4794	28.12	72.	21.	6.	1.	1.	74.	21.	3.	2.
77947 R	2695.00	4815	1110	249	23	12	1394	6209	22.45	78.	18.	4.	0.	0.	80.	18.	2.	1.
77947 T	2725.00	6144	1158	221	24	15	1418	7562	18.75	81.	15.	3.	0.	0.	82.	16.	2.	1.
77947 V	2755.00	2034	625	164	13	8	810	2844	28.48	72.	22.	6.	0.	0.	77.	20.	2.	1.

06/08/86

ESSO AUSTRALIA LTD.

C1-C4 HYDROCARBON ANALYSES

REPORT A - HEADSPACE GAS

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M	TOTAL GAS E	TOTAL GAS P	TOTAL GAS IB	TOTAL GAS NB	WET GAS E	WET GAS P	WET GAS I
		GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)							
77947 X	2785.00	2600	580	122	14	8	724	3324	21.78	78.	17.	4.	0.	0.	80.	17.	[illegible]
77947 Z	2815.00	5024	585	118	25	21	749	5773	12.97	87.	10.	2.	0.	0.	78.	16.	[illegible]
77948 B	2845.00	2721	248	45	7	4	304	3025	10.05	90.	8.	1.	0.	0.	82.	15.	[illegible]
77948 D	2875.00	2669	375	92	15	13	495	3164	15.64	84.	12.	3.	0.	0.	76.	19.	[illegible]

TABLE 2

TOTAL ORGANIC CARBON REPORT

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	TOC%	AN	TOC%	AN	TOC%	DESCRIPTION
77921 N	1412.50	MIOCENE-OLIGOCENE	SEASPRAY GROUP	1	.32					SH GRNISH GY
77921 M	1418.00	MIOCENE-OLIGOCENE	SEASPRAY GROUP	1	.14					SLST TAN-PL YEL BRN
77921 I	1478.00	EARLY EOCENE	LATROBE GROUP	1	36.53					COAL BLK
77921 G	1493.00	EARLY EOCENE	LATROBE GROUP	1	.66					SLST LT OL GY
77921 C	1562.50	PALEOCENE	LATROBE GROUP	1	1.03					SH LT OL GY
77921 A	1603.00	PALEOCENE	LATROBE GROUP	1	5.58					SH TR COAL BLK
77920 Y	1646.00	PALEOCENE	LATROBE GROUP	1	.25					SH LT GY
77920 V	1727.00	PALEOCENE	LATROBE GROUP	1	.89					SLST MED GY
77920 U	1733.50	MAASTRICHTIAN	LATROBE GROUP	1	1.12					SLST DK GY
77920 S	1760.00	MAASTRICHTIAN	LATROBE GROUP	1	.95					SLST MED GY
77919 N	2088.00	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	.51					SLST LT OL GY
77919 J	2142.00	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	.26					SH DK GY
77919 H	2155.00	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	2.06					SLST DK GY
77919 D	2187.50	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	1.98					SLST BLK
77919 C	2192.00	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	3.74					SLST DK GY-BLK
77919 B	2196.50	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	3.12					SH GYISH BLK
77919 A	2209.50	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	.22					SH MED DK GY
77918 X	2234.00	CAMPANIAN-SANTONIAN	LATROBE GROUP	1	.60					SH DK GY
77918 S	2296.50	SANTONIAN-TURONIAN	KIPPER	1	1.16					SLST MED DK GY
77920 M	2307.00	SANTONIAN-TURONIAN	KIPPER	1	.98					SLST GY
77918 R	2320.00	SANTONIAN-TURONIAN	KIPPER	1	1.81					SLST MED DK GY
77918 Q	2342.50	SANTONIAN-TURONIAN	KIPPER	1	1.91					SLST GY BLK
77918 P	2396.00	SANTONIAN-TURONIAN	KIPPER	1	2.66					SLST DK GY
77920 J	2408.00	SANTONIAN-TURONIAN	KIPPER	1	1.75					SLST MED DK GY
77920 I	2420.00	SANTONIAN-TURONIAN	KIPPER	1	2.31					SH DK GY
77918 O	2442.00	SANTONIAN-TURONIAN	KIPPER	1	1.45					SLST MED GY
77918 N	2451.00	SANTONIAN-TURONIAN	KIPPER	1	.90					SH MED DK GY
77920 H	2460.00	SANTONIAN-TURONIAN	KIPPER	1	3.58					SH DK GY
77920 G	2483.00	SANTONIAN-TURONIAN	KIPPER	1	1.68					SLST MED DK GY
77920 F	2493.00	SANTONIAN-TURONIAN	KIPPER	1	1.38					SLST DK GY
77918 M	2500.00	SANTONIAN-TURONIAN	KIPPER	1	2.45					SH DK GY-BLK
77920 E	2519.50	SANTONIAN-TURONIAN	KIPPER	1	1.72					SH DK GY
77918 L	2538.00	SANTONIAN-TURONIAN	KIPPER	1	2.02					SH DK GY
77918 K	2559.00	SANTONIAN-TURONIAN	KIPPER	1	2.42					SLST MED GY
77920 D	2581.50	SANTONIAN-TURONIAN	KIPPER	1	2.26					SH MED DK GY
77918 J	2601.00	SANTONIAN-TURONIAN	KIPPER	1	.80					SLST MED GY
77918 I	2617.00	SANTONIAN-TURONIAN	KIPPER	1	2.03					SLST DK GY
77920 B	2640.00	SANTONIAN-TURONIAN	KIPPER	1	1.70					SLST DK GYISH BRN
77918 G	2661.00	SANTONIAN-TURONIAN	KIPPER	1	1.16					SLST DK GY
77920 A	2686.00	SANTONIAN-TURONIAN	KIPPER	1	1.19					SH GYISH BLK
77918 F	2697.00	SANTONIAN-TURONIAN	KIPPER	1	1.33					SH MED DK GY
77918 E	2709.00	SANTONIAN-TURONIAN	KIPPER	1	1.95					SH MED DK GY
77919 Z	2730.00	SANTONIAN-TURONIAN	KIPPER	1	1.64					CLYST DK GY
77918 C	2773.00	SANTONIAN-TURONIAN	KIPPER	1	1.65					SLST BRN GY
77919 Y	2794.00	SANTONIAN-TURONIAN	KIPPER	1	1.55					SH BLK
77919 X	2805.00	SANTONIAN-TURONIAN	KIPPER	1	.72					SH DK GY
77919 W	2824.00	SANTONIAN-TURONIAN	KIPPER	1	.43					SLST GY

Table 2 cont.

TOTAL ORGANIC CARBON REPORT

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	AGE	FORMATION	AN	TOC%	AN	TOC%	AN	TOC%	DESCRIPTION
77918 B	2839.00	SANTONIAN-TURONIAN	KIPPER	1	.95					SDY SLST MED-LT GY
77918 A	2862.00	SANTONIAN-TURONIAN	KIPPER	1	1.70					SLST DY GY

18/09/86

ESSO AUSTRALIA LTD. TABLE

ROCK EVAL ANALYSES

BASIN - GIPPSLAND
WELL - KIPPER 1

REPORT A - SULPHUR & PYROLYZABLE CARBON

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	TMAX	S1	S2	S3	PI	S2/S3	PC	COMMENTS
77921 I	1478.0	CRSW	EARLY EOCENE	412.	10.92	209.47	4 04	.05	51.85	18.28	
77919 N	2088.0	CRSW	CAMPANIAN-SANTONIAN	431.	.07	.88	.31	.08	2.84	.08	
77919 H	2155.0	CRSW	CAMPANIAN-SANTONIAN	436.	.31	1.17	.23	.21	5.04	.12	
77919 D	2187.5	CRSW	CAMPANIAN-SANTONIAN	432.	.20	.79	.25	.20	3.19	.08	
77919 C	2192.0	CRSW	CAMPANIAN-SANTONIAN	436.	.47	2.18	.27	.18	8.12	.22	
77919 B	2196.5	CRSW	CAMPANIAN-SANTONIAN	435.	.78	3.17	.27	.20	11.74	.32	
77918 X	2234.0	CRSW	CAMPANIAN-SANTONIAN	434.	.13	.36	.16	.26	2.19	.04	
77918 S	2296.5	CRSW	SANTONIAN-TURONIAN	437.	.11	.69	.33	.14	2.07	.07	
77918 R	2320.0	CRSW	SANTONIAN-TURONIAN	435.	.11	.97	.15	.11	6.31	.09	
77918 Q	2342.5	CRSW	SANTONIAN-TURONIAN	441.	.14	1.10	.36	.11	3.07	.10	
77918 P	2396.0	CRSW	SANTONIAN-TURONIAN	442.	.16	1.30	.26	.11	4.90	.12	
77918 O	2442.0	CRSW	SANTONIAN-TURONIAN	437.	.17	.73	.14	.19	5.31	.08	
77918 N	2451.0	CRSW	SANTONIAN-TURONIAN	444.	.14	.40	.14	.26	2.85	.04	
77918 M	2500.0	CRSW	SANTONIAN-TURONIAN	433.	.25	1.91	.25	.12	7.65	.18	
77918 L	2538.0	CRSW	SANTONIAN-TURONIAN	435.	.17	.86	.44	.17	1.94	.08	
77919 Y	2794.0	CRSW	SANTONIAN-TURONIAN	436.	.08	1.23	.39	.06	3.13	.11	
77919 X	2805.0	CRSW	SANTONIAN-TURONIAN	436.	.08	.47	.37	.13	1.28	.05	
77918 B	2839.0	CRSW	SANTONIAN-TURONIAN	457.	.09	.36	.38	.21	.91	.04	
77918 A	2962.0	CRSW	SANTONIAN-TURONIAN	456.	.20	.56	.40	.26	1.38	.06	

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

ROCK EVAL ANALYSES

BASIN - GIPPSLAND
WELL - KIPPER 1

REPORT B - TOTAL CARBON, H/O INDICES

SAMPLE NO.	DEPTH	SAMPLE TYPE	FORMATION	TC	HI	OI	HI/OI	COMMENTS
77921 I	1478.0	CRSW	LATROBE GROUP	36.53	570.	11.	51.85	
77919 N	2068.0	CRSW	LATROBE GROUP	.51	171.	60.	2.84	
77919 H	2155.0	CRSW	LATROBE GROUP	2.06	57.	11.	5.04	
77919 D	2187.5	CRSW	LATROBE GROUP	1.98	40.	12.	3.19	
77919 C	2192.0	CRSW	LATROBE GROUP	3.74	58.	7.	8.12	
77919 B	2196.5	CRSW	LATROBE GROUP	3.12	100.	9.	11.74	
77918 X	2234.0	CRSW	LATROBE GROUP	.60	60.	27.	2.19	
77918 S	2296.5	CRSW	KIPPER	1.16	57.	29.	2.08	
77918 R	2320.0	CRSW	KIPPER	1.81	51.	8.	6.31	
77918 Q	2342.5	CRSW	KIPPER	1.91	57.	19.	3.07	
77918 P	2396.0	CRSW	KIPPER	2.65	49.	10.	4.90	
77918 O	2442.0	CRSW	KIPPER	1.45	51.	10.	5.31	
77918 N	2451.0	CRSW	KIPPER	.90	37.	33.	1.12	
77918 M	2500.0	CRSW	KIPPER	2.45	76.	10.	7.65	
77918 L	2538.0	CRSW	KIPPER	2.02	42.	22.	1.94	
77919 Y	2794.0	CRSW	KIPPER	1.55	77.	25.	3.13	
77919 X	2805.0	CRSW	KIPPER	.72	66.	55.	1.20	
77918 B	2839.0	CRSW	KIPPER	.95	36.	40.	.91	
77918 A	2862.0	CRSW	KIPPER	1.70	33.	24.	1.38	

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

06/08/86

TABLE 4

ESSO AUSTRALIA LTD.

P

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
77934 T	1430.70	CRSG	MID EOCENE	GURNARD	1.09	.17	.02	
77934 U	1433.40	CRSG	MID EOCENE	GURNARD	.87	.24	.02	
77934 A	1436.20	CRSG	MID EOCENE	GURNARD	.87	.26	.02	
77934 B	1436.60	CRSG	MID EOCENE	GURNARD	1.12	.17	.02	
77934 D	1437.50	CRSG	EARLY EOCENE	FLOUNDER	.92	.30	.03	
77934 E	1437.72	CRSG	EARLY EOCENE	FLOUNDER	1.16	.21	.01	
77934 F	1438.00	CRSG	EARLY EOCENE	FLOUNDER	1.13	.24	.01	
77934 H	1439.00	CRSG	EARLY EOCENE	FLOUNDER	1.49	.38	.00	
77934 I	1440.44	CRSG	EARLY EOCENE	FLOUNDER	1.06	.31	.02	
77934 J	1442.80	CRSG	EARLY EOCENE	FLOUNDER	1.38	.21	.01	
77934 K	1444.50	CRSG	EARLY EOCENE	FLOUNDER	1.07	.36	.01	
77934 L	1445.40	CRSG	EARLY EOCENE	FLOUNDER	.93	.29	.02	
77934 V	1449.80	CRSG	EARLY EOCENE	FLOUNDER	.91	.26	.02	
77934 W	1453.80	CRSG	EARLY EOCENE	FLOUNDER	.91	.29	.02	
77934 X	1454.40	CRSG	EARLY EOCENE	FLOUNDER	.90	.32	.02	
77921 J	1464.00	CRSW	EARLY EOCENE	LATROBE GROUP	.89	.27	.01	
77921 G	1493.00	CRSW	EARLY EOCENE	LATROBE GROUP	.84	.27	.02	
77921 F	1506.00	CRSW	PALEOCENE	LATROBE GROUP	.80	.25	.01	
77921 C	1562.50	CRSW	PALEOCENE	LATROBE GROUP	1.18	.20	.01	
77920 Y	1646.00	CRSW	PALEOCENE	LATROBE GROUP	1.11	.30	.01	
77920 V	1727.00	CRSW	PALEOCENE	LATROBE GROUP	.74	.27	.01	
77920 U	1733.50	CRSW	MAASTRICHTIAN	LATROBE GROUP	.76	.20	.01	
77920 S	1760.00	CRSW	MAASTRICHTIAN	LATROBE GROUP	.61	.18	.01	
77930 I	1770.00	CTSG	MAASTRICHTIAN	LATROBE GROUP	.85	.19	.01	
77920 Q	1805.00	CRSW	MAASTRICHTIAN	LATROBE GROUP	.70	.20	.02	
77930 J	1830.00	CTSG	MAASTRICHTIAN	LATROBE GROUP	.86	.19	.01	
77934 M	1832.50	CRSG	MAASTRICHTIAN	LATROBE GROUP	.80	.19	.01	
77934 N	1835.00	CRSG	MAASTRICHTIAN	LATROBE GROUP	.92	.19	.02	
77934 O	1838.00	SRCG	MAASTRICHTIAN	LATROBE GROUP	1.00	.21	.01	
77934 P	1839.10	CRSG	MAASTRICHTIAN	LATROBE GROUP	.80	.19	.01	
77934 Q	1839.90	CRSG	MAASTRICHTIAN	LATROBE GROUP	.73	.19	.01	
77934 R	1840.60	CRSG	MAASTRICHTIAN	LATROBE GROUP	.81	.20	.01	
77930 K	1855.00	CTSG	MAASTRICHTIAN	LATROBE GROUP	.96	.23	.01	
77930 L	1880.00	CTSG	MAASTRICHTIAN	LATROBE GROUP	.87	.22	.01	
77930 M	1890.00	CTSG	MAASTRICHTIAN	LATROBE GROUP	.91	.21	.01	
77930 N	1900.00	CTSG		VOLCANICS	.85	.22	.01	
77919 S	1998.00	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	1.07	.27	.01	
77930 B	2000.50	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.90	.23	.01	
77930 O	2045.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.90	.21	.01	
77930 D	2050.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.87	.23	.01	
77919 O	2052.00	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.60	.13	.01	
77930 E	2055.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.83	.23	.01	
77930 F	2080.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.77	.18	.01	
77919 N	2088.00	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.99	.15	.01	
77930 G	2090.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.80	.18	.02	

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
77930 P	2110.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.81	.17	.02	
77930 H	2140.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.61	.25	.02	
77933 L	2145.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.84	.25	.01	
77919 H	2155.00	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.67	.13	.02	
77933 O	2160.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.70	.20	.01	
77933 P	2165.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.75	.21	.01	
77933 T	2185.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.57	.27	.02	
77919 D	2187.50	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.71	.15	.02	
77919 C	2192.00	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.62	.21	.02	
77919 B	2196.50	CRSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.68	.12	.02	
77919 A	2209.50	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.59	.93	.02	
77933 X	2220.00	CTSG	CAMPANIAN-SANTONIAN	LATROBE GROUP	.68	.17	.02	
77918 W	2245.50	CRSW	CAMPANIAN-SANTONIAN	LATROBE GROUP	.69	.09	.01	
77918 S	2296.50	CRSW	SANTONIAN-TURONIAN	KIPPER	.65	.13	.02	
77920 M	2307.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.65	.14	.02	
77918 R	2320.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.64	.18	.02	
77918 Q	2342.50	CRSW	SANTONIAN-TURONIAN	KIPPER	.69	.14	.02	
77920 L	2357.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.70	.12	.02	
77920 K	2381.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.63	.14	.02	
77918 P	2396.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.65	.18	.02	
77920 J	2408.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.67	.20	.02	
77920 I	2420.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.66	.19	.02	
77918 O	2442.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.69	.14	.02	
77918 N	2451.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.61	.15	.02	
77920 H	2460.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.64	.12	.02	
77920 G	2483.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.69	.16	.02	
77920 F	2493.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.63	.18	.02	
77918 M	2500.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.74	.15	.02	
77920 E	2519.50	CRSW	SANTONIAN-TURONIAN	KIPPER	.64	.14	.03	
77918 L	2538.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.61	.11	.02	
77918 K	2559.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.66	.11	.02	
77920 D	2581.50	CRSW	SANTONIAN-TURONIAN	KIPPER	.71	.17	.02	
77918 J	2601.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.64	.12	.02	
77917 P	2610.00	CTSG	SANTONIAN-TURONIAN	KIPPER	.46	.32	.02	
77918 I	2617.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.69	.16	.02	
77920 C	2635.50	CRSW	SANTONIAN-TURONIAN	KIPPER	.65	.11	.02	
77920 B	2640.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.66	.14	.02	
77918 G	2661.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.66	.18	.02	
77920 A	2686.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.75	.11	.03	
77917 R	2690.00	CTSG	SANTONIAN-TURONIAN	KIPPER	.53	.29	.02	
77918 F	2697.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.65	.14	.03	
77918 E	2709.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.72	.13	.03	
77919 Z	2730.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.61	.15	.02	
77917 S	2735.00	CTSG	SANTONIAN-TURONIAN	KIPPER	.51	.24	.02	
77917 T	2740.00	CTSG	SANTONIAN-TURONIAN	KIPPER	.62	.16	.02	

Table 4 (cont)

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
77918 D	2756.50	CRSW	SANTONIAN-TURONIAN	KIPPER	.64	.10	.02	
77918 C	2773.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.65	.11	.03	
77919 Y	2794.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.71	.16	.03	
77919 X	2805.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.80	.16	.02	HIGH ASH
77919 W	2824.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.52	.13	.02	
77918 B	2839.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.63	.15	.02	
77918 A	2862.00	CRSW	SANTONIAN-TURONIAN	KIPPER	.58	.16	.02	

ESSO

5.5.86 A1/1

KIPPER NO. 1

KK No.	Esso No.	Depth m	$\bar{R}_v$ max %	Range R_v max %	N	Description Including Exinite Fluorescence
x4925	77921 -I	1478 SWC 106	0.41	0.33-0.53	28	Abundant sporinite, yellow to orange, abundant suberinite, dull orange to weak brown, common to abundant liptodetrinite, bright yellow to dull orange, common resinite, bright yellow to dull orange, sparse cutinite, yellow to orange. (Coal>>shaly coal>>claystone. Coal dominant, V>I>E. Duroclarite>clarite>durite>vitrite>clarodurite>inertite. Shaly coal abundant, V>I>E. Duroclarite>clarite. Fungal sclerotinite present. Dom rare, V>I>E. All three maceral groups rare as dom. Weak to moderate dull green fluorescing oil haze developed from coal and shaly coal in fluorescent light. Fluorinite abundant. Lower end of the $\bar{R}_v$ range is affected by the presence of suberinite or bituminite related vitrinite.)
		$\bar{R}_I$	1.26	0.86-1.68	5	
x4926	77921 -A	1603 SWC 98	0.48	0.41-0.59	26	Abundant sporinite, bright yellow to orange, abundant suberinite, dull orange and weak brown, rare resinite, yellow, rare fluorinite, green. (Coal>>shaly coal>claystone>sandstone. Coal dominant, V>>E>>I. Clarite>vitrite>>duroclarite. Shaly coal abundant, V>>E>>I. Clarite>>vitrite. Vitrinite is dominantly relatively open textured texto-ulminite. Dom sparse. V>E>I. Vitrinite and exinite sparse, inertinite rare. Vitrinite shows weak brown fluorescence. Moderate oil haze developed from some coal and shaly coal when exposed to fluorescent light. Green fluorescing oil droplets rare in coal. Lower end of $\bar{R}_v$ range affected by presence of suberinite. Pyrite sparse.)
x4927	77920 -V	1727 SWC 92	0.46	0.37-0.56	25	Rare to sparse sporinite and rare liptodetrinite, bright yellow to orange, rare cutinite, yellow to orange. (Sandstone>>siltstone>>coal. Coal trace, vitrite=inertite. Dom common, I>V>E. Inertinite and vitrinite sparse, exinite rare to sparse. Pyrite major.)
x4928	77918 -Z	2221.5 SWC 39	-	-	-	Rare liptodetrinite, yellow to orange. (Indeterminate lithology. Dom rare, I>E, may be contaminants. Inertinite and exinite rare, vitrinite absent. Yellow fluorescing ?oil droplets sparse. Mineral fluorescence weak to absent. Inorganic mud additive sparse. Pyrite sparse.)
		$\bar{R}_I$	1.20	1.06-1.40	4	

ESSO

6.5.86 A1/2

KIPPER NO. 1

KK No.	Esso No.	Depth m	$\bar{R}_v$ max %	Range R_v max %	N	Description Including Exinite Fluorescence
x4929	77920 -I	2420 SWC 74	0.70	0.63-0.79	18	Sparse sporinite, yellow to orange, rare cutinite, yellow orange to orange. (Calcareous sandstone. Dom abundant, I>V>E. Inertinite abundant, vitrinite and exinite sparse. Mineral matter fluorescence moderate. Pyrite sparse.)
		$\bar{R}_I$	1.48	0.82-2.18	15	
x4930	77920 -B	2640 SWC 67	0.73	0.60-0.81	21	Rare cutinite, yellow orange, rare sporinite, yellow. (Calcareous sandstone. Dom common, I>V>E. Inertinite common, vitrinite sparse, exinite rare. Mineral matter fluorescence moderate to strong. Pyrite sparse.)
		$\bar{R}_I$	1.29	0.90-2.08	15	
x4931	77919 -X	2805 SWC 63	0.89	0.75-0.99	25	Sparse sporinite and rare liptodetrinite, yellow to orange. (Claystone>sandstone. Dom common, V>I>E. Vitrinite common, inertinite and exinite sparse. Pyrite sparse.)

TABLE 6. THERMAL ALTERATION INDEX, KIPPER-1

	DEPTH	TAI
SWC	1760.0m	2.3
SWC	1839.9m	2.3
CTS	1850-1855m	2.3
CTS	1885-1890m	2.3
TOP OF VOLCANICS	1895	
BASE OF VOLCANICS	1989	
SWC	1998m	2.3
SWC	2196.5m	2.4
SWC	2187.5m	2.3
SWC	2862.0m	2.4

TABLE 7. Kipper-1
Gas Composition
RFT 2/32, 2028.4m

HYDROCARBON ANALYSIS OF RESERVOIR FLUID SAMPLE TO UNDECANES PLUS

Cylinder #: RFS 1116

Component	Mol Percent	GPM
Hydrogen Sulphide	0.00	
Carbon Dioxide	10.40	
Nitrogen	0.26	
Methane	77.50	
Ethane	5.94	1.584
Propane	2.47	0.678
iso-Butane	0.43	0.140
n-Butane	0.76	0.239
iso-Pentane	0.27	0.099
n-Pentane	0.27	0.098
Hexanes	0.30	0.116
Heptanes	0.40	0.634 (C7+)
Octanes	0.46	
Nonanes	0.20	
Decanes	0.11	
Undecanes plus	0.23	
	100.00	3.588

Gas gravity (Air = 1.000): 0.785

Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F): 1104

TABLE 8.

ESSO AUSTRALIA LTD.

OIL - API GRAVITY, POUR POINT & SULPHUR %

BASIN - GIPPSLAND
WELL - KIPPER 1

SAMPLE NO.	DEPTH	AGE	FORMATION	API GRAVITY	POUR PT. (OF)	SULPHUR %	COMMENTS
77917 C	1437.70	EARLY EOCENE	FLOUNDER	46.60	.	.	RFT 6/37
77917 D	1736.50	MAASTRICHTIAN	LATROBE GROUP	34.70	.	.	RFT 5
77917 Y	1801.40	MAASTRICHTIAN	LATROBE GROUP	52.84	.	.	RFT 4/34
77917 E	1823.20	MAASTRICHTIAN	LATROBE GROUP	45.00	.	.	RFT 3/33
77917 F	2028.40	CAMPANIAN-SANTONIAN	LATROBE GROUP	52.70	.	.	RFT 2/32
77917 X	2157.00	CAMPANIAN-SANTONIAN	LATROBE GROUP	48.94	.	.	RFT 12/64
77917 U	2221.50	CAMPANIAN-SANTONIAN	LATROBE GROUP	46.62	.	.	RFT 11/63
77917 V	2269.50	CAMPANIAN-SANTONIAN	LATROBE GROUP	39.87	.	.	RFT 10/62
77917 W	2845.50	SANTONIAN-TURONIAN	KIPPER	39.25	.	.	RFT 8/59

Appendix 6

APPENDIX 6

SYNTHETIC SEISMIC TRACE

SYNTHETIC SEISMIC TRACE

PARAMETERS

WELL :	KIPPER-1
T.D. :	2875 metres KB
KB :	21 metres
WATER DEPTH :	94 metres
POLARITY :	Trough represents acoustic impedance increase.
PULSE TYPE :	Zero phase, second derivative gaussian function.
PEAK FREQUENCY :	25 hz
SAMPLE INTERVAL :	2 metres
CHECK SHOT CORRECTIONS :	Linear interpretation after calculating reflection coefficients.

See WCR Volume 1 for enclosure PE603400

Doc. 2558L/19

PE905998

This is an enclosure indicator page.
The enclosure PE905998 is enclosed within the container PE906050 at this location in this document.

The enclosure PE905998 has the following characteristics:

ITEM_BARCODE =	PE905998
CONTAINER_BARCODE =	PE906050
NAME =	Geogram
BASIN =	GIPPSLAND BASIN
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	SYNTH_SEISMOGRAM
DESCRIPTION =	Geogram (enclosure from appendix 6 of WCR vol.1) for Kipper-1
REMARKS =	
DATE_CREATED =	7/04/86
DATE_RECEIVED =	24/06/86
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	SCHLUMBERGER
CLIENT_OP_CO =	ESSO AUSTRALIA LTD

(Inserted by DNRE - Vic Govt Mines Dept)

Appendix 7

APPENDIX 7

KIPPER-1

PRODUCTION TEST REPORT

S.T. KOH
April, 1986

Doc. 2510L/19

TABLE OF CONTENTS

KIPPER NO. 1

PRODUCTION TEST REPORT

I SUMMARY OF RESULTS AND CONCLUSIONS

Table 1 - Production Test Results Summary

II BACKGROUND AND TEST OBJECTIVES

III TEST RESULTS AND DISCUSSION

Table 2 - Production Test No. 1 Sequence of Events Summary

Table 3 - Comparison of Measured Bottom-hole Pressures Between H.P. Gauge and Amerada Gauge

Figure 1 - H.P. Gauge Horner Plot Build-up for Shut-in Period Between 2138-2225 hours April 6, 1986

IV OTIS DOWNHOLE SHUT-IN TOOL FAILURE

KIPPER NO. 1

PRODUCTION TEST REPORT

I SUMMARY OF RESULTS AND CONCLUSIONS

One production test was performed in the Intra-Latrobe over the sand interval 2005-2013m KB (1984-1992m SS) in Kipper No. 1 well. The test interval produced gas with a specific gravity of 0.74 at a rate of 24.9 million SCF/D through a 3 1/2 inch test string on a 64/64 inch choke with FWHP of 1205 psig and FWHT of 116°F. Condensate to gas ratio was 21.4 STB/million SCF at the stabilised separator operating pressure and temperature of 565 psig and 91°F respectively. Measured gravity of condensate was 54.6° API. Average measured watercut based on separator liquid rates was 2.9 percent. Neither hydrogen sulphide gas nor sand production were observed at surface during the initial and major flow periods. Measured amount of carbon dioxide in the separator gas was 14.5 percent by volume. Estimated cumulative reservoir fluids produced during the 11.57 hours of major flow period were 11.41 million SCF gas, 235.9 STB condensate and 7.0 barrels of connate water. The produced fluids in the test are believed to be representative of the perforated interval. Based on the corrected Amerada gauge flowing bottomhole pressure of 3185.1 psig and the measured H.P. gauge initial pressure of 3246.4 psia, the productivity index upstream of the DHSIT flow area was estimated to be 460 RB/D/psi assuming an initial gas formation volume factor Bg of 0.9 RB/kSCF.

Horner plot build-up analysis on the early portion of the second shut-in period between 2138-2225 hours gave an estimated formation permeability-thickness product of 12,679 md-ft or a formation permeability of 484 md assuming a net sand contributing thickness of 26.2 ft (8m). A skin factor of 2.5 was estimated indicating that the well was slightly damaged. However, relative to the flowing bottom hole pressure measured by the H.P. gauge downstream of the DHSIT flow area, a significantly higher apparent skin factor of 45 was estimated indicating that the DHSIT flow area was severely affecting gas flow downhole. A summary of the production test results is given in Table 1.

The main conclusions arising from the results of the test at Kipper-1 are:

(i) the test demonstrated that the reservoir would provide adequate gas deliverability

(ii) the interval tested indicated that the sands at the top of the 290m gross gas column have good formation permeability of 484md

(iii) no pressure depletion was measured after flowing the well for 11.57 hours of major flow.

(iv) under high gas rate test, the DHSIT flow area of 1.1 square inch severely restricted flow resulting in high skin factor when the flowing bottomhole pressure measured from inside the DHSIT flow area was used in calculating total pressure drawdown.

(v) the Otis J-latch type DHSIT failed under high rate gas test conditions. It is recommended that the alternative Otis weight latch DHSIT should be used for all future gas tests.

.../2

II BACKGROUND AND TEST OBJECTIVES

The Kipper-1 exploration well was drilled to the final total depth of 2875m KB (2854m SS) and intersected a major gas accumulation over the interval 1989-2279m KB. Average porosity and water saturation over the 290m gross gas column was 17 percent and 25 percent respectively. Open hole wireline logs run over the 290m interval confirmed the presence of gas when RFT run numbers 2 and 9-12 recovered formation gas samples. After the completion of open hole wireline logs, a $9^5/8$ inch casing string was run with the casing shoe located at 2861m KB for production testing. The objectives of the test were:

1. To confirm that the reservoir is capable of high gas productivity,
2. To measure the permeability of a typical region of the reservoir,
3. To investigate reservoir heterogeneities in a region near the wellbore,
4. To confirm the absence of H_2S and,
5. To measure the condensate to gas ratio and obtain samples for compositional analysis.

With the exception of the third objective, all the remaining test objectives were fulfilled during the test. Investigation of reservoir heterogeneity was not possible because of the failure of both the Hewlett-Packard gauge and the downhole shut-in tool during the test.

III TEST RESULTS AND DISCUSSION

Production Test No. 1 (2005-2013m KB)

The sequence of major events from the time the well was perforated through to the final build-up period are given in Table 2. After the initial shut-in wellhead pressure had stabilised at 2680 psig during the build-up period, a Hewlett-Packard gauge with surface read-out and the top Amerada gauge (0-6000 psig, 72 hours clock) were run in tandem with the OTIS downhole shut-in tool (DHSIT) to bottom. The second Amerada gauge was not run in the well because it was severely damaged during the wireline rig up operation conducted under adverse sea-state and weather conditions. After 6.2 hours of initial shut-in, the initial reservoir pressure was measured by the H.P. gauge as 3246.4 psia at 1980.3m KB. Relative to the RFT survey formation pressure of 3260 psia at 2006.4mKB, the initial pressure of 3246.4 psia at 1980.3m KB was six psi lower assuming a gas gradient of 0.29psi/m in the 26.1m depth interval. The six psi pressure difference was probably due to the presence of condensate in the wellbore below 1980.3m KB. After correcting for zero base line calibration error, the Amerada gauge initial and final static bottomhole pressures were in good agreement to within 3.1 psi of the measured H.P. gauge initial pressure of 3231.7 psig. It was necessary to subtract 34 psi from the original Amerada pressures for zero base line calibration error because the stylus of the Amerada gauge did not return to the scratch chart zero base line under atmospheric conditions. Details of the H.P. pressures and their corresponding original and corrected Amerada pressures are provided in Table 3. During the subsequent times when the well was shut-in at surface, the final wellhead pressures as well as the final static bottomhole pressures from both the H.P. and Amerada gauges were observed to build-up rapidly to within a few psi of their respective stabilised values of 2680 psig (WHP), 3246.4 psia (H.P.) and 3231.7 psig (Amerada corrected). The rapid bottomhole pressure buildups to their respective initial pressures indicated no pressure depletion and relatively good formation permeability in the interval tested.

.../3

During the major flow period the well was temporarily shut-in at surface twice because of DHSIT failures. Attempts to re-seat the DHSIT in its receptacle after the first failure were successful. However attempts to re-seat the DHSIT were unsuccessful during the second failure which occurred approximately half way through the major flow period. The H.P. gauge malfunctioned while attempts were made to re-seat the DHSIT in the receptacle during the second temporary shut-in at surface. As the H.P. gauge failed 52 minutes into the second temporary shut-in, only the first 47 minutes of build-up data from the H.P. gauge were available for Horner plot build-up analysis as shown in Figure 1. Because of phase segregation and other wellbore effects immediately after shut-in, the presence of a gas hump during the first 22 minutes of build-up equivalent to a radius of investigation of 460 ft (140m) from the wellbore could not be used for interpretation. The remaining MTR region (460 to 672 ft from the well) unaffected by phase segregation gave a slope of 5.5 psi/cycle. Permeability-thickness product based on the 5.5 psi/cycle slope and the gas flow rate of 23.8 million SCF/D measured prior to shut-in was calculated to be 12,679 md-ft or a formation permeability of 484 md assuming a net sand contributing thickness of 26.2 ft (8m). The corresponding average formation permeability of 369 md calculated from the productivity index of 460 RB/D/psi as measured by the Amerada gauge outside the DHSIT flow area was 76 percent lower than the Horner build-up analysis permeability. Skin factor below the DHSIT was estimated to be 2.5 which corresponds to a damage ratio of 1.35. As anticipated, the skin factor estimated from using the H.P. gauge final bottomhole flowing pressure of 2995 psia immediately downstream of the DHSIT flow area provided a significantly higher apparent skin of 45 because 81 percent of total bottomhole pressure drawdown of 251.4 psi was due to gas flowing through the DHSIT flow area of 1.1 square inch. The high skin factor of 45 was equivalent to a damage ratio of 6.9. Results from this test indicated that extreme care should be exercised when analysing gas test H.P. pressure data taken in association with the DHSIT.

The major flow period was resumed when it became apparent that the failed H.P. gauge and wireline could not be retrieved without killing the well. After a further 5.17 hours of major flow, the well was shut-in at surface. During the last 3-4 hours of flow, separator and wellhead conditions and flow rates were extremely stable. Prior to final shut-in, three 20 litre separator gas samples and three 1000cc separator condensate samples were taken for compositional analysis.

IV OTIS DOWNHOLE SHUT-IN TOOL (DHSIT) FAILURE

The main objective in running the Otis DHSIT during the gas test was to minimise anticipated wellbore phase segregation and afterflow effects particularly during the early part of the final shut-in period. Differential test pressures across the closed DHSIT were of the order of 600-700 psi. Unfortunately the DHSIT was dislodged from the receptacle twice during the major flow period despite being successfully pressure tested from below prior to flowing the well. After the DHSIT was dislodged from the receptacle for the second time, attempts to relocate the DHSIT in the receptacle failed because of the kinks in the wireline which also resulted in the failure of the H.P. gauge downhole (loss of signal). Otis Engineering at Sale attributed the DHSIT failures to the tool unjaying out of the receptacle as a result of the following combination of factors: high gas rate, minimum amount of wireline weight used and momentary downhole condensate slugging resulting in the pulsing of the DHSIT. The J-latch mechanism in the DHSIT was designed to automatically unlatch from the receptacle on the fourth set down/pull up cycle.

The last time the J-latch type DHSIT was used was during the successful Whiting-2 oil production test. Until Otis can prove that the J-latch DHSIT can successfully be used on high rate gas wells, it is recommended that the alternative Otis weight latch DHSIT should be used for all future gas well tests since the weight latch mechanism is not expected to fail under dynamic wellbore flowing conditions.

TABLE I

KIPPER-1 PRODUCTION TEST RESULTS SUMMARY

TEST DATA:

1. Interval : 2005-2013 mMDKB. (TCP, 6 SPF, 60 degrees phasing)

2. Average Porosity within perforated interval : 20.9%

3. Estimated formation permeability : 484 md

4. Estimated cumulative production : 11.41 million SCF GAS
235.9 STB condensate
7.0 BBLS formation water

5. Average stabilised gas rate : 24.9 MSCF/D

6. Choke size : 64/64 inch fixed choke

7. Average FWHP : 1205 psig

8. Average FWHT : 116° F

9. Average separator pressure : 565 psig

10. Average separator temperature : 91°F

11. Length of flow during major flow period : 11.57 hours

12. Gravity of gas : 0.74 (AIR = 1.0)

13. Gravity of condensate : 54.6° API @ 60°F

14. Condensate to gas ratio : 21.4 STB/million SCF

15. Average watercut : 2.9%

16. Chlorides of formation water : 800 PPM (titration)

17. Hydrogen sulphide : nil

18. Carbon dioxide : 14.5%

19. Initial pressure @ 1980.3 mMDKB : 3246.4 psia (H.P.)

20. Average flowing pressure : 2995 psia (H.P.) above DHSIT flow area
: 3199.8 psia (Amerada) below DHSIT flow area

21. Skin above DHSIT/below DHSIT 45/2.5

22. Maximum BHT : 206°F

23. Average shut-in WHP : 2690 psig

24. Separator samples taken

20 LITRES SEPARATOR GAS	1000CC SEPARATOR CONDENSATE	SENT TO
1	1	Analysis, CORELAB, ADELAIDE
1	1	Analysis, FLOPETROL, ADELAIDE
1	1	Spare, FISHER CONTROL, SALE

25. Atmospheric samples taken:
6 x 25 litres jerry cans stock tank condensate
13 x 1 gallon plastic bottle formation water.

(0244F:30)

TABLE 2

KIPPER-1 PRODUCTION TEST SEQUENCE OF EVENTS SUMMARY

TIME	DATE	PERIOD (HOURS)	COMMENTS
0639	6 April, 1986	-	Perforate 2005-2013 mMDKB with Schlumberger TCP gun 6 SPF, 60 degrees phasing. Note well was perforated with approximately 840 psi underbalance.
0645-0815	6 April, 1986	1.50	Initial flow and well clean-up period.
0815-1430	6 April, 1986	6.25	Initial shut-in period and rig up to run downhole shut-in tool (DHSIT) and HP/AMERADA pressure gauges.
1430-1512	6 April, 1986	0.70	Major flow.
1512-1556	6 April, 1986	0.73	Well S.I. to re-seat DHSIT in receptacle.
1556-2138	6 April, 1986	5.70	Continue major flow. Flow through separator @ 1630 hours.
2138-0025	6-7 April, 1986	2.78	Well S.I. and attempted to re-seat DHSIT. Lost HP signal @ 2230 hours. Attempted to POH DHSIT. Believed wireline entangled below stuffing box.
0025-0535	7 April, 1986	5.17	Continue major flow. Flow through separator @ 0055 hours. Took separator gas and condensate samples from 0400-0530 hours.
0535-0800	7 April, 1986	2.42	Well S.I. for final build-up prior to killing and plug and abandoning the well.

TABLE 3

COMPARISON OF MEASURED BOTTOMHOLE PRESSURES
BETWEEN H.P. GAUGE AND AMERADA GAUGE

	Pressures (psig)		
	H.P. @ 1980.3mKB	AMERADA[1] @ 1983.6mKB	CORRECTED[2] AMERADA @ 1983.6mKB
Initial Pressure	3231.7	3265.7	3231.7
First FBHP during Major Flow	3124.8	3213.3	3179.3
First S.I. at Wellhead	3220.4	3264.2	3230.2
Second FBHP during Major Flow	2980.3	3219.1	3185.1
Second S.I. at Wellhead	3231.3	3262.6	3228.6
Third FBHP during Major Flow	N.A.[3]	3214.8	3180.8
Third (final) S.I. at Wellhead	N.A.[3]	3262.6	3228.6

Notes:

1. Amerada pressure data uncorrected for error due to zero base line calibration error on scratch chart (i.e. stylus did not return to zero base line when the Amerada gauge was at surface).

2. Corrected Amerada pressure based on -34 psi correction for zero base line calibration error to adjust Amerada initial reservoir pressure to H.P. initial reservoir pressure.

3. No H.P. data available after 2230 hours April 6, 1986 when the H.P. failed.

KIPPER-1 P.T. No. 1

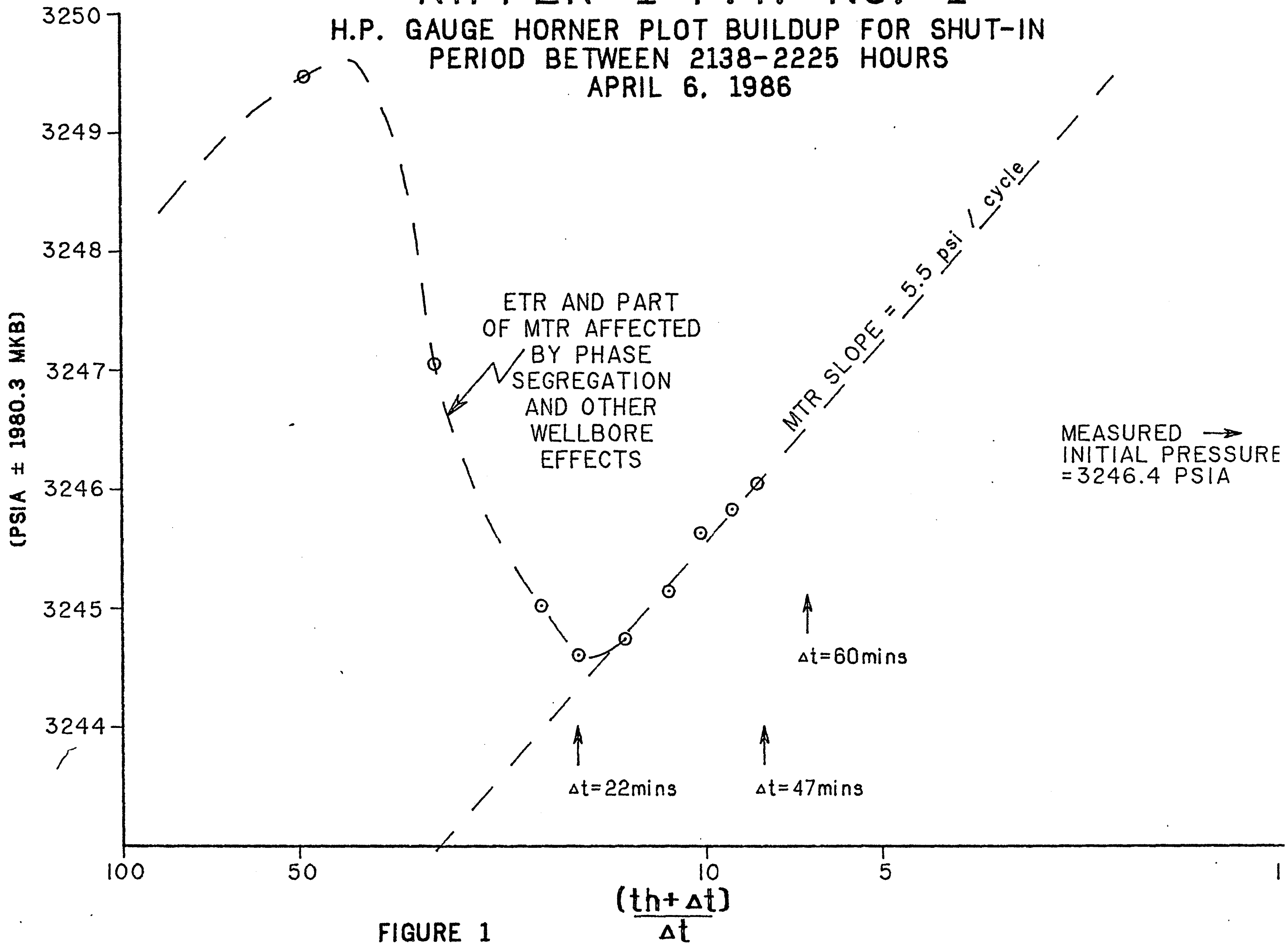


FIGURE 1

DFT.KIPPER.PT-1 7-86

DWG. 2340/OP

Appendix 8

APPENDIX 8

KIPPER PETROGRAPHY REPORT

P.A. Arditto
June, 1986

Doc. 2510L/20

INTRODUCTION

Eight SWC samples from the Kipper-1 gas reservoir were examined to determine whether variations in mineralogy were responsible for anomalous 'shaley sand' neutron log character in apparently clean sands as revealed by the gammaray log. The upper half of the gas reservoir has a relatively clean character while the lower half appears to be poorer quality sand.

One SWC sample from the overlying igneous interval was also examined to determine if petrographic character and mineralogical composition gives some indication of the mode of emplacement of the igneous body.

METHOD

Portions of all SWC samples were dried and vacuum impregnated with a blue dyed epoxy resin prior to thin section preparation. The prepared thin sections were examined and point counted (500 points) to determine mineralogical composition.

Small portions of each SWC were carefully dispersed in a weak calgon solution and the resulting clay suspension was separated out using standard sedimentation techniques to recover the $<2\mu$ fraction. This fraction was prepared as oriented glass mounts, dried, and despatched to U.N.S.W. for XDR investigation.

The samples were run using Coka radiation at 2^{o}/minute for untreated, glycolated and heated slides. The resulting diffractograms were returned and interpreted using the method of Carver to estimate the relative proportions of each clay mineral present.

RESULTS

Table 1 gives the modal analysis for the SWC material examined. All sandstone samples have a similar composition, although SWC's 46 to 35 have a significantly higher proportion of rock fragments and depositional matrix compared to those higher in the section. This probably accounts for the higher neutron response and generally dirtier nature of the deeper part of the reservoir. Well-crystallised authigenic 'books' and 'worms' of kaolinite are a common feature of all samples examined. The igneous material, although highly altered, appears to be a dolerite according to composition and grain size. The alteration product of the rock is largely authigenic clay - 23% (smectite 90%, kaolinite 10%) and carbonate (calcite 17%). These are possibly the result of deuteric alteration of melt shortly after emplacement. The high smectite content also explains the caved nature of much of the hole through this interval.

CONCLUSION

Given the sparse data distribution, it would appear that the reduction in the quality of the reservoir with depth is due to the increase of depositional matrix within the sandstone and not due to diagenetic cements. The very limited sampling of the igneous body above the reservoir is possibly suggestive of an intrusion rather than a flow.

Doc 2307/56

Table 1

KIPPER-1

Modal Analysis

(500 point counts/slide)

Gas Reservoir

Depth(m)	SWC	Quartz (Pebbles)	Quartz	Feldspar	Mica	Heavy Minerals	Rock Fragments (Sedimentary & Metamorphic)	Chert	Matrix	Carbonate	Authigenic Clays	Silica Cement	Iron Oxides	Pyrite
1993	59	12.2	53.8	5.8	-	-	0.2	6.0	1.6	0.4	17.1	2.0	-	0.9
2122	51	-	52.2	1.6	0.7	-	0.2	-	-	1.3	41.6	0.9	1.6	-
2148	48	-	69.3	3.8	1.0	-	-	1.6	0.8	-	22.5	1.0	-	-
2158	46	-	73.2	1.7	-	-	1.6	2.7	6.7	0.2	13.2	0.7	-	-
2173	45	12.4	45.6	3.0	1.4	0.2	1.2	0.2	15.4	-	20.4	0.2	-	-
2181	44	20.0	56.0	1.0	0.3	-	3.0	-	6.7	-	12.3	0.7	-	-
2221.5	39	12.3	18.7	3.7	-	-	0.4	35.7	20.3	2.3	6.3	0.3	-	-
2270	35	51.4	19.6	4.0	1.0	-	5.6	-	6.0	0.4	7.2	3.0	0.6	-

Depth(m)	SWC (Igneous)	Plagioclase	Pyroxene	Carbonate	Opaques	Authigenic Clays	Silica Cement
1910	81	48.0	1.8	17.0	9.2	23.0	1.0

Table 2

KIPPER-1

Clay Fraction Analysis (< 2μ)

Gas Reservoir Depth(m)	SWC	Kaolinite	Illite	Illite-Smectite Mixed Layer	Smectite
1993	59	79	16	-	5
2122	51	79	16	5	-
2148	48	82	15	3	-
2158	46	51	38	11	-
2173	45	79	15	6	-
2181	44	80	15	5	-
2221.5	39	89	9	2	-
2270	35	82	6	2	-
Igneous					
1910	81	10	-	-	90

2307L/58

Kipper-1 W.C.R
Vol 2.

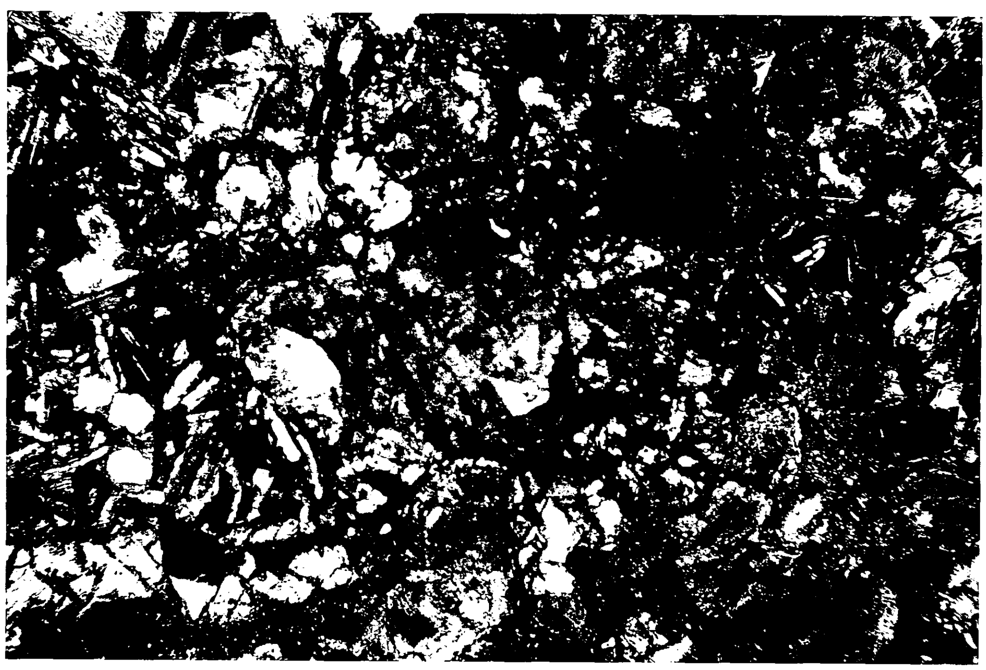
PHOTOGRAPHS OF SIDEWALL

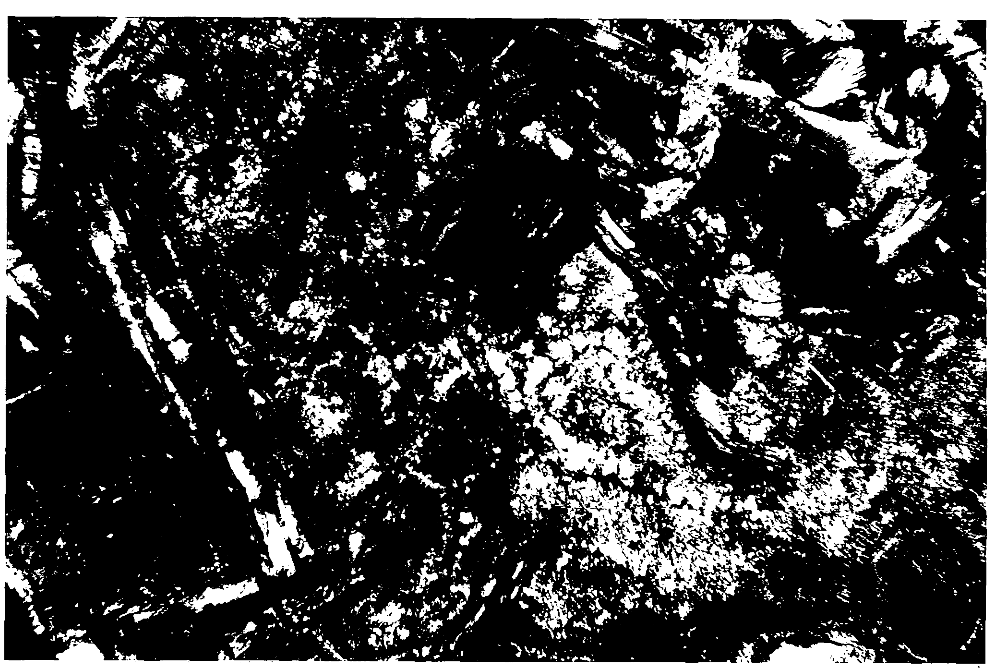
CORE THIN SECTIONS

Doc. 2520L/54

PLATE 1

Kipper -1
W.C.R.
Vol 2.





PE906051

This is an enclosure indicator page.
The enclosure PE906051 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906051 has the following characteristics:

ITEM_BARCODE =	PE906051
CONTAINER_BARCODE =	PE906050
NAME =	Thin Section Photographs
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Colour microphotographs of thin sections from (appendix 8 of WCR vol.2) Kipper-1 Plate 1.
REMARKS =	
DATE_CREATED =	30/06/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

27 FEB 1987

PLATE 1

Kipper-1 W.C.R.
Vol. 2.

SWC 81 1910.0mKB. Altered Volcanics

A general view of the volcanics, showing plagioclase laths, some black to dark brown opaque (iron oxide?) material, occasional pyroxene. (Crossed polars, X4).

SWC 81 1910.0mKB. Altered Volcanics

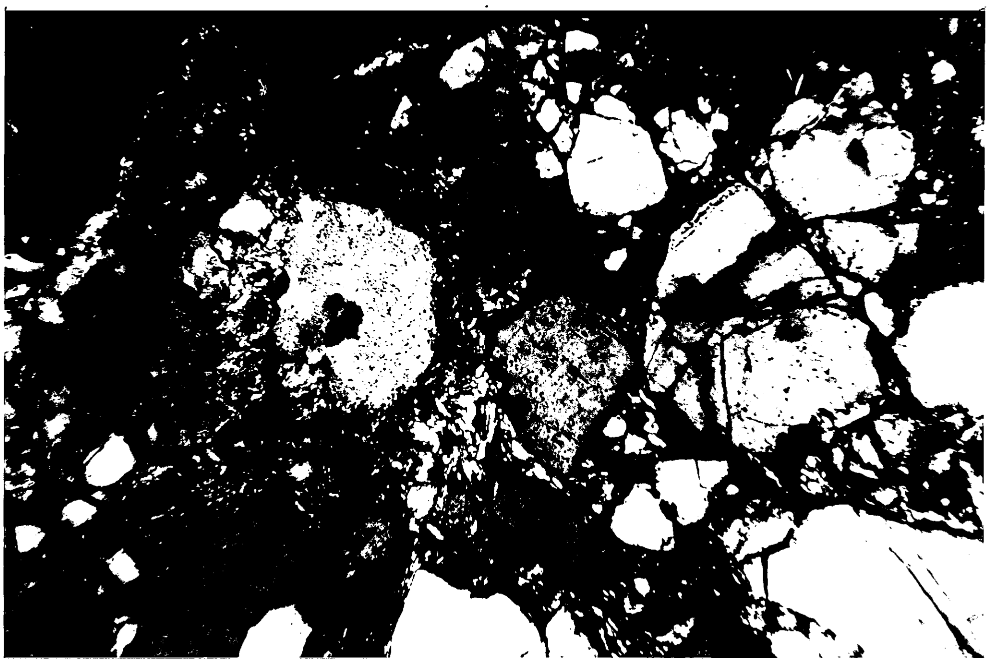
View showing relatively fresh pyroxenes. The pyroxenes are commonly highly altered to clay and possibly carbonate. (Crossed polars, X4).

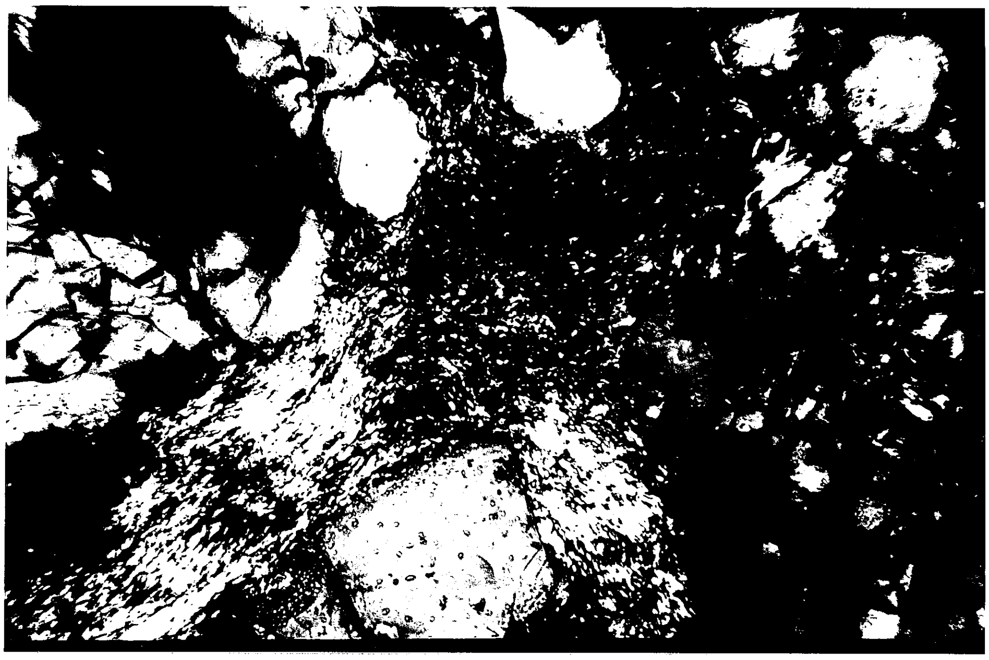
SWC 81 1910.0mKB. Altered Volcanics

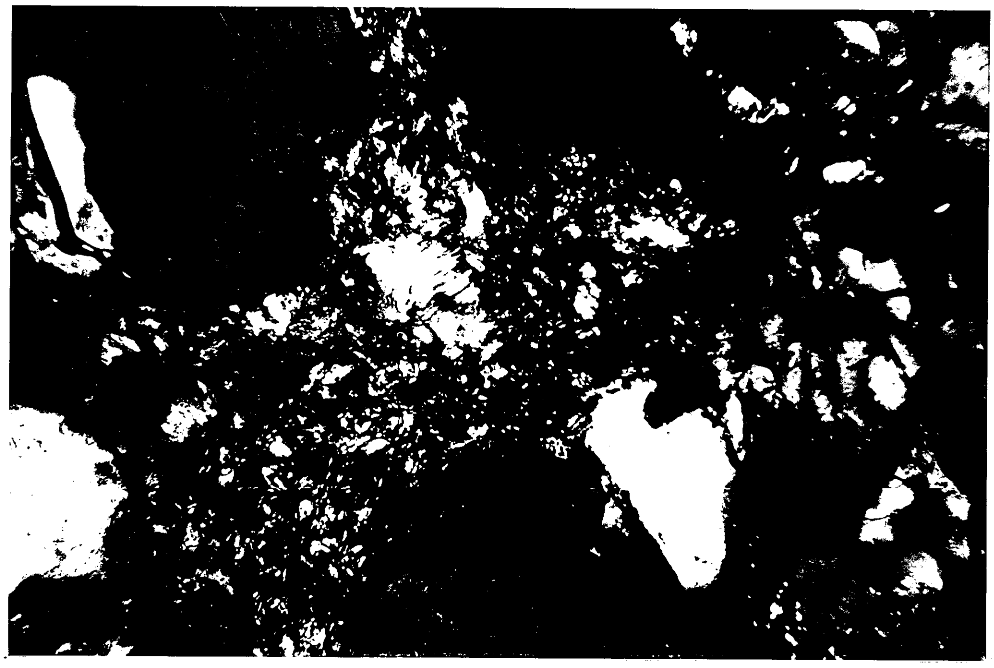
View showing vesicle/void completely infilled by several generations of fringing clay. (Crossed polars, X10).

PLATE 2

Kipper-1
W.C.R.
Vol 2.







PE906052

This is an enclosure indicator page.
The enclosure PE906052 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906052 has the following characteristics:

ITEM_BARCODE = PE906052
CONTAINER_BARCODE = PE906050
NAME = Thin Section Photographs
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Colour microphotographs of thin sections from (appendix 8 of WCR vol.2) Kipper-1 Plate 2.
REMARKS =
DATE_CREATED = 30/06/1986
DATE_RECEIVED = 27/02/1987
W_NO = W930
WELL_NAME = KIPPER-1
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PLATE 2

Kipper-1 W.C.R.
Vol 2.

SWC 51 2122.0mKB. Sandstone

Examination of the thin section shows this sandstone is medium to coarse grained, and poorly sorted with silt and authigenic clay matrix. This view shows quartz grains with highly birefringent authigenic (mixed layer?) clay in the centre. (Crossed polars, X10).

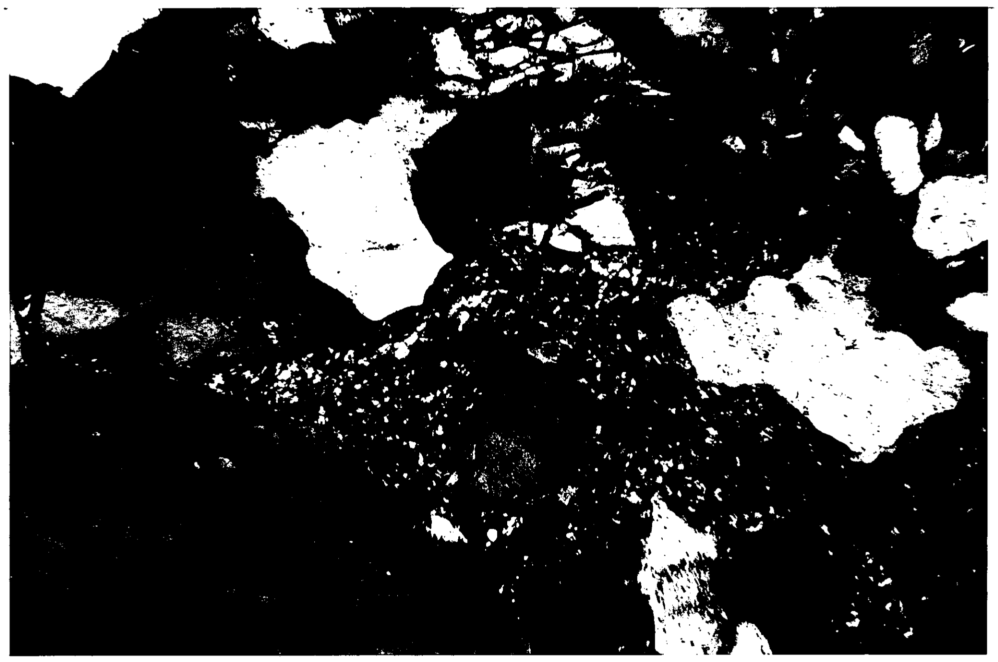
SWC 51 2122.0mKB. Sandstone

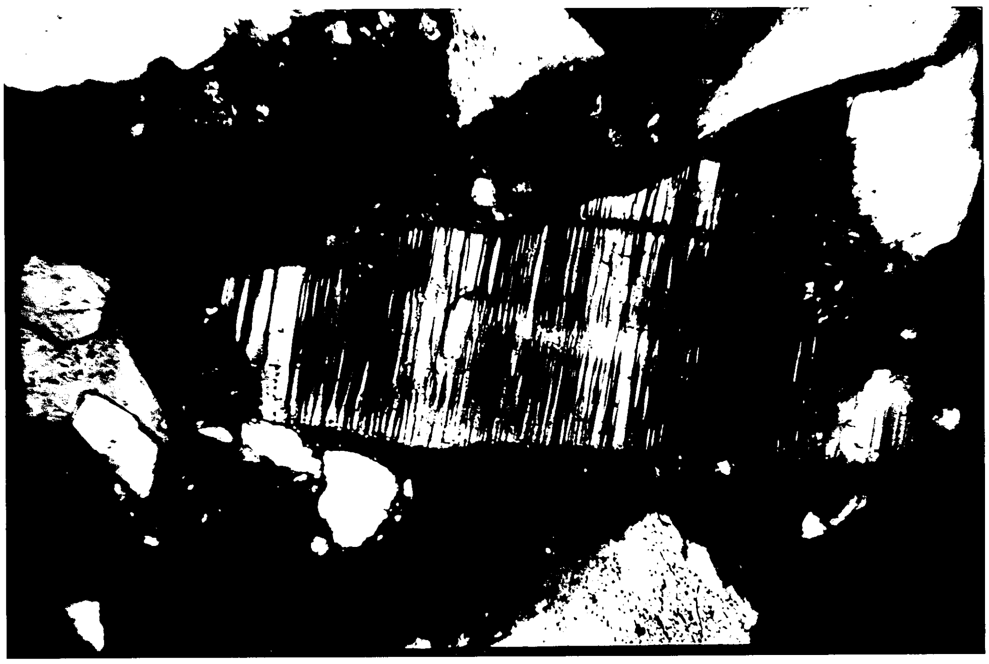
This view shows authigenic kaolinite and matrix infilling the space between quartz grains. (Crossed polars, X25).

SWC 51 2122.0mKB. Sandstone

This view shows books of authigenic kaolinite infilling the space between quartz grains. (Crossed polars, X25).

PLATE 3





PE906053

This is an enclosure indicator page.
The enclosure PE906053 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906053 has the following characteristics:

ITEM_BARCODE =	PE906053
CONTAINER_BARCODE =	PE906050
NAME =	Thin Section Photographs
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Colour microphotographs of thin sections from (appendix 8 of WCR vol.2) Kipper-1 Plate 3.
REMARKS =	
DATE_CREATED =	30/06/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

27 FEB 1987 PLATE 3

Kipper-1 W.C.R. Vol 2.

SWC 48 2148.0mKB. Sandstone

Examination of the thin section shows this sandstone to be coarse to very coarse grained, poorly sorted with common clay matrix. The quartz grains are heavily fractured, which is thought to be a result of taking the sidewall core sample. This view shows quartz and feldspar grains with authigenic kaolinite filling the space bewteen. (Crossed polars, X10).

SWC 51 2148.0mKB. Sandstone

This view shows a microline grain and quartz grains. (Crossed polars X10).

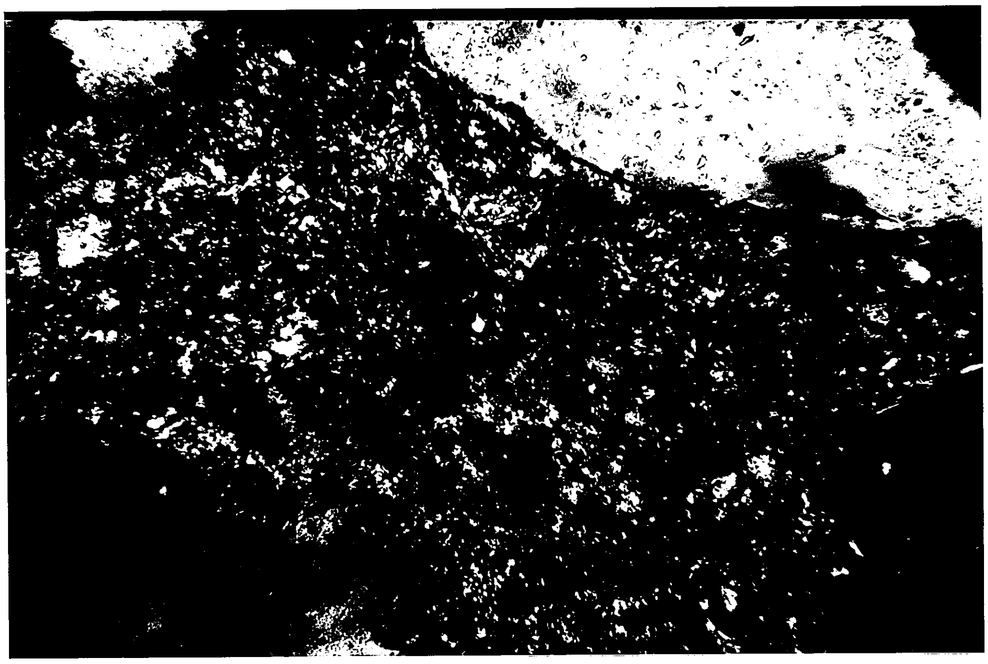
SWC 51 2148.0mKB. Sandstone

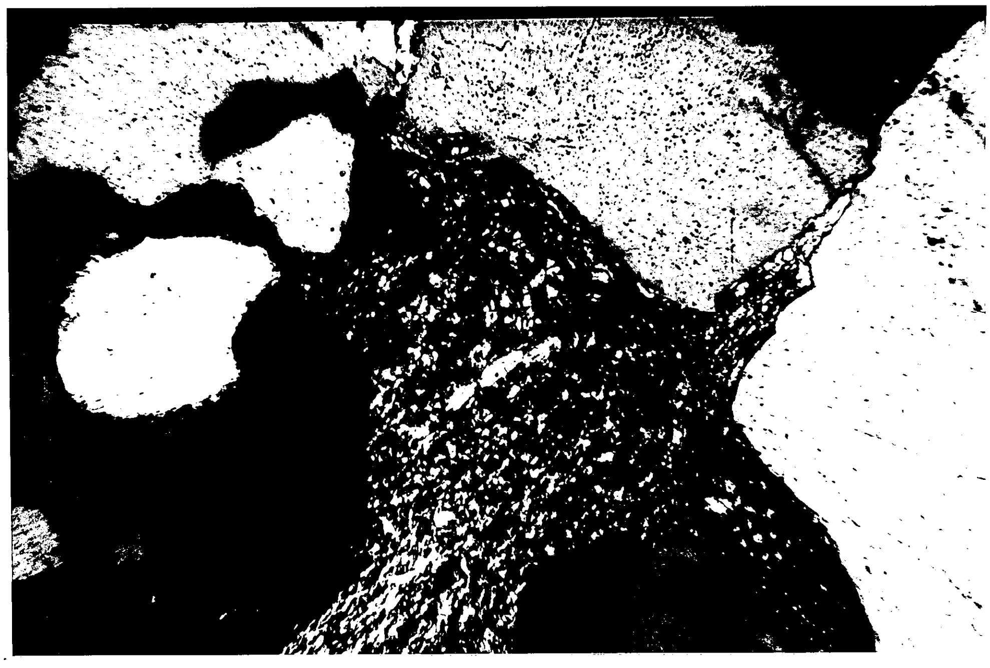
This view shows authigenic kaolinite infilling the space between quartz grains. (Crossed polars, X10).

Doc. 2520L/57

PLATE 4

Kipper -1
W.C.R.
Vol 2.





PE906054

This is an enclosure indicator page.
The enclosure PE906054 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906054 has the following characteristics:

ITEM_BARCODE =	PE906054
CONTAINER_BARCODE =	PE906050
NAME =	Thin Section Photographs
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Colour microphotographs of thin sections from (appendix 8 of WCR vol.2) Kipper-1 Plate 4.
REMARKS =	
DATE_CREATED =	30/06/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PLATE 4

Kipper-1 . W.C.R.
Vol 2.

SWC 48 2148.0mKB. Sandstone

Same view as Plate 3 (iii), showing books of authigenic kaolinite. (Crossed polars, X25).

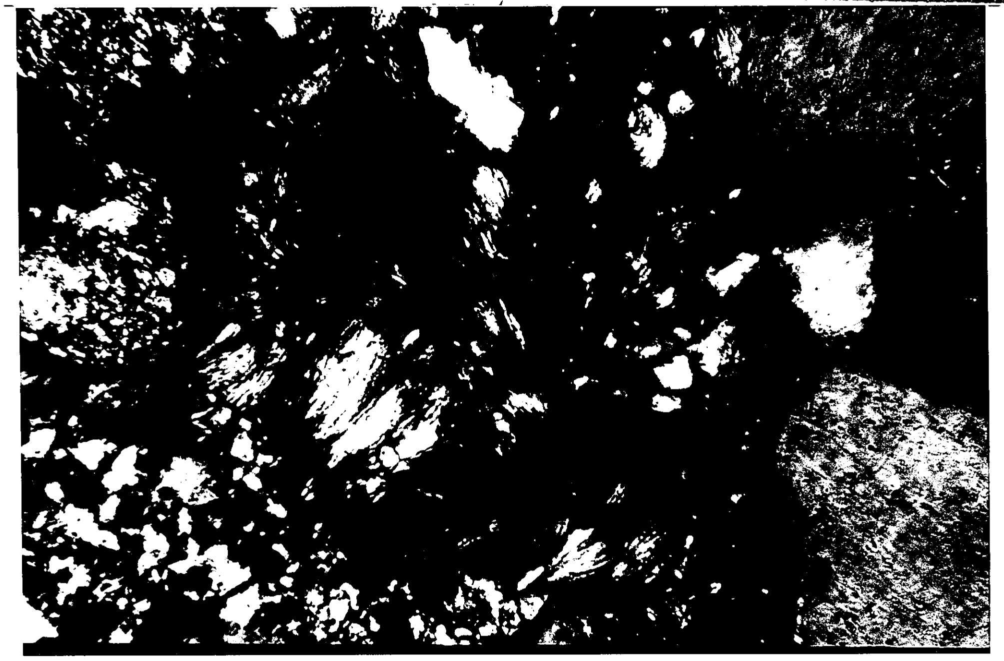
SWC 46 2158.0mKB. Sandstone

Examination of the thin section shows this sandstone to be coarse grained, moderately sorted with some authigenic clay and matrix. The quartz grains are commonly fractured. This view shows matrix and kaolinite? infilling the space between quartz grains. (Crossed polars, X25).

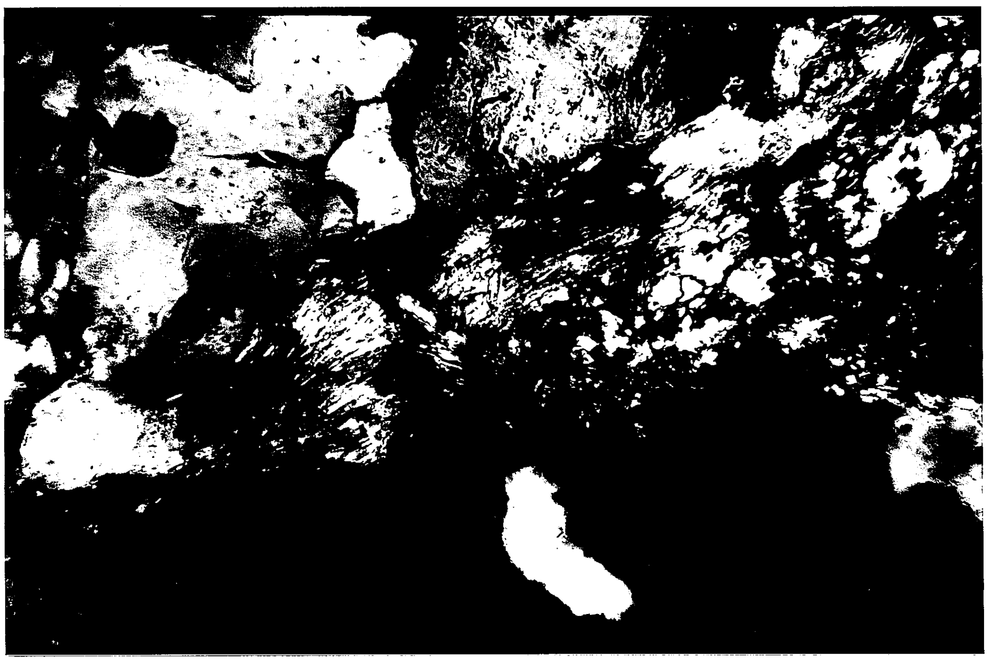
SWC 44 2181.0mKB. Sandstone

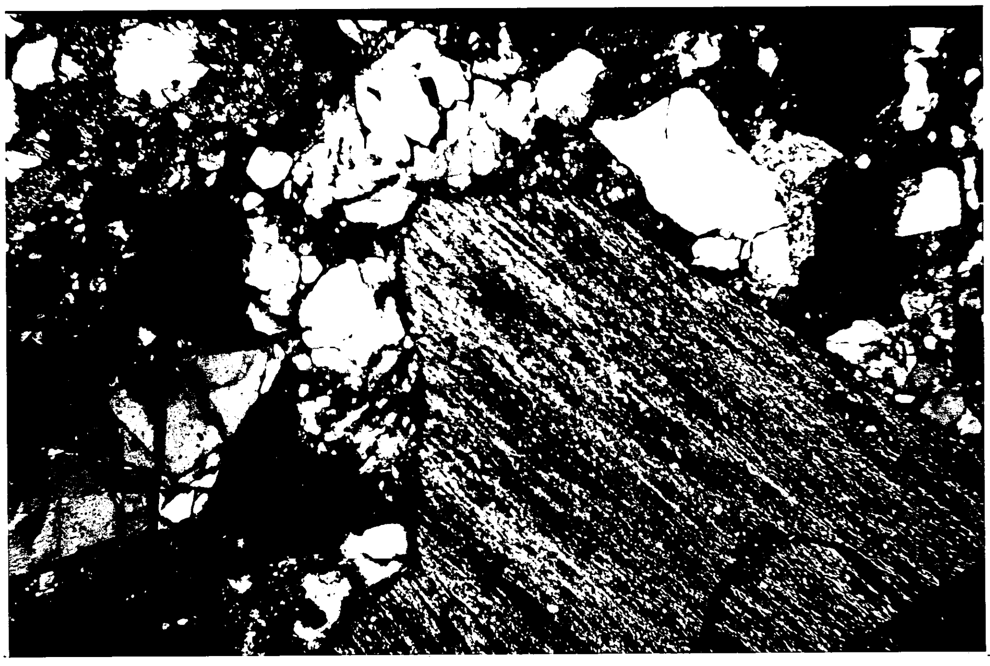
Examination of the thin section shows this sandstone is dominantly coarse grained, moderately sorted with some authigenic clay matrix. This view shows authigenic (mixed layer?) clay infilling the space between quartz grains. (Crossed polars, X10).

PLATE 5



Kipper-1
W.C.R.
Vol 2





PE906055

This is an enclosure indicator page.
The enclosure PE906055 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906055 has the following characteristics:

ITEM_BARCODE =	PE906055
CONTAINER_BARCODE =	PE906050
NAME =	Thin Section Photographs
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	PHOTOMICROGRAPH
DESCRIPTION =	Colour microphotographs of thin sections from (appendix 8 of WCR vol.2) Kipper-1 Plate 5.
REMARKS =	
DATE_CREATED =	30/06/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

27 FEB 1987 PLATE 5

PETROLEUM DIVISION

Kipper -1 W.C.R.
Vol 2.

SWC 39 2221.5mKB. Conglomerate

Examination of the thin section shows this sample to be a very poorly sorted conglomerate containing well rounded rock fragments (quartzite) up to 1cm in diameter, with clay and silt matrix. This view shows authigenic kaolinite books and silt matrix. (Crossed polars, X25).

SWC 35 2270.0mKB. Conglomeratic Sandstone

Examination of the thin section shows this sample to be a very coarse to pebbly sandstone, very poorly sorted, containing rounded granules and rock fragments up to 1cm in diameter. This view shows authigenic clay (kaolinite?) and silt matrix infilling space between quartz grains. (Crossed polars, X25).

SWC 35 2270.0mKB. Conglomeratic Sandstone

This view shows a schist rock fragment and quartz grains. (Crossed polars, X4).

Appendix 9

APPENDIX 9

STRUCTURAL INTERPRETATION OF
KIPPER-1 DIPMETER

W. MUDGE
November 1986
Esso Australia Ltd.

KIPPER-1

DIPMETER ANALYSIS

SUMMARY

1. From the Top of the Latrobe Group to the base of the reservoir (1419.5-2279mKB) dips trend in a NW-NE direction increasing with depth representing rollover into the Kipper fault.

2. Two antithetic faults are interpreted to be intersected over the interval 2320-2390mKB. These faults have a minimum throw of approximately 20m, they strike SW-NE and are down to the NW. This agrees with the trend of larger antithetic faults mapped at the base of the volcanics.

3. A fault is interpreted to be intersected at 2554mKB causing an abrupt change from north easterly dips to southwesterly dips. It is not clear if this is the major Kipper fault, or a synthetic fault.

DISCUSSION

1419.5-1893mKB

This interval is bounded by the Top of Latrobe Group and the top of the volcanics. A number of good structural trends are present over the intervals 1550-1600mKB and 1795-1845mKB. Structural dip is low, ranging from 2-4^{0} N-NE to 6-8^{0} N-NW gradually increasing with depth. This trend represents the northerly rollover into the Kipper fault.

1893-1989mKB

This interval consists of volcanics through which no valid dip patterns exist, indicating a lack of internal bedding.

1989-2279mKB

This interval represents the S-1 gas reservoir penetrated in Kipper-1. Dips are generally N-NW, and increase in magnitude with depth. These dips represent the northerly rollover into the Kipper fault which increases as the well approaches the fault plane.

2280-2388mKB

Two antithetic faults were intersected over this interval. The first is at 2340mKB and the second at approximately 2378mKB, both exhibit fault drag patterns. The faults strike in a SW-NE direction and are down to the NW. The southerly dips represent rollover into the antithetic fault plane. The minimum throw of these faults is in the order of 20 metres. The strike direction is consistent with larger antithetic faults interpreted from seismic data at the base of the volcanics.

2388-2554mKB

North-easterly dips are present over this interval ranging in magnitude from 2^{o}-12^{o}. This is interpreted as rollover into the fault. An increase to 20^{o} NE occurs at 2554mKB.

2554-2870mKB

Dips are very consistent over this interval. They range in magnitude from 10^{o}-20^{o} (dominantly 15^{o})in a consistent south-westerly direction. These dips are interpreted to represent the upside of the Kipper fault implying the fault was crossed at 2554mKB. If it is assumed that the increase in dips at 2554mKB is due to fault drag a NW-SE fault strike is interpreted. This is consistent with the mapped strike.

Doc. 2413L/40-42

SCHEMATIC OF DIPMETER INTERPRETATION

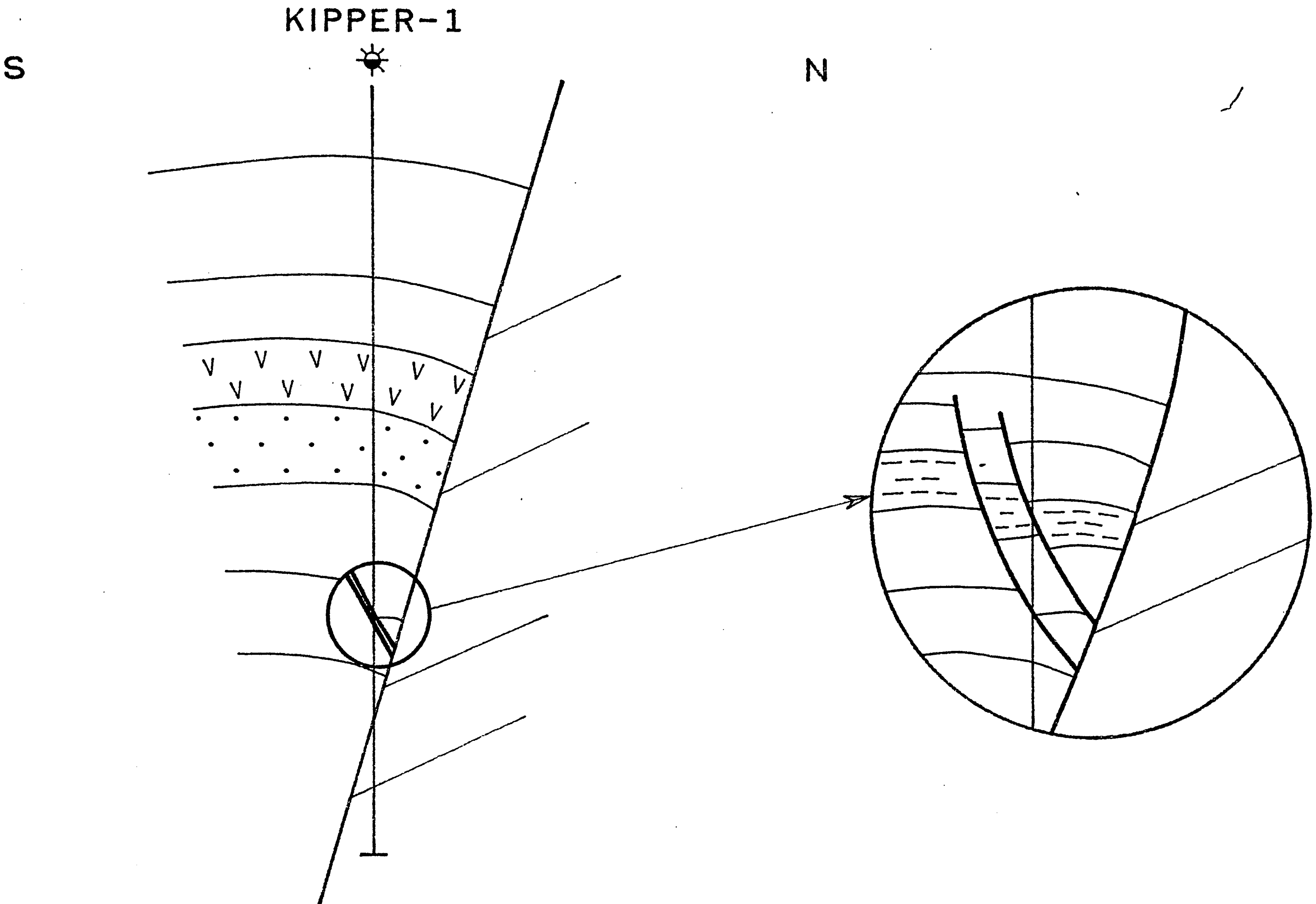


FIGURE 1

DWG. 2340/OP/10

DFT.KIPPER-1.DIPMETER 12-86

PE603403

This is an enclosure indicator page.
The enclosure PE603403 is enclosed within the container PE906050 at this location in this document.

The enclosure PE603403 has the following characteristics:

ITEM_BARCODE =	PE603403
CONTAINER_BARCODE =	PE906050
NAME =	Composite Log and Dipmeter Analysis
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	COMPOSITE_LOG
DESCRIPTION =	Composite Log for Kipper-1 containing gamma ray neutron porosity sonic and dipmeter analysis (enclosure from appendix 9 of WCR vol.2).
REMARKS =	Composite log also has a dipmeter analysis down the right hand side of the log
DATE_CREATED =	
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

Enclosures

PE906056

This is an enclosure indicator page.
The enclosure PE906056 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906056 has the following characteristics:

```
     ITEM_BARCODE = PE906056
CONTAINER_BARCODE = PE906050
             NAME = Geological Cross-Section A-A'
            BASIN = GIPPSLAND
           PERMIT = VIC/P19
             TYPE = WELL
          SUBTYPE = CROSS_SECTION
      DESCRIPTION = Geological cross-section A-A'
                    (enclosure 1 from WCR vol.2) showing
                    Kipper-1.
          REMARKS =
     DATE_CREATED = 30/11/1986
    DATE_RECEIVED = 27/02/1987
             W_NO = W930
        WELL_NAME = KIPPER-1
       CONTRACTOR =
     CLIENT_OP_CO = ESSO AUSTRALIA LIMITED
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE906057

This is an enclosure indicator page.
The enclosure PE906057 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906057 has the following characteristics:

ITEM_BARCODE =	PE906057
CONTAINER_BARCODE =	PE906050
NAME =	Structure Map - Top of Latrobe Group
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	SEISMIC
SUBTYPE =	HRZN_CONTR_MAP
DESCRIPTION =	Structure map - top of Latrobe Group around Kipper-1(enclosure 2 from WCR vol.2)
REMARKS =	
DATE_CREATED =	30/11/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE906058

This is an enclosure indicator page.
The enclosure PE906058 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906058 has the following characteristics:

ITEM_BARCODE =	PE906058
CONTAINER_BARCODE =	PE906050
NAME =	Structure Map - Base of Post-Volcanics
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	SEISMIC
SUBTYPE =	HRZN_CONTR_MAP
DESCRIPTION =	Structure map -base of Post-Volcanics around Kipper-1 (enclosure 3 from WCR vol.2)
REMARKS =	
DATE_CREATED =	30/11/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE906059

This is an enclosure indicator page.
The enclosure PE906059 is enclosed within the container PE906050 at this location in this document.

The enclosure PE906059 has the following characteristics:

ITEM_BARCODE =	PE906059
CONTAINER_BARCODE =	PE906050
NAME =	Structure Map - Top of S-1 Gas
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	SEISMIC
SUBTYPE =	HRZN_CONTR_MAP
DESCRIPTION =	Structure map - top S-1 Gas around Kipper-1(enclosure 4 of WCR vol.2)
REMARKS =	
DATE_CREATED =	30/11/1986
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603408

This is an enclosure indicator page.
The enclosure PE603408 is enclosed within the container PE906050 at this location in this document.

The enclosure PE603408 has the following characteristics:

ITEM_BARCODE =	PE603408
CONTAINER_BARCODE =	PE906050
NAME =	Synthetic Seismic Trace
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	SYNTH_SEISMOGRAPH
DESCRIPTION =	Synthetic seismic trace for Kipper-1 including interval velocity density specific impedance reflection coefficient and time-depth plot.
REMARKS =	
DATE_CREATED =	
DATE_RECEIVED =	27/02/1987
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE604505

This is an enclosure indicator page.
The enclosure PE604505 is enclosed within the container PE906050 at this location in this document.

The enclosure PE604505 has the following characteristics:

ITEM_BARCODE =	PE604505
CONTAINER_BARCODE =	PE906050
NAME =	Well Completion Log
BASIN =	GIPPSLAND BASIN
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	COMPLETION_LOG
DESCRIPTION =	Well Completion Log (enclosure 5 from WCR) for Kipper-1
REMARKS =	
DATE_CREATED =	11/04/86
DATE_RECEIVED =	
W_NO =	W930
WELL_NAME =	KIPPER-1
CONTRACTOR =	
CLIENT_OP_CO =	ESSO EXPLORATION AND PRODUCTION AUSTRALIA LTD

(Inserted by DNRE - Vic Govt Mines Dept)