

Department of Resources and Energy
Bureau of Mineral Resources, Geology and Geophysics

Australian Petroleum Accumulations Report 2
Bass Basin, Tasmania and Victoria

S. Ozimic, E. Nicholas, & L. Pain
Resource Assessment Division

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Minister: Senator The Hon. Gareth Evans, QC

Secretary: G.C. Evans

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FOREWORD

This is the second in a series of reports prepared in the Bureau of Mineral Resources, Geology & Geophysics to present data on Australian petroleum accumulations. Each report in the series characterises the petroleum from a particular sedimentary basin, and presents the data together with notes on the basin's setting, stratigraphy, structure, traps, reservoir and source rocks, and petroleum characteristics, reserves, and production developments. The data presented are designed as a ready reference to those interested in petroleum exploration and developments in Australia.

This report summarises the data from the 6 petroleum accumulations found to date in the Bass Basin, Tasmania and Victoria. The first report published in the series presented information on petroleum accumulations in the Amadeus Basin, and future reports within the next two years will provide similar data on accumulations in the Gippsland, Bonaparte, Otway, Perth, Surat, Bowen, Eromanga, and Cooper Basins.

L.C. Ranford
First Assistant Director
Resource Assessment Division

CONTENTS

	Page
e	
ABSTRACT.....	vi
INTRODUCTION.....	1
BASIN SUMMARY.....	1
Setting and stratigraphy	1
Petroleum accumulations	2
Structure and petroleum traps	3
Petroleum-bearing rock units	5
Source rocks and maturation	7
Nature of petroleum	7
Petroleum reserves	9
Petroleum production developments	9
PETROLEUM ACCUMULATIONS SUMMARIES.....	10
1. Pelican.....	11
2. Yolla.....	18
3. Cormorant.....	21
4. Bass.....	25
5. Poonboon.....	27
6. Aroo.....	29
ACKNOWLEDGEMENTS.....	32
REFERENCES.....	32
GLOSSARY.....	34

FIGURES

1. Structure and depth of the top of the Eastern View Coal Measures ..	3
2. Structure and depth of the Paleocene lower <u>Lygistepollenites</u> <u>balmei</u> zone.....	4
3. Examples of petroleum trap configurations in the Bass Basin.....	5

TABLES

1. Crude oil analysis, Cormorant accumulation.....	8
2. Natural gas analysis, Pelican accumulation.....	8

PLATE

1. Petroleum accumulations in the Bass Basin	
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ABSTRACT

Six petroleum accumulations have been discovered since 1965 in the Bass Basin of southeastern Australia.

The petroleum in the Bass Basin mainly occupies the structural fold-related traps within the Lower Cretaceous to Upper Eocene fluvio-deltaic clastic rocks of the Eastern View Coal Measures. It is believed to be of humic, algal, and herbaceous origin, and occurs as crude oil (21-50°API); condensate (49-51°API); and gases (mainly wet).

The basin's estimated petroleum recoverable reserves as at 31 December 1985 comprise $2.25 \times 10^6 \text{m}^3$ of oil, $7.38 \times 10^6 \text{m}^3$ of condensate; $4.70 \times 10^6 \text{m}^3$ of liquid petroleum gas (LPG); and $13.20 \times 10^9 \text{m}^3$ of sales gas.

INTRODUCTION

This report summarises information on the petroleum accumulations found in the Bass Basin up to 31 December 1985. It describes the basin's setting, structure and traps, reservoir and source rocks, maturation, nature of petroleum, and petroleum reserves.

The objectives in summarising the available data are:

- to provide the capacity to understand the distribution and characteristics of petroleum accumulations in the Bass Basin;
- to provide assistance for exploration for additional reserves; and
- to facilitate basic geological and geochemical research.

The data presented in this report were drawn from the continuing petroleum exploration programs in the Bass Basin in which the detailed assessments of individual accumulations have been released by the operators.

BASIN SUMMARY

Setting and stratigraphy

The Bass Basin (locality map, Plate 1) is a northwest-trending basin located mainly on the continental shelf in Bass Strait between the Australian mainland and Tasmania (Robinson, 1974; Brown, 1976; Robertson & others, 1978). An onshore extension of the basin, the Boobyalla Sub-basin, occurs in northeast Tasmania (Moore & others, 1984). The basin is separated from the Gippsland Basin to the southwest by the King Island High. Another basement ridge, extending from King Island to Mornington Peninsula, forms the boundary with the Torquay Basin, although the upper part of the Bass Basin sequence extends over the ridge and crops out onshore in Victoria. To the west of the Boobyalla Sub-basin the southern boundary is an unconformable contact between basin sediments and basement, close to the northern coast of Tasmania. The northern boundary is taken as an arbitrary line between Mornington Peninsula and Wilsons Promontory. Water depths are up to 90 m, and, in the area most prospective for hydrocarbons, generally exceed 60 m.

The basin's stratigraphic units and their thicknesses are shown in Plate 1. The stratigraphy has been interpreted in plate tectonic terms to

reflect the events leading to the separation of Australia from Antarctica and from the Lord Howe Rise and New Zealand during the late Mesozoic and Tertiary (Griffiths, 1971; Elliot, 1972; Gunn, 1975). The results of more recent studies of the stratigraphy and development of the Bass Basin are documented by Davidson & others (1984), and Williamson & others (1985).

Limited well control suggests that the Lower Cretaceous (and Upper Jurassic?) Otway Group contains non-marine clastic sediments deposited during the rifting which initiated basin development. The Upper Cretaceous to Upper Eocene Eastern View Coal Measures reflect continuing basin subsidence associated with continent separation. Non-marine clastic sediments were deposited in alluvial-fan, flood-plain, and lacustrine environments in which coal swamps proliferated during the Eocene (Williamson & others, 1985). The mainly Upper Cretaceous sediments in the Boobyalla Sub-basin are interpreted as a 'near source' facies of the Eastern View Coal Measures (Moore & others, 1984).

The Upper Eocene Demons Bluff Formation, comprising fine-grained clastic sediments, marks the establishment of basin-wide restricted marine conditions. The transition from a restricted marine to an open continental shelf environment is reflected in the marl and limestone sequence of the Oligocene to Pliocene Torquay Group.

Extensive igneous activity produced both intrusive and extrusive rocks ranging in age from Late Cretaceous to Miocene.

Petroleum accumulations

In the Bass Basin, petroleum occurs in both subeconomic and uneconomic quantities. Gas/condensate was discovered in 1967 in Bass No. 3 petroleum exploration well (Esso, 1967). Since then over 22 petroleum exploration wells have been drilled in the basin, resulting in the discovery of three subeconomic petroleum accumulations:

- Pelican (gas/condensate)
- Yolla (oil and gas/condensate)
- Cormorant (oil and gas/condensate)

Further, there are another three uneconomic accumulations:

- Bass (gas/condensate)
- Poonboon (gas)
- Aroo (gas)

Details of all the basin's petroleum accumulations are summarised in the 'Petroleum accumulations summaries' section of this report, and are graphically depicted in Plate 1.

Structure and petroleum traps

The major structural trends in the Bass Basin are shown in Figures 1 and 2. Basement-involved tilted fault-blocks produced by normal faulting during the rifting (extensional) stage of basin development are the dominant feature; fault trends are mainly northwesterly to west-northwesterly. In addition to the normal faults, basin-spanning northeast-trending transfer faults (analogous to oceanic transforms) developed during the extensional stage, and offset the normal faults right-laterally (Etheridge & others, 1985).

Structural development in the Bass Basin increases with depth, and is most evident in the pre-Eocene sequence (Fig. 2). Relatively few structures have been mapped on the top of the Eastern View Coal Measures

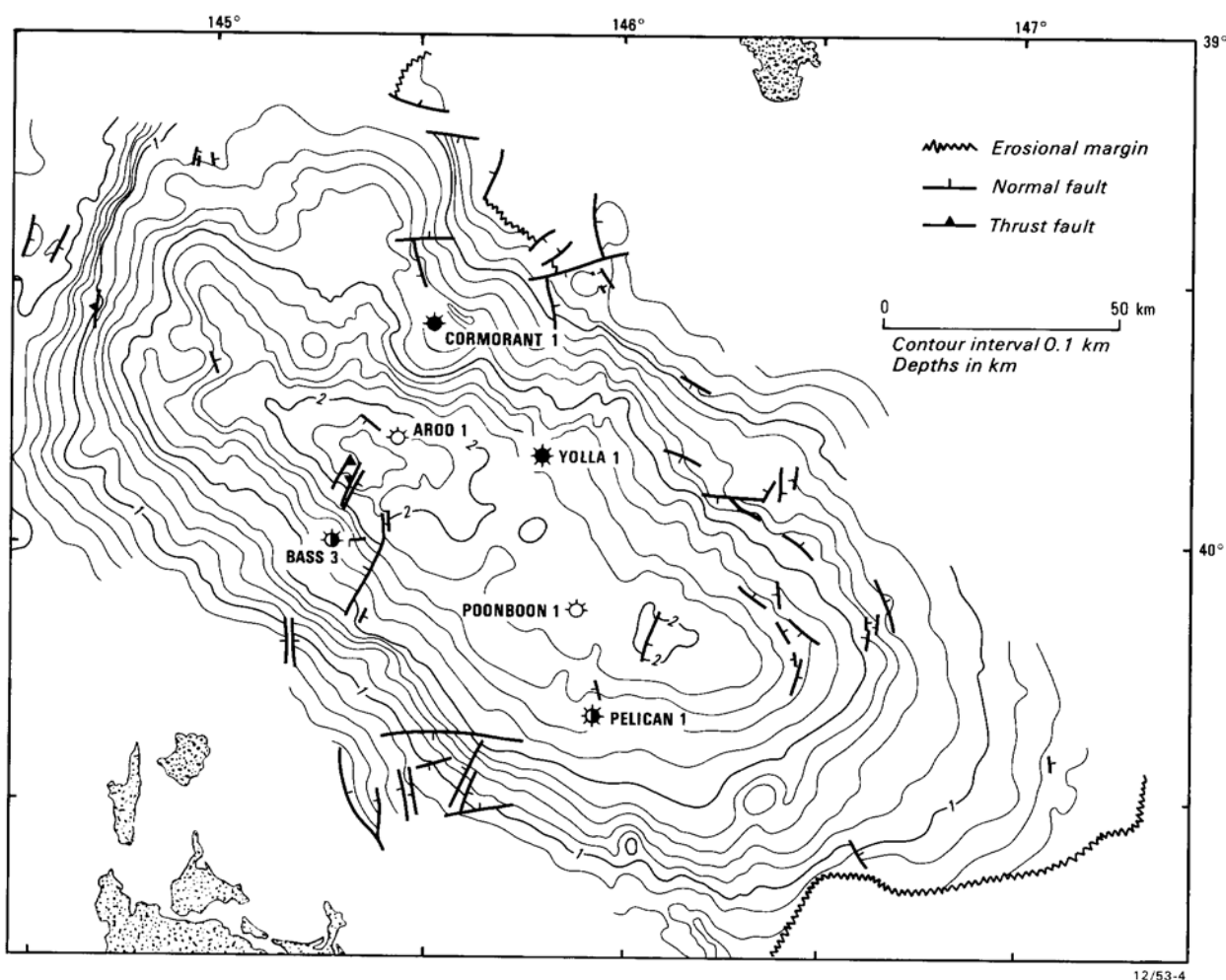


Fig 3 — Regional structure of the top of the Eocene Eastern View Coal Measures (after Williamson & others, 1985)

(Fig. 1); Davidson & others (1984) interpreted normal fault-blocks modified by wrench and reverse-faulting at this level.

All the petroleum detected to date in the Bass Basin has been in structural traps in the Eastern View Coal Measures, and, except in Yolla No. 1 and Cormorant No. 1, only in the Paleocene and Lower Eocene parts of the unit. The Demons Bluff Formation and intraformational shale in the Eastern View Coal Measures provide sealing units. The absence of significant petroleum discoveries at the top of the Eastern View Coal Measures is attributed (Davidson & others, 1984) to (1) the moderately few normal faults that reach this level, particularly over the basin depocentre, and (2) the extensive occurrence of low-permeability sediments in the Lower Eocene and Paleocene parts of the unit, which would have inhibited vertical migration of petroleum to traps at the top of the coal measure sequence.

Figure 3 illustrates the types of trap drilled to date in the basin.

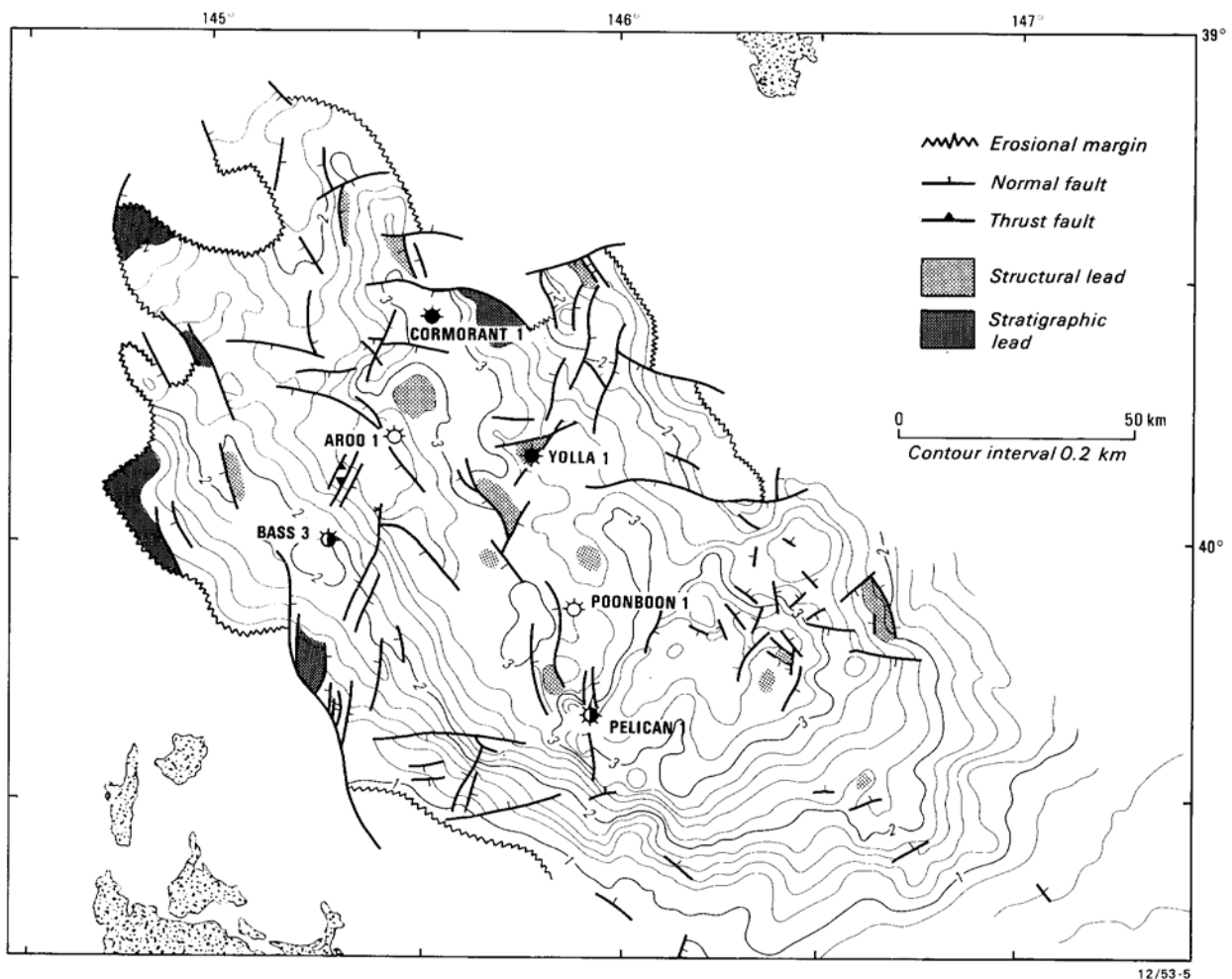


Fig. 2. Structure and depth of the Paleocene lower *Lygistepollenites balmei* zone (after Williamson & others, 1985)

Petroleum-bearing rock units

The quality of petroleum-bearing rock units in the Bass Basin ranges from poor to moderate. Sedimentological studies indicate that the basin contains up to five different facies: distributory-channel sandstone; linear-barrier sandstone delta-front sands; shallow-marine clastics; and chemical deposits.

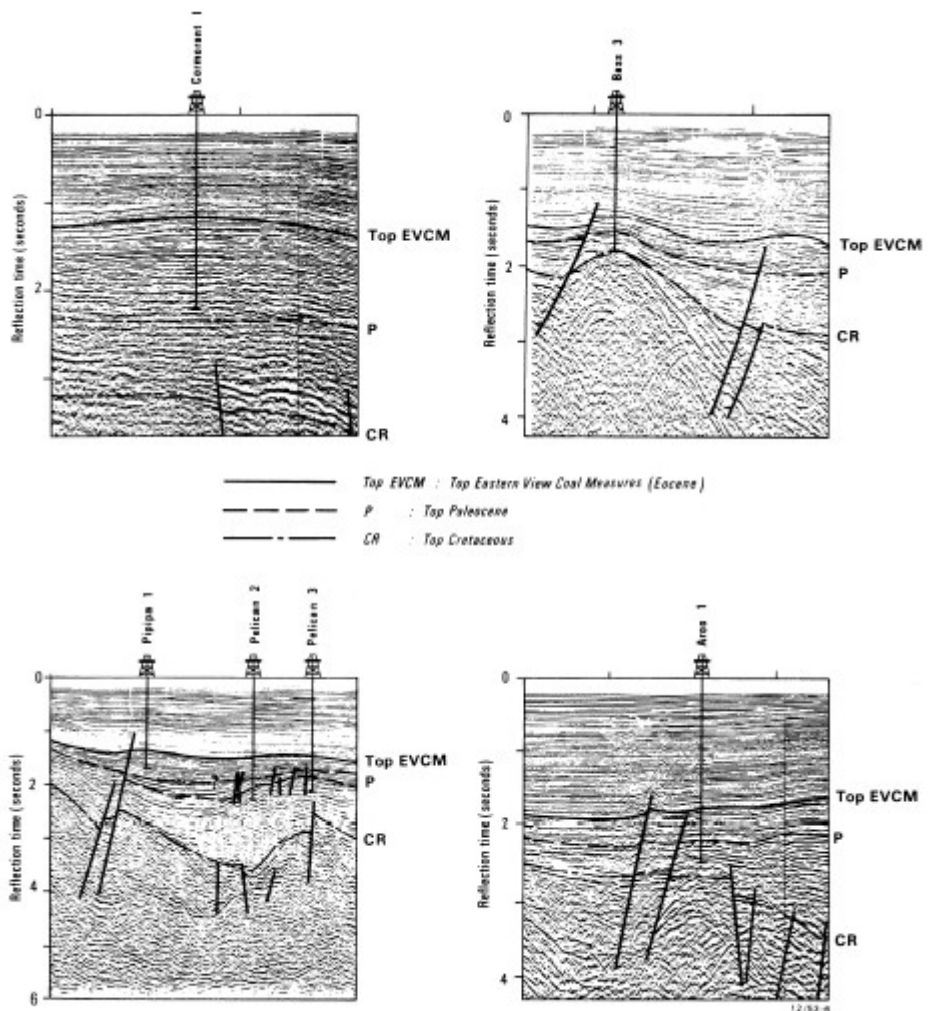


Fig. 3. Examples of petroleum trap configurations in the Bass Basin (after Williamson & others, 1985)

The petroleum-bearing rocks of the Eastern View Coal Measures are an amalgamation of terrestrial quartz-rich siliciclastics comprising interbedded coal-mudstone, siltstone, and sandstone that have undergone a complex postdepositional history.

Sandstones of the upper Eastern View Coal Measures are proven petroleum-bearing units, and have been tested by the Cormorant No. 1 and Yolla No. 1 wells. These units consist of very fine to coarse-grained sandstone with minor clay matrix. The porosity in these units ranges up to 30 per cent. Permeabilities are generally low; locally, however, they range up to 204 md.

The quality of the lower Eastern View Coal Measures petroleum-bearing units is poorer than that of the overlying upper units. These lower units comprise fine to coarse-grained carbonaceous, partly glauconitic sandstone with minor calcareous cement. Porosities in these units range up to 25 per cent, and permeabilities up to 200 md.

According to Meszoly & others (1985), the nature and distribution of porosity in the Eastern View Coal Measures suggest that potential petroleum-bearing unit quality is greatest between 190 and 2700 m below sea level basin-wide. They have distinguished two types of diagenesis in sandstone of this formation: the Bass and Pelican types. Bass-type diagenesis primarily features carbonate authigenesis (a major cause of porosity occlusion), and is typical of sandstones between the top of the Eastern View Coal Measures and about 1950 m below sea level. Pelican-type diagenesis is typical in sandstone below 2000 m, and partly overprints Bass-type modifications. Shallow Pelican-type modifications include the widespread dissolution (by formation waters) of carbonate cement of detrital minerals in clastic rocks (the major mechanism of porosity preservation/development). Deeper Pelican-type petroleum-bearing units exhibit more intense quartz overgrowth cementation. Cap rocks to petroleum-bearing units in the Eastern View Coal Measures comprise impermeable sandstone, siltstone, shale, coal beds, and possibly volcanics.

The Otway Group succession has not been completely penetrated in the Bass Basin. The maximum thickness of 1200 m was intersected in Durroon No. 1 well (Robertson & others, 1978), and consists of interbedded lithic sandstone and siltstone containing some thin conglomerate beds and thin coal seams. The quality of potential petroleum-bearing units has not been fully evaluated.

The Upper Eocene Demons Bluff Formation and the Oligocene-Pliocene Torquay Group - comprising homogeneous shale, siltstone, and calcareous beds - contain no known reservoirs.

Source rocks and maturation

The potential petroleum source rocks in the Bass Basin include siltstone, shale, coal, and minor carbonates. Numerous source-rock studies (Raphael & Saxby, 1979; Saxby & others, 1980; Nicholas & others, 1981) of the Bass Basin sequence have established that the Eastern View Coal Measures are the most important source that probably charged the six presently known petroleum accumulations with gas, condensate, and oil.

Although the prevalence of vitrinitic kerogen within the Eastern View Coal Measures indicates generally a gas-prone province, exinite-kerogen of moderate proportions has been identified too, thus indicating the presence of a subordinate oil-prone province. A typical maceral sample comprises: vitrinite 84 per cent, exinite 12 per cent, and inertinite 4 per cent. Measured total organic carbon (TOC) ranges from 1.2 to 20.1 per cent in the lower Eastern View Coal Measures, and from 1.8 to 4.5 per cent in the Otway Group.

Thermal maturation studies by Kantsler & others (1978) and Nicholas & others (1981), and geohistory studies by Etheridge & others (1984), all suggest that present-day maturity for oil generation ($R_o = 0.6-0.7$ per cent) normally begins in the Paleocene at depths of around 2.5-3.0 km. Therefore, none of the wells drilled in the basin was deep enough to have penetrated mature source rocks, with the possible exception of Cormorant No. 1. The deep wells in the basin centre, and wells on the southwest flank near the Pelican accumulation, appear to have been terminated just above the zone of initial petroleum generation.

The Demons Bluff Formation and the Torquay Group are regarded as immature for petroleum generation. The Lower Cretaceous Otway Group is, however, rated on limited sampling as a fair to good source of gas (Nicholas & others, 1981).

Nature of petroleum

Oils discovered in the Cormorant and Yolla accumulations occur in stratigraphically and depthwise equivalent rock units (Plate 1). The Cormorant oil has a gravity of 21.6° API, whereas the Yolla oil gravity is

about 51°API. The somewhat heavy oil discovered in Cormorant No. 1 well is interpreted to be a residual accumulation resulting from possible biodegradation. The fact that both oils are trapped in immature rocks (in the pre-oil generation zone) suggests that both may have been generated in rocks of greater depth and maturity, but migrated up-dip along fault planes into present-day traps.

Dry gas was discovered in Aroo and Poonboon wells and is trapped in the lower Eastern View Coal Measures. Gas rich in liquids was discovered in Cormorant, Pelican, and Yolla wells. Condensate from Pelican and Yolla accumulations ranges in gravity from 49-51°API. The gas:condensate ratio from the Pelican discovery was estimated at 765 m of liquid:10⁶m³ of raw gas. Tables 1 and 2 list the characteristics of Cormorant oil and Pelican gas.

TABLE 1
CRUDE-OIL ANALYSIS

Accumulation:	Cormorant
Trap:	Eocene (N)
Petroleum-bearing unit:	N-1 (Plate 1)

<u>Component</u>	<u>Variable</u>
Gravity:	21.6°API
Specific gravity:	0.924 @ standard conditions
Sulphur (%wt):	0.38 of C ₁₀ ⁺ fraction
Colour:	Dark brown
C ₁ -C ₄ :	Trace
C ₅ :	Undetectable
C ₆ :	0.45% (wt)
C ₇ :	1.85%
C ₈ :	2.38%
C ₉ :	2.92%
C ₁₀ ⁺ :	92.39%
Total hydrocarbons:	94.9%
Water:	5.1%

After Esso (1970c).

TABLE 2
NATURAL-GAS ANALYSIS

Accumulation:	Pelican
Trap:	Pelican Central
Petroleum-bearing unit:	M-6 (Plate 1)

<u>Component</u>	<u>Molecular</u> <u>per cent</u>
methane	54.88
ethane	9.44
propane	9.47
isobutane	3.36
n-butane	4.52
isopentane	1.44
n-pentane	1.82
hexane +	9.31
hydrogen sulphide	5.10
nitrogen	0.66
helium	0.00
Total	100.00

After Esso (1970a).

Petroleum reserves

Estimated recoverable petroleum reserves for the Bass Basin as at 31 December 1985 comprised $2.25 \times 10^6 \text{ m}^3$ of oil; $7.38 \times 10^6 \text{ m}^3$ of condensate; $4.70 \times 10^6 \text{ m}^3$ of LPG; and $13.20 \times 10^9 \text{ m}^3$ of sales gas (BMR, 1986). All reserves listed above either have been provide to BMR by the Department of Mines, Tasmania, or are BMR estimates.

Petroleum production developments

To date no petroleum production developments have taken place nor are any contemplated.

PETROLEUM ACCUMULATIONS SUMMARIES

PETROLEUM ACCUMULATIONS SUMMARY SHEET

ACCUMULATION: *Pelican*

COMPILATION DATE: *31/07/86*

OPERATOR: *Esso Australia Ltd*

TYPE: *Gas/condensate*

COMMERCIAL STATUS: *Subeconomic and undeveloped*

LOCATION: *Approximately 80 km north of Burnie, offshore Tasmania*

STATE: *Tasmania*

PETROLEUM TITLE(S): *T/P5, T/P6*

FIRST DISCOVERY WELL: *Pelican No.1 (Esso, 1970a)*

- latitude: *40°20'20"* longitude: *145°50'37"*
- discovery: *gas/condensate*
- date total depth reached: *April 1970*

SECOND DISCOVERY WELL: *Pelican No.2 (Esso, 1970b)*

- latitude: *40°18'28"* longitude: *145°19'12"*
- discovery: *gas/condensate*
- date total depth reached: *August 1970*

THIRD DISCOVERY WELL: *Pelican No.4 (Hematite, 1979)*

- latitude: *40°21'38"* longitude: *145°52'18"*
- discovery: *gas/condensate*
- date total depth reached: *February 1979*

NUMBER OF WELLS DRILLED: *5* exploration
Nil development

STRUCTURE: *Anticline: northwest-trending; intensely faulted*

- areal closure: *95 sq.km*
- vertical closure: *120 m*

SUBDIVISION OF PETROLEUM ACCUMULATION:

- 3* traps
- 11* petroleum-bearing units

NUMBER AND TYPE OF PRODUCING ZONES:

- *Nil* gas *Nil* gas/condensate
- *Nil* gas/oil *Nil* oil

DRIVE MECHANISM: *?*

PRODUCTION COMMENCED: *Nil*

PRODUCTION INFRASTRUCTURE: *Nil*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 1: *Pelican Northwest*

DISCOVERY WELL: *Pelican No.2*

CONTENTS: *Gas/condensate*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *M-4*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone and minor thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2755.4 m below sea level (BSL)*

POROSITY: *15%*

PERMEABILITY: *Low*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 2: *M-5*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal layers*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2837.68 m BSL*

POROSITY: *29%*

PERMEABILITY: *Low*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 3: M-6

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2913.9 m BSL*

POROSITY: *17%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 2: *Pelican Central*

DISCOVERY WELL: *Pelican No.1*

CONTENTS: *Gas/condensate*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *M-1*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2441.4 m BSL*

POROSITY: *16%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Normal (1.822 °C/100m)*

PRESSURE GRADIENT: *Normal, 9730 pascals/metre (Pa/m)*

PETROLEUM-BEARING UNIT 2: *M-2*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2519.2 m BSL*

POROSITY: *22%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Normal (1.822 °C/100m)*

PRESSURE GRADIENT: *Slightly above normal, 10120 Pa/m*

PETROLEUM-BEARING UNIT 3: M-3

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2552.1 m BSL*

POROSITY: *16%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Slightly above normal (10070 Pa/m)*

PETROLEUM-BEARING UNIT 4: M-4

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2706.0 m BSL*

POROSITY: *19%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Slightly above normal (10610 Pa/m)*

PETROLEUM-BEARING UNIT 5: M-6

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2826.1 m BSL*

POROSITY: *23%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Slightly above normal, (10678 Pa/m)*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 3: *Pelican Southeast*

DISCOVERY WELL: *Pelican No.4*

CONTENTS: *Gas/condensate*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *M-4*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2708.5 m BSL*

POROSITY: *13%*

PERMEABILITY: *1.7 md*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 2: *M-5*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2763.9 m BSL*

POROSITY: *13%*

PERMEABILITY: *1.7 md*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 3: M-6

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (lower M.diversus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal seams*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2852.3 m BSL*

POROSITY: *13%*

PERMEABILITY: *1.7 md*

TEMPERATURE GRADIENT: *Normal*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

ACCUMULATION: *Yolla*

COMPILATION DATE: *7/10/86*

OPERATOR: *Amoco Australia Petroleum Co.*

TYPE: *Oil; gas/condensate*

COMMERCIAL STATUS: *Subeconomic and undeveloped*

LOCATION: *Approximately 142 km north of Burnie, offshore Tasmania*

STATE: *Tasmania*

PETROLEUM TITLE(S): *T/14P*

DISCOVERY WELL: *Yolla No.1 (Amoco, 1986)*

- latitude: *39°50'18"* longitude: *145°48'20"*
- discovery: *oil; gas/condensate*
- date total depth reached: *August 1985*

NUMBER OF WELLS DRILLED: *1* exploration
Nil development

STRUCTURE: *Dome: basement high, circular structure, partly faulted*

- areal closure: *7.1 sq.km*
- vertical closure: *approximately 40 m*

SUBDIVISION OF PETROLEUM ACCUMULATION:

- 2* traps
- 3* petroleum-bearing units

NUMBER AND TYPE OF PRODUCING ZONES:

- *Nil* gas *Nil* gas/condensate
- *Nil* gas/oil *Nil* oil

DRIVE MECHANISM: *?*

PRODUCTION COMMENCED: *Nil*

PRODUCTION INFRASTRUCTURE: *Nil*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 1: *Eocene (N)*

DISCOVERY WELL: *Yolla No.1*

CONTENTS: *Gas/condensate; oil*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *N-1*

PETROLEUM CONTENTS: *Gas/condensate; oil*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Late Eocene (upper N.asperus)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: interbedded with shale, siltstone, coal, and
minor dolomite*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *1801.9 m BSL*

POROSITY: *Average 26%*

PERMEABILITY: *11 to 204 md*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 2: *Paleocene (L)*

DISCOVERY WELL: *Yolla No.1*

CONTENTS: *Gas/condensate*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *L-1*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Late Paleocene (upper L.balmei)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: interbedded with shale, siltstone, coal, and
minor dolomite*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2798.0 m BSL*

POROSITY: *Average 19%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 2: *L-2*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Late Paleocene (upper L.balmei)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: interbedded with shale, siltstone, coal, and
minor dolomite*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2976.9 m BSL*

POROSITY: *Average 19%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

ACCUMULATION: *Cormorant*

COMPILATION DATE: *7/10/86*

OPERATOR: *Esso Australia Ltd*

TYPE: *Oil; gas/condensate*

COMMERCIAL STATUS: *Subeconomic and undeveloped*

LOCATION: *Approximately 195 km south-southeast of Melbourne and 164 km north-northwest of Burnie, offshore Tasmania*

STATE: *Tasmania*

PETROLEUM TITLE(S): *T/18P*

DISCOVERY WELL: *Cormorant No.1 (Esso, 1970c)*

- latitude: *39°34'22"* longitude: *145°31'35"*

- discovery: *oil; gas/condensate*

- date total depth reached: *July 1970*

NUMBER OF WELLS DRILLED: *1* exploration
Nil development

STRUCTURE: *Anticline: dissected by north-south-trending faults*

- areal closure: *135 sq.km*

- vertical closure: *approximately 110 m*

SUBDIVISION OF PETROLEUM ACCUMULATION:

2 traps

5 petroleum-bearing units

NUMBER AND TYPE OF PRODUCING ZONES:

- *Nil* gas *Nil* gas/condensate

- *Nil* gas/oil *Nil* oil

DRIVE MECHANISM: *?*

PRODUCTION COMMENCED: *Nil*

PRODUCTION INFRASTRUCTURE: *Nil*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 1: *Eocene (N)*

DISCOVERY WELL: *Cormorant No.1*

CONTENTS: *Oil*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *NL-1*

PETROLEUM CONTENTS: *Oil*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Middle Eocene (lower N.asperus)*

TRAPPING MECHANISM: *Structural/stratigraphic*

LITHOLOGY: *Sandstone: marginal marine; carbonaceous; interbedded with siltstone and minor shale*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *1468.52 m BSL*

POROSITY: *Average 20%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 2: *L-2*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Late Paleocene (upper L.balmei)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: marginal marine; carbonaceous; interbedded with siltstone and minor shale*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *1468.52 m BSL*

POROSITY: *20%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 2: *Eocene (M)*

DISCOVERY WELL: *Cormorant No.1*

CONTENTS: *Gas/condensate*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *M-1.1*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (upper M.diversus)*

TRAPPING MECHANISM: *Stratigraphic?*

LITHOLOGY: *Sandstone: carbonaceous; interbedded with siltstone and coal beds*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *1795.27 m BSL*

POROSITY: *20%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 2: *M-1.2*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (upper M.diversus)*

TRAPPING MECHANISM: *Stratigraphic?*

LITHOLOGY: *Sandstone: non-marine; carbonaceous; interbedded with minor siltstone and shale*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *1976.62 m BSL*

POROSITY: *20%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 3: M-1.3

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (upper M.diversus)*

TRAPPING MECHANISM: *Stratigraphic?*

LITHOLOGY: *Sandstone: non-marine; calcareous; interbedded with siltstone and shale*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2241.19 m BSL*

POROSITY: *20%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 4: M-2.1

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Dormant*

FORMATION: *Eastern View Coal Measures*

AGE: *Early Eocene (upper M.diversus)*

TRAPPING MECHANISM: *Stratigraphic?*

LITHOLOGY: *Sandstone: non-marine; carbonaceous; interbedded with minor siltstone*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2313.42 m BSL*

POROSITY: *20%*

PERMEABILITY: *Not determined*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

ACCUMULATION: *Bass*

COMPILATION DATE: *7/10/86*

OPERATOR: *Esso Australia Ltd*

TYPE: *Gas/condensate show*

COMMERCIAL STATUS: *Uneconomic and undeveloped*

LOCATION: *Approximately 142 km north of Burnie, offshore Tasmania*

STATE: *Tasmania*

PETROLEUM TITLE(S): *T/18P*

DISCOVERY WELL: *Bass No.3 (Esso, 1967)*

- latitude: *39°59'51"* longitude: *145°16'57"*

- discovery: *gas/condensate*

- date total depth reached: *March 1967*

NUMBER OF WELLS DRILLED: *3* exploration
Nil development

STRUCTURE: *Anticline: partly faulted by a northwest-southeast-trending fault*

- areal closure: *78 sq.km*

- vertical closure: *91.4 m*

SUBDIVISION OF PETROLEUM ACCUMULATION:

1 traps

1 petroleum-bearing units

NUMBER AND TYPE OF PRODUCING ZONES:

- *Nil* gas *Nil* gas/condensate

- *Nil* gas/oil *Nil* oil

DRIVE MECHANISM: *?*

PRODUCTION COMMENCED: *Nil*

PRODUCTION INFRASTRUCTURE: *Nil*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 1: *Paleocene (L)*

DISCOVERY WELL: *Bass No.3*

CONTENTS: *Gas/condensate*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *L-1*

PETROLEUM CONTENTS: *Gas/condensate*

PRODUCTION STATUS: *Nil*

FORMATION: *Eastern View Coal Measures*

AGE: *Middle-Late Paleocene (lower L.balmei)*

TRAPPING MECHANISM: *Structural*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and
minor coal beds*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2045.6 m BSL*

POROSITY: *18 to 30%*

PERMEABILITY: *2 to 30 md*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

ACCUMULATION: *Poonboon*

COMPILATION DATE: *9/10/86*

OPERATOR: *Esso Australia Ltd*

TYPE: *Gas show*

COMMERCIAL STATUS: *Uneconomic and undeveloped*

LOCATION: *Approximately 110 km north of Burnie, offshore Tasmania*

STATE: *Tasmania*

PETROLEUM TITLE(S): *T/18P*

DISCOVERY WELL: *Poonboon No.1 (Esso, 1972)*

- latitude: *40°08'17"* longitude: *145°55'00"*

- discovery: *gas*

- date total depth reached: *September 1972*

NUMBER OF WELLS DRILLED: *1* exploration
Nil development

STRUCTURE: *Anticline: ?sedimentary drape over a basement high*

- areal closure: *approximately 45 sq.km*

- vertical closure: *approximately 15 m*

SUBDIVISION OF PETROLEUM ACCUMULATION:

1 traps

1 petroleum-bearing units

NUMBER AND TYPE OF PRODUCING ZONES:

- *Nil* gas *Nil* gas/condensate

- *Nil* gas/oil *Nil* oil

DRIVE MECHANISM: *?*

PRODUCTION COMMENCED: *Nil*

PRODUCTION INFRASTRUCTURE: *Nil*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 1: *Paleocene (L)*

DISCOVERY WELL: *Poonboon No.1*

CONTENTS: *Gas*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *L-1*

PETROLEUM CONTENTS: *Gas*

PRODUCTION STATUS: *Nil*

FORMATION: *Eastern View Coal Measures*

AGE: *Middle-Late Paleocene (lower L.balmei)*

TRAPPING MECHANISM: *Structural?*

LITHOLOGY: *Sandstone: non-marine; interbedded with siltstone, shale, and thin coal beds*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *3167.78 m BSL*

POROSITY: *15 to 23%*

PERMEABILITY: *100 md*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

ACCUMULATION: *Aroo*

COMPILATION DATE: *7/10/86*

OPERATOR: *Hematite Petroleum Pty Ltd*

TYPE: *Gas show*

COMMERCIAL STATUS: *Uneconomic and undeveloped*

LOCATION: *Approximately 140 km north of Burnie, offshore Tasmania*

STATE: *Tasmania*

PETROLEUM TITLE(S): *T/18P*

DISCOVERY WELL: *Aroo No.1 (Hematite, 1974)*

- latitude: *39°47'30"* longitude: *145°26'47"*

- discovery: *gas*

- date total depth reached: *April 1974*

NUMBER OF WELLS DRILLED: *1* exploration
Nil development

STRUCTURE: *Anticline: northwest-trending, overlying a regional northeast-trending basement high*

- areal closure: *approximately 140 sq.km*

- vertical closure: *approximately 100 m*

SUBDIVISION OF PETROLEUM ACCUMULATION:

1 traps

3 petroleum-bearing units

NUMBER AND TYPE OF PRODUCING ZONES:

- *Nil* gas *Nil* gas/condensate

- *Nil* gas/oil *Nil* oil

DRIVE MECHANISM: *?*

PRODUCTION COMMENCED: *Nil*

PRODUCTION INFRASTRUCTURE: *Nil*

PETROLEUM ACCUMULATIONS SUMMARY SHEET

TRAP

TRAP 1: *Paleocene (L)*

DISCOVERY WELL: *Aroo No.1*

CONTENTS: *Gas*

PETROLEUM-BEARING UNIT(S)

PETROLEUM-BEARING UNIT 1: *L-1*

PETROLEUM CONTENTS: *Gas*

PRODUCTION STATUS: *Nil*

FORMATION: *Eastern View Coal Measures*

AGE: *Middle-Late Paleocene (lower L.balmei)*

TRAPPING MECHANISM: *Structural?*

LITHOLOGY: *Sandstone: marginal marine; interbedded with carbonaceous siltstone, shale, and minor dolomite*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2774.0 m BSL*

POROSITY: *17.6 to 20.8%*

PERMEABILITY: *0.89 to 113 md*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 2: *L-2.0*

PETROLEUM CONTENTS: *Gas*

PRODUCTION STATUS: *Nil*

FORMATION: *Eastern View Coal Measures*

AGE: *Middle-Late Paleocene (lower L.balmei)*

TRAPPING MECHANISM: *Structural?*

LITHOLOGY: *Sandstone: marginal marine; interbedded with calcareous and carbonaceous siltstone and shale; minor dolomite*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *2895.0 m BSL*

POROSITY: *17.6 to 20.8%*

PERMEABILITY: *0.89 to 113 md*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

PETROLEUM-BEARING UNIT 3: L-2.1

PETROLEUM CONTENTS: *Gas*

PRODUCTION STATUS: *Nil*

FORMATION: *Eastern View Coal Measures*

AGE: *Middle-Late Paleocene (lower L.balmei)*

TRAPPING MECHANISM: *Structural?*

LITHOLOGY: *Sandstone: marginal marine; interbedded with carbonaceous and calcareous siltstone; minor coal and dolomite beds*

DEPTH TO TOP OF PETROLEUM-BEARING UNIT : *3135.20 m BSL*

POROSITY: *17.6 to 20.8%*

PERMEABILITY: *0.89 to 113 md*

TEMPERATURE GRADIENT: *Not determined*

PRESSURE GRADIENT: *Not determined*

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GLOSSARY

Accumulation: a general term representing all petroleum finds irrespective of their commercial viability. An accumulation may comprise a single or multiple petroleum traps all grouped on, or related to, the same individual geological structure and/or stratigraphic position.

Condensate: a liquid mixture consisting of pentanes and heavier hydrocarbons that are recoverable from a gas well through a surface-separating facility.

Crude oil: a mixture of hydrocarbons that existed in the liquid phase in underground rock formations, and remains liquid at atmospheric pressure after passing through a surface-separating facility.

Liquid petroleum gas (LPG): a liquid mixture consisting of all the propane and butane that are recoverable from a gas well through a surface-separating facility.

Natural gas: a mixture of hydrocarbons and non-hydrocarbons which exist as a gas in underground rock formations.

Natural-gas liquid: a liquid mixture of LPG and condensate.

Petroleum: a gaseous and/or liquid mixture of a great many hydrocarbons and hydrocarbon compounds occurring naturally in rocks.

Petroleum-bearing unit: an interval, containing petroleum, that can be distinguished on one or more characters (e.g., lithology, stratigraphic zone, etc.).

Sales gas: a mixture of methane and ethane and up to 3 per cent of carbon dioxide.

Subeconomic accumulation: a petroleum accumulation that is deemed by the operator or by the designated authority to have sufficient petroleum reserves, but which has not yet been declared economically viable; it may be either geologically proved or awaiting further approval.

Trap: any geological condition (structural or stratigraphic, or both) which prevents the vertical or lateral movements of gaseous or liquid petroleum.

Uneconomic accumulation: a petroleum accumulation (generally a show only) that is deemed by the operator or by the designated authority to be volumetrically insignificant and most probably non-recoverable.



DEPARTMENT OF RESOURCES AND ENERGY

COMPILED BY S.OZIMIC, E.NICHOLAS, L.PAIN AND A.HAUPT IN CO-OPERATION WITH ESSO (AUST) LTD, B.H.P. PETROLEUM PTY LTD, AMOCO AUSTRALIA PETROLEUM CO. AND DEPARTMENT OF MINES TASMANIA (SEPTEMBER, 1986). DRAWN BY J.M. JENKINS AND F.M. FIORESE

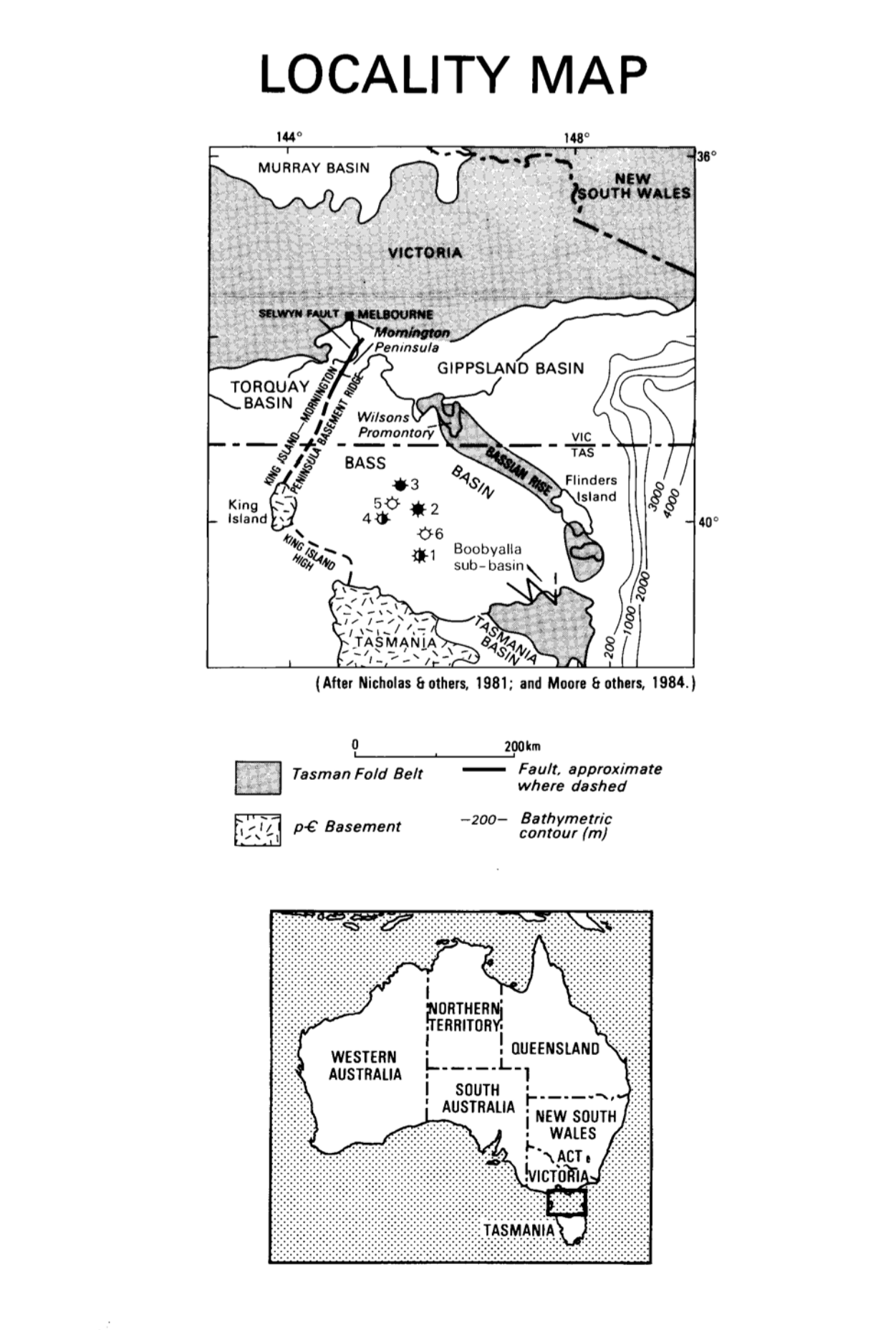
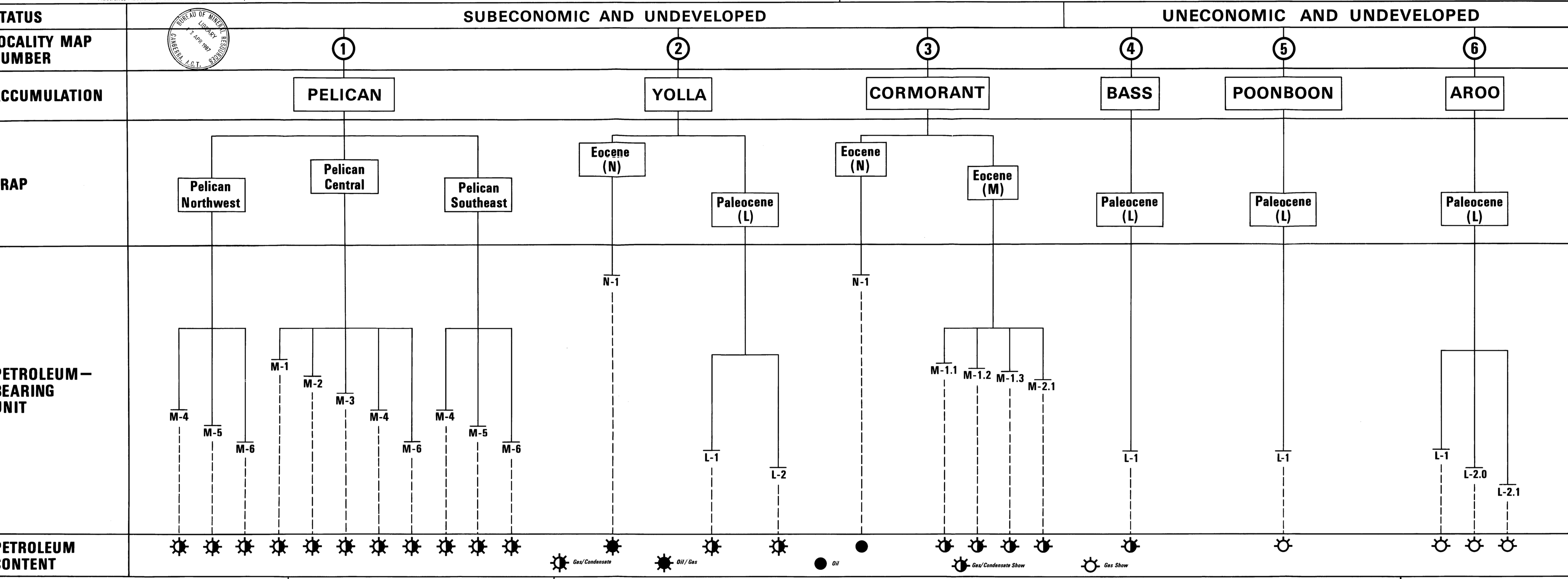
BIBLIOGRAPHICAL CITATION: OZIMIC, S., NICHOLAS, E. & PAIN, L., 1986 — Bass Basin, Tasmania and Victoria. Bureau of Mineral Resources, Australia, Australian Petroleum Accumulations Report 2.

AUSTRALIAN PETROLEUM ACCUMULATIONS

BASS BASIN



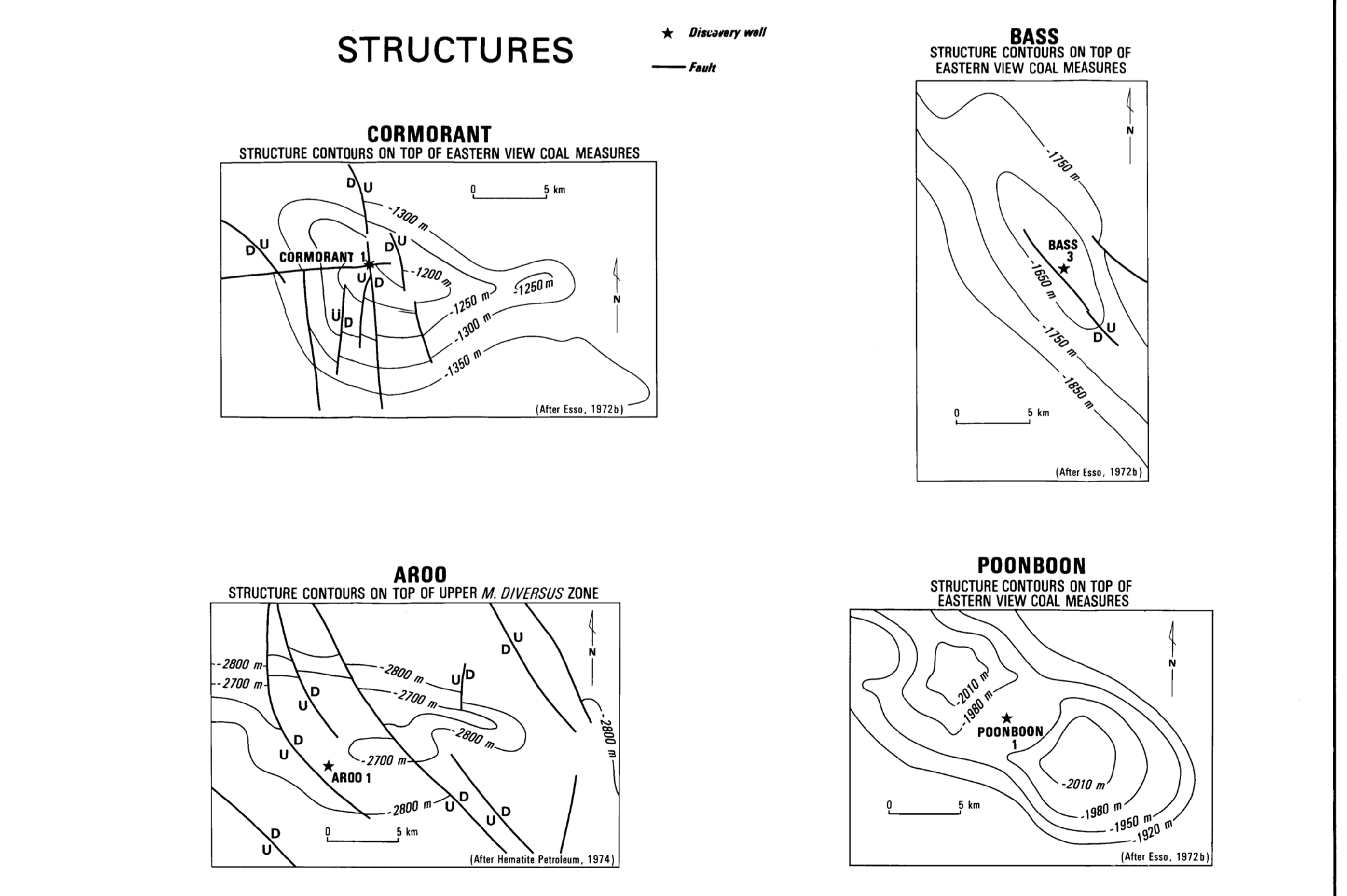
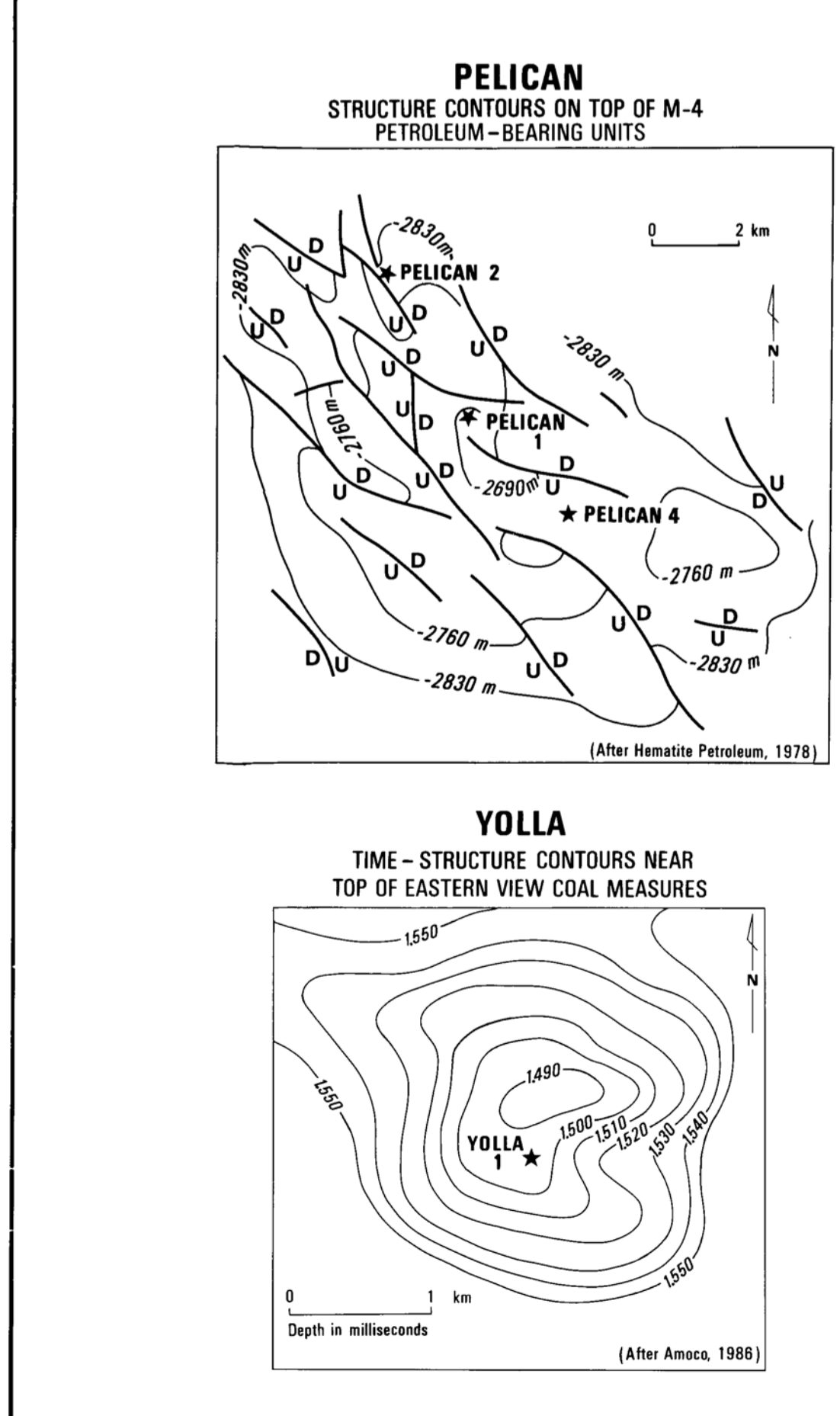
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STRATIGRAPHY

SYSTEM	EPOCH	SPORE - POLLEN ASSEMBLAGES & CODES	STRATIGRAPHY	MAXIMUM THICKNESS (m)
MIOCENE-PLIOCENE			TORQUAY GROUP	2400
			DEMONS BLUFF FORMATION	
OLIGOCENE	Late	<i>Nesofagidites asperus</i>	EASTERN VIEW	1100
	Middle	<i>Nesofagidites asperus</i>		
	Early	<i>Protocidites asperipalpis</i>		
	Early	<i>Malvacolpites diversus</i>		
PALEOCENE	Late	<i>Lygistipollenites balnei</i>	COAL MEASURES	6900
	Middle	<i>Lygistipollenites balnei</i>		
	Early			
CRETACEOUS	Late	<i>Tricolpites longus</i>	OTWAY GROUP	>1200
	Early			

(Modified after Nicholas & others, 1981)



ESTIMATED PETROLEUM RESERVES

RECOVERABLE RESERVES	as of	31	12	85
Gas (Sales)		13.20 x 10 ⁹ m ³		
LPG		4.70 x 10 ⁶ m ³		
Condensate		7.38 x 10 ⁶ m ³		
Oil		2.25 x 10 ⁶ m ³		
CUMULATIVE PRODUCTION	as of	31	12	85
Gas (Sales)		NIL		
LPG		NIL		
Condensate		NIL		
Oil		NIL		
Comments				