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079001

OTWAY/KING PART-V*

FINAL SUBSIDY REPORT

of

THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

PREPARED FOR

THE BUREAU OF MINERAL RESOURCES CANBERRA

by

ESSO EXPLORATION AND PRODUCTION AUSTRALIA, INC.

MARCH, 1969

REPORT AUST 102

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OR-064

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ABSTRACT

Esso Exploration and Production Australia Inc. carried out the Offshore Otway ER-68 Seismic and Magnetic Survey between October 10 and November 23, 1968. 1110 miles of 12 fold CDP information were shot with Aquapulse and were digitally processed. 425 miles of previously shot 6 fold CDP data were digitally reprocessed in conjunction with the Survey. The results of the ER-68 Survey have been integrated into previous work, and a total seismic interpretation of all parts of the Esso farm-in tenements of the Offshore Otway Basin, except for the South King Island Sub-basin, is reviewed.

Results of the survey show that the Encounter Bay area is underlain by shallow Basement, and is therefore probably non prospective for hydrocarbons. Prospects have been outlined that involve Cretaceous and Paleocene rocks.

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INTRODUCTION

A. LOCATION

The Offshore Otway ER-68 Marine Seismic and Magnetic Survey was conducted between October 10, 1968 and November 23, 1968 in the waters of the Southern Ocean immediately west of Bass Strait (see Index Map, figure 1). The work was done by Esso Exploration and Production Australia Inc. in connection with a farm-in agreement with Hematite Petroleum Pty. Ltd. that covers the following licences: SA-P2, SA-P3, P.E.P. 40, P.E.P. 49 and T-P3. Several miles were shot off Esso's farm-in area on P.E.P. 22 in Victoria.

The field work was carried out by Western Geophysical Company and the processing by Geophysical Services International, with supervision and interpretation by Esso. Field operations are covered in a comprehensive report by Western that is included in the appendix of this report.

In addition to the ER-68 Survey, portions of a previous Seismic Survey within the Esso farm-in was digitally processed for the first time (see plate 1) with costs subsidized by the Bureau of Mineral Resources.

This report covers results from the ER-68 Survey and the digital reprocessing, and presents an interpretation that is integrated into and includes results from previous Surveys.

B. PURPOSE OF SURVEY

The objectives of the ER-68 Marine Seismic and Magnetic Survey were as follows:

1. To explore via reconnaissance program the possiblity of thick sedimentary section at the south extremity of "S.A.-P2" in Encounter Bay.

2. To provide detailed control on the northern pinchout of the Lower Cretaceous Crayfish Sand against shallow Basement along the Cape Jaffa hinge line south of 37° longitude.

3. To provide additional control on an anticlinal lead south of Esso Crayfish A-1.

4. To delineate Upper Cretaceous fault traps with fill-in seismic control in the area between Esso Argonaut A-1 and Shell Voluta 1-A.

5. To provide detail control southeast of Portland on a Pre-Tertiary anticlinal trend.

6. To provide fill-in control south of Warrnambool in an area of potentially prospective Waarre Sandstone (basal Upper Cretaceous).

7. To detail a series of Basement Highs in the West King Island area.

8. To detail an anticlinal structure in the Anglesea Sub-basin.

The purpose of the shipboard magnetometer survey was to help define areas of igneous activity, and in general to complement the seismic interpretation. The purpose of the reprocessing program (425 miles) was to process digitally data from the EO-67 survey that had previously been recorded digitally but only analog processed. The reprocessing program was planned to include only areas potentially prospective for hydrocarbons.

C. GEOLOGIC HISTORY

The Otway Basin trends east-west across south western Victoria into South Australia and encompasses about 33,000 square miles. The Basin is Mesozoic to late Tertiary in age and is located in the southern part of the old Paleozoic Tasman Geosyncline.

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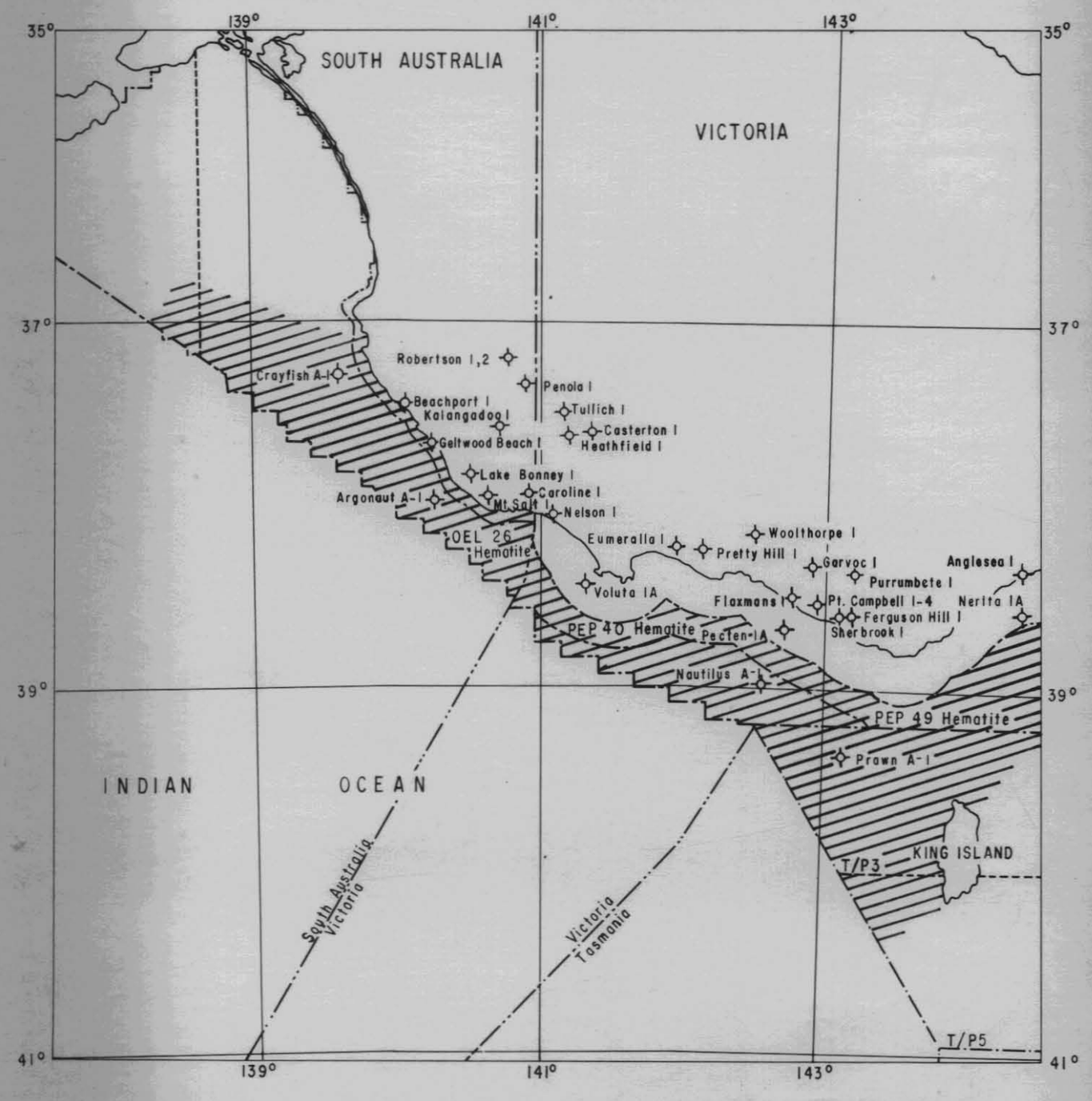
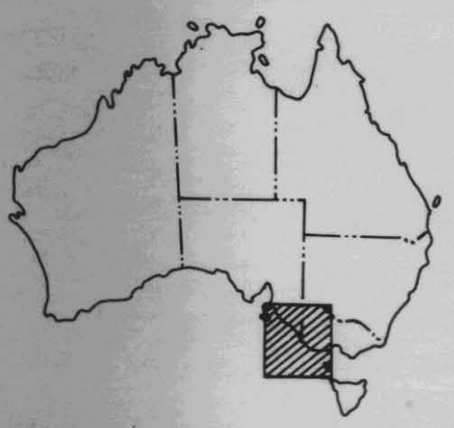


INDEX MAP



LEGEND

Location of Survey

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

OTWAY BASIN

VICTORIA – SOUTH AUSTRALIA

LOCATION MAP

TO ACCOMPANY: FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

0 20 40 80 120

Miles

FIGURE 1

DWG. 1122/G/1

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CRAYFISH A-1 | ARGONAUT A-1 | NAUTILUS A-1 | PRAWN A-1

S.L.

GAMBIER LS.

Oligocene-Miocene

PORT CAMPBELL LIMESTONE

Paleocene-U.Eocene

PEBBLE PT.

NELSON-KINGSTON GS.

Sponge spicules

GELLIBRAND MARL

Miocene

Oligocene

MEPUNGA

Paleocene-U.Eocene

PEBBLE PT.

Senonian marker

?

T.D.6597

PRETTY HILL SS.
Quartzoze Deltaic sands. Some clay choking.

Non-Marine

Marine

BELFAST MUDSTONE
(Marine)
Upper Cretaceous

Non-Marine Lithic

T.D.10,497

IGNEOUS

Marine Shale and Mudstone

T.D.12,163

T.D.10,477

WAARRE SS.

BASEMENT

OTWAY GROUP
Lower Cretaceous
(Non-Marine. Lithic, chloritic sandstones. siltstones and mudstones. Greywackes)

BASEMENT
Paleozoic
(Schists, gneisses and granites)

-2000 -4000 -6000 -8000 -10,000 -12,000 -14,000 -16,000 -18,000 -20,000

Vertical Exaggeration 40:1

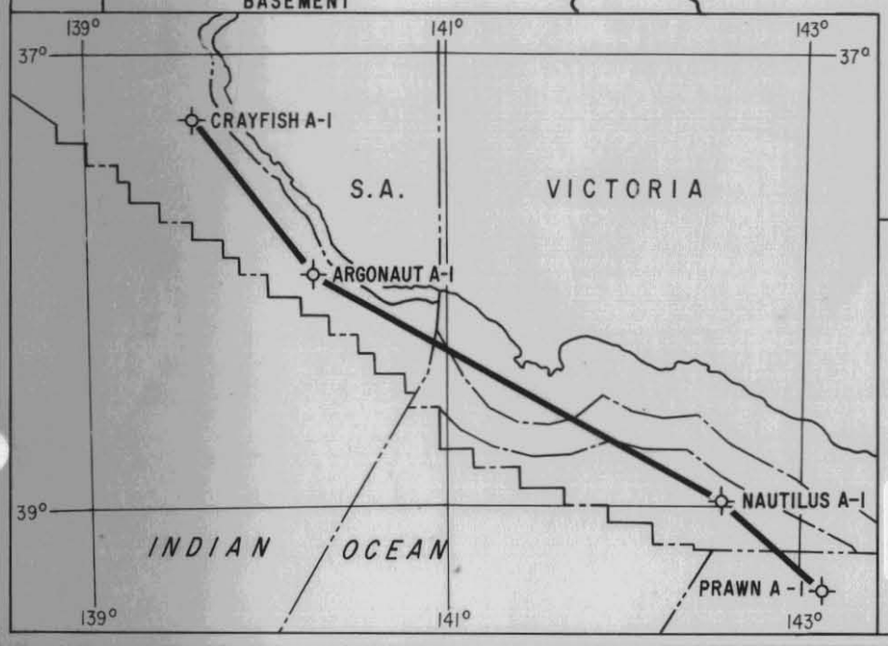

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FIGURE 2

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

OTWAY BASIN

CAPE JAFFA-KING ISLAND GEOLOGICAL CROSS SECTION

0 MILES 10

AUTHOR: E.A.JAMES DRAFTED: M.F.W.

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Dwg. 1122\G\2

The Paleozoic sequence ranges in age from Cambrian to Carboniferous, and may exceed 25,000 feet in thickness on the southeast side of the Otway Basin. Four onshore wells, Frome-Broken Hill Ferguson's Hill-1, Pretty Hill-1. Alliance Kalangadoo-1 and Robertson-1 have encountered Paleozoic rocks without shows of hydrocarbons. The strata consist of complexly folded, faulted, metamorphosed sediments with extrusive and intrusive igneous rocks. The Paleozoic are considered to be "economic basement" for the Otway Basin.

The Tasman Geosyncline was terminated in late Carboniferous to early Permian time by the Hunter Bowen Orogeny which was followed by the development of the Otway Basin in Jurassic and Lower Cretaceous time.

Jurassic to early Lower Cretaceous clastic sediments were deposited in a poorly defined east-west trending trough which extended from offshore South Australia south of Cape Jaffa to western Victoria near Casterton. Only one well, Planet Oil Casterton-1, encountered Jurassic rocks, where 1282 feet of clastics and dolerite lay unconformably over Paleozoic slate. The section consists of a 490 foot thick sub-greywack underlain by dark grey, carbonaceous shale, siltstone and two dolerite sills.

The Lower Cretaceous may have a maximum thickness of 15,000 feet. This section is predominantly non-marine and consists of greywackes, sub-greywackes, carbonaceous siltstones and chloritic mudstones. The sandstones usually contain abundant matrix material, which results in low permeabilities. A clean quartzose sandstone of basal Lower Cretaceous age was encountered at Frome-Broken Hill Pretty Hill-1 which exhibited excellent reservoir characteristics. The sandstone was 1910 feet thick with measured porosities of 19% to 25% and high permeabilities that range from 198 to 2756 millidarcies. An equivalent age sandstone section was drilled at Esso Crayfish A-1 that was in excess of 5257 feet thick. The sand was more fine grained than at Pretty Hill-1, and suffered from clay choking. However, subsequent production tests proved the Crayfish sandstone capable of sustained fluid output. The top of this massive sandstone is an angular unconformity in the Crayfish area, where early Lower Cretaceous sediments were uplifed and truncated.

Similar aged porous and permeable Lower Cretaceous sands were also encountered by Planet Casterton-1, as well as at Interstate Woolsthorpe-1 and Garvoc-1.

Late Lower Cretaceous, Otway Group sediments were deposited unconformably over this older Lower Cretaceous unconformity, or over Jurassic and Paleozoic rocks of various types. The axis of Otway deposition is northwest-southeast, parallel to the present coast of Victoria and South Australia from Gippsland to Cape Jaffa. The section is non-marine greywackes, mudstones and coal that is up to 8976 feet thick in more basinal areas. The clastics were probably derived from uplifted Mesozoic and Paleozoic highlands to the north and south of the depositional trough. While the highland to the north of the Otway trough is easily outlined from geological evidence, the highland to the south is largely conjectural and is not documented in fact. Recent papers (Le Pichon, X., Heirtzler, J.R., 1968, Magnetic anomalies in the Indian Ocean and ocean floor spreading: Jour. Geophys. Res. 73 (6). Isacks B. et al, 1968, Seismology and the new global tectonics, Jour. Geophys. Res. 73 (28). Vine, F.J., 1966, Spreading of the ocean floor; new evidence, Science 1954) on the theory of continental drift suggest that the southern highlandmay have been the present day Antarctic continental landmass.

At the close of Lower Cretaceous (Otway) time, there were areas of uplift, faulting, truncation and erosion. The truncation and faulting is seen by seismic in the Victorian and Tasmanian portions of the Otway Basin.

However, to the west in the area of Esso Crayfish A-1, there is no obvious angular unconformity. In the Gambier Sunklands, deposition may have been continuous between Lower and Upper Cretaceous, with the subtle marine drowning of the Otway non-marine sediments representing the break between the two ages.

Upper Cretaceous sediments generally consist of a basal sandstone unit overlain by a marine shale-mudstone which changes facies vertically into a shallow marine sand-mudstone sequence and culminates at the top of Upper Cretaceous in a non-marine deltaic sand sequence. The axis of deposition roughly coincides with that of Lower Cretaceous. The Upper Cretaceous is more than 8000 feet thick at Shell Voluta 1-A and probably exceeds 10,000 feet in the depositional centres of the basin. Large Upper Cretaceous fault displacements contemporaneous with deposition are documented in the Port Campbell area and are seen by seismic in the general area between West King Island to a hinge line near Geltwood Beach.

During Paleocene through to Upper Eocene time, gentle subsidence took place in the Otway Basin and up to 4000 feet of clastic sediments were deposited in an environment that ranges from paralic to neritic. These clastics were sourced from the north, and they thicken to the centre of the basin then thin southernward in clinoform slopes onto Upper Cretaceous beds. There is seismic evidence of complex Paleocene faulting from south of Warrnambool to the Geltwood Beach Hinge Line, while the eastern half of the basin is undisturbed. Faulting during Eocene time is recognized only in the Gambier Sunklands, and by Oligocene and Lower Miocene time major faulting has stopped.

In Upper Eocene through Lower Pliocene times, marls and limestones were deposited by a transgressive sea. Marine conditions persisted into late Miocene time when transgression reached its fullest extent. During Pliocene time the Otway Basin was subjected to epeirogenic uplift which was probably accompanied by some gentle folding and faulting. Vulcanism was widespread during this time in Tasmania and west-central Victoria. In late Pliocene and Pleistocene time the sea assumed its present position.

D. REGIONAL BASIN CROSS SECTION

Figure 2 is a regional basin cross section between Esso's four offshore tests to demonstrate regional stratigraphy and the concepts of regional geology. Exaggeration of the vertical scale is forty times, and structural detail has been omitted.

E. HISTORY OF EXPLORATION

The search for petroleum has been carried out in the Otway Basin for many years and although no commercial occurrences of hydrocarbons have been found to date, several wells have recorded shows of gas and oil. Frome-Broken Hill Port Campbell No. 1 recorded an initial gas flow of 4.2 MMCF per day with some condensate from the Waarre Formation. Rapidly declining pressure, however, provided the interval to be non-commercial in this well. An offset, Port Campbell No. 4, produced small quantities of oil emulsion with gas cut salt water.

The second stage of exploration in the Otway Basin commenced with a program by Shell Development (Australia) Pty. Ltd. when three offshore wells were drilled during 1967. Their first test, Pecten 1-A, flowed gas at the rate of 145 Mcf per day plus salt water from a 42 foot interval of the Waarre Formation, and the well was subsequently abandoned. The two other Shell tests, Nerita 1-A and Voluta 1-A were abandoned without shows.

Esso's offshore drilling program between September 1967 and June 1968 has resulted in four abandonments, Crayfish A-1, Prawn A-1, Nautilus A-1 and Argonaut A-1. Interstate reactivated interest in onshore exploration late in 1968 with their tests at Woolsthorpe-1, Garvoc-1 and Purumbeete-1. No hydrocarbon shows were encountered, but the distribution of the Lower Cretaceous Pretty Hill sandstone was found to be more widespread than previously forecast.

There has been no drilling activity in the first quarter of 1969.

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F. HYDROCARBON POTENTIAL

To date, all hydrocarbon occurrences in the Otway Basin have been in the Cretaceous. Very little is known about the potential of the Jurassic, and the Paleozoic is considered to be economic basement. The Otway Group appears to have some potential as a source for oil and gas, and the Pretty Hills and Crayfish Sandstones show good reservoir characteristics.

The basal Upper Cretaceous Waarre Formation has a good show record, and, where overlain by Belfast shale, presents a good opportunity for hydrocarbon entrapment. The Upper Cretaceous contains thick shales, such as at Voluta 1-A, that should be good source rocks, and there are abundant reservoirs in the upper sandstone units.

The Tertiary has been extensively fresh water flushed in wells drilled so far. In the seaward direction, interfingering of massive sands with silts and shales will probably inhibit flushing, and reservoir, source and seal rocks may be present.

G. PREVIOUS GEOPHYSICAL SURVEYS

The landward areas adjoining the Esso-Hematite tenements have been explored by reflection seismograph, gravity meter and airborne magnetometer. The results are summarized in various Subsidy Reports made to the Bureau of Mineral Resources. For a comprehensive bibliography, see "A Preliminary Review of the Otway Basin", Record 1966/170 by Bureau of Mineral Resources.

The Esso-Hematite tenements were previously explored by the Flinders Island-Kingston Survey, the Cape Grim to Cape Jaffa Marine Seismic Survey, the Offshore Otway Basin Marine Seismic Survey and the Offshore Otway Basin Marine Seismic and Magnetic Survey, EP-67. In addition, the Bass Strait and Encounter Bay Aeromagnetic Survey obtained reconnaissance information over the Otway Basin. Final subsidy reports of these surveys have been presented to the Bureau of Mineral Resources.

At the commencement of the ER-68 Survey, there were available on the Esso Hematite tenements 1064 miles of single fold data, 1554 miles of three fold CDP data and 3334 miles of six fold CDP data. Modern digital processing techniques have been applied to 218 miles of single fold, 380 miles of three fold and 2188 miles of six fold CDP data under subsidy of the BMR. The remaining data were analog processed.

RESULTS OF CURRENT SURVEY

A. FIELD WORK

1) Seismic Survey

A total of 1110 miles of 12 fold CDP data was recorded digitally in the ER-68 Survey. A 2400 meter neutrally bouyant streamer cable was towed at a depth of 40 feet with an offset distance of 850 feet from the first geophone group to the recording boat. Energy source was Aquapulse, the Esso Production Research Company developed sleeve exploder in which a mixture of propane and oxygen is ignited 25 feet subsea with the combustion products vented through an exhaust line to the atmosphere. Four Aquapulse guns were detonated simultaneously with recordings made from 24 groups of 32 pressure sensitive crystal seismometers per group through an SDS 1010 binary gain amplifier onto an I.B.M. 9 track format digital magnetic tape with a sample period of two milliseconds. Aquapulse detonations were repeated approximately every 25 meters so that four pops (of four guns each) could be summed to emulate a single shot every 100 meters to result in 12 fold multiple coverage.

Survey control was maintained by Shoran radio navigation system.

For a detailed discussion of seismic and surveying field techniques, please refer to Appendix A which is the operations report by the field contractor, Western Geophysical Company.

Results of the ER-68 Aquapulse Survey were in general as good or better than 50 pounds or 100 pounds of dynamite used in the previous EP and EO Surveys. Exceptions to this can be found in the dip lines of central Victoria, ER-37, 39, 41 and 43, where rough seas apparently caused a sufficiently high noise level that the relatively low energy Aquapulse source was inferior to parallel lines of 6 fold dynamite source. On these ER lines, there is some flat lying energy below one second which is thought to be coherent noise caused by cable jerk and wave action from rough seas.

2) Magnetic Survey

The Western digital recording boat was equipped with a Varian direct readout magnetometer and marine towing system. The Varian V-4937 Proton Magnetometer uses phase lock circuitry to multiply the proton precision frequency received from the sensor. Selection of a unique time base to solve the proton constantallows field values to be presented on an analog strip-chart recorder. The system response exceeds by two orders of magnitude the steepest field gradients encountered in marine surveys. The V-4937 is intended for shipboard or station use but it is well suited for all general purpose survey work in which fast, accurate counts must be taken in high noise conditions. This instrument has a senstivity of plus or minus 1 gamma and samples the field every 6 seconds. The orientation free magnetometer consists of a completely encapsuled sensor and 750 feet of tow cable. The tow cable consists of 2 conductors, shielding, and a Type 310 stainless steel strain member with neoprene jacketing. The sensor housing will withstand pressures up to 500 psi.

Of the 1110 miles of ER line coverage, approximately 1010 miles of magnetic coverage was obtained. On line ER-45 the magnetometer was not working at all. The instrument although recording, was malfunctioning on lines ER-37, 41, 43, 46 and 47.

The ER Magnetic Survey results were interpreted in conjunction with the EP Survey on which a V-4937 proton magnetometer was also used. Of the 970 miles of EP line coverage, approximately 780 miles of magnetic data were recorded of which 74 miles are unreliable due to recording unit malfunction. The results of the EP and ER Surveys are presented as a map of Total Magnetic Intensity on plates 10(a, b) with a contour interval of 20 gammas.

B. DIGITAL PROCESSING

1) ER-68 Survey

All digital processing was done by G.S.I. on TIAC computers at St. Leonards N.S.W. under the supervision of Esso geophysicists. Translation was made from IBM format of the field tapes to TIAC format. Four Aquapulse pops were summed into one simulated shot. Then the digital processes of True Amplitude Recovery, Normal Moveout Correction, 12 fold stack, Time Variant Deconvolution, Time Variant Filter, and Digital A.G.C. were applied. Digital processing was done at a four millisecond sample rate and display was onto variable density film negatives from which photographic prints were made for interpretation.

Velocity control was maintained for normal moveout correction by T-delta T analysis of single fold sections and from Automated Velocity Scans taken approximately every ten line miles. The Automated Velocity Scan is a G.S.I. developed technique whereby initially 24 traces of differing spread distances but from two adjacent reflection depth points are gathered. Normal moveout corrections are applied to the gather in twelve millisecond steps from 0 to 1140 milliseconds (at the distant trace) and the 24 traces stacked into one for each moveout change. The stacked

5 cm

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REFLECTION TIME CORRECTIONS IN FEET

0 ·100 ·200 ·300 ·400 ·500 ·600 ·700 ·800 ·900 1·000 1·100

WATER DEPTH IN FEET

1000
2000
3000
4000
5000
6000
7000

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

SOUTH AUSTRALIA — VICTORIA

WATER DEPTH CORRECTIONS

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MAY 1968

FIGURE 3

DWG. 1122/G/3

traces are displayed as a function of moveout applied to the end trace. Maximum stack amplitudes are output from the computer as a print out of average velocity versus 2 way reflection time. The locations of Automated Velocity Scans are shown on Plates 11 (a, b) and the scans plus the computer print outs are submitted with this report.

2. Previous Surveys

425 miles of the EO-67 Survey that was shot by G.S.I and digitally recorded were processed digitally for the first time under BMR subsidy. Plate 1 shows the program. Digital processes of True Amplitude Recovery, Normal Moveout Correction, 6 fold stack, Time Variant Deconvolution, Time Variant Filter and Digital A.G.C. were applied. Velocity control was maintained from T delta T analysis of single fold records, and Automated Velocity Scans were not run.

Results were very good, and a large improvement over previous analog processing.

C. INTERPRETATION METHODS AND PARAMETERS

Seven offshore wells were used to identify reflecting horizons. These include the Esso wells, Crayfish A-1, Argonaut A-1, Nautilus A-1, Prawn A-1 and the Shell wells Voluta 1-A, Pecten 1-A and Nerita 1-A. The following horizons were identified and mapped.

1. Economic Basement (plates 2(a,b,c,d,e,f)) is not tied to any well, but is tied by projection from King Island and from refraction identification of shallow Basement in Encounter Bay.

2. Top Crayfish Sand (plates 3(a,b,c)) has been tied to Esso Crayfish A-1. The reflection was identified as the "Pretty Hills Unconformity" in the EP-67 Subsidy report.

3. Top Otway (plates 4 (a,b,c)) has been tied to Shell Pecten 1-A and Esso Prawn A-1.

4. Senonian Marker (plates 5(a,b,c)) does not tie to any geologically identifiable marker bed. However, it is tied at two wells, Argonaut A-1 and Voluta 1-A, to approximately the Base of the Paaratte.

5. Base of Tertiary (plates 6 (a,b,c,d,e,f,g,h,i)) has been tied to all the offshore wells in the basin. Within the Gambier Sunklands, the Base of Tertiary is an excellent reflection. In the Victorian area of Prawn-Pecten-Nautilus, the Base of Tertiary is at the base of south clinoforming Tertiary units. Within the Anglesea Sub-basin, the Base of Tertiary has been tied to the bottom of the Eastern View Coal Measures at Nerita 1-A, and therefore the mapped seismic marker may be partly within the Upper Cretaceous. At the basin margins, the mapped horizon no longer is Top of Upper Cretaceous, but becomes Top Otway and the Economic Basement.

6. Top Eocene Sandstone (plates 7 (a, b, c)) has been tied to all offshore wells except Crayfish A-1. It is a good reflecting horizon that marks the top of Tertiary coarse clastics. The reflection may be partly lower Oligocene, since the Mepunga, Nelson and Kingston Green Sand Formations fall below the mapped horizon, and are thought to be Lower Oligocene. In the Anglesea Sub-basin, the reflection is tied to the top of the Demon's Bluff Formation at Nerita 1-A.

7. Lower Miocene Marker (plates 8 (a, b)) has been tied to Nautilus A-1, Prawn A-1 and by projection to Pecten 1-A. It is a reflecting horizon within the Gellibrand Marl of Lower Miocene age, probably a time-rock unit.

The identified reflections were mapped in two way reflection time at the scale and contour interval necessary to illustrate anomalous conditions. A suite of time-depth curves (figure 4) is submitted to assist the reader in converting from time to depth maps.

An innovation on normal interpretation methods was used in Encounter Bay to map Economic Basement (plates 2(a,b,c)). The reflecting horizon was too shallow to be mapped reliably on reflection VDF sections. Therefore VDF refraction displays were taken approximately every fifty shot points to identify the Basement refractor. The location of the refraction displays is shown on plate 11a, and the displays are included with this report. The following interpretive procedure was used:

First arrivals at successive geophones on the uncorrected VDF displays, in the case of true refractions are colinear. This alignment of first arrivals was projected to the edges of the display, and to a point vertically below the shot point, 850 feet from the first geophone.

The velocity of the refractor was calculated according to the formula

$$V_2 = \frac{L}{\Delta t}$$

where V_2 = velocity of refractor
L = cable length
Δt = difference in time of first arrival at first and last groups of geophones

The refractor is related to events on the seismic section by the formulas

$$h = \frac{t_0 V_1}{2 \cos \theta} \qquad \theta = \sin^{-1} \frac{V_1}{V_2}$$

where h = depth to reflector
t_o = intercept time projected to zero spread
θ = critical angle
V_1 = velocity of overburden (estimated at 6,000 ft./sec)
V_2 = velocity of reflector (as calculated above)

The average velocity of the reflector is 17,300 ft/sec, with values ranging from 14,740 ft/sec to 19,460 ft/sec, the variation being generally related to down-dip or up-dip shooting. Some anomalous values were disregarded.

D. REPRESENTATIVE BASIN CROSS SECTIONS

Six VDF sections that demonstrate the Otway Basin regional geology with seismic correlations are shown in figures 5 (a to f). The location of the sections is on all maps.

1) Section A-A' Figure 5 (a)

This section runs from Encounter Bay parallel to the coastline to near the South Australia-Victoria border. Seismic markers shown are Economic Basement, Top Crayfish Sand, Senonian Marker, Base Tertiary and Top Eocene Sandstone. From west to east, the features of interest are:

a) The Cape Jaffa Hinge line (about shot point 3200) on Economic Basement with Crayfish Sand pinching out against rising Basement.

b) The Crayfish Platform (between SP 3200 and 1355) where the Top Crayfish Sand is a gently dipping plane.

c) The Geltwood Beach Hinge Line (around S.P. 1355) which marks the western edge of thick Upper Cretaceous sedimentation.

d) The general area east of SP 1355 which shows densely faulted Upper Cretaceous and Lower Tertiary rocks, with the Esso Argonaut A-1 location testing the upthrown side of a large fault block. This faulted area falls in the area known as the Gambier Sunklands.

2) Section B-B' Figure 5 (b)

The section is a dip line through the Gambier Sunklands to illustrate the densely faulted nature of Upper Cretaceous and Lower Tertiary rocks. Also of note is the south dipping clinoforming attitude of reflectors between Top Eocene Sandstone and Base Tertiary markers, and the gross clinoform on the Top Eocene Sandstone at the south end of the line.

079015

ONE WAY TIME BELOW SEA LEVEL (STATIC CORRECTED FOR TRAVEL TIME IN WATER)

0·1 0·2 0·3 0·4 0·5 0·6 0·7 0·8 0·9 1·0 1·1 1·2 1·3 1·4 1·5 1·6 1·7 1·8 1·9

TWO WAY TIME BELOW SEA LEVEL (STATIC CORRECTED FOR TRAVEL TIME IN WATER)

0·2 0·4 0·6 0·8 1·0 1·2 1·4 1·6 1·8 2·0 2·2 2·4 2·6 2·8 3·0 3·2 3·4 3·6 3·8

DEPTH IN FEET BELOW SEA LEVEL

1000 2000 3000 4000 5000 6000 7000 8000 9000 10,000 11,000

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

TIME DEPTH CURVES

5 cm

DATUM: SEA LEVEL.

AUTHOR: D. McEVOY

TO ACCOMPANY: FINAL SUBSIDY REPORT, OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY. MARCH, 1969

LEGEND

	Water Depth	Static Correction
Nautilus	327'	0·033 Secs.
Prawn	354'	0·035 Secs.
Crayfish	169'	0·017 Secs.
Argonaut	253'	0·025 Secs.

FIG. 4

Dwg 1122/G/4

079616

5 KM
SEISMIC INTERPRETATION AND PRODUCTION POTENTIAL MAP
FIGURE 19
SHELL PETROLEUM COMPANY
SHELL DEVELOPMENT CO.
SHELL OIL COMPANY
SHELL OIL COMPANY
SHELL OIL COMPANY

079017

FIGURE 5b

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

Dwg.1122 G 6

NEG

GSI DIGITAL PROCESSING CENTRE
SYDNEY, N.S.W., AUSTRALIA
1. SAMPLE PERIOD 4 ms. 2. TAR: B= -10 db, α= 2·5 db/sec
Gates 0 to 4000 ms
3. NMO Equalization gate 2000 to 3000 ms
4. DECON: 64 pts 4 ms dec., Design gate 200 to 4000 ms,
No. of gates/trace 2, Gate shift ms, trace from tr
5. DIGITAL FILTER: 35 pts 4 ms dec., hz
6. DPS ■, OWBS □, TVD ■, DGN □, ARD □, AR2 □, DGF □, TVF ■, M-4 □
7. TIAC Reg 2695 8. Field Tape 1910 9. P/R Gain 8 db
GSI Input Crew 851 Date NOV'68

SYDNEY, N.S.W., AUSTRALIA
AREA OTWAY LINE ER-13
RECORDING PARAMETERS 8 Pops/S.P. S.P. offGp.24
Source AQUAPULSE, Charge Size lbs
Rec. Filter Time 1·5 sec., Dry 50 lbs., Prop 20 lbs
Cable Length 7590 ft., Group Interval 330 ft
S.P. Interval 660 ft
Pops/Vertical Sum 4:1 Processed 12 Fold
Recording Filters 100 - 5 hz
WGC Field Crew 64 Date OCT'68

MAGNETOMETER PLOT

60800 gammas — 60900 gammas — 61000 gammas — 61100 gammas — 61200 gammas — 61300 gammas — 61400 gammas — 61500 gammas — 61600 gammas

5 cm

FAST DIGITAL AGC LINE ER 13
Scale Ratio = 3 Dist. 1 sec.

B' — SA-9 — 1515 — 1520 — 1530 — 1540 — ER-36 — 1550 — 1560 — VG — 1570 — 1580 — ER-314 55-31 — 1590 — 1600 — 1610 — 1620 — LINE ER 13 — 1630 — ER-32 — 1640 — 1650 — 1660 — VG — 1670 — 1680 — B — SA-14 ER-30 — NNE

12 FOLD STACK
TVP 20-60=500ms
35-55 = 600"
40-50 = 700"
10-40 = 1000"
10-30 = 1400"
10-25 = 2000"

EOCENE SANDSTONE
BASE OF TERTIARY
SENONIAN MARKER

079018

5 cm

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

FIGURE 5c

Dwg 1122 G 7

NEG.

DIGITAL BAND PASS FILTERING

GSI DIGITAL PROCESSING CENTRE
SYDNEY, N.S.W., AUSTRALIA

SYDNEY, N.S.W., AUSTRALIA
AREA OTWAY LINE ER-29
AQUAPULSE
WGC

MAGNETOMETER PLOT

FAST DIGITAL AGC

LINE ER 29

NE

12 FOLD STACK TVF

VELFCT E0158-1

VEL FCT ER29A

VEL FCT E0238C

VEL FCT E0244A

SEDIMENTARY MARGIN

BASE OF TERTIARY

SOLENT SANDSTONE

ER-29

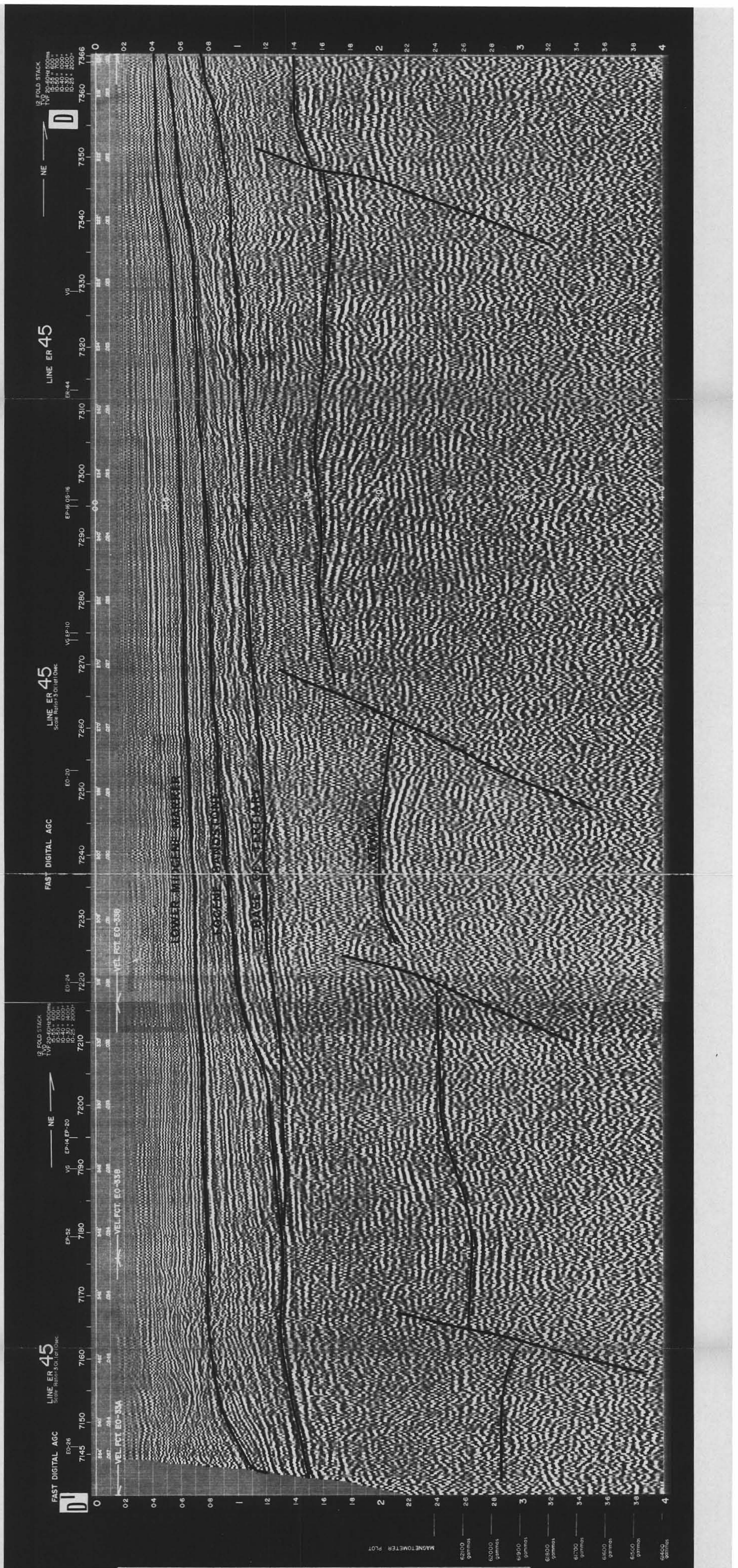


FIGURE 5d

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

Dwg.1122 G 8

079019

079020

5 cm

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

FIGURE 5e

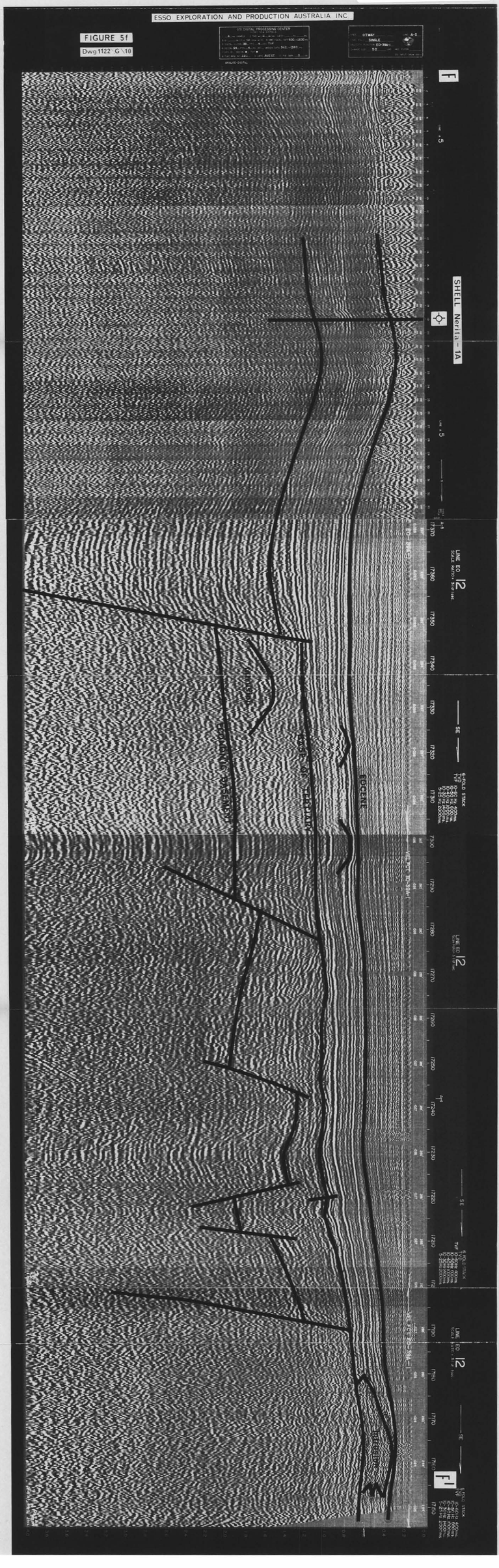
Dwg. 1122 G 9

GSI DIGITAL PROCESSING CENTRE
SYDNEY, N.S.W., AUSTRALIA

1. SAMPLE PERIOD 4 ms. 2. TAR: B= -19 db., α= 4 db./sec.
Gate= 0 to 4000 ms.
3. NMO Equalization gate 1200 to 2500 ms.
4. DECON 64 pts. 4 ms. dec., Design gate 200 to 4000 ms.,
No. of gates/trace 2, Gate shift ____ ms./trace from tr. ____.
5. DIGITAL FILTER 35 pts. 4 ms. dec., ____ - ____ Hz.
6. DPS ■, OWBS □, TVD ■, DCN □, ARD □, AR2 □, DGF □, TVF ■, M-4 □
7. TIAC Req. 2025 8. Hold Tape 631 9. P/B Gain 10 db.
GSI Input Crew 851 Date SEPT '68

SYDNEY, N.S.W., AUSTRALIA
AREA OTWAY LINE EO-51
RECORDING PARAMETERS: ____ Pops/S.P. S.P off op 18-5
Source POWDER, Charge Size 100 lbs.
Fill Time ____ sec., Oxy. ____ lbs., Prop. ____ lbs.
Cable Length 7544 ft., Group Interval 328 ft.
S.P. Interval 656 ft.
Pops / Vertical Sum ____ Processed 6 Fold.
Recording Filters 75 - 8 Hz.
GSI Field Crew 921 Date '66-'67

079021


5 cm
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.
FIGURE 5f
Dwg 1122 G \10
SHELL Nerita-1A
LINE EO 12
SE
F
F'

3) Section C-C' Figure 5 (c)

The section is a dip line from west central Victoria to show a potentially prospective high in Upper Cretaceous and Paleocene rocks. The Eocene and Paleocene interval is anomalously thick at the north end of the line and this thick trend is probably part of a regional Lower Tertiary subsidence. Also of note is the regional downdip wedgeout of Eocene and Paleocene at the south end of the section.

4) Section D-D' Figure 5 (d)

The section is a dip line across central Victoria to demonstrate the faulted nature of the Top Otway seismic marker. Also shown on this section is the regional downdip wedgeout of the Eocene and Paleocene clastics.

5) Section E-E' Figure 5 (e)

The section is a dip line from the West King Island area to demonstrate the gross relief of Economic Basement anomalies in that area. The Pre-Tertiary section is probably largely Lower Cretaceous. Also shown on this line is a typical igneous intrusion.

6) Section F-F' Figure 5 (f)

The section crosses the Anglesea Sub-basin from Shell Nerita 1-A to the Mornington-King Island high that separates the Otway Basin from the Bass Basin. The Cretaceous section is heavily faulted. Shown are four igneous intrusions, which, since they do not pierce the underlying reflectors, must rise through very narrow chimneys. This section is representative of structural patterns seen in the Anglesea Sub-basin.

E. MAPPED HORIZONS

Structure contour maps of seismic markers are presented at the scale of 1/100,000 and 1/250,000 on plates 2 through 8. In addition a water depth map at 1/500,000 is shown on plates 9 (a, b). A discussion of the significant map features of plates 2 to 8 follows:-

1) Economic Basement: (plates 2 (a,b,c,d,e,f))

The reflection is mappable only at the basin margins. In the western margin (plates 2(a,b,c) and figure 5 (a)), the significant features are:

(a) The Cape Jaffa Hinge line the top edge of which is roughly defined by the .900 second contour (plates 2(a,c)) which essentially defines the western limit of the Otway Basin. To the north and west, the Encounter Bay area is underlain by shallow basement.

(b) The faulted tilt block, down to the north that trends from the south side of Cape Jaffa Hinge Line to the general high area marked by a fault at shot point 1750 on EP-40 (figure 5 (a)). This sets up a regionally thick area of Crayfish Sand which has been drilled at Esso Crayfish A-1.

(c) The west plunging anticlinal nose that trends from the north end of EP-3 to S.P. 1940 of line EO-7. This is probably the southern extension of the Beachport High, that has been reported by Leslie (Petroleum Exploration in the Otway Basin, Commonwealth Mining and Mettalurgical Congress 1965 Paper 34/109) and which appears to be a strongly expressed Basement positive.

In the eastern margin of the basin (plates 2 (d,e,f)) the significant features on Economic Basement are:

a) The West King Island fault (plates 2 (d,e) and figure 5(e)), which defines the edge of the basin and separates the King Island Basement positive from the Otway Basin.

b) Four well defined Basement structural closures (plate 2 (e)) the best defined of which crosses EO-51 (figure 5 (e)) at shot point 12535.

c) Within the Anglesea Sub-basin (plate 2 (b)), the basin margin faults that define the sub basin, one of which is shown on figure 5 (b) at shot point 17190.

2) Top Crayfish Sand (plates 3 (a, b, c))

The significant features on the top Crayfish Sand are:

a) The regional pinch out of the Crayfish Sand against Economic Basement along the Cape Jaffa hinge line, an updip closure against which is defined by the .850 contour (plate 3(b)) which is shown on figure 5 (a) at shot point 3215.

b) A series of complex faulted deep closures associated with the Geltwood Beach Hinge Line at the southern edge of the mapped reflector (plate 3 (b)). The biggest of these anomalies is centered at shot point 2590 of ER-26.

c) A high area, open to the north (plate 5(b)) at the north end of EP-3. This may be the southern expression of the Beachport High.

d) The southern edge of the mapped reflector, which approximately defines the Upper Cretaceous Geltwood Beach Hinge Line.

3. Top Otway (plates 4(a,b,c))

The Top Otway unconformity is mappable only in the Victorian and northwest Tasmanian portions of the basin. The outstanding feature of the maps is the amount of faulting. The Top Otway is often a poor reflector, and therefore it is emphasized that possible errors may exist within detail of plates 4(a,b and c). Significant features on the Top Otway are as follows:

a) Esso Prawn A-1 (plate 4(c)) is drilled on the immediate downside of a 3500 foot normal fault.

b) There is a major fault that runs northwest from the south end of line EO-37 (plate 4(b)) to the north end of ER-39 (plate 4(a))

c) Numerous structural closures usually against small faults, are found on the tilt block north of the just described major fault.

3. Senonian Marker (plates 5(a,b,c))

The reflection is mappable only in the Gambier Sunklands of eastern South Australia and western Victoria. The reflecting horizon is heavily faulted, producing throughout the mapped area numerous fault closures.

4. Base of Tertiary (plates 6(a,b,c,d,e,f,g,h,i))

The reflection is mappable regionally and defines the gross Paleocene movements of the Otway Basin. These are as follows:

1) The Geltwood Beach Hinge Line, a zone of increased rate of dip (plates 6 (c,d))

2) The heavily faulted sub province through the Gambier Sunklands that dies out in west central Victoria (plates 6 (d,e,f))

3) A regional low at the north end of ER-29 that may trend southwest from as far north as the onshore well Heywood 10 (plates 6 (e,f)).

4) A generally undisturbed surface (plates 6(f,gh)) from the regional low to the West King fault that is intruded by volcanics close to the King Island area.

5) The outline of the Anglesea Sub-basin (plate 6(e)).

Individual closures are numerous within the faulted Gambier Sunklands; Argonaut A-1 tested a well defined fault closure without any shows of hydrocarbons.

5. Top Eocene Sandstone (plates 7(a,b,c))

The outstanding feature of the map is the southern zero line of the lower Tertiary clastics which marks the clinoformal edge of Tertiary sand deposition. The Paleocene faulting shown on Base Tertiary maps in the Gambier Sunklands area is largely absent at the Top Eocene Sandstone; an exception to this is apparently post Eocene fault rejuvenation in the Argonaut area (plates 7(a)).

There are no structural closures on the Top Eocene Sandstone considered to be worthy hydrocarbon prospects.

6. Lower Miocene Marker (plates 8(a,b,))

The outstanding feature of these maps are four major deep erosional channels that cut the Lower Miocene Marker in the centre of the basin in the Nautilus area. These are filled with Mid-Miocene and younger rocks, and apparently the channels were caused by submarine erosion or slumping close to the edge of the then existent Lower Miocene continental shelf.

There are no structures prospective for hydrocarbons at the level of the Lower Miocene Marker.

F. Magnetic Survey Interpretation

Plates 10 (a,b) are total magnetic intensity contoured at an interval of 20 gammas from the EP-67 and ER-68 shipboard magnetometer readings. No correction was made for the regional geomagnetic gradient, in this area of the order of 8 gammas per mile. The datum is arbitrary and the diurnal variation (of the order of 10 gammas) has been adjusted by forcing intersecting magnetic profiles to tie and distributing mistie readings over the profile.

The maps have been subdivided into subsheets to conform with the previous aeromagnetic survey of the area, The Bass Strait to Encounter Bay Aeromagnetic Survey by Hematite Exploration Pty. Ltd. Depth estimates are based upon the Peters (1949) half-slope method, the model results of Vacquier et al (1951) and, since there are surveys at two elevations (aeromagnetics and shipboard magnetics) depths to a theoretical point pole source. Discussion of individual sheets follows.

Sheet 5

Only two lines were surveyed in this area and a single circular anomaly (5.1) of 380 gammas occurs at their intersection. A similar anomaly of 250 gammas occurs on the aeromagnetic map at the same location. The anomaly recorded by the marine survey is slightly smaller in area and indicates a source (magnetic basement) at a depth of less than 4000 feet versus about 3000 feet from the aeromagnetic survey.

A number of intense narrow anomalies were recorded on line ER-2, indicating that the depth to magnetic basement decreases to the southeast.

Sheets 7 and 8

The depth to basement probably increases again to the southeast in the northeastern corner of sheet 7.

Although masked by a north-south regional, two magnetic highs, anomalies 8.1 and 8.3 separated by a large weak low, anomaly 8.2, occur at the top of Sheet 8. Anomaly 8.1 has the form of a long narrow east-northeast trending high of about 80 gammas.

Anomaly 8.3 is not fully defined, but has a magnitude of at least 100 gammas. Anomaly 8.1 indicates a magnetic basement depth of the order of 3000 feet. The depth of basement increases to the south.

Anomaly 8.1 is not reflected in the aeromagnetic map and may correspond to a number of small separate magnetic highs in the northeastern corner of this sheet. Anomaly 8.2 is reflected by a broad magnetic low.

Anomalies 8.3, 8.4 and 8.5 can be correlated more or less with the anomalies of the same number on the aeromagnetic map. Since none of these anomalies is completely defined by the present survey, it is not possible to compare them with those recorded by the aeromagnetic survey.

Sheet 9

Only the extreme southwestern corner of this sheet is covered by the present survey. A single broad low occurs as on the aeromagnetic map. No accurate depth to basement determination is possible, but this depth is at least 10,000 feet.

Sheets 11 and 12

The surveyed portions of these sheets consist of a featureless north-south regional gradient of approximately 8 gammas/mile, increasing southward. Only on line ER-25 is there an increase in magnetic intensity approaching the coast where basalts are recorded on the aeromagnetic map.

Sheet 13

The strike of the regional gradient changes at the western edge of this sheet from east-west to roughly northwest-southeast. This possibly corresponds to a lateral east-west change in the nature of the basement rock.

A number of intense narrow anomalies were recorded on line ER-37. A similar area of intense magnetic disturbance was recorded by the aeromagnetic survey at latitude 38°28' longitude 149° and both are probably due to basalts at a very shallow depth, possibly on the sea floor. The extent of these basalts appears fairly limited.

Anomaly 13.2 may well correspond to the aeromagnetic anomaly of the same number. The source of this anomaly (a magnetic low) probably lies within the sedimentary sequence at a depth of 1000 to 1500 feet. The small magnetic high at S.P. 6420 on line ER-44 to the east is probably also due to an intrusive high in the sedimentary sequence.

Sheet 20W (West of sheet 20)

Only the exteme northeastern corner of this sheet was surveyed. A single broad low of about 20 gammas (anomaly 20W.1) was recorded. No reliable depth estimate can be made, but it is probably of the order of 10,000 feet. There is no aeromagnetic coverage.

Sheet 14

In the surveyed area the outstanding feature is the abrupt change from areas that are undistrubed to areas that are magnetically highly disturbed.

This highly disturbed area is probably due to near surface basalts. Since this disturbance was recorded on three lines on this sheet as well as on shore, it appears that, unlike further west in sheet 13, these basalts are almost continuous across the southwestern quarter of sheet 14.

Sheet 20

To judge from the limited coverage available, the northwestern quarter of this sheet is magnetically undistrubed apart from a northwest striking regional of about 8 gammas/mile. No depth estimate can be made, but by comparison with the results obtained elsewhere in the Otway Basin, basement is probably fairly deep; certainly greater than 5000 feet.

Towards the south the basin appears to shallow. The source of anomaly 20.4 is at a depth of the order of 3000 feet (?). The sources of anomalies 20.1, 20.2 and 20.5 are much shallower. This, when considered with the marked swing in the strike of the magnetic anomaly contours between lines ER-52 and EP-35 indicates a possible west side down north-south striking fault between these two lines.

Sheet 15 The Anglesea Sub-basin

Within the very small area surveyed a number of anomalies occur. Anomaly 26.1 is almost certainly produced by a near surface source, but in no case is any great depth to basement indicated.

Sheet 26 The South King Island Sub-basin.

Anomaly 26.1 has a source at a depth of about 3000 feet which appears to be the deepest basement in this area. Anomalies 26.2, 26.3, 26.4 and 26.5 are not fully delineated, but would appear to be due to sources at much shallower depths, probably intrusives within the sedimentary sequence.

References Listed

Peters, L.J. (1949) "The Direct Approach to Magnetic Interpretation and its Applications". Geophysics Vo.. 14 pp 290-320.

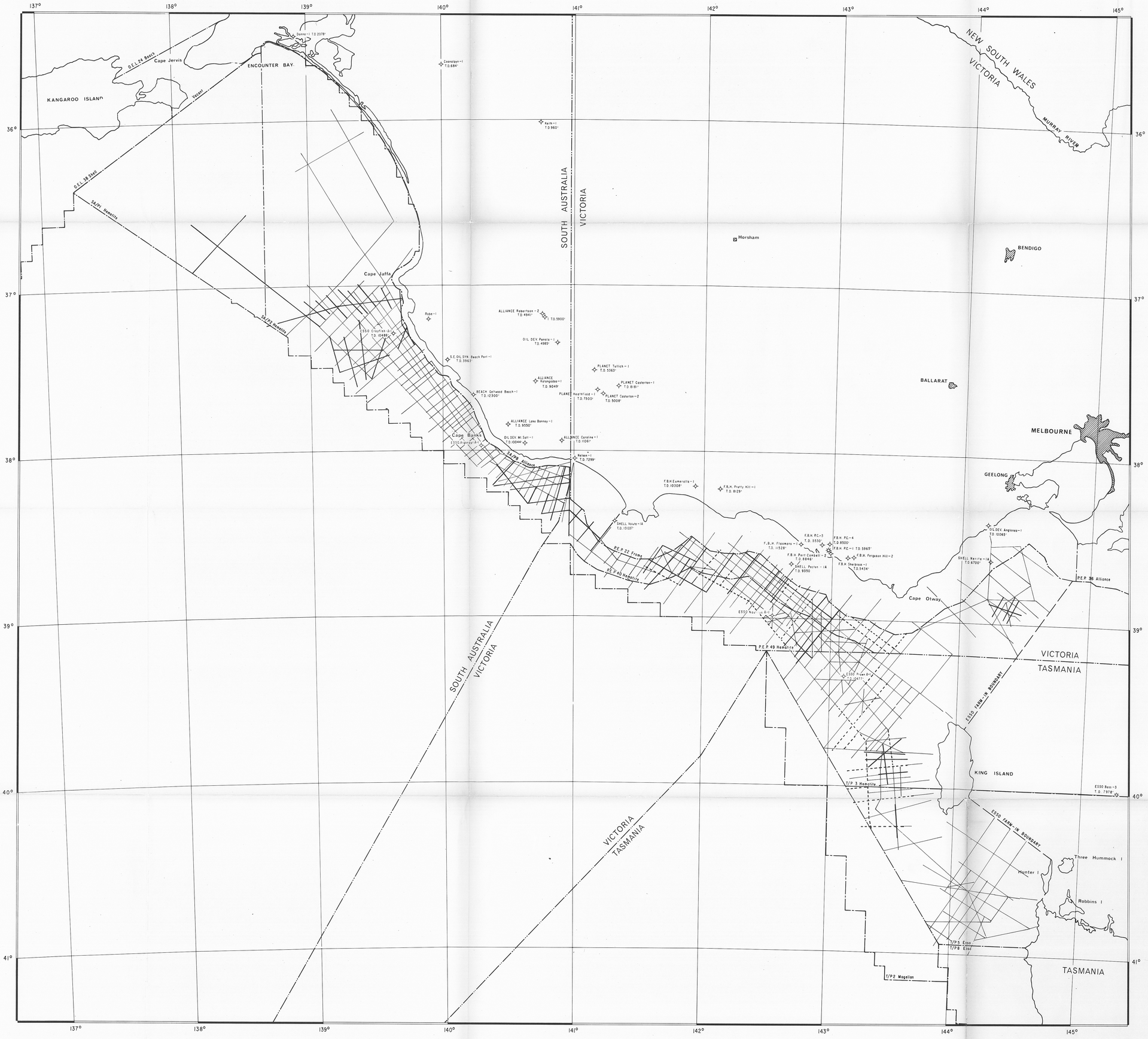
Vacquier, V. et al (1951) "The Interpretation of Aeromagnetic Maps. Geol. Soc. Am Mem. No. 47

CONCLUSIONS AND RECOMMENDATIONS

The Offshore Otway ER-68 Seismic and Magnetic Survey fulfilled its purpose in detailing specific structual anomalies, and in providing structural leads in areas of reconnaissance shooting. The Encounter Bay area was proven to be underlain by shallow basement and devoid of hydrocarbon prospects. Digital reprocessing in association with the ER-68 Survey in Victoria and Tasmania, plus stratigraphic information gained from the Esso Prawn A-1 and Nautilus A-1 wells, made possible for the first time the construction of seismic structure maps on Pre Tertiary markers in Victoria and Tasmania. The shipborne ER-68 Magnetometer Survey, when used with the EP-67 magnetometer results provided a loose grid to help define gross basin structure, and to help pinpoint shallow igneous activity.

Interpretation of the ER-68 Survey with old data has provided a substantial prospect inventory and some new geological thoughts concerning the architecture of the Otway Basin. The validity of the concepts expressed in this report will be best tested by further exploratory drilling.

M.G. Parsons



INDEX MAP



LEGEND

- Seismic Line
- ER 68 Survey — 1110 miles
- Reprocessed — 425 miles
- Dry and Abandoned Well
- Abandoned Well — Gas Show
- Gas Well — Shut In
- Currently Drilling Well

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

OTWAY BASIN

SOUTH AUSTRALIA — VICTORIA

SEISMIC COVERAGE MAP

5 cm

079027

Scale 1:1,000,000

20 10 0 20 40

MILES

AUTHOR : A.D. POOLE

DRAFTED BY : S.B. WILMSHURST

TO ACCOMPANY : FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

DATE : MARCH 1969

PLATE I

OR-064

Dwg. 1122/6/11

OTWAY/LING PART-M*

138°00' 15' 30' 45' 139°00'

36°30'

45'

460,000

440,000

37°00'

420,000

400,000

380,000

37°30'

600,000 620,000 640,000 660,000 180,000 200,000

0.200 0.300 0.400 0.500 0.600 0.700 0.800 0.900 1.000 1.100 1.200 1.300 1.400 1.500 1.600 1.700 1.800

ER-1 ER-2 ER-3 ER-4

SA-10

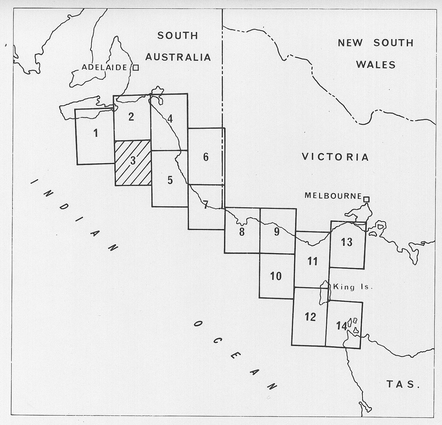
SS-28 SS-2

2280 Kissing

Hematite SA/P3

Hematite SA/P2

MAP INDEX



LEGEND

- Dry and abandoned well with show of gas
- Dry and abandoned well
- o230 — Seismic shot point
- U / D — Fault, "D" downthrown side
- —0.400— Structure contour in seconds
- A — A' Line of seismic cross-section
- Petroleum Tenement Boundary
- Igneous intrusion, reflector pierced
- Igneous intrusion, reflector not pierced

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

SOUTH AUSTRALIA

STRUCTURE MAP ON TOP OF ECONOMIC BASEMENT

5 cm

079028

CONTOUR INTERVAL: 0.050 SECONDS DATUM: SEA LEVEL

Scale 1:100,000

2 1 0 2 4

MILES

AUTHOR: J BEIN and D. I. McEVOY DRAFTED BY: P.L. SPINNER

TO ACCOMPANY FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

DATE: MARCH 1969

SHEET 3 PLATE II a

OR-064 Dwg: 1122/6/12

OTWAY/KING PART-V*

LAKE ALEXANDRIA

LAKE ALBERT

THE COORONG

S O U T H A U S T R A L I A

SA/P2 Hematite

SA-1 SA-2 SA-10 SA-11

DU

0.200 0.250 0.300 0.350 0.400 0.450 0.500 0.550 0.600 0.650 0.700

39°00' 15' 30' 45' 140°00'

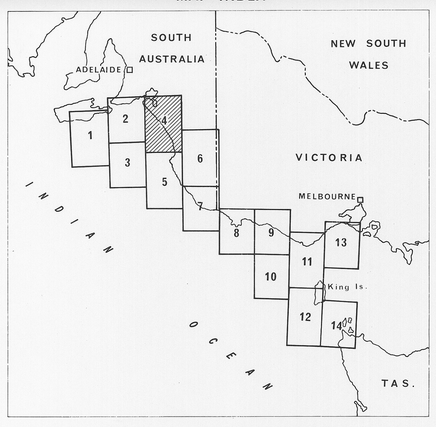
35°30' 45' 36°00' 15' 36°45'

139°00'

210,000y 240,000y 260,000y 280,000y 300,000x

600,000y 580,000y 560,000y 540,000y 520,000y 500,000y 480,000y

MAP INDEX



LEGEND

- Dry and abandoned well with show of gas
- Dry and abandoned well
- o230 Seismic shot point
- U / D Fault, "D" downthrown side
- — 0.350 — Structure contour in seconds
- A — A' Line of seismic cross-section
- Petroleum Tenement Boundary
- Igneous intrusion, reflector pierced
- Igneous intrusion, reflector not pierced

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

VICTORIA

STRUCTURE MAP ON TOP OF ECONOMIC BASEMENT

5 cm

079029

CONTOUR INTERVAL : 0.050 SECONDS

DATUM: SEA LEVEL

Scale 1:100,000

2 1 0 2 4

MILES

AUTHOR: R.W.WIGGIN

DRAFTED BY: M.F.WEETMAN

TO ACCOMPANY: FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

DATE: MARCH 1969

SHEET 4

PLATE II b

Dwg: 1122/G/13

OTWAY/IND PART-V*

139°00' 15' 30' 45' 140°00'

36°45'

37°00'

15'

30' SA/P2 Hematite

45'

38°00'

460,000 440,000 420,000 400,000 380,000 360,000 340,000 320,000

220,000 240,000 260,000 280,000 300,000

SOUTH AUSTRALIA

Robe - 1

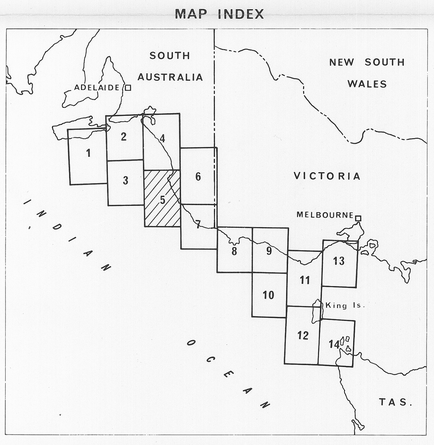
King Is.

Otway 95

Croyfish A-1 619175
T.D. 10,497

SA/P8 Allocated

MAP INDEX



LEGEND

- Dry and abandoned well with show of gas
- Dry and abandoned well
- Seismic shot point
- Fault, "D" downthrown side
- Structure contour in seconds
- Line of seismic cross-section
- Petroleum Tenement Boundary
- Igneous intrusion, reflector pierced
- Igneous intrusion, reflector not pierced

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

SOUTH AUSTRALIA

STRUCTURE MAP ON TOP OF ECONOMIC BASEMENT

5 cm

079030

CONTOUR INTERVAL: 0.050 and 0.100 SECONDS. DATUM: SEA LEVEL

Scale 1:100,000

2 1 0 2 4

MILES

AUTHOR: R.W. WIGGIN DRAFTED BY: M.Y. ELENIUS

TO ACCOMPANY FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

DATE: MARCH 1969

SHEET 5 PLATE II c

Dwg: 1122/6/14

OR-064

OTWAY/KING PART-M*

143°00' 15' 30' 45' 144°00'

38°30'

V I C T O R I A

Yougher – 1
Yougher – 3
F.B.H. Sherbrook – 1 T.D. 5434'
F.B.H. Fergusons Hill – 1 T.D. 11,633'
Latrobe – 1 T.D. 2034'
Krambruk – 3
Krambruk – 1

39°00'

PEP 22 FBH

PEP 40 Hematite

PEP 49 Hematite

T/P 5 Hematite

ESSO Prown A-1 T.D. 10,477'

BASEMENT DEEPER THAN 4,000 SECONDS

EDGE OF CRETACEOUS

VICTORIA
TASMANIA

KING ISLAND

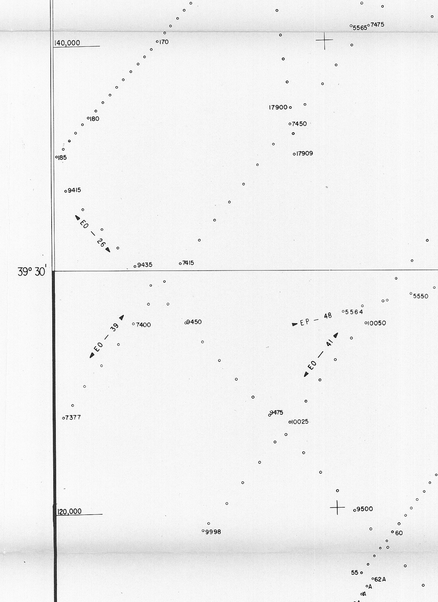
45'

39°30'

15'

240,000 220,000 200,000 180,000 160,000 140,000 120,000 100,000 80,000 60,000

MAP INDEX



LEGEND

- Dry and abandoned well with show of gas
- Dry and abandoned well
- Seismic shot point
- Fault, "D" downthrown side
- Structure contour in seconds
- Line of seismic cross-section
- Petroleum Tenement Boundary
- Igneous intrusion, reflector pierced
- Igneous intrusion, reflector not pierced

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

VICTORIA – TASMANIA

STRUCTURE MAP ON TOP OF ECONOMIC BASEMENT

5 cm

079031

CONTOUR INTERVAL : 0.050 and 0.100 SECONDS

DATUM: SEA LEVEL

Scale 1:100,000

2 1 0 2 4

MILES

AUTHOR: C.C. HORGAN

DRAFTED BY: M.R. CHÂTENAY

TO ACCOMPANY: FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

DATE: MARCH 1969

SHEET 11

PLATE II d

Dwg: 1122/G/15

OTWAY/KIND PART-W*

143°00' 15' 30' 45' 144°00'

39°45'

40°00'

15'

30'

41°00'

BASEMENT DEEPER THAN 4000 SECONDS

EDGE OF CRETACEOUS

KING ISLAND

E E'

T/P 2 Magellan

T/P 5 Hematite

T/P 8 Esso

EP — 61

EP — 43

EP — 65

EP — 38

EP — 59

EP — 36

EP — 26

EP — 63

EP — 34

EP — 30

EP — 2

EP — 6

EP — 4

EP — 8

EP — 24

EP — 37

EP — 03

EP — 57

EP — 55

EP — 33

EP — 61

EP — 45

EP — 44

EP — 03

EP — 03

EP — 03

144° 00' 15' 30' 45' 145° 00'

38° 15'

VICTORIA

PORT PHILLIP

Dunreed – 2
Geelong Flow Oil – 1
Queenscliff – 7
Wensleydale – 1
Jan Juc – 5
Port Addis – 1
Jan Juc – 4
Port Addis – 6
Angahook
Anglesea – 3
Anglesea – 2
O.D.N.L. Anglesea – 1 T.D. 10,065
West Mineral Corp. – 13
Sorrento
Nepean – 29
Wannaeue – 13

Line 92
Line 155
Line 149
Line 75
Line 92
Line 92
Line 82

0046 – 155
0046 – 153
0046 – 86
0046 – 284
0046 – 84
0046 – 280
0046 – 82
0046 – 181
0046 – 157
0046 – 159
0046 – 78
0046 – 74
0046 – 79
0046 – 155
0046 – 69
0046 – 159

F

Nerita – 1 T.D. 6,700

A – 2
A – 15
A – 11
A – 12
A – 13
A – 10
A – 8
A – 4
A – 6

P.E.P. 38 F.B.H.

P.E.P. 36 Alliance

EDGE OF CRETACEOUS

EDGE OF CRETACEOUS

ESSO – HEMATITE OTWAY FARM – IN

ESSO – HEMATITE OTWAY FARM – IN

F'

ER – 45
ER – 50
ER – 51
ER – 52
ER – 53
ER – 54
ER – 55
ER – 56
ER – 57
ER – 58
ER – 59
ER – 60
ER – 61
ER – 62
ER – 63
ER – 64

ES – 64
ES – 60
ES – 61
ES – 62
ES – 63
ES – 38

E.D. – 14
E.D. – 84
E.D. – 58
E.D. – 41

0.500 0.400 0.300 0.200 0.700 0.750 0.450 0.600 0.650 0.250

1.700 1.800 1.900 2.000 2.100 2.200 2.300 2.400 2.600 1.300 1.400 1.500 1.600

PEP 40 Hematite

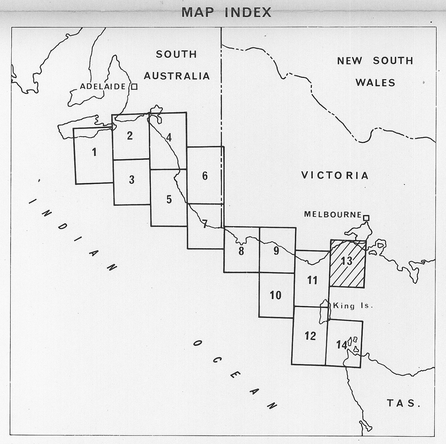
T/P 3 Hematite

39° 00'

39° 15'

144° 00' 15' 30' 45' 145° 00'

MAP INDEX



LEGEND

- Dry and abandoned well with show of gas
- Dry and abandoned well
- 230 Seismic shot point
- U / D Fault, "D" downthrown side
- —0.400— Structure contour in seconds
- A —— A' Line of seismic cross-section
- Petroleum Tenement Boundary
- Igneous intrusion, reflector pierced
- Igneous intrusion, reflector not pierced

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE OTWAY BASIN

VICTORIA – TASMANIA

STRUCTURE MAP ON TOP OF ECONOMIC BASEMENT

5 cm

079033

CONTOUR INTERVAL: 0.050 and 0.100 SECONDS

DATUM: SEA LEVEL

Scale 1:100,000

2 1 0 2 4

MILES

AUTHOR: C.C. HORGAN

DRAFTED BY: K.H. REISS

TO ACCOMPANY: FINAL SUBSIDY REPORT OF THE OFFSHORE OTWAY ER-68 SEISMIC AND MAGNETIC SURVEY

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SHEET 13

PLATE II f

OR-064

Dwg: 1122/G/17

OTWAY/KING PART-VI*

OFFSHORE OTWAY ER-68 SEISMIC & MAGNETIC SURVEY

079034

OTWAY/ING PART-V*

Part 1	Final Report
	Figures 1 and 5
	Plates 1 and 2
Part 2	Operators Reports
	Inventory of Seismic Sections
	Plates 3 and 4
Part 3	Plates 5 to 12

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TPR
OR-064