# PRELIMINARY REPORT

# PETROLEUM EXPLORATION POTENTIAL

# OFFSHORE POLDA TROUGH, SOUTH AUSTRALIA

By

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## INTRODUCTION

This report summarizes a geological review and evaluation of Outback Oil Company's offshore exploration permit EPP 15 - the Polda Trough. The permit (400 graticular blocks, approximately 6.7 million acres) covers the entire eastern silled basin from near Latitude 133° East to the west shore of the Eyre Peninsula (Figure 4, Plate V). The review is of a reconnaissance nature with the main purposes of determining the significance of Outback's Gemini No. 1 well drilled within the Trough, related geologic factors, and their bearing upon further exploration.

The Outback Gemini No. 1 well, located over a deep seismic anomaly, penetrated 2810' of Upper Jurassic-Tertiary sediments before encountering Precambrian volcanics. The well was plugged and abandoned November 7, 1975 at a total depth of 2932'. A sedimentary section of some 10,000' had been anticipated based upon geophysical data.

Conclusions: The main conclusions relevant to the Gemini well and further exploration potential of the Trough are:

I. The Gemini well was, unfortunately, little more than an expensive strat test. The well was located over a structure appearing on Conoco's so-called "deep seismic reflector" which originates within the basement complex. No structural closure involving the Upper Jurassic-Tertiary beds was penetrated according to shallow seismic Horizon "A" Map (Plate IV). Thus no valid test of the Polda Trough exists.

II. The main exploration potential lies in the deeper east sector of Polda. The Trough within the permit area may be divided into east and west sectors based upon structural complexity and depth of sedimentary fill (Fig. 11).

The western sector is complexly faulted and folded with a generally shallower, variably displaced basement. Gemini was located over a high basement block near the east end of the area.

The eastern sector is a stratigraphically complex, but intact, west dipping, down faulted block. Polda's thickest, best developed sedimentary section (estimated 10,000') occurs in the downdip limb of the block. Two large possible drilling targets located in this area are described as follows:

1. A complex, rootless, closed structure with numerous stratigraphic units thinning upon it. The "structure" has an apparent closure of some 450' and covers an area of 20 square miles. See "shallow strat anomaly" Plates II, III and IV.

2. Of equal interest is a large, deeper, west-dipping stratigraphic lens.

The lens appears to pinchout to the north, south, and east and is partially fault closed on the west. It covers an area of possibly 30 square miles and has a maximum thickness of 700'. Depth of the lower limb is approximately 9000'. The upper limb is approximately 6000'. Petroleum capacity of the upper one-half of the wedge, assuming a sandstone with common reservoir parameters would easily exceed 500 million barrels, recoverable. See "deep strat anomaly" Plates II, III, and IV.

Recommendations: - A detailed seismic review of existing East Polda data is recommended. Contingent upon these results, a two well program to test the above anomalies is further recommended.

## REGIONAL GEOLOGY

The Polda Trough is an Upper Jurassic to possibly Pre-Permian infra-basin which lies unconformably beneath Lower Cretaceous-Tertiary sediments of the Eucla Basin. In regional scheme the Cretaceous-Tertiary platform (cratonic basement) cover thickens southward offshore whereas the underlying Paleozoic platform cover, present in scattered remnants to the south, forms a more solid cover and thickens northward into the Officer Basin. Eucla's perimeters are defined by four adjacent tectonic features (Figures 1, 3, Plate I).

The Gawler and Yilgarn Block, Precambrian shield areas on the east and west.

The Great Australian Bight Ridge, a landward or north tilting basement sill on the south.

The Officer Basin on the north, which is in turn flanked by the Precambrian Musgrave Block.

Polda is a rift or graben over 200 miles long and 25 miles wide. It extends eastward to near the center of the Eyre Peninsula terminating across the south plunge of the Gawler Block. A major sill near Latitude 133° East divides the trough into roughly equal east and west basins. The structure is traced westward from the central sill by aeromagnetic and seismic data down the continental shelf and to the base of the continental slope.

The tectonic origin of Polda is complex. In his brief report on the trough (pre-Gemini well), R. F. K. Tothill related it to rifting and separation of the Australian and Antarctic continental plates. Believing that Polda's predominant sedimentary fill was Lower Tertiary - Lower Cretaceous, he chronologically equated the trough to a genera of basins: Otway, Bass and Gippsland, which were synchronously formed along the Australian continental margin during rifting and separation of the Australian and Antarctic continental plates. Falvey, et al, date incipient rifting at early Upper Cretaceous. Polda predates this activity, as final deformation of the trough occurred with the folding and contemporaneous deposition of its Late Jurassic sediments. It contains several thousand feet of Pre-Jurassic sediments. Precambrian clastics outcrop within the east, onshore extension of the trough.

Polda's east-west alignment is essentially parallel to other old tectonic features of south and central Australia, including the Amadeus Basin, Officer Basin, intervening

Musgrave Block and westerly swing of the Kanmantoo Belt. Most significant perhaps is its alignment with the steep south edge of the Great Australian Bight Ridge and corresponding, continental slope - the western trace and vestigal "north rim" of the Polda Rift. Polda is unique in that it has elements in common with regional features, Precambrian - Paleozoic infrabasins of Eucla and the younger rift related basins to the southeast along the continental margin.

The cessation of Polda's deformation near the end of Late Jurassic is interpreted to be a regionally significant event related to the shifting of shear stresses from Polda to the southeast, obliquely across the north-south grain of the East Australian Orogenic Belts.

Further to the subject of rifting, Deighton and Falvey, posing a question as to the earliest east-west structures permitting influx of sea water and thus deposition of marginal marine environments on the Australian continent, quoted the following exerpt. "McGowran (1973) believes that there is some evidence that incipient rifting already had occurred in the Early Permian. This surmise is based on the presence of phytoplanktonic and arenaceous benthonic formaminifera in the southern Australian Permian sediments (eg. in the Denman Basin, below the Eucla Basin). McGowran (loc. cit. fig. 1) shows marine ingressions coming from the southwest but the present distribution of these Permian marginal marine sediments is erratic and not oriented in even a rough east-west direction across the continental mass". The later point may be in part explained by the heavy Post-Permian erosion evident over the Eucla platform.

Two main conclusions emerge from the foregoing:

1. Polda seems to be the logical precursor to rifting and eventual separation of Australian-Antarctic continental plates. Two stages of development appear to have occurred.

   Stage I - Origin and development of Polda Rift, Pre-Permian (or Early Permian) - Late Jurassic.

   Stage II - shifting of shear stresses to southeast, Early Cretaceous - Oligocene.

   The Early Permian trough would have been a natural conduit for early marine ingressions onto the Australian continent and into the east Polda Trough.

2. In view of Polda's evolution as projected from the critical Permian through Jurassic Periods, the basin is a viable exploration objective.

## GENERAL STRATIGRAPHY

### The Gemini Section

The stratigraphic sequence of rocks drilled by the Gemini well include:

| | | | |
|---|---|---|---|
| Tertiary Miocene ?<br>Eocene ? | | (Sea Floor) | 224-935' |
| Upper Jurassic | Polda fm. sandstones, shales, siltstones & coal | | 935-2810' |
| Proterozoic | Roopena volcanics ? | | 2810-2932' |

Roopena Volcanics - The Australian Mineral Development Laboratories conducted petrographic and X-Ray diffraction analyses of drill cuttings from the interval 2820-2900'. AMDEL concluded that this interval consists of a highly altered basaltic or basic volcanic rock. Comparison of Gemini samples to three samples of Roopena volcanics (Adeladian) indicated different modes of alteration. The Roopena samples however were considered to be atypical. Descriptions of Roopena volcanics in AMDEL Report MP 809/69 by Turner are reportedly similar to the Gemini volcanics. Possible correlations between volcanics of the Gemini and Mallabie wells were also noted. The Mallabie volcanics are observed to have low magnetic susceptibilities. This would be significant in the interpretation of Polda magnetics as these rocks would not constitute a strong source of local magnetic anomalies.

The Gemini samples were insufficient to age date; hence, some speculation could be made as to a Jurassic age. Some Jurassic volcanics are known to occur in the area. While the presence of Jurassic volcanics would be encouraging in terms of possible deeper Jurassic section, problems related to their mode of occurrence, lateral and vertical distribution would still need resolving. On the strength of AMDEL's conclusions and the prevalence of Pre-cambrian volcanics over the Gawler Platform, a Jurassic age seems precluded.

Polda Formation - The sequence of fluviatile to lacustrine sandstones, siltstones, shales and coals encountered between 935' and 2810' were determined by palynology (S.A. Dept. of Mines) to be of Late Jurassic age. The Polda fm. is an isolated remnant confined to the silled or closed eastern portion of the Trough. This would attest to either Jurassic sedimentation being limited to the Trough area and/or severity of post-Jurassic erosion. Seismic sections (Plate II and III) suggest that Upper Jurassic sediments were folded contemporaneous to deposition as drape folding of these beds seem to conform to the underlying Pre-Jurassic fault blocks. The Jurassic folds diminish upward within the Jurassic sequence and are truncated by an unconformity. The unconformity appears to be deeper than the logged top of the Jurassic and could infer a thicker Tertiary or presence of a thin Lower Cretaceous section not identified from drill cuttings (see Tertiary below).

Numerous sandstones occur in this sequence with good porosities and permeabilities. No shows of oil were reported in cuttings or sidewall cores. No traces of hydrocarbons were detected by the mud logger or Schlumberger logs. This is not surprising considering that the Gemini well was drilled off structure in this section. The Upper Jurassic non-marine environments in the trough should not be too disturbing considering that the productive Cretaceous-Tertiary Latrobe group of Gippsland Basin consists of sands, shales and coals deposited in fluvial, lacustrine and paludal environments. Source of the high wax crudes produced from the group are considered to be land derived organics indigenous to the group. The Upper Jurassic-Lower Cretaceous Strzelecki Group of Gippsland consists of non-marine sands, shales and minor coals. This sequence is generally considered economic basement due to the lack of a reservoir facies, as is the case with the equivalent Otway Group in the Otway Basin. Another problem in Otway is its tensional style tectonics and lack of a mechanism for the formation of structural traps. This is not the case with Polda however. The generation of hydro carbons in Polda's Upper Jurassic sequence would seem to require a greater thickness as might conceivably exist in eastern Polda, depending upon the actual age, the Pre-Jurassic sequence is proven to be. The Upper Jurassic could otherwise function as reservoir with a migrational source of hydrocarbons from the deeper Pre-Jurassic beds.

Tertiary - No samples of Tertiary rocks were recovered. It is therefore assumed that Eocene, non-marine sands and clays found in shallow, onshore Polda wells were present in this interval. The Eocene-Oligocene Wilson Bluff Ls. may also have been penetrated. A micro-paleontologic study of Gemini well cuttings by David Taylor, consultant for the S.A. Department of Mines, noted Brachiopod shell fragments from the interval 1120-1150'. Their suggested origin was the Wilson Bluff Ls. Well samples through this interval were noted to be poor. The Jurassic top (935') would thus be correspondingly lower (1150').

Pre-Jurassic Sediments

Sediments older than the Upper Jurassic (oldest sediments penetrated by Gemini), fall into two categories based upon structural attitude, general strength and continuity of seismic bedding, history of stratigraphic occurrences elsewhere in the region, etc.

1. Basement - for all practical purposes includes a complex of Proterozoic crystalline rocks, metasediments and volcanics. Some Cambro-Ordovician metasediments could be involved.

2. Pre-Jurassic - the least known unit, could actually include sediments ranging in age from Mid-Jurassic through the Permian. Permian age sediments are generally suspected however.

Several local and regional criteria are noted which support the presence of these major stratigraphic units and suggest other aspects of Polda's origin and development.

The eastern end of the trough contains Pre-Cambrian grits and conglomerates which outcrop onshore at Mt. Wedge (Figure 7). These are said to resemble the Adeladian Corunna Conglomerates. Whether or not these sediments were deposited in the trough or later down faulted cannot be ascertained. In the later case, down faulting considerably earlier than the Permian would seem requisite to preserving this section from erosion. The Polda Stratigraphic Hole No. 1 onshore, located about 12 miles east-southeast of Mt. Wedge, drilled some 170 meters of Upper Jurassic and Middle Eocene non-marine sands, lignite and clays. The nature and age of sedimentary fill in extreme western Polda (west of Latitude 133$^{o}$ East) is not known.

Outback previously explored and drilled wells in the much shallower Denman Trough and Mallabie Depression, infra-basins beneath the Eucla Basin. A summary of these older infra-basins is useful in establishing certain aspects of Polda's Pre-Jurassic beds.

The Denman Basin, located 200 miles west of the Gemini location, is a shallow northwest trending graben with parallel, central horst or basement ridge. Basin fill appears to consist largely of Permian rocks. Lower Cretaceous and Tertiary sediments form a flat, structurally undisturbed cover spanning the trough. Cretaceous sediments appear to fill lows on the rugged post-Permian erosional surface.

Outback's No. 1 Apollo well (Location Figure 4) was drilled on a seismic anomaly, one of three large structural-topographic culminations of the central horst. The stratigraphic sequence encountered included:

| | | |
|---|---|---|
| Tertiary-Miocene | Abracurria ls. | ?- |
| U. Eocene | Wilson Bluff ls. | ?-1242' |
| L. Eocene | Pidinga-Glauconitic ss. | 1242-1396' |
| L. Cretaceous | Shale, sandstone & siltstone | 1396-2564' |
| Permian | Shale, mudstone & sandstone | 2564-2830' |
| Proterozoic | Granite | 2830-2875' |

From well and seismic data these units are defined as follows:

Proterozoic - This zone is locally composed of deformed granite or granite gneiss. The top is marked by an unconformity or relict, high relief topographic surface.

Paleozoics - Permian - Permian sandstones and shales (environment unknown) constitute the basin fill. These sediments appear to have been deposited in a fault controlled topographic basin. Beds conform to the underlying topography and bear evidence of only minor disturbance or rejuvenation of older faults. Top of the Permian is heavily eroded and channeled.

Lower Cretaceous - These sediments form a south regionally dipping cover over the Denman Trough and fill channels on the post-Permian topography. The sequence is unaffected by the deeper, older tectonics. Tenneco recognized these same general relationships in their seismic interpretation of an area northwest of the basin where seismic sections exhibited a rugged post-Permian topographic surface on Basement with Cretaceous infilling.

The Mallabie Depression (Figures 8 and 9) is similar in aspect to Denman Basin but is deeper and contains Pre-Cambrian - Early Paleozoic volcanics and metasediments. The stratigraphic column penetrated by Outback's Mallabie No. 1 well included:

| | | |
|---|---|---|
| Tertiary | L. Miocene Nullarbor ls. | 0- 108' |
| | U. Eocene Wilson Bluff ls. | 108- 563' |
| | Eocene Pidinga Fm. siltstones, sandstones & clays | 563- 617' |
| L. Cretaceous | Sandstones, siltstones, mudstones & conglomerates | 617-1140' |
| Permian | Sandstones, siltstones & claystones | 1140-1430' |
| Cambro-Ordovician | Sandstones & siltstones | 1430-3006' |
| Proterozoic | Roopena volcanics | 3006-3956' |
| | Sandstones | 3956-4400' |
| Proterozoic | Granite gneiss | 4400-4907' |

Due to the lack of other available data on Mallabie, its more precise geologic nature cannot be reported. The general impression is that Mallabie and Denman are both parts of a buried fault controlled topography or drainage system possibly originating in the Proterozoic. Mallabie's Permian fill is thought to be composed both of tillites and marine lagoonal claystones. Harris and Ludbrook in their paper, "Occurrence of Permian Sediments in the Eucla Basin, South Australia" suggest that the claystones of the sequence and included foraminifera indicate a lagoonal environment with restricted access to open marine conditions. The unconformably overlying Cretaceous beds appear to thin regionally to the east across the Mallabie Depression.

Seismic - Stratigraphy, East Polda - Attention is focused upon some seismic details of Polda's massive east block, site of the Trough's thickest sedimentary section (estimated 10,000'). Seismic Line 1 (Plate II) presents an excellent stratigraphic profile of the block and trough. The block appears largely intact. Spurious seismic events at the extreme west end mask details of that area. Pre-Jurassic stratigraphy of the east block probably was continuous to the west prior to the structural displacement of the high western blocks.

The section is characterized as follows:

> Basement would appear more clearly defined at the shallow east end but less distinct and more arbitrarily traced to the west. Pre-Jurassic bedding above the so-called basement appears evenly and consistently bedded as if deposition were subaqueous. The large stratigraphic wedge half way up the sequence appears transgressive to the east followed again by a sequence of uniform bedding with a gradual depositional slope to the west. Bedding in the upper sequence becomes more erratic suggesting rapid influx of sediments from the east as the steep west dipping fore-set beds developed. Top of the sequence is truncated by an undulating unconformity surface which apparently created the large closed, topographic structure seen on the seismic map (Plate IV). Drape folds of the Upper Jurassic, conforming to this topography, die out against the disconformity at the top of the sequence. Drape folding is more pronounced over basement structures to the west. See seismic section 71-10, Plate III. Environments of the Upper Jurassic varied between fluviatile, paludal and lacustrine. The flat lying, tectonically undisturbed Miocene-Eocene beds cover the trough.

Major exploration objectives of the east block are the topographic structure, associated pinching stratigraphic units and the deeper large stratigraphic wedge. These should be further defined seismically as drilling prospects.

Age of Pre-Jurassic Sediments - Speculation upon the possible age of Polda's Pre-Jurassic rocks is tenuous, but a Permian age seems indicated for the following reasons:

1. The possibility that these sediments could be younger than Permian seems precluded by the absence of middle to early Jurassic sedimentation in Otway, Bass and Gippland Basins.

2. Observing that Permian sediments are common to both Denman and Mallabie basins, it would seem to follow that Permian sediments would have been even more favorably received in the deeper, active structure and topography of Polda. If marine ingression from the west did take place as McGowran hinted, Polda would have afforded the easiest access. A possible marine environment for Pre-Jurassic rocks of East Polda could thus be implied.

3. That the Pre-Jurassic sequence is composed of Proterozoic - Early Paleozoic metasediments and volcanics (as in the Mallabie Depression) would seem to be ruled out by the clarity and excellent bedding characteristics demonstrated by seismic line I, Plate II. If older sediments and especially volcanics are present in East Polda, they probably occur beneath the Pre-Jurassic.

4. The heavy erosion surface marking the top of the Pre-Jurassic in Polda would seem correlative to the Post-Permian erosional surface in Denman Basin.

## STRUCTURE - GEOPHYSICS

Seismic Data - The offshore extension of Polda Trough was first indicated by a Shell-Outback aeromagnetic survey conducted in 1966. Subsequent reflection and refraction seismic work at the western end of the Basin by Shell indicated deep refractors which shallowed rapidly eastward toward a structural sill dividing the basin at Latitude 133$^{o}$ East. Shell thus dropped their permit which included EPP 15 not realizing that the basin deepened again to the east of the sill. A Sparker survey by Bridge Oil, 1969 defined the silled eastern trough. Two other detailed marine seismic surveys of the eastern trough were conducted jointly by Bridge, Target and Conoco in 1971. Conoco's interpretation (Figure 10) indicated at least 10,000' of sedimentary column but grossly misinterpreted the basin's internal structures.

Structural interpretation of the trough is based upon a few available key seismic lines, regional gravity, magnetic data and Gemini well data. While many details remain to be worked out, a fairly coherent overall picture has been developed and is outlined as follows:

> Polda Trough is a regional rift or graben (Figure 4) which traverses some 230 miles from near the south center of the Gawler Block west down the continental shelf and slope of the Great Australia Bight. A major sill or structural block located just east of Latitude 133$^{o}$ East divides the trough into east and west segments or basins. The eastern basin (Figure 11), subject of this report, may be further divided into two sectors based upon degree of tectonic disturbance, thickness and continuity of sedimentary fill. The west sector is complexly block faulted and folded and has a comparatively shallow, variably displaced basement. Beds of the Upper Jurassic resting upon block faulted basement and/or Pre-Jurassic strata, are drape folded and conform to the underlying structure (Plate I). The Gemini well is apparently located over a high basement block near the extreme east end of this area. The east sector (Plate II) consists of a west dipping, down faulted block, comparatively intact structurally. This area contains some large potential stratigraphic traps which are of prime exploration interest. Tectonic folds are absent. Topographic structure associated with the Pre-Jurassic unconformity and overlying drape folding of Upper Jurassic beds does occur.

Magnetic and Gravity Data - The magnetic and gravity surveys of Polda (Figures 4, 5, and 6) are regional and yield few basement details of the Trough. Significant observations of this data are summarized as follows:

> The possibility that the Gemini well might have encountered a volcanic plug or other intrusive mass was investigated. No local anomaly is noted on the total field magnetics in the area of the Gemini location. A weak magnetic deviation and "divide" occur in the area but are thought to be fault related. AMDEL noted, however, that volcanics encountered by the Mallabie well, possible correlative of the Gemini volcanics, have low magnetic susceptibilities and hence would not be a likely source of magnetic anomalies. In view of the nature of structural blocks underlying the Upper Jurassic and common occurrence of volcanics in eroded shield areas of South Australia, presence of a plug is generally ruled out.

The east-west magnetic trace of Polda is well defined by the Depth to Magnetic Basement Map (Figure 4). Greater detail of the east basin, small portion of the west basin and dividing sill are seen on the Total Field Magnetics Map (Figure 5). The most intriguing feature is the apparent, incremental shifting of Polda's east-west magnetic axis to the south. Noting that the central sill and axial shift coincided with one of Robert's regional faults, the same relationship seemed to fit other axial offsets to the east. What emerges is an apparent system of second order, right lateral shear faults intersecting Polda's primary east-west shear.

A gravity survey (Figure 7) defines the trough's extreme east end near the center of the Eyre Peninsula. The presence of possibly down faulted Precambrian grits and conglomerates in the Mt. Wedge area of the trough conveys an impression of the trough's early origin, possibly Pre-Permian.

Another of the basin's enigmas is the sweep of magnetic and gravity axes north of the Gemini location, especially in view of the clear presence of deep sediments of the east block (Plate II). A clue may be seen on seismic line 71-10 (Plate III) in the possible presence of a narrow, deep graben north of the Gemini location. Features such as these need further evaluation.

Sequence of Tectonic Events - In light of the foregoing observations structural evolution of the trough appears to have undergone these major episodes:

1. Pre-Permian (or Early Permian) incipient rifting based upon:

   a. Presence of Precambrian clastics in the Mt. Wedge area of the trough.

   b. Possible additional downfaulted Precambrian metasediments and associated volcanics as encountered by the Gemini well.

   c. Parallelism of the Polda Rift to other old regional structures.

   d. Perfect alignment with the western continental margin and northernmost line of incipient rifting and between the Australian and Antarctic continental plates (Figure 12).

2. Permian - downfaulting of the graben and sedimentation within. Possible marine ingressions from the west may have occurred.

3. Post-Permian (Post-Triassic at latest) - uplift and major internal fault segmentation of the trough. Severe erosion of upthrown blocks occurs.

4. Late Jurassic - renewed subsidence of trough with minor vertical adjustment of internal fault blocks contemporaneous with Late Jurassic sedimentation. This is evidenced by drape folding of Upper Jurassic beds over deformed Pre-Jurassic rocks. Deformation of Polda ends as shear stresses shift to the southeast.

5. Surface lineaments and opposing strandline offsets at Anxious Bay mark Polda's fault intersections with the mainland indicating continued jostling of basement blocks.

Structural Traps - No closed structural or anticlinal structures have been tested in Polda thus the potential of these features is not known. Further seismic evaluation of west sector structures is required. Because of the relatively thin Upper Jurassic section, structures immediately adjacent to the east sector would seem most prospective as possible sources of petroleum from deeper beds would be greater. Structures of immediate interest would be North and East Gemini (Plate IV).

One of the single greatest factors related to oil production in Gippsland Basin is the presence of trapping structures and anticlines which are generally found lacking in the adjacent, non-productive Bass and Otway Basins. Gippsland structures are believed to be created by a system of right lateral shear faults. Polda has an abundance of internal structures which also appear related to a system of right lateral shear faults.

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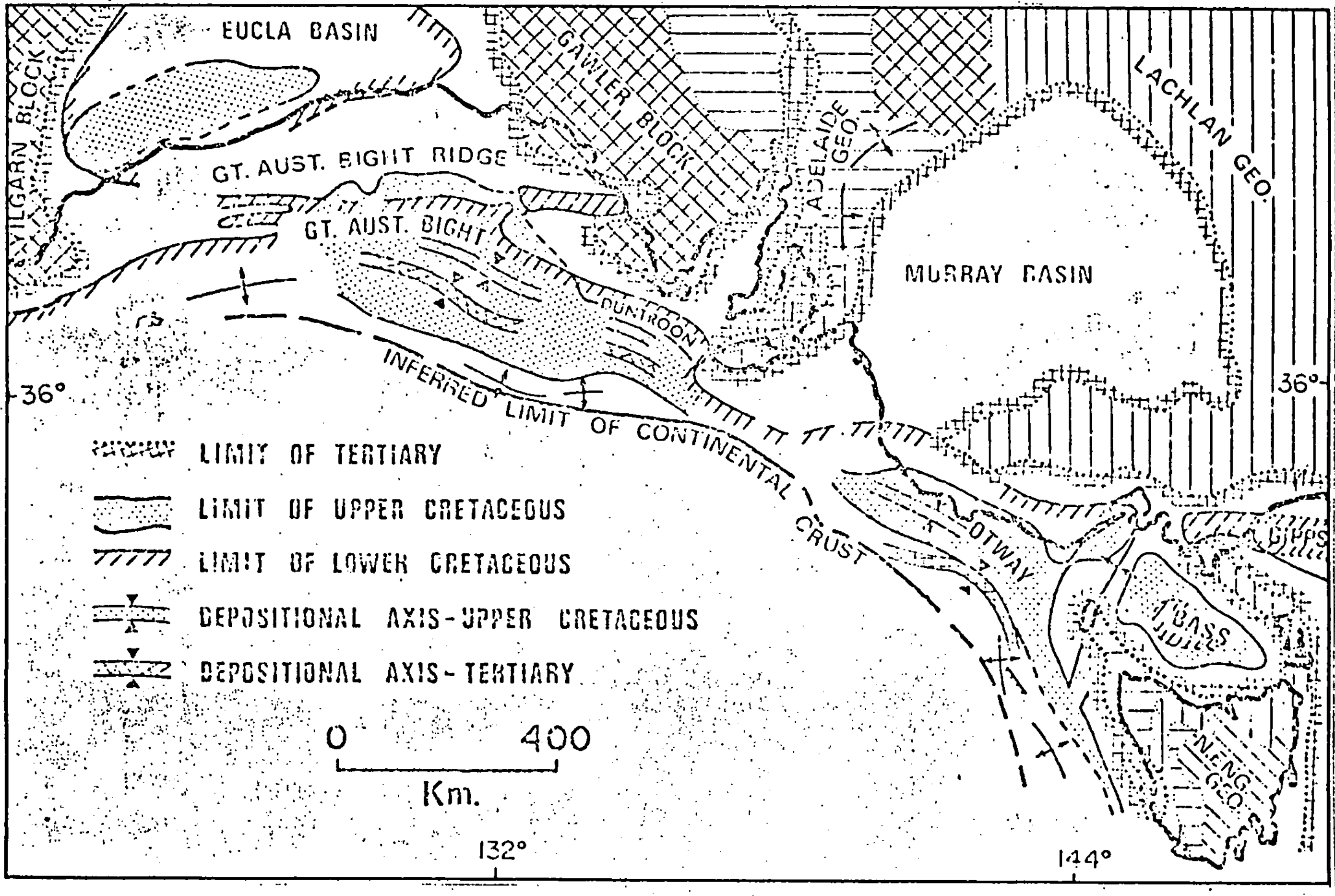



Fig. 1. Geological map showing distribution of Mesozoic and Tertiary basins along continental margin of southern Australia.

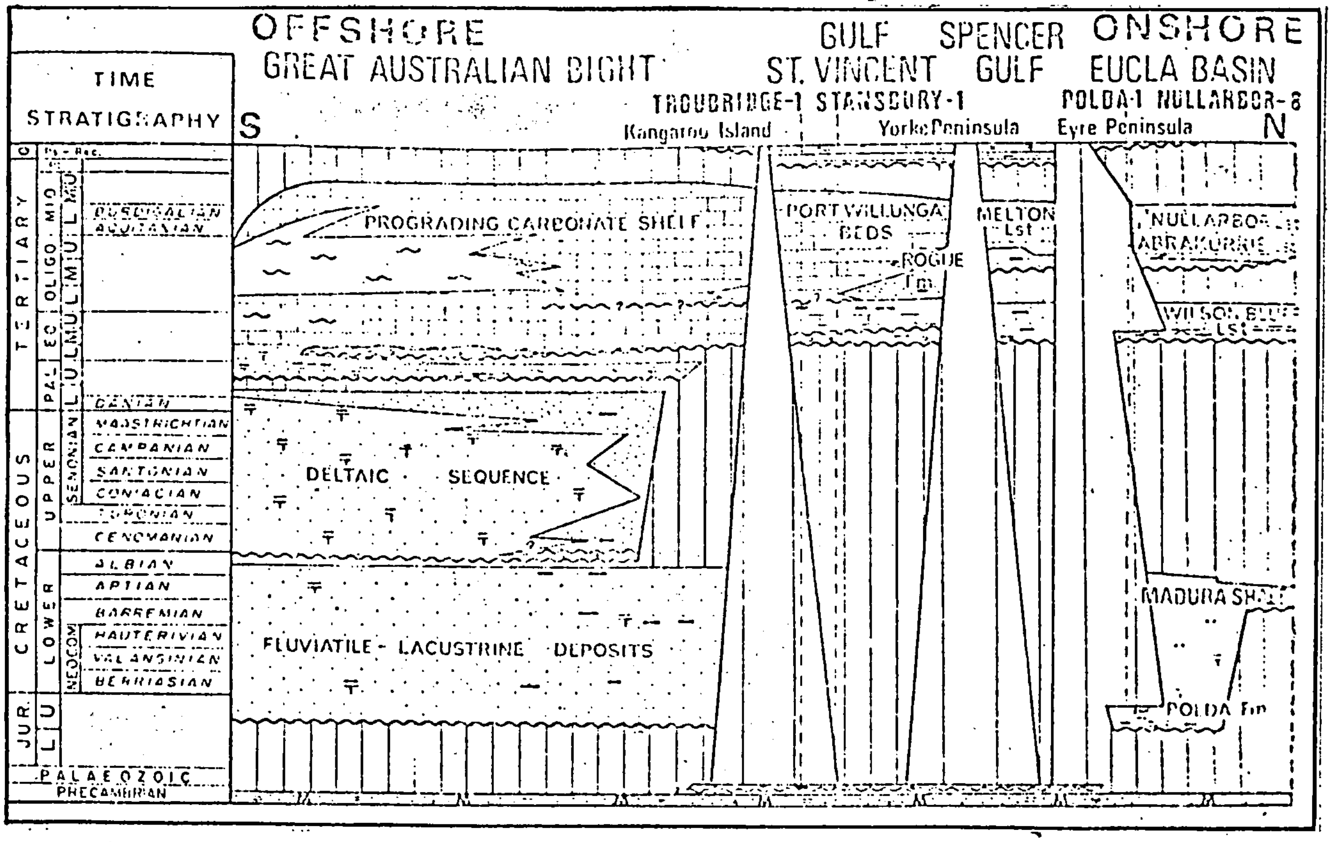



Fig. 2. Schematic stratigraphic chart for the Great Australian Bight Basin. (Boef and Doust, APEA Journal 1975.)

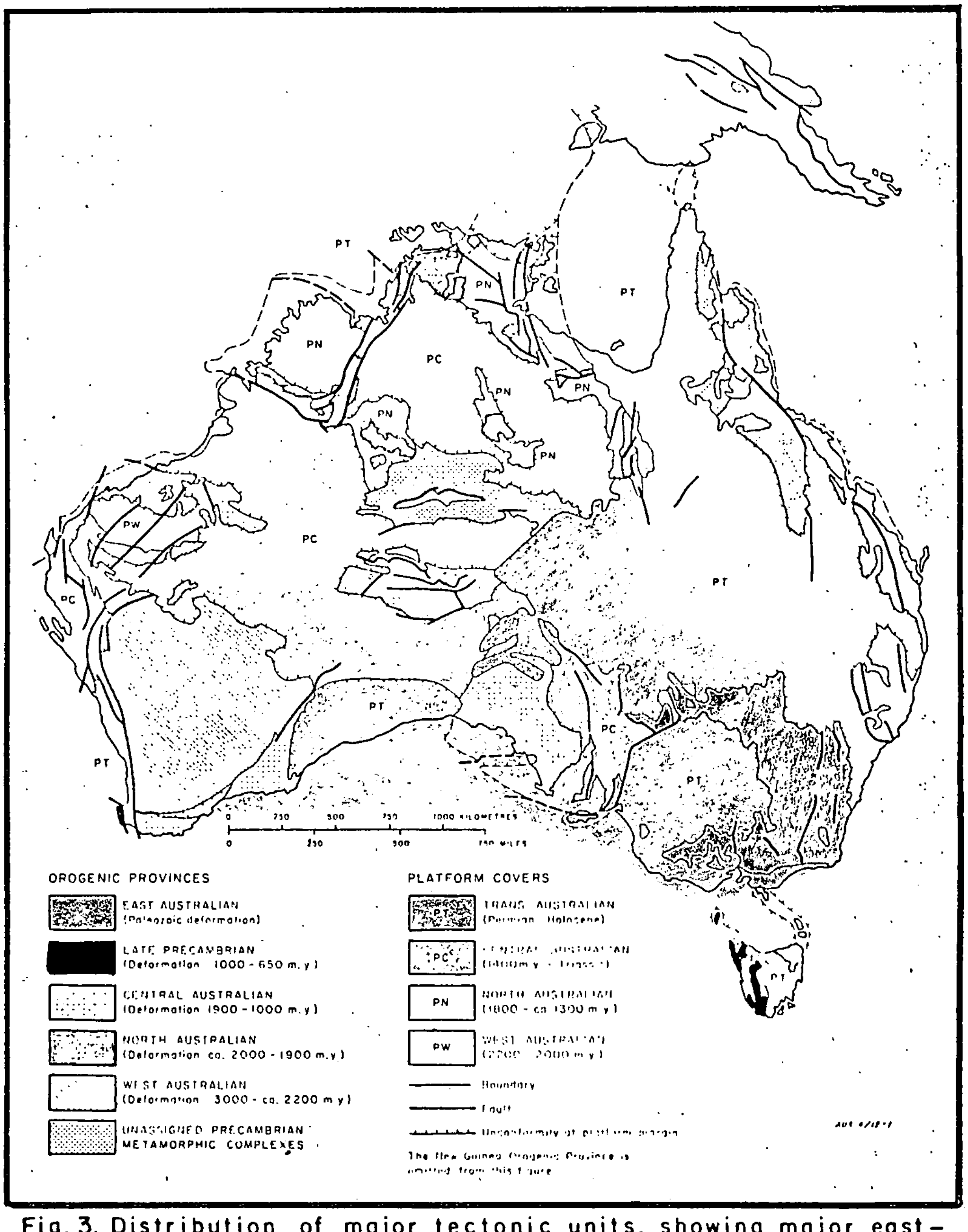
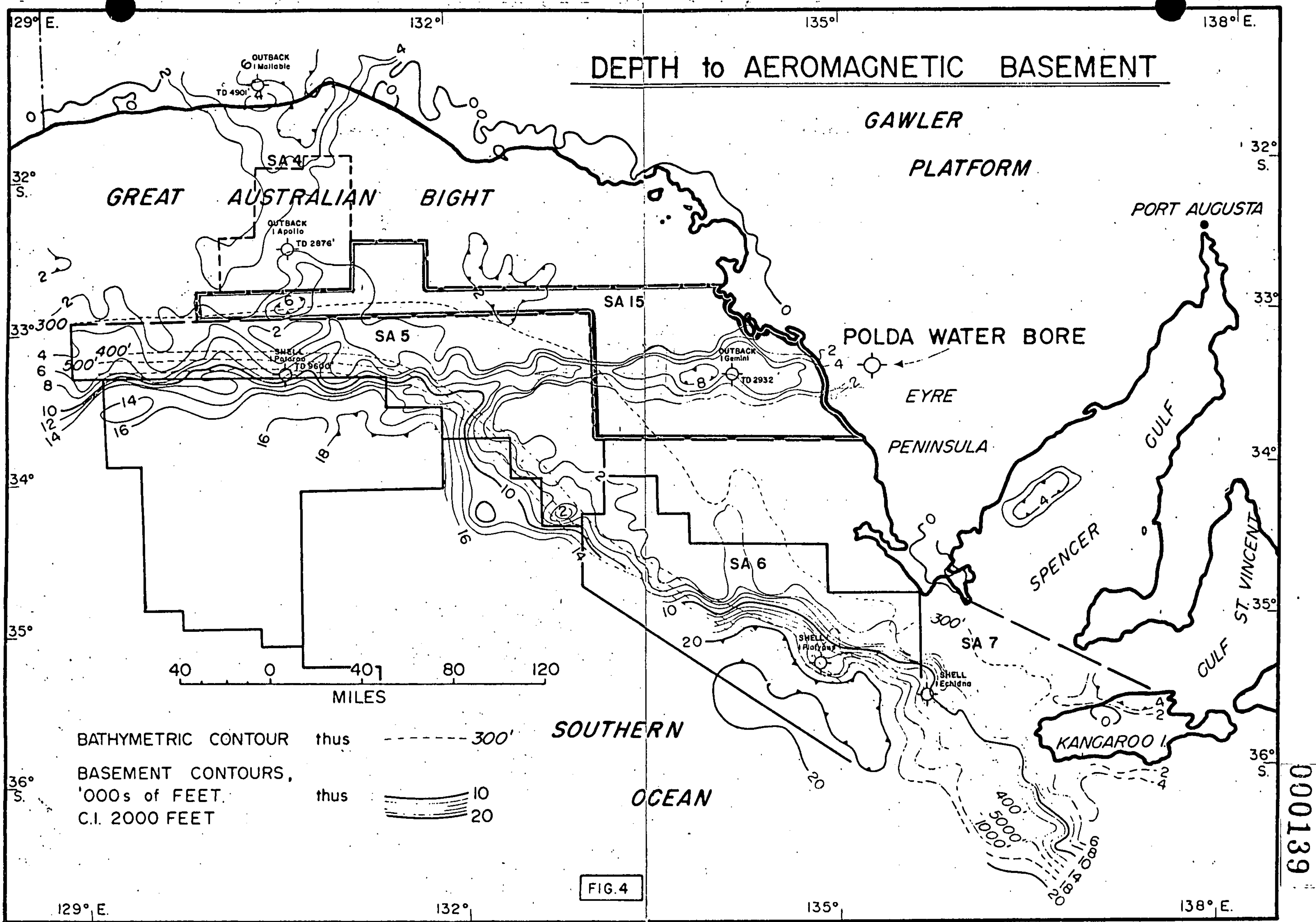
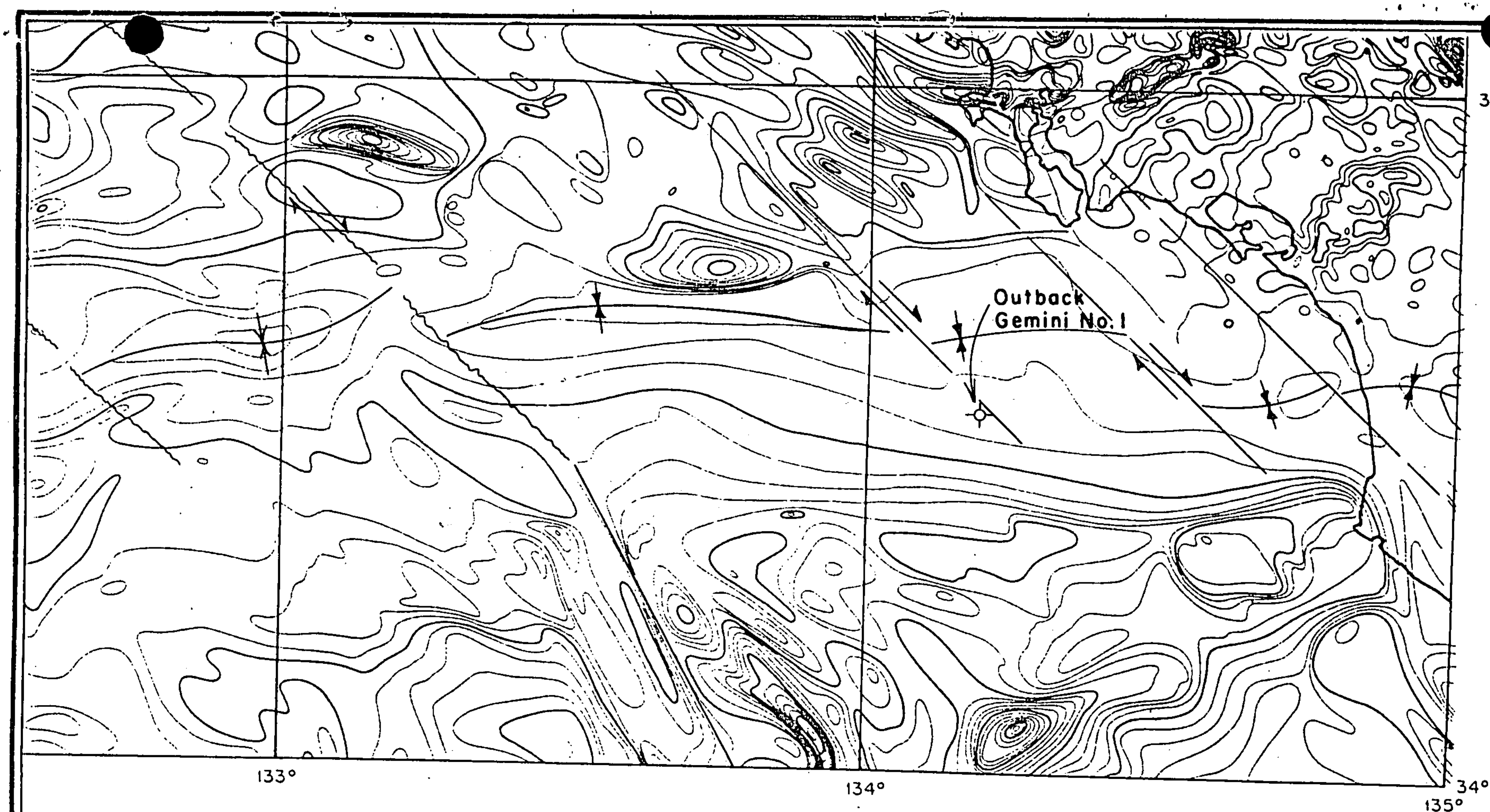



Fig. 3. Distribution of major tectonic units, showing major east-west salients. (Bureau of Mineral Resources, Australia, Bulletin 145).


DEPTH to AEROMAGNETIC BASEMENT
GAWLER
PLATFORM
GREAT AUSTRALIAN BIGHT
PORT AUGUSTA
POLDA WATER BORE
EYRE
PENINSULA
SPENCER
GULF
GULF
ST. VINCENT
KANGAROO I.
SOUTHERN
OCEAN
SA 4
SA 5
SA 15
SA 6
SA 7
OUTBACK 1 Mallable
TD 4901'
OUTBACK 1 Apollo
TD 2876'
SHELL 1 Potoroo
TD 9600'
OUTBACK 1 Gemini
TD 2932
SHELL 1 Platypus
SHELL 1 Echidna
129° E.
132°
135°
138° E.
32° S.
33°
34°
35°
36° S.
40 0 40 80 120
MILES
BATHYMETRIC CONTOUR thus 300'
BASEMENT CONTOURS, '000s of FEET. thus 10 20
C.I. 2000 FEET
000139
FIG. 4




ROBERT'S REGIONAL FAULT

MAGNETIC LINEAMENTS

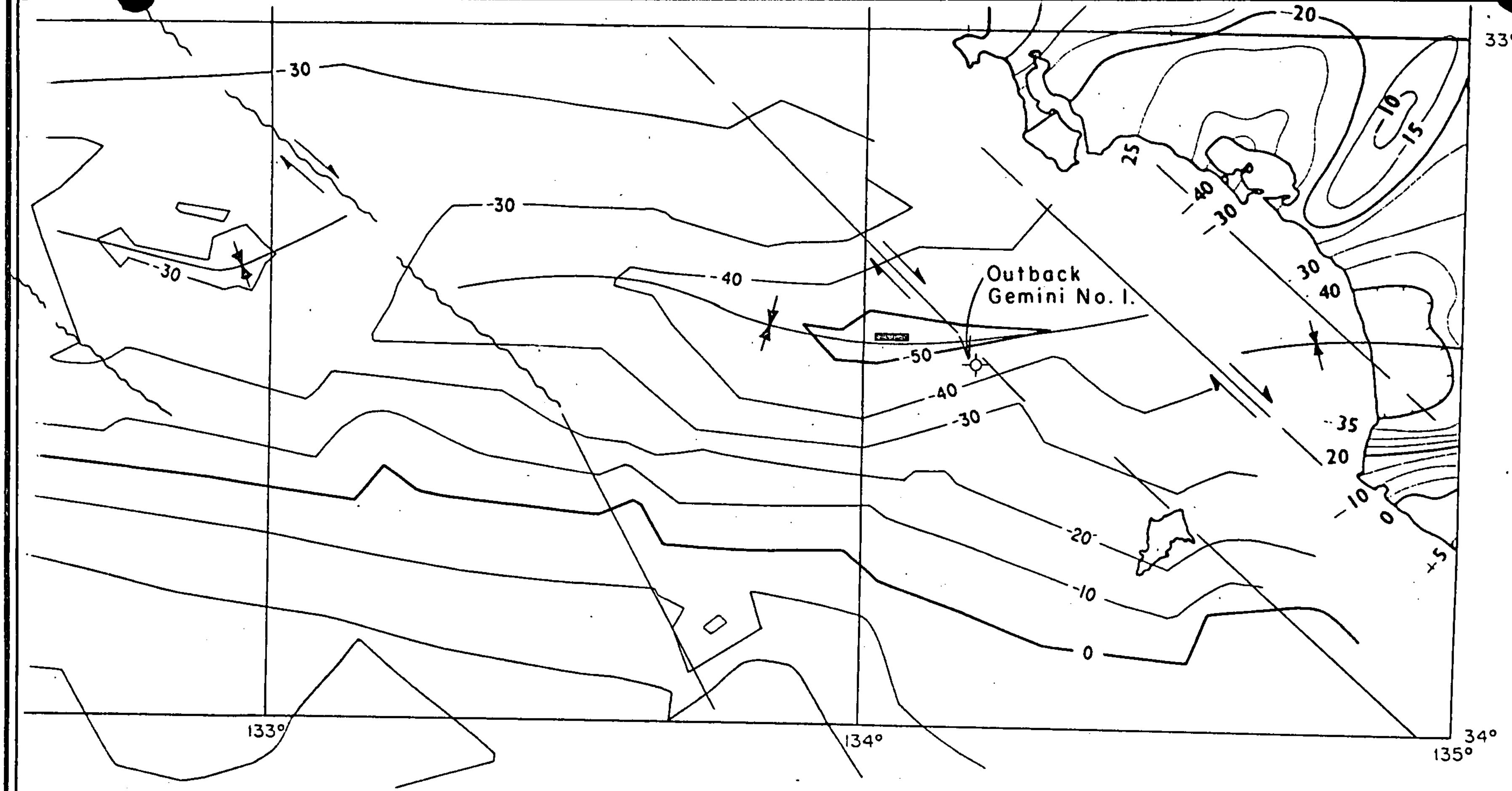
MAGNETIC AXIS POLDA TROUGH

20 0 20 Scale Km

Figure 5.

| DEPARTMENT OF MINES–SOUTH AUSTRALIA | | | | |
|---|---|---|---|---|
| NULLARBOR-FOWLER AREA GEOPHYSICAL INVESTIGATION | | | | |
| **TOTAL MAGNETIC INTENSITY** | | | | |
| | COMPILED: D. ROBERTS | DRN: R.G. | SCALE: 1:1000000 | PLAN NUMBER |
| DIRECTOR OF MINES | | CKD: | DATE: OCT. '75 | 75-1101 |

000140



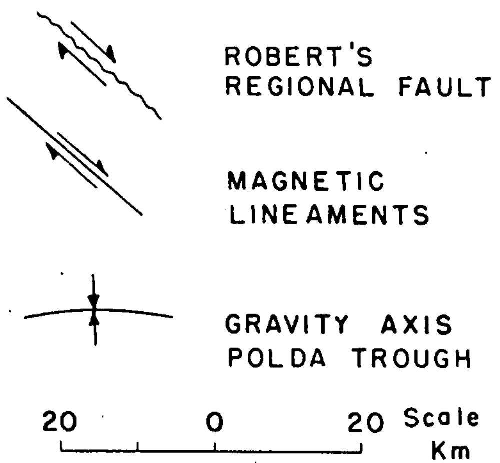




Figure 6.

DEPARTMENT OF MINES-SOUTH AUSTRALIA

NULLARBOR-FOWLER AREA GEOPHYSICAL INVESTIGATION

# BOUGUER GRAVITY CONTOURS

| | | | | |
|---|---|---|---|---|
| | COMPILED: D.ROBERTS | DRN: R.G. | SCALE: 1:1000 000 | PLAN NUMBER 75-1100 |
| DIRECTOR OF MINES | | CKD: | DATE: OCT. '75 | |

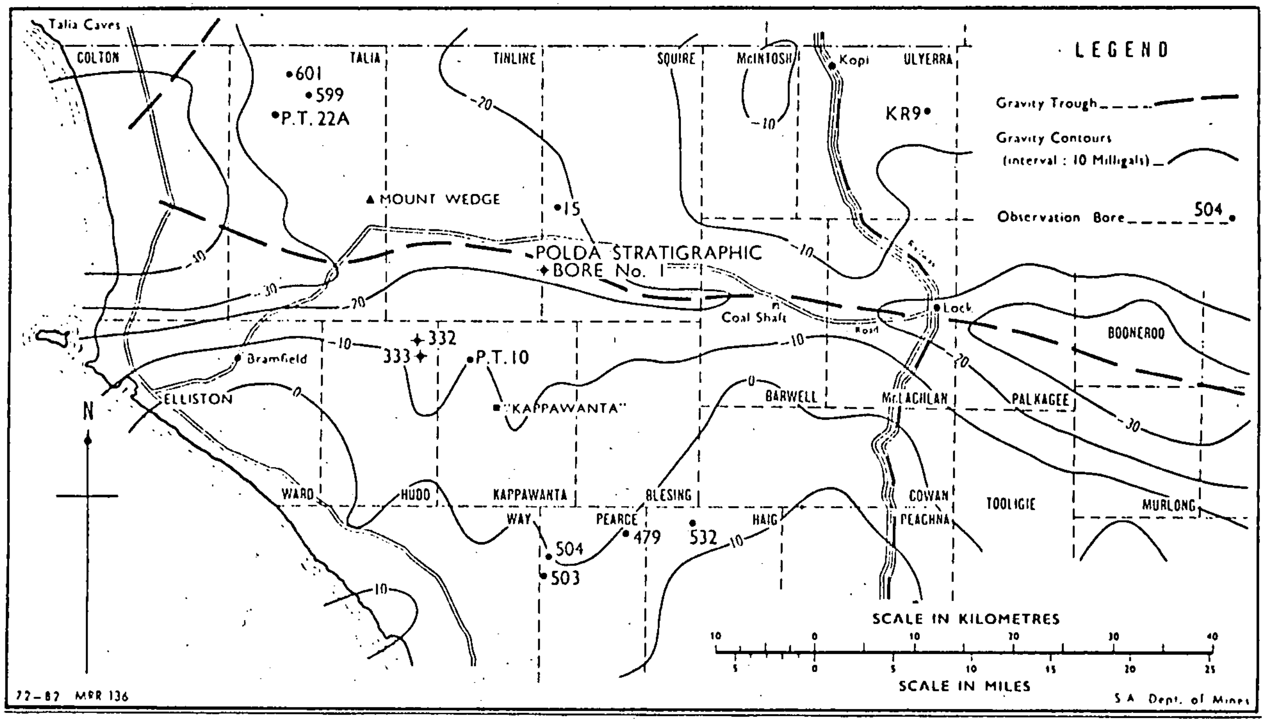



Fig. 7. Gravity contours showing eastward extension of Polda Basin, Eyre Peninsula.

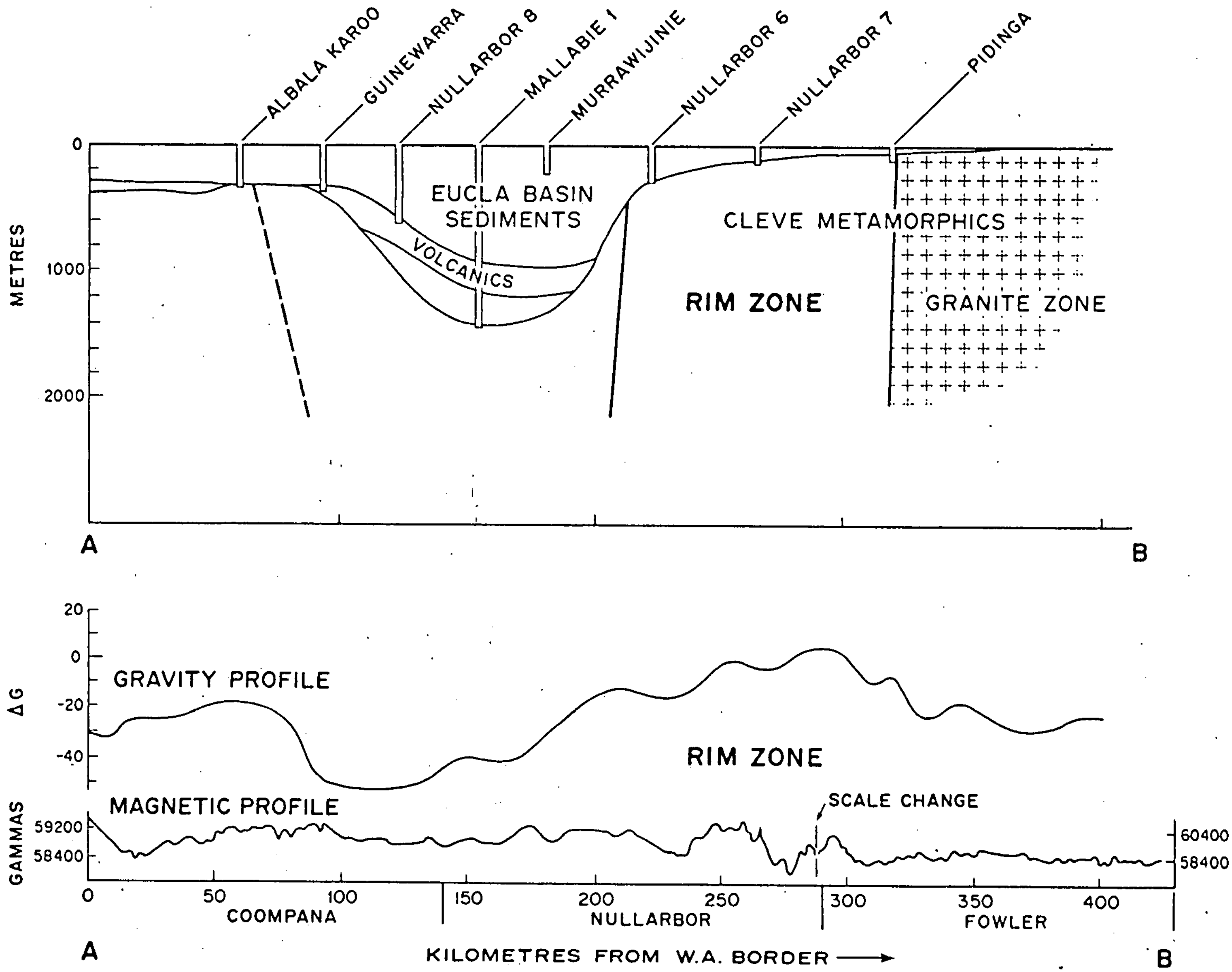



FIG. 8

DEPARTMENT OF MINES – SOUTH AUSTRALIA

NULLARBOR-FOWLER AREA
GEOPHYSICAL INVESTIGATION

# REGIONAL PROFILE A-B

COMPILED: D.ROBERTS
DRN: R.G.
CKD:
SCALE:
DATE: NOV. '75
DRG. Nº S-12017

000143

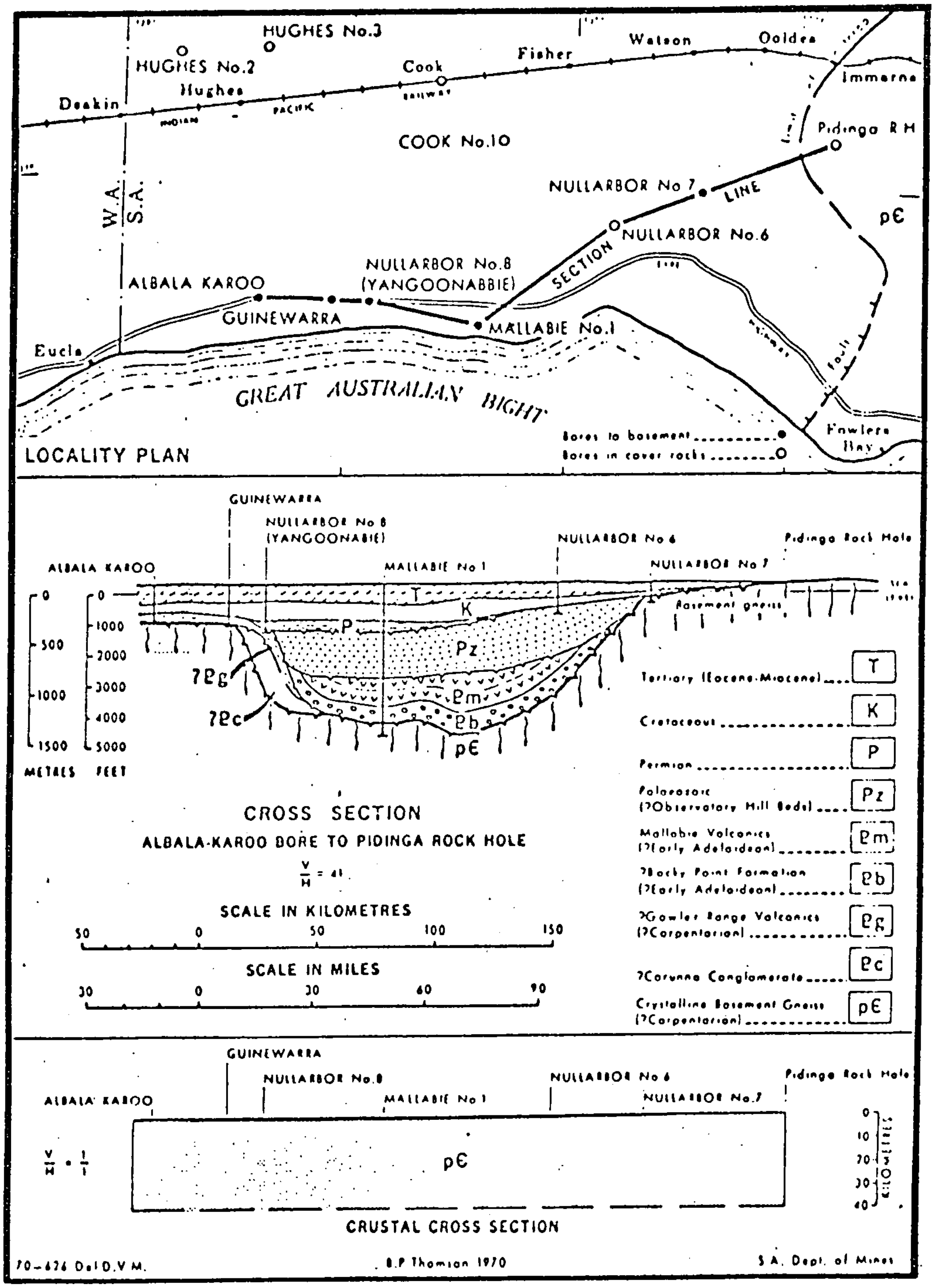
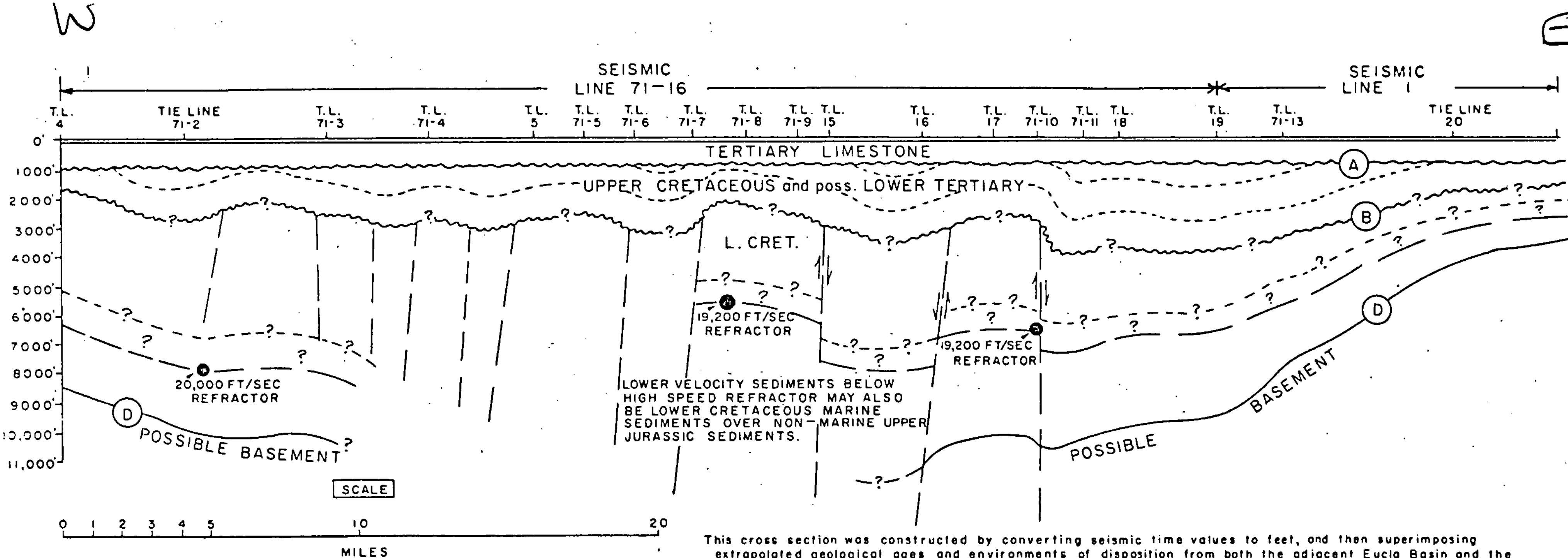



Fig. 9. Cross Section and location map of Mallabie Depression. (Thomson, 1970.)




This cross section was constructed by converting seismic time values to feet, and then superimposing extrapolated geological ages and environments of disposition from both the adjacent Eucla Basin and the more distant Otway Basin. Three important observations arising from this cross section are as follows:

1) There is a widespread angular unconformity (Horizon "A") between the flat lying Tertiary carbonates and the older sediments (U. Cretaceous ?).

2) Horizon "B" (the most reliable and widespread seismic marker below the flat lying "A" event) probably reflects deep seated block-faulting in the Precambrian basement. This assumption is based on the observation that Horizon "D" (basement) in the shallow east end of the basin generally conforms to the configuration of the "B" marker. Unfortunately, the "D" horizon can only be picked locally in the deeper portions of the basin.

3) The 19 to 20 thousand ft/sec. refractor may indicate the presence of thin dolomite "stringers" similar to those widely encountered in the Cretaceous sand-shale sequence of the Eucla Basin. The seismic evidence of lower velocity sediments below this high speed refractor could therefore represent additional Cretacous marine rocks overlying older Mesozoic non-marine detritus.

?

FIG. 10. Geologic interpretation of East-West Seismic Line 71-16 parallel to axis of Polda trough by Tothill, Arthur and Purcell (Conoco) prior to drilling of Gemini Nº 1 (1972). See corresponding seismic map, Plate IV.

0001 45

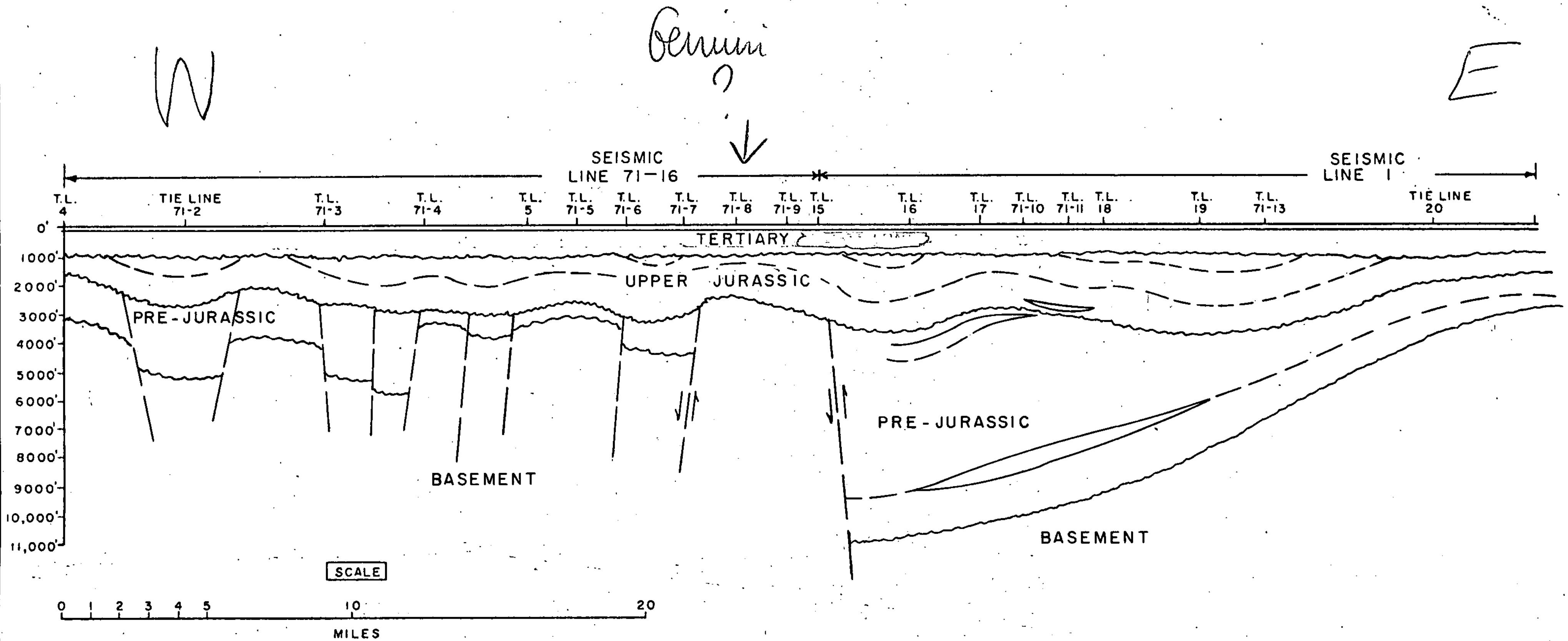



Fig. 11. Interpretive sketch East-West seismic lines 71-16 and 1 parallel to axis of Polda Trough.

?

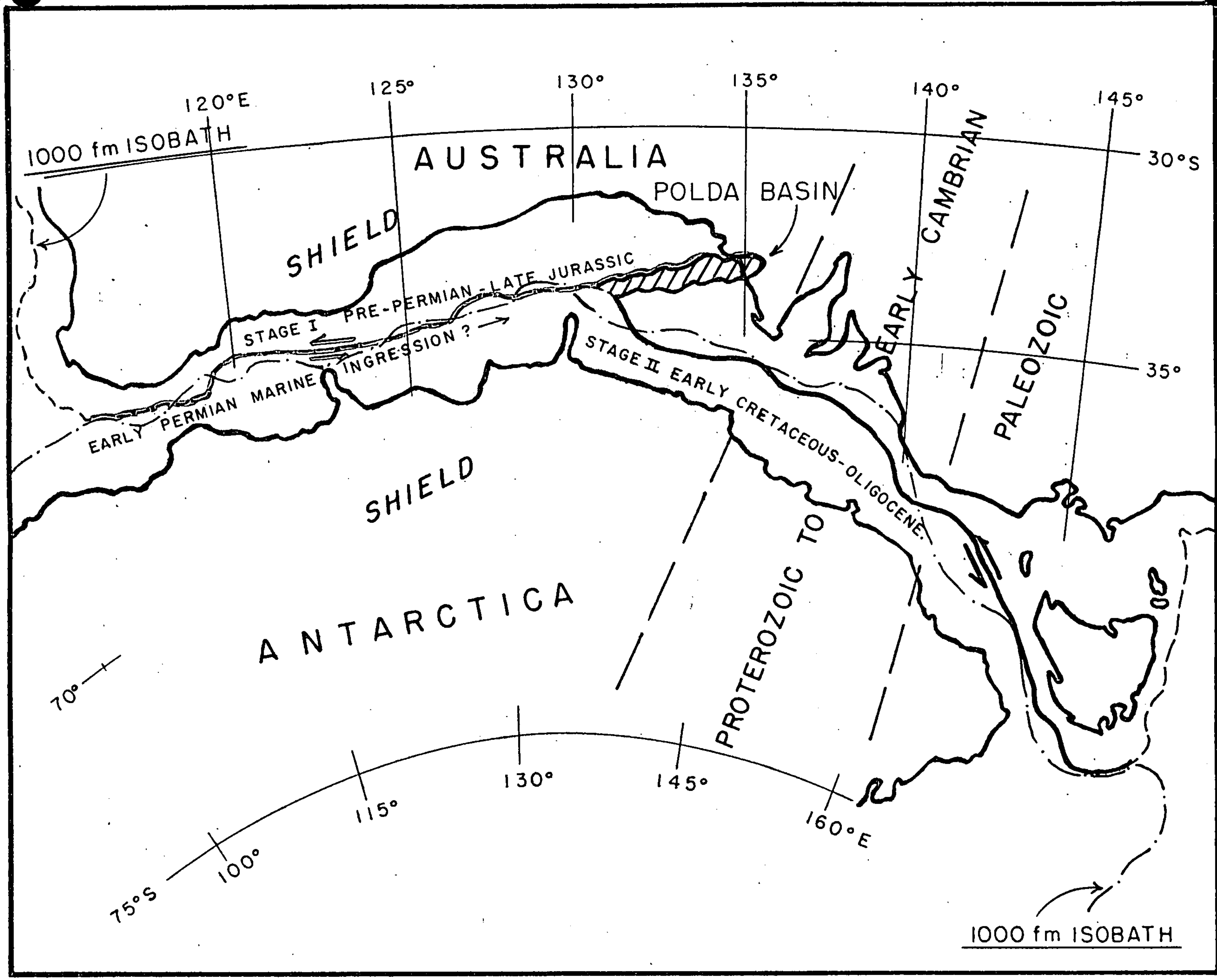
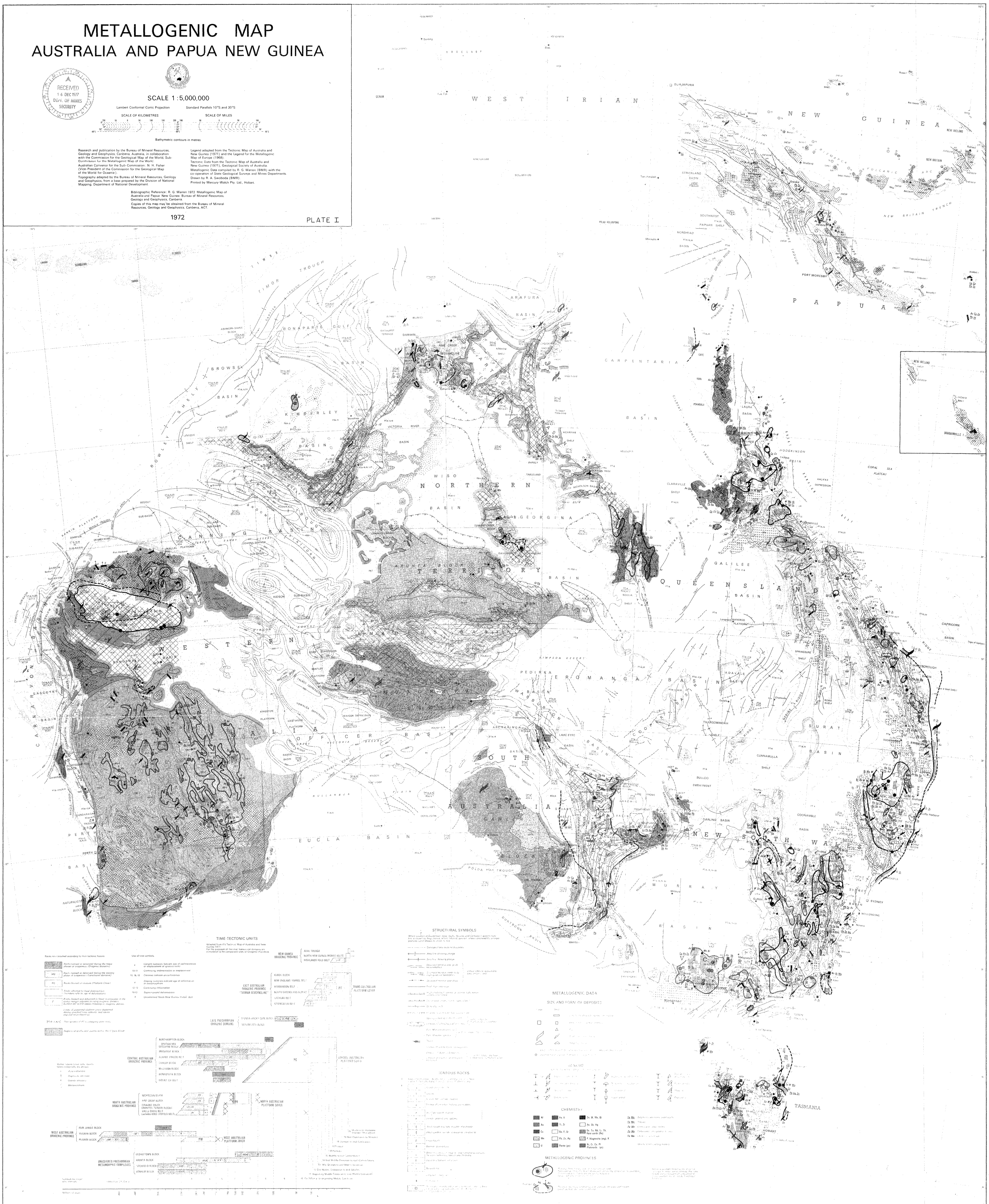



FIG. 12. Sketch showing original contact Australia - Antarctic continental plates along 1000 fathom Isobath or approximate edge of continental margins and general scheme of two stage rift development, involving Polda Basin in Stage I. Pre-Permian - Upper Jurassic. Stage II developed from Polda to southeast. Early Cretaceous - Oligocene.

0001147

Plate I 4030-7



# EAST POLDA TROUGH

SEISMIC LINE I
PLATE II

4030-8

CLIENT: BRIDGE OIL N.L.
LINE: 1
SHOT POINTS: 015-915
PROSPECT: EEP-13
LOCATION: OFFSHORE AUSTRALIA
PRESENTATION: DECONVOLVED 24 PT. STACK

**TELEDYNE EXPLORATION** — EAST

| FIELD DATA | PROCESSING INFORMATION | | PLAYBACK DATA |
|---|---|---|---|
| PARTY # 706 | DATUM PLANE SEA LEVEL | VELOCITY COMPUTED FROM VELOCITY ANALYSES & 100% | DATE 4-30-70 |
| INSTRUMENTS: [X] DIGITAL SDS 1010 | STACK MUTE .100-1.600 | | REEL # HR-884 HR-877 HR-681 |
| [ ] AM [ ] F.M. | DATA REDUCTION PROCESS | DECONVOLUTION [X] TV | |
| FILTER 10-100 | 1 FULL DYN RANGE RECOVERY | OPER LENGTH 240 MILS | ANALOG OUTPUT |
| AGC RATE BGR | 2 GAIN NORMALIZATION | CORR GATE(S) 200-2200, 1600-3600 | FILTER OUT-1/100 |
| SPREAD 800-5400 | 3 VELOCITY ANALYSIS | BND LMT 14-50 TIME 0-2.2 | AGC NONE |
| SP INTERVAL 100' | 4 NMO STATICS | BND LMT 10-50 TIME 1.6-4.0 | MIX NONE |
| GRP INTERVAL 200' | 5 STACK FOLD CDP | DIGITAL FILTER [X] TV | PRESENTATION DIGITALLY FILTERED DECONVOLVED 24 STACK |
| ENERGY AIRGUN | 6 DECONVOLUTION | L 24 H 60 TIME 0.000-1.000 | |
| REMARKS 3 IN. LINE | 7 DIGITAL FILTER | L 16 H 60 TIME 0.500-3.000 | REMARKS |
| | STATIC EDIT | L 10 H 40 TIME 2.500-4.000 | |
| | 8 OTHER DIGITAL AGC | L H TIME | |



OUTBACK OIL CO.
GEMINI NO. 1
TD 2932
(2 MILES NORTH OF LINE)

4030-9

# EAST POLDA TROUGH

SEISMIC LINE 71-10



PLATE III


PLATE IV

TARGET EXPLORATION PTY. LIMITED

POLDA BASIN

SECOND MARINE SEISMIC SURVEY

E.P.P. 13 SOUTH AUSTRALIA

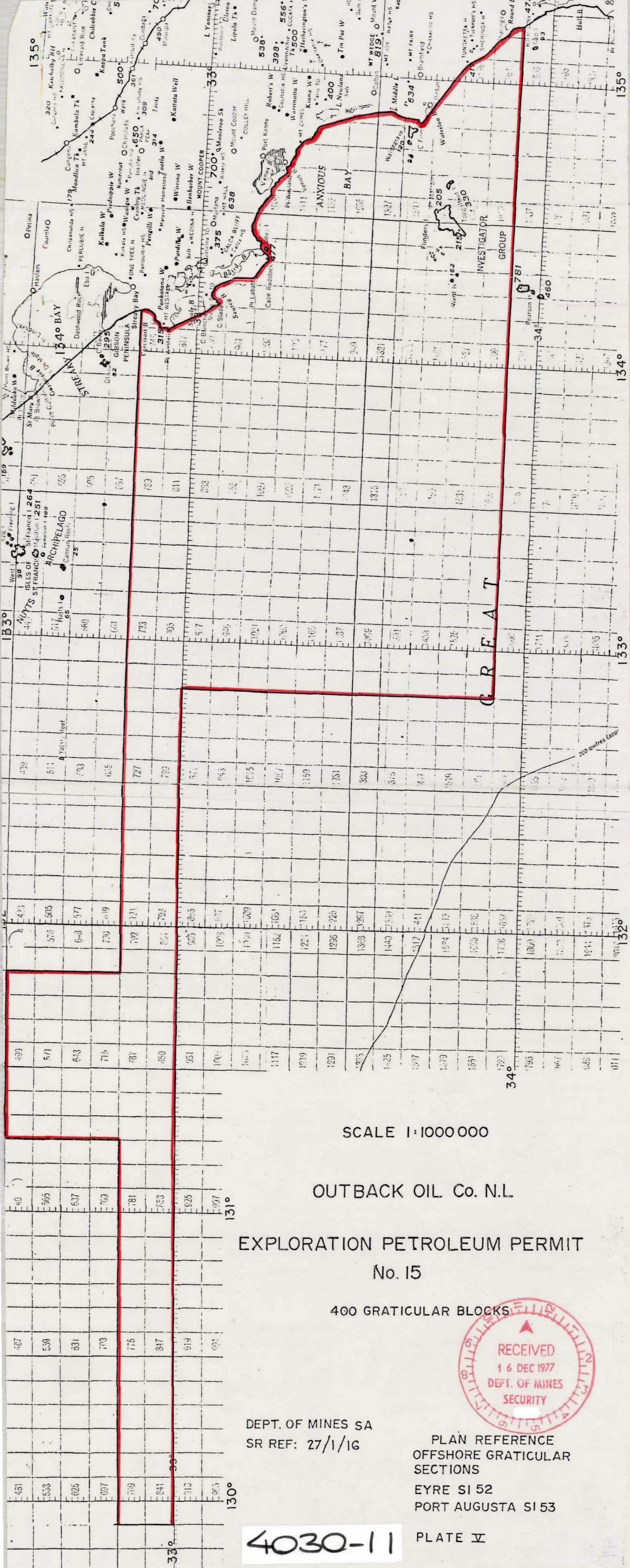
STRUCTURE CONTOURS

HORIZON A

INTERPRETED BY H. N. INGALL
AUSTRALIAN EXPLORATION CONSULTANTS PTY. LTD.
OCTOBER 1971



4030-10




SCALE 1:1000000

OUTBACK OIL Co. N.L

EXPLORATION PETROLEUM PERMIT

No. 15

400 GRATICULAR BLOCKS

RECEIVED
16 DEC 1977
DEPT. OF MINES
SECURITY

DEPT. OF MINES SA
SR REF: 27/1/16

PLAN REFERENCE
OFFSHORE GRATICULAR SECTIONS
EYRE SI 52
PORT AUGUSTA SI 53

4030-11

PLATE V