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Report EP-45307

INTERPRETATION REPORT:

MARINE GEOPHYSICAL SURVEY OFFSHORE SOUTHERN AUSTRALIA

CONDUCTED WITH M.V. PETREL

from 19 December 1972 to 18 April 1973

Prepared for

Shell Development (Australia) Pty Ltd

by

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Key words

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I. GENERAL INTRODUCTION

This report represents an evaluation by Shell's deep water exploration team of data collected during the 1972-3 survey by the M.V. Petrel in southern Australia. The survey covered the continental slope area from Perth in western Australia to Cape Howe in Victoria, and was laid out in the form of a zig-zag grid. The distance between the end points of the zig-zag varied but was normally of the order of 150 kms (Fig. 1). The lines involved comprise numbers N 314 (1)-N 325, N 330-N 333, N 400-N 417 and N 427-N 438. A total of 10,904 kms was surveyed.

A report of the operational aspects of the survey has already been submitted (Report EP-44811 of June 1973).

The seismic sections were obtained using a 1090 cubic inch airgun array with a working pressure of 2000 psi. Shipboard sections were displayed on a VAX near-trace playout, together with continuous magnetic and gravity profiles.

The interpretation was carried out by a team of geophysicists and geologists in the special deep-water evaluation team of SIPM under the direction of P. Lehner. Seismic sections were interpreted by A.D. Ingles and P. Allenbach of EP/13 and magnetic basement depths were computed by J. Adriaanse of EP/12. The geological interpretation was carried out by H. Doust of EP/13.

For the purposes of constructing depth maps and depth sections in the offshore area where there was little well or velocity control, the following velocity functions were employed throughout

water : 1500 m/sec
sediment : $(1650 + 0.75\ z)$ m/sec

The latter (the so-called Houbolt function) has been computed as an average for deeper water sediments by J. Houbolt of the Shell research laboratory, KSEPL at Rijswijk. It is thought that for levels deeper than 4 or 5 kms of sediment in parts of south Australia it may be rather fast, resulting in exaggerated thicknesses.

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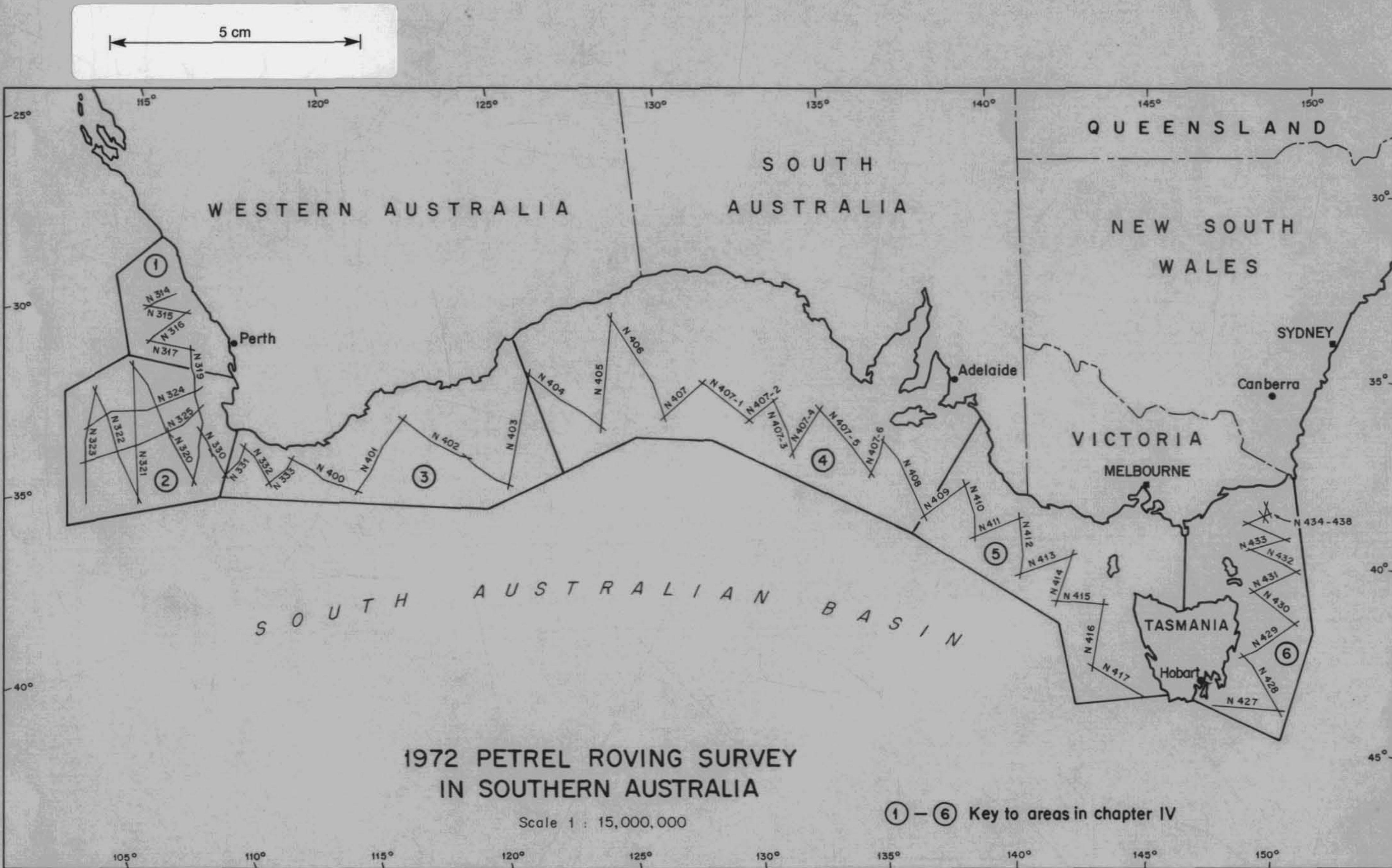

1972 PETREL ROVING SURVEY IN SOUTHERN AUSTRALIA

Scale 1 : 15,000,000

① – ⑥ Key to areas in chapter IV

Fig. 1

EP45307 G.62166

II. DISCUSSION OF THE BATHYMETRIC AND PHYSIOGRAPHIC MAPS (Encl. 1-6)

Southern Australia is characterised by physiographic provinces belonging to Atlantic-type continental margins. In their simplest form they comprise a shelf, slope and continental rise. Marginal plateaux, dividing the slope into upper and lower parts, are present in several areas : they probably formed as the result of subsidence of shelf areas and seem to be composed of downfaulted and downwarped areas of both relatively shallow basement (e.g. Naturaliste Plateau) and subsided sedimentary depocentres (e.g. Ceduna Plateau).

The shelf follows the coastal trend rather closely. It is generally characterised by very shallow basement and corresponds to a drowned peneplain surface of early Tertiary age.

The slope is usually steep, plunging from the shelf to bathyal depths within 50-75 kms. It seems to be defined by faults or fault systems parallel to the continental margin in most cases, but in the area of the Otway basin, where structural trends transect the slope at an angle, it is divided into spurs and re-entrants (Encl. 5). Generally speaking, the slope physiography is rugged, due to erosion and slumping. It is traversed throughout much of its length by erosion channels or submarine canyons. The latter are rather straight and are directed radially away from the coast. Although few have a sedimentary fill they probably form the channels by which sediment from rivers and the shelf reaches the continental rise and abyssal plains. Most are of small dimensions although the largest, the Murray Canyon, has a vertical relief of 2000 m (Conolly and v.d. Borch, 1967).

The continental rise, which lies at depths of 4000 to 5000 m, forms a gentle seaward-dipping province bordering the base of the continental slope. In general the topography is smooth but rather undulating.

A number of isolated abyssal plains are concentrated at the oceanward limit of the continental rise adjacent to the larger submarine canyons e.g. Perth, Gippsland.
An abyssal hills province, which resembles the abyssal plains, but which contains areas of exposed basement and hills may also be recognised. Swales, in which topographic relief is subdued by a thin sediment cover, border the abyssal plains and the continental rise.

South of the Naturaliste Plateau lies an area of irregular ridges and valleys, with a strong W-E linearity, that forms the Diamantina fracture zone. This is a feature that stretches from the Ninety East ridge in the west as far east as the Great Australian Bight. It seems to merge with the Australian continental margin in the area of the Beachport Plateau.

The largest of the <u>marginal plateaux</u> is the Naturaliste Plateau (Encl. 4). This comprises an east-west trending whaleback feature, lying at water depths between 2500 and 3000 m. The southern slope is relatively steep, forming a marginal scarp slope, but the northern slope shelves gently to oceanic depths. The plateau is partly separated from the southwest tip of Australia by a depression occupied by the continental rise.

The marginal plateaux of the Great Australian Bight show considerable variation in form and internal structure. The Eyre Plateau cannot strictly be considered as a plateau since it is not separated from the shelf by a slope : it is more properly referred to as deeper shelf. It overlies fault blocks with sedimentary fill. The Ceduna and Beachport plateaux are composed of thick wedges of deltaic sediment that have subsided, probably under load. They lie at depths between 500 m and 2000 m and replace the continental rise in areas where they are developed.

The East Tasman Plateau lies at depths of 2800 m-3500 m and is of low relief. As with the Naturaliste Plateau it is a low relief feature, partly separated from east Tasmania by a depression occupied by the continental rise.

III. STRUCTURAL AND SEDIMENTARY FRAMEWORK

1. General

The continental margin south of Australia is dominated everywhere by a primary tension-fault system that has caused areas of continental elevation to subside to deeper structural levels. The grabens and half-grabens that were formed during this subsidence have been filled with thick sequences of continental and deltaic sediments. At a later date these sediments were themselves deformed by renewed tension faulting, often giving rise to slump or synsedimentary fault patterns. The area is not at present undergoing deformation, the last major movements having occurred in early Tertiary times.

The Petrel survey was conducted with the object of investigating the structure of the transition zone between the continent itself and the ocean basins that flank it.

It was found that a considerable part of the continental margin of southern Australia overlies a linear depocentre that includes sediments up to 10 kms thick : on the shelf the sediments usually overlie shallow basement, but on the slope and continental rise a thick wedge or lens of sediment is present (isopach maps, Encl. 13-15). Below the outer parts of the continental rise and the abyssal plains the basement again becomes shallow and is of oceanic character. The portions of the surveyed area that lie to the west of Perth and east of Tasmania do not contain areas with thick sedimentary fill.

Plate tectonic models suggest that the south and east coasts of Australia were bordered by landmasses during the Palaeozoic to early Mesozoic (e.g. Griffiths, 1973) and that the ocean basins that now surround the continent arose as a result of the drifting apart of the Australian, Antarctic and New Zealand continental blocks during the late Mesozoic and Tertiary. It has been suggested that the tension fault systems that control the continental margin are related to collapse that accompanied the inception of this rift process.

2. Basement

It is possible to recognise two types of acoustic basement on the seismic sections:

(i) The first, which is considered to represent older continental rocks such as Pre-Cambrian or Palaeozoic metamorphics, is typified by a rough but flat, continuous and well defined bounding reflection, often displaced by normal faults (mainly antithetic).

(ii) The second type of basement usually appears as an envelope of diffraction curves. It is normally not faulted, but may be flat or form pronounced hills or ridges. It can generally be ascribed to a thick volcanic layer or to successive extrusion levels as indicated by magnetics. It forms the basement in the oceanic parts of the sections, where it is referred to as layer 2 of the crust. In some places the basement-boundary reflector shifts vertically in the sequence, and it cannot be regarded as a continuous horizon throughout the area.

3. <u>Sedimentary cover</u>

The sedimentary cover, which is mainly of Mesozoic to Tertiary age, is best-developed along a linear depocentre trend in the offshore area south of Australia. The thickness reaches a maximum below the slope and proximal continental rise (Encl. 13-15) and thins in both north and south directions against shallower basement.

In the areas of shallow continental basement the sediments are faulted with the basement to form tilt blocks, generally landward-dipping. On the continental slope where the sedimentary section is thin (e.g. Perth, E. Tasmania, Albany) the sediments have slumped extensively.

The areas of thick sediments below the plateaux, slope and rise have suffered systematic slope failure, manifested by mega-slumps, synsedimentary faults and related thrust faults. As more than one period of movement is recognisable the resultant structural picture is rather complicated. In its simplest form, however, a belt characterised by synsedimentary rotational faults may be seen below the continental slope around almost the whole of the Great Australian Bight (it is absent from the Perth, Naturaliste Plateau and east Tasmanian areas) (Encl. 7-9). Typically the faults are steep in the shallow parts of the sections and it is suspected that they flatten-out with depth, although this has not been directly observed.

Many of the faults are hard to distinguish from step faults as the sediments dip antithetically landwards in both cases, but in several areas growth is indicated by thicker sediments and anticlinal features in the downthrown block. Near the base of the slope and below the proximal part of the continental rise a band of low angle thrust-faults (toe thrusts) is present. The thrusts themselves are not readily distinguishable but can be recognised from the irregularity of the basement topography and from various landward-dipping interfaces (e.g. N 403-1 sp 1000, Encl. 17). They are regarded as being fairly constant features along the southern Australian margin.

In summary, passing from the shelf to the deep sea, the following structural zones are commonly recognised:

(i) A shelf area of shallow basement, often monoclinally dipping to the seaward, in which the sediments are involved with the basement in vertical normal faults of small displacement.

(ii) An area of block-faulting, giving rise to landward-dipping tilt blocks of Pre-Cambrian to Palaeozoic basement with local fills of tilted Mesozoic rocks. This forms deeper shelf areas or parts of marginal plateaux.

(iii) An area of thick sediments forming a linear depocentre trend parallel to the continental margin. It is characterised by elongate synsedimentary rotational faults parallel to the strike and hading seawards. This province forms the continental slope and parts of plateaux.

(iv) An area at the slope base where low angled thrust faults are present. They are directly related to the synsedimentary faults, with which they are assumed to be connected. 4-5 km of sediment is often involved in these growth fault-toe thrust couples, over a distance of 20-30 kms.

(v) The continental rise proper, characterised by rather undisturbed but slightly tilted sediments overlying a seaward-shallowing basement. It is bounded by the abyssal plain areas in which flat lying sediments overlie an oceanic basement.

IV. DISCUSSION OF REGIONAL GEOLOGY

1. Perth Basin Area*

The Perth Basin comprises a N-S to NNW-ESE trending graben complex lying adjacent to the continental margin of western Australia. It is thought to have come into existence during the early Mesozoic. In the offshore shelf area, a number of NE-SW trending ridges and basins have been recognised by WAPET and these have been interpreted as continuing into the deeper water area as far as the base of the slope (Encl. 7). On all of the Petrel seismic sections the sedimentary sequence is thin. It is partly absent from zones of the slope, where it has been removed by slumping and erosion.

The sedimentary sequence represented on the isopach map (Encl. 13) overlies a prominent regional unconformity of Neocomian age that is recognisable in the Perth basin (Brown et al., 1968) and probably correlates with the age of the basement in the deep sea (GC. 259). It onlaps onto a sharp relief that probably had a similar configuration as at the present-day.

At the landward ends of the lines, reflections can be seen below the unconformity : they mostly dip in a landward direction (Encl. 16, N 316) and are thought to represent Permian and Triassic deposits lying close to the western rim of the Perth basin proper. A trough-like area seen on lines N 311 and N 312 (Encl. 7), however, may represent a separate sub-basin. Pre-Cambrian metamorphic basement is thought to underlie the regional unconformity in the lower part of the slope.

Towards the seaward ends of the lines the pre-Neocomian is composed of a flat or nearly flat-lying volcanic basement that seems to onlap the continental basement at the base of the slope. Isolated reflections in this basement are parallel or subparallel to the unconformity surface. The crustal structure in the offshore area is thought to be of normal oceanic character (Francis and Raitt, 1967).

The post-Neocomian period has been marked by quiet deposition in deep waters - possibly at very much the same depths as at the present-day. The isopach map (Encl. 13) shows that with the exception of basinal or valley-like areas in the unconformity surface, the sediments are rather thin. The entire section penetrated in GC.259 consists of deep-water clays, although large intervals are not represented (e.g. KU, EOM-PL), a fact attributed to local current activity or slumping.

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* The interpretation of this area includes data from a number of lines observed during Shell's 1971 survey in northern and western Australia (Report EP-44157II).

On the upper part of the slope and in the Perth basin itself the Neocomian-Albian section may be seen onlapping sharp relief. Later sediments, both shallow water limestones and deeper water marls and clays follow the pre-existing relief with general conformity.

2. Naturaliste Plateau

The Naturaliste Plateau is an area of gentle relief composed of folded and faulted lower Mesozoic rocks overlain by a thin section of Upper Cretaceous to Tertiary. It is similar in structure to the Broken Ridge. A marked unconformity, similar to that recognised in the Perth Basin is present and is thought to be of the same, Neocomian, age.

On the seismic sections discontinuous reflections representing the pre-Neocomian are aligned into a series of broad anticlines and synclines with gently dipping flanks. The total thickness of the pre-Neocomian is probably variable, but in some basinal areas it certainly exceeds 2000 m. A minimum thickness of about 1000 m is present, however, over much of the plateau area.

In a number of places, reflections are absent below the unconformity (normally where shallow magnetic basement picks have been obtained), indicating high basement, intrusions or volcanics. The composition of the sequence is unknown but it is thought, by analogy with the Perth Basin, to represent Triassic to Lower Cretaceous sediments of lacustrine or marginal marine facies. It is anticipated that parts of the plateau may have been emergent for at least part of the time.

The structural trends in the pre-unconformity sediments lie between NNW-SSE and NW-SE (as in the offshore Perth Basin). Anticlinal areas that correspond to high basement picks may, however, be due to local intrusions (e.g. N 321 sp 4900, Encl. 16). Signs of intra-basement unconformities are rare, but true basement may be present, for instance, at 4400 m depth on N 323, sp 3650 (Encl. 16). Basinal areas may correspond to grabens, as in the Perth Basin.

To the north of the Plateau the pre-Neocomian basement gradually assumes a hilly volcanic aspect with occasional reflections subparallel to the sea floor (N 323, sp 7000-7500, Encl. 16) and it is difficult to define the point at which the character changes. To the south of the plateau, however, the volcanic basement gives rise a very rugged topography and seems to terminate against a scarp at the southern boundary. GC.264, drilled near the edge of this scarp bottomed in volcaniclastics of Neocomian (?) age.

The oldest recorded post-unconformity sediments are of Albian age (GC.258). They onlap onto the pre-existing relief and are subhorizontally bedded. The oldest sediments are present only in the basinal areas and are possibly composed of glauconitic sands of Neocomian to Albian age (e.g. N 321, sp 5000-6000, Encl. 16) : the top of this sequence may have been penetrated at the very base of GC.258. The overlying sequence passes up from Albian to Cenomanian clays into Upper Cretaceous to Recent chalks and oozes of deeper water origin. There are numerous hiatuses in the succession, probably due to current controlled deposition/erosion. At core hole RC 8-56, Turonian chalks are found 100 cm below the sea floor. The fauna indicates that deep sea conditions were already achieved by Middle Albian times, and there are few signs of post Middle Cretaceous deformation. The clays at the base of the sequence probably form much of the thicker sections visible in the basinal areas (Encl. 7, 13). Cross-bedding (N 324-1, sp 2300-2400, Encl. 16) and unconformities (N 324-1, sp 300, Encl. 16) probably indicate local high energy slope environments and slight tilting.

3. Albany-Esperance Area

In this area the tectonic trends follow the east-west trend of the coastline. The slope is steep and is characterised by deep erosion channels and slumps.

Below the Neocomian unconformity Pre-Cambrian metamorphics of 5.6 km/sec seismic velocity underlie the shelf along much of the area. Off the southern end of the Perth Basin, however, nearly 2000 m of tilted sediments, probably of Permian to Lower Mesozoic age, may be seen both on the shelf and in deeper water (where they have been downfaulted).

At the seaward ends of the sections, the basement is of volcanic character and has a layer 2 velocity (5.5 km/sec in V.16.37, Hawkins et al., 1965). Near the slope base it seems to onlap the pre-unconformity basement (e.g. N 400, sp 2000-3000, Encl. 17). Magnetic basement picks from the unconformity level higher up the slope and on the shelf, together with outcrops of Neocomian tholeiite (Bunbury Basalt, Veevers and Evans, 1973), suggest that volcanics cover several parts of the continental margin.

The post-Neocomian sediments may be divided into three units. The lowest is only present locally on the slope and may be absent from the deep water. It is thought to represent the Neocomian to Albian interval but is not always distinguishable from below and has been excluded from the isopach map (Encl. 13, 14).

The middle unit, which is thought to be of Upper Cretaceous to Palaeocene age, comprises the bulk of the post-Neocomian section. It has been involved in slumps and seaward-dipping antithetic synsedimentary faults on the slope and generally dips landwards in a counter direction. At the base of the slope there are some indications of small toe thrusts (e.g. N 403, sp 3350 Encl. 17). Below the continental rise the unit dips gently to the seaward and shows the effects of slight tilting and faulting, possibly due to compaction or intrusion. The sediments probably consist of clays or marls on the slope and turbidites on the continental rise (where a maximum thickness of 2000 m is developed). They are thought to have a seismic velocity in the range of 3-4 km/sec.

The uppermost unit probably represents deep water sediments, mainly limestones and marls, of Eocene to Miocene age. It is usually less than 500 m thick and thins gradually towards the south where it onlaps the volcanic basement. It is almost completely undeformed but is truncated by erosion, especially on the slope.

4. Great Australian Bight

In the Great Australian Bight the structural trends follow those of the continental margin, but are complicated by the presence of a thick wedge of sediments below the Ceduna Plateau.

Much of the shelf area is characterised by steep magnetic gradients and is occupied by very shallow Pre-Cambrian and Palaeozoic basement. The plateau and slope are formed on a foundation of landward-tilted basement that has been divided into linear blocks by normal faults with a vertical throw of up to 7 kms. Upon this foundation fluvio-marine sediments were deposited along a linear trend. To the seaward the basement gradually becomes shallower again and eventually, at the southernmost ends of the lines, lies just below the sea floor.

An irregular ridge of acoustic basement lies at the seaward limit of the Ceduna Plateau (e.g. N 407, sp 2000-3000, Encl. 17, also Encl. 8). Its composition is unknown, but it is thought that the following possibilities exist:

(i) It represents a ridge of downfaulted crystalline basement similar to those farther to the north.

(ii) It represents buried relief of older Mesozoic rocks.

(iii) It represents a slump-mass or toe thrust belt that came into existence before the deposition and deformation of the Upper Cretaceous cycle, under which it lies.

Of these possibilities, the last (iii) is preferred in view of the structural position, the fact that it is penetrated by younger synsedimentary faults, and from correlation with the area to the north (line N 407, Encl. 17). The ridge has no magnetic or gravity expression and possibly consists of slumped Lower Cretaceous lacustrine rocks.

The volcanic horizon that forms the oceanic basement farther to the south passes landwards into a reflector that seems to onlap onto the relief of the ridge discussed above.

The basinwide Neocomian unconformity recognised in Western Australia is not so well developed in the Bight area. The major unconformity visible at the landward ends of the sections lies above crystalline basement, and the sedimentary sequence probably ranges from Jurassic to Cenozoic. Below the slope and continental rise a basal unconformity is not usually traceable and the deepest continuous reflections may arise from the Upper Cretaceous. The Cretaceous to Tertiary sequence is affected by rotational synsedimentary faults in the area of the Ceduna Plateau - these give rise to a belt of long, linear, convex-to-the-land faults that follow the continental margin for several hundred kilometres. In the downthrown (seaward) blocks anticlinal features are common (e.g. N 407, sp 2450, Encl. 17) and growth is often observed (e.g. N 407-2, sp 1700, Encl. 18). The faults affect the areas of thickest sediment accumulation and are absent from areas of shallow basement. Below the slope, they penetrate the features interpreted as possible slumps or toe thrusts (see p. 10) of Lower Cretaceous rocks and farther to the seaward pass into a belt of slope base thrust faults. The Lower Tertiary section, which overlies a well defined regional unconformity in the deeper water areas, truncates this belt of thrusts and is undisturbed.

Upper Cretaceous sediments reach considerable thicknesses below the Ceduna Plateau. They were deposited under fluviomarine conditions and, on the shelf, may be seen to comprise megaforeset cycles representing separate phases of deltaic growth. It is thought that more distal fluvio-marine environments occur in the deeper water area. The collapse of the continental margin that preceeded this depositional phase is most likely to have taken place in Neocomian or Albian-Cenomanian times. If the former is the case, the Neocomian-Albian section below the plateau will most probably be of the same facies as the Upper Cretaceous (i.e. fluvio-marine) and the acoustic basement ridge (p. 10) may represent a toe-thrust belt. If, on the other hand, the collapse took place in Albian-Cenomanian times then it is most likely that the Lower Cretaceous is, like the Jurassic and lowermost Cretaceous, of lacustrine facies (as on the shelf) and that the acoustic basement ridge represents a gravity-induced slumped mass.

Tertiary turbiditic sediments of the continental rise onlap against relief to both the north and south. Subsequent tilting and faulting have created a slight slope and led to some erosion. Tertiary sediments on the shelf and continental slope comprise relict calcareous sands and oozes respectively (Conolly and v.d. Borch, 1967). Buried channels and canyons together with other signs of current controlled deposition can be seen in the Eocene to Quaternary succession (v.d. Borch, 1967).

5. Offshore Otway Basin and West Tasmania

In this area the structural trend swings from NW-SE to N-S, following that of the continental margin. The depocentre in the deeper water area is separated by a shallow basement ridge from the Otway and Bass basins and has had an independant geological history.

In the area offshore from the Otway Basin the structural trends in the Upper Cretaceous and Tertiary are similar to those of the Great Australian Bight : passing from landward to seaward, block-fault, synsedimentary fault and thrust fault trends may be seen. A well-developed base Tertiary unconformity separates a seaward-dipping Palaeocene cycle from the faulted and eroded Upper Cretaceous. The later Tertiary deposits overlie a second unconformity, but have been eroded from the shelf and upper slope. Below the continental rise they onlap both landwards and seawards suggesting that they were deposited as turbidites in an abyssal plain environment.

In the deeper sea area west of Tasmania the tectonic style is much simpler than to the north-west. The slope is very gentle and the base Tertiary unconformity is rather flat. In addition the Upper Cretaceous is affected by synsedimentary faults of small throw only, and there are few signs of coupled thrusts. Both the Upper Cretaceous and Palaeocene probably comprise megaforeset cycles - such a feature can be clearly seen in the Palaeocene on N 414 (Encl. 19).

On two lines west of Tasmania the landward ends of the lines (N 416, N 417, Encl. 19) show a steeply dipping flank of shallow basement. Landward dips seen within this basement (e.g. N 416, sp 1100, Encl. 19) may represent an older Mesozoic section. GC.282, drilled about mid-way between the seaward ends of Petrel lines N 416 and N 417 penetrated pre-Upper Eocene basalt at 300 m below the sea floor. This suggests that the unconformity at the top of the Palaeocene corresponds to a basalt layer - perhaps of the same age as the "Older Basalts" of Victoria.

6. East Tasmania and Offshore Gippsland Basin

East of Tasmania the basal unconformity visible on the sections lies within the Upper Cretaceous (GC.283). The continental basement forms a series of linear north-south trending step-faulted blocks of pre-Mesozoic basement with occasional wedges of landward-dipping continental sediments (? Lower Cretaceous) e.g. N 427, sp 750, Encl. 19). This kind of basement probably also underlies the east Tasman Plateau. At the base of the continental slope the basement changes abruptly to one of volcanic character and is buried below an abyssal plain.

Throughout the area the Upper Cretaceous to Tertiary section is thinner than along the margin of southern Australia (Encl. 15) and is basically undisturbed. The lower part, however, shows slight basinward dips below a minor unconformity e.g. N 427, sp 1100 (Encl. 19). Within the succession volcanic horizons, marked by bundles of diffractions, may be seen in the lower part on some lines e.g. N 427, sp 1800-2200 (Encl. 19). In addition, horizons marked by discontinuous, but well-developed reflections occur, for example on N 431 (Encl. 19). They may result from the load of more competent turbiditic horizons over deep sea clays. Signs of possible clay diapirism may be seen on N 430, sp 2600.

The Gippsland Basin forms an east-west trending block-faulted graben filled with Permian to Cenomanian continental sediments. Its cuts across the trend of the continental margin and the proximal part is filled with a deltaic sequence of Upper Cretaceous sediments. Transgressive carbonates of Tertiary age unconformably overlie the entire basin area and blanket the existing relief. At the seaward end of the basin, the sediments thin towards a submarine canyon system in front of the buried delta. In the deep sea the basement rises to a shallower level and is overlain by Neogene sediments of the Tasman Abyssal Plain.

V. SUMMARY OF GEOLOGICAL HISTORY

The structure of the continental margin south of Australia arose as a result of block faulting and regional downwarp. The dating of these movements has been interpreted as follows:

1. Western Australia : the Block faulting that created the Perth Basin graben took place in the Lower Mesozoic (p. 7). The Regional downwarp that created the structural framework has been dated as Neocomian (Brown et al., 1972) while the ocean basement west of Perth is thought to be of Neocomian to/or Albian age (GC.257, 259).

2. Southern Australia : Block faulting began in Jurassic times, while the Regional downwarp may have taken place in Neocomian and/or Albian times (p.11). The ocean basement south of Australia is regarded, on the evidence of magnetic lineations, as being of Palaeocene to Quaternary age (55-0 my, Sutherland et al., 1973), the Palaeocene part being adjacent to the continental margin.

3. Eastern Australia : the initial block faults formed during the Upper Jurassic or Lower Cretaceous. The regional downwarp is thought to have taken place during the Upper Cretaceous and the ocean basement of the Tasman Sea is reported to be of Senonian age (80-65 my, Sutherland et al., 1973).

The sequence of geological events associated with these movements may be summarised as follows:

(1) Block faulting leading to the formation of an initial graben or rift valley. This seems to have taken place in Lower Mesozoic times in the Perth Basin and in Jurassic (?) times in the Great Australian Bight and in Gippsland. In the Perth area the graben had a NNW-SSE trend and in southern Australia individual grabens have an E-W or NW-SE trend.

(2) Following the graben formation a thick sequence of mainly continental to coastal clastics were laid down (up to 10 km in the Perth Basin, Encl. 16) during the Triassic to Lower Cretaceous (Neocomian in the Perth Basin and Neocomian (?) or Albian in the Great Australian Bight and farther to the east).

(3) The graben fill stage was terminated by a phase of regional downwarp along very much the same trend, the main features of which were:

(a) Block faulting and tilting of basement blocks together with their sedimentary fill, where present,
(b) collapse to oceanic depth of those blocks adjacent to the present continental margin,
(c) slope failure and sediment slumping along the scarp slope so formed, and

(d) extrusion of volcanics in areas of oceanic depth. This formed a new basement, that onlaps onto the foundered basement blocks at the slope base.

These movements probably spanned a considerable period of time : In the Perth Basin the initial block fault movements took place at the end of the Jurassic and continued until the period of major downwarp in the Neocomian. At the same time volcanic extrusions formed the adjacent ocean floor. In part of the Great Australian Bight downwarping of fault-blocks may have taken place along the axis of a pre-existing graben, and been followed by slumping of the older sedimentary fill (p.11). Downwarp in the Great Australian Bight may have taken place during the Neocomian or during the Albian to Cenomanian as in S.E. Australia.

(4) A phase of clastic deposition in the form of deltaic build-out into an open marine basin and general infill in relief. This spanned the Neocomian to Turonian interval in western Australia, and the Albian to Upper Eocene farther to the east. It was characterised by continued downwarp and subsidence.

Deposition of thick sedimentary sections took place in the Great Australian Bight and in the Gippsland Basin graben, adjacent to contemporary drainage systems. The Western Australian and Tasmanian areas that lay adjacent to uplands with immature drainage patterns received relatively little sediment, and the Naturaliste Plateau none at all.

Deposition of fluvio-marine cycles was concentrated off the coast adjacent to South Australia. Where thicknesses are in excess of 2000 m, the load later led to phases of slope failure and growth faulting. Elsewhere on the slope and continental rise clays and silts of distal-foreset to bottomset facies or turbiditic sequences are likely to be most common.

(5) The depositional phase was terminated by a series of marine transgressions that flooded large areas of peneplained land surface and arrested the drainage system. Clastic deposition ceased and current-controlled sedimentation, mainly of open marine chalks and calcareous sandstones, commenced. There are many hiatuses in the succession (e.g. much of the Neogene) but deposition seems to have been fairly widespread in, for instance, the Quaternary.

The most important transgressions were regional, and took place during the Turonian (Perth Basin) and at the end of the Eocene (e.g. Gippsland Basin). The sediments form a thin blanket over the shelf and upper slope and are basically undisturbed. Erosion from the slope, shelf and land areas has provided material for turbidity current deposition in the abyssal plains. This last phase corresponds to a stage of oceanic circulation.

Plate tectonic models associate this geological history with the fragmentation of a super-continent, Gondwana (e.g. Laughton et al., 1972). It has been proposed that southern Australia lay adjacent to part of Wilke's land in Antarctica, and that eastern Australia lay adjacent to the Lord Howe Rise (e.g. Griffiths, 1973). The block faulting and graben formation have been linked with the beginning of movements that led to the rupture and fragmentation of this continental mass, while the inception of rifting is correlated with the phase of regional downwarp and creation of new oceanic crust in the ocean basins adjacent to the Australian continental margin.

- o -

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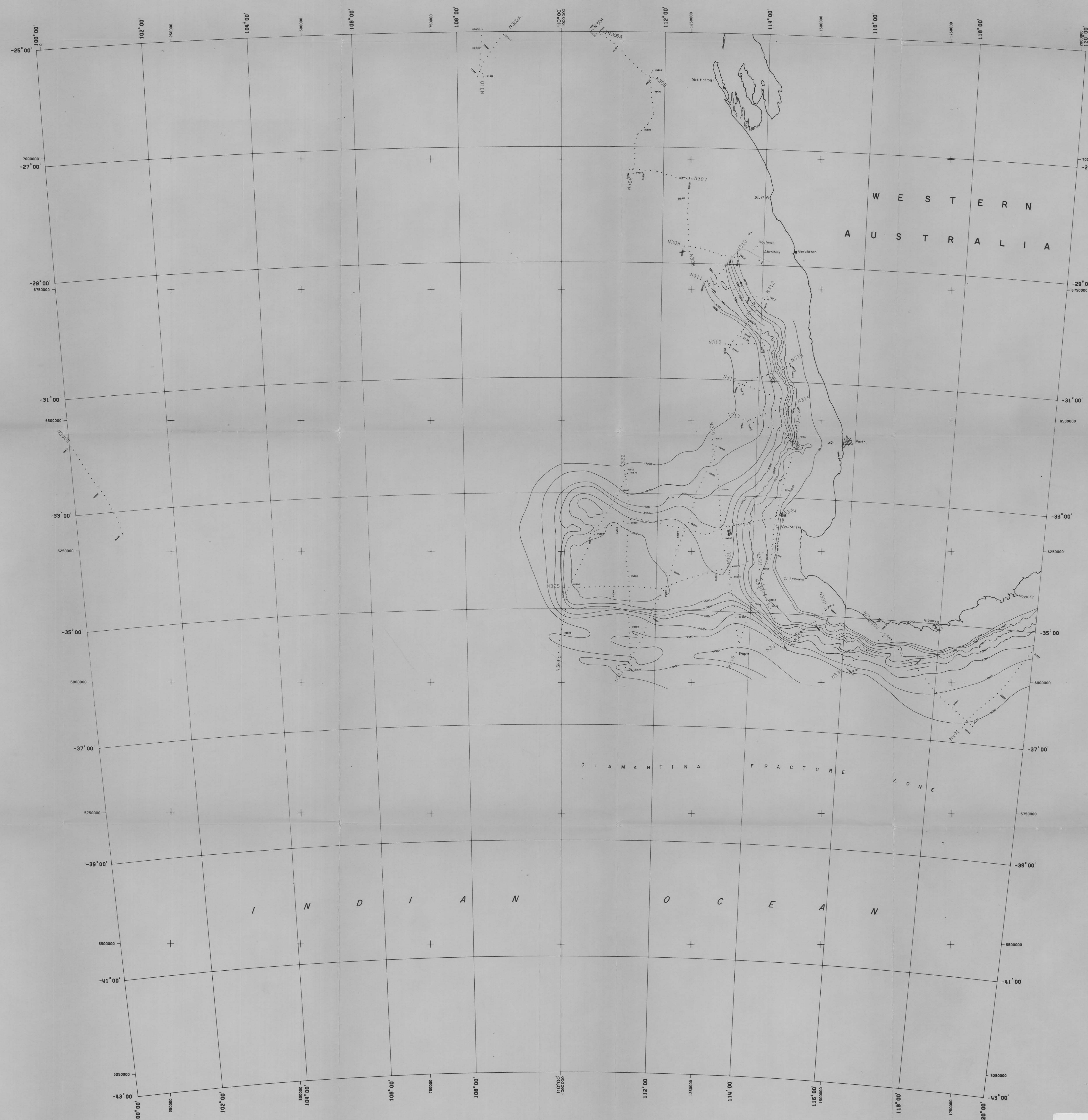
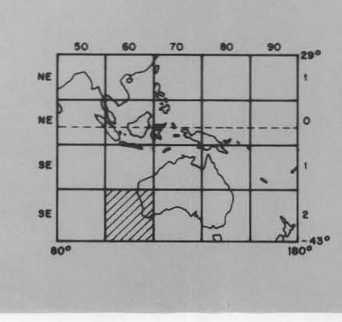
SE 62





T.M. PROJECTION   C.M. 110°   SCALE FACTOR 0,996
INTERNATIONAL SPHEROID

BATHYMETRY IN METRES
contour interval 500 m
(the 200 m isobath has been added)

- 0 – 1000 m
- 1000 – 2000 m
- 2000 – 4000 m
- 4000 – 6000 m

Bathymetry is derived from Petrel 1973 Survey, using a constant water velocity of 1500 m/sec.

Bathymetric trends were derived from the Bathymetric map of the Southeast Indian Ocean by D.E. Hayes & J.R. Conolly 1971 (unpublished)

041024

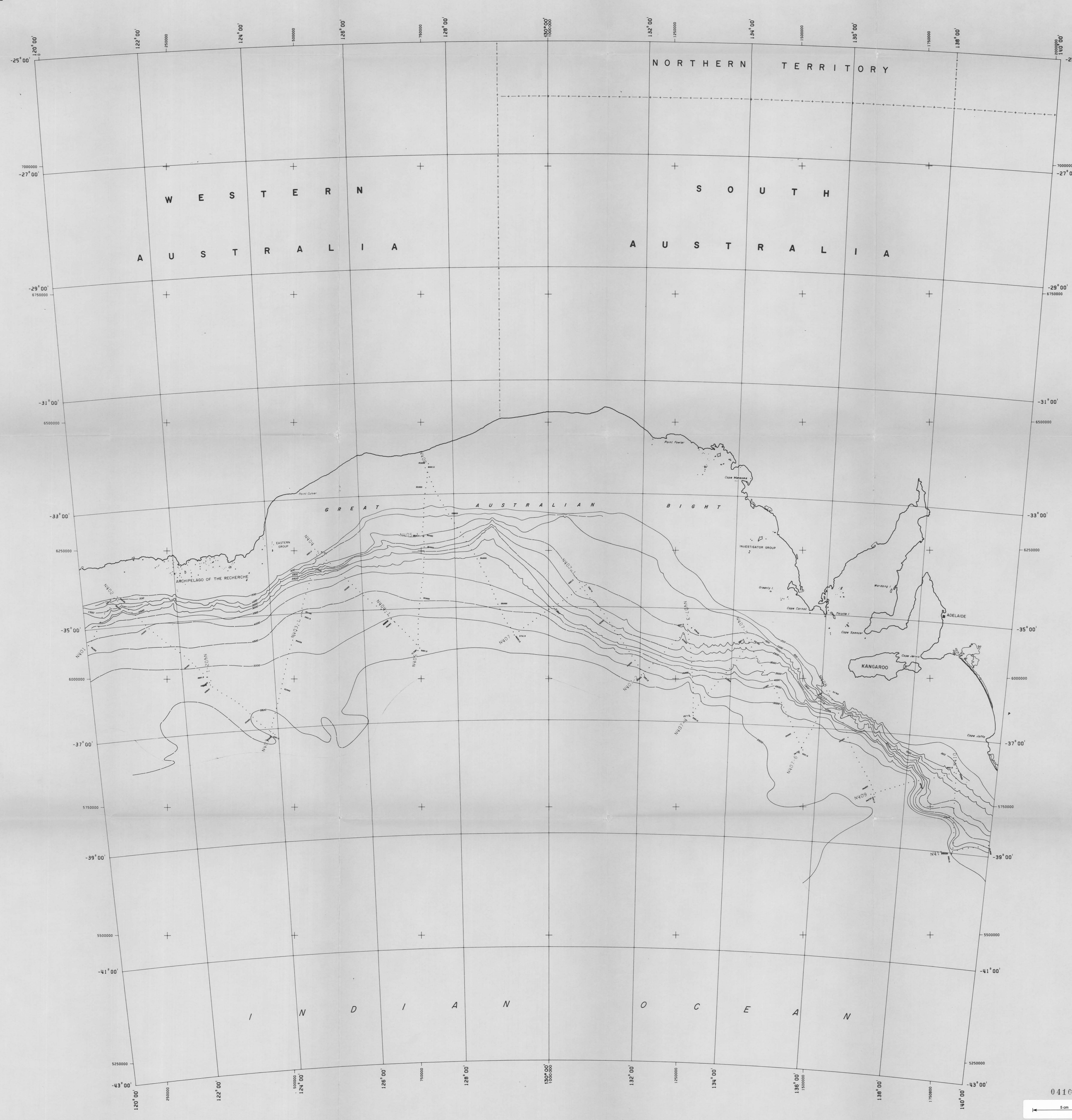
5 cm

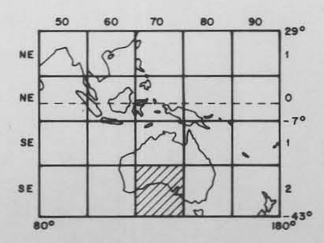
SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.W. AUSTRALIA BATHYMETRY SHEET SE 62 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 1	Date: December 1973
Report No.: EP 45307		Draw. No.: G.62128/1

OR-088

1

SE 72





T.M. PROJECTION C.M. 130°
INTERNATIONAL SPHEROID
S.F. 0.996

BATHYMETRY IN METRES
contour interval 500m
(the 200m isobath has been added)

- 0 - 1000 m
- 1000 - 2000 m
- 2000 - 4000 m
- 4000 - 6000 m

Bathymetry is derived from Petrel 1973 Survey, using a constant water velocity of 1500 m/sec.

Bathymetric trends were derived from the Bathymetric map of the Southeast Indian Ocean by D.E. Hayes & J.R. Conolly 1971 (unpublished)

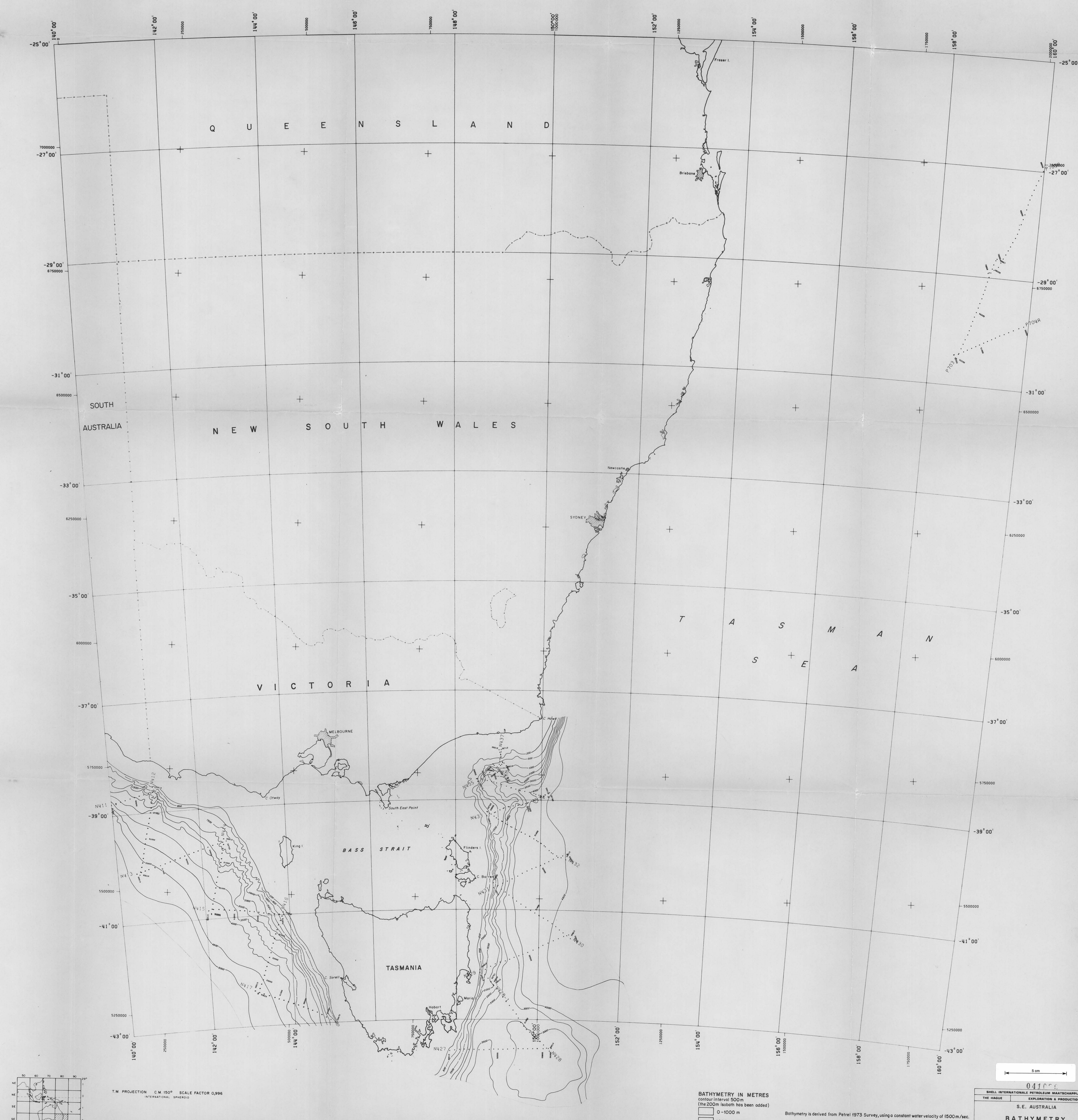
041025

5 cm

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
GREAT AUSTRALIAN BIGHT **BATHYMETRY** **SHEET SE72** Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 2	Date: December 1973
Report No.: EP 45307		Draw. No.: G.62128/2

OR-088

SE 82



5 cm

BATHYMETRY IN METRES
contour interval 500 m
(the 200m isobath has been added)

- 0 - 1000 m
- 1000 - 2000 m
- 2000 - 4000 m
- 4000 - 6000 m

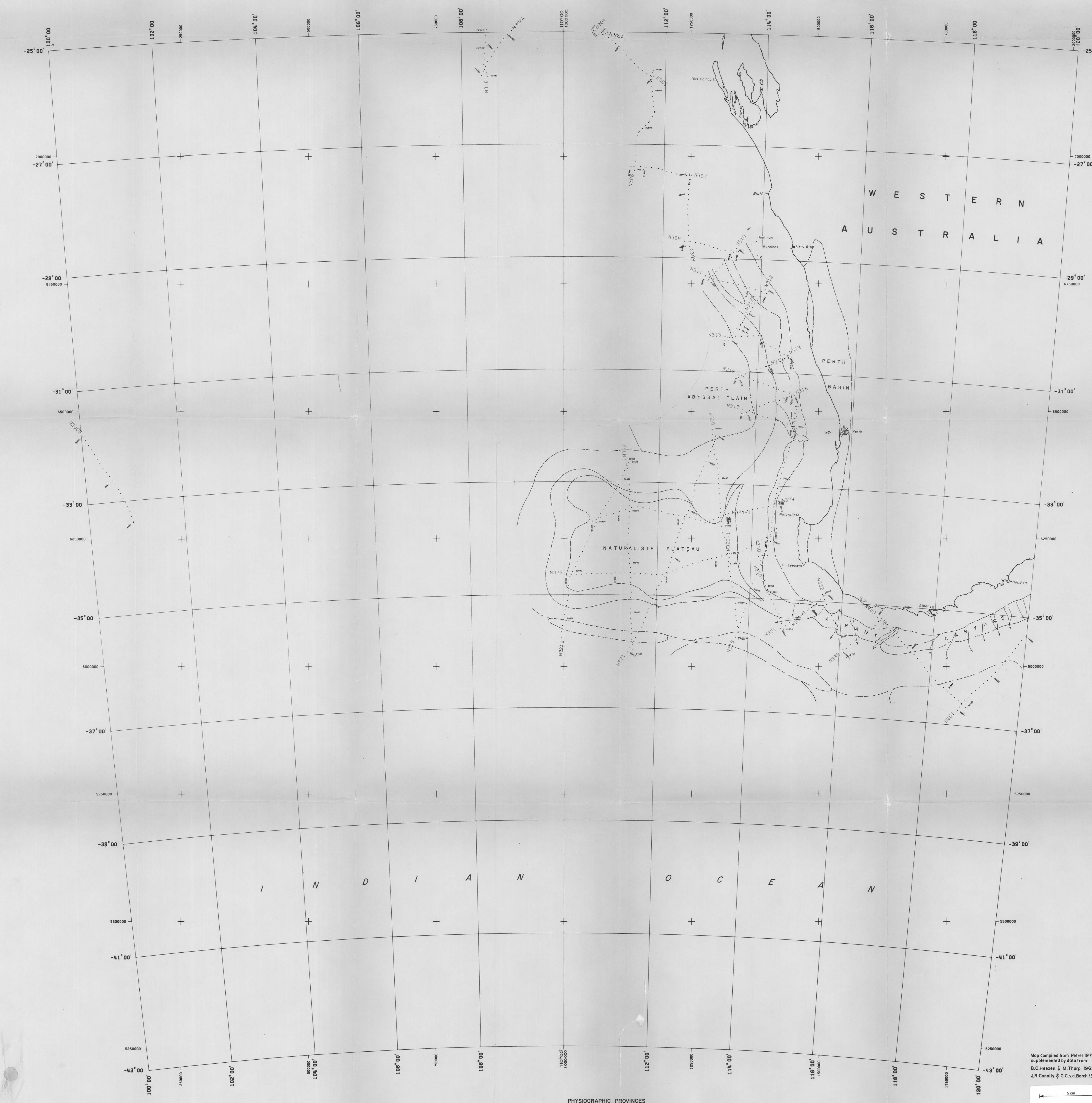
Bathymetry is derived from Petrel 1973 Survey, using a constant water velocity of 1500 m/sec.

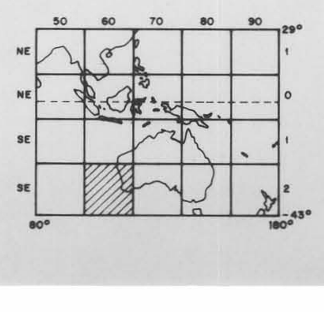
Bathymetric trends were derived from the Bathymetric map of the Southeast Indian Ocean by D.E.Hayes & J.R.Conolly 1971 (unpublished)

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.E. AUSTRALIA BATHYMETRY SHEET SE 82 Scale 1:2,500,000		
Author: H. Doust	Encl.: 3	Date: December 1973
Report No.: EP 45307		Draw. No.: G. 62128/3

OR-088 3

SE 62





T.M. PROJECTION C.M. 110° SCALE FACTOR 0,996
INTERNATIONAL SPHEROID

PHYSIOGRAPHIC PROVINCES

Continent : Older rocks	Continental Rise
" : Sedimentary basins	Ridges
Shelf (Continental Margin)	Abyssal Hills
Slope "	Abyssal Plain
Plateau "	Swale
Trough/Canyon "	Path of Canyon

The boundary within the shelf province marks a break in slope; it separates an inner shelf area from an outer shelf area.

Map compiled from Petrel 1973 Survey data supplemented by data from:

B.C.Heezen & M.Tharp 1965

J.R.Conolly & C.C.v.d.Borch 1967

5 cm

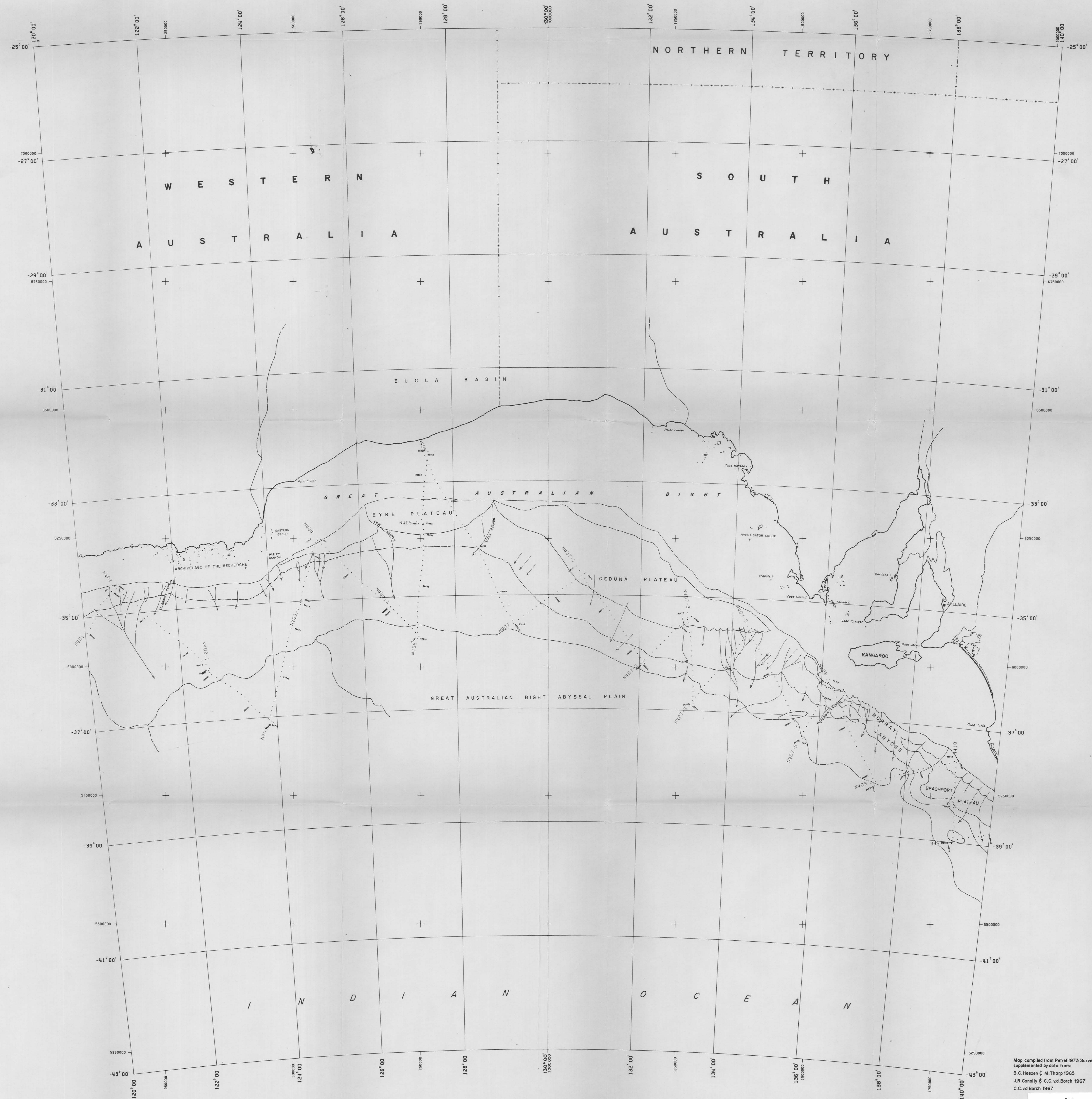
041027

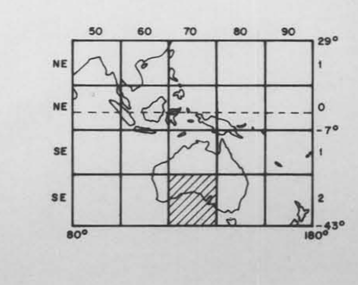
SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.W. AUSTRALIA MARINE PHYSIOGRAPHY SHEET SE 62 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 4	Date: December 1973
Report No.: EP 45307		Draw. No.: G.62128/4

OR-088

4

SE 72





T.M. PROJECTION C.M. 130°
INTERNATIONAL SPHEROID
S.F. 0.996

PHYSIOGRAPHIC PROVINCES

- Continent : Older rocks
- " : Sedimentary basins
- Shelf (Continental Margin)
- Slope "
- Plateau "
- Continental Rise
- Ridges
- Abyssal Hills
- Abyssal Plain
- Path of Canyon

The boundary within the shelf province marks a break in slope; it separates an inner shelf area from an outer shelf area.

Map compiled from Petrel 1973 Survey data supplemented by data from:
B.C.Heezen & M.Tharp 1965
J.R.Conolly & C.C.v.d.Borch 1967
C.C.v.d.Borch 1967

041028

5 cm

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	

GREAT AUSTRALIAN BIGHT

MARINE PHYSIOGRAPHY

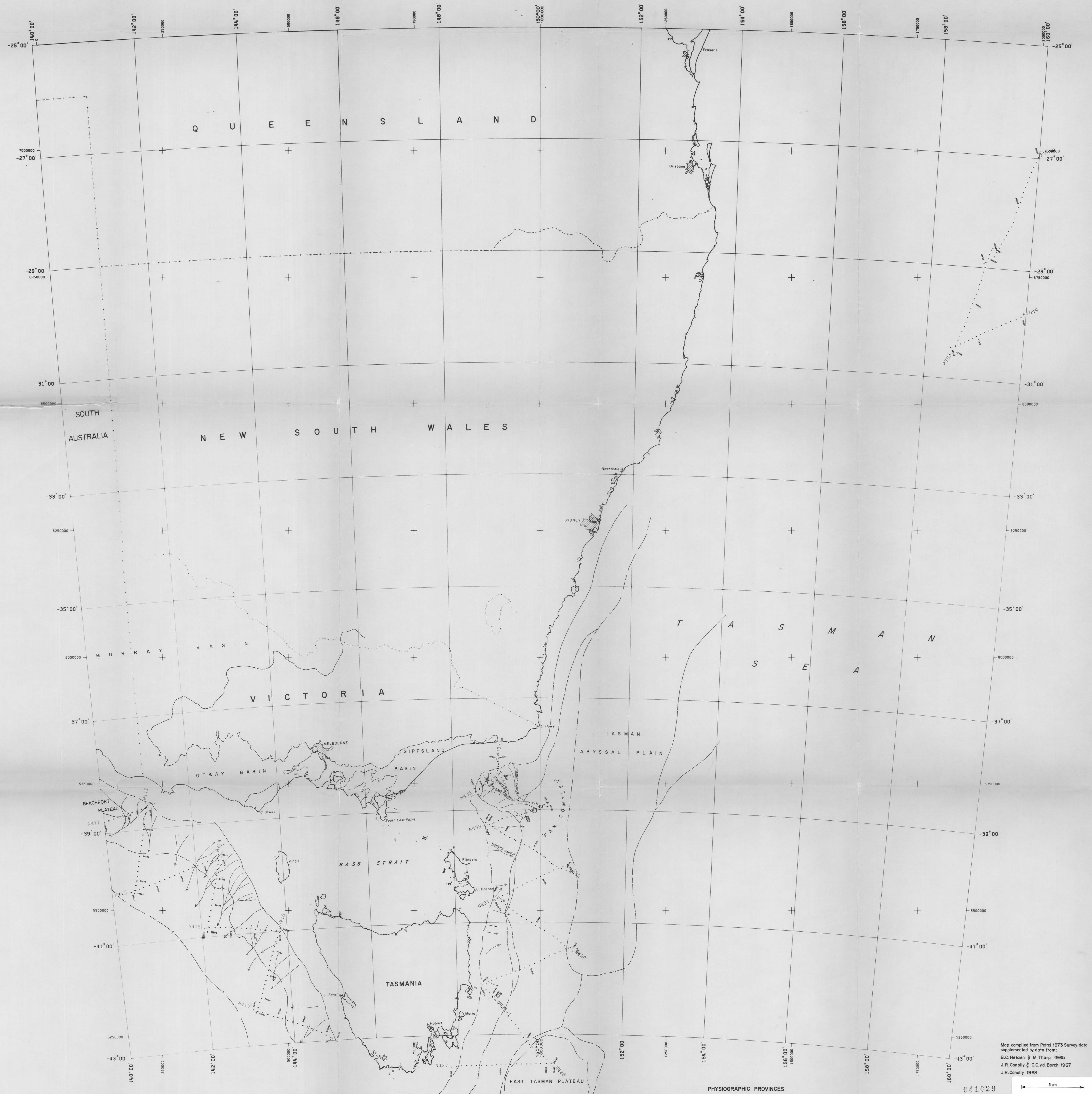
SHEET SE72
Scale 1 : 2,500,000

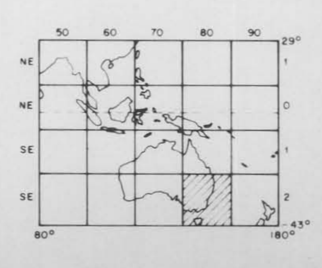
Author: H. Doust	Encl.: 5	Date: December 1973
Report No.: EP 45307		Draw. No.: G. 62128/5

OR-088

5

SE 82





T.M. PROJECTION C.M. 150° SCALE FACTOR 0.996
INTERNATIONAL SPHEROID

Map compiled from Petrel 1973 Survey data supplemented by data from:
B.C.Heezen & M.Tharp 1965
J.R.Conolly & C.C.v.d. Borch 1967
J.R.Conolly 1968

5 cm

C41029

PHYSIOGRAPHIC PROVINCES

Continent : Older rocks	Trough/Canyon (Continental Margin)
" : Sedimentary basins	Continental Rise
Shelf (Continental Margin)	Abyssal Hills
Slope "	Abyssal Plain
Plateau "	Swale
Ridges "	Path of Canyon

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.
THE HAGUE — EXPLORATION & PRODUCTION

S.E. AUSTRALIA

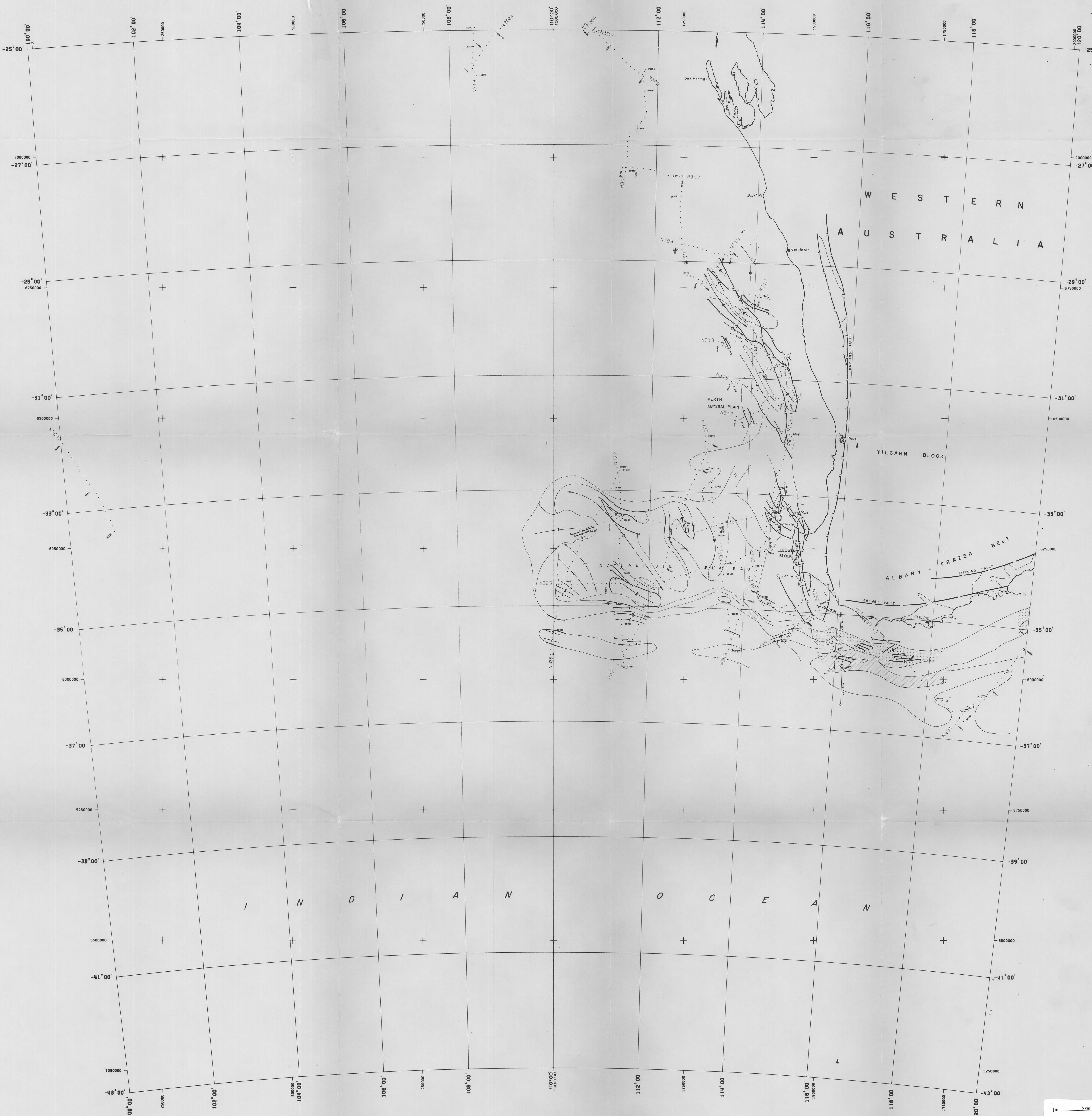
MARINE PHYSIOGRAPHY

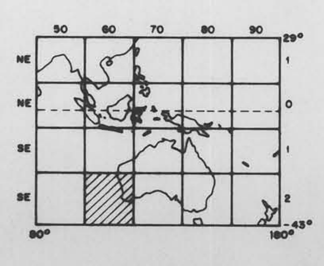
SHEET SE 82
Scale 1 : 2,500,000

Author: H. Doust	Encl.: 6	Date: December 1973
Report No.: EP 45 307		Draw. No.: G. 62128/6

OR-088 (6)

SE 62





CONTINENTAL STRUCTURAL PROVINCES

overlying non-volcanic basement of older rocks

- Outcrop of basement, mainly Pre-Cambrian metamorphics
- Basement covered with very thin or impersistent sediments
- Basement covered by relatively thick sediments
- Basinal areas with thicker sedimentary sections

OCEANIC STRUCTURAL PROVINCES

overlying volcanic ocean basement of Upper Mesozoic or Lower Tertiary age

- Outcrop of basement
- Basement covered with thin sediments
- Basement covered by thicker sediments

- Zones of synsedimentary faults
- Zones of thrust faults
- Faults, hatched on downthrown side
- Anticlinal or ridge axes } open if trend uncertain
- Synclinal or basin axes } open if trend uncertain
- Anticlines
- Crustal profiles

The map was constructed using data from the Petrel 1973 survey, and was supplemented with the following:
L.V. Hawkins, J.F. Hennion, J.E. Nafe and R.F. Thyer (1965)
" " " and H.A. Doyle (1965)

Tectonic map of Australia 1:2,534,000 (1960)

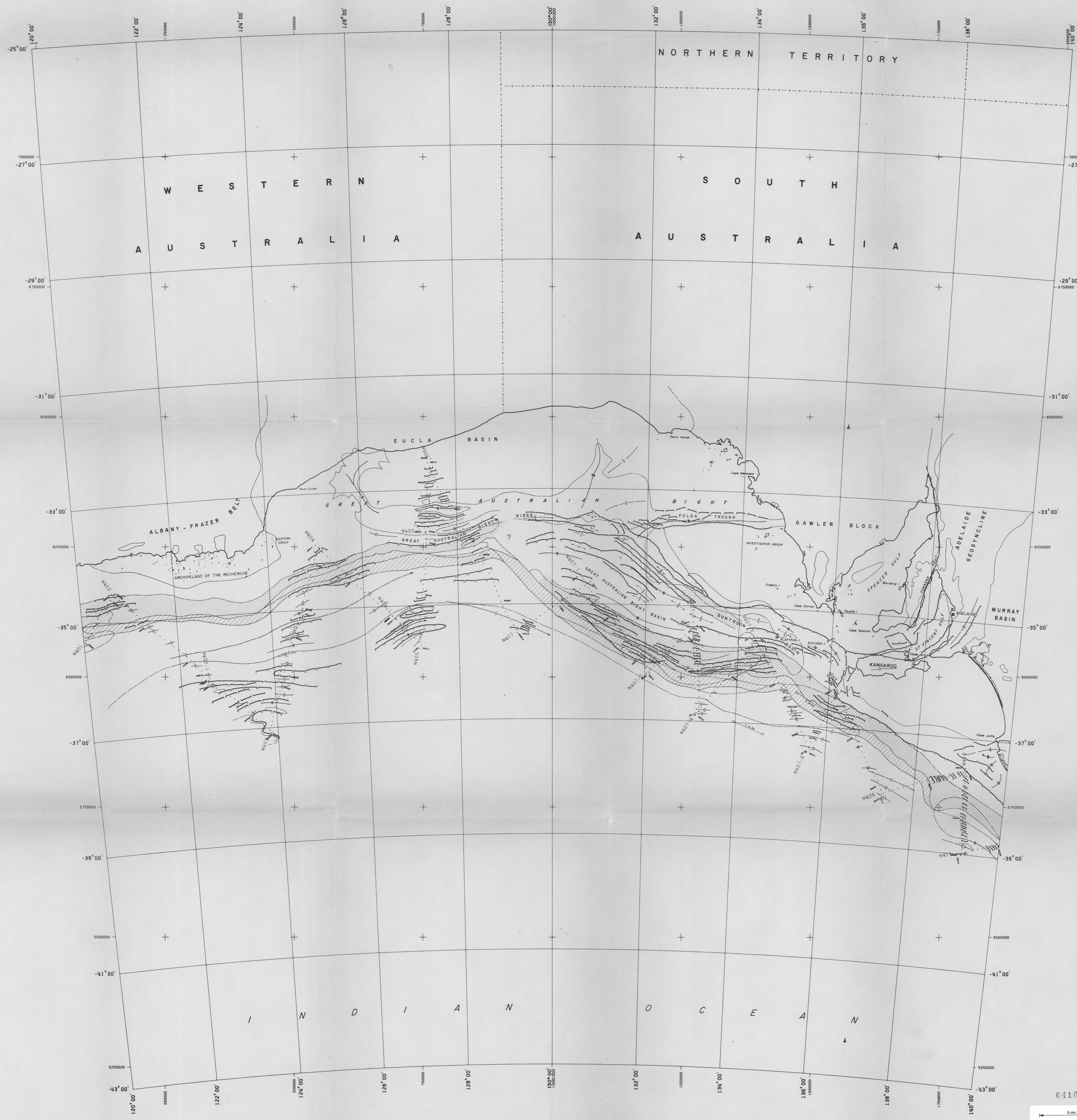
5 cm

041030

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.W. AUSTRALIA STRUCTURAL MAP SHEET SE 62 Scale 1:2,500,000		
Author: H. Doust	Encl.: 7	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128/7

OR-088 (7)

SE 72



T.M. PROJECTION C.M. 130°
INTERNATIONAL SPHEROID
S.F. 0.996

CONTINENTAL STRUCTURAL PROVINCES

overlying non-volcanic basement of older rocks

- Outcrop of basement, mainly Pre-Cambrian metamorphics
- Basement covered with very thin or impersistent sediments
- Basement covered by relatively thick sediments
- Basinal areas with thicker sedimentary sections

OCEANIC STRUCTURAL PROVINCES

overlying volcanic ocean basement of Upper Mesozoic or Lower Tertiary age

- Outcrop of basement
- Basement covered with thin sediments
- Basement covered by thicker sediments

- Zones of synsedimentary faults
- Zones of thrust faults
- Faults, hatched on downthrown side
- Anticlinal or ridge axes } open if trend uncertain
- Synclinal or basin axes } open if trend uncertain
- Anticlines
- Crustal profiles

The map was constructed using data from the Petrel 1973 survey, and was supplemented with the following:

L.V. Hawkins, J.F. Hennion, J.E. Nafe and H.A. Doyle (1965)

J.R. Conolly, A. Flavelle and R.S. Dietz (1970)

Tectonic map of Australia 1:2,534,400 (1960)

Shell files

041031

5 cm

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.
THE HAGUE — EXPLORATION & PRODUCTION

GREAT AUSTRALIAN BIGHT

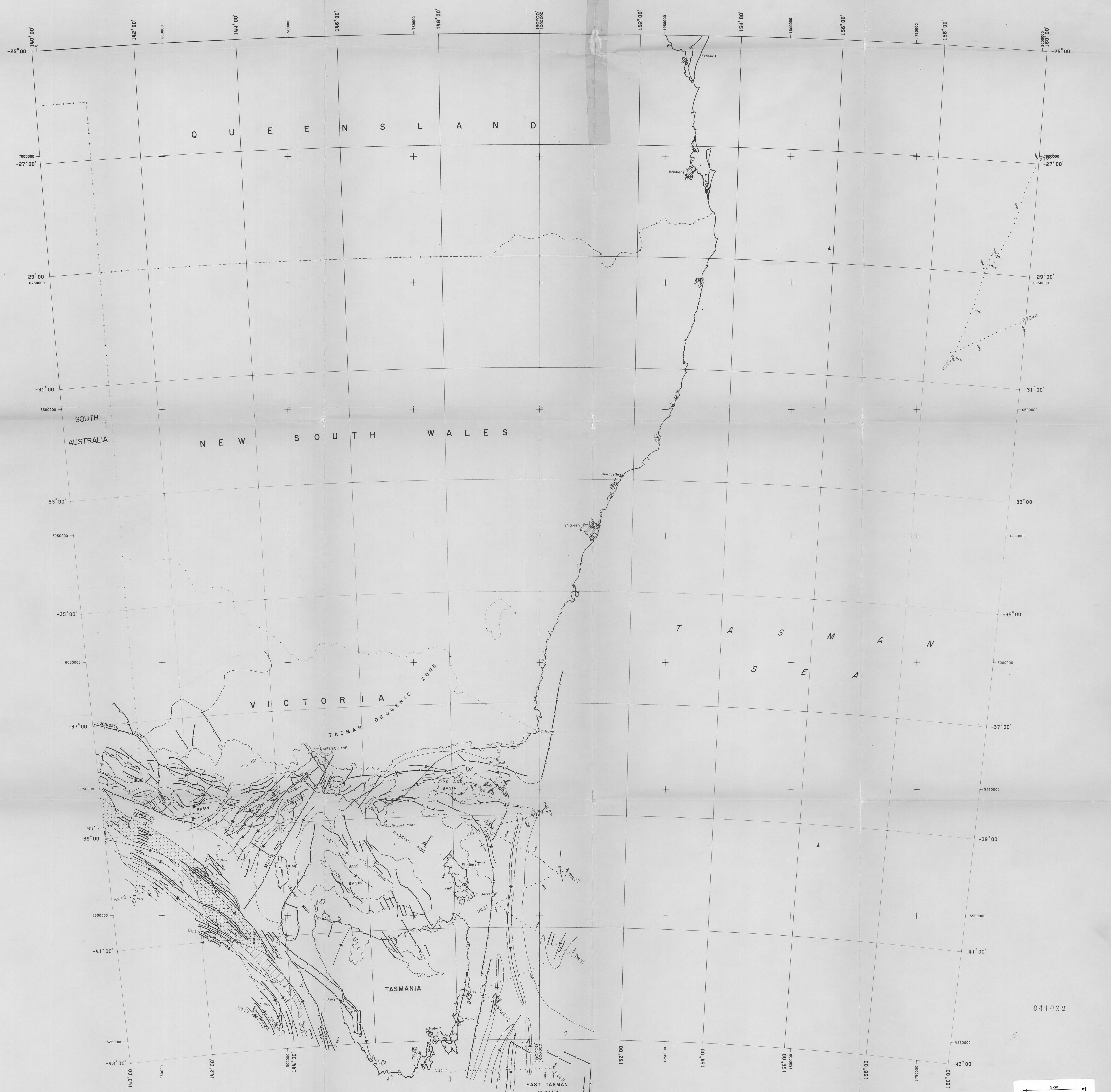
STRUCTURAL MAP

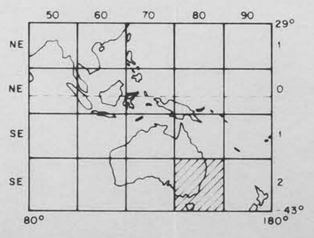
SHEET SE72
Scale 1: 2,500,000

Author: H. Doust | Encl.: 8 | Date: December 1973
Report No.: EP 45307 | Drew. No.: G 62128/8

OR-088 (8)

SE 82





T.M PROJECTION C.M. 150° SCALE FACTOR 0,996
INTERNATIONAL SPHEROID

CONTINENTAL STRUCTURAL PROVINCES

overlying non-volcanic basement of older rocks

- Outcrop of basement, mainly Pre-Cambrian metamorphics
- Basement covered with very thin or impersistent sediments
- Basement covered by relatively thick sediments
- Basinal areas with thicker sedimentary sections

OCEANIC STRUCTURAL PROVINCES

overlying volcanic ocean basement of Upper Mesozoic or Lower Tertiary age

- Outcrop of basement
- Basement covered with thin sediments
- Basement covered by thicker sediments

- Zones of synsedimentary faults
- Zones of thrust faults
- Faults, hatched on downthrown side
- Anticlinal or ridge axes } open if trend uncertain
- Synclinal or basin axes } open if trend uncertain
- Anticlines
- Crustal profiles

The map was constructed using data from the Petrel 1973 survey, and was supplemented with the following:

R.B. Leslie (1966)
M.A. Reynolds (1967)
L.G. Weeks and B.M. Hopkins (1967)
A.H. White (1968)
Tectonic map of Australia 1 : 2,534,400 (1960)
Shell files

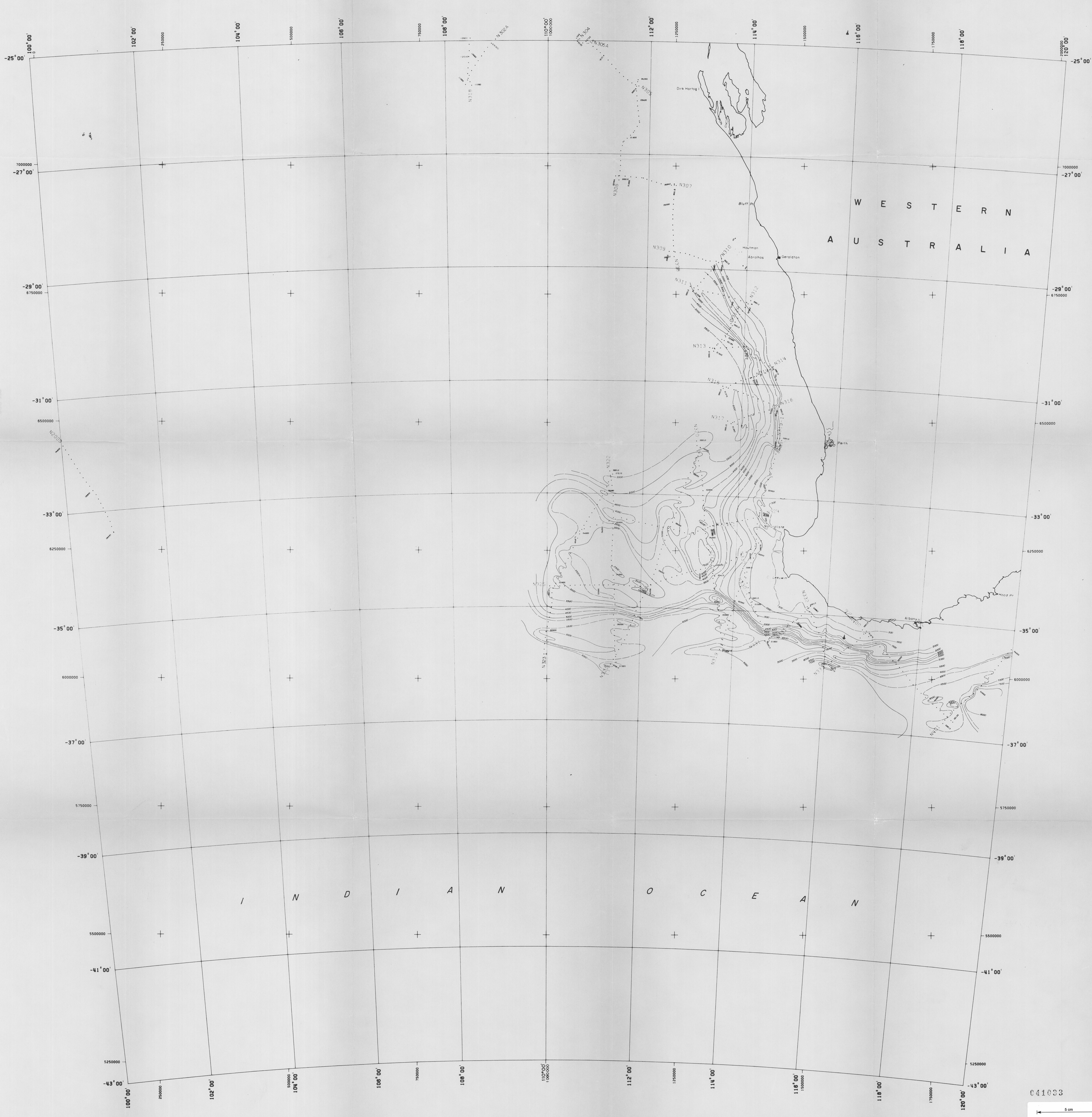
5 cm

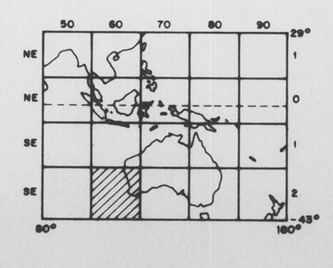
O/S 34

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S. E. AUSTRALIA STRUCTURAL MAP SHEET SE 82 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 9	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128/9

OR-088 (9)

SE 62





T.M. PROJECTION C.M. 110° SCALE FACTOR 0.996
INTERNATIONAL SPHEROID

STRUCTURE CONTOURS B.S.L. FROM PETREL DATA

above deepest visible unconformity; a Lower Cretaceous horizon.

above sea level /absent	4000-6000 m
0-1000 m	6000-8000 m
1000-2000 m	8000-10000 m
2000-4000 m	

Contour interval 500m
Depth conversion by Houboldt velocity function : V=(1650+0.75z) m/sec.

041033

5 cm

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.
THE HAGUE | EXPLORATION & PRODUCTION

S.W. AUSTRALIA

STRUCTURE CONTOUR MAP

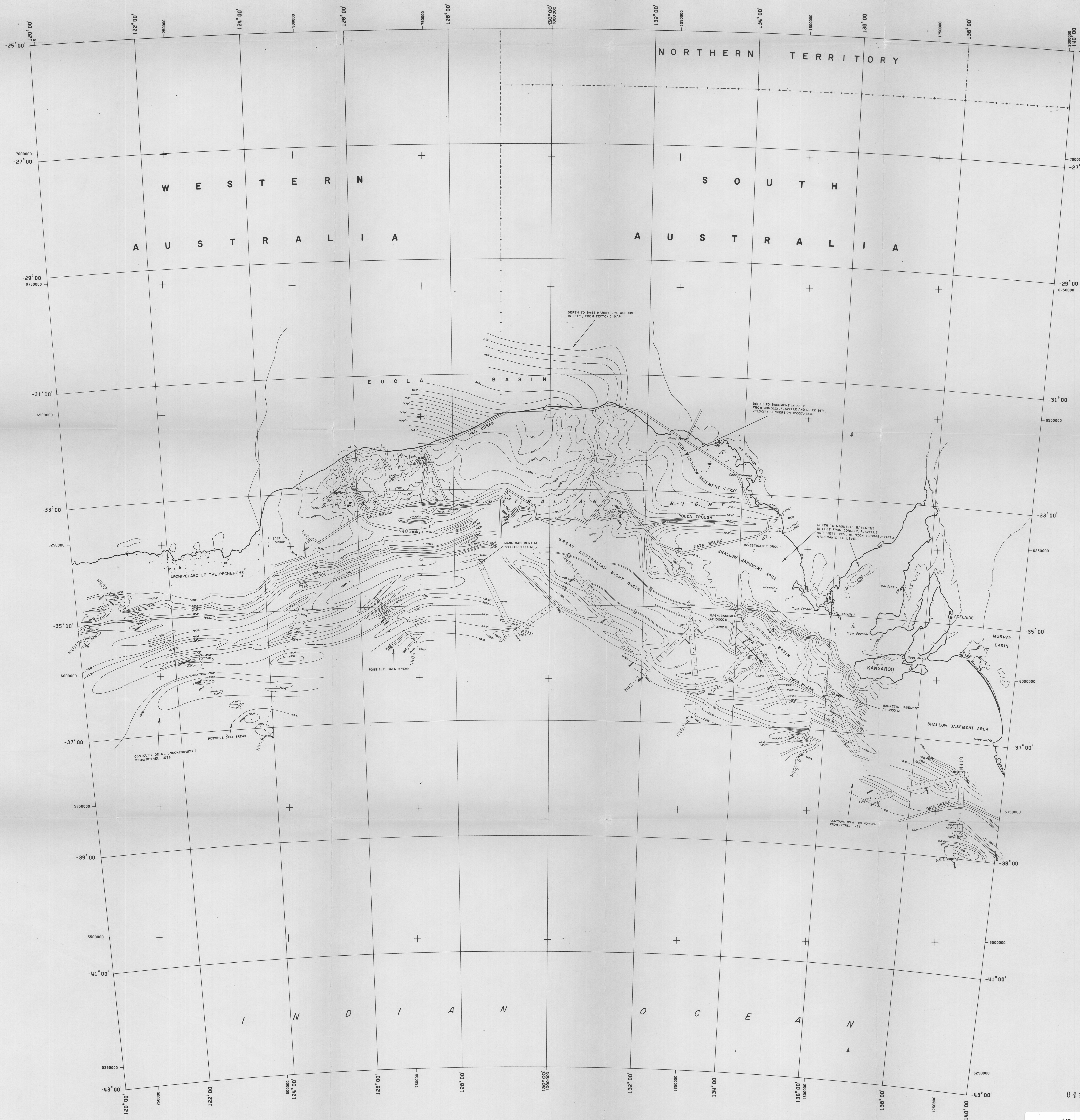
SHEET SE 62
Scale 1 : 2,500,000

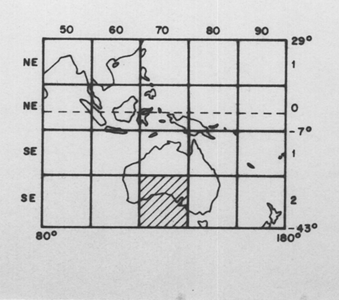
Author: H. Doust	Encl.: 10	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128/10

OR-088

10

SE 72





T.M. PROJECTION C.M. 130°
INTERNATIONAL SPHEROID
S.F. 0.996

Unless specified contour interval 1000 m

STRUCTURE CONTOURS B.S.L. FROM PETREL DATA

Above deepest visible unconformity: Mainly intra Cretaceous horizons

- above sea level/absent
- 0 - 1000 m
- 1000 - 2000 m
- 2000 - 4000 m
- 4000 - 6000 m
- 6000 - 8000 m
- 8000 - 10000 m
- 10000 - 12000 m
- > 12000 m

Depth of deepest visible sediments, no basal unconformity seen

△ Depth to magnetic basement (Petrel data), calculated by J. Adriaanse from Petrel Magn. profiles.

Depth conversion by Houboldt velocity function: $V = (1650 + 0{,}75z)$ m/sec.

OTHER DATA:

Contours in feet; Colours on the map are as close as possible to metric equivalents.

Onshore Eucla basin: Tectonic map of Australia, 1960 1:2,534,400

Offshore Eucla basin: J.R. Conolly, A. Flavelle and R.S. Dietz, 1971 Fig. 16

Offshore East Bight: J.R. Conolly, A. Flavelle and R.S. Dietz, 1971 Fig. 7

041034

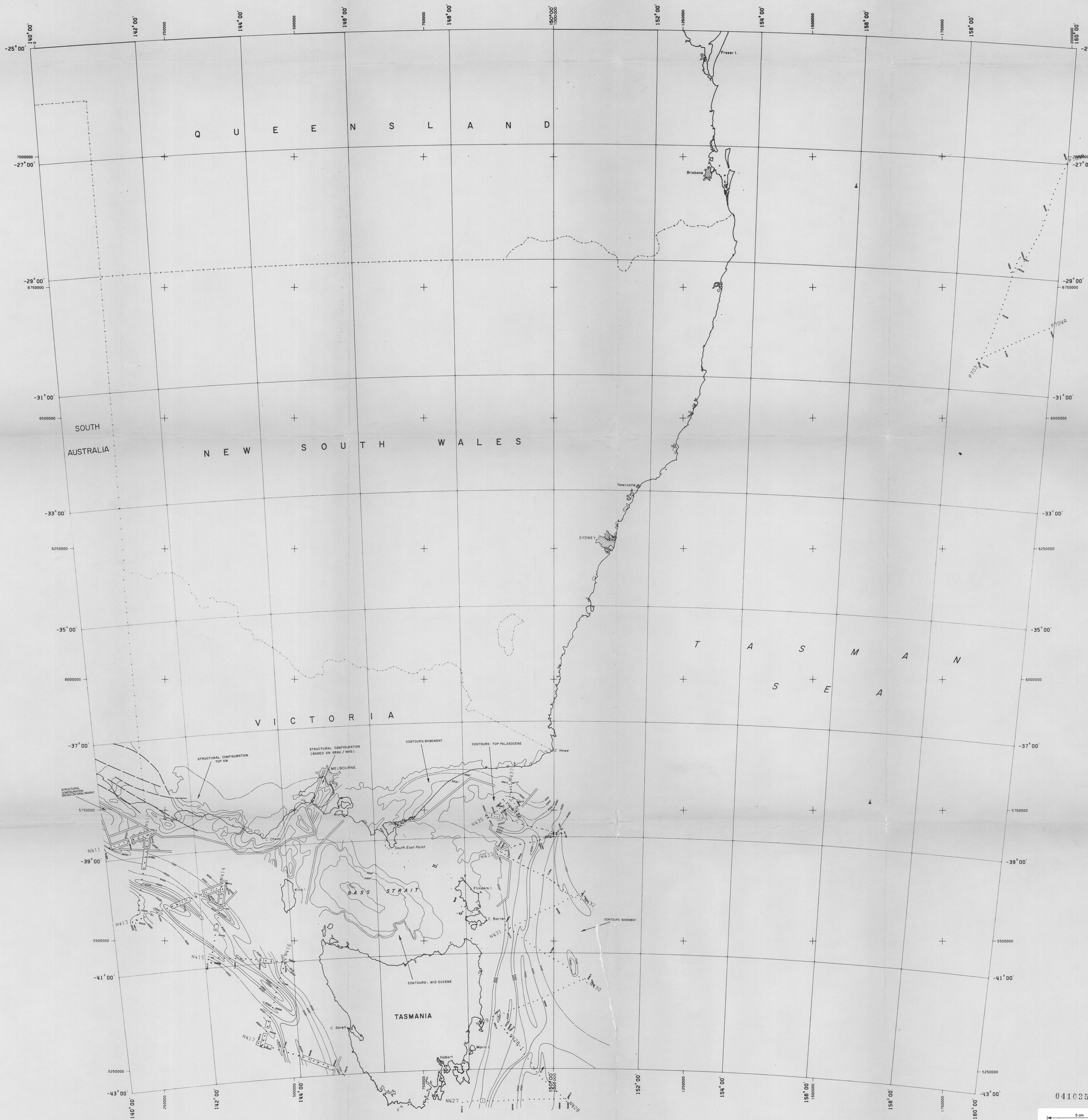
5 cm

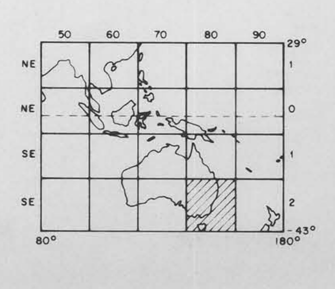
SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
GREAT AUSTRALIAN BIGHT STRUCTURE CONTOUR MAP SHEET SE72 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 11	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128/11

OR-088

11

SE 82





041035

5 cm

STRUCTURE CONTOURS B.S.L. FROM PETREL DATA

above deepest visible unconformity: Cretaceous or Lower Tertiary horizons

- above sea level/absent
- 0-1000 m
- 1000-2000 m
- 2000-4000 m
- 4000-6000 m
- 6000-8000 m
- 8000-10000 m
- 10000-12000 m

Contour interval 1000 m unless specified

Depth of deepest visible sediments, no basal unconformity seen

Depth conversion by Houboldt velocity function: $V = (1650 + 0,75z)$ m/sec.

OTHER DATA: where contours are in feet, colours on the map are as close as possible to metric equivalents.

Otway basin: R.B. Leslie, 1966 Fig. 3,4. Roughly calibrated qualitative data.

Bass basin: From Shell files.

Gippsland basin: Tectonic map of Australia 1960, 1: 2,534,400 and Shell files.

ds/34

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.E. AUSTRALIA		
STRUCTURE CONTOUR MAP		
SHEET SE 82 Scale 1: 2,500,000		
Author: H. Doust	Encl.: 12	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128/12

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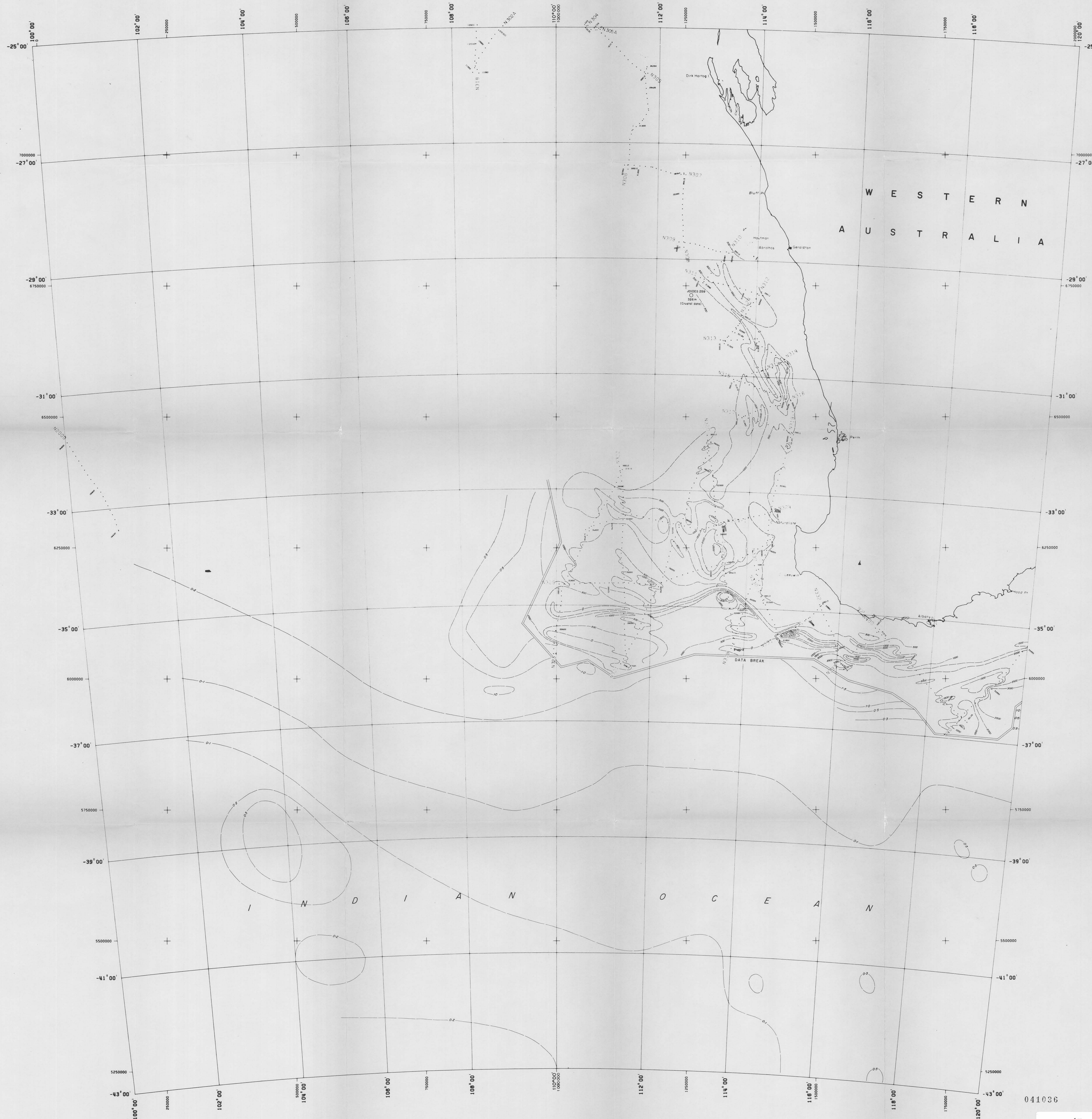
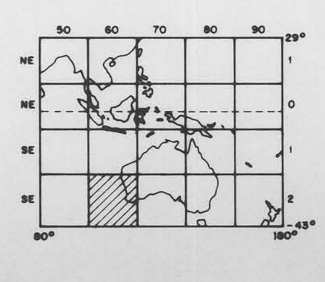
(12)

SE 62





T.M. PROJECTION C.M. 110° SCALE FACTOR 0,996
INTERNATIONAL SPHEROID

SEDIMENT THICKNESS FROM PETREL DATA

above Lower Cretaceous unconformity
depth conversion by Houboldt velocity function : $V = (1650 + 0.75z)$ m/sec

- 0
- 0 - 1000 m
- 1000 - 2000 m
- 2000 - 4000 m

Contour interval 500 m

OTHER DATA

above acoustic basement
S. Indian Ocean : Houtz and Markl (unpublished Lamont preprint) Fig. 3

- 0 - 1.0 sec.
- 1.0 - 1.5 sec.
- 1.5 - 2.0 sec.
- ○ Depth from Joides core-hole

041036

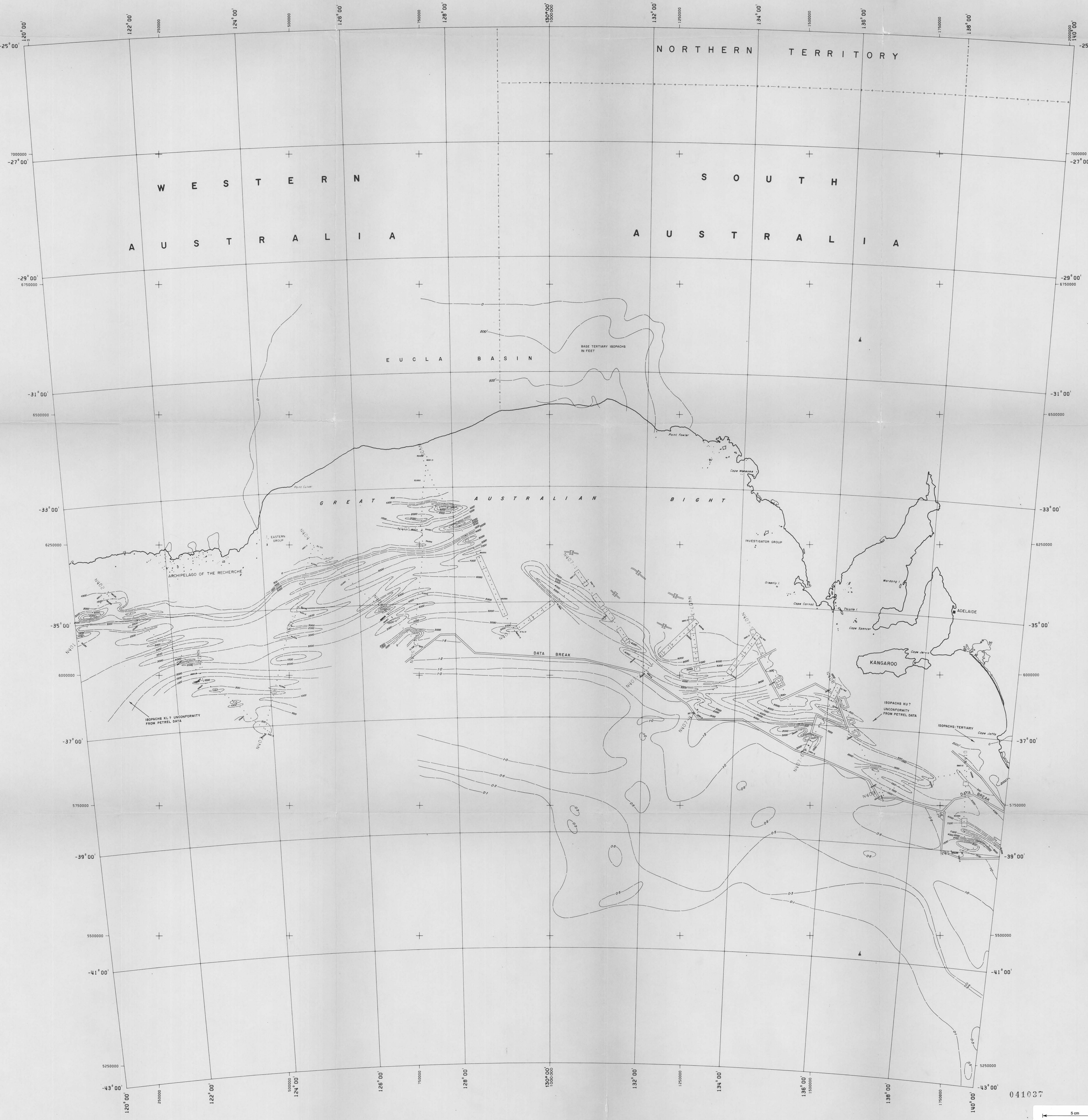
5 cm

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.W. AUSTRALIA ISOPACH MAP OF BASIN FILL SHEET SE 62 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 13	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128 / 13

OR-088

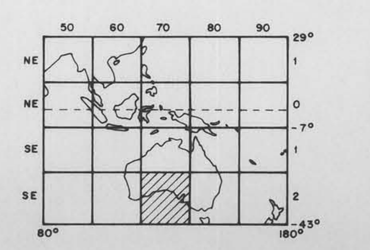
13

SE 72



041037

5 cm



T.M. PROJECTION C.M. 130°
INTERNATIONAL SPHEROID
S.F. 0.996

Unless specified contour interval 1000m.

SEDIMENT THICKNESS FROM PETREL DATA
above intra Cretaceous unconformities
depth conversion by Houboldt velocity function: $V = (1650 + 0.75z)$ m/sec

0	4000-6000 m
0-1000 m	6000-8000 m
1000-2000 m	8000-10 000 m
2000-4000 m	Minimum thickness of sediment No basal unconformity visible

OTHER DATA
above acoustic basement
S. of Australia: Houtz and Markl (unpublished Lamont prepint) Fig. 6

- 0-1.0 sec.
- 1.0-1.5 sec.
- 1.5-2.0 sec.

Eucla Basin: isopachs Tertiary in feet from Shell files

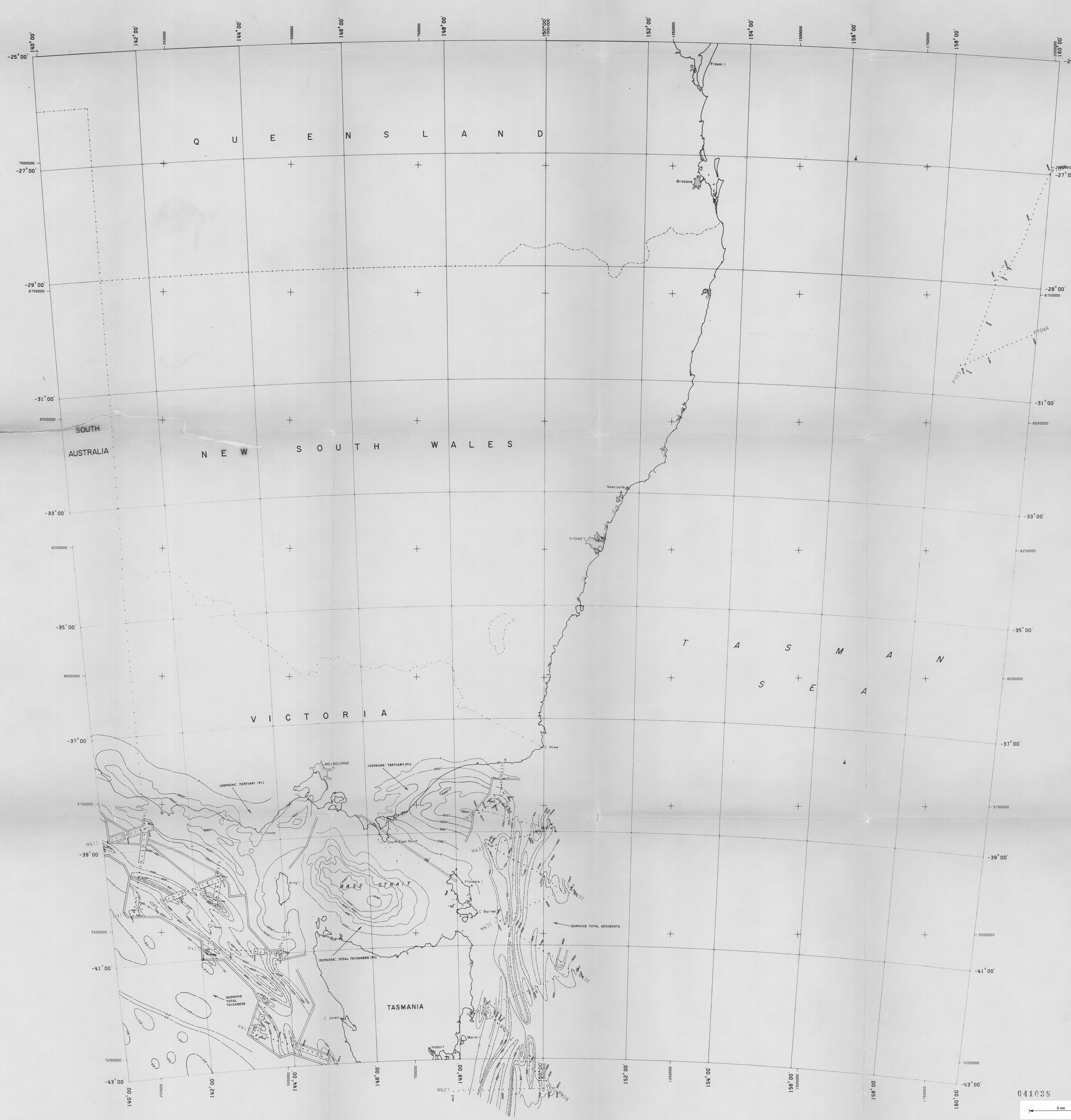
Otway Basin: isopachs Tertiary in feet from L.G. Weeks and B.M. Hopkins 1967 - Fig. 13 where contours are in feet, colours on the map are as close as possible to metric equivalents

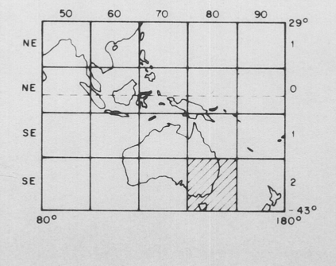
SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
GREAT AUSTRALIAN BIGHT **ISOPACH MAP OF BASIN FILL** SHEET SE72 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 14	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128 / 14

OR-088

14

SE 82





T.M. PROJECTION C.M. 150° SCALE FACTOR 0.996
INTERNATIONAL SPHEROID

Unless specified contour interval 1000 m

041038

5 cm

SEDIMENT THICKNESS FROM PETREL DATA
above Cretaceous and Lower Tertiary unconformities
depth conversion by Houboldt velocity function : $V = (1650 + 0.75z)$ m/sec

- 0
- 0-1000 m
- 1000 - 2000 m
- 2000 - 4000 m
- 4000 - 6000 m
- 6000 - 8000 m
- > 8000 m
- Minimum thickness of sediment No basal unconformity visible

OTHER DATA
above acoustic basement
S. of Australia: Houtz and Markl (unpublished Lamont prepint) Fig.6

- 0 - 1.0 sec.
- 1.0 - 1.5 sec.

Otway, Bass and Gippsland basins: Isopachs in feet from
L.G. Weeks and B.M. Hopkins (1967) Figs. 7, 10, 13.
colours on the map are as close as possible to metric equivalents

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S. E. AUSTRALIA ISOPACH MAP OF BASIN FILL SHEET SE 82 Scale 1 : 2,500,000		
Author: H. Doust	Encl.: 15	Date: December 1973
Report No.: EP 45307		Draw. No.: G 62128/15

OR-088 (15)

KEY TO SECTIONS

T	Tertiary
KU	Upper Cretaceous ; used for whole of Post-Neocomian section where age uncertain
KL	Lower Cretaceous ; including Pre-and Post-Neocomian
J	Jurassic
Tr	Triassic
P	Permian
Bm	Pre-Permian basement ; usually Pre-Cambrian / Palaeozoic metamorphics
	Volcanic basement ; usually Middle Cretaceous
NC	Neocomian
AB	Albian

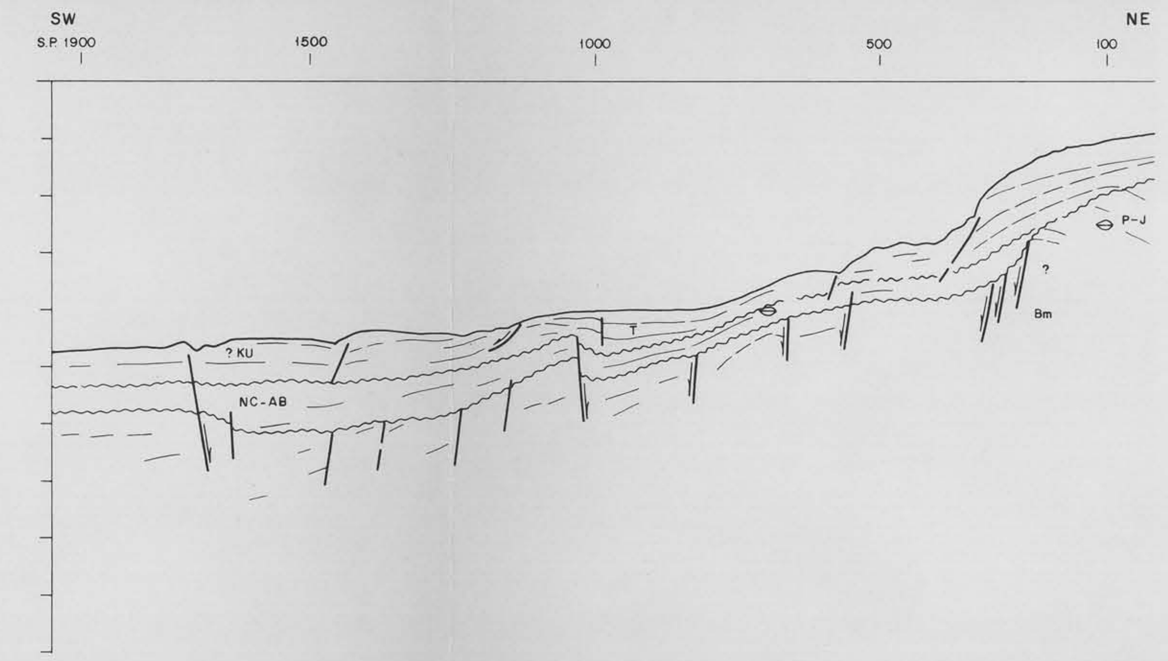
Reflectors

Unconformities

Faults, sense of movement indicated

Magnetic basement depth: calculated by J. Adriaanse (S.I.P.M. EP/12).

PETREL SEISMIC SECTION N 316



SHELL 1972 PETREL ROVING SURVEY
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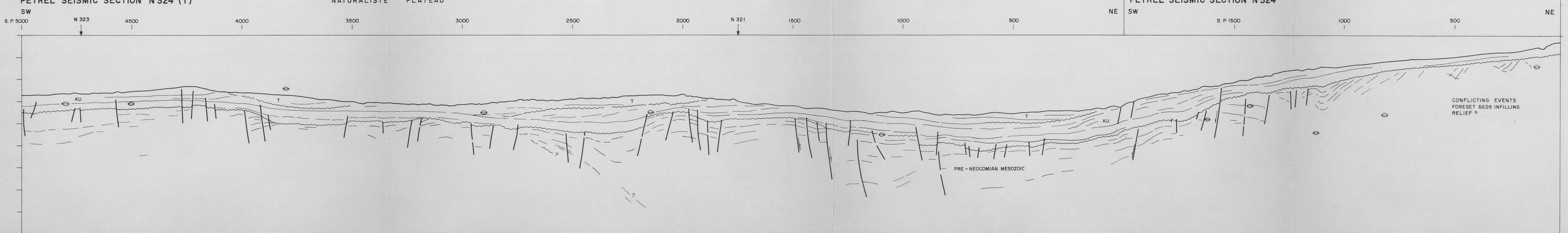
PART 2
OR-088

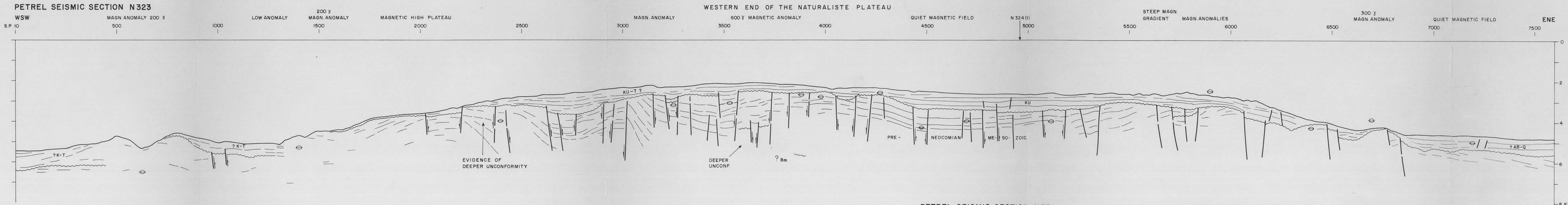
PETREL SEISMIC SECTION N 324 (1)

PETREL SEISMIC SECTION N 324



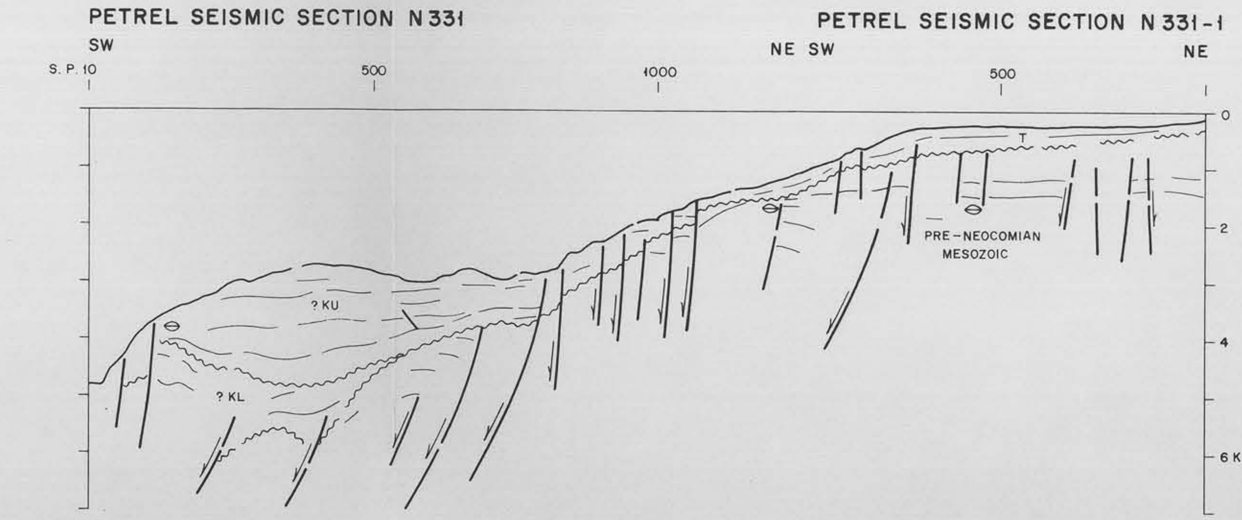
PETREL SEISMIC SECTION N 321

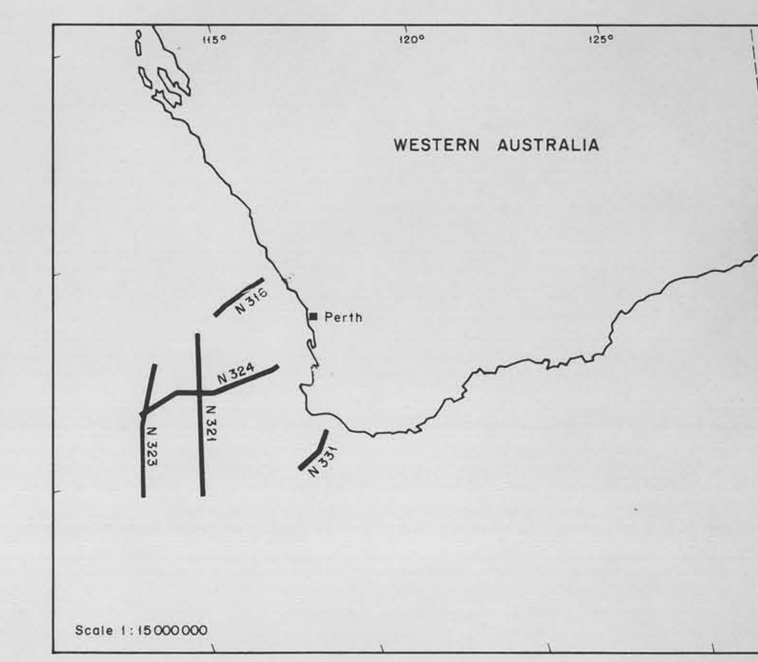
PETREL SEISMIC SECTION N 323



PETREL SEISMIC SECTION N 331

PETREL SEISMIC SECTION N 331-1





DEPTH SECTIONS FROM PETREL DATA

Drawn from shipboard time-sections using the following velocity functions:

Water : 1500 m/sec.

Sediment : (1650 + 0,75z) m/sec. (Houboldt function)

Interpretation of shipboard sections by A.D. Ingles (SIPM EP/13)

OTHER DATA

G.C. 258: Report of the Deep Sea drilling Project Leg 26, B.P. Luyendyk et al, Geotimes, March 1973; 16-19.

G.C. 264: " " " " " Leg 28, D.E. Hayes et al, Geotimes, June 1973; 19-24.

Core RC 8-56: L.H. Burckle, T. Saito and M. Ewing (1967)

5 cm

041039

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.			
THE HAGUE	EXPLORATION & PRODUCTION		
S.W. AUSTRALIA			
REGIONAL SEISMIC SECTIONS			
HORZ. SCALE 1 : 500000 VERT. SCALE 1 : 100000			
Author: H. Doust	Encl.: 16	Date: Januari 1974	
Report No.: EP 45307		Draw. No.: G 62129/1	

OR-088

(16)

KEY TO SECTIONS

T	Tertiary
TL	Lowermost Tertiary; where identifiable as a distinct unit.
KU	Upper Cretaceous; includes Lowermost Tertiary where inseparable
KL	Lower Cretaceous
J	Jurassic
Bm	Pre-Permian basement; usually Pre-Cambrian or Palaeozoic Metamorphics
	Volcanic basement; usually Middle Cretaceous
	Main sandy units (schematic geological section)

Reflectors

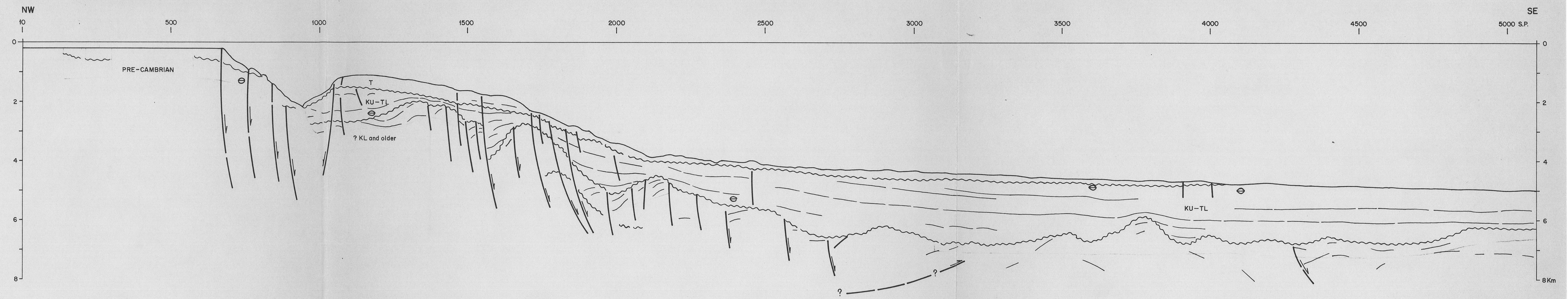
Unconformities

Faults, sense of movement indicated

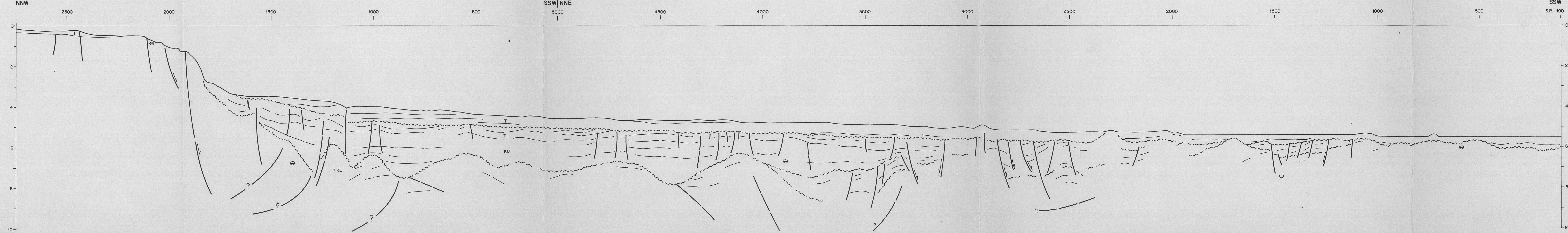
Magnetic basement depth; calculated by J. Adriaanse (SIPM EP/12)

x x x Volcanics

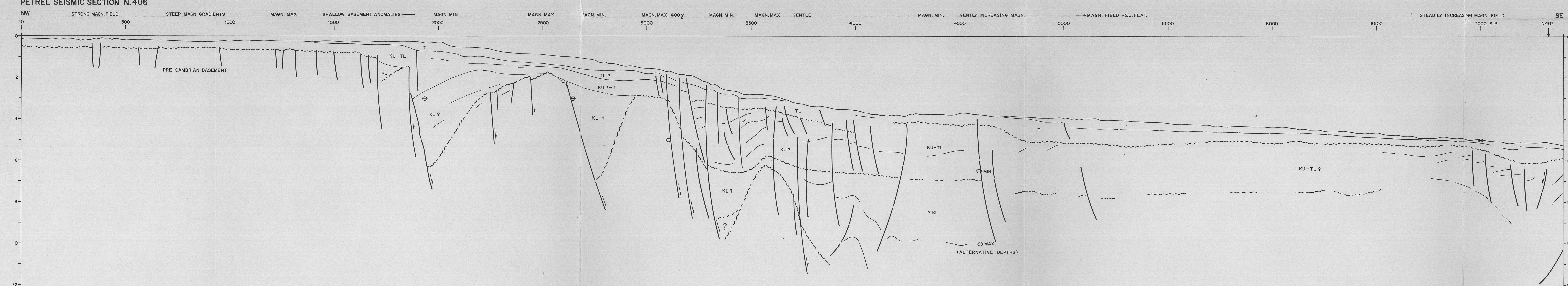
PETREL SEISMIC SECTION N400



PETREL SEISMIC SECTION N403-1 / PETREL SEISMIC SECTION N403



PETREL SEISMIC SECTION N.406



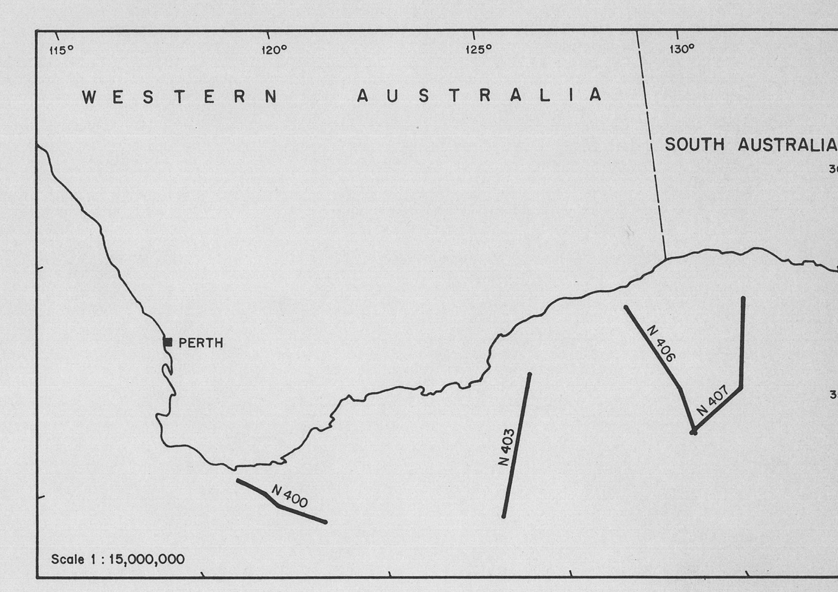
DEPTH SECTIONS FROM PETREL DATA

Drawn from shipboard time-sections used the following velocity functions:

Water: 1500 m/sec.

Sediment: (1650 + 0,75z) m/sec. (Houboldt function)

Interpretation of shipboard sections by A.D. Ingles (SIPM EP/13)



SCHEMATIC GEOLOGICAL SECTION FROM SHELL / PETREL SEISMIC SECTION N407

OTHER DATA

Schematic geological section from Shell files.

(Houboldt velocity function used in depth conversion).

041040

5 cm

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.	
THE HAGUE	EXPLORATION & PRODUCTION

GREAT AUSTRALIAN BIGHT

REGIONAL SEISMIC SECTIONS (WESTERN PART)

VERT. SCALE 1 : 100,000
HOR. SCALE 1 : 500,000

Author: H. Doust	Encl.	Date: January 1974
Report No.: EP 45307	17	Draw. No.: G 62129/2

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SHELL 1972 PETREL ROVING SURVEY
INTERPRETATION REPORT
PART 2.

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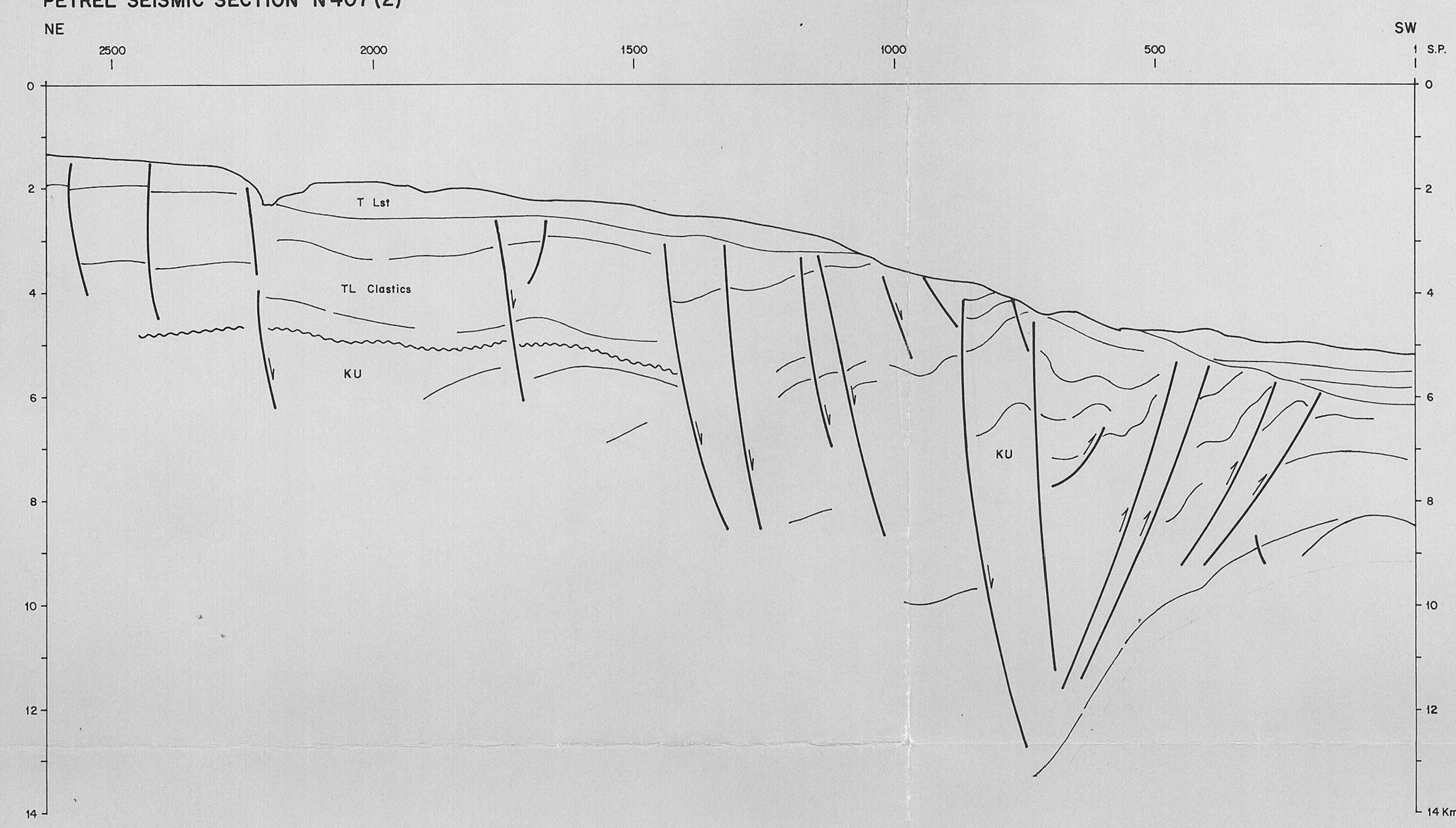
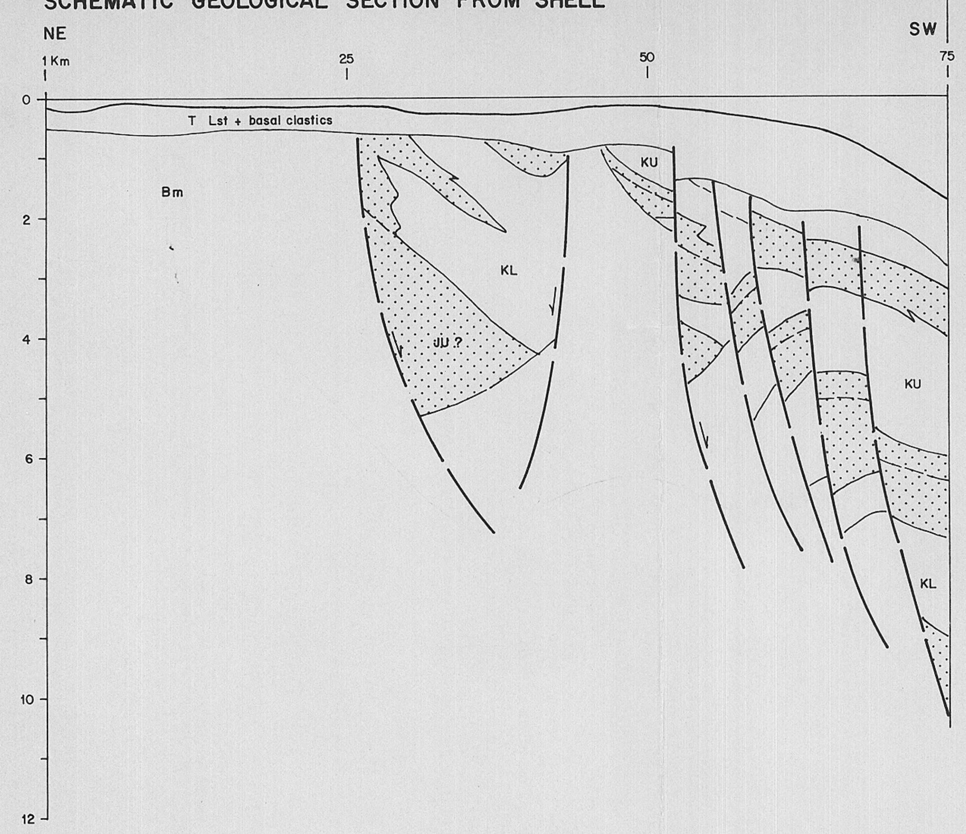
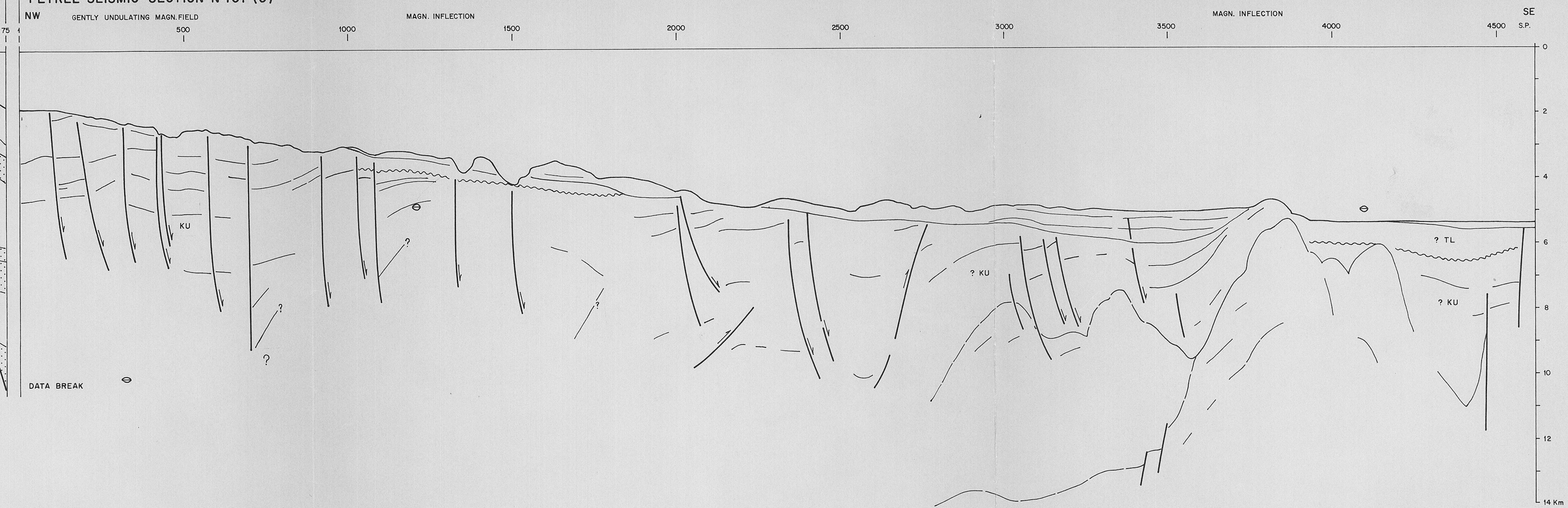
PETREL SEISMIC SECTION N407(2)



SCHEMATIC GEOLOGICAL SECTION FROM SHELL



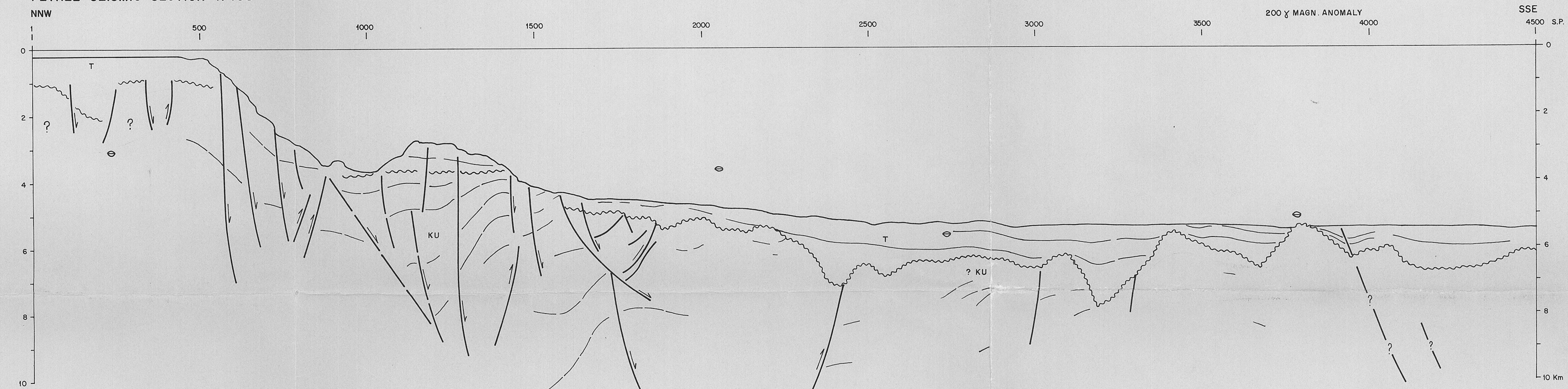
PETREL SEISMIC SECTION N407(5)



KEY TO SECTIONS

T	Tertiary
TL	Lowermost Tertiary; where identifiable as a distinct unit
KU	Upper Cretaceous
KL	Lower Cretaceous
J	Jurassic
Bm	Pre-Permian basement; usually Pre-Cambrian or Palaeozoic metamorphics
	Volcanic basement; usually Middle Cretaceous
	Main sandy units (schematic geological section)

PETREL SEISMIC SECTION N408



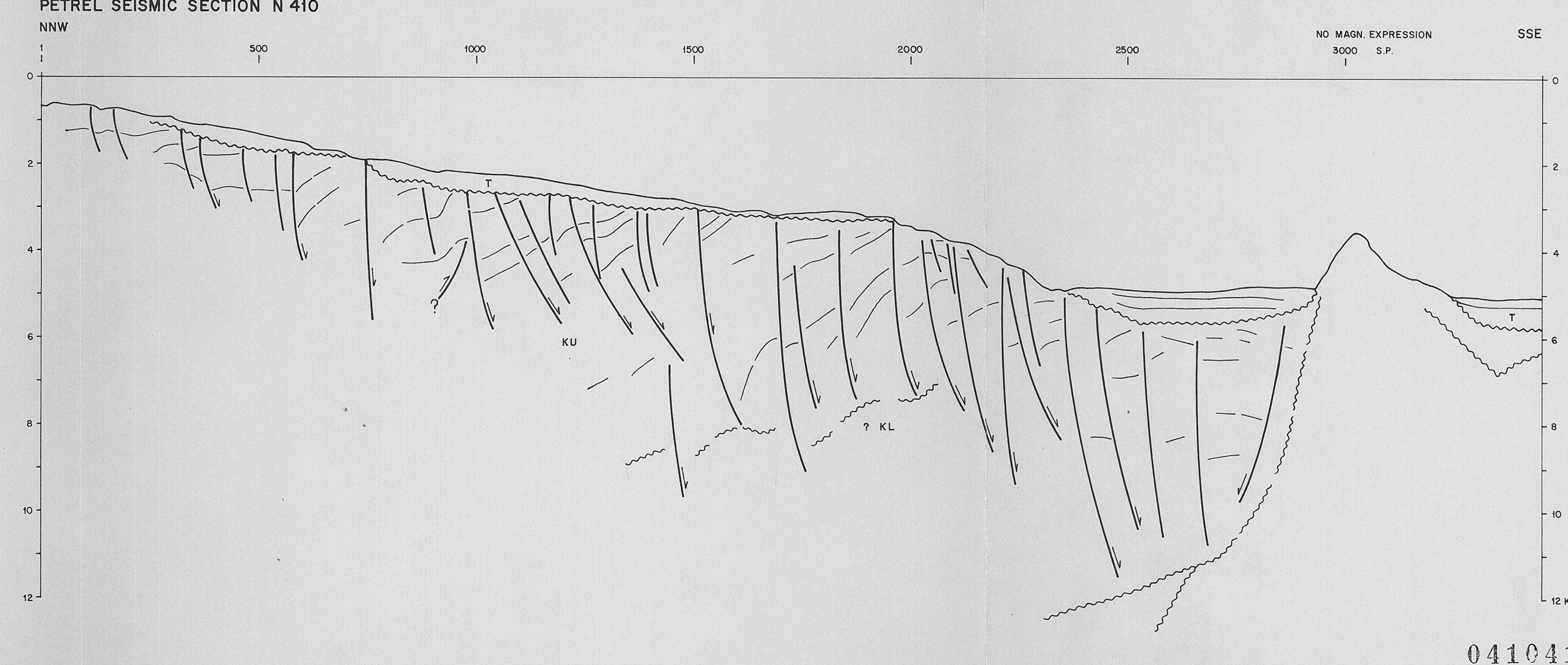
Reflectors

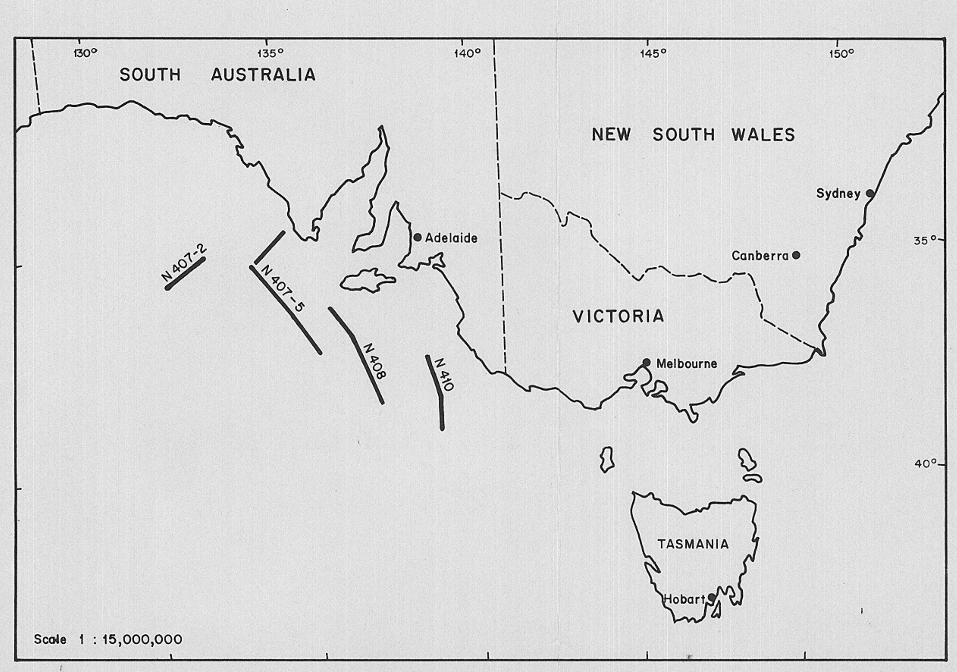
Unconformities

Faults, sense of movement indicated

Magnetic basement depth: calculated by J. Adriaanse (S.I.P.M. EP/12)

PETREL SEISMIC SECTION N410





041041

5 cm

DEPTH SECTIONS FROM PETREL DATA

Drawn from shipboard time-sections using the following velocity functions:

Water: 1500 m/sec.

Sediment: $(1650 + 0.75z)$ m/sec. (Houboldt function)

Interpretation of shipboard sections by A.D. Ingles (S.I.P.M. EP/13)

OTHER DATA

Schematic geological section from Shell files

(Houboldt velocity function used in depth conversion)

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
GREAT AUSTRALIAN BIGHT REGIONAL SEISMIC SECTIONS (EASTERN PART) VERT. SCALE 1 : 100,000 HOR. SCALE 1 : 500,000		
Author: H.Doust	Encl.: 18	Date: January 1974
Report No.: EP 45307		Draw. No.: G 63129/3

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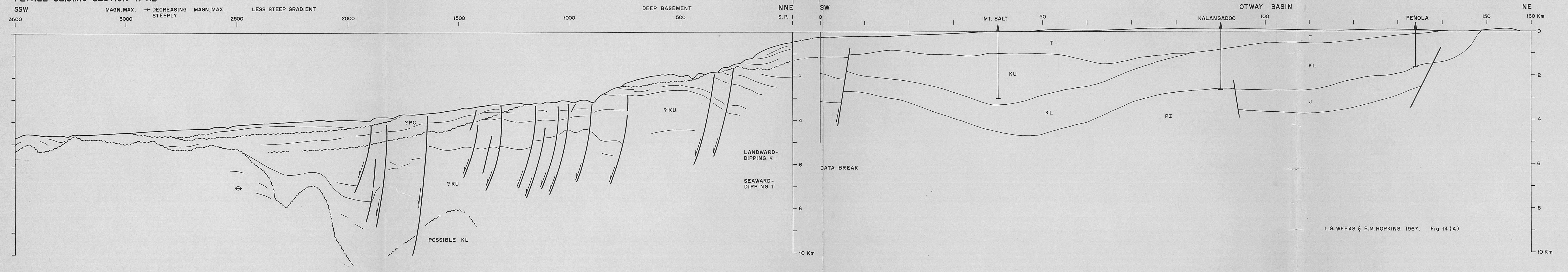
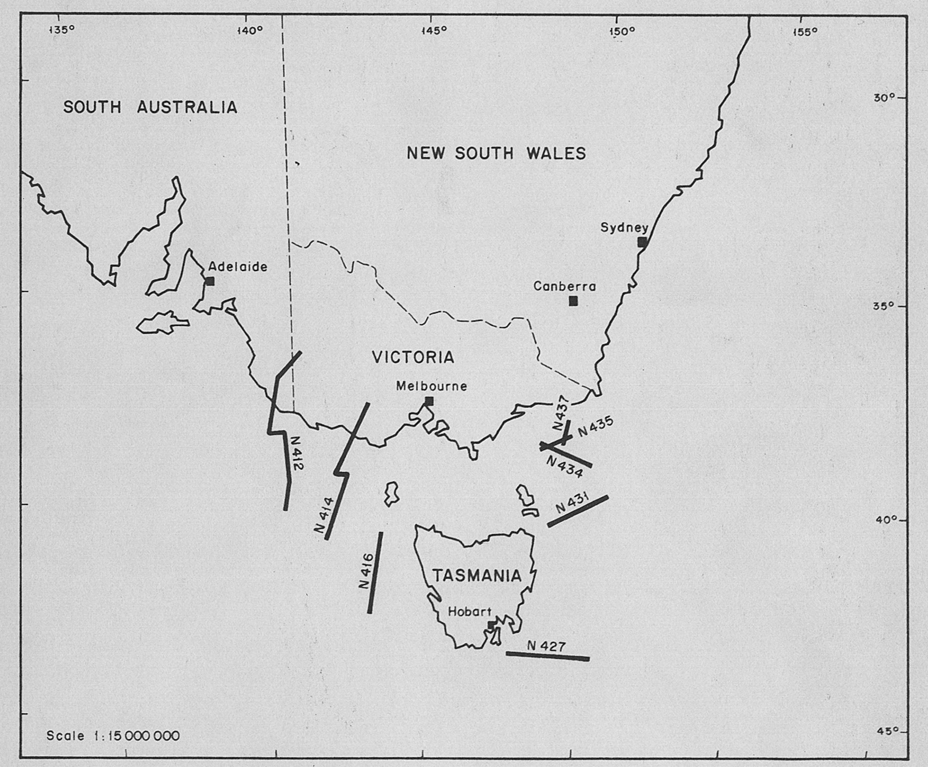
PETREL SEISMIC SECTION N 412

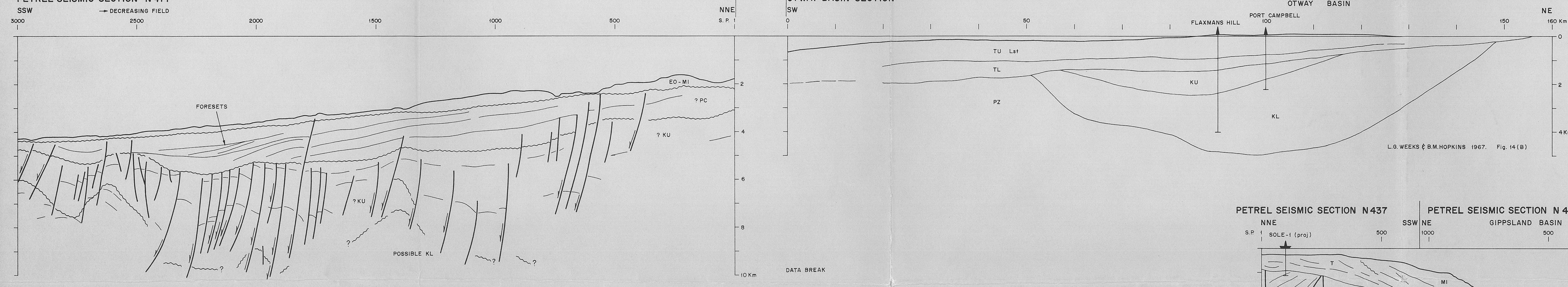
OTWAY BASIN SECTION



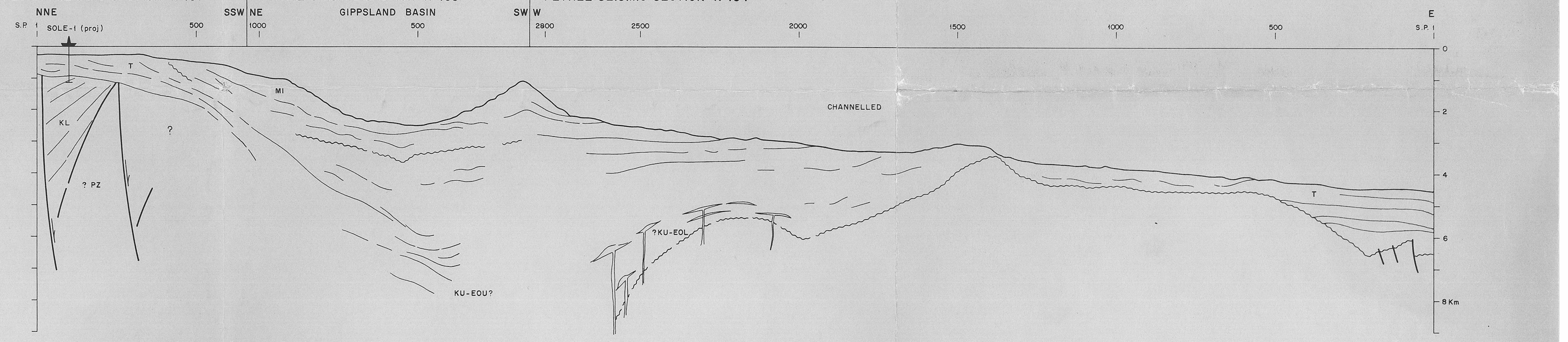


PETREL SEISMIC SECTION N 414

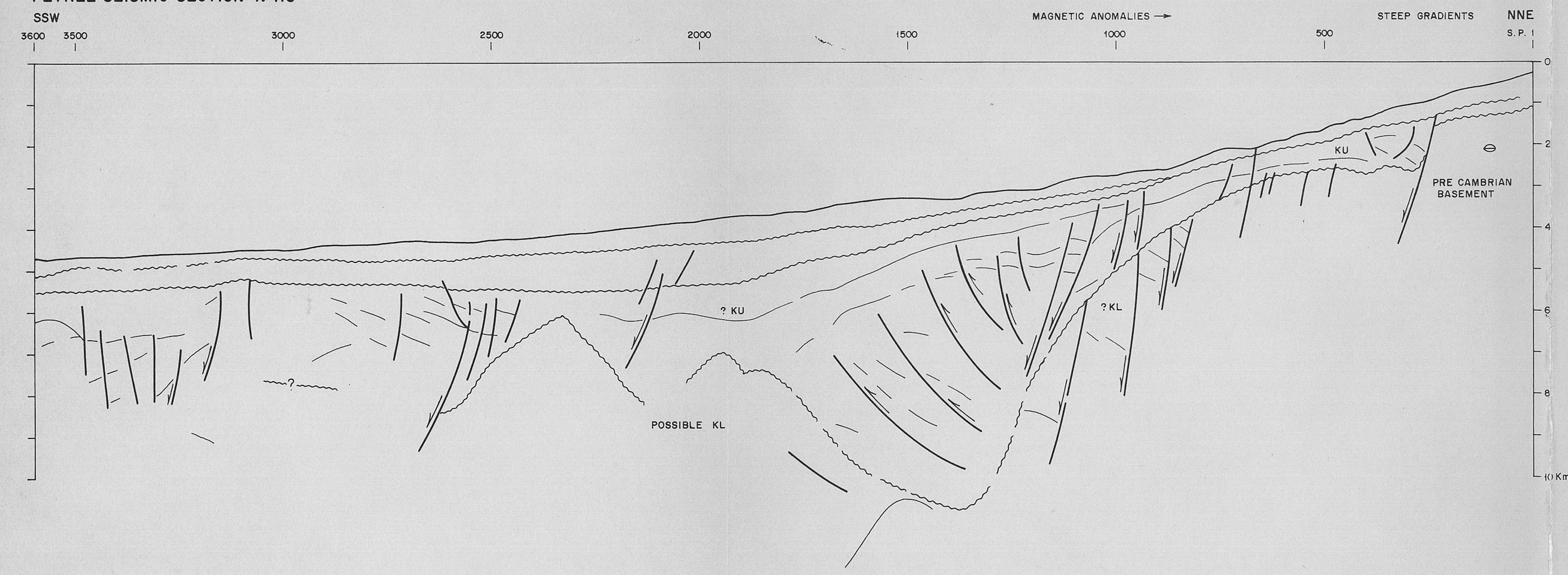
OTWAY BASIN SECTION



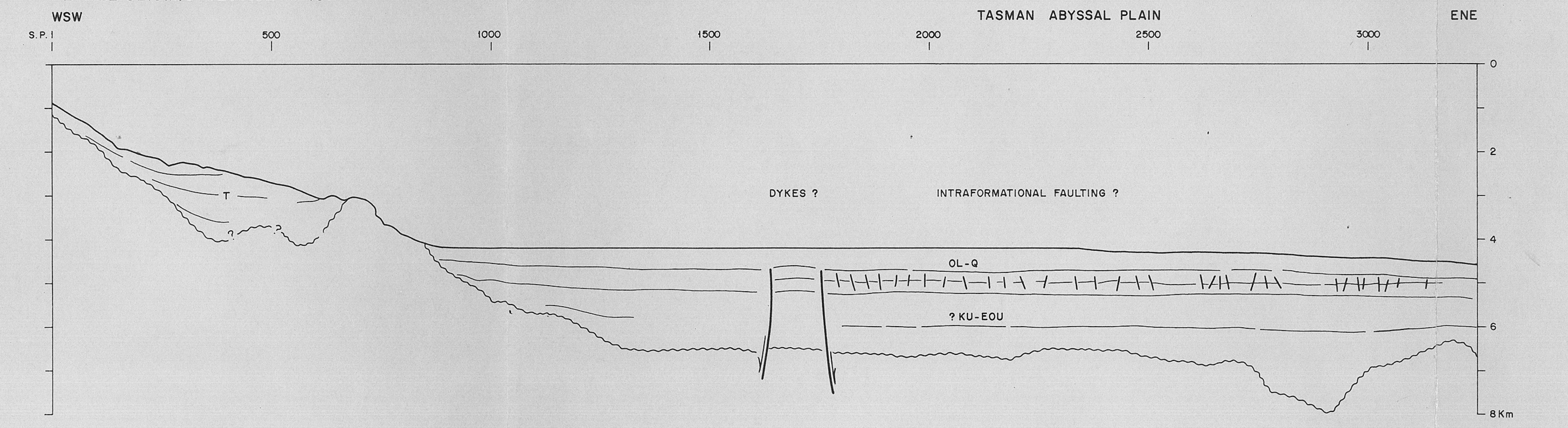
PETREL SEISMIC SECTION N 437 | PETREL SEISMIC SECTION N 435 | PETREL SEISMIC SECTION N 434



PETREL SEISMIC SECTION N 416



PETREL SEISMIC SECTION N 431



DEPTH SECTIONS FROM PETREL DATA

Drawn from shipboard time-sections using the following velocity functions:

Water: 1500 m/sec.

Sediment: (1650 + 0,75z) m/sec. (Houboldt function)

Interpretation of shipboard sections by A.D. Ingles and P. Allenbach (EP/13)

OTHER DATA

Otway Basin geological sections from L.G. Weeks and B.M. Hopkins (1967)

KEY TO SECTIONS

T	Tertiary
TL	Lowermost Tertiary; where identifiable as a separate unit
KU	Upper Cretaceous; east of Tasmania includes Lower Tertiary at top
KL	Lower Cretaceous
J	Jurassic
Bm	Pre-Permian basement; mainly Palaeozoic
	Volcanic basement; usually Middle to Upper Cretaceous

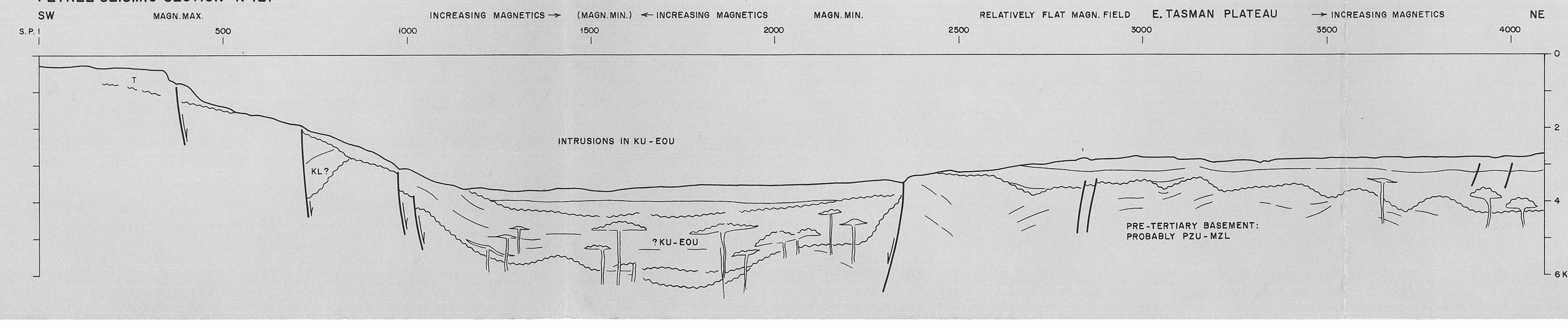
Reflectors

Unconformities

Faults, sense of movement indicated

Magnetic basement depth: calculated by J. Adriaanse (S.I.P.M. EP/12)

PETREL SEISMIC SECTION N 427



041042

5 cm

o/s 34

SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V.		
THE HAGUE	EXPLORATION & PRODUCTION	
S.E. AUSTRALIA		
REGIONAL SEISMIC SECTIONS		
HORZ. SCALE 1:500000 VERT. SCALE 1:100000		
Author: H. Doust	Encl.: 19	Date: January 1974
Report No.: EP 45307		Draw. No.: G 62129/4

OR-088

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