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SUMMARY OF OIL SEARCH ACTIVITIES IN AUSTRALIA AND PAPUA NEW GUINEA DURING 1968

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SUMMARY

During calendar year 1968, 232 wells, including step-out and development wells, were completed and a small number were in progress at the end of the year. The total footage drilled, including uncompleted holes, was 1 103 962 feet, of which 437 000 feet were drilled in Western Australia and 252 013 feet in Queensland. No new oil fields were discovered, but encouraging shows of oil and gas came from wells in Bass Strait, Victoria. The 1967 oil strike at Kingfish in Bass Strait was extended by two wells, located about 2 miles and 6 miles west of the discovery well. Other encouraging shows of oil came from the southern part of the offshore Perth Basin, Western Australia, and from Legendre No. 1 in the northern offshore Carnarvon Basin. New gas discoveries were made in the Surat Basin near Roma, Queensland and also at Mondarra in the northern onshore Perth Basin, and in the Gulf of Papua.

Australia's first offshore drilling/production platforms were completed in Bass Strait, first at Barracouta Field in April and later at Marlin Field. Drilling of production wells started from both platforms, but a serious gas blow-out from the Marlin A7 well on 2 December 1968 forced work to stop on the Marlin Field and eventually caused delays to the operator's plans for production of oil and gas from the Bass Strait fields during 1969.

47 seismic surveys, 8 gravity surveys, 7 aeromagnetic surveys, and 1 magneto-telluric survey were conducted under the Commonwealth Petroleum Search Subsidy Act, and numerous unsubsidized geophysical surveys were reported.

The total expenditure on petroleum exploration development and production in Australia and Papua New Guinea by Governments and private enterprise during 1968 was $142 344 408. Payments made under the Petroleum Search Subsidy Act during 1968 totalled $13 905 484. The cost of operations by the Bureau of Mineral Resources (BMR) attributable to petroleum exploration and associated activities in 1968 amounted to $3 184 701.

INTRODUCTION

This report is given in the light of information available at the time of writing (1969). The sources of information were mainly the final reports of drilling and geophysical operations carried out under the Commonwealth Government's Petroleum Search Subsidy Act (P.S.S.A.), but other information from Press reports, commercial scouting services, the Petroleum Newsletter issued quarterly by BMR, and publications in various journals have been used. It is not always possible to verify the accuracy of some of this information.

The Final Reports of operations conducted under the Petroleum Search Subsidy Act deserve special mention. Most of the Final Reports for 1968 subsidized operations are unpublished at present, and are referred to in this report by their BMR file numbers following their official titles. This is a convenient method and removes the necessity for a long list of references. The reader should bear in mind that the interpretations in some Final Reports may be amended when these reports are published by BMR; because of an unavoidable time lag between completion of the operation and publication of the results it is sometimes possible for authors and publishers in conjunction to revise an interpretation.

Figure 2 of this report shows only subsidized geophysical surveys; although numerous unsubsidized surveys were reported during the year, their locations are not always available and their titles are sometimes confusing with regard to the BMR nomenclature of subsidized surveys.

ADAVALE BASIN

Two wells were drilled on seismically-determined structures - Australian Sun Oil Co.'s. Fairlea No. 1 (BMR file 68/2010), and American Overseas Petroleum Ltd's Ravensbourne No. 1 (BMR file 68/2027) with Devonian sediments being at least one of the target horizons (other wells with targets in Permian and Triassic sediments of superimposed basins are mentioned elsewhere in this report). No significant shows of hydrocarbons were found in either well.

Permian and Devonian "D4" sandstones were the primary targets in Fairlea No. 1, but electric log analysis indicated that all reservoirs except Lower Permian sandstones (4 773-4 834 ft) contained water. The Devonian "D3" and "D4" horizons were absent, and a prominent seismic marker, previously correlated with the "D3" horizon, was established as originating from an unconf rmity between the Etonvale "D2" horizon and

the underlying Lower Devonian Gilmore Formation. The well bottomed in Lower Devonian metamorphics at 10 235 feet. The drilling results confirmed seismic predictions of the northward extension of the Adavale Basin.

In Ravensbourne No. 1 TD, 7 736 feet, Lower Devonian targets were found to consist predominantly of sandstone with poor reservoir characteristics, and minor shale and siltstone with poor source and cap-rock potential. Upper and Middle Devonian sequences were absent, as expected, but the whole of the Devonian sequence, (5 020-7 736 ft) was difficult to correlate with any known section.

AMADEUS BASIN

Magellan Petroleum (N.T.) Pty Ltd spudded Tyler No. 1 (BMR file 68/2031) on 29 June 1968, and the well was drilling ahead at 9 261 feet at the end of December 1968.

The well was located on a seismically-determined structure in O.P. 43, N.T., some 25 miles north of Palm Valley No. 1 well.

Magellan Petroleum (N.T.) Pty Ltd carried out geological field work in O.P. 43 and O.P. 56 at various times during the year, and also initiated a feasibility study for the local usage of hydrocarbons from the Mereenie Field. BMR cored one hole to examine evaporite sequences in the Bitter Springs Formation, and continued a program of detailed examination of the Gosses Bluff Astrobleme which in 1968 involved geological field work and aeromagnetic, gravity, and seismic surveys.

BONAPARTE GULF BASIN

The main activities onshore were the Westralian Oil Ltd Keep River R-2 Seismic Survey (BMR file 68/3043) and the drilling of the Australian Aquitaine Petroleum Pty Ltd Keep River No. 1 well (BMR file 68/2039).

The Keep River R-2 Seismic Survey was carried out to extend previous coverage southwest of Spirit Hill No. 1 well, and to evaluate the tectonic framework in the southern part of the Title area. Horizons C (? Basement), B (? Devonian), and A (? Lower Carboniferous) were mapped in the program, which consisted of about 37 line-miles of 600% CDP,

digitally recorded. Record quality was generally fair to good, but poor in fault zones.

Horizons C and B were found to be faulted extensively by six faults tending north-northeast, including the Cockatoo Fault. Two faults trending northwest were also mapped. All but two of the north-northeast-trending faults penetrated Horizon A. An isopach map of A-B Horizons shows thinning over structural highs and thickening over lows.

Keep River No. 1 well in O.P. 162, located on a seismically-determined anticline, spudded on 3 September 1968 and was drilling ahead at 11 178 feet on 31 December 1968. It reached T.D. of 15 623 feet on 23 February 1969, and some shows of dry gas were reported.

BOWEN BASIN

Four wells were drilled, but no geophysical activity was reported.

Alliance Oil Development Australia N.L.'s Penjobe No. 1 well (BMR file 68/2007) was drilled in Authority to prospect (A.T.P.) 126P, and was located at shot point 10, line C, of the subsidized Kareela Seismic Survey (BMR file 67/11204) on an anticline on the eastern flank of the Anakie-Nebine Ridge. The Permian section was thin, and the well penetrated the Carboniferous Ducabrook Formation at 1 540 feet. Total depth was 1 828 feet.

Planet Exploration Company Pty Ltd drilled three unsuccessful wells in A.T.P. 100P-Warrinilla No. 3, Warrinilla No. 4, and Warrinilla No. 5.

Warrinilla No. 3 (BMR file 67/4272) reached total depth on 1 January 1968. It was drilled on the eastern flank of the Denison Trough. It spudded in shale of the Triassic Rewan Formation and intersected Permian sediments at about 1 348 feet and low-grade Carboniferous to Devonian metamorphics at 7 054 feet. Minor gas, and rich oil shows were encountered in a thick section of Permian Aldebaran Sandstone, but there was no permeability, and drillstem tests failed to produce any formation fluids. The well was plugged and abandoned at a total depth of 7 512 feet.

Warrinilla No. 4 (BMR file 68/2001) was drilled 5 012 feet to total depth on the Warrinilla Anticline, some 2½ miles west-southwest of Warrinilla No. 3, at a location where better permeability in the Aldebaran Sandstone was predicted. This prediction was correct, but no commercial

hydrocarbons were recovered. Permian units above the Aldebaran Sandstone lack porosity.

Warrinilla No. 5 (BMR file 68/2006) was located 2 miles south-southeast of Warrinilla No. 4, and was also drilled in a seismically-determined closure on the Warrinilla Anticline. The well reached T.D. of 6 729 feet, and although no commercial hydrocarbons were found, the first flow of hydrocarbons (dry gas) from the upper part of the Upper Permian Bandanna Formation was recorded. Additional gas was obtained from the Permian Peawaddy Formation.

A field party from the BMR Geological Branch studied the environment of deposition of the Triassic Mimosa Group.

CANNING BASIN

A considerable amount of geophysical work was done, both onshore and offshore, during 1968 and several wells were drilled onshore, but no commercial hydrocarbons were found. There is no record of geological field work.

In the northern part of the Basin, Westralian Oil Ltd conducted the Napier Refraction Survey (BMR file 68/3033) to seek subsurface reversals on a number of outcropping anticlines plunging either south or southwest or both, near the northern edge of the Lennard Shelf. 64.5 line-miles were recorded, and reversal of dip was indicated on two features.

Also in the northern part of the Basin, West Australian Petroleum Pty Ltd (Wapet) made two seismic surveys both on P.E. 30H. The Lennard Seismic Survey (BMR file 68/3018), was a detailed reflection survey of about 39 line-miles, with 600% coverage, and digital recording; the objective was to obtain information on the structure of reefs and to record the dip of fore-reef and back-reef facies in the Devonian sequence near Meda No. 1 well. Although these features were mapped on dip evidence, they do not prove reefing. The Baskerville Seismic Survey (BMR file 68/3023) was designed to check a structural high indicated by aeromagnetic and gravity work in the northwestern part of the Fitzroy Trough, and also to connect the Dampierland Seismic Survey (BMR file 65/4816) with a previous survey, by Gewerkschaft-Elwerath, to the south. The Baskerville survey suggested two major anticlines, but reflection quality was poor and detailed work is required to confirm them.

In the southeastern Canning Basin, Australian Aquitaine Petroleum Pty Ltd carried out the Terry Range Magnetotelluric Survey (BMR file 68/3016) and the Ryan Seismic and Gravity Survey (BMR file 68/3026); both surveys were located in parts of each of P.E. 151H, 152H and 205H. The Terry Range Survey was the first subsidized magnetotelluric survey carried out in Australia. The method purports to show sedimentary layers of different conductivity or resistivity properties and the instruments measure the relative amplitude of the telluric currents and the magnetic fields inducing them, within a broad frequency range. The survey confirmed, in general, the shape of part of the Kidson Sub-basin basement. In the southeast extension of the Fitzroy Trough the magnetotelluric results showed a contrast, within the sedimentary section, which was later confirmed by the Ryan survey.

The Ryan Seismic and Gravity Survey consisted of reflection and refraction work; 46 gravity bases were established and 1 029 new stations were read. The seismic work aimed at establishing the shape, depth, and flanks of the southeast Fitzroy Trough, and the shape and depth of the eastern end of the Kidson Sub-basin. The record quality was only poor to fair, and in the Kidson Sub-basin the results generally confirmed those of the previous Dakota Seismic and Gravity Survey (BMR file 67/11161). In the Fitzroy Trough, two seismic lines in the Point Moody area showed a thick sedimentary section thinning east and southeast. Strong tectonics, and unconformities or erosion surfaces, were indicated.

Offshore, Wapet's Wallal Marine Seismic Survey (BMR file 67/11208) was a short reconnaissance survey to determine whether a structural embayment occurs southwest of the Wallal Platform. The survey results showed that a structural embayment does occur; it is bounded in the northeast by a fault and in the southwest by thinning of section adjacent to an upthrown fault block. The thickest sedimentary section is on the downthrow (northeast) side of a major fault. Three structures with fault closure were indicated. The embayment may become a significant prospect for hydrocarbons because of the presence of marine Jurassic and Triassic sediments in nearby onshore wells.

The Offshore Canning-Seringapatam Marine Seismic Survey (BMR file 68/3027) of B.O.C. of Australia Ltd involved 1 737 new line-miles of digitally recorded reflection seismic survey and one reverse refraction profile; previous data (1964-1966) were reprocessed and integrated with the results of the Seringapatam survey. Only part of this survey was in the offshore Canning Basin. The southwestern flank of the Basin was established in Horizon B, which was a good reflector throughout the area. Horizon A

represented a prominent unconformity (? Senonian), and the results showed that folding in the area of the southern flank of the Basin generally preceded the Senonian. Several structures, including prominent anticlines, were found in the southern part of the Basin.

BMR conducted a marine gravity, magnetic, and seismic survey of the Northwest Shelf in 1968; the area extended from Barrow Island to Ashmore Reef and about 15 000 line-miles of traverse were completed along easterly lines about 10 miles apart. In the offshore Canning Basin part of the survey, there are intense Bouguer anomaly and magnetic anomaly features, with a general trend northwest, and the onshore Canning Basin structural trends continue offshore almost to the edge of the continental shelf. The seismic results gave information down to about the top of the Cretaceous section.

Wells were drilled in both the northern and southern parts of the Canning Basin, but the southern part received more attention than the northern. Wapet's Doran No. 1 well (BMR file 68/2033) was located at shot point 187, Line BC of the Dampier Downs Seismic Survey, and was designed as a test of Permian and pre-Permian sediments in a broad asymmetric dome on the Jurgurra Terrace. The well penetrated Quaternary, Jurassic, Permian, and Devonian-Carboniferous sequences to 2 504 feet, but no hydrocarbons were found.

Wapet's Willara Hill No. 1 (BMR file 68/2044) was drilled on a seismically-determined high on the Admiral Bay hinge line, to follow up the results of Willara No. 1 well, (south of the hinge line) which penetrated good reservoir sandstones in the Permian Grant Formation. These sandstones were not positively identified in Willara Hill No. 1, (T.D. 2 815 ft) but may occur at about 2 630 feet. Log evaluation indicated porosities of about 30% in the Permian sandstones but there was not much shale to act as cap-rock in the section. No hydrocarbons were discovered.

Wapet's Chirup No. 1 was an unsubsidized core hole located about 130 miles east-northeast of Port Hedland, on the northwest coastal highway. Total depth was 2 502 feet.

Total Exploration Australia Pty Ltd drilled three wells on the Broome Platform, in P.E. 259H. Edgar Range No. 1 well (BMR file 68/2041) was located at Station No. 1798, Line CR, of the McLarty Seismic and Gravity Survey (BMR file 67/11145), on the Broome Platform. This was a stratigraphic well, drilled on a poorly-defined seismic dome to 6 457 feet. The well drilled Jurassic, Permian, Devonian-Ordovician, and Ordovician

sediments and penetrated Precambrian basement at 6 286 feet. The Jurassic and some of the Permian beds were porous and permeable, but porosity was slight in pre-Permian sediments. Live oil was found in the Devonian-Ordovician Carribuddy Formation (Member E).

Total's McLarty No. 1 well (BMR file 68/2009) was drilled to 8 500 feet on a seismically determined structure, to test pre-Permian sediments. The results showed that the Permian sequence was eroded down to the Sakmarian Grant Formation and that there were no reservoir rocks below the Permian. Traces of fluorescence in the Ordovician Goldwyer Formation confirmed its source rock potential. A previously unknown sandstone sequence, 820 feet thick, was found below the Ordovician Thangoo Limestone sequence.

Total's Kemp Field No. 1 well (BMR file 68/2048) a stratigraphic well in an area of poor seismic records was located about midway between the McLarty No. 1 and Sahara No. 1 wells. The only hydrocarbon indications came from pin-point fluorescence in cores cut in the Devonian Mellinjerie Limestone. However, the well gave the following important stratigraphic results:

(1) The Permian sequence is not deeply eroded at this locality;

(ii) Conodonts in the Mellinjerie Limestone show that it is Middle to Upper Devonian;

(iii) The boundary between the Mellinjerie Limestone and the underlying Tangalgoo Red Beds was confirmed as transitional;

(iv) The Tandalgoo Red Beds thicken from 1 295 feet in McLarty No. 1 to 1 965 feet in Sahara No. 1;

(v) Mineralogical studies show that member A of the Caribuddy Formation and members B-D of the Tandalgoo Red Beds have constant composition and retain their mineralogical composition over long distances.

In the southeastern part of the Canning Basin Australian Aquitaine Petroleum Pty Ltd drilled Wilson Cliffs No. 1 well (BMR file 68/2011) to a total depth of 12 212 feet. No significant shows of hydrocarbons were found. The principal objective was to determine stratigraphy above economic basement; secondary objectives were to identify seismic markers and to evaluate the hydrocarbon potential of the Lower Palaeozoic sequence. The well drilled Tertiary, Mesozoic, Permian, Devonian, Ordovician, and ?Cambrian sequences before penetrating ?Upper Proterozoic shale at

11 746 feet. Good correlation can be made with Kidson No. 1 well (20 miles west-southwest) for the Ordovician Goldwyer Formation and younger sequences, but below the Goldwyer Formation correlation with known Canning Basin units is difficult, and some correlation with Amadeus Basin units is possible. All Ordovician reservoirs were tight and impermeable, but the Permian formations have fair porosity and permeability.

CARNARVON BASIN

52 development wells were drilled in 1968, and a pilot waterflood project was put into operation during the year.

Elsewhere, Wapet continued an active exploration program without success. Numerous seismic surveys, both subsidized and unsubsidized, were run and several wells and core holes were drilled. No geological mapping has been reported.

Wapet's unsubsidized seismic surveys (results are not available) included a marine survey in P.E. 217H near Barrow Island, and the Cape Range, Mingaloo, and Southern Rough Range onshore surveys.

The subsidized Table Marine Seismic Survey (BMR file 68/3001) was conducted in P.E. 28H, 217H and 233H. This large survey included both reconnaissance and detailed seismic surveying from 29 January to 4 June 1968. The survey located six structures recommended as drilling targets, and five others worthy of additional detailed work. Five horizons were mapped: base Toolonga Calcilutite (U. Cretaceous), basal Cretaceous unconformity, top Dingo Claystone (Jurassic), base Mesozoic, within the pre-Cretaceous. The top horizon was mapped on a reliable event with a regional northwest dip. In all the deeper horizons a closed high was mapped, located 14 miles offshore north of N.W. Cape. Six structures were mapped at the level of the basal Cretaceous unconformity. The depth contours on this horizon parallel the coast. Three structures were mapped on the base Mesozoic horizon which was heavily faulted.

Wapet's Helby Marine Seismic Survey (BMR file 68/3045) consisted of 81 miles of 1200% reflection coverage, and was designed to add control in the Yardie and Vlaming Anticlines (53 line-miles), and one reconnaissance line of 27 miles evaluated the possibility of a southern extension of the Cape Range Anticline.

This survey was related to the subsidized onshore Mandu Seismic Survey (BMR file 68/3042) and the Jurabi Marine Seismic Survey (BMR file 68/3059) conducted at the end of 1968 and the beginning of 1969 respectively. Together the three surveys indicated that the Yardie Anticline seems to extend offshore, parallel to the coastline, and the Vlaming Anticline seems to extend onshore. The axis of the Yardie Anticline was determined. No reasonable drilling target was located.

Marathon Petroleum Australia Ltd completed the onshore subsidized Mia Mia Seismic Survey (BMR file 67/11179) in 1968. The survey began on 29 August 1967, and was completed on 28 April 1968, in a Wapet farm-out area in P.E. 260H. This large survey of 888 line-miles of 5- and 6-fold CDP and 610 miles of single- and refraction profiling outlines parts of the Gascoyne, Onslow and Merlinleigh Basins, and the Wandagee Ridge. The seismic interpretation agreed well with previous aeromagnetic and gravity interpretation. Two horizons were mapped - a shallow horizon believed to be near the base of the Permian section, and a deeper one within the Lower Palaeozoic. Six structures were indicated, and the most promising (beneath the surface Giralia Anticline) had about 200 feet of vertical closure on the shallow horizon and about 300 feet on the deep one.

Apart from the operations on Barrow Island, Wapet drilled six shallow core holes and five unsudsidized exploration wells (Table 1) and two subsidized ones, whilst B.O.C. of Australia Ltd completed one offshore well and spudded another, and Marathon spudded an onshore well on the Giralia Anticline.

Wapet's Observation Island No. 1 well (BMR file 67/4275) spudded on 1 January 1968 and reached T.D. (7 510 feet) on 12 February 1968. The well was drilled to evaluate stratigraphy and hydrocarbon potential in an area near the Yanrey Ridge. The stratigraphy to the base of the Cretaceous was standard for the northwestern part of the Carnarvon Basin, but below this level (3 052 feet) Triassic sediments were penetrated to total depth. The Triassic can be correlated with the sequence in Wapet's Onslow No. 1 well onshore. The only show of oil was in the Lower Cretaceous Birdrong Sandstone (2 996-3 052 feet), but a drill stem test produced only formation water.

Wapet's Hope Island No. 1 well (BMR file 68/2003) was sited on geological evidence, close to the West Yampey Fault which might have provided a seal for hydrocarbons in the Birdrong Sandstone. This formation was present (2 920-2 989 feet), but a drill-stem test produced brackish water. The formation, and the underlying Triassic Locker Shale and Permian Kennedy Group, all contained beds with good reservoir characteristics.

B.O.C. of Australia Ltd drilled the offshore Legendre No. 1 well (BMR file 68/2016) on a seismically - determined closed structure in the north of the Carnarvon Basin. The sequence penetrated indicated the northerly continuation of the Carnarvon Basin. A drill-stem test, 6 211-6 280 feet, recovered oil from the top of the zone and water from the bottom. The test of perforated intervals 6 211-6 215 feet and 6 223-6 227 feet recovered 47° oil at the rate of 1 014 B/D, but the well was declared non-commercial.

B.O.C. of Australia's second offshore well in the Carnarvon Basin was Dampier No. 1 (BMR file 68/2052) which was spudded on 22 November 1968 and was drilling at a depth of 8 611 feet at the end of the year. The well was located on the crest of a seismically-determined anticline closed at all levels below a horizon near the top of the Lower Cretaceous.

Onshore, Marathon Petroleum Australia Ltd spudded Remarkable Hill No. 1 (BMR file 68/2050) on 15 October 1968 and the well was drilling ahead at the end of the year at 7 959 feet. It was located on a seismically-determined anticline in Palaeozoic rocks, which has a common axis with the surface Giralia Anticline.

CARPENTARIA BASIN

There was no exploration activity in 1968.

CLARENCE-MORETON BASIN

Clarence River Basin Oil Exploration Co. N.L. conducted one seismic survey and drilled one well.

The subsidized South Grafton Seismic Survey (BMR file 68/3009) was conducted in P.E.L. 66 in an area south of Grafton to delineate a postulated structure and to correlate reflections with the sequence in Grafton Racecourse Nos 1 and 2 wells. The survey failed to confirm a closed structure, and no correlation of reflections with known geologic markers was possible.

The subsidized Hogarth No. 1 well (BMR file 68/2030) was located 18 miles west of Casino, N.S.W., on the Hogarth Dome, which had not been detailed by geophysical surveys. The sequence drilled was generally tight

and strongly-cemented; small quantities of gas associated with coal seams were recorded but four drill-stem tests failed because the packers failed to seat. The well was abandoned at 3 996 feet.

COOPER BASIN

Delhi Australian Petroleum Ltd conducted an active drilling program - both exploration and development - and also carried out the following geophysical surveys.

(i) Southwest Cooper Basin Gravity Survey (BMR file 67/4835) in O.E.L. 20 and 21,

(ii) Cooper Basin Seismic Survey (unsubsidized)

The subsidized gravity survey was aimed at providing information additional to that already available to assist in the interpretation of pre-Permian seismic data and basement configuration and to obtain leads for future detailed seismic work and drilling. 1 775 miles were surveyed with ½-mile station spacing; 3 560 stations were occupied. A detailed Bouguer gravity anomaly map was produced from which residual contour maps were derived that showed up the structures in greater detail. Some Permian structures were identified in this way. The Cambrian structures were only vaguely apparent on the residual maps. It was considered that a few of the gravity features were attractive prospects for seismic programs.

The second survey was conducted over a period of nine months, starting in September. No results are available.

Total Exploration Australia Pty Ltd drilled the subsidized Tickalara No. 1 well, Queensland. It was located on a closed anticline trending northwest, and bounded on both flanks by low displacement faults. The structure contours on top of the Permian showed vertical closure up to 180 feet over 35 square miles. The well was terminated in Precambrian granite 5 765 feet. The Ordovician was absent, and the middle Permian (Gidgealpa Formation) rested unconformably on Permo-Carboniferous strata. The Jurassic section was as expected, but the Triassic Nappamerie Formation was absent. There were weak oil shows in the Permo-Carboniferous (Merrimelia Formation). The Permian reservoirs were watersaturated.

Delhi Australian Petroleum Ltd drilled the subsidized well Tinga Tingana No. 1 to T.D. 7 552 feet. It was located near the crest of the seismically determined Tinga Tingana anticline. No hydrocarbons were recorded but the well encountered excellent reservoirs and low temperatures in the Permian and undifferentiated Upper Palaeozoic sediments. All the sands were water-bearing. Steeply-dipping, unprospective, Lower Palaeozoic sediments were encountered beneath the undifferentiated Upper Palaeozoic sediments.

The same company drilled three development wells in the Gidgealpa gas field - Gidgealpa Nos 8, 9, and 10. No. 8 was completed as a dual gas producer and the other two as gas producers.

In the Moomba field, the Company drilled Moomba Nos 7 and 8 as development wells. No. 8 was completed as a gas producer and No. 7 was left standing as an unperforated gas well. Daralingie No. 2 (T.D. 7 924 feet) was drilled 23 miles southwest of the Moomba discovery well and was completed as a gas producer. Wanchoocha No. 1 was drilled 35 miles southwest of the Moomba discovery well. It was dry, and terminated in basement at 6 515 feet. Boxwood No. 1 was drilled to 6 342 feet, as a wildcat, 35 miles southwest of Moomba on a closed anticlinal structure delineated by seismic surveys. Mudlalee No. 1 was drilled to 8 829 feet, 19 miles southeast of the Moomba field. These wells were unsubsidized, and no information other than that in Table 1 is available.

DALY RIVER-WISO BASIN

There was no activity in 1968.

DRUMMOND BASIN

There was no activity in 1968.

EROMANGA BASIN

During the year BMR completed the geological mapping of the basin.

Two geophysical surveys were carried out. The Clarence River Basin Oil Exploration Co. N.L. completed the subsidized Winnathee gravity Survey (BMR file 68/3041) in P.E.L. 125, N.S.W. The objective was to confirm the northern extension of the Bancannia Trough into the permit area. The Bouguer anomaly map showed a series of highs and lows with a north-northwest trend. The features were poorly defined on the scale used. Local anomalies were almost absent approximately north of latitude 29°45'S., indicating a change of basement type.

Alliance Oil Development Australia N.L. completed the subsidized Coorajah Seismic and Gravity Survey (BMR file 67/11206) in Queensland in February 1968. The objective was to outline three possible drilling sites in the Triassic and Permian in the following areas:

(i) west flank of the Canaway Anticline.

(ii) northern extension of the Chandos Anticline.

(iii) eastern flank of the Chandos Anticline.

Three horizons were mapped: 'Blythesdale'; 'probable Walloon' (conformable with Blythesdale', and 'Permian' including the base of the Mesozoic where the Permian is absent. The gravity results showed unusually close qualitative correlation with the seismic.

Thunda No. 1 was drilled to 7 911 feet, as a result of this survey.

Six subsidized wells were drilled in the basin during the year, three at the southern end of Lake Frome in the Lake Frome Embayment.

The Lake Frome wells were drilled by Delhi Australian Petroleum Ltd, to investigate the stratigraphy and structure of the pre-Mesozoic sediments. No. 3 was drilled first, and penetrated Quaternary, Tertiary, and Middle Cambrian Sediments. No. 2 penetrated Quaternary, Tertiary, Lower Cretaceous, Middle Cambrian, and Lower Cambrian Sediments. No. 1 penetrated Quaternary, Tertiary, Lower Cretaceous, Middle Cambrian, and Lower Cambrian sediments. The marine Cambrian section was directly correlatable with outcrops of Middle and Lower Cambrian sediments in the northern Flinders Ranges. The presence of the Palaeozoic section upgraded the petroleum prospects of the area.

Alliance Oil Development Australia N.L. drilled three subsidized wells in Queensland. Thunda No. 1 was located on the culmination of the seismically determined Thunda Structure, on the eastern edge of the Jundah Infra-basin, 25 miles north-northeast of Chandos No. 1. The structure is

15 x 3 square miles, with 200 feet of closure on the "P" horizon. The well penetrated a thick (some 7 000 ft) Mesozoic section before entering the Permian Gidgealpa Formation (118 feet thick). There were no significant hydrocarbon shows and the well was terminated in the Innamincka Red Beds (Lower Carboniferous-Devonian). Cumbroo No. 1 tested the Permian Gidgealpa Formation and the Triassic Chandos Beds. It spudded in Tertiary (167 ft thick) and drilled through a thick section of Cretaceous, Jurassic, and Triassic sediments before entering the Gidgealpa Formation at 6 992 feet (138 ft thick). It terminated in the Innamincka Red Beds at 7 241 feet. Budgerygar No. 1 was drilled on the northern culmination of the seismically determined Canaway Anticline. It spudded in the Cretaceous (Upper Winton Formation), and drilled through some 5 000 feet of Mesozoic section before entering the Upper Permian, which had a thickness of only 18 feet, and was underlain by early Palaeozoic granodiorite basement (T.D. 5 350 ft).

There was no sandstone in the Permian. The sandstones in the Triassic were porous and permeable, but water-saturated.

EUCLA BASIN

There was no drilling during the year. Shell Development (Australia) Pty Ltd completed the South Australian Shelf R-2 Marine Seismic Survey (67/11205) in O.E.L. 38, S.A. consisting of 462 miles of reflection survey and 4 refraction probes. Two areas were surveyed, one adjacent to Kangaroo Island and the other 150 miles west of Eyre Peninsula.

The following results were obtained:

(i) Mappable data were obtained in both areas;

(ii) a thick sedimentary sequence exists south of a shallow basement platform. A strong unconformity exists below Horizons A and B. Three large structural features were outlined, particularly beneath the unconformity and closure was indicated;

(iii) in the second area there are up to 8 000 feet of section in an east-trending basin which plunges west. No significant structural leads were found.

GALILEE BASIN

There was one subsidized geophysical survey completed during the year. Western River Seismic Survey (67/11198) in A.T.P. 118P Qld, was

carried out by Phillips Australian Oil Company. It began in November 1967 and was completed in March 1968. The objective was to investigate the extent and structure of Pre-Jurassic sediments on the 'down' side of the Cork Fault - by reconnaissance and semi-detailed work - and to investigate a structure indicated by the 1966 Collingwood survey.

The reflection originally identified as Permian (?) in the 1966 survey is now believed to represent the basal Jurassic unconformity. Three reflection horizon (Blythesdale Group, base of the Jurassic, and base of the Permian) were picked along most of the survey line. The upper two are strong and continuous, the lower one faulted and erratic. The results indicated that the Cork Fault is pre-Blythesdale in age, and that up to 2 000 feet of pre-Jurassic sediments exist on the downthrown side of the fault. The three horizons were contoured and show a general increase of structural relief with depth; they confirm the extension of the Cork Fault southwest to the limits of the survey area.

Australian Sun Oil Company drilled one subsidized well, Barcoo No. 1, on a seismically determined closed structure. The primary targets were Permian sandstones, with Triassic and Jurassic sandstones as secondary targets. The well spudded in the Upper Cretaceous (Winton Formation), and drilled through some 3 800 feet of Mesozoic sediments before intersecting the Upper Carboniferous/Lower Permian rocks. It was terminated in Devonian (?) basement at 5 631 feet. There were no significant shows of hydrocarbons. All the reservoir sections were water-bearing. The Mesozoic sections contained fresh water and there were several porous sandstone beds in the Permian.

GEORGINA BASIN

There was no activity in 1968.

GIPPSLAND BASIN

Work in the Bass Basin is also considered in this section. The greatest activity, both geophysical and drilling was in the offshore Gippsland Basin. Esso Exploration and Production Australia Inc. drilled twenty three wells. Oil was discovered in Kingfish 2 well (2 miles west of the original discovery well Kingfish 1, drilled in 1967), and in Kingfish 3, which was located 6 miles west of Kingfish 7. The Barracouta Platform was completed

in April 1968 and nine development wells (Barracouta A-2 - A-10 inclusive) were drilled to supply natural gas to Melbourne. Construction of the Marlin Platform began in April 1968 and Marlin A-3 - A-7 inclusive were drilled from it. On 2 December 1968 Marlin A-7 well blew out and although it was controlled early in 1969 production was delayed. Three unsubsidized wildcat wells - Groper -1 (dry), Flounder -1 (small show of oil below 8 200 feet), and Perch -1 (non-commercial oil) complete the Esso drilling activities.

There were four subsidized geophysical operations. A.P.M. Development Pty Ltd conducted the Toongabbie Seismic Survey (BMR file 68/3022) in P.P.L. 192. This was a combined refraction/reflection survey, 24 miles of refraction east of Toongabbie, Vic., with 6.5 miles of reflection work along this line. The refraction work indicated more than 10 000 feet of sediments in the centre and east of the survey area, but less than 4 000 feet in the west. The reflection work showed that continuous reflections could be mapped only down to one second - deeper events may be obscured by coal in the sequence.

Esso Exploration and Production Australia Inc. was the operator for the Bass EF-68 Seismic Survey (BMR file 68/3014) in the Bass Basin. The survey involved about 390 miles of traverse, and the reprocessing of 293 miles of previous six-fold and single-fold analogue data, which were then integrated with the 1968 results. A new local and regional interpretation resulted. Four local areas and/or structures were surveyed and named as follows:

(i) Frigate, on the southwestern flank of the Bass Basin: this is a small, low-relief anticline with 150 feet of closure on the Eocene horizon, but not closed on the Oligocene horizon. Economic basement is 7 000 feet below the crest of the structure. The structural history is similar to that of the structures tested unsuccessfully by Bass No. 1 and Bass No. 2, and therefore the Frigate structure is unattractive.

(ii) Pelican: This is a large anticline trending west, on the southwestern flank of the Bass Basin. Vertical closure of 600 feet was mapped near the top of the Upper Cretaceous but the seismic event was discontinuous and cannot be correlated or tied to well control. Basement may be deeper than 12 000 feet below sea level.

(iii) Penguin: on the northeastern flank of the Bass Basin. Eocene sand was traced onto shallow basement, but lateral changes in reflection count indicate that the underlying upper Eocene siltstone may grade up-dip into sandstone.

(iv) Heron: An area of about 2 000 square miles on the southwestern Bass Basin. This was covered by regional work only, but the results indicated more than 20 000 feet of sediments with complex faulting and folding. Some major faults have displacements exceeding 10 000 feet.

In the Gippsland Basin Esso carried out the Gippsland EH-68 Marine Seismic Survey (BMR file 68/3015) in P.E.P. 38, P.E.P. 39, and E.L. 1/60. This consisted of 141 miles of subsidized 12-fold CDP survey, digitally processed, and integrated with previous surveys. The total survey consisted of 703 miles but the majority of this was in areas excluded from subsidy. The subsidized part of the survey showed that the Latrobe Valley Coal Measures onlapped shallow basement, and a clear outline of the edge of the formation was obtained.

Esso began the Gippsland B.69A Marine Seismic and Magnetic Survey (BMR file 68/3058) on 24 December 1968, and the survey was in progress at the end of the year.

Magellan Petroleum Southern Pty Ltd completed the East Gippsland Basin Seismic and Magnetic Survey (BMR file 68/3049) in P.E.P. 63A and TI/P to get stratigraphic and structural information in an area near to, but east of, the Bass Strait oil and gas fields. This was a survey of 345 line-miles, but part of it was in an area excluded from subsidy. Reflection identification was provided by synthetic seismograms generated from the continuous velocity log of Esso-BHP Marlin No. 1 well and carried from the unsubsidized line M44B to the remainder of the area.

In the subsidized work, three horizons were mapped: A, within the Miocene sequence, and considered to be reliable for definition of structure within the Miocene; B, an erosional unconformity at the top of the Latrobe Valley Formation, and C, basement.

A-B isopachs show general thickening to the north in P.E.P. 63A and to the west in TI/P. B-C isopachs show general southward thickening in P.E.P. 65A.

Only one anticline and another poorly defined anticline were interpreted. The better anticline is in TI/P and is shown on all three mapped horizons. It is closed on horizon B, with vertical closure of 250 feet and an areal extent of about 10 square miles. The water depth ranges from 320 to 400 feet, and depth to horizon B is interpreted as 4 750 feet.

LAURA BASIN

The only activity in this basin during 1968 was the Cooktown Aeromagnetic Survey (BMR file 68/3010) in A.T.P. 127P carried out by Corbett Reef Ltd. This was an offshore survey, involving 4 844 statute miles flown easterly at 2-mile spacing, and extending from the coast to the Great Barried Reef. The results showed strong magnetic anomalies, along the coast and in the Cape Melville area, indicative of shallow basement. To the east and along the Great Barried Reef, however, magnetic anomalies are weak, and basement depths exceeding 10 000 feet are indicated.

MARYBOROUGH BASIN

One subsidized seismic survey and five wells were completed in 1968. Exoil N.L. was the operator for the North Bundaberg Seismic Survey (BMR file 67/11200) in the northern onshore part of the basin, in A.T.P. 70P. The survey began late in 1967 and was completed in March 1968.

A weight-dropping device was used at the beginning of the survey, because the area was closely settled. However, the results ranged from poor to negligible and after three weeks the method was discarded in favour of conventional shooting. This gave data of generally fair quality. No closed structures were found; the presence of a structure plunging northwest was demonstrated, but all dips were easterly.

Australian Gulf Oil Company drilled three offshore wells in A.T.P. 90P. Capricorn No. 1 was abandoned at 940 feet for mechanical reasons, and Capricorn No. 1A (BMR file 67/4269) was spudded nearby on 22 November 1967 and reached total depth at 5 609 feet on 10 January 1968. Capricorn No. 1A was drilled on a seismically determined anticline with 250 feet of closure on an upper Tertiary horizon, and 900 feet on a deeper one which was thought to be 'base of Tertiary'. The drilling results showed that the anticlinal structure is depicting relief on the top of a Lower Tertiary conglomerate (4 030-5 250 feet) which unconformably overlies volcanics of ? Cretaceous age. No hydrocarbons were found.

Aquarius No. 1 well (BMR file 67/4276) was drilled some 25 miles east of Capricorn No. 1A. The well did not penetrate a ? Cretaceous volcanic sequence but bottomed at 8 695 feet in slightly metamorphosed sediments of probable Palaeozoic age. No hydrocarbons were found.

In A.T.P. 71P, Amalgamated Petroleum N.L. ran an ubsubsidized marine seismic survey, from the coast to the edge of the continental shelf. No details of the survey are known. The same company drilled the unsuccessful Matjara No. 1 well (BMR file 68/2025) in A.T.P. 71P, on a shallow structure indicated by the Moreton Reflection Seismic survey. The well penetrated about 1 000 feet of sediments above igneous rocks whose base had not been reached at T.D. (3 275 feet).

In A.T.P. 116P, Associated Australian Oilfields N.L. drilled the unsuccessful St Helena No. 1 well (BMR file 68/2047) to T.D. of 2 069 feet. This was a stratigraphic well located on a postulated anticline; the sedimentary sequence was found to be thin and no significant hydrocarbons were found - high gas detector readings were related to thin coal seams.

MURRAY BASIN/BANCANNIA TROUGH

No wells were drilled during 1968, but two gravity surveys and three seismic surveys were made; all were subsidized.

The Four Corners Gravity Survey (BMR file 68/3005) of Alliance Oil Development Australia N.L. was done in P.E.L. 52, N.S.W., near the northern end of the Murray Basin. 342 new gravity stations were established and tied via base B of the 1969 Scopes Gravity Survey (BMR file 66/4826) to BMR Isogal Stations. Ground magnetic work was done in conjunction with the gravity survey, and the objective of the survey was to get detailed information on structures indicated by the Scopes Survey. The results of the Four Corners Survey showed that the best structure indicated was a basement high, and detailed work on another structure in the Malta Lake area added nothing significant. The thickest section, on a depression between two gravity maxima, was calculated at 2 100 feet. One of the most significant results of the Four Corners Survey was that it showed, together with shallow stratigraphic drilling, that a large area of Precambrian rock underlies shallow cover southeast of Broken Hill.

Planet Exploration Co. Pty. Ltd. conducted the Murrumbidgee Gravity Survey (BMR file 68/3032) in the southeast of the Murray Basin, to delineate individual basins in that area. The objective was not achieved: The gravity results reflect variations in basement density rather than variations in thickness of sedimentary cover, independently shown by previous aeromagnetic and seismic surveys, e.g. three large gravity lows were interpreted, but the largest is over an area of granite outcrop. Positive anomalies in the eastern part of the survey area may indicate shallow Devonian and/or Ordovician sediments.

The Tandou-Coombah Seismic Survey (BMR file 68/3007) of North Australian Petroleum Company consisted of 89 miles of reflection and refraction work in P.E.L. 113, N.S.W. The survey showed a thick sedimentary section in the Menindee Trough, probably of Devonian age.

Alliance Oil Development Australia N.L. conducted the Lake Wintlow Seismic Survey (BMR file 68/3031) in P.E.L. 52, to investigate gravity anomalies found in previous surveys and to investigate the Palaeozoic section found in the previously drilled Blantyre No. 1 well (Permian, Carboniferous, and Devonian beneath thin Tertiary cover). The survey consisted of both reflection and refraction work. A very thin section was indicated above the Precambrian on the Lake Wintlow 'high', and basement depth of 13 000 feet at Blantyre No. 1 was indicated. In the Four Corners area basement depth was calculated at 18 500 feet, but near Scopes Range in the northwest of the Permit a very thin (less than 500 feet) Palaeozoic section was indicated.

A belt of Devonian sediments north and northeast of the Murray Basin, and extending beneath it, has been given several names, in whole or in part, and some confusion exists with regard to what basin these sediments occupy. They will not fit the definition of Murray Basin in the BMR 1969 ECAFE paper*, but it is appropriate to consider them in a section of the report adjacent to that on the Murray Basin, because exploration in both areas overlaps.

In this area, Planet Exploration Co. Pty Ltd carried out field work, drilled two wells, and conducted geophysical surveys. The Nucha Seismic Survey (BMR file 68/3021) on P.E.L. 114, N.S.W., was tied to the Company's Bancannia South No. 1 well (BMR file 67/4268). The survey mapped a closed structure covering about 18 square miles, and with vertical closure exceeding 1 000 feet, in Devonian sediments.

The Lake Poopelloe R-2 Seismic Survey (BMR file 68/3037), in P.E.L. 131, N.S.W., was a 6-fold CDP reflection survey to seek suitable drilling targets in Lower Palaeozoic sequences. The results were generally poor but a structural nose, near the intersection of lines 1, 2, and 3 was delineated on phantom data, and the anomaly agreed reasonably well with previous gravity surveys and with outcrop data.

The Bancannia South No. 1 well (BMR file 67/4268) was completed in 1968 at 11 185 feet; no significant hydrocarbons were found. The well was drilled on a seismically determined structure and penetrated Tertiary,

* BMR, 1969-The sedimentary basins of Australia and Papua New Guinea and the stratigraphic occurrence of hydrocarbons. ECAFE Symp. Devel. Pet. Resour. Asia and Far East, Canberra, 1969.

Cretaceous, and Devonian sediments before entering andesite and dacite of unknown age; the structure is an erosional remnant of these volcanics. Good porosity was observed in Middle to Upper Devonian sandstone.

The Bancannia North No. 1 well (BMR file 67/4277) was also completed in 1968 at 4 851 feet, and failed to recover any significant hydrocarbons. The well was located on Line 6, ½ -1 mile east of shot point 64A of the previous Lake Windauka Seismic Survey. From 1 310 feet to total depth the well penetrated a sequence of Carboniferous - Upper Devonian - Middle Devonian 'red beds'. Poor to fair porosity was evident in the interval 3 070-3 730 feet.

NGALIA BASIN

BMR completed a seismic survey commenced in 1967, and mapped the 1:250 000 Sheet areas of Lake Mackay, Napperby, and Mount Doreen (in part). Three scout holes were drilled in the Napperby Sheet area.

The Ngalia Basin Gravity Survey (BMR file 68/3051) was carried out by Magellan Petroleum Southern Pty Ltd in O.P. 165, N.T. Its objective was to obtain information that could be integrated with the BMR seismic survey.

Previous surveys have indicated that the basin is asymmetrical with a maximum depth about 20 000 feet, the axis being near an overthrust northern flank. It has been postulated that salt is present low in the section and may have formed a decollement surface during overthrust faulting from the north.

In the presentation of results, the gravity profiles are plotted directly onto BMR seismic records. The main gravity features, mostly faults, are thus easily compared with the reflection records, and a good correlation was found.

OFFICER BASIN

The only activity was the subsidized drilling of Munyarai No. 1 well by Continental Oil Co. of Australia Ltd, on a seismically determined anticline. Three broad lithological zones were distinguished in the section drilled:

(i) Red-brown dirt sandstone with interbedded siltstone and mudstone, gypsiferous in the upper 1 700 feet, surface - 3 000 feet;

(ii) Clean quartz sandstone (mainly), commonly porous, 3 000-5 150 feet;

(iii) Laminated grey shale, commonly very calcareous, two limestone intervals, 5 150-9 150 feet (T.D.).

There were no diagnostic fossils but palynology indicated a Devonian age for the bottom shale. The dips were flat.

OTWAY BASIN

Five subsidized geophysical surveys were carried out during 1968:

(i) Hawkesdale Gravity Survey (BMR file 68/3035) in P.E.P. 5 (Victoria).

(ii) Otway EP-67 Marine Seismic and Magnetic Survey (BMR file 67/11188) in O.E.L. 26 S.A., P.E.P. 40 and 49, Vic., and E.L. 1/60, Tas.

(iii) Otway EU-68 Marine Seismic and Magnetic Survey (BMR file 68/3052) in SA/P8

(iv) Otway EV-68 Land Gravity Survey (BMR file 68/3056) in O.E.L. 22, S.A.

(v) Otway ER-68 Marine Seismic Survey (BMR file 68/3036) in P.2 and 3, S.A., P.E.P. 40 and 49, Vic, and T/3P, Tas.

The Hawkesdale survey was by Shell Development (Australia) Pty Ltd. The objectives were to establish regional trends, to delineate basement structures, and to attempt to determine the distribution and thickness variations of the Pretty Hill Sandstone. 1931 field stations and 27 base stations were established.

The following results were obtained:-

(i) There is a significant density contrast near the surface due to shallow basalt sheets of a fairly uniform thickness (about 400 feet).

(ii) The density of the Pretty Hill Sandstone is too close to that of the basement to permit their separation.

(iii) There is a strong regional trend in a west-northwest direction, consisting of a chain of highs and lows related to basement highs and lows.

(iv) A northerly trend called the 'Hawkesdale Gravity Complex' was defined, and crosses the west-northwest trend.

(v) A residual anomaly map shows the north-northwest trend, suggesting that the trend is related to basement configuration.

The Otway EP-67 survey was by Esso Exploration and Production Australia Inc. 970 miles of traverse (six-fold CDP, digitally processed results) were completed. The report also covers the results of the digital processing (subsidized) of 1 598 miles of previous surveys. 780 miles of magnetic coverage were obtained but 38 miles were unreliable and another 36 questionable.

A strongly faulted area of the offshore Gambier Sub-basin was outlined, the western limit of which is on the Upper Cretaceous and Tertiary hingeline. One of the fault closures is a drilling prospect. In the Victoria/ Tasmania offshore area, the survey defined a stratigraphical structural prospect in the Lower Oligocene, which is the site of the Nautilus A-1 well. Three anticlines at the base of the Tertiary were outlined. Mesozoic structures were generally difficult to define because of truncation and faulting.

The Otway EU-68 survey was also by Esso; the objectives were to map the nearshore part of the Beachport High, which is a large basement high known from previous gravity and magnetic surveys, and to look for stratigraphic traps. 47 miles of traverse (6-fold CDP, using Aquapulse energy source) were completed and the data processed digitally.

The survey successfully defined the Beachport High (offshore) and mapped a potential reservoir, the 'Crayfish Sandstone', which pinches out against the basement high. The sand was deposited in early Lower Cretaceous time contemporaneously with the block faulting which produced the high, and it fills depressions in the basement surface. Three horizons were mapped - economic basement (granite or Palaeozoic metamorphic rocks), the top of the Crayfish Sandstone, and the base of the Tertiary. The magnetometer was not used because of the possibility of damage against the many shoals and islands in the survey area.

The Otway EV-68 survey by Esso established 2 088 gravity stations at ½-mile intervals, tied to the BMR Mount Gambier Pendulum Station. The regional result is a broad gravity trough, with relatively sharp highs within it. A trend of these highs borders the area to the north, and probably correlates with the Padthaway basement ridge. There are three positive anomalies in the southern part of the area, the most pronounced being centred on Beachport. Within the regional gravity trough, a northwest trend (Penola Trough) is truncated by another major trough (Robe Trough) which trends easterly. Major faulting is indicated on the southern border of the Padthaway Ridge. The Robe Trough contains more than 20 000 feet of sediments and there are up to 12 500 feet in the Penola Trough as computed from a low density sedimentary isopach map derived from the residual gravity map.

The Otway ER-68 survey, by Esso, had a scope of 1 110 miles of 12-fold CDP, using Aquapulse energy source and digitally processed. 4.25 miles of previous work (Otway EP-67) was digitally reprocessed, with improvement in quality. The area was immediately west of Bass Strait. The results of this survey have been integrated into previous work to give a total seismic interpretation of all parts of the Esso farm-in title areas of the offshore Otway Basin. This total interpretation is presented in the final report, illustrated with several cross-sections.

Six wells were drilled in the basin during the year. Esso drilled three subsidized wells offshore, and Interstate Oil Ltd drilled three subsidized onshore wells.

The first offshore well drilled was Prawn A-1 in Tasmanian waters, TD. 10 477 feet. The well was drilled on the crest of a north-south trending, closed, pre-Tertiary anticline primarily to test sandstones of Lower and Upper Cretaceous age. Tertiary strata were penetrated to 4 180 feet followed by an unexpectedly thick sequence (5 510 feet) of Upper Cretaceous, Sherbrook Group consisting mainly of quartz, sandstone with occasional interbedded carbonaceous shale. Porosity was high for the most part, and a massive conglomerate occurred at the base. The underlying Lower Cretaceous Otway Group was penetrated to total depth. It consisted of impermeable lithic sandstone with occasional interbedded shale.

The second offshore well Nautilus -1 was drilled to 6 597 feet to test a seismically determined fan-shaped wedge of sandstone and shale of Lower Oligocene age. The wedge proved to be of skeletal limestone interbedded with tough grey calcareous shale. There were no coarse clastics in the zone of interest, and no porosity or permeability. No samples were obtained from the well above 1 000 feet; below that the strata penetrated were:

Miocene - Port Campbell Limestone

Oligocene - Gellibrand Marl Equivalent

Basal Tertiary sandstone

Eroded surface

Upper Cretaceous - Belfast Mudstone

The basal Tertiary sandstone was unexpected, and its discovery is a significant contribution to the geology of the Otway Basin.

The third offshore well, Argonaut -1, was drilled as a stratigraphic test on a seismically defined structure with fault closure. It was expected that Upper Cretaceous shale on the downside of the fault would provide an effective fault seal against sandstone on the upthrown side. To T.D. 12 163 feet, the well penetrated the following sequence:

Miocene - Oligocene	Gambier Limestone
Upper Eocene	Kingston Greensand
Eocene-Palaeocene	Knight Group
Palaeocene	Bahgallah Formation
Upper Cretaceous	Curdies-Paarratte undifferentiated
	Belfast Mudstone
	Waarre Formation

The Upper Cretaceous sediments proved too sandy to provide a seal on the fault and there was no closure on the Waarre sandstone on the upthrown side, the Belfast Mudstone having been downthrown too far. Good reservoir rocks were found in the Upper Cretaceous but there were no good cap-rocks at the base of the Tertiary. There were no hydrocarbon shows and the well was plugged and abandoned in the Waarre Formation.

The first of the onshore wells was Woolsthorpe No. 1, drilled in the northern hinge-zone of the Otway Basin close to the axis of the northerly-trending Warrnambool structural ridge. The well penetrated Recent to ?Pliocene sediments lying unconformably on upper Miocene to Oligocene strata (Heytesbury Group) at the base of which was another unconformity between the Clifton Formation and the Lower Cretaceous-?Jurassic Otway Group. There was a possible disconformity within the Otway Group between the Eumeralla Formation and the Geltwood Beach Formation. There were

no hydrocarbon shows. The permeable sands in the lower part of the Otway Group were water-bearing. The well was plugged and abandoned in the ?Jurassic Casterton Beds at T.D. 6 467 feet.

Garvoc No. 1, the second onshore well, was drilled to T.D. 5 030 feet on a positive gravity nose also on the northern hinge-zone area of the basin, and was designed to test permeable sands in the Lower Cretaceous Otway Group, in a position of suspected stratigraphic wedgeout, based on seismic evidence.

The following sequence was intersected:

Recent to Pleistocene		Newer Volcanics
	unconformity	
Upper Miocene to Oligocene		Heytesbury Group
	?disconformity	
Upper Eocene		Ninanda Group
Lower Cretaceous		Otway Group
? Ordovician		Basement complex

As in Woolsthorpe No. 1, there was a possible disconformity within the Otway Group, between the Eumeralla Formation and the Geltwood Beach Formation, suggested by palynological determinations and dipmeter readings. A drill-stem test in the Pretty Hill Sandstone (Lower Cretaceous) gave salt water strongly cut with carbon dioxide.

The third onshore well, Purrumbete No. 1, was drilled in the same area as the other two onshore wells to test permeable sands in the Lower Cretaceous Otway Group. Basement was predicted at 4 800 feet, but after drilling to 6 000 feet, the well was plugged and abandoned in the Geltwood Beach Formation of the Otway Group.

The well penetrated the following sequence:

Middle Miocene to upper Oligocene		Heytesbury Group
Upper Eocene		Ninanda Group
	disconformity	
?Upper to middle Palaeocene		?Wangerrip Group
	unconformity	
Lower Cretaceous		Otway Group

A disconformity between the Eumeralla Formation and the Geltwood Beach Formation was also recorded in this well. There were no significant hydrocarbons.

OXLEY BASIN

There were no wells drilled during the year.

Alliance Oil Development Australia N.L. carried out the Quirindi Gravity Survey (68/3002) and the Breeza Seismic Survey (68/3034). The objectives of the gravity survey were to delineate the structure of the basin, and locate areas of thick section. The Bouguer anomaly values are obscured by a large Bouguer anomaly regional gravity gradient increasing towards the west. Removal of the regional effect leaves a residual gravity map which compares well with the known geology of the area. The Mooki Thrust Zone is clearly delineated and a series of gravity highs to the west of the fault correspond to photogeologically mapped anticlines.

The Breeza Seismic Survey (68/3034) in P.E.L. 85, N.S.W. consisted of 65 miles of reflection work and one refraction line.

The objectives were to correlate information from Quirindi No. 1 well, and information from previous geological and geophysical surveys. The results showed a major anticline, with substantial closure in the Permian. The deep reflections were generally very poor, due to basalt and andesitic flows and coal beds.

PERTH BASIN

Exploration in this basin was marked by concentration on marine seismic surveys and by the drilling of the first offshore wells. Gas was discovered onshore in Mondarra No. 1 (near Dongara), and also in Whicher Range No. 1 in the southern part of the basin. Wapet was the main explorer, but Union Oil Development Corporation and B.P. Petroleum Development Australia Pty Ltd made significant contributions.

Wapet conducted all four subsidized marine surveys, two unsubsidized marine (Bunbury-Mandurah and Dongara) and one unsubsidized land survey (Mondarra Seismic Survey). The subsidized Direction Bank Marine Seismic Survey (BMR file 68/3003) was designed to detail anomalies indicated from previous geophysical work and to extend regional seismic reconnaissance northward from the Perth area. The survey showed a large graben trending north, with several thousand feet of probable Tertiary, Cretaceous, and Jurassic sediments; the area of thickest section contained no closed structures. The graben is bounded on the southwest and west by pre-Jurassic sediments,

overlain by relatively thin Cretaceous and younger sediments. The most promising pre-Jurassic feature is the Bunbury Structure, which is located southeast of the main graben and has maximum closure of 1 000 feet on Horizon D (?Triassic).

Wapet's Turtle Dove Marine Seismic Survey (BMR file 68/2000) in P.E. 225H was done to verify and detail structures indicated by previous seismic reconnaissance. The survey verified only one of these structures, and mapped it as an anticline trending north through the eastern part of the surveyed area. The anticline has 2 000 feet of vertical closure against a fault trending north on the eastern flank; the areal extent of the fault closure is 36 square miles. An area of 8 square miles is closed by folding independent of faulting, with maximum vertical closure of 500 feet. The maximum thickness of prospective section was not defined.

Wapet's Beagle Marine Seismic Survey (BMR file 68/3038) was conducted in the northern offshore Perth Basin, in Permits WA-13-P, 14-P, and 20-P. It consisted of 166 miles of 1 200% reflection coverage and 36 miles of reverse refraction work. Data from about 30 miles coverage from previous surveys were included in the interpretation of results. The objectives of the survey were to get reconnaissance control over the unexplored western flank of the Beagle Ridge and to tie the results to the Dongara (BMR file 67/11150) and Turtle Dove (BMR file 68/3000) marine seismic surveys in the north and to the Direction Bank Marine Seismic Survey (BMR file 68/3003) in the south.

The Beagle Marine Seismic Survey showed that the western flank of the Beagle Ridge is featureless. A north-trending syncline separates the Beagle Ridge from another pronounced regional structural ridge trending northwest, and isopachs show only slight thinning across this western ridge. The survey could not proceed close enough to onshore wells to permit definite stratigraphic identification of reflections, but a reasonable correlation was made. This interpretation shows that the northern part of the surveyed area contains Jurassic, Triassic, and Permian sediments but the southern part contains only Permian. Poor quality records in the southern part of Line DA of the Beagle Survey prevented a tie between the Dongara and Direction Bank Surveys.

Wapet's Sugarloaf Marine Seismic Survey (BMR file 68/3039) was conducted in WA-13-P and 14-P, with the object of extending reconnaissance control into the southern Perth Basin west of a coastal basement ridge. Near Rottnest Island the records were of poor to questionable quality, but elsewhere results were much better and Horizons A2 (?Cretaceous), B(basal Cretaceous unconformity), C(?Lower Jurassic), D(pre-Jurassic, probably Triassic) and

D2 (pre-Jurassic, deeper than D) was mapped. In the southwestern part of the survey area a very prominent pre-Cretaceous ridge occurs, plunging northwest, with three closed features. The depths to the apices of these structures ranges from 4 000 to 6 000 feet below sea level.

Union Oil Development Corporation completed the Margaret River Seismic Survey which was started at the end of 1967. It was located south of Busselton in the southern part of the basin and was designed to detail leads revealed by earlier work, and to extend reconnaissance in the northern part of the survey area. The survey produced data of improved quality in an area of complex faulting. Two structures were delineated and numerous other faults controlled features mapped.

Drilling activity in the Perth Basin consisted of three onshore wells completed and one drilling at the end of 1968, and two offshore wells completed, with one drilling. In the northern Perth Basin Wapet drilled the unsubsidized onshore Dongara No. 7 well in P.E. 27H; this reached total depth of 7 100 feet without encountering hydrocarbons and was abandoned. A few miles to the southeast, Wapet drilled the unsubsidized Mondarra No. 1 well to total depth of 10 049 feet. A 4-hour production test of the interval 8 822-8 860 feet resulted in a gas flow at the rate of 10 MMcf/D, and the well was shut in. Mondarra No. 2 was spudded some 2 to 3 miles south of the No. 1 well on 20 December 1968 and was drilling at the end of the year (the well encountered gas early in 1969).

In the southern Perth Basin, Union Oil Development Corporation drilled the Whicher Range No. 1 well (BMR file 68/2005) to total depth of 15 266 feet, setting a new Australian depth record. The well was designed to test a Jurassic-Permian sequence in a seismically determined dome delineated by the Margaret River Seismic Survey with about 900 feet of closure near the top of the Permian. The top of the Upper Permian was reached at 12 846 feet and gas was found associated with coal beds (Irwin River Coal Measures). Several formation tests were run through perforations over the interval 12 958-14 017 feet; the best results came from the interval 13 662.5-13 694 feet, which yielded gas at a rate of 1.93 MMcfd, but acidizing and fraccing failed to improve the performance. The well was abandoned.

Offshore activity was increased by the arrival of the jack-up rig Jubilee, towed from Urange, Texas, for use by Wapet. The first offshore well drilled in the Basin was the B.P. Petroleum Development Australia Pty Ltd Gun Island No. 1 (BMR file 68/2015) which was located about 70 miles from the coast in the northern part of the basin. This was a stratigraphic well but was located in a seismically defined fault structure with uncertain closure. Below the unconformity at the base of the Lower

Cretaceous at 2 978 feet, the well penetrated 9 242 feet of Lower to Upper Jurassic sandstone, siltstone, and shale, with minor coal beds. This Jurassic sequence can be confidently correlated with onshore formations and consists of continental and paralic sections with a lower Middle Jurassic marine phase. The only signs of hydrocarbons were traces of methane below 10 037 feet, but the well achieved its stratigraphic purpose, and was plugged and abandoned at 12 220 feet.

In the southern offshore basin, Wapet's Quinns Rock No. 1 well (BMR file 68/2046) was drilled 12 miles offshore and 22 miles west-northwest of Fremantle. From 2 780 to 7 248 feet (TD) the well penetrated 4 468 feet of marine Yarragadee Formation which was apparently mainly of Lower Cretaceous age and therefore younger than any of the same formation penetrated in the nearest onshore wells (Cockburn No. 1 and Gin Gin No. 1). In Quinns Rock No. 1 the Yarragadee Formation consists of 71% sandstone and 29% shale and fine siltstone, but the shale beds are thin except in the interval 5 218-5 405 feet. The shale unit at 5 218 feet is now considered as the source of a seismic reflection believed previously to emanate from Lower Jurassic beds. The sandstone of the Yarragadee Formation had good porosities (25%-30%) and permeability (600-2 000 md) to a depth of 5 874 feet but below that cementation decreases the reservoir potential. No hydrocarbons were detected in the well.

Wapet's Gage Roads No. 1 well (BMR file 68/2039) was spudded on 27 November, 1968 and was drilling ahead at 6 976 feet at the end of the year.

PIRIE-TORRENS BASIN

There was no activity in this Basin during 1968.

ST VINCENT BASIN

There were no wells drilled during the year but the following geophysical work was carried out.

1) Young Rocks Aeromagnetic Survey (BMR file 68/3055) 36°-37°30'S, 136°30'-139°00'E.

2) South Australian Shelf R-3 Marine Seismic Survey (BMR file 68/3048) in O.E.L. 38.

3) St Vincent Gulf Marine Seismic Survey (BMR file 67/11192) in O.E.L. 24.

The first survey, by Hematite Petroleum Pty Ltd, had a scope of 1 777 miles of lines and tie-lines. The northerly lines were 2 and 4 miles apart, and the easterly ties 5, 8, and 10 miles apart. They were flown at 1 500 feet above sea level. The results indicate that magnetic basement deepens towards the south and west, and the depth increase is marked by numerous fairly parallel anticlines and synclines. To the southwest, the basement deepens into a large depression. However, the 10 000 and 12 000 foot isobaths are based on interpretation of incomplete anomalies. Over almost two-thirds of the survey area there is less than 6 000 feet of sediments. It is believed that there is only one magnetic marker in the deep zone, but it is difficult to prove that there is only one magnetic marker over the whole survey area.

The second survey was completed on 2 January 1969 but has been included here. Two areas were covered: 1) 'Duntroon Basin' south of Eyre Peninsula and west of Kangaroo Island, 2) About 150 miles west of Elliston.

In the first area the results indicated a downfaulted basement overlain by thick sediments in two sequences separated by an unconformity: a folded section of ?Mesozoic age, and another that is weakly deformed, and probably Tertiary. The Mesozoic is locally 1 500 feet thick, and shows a marked thinning over basement highs. The basement trends west-northwest. Horizon A (base of Tertiary carbonates) shows regional southwesterly dip, with Tertiary thickness increasing from 1 400 to 6 700 feet. Several structural leads coincide with high basement trending west-northwest. In some cases, the sediments pinch out against the basement. A 'B' horizon gave poor results, and horizon 'D' (in the Mesozoic) could not be correlated because of truncations and high dips in the Mesozoic. Detailed seismic work was recommended for some structures.

In the second area, a thin Mesozoic section overlies basement, and no prospective structures could be found. The base of the Tertiary horizon onlaps rising basement to the north and south of the Elliston Trough. In the north of the trough, the basement is downfaulted, the main faulting trending northeast.

The third survey began in 1967 and was completed in August 1968. The scope was 440 miles of single fold, and 90 miles of 3-fold, CDP reflection survey. The results generally confirmed the structural trends indicated by previous submarine gravity and aeromagnetic surveys. Several

structures striking northeast were indicated off Rapid Bay and Troughbridge Island. The post-Cambrian section thickens to the southeast and attains a maximum thickness of 3 000-4 000 feet (of Tertiary/Permian).

SURAT BASIN

Thirty five wells were drilled in the basin during the year, one was subsidized and ten were development wells.

Union Oil Development Corporation (Union) drilled five development wells in the Moonie Field. These were Moonie Nos 30-34, all of which were completed as oil producers.

Associated Australian Oilfields N.L. (A.A.O.) drilled Pleasant Hills Nos 2-6, all development wells, in the Roma area. They were all completed as potential gas producers.

Union also drilled three exploration wells - Foyleview No. 1, Bainbilla No. 1, and Paringa No. 1. Foyleview No. 1 was subsidized; it was located 93 miles northwest of the Alton Field, and was drilled on a dome of large areal extent to T.D. 3 957 feet. The target was the Hutton Sandstone. The well spudded in the Cretaceous (Roma Formation), and penetrated the Jurassic Blythesdale Formation, Walloon Formation and Hutton Sandstone. The Hutton Sandstone was underlain unconformably by the Devonian Timbury Hills Formation. There were no hydrocarbons, and the well was completed as a water well.

Bainbilla No. 1 was located northeast of Foyleview No. 1 and was terminated in basement at 6 412 feet. There were no commercial hydrocarbons and it was completed as a water well. The target is not known but the Hutton and Evergreen Formations were penetrated.

Paringa No. 1 (T.D. 6 836 feet) was located 45 miles south of Moonie. The well penetrated the same stratigraphic sequence as Bainbilla No. 1 and was also converted to a water well.

A.A.O. drilled 21 unsubsidized exploration wells during the year and they are listed in Table 1. The targets are not known, but in all cases where the stratigraphy has been published, the wells penetrated the Hutton Sandstone and Evergreen Formation.

A.A.O. completed two seismic surveys during the year - the Coonardo-Muggleton Reflection Seismic Survey, Roma, and the Westgrove Seismic Survey. These were unsubsidized, and no information is available.

SYDNEY BASIN

Australian Oil and Gas Corporation Ltd (A.O.G.) drilled three wells during the year - Berkshire Park No. 1, Lower Portland No. 1 and Higher Macdonald No. 1, in that order. They were all drilled to investigate the reservoir potential of the sand sections of the Narrabeen Group in a previously untested region in the central western part of the Sydney Basin.

Berkshire Park No. 1 was located four imiles southwest of Windsor. One interval in the Narrabeen Group was tested for gas but the sand proved very tight. The top of the Permian was intersected at 3 066 feet and the well was terminated at 3 580 feet.

Lower Portland No. 1, located 18 miles north of Windsor, was bottomed at 2 918 feet in Permian sediments. There were no reports of hydrocarbons.

Higher Macdonald No. 1, located 36 miles north of Wisemans Ferry, was the only subsidized well in the group. The Narrabeen Group sandstones intersected were heavily cemented with clay and therefore had very low porosities. The sequence could not be correlated with major units to the south and Bradley's (1964) subdivisions for the Mellong area were used i.e. the Narrabeen Group was divided into upper Unit N.W., Middle Unit N.W., and Lower Unit N.W.

The Bulgo Sandstone (the Middle Unit N.W.) had lost its character and had become siltier and could not be differentiated in this section. This was in contrast to the two earlier wells in which the sequence could be correlated with major units from the south, and the Bulgo Sandstone differentiated. (Bradley, K., 1964 - Preliminary Report. Narrabeen Group. Sydney Basin Stratigraphy. A.O.G. Company Report (unpubl.)).

Central Coast Oil Ltd was drilling Terrigal No. 1A throughout the year. This is an unsubsidized well located one mile from Terrigal. It was reported to be drilling in the Tomago Coal Measures in March, and to be still in Coal Measures in August. It reached a depth of 6 156 feet in October, and was still at this depth at the end of the year due to delays caused by fishing operations.

TASMANIA

Esso Exploration and Production Australia Inc. completed the Tasmania EE-68 Marine Seismic and Magnetic Survey (BMR file 68/3013) in E.L. 18/65.

The survey was a one line 12-fold CDP reconnaissance survey of 181 miles off the west coast of Tasmania in an area bounded by latitudes 40°45'-43°10'S and longitudes 144°00'-146°00'E. It covered 8 350 square miles; the survey line paralleled the coast. The objective was to determine the thickness and structure of the sedimentary section. The only previous geophysical work was an aeromagnetic survey done by the Company in 1966-67.

The seismic reflectors were identified by correlation with Prawn A-1 (see Otway Basin, this report), and with basement outcrop on King Island. Four horizons were mapped:

1. Economic basement (base of Cretaceous? or top of Palaeozoic);
2. Base of Tertiary (represents an unconformity);
3. Eocene;
4. Lower Miocene Marker which could not be tied to a Lower Miocene reflector at Prawn A-1 well.

The survey showed two areas of thick sediments and a shallow low-relief reversal of the basement near one shot-point.

Magnetic data were not recorded over the southern 80 miles of seismic profile, because of malfunction of the magnetomeer. Otherwise the magnetic survey agreed with the previous one.

Nudec Petroleum Exploration Co. drilled one unsubsidized well, Badcocks No. 1 in E.L. 15/67. It was plugged and abandoned at a T.D. of 2 256 feet. No other information is available.

YARROL BASIN

The only activity in this basin during the year was the drilling of one subsidized well, Bukali No. 1, by Amalgamated Petroleum N.L. The well was located 4 miles north of Monto in A.T.P. 137P. Geochemical tests had shown statistically anomalous concentrations of hydrocarbons in Upper Palaeozoic rocks in this area.

The stratigraphic sequence intersected was Permian-Youlambie Formation overlying un-named Permian? sediments which lie unconformably on Carboniferous?. The sediments were denser and tougher than expected and one, or possibly two, faults were drilled through. There were no hydrocarbon shows, and the well was plugged and abandoned at 2 195 feet.

OFFSHORE NORTH AND NORTHWEST AUSTRALIA

This areal classification is included here to cater for much of the Timor Sea, Northwest Shelf, and Arafura Sea where basin and sub-basin names are mostly informal. Inevitably some overlap into more established basins, e.g., Bonaparte Gulf Basin, will occur.

One well was completed in these offshore areas in 1968, and three subsidized seismic surveys were run (see Bonaparte Gulf Basin, Table 2); the Geophysical Branch of BMR has conducted an extensive marine seismic (Sparker) survey. The results of this survey are not yet documented.

Off the northwest coast, Arco Ltd was the Operator for the Londonderry Rise Seismic Survey (BMR file 68/3024) in O.P. 151, Parts 1 and 2, N.T., and P.E. 221H, W.A. The survey involved 5 139 line miles, using conventional and the Flexotir energy sources. Detailed and semi-detailed work was done in the north, detailed in the south, and reconnaissance in the central part of the area. Some of the survey was done in the Bonaparte Gulf Basin. Three horizons, ranging from Palaeozoic to Tertiary, were mapped over nearly all of the survey area. Four structures were confirmed in the Bonaparte Gulf area, and their shapes and closures were defined; in the same area, three bodies of intrusive rocks were delineated. Four other structures were mapped in the northwest of the survey area, and one in the northeast, whilst two features of probably intrusive origin were discovered in the central area. Several indefinite trends and anomalies were found in the central, northern, and northwestern areas, and these warrant further investigation by more detailed work.

Shell Development (Australia) Pty Ltd conducted the Arafura D-1 Marine Seismic Survey (BMR file 68/3020) in O.P. 127, 128 and 140, N.T., off the northern coast of Arnhem Land. The survey used the air-gun energy source, and the objectives were to map the area with improved methods and to reprocess some existing data. The survey totalled 688 line miles (215 miles in O.P. 127, 208 in O.P. 128, and 265 in O.P. 140).

Seven horizons were mapped in O.P. 128, and in order of increasing depth were X, B, Y, Z, C (unconformity), D, and E. A closed structure was found on each of X, B, Y, Z. In the O.P. 127-140 area, very little structural deformation was found; there was no closed structure beneath Lyndedoch Bank (O.P. 127), but a dip reversal was mapped near Goodrich Bank. Stratigraphic correlation of horizons with outcrop on Bathurst and Melville Islands is indefinite, but Horizon C is considered to represent the Mesozoic/Proterozoic boundary. There is no definite evidence of Jurassic and Triassic sediments in the survey area.

The New Year Island Seismic Survey (BMR file 68/3025) of Australian Aquitaine Petroleum Pty Ltd in O.P. 156 was also located off the northern coast of Arnhem Land. The objective was to make a reconnaissance of the pre-Mesozoic horizons, which gave doubtful results on previous surveys; the Flexotir energy source was used to give 6-fold coverage. Five horizons - 1, 2, 3 (base of Mesozoic), 4, and 5, in increasing depth, were mapped. Horizon 4 was generally good, but 5 was unreliable in places. Below the Mesozoic unconformity, a folded and faulted zone was mapped in the central part of E.P. 156, and in this zone the relatively slow velocities suggested Palaeozoic sediments instead of Precambrian basement. No attractive structures were found above the unconformity on Horizon 3.

The only well drilled in the offshore area was Ashmore Reef No. 1 (BMR file 67/4264) located about 400 miles west of Darwin. This was primarily a stratigraphic well, drilled by B.O.C. of Australia Ltd, but it was sited on the seismically determined Ashmore Reef Anticline. This well discovered no significant hydrocarbons, but it was very important stratigraphically and penetrated Quaternary, Tertiary, Cretaceous, Jurassic, and Triassic sequences before reaching T.D. of 12 843 feet. The Lower Miocene-Upper Cretaceous sequence (2 635-7 956 feet) is the most complete sequence (in a time-rock sense) known in the Indo-Pacific region. Sharp lithological breaks in the well corresponded accurately with seismic events, and the sequence penetrated thus provided good seismic control for the area.

PAPUAN BASIN

Exploration activity was strong in 1968, both onshore and offshore. Several geophysical surveys were run, several wells were drilled, and geological field work was done. The field surveys were carried out by Australasian Petroleum Co. Pty Ltd in P. 27, and by B.P. Petroleum Development Australia Pty Ltd in P. 46.

Seismic and Gravity Surveys

Union Oil Development Corporation conducted the Turama River Seismic Survey (BMR file 67/11190) in P. 51; the survey began late in 1967 and was completed early in 1968. The data from this survey were of poor quality and, although they were partly improved by Laserscan, only two poor quality reflectors were recognizable. No conclusive evidence of structure was obtained.

Phillips Australian Oil Company's Permit 42, R-1 Marine Seismic Survey (BMR file 67/11194) began in 1967 and was completed in March 1968. The survey involved 1 341 miles of new work (901 miles using Aquapulse and 430 miles using conventional explosive energy source); 645 miles of previous seismic data from the northerly-adjoining offshore P. 39 were incorporated in the interpretation of the Permit 42, R-1 survey. The objective of the survey was to locate reefs, and this was achieved. The quality of the data was good, and the interpretation showed one or more Lower Miocene bioherms developed on a Mesozoic anticline and covered by 7 000-10 000 feet of Middle Miocene-Recent clastic sediments.

The onshore Era-Pie-Purari Seismic Reflection Survey (BMR file 67/11199) of Australasian Petroleum Company Pty Ltd, in L1, was another survey which began in 1967 and was completed in the following year. This was a reconnaissance survey of 142 miles, centred at approximately latitude 7°20'S, longitude 144°55'E. The survey's objective was to locate favourable folds and/or reefs for later detailed investigation. Four horizons were mapped and in the most reliable one, the E Horizon (base of Eocene), two significant anomalies which could be either reefs or folds, were indicated. These were later investigated in 1968/69 by the Era-Pie-Purari D1 Detail Reflection Survey (BMR file 68/3044), and two anomalies due to reefs interpreted.

Tenneco Australia Inc. conducted the Triangle Reef Marine Seismic Survey (BMR file 68/3008) in A.T.P. 88P, and A.T.P. 134 P, Queensland; the survey entailed 239 miles in A.T.P. 88P and 56 miles in A.T.P. 134P, of 6-fold CDP, digitally recorded data. It was impossible to get seismic records in areas of the Great Barrier Reef, in A.T.P. 134P, but some very useful information was obtained in A.T.P. 88P. In the northeastern part of this area, more than 10 000 feet of sedimentary section was interpreted, and this sequence thins to the south and west into A.T.P. 134P. The Komewu Fault System trends southwest into A.T.P. 88P and crosses the central part of the permit area; this fault is downthrown to the northeast, and a series of anticlines in ?Mesozoic rocks trend parallel to the fault on the downthrown side.

The Warrior Reef Seismic Survey (BMR file 68/3011) of American Overseas Petroleum Ltd was another marine survey in Great Barrier Reef waters. It was located in A.T.P. 133P, Queensland and consisted of 100 miles of reflection work (55 miles at 600% coverage, 45 miles at 300% coverage), and one refraction profile. Four horizons were mapped, but two of them, namely the Tertiary-Mesozoic unconformity and ?basement, were unreliable. In the northeast of A.T.P. 133P, the thickness of the sedimentary sequence exceeds 10 000 feet, but it thins to the north, west, and south. The southward thinning is gradual, but thinning to the north is erratic due to faulting in ?Mesozoic rocks - the most erratic changes occur near the Papuan mainland. In a few places, pre-Mesozoic sediments may form basement, instead of the granite which is assumed to be usually beneath the Mesozoic section.

The Nomad Seismic Survey (BMR file 68/3019) of Australasian Petroleum Company Pty Ltd was a land survey in P.27. It consisted of 6-fold CDP reflection work to determine whether the (surface) Cecilia Anticline persisted at depth, and whether a subsurface anticline was present to the southwest of the Cecilia Anticline.

The survey was hampered by access problems, and transport was by helicopter. The southern flank of the Cecilia Anticline was too rough to survey, and the primary objective of the survey was not achieved. With regard to the second objective, indications only of folding were found southwest of the Cecilia Anticline.

The Fly River Delta Seismic Survey (BMR file 68/3046) of Australasian Petroleum Company Pty Ltd, in L.6 and L.7, commenced in 1968 and was completed in 1969. The objective of this survey was to seek structure in Mesozoic sandstone sequences.

Phillips Australian Oil Company's Bligh Entrance Marine Seismic Survey (BMR file 68/3050) also began in 1968, but was not completed until the next year. Its objectives were to provide detailed coverage over previously discovered anomalies in PNG 2P and 3P, and to extend reconnaissance to PNG 1P and 2P.

B.P. Petroleum Development Australia Pty Ltd conducted the Kaganu Seismic Survey (BMR file 68/3012) in P.46; this was a reflection survey involving 111 miles of 6-fold CDP work. The data were very poor, due to noise, but the results showed in general that the steep surface folds in Tertiary rocks do not persist in the Mesozoic at depth; therefore a decollement surface must be present. No significant structures were detected within Mesozoic sediments.

The Kaganu Gravity Survey (BMR file 68/3012) was run concurrently with the seismic survey of the same name, to supplement the other data. 57 bases were occupied, and 344 traverse stations established. Results showed that the axis of a major anticline, with a core of dense ?Cretaceous rocks, trends northwest and can be traced for 16 miles. Some indications of the depth of the decollement surface were obtained, but no structure was defined below that surface.

Aeromagnetic Surveys

Three surveys were run. The Union Oil Development Corporation Fly-Turama Aeromagnetic Survey in P.51 involved 66 779 statute miles (3 712 of traverse, 3 066 of tie lines) flown northerly at 2-mile spacing and easterly at 3-mile spacing.

The objectives were to establish basement depths and to develop targets for other geophysical surveys. The results showed that the basement surface dips north and northeast to a depth of about 14 000 feet below sea level, and numerous anomalies which may be associated with structure, were indicated, and may warrant further geophysical work.

The Fly River Aeromagnetic Survey (BMR file 68/3029) of American Overseas Petroleum Limited, covered parts of P.55 and L.7 with flight lines 1.25 miles apart. The total magnetic intensity contour map did not show a predominant trend. The depth to magnetic basement was generally less than 7 000 feet below sea level.

The Carrington-Ka Aeromagnetic Survey (BMR file 68/3030) was flown for B.P. Petroleum Development Australia Pty Ltd, in parts of each P.46, P. 27 and P.37. The survey employed the gradiometer method, and consisted of 5 693 statute miles, with northeast traverse lines flown at 2-mile spacing, and northwest tie lines at 3-6 mile spacing. The aircraft's height varied according to topography. The objectives were to determine whether the Strickland Gorge basement high extends along strike to Larami; to delineate any other basement highs; and to determine basement depth, and thus apparent thickness of the Mesozoic sequence. Some difficulties in interpreting the results were experienced; in particular, anomalies due to basement were difficult to distinguish from near-surface magnetic sources such as volcanic rock. However, the interpretation showed the Strickland Gorge basement high does extend to Larami, and also that basement depth north and east of the Nomad River is about 14 000 feet (which agrees well with seismic interpretation).

Drilling

Eight wells were drilled, all in the Gulf of Papua, and good gas flows were recorded from two on the western side, but disappointing results came from all wells to the east.

Phillips Australian Oil Company drilled four wells in P.39, on the eastern side of the Gulf of Papua. Orokolo No. 1 well (BMR file 67/4274) was drilled to total depth of 11 999 feet without encountering any significant hydrocarbons. The well was located on a seismically determined closed structure. From 1 350 to 3 630 feet the well penetrated porous, water-bearing sandstone of Recent-Pliocene age, and below 3 630 feet the sequence consisted of Pliocene gas-saturated mudstone but without significant sandstone intervals. The presence of re-worked Miocene foraminifera in lower and middle Pliocene sequences indicate erosion and probably structural movement.

Maiva No. 1 well (BMR file 68/2014) was located in the seismically determined Maiva Structure, 12 miles offshore and 97 miles northwest of Port Moresby. High gas readings of methane were logged in Pliocene mudstone between 5 000 and 7 950 feet, but no reservoir rocks were found in this interval. Drilling was terminated at 9 807 feet after encountering steeply-dipping clastics and volcanics. Abundant reef detritus was found scattered through the Recent-upper Pliocene sediments (sea-bed to 4 024 feet).

Iokea No. 1 well (BMR file 68/2013) was drilled on a seismically determined structure and penetrated Recent, Pleistocene, Pliocene, and upper Miocene clastic sediments to 4 533 feet; at this depth the well penetrated a sequence of agglomerate with an interbedded basalt. Geological and seismic evidence suggested that the volcanic sequence is of upper Miocene age and can be correlated with basalt and tuff encountered at 7 955 feet in Maiva No. 1. No significant hydrocarbons were found and the well was plugged and abandoned at 4 840 feet.

Kapuri No. 1 well (BMR file 68/2038) was drilled on a seismically determined structure which was interpreted as either a bioherm or a volcanic pile. At 5 064 feet the well penetrated a lower Pliocene reef limestone and remained in this sequence to total depth (5 572 ft). No hydrocarbons were found, and a drill-stem test of the reef limestone recovered formation water. Metamorphic and andesite-basalt lithic fragments in the clastic sediments of Kapuri No. 1 are similar to the lithics in Maiva No. 1 and Iokea No. 1, indicating a similar provenance for all these sequences. Probable granitic rock fragments were found at 2 332 feet in Kapuri No. 1 and this is the first suggestion of a granitic source for part of the sequence in the eastern flank of the Papuan Basin.

In the western flank of the Papuan Basin, Phillips Australian Oil Company drilled Uramu No. 1 and A-1, Pasca No. 1 and Pasca C No. 1, and Esso drilled Ini No. 1; two of these produced gas in substantial quantity from Miocene reefs. Uramu No. A-1 (BMR file 67/4256) produced gas at rates up to 24.4 MMcfd plus 2 bbl/hr condensate; the well is suspended. Pasca A No. 2 was drilling ahead at the end of the year.

Esso's Ini No. 1 was unsubsidized. It was located 13 miles north of Uramu A-1 and reached total depth of 8 970 feet. No significant hydrocarbons were found. Pasco No. 1 well (BMR file 68/2040) was located on a seismically interpreted reef some 160 miles west-northwest of Port Moresby. Reef limestone was drilled from 7 216 to 8 477 feet (T.D.), but no samples were recovered below 7 245 feet. Drill-stem Test No. 1(d) recovered gas at the rate of 8.06 MMcfd, plus 101 bbl/hr condensate. A drill-stem test of a lower interval (8 094-8 218 feet) recovered gas at the rate of 1.64 MMcfd, plus salt water. The well was abandoned.

Pasca C No. 1 well was drilled to total depth of 14 001 feet but no reef limestone and no hydrocarbons were discovered. The well was located 8.5 miles northeast of Pasca No. 1, and was unsubsidized.

NORTHERN NEW GUINEA BASIN

No drilling was done in this basin during 1968, and company exploration efforts were confined to geological field work by Continental Oil Company of Australia Ltd and two aeromagnetic surveys. A field party from BMR mapped Mesozoic sediments in part of this basin during 1968.

The Madang Aeromagnetic Survey (BMR file 68/3040) of Continental Oil Company of Australia Ltd was flown over P.41, in the Ramu Valley and lower Sepik region, to determine regional basin shape between the central ranges and the coast. The survey outlined the 'Ramu River Basin', which trends northwest and contains about 13 000 feet of sediments in the eastern part. (BMR gravity surveys show a 'low' parallel to the axis of the magnetically determined basin). In the western part of the surveyed area, the sedimentary thickness ranges from 1 500-12 000 feet, but numerous 'highs' of probable basement are interpreted in this region.

The Makambu Aeromagnetic Survey (BMR file 68/3054) of Australian Aquitaine Petroleum Pty Ltd was conducted in P.45, and was flown to get a broad knowledge of structural trends before beginning seismic work. The flight lines crossed outcrops of plutonic, metamorphic, and

volcanic rocks, and the results show the probable subsurface extension of igneous rocks at shallow depths; a sedimentary basin, of limited extent but relatively deep (6 500-8 200 ft), was also shown. The basin trends northwest, and its axis is about 3 miles south of Makambu.

CAPE VOGEL BASIN

General Exploration Co. of Australasia Ltd reported on a geological survey of this basin in 1968, and in the same year a field party from BMR mapped part of the Basin area and the basic rocks which form the western basin margin.

TABLE 1

WELLS DRILLING IN 1968

BASIN COMPANY Well Name BMR file no. if subsidized	Latitude Longitude	G.L./W.D. K.B./R.T.	Date spudded T.D. date	Basis for location	T.D.'	DST'S	Status
ADAVALE BASIN							
AUSTRALIAN SUN OIL CO.							
Fairlea No. 1 BMR file 68/2010	24° 29' 50"S 145° 19' 52"E	G.L. 959' K.B. 973'	12/4/68 19/6/68	Seismic	10 235'		PA
AMERICAN OVERSEAS PETROLEUM LTD							
Ravensbourne No. 1 BMR file 68/2027	24° 50' 06"S 145° 37' 08"E	G.L. 1113' K.B. 1126'	24/6/68 26/7/68	Seismic	7 736'		PA
AMADEUS BASIN							
MAGELLAN PETROLEUM (N.T.) PTY LTD							
Tyler No. 1 BMR file 68/2031	23° 45' 23"S 132° 24' 45"E	G.L. 2528' K.B. 2538'	29/6/68	Seismic	9 261'	DST 1 - 8 805-9 143' Misrun; rec. 30' drilling water	drilling ahead
BONAPARTE GULF BASIN							
AUSTRALIAN AQUITAINE PETROLEUM PTY LTD							
Keep River No. 1 BMR file 68/2029	15° 10' 05"S 129° 05' 22"E	G.L. 75' R.T. 91'	3/9/68	Seismic	11 178'	DST Nos. 1-3, 5, 7-8: rec. salt water and mud. DST No. 4: 8 475-11 000' rec. 6 725' gas cut mud. DST No. 6: 7 177-7 235' rec. 350' gas cut mud. 4 450' salt water.	drilling ahead
BOWEN BASIN							
ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.							
Penjobe No. 1 BMR file 68/2007	24° 25' 31"S 147° 56' 48"E	G.L. 1075' K.B. 1094'	31/3/68 9/4/68	Seismic	1 828'	DST No. 1, 1 177-1 828' rec. 270' watery mud	Plugged & converted to water well.
PLANET EXPLORATION CO PTY LTD							
Warrinilla No. 3 BMR file 67/4272	24° 29' 50"S 145° 19' 52"E	G.L. 877' K.B. 890'	20/11/67 1/1/68		7 512'		PA

Warrinilla No. 4 BMR file 68/2001	24° 58' 25"S 148° 33' 55"E	G.L. 908' K.B. 921'	17/1/68 9/2/68		5 012'		PA
Warrinilla No. 5 BMR file 68/2007	25° 00' 02"S 148° 34' 25"E	G.L. 932' K.B. 947'	20/3/68 26/4/68		6 729'	DST 1 206-1 261' rec. dry gas at rate of 50 Mcfd. DST 2 592-2 658') in Peawaddy Fm. Max. 2 658-2 725') rate 500 Mcfd, declining to 100-120 Mcfd DST 4 455-4 465' rec. 1 500' of gas cut mud from lower Aldebaran Fm.	PA

CANNING BASIN

AUSTRALIAN AQUITAINE PETROLEUM LTD

Wilson Cliffs No. 1 BMR file 68/2011	22° 16' 39"S 126° 46' 55"E	G.L. 1444' R.T. 1460'	8/6/68 29/11/68	Seismic	12 212'	DST No. 1 12 212-7 507' rec. 1 304' mud DST No. 2 6 494-6 476' rec. 5 346' water & mud.	PA

TOTAL EXPLORATION AUSTRALIA PTY LTD

McLarty No. 1 BMR file 68/2009	19° 23' 45"S 123° 39' 30"E	G.L. 558' K.B. 572'	14/5/68 29/7/68	Wildcat	8 500'		PA
Edgar Range No. 1 BMR file 68/2041	18° 45' 26"S 123° 35' 33"E	G.L. 433' K.B. 447'	11/8/68 13/9/68	Seismic	6 457'		PA
Kemp Field No. 1 BMR file 68/2048	20° 19' 10"S 123° 27' 58"E	G.L. 768' K.B. 782'	28/9/68 12/10/68	Seismic	3 875'	DST No. 2 2 773-2 867' rec. 2 425' salt water (7 300 ppm); Fm pressure 1 217 psi.	PA

WEST AUSTRALIAN PETROLEUM PTY LTD

Doran No. 1 BMR file 68/2033	18° 10' 56"S 123° 29' 06"E	G.L. 209' K.B. 214'	22/7/68 5/8/68	Strat. test	2 504'		Plugged & converted to water well
Willara Hill No. 1 BMR file 68/2044	19° 03' 31"S 121° 52' 45"E	G.L. 247' R.T. 252'	10/8/68 21/8/68	Seismic	2 815'		PA
Chirup No. 1	19° 50' 54"S 120° 25' 57"E	G.L. 10' R.T. 15'	26/8/68 6/9/68		2 502'		PA

CARNARVON BASIN

B.O.C. OF AUSTRALIA LTD

Legendre No. 1 BMR file 68/2016	19° 40' 16"S 116° 43' 57"E	W.D. 170' R.T. 30'	7/6/68 17/11/68	Seismic	11 393'	DST 6 211-6 227' flowed oil at 1 014 B/D and gas at 0.11 MMcfd through 24/64" choke	PA
Dampier No. 1 BMR file 68/2052	19° 52' 21"S 116° 00' 49"E	W.D. 250' R.T. 30'	22/11/68	Seismic	8 611'	DST No. 1, 9 666-9 805' (perforated in parts) Misrun	drilling ahead

						DST No. 2, 9 666-9 805' (perforated in parts) Weak blow; rec. 1 890' gas cut mud. DST No. 3, 10 000-10 057' (perforated in parts) Misrun. DST No. 4, 10 000-10 057' (perforated in parts) Weak blow; rec. 1 530' gas cut mud. DSt No. 5, 12 084-13 588' (open hole) Weak moderate blow; rec. 42.5 bbls gas cut mud.	
MARATHON PETROLEUM AUSTRALIA LTD							
Remarkable Hill No. 1 BMR file 68/2050	22° 57' 20"S 114° 09' 20"E	G.L. 350' K.B. 364'	15/10/68	Seismic	7 959'		drilling ahead
WEST AUSTRALIAN PETROLEUM PTY LTD							
Observation Island No. 1 BMR file 67/4275	21° 44' 28"S 114° 32' 12"E	G.L. 16' K.B. 30'	1/1/68 12/2/68	Strat. test	7 510'		PA
Hope Island No. 1 BMR file 68/2003	22° 09' 34"S 114° 28' 35"E	G.L. 16' R.T. 30'	26/2/68 13/3/68		4 680'	DST No. 1, 2 920-2 963' produced 2 872' brackish water.	PA
Direction Island No. 1 (Core Hole)	21° 32' 03"S 115° 07' 42"E	G.L. 15' R.T. 20'	26/4/68 6/5/68		2 207'		PA
Mangrove Island No. 1 (Core Hole)	21° 14' 22"S 115° 46' 04"E	G.L. 15' R.T. 20'	6/6/68 14/6/68		938'		PA
Mary Anne No. 1 (Core Hole)	21° 17' 55"S 115° 30' 04"E	G.L. 15' R.T. 20'	12/5/68 20/5/68		1 750		PA
Mulyery No. 1 (Core Hole)	21° 18' 26"S 115° 47' 48"E	G.L. 15' R.T. 20'	11/1/68 18/1/68		458'		PA
North Sandy Island No. 1 (Core Hole)	21° 06' 25"S 115° 38' 56"E	G.L. 15' R.T. 20'	24/5/68 1/6/68		2 000'		PA
Peedamullah No. 1 (Core Hole)	21° 24' 26"S 115° 37' 50"E	G.L. 18' R.T. 23'	24/12/67 7/1/68		1 077'		PA
Sandy Point No. 1	22° 25' 49"S 113° 47' 49"E	G.L. 366' R.T. 378'	30/11/67 29/1/68		9 991'		PA
Stokes Point No. 1	20° 52' 55"S 115° 22' 55"E	G.L. 57' R.T. 71'	9/5/68 15/6/68		8 150'		Standing-awaiting fracturing treatment
Thevenard No. 1	21° 27' 45"S 115° 01' 05"E	G.L. 16' R.T. 30'	28/3/68 28/4/68		6 810'		PA
Urala No. 1	21° 49' 06"S 114° 43' 22"E	G.L. 7' R.T. 12'	15/9/68 7/10/68		2 500'		PA

TD

Flacourt No. 1	20° 44' 44"S 115° 22' 40"E	G.L. 165' R.T. 175'	8/6/68 13/6/68		2 680'		Completed as potential oil producer
Barrow Island Windalia Development Wells Nos. 168-218 W.I. 3-46, W.S. 1-4A	20° 50' 00"S 115° 06' 55"E						Completed as oil producers

CLARENCE-MORETON BASIN

CLARENCE RIVER BASIN OIL EXPLORATION CO. N.L.

Hogarth No. 1 BMR file 68/2030	28° 54' 10"S 152° 51' 20"E	G.L. 350' K.B. 362'	12/10/68 13/11/68		3 996'	DST 1 790-2 060') Failed because packer DST 1 762-2 060') would not seat. DST 2 730 - 3 190') DST 2 720-3 180')	PA

COOPER BASIN

DELHI-AUSTRALIAN PETROLEUM LTD

Tinga Tingana No. 1 BMR file 68/2000	29° 00' 45"S 140° 05' 38"E	G.L. 82' K.B. 98'	2/1/68 26/2/68	Seismic	7 552'		PA
Boxwood No. 1	28° 31' 24"S 139° 50' 43"E	G.L. 70' K.B. 86'	18/4/68 2/5/68		6 342'		PA
Daralingie No. 2	28° 23' 21"S 139° 58' 01"E		21/3/68		7 924'		Completed for production as gas well.
Gidgealpa No. 8	27° 57' 02"S 140° 01' 40"E	G.L. 182' K.B. 198'	5/8/68 22/8/68	Development	7 149'	DST 6 966-7 036', Rec. 9.7 MMcfd, at pressure 2 410 psi. DST 6 826-6 942' Rec. 9.42 MMcfd, at pressure 2 300 psi.	"
Gidgealpa No. 9	27° 59' 25"S 140° 01' 18"E		11/9/68 4/10/68	"	7 533'	DST 6 899-7 040', flowed gas at rate of 9.3 MMcfd	"
Gidgealpa No. 10	27° 57' 41"S 140° 03' 19"E		6/10/68 17/10/68	"	7 231'	DST 6 888-7 040, gas flowed 9.3 MMcfd	"
Moomba No. 7	28° 05' 46"S 140° 19' 04"E	G.L. 122' K.B. 138'	20/12/67 8/2/68	"	9 955'		Left standing as unperforated gas well.
Moomba No. 8	28° 06' 44"S 140° 07' 47"E	G.L. 107' K.B. 117'	17/6/68 24/7/68	"	9 995'	DST 7 664-7 7 57', 891 000 cfd from upper part of Permian. DST 7 767-7 821', 2.4 MMcfd, ¼" choke, 600' drilling mud. DST 7 835-7 908', 3.2 MMcfd, ¼" choke, 7.5 MMcfd 7/16" choke.	Completed for production as gas well.

Mudlalee No. 1	28° 19' 22"S 140° 31' 31"E	G.L. 163' K.B. 179'	27/12/67 17/1/68		8 829'		PA
Wanchoocha No. 1	28° 31' 45"S 139° 59' 04"E		10/3/68 28/3/68		6 515'		PA
TOTAL EXPLORATION AUSTRALIA PTY LTD							
Tickalara No. 1	28° 19' 20"S 141° 24' 50"E	G.L. 419' K.B. 433'	18/8/68 4/9/68	Seismic	5 765'		PA
EROMANGA BASIN							
ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.							
Thunda No. 1 BMR file 68/2023	25° 29' 30"S 143° 28' 28"E	G.L. 655' K.B. 669'	24/6/68 17/7/68	Seismic	7 911'		PA
Cumbroo No. 1 BMR file 68/2043	26° 13' 40"S 143° 22' 47"E	G.L. 530' K.B. 543'	4/8/68 26/8/68	Seismic	7 241'	DST 1, 7 084-7 112' Rec. ½ pint of viscous oil, 50' of oil cut mud, pressures low	PA
Budgerygar No. 1 BMR file 68/2051	25° 14' 19"S 143° 48' 28"E	G.L. 605' K.B. 621'	29/11/68 16/12/68	Seismic	5 350'	DST 1, (open hole) 4 786-4 814', Rec. 3600 gph water, 2500 ppm.	PA
DELHI AUSTRALIAN PETROLEUM LTD							
Lake Frome No. 1 BMR file 68/2022	31° 03' 25"S 139° 51' 52"E	G.L. 15' K.B. 21'	11/8/68 21/8/68		2 566'		PA
Lake Frome No. 2 BMR file 68/2022	31° 02' 44"S 139° 43' 44"E	G.L. 6' K.B. ?	17/7/68 6/8/68	Strat.	2 532'	DST 1, 1 595-1 727' Open Hole rec. 120' mud, 230' muddy water, 1 000' red muddy water. (salty). DST 2, 1 997-2 100'. Wirrealpa Lst. tight.	PA
Lake Frome No. 3 BMR file 68/2022	31° 04' 40"S 139° 37' 20"E	G.L. 90' K.B. 96'	23/6/68 12/7/68	Strat.	2 561'		PA
GALILEE BASIN							
AUSTRALIAN SUN OIL COMPANY LTD							
Barcoo No. 1 BMR file 68/2026	24° 17' 09"S 145° 08' 18"E	G.L. 815' K.B. 829'	30/6/68 27/7/68	Seismic	5 631'		PA
GIPPSLAND BASIN							
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.							
Barracouta A-2	38° 17' 53"S 147° 40' 37"E	W.D. 150'	8/3/68 12/4/68		4 154'		Completed as gas producer

Barracouta A-3	38° 17' 53"S 147° 40' 37"E	W.D. 150' R.T. 81'	20/4/68 18/4/68	11 775'	Suspended
Barracouta A-4	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T. 81'	30/7/68 25/8/68	5 770'	Completed as oil producer
Barracouta A-5	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T. 81'	1/10/68 9/10/68	4 967'	Completed as p otential oil and/or gas producer
Barracouta A-6	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T. 81'	12/9/68 30/9/68	5 745'	Completed as oil producer
Barracouta A-7	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T. 81'	6/10/68 7/11/68	7 685'	Completed as potential oil producer
Barracouta A-8	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T.81'	7/11/68 19/11/68	6 046'	Completed as potential gas producer
Barracouta A-9	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T. 81'	22/11/68 29/11/68	5 528'	Completed as potential oil and/or gas producer
Barracouta A-10	38° 17' 54"S 147° 40' 35"E	W.D. 150' R.T. 81'	6/12/68 30/12/68	3 997'	Completed as potential gas producer.
Groper -1	38° 56' 20"S 147° 24' 56"E	W.D. 190'	18/12/68	3 005'	Drilling ahead
Flounder -1	38° 18' 52"S 148° 25' 29"E	W.D. 287'	10/7/68 24/8/68	11 740'	Plugged as possible future oil producer
Kingfish -2	38° 35' 55"S 148° 10' 13"E	W.D. 250'	28/11/67 25/1/68	8 021'	Plugged back for future completion as oil producer
Kingfish -3	38° 35' 03"S 148° 06' 07"E	W.D. 243' R.T. 31'	2/2/68 28/2/68	8 299'	Plugged back for future completion as oil producer
Marlin A-3	38° 13' 56"S 148° 13' 16"E	W.D. 192' R.T. 81'	18/5/68 3/10/68	6 423'	Completed as potential gas producer
Marlin A-4	38° 13' 56"S 148° 13' 16"E	W.D. 192' R.T. 81'	3/10/68 7/11/68	6 784'	Completed as potential gas producer

Marlin A-5	38° 13' 56"S 148° 13' 16"E	W.D. 192' R.T. 81'	7/11/68 22/11/68		6 885'		Completed as potential gas producer
Marlin A-6	38° 13' 56"S 148° 13' 16"E	W.D. 192' R.T. 81'	22/8/68 22/11/68		10 846'		Completed as potential gas producer
Marlin A-7	38° 13' 56"S 148° 13' 16"E	W.D. 192' R.T. 81'	26/11/68		1 015'		Temporarily suspended due to blow out
Perch -1	38° 34' 37"S 147° 19' 24"E	W.D. 138'	13/3/68 2/5/68		9 406'		PA
Snapper -1	38° 12' 03"S 148° 00' 49"E	W.D. 180'	9/5/68 9/12/68		12 320'	9 295-9 325', 12 hour Production Test, ½" choke, 1.1 MMcfd (rate) plus 5BOPD 39 gravity oil, non commercial.	Suspended as future oil/gas producer
Tuna -1	38° 10' 25"S 148° 25' 03"E	W.D. 198'	7/5/68 12/10/68		11 944'		Plugged as possible future oil producer
Tuna -2	38° 10' 52"S 148° 23' 14"E	W.D. 195'	31/10/68 5/12/68		9 060'		Suspended as future oil/gas producer

MARYBOROUGH BASIN

AUSTRALIAN GULF OIL COMPANY

Capricorn No. 1 BMR file 67/4269	Abandoned at 940' because 20" casing parted at 465' after being run to 886'.						
Capricorn No. 1A BMR file 67/4269	22° 42' 14"S 152° 16' 55"E	W.D. 347' K.B. 32'	22/11/67 10/1/68	Seismic	5 609'		PA
Aquarius No. 1 BMR file 67/4276	22° 37' 13"S 152° 39' 02"E	W.D. 213' K.B. 32'	21/1/68 23/3/68		8 695'		PA

AMALGAMATED PETROLEUM N.L.

Matjara No. 1 BMR file 68/2025	27° 09' 52"S 153° 33' 00"E	W.D. 280' K.B. 30'	25/6/68 30/7/68	Seismic	3 275'		PA

ASSOCIATED AUSTRALIAN OILFIELDS N.L.

St Helena No. 1 BMR file 68/2047	27° 23' 37"S 153 13' 52"E	G.L. 10' K.B. 21'	16/9/68 24/9/68	Stratigraphic	2 069'		PA

MURRAY-BANCANNIA TROUGH

PLANET EXPLORATION CO PTY LTD

Bancannia South No. 1 BMR file 67/4268	31° 05' 30"S 141° 49' 00"E	G.L. 492' K.B. 506'	25/9/67 29/2/68	Seismic	11 185'		PA

Bancannia North No. 1 BMR file 67/4277	30° 36' 15"S 141° 49' 50"E	G.L. 62' K.B. 376'	25/3/68 19/4/68	Seismic	4 851'		PA
OFFICER BASIN							
CONTINENTAL OIL CO. OF AUSTRALIA LTD							
Munyarai No. 1 BMR file 68/2012	27° 41' 53"S 132° 00' 03"E	G.L. 1 360' K.B. 1 377'	6/7/68 19/8/68	Seismic	9 510'		PA
OTWAY BASIN							
ESSO EXPLORATION AND PRODUCTION AUSTRALIA LTD							
Nautilus -1 BMR file 68/2008	38° 58' 42"S 142° 32' 47"E	W.D. 210' R.T. 89'	13/4/68 15/5/68	Seismic	6 597'		PA
Argonaut -1 BMR file 68/2018	37° 58' 18"S 140° 15' 32"E	W.D. 253' K.B. 93'	14/5/68 29/6/68	Seismic	12 163'		PA
Prawn A-1 BMR file 67/4273	39° 21' 25"S 143° 06' 27"E	W.D. 360'	28/12/67 2/4/68		10 477'		PA
INTERSTATE OIL LTD							
Woolsthorpe No. 1 BMR file 68/2018	38° 08' 08"S 142° 29' 47"E	G.L. 400' K.B. 411'	18/5/68 12/6/68		6 467'		PA
Garvoc No. 1 BMR file 68/2020	38° 19' 19"S 142° 52' 33"E	G.L. 352' K.B. 363'	21/6/68 6/7/68	Gravity	5 030'	DST 4 478-4 970', Rec. 4 270' salt water, strongly gas cut mud with carbon dioxide	PA
Purrumbete No. 1 BMR file 68/2021	36° 21' 56"S 143° 12' 27"E	G.L. 475' K.B. 486'	13/7/68 30/7/68	Strat.	6 000'		PA
PERTH BASIN							
B.P. PETROLEUM DEVELOPMENT AUSTRALIA PTY LTD							
Gun Island No. 1 BMR file 68/2015	28° 53' 30"S 113° 51' 27"E	G.L. 10' K.B. 24'	26/6/68 6/11/68	Seismic	12 220'		PA
UNION OIL DEVELOPMENT CORPORATION							
Whicher Range No. 1 BMR file 68/2005	33° 50' 15"S 115° 22' 11"E	G.L. 485' K.B. 502'	19/3/68 23/7/68	Seismic	15 266'	DST No. 6, 13 662-13 694', up to 1.93 MMcfd gas through ½" choke.	PA
WEST AUSTRALIAN PETROLEUM PTY LTD							
Quinns Rock No. 1 BMR file 68/2046	31° 48' 09"S 115° 30' 50"E	W.D. 133' R.T. 79'	10/10/68 10/11/68		7 248'	DST 5 775-5 781', 5 790-5 804', Rec. 40 bbls 37° gravity oil, 82 bbls salt water after swabbing	PA

Gage Roads No. 1 BMR file 68/2039	31° 57' 12"S 115° 22' 38"E	W.D. 191' R.T. 70'	27/11/68	Seismic	6 976'	DST 5 838-5 847', Rec. oil at rate of 300 BOPD, 41.2 gravity, after swabbing 5 hours, actually rec. 58½ bbl oil 41.2°, 25 bbls water = 40 000 ppm NaCl.	Drilling ahead
Dongara No. 7	29° 18' 36"S 115° 01' 38"E	G.L. 141' R.T. 154'	24/7/68 20/8/68		7 100'		PA
Mondarra No. 1	29° 18' 51"S 115° 06' 55"E	G.L. 254' D.F. 273'	9/10/68 25/11/68		10 049'	DST 8 820-8 834', ¼" sfc choke, 2 MMcfd estimated flow. Production test, (4 hours), 8 822-8 860' gas to surface at rate of 10 MMcfd, through a ⅜" surface choke.	Completed as potential gas well.
Mondarra No. 2	29° 21' 07"S 115° 06' 05"E	G.L. 87' R.T. 101'	20/12/68		6 783'	DST 8 975-8 991', rec. 700 000 cfd fracing gave test at rate of 2½ MMcfd, ½" choke.	Drilling ahead

SURAT BASIN

UNION OIL DEVELOPMENT CORPORATION

Pleasant Hills No. 2	26° 23' 20"S 149° 00' 09"E	G.L. 1 283' K.B. 1 294'	26/10/68 7/1/68		4 065'	DST 1, 3 260-3 360' DST 2, 3 446-3 690', 3.4 MMcfd gas 120 bbls/day water 1.8 ohms/60°F DST 3, 3 344-3 506' 3.2 MMcfd, 120 bbls water ½" choke.	Completed as gas producer
Pleasant Hills No. 3	26° 24' 15"S 149° 00' 08"E	G.L. 1 360' K.B. 1 371'	17/11/68 25/11/68		3 566'	DST 1, 3 420-3 490', 5.1 MMcfd gas	" "
Pleasant Hills No. 4	26° 23' 24"S 148° 58' 55"E	G.L. 1 390' K.B. 1 401'	26/11/68 4/12/68		3542'	DST 1, 3 440'-3 507', gas at rate of 5.09 MMcfd, ½" bottom hole choke.	" "
Pleasant Hills No. 5	26° 25' 15"S 149° 01' 00"E	G.L. 1 329' K.B. 1 340'	7/12/68 13/12/68		3 522'	DST 1, 3 390-3 450', gas at 5.09 MMcfd.	" "
Pleasant Hills No. 6	26° 25' 12"S 148° 59' 10"E	G.L. 1 353' K.B. 1 364'	15/12/68 23/12/68		3 659'	DST 1, 3 290-3 375', Rec. 10' mud DST 2, 3 429-3 485', gas 4 MMcfd DST 3, 3 485-3 537' gas flowed rate of 1.2 MMcfd, ½" choke.	" "
Pringle Downs No. 3	26° 40' 12"S 148° 42' 50"E	G.L. 1 023' K.B. 1 034'	9/3/68 16/3/68		4 283'	DST 1, 3 950-4 283' Rec. 200' mud, 500' muddy water.	PA
Pringle Downs No. 4	26° 40' 40"S 148° 41' 50"E	G.L. 1 009' K.B. 1 020'	17/3/68 25/3/68		4 262'		PA
Sunnybank West No. 1	26° 56' 35"S 149° 08' 55"E	G.L. 878 K.B. 39'	24/2/68 8/3/68		6 303'	DST 1, 5 445-4 495', Rec. 200' gas & oil cut mud, 200' watery mud, 100' muddy water, 3 585' clear water.	Completed as water well.
Taunton No. 1	26° 53' 40"S 149° 01' 45"E	G.L. 867' K.B. 882'	9/11/68 16/11/68		4 888'		" "

Tingun No. 1	26° 39' 01"S 148° 52' 22"E	G.L. 996' K.B. 1 011'	12/12/68 21/12/68	4 814'		PA
Wallumbilla South No. 4	26° 38' 54"S 149° 11' 57"E	G.L. 961' K.B. 976'	7/8/68 26/8/68	6 497'		PA
Womblebank No. 1	25° 47' 35"S 148° 11' 35"E	G.L. 1 703' K.B. 1 718'	12/10/68 25/10/68	4 426'		PA
Foyleview No. 1 BMR file 68/2004	27° 17' 30"S 148° 02' 52"E	G.L. 928' K.B. 942'	21/4/68 27/4/68	3 957'	Open hole Fm. test, 3 500-3 540' Rec. fresh water at rate of 50 000 BPD	Plugged back & converted to water well
Alton No. 8	27° 56' 25"S 147° 22' 05"E	G.L. 711' K.B. 725'	4/1/68 24/1/68	6 215'		Completed as oil producer
Bainbilla No. 1	27° 02' 59"S 149° 06' 53"E	G.L. 803' K.B. 817'	7/5/68 27/5/68	6 412'	DST 1, 5 813-5 830' Rec. 130' gas cut muddy water DST 2, 6 068-6 412' 150 MMcfd gas DST 3, 6 110-6 166' non-commercial flow of gas; initial flow 10 Mmcfd; with no water.	Plugged and converted to water well
Moonie No. 30	27° 44' 09"S 150° 16' 02"E	G.L. 880' K.B. 894'	11/1/68 3/2/68	5 949'		Completed as oil producer
Moonie No. 31	27° 44' 48"S 150° 15' 10"E	G.L. 874' K.B. 889'	7/2/68 24/2/68	5 929'		" "
Moonie No. 32	27° 44' 58"S 150° 15' 03"E	G.L. 875' K.B. 889'	28/2/68 14/3/68	5 814'		" "
Moonie No. 33	27° 45' 33"S 150° 14' 30"E	G.L. 873' K.B. 887'	16/3/68 30/3/68	5 880'		" "
Moonie No. 34	27° 45' 56"S 150° 14' 24"E	G.L. 871' K.B. 885'	3/4/68 17/4/68	5 875'		" "
Paringa No. 1	28° 23' 16"S 150° 06' 41"E	G.L. 666' K.B. 680'	5/6/68 24/6/68	6 836'		Plugged & converted to water well
ASSOCIATED AUSTRALIAN OILFIELDS N.L.						
Banoona No. 1	26° 54' 45"S 149° 08' 50"E	G.L. 911' K.B. 926'	30/10/68 6/11/68	5 340'		" "
Bobadilla No. 1	26° 39' 27"S 148 38' 15"E	G.L. 1 057' K.B. 1 068'	2/4/68 10/4/68	4 262'		" "
Bundella No. 1	26° 41' 42"S 149° 11' 06"E	G.L. 995' K.B. 1010'	20/11/68 9/12/68	6 707'	DST 1, 5 370-5 410' GTS 45 mins. RTSTM 2 730' water RW 1.060@94°F. DST 2, 5 510-5 578' GTS 18 mins. RTSTM Rec. 450' GCM slightly oil cut. DST 3, 6 424-6 707' GTS 20 mins. RTSGTS Rec. 350' GCM.	" "

Chinchinbilla No. 2	26° 37' 42"S 148° 45' 34"E	G.L. 954' K.B. 965'	19/4/68 25/4/68		4 137'		PA
Comberngo East No. 1	26° 51' 35"S 149° 11' 00"E	G.L. 924' K.B. 938'	8/5/68 26/5/68		6 745'		Plugged & converted to water well
Coonardoo No. 1	26° 41' 15"S 148° 59' 25"E	G.L. 1 065' K.B. 1 080'	10/2/68 20/2/68		5 662'	DST 1, 4 520-4 586', Rec. 5' mud DST 2, 4 804-4 870' Rec. 70' mud 4 100' water. DST 3, 5 140'05 668' Rec. 900' mud 400' watery mud, 3 350' water.	PA
Dirinda No. 3	26° 41' 12"S 148° 38' 40"E	G.L. 1 048' K.B. 1059'	26/3/68 1/4/68		4 359'		PA
Glentulloch No. 2	25° 46' 17"S 148° 22' 47"E	G.L. 1 467' K.B. 1 478'	28/8/68 9/9/68		3 121'	DST 1, 2 487-2 520', 1.02 MMcfd Rec. 2' gas cut mud. DST 2, 2 522-2 595', 32 MMcfd Rec. 20' gas cut mud. DST 3, 2 595-2 670', 12 MMcfd Rec. 10' gas cut mud. DST 4, 2 670-2 726' 2.84 MMcfd Rec. 120' gas cut mud. DST 5, 2 726-2 776', Rec. 880' water Rw 0.61 ohms at 72°F	Completed as potential gas producer
Glentulloch No. 3	25° 46' 42"S 148° 23' 30"E	G.L. 1 513' K.B. 1 524'	29/9/68 8/10/68		3 143'	DST 1, 2 610-2 680' 36 MMcfd Rec. 30' mud	PA
Kildare North No. 1	25° 40' 43"E 149° 22' 30"E	G.L. 1 540' K.B. 1 551'	11/9/68 28/9/68		4 560'		PA
Latemore South No. 1	26° 38' 35"S 149° 06' 20"E	G.L. 1 024' K.B. 1 039'	28/5/68 10/6/68		5 713'	DST 1, 5 271-5 284' Rec. gas at 25 MMcfd.	PA
Miegunyah No. 1	26° 36' 44"S 148° 39' 13"E	G.L. 972' K.B. 983'	11/4/68 17/4/68		3 921'	DST 1, 3 680-3 748', Rec. 1 450' muddy water.	PA
Pine Ridge No. 13	26° 27' 24"S 149° 00' 36"E	G.L. 1 160' K.B. 1 171'	18/10/68 25/10/68		3 853'	DST 1, 3 595-3 625', Rec. 3 300' water Rw 2.0 ohms at 72°F.	PA
Pine Ridge No. 14	26° 27' 48"S 148° 55' 40"E	G.L. 1 218' K.B. 1 229'	10/11/68 15/11/68		3 353'		Plugged & converted to water well

SYDNEY BASIN

AUSTRALIAN OIL & GAS CORPORATION DTD

Higher McDonald No. 1 BMR file 68/2037	33° 12' 55"S 150° 55' 53"E	G.L. 55' K.B. 69'	6/9/68 20/9/68	Strat.	2 060'		PA
Berkshire Park No. 1	33° 46' 53"S 150° 47' 27"E	G.L. 34' K.B. 45'	8/7/68 6/8/68		3 580'	DST (Open Hole) 1 764-1 794' very tight	PA

Lower Portland No. 1	33° 26' 00"S 150° 51' 53"E	G.L. 25' K.B. 42'	13/8/68 31/9/68		2 918'		PA
CENTRAL COAST OIL							
Terrigal No. 1A	33° 26' 22"S 151° 25' 56"E	G.L. 15' K.B. 15'	2/12/59, resumed /4/68 suspended /12/68		6 156' when suspended.		Suspended
TASMANIA							
NUDEC PETROLEUM EXPLORATION CO.							
Badcocks No. 1	41° 39' 12"S 147° 00' 00"E		15/4/68 24/10/68		2 256'		PA
YARROL BASIN							
AMALGAMATED PETROLEUM N.L.							
Bukali No. 1 BMR file 68/2024	24° 48' 50"S 151° 08' 10"E	G.L. 807' K.B. 816'	5/6/68 14/8/68	Geochemistry	2 195'		PA
OFFSHORE NORTH & NORTHWEST AUSTRALIA							
B.O.C. OF AUSTRALIA LTD							
Ashmore Reef No. 1 BMR file 67/4264	12° 10' 49"S 123° 05' 10"E	W.D. 127' R.T. 33'	16/10/67 2/4/68	Seismic	12 843'		PA
PAPUAN BASIN							
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.							
Ini No. 1	07° 37' 19"S 144° 44' 04"E	G.L. 5'	25/7/68 14/10/68		7 740'		PA
PHILLIPS AUSTRALIAN OIL COMPANY							
Orokolo No. 1 BMR file 67/4274	08° 04' 25"S 145° 23' 57"E	W.D. 189' K.B. 34'	23/3/68 2/5/68	Seismic	11 999'	DST 1, 730-1 765', perforated, rec. 400' water, (16 100 ppm Chloride)	PA
Maiva No. 1 BMR file 68/2014	08° 27' 18"S 146° 06' 58"E	W.D. 270' K.B. 34'	11/5/68 17/6/68	Structural	9 807'		PA
Tokea No. 1 BMR file 68/2013	08° 23' 35"S 146° 11' 46"E	W.D. 98' K.B. 34'	22/6/68 5/7/68	Seismic	4 840'	DST 4 539-4 840', water flowed 348 bbls/hr. Rec. 4 509' of salt water.	PA
Kapuri No. 1 BMR file 68/2038	08° 18' 22"S 146° 08' 04"E	W.D. 87' K.B. 34'	11/7/68 30/7/68	Seismic	5 572'		PA
Pasca No. 1 BMR file 68/2040	08° 36' 27"S 144° 53' 43"E	W.D. 312' K.B. 34'	6/8/68 2/10/68	Seismic	8 477'	Test No. 1, 7 211-7 245' rec. 7.2 MMcfd gas plus 101 bbls condensate Test No. 2, 8 094-8 218' rec. water and gas in amounts up to 1 090 MMcfd.	PA
Pasca C No. 1	08° 30' 45"S 144° 58' 31"E	W.D. 293' K.B. 34'	25/10/68 7/12/68		14 001'		PA

Pasca A No. 1	08° 36' 21"E 144° 54' 52"E	W.D. 314' K.B. 34'	13/12/68		7 250'	DST 72 10-7 248' open hole, rate 17.2 MMcfd + 1 375 bbls condensate DST, lower 20' section, rec. 1 100 bbls condensate and gasat rate of 15.7 MMcfd, 26/64" choke.
						Drilling ahead
Uramu No. 1 BMR file 67/4256	07° 48' 23"S 144° 41' 39"E					PA at 6 433' because of high pressures and lost circulation.
Uramu No. A-1 BMR file 67/4256	07° 48' 23"S 144° 41' 39"E	W.D. 34'	9/1/68 14/3/68		10 106'	shut Suspended in gas discovery.

TABLE 2

SUBSIDIZED GEOPHYSICAL OPERATIONS DURING 1968

BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
BASS BASIN			
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.			
Bass EF-68 marine seismic. BMR file 68/3014	T/3P, T/4P, T/5P T/6P	27/6/68-11/8/68	627 km (390 miles) Aquapulse CDP and 472 km (293.5 miles) of single fold and 6-fold data digitally re-processed.
Bass B-69A marine seismic and magnetic BMR file 68/3057	EL-T/4P, T/6P	21/12/68-16/1/69	1146 km (712 miles) 12-fold stack aquapulse with magnetometer profile along each line.
BONAPARTE GULF BASIN			
ARCO AUSTRALIA LTD			
Londonderry Rise seismic BMR file 68/3024	OP 151, P1, P2, PE 221H, WA 15P, 16P, 17P, 18P	12/6/68-17/12/68	8270 km (5139 miles) conventional and Flexotir (detailed in north and south, reconnaissance in centre).
AUSTRALIAN AQUITAINE PETROLEUM PTY LTD			
New Year Island seismic BMR file 68/3025	OP 156	4/7/68-18/8/68	800 km (497 miles) Flexotir 6-fold coverage, deconvolved.
SHELL DEVELOPMENT (AUSTRALIA) PTY LTD			
Arafura D-1 marine seismic BMR file 68/3020	OP 127, 128, 140	25/5/68-29/7/68	1107 km (688 miles) 24-fold coverage, tuned array of air guns.
WESTRALIAN OIL LTD			
Keep River R-2 seismic BMR file 68/3043	OL 1	7/11/68-25/11/68	60 km (37 miles) 600% CDP, digitally recorded.
CANNING BASIN			
AUSTRALIAN AQUITAINE PETROLEUM PTY LTD			
Terry Range magneto-telluric BMR file 68/3016	PE 151H, 152H, 205H	9/5/68-12/9/68	109 magnetotelluric soundings were made. Data recorded digitally on magnetic tape.

BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
Ryan seismic and gravity BMR file 68/3026	PE 151H, 152H, 205H	15/6/68-10/10/68	34.5 km (21.4 miles) single fold reflection, 306.6 km (190.5 miles) 6-fold refraction, 35.7 km (22.0 miles) 12-fold refraction, 1029 new gravity stations.
B.O.C. OF AUSTRALIA LTD			
Offshore Canning-Seringapatam marine seismic BMR file 68/3037	PE 213H	20/6/68-27/9/68	2802 km (1741 miles) of new line was shot by Aquapulse. One reverse refraction profile shot, 1988 km (1235 miles) of older line were reprocessed.
WEST AUSTRALIAN PETROLEUM PTY LTD			
Wallal marine seismic BMR file 67/11208	PE 30H	30/5/68-31/5/68	103 km (64.2 miles) 6-fold reflections recorded digitally.
Lennard seismic BMR file 68/3018	PE 30H	25/5/68-28/6/68	63 km (39.1 miles) 6-fold, digitally recorded.
Baskerville seismic BMR file 68/3023	PE 30H	30/6/68-21/7/68	113 km (70 miles) 6-fold CDP.
WESTRALIAN OIL LTD			
Napier refraction survey BMR file 68/3033	PE 106H, 253H	30/8/68-30/9/68	97 km (60 miles) continuous refraction profiling.
CARNARVON BASIN			
MARATHON PETROLEUM AUSTRALIA LTD			
Mia Mia seismic BMR file 67/11179	PE 260H	29/8/67-28/4/68	1431 km (889 miles) of 5-fold and 6-fold CDP, 982 km (610 miles) single end refraction profiles.

BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
WEST AUSTRALIAN PETROLEUM PTY LTD			
Table marine seismic BMR file 68/3001	PE 28H, 217H, 233H	29/1/68–4/6/68	48 km (30 miles) 2400% coverage using airguns. 575 km (357 miles) 400% covering using explosives and 200 km (124 miles) 600% coverage using explosives.
Mandu seismic BMR file 68/3042	PE 28H	15/10/68–28/10/68	33 km (21 miles) 6-fold CDP stack.
Helby marine seismic BMR file 68/3045	PE 24P, 25P	26/10/68–28/10/68	131 km (81 miles) 12-fold reflection coverage.
CLARENCE-MORETON BASIN			
CLARENCE RIVER BASIN OIL EXPLORATION CO. N.L.			
South Grafton seismic BMR file 68/3009	PEL 66	27/3/68–5/4/68	16 km (10 miles) 4-fold reflection coverage.
COOPER BASIN			
DELHI AUSTRALIAN PETROLEUM LTD			
Southwest Cooper Basin gravity BMR file 67/4835	OEL 20, 21	8/1/68–8/5/68	Gravity traverses totalling 2857 km (1775 miles) were recorded.
EROMANGA BASIN			
ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.			
Coorajah seismic and gravity BMR file 67/11206	ATP 98P, 131P	4/1/68–8/6/68	521 km (324 miles) conventional reflection, 735 gravity stations, 90 base stations recorded.
CLARENCE RIVER BASIN OIL EXPLORATION CO. LTD			
Winnathee gravity survey BMR file 68/3041	PEI 125	2/10/68–30/10/68	473 new gravity stations recorded over 793 km (493 miles).

BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
EUCLA BASIN			
SHELL DEVELOPMENT (AUSTRALIA) PTY LTD			
South Australian Shelf R-2 marine seismic BMR file 67/11205	OEL 38	6/1/68-6/2/68	744 km (462 miles) reflection survey (647 km using explosive, 97 km using airgun), 4 refraction probes.
GALILEE BASIN			
PHILLIPS AUSTRALIAN OIL COMPANY			
Western River seismic BMR file 67/11198	ATP 118P	15/11/67-24/3/68	263 km (164 miles) conventional coverage, 31 km (19 miles) 12-fold CDP.
GIPPSLAND BASIN			
A.P.M. DEVELOPMENT PTY LTD			
Toongabbie seismic BMR file 68/3022	PPL 192	18/6/68-28/6/68	39 km (24 miles) reverse coverage refraction and 11 km (7 miles) reflection shooting.
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.			
Gippsland EH-68 marine seismic BMR file 68/3015	PEP 38, 39, EL-1/60	1/5/68-24/6/68	227 km (141 miles) 12-fold CDP aquapulse.
Gippsland B69A marine seismic and magnetic BMR file 68/3058	PEP 38, 39 EL 1/60	24/12/68-21/3/69	438 km (272 miles) 12-fold CDP aquapulse.
MAGELLAN PETROLEUM SOUTHERN PTY LTD			
East Gippsland Basin seismic and magnetic BMR file 68/3049	PEP 63, T/1P	7/12/68-19/12/68	555 km (345 miles) aquapulse with magnetometer profile along each line.
LAURA BASIN			
CORBETT REEF LTD			
Cooktown aeromagnetic BMR file 68/3010	ATP 127P	18/5/68-18/6/68	7796 km (4844 miles) traverse recorded by fluxgate magnetometer.

BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
MARYBOROUGH BASIN			
EXOIL N.L.			
North Bundaberg seismic BMR file 67/11200	ATP 70P	23/11/67-5/3/68	19 km (12 miles) using 'stomper' energy source 19 km (12 miles) using explosives for 3-fold CDP conventional shooting.
MURRAY BASIN/BANCANNIA TROUGH			
ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.			
Four Corners gravity BMR file 68/3005	PEL 52	11/3/68-29/3/68	342 new gravity stations read, 338 total magnetic intensity stations established.
Lake Wintlow seismic BMR file 68/3031	PEL 52	4/7/68-29/8/68	113 km (70 miles) conventional reflection and 45 km (28 miles) refraction profiles.
NORTH AUSTRALIAN PETROLEUM COMPANY			
Tandou-Coombah seismic BMR file 68/3007	PEL 113	4/3/68-24/4/68	143 km (89 miles) of 5-fold CDP coverage.
PLANET EXPLORATION CO. PTY LTD			
Nucha seismic BMR file 68/3021	PEL 114	1/6/68-26/8/68	202 km (126 miles) 6-fold CDP coverage.
Murrumbidgee gravity BMR file 68/3032	PEL A233, A 236	4/8/68-6/12/68	2441 new gravity stations were read, including 230 base stations.
Lake Poopelloe R-2 seismic BMR file 68/3037	PEL 141	11/9/68-12/12/68	94 km (58 miles) 6-fold CDP coverage.
NGALIA BASIN			
MAGELLAN PETROLEUM SOUTHERN PTY LTD			
Ngalia Gravity BMR file 68/3051	OP 165		327 gravity readings taken along BMR traverses.

BASIN. Operating Company Survey Name BMR file No.	Permit	Duration	Extent
OTWAY BASIN			
ESSO EXPLORATION & PRODUCTION AUSTRALIA INC.			
Otway EP-67 marine seismic and magnetic BMR file 67/11188	OEL 26, PEP 40, 49, EL 1/60	28/9/67-9/1/68	1561 km (970 miles) 6-fold CDP recorded, 2572 km (1598 miles) digitally reprocessed, 1255 km (780 miles) magnetic coverage recorded.
Otway ER-68 marine seismic BMR file 68/3036	OEL 26, PEP 40, 49, EL 1/60, PEP 22	10/10/68-23/11/68	1786 km (1110 miles) 12-fold CDP recorded, also 684 km (425 miles) previous work was reprocessed.
Otway EU-68 marine seismic and magnetic BMR file 68/3052	SA/P8	16/11/68-22/11/68	76 km (47 miles) 6-fold CDP shot using Aquapulse.
Otway EV-68 land gravity BMR file 68/3056	OEL 22	10/12/68-17/1/69	2088 gravity stations read at 0.8 km (0.5 miles) intervals.
SHELL DEVELOPMENT (AUSTRALIA) PTY LTD			
Hawkesdale gravity BMR file 68/3035	PEP 5	4/9/68-15/12/68	1931 field stations & 27 base stations read.
Hawkesdale seismic BMR file 68/3053	PEP 5, 6	9/12/68-25/4/69	412 km (256 miles) 6-fold CDP coverage.
OXLEY BASIN			
ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.			
Quirindi gravity BMR file 68/3002	PEL 85	26/1/68-31/3/68	920 new stations established including 23 base stations.
Breeza seismic BMR file 68/3034	PEL 85	3/9/68-26/9/68	105 km (65 miles) conventional single-fold coverage, with analogue recording.

BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
PERTH BASIN			
UNION OIL DEVELOPMENT CORPORATION			
Margaret River seismic BMR file 67/11191	PE 261 H	21/10/67-11/3/68	357 km (222 miles) 6-fold CDP were shot.
WEST AUSTRALIAN PETROLEUM PTY LTD			
Turtle Dove marine seismic BMR file 68/3000	PE 225 H	7/2/68-6/3/68	381 km (237 miles) of reflection seismic, of which 21 km (13 miles) was by air-gun.
Direction Bank marine seismic BMR file 68/3003	PE 27H, 225H	12/3/68-23/4/68	1629 km (1012 miles) of multicoverage using explosive and air-gun energy source.
Beagle marine seismic BMR file 68/3038	WA 13P, 14P, 20P	11/10/68-19/10/68	267 km (166 miles) 12-fold reflection and 58 km (36 miles) reverse refraction coverage.
Sugarloaf marine seismic BMR file 68/3039	WA 13P, 14P	3/10/68-23/10/68	517 km (321 miles) 36-fold CDP coverage using Aquapulse energy source.
ST VINCENT BASIN			
BEACH PETROLEUM N.L.			
St Vincent Gulf marine seismic BMR file 67/11192	OEL 24	14/10/67-16/8/68	708 km (440 miles) single fold coverage and 145 km (90 miles) 3-fold CDP.
HEMATITE PETROLEUM PTY LTD			
Young Rocks aeromagnetic BMR file 68/3055	SA P1, OEL 38	10/12/68-14/12/68	2860 km (1777 miles) of lines & tie lines were recorded.
SHELL DEVELOPMENT (AUSTRALIA) PTY LTD			
South Australian Shelf R-3 marine seismic BMR file 68/3048	EP 5, 6, 7, OEL 38	7/11/68-2/1/69	330 km (205 miles) 6-fold CDP using explosives, & digitally processed, and 951 km (591 miles) 12-fold coverage by air-gun.

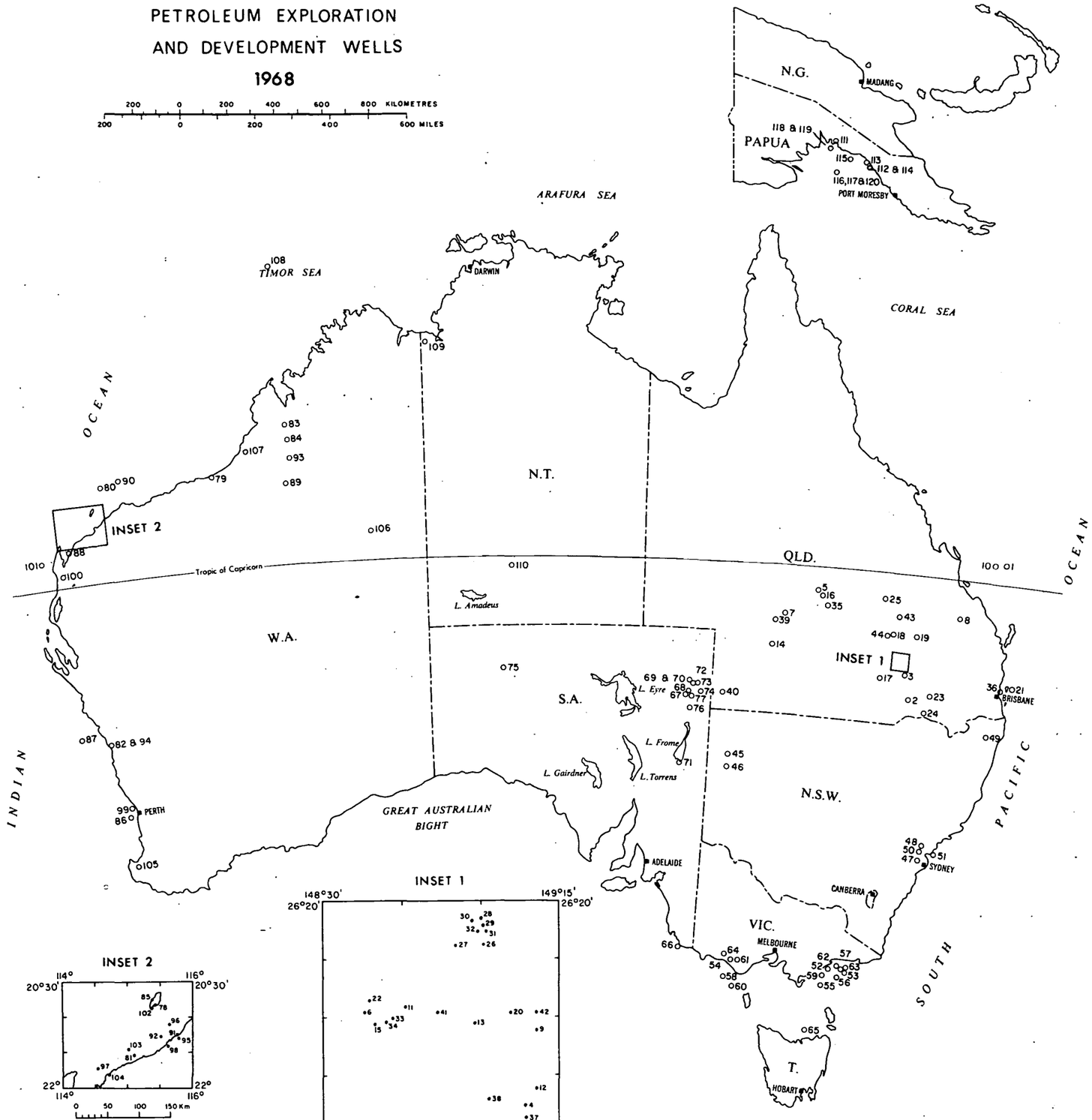
BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
TASMANIA			
ESSO EXPLORATION AND PRODUCTION INC.			
Tasmania EE-68 marine seismic and magnetic BMR file 68/3013	EL 18/65	2/9/68-3/12/68	291 km (181 miles) 12-fold CDP using Aqua-pulse energy source.
PAPUAN BASIN			
AMERICAN OVERSEAS PETROLEUM LTD			
Warrior Reef seismic BMR file 68/3011	ATP 133P	25/4/68-29/4/68	89 km (55 miles) 6-fold coverage, 72 km (45 miles) 3-fold coverage and 13 km (8 miles) reversed refraction coverage.
Fly River aeromagnetic BMR file 68/3029	P55, L7	29/6/68-17/7/68	8047 km (5000 miles) of line recorded.
AUSTRALASIAN PETROLEUM COMPANY PTY LTD			
Era-Pie-Purari seismic BMR file 67/11199	L1	31/10/67-18/5/68	229 km (142 miles) 6-fold CDP.
Nomad seismic BMR file 68/3019	P27	22/10/68-3/12/68	39 km (24 miles) 6-fold CDP reflection work.
Era-Pie Purari D-1 seismic BMR file 68/3044	L1	26/10/68-30/5/69	209 km (130 miles) 6-fold CDP reflection.
Fly River Delta seismic BMR file 68/3046	L6, L7	25/11/68-16/5/69	692 km (430 miles) marine traverses and 60 km (37 miles) land traverses recorded with 6-fold coverage.
BP DEVELOPMENT AUSTRALIA PTY LTD			
Kagua seismic & gravity BMR file 68/3012	P 46	19/5/68-19/11/68	179 km (111 miles) 6-fold CDP coverage. 344 gravity stations & 57 base stations recorded.
Carrington-Ka aeromagnetic BMR file 68/3030	P27, 37, 46	27/7/68-26/9/68	9162 km (5693 miles) of line flown & recorded.

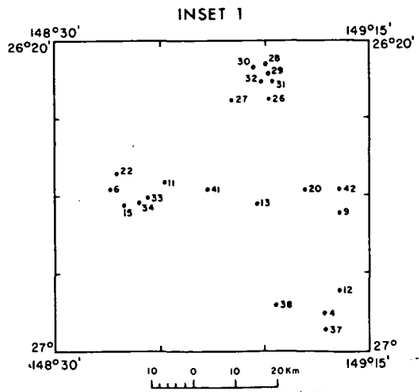
BASIN Operating Company Survey Name BMR file No.	Permit	Duration	Extent
PHILLIPS AUSTRALIAN OIL COMPANY			
Permit 42, R-1 marine seismic BMR file 67/11194	P42	27/11/67-3/3/68	692 km (430 miles) explosive & 1466 km (911 miles) aquapulse at 600% coverage. 82 km (51 miles) reprocessed.
Bligh Entrance marine seismic BMR file 68/3050	1P, 2P, 3P	20/11/68-19/1/69	2168 km (1347 miles) Aquapulse, 2010 km (1249 miles) were reprocessed from previous surveys.
TENNECO AUSTRALIA INC.			
Triangle Reef marine seismic BMR file 68/3008	AP 88P, 134P	23/3/68-23/4/68	476 km (296 miles) 6-fold coverage.
UNION OIL DEVELOPMENT CORPORATION			
Turama River seismic BMR file 67/11190	P 51	11/10/67-14/1/68	16 km (10 miles) 6-fold CDP coverage.
Fly-Turama aeromagnetic BMR file 68/3028	P 51	9/8/68-7/9/68	10,910 km (6779 miles) of line flown and recorded.
NORTHERN NEW GUINEA BASIN			
AUSTRALIAN AQUITAINE PETROLEUM PTY LTD			
Makambu aeromagnetic BMR file 68/3054	P 45	16/11/68-18/11/68	1346 km (836 miles) line flows and recorded with a cesium vapour magnetometer.
CONTINENTAL OIL COMPANY OF AUSTRALIA			
Madang aeromagnetic BMR file 68/3040	P 41	13/9/68-9/11/68	10,099 km (6257 miles) line flown and recorded with a cesium vapour magnetometer.

AUSTRALIA AND PAPUA NEW GUINEA

PETROLEUM EXPLORATION AND DEVELOPMENT WELLS

1968





Note: Unless otherwise stated, well location refers to No. 1 well.

1 Aquarius Qld.
2 Alton 8 Qld.
3 Bainbilla Qld.
4 Banoona Qld.
5 Barcoo Qld.
6 Bobadilla Qld.
7 Budgerygar Qld.
8 Bukali Qld.
9 Bundella Qld.
10 Capricorn 1A Qld.
11 Chinchinbilla 2 Qld.
12 Combarngo East Qld.
13 Coonardoo Qld.
14 Cumbroo Qld.
15 Dirinda 3 Qld.
16 Fairlea Qld.
17 Foyleview Qld.
18 Glentulloch 2 & 3 Qld.
19 Kildare North Qld.
20 Latemore South Qld.
21 Matjara Qld.
22 Miegunyah Qld.
23 Moonie 30-34 Qld.
24 Paringa Qld.
25 Penjobe Qld.
26 Pine Ridge 13 Qld.
27 Pine Ridge 14 Qld.
28 Pleasant Hills 2 Qld.
29 Pleasant Hills 3 Qld.
30 Pleasant Hills 4 Qld.
31 Pleasant Hills 5 Qld.
32 Pleasant Hills 6 Qld.
33 Pringle Downs 3 Qld.
34 Pringle Downs 4 Qld.
35 Ravensbourne Qld.
36 St Helena Qld.
37 Sunnnybank West Qld.
38 Taunton Qld.
39 Thunda Qld.
40 Tickalara Qld.
41 Tingun Qld.
42 Wallumbilla South Qld.
43 Warrinilla 3,4 & 5 Qld.
44 Womblebank Qld.
45 Bancannia North N.S.W.
46 Bancannia South N.S.W.
47 Berkshire Park N.S.W.
48 Higher MacDonald N.S.W.
49 Hogarth N.S.W.
50 Lower Portland N.S.W.
51 Terrigal 1A N.S.W.
52 Barracouta A2-A10 Vic.
53 Flounder Vic.
54 Garvoc Vic.
55 Groper Vic.
56 Kingfish 2 & 3 Vic.
57 Marlin A3-A7 Vic.
58 Nautilus Vic.
59 Perch Vic.
60 Prawn Vic.
61 Purrumbete Vic.
62 Snapper Vic.
63 Tuna 1 & 2 Vic.
64 Woolsthorpe Vic.
65 Badcocks Tas.
66 Argonaut S.A.
67 Boxwood S.A.
68 Daralingie 2 S.A.
69 Gidgealpa 8 S.A.
70 Gidgealpa 9 & 10 S.A.
71 Lake Frome 1,2& 3 S.A.
72 Moomba 7 S.A.
73 Moomba 8 S.A.
74 Mudlalee S.A.
75 Munyarai S.A.
76 Tinga Tingana S.A.
77 Wancoocha S.A.
78 Barrow Island 168-218 W.A.
79 Chirup W.A.
80 Dampier W.A.
81 Direction Is.W.A.
82 Dongara 7 W.A.
83 Doran W.A.
84 Edgar Range W.A.
85 Flacourt W.A.
86 Gage Roads W.A.
87 Gun Island W.A.
88 Hope Island W.A.
89 Kemp Field W.A.
90 Legendre W.A.
91 Mangrove Island W.A.
92 Mary Anne W.A.
93 McLarty W.A.
94 Mondarra 1 & 2 W.A.
95 Mulyery W.A.
96 North Sandy Island W.A.
97 Observation Island W.A.
98 Peedamulla W.A.
99 Quinns Rock W.A.
100 Remarkable Hill W.A.
101 Sandy Point W.A.
102 Stokes Point W.A.
103 Thevenard W.A.
104 Urala W.A.
105 Whicher Range W.A.
106 Wilson Cliffs W.A.
107 Willara Hill W.A.
108 Ashmore Reef W.A.
109 Keep River N.T.
110 Tyler N.T.
111 Ini Papua
112 Iokea Papua
113 Kapuri Papua
114 Maiva Papua
115 Orokolo Papua
116 Pasca Papua
117 Pasca C1 Papua
118 Uramu Papua
119 Uramu A-2 Papua
120 Pasca A-2 Papua

B. M. R. Petroleum Exploration Branch, 1972. To accompany Record No. 1969/153

AUSTRALIA AND PAPUA NEW GUINEA

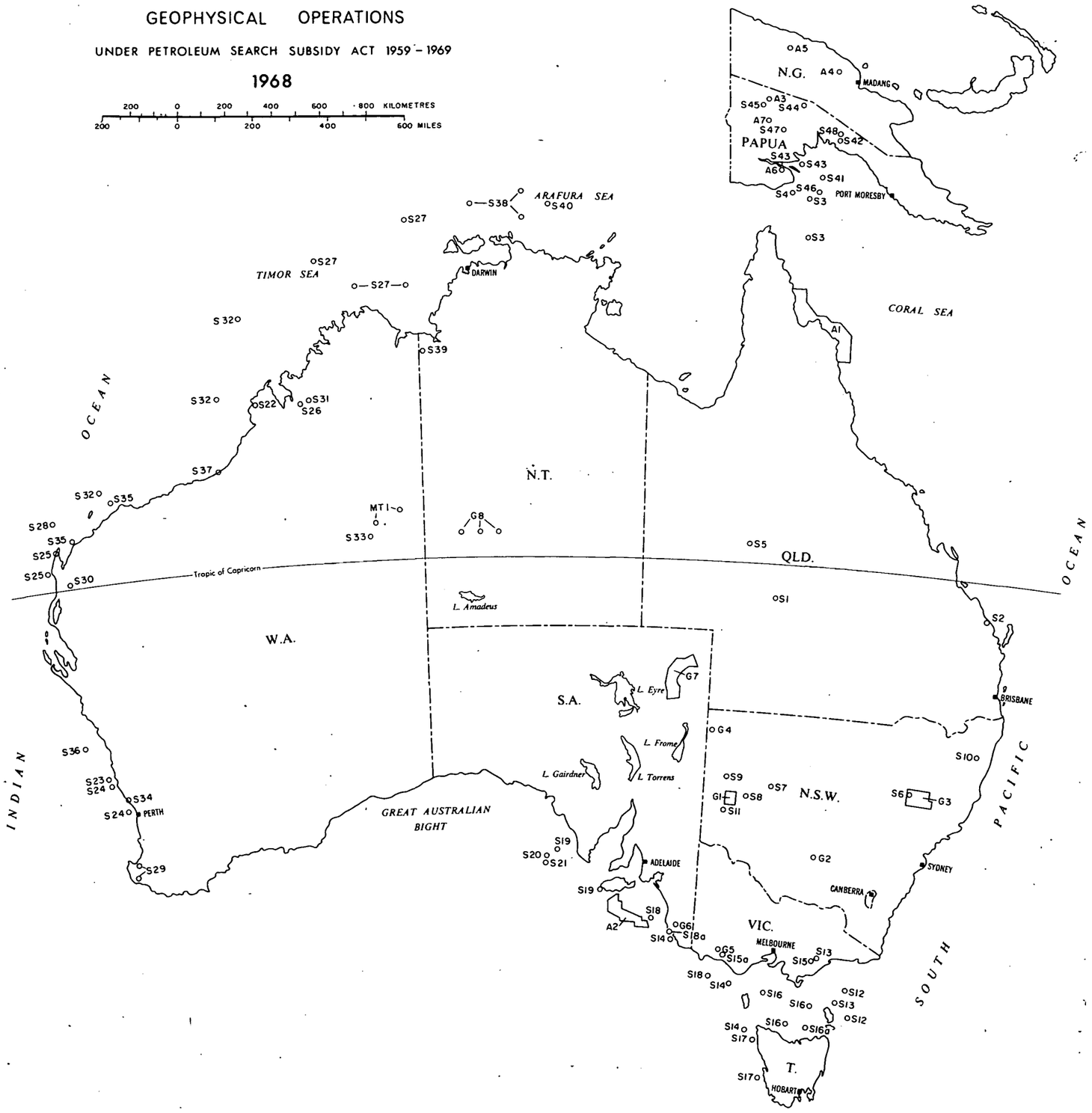
GEOPHYSICAL OPERATIONS

UNDER PETROLEUM SEARCH SUBSIDY ACT 1959 - 1969

1968

200 0 200 400 600 800 KILOMETRES

200 0 200 400 600 MILES



S—SEISMIC SURVEYS

S1 Coorajah, Qld (& Gravity)
S2 North Bundaberg, Qld
S3 Triangle Reef, Qld
S4 Warrior Reef, Qld & Papua
S5 Western River, Qld
S6 Breeza, N.S.W.
S7 Lake Poopelloe R-2, N.S.W.
S8 Lake Wintlow, N.S.W.
S9 Nucha, N.S.W.
S10 South Grafton, N.S.W.
S11 Tandou-Coombah, N.S.W.
S12 East Gippsland Basin, Vic. (& Magnetic)
S13 Gippsland EH-68, Vic. & Tas.
S14 Otway EP-67, Vic. (& Magnetic)
S15 Toongabbie, Vic.
S15a Hawkesdale, Qld
S16 Bass EF-68, Tas.
S16a Bass B-69A, Tas. (& Magnetic)
S17 Tasmania EE-68, Tas. (& Magnetic)
S18 Otway ER-68, S.A. Vic. & Tas. (& Magnetic)
S18a Otway EU-68, S.A. (& Magnetic)
S19 South Australia Shelf R-2, S.A.
S20 South Australia Shelf R-3, S.A.
S21 St. Vincent Gulf, S.A.
S22 Baskerville, W.A.
S23 Beagle, W.A.
S24 Direction Bank, W.A.
S25 Helby, W.A.
S26 Lennard, W.A.
S27 Londonderry Rise, W.A. & N.T.
S28 Mandu, W.A.
S29 Margaret River, W.A.
S30 Mia Mia, W.A.
S31 Napier, W.A.
S32 Offshore Canning-Seringapatam, W.A.
S33 Ryan, W.A. (& Gravity)
S34 Sugarloaf, W.A.
S35 Table, W.A.
S36 Turtle Dove, W.A.
S37 Wallal, W.A.
S38 Arafura D-1, N.T.
S39 Keep River R-2, N.T.
S40 New Year Island, N.T.
S41 Bligh Entrance, Papua
S42 Era-Pie-Purari D-1, Papua
S43 Fly River Delta, Papua
S44 Kagua, Papua
S45 Nomad, Papua (& Gravity)
S46 Permit 42 R-1, Papua
S47 Turama River, Papua
S48 Era-Pie-Purari, Papua

G—GRAVITY SURVEYS

G1 Four Corners, N.S.W.
G2 Murrumbidgee, N.S.W.
G3 Quirindi, N.S.W.
G4 Winnathee, N.S.W.
G5 Hawkesdale, Vic.
G6 Otway EV-68, S.A.
G7 South West Cooper Basin, S.A.
G8 Ngalia Basin, N.T.

A—AEROMAGNETIC SURVEYS

A1 Cooktown, Qld
A2 Young Rocks, S.A.
A3 Carrington-Ka, Papua
A4 Madang, N.G.
A5 Makambu, N.G.
A6 Fly River, Papua
A7 Fly-Turama, Papua

MT—MAGNETOTELLURIC SURVEYS

MT1 Terry Range, W.A.

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