COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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Report No. 41A

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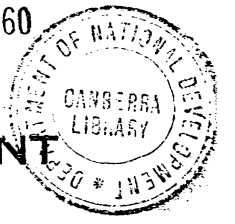
SUMMARY OF OIL-SEARCH ACTIVITIES IN AUSTRALIA AND NEW GUINEA TO JUNE, 1959

Complimentary

Issued under the Authority of Senator the Hon. W. H. Spooner,
Minister for National Development
1960

LIST OF REPORTS

1. Preliminary Report on the Geophysical Survey of the Collie Coal Basin.—N. G. Chamberlain, 1948.
2. Observations on Stratigraphy and Palaeontology of Devonian, Western Portion of Kimberley Division, Western Australia.—Curt Teichert, 1949.
3. Preliminary Report on Geology and Coal Resources of Oaklands-Coorabin Coalfield, New South Wales.—E. K. Sturmfels, 1950.
4. Geology of the Nerrima Dome, Kimberley Division, Western Australia—D. J. Guppy, J. O. Cuthbert and A. W. Lindner, 1950.
5. Observations of Terrestial Magnetism at Heard, Kerguelen and Macquarie Islands, 1947-1948 (carried out in co-operation with the Australian National Antarctic Research Expedition, 1947-1948).—N. G. Chamberlain, 1952.
6. Geology of New Occidental, New Cobar and Chesney Mines, Cobar, New South Wales.—C. J. Sullivan, 1951.
7. Mount Chalmers Copper and Gold Mine, Queensland.—N. H. Fisher and H. B. Owen, 1952.
8. Geological and Geophysical Surveys, Ashford Coal Field, New South Wales.—H. B. Owen, G. M. Burton and L. W. Williams, 1954.
9. The Mineral Deposits and Mining Industry of Papua-New Guinea.—P. B. Nye and N. H. Fisher, 1954.
10. Geological Reconnaissance of South-Western Portion of Northern Territory.—G. F. Joklik, 1952.
11. The Nelson Bore, South-Western Victoria; Micropalaeontology and Stratigraphical Succession.—I. Crespin, 1954.
12. Stratigraphy and Micropalaeontology of the Marine Tertiary Rocks between Adelaide and Aldinga, South Australia.—I. Crespin, 1954.
13. The Geology of Dampier Peninsula, Western Australia.—R. O. Brunnschweiler, 1957.
14. A Provisional Isogonic Map of Australia and New Guinea, showing Predicted Values for the Epoch 1955.5.—F. W. Wood and I. B. Everingham, 1953.
15. Progress Report on the Stratigraphy and Structure of the Carnarvon Basin, Western Australia.—M. A. Condon, 1954.
16. Seismic Reflection Survey at Roma, Queensland.—J. C. Dooley, 1954.
17. Mount Philip Iron Deposit, Cloncurry District, Queensland.—E. K. Carter and J. H. Brooks, 1955.
18. Petrology and Petrography of Limestones from the Fitzroy Basin, Western Australia.—J. E. Glover, 1955.
19. Seismic Reflection Survey, Darriman, Gippsland, Victoria.—M. J. Garrett, 1955.
20. Micropalaeontological Investigations in the Bureau of Mineral Resources, Geology and Geophysics, 1927-52.—I. Crespin, 1956.
21. Magnetic Results from Heard Island, 1952.—L. N. Ingall, 1955.
22. Oil in Glauconitic Sandstone at Lakes Entrance, Victoria—R. F. Thyer and L. C. Noakes, 1955.
23. Seismic Reflection Survey at Roma, Queensland, 1952-53.—L. W. Williams, 1955.
24. Sedimentary Environment as a Control of Uranium Mineralization in the Katherine-Darwin Region, Northern Territory.—M. A. Condon and B. P. Walpole, 1955.
25. Papers on Tertiary Micropalaeontology.—I. Crespin, F. M. Kicinski, S. J. Patterson and D. J. Belford, 1956.



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DEPARTMENT OF NATIONAL DEVELOPMENT

Minister: SENATOR THE HON. W. H. SPOONER, M.M.

Secretary: H. G. RAGGATT, C.B.E.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Director: J. M. RAYNER

Deputy Director: H. TEMPLE WATTS

This Report was prepared in the Geological and Petroleum Technology Sections

Chief Geologist: N. H. FISHER

Chief Petroleum Technologist: H. S. TAYLOR-ROGERS

Summary of oil-search activities in Australia and New Guinea to the end of 1959.

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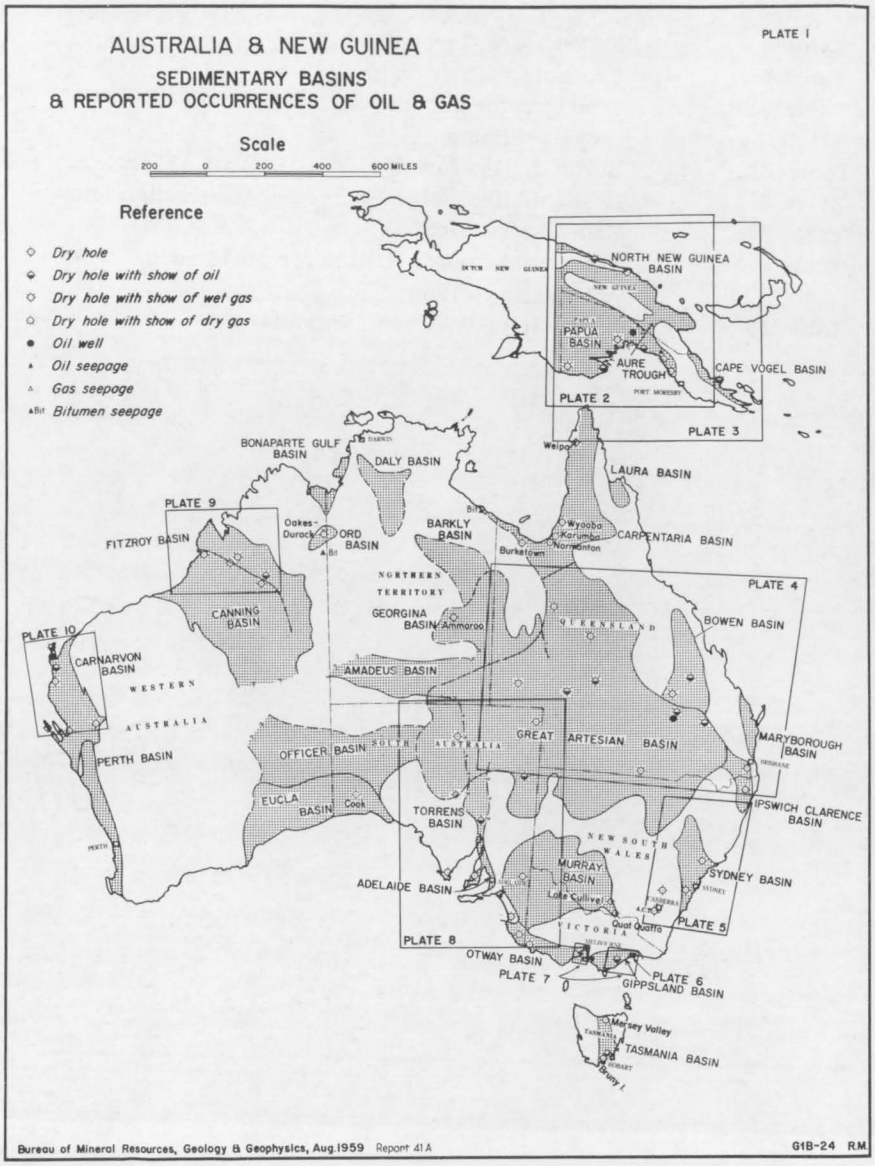
PLATE 1

AUSTRALIA & NEW GUINEA

SEDIMENTARY BASINS & REPORTED OCCURRENCES OF OIL & GAS



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G1B-24 R.M.

INTRODUCTION

This report revises and enlarges the material which has appeared in -

Records 1943-63 - Summary of Oil Drilling Activities in Australia and New Guinea, by H.G. Raggatt and Irene Crespin.

Records 1957-7 - Summary of Oil Search Activities in Australia and New Guinea to the End of 1956, by M.A. Condon, H.S. Taylor-Rogers and N.H. Fisher.

Report No. 41 - Summary of Oil Search Activities in Australia and New Guinea to the End of 1957, by M.A. Condon, N.H. Fisher and G.R.J. Terpstra.

Most of the information relating to the period before 1944 was compiled by Raggatt and Crespin. This was revised and added to by H. Temple Watts, M.A. Condon and B.H. Stinear in 1949. The geological and geophysical information for the present report was compiled by M.A. Condon and the drilling and expenditure data by H.S. Taylor-Rogers. Further attention has been given to the report by several of those named above and by other officers of the Bureau.

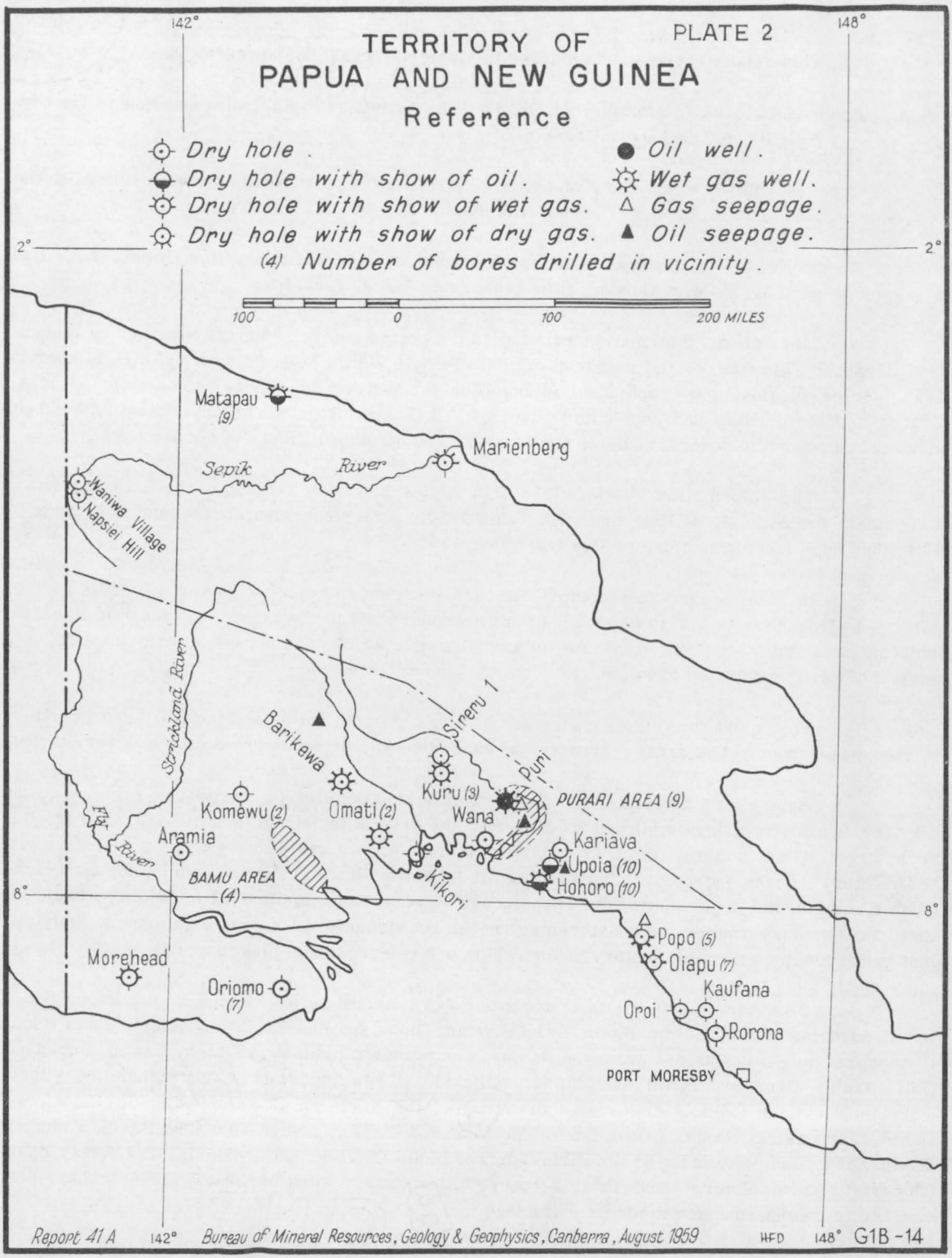
The information contained in this report has been revised to the following dates: geological, geophysical, drilling and well status to 30th September 1959; petroleum tenements to 30th June 1959; and expenditure to 31st December 1958.

In this report "petroleum" is used to refer to hydrocarbons in general, "gas" to gaseous hydrocarbons, "oil" to crude oil (liquid hydrocarbons) and "wax" or "bitumen" to the solid hydrocarbons; "dry gas" is used for inflammable gas which does not contain any considerable amount of easily separated gasoline.

Papua and New Guinea are treated first, and then the States and the Northern Territory in clockwise order. The drilling activity and expenditure is presented by States and Territories.

Australia and Papua & New Guinea may be regarded for the purpose of exploration for oil as being made up of three main groups of rocks: the crystalline rocks (granite and other igneous rocks, gneiss, and schist), which are unlikely to have oil accumulations except at a contact with sedimentary rocks; strongly indurated and distorted sedimentary rocks, which are unlikely to contain commercial accumulations of oil, although they may have supplied oil to adjoining undistributed sedimentary rocks; and sedimentary rocks not strongly indurated or deformed. Only this last group occupies the sedimentary basins which are referred to in this report.

The main basins (Plate 1) are as follows: Northern New Guinea Basin, Papua Basin, Great Artesian Basin, Bowen Basin, Sydney Basin, Gippsland Basin, Murray Basin, Eucla Basin, Officer Basin, Perth Basin, Carnarvon Basin, Canning Basin (including Fitzroy Basin), Bonaparte Gulf Basin, Georgina Basin, and Amadeus Basin. Less important basins include the Aitape-Torricelli and the Sepik-Finisterre subdivisions of the Northern New Guinea Basin, Cape Vogel Basin, Carpentaria Basin, Laura Basin, Maryborough Basin, Ipswich-Clarence Basin, Tasmania Basin, Otway Basin, Adelaide Basin, Pirie-Torrens Basin, Ord Basin, Daly Basin, and Barkly Basin. The basin nomenclature used in this report follows mainly that of Condon (1956) and has been checked to give due regard to priority of usage.



Report 41 A 142° Bureau of Mineral Resources, Geology & Geophysics, Canberra, August 1959 HFD 148° G1B-14

PAPUA AND NEW GUINEA

(See Plate 2)

HISTORY OF INVESTIGATIONS.

The following account is based partly on the report of the Anglo-Persian Oil Company on the operations it conducted for the Commonwealth Government during 1920-1929 (A.P.O.C. 1930), partly on notes supplied by private companies, and partly on information available from official files. Because many of the investigations have been made concurrently in Papua and New Guinea and it is difficult to apportion costs between these territories, no attempt has been made to give separate accounts for each. By far the greatest amount of work, however, has been done in Papua. The drilling done in the Territory of New Guinea has been limited to one bore at Marienberg and shallow bores at Matapau and on the upper Sepik River.

Commonwealth Government and Anglo-Persian Oil Company.

1912-1919. The existence of oil seepages near the Vailala River in Papua was first reported in 1911, and soon afterwards the British New Guinea Development Company began drilling at Upoia with a hand-drilling rig. From 1912 onward exploration work was conducted by the Commonwealth Government as a national undertaking (Wade, 1914). Nine bores,the deepest of which was 1,770 feet, were drilled at Upoia. Oil shows were reported in some of these. An estimated sum of £141,534 was spent during this period.

1919-1929. The Anglo-Persian Oil Company became associated with this enterprise in July 1919, when an agreement was signed in which the Australian and British Governments each undertook to provide a sum of £50,000, and the company undertook to supply and direct, as agents for the two Governments, the technical staff necessary for geological exploration, selection of sites for test-drilling, and the conduct of drilling operations.

Field work under this agreement began in March 1920. The first test bore at Popo was started two years later, and was drilled without much difficulty to 1,775 feet, but had to be abandoned on account of running muds at 1,825 feet. The second and third bores, drilled 1,100 feet from the first, were abandoned at 880 and 2,707 feet, for the same reason.

The cost of these operations had by the end of 1921 exhausted the £100,000 provided by the agreement of 1919. The British Government withdrew from the enterprise, and the Australian Government took over its share for the sum of £25,000, authorising the Anglo-Persian Oil Company to continue operations as its agents, by a succession of temporary arrangements based on the general terms of the original agreement.

In July 1923, the Australian Government approved an arrangement under which the drilling operations were to be continued on the Government's behalf, subject to certain conditions. This arrangement remained in force until the middle of 1926, when operations at Popo were suspended owing to the failure of No. 3 bore to reach the depth that was regarded as necessary.

Expenditure under the joint agreement had at this time reached a total of £227,256.

The position then was that the Australian Government had thrown open most of Papua and New Guinea to private enterprise, retaining only a block of country from Popo to Yule Island as a Government reserve. The three bores drilled at Popo had in spite of the most persistent effort not attained the depths required by the geological report. The Anglo-Persian Oil Company's drilling and geological staffs recommended a fourth location at Popa, which was accepted by the Australian Government after it had consulted Dr. Arthur Wade. At the request of the Government the company carried out additional geological field work in the area from the end of 1927 until October 1929. Popo No. 4 was spudded in in August 1927, but was abandoned at a depth of 895 feet. Popo No. 5, a thousand feet from No.4, was commenced in February 1928 and abandoned at 1,394 feet, on account of drilling difficulties. The agreement was terminated by the Australian Government in 1929 and operations ceased.

Expenditure for the period 1926-1929 amounted to £121,526, making a total of £490,316 for the period 1912-1929. All the technical direction and advice provided by the Anglo-Persian Oil Company under the agreements was given without fee.

Relatively Small Private Companies.

From 1923 to date private companies have spent considerable sums of money in New Guinea on geological and geophysical work, scout boring, and test drilling.

Ormildah Oil Development Co. Ltd. and New Guinea Oil Co. did some drilling in 1923-1926. The former company drilled a bore at Marienberg in New Guinea to a depth of 2,705 feet in 1926; the New Guinea Oil Co. Ltd sank seven scout bores near Hohoro in Papua during the years 1923 to 1926, and in 1926 drilled a deeper hole to a depth of 1,517 feet, in which gas and oil were reported. Geological reconnaissances were made by Pacific Island Investment Company and Mandated Development Ltd.

At Matapau, New Guinea, Mandated Development Co. Ltd drilled six shallow bores between 1924 and 1926: No. 1, 70 feet; No.2, 661 feet; No.3, 594 feet; No.4, 137 feet; No.5, 303 feet; and No. 6, 765 feet. From 1929 to 1932, this Company drilled three more bores in the same area: No. 7, 1,331 feet; No.8, 60 feet; and No. 9, 510 feet.

The four companies mentioned above probably spent about £100,000 in their search for oil.

In 1927-1928, Vogel (Papua) Oil Co. Ltd drilled two bores, to 180 and 1,018 feet, at Kukuia in the Cape Vogel area.

Of the other smaller companies, Orimo Oil Ltd, Oil Search Ltd, and Papuan Apinaipi Petroleum Co. Ltd may be specially mentioned. Between them, the first two spent £180,000 on geological work in Papua and New Guinea, and Oil Search Ltd carried out investigations to a stage where two major oil companies became interested (see below).

Oriomo Oil Ltd operated in the Western Division of Papua, where it drilled seven bores in 1927/1928 in the Oriomo area: Maremosab bore, 1,595 feet; No.1 bore, Wohomul,

1,260 feet; No.2 bore, Wohomul, 1,890 feet; a bore at Oriomo, 873 feet; two bores at Wonia, 785 and 665 feet; and one of which no particulars are available. Gas, bitumen, and paraffin wax were reported from the Maremosab and Wohomul bores.

The Papuan Apinaipi Petroleum Co. Ltd, which was formed in April, 1937, carried out geological work in the Oiapu district and put down five scout and two deeper holes on a well-defined structure. The scout drilling totalled 5,418 feet. The deeper holes were Oiapu No. 1 which reached 2,769 feet and Oiapu No.2, 2,086 feet. Work ceased in the area when staff was evacuated in early 1942. Some geological mapping was carried out by Bureau of Mineral Resources geologists during 1947, 1948 and 1949 (Guppy, 1947; Condon, 1949), but the company lost its area in 1950 through inability to carry out the terms of the Permit.

The company was re-constituted and in 1954 was granted a Permit, No. 22, over a bigger area, including the area of its former Permit 6 and much of Permit 7, which had been surrendered by Australasian Petroleum Co. Pty Ltd. It has since carried out revision geological surveys in the permit area, and reconnaissance gravity work. A stratigraphic bore, Kaufana No. 1, was begun on the Kaufana Anticline, on the Aroa River, west of Port Moresby, in December 1957, and was completed in January 1958 at 3,380 feet.

The operation was subsidized under the terms of the Petroleum Search Subsidy Act 1957-1958.

The company has expended £777,003, including £48,338 by way of subsidy from the Commonwealth.

Papua Oil Development Co. Ltd, a subsidiary of the Shell Company, operated during 1936 to 1939 in ten permit areas in the Western, Delta, and Central Divisions of Papua. These permits covered an area of 22,700 square miles and extended along a narrow coastal strip of the Gulf of Papua, the Bamu River, and the lower sections of the Fly and Strickland Rivers. Extensive investigations were carried out, including aerial, geological, and geophysical surveys, and core drilling. Fifteen scout bores were drilled, with a total footage of 20,167 feet, but no test well was put down. Of the scout bores, four were in the Bamu area, one at Kikori, nine in the Purari area and one at Rorona (Plate 2). The depths of these bores are as follows :

	Well	Depth (in feet)
Bamu	1	2,138
	2	1,228
	3	1,901
	4	1,140
Kikori	5	2,502
Purari	6	2,551
	7	1,012
	8	1,037
	9	909
	10	778
	11	1,035
	12	797
	13	876
	13A	1,050
Rorona	1	1,222
Total	15	20,176 feet.

The total expenditure by this company amounted to £411,000.

Enterprise of New Guinea Gold and Petroleum Development N.L. was granted a Permit, No. 21, over an area along the border of Dutch New Guinea, in the upper part of the Sepik River valley, in 1954. A geological reconnaissance (Perry, 1956), a gravity survey, and a core-drilling programme were completed. In 1957 a bore was drilled to 218 feet at Waniwa Village and one at Napsiei to 775 feet.

The Island Exploration Co. Pty Ltd.

This company was formed in 1936 by D'Arcy Exploration Co. Ltd and Vacuum Oil Co. Pty Ltd and was engaged in exploration in New Guinea from January 1937 to December 1939, and in Papua from November 1936 to the present.

In New Guinea, the company's permit area was in the Madang area, between the Ramu and Markham Rivers and the coast. Geological reconnaissance was carried out over 8,000 square miles, and aerial survey over 2,370 square miles. No test well was drilled. The company surrendered its New Guinea Permit No. 2 in December 1939, after a total expenditure in respect of the permit of £117,615.

The company's activities in Papua have extended from the Turama and Kikori Rivers in mid-western Papua to the Dutch border and have included geological reconnaissance over 11,300 square miles, aerial survey of 8,900 square miles, and geophysical survey of 15,000 square miles. In addition to test drilling, shallow holes have been put down for geological information.

The company has drilled two exploratory bores on the Omati River in its Permit No.2. Omati No. 1, a location based on geological field work and sited on the Darai Anticline, reached a final depth of 14,352 feet in 1955. Gas was encountered in Cretaceous sediments at 12,162 feet, and in Jurassic sediments at 13,468 feet and 13,743 feet. Omati No. 2 was drilled west of Omati No. 1 on the same structure to a final depth of 10,880 feet.

A bore drilled at Aramia, Aramia No. 1, the location of which was based on preliminary interpretation of geophysical data, reached basement (granite) at 6,614 feet (final depth 6,628 feet). The company, jointly with the Australasian Petroleum Co. Pty Ltd, drilled Barikewa No. 1 at a site chosen on the basis of geological field work, near the Kikori River, at the culmination of the Barikewa Anticline. The well was completed in July 1958 at a depth of 13,890 feet. Oil shows were found in Eocene limestone; traces of oil were encountered in the Cretaceous beds at 5,018 feet and 5,446 feet, and strong flows of gas below 5,000 feet.

Komewu No. 1, the location of which was based mainly on seismic evidence, was drilled on the Komewu structure on the upthrown side of a fault and reached basement at 6,135 feet (final depth 6,393 feet). A second bore on this structure, Komewu No. 2, was spudded in near the end of 1957, and drilled to a total depth of 9,977 feet in 1958. There were no indications of oil or gas. Granite basement was reached at 9,950 feet.

Australasian Petroleum Co. Pty Ltd.

In 1938, Oil Search Ltd united with D'Arcy Exploration Co. Ltd and Vacuum Oil Co. Pty Ltd to form the Australasian Petroleum Co. Pty Ltd. This company which operates jointly with Island Exploration Co. Pty Ltd took over the areas previously held by Oil Search Ltd.

In New Guinea, the Company operated in the Sepik District. Approximately 6,500 square miles were covered by geological reconnaissance and 7,422 square miles by aerial survey. No test well was drilled.

In Papua operations have been continuous since October 1938, except for a period from February 1942 to late 1945, when they were suspended for security reasons. The Company's activities included geological reconnaissance over 9,500 square miles, aerial survey of 10,315 square miles, and geophysical surveys of 3,000 square miles; operations extended from the Gulf to the Delta and Western Divisions. A few scout bores for geological information only were drilled on Yule Island. The company was engaged in drilling a deep test on the Kariava Anticline, at a location based on geological field work (later followed up by a seismic refraction survey), when operations were suspended in January 1942 at a depth of 5,400 feet; some traces of oil and gas were encountered. In 1946 drilling was resumed and reached a final depth of 12,621 feet, without encountering further indications of petroleum.

The Company continued to carry out a programme of exploration drilling. Oroi No. 1. a hole based on geological and gravity work, located on the Oroi Anticline, was drilled to 5,516 feet. Some gas was encountered below 4,232 feet. Wana No. 1, at a location based on geological and geophysical work, on the Era-Baroi Anticline, was drilled to 9,866 feet. Traces of gas were encountered below 5,400 feet. Hohoro No.1 and Hohoro No.2, located on the Hohoro structure at sites based on geological work, were drilled to 4,721 feet and 10,642 feet respectively. In Hohoro No. 1 shows of oil and gas were encountered, in Hohoro No.2 traces of gas only. Upoia No.1, at a location based on geological work, on the Upoia Anticline, was drilled to 5,356 feet and shows of oil were encountered.

The location of Kuru No.1 on the Kuru Anticline was based on a geological survey. The well blew out at 998 feet in Miocene limestone, and Kuru No.1A was drilled 200 feet away from No.1 to kill the gas flow. Kuru No.2 was subsequently drilled, but at 5,838 feet the hole had to be plugged back to 4,420 feet and side-tracked. The side-tracked hole was drilled to a total depth of 7,305 feet. The gas reservoir found in Kuru No.1 was penetrated between 970 and 1,170 feet; traces of gas were encountered at 5,700 and 5,919 feet, and traces of oil at 7,013 feet. Kuru No. 3 was drilled to a total depth of 8,843 feet; high-pressure water with a trace of gas was met at the bottom.

Sireru No.1 was drilled 7 miles north of Kuru No.1 in order to test the Miocene limestones. The site was selected mainly because of the similarity and proximity of the Sireru Anticline to the Kuru Anticline, coupled with the presence of gas in Kuru. The bore was drilled to 1,510 feet. From 718 - 1,510 feet it cut dense limestone, which on testing yielded only gaseous saline water.

Morehead No. 1, on the Morehead Anticline, was drilled to 8,087 feet, penetrating Jurassic arkosic sandstone from 7,265 feet to bottom. Gas-cutting occurred between 7,277 feet and 7,293 feet. The bore was sited on the results of aeromagnetic survey and seismic refraction work.

Puri No. 1 was drilled on the Puri Anticline to a total depth of 10,100 feet. The location was chosen after a geological reconnaissance. The operation received a subsidy under the Petroleum Search Subsidy Act 1957-1958. Miocene marl and limestone were cut from surface to 1940 feet, Eocene limestone to 2,022 feet and Cretaceous shale and siltstone to 7,425 feet, where a major thrust fault was met. Below the thrust, Miocene limestone was dut to 8,060 feet, Eocene limestone to 8,878 feet, and Cretaceous shale and siltstone to total depth. A formation test of the interval 7,460 - 7,508 feet produced gas at about 3 million cubic feet/day, then oil at a maximum flow of 1,600 bbl/day, and finally, after two days' testing, oil and water.

In order to obtain data on the geometry of the thrust, directional holes were drilled from Puri No. 1 above the thrust. Puri No. 1A was deviated from 6,090 feet and drilled to a total depth of 7,927 feet, Puri No. 1B was deviated from 3,870 feet to a total depth of 8,520 feet.

In addition to the drilling mentioned above the company has carried out a comprehensive programme of exploration since 1946, with geological parties operating in both New Guinea and Papua, but mainly in Papua, and geophysical surveys - gravity, magnetic and seismic - in mid-western Papua.

EXPENDITURE.

Since the start of oil exploration in Papua and New Guinea in 1912, 33 bores for oil, totalling about 179,000 feet, have been drilled.

The total expenditure on oil exploration in Papua and New Guinea up to the end of 1958 is shown in Table I.

TABLE I.

	British Govt £	Commonwealth Govt £	Companies £
1. By Commonwealth Government			
(a) On its own account - 1912-1919	-	141,534	-
(b) Under Anglo-Persian agreement			
(i) 1919-1926	-	227,256	-
(ii) 1927-1929	-	121,526	-
2. By British Government - 1919-1926	25,000	-	-
3. By Companies -			
(a) Sundry small companies 1923-1926	-	9,062(x)	100,000
(b) 1946-1958 (estimate)	-	-	30,000
(c) Oil Search Limited and Oriomo Oil Limited	-	-	180,000
(d) Papuan Apinaipi Petroleum Co. Ltd.	-	48,338(y)	728,665
(e) Papuan Oil Development Co. Ltd.	-	-	411,000
(f) Island Exploration Co. Pty. Ltd.	-	-	10,095,782
(g) Australasian Petroleum Co. Pty. Ltd.	-	200,000(y)	19,197,149
(h) Enterprise of New Guinea Gold and Petroleum Development N.L.	-	-	137,744
Total Expenditure	25,000	747,716	30,880,340
		TOTAL	£31,653,056

(x) Subsidy to New Guinea Oil Co. Ltd.

(y) Subsidy, including subsidy under the Petroleum Search Subsidy Act 1957-1958.

GEOLOGY.

In Papua and New Guinea, unmetamorphosed sedimentary rocks ranging in age from Permian to Recent are known.

Permian.

Permian sediments (Glaessner, Llewellyn, & Stanley, 1950; Rickwood, 1955) are known only in the Western Highlands, where calcareous arkose and marine limestone, with a maximum total exposed thickness of 800 feet, unconformably overlie granite and metamorphic rocks. No strata referable to the Permian have been met in drilling.

Mesozoic.

The New Guinea basin - of Jurassic to Cretaceous age - is part of the Australo-Pacific geosyncline (Schuppli, 1946), which developed between the opposed stable areas of the Australian and Melanesian continents. Outcrops of Mesozoic strata occur mainly in the central mountain ranges, to the west of the Aure Trough. Small outcrops occur in the Port Moresby district and in the Owen Stanley Range.

Much of the outcrop area of Mesozoic rocks has been examined in reconnaissance surveys by geologists of Australasian Petroleum Co. Pty Ltd and Island Exploration Co. Pty Ltd. Osborne (1945), Carey (1945), and Glaessner (1945) have reported on earlier work, and Rickwood (1955) and Osborne (1956) on later.

"The Jurassic sequence of New Guinea is well known palaeontologically although Jurassic rocks have only rarely been seen in situ" (Glaessner, 1943). Jurassic strata of New Guinea, so far as is known, consist of shale with hard siliceous fossiliferous nodules and some sandy limestone. The oldest Mesozoic fossils from New Guinea are Upper Lias - Goeloceras moermanni Kruizinga - which were found at Etna Bay (Western New Guinea).

A faunal gap occurs in the Upper Oxfordian-Kimmeridgian stages - apparently corresponding with a similar gap in the classical section of the Spiti shales of the Himalayas (Uhlig, 1910). Osborne (1945) attributes this gap to faulting, but also mentions a conglomerate at the base of the upper beds - indicating the possibility of an erosion interval. A thickness of 4,000 feet of shale and sandstone (the Kuabgen Group) was mapped in the headwaters of the Fly River. The age of the lowest beds of this group is probably Callovian. In the Chimbu area (Noakes, 1939), granite underlies the Upper Jurassic sediments in places, but elsewhere in the Western Highlands the Upper Jurassic rests on Permian sediments (Rickwood, 1955). The absence of Mesozoic strata in the coastal ranges of Northern New Guinea and in the foothills of Papua, wherever the base of the Tertiary is exposed, indicates that the Mesozoic basin was relatively narrow.

A hiatus apparently separates the Jurassic from the Cretaceous strata, although so far as is known there is no angular unconformity. The Cretaceous strata, of Aptian to Cenomanian age, consist dominantly of sandstone in the lower part and mudstone in the upper part. The upper Cretaceous beds are upwards of 7,000 feet thick.

Where Mesozoic sediments crop out they are gently to moderately folded.

Between the Upper Cretaceous and the Tertiary is another large faunal gap which, according to Osborne (1945), may be due to deep submergence of the area.

Tertiary.

The Northern New Guinea Basin extends from the Huon Peninsula to the Netherlands New Guinea border and beyond, and from the Sepik River valley to north of the coast. Shelf-type limestone along the coast and sedimentary structures in the geosynclinal sediments farther inland indicate that the sediments are derived from the north and that the hinge between the shelf and trough in the Tertiary is close to the present coast.

Miocene marine shale, greywacke, and thick limestone, of an aggregate thickness of 12,000 feet, rest unconformably on Eocene limestone and chert, on Mesozoic sediments, or on the schist and granite of the basement. More or less unconformably overlying the Miocene are Pliocene marine and freshwater shale, sandstone, and conglomerate, with some minor lignites, ranging in total thickness from 7,000 to 15,000 feet. The thickness is variable because folding started in later Miocene time, the Miocene strata were terminated by erosion, and more or less detached basins of Pliocene deposition were formed. The coastal ranges were probably rising during Pliocene time, but the main movement occurred at the end of the Pliocene, and gave rise to three main structural units - the narrow coastal belt, the geanticlinal coastal ranges, and the Sepik-Markham fault trough or synclinal trough. The coastal lowlands are essentially only the flank of the geanticline except in the western part, where they widen out in the Bewani Geosyncline.

The geanticlinal coastal ranges comprise the Finisterre and Saruwaged Ranges north-west of Lae, the Adelbert Range west of Madang, and the Torricelli and Bewani Mountains west of the mouths of the Sepik and Ramu Rivers. Miocene strata form the central parts of the eastern geanticlines, with Pliocene strata, folded and faulted, on the flanks. The Torricelli-Bewani uplift exposed the pre-Tertiary metamorphic and igneous rocks in the core of the ranges, with Miocene and Pliocene strata on the flanks.

The great Sepik-Ramu-Markham Trough, which extends into Netherlands New Guinea as the valleys of the Idenberg and Rouffaer Rivers, is either a fault trough or a synclinal trough. Tertiary sediments on the south side are very much thinner and folding is more gentle than on the northern side.

Papua Basin. The Tertiary basin in Papua is an asymmetric basin of deposition (ideo-geosyncline) with gently-folded strata on the south-western side, where the basin is hinged on the Australian Shield, and very thick steeply-folded strata against the Central Ranges of New Guinea. In the Aure Trough there are at least 15,000 feet of Miocene marine sediments - greywacke, tuffaceous sandstone, mudstone, and shale. To the south-east, Miocene limestone and mudstone rest unconformably on Eocene limestone, siliceous shale, and chert, on Mesozoic strata, or on metamorphic and igneous rocks of the basement complex. The Pliocene strata include marine and terrestrial sediments - sandstone, siltstone, conglomerate, agglomerate, and tuff. In places middle Miocene lies disconformably on lower, and Pliocene on Miocene. The Basin is marked by the large amount of volcanic material in the Upper Tertiary sediments.

Oil and gas indications.

Many seepages of oil and gas are known to occur in the Vailala-Purari area and in the western foothills area of Mesozoic outcrop. The seepages appear to come from the Cretaceous, lower Miocene and middle Miocene, although in many places they are close to faults along which the oil and gas may have moved. Oil shows were obtained at Upoia, Hohoro, and Barikewa, and a gas show in Omati No. 1. High-pressure gas was found in Kuru No. 1 (which blew out), No. 2, and No. 3. Gas was also encountered in Barikewa No. 1. A flow of gas and oil was obtained in Puri No. 1.

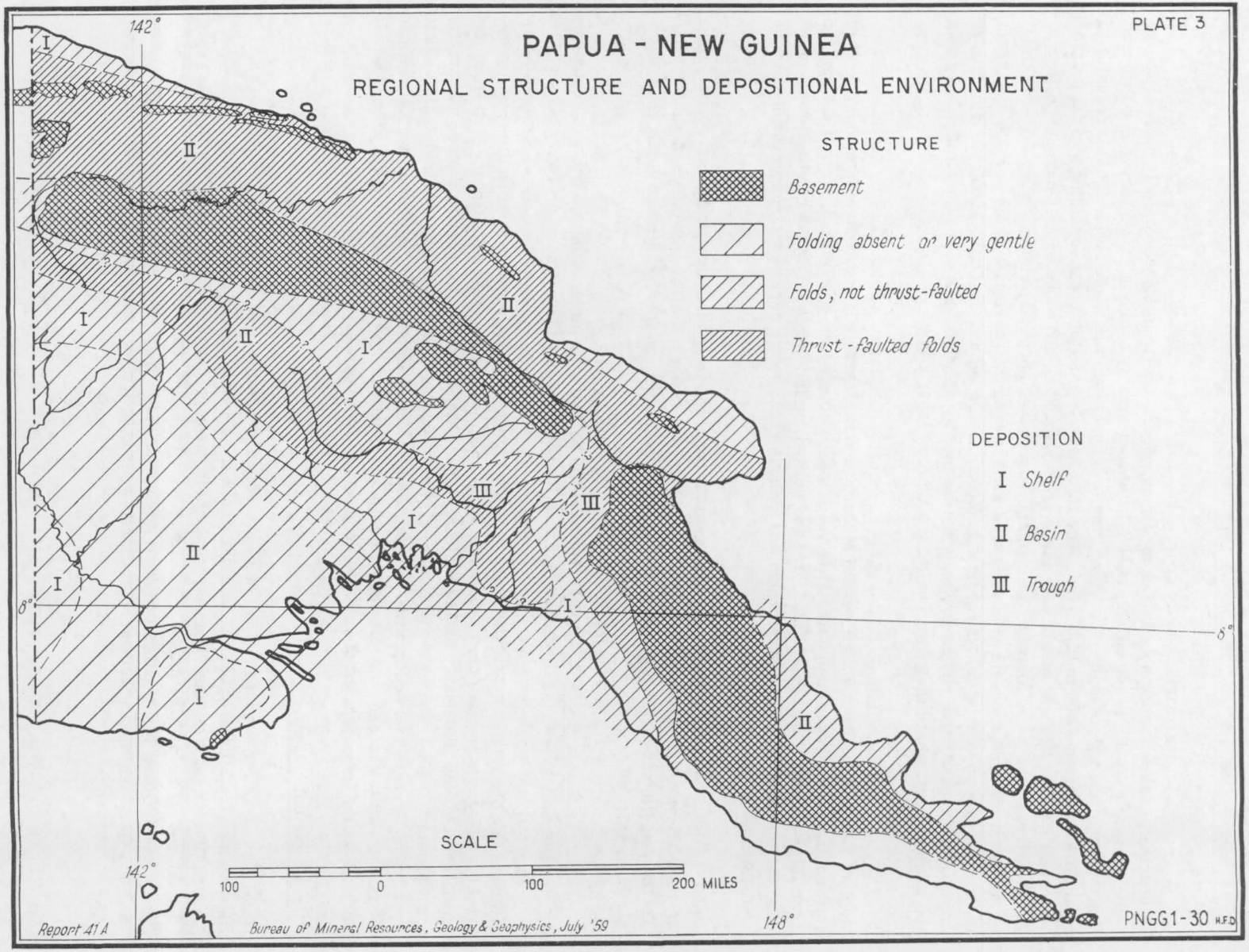


PLATE 3
PAPUA - NEW GUINEA
REGIONAL STRUCTURE AND DEPOSITIONAL ENVIRONMENT
STRUCTURE
Basement
Folding absent or very gentle
Folds, not thrust-faulted
Thrust-faulted folds
DEPOSITION
I Shelf
II Basin
III Trough
142°
148°
8°
SCALE
100 0 100 200 MILES
Report 41 A
Bureau of Mineral Resources, Geology & Geophysics, July '59
PNGG1-30 H.F.D.

PRESENT STATUS OF EXPLORATION.

At 30th June, 1959, the following Companies held petroleum tenements in Papua and New Guinea :-

Australasian Petroleum Co. Pty Ltd; Island Exploration Co. Pty Ltd; The Papuan Apinaipi Petroleum Co. Ltd; Enterprise of New Guinea Gold and Petroleum Development N.L.; and Camelot Nominees Pty Ltd. For details see Appendix 4 and Plate 11.

Nearly all the permit areas, and much of the remaining terrain underlain by sedimentary rocks, have been geologically surveyed, at least in reconnaissance. Geophysical surveys have been carried out over a large area of western Papua. Widely separated localities have been drilled.

The stratigraphical succession and its regional variations and the regional structure are moderately well established, although, of course, much remains to be done in filling in the details on which successful drilling often depends.

On the accompanying plan (Plate 3) the regional structure, tectonic and depositional, is indicated diagrammatically. Geologically, the order of importance of the various zones for oil accumulation is as follows :

(1) (Most important). The zones of moderate folding without dominant thrust faulting, in the shelf area of deposition;

(2) The zones of moderate folding within the basins of deposition;

(3) The basins with mainly depositional folding;

(4) Shelf areas marginal to the basins;

(5) The strongly folded and thrust-faulted basin sediments;

(6) The strongly folded and thrust-faulted sediments deposited in a trough.

Experience in New Guinea emphasizes the importance of careful and detailed geological surveys of structures, and of seismic surveys to map subsurface structure, even those that are well exposed at the surface. In areas where on the one hand complicated tectonics, diapiric structures, thrust faulting, and rapid lateral variations in thickness and lithology of formations are common, and, on the other, drilling costs are extremely high, it is doubly desirable to obtain all possible information on subsurface structure and its relation to surface exposure before siting test wells. Where a good petroleum show is encountered, absence of seismic survey can effectively prevent reasoned location of a second bore. Admittedly, in some areas, difficulties of terrain make seismic survey impracticable.

QUEENSLAND

(See Plate 4)

HISTORY OF INVESTIGATIONS.

The greater part of the following information on drilling activities in Queensland has been obtained from Queensland Geological Survey Publication No. 247 (Cameron, 1915), the Annual Reports of the Under Secretary for Mines, Queensland, from 1914 to 1955, and the Queensland Government Mining Journals from 1914 to 1958, especially Ball (1927 and 1934). Information from Department files and from reports supplied by some of the companies, including Oil Search Ltd, Roma Blocks Ltd, and Shell (Queensland) Development Pty Ltd, has also been used.

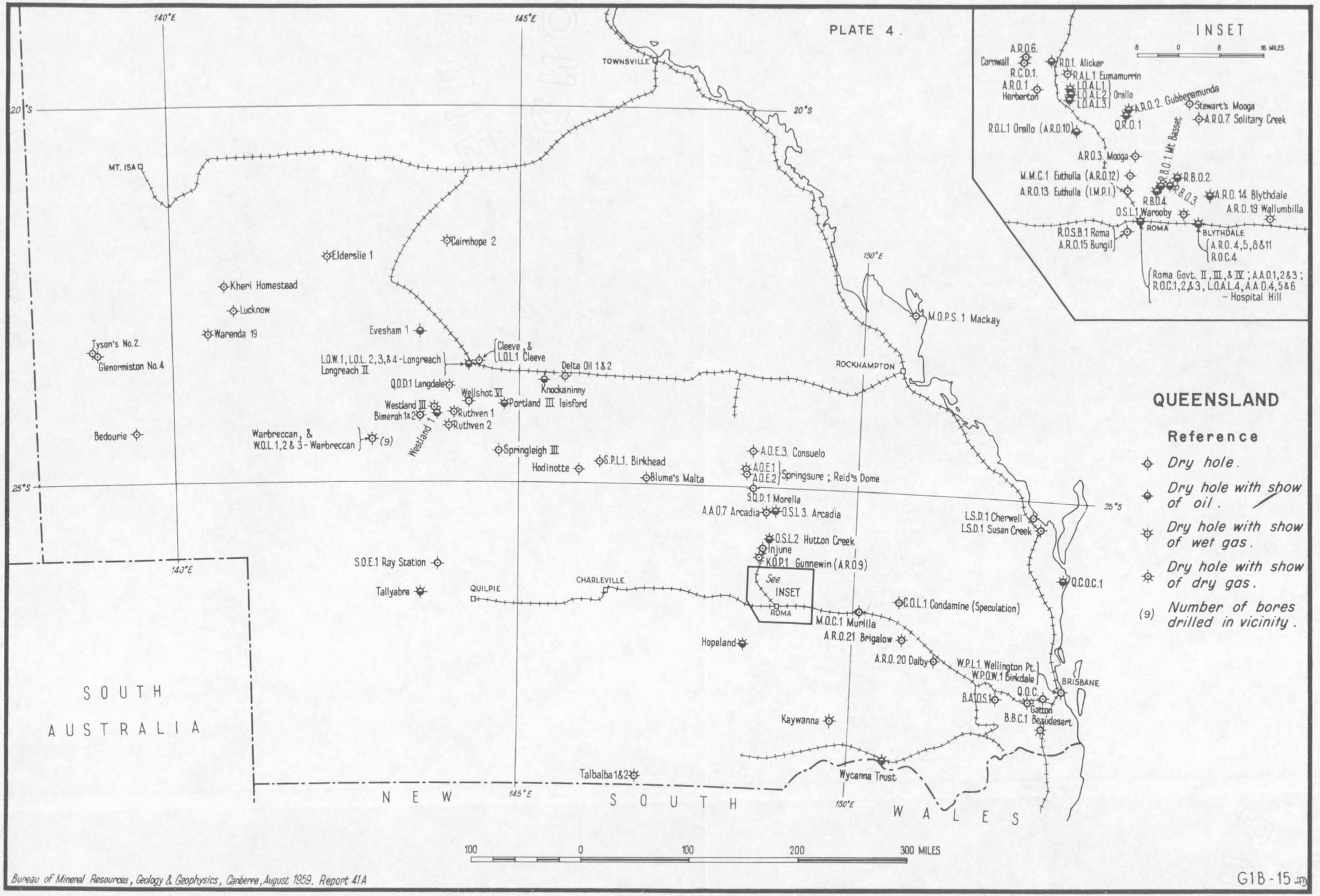
Roma.

In 1900 the Roma town water bore No. 2 was being deepened to increase its artesian flow, when, at 3,683 feet (about 2,000 feet below the principal artesian aquifer), a flow of natural gas measured at 44,600 cubic feet per day was struck. This gas blew off freely for four years. In 1904 the flow of gas was measured at 72,000 cubic feet per day. In 1906 a gasometer was erected to collect the gas from the bore, the town was reticulated, and the streets were lit for ten days. The gas flow then suddenly diminished and the lighting scheme had to be abandoned. In 1907 the Roma Mineral Oil Co., with Government assistance, drilled a new bore known as Roma No. 3, 250 feet south of No. 2. In 1908 gas was struck in this bore at 3,702 feet and caught fire. The fire was extinguished with great difficulty after it had been burning for six weeks. The bore was abandoned at a depth of 3,713 feet with three sets of tools in the hole.

At this stage the Queensland Government sought the advice of petroleum technologists in Great Britain and the United States, and after considering their advice decided to drill further bores.

A Californian Standard percussion drilling rig was brought from the United States, and in January 1916 a bore known as Roma No. 4 was begun for the Queensland Government, on a site chosen by W.E. Cameron of the Queensland Geological Survey, 400 feet west-south-west of Roma No. 3. The chief purpose of the bore was to test for oil below the gas sands. Many mechanical difficulties were experienced in drilling this hole and progress was slow. The total depth of 3,702 feet was reached in 1919, and the hole was finally abandoned in 1922. Gas was struck below 3,610 feet. A test made in an oil absorportion apparatus in 1920 gave a yield of 1.22 pints of gasoline per thousand cubic feet of gas.

In 1923 new petroleum legislation, providing for the issue of permits to prospect up to 10,000 acres, and leases of a like amount, was introduced, but a rectangular area of 3,600 square miles around the Roma bores was withheld as a Government Oil Reservation. A licence was, however, granted to Lander Oilfields of Australia, near the centre of the Reservation at Orallo. Between 1923 and 1929 this company drilled three holes near Orallo to depths of 2,644, 2,839, and 2,672 feet, and one near Roma to a depth of 4,158 feet. Small oil and gas shows were reported from the first three, and gas from the fourth yielded on test about 2.5 pints of gasoline per thousand cubic feet of gas.



Bureau of Mineral Resources, Geology & Geophysics, Canberra, August 1959. Report 41A

TABLE 2.

LIST OF WELLS DRILLED FOR OIL EXPLORATION, AND OF SOME WATER BORES SHOWING OIL AND/OR GAS IN QUEENSLAND.

Well	Location	Date Spudded in	Date Completed	Gas or Oil	Company etc.	Structural Information	Basement, Depth and nature	Total Depth	Miscellaneous	Reference
A.A.O. 1	Roma	1952	1952		Assoc. Aust. Oil Fields	On structural high defined by		3892'		Records 1957/7 App. 2, p. 3
2	"	1952	1953	Traces of oil	" " " N.L.	geol. surveys		3616'		" "
3	"	1953	1953	" "	" " "			3644'		" "
							3891' Metamorphics	3891'		Q.G.M.J. June 1954, 457
4	Hospital Hill (Roma)	1954	1954	Gas 3694-3714	" " "	Hospital Hill Dome	Basal Cong	4079'		" Feb. 1955, 105
5	" "	1954	1955	Traces of oil and gas	" " "		4070'			
6	" "	1955	1955		" " "	" "	4273'	4285'		" July 1955, 496
7	Arcadia "	1957	1957	Minor gas 2919-2951	" " "	Arcadia Structures		3280'		" July 1957, 487
8	Karumba, Gulf of Carpentaria	1958	1958		" " "	Gravity high	2361' Quartzite	2364'		A.O.G.J. Feb. 1958, 18
A.O.E. 1	Reid's Dome (Springsure)	1954	1955	Gas and traces of oil 3474'	Aust. Oil Exploration	Springsure Anticline	9060' Metamorphics	9060'	The Reid Dome was	Bull. A.A.P.G. Vol. 40 (10)
2	" "	1955	1955		" "	4m. N. of crest of Reid Dome			mapped in 1930 by	1956, 2336
								4060'	Qld Geol. Surv.	2337
3	Consuelo	1955	1955		" "	Consuelo Anticline		4437'	(Mr. J.H. Reid)	2338
A.O.G. Scout 1	Talbalba	1957	1957		Aust. Oil & Gas Corporation Ltd			774'		A.O.G.J. Jan. 1958, 13
Scout 2	"	1957			" "			1000'		" "
A.R.O. 1	Herberton, 31m. N.W. of Roma	1928	1929	Minor gas shows 450', 2020', 2310.	Aust. Roma Oil Ltd		2414'	2424'		Q.G.M.J. Nov. 1929, 460
2	Gubberamunda	1929	1929	Minor gas and oil shows between 2080' and 2734'	" "		2773'	2831'		" "
3	Mooga	1929	1929	Minor gas shows 2080' and 2815' to basement	" "		3132' Granite	3210'		" Aug. 1929, 336
4	Blythdale	1929	1929	Gas at 3840' oil sand 3844-3850'	" "		3866' Granite	3904'		" Oct. 1952, 853
5	"	1930	1930	Heavy crude oil and water at 3830'.	" "			3848'6"		" Oct. 1952, 853
6	Cornwall	1927	1930		" "			2306'		
7	Solitary Creek	1929	1932	Traces of oil and gas between 1400' and 3581'.	" "		3586' Metamorphics	3609'	Equals Well RMO. 1 Solitary Creek	Annual Rep. Q.1931, 153
8	Blythdale	1930	1930	3857' oil sand	" "		3988' Granite	3988'		" 1930, 135
9	Gunnewin	1929		4123' - 4129'	" "				Equals K.O.P. 1 Gunnewin	
10	Equals R.O.C. 1 Oralla									
11	Blythdale	1929	1931	Gas between 4118' - 4123' oil sand 385' and 3909'.	" "		4135' Granite	4162'	This well equals E.R.O. 1	
12	Euthulla								Equals M.M.C. 1	
13	"	1928	1931	Traces oil 980', 1060' 1365' and 2,000'.	" "			2705'	Equals I.M.P.I. Interstate Mines and Petroleum 1	Annual Rep. Q. 1931, 153
14	Blythdale	1931	1931	Gas and light oil 3480 - 3530'.	" "		3533' Granite	3544'		Q.G.M.J. Oct. 1952, 853.
15	Bungil, 4m. S.W. of Roma	1929	1931	Small gas shows 2430' traces oil and gas 3699' - 3732'.	" "		4090' Slates	4110'	Equals R.O.S.B. 1	Ann. Rep. Q. 1931, 153.
16	R.O.C. 1 Hospital Hill									
17	Equals R.O.C. 3 Roma									

Well	Location	Date Spudded in	Date Completed	Gas or Oil	Company etc.	Structural Information	Basement, Depth and nature	Total Depth	Miscellaneous	Reference
A.R.O. 19	Wallumbilla	1932	1933	Gas 4842' Traces oil.	Aust. Roma Oil Ltd			4968'		Q.G.M.J.Oct. 1952, 853
20	Dalby	1934	1935		R.O. (Dalby) Ltd			3543'	Used for town water supply.	
21	Brigalow	1936	1937	Gas showings 348' to 554'	Aust. Roma Oil Ltd			611'		
B.A.O.S. 1	S.W. of Gatton	1931	1931	Traces of heavy oil 930' and 945'	Br. Aust. Oil Syndicate	Tent Hill Dome		1082'		" "
B.B.C. 1	Beaudesert	1929	1931	Methane at 1420'	Beaudesert Boring Co.			1600'		Annual Rep. Q.1931, 153
Bimberah 1	Stonehenge, 65m.	-	1925	Gas	Gov. Water Bore Hole			4860'		Q.G.M.J.Oct. 1952, 854
2	S.W. of Longreach	-	1928	Gas	" "			4310'		
Blume's Malta	35 m. East of Tambo	1924	1926	Traces of yellow oil at 900'.	Malta Oil Co.			1385'	Equals M.O.C.1 Nive River	Q.G.M.J.Oct. 1952, 853
Cairnhope 2	60 m. N.E. of Winton	-	1925	Oil in shale at 2200'	Gov. Water Bore Hole			2732'		" "
Cleve	10 m. E. of Longreach	-	1925	Traces of oil at 1500'	" "			3000'		" " 854
C.O.L. 1	Speculation, 24 m. N. of Chinchilla	1948	?	Small oil and gas showings	Condamine Oil Co. Ltd			2333'	(Standing)	
Delta Oil 1	14 m. E. of Barcaldine	1929	1929	Traces oil 639' - 675'	Delta Oil N.L.			675'		" " 853
2	" "	1930	1930		" "			420'		
Elderslie 1	60 m. W. of Winton	-	1928	Gas at 3380'	Gov. Water Bore Hole			3500'		" " 854
Evesham 1	50 m. S.E. of Winton	-	1928	Gas at 4100'	" "			4150'		" "
F.B.H. 1	Wyaaba, Gulf of Carpentaria	1957	1957		Ass. Aust. Oilfields N.L. Frome Broken Hill Co. Pty Ltd Ass. Freney Oil Fields N.L.		2758'	2822'		A.O.G.J. Nov. 1957, 25
Glenormiston		-	1916	Traces of oil	Station Bore			903'		
Hodinotte's Oil Bore	20 m. W. of Tambo	1922	1922					1200'		
Hopeland	47 m. S.W. of Roma	-	1928	Gas 3876', 4255' Oil and wax reported	Gov. Water Bore Hole		4470' Metamorphics	4492'		Q.G.M.J. Aug. 1929, 336
Injune	50 m. N. of Roma	1953	1953	Grease 275' - 279'	Town Water Bore			1274'		
Inverleigh West	40 m. S.E. of Burketown	-	1930	Traces dark oil at 2000'	Gov. Water Bore Hole			2240'		Q.G.M.J.Oct. 1952, 854
Kaywanna Trust Bore	48 m. N.W. of Goondiwindi (19 m. N. Bungunya Box Yard Creek).	1927		3347' greasy sludge 3345' gas.	Kaywanna Trust Bore Co. Ltd			4341'		Q.G.M.J.Aug. 1927, 304
Kheri Homestead	62 m. N.E. of Boulia	-	1909	Traces of gas	Station Bore			1413'		
Knockaninny	7 miles S. of Barcaldine	-	1929	Oil sludge at 2176'	Gov. Water Bore Hole			2180'		
K.O.P. 1	Gunewin	1928	1930	Gas between 1140' and 1772'	Kayenta Oil Pty Ltd		2060' Metamorphics	2104'	Equals A.R.O. 9 Gunnewin	Q.G.M.J.Jan. 1929, 10

Well	Location	Date Spudded in	Date Completed	Gas or Oil	Company etc.	Structural Information	Basement, Depth and nature	Total Depth	Miscellaneous	Reference
L.O.A.L. 1	Orallo, 28 m. N.W. of Roma	1923	1925	Small oil and gas showing 1800' to bottom	Lander Oilfields (Australia) Ltd			2644'		Q.G.M.J.Nov. 1929, 460
2	Orallo	1924	1925	Gas and oil showing 760' gas at 2180' to 2208'	" "			2839'		
3	Orallo	1926	1926	Gas and oil showing below 1900'	" "		2660' Granite	2672'		" "
4	Hospital Hill (Roma)	1929	1929	Gas at 3691' also traces of oil at 2800', 2890' & 3500'.	" "		3838' Metamorphic rock	4158'		Q.G.M.J.Oct. 1952, 853
L.O.L. 1	(Cleeve 1) Cleeve Station	1954	1955		Longreach Oil Ltd		3056' Granite	3068'		Q.G.M.J.Feb. 1955, 105
2	Longreach	1955	1955		" "		3219' Granite	3224'		A.O.G.J.Jan. 1956, 11 Q.G.M.J.Mar. 1955, 185
3	"	1955	1955		" "		3405' Granite	3490'		A.O.G.J.Jan. 1956, 11 Q.G.M.J.Apr. 1955, 265
4	"	1955	1955	Oil impregnated sandstone 3125' - 3225', 3245' - 3249'.	" "		3275' Granite	3277'		O.A.G.J.Jan. 1956, 11 Q.G.M.J.May. 1955, 332
5	"	1958			" "					A.O.G.J.Jan. 1956, 11
Longreach 2			1925	Dark wax at 3230' gas at 2500', 3298'.	Gov. Water Bore Hole			3298'		
L.O.W. 1	Longreach	1929	1931	Gas 2336', 3229' wax 2910', oil 3227' and 2486'.	Longreach Oil Wells Ltd.			1367'		Q.G.M.J.Oct. 1952, 854
L.S.D. 1	Cherwell Creek, 25 m. N.W. of Maryborough	1954	1955		Lucky Stike Drilling Co.	Cherwell Ck. Anticline Maryborough Basin	3254' Granite	3351'		Q.G.M.J.Oct. 1952, 853
L.S.D. 2	Susan Creek, 15 m. N.N.E. of Maryborough	1955	1955		" "			9773'	Equals O.D.E. 1. Deepest well in Qld.	Q.G.M.J.May, 1955, 309 " Dec. 1954, 968
Lucknow	64 m. E.N.E. of Boulia		1914	Traces of oil	Station Bore			8069' 1165'		A.O.G.J. Jan. 1956, 11
M.M.C. 1	Euthulla	1928	1931	Trace of oil at 1270', gas at 1988	Midcontinental Mines to 2005'. A.R.O. to 3020'.			3020'	Equals A.R.O. 12 Euthulla	
M.O.C. 1	Boyanda, 4m. W. of Miles	1935	1935	Gas 2130' and 2510', traces of oil 3630' to 4742'.	Murilla Oil Co.			4798'		Q.G.M.J.Oct. 1952, 853
M.O.P.S. 1	Cape Hillsborough	1956	1957		Mackay Oil Prospecting Syndicate.			2115'		A.O.G.J.May, 1957, 32
O.S.L. 1	Warooby, 7 m. E of Roma	1934	1934	Gas from 3629' - 3645'.	Oil Search Ltd.	Structure based on scout drilling	3764' Granite	3794'		Q.G.M.J.Oct. 1952, 854
O.S.L. 2	Hutton Ck., 60 m. N. of Roma	1935	1938	Small gas show at 2325'.	" "	Well water on the crest of Hutton Dome		4688'		Bull.A.A.P.G. 40(10) 1956, 233.
O.S.L. 3 Arcadia	80 m. N. of Roma	1936	1939	Gas at 1187', 2670'; and below 2487.	" "	Arcadia Dome, established by geol. survey and scout drilling.		6036'		Q.G.M.J.Oct. 1952, 853 Bull.A.A.P.G. 40(10), 1956, 2334.

Well	Location	Date Spudded in	Date Completed	Gas or Oil	Company etc.	Structural Information	Basement, Depth and nature	Total Depth	Miscellaneous	Reference
Portland 3.	Isisford	1928		Gas, oil reported				4163'		
Q.C.O.C. 1	Tewantin, N. of Brisbane	1924	1924	Small gas and oil shows	Queensland Coastal Oil Concessions (North)			835'		
Q.O.C. Wolston	10 m. S.W. of Brisbane	1920	1929	Gas and traces of oil	Queensland Oil Corporation Ltd			1715'		Q.G.M.J.Oct. 1952, 853
Q.O.D. 1	Langdale, 30 m. S.W. of Longreach	1927	1927	Gas 1928'	Queensland Oil Development Co. Ltd			2520'		Q.G.M.J.Oct. 1952, 854
Q.R.O. 1	Gubberamunda, 20 m. N. of Roma	1928	1930	Traces of oil at 910' and gas below.	Queensland Roma Oil Co.		2814' Metamorphics	2841'		Q.G.M.J.Oct. 1952, 853
R.A.L. 1	Eumamurrin	1929	1929	Gas showing at 423'	Roma Alicker Ltd.			912'		
R.B.O. 1	Mt. Basset, 7 m. N.E. of Roma	1929	1931	Oil from bailing 3445-3447, 3503-3510; Gas at 2452', 3000; 3375'.	Roma Blocks Oil Co. N.L.		3515' Granite	3561'		Q.G.M.J.Oct. 1952, 853
2	" "	1938	1939	Gas and oil traces below 3798'.	" "		4010' Granite	4050'		
3	1 m. S.E. of R.B.O. 1	1939	1940	Gas and traces of oil at 3586'-3629'.	" "	On structure determined by scout drilling.	3625' Granite	3629'		Q.G.M.J.Oct. 1952, 853
4	(½ m. S.R.B.O. 1).	1940	1941	Oil sand 3497' and 3566'	" "		3611' Granite	3660'		Q.G.M.J.Oct. 1952, 853
R.C.D. 1	Cornwall, 37 m. N.W. of Roma	1927	1929		Roma Cornwall Dome N.L.	Dome			Drilled only 300' deepened by A.R.O. See A.R.O.6 Cornwall	Q.G.M.J.Nov. 1929, 461
R.D. 1	Alicker, 25 m. N.W. of Roma	1929	1929	Oil shows between 1325'-1565'.	Rome Dome Ltd	Dome	2235'6"	2255'		Q.G.M.J.Nov. 1929, 460
R.M.O. 1	Solitary Creek, 20 m. N.E. of Roma	1929	-		Commenced by Roma Mooga Oilfields N.L. Completed by Aust. Roma Oil Ltd				Equals A.R.O. 7 Solitary Creek.	Annual Rep. Q. 1932, 162
R.O.C. 1	Hospital Hill, Roma	1927	1929	Major show gas at 3703'. Minor shows 1715'-1790'. Oil sand 3703'-3727' and 3821' to basement.	Roma Oil Corporation Ltd	Dome	3859' Metamorphics	3875'	1.3 pints gasoline per 1000' c.ft.gas from 3703'. Equals A.R.O. 16.	Q.G.M.J.Oct. 1952, 854
2	" "	1928	1929	Gas between 2450'-3920' Oil sands 3474' 3645', 3844', 3910'	" "	Dome	3955' Slates	4005'		Q.G.M.J.Apr. 1929, 160
3	" "	1929	1930	Wet gas from 3634' 3696', 3709'. Oil sand 3634' - 3722'.	" "	Dome		3732'	1772 gals. light oil in 3 months. Equals A.R.O. 17.	Q.G.M.J.Oct. 1952, 854
4	Blythdale	1930	1930	3832' oil sand. Gas shows between 3100' and 3830'.	" "	Dome		3839'		Annual Rep.Q. 1930, 135
R.O.L. 1	Orallo, 21 m. N.W. of Roma	1929	1930	Gas and oil showing 2800' - 2835'.			2835' Metamorphics	2863'	Equals A.R.O. 10 Orallo	Q.G.M.J.Nov. 1929, 461 Bull.A.A.P.G., Dec.1951, 2510.

Well	Location	Date Spudded in	Date Completed	Gas or Oil	Company etc.	Structural Information	Basement, depth and nature	Total Depth	Miscellaneous	Reference
Roma Govt. II	Hospital Hill Roma	1899	1900	Gas at 3683' - 3710	Govt. Water Bore Hole	Dome		3710'	Gas flow suddenly ceased in 1960.	Q.G.M.J.Oct. 1952, 853
Roma Govt. III	" " "	1907	1910	Wet gas at 3702'	" "	Dome		3713'	Equals Qld. Gov. 3 Hospital Hill.	Q.G.M.J.Oct. 1952, 854
Roma Govt. IV	" " "	1915	1922	Gas between 1760' and 3702'	" "	Dome		3702'		Q.G.M.J.Oct. 1952, 854
R.O.S.B. 1	4 m. S.W. of Roma	1929	-		Roma Oil South Blocks Ltd				Equals A.R.O. 15 Bungil	Q.G.M.J.Nov. 1929, 463
Ruthven 1	45 m. S.S.W. of Longreach	1918	-	Gas, wax at 4100'	Govt. Water Bore Hole			4105'		Q.G.M.J.Oct. 1952, 854
Ruthven 2	8 m. N.W. of Ruthven 1	-	-	Gas at 2250', wax at 4049'.	" "			4515'		Q.G.M.J.Oct. 1952, 854
S.O.E. 1	Ray, 65 m. N.W. of Quilpie	1957	1957	Small gas show at 760'	L.H. Smart Oil Pty Exploration Ltd			820'	Stratigraphic hole	A.O.G.J.Dec. 1957, 17
S.O.E. 2	Cannaway Downs				" "			1350'	Drilling hole	Q.G.M.J.June 1957, 421
S.P.L. 1	Birkhead, 20 m. of N. Tambo	1957	1957		South Pacific Pty Ltd			5186'		Q.G.M.J.June 1957, 421
Springleigh III	50 m. W.S.W. of Blackall	1918	-	Wax at 2500', 5450', 6700'.	Stewarts Mooga N.L.			7009'		Q.G.M.J.Oct. 1952, 854
Stewarts Mooga N.L.	Mooga, 23 m. N.N.E. of Roma	1928	1930		" "		3533' Slate, quartzite	3567'		Q.G.M.J.Nov. 1929, 460
S.Q.D. 1	Morella	1950	1951		Shell Qld Dev. Co.	Warrinilla structure Morella Anticline	4365' Ingneous	4634'	Preceded by scout drilling	Bull.A.A.P.G.Vol.40(10), 1956, 2334.
Talbalba	120 m. S.E. Eulo	1933	-	Oil at 616'?	Govt. Water Bore Hole			1500'		(Q.G.M.J.Oct. 1952, 854 (A.O.G.J.Dec. 1952, 15
Tallyabra	45 m. W. of Quilpie	1925	-	Oil at 1489' 2034'-2051' Gas at 2538'	" "			2580'		Q.G.M.J.Oct. 1952, 854
Tyson's No. 2	18 m. S. of Glenormiston	1910	1910	Kerosene smell	Station Bore			700'		
Warbreccan	110 m. S.W. of Longreach	1898	-	Gas	Govt. Water Bore Hole			4330'		Q.G.M.J.Oct. 1952, 854
Warenda 19	47 m. E.S.E. of Boulia	-	1893	Gas	Station Bore			780'		I.W.S.Record, & Q.G.M.J. Oct. 1952.
Wellshot VI	35 m. S. of Longreach	1928	-	Gas at 800'	Govt. Water Bore Hole			4008'		Q.G.M.J.Oct. 1952, 854
Westland 1		1927	-	Gas	" "			2890'		
Westland III	45 m. S.W. of Longreach	1927	-	Gas, dark oil at 2035'	" "			2080'		Q.G.M.J.Oct. 1952, 854
W.O.L. 1	Warbreccan, S.W. of Longreach	1955	1955		Westland Oil Co. Ltd		5432' Granite	5433'		A.O.G.J.Jan. 1956, 11 Q.G.M.J.Mar. 1955, 187
W.O.L. 2	Warbreccan	1955	1955		" "			5224'		A.O.G.J.Jan. 1956, 11 Q.G.M.J.Apr. 1955, 266
W.O.L. 3	Warbreccan	1955	1955		" "			6054		Q.G.M.J.Spt. 1955, 682
W.P.L. 1	Wellington Point	1955	1955		Winnellis Pty Ltd		3699' Metamorphics	3751'		(A.O.G.J.Sept. 1955, 25
W.P.O.W. 1	Birkdale, 12 m. E. of Brisbane	1930	1934	Traces oil, 1450', 2230', 1565'.	Wellington Point Oil Wells Ltd		3500' Schists Metamorphics	3950'		(Q.G.M.J.Sept.1955, 682 Q.G.M.J.Oct. 1952, 854
Wycanna Trust 1	W. of Goondiwindi		1956	Gas and oil show at 2460'.	Wycanna Trust			4105'		
Z.C.L. 1	Weipa, Cape York Peninsula	1957	1957		Zinc Corporation Ltd		2958'	3243'	Completed as a water well	Q.G.M.J.Spt. 1957, 664.

In September 1927, Roma Oil Corporation Ltd No. 1 bore, drilled with a rotary plant, struck a flow of 600,000 cubic feet of gas per day at 3,703 feet. In October 1928, a Braun gas absorption plant was installed to recover the gasoline content of the gas, which ranged from 1.25 to 2.0 pints per thousand cubic feet of gas. The bore was deepened in 1929 to 3,875 feet and light oil was found between 3,703 feet and 3,727 feet. The well is said to have produced 3,100 gallons of oil of dark to light colour in the first fifteen months. The gas yield at this time was estimated at 1,277,000 cubic feet per day. The gas was accompanied by some water. The absorption plant continued in operation for several years. The total amount of gasoline thus extracted until 1932, when the supply of gas failed, was about 30,000 gallons.

Roma Oil Corporation Ltd No. 2 bore was begun in March 1928, on a site west of earlier activities on Hospital Hill. Basement was encountered at 3,955 feet, without any notable discovery of gas or oil.

Builders Ltd was registered in December 1927, to correlate the geological information from the various deep bores and to carry out subsurface prospecting by scout drilling and pit sinking near Roma. Between June 1928 and July 1929 this company put down 158 scout bores with an average depth of 240 feet.

Roma Oil Corporation Ltd No. 3 bore was drilled on the eastern side of Hospital Hill and yielded considerable water and only moderate amounts of gas. It was abandoned at 3,732 feet.

Between 1927 and 1932 several deep bores were drilled in the surrounding district, but the only bores with noteworthy indications of oil or gas were those at Blythdale and the one at Mount Bassett (Roma Blocks Oil Co. No. 1 on Block 16), where the gas will still burn at the casing head. The latter bore was drilled to 3,447 feet and gave a yield of ten gallons of light oil per day; it was later carried to granite bedrock at 3,561 feet. A bailing test in 1937 confirmed the original yield. Roma Blocks Oil Co. later (1938-1941) drilled three other bores in the Mount Bassett area, in all of which petroliferous gas or oil or both was obtained.

In 1933 the deepest bore in the district, A.R.O. No. 19, was drilled at Wallumbilla to a depth of 4,968 feet without reaching bedrock.

From June 1933 to September 1934, Oil Search Ltd drilled 78 scout bores around Roma. On the data so obtained, a deep test was begun in March 1934 at Warooby Creek, six and a half miles east of Roma. This struck basement at 3,764 feet in August of the same year, and was continued to 3,794 feet. Gas was encountered at two or three horizons; the main flow, from a depth of 3,629 feet to 3,645 feet, was tested and estimated at 650,000 cubic feet per day. The well was subsequently plugged, pending the results of further activities to the north by the same company.

After World War II Roma Blocks Oil Co. N.L. became associated with Kalimna Oil Co. N.L., Australian Oil Development Co. N.L. and Roma North Oil Co. N.L., and continued to collect information on bores previously drilled in the Roma district. In 1948 the company was granted an Authority to Prospect for Petroleum over 10,000 square miles north of Roma. A topographic survey of the area, and gravity, magnetic and seismic surveys conducted by parties from the Bureau of Mineral Resources, were completed, and aerial photographs of the area held by the company were taken by the Royal Australian Air Force.

In 1952 Associated Australian Oilfields N.L. began drilling, and five holes were put down, two on Block 16 and three on Hospital Hill in Roma. Those on Block 16, A.A.O. No. 2 and No. 3, were drilled to 3,616 and 3,644 feet respectively and found traces of oil in thin sands in the lowermost part of the Moolayember Shale. A.A.O. No. 4, in the Showgrounds on Hospital Hill, was drilled to 3,891 feet, where it entered metamorphic rock. A flow of wet gas of more than 870,000 cubic feet per day was tested between 3,694 and 3,714 feet. A.A.O. No. 5, north-east of No. 4, was drilled to 4,079 feet, and A.A.O. No. 6, south-east of No. 4, to 4,285 feet; in these the gas flow was very small.

Arcadia.

After making geological surveys of the district in August and September 1935, Oil Search Ltd put down a scout bore to a depth of 442 feet on Arcadia Dome, 85 miles north of Roma. Traces of oil and gas were met between 195 and 300 feet. At the beginning of 1936 Drillers Ltd, a subsidiary of Oil Search Ltd, began a deep test on this structure. Drilling was suspended in September 1939 when the well was 6,036 feet deep. Gas at 1,187 feet tested at 250,000 cubic feet per day, and other gas horizons were cut below 2,487 feet and at 2,670 feet. The gas from a lower horizon gave a flow test over a period of several months of about 3,000,000 cubic feet per day; however, it contained about 70 per cent carbon dioxide.

In 1957 Associated Australian Oilfields N.L. drilled A.A.O. No. 7 on the Arcadia structure to 3,280 feet. A drill stem test between 2,919 feet and 2,951 feet produced a small quantity of gas.

Drillers Ltd started a test bore on Hutton Creek Dome, 60 miles north of Roma, in October, 1935. The bore entered steeply dipping and sheared sediments at about 4,080 feet and was abandoned at 4,688 feet. Opinion has been divided as to whether the high-dipping beds represent pre-Permian bedrock or a fault zone in the Permian. The evidence seems conclusive in favour of the fault hypothesis.

Springsure Area.

From 1939 to April 1944 and from 1947 to 1952 a subsidiary of the Shell Company, Shell (Queensland) Development Pty Ltd, was engaged in a geological, aerial and geophysical survey of central, south-western and western Queensland. About 32,000 square miles were covered by detailed geological mapping and reconnaissance, 192,000 square miles by geophysical survey (mostly reconnaissance gravimeter) and 10,000 square miles by aerial photography. Two Authorities to Prospect for Petroleum were held over areas aggregating 59,000 square miles, as well as three Prospecting Petroleum Permits embracing 525 square miles near Roma. The Rolleston area, about 262 miles west of Rockhampton, was geologically surveyed and 38 scout bores with an average depth of 800 feet were drilled. A promising geological structre was delineated at Warrinilla, and the company drilled Morella No. 1. This bore, located on the Morella Anticline, was spudded in April 1950. It started in the Lower Triassic Rewan Formation, penetrated a complete Permian section, and entered volcanics at 4,365 feet (final depth 4,634). No oil and only very slight traces of gas were observed.

From 1st April 1940 to close of operations, the company spent £920,000 in oil exploration on its areas in Queensland.

During 1954-1955 Australasian Oil Exploration Company drilled two bores on Reid's Dome, a structure mapped in 1930 by J.H. Reid, who was then a geologist of the Queensland Geological Survey. Small shows of gas were reported. One test bore was drilled on the Consuelo Anticline (Webb, 1956).

The Bureau of Mineral Resources carried out a trial seismic survey across the Comet Anticline and indicated a high velocity refractor at 2,200 feet (Smith, 1951).

Southern Queensland.

In addition to Shell (Queensland) Development Pty Ltd, other companies, including Commonwealth Oil Refineries and Superior Oil Company, have made geological reconnaissances in southern Queensland. Australian Mining and Smelting Co. Ltd was granted an Authority to Prospect for Petroleum over an area of 25,000 square miles in south-western Queensland, for a term of one year commencing on 1st March 1947. The Authority was later transferred to Frome-Broken Hill Co. Pty Ltd, an organization formed by D'Arcy Exploration Co. Ltd, Vacuum Oil Co. Pty Ltd, and Zinc Corporation Ltd. Frome-Broken Hill Co. Pty Ltd carried out aerial and geophysical surveys - gravity and magnetic - over the part of the Great Artesian Basin that lay within the boundaries of the Authority to Prospect. When the surveys were completed, the company abandoned the area.

A small Queensland company known as Condamine Oil Co. Ltd holds a permit covering 100 square miles in the Speculation district, about 22 miles north of Chinchilla. The first exploratory bore was started by this company in April 1948. It reached a depth of 2,333 feet at the end of 1957 and was in a conglomerate, composed largely of igneous materials and thought to be pre-Mesozoic. Minor oil and gas shows have been reported.

During 1955 a hole was drilled at Wellington Point by Winneills Pty Ltd to a depth of 3,751 feet, passing through basalt and Mesozoic freshwater sediments into Palaeozoic schists.

The Wycanna Trust completed, in 1956, Wycanna Trust No. 1, west of Goondiwindi, which reached a total depth of 4,105 feet. A gas and oil show was reported at 2,460 feet.

At Ray Station, 65 miles north-west of Quilpie, a scout bore was drilled by L.H. Smart Oil Exploration Pty Ltd, to confirm an earlier reported oil-show in an old water bore. The bore is located off a gravity high indicated by geophysical work carried out in the area. Some gas was encountered at 760 feet. Total depth of the bore was 820 feet.

Australian Oil and Gas Corporation Ltd drilled two stratigraphic bores in 1957. A.O.G. 1 Talbalba reached 774 feet; salt water was met at 600 feet and 700 feet. A.O.G. 2 Talbalba was abandoned at 1,000 feet.

Maryborough Basin.

In 1954-55, after geological reconnaissance, Lucky Strike Drilling Company drilled two bores, L.S.D. No. 1 Cherwell Creek to 9,773 feet, and L.S.D. No. 2 Susan Creek to 8,069 feet, in the Maryborough Basin.

Mackay.

In 1957 M.O.P.S. No. 1 was drilled by the Mackay Oil Prospecting Syndicate at Cape Hillsborough, north of Mackay. The bore reached 2,115 feet.

Longreach.

At Longreach, small quantities of an impure paraffin wax have been reported for some years from a bore which supplies the town with water. Similar material was found in a neighbouring bore, drilled by Longreach Oil Ltd. Petroliferous gas is known to occur in the same district. Since 1955, Longreach Oil Ltd has drilled five bores around Longreach. Westland Oil Co. Ltd carried out a gravity survey of a large area in 1955 south of Longreach and drilled three bores.

Tambo.

In 1957, South Pacific Pty Ltd drilled S.P.L. No. 1 Birkhead, 20 miles north of Tambo, to test Mesozoic and Palaeozoic strata. The well was abandoned in June 1957 at 5,186 feet. No further information is available.

Carpentaria Basin.

In the Carpentaria Basin much geophysical work was carried out during 1957 and about nine gravity highs were observed. A bore, F.B.H. No. 1 Wyaaba, was drilled (jointly by Frome-Broken Hill Co. Pty Ltd, Associated Freney Oil Fields N.L., and Associated Australian Oilfields N.L.) on one of them. It was sited not far from the Staaten River close to the boundaries of the Authorities to Prospect of the three companies, and was abandoned at a depth of 2,822 feet; basement was reached at 2,758 feet.

Zinc Corporation Ltd drilled a bore (in its bauxite prospecting area), Z.C.L. No. 1 Weipa, three miles east of the Weipa Mission on Cape York Peninsula. This bore reached basement at 2,958 feet (total depth 3,243 feet). At 2,000 feet a flow of artesian water of 6,000,000 gallons per day was struck. The bore has been completed as a water well.

In 1957-1958 Associated Australian Oilfields N.L. drilled A.A.O. No. 8 at Karumba near Normanton. This bore reached a total depth of 2,364 feet after penetrating quartzite basement at 2,360 feet. It was subsidised under the Petroleum Search Subsidy Act 1957-58.

General.

Table 2 shows the bores drilled in search of oil in Queensland. Included in the table are details of a few water bores in which oil or gas has been encountered. The Bureau is indebted to the State Mines Department for checking the table and bringing it up to date.

Gas or oil has also been reported in the following water bores (Wade, 1950, p.462):

Gas and oil. Arcadia, Blythdale, Landlen, Lucknow, Mellew, Thompson Wells, Wallumbilla.

Oil. Beaudesert, Bogarella, Danderaga, Ensay, Euthulla, Home Creek, Julia Creek, Laguna Beach, Macfarlane, Malta, Mingeburra, Minnie Downs, Mt. Bassett, Wolston, Glenormiston.

Gas. Avoca 3, Bedourie South, Brookwood, Buffalo, Bulgroo, Coinda, Crystal Brook, Dalby, Duaringa, Eromanga, Forest, Glenariffe, Glenalvon, Hutton Creek, Janesland, Lowood, Lynnfield, Manfred, Maria Creek, Mt. Hutton, Racecourse, Scouller, Styx, Terachie, Tocal, Wood Duck, Kheri Homestead, Warenda.

EXPENDITURE.

Table 3 sets out the available information on expenditure by individual companies.

TABLE 3.

	£	£
1. To 1931 inclusive:		
Geological	5,000	
Geophysical	20,000	
Scout Boring	20,000	
Drilling (59,000 feet percussion, 50,000 feet rotary)	750,000	795,000
2. 1932-1945:		
(a) Oil Search Ltd and subsidiary (Drillers Limited):		
Geological and Administrative	43,543	
Drilling (incl. Plant, £31,088 and Commonwealth Subsidy £31,485)	98,223	
(b) Roma Blocks Oil Company : Drilling (incl. Commonwealth Subsidy £10,142)	35,000	
Exploration	65,000	
(c) Shell (Queensland) Development Pty Ltd : Geological geophysical and aerial surveys	219,401	461,167
3. 1946 to end of 1958		
(a) Roma Blocks and Associated Companies	39,064	
(b) Associated Australian Oilfields N.L. (including expenditure on surveys in Northern Territory)	707,486	
(c) Westland Oil Co. Ltd	483,405	
(d) Australasian Oil Expl. Ltd	1,267,015	
(e) Winneills Pty Ltd	51,871	

		£	£
(f)	Longreach Oil Ltd	176,834	
(g)	Shell (Q'ld) Development Pty Ltd	701,000	
(h)	South Pacific Pty Ltd	130,336	
(i)	Australian Oil and Gas Corporation Ltd	27,255	
(j)	Frome-Broken Hill Co. Pty Ltd	121,726	
(k)	Santos Ltd	42,894	
(l)	Smart Oil Exploration Co. Ltd	15,005	
(m)	Associated Freney Oil Fields N.L.	49,437	
(n)	Delhi Australian Petroleum Ltd	38,250	
(o)	Condamine Oil Co. Ltd	9,153	
(p)	Consolidated Zinc Pty Ltd	3,533	
(q)	Oil Drilling & Exploration Ltd	1,678	
(r)	Oklahoma Australian Oil Co.	21,813	
(s)	Papuan Apinaipi Petroleum Co. Ltd	56,000	
(t)	South Queensland Petroleum Pty Ltd	1,294	
(u)	Australian Mining and Smelting Co. Ltd	188,359	
(v)	Other Companies	325,945	
(w)	Sundry, estimated	200,000	4,659,353
		TOTAL TO END OF 1958	£5,915,520

GEOLOGY

Before World War II, subsurface investigation was concentrated on Roma largely because of the chance striking of gas in a water bore there in 1900. Since the war, investigations have been carried out over a wide area.

Roma District (Reeves, 1947)

Stratigraphy. Parts of the Great Artesian Basin and the Bowen Basin underlie the Roma district.

Permian sediments in the Bowen Basin consist, in descending order, of 2,800 feet of clay shale, 400 feet of arkosic calcareous sandstone with beds of coal, 1,200 feet of dark marine shale and sandy limestone, 600 feet of dark sandy marine shale, 1,700 feet of coarse sandstone and more than 300 feet of marine shale. Unconformably overlying the Permian are Lower and Middle Triassic non-marine fine-grained sandstone and tuffaceous shale up to 1,400 feet. These are separated by an unconformity from Upper Triassic non-marine sandstone (coarse to fine-grained) and clay shale, about 1,000 feet thick. These beds extend out into the Great Artesian Basin.

Conformably above the Upper Triassic beds is a sequence of non-marine sandstone, sandy shale and coal beds of Jurassic age, about 2,500 feet thick. Conformably above this again is a thickness of about 200 feet of dark marine Cretaceous shale with friable porous sandstone at the base, which forms the basal part of the Roma Group cropping out north of Roma.

Structure. Around Roma itself the Cretaceous and Jurassic strata dip gently southwards at 45 to 100 feet to the mile. Farther north anticlinal structures occur in Triassic and Permian strata. There is some suggestion of an east-west fault just north of Injune.

Oil and gas indications. Most of the gas and many of the oil shows in the Roma bores came from gritty and coarse sandstone 2 to 5 feet thick near the base of the Triassic Moolayember Shale. In the Arcadia well the gas came from Permian Aldebaran Sandstone.

Springsure Area (Hill, 1957)

After some earlier work by Reid (1930), the Springsure area, which is in the western part of the Bowen Basin, was extensively investigated in the early war years by Shell (Queensland) Development Pty Ltd, and work has continued since the war.

Stratigraphy. Devonian sediments rest unconformably on schist and granite west of Springsure. Carboniferous sediments overlie the Devonian, and Permian sediments overlie the Carboniferous and crop out over large areas to the west and south-east of Springsure. Triassic and Triassic-Jurassic sediments overlap the Palaeozoic.

The lower Devonian beds consist of 3,500 feet of arenaceous sediments with minor shales; the upper part of the Devonian (unconformable on the lower) consists of 4,000 feet of conglomeratic sandstone, with minor mudstone, and 3,000 feet of sandstone and claystone with thin limestone beds.

The lowermost conglomerate and sandstone of the Carboniferous (200 to 1,100 feet thick) are unconformable on the Devonian. They are succeeded by flaggy sandstone 1,100 feet thick, and 8,500 feet of feldspathic sandstone and siltstone with lenses of algal limestone.

The Permian beds west of Springsure are mainly continental and comprise glacial sediments 2,400 feet thick followed by sandstone 4,500 feet thick, fossiliferous marine limestone 50 feet thick, and sandstone 1,300 feet thick.

South-east of Springsure the exposed Permian sequence consists of 2,000 feet of sandstone, shale and sandy limestone, with some glacial sediments and marine fossils; 500 feet of dark shale and thin marly limestone with marine fossils; in some places andesitic volcanic rocks at least 300 feet thick; 2,500 feet of sandstone; 500 feet of shale, marl, sandstone, and limestone, with abundant marine fossils; 200 feet of sandstone; 100 feet of limestone, marl, and shale, with rick marine fauna; 300 feet of carbonaceous shale; and 700 feet of sandstone, shale, and coal seams.

Triassic and later sediments are discussed under "Great Artesian Basin".

Structure. The area includes several well-expressed anticlines, on three of which (Morella, Reid's Dome, and Consuelo) bores have been drilled.

REPORT 41A - ERRATUM

Table 6, which is inserted between pages 19 and 20, should have been placed opposite page 28.

TABLE 6.

BORES DRILLED FOR OIL, LAKES ENTRANCE, VICTORIA.

(Note: See Plate 7 for locations of bores 1-8, 52, and 117; Plate 6 for bores 9-51 and 118).

No.	Bore	Surface Level	Depth	Glauconitic Sandstone	Basement at	Basement Rock	Bottom Water	Oil	Reference and Notes
1	No. 1 Ph. Bumberrah	5	1226'6"	32'6" at 1194'	-	-	1500 gal/hr at 1180'	Nil	(9, p. 7) Not checked against driller's log
2	No. 2 Pt. Addis Co.	5	949'	Absent	934?	Schist	1440 gal/hr. at 803' inc. 2800 at 933'.	?. See "notes" column.	(8, p.135) Driller reports traces of oil 850' to 864' in fine white sand.
3	No. 2 Gippsland Oil Co.	225	1106'		-	-	-	-	(7, p. 163) Drilling suspended in micacecus beds. W.G.
4	No. 3 Gippsland Oil Co.	220	1461'	43' at 1380'	-	-	-	-	
5	No. 1 Gippsland Oil Co.	255	1766'	16' at 1446'	1484'	Shale	Small sub-artesian flow at 1462'	Trace	(7, p.161) W.G.
6	No. 1 Pt. Addis Co.	2	1474'	36' at 1396'			120 gal/hr. at 1354; 20,000 gal/hr. at 1432'	Nil	(8, p. 116) (4) W.G.
7	No. 3 Ph. Colquhoun	5	1454'	✕ 20' at '434'	-	-	-	Nil	(10) (7, p.159-160).
8	No. 1 Ph. Colquhoun North	100	660'	Absent	-	-	-	Nil	(8, p. 117) (4)
9	No. 5 Ph. Colquhoun	10	1255'	✕ 1228-1249'	-	-	-	Nil	(10) (7, p.161) W.
10	No. 2 Ph. Colquhoun	60	974'3"		974?'	Granite	Artesian flow at 700', 967' and 974.	?. See "notes" column.	(8, p.136) Driller reports traces of oil at 835'.
11	No. 1 S.A. Oil Co.	187	1250'	29' at 1150'?	1250'?	? Granite	-	Present	°Records unreliable.
12	No. 6 Ph. Colquhoun	175	1458'	23' at 1401	1457'	Granite	-	Nil	(10)
13	No. 1 Kalimna Oil Co.	4	1474'	31' at 1387'6	1472'	Schist	Between 1414' and 1418'6"	Nil	(8, p.117) (5).
14	No. 5 S.A. Oil Co.	139	1320'	?58' at 1261'	?1320'	? Granite	-	Nil	Depth records doubtful.
15	No. 2 Kalimna Oil Co.	163	1406'	34' at 1370'	1406?'	? Slate	-	Nil	W.
16	No. 3 S.A. Oil Co.	165	1350'	35' at 1313'	-	? Slate	-	10 gal/day. short tests. Over 3 gal/day for 216 days. Both bailing.	
17	No. 1 Ph. Colquhoun	9	1404'6"	41½ at 1331'	1404'	Granite	1800 gal/hr. at 1358'. inc. to 10,000	1 pint/day.	(8, p.89) (4) (2, p.646) W.O.

(Table 6 Cont'd).

No.	Bore	Surface Level	Depth	Glauconitic Sandstone	Basement at	Basement rock	Bottom Water	Oil	Reference and Notes
18	No. 8 Ph. Colquhoun	6	1165'	44' at 1050'	1155'	Granite	100-300 gal/hr. 1056-1104', 1300 gal/hr. at 1122'.	Up to 13 gal/day.	W.G.
19.	No. 1 Oil Search Ltd	132	1276'	42' at 1232'	-	-	Small quantity at 1271	Very small amount.	
20	No. 2 Oil Search Ltd	142	1319'	~~X~~ 36' at 1283'	-	-	-	Pumping test 2 barrels/day = 70 gal/ day. (Co's figures)	
21	No. 4 Ph. Colquhoun	15	1509'9"	23' at 1421'	1508	Granite	At 1455'	Trace	(10) (7, p.160-161).
22	No. 2 Tanjil No. 1 Co.	177	1264' (see notes)	36' at 1228'	-	? Granite	-	10 gal/day.	Co. Records 1271. Oil Search Ltd.
23	No. 4 Pt. Addis Co.	201	1348'6"	~~X~~ 38' at 1310'6"	-	-	-	106 gals. bailed in 18 days = 5.8 gals per day/	(9, p.7).
24	No. 3 Mac's Oil Wells	30	1310'	At 1250'	-	-	Artesian	Present	
25	No. 2 Mac's Oil Wells	50	1297'	~~X~~ 35' at 1262	-	-	Artesian	110 gal/day bailing (Oil Search Ltd)	Well still flowing.Water & Oil yield can be measured. 0
26	No. 1 Mac's Oil Wells	41	1308'	~~X~~ 48' at 1260'	-	-	-	Present	
27	No. 1 Midwest Co.	183	1320'	30' at 1280'	-	-	-	Present	
28	No. 3 Lake View Co.	85	1285'	~~X~~ 30' at 1255'	-	-	-	? 20 gal/day	
29	No. 2 Midwest Co.	131	3400'	28 at 1227'	-	Granite	-	Company's bailing test 1937, 114 days average 18.3 gal/day.	(11) W.
30	Imray Bore, Austral Oil Syndicate	135	1274'	~~X~~ 21' at 1253'	-	-	-	5 gal/day over extended period	(6) (7,p.163). W.
31	No. 11 Ph. Colquhoun	200	1238'	84½ at 1149'	1238'	Granite	-	Present.No test. Hole water flooded.	
32	No. 4 S.A. Oil Co.	140	1255'	~~X~~ 33' at 1222'	-	-	-	7 months pumping average 6½ gal/day. Co's. figures)	
33	No. 6 S.A. Oil Co.	97	1255'	34' at 1186'	?1255'	? Granite	-	Present	
34	No. 7 S.A. Oil Co.	88	1255'	29' at 1193'	-	-	-	7 months pumping average 15 gal/day. (Co's. figs.)	
35	No. 1 Tanjil No. 1 Co.	196	1269'	~~X~~ 31' at 1238'	-	-	-	10 gal/day (Co's. figures)	Oil Search Ltd.

(Table 6 Cont'd).

No.	Bore	Surface Level	Depth	Glauconitic Sandstone	Basement at	Basement rock	Bottom Water	Oil	Reference and Notes
36	Houghton's Bore, Texland Co.	164'	1274'	✱ 29' at 1245'	-	-	-	Present	0.
37	No. 2 S.A. Oil Co.	151	1305'	38' at 1245	-	-	-	Present	(3) W.O.
38	No. 8 S.A.	144	1278'	✱ 28' at 1250'	-	-	-	Co's figs: pumping Dec. 1932 to May 1934, av. about 2 gal. dry oil/hr.	
39	Foster's Bore, Austral Oil Syndicate	93	1260'	✱ 31' at 1229'	-	-	Fair quantity.	100 gal/day (pumping)	(7, p.163).
40	No. 10 Pt. Colquhoun	140	1382'	44' at 1255'	1362	Granite	Small quantity at 1294'	7.7 gal/day	W.
41	No. 3 Pt. Addis Co.	28	1241'	38' at 1202'	-	-	1' water sand at 1239'6" (in glauconitic bed) approx. 23 gal/day bailed.	686 gals. bailed in 88 days = 7.8 gal/day.	(8, p.137) (15, p.7).
42	No. 1 Tanjil No. 2 Co.	231	1360'	31' at 1290'	--	Granite	-	Present	
43	No. 1 Midfield Co.	199	1305	✱ 33' at 1272'	-	-	-	Present	
44	No. 2 Midfield Co.	173	1308	✱ 28' at 1280'	-	-	-	Present	
45	No. 2 Lake View Co.	177	1302'	✱ 39' at 12	-	-	-	Present	
46	No. 3 Oil Search Ltd.	117	1310'6"	34' at 1276	-	-	Pumping 128 gal/hr.	Pumping test 2 gal/hr. = 48 gal/day. (Co. figures)	Oil at base of reservoir bed, 1308-1310'. Water sand 1310' - 1310'6".
47	No. 2 Lakes Entrance Development Co.	31	1275'	61' at 1209'	1270'	Granite	60 gal/hr.	a pint/day	W.G.O. (8, p.69) 1, p.561: 2.p.646).
48	No. 1 Lake View Co.	141	1207'	37' at 1170'	?	? Slate	-	Present	
49	No. 9 Ph. Colquhoun	7	1244'	40'6" at 1186'	1242'	Hornfels	Artesian 93 gal/hr. at 700'	Nil.	
50	No. 1 Lakes Entrance Development Co.	9	1215'	(4) 16' at 1084 (8) 31'6" at 1080'	1210'	Slate	1200 gal/hr.	Trace	W.G.O. (8, p.24)
51	No. 7 Ph. Colquhoun	5	1221'6"	35' at 1185	1221	Slate		Nil	(10) W.
52	Cobden's Bore	20	1507'	Absent	?	? Granite	1354' - 1480'; water rising to 10' from surface	Nil	Log does not specify granite as bedrock.
117	No. 1 Dome Frome 1		564	-		-	-		
	2		557						
	3		582			-	-	1290' some gas and oil impregnated oil glauconite.	
	4		1300						
	5		610						
118	No. 1 Oilco		1366'	-	1366				

(Table 6 Cont'd).

References and Notes:

W	=	Water analyses made at Mines Department Laboratory
G	=	Gas " " "
O	=	Oil " " "
X-	=	Full thickness of glauconitic sandstone not penetrated.

The numbers in the last column refer to the following publications:

1. Baragwanath, 1937a.
2. Baragwanath, 1937b.
3. Binney, 1937.
4. Chapman & Crespin, 1932.
5. Chapman & Crespin, 1935.
6. Croll, 1939.
7. Croll, 1940.
8. Records of Boring Operations, Mines Department of Victoria, 1923-1930.
9. Ibid., 1931-1937.
10. Annual Report, Secretary for Mines, Mines Department, Victoria, 1940.
11. Thomas, 1937.
12. Crespin, 1943.

Great Artesian Basin (Whitehouse, 1955; Sprigg, 1958).

Small shows of petroleum have been reported from many artesian water bores in the Great Artesian Basin (Mott, 1952). Several bores have been drilled (as at Longreach) apart from the numerous bores put down for artesian water.

Stratigraphy. Sediments ranging in age from Triassic to Cretaceous occupy the Basin. Underlying these are Palaeozoic sediments and metamorphic and granitic rocks. Little is known of the geology or distribution of Palaeozoic sedimentary rocks in the Basin, although they may be of importance in the search for oil.

The Triassic sediments of the Great Artesian Basin consist of sandstone, siltstone, and shale, ranging in thickness from about 800 feet to 2,700 feet. They crop out only in the central part of the eastern margin of the Basin, but are known in bores as far west as Middleton. They consist of continental sediments containing plant fossils.

Jurassic sediments from 1,000 to 2,850 feet thick crop out along the eastern margin of the Basin from near Aramac to near Moree (N.S.W.) and have been recognized in bores west of Longreach and Wyandra. Interbedded siltstone and sandstone predominate, with one sandstone formation near the top. The Jurassic is continental, with plant fossils.

The Cretaceous sediments consist of siltstone, shale, radiolarite, thin sandstone, and one sandstone formation at base. Part of the sequence is marine in origin. The thickness ranges from about 900 to about 4,500 feet. The area of outcrop is the main central and western parts of the Basin but outcrop generally is very poor because of soil development over the siltstone.

Structure. The Great Artesian Basin is a very large but relatively shallow downwarp which is divided into several subsidiary but large basins by basement ridges. Much of the structural relief in the Mesozoic sediments is possibly caused by deposition over a surface of marked relief, perhaps increased by differential sagging and compaction. Several large structures 30 to 50 miles long have recently been reported from the central area of the Basin.

Maryborough Basin.

In a small basin north and south of Maryborough, Mesozoic sediments rest on indurated Permian sediments.

Stratigraphy. Permian marine sandstone, shale, limestone and tuff intruded by granite, and containing in places, as at Gympie, goldbearing quartz reefs, probably form the floor of the Basin. Shale, sandy shale, sandstone and conglomerate of Triassic age unconformably overlie the Permian. Little is known of their thickness.

Lacustrine shale and sandstone with coal seams of Jurassic age are intruded by granite and by hornblende porphyrite dykes. Little work has been done on this sequence.

The Cretaceous marine sediments previously reported as 600 feet thick (Bryan & Jones, 1946, p.63) were found to be at least 6,000 feet thick in L.S.D. No. 1 Cherwell Creek.

Structure. The generally synclinal shape of the Basin is broken by several large anticlines, only parts of which remain above sea level. Insufficient work has been done to indicate the details of the anticlinal structures.

PRESENT STATUS OF EXPLORATION.

The following companies and individuals held oil exploration tenements in Queensland at the end of June 1959 :

Trans-Pacific Corp.; Australian American Oil Co. Pty Ltd; Humber Barrier Reef Oils Pty Ltd; The Papuan Apinaipi Petroleum Co. Ltd; Associated Australian Oilfields N.L.: Associated Freney Oil Fields N.L.: Australian Oil & Gas Corp. Ltd; Santos Ltd; Delhi Australian Petroleum Ltd; L.H. Smart Oil Exploration Co. Ltd; Plymouth Oil Co.; Magellan Pet. Corp.; Central Q'land Pet. Co. Pty Ltd; Carpentaria Oils Pty Ltd; Reef Oil Co. Pty Ltd; Artesian Basin Oil Co. Pty Ltd; Pacific American Oil Co.; Queensland American Oil Co. (50% Gene Goff, 50% Phillips/Sunray); Oklahoma Australian Oil Co. (100% Phillips Sunray); Stekoll Australian Petroleum Ltd; Condamine Oil Ltd; Planet Exploration Co Pty Ltd; W.C. Walz & H.J. Walz; Standard Gas Pty. Ltd; Longreach Oil Ltd; J.G. Fuller. (For details see Appendix 4 and Plate 11.)

A typical burst of drilling activity followed the discovery of oil at Rough Range (Western Australia) in 1953; then the tempo of the search for oil in Queensland markedly decreased in 1955 and 1956. In 1956 no drilling was done. In 1957 and 1958 eleven bores totalling 20,424 feet were drilled.

Although several companies have carried out geological and geophysical investigations that led to drilling, and Government organizations have made geological and geophysical surveys, nowhere in Queensland has there been the integrated geological, geophysical, and drilling exploration over large areas required to indicate the areas where oil may have been formed and is most likely to have accumulated. Almost all exploration in Queensland has resulted from chance encounters in water bores of shows of oil or gas or from structural mapping without regard to the geological history of the area concerned.

On the basis of the rather poor stratigraphical, structural and palaeogeographic evidence available, M.A. Condon thinks that certain areas, roughly in order of attractiveness, should be thoroughly investigated to determine the stratigraphic sequence and its variations, the structure and the geological history. The areas are: Georgina Basin, Bowen Basin, central area of the Great Artesian Basin (in southwest Queensland), Maryborough Basin (and its offshore extension), the off-shore part of the Carpentaria Basin, and the Laura Basin. The Ipswich-Clarence, Bowen, and Maryborough Basins have reasonable prospects of producing dry gas. Drilling may be necessary to help in this investigation; but random drilling may serve only to discourage investment in the search for oil in an area where there is no lack of minor indications of its presence.

NEW SOUTH WALES

(See Plate 5).

HISTORY OF INVESTIGATIONS.

Leo J. Jones (1921) reviewed the history of prospecting for oil in New South Wales up to 1921, and additional notes prepared by H.G. Raggatt were published in 1932. These reports have been drawn upon, but information from official files and company records (chiefly those of Oil Search Ltd and Australian Oil and Gas Corporation Ltd) has also been used to bring this account up to date.

The Permo-Triassic rocks of central-eastern New South Wales have attracted most attention.

Ipswich-Clarence Basin.

A water bore drilled on the Grafton Racecourse between 1897 and 1902 encountered a show of dry gas.

About 1933, Clarence River Oil Prospecting Company put down a bore for gas and oil, 2½ miles south of Halfway Creek, which is about 18 miles south-east of Grafton on the main Grafton-Woolgoolga road. The bore was drilled and cored to 2,580 feet. No mapping or field investigation of any kind was done. No gas was noted during drilling, but it was found later that if the hole was shut in for a few days, a little gas containing 5 per cent ethane would accumulate.

A bore was drilled near Grafton by Clarence River Basin Oil Exploration Co. N.L. in 1955. This was abandoned at a depth of 4,583 feet. Press reports state that some gas was encountered. Another bore, Grafton No. 3, was started in 1958. In February 1959 its depth was reported to be 1,290 feet; operations have been temporarily suspended.

Sydney Basin : Hunter River District.

The Hunter River district has been geologically mapped by the Geological Survey of New South Wales and several anticlines are known (Morrison & Jones, 1925; Raggatt, 1938; Booker, 1953).

Loder Dome. Oil and Gas Investigations Ltd drilled to a depth of 2,391 feet in 1926-1927 on a well-defined structure in the Upper Marine Series of the Permian. The bore was discontinued after penetrating 352 feet into the Lower Marine Series. Only slight gas shows were noted. It is estimated that the venture cost about £20,000, including a Commonwealth subsidy of £2,260.

Belford Dome. In 1927-1928 Belford Dome Ltd drilled two core holes to depths 1,550 and 1,664 feet respectively and carried a test bore to a depth of 1,498 feet, using a cable tool rig. The structure had been adequately defined by geological mapping. The sequence proved is much the same as at the Loder Dome. Small gas shows were reported. This Company spent about £48,000, of which the actual drilling cost about half.

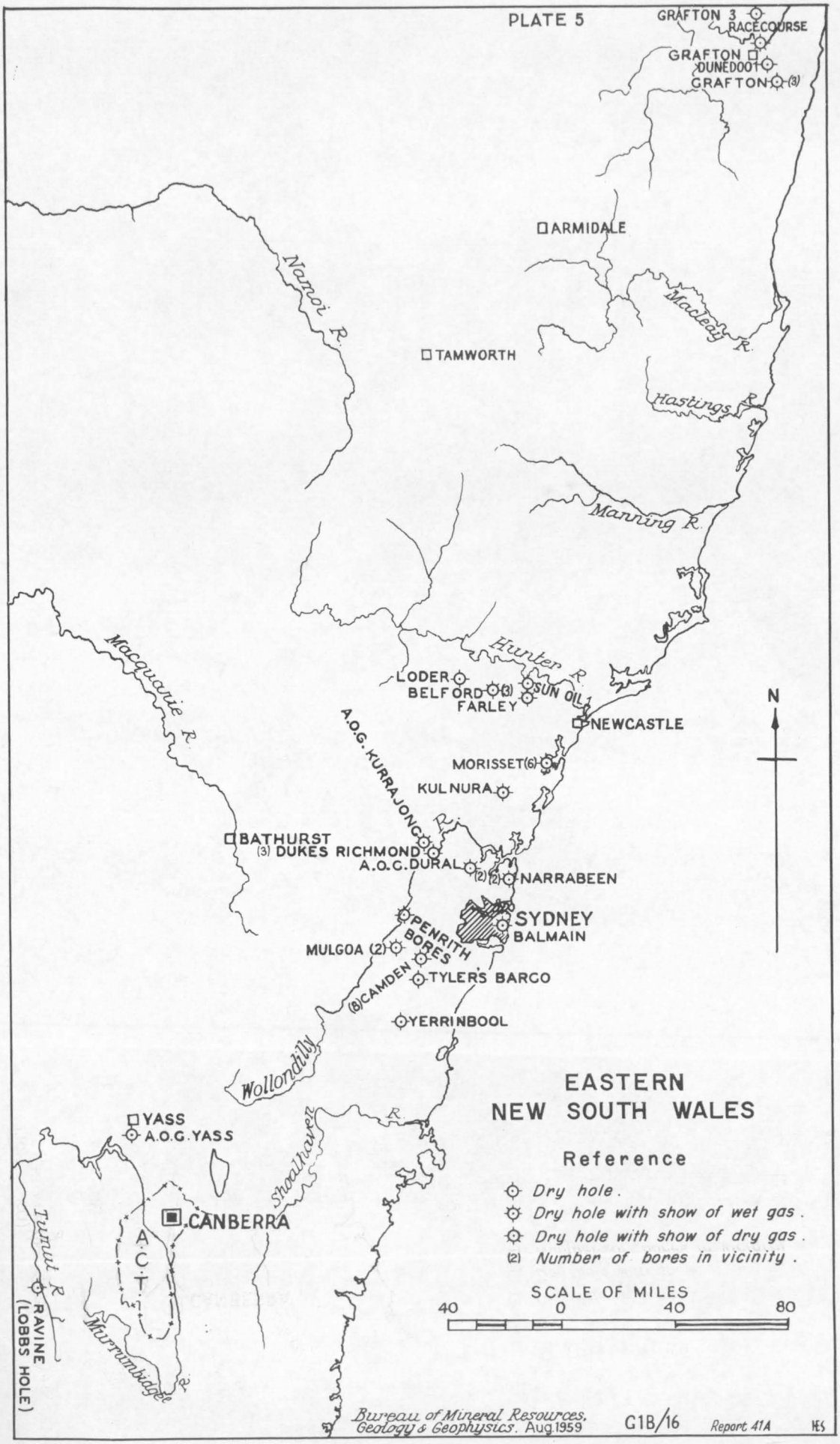


PLATE 5
GRAFTON 3
RACECOURSE
GRAFTON
DUNEDOO
GRAFTON (3)
ARMIDALE
Namoi R.
Macleay R.
TAMWORTH
Hastings R.
Manning R.
Hunter R.
LODER
BELFORD (3)
SUN OIL
FARLEY
NEWCASTLE
Macquarie R.
A.O.G. KURRAJONG
MORISSET (6)
KULNURA
BATHURST
(3) DUKES RICHMOND
A.O.G. DURAL
(2) (2) NARRABEEN
SYDNEY
BALMAIN
PENRITH BORES
MULGOA (2)
(8) CAMDEN
TYLER'S BARCO
YERRINBOOL
Wollondilly R.
Shoalhaven R.
YASS
A.O.G. YASS
CANBERRA
A.C.T.
Tumut R.
RAVINE (LOBBS HOLE)
Murrumbidgee R.
N
EASTERN
NEW SOUTH WALES
Reference
Dry hole.
Dry hole with show of wet gas.
Dry hole with show of dry gas.
(2) Number of bores in vicinity.
SCALE OF MILES
40 0 40 80
Bureau of Mineral Resources, Geology & Geophysics. Aug. 1959
G1B/16
Report 41A
HES

Farley Bore. This bore, drilled by W.J. Maskell, was suspended at a depth of 5,364 feet in 1936. The site was not well chosen: the bore started in steeply dipping sediments of the Permian Dalwood Group. Small gas shows were reported. A sum of about £12,000 was spent on drilling.

Ravensfield. Sun Oil Co. of California spudded in a bore near the Ravensfield Quarries in January 1959. This was drilled by percussion plant to 1,005 feet, cased, and continued with a diamond drill. This bore started in the Permian Dalwood Group on an anticlinal nose on the east flank of the Lochinvar Anticline. In May 1959 it had reached 2,700 feet.

Sydney Basin: Sydney-Gosford District. The bores drilled in this district in the search for oil are listed below. They all started in the Triassic and penetrated to or through the Permian Upper Coal Measures.

Kulnura Bore. Kamilaroi Oil Co. Ltd, a subsidiary of Oil Search Ltd. drilled this bore in 1935-1938 to a depth of 6,293 feet. It entered the Permian at 2,700 feet, then penetrated 1,075 feet of Upper Coal Measures, 715 feet of Upper Marine Series (? Branxton Stage), 177 feet of Lower Coal Measures and 1,625 feet of Lower Marine Series. Small gas shows were logged. The enterprise cost some £50,000, including £17,000 Commonwealth Government subsidy.

Richmond Bores. Three bores were put down at Redbank, near Richmond, in 1910-1916; the deepest of these reached 877 feet. A trace of oil of paraffin base was reported from No.3 bore.

Penrith Bore. This bore was drilled to a depth of about 2,700 feet in 1918-1920. Gas was found but owing to the poor technique employed in drilling, the flow could not be adequately tested.

Mulgoa Bore. Mulgoa No. 1, five miles south-west of Penrith, was put down by Gas Drillers Ltd, a subsidiary of Oil Search Ltd, on a sharply folded structure with a faulted and jointed crest. The bore reached a depth of 3,125 feet. Numerous gas shows were encountered over a wide vertical range. Estimated expenditure was £27,000, including £2,800 of Commonwealth Government subsidy.

In 1958 Australian Oil and Gas Corporation Ltd started a second bore about 1½ miles east-south-east of Mulgoa No. 1. The operation was approved for subsidy under the Petroleum Search Subsidy Act 1957-1958. On 30th September, 1959, Mulgoa No.2, drilled by percussion plant, had reached 5,601 feet. Several small shows of gas had been reported.

Narrabeen Bores. Two bores were sunk at Narrabeen to depths of 1,200 feet and 2,015 feet; both of them struck gas flows at 700 feet.

Balmain Bore (Raggatt & Crespin, 1941). A bore drilled in 1932-1937 by Natural Gas and Oil Corporation Ltd from the bottom of the Balmain Coal Shaft (itself 2,937 feet deep) reached a total depth of 4,937 feet. A small yield of gas was obtained between 4,180 and 4,530 feet. Gas was drawn off from the sealed colliery workings for a time during the war at the rate of 120,000 cubic feet per week and used in cylinders and bags as a petrol substitute for motor vehicles.

Yerrinbool Bore. In 1921-1922 the Yerrinbool Oil Prospecting Syndicate drilled a hole to a depth of 2,238 feet. There is no record to indicate whether or not any oil or gas shows were encountered.

Tyler's Bargo Bore. Few details are known concerning the bore put down by Mr Tyler, a few miles west of Bargo. It had reached a depth of 3,550 feet when operations were suspended in 1935. Some gas was noted during drilling.

Kurrajong and Dural. In 1954, Australian Oil and Gas Corporation Ltd started a geological, geophysical, and drilling investigation of the Sydney district. In 1954 a bore was started at Kurrajong Heights; gas was encountered at 2,000 feet. Drilling was suspended in the same year at a depth of 4,755 feet.

In 1956 the Company started a bore at Dural (Dural No. 1). Gas was encountered at 3,063 and 3,521 feet. Drilling was discontinued at 5,203 feet because of bad caving. Dural No. 2 was drilled about two miles west of No. 1; gas was encountered in this bore at 3,325 feet (20,000 cubic feet a day). The total depth of Dural No. 2 was 6,465 feet.

Camden. Since 1957, Australian Oil and Gas Corporation Ltd has drilled several bores in the Camden area: Camden No. 1 (total depth 2,272 feet) had shows of dry gas at 1,173 and 1,209 feet and, at 1,355 feet, a flow of 50,000 cubic feet a day of dry gas; No. 2 (total depth 2,230 feet) had dry gas shows at 1,076 and 1,699 feet; No. 3 (total depth 1,830 feet) had a dry gas show at 914 feet; No. 4 (total depth 1,890 feet) had dry gas at 1,167 and 1,209 feet; No. 5 (total depth 1,939 feet) had dry gas shows at 829, 908, 1,220, 1,254, and 1,562 feet. Nos. 6,7,8 and 9 were all completed in 1959. In No. 6, total depth 1,981 feet, several dry gas shows were encountered between 880 feet and 1,947 feet; the total flow was 70,000 cubic feet per day; No. 7, total depth 1,690 feet, had a dry gas show at 1,350 feet, and yielded a milllion cubic feet per day at bottom; No. 8, total depth 2,100 feet, had a reported gas show at 1,742 feet; and No. 9, total depth 2,104 feet, had shows of gas at 1,346 feet, 1,390 feet, and 1,800 feet.

Morisset. Australian Oil and Gas Corporation Ltd drilled six structural scout bores during 1957 in the Wyee-Morisset area with an aggregate footage of 2,882.

Other Localities.

Most of the exploration that has been done outside the central-eastern Permo-Triassic basin and the Grafton district has little economic significance.

In 1917 a bore was drilled to a depth of 763 feet at Ravine, Yarrangobilly district, in the vicinity of the Lobb's Hole copper mine, because inflammable gas has been observed issuing in the mine workings. Some drilling has also been done in the Tamworth and Scone districts, but the total footage in both localities is small.

Two bores were sunk near Jerilderie to depths of 1,150 and 800 feet (See Lake Cullivel and Quat Quatta, Plate 1).

In 1956, Australian Oil and Gas Corporation Ltd drilled near Yass, to a depth of 1,107 feet in Silurian beds.

EXPENDITURE.

An estimate of expenditure incurred in the search for oil in New South Wales is given in Table 4.

Table 4.

	£	Total £
To the end of 1945:		
Loder Bore (including Commonwealth Government subsidy of £2,260.)	20,000	
Belford Bores	48,000	
Farley Bore (estimated)	12,000	
Kulnura Bore (including Commonwealth Government subsidy of £17,000(estimated)).	50,000	
Richmond Bore (estimated)	5,000	
Penrith Bore (estimated)	7,000	
Mulgoa Bore (including Commonwealth Government subsidy of £2,800).	27,000	
Narrabeen	10,000	
Balmain Bore (excluding colliery experiment, estimated)	6,000	
Yerrinbool Bore (estimated)	7,000	
Tyler's Bargo Bore (estimated)	7,000	
All others (estimated)	30,000	229,000
1946 - 1958		
Australian Oil and Gas Corp. Ltd (including survey cost in S. Australia to 1957)	598,823	
Clarence River Basin Oil Explor. Co. N.L. (including survey cost in S. Australia to 1957)	102,893	
Frome-Broken Hill Co. Pty Ltd	23,198	
Oil Drilling and Exploration Ltd	243	
Sundry unrecorded (estimated)	100,000	825,157
	TOTAL	£1,054,157

GEOLOGY

Four sedimentary basins in New South Wales have not suffered severe deformation : the Permo-Triassic basin of east-central New South Wales (the Sydney Basin), in which most of the drilling has been done; the Mesozoic basin of north-western New South Wales (the southern part of the Great Artesian Basin); the Mesozoic - mainly freshwater - basin of north-eastern New South Wales and Southern Queensland (the Ipswich-Clarence Basin); and the Tertiary basin of south-western New South Wales (part of the Murray Basin).

Sydney Basin.

The Sydney Basin stretches from near Murrurundi in the north to near Bateman's Bay in the south, and westerly from the coast to a few miles beyond Lithgow and Rylstone. An unknown but probably large part of the original basin is covered by the Pacific Ocean.

Stratigraphy. Table 5 shows the stratigraphic succession in the northern part of the Basin. The thicknesses given refer to the type areas. The formations listed are not present everywhere throughout the Sydney Basin. The sequence was laid down in a large gulf in which periods of free access to the sea alternated with periods of restricted access.

The Dalwood Group ("Lower Marine Series") crops out only in the Newcastle area, but is fairly thick. The Maitland Group ("Upper Marine Series") was laid down in the most extensive basin of the whole sedimentary episode; its thickest sequence, of 5,000 feet, is in the Newcastle district. The two marine sequences are separated by the Greta Coal Measures, and capped by the Newcastle and Tomago Coal Measures.

The marine sediments offer possible source beds of petroleum, and the coal measures possible source beds of dry gas; there are sufficient pervious sandstones and conglomerates to act as reservoir beds.

Table 5.

STRATIGRAPHIC SUCCESSION, NORTHERN PART OF SYDNEY BASIN.
(partly after David, 1950, and Hill, 1955).

	Unit		Max. thickness feet	Lithology
TRIASSIC	Wianamatta	-	850	Shale, calcareous flaggy sandstone
	Hawkesbury		1,000	Cross-bedded glistening white sandstone, fossiliferous shale
	Narrabeen	Upper	560	Sandstone with shaly sandstone and shale.
		Middle	850	Red and green shale; sandstone and fine conglomerate.
		Lower	880	- ditto -
PERMIAN	"Upper Coal Measures"	Newcastle Coal Measures	1,500	Conglomerate, sandstone, shale, coal seams.
		Tomago Coal Measures	2,000	Shale and sandstone, coal seams.
	Maitland Group	Mulbring Sub-group	3,000	Shale and claystone
		Muree Formation	400	Sandstone, sandy claystone, calcareous in part.
		Branxton Sub-group	1,400 1,500	Sandy shale and claystone Sandstone.

Greta Coal Measures		300	Fine conglomerate, sandstone, shale and coal seams.
Dalwood Group	Farley Formation	985	Sandy shale and claystone; Ravensfield sandstone (200') at base.
	Rutherford Formation	1,170	Sandy shale, mudstone, with limestone and basalt.
	Allandale Formation	1,000	Calcareous claystone, conglomerate (250') at base.
	Lochinvar Formation	2,750	Shale, claystone, sandstone, amygdaloidal basalt. Red brown shale at base.

Structure. The regional structure of the Permo-Triassic sediments is synclinal. The low point of the Basin is considered to be in the Newcastle district, although the low point of the syncline in the Triassic sediments is in the Sydney area. This structural basin is the original basin of deposition, which has been little altered. On the north-east the Hunter Thrust Fault modified that side of the basin, bringing Kuttung (Carboniferous) tillites over the Permian sediments (Osborne, 1949).

In the Permian rocks of the Hunter Valley there are many anticlines - the faulted Muswellbrook and Lochinvar Domes, which are eroded down to the Dalwood Group sediments, and smaller domes in the Singleton area - the Loder, Belford, Sedgefield, and Darlington Domes - which have been eroded down to the Branxton Sub-group of the Maitland Group. In the Triassic rocks one large domed anticline - the Kulnura Dome - has been mapped. One bore has been drilled on this dome. The anticline on which the Loder Dome is developed continues to the south and has a minor expression in the Triassic rocks. A small sharp anticline has been drilled at Mulgoa.

Oil and gas indications. Gas, including dry gas, has been reported in small amounts from bores at Loder, Belford, Kulnura, Mulgoa, Farley, Penrith, Narrabeen, Balmain, Bargo, and Dural. Dry gas shows and one large flow have been reported from the Camden bores. Oil shows have been reported from a bore at Richmond (probably in Narrabeen sediments). Reported gas appears to have come from Dalwood, Greta, Maitland, Upper Coal Measure and Narrabeen rocks. The bores at Loder, Belford, Kulnura, Mulgoa and Dural were located on anticlines.

PRESENT STATUS OF EXPLORATION.

At the end of June 1959, tenements for petroleum exploration were held by : Clarence River Basin Oil Exploration Co. N.L.; Australian Oil & Gas Corporation Ltd; E. Gulliver; Oil Search Ltd; R.W. Addison.; Australian Iron & Steel Ltd; B.C. Hancox.; Builders Inc. Pty Ltd; J.A. O'Shea; J.G. Fuller; P.E. Gauld.; L.H. Smart Oil Exploration Co. Ltd; R.B. Withers;

Harver Corporation Ltd; J.G. Donaldson.; J.C. Reynolds.; C.J. Ellis.; Consolidated Oil Pty Ltd; P.E. Gauld (Nom. Sun Oil of California).

Applications for tenements had been received from Dome Oil & Minerals Syndicate N.L. and Consolidated Oil Pty Ltd. (For details see Appendix 4 and Plate 11).

Much of the drilling carried out before 1954 was not guided by geological control, though several anticlines found by geological mapping had been drilled. The exploration being carried out by Australian Oil and Gas Corporation Ltd in the Sydney Basin includes geological and geophysical surveys and scout and test drilling; the results obtained are likely to be of continuing value in the search for oil or dry gas. The company is investigating dry gas sands in the Camden area.

Apart from this company's work, the available geological and geophysical information in the Sydney Basin and in the Ipswich-Clarence, Murray, and Great Artesian Basins is not sufficiently precise for the requirements of oil exploration. However, information is accumulating, mainly as a result of company geophysical work, and geological work by the Geological Survey of New South Wales.

VICTORIA

(See Plates 6, 7 and 8)

HISTORY OF INVESTIGATIONS.

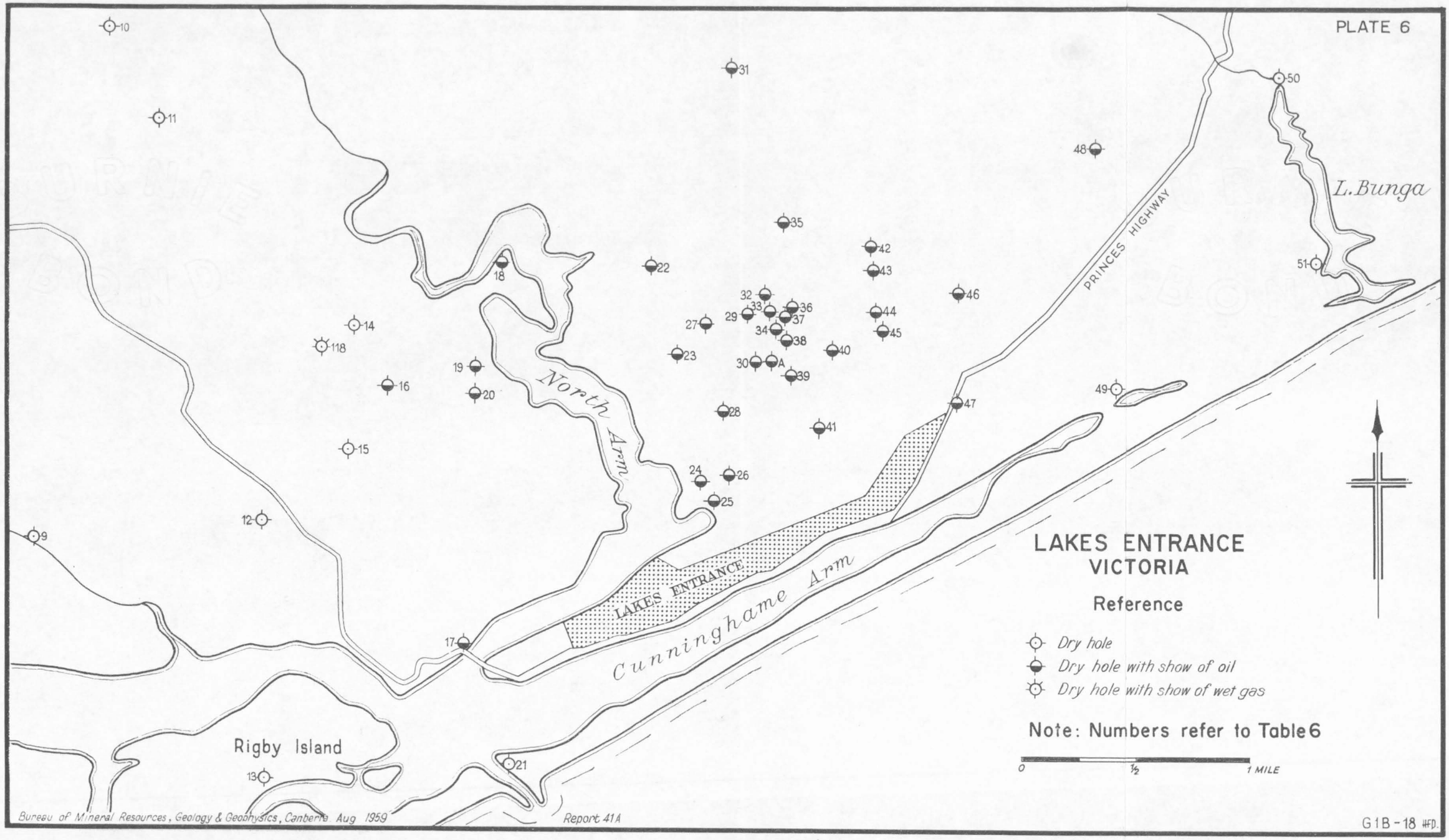
Drilling for oil in Victoria dates from 1914; but the principal activity has been since 1924, when a bore put down at Lake Bunga by the Lakes Entrance Development Co. (No. 50 on Plate 6), on a site recommended by the Director of the Victorian Geological Survey, struck a flow of artesian water with traces of oil and a flow of natural gas at 1,070 feet. Since that date many companies have been formed to carry on operations in various parts of the State.

The East Gippsland area has continued to receive most attention. Before World War II, the main effort was put into wildcat drilling without geological or geophysical help in selecting sites. After the war, the Geological Survey of Victoria carried out geological surveys to help in the assessment of the oil potential and to locate drilling areas. The Bureau of Mineral Resources has carried out gravity, aeromagnetic, and seismic surveys to obtain the regional shape of the Gippsland Basin and to indicate structural targets for drilling. The Bureau has also carried out gravity surveys in western Victoria and Port Phillip Bay, and seismic test shooting over the basalt flows near Heywood. Since the war investigations have included the pre-Tertiary sediments.

East Gippsland (Baragwanath, 1937).

Lakes Entrance (See Plate 6). Fifty-four bores have been put down in the search for oil in the Lakes Entrance area. Of these three were drilled by the Victorian Mines Department, nine jointly by the Victorian and Commonwealth Governments and the remainder by private companies : Table 6 records particulars of all bores. The co-operation of the State Mines Department in compiling this statement is gratefully acknowledged.

PLATE 6



LAKES ENTRANCE VICTORIA

Reference

- Dry hole
- Dry hole with show of oil
- Dry hole with show of wet gas

Note: Numbers refer to Table 6

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Bureau of Mineral Resources, Geology & Geophysics, Canberra Aug 1959 Report 41A

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TABLE 7.

BORES DRILLED IN THE BAIRNSDALE - SALE DISTRICTS

PARISH	NAME OR NUMBER	DEPTH FT.	NUMBER ON PLATE 7	OIL OR GAS INDICATIONS & REMAINS
BAIRNSDALE	3 (Cobber's Creek)	886	53	
	4 (Forge Creek)	1,410	54	
	5 (Eagle Point)	1,552	55	
MOORMURNG	1	1,022	56	
Frome Lakes Pty. Ltd.	5 (Gippsland)	1,550	57	Also known as Frome Lakes Pty. Ltd. No. 6
COOGULMERANG	1	945	58	
	2	640	59	
Oil Search Ltd.	3 (Tom's Creek)	1,204	60	
	1 (Bravo Plant)	282	61	
	2 (Bravo Plant)	306	62	
	3 (Steam Drill)	1,446	63	
NINDOO	1	533'	64	
YEERUNG	1	1,345	65	
MEERLIEU	1	1,208	66	
NUNTIN	1	1,453	67	
	2 (Lake Kakydra)	3,560	68	
STRATFORD	1	665	69	
Frome Lakes Pty. Ltd.	4 (Gippsland)	1,815	70	
BUNDALAGUAH	1	606	71	
	2	650	72	
	3	659	73	
WURRUK WURRUK	1 (Sale)	3,214	74	
GLENCOE	2	947	75	
	3	234	76	
	4	346	77	
	5	542	78	
	6	652	79	
	7	1,381	80	
	8	1,406	81	
Texland Oil Co.	1	1,085	82	
Lake Wellington Oil Wells	1	2,217	83	

TABLE 7 (Cont'd).

PARISH	NAME OR NUMBER	DEPTH FT.	NUMBER ON PLATE 7	OIL OR GAS INDICATIONS & REMARKS
GLENCOE SOUTH	2	923	84	Fairly strong gas show at 590'
Tanjil - Pt. Addis Co.	1	1,400	85	Oil show at 850' - 855'
	2	2,760	86	
Midfield Oil Co.	1	960	87	
WULLA WELLOCK	2	1,420	88	
STRADBROKE	14 (Monkey Creek)	1,521	89	
	15	647	90	
	16 (Merriman's Creek)	1,476	91	
DARRIMAN	3	1,207	92	
	4	1,250	93	
Frome Lakes Pty Ltd.	1 (Darriman)	4,730	94	
WOODSIDE	5	312	95	
	6	328	96	
(Woodside (Lakes Entrance) Oil Co. N.L.	1	6,008	97	Oil Shows at 1290', 2,550' - 2,585' & 4,390' - 4,400'
	2	8,862	98	Oil shows at 1345' - 1,350' & 5,585' - 5,600'
	3	5,985	99	
	4	2,694	100	
	7	1,366	?	Also known as Oilco No. 1
Hedley	1	4,013	119	Also known as Woodside (Lakes Entrance) Oil Co. N.L. No. 6.
Frome Lakes Pty. Ltd.	1 (Gippsland)	790	101	
	1A (Gippsland)	1,962	102	
	2 (Gippsland)	1,552	103	
WOODSIDE				
Frome Lakes Pty. Ltd.	3 (Gippsland)	1,876	104	
BENGWORDEN		924	105	
Oil Search Ltd.	1	1,087	106	
	2			
BENGWORDEN SOUTH	1 (Holland's Landing)	4,004	107	
BOOLE POOLE	1 (Sperm Whale Head)	3,111	108	
Valve Oil Wells	1 (Pelican Point)	2,309	109	Traces of oil at 1650' - 1735, 1791', 1826' - 1869', 2080' - 2085', 2168' - 2185'.

TABLE 7 (Cont'd).

PARISH	NAME OR NUMBER	DEPTH FT.	NUMBER ON PLATE 7	OIL OR GAS INDICATIONS & REMARKS
GOON NURE	1 (Romawi)	3,244	110	
Amalgamated Oil Synd.	1	2,929	111	Traces of oil, strong gas flow.
SEACOMBE	1	1,570	112	
DULUNGALONG	1	1,616	113	
Signal Hill Exploration	1	2,295	114	
GIFFARD	14	1,600	115	
DEVON				
Westralian Oil Ltd.	1 (Yarram)	1,875	116	
BALLONG				
Frome Lakes Pty Ltd.	8	557	120	Also known as Dome - Frome 2
	10	1,300	122	" " - Frome 4
Dome Oil & Minerals Synd. N.L.	5	948	-	Drilling, also known as Ekberg No. 1 Located approximately 3/4 miles south of Buchan.
TARRA TARRA				
Frome Lakes Pty. Ltd.	9	582	121	Also known as Dome - Frome 3
NOWA NOWA				
Lakes Oil Ltd.	1	1,230	-	Also known as East End Bore No. 1 Located approximately 8 miles south-west of Orbost.

(The number of the bores refer to Government Bores unless otherwise stated).

The total footage drilled in the area is 70,036. The drilling has served to delineate an area of at least eight square miles within which oil occurs in a glauconitic sandstone of Eocene age at an average depth of 1,200 feet. The companies engaged in the area reported to the Victorian Mines Department a production of 107,129 gallons of oil for the period 1930 to July 1941, and Messrs. Ramsay and Treganowan stated that they purchased approximately "100,000 gallons of dehydrated crude oil" from the producers at Lakes Entrance.

A circular shaft was put down at Lakes Entrance in Allotment 31, Parish of Colquhoun, two miles north-east of Lakes Entrance township, during World War II under the joint direction of the Commonwealth and State Governments. It was proposed to develop the area by horizontal drilling from the shaft. The concrete-lined shaft, of ten feet inside diameter, was sunk to a depth of 1,156 feet, approximately 40 feet above the top of the oil-bearing glauconitic sandstone. In June 1945, a diamond drill hole was drilled from the shaft bottom to 1,220 feet. Further tests made at shaft bottom indicated that production on a commercial scale was not likely to result, and the project was abandoned by the Governments on 9th May 1946. Later work was done in the area by Lakes Oil Ltd. A pilot bore 130 feet north of the shaft was drilled to 1,219 feet and passed into the glauconitic sandstone at about 1,190 feet. The company then did some drilling from a work chamber at the base of the shaft, in an unsuccessful attempt to secure commercial production of oil.

Bairnsdale-Sale area (See Plate 7 and Table 7). Of the bores listed in Table 7, thirty were put down by private companies.

Port Phillip Bay.

Drilling done around Port Phillip Bay is :

	Feet
Sorrento Bore (Gov't)	1,696
Torquay Bores (Pt. Addis Co.)	
No. 6	842
No. 7	922
Torquay Oil Wells (five bores)	4,552
	8,012

Western Victoria (See Plate 8).

The following bores have been put down in Western Victoria :

	Feet
Hamilton, Ph. Yulecart (Gov't).	252
Comaum Bore (Pt. Addis Co.)	1,171
Ph. Dartmoor (24 Gov't bores)	3,096
Mumbannar No. 1 Bore (Mersey Valley Oil Co.)	1,100
Portland (Producing Oilfields)	2,835
Nelson, Ph. Glenelg	
Govt.	7,305
Western Petroleum	1,000
	17,609

PLATE 7

SOUTH OF MELBOURNE VICTORIA

Scale

10 5 0 10 20 MILES

Reference

- Dry hole .
- Dry hole with show of oil .
- Dry hole with show of wet gas.
- (7) Number of bores in vicinity .

MELBOURNE

PORT PHILLIP BAY

GEELONG

SORRENTO

(7) TORQUAY

BASS STRAIT

Thomson R.

YALLOURN

La Trobe R.

Avon R.

Perry R.

Mitchell R.

Toms Ck.

Merrimans Ck.

Lake Wellington

SALE

BAIRNSDALE

LAKES ENTRANCE

See Plate 6.

Beach

Mile

BASS STRAIT

Ninety

Bruthen Ck.

Tarra R.

Corner Inlet

EASTERN GIPPSLAND VICTORIA

Scale

10 5 0 10 20 MILES

Reference

- Dry hole .
- Dry hole with show of oil.
- Dry hole with show of wet gas.

Note : Numbers refer to Table 7.

G 1B-17

Bureau of Mineral Resources, Geology & Geophysics, Aug.1959. Report 41A

The Commonwealth and State Governments jointly drilled the Nelson Bore, which was put down to prove the Tertiary sequence in the area. Drilling was suspended on 28th November, 1945, at a depth of 7,305 feet. The bore finished in sediments which may be of lowest Eocene or Cretaceous age, without encountering any indications of petroleum. The thickness of Tertiary sediments proved - more than 5,300 feet - was much greater than was expected.

EXPENDITURE

An estimate of expenditure incurred in the search for oil in Victoria is given in Table 8.

TABLE 8.

	£	Total £
To the end of 1945:		
Victorian Government (1924-32 and 1935-41)	35,000	
Nelson Bore	36,385	
Commonwealth Government (1935-41)	19,000	
Nelson Bore	36,385	
Oil Search Limited		
Test Wells	9,700	
Geology, geophysics and scout drilling	11,000	
Austral Oil Drilling Syndicate	40,000	
Other Oil Companies (including South Australian Oil Wells)	105,000	292,470
1946-1958		
Frome-Broken Hill Co. Pty Ltd and Frome Lakes Pty Ltd	591,126	
Woodside (Lakes Entrance) Oil Co. N.L.	649,885	
Dome Oil and Minerals Syndicate N.L.	5,833	
Westralian Oil Ltd	8,785	
Victorian Oil N.L.	900	
Sundry unrecorded, excluding expenditure by Lakes Oil Ltd on horizontal drilling from Lakes Entrance S. Shaft	150,000	1,406,529
	TOTAL	£1,698,999

GEOLOGY (Boutakoff, 1956)

Sedimentary basins which have not been severely deformed are the Carboniferous basins of the Mansfield district and the Grampians, the Jurassic basin of South Gippsland and the Otway Ranges, and the Tertiary basins of Gippsland, Port Phillip Bay, western Victoria, and north-western Victoria (part of the Murray Basin).

Mansfield Area.

In the Mansfield district, about 150 miles north-east of Melbourne, a sequence of sandstone, shale, limestone, and conglomerate, with Carboniferous fish remains near the top, dips at low angles to the west and is bounded on the west by a major fault. The rocks were deposited in an estuarine environment. No anticlines are known, but minor faults and stratigraphic traps would provide closure, so that, though not as favourable for oil accumulation as some other basins, the area should not be entirely disregarded.

The Grampians

Of probably the same age as the Mansfield beds are the marine (estuarine) sandstones and shales of the Grampians area (200 miles west of Melbourne). Here the sediments are faulted and gently folded, and oil could have originated and accumulated in them.

Jurassic Basin of South Gippsland and the Otway Ranges.

Outcropping in South Gippsland and in the Otway Ranges is a succession of fresh-water to estuarine greywacke, arkose, and coal, generally block-faulted and with some folds. The arenaceous rocks are not likely to be a source of oil, but the coal measures may give rise to dry gas. The Gippsland sequence may change eastward into marine sediments.

Gippsland Basin.

The Lakes Entrance area is part of a Tertiary marine basin of deposition which probably has not been deformed at all.

Pleistocene to upper Pliocene sand and clay rest on lower Pliocene shelly marl; each sequence is up to 250 feet thick. The lower Pliocene marl rests on about 700 feet of Miocene bryozoal limestone and marl, about 300 feet of Oligocene, or upper Eocene, micaceous marl and glanconitic sandstone, and 30 feet of Eocene ferruginous sandstone. Near Lakes Entrance, lower Tertiary sediments rest on a basement of granitic and metamorphic rocks; farther west they rest unconformably on Jurassic greywacke and arkose with coal. The Jurassic sediments crop out from 15 miles south-south-east of Traralgon to Western Port; they are unconformable on Palaeozoic sedimentary, metamorphic, and granitic rocks.

The Tertiary sediments of the Gippsland Lakes area dip southward at about 3^{o} or less.

Small oil and gas shows occur in the Miocene polyzoal limestone and in the Eocene glauconitic sandstone. Suitable structures are generally absent, and the low permeability of the glauconitic sandstone makes this area a poor prospect.

Port Phillip Bay

In the Tertiary sedimentary basin in the Port Phillip Bay district, the beds range in age from Eocene to Pliocene, and include marine, estuarine, and freshwater sediments - sandstone,

clay, limestone, and lignite. They have been folded and faulted in places (e.g. at Beaumaris and Torquay). No oil indications have been reported.

Otaway Basin

The South Australian border transects the Otway Basin of Mesozoic-Tertiary marine and freshwater sediments. Little information is available on the stratigraphy and structure of this basin, but the presence of more than 7,000 feet of marine sediments in the Nelson Bore (Crespin, 1954) justifies a search for structures (Ward, 1941 and 1946; Sprigg & Boutakoff, 1953). *

Murray Basin

The Murray Basin of Tertiary sediments extends from Murray Bridge to Corowa and from Wilcannia on the Darling River to Naracoorte.

Up to 350 feet of Pliocene sands rest on 150 feet of lower Pliocene clay which overlies about 550 feet of Miocene limestone, over 500 feet of Eocene ligneous clay and sand. Near Corowa marine and glacial Permian sediments underlie the Tertiary.

A broad uplift in the South Australian portion of the Murray Basin south of the Murray River extends into Victoria near Murrayville. Drilling has revealed the presence of many gentle anticlinal structures in the Tertiary strata of the basin. Some of these are depositional structures, but some at least are due to faulting in the pre-Tertiary bedrock (Gloe, 1947, p. 116).

Most of the holes put down in the Murray Basin have been water bores and in their logs no mention is made of gas or oil.

PRESENT STATUS OF EXPLORATION

The following held petroleum tenements in Victoria on 30th June 1959: Frome-Broken Hill Co. Pty Ltd; Lochiel Oil Search and Prospecting Co. Ltd; Woodside (Lakes Entrance) Oil Co. N.L.; Dome Oil and Minerals Syndicate N.L.; Lakes Oil Pty Ltd; Victorian Oil N.L.; Oilco Ltd; Australian Paper Manufacturers Ltd; Westralian Oil Ltd; A.E. Ekberg; J.G. Fuller. (For details see Appendix 4 and Plate 11.)

The stratigraphy and structure of the eastern (marine) and western (terrestrial) parts of the Gippsland Tertiary basin have been established, but the details of variation between the two areas are not known. The regional shape of the basin has been established by gravity and aeromagnetic surveys and drilling. Little is known of the detailed stratigraphy of the Mesozoic sediments of Gippsland and the Otway Ranges; the structure of the areas of outcrop is broadly known. The stratigraphy and structure of the Tertiary and Mesozoic sediments of western Victoria have not been established. Work by Frome-Broken Hill Co. Pty Ltd, the Mines Department of Victoria, and the Bureau of Mineral Resources is increasing the data available. The Port Fairy bore, drilled by the Victorian Mines Department to a total depth of 5,521 feet, discovered Mesozoic fossils. The Geological Survey of Victoria is investigating the stratigraphy of the Tertiary sediments of the Murray Basin and geophysical surveys have been made by several companies.

* Gas and condensate were encountered in December, 1959 in Port Campbell No. 1 Bore between 5,656 and 5,666 in bretaceous sandstone.


PLATE 8.
136°
142°
26°
32°
Haddon Downs (5)
The Alberga
Innamincka
QUEENSLAND
Oodnadatta (4)
The Warburton
L. Eyre
Cooper Ck.
Kopperamanna
Tilcha
SOUTH AUSTRALIA
NEW SOUTH WALES
Cootabarlow
L. Frome
Lakeside
Black Oak
Woomera
L. Torrens
Parachilna (2)
L. Gairdner
L. Torrens
BROKEN HILL
Wilkatana (24)
PORT AUGUSTA
Hd. Clinton (2)
(2) Maitland
Mallala
Pt. Victoria
Pt. Gawler
Minlaton (2)
Hd. Yatala
Ramsay
Wannilla
Peezy Swamp
Stansbury
ADELAIDE
Loxton
Murray R.
Tailem Bend
Black Swamp
Pinnaroo
Coonalpyn
Kangaroo Island
Hd. C... dwell (7)
Keith
VICTORIA
Kingston
(4) Hd. Lacepede
Robe
Comaum
Riddoch
Hindmarsh
Mt. Gambier
Mumbanna
Dartmoor (24)
Hamilton
BALLARAT
Hd. Caroline
Nelson
(2) Portland
Polpara
38°
100 0 100 200 MILES
EASTERN SOUTH AUSTRALIA AND WESTERN VICTORIA
Reference
Dry hole.
Dry hole with show of oil.
Dry hole with show of wet gas.
(2) Number of bores in vicinity.
Bureau of Mineral Resources, Geology & Geophysics, Canberra, August 1959. Report 41A
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TASMANIA

(See Plate 1).

Sediments older than Permian in Tasmania are too strongly indurated and deformed to offer any possibility of petroleum accumulation. The east-central area of Tasmania contains marine and terrestrial sediments of Permian and Triassic age intruded by dolerite sills. The limits of the basin of deposition are poorly defined, but, roughly, the western edge of the basin runs from Davenport to Dover and the eastern edge from Launceston to St. Mary's.

The only locality where any extensive drilling has been done is the Mersey Valley district (McIntosh Reid, 1924), where two companies have between them drilled 21 holes at an estimated cost of £60,000. Mersey Valley Oil Co. Ltd drilled nine holes totalling 5,781 feet, and Adelaide Oil Exploration Company drilled twelve holes with an aggregate depth of 8,507 feet.

A hole was drilled in 1915 to a depth of 430 feet on Bruny Island. Some shallow drilling has been done elsewhere.

The total expenditure on oil drilling in Tasmania is about £125,000.

SOUTH AUSTRALIA

(See Plate 8).

HISTORY OF INVESTIGATIONS

The presence of coorongite, known since 1852, early directed attention to the Coorong area, where the first bore for oil was drilled in 1892. Seven bores, with an aggregate depth of 4,916 feet, have been drilled in this area. From 1915 to 1919 six bores were drilled in the Robe area, and from 1925 to 1930 seven bores were drilled in the Mount Gambier district.

Up to 1930, no geological or geophysical mapping had been attempted. In 1930 a geological survey indicated an anticline about five miles west-north-west of Mount Gambier. A magnetometer survey was carried out on this structure, which was then drilled. Only one bore was put down and only one other bore has since been drilled in this district.

In 1954, after geological surveys by State geologists in both South Australia and Victoria (Sprigg & Boutakoff, 1953), the Mines Department of South Australia conducted a gravity survey of the south-eastern part of South Australia, and the Bureau of Mineral Resources made a gravity survey of the adjoining area of Victoria.

Before World War II, bores had been drilled, mainly near supposed petroleum indications, in Yorke Peninsula, Eyre Peninsula, the Adelaide Plains, and Kangaroo Island. Stratigraphic drilling by the South Australian Mines Department on Yorke Peninsula has found "grease" and slicks of oil in Permian tillite and underlying Cambrian beds.

TABLE 9.

SUMMARY OF BORES DRILLED FOR OIL IN SOUTH AUSTRALIA TO 1950

Year Drilled	Name of Company	Location of Bore	Total Depth	Depth to Basement	Strata Penetrated	Nature of Bottom	Reason for Site Selection
?	Adelaide Oil Exploration Co.	Sec. 9. Hd. Riddock	1045	-	Oligocene with basalts	Tertiary Sand	Unknown
1930	" "	Maitland, Showground, Hd. Maitland	404	Surface	Precambrian gneiss	Precambrian gneiss	"
1931	" "	Sec. 107 Hd. Maitland	1549	"	" "	" "	"
?	" "	Minlaton Sec. 71 Hd. Minlacowie	1942	?	No reliable record	? Precambrian Limestone	"
	American Beach Oil Co.	Sec. 134 Hd. Dudley K.I.	961	292	0-135 Pleistocene sands 135-292 Tertiary clays	Precambrian schist.	
1923	Assoc. Oil Corporation	Sec. 301 Hd. Blanche	2110	-	Oligocene, lower Tertiary	Lower Tertiary	"
1920	Black Swamp OilCo.	Sec. 267 Hd. Nangkita	352	Surface	Permian tillite	Permian tillite	Iron oxide films
1926	Co-op. Oil Co.	Sec. 103 Hd. Yatala	1354	-	0-33 Recent 33-1354 Tertiary	Tertiary	Diviner's site.
1922	Coorong Oil Co.	Salt Creek, County Cardwell	931	924	0-503 Recent & Ter- 503-924 Tillite (tiary.	Precambrian Slate	Shores of Coorong
1924	" "	(1) Section B. Hundred Santo	650	190	0-190 Tertiary	Precambrian Phyllite	
1924	" "	(2) " "	656	-		Tertiary	
1924	" "	(3) " "	701			"	
1932	Enterprise Oil Prospecting Co.	Salt Creek County Cardwell	606	518	No record	Precambrian Slate	
1933	" "	" "	450	400	0-36 Recent 36-400 Tertiary	Precambrian Slate & Schist	
?	" "	Section 442 N.E. Hd. Lacepede	466	402	Pleistocene-Eocene	Precambrian Slate	

Year Drilled	Name of Company	Location of Bore	Total Depth	Depth to Basement	Strata Penetrated	Nature of Bottom	Reason for Site Selection
?	Enterprise Oil Prospecting Co.	Section 442 N.E. Hd. Lacepede	204	-	Pleistocene - upper Pliocene	Tertiary - upper Pliocene	Unknown
1914	Eyre Peninsula Oil Co.	Section 3P Hd. Wanilla	150	50	0-50 No record	Precambrian granite	"
1948/1950	Frome Broken Hill Co.	Tilcha Bore	2353	2351	0-650 Post Aptian-Recent 650-2222 Lower Cretaceous (Albian-Aptian) 2222-2351 Upper Jurassic (Blythsdale) 2351-2353 ? Bedrock		Oil and gas exploration based on extensive geological and geophysical Surveys.
	" "	Cootabarlow Bore	1615	1470	0-750 Post Aptian-Recent 750-1390 Lower Cretaceous (Albian-Aptian) 1390-1470 Upper Jurassic (?lower Cretaceous) (Blythsdale) 1470-1615 Quartzite - (Bedrock)		
	" "	Kopperamanna	3256	-	0-164 Recent-Tertiary 164-1124 Upper Cretaceous 1124-2885 Lower Cretaceous 2885-3256 Jurassic		
?	Hallions Bore Hole	Sec.Q.Hd.Port Gawler	603	-	Upper Middle Tertiary	Tertiary	Diviner's site
?	Kingston Amalgamated Oil Wells	Sec. 10B Hd. Murrabinna	1363	280	Oligocene-Eocene	Precambrian Slate	Unknown
?	Largs Bay Oil Co.	Largs Bay Jetty Hd. Port Adelaide	305	-	-	Tertiary sand and clay	"
1924	Mallala Lignite Bore Hole	Sec.534, Hd. Grace	543	503	Tertiary lignites	Clays (Weathered bedrock)	To test for lignite
	Mines Department	No.2 Bore hole Leigh Creek Coalfield	2101	1900	Triassic Coal Measures	Precambrian Slate	Testing coal basin.
?	Minlaton Oil Prospecting Synd.	Sec.112 Hd. Ramsay	1800	253	0-253 Cambrian limestone 253-1800 Upper & Middle Precambrian	Precambrian Limestone	Diviner's site.

Year Drilled	Name of Company	Location of Bore	Total Depth	Depth to Basement	Strata Penetrated	Nature of Bottom	Reason for Site Selection
	Mount Barker Oil Co.	Sec.3728 Hd. Macclesfield	407	Surface	-	Precambrian slate	Diviner's site
1930	Oil Search Limited	Sec.170 Hd.Blanche	2013	-	Oligocene, lower Tertiary	Lower Tertiary	Geological (Knight's Dome).
?	Peninsula Oil Syndicate	Sec. 153 Hd. Ramsay	315	105	0-105 Tertiary Sands 105-235 Permian Tillite	Precambrian Shales	Unknown
1931	" "	Sec.121 Hd. Moorowie	1132	661	0-138 Recent marine sediments 138-650 Permian Tillite 650-661 Limestone	Precambrian Schist	Diviner's site.
	Producers Oil Wells	Sec.150 Hd.Blanche	1220	-	Oligocene, lower Tertiary	Lower Tertiary	Unknown
1915	SA. Oil Wells Co.	Sec.714 Hd. Water-house	4504	?1475	-1475 Pleistocene, Oligocene, lower Tertiary, 1475-4504 Jurassic coal measures	Jurassic Shale	Unknown
1915	" "	Sec.195 Hd.Hindmarsh	1532	-	Oligocene, lower Tertiary	Tertiary Sand	"
1915	" "	Sec.337 Hd.Caroline	1226	-		Tertiary Sand and clay	"
	" "	" .336 " "	1824	-		" "	"
	" "	" 543 " "	1561	-		" "	"
	" "	" 598 " "	839	-		Tertiary sand	"
1892	Salt Creek Petroleum Co.	Salt Creek, County Cardwell	922	365	365 Tertiary	Precambrian Marble	Coorongite nearby.
	Southern Ocean Oil Co.	Sec.507, Hd.Lacepede	1170	-	No record	? Tertiary	Unknown

Year Drilled	Name of Company	Location of Bore	Total Depth	Depth to Basement	Strata Penetrated	Nature of Bottom	Reason for Site Selection
1925	Southern Ocean Oil Co.		2660	484	Pleistocene, Oligocene, Eocene	Precambrian Limestone & Quartzite	Unknown
Before 1914	Wakefield Prosp. Oil Shale Co.	Sec.161 Hd.Clinton	133	125	0-125 Recent and Tertiary	? Precambrian Slate	"
	" "	" "	147	125	" "		
1934	Wilkatana Bore hole	Pastoral Lease 1701 S of Lake Torrens	180		No information	?	"
	Zinc Corporation Ltd.	Lakeside Bore	1076	1072?	0-650 Post Aptian-Recent 650-990 Lower Cretaceous (Albian-Aptian) 990-1072 Upper Jurassic (?Lower Cretaceous) (Blythsdale). 1072-1076 Sandstone (?Bedrock)		
	" "	Black Oak Bore	454	448	0-360 Post Aptian-Recent 360-448 Lower Cretaceous (Aptian) 448-454 Bedrock (slate)		

Several artesian water bores in the area north and east of Lake Frome encountered inflammable gas; these bores were drilled on the south-western margin of the Great Artesian Basin. In 1946-1947, Frome-Broken Hill Co. Pty Ltd carried out extensive geological and geophysical surveys in the area north-east of Lake Frome, and drilled a bore at Kopperamanna and one at Lake Cootarbarlow. From 1955 to 1957, South Australia and Northern Territory Oil Search (Santos) Ltd drilled 24 bores at Wilkatana, where oil was reported in a water bore in 1934. Shows of oil were reported in Tertiary and Cambrian sediments.

Santos Ltd has carried out geological and geophysical surveys in north-eastern South Australia. Late in 1958 Delhi Australian Petroleum Ltd joined with Santos Ltd in the exploration of the Great Artesian Basin. Innamincka No. 1 was spudded in on 29th March 1959, and on 30th September 1959 had reached a depth of 11,212 feet. It is being subsidized under the Petroleum Search Subsidy Act 1957-1958.

Clarence River Basin Oil Exploration Co. N.L. carried out a geological survey of an area north of Woomera in 1956, and in 1958 drilled a stratigraphic bore, Woomera No. 1, to a total depth of 2,005 feet. The hole cut unfossiliferous red siltstone and quartz greywacke probably of Proterozoic age. It was subsidized under the Petroleum Search Subsidy Act 1957-1958.

In 1956 Australian Oil and Gas Corporation Ltd drilled a bore at Loxton to a total of 1,602 feet.

Murray Basin Oil Syndicate carried out an aeromagnetic survey of a large area between the Murray River and the Victorian border in 1955, and in 1958 drilled bores at Pinnaroo (final depth 1,280feet), Coonalpyn No. 1 (final depth 684 feet) and Keith No. 1 (final depth 960 feet).

Very small traces of free oil were recorded from the No.2 bore hole put down to test the coal measures at Leigh Creek (R.M.S.A., 1908, p.345). The Director of Mines has commented, also, that "possibly some oil was found in the 180-foot bore hole south of Lake Torrens, but, after the early report, attempts to collect even a few drops of oil were unsuccessful."

The Bureau of Mineral Resources made reconnaissance flights with the airborne magnetometer over the Eucla Basin in South Australia and Western Australia in 1954, and found that, though the sediments of the Eucla Basin generally are less than 2,000 feet thick, a separate basin with sediments more than 2,000 feet thick is developed between the north margin of the Eucla Basin and the crystalline Precambrian of the Musgrave Range (Quilty & Goodeve, 1958). These sediments may be Proterozoic or Palaeozoic or both (Glaessner & Parkin, 1958, p.85).

In 1955, gravity traverses were made by the Bureau along the Transcontinental Railway from Ooldea to Kalgoorlie and thence to Perth, along the Eyre Highway from Ceduna to Norseman, and from Mundrabilla on the highway to Forrest on the railway.

Table 9 lists bores drilled in South Australia up to 1950. It gives total depth, the nature of the formation at the bottom of the bore and the ages of the rocks penetrated. The co-operation of the State Mines Department in compiling this table is gratefully acknowledged. Most of the bores call for little comment, and many were put down at locations which could not be regarded as geologically favourable. The main interest, as stated above, has been in the south-east corner of South Australia, particularly the Mount Gambier district. The depth of bedrock in the

Mount Gambier district has never been determined, but as sedimentation in that area was continuous with adjoining areas across the border in Victoria, the Nelson Bore, which was drilled to a depth of 7,305 feet, served to outline the geological section for both States.

EXPENDITURE.

An estimate of expenditure on oil search in South Australia is as follows :

	£	£
Prior to 1942 (Estimated)		200,000
1942-1958		
Santos Limited	459,130	
Delhi Australian Petroleum Ltd	114,750	
Australian Oil & Gas. Corp. Ltd	11,855	
Enterprise Oil Expn Ltd	92,463	
Dome Oil and Minerals Synd. N.L.	14,458	
Frome-Broken Hill Co. Pty Ltd	10,446	
Oil Drilling and Exploration Ltd	2,355	
Clarence River Basin Oil Expln Co. N.L.	9,509	
South Australian Mines Department	36,500	
Sundry	50,000	801,466
	TOTAL	£1,001,466

GEOLOGY (Glaessner & Parkin, 1958).

There are four well-defined sedimentary basins in South Australia - the south-western part of the Great Artesian Basin, the south-western part of the Murray Basin, the eastern part of the Eucla Basin, and the Adelaide Basin. Sediments occur outside these basins, the most significant areas being Yorke Peninsula, the Torrens Basin, and the Officer Basin.

Great Artesian Basin

The portion of this basin in South Australia covers the north-east part of the State east from longitude 134° E and north from latitude 31½° S.

Stratigraphy. The Cainozoic is now known to be represented only by a thin layer of silicified sandstone forming the surface of buttes and mesas, and continental and salt-lake sediments deposited in topographic depressions such as Lake Eyre and Lake Frome. The silicified sandstone overlies 100 to 300 feet of light-coloured shale, mudstone, and sandstone, previously referred to the Eyrian, but now known to be equivalent to the upper part of the Cretaceous Winton Formation. This thickens to 2,500 feet of sandstone, shale, and green sandstone, with some lignite and lignitic shale, in the deepest part of the Basin. It is conformably underlain by the equivalent of the marine Tambo and Roma Formations, consisting mainly of dark grey shale with beds of green and grey limestone and calcareous sandstone. In the north-east corner of the State these two formations together are more than 2,500 feet thick. They rest conformably on the Cretaceous sandstone, 300 to 500 feet thick, which constitutes the main artesian aquifer in South Australia.

On the south-western edge of the Basin, Cretaceous sandstone directly overlies 2,500 feet of Permian shale, with intercalated coal seams near the top and glacigene shale and tillite lower down.

Structure. Boring for water and recent geological and geophysical surveys by Santos Ltd have shown that although the basin is generally synclinal there are many large anticlines and faults.

Oil and gas indications. Inflammable gas was reported in the Quinyambie New Homestead Bore (completed 1945) at the south edge of the basin near the border with New South Wales (Ward, 1946, p.216). This bore apparently reached the Jurassic sandstone. Few bores have reached Triassic or Permian strata. More recently "grease" and minor oil shows have been reported from water bores in the Oodnadatta district.

Murray Basin.

The boundary between the Murray Basin and the Otway Basin has not been defined but is most probably the Padthaway Horst, a basement ridge between Murray Bridge and Naracoorte. The Murray Basin extends northward from this ridge to about latitude 33° S.

Stratigraphy. In the South Australian part of the Murray Basin, the Lower Cretaceous marine sand and shale in the Loxton bore are the oldest known sediments. These are overlain by marine Tertiary lignitic sandstone, shale, and limestone that are 1,500 feet thick at Loxton and range down to about 400 feet at Coonalpyn.

Structure. The major synclinal structure of the Basin is apparently fairly simple, but some faults are indicated in the south-western area. Very little is known of the details of the structure of the pre-Tertiary sediments, or of the shape of the basin floor.

Oil and gas indications. No indications of oil or gas have been reported from bores in the South Australian part of the Murray Basin.

Otway Basin

The Otway Basin extends westward from the Victorian border to near Kingston, and is bounded on the north by the Padthaway basement ridge.

Stratigraphy. The Tertiary sequence thickens rapidly southward towards the Nelson Bore, which probably did not penetrate the full Tertiary section. The Oligocene-Miocene limestone has a maximum known thickness of 800 feet at Nelson Bore. Coal measures thought to be Jurassic were penetrated in the Robe bore from 1,475 to 4,504 feet.

Oil and gas indications. Inflammable gas was reported at 950 feet in the Blackford bore, about 12 miles east of Kingston (Ward, 1946, p.261).

Eucla Basin.

The portion of the Eucla Basin in South Australia extends from the border with Western Australia east to longitude 132°E and from the coast north to latitude 30°S. Its surface is the Nullabor Plain.

Stratigraphy. A total thickness of 1,150 feet of sediments has been proved by drilling in the South Australian portion of the Basin. The Tertiary beds are 700 feet thick and consist of marine limestone underlain by paralic sediments. They conformably overlie Cretaceous estuarine sands, with some marine bands, totalling 450 feet.

Structure. Information obtained from drilling shows no evidence of anticlinal or fault structures, though they may exist.

Oil and gas indications. Gas was reported at 220 feet in the Muddaugana bore (130°45'E; 21°20'S;)

St. Vincent Basin

The St. Vincent Basin is a small Tertiary and possibly Cretaceous basin on the eastern shore and under the waters of St Vincent Gulf.

Stratigraphy. According to the Department of Mines of South Australia, Cainozoic sediments only are known in this basin, ranging in age from Eocene to Recent. However, Miss Irene Crespin believes, on the evidence of arenaceous foraminifera, that Lower Cretaceous is present. The age of the sediments therefore may range from Cretaceous to Recent, with an unconformity above the Lower Cretaceous sandstone, another above the Eocene sandstone, and a disconformity between the middle Miocene and the Pliocene. The deepest section penetrated was 2,242 feet in a bore at Croydon near Adelaide; it consisted of 385 feet of Recent to Pleistocene sands and clays, 230 feet of Pliocene clay, limestone, and calcareous sand, and 1,637 feet of marine sand, limestone, and calcareous sandstone, with some paralic clays and sands.

Structure. The St Vincent Basin is mainly a down-warp, although some of the older faults moved during the warping. Gentle anticlines are developed in the Tertiary sediments.

Oil and gas indications. No oil or gas has been reported from the many bores drilled for water, but very few penetrated the full thickness of sedimentary rocks.

Yorke Peninsula

Stratigraphy. On the northern part of Yorke Peninsula two Cambrian limestone beds, the Parara Limestone, 450 feet or more thick, and the Kulpara Limestone, 1,200 feet thick, crop out. (They occupy a similar stratigraphical position to those explored by Santos Ltd at Wilkatana.) Farther south they are overlain by 600 feet or more of Permian fluvioglacial material and Tertiary clays and sands. At Minlaton a stratigraphic bore drilled by the Department of Mines penetrated Permian glacial and marine sediments and entered the Cambrian at 640 feet; it passed through the

following Cambrian succession: Wirrealpa Limestone 80 feet, red bed clastics 361 feet, limestone conglomerate and chocolate shale 90 feet, Parara Limestone 946 feet, Kulpara Limestone 1,000 feet. The Kulpara Limestone is highly porous, the Parara less porous, and the Wirrealpa only slightly so. Farther south at Stansbury another bore passed through 920 feet of Permian sediments into unidentified bedrock.

Structure. At this stage little is known about the structure of the buried Cambrian rocks. Geophysical methods are the only means of determining structure. Trial gravity, magnetic and seismic surveys have been conducted by the Department of Mines, but poor surface conditions have rendered all but the continuous refraction seismic method unsuitable. Difficult shothole drilling conditions make this method expensive.

Oil and gas indications. Small amounts of "grease" and gas were encountered in both the Minlaton and Stansbury bores at and above the Cambrian-Permian contact. No shows have been recorded in the Cambrian itself.

Torrens Basin.

A poorly-defined area of Lower Palaeozoic and probably Upper Proterozoic sediments, covered in part by Tertiary sediments, lies north and west of Port Pirie. Little is published on the details of the stratigraphy and structure of the Basin; Santos Ltd carried out geological surveys in the area.

Oil and gas indications. Oil was reported from a water bore at Wilkatana Station in 1934. Santos Ltd have drilled 24 holes, in many of which they report shows of oil and gas in both Tertiary and Cambrian sediments.

PRESENT STATUS OF EXPLORATION.

As at 30th June, 1959, five companies - Santos Ltd; Clarence River Basin Oil Exploration Co. N.L.; Oil Drilling & Exploration Ltd (Exoil Pty Ltd); Delhi Australian Petroleum Ltd; and General Exploration of Australia Ltd - hold Oil Exploration Licences in South Australia. For details see Appendix 4 and Plate 11.

Geological, gravity, and seismic surveys and scout drilling by Santos Ltd resulted in the discovery of several large anticlines in the central area of the Great Artesian Basin. Delhi Australian Petroleum Ltd joined with Santos Ltd to explore this area in 1958; they were later joined by Frome-Broken Hill Co. Pty Ltd, and the group is drilling a deep stratigraphic test at Innamincka. The work by Santos Ltd and the entry of Delhi Australian Petroleum Ltd have stimulated interest in a large adjoining area in Queensland, Northern Territory, and New South Wales.

The thick sedimentary sequence indicated by seismic surveys was confirmed in the drilling at Innamincka. Much additional seismic, gravity, geological, and, particularly, drilling investigation is required before even the regional outlines of the stratigraphy and structure are established; in particular, very little is known of the stratigraphy and structure of the rocks underlying the Mesozoic in the greater part of the Great Artesian Basin.

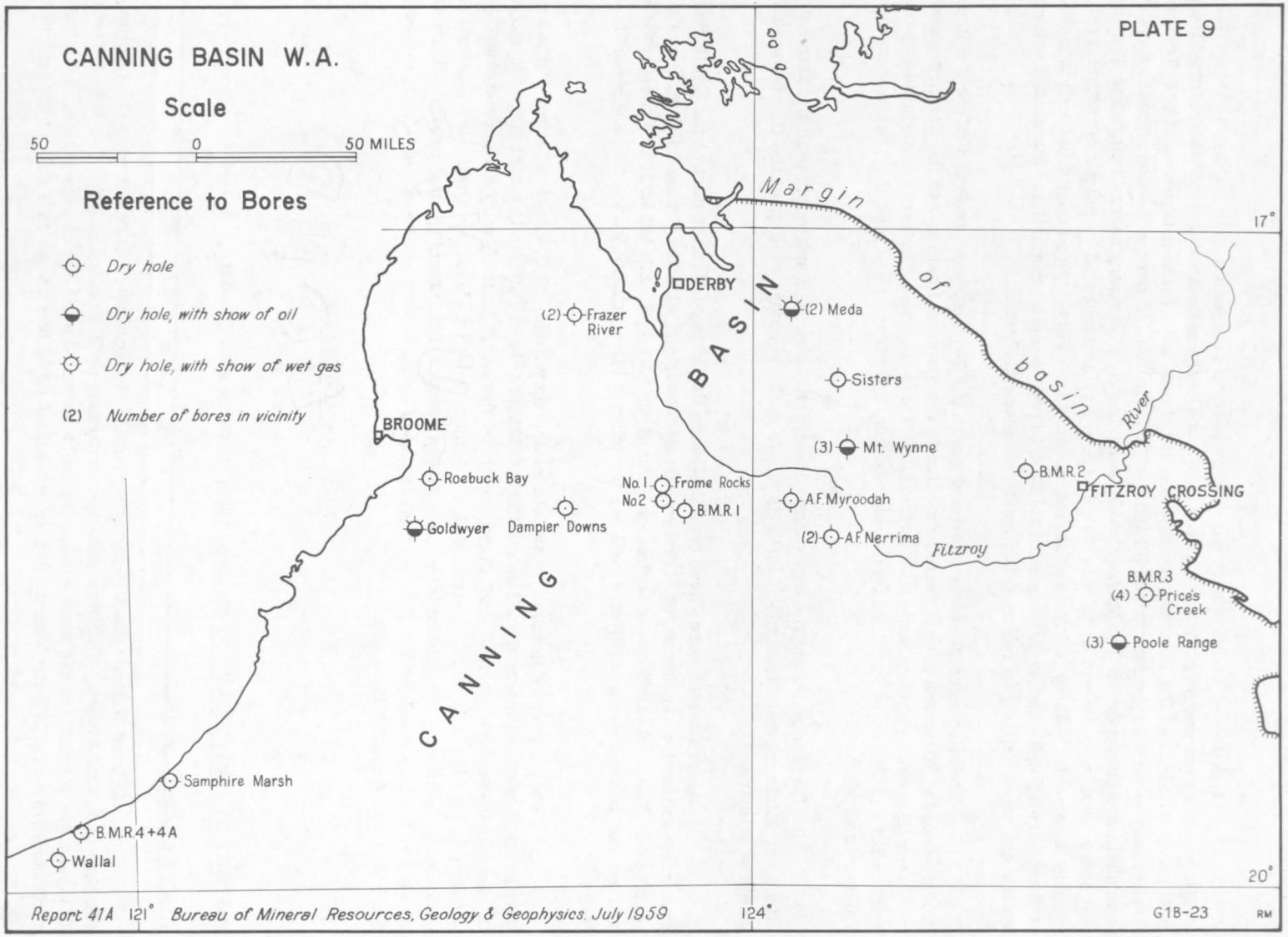
PLATE 9
CANNING BASIN W.A.
Scale
50 0 50 MILES
Reference to Bores
Dry hole
Dry hole, with show of oil
Dry hole, with show of wet gas
(2) Number of bores in vicinity
Margin of basin
River
17°
DERBY
(2) Frazer River
(2) Meda
BASIN
Sisters
BROOME
(3) Mt. Wynne
B.M.R.2
FITZROY CROSSING
Roebuck Bay
No.1 Frome Rocks
No.2 B.M.R.1
A.F. Myroodah
Goldwyer
Dampier Downs
(2) A.F. Nerrima
Fitzroy
B.M.R.3
(4) Prices Creek
(3) Poole Range
CANNING
Samphire Marsh
B.M.R.4+4A
Wallal
20°
Report 41A
121°
Bureau of Mineral Resources, Geology & Geophysics. July 1959
124°
G1B-23
RM

Gravity and aeromagnetic surveys by several companies and work by the Department of Mines have provided a fairly clear regional picture of the structural form of the Murray Basin in South Australia, and the Tertiary stratigraphy is established. All that is known of pre-Tertiary stratigraphy is that, in the Australian Oil and Gas Corporation Ltd bore at Loxton, marine Cretaceous shale was encountered. The Murray Basin is apparently a Tertiary basin; before the Tertiary the same area was occupied by several discrete basins separated by ridges of metamorphic-igneous basement. Nothing is known about the extent of pre-Tertiary sediments in these basins or of their stratigraphy and significance in relation to petroleum accumulation. Integrated seismic survey and scout drilling is required to investigate these problems.

The discovery of shows of oil and gas in the Tertiary sandstone and in the Cambrian limestone of the Wilkatana area directed attention to the Torrens Basin and to the Cambrian sediments which probably cover a large area around Lake Torrens, under Tertiary cover in most parts. Much additional work is required on the stratigraphy and structure of both the Tertiary and pre-Tertiary sediments.

On Yorke Peninsula bores have been drilled by the South Australian Department of Mines, at Minlaton and Stansbury. Little is known of the regional geology of the Cambrian sediments of this area.

Several water bores have been drilled in the South Australian part of the Eucla Basin These established a sequence of Tertiary, Cretaceous, and older sediments dipping generally southward. The total thickness of sediments is small (up to 1,400 feet), but as it is almost entirely marine the Basin merits additional drilling to indicate stratigraphic variations and potential oil traps.

A previously unknown basin containing more than 20,000 feet of Lower Palaeozoic (and Proterozoic) sediments (Glaessner & Parkin, 1958) has been indicated by aeromagnetic survey in the north-western part of the State, north of the Eucla Basin (Quilty & Goodeve, 1958). It appears to be confined at its eastern end but extends west into Western Australia. Sturtian and Ordovician sediments crop out on the north-eastern margin. The name "Officer Basin," which was suggested for this basin by Mr. R.C. Sprigg, has been accepted by the Geological Surveys of South Australia and Western Australia.

WESTERN AUSTRALIA

(See Plates 9 and 10)

HISTORY OF INVESTIGATIONS (Hobson, 1936; McWhae et al., 1958).

Kimberley Area (See Plate 9).

In 1919 Walter Oakes reported the finding of glance pitch in basalt near the junction of the Negri and Ord Rivers. The discovery was confirmed by Blatchford (1922). The Oakes-Durack Company was formed and the area was geologically examined by D.J. Mahoney (1922). As a result of Mahoney's work, a bore was drilled to a depth of 1,196 feet on the east side of the Ord River

about 30 miles south of the Negri-Ord junction. From 788 feet onwards the bore passed through basalt. Gas with a petroliferous and sulphurous odour was noticed when the bore was 788 feet deep.

In 1919, Harry Price reported that he had obtained traces of oil in a water bore being sunk on Gogo Station, West Kimberley Division. This discovery was also confirmed by Blatchford (1922). Freney-Kimberley Oil Company was formed and geological work was started. Four bores ranging in depth from 340 to 1,008 feet were drilled near Price's water bore between September 1922 and late 1923. No. 1 (1,008 feet), drilled September to December 1922, No. 2 (340 feet), drilled December 1922, and No. 3, (809 feet), drilled January to May 1923, were all sunk close to Price's original bore, and showed traces of oil, but No. 4 (444 feet), two miles to the west, showed none. Nos. 1, 2, and 3 were drilled in limestone, now known to be of Ordovician age. No. 4 started in Permian Grant Formation and passed into Devonian limestone at 444 feet.

Blatchford and Talbot continued geological surveys throughout the Fitzroy Basin; a drilling site was selected at Mt. Wynne. Calyx drilling began about the middle of 1922. When the first hole had reached a depth of 896 feet, it was decided to change to percussion drilling, but the hole was found to be crooked, and was abandoned. Bituminous material was recorded at several depths: 109 feet, 118 feet 6 inches, 121 feet 6 inches, 225 feet, and 274 feet (?). Samples obtained at 120 feet were examined by Simpson (1922) and were considered to be true petroleum residues.

Mt. Wynne No. 2, also beginning near the top of the Grant Formation, was carried to a depth of 2,154 feet. The log of this bore is given by Blatchford (1927), and shows that globules of oil and bituminous material were noted at various depths between 524 feet and 1,886 feet. Bituminous material was also found in the hole above 524 feet. A water-shut-off was attempted at 2,084 feet, but failed because the shale band was thin and underlain by a friable sand containing water. Drilling was stopped in September 1925.

As a result of Dr. Wade's visit of inspection in 1924 and work by Blatchford and Talbot at Poole Range, drilling was started about 100 feet below the top of the Grant Formation on the Poole Range structure. A pilot hole was drilled to a depth of 1,051 feet.

The test bore was drilled to 3,264 feet. Many water sands were met, and although several attempts were made to cement or case off these aquifers none was successful. Shows of oil were reported at several depths, the best between 2,085 and 2,115 feet (Blatchford, 1929). After further consideration of the original mapping of the area, a change in drilling site was proposed. The drawing of structure contours disclosed an apparently suitable structure east of the original site. Drilling at the new site was suspended at 1,545 feet.

Wade mapped a faulted anticline at Nerrima, and the Freney-Kimberley Oil Co. started its Nerrima Bore on 22nd September 1939. The bore had reached a depth of 4,271 feet when operations were suspended (because of the war) in February 1942. Slight gas shows were reported at 2,285 feet and 3,206 feet. The company resumed operations on the bore in March 1949, but owing to insurmountable mechanical difficulties the hole was abandoned at its original depth.

After the discovery of oil at Rough Range in November 1953, Freney Kimberley Oil Co. (1932) N.L., which was formed from the old Freney Kimberley Oil Co., joined Associated

Australian Oilfields N.L. to form a new company, Associated Freney Oil Fields N.L. This company carried out geological and geophysical surveys and in 1955 drilled a second bore, No. AFO-1, on the Nerrima Anticline to a depth of 9,072 feet. Permian Noonkanbah Formation was cut from the surface to 900 feet, Poole Sandstone from 990 to 2,165 feet and Grant Formation from 2,165 to 8,010 feet; Upper Carboniferous was penetrated from 8,010 feet to 9,072 feet. Oil-stained sandstone was encountered in the top of the Grant Formation.

Associated Freney Oil Fields N.L. drilled a bore on Myroodah Anticline during 1955 and 1956, after the Bureau of Mineral Resources had carried out gravity and seismic surveys over the area. The total depth reached was 6,001 feet. The following formations of Permian age were penetrated: Liveringa Formation to 1,430 feet; Noonkanbah Formation 1,430 - 2,702 feet; Poole Sandstone 2,702 - 3,810 feet; Grant Formation 3,810 - 6,001 feet. No shows of oil or gas were reported.

The same company did geological and geophysical work over a poorly exposed structure on the Sisters Plateau. The Ryan Anticline was discovered and a bore, Sisters No. 1, was started late in 1956 and completed in 1957 at a depth of 9,828 feet. A small vug containing oil was reported from the interval 8,896 - 8,902 feet and some 'tar' at 7,835 feet, 7,915 feet, and 8,995 feet. The following stratigraphic sequence was drilled: Permian to 5,183 feet (1,108 feet of Liveringa Formation, 730 feet of Noonkanbah Formation); Carboniferous, 5,183 - 6,190 feet (667 feet of Upper or Middle Carboniferous, 340 feet of Lower Carboniferous); Devonian, 6,190 - 9,828 feet (3,638 feet of Upper Devonian).

In 1940 and 1941 Caltex Oil Development Pty Ltd carried out geological reconnaissance in the Fitzroy valley and in the Carnarvon and Perth Basins, but no drilling was done.

From 1946 to 1949, the Fitzroy Basin was surveyed geologically and from the air by geologists of Bonaparte Gulf Co. Ltd, a company formed by D'Arcy Exploration Co. Ltd, Vacuum Oil Co. Pty Ltd, and Zinc Corporation Ltd.

Geologists and geophysicists of the Bureau of Mineral Resources have been carrying out detailed regional and some detailed surveys in the Fitzroy Basin from 1947 and in the Carnarvon Basin from 1948. The Bureau has also drilled three stratigraphic bores in the Fitzroy Basin (Henderson, 1956).

Partly as a result of the early work of the Bureau geologists, the company holding the Permits to Explore for Petroleum, both in the Kimberley area and in the North West Division (Ampol Petroleum Ltd), was able to form an operating company with Caltex, West Australian Petroleum Pty Ltd. This company has carried out geological and geophysical surveys in the Canning, Carnarvon, and Perth Basins and has drilled several test and stratigraphic holes in the first two Basins. One bore (Grant Range No. 1) was drilled on the crest of the Grant Range Anticline, after geological and geophysical surveys had been carried out. It was drilled to 12,915 feet, passing through Permian Grant Formation from surface to about 7,800 feet, Upper Carboniferous siltstone from about 7,800 to 9,550 feet, evaporites from 9,550 to 10,150 feet, and hard sandstone from 10,150 feet to total depth. No oil or gas shows were reported.

West Australian Petroleum Pty Ltd, after geophysical surveys and core-drilling, also drilled a test on the Dampier Peninsula. This bore, Fraser River No. 1, was drilled in 1955-1956 to 10,144 feet, finishing in gabbro, probably of Precambrian age.

In 1954 and 1955, Westralian Oil Ltd did some geological work along the northern margin of the Fitzroy Basin.

In 1954 and 1955 several small companies and syndicates held permits to explore in various parts of Western Australia, but did little work.

In 1955, the Bureau of Mineral Resources, on the basis of a gravity survey by its Geophysical Section and a seismic profile obtained by West Australian Petroleum Pty Ltd, drilled a stratigraphic bore, B.M.R. No. 1, on Jurgurra Creek south of the "Fenton Fault", to establish stratigraphic and structural relationships across the "Fault". This bore, which had to be abandoned at 1,680 feet when the drill pipe became stuck, started in Permian Noonkanbah Formation, not in Jurassic as had been expected, and passed out of Noonkanbah at 770 feet; Poole Sandstone was cut from 770 feet to the bottom. This established that there was little displacement across the "Fenton Fault" and that the Permian formations continued across it at this place without obvious change.

In late 1955 and 1956, the Bureau of Mineral Resources drilled a stratigraphic bore, B.M.R. No. 2, to 4,000 feet at Laurel Downs to obtain a section of the newly discovered Lower Carboniferous and to examine changes in thickness and lithology of the Carboniferous and Devonian as far out into the Basin from outcrop as practicable. Although the outcrop is only ten miles away, the lithology and thickness in the bore are very different, and indicate a change into petroleum source-bed type.

In 1956, the Bureau of Mineral Resources drilled a stratigraphic bore in the Price's Creek area to determine the total thickness of the Ordovician sediments and what rocks were beneath them. This bore, B.M.R. No. 3, was drilled to 694 feet; the Lower Ordovician Price's Creek Group probably continues from the surface down to 325 feet; below this are 268 feet of arkose and 60 feet of tuff which may be Ordovician or possibly Cambrian; under this is hard schist and hornfels, probably Precambrian.

The Bureau of Mineral Resources flew reconnaissance aeromagnetic traverses over much of the Canning Basin in 1954. The profiles indicated areas of shallow basement immediately south of the "Fenton Fault", east from near Anna Plains, and near Wallal. West Australian Petroleum Pty Ltd carried out more detailed aeromagnetic surveys in the coastal region of the Basin and a detailed gravity survey of the area.

As a result of this work the company drilled Roebuck Bay No. 1 in 1956, to a total depth of 4,000 feet. Jurassic siltstone and Permian Grant Formation were reported; Devonian or Ordovician calcarenite underlies the Grant Formation at 3,354 feet; Ordovician dolomite appears at 3,660 feet and continues to total depth (McWhae et al., 1958, p.29). West Australian Petroleum Pty Ltd drilled Dampier Downs No. 1 in 1956 to a total depth of 3,028 feet. McWhae et al. (1958) report Jurassic siltstone, Permian Grant Formation with foraminifera to 2,625 feet and Ordovician dolomite from 2,625 feet to total depth. Samphire Marsh No. 1 was drilled to a total depth of 6,664

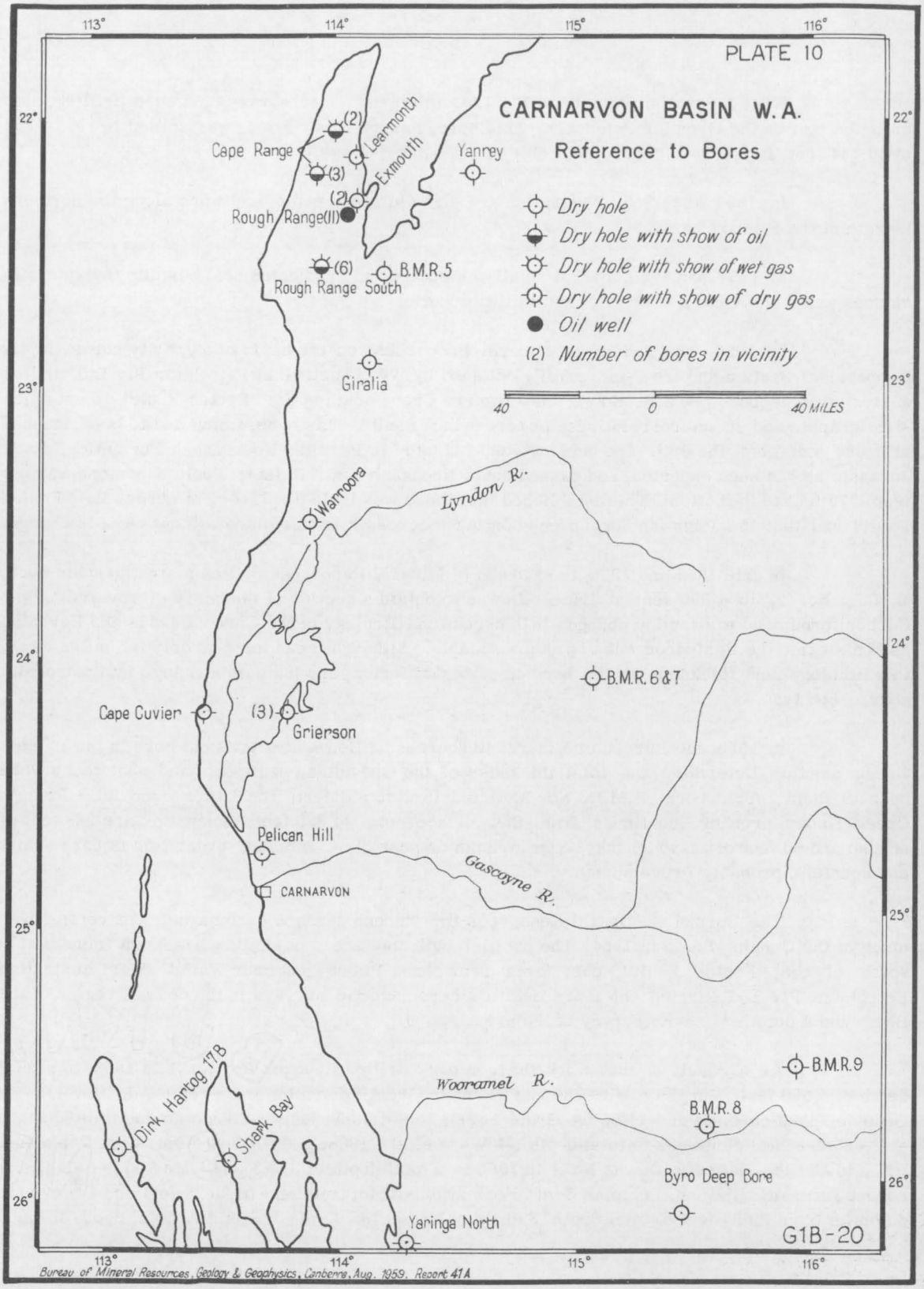
PLATE 10
CARNARVON BASIN W.A.
Reference to Bores
Dry hole
Dry hole with show of oil
Dry hole with show of wet gas
Dry hole with show of dry gas
Oil well
(2) Number of bores in vicinity
40 0 40 MILES
113°
114°
115°
116°
22°
23°
24°
25°
26°
Cape Range
(2)
Learmonth
Exmouth
(3)
(2)
Rough Range(II)
Yanrey
(6)
B.M.R.5
Rough Range South
Giralia
Warroora
Lyndon R.
B.M.R.6&7
Cape Cuvier
(3)
Grierson
Pelican Hill
CARNARVON
Gascoyne R.
Dirk Hartog I.
Shark Bay
Wooramel R.
B.M.R.9
B.M.R.8
Byro Deep Bore
Yaringa North
G1B-20
Bureau of Mineral Resources, Geology & Geophysics, Canberra, Aug. 1959. Report 41A

feet; it was subsidised under the Petroleum Search Subsidy Act 1957-1958. Quaternary sediments were penetrated to 140 feet, Cretaceous Broome Sandstone between 140 and 560 feet, Jurassic Jarlemai Siltstone from 560 to 816 feet, Alexander Formation from 816 to 1,170 feet, Jurgurra Sandstone from 1,170 to 2,258 feet, Permian Grant Formation from 2,258 to 4,070 feet, Lower Ordovician shale and calcilutite from 4,070 feet to 5,500 feet, sandstone and siltstone from 5,500 to 5,200 feet, quartz sandstone from 6,200 to 6,610 feet, gneissic granite from 6,610 feet to total depth. Goldwyer No. 1 was drilled in 1958 by West Australian Petroleum Pty Ltd to a total depth of 4,720 feet. Limestone was reported at 3,561 and 4,013 feet, limestone and dark grey shale at 4,326 feet, and basement at total depth.

In 1958 the Bureau of Mineral Resources drilled B.M.R. No. 4 (Wallal) to 1,410 feet, when artesian water caused the hole to be abandoned. B.M.R. No. 4A (Wallal) was drilled nearby to a total depth of 2,229 feet, penetrating Quaternary sediments to 78 feet, Lower Cretaceous sandstone from 78 to 346 feet, Jurassic siltstone from 346 to 910 feet, Jurassic sandstone from 910 to 1,797 feet, Jurassic or Triassic siltstone from 1,797 to 1,990 feet, Permian siltstone from 1,990 to 2,224 feet, and granitic gneiss from 2,224 to 2,229 feet.

West Australian Petroleum Pty Ltd carried out seismic surveys east of Broome and in the Meda area, and in 1958 drilled Meda No. 1 to a total depth of 8,809 feet. This operation also received Commonwealth subsidy under the Petroleum Search Subsidy Act 1957-1958. V. Pudovskis (Company Completion Report) gives the following sequence : alluvium to 60 feet; Triassic or Upper Permian Blina Shale 60 - 714 feet, Upper Permian Liveringa Formation 714 - 1,303 feet, Permian Noonkanbah Formation 1,303 - 2,225 feet, Poole Sandstone 2,225 - 2,426 feet, Grant Formation 2,426 - 4,201 feet; Upper Carboniferous Anderson Formation 4,201 - 4,935 feet (sandy and tillitic siltstone 4,201 - 4,552 feet, sandstone 4,552 - 4,935 feet); Lower Carboniferous Laurel Formation 4,935 - 5,483 feet (siltstone and sandstone 4,935 - 5,168 feet, dolomitic limestone, calcarenite and siltstone 5,168 - 5,483 feet); Upper Devonian Fairfield Formation 5,483 - 6,620 feet, mainly of calcarenite, Upper Devonian reef complex 6,620 - 8,663 feet; Precambrian quartz-mica schist 8,663 - 8,809 feet. Shows of oil were reported at 5,110 - 5,133 feet, and shows of dry gas at 6,594 - 6,695 feet and 7,954 - 7,669 feet.

Meda No. 2 was drilled in 1959 to a depth of 7,628 feet. A slight oil show was reported at 5,294 feet. Frome Rocks No. 1 was drilled in 1959 to a total depth of 4,000 feet. Rock salt and brecciated dolomite and dolomitic shale were cut from 2,263 feet to bottom. This operation also was subsidized under the Petroleum Search Subsidy Act. Frome Rocks No. 2 (also receiving Commonwealth subsidy) was drilled about four miles south of Frome Rocks No. 1 to 7,504 feet.

Carnarvon (North West) Basin (See Plate 10).

F.G. Clapp (1925), after a brief reconnaissance, reported unfavourably on the oil prospects of the area. W.G. Woolnough (1933) confirmed the existence of the Cape Range Anticline and noted several other anticlinal structures. Oil Search Ltd carried out reconnaissance surveys over the northern part of the Carnarvon Basin in 1932 to 1934, and detailed surveys in the Byro Plains area south of the Wooramel River (Condit, 1935; Raggatt, 1936). They drilled one bore at the south end of Byro Plains to a total depth of 2,218 feet; the sequence drilled was : Madeline Formation (siltstone and shale) 0-230 feet, Wooramel Group (sandstone) 230-1236 feet, Callytharra

and/or Carrandibby Formation (shale) 1,236 - 2,018 feet, Lyons Group (tillitic siltstone and grey-wache) 2,018 - 2,218 feet (total depth).

No further exploration was undertaken until 1948, when the Bureau of Mineral Resources began the systematic mapping of the Basin and established the existence of Devonian and Carboniferous as well as Permian sediments (Teichert, 1949).

Subsequently Ampol Petroleum Ltd took out a petroleum permit over the area and, as a result of the Bureau's stratigraphic discoveries, succeeded in interesting the Caltex group in undertaking exploratory work after Richfield Oil Corporation and Signal Oil and Gas Company had both examined the area but had not been able to continue with exploration. An exploration company, West Australian Petroleum Pty Ltd, was formed, with Caltex holding 80 per cent and Ampol Exploration Ltd 20 per cent of the shares. The Company holds Permits to explore and licences to prospect covering the whole of the Carvarvon Basin.

In October, 1958, the Royal Dutch-Shell Company joined West Australian Petroleum Pty Ltd, which was re-organized to give a two-sevenths interest to each of Royal Dutch-Shell, California Asiatic Oil Co., and Texaco Overseas Petroleum Pty Ltd, and one-seventh of Ampol Exploration Ltd.

Geological and gravity surveys by the Bureau of Mineral Resources and seismic surveys by the Company enabled West Australian Petroleum Pty Ltd to site a well, Rough Range No. 1, on the east flank of an anticline in Miocene limestone; drilling started in September 1953. In November 1953, oil was discovered and tested at 500 bbl/day. After several days' testing, the oil sand in the Birdrong Formation was cemented off and drilling continued to 14,607 feet, where it was abandoned because of a stuck bit. Tertiary limestone was penetrated from surface to 1,300 feet, Cretaceous limestone and marl from 1,300 to 1,600 feet, Cretaceous shale from 1,600 to 3,604 feet, sandstone from 3,604 to 3,990 feet, Lower Cretaceous and Jurassic sandstone and siltstone from 3,990 to 6,235 feet, Permian and Lyons Group 6,235 to about 10,300 feet, Carboniferous siltstone and sandstone from 10,300 feet to total depth.

Rough Range No. 1A (T.D. 3,657 feet) was drilled close to No. 1, in order to carry out a production test. Rough Range No. 2 was drilled on the apex of the surface anticline to prove a gas cap in the oil sand, but penetrated the sand below the base of the oil column in Rough Range No. 1.

Rough Range Nos. 3, 4, 5, 6, 7, and 8 were drilled in an attempt to find an up-dip extension of the oil sand, but all found the sand below the base of the oil column in No. 1. After a careful seismic reflection survey, Rough Range No. 9 was drilled, but found the sand at the lowest level of all. Six structural holes have since been drilled on Rough Range South. One of these, Rough Range South No. 5, was drilled through the sand without finding oil. In 1957 Rough Range No. 10 (750 feet north-east of No. 1A) was drilled to a depth of 3,740 feet; slight indications of oil and gas were encountered between 3,651 and 3,664 feet.

The Cape Range Anticline was surveyed geologically by the Bureau of Mineral Resources, a gravity survey was run around it, and several trial seismic lines were surveyed. West Australian Petroleum Pty Ltd drilled Cape Range No. 1 on the north-eastern flank of the

anticline to a total depth of 8,019 feet. Cape Range No. 2 was drilled to a total depth of 15,170 feet, $2\frac{1}{2}$ miles south-south-west of Cape Range No. 1. It penetrated about 1,560 feet of Tertiary limestone 1,945 feet of Cretaceous shale, 215 feet of Cretaceous sandstone (the same as the oil sand in Rough No. 1), about 1,100 feet of Lower Cretaceous siltstone, and 10,360 feet of Jurassic siltstone. A gas show was encountered at 10,000 feet; this tested initially at 300,000 cubic feet/day, but dropped to 48,000 cubic feet/day.

Cape Range No.3A (3,737 feet) and No. 4(3,858 feet) were drilled to locate and examine the Birdrong oil sand. Oil and gas shows were reported from the sand in No.3A, but it was missing in No. 4.

Exploration holes have been drilled by West Australian Petroleum Pty Ltd on many of the exposed anticlines in the Basin. Giralia No. 1 was drilled on the east flank of the Giralia Anticline, near the apex, to a total depth of 4,080 feet. Lower Cretaceous shale and Birdrong sand were penetrated from surface to 370 feet, Permian siltstone and sandstone from 370 to 4,035 feet, and Permian Lyons Group from 4,035 feet to bottom. No oil indications were reported.

Warroora No. 1 was drilled on the east flank of the Warroora Anticline. Cretaceous sediments, including the Birdrong sand, were penetrated from surface to 1,100 feet. Below the Birdrong sand, Permian Lyons Group was penetrated from 1,353 feet to the total depth of 5,992 feet.

Grierson No. 1 (1,437 feet), No. 2 (1,501 feet), and No. 3(1,450 feet) were located on a traverse across the Grierson Anticline. Only a trace of oil was reported, from No. 1, at the top of the Birdrong sand. This well was completed as an artesian well.

Cuvier No. 1 was drilled on the Cuvier Anticline to a total depth of 1,500 feet. Beneath the base of the Birdrong sand at 1,337 feet, Devonian calcareous sediments were encountered.

At Dirk Hartog Island, 21 structure holes were drilled. A test bore (Dirk Hartog No. 17B) was started early in 1957, and was drilled to a depth of 4,998 feet. The Birdrong Formation was reached at 2,179 feet; no oil or gas was reported. At Yanrey, not far from the coast of Exmouth Gulf, Yanrey No. 1 was drilled to a depth of 1,413 feet. Precambrian schists were encountered at 1,383 feet.

In 1958, the Bureau of Mineral Resources drilled a stratigraphic bore, B.M.R. No. 5 (Giralia), on the north end of the Giralia Anticline to determine the nature and age of beds above an unconformity indicated by a seismic survey by the Bureau of Mineral Resources (Vale, 1951). BMR No. 5 was drilled to 2,070 feet and proved these beds to be Artinskian (Lower Permian). Two bores, BMR No. 6 and BMR No. 7, were drilled in a syncline in Permian rocks near Muderong Tank, Middalya Station, 95 miles east-north-west of Carnarvon, to provide information on the relationship between structure and sedimentation. They indicated that the syncline was present as a topographic basin during sedimentation.

Other areas

A few bores have been drilled for oil in the South-West Division.

EXPENDITURE.

The figures in Table 10 cover the major expenditure on oil search in Western Australia.

TABLE 10

Estimated Expenditure on Oil Search in Western Australia to the end of 1958.

	£	Total £
Prior to 1945:		
Freney Kimberley Oil Co.	138,283	
Commonwealth subsidy to F.K.O.	39,717	
State subsidy to F.K.O.	24,288	
Caltex Oil Development	37,500	
Oil Search Limited	12,000	
Minor Companies (estimated)	35,500	287,288
1946-1958		
Freney Kimberley Oil Co. (1932) N.L.	110,298	
West Australian Petroleum Pty Ltd	13,288,996	
Ampol Exploration Pty Ltd	431,420	
Associated Freney Oil Fields N.L. (including survey costs in N.T. to 1957)	866,355	
Westralian Oil Ltd (including survey costs in W.A., N.T., and Vic. to 1957)	132,345	
Gulf Oil Syndicate	1,900	
Frome-Broken Hill Co. Pty Ltd	6,614	
Sundry minor companies (estimated)	50,000	14,887,928
	TOTAL	£15,175,216

GEOLOGY

The seven main sedimentary basins in Western Australia are : the Eucla Basin, the Perth Basin, the Carnarvon Basin, the Canning Basin (which includes the Fitzroy Basin), the Ord Basin, the Bonaparte Gulf Basin, and the newly discovered Officer Basin north of the Eucla Basin.

Eucla Basin

The western part of the Eucla Basin extends from the South Australian border west to longitude 123°E and from the coast to about latitude 29°S.

Stratigraphy. About 1,000 feet of Tertiary limestone rests on 1,500 feet of Cretaceous, which rests unconformably on older sediments of unknown age, or on metamorphic or granitic basement.

Structure. The Eucla Basin is a depositional syncline. No folds or faults are known, but there are sure to be depositional folds even if tectonic folding has not occurred.

Oil and gas indications. No oil or gas indications are known from water bores in the Basin in Western Australia.

Perth Basin

The Perth Basin extends southwards from latitude 26°15,S. between the coast and the Precambrian tableland.

Stratigraphy. Very little is known of the stratigraphic detail of the Basin, but outcrops at the north end and information from water bores suggest that there may be at least 7,000 feet of Tertiary limestone, Cretaceous shale, Jurassic sandstone, and Permian sandstone and shale. A formation, perhaps 20,000 feet thick, of possible Ordovician age underlies the Permian.

Structure. Gravity, aeromagnetic, and seismic surveys indicate that the regional structure is synclinal, with at least 30,000 feet of sediments in the deepest part. Several anticlines have been indicated. A basement ridge extends north and south from the Precambrian inlier at Ajana.

Carnarvon Basin. (Condon, Johnstone, Perry, & Crespin 1953; Condon, 1954; Condon, Johnstone, Prichard, & Johnstone, 1954; McWhae et al., 1958).

The Carnarvon Basin stretches from Onslow to the Murchison River (latitude 22°S to 28°S) and from about longitude 116°E westward.

Stratigraphy. Along the coast Tertiary limestone 1,000 feet thick lies disconformably over Cretaceous limestone, shale, and sandstone, about 4,000 feet thick. In the Cape Range, a bore has been drilled through 10,360 feet of Jurassic siltstone, not represented in outcrop anywhere in the Basin. Outcropping at the eastern edge of the Basin, unconformably beneath the Cretaceous, is a conformable succession of Permian marine shale, sandstone, limestone, and glacial greywacke, 10,000 feet thick; Carbonaceous arkose and limestone about 2,000 feet thick; and Devonian sandstone, limestone, and greywacke about 4,000 feet thick. 2,425 feet of Silurian dolomite and limestone were penetrated in Dirk Hartog No. 17B (McWhae et al., 1958, p.31). Possible Lower Palaeozoic sediments about 15,000 feet thick are unconformable beneath Cretaceous and Permian sediments.

Structure. The Carnarvon Basin is made up of a number of subsidiary basins separated by ridges of Precambrian basement covered in most places by sedimentary sequences. Most of the major structures are depositional. Anticlines are known in the Tertiary and Mesozoic in the coastal region and are probably present in Palaeozoic sediments over some of the basement ridges.

Oil and gas indications. No oil or gas seepages are known. Gas has been reported from a water bore at Yaringa North near the south end of Shark Bay.

Oil was discovered in November 1953, in Rough Range No. 1; it was tested to flow at about 500 bbl/day. Nine other holes have been drilled on the same surface structure, but all have encountered the oil sand at a lower elevation than the base of the oil column in the discovery well.

A strong gas show was tested in Cape Range No. 2, but the rate was only 48,000 cubic feet per day. Gas was tested deep in the discovery well on Rough Range. Traces of oil were reported from Grierson No. 1.

Canning (including Fitzroy) Basin (Traves, Casey, & Wells, 1956; Guppy, Lindner, Rattigan, & Casey, 1958).

The Canning Basin is the second largest sedimentary basin in Australia, and covers an area of about 170,000 square miles. It extends along the north-west coast from east of Port Hedland to King Sound and from the coast covers a large U-shaped area extending eastward to longitude 128°30'E, and south beyond latitude 24°S. The large subsidiary basin forming the north-eastern part of the Canning Basin has been named the Fitzroy Basin.

Stratigraphy. At outcrop, about 15,000 feet of Ordovician, Devonian, Carboniferous, Triassic, and Jurassic marine and freshwater sediments overlie Precambrian rocks.

Ordovician rocks are known in outcrop only at Prices Creek, where they are about 2,800 feet thick and include petroliferous siltstone. Shelf-type Ordovician dolomite and calcarenite occur in West Australian Petroleum Pty Ltd's Roebuck Bay No. 1 and Dampier Downs No. 1 (McWhae et al., 1958, P.29). In the Samphire Marsh No. 1, Ordovician shale, calcilutite, and calcarenite were drilled from 4,070 to 6,610 feet. Devonian and Carboniferous sediments of variable thickness crop out along the north-eastern margin where they are about 5,000 feet thick, and mainly calcareous. Devonian calcareous sediments have been encountered in bores 17 miles from the north-eastern margin at Roebuck Bay. Upper Carboniferous carbonaceous shale and sandstone about 5,000 feet thick were drilled at Grant Range.

Permian rocks cropping out in the Fitzroy Basin comprise 5,000 feet of shallow marine and freshwater sandstone and shale. The sequence thins to the south and east, possibly to about 1,000 feet. In bores, the lowermost Permian formation, the Grant Formation, has been shown to be 8,500 feet thick at Grant Range, but only about 1,400 feet thick at Roebuck Bay, where the entire Permian sequence is only about 2,200 feet thick.

Triassic and Jurassic rocks comprise 1,000 feet of marine and freshwater sandstone and shale in outcrop. They unconformably overlie the Permian in the coastal aea and in the Derby and Edgar Range synclines. In Roebuck Bay No. 1 they are about 1,100 feet thick.

Structure. The Canning Basin is probably made up of three main basins separated by basement ridges. Only the northernmost, the Fitzroy Basin, has been named. The southernmost basin has been shown to be 6,610 feet deep by Samphire Marsh No. 1, and the southern shelf to have 2,146 feet of Permian and Mesozoic sediments at BMR No. 4 (Wallal).

The basement ridges appear to have been in existence throughout the history of the Canning Basin and to have controlled the sedimentation and the depositional structures. If this is so, they are undoubtedly the most favourable places in which to conduct exploration for oil.

Large anticlines occur in the marginal Devonian sediments and in the Permian sediments of the Fitzroy Basin.

Frome Rocks No. 1, drilled by West Australian Petroleum Pty Ltd, found intrusive rock salt, gypsum, and dolomite, from 2,263 feet to total depth (4,000 feet). In the south-east Canning Basin a probable salt dome has up-arched Permian and Cretaceous strata (Veevers & Wells, 1959). Salt domes may, therefore, be concealed beneath the Mesozoic cover.

Oil and gas indications. Many of the oil bores in the Fitzroy River area produced small shows of oil, gas, and bitumen. In the Prices Creek bores, traces of oil were reported in Ordovician limestone. At Mount Wynne bituminous material was reported from several depths in the first bore, and globules of oil between 524 feet and 1,886 feet and some bituminous material in the second bore. The Poole Range bore showed oil at 2,085 feet and 2,115 feet and gas and light oil at 3,138 feet. The Nerrima Bore obtained slight shows of gas at 2,285 feet and 3,206 feet. Shows of oil have been reported from West Australian Petroleum Pty Ltd's Goldwyer No. 1 and Meda No. 1.

Ord Basin

A Palaeozoic basin lies between longitudes 128°10'E. and 129°30'E and between latitudes 16°00'S. and 18°30'S., with an area of about 4,300 square miles. The area is drained by the Ord River and its tributaries.

Stratigraphy. Cambrian shale and sandstone 2,000 feet thick rest on Lower Cambrian shale and limestone 1,000 feet thick. This limestone rests on Cambrian basalt and agglomerate about 3,000 feet thick.

Structure. There are two synclinal basins - the Rosewood Basin (Cambrian sediments) and the Hardman Basin (Cambrian sediments, and basalt).

Oil and gas indications. Bituminous material occurs at the top of the basalt near the Negri-Ord River junction.

Bonaparte Gulf Basin.

The Bonaparte Gulf Basin occupies the area east and south of Bonaparte Gulf and an unknown part of the Gulf itself. It lies partly in Western Australia and partly in Northern Territory.

Stratigraphy. Cambrian, Ordovician, Devonian, Carboniferous and Permian sediments rest unconformably on Precambrian sediments, schist, and granite (Traves, 1955).

The Cambrian consists of about 2,000 feet of sandstone, limestone, and shale; the Ordovician of 550 feet of glauconitic sandstone; the Devonian of 3,000 feet of sandstone and 4,000 feet of calcareous sediments; the Carboniferous of 3,000 feet of conglomeratic (? glacial) sandstone and calcareous sediments; and the Permian of 1,500 feet of shale and sandstone.

Unconformities are known above the Precambrian, between Lower Ordovician and Devonian, and between Lower Carboniferous and Upper Carboniferous.

Structure. The Basin is divided into two major subsidiary basins by a meridional ridge of Precambrian rocks. Several anticlines are present in the eastern basin and the structure of the Palaeozoic sediments covering the basement ridge may be anticlinal.

Oil and gas indications. No seepages have been reported.

Officer Basin

In 1954, the Bureau of Mineral Resources flew reconnaissance aeromagnetic profiles across the area north of the Great Australian Bight. These indicated a large area, north of the Eucla Basin, where sediments are probably more than 20,000 feet thick. On the north-eastern margin of this area, in South Australia, Geosurveys of Australia Ltd found Sturtian and possibly Ordovician sediments totalling more than 15,000 feet in outcrop (Glaessner & Parkin, 1958, p.85). No other work has been done on this area, which is indicated by the aeromagnetic survey to be at least 600 miles long and 130 miles wide.

PRESENT STATUS OF EXPLORATION.

At 30th June, 1959, the following companies held petroleum tenements in Western Australia: West Australian Petroleum Pty Ltd; Westralian Oil Ltd; Gulf Oil Syndicate; Oil Drilling and Exploration Ltd (Exoil Pty Ltd); Jackson Exploration; Hawkestone Oil Co. Ltd; Frome-Broken Hill Co. Pty Ltd; and Associated Freney Oil Fields N.L.

Applications for petroleum tenements had been received from Kalgoorlie Goldfields Pet. N.L. and Oil Drilling and Exploration Ltd.

West Australian Petroleum Pty Ltd engaged in geological and geophysical surveys of the Canning Basin, including the Fitzroy Basin. During 1958 and early 1959, the Company drilled on the Broome Ridge and on its north and south flanks. This work indicated that the Broome Ridge was elevated throughout Palaeozoic sedimentation, that there is only moderate relief in the basement of the Canning Basin to the south, and that Ordovician marine sediments are present both on the Broome Ridge and in a minor basin in the Samphire Marsh area. The work in the Meda region confirmed that this area was one of shelf sedimentation, distinct from the unstable central part of the Fitzroy Basin. Buried Devonian organic reefs have been found and several similar structures indicated. The discovery of intrusive salt in Frome Rocks No. 1 and of a dome suggestive of a salt-dome in the south-eastern Canning Basin (Veevers & Wells, 1959) suggests the possibility of salt-domes beneath the Mesozoic.

Exoil Pty Ltd proposes to do some stratigraphic drilling in the Eucla Basin. So far as is known the other permittees are not doing any exploration.

The Bureau of Mineral Resources has completed the reconnaissance geological and geophysical survey of the Canning Basin, and is now compiling the results of field work in this and in the Carnarvon Basin.

After the discovery of oil in the first test well drilled in the Carnarvon Basin, the subsequent drilling has been extremely disappointing. However, good production was tested in Rough Range No. 1, although it appears that that well is on the edge of the pool since the oil-water contact is present in the well. The outlines of this pool have not been determined, nor have the structural controls been resolved. Early geophysical work by the Bureau of Mineral Resources indicated a positive gravity anomaly to the east of the surface anticline; Bureau geophysicists made an analysis of this anomaly and concluded that the anomaly was produced by a feature between 3,700 feet and 4,300 feet depth. If this conclusion is correct, the anomaly may indicate the structure of the unconformity below the Birdrong sand. The shape of the wedge of Jurassic and Lower Cretaceous sediments below the Birdrong Formation has not yet been determined; this sequence is known to contain abundant traces of petroleum - the pinchout of the wedge should be an important area for testing. The sediments overlying the basement ridges are practically unknown either stratigraphically or structurally. A line of core-holes, preferably with accompanying seismic survey, is required, particularly across the main Ajana-Wandagee Ridge, and preferably across areas of high gravity anomaly such as west of Winning Pool, at Binthalya Homestead, and east of Pimbie Homestead. Much more information is required about the areal geology and structure of the sediments beneath the base of the Birdrong Formation.

The Bureau of Mineral Resources has drilled stratigraphic bores near Mt. Madeline (BMR No. 8) and on Daurie Creek (BMR No. 9) to obtain additional information on the relationship between structure and sedimentation. BMR No. 8 was drilled to 3,004 feet and BMR No. 9 to 2,299 feet, both in Permian sediments.

In the Perth Basin, gravity, seismic, and aeromagnetic surveys by the Bureau of Mineral Resources and gravity surveys by West Australian Petroleum Pty Ltd have indicated a very great thickness of sediments filling a basin between the Darling Scarp and the edge of the continental shelf. A large anticline has been proved by seismic survey in the Gin Gin area and large structural relief has been indicated at the southern end of the Basin, in the Busselton area, and at the north-western part of the Basin in the area south from Dongara. Because this is the main area of settlement in Western Australia, discovery of oil or gas would be of relatively greater importance there than elsewhere in the State. If the main reason for not testing the Gin Gin anticline is the presence of outcrops of terrestrial sediments to the east, this is not valid, since the type of lacustrine sediments known in outcrop could produce dry gas which would be of value in the Perth metropolitan area. Apart from this it is very possible that marine or paralic sediments have developed, and petroleum may have accumulated. Further seismic surveys are required over the sites of irregularities in the generally smooth gravity contours to decide whether these irregularities are produced by tectonic features or sedimentary structures such as sand bars or sand pinchouts. Examples of such irregularities are at Coolcalalaya (on the Murchison River), 14 miles west of Mullewa, 25 miles south-south-east of Dongara, 20 miles west of Coorow, 32 miles north-west of Gin Gin, and possibly immediately east of Perth.

The Bureau of Mineral Resources is drilling a stratigraphic bore on the basement ridge ("Beagle Ridge") indicated by the Bureau's aeromagnetic survey south of Dongara. The depth to basement computed from aeromagnetic data is probably between 4,000 and 5,000 feet, but may be less.

In the Canning Basin, additional gravity and possibly aeromagnetic surveys are required to locate adequately the basement ridges separating the subsidiary basins. Detailed gravity surveys followed by seismic surveys are required over selected areas of these ridges. These surveys may be expected to indicate the shape of the basement ridge; anticlines in the overlying sediments; sedimentary structures such as reefs, sand bars, and pinchouts; and unconformities. This information will give a basis for test drilling. In this sort of environment many of the targets will be on the flank of the ridge rather than on its crest, although there are also important targets on the crestal area. In the Fitzroy Basin, where reconnaissance and detailed gravity surveys and seismic profiles are available, irregularities in the gravity contours should be examined in detail by gravity and seismic surveys and possibly core-drilling in search of test drilling targets. Adequate source beds are known in the Ordovician, Devonian, Carboniferous, and Permian; reservoir beds are known in the Ordovician, Devonian, and Permian; and the basement ridges have been shown to be favourable for development of reservoir rocks.

In the Bonaparte Gulf Basin, the outlines of the outcrop stratigraphy and structure are known. The whole Basin should be covered by gravity survey; the Gulf part of the Basin has been surveyed by marine gravity meter and airborne magnetometer. Structures indicated at the surface or by the gravity and magnetometer work should be preferably be confirmed by seismic survey before test drilling. Core drilling is of value in calibrating the seismic and gravity results.

One of the main geological problems still to be resolved throughout the Western Australian area is that of the fundamental structural control. M.A. Condon holds the opinion that the main control is the original shape of the Precambrian surface on which the sediments were deposited; the companies appear to be working on the assumption of conventional tectonic control. Until the basic structural control is established all detailed exploration must remain a matter of trial and error. The results to date appear to confirm the idea of original structures formed by deposition over pre-existing hills, but the evidence is not unequivocal. Perhaps an area such as Rough Range, where there are already a number of holes, should be drilled until the structural evidence is strong enough to be used with confidence.

NORTHERN TERRITORY

(See Plate 1)

HISTORY OF INVESTIGATIONS

Bitumen was found in 1839 by members of the crew of H.M.S. Beagle in a well at the Holdfast Reach in the tidal reaches of the Victoria River (Stokes, 1846, p.96). So far as is known, this seepage has not been re-discovered.

Several bores were drilled by the Mines Department of South Australia early in the twentieth century along the coast between Port Keats and the Daly River, in the Bonaparte Gulf Basin. One at Port Keats (Port Keats No. 4) had a total depth of 1,505 feet in Permian sediments, and No. 2 at Anson Bay had a total depth of 1,506 feet, also in Permian sediments.

Some drilling was done on Elcho Island in 1924 to 1926.

Australian Mining and Smelting Co. Ltd held Oil Exploration Licences for about 15,000 square miles in the Northern Territory in 1947. Bonaparte Gulf Co. Ltd carried out geological reconnaissance over this area before the concessions were abandoned. Australian Motorists Petrol Co. Ltd held Oil Exploration Licences over 28,000 square miles in the Ord River district of the Bonaparte Gulf area during 1948-1951. No work was done in the area.

In 1954, after the discovery of oil at Rough Range, many applications for Permits to Explore for petroleum were made. Several Permits were granted over areas in the Bonaparte Gulf area, and in the Alice Springs area.

Santos Ltd carried out geological reconnaissance over the area south and west of Alice Springs and abandoned its Permit. Associated Australian Oilfields N.L. carried out geological surveys in its Permit area in the Bonaparte Gulf Basin, as did Westralian Oil Ltd. in its adjoining Permit area. Westralian Oil Ltd is drilling a hole for stratigraphic information near Spirit Hill, Burt Range. This proposal has been approved as qualifying for financial assistance under the Petroleum Search Subsidy Act 1957-1958.

The Bureau of Mineral Resources has carried out reconnaissance seismic surveys in the Bonaparte Gulf Basin.

Geologists of Frome-Broken Hill Co. Pty Ltd found a bitumen seepage with Jurassic fossils in the Robinson River area in 1945; this was analysed and found to be a residual crude oil. The Company was granted a Permit to Explore for Petroleum to the south of the Gulf of Carpentaria. It made a geological reconnaissance of the land portion of the Permit area, and airborne magnetometer surveys across both the land and offshore areas, but has since abandoned the Permit.

Inflammable gas was encountered in a water bore on Ammaroo Station, on the Sandover River about 160 miles north-east of Alice Springs, during 1956. The bore was being drilled through Cambrian limestone when, at a depth of 135 feet, an explosion occurred. A geologist reported later that gas was entering the hole between 135 and 173 feet and issuing from the surface at a slow but steady rate. The drillers obtained a Permit to Explore, but no worthwhile exploration was undertaken.

During 1959 several Permits have been granted and others applied for in the south-eastern part of the Territory, and in the area to the west and south of Alice Springs.

In 1956, the Bureau of Mineral Resources started a geological survey of the Amadeus Basin. The sequence was established in the Ellery Creek area as a basis for mapping. A survey of the part of the Georgina Basin that lies in the Northern Territory has been undertaken to co-ordinate with a survey of the Basin in Queensland.

The total estimated expenditure on oil search in the Northern Territory until the end of 1958 was £179,159.

GEOLOGY.

On the basis of present geological knowledge, four main areas in the Northern Territory may be regarded as having some possibility of commercial accumulations of petroleum; the Bonaparte Gulf Basin, the Carpentaria Basin, the Georgina Basin, and the Amadeus Basin. Other sedimentary basins whose prospects of petroleum accumulation are not known are the Barkly Basin and the Daly Basin.

Bonaparte Gulf Basin (See "Western Australia")

In the Northern Territory portion of this Basin, only Carboniferous and Permian sediments crop out, but several anticlinal structures are known to exist.

Carpentaria Basin

This Basin is the northern extension of the Great Artesian Basin. Its extent in the Northern Territory is unknown. Marine Cretaceous and Tertiary rocks are known on Wellesley Islands, and gas was encountered in a water bore at Normanton (Queensland). Jurassic fossils were found associated with a seepage of heavy oil on Robinson River.

Georgina Basin

Marine sediments ranging in age from Proterozoic to Ordovician overlap the crystalline Precambrian rocks of the Mt. Isa - Cloncurry area, and near the contact have marked structural relief. The Cambrian sediments contain small amounts of petroleum impregnation. To the south-west the Cambrian sediments occupy a syncline in the Tarlton and Toko Ranges. These Lower Palaeozoic sediments continue southward under the Mesozoic sediments of the Great Artesian Basin, but their extent is not known. Embayments with appreciable structural relief extend westward to the Stuart Highway. Cambrian sediments, in which the Ammaroo bore was drilled, overlap the Precambrian sediments of the Hatches Creek Group near Elkedra.

Barkly Basin

This is a basin, apparently shallow, containing Proterozoic and Cambrian sediments, probably marine. Little is known of the stratigraphy and strucutre.

Daly Basin

This is a shallow basin of Cambrian marine sediments recently mapped by geologists of the Bureau of Mineral Resources. The limestones are reported to contain traces of petroleum.

Amadeus Basin

This is a large basin of Proterozoic and Lower Palaeozoic marine sediments. The sediments have been strongly folded and faulted. Large anticlines exist and sediments not unfavour-

able for formation and accumulation of petroleum are known, but details are lacking. The remoteness of this area from possible markets reduces its attractiveness for petroleum exploration.

PRESENT STATUS OF EXPLORATION

At 30th June, 1959, the following Companies held petroleum tenements in the Northern Territory :

Associated Australian Oilfields N.L.; Westralian Oil Ltd; Santos Ltd; Geosurveys of Australia Ltd; and Delhi Australian Petroleum Ltd.

Applications for petroleum tenements had been received from the following Companies:

Frome-Broken Hill Co. Pty Ltd; Trans Pacific Petroleum Exploration Syndicate; P.E. Gauld; Australian Mining and Smelting Co. Ltd; Three States Australian Petroleum Ltd; Texas American Oil Corporation; American Australian Oil Co.; Western States Natural Gas Co.; Dallas Southern Corporation; and North Australian Petroleum Co. (For details see Appendix 4 and Plate 11).

Geological and geophysical work is continuing in the Bonaparte Gulf area. A stratigraphic hole is being drilled by Westralian Oil Ltd in its Permit area at Spirit Hill. Geological work is planned in the Amadeus area, and to the north-east and south-east of Alice Springs. Frome-Broken Hill Co. Pty Ltd had several field parties in Central Australia during 1958.

The Bureau of Mineral Resources has carried out trial seismic surveys in the Bonaparte Gulf area and has started regional geological surveys of the Amadeus Basin and the Georgina Basin, which, it is hoped, will establish correlations between the two basins.

In none of these basins is the geological and geophysical work sufficiently advanced to give a reliable assessment of the petroleum potential. The sequence has been established in the Amadeus Basin, but little is known of the variations within the Basin. The regional structure is indicated but not reliably established. The stratigraphical sequence has been established in the Northern Territory part of the Georgina Basin and the regional structure and some structural details mapped. Geological mapping, reconnaissance gravity surveys, aeromagnetic survey, and a few trial seismic profiles have established the outlines of the stratigraphy and structure of the Northern Territory part of the Bonaparte Gulf Basin. Drilling is required to give precision to the stratigraphical sequence and to indicate stratigraphic variations. Nothing is known of the subsurface extent of the pre-Permian sediments.

SUMMARY.

This summary is intended to give a perspective view of the search for oil throughout Australia and New Guinea.

GEOLOGY

Outcrop geology is known reasonably adequately only in Papua, the northern Sydney

Basin, Victoria, and the Carnarvon and Fitzroy Basins of Western Australia. Subsurface geology is practically unknown, except in small areas of the Carnarvon, Canning, and Sydney Basins.

Much additional geological work is required in outcrop areas of sedimentary basins of New Guinea, Queensland, New South Wales, South Australia, and the Northern Territory, and in the Perth, Canning, and Bonaparte Gulf Basins and possibly the Eucla Basin of Western Australia.

GEOPHYSICS

Gravity or magnetic surveys, or both, of reasonable reconnaissance standard have been completed in western Papua, central Queensland, the central Sydney Basin, Gippsland Basin, western Victoria and south-eastern South Australia, the Frome Embayment in South Australia, and the Perth, Carnarvon, Fitzroy, and Canning Basins of Western Australia. Similar surveys are required in the remainder of the sedimentary basins of Papua and New Guinea; the Great Artesian Basin and its extension the Carpentaria Basin; some of the smaller areas along the edge of the geosynclinal belt of coastal Queensland; the remainder of the Sydney Basin; the Murray Basin in New South Wales; parts of the Canning and Bonaparte Gulf Basins and possibly the Eucla Basin; the Amadeus Basin; and the Georgina Basin.

Seismic surveys are desirable to check sub-surface structure before drilling.

DRILLING

Following is a summary of total drilling by States (to 30th September 1959).

State or Territory	Number of bores drilled	Footage
Papua and New Guinea	36	185,037
Queensland	64	240,742
New South Wales	39	96,552
Victoria	142	219,517
Tasmania	21	14,288
South Australia	84	79,939
Western Australia	84	288,718
Northern Territory	-	-
Totals	470	1,124,793

Most of the drilling undertaken to date in Australia and Papua-New Guinea has been wildcatting in the sense that not enough was known about the stratigraphy and structure and geological history to drill for expected targets. An exception to this was the Rough Range well, which discovered oil in the first target formation and a gas show in the second target formation; but even in this case the structure and geological history were insufficiently known.

Much of the drilling for oil has not been technically adequate to discover all indications of petroleum and to test them properly. This was particularly so with much of the percussion drilling before World War II, when it was commonly assumed that oil would make its presence known as a gusher. In general it is probably less likely that a commercial oil pool would be overlooked in a dry percussion bore than in a rotary bore using drilling mud, but even in a percussion bore the bit and cuttings could seal the sand as it is drilled through. It is most essential that all bores be electrically logged before casing; that a geologist, petroleum engineer, or geophysicist, experienced in the interpretation of electric logs in terms of petroleum occurrence, examine the logs before the bore is abandoned; and that any petroleum occurrence be adequately tested, at least until formation fluid is returned at a rate consistent with the recorded pressure and the permeability indicated by or computed from the electric log.

Further work, with modern drilling methods using rotary equipment and the latest techniques, good mud control, formation testing, electrical logging, continuous mud logging, sampling, coring, and the analysis of the results by competent geologists and petroleum engineers, should enable a maximum of information to be speedily obtained. The use of rotary equipment has the added advantage that the risk of a "blow-out" (gusher) is minimized, with the reduction of fire hazard, loss of life, and damage to property and the reservoir. This is particularly true as drilling goes deeper.

Wherever an oil show is obtained in a bore, all information should be examined to ascertain whether or not the show may be a pointer to a large accumulation. This can only be done with confidence if the knowledge of the structure, stratigraphy, and geological history in the vicinity is adequate.

No structure in Australia has been "drilled out", that is drilled sufficiently to establish structure and stratigraphy including variations; and none, except perhaps Roma, has been drilled sufficiently to indicate that a large accumulation is unlikely.

EXPENDITURE

Expenditure which can be accounted for in the search for oil in Australia to the end of 1958 is divided among the States and Territories as follows :

Papua-New Guinea	£31,653,056
Queensland	5,915,520
New South Wales	1,054,155
Victoria	1,698,999
Tasmania	125,000
South Australia	1,001,466
Western Australia	15,175,216
Northern Territory	179,159
TOTAL	£56,802,573

PRESENT STATUS OF EXPLORATION

Two promising oil discoveries have been made, one by West Australian Petroleum Pty Ltd at Rough Range, Western Australia, and other by Australasian Petroleum Co. Pty Ltd at Puri, Papua. Large gas strikes have been made by Australasian Petroleum Co at Kuru and by Island Exploration Co. Pty Ltd at Barikewa in Papua. Oil and gas shows have been encountered elsewhere in Papua and Western Australia and in Queensland, Victoria, and South Australia. Dry gas has been obtained in New South Wales and a show of wet gas in the Northern Territory.

Geological and geophysical information in most of the prospective areas is known only in broadest outline. In very few areas is the geological information sufficiently precise for scientific location of drilling sites or for following indications when found. Partly because reports submitted to Government authorities have had to be held as confidential, and partly because in some cases adequate reports have not been a requirement for satisfaction of Permit conditions, the same sort of exploratory work has been repeated in some areas. This was uneconomical; the same amount of work could have extended the sum of knowledge instead of merely confirming it, particularly since the confirmation is inherent in the more precise investigations.

The companies now operating spent about nine and a half million pounds during 1956, over seven million pounds during 1957, and five and a half million pounds in 1958.

Oil exploration companies hold tenements to search for oil in all States and Territories except Tasmania. The number of Companies and the areas held at 30th June, 1959, were as follows :-

State or Territory	Number of Companies	Areas held (sq.miles)
New Guinea	1	3,600
Papua	4	41,533
Queensland	25	824,928
New South Wales	10	53,339
Victoria	11	38,806
Tasmania	-	-
South Australia	5	276,226
Western Australia	8	428,535
Northern Territory	5	42,250
TOTAL	69	1,709,217

Drilling activity is shown in Appendices 1 and 5.

PROSPECTS

The discovery of oil in Western Australia and oil and gas in Papua confirms the geologists' general opinion that petroleum is likely to occur in useful quantities both in Papua-New Guinea and in Australia. In themselves, the discoveries are important pointers to the targets which in the immediate vicinity may lead to commercial accumulations of petroleum. This sort of lead has not formerly been available.

There is still a possibility of the presence of a useful oil accumulation at Rough Range. The discovery of a very big wedge of petroliferous sediments under the Cape Range gives promise of accumulations up-dip. The indication of contemporaneous structural relief in the Western Australian basins adds to the prospect of petroleum accumulations above the basement ridges. In Papua, the regional geology has been outlined, and largely as a result of this the first gas wells have been drilled at Kuru and Barikewa and the first well to produce a promising flow of oil at Puri. It may be expected that continued exploration in the same province, in the area between the shelf and the Aure Trough, will produce continuing success.

In Queensland, there is plenty of promise in the large number of oil and gas shows in water and oil bores widely spaced over the state. Geological and geophysical exploration, regional in the first place, is required to bring some meaning into the present random occurrences of shows of petroleum. More attention might profitably be paid to the substrata of the Great Artesian Basin, which are known to include older sediments in some places. Some of the oil shows in the Mesozoic may have come from older sediments. Petroliferous source beds and tectonic structures have been established in the Cambro-Ordovician sediments of West Queensland that underlie the Mesozoic sediments of the Artesian Basin. In the coastal region of Queensland more attention must be given to the regional variations in structure and stratigraphy so that the dominantly important "hinge-line" may be recognised.

In the Sydney Basin, the main operating company is continuing its exploration programme. Suitable marine Palaeozoic sediments may lie beneath the Tertiary-Mesozoic cover of the New South Wales part of the Murray Basin; investigation of this Basin would be difficult and costly, requiring gravity and seismic surveys and scout drilling.

In Gippsland recent exploration has included the Jurassic without appreciably improving the prospects of the Tertiary sequence.

In western Victoria and south-eastern South Australia, a thick sequence of marine Tertiary sediments has been established. In the Torrens Basin, oil shows have been found in Tertiary and Cambrian sediments, but no suitable large structures are known, although they may be present.

No single area in Australia and Papua-New Guinea can be said to have been thoroughly tested, although some areas have been shown to be of lithology and structure unlikely to contain large accumulations of petroleum.

The areas which, on available geological and geophysical information, are most likely to contain commercial accumulations of petroleum may be listed roughly in order of present potential (which is very largely the order of knowledge of the areas):

West side of Aure Trough, Papua
Rough Range, Carnarvon Basin
Cape Range East, Carnarvon Basin
East site of Aure Trough, Papua
Broome Ridge, Canning Basin

Ajana-Wandagee Ridge, Carnarvon Basin
North-eastern margin of Fitzroy Basin
Northern hinge of New Guinea Basin
Queensland coastal basins
Georgina Basin in Queensland
Central part of Great Artesian Basin
Perth Basin
Carpentaria Basin
Gippsland Basin
Bonaparte Gulf Basin
Murray Basin in New South Wales
Torrens Basin
Murray Basin in South Australia and Victoria.

Useful amounts of dry gas may be produced from :

Bowen Basin
Maryborough Basin
Ipswich-Clarence Basin
Sydney Basin
Perth Basin
Permo-Triassic Basin of Tasmania.

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PETROLEUM PERMITS, LICENCES AND LEASES

IN AUSTRALIA AND THE TERRITORY OF PAPUA-NEW GUINEA

AS AT 30-6-59

PLATE 11

SCALE IN MILES
100 0 100 200 300 400

DUTCH NEW GUINEA
NEW GUINEA
NEW IRELAND
NEW BRITAIN
App'l 29
Rabaul
Lae
P.27
L.2
P.24
P.12
L.1
P.14
P.22
L.3
P.15
Kikori
Kerema
P.26
P.18
Daru
PORT MORESBY
O.P.8
App'l P.33 Part I
DARWIN
Port Kennedy
53 P.
2-5 acres excluded area
58 P.
Coen
Pine Creek
Katherine
O.P.2
127 H
O.P.3
App'l P.32 Part I
Daly Waters
App'l P.31
Borroloola
App'l P.26
App'l P.32 Part 2
App'l P.30
App'l P.33 Part 2
64 P.
Karumba
Normanton 65 P.
Cairns
Cooktown
61 P.
64 P.
73 P.
Townsville
NORTHERN TERRITORY
Tennant Creek
App'l P.25 Part I
Barrow Creek
Cloncurry
Mt. Isa
69 P.
QUEENSLAND
Mackay
68 P.
53 P.
54 P.
62 P.
Winton
64 P.
Longreach
39 P.
P.P.P.699
Clermont
56 P.
Rockhampton
P.P.P.705
Springsure P.P.P.697
App'l P.27
Alice Spring
App'l P.33 Part 3
App'l P.25
App'l P.28
Part 2
App'l P.24
O.P.22
O.P.19
App'l P.29
66 P. & 67 P.
Birdsville
52 P.
63 P.
P.P.P.706
P.P.P.707
Theodore
Maryborough
70 P.
55 P.
60 P.
Quilpie
Roma
Miles
P.P.P.685
Chinchilla
72 P.
57 P.
P.P.P.704
Toowoomba
71 P.
41
BRISBANE
38 39
P.E.L. 14
Grafton
Coff's Harbour
43
44
58
Tamworth
P.E.L. 3
P.E.L. 12
Gloucester
PPL 1
P.E.L. 9
PPL 6
P.E.L. 11
P.E.L. 10
Newcastle
PPL 2
P.E.L. 13
PPL 3
SYDNEY
P.E.L. 25
Wollongong
PPL 5
Nowra
One Mile Limit
App'l (PPL) 23
CANBERRA
App'l (PPL) 22
SEE INSET FOR VICTORIAN DETAILS
Albury
Bendigo
Ballarat
MELBOURNE
O.E.L. 22
Beachport 3 Mile Limit
VICTORIA
Launceston
TASMANIA
HOBART
142°
148°
154°
38°
P.E.L. 2
P.E.L. 7
P.E.L. 6
P.E.L. 8
45
49
50
53
54
55
59
51
52
57
Broken Hill
NEW SOUTH WALES
33
P.E.L. 5
P.E.L. 4
48
47
46
Mildura
56
P.E.L. 23
PPL 4
O.E.L. 23
Oodnadatta
L. Eyre
L. Torrens
L. Frome
O.E.L. 19
SOUTH AUSTRALIA
O.E.L. 12
Ooldea
Forrest
138 H
Eucla
137 H
Rawlinna
139 H
3 Mile Limit
Ceduna
Port Augusta
Port Pirie
Excluded
Port Adelaide
ADELAIDE
Eyre
140 H
141 H = 143 H
Esperance
Kalgoorlie
Geraldton
27 H
PERTH
133 H
Albany
112°
118°
124°
130°
136°
148 H
146 H
145 H
147 H
134 H
135 H
136 H
WESTERN AUSTRALIA
37 H
35 H
36 H
52 H
51 H
18 H
28 H
29 H
30 H
31 H
32 H
34 H
33 H
28 H
Carnarvon
Onslow
29 H
Port Hedland
53 H
30 H
142 H
54 H
106 H
157 H
39 H
Derby
27 H
61 H
62 H
24 H
Broome
25 H
23 H
56 H
59 H
60 H
Fitzroy Crossing
55 H
26 H
41 H
46 H
58 H
40 H
21 H
20 H
19 H
45 H
22 H
20°
26°
32°
14°
Mildura
P.E.P. 18
Robinvale
Ouyen
35°
P.E.P. 19
P.E.P. 20
Swan Hill
Kerang
P.E.P. 15
Birchip
Tocumwal
Echuca
Wodonga
Corryongo
36°
Kaniva
P.E.P. 12
P.E.P. 17
Warracknabeal
Horsham
P.E.P. 21
Bendigo
Mansfield
37°
Ballarat
MELBOURNE
Dartmoor
P.E.P. 5
38°
Portland
Warrnambool
App'l P.E.P. 22
Excluded
Colac
P.E.P. 6
Lorne
Queenscliff
15 Mile Limit
39°
141°
143°
145°
147°
149°
150°
P.P.L. 254
P.P.L. 196
P.P.L. 185
P.P.L. 246
P.P.L. 180
P.P.L. 197
P.P.L. 248
Orbost
P.P.L. 191
P.P.L. 192
P.P.L. 193
P.P.L. 252
P.P.L. 216
P.P.L. 254
P.P.L. 212
P.P.L. 250
P.P.L. 253
P.P.L. 215
P.P.L. 210
P.P.L. 255
P.P.L. 251
P.P.L. 184
P.P.L. 164
P.P.L. 160
P.P.L. 157
P.P.L. 201
P.P.L. 199
P.P.L. 247
P.P.L. 174
P.P.L. 213

VICTORIA
SCALE IN MILES
32 0 32 64 96

Based on information supplied by State and Territorial Departments of Mines. For further details application should be made direct to the Department of Mines of the State or Territory concerned.

G.M.

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APPENDIX 1.

WELLS DRILLED IN CONNECTION WITH THE SEARCH FOR PETROLEUM - 1946 TO 30TH SEPTEMBER, 1959.

* Denotes wells that received subsidy under the Commonwealth Petroleum Search Subsidy Act 1957-58.

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage Area	Total Footage State or Territory	Year Completed
PAPUA	Island Exploration Co. Pty Ltd		Omati No. 1	14,352			1955
			Omati No. 2	10,880			1955
			Aramia No. 1	6,628			1955
			Barikewa No. 1	13,890			1958
			Komewu No. 1	6,393			1957
			Komewu No. 2	9,979			1958
	Australasian Petroleum Co. Pty Ltd		Kuru No. 1	998			1956
			Kuru No. 1A	986			1956
			Kuru No. 2	7,305			1957
			Kuru No. 3	8,843			1958
			Morehead No. 1	8,087			1957
			Kariava No. 1	12,621			1948
			Oroi No. 1	5,516			1949
			Upoia No. 1	5,356			1950
			Wana No. 1	9,866			1951
			Hohoro No. 1	4,721			1950
			Hohoro No. 2	10,642			1952
			Sireru No. 1	1,510			1957
			*Puri No. 1	10,100			1959
			Puri No. 1A (Deviation)	T.D. 7,528 footage 1438			1959
			Puri No. 1B "	T.D. 8,520 footage 4,649			1959
			Bwata No. 1	2,674			Drilling
	The Papuan Apinaipi Petroleum Co. Ltd		*Kaufana No. 1	3,380	160,814	160,814	1958
NEW GUINEA	Enterprise of New Guinea Gold & Pet. Dev. N.L.	Sepik River	Waniwa Village No. 1	218			1957
			Napsiei No. 1	775	993	993	1957
QUEENSLAND	Associated Australian Oilfields N.L.	Roma	A.A.O. No. 1 Roma	3,892			1952
			A.A.O. No. 2 "	3,616			1953
			A.A.O. No. 3 "	3,644			1953
			A.A.O. No. 4 Hospital Hill	3,891			1954
			A.A.O. No. 5 " "	4,079			1955
			A.A.O. No. 6 " "	4,285	23,407		1955
		Arcadia	A.A.O. No. 7 Arcadia	3,280	3,280		1957
	Australasian Oil Exploration Ltd	Springsure	A.O.E. No. 1 Reid's Dome	9,060			1955
			A.O.E. No. 2 " "	4,060			1955
			A.O.E. No. 3 Consuelo	4,437			1955
	Shell (Q'land) Development Pty Ltd		S.Q.D. No. 1 Morella	4,634	22,191		1951
	Lucky Strike Drilling Co.	Maryborough	L.S.D. No. 1 Cherwell Ck.	9,773			1955
			L.S.D. No. 2 Susan Ck.	8,069	17,842		1955

APPENDIX 1 (Cont'd).

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage Area	Total Footage State or Territory	Year Completed
QUEENSLAND (Cont'd)	Longreach Oil Ltd	Longreach	L.O.L. No. 1 Cleeve	3,068			1955
			L.O.L. No. 2 Longreach	3,224			1955
			L.O.L. No. 3 "	3,490			1955
			L.O.L. No. 4 "	3,277			1955
			L.O.L. No. 5 "	1,367			1958
			L.O.L. No. 6 "	1,268			1959
	Westland Oil Co. Ltd		W.O.L. No. 1 Warbreccan	5,433			1955
			W.O.L. No. 2 "	5,224			1955
			W.O.L. No. 3 "	6,054	32,405		1955
	South Pacific Pty Ltd	Birkhead	S.P.L. No. 1 Birkhead	5,186	5,186		1957
	Mackay Oil Prospecting	Mackay	M.O.S.P. No. 1 Mackay	2,115	2,115		1957
	L.H. Smart Oil Exploration Pty Ltd	Eromanga	S.O.E. No. 1 Ray Station	820			1958
			S.O.E. No. 2 Cannaway Downs	1,575			1959
			S.O.E. No. 3 Gumbla	1,066	3,461		Drilling
	Winneills Pty Ltd	Ipswich Basin	W.P.L. No. 1 Wellington Pt.	3,751	3,751		1955
	Murilla Oil Co.	Roma East	M.O.C. No. 1 Boyanda	4,798			1956
	Condamine Oil Ltd		No. 1 Speculation	2,333	7,131		Standing
	Wycanna Trust	Goodiwindi	No. 1 Wycanna Trust	4,105	4,105		1956
	Standard Gas Pty Ltd	Brisbane	S.G.P. No. 6 Gundale	288			1959
			S.G.P. No. 7 Cribb Island	235			1959
			S.G.P. No. 8 " "	362			1959
			S.G.P. No. 9 " "	134	1,019		Drilling
	Australian Oil & Gas Corporation Ltd	Tara	A.O.G. No. 2 Mirri Mirri	T.D. 4,645 footage			1959
				1,645	1,645		Deepened
	Australian Oil & Gas Corporation Ltd	Talbalba	A.O.G. No. 1 Talbalba	774			1957
			A.O.G. No. 2 "	1,000	1,774		1957
	Associated Australian Oilfields N.L.	Carpentaria Basin	* A.A.O. No. 8 Karumba				1958
	Frome Broken Hill Co. Pty Ltd) Associated Freney Oil Fields N.L.; Associated Australian Oilfields N.L.)		F.B.H. No. 1 Wyaaba	2,822			1957
	Zinc Corporation Ltd		Z.C.L. No. 1 Weipa	3,243	8,429		1957
	Humber Barrier Reef Oils Pty Ltd	Capricorn Group Is.	* H.B.R. No. 1 Wreck Is.	1,898	1,898	139,639	1959
NEW SOUTH WALES	Australian Oil & Gas Corporation Ltd	Sydney	Kurrajong No. 1	4,755			1955
			Dural No. 1	5,203			1956
			Dural No. 2	6,465			1958
			*Mulgoa No. 2	5,601	22,024		Drilling

APPENDIX 1 (Cont'd).

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage Area	Total Footage State or Territory	Year Completed
NEW SOUTH WALES(C'td.)	Australian Oil & Gas Corporation Ltd	Camden	Camden No. 1	2,272	22,024		1958
			" No. 2	2,230			1958
			" No. 3	1,830			1958
			" No. 4	1,890			1958
			" No. 5	1,939			1958
			" No. 6	1,981			1959
			" No. 7	1,702			1959
			" No. 8	2,102			1959
			" No. 9	2,104			1959
			" No. 10	-	18,050		Preparing Location
	Australian Oil & Gas Corporation Ltd		Morisset No. 1	571			1957
			" No. 2	429			1957
			" No. 3	520			1957
			" No. 4	726			1957
			" No. 5	272			1957
			" No. 6	303	2,821		1958
	Australian Oil & Gas Corporation Ltd	Yass	Yass No. 1	1,107	1,107		1956
	Clarence River Basin Oil Exploration Co. N.L.	Grafton	Grafton No. 1	4,583			1955
			" No. 2	1,290	5,873		Redrilling
	Sun Oil Co. of California	Maitland	Sun No. 1	2,009	2,009		Suspended
	J.C. Reynolds	Dunedoo	Dunedoo No. 1	257	257		Suspended
	E.J. Ellis	Junee	Junee No. 1	1,149	1,149		Suspended
	Australian Iron & Steel	Bankstown	Condell Park No. 1	796	796	54,086	Drilling
VICTORIA	Woodside (Lakes Entrance) Oil Co. N.L.	Woodside	Woodside No. 1	6,008			1955
			" No. 2	8,862			1957
			" No. 3	5,985			1956
			" No. 4	2,694			1957
			Hedley No. 1	4,013			1958
	Oil Co. Ltd		Oilco No. 1	1,366			1957
	Dome Oil & Minerals Syndicate N.L.		Dome Frome No. 1	564			1957
	Westralian Oil Ltd		Yarram No. 1	1,875			1957
	Frome-Lakes Pty Ltd		Darriman	4,730	36,097		1955
	Frome-Lakes Oil Co.	Lake Tyers	Dome Frome No. 2	557			1958
			" " No. 3	582			1958
			" " No. 4	1,300	2,439		1958
	Lakes Oil Ltd	Lakes Entrance	East End Bore	1,230			1959
	Commonwealth & State		Pilot Bore	1,310	2,540		1945
	A.E. Ekberg	Nowa Nowa	Ekberg No. 1	948	948		Drilling
	Frome Broken Hill Co. Pty Ltd	Port Campbell	*Port Campbell No. 1	3,002	3,002		Drilling

APPENDIX 1 (Cont'd).

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage		Year Completed
					Area	State or Territory	
VICTORIA (C'td)	Frome-Lakes Pty Ltd	Gippsland	No. 1	790			1956
			No. 1A	1,962			1956
			No. 2	1,552			1956
			No. 3	1,876			1956
			No. 4	1,815			1956
			No. 5	1,550	9,545	54,571	1957
SOUTH AUSTRALIA	Santos Ltd	Wilkatana	Wilkatana No. 1	2,199			1956
			" No. 2	1,025			1956
			" No. 3	1,264			1956
			" No. 3A	1,050			1956
			" No. 4	1,435			1956
			" No. 5	516			1956
			" No. 6	445			1956
			" No. 7	476			1956
			" No. 8	1,065			1956
			" No. 9	1,167			1956
			" No. 10	45			1956
			" No. 10A	267			1956
			" No. 11	1,109			1956
			" No. 12	237			1956
			" No. 13	582			1956
			" No. 14	600			1956
			" No. 15	580			1956
			" No. 16	932			1956
			" No. 17	209			1956
			" No. 18	428			1956
			" No. 19	415			1957
			" No. 19A	391			1957
			" No. 19B	450			1957
			" No. 20	593	17,480		1957
	Santos Ltd	Oodnadatta	Oodnadatta 0.1	1,322			1957
			" 0.1A	340			1957
			" 0.2	311			1957
			" 0.3	128	2,101		1957
	Santos Ltd	Parachilna	Motpena 1	702			1957
			" 1A	578	1,280		1957
	Santos Ltd	Haddon Downs	Haddon Downs No. 1	1,502			1957
			" " No. 2	750			1957
			" " No. 3	770			1957
			" " No. 4	835			1957
			" " No. 5	1,503	5,360		1958
	Clarence River Basin Oil Exploration Co. N.L.	Woomera	*Woomera No. 1	2,005	2,005		1958

APPENDIX 1(Cont'd).

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage Area	Total Footage State or Territory	Year Completed
SOUTH AUSTRALIA (Cont'd)	Australian Oil & Gas Corporation Ltd	Murray Basin	Loxton No. 1	1,602			1956
	Murray Basin Oil Syndicate		Pinnaroo No. 1	1,280			1958
			Tailem Bend No. 1	263			1956
			Coonalpyn No. 1	684			1958
			Keith No. 1	960	4,789		1958
	Enterprise Oil Exploration Pty Ltd	Frome Embayment	Tilcha No. 1	2,353			1949
			Cootabarlow No. 2	1,615			1949
			Lakeside No. 1	1,076			1950
			Black Oak	454			1950
	Frome-Broken Hill Co. Pty Ltd		Kopperamanna	3,256	8,754		1948
	South Australian State Mines Department	Yorke Peninsula	Port Clinton No. 1	518			1957
			Minlaton No. 1	3,261			1958
			Stansbury No. 1	1,360	5,139		1958
	Delhi Australian Petroleum Ltd	Innamincka	*Innamincka No. 1	11,186	11,186	58,094	Drilling
WESTERN AUSTRALIA	West Australian Petroleum Pty Ltd	Exmouth Gulf	Rough Range No. 1	14,607			1954
			" " No. 1A	3,657			1954
			" " No. 2	4,079			1954
			" " No. 3	3,915			1954
			" " No. 4	3,760			1954
			" " No. 5	3,772			1954
			" " No. 6	3,697			1955
			" " No. 7	4,281			1955
			" " No. 8	3,919			1955
			" " No. 9	3,844			1955
			" " No. 10	3,740			1957
			Exmouth No. 1	1,759			1956
			" No. 2	2,029			1956
			Yanrey No. 1	1,413			1957
			Learmonth No. 1	7,636			1958
			Rough Range South No. 1	2,866			1956
			" " " No. 2	1,523			1956
			" " " No. 3	1,900			1956
			" " " No. 4	2,289			1956
			" " " No. 5	4,760			1956
			" " " No. 6	1,594			1956
			Cape Range No. 1	8,019			1955
			" " No. 2	15,170			1956
			" " No. 3A	3,737			1956
			" " No. 4	3,858	111,824		1956

APPENDIX 1 (Cont'd)

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage Area	Total Footage State or Territory	Year Completed
WESTERN AUSTRALIA (Cont'd)	West Australian Petroleum Pty Ltd	Carnarvon	Dirk Hartog No. 1	1,110			1955
			" " No. 2	840			1955
			" " No. 3	895			1955
			" " No. 4	1,500			1955
			" " No. 5	924			1956
			" " No. 6	1,000			1956
			" " No. 7	268			1956
			" " No. 7A	900			1956
			" " No. 8	778			1956
			" " No. 8A	1,196			1956
			" " No. 9	180			1956
			" " No. 9A	845			1956
			" " No. 10	876			1956
			" " No. 11	817			1956
			" " No. 12	910			1956
			" " No. 13	975			1956
			" " No. 14	975			1956
			" " No. 15	1,053			1956
			" " No. 16	850			1956
			" " No. 17A	541			1957
			" " No. 17B	4,998			1957
			Grierson No. 1	1,437			1955
			" No. 2	1,501			1955
			" No. 3	1,450			1955
			Cuvier No. 1	1,500			1955
			Giralia No. 1	4,080			1955
			Warroora No. 1	5,992			1955
	Bureau of Mineral Resources Geology & Geophysics		B.M.R. No. 5 Giralia	2,070			1958
			B.M.R. No. 6 Muderong	1,002			1958
			B.M.R. No. 7 Muderong	1,997			1958
			B.M.R. No. 8 Mt. Madeline	3,004			1959
			B.M.R. No. 9 Daurie Ck.	2,299	48,763		1959
	West Australian Petroleum Pty Ltd	Canning	Wallal Down Core Hole No. 1	1,014			1957
			*Samphire Marsh No. 1	6,664			1958
			Goldwyer No. 1	4,720			1958
			*Frome Rocks No. 1	4,000			1959
			*Frome Rocks No. 2	7,504			1959
	Bureau of Mineral Resources Geology & Geophysics		B.M.R. No. 4 Wallal	1,410			1958
			B.M.R. No. 4A Wallal	2,229	27,541		1958
	West Australian Petroleum Pty Ltd	Fitzroy Basin	Roebuck Bay No. 1	4,000			1956
			Dampier Downs No. 1	3,028			1956
			* Meda No. 1	8,809			1959
			Meda No. 2	7,628			1959
			Grant Range No. 1	12,915			1955
			Fraser River No. 1	10,144			1956

APPENDIX 1 (Cont'd).

State or Territory	Company	Area	Well Number	Depth Feet	Total Footage Area	Total Footage State or Territory	Year Completed
WESTERN AUSTRALIA (Cont'd).	Associated Freney Oil Fields N.L.		A.F.O. No. 1 Nerrima	9,072			1955
			A.F.O. No. 1 Myroodah	6,001			1956
			A.F.O. No. 1 Sisters Terrace	9,828			1957
	Bureau of Mineral Resources Geology & Geophysics		B.M.R. No. 1 Jurgurra Ck.	1,680			1955
			B.M.R. No. 2 Laurel Downs	4,000			1956
			B.M.R. No. 3 Prices Ck.	694	77,799		1956
	" " "	Perth Basin	B.M.R. No. 10 Beagle Ridge	3,910	3,910	269,837	Suspended
NORTHERN TERRITORY	Westralian Oil Ltd	Burt Basin	*Spirit Hill No. 1	932	932	932	Drilling
TASMANIA	Nil					Nil	
					GRAND TOTAL	738,966	

APPENDIX 2

EXPENDITURE ON OIL SEARCH

PART (A)

To 31st December, 1945, approximately (taken as the end of the war period, during which operations were virtually at a stand-still).

PAPUA - NEW GUINEA

	£	Total £
Commonwealth Government (including subsidy of £29,608 to Papuan Apinaipi and £9,062 to New Guinea Oil Co.)	528,986	
British Government	25,000	
Papuan Apinaipi Petroleum Co. Ltd.	101,827	
Papuan Oil Development Co. Ltd.	411,000	
Island Exploration Co. Pty. Ltd.	376,750	
Australasian Petroleum Co. Pty Ltd.	1,054,563	
Oil Search Ltd. and subsidiaries	180,000	
Sundry small companies, allow	100,000	2,778,126
QUEENSLAND		
Estimated to end of 1931 (including cost of drilling)(Geological Survey of Queensland).	795,000	
Oil Search Limited and subsidiaries	110,281	
Roma Blocks Oil Co. and Associates	89,858	
Shell (Queensland) Development Pty. Ltd.	219,401	
Commonwealth Government (Subsidies of £31,485 to Oil Search Ltd. Group and £10,142 to Roma Blocks)	41,627	1,256,167
NEW SOUTH WALES		
Loder Bore	17,740	
Belford Bores	48,000	
Farley Bore (Estimated)	12,000	
Kulnura Bore "	33,000	
Richmond Bores "	5,000	
Penrith Bore "	7,000	
Mulgoa Bore	24,200	
Narrabeen Bores	10,000	
Balmain (Estimated)	6,000	
Yerrinbool Bore "	7,000	
Tyler's Bargo Bore (Estimated)	7,000	
Commonwealth Government (Subsidies of £2,260 for Loder Bore, £17,000 for Kulnura and £2,800 for Mulgoa)	22,060	
All Others, estimated	30,000	229,000

No record is at present available of expenditure on surveys.

Appendix (2) Cont'd. Part (A)

	£	Total £
VICTORIA		
Victorian Government		
General	35,000	
Nelson Bore	36,385	
Commonwealth Government		
General	19,000	
Nelson Bore	36,385	
Oil Search Limited		
Test Drilling	9,700	
Geology, geophysics and scout drilling	11,000	
Austral Oil Drilling Syndicate	40,000	
Other oil companies, estimated	105,000	292,470
No expenditure figure is included for the Lakes Entrance Shaft.		
TASMANIA		
No records exist, but the expenditure is thought to have been possibly £100,000.		100,000
SOUTH AUSTRALIA		
An estimate by the then Director of Mines placed the expenditure on the search for oil at not less than £200,000 prior to 1942.		200,000
No records are available.		
WESTERN AUSTRALIA		
Freney Kimberley Oil Company	138,283	
Oil Search Limited	12,000	
Caltex Oil Development Pty Ltd	37,500	
Commonwealth Government (S)	39,717	
State Government (S)	24,288	
(S) Subsidies to Freney Kimberley Oil Company		
Others, estimated	35,500	287,288
NORTHERN TERRITORY		
No record of cost is available, and it is thought that expenditure was negligible.		
	TOTAL	£5,143,051

Appendix (2) Cont'd. Part (A).

RECAPITULATION

PAPUA - NEW GUINEA	£2,778,126
QUEENSLAND	1,256,167
NEW SOUTH WALES	229,000
VICTORIA	292,470
TASMANIA	100,000
SOUTH AUSTRALIA	200,000
WESTERN AUSTRALIA	287,288
	£5,143,051

PART (B).

From 1st January, 1946, approximately to 31st December, 1958.

PAPUA - NEW GUINEA

	£	Total £
Australasian Petroleum Co. Pty Ltd		
1946	225,032	
1947	554,340	
1948	880,587	
1949	2,311,114	
1950	1,728,160	
1951	964,164	
1952	515,821	
1953	66,495	
1954	1,559,123	
1955	2,522,519	
1956	2,604.559	
1957	2,222,952	
1958	2,187,720	18,342,586
Island Exploration Co. Pty Ltd		
1946	1,513	
1947	4,342	
1948	61,143	
1949-1950	102,781	
1951	397,669	
1952	704,798	
1953	1,112,407	
1954	1,376,526	
1955	1,512,386	
1956	1,826,621	
1957	1,850,035	
1958	768,811	9,719,032
Enterprise of New Guinea Gold and Petroleum Development N.L.		
1955	37,914	
1956	42,569	
1957	43,261	
1958	14,000	137,744

Appendix (2) Cont'd. Part (B).

	£	Total £	
Papuan Apinaipi Petroleum Co. Ltd			
1946-1950	12,817		
1954	13,316		
1955 (Estimated)	25,000		
1956	45,000		
1957	438,150		
1958	111,285	645,568	
Sundry unrecorded, estimated		30,000	28,874,930
QUEENSLAND			
Roma Blocks and associated companies:			
1946	3,100		
1947	4,800		
1948	6,464		
1949	6,929		
1950	8,005		
1951	8,366		
1952 (Estimated)	1,400		
1953 (LIQUIDATED)		39,064	
Associated Australian Oilfields N.L.			
1952	102,929		
1953	54,643		
1954	77,203		
1955	250,358		
1956	104,687		
1957	79,666		
1958	38,000	707,486	
(Includes expenditure on surveys in Northern Territory up to 1957).			
Westland Oil Co. Ltd			
1955	352,405		
1956	131,000	483,405	
Since liquidated			
Australasian Oil Exploration Ltd			
1955	796,059		
1956	470,956	1,267,015	
Winneills Pty Ltd			
1954	1,102		
1955	48,742		
1956	2,027	51,871	
(Includes expenditure on Wellington Point bore by this company, Oil Drilling & Exploration Ltd, and Longreach Oil Ltd.)	C/fwd.	2,548,841	

Appendix (2) Cont'd. Part (B).	£	Total £	
Queensland (Cont'd).		B/fd.	2,548,841
Longreach Oil Ltd			
1955	165,039		
1956	6,326		
1957	?		
1958	5,469	176,834	
(see note under Winneills Pty Ltd)			
Shell (Queensland) Development Pty Ltd			
1947-1951		701,000	
(The gross expenditure was about £1,181,000 on post-war work, and disposal of assets realized above £480,000).			
South Pacific Pty Ltd			
1957	121,400		
1958	8,936	130,336	
Frome Broken Hill Co. Pty Ltd			
1957	70,992		
1958	50,734	121,726	
Santos Limited			
1957	14,894		
1958	28,000	42,894	
L.H. Smart Exploration Pty Ltd			
1957	4,200		
1958	10,805	15,005	
Australian Oil and Gas Corp. Ltd			
1957	14,905		
1958	12,350	27,255	
Associated Freney Oil Fields N.L.			
1957	6,437		
1958	43,000	49,437	
Australian Mining and Smelting Co. Ltd			
1957	185,042		
1958	3,317	188,359	
Condamine Oil Ltd (1958)		9,153	
Consolidated Zinc Pty Ltd (1958)		3,533	
Delhi Australian Petroleum Ltd (1958)		38,250	
Oil Drilling and Exploration Ltd (1958)		1,678	
Oklahoma Australian Oil Co. (1958)		21,813	
Papuan Apinaipi Petroleum Co. Ltd (1958)		56,000	
South Queensland Petroleum Pty Ltd (1958)		1,294	
Other companies		325,945	
Sundry unrecorded, estimated		200,000	4,659,353

Appendix (2) Cont'd. Part (B).

	£	Total £	
NEW SOUTH WALES			
Australian Oil & Gas Corporation Ltd			
1955	202,105		
1956	146,748		
1957	108,910		
1958	141,060	598,823	
(includes survey costs in South Australia to 1957)			
Clarence River Basin Oil Exploration Co. N.L.			
1955	15,142		
1956	76,953		
1957	6,363		
1958	4,433	102,891	
(includes survey costs in South Australia to 1957)			
Frome Broken Hill Co. Pty Ltd			
1957	17,654		
1958	5,544	23,198	
Oil Drilling & Exploration Ltd (1958).		243	
Sundry unrecorded, estimated.		100,000	825,155
VICTORIA			
Frome Broken Hill Co. Pty Ltd & Frome Lakes Pty Ltd			
1955	169,600		
1956	193,000		
1957	72,141		
1958	156,385	591,126	
(includes expenditure on surveys in Queensland and the Northern Territory to 1957)			
Woodside (Lakes Entrance) Oil Co. N.L.			
1955	57,236		
1956	322,422		
1957	160,685		
1958	109,542	649,885	
Dome Oil and Minerals Syndicate N.L.			
1957	5,833		
1958	-	5,833	
Westralian Oil Ltd			
1957	8,785		
1958	-	8,785	
Victorian Oil N.L. (1958)		900	

Appendix (2) Cont'd). Part (B).

	£	Total £	
VICTORIA (Cont'd).			
Sundry unrecorded, estimated, excluding expenditure by Lakes Oil Ltd. on horizontal drilling from base of Lakes Entrance Shaft		150,000	1,406,529
TASMANIA			
Sundry unrecorded, estimated		25,000	25,000
SOUTH AUSTRALIA			
Santos Ltd:			
1955(x)	31,336		
1956(x)	136,085		
1957	200,709		
1958	91,000	459,130	
(x) (Includes survey costs in Northern Territory).			
Australian Oil & Gas Corporation Ltd			
1957	6,555		
1958	5,300	11,855	
Frome Broken Hill Co. Pty Ltd			
1957	9,783		
	663	10,446	
South Australia Dept. of Mines		36,500	
Enterprise Oil Exploration Pty Ltd		92,463	
Delhi Australian Petroleum Ltd (1958)		114,750	
Dome Oil & Minerals Syndicate N.L. (1958)		14,458	
Oil Drilling & Exploration Ltd (1958)		2,355	
Clarence River Basin Oil Expln. Co. N.L. (1958)		9,509	
Sundry unrecorded, estimated		50,000	801,466
WESTERN AUSTRALIA	£		
Ampol Exploration Pty Ltd			
1948/53	333,452		
1954 (Administration)	23,375		
1955 "	50,352		
1956 "	24,241	431,420	
West Australian Petroleum Pty Ltd			
1953/54 (x)	2,617,744		
1955 (x)	4,500,000		
1956 (x)	3,325,000		
1957 (x)	1,500,000		
1958 (x)	1,346,252	13,288,996	
(x) (includes a one-fifth interest by Ampol Exploration Ltd.)			

Appendix 2 Cont'd.

	£	Total £	
WESTERN AUSTRALIA (Cont'd)			
Associated Freney Oil Fields N.L.			
1955	447,543		
1956	243,217		
1957	175,595		
1958	-	866,355	
Westralian Oil Ltd			
1955	78,103		
1956	52,874		
1957	-		
1958	1,368	132,345	
(includes work done in Western Australian, Victoria and Northern Territory to 1957).			
Frome Broken Hill Co. Pty Ltd (1958)		6,614	
Gulf Oil Syndicate		1,900	
Freney Kimberley Oil Co. (1932) N.L.			
1946/47	10,834		
1948	29,856		
1949	24,321		
1950	15,810		
1951	4,477		
1952 (estimated)	5,000		
1953 "	5,000		
1954 "	5,000		
1955 "	5,000		
1956 "	5,000	110,298	
(Including subsidy of £15,000 from Western Australian Government)			
Sundry unrecorded estimated	50,000	14,887,928	
NORTHERN TERRITORY			
Frome Broken Hill Co. Pty Ltd (1958)	61,458		
Westralian Oil Ltd (1958)	2,901	64,359	
RECAPITULATION			
PAPUA - NEW GUINEA		28,874,930	
QUEENSLAND		4,659,353	
NEW SOUTH WALES		825,155	
VICTORIA		1,406,529	
TASMANIA		25,000	
SOUTH AUSTRALIA		801,466	
WESTERN AUSTRALIA		14,887,928	
NORTHERN TERRITORY		64,359	51,544,720
COMMONWEALTH GOVERNMENT (THROUGH BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS).			1,720,000
		TOTAL	53,264,720

APPENDIX 3.

CENSUS OF TEST DRILLING PLANTS FOR OIL SEARCH

AS AT 31.12.1958.

The ratings shown below are for $4\frac{1}{2}$" drill pipe weighing 16.60 pounds per foot unless otherwise shown. Higher ratings are permissible using $3\frac{1}{2}$" 13.30 lbs/ft, or 2-7/8" 10.40 lbs/ft drill pipe, provided adequate power is available. Locations of plants given are at 31st December, 1958.

Associated Australian Oilfields N.L.

1 - Sullivan Type "300" rated for drilling to 3,000 - 4,000 feet with 2-7/8" drill pipe. Idle.

Papuan Apinaipi Petroleum Co. Ltd

1 - National Type "T-32" rated for drilling to 5,500 feet. Idle.
1 - National Type "55" rated for drilling to 7,000 feet. Idle.

Woodside (Lakes Entrance) Oil Co. N.L.

1 - Brewster Type "N-4" rated for drilling to 5,500 feet. Idle.

Mines Department, Victoria

1 - Emsco Type "GB-250-T" rated for drilling to 5,500 feet. Located in the Tyrendarra area, Victoria.

Australian Oil & Gas Corporation Ltd

1 - Bucyrus-erie Percussion Drill Type "48-L" rated for drilling to 6,000 feet. Drilling at Mulgoa, N.S.W.
1 - Bucyrus-Erie Percussion Drill Type "28-L" rated for drilling to 2,500 feet. Drilling at Camden, N.S.W.

Australasian Petroleum Co. Pty Ltd

(In associated with Island Exploration Co. Pty Ltd)

1 - National Type "130" rated for 13,000 feet. Idle.
1 - National Type "100" rated for 10,000 feet. Idle.
1 - National Type "50" converted for use as HELIRIG, (i.e. to be flown to site by helicopter). At Puri No.1*
1 - National Type "50" converted for use as HELIRIG. Idle*
1 - National Type "50" rated for 5,000 feet. Idle.

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* This drilling unit is rated to drill to 10,000 feet using a composite string of $4\frac{1}{2}$", 12.75 lbs/ft and $3\frac{1}{2}$", 8.81 lbs/ft drill tubing.

APPENDIX 3(Cont'd)

Oil Drilling and Exploration Ltd
(Drilling Contractors)

1 - National Type "80-B" rated for 10,000 feet. Idle.
1 - National Type "55" rated for 5,500 feet. Idle.
1 - National Type "T-20" rated for 4,000 feet. Idle.

West Australian Petroleum Pty Ltd

1 - National Type "130" rated for 13,000 feet. Since sold to the Delta Drilling Company (Drilling Contractors).
1 - National Type "100" rated for 10,000 feet. Located at Meda, W.A.
1 - National Type "T-32" rated for 5,500 feet. Drilling at Frome Rocks, W.A.

APPENDIX 4.

LIST OF PERMITS LICENCES AND LEASES (OR EQUIVALENTS)

BY STATES AND TERRITORIES.

IN FORCE AT 30.6.1959.

State or Territory	Type of Authority	Number of Authority	Holder	Area (Sq. miles)	Date of Expiry
NEW GUINEA	Application for Permit to Explore	29	Enterprise of New Guinea Gold and Petroleum Development N.L.	3,600	Pending
PAPUA	Permit to Explore	12	Australasian Petroleum Co. Pty Ltd	1,704	30. 6.60
		14	" " " " "	1,365	30. 6.60
		15	Island Exploration Co. Pty Ltd	4,938	13. 6.60
		18	Island Exploration Co. Pty Ltd	2,148	2. 9.59
		22	Papuan Apinaipi Petroleum Co. Ltd	8,740	10. 8.60
		24	Australasian Petroleum Co. Pty Ltd	692	25.10.61
		26	Camelot Nominees Pty Ltd	9,500	21. 5.60
		27	Australasian Petroleum Co. Pty Ltd	8,930	13. 5.60
	Licence to Prospect	1	Australasian Petroleum Co. Pty Ltd	2,705	31.10.59
		2 & 3	Island Exploration Co. Pty Ltd	811	31.10.59
QUEENSLAND					
	Authority to Prospect (P)	39P	Trans-Pacific Corporation	8,300	31.12.59
		52P	Australian American Oil Co. Pty Ltd	18,900	31. 1.61
		53P	Humber Barrier Reef Oils Pty Ltd	75,300	31. 7.61
		54P	Papuan Apinaipi Petroleum Co. Ltd	43,000	31. 8.61
		55P	Associated Australian Oilfields N.L.	13,100	30. 9.61
		56P	Associated Freney Oil Fields N.L.	33,440	30. 9.61
		57P	Australian Oil & Gas Corporation Ltd	43,000	30. 9.61
		58P	Santos Ltd. & Delhi Australian Pet Ltd (50:50)	137,000	31.10.63
		60P	L.H. Smart Oil Exploration Co. Ltd	15,800	31.12.61
		61P	Plymouth Oil Company	45,900	31. 3.62
		62P	Magellan Pet. Corp. & Central Q'land Pet. Co. Pty Ltd (75:25)	5,000	31.12.61
		63P	Magellan Petroleum Corporation	37,700	31. 3.62
		64P	Carpentaria Oils Pty Ltd	37,700	31. 3.62
		65P	Associated Australian Oilfields N.L. & Associated Freney Oil Fields N.L. (50:50)	15,500	31.12.59
		66P & 67P	Santos Ltd. & Delhi Australian Petroleum Ltd - (Checkerboarded & Interrelated)	33,800 each	31.12.68 (both)
		68P	Reef Oil Company Pty Ltd	12,000	31. 3.62
		69P	Artesian Basin Oil Company Pty Ltd	57,900	31. 3.62
		70P	Pacific American Oil Co.	10,000	31. 3.64
		71P	Queensland American Oil Co. (50% Gene Goff, 50% Phillips/Sunray)	29,500	31. 3.64
		72P	Oklahoma Australian Oil Company (100% Phillips Sunray)	35,000	31. 3.64

APPENDIX 4 (Cont'd).

State or Territory	Type of Authority	Number of Authority	Holder	Area (Sq. miles)	Date of Expiry
	Prospecting Petroleum Permits (P.P.P.)	685	Condamine Oil Ltd	100	31. 7.59
		697	Planet Exploration Co. Pty Ltd	200	30. 4.61
		699	W.C. Walz & H.J. Walz	200	31. 5.59
		704	Standard Gas Pty Ltd	200	31. 8.60
		705	Longreach Oil Ltd	188	28. 2.61
		706	Planet Exploration Co. Pty Ltd	200	30. 4.61
		707	J.G. Fuller	200	30. 4.61
NEW SOUTH WALES	Petroleum Exploration Licence (P.E.L.)	14	Clarence River Basin Oil Expln. Co. N.L.	4,500	6. 5.60
		2	Australian Oil & Gas Corp. Ltd	5,000	27. 9.59
		3	E. Gulliver	2,708	19.11.59
		4	Australian Oil & Gas Corp. Ltd	5,000	27. 6.60
		5	" " "	5,000	27. 6.60
		6	" " "	3,500	9. 8.59
		7	" " "	4,126	9. 8.59
		8	" " "	3,750	9. 8.59
		9	" " "	4,270	30.11.59
		10	Oil Search Ltd. (Nom: A.O.G.)	3,330	30.11.59
		11	R.W. Addison (Nom: P.E.Gauld)	336	30.11.59
		12	E. Gulliver	185.8	6. 5.60
		13	Australian Oil & Gas Corp. Ltd	3,566	31. 5.60
		23	" " "	5,000	27.11.59
		25	Australian Iron & Steel Ltd	2,460	27.11.59
	Applications pending	Appn.No.			
		38	B.C. Hancox (Nom: Builders Inc. Pty Ltd)	1,020	-
		39	" " "	545	-
		41	" " "	225	-
		43	Builders Inc. Pty Ltd	4,129	-
		44	J.A. O'Shea (Nom: Composite Industries)	2,029	-
		45	Clarence River Basin Oil Expln. Co. N.L.	2,500	-
		46	J.G. Fuller (Nom: Planet Expln. Co. Pty Ltd)	5,000	-
		47	" " " "	5,000	-
		48	" " " "	4,900	-
		49	P.E. Gauld	4,608	-
		50	L.H. Smart Oil Expln. Co. Ltd	2,160	-
		51	" " "	4,080	-
		52	R.B. Withers (Nom: Builders Inc. Pty Ltd)	5,000	-
		53	" " "	4,500	-
		54	" " "	4,500	-
		55	" " "	5,000	-
		56	" " "	4,000	-
		57	Harver Corporation Ltd "	1,700	-

27.

APPENDIX 4 (Cont'd).

State or Territory	Type of Authority	Number of Authority	Holder	Area (Sq. miles)	Date of Expiry
		Appln.No.			
		58	J.G. Donaldson (Nom: Builders Inc. Pty Ltd)	2,000	-
		59	J.G. Fuller (Nom: Planet Expln Pty Ltd)	5,000	-
	Petroleum Prospecting Licences (P.P.L.)	1	J.C. Reynolds	14	19.11.59
		2	Australian Oil & Gas Corp. Ltd	197	27. 6.59
		3	" " "	200	27. 6.59
		4	C.J. Ellis	8.25	10. 7.59
		5	Consolidated Oil Pty Ltd	23.25	16. 9.59
		6	P.E. Gauld (Nom: Sun Oil of California)	48	11. 9.60
	Applications pending	Appln.No.			
		22	Dome Oil & Minerals Syndicate N.L.	107.25	-
		23	Consolidated Oil Pty Ltd	9.2	-
VICTORIA	Petroleum Prospecting Licence (P.P.L.)	157	Lakes Oil Pty Ltd	200	31. 5.59
		160	"" "	183	31.10.59
		164	Victorian Oil N.L.	149	31. 1.60
		180,215,216	" "	437	29. 2.60
		184,185	" "	111	30. 4.60
		191	" "	139	31. 8.59
		212	" "	167	31.12.59
		174	Woodside (Lakes Entrance) Oil Co. N.L.	200	29. 2.60
		213	" " " "	158	31. 1.60
		247	" " " "	149	30. 6.60
		250,251,252)	" " " ")	1,024	30. 4.63
		253,254,255)	" " " ")		
		196,197,201	Oilco Ltd	482	30. 9.59
		248	" "	141	31.10.60
		192	Australian Paper Manufacturers Ltd	193	31.12.59
		193	" " " "	182	31. 8.59
		199	Westralian Oil Ltd	80	30. 9.59
		210	" "	191	31.10.59
		246	A.E. Ekberg	197	30. 6.60
	Petroleum Exploration Permits (P.E.P.)	5, 6	Frome Broken Hill Co. Pty Ltd	8,635	31. 5.60
		22	" " "	4,000	(application pending)
		12	Lochiel Oil Search & Prospecting Co. Ltd	1,183	30. 6.59
		15	Woodside (Lakes Entrance) Oil Co. N.L.	4,530	31. 3.60
		21	" " "	4,100	30. 4.61
		17	Dome Oil & Minerals Synd. N.L.	2,186	30. 6.60
		18,19,20	John George Fuller	13,789	31. 1.61
TASMANIA	-	-	None	-	-

APPENDIX 4 (Cont'd)

State or Territory	Type of Authority	Number of Authority	Holder	Area (Sq. miles)	Date of Expiry
SOUTH AUSTRALIA	Oil Exploration Licence (O.E.L.)	12/1	Clarence River Basin Oil Exploration Co. N.L.	8,900	Renewal
		19/1	Oil Drilling & Exploration Ltd (Exoil Pty Ltd)	85,776	30. 9.60
		20/1	Delhi Australian Petroleum Ltd	88,325	28. 2.64
		21/1	Santos Ltd	88,325	28. 2.64
		22/1	General Exploration of Australia Ltd	4,900	19. 4.64
WESTERN AUSTRALIA	Permits to Explore	27H	West Australian Petroleum Pty Ltd	52,000	22.10.59
		28H	" " "	51,000	22.10.59
		29H	" " "	31,000	22.10.59
		30H	West Australian Petroleum Pty Ltd	151,600	22.10.59
		106H	Westralian Oil Ltd	11,250	28. 9.59
		127H	Gulf Oil Syndicate	13,000	28. 3.60
		133H	Jackson Exploration	15,800	2. 9.59
		134H	Oil Drilling & Exploration Ltd (Exoil Pty Ltd)	13,000	9.12.60
		135H	" " " "	13,000	9.12.60
		136H	" " " "	13,000	9.12.60
		137H	Oil Drilling & Exploration Ltd (Exoil Pty Ltd)	13,000	9.12.60
		138H	" " " "	13,000	9.12.60
		139H	" " " "	13,000	9.12.60
		140H	Oil Drilling & Exploration Ltd (Exoil Pty Ltd)	13,240	9.12.60
		142H	Hawkestone Oil. Co. Ltd	5,500	8. 4.61
	Applications only	141H & 143H	Kalgoorlie Goldfields Pet. N.L. & Oil Drilling & Exploration Ltd	13,000 each	pending
		144H	Frome Broken Hill Co. Pty Ltd	16,800	pending
		145H	" " "	13,000	pending
		146H	" " "	13,000	pending
		147H	Frome Broken Hill Co. Pty Ltd	13,000	pending
		148H	" " "	13,000	pending
	Licence to Prospect	18H	West Australian Petroleum Pty Ltd	120 total	17. 8.59
		19H-37H (incl)	" " "	3,622	17. 5.60
		39H	" " "	186	21.12.59
		40H	West Australian Petroleum Pty Ltd	160	21.12.59
		41H	" " "	133	21.12.59
		42H	" " "	192	21.12.59
		44H	West Australian Petroleum Pty Ltd	195	21.12.59
		45H	" " "	180	21.12.59
		46H	" " "	189	17.11.59
		51H	West Australian Petroleum Pty Ltd	191	19. 6.60
		52H	" " "	190	6.10.59
		53H	" " "	195	16.12.59
		54H	West Australian Petroleum Pty Ltd	195	7. 5.60
		55H	" " "	197	14. 7.60
		56H	" " "	200	22. 2.61

APPENDIX 4. (Cont'd).

State or Territory	Type of Authority	Number of Authority	Holder	Area (Sq. miles)	Date of Expiry
WESTERN AUSTRALIA (Cont'd).	Applications Only	57H	Westralian Oil Ltd	200	pending
		58H (was 47H)	Associated Freney Oil Fields N.L.	120	pending
		59H (part old 16H)	" " "	112	pending
		60H (part old 16H)	Associated Freney Oil Fields N.L.	112	pending
		61H (part old 17H)	" " "	112	pending
NORTHERN TERRITORY	Permit to Explore	2	Associated Australian Oilfields N.L.	7,600	23.12.59
		3	Westralian Oil Ltd	7,400	23. 6.60
		8	Santos Ltd	7,450	11. 7.60
		19	Geosurveys of Australia Ltd	9,800	15. 3.60
		22	Delhi Australian Petroleum Ltd	10,000	15. 3.60
	Applications for Permits	24	Frome Broken Hill Co. Pty Ltd	10,000	pending
		25	Trans Pacific Petroleum Exploration Synd.	9,100	pending
		26	P.E. Gauld	10,000	pending
		27	Australian Mining and Smelting Co. Ltd	8,000	pending
		28	Three States Australian Petroleum Ltd	10,000	pending
		29	Texas American Oil Corporation	3,120	pending
		30	American Australian Oil Co.	10,000	pending
		31	Western States Natural Gas Co.	10,000	pending
		32	Dallas Southern Corporation	6,214.5	pending
		33	North Australian Petroleum Co.	10,000 (3 areas)	pending

APPENDIX 5.

LIST OF STRATIGRAPHIC WELLS DRILLED UNDER PETROLEUM SEARCH SUBSIDY ACT 1957-1958

STATUS AS AT 30TH SEPTEMBER, 1959.

COMPANY	WELL	LOCATION OR CO-ORDINATES	DATE COMPLETED OR SUSPENDED	TOTAL DEPTH (IN FEET)	HYDROCARBON INDICATIONS	STRATIGRAPHY (DEPTH IN FEET)
Papuan Apinaipi Petroleum Co. Ltd	Kaufana No. 1	Lat. 9° 00' 35" S. Long. 146° 48' 05" E.	11th January, 1958	3380	None	10-50 Pliocene 50-3380 Miocene
Associated Australian Oilfields N.L.	AAO. No. 8 (Karumba)	Lat. 17° 24' 36.4" S. Long. 140° 52' 21.9" E.	3rd March, 1958	2364	None	0-70 Quaternary 70-129 Tertiary 129-2279 Cretaceous 2279-2360 Cretaceous - Jurassic 2360-2364 Palaeozoic or Proterozoic Basement
West Australian Petroleum Pty Ltd	Samphire Marsh No. 1	Lat. 19° 31' 07.6" S. Long 121° 10' 50.8 E.	4th May, 1958	6664	None	0-134 Quaternary 134-559 Lower Cretaceous 559-2258 Jurassic 2258-4069 Permian 4069-6610 Lower Ordovician 6610-6664 Granite
Clarence River Basin Oil Exploration Co. NL.	Woomera No. 1	Phillip Ponds, S.A.	30th May, 1958	2005	None	0-2005 Cambrian and/or Proterozoic
Australasian Petroleum Co. Pty Ltd	Puri No. 1	Lat. 07° 06' 24" S. Long. 144° 59' 56" E.	7th August, 1958	10100	Flow of oil and gas	0-1762 Miocene 1762-2022 Eocene 2022-7425 Cretaceous 7425-8036 Miocene 8036-8928 Eocene 8928-10100 Cretaceous
West Australian Petroleum Pty Ltd	Meda No. 1	Lat. 17° 24' 00" S. Long 124° 11' 30" E.	21st November, 1958	8809	Small amounts of crude oil and gas	0-60 Alluvium 60-714 Triassic or Permian 714-4201 Permian 4201-6150 Carboniferous 6150-8663 Devonian 8663-8809 Precambrian (schists)
West Australian Petroleum Pty Ltd	Frome Rocks No.1	Late 18° 11' 48" S. Long. 123° 39' 35" E.	3rd February, 1959	4000	None	0-40 Alluvium 40-734 Jurassic 734-4000 Pre-Permian
West Australian Petroleum Pty Ltd	Frome Rocks No. 2	Lat. 18° 15' 15" S. Long. 123° 39' 35" E.	4th June, 1959	7504	None	0-30 Alluvium 30-206 Jurassic 206-3557 Permian 3557-7504 Devonian
Australian Oil and Gas Corporation Ltd	Mulgoa No. 2	Lat. 33° 49' S. Long. 150° 38½' E.	Drilling	5601 (on 30/9/59)	Dry gas shows	0-3000? Triassic
Santos Ltd) Delhi Australian Petr. Ltd) Frome Broken Hill Co. Pty Ltd)	Innamincka No. 1	Lat. 27° 29' 21.3" Long. 140° 55' 07.7"	Drilling	11212 (on 30/9/59)	Traces of oil	

APPENDIX 5 (Cont'd)

COMPANY	WELL	LOCATION OR CO-ORDINATES	DATE COMPLETED OR SUSPENDED	TOTAL DEPTH (IN FEET)	HYDROCARBON INDICATIONS	STRATIGRAPHY (DEPTH IN FEET)
Humber Barrier Reef Oils Pty Ltd	Wreck Island No.1	Wreck Island, Queensland	20th June, 1959	1898	None	0-550 ?Quaternary ?550-1110 Pliocene 1110-1795 Miocene 1795-1898 Dacite porphyry basement
Westralian Oil Ltd	Spirit Hill No. 1	Lat. 15° 30' 30" Long. 129° 04' 00"	Drilling	350 (on 30/9/59)	-	
Frome Broken Hill Co. Pty Ltd	Port Campbell No. 1	Lat. 38° 35' 57" Long. 142° 57' 50"	Drilling	3340 (on 30/9/59)	-	

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31. Magnetic Results from Macquarie Island, 1953.—P. B. Tenni and J. A. Brooks, 1956.
32. Geophysical Investigations for Radioactivity in the Harts Range Area, Northern Territory.—J. Daly and D. F. Dyson, 1956.
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37. The Geology of the Wooramel River Area, Carnarvon Basin, Western Australia.—M. C. Konecki, J. M. Dickins and T. Quinlan, 1959.
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