

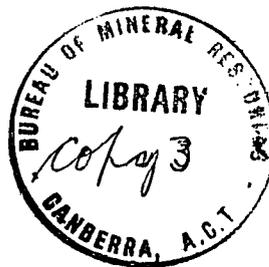
A. K. Swales.

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.
BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

1960/122

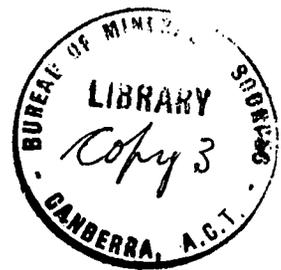


SUMMARY OF ACTIVITIES - 1960. SEDIMENTARY BASINS.

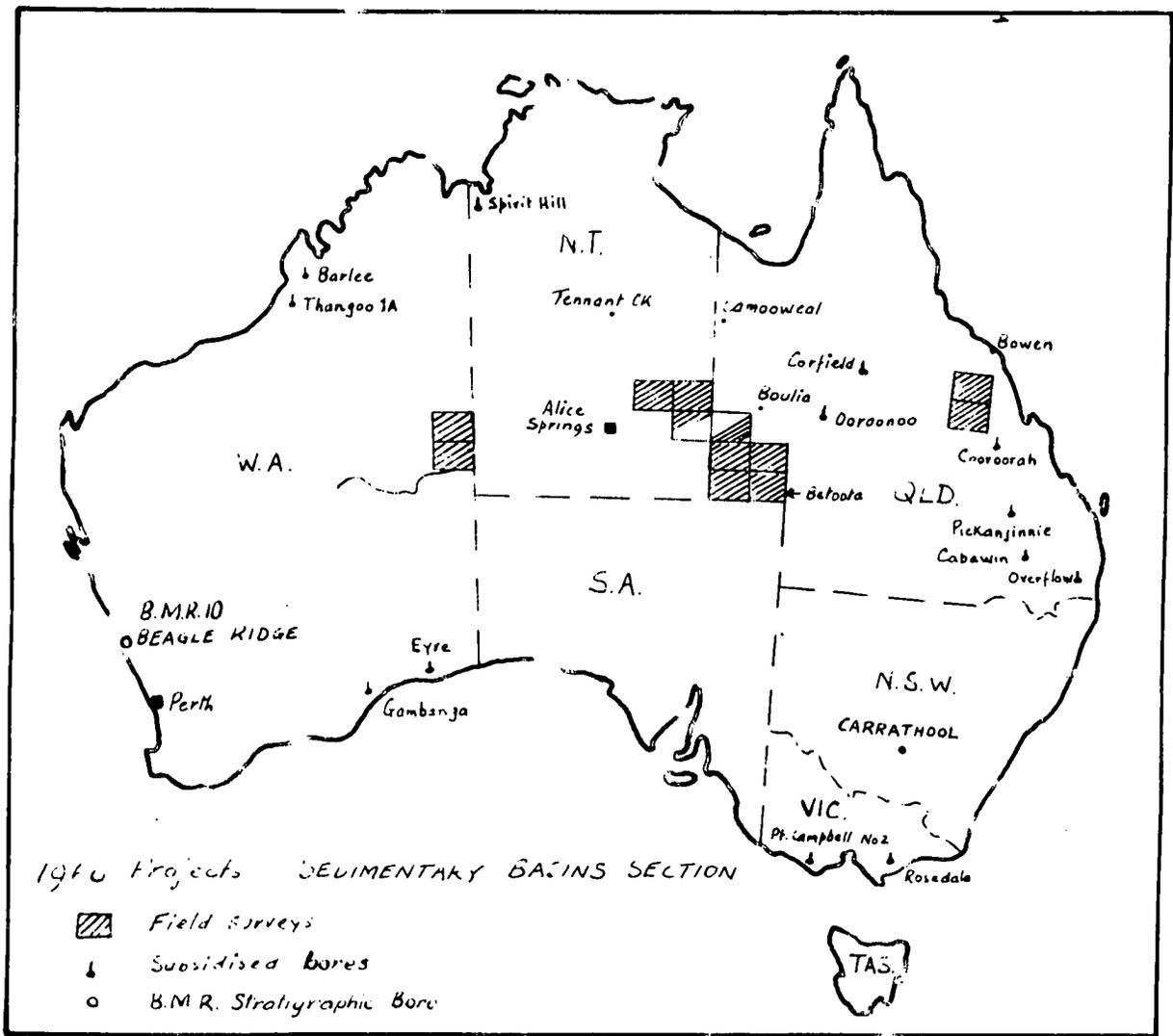
The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

SUMMARY OF ACTIVITIES - 1960

RECORDS 1960/122



<u>CONTENTS</u>	<u>PAGE</u>
SUMMARY	1
BOWEN BASIN MT. COOLON FOUR MILE SHEET by E.J. Malone	2
BOWEN BASIN CLERMONT PARTY by J.J. Veevers & M.A. Randal	3
GREAT ARTESIAN BASIN SUMMARY OF ACTIVITIES by M.A. Reynolds, F. Olgers & W.J. Jauncey	5
S.E. CANNING-W. AMADEUS SUMMARY OF ACTIVITIES by A.T. Wells	6
GEORGINA BASIN SUMMARY OF ACTIVITIES by K.G. Smith	8
STRATIGRAPHIC DRILLING REPORT ON ACTIVITIES DURING 1960 by R.A. McTavish	11



SUMMARY OF ACTIVITIES - 1960

Sedimentary Basins Section

Four field parties, with 17 geologists, operated in various sedimentary basins in Australia from June to October 1960. A locality map showing the main areas of activity is attached.

In the Bowen Basin, a party under E.J. Malone concentrated on the Mt. Coolon 4-mile sheet, and a second party under J.J. Veevers covered the Clermont sheet; each party was accompanied by a geologist of the Queensland Geological Survey.

In the Great Artesian Basin, mapping was continued in the western areas under M.A. Reynolds where most of five 4-mile sheets were mapped.

Field mapping continued in the Georgina Basin where K.G. Smith's party checked the geology and measured sections on three 4-mile sheets previously covered in reconnaissance in previous years. Traverses were also made in areas to the north, and type sections in the Camooweal region were examined.

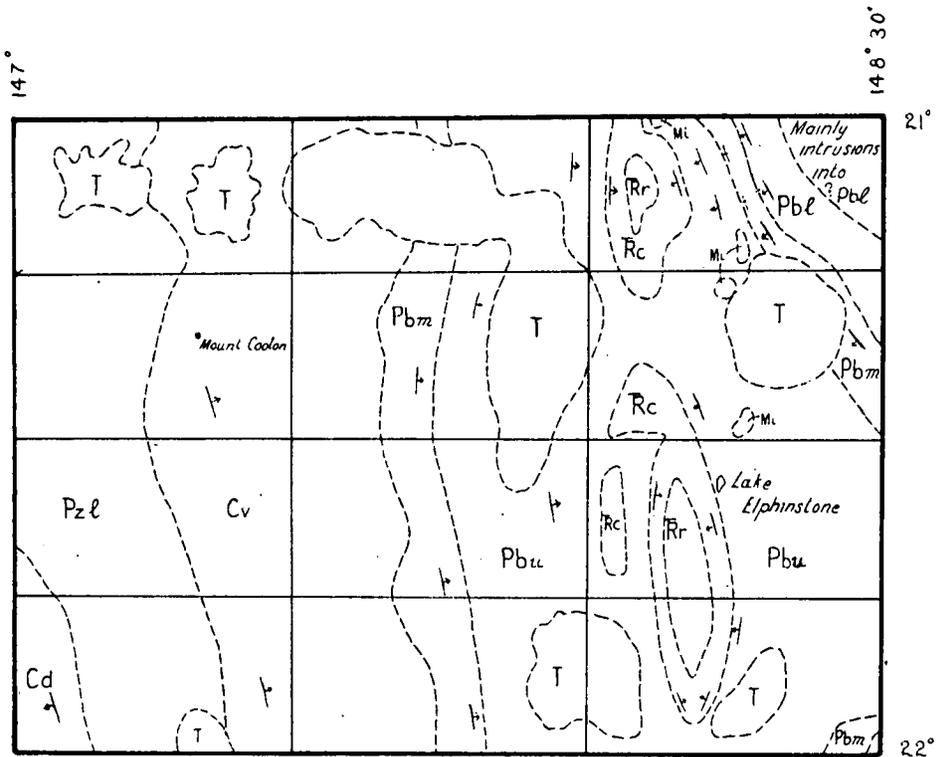
An area between the south-east Canning and western Amadeus Basin was mapped by a party led by A.T. Wells; two 4-mile sheets (Macdonald and Rawlinson) were covered and several long traverses west and north-east of these sheets were made. Although most of the area consisted of Precambrian rocks, several important, hitherto unknown fossil localities were found.

Subsidy Bores. Eleven bores were completed in 1960, for which subsidy was given. They were Associated Australian Oilfields Pickanjinie No. 1 (total depth 5213 ft.); WAPET Barlee No. 1 (8101 feet); WAPET Thangoo No. 1A (5429 ft.); Conorodo Ooroonoo No. 1 (3852 ft.); Exoil Eyre No. 1 (1719 ft.); Exoil Gambanga No. 1 (1282 ft.); Associated Freney Oilfields Cocroorah No. 1 (3523 ft.); Aust. Paper Manufacture Rosedale No. 1 (5836 ft.); Queensland-America Overflow No. 1 (2993 ft.); Magellan Corfield No. 1 (subsidised from 2726 to 4507 total depth); Delhi-Santos-Frome-Broken Hill Betoota No. 1 (9824 ft.).

Four other bores also subsidised, are in the process of drilling. They are Australian Petroleum Coy Ichi No. 1 in Papua (drilling ahead at 7500 ft.); Westralian Oil Spirit Hill (2935 feet); Frome-Broken Hill Port Campbell No. 2 (subsidised from about 7100 feet - currently drilling ahead at 8150 feet); Union-Kern-Australian Oil & Gas Cabawin No. 1 (drilling ahead at 7600 feet).

Stratigraphic Drilling. Only one stratigraphic bore was completed in 1960 by the B.M.R.; that was BMR 10A Beagle Ridge in the Perth Basin; R. McTavish was the well site geologist. McTavish also visited and collected samples from a deep B.M.R. seismic shot hole at Carrathool in the Murray Basin.

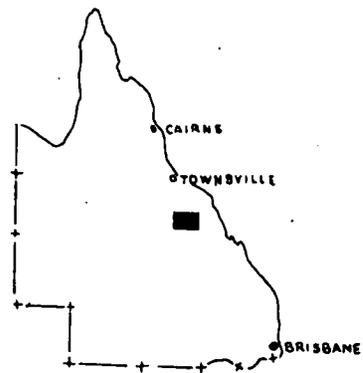
MOUNT COOLON



- | | | | | | |
|-----|---------------------|-----|--------------------|-----|--------------------------|
| T | Tertiary undiff. | Rr | Redcliffe Vale fm | Rc | Carborough Sandstone |
| Pbu | Upper Bowen Seds. | Pbm | Middle Bowen Seds. | Pbl | Lower Bowen volcanics |
| Cv | Carboniferous volcs | Cd | Drummund Group | Pzl | Lower Palaeozoic undiff. |
| Mi | Mesozoic intrusions | | | | |

INDEX TO ADJOINING SHEETS

CHARTERS TOWERS	BOWEN	PROSERPINE
BUCHANAN	MT COOLON	MACKAY
GALILEE	CLERMONT	ST LAWRENCE



BOWEN BASIN

MT. COOLON FOUR MILE SHEET

by

E.J. Malone

The Mt. Coolon Party consisted of E.J. Malone, party leader, D.W.P. Corbett, and A.R. Jensen of the Bureau of Mineral Resources, and P.E. Bock (June - 9th September) and L.G. Cutler (9th September-October) represented the Geological Survey of Queensland.

The party commenced mapping on the 7th June and ceased field work on the 15th October.

The geology of the Mt. Coolon 4-mile area is shown in the accompanying sketch map and graphic log.

The Lower Palaeozoic basement in the west of the sheet area probably formed a ridge above sea level during the Carboniferous. Carboniferous volcanics unconformably overlie the ridge to the east and Carboniferous Drummond Group overlie it on the west; both units contain abundant Leptophloeum veltheimianum near the basement ridge.

Although the two Carboniferous units have little lithological similarity, they are probably time equivalents, in part at least. The volcanics consist mainly of acid volcanics, (intrusive as well as extrusive), with only minor interbedded sediments. The Drummond Group, in the Mt. Coolon area, consists of feldspathic quartz sandstone, siltstone and agglomerate; further west, it consists of quartz sandstone, conglomerate and siltstone with no volcanic rocks.

The Lower Bowen volcanics form a very thick wedge of intermediate to acid volcanics with intrusives, and minor interbedded sediments. They crop out in the eastern part of the 4-mile area and apparently wedge out towards the west.

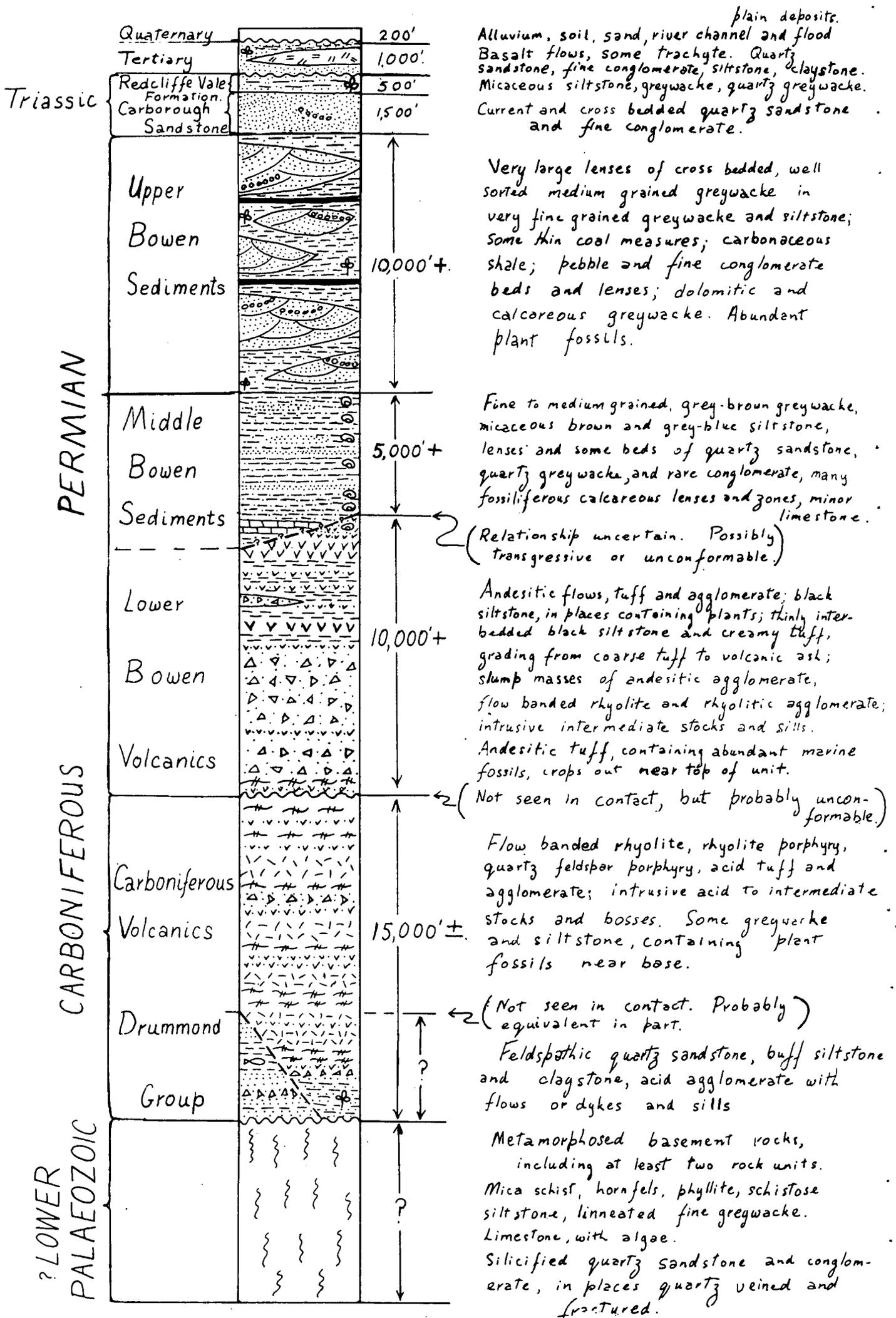
The Middle Bowen marine sediments unconformably overlie the Lower Bowen volcanics in the east of the Mt. Coolon area and unconformably overlie the Carboniferous volcanics in the west. They apparently transgressed westwards beyond the limits of the trough in which the Lower Bowen volcanics were deposited; a quartz greywacke-siltstone assemblage occupies the eastern (trough) area and mainly quartz sandstone crops out in the west where the unit becomes thinner.

The Upper Bowen sediments are a freshwater sequence conformably overlying the Middle Bowen sediments. No unconformity was observed between the Upper Bowen sediments and the overlying Triassic Carborough Sandstone, which is transitional into the Triassic Redcliffe Formation.

A number of small to moderately large igneous bodies intrude the Permian sediments. Some of the intrusives definitely postdate the Carborough Sandstone and all of them are considered to be Mesozoic in age. Most of the intrusives are found in the

GRAPHIC LOG.

Mt Coolon 4-mile area.



Scale: 1" = 5,000' approximately.

eastern (trough) zone and only very small sills or dykes were found intruding the Permian sediments further to the west. Tight folding also occurs in this trough zone.

The western limit of outcrop of the Middle Bowen marine sediments is probably close to the limit of deposition of these sediments. In the north east of the Mt. Coolon area, the outcrop of the Middle Bowen sediments forms the north-east limb of what has been referred to as the Bowen Basin syncline. The quartz greywacke-siltstone assemblage of the Middle Bowen is steeply dipping and is typical of a trough environment. The eastern boundary of the Bowen Basin in this area is probably structural, not depositional, and the depositional edge is much further to the east.

BOWEN BASIN

SUMMARY OF ACTIVITIES - 1960, CLERMONT PARTY

by

J.J. Veevers & M.A. Randal

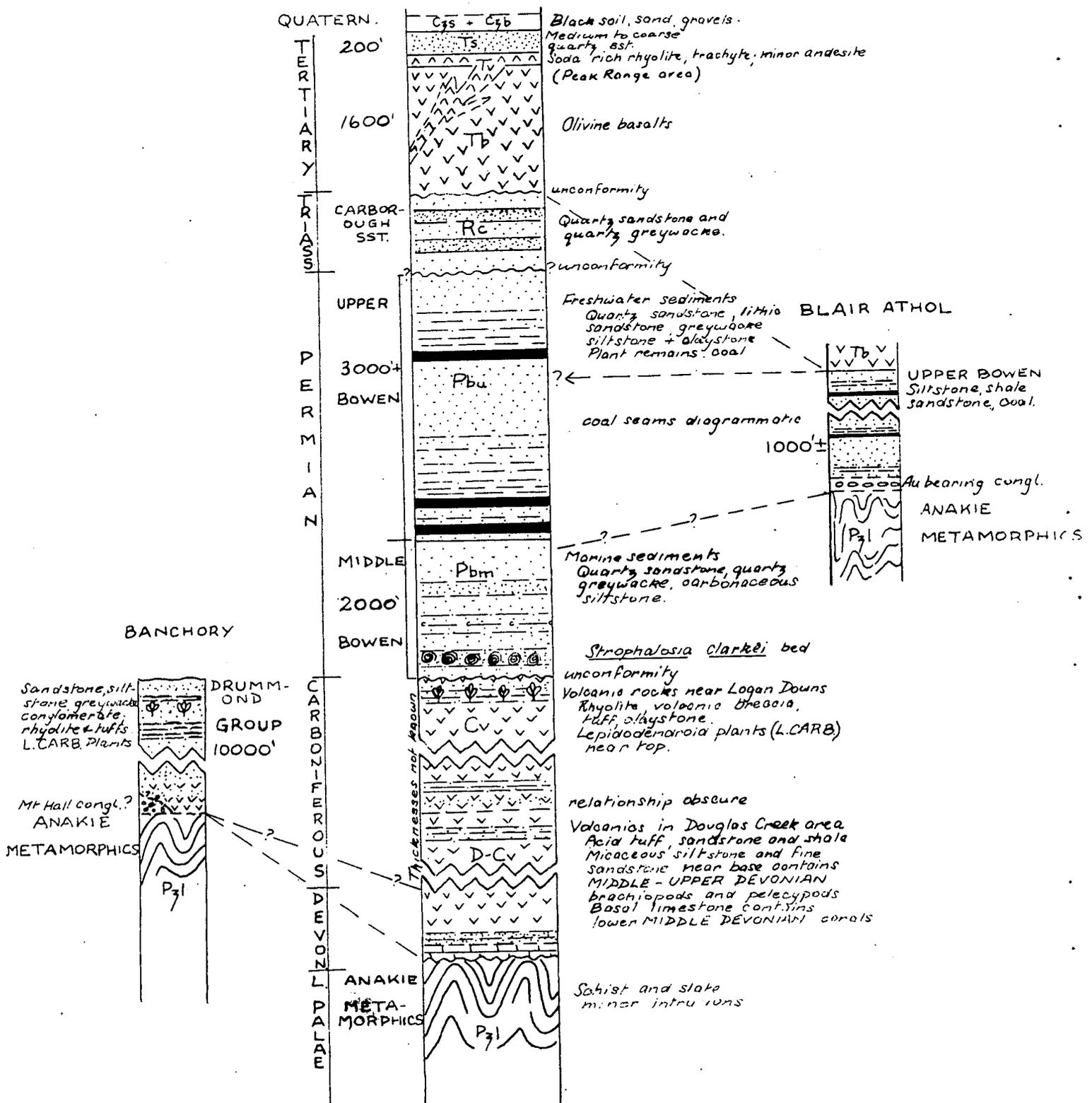
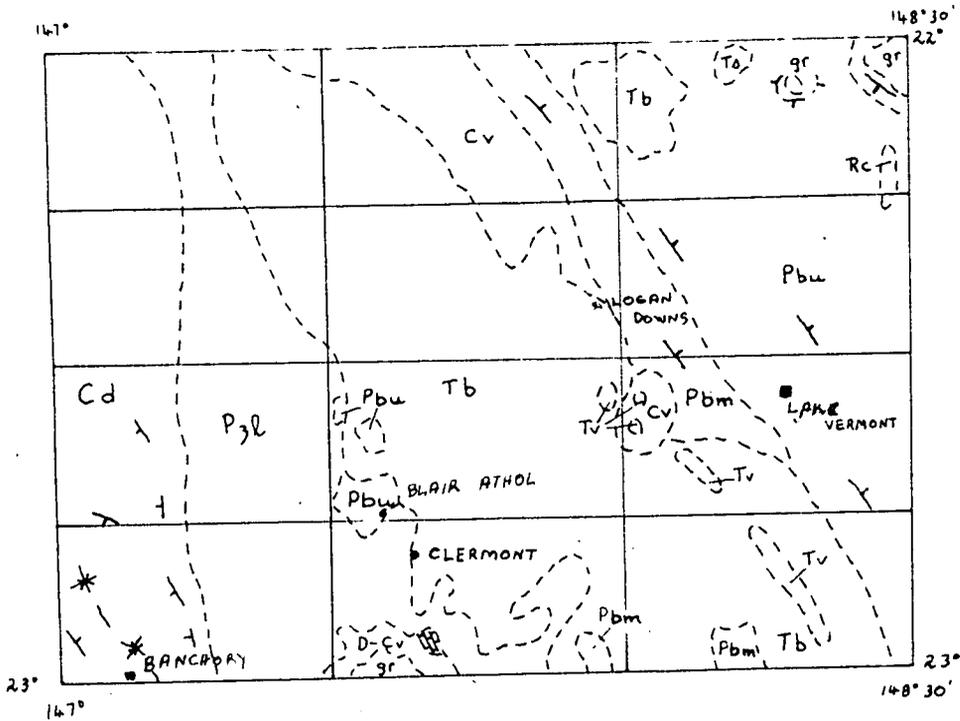
The party consisted of J.J. Veevers (Party Leader), M.A. Randal, R.G. Mollan and R.J. Paten (Queensland Geological Survey). The party left Brisbane for the Bowen Basin on 22nd May and after inspecting various sections within the Basin commenced mapping the Clermont 4-mile area on 9th June. The Party returned to Canberra on 28th October after visiting the drilling rig at Cabawin No. 1 Bore, near Tara, Queensland.

The information obtained during the mapping of the Clermont 4-mile is outlined below:

1) The oldest exposed rocks in the area are the sheared and folded schists and slates of the Anakie High (Anakie Metamorphics). There is a strong structural and metamorphic unconformity between this unit and the adjacent rocks of Devonian and Carboniferous ages. Previous workers regarded the age of the unit as Lower Palaeozoic; because there is no detailed information on the structure and lithology within the unit no attempt can yet be made to give a more accurate age for these rocks.

The Anakie Metamorphics extend in a wide belt from west of Emerald to north of Mt. Coolon. Copper mineralisation occurs in these rocks in the Clermont district.

CLERMONT 4-MILE AREA



2) Near Douglas Homestead, south of Clermont, a sequence of crystalline limestone, siltstone, sandstone and volcanics is thrust faulted against metamorphic rocks of the Anakie High. In places the contact with the older rocks is obscure but it appears to be an unconformity. Lower Middle Devonian corals have been found in the limestone which has not been seen in contact with the overlying volcanics. At the base of the volcanics a siltstone bed contains brachiopods and pelecypods which range from Middle to Upper Devonian. The volcanics are tentatively correlated with similar volcanics which occur in the Logan Downs area and which contain, near the top, Lower Carboniferous plant fossils similar to ones found in the rocks of the Drummond Group. The rocks of the Anakie High and the volcanics in the Douglas Homestead area area intruded by large bodies of diorite and by syenite dykes.

The older volcanics in the Clermont area, previously thought to be in part Lower Bowen, apparently range from Middle Devonian to Lower Carboniferous.

3) West of the Anakie High, over 10,000 feet of volcanics and sediments are exposed in a broad syncline which extends to the west onto the Galilee sheet and to the south onto the Emerald sheet. On the western side the underlying rocks are not exposed; on the eastern side tuffs and rhyolite unconformably overlie the Anakie Metamorphics. These volcanics do not crop out on the western side of the basin in the sheet area; the lowermost beds may be equivalent to the Mt. Hall Conglomerate. Plant remains, indicating Lower Carboniferous age have been found in the section. The sequence has in the past been referred to as the Drummond Group.

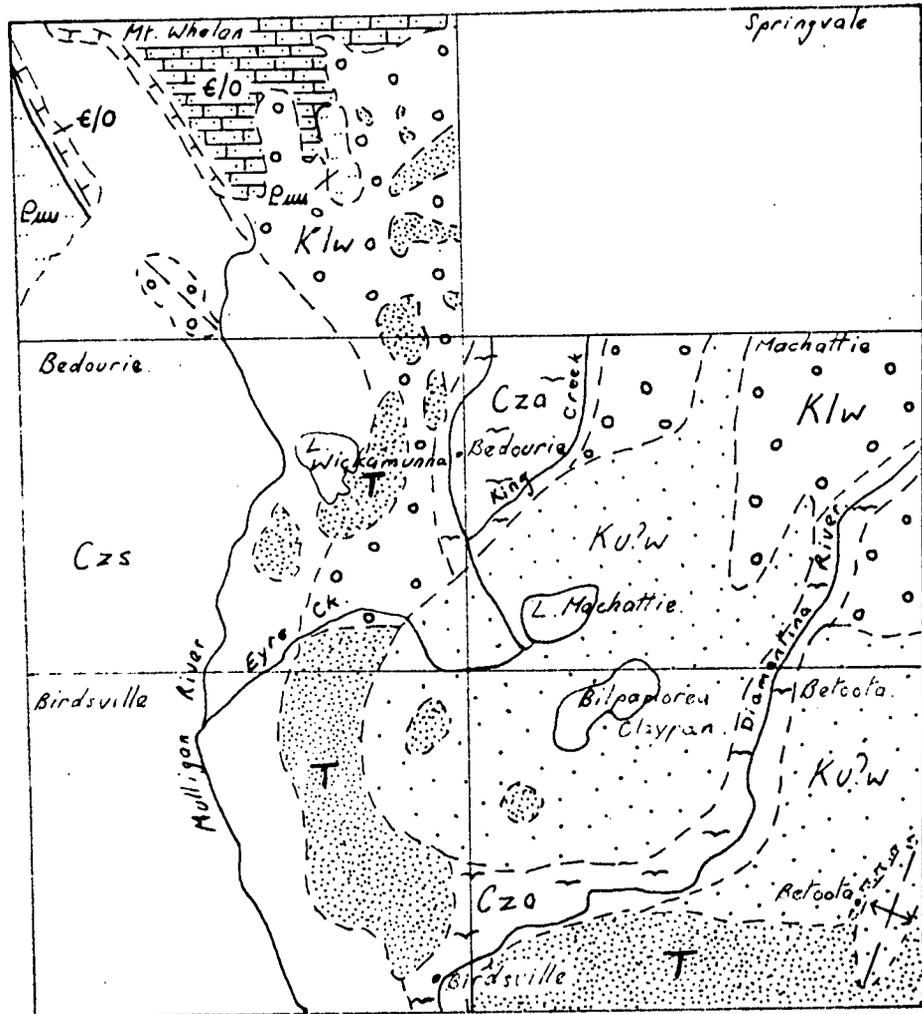
4) The oldest exposed Permian rocks in the area are equivalent to the Ingelara Shale. Its contact with the underlying volcanics is unconformable. The marine Permian rocks exposed in the Clermont area consist of quartz sandstone, quartz greywacke carbonaceous siltstone and are 1500-2000 feet thick. One prominent fossil bed occurs near the base and contains abundant remains of Strophalosia clarkei. Other fossil beds occur throughout the section.

Rocks which may be older than the Ingelara Shale occur in the north east of the Clermont area. They crop out on the eastern side of the Bowen Basin and have been intruded by igneous rocks which may cause difficulty in the identification of the fossil material.

The marine Permian rocks of the Middle Bowen are conformably overlain by freshwater sediments of the Upper Bowen. At least 3,000 feet of quartz greywacke, lithic sandstone, siltstone, mudstone, and carbonaceous rocks are exposed. Coal seams are exposed near Lake Vermont Homestead, Booroondara Homestead and in Cherwell Creek. In the north east of the area the freshwater sediments have been domed by igneous intrusions. Plant fossils are abundant.

The Permian marine rocks are generally flat lying except, a) where they are affected by igneous intrusions; b) where they have been locally folded; c) near their boundary with the freshwater sediments.

GEOLOGICAL SCETCH-MAP OF MT. WHELAN - BEDOURIE -
MACHATTIE - BIRDSVILLE - BETOOTA AREA.



REFERENCE.

- | | |
|---|--|
|  Cainozoic. Alluvium. |  Lower Cretaceous.
Wilgunya Formation. |
|  Cainozoic. Aolian Sand. |  Cambro-Ordovician. |
|  Tertiary. |  Upper Proterozoic. |
|  ?Upper Cretaceous.
Winton Formation. | |

5) In the north east of the area, an isolated ridge of quartz greywacke interbedded with clean quartz sandstone has been referred to the Triassic Carborough Sandstone. This follows the previous literature. During the recent mapping a poorly preserved equisetale stem was found midway in the sequence which totals approx. 1,000'. No contact with the underlying Permian rocks has been seen. The lithology of this outlier lacks the dark colour and siltstone bands characteristic of the Permian freshwater sequence.

6) The Permian rocks and the Anakie Metamorphics are unconformably overlain by large areas of olivine basalt with minor andesite and trachyte flows. The volcanics are probably of Tertiary age and a thickness of 1600' has been measured. The soda rich volcanics of the Peak Range area appear to be genetically related to these rocks, which they intrude as plugs and sills and in places overlie as flows. The volcanics of the Peak Range include soda-rich trachytes, rhyolites, and minor basic rocks. They intrude also the marine Permian; the soda-rich volcanics form domes which in many places, have collapsed to give "saucer-shaped" bodies.

7) The Tertiary basalt and the Upper Bowen rocks are overlain by 200 feet of medium to coarse clean quartz sandstone.

GREAT ARTESIAN BASIN

SUMMARY OF ACTIVITIES

by

M.A. Reynolds, F. Olgers, W.J. Jauncey

M.A. Reynolds completed reports on the Springvale area, Gilberton-Georgetown (Record 1960/68) area and Roma typesections (Record 1960/67).

F. Olgers joined the Bureau in February and assisted M.A. Reynolds in the preparation of maps for the above mentioned reports.

W.J. Jauncey arrived in Canberra in April. Olgers and Jauncey prepared for fieldwork in the Great Artesian Basin.

Field work commenced at Bedourie on June 13th and was completed on October 17th, with the exception of helicopter traverses carried out in the west of the area by M.A. Reynolds in November. Since the end of October work has been carried out on the compilation of uncontrolled 4-mile sheets.

The geological mapping of four 4-mile areas (Bedourie, Machattie, Birdsville and Betoota) was completed and the Mt. Whelan 4-mile sheet, commenced in 1959, was completed. Topographical information and bore data were collected from station owners.

STRATIGRAPHIC COLUMN.

TERTIARY

Austral Downs
Limestone.
Marion Sstn.

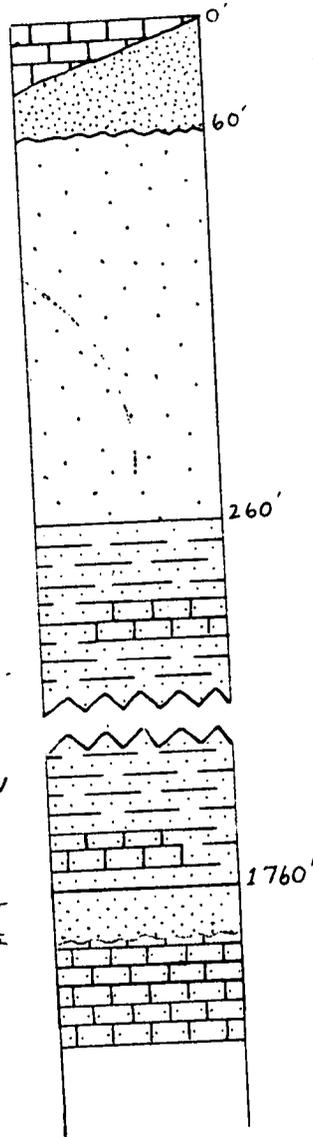
WINTON
FORMATION

CRETACEOUS

WILGUNYA
FORMATION

LONGSIGHT
SANDSTONE

LOWER
PALAEOZOIC



Vertical scale: 1 inch to 100 feet.

S. Skwarko visited the party from June 26th to August 5th. During this period traverses were carried out in the Mt. Whelan and Springvale areas; fossils were collected from Lower Cretaceous formations.

The Bedourie-Machattie-Birdsville-Betoota area is covered in the main by sediments of Cretaceous and Tertiary age. In the west and north of the Mt. Whelan area, sediments of Precambrian and Cambro-Ordovician age occur. (see accompanying sketch map and stratigraphical column).

The Toolebuc Member of the Wilgunya Formation (Lower Cretaceous) has been traced from the Springvale 4-mile area into the Mt. Whelan area.

Important structural features of the area are:

1. A large dome in the south-east of the Betoota area.
2. North-east, south-west trends in the Machattie 4-mile area cutting across the southern end of the Burke River Structure.
3. A north-north-east, south-south-west trend which can be traced across the Mt. Whelan 4-mile sheet and as far south as the Birdsville sheet.

S.E. CANNING-W. AMADEUS

SUMMARY OF ACTIVITIES - 1960

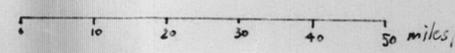
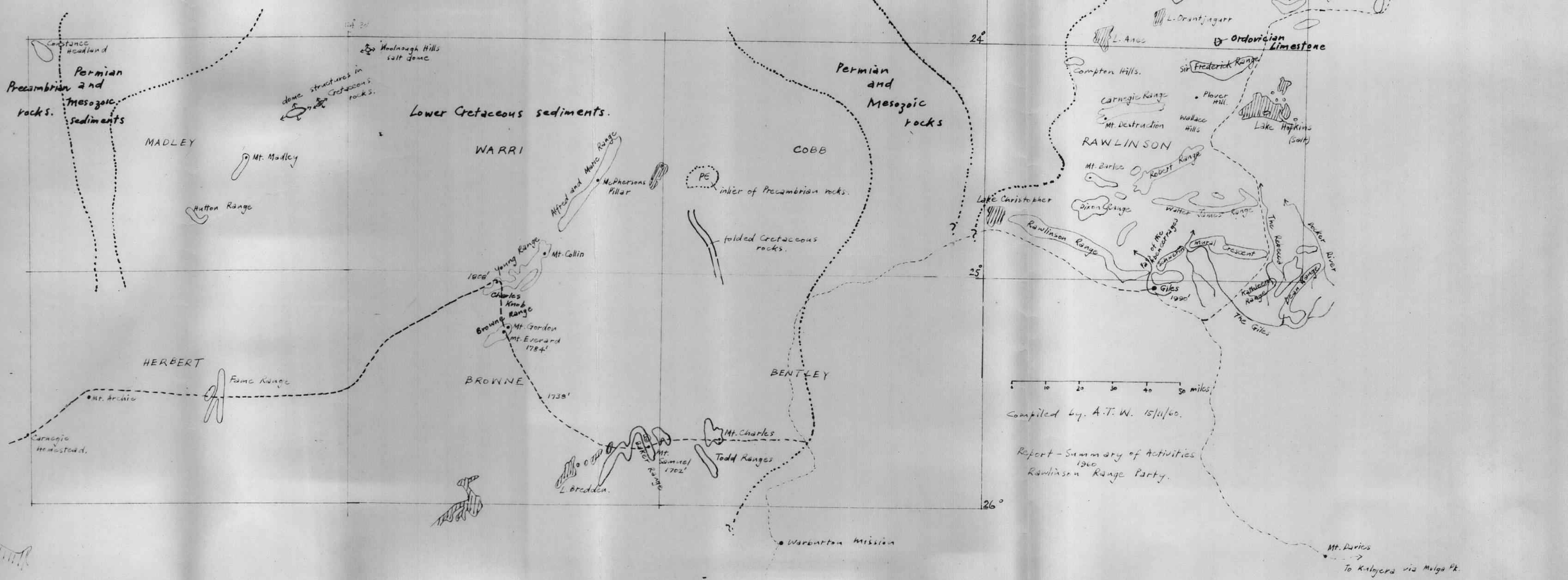
by

A.T. Wells

From January to April A.T. Wells collaborated with J.J. Veevers on the compilation of the Bulletin on the Canning Basin. The Bulletin was completed together with 20 mile geological and tectonic maps and passed over for editing.

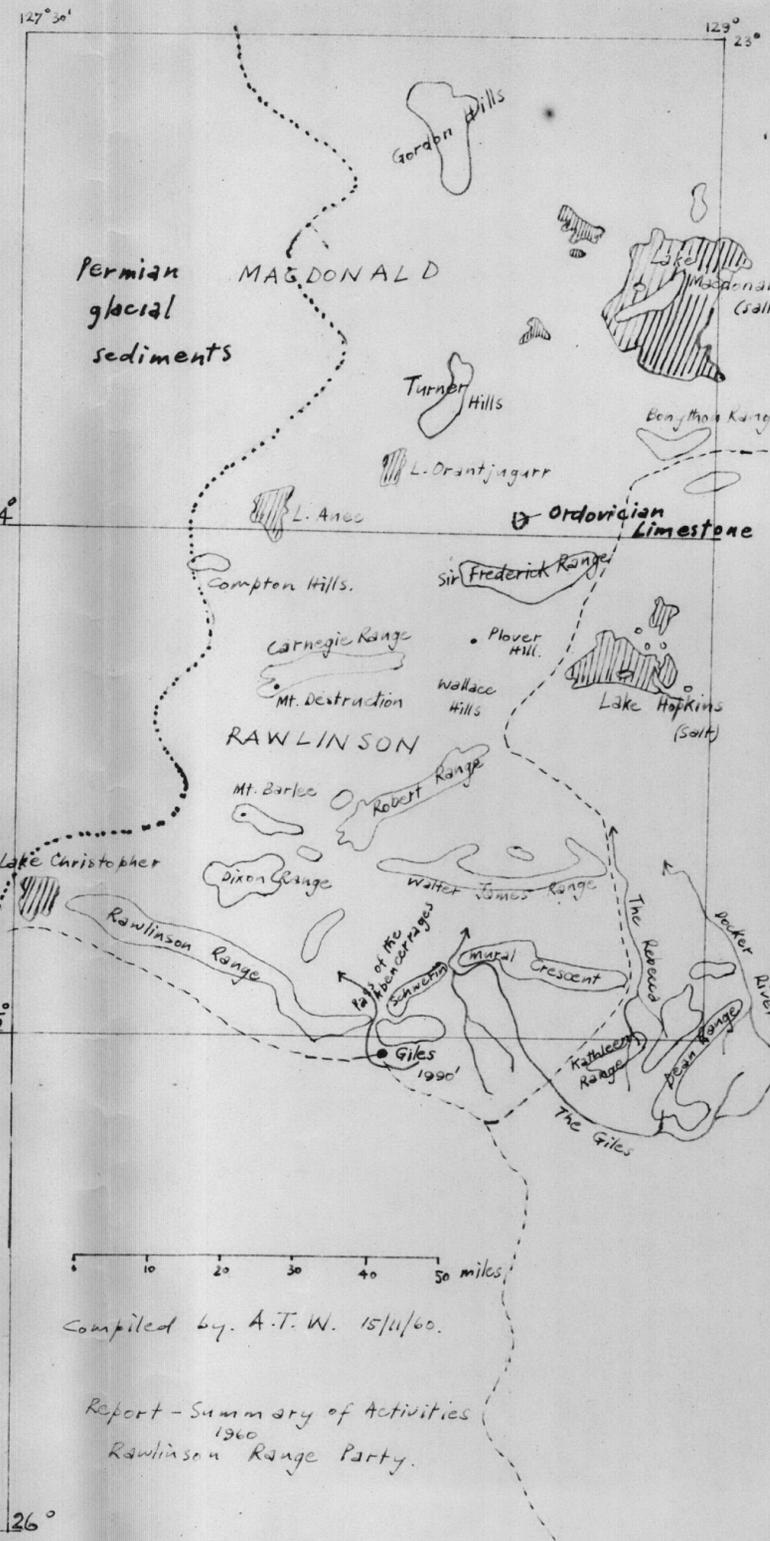
From May to October A.T. Wells, D.J. Forman and L.C. Ranford carried out reconnaissance mapping on the Macdonald (F/52-14) and Rawlinson (G/52-2) W.A. four-mile sheet areas. A brief examination of fossiliferous Mesozoic rocks between Giles Weather Station and Carnegie Homestead was made. The more important results of the survey are as follows.

Two small areas of fossiliferous Ordovician red limestone, 10 feet thick, containing bryozoa, phosphatic brachiopods, echinoderm ossicles, and conodonts were discovered about 40 miles south-west of Lake Macdonald; the limestone is overlain at one locality by about 10 feet of siltstone and sandstone. The limestone overlies the adjoining older rocks with an angular unconformity. The closest fossiliferous Ordovician rocks outside this area crop out in the George-Gill Range about 125 miles east.



Compiled by A.T.W. 15/11/60.

Report - Summary of Activities
1960
Rawlinson Range Party.



To Alice Springs via Mt. Li Big

To Kalbarra via Mulga Pk.

Precambrian low grade metamorphic rocks crop out on the southern half of the Rawlinson sheet area in the Rawlinson and Dean Ranges and Schwerin Mural Crescent. The succession is about 3,500 feet thick but it is complicated by faulting and overthrusting. The metamorphics are intruded by extensive sheets of quartz-feldspar porphyry which is possibly comagmatic with granite intrusions near the Kathleen and Dean Ranges; the field evidence suggests that the granite emplacement was subsequent to porphyry intrusion.

Copper carbonate occurs in sheared porphyry near the Kathleen Range. A grab sample of some of the richer material assayed 2.3% copper.

In the north-eastern section of the Macdonald sheet, Precambrian quartzite, schist, gneiss, granite and quartz-feldspar porphyry are overlain with an angular unconformity by a thick younger (Upper Proterozoic and possibly Lower Palaeozoic) sedimentary sequence. This sequence commencing from the top is:-

10 feet	Red limestone and some siltstone and sandstone (Ordovician)
ANGULAR UNCONFORMITY	
600 feet	Quartz greywacke, micaceous siltstone and sandstone; ?Shelly fragments.
900 feet	Current bedded slumped, cross-bedded sandstone (calcareous in part) which grades laterally into thick boulder beds.
2800 feet	Calcareous calcilutite with abundant calcareous algae and a <u>tillite</u> horizon near the base of the section. These beds grade laterally into a quartz greywacke and sandstone sequence 4100 feet thick.
800 feet	Dolomite and some limestone. Abundant Calcareous algae. Maybe Bitter Springs Limestone equivalent.
400 feet	Quartz sandstone, shale and fine conglomerate.

The thicknesses above were measured in incomplete sections; photointerpreted thicknesses are much greater.

The lowermost formation is similar stratigraphically and logically to the Heavitree Quartzite of the Hermannsburg area, the overlying carbonate formation to the Bitter Springs Limestone and the glacial beds to the Areyonga Formation.

Near the centre of the Rawlinson sheet area the 600 and 900 foot arenaceous sequence is faulted against Precambrian quartz sandstone. North of this E-W fault, between the two areas of older Precambrian rocks, the above succession is folded, into broad domes and basins with north-south trending axes and flank dips of 25-30°.

Indeterminate ?shelly fragments suggest a Palaeozoic age for the upper part of the sequence.

The youngest rocks encountered in the area are horizontal glacial Permian deposits which cover a large part of western portion of the sheets and occur as remnants unconformably overlying older rocks as far east as the N.T.-W.A. border. These sediments are an extension of the Permian glacial deposits from the Canning Basin.

The reconnaissance between Giles and Carnegie established the presence of a large sheet of Mesozoic rocks (probably mostly Cretaceous) which extends from Mt. Charles in the east to the Fame Range in the west, a distance of 190 miles. Marine lower Cretaceous fossils were collected at Mt. Samuel (lat. 25°46', long. 125°56') on the Browne 4-mile sheet (G/51-8) from essentially horizontal sediments. However, in local areas the sediments are folded and about 20 miles N.E. of Mt. Madley (Madley 4-mile sheet G/51-3) the sediments are domed. The Mesozoic sediments extend as far south as latitude 26°S, the present limit of air-photo coverage.

GEORGINA BASIN

SUMMARY OF ACTIVITIES - 1960

by

K.G. Smith

A party consisting of K.G. Smith, R.R. Vine, P. Jones (3/8/60-18/10/60) and E.N. Milligan (21/8/60-18/10/60) spent from the 14/6/60 to 18/10/60 carrying out field work in the Georgina Basin; M.A. Condon visited the party from 13/6/60 to 5/7/60.

The survey was designed to resolve problems on each of the Huckitta, Tobermory and Hay River 4-mile sheets, as well as to begin mapping Palaeozoic rocks on the Elkedra 4-mile Sheet, and to inspect the geology of other parts of the Georgina Basin, e.g. on Sandover River, Avon Downs 4-mile Sheets, N.T., and on the Camooweal Sheet, Queensland.

Results Checks on each of the Huckitta, Tobermory and Hay River Sheets were completed, and three one-mile sheets on the Elkedra 4-mile were mapped. New information resulting from this work is:

(a) Hay River 4-mile Sheet

On the western side of the Toomba Range, the Kelly Creek and Nora Formations were found, but the outcrop is poor. Fossils were collected from both Formations. Samples from three water bores, drilled in 1960 along the Field River south of Gnallan-a-gea well, disclosed a non-outcropping sandstone and siltstone unit, 75-90 feet thick, which overlies green "tillitic"

siltstone of the Field River Beds. The age of this non-outcropping unit maybe either Permian or Mesozoic.

(b) Tobermory 4-mile Sheet

Several areas mapped in 1959 as sandstone of Upper Cambrian-Lower Ordovician age consist mainly of weathered dolomite of Lower Ordovician age. Other smaller areas, mapped previously as Permian Tarlton Formation, were found to contain only weathered Ordovician dolomite with a few pebbles of the Tarlton Formation strewn on its surface.

Additional specimens of fossil wood were obtained from the Tarlton Formation, in an attempt to get more diagnostic specimens than those collected in 1959.

Samples from three water bores drilled in 1960, on Tarlton Downs Station gave sub-surface information on Upper Cambrian-Lower Ordovician sediments.

(c) Huckitta 4-mile Sheet

Cambrian. The area west and south-west of Huckitta homestead contains a thick sequence of carbonate rocks, of Middle and Upper Cambrian age. Complicated structure and a lack of outcrop prevent the measurement of a complete section at any one locality, but a summation of measurements gives a thickness of 3,500 feet. The lower 1600 feet (approximate) belongs to the Middle Cambrian Arthur Creek Beds; the upper part is the Arrinthrunga Formation, of Upper Cambrian age. Only two fossil horizons have been found in the Arthur Creek Beds in this area. In the Arrinthrunga Formation, brachiopods were discovered in a dolomite bed 200 feet below the formation top, and trilobites were located in a sandstone lens 100 feet below the top of the Formation.

Additional structural mapping revealed that in the north-eastern quadrant of the Huckitta Sheet the Arrinthrunga has not been folded into a broad anticline. The regional dips are actually to the west and south-west; the impression of an anticline has been caused by downward movement of the top unit of the Formation, on the eastern side of two parallel, NW-trending faults. The larger of these faults extends on to the Elkedra 4-mile Sheet for about 40 miles, and its total length is about 80 miles. The stratigraphic throw on this fault ranges from 200 to 1,000 feet.

In the N.E. corner of the Huckitta Sheet, fossiliferous Upper Cambrian sediments of the Tomahawk Beds occur; they extend to each of the adjoining 4-mile Sheets of Elkedra, Sandover River and Tobermory.

In the area of Lucy Creek homestead and No. 3 and No. 8 Bores of that station, an estimated 300 feet is missing from the top dolomite unit of the Arrinthrunga Formation; the absence cannot be attributed to faulting, and it is believed that in this area Upper Cambrian sediments of the Tomahawk Beds are unconformable on the Arrinthrunga Formation.

Devonian. Additional specimens of fossil fish were obtained from the Point Spring area. The specimens were obtained 1640 feet above the local base of the Dulcie Sandstone and are from the same horizon as those of the original discovery (1958).

From the N.W. quadrant of the Huckitta Sheet the Dulcie Sandstone was traced westwards to the Alcoota Sheet almost to Utopia Station. Photo-interpretation indicates that it continues on to the Barrow Creek Sheet.

(d) Elkedra 4-mile Sheet

The following one-mile Sheets were mapped: Nos. 321, 322 and 332. No. 321 contains thin lower Middle Cambrian sediments (the Sandover Beds) unconformable on the Lower Proterozoic Hatches Creek Group. The eastern edge of outcrop of the Sandover Beds coincides with a N.W. trending fault trace; the outcrop of the unit on the downthrown (eastern) side of the fault is too poor to be able to show its stratigraphic position.

On Sheet No. 322 there are outcrops of dolomite, dolomite and quartz sandstone which are believed to belong to the top dolomite unit of the Arrinthrunga Formation. The regional dip is to the south-east. Sheet No. 322 contains sandstone and dolarenite of the Tomahawk Beds, faulted against the top of the Arrinthrunga Formation. The base of the Tomahawk Beds is not exposed; the thickest section measured is 280 feet and most of it is of Upper Cambrian age; highest fossils collected may be Ordovician but this requires confirmation.

Conclusions

(i) The Huckitta area of Cambrian sedimentation may deserve its own sub-basin name.

(ii) The margins of the western arm of the Georgina Basin will be delineated by mapping the N.E. quadrant of the Alcoota 4-mile Sheet and the Barrow Creek and Elkedra 4-mile Sheets. These Sheets contain some important stratigraphy and it is expected that the history of Upper Cambrian transgressions will be much clearer when the Sheets are mapped.

(iii) A regional progress map at 10-mile scale can now be produced.

(e) Underground Water

In accordance with its initial instructions, issued in 1957, the party has studied closely the lithologies and thicknesses of formations, and the records of existing water bores, to assess the underground water potential of the region. This assessment has been tested, during 1959 and 1960 field seasons, by the drilling of several bores on sites selected by the party. To date, all of these have been successful. In addition, two bores on sites selected by pastoralists were saved from being abandoned when the log indicated that both would stop above good aquifers. Several sites selected by pastoralists were inspected and condemned for various reasons.

All bores on the party's sites were drilled in order to develop unused country, e.g., the available grazing area on Tarlton Downs Station has been doubled. In terms of the country's development, and of the value of a successful bore to a cattle station, the survey of the Tobermory and Hay River Sheets has paid for itself with water bores. The Huckitta area is now being drilled.

During 1960, much time was spent selecting water bore sites, but this was essential because most stations in the region are in their first stages of development, i.e., bores about 8 miles apart. The second stage (4 miles apart) will be considerably easier with good records from the first one. The party's return from this work was valuable sub-surface information on lithologies, and some good checks on its regional mapping; each foot costs the pastoralist at least £3, and each unnecessary foot, in a successful bore, about £8.

All logs, locations of and reasons for bore sites, and information on water-bearing formations have been reported to the Resident Geologist, Alice Springs.

STRATIGRAPHIC DRILLING

REPORT ON ACTIVITIES DURING 1960

by

R.A. McTavish

A completion report on Bore BMR 10, Beagle Ridge (Record 1960/31) was prepared during January to March. From April to Mid-May arrangements were made for the French Institute of Petroleum consulting party in Western Australia, and the party was accompanied in the Carnarvon Basin. From Mid-May to July: Wellsite Geology of BMR 10A, Beagle Ridge. August to Mid-October: Prepared completion report on Bore BMR 10A, Beagle Ridge, and the report on Stratigraphic Drilling at Beagle Ridge. 17th to 31st October: Visited Carrathool Bore, reported on the bore, and completed 'Bibliographic Index of the Cretaceous Invertebrates of the Great Artesian Basin and Nearby Areas'. (Record 1960/116). November: Commenced the study of the Triassic Invertebrate Fauna from Beagle Ridge.

Bore Data

BMR 10 (Beagle Ridge) was drilled, because a subsurface basement ridge had been recognized as a result of aeromagnetic and gravity surveys conducted by the Bureau of Mineral Resources; the ridge has become known as 'Beagle Ridge'.

It was expected that drilling at Beagle Ridge would yield new information on the stratigraphy of the Perth Basin, and particularly on the geological history of Beagle Ridge. The geological record on Beagle Ridge had been considered important in the light of results obtained from drilling on the Broome Ridge of the Canning Basin, where shallow-water Ordovician sediments had been recognized at shallow depth.

BMR 10 was drilled immediately above the highest accessible part of Beagle Ridge, and it was planned to drill to basement. Numerous mechanical difficulties arose during the drilling of BMR 10 (the bore was drilled by Oil Drilling and Exploration Pty. Ltd. with their own T-20 rig), and it had to be abandoned at a total depth of 3910 feet.

A thin section of about 100 feet of Pleistocene marine calcarenite was penetrated; it overlay unconformably about 1,000 feet of coarse-grained Cockleshell Gully Sandstone (Jurassic). Below the Jurassic was a thick sequence of marine deltaic siltstone and sandstone, and dark green-grey shale, which yielded the first definite Triassic ammonites recognized in Australia. Three lithological units occur in the Triassic sequence, one could be referred to the Kockatea Shale, but the overlying units were new. Disconformably below the Triassic is a sequence of Permian siltstone and sandstone which persists to total depth.

Oil-staining and traces of visible oil were evident in this Permian at 3720 feet. The oil show and the presence of suitable source, reservoir, and cap rocks in BMR 10 enhance the prospects for petroleum in the Perth Basin.

BMR 10A (Beagle Ridge) was drilled as a replacement to complete the project of Beagle Ridge by drilling to basement. Oil Drilling and Exploration Pty. Ltd. drilled BMR 10A under contract, using their National T-20 rig.

BMR 10A was drilled to a total depth of 4862 feet. The basement, dominantly of metamorphic rocks similar to some from the Greenough Block, was encountered first at 4794 feet.

A sequence of Pleistocene, Jurassic, Triassic, and Permian sediments, similar to that in BMR 10, was encountered to 3900 feet. Below 3900 feet a thick sequence of about 900 feet of Permian (Artinskian) sediments, comparable to the Artinskian sequence of the Irwin River area, lies unconformably on basement. The sequence comprises interbedded siltstone and sandstone which gradually passes downwards into a sequence of rapidly alternating sandstone, siltstone, shale, and thin beds of coal. The basal unit consists of an interbedded sequence of siltstone, sandstone, and mudstone, all calcareous in part, and a thin limestone bed.

Definite correlation of the upper and lower limits of the Permian succession are impossible at present, but their Artinskian age is certain.

Beagle Ridge is possibly a faulted southern extension of the Greenough Block, and it was probably a positive feature during most of the Palaeozoic, at least, and was not submerged until the lower Permian (Artinskian-Upper Sakmarian).

A seismic hole (S.P. 4), Carrathool, New South Wales was drilled to determine the nature of the refractor that had been recognized at about 850 feet by the BMR seismic party.

The hole (S.P. 4) reached a total depth of 864 feet; it penetrated a sequence of unconsolidated river sands, clays, and some thin lignitic beds, which contain Nothofagus and other spores and pollen grains. Similar lignitic beds are known from near Yenda, and are of possible Oligocene age.

A bed of consolidated claystone at 840 feet was regarded as the refracting bed; the bore was still in consolidated claystone at total depth. In the absence of a velocity survey it was impossible to determine whether or not the claystone is the refractor.

Other Projects

The 'Bibliographic Index of the Cretaceous Invertebrates of the Great Artesian Basin and Nearby Areas' (Record 1960/116) considers more than 550 specific names, discusses the validity of some of the generic names used, and records the geographical and geological distribution of the species cited, within the area under consideration.

The study of the Triassic Invertebrate Fauna of Beagle Ridge has been commenced. The fauna is the first definite marine Triassic fauna found in Australia. Three ammonite genera have been recognized (Subinyoites, Discophiceras, and ?Glyptophiceras), and the fauna has been determined as belonging to the Otoceratan substage of the Lower Triassic (Scythian). The pelecypod Claraia, which is indicative of the Scythian, is present also.