COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

REPORT No. 102

Geology of the Baralaba 1:250,000 Sheet Area, Queensland

BY

F. OLGERS, A. W. WEBB, J. A. J. SMIT (B.M.R.), AND B. A. COXHEAD (G.S.Q.)

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SUMMARY

Outcrop in the Baralaba Sheet area is generally poor owing to the softness of most of the sedimentary formations and the extensive cover of Cainozoic sediments. The Clematis and Precipice Sandstones are the only formations to form conspicuous topographic features.

The oldest exposed rocks are the Lower Permian Camboon Andesite in the north-east. They are overlain by an unknown thickness of tightly folded Permian Back Creek Group and Upper Bowen Coal Measures, which crop out only east of the Dawson River.

The Permian rocks are overlain by up to 20,000 feet of Triassic sediments, comprising the Rewan Formation, Clematis Sandstone, and Moolayember Formation. The tremendous thickness of sediments, as compared with neighbouring areas, indicates that the southern part of the Baralaba Sheet area was the locus of the major downwarp in the Bowen Basin.

The whole sedimentary sequence west of the Dawson River has been gently folded. The largest structure is the Mimosa Syncline.

In recent years, great interest has been shown in the area in connexion with the search for oil and gas. Practically the whole area has been covered by seismic surveys, several exploratory wells have been drilled, and accumulations of gas have been discovered in the Rolleston and Arcturus Anticlines, 7 miles south and 28 miles north-north-west of Rolleston, in the west of the Baralaba Sheet area.

INTRODUCTION

The Baralaba 1:250,000 Sheet area was mapped in 1963 as part of a programme of regional mapping in the Bowen Basin, to assist in the search for oil. The party consisted of F. Olgers, A.W. Webb, and J.A.J. Smit of the Bureau of Mineral Resources and B.A. Coxhead of the Geological Survey of Queensland. Fieldwork was done between June and October 1963.

The Baralaba Sheet area lies between latitudes 24°S. and 25°S. and longitudes 148°30'E. and 150°E. in central Queensland, 70 miles south-west of Rockhampton. The coal-mining centres of Baralaba and Moura, the small pastoral supply centre of Rolleston, and the Woorabinda Aboriginal Settlement are the only towns in the area.

Road access is good. Two main roads cross the Sheet area - the Taroom/Bauhinia Downs/Duaringa road from south to north, and the Moura/Bauhinia Downs/Rolleston road from east to west. Vehicular access within the area in the dry season is reasonably good in most places. A railway line extends from Rockhampton through Baralaba and south along the Dawson River to Theodore in the Monto Sheet area. It is used mainly for the transport of coal, from the Baralaba mine and the Moura open cut, and beef cattle to the coast. The nearest commercial airfields are at Rockhampton and Emerald.

The region has a subtropical climate with an annual rainfall of 20 to 30 inches, most of which falls during the summer.

Beef-cattle raising is the main industry in the area, and the Dawson Valley is extensively used for the growing of crops, mainly wheat and sorghum. Coal mining at Baralaba and timber cutting are also important. The whole area is moderately to densely timbered. Brigalow scrub is widespread, but in recent years large areas have been cleared for pasture improvement or agricultural purposes.

The Sheet area is covered by air-photographs on a scale of 1:85,000 taken by Adastra Airways Pty Ltd in 1961. From these, the Division of National Mapping has prepared uncontrolled photo-mosaics at a scale of 1 inch to 1 mile and principal-point plots controlled by slotted templet assemblies at a scale of 1:93,000. These slotted templets were used in preparing the base for the accompanying geological map. The Division was preparing a planimetric map at 1:250,000 scale at the time of writing. Other maps covering the area include maps at scales of 1 inch to 4 miles and 1 inch to 2 miles published by the Department of Lands, Brisbane, and a planimetric map (1 inch to 4 miles) published by the Army in 1944.

Geological Investigations

The first written report on the geology of the Baralaba area was by Daintree (1872), who made reference to coal in the Dawson River. Dunstan (1901) attempted to trace the coal-bearing strata of the Dawson Valley northwards to the Central Railway, where the coal could be mined profitably. Numerous items of geological interest concerning the exploration and development of the mineral resources of the area around Baralaba appeared in the Annual Reports of the Queensland Mines Department and the Queensland Government Mining Journal during the period 1902-1924. Jensen (1926) made a geological reconnaissance of the area between Roma, Springsure, Tambo, and Taroom, during which he examined the Mesozoic sediments in the southern portion of the Sheet area near Stonecroft and Bedourie homesteads. Reid (1939, 1944, and 1945 a,b,c), after detailed drilling operations, reported on the

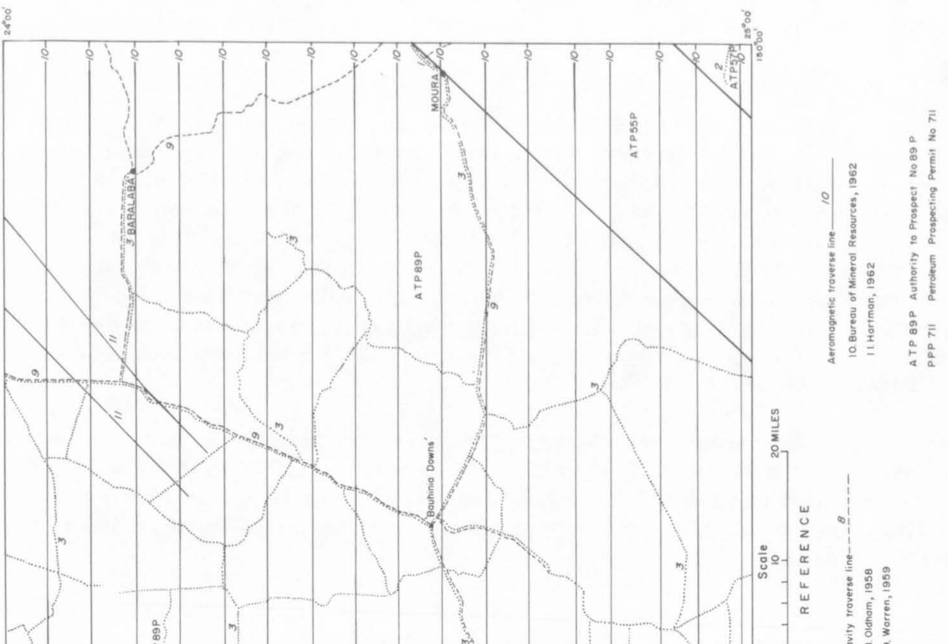


Fig. 1. Petroleum prospecting tenements and geophysical traverses

geology and complicated structure of the coal measures at Baralaba. East (appendix in Reid, 1945c) summarized the results of diamond drilling. The western part was examined by geologists of Shell (Queensland) Development Pty Ltd from 1941 to 1950 as part of a regional survey covering mainly large portions of the Springsure and Emerald 1:250,000 Sheet areas (SQD, 1952). Tweedale (in Hill & Denmead, 1960, p. 281) named and described the Mimosa Syncline between the Dawson and Expedition Ranges. In recent years, several oil and coal company geologists have examined parts of the Sheet in the course of regional surveys.

Geophysical Investigations

A large amount of geophysical work has been done in the Sheet area in recent years (Fig. 1). Seismic surveys covering almost the entire region west of the Dawson Range were conducted in: the Moura area (Austral Geoprospectors Pty Ltd, 1962a); the region between the Dawson and Expedition Ranges (United Geophysical, 1962; Marathon Petroleum Ltd, 1963); west of the Expedition Range and north of Rolleston (Geophysical Service International, 1962, 1964); Planet Downs homestead area (Austral Geoprospectors Pty Ltd, 1962b); Warrinilla homestead area (Austral Geoprospectors Pty Ltd, 1962c); Rolleston/Glenidal homestead area (Geophysical Service International, 1963, 1964); and a small area in the south-east (Kahanoff, 1962). All the seismic surveys were subsidized and the completion reports are available at the Bureau of Mineral Resources.

The earliest reliable gravity work in the area, covering the region between Rolleston and Comet (in the Duaringa Sheet area), was carried out by the Bureau of Mineral Resources (Oldham, 1958). The entire Sheet area is covered by a detailed gravity survey by Mines Administration Pty Ltd (Warren, 1959) and a regional survey by the Bureau of Mineral Resources (unpubl.).

A regional aeromagnetic survey of the Bowen Basin, with east-west flight lines at 2-mile intervals, was conducted by the Bureau of Mineral Resources in 1961-1962 (unpubl.). Parts of two flight lines of an aeromagnetic survey of the Great Barrier Reef by the Australian Oil and Gas Corporation cross the area (Hartman, 1962).

PHYSIOGRAPHY

The Baralaba Sheet area is drained largely by the Dawson River system; a small area in the west is drained by the Comet River and its tributaries. The Expedition Range forms the divide between the two systems. The Dawson River has a meandering course, and oxbow lakes and anabranches are common. It flows for most of the year and causes widespread flooding during the wet season. The area between the Expedition and Dawson Ranges is drained by Mimosa Creek and its tributaries. Mimosa Creek flows through a gap in the Dawson Range, 12 miles west of Moura, to join the Dawson River.

The Sheet area can be subdivided into four major topographic units: ranges, tableland, lowlands, and flood plains (Fig. 2).

The ranges are composed of the predominantly sandy rocks of the Clematis Sandstone. The Dawson Range in the east is rarely more than 2 miles wide and rises up to 400 feet above the surrounding lowlands. It consists of a chain of west-dipping cuestas and forms a watershed which is breached only by Mimosa and Gap Creeks. The Expedition and Shotover Ranges are up to 20 miles wide and are, in many places, very rugged. The highest peak is

TABLE I - STRATIGRAPHY OF THE BARALABA SHEET

AGE	ROCK UNIT AND MAP SYMBOL	THICKNESS IN FEET	LITHOLOGY	PALAEONTOLOGY	STRATIGRAPHIC RELATIONSHIPS	ENVIRONMENT OF DEPOSITION
	(Cz)	Superficial	Soil, sand, gravel, alluvium		Unconformably overlie all older units	In situ weathering a vial
QUATERNARY	(Qa)	0 - 100	Gravel, sand, clay			Fluvial
TERTIARY	(Ta)	0 - 200+	Sandstone, siltstone, claystone, conglomerate		(Ta) and (Tb) are interbedded and unconformably overlie Permian and Triassic units	Piedmont, fluvial ar ustrine
TERTIARY	(Tb)	0 - 200+	Olivine basalt			Terrestrial
JURASSIC	Boxvale Sandstone Member (Jlb)	140	Quartz sandstone, micaceous quartz sandstone; minor micaceous siltstone and mudstone	Wood fragment impressions	Member near top of the Evergreen Formation	Freshwater shore-li posit
JURASSIC	Evergreen Formation (Jle)	310	Shale, fine-grained micaceous sandstone	Plant fragments, foraminifera, hystrichospherids	Conformably overlies Precipice Sandstone	Estuarine
JURASSIC	Precipice Sandstone (Jlp)	240	Poorly sorted quartz sandstone; some conglomerate		Unconformably overlies Moolayember Formation	Fluvial 'blanket' typ
TRIASSIC	Moolayember Formation (Rm)	5500+	Lithic sandstone, grey shale, conglomerate	Some plant fossils: Dicroidium Sphenopteris, Thinnfeldia, Phyllopteris, and equisetalean stems (Appendix 2)	Conformably overlies Clematis Sandstone	Estuarine or lacu
TRIASSIC	Clematis Sandstone (Rc)	800-1000	Mainly quartz sandstone; feldspathic sandstone and micaceous siltstone		Overlies Rewan Formation, possibly disconformably	Fluvial 'blanket' type
TRIASSIC	Rewan Formation (Rr)	Up to 12000 in east, 250-1300 in western area	Lithic sandstone and siltstone, chocolate siltstone and shale		Conformably overlies Baralaba Coal Measures in east and the upper part of the Bandanna Formation in west	Fluvial partly in dee subsiding trough
PERMIAN	Baralaba Coal Measures Pul)	1250+	Feldspathic sandstone, lithic-feldspathic sandstone, coal, siltstone, shale	Abundant plant material: Glossopteris flora (Rigby, 1962; and Appendix 2)	Conformably overlies the Gyranda Formation; Equivalent to lower part of Bandanna Formation and Peawaddy Formation	Lacustrine
PERMIAN	Gyranda Formation (Puy)	1500±	Calcareous lithic sandstone, dark grey siltstone and shale	Macerated plant material	Conformably overlies Flat Top Formation	Estuarine or Lacustrine
PERMIAN	Bandanna Formation (Upper Part)	1475 (AFO Rolleston No. 1); 1250 (AFO Purbrook No. 1)	Greywacke, siltstone, carbonaceous shale, coal	Plant remains	Subsurface only, apparently conformable on lower part of Bandanna Formation	Swamp or lacustrine
UPPER PERMIAN — BACK CREEK GROUP (OUTCROP, NORTH-EAST OF SHEET AREA) (formerly Middle Bowen Beds)	Undifferentiated (pb)		Lithic sandstone, grey and olive-green shale, green quartz lithic sandstone	Marine fossils: brachiopods, pelecypods, gastropods, crinoids (Fauna IV, Dickins, Malone & Jensen, 1964)	Unconformably overlies Camboon Andesite and Rannes Beds	Marine
UPPER PERMIAN — BACK CREEK GROUP (OUTCROP)	Flat Top Formation (Puf)	1100	Calcilutite; some coquinite	Abundant marine fossils: brachiopods, pelecypods, gastropods, crinoid ossicles, bryozoans, corals; including Parallelodon, Myonia, Platyteichum, Terrakea, Strophalosia, Neospirifer, Licharewia, Ingelarella, and Streptorynchus (Fauna IV, Dickins et al., 1964)	Conformably overlies Barfield Formation; Equivalent to lower part of the Bandanna Formation & Peawaddy Formation	Shallow marine
UPPER PERMIAN — BACK CREEK GROUP (OUTCROP)	Barfield Formation (Pur)	3000±	Calcareous silty mudstone; minor lithic sandstone and limestone	Abundant marine fossils: brachiopods, pelecypods, gastropods, crinoids, including Glyptoleda, Chaenomya, Atomodesma, Stutchburia, Warthia, and Calceolispongia	Conformably overlies Oxtrack Formation	Marine
UPPER PERMIAN — BACK CREEK GROUP (OUTCROP)	Oxtrack Formation (Puo)	50±	Calcilutite, limestone	Marine fossils: brachiopods, pelecypods, bryozoans (Fauna IV, Dickins et al., 1964)	Overlies Lower Permian(?) with marked unconformity	Shallow marin
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE WEST OF SHEET AREA) (formerly Middle Bowen Beds)	Bandanna Formation (Lower part)	In AFO PURBROOK No. 1: 338; In AFO ROLLESTON No. 1: 360	Carbonaceous shale, tuff, sandstone, coal; some crystalline limestone, dolomite	Equisetalean plant remains, bryozoa-like (?) fragments, hystrichospherids	Subsurface only. Apparently a structurally conformable sequence but probably includes some disconformities	Estuarine
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE)	Peawaddy Formation	Purbrook: 1132; Rolleston: 1185	Sandstone, carbonaceous shale, grey shale, siltstone, marl, limestone	Marine fossils, shell fragments, carbonized plant remains [Upper part of unit (Mantuan Productus Bed) richly fossiliferous in Springsure area (Dickins in Mollan et al., 1964)]		Shallow marine
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE)	Catherine Sandstone	Purbrook: 73; Rolleston: 90	Clean poorly sorted coarse to pebbly quartz sandstone	Some marine shells in outcrop in Springsure area (Dickins in Mollan et al., 1964)		Delatic
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE)	Ingelara Formation	Purbrook: 107; Rolleston: 25	Grey shale, minor marl, some siltstone interbeds	Pyritic plant fragments. (Rich marine fauna in outcrop in Springsure area (Dickins in Mollan et al, 1964))		Shallow marine or estuarine
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE)	Aldebaran Sandstone	Purbrook: 1475; Rolleston: 675	Lithic quartz sandstone; some quartz pebble beds, poorly sorted quartzitic sandstone, quartzite, siltstone, shale	Poor plant fossils		Shallow marine or estuarine with delatic sands
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE)	Cattle Creek Formation	Purbrook: 2510; Rolleston: 925	Black pyritic shale, sandstone, siltstone	Plant fragments, bryozoa fragments, marine shell fragments. (Rich marine fauna in outcrop in Springsure area (Dickins in Mollan et al., 1964))		Shallow marine
LOWER PERMIAN — BACK CREEK GROUP (SUB-SURFACE)	'Undivided freshwater beds'	2396	Sandstone, siltstone, coal, carbonaceous shale, dolomite, greywacke conglomerate, greywacke, shale	Ostracodes, a pelecypod (Anthraconaia?), Glossopteris, fragmentary plant remains		Freshwater
LOWER PERMIAN(?)	Rannes Beds (Plw)		Green and grey shale, siltstone and tuffaceous sandstone; some slate		Conformably(?) overlies Camboon Andesite	Crinoidal limestone to north-east in Gogango Range suggests at least partly marine
LOWER PERMIAN(?)	Camboon Andesite (Pln)		Andesite, basalt, agglomerate, crystal tuff, tuff		Base of unit not exposed	Probably mainly terrestrial
UPPER DEVONIAN	Timbury Hills Formation	199+ in AFO Purbrook No. 1	Quartzose sandstone, grey-green shale. The rock is fractured and veined with calcite	Leptophloeum australe (Woods in Mines Administration Pty Ltd, 1963b)	Unconformably overlain by the Permian sequence	

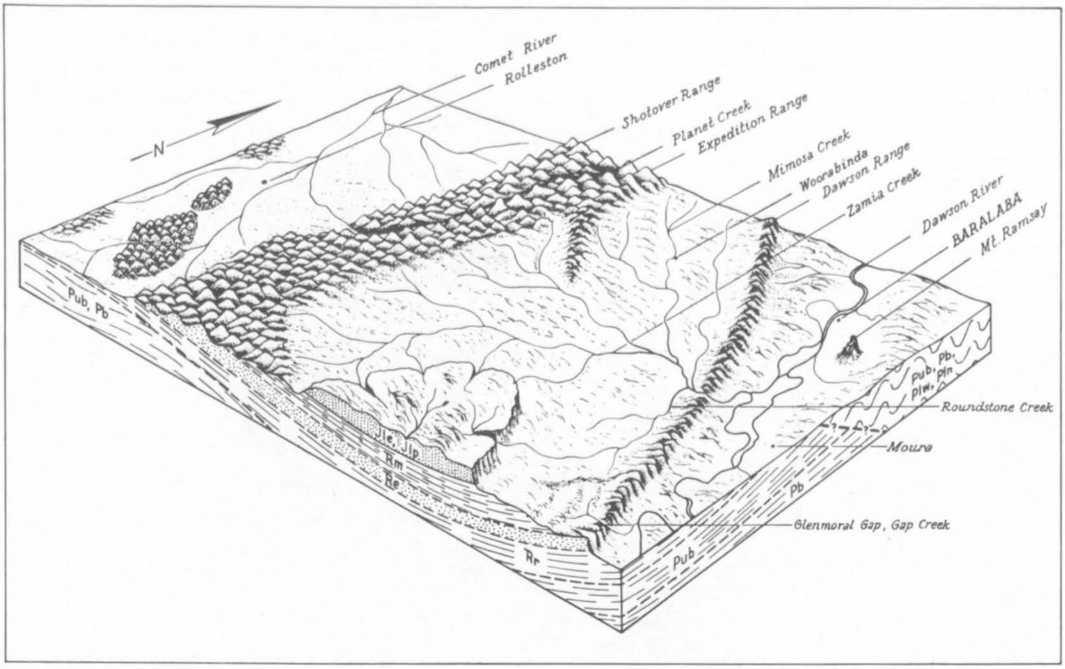


Fig. 2. Physiography of the Baralaba Sheet area

Mount Nicholson (2524 feet). The general height of the ranges is about 1800 feet, about 1000 feet above local base level. Small ranges up to 700 feet above the plain occur south and north-west of Rolleston. Mount Ramsay, a solitary mountain in the north-east, rises sharply 1100 feet above the surrounding country.

A tableland, formed by nearly flat-lying Jurassic strata, rises up to 400 feet above the lowlands near the southern boundary. It is bounded by precipitous cliffs and has a gently undulating surface.

Lowlands occupy most of the remainder of the Sheet area. Relief is generally low, with only a few rounded hills and strike ridges rising above the plain.

Extensive flood plains occur along the Dawson and Comet Rivers.

DESCRIPTION OF ROCK UNITS

Introduction

The stratigraphy of the Baralaba Sheet area is summarized in Table 1. Mapping and geophysical surveys have indicated a total thickness of about 25,000 feet of Permian and Triassic sediments, the thickest accumulation of sediments in the Bowen Basin. The Bowen Basin sequence is unconformably overlain by Jurassic strata of the Great Artesian Basin. Most of the sediments were probably laid down in non-marine shallow-water environments; only the Back Creek Group contains marine fossils.

Permian rocks crop out only in the north-east corner, near Baralaba; they are also exposed in the Springsure Anticline, 15 miles west of the Sheet area, and seismic surveys and exploratory wells indicate their subsurface presence throughout the area. The Permian sequence encountered in wells in the west is very different from the outcrop section in the north-east; consequently, the nomenclature used in the well sections is that of the Springsure area. The correlation between the subsurface units in the west and the formations mapped in the north-east is shown in Table 2.

TABLE 2 - CORRELATION CHART

		Western part (subsurface)		North-eastern part (outcrop)
Lower Triassic		Rewan Formation		Rewan Formation
		Bandanna Formation (upper part)	Upper Bowen Coal Measures	(Baralaba Coal Measures (Gyranda Formation
Upper Permian	Back Creek Group (formerly Middle Bowen Beds)	(Bandanna Formation ((lower part) ((Peawaddy Formation ((((((	Back Creek Group (formerly Middle Bowen Beds	(Flat Top Formation ((Barfield Formation ((Oxtrack Formation
			----------Unconformity--------	
Lower Permian		((Catherine Sandstone ((Ingelara Formation ((Aldebaran Sandstone ((Cattle Creek Formation ('Undivided freshwater beds'	Rannes Beds)) Camboon) Andesite)	Lower Permian or older
	----------Unconformity-------			
Upper Devonian	Timbury Hills Formation			

Timbury Hills Formation

The Timbury Hills Formation (Derrington, 1961), consisting of lithic quartz sandstone, green partly carbonaceous siltstone, and grey-green shale, was encountered in AFO Purbrook No. 1 well between 4758 and 4949 feet. The rocks are fractured and veined with calcite. A thin band of carbonaceous material yielded the Upper Devonian plant Leptophloeum australe. The formation can possibly be correlated with part of the Drummond Basin sequence which crops out farther to the west in the Springsure and Emerald Sheet areas. In AFO Purbrook No. 1, the Timbury Hills Formation is unconformably overlain by the Back Creek Group (Fig. 8).

Camboon Andesite

The oldest rocks exposed in the area are in the north-east corner on the southern nose of the Thuriba Anticline. They are volcanic rocks which are widespread farther to the east and south-east in the Rockhampton, Monto, and Mundubbera Sheet areas.

The name Camboon Andesite was first used for these volcanics by Derrington & Morgan in an unpublished report for Mines Administration Pty Ltd and was published by Derrington, Glover, & Morgan in 1959. The unit is named after Camboon homestead in the Mundubbera Sheet area. The type area of the formation is near Camboon homestead.

The unit, which crops out over a small area in the north-east, forms low lightly vegetated hills. It consists mainly of extrusives; farther to the east in the Gogango Range, it includes some sediments and pyroclastics (Olgers et al., 1964a). Andesite, the most abundant rock type, is generally massive, dark grey, and medium-grained; less commonly it is porphyritic with phenocrysts of plagioclase. Subordinate fine-grained dark grey basalt with calcite amygdales is also present. Rubble derived from pyroclastic deposits occurs in the southern part of the outcrop area.

The boundary between the Camboon Andesite and the overlying units is poorly exposed. In the western limb of the Thuriba Anticline, the volcanics are overlain by the Oxtrack Formation and the undifferentiated Back Creek Group, and in the east limb of the anticline by the sheared argillaceous and tuffaceous sediments of the Rannes Beds. The relationship with the Oxtrack Formation is almost certainly unconformable.

The Camboon Andesite was probably laid down partly on land and partly in water. It contains a Glossopteris flora in sedimentary interbeds in the Mundubbera Sheet area (Wass, 1962) and Lower Permian marine fossils in interbedded limestone in the Monto Sheet area (Dear, pers. comm.), and can be correlated with the Lower Permian Lower Bowen Volcanics farther to the north on age, stratigraphic position, and lithology. The thickness of the unit is not known, as the base is nowhere exposed.

Rannes Beds

The name 'Rannes Altered Rocks' was first used by Dunstan (1901) to describe the slaty rocks in the Rannes Hill area, 20 miles east-north-east of Baralaba. Dunstan included these rocks in the 'Gympie Formation'. Reid & Morton (1928) used the name 'Rannes Series' for the rocks in the Gogango Range and correlated them with the Lower Palaeozoic 'Emu Park and Anakie Series'. In this Report, the unit will be referred to as the 'Rannes Beds'. The type area is in the Rannes Hill area on the Monto Sheet area.

The Rannes Beds crop out over a very small area in the north-east of the Baralaba Sheet area, but are widely distributed in the Gogango Range to the east, where they have been described in more detail (Olgers et al., 1964a).

In the Baralaba Sheet area, the unit consists mainly of unfossiliferous greenish shale, siltstone, and fine-grained tuffaceous sandstone which in places have been intensely sheared.

On the eastern limb of the Thuriba Anticline the Rannes Beds overlie the Camboon Andesite with apparent conformity, and consequently are thought to be Lower Permian in age. The unit is unfossiliferous in the Baralaba Sheet area, but in the Gogango Range it contains limestone, indicating that at least part of the sequence was laid down in a marine environment. The thickness of the Rannes Beds is not known.

'Undivided freshwater beds'

Freshwater sediments were encountered in AFO Rolleston No. 1 (7110 - T.D. 9506 ft) and in Planet Warrinilla North No. 1 (6605 - T.D. 6878 ft) in the south-west of the Sheet area. This freshwater sequence can be correlated with the 'undivided freshwater beds' (Webb, 1956) penetrated in AOE No. 1 (Reids Dome) in the south-east of the Springsure Sheet area. The upper part of the 'undivided freshwater beds' can be correlated with the Orion Formation, which crops out in two places along the axis of the Springsure Sheet area (Mollan et al., 1964).

In the subsurface in the Baralaba Sheet area, the 'undivided freshwater beds' consist of fine to medium-grained lithic feldspathic quartz sandstone with coaly flakes and stringers, siltstone, black carbonaceous shale, coal, greywacke conglomerate, greywacke, and some dolomite. Macerated plant material, *Glossopteris*, a pelecypod, and ostracods have been recovered from the unit. In the wells, the Lower Permian 'undivided freshwater beds' are overlain by the Cattle Creek Formation (Fig. 8).

Back Creek Group

In the Mundubbera Sheet area, Glover (1954) used the name 'Back Creek Formation' for the Middle Bowen Beds, a Permian marine unit recognized throughout the Bowen Basin. The name was later changed to 'Back Creek Group' (Derrington et al., 1959). In the area west of Banana, 25 miles south-east of Baralaba, the Group was subdivided into three units, the Oxtrack Formation, Barfield Formation, and Flat Top Formation (Derrington et al., 1959). These units can be recognized in the north-east of the Baralaba Sheet area. In the Don River area and east of Mount Ramsay, outcrop is generally poor and the Group could not be subdivided.

In the north-east only the Upper Permian part of the Back Creek Group is present; it unconformably overlies the Camboon Andesite. The Lower Permian part of the Group was either not laid down or was removed before the Upper Permian sedimentation began.

The name 'Back Creek Group' is now used throughout the Bowen Basin for the Permian marine sequence previously referred to as the Middle Bowen Beds. In the Springsure area, and in the west of the Baralaba Sheet, the Back Creek Group is of Lower to Upper Permian age and probably conformably overlies the 'undivided freshwater beds' (Table 2).

The formations in the Back Creek Group are discussed below. The subsurface units in the west of the area are dealt with briefly. They have been fully described from the Springsure Sheet area by Mollan, Exon, & Kirkegaard (1964).

Oxtrack Formation

The name 'Oxtrack Creek Member' of the Back Creek Formation was first used by Glover (1954); it was later changed to 'Oxtrack Formation' (Derrington et al., 1959). The unit was named after Oxtrack Creek, a tributary of the Dawson River in the Mundubbera Sheet area. The type area of the formation is also in Oxtrack Creek.

The Oxtrack Formation crops out over a very small area in the north-eastern corner of the Baralaba Sheet area, on the western flank of the Thuriba Anticline. It does not form any topographic features and occurs mainly as rubble. The unit has no distinct air-photo pattern. It consists of fossiliferous grey and light brown calcareous siltstone. North-east of the Sheet area, near Thuriba homestead, it includes limestone containing a rich fauna of crinoids, corals, brachiopods, and bryozoa (Olgers et al., 1964a).

The Oxtrack Formation overlies the Camboon Andesite and is overlain by an unnamed sequence of the Back Creek Group, but the contacts are not exposed. The Oxtrack Formation is equivalent to part of Unit C (Dickins, Malone, & Jensen, 1964) and is probably Upper Permian. The unit is thin and probably rests unconformably on the Camboon Andesite.

Barfield Formation

Glover first used the name 'Barfield Formation' in the Monto 1:250,000 Sheet area, east of the Baralaba Sheet (unpubl. report to Mines Administration Pty Ltd). The name was later published by Derrington, Glover, & Morgan (1959). The formation is named after Barfield homestead in the Banana district, where the type area is located.

In the Baralaba Sheet area, the Barfield Formation crops out in the core of the anticlinorium 6 miles east of Baralaba. It forms fairly low country and has no distinct air-photo pattern.

The predominant rock type is grey and greenish grey calcareous silty mudstone containing calcareous nodules and interbeds of fine to medium-grained greenish lithic calcareous sandstone. Some lenses of limestone, largely made up of Cladochonus, are present. The lithic sandstone is richly fossiliferous, and contains pelecypods, gastropods, brachiopods, corals, crinoids, and bryozoa (Appendix 1).

The Barfield Formation is conformably overlain by the Flat Top Formation. The contact with the underlying Oxtrack Formation is conformable where exposed in the Monto Sheet area, but it is not exposed in the Baralaba Sheet area. The thickness of the formation in this area is not known; up to 2900 feet is present in the type area and 7000 to 14,000 feet has been reported from east of the Banana Fault in the north-west of the Monto Sheet area (Derrington & Morgan in Hill & Denmead, 1960, p. 207). The age of the formation is Upper Permian.

Flat Top Formation

The name 'Flat Top Formation' was first used by Glover is an unpublished report to Mines Administration Pty Ltd and was published by Derrington, Glover, & Morgan (1959). The formation was named after Flat Top Mountain in the Banana district. The type area of the unit is 4 miles east of Banana beside the Dawson Highway.

In the Baralaba Sheet area, the formation crops out in two narrow north-north-westerly belts, one about 4 miles east of Baralaba and the other 6 miles south-east of Mount Ramsay. It forms low lightly vegetated ridges, rising about 200 feet above the surrounding country.

East of Baralaba, the lithology of the Flat Top Formation is uniform, and the main rock type is a well indurated blue-grey richly fossiliferous calcilutite, generally silicified with some interbeds of coquinite. The calcilutite consists of 80 percent argillaceous carbonate material, and quartz, feldspar, and rock fragments. South-east of Mount Ramsay, the outcrops of the formation are not as prominent and consist of interbedded fossiliferous white fine-grained sandstone and siltstone, fossiliferous limestone, and some acid and intermediate volcanics showing varying degrees of shearing (probably sills). Some greenish medium-grained quartz lithic sandstone and brown and grey cherty siltstone are also present.

The Flat Top Formation crops out in the western limb of the anticlinorium 6 miles east of Baralaba. It rests conformably on the Barfield Formation and is conformably overlain by the Gyranda Formation.

Near Baralaba, the formation is about 1100 feet thick. It is richly fossiliferous (Appendix 1), and contains pelecypods, gastropods, brachiopods, corals, and crinoids. The age is Upper Permian.

Cattle Creek Formation

The Cattle Creek Formation (Hill, 1957) was originally named the 'Cattle Creek Series' by Shell (Queensland) Development Pty Ltd (1952) after Cattle Creek in Reids Dome in the Springsure Sheet area. The type section is in Cattle Creek.

In the wells in the Baralaba Sheet area, the unit consists mainly of black pyritic shale with minor greywacke and siltstone. The shale contains angular cobbles of coarsely crystalline limestone (glacial erratics?) at several intervals. Fragments of bryozoa and marine shells were recovered, and pyritized and carbonized plant fragments occur throughout the unit. The Lower Permian Cattle Creek Formation is 2500 feet thick in the Denison Trough (AFO Rolleston No. 1), but only 900 feet on the Comet Ridge to the east (AFO Purbrook No. 1) (Fig. 8).

Aldebaran Sandstone

The term 'Aldebaran Sandstones' was first used by Reid (1930) in the Springsure Anticline. The unit is now formally referred to as the Aldebaran Sandstone. The type section of the formation is in Aldebaran Creek in the Springsure Sheet area.

In the Baralaba Sheet area, the unit consists mainly of sandstone with minor siltstone containing rare coal stringers, and pyritic shale. The unit is cross-bedded and contains poorly preserved plant fossils throughout, which suggests that it was deposited in a deltaic or estuarine environment. It ranges in thickness from 1475 feet in AFO Rolleston No. 1 to 675 feet in AFO Purbrook No. 1 (Fig. 8).

Ingelara Formation

The term 'Ingelara Stage' was first published by Raggatt & Fletcher (1937); they assigned the Ingelara Stage to the interval between the Catherine and Aldebaran Sandstones. Hill (1956) first used the name 'Ingelara Formation'. The formation was named after Ingelara homestead. Mollan et al. (1964) proposed that the area 1 mile south-east of Mount Catherine in the Springsure Sheet area be taken as the type area.

In the wells, the formation consists mainly of dark grey shale with interbeds of marl and siltstone, and pyritic plant fragments. The Ingelara Formation is only 100 feet thick in the Denison Trough (AFO Rolleston No. 1) and thins eastward to 25 feet on the Comet Ridge (AFO Purbrook No. 1) as compared with a thickness of 650 feet in the type area (Fig. 8). In the Springsure area, the formation contains a marine fauna (Dickins in Mollan et al., 1964).

Catherine Sandstone

The name 'Catherine Sandstones' was first used by Reid (1930). Shell (1952) used the name 'Catherine Series', but Hill (1947) reverted to 'Catherine Sandstone'. The stratigraphic interval included in each of the definitions of the unit varied from author to author. Mollan et al. (1964) used Reid's definition. The type area of the unit is at Mount Catherine.

In the subsurface in the Baralaba area, the Catherine Sandstone consists of unfossiliferous coarse to pebbly quartz sandstone. The unit is 75 feet thick in AFO Rolleston No. 1 and 100 feet in AFO Purbrook No. 1 (Fig. 8). The Catherine Sandstone contains several marine fossil horizons in the Springsure Sheet area (Dickins in Mollan et al., 1964).

Peawaddy Formation

The name 'Peawaddy Formation' was first published by Mollan, Kirkegaard, Exon, & Dickins (1964). The type section of the unit is in Peawaddy Creek in the west limb of the Consuelo Anticline in the Springsure Sheet area. The Peawaddy Formation contains the very fossiliferous coquinitic sandstone and siltstone lenses of the Mantuan Productus Bed at or near the top.

In the wells, the unit consists mainly of dark grey shale with thin siltstone interbeds, black carbonaceous shale and minor marl, limestone, and quartz sandstone. The quartz sandstone occurs near the top of the unit and can be correlated with the Mantuan Productus Bed. Marine fossils and carbonized plant remains have been recovered from the wells. The Peawaddy Formation, which is of Upper Permian age, is 1130 feet thick in AFO Rolleston No. 1 and 1185 feet in AFO Purbrook No. 1 (Fig. 8). The formation, together with the overlying lower part of the Bandanna Formation, can be correlated with the Oxtrack, Barfield, and Flat Top Formations of the north-east Baralaba area (Table 2).

Bandanna Formation

The Bandanna Formation (Hill, 1957) was originally named the 'Bandanna Series' by Shell (1952). The unit is named after Bandanna homestead in the Eddystone Sheet area.

On lithological grounds, the formation can be subdivided into two parts. The lower part consists mainly of dark grey and black carbonaceous shale with some tuff, limestones, coal, and sandstone. In the Springsure area, the lower part of the Bandanna Formation, which contains plant material near the top and marine fossils towards its base, represents the transition from marine to freshwater sedimentation. The upper part of the Bandanna Formation consists of interbedded lithic sandstone and siltstone with several coal seams, and was laid down in paludal and lacustrine environments. The upper part of the Bandanna Formation can be correlated with the upper Bowen Coal Measures in the north-east.

Upper Bowen Coal Measures

The name 'Upper Bowen Formation' was first used by Jack & Etheridge (1892) to describe the upper freshwater division of Etheridge's (1872) 'Bowen River Series', which had previously been referred to by Jack (1879) as 'Upper (freshwater) Series'. The name 'Upper Bowen Coal Measures' was used on the Geological Map of Queensland (1953). In the Baralaba area, the name has been used for rocks which occupy the same stratigraphical position as the Upper Bowen Coal Measures farther north in the Duaringa Sheet area, that is, between the Lower to Upper Permian Back Creek Group below and the Triassic Rewan Formation above.

A study of the Upper Bowen Coal Measures in the Bowen Basin has been made by geologists of Utah Development Co. (King, 1963). In the Baralaba Sheet area, the unit was studied in great detail by Reid (1939, 1944, and 1945 a,b,c) who made the following twofold division (1944):

(i) 'Calcareous Series': the informal name given to the lower part of the formation; the area of outcrop lies between Baralaba and the marine Permian rocks 4 miles to the east.

(ii) Baralaba Coal Measures: the upper unit containing the coal and cropping out over a small area along the Dawson River near Baralaba.

Reid (1945a) applied the name Baralaba/Kianga Coal Measures to the upper unit, but in a later report (1945c) he reverted to Baralaba Coal Measures.

A similar twofold division of the Upper Bowen Coal Measures is used in this Report. The upper part of the unit will be referred to as the 'Baralaba Coal Measures'. The lower part, Reid's 'Calcareous Series', is lithologically similar to the lower part of the Upper Bowen Coal Measures in the Mundubbera Sheet area (Jensen et al., 1964) where the name 'Gyranda Formation' (Derrington et al., 1959) was used. The same name is used in this Report.

The Upper Bowen Coal Measures do not crop out in the west of the Baralaba Sheet area. Their equivalent, the upper part of the Bandanna Formation (Hill, 1957), has been recorded in the exploratory wells drilled in the south-west.

Gyranda Formation

The name 'Gyranda Formation' was first used by geologists of Mines Administration Pty Ltd in the Cracow area in 1954, and was published in 1959 by Derrington, Glover, & Morgan. The unit was named after Gyranda homestead and the type area is in Back Creek in the Mundubbera Sheet area.

The formation crops out in a series of isolated outcrops which lie in a north-north-west-trending belt east of Baralaba. Outcrop is generally poor and confined to creek beds. The best outcrops occur east and south-east of Baralaba in the Dawson River, in Benleith Creek, and west of Mount Ramsay. The unit has no distinct air-photo pattern; it produces a flat topography with moderately dense vegetation.

The unit consists essentially of dark thinly bedded shale, sandy shale, and siltstone, interbedded with grey calcareous lithic sandstone. The sandstone is medium to thick-bedded and contains in places small rounded nodules up to 3 inches in diameter. It contains approximately 75 percent lithic material, including fragments of quartzite, granite, argillaceous material (most common), and volcanics; 10 to 15 percent quartz; and 5 percent feldspar, set in a micaceous matrix. Some bands of chert and greenish yellow calcareous tuffaceous sandstone are present near the base of the unit near Kalewa Siding. Secondary calcite is common in the sandstones and some veins of calcite are present.

The unit is tightly folded, with steeper dips on the western limbs of the folds. The amplitude of the folding decreases westward. Overturning has taken place near Kalewa Siding, where the contact between the Gyranda Formation and the underlying Flat Top Formation dips eastward. The Gyranda Formation rests conformably on the Flat Top Formation and is conformably overlain by the Baralaba Coal Measures. It can be correlated with parts of the Banana and Wiseman Formations of the Banana area (Derrington et al., 1959).

At Mount Ramsay, the unit is intruded by a trachyte stock. A soda trachyte dyke, probably associated with the Mount Ramsay intrusion, intrudes the sediments 4.5 miles east of Baralaba. The trachyte contains blocky fragments of siltstone.

The Gyranda Formation does not contain marine fossils. Fragmentary plant material, including wood, is abundant, and the unit is thought to have been laid down in a shallow-water lacustrine or estuarine environment.

The thickness of the unit cannot be determined accurately because of the deformation, but it is estimated to be about 1500 feet.

The Gyranda Formation lies between identified Upper Permian units and is therefore of Upper Permian age.

Baralaba Coal Measures

The Baralaba Coal Measures crop out over a small area in the bed of the Dawson River near Baralaba. Outcrop is good where the main Baralaba/Duaringa road crosses the Dawson River; elsewhere it is poor. Only the basal part of the unit is exposed; the top of the formation and the base of the overlying Rewan Formation are covered by Cainozoic deposits.

The most striking rock type in the Baralaba Coal Measures at Baralaba is massive buff-coloured medium to coarse-grained medium to thick-bedded feldspathic sandstone containing bands of concretionary ironstone and large nodules of fine-grained calcareous sandstone. This rock forms prominent outcrops at the Baralaba bridge. The sandstone is similar to the feldspathic sandstone overlying the coal being mined at the Moura open cut. Interbedded with the sandstone at Baralaba are dark grey shale, coal, lithic feldspathic sandstone, and multicoloured siltstone containing large ferruginous nodules. Eight coal seams over 5 feet thick, totalling about 66 feet, have been disclosed by recent drilling in the area (Fig. 3). Some dykes, probably associated with the Mount Ramsay intrusion, have been encountered in the drillholes.

The structure of the Baralaba Coal Measures is complicated by folding and faulting and has been described in great detail by Reid (1954c). The rocks have been folded into a series of anticlines and synclines trending north-north-west. In places, the folding is tight and dips up to 80° have been recorded. Folding is asymmetrical with easterly dips averaging 40° and westerly dips 60°. Some faulting has taken place; a high-angle reverse fault is exposed in the Dawson River at Baralaba. It dips 80° in a south-westerly direction, and drilling records indicate a vertical displacement of about 380 feet.

The Baralaba Coal Measures rest conformably on the Gyranda Formation and are overlain by the Rewan Formation, but the contact is not exposed. The relationship is possibly disconformable in the Mundubbera Sheet area (Jensen et al., 1964).

Marine fossils have not been recorded. The unit was laid down in a shallow lacustrine environment which favoured the preservation of plant material. The interbedding of coal with thick beds of coarse feldspathic sandstone indicates alternating slow and rapid sedimentation. King (1963) suggests that the coals were not formed in situ but are of drift origin, mainly because of the sorting of the plant material and the absence of soil horizons with stumps and roots below the coal seams.

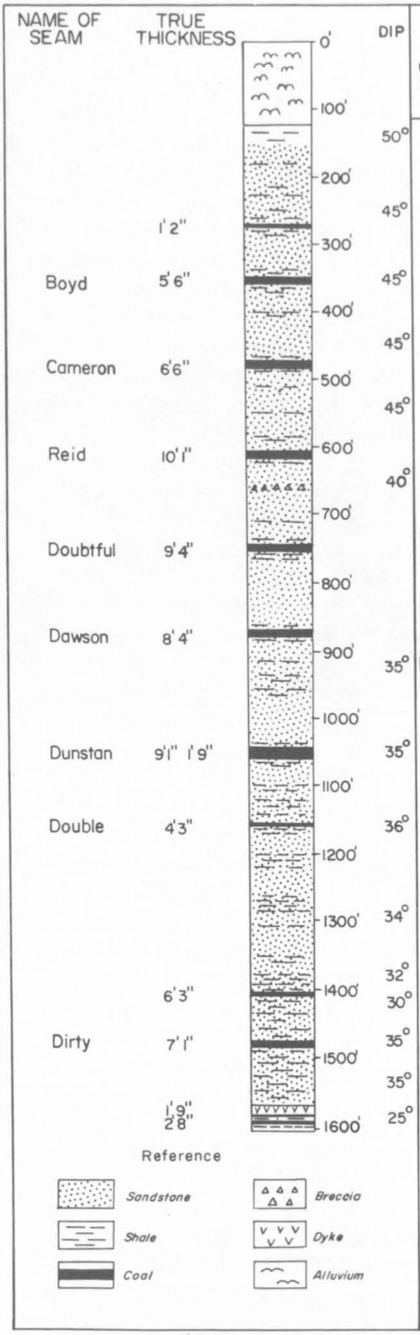
The total thickness of the Baralaba Coal Measures in the Baralaba area is not known, as the top of the formation is not exposed. A thickness of at least 1250 feet has been proved by drilling.

Abundant plant material is present in the formation, and collections from Baralaba have been described by Rigby (1962) and White (Appendix 2). Palaeontological evidence indicates that the Baralaba Coal Measures are Upper Permian.

Rewan Formation

In this Report, the Triassic sequence in the Baralaba Sheet area is subdivided into three previously recognized units, the Rewan Formation, the Clematis Sandstone, and the Moolayember Formation. Mack (1963) mapped the whole of the Triassic sequence in the Baralaba Sheet area as Cabawin Formation, the type section of which is in Union-Kern-AOG Cabawin No. 1 well, 200 miles south of the Sheet area in the Surat Basin. The lithology of the Cabawin Formation in Cabawin No. 1 (Fehr & Bastian, 1962) differs considerably from the outcrop section of the Triassic sequence in the Baralaba Sheet area and the name is not used in this Report. The name 'Rewan Formation' was first published by Hill (1957). The unit was named after Rewan homestead, the type area, in the south-east corner of the Springsure Sheet area. In the south-west of the Baralaba Sheet area, outcrop is poor, but the rock types present are characteristic of the formation in the type area. East of the Dawson Range, the Rewan Formation is also lithologically similar to sediments of the type area, and is contiguous in outcrop with rocks mapped as Rewan Formation in the Duaringa Sheet area (Malone et al., 1963).

The Rewan Formation is best exposed along the eastern side of the Dawson Range, where bedding trend-lines are conspicuous on the air-photographs. The formation also crops out between the Mimosa and Nuga Nuga Synclines and the Nuga Nuga and Rewan Synclines, in creek exposures, and in gullies which undercut the base of the cliff-forming Clematis Sandstone, as at Mount Panorama. Because of the predominantly soft argillaceous nature of the sediments, the Rewan Formation is usually covered by deep soil. The formation supports a moderate to dense vegetation and has no distinct air-photo pattern, except east of the Dawson Range.



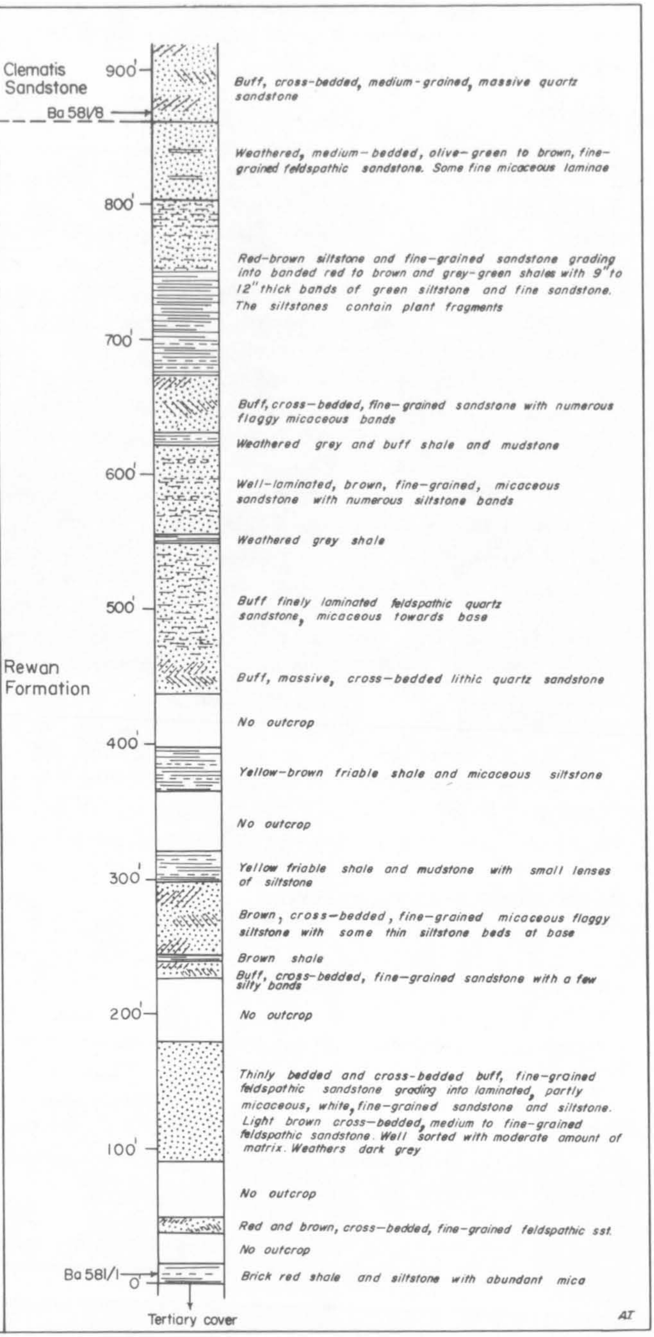


Fig. 3. Typical section, Baralaba Coal Measures, Dawson Valley Coal Mine

Fig. 4. Measured section, top of Rewan Formation, Dawson Range

Shell (Queensland) Development Pty Ltd 1952) divided the Rewan Formation in the type area into a 'Lower Rewan Group' and 'Upper Rewan Group': the former is characterized by coarse-grained polygenic sandstone and grit with thin intercalations of chocolate-brown clay; the latter by massive chocolate-coloured clay with occasional grey, white, and green silty bands and lenses of sandstone.

In the Baralaba Sheet area outcrop is poor, particularly in the south-west, and the unit could not be subdivided. Unlike the type section, the formation east of the Dawson Range contains abundant sandstone towards the top, but soft chocolate-coloured mudstone is the characteristic and most common rock type. The mudstone is massive and contains thin lenses of pale green shale and greenish medium-grained sandstone. Interbedded with the mudstone, and particularly near the base and the top of the formation, are thick beds of labile sandstone and greywacke (Pettijohn, 1957) (Fig. 4). The sandstones at the base of the unit contain up to 40 percent volcanic detritus, about 10 percent feldspar, and up to 5 percent quartz. Higher in the section, in the middle of the Rewan Formation, the percentage of volcanic material is 25 percent and the quartz content is 10 to 15 percent. At the top of the formation, the quartz content is about 25 percent and volcanic material is absent. A bed of volcanic conglomerate occurs near the base of the formation.

Higher than presently recognized base of Rewan

Shell (1952) reports evidence for a gentle regional angular unconformity at the base of the Rewan Formation in the type area and in the Arcadia area of the Taroom Sheet (Woolley, 1944), and Planet Exploration Co. Pty Ltd (1963a) suggests that an unconformity is present in Warrinilla No. 1 well. In the Theodore area, 30 miles south of Moura, the Rewan Formation appears to be concordant with the underlying Upper Bowen Coal Measures; both units dip gently to the west at 10° to 15°. Farther to the north, north-west of Baralaba, the Rewan Formation dips gently to the south-west, but the underlying Baralaba Coal Measures are tightly folded and even overfolded. The contact between these formations is not exposed and it is not known whether the folding has affected the Rewan Formation. In the type area, the formation is unconformably overlain by the Clematis Sandstone. In the Baralaba Sheet area, there is no evidence to indicate an unconformity. The trend of the bedding in both formations is concordant near the contact. The strike is about 020° in the north, and from 015° to 020° in the south. At the contact, there is a sudden change in lithology from brown lithic sandstone in the Rewan Formation to clean quartz sandstone in the Clematis Sandstone, which suggests that a disconformity may be present.

Red-beds are generally accepted to be non-marine terrigenous deposits which owe their red colour to finely divided hematite. The hematite was probably derived from red residual soils which formed under hot humid conditions in neighbouring areas. Sedimentation was possibly fluviatile, with fine red muds deposited away from the channels and the lenses of brown-weathering sandstone in and near the channels. The sandstone is finely cross-bedded. Intraformational conglomerate and desiccation cracks were observed in the Duaringa Sheet area (Malone et al., 1963); so the unit was laid down in shallow water, part of which at least dried up periodically, enabling oxidizing conditions to be maintained and the red-beds to be preserved.

The thickness of the Rewan Formation in the type area is 1600 feet (Mollan et al., 1964). In the north-eastern part of the Baralaba Sheet area, the measured thickness of an incomplete section was 850 feet (Fig. 4), which is about the same as the thickness of the formation in the Duaringa Sheet area (Malone et al., 1963). In the south-east corner of the Baralaba Sheet area and the adjoining portion of the Monto Sheet area around Theodore, the base and top of the Rewan Formation are reasonably well exposed, and can be recognized on the air-photographs. The central part of the formation is poorly exposed. Dips at the base and top of the formation are about 20^{o} In the central part, a 7^{o} dip was recorded in the Baralaba Sheet area and a 45^{o} dip in the north-east of the Mundubbera Sheet area (Jensen et al., 1964), where it may have been faulted. The thickness of the Rewan Formation in the south-east of the Sheet area is uncertain, but seismic surveys (United Geophysical, 1962) show about 12,000 feet of section which may be assigned to this unit. This indicates a tremendous thickening of the Rewan Formation to the east of the type area.

Probable Triassic plants and spores were found in the Rewan Formation in the Duaringa Sheet area (Malone et al., 1963), but no fossils have been found in the Baralaba Sheet area. Latest spore evidence suggests that the formation is Lower Triassic (Evans, in Mines Administration Pty Ltd, 1962).

Clematis Sandstone

Jensen (1926) first used the term 'Clematis Series' for beds above the 'Upper Bowen' and below the 'Ipswich Beds'. Later authors used the name 'Carnarvon' for beds equivalent, at least in part, to beds named 'Clematis' by Jensen. Whitehouse (1955) discussed the application of the various names and preferred Clematis Sandstone on grounds of priority and convenience. Whitehouse designated the type area as the gorge of Clematis Creek, in the Expedition Range near the southern margin of the Baralaba Sheet area. Mack (1963) mapped the Clematis Sandstone in the Expedition Range in the Baralaba Sheet area as the Clematis Formation, a sandstone tongue within the Cabawin Formation. The Clematis Sandstone in the Dawson Range was not differentiated from the Cabawin Formation by Mack and was loosely referred to as the 'Dawson Range Beds'. The name Cabawin Formation is not used in this Report (see p. 14).

The main outcrops of the Clematis Sandstone are along the limbs of the broad Mimosa Syncline, and form two ranges trending approximately north-south; the Dawson Range in the east and the Expedition and Shotover Ranges in the west. To the north, in the Duaringa Sheet area, these ranges join in the Blackdown Tableland, which forms the nose of the Mimosa Syncline. To the south of the Taroom Sheet area, they are blanketed by the Precipice Sandstone. Elsewhere in the Baralaba Sheet area the Clematis Sandstone forms mesas in the broadly folded Nuga Nuga Syncline, and in the Rewan Syncline on the adjoining Springsure Sheet area. The formation is a massive, cliff-forming unit, especially in the Expedition and Shotover Ranges, where sheer cliffs and caves (many with aboriginal paintings) produce spectacular scenery. The Dawson Range is lower and consists mainly of a series of cuestas.

The Clematis Sandstone consists mainly of massive to thickly bedded white to yellow-brown medium-grained micaceous quartz sandstone, but varies widely from well-compacted well-sorted clean fine to medium-grained quartz sandstone to very friable unsorted porous coarse-grained kaolinitic quartz sandstone with numerous bands of small milky quartz pebbles. Thin interbeds of soft ferruginous micaceous siltstone and brown medium-grained feldspathic quartz sandstone are common throughout the unit (Pl. 1). The sandstone generally exhibits festoon or planar bedding or both (Pl. 2, fig. 1). This cross-bedding is best developed in the more massive coarse-grained quartz sandstone, especially in the Expedition and Shotover Ranges. The prominent vertical joints in the Clematis Sandstone strike 050^{o} and 145^{o}.

The results of a detailed study of the orientation of current structures are illustrated in Figure 5. Each point represents a locality at which readings were made and each concentric circle represents 5 percent of readings. The readings in the Dawson Range were stereographically corrected for the dips of the bedding planes, but in the Expedition Range the readings were obtained from cross-beds in practically horizontal beds and no adjustment was necessary. The dip of the cross-beds is remarkably constant and averages 20°. Figure 5 clearly shows that the current direction in the east was south-south-easterly and in the west east-south-easterly to south-easterly. At point 11, an anomalous south-westerly current direction is indicated.

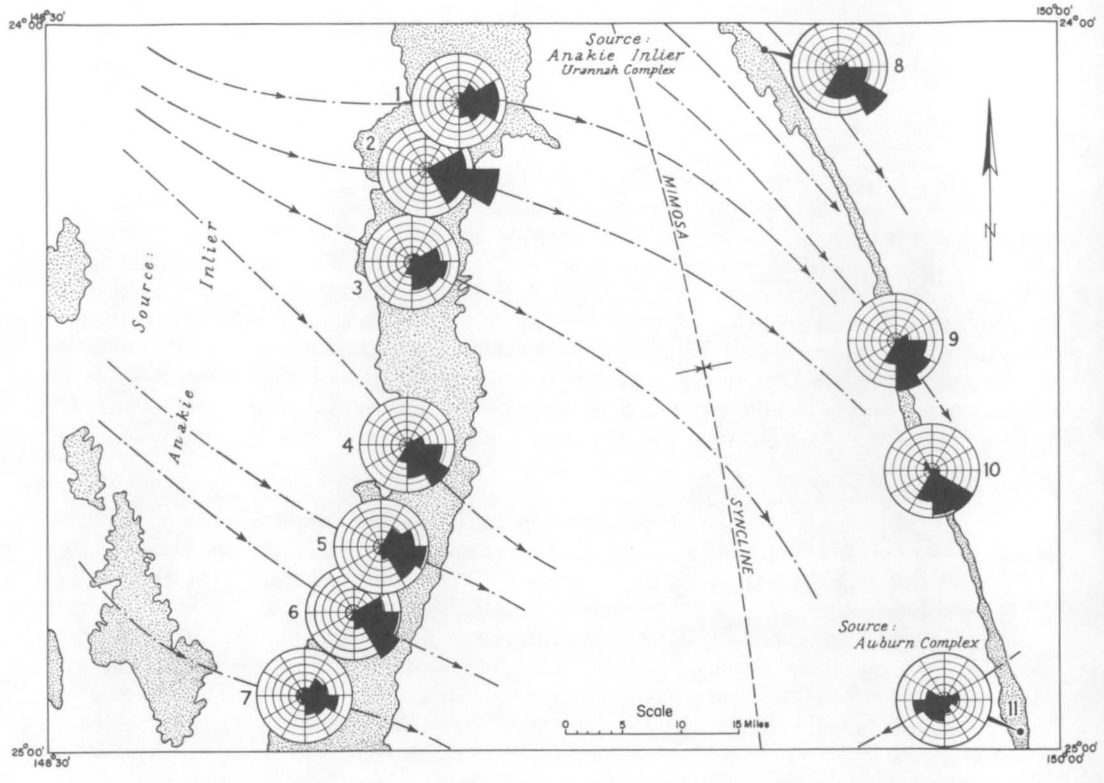


Fig. 5. Analysis of cross-bedding in Clematis Sandstone

Four sections were measured in the Clematis Sandstone (Pl. 1). The roughness of the terrain and the probability of faulting along Planet Creek prevented the measurement of a complete section in the Expedition and Shotover Ranges. The incomplete section of about 800 feet measured in the type area in Clematis Creek differs lithologically from the other measured sections. Between the two main cavernous and cliff-forming sandstones in the Expedition Range is a massive strongly current-bedded well-jointed friable medium to coarse-grained sandstone which is not present elsewhere in the Sheet area. This sandstone weathers readily along joint planes to form rows of isolated rounded pillar-like outcrops. This sandstone crops out in the Expedition Range from the type area in the south to the northern Sheet boundary.

The Clematis Sandstone crops out on the flanks of the Mimosa Syncline. On the eastern limb, dips range from 10° to 15°, and on the western limb from near-horizontal to 10°. The Shotover Anticline is a small fold on the western flank of the Mimosa Syncline. The dips on the flanks are about 20° and there is a fault along the east flank parallel to the axial plane. Dips near the fault range up to 65°. Some small faults occur also in the Expedition Range. A large north-south fault in this area is suggested by the very straight course of Planet Creek. In the south-west of the Sheet area, the Clematis Sandstone occurs in the shallow-dipping Nuga Nuga Syncline and the east limb of the Rewan Syncline.

The Clematis Sandstone rests on the Rewan Formation, possibly with a slight disconformity (see p.16) and is overlain probably conformably, by the Moolayember Formation in the Mimosa Syncline.

The Clematis Sandstone represents a marked change in both provenance and depositional environment from that of the Rewan Formation. The abundant current-bedding, ripple-marking, and cut-and-fill structures suggest sorting, spreading, and deposition by relatively fast-flowing streams. The general angularity of the grains and the absence of labile minerals probably indicates extensive chemical weathering of a granitic terrain. The current-bedding study (Fig. 5) has shown that the sand was derived from a northerly source area, probably the Anakie Inlier and Urannah Complex.

The thickness of the Clematis Sandstone ranges from 100 feet in the west of the Springsure Sheet area to 500 feet in the Reids Dome area (Mollan et al., 1964), and at least 800 feet in the Expedition Range, and possibly up to 1000 feet in the Dawson Range (Pl. 1).

Plant fossils from the Springsure Sheet area indicate that the formation is Triassic (Hill, 1957, p. 12), and recent palynological work suggests a late Lower or early Middle Triassic age (Evans, pers. comm.).

Moolayember Formation

Reeves (1947) first used the name 'Moolayember Shale' for a sequence of olive-green sandy tuffaceous shale and thin calcareous sandstone which he correlated with the Ipswich Series in the Roma district. The type locality of the formation is along the main Injune/Rolleston road where it descends to Moolayember Creek, north of Injune. Mack (1963) included the Moolayember Formation and underlying Clematis Sandstone and Rewan Formation in the Cabawin Formation, but the name is not used in this Report (see p. 14).

The Moolayember Formation crops out in the Mimosa Syncline. Outcrop is generally poor because of the softness of the sediments. The main area of outcrop is in the southern part of the syncline, where exposures are present in deep creek beds and along low strike ridges. The few small outcrops in the Wooroonah homestead area near the northern boundary of the Sheet are the most northerly outcrops of the formation in the Bowen Basin. In most areas, the formation is covered by thick soils which support, in places, a dense brigalow scrub. The formation erodes to form flat country which has, in places, a distinctly banded pattern on the air-photographs due to alternating sandy and shaly beds.

The Moolayember Formation consists essentially of a sequence of shale, siltstone, and greywacke with several beds of conglomerate, mainly towards the base. The finer-grained sediments crop out poorly but are best exposed near Wooroonah homestead. Greenish, grey, and yellow-brown shale and siltstone crop out in the deeper creek beds. Some thin beds of greywacke and layers of calcareous and ferruginous nodules are present. Plant remains occur in some of the argillaceous sediments and nodules. The finer-grained rocks in the south are generally similar. In the south, resistant greywacke interbeds can be traced over long distances on the air-photographs. The greywackes contain from 10 to 55 percent lithic material, including extrusive volcanics, tuffs, and fine-grained sediments (Appendix 3). Lithic feldspathic sandstone, feldspathic quartz sandstone, and quartz sandstone are also present, the last only near the base of the unit. The sandstone frequently has a calcareous cement. Conglomerate is present, mainly towards the base, and crops out as beds, up to 200 feet thick, in Roundstone Creek at the Moura/Bauhinia Downs road crossing, and at a locality 3 miles west of Glenmoral Gap. The pebbles and cobbles are up to 6 inches in diameter, and consist mainly of chert and basic volcanics (Bastian, 1965).

In the Baralaba Sheet area, the Moolayember Formation is found only in the Mimosa Syncline, where it rests conformably on the Clematis Sandstone.

The boundary between the Clematis Sandstone and the Moolayember Formation is sharply defined on the air-photographs and in the field has been placed where the massive quartz sandstone (Clematis Sandstone) gives way to isolated outcrops of feldspathic quartz sandstone, greywacke, shale, and some isolated beds of quartz sandstone.

Below the unconformity between the Precipice Sandstone and the Moolayember Formation, the formation has been deeply weathered. The weathering profile is well exposed in the Taroom and Mundubbera Sheet areas (Jensen et al., 1964) where it affects the whole stratigraphic sequence between the Moolayember Formation and the Camboon Andesite.

Little is known about the environment of deposition of the formation, mainly because it is poorly exposed. The presence of fragmental plant material, some thick beds of conglomerate, and current structures in the sandstone, suggest that deposition possibly took place in relatively shallow water, perhaps in a lacustrine or estuarine environment. No marine fossils have been found, but the presence of hystrichospherids suggests periodic marine incursions (Evans, 1962).

The known thickness of the formation is greatest in the centre of the Mimosa Syncline, where, in the Bauhinia Downs area, seismic surveys by United Geophysical (1962) indicate a thickness of about 5500 feet. It is perhaps even thicker near the southern boundary of the Sheet. In the Springsure Sheet area, the formation is only a few hundred feet thick. The rapid thickening to the east suggests that sedimentation was taking place during the development of a major downwarp.

A collection of fossil plants from the Wooroonah homestead area has been described by White (Appendix 2). The Moolayember Formation is Triassic, and not older than Middle Triassic (Evans, in Mines Administration Pty Ltd, 1962).

Precipice Sandstone

In the southern Mimosa Syncline, the Triassic Clematis Sandstone and Moolayember Formation are unconformably overlain by rocks which have in the past been correlated with the Triassic Bundamba Group of the Ipswich area and were referred to as the 'Bundamba Series' (Reeves, 1947). The series was subdivided by Reeves into four members: the Bundamba Sandstone (at the base), an unnamed shale unit, the Boxvale Sandstone, and the Hutton Sandstone. Whitehouse (1955) examined the sequence in the southern Bowen Basin in detail and renamed the Bundamba Sandstone the Precipice Sandstone. The formation derives its name from Precipice Creek, and the type area is in the gorge of Precipice Creek, a tributary of the Dawson River in the Taroom Sheet area.

Mack (1963) used the term 'Bundamba Formation' in place of Bundamba Series, and divided it into three members of which the lowest is equivalent to the Precipice Sandstone. Palynological studies (Evans, 1964a) indicate that the Precipice Sandstone is Lower Jurassic, and is not equivalent to the Triassic Bundamba Group of the type area in the Ipswich coalfield. Consequently, the name 'Bundamba' cannot be applied to it and the local formation name Precipice Sandstone should be used.

The Precipice Sandstone crops out in a series of steep breakaways, buttes, and mesas in the axial region of the Mimosa Syncline near the southern margin of the Baralaba Sheet. The breakaways occur along the northern margin of a tableland which slopes gently towards the south. The Sandstone crops out in the steep cliffs and in a narrow rim along the top of the tableland. Away from the edge, it is overlain by the Evergreen Formation.

Near Stonecroft homestead, the formation is 250 feet thick and consists mainly of white and cream poorly sorted prominently cross-bedded quartz sandstone, commonly containing coarse milky quartz grains (Fig. 6). The sandstone is open-textured and has a small amount of light-coloured kaolinitic clay cement. Caves are common, particularly where the unit is coarse-grained and current-bedded; the sand grains are relatively easily removed by water action along joints.

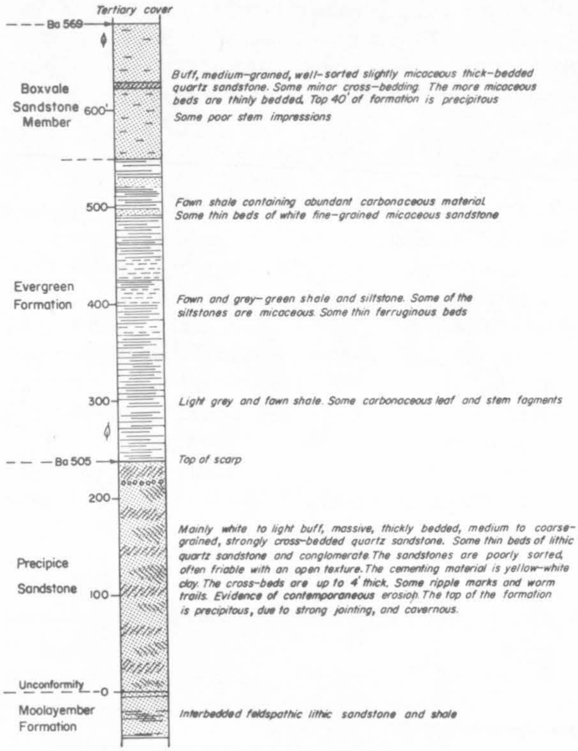


Fig. 6. Composite section, Jurassic units, Stonecroft homestead area

Some thin beds of feldspathic sandstone and conglomerate are present. Coarse cross-bedding, with individual cross-beds up to 4 feet thick, is a prominent feature of the sandstone. No detailed study was made of the orientation of the cross-bedding because most of the outcrops are inaccessible. The alignment of the precipitous cliffs along the edge of the tableland is controlled by a prominent system of vertical joints which strike 110^{o} and 155^{o}.

In the axial region of the Mimosa Syncline near the southern boundary, the Precipice Sandstone lies unconformably on the Moolayember Formation. Farther south, in the Taroom and Mundubbera Sheet areas, the Precipice Sandstone blankets the Mimosa Syncline and is unconformable on the Clematis Sandstone, Rewan Formation, Upper Bowen Coal Measures (Baralaba Coal Measures and Gyranda Formation), Back Creek Group, and Camboon Andesite. The formation is conformably overlain by the Evergreen Formation.

The Precipice Sandstone was the first unit to be laid down in the area after the Upper Triassic folding and subsequent erosion. The formation consists essentially of quartz sandstone, probably derived from pre-existing sandstones such as the Clematis Sandstone and sandstones of the Upper Bowen Coal Measures, which were exposed on the edges of the basin farther to the north after the orogeny. Erosion of granitic terrains may also have contributed sediment to the formation. The dominance of quartz suggests that the climate and topography of the source area were such as to allow thorough chemical weathering. The areal extent of the formation and the uniformity of its lithology indicate that most of the sand was transported over great distances and the conditions in the depositional area were fairly uniform. Current-bedding is characteristic of the formation and cut-and-fill structures were observed in places. The deposits are probably fluviatile, and most of the finer fractions were removed by currents.

Evergreen Formation and Boxvale Sandstone Member

The unit was first referred to by Reeves (1947) as an unnamed shale unit in the 'Bundamba Series', but was later named 'Evergreen Shale' by Whitehouse (1955) after Evergreen homestead, 21 miles north-east of Injune in the Taroom Sheet area. Mack (1963) included part of the Evergreen Formation in the middle member of his Bundamba Formation, and included the Boxvale Sandstone in the upper member. Since this sequence is not stratigraphically equivalent to the type Bundamba Group, the name 'Bundamba' should not be applied to them. Jensen et al. (1964) included the Boxvale Sandstone in the Evergreen Formation as a member. The upper part of the formation, overlying the Boxvale Sandstone Member, is not present in the Baralaba Sheet area. The type area of the Evergreen Formation is in the valley of the Dawson River immediately below Evergreen homestead in the Taroom Sheet area, and the type area of the Boxvale Sandstone Member is around Boxvale station in the Roma district.

In the Baralaba Sheet area, the formation crops out over a small area on the southern tableland, where it forms moderately vegetated gently undulating country.

The lower part of the formation is poorly exposed. It consists of 310 feet of fawn and grey-green shale, containing abundant carbonaceous plant remains, flaggy siltstone, and thin interbeds of white fine-grained micaceous sandstone.

The Evergreen Formation rests conformably on the Precipice Sandstone in the Mimosa Syncline.

The lower part of the Evergreen Formation was probably laid down in an estuarine or lacustrine environment with periodic marine incursions as indicated by the presence of forminifera and hystrichospherids (Evans, 1962).

The Boxvale Sandstone Member of the Evergreen Formation crops out over a small area near the southern boundary of the Sheet and forms precipitous mesas up to 100 feet high.

The Member consists of 140 feet of thickly bedded buff fine to medium-grained quartz sandstone with some thin interbeds of fine-grained micaceous quartz sandstone (Fig. 6). The sand grains are well rounded, and include both clear and milky quartz. The sandstone is well sorted, shows little cross-bedding, and has little matrix. Wood impressions are common.

The well-sorted and rounded sands and the presence of wood fragments and some hystrichospherids indicate that the Boxvale Sandstone Member was laid down in the shallow non-marine environment where the sand was considerably reworked and sorted, and which was invaded by the sea for short periods.

Tertiary Sediments

The earliest work on the Tertiary rocks in the central Bowen Basin was done by Dunstan (1913), who referred to these rocks in the Duaringa area, north of Baralaba, as the 'Nerang - Duaringa Series'. Reid & Morton (1928) used the name 'Duaringa - Emerald Series' for the same sequence. On the Geological Map of Queensland (1953), the name 'Duaringa Formation' was used for the Tertiary rocks along the Dawson and Mackenzie Rivers on the Baralaba and Duaringa Sheet areas. The Tertiary sequence in the Dawson River area is identical with those elsewhere in the Baralaba Sheet area. No formal name has been used for these sediments on the 1:250,000 geological Sheet.

Tertiary sediments are widely distributed and occur mainly in a narrow belt east of the Dawson Range, in the northern part of the Mimosa Syncline, and in the north-west corner of the Sheet area. Isolated outcrops occur in the south-west and south-east. The topography is generally flat, with a slight slope away from the ranges. Breakaways are formed in places along the Dawson River and an isolated area of tableland occurs in the Forest Hills area. Most of the Tertiary sediments are covered by thick sand and a moderately dense vegetation.

The beds are poorly exposed, and outcrops are generally confined to breakaways and deep creek beds. The sediments consist mainly of white, yellow, and buff quartz sandstone, in places pebbly or conglomeratic, and silty and sandy claystone. Close to the ranges, the sediments are often conglomeratic and contain large blocks of Clematis Sandstone. A curious deposit of probable Tertiary age occurs 1 mile east of Wooroonah homestead. It consists of an accumulation of boulders, up to 20 feet across, of cross-bedded quartz sandstone, mixed with smaller boulders and cobbles which were all derived from the Clematis or Precipice Sandstones. A few similar boulders, silicified, occur 2 miles south-west of Wooroonah homestead. The origin of these boulder deposits is unknown, but it has been suggested (Tweedale, pers. comm.) that they could have been formed by landslides.

Most of the Tertiary sediments have been lateritized and exposures of the mottled zone are common. This zone, containing boulders of 'billy' up to 2 feet in diameter, is well exposed in the bank of Perch Creek at Nulalbin homestead, 13 miles west-south-west of Baralaba (Pl. 2, fig. 2).

The Tertiary sediments are interbedded with basalt flows, unconformably overlie Permian, Triassic, and Jurassic rocks, and are in most places covered by superficial sand. The sediments dip gently away from the principal ranges; elsewhere they are mainly horizontal. East and north-east of Baralaba, slopes of up to 20^{o} occur in the Tertiary sediments, giving the appearance that the sediments are folded. These slopes are not parallel to the bedding planes and are thought to be remnants of an undulating surface within the laterite profile.

The sediments nearest the ranges are piedmont deposits containing large blocks and boulders of Clematis Sandstone and Precipice Sandstone. Away from the ranges, finer sediments were laid down as alluvial fans and lake deposits.

The thickness of the Tertiary deposits is unknown; it is at least 200 feet north-west of Baralaba, but elsewhere it is probably much less. At least 600 feet has been reported farther to the north from the Duaringa Bore (Dunstan, 1901). David (1932) examined fish remains from the Duaringa Bore and assigned them to the Oligocene. Other fossil fish remains were examined by Hills (1934), who could only assign a Tertiary age to them.

Tertiary Basalt

Basalt is widely distributed in the Baralaba Sheet area. The main developments are in the Rolleston/Planet Downs/Bauhinia Downs area, and in the Stonecroft homestead area extending northwards to Boonberry homestead. Smaller outcrops occur west and south of Woorabinda in the north-west and in the Expedition Range east of Glenidal homestead. Basalt does not occur east of the axis of the Mimosa Syncline. The basalt forms a black soil which generally supports a dense cover of grass and a few trees. The air-photo pattern is distinctive. The weathered basalt is an excellent shallow source of potable water.

The basalt is massive, fine-grained, dark brown to purplish grey (Appendix 3), and in places is vesicular or amygdaloidal. Columnar jointing is common. The flows are interbedded with sediments, as is well shown in Blackboy Gully, 11 miles south of Woorabinda.

In most places, the basalt occurs in large sheets of varying thickness. In the Expedition Range, west of Bauhinia Downs homestead, and in the southern tableland in the Stonecroft homestead area, the basalt occurs in long thin sinuous belts which probably represent old valley fills. A shallow drill-hole (BMR 16) in the Expedition Range, and seismic shot-holes just to the west of BMR 16, penetrated basalt and indicate that the basalt sheets to the east and west of the Expedition Range are connected through this valley. The presence of basalt on top of the range east of Glenidal homestead also indicates that the lavas in the south-west corner of the area probably formed a continuous sheet which has since been largely eroded away. Some of the basalt hills in the Bauhinia Downs area may be volcanic vents.

The basalts are probably continuous with those in the eastern part of the Springsure Sheet area, the south-eastern part of the Emerald Sheet area, and the south-western part of the Duaringa Sheet area, and are of Tertiary age.

Superficial Deposits

Cainozoic alluvium, along the rivers and creeks, and soil and sand cover large parts of the Baralaba Sheet area.

The Clematis Sandstone and Precipice Sandstone are the only resistant rocks in the area and form the main topographic features. All other soft sediments weather and erode readily to produce extensive soil cover.

Blacksoil (Cz) plains are widespread: in the north-east, mainly over the Permian rocks; in the south-east, mainly over the Moolayember Formation; and in the south-west, mainly over the Rewan Formation. Soil is also extensively developed over areas mapped as Moolayember Formation and Tertiary basalt.

Large areas, mainly covered by sandy soil and sand, in the northern half of the Sheet area between the Dawson and Expendition Ranges and west of the Expedition Range were mapped as the Tertiary sediments which they overlie.

The wide flood-plain deposits of clay and silt along the Dawson, Comet, and Brown Rivers are probably not more than 100 feet thick.

INTRUSIONS

The Permian sequence in the Baralaba area is intruded by a stock at Mount Ramsay, and dykes at Baralaba and 4.5 miles to the east.

The intrusion at Mount Ramsay, 7 miles south-east of Baralaba, rises sharply about 1100 feet above the surrounding plain. It is about 2 miles long and 1 mile wide at its widest point; the long axis of the intrusion trends north-north-west. Viewed from the north, the intrusion appears to dip steeply towards the north-east. The country rocks around Mount Ramsay have been domed. The intrusion consists of massive fine and coarse-grained trachyte. A north-westerly trachyte dyke, containing blocky fragments of country rock, crops out 4.5 miles east of Baralaba along the main road. A similar dyke or sill was encountered in diamond-drill-holes in the Baralaba area (Fig. 3).

The Mount Ramsay intrusion and the dykes which intrude the Upper Bowen Coal Measures are probably related. Age determinations (potassium/argon and whole rock) indicate a minimum age of 70 million years.

STRUCTURE

The Baralaba Sheet area lies almost entirely within the Bowen Basin. Near the southern Sheet boundary, the Bowen Basin, occupied by Permian-Triassic rocks, is overlapped by the Jurassic sediments of the Surat Basin.

Recent geophysical work (Fig. 7), and surface mapping have shown that the sediments in the Baralaba Sheet area, except in the north-east corner, are gently folded. The Mimosa Syncline, the largest structure, occupies more than half the Sheet area. The syncline is a major downwarp up to 80 miles wide, in which subsidence and sedimentation were particularly active in Triassic time when the Rewan and Moolayember Formations were laid down. The syncline was only slightly affected by subsequent folding. A small reversal, the Shotover Anticline, occurs on the west limb near the northern boundary of the Sheet. To the north-east, the Mimosa Syncline is flanked by a zone of tightly folded and overfolded, faulted, and possibly thrust-faulted Permian rocks, shown as the 'Folded Zone' on Figure 7. The axes and faults in this area trend north-north-west, parallel to the regional trend of

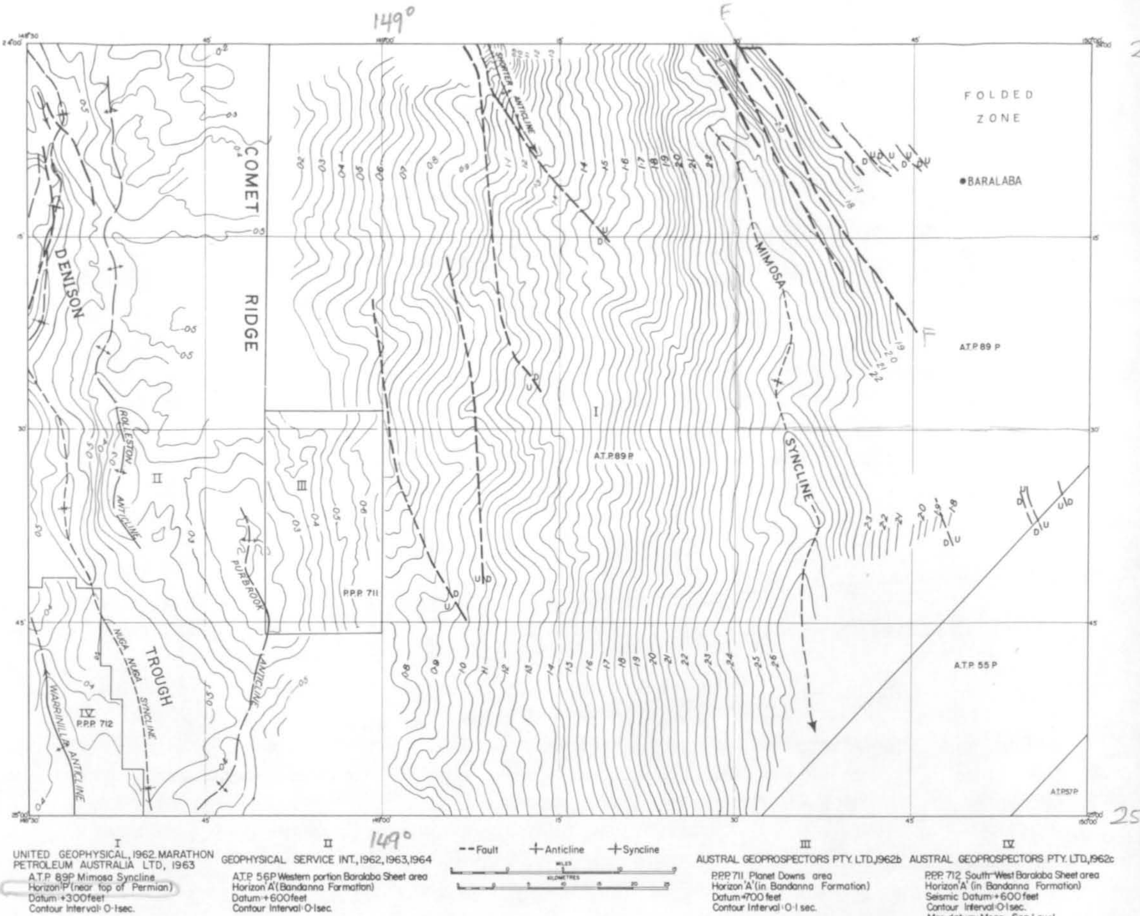


Fig. 7. Structure contours on Upper Permian seismic reflector (near top of Perm.)

the Bowen Basin, but the style of folding is very different from that of the remainder of the Sheet area. The Folded Zone may be bounded on the west by a low-angle, east-dipping thrust zone which possibly is the north-westerly extension of the Banana Fault, mapped farther to the south-east in the Monto 1:250,000 Sheet area (Glover, in Hill & Denmead, 1960, p. 205). Outcrop in the area is obscured by Cainozoic cover, but seismic surveys north-west of Baralaba indicate a series of north-west-trending reverse faults (United Geophysical, 1962). To the west, the Mimosa Syncline is flanked by the Comet Ridge (Fig. 7), consisting mainly of Devonian rocks, and covered by a relatively thin sequence of gently folded Permian and Triassic rocks (about 4750 feet in AFO Purbrook No. 1). The Denison Trough west of the Comet Ridge, and partly on the Springsure Sheet, contains at least 9500 feet of folded Permian and Triassic Strata (AFO Rolleston No. 1).

The Permian-Triassic sequence was folded principally during late Triassic time. Possibly some of the deformation in the Folded Zone was brought about during the period of uplift and emergence in the Lower Permian. Fold axes generally trend north-north-west, parallel to the axes of the Denison Trough, Comet Ridge, and the Mimosa Syncline. The amplitude of folding on the Comet Ridge is small and the axes are shorter and more sinuous than those to the east and west in the troughs. The Permian-Triassic folds are truncated by the erosional unconformity on which the Lower Jurassic Precipice Sandstone was deposited. The Jurassic and Cainozoic rocks are not folded.

Individual Structures

Anticlinorium east of Baralaba: The western limb and northern nose of a small anticlinorium, in which three anticlinal axes were mapped, are exposed 5 miles east of Baralaba. The structure is outlined by the well exposed and richly fossiliferous Flat Top Formation. The soft siltstone of the Barfield Formation is exposed in the core. The dips on the flanks on the northern nose range from 20° to 50°, with steeper dips to the west. The west limb of the anticlinorium is slightly overturned, indicating that deformation was produced by stress from the east or north-east.

Mimosa Syncline: The Mimosa Syncline is the dominant structure of the Baralaba Sheet area and the largest in the Bowen Basin. It extends from just south of Bluff in the Duaringa Sheet area through the Baralaba Sheet area into the Taroom Sheet, and can be traced on the subsurface into the Roma Sheet area, a total distance of about 150 miles.

In the Baralaba Sheet area, the Mimosa Syncline is outlined by the Clematis Sandstone, which forms the Expedition and Shotover Ranges in the west and the Dawson Range in the east. The syncline ranges in width from 30 miles in the north to 60 miles in the south.

The stratigraphy of the Mimosa Syncline is well known from the surface geology. Permian and Triassic sediments are unconformably overlain by Jurassic sediments. The greatest thickness of Permo-Triassic sediments in the Mimosa Syncline is in the Bauhinia Downs/Moura area and is estimated to be about 25,00 feet (United Geophysical, 1962; Marathon Petroleum Australia Ltd, 1963). The Jurassic rocks, which overlie the Permo-Triassic sequence with a marked unconformity, attain a thickness of about 700 feet in the Baralaba Sheet area.

Seismic surveys by United Geophysical Corporation (1962) for Marathon Petroleum Australia Ltd (Figs 1, 7) show that the Mimosa Syncline is an asymmetrical syncline with a south-easterly to southerly plunge. The synclinal structure is clearly shown on reflecting horizons at the top of the Clematis Sandstone and at the top of the Upper Permian coal measures. The axis of the Mimosa Syncline at the Clematis Sandstone horizon lies to the west of the axis of the coal measures horizon. Towards the northern boundary of the Sheet, the trend of the axis of the syncline changes gradually from north to north-west; the structure .tours on the coal measures horizon show that the syncline bifurcates.

The western flank of the syncline shows several minor reversals of dip and possible reversals and two closed high zones referred to as the Shotover and Glenhaughton structures. The Shotover structure is extensively faulted and lies just north of the Baralaba Sheet area in the Duaringa Sheet; the southerly plunge of the anticline, which is manifest at the surface by Clematis Sandstone, lies in the Baralaba Sheet area. The Glenhaughton structure is 16 miles south of the Baralaba Sheet area in the Taroom Sheet. Glenhaughton No. 1 was drilled by Marathon Petroleum on the structure in 1964 to a depth of 9418 feet. No hydrocarbons were encountered.

No reversals of dip are present on the eastern limb of the Mimosa Syncline. Seismic reflections from the coal measures horizon show that the eastern flank of the syncline in the north-east of the area is extensively faulted. Reflections at the Clematis Sandstone horizon at shallow depths were too poor to detect such faults, and it is not known what effect the Permian faults have on the younger formations. The whole area is blanketed by Cainozoic cover. Some faults cutting the Moolayember Formation were mapped a few miles to the north-west near Wooroonah homestead.

Planet Downs Structure: Previously compiled geological maps covering the Planet Downs area, west of the Expedition Range, invariably show an anticlinal axis just west of the Expedition Range between Rolleston and Bauhinia Downs homestead (e.g., Tweedale & Isbell in Hill & Denmead, 1960, Fig. 27). There is no evidence at the surface of this structure. The Clematis Sandstone in the Expedition Range dips consistently to the east and the area west of the ranges is covered by Cainozoic basalt and sediments.

A seismic survey was conducted by Austral Geoprospectors Pty Ltd (1962) for Planet Oil Co. N.L. in the Planet Downs area. Reflection quality was good except in areas of basalt cover. The survey suggests the presence of an anticline with the apex lying west of the south-western edge of the permit area (PPP 711). A small positive structural anomaly, dependent on minor faulting for critical west dip, is present in the south-western corner of PPP 711 on the eastern flank of the anticline, and a pronounced positive anomaly was postulated to lie in the central-north-west of PPP 711. Some faults are present in the south-west corner of the permit area.

Purbrook-Arcadia Anticline: The Purbrook-Arcadia structure is a regional anticline which has been delineated in the subsurface by seismic surveys over a distance of 50 miles in the south-west of the Baralaba Sheet area and the north-west of the Taroom Sheet. The anticline lies between the Mimosa Syncline to the east and the Nuga Nuga Syncline to the west. The whole area is covered by Cainozoic deposits and only a few poor outcrops of Rewan Formation are present. A seismic survey conducted by Geophysical Service International (1963, 1964) for Mines Administration Pty Ltd shows that the axis of the structure is sinuous and its trend varies from north-east to north-west.

The Purbrook Anticline is the main culmination in the Baralaba Sheet area and lies 15.5 miles south-east of Rolleston. AFO Purbrook No. 1, AP Cometside No. 1, AP Motley No. 1, and AP Purbrook South No. 1 were drilled on the crest of the structure, which has an estimated closure of 1000 feet over 250 square miles. No hydrocarbons were encountered in the wells. Smaller culminations occur on the axis near the southern boundary of the Sheet. The main culmination in the Taroom Sheet area is the Arcadia Anticline, on which OSL No. 3 (T.D. 6025ft) and AAO No. 7 (T.D. 3280ft) were drilled from 1936 to 1938 and in 1957 respectively. Gas was encountered in the Permian in OSL No. 3 between 1187 and 3955 feet.

Warrinilla Anticline: This structure is in the south-west corner of the Baralaba and north-west corner of the Taroom Sheet areas. It lies between the Nuga Nuga Syncline to the east and the Rewan Syncline to the west, both of which are outlined by the boldly outcropping Clematis Sandstone. Some poor outcrops of Rewan Formation are present in the core of the anticline.

Seismic work by Austral Geoprospectors Pty Ltd (1962c) for Planet Oil Co. N.L. shows that the structure is a broad anticline which plunges in a north-north-westerly direction. It is asymmetrical with a gentle east flank and a steep west flank. A major fault has been postulated along the west flank of the structure between it and the Morella Anticline to the south-west.

A few culminations are present along the crest of the main structure. The largest culmination lies in PPP712, 30 miles south of Rolleston, 'with closure ranging from 120 feet on Horizon AF1 (about 100 feet below the top of the Ingelara Formation), to 60 feet on Horizon AF3 (top of the Cattle Creek Formation).' Planet Warrinilla North No. 1 (T.D. 6701 ft) was drilled in 1963 on a culmination on the Warrinilla Anticline 16 miles south of the Baralaba Sheet area in the Taroom Sheet area. Gas was obtained in drill stem tests in Warrinilla No. 1 from the Aldebaran Sandstone (3367-3434 ft), and the Cattle Creek Formation (4172-4212ft).

Rolleston Anticline: The Rolleston Anticline is a broad structure trending north-south. Its culmination lies 6 miles south of Rolleston. The structure has no surface expression and was located by a seismic survey by Geophysical Service International (1963) for Mines Administration Pty Ltd. Subsequent detailed seismic work was done in the area and AFO Rolleston Nos 1 to 8 were drilled on the structure, which was estimated to have a closure of 400 feet over about 20 square miles. The objective of Rolleston No. 1 Well was to test the fluid content of the Permian formations, the prime target being the Aldebaran Sandstone. A considerable flow of gas, reported to be about 43 million cubic feet per day, was obtained from the interval 2945 to 2980 feet. Rolleston No. 3 produced about 3 million cubic feet of gas per day. The other Rolleston wells were either dry or yielded small shows of gas.

Structures in the north-west of the Baralaba Sheet area: The area north of Rolleston in ATP 56P is covered by Cainozoic deposits and there are no surface indications of the structures present at depth. Seismic surveys by Geophysical Service International (1962, 1964) for Mines Administration Pty Ltd have shown that the area is gently folded and represents the southern extension of the Comet Platform (Derrington & Morgan in Hill & Denmead, 1960, p. 209). The axes of the structures are sinuous about a general north-south direction. Several culminations occur on the two main anticlinal axes. The syncline between the two anticlines is the extension of the Nuga Nuga Syncline, which is expressed at the surface farther to the south. Three wells have recently been drilled on the Arcturus Anticline in the north-west of the Sheet area. AFO Arcturus Nos 1 and 3 have been developed as gas/condensate wells. Arcturus No. 4 was abandoned (Table 3); Arcturus No. 2, drilled in the Springsure Sheet area, was also abandoned.

GEOLOGICAL HISTORY

The oldest exposed rocks in the Baralaba Sheet area are the Lower Permian Camboon Andesite and closely associated Rannes Beds in the core and east limb of the Thuriba Anticline in the north-east corner of the Sheet area. The volcanics are interbedded with sediments which, in some places in the Monto Sheet area, contain marine fossils. The volcanics were probably laid down on land and in shallow coastal waters along the western edge of the Yarrol Basin. The vulcanism was probably closely associated with the gradual subsidence of the area to the west which led to the formation of a marine sedimentary basin, the Bowen Basin. Subsidence in the Bowen Basin began in the west of the Sheet area with the formation of the Dennison Trough, in which a great thickness of freshwater sediments was laid down in Lower Permian time (Fig. 8). Freshwater sedimentation ceased in the Lower Permian, and the sea invaded the Dennison Trough and transgressed to the east across the Comet Ridge. The easterly extent of the transgression is not known. In the west, the predominantly marine Lower to Upper Permian Back Creek Group was laid down in a shallow sea in this slowly subsiding basin. Subsidence was slowest in the area of the Comet Ridge, where a relatively thin Permian sequence was laid down (Fig. 8). The marine sedimentation (Cattle Creek, Ingelara, and Peawaddy Formations) was periodically interrupted by the deposition of fluvial and

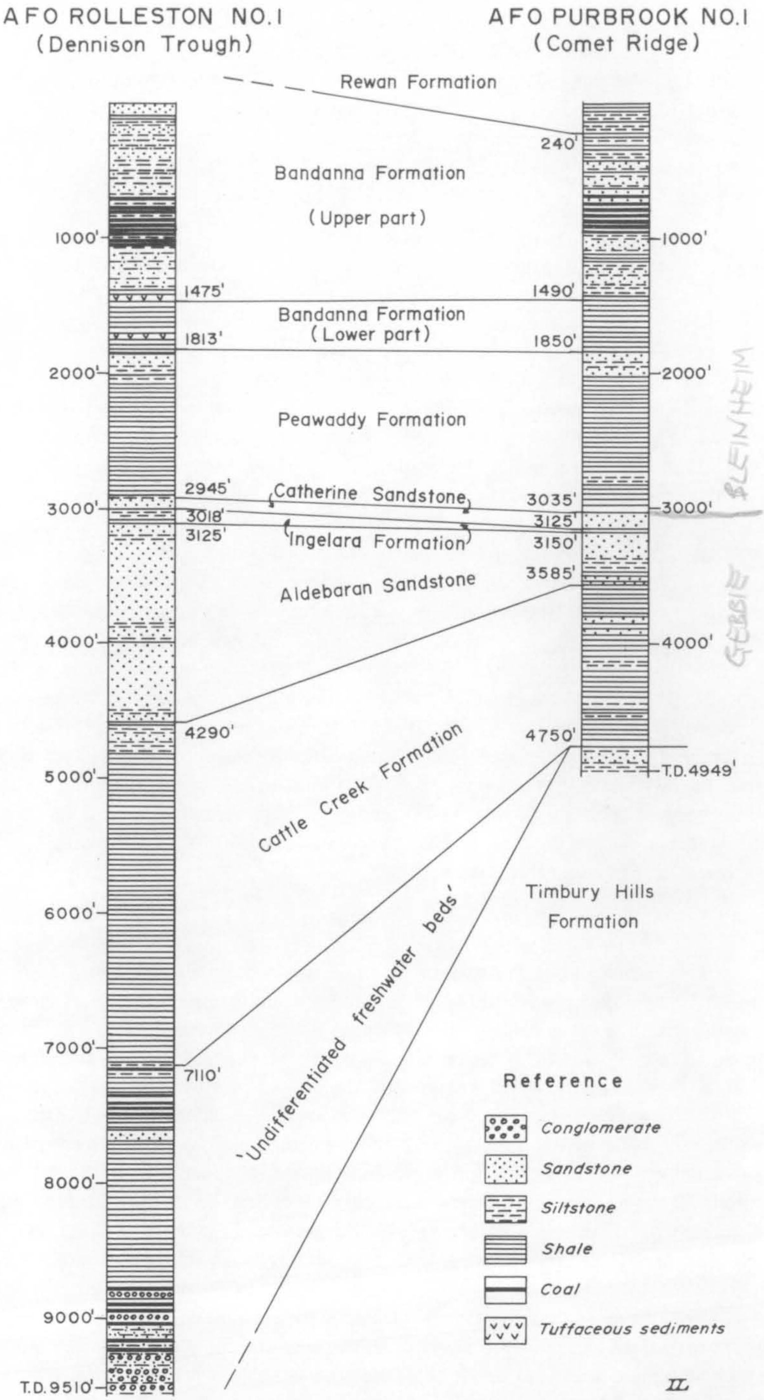


Fig. 8. Correlation chart, AFO Rolleston No. 1 and AFO Purbrook No. 1

deltaic sands (Aldebaran and Catherine Sandstones). The lower part of the Bandanna Formation at the top of the Back Creek Group represents the transition from marine to freshwater sedimention. In the north-east, the Camboon Andesite is directly overlain by the Upper Permian part of the Back Creek Group (Table 2). The Lower Permian part of the Group, which is well represented farther to the north and west, was either not laid down in the east of the Sheet area, or was removed before the Oxtrack Formation was deposited. Farther to the south, in the Monto and Mundubbera Sheet areas, there is evidence that a large part of the section has been removed by erosion (Jensen et al., 1964), and similar events may have occurred in the Baralaba Sheet area.

Early in the Upper Permian, the Bowen Basin gradually lost its connexion with the sea and changed from a marine basin with a varied fauna to a freshwater basin in which sediments containing abundant plant material were deposited. The lower part of the Upper Bowen Coal Measures in the east of the area (Gyranda Formation) was probably laid down in a paralic environment (Malone et al., 1963). The upper part of the unit, the Baralaba Coal Measures, was laid down in a lacustrine environment. Volcanic activity occurred during the deposition of the Upper Bowen Coal Measures as shown by the tuffaceous nature of some of the sediments.

In the Lower Triassic, conditions changed within the basin and in the areas from which the sediments were derived and the red-bed sequence of the Rewan Formation, consisting mainly of purplish red mudstone and greenish lithic sandstone, was laid down. Wood and other plant remains are present, but are not nearly as common as in the Upper Bowen Coal Measures. The lithology and organic content of the formation indicate deposition in a shallow non-marine environment.

The main locus of sedimentation of the Rewan Formation was in the south-east of the Baralaba Sheet area, in the then developing Mimosa Syncline, east of the present axis.

A considerable change of provenance and depositional environment took place, probably in the Middle Triassic, as indicated by the deposition of cross-bedded quartz sandstone (Clematis Sandstone). A detailed study of the cross-bedding (Fig. 5) has shown that the sediments were possibly derived from the Urannah Complex to the north and the Anakie Inlier to the north-west of the Baralaba Sheet area. The Auburn Complex may also have contributed some of the material. Deposition was probably fluviatile. The uniform thickness of the Clematis Sandstone in the Mimosa Syncline and on the Comet Ridge to the west, and the maturity of the sediments, indicate that subsidence was slow during deposition of the formation.

In the Middle to Upper Triassic, the shale, lithic sandstone, and conglomerate of the Moolayember Formation were laid down, signifying another major change in provenance. Sedimentation probably took place in a generally shallow, but rapidly subsiding non-marine basin. Subsidence was greatest in the Mimosa Syncline.

The orogenic phase of the Bowen Basin, involving folding, uplift, and minor intrusion, began after or towards the end of deposition of the Moolayember Formation. Extensive erosion followed, removing most of the Moolayember Formation except from the trough of the Mimosa Syncline.

Early in the Jurassic, the Precipice Sandstone was laid down in a shallow non-marine environment, unconformably on the deeply weathered Moolayember Formation and Clematis Sandstone. The quartz sandstone of the Precipice Sandstone was possibly derived from the same source as the Clematis Sandstone and laid down under similar conditions.

Later in the Jurassic, sedimentation changed slightly and the siltstone and shale of the Evergreen Formation and the quartz sandstone of the Boxvale Sandstone Member were laid down. Plant material is abundant. The presence of hystrichospherids and foraminifera in the Evergreen Formation indicates that marine incursions took place during the Jurassic.

The subsequent history of the Baralaba Sheet area is epeirogenic. Tertiary basalt was poured out over large areas in the Mimosa Syncline and west of the Expedition Range. The basalts are interbedded with Tertiary sediments, which were deposited as alluvial fans and lake deposits between the main ranges over most of the Sheet area. The trachyte stock and associated dykes, in the Upper Bowen Coal Measures south-east of Baralaba, were probably intruded in the Upper Cretaceous or Tertiary.

ECONOMIC GEOLOGY

Coal has been mined at Baralaba since 1921. In 1958, Thiess Brothers discovered large deposits of coking coal near Moura and Kianga, just east of the Baralaba Sheet area. Production from the Moura open cut will reach 1,000,000 tons per year in the near future. The Moura coal is being exported to Japan through the port of Gladstone.

The water resources of the Baralaba area are fair. Landholders generally rely on surface water collected in waterholes, tanks, or dams, or on small supplies from shallow bores or wells in alluvium along the creeks. The towns of Baralaba and Moura obtain their supplies from the Dawson River.

Gas was found in the Rolleston area at the end of 1963. The potential of the area is good and drilling is continuing.

Oil Prospects

Sixteen exploratory wells have been drilled in the western part of the Baralaba Sheet area (see Table 3). Completion reports for subsidized wells are available in the Bureau of Mineral Resources and Geological Survey of Queensland.

Geological mapping and extensive geophysical investigations indicate that numerous closed structures are present west of the Expedition Range in the Baralaba Sheet area (Fig. 7). Because the folding is gentle, closure is generally small but extends over large areas.

The marine Permian units in the Bowen Basin contain a considerable thickness of black shale, which are the source beds of the oil and gas found in some of the bores in the Bowen Basin.

Reservoir rocks occur throughout the Permian section in the Bandanna Formation, Catherine Sandstone, Aldebaran Sandstone, and Cattle Creek Formation. Drilling has shown that the Aldebaran Sandstone and Catherine Sandstone have the best reservoir characteristics and are therefore the prime targets in most drilling operations; but all the formations cited above may be prospective. The porosity of the reservoir rocks is very variable, as was clearly shown in the Rolleston Anticline. The sands in AFO Rolleston Nos 1, 3, and 8 were porous and yielded 44 million, 3.7 million, and 1 million cubic feet of gas per day respectively. However, the sands in Rolleston Nos 2, 4, 6, and 7 were either tight or yielded small quantities of gas. The Precipice Sandstone, which crops out in the south of the Baralaba Sheet area, is the best reservoir rock farther to the south in the Surat Basin, and is the producing sand in the Moonie Oilfield.

TABLE 3 - EXPLORATORY WELLS

Name	Location Latitude	Location Longitude	Year	Total Depth (feet)	Oil/Gas Shows	Depth of Show (feet)	Formation	Status	Common-wealth Subsidy
AFO Arcturus No. 1	23 03 40	148 30 00	1964	6203	ca 7.5 MMcf/D	1690-2580	Bandanna Formation (upper part) and Peawaddy Formation	Gas/ Condensate Well	Yes
	24 04 21	148 30 40	1964	2150	1.4 MMcf/D	1687-2116		Gas/ Condensate Well	No
	24 05 20	148 31 05	1965	3651	Dry			Abandoned	No
AFO Purbrook No. 1	24 37 10	148 48 20	1963	4949	Dry			Abandoned	Yes
AFO Rolleston No. 1	24 34 00	148 37 20	1963	9508	ca 43 MMcf/D ca 1 MMcf/D	2945-2980 1836-1902	Catherine Sandstone Peawaddy Formation	Gas/ Condensate Well	Yes
2	24 33 10	148 38 15	1963	4732	Show of gas			Abandoned	No
3	24 33 10	148 37 20	1964	3258	ca 3.7 MMcf/D	3024-3072	Catherine Sandstone	Gas/ Condensate Well	No
4	24 35 00	148 37 20	1964	3500	Dry			Abandoned	No
5	24 34 00	148 36 22	1964	3634	Dry			Abandoned	No
6	24 35 50	148 37 20	1964	5490	Dry			Abandoned	No
7	24 33 10	148 36 52	1964	3500	40 Mcf/D	1930-2153	Peawaddy Formation	Abandoned	No
8	24 33 47	148 38 48	1964	3400	1 MMcf/D	1940-2066	Peawaddy Formation	Gas/ Condensate Well	No
AP Cometside No. 1	24 39 30	148 48 6	1964	5561	Dry			Abandoned	Yes
AP Motley No. 1	24 38 52	148 46 23	1964	4187	Dry			Abandoned	Yes
AP Purbrook South No. 1	24 49 30	148 46 40	1964	5582	Dry			Abandoned	Yes
P. Warrinilla North No. 1	24 52 49	148 31 50	1963	6879	ca 160 Mcf/D	4005-4120 4510-4573	Aldebaran Sandstone	Abandoned	Yes

AFO, Associated Freney Oil Fields N.L.; P, Planet Exploration Co Pty Ltd; AP, Amalgamated Petroleum Exploration Pty Ltd.

The Ingelara and Peawaddy Formations provide the cap-rocks to the reservoirs. Lithological changes within the Permian formations also provide capping.

The area of greatest interest in the Mimosa Syncline lies along the western boundary of ATP 89P on the western flank of the structure. Several minor reversals, possible reversals, and closed anticlines, aligned in a north-south direction, are present. The possibility of stratigraphic traps in the area cannot be overlooked since thinning towards the west takes place, as indicated on an isopach map of the Clematis Sandstone/coal measures interval prepared by United Geophysical (1962).

The north-east corner is of little interest for oil exploration because of its tectonic history. The rocks are tightly folded and have been intruded. The east flank of the Mimosa Syncline and the area east of the Dawson Range and south of Mount Ramsay have not been adequately tested. The rocks dip gently to the west and geophysical work has shown the presence of strike faults. The oil potential is probably not great, but there is the possibility of accumulations of hydrocarbons in structural or stratigraphic traps.

Coal

Coal was first noted in the Baralaba Sheet area by Daintree (1872). The first detailed work on the coal-bearing strata was done between 1898 and 1901 by Dunstan (1901). Dunstan's work encouraged two companies to take up coal prospecting leases near Baralaba: the Dunstan Coal Mining Syndicate, which took up leases around the present site of the township of Baralaba, and the Dawson River Anthracite Coal Prospecting Co., which took up leases about 3 miles farther south.

From 1902-04 the Dunstan company sank 7 shafts and 7 bores and the Dawson River company 4 shafts and 7 bores, and the existence of a number of seams was proved.

The State Government conducted a diamond drilling programme from 1908 to 1911, and some 43 bores were sunk. The southern part of the area drilled was later chosen as the site for a State coal mine.

In 1917-18, 16 diamond-drill-holes were sunk on the northern part of the old Dunstan company leases at Baralaba for a new company, the Dawson Valley Coal Mine, a subsidiary of Mount Morgan Ltd.

In 1920 a State Coal Mine was initiated and a shaft sunk approximately 1 mile south of the Baralaba Hospital. The mine started production in 1921 and continued producing until 1928, when it was forced to close because of severe damage by flooding. During its eight years of operation the mine produced 215,180 tons of coal.

The Dawson Valley Coal Mine commenced production in 1922. Except for the period 1929-1932, coal has been mined continuously; the total production to the end of 1962 was 824,300 tons.

The coal is a soft, low-volatile, non-coking type which ranges in rank from a semi-anthracite in the south of the field to a semi-bituminous coal in the north. In the southern part of the field, the fuel ratio ranges from 9.1 to 12.0 (volatile matter 7.8 to 9.9 percent), while in the north around Baralaba, the ratio is 5.2 to 6.5 (volatile matter 13.3 to 16.2 percent), which represents a change from semi-anthracite to semi-bituminous coal.

Proximate analyses of three seams are shown below:

	Dawson Seam (8 feet) %	Dunstan Seam (10 feet) %	Dawson Seam %
Moisture at 105°C	1.5	1.7	1.8
Volatiles	11.9	10.5	11.4
Fixed carbon	74.1	77.0	76.3
Ash	12.5	10.8	10.5

Workable reserves were estimated by Reid (1945c) to be contained within an area of 5.6 square miles. Probable reserves are of the order of 200 million tons in five seams exceeding 5 feet in thickness. Of this total, approximately 93 million tons are probably contained in the Dunstan and Dawson seams, which range from 7 feet to about 10 feet in thickness. These two seams have provided nearly all coal mined to date.

Recent deep drilling in the Baralaba area has revealed the presence of 1250 feet of coal measures containing 10 seams which can be correlated over most of the area around Baralaba; 8 of the seams exceed 5 feet in thickness (Fig. 3). Drilling by Thiess Brothers south of Baralaba led to the discovery in 1958 of coking coals at Kianga and Moura. Large quantities of coking coal have since been mined and exported to Japan.

<u>Surface and Underground Water</u>

The landholders in the Baralaba Sheet area rely mainly on earth tanks, dams, and permanent waterholes for watering stock. Numerous boreholes and shallow wells have been sunk, but the underground water resources have not been fully developed. The average annual rainfall of 20 to 30 inches is sufficient to keep most of the reservoirs filled the year round. The Dawson, Comet, and Brown Rivers and many of the larger creeks, including Planet and Mimosa Creeks, flow for a large part of the year and contain permanent waterholes.

Data on the 237 known bores, dug wells, and spears in the Baralaba Sheet area are set out in Table 4. Most of the information was made available by the Queensland Lands Department. In many cases it was difficult to determine in which units the aquifers lie, because the depth of the bores is unknown. Most of the bores are from 100 to 200 feet deep. Two of the bores (Nos 75 and 76), 2 miles east of Bauhinia Downs homestead, are 1100 feet deep.

Most of the bores in the Sheet area were put down between the Expedition and Dawson Ranges in the Moolayember Formation and Tertiary basalt. Very few have been sunk in the ranges. The bores west of the Expedition Range were drilled mainly in Tertiary rocks, and only two have been sunk to the east of the Dawson Range.

<u>Alluvium</u>: Many of the bores and wells, and all spears, were put down to a shallow depth in alluvium along the rivers and creeks, where good supplies of fresh water can generally be obtained.

<u>Tertiary Sediments</u>: Only a few bores produce water from Tertiary sediments, and most of them are located in the north west and in the Mimosa Syncline near Pine Hut homestead. Most of the unsuccessful bores were sunk in Tertiary sediments, and the water in some of the bores in the north west may be derived from interbedded basalts.

Tertiary Basalt: The Tertiary basalt, as elsewhere in the Bowen Basin, provides good supplies of excellent water.

Jurassic Formations: Not many bores have been put down in the southern tableland, where the Precipice Sandstone and Evergreen Formation crop out. One bore (No. 227) bottomed in the Precipice Sandstone, but was abandoned because of its salinity. Four bores (Nos 217, 218, 219, and 228) bottomed in the Evergreen Formation. All are in use for watering stock.

Moolayember Formation: The majority of bores in the area were put down in this formation, which consists of conglomerate, sandstone, and shale. Most of the bores are good producers, with yields of up to 1000 gallons per hour. BMR 19, drilled in the formation 7 miles north of Stonecroft homestead, encountered water at 40 and 115 feet; the potential production probably exceeds 200 gallons per hour.

Clematis Sandstone: Only six bores (Nos 56, 82, 108, 127, 130, and 164) are known to have bottomed in the Clematis Sandstone. All except one (No. 108) are good producers. BMR 16, drilled in the Expedition Range alongside the main road to a depth of 200 feet, was dry. BMR 20 and 21 were drilled in the Dawson Range in Glenmoral Gap in the south-east; both encountered good supplies but were drilled close to a deep waterhole.

Rewan Formation: Several bores west of the Expedition Range probably bottomed in the Rewan Formation. All except one are in use. BMR 18, BMR 22, and BMR 23 were put down in the Rewan Formation east of the Dawson Range without striking water, and the water potential in this area is regarded as poor.

Permian Formations: The water potential of the Upper Bowen Coal Measures, Back Creek Group, and Camboon Andesite is unknown. Only one bore (No. 40) is known to have been drilled in these rocks.

TABLE 4 - WATER-BORES

Map Reference No.	Property or Holding	Type of Supply	Depth (feet)	Formation
1	Comet Downs	Bore		Alluvium
2	Memooloo	"		Tertiary
3	Togara	"		"
4	Comet Downs	"		Tertiary basalt
5	Memooloo	"		" "
6	Yandine	"	73	Alluvium
7	Mira	"	70	Tertiary
8	Coonabar	"	117	"
9	"	"	117	"
10	"	"	115	"
11	"	"		Alluvium
12	C & W Reserve	"		"
13	GH3215	"	85	Tertiary basalt
14	Meteor Downs	"		" "

Map Reference No.	Property or Holding	Type of Supply	Depth (feet)	Formation
15	Meteor Downs	Bore		Tertiary basalt
16	GH3218	"		" "
17	Meteor Downs	"		" "
18	" "	"		" "
19	GF3232	Well	200	" "
20	"	Bore	112	" "
21	Mt Pleasant	"	98	" "
22	" "	"	95	Alluvium
23	Nogun	"	83	"
24	"	"		"
25	Cometside	"	36	"
26	Warrinilla	"	112	"
27	Wysbey	"	100	"
28	"	"	80	"
29	"	"	78	"
30	"	"	54	"
31	Lalcham	"		Tertiary
32	"	"	130	"
33	GF9092	Spear		Alluvium
34	GH9093	"		"
35	Brackenby	"		"
36	Box Gully	"		"
37	" "	"		"
38	Mimosa Park	"		"
39	Central Creek	"		"
40	GH9390A	"		Permian sediments
41	Benleith	"		Alluvium
42	Central Creek	Bore		"
43	Glenbower	Spear		"
44	"	"		"
45	Central Creek	"		"
46	Oaklands	"		"
47	Mimosa Park	"		"
48	Glenbower	"		"
49	Goomally	"		"
50	"	"		"
51	"	"		"
52	Oaklands	"		"
53	"	"		"
54	Goomally	"		"
55	Repulse	"	2	"
56	"	Bore	360	Clematis Sandstone
57	Coonabar	"	240	Rewan Formation
58	Planet Downs	"	400	" "
59	" "	Spear	45	Alluvium
60	Barranja	Bore	75	Moolayember Formation
61	"	"	2 0	" "

Map Reference No.	Property or Holding	Type of Supply	Depth (feet)	Formation
62	Bandera	Bore		Alluvium
63	Planet Downs	"	200	Rewan Formation
64	" "	"	200	" "
65	" "	Spear	12	Alluvium
66	Glen Elgin	"		Tertiary basalt
67	" "	"		Alluvium
68	Conciliation	Well		"
69	Planet Downs	Spear		"
70	" "	"		"
71	Glen Elgin	Well	8	"
72	" "	Bore	69	Moolayember Formation
73	Bauhinia Downs	"	170	" "
74	" "	"	200	" "
75	" "	"	1100	" "
76	Muggine	"	1100	" "
77	"	"	78	" "
78	"	"	150	" "
79	"	"	93	" "
80	Laurel Hills	"	76	" "
81	Planet Downs	Well	60	Tertiary basalt
82	" "	Bore	180	Clematis Sandstone
83	Oakland Park	"	120	Moolayember Formation
84	" "	Well	100	" "
85	" "	Bore	195	" "
86	Corramar	"	120	" "
87	Oakland Park	Well	40	" "
88	Bauhinia Downs	Bore	130	" "
89	" "	"	130	" "
90	" "	"	100	" "
91	Loatta	"	411	" "
92	Planet Downs	"	190	Rewan Formation
93	Basalt Creek	"	87	" "
94	" "	"	105	Tertiary basalt
95	" "	"	54	" "
96	Lenore Hills	Well		Clematis Sandstone
97	" "	"		Tertiary basalt
98	" "	"		" "
99	Carramar	Bore		" "
100	"	"	70	" "
101	"	"		" "
102	"	"		Moolayember Formation
103	Kidell Plains	"	137	" "
104	" "	"	154	" "
105	" "	"	335	" "
106	" "	"	200	" "
107	Boonberry	"	200	" "
108	Lenore Hills	"	380	Clematis Sandstone

Map Reference No.	Property or Holding	Type of Supply	Depth (feet)	Formation
109	Fairfield	Bore	320	Moolayember Formation
110	Booroomen	"	245	" "
111	Boonberry	"	375	" "
112	Cometside	"	175	Rewan Formation
113	Fairfield	Well	90	Moolayember Formation
114	Spottswood	Bore	97	" "
115	"	"	104	" "
116	"	"	113	" "
117	"	"	110	" "
118	"	"		" "
119	"	"		" "
120	"	"	160	" "
121	Deep Creek	"	105	Rewan Formation
122	" "	Well	55	" "
123	Mt Aldis	Bore		Moolayember Formation
124	Palmgrove	"		" "
125	"	"		" "
126	Deep Creek	"	107	Rewan Formation
127	Mt Aldis	"		Clematis Sandstone
128	Deep Creek	"		Rewan Formation
129	Palmgrove	"	26	Moolayember Formation
130	Saline Creek	"	200	Clematis Sandstone
131	" "	"	350	Moolayember Formation
132	GH9083	"	250	Clematis Sandstone
133	" "	Spear		Alluvium
134	Redcliffe	"		"
135	Olenga	"		"
136	"	"		"
137	Pine Hut	Bore		Tertiary
138	" "	"	70	"
139	" "	"		Alluvium
140	" "	"		"
141	" "	"		"
142	" "	"		"
143	" "	"	110	Tertiary
144	" "	Spear		Alluvium
145	" "	Bore		"
146	" "	"		"
147	" "	"		Tertiary
148	" "	"		"
149	" "	"		"
150	" "	"	140	"
151	" "	"	57	"
152	" "	Well	24	"
153	" "	Bore	140	"
154	" "	"	110	"
155	" "	"		"

Map Reference No.	Property or Holding	Type of Supply	Depth (feet)	Formation
156	Pine Hut	Bore	140	Tertiary
157	" "	Spear		Alluvium
158	Mimosa Vale	"		"
159	" "	"		"
160	Avoca	"		"
161	"	"		"
162	"	Bore	40	"
163	"	"	127	Tertiary
164	"	"	130	Clematis Sandstone
165	Beckersley	Spear		Alluvium
166	"	"		"
167	"	"		"
168	Roundstone	Bore	220	Moolayember Formation
169	"	"	130	" "
170	"	"	200	" "
171	"	"	200	" "
172	"	"	150	" "
173	"	"	250	" "
174	Thalmera North	"	194	" "
175	Junedale	"	242	" "
176	"	"		" "
177	"	"		" "
178	"	"	92	" "
179	"	"		" "
180	"	"	209	" "
181	Thalmera North	"	68	" "
182	" "	"	74	" "
183	Junedale	"	114	" "
184	"	"	215	" "
185	Boonberry	Bore	375	Moolayember Formation
186	Junedale	"	120	" "
187	Spottswood	"	140	" "
188	Pegunny	"		" "
189	Thalmera South	Well	35	" "
190	" "	Bore	130	" "
191	" "	"	250	" "
192	" "	"	190	" "
193	Rhyddings	"	125	" "
194	Highworth	Well	105	" "
195	"	Bore	127	" "
196	Rhyddings	Well	45	Alluvium
197	"	Bore	120	Moolayember Formation
198	"	"	160	" "
199	Punchbowl	Well	70	Tertiary basalt
200	"	Bore	120-370	Moolayember Formation
201	Thalmera South	"	413	" "

Map Reference No.	Property or Holding	Type of Supply	Depth (feet)	Formation	
202	Punchbowl	Bore	360	Moolayember	Formation
203	"	"		"	"
204	"	"	120-370	"	"
205	Thalmera South	"	62	"	"
206	Rhyddings	"	820	"	"
207	Highworth	"	111	"	"
208	"	"	202	"	"
209	"	"	105	"	"
210	Thomby	"	150	"	"
211	"	"	130	"	"
212	"	"	335	"	"
213	"	"	335	"	"
214	"	"	120	"	"
215	"	"		"	"
216	Forest Hills	"	350	"	"
217	Stonecroft	"	258	Evergreen	Formation
218	"	"	300	"	"
219	"	"	300	"	"
220	G.H.9409	"		Moolayember	Formation
221	" "	"	120-350	"	"
222	" "	"	120-350	"	"
223	" "	"	120-350	"	"
224	" "	"	120-350	"	"
225	" "	"	120-350	"	"
226	" "	"	120-350	"	"
227	Stonecroft	"	320	Precipice	Sandstone
228	G.H.1502	"	258-320	Evergreen	Formation
229	Forest Hills	Well	75	Tertiary	
230	" "	"	32	"	
231		Bore		"	basalt
232	Punchbowl	"	98	Moolayember	Formation
233	Pegunny	"		"	"
234	"	"		"	"

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APPENDIX 1

PERMIAN MARINE MACROFOSSILS FROM THE BARALABA SHEET AREA

by

J.M. Dickins

Fossils are recorded from two formations only, the Barfield and Flat Top Formations, and the collections have been made from a relatively restricted area north-east of Baralaba township. Only two localities contain material from the Barfield and these are from its upper part: the rest are from the Flat Top. As the samples from the Flat Top are close together stratigraphically and there is little doubt on their position, the localities are not considered separately. The positions, however, of all the localities are shown on the Baralaba 1:250,000 Geological Sheet.

The identifications are standardized with those used in other reports on the fossils from the Bowen Basin.

IDENTIFICATIONS

Upper part of the Barfield Formation

Ba 814

Pelecypods

Anthraconeilo sp.

Glyptoleda cf. *glomerata* Fletcher, 1945

Chaenomya sp. (Fauna IV type)

Palaeosolen? sp.

Atomodesma sp. (unisulcate or bisulcate form)

Astartidae gen.et sp. nov.B?

Gastropods

Warthia sp.

Upper part of Barfield Formation and Flat Top Formation

Ba 321

This locality is in the Barfield Formation and most of the fossils are from the Barfield. A few, however, seem to have rolled down the hill from the overlying Flat Top.

Pelecypods

Glyptoleda glomerata Fletcher, 1945

Astartila cf. *cytherea* Dana, 1847

Chaenomya sp?

Pyramus sp. (similar to species in CL 12/2 and CL 14 of Clermont area and to specimens from the Lonesome Creek road quarry on the Monto Sheet.)

Atomodesma sp. (no anterior grooves)

Stutchburia compressa (Morris, 1845)

Astartidae gen. et sp. nov. B

Gastropods

Stachella sp.

Indet. pleurotomarian

Brachiopods

Terrakea solida (Etheridge & Dun, 1909)

'Martinia' sp.

Licharewia sp. nov.

Crinoids

Calceolispongia kalewaensis Dickins (in press).

Flat Top Formation

Localities Ba 312, 320, 323, 806 (same as Ba 1), 810, 811, 813, and 834

Pelecypods

Nuculopsis (Nuculopsis) sp.

Parallelodon sp. nov. B

Myonia carinata (Morris, 1845)

Chaenomya? cf. carinata Etheridge Jnr, 1892.

Aviculopecten sp.

Astartidae gen. et sp. nov. B.

Gastropods

Platyteichum coniforme (Etheridge Jnr, 1892)

Peruvispira sp.

Brachiopods

Terrakea solida (Etheridge & Dun, 1909) (Contains specimens which vary considerably in dimensions and the development of the adductor muscle platform).

Productidae gen., sp. nov.

Strophalosia clarkei var. minima Maxwell, 1954

Strophalosia ovalis Maxwell, 1954

Lissochonetes sp.

Neospirifer sp. A

Neospirifer sp. B?

Licharewia sp. nov.

Ingelarella ingelarensis Campbell, 1960

Ingelarella mantuanensis Campbell, 1960

Notospirifer minutus Campbell, 1960

'Martinia' sp.

Streptorhynchus pelicanensis Fletcher, 1952

Plekonella sp.

Terebratuloids

Crinoid ossicles

Fenestellid bryozoans

Single corals

CONCLUSIONS

The relationships of the faunas from the Oxtrack, Barfield, and Flat Top Formations are considered fully elsewhere (Dickins, 1964a) - they are all closely related. The strata considered in this Report appear to represent the upper part of the Barfield Formation and the Flat Top Formation, as both the lithological and faunal sequence is essentially the same as that found in the Monto and Mundubbera Sheet areas even though the distance to the nearest other outcrop of these formations is considerable.

The faunas from both formations belong to Fauna IV from the upper part (Blenheim Subgroup, previously Unit C) of the Back Creek Group (Middle Bowen Beds) (Dickins, 1964b, and Dickins, Malone, & Jensen, 1964), and are probably lower Upper Permian. Elsewhere in the Bowen Basin they are closest to the faunas from the Mantuan Productus Bed and the stratigraphic interval containing the Big Strophalosia Zone and the Streptorhynchus pelicanensis Bed.

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APPENDIX 2

PLANT FOSSILS FROM BARALABA

by

Mary E. White

In 1963, Upper Bowen Coal Measure plants were collected in the Baralaba coal mine, the Moura open-cut mine, and at locality BA 368. The preservation of many of the specimens is exceptionally good. Those from the Baralaba mine are coaly and the impressions on the black rock are difficult to photograph, so wherever possible a species is illustrated from specimens in the Moura open cut collection, where the carbonized impressions on pale grey shale are ideal for photography.

Specimens from the Moolayember Formation containing Triassic or Triassic/ Jurassic plants are not very good and are not suitable for photography.

1. Locality BA 368: 2 miles south-west of Theodore beside the Theodore/Taroom road. Monto 1:250,000 Sheet.

Specimens F 22434

Nummulospermum bowenense Walkom (seeds)

Glossopteris indica Sch.

Glossopteris angustifolia Brong.

Pointed, narrow *Glossopteris* scale leaves

Glossopteris conspicua Feist.

Broad, cordate *Glossopteris* scale leaves

Vertebraria indica Royle

Sphenopteris lobifolia (Morr.)

Indeterminate wood impressions

This is a typical Upper Bowen assemblage.

Age: Upper Permian.

2. Locality, Baralaba Coal Mine: Baralaba, Baralaba 1:250,000 Sheet.

Specimens F 22437 and F22446 (illustrated)

Equisetalean stems and leaf sheaths of *Phyllotheca australis* Brong. are associated with leaves of *Glossopteris indica* Sch., *Glossopteris communis* Feist., and occasional leaves of *Glossopteris parallela* Feist. A fern, *Sphenopteris lobifolia* (Morr.), is also present.

Glossopteris parallela, illustrated in Plate A, figure 1, is a leaf with a strongly Taenoipteroid appearance, having parallel margins, a distinct midrib, and lateral venation almost at right angles to the midrib with anastomoses only close to the midrib. The leaves are elongated and narrow. Taeniopteroid Glossopteris leaves are characteristic of Upper Permian horizons. They are forerunners of the Taeniopteris flora of the Triassic and Jurassic.

Phyllotheca australis, illustrated in Plate A, figure 1, is a very common equisetalean of Permian strata in Australia. Well-preserved leaf sheaths are relatively rare.

Age: Upper Permian.

3. Locality, Moura Open Cut Mine: Five miles east of Moura, Monto 1:250,000 Sheet. Upper Bowen Coal Measures.

Specimens F 22438 (bulk of collection)

Specimens F 22439-45 (illustrated)

Vertebraria indica Royle

Glossopteris communis Feist.

Glossopteris conspicua Feist.

Glossopteris indica Sch.

Glossopteris jonesi Walkom

Glossopteris ampla Dana

Glossopteris angustifolia Brong.

Glossopteris scale leaves - small, pointed

Glossopteris scale leaves - elongated, foliose, fertile scale-frond type

Glossopteris scale leaves - broad, elongated type

Dictyopteridium sporiferum Feist.

Sphenopteris lobifolia Feist.

Sphenopteris polymorpha Feist.

Cladophlebis roylei Arber

Specimen F 22439: Plate A, figure 2 shows beautifully preserved fronds with lobed pinnules of Sphenopteris polymorpha Feist. (associated with Glossopteris communis and Glossopteris indica).

Specimen F 22440: In Plate B, figure 1, a terminal portion of a frond of Sphenopteris lobifolia (Morr.) is illustrated.

Specimen F 22441: Plate B, figure 2 shows a very large leaf of Glossopteris conspicua Feist.

Specimen F 22442: In Plate B, figure 3, a large leaf of Glossopteris communis shows the venation and the form of the leaf tapering towards the apex.

Specimen F 22443: Plate C shows leaves of Glossopteris conspicua (A) associated with Glossopteris communis (B) and two scale fronds (or modified leaves) (C). The scale fronds are similar to the modified and fertile leaves which occur with Lidgettonia australis White, the fertile phase of Glossopteris angustifolia from the Bowen Basin (White, 1961).

On the reverse side of the specimen, two broad, pointed scale-fronds occur in close proximity as if they were two of a three-frond whorl. These scale fronds are of the same type as those which occur associated with Lidgettonia africana (Thomas, 1958).

Specimen F 22444: Plate D, figure 1 shows a reproductive structure of Dictyopteridium sporiferum Feist. type. The organ is 2.5 cm long and 1 cm wide, tapering slightly at the base. It is covered with circular sporangia. Faint gangamopteroid venation is visible between the sporangia and the margins of the organ are smooth and slightly down-turned.

Similar examples of Dictyopteridium sporiferum were recorded from Baralaba in 1962 (Rigby, 1962; White, 1963) and by Walkom (1922) from Dawson Valley, Queensland.

Dictyopteridium sporiferum is in my opinion the fertile male scale frond of a Glossopteris. It seems probable that it is the fertile phase of Glossopteris communis whose female fertile phase is described as Cistella bowensis (White, 1963).

Specimen F 22445: Plate D, figure 2 shows Dictyopteridium sporiferum slightly larger than that in Plate D, figure 1.

Specimen F 22447: Plate D, figure 3 shows Glossopteris jonesi Walk.

Age of Moura open-cut mine plant assemblage: Upper Permian.

4. Locality BA 10: Mimosa Creek, 2 miles west of Wooroonah homestead. Baralaba 1:250,000 Sheet. Moolayember Formation.

Specimens F 22436

Dicroidium odontopteroides (Morr.) Gothan

Equisetalean stems

Sphenopteris sp. cf. S. superba Shirley. Terminal portions of fronds only, venation indistinct

Thinnfeldia talbragarensis Walk. A frond with portions of 4 pinnae. Each has a lobed margin. Preservation is poor and determination on such an incomplete specimen is not very reliable. T. talbragarensis was described from the Talbragar Fish Beds and occurs also in the Ipswich and Esk Series

Phyllopteris sp.

Dicroidium lancifolium type pinnules. May be referable to D. odontopteroides or to Thinnfeldia hughesi

Age of BA 10: Triassic or Triassic/Jurassic.

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Plate A

Figure 1. Phyllotheca australis Brong., Glossopteris parallela Feist. Natural size, Specimen F 22446

Figure 2. Sphenopteris polymorpha Feist. Natural size, Specimen F 22439

Plate B

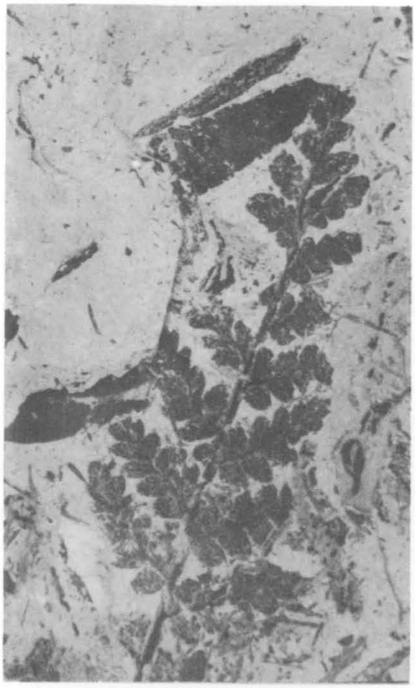


Figure 1. Sphenopteris lobifolia Morr. Natural size, Specimen F 22440

Figure 2. Glossopteris conspicua Feist. Natural size, Specimen F 22441

Plate B

Figure 3. Glossopteris communis Feist. Natural size, Specimen F 22442

Plate C

Glossopteris conspicua (A), Glossopteris communis (B), Glossopteris scale fronds (C). Natural size, Specimen F 22443

Plate D

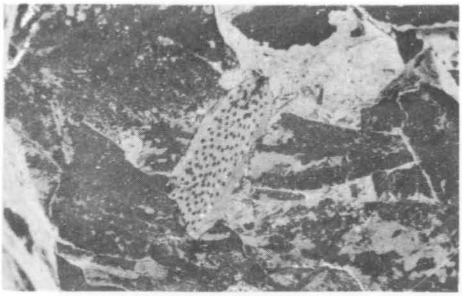


Figure 1. Dictyopteridium sporiferum Feist. Natural size, Specimen F 22444

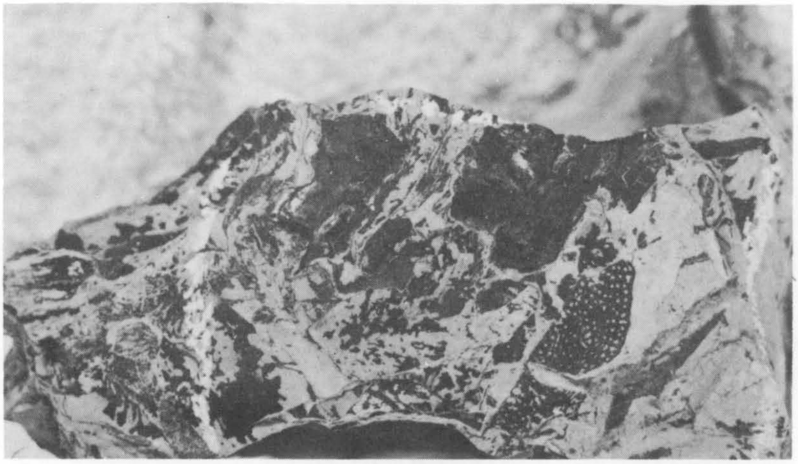


Figure 2. Dictyopteridium sporiferum Feist. Natural size, Specimen F22445

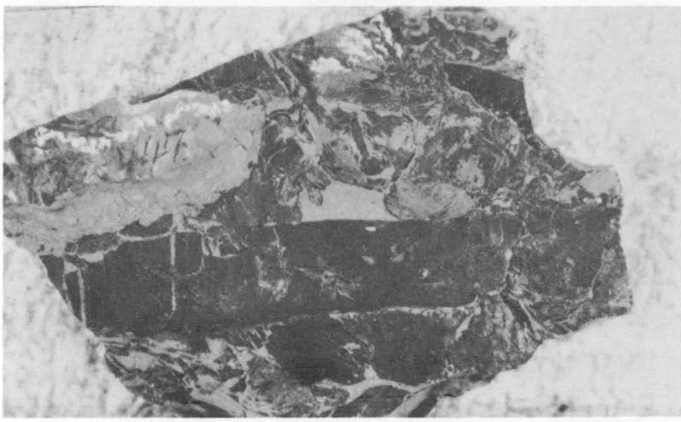


Figure 3. Glossopteris jonesi Walk. Natural size, Specimen F 22447

APPENDIX 3

LITHOLOGICAL LOGS OF BMR SHALLOW DRILL-HOLES

(For location of BMR drill-holes see Figure A)

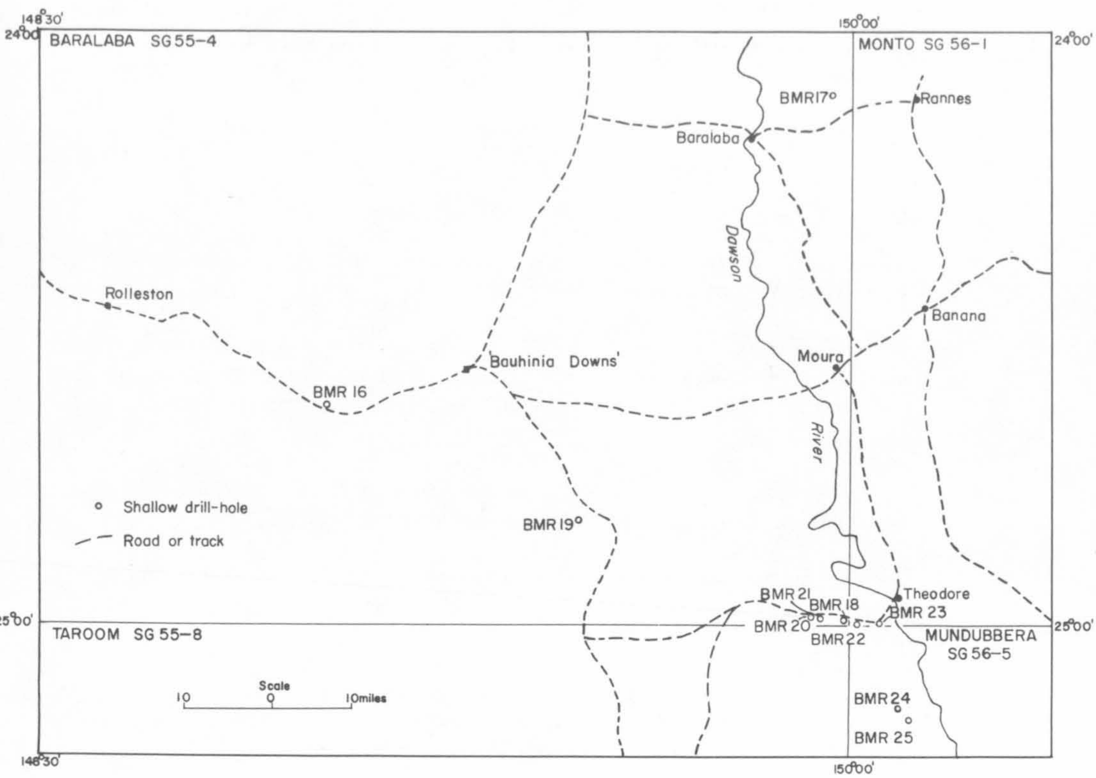


Fig. A. Locations of BMR shallow drill-holes, Baralaba Sheet area

Rewan Formation

BMR 21 Top 80 feet of Rewan Formation and lower 30 feet of Clematis Sandstone.

Thickness (feet)	Description
0- 5	Sandy soil.
5- 30	Mainly weathered sandstone and sandy clay (Clematis Sandstone).
30-110	Labile calcareous sandstone, fine-grained, hard, dark blue-grey; interbedded with grey and purple mudstone, containing abundant plants near base.

Specimen from 3-35 feet. Calcareous subgreywacke, fine to medium-grained. Composition: quartz $<$50%; chert 10%; potash feldspar 10%; rock fragments$>$ 15%; matrix 5%; calcareous cement 30%.

Thickness (feet)	Description
	Specimen from 102 feet. Argillaceous sandstone, fine-grained. Composition: quartz 25%; chert 15%; micas 10%; potash feldspar 5%; rock fragments 5%; clay matrix 20%; calcareous cement 10%; chlorite 5%; carbonaceous matter 5%.

BMR 18 Approximately in middle of Rewan Formation, about 5000 feet below BMR 21.

Thickness (feet)	Description
0- 36	Alluvium, soil.
36- 60	Mudstone, dark red-brown, massive, with some sandstone, fine-grained, labile. Some fragments of calcite.
	Specimen from 40-50 feet. Fine-grained ferruginous subgreywacke. Average grainsize 0.1 mm. Composition: quartz $<$ 15%; chert 5%; potash feldspar 10%; plagioclase 5%; rock fragments 20%; micaceous matrix 10%; iron oxide cement $>$ 25%.
	Specimen from 50-60 feet. As for specimen from 40-50 feet, but no iron oxide cement, but about 10% chalcedony, epidote, and opaques.
60-170	Labile sandstone (subgreywacke), mainly fine-grained, some medium to coarse-grained, argillaceous matrix, and in places ferruginous cement. Some beds of red-brown mudstone.
	Specimen from 90-100 feet. Medium-grained subgreywacke. Average grain size 0.4 mm. Composition: quartz 15%; quartzite 5%; chert 10%; potash feldspar 15%; plagioclase 5%; rock fragments 35%; micaceous matrix 15%.
	Specimen from 130-140 feet. Subgreywacke. Average grainsize 0.35 mm. Composition: quartz 15%; chert 10%; feldspar 25%; rock fragments 45%; matrix 5%.
170-210	Mudstone, dark red-brown, massive; with some sandstone, labile, fine-grained, argillaceous and ferruginous, interbedded near base with grey mudstone and fine to medium-grained argillaceous labile sandstone.
	Specimen from 170-180 feet. Ferruginous lithic greywacke, fine-grained. Composition: quartz 10%; chert 20%; potash feldspar 10%; rock fragments 25%; argillaceous matrix 15%; iron oxide cement 15%.
	Specimen from 106-110 feet. Lithic greywacke, fine-grained, well sorted. Composition: quartz 10%; quartzite 5%; chert 10%; potash feldspar 20%; plagioclase 5%; rock fragments 25%; micaceous matrix 15%; accessories include 3% epidote, rare tourmaline.

BMR 22 Approximately in middle of Rewan Formation, about 500 feet below BMR 18.

Thickness (feet)	Description
0- 30	Sandy soil, sand, sandy clay, and clay.
30- 50	Sandstone, argillaceous, weathered grey to brown, mainly fine to medium-grained; mudstone interbeds.
	Specimen from 40-50 feet. Subgreywacke. Average grainsize 0.15 mm. Composition: quartz 5%; chert 15%; potash feldspar 15%; rock fragments 35%; clay matrix 10%; iron oxide cement 15%.
50-230	Mudstone, dark red-brown, massive; interbedded with dark grey mudstone, containing scattered sand grains and grading into fine-grained lithic sandstone.
	Specimen from 70-80 feet. Mudstone. Composition: quartz and feldspar 15%; clay aggregates 20%; ferruginized mass 35%; chert(?) 30%.
	Specimen from 170-180 feet. Subgreywacke, fine-grained. Average grainsize 0.2 mm. Composition: quartz 5%; quartzite 5%; chert 15%; potash feldspar 15%; rock fragments 40%; argillaceous matrix 10%; chlorite 5%; opaques 5%.

BMR 23 Approximately 2000 feet above the base of the Rewan Formation, and about 3000 feet below BMR 22.

Thickness (feet)	Description
0- 20	Soil, clay.
20- 80	Mudstone, dark red-brown, massive in part; interbedded and interlaminated with greenish to grey mudstone, sandy in places, and argillaceous lithic sandstone, fine to medium-grained.
80- 90	Specimen from 80-90 feet. Sandstone, lithic, fine to medium-grained, buff. Composition: quartz and quartzite 15%; chert 15%; potash feldspar 12%; plagioclase 3%; rock fragments 40%; clay matrix 15%.
90-120	Mudstone, dark red-brown, massive; interbedded with feldspathic lithic sandstone and mudstone.
120-130	Sandstone, calcareous, volcanic; with some mudstone interbeds.
	Specimen from 120-130 feet. Volcanic sandstone, medium-grained. Composition: quartz 10%; quartzite 5%; potash feldspar 10%; rock fragments, mainly volcanic 35%; calcareous cement 25%; chlorite 5%.

BMR 24 Approximately 400 feet above the base of the Rewan Formation.

Thickness (feet)	Description
0- 5	Sandy soil.
5- 30	Volcanic sandstone, calcareous, medium-grained; interbedded with mudstone, dark red-brown to dark grey-green.

Specimen from 20-30 feet. Sandstone. Composition: quartz 5%; potash feldspar 3%; plagioclase 7%; volcanic fragments 50%; calcareous cement 25%; opaques 3%.

Thickness (feet)	Description
30- 70	Mudstone, dark red-brown and dark grey-green, massive in places, elsewhere interlaminated, sandy in places; some interbeds of grey-green volcanic sandstone.
70- 85	Volcanic sandstone, calcareous and micaceous in places, fine-grained; with some mudstone interbeds.
	Specimen from 70-80 feet. Volcanic sandstone, micaceous, fine-grained, average grainsize 0.12 mm. Composition: quartz > 5%; chert 30%; micas 15%; potash feldspar 10%; volcanic fragments 30%; iron oxide cement 10%.

BMR 25 Within 50 feet of the base of the Rewan Formation.

Thickness (feet)	Description
0- 10	Sandy soil.
10- 30	Volcanic sandstone, calcareous, grey-brown; with some brown mudstone interbeds.
	Specimen from 20-30 feet. Calcareous volcanic sandstone. Average grainsize 0.8 mm. Composition: quartz 3%; chert 15%; micas 2%; feldspar 5%; volcanic fragments 15%; other rock fragments 10%; calcareous cement 50%; coal fragments 3%.
30- 50	Mudstone, red-brown, sandy in part; with some fine-grained volcanic sandstone interbeds.
	Specimen from 40-50 feet. Volcanic sandstone. Average grainsize 0.15 mm. Composition: quartz 5%; chert 35%; feldspar 5%; volcanic fragments 20%; matrix 15%; cement 20%.
50-78	Mainly coarse volcanic sandstone with some mudstone interbeds.
	Specimen from 50-60 feet. Volcanic sandstone. Average grainsize 0.6 mm. Composition: quartz 5%; chert 10%; feldspar 10%; volcanic fragments 40%; other rock fragments 15%; matrix 5%; calcareous cement 5%; chloritic matrix 10%.
78- 85	Volcanic pebble conglomerate and coarse pebbly volcanic sandstone; pebbles mainly volcanic, up to 2 inches in diameter, well rounded.
	Specimen from 82 feet. Sandstone. Average grainsize 0.8 mm. Composition: quartzite 5%; chert 20%; feldspar 10%; volcanic fragments 40%; other rock fragments 10%; matrix 5%; calcareous cement 10%.

Clematis Sandstone

BMR 16

Thickness (feet)	Description
0- 40	Alluvium, soil.
40-200	Sandstone, yellow-brown, fawn, red-brown, medium to coarse-grained, quartzose, abundant ferruginous argillaceous matrix and ferruginous cement; sorting poor to moderate; some limonite nodules and limonitic clay pellets; abundant muscovite in places.

Specimen from 40-60 feet. Ferruginous sandstone. Average grainsize 0.3 mm. Composition: quartz 50%; chert 5%; clay matrix 25%; iron oxide cement 20%.

Specimen from 100-110 feet. Argillaceous sandstone. Average grainsize 0.3 mm, maximum grainsize 1.5 mm; poorly sorted. Composition: quartz 50%; quartzite 5%; ferruginous clay matrix 45%.

BMR 20

Thickness (feet)	Description
0- 10	Alluvium, sand.
10- 50	Sandstone, quartzose, feldspathic, medium to coarse-grained.
50- 80	Sandstone, as above, interbedded with dark grey-blue mudstone with light grey sandy laminae.
80- 90	Sandstone, kaolinitic, medium to coarse-grained, gritty in places.

Specimen from 80-90 feet. Sandstone. Composition: quartz 35%; chert 15%; potash feldspar 15%; rock fragments > 5%; kaolinitic matrix 20%; siderite cement 10%.

Moolayember Formation

BMR 19

Thickness (feet)	Description
0- 60	Alluvium, gravel, and sand.
60- 80	Sandstone, feldspathic, labile, micaceous, calcareous, argillaceous, fine to medium-grained, grey; some mudstone interbeds.

Thickness (feet)	Description
	Specimen from 70-80 feet. Calcareous argillaceous sandstone. Composition: quartz 15%; chert 10%; mica 10%; potash feldspar 15%; volcanic rock fragments 5%; clay matrix 20%; calcareous cement 20%.
80-100	Mudstone, dark grey, laminated in part; with some interbeds of fine sandstone as above.
100-130	Sandstone, grey-white, fine-grained, as above; with some mudstone interbeds, and conglomerate.
	Specimen from 110-115 feet. Fine-grained subgreywacke. Composition: quartz 10%; chert 20%; micas 15%; potash feldspar 15%; rock fragments 20%; clay matrix 10%.

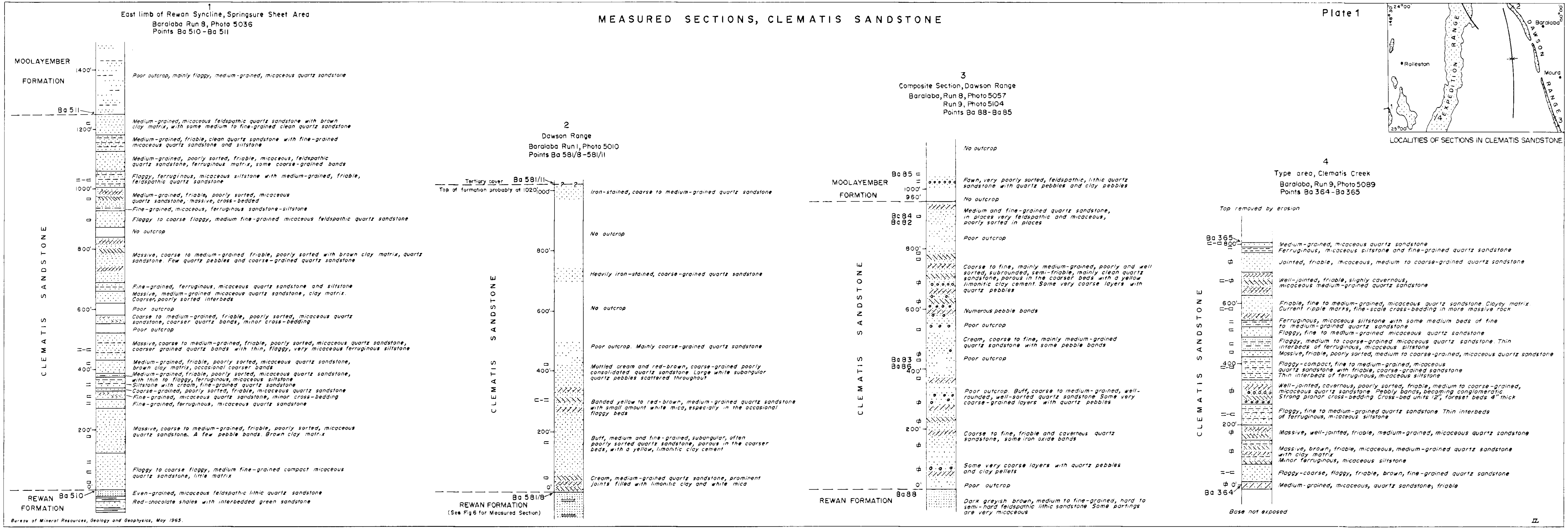
Camboon Andesite

BMR 17 Cainozoic sediments and 26 feet of Camboon Andesite.

Thickness (feet)	Description
0- 20	Alluvium, soil.
20-174	Clay, pale grey, green, brown and purple, iron-stained in places, containing some scattered quartz grains and ferruginous nodules. Some red-brown limonitic nodules near base, possibly derived from underlying weathered volcanics.
174-200	Andesite, weathered near top.
	Specimen from 174-180 feet. Andesite. Composition: plagioclase (mainly andesine and some labradorite) 70%; pyroxene 20%; ilmenite 10%. Some amygdales filled with zeolites and chalcedony.

Plate 1

MEASURED SECTIONS, CLEMATIS SANDSTONE



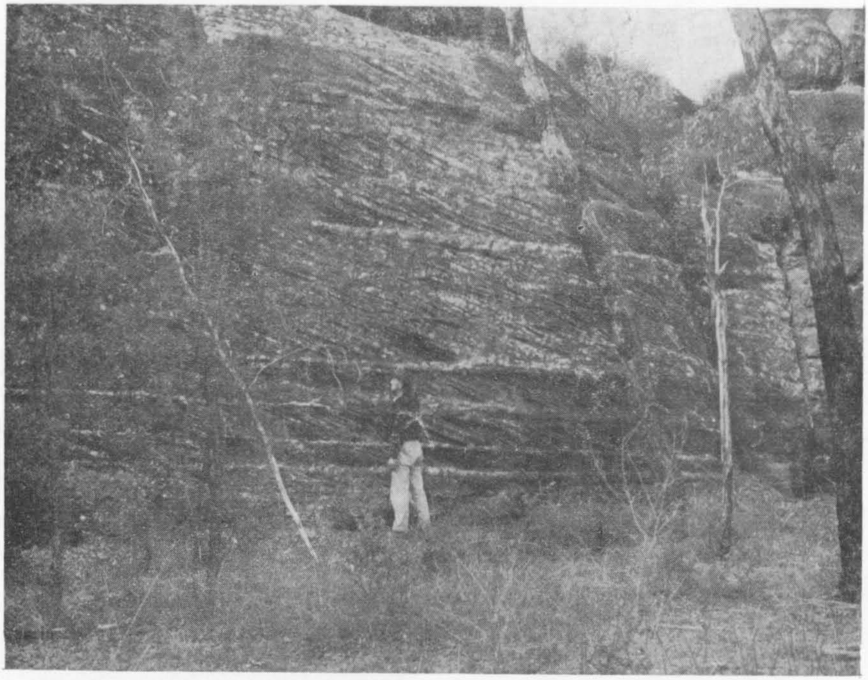


Fig. 1 Cross-bedding in the Clematis Sandstone, Expedition Range

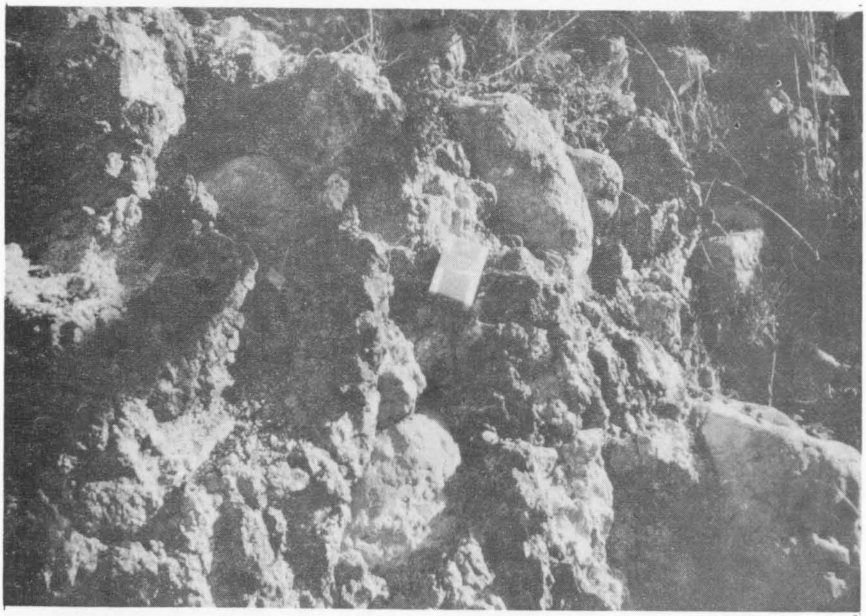


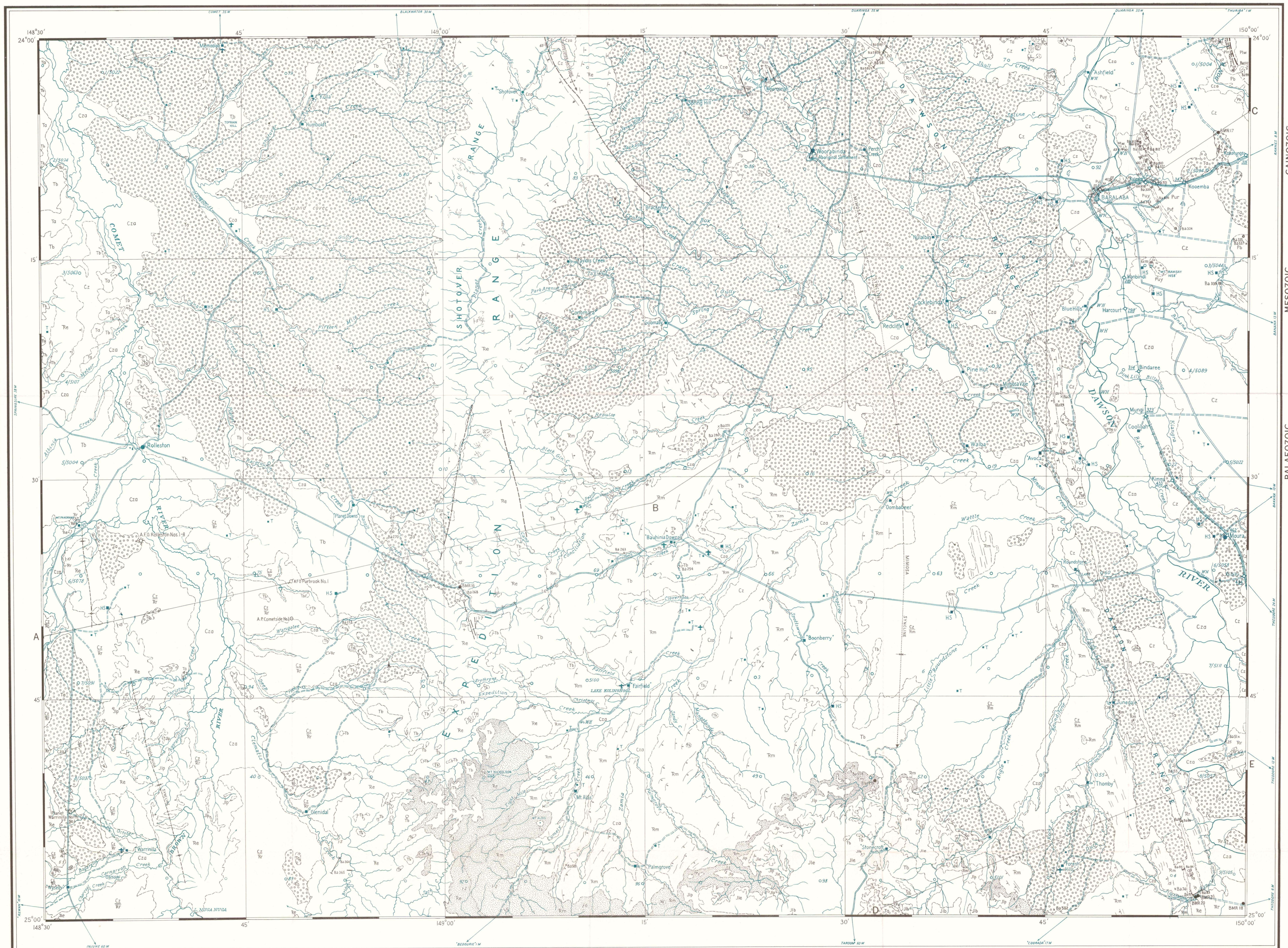
Fig. 2 Boulders of 'billy' in the laterite profile, Nulalbin homestead

BARALABA
QUEENSLAND

AUSTRALIA 1:250,000

1:250,000 GEOLOGICAL SERIES SHEET SG 55-4

PRELIMINARY EDITION, 1964
SUBJECT TO AMENDMENT



Reference

CAINOZOIC		Cz	Soil, sand, gravel, alluvium
		Cza	Alluvium
TERTIARY			Laterite
		Ta	Sandstone, siltstone, claystone, conglomerate; some volcanics
		Tb	Basalt
TERTIARY OR CRETACEOUS			Trachyte
MESOZOIC — JURASSIC	Evergreen Formation	Jle	Grey shale, white, fine grained, micaceous sandstone. Abundant plant fragments
	Boxvale Sandstone Member	Jlb	Clean, fine-medium grained quartz sandstone; fossil wood
	Precipice Sandstone	Jlp	Poorly sorted, strongly cross-bedded quartz sandstone; some conglomerate
			Weathered profile (mainly silicification)
TRIASSIC	Moolayember Formation	Ꞧm	Lithic sandstone, grey shale, conglomerate. Plant fossils
	Clematis Sandstone	Ꞧe	Medium grained, cross-bedded quartz sandstone, micaceous shale
	Rewan Formation	Ꞧr	Buff, lithic sandstone and siltstone, red siltstone and shale
PALAEOZOIC — UPPER PERMIAN	Upper Bowen Coal Measures Baralaba Coal Measures	Pul	Feldspathic sandstone, coal, lithic feldspathic sandstone, siltstone, shale. Plant fossils
	Gyranda Formation	Puy	Lithic feldspathic sandstone, greywacke, shale. Plant fragments
	Back Creek Group Undifferentiated	Pb	Lithic sandstone, grey and olive green shale, green quartz lithic sandstone
	Flat Top Formation	Puf	Richly fossiliferous calcilutite. Some coquinite
	Barfield Formation	Pur	Calcareous silty mudstone with calcareous nodules. Limestone lenses
	Oxtrack Formation	Puo	Fossiliferous limestone and grey and light brown calcareous siltstone
LOWER PERMIAN	Rannes Beds	Plw	Greenish shale, siltstone, fine grained tuffaceous sandstone, slate
	Camboon Andesite	Pln	Andesite, basalt, crystal tuff, tuff

Geological boundary
Anticline, showing plunge
Syncline, showing plunge
Fault

Where location of boundaries, folds and faults is approximate, line is broken; where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes

30 Strike and dip of strata
Vertical strata
Horizontal strata
80 Strike and dip of overturned strata
Dip < 15° } air-photo interpretation
Bedding trend line } air-photo interpretation
Joints } air-photo interpretation

Macrofossil locality } Ba 473 - Locality reference number
Plant fossil locality } Ba 473 - Locality reference number
Fossil wood
× Ba 750 Specimen locality and number
tr Trachyte dyke
c Coal mine

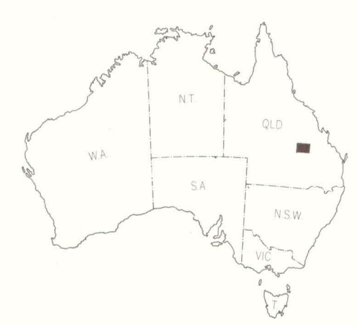
Dry exploratory hole (abandoned) } drilled for oil or gas
Gas well } drilled for oil or gas
Abandoned well with show of gas } drilled for oil or gas
Well being drilled } drilled for oil or gas
● BMR17 B.M.R. shallow drill hole
Measured section. Where dashed, section transferred along strike

▪ T Tank
Dam
WH Waterhole

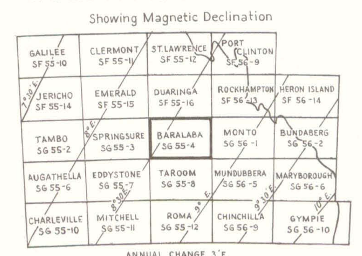
Road
Vehicle track
Railway with siding
Quarry
▪ "Avoca" } Homestead
▪ HS } Homestead
Landing ground
·640' Height in feet, instrument levelled. Datum: Mean sea level
○ 6/5058 Air-photo centre point - run/number

Compiled and issued by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development, in conjunction with the Geological Survey of Queensland. Slotted templates supplied by the Division of National Mapping, Department of National Development. Aerial photography by Adastra Airways Pty. Ltd.; complete vertical coverage at 1:85,000 scale. Transverse Mercator Projection

Geology and compilation, 1963, by: F. Olgers, A.W. Webb, and J.A.J. Smit, (B.M.R.), and B.A. Coxhead, (G.S.Q.)
Drawn by: E.H.J. Feeken



INDEX TO ADJOINING SHEETS
Showing Magnetic Declination



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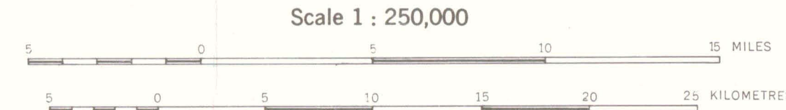
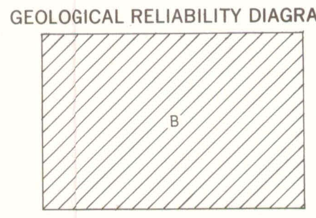


GEOLOGICAL RELIABILITY DIAGRAM



B Detailed reconnaissance, numerous traverses, air-photo interpretation

Sections
Folding partly diagrammatic
(Cz and Cza omitted from sections)
Scale $\frac{V}{H} = 2$