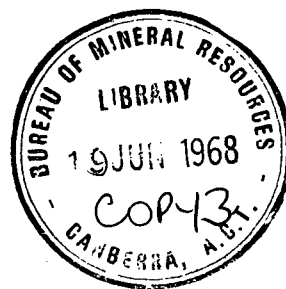


**DEPARTMENT OF NATIONAL DEVELOPMENT  
BUREAU OF MINERAL RESOURCES  
GEOLOGY AND GEOPHYSICS**

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**REPORT ON THE PHOTO-INTERPRETATION OF THE WARWICK 1:250,000  
SCALE SHEET, QUEENSLAND AND NEW SOUTH WALES**

by

**C.E. Maffi**

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 It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

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## SUMMARY

Palaeozoic rocks crop out in the south-west half of the sheet and are intruded by a large mass of presumably Permian granite. A south-easterly trend characterizes the Palaeozoic to the north-west of the granite mass.

Mesozoic rocks, divided into three morphological units, overlie the Palaeozoic and the granite and occupy the north-east half of the sheet. They form two large synclines with gently dipping flanks, which extend considerably outside the sheet.

Tertiary volcanics cap the older rocks. Tertiary intrusives penetrate Palaeozoic, Mesozoic and volcanic rocks. In the north-east quarter of the sheet, the Mount Barney Complex is an interesting dome structure.

## INTRODUCTION

This study has been accomplished with the purpose of assisting in the planning and execution of future field work.

The photo-interpretation was carried out on black and white prints of vertical air-photographs taken by Adastraphoto in August and September 1963. The photo-coverage data are: direction of runs: east-west; focal length: 88.09 mm; flight altitude: 25,000 feet; nominal scale 1:85,000; forward overlap 80%.

The photographs are little affected by distortions, but the prints are generally dark and the tone-contrast is low. In places, most details in dark areas are missing: see for instance run 3, photos 150 to 158.

Because of the wide overlap, only every second photograph was used and overlays on every fourth photograph were annotated. The annotation was carried out by the use of a scanning mirror stereoscope equipped with a 3X magnification binocular.

Previous work (listed in the References) was used as a guide for the photointerpretation, particularly in order to relate morphological units with the stratigraphy. A field check was carried out only along the Goondiwindi-Warwick-Stanthorpe-Pikedale road. A list of specimens collected is recorded in Appendix 1.

The annotation was compiled on overlays of the photo-scale planimetric map prepared by the Royal Australian Survey Corps. The compilation was photographically reduced to 1:250,000 scale, assembled and combined with a simplified reduction of the planimetric map, to obtain a composite print.

The road system is generally well developed on areas where Mesozoic or volcanic rocks crop out; elsewhere it is poor. In places, particularly on the granite and on the Palaeozoic rocks, access may be difficult.

Stratigraphic data from a bore drilled by Phillips Petroleum Co. are listed in Appendix 2.

TABLE 1  
SUMMARY OF STRATIGRAPHY

<u>Photogeological character</u>			<u>Possible geological equivalent</u>	
Light toned, flat lying generally treeless	Qa	Alluvium	QUATERNARY	C
Light toned surfaces, slightly elevated above Qa	Qt	Terrace deposits		
Medium to dark toned. Abundant vegetation where gently sloping. High relief, hard appearance, rough and fractured surface. In places elevated peaks with steep walls	Ti	Intrusive rocks	TERTIARY	I
Light to medium toned, generally covered by dark, abundant vegetation. Characteristic terraces visible in places. Surfaces in general deeply eroded.	Tv	Basalt		
Light toned, cultivated. Soft appearance with some hard beds. Fine drainage network.	M <sub>3</sub>		JURASSIC-CRETACEOUS?	M E S O Z O I C
Very light to light toned. Cultivated or grassy with scattered trees; forest in places. Low relief, soft appearance; forms small, rounded hills	M <sub>2</sub>		U. JURASSIC?	
Light to medium toned. Grassy or tree-covered. Moderate relief, well developed drainage. Hard beds alternate with soft levels.	M <sub>1</sub>		L. JURASSIC?	
	M		UNDIFFERENT.	
Light to medium toned. In places low, slightly undulating, grassy or cultivated land; in places medium to high relief, steep slopes rough and hard appearance, well developed drainage. Generally jointed	g	Granite	PERMIAN	P A L E O Z O I C
Light toned. Scattered trees. Hard appearance, bedded	P	"Faulted blocks" south of Warwick	PERMIAN	
Medium grey tone mainly concealed by dark forest. Hard appearance. Drainage network well developed	C	Limestone, sandstone and shale (Mt. Barney)	CARBONIFEROUS	



Table 1 (Cont.)

Medium grey toned, generally concealed by forest. Dense drainage network with rounded interfluves. Prominent trend	Pzt	Shale, sandstone and limestone	DEVONIAN	}	P A L A E O Z O I C
Light toned, soft appearance, forming low lying, gently undulating land	Pzs				
Medium toned, abundant dark vegetation. Medium to strong relief, well developed drainage	P <sub>z</sub>		UNDIFFER.		
	?	Undetermined Units			

## PHYSIOGRAPHY

The main drainage divide (Great Dividing Range), running approximately from north to south, separates the area into two parts. The western part includes the basins of the Condamine River, Macintyre Brook and Dumaresq River. The eastern part includes the basins of the Logan River, Richmond River and Clarence River.

The whole region is markedly rough, with the exception of small areas where unit M<sub>2</sub> or weathered granite crop out. In the north-east quarter, according to the ICAO 1:1,000,000 aeronautical chart, the Mount Barney Complex reaches an altitude of 4449 feet and altitudes of up to 4200 feet are present south of Stanthorpe.

Wide alluvial valleys lie along the eastern margin of the sheet.

## STRATIGRAPHY

### UNDETERMINED UNITS

Outcrops lacking definite photogeological character and clear stratigraphic position were mapped as undetermined units. Geographically, all but one lie between Palaeozoic rocks and granite and might belong to either of these units. The southern undetermined units occupy a depressed position with respect to the bordering rocks; their boundaries are generally uncertain.

### PALAEOZOIC

Palaeozoic rocks crop out in the south-west half of the sheet, around the granite mass. To the west of the granite, the unit Pzt, which corresponds to Wade's (1941) Devonian, lies on rocks corresponding to Wade's (1941) Carboniferous. Because of the discrepancy between position and age, the lower unit was mapped as Undifferentiated Palaeozoic.

To the east of the granite, where both Wade (1941) and McElroy (1962) mapped Carboniferous and Permian, no distinction was possible from air-photographs. Accordingly, this area also was ascribed to Undifferentiated Palaeozoic.

### Undifferentiated Palaeozoic

Undifferentiated Palaeozoic appears on air-photographs as medium-grey toned, generally covered by abundant, dark vegetation. The relief is generally medium, but ranges to strong in many places. The drainage network is well developed. Some traces of bedding are visible near the boundary with Pzt, north of Pikedale. Isolated patches with strong relief but smooth

surfaces, on the granite area, were doubtfully mapped as Pz (photographs 5/83 and 6/38). A field check is suggested.

A good section is exposed in fresh road-cuts between Mallow and Pikedale, west of Stanthorpe. Mostly, interbedded arenites and shales were seen; this contrasts with Wade (1941, p. 16), who describes the unit as: mudstones, shales, limestones, occasional beds of quartzites.

To the east of the granite, McElroy (1962) mapped Emu Creek Beds (Carboniferous) and Boorook and Cherriot Hills Groups (Permian). The Carboniferous (p. 9) is formed by mudstones, tuffs, tuffaceous sandstones and occasional bands of conglomerates. The Permian is formed by mudstones, pyroclastics, volcanics and limestones.

#### Unit Pzs

At the west of the sheet and in continuity with the Goondiwindi photogeological map, a light toned, soft unit forming a low lying, gently undulating terrain, was isolated from Pz. Little lithological reason for this division could be found during the field check. The stratigraphic relationship with the surrounding Pz is uncertain.

#### Devonian - Unit Pzt

Overlying Pz in the north-west part of the sheet is a medium grey toned unit, generally covered by forest with a dense drainage network and rounded interfluvies. A prominent south-easterly trend, probably related to bedding, characterizes this unit in most places. The area south of Warwick, where this trend does not show, was ascribed to the unit because it corresponds with the Silverwood Group, of Devonian time, mapped by Richards and Bryan (1924).

The classification of Pzt as Devonian depends upon few fossils and tentative correlations mentioned by Wade (1941, p. 18). Interbedded shales, sandstones and limestones compose the unit.

#### Carboniferous

A small outcrop of Palaeozoic rocks at Mount Barney (north-east quarter of the sheet) is classified by Stephenson (1959) as Carboniferous. On the photographs a medium grey tone shows up in patches amongst dark forest. The rock appears hard, with a well developed drainage network.

Limestones and sandstones at the bottom, shales and sandstones at the top compose this sequence (Stephenson, 1959).

#### Permian - The Faulted Blocks

Armstrong (1966, p. 15) describes four small Permian outcrops, previously mapped by Richards and Bryan (1924), faulted against Devonian rocks, to the south of Warwick: the Eight Mile Block, the Stanthorpe Road

Block, the Tunnel Block and the Condamine Block.

The Eight Mile Block appears on the photographs as a light toned unit covered by scattered trees, with traces of bedding clearly visible and hard appearance. The other Blocks are too small to bear definite characters; they show just a little difference from the bordering rocks.

#### Permian - The granite

A large mass of granite is intruded into the Palaeozoic rocks. According to Mack (1963) and Wade (1941) the intrusion is inferred to have taken place during Permian time.

A light to medium tone and abundant jointing traces are the general features of the granite. Other aspects are diverse; where the rock is fresh, it shows a medium to high relief, steep slopes, rough and hard appearance (photo 5/75) where it is weathered, it forms a low, gently undulating, grassy or cultivated land (photo 3/178).

In many places the difference between granite and Palaeozoic rocks on photographs is slight and the separation is difficult; inferred boundaries were used.

A semi-circular supposed dyke up to 3 miles across was located to the west of Wallangarra.

#### MESOZOIC

The Mesozoic rocks overlies the Palaeozoic and, in places, the granite. They crop out in the north and east parts of the sheet.

#### Undifferentiated Mesozoic

Two minor patches of relatively soft rocks, one capping the granite, the other capping the Palaeozoic, were dubiously ascribed to Undifferentiated Mesozoic. There were not enough elements for a more detailed classification; a field check is suggested.

#### Unit M<sub>1</sub>

A light to medium toned unit, covered by grass and trees was mapped as M<sub>1</sub>. The relief is moderate and the drainage network is well developed. Some hard beds or groups of beds alternate with soft levels (photographs 1/32 and 2/126 to 130). Geographically, M<sub>1</sub> corresponds to Bundamba Group and Marburg Formation mapped by McElroy (1962) and, in the north-east corner of the sheet, to Bundamba Formation mapped by Mack (1963).

The unit consists dominantly of sandstones with minor shales, claystones and siltstones.

## Unit M<sub>2</sub>

Unit M<sub>2</sub> overlies in apparently conformable sequence unit M<sub>1</sub>. The boundary was drawn above the topmost hard level of M<sub>1</sub>. On photographs M<sub>2</sub> has a very light to light tone; the surface appears soft, cultivated or grassy, generally with scattered trees; forest occurs in places. A landscape of rounded hills with low relief is characteristic of this unit (photographs 1/36 to 40 and 2/118 to 126).

Geographically, M<sub>2</sub> corresponds to McElroy's Walloon Coal Measures and Kangaroo Creek Sandstone. It consists typically of claystones and sandstones.

## Unit M<sub>3</sub>

A light toned, cultivated unit apparently conformable on M<sub>2</sub> was designated M<sub>3</sub>. The unit is fairly soft with some hard beds in relief and a fine drainage network (photographs 7/31 to 35).

Geographically M<sub>3</sub> corresponds to McElroy's Grafton Formation and is described as a sequence of sandstones, siltstones and claystones.

## CAINOZOIC

### Tertiary Basalts

Thick flows of basalt cap the Palaeozoic and Mesozoic rocks. On the photographs a light to medium tone appears through dark, abundant vegetation. Generally the basalt is deeply eroded, but in places characteristic terraces are clearly visible (photographs 2/114 and 118). The contact with older rocks is an irregular surface not parallel to the planes separating different flows.

### Tertiary Intrusives

A concentration of intrusive bodies occurs in the north-east quarter of the sheet; supposed intrusives are scattered to the south. The intrusives are associated with Carboniferous rocks at Mount Barney and, elsewhere, with Mesozoic rocks and with volcanics. A doubtful intrusive body occurs in the Palaeozoic, 15 miles northwest of Tabulam along the Clarence River.

The intrusives are medium to dark toned with thick vegetation concentrated where the slopes are gentle. The surface is generally hard and rough, with abundant traces of fractures. The relief is high and in places elevated peaks with steep walls occur (photographs 1/40 and 2/118). Some ring dykes are visible for instance on photograph 5/95.

The intrusives include rhyolite, diorite, trachyte, gabbro and dolerite (Stephenson, 1960 and McElroy, 1962).

### Quaternary-Terrace deposits

Terrace deposits occur along the Logan and Clarence Rivers. They appear as light toned surfaces, slightly elevated above the alluvium.

### Quaternary-Alluvium

Alluvium is present along many watercourses, particularly where they flow across soft formations.

A well developed alluvial plain with abandoned meanders occurs in the south-east corner of the sheet, along Richmond River. The river has deeply eroded the surface and actually flows between steep banks.

## STRUCTURE

Bedding traces are rarely visible on the Undifferentiated Palaeozoic, with the exception of an area at the centre-west of the sheet, where the unit is folded together with Pzt. The fold axes trend south-east.

The prominent trend which characterizes unit Pzt shows an almost regular south-east direction. This pattern may be the result of the intersection of a regularly dipping sequence with the topographic surface; however it may be due as well to parallel, intense folding.

Both Pz and Pzt units are moderately faulted and jointed, with the exception of the zone encircling the granite body, where intense fracturing occurs.

To the south and south-east of Warwick, the four Blocks of Permian rocks have been dropped down between Devonian rocks by means of faults which, for their relationships with topography, appear vertical or near-vertical. The Eight Mile Block is folded in a north-easterly trending syncline.

The granite is in general very fractured. The lines on the map do not represent single joints but joint sets; however the most prominent joints, annotated with their true position and length, were chosen for this representation. Only principal sets are shown.

Faults, some of them extending for many miles, intersect or bound the granite mass.

Mesozoic rocks form two very large, probably regional synclines with gently dipping limbs and axes trending south-east. One of them occurs in the centre north of the sheet and is partly concealed by volcanics. The second, in the south-east corner, has its main extension in southerly direction outside the sheet (McElroy, 1962).

Basalt flows, in places, dip conformably with the underlying Mesozoic (see for instance photo 2/122).

The Mount Barney Complex has the form of a dome somewhat elongated in a north-easterly direction, with steeply dipping flanks. Carboniferous rocks crop out in the core, whereas the shell is formed by Mesozoic sediments, and intrusive rocks penetrate the complex. A ring structure up to 3 miles across occurs around the Focal Peak, just to the west of the central core. Faults and joints complicate the structure.

To the north-east and east of the Mount Barney Complex, Mesozoic sediments are compressed into a narrow syncline with curved axis.

An important near-vertical fault trending roughly north-south cuts across unit M<sub>1</sub> in the north east corner of the sheet.

### CONCLUSIONS

The lack of distinctive morphology and the scarcity of bedding, as well as the lack of satisfactory field check prevented detailed mapping, particularly where Palaeozoic rocks crop out.

Special caution is recommended in the use of the photogeological map where dashed or queried boundaries and queried letter-symbols were used. Localities where a field check is suggested are annotated on the air photographs and sketched on a copy of the 1:250,000 sheet, for use of the field party.

Sections of the Palaeozoic may be checked along the Waterloo-Goondivindi and the Stanthorpe-Pikedale-Goondivindi roads (where recent cuts show the fresh rock) as well as along the Tabulam-Drake-Sandy Hill road.

Cuttings along the road and the railway from Warwick to the south through Mesozoic, Palaeozoic (including the faulted blocks) and granite may provide good exposures.

On the photographs the Mesozoic appears to be well exposed along the Warwick-Killarney road and to the east of Drake.

For the field-mapping of the Mount Barney Complex, the use of helicopters is suggested.

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N.S.W.)



APPENDIX 1

FIELD TRAVERSES

During the 1967 field season, a traverse was made along the Goondiwindi-Warwick-Stanthorpe-Pikedale road.

Specimen localities and observation points are recorded on the photographs, photomosaics and map. They are marked by W followed by consecutive numbers. Two specimens collected during the field check of Goondiwindi sheet and falling within Warwick sheet are marked by G followed by the numbers of run, photograph and point. The specimens collected are listed below; they are described using the nomenclature of Guppy, 1964.

- W2 - a) Grey, medium to coarse grained arkosic sandstone. Interbedded:  
b) Dark grey, laminated siltstone with grains and crystals of quartz.
- W3 - a) Blue-grey, fine grained orthoquartzite. Interbedded:  
b) Light grey, fine to medium grained, cross-laminated?, fractured arkosic sandstone with minor dark mica.
- W4 - Grey, medium to coarse grained quartzite.
- W6 - a) Light brown, fine to medium grained, laminated arkosic sandstone. Interbedded:  
b) Grey, laminated siltstone.
- W7 - Whitish, porphyritic granite.
- W8 - a) Blue-grey, fine grained, fractured orthoquartzite. Interbedded:  
b) Whitish, laminated siltstone.
- W12 - Blue-grey, fine to medium grained dolarenite? Fractures filled by crystalline calcite.
- W14 - Grains and crystals of feldspar in dark blue-grey, fine grained, undetermined matrix.
- W15 - Pinkish porphyritic granite.
- W16 - Lenticular grains of feldspar? in reddish-brown, undetermined matrix.
- W18 - Dark grey, fine grained arenite. Rare small crystals of pyrite.
- W19 - Light brown to grey, poorly sorted arenite.
- W20 - Coarse, greyish quartzite.
- G3/09 - 2 - Whitish, very fine grained, fractured, hard limestone.
- G6/26 - 1 - Light blue-grey, very fine grained orthoquartzite.

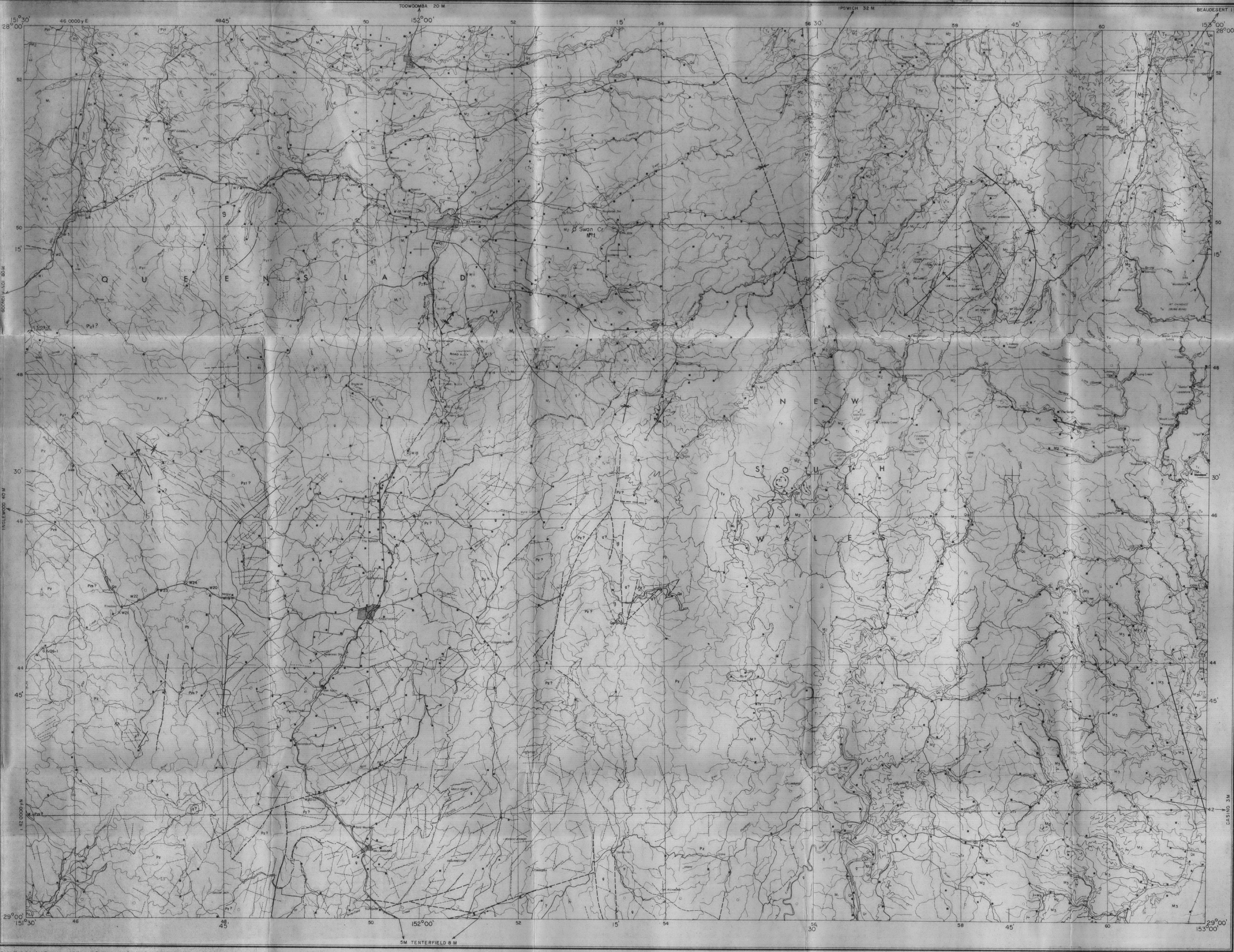
APPENDIX 2

Swan Creek No. 1 oil bore

Company: Phillip Petroleum  
Location: Lat.  $28^{\circ} 13' 40''$   
Long.  $152^{\circ} 11' 40''$   
Bottom depth: 1650 feet  
Result: dry and abandoned

<u>Formations</u>	<u>Depth</u> (feet)	<u>Thickness</u> (feet)
Hutton Sandstone	0 - 765	765
Evergreen Shale	765 - 1160	395
Permo-Carboniferous	1160 - bottom	490 +





REFERENCE

Photogeological Character	Possible Geological Equivalent	
Light toned, flat lying, generally treeless	Qa	Alluvium
Light toned surfaces, slightly elevated above Qa	Q1	Terrace deposits
Medium to dark toned, abundant vegetation where gently sloping, high relief, hard appearance, rough and fractured surface, in places elevated peaks with steep walls	Ti	Intrusive rock
Light to medium toned, generally covered by dark, abundant vegetation. Characteristic terraces clearly visible in places. Surface in general deeply eroded	Tv	Basalt
Light toned, cultivated. Soft appearance with some hard beds. Fine drainage network	M3	
Very light to light toned. Cultivated or grassy with scattered trees; forest in places. Low relief, soft appearance, forms small, rounded hills	M2	
Light to medium toned. Grassy or tree-covered, moderate relief, well-developed drainage. Hard beds alternate with soft levels	M1	
	M	UNDIFFERENTIATED
Light to medium toned in places low, slightly undulating, grassy or cultivated land, in places medium to high relief, steep slopes, rough and hard appearance, well developed drainage. Generally jointed	g	Granite
Light toned. Scattered trees. Hard appearance, bedded	P	"Faulted blocks" south of Warwick
Medium grey tone concealed by dark forest. Hard appearance. Drainage network well developed	C	Limestone, sandstone and shale (Mt Barney)
Medium grey tone generally concealed by forest. Dense drainage network with rounded interfluvies. Prominent trend	Pzt	Shale, sandstone and limestone
Light toned, soft appearance, forming low lying, gently undulating land	Pzs	
Medium toned, abundant dark vegetation. Medium to strong relief, well developed drainage	Pz	
	Pz	UNDIFFERENTIATED
	?	Undetermined Units

- Lithological boundary

Probable lithological boundary

Queried where inferred

Anticlinal axis

Synclinal axis

Fault

Probable fault

Edge of bed

Probable edge of bed

Edge of bed expressed as scarp

Estimated dips

Horizontal

Very low

Low

Medium

Steep

Vertical

Undetermined

Trend line

Joint pattern

Topographic scarp

Laterite (L), Terrace (T), Scree (S)

Dyke

x wzo Sample location or observation point

o Dry hole — abandoned
- Principal road

Minor roads and tracks

Railway line

Telephone line

Fence

State boundary

Mine

Homestead

Yard

Windpump

Airport or Airfield, Landing ground

Bore

Tank

Well

Spring

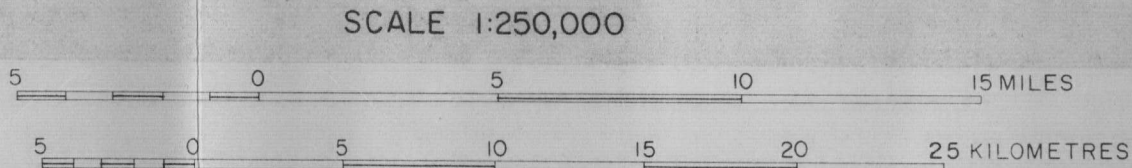
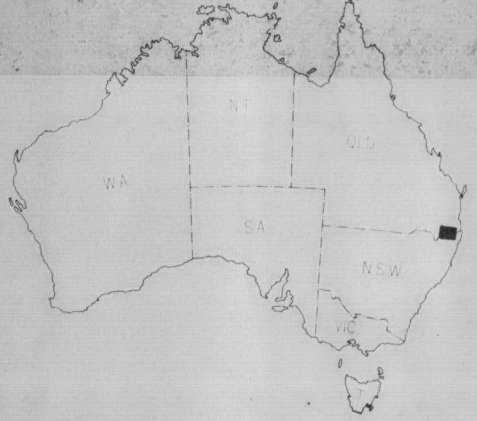
Waterhole

Dam

Photo-centre points

Photo-centre points—adjoining sheet

Compiled by the Bureau of Mineral Resources, Geology and Geophysics.  
Detail adjusted to photoscale compilation prepared by the Royal Australian Survey Corps.  
Aerial photography by Adastral Airways Pty. Ltd., complete vertical  
coverage at 1:85,000 scale. Transverse Mercator Projection.



DALBY	IPSWICH	BRISBANE
GOONDIWINDI	WARWICK	TWEED HEADS
INVERELL	GRAFTON	MACLEAN

Photo-interpretation by the Photogeological Group,  
Bureau of Mineral Resources, Geology and Geophysics 1968  
Interpreted by: C.E. Moffit