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DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

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PHOTO INTERPRETATION OF AUVERGNE 1:250,000 SCALE SHEET NORTHERN TERRITORY

(Excluding Bonaparte Gulf Basin)

by

W.J. Perry

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 It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

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CONTENTS

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SUMMARY

Gently folded Upper Proterozoic formations "Skull Creek Limestone", "Jasper Gorge Sandstone", Angalarri Siltstone ("Auvergne Shale") and Yambarra Beds ("Pinkerton Beds") have been traced from the astern boundary of the Sheet in a south westerly direction to the southern boundary. In the south-west a sequence of variable thickness possibly of glacial origin rests unconformably on the Yambarra Beds. A north-east trending fault zone, a probable splay of the Halls Creek Fault, separates the gently folded rocks to the south-east from strongly folded and faulted sediments and rare igneous rocks to the north-west. It seems that the Yambarra Beds are present within the strongly folded region near its south-eastern margin.

INTRODUCTION

Photo-interpretation of the greater part of the Auvergne 1:250,000 scale Sheet has been carried out with the purpose of assisting in the planning and execution of the field work scheduled for the 1967 season.

That part of the Sheet concerning the Bonaparte Gulf Basin has been mapped previously (Veevers and Roberts, 1966) and the results of this work are incorporated in the photogeological map accompanying this report. The area geologically mapped is indicated as category A on the reliability diagram.

The photographs have a nominal scale of 1:50,000 and were taken by the R.A.A.F. in 1948. Contrast is generally low, and strong distortion is evident in some stereo pairs, e.g. Run 6, Photos 5031-2.

Transparent overlays of alternate photographs were annotated, and the annotations compiled on overlays of the Division of National Mapping photo-scale planimetric sheets. After editing, letter symbols were added and the resulting photogeological compilations were reduced photographically to 1:250,000 scale, film positives made and assembled, and the positive assembly combined with the National Mapping 1:250,000 scale planimetric compilation to produce a composite print.

Geological work prior to 1955 is summarized by Traves (1955). Other documents consulted are listed in the References.

PHYSIOGRAPHY

Paterson (1956) in his report on the geomorphology of the Ord-Victoria Area divided the Auvergne Sheet into three morphological units, the Victoria River Plateau covering most of the Sheet, the Cambridge Gulf Lowlands in the north-west and the Halls Creek Ridges in the south-west.

The following descriptions are taken from the map accompanying Paterson's report. Within the Victoria River Plateau region, in the south-east are the limestone ridges, cuestas and plateaus of the "Skull Creek Limestone", bordered on the north-west by similar land forms developed in the "Jasper Gorge Sandstone". To the north-west the fluvial plains of the West Baines, East Baines and Victoria Rivers form a low-lying belt twelve to fifteen miles across that extends from near the north-east corner to the south-central part of the Sheet. These are succeeded to the north-west by ridges, hog backs, cuestas and structural plateaus of moderate to low relief, chiefly in the Yambarra sequence, and further to the north-west by similar landforms in the undifferentiated Precambrian rocks.

STRATIGRAPHY

PRECAMBRIAN

1. Undifferentiated pC

The term is used for basement rocks bordering the Bonaparte Gulf Basin, that cannot be satisfactorily sub-divided on airphoto evidence because of structural complexity or because of their massive appearance. In a few places, boundaries have been drawn, e.g. Run 8, Photo 5096, within the pC. Sections could be measured in an area of gentle folding south-west of Transit Hill (R5/5196). In the far south-west at least some of the rocks designated pC are continuations of Halls Creek Group mapped on Lissadell and Cambridge Gulf Sheets (Dow, et. al., 1964).

2. pCa, pCb, pCc.

These symbols refer to an area at approximately lat. 15°25'S, long. 129°45'E in the Victoria River one-Mile Sheet where the pC has been divided into three units (R6/5026). The oldest, pCa has a light tone, a hard

TABLE 1.

AUVERGNE

Photogeological character	Symbol	Possible geological interpretation		
	Qac	Coastal and riverine deposits	Quaternary	Cainozoic
	Qa	Alluvium		
	Qt	Terrace deposits		
	Czs	Sand, soil, colluvium	Undifferentiated	
Dark toned, forms low scarp	Czl	Laterite		
Medium toned, low lying, not distinctive	Pz	Sandstone	Undifferentiated	Palaeozoic
Medium toned, smooth surface, jointed	€la	Antrim Plateau Volcanics	Lower Cambrian	
Medium grey toned, rounded outcrop	Bd	Duerdin Group	Proterozoic	Precambrian
Medium toned, bedded	Bx2			
Pale grey, soft with rounded interfluves	Bx1			
Medium toned, rough surface, hard appearance, much jointed	Bx			
Forms hard bed at top of y2 bench	Buy3			
Medium toned, bedded	Buy2			
Medium toned, bedded	Buy1			
Medium toned, bedded, scarp-forming	Buy			
	By	Yambarra Beds undifferentiated		
	Baj	Angalarri Siltstone and "Jasper Gorge Sandstone" undiff.		
Medium toned, soft	Bua	Angalarri Siltstone		
Light to medium toned, bedded, jointed	Buj	"Jasper Gorge Sandstone"		
Light toned, thin bedded	Bus	"Skull Creek Limestone"		
	B	Steeply dipping beds within Bus		
Medium toned, hummocky surface, low relief	pCg	Lamboo Complex		
	pC			
Queens Channel 1 Mile Sheet				
Dark toned, bedded	pC5		Undifferentiated	
Light toned, well bedded, hard appearance	pC4			
Medium toned, soft	pC3			
Medium toned, hard	pC2			
Medium toned, soft	pC1			
Victoria River 1 Mile Sheet				
Dark toned, bedding indistinct	pCc			
Medium to light toned, massive	pCb			
Light toned, bedded, jointed, rough surface				

(Rec.1967/76)

appearance and is bedded; it is probably a quartzite. It is overlain conformably by a dark-toned massive thin unit pCc, an outlier of which crops out some three miles to the north-north-east (R5/5188). The west side of pCb (R6/5024) seems to be faulted, for the pCa, if it is correctly identified, appears to overlie pCb at this locality.

3. pC1 to pC5.

In the vicinity of lat. 15°05'S long. 129°45'E on Queens Channel 1 mile Sheet (R1/5016), the pC is locally separated into five divisions mainly on the basis of resistance to erosion. From the base upwards these are pC1, soft and dark toned, pC2 hard, light toned, pC3 soft, dark toned, pC4 hard, light toned, well bedded, and pC5 dark toned, bedded.

Igneous rocks pCg

Rocks referred to the Lamboo Complex by Traves (1955, p.14) are shown on the map by the symbol pCg (R11/5122). An area on R2/5068 may also belong to this category.

PROTEROZOIC

Proterozoic undifferentiated B

This symbol has been applied to a steeply dipping zone within the "Skull Creek Limestone" and "Jasper Gorge Sandstone" (R12/5162) in which both these formations may be represented.

"Skull Creek Limestone" Bus

In an unpublished report, Laing and Allen (1956) used this name for a sequence principally of thin-bedded dolomitic limestone and chert, that they mapped on Delamere Sheet and in the south-east of Auvergne Sheet. The unit has a light toned, well-bedded appearance with rounded interfluves, and is generally of low relief except where protected by the more resistant "Jasper Gorge Sandstone".

"Jasper Gorge Sandstone" Buj

In the south-east of Auvergne Sheet, this sandstone forms the crest of the Newcastle Range; it rests directly on the "Skull Creek Limestone" whereas east of Skull Creek on Delamere Sheet the siltstone of "Coolibah Formation" is between the Bus and Buj. The sandstone has a regular gentle dip to the north-

west. It is light toned, bedded and jointed. Well developed sink holes have been observed on R12/5162 and R13/5176 close to the edge of the outcrop of Buj, and it is suggested that these must be due to collapse of the underlying dolomitic limestone. A suitable place for measuring a section may be found on R10/5084 in the vicinity of Timber Creek Trading Post. R14/5050 north of Barrabarrac Creek may also be suitable for sections in both Bus and Buj.

Angalarri Siltstone Bua

Randal (1961) named this unit on the Fergusson River Sheet to the north-east of Auvergne Sheet and it has been traced on the air photos across Delamere Sheet on to Auvergne. It is equivalent to the "Auvergne Shale" of Laing and Allen (1956, p 18). The contact of the Angalarri Siltstone with the "Jasper Gorge Sandstone" may possibly be seen on R13/5180 in a creek about 1 mile north-east of the East Baines River. Low rises in the Whirlwind Plains have been mapped as Bua though they show joint patterns similar to those in the Buj. The photo character however, is different from that of the Jasper Gorge Sandstone indicating probably that there is a thin layer of Bua over the Buj. The Bua is best exposed in the scarps of the Pinkerton and Yambarran Ranges where it is protected from erosion by the overlying Yambarra Beds. Localities that appear suitable for the measuring of sections are Skinner Point R14/5052, Razorback R12/5150, Karracumby Peak R8/5114, The Tombs R6/5028, Mount Golla Golla R5/5172 and on R3/5087 and 5098, but there will be many other suitable places in the zone of outcrop, that extends from the north-east corner of the Sheet south-westerly for more than 80 miles.

Yambarra Beds By

The Yambarra Beds overlie the Angalarri Siltstone conformably (Randal, 1962, p.9). On the airphotos several benches are visible within the Beds and these have been used to subdivide the Beds into four units. From the base upwards these are Buy, the first hard bed that overlies the Angalarri Siltstone, Buy1 the first bench above Buy, Buy2 the second bench and Buy3 a hard bed at the top of the Buy2 bench. These are best exposed in the Pinkerton and Spencer Ranges. The photo character of the individual units is not distinctive and in steeply dipping zones it has been found necessary to group them as By undifferentiated. In the field, it may be found not practicable to map all the subdivisions.

The anticline 3 miles south of Bucket Spring (R10/5055) though shown as pC undifferentiated is probably in the Yambarra Beds and a place suitable for examining the section is indicated on R11/5122.

Skinner Point (R14/5052) is suggested as a locality for measuring a section through Buy. On R14/5078 the scarp-forming bed west of the principal point has a similar photo character to Buy.

Bx

Bx is a strongly jointed medium-toned unit, probably a quartzite, that overlies the Yambarra Beds with structural conformity. However, on the track to Bullo Homestead (R11.5150) small isolated patches (map symbol Bx?) of conglomeratic sandstone (Dunn, 1965, p. 6) unconformably overlie the Yambarra Beds ("Pinkerton Beds"). Similar remnants have been observed on the air photos at a locality some four miles to the south-west (R12/5148), and these all have a photo character like that of Bx. Most of the mounds of sandstone rest at different levels on Buy2 but a few are on Buy3; if they belong to unit Bx they could have arrived at their present position by gravity sliding, but why they should be preserved in only the two localities is a difficulty. Dunn (op. cit) suggests that they may be of Palaeozoic age, and related to sediments in the Bonaparte Gulf Basin. Some support is given to this view by the occurrence of similar isolated knobs on R14/5062 not far from a probable Devonian outcrop. Closely spaced jointing in the south of R9/5028 possibly indicates cross-bedding.

Bx1

Overlying Bx unconformably, is a pale grey soft formation designated Bx1. The unconformable relationship can be seen on R12/5138, on R12/5144, and also on R14/5072 where Px1 overlaps on to the Yambarra Beds. The dendritic drainage pattern associated with homogeneous formations such as conglomerate is clearly shown on R14/5070, and the possibility exists that Bx1 is a tillite. The nearest mapped tillite is the Moonlight Valley Tillite in the north-east corner of Lissadell Sheet (Dow et. al., 1964).

Bx2

Unit Bx1 is overlain conformably by a medium-grey toned bedded formation Bx2. It has a more restricted distribution than Bx1, the principal area of outcrop being in a syncline south of Sandy Creek (R9/5032), with

scattered outliers further south.

Duerdin Group Bd (formerly "Ord Group").

Rocks belonging to this sequence have been mapped in Cambridge Gulf and Lissadell Sheets (Dow, et al., 1964), and extend on to the Auvergne Sheet in the far south-west. On the air photos they have a mid-grey tone and a rounded outcrop, and on the preliminary edition of Lissadell Sheet are mapped as the Jarrad Sandstone Member of the Ranford Formation. The relationship of the Duerdin Group to photogeological units on Auvergne Sheet is not known because of lack of continuity, but possibly units Bx1 and Bx2 may be correlated with the Group.

PALAEOZOIC

Antrim Plateau Volcanics Cla

Scattered outcrops assigned to this formation are found in the south-west. They are of low relief, have a grey tone, smooth surface and show jointing.

Palaeozoic undifferentiated Pz

An area about nine miles north-west of Timber Creek shown on Traves map (Traves, 1955) as possible Weaber Group, is referred to on the photo-geological map as Pz. It is low lying and of medium grey tone, but not of distinctive appearance. Veevers (pers. comm.) has visited the southern part of the outcrop, and reports a lithology of pebbly sandstone, cross-bedded.

CAINOZOIC

Laterite Czl

Laterite, with its rather characteristic dark tone and flat surface, is found chiefly on the Yambarra Beds in the Yambarran Range in the north-east; a few remnants have been mapped on the "Jasper Gorge Sandstone" south of the East Baines Gorge.

Soil, sand, colluvium Czs

Czs applies to soil, sand and colluvial deposits found in many areas in gentle slopes between the river alluvium and rock outcrops.

QUATERNARY

Qt.

This refers to flat-lying probable terrace deposits (R3/5096 and 5098); the edge of the terrace on photo 5096 shows as soft light-toned material being eroded by the present streams. On photo 5098 terrace deposits have also been differentiated along the Victoria River downstream from Timber Creek.

Coastal and riverine deposits Qac

Qac is distinguished from Qa by its usually light tone, and in places, mottled appearance, due to tidal influence.

STRUCTURE

Two regions with distinct structural styles are evident on the Auvergne Sheet; a much faulted and folded belt bordering the Bonaparte Gulf Basin, and a gently folded region to the south-east, including the monoclines of the Pinkerton-Yambarran and Newcastle Ranges.

The boundary between the two regions is a north-east trending fault zone located along Sandy Creek (tributary of the Keep River), Paperbark Creek and probably extending north-east along Laingang Creek. It is regarded as a probable splay of the Halls Creek Fault, (Dow et al., 1964) with a large down-throw to the south-east. Faulting in the vicinity of Ernie Lagoon (R12/5036) has affected Devonian rocks, and the resultant vertical movement is down to the west. In the south-west of Auvergne Sheet, rocks of the Halls Creek Group form part of the folded belt, extending from Cambridge Gulf Sheet. In the north-east of the folded belt however, (R2/5073, R1/5016) it seems probable that folding has involved the Yambarra sequence.

The main fault has caused overturning of the north limb of the north-east trending syncline that lies to the north-west of the Bullo River. A parallel fault half a mile to the south of the main fault is thought to be responsible for the abrupt termination of unit Bx in this area. The nature of the contact between Bx and the steeply dipping pC, to the north may be observable in the small creek north-west of the principal point of Photo 5033, Run 9. On R9/5034 a fault trending north-north-east has caused an east-block-

north relative movement of the pC beds, and is therefore considered to be later than the main north-east trending fault.

The region south of the main north-east fault is characterized by gentle folding; in the far south-west the monocline of the Newcastle Range dips gently north-west beneath the fluvial plains of the Victoria and Baines Rivers, and to the north of the plains, the monocline of the Pinkerton - Yambarran Ranges also dips north-west. The latter monocline is cut by several strike faults of the order of ten miles long, for example, in the Spencer Range, that have produced narrow steeply dipping zones designated as undifferentiated Yambarra Beds. On R11/5110 unit Bx appears to lap over the north-east trending fault, but this is possibly due to recent slumping down the slope. On R10/5066 a fault trending north-west definitely cuts unit Bx. East of Alligator Waterhole (R14/5072) a north-north-west trending fault seems to be later than the strike fault system. In the general area north of here the unit Bx caps a structural plateau that is bounded on the north by the long north-east trending syncline immediately south of the postulated splay of the Halls Creek Fault.

North-east of Shoal Beach on the Victoria River the structure in the Yambarra Beds is not clear from the air photos (R5/5184); it appears that Angalarri Siltstone overlies Yambarra Beds, but this apparent contradiction may be due to a lateral thickening of a soft bed in the Yambarra sequence.

North-east of this area, more or less meridional faulting has caused local steepening of the dips within the Yambarra sequence.

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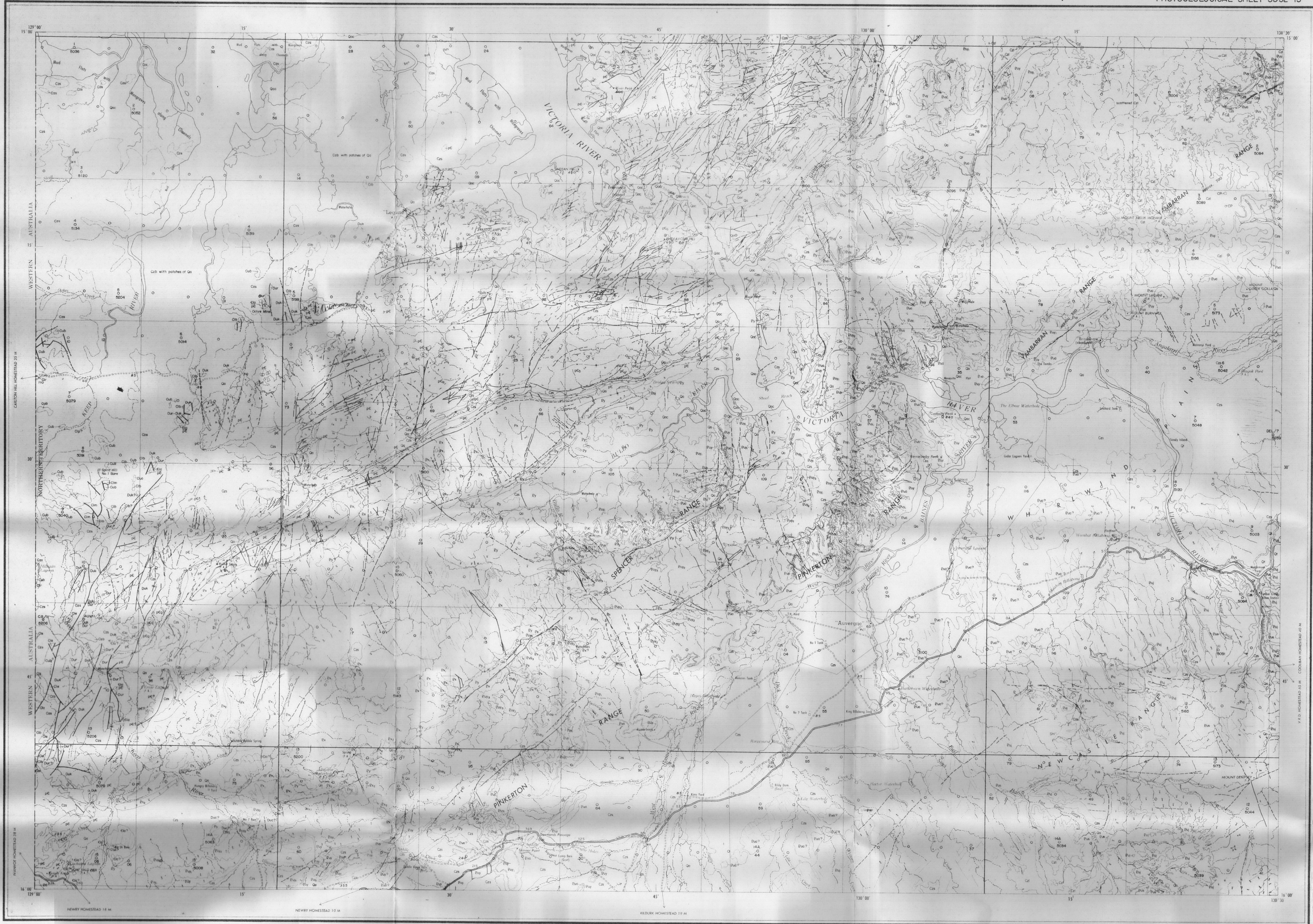
GEOLOGY AND GEOPHYSICS

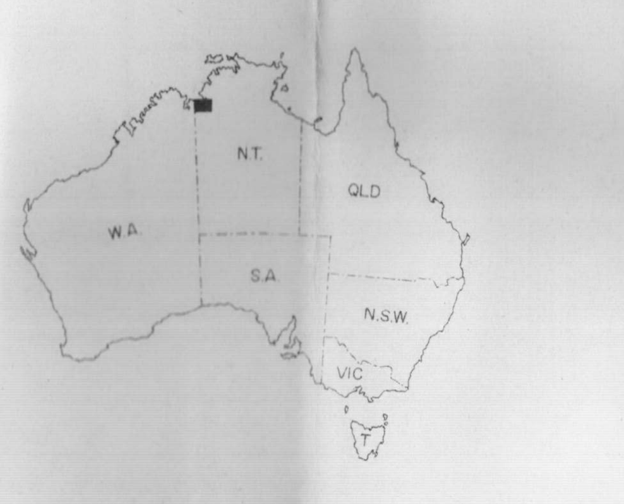
AUVERGNE

NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SD52-15



Compiled by the Bureau of Mineral Resources, Geology and Geophysics.
Detail adjusted to photoscale compilation prepared by the Division of National Mapping, Department of National Development.
Aerial photography by Royal Australian Air Force; complete vertical coverage at 1:48,000 scale. Transverse Mercator Projection.



SCALE 1:250,000

5 0 5 10 15 MILES

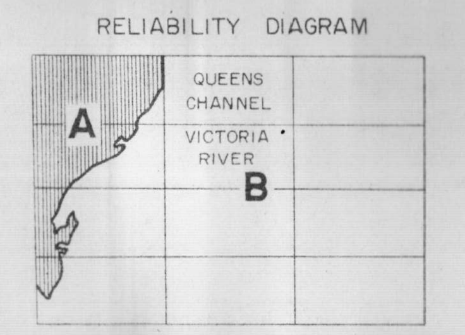
5 0 5 10 15 20 25 KILOMETRES

INDEX TO ADJOINING SHEETS

MEDUSA BANKS	PORT KEATS	FERGUSSON RIVER
CAMBRIDGE GULF	AUVERGNE	DELAMERE
LISSADELL	WATERLOO	VICTORIA RIVER DOWNS

Photo-interpretation by the Photogeological Group,
Bureau of Mineral Resources, Geology and Geophysics 1967
Interpreted by: W.J. Perry

RELIABILITY DIAGRAM



A Geological mapping "Bonaparte Gulf Basin" area by Veevers and Roberts, 1966

D52/A15/4

REFERENCE

Photogeological Character	Symbol	Possible Geological Interpretation		
	Qac	Coastal and riverine deposits	QUATERNARY	CAINOZOIC
	Qa	Alluvium	QUATERNARY	CAINOZOIC
	Qt	Terrace deposits	QUATERNARY	CAINOZOIC
	Czs	Sand, soil, colluvium	UNDIFFERENTIATED	CAINOZOIC
Dark toned, forms low scarp	Czl	Laterite	UNDIFFERENTIATED	CAINOZOIC
Medium toned, low lying, not distinctive	Pz	Sandstone	UNDIFFERENTIATED	PALAEOZOIC
Medium toned, smooth surface, jointed	Ꞓla	Antrim Plateau Volcanics	LOWER CAMBRIAN	PALAEOZOIC
Medium grey toned, rounded outcrop	Ꝑd	Duerdin Group	PROTEROZOIC	PRECAMBRIAN
Medium toned, bedded	Ꝑx₂		PROTEROZOIC	PRECAMBRIAN
Pale grey, soft with rounded interfluves	Ꝑx₁		PROTEROZOIC	PRECAMBRIAN
Medium toned, rough surface, hard appearance, much jointed	Ꝑx		PROTEROZOIC	PRECAMBRIAN
Forms hard bed at top of y_2 bench	Ꝑuy₃		PROTEROZOIC	PRECAMBRIAN
Medium toned, bedded	Ꝑuy₂		PROTEROZOIC	PRECAMBRIAN
Medium toned, bedded	Ꝑuy₁		PROTEROZOIC	PRECAMBRIAN
Medium toned, bedded, scarp-forming	Ꝑuy		PROTEROZOIC	PRECAMBRIAN
	Ꝑy	Yambarra Beds undifferentiated	PROTEROZOIC	PRECAMBRIAN
	Ꝑaj	Angalarri Siltstone and "Jasper Gorge Sandstone" undifferentiated	PROTEROZOIC	PRECAMBRIAN
Medium toned, soft	Ꝑua	Angalarri Siltstone	PROTEROZOIC	PRECAMBRIAN
Light to medium toned, bedded, jointed	Ꝑuj	"Jasper Gorge Sandstone"	PROTEROZOIC	PRECAMBRIAN
Light toned, thin bedded	Ꝑus	"Skull Creek Limestone"	PROTEROZOIC	PRECAMBRIAN
	Ꝑ	Steeply dipping beds within Ꝑus	PROTEROZOIC	PRECAMBRIAN
Medium toned, hummocky surface, low relief	pꞒg	Lamboo Complex	UNDIFFERENTIATED	PRECAMBRIAN
	pꞒ		UNDIFFERENTIATED	PRECAMBRIAN
QUEENS CHANNEL 1 MILE SHEET				
Dark toned, bedded	pꞒ₅		UNDIFFERENTIATED	PRECAMBRIAN
Light toned, well bedded, hard appearance	pꞒ₄		UNDIFFERENTIATED	PRECAMBRIAN
Medium toned, soft	pꞒ₃		UNDIFFERENTIATED	PRECAMBRIAN
Medium toned, hard	pꞒ₂		UNDIFFERENTIATED	PRECAMBRIAN
Medium toned, soft	pꞒ₁		UNDIFFERENTIATED	PRECAMBRIAN
VICTORIA RIVER 1 MILE SHEET				
Dark toned, bedding indistinct	pꞒc		UNDIFFERENTIATED	PRECAMBRIAN
Medium to light toned, massive	pꞒb		UNDIFFERENTIATED	PRECAMBRIAN
Light toned, bedded, jointed, rough surface	pꞒa		UNDIFFERENTIATED	PRECAMBRIAN

Geological Mapping
Bonaparte Gulf Basin

Era	Period	Unit	Symbol	Description
CAINOZOIC	QUATERNARY		Qac	*Coastal alluvium*
CAINOZOIC	QUATERNARY		Qa	*Alluvium*
CAINOZOIC	UNDIFFERENTIATED		Czs	*Sand*
CAINOZOIC	UNDIFFERENTIATED		Czb	*Black soil*
PALAEOZOIC	UPPER CARBONIFEROUS	Border Creek Formation	Cub	
PALAEOZOIC	LOWER CARBONIFEROUS	Point Spring Sandstone	Clp	
PALAEOZOIC	LOWER CARBONIFEROUS	Burvill Beds	Clr	
PALAEOZOIC	LOWER CARBONIFEROUS	Milligans Beds	Clm	
PALAEOZOIC	LOWER CARBONIFEROUS	Zimmermann Beds	Clz	
PALAEOZOIC	LOWER CARBONIFEROUS	Septimus Limestone	Cls	
PALAEOZOIC	LOWER CARBONIFEROUS	Enga Sandstone	Cle	
PALAEOZOIC	LOWER CARBONIFEROUS	Burt Range Formation	Clb	
PALAEOZOIC	UPPER DEVONIAN	Cockatoo Formation	Duc	
PALAEOZOIC	UPPER DEVONIAN	Kellys Knob Sandstone Member	Duk	
PALAEOZOIC	UPPER DEVONIAN	Ragged Range Conglomerate Member	Dur	
PALAEOZOIC	LOWER CAMBRIAN	Antrim Plateau Volcanics	Ꞓla	
PRECAMBRIAN		Undifferentiated	pꞒ	

Geological boundary
Lithological boundary, probable boundary (photo interpretation)
Anticlinal axis
Synclinal axis
Fault, probable fault or lineament
Edge of bed, probable edge of bed
Strike and dip of strata
Prevailing strike and dip of strata
Horizontal strata
Estimated dips (photo interpretation)
< 15°
very low — *steep*
low — *horizontal*
medium — *vertical*
Trend lines (photo interpretation)
Joint pattern (photo interpretation)

Mine
Oil exploration well; abandoned, dry
Sand dunes
B *Bore*
Windpump
T *Tank*
D *Dam*
WH *Waterhole*
SH *Sinkhole*
Highway, major road
Minor road, track
Siding Station *Railway line*
Airport or airfield; landing ground
Homestead
Yard
Fence