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Report of Photo-Interpretation of the Birrindudu and Tanami 1:250,000 Scale Sheets — Northern Territory

by

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REPORT OF PHOTO-INTERPRETATION OF THE BIRRINDUDU AND TANAMI 1:250,000 SCALE SHEETS - NORTHERN TERRITORY

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CONTENTS

SUMMARY

The Birrindudu and Tanami Sheets cover areas of plateau topography in which low scattered hills formed by resistant outcrop are separated by extensive tracts of sand/soil cover.

Lithologies similar to the Lower? Proterozoic Halls Creek Metamorphics occur on the southern part of Tanami.

Outcrops of Upper? Proterozoic sediments predominate throughout the sheets. These sandstone, shale, conglomerate lithologies unconformably overlie the Lower? Proterozoic and equate to the Gardiner Beds and Mt Winnecke Sandstone. An attempt has been made to subdivide the Upper? Proterozoic.

Granitic rocks - including the Winnecke Granophyre - occur over a north-south zone between Wilson Creek and Hooker Creek. These intrude the Proterozoic lithologies and are unconformably overlain by Lower Cambrian Antrim Plateau Volcanics in the north of the Birrindudu Sheet area. Middle Cambrian Merrina Beds may occur on the eastern side of both sheet areas.

The extensive Cainozoic cover over both areas has been subdivided into six units.

The most obvious structural features of the area are two broad anticlinal domes outlined by Upper? Proterozoic rocks. These are relatively undisturbed but the lithologies between the domes exhibit complex structural deformation. Gravity data suggests that the two domes may have cores of granitic composition.

INTRODUCTION

This study was carried out for the purpose of assisting in the planning and execution of future field work.

Data relating to the black and white aerial photographs used are as follows:

BIRRINDUDU - Interpretation was carried out on vertical photographs flown by RAAF between April and September 1948. These were flown at an altitude of 7,520m with cameras of focal lengths between 152.2mm and 154.4mm. Nominal scale 1:50,000. Photographs flown June 1967 by Adastra - at 7,620m with a 88.41mm focal length camera - were consulted when necessary.

TANAMI - Interpretation was carried out on vertical photographs flown by RAAF between June and September 1950. These were flown at an altitude of 7,620m with cameras of focal lengths between 152.2mm and 154.4mm. Nominal photo scale 1:50,000. Two runs of photographs covering a 16km wide strip along the top of the sheet were flown by Adastra between May and June 1967. These photos - taken at an altitude of 7,620m with a 88.41mm focal length camera - were consulted when necessary.

Photogeological interpretation was annotated on transparent overlays attached to alternate photographs. Previous work, listed in the Bibliography, was used as a guide for photointerpretation. The initial interpretation was modified, where necessary, following a reconnaissance field check in July 1969.

Annotation was compiled on overlays of the photoscale planimetric sheets prepared by the Division of National Mapping. Compilation sheets were photographically reduced to 1:250,000 scale, assembled and combined with the Division of National Mapping 1:250,000 planimetric maps to obtain a composite print.

Within the areas studies, road systems are poorly developed. The Gordon Downs - Birrindudu - Inverway road crosses the northwestern corner of Birrindudu Sheet. The Alice Springs - Tanami - Gordon Downs road crosses the southwest corner of Tanami Sheet. All other tracks such as Tanami - Hooker Creed, Hooker Creek - Birrindudu, are accessible by four-wheel drive vehicles. Access to the central regions of both Birrindudu and Tanami Sheets involves cross country travel with a four-wheel drive vehicle.

PHYSIOGRAPHY

The physiography of the Birrindudu-Tanami Sheet areas is controlled by two main planar features. The western and central region is part of a plateau - the Sturt Plateau (Fig. 1). A broad dissected margin (unit 2, Fig. 1) separates the Sturt Plateau from a low level plain on its eastern side. The plain can be further separated into at least four physiographic divisions (units 4 to 7 in Fig. 1).

Laterites developed at different elevations over the Birrindudu and Tanami Sheet areas have been classified as parts of the Tennant Creek and Ashburton erosion surfaces by Hays (1967).

Past workers considered that the Sturt Plateau extended well to the east of the Birrindudu Sheet area (Traves, 1955). Spot elevations on the Birrindudu and Tanami 1:250,000 Bouguer Anomalies Gravity Sheets (B.M.R., 1967) show a topographic high extending from the headwaters of Hooker Creek (130°E, 18°S) to Tanami (129°40E, 20°S). The altitude of this feature ranges between 410 m and 520 m above sea level and divides runoff in the region into easterly and southwesterly drainage directions. This topographic high defines the eastern edge of the Sturt Plateau (Fig. 1).

Sturt Plateau

Planation processes are well developed over the Sturt Plateau and the topography closely reflects rock properties. Generally only erosion-resistant rocks are exposed above the sand/soil cover on the plateau. Incised drainage channels form only on and adjacent to the low topographic rises formed by the resistant outcrops. Elsewhere any substantial runoff drains along broad topographic lows which are commonly almost imperceptible at ground level.

Dissected Plateau Margin

The relatively broad dissected margin (unit 2, Fig. 1) on the eastern edge of the Sturt Plateau contains the headwaters of the eastwards draining watercourses of the region.

Victoria River Plains and Terraces

In the northeast corner of Birrindudu Sheet (unit 3, Fig. 1) a small area of Victoria River Plains and Terraces (Traves, 1955) is contained by the watershed of the northerly flowing Victoria River.

Low level plain

The low level plain, east of the dissected plateau margin, occurs at an altitude of about 300 m a.s.l. This plain has been divided into some of the physiographic divisions established on Winnecke Creek and Tanami East 1:250,000 Sheet areas (Milligan et al., 1966). The boundaries of four divisions; the Hooker Creek Uplands, Winnecke Tableland, Lowland Dunefields, and Hanson-Lander Plains are tentatively shown on Fig. 1. A further four divisions shown by Milligan et al., (1966) can not be identified on available data and will require further field investigation.

Hooker Creek Uplands

The Hooker Creek Uplands is a gently undulating sand plain with low rises capped by sandy pisolitic laterite gravel.

Winnecke Tableland

The slopes of most of the Winnecke Tableland are covered by aeolian sand. Higher rises are capped with pisolitic lateritic gravel.

Lowland Dunefields

The dunes of this field are low, linear and widely spaced (2 km or more apart).

Hanson-Lander Plains

These are broad areas of mulga-covered plains with few hills.

BIRRINDUDU - TANAMI PHYSIOGRAPHIC DIVISIONS

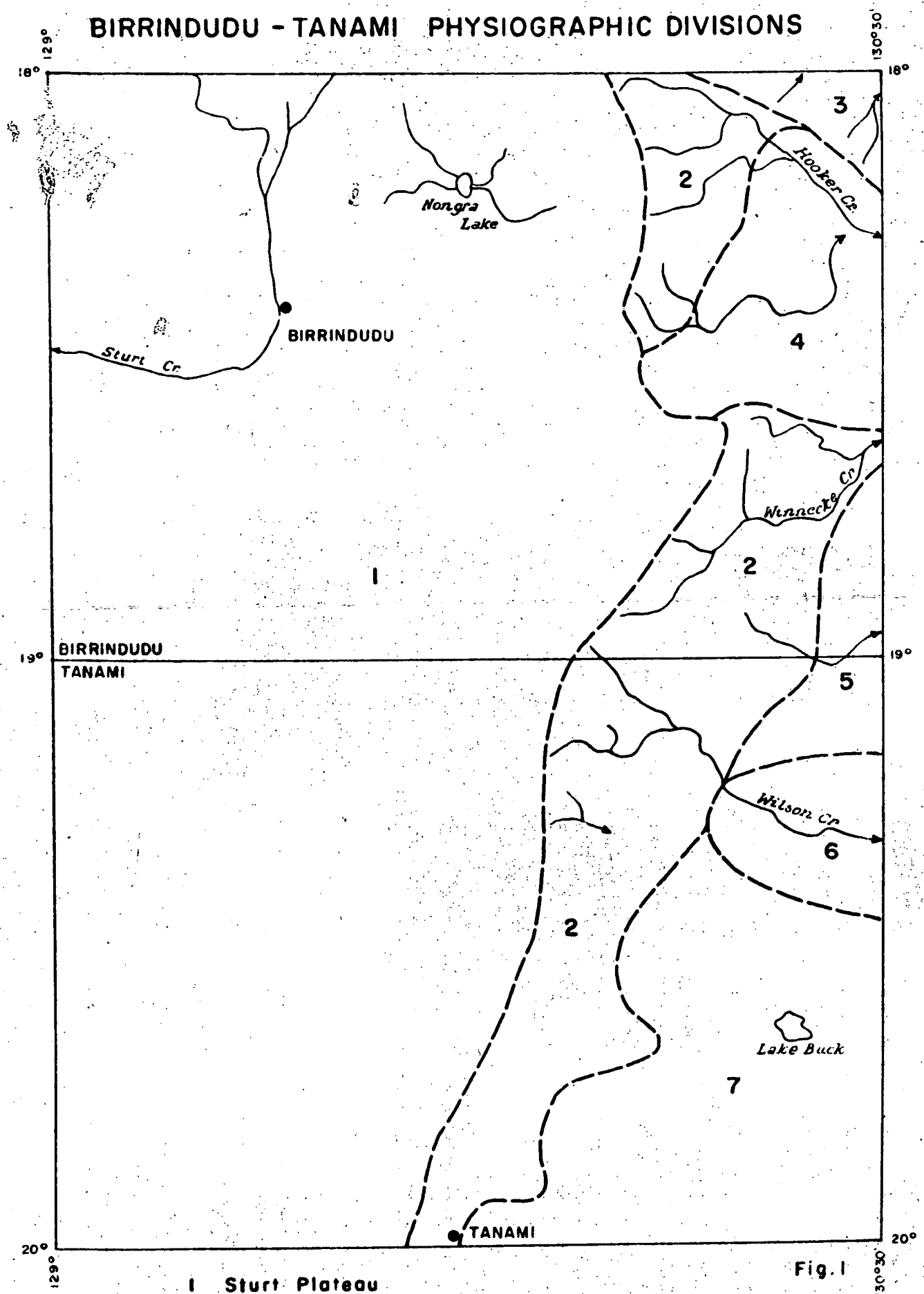

Fig. 1

1 Sturt Plateau
2 Dissected plateau margin
3 Victoria River Plains and Terraces
4 Hooker Creek Uplands
5 Winnecke Tableland
6 Lowland Dunefields
7 Hanson - Lander Plains

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STRATIGRAPHY

The following stratigraphic divisions have been used in the photogeological interpretation.

Photogeological Character		Possible Geological Equivalent		
Generally light toned, flat lying, sparse vegetation	Qa	Alluvium	Quaternary	CAINOZOIC
Very light toned, flat lying, generally treeless	Czb+	Residual black soil or old alluvium		
Medium tone, arcuate vegitation patterns	Cza*	Old alluvium		
While to medium tone, cerebriform texture	Czt	Travertine		
Dark toned, smooth surface	Czl	Laterite		
Medium tone, smooth surface	Cz	Undifferentiated		
Very light tone, occurs as small remnants	U*	Undetermined		PALAEOZOIC
Light to medium tone, low relief	Gme	Merrina Beds	Middle Cambrian	
Light to medium tone, jointed, convex slopes when laterite capped	Gla+	Antrim Plateau Volcanics	Lower Cambrian	
Dark tone, low smooth topography	Bv*	Volcanics		PROTEROZOIC
White toned remnants over Be, often mesaform	Be1	Winnecke Granophyre deeply weathered		
Medium to dark tone, Uneven relief, jointed	Be	Winnecke Granophyre		
Light toned, flat or near flat lying, jointed	B3*	Sandstones	UPPER?	
Light toned, interbedded competent and incompetent beds, jointed	B2	Sandstones, conglomerates (Gardiner Beds?)		
Light toned, massive lithology, wavy bedding traces, jointed	B1	Quartz sandstones (Mt Winnecke Sandstone?)		
Light toned, bedded, jointed	B	Undifferentiated sediments		
----------		UNCONFORMITY		
Light to medium tone, low topography, concave slopes. Wavy bedding traces	Bm*	Metamorphics (Phyllites, shales)	LOWER?	

* interpreted on Tanami only
\+ interpreted on Birrindudu only

PROTEROZOIC

Lower? Proterozoic

Bm Metamorphics (Tanami only)

The Bm metamorphics are generally light toned lithologies. They are characterised by narrow resistant beds within a softer lithology resulting in outcrops with concave slopes. The beds are generally contorted and show wavy trend lines. Outcrops appear to be relatively soft and scattered and have only been recognized on the south west and south central parts of Tanami Sheet. These lithologies correspond to the Halls Creek Metamorphics of the Billiluna 1:250,000 Sheet and are predominantly, sheared quartz-greywacke, slate, laminated claystone, siltstone and sandstone (Casey & Wells, 1960).

Upper? Proterozoic

Outcrops of Upper? Proterozoic sediments predominate throughout both sheet areas and on the photographs appear to be lithologically similar. Similarity of lithology and discontinuity of outcrop will possibly prevent detailed field subdivision of the Upper? Proterozoic being made.

An attempt has been made to subdivide these sediments on the basis of subtle photo differences. Proterozoic sediment distribution shown as B, B1, B2 or B3 is considered to be basically accurate, however the degree of accuracy obtained in attempting to subdivide B into B1, B2, and B3 is unknown. Since the photo characters used in differentiation are based on such criteria as the presence or absence of wavy bedding traces, the distribution of subdivided lithologies, as shown, may not be valid. It could be a reflection of structural complexity within the same lithology. Thus the subdivisions B1, B2, B3 can only be considered as potential guidelines to distribution subject to verification by field work.

Units B1, B2, B3 as listed in the reference are not necessarily in stratigraphic order.

B Undifferentiated sediments

The undifferentiated sediments (B) outcrops are generally light toned and show jointing and bedding. They consist of sandstones and conglomerates. Wherever possible the Proterozoic lithologies have been classified into B1, B2 or B3.

B1 Quartz Sandstones (Mt Winnecke Sandstone?)

Outcrop on air photographs is light toned and is characterised by apparently similar lithologies with abundant wavy bedding traces throughout. Field observations show these rocks to be monomineralic medium to coarse-grained quartz sandstone, fine grit and conglomerate. Photo distribution shows B 1 to be extensively developed in the southeast of the Birrindudu sheet. These lithologies were previously given the formation name of Mt Winnecke Sandstone (Traves, 1955). One field observation of interbedded volcanic rock was made - see Appendix.

B2 Sandstones, Conglomerates (Gardiner Beds?)

The B2 sandstones, conglomerates have a light photo tone and are characterised by the presence of competent and incompetent beds which have been strongly emphasized by differential erosion. Reconnaissance traversing along the Tanami - Hooker Creek track failed to locate any remnants of the incompetent lithology. Casey & Wells (1960) report interbedded shale.

There is no indication of the abundant wavy bedding traces characteristic of B1 in the massive outcrops. Thus the extensive outcrops forming the Gardiner Range on the western side of the Tanami sheet have been included in B2. Casey & Wells (1960) defined these conglomerates and hard, current bedded, ripple marked sandstones as the Gardiner Beds. Rocks observed at Mt Tanami match the description given by Casey & Wells for the Gardiner Beds.

The unconformable contact between the Lower? Proterozoic metamorphics Bm and the overlying Upper? Proterozoic B2 can be interpreted on air photographs Tanami Run 7/photo 5055 and 11/5157.

B3 Sandstones (Tanami only)

The B3 sandstones are light toned with appearance similar to B2. They occur on Tanami 1A E-C/5167 as flat or near flat lying beds occupying a synclinal structure. This lithology should be field checked to establish whether it is conformable or unconformable with the underlying Proterozoic sandstones.

Be, Be1, Winnecke Granophyre

All areas interpreted as, or known from field observations to be, granitic rocks have been shown as Be (Winnecke Granophyre) on the photogeological maps. Unweathered or moderately weathered outcrops have a medium to dark photo tone. Areas of extensive outcrop are strongly jointed and show uneven relief. The name Winnecke Granophyre was proposed by Traves (1955) for granophyre outcrops at the headwaters of Winnecke Creek. There the granophyre intrudes the Mt Winnecke Sandstone (B1). Quartz and tourmaline veins are common through the sandstone near the granophyre contact. One field observation was made of a dacitic rock (see Appendix) at the granophyre - sandstone contact. The dacitic rock appeared to be a phase of the granophyre intrusion.

The main area of Be interpreted approximates to a near linear zone extending from near Wilson Creek northwards to Hooker Creek where it is overlain by Antrim Plateau Volcanics (Cla).

Areas of deeply weathered Winnecke Granophyre have been shown as Be1; these are characteristically light toned, commonly mesaform, flat topped remnants over the comparatively unweathered Be. In outcrop the B1 retains its original granitic texture but is friable and ironstained. The depth of weathering to solid rock is variable; thickness of as much as 7m were observed. The flat upper surface of the weathered remnants appears (on the photographs) to occur at a similar level and suggests it may represent an older land surface, possibly of the same age as laterite developed on Cla.

For the sake of brevity all other suspected granite outcrops have been annotated Be?. These are:

a resistant outcrop in Wilson Creek (Tanami 3/5059)

scattered outcrops in the Black Hills region (Tanami 10/5087)

on Birrindudu 13/5146, scattered light toned outcrops have been annotated granite after Brown (1909).

on Birrindudu 15/5139 (Tanami sheet), isolated outcrops have been shown as Be?. They appear different from the nearby Bm and B2 outcrops and may be remnants of extensive granite intrusion in this region. (This is discussed further under Structure).

Bv Volcanics (Tanami only)

A low relief area with dark photo tone has been mapped near Supplejack Downs as Bv. This consists of a medium to fine-grained basalt, in places amygdaloidal. In hand specimen this basalt appears the same as volcanics observed within the Antrim Plateau Volcanics (Cla) on the Birrindudu Sheet. On this basis it is suspected as being an outlier of the Antrim Plateau Volcanics, possibly preserved from erosion by downfaulting along a quartz filled shear on its eastern side. Dunn (1965) called this basalt the "Supplejack Downs Volcanics" (unpublished stratigraphic name).

PALAEOZOIC

Lower Cambrian

Cla Antrim Plateau Volcanics (Birrindudu only)

The Antrim Plateau Volcanics (Cla) unconformably overlie Proterozoic lithologies. In the northeast of the sheet area where the volcanics are deeply dissected they have a medium to light photo tone. Where resistant laterite cappings are present, the resultant scarps develop convex slopes. Elsewhere within the sheet, where stream dissection is minimal, photointerpretation is more difficult because of deep weathering and lack of outcrop. Exposures in breakaways still show the general photogeological characters. Laterite is known to be well developed on Cla and areas of laterite between such outcrops are probably a fair indication of Cla at depth. No Cla has been positively interpreted south of Birrindudu Run 11. This limit may indicate the southernmost extent of the volcanic flows. All field observations of Antrim Plateau Volcanics were of basic volcanics (Basalts).

Middle Cambrian

Cme Merrina Beds

On the eastern edge of Birrindudu Sheet area scattered outcrops with a light photo tone, sparse vegetation and low relief, have been interpreted as Marrina Beds (Cme).

This terminology for interbedded dolomite siltstone and sandstone, has been extrapolated from the Winnecke Creek 1:250,000 sheet (Milligan et al., 1966). On the eastern side of Tanami Sheet area more extensive outcrops have been annotated as Cme. On the Tanami East 1:250,000 sheet adjoining outcrops have been shown by Milligan et al., (1966) as undifferentiated Lower Palaeozoic

(Bzl) K.G. Smith (pers. comm.) has indicated that more recent work has verified that the outcrops shown as Lower Palaeozoic are of Cambrian age. For this reason they are shown as Merrina Beds (Cme) on Tanami Sheet.

UNDETERMINED

U Undetermined (Tanami only)

Several small scattered outcrops with a distinctive very light photo tone have been shown as U - undetermined. Outcrops are usually mesaform and those on Tanami 1/5019 and 3/5866 exhibit strong fracturing. On the ground deeply weathered granular rocks were observed which could be either sandstone or tuff. They overlie the volcanics (Bv) near Supplejack Downs and this may indicate a Cambrian or younger age.

CAINOZOIC

The extensive cover of Cainozoic material on both Birrindudu and Tanami Sheet areas has been differentiated into six units.

Cz Undifferentiated

The Cz unit consists of undifferentiated soil, alluvium, colluvium, gravel and sand (including dune sand). On photographs it has a medium to light tone, and generally appears to have a smooth surface.

Czl Laterite

Laterite surfaces have a dark photo tone and are normally well vegetated. Laterite has been interpreted on Upper? Proterozoic lithologies although the most extensive development has been noted on Gla. On Birrindudu 2/5084, 5m of laterite ironstone capping was observed over 15m of mottled weathered Gla.

Extensive Czl has been shown between Hooker Creek and Winnecke Creek. In this region sand cover up to 1m thick was observed on the laterite. Differentation of small areas of the Czl topographically above the sand cover was not feasible for 1:250,000 mapping so sand covered laterite has been shown as Czl?.

Relationships between land surfaces and laterites in the general region have been discussed by Hays (1967).

Czt Travertine

Travertine outcrops have a white to medium photo tone and a characteristic cerebriform (brain-like) texture. The Czt outcrops occur as small topographic rises situated in the central low areas of broad valleys. This suggests the travertine originated as a result of deposition of lime rich material in ponds in the watercourses. Inferred ponding behind a topographic barrier is illustrated on Tanami 6W-C/5063. Maximum thicknesses of travertine are not known. Up to 3m occurs above ground level at Talbot Well Tanami 6E-C/5052. Nearly all water bores have been sunk in Czt and examination of drilling records should provide subsurface data on travertine thickness.

Only two areas of Czt have been identified on Birrindudu.

Cza Old Alluvium (Tanami only)

The old alluvium (Cza) unit has been differentiated primarily on vegetation distribution and pattern. It is generally well vegetated with arcuate growth patterns. Where vegetation is lacking the alluvium has a medium photo tone. The Cza occurs along present day topographic lows or in distributions indicating past topographic lows. It is interpreted as indicating distributary drainage courses. Similar drainage in central Australia has been studied by Mabbutt (1967). Because of topographic control there is a direct relation between distribution of Cza and Czt.

The Cza unit was not differentiated on Birrindudu; minor occurrences can be expected near Czt outcrops, particularly in the vicinity of 13A/5171.

Czb Residual black soil or old alluvium (Birrindudu only)

Black soil areas have a very light photo tone and are generally flat and treeless. The floodout areas of the Sturt and Eva Creeks contain the most extensive Czb deposits. These may occupy old lake areas. Shields (1965) reports the Birrindudu homestead bore penetrated 3m of lateritic sand and gravel then 21m of green white sandy clay overlying weathered basalt. The green white sandy clay is considered to be Sturt Creek floodout deposit.

Quaternary

Qa Alluvium

The Qa alluvium is generally light toned flat lying and sparsely vegetated. The main deposits shown are along river tracts and in playa lakes and saltpans. Numerous floodout deposits of Qa occur on the pediment slopes around topographic highs. These are generally too small to represent at 1:250,000 scale and most have been incorporated into the Cz.

STRUCTURE

Structural interpretation is difficult due to the lack of continuous outcrop and the failure to identify useful marker beds in the Upper? Proterozoic lithologies.

The Lower? Proterozoic metamorphic rocks Em are intensely folded. Trend lines strongly reflect fold structures in the overlying Upper? Proterozoic sediments, although pre-Upper? Proterozoic folding is evident.

Two major structural features are obvious in the Upper? Proterozoic. These are: a broad northeast trending dome centred on 19° 45'S, 129° 30'E, and a similar east-west trending dome centred on 18° 55'S, 129° 15'E. These domes are indicated by discontinuous outcrops of Upper? Proterozoic low dipping sediments. Outcrop within these areas is almost completely obscured by Cz cover. Granite outcrop has been interpreted in the vicinity of Birrindudu 13/5146 and it is suspected that both domes have cores of granite. Gravity surveys of the area (Whitworth, 1970) show that the domes correspond to strong negative gravity anomalies. Flavelle (1968) in his discussion of gravity surveys over similar lithologies on the Billiluna Sheet area considered that gravity highs correlated with the highly metamorphosed sediments of Lower? Proterozoic age (i.e. equivalent to Em). As the Upper? Proterozoic sediments are relatively thin the gravity lows are probably caused by granite intrusions.

In contrast to the relatively undisturbed Proterozoic sediments flanking the domes, the Proterozoic between the two structures is strongly folded and faulted. This is particularly noticeable on photos Tanami 1A W-C/5012 to 5020. The greatest structural complexity observed in Proterozoic rocks occurs in the zone bounded by the two domes and the Gardiner and Ware Ranges.

A northeast-trending gravity low occurs approximately 25 km east of Tanami Bore (Whitworth, 1970). This is probably related to granite.

Apart from the suspected granite areas interpreted from gravity data the known granite outcrops occur along a north-south trending zone extending from The Granites (South of Tanami Sheet) to the headwaters of Hooker Creek. This zone approximates the eastern edge of a basement ridge interpreted from gravity data (Whitworth, 1970) , and also to an upwarp axis interpreted from land surface studies (Hays, 1967). This data suggests the granite has been intruded along a major north-south trending zone of structural weakness. Field mapping over this zone may reveal more granite outcrop than has been interpreted from photographs.

The Antrim Plateau Volcanics Cla, unconformably overlie the granite Be, and Proterozoic lithologies. They are generally subhorizontal and show little structural disturbance.

ECONOMIC GEOLOGY

A brief review of economic geology is given by Dunn (1965).

Brown (1909), Gee (1911), Hossfeld (1940), have reported on the Tanami goldfield. Consolidated Zinc Pty Ltd and Anaconda Australia Inc. have investigated quartz-hematite lodes in The Black Hills area.

Clark & Blockley (1960) and Prichard, Dallwitz & Roberts (1960) have reported on uranium mineralization at the Killi Killi Hills (Tanami photo 11/5158) about 2 km west of the W.A.-N.T. border.

Spence (1964) has reported several airborne radiometric anomalies on the Tanami sheet. Two of these anomalies - reference numbers 2 and 5 (Spence 1964, Plate 5) - were investigated in the field with an Austral Monitor TM 64G portable Geiger counter, but no anomalous radioactivity was detected.

CONCLUSIONS

For the purpose of 1:250,000 scale mapping the author is confident that outcrop boundaries are accurate.

Scarcity of hardrock outcrop and the presence of extensive Cainozoic mantling materials prohibits accurate identification and subdivision of outcrops. This is particularly relevant to the Upper? Proterozoic lithologies and the subdivisions B1, B2, B3 can be considered only as potential guidelines to distribution, subject to field verification.

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APPENDIX

The following notes were made during a photo-geological reconnaissance field trip, July 1969.

Data numbers refer to photo points recorded on air photographs held in the Air photograph collection, Geological Drafting office, Bureau of Mineral Resources, Canberra.

BIRRINDUDU

RC9 photographs at 1:83,000 scale, flown 1967.

Run 1/Photo 0055

Bir 20 - Lateritized Antrim Plateau Volcanics

Bir 21 - " " " "

Bir 22 - " " " "

Bir 23 - Outcrop of oolitic ironstone. (Appears to be a Recent? localized deposit in the creek bed).

Bir 24 - Weathered Antrim Plateau Volcanics.

Bir 25 - Granite at ground surface level, hills above general ground level consist of volcanics.

Bir 26 - Granite buttes.

Bir 27 - Granite exposure in creek.

Bir 28 - Granite outcrop in lateritic soil.

Run 2/0021

Bir 16 - Laterite over Antrim Plateau basalts.

Bir 17 - Weathered quartz biotite granite overlain by weathered basalt.

Bir 18 - Weathered granite. Extensive tourmaline float.

Bir 19 - Weathered granite.

Run 2/0029

Bir 30, 31 - Granite.

Bir 32 - Quartz outcrop - dyke? in granite.

Run 3/125

Bir 33 - Weathered pink mudstone.

Bir 34 - Spotted meta-sediments - Within intrusive contact aureole.

Bir 35 - Granite

Bir 36 - Granite (Road traverses granite between 35 and 36).

Run 6/209

Bir 1 - Weathered medium-grained quartz sandstone.

Bir 2 - Cemented quartz sandstone.

Bir 3 - Highly decomposed granitic? material.

Bir 5 - Highly decomposed white volcanic ? (possibly tuff?).

Bir 6 - Sandstone with mud pellets overlying volcanics.

Run 7/127

Bir 7 - Dacitic rock, edge of granophyre near granophyre-sandstone contact.

Bir 8 - Granophyre.

Bir 9 - Quartz sandstone.

Bir 10 - Ferricrete on deeply weathered granophyre.

Bir 11 - Quartz dyke.

Bir 12 - Weakly metamorphosed fine-grained sandstone.

Bir 13 - Tourmaline veining in meta-sandstone.

Bir 14 - Deeply weathered coarse-grained granite.

Bir 15 - Granite.

TANAMI

RC9 photographs at 1:83,000 scale Flown 1967.

Run 1E/021

Tan 1 - Even grained quartz sandstone.

Tan 2 - Weathered fine-grained quartz porphyry. Possibly interbedded with sandstone.

Tan 3 - Weathered porphyritic volcanics. Interbedded? with sandstone.

K17 photographs at 1:50,000 scale Flown 1950.

Run 1/5019

Tan 4 - Even grained quartz sandstone.

Tan 5 - Fine-grained brown sandstone.

Tan 6 - Weathered residual of volcanic? tuff?

Run 1A/5175

Tan 7 - Sandstone.

Tan 8 - Agatiform quartz veining (shear) in sandstone.

Run 2/5083

Tan 9, 10- Fine-grained sandstone

Run 2/5081

Tan 15 - Supplejack Downs - Mill on bore in siliceous travertine.

Tan 16 - Flaggy quartz sandstone.

Tan 17 - Siliceous cherty rock, indurated. May be siliceous replacement of calcareous reef structures? Further work warranted.

Run 3/5066

Tan 11 - Fine-grained sandstone.

Tan 12 - Quartz dyke.

Tan 13 - Mill on bore in siliceous travertine.

Tan 14 - Basalt.

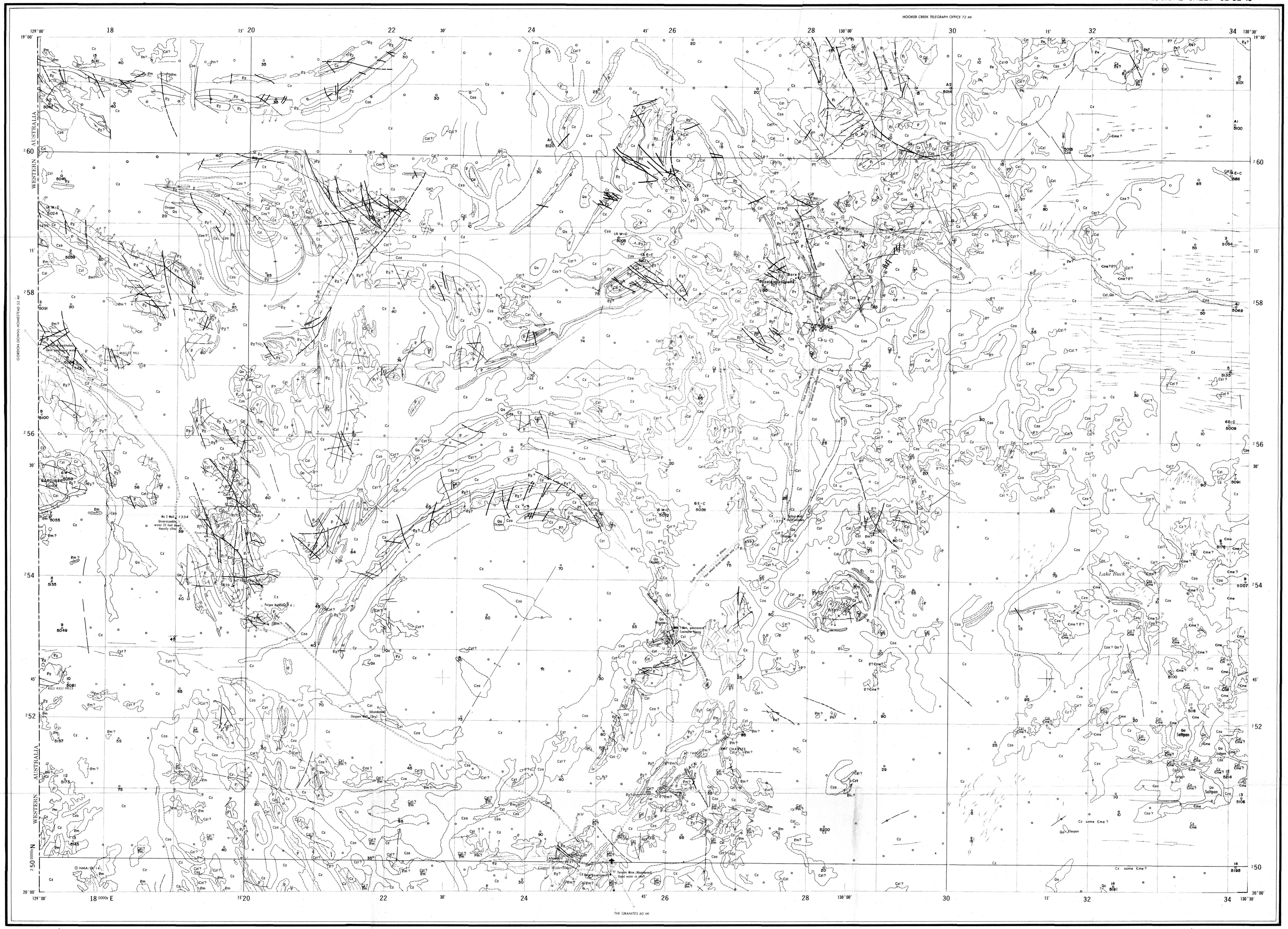
Tan 18 - Silcrete capped deeply weathered rocks sandstone?, volcanics? Same as Tan 6.

Tan 19 - Same as Tan 18, Tan 6.

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

TANAMI
NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SE 52-15



REFERENCE

Photogeological Character	Symbol	Possible Geological Equivalent		
Generally light toned, flat lying, sparse vegetation	Qa	Alluvium	QUATERNARY	
Medium toned, arcuate vegetation patterns	Cza	Old alluvium		CAINOZOIC
White to medium tone, cerebriform texture	Czt	Travertine		CAINOZOIC
Dark toned, smooth surface	Czl	Laterite		CAINOZOIC
Medium tone, smooth surface	Cz	Undifferentiated		CAINOZOIC
Very light tone, occurs as small remnants	U	Undetermined		
Light to medium tone, low relief	Ꞓme	Merrina Beds	MIDDLE CAMBRIAN	PALAEOZOIC
Dark tone, low smooth topography	Ꝑv	Volcanics	UPPER ?	PROTEROZOIC
White toned remnants over Ꝑe often mesaform	$Ꝑe_1$	Winnecke Granophyre - deeply weathered	UPPER ?	PROTEROZOIC
Medium to dark tone. Uneven relief. Jointed	Ꝑe	Winnecke Granophyre	UPPER ?	PROTEROZOIC
Light toned, flat or near flat lying, jointed	$Ꝑ_3$	Sandstones	UPPER ?	PROTEROZOIC
Light toned, interbedded competent and incompetent beds. Jointed	$Ꝑ_2$	Sandstones, conglomerates (Gardiner Beds ?)	UPPER ?	PROTEROZOIC
Light toned, massive lithology, wavy bedding trace, jointed	$Ꝑ_1$	Quartz sandstones (Mt Winnecke Sandstone?)	UPPER ?	PROTEROZOIC
Light toned, bedded, jointed	Ꝑ	Undifferentiated sediments	UPPER ?	PROTEROZOIC
		UNCONFORMITY		
Light to medium tone, low topography, concave slopes. Wavy bedding traces	Ꝑm	Metamorphics (Phyllites, shales)	LOWER ?	PROTEROZOIC

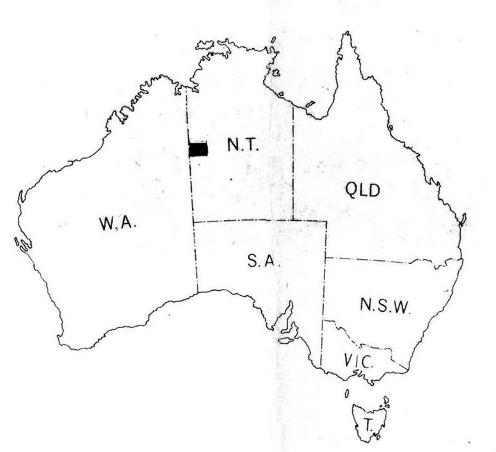
Lithological boundary
Probable lithological boundary
Anticlinal axis
Synclinal axis
Fault
Probable fault
Edge of bed
Lineament

Estimated dips
Horizontal
Very low
Low
Medium
Steep
Vertical

Trend line
Joint pattern
Topographic scarp
Laterite (L), Terrace (T), Scree (S)
Dyke
Sand dune

Principal road
Minor roads and tracks
SIDING STATION Railway line
Telephone line
Fence
State boundary
Mine
Homestead
Yard
Windpump
Airport or Airfield, Landing ground
B Bore
T Tank
W Well
S Spring
WH Waterhole
D 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 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

GORDON DOWNS	BIRRINDUDU	WINNECKE CREEK
BILLILUNA	TANAMI	TANAMI EAST
LUCAS	THE GRANITES	MT. SOLITAIRE

Photo-interpretation by the Photogeological Group,
Bureau of Mineral Resources, Geology and Geophysics 1969
Interpreted by: C. J. Simpson

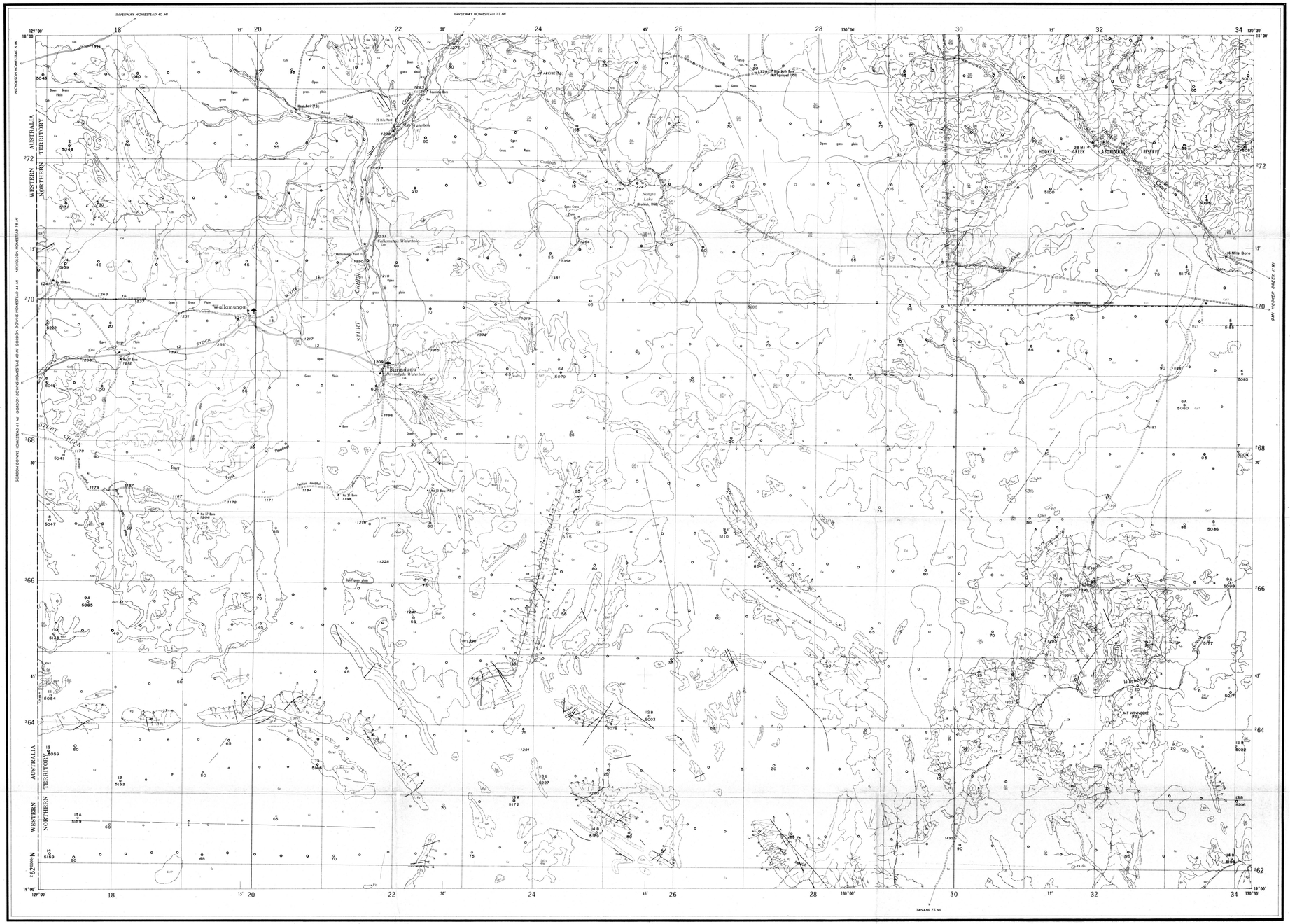
TANAMI
E52-15 NORTHERN TERRITORY

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

BIRRINDUDU

NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SE 52-11



REFERENCE

Photogeological Character	Symbol	Possible Geological Equivalent		
Generally light toned, flat lying, sparse vegetation	Qa	Alluvium	QUATERNARY	CAINOZOIC
Very light toned, flat lying, generally treeless	Czb	Residual black soil or old alluvium		
White to medium tone, cerebriform texture	Czt	Travertine		
Dark toned smooth surface, sometimes mesaform	Czl	Laterite		
Medium tone, smooth surface	Cz	Undifferentiated		
Light to medium tone, low relief	€me	Merrina Beds	MIDDLE–LOWER CAMBRIAN	PALAEOZOIC
Light to medium tone, jointed, convex slopes when laterite capped.	€la	Antrim Plateau Volcanics		
White toned remnants over Pe often mesaform	Pe_1	Winnecke Granophyre – deeply weathered	UPPER ?	PROTEROZOIC
Medium to dark tone. Uneven relief. Jointed	Pe	Winnecke Granophyre		
Light toned, interbedded competent and incompetent beds. Jointed	P_2	Sandstones, conglomerates (Gardiner Beds ?)		
Light toned, massive lithology, wavy bedding trace, jointed	P_1	Quartz sandstones (Mt. Winnecke Sandstone ?)		
Light toned, bedded, jointed	P	Undifferentiated sediments		

- Lithological boundary
- Probable lithological boundary
- Anticlinal axis
- Synclinal axis
- Fault
- Probable fault
- Edge of bed
- Lineament

Estimated dips

- Horizontal
- Very low
- Low
- Medium
- Steep
- Vertical
- Trend line
- Joint pattern
- Topographic scarp
- Laterite (L), Terrace (T), Scree (S)
- Dyke
- Sand dune

- 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
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Photo-interpretation by the Photogeological Group,
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BIRRINDUDU
SE 52-11 NORTHERN TERRITORY