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TITLE: EXPLANATORY NOTES ON THE TUREE
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EXPLANATORY NOTES ON THE TUREE CREEK 1:250,000

GEOLOGICAL SHEET, WESTERN AUSTRALIA

compiled by J. L. Daniels

Record No. 1967/7

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PLATE

1:250,000 geological map, Turee Creek

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Figure 2 Drainage provinces and water supplies.

INTRODUCTION

The Turee Creek 1:250,000 Sheet SF/50-15 is bounded by latitude 23° and 24° S and by longitude 117° and $118^{\circ} 30'E$. It is located in the southern sector of the Hamersley Iron Province in the North-West Division of Western Australia.

The Sheet area has been mapped as part of a comprehensive regional survey of the Precambrian of the North-West Division, special attention being paid to the areas with potential iron ore.

There are no towns in the Sheet area. Several stations graze sheep or cattle, but there are only two established homesteads. The region is poorly supplied with roads and tracks. One main road, a graded gravel road, crosses the Sheet area from Ashburton Downs and follows the Ashburton valley. It is part of the main route joining Onslow with Meekatharra. Since the present geological survey has been completed another road has been graded between Ashburton Downs and Rocklea Station to the north in the Mt. Bruce Sheet area. A few minor tracks connect most of the wells and bores in the northwestern quadrant of the area but the remainder of the region is almost devoid of tracks.

PREVIOUS INVESTIGATIONS

Prior to the present survey no systematic mapping had been undertaken in the Turee Creek Sheet area.

Visits were made to the area by Woodward in 1890, Maitland in 1907, and Talbot in 1926. Woodward investigated the gold diggings on the south side of the Ashburton valley. Maitland made a geological traverse from Bangemall (Mt. Phillips Sheet area) to Mt. Blair. Talbot (1926) made the first major geological traverse across a large part of the Turee Creek Sheet area. He undertook traverses along the Ashburton valley and several of its tributaries and recognised and described the main divisions.

Some of the correlations made by the earlier workers are not now accepted. The errors were largely caused by regarding the Ashburton Beds (now Ashburton and Capricorn Formations) as equivalent to the Mosquito Creek Series and of Archaean age; they are now known to be the youngest rocks of the Mt. Bruce Supergroup and of Lower Proterozoic age (MacLeod, 1966; de la Hunty, 1965).

No mining is being undertaken in the Turee Creek Sheet area. The Ashburton valley region was previously the scene of much alluvial gold prospecting and some base metal search. Within recent years several companies have intermittently prospected the northern part of the Sheet area for iron ore. The southwestern part of the Sheet area, occupied by Bangemall Group rocks, is currently being investigated for base metals.

The present regional geological survey was undertaken in 1963 by J. L. Daniels, R. Halligan, and W. R. Jones.

PHYSIOGRAPHY

Topographically the Turee Creek Sheet area may be divided into four main zones corresponding broadly to the areas occupied by the Proterozoic Bangemall Group, Bresnahan Group, Ashburton Formation, and Mt. Bruce Supergroup excluding the Ashburton Formation.

The Bangemall Group forms a triangular area in the southwest corner of the Sheet area. These rocks form relatively high, dissected country difficult of access and traverse. Several creeks cut the region. The most spectacular of these is Fords Creek, which has carved a deeply incised, meandering course. The northern edge of the Bangemall Group area is a high, often precipitous escarpment, which is one of the dominant features of the Sheet area.

Bresnahan Group rocks form an arc of moderately high ground around the headwaters of the Kennedy Creek. Weathering

of the arenaceous rocks of the Bresnahan Group has given rise to the patches of sand dune country immediately to the east.

The broad Ashburton valley is largely occupied by cleaved shales and grits of the Ashburton Formation. Weathering has produced a monotonous low relief region with abundant low strike-ridges.

Lower Proterozoic rocks of the north and northeast section of the Sheet area have given rise to high relief country, some of which is very rugged.

The Turee Creek Sheet area is traversed by the Ashburton River and several of its large tributaries. Overall the Ashburton River follows the strike of the Ashburton Formation. The main tributaries, the Seven Mile Creek, Turee Creek, Angelo River, and Wandarry Creek, all cut across the bedding and have a northeasterly trend. Their direction is controlled by a series of dykes, faults, and possible folds of the same trend.

STRATIGRAPHY

The Turee Creek Sheet area contains representatives of all the Proterozoic groups known in the North-West Division. Local modification of thickness and lithology is noticeable, but on the whole the units are closely comparable with the same or equivalent units described from other areas in the North-West Division.

A stratigraphic column for the Turee Creek Sheet area is given in Table 1.

PROTEROZOIC

FORTESCUE GROUP

Sediments and volcanic rocks of the Fortescue Group form much of the rugged country in the north-central part of the Sheet area.

Hardey Sandstone

The lowest formation of the Fortescue Group exposed in the Turee Creek Sheet area is the Hardey Sandstone, which crops out in the core of a dome approximately 40 miles north-east of Ashburton Downs. It consists of coarse, white, somewhat friable sandstone with occasional pebble beds. Interbedded with the sandstone are several basalt flows. No estimate of the thickness of the formation is given, but it is much thinner than in the Mt. Bruce Sheet area where a thickness of 4,000 feet is known.

Mt. Jope Volcanics

Overlying the Hardey Sandstone is a series of basalts and pyroclastic rocks together termed the Mt. Jope Volcanics. In the Mt. Bruce Sheet area to the north, de la Hunty (1965) further subdivided this formation into three members: these have been recognised in the Turee Creek Sheet area, but most of their boundaries have been photo-interpreted. Well developed pillow lavas, frequently amygdaloidal, have been seen at several localities together with rare sandstone beds. The pyroclastic unit, however, though containing coarse agglomerate near Running Water Pool, appears to be composed largely of fine-grained, green-black basalt, and rare thin chert and shale. This is in strong contrast to the Mt. Bruce area where the unit is almost entirely pyroclastic.

Jeerinah Formation

This formation consists of uniform thin bands of basalt flows with interbedded thin chert and shale which show some silicification. The thickness is approximately 3,000 feet. No dolerite sills were positively identified and there are apparently no thick shales as seen in this formation in the Wyloo and Mt. Bruce Sheet areas.

HAMERSLEY GROUP

Hamersley Group rocks are generally well exposed in the northeastern part of the Sheet area. From the main outcrop a narrow zone extends from Mt. Maguire for some 26 miles northwesterly where it terminates abruptly against a fault.

Apart from a few minor variations, the lithological character of each of the formations is constant across the Turee Creek Sheet area and the stratigraphy is identical with that described from adjoining areas (see de la Hunty, 1965; Daniels and MacLeod, 1965). A summary of the regional stratigraphy is also given by MacLeod (1966).

Marra Mamba Iron Formation

The Marra Mamba Iron Formation is the lowest formation in the Hamersley Group and conformably overlies the Fortescue Group. It is approximately 600 feet thick and has topographic expression as a practically continuous narrow ridge. This is especially well seen on the northwestern side of the Turee Creek Syncline. On the southern margin of the main Fortescue Group outcrop, near Seven Mile Creek, the Marra Mamba Iron Formation crops out as a series of discontinuous short ridges; the intermittent nature being caused by faulting. A small arcuate outcrop appears in the northeastern corner of the Sheet area surrounding an inlier of Fortescue Group rocks.

In the Turee Creek Sheet area the formation is identical with other occurrences in the Hamersley Iron Province. It consists of alternating bands of yellow to yellow-brown chert and brown to black iron formation (referred to as jaspilite in Reference on 1:250,000 map) with interbanded thin shale. Pinch and swell structures are common.

Small hematite enrichments in the upper 50 feet of the formation have been found in the northeastern corner of the Sheet area.

Wittenoom Dolomite

This formation, which conformably overlies the Marra Mamba Iron Formation, is extremely poorly exposed. It is covered by a variable thickness of scree or alluvium and normally underlies broad valleys flanked on one side by Marra Mamba Iron Formation. Though outcrop is poor the extent of the dolomite can be clearly defined. It consists of light weathering, grey to brown crystalline dolomite with occasional chert pods.

Mt. Sylvia Formation

Conformably overlying the Wittenoom Dolomite is the Mt. Sylvia Formation which consists of shale, dolomitic shale, and banded iron formation. The shales weather white to light grey and are easily eroded in strong contrast to the iron formation bands which stand out as distinctive ledges up to 20 feet thick. Generally there are three main iron formation bands, which together form a distinctive marker unit. The uppermost of these iron formation beds is the most persistent, but is not recognisable at Seven Mile Creek.

Mt. McRae Shale

The Mt. McRae Shale underlies the Brockman Iron Formation. It is exposed to some extent in the cliff section below the iron formation. The formation consists of shale, siltstone, and dolomitic shale.

Brockman Iron Formation

The Brockman Iron Formation conformably overlies the Mt. McRae Shale. It consists of interbanded chert, quartz-iron oxide rock, shale, and very rare riebeckite or riebeckitic chert. The chert and quartz-iron oxide rocks are internally very finely banded. A few small circular

structures, (macules of Trendall, 1966), are reported from the lower part of the formation from the northwestern side of the Turee Creek Syncline.

The formation gives rise to distinctive, high, rounded hills often fringed by steep cliffs. Weathering obscures many of the primary sedimentary features and gives the formation outcrop a rusty-brown appearance. It is the principal host for hematite deposits.

During a regional detailed survey of blue asbestos deposits in the Hamersley Iron Province, the Brockman Iron Formation was further subdivided into five members by Ryan and Blockley (1965). The lowest of these, the Dales Gorge Member, commanded the most attention. This member is normally approximately 400 feet thick in the main part of the basin to the north of the Turee Creek Sheet area, while the whole formation is approximately 2,000 feet thick. Two sections through the Dales Gorge Member were measured by J. Blockley in the Turee Creek Sheet area. In the Seven Mile Creek area the Dales Gorge Member is only 285 feet thick and the full thickness of the Brockman Iron Formation is estimated to be about 1,000 feet. In Turee Creek, on the northwestern side of the Turee Creek Syncline, the Dales Gorge Member is thicker than normal and measures 460 feet. At this locality it consists of sixteen shales and seventeen banded iron formation units, all well defined and comparable to the Wittenoom section (Trendall, 1965). At Seven Mile Creek, no clear comparison of units within the Dales Gorge Member could be made with the Turee Creek section. It has been suggested that the edge of the Brockman Iron Formation basin lies not very far to the south. It is concluded that no Brockman Iron Formation is present under the majority of the Wyloo Group sediments of the Ashburton valley.

Weeli Wolli Formation

This formation is characterised by the presence of finely banded red and black banded iron formation and numerous dolerite sills. The lower boundary with the Brockman Iron Formation is not well defined and is apparently transitional. Ferruginous and argillaceous shales are also present.

The photo-pattern displayed by the formation is distinctive and largely attributable to the presence of the dolerite sills. But for these sills the formation would be hard to define accurately.

On the southern side of the Turee Creek Syncline, red and black banded iron formation show very complicated small scale folds in which the symmetry has apparently been destroyed. In the same region some of the bands of banded iron formation carry nodules of green chert.

Contact metamorphosed banded iron formation at the upper contacts of dolerite sills have been seen on the northeastern side of the Turee Creek Syncline and confirm that some, at least, of the dolerites are intrusive and not lavas.

Near the top of the formation on the eastern side of the Turee Creek Syncline a possible volcanic ash occurs interbanded with banded iron formation.

Woongarra Volcanics

The Woongarra Volcanics overlie the Weeli Wolli Formation and consist of a variety of grey or grey-green porphyritic acid lavas, weathering to pale brownish-orange.

On the eastern side of the Turee Creek Syncline the whole formation is only about 50 feet thick, but thickens rapidly to the north and south where it attains its more normal thickness of about 1,000 feet. In the Seven Mile Creek area a thinning of the formation is again noted. This is perhaps in part caused by strike faulting.

North of the Turee Creek Syncline some 4 miles north-northeast of O'Brien well, the Woongarra Volcanics

consist of breccias of possible volcanic origin.

Boolgeeda Iron Formation

The Woongarra Volcanics are overlain by the Boolgeeda Iron Formation. Together they frequently form distinctive hills with acid volcanics at the base capped by thin sheets of banded iron formation. The iron formation is sometimes domed.

The formation consists of thinly banded iron formation with much ferruginous, fissile, purple shale. Much superficial enrichment in hematite is apparent, but it is not expected that this persists at depth.

WYLOO GROUP

Wylloo Group rocks occupy a little over 3,000 square miles of the Turee Creek Sheet area, mainly in the broad Ashburton valley. An area of some 120 square miles occurs in the centre of the Turee Creek Syncline.

The group is unconformably overlain in the southeast and south by the Bresnahan Group and the Bangemall Group respectively. The contact between the Wylloo Group and the underlying Hamersley Group is not well known, but there is no reason, in the Turee Creek Sheet area, to postulate either an unconformity or a disconformity between them. Where exposures are reasonable and absence of faulting allows, as near Mt. Channar, the groups are apparently conformable.

However a drastic change in lithology took place at the beginning of Wylloo Group times: the dominantly chemical deposition of the Hamersley Group was replaced by a dominantly clastic and geosynclinal deposition of the Wylloo Group. In Hamersley Group times, the centre of the basin is thought to lie to the north of the Turee Creek Sheet area, while the main axis of the basin or trough of the Wylloo Group, especially the Ashburton Formation, probably lies along the line of the Ashburton River. This apparent southerly shift in the main axis of deposition was probably controlled by uplift to the

north of the present Pilbara Archaean area and its immediate borders. Some erosion of Hamersley Group sediments is postulated because of the presence of banded iron formation fragments in many of the Wyloo Group greywackes.

Possibly further north than the Turee Creek Sheet area, the Wyloo Group would show unconformable relationships to the Hamersley Group, but immediately north of Turee Creek Sheet area no Wyloo Group now remains.

The Wyloo Group comprises a thick sequence of clastic sediments, basic volcanic rocks, and dolomitic limestones. Much variation in thickness of individual formations is apparent and lateral facies changes are common and often rapid. It has been subdivided into six formations.

Turee Creek Formation

Overlying the Boolgeeda Iron Formation is the Turee Creek Formation. It consists of a series of greywackes and shales and though not well exposed is thought to be approximately 1,500 feet thick on the western side of the Turee Creek Syncline. Westward the formation thins rapidly. In the Seven Mile Creek area its thickness is estimated at 200 feet maximum.

Beasley River Quartzite

Conformably overlying the Turee Creek Formation is the Beasley River Quartzite. It may be white, grey, pale fawn or mauve, and frequently silicified and glassy. It is generally fine-grained, although pebble beds and rare conglomerates are noted. Small red jasper grains and rare red jasper pebbles are present in the quartzite. Their colour suggests derivation from the underlying Hamersley Group.

The formation weathers to form higher ground than the adjacent formations. This is particularly well seen in the Turee Creek Syncline where the formation is approximately 600 feet thick. A much thinner section is present in the Seven Mile Creek area.

Mt. McGrath Formation

The Mt. McGrath Formation, which conformably overlies the Beasley River Quartzite, consists of a series of shale, sandstone, greywacke, conglomerate, dolomite, quartzite, and basalt. The main basalt horizon has been named the Cheela Springs Basalt Member. In the middle of the Turee Creek Syncline this member occurs in a number of small exposures as a black, fine-grained basalt, some areas of which are highly vesicular.

Subdivision of the rest of the Mt. McGrath Formation into members, correlatable with those defined by de la Hunty (1965) for the Mt. Bruce Sheet area, is not possible in the Turee Creek Sheet area.

The faulted nature of the area and the rapid lensing of the individual beds along strike precludes any measurement of a complete succession. South of Mt. Channar a thick, dominantly arenaceous succession is exposed:

Top

Shale, greywacke, and thin conglomerates)) Thickness approximately 3,000 feet
Banded siltstone and shale	
Sandstone and conglomerate	
Conglomerate with jaspilite fragments	

Base not seen

Near Neerambah Spring the formation includes dolomite, conglomerate, shale, and basalt.

Duck Creek Dolomite

The Duck Creek Dolomite occurs as a long narrow discontinuous outcrop extending diagonally from northwest to southeast across most of the Sheet area. It is a cream weathering, fairly well-bedded, grey dolomite frequently carrying stromatoliths. A superficial chert breccia cover is developed over the dolomite at a number of localities.

The most southeasterly exposures of the formation,

which are also the most southerly exposures of the formation in the Pilbara, occur in the Kennedy Creek region. Here they pass stratigraphically conformably upwards into Ashburton Formation and are unconformably overlain by the Bresnahan Group. The dolomite is white to grey blue, weathers pale ochre, and sometimes carries quartz grains. It is cut by quartz and quartz-calcite veins. Algal structures at this locality consist of internally banded, cylindrical forms approximately half an inch in diameter and several inches long. Although they are closely associated they are separated by darker structureless dolomite.

Ashburton Formation

Conformably overlying the Duck Creek Dolomite is the Ashburton Formation. It consists of a thick series of dark-brown and maroon-weathering shales with smaller amounts of greywacke and rare thin bands of oily-black dolomite.

Its total thickness in the Turee Creek Sheet area is unknown. This gap in knowledge is caused by two main factors. The majority of the sequence is composed of a monotonous series of brown weathering shales regionally devoid of any obvious marker bands. Local markers of greywacke and dolomite do occur, but cannot be traced for more than a few miles on account of their lens-like character and the regional folding. The latter, mainly the result of the Ophthalmian Fold Period, has impressed the shales with a strong axial plane cleavage. The combination of cleavage and weathering precludes any accurate determinations of both total thickness and overall regional structure of the Ashburton Formation.

In the Kennedy Creek area an attempt was made to establish a section at the base of the Ashburton Formation.

(Top of section present)		Feet
Ashburton Formation	(Maroon and pale-green shales with rare grits	10,000
	(Dominant dark-brownish grits with few shale bands	9,900
	(Cleaved maroon shales with some grits	4,900
Duck Creek Dolomite		

In the upper part of the section no folding was noted. However along strike to the northwest tight folding was observed. The total thickness of 24,800 feet may therefore be suspect.

It was not possible to trace these units further west near the Angelo River. In the Ashburton Downs region cleaved brown shale seems to be the dominant rock type.

The colour of the Ashburton Formation is almost certainly a surface feature; fresh rocks from creeks are much greyer. Samples of the same formation from a disused mine in the Kooline region (Edmund 1:250,000 Sheet area), some 45 miles northwest of Ashburton Downs, are light bluish-grey and show extremely fine sedimentary banding as parallel planes or as current bedding. There is no reason to suppose that this is not also typical of fresh Ashburton Formation in the Turee Creek Sheet area. What could be sedimentary banding on a larger scale is more easily seen from the air. This shows up as units from 6 inches to several feet thick, which on the ground are not obvious unless accompanied by greywacke bands.

Mention has already been made of one of the effects of the Ophthalmian folding. As well as the development of the axial plane cleavage, rodding is also regionally developed. It may be seen especially well immediately southeast of Mt. Blair. Rapid, large variation in orientation of the rods is common over short distances and hinders a clear understanding of the regional structure. The greywackes are also subject to the same effects, but they break down into larger units.

Lineations may also be developed on the greywackes,

which not infrequently also show groove casts. The main folding has taken place along westerly to west-northwesterly trends. In the Edmund Sheet area, immediately to the west of the Turee Creek Sheet area, it is known that the provenance of the greywackes lies to the east. The turbidity currents responsible have produced easterly trending groove casts on the soles of the greywackes. Here possible confusion may arise between the two sets of linear features and care must be taken in identifying each.

Metamorphosed rocks of the Ashburton Formation are only known in a very small area in the Turee Creek Sheet area. They occur in Fords Creek immediately underlying Bangemall Group rocks. They consist of porphyroblastic plates of biotite sieved with abundant inclusions of quartz and minor chlorite and zircon set in a very fine-grained groundmass of quartz and muscovite. Abundant small subhedral to euhedral grains of blue-green tourmaline are present; their shape suggesting metamorphic growth rather than a detrital origin. In one sample porphyroblasts of andalusite are present.

The formation is cut by numerous quartz veins, some of which carry specular hematite and limonite and rarely tourmaline. Thin quartz-muscovite-andalusite veins are present in the Kennedy Creek region where cubes of limonite after pyrite occur in the host rock. Gold is known in some of the quartz veins near Ashburton Downs. Copper and lead mineralization is known in veins cutting Ashburton Formation south of the Capricorn Range.

North of Mt. Boggola an elongated uralitised basic mass shows an intrusive contact with the Ashburton Formation. Its texture is variable and is possibly locally agglomeratic.

Capricorn Formation

The Capricorn Formation is a well-banded series of shale, mudstone, sandstone, greywacke, dolomite, occasional pebble beds, and possible spherulitic rhyolites. It forms

high, long thin ridges with a southeasterly elongation and is named after the Capricorn Range immediately south of Ashburton Downs. It overlies Ashburton Formation with which it was previously grouped (Halligan and Daniels, 1964). No other formation overlies the Capricorn Formation in the Turee Creek Sheet area.

The exact status of this formation is open to discussion since its junction with the Ashburton Formation is not yet fully known. In most cases the junction appears to be conformable, although local disconformities or unconformities have been noticed. It is at present regarded as a formation of the Wyloo Group.

It is unconformably overlain by the Bangemall Group in the Edmund Sheet area. Its relation to the Bresnahan Group is not known with certainty as the two are developed in different regions of the Turee Creek Sheet area. It is regarded as older than the Bresnahan Group and pre-Ophthalmian folding on account of the more intense folding that the Capricorn Formation has undergone.

Its total thickness is unknown. In the Capricorn Range, south of Ashburton Downs homestead, an incomplete section of approximately 350 feet is present.

Sedimentary structures are well developed. They include ripple marks, cross bedding, groove casts, flute casts, load casts, and 'ball and pillow' structures. Dessication cracks associated with ripple marked sandstone has also been seen. Palaeocurrent measurements indicate the presence of two directions of currents: one from the northwest and the other from the north or north-northeast. The deposit is thought to have been formed in a shallow water environment and subjected to occasional periods of uplift above sea level and consequent dessication.

BRESNAHAN GROUP

After folding and erosion to a peneplain of the Mt. Bruce Supergroup, arenaceous sediments of the Bresnahan Group were deposited.

Apart from the small outliers near Mt. Boggola, Bresnahan Group rocks are restricted to the southeastern portion of the Sheet area. The group unconformably overlies Duck Creek Dolomite and Ashburton Formation in the Kennedy Creek region. The northern boundary, though not exposed, is thought to be faulted with Bresnahan Group sediments down-faulted against formations of the Wyloo Group.

It is subdivided into two formations.

Cherrybooka Conglomerate

The Cherrybooka Conglomerate, the basal unit, is approximately 400 feet thick at Mt. Bresnahan, but thins rapidly to the east. Between the Kennedy Creek and Angelo River the conglomerate is approximately 30 feet thick. A similar thickness is present at Mt. Boggola. It is well exposed at Mt. Bresnahan, where it forms impressive rounded slopes. Exfoliation sheets, several feet thick, are a feature of the slopes. At this locality the formation consists of a thick poorly banded accumulation of boulders up to 2 feet diameter. Rock types include vein quartz, grey, white, and mauve quartzite frequently showing current bedding; conglomerate possibly derived from the Beasley River Quartzite; and occasional fine-grained tourmaline or tourmaline-quartz rock. The matrix is poorly sorted, generally mauve, and carries much mica.

Kunderong Sandstone

The upper formation, the Kunderong Sandstone, is a well-banded, current-bedded arkose or feldspathic sandstone forming rounded hills of moderate relief. The hill slopes are

covered by loose flagstones. Secondary silicification is noticeable on the upper slopes. The formation is identical to and continuous with that described in more detail from the Newman Sheet area (Daniels and MacLeod, 1965), where it attains its maximum development.

Rare dolerite dykes cut the Bresnahan Group but no basic sheets are present, in contrast to the area immediately east in the Newman Sheet area.

In the south, the group is overlain with marked angular unconformity by rocks of the Bangemall Group.

BANGEMALL GROUP

Bangemall Group rocks occupy a roughly triangular area of approximately 1,400 square miles in the southern and southwestern part of the Sheet area. The eastern extremity of the outcrop unconformably overlies the Bresnahan Group while the remainder is unconformable over Ashburton Formation. The unconformity has previously been referred to by Maitland (1919) as the Top Camp unconformity. It is especially well exposed along much of its length in the southwestern part of the Sheet area. Rocks of the Bangemall Group dip at low angles to the south and overlie tightly folded Ashburton Formation.

During the geological survey of the Turee Creek Sheet area the Bangemall Group was subdivided into three formations:

Top Kurabuka Formation

Fords Creek Shale

Top Camp Dolomite

More recent mapping of the Bangemall Group in the Edmund Sheet area has further subdivided the lowest formation into several units (Daniels, 1966). Although the name Top Camp Dolomite is now superceded, it is convenient to retain the name here, since so far, the more recent subdivisions have not been extended into the Turee Creek Sheet area.

Top Camp Dolomite

A detailed traverse up Fords Creek was undertaken by R. Halligan and a summary of the results are given in the following table:

Top	Thickness
Grey, buff and fawn shaly dolomite, dolomitic shale, minor dark blue-grey dolomite, and banded chert.	approx. 660 feet
Alternating pale grey, cream-weathering fine-grained dolomite, and red-brown weathering dolomite, which includes intraformational breccia beds one to four feet thick with fragments up to two feet long and oriented roughly parallel to bedding. The lower part of the section includes gritty and pebbly limestone (4-feet thick), shaly limestone, and chert (80 feet thick), underlain by brown weathering massive grey dolomite (10 feet thick).	approx. 660 feet
Medium to coarse brown-weathering quartz sandstone with well-developed slump structures (8 feet). White orthoquartzite (4 feet). Massive limestone (6 feet). Minor unconformity. Thin-bedded dolomite, dolomitic shale with some thin sandstone and chert bands. Interbedded, blocky to massive buff and grey weathering dolomite with <u>Collenia undosa</u> and fine-grained, buff, siliceous quartz sandstone. Dark grey to black shale at base.	approx. 1,100 feet total
Dolerite sill	660 feet
Interbedded, thin-bedded, pale fawn dolomite. fine to medium-grained siliceous quartz sandstone, and thick-bedded pale fawn dolomite with <u>Collenia undosa</u> . Minor shales each with grit band at base. Pea conglomerates and gritty beds make up the lowermost 20 feet of the sequence.	approx. 710 feet

Unconformity

Ashburton Formation

Briefly the Top Camp Dolomite consists of a series of interbedded dolomites (frequently algal), shales, sandstones, and cherts. They were probably largely deposited under shallow water conditions.

Fords Creek Shale

This formation comprises a 5,700 feet thick sequence of greenish brown shales and silty shales with thin interbedded mudstones, dark, fine-grained quartzites, and rare coarse orthoquartzites. The shales are greener and more

dolomitic towards the base; the sandstones become more frequent towards the top of the sequence. Thin coarse-grained dolerite sills are frequently encountered in the sequence.

Kurabuka Formation

This formation consists of white, medium-grained orthoquartzite with white and greenish shales and silty shales. The base of the formation consists of a 100 feet thick orthoquartzite which forms a prominent cliff feature and a useful mapping horizon. Several thick dolerite sills intrude the formation. About 600 feet of the Kurabuka Formation is present in the Turee Creek Sheet area where the top is not known.

CAINOZOIC

Cainozoic deposits of the Turee Creek Sheet area are subdivided into two broad divisions based on degree of lithification. An older group consists of pisolitic iron deposits, calcrete, and partially consolidated colluvium. The younger group comprises wind blown sand, unconsolidated colluvium, and river sand and gravel.

The pisolitic iron deposits are not well developed in the region and are not a likely source for much future iron ore. They occur as narrow outcrops of no great length and are confined to valleys draining Hamersley Group sediments. They closely resemble those of the Robe River, described by Harms and Morgan (1964). Some carry abundant fossil wood fragments and rare unaltered chert.

Large calcrete bodies occur in the Ashburton valley and many of its tributaries. In the Ashburton valley itself most of these bodies have been partially eroded to form extensive mesas exposing a thickness of some 150 feet of calcrete overlying a thin clayey sand with abundant small

rounded pebbles of jaspilite. Opaline silica frequently develops as patches in the calcrete. In most of the tributaries, especially the Angelo River, erosion has not proceeded to such an extent and the calcrete bodies are found with no greater relief than that of the surrounding Cainozoic deposits. They are also partially obscured by younger colluvium. Their relative age to the older, partly consolidated colluvium is not known but they could be lateral equivalents: the latter occupying the higher parts of the valley slopes and completely infilling the upper reaches. Much of this partly consolidated colluvium consists of jaspilite fragments.

Partly covering and to some extent flanking the Bresnahan Group in the southeast part of the Sheet area is a region of scattered wind blown sand deposits most probably derived from the arenaceous sediments of the Bresnahan Group.

The majority of the river beds are occupied by coarse gravels and to a lesser extent fine sands. Together with the adjacent unconsolidated colluvium they make excellent aquifers.

Flanking Mt. Bresnahan are large, partly consolidated scree deposits consisting of boulders and sands, weathered out of the Cherrybooka Conglomerate which makes up most of the hill. This scree is probably related in age to the partly consolidated colluvium elsewhere, and differs only in the source of the constituent fragments.

STRUCTURE

FOLDING

The central part of the Hamersley Iron Province is characterised by a series of domes and basins (MacLeod, 1966; Halligan and Daniels, 1964). The pattern is by no means regular and is not yet fully understood. However, the simplified history is that the Mt. Bruce Supergroup rocks have

been subjected firstly to the Ophthalmian folding and somewhat later to the Rocklean folding. The latter acted along roughly northeast trending lines, whereas the former produced fold axes tending to arc the Archaean of the Pilbara. The Ophthalmian folding increases in intensity southward. The Turee Creek Sheet area lies in this more intensely folded southern region.

In the Newman Sheet area (Daniels and MacLeod, 1965) the Ophthalmian fold axes have a general westerly trend. Continued into the Turee Creek Sheet area the fold trends are initially westerly but swing into west-northwesterly trends in the western part of the region.

The effects of the Rocklean folding can be seen particularly well with the production by interference with Ophthalmian folds of a dome approximately 40 miles northeast of Ashburton Downs homestead and a prominent synclinal structure, The Turee Creek Syncline, in the northeastern part of the Sheet area. On a smaller scale, dome and basin structures can be seen in many of the jaspilite structures.

Immediately northeast of the Turee Creek Syncline, an anticline in Brockman Iron Formation trends 292° to 295° and has a low plunge to the northwest. Pinch and swell structures, appearing as ripples on bedding planes are confined to the limbs of the fold. They are not present in the axial region where the beds are tightly folded. The orientation of the long axes of the ripples as well as that of the minor fold axes are parallel to the main fold axis. Outside the main axial region a greater spread is apparent. It is concluded that these pinch and swell structures have been produced by folding and are considered to be akin to boudinage structures. They are thought to be of a different origin from the 'regional ripples' seen in the less deformed area to the north near Wittenoom (Trendall, 1966).

In the Ashburton Formation, minor structures are

abundant and complex. Folded lineations have been measured in a number of places, but little consistency is forthcoming, though it is almost certain that a major fold axis extends down the Ashburton valley.

Rodding is common in shale near Mt. Blair, but abrupt variations in direction are common precluding any simple understanding of the structure.

In comparison with the Mt. Bruce Supergroup the structures displayed by the Bresnahan and Bangemall Groups are simple. The Bresnahan Group forms a faulted, northwest trending, broad anticline, eroded along its centre and exposing Ashburton Formation below. The Bangemall Group dips at low angles to the south. Folding increases in intensity to the southwest.

FAULTING

Faulting has affected all the Proterozoic Groups and the trends, together with those of the dolerite dykes which follow to some extent the faults, can be divided into three trends:

1. west northwest to northwest
2. northeast
3. arcs concave to east.

West northwest to northwest faults

Throughout most of the Sheet area, especially in the north and east, faults of this trend are common and form the dominant fault trend of the region. Erosion has frequently been rapid along these lines leaving a series of parallel trenches. Examples of these are especially common in the Brockman Iron Formation. Some, at least, are known to be occupied by dolerite, but exposures in these trenches are usually poor.

Strike faults, of this trend, in the Seven Mile

Creek region are probably in part responsible for some of the apparent thinning of the Hamersley and lower Wyloo Group sequence in that region.

Northeast faults

Northeast trending faults are not as common as the previous group but occur at intervals across the whole Sheet area. They are frequently occupied along considerable parts of their lengths by dolerite dykes. They are related to a Pilbara-wide system of northeast-trending structures described in detail elsewhere.

Arc faulting concave to east

A few curved faults and associated dykes occur in the Turee Creek Sheet area. The most noticeable can be traced intermittently from a point 8 miles southwest of Mt. Boggola, in an arc concave to the east, to the Seven Mile Creek area. It appears to be largely occupied by dolerite and has a radius of curvature of approximately 42 miles. Its centre of curvature lies near a point about 25 miles north-northeast of Mt. Bresnahan. Concentric with and 8 miles to the west of this arc is a partial arc of approximately 20 miles length. This shows on the map partly as a fault and partly as a dyke.

In the southeast of the Sheet area another arc, composed of aligned dykes and a fault has a radius of curvature of 90 miles. Its centre of curvature lies to the east-southeast of the Sheet area in the vicinity of Bulloo Downs homestead.

As for the northeast trending structures, these arcs are found intermittently over a large area of the Pilbara.

ECONOMIC GEOLOGY

GOLD

Gold was first discovered in the Ashburton valley

in 1890. Since then and until about 1945, alluvial and reef gold has been worked at several places near Ashburton Downs. Several thousand ounces of gold have been obtained from the district; some are from reefs, but the majority are from alluvial deposits.

'Soldier's Secret', on the Wandarry Creek, just below the unconformity between the Ashburton Formation and the Bangemall Group, is an alluvial deposit not now worked. Maitland (1909) records that the gold was found in gulleys in Ashburton Formation near where the formation is cut by several thick quartz reefs.

'Top Camp', on Fords Creek, is about 18 miles south east of 'Soldier's Secret' and is probably the locality of the original discovery of gold in the Ashburton valley. It is reported to have yielded several thousand ounces, but exact figures are not available. The gold was obtained from alluvium overlying Ashburton Formation cut by thin quartz veins, some of which are ferruginous.

Between 'Top Camp' and 'Soldier's Secret' alluvial workings are recorded on a map published by Talbot (1926).

A thin ferruginous vein, reported to assay 5 oz of gold per ton occurs in the dome structure approximately 44 miles east-northeast of Ashburton Downs.

Small nuggets of gold in quartz have been found within a few miles of Ashburton Downs, but the exact locality is not known.

The upper reaches of the Kennedy Creek and Cherrybooka Creek were suggested as likely areas for gold mineralisation by Talbot in 1926. He also suggested that the Mt. Bresnahan region be prospected for gold and based this on the reasonably similar nature of the Cherrybooka Conglomerate with the basal conglomerate at Nullagine, which has yielded gold. If the lithological similarity has any meaning, then the Cherrybooka Conglomerate should also be prospected for diamonds.

It appears that there are reasonable chances of finding small deposits of alluvial gold in many localities in the Ashburton valley.

COPPER AND LEAD

Several small copper-bearing quartz veins of about 3 or 4 feet average width occur cutting Ashburton and Capricorn Formations a few miles southeast and south-southeast of Ashburton Downs. A description of these is given by Low (1963). Minerals identified include malachite, chalcocite, and a little chalcopyrite and barite. Some lead minerals are known in similar deposits a few miles to the west in the Edmund Sheet area and it is not unlikely that they also occur in these veins. Only a few tons of ore have been obtained from these deposits. Low suggests that they might be worth drilling.

HEMATITE

Potentially economic hematite bodies are restricted to the Brockman Iron Formation where they occur towards the base of this unit in suitable structural environments (MacLeod, 1966).

A number of small hematite bodies occur in the Seven Mile Creek region. Halligan estimates that they range in size from 50,000 tons per foot depth to 3,000,000 tons per foot depth. No depth figures can be given for these deposits as no drilling has been undertaken. The largest is thought to contain a minimum of 100,000,000 tons of high-grade hematite.

Another moderately large deposit of hematite occurs on the junction of Turee Creek Sheet area and the Newman Sheet area at approximately $23^{\circ} 09' S$ latitude and $118^{\circ} 30' E$ longitude. The quality of this could be marred by the presence of some infolded banded iron formation bands.

A few hematite enrichments are found in the Marra Mamba Iron Formation but are too small to be of economic value.

The area holds good promise for the discovery of further iron ore deposits though with the large amount already available from the Mt. Bruce and Newman Sheet areas it will probably be a long while before further prospecting will be considered necessary.

LIMONITE

The Robe Pisolite is not sufficiently well developed anywhere in the Sheet area to be of economic interest.

ASBESTOS

A small amount of crocidolite was found by J. Blockley at Fish Pool. It occurs as a thin seam with maximum thickness of between a quarter and half an inch, in the middle of the Brockman Iron Formation.

The area appears unlikely to possess any asbestos deposits of reasonable size.

WATER

The Ashburton River is generally non-perennial and after seasonal floods breaks up into a series of pools, some of which are apparently permanent. Permanent pools exist on some of the tributaries of the Ashburton River.

Underground water is generally obtained from near creeks, in alluvium, colluvium, and calcrete.

Ashburton Downs wells range from 20 to 80 feet in depth. Some of these have been deepened by the addition of a bore. Quality and yield are both generally good.

Mininer wells and bores tend to be of poorer quality than those of Ashburton Downs, while the yields are apparently similar.

Quality of wells in the northern part of the Sheet area tends to be good though the yields are only fair to poor.

A selection of typical underground supplies from the Turee Creek Sheet area is given in Table 2, and a list of bores and wells in Table 3.

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TABLE 1
TUREE CREEK 1:250,000 GEOLOGICAL SERIES
STRATIGRAPHIC COLUMN

Age	Group	Map Symbol	Formation	Lithology	Thickness (feet)	Remarks
Cainozoic	Quaternary			Alluvium Colluvium. Unconsolidated sand and gravel Wind blown sand		Good aquifer
	Tertiary					
Proterozoic	Bangemall					
	Bresnahan					
Proterozoic	Wylloo					

Age	Group	Map Symbol	Formation	Lithology	Thickness (feet)	Remarks
Proterozoic	Wylloo	Pwb	Cheela Springs Basalt Member	Amygdaloidal basalt	?	Member of Mt. McGrath Formation
		Pwq	Beasley River Quartzite	Coarse quartzite with some pebble beds	600	
		Pwt	Turee Creek Formation	Shale, greywacke, conglomerate, and dolomite	1,500	
	Hamersley	Pho	Boolgeeda Iron Formation	Ferruginous siltstone, banded iron formation, and shale	700	Intruded by dolerite sills Host for major hematite bodies
		Phw	Woongarra Volcanics	Rhyolite and dacite, often porphyritic	50-?1,000	
		Phj	Weeli Wollli Formation	Banded iron formation and some shale	1,200	
		Phb	Brockman Iron Formation	Banded iron formation, chert, and shale	app.2,000	
		Phs	(Mt. McRae Shale Mt. Sylvia Formation)	Shale, siltstone, dolomitic shale, and banded iron formation	300	
		Phd	Wittenoom Dolomite	Banded iron formation, shale, dolomitic shale	100	
		Phm	Marra Mamba Iron Formation	Dolomite with some shale and chert	?500	
	Fortescue	Pfj	Jeerinah Formation	Chert, banded iron formation, mudstone, quartzite, dolomite, and basalt	app.3,000	} Together known as Mt. Jope Volcanics
		Pfbu	Bunjinah Pillow Lava Member	Vesicular basalt. Frequently shows pillow structure		
		Pfbp	Pyradie Pyroclastic Member	Pyroclastic deposits and basalts		
		Pfbo	Boongal Pillow Lava Member	Basalt. Frequently shows pillow structure		

Age	Group	Map Symbol	Formation	Lithology	Thickness (feet)	Remarks
	Fortescue	Pfh Pfhb	Hardey Sandstone	Sandstone and conglomerate Basalt members in Hardey Sandstone		
Proterozoic		a b		INTRUSIVE ROCKS Dolerite in dykes Dolerite sills		Age uncertain. Some cut Bangemall Group. Probably several ages. Intrusive into Mt. Bruce Supergroup and Bangemall Group

* This formation name is superceded. See p.17.

TABLE 2

TYPICAL UNDERGROUND WATER SUPPLIES, TUREE CREEK

Name	Total Depth (feet)	Water Level (feet)	Quality	Yield (gph)
<u>Ashburton Downs</u>				
<u>Station</u>				
No. 1B	48.5	16	good	good
No. 4W	72.5	10	v. good	good
No. 7W	40	10	stock	300
No. 18B	59	23	good	600
<u>Rocklea Station</u>				
Billie Camp W	70	-	good	poor
Jupiter W	80	-	good	fair
5 Mile W	25	-	good	fair
<u>Mininer Station</u>				
M1	130	100	fair	600+
M7	186	120	good	500

TABLE 3

TURKE CREEK BORES AND WELLS

Map No.	Name	Total Depth (feet)	Water Level (feet)	Quality (ppm)	Yield (gph)
	<u>Ashburton Downs Stn.</u>				
A 1	No. 29B			good	good
A 2	No. 28B			"	"
A 3	No. 2W	app. 30		v. good	"
A 4	No. 16W	20	14	"	"
A 5	No. 1B	48.5	16	good	"
A 6	No. 30B	?150		"	"
A 7	No. 13B				
A 8	No. 3W	40		v. poor	poor
A 9	No. 17B	148	98	stock	270
A10	No. 44B	81	20	poor	good
A11	No. 32B	254	79	stock	"
A12	No. 21B	119	52	10,740	280
A13	W				
A14	No. 6B	115.5	77.5	v. good	400
A15	No. 4W	72.5	10	"	good
A16	No. 38W	60		stock	600
A17	No. 7W	40	10	"	300
A18	No. 45B	120		3,020	good
A19	Shearing Shed B	80		2,860	"
A20	No. 43B	127	57	good	"
A21	No. 22B	108	51	v. poor	"
A22	No. 8W	42	11	v. good	"
A23	No. 32B	254	79	stock	"
A24	No. 10W	64	26.5	good	250
A25	Pirraburdu W			"	poor
A26	10 Mile W	35		"	fair
A27	No. 9B	64	36	"	good
A28	No. 36B	84	30	v. good	600
A29	No. 11W	25		"	good
A30	No. 42B				
A31	No. 18B	59	23	good	600
A32	No. 26B	200	37	"	good
A33	No. 14W				
A34	No. 23B			good	good
A35	No. 12W	84	18	"	"
	<u>Wyloo Stn.</u>				
W 1	Success B				

Map No.	Name	Total Depth (feet)	Water Level (feet)	Quality (ppm)	Yield (gph)
	<u>Rocklea Stn.</u>				
R 1	Cairn Hill W	50		good	poor
R 2	Bundella W	50		good	
R 3	Wona W				
R 4	Billie Camp W	70		good	poor
R 5	Muchamary W	80		good	good
R 6	Jenener W				
R 7	Moonma W				
R 8	Binyarry W			good	poor
R 9	White W			"	v. poor
R10	Southern Cross W			"	poor
R11	Jupiter W	80		"	fair
R12	Gobo W	80		"	"
R13	Minga W	40		"	v. poor
R14	Warri W				dry
R15	Chalk W	45		fair	fair
R16	5 Mile W	25		good	"
	<u>Turee Creek Stn.</u>				
T 1	Boolberra T				
T 2	Babbabarin-yina T				
T 3	Kennedy W				
	<u>Mt. Vernon Stn.</u>				
V 1	Edward W				
V 2	Tollerang B				
V 3	Pingandi W				
	<u>Mininer Stn.</u>				
M 1	M 1	130	100	fair	600+
M 2	M 2		3	"	"
M 4	M 4	60		v. poor	
M 5	M 5	165	50	v. poor	aban-
M 6	M 6				doned
M 7	M 7	186	120	good	500
M 8	M 8	130	100	v. poor	aban-
M 9	M 9	60	35	good	doned
M10	M10	87	65	"	v. good
M12	M12	45		v. poor	600
M14	M14	35	25	"	aban-
	<u>Dooley Downs Stn.</u>				
D 1	White Hills W				doned

Map No.	Name	Total Depth (feet)	Water Level (feet)	Quality (ppm)	Yield (gph)
	<u>Juna Downs</u> <u>Stn.</u>				
J 1	Balgara W				
J 2	Brian W				
J 3	O'Brien W				
J 4	W				
J 5	Divide W				
	<u>Open Country</u>				
G 1	Woolongona W				
G 2	Bukardi W				
G 3	W				

Notes: ppm = parts per million
gph = gallons per hour
v. poor = very poor
v. good = very good

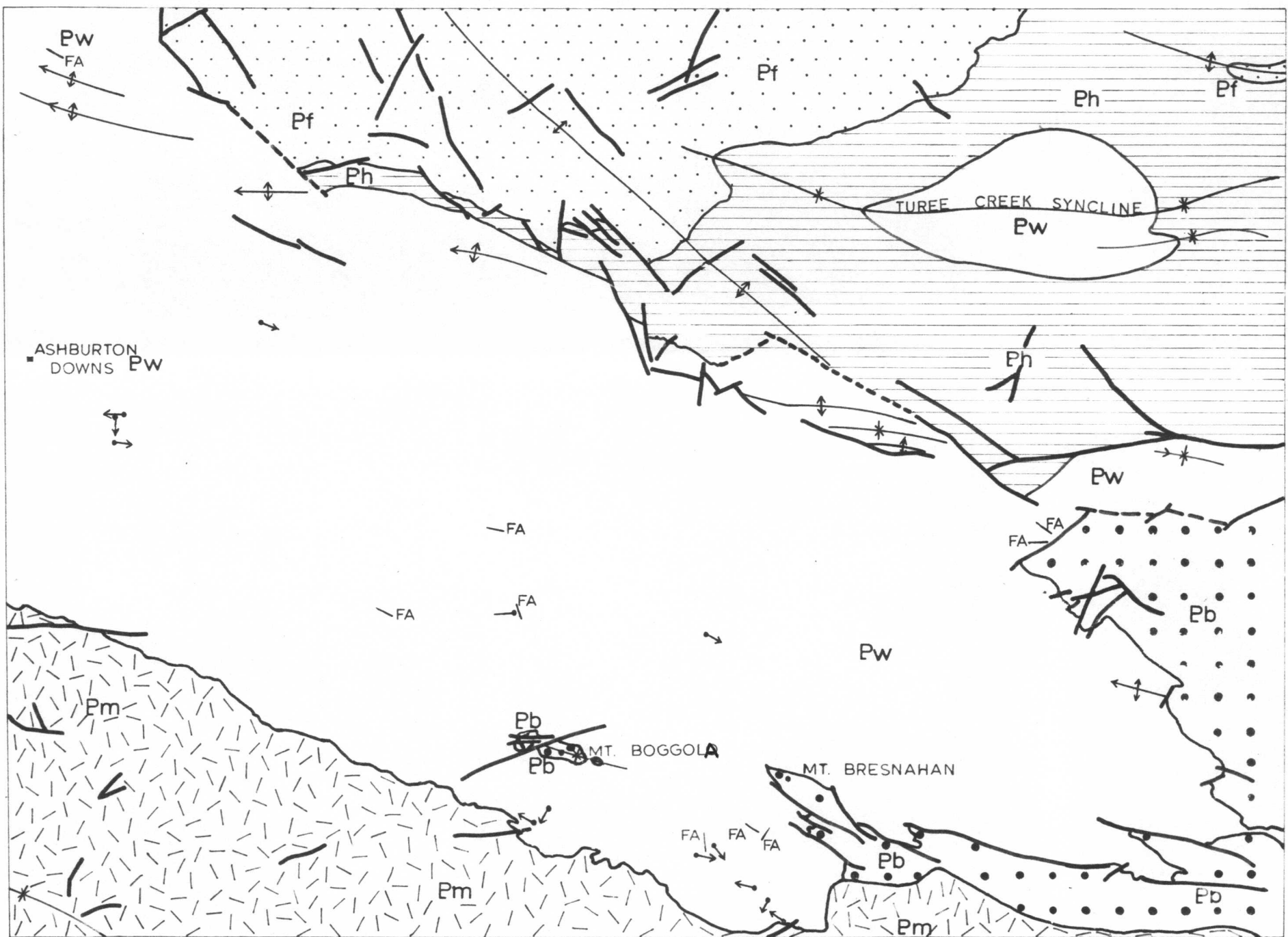


FIGURE 1

STRUCTURAL SKETCH MAP TUREE CREEK SHEET SF50-15

SCALE OF MILES



REFERENCE

PROTEROZOIC		Bangemall Group
		Unconformity
		Bresnahan Group
		Unconformity
		Wyloo Group
		Hamersley Group
		Fortescue Group

	Geological boundary
	Fault
	Anticline
	Syncline
	Minor fold axis
	Pitch of fold
	Lineation

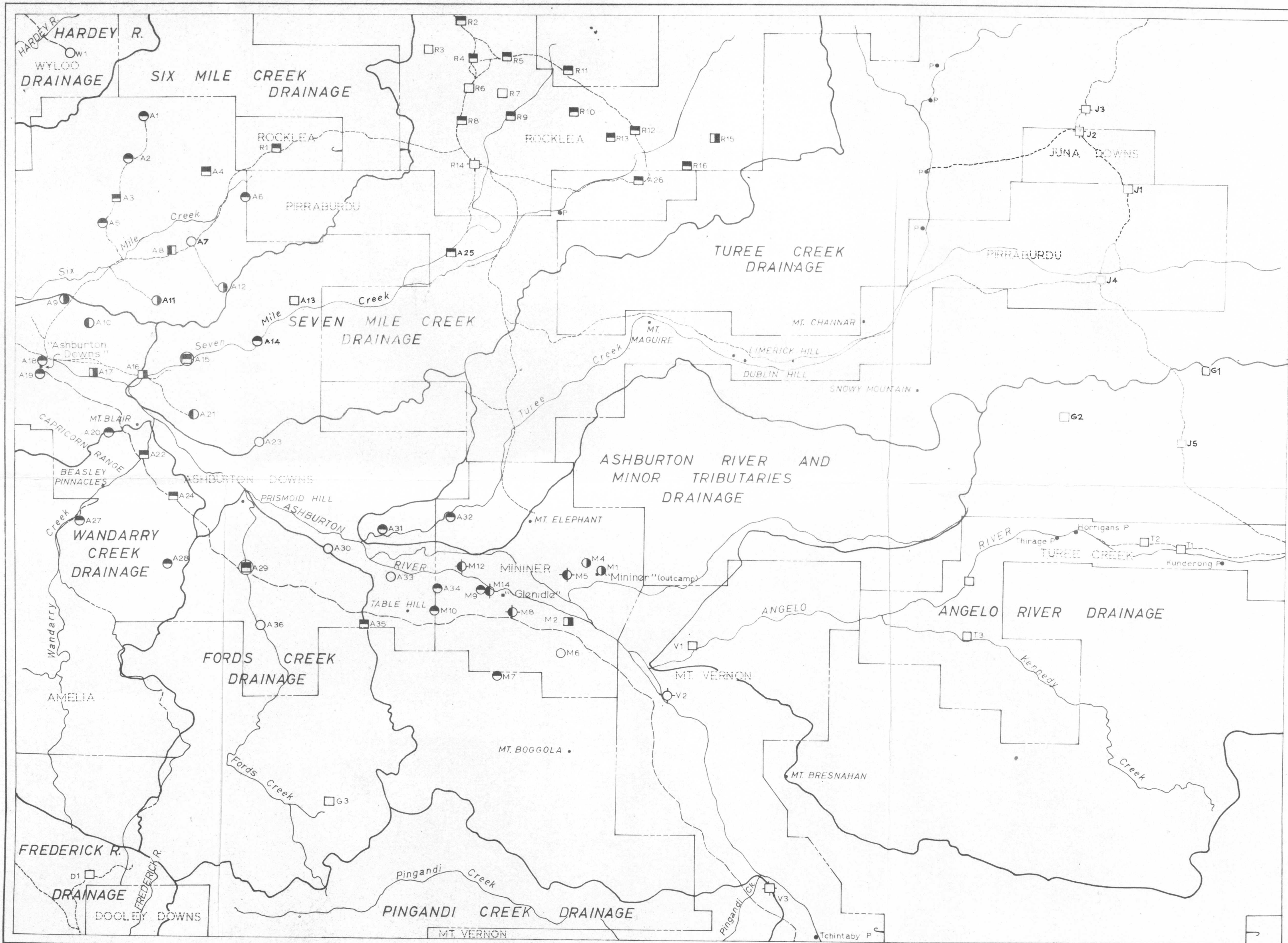
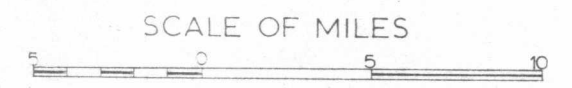


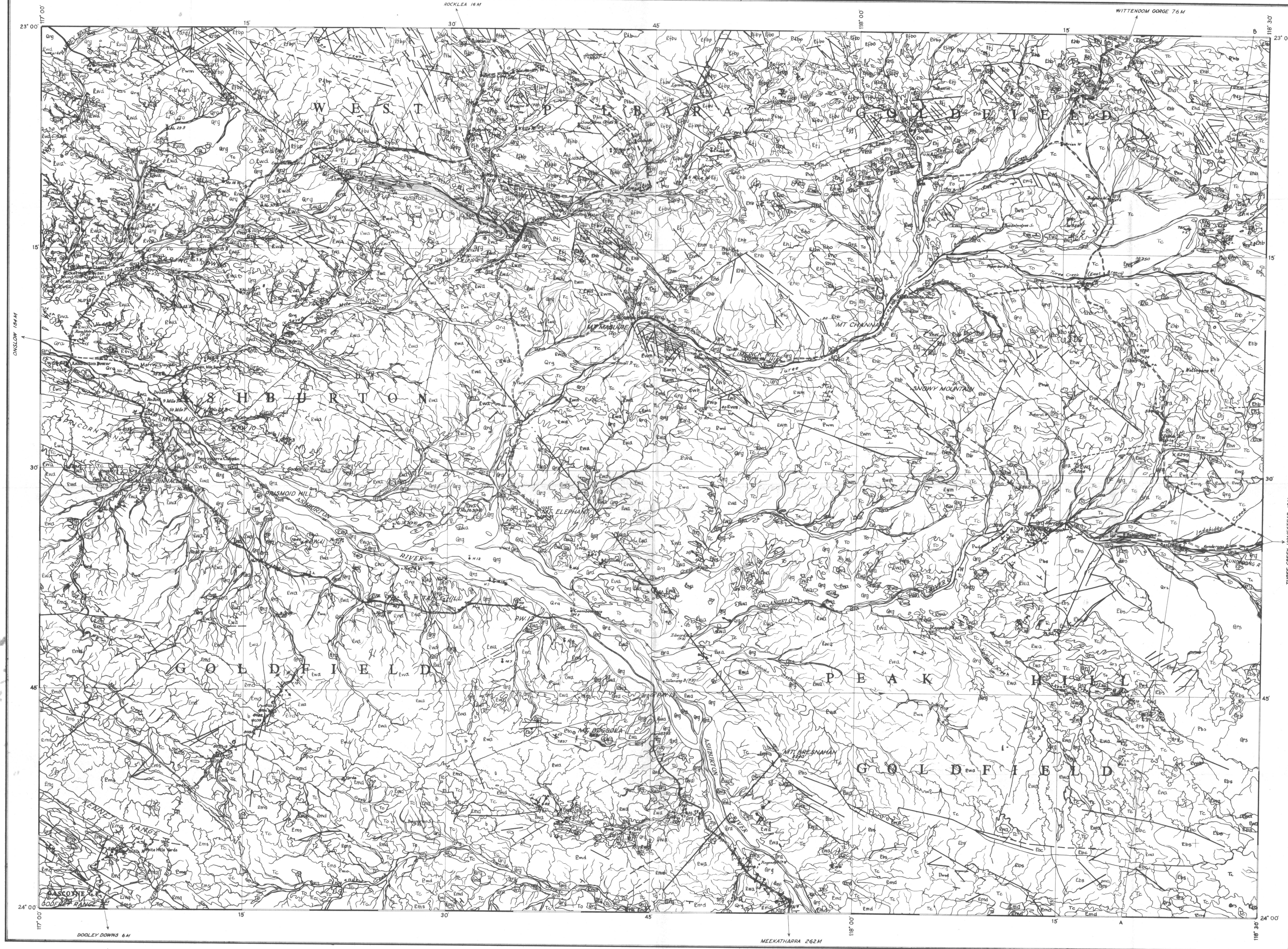
FIGURE 2
DRAINAGE PROVINCES
AND
WATER SUPPLIES
TUREE CREEK SHEET SF 50-15



REFERENCE

Main road	—
Roads and tracks	---
Station boundary	----
Homestead	■
Hill	•
Drainage province boundary	—
Stream (non-perennial)	~
Pool	• P
Well - quality not specified	□
quality potable	■
quality stock	■
quality saline	■
deepened by bore	■
abandoned	■
Bore - quality not specified	○
quality potable	○
quality stock	○
quality saline	○
abandoned	○

Note: Details for wells and bores shown on this sheet are available at the Geological Survey of Western Australia.



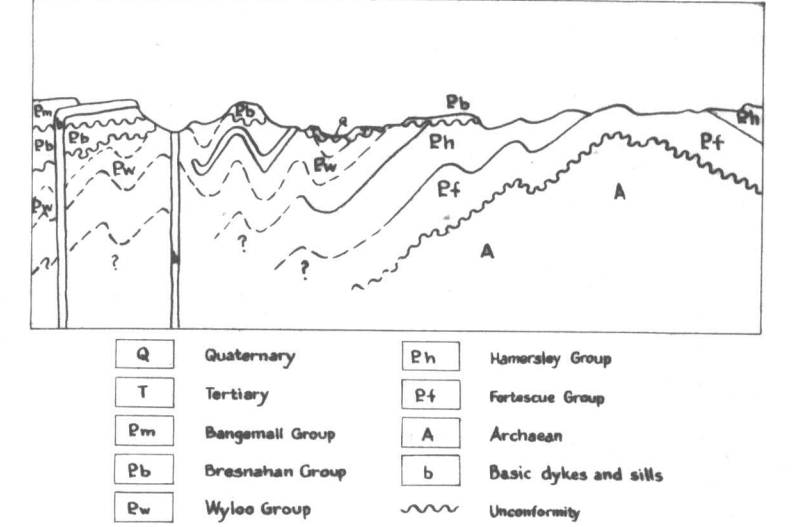
SYMBOLS

Geological boundary	---
Fault	---
Fault probable	- - - -
Fault concealed	---
Fault with downthrown side indicated	---
Anticline axis	+
Synclinal axis	+
Concealed synclinal axis	+
Joint	---
Strike and dip of bedding	---
Bedding horizontal	---
Bedding vertical	---
Bedding over-turned	---
Cleavage inclined	---
Cleavage vertical	---
Lineation	---
Mineral field area	---
Trend line	---
Fault locality	---
Goldfield boundary	---
Formed road	---
Track	---
Homestead	---
Yard	---
Landing ground	---
Well or bore with windpump	---
Well	---
Bore	---
Spring	---
Pit	---
Watercourse (non perennial)	---
Perennial channel	---
Topographical station	---
Topographical station, minor	---
Spot height	---
Mineral occurrence	---
Gold	---
Copper	---

REFERENCE

QUATERNARY	Qv	Alluvium
	Qs	Diffusion - Superficial, unconsolidated sand and gravel
	Qd	Wind blown sand
TERTIARY	Tc	Colluvium - Partly consolidated valley fill. Some boulder beds
	Ts	Calcrete - Limestone and calcareous gravel. Locally opaline silica
	Tp	Limestone - Limestone, often fossiliferous; carries fossil wood fragments
	Th	Hametite - Hametite deposits, including camps. Mostly residual on SHOOKMAN IRON FORMATION. Contains iron ore
MIDDLE AND UPPER PROTEROZOIC	Pm	KURABUKA FORMATION: Sandstone, silty shale and shale
	Pw	FORDE CREEK SHALE: Greenish shale with some greywacke and chert
	Pd	TOP CAMP DOLOMITE: Undifferentiated unit of dolomite, sandstone, shale and chert
LOWER AND MIDDLE PROTEROZOIC	Pbs	RUBBERBONG SANDSTONE: Thin-bedded, current-bedded sandstone, quartzite and aliose
	Pbc	CHERRYBROOK CONGLOMERATE: Coarse conglomerate with this sandstone bands
WYLOO GROUP	Pw	CAPRICORN FORMATION: Sandstone, greywacke, dolomite and shale
	Pw	ASHBURTON FORMATION: Shale and greywacke
	Pw	SHOCK CREEK DOLOMITE: Grey, cream-weathering dolomite. Contains Stromatolite
	Pw	MT. MURTHY FORMATION: Sandstone, siltstone, conglomerate and shale
	Pw	Chertia Springs Basalt Member: Angular basalt
	Pw	REARLEY RIVER QUARTZITE: White, medium to coarse grained quartzite with some pebble beds
	Pw	TUREE CREEK FORMATION: Shale, greywacke, conglomerate and dolomite
	Pw	WODJEDRA IRON FORMATION: Purple, ferruginous, flaggy siltstone, jaspilite and shale
	Pw	WODJEDRA VOLCANIC ROCKS: Rhyolite and dacite flows, often porphyritic. Some agglomerate
	Pw	WELL WOLLI FORMATION: Banded jaspilite and some shale. Intruded by granite sills
	Pw	SHOOKMAN IRON FORMATION: Banded jaspilite and chert with some shale and dolomite
	Pw	MT. MURTHY SHALE: Purple, silty shale, dolomite, shale and some jaspilite. Division includes MT. SYLVIA FORMATION: Three thin jaspilite beds and dolomite shale
	Pw	WITTENOOM DOLOMITE: Grey dolomite with some chert and shale
	Pw	MARRA MARRA IRON FORMATION: Chert and jaspilite with some shale
	Pw	JERRAH FORMATION: Shale, chert, jaspilite, mudstone, quartzite and dolomite. Intruded by granite sills
	Pw	Bunimah Pillow Lava Member: Pyroclastic deposits
	Pw	Pyralite Pyroclastic Member: Pyroclastic deposits
	Pw	Boongal Pillow Lava Member: Basalt
	Pw	HARVEY SANDSTONE: Sandstone and conglomerate
	Pw	Medium grained basalt
INTRUSIVE ROCKS		
	b	Dolerite sills, somewhat transgressive
	d	Dolerite dykes
	q	Quartz veins

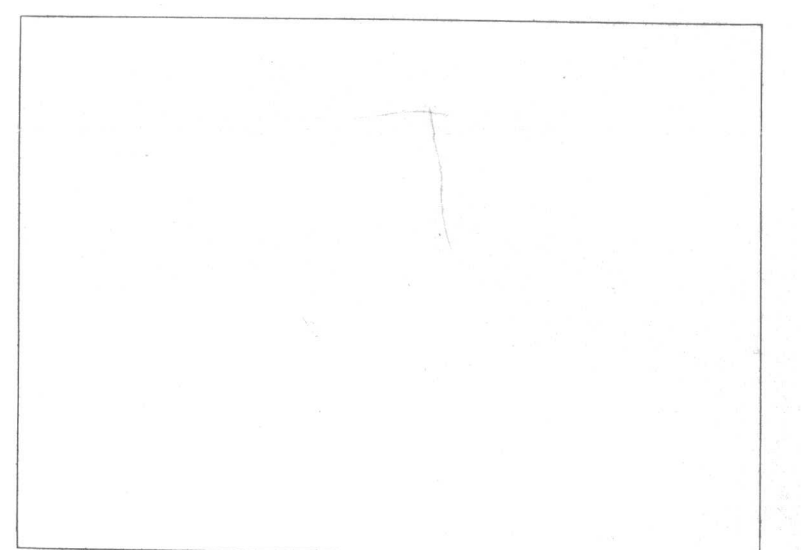
DIAGRAMMATIC RELATIONSHIP OF ROCK UNITS



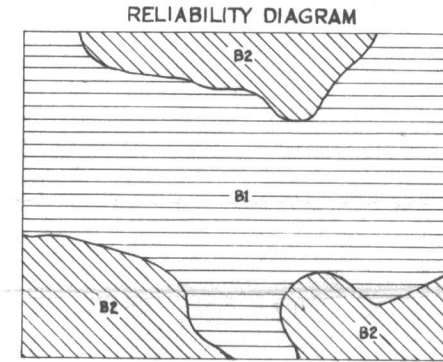
DECLINATION DIAGRAM



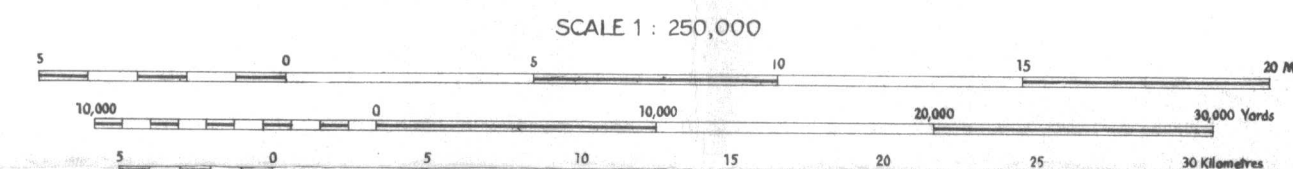
FLIGHT DIAGRAM



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Copies of this map may be obtained in Perth from the Geological Survey of Western Australia or the Bureau of Mineral Resources, Geology and Geophysics in Canberra, A.C.T.



BI Numerous traverses with air photo interpretation
BE Air photo interpretation with a few traverses

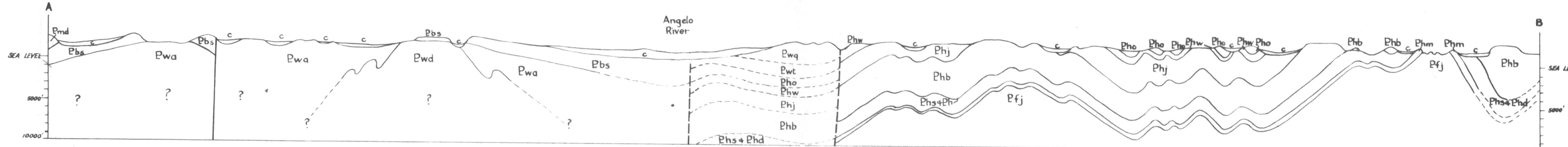


TRANSVERSE MERCATOR PROJECTION
ZONE 1 AUSTRALIA SERIES

INDEX TO ADJOINING SHEETS

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DIAGRAMMATIC SECTION A - B
SCALE 1:25,000



Undifferentiated (ZAKOZOC)