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EXPLANATORY NOTES TO THE CLARKE RIVER 4-MILE SHEET

Compiled by

D. A. White

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INTRODUCTION

The Clarke River 4-mile Sheet area is bounded by longitudes 144° 0' and 145° 30', and by latitudes 19° 0' and 20° 0'; the central region of the sheet is about 140 miles west of Townsville in North Queensland.

The map, which these notes accompany, is the result of regional geological mapping in 1956, 1957 and 1958 by a combined party of the Bureau of Mineral Resources and the Geological Survey of Queensland.

Maps and aerial photographs covering the Clarke River Sheet area are:-

Photographs flown by the R.A.A.F. at a scale of 1:43,000;

Photo-mosaic map (4 miles to 1 inch) prepared by and obtained from the Division of National Mapping, Canberra;

Photo-maps at 1 mile to 1 inch; dyeline maps controlled by slotted template assembly (at air-photo scale, about 1 mile to 1¼ inches) with principal points and topography;

And 4 mile to 1 inch planimetric maps prepared by the A.H.Q. Cartographic Company in 1942 and the Royal Australian Survey Corps in 1957, and supplied by the Division of National Mapping, Canberra.

The following information was obtained from the Atlas of Australian Resources prepared by the Division of Regional Development, Department of National Mapping, Canberra.

Most of the Clarke River sheet is covered with mixed tropical woodland. The seasonal growth is restricted to the hot summer; the dry season extends from April to December. The average annual rainfall is 25 inches; January is the wettest month, when the average rainfall is 7 inches. The area has less than an average of 5 days per year of frosts. Normal mean winter (June, July, August) temperature is about 65°F. Normal mean summer (December, January, February) temperature is between 80°F and 85°F. The normal annual range of temperature is 50°F-60°F.; the average number of days per year when the temperature exceeds 100°F is 20.

PREVIOUS INVESTIGATIONS

There were few previous investigations. They dealt mainly with the Devonian limestones in the Broken River area, and with the Cainozoic basalts and mineral deposits.

After Daintree (1872) estimated that the Broken River sediments were 23,000 feet thick, Jack and Etheridge (1892) measured 20,782 feet of sediments in the Broken River; they also correlated the Broken River limestones with the Middle Devonian Burdekin limestones. This correlation was later critically examined by Reid (1930).

Regional surveys on the Clarke River Sheet area began in 1953 and continued to 1958. In 1953 and 1954 the Land Research and Regional Survey Section, Commonwealth Scientific and Industrial Research Organization, surveyed the Leichhardt-Gilbert area for land use, and included the Clarke River Sheet in its south-eastern boundary. Some of the geological and physiographical results of this survey are recorded by Twidale (1956a, 1956b).

In 1955 the Bureau of Mineral Resources surveyed with airborne scintillograph equipment 2,400 square miles in the north-eastern part of the Clarke River 4-Mile Sheet area. The results are recorded by Parkinson and Mulder (1956). After this survey a combined geological party of the Bureau of Mineral Resources and the Geological Survey of Queensland in 1956 began to map the Clarke River Sheet area and to examine the radioactive anomalies discovered in 1955. The mapping was completed in 1958. These results are recorded by White & Hughes (1957), Green (1958), White, Best, et al. (1959), White, Stewart, et al. (1959), Branch (1959).

Dr. Dorothy Hill, University of Queensland, determined numerous corals from the Broken River and Clarke River areas that greatly assisted the mapping of the Siluro-Devonian succession. Dr. Hill's preliminary results are recorded by White & Hughes (1957), Hill (1958), White, Stewart et al. (1959), and White, Best, et al. (1959). Mary White (1949) determined plant fossils from the Upper Devonian and Carboniferous sediments.

In 1959 the Bureau of Mineral Resources tested chromite deposits in the Gray Creek area by gravity and magnetic surveys; at the same time the deposits were mapped by New Consolidated Goldfields Company (Clarke, 1959; Wilson, 1959). The geophysical results are recorded by Tate (1959).

PHYSIOGRAPHY

The physiographical units of the Clarke River 4-Mile Sheet area have been discussed by Twidale (1956), who in 1953 and 1954 accompanied the C.S.I.R.O. land-use survey of the Leichhardt/Gilbert area as a geomorphologist. These units are shown in Figure 1; they closely agree to Twidale's units, but in places the boundaries have been modified. The sheet area contains Uplands and Plains in the northern part and Plateaux separated by Uplands in the south.

The physiographical units are also geological units. For example: plateaux are generally confined to areas of Cainozoic basalt and Mesozoic sediment; extensive plains are formed on Precambrian granite; Uplands are generally restricted to areas of steeply dipping Palaeozoic sediments and in some areas restricted to Precambrian sediments and metamorphics.

Twidale has divided the Leichhardt/Gilbert area into 4 major physiographical units, which he named from west to east: the 'Isa Highlands'; the 'Carpentaria Plains'; the 'Inland Plains'; the 'Einasleigh Uplands'.

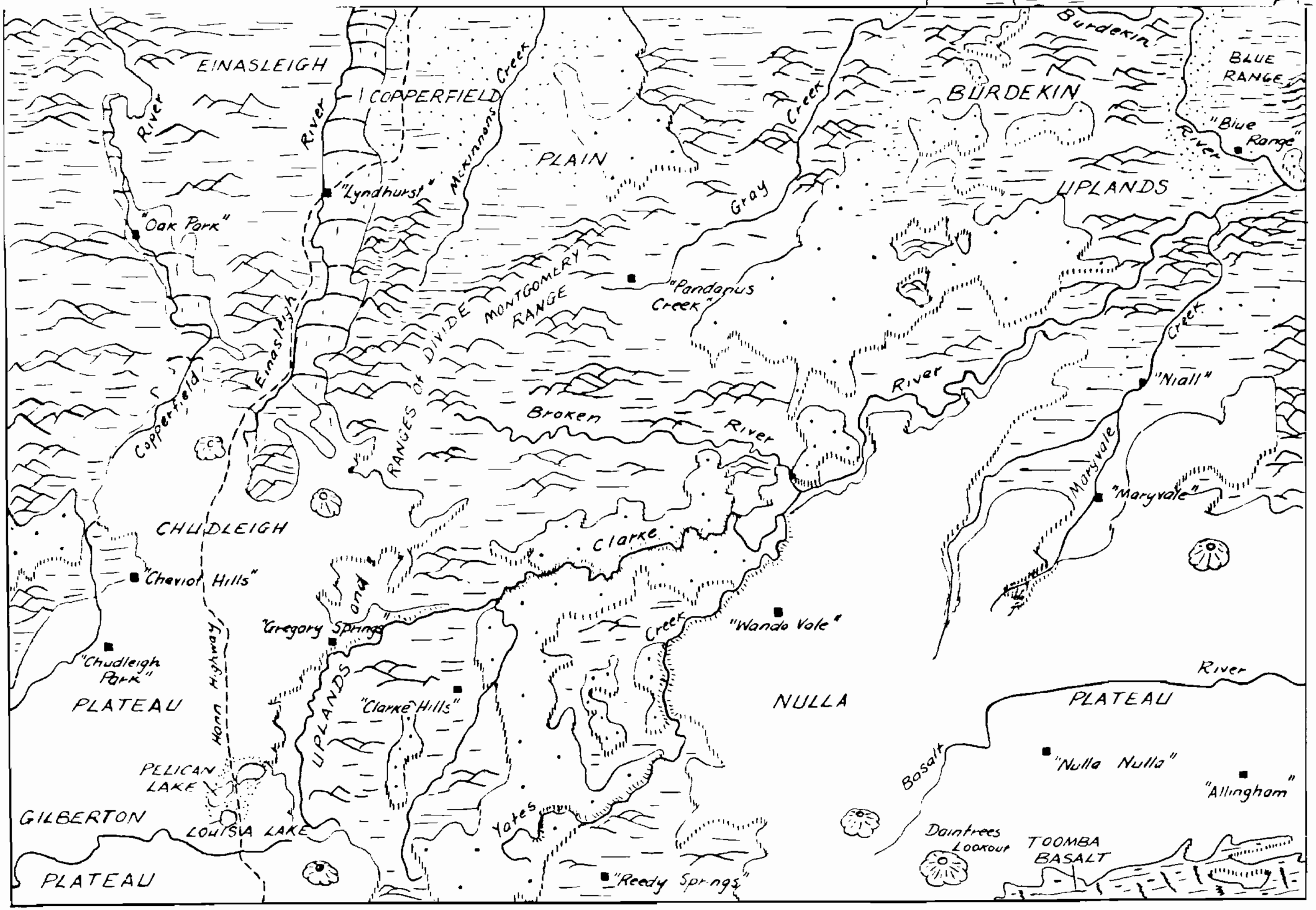


FIGURE 1. PHYSIOGRAPHICAL UNITS CLARKE RIVER 4-MILE SHEET

SCALE 12 MILES TO 1 INCH

The Einasleigh Uplands occupy 60,000 square miles of the eastern part of the Leichhardt area, of which 6,800 square miles is in the Clarke River Sheet area. The height of the Einasleigh Uplands ranges from 3,000 feet in the Dividing Range of the central western region to about 1,000 feet near the junction of the Clarke and the Burdekin Rivers in the north-eastern corner of the sheet. The Uplands are drained by the Copperfield and Einasleigh Rivers, that flow north before finally joining the Gilbert River, which enters the Gulf of Carpentaria; the Uplands are also drained by the Clarke River, that flows north-east and joins the Burdekin River to finally enter the South Pacific Ocean.

The Einasleigh Uplands have been subdivided by Twidale into 8 units:-

(i) the Uplands and Ranges of the Divide;
(ii) the Einasleigh-Copperfield Plain;
(iii) the Burdekin Uplands;
(iv) the Nulla Plateau;
(v) the Chudleigh Plateau;
(vi) the Gilberton Plateau;
(vii) the Newcastle Range;
(viii) the Cape Upland.

The Uplands and Ranges of the Divide form an arc in the central western region that extends for about 50 miles from near Gregory Springs Homestead north-east to the vicinity of Pandanus Homestead. The most rugged part of the Divide is the Montgomery Range, which consists of rhyolite porphyry and silicified quartz sediments. The altitude of the Divide gradually decreases from 2,500 feet in the Montgomery Range, to 1800 feet in the north, where it merges with the Einasleigh-Copperfield Plain.

The Einasleigh-Copperfield Plain occupies 900 square miles in the north. It is drained by the Einasleigh River, Copperfield River and Mckinnon Creek. The plain is covered with thick sandy soil derived from granitic rocks, with isolated uplands of Archaean metamorphics. This soil-covered plain is interrupted by two flows of basalt, that have been extruded from craters to the south on the Chudleigh Plateau, and have flowed down the Copperfield and Einasleigh Rivers. From the study of heights of lateritized plateaux, bevelled surfaces, and of ridge crests, Twidale (1956) showed that the Einasleigh-Copperfield Plain was a down-faulted part of a pre-middle Mesozoic surface of erosion. Along its eastern boundary the Einasleigh-Copperfield Plain merges into a plateau and forms part of the Great Dividing Range. Farther east the tributaries of Gray Creek have dissected the plain to form a rugged topography termed the 'Burdekin Uplands'.

<u>The Burdekin Uplands</u> occupy about 1,000 square miles between Gray Creek and the eastern boundary of the sheet area. The Uplands consist mainly of steeply-dipping Palaeozoic sediments and some basic igneous rocks, that are eroded into a monotonous pattern of hills and valleys; the altitude of the Uplands ranges from about 1600 feet to about 1100 feet near Blue Range Station on the Burdekin River. The Uplands contain an extensive sandy plain along the Burdekin River near its junction with the Clarke River.

The Blue Range is a prominent land mark along the eastern edge of the Burdekin Uplands and rises to an altitude of about 2,000 feet. The range consists of Carboniferous sandstone and conglomerate in a syncline. Dips are about 35 degrees towards the centre of the range but steeper along faulted edges.

<u>The Nulla Plateau</u> is the most extensive plateau on the Clarke River sheet area. It occupies about 1500 square miles between Clarke River and Yates Creek in the south-eastern part. Outliers of the plateau are exposed farther east between Yates Creek and the headwaters of Clarke River. The plateau consists of Cainozoic basalt flows

extruded from craters, many of which have been preserved as cone-shaped hills roughly 100 feet high. 'Daintrees Lookout' is the most conspicuous crater in the southern part of the plateau. The altitude of the Nulla Plateau ranges from 2,000 feet in the south to about 1,700 feet in the north; here its scarp has been eroded and so reduced in height by the Maryvale Creek and its tributaries that the plateau merges with the plains of the Burdekin Uplands.

The Nulla Plateau contains an area of rough basalt walls and ridges covered with little or no soil in the south-eastern corner of the sheet area. This area is confined to a recent flow of basalt named by Twidale (1956) as the "Toomba Basalt".

The Chudleigh Plateau like the Nulla Plateau consists of basalt flows extruded from several craters. Most of the craters are situated between Cheviot Hills Homestead and the Hann Highway (connecting Hughenden and Cairns); they are preserved in various stages of erosion. The Chudleigh Plateau is part of the Great Dividing Range and attains an altitude of 3,000 feet between Cheviot Hills and Gregory Springs Homesteads. The height of the plateau gradually descends north along two basalt flows, one in the Copperfield River and the other in the Einasleigh River. The Chudleigh Plateau merges to the east and south with the Gilberton Plateau, which consists of flat lying Mesozoic sediments covered with thick sandy soil.

STRATIGRAPHY AND PALAEONTOLOGY

Table 1 summarizes the stratigraphy and palaeontology. 34 rock units have been named according to the Australian Code of Stratigraphical Nomenclature. The units range from Archaean to Recent.

The ages of the granites are not precisely known. Until age determinations by radioactive measurements are obtained the ages of the granites are placed in the late

Precambrian and Upper Palaeozoic. The Upper Palaeozoic granites are further restricted to the Permian from evidence obtained in 1959 on the Atherton 4-mile Sheet farther north.

Numerous fossils have been found in the Palaeozoic succession. In particular, corals were abundant in the limestones of the Devonian Broken River Formation; graptolites were found for the first time in Queensland in the Wairuna Formation at the road crossing of the Broken River (White & Stewart, 1959); Rhacopteris and Lepidodendron plants were collected from the Carboniferous Bundock Creek and Clarke River Formations. The wide range of fossiliferous sediments has enabled us to date the intrusion of ultrabasics of the Gray Creek Complex as Lower Devonian.

STRUCTURE

Generally the structure of the Precambrian determines the shape of the area of Palaeozoic sedimentation and the subsequent deformation of the Palaeozoic sediments. For example: the north-east and north-north-east trends of the Palaeozoic conform to the Precambrian trends and to the faulted boundary between the Precambrian and Palaeozoic. Later folding and faulting of the Palaeozoic generally parallel the faulted Precambrian/Palaeozoic boundary.

Fold.

Precambrian. The trend of the fold axes of the Precambrian range from north-north-west in the western part of the sheet area, and north-east in the southern part of the area. The Archaean is intensely isoclinally-folded; the foliation dips from about 80 degrees to vertical. The P roterozoic sediments are moderatetly folded into open anticlines and synclines that plunge up to 40 degrees, and bedding dips from 50 to 90 degrees.

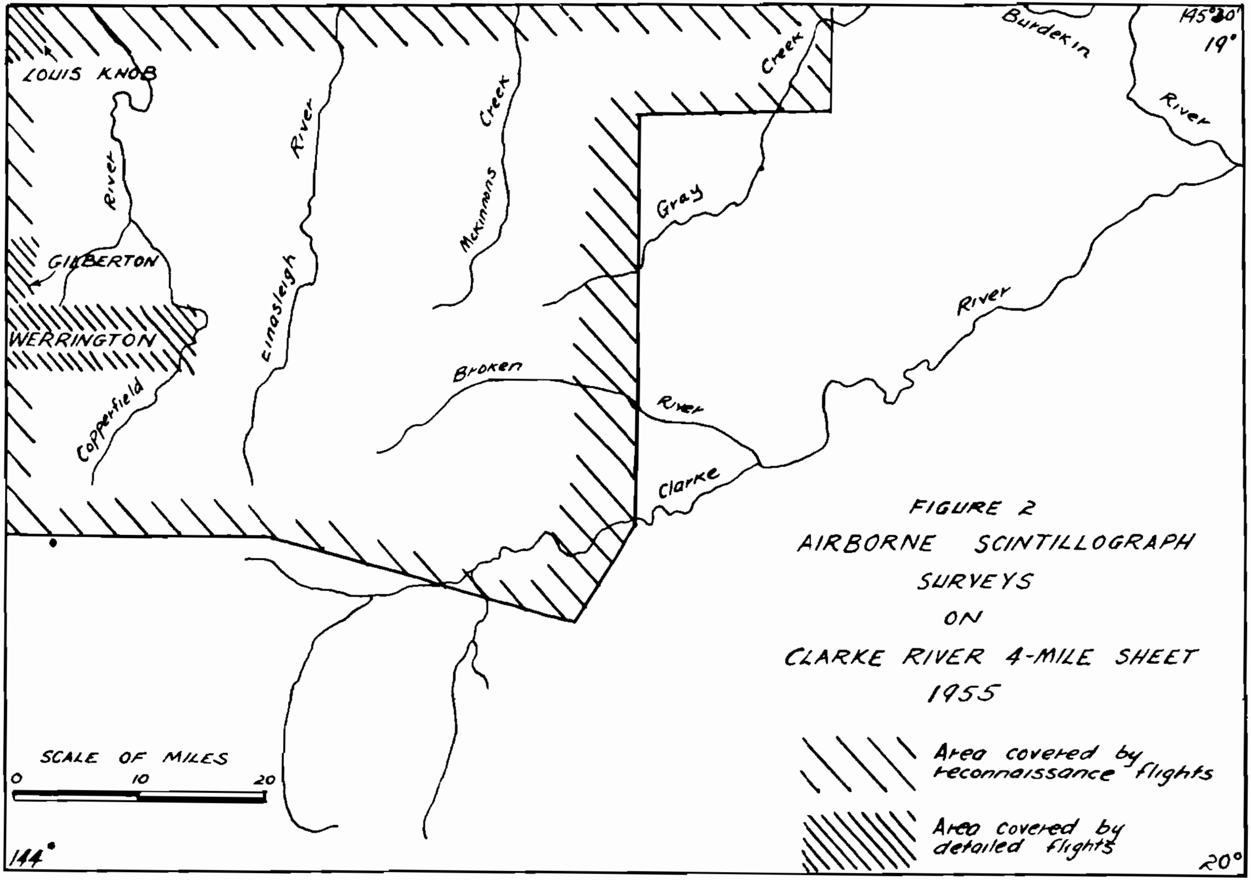


FIGURE 2
AIRBORNE SCINTILLOGRAPH SURVEYS ON CLARKE RIVER 4-MILE SHEET
1955

Palaeozoic. The folding of the Palaeozoic ranges from tight and isoclinal in the Silurian, through moderate open shallow plunging anticlines and synclines in the Devonian, to dome and basin folds in the Upper Devonian and and Carboniferous. The Upper Devonian/Carboniferous succession dips average about 35 degrees.

Fault

The Precambrian, Palaeozoic and Mesozoic successions are all faulted. Movement along the faults is mainly vertical with little to no horizontal component. Major faults separate the Precambrian and Palaeozoic areas of sedimentation. One of these faults coincides with the Clarke River; another fault conforms to part of the Great Dividing Range and trends north-east. Faults also separate the Carboniferous basins of sedimentation from the Siluro-Devonian areas; one of these faults trend north-north-east along the eastern valley of Gray Creek.

The alignment of volcanic craters on the Chudleigh Basalt Plateau parallel to, and in places coincident with, the major faults along the Precambrian/Palaeozoic boundary, suggests that these faults were rejuvenated in the Cainozoic.

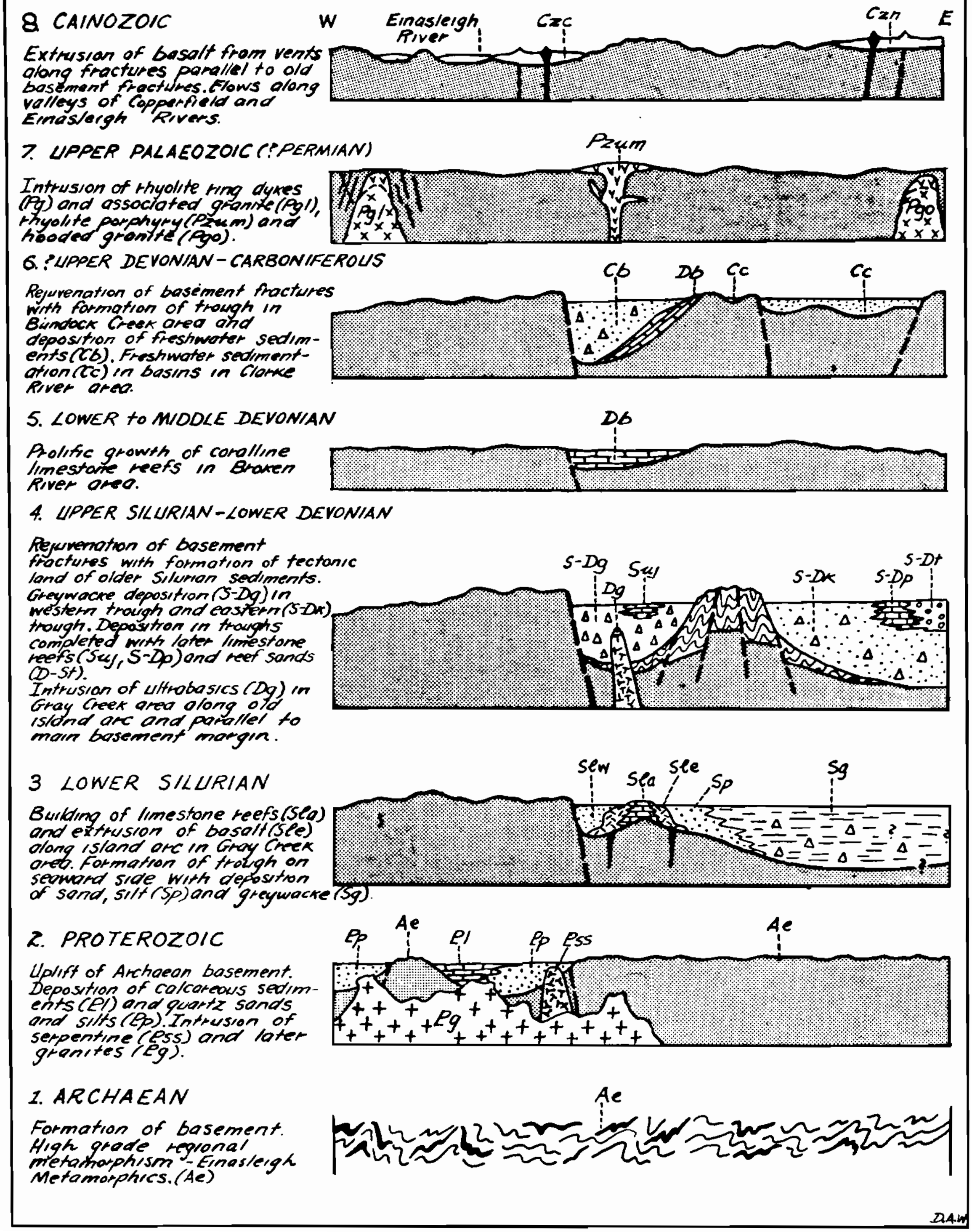
Joints

A system of closely spaced north-east and north-west joints is well exposed in the Upper Palaeozoic granite and rhyolite, particularly the Montgomery Range Rhyolite Porphyry and the Lochaber Granite. Among the Precambrian granites, the Dumbano Granite is the most jointed.

GEOPHYSICAL SURVEYS

In 1955 airborne scintillograph surveys of about 2,100 square miles of the Clarke River sheet area were carried out by the Bureau of Mineral Resources using D.C.3 and Auster aircraft. After the initial reconnaissance flying at 500 feet and inspection of the anomalies, areas were selected and re-flown at an altitude of 100 and 200 feet.

FIGURE 3. TECTONIC HISTORY CLARKE RIVER 4-MILE SHEET



The selected areas and the area covered by the initial reconnaissance flying is shown in Figure 2. The results of the airborne survey are reported by Parkinson & Mulder (1956). The airborne anomalies were later examined on the ground and reported by White & Hughes (1957).

TECTONIC HISTORY

Figure 3 summarizes the tectonic history of the Clarke River 4-mile Sheet area.

ECONOMIC GEOLOGY

Wolfram and Molybdenite

Wolfram and Molybdenite have been extracted from a quartz reef exposed in the Lochaber Granite about 14 miles south of Kidston (Einasleigh 4-mile Sheet) in the north-western corner of the sheet area. Saint-Smith (1915) has described the workings (the Perserverance Mine, locally known as the Lochaber Mine). The reef was discovered in 1905. It occupies a north-east joint in the Lochaber Granite and dips steeply to the north-west. The reef is 700 feet long, ranges from 1 to 2 feet wide, and developed to a maximum depth of 30 feet; the mineralized part of the reef is about 300 feet long, averages 1 to 2 feet wide, and is a maximum of 30 feet deep. Molybdenite is exposed in the main line of the reef as thin parallel vertically dipping seams through the quartz. The best molybdenite values are obtained in the deepest part of the workings. Some pyrite and fluorite are with the wolfram and molybdenite. Production figures from the Perserverance Mine have not been recorded.

Wolfram has been mined near the Gordon Stanley Copper mine, 8 miles south-west of Werrington Homestead near the western margin of the sheet area. The wolfram is in quartz veins in the Precambrian Dumbano Granite and near its contact with the sediments of the Paddys Creek Formation.

Gold

Gold has been mined from the Lucky Creek Goldfield situated near the headwaters of Lucky Creek, which is a tributary of the Burdekin River in the northern part of the sheet area. The gold is in lenticular quartz reefs that conform to the bedding of steeply-dipping sediments of the Lucky Creek Formation. Gold mineralization occupied a length of 1,000 feet and a width ranging from 8 inches to 2 feet. The deepest mine was the "Try Again", which was worked to a depth of 115 feet. Production reached a peak in 1907, when about 250 tons of ore was mined to yield an average of 2 ozs. Au per ton.

Antimony

Antimony has been mined from two localities in the Broken River region in the central part of the sheet area. The first locality is near the confluence of Dosey Creek and the Broken River. A shaft 40 feet deep has been sunk on a fissure vein of unknown width. From 1894 to 1941 20 tons of ore averaging 58 per cent of stibnite have been mined from the vein.

The second locality is 4 miles north-east of Pandanus Homestead. The antimony veins dip steeply in greywacke of the Graveyard Creek Formation and are exposed along a length of 155 feet, to a depth of 8 to 13 feet, and a width of 3 to 12 inches. The antimony ore is mixed cervantite and stibnite. Production in 1944 was about 15 tons assaying 58.2 per cent Sb and 0.2 per cent As.

Chromium

Chromite is exposed in the eastern valley of Gray Creek 15 miles north-east of Pandanus Homestead. The chromite is lenticular and dips steeply; it occupies a 45 feet-wide zone between the contact of gabbro and serpentine of the Devonian Gray Creek Complex. Chromite crops out in two areas.

(i) the southern area; this is the largest area and contains chromite mineralization over a length of 1800 feet, 50 percent of which consists of chromite. The average width of the chromite lenses is 25 feet. Chromite reserves are estimated at 6,000 tons per vertical foot averaging 33 percent Cr_2O_3. Magnetic and gravity surveys by the Bureau of Mineral Resources tested the most promising part of the southern chromite prospect (Tate, 1959). Some small gravity anomalies were obtained that suggest a total amount of near-surface chromite of not more than 20,000 tons.

(ii) the northern area; this is located 3 miles north-north-east of the southern area in a separate serpentine mass. Chromite is exposed intermittently over a length of 1200 feet and a average width of 45 feet. Chromite occupies about 60 percent of the total area.

Copper

The Gordon Stanley Copper mine situated 14 miles south-west of Werrington Homestead was operated for a short period in 1956. A few tons of 20 percent copper was mined from a shaft that was sunk to a depth of 40 feet on a 3 feet wide quartz-hematite reef. The ore is partly silicified and contains copper carbonate to a few feet of the surface. At deeper levels this ore grades into copper oxide and minor malachite, which are exposed in vugs and cavities.

Tin

Alluvial tin of little economic value has been obtained in the Clarke River, 4 miles from the Clarke River Telegraph Station.

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STRATIGRAPHY CLARKE RIVER 4-MILE SHEET

Period	Age	Rock Unit	Lithology	Thickness	Distribution	Topography	Structure	Palaeontology, Age Correlation	Stratigraphic Relationship	Economic Geology	Principal References
CAINOZOIC		Alluvium (Qa)	Light-textured high sand content in granitic terrains. Black high clay content in basaltic areas.	0-50 feet	Along Burdekin, Einasleigh and Clarke Rivers, Gray Creek. Widespread along McKinnon's Creek system.	Flat flood plains Steep river banks.	Flat lying			Good water at shallow depths.	White, Stewart et al. (1959)
		Residual soils (Qs)	Sandy soils. Clayey soils in basaltic areas.	Superficial	Along Great Dividing Range in northern part of the sheet.	Plains	Flat to undulating.			Good water at shallow depths, particularly granitic soils	
	Late Pleistocene to Early Recent	Toomba Basalt (Qrt)	Olivine basalt	Unknown (? 100 feet)	About 100 square miles in south-eastern corner of sheet	Rough plain, consisting of jagged blocks of basalt with little to no soil.	Lava walls, fissures, tunnels	Late Pleistocene to early Recent Kinrara Basalt.	Unconformably overlies Nulla Basalt.		Twidale (1956)
		Undifferentiated ([illegible])	White clayey friable quartz sandstone, shale, conglomerate	150 feet max.	Gray Creek near Miner's Lake. About 2 square miles near Clarke River Telegraph Station.	Plains. Steep river banks.	0° to 5° dip. Ancestral river -or lake-fill	Unlithified sediments near junction of Glendhu & Burdekin Rivers. (Einasleigh sheet)	Metamorphosed by basalt to form billy. Unconformably overlies Perry Creek Formation & Tribute Hills sandstone.	Tin. (Clarke River) Good water at shallow depths	
		Laterite & Lateritic soils (Czl)	Mottled & pallid zones with thin ferruginous zinc	20 feet max.	Great Dividing Range Along telephone line between Porphyry Cr. & Clarke River	Mesas & plateaux.	Flat lying		Formed on Palaeozoic sediments Precambrian granite & Mesozoic sediments	Springs	White & Hughes (1957) White, Stewart et al. (1959)
		Basalt (Czb)	Olivine basalt	100 feet	Isolated areas	Plains	Valley-Fill Craters	?Pliocene to ? Pleistocene. McBride Basalt & older basaltic flows on Einasleigh sheet	Uncomformably overlies Precambrian metamorphics	Good supply of water	
		Billy (Czy)	Quartzite (metamorphosed quartz sands)	5 to 15 feet	About 10 square miles near Clarke River Telegraph Station along Clarke River	Resistant low rises	0° to 5° dip	Billy in Camel Creek region (Einasleigh sheet)	Unconformably overlain by Cainozoic basalts		White, Best et al. (1959)
		Chudleigh Basalt (Czc)	Olivine basalt, commonly vesicular & amygdaloidal	10 ft to 500 feet	Covers about 500 square miles. Flows fill valleys of Einasleigh & Copperfield Rivers.	Plateau. Rough plains with numerous rises, black soil & basalt boulders	Valley-fill. Craters near Chudleigh Park Station	?Pliocene to ?Pleistocene McBride Basalt (Einasleigh sheet) & Nulla Basalt	Unconformably overlies billy, Precambrian & Palaeozoic successions.	Good supply of water	White, Best et al. (1959)
		Nulla Basalt (Czn)	Olivine Basalt	200 to 500 feet	2,500 square miles in southern half of sheet	Plateau	Flat lying	?Late Pliocene to ?early Pleistocene	Unconformably overlies Mesozoic, Palaeozoic & Precambrian successions		Twidale (1956)

Period	Age	Rock Unit	Lithology	Thickness	Distribution	Topography	Structure	Palaeontology, Age Correlation	Stratigraphic Relationship	Economic Geology	Principal References
MESOZOIC	Lower Cretaceous	Gilbert River Formation (Klg)		100 feet	Extends east as far as Gregory Springs Hs. & Hann Highway.	Mesas	Flat lying	Indeterminable plants at Gregory Springs. Elsewhere on Georgetown & Gilberton sheets Lower Cretaceous. Blythesdale sandstone	Unconformably overlies Precambrian	Springs	White & Hughes(1957) Reynolds (1960)
		Undifferentiated (Pzu)	Rhyolite, rhyolite porphyry, quartz porphyry & agglomerate								
		Montgomery Range Rhyolite Porphyry (Pzum)	Rhyolite porphyry & rhyolite		120 square miles in Montgomery Range. Forms part of Great Dividing Range	Rough hills	Steeply dipping intrusives to 35° dipping sills and ? flows. Well jointed	Upper Palaeozoic	Intrudes Lower Carboniferous Bundock Creek Formation.		White, Stewart et al(1959) White, Best Branch (1959)
		Oweenee Granite (Pgo)	Coarse, pink porphyritic granite & microgranite & some rhyolite		65 square miles along eastern margin of sheet	Rough hills	well jointed NNW & NNE	Upper Palaeozoic (?Permian) Esmeralda granite, Croydon felsite	Intrudes the Carboniferous Clarke River formation	Tin	White, Stewart et al (1959)
PALAEOZOIC	?Permian	Lochaber Granite (Pgl)	Grey-pink porphyritic (in felspar) granite withminor amounts of mafic minerals. Rhyolite		300 square miles in north-western part of sheet	Rough hills about 500 ft above surrounding country	Oval-shaped mass. Granite grades marginwards to a flow banded rhyolite hood. Tors well jointed .	?Permian Elizabeth Ck. Granite & Butlers Knob Complex(Einasleigh 4-mile sheet)	Intrudes Precambrian & probably core of Bagstowe Ring Dyke Complex.	Wolfram	Branch (1959)
	?Permian	Bagstowe Ring Dyke Complex (Pg)	Rhyolite		300 square miles in NW part of sheet	Rough hills to low rough rises	Steeply dipping ring dykes, core sheets & dyke swarms	?Permian Ring dyke complexes on Atherton 4-mile	Intrudes Precambrian		Branch (1959)
UPPER	?Permian	Butlers Igneous Complex (Pb)	Medium-grained pink granite, rhyolite porphyry & trachyte.		14 square miles in NW corner of sheet	Rough hills. Butlers Knob prominent peak	Oval-shaped mass. Inclined granite sheet intruded into its rhyolite hood Ring dykes	?Permian Granite similar to Lochaber Granite. Genetically related to Bagstowe Ring Dyke Complex & similar ring dykes on Atherton 4-mile sheet	Intrudes Precambrian Dumbano Granite		Branch (1959)
	Carboniferous	Clarke River Formation (Cc)	Quartz-jasper conglomerate, quartz greywacke sandstone, shale, lenses of limestone & calcareous siltstone	5,000 to 7,500 feet (1st. 10 to 50 feet)	300 square miles between Gray Cr. & Clarke River. Outlier of 60 square miles in Blue Range	Uplands of strike ridges	Dips 10° to 35° basinwards with steeper to vertical dips on faulted margins	Chonetes, gastropods, nautiloids. ?Productella, ?Streptorhynchus, ?Productus. Plants Calamites radiatus, Lepidodendron cf. veltheimianum, Rhacopteris ovata, Sigallaria, Stigmaria ficoides, Diplothmema? Lower Carboniferous (Tournaisian) to Middle Carboniferous. Bundock Creek Formation, Gilberton Formation(Gilberton sheet), Silver Valley Conglomerate (Atherton sheet). Star Beds (Townsville 4 mile)	Unconformably overlies the Perry Creek, Kangaroo Hills & Greenvale Formations. Faulted against Broken River & Wairuna Formations along its western boundary. Intruded by Oweenee Granite along its eastern margin		White, Stewart et al. (1959)

Period	Age	Rock Unit	Lithology	Thickness	Distribution	Topography	Structure	Palaeontology, Age Correlation	Stratigraphic Relationship	Economic Geology	Principal References
PALAEOZOIC	Upper Devonian/ Lower Carboniferous	Bundock Creek Formation D-Cb	Clayey quartz sandstone, arkose, siltstone, shale lenses of conglomerate & limestone.	20,000 feet	400 square miles in headwaters of Bundock Creek & Broken River	Rough silicified strike ridges forming part of Great Dividing Range	Dips 20° to 80°. Basin & dome. Open moderate syncline & anticline	Brachiopods(Brachythris davidis, Avonia kennedyensis, Crenipecten, Allorisma, Leiopteria) Gastropods (Megaphyllum?, Macgeea). Corals (Frasnian)-Thamnopora, Aulopora Plants - Psilophyton? Upper Devonian to Lower Carboniferous (Tournaisian). Gilbert River Formation (Gilberton 4-Mile), Clarke River Formation, Silver Valley Conglomerate (Atherton 4-Mile), Star Beds (Townsville 4-Mile)	?Unconformably overlies the Broken River Formation. Fault contact with Precambrian. Intruded by Montgomery Range Rhyolite Porphyry.		White, Stewart et al. (1959) White, Best et al. (1959)
	?Devonian	Craigie Granodiorite (Dgc)	Medium grained, dark grey, slightly porphyritic		3 square miles in Broken River		Oval-shaped intrusive	?Upper Palaeozoic. Granodiorite of the Grey Creek Complex	Intrudes the Devonian Broken River Formation(?)	?Gold	White, Stewart et al. (1959)
	?Devonian	Undifferentiated Basics (Dd)	Dolerite, basalt (amygdaloidal), some gabbro & diorite		Dolerite dyke swarm between Porphyry & Gray Creeks. Basalt associated with 1st. reefs of Perry Creek Formation.	Weathered & decomposed rubble rises. Usually marked by resistant jasper & chert ridges	Linear. Well jointed.	?Lower Devonian Basics of Boiler Gully & Gray Creek Complexes	Intrudes Silurian & Lower Devonian successions	?Gold Copper	White, Best et al. (1959)
	?Devonian	Gray Creek Complex (Dg)	Serpentine, pyroxenite, gabbro, amphibolite, granodiorite & diorite		An elongated mass 15 miles long & 3 miles wide exposed in valley of Gray Creek in northern part of sheet.	Rough rises to ridges. Serpentine contains a hard silicified capping	Linear.	?Lower Devonian Boiler Gully Complex (Einasleigh sheet)	Intrudes Silurian & Upper Silurian-Lower Devonian sediments. Does not intrude Broken River Formation. Faulted against Carboniferous sediments.	Chromite Nickel Copper Gold	Green (1958) White, Stewart et al (1959)
	Middle Devonian	Broken River Formation (Dmb)	Limestone, limestone conglomerate, calcareous sediments, shale, siltstone.	17,000 feet	Narrow belt 4 miles wide, 25 miles long in central part of sheet in Broken River area.	Long rough strike ridges.	Tightly folded along NE axis. Steep to vertical dips	Lower Devonian corals include Pseudamplexus, Acanthophyllum, Radiophyllum, Spongophylloides, Hexagonaria, Phillipsastrea, Cystiphyllum, Favosites, Heliolites. Middle Devonian corals include Metriophyllum, Disphyllum, Phacellophyllum, Endophyllum & Stromatoporoids. Burdekin River Limestone (Townsville sheet) & ?part of Chillagoe Formation (Atherton sheet)	Unconformably overlies Graveyard Creek Formation & Jack Limestone. Possibly(see sketch section) unconformably overlain by Bundock Creek Formation. Intruded by Craigie Granodiorite & Montgomery Range Rhyolite Porphyry.	Antimony	Etheridge (1872) White, Stewart et al. (1959) White (1959)
	Siluro-Devonian	Graveyard Creek Formation (S-Dg)	Greywacke, greywacke siltstone, greywacke conglomerate minor lenses of limestone	8,000 feet to 12,000 feet	100 square miles from Dinner Creek to headwaters of Gray Creek, northern part of sheet	Rubble low rises. Excellent exposures in creeks.	Tightly folded along NNE axes. Well jointed. Steep(70°) to vertical dips	Upper Silurian to ?Lower Devonian. Corals (Favosites, Alveolites, Halysites, Tryplasma, Phaulactis, Plasmopora) & finely branching stromatoporoids. Kangaroo Hills Formation. Mt. Garnet Formation (Atherton sheet)	Unconformably overlies Wairuna Formation. Unconformably overlain by Broken River Formation. Intruded by Gray Creek Complex.	Antimony	White, Stewart et al. (1959)

Period	Age	Rock Unit	Lithology	Thickness	Distribution	Topography	Structure	Palaeontology, Age Correlation	Stratigraphic Relationship	Economic Geology	Principal References
PALAEOZOIC	UPPER SILURIAN - LOWER DEVONIAN	Jack Limestone Member (Sdj)	Limestone, Limestone conglomerate	2,000 feet	Narrow belt (½ mile wide by 15 miles long)	Rough karst ridges.	Steep to vertical dips. Massive reef.	Corals include Favosites, Heliolites, Cystiphyllum, Ketophyllum, Entelophyllum. Upper Silurian. Limestone reefs of Perry Creek Formation. Chillagoe Formation (Atherton sheet)	Lens within upper part of the Graveyard Creek Formation. Unconformably overlain by Broken River Formation.		White, Stewart et al. (1959)
		Crooked Creek Conglomerate Member (S-Dc)	Greywacke conglomerate		50 square miles west of Gray Creek from Dinner Creek to Graveyard Creek	Pebbly rises. Best exposed in creeks	Valley fill; simple anticline & syncline	Upper Silurian to ?Lower Devonian. Greywacke conglomerate lenses of Kangaroo Hills Formation	Conformable basal member of Graveyard Creek Formation. Unconformably overlies Precambrian & Silurian sediments		White, Stewart et al. (1959) White, Best et al. (1959)
		Tribute Hills Sandstone (S-Dt)	White to cream quartz sandstone with some quartz siltstone	3,500 feet to 5,000 feet	45 square miles along Clarke River near its junction with the Burdekin River.	Rough hills parallel Clarke River	Steep to vertical dips. Faulted.	Upper Silurian to Lower Devonian	Conformable with some gradation with Perry Creek Formation. Conformably overlies Kangaroo Hills Formation.		White, Stewart et al. (1959)
		Perry Creek Formation (S-Dp)	Well bedded quartz sandstone & quarts siltstone with lenses of limestone & limestone conglomerate. Sands are generally cross-bedded.	3,500 feet	200 square miles in Christmas Creek/ Clarke River area in NE part of sheet.	Strike ridges	Steep to vertical dips. Overturned beds. Crossbedding; Rhythmic alternating beds. Faulted.	Corals- Favosites, Alveolites, Halysites, Tryplasma, Cystiphyllum, Plasmopora, Heliolites, Clapopora, ?Propora, Striatopora. Upper Silurian to Lower Devonian. Jack Limestone. Chillagoe Formation & limestone of Mt. Garnet Formation (Atherton sheet)	Conformably overlies Kangaroo Hills Formation with some gradation. ?Grades into Tribute Hills sandstone to south.		White, Stewart et al. (1959)
		Kangaroo Hills Formation (S-Dk)	Fine grained clayey quartz sandstone, quartz siltstone, shale, lenses of greywacke conglomerate	35,000 feet to 40,000 feet	Covers an area of 1000 square miles, about half exposed in NE part of sheet	Strike ridges & low rises. Best exposed in creek sections	Tightly folded with many overturned beds. Thinly bedded rhythmically alternating sequence; cross bedding & graded bedding.	Upper Silurian to Lower Devonian. Graveyard Creek Formation. Mt. Garnet Formation. (Atherton Sheet)	Unconformably overlies the Greenvale Formation. Conformably underlies the Perry Creek Formation. Intruded by Oweenee Granite. Unconformably overlain by Clarke River Formation.	Poor aquifer. Wolfram, tin, lead, iron & copper at Ewan (Ingham Sheet)	White, Best et al. (1959)
	SILURIAN	Pelican Range Formation (Sp)	Brown massive thinly bedded coarse to medium-grained clayey quartz sandstone, quartz siltstone, shale, claystone.	?5,000 feet	Wedged-shape area of 20 square miles from northern edge of sheet to Gill Creek.	Strike ridges from main Pelican Lake Range	Tightly folded strike faults. Steep to vertical dips. Load & groove casts.	Silurian	Down faulted into the Greenvale Formation		White, Stewart et al. (1959) White, Best et al (1959)
		Greenvale Formation (Sg)	Buff quartz siltstone, shale, lenses of quartz greywacke, greywacke & pebble greywacke conglomerate	?30,000 feet	Exposed over 650 square miles including its northern extension into Einasleigh sheet.	Strike ridges & rises	Tightly folded sheared. Irregular bedding.	?Silurian	Unconformably overlain by Kangaroo Hills Formation. Faulted against Pelican Range & Wairuna Formation.		White, Best et al. (1959)
	Lower Silurian (Wenlock to Upper Llandovery)	Wairuna Formation (Spw)	Thinly bedded quartz siltstone, clayey quartz, sandstone & shale	?5,000 feet	80 miles long by 4 mile belt from Broken River north to Wairuna Hs. (Einasleigh sheet)	Strike ridges & valleys	Tightly folded Sheared Steep to vertical dips. Cross-bedding in sandstone.	Graptolites (Monograptus); trilobites (Encrinurus, Scutellidae, Proetus?, Sphaerexochus? or Onycopyge) brachiopods (Brachyprion); pelecypods; corals; bryozoa. Late Lower Silurian.	Unconformably overlain by Graveyard Ck Formation. Faulted against Precambrian succession. Intruded by Craigie Granodiorite & Gray Creek Complex.		White, Best et al. (1959)

Period	Age	Rock Unit	Lithology	Thickness	Distribution	Topography	Structure	Palaeontology, Age Correlation	Stratigraphic Relationship	Economic Geology	Principal References
PALAEOZOIC	Lower Silurian	Everetts Creek Volcanic Member (Sle)	Albitized basalt dolerite, agglomerate, tuff, greywacke	3,000 feet	Belt 20 miles long by 1 mile wide along Gray Creek.	Best exposed on Gray Creek	Altered & sheared	?Lower Silurian	Underlain conformably by Carriers Well. Limestone. Intruded by Gray Creek Complex Unconformably overlain by Graveyard Creek Formation.	?Gold	Green(1958) White, Stewart et al. (1959)
PALAEOZOIC	Lower Silurian	Carriers Well Limestone Member (Sla)	Lenticular limestone, in part biothermal massive & oolitic. Minor amounts of calcareous sediments, quartz sandstone	1,000 feet	12 miles long by 1 mile wide along Gray Creek	Low slabs & some low pinnacles	Sheared, partly recrystallised. Steep to vertical dip.	Lower Silurian (?Upper Ordovician) corals.	Closely associated & generally underlies Everett's Ck Volcanic Member. Unconformably overlain by Graveyard Creek Formation. Intruded by Gray Creek Complex.	Good aquifer	White, Stewart et al (1959) Green(1958)
PRECAMBRIAN	?PROTEROZOIC	Forsayth Granite (Pgf)	Grey, coarse-grained porphyritic biotite granite		A few square miles in NW part of sheet. 2,000 sq.miles on Einasleigh and Georgetown sheets.	Deeply weathered scattered tors & pavements separated by a thick sandy soil.	Platy flow	?Late Precambrian	Intrudes Einasleigh Metamorphics. Intruded by Bagstowe Igneous Complex.	Gold	White & Hughes (1959) White, Best et al(1959)
PRECAMBRIAN	?PROTEROZOIC	Dumbano Granite (Pgu)	Medium-grained grey biotite granite with pink porphyritic feldspar.		About 800 sq.miles in Western & Southern part of sheet.	Weathered tors & pavements separated by thick sandy soil.	Platy flow	?Late Precambrian. Robin Hood Granite, Forsayth & Dido Granites.	Intrudes Einasleigh Metamorphics & Paddys River Formation. Intruded by Bagstowe Igneous Complex. Unconformably overlain by Bundock Creek Formation.	Wolfram Copper	White, Best et al(1959)
PRECAMBRIAN	?PROTEROZOIC	McKinnons Creek Granite (Pgm)	Coarse, even grained cream-pink muscovite granite. In places finer parts are foliated.		120 sq.miles in McKinnons Creek area, northern part of sheet.	Weathered tors separated by thick sandy soil.		?Late Precambrian. Forsayth, Dumbano ido Granites.	Intrudes Paddys Creek & Lucky Creek Formations. Unconformably overlain by rooked Creek Conglomerate. (Upper Silurian)		White, Best et al(1959)
PRECAMBRIAN	?PROTEROZOIC	Dido Granite (Pgd)	Grey, foliated medium-grained hornblende-biotite granodiorite		Along Hann Highway between Bundock Cr.& McKinnon Cr. Eastern edge of Great Dividing Range.	Low tors scattered through thick soil cover.	Platy flow	?Late Precambrian. Forsayth, Dumbano & McKinnons Creek Granites	Intrudes Einasleigh Metamorphics, Paddys & Lucky Creek Formations	Gold	White, Best et al(1959)
PRECAMBRIAN	?PROTEROZOIC	Cobbold Dolerite (Pdc)	Dolerite, locally metamorphosed to amphibolite.		Isolated bodies near Werrington Station	Strike ridges & low rises	Dykes & sills	Precambrian	Intruded by Dumbano Granite. Intrudes the Proterozoic & Archaean succession.	Copper	White, Best et al(1959)
PRECAMBRIAN	?PROTEROZOIC	Sandalwood Serpentinite (Pss)	Serpentinite, generally metamorphosed to antigorite, with chlorite, talc & tremolite.		NNE trending belt about 15 miles long in Burges Dam area. Extends for 6 miles NE into Einasleigh sheet.	Low rough silicified mounds & strike ridges	Steeply dipping lenticular sill-like bodies.	Precambrian	Intruded by McKinnons Ck. Granite. Intrudes Lucky Ck. & Paddys Ck. Formations	Copper Nickel Chromium & manganese in Halle Reward Mine area (Einasleigh sheet)	White et al. (1958); Green(1958)

Per-iod	Age	Rock Unit	Lithology	Thick-ness	Distribution	Topography	Structure	Palaeontology, Age Correlation	Stratigraphic Relationship	Economic Geology	Principal References
PRECAMBRIAN	?PROTEROZOIC	Paddys Creek (Bp)	Well-bedded quartzite & quartz phyllite	1,000 feet to 3,000 feet	50 sq.miles in northern part of sheet	Strike ridges (quartzite) & valleys (phyllite)	Steep dips (60° to 80°) Moderately folded	?Proterozoic Part of Robertson River Metamorphics (Georgetown sheet)	Conformably overlies Lucky Ck.Formation with some interfingering. Intruded by Sandalwood Serpentinite. Faulted against Wairuna Formation.	Copper	White & Hughes(1957); White et al. (1958)
		Lucky Creek Formation (Pl)	Actinolite schist, quartz-chlorite-epidote schist, quartz-albite-hornblende schist,marble, calc-silicate hornfels calcareous greywacke.	10,000 to 15,000 feet	20 sq.miles in northern part of sheet.	Valleys & plains . Well exposed in creek sections,otherwise covered with thick red-brown soil.	Tightly folded . Many drag-folds. Steep to vertical dips.	?Proterozoic Bernecker Creek Formation. (Gilberton sheet)	Conformably underlies Paddys Ck.Formation Contact metamorphosed by Dido Granodiorite.	Gold & Copper. Good water supply from marble lenses.	
	?ARCHAEAN	Einasleigh Metamorphics (A[illegible])	Gneiss (in places ptygmatic) granulite, migmatite, garnet schist,garnet quartzite, & amphibolite	Unknown	In isolated areas in western half of sheet between Clark River & Werrington Station.	Plains,ridges & rough hills	Strongly foliated	?Archaean Halls Reward Metamorphics (Einasleigh sheet), Dargalong Metamorphics (Atherton sheet)	Metamorphic unconformity against ?Proterozoic succession. Intruded & retrograde metamorphosed by Late Precambrian Granites.		White & Hughes(1957) White,Best et al(1959); White & Wyatt(1960)
		Undifferentiated Metamorphics (p€)	Gneiss, schist, quartzite hornfels	Unknown	In isolated areas between Clarke River & Cargoon Station (Hughenden sheet)	Strike ridges	Strongly foliated Steep to vertical dips	Precambrian	Intruded by late Precambrian granites.		

Section C-D

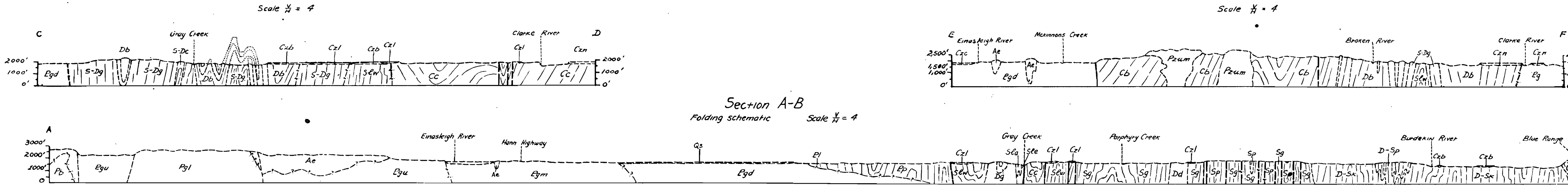
Scale $\frac{V}{H}$ = 4

Section E-F

Scale $\frac{V}{H}$ = 4

Section A-B

Folding schematic   Scale $\frac{V}{H}$ = 4



Scale

4 Miles to 1 Inch

2 0 2 4 6 8 10 12 14 16 Miles

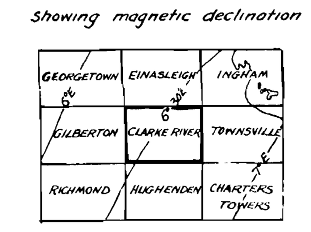
Geology by: D.A. White, K. Hughes, J.R. Stewart, D.H. Wyatt, C.D. Branch, D.H. Green.

Compiled January 1960 by: D.A. White

Drawn by:

INDEX TO ADJOINING SHEETS

Showing magnetic declination



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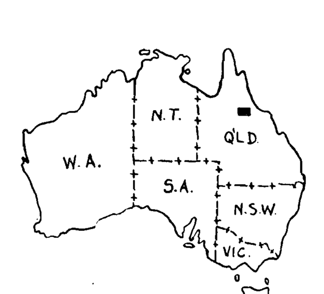
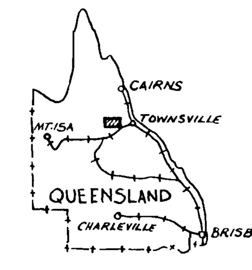
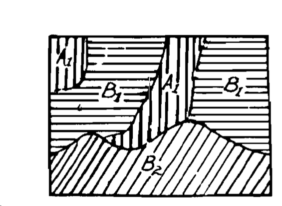






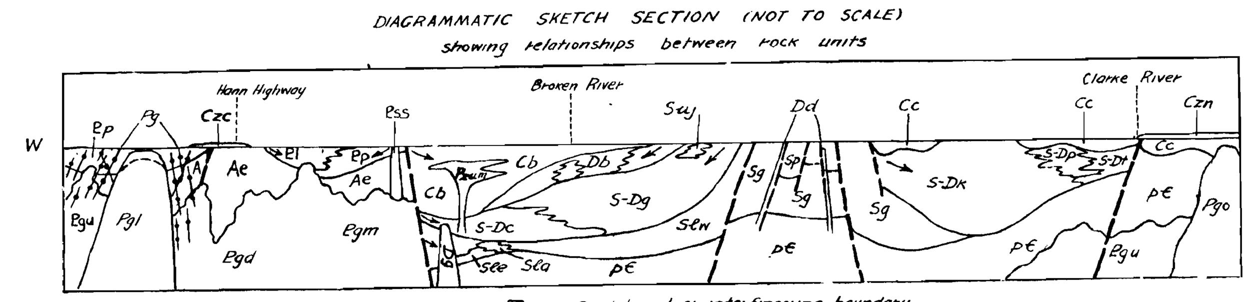
A_1 Detailed mapping

B_1 Detailed reconnaissance - numerous traverses and photo interpretation

B_2 Reconnaissance - traverses and photo interpretation

DIAGRAMMATIC SKETCH SECTION (NOT TO SCALE)

showing relationships between rock units



unconformity   gradational or interfingering boundary

direction of main sedimentation

Reference

CAINOZOIC	QUATERNARY		Qa	Alluvium
			Qs	Soil
	RECENT	Toomba Basalt	Qzt	Olivine basalt
	? PLIOCENE to PLEISTOCENE		Cz	Conglomerate, sandstone, shale, claystone
		Chudleigh Basalt	Czc	Olivine basalt
		Nulla Basalt	Czn	Olivine basalt
			Czb	Basalt undifferentiated
			Czy	Billy (silicified quartz sand)
			Czl	Laterite and lateritic soil
MESOZOIC	LOWER CRETACEOUS	Gilbert River Formation	Klg	Conglomerate, sandstone and siltstone
UPPER PALAEOZOIC			Pzu	Undifferentiated rhyolite, rhyolite porphyry and quartz porphyry
		Montgomery Range Rhyolite Porphyry	Pzum	Rhyolite porphyry
		Craigie Granodiorite	Pzuc	
	? PERMIAN	Oweenee Granite	Pgo	Porphyritic granite and microgranite
		Lochaber Granite	Pgl	Granite with rhyolite porphyry hood
		Butlers Igneous Complex	Pb	Rhyolite; Granite
		Bagstowe Ring Dyke Complex	Pg	Granite; Microgranodiorite; Pink and grey rhyolite
	CARBONIFEROUS	Clarke River Formation	Cc	Conglomerate, sandstone, shale
		Bundock Creek Formation	Cb	Arkose, sandstone, siltstone, shale
PALAEOZOIC	LOWER to MIDDLE DEVONIAN	Broken River Formation	Db/A	Limestone, limestone conglomerate, shale - " " "A" limestone lens
	? LOWER DEVONIAN	Gray Creek Complex	Dg	Serpentinite; Diallagite; Gabbro; Granodiorite
			Dd	Dolerite, amygdaloidal basalt with roof pendants of jasper
	UPPER SILURIAN to LOWER DEVONIAN	Graveyard Creek Formation	S-Dg	Greywacke, greywacke siltstone, limestone
		Crooked Creek Conglomerate Member	S-Dc	Greywacke Conglomerate
		Jack Limestone	Suj	Limestone
		Tribute Hills Sandstone	S-Dt	Quartz sandstone, minor quartz siltstone
		Perry Creek Formation	S-Dp	Quartz sandstone, quartz siltstone and shale; Limestone and limestone conglomerate
		Kangaroo Hills Formation	S-Dk	Quartz sandstone, quartz siltstone, shale lenses of greywacke and greywacke conglomerate.
	SILURIAN	Greenvale Formation	Sg	Clayey quartz siltstone, quartz greywacke
		Pelican Range Formation	Sp	Quartz sandstone, quartz siltstone and greywacke lenses.
	LOWER SILURIAN	Wairuna Formation	Slw	Quartz siltstone, quartz sandstone, claystone, shale
		Carriers Well Limestone Member	Sla	Biohermal and oolitic limestone
		Everetts Creek Volcanic Member	Sle	Basalt, agglomerate, tuff.
PRECAMBRIAN			p€	Undifferentiated gneiss, schist, granulite and hornfels
	PROTEROZOIC	Forsayth Granite	Egf	Grey porphyritic biotite granite
		Dumbano Granite	Egu	Grey medium-grained biotite granite with pink porphyritic feldspar
		Mckinnons Creek Granite	Egm	Coarse even-grained cream-pink muscovite granite
		Dido Granodiorite	Egd	Grey, medium-grained, hornblende-biotite granodiorite
		Sandalwood Serpentinite	Ess	Serpentinite with chlorite, talc and tremolite; Gabbro
		Cobbold Dolerite	Edc	Dolerite, locally metamorphosed to amphibolite
		Paddys Creek Formation	Ep	Quartzite, quartz phyllite
		Lucky Creek Formation	El	Actinolite schist, marble, calc-silicate hornfels
	ARCHAEAN	Einasleigh Metamorphics	Ae	Gneiss, granulite, quartzite, migmatite.

Geological Boundaries

- Established boundary, position accurate
- Established boundary, position approximate
- Inferred, probable or indefinite boundary
- Strike and dip of strata
  - 60 Inclined
  - 60 Overturned
  - Vertical
- Strike and dip of foliation
  - 60 Inclined
  - Vertical →50 Direction and plunge of lineation
- Photointerpretation
  - Trend lines
  - Outcrop with dip 0°-15°
  - Outcrop with dip 15°-45°
  - Joint pattern
- Folds
  - 40 Plunge of anticline
  - 40 Plunge of syncline
  - 40 Strike and plunge of dragfold
- Faults
  - Established fault, position accurate
  - Established fault, position approximate
  - Established fault, position concealed
  - Fault showing relative movement
- Inferred or probable fault
- Inferred or probable fault, concealed
- Dyke r-rhyolite a-aplite p-pegmatite s-serpentine
- Volcanic crater
- 84 Marine fossil locality, text reference
- 66 Freshwater fossil locality, text reference.
- Cu Mine
- (Cu) Mineral deposit Au-gold Cr-chromium Cu-copper Mo-molybdenum Sb-antimony Sn-tin W-tungsten
- Vehicle track
- Fence
- Telephone line
- Dam
- •B Bore
- •S Spring
- •W Well
- Wind pump
- "Oak Park" Homestead
- Airstrip
- Astro station
- •1300 Barometric spot height: M.S.L.

CLARKE RIVER

SHEET E 55-13