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"TECTONIC DEVELOPMENT OF THE LOWER PROTEROZOIC BASEMENT IN THE KIMBERLEY DISTRICT OF NORTHWESTERN WESTERN AUSTRALIA"

A Thesis submitted in partial fulfilment of
the requirements for the award of the degree of

DOCTOR OF PHILOSOPHY

from

THE UNIVERSITY OF ADELAIDE

by

S.L. HANCOCK

Awarded 1991

Department of Geology and
Mineralogy 1991

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL MAP

EAST KIMBERLEY REGION

WESTERN AUSTRALIA

1967

Scale 1:500,000

10 5 0 10 20 30 40 MILES

10 5 0 10 20 30 40 50 60 KILOMETRES

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Geology, 1962-64, by: D.B. Dow, J.W. Smith, H.L. Davies, K.A. Plumb, H.G. Roberts, D. Dunnet, J.H. Lotter, V.M. Bofinger, D.C. Gellatly, G.M. Derrick (B.M.R.), I. Gemuts, R. Halligan, A.D. Allen, J.R. Passmore, K.J. Morgan (G.S.W.A.)

Compiled, 1968, by: D.B. Dow, I. Gemuts, A.S. Mikolajczak

Cartography by: Geological Branch, B.M.R.

Drawn by: A.S. Mikolajczak

CAINOZOIC

- QUATERNARY / UNDIFFERENTIATED — Q — Coastal alluvium, minor evaporite deposits
- Cz — Sand, soil, gravel, alluvium, travertine
- TERTIARY — Undifferentiated — T — Laterite, alluvium, chalcedonic limestone

PALAEOZOIC

- UNDIFFERENTIATED — Pz — Sedimentary rocks of Bonaparte Gulf Basin
- DEVONIAN — D — Friable quartz sandstone, some conglomerate
- CAMBRIAN — Negri Group
  - Undifferentiated — Cm — Siltstone, shale, limestone
  - Headleys Limestone — Cmg — Fine-grained grey limestone, some chert nodules
  - Antrim Plateau Volcanics — Cla — Tholeiitic basalt, minor agglomerate. Includes Lolly Conglomerate at base in west

PROTEROZOIC

UNDIFF.*

- Gardiner Beds — Eyd — Quartz sandstone, Ferruginous sandstone, pebble conglomerate, algal dolomite

UPPER PROTEROZOIC

- Albert Edward Group
  - Flat Rock Formation, Nyuless Sandstone, Timperley Shale, Boonell Dolomite, Elvire Formation, Mount Forster Sandstone — Ea — Fine-grained ferruginous sandstone, commonly dolomitic; Quartz sandstone; Green and grey shale and siltstone; Dolomite, minor dolomite, conglomerate and breccia; Shale, siltstone
  - Mount Forster Sandstone — Eao — Quartz sandstone, pebble conglomerate
- Louisa Downs Group
  - Lubbock Formation, Tean Formation, McAlly Shale, Yurobi Formation, Egan Formation — El — Siltstone, shale, sub-greywacke, partly dolomitic. Feldspathic sandstone, sub-greywacke, pebble conglomerate. Shale, siltstone; rare fine-grained quartz sandstone. Quartz sandstone, feldspathic sandstone; some siltstone, shale, and dolomitic rocks
  - Egan Formation — Ele — Tillite, pebbly sandstone, dolomite, limestone, and dolomitic sediments
- Durack Group
  - Ranford Formation, Moonlight Valley Tillite, Frank River Sandstone, Fargoo Tillite — Eos — Micaceous quartz siltstone, very fine-grained quartz sandstone, red and green shale, dolomitic sandstone
  - Moonlight Valley Tillite — Eom — Tillite, minor dolomite-cobble conglomerate, dolomite
  - Frank River Sandstone, Fargoo Tillite — Eof — Dolomitic sandstone and greywacke; Tillite, boulder conglomerate
- Kununarri Group
  - Mount Bertram Sandstone, Wirara Formation, Stein Formation — En — Micaceous, ferruginous quartz sandstone, minor shale, siltstone. Green and red siltstone and shale, some quartz sandstone. Coarse-grained purple greywacke
  - Landrigan Tillite — Eni — Tillite, sandstone lenses, minor dolomite

MIDDLE PROTEROZOIC

- Helicopter Siltstone — Est — Laminated siltstone and shale
- Wade Creek Sandstone, Mount John Shale Member — Esw — Quartz sandstone
- Wade Creek Sandstone, Mount John Shale Member — Esj — Shale, siltstone, minor ferruginous sandstone, chert
- Glidden Group
  - Maddox Formation, Forman Sandstone, Matheson Formation, Harms Sandstone — Em — Black shale and siltstone, feldspathic sandstone. Fine-grained quartz sandstone. Claystone, shale, siltstone, sub-greywacke. Quartz sandstone, minor shale and siltstone
- Carr Boyd Group
  - Bandicoot Range Beds, Pincombe Formation, Stonewall Sandstone, Glenhill Formation, Lissadell Formation, Golden Gate Siltstone, Hansman Sandstone — Pc — Quartz sandstone, partly ferruginous; conglomerate, siltstone. Siliceous siltstone, quartz sandstone. Friable quartz sandstone. Shale, siltstone; quartz sandstone, rarely glauconitic. Quartz sandstone, siltstone. Black pyritic shale; siltstone, sandstone, rhyolite tuff. Quartz sandstone

UNDIFFERENTIATED

- ADELAIDEAN OR CARPENTARIAN
  - Bungle Bungle Dolomite — Pdb — Dolomite, dolomitic shale, minor limestone
  - Mount Parker Sandstone — Pdp — Quartz sandstone, minor pebble conglomerate
  - Colombo Sandstone — Pm — Quartz sandstone, chert pebble breccia and conglomerate
  - Hart Dolerite — Pdh — Tholeiitic dolerite, gabbro, some pyroxene granophyre differentiates
- CARPENTARIAN
  - Fish Hole Dolerite — Dolomite of unknown origin, mostly intrusive
  - Fish Hole Dolerite — Pf — Highly epidotized vesicular dolerite

LOWER & MIDDLE PROTEROZOIC

- Cockburn Sub-basin
  - Crawhurst Group
    - Hibberson Dolomite, Collett Siltstone, Liga Shale, Hilfordy Formation — Pr — Massive dolomite, dolomitic breccia and sandstone. Purple and green siltstone, rarely pyritic; dolomite. Green shale, minor micaceous siltstone. Quartz sandstone, ferruginous siltstone, shale
  - Bastion Group
    - Cockburn Sandstone, Wyndham Shale, Mendena Formation — Pt — Quartz sandstone, minor micaceous siltstone, green shale. Green and grey shale, fine-grained sandstone. Quartz sandstone, green and purple siltstone, dolomite
  - Kimberley Group
    - Pentecost Sandstone, Elgee Siltstone, Warton Sandstone, Carson Volcanics, King Leopold Sandstone — Pk — Quartz sandstone, minor glauconitic sandstone, siltstone. Red-brown siltstone and shale. Dolomite member. Quartz sandstone. Tholeiitic basalt, rare agglomerate, feldspathic sandstone. Quartz sandstone, pebbly sandstone, conglomerate
  - Speewah Group
    - Luman Siltstone, Lansdowne Arkose, Valentine Siltstone, Tunganary Formation, O'Donnell Formation — Pp — Siltstone, shale, fine-grained sandstone. Feldspathic and quartz sandstone, arkose, siltstone. Rare glauconitic arkose. Green siltstone, rhyolitic ashstone and tuff. Quartz sandstone, feldspathic sandstone, green siltstone. Sub-greywacke, quartz sandstone, green shale
    - Revolver Creek Formation — Pv — Amygdaloidal basalt, arkose, quartz sandstone, siltstone
    - Red Rock Beds — Pr — Quartz sandstone, quartz conglomerate, siltstone
    - Moola Bulla Formation — Px — Arkosic sandstone, quartz conglomerate; greywacke and siltstone
    - Whitewater Volcanics — Pw — Porphyritic acid and minor intermediate volcanic rocks. Minor sedimentary rocks

PROTEROZOIC

LOWER PROTEROZOIC

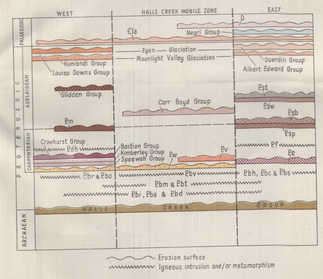
- Lamboo Complex
  - Undifferentiated Lamboo Complex — Pbr — Rhyolite, dacite, microgranite
  - Violet Valley Tonalite — Pg — Intimate mixture of granite, gabbro, and metamorphic rocks. Granitic rocks in north-western corner
  - Violet Valley Tonalite — Pbv — Biotite-rich tonalite; some granodiorite, gabbro
  - McHale Granodiorite — Pbh — Hornblende biotite granodiorite, adamellite
  - Castlereagh Hill Porphyry — Pbc — Quartz feldspar porphyry, adamellite
  - Bow River Granite — Pbo — Coarse-grained granite and granodiorite, porphyritic to even-grained
  - Sophie Downs Granite — Pbs — Granite, granophyric granite, some microgranite
  - Mabel Downs Granodiorite — Pbm — Foliated hornblende granodiorite and tonalite; some biotite granite, orthopyroxene granite, and migmatite
  - Tickalara Metamorphics — Pbt — Schist, paragneiss, orthogneiss, migmatite, amphibolite
  - Mc Intosh Gabbro — Pbi — Calc-silicate rocks; Gabbro and dolerite, mostly uralitised; amphibolite, basic granulite
  - Alice Downs Ultrabasics — Pbu — Pyroxenite, peridotite, chlorite-tremolite rock
  - Woodward Dolerite — Pbd — Basic and ultrabasic sills and dykes

ARCHAEAN OR LOWER PROTEROZOIC

- Halls Creek Group
  - Undifferentiated — An — Sub-greywacke, siltstone, mica schist, some conglomerate and dolomite
  - Olympio Formation — Aho — Sub-greywacke, greywacke, siltstone, shale, some arkose, conglomerate, and rare dolomite
  - Biscay Formation — Ahr — Basic volcanics and intrusive rocks, greywacke and siltstone. Limestone, dolomite, carbonated basic rocks
  - Saunders Creek Formation — Ahs — Indurated sandstone and quartz conglomerate
  - Ding Dong Downs Volcanics — Ahd — Basic volcanic rocks, minor greywacke and siltstone; rhyolite, probably intrusive

* Subdivisions of the Precambrian time-scale used by the Geological Survey of Western Australia; shown in grey

DIAGRAMMATIC RELATIONSHIP OF ROCK UNITS



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Transverse Mercator Projection

Geological boundary

- Anticline, showing plunge
- Syncline, showing plunge
- Overturned anticline
- Plunge of minor anticline
- Plunge of minor syncline
- Plunge of drag fold
- Plunge of fold axis
- Fault, showing relative horizontal movement (q-quartz filled)
- Low-angle thrust fault
- Inclined fault
- Shear-zone

Where location of boundaries, folds and faults is approximate, line is broken; where inferred queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes

- Strike and dip of strata
- Prevailing strike and dip of strata
- Vertical strata
- Horizontal strata
- Overturned strata
- Dip < 5°
- Dip < 15°
- Trend lines
- Tightly folded strata
- Joint pattern

(air-photo interpretation)

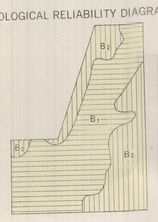
- Strike and dip of foliation
- Prevailing strike and dip of foliation
- Inclined banding in igneous rocks
- Glaciated bedrock, showing direction of ice movement
- Macrofossil locality
- Dyke or vein; q-quartz, do-dolerite, ap-amphibolite, p-pegmatite, rh-rhyolite, rd-rhyodacite, g-granodiorite

- Prospect: little or no production
- Mine not being worked
- Alluvial workings
- Minor mineral occurrence
- Unexploited mineral deposit

Ac	Asbestos-chrysotile	Mn	Manganese
Ag	Silver	Nb	Columbium (niobium)
Au	Gold	Ni	Nickel
Cr	Chromium	Pb	Lead
Cu	Copper	Pt	Platinum
Fe	Iron	Sn	Tin
Fl	Fluorite	U	Uranium

- Diamond drill hole
- Oil exploration well; abandoned, no show of hydrocarbons
- Bore with reference number
- Abandoned bore
- Well
- Windpump
- Water tank
- Earth tank or dam
- Irrigation dam
- Dam on stream
- Waterhole
- Spring
- Highway
- Road
- Vehicle track
- Airport
- Landing ground
- Homestead; Abd-abandoned
- Yard
- Telephone line
- State boundary
- Trigonometrical station
- Height in feet, datum: mean sea level

GEOLOGICAL RELIABILITY DIAGRAM

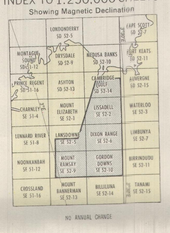


B_1 Detailed reconnaissance - numerous traverses and air-photo interpretation

B_2 Reconnaissance - some traverses and air-photo interpretation

INDEX TO 1:250,000 SHEETS

Showing Magnetic Declination



NO ANNUAL CHANGE

EAST KIMBERLEY REGION

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AREA OF MAP 3: THE EAST KIMBERLEY TRAVERSE

MAP 10

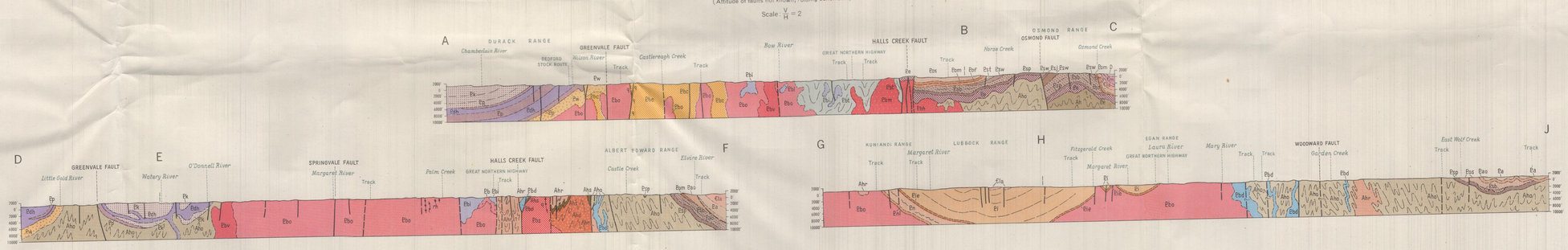
CUMMINS RANGE

Sections

(Cainozoic sediments omitted from sections)

(Attitude of faults not known; Folding schematic)

Scale: $\frac{V}{H} = 2$



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GEOLOGY OF THE KIMBERLEY REGION

WESTERN AUSTRALIA

WEST KIMBERLEY

1976

WITH COMBINED REFERENCE FOR WEST KIMBERLEY, EAST KIMBERLEY AND NORTH KIMBERLEY SHEETS

Scale 1:500 000

10 0 10 20 30 40 50 KILOMETRES

Transverse Mercator Projection

Published by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Resources, in conjunction with the Geological Survey of Western Australia. Issued under the joint authority of the Minister for National Resources, and the Hon. A. Mensaros, M.L.A., W.A., Minister for Mines
Base map compiled by BMR from 1:250 000
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Precambrian Geology 1964-67, by D. C. Gellatly, G. M. Derrick, C. M. Morgan, K. A. Plumb, H. G. Roberts, D. B. Dow BMR
J. Sofoulis, R. Halligan, I. Gemuts, A. D. Allen, R. A. Farbridge GSWA
1974, by P. C. Muhling GSWA, D. H. Blake BMR
Phanerozoic Geology 1948-64, by R. D. Brunnschweiler, D. Guppy, A. Lindner, J. Rattigan, J. N. Casey, J. D. Cuthbert, A. B. Clarke BMR
P. E. Playford, D. C. Lowry GSWA
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LOCALITY MAP

INDEX TO KIMBERLEY 1:500 000 MAP AND 1:250 000 SHEETS
Showing magnetic declination

LONDONDERRY SD 52-5
CAPE SCOTT SD 52-7
BROWSE ISLAND SD 51-11
MONTAGUE SOUND SD 51-12
DRYSDALE SD 52-9
MEDUSA BANKS SD 52-10
PORT KEATS SD 52-11
CAMDEN SOUND SD 51-15
PRINCE REGENT SD 51-16
ASHTON SD 52-13
CAMBRIDGE GULF SD 52-14
AUVERGNE SD 52-15
PENDER SE 51-2
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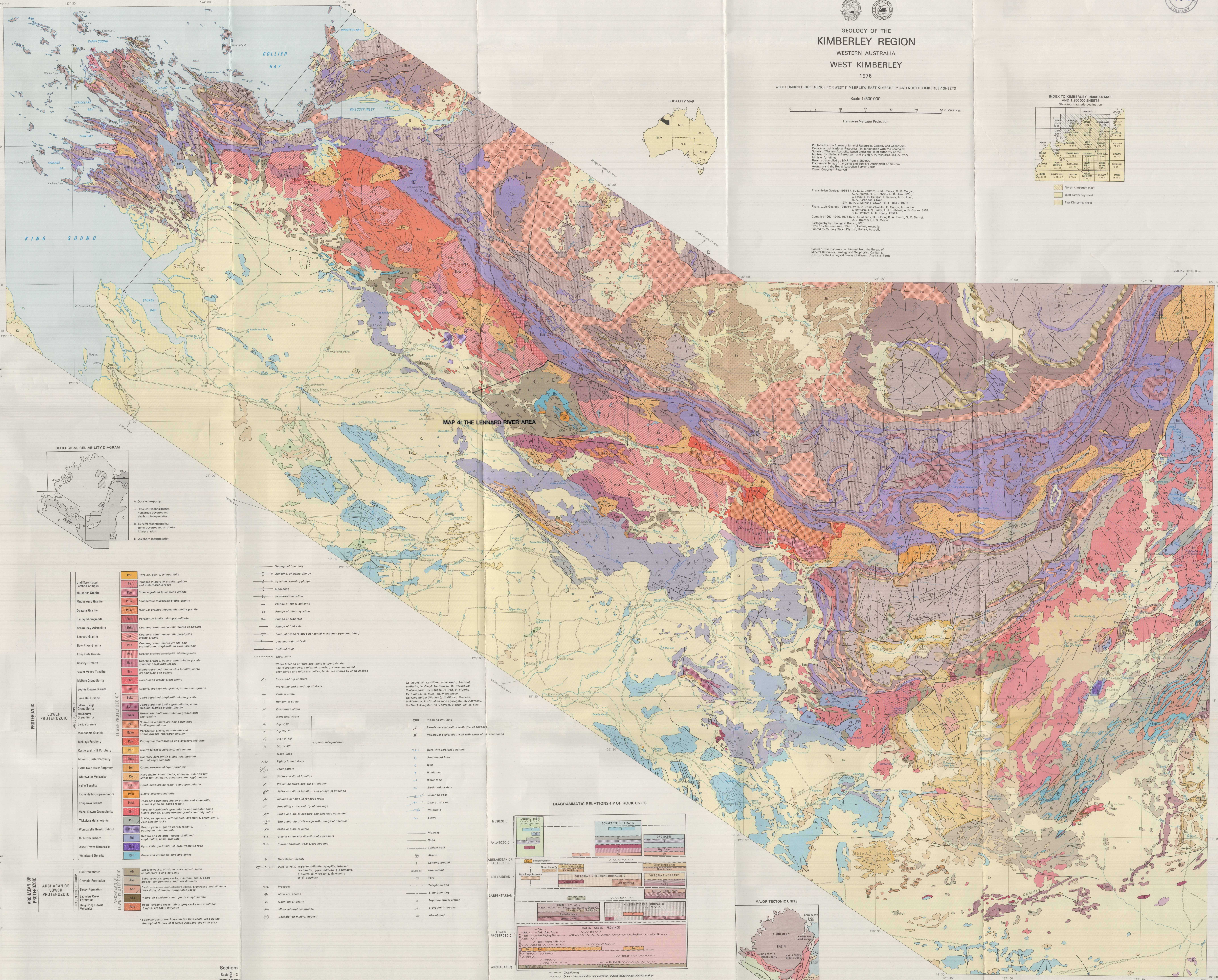
CHARNLEY SE 51-4
MOUNT ELIZABETH SE 52-1
LISSADELL SE 52-2
WATERLOO SE 52-3
BROOME SE 51-6
DERBY SE 51-7
LENNARD RIVER SE 51-8
LANSDOWNE SE 52-5
DIXON RANGE SE 52-6
LIMBUNYA SE 52-7
LA GRANGE SE 51-10
MOUNT ANDERSON SE 51-11
NOONKANBAH SE 51-12
MOUNT RAMSAY SE 52-9
GORDON DOWNS SE 52-10
BIRRINDUDU SE 52-11
MUNRO SE 51-14
McLARTY HILLS SE 51-15
CROSSLAND SE 51-16
MOUNT BANNERMAN SE 52-13
BILLILUNA SE 52-14
TANAMI SE 52-15

North Kimberley sheet
West Kimberley sheet
East Kimberley sheet



Reference

Era / Period	Unit	Symbol	Description
CAINOZOIC — QUATERNARY		Q	Coastal mud and sand; salt-encrusted locally
		Cz	Sand, soil, gravel, alluvium, travertine
CAINOZOIC — TERTIARY		T	Laterite, alluvium, chalcedonic limestone
		Tb	Bauxite, aluminous laterite
		Tp	Laterite
MESOZOIC — JURASSIC OR MIOCENE		Jf	Leucite-rich lamprophyre
MESOZOIC — TRIASSIC		Ŗ	Fine-grained sandstone, siltstone, shale
PALAEOZOIC — PERMIAN		P	Coarse-grained pebbly quartz sandstone and conglomerate; sandstone, siltstone, shale
PERMIAN AND/OR DEVONIAN		DP	Cobble and boulder conglomerate, minor quartz sandstone
CARBONIFEROUS		C	Limestone, calcarenite, calcareous sandstone, quartz sandstone, siltstone, shale
DEVONIAN		D	REEF COMPLEX: Limestone, calcarenite, calcirudite, calcilutite, siltstone, shale
			Quartz sandstone, conglomerate, minor limestone
ORDOVICIAN		O	Limestone, dolomite, glauconitic sandstone, sandstone, shale
CAMBRIAN		€	Sandstone, dolomite, siltstone
		€m	Siltstone, shale, limestone
	NEGRI GROUP — Headleys Limestone	€my	Fine-grained grey limestone, some chert nodules
	Antrim Plateau Volcanics	€la	Tholeiitic basalt, minor agglomerate. Includes Lally Conglomerate at base
PROTEROZOIC OR PALAEOZOIC		p	Fine-grained quartz-feldspar porphyry
ADELAIDEAN OR PALAEOZOIC	OSCAR RANGE SUCCESSION — Spielers Volcanics	Pzs	Sheared rhyolitic ash-flow tuff
PROTEROZOIC — ADELAIDEAN — UPPER PROTEROZOIC	ALBERT EDWARD GROUP — Flat Rock Formation	Ꝑa	Fine-grained ferruginous sandstone, commonly dolomitic
	Nyuless Sandstone		Quartz sandstone
	Timperley Shale		Green and grey shale and siltstone
	Boonall Dolomite		Dolomite, minor dolomite conglomerate and breccia
	Elvire Formation		Shale, siltstone
	Mount Forster Sandstone	Ꝑao	Quartz sandstone, pebble conglomerate
	LOUISA DOWNS GROUP — Lubbock Formation	Ꝑi	Siltstone, shale, subgreywacke, partly dolomitic
	Tean Formation		Feldspathic sandstone, subgreywacke, partly dolomitic
	McAlly Shale		Shale, siltstone; rare fine-grained quartz sandstone
	Yurabi Formation		Quartz sandstone, feldspathic sandstone; some siltstone, shale and dolomitic rocks
	Egan Formation	Ꝑie	Tillite, pebbly sandstone, dolomite, limestone and dolomitic sediments
	DUERDIN GROUP — Ranford Formation	Ꝑos	Micaceous quartz siltstone, very fine-grained quartz sandstone, red and green shale, dolomitic sandstone
	Moonlight Valley Tillite	Ꝑom	Tillite, minor dolomite-cobble conglomerate, dolomite
	Frank River Sandstone	Ꝑof	Dolomitic sandstone and greywacke
	Fargoo Tillite		Tillite, boulder conglomerate
	KUNIANDI GROUP — Mount Bertram Sandstone	Ꝑn	Micaceous, ferruginous quartz sandstone; minor shale, siltstone
	Wirara Formation		Green and red siltstone and shale, some quartz sandstone
	~~Stein Formation~~		~~Coarse-grained purple greywacke~~
	Landrigan Tillite	Ꝑnl	Tillite, sandstone lenses, minor dolomite
	MOUNT HOUSE GROUP — Estaughs Formation	Ꝑh	Hematitic quartz sandstone and siltstone
	Throssell Shale		Grey-green micaceous shale and fine-grained sandstone, minor dolomitic sediments
	Traine Formation		Sandstone, minor dolomite, scattered glacial erratics
	Walsh Tillite	Ꝑhw	Tillite, pink dolomite, pebbly quartz sandstone
MIDDLE PROTEROZOIC	Helicopter Siltstone	Ꝑst	Laminated siltstone and shale
	Wade Creek Sandstone	Ꝑsw	Quartz sandstone
	Mount John Shale Member	Ꝑsj	Shale, siltstone; minor ferruginous sandstone, chert
	GLIDDEN GROUP — Maddox Formation	Ꝑd	Black shale and siltstone, feldspathic sandstone
	Forman Sandstone		Fine-grained quartz sandstone
	Matheson Formation		Claystone, shale, siltstone, subgreywacke
	Harms Sandstone		Quartz sandstone, minor shale and siltstone
	CARR BOYD GROUP — Bandicoot Range Beds	Ꝑcb	Quartz sandstone, conglomerate, ferruginous sandstone, siltstone
	Pincombe Formation	Ꝑcp	Siliceous siltstone, micaceous shale, quartz sandstone
	Stonewall Sandstone	Ꝑcs	Subfriable quartz sandstone and feldspathic sandstone; minor red shale
	Glenhill Formation	Ꝑcg	Red-brown and green shale and siltstone, glauconitic sandstone, quartz sandstone
	Lissadell Formation	Ꝑcl	Quartz sandstone, siltstone and shale; minor tuff, pyritic sandstone
	Golden Gate Siltstone	Ꝑcd	Black pyritic shale, micaceous siltstone, subgreywacke, tuff, hematite
	Hensman Sandstone		Quartz sandstone
	Gardiner Beds	Ꝑyd	Quartz sandstone, ferruginous sandstone, pebble conglomerate, algal dolomite
CARPENTARIAN AND/OR ADELAIDEAN — UNDIFFERENTIATED	Bungle Bungle Dolomite	Ꝑsb	Dolomite, dolomitic shale, minor limestone
	Mount Parker Sandstone	Ꝑsp	Quartz sandstone, minor pebble conglomerate
	Colombo Sandstone	Ꝑm	Quartz sandstone, chert pebble breccia and conglomerate
	OSCAR RANGE SUCCESSION — Ninety Seven Mile Beds	Ꝑzn	Quartzite, cobble and boulder conglomerate, phyllite, epidotised basalt
	Elimberrie Beds	Ꝑzb	Quartzite, feldspathic sandstone, phyllite, (?) tillite, dolomite
	Linesman Beds	Ꝑzl	Siltstone, shale, feldspathic sandstone
	Ellendale Beds	Ꝑze	Quartzite, feldspathic sandstone, cobble and boulder conglomerate, siltstone, shale
	Le Lievre Beds	Ꝑzv	Quartzite, phyllite
	Christophers Beds	Ꝑzc	Quartzite, feldspathic sandstone, phyllite; minor conglomerate and dolomite
	Mount Wilson Beds	Ꝑzw	Coarse-grained quartz and feldspathic sandstone, arkose
CARPENTARIAN			Dolomite of unknown origin, mostly intrusive
	Wotjulum Porphyry	Ꝑqw	Quartz-feldspar porphyry
	Hart Dolerite	Ꝑdh	Tholeiitic dolerite, granophyre
	Fish Hole Dolerite	Ꝑf	Highly epidotized vesicular dolerite
LOWER & MIDDLE PROTEROZOIC	CROWHURST GROUP — Hibberson Dolomite	Ꝑr	Massive dolomite, dolomitic breccia and sandstone
	Collett Siltstone		Purple and green siltstone, rarely pyritic; dolomite
	Liga Shale		Green shale, minor micaceous siltstone
	Hilfordy Formation	Ꝑrh	Quartz sandstone, ferruginous siltstone, shale
	BASTION GROUP — Cockburn Sandstone	Ꝑtc	Quartz sandstone; minor micaceous fine-grained sandstone, shale
	Wyndham Shale	Ꝑt	Green and grey shale and siltstone, fine-grained sandstone
	Mendena Formation		Quartz sandstone, green and purple siltstone, dolomite
LOWER PROTEROZOIC	KIMBERLEY GROUP — Pentecost Sandstone	Ꝑkp	Quartz and feldspathic sandstone, grey and purple siltstone, glauconitic sandstone
	Yampi Member	Ꝑkpy	Haematitic sandstone, feldspathic sandstone, iron ore
	Elgee Siltstone	Ꝑke	Red and grey siltstone, minor sandstone; phyllite, limestone and dolomite locally
	Warton Sandstone	Ꝑkw	Quartz and feldspathic sandstone, siltstone
	Carson Volcanics	Ꝑkc	Tholeiitic basalt, spilite, feldspathic sandstone, siltstone, chert
	King Leopold Sandstone	Ꝑkl	Quartz sandstone; minor conglomerate
	SPEEWAH GROUP — Undifferentiated	Ꝑp	Quartz sandstone, micaceous locally; minor phyllite, pebble conglomerate
	Luman Siltstone	Ꝑpo	Micaceous siltstone, shale, fine-grained sandstone
	Lansdowne Arkose		Feldspathic sandstone, arkose, quartz sandstone, micaceous siltstone and shale
	Valentine Siltstone		Green siltstone, feldspathic sandstone, rhyolitic ashstone and tuff
	Tunganary Formation	Ꝑpn	Feldspathic sandstone, quartz sandstone arkose, green shale and siltstone
	O'Donnell Formation		Khaki shale, siltstone, greywacke; quartz sandstone, granule sandstone, conglomerate
	Revolver Creek Formation	Ꝑv	Amygdaloidal basalt, arkose, quartz sandstone, siltstone
	Red Rock Beds	Ꝑs	Quartz sandstone, quartz conglomerate, siltstone
	Moola Bulla Formation	Ꝑx	Arkosic sandstone, quartz conglomerate, greywacke and siltstone

Era	Unit	Symbol	Description
PROTEROZOIC — LOWER PROTEROZOIC* — LAMBOO COMPLEX		Ꝑbr	Rhyolite, dacite, microgranite
	Undifferentiated Lamboo Complex	Ꝑb	Intimate mixture of granite, gabbro and metamorphic rocks
	Mulkerins Granite	Ꝑbu	Coarse-grained leucocratic granite
	Mount Amy Granite	Ꝑbka	Leucocratic muscovite-biotite granite
	Dyasons Granite	Ꝑbky	Medium-grained leucocratic biotite granite
	Tarraji Microgranite	Ꝑbkt	Porphyritic biotite microgranodiorite
	Secure Bay Adamellite	Ꝑbks	Coarse-grained leucocratic biotite adamellite
	Lennard Granite	Ꝑbkl	Coarse-grained leucocratic porphyritic biotite granite
	Bow River Granite	Ꝑbo	Coarse-grained biotite granite and granodiorite, porphyritic to even-grained
	Long Hole Granite	Ꝑbg	~~Coarse-grained porphyritic biotite granite~~
	Chaneys Granite	Ꝑby	Coarse-grained, even-grained biotite granite, sparsely porphyritic locally
	Violet Valley Tonalite	Ꝑbv	Medium-grained, biotite-rich tonalite, some granodiorite and gabbro
	McHale Granodiorite	Ꝑbh	Hornblende-biotite granodiorite
	Sophie Downs Granite	Ꝑbs	Granite, granophyric granite; some microgranite
	Cone Hill Granite	Ꝑbkc	Coarse-grained porphyritic biotite granite
	Pillara Range Granodiorite	Ꝑbkp	Coarse-grained biotite granodiorite, minor medium-grained biotite tonalite
	McSherrys Granodiorite	Ꝑbkm	Mesocratic biotite-hornblende granodiorite and tonalite
	Lerida Granite	Ꝑbl	Coarse to medium-grained porphyritic biotite-granodiorite
	Mondooma Granite	Ꝑbko	Porphyritic biotite, hornblende and orthopyroxene microgranodiorite
	Bickleys Porphyry	Ꝑbb	Porphyritic microgranite and microgranodiorite
	Castlereagh Hill Porphyry	Ꝑbc	Quartz-feldspar porphyry, adamellite
	Mount Disaster Porphyry	Ꝑbkd	Coarsely porphyritic biotite microgranite and microgranodiorite
	Little Gold River Porphyry	Ꝑwl	Orthopyroxene-feldspar porphyry
	Whitewater Volcanics	Ꝑw	Rhyodacite; minor dacite, andesite, ash-flow tuff. Minor tuff, siltstone, conglomerate, agglomerate
	Nellie Tonalite	Ꝑbkn	Hornblende-biotite tonalite and granodiorite
	Richenda Microgranodiorite	Ꝑbkr	Biotite microgranodiorite
	Kongorow Granite	Ꝑbkk	Coarsely porphyritic biotite granite and adamellite, remnant gneissic bands locally
	Mabel Downs Granodiorite	Ꝑbm	Foliated hornblende granodiorite and tonalite; some biotite granite, orthopyroxene granite and migmatite
	Tickalara Metamorphics	Ꝑbt	Schist, paragneiss, orthogneiss, migmatite, amphibolite. Calc-silicate rocks
	Wombarella Quartz Gabbro	Ꝑbkw	Quartz gabbro, quartz norite, tonalite, porphyritic microtonalite
	McIntosh Gabbro	Ꝑbi	Gabbro and dolerite, mostly uralitised; amphibolite, basic granulite
	Alice Downs Ultrabasics	Ꝑba	Pyroxenite, peridotite, chlorite-tremolite rock
	Woodward Dolerite	Ꝑbd	Basic and ultrabasic sills and dykes
ARCHAEAN OR PROTEROZOIC — ARCHAEAN OR LOWER PROTEROZOIC — HALLS CREEK GROUP	Undifferentiated	Ah	Subgreywacke, siltstone, mica schist, some conglomerate and dolomite
	Olympio Formation	Aho	Subgreywacke, greywacke, siltstone, shale, some arkose, conglomerate and rare dolomite
	Biscay Formation	Ahr	Basic volcanics and intrusive rocks, greywacke and siltstone. Limestone, dolomite, carbonated rocks
	Saunders Creek Formation	Ahs	Indurated sandstone and quartz conglomerate
	Ding Dong Downs Volcanics	Ahd	Basic volcanic rocks, minor greywacke and siltstone; rhyolite, probably intrusive

* Subdivisions of the Precambrian time-scale used by the Geological Survey of Western Australia shown in grey

Geological boundary
Anticline, showing plunge
Syncline, showing plunge
Monocline
Overturned anticline
Plunge of minor anticline
Plunge of minor syncline
Plunge of drag fold
Plunge of fold axis
Fault, showing relative horizontal movement (q-quartz filled)
Low angle thrust fault
Inclined fault
Shear zone
Where location of folds and faults is approximate, line is broken; where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes
Strike and dip of strata
Prevailing strike and dip of strata
Vertical strata
Horizontal strata
Overturned strata
Horizontal strata
Dip < 5°
Dip 5°–15°
Dip 15°–45°
Dip > 45°
Trend lines
Tightly folded strata
Joint pattern
(airphoto interpretation)
Strike and dip of foliation
Prevailing strike and dip of foliation
Strike and dip of foliation with plunge of lineation
Inclined banding in igneous rocks
Prevailing strike and dip of cleavage
Strike and dip of bedding and cleavage coincident
Strike and dip of cleavage with plunge of lineation
Strike and dip of joints
Glacial striae with direction of movement
Current direction from cross bedding
Macrofossil locality
Dyke or vein; amph-amphibolite, ap-aplite, b-basalt, do-dolerite, g-granodiorite, p-pegmatite, q-quartz, rd-rhyodacite, rh-rhyolite porph-porphyry
Prospect
Mine not worked
Open cut or quarry
Minor mineral occurrence
Unexploited mineral deposit

Ac-Asbestos, Ag-Silver, As-Arsenic, Au-Gold, Ba-Barite, Be-Beryl, Bx-Bauxite, Cn-Corundum, Cr-Chromium, Cu-Copper, Fe-Iron, Fl-Fluorite, Ky-Kyanite, Mi-Mica, Mn-Manganese, Nb-Columbium (Niobium), Ni-Nickel, Pb-Lead, Pt-Platinum, Rc-Crushed rock aggregate, Sb-Antimony, Sn-Tin, T-Tungsten, Th-Thorium, U-Uranium, Zn-Zinc

Diamond drill hole
Petroleum exploration well- dry, abandoned
Petroleum exploration well with show of oil, abandoned
Bore with reference number
Abandoned bore
Well
Windpump
Water tank
Earth tank or dam
Irrigation dam
Dam on stream
Waterhole
Spring
Highway
Road
Vehicle track
Airport
Landing ground
Homestead
Yard
Telephone line
State boundary
Trigonometrical station
Elevation in metres
Abandoned

GEOLOGICAL RELIABILITY DIAGRAM

A Detailed mapping
B Detailed reconnaissance: numerous traverses and airphoto interpretation
C General reconnaissance: some traverses and airphoto interpretation
D Airphoto interpretation

DIAGRAMMATIC RELATIONSHIP OF ROCK UNITS

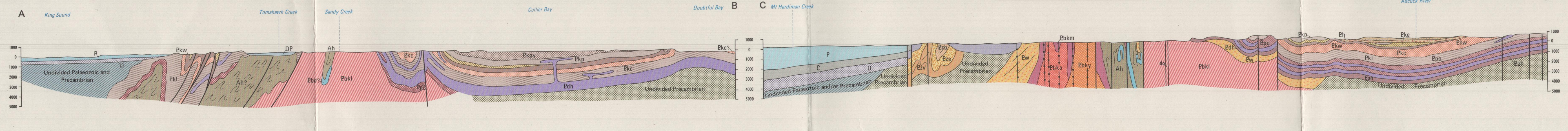
MESOZOIC
PALAEOZOIC
ADELAIDEAN OR PALAEOZOIC
ADELAIDEAN
CARPENTARIAN
LOWER PROTEROZOIC
ARCHAEAN (?)
CANNING BASIN
BONAPARTE GULF BASIN
ORD BASIN
Negri Group
Spielers Volcanics
Mount House Gp
Louisa Downs Group
Kuniandi Group
Oscar Range Succession
VICTORIA RIVER BASIN EQUIVALENTS
Glidden Group
Carr Boyd Group
VICTORIA RIVER BASIN
Albert Edward Group
Duerdin Group
BIRRINDUDU BASIN
KIMBERLEY BASIN
Crowhurst Gp
Bastion Gp
Kimberley Group
Speewah Group
KIMBERLEY BASIN EQUIVALENTS
HALLS CREEK PROVINCE
Lamboo Complex
Halls Creek Group

Unconformity
Igneous intrusion and/or metamorphism; queries indicate uncertain relationships

MAJOR TECTONIC UNITS

BONAPARTE GULF BASIN
KIMBERLEY BASIN
Victoria River Basin Equivalents
KING LEOPOLD MOBILE ZONE
HALLS CREEK MOBILE ZONE
HALLS CREEK PROVINCE
ORD BASIN
VICTORIA RIVER BASIN
BIRRINDUDU BASIN
CANNING BASIN
Victoria River Basin Equivalents

Sections
Scale: V/H = 2
Depth in metres
Cainozoic sediments omitted



KIMBERLEY REGION

MAP 2

MAP 3 1:200 000 (approx.)
SOLID GEOLOGY
EAST KIMBERLEY TRAVERSE.

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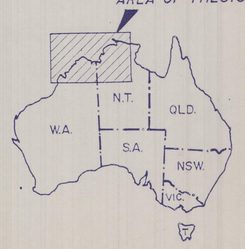
AREA OF THESIS



LEGEND

Tp — Tertiary Laterite — Pisolitic laterite

DPC — Devonian or Permian Conglomerate — Lithic pebble conglomerate

unconformity

Adelaidean

Edward Albert Group

Pao: Mount Forster Sandstone — quartz sandstone ; fine conglomerate, minor shale and siltstone.

Duerdin Group

Pos: Ranford Formation — khaki, green brown and grey floggy sandstone and siltstone, minor shale ; basal dolomitic feldspathic sandstone.

Pom: Moonlight Valley Tillite — tillite overlain laminated, pink dolomite

unconformity

Mid-Carpentarian

Psb: Bungle Bungle Dolomite — dolomite, dolomitic shale, minor quartz sandstone, algal dolomite

Psp: Mount Parker Sandstone — blocky to floggy quartz sandstone, basal quartz pebble conglomerate

unconformity

Early Carpentarian Kimberley Basin

Kimberley Group

Pdh: Hart Dolerite / Fish Hole Dolerite — Tholeiitic dolerite, minor granophyre

Ppe: Pentecost Sandstone — Quartz sandstone and feldspathic sandstone

Pke: Elgee Siltstone — Red brown, friable siltstone and quartz sandstone, basal grey to green micaceous siltstone and dolomite

Pkw: Weaton Sandstone — Pale purple, brown, feldspathic sandstone ; white cross-bedded quartz sandstone

Pkc: Carson Volcanics — Tholeiitic basalt and spilite, amygdaloidal in part; rhyolitic tuff and agglomerate ; feldspathic sandstone, siltstone, minor limestone

Pkl: King Leopold Sandstone — Massive white to pale purple, cross bedded, poorly sorted sandstone ; minor siltstone, local pebble to boulder conglomerate

disconformity and local unconformity

Speewah Group

Ppl: Lumen Siltstone — Purple, grey micaceous shale and siltstone

Ppa: Lansdowne Arkose — Buff to pale pink, cross bedded feldspathic sandstone, arkose, purple, grey and green micaceous siltstone and shale

Ppu: Valentine Siltstone — Chloritic siltstone ; grey green mudstone, feldspathic sandstone and rhyolitic tuff

Ppt: Tungonary Formation — Buff to pale grey, feldspathic quartz sandstone, sandstone, pink arkose, granule sandstone, grey green shale, micaceous siltstone, chert

Ppn: O'Donnell Formation — Khaki shale, siltstone and greywacke, white, purple, brown quartz sandstone ; glauconitic sandstone. Conglomerate at base

unconformity

Px: Maola Bulla Formation — Shale, sandstone, feldspathic arkose, greywacke, conglomerate

? unconformity relationship ? never exposed

Lamboo Complex

Pbo: Bow River Granite (includes Sophie Downs Granite) — Grey, coarse grained porphyritic biotite granite

Pbr: Richenda Microgranodiorite — equigranular biotite granodiorite

Pbm: Mt Sherries Granodiorite — Biotite granodiorite and gneissic granodiorite

Pbko: Kangorow Granite — gneissic biotite granite, part porphyritic

Whitewater Volcanics Association

Pw: Whitewater Volcanics — Quartz-feldspar porphyritic ignimbrites, lesser dacites, local intrusive porphyry

Tickalara Metamorphics — Domains 5, 2 (see text)

Pt: undifferentiated metamorphics — amphibolite facies equivalents of Halls Creek Group with minor basic and granitoid gneissic intrusives

gneissic granite, granodiorite — complexes mapped or inspected during field activities

amphibolite — includes intrusive complexes sills and pillowed metabasalts of Halls Creek Group

calc silicate

Halls Creek Group

Domain 1 West

tholeiitic metadolerite as composite sills, minor plagioclase glomeroporphyritic and porphyritic metadolerite

UNIT 2 — acid tuffaceous phyllite and meta-acid tuff, minor graphitic phyllite

UNIT 1 — quartzo-feldspathic wacke, quartz wacke, quartz-muscovite phyllite, muscovite-andalusite-quartz phyllite. Greenschist to lower amphibolite

Domain 1 East

Pto — Quartzo-feldspathic meta-wacke and phyllite, greenschist facies

Domain 6

Pc: Olympic Formation — quartz-feldspar-lithic turbidite wacke, quartz wacke, quartz rich phyllite ; greenschist to lower amphibolite facies

Biscay Formation:

Woodward Dolerite — amphibolite after tholeiitic dolerite, feldspar megacrystic dolerite, minor basalt

PB4 Biscay Unit 4 — quartz-feldspar wacke and phyllite with bands of marble and thin acid-tuffaceous phyllite

PB3 Biscay Unit 3 — acid-tuffaceous phyllite, quartz sericite phyllite, thick marble near base, thin marble bands at top

Biscay Unit 3 rhyolite — spherulitic rhyolite, minor latite intrusive lobes stratabound

calc silicate — marble, minor calc-silicate and graphitic phyllite

PB2 Biscay Unit 2 — meta-acid tuff and tuffaceous phyllite

PB1 Biscay Unit 1 — upper marble, calc silicate ; quartz-feldspar phyllitic, tuffaceous phyllite ; meta basalt, meta dolerite

Saunders Creek Formation — cross bedded quartz arenite ; magnetite rich quartz arenite

unconformity

Ding Dong Downs Volcanics

PD3 Ding Dong Downs Volcanics Unit 3 — acid meta-tuff, acid tuffaceous phyllite

PD2 Ding Dong Downs Volcanics Unit 2 — amygdaloidal, massive and pillowed amphibolite after metabasalt

PD1 Ding Dong Downs Volcanics Unit 1 — intercalated acid-tuffaceous phyllite, acid meta-tuff and amphibolite after metabasalt

BASE OF SEQUENCE NOT EXPOSED

STRUCTURAL LEGEND

Strike and dip of bedding

Strike and dip of cleavage, generation 3

Trend and plunge of fold axis, generation 3

Fault

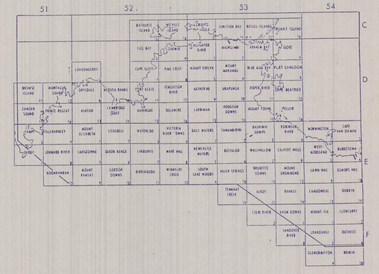
Anticline and syncline axial trace respectively with plunge, generation 3 or as indicated

Cross section location, sections appended

SCALE 1:83,000 approx.

0 200 400 600 800 1000 metres

INDEX TO 1:250 000 SHEETS



MAP 4. SOLID GEOLOGY LENNARD RIVER INLIER

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AREA OF THESIS

LEGEND

Tp — Tertiary Laterite — Pisolitic laterite

DPC — Devonian or Permian Conglomerate — Lithic pebble conglomerate

unconformity

Adelaidean

Edward Albert Group

Pem — Mount Forster Sandstone — quartz sandstone ± fine conglomerate, minor shale and siltstone

Duerdin Group

Pre — Rantord Formation — khaki, green brown and grey flaggy sandstone and siltstone, minor shale & basal dolomitic feldspathic sandstone

Pam — Moonlight Valley Tillite — tillite overlain laminated, pink dolomite

unconformity

Mid-Carpentarian

Pdo — Bungle Bungle Dolomite — dolomite, dolomitic shale, minor quartz sandstone, algal dolomite

Pap — Mount Parker Sandstone — blocky to flaggy quartz sandstone, basal quartz pebble conglomerate

unconformity

Early Carpentarian Kimberley Basin

Kimberley Group

Pdh — Hart Dolerite / Fish Hole Dolerite — Tholeiitic dolerite, minor granophyre

Pap — Pentecost Sandstone — Quartz sandstone and feldspathic sandstone

Pre — Ecles Siltstone — Red brown, friable siltstone and quartz sandstone, basal grey to green micaceous siltstone and dolomite

Pww — Weston Sandstone — Pale purple, brown, feldspathic sandstone, white cross-bedded quartz sandstone

Pv — Carson Volcanics — Tholeiitic basalt and spilite, amygdaloidal in part; rhyolitic tuff and agglomerate, feldspathic sandstone, siltstone, minor limestone

Pkl — King Leopold Sandstone — Massive white to pink purple, cross bedded, partly feldspathic sandstone; minor siltstone, local pebble to boulder conglomerate

unconformity and local unconformity

Speewah Group

Ppl — Lamon Siltstone — Purple, grey micaceous shale and siltstone

Ppo — Lonadowne Arkose — Buff to pale pink, cross bedded feldspathic sandstone, arkose, purple, grey and green micaceous siltstone and shale

Ppv — Valentine Siltstone — Chloritic sandstone; grey green mudstone, feldspathic sandstone and rhyolitic tuff

Ppt — Tungamary Formation — Buff to pale grey, ferruginous quartz sandstone, sandstone, pink arkose, manure sandstone, grey green shale, micaceous siltstone, marl

Ppo — O'Donnell Formation — Khaki shale, siltstone and greywacke; white, purple, brown quartz sandstone; glauconitic sandstone. Conglomerate at base

unconformity

Pe — Moola Bulla Formation — Shale, sandstone, feldspathic arenite, greywacke, conglomerate

P unconformity - relationship never exposed

Lamboo Complex

Pbb — Bow River Granite (includes Elaine Downs Granite) — Grey, coarse grained porphyritic biotite granite

Pgr — Richards Micrographic granodiorite — equigranular biotite granodiorite

Pgm — Mt Sparcus Granodiorite — Biotite granodiorite and granitic granodiorite

Pbkg — Kangaroo Granite — pinkish biotite granite, part porphyritic

Whitewater Volcanics Association

Pw — Whitewater Volcanics — Quartz-feldspar porphyritic ignimbrites, lesser dacites, local intrusive porphyry

Tickalara Metamorphics

Domains 1, 2 (see text)

Pt — undifferentiated metamorphics — amphibolite facies equivalents of Halls Creek Group with minor basic and granitoid gneissic intrusives

granitic granite, granodiorite — complexes mapped or inspected during field activities

pyroxenite — Includes intrusive complexes with and without metabasalts of Halls Creek Group.

calc silicate

Halls Creek Group

Domain 1 West

UNIT 2 — rhyolitic metaclastite ex composite sills, minor plagioclase glomeroporphyritic and porphyritic metabasalts

UNIT 1 — acid tuffaceous phyllite and meta-acid tuff, minor graphitic phyllite

quartz-feldspathic wacke, quartz wacke, quartz-muscovite phyllite, muscovite-andalusite-quartz phyllite. Greenschist to lower amphibolite

Domain 1 East

P1e — Quartz-feldspathic meta-wacke and phyllite, greenschist facies

Domain 6

Pc — Olympic Formation — quartz-feldspar-lithic turbidite wacke, quartz wacke, quartz rock phyllite, greenschist to lower amphibolite facies

Woodward Dolerite — amphibolite after tholeiitic dolerite, plagioclase megacrystic dolerite, minor basalt

Biscay Formation

PB4 — Biscay Unit 4 — quartz-feldspar wacke and phyllite with bands of marble and thin acid-tuffaceous phyllite

PB3 — Biscay Unit 3 — acid-tuffaceous phyllite, quartz sericite phyllite, thick marble near base, thin marble bands on top

Biscay Unit 3 rhyolite — epiclastic rhyolite, minor lense intrusive lobes stratabound

calc silicate — marble, minor calc-silicate and graphitic phyllite

PB2 — Biscay Unit 2 — meta-acid tuff and tuffaceous phyllite

PB1 — Biscay Unit 1 — upper marble, calc silicate; quartz-feldspar phyllite, tuffaceous phyllite; meta basalt, meta dolerite

Saunders Creek Formation — cross bedded quartz arenite, magnetite rich quartz granite

unconformity

Ding Dong Downs Volcanics

PD 3 — Ding Dong Downs Volcanics Unit 3 — acid meta-tuff, acid tuffaceous phyllite

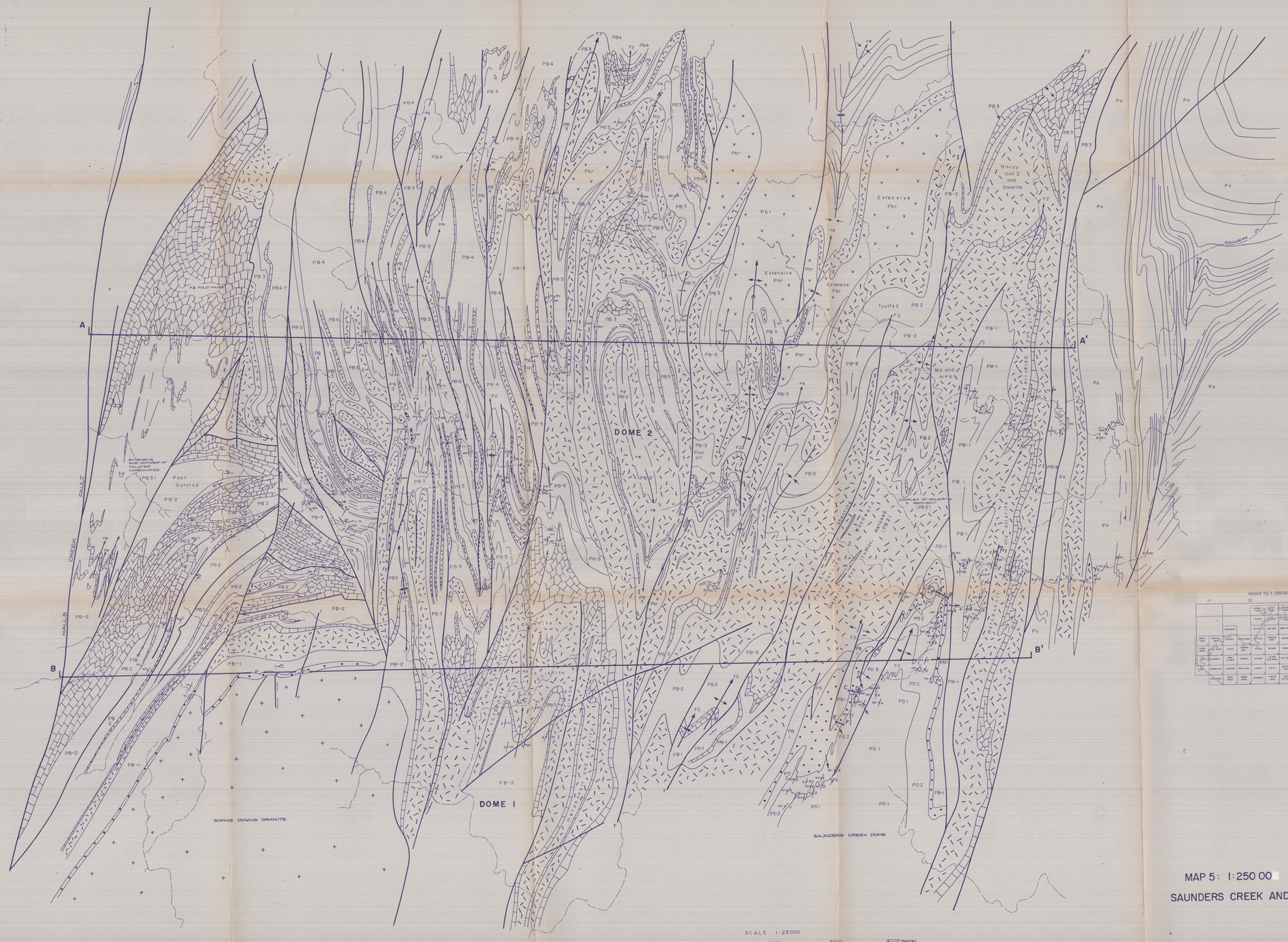
PD 2 — Ding Dong Downs Volcanics Unit 2 — amygdaloidal, mantles and pillowed amphibolite after metabasalt

PD 1 — Ding Dong Downs Volcanics Unit 1 — interbedded acid-tuffaceous phyllite, acid meta-tuff and amphibolite after metabasalt

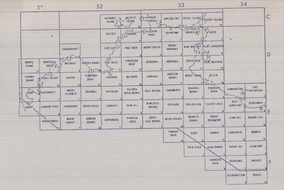
BASE OF SEQUENCE NOT EXPOSED

STRUCTURAL LEGEND

- 60 — Strike and dip of bedding
- 60 S3 — Strike and dip of cleavage, generation 3
- 15 F3 — Trend and plunge of fold axis, generation 3
- F — F — Fault
- Anticline and synciline axial trace respectively with plunge, generation 3 or as indicated
- A — A — Cross section location, sections appended
- Measured Section
- Palaeocurrent direction.



INDEX TO 1:250 000 SHEETS



MAP 5: 1:250 000 SOLID GEOLOGY

SAUNDERS CREEK AND SOPHIE DOWNS DOMES

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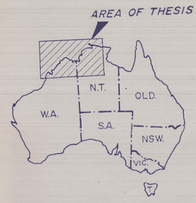
AREA OF THESIS



LEGEND

Tp — Tertiary Laterite — Pisolitic laterite
DPC — Devonian or Permian Conglomerate — Lithic pebble conglomerate

unconformity

Adelaidean

Edward Albert Group

Pga — Mount Forster Sandstone — quartz sandstone , fine conglomerate , minor shale and siltstone

Duerdin Group

Pes — Rantora Formation — shaki, green brown and grey floggy sandstone and siltstone, minor shale , basal dolomitic feldspathic sandstone.

Pem — Moonlight Valley Tillite — tillite overlain laminated, pink dolomite

unconformity

Mid-Carpentarian

Pkb — Bungle Bungle Dolomite — dolomite, dolomitic shale, minor quartz sandstone , algal dolomite

Pep — Mount Parker Sandstone — blocky to floggy quartz sandstone, basal quartz pebble conglomerate

unconformity

Early Carpentarian Kimberley Basin

Pdh — Hart Dolerite / Fish Hole Dolerite — Tholeiitic dolerite , minor granophyre

Pkp — Pentecost Sandstone — Quartz sandstone and feldspathic sandstone

Pke — Elgee Siltstone — Red brown, friable siltstone and quartz sandstone, basal grey to green micaceous siltstone and dolomite

Kimberley Group

Pkw — Warton Sandstone — Pale purple, brown, feldspathic sandstone, white cross-bedded quartz sandstone

Pkc — Carson Volcanics — Tholeiitic basalt and spilite , amygdaloidal in part, rhyolitic tuff and agglomerate , feldspathic sandstone, siltstone, minor limestone

Pkl — King Leopold Sandstone — Massive white to pale purple, cross bedded, poorly sorted sandstone ; minor siltstone, local pebble to boulder conglomerate

disconformity and local uncertainty

Ppl — Lumon Siltstone — Purple, grey micaceous shale and siltstone

Ppa — Lansdowne Arkose — Buff to pale pink, cross bedded feldspathic sandstone, arkose, purple, grey and green micaceous siltstone and shale.

Speewah Group

Ppv — Valentine Siltstone — Chloritic siltstone , grey green mudstone, feldspathic sandstone and rhyolitic tuff

Ppt — Tungahara Formation — Buff to pale grey, feldspathic quartz sandstone, sandstone , pink arkose , granule sandstone, grey green shale , micaceous siltstone,chert

Ppm — M'Donnell Formation — Khaki shale, siltstone and greywacke , white, purple, brown quartz sandstone ; glauconitic sandstone. Conglomerate at base

unconformity

Px — Moola Bulla Formation — Shale, sandstone, feldspathic arkose, greywacke, conglomerate

? unconformity relationship ? never exposed

Lamboo Complex

Pbo — Bow River Granite (includes Sophie Downs Granite) — Grey, coarse grained porphyritic biotite granite

Pbr — Richenda Microgranodiorite — equigranular biotite granodiorite

Pbm — M'Sherries Granodiorite — Biotite granodiorite and gneissic granodiorite

Pbko — Kongorow Granite — gneissic biotite granite, part porphyritic

Whitewater Volcanics Association

Pw — Whitewater Volcanics — Quartz-feldspar porphyritic ignimbrites, lesser dacites, local intrusive porphyry

Tickalara Metamorphics — Domains 5, 2 (see text)

Pt — undifferentiated metamorphics — amphibolite facies equivalents of Halls Creek Group with minor basic and granitoid gneissic intrusives

gneissic granite, granodiorite — complexes mapped or inspected during field activities

amphibolite — includes intrusive complexes sills and pillowed metabasalts of Halls Creek Group

calc silicate

Halls Creek Group

Domain 1 West

tholeiitic metadolerite as composite sills , minor plagioclase glomeroporphyritic and porphyritic metadolerite

UNIT 2 — acid tuffaceous phyllite and meta-acid tuff , minor ?-philic phyllite

UNIT 1 — quartz-feldspathic wacke, quartz wacke, quartz-muscovite phyllite , muscovite-andalusite-quartz phyllite . Greenschist to lower amphibolite

Domain 1 East

Plo — Quartz-feldspathic meta-wacke and phyllite, greenschist facies

Domain 6

Po — Olympic Formation — quartz-feldspar-lithic turbidite wacke, quartz wacke, quartz rich phyllite ; greenschist to lower amphibolite facies

Woodward Dolerite — amphibolite after tholeiitic dolerite, feldspar megacrystic dolerite , minor basalt

PB4 — Biscay Unit 4 — quartz-feldspar wacke and phyllite with bands of marble and thin acid-tuffaceous phyllite

PB3 — Biscay Unit 3 — acid-tuffaceous phyllite, quartz-sericite phyllite, thick marble near base, thin marble bands at top

Biscay Formation

Biscay Unit 3 — rhyolite — spherulitic rhyolite , minor lahar intrusive lobes stratabound

calc silicate — marble , minor calc-silicate and graphitic phyllite

PB2 — Biscay Unit 2 — meta-acid tuff and tuffaceous phyllite

PB1 — Biscay Unit 1 — upper marble, calc silicate ; quartz-feldspar phyllite, tuffaceous phyllite ; meta basalt, meta dolerite

Saunders Creek Formation — cross bedded quartz arenite , magnetite rich quartz arenite

unconformity

Ding Dong Downs Volcanics

PD 3 — Ding Dong Downs Volcanics Unit 3 — acid meta-tuff , acid tuffaceous phyllite

PD 2 — Ding Dong Downs Volcanics Unit 2 — amygdaloidal, massive and pillowed amphibolite after metabasalt

PD 1 — Ding Dong Downs Volcanics Unit 1 — intercalated acid-tuffaceous phyllite , acid meta-tuff and amphibolite after metabasalt

BASE OF SEQUENCE NOT EXPOSED

STRUCTURAL LEGEND

60 — Strike and dip of bedding

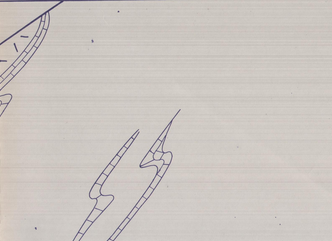
60 — S — Strike and dip of cleavage, generation S

15 — Trend and plunge of fold axis , generation S

F — F — Fault

Anticline and syncline axial trace respectively with plunge, generation S or as indicated

A — A' — Cross section location , sections appended



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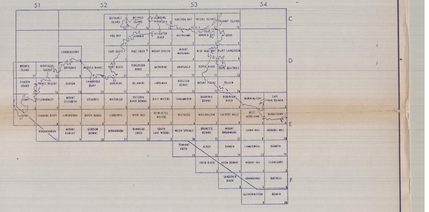

SCALE 1:25,000

0 500m 1km 2km 3km

SOLID GEOLOGY
GRANTS PATCH / PANTON RIVER

MAP 6

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LEGEND

ROCK TYPES

- Mtb — Metabasalts
- Md — Meta dolerite (Woodward Dolerite)
- Pbr — Rhyolite complexes (Unit 3)
- Calc silicate-marble

STRATIGRAPHY

- PO — Olympic Formation
- BISCAY FORMATION (PB)
  - PB4 — Biscay Formation – Unit 4 (4)
  - PB3 — Biscay Formation – Unit 3 (3,3·1, 3·2, 3·3)
  - PB2 — Biscay Formation – Unit 2 (2)
  - PB1 — Biscay Formation Unit 1
- SAUNDERS CREEK FORMATION — Saunders Creek Formation
- unconformity
- PD3 — Ding Dong Downs Volcanics Unit 3
- PD2 — Ding Dong Downs Volcanics Unit 2
- PD1 — Ding Dong Downs Volcanics Unit 1

INTRUSIVE UNITS

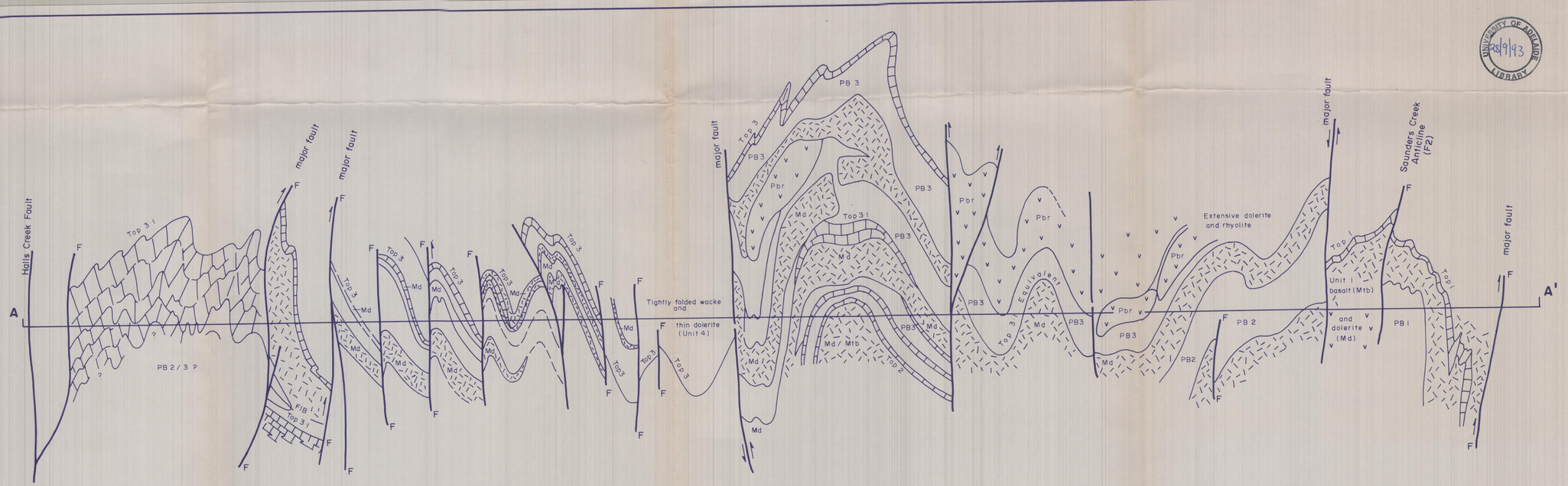
- Weakly deformed granite
- Schistose granite (bars denote form of Si)

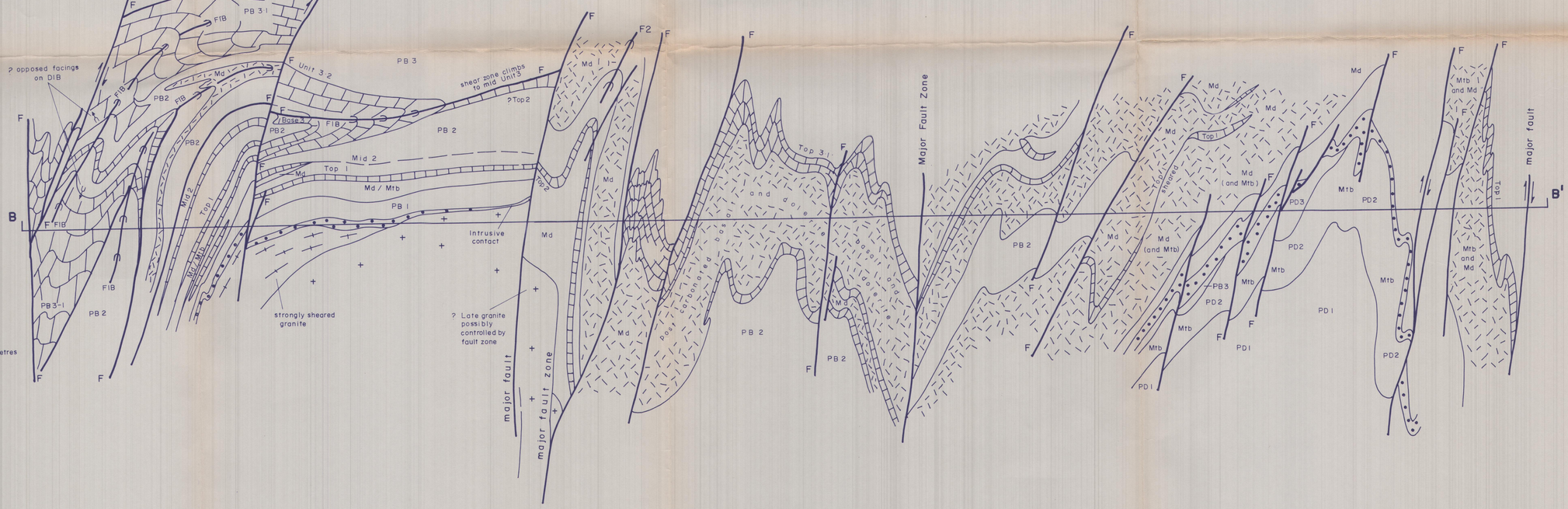
STRUCTUAL SYMBOLS

- F1, F1B, F2 — Fold axial surfaces
- Faults
- 40 — Strike and dip of bedding
- 2 / 85 — Strike and dip of cleavage generation
- 2 / 20 — Trend and plunge of fold 2 generation 2

SCALE 1:25000

0 500 1000 2000 3000 metres





CROSS SECTIONS

SAUNDERS CREEK TO SOPHIE DOWNS DOMES

MAP. 7

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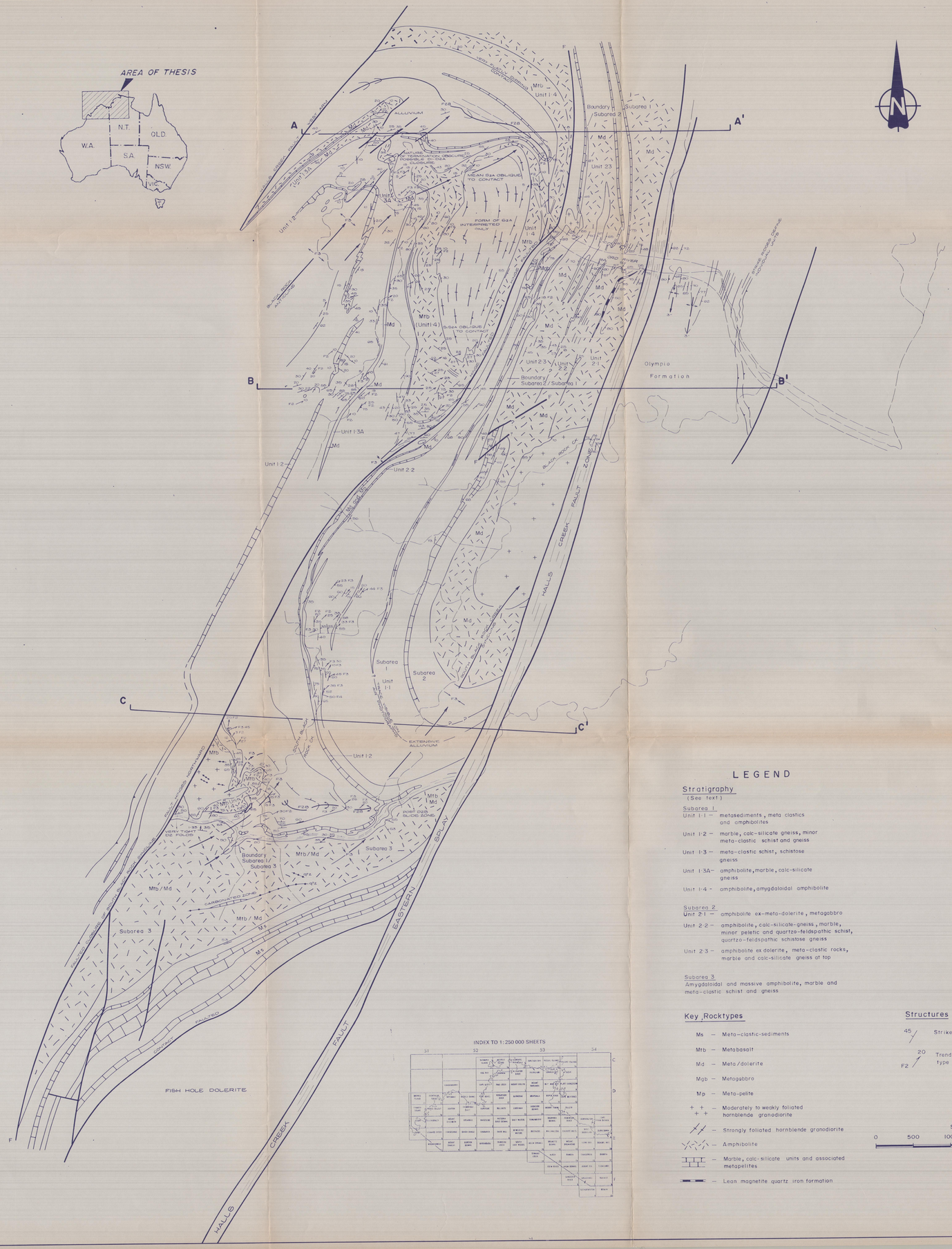
2241193

AREA OF THESIS



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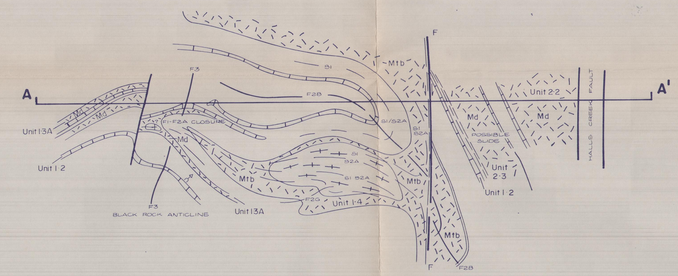
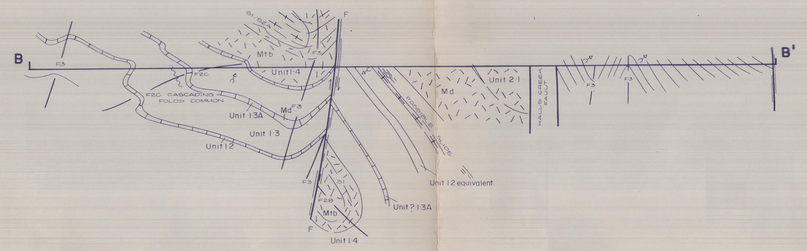
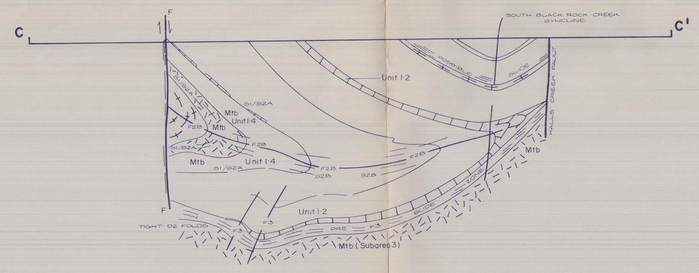
CROSS SECTIONS 1:25 000
NO VERTICAL EXAGGERATION







LEGEND

Stratigraphy
(See text)

Subarea 1

Unit 1·1 – metasediments, meta clastics and amphibolites

Unit 1·2 – marble, calc-silicate gneiss, minor meta-clastic schist and gneiss

Unit 1·3 – meta-clastic schist, schistose gneiss

Unit 1·3A – amphibolite, marble, calc-silicate gneiss

Unit 1·4 – amphibolite, amygdaloidal amphibolite

Subarea 2

Unit 2·1 – amphibolite ex-meta-dolerite, metagabbro

Unit 2·2 – amphibolite, calc-silicate-gneiss, marble, minor pelitic and quartzo-feldspathic schist, quartzo-feldspathic schistose gneiss

Unit 2·3 – amphibolite ex dolerite, meta-clastic rocks, marble and calc-silicate gneiss at top

Subarea 3

Amygdaloidal and massive amphibolite, marble and meta-clastic schist and gneiss

Key Rocktypes

Ms – Meta-clastic-sediments

Mtb – Metabasalt

Md – Meta/dolerite

Mgb – Metagabbro

Mp – Meta-pelite

+ + / + + – Moderately to weakly foliated hornblende granodiorite

– Strongly foliated hornblende granodiorite

– Amphibolite

– Marble, calc-silicate units and associated metapelites

– Lean magnetite quartz iron formation

Structures

45/ – Strike and dip of bedding S1 S2A

F2 20/ – Trend and plunge fold axes type indicated

SCALE 1:25 000

0 500 1000 2000 3000 metres

MAP 8. SOLID GEOLOGY AND STRUCTURAL CROSS SECTIONS
BLACK ROCK ANTICLINE : DOMAIN 5

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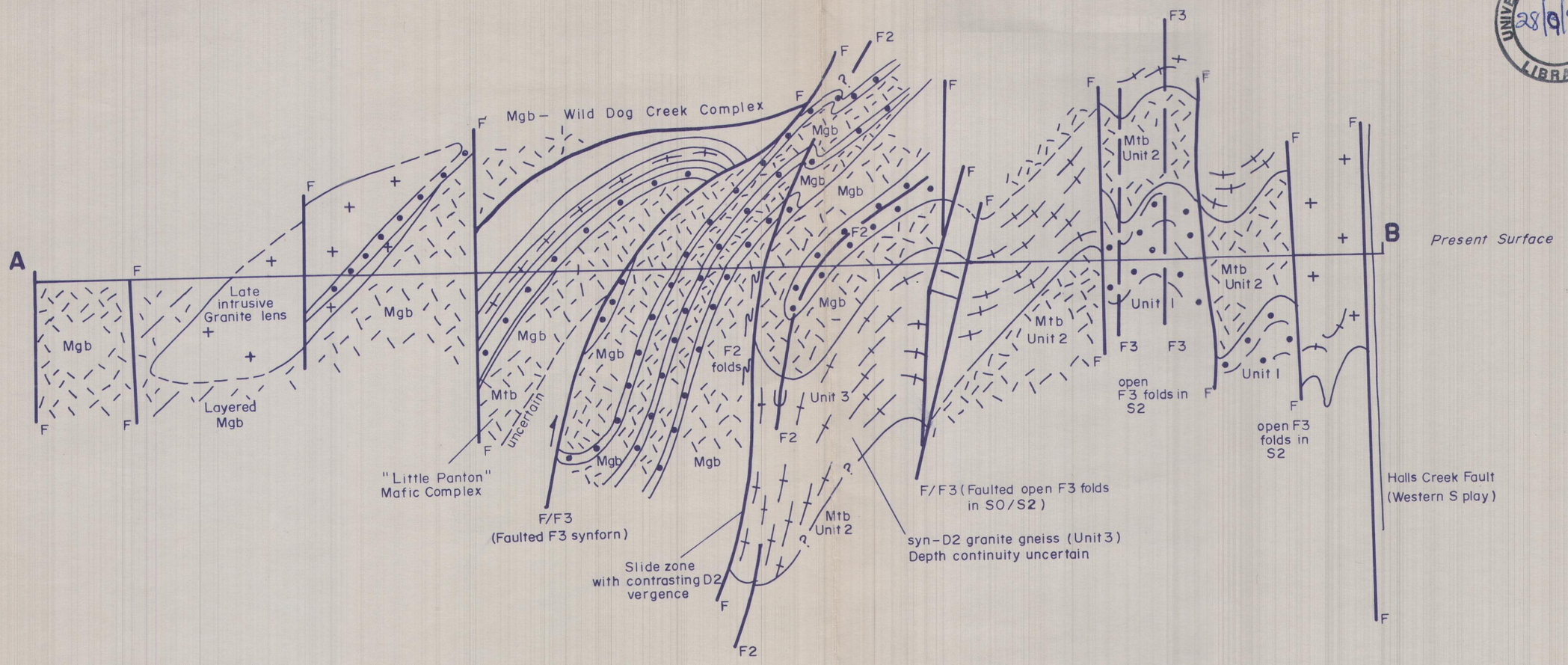

Rocktype Legend

Mgb	Metagabbro and Amphibolite
	Metasediments, lines show S2//S0
	Meta-granite and granite gneiss (long bar shows S2)
Mtb	Metabasalt, Pillowed Metabasalt, Amphibolite with calc-silicate bands, pods, lenses
+ + + +	Granite with minor granite gneiss

NOTE: Cross section shown in generalized and depth continuity of units cannot be reliably estimated in this terrain of abandant granite emplacement.

SCALE 1 : 25 000

0 500 1000 2000 metres

MAP. 9 1:25 000 STRUCTURAL CROSS SECTION
DOMAIN 5 : PANTON RIVER

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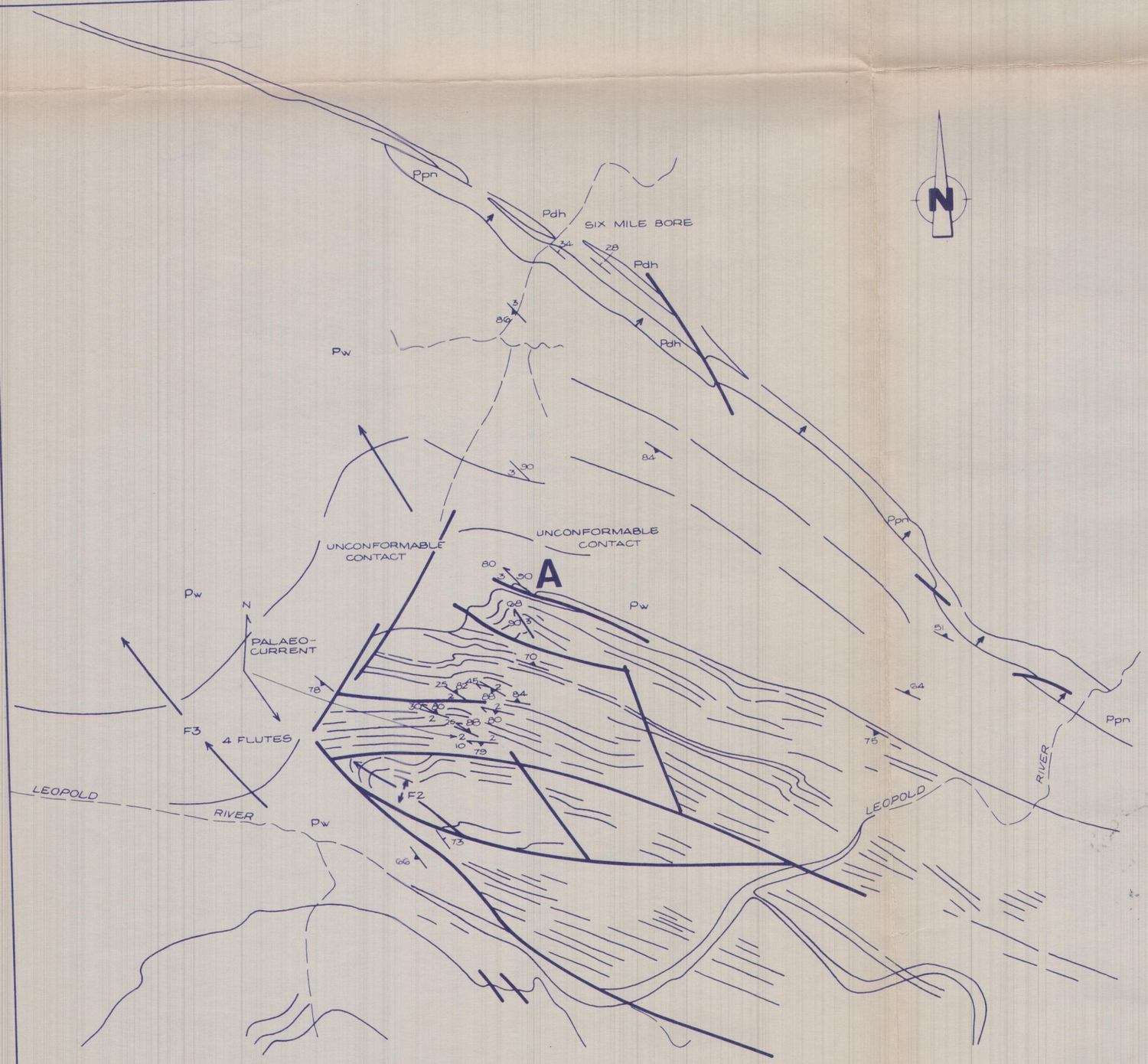

LEGEND

STRATIGRAPHIC

KIMBERLEY BASIN - Hart Dolerite Pdh (tholeiitic dolerite and gabbro).

O'Donnell Formation Ppn (white and brown qtz sst wt khaki siltstone)

WHITE WATER VOLCANICS - rhyodacitic and dactic tuffs with basal volcanic cobble conglomerate.

HALLS CREEK GROUP - qtz arkosic wackes and qtz chlorite siltstones.

STRUCTURAL

strike and dip of primary layering

strike and dip of S2 surface (68° dip) with $\ell^2_{0,1}$ plunging 10°

F2 fold axis (F2 age)

fault

MAP. 10 SOLID GEOLOGY SIX MILE BORE AREA

SCALE: 1:83,000 approx.

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AUSTRALIA

GEOLOGY OF THE
PINE CREEK GEOSYNCLINE
NORTHERN TERRITORY

by R.S. Needham and P.G. Stuart-Smith

1984

MAP LOCALITY

Scale 1:500 000

10 0 10 20 30 40 50 KILOMETRES

Transverse Mercator Projection

Geology 1951–83 by BMR and NTGS
Map compiled 1983 by R.S. Needham, P.G. Stuart-Smith, C.P. Knight BMR
B.A. Pietsch, D. Dundas NTGS
Edited by G.W. D'Addario, D.M. Pillinger
Cartography by C.P. Knight and R. Swoboda
Drawn by C.P. Knight
Printed by Mercury-Walch, Hobart, Australia

Published by the Bureau of Mineral Resources, Geology and Geophysics, Department of Resources and Energy. Issued under the authority of the Minister for Resources and Energy
Topographic base compiled by the Bureau of Mineral Resources, Geology and Geophysics, from the World Aeronautical Chart, ICAO 1:1 000 000 series produced by the Division of National Mapping, Department of Resources and Energy

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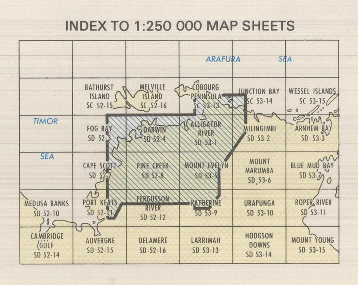
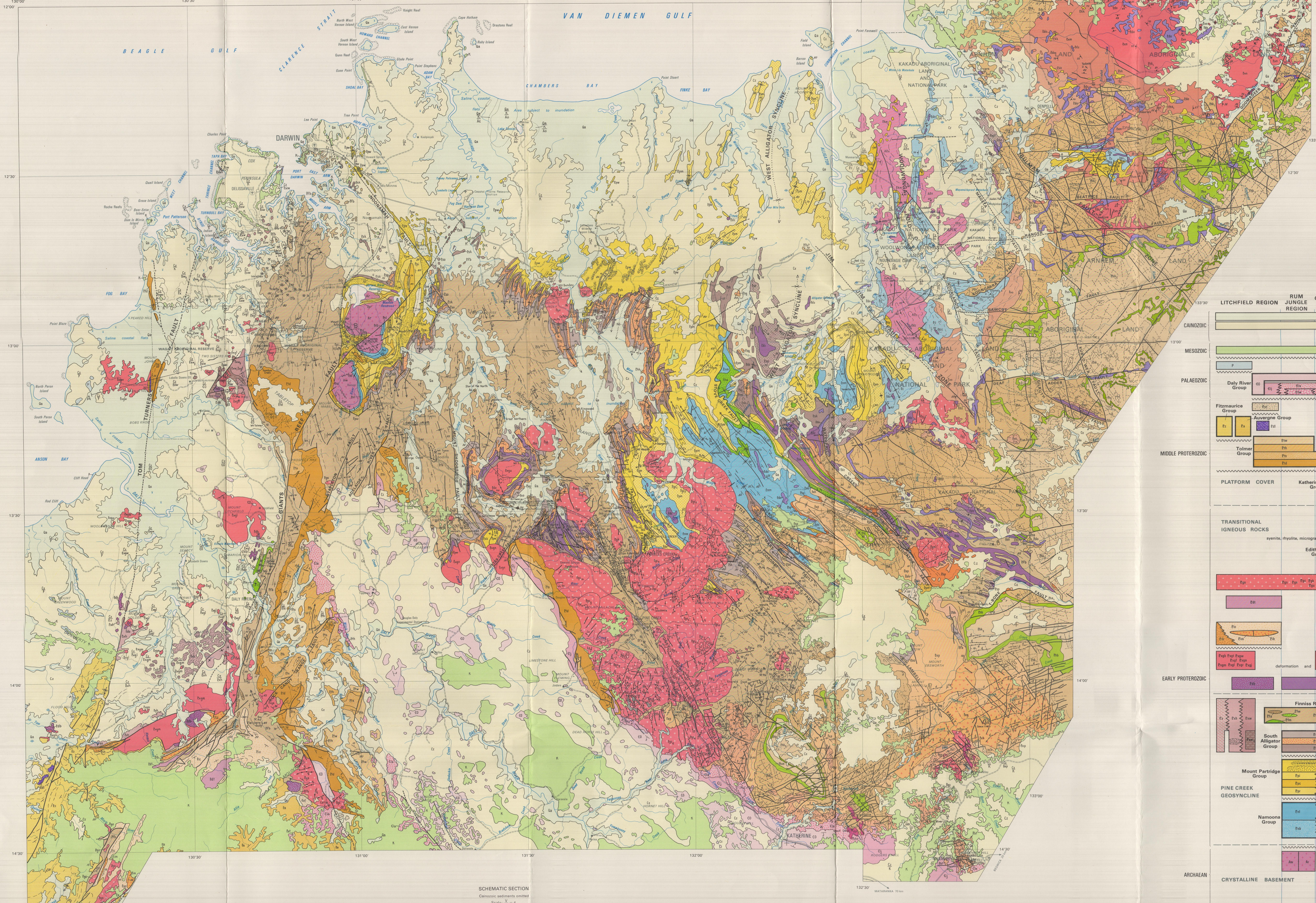
Bibliographic reference:
Needham, R.S. and Stuart-Smith, P.G.
1984 — Geology of the Pine Creek Geosyncline. 1:500 000 scale map.
Australian Bureau of Mineral Resources, Canberra, A.C.T.

INDEX TO 1:250 000 MAP SHEETS

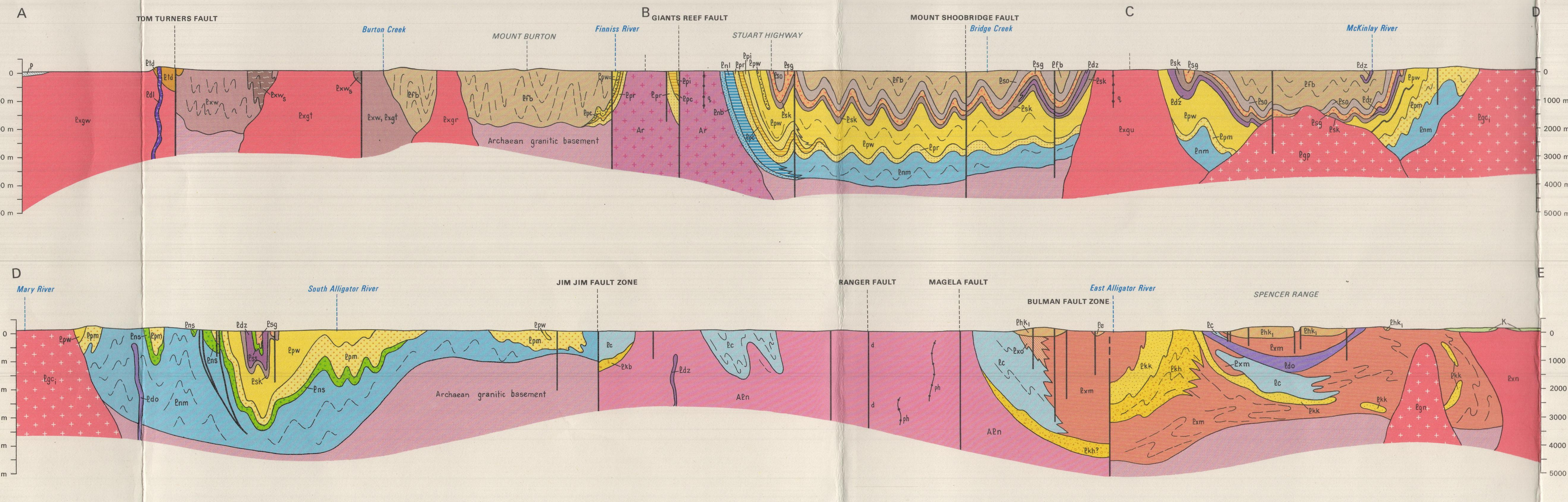




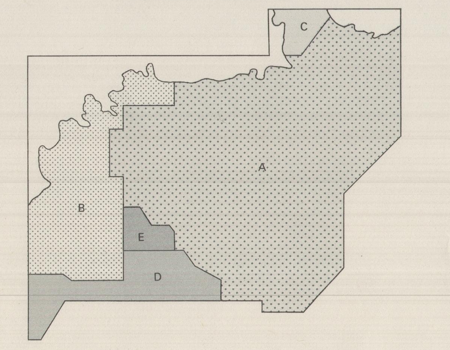
SCHEMATIC SECTION

Cainozoic sediments omitted

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



RELIABILITY DIAGRAM



A BMR and BMR–NT Geological Survey 1:100 000 scale mapping, 1971–1982
B NT Geological Survey 1:100 000 scale mapping, 1979–1983
C BMR 1:250 000 scale mapping, 1972–1973 (BMR Bulletin 177)
D BMR 1:250 000 scale mapping, 1965–1970 (BMR Bulletin 168)
E BMR 1:250 000 scale mapping, 1958 (BMR Bulletin 82)

Legend

- Geological boundary
- Anticline showing trend of plunge of axis
- Syncline showing trend of plunge of axis
- Overturned anticline
- Overturned syncline
- FA Trend of plunge fold axis
- Fault; reverse fault, triangle on upthrown side

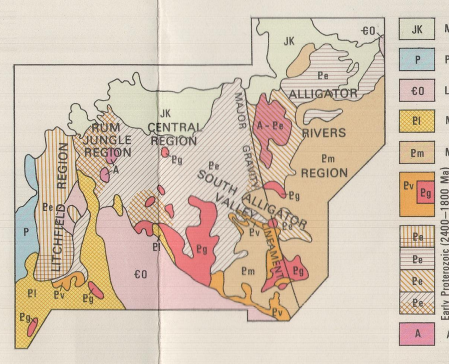
Where location of boundaries, folds and faults is approximate line is broken; where inferred, queried; where concealed boundaries and folds are dotted, faults are shown by short dashes

- Shear zone
- Strike and dip of strata
- Vertical strata
- Horizontal strata
- Strike and dip of overturned strata
- Plunge symbol on trend line
- Trend-line (airphoto interpretation)
- Trend-line showing dip of 5° to 15° (airphoto interpretation)
- Lineament (airphoto interpretation)
- Joint pattern
- Strike and dip of cleavage
- Strike and dip of foliation
- Vertical foliation
- Strike and dip of platy flow structure
- Horizontal platy flow structure
- Dyke or vein; a — aplite, d — dolerite, f — felsite, gr — granite, g — greisen, ph — phonolite, p — porphyry, q — quartz, qt — quartz-tourmaline, s — syenite, rhyolite, microgranite
- Prospect with little production
- Mine, minor
- Mine or deposit, major
- Open cut, quarry; minor
- Alluvial workings, minor
- Limit of mining activity

Ag — Silver, As — Arsenic, Au — Gold, Bi — Bismuth, Cd — Cadmium
Co — Cobalt, Cu — Copper, Fe — Iron, Li — Lithium, Mn — Manganese,
Mo — Molybdenum, Ni — Nickel, Pb — Lead, Ph — Phosphate, Sn — Tin, Ta — Tantalum,
Th — Thorium, U — Uranium, W — Tungsten (Wolfram, Scheelite), Z — Zinc

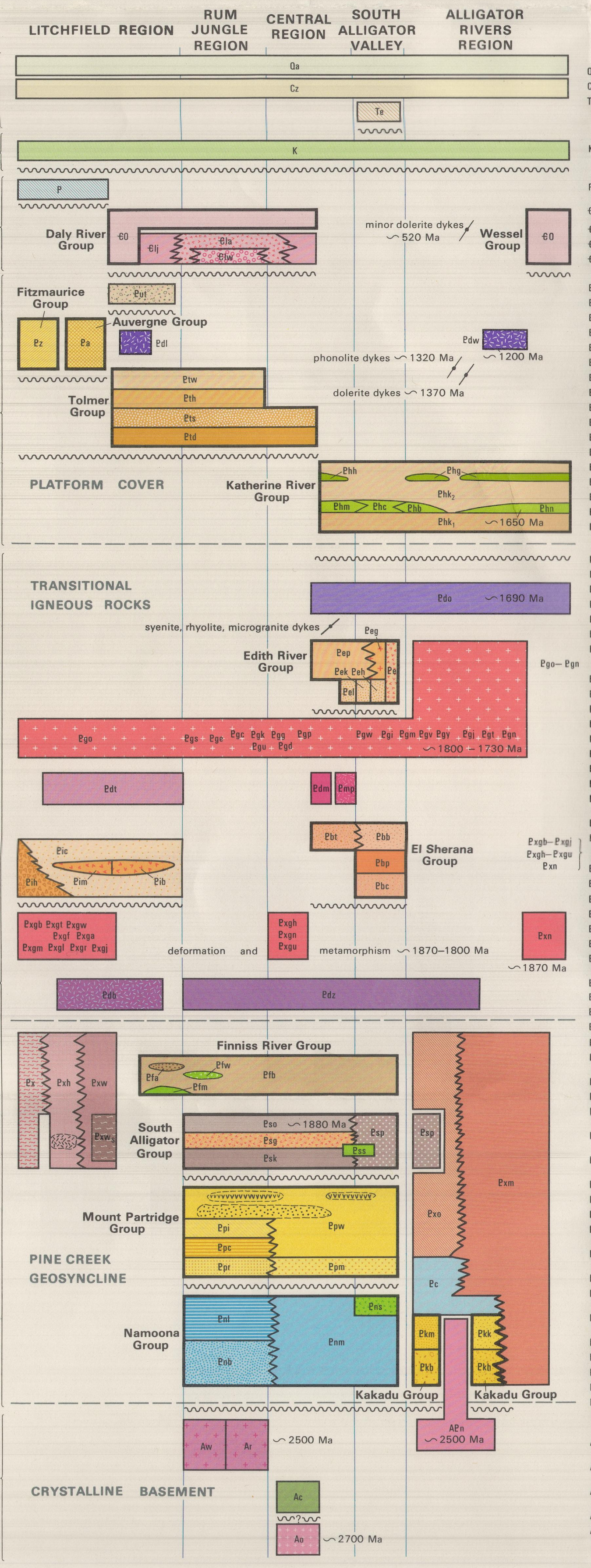
- Dome, structural
- Highway
- Road
- Vehicle track
- Railway with siding
- Built-up area
- Settlement
- Homestead
- Building
- Airport
- Landing ground
- Reef
- Swamp
- Mangroves

MAJOR DIVISIONS



Symbol	Division	Group
JK	Mesozoic — Bathurst Terrace	Platform Cover
P	Permian — Bonaparte Gulf Basin	Platform Cover
€0	Lower Palaeozoic — Daly River Basin, Arafura Basin	Platform Cover
Ꝑl	Middle Proterozoic — Victoria River Basin	Platform Cover
Ꝑm	Middle Proterozoic (1650–1400 Ma) — McArthur Basin	Platform Cover
Ꝑv, Ꝑg	Granite, volcanics and sediments (Early Proterozoic (2400–1800 Ma))	Transitional igneous rocks
Ꝑe	Litchfield Domain (medium grade) (low-medium grade)	Pine Creek Geosyncline
Ꝑe	Nimbuwah Domain (medium-high grade)	Pine Creek Geosyncline
Ꝑe	Nanambu Domain (medium grade)	Pine Creek Geosyncline
Ꝑe	Central Domain (low grade) (low-medium grade)	Pine Creek Geosyncline
A	Archaean (2500–2400 Ma)	Crystalline Basement

Stratigraphic chart



Symbol	Unit	Description
Qa		Silt, sand, clay, mud; coastal and river alluvium
Cz		Sand, gravel and laterite; colluvial, talus and transported terrestial sediments
Te		Brown ferruginous and white clayey coarse poorly sorted quartz sandstone
K		Fine to coarse sandstone, siltstone and conglomerate: marine and terrestial sediments
P		Siltstone, silty sandstone, minor limestone, basal conglomerate, diamictite
€0	Undivided Cambrian and Ordovician sediments	Limestone, sandstone, siltstone, dolomite, calcilutite, marl
€la	Antrim Plateau Volcanics	Massive and vesicular basalt, minor agglomerate
€lj	Jindare Formation	Mottled ferruginous clayey sandstone, siltstone, cherty flake breccia, calcarenite, quartzite; rare evaporite pseudomorphs
€lw	Witch Wai Conglomerate	Ferruginous sandy boulder and pebble conglomerate, micaceous quartz arenite
Ꝑut	Uniya Tillite	Tillite, glaciolacustrine arenite with dropstones: fluvioglacial sediments
Ꝑz		Sandstone, siltstone, shale, minor grit and conglomerate
Ꝑa		Sandstone, siltstone, sandy and silty dolomite, algal and oolitic dolomite, shale
Ꝑdl		Dolerite
Ꝑdw	Wurugoij Dolerite	Medium dolerite
Ꝑtw	Waterbag Creek Formation	Ferruginous sandstone and siltstone, minor dolomite and marl, halite pseudomorphs
Ꝑth	Hinde Dolomite	Dolomite and minor limestone, dolomitic siltstone
Ꝑts	Stray Creek Sandstone	Flaggy quartz sandstone, green siltstone and shale, dolomitic in places
Ꝑtd	Depot Creek Sandstone	Massive cross-bedded quartz sandstone, pebble bands
Ꝑhk₂	Kombolgie Formation	Medium to coarse quartz sandstone, cross-bedded and ripple-marked, minor siltstone, pebbly beds and conglomerate
Ꝑhg	Gilruth Volcanic Member	Vesicular basalt, tuffaceous siltstone, minor banded quartz-jasperite
Ꝑhh	Henwood Creek Volcanic Member	Basalt, andesite, minor tuff
Ꝑhn	Nungbalgarri Volcanic Member	Andesite to rhyodacite flows and minor dykes, vesicular and in places jasper-rich at top, minor intercalated sandstone
Ꝑhb	Birdie Creek Volcanic Member	Andesite, vesicular in places
Ꝑhc	Mount Callanan Volcanic Member	Andesite, vesicular in places
Ꝑhm	McAddens Creek Volcanic Member	Vesicular basalt and andesite, minor tuff and rhyolite
Ꝑhk₁		Medium to very coarse sandstone, cross-bedded and ripple-marked, quartz pebble conglomerate, minor siltstone
Ꝑdo	Oenpelli Dolerite	Olivine dolerite, commonly porphyritic, quartz dolerite, granophyre: differentiated lopoliths
Ꝑe		Rhyolite, dacite, minor basic volcanics, ignimbrite, tuffaceous siltstone
Ꝑep	Plum Tree Creek Volcanics	Rhyolite, dacite, ignimbrite, minor basic volcanics, lenses of tuffaceous sandstone
Ꝑeg	Grace Creek Granite	Red and minor grey porphyritic and xenolithic microgranite and medium-coarse granite
Ꝑel	Phillips Creek Sandstone	Sandstone, conglomerate, shale, tuffaceous sediments
Ꝑek	Kurrundie Sandstone	Purple quartz greywacke
Ꝑeh	Hindrance Creek Sandstone	Pink feldspathic sandstone, pebbly in places, minor quartz pebble conglomerate
	Postorogenic granitoids	Granite, granodiorite, adamellite, leucogranite (see separate reference below)
Ꝑdt	Ti Tree Granophyre	Granophyre
Ꝑdm	Maude Dolerite	Medium grey to green dolerite
Ꝑmp	Maranboy Porphyry	Grey-green feldspar porphyry
Ꝑic	Chilling Sandstone	White quartz sandstone, ripple-marked and cross-bedded, minor conglomerate, siltstone and tuff
Ꝑim	Meeway Volcanics	Porphyritic acid lava, tuff
Ꝑib	Berinka Volcanics	Acid and minor intermediate lava, minor sandstone and tuff interbeds, granophyric acid intrusive rocks
Ꝑih	Henschke Breccia	Coarse ferruginous sedimentary breccia and conglomerate with sandstone fragments, minor sandstone
Ꝑbt	Tollis Formation	Greywacke, siltstone, argillite, tuff, ignimbrite, basalt
Ꝑbb	Big Sunday Formation	Fine to coarse feldspathic greywacke, shale, tuffaceous chert, crystal tuff, basalt, rhyolite and minor siltstone, sandy siltstone and quartzite
Ꝑbp	Pul Pul Rhyolite	Purple to pink rhyolite and ignimbrite, minor black rhyolite
Ꝑbc	Coronation Sandstone	Very coarse pebbly quartz sandstone, conglomerate, shale, siltstone, greywacke, tuff, ignimbrite, rhyolite and minor basalt
	Synorogenic granitoids	Granite, adamellite, granodiorite, tonalite, leucogranite (see separate reference below)
Ꝑdz	Zamu Dolerite	Quartz dolerite and granophyre; metamorphosed to amphibolite in northeast
Ꝑdb	Wangi Basics	Metamorphosed massive to foliated gabbro, porphyritic dolerite, basalt anorthosite, diorite, meta-peridotite, metapyroxenite; harzburgite
Ꝑxm	Myra Falls Metamorphics	Muscovite-biotite-feldspar-quartz schist and gneiss, commonly with amphibole and garnet, and quartz-rich pods and bands
Ꝑxo	Nourlangie Schist	Quartz-mica schist, mica-quartz schist, minor quartzite
Ꝑx		Quartz-mica gneiss, quartz-biotite-feldspar gneiss, quartz-biotite schist, amphibolite (sub-surface only)
Ꝑxh	Hermit Creek Metamorphics	Sillimanite gneiss, garnet-cordierite gneiss, biotite-quartz schist, (symbol) denotes mafic meta-igneous rocks
Ꝑxw	Well Tree Schist	Sillimanite or andalusite-bearing quartz-feldspar-biotite-muscovite schist and quartz-feldspar-biotite-muscovite gneiss; minor quartzite
Ꝑxw₅	Sweets Member	Micrognesis, amphibolite, calc-silicate rock, marble, quartz-feldspar-biotite-muscovite schist and gneiss, graphitic schist
Ꝑfb	Burrell Creek Formation	Greywacke, siltstone, shale, minor conglomerate, rare argillite and felsic volcanics
Ꝑfa	Angulmeri Quartzite Member	Cross-bedded, white quartzite
Ꝑfw	Warr's Volcanic Member	Felsic volcanic flows, tuffaceous siltstone and arenite
Ꝑfm	Mulluk Mulluk Volcanic Member	Spherulitic rhyolite
Ꝑso	Mount Bonnie Formation	Slate (carbonaceous in places), shale, phyllite, siltstone, greywacke, argillite, crystal tuff, tuffaceous chert, minor ferruginous siltstone with chert bands, lenses and nodules
Ꝑsg	Gerowie Tuff	Black-green cherty tuff, crystal tuff, green argillite, pale green tuffaceous greywacke, rare chert-banded siltstone
Ꝑss	Shovel Billabong Andesite	Variolitic andesite
Ꝑsk	Koolpin Formation	Ferruginous siltstone with chert bands, lenses and nodules, pyritic carbonaceous shale, silicified dolomite, minor phyllite, jasper and banded iron formation
Ꝑsp	Kapalga Formation	Ferruginous siltstone, chert bands and nodules in places (commonly carbonaceous at depth), phyllite and greywacke, minor slate, arkose and sandstone, rare schist in northeast
Ꝑpw	Wildman Siltstone	Siltstone, in places carbonaceous at depth, red and cream laminated siltstone, minor fine blocky quartzite and quartz greywacke; (symbol) denotes quartzite, (symbol) denotes andesite, basalt and tuff
Ꝑpi	Whites Formation	Dolomitic, pyritic and carbonaceous shale, dololutite, minor quartzite and calc-silicate rock
Ꝑpc	Coomalie Dolomite	Dolomite, magnesite, dolomite breccia, tremolite schist, calcilutite, algal structures and evaporite pseudomorphs in places
Ꝑpr	Crater Formation	Feldspathic sandstone, pebble conglomerate, siltstone, pyritic in part, basal ferruginous conglomerate in places
Ꝑpm	Mundogie Sandstone	Coarse to medium quartz sandstone and orthoquartzite, commonly pebbly, quartz pebble conglomerate, siltstone; cross-bedded, scoured and graded beds. Minor schist and gneiss
Ꝑc	Cahill Formation	Mica-feldspar-quartz schist and quartz-mica schist with garnet, amphibole and kyanite in places, carbonaceous schist, crystalline dolomite-magnesite, and calc-silicate gneiss near base
Ꝑns	Stag Creek Volcanics	Basic volcanic breccia, andesite, tuff, tuffaceous shale, tuffaceous greywacke
Ꝑnm	Masson Formation	Ferruginous shale (mostly carbonaceous at depth), fine to coarse calcareous and volcanic greywacke, dolarenite, sandstone, dolomite
Ꝑnl	Celia Dolomite	Dolomite, magnesite, silicified or with algal structures in places, tremolite schist, minor sandstone, arkose, carbonaceous sediments
Ꝑnb	Beestons Formation	Arkose, feldspathic sandstone, conglomerate, siltstone
Ꝑkm	Munmarlary Quartzite	Massive to friable gneissic orthoquartzite, minor schist
Ꝑkk	Kudjumarndi Quartzite	Orthoquartzite, quartz gneiss, minor schist, rare cross-bedding, rare amphibole
Ꝑkb	Mount Basedow Gneiss	White-grey-pink coarse muscovite-biotite gneiss, granitoid gneiss, minor schist
Ꝑkh	Mount Howship Gneiss	Very coarse white feldspathic leucogneiss, minor schist, rare garnet and amphibole
AꝐn	Nanambu Complex	Leucogranite, pegmatoid gneiss, biotite-chlorite schist, porphyroblastic to equigranular massive to foliated biotite granite, migmatite, garnetiferous in places
Ar	Rum Jungle Complex	Gneiss, migmatite, coarse leucocratic granite, grey medium granite, minor schist, amphibolite, banded iron formation and quartzite
Aw	Waterhouse Complex	Aplitic leucocratic granite, adamellite, fine to coarse granite, garnetiferous or porphyritic in places, dolerite, amphibolite, uralitised granodiorite, schist, gneiss, migmatite, metasediments, banded iron formation
Ac	Dirty Water Metamorphics	Quartz-calcite-chlorite schist, banded iron formation, graphitic calcite-mica schist, meta-arkose and dolomite (sub-surface only)
Ao	Woolner Granite	Grey and pink foliated muscovite-biotite granite (sub-surface only)

POSTOROGENIC GRANITOIDS

Symbols listed in alphabetic order

Symbol	Name	Description
Ꝑgc₁	Allamber Springs Granite	Coarse pink-green porphyritic hornblende-biotite granite, pink medium-coarse-porphyritic biotite leucogranite
Ꝑgc₂	Bonrook Granite	Coarse pink leucogranite, coarse grey porphyritic biotite granite
Ꝑgc₃	McCarthys Granite	Coarse pink-green porphyritic hornblende-biotite granite; coarse grey porphyritic biotite granite; coarse pink, partly porphyritic, biotite leucogranite
Ꝑgc₄	Driffield Granite	Coarse pink equigranular to porphyritic biotite leucogranite, medium-coarse grey or pink-green porphyritic hornblende biotite granite
Ꝑgc₅	Tennysons Leucogranite	Coarse pink-light grey porphyritic biotite leucogranite, fine to coarse white equigranular leucogranite in places with quartz phenocrysts
Ꝑgc₆	Fingerpost Granodiorite	Coarse porphyritic biotite hornblende granodiorite
Ꝑgc₇	Douglas Leucogranite	Coarse light grey porphyritic biotite leucogranite, fine-medium equigranular leucogranite
Ꝑgc₈	Minglo Granite	Coarse pink-green porphyritic hornblende-biotite granite
Ꝑgc₉	McMinns Bluff Granite	Coarse pink-green porphyritic hornblende-biotite granite
Ꝑgc₁₀	Foelsche Leucogranite	Fine equigranular leucogranite
Ꝑgc₁₁	Mount Porter Granite	Coarse pink-green porphyritic hornblende-biotite granite
Ꝑgc₁₂	Frances Creek Leucogranite	Fine equigranular leucogranite
Ꝑgc₁₃	Saunders Granite	Medium equigranular biotite leucogranite
Ꝑgc₁₄	Tabletop Granite	Coarse pink equigranular and porphyritic biotite leucogranite, medium-coarse pink-green porphyritic hornblende-biotite granite
Ꝑgc₁₅	Umbrawarra Leucogranite	Coarse light grey porphyritic biotite leucogranite
Ꝑgc₁₆	Wandie Granite	Coarse pink-green porphyritic hornblende-biotite granite, medium equigranular and coarse porphyritic biotite leucogranite
Ꝑgc₁₇	Yenberrie Leucogranite	Coarse pink and medium white leucogranite
Ꝑgc₁₈	Bludells Monzonite	Medium grey-green biotite-hornblende-quartz monzonite, quartz syenite; minor quartz monzodiorite and dolerite
Ꝑgd	Mount Goyder Syenite	Dark pinkish grey porphyritic syenite and quartz syenite
Ꝑge	Reynolds River Granite	Pink medium porphyritic adamellite, grey medium hornblende-biotite granite
Ꝑgg	Margaret Granite	Pink and green coarse porphyritic adamellite
Ꝑgi	Mount Davis Granite	Coarse porphyritic pink granite and pink and green adamellite, feldspar porphyry
Ꝑgj	Jim Jim Granite	Sericitised cream to pink, coarse to porphyritic biotite granite
Ꝑgk	McKinlay Granite	Light grey medium to coarse adamellite
Ꝑgm	Malone Creek Granite	Fine to medium aplitic granite, in places porphyritic near margins
Ꝑgn	Nabarlek Granite	Sericitised cream coarse granite
Ꝑgo	Koolendong Granite	Coarse granite, adamellite and granodiorite, even and porphyritic
Ꝑgp	Prices Springs Granite	Grey massive medium to coarse porphyritic biotite granite and biotite adamellite
Ꝑgs	Soldiers Creek Granite	Coarse muscovite-biotite adamellite and granodiorite
Ꝑgt	Tin Camp Granite	Sericitised white-cream coarse granite
Ꝑgu	Mount Bundey Granite	Pink medium to coarse hornblende-biotite granite and adamellite, porphyritic in places
Ꝑgv	Eva Valley Granite	Fine to coarse grey, pink and green equigranular to porphyritic leucogranite
Ꝑgw	Wolfram Hill Granite	Pink medium granite, grey fine biotite adamellite
Ꝑgy	Yeuralba Granite	Leucocratic porphyritic adamellite, greisenised in the south

Ꝑgc₁–Ꝑgc₁₈: Cullen Batholith

SYNOROGENIC GRANITOIDS

Symbols listed in alphabetic order

Symbol	Name	Description
Ꝑxga	Allia Creek Granite	Coarse porphyritic muscovite-biotite granite, granodiorite and tonalite
Ꝑxgb	Turnbull Bay Granite	Coarse muscovite granite
Ꝑxgf	Fish Billabong Granite	Biotite adamellite, aplite
Ꝑxgh	Shoobridge Granite	Mainly porphyritic hornblende-biotite adamellite, with core of leucocratic adamellite and fringe of hornblende-biotite granodiorite
Ꝑxgj	Jammine Granite	Tourmaline-muscovite leucogranite
Ꝑxgl	Litchfield Granite	Massive to moderately foliated granite, adamellite, commonly with tourmaline-bearing pegmatites
Ꝑxgm	Murrakamangee Granite	Moderately to strongly foliated garnetiferous muscovite-biotite tonalite; numerous xenoliths
Ꝑxgn	Fenton Granite	Pink and green coarse porphyritic hornblende-biotite granite in the east, sheared in places and with minor adamellite and albitite; grey medium to coarse foliated biotite granite in the west
Ꝑxgr	Roberts Creek Granite	Granodiorite, adamellite, garnetiferous tonalite
Ꝑxgt	Two Sisters Granite	Granite, granodiorite and adamellite, commonly garnetiferous and tourmaline-bearing
Ꝑxgu	Burnside Granite	Grey fine-medium biotite granite, porphyritic in places
Ꝑxgw	Wagait Granite	Coarse hornblende-biotite adamellite, granite
Ꝑxn	Nimbuwah Complex	Homogeneous to foliated leucocratic granite, porphyroblastic hornblende-biotite granodiorite, granitic to tonalitic migmatite, garnetiferous in places, grey medium biotite granite, coarse graphitic granite

PINE CREEK GEOSYNCLINE

1:500 000

1984

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W — HALLS CREEK MOBILE ZONE — E

AGE IN MILLIONS OF YEARS BEFORE PRESENT

PHANEROZOIC — CAMBRIAN — ADELAIDEAN

PROTEROZOIC — CARPENTARIAN — LOWER PROTEROZOIC

500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200

NEGRI GROUP

Antrim Plateau Volcanics

LOUISA DOWNS GROUP: Lubbock Formation; Tean Formation; McAlly Shale ●666 ± 56; Yurabi Formation; Egan Formation

EGAN GLACIATION

ALBERT EDWARD GROUP: Flat Rock Formation; Nyuless Sandstone; Timperley Shale ●666 ± 56; Boonall Dolomite; Elvire Formation ●653 ± 48; Mount Forster Sandstone

KUNIANDI GROUP: Mount Bertram Sandstone; Wirara Formation; Stein Formation ●739 ± 30; Landrigan Tillite

MOONLIGHT VALLEY GLACIATION

DUERDIN GROUP: Renford Formation; Johnny Cake Shale Member ●685 ± 98; Jarrad Sandstone Member; Moonlight Valley Tillite ●739 ± 30; Frank River Sandstone; Fargoo Tillite

REFERENCE

- Unconformity showing youngest formation known to have been eroded
- Glaciation
- Vulcanism
- Intrusion of basic rocks
- Intrusion of acidic rocks
- Regional metamorphism
- ●1184 ± 23 — Isotopic age determination in millions of years

GLIDDEN GROUP: Maddox Formation ●1031 ± 23; Forman Sandstone; Matheson Formation; Harms Sandstone

CARR – BOYD GROUP: Bandicoot Range Beds; Pincombe Formation ●906 ± 181; Stonewall Sandstone; Glenhill Formation; Lissadell Formation; Golden Gate Formation ●1184 ± 123; Hensman Sandstone

Helicopter Siltstone; Wade Creek Sandstone; Mount John Shale Member ●1128 ± 110

Bungle Bungle Dolomite; Mount Parker Sandstone

Colombo Sandstone

Rhyolite porphyry (Pbr) and aplite dykes ●1537

CROWHURST GROUP: Hibberson Dolomite; Collett Siltstone; Liga Shale; Hilfordy Formation

BASTION GROUP: Cockburn Sandstone; Wyndham Shale ●1707 ± 31; Mendena Formation

KIMBERLEY GROUP: Pentecost Sandstone; Elgee Siltstone; Warton Sandstone; Carson Volcanics ●1807; King Leopold Sandstone

Hart Dolerite ●1800 ± 25

Revolver Creek Formation

Fish Hole Dolerite

SPEEWAH GROUP: Luman Siltstone; Lansdowne Arkose; Valentine Siltstone ●1761; Tunganary Formation; O'Donnell Formation ●1732

Moola Bulla Formation

Red Rock Beds

Whitewater Volcanics ●1788 ± 40 ●1823 ± 17

Bow River Granite ●1854 ± 14 — POST TECTONIC GRANITES — McHale Granite ●1854 ± 14, Violet Valley Tonalite

LAMBOO COMPLEX

SYNTECTONIC GRANITE (Mabel Downs Granodiorite) ●1963 ± 46

Tickalara Metamorphics

McIntosh Gabbro, Alice Downs Ultrabasics, Woodward Dolorite

Sophie Downs Granite (Cummins Range area)

? METAMORPHISM ?

Olympio Formation

Olympio Formation

Biscay Formation; Saunders Creek Formation; Ding Dong Downs Volcanics

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