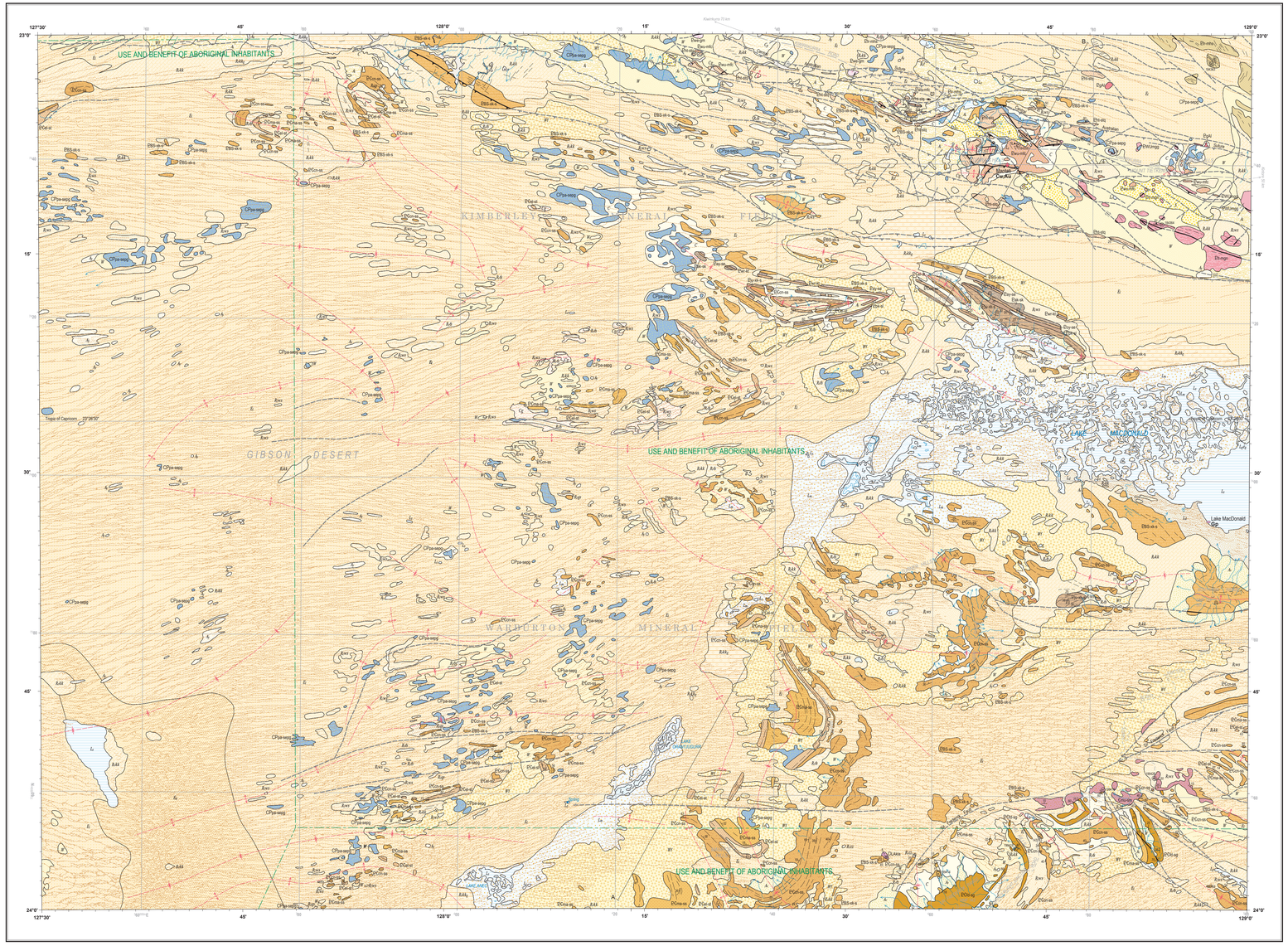
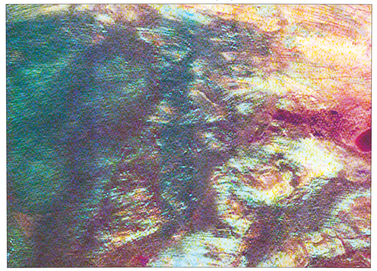
MACDONALD

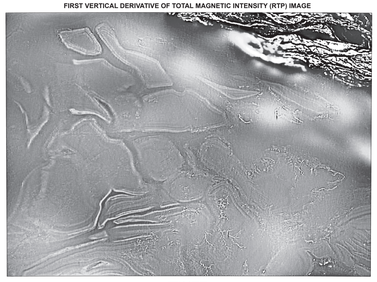
AUSTRALIA 1 : 250 000 GEOLOGICAL SERIES | **GEOLOGICAL SURVEY OF WESTERN AUSTRALIA** | **SHEET SF 52-14**



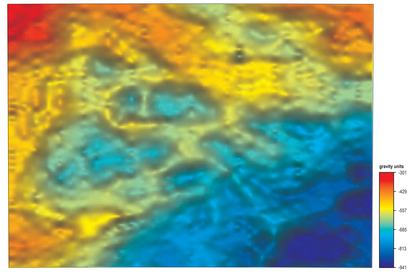
RADIOMETRIC IMAGE (KTU)



FIRST VERTICAL DERIVATIVE OF TOTAL MAGNETIC INTENSITY (RTP) IMAGE

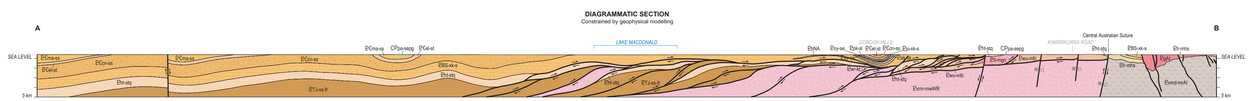


BOUGUER GRAVITY IMAGE



DIAGRAMMATIC SECTION

Constrained by geophysical modelling



CENOZOIC

Coluvial units

- **C** Coluvium derived from different rock types: includes gravel, sand, silt and clay
- **C_y** Clay, silt, and sand of mixed origin in pedolpain deposits; subcropping bedrock
- **C_g** Gravel, sand, and silt, commonly derived from quartzolithic/lithic rocks and associated weathering products

Sheetwash units

- **W** Clay, silt, and sand in sheetwash fans
- **W_f** Clay, silt, and sand with abundant ferruginous grit
- **W_g** Clay, silt, and sand, commonly derived from quartzolithic/lithic rocks

Alluvial units

- **A** Sand, silt, and clay in alluvial drainage depressions, claypans, and ephemeral floodplain lakes; low-lying areas with internal drainage
- **A_s** Superficial channel commonly terminating at a sheetwash zone; ephemeral
- **A_f** Clay, silt, sand, and gravel in alluvial fans
- **A_l** Sand, silt, and clay in localized depressions within eolian sandplain

Lacustrine units

- **L_u** Lake and lacustrine deposits: undifferentiated
- **L_d** Sand, silt, and gypsum in dunes adjacent to and within playa lakes
- **L_g** Silt, sand, and gravel in halophyte flats adjacent to playa lakes
- **L_{gf2}** Lithified and unconsolidated gypsum and clay, in locally well-bedded deposits fringing salt lakes
- **L_m** Mixed dune, evaporite, and alluvial deposits, typically adjacent to playa lakes
- **L_e** Saline and gypsiferous evaporite deposits, clay, silt, and sand in playa deposits
- **L_s** Saline lake, rimmed by evaporitic gypsum and carbonate deposits

Eolian units

- **El** Unconsolidated to consolidated, quartz-dominated eolian sand in longitudinal dunefield
- **Ex** Net-like dunefield

Sandplain unit

- **S** Residual and eolian sand with minor silt and clay; low vegetated dunes locally common

Residual or relict units

- **R_{qt}** In situ weathered sedimentary rocks; quartz-rich
- **R_{wx}** Residual sedimentary rocks; weathered
- **RdR_f** Ferruginous duricrust; massive to rubbly; derived from granitic rocks; includes iron-cemented reworked product
- **R_d** Ferruginous duricrust and iron-cemented products derived from sedimentary rocks
- **RdA_k** Calcrete; undifferentiated
- **RdA_{gr}** Groundwater calcrete; locally forms low mounds; nodular to massive; commonly with alternating layers of carbonate and chalcedony
- **R_{cz}** Silcrete; residual or relict siliceous duricrust
- **R_f** Transported ferruginous duricrust; iron-cemented sand and gravel

PHANEROZOIC

Fitzroy Movement (237–199 Ma)

- **CPpa-wpg** **PATERSON FORMATION:** conglomerate (including diamictite), sandstone, and siltstone; largely glacigene (line unit in section only)

Alice Springs Orogeny (450–295 Ma)

- **OLAlAs** **Ordovician sedimentary rocks, Amadeus Basin:** pink to pale-grey, coarse-grained calcarenite, and rare sandstone; abundant fossil fragments

Petermann Orogeny (580–520 Ma)

- **Cmu-sm** **MU FORMATION:** cobble to boulder conglomerate with predominantly sedimentary clasts and ferruginous, friable, sandy matrix; local red-brown sandstone and pebbly sandstone; and minor siltstone (inferred to have been deposited during the Petermann Orogeny)
- **ECms-ss** **MAURICE FORMATION:** fine- to medium-grained, cross-bedded, poorly-sorted, friable, lithic, feldspathic and micaceous red-brown sandstone; micaceous red-brown siltstone (inferred to have been deposited during the Petermann Orogeny)
- **ECkl-sg** / **ECel-st** ECkl-sg **SIR FREDERICK CONGLOMERATE:** cobble to boulder conglomerate with predominantly sedimentary clasts and friable, sandy matrix; interbedded unit of red-brown, poorly-sorted, lithic sandstone in Mu Hills (inferred to have been deposited during the Petermann Orogeny)
  ECel-st **ELLIS SANDSTONE:** medium-grained, cross-bedded, white to pale-brown sandstone and pebbly sandstone (inferred to have been deposited during the Petermann Orogeny)
- **ECcn-ss** **CARNEGIE FORMATION:** fine- to medium-grained, cross-bedded, poorly-sorted, lithic and feldspathic red-brown sandstone; poorly-exposed, micaceous red-brown siltstone (inferred to have been deposited during the Petermann Orogeny)
- **Ejv-ss** **JULIE FORMATION:** limestone, dolomite, siltstone, and sandstone; stromatolitic; common diagenetic silicification in carbonates
- **Epk-sl** **PERTATATAKA FORMATION:** siltstone, shale, and minor sandstone; very poorly exposed
- **Elyo-ss** **OLYMPIC FORMATION:** diamictite, sandstone, conglomerate, and siltstone; large erratics; common glacially faceted and striated clasts
- **Etak-ss** **ARALKA FORMATION:** siltstone, shale, limestone, dolomite, and minor sandstone; stromatolitic
- **Eary-ss** **AREYONGA FORMATION:** diamictite and conglomerate; rare glacially faceted and striated clasts; very poorly exposed
- **Ewr-st** **WALLARA FORMATION:** dolomite, oolitic dolomite, sandstone, and siltstone; stromatolitic; commonly silicified to chert and sandy chert at surface
- **EbNA** **Amadeus Basin mafic unit:** mafic rock within the Amadeus Basin; unexposed, interpreted from geophysical data (section only)
- **EBS-sh-s** Dolomite, stromatolitic dolomite, siltstone, and sandstone; evaporites in subsurface
- **Eht-stq** **HEAVITREE FORMATION:** quartz sandstone and quartzite; lesser siltstone and pebbly conglomerate
- **ET-sa-b** Siliciclastic sedimentary and volcanic rocks; locally metamorphosed (section only)
- **R** / **R1** Quartz vein or pod; massive, crystalline, or brecciated; age uncertain

Chewings Orogeny (1590–1570 Ma)

Liebig Orogeny (1640–1630 Ma)

- **DWLmgg** Foliated hornblende metagranodiorite to quartz metadiorite; may include two-pyroxene metagranite or migmatitic felsic rocks
- c. 1640 Ma — **Dwa-gn** **MOUNT WEBB GRANITE:** metamonzogranite; local metasyenogranite, metagranodiorite, and metatonalite
- c. 1650 Ma — **Dwu-mfc** **WALUNGURRU VOLCANICS:** metadacite and metarhyodacite; may include intermediate to mafic metavolcanic rocks
- c. 1691 Ma — **Dh-ongn** **ININTI GRANITE:** foliated, porphyritic granitic gneiss; may include syenogranitic gneiss with metasedimentary xenoliths
- **Dwm-mwWR** **Warumpi Province metamorphic unit:** undivided granitic gneiss and metamorphosed, felsic to mafic volcanic and volcaniclastic rocks (section only)

Yambah Event (1780–1770 Ma)

- **DyAi** **Aileron Province granitic unit:** granitic rock

Stafford Event (1810–1790 Ma)

- <1838 Ma — **Dh-mhs** **LANDER ROCK FORMATION:** interbedded psammitic and pelitic schist; quartz–muscovite schist; may include metamorphosed banded iron-formation and metavolcanic rocks
- **Dwmd-mvAI** **Aileron Province metamorphic unit:** undivided metasedimentary and meta-igneous rocks (section only)

Geological boundary

- exposed
- thrust, exposed, triangle on upthrown side
- strike-slip, exposed, showing relative dextral displacement
- thrust oblique, exposed, triangle on upthrown side, showing relative dextral displacement
- concealed
- normal, concealed, tick on downthrown side
- thrust, concealed, triangle on upthrown side
- strike-slip, concealed, showing relative dextral displacement
- thrust oblique, concealed, triangle on upthrown side, showing relative dextral displacement
- relative movement (section only):
  - vertical, direction indicated by arrows
  - horizontal, towards viewer, away from viewer

Fold axial trace

- exposed
- anticline, exposed
- syncline, exposed
- anticline, concealed
- syncline, concealed

Small-scale fold axis, showing strike and dip

- inclined

Small-scale fold axis, showing trend and plunge

- inclined

Bedding, showing strike and dip

- inclined
- overturned, inclined
- way-up not known, inclined

Trend of bedding

Metamorphic foliation, showing strike and dip

- inclined

Gneissic layering, showing strike and dip

- inclined

Airphoto or satellite image lineament

- unspecified

Macrofossil locality

Plant fossil locality

Stromatolite fossil locality

- isotopic age determination site with identification number: 1594/14

Road, unsealed

Track

Aboriginal reserve boundary

Horizontal control; minor

Sand dune crest

Watercourse

Lake

Spring

- Spring

Mineral field boundary

DATA SOURCES

Theme	Data Currency	Organization[1]
Geology *	2018	Department of Mines, Industry Regulation and Safety
Mineral sites *	2018	Department of Mines, Industry Regulation and Safety
Structural data	2018	Department of Mines, Industry Regulation and Safety
Horizontal control	2018	Landgate
Topography	2017	Landgate

* DMIRS data can be viewed interactively via GeoVIEW.WA <www.dmp.wa.gov.au/geoview>, and related datasets can be downloaded from the GSWA Data and Software Centre <www.dmp.wa.gov.au/dasc/centre>

[1] WA State Government unless otherwise indicated

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REDKNAP 4153	HARTUNG 4253	WILSON CLIFFS 4353	CROZIE 4453	DIAMP BELL 4553	MARINBA 4653	SANDFORD CLIFFS 4753	WARBURTON 4853	NICKOL 4953
							LAKE MACKAY	
TERRY 4152	DAMOTA HILLS 4252	TOP OF RISE 4352	POLLOCK 4452	WEBB 4552	LAKE MACKAY 4652	EDERTON 4752	REDVERS 4852	CAREY 4952
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1 : 100 000 maps shown in black
1 : 250 000 maps shown in brown

Search for GSWA map products online at <www.dmp.wa.gov.au/GSWApublications>
Grey lines show magnetic declination for June 2018 derived from the 2015 AUDF model.
Annual change is 4'25" per year westerly at the centre of the map.
The information is current to the year 2018.

MINERAL SITES

MINERALIZATION STYLE

- Vein and hydrothermal
- Regolith hosted

COMMODITY GROUP

- Base metal
- Industrial mineral

COMMODITY

Copper ..... Cu
Gold ..... Au
Gypsum ..... Gp

SITE NAME

Mine, deposit, prospect, or occurrence ..... Mantati

Mineralization sites on this map have been extracted from the MINEDEX database. For clarity, names have been shown only for selected sites. Full details of site numbers, site locations, site status, mineralization, and commodities can be obtained from the MINEDEX database, accessed at <www.dmp.wa.gov.au/minedex>.

Compiled by CV Spaggiari 2007–09; PW Haines, N de Souza Kovacs, CV Spaggiari, G Escott, DW Maidment and RE Murdie 2016–18

Geology by AT Wells, DJ Forman and LC Ranford 1960–62; CV Spaggiari and IM Tyler 2007; PW Haines and HJ Allen 2009, 2011–12

Regolith by N de Souza Kovacs and G Escott 2016–18

The authors would like to thank the traditional owners of the area for their help and support, and for allowing access to their lands for their purpose of scientific research.

Explanatory Notes for units and events are available online at <www.dmp.wa.gov.au/ENS>.

Geochronology from GSWA data (published and in preparation) and interpreted from external sources (listed below). Some GSWA geochronology may come from samples obtained on adjoining map sheets. GSWA geochronology data are available online at <www.dmp.wa.gov.au/geochron>.

External geochronology by:
(1) Kendall, B et al. 2006, Geology, v. 34, p. 729–732
(2) Kositcin, N et al. 2015, Northern Territory Geological Survey, Record 2015-001, 56p.

Cartography by S Mulligan

Edited by SR White and K Greenberg

Published by Geological Survey of Western Australia

This map is published in digital format (PDF) and is available online at <www.dmp.wa.gov.au/GSWApublications>.

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Phone: +61 8 9222 3459 Fax: +61 8 9222 3444
Website: www.dmp.wa.gov.au/gswa Email: geological.survey@dmirs.wa.gov.au

The recommended reference for this map is:
Haines, PW, de Souza Kovacs, N, Spaggiari, CV, Escott, G, Allen, HJ, Tyler, IM, Maidment, DW, and Murdie, RE 2018, Macdonald, WA Sheet SF 52-14 (2nd edition): Geological Survey of Western Australia, 1:250 000 Geological Series.

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EXPLORATION INCENTIVE SCHEME

NGAANYATJARRA COUNCIL (Aboriginal Corporation)

CENTRAL DESERT NATIVE TITLE SERVICES

Kiwirrkurra Community

Government of Western Australia
Department of Mines, Industry Regulation and Safety
HON BILL JOHNSTON MLA
MINISTER FOR MINES AND PETROLEUM

Geological Survey of Western Australia
JEFF HAWORTH, EXECUTIVE DIRECTOR
GEOSCIENCE AND RESOURCE STRATEGY

SCALE 1 : 250 000

5000 0 5 10 15 20 25
Metres Kilometres

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM

Grid lines indicate 20 000 metre interval of the Map Grid Australia Zone 52

The Map Grid Australia (MGA) is based on the Geocentric Datum of Australia 1994 (GDA94). GDA94 positions are compatible within one metre of the datum WGS84 positions

MACDONALD

SHEET SF 52-14
SECOND EDITION 2018
Version 1 — June 2018