Sandstone 2742, section A–B, 1:100 000 geological map

(Sandstone and Gum Creek greenstone belts, Southern Cross Domain, Yilgarn Craton)

RE Murdie

Location

Maps: Youanmi (SH 50-4) and Sandstone (2742)

Zone: MGA Zone 50

End coordinates: 709070E 6905700N to 743250E 6905725N

Length: 34 km

Scale of interpretation: 1:100 000

This east- to west-oriented section crosses the northern part of the Sandstone greenstone belt (Fig. 1).

Tectonic units

The Sandstone greenstone belt is a refolded syncline of greenstone stratigraphy sitting on the edge of the Southern Cross Domain. No regional stratigraphy has been established across the domain, but the local stratigraphy has been determined from mapping and drillcores, although a lack of outcrop precludes correlation of the northern part of the greenstone with the better exposed southern part found on sheet Atley.

The Sandstone greenstone belt in the north is a mafic-dominated succession overlain by fine-grained clastic sedimentary rocks (Tingey, 1985; Chen, 2005) with intercalated banded iron-formations (BIF).

The greenstones have fault-bounded contacts with the surrounding Archean granites which are typically poorly exposed. They are dominated by monzogranites with subordinate granodiorites. Strongly deformed granitic rocks are mapped with, and adjacent to, the major shear zones (Tingey, 1985; Chen, 2005).

Structure

The major fault in this area is the Youanmi Shear Zone, which forms the boundary between the Murchison Domain in the west and the Southern Cross Domain in the east. From the seismic reflection surveys of 2010 it was shown to be a trans-crustal fault going all the way to the mantle (Wyche et al., 2014). It dips to the east and with the west-dipping Edale Fault bounds the Sandstone greenstone belt.

The Sandstone greenstone belt is a refolded syncline. The original F1 east-trending syncline has been overprinted by the F2 syncline with box-fold geometry and is disrupted by brittle faults (Chen, 2005).

Geophysical data

A gravity profile was extracted from the Geological Survey of Western Australia (GSWA) 2013 400 m gravity merged grid of Western Australia (GSWA, 2013a). Magnetic data were extracted along the same profile from the 80 m magnetic compilation of Western Australia (GSWA, 2013b). Topographic data were taken from the Shuttle Radar Topography Mission (SRTM) at the same points.

Physical property data were compiled from Williams (2009) and Gessner et al. (2014) (Table 1).

Modelling

All forward modelling was performed in 2.5D in the GM-SYS software run within the Oasis Montaj software.

Initial conceptual models were generated from a combination of the cross-section on the Sandstone map sheet (Chen and Painter, 2005) and interpretation of the 10GA-YU2 seismic line (Zibra et al., 2014) which traverses close to the A–B section.

Results

The section across the Sandstone greenstone belt was modelled down to a depth of 35 km (Fig. 2c) as part of the modelling of seismic line 10GA-YU2. The broad gravity peak seen in the section can be attributed to the higher density of the Sandstone greenstone belt (Fig. 2b). The only unit modelled within the greenstone are the metasediments and the ultramafic unit with the slightly higher density in the centre (Fig. 2c). There are BIF throughout the greenstone as shown in the magnetic peaks (Fig. 2d) and the profile (Fig. 2e). Nevertheless, they are too narrow to be identified in the gravity data. The Unaly Hill greenstone belt outcrops just on the edge of the map and appears in this section as a small gravity high in the west of the section. It is modelled as a blind body of mafic density. This also contributes to a broad shallow peak in the magnetic signal.

Although this section contains the Youanmi Shear Zone, which divides the Murchison Domain from the Southern Cross Domain, both domains are largely composed of granites. Consequently, there is only negligible density contrast between both. However, it appears that the Southern Cross granites have a stronger magnetic signal than the Murchison granites.

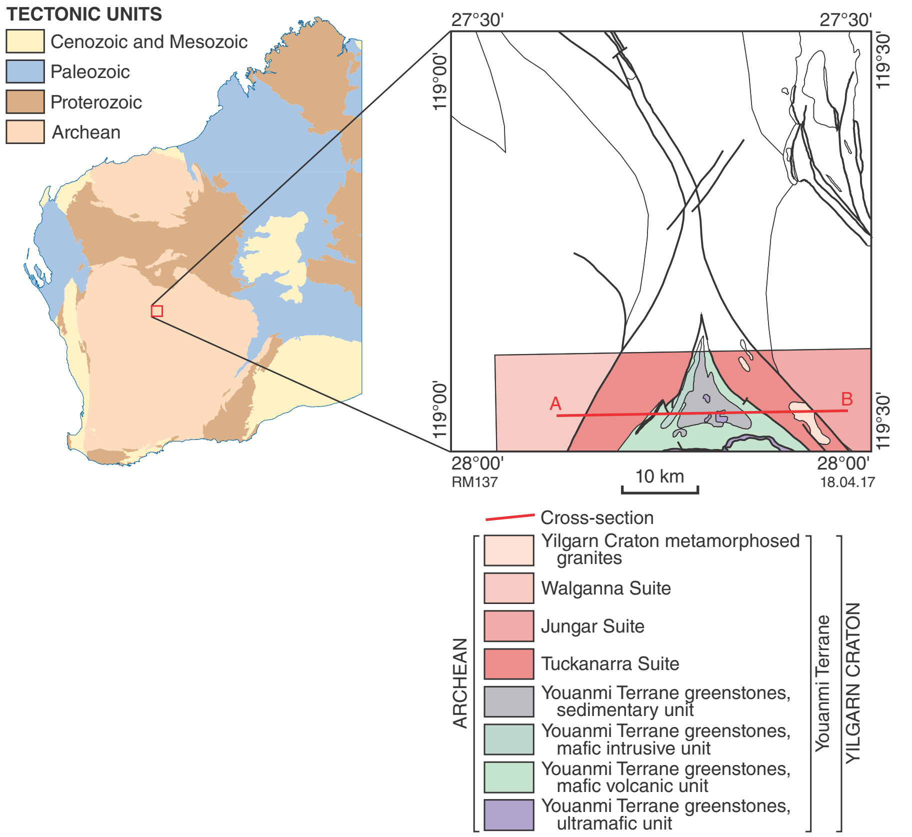

Figure 1. Location of sheet Sandstone with simplified interpreted bedrock geology within 8 km of cross-section A–B

Table 1. Petrophysical properties of modelled units and the corresponding map codes and lithologies. The colour column refers to colours used in Figure 2a

Colour	*Modelled unit*	*Map code*	*Density (g/cm³)*	*Magnetic susceptibility (SI)*
	Yilgarn Craton granites	A-g-Y, A-gm-Y	2.61	0.019
	Youanmi Terrane greenstone (Unaly Hill greenstone belt)		2.86	0.027
	Youanmi Terrane greenstone (Sandstone greenstone belt)			
	Mafic units	A-mba-YSA, A-mogs-YSA, A-bb-YSA A-mbbs-YSA	2.85	0.000
	BIF	A-cib-YSA		0.009 – 0.033
	Metasediments and ultramafic rocks	A-sh-YSA, A-mu-YSA	2.89	0.000
	Yilgarn Craton sheared and foliated granite	A-mgms-Y, A-mgss-Y, A-mgn-Y	2.56 – 2.72	0.000 – 0.046
	Murchison Terrane granitic rocks		2.55 – 2.58	0.001
	Southern Cross Terrane granitic rocks		2.50 – 2.57	0.024
	Yarraquin Seismic Province		2.85	0.000
	Lower crust		2.90	0.000

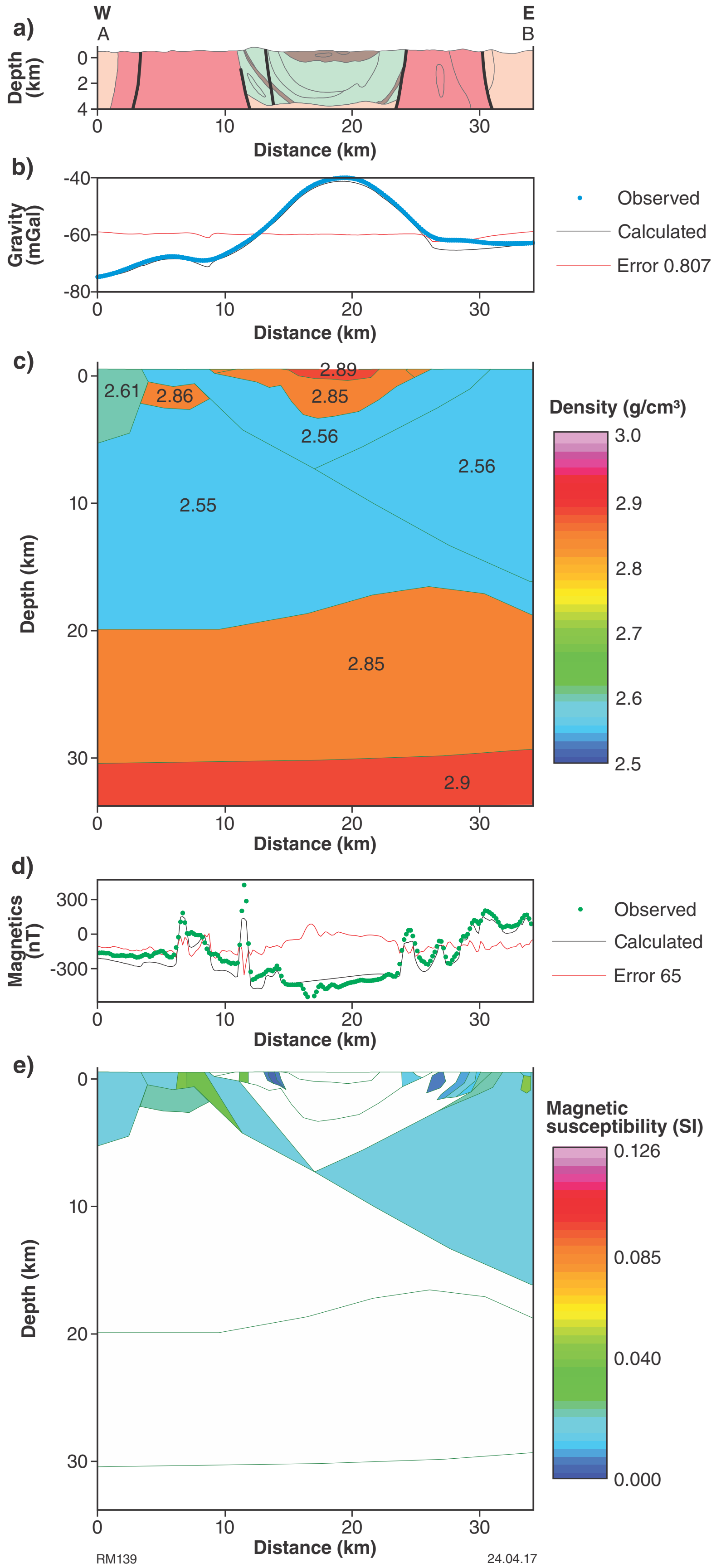

Figure 2. **Profiles across section A–B from sheet Sandstone showing: a) lithological section; b) observed and calculated gravity anomaly profile with error line; c) section of density per lithology; d) observed and calculated magnetic anomaly profile with error line; e) section of magnetic susceptibility per lithology**

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