10.1071/PVv2016n185newsp16

GA: update on geophysical survey progress from the Geological Surveys of Western Australia, South Australia, Northern Territory, Queensland and Victoria (information current on 11 November 2016)

Further information on these surveys is available from Murray Richardson at GA via email at Murray.Richardson@ga.gov.au or telephone on (02) 6249 9229.

Table 1. Airborne magnetic and radiometric surveys

Survey name	Client	Project management	Contractor	Start flying	Line km	Spacing AGL Dir	Area (km²)	End flying	Final data to GA	Locality diagram (*Preview*)	GADDS release
Gawler Craton Oodnadatta	GSSA	GA	TBA	TBA	240 240	200 m	60 m NS or EW	43 680	TBA	183: Aug 2016 p. 34	A contract with the preferred supplier is in the final stages of drafting by GA
Gawler Craton Ooldea	SSA	GA	TBA	TBA	208 560	200 m	60 m NS or EW	37 920	TBA	183: Aug 2016 p. 34	A contract with the preferred supplier is in the final stages of drafting by GA
Gawler Craton Lake Torrens	GSSA	GA	TBA	TBA	161 386	200 m	60 m NS or EW	29 360	TBA	183: Aug 2016 p. 34	A contract with the preferred supplier is in the final stages of drafting by GA
Coonabarabran	GSNSW	GA	TBA	TBA	~50 000	250 m 60 m EW	11 000	TBA	TBA	184: Oct 2016 p. 23	The Quotation Request is in preparation by GA in collaboration with GSNSW

TBA, to be advised.

Table 2. Gravity surveys

Survey name	Client	Project management	Contractor	Start survey	No. of stations	Station spacing (km)	Area (km²)	End survey	Final data to GA	Locality diagram (*Preview*)	GADDS release
Stavely	GSV	GA	TBA	Est. 28 Nov 2016	Approx. 3465	200 m station interval along 14 traverses	TBA	TBA	TBA	The proposed survey covers parts of the Horsham, Hamilton, Ballarat and Colac Standard 1:250 000 map sheets. The survey is to collect gravity stations spaced 200 m apart on 14 separate road traverses.	A contract with the preferred supplier is being prepared by GA
Wiluna	GSWA	GA	Atlas Geophysics	21 Aug 2016	Approx 4454 in 2 separate areas	2500 m regular grid	103 000	21 Sep 2016	Nov 2016	184: Oct 2016 p. 24	The current survey covers the Nabberu, Wiluna and Sir Samuel Standard 1:250 000 map sheet areas. The survey completed data acquisition on 21 Sep 2016. The data were released via GADDS on 24 Nov 2016.
East Kimberley Airborne Gravity Survey	GSWA	GA	TBA	8 Oct 2016	38 000 line km	2500 m line spacing	82 690	TBA	TBA	184: Oct 2016 p. 24	The proposed survey covers the Medusa Banks, Cambridge Gulf, Lissadell, Gordon Downs, Mount Ramsay and Lansdowne standard 1:250 000 map sheet areas. The survey was 53.3% complete on 6 Nov 2016.
Daly Basin	NTGS	GA	Atlas Geophysics	13 Jul 2016	2537	Regular grid of 4, 2 and 1 km	35 730	6 Aug 2016	TBA	182: Jun 2016 p. 22	The data were released via GADDS on 21 Oct 2016
Coompana – PACE area	GSSA	GA	TBA	TBA	15 362	Regular grid of 2, 1 and 0.5 km	100 000	TBA	TBA	183: Aug 2016 p. 34	A quotation request is in the final stages of preparation

TBA, to be advised.

Table 3. AEM surveys

Survey name	Client	Project management	Contractor	Start flying	Line km	Spacing AGL Dir	Area (km²)	End flying	Final data to GA	Locality diagram (*Preview*)	GADDS release
Musgraves – PACE Area	GSSA	GA	CGG Aviation	18 Aug 2016	8489	2 km; E–W lines	16 371	The survey completed flying on 17 Sep 2016	Expected on 24 Nov 2016	179: Dec 2015 p. 23	The proposed survey covers parts of the Mann, Woodroffe, Birksgate and Lindsay Standard 1:250 000 map sheets
Musgraves – CSIRO Area	GSSA	GA	SkyTEM Australia	15 Sep 2016	7182	2 km; E–W lines	14 320	The survey completed flying on 13 Oct 2016	Expected early Dec 2016	179: Dec 2015 p. 23	The proposed survey covers parts of the Woodroffe, Alberga, Lindsay and Everard Standard 1:250 000 map sheets
Isa Region	GSQ	GA	Geotech Airborne	8 Aug 2016	15 692	2 km; E–W	33 200	The survey completed flying on 4 Nov 2016	TBA	182: Jun 2016 p. 23	The survey covers the Dobbyn, Cloncurry, Julia Creek, Duchess, McKinlay, Boulia and Mackunda Standard 1:250 000 map sheets. Additional work of approx. 1600 km was flown in late Nov in the Lawn Hill region

TBA, to be advised.

Geological Survey of South Australia: New state-wide grids available

A new gravity grid for South Australia has been produced using a 'supervised variable density' gridding method that utilised a GIS to classify the South Australian gravity station data into its optimal gridding resolution (Figure 1). This information provided the framework to manage and control a series of eight iterations of minimum curvature gridding to produce a virtually seamless 100 metre final grid, free of the gridding artefacts normally produced as a consequence of gridding regional data of variable density. The South Australian onshore and offshore ground and sea-borne gravity database was the dataset driving the interpolation while also utilising gravity station data from neighbouring states to eliminate edge effects. The data used for the interpolation comprises some 530 000 data points, extracted from a total of approximately 600 000 data points.

A new Total Magnetic Intensity (TMI) grid of South Australia was created by merging over 300 separate TMI grids from various eras and instruments. Similarly, new radiometric images of South Australia were created by merging over 1200 separate radiometric grids from various eras and instruments. The datasets used to create the magnetic and radiometric grids have been collected through numerous industry and Government exploration initiatives since the 1950s. Total Magnetic Intensity is measured in nanoTeslas (nT), and radiometrics are measured in ppm (Thorium and Uranium) and % (Potassium). Magnetic data are gridded at 35 metre cell size and radiometric data at 100 metre cell size. Interpretations should not be made a scales less than these.

All the grids are freely available via SARIG (sarig.pir.sa.gov.au). Use the Geophysical Data option under the Databases menu to select an area of interest and follow the prompts. A link to a zip file will be emailed to you. For assistance with SARIG, please don't hesitate to contact Customer Services (resources.customerservices@sa.gov.au or 08 8463 3000).

Philip Heath, Tim Keeping, Gary Reed and Laz Katona
Geological Survey of South Australia
Philip.Heath@sa.gov.au

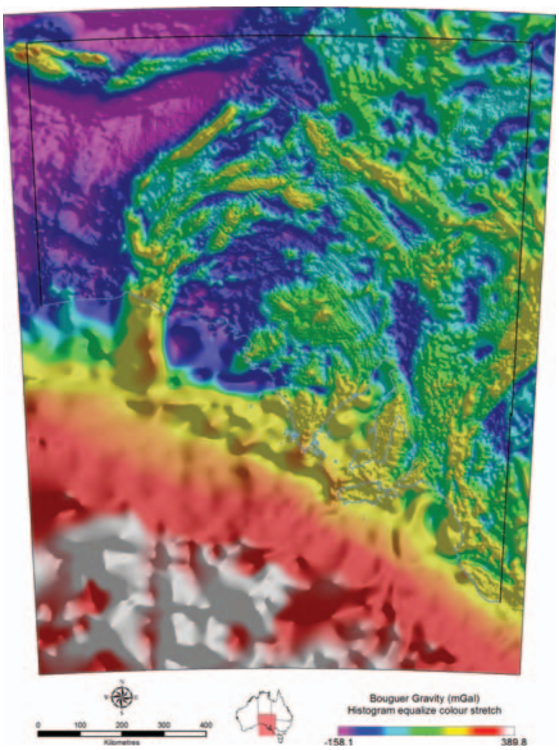

Figure 1. *The new gravity grid for South Australia.*

Geological Survey of Western Australia: East Kimberley 2016 regional aerogravity survey

The first airborne gravity survey to be contracted under the Western Australia Reconnaissance Gravity (WARGRAV2) Project is presently underway in the eastern Kimberley region of Western Australia.

The WARGRAV2 project — the subject of a National Collaboration Framework Agreement between the Geological Survey of Western Australia (GSWA) and Geoscience Australia (GA) — has the objective of completing 'generation 2' regional gravity coverage of Western Australia (see *Preview* issue 183, August 2016).

The East Kimberley 2016 airborne gravity survey area covers some 84 000 km^2 and encompasses much of the Halls Creek Orogen and parts of younger basins to the north and east (Figure 1).

The survey is being flown at a nominal height of 160 m above ground level along east–west lines at 2.5 km line spacing (25 km tie-lines). With an along-line spatial wavelength resolution[1] of 5 km or less, this configuration provides equivalent 2D spatial resolution with the 2.5 km grid of ground data that have been acquired from helicopter-assisted surveys in the southern and western parts of Western Australia since 2009.

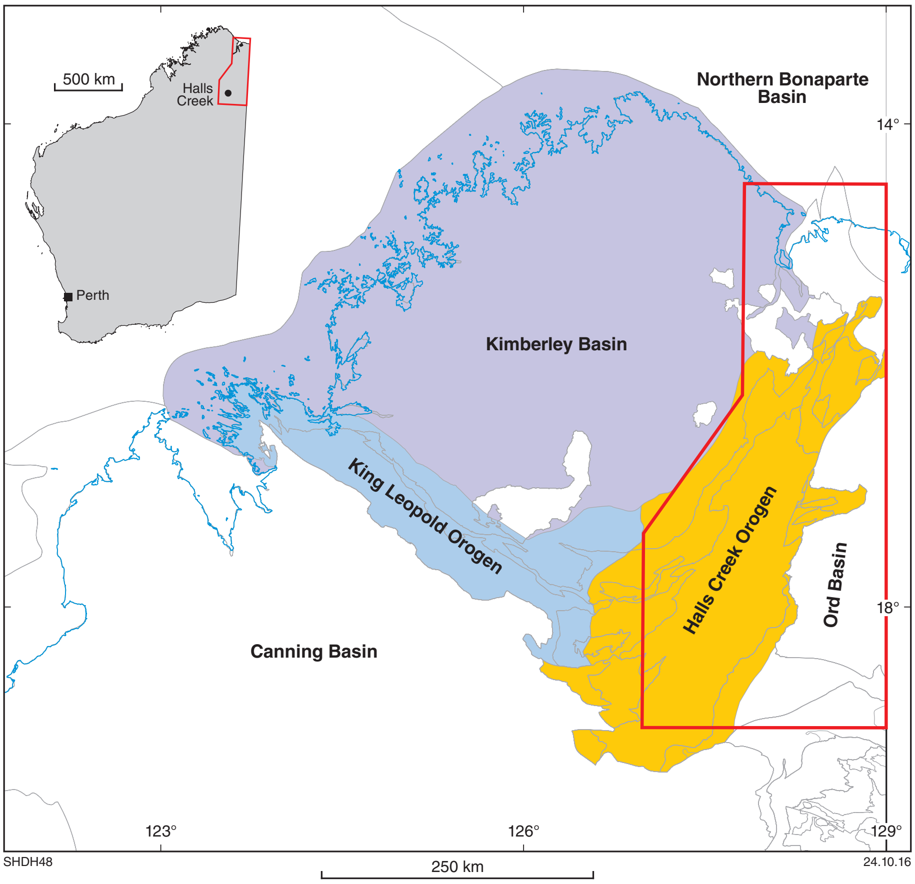

Figure 1. *Survey location relative to major tectonic units.*

Accuracy and precision

ISO 5725-1:1994(en) — Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions. International Organization for Standardization; https://www.iso.org/obp/ui/#iso:std:iso:5725:-1:ed-1:v1:en

ISO 5725 uses the terms 'trueness' and 'precision' to describe the accuracy of a measurement method.

'Trueness' refers to the closeness of agreement between the arithmetic mean of a large number of test results and the true or accepted reference value. The measure of trueness is usually expressed in terms of bias, the total systematic error as contrasted to random error.

'Precision' refers to the closeness of agreement between test results. Precision depends only on the distribution of random errors and does not relate to the true value or the specified value. The measure of precision is usually computed as a standard deviation of the test results.

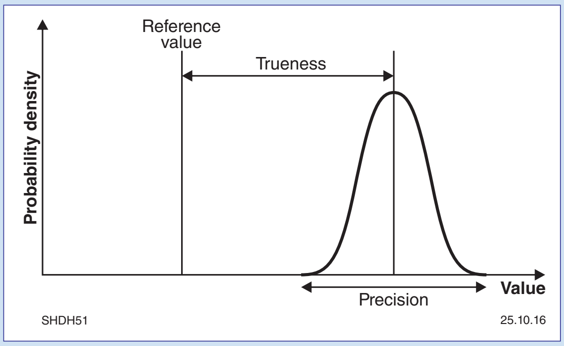

Figure is from https://commons.wikimedia.org/wiki/File:Accuracy_and_precision.svg

[1]The spatial resolution of a set of discrete, equally spaced, independent measurements (e.g. a ground gravity survey) is the distance between two measurements. The spatial wavelength resolution of the set is twice that distance. With oversampled data that are subjected to low-pass spatial filtering — as is typically the case in high-frequency data recording in an airborne gravity survey — we define the spatial wavelength resolution of the filtered dataset as the wavelength that has a gain of 0.5 (50% pass) in the filter gain spectrum. The spatial resolution is defined as half this distance.

The survey is funded by the Government of Western Australia as part of the government's Exploration Incentive Scheme. Contract tender and management services are provided by GA's Geophysical Acquisition and Processing Section.

The survey contract was awarded to Sander Geophysics following a public tender process that commenced in June 2016. Data acquisition commenced on 7 October and was completed on 4 December. Release of the data is anticipated in the first quarter of 2017.

The contract value of $1.12 million inclusive of tax (Commonwealth Contract Notice CN3380648; www.tenders.gov.au) for a nominal 38 000 survey line-km is equivalent to a cost of approximately $80 per '2.5 km ground station' for the 13 800 stations that would be required to cover the same areal extent with a 2.5 km helicopter-assisted survey grid.

On the plus side of this high relative cost is the ability to extend coverage offshore and over otherwise inaccessible areas. The cost must also be considered in the context of a regime in this region of Western Australia where obtaining ground access clearance is becoming increasingly expensive and time-consuming with increasingly large exclusion zones disrupting uniform data coverage.

In discussing survey accuracy, we follow the definitions of ISO 5725 which uses the general term 'accuracy' to refer to both 'trueness' and 'precision' (see inset). For this survey, the Sander Geophysics' AIRGrav gravimeter measurements are tied via a local survey base to Australian Fundamental Gravity Network station #1993929189 at Kununurra airport. Therefore, the values are 'true' by assumption and levelling so that accuracy equates only to precision.

The precision of the gravimeter measurements in static mode is being monitored by daily calibration tests at the survey base station. Survey inflight data precision is being estimated by multiple passes along a test line over a stretch of road along which ground measurements were made at 1 km spacing in 2011 and by comparison of survey line segments that coincide with ground survey points (Figure 2). The overall survey precision will be quantified by the standard deviation of the differences at tie-line and traverse line intersections.

The precision of airborne gravity surveys is less than that of ground surveys because the airborne gravity measurements are subject to more sources of variation. However, the lower precision is less critical at these 'regional interpretation scales' where small anomaly amplitude discrimination is less of an issue than for detailed surveys.

Figure 3 shows a comparison of the airborne data from a segment of a survey tie-line with ground data from a 1999 survey with 2 km station spacing.

For further information, contact geophysics@dmp.wa.gov.au.

David Howard
Geological Survey of Western Australia
david.howard@dmp.wa.gov.au
(With acknowledgements to Murray Richardson and Richard Lane at GA; John Brett at GSWA.)

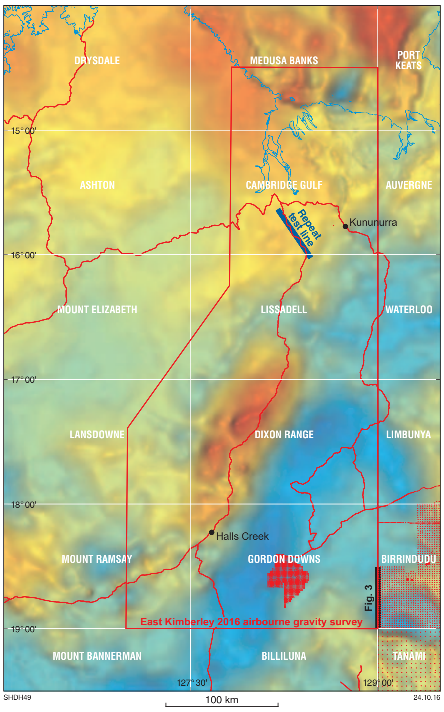

Figure 2. *East Kimberley 2016 airborne gravity survey area and test lines. Survey outline in red shown on background of 1:250 000 map sheet index and current Western Australian State compilation Bouguer anomaly grid based mainly on 11 km BMR data. Red dots are station locations of ground surveys with GA reliability rating of 5 or more that may be used for comparisons with the airborne survey data. Solid blue line west of Kununurra is survey repeat test line for estimation of inflight data precision (see text). Solid black line in southeast corner is line of ground and airborne profiles shown in Figure 3.*

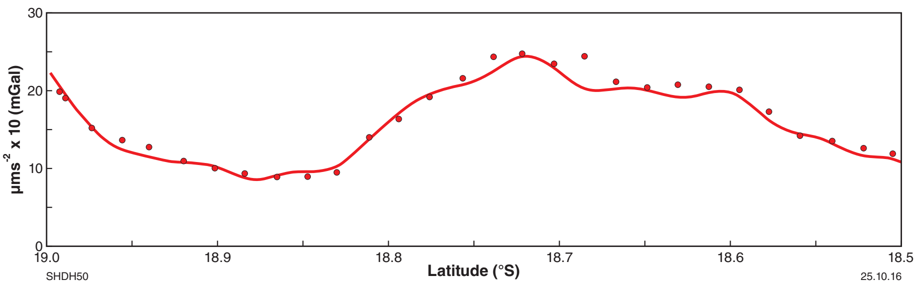

Figure 3. *Comparison of airborne data with ground data. Solid line is profile of field-processed airborne free air anomaly at 160 m AGL from segment of eastern boundary tie-line T109 along meridian 129E after filtering with 100 s low-pass filter (c. 5 km wavelength at 50% gain) — see Figure 2 for location; profile length is 55 km. Points are ground free air anomaly values from NTGS Tanami–The Granites Infill survey 1999 at 2 km spacing (publicly available from www.ga.gov.au/gadds); data have not been upward continued. The line of ground data points is located about 500 m east of the path of the airborne survey line.*