

Aerial survey sets new benchmark

In recent years, Geoscience Australia has undertaken a number of significant aerial surveys, but the latest airborne electromagnetic (AEM) survey is eclipsing all others.

The Frome AEM survey, which commenced on 22 May 2010, will cover 95 450 square kilometres in South Australia's outback. This represents almost 10 per cent of South Australia's total area, or around half the area of Victoria, which makes it the most extensive single AEM survey ever undertaken in Australia (figure 1).

A fixed wing Shorts Sky Van aircraft will fly a total of 34 986 line kilometres at 2.5 and 5 kilometre line spacing over the Frome Embayment and northern Murray Basin to the east and north of the Flinders Ranges. The Frome region is considered to have a high potential for uranium mineralisation with major uranium deposits already identified in the survey area at Beverley, Honeymoon and Four Mile.

The Frome survey will demonstrate the effectiveness of AEM data in supporting exploration for energy resources through mapping subsurface geology, including prospective sedimentary horizons and faults. The survey datasets will also help to improve understanding of the groundwater resources in the area.

The survey has total funding of \$2.67 million and is a collaborative project involving Geoscience Australia, the South Australian Government through Primary Industries and Resources South Australia and a consortium of exploration industry representatives. It is a major component of Geoscience Australia's Onshore Energy Security Program which is designed to reduce risk in exploration and support development of Australia's onshore energy resources.

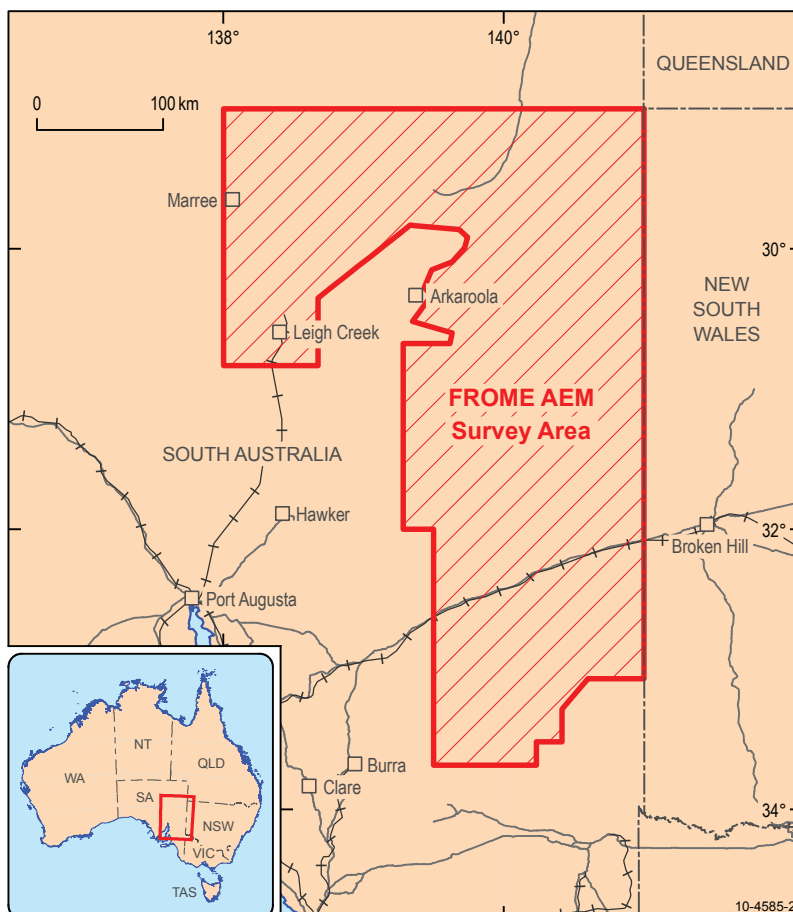


Figure 1. The survey area over the Frome Embayment and northern Murray Basin in South Australia.

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Gawler Craton and Curnamona Province seismic lines show potential

Between mid-2008 and early 2009, Geoscience Australia, in conjunction with Primary Industries and Resources South Australia (PIRSA), acquired around 720 kilometres of new deep seismic reflection data in the southern Gawler Craton and Curnamona Province, South Australia. The main aim of the seismic surveys was to image the crustal architecture of these areas, as well as the overlying Adelaide Rift System, to evaluate the uranium, geothermal and petroleum potential of the region. The project was part of Geoscience Australia's Onshore Energy Security Program which is designed to reduce risk in exploration and support development of Australia's onshore energy resources.

Seismic data were collected along a number of transects (figure 1):

- Curnamona Line, around 262 kilometres in length, which runs south to north across the Frome Embayment (08GA-C1)
- Curnamona-Gawler Link line, around 144 kilometres, which links the Gawler and Curnamona Provinces across the Flinders Ranges (09GA-CG1)

- Arrowie Basin line, around 60 kilometres, which crosses the Arrowie Basin to the north of Port Augusta (08GA-A1)
- Eyre Peninsula line, around 253 kilometres, across Eyre Peninsula from east of Streaky Bay to just south of Port Augusta (08GA-G1).

New magnetotelluric (MT) data, which measures variations in the electrical conductivity of earth materials, were also collected along some of the seismic lines. In 2009 Torrens

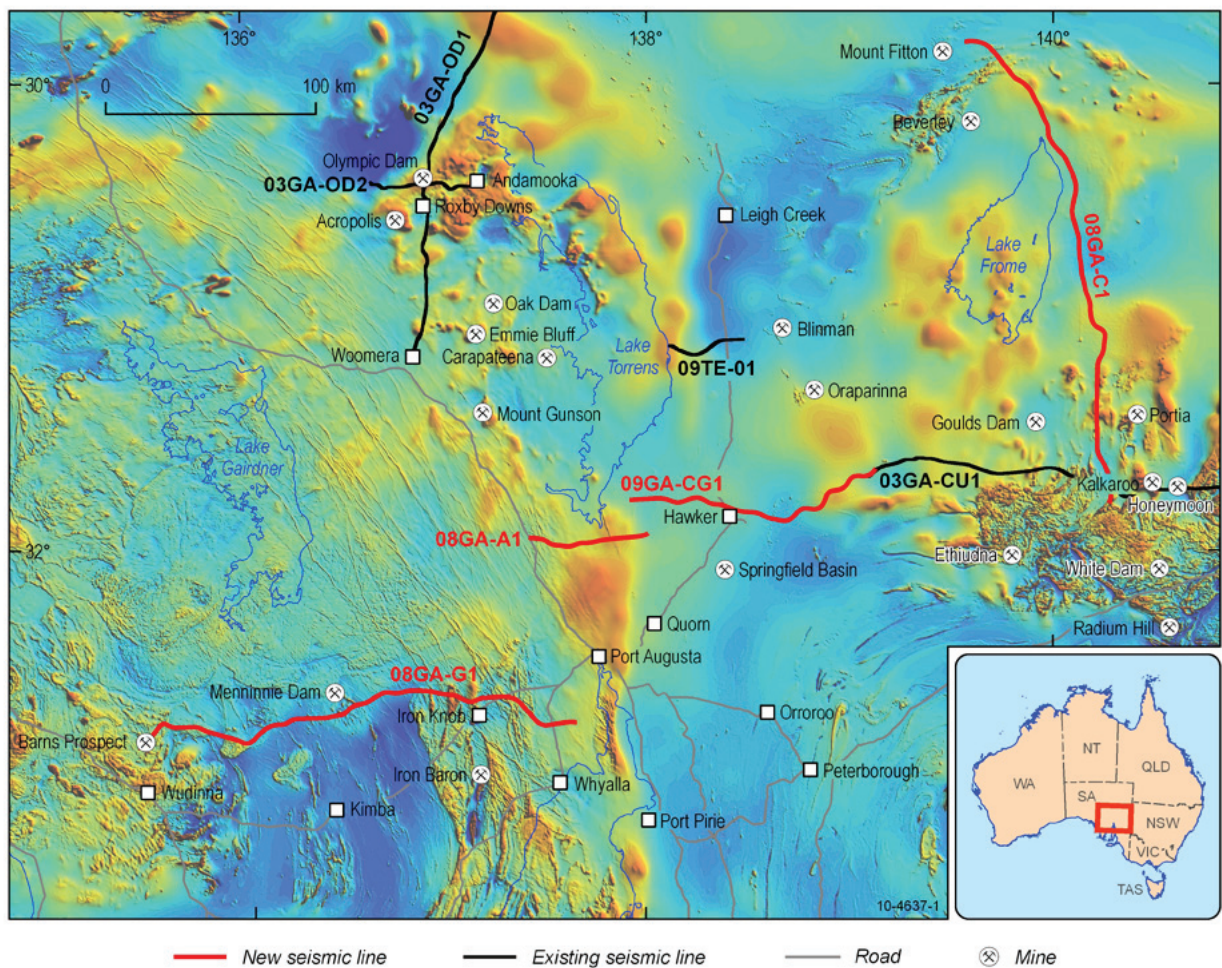


Figure 1. Location of new and existing seismic transects in the southern Gawler Craton and Curnamona Province, South Australia, on a total magnetic intensity image.

Energy acquired the 41 kilometres long Parachilna seismic line (09TE-01), which is about 90 kilometres to the north of the Arrowie Basin line, as part of their geothermal exploration program. This line was also integrated into this study. Collectively these lines, together with the Olympic Dam and Curnamona seismic reflection data collected in 2003 (03GA-OD1, 03GA-OD2 and 03GA-CU1), provide seismic transects which can be used to characterise the crustal architecture and inferred geodynamics of this region (figure 1). This architecture and geodynamic interpretation can then be integrated with other geological and geophysical data sets to evaluate energy and other mineral systems at a regional scale.

The seismic and magnetotelluric data and interpretations, together with other geological datasets and geophysical modelling, were presented at the South Australian Seismic and MT Workshop held in Adelaide on 6 May 2010. Some of the key results included the identification of deep faults and seismically nonreflective areas, along two of the new seismic lines, which are similar to those observed below the Olympic Dam deposit. This suggests that these regions also have a high potential for uranium and other mineralisation. The new data, which identify crustal boundaries and changes in seismic character across the region, also provide a guide for geothermal exploration when integrated with surface heat flow measurements.

The next seismic and MT Workshop, which will present the results from the GOMA transect (northern Gawler Craton, Officer Basin, Musgrave Province and southern Amadeus Basin) will be held in Adelaide on 25 November, 2010.

Towards a Global Earthquake Model

Over the last decade more than half a million people died as a result of earthquakes and tsunami. Most of these deaths occurred in the developing world, where risk is increasing because of rapid population growth and urbanisation. In many seismically active regions no hazard and risk models exist, and even where models are available, they are often poorly understood, highly subjective and inaccessible to the community at risk. Better risk awareness should reduce the toll from earthquakes by leading to better construction standards, improved emergency response, and greater access to risk transfer mechanisms such as insurance.

The Global Science Forum of the Organisation for Economic Co-operation and Development (OECD-GSF) has initiated and approved the Global Earthquake Model (GEM). GEM aims to establish a uniform, independent standard to calculate and communicate earthquake risk worldwide. With support from academia, governments, and industry, GEM will contribute to achieving profound, lasting reductions in earthquake risk worldwide.

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Related websites/articles

The processed seismic data from these transects can be downloaded at

www.ga.gov.au/minerals/research/national/seismic/index.jsp

South Australian Seismic and MT Workshop 2010: Extended Abstracts (Geoscience Australia Record 2010/10)

www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=70149

Presentations from the South Australian Seismic and MT Workshop 2010 can be downloaded at

www.ga.gov.au/minerals/research/national/oegf/index.jsp



Figure 1. Signing of the collaborative agreement between Geoscience Australia and the Global Earthquake Model by GEM Secretary General, Rui Pinho, with John Schneider of Geoscience Australia in the background. The signing was held on 3 June 2010 in Washington, USA.

GEM is

- **dynamic**—users can input their own data into an updatable model.
- **global**—it will set uniform standards across the world and covers developed and developing areas.
- **open access**—a transparent tool available to everybody.
- **state-of-the-art**—with leading regional and global experts in all relevant disciplines sharing knowledge and working together on its development.
- **a public-private partnership**—combines the strengths and objectives of the public and private sector.
- **comprehensive**—it will consider earthquake hazard and risk, including direct and indirect estimates of socio-economic impact.
- **community-developed**—with a wide community involved in developing GEM's software and tools and collecting the data necessary to model earthquake hazard and risk.

Geoscience Australia has signed a collaborative agreement with GEM as a public partner which will facilitate and support collaboration until December 2013 (figure1). Over this period the agency will work closely with GEM's international network to enhance earthquake risk modelling capabilities throughout the world.

Assessing the impact of seawater intrusion on groundwater

Fresh groundwater stored in coastal aquifers constitutes an important resource for urban and rural residents as well as industrial and agricultural activities. Continuing population expansion along Australia's coastal fringe, combined with significant reduction in rainfall in many coastal catchments, has led to an increasing dependency on coastal groundwater resources. Although the situation varies across the country, there is evidence of over-use in several major Australian coastal aquifers.

One consequence of the over-use of coastal groundwater resources is the increased risk of salinisation of aquifers through the encroachment of seawater. Seawater (or saltwater) intrusion (SWI) is the influx of seawater into an area where freshwater normally predominates, and can occur undetected within sub-surface water resources. To date, there has not been a comprehensive SWI



In particular, Geoscience Australia will:

- engage with stakeholders in southeast Asia and the southwest Pacific to ensure that GEM addresses their needs, is understood and is supported
- represent the Australian Government by contributing to scientific and technical debate and participating in decision-making processes
- exchange scientific and technical information such as approaches to risk modelling.

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Geoscience Australia is currently undertaking a national-scale vulnerability assessment of coastal aquifers to seawater intrusion in collaboration with the National Centre for Groundwater Research and Training (NCGRT) as well as state and territory water agencies. Project funding has been provided through the Raising National Water Standards program which is administered by the National Water Commission. The project commenced in November 2009 and will run for two and a half years. The project will identify those coastal groundwater resources currently vulnerable to seawater intrusion and potentially at risk as a result of over-extraction, sea-level rise and/or recharge-discharge variations associated with climate change.

The first project stakeholder workshop, held in Canberra on 5 and 6 May 2010, was attended by eighteen representatives from the Australian Government, state and territory water agencies, NCGRT and CSIRO Water for a Healthy Country. The workshop provided a clear scientific direction for the project and stakeholders were generally supportive of the objectives and proposed approaches. They offered to provide relevant datasets and will continue to share knowledge and information.

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