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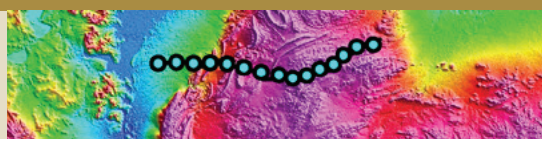
Onshore Energy Security Program maintains momentum

Delivering data and improved scientific understanding



Ned Stolz

Geoscience Australia's Onshore Energy Security Program (OESP) is a five-year program announced in August 2006 designed to reduce risk in exploration and support development of Australia's onshore energy resources. The program received funding of $58.9 million to acquire and deliver pre-competitive geophysical and geochemical data as well as value-added geological interpretations and other products for the exploration industry. Projects within the scheme were implemented either at the national scale or were focussed on particular geological regions identified as having the potential to host undiscovered energy resources. The main components of the Program are:

- An Australia-wide airborne geophysical survey (AWAGS) to improve the quality of airborne radiometric and magnetic datasets for uranium and geothermal energy exploration.
- A national geochemical survey to provide consistent baseline information about chemical concentrations in the crust, particularly radioelements such as uranium and thorium.
- Regional scale (between 100 and 1000 kilometres) deep crustal reflection seismic surveys targeting areas prospective for hydrocarbon, uranium, and geothermal energy resources.
- Regional-scale airborne electromagnetic (AEM) surveys targeting areas with potential for uranium mineralisation.
- A national project aimed at improving the quality of pre-competitive data and knowledge for targeting geothermal energy systems.
- Regional scale interpretations of the geodynamic framework of major energy provinces based on seismic, potential-field, and other geoscientific datasets.

As the OESP has moved into its final two years the program is focussing on the delivery of data and project outcomes to the resource exploration industries. A full description of OESP projects can be found on the Geoscience Australia website and new data releases and updates are announced through Geoscience Australia's monthly newsletter *Minerals Alert*.

Completed projects and major products

New radiometric map of Australia

The new Radiometric Map of Australia (see *AusGeo News 92* and *95*) was produced by levelling and merging hundreds of separate airborne radiometric surveys using a national baseline dataset derived from the AWAGS survey (Minty et al 2009). The map was launched by the Minister for Resources and Energy, the Hon. Martin Ferguson AM MP, during the Australian Society of Exploration Geophysicists 20th International Conference and Exhibition in Adelaide during February 2009.

The availability of the new merged radiometric data via the Geophysical Archive Data Delivery System (GADDS) on the Geoscience Portal website led to an increase in downloads of digital data from 21 000 megabytes in January 2009 to 58 000 megabytes in March 2009. The radiometric dataset covering the Australian mainland and Tasmania (over 73 gigabytes of data) is too big to be delivered via the web; however, 65 clients have requested the full data be copied onto a portable hard-drive.

The new Radiometric Map of Australia and its application to energy and mineral exploration and other land use issues featured in several conference presentations given by Geoscience Australia staff during 2009. They included a keynote address by the recently-retired CEO, Dr Neil Williams, at the AusIMM Uranium Conference in Darwin, which can be viewed through the Geoscience Australia website.

The results from the AWAGS survey have also been incorporated into the soon-to-be-released 5th edition of the Magnetic Anomaly Map of Australia. The very long flight lines of the AWAGS survey give an accurate coverage of the intermediate wavelengths (150 kilometres to 400 kilometres) of the Earth's crustal magnetic anomaly field. This provides an important constraint when merging over 800 separate airborne magnetic survey grids together to produce the new national map. The new edition of the map exemplifies how Geoscience Australia constantly improves the quality of pre-competitive datasets available to industry.

"National and regional projects are now well advanced and most are processing, analysing, modelling and reporting on acquired data. "

North Queensland geodynamic interpretation

The North Queensland geodynamic framework interpretation was one of the first major regional projects delivered under the OESP. The project was undertaken in collaboration with the Geological Survey of Queensland (GSQ) and culminated in a very successful workshop in Townsville in July 2009 which was attended by over 80 industry, research and government stakeholders. The workshop summarised the acquisition, processing and interpretation of 1176 kilometres of deep reflection seismic data and magneto-telluric (MT) data–one of the largest deep crustal seismic interpretation projects ever undertaken! The project also included results from modelling and inversion of magnetic and gravity data, solid geology interpretation, and construction of a 3D geological model for the North Queensland region. Extended abstracts from the workshop are included in the Proceedings of the AIG Northern Queensland Exploration and Mining 2009 conference (Camuti and Young 2009). Results from the project are also included in Geoscience Australia Records 2009/29 (Chopping & Henson 2009) and 2009/30 (Kositcin et al 2009).

A summary of the interpretation outcomes, including the implications for energy exploration, was featured in *AusGeo News 96*. Key results were:

- discovery of the Millungera Basin beneath the younger Carpentaria Basin
- imaging of a major crustal boundary at the eastern margin of the Mt Isa Province
- detecting an interpreted fossil subduction zone to the west of the Etheridge province.

These results have been favourably received by explorers in the region, with some companies incorporating the new models into their targeting criteria. To follow up the project outcomes, GSQ have recently acquired another 240 MT stations in the Mt Isa region. They include 50 stations designed to resolve the structure of the Millungera Basin and the Geological Survey of Queensland expects to release the MT results during 2010.

Current projects and recent data acquisition

Geoscience Australia's Airborne Electromagnetic Project has already released contractor-supplied data from the Paterson and Pine Creek regions, and is currently inverting these data and compiling complementary datasets for interpretation and release in 2010 and 2011.
The Geodynamic Framework Project is now collaborating with Primary Industries and Resources South Australia to interpret over 1300 kilometres of seismic reflection, gravity and MT data in South Australia. The National Geochemical Survey of Australia has completed sample collection and is now delivering preliminary results such as the Preliminary Soil pH map of Australia.

Paterson Province AEM Survey, Western Australia

Regional Airborne Electromagnetic (AEM) surveys are a major component of the OESP because of their ability to map basement rocks, and identify key features associated with uranium and other mineral system prospectivity. The Paterson AEM survey in north-west Western Australia is the first AEM project to be delivered under the OESP. The survey comprises 29 200 line-kilometres covering a region of 49 000 square kilometres, which includes the Kintyre uranium deposit, the Nifty copper mine and the Telfer gold mine. Production of value-added and interpretation products from the survey is continuing. A drillhole database used to assist with interpreting the Paterson AEM data has been released as Geoscience Australia Record 2009/31 (Roach 2009). The database includes locations for over 6500 publicly-available drillholes in the Paterson region and logs for over 4300 of these holes (figure 1).

The AEM data are being interpreted using sample-by-sample layered earth inversion (LEI) products due for release in April 2010 using an algorithm developed at Geoscience Australia (Brodie and Sambridge 2006). LEI products include located data, geo-located conductivity depth sections, depth slice grids, elevation slice grids and an inversion report. The inversion report will include a model description, a selection of data products and validation using public domain drillhole logs. Another important product to be released is the per cent data influence (PDI), which measures the change in the inverted conductivity relative to the change in the reference model, based on results of two fit-for-purpose inversions. The PDI is used as a skin between the data-driven and the model-driven results of the inversion, and has been incorporated into all LEI products. Since the PDI indicates the effective depth penetration of AEM, Geoscience Australia has created an AEM 'Go-map' based on the PDI gridded to a depth of 500 metres.

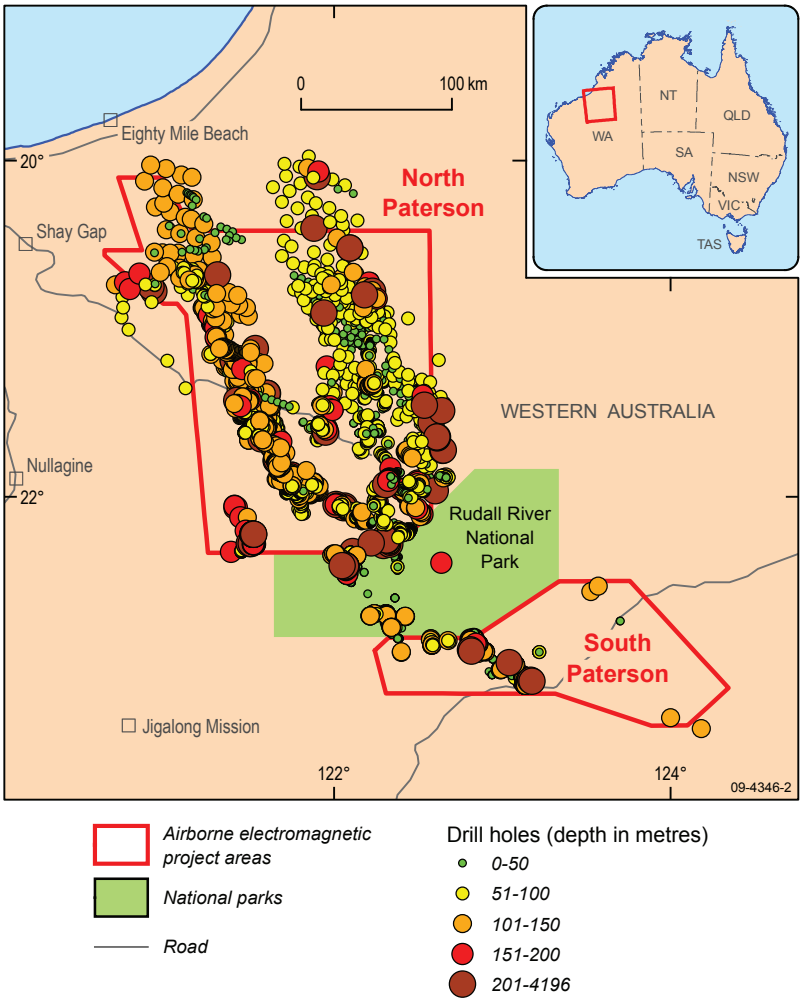


Figure 1. Location and depth of drillholes included in the recently-released database shown with the survey boundaries of the Paterson AEM survey data. Inset map shows the location of the Paterson AEM region in northwest Western Australia.

Staff involved in the AEM project will present key results from the Paterson AEM survey to industry and other stakeholders at a one-day workshop in Perth planned for April 2010. In late 2010 Geoscience Australia plans to release an interpretation report describing the geological and energy implications of the Paterson Province AEM survey. The report will highlight the use of regional AEM surveying for decreasing exploration risk in frontier exploration areas as well as its application in more mature exploration terrains.

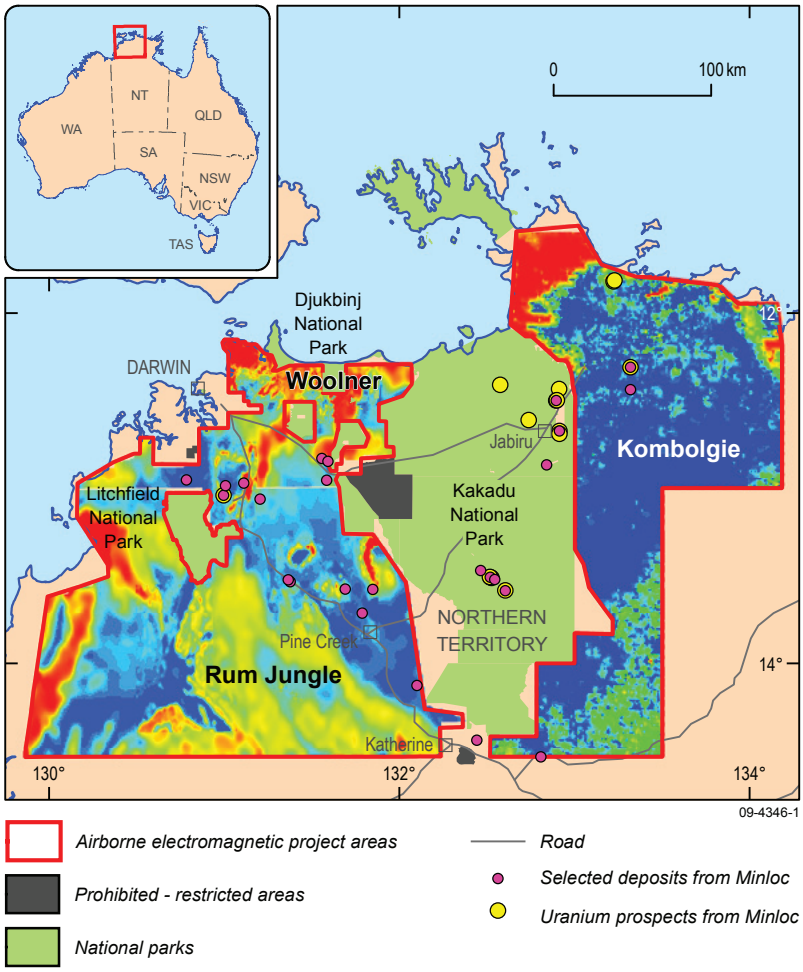


Figure 2. The Pine Creek AEM Survey regions in the Northern Territory of Australia showing selected uranium and mineral deposits associated with example EMflow 40-60 metres and EMflow 45-60 metres conductivity grids from the Woolner–Rum Jungle and Kombolgie survey areas respectively. Cool colours indicate resistive areas while warm colours indicate conductive zones.

Pine Creek Airborne Electromagnetic Survey, Northern Territory

The Pine Creek Province in the Northern Territory is highly prospective for unconformity-related uranium deposits. Here the Mesoproterozoic Kombolgie Sandstone of the McArthur Basin unconformably overlies Archean to Paleoproterozoic granites and metasedimentary rocks of the Pine Creek Orogen. There is also potential for sandstone-hosted uranium (Westmoreland style) deposits where the Oenpelli Dolerite intrudes Kombolgie Sandstone. The area south of Rum Jungle has a potential for buried Cenozoic palaeovalley-hosted uranium; however, further evaluation is required to establish the existence of suitable structures in the region.

There are many currently known uranium occurrences in the Pine Creek region, with the main deposits being: Ranger, Jabiluka, Koongarra and Narbarlek in the Alligator River area; Dysons and Whites in the Rum Jungle area; and Coronation Hill in the South Alligator Valley area. All these deposits are located below the Kombolgie unconformity within Paleoproterozoic metasedimentary rocks.

The Pine Creek AEM survey was the largest regional AEM survey ever undertaken in Northern Australia, and possibly one of the largest anywhere in the world. This survey covered more than 75 000 square kilometres. The flight line spacings employed during this survey are a combination of 1.66 kilometre and 5 kilometre spacings and were designed to target those areas with the highest prospectivity in the region. The Pine Creek survey is divided into two major parts, namely an eastern portion and a western portion, as shown in figure 2. The western portion includes the Woolner Granite and Rum Jungle areas. The eastern portion is mostly the Kombolgie Plateau and associated near-escarpment foothills and slopes, but also includes the northern coastal plain extending as far north as the Cobourg Peninsula.

In the western portion the TEMPEST AEM fixed-wing system was used whereas in the eastern one the VTEM helicopter-based system was used. The processed survey data from the west may better highlight subsurface geological features, such as unconformities, which are possibly related to uranium mineralisation. Elsewhere, and towards the eastern area,

possible palaeovalley-hosted and other structure-related uranium mineralisation could play a more important role. Contractor-supplied survey data are now available for download via a link on the AEM Project webpage which can be accessed through the Geoscience Australia website.

To facilitate interpretation of the AEM responses, subsurface electrical conductivity predictions are derived from the AEM survey data using Geoscience Australia's LEI algorithm. An example LEI model from the Woolner Survey Area is shown in figure 3. A drillhole database has been constructed incorporating the deeper mineral exploration drillholes and water bores across the survey area. These are being integrated with other data-layers in 2D and 3D to support the AEM data interpretation processes.

The processed and interpreted Pine Creek AEM datasets will help define the presence and extent of conductive units in the Pine Creek Orogen, and the depth to the known unconformity between the Pine Creek Orogen and the Kombolgie Subgroup. In addition, they will enable more reliable predictions of the depth and extent of the Woolner Granite and Koolpinyah Dolomite.

Interpretation of the AEM data will help identify and characterise a range of mapped and unmapped major geological structures that may have served as mineralising fluid pathways. Palaeovalleys may also be mapped in the survey region and an estimate of the thickness of Mesozoic–Cenozoic sedimentary cover derived.

The OESP projects in the Pine Creek and Paterson areas, have delivered reliable, pre-competitive AEM data to the exploration industry, and have improved the scientific understanding of the energy resource potential of the region.

Gawler–Curnamona geodynamic interpretation

This regional interpretation project focuses on the uranium and geothermal energy potential of the Gawler and Curnamona provinces in South Australia. Three deep crustal reflection seismic lines were acquired in June and July 2008 (see figure 4):

- the Gawler Line (08GA-G01) across Eyre Peninsula from east of Streaky Bay to just south of Port Augusta

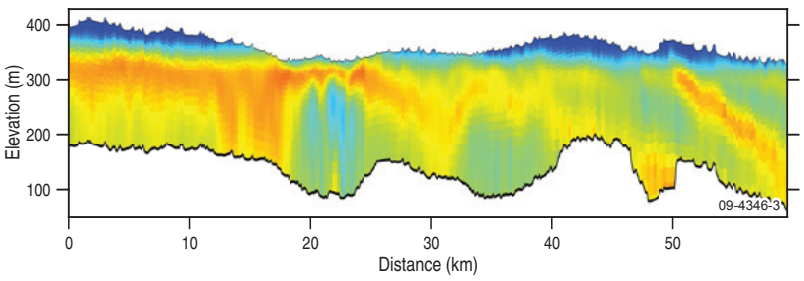


Figure 3. An example of a Geoscience Australia layered earth inversion (LEI), for an area near the Woolner Granite, showing resistive Cretaceous cover and a strong, easterly-dipping conductive unit in the far right of the image. Cool colours indicate resistors while warm colours indicate conductors.

- the Arrowie Line (08GA-A01) which crosses the Arrowie Basin to the north of Port Augusta
- the Curnamona Line (08GA-C01) which runs south to north across the Frome Embayment and terminates on the Mt Painter Inlier.

Magneto-telluric data were collected along the Gawler and Curnamona Lines to image the electrical conductivity structure of the deep crust. Refraction seismic data were collected along the Gawler line using source-receiver offsets of up to 70 kilometres which allowed seismologists to estimate the seismic velocities of the deep crust.

In January 2009, Primary Industries and Resources South Australia (PIRSA) provided funding which enabled completion of a fourth line (09GA-CG1) which links the Gawler and Curnamona provinces across the Flinders Ranges. This line provides a connection between the Gawler and Arrowie Seismic Lines and an east-west seismic line acquired over the Curnamona Province in 2003–04 (03GA-CU1). Consequently there is a deep crustal seismic transect from the western Eyre Peninsula through to Broken Hill.

Processed seismic data and sections from these four lines can now be downloaded from the Geoscience Australia website. Results over the Arrowie Basin have generated interest from a

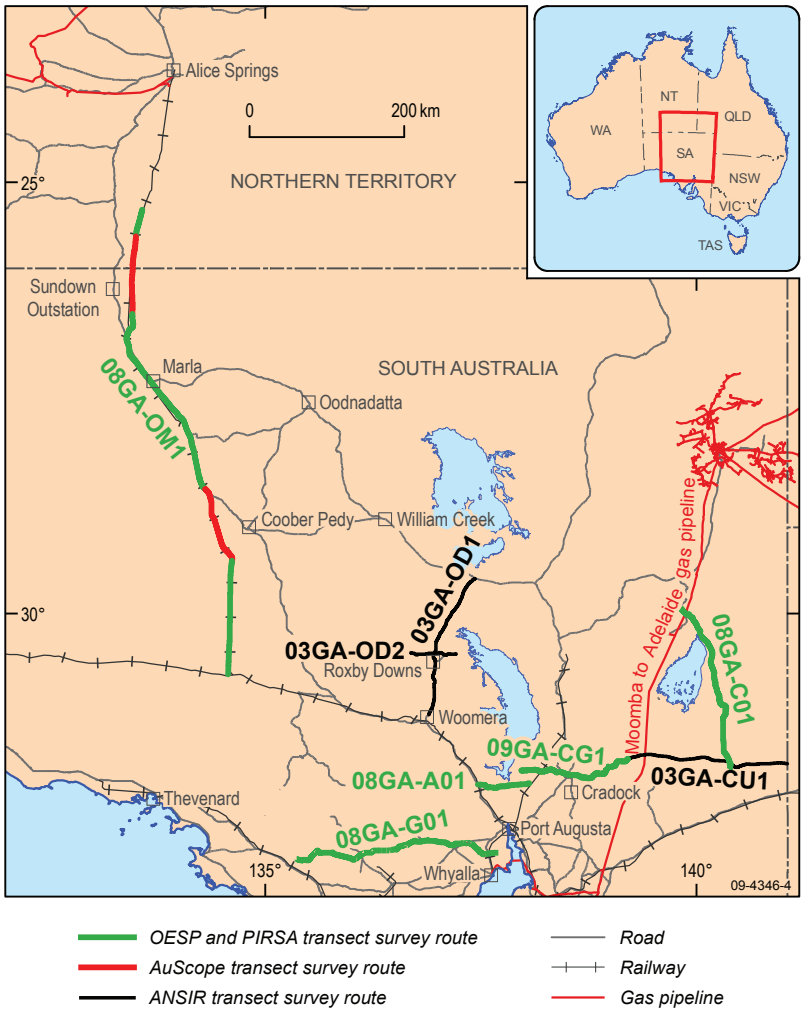


Figure 4. Location map of northern South Australia showing the seismic traverses acquired under the OESP and AuScope programs as well as pre-existing seismic traverses.

number of companies which are actively exploring for hydrocarbons, minerals, and geothermal energy resources. The Gawler Line crosses an interpreted magnetic domain containing Archean granites recently dated by Geoscience Australia and PIRSA as being some of the oldest in Australia (about 3100 million years: see *AusGeo News 92*). The Archean domain within the predominantly Proterozoic age rocks of the Gawler Craton may have major implications for the geodynamic interpretation of the region. These include the potential to host base-metal, iron-ore and uranium deposits.

Acquiring MT data at 10 kilometre station spacings along the transects was a major component of the Gawler–Curnamona surveys. The OESP is the first program in over two decades in which Geoscience Australia scientists have been directly involved in acquisition, processing and interpretation of MT measurements. MT data along the east-west Gawler line were acquired in a collaborative project between the University of Adelaide and Geoscience Australia. The acquisition of data along the Link line was a collaborative project between PIRSA, Geoscience Australia and the University of Adelaide. The data along the north-south Curnamona line were acquired for Geoscience Australia on contract. Processing and preliminary interpretation of the MT data for these surveys will be completed this year and results will be incorporated into the geodynamic analysis of the Gawler and Curnamona provinces. Figure 5 shows MT station locations in South Australia and a conductivity-depth section derived from the MT measurements along the Curnamona Transect (08GA-C01). The image shows conductive near-surface sediments of the Frome Embayment in the top of the section, south of the more resistive Mt Painter Inlier. The conductive zone at depth on the southern end of the transect is interpreted as rocks of the Willyama Supergroup. Images of the conductivity structure of the crust are highly complementary to the structural information provided by the reflection seismic data.

Interpretation of the seismic sections has now commenced in collaboration with geologists from PIRSA. Seismic and MT data are being integrated with other geological and geophysical data, including 3D inversions of the gravity and magnetics. Results of the regional interpretation will be released during a workshop on 6 May 2010 following the South Australia Resource and Energy Investment Conference (SAREIC) in Adelaide.

Gawler–Officer–Musgrave–Amadeus (GOMA) Seismic Line

This project is a collaborative effort between Geoscience Australia (as part of the OESP), AuScope (funded by the National Collaborative Research Infrastructure Strategy: NCRIS), PIRSA, and the Northern Territory Geological Survey (NTGS). The line (08GA-OM1) extends south to north from Tarcoola in South Australia to 200 kilometres south of Alice Springs, crossing the northern margin of the Gawler Province, the eastern end of the Officer Basin, the eastern end of the Musgrave province and the southern margin of the Amadeus Basin (figure 4).

Both the Officer and Amadeus Basins are considered to be under-explored for hydrocarbons. Exploration during the 1960s and 1970s identified hydrocarbon shows in these Neoproterozoic to Paleozoic basins but since the discovery of commercial oil and gas in the Cooper–Eromanga province in the late 1960s, only limited exploration has been carried out. The Amadeus Basin is the only Neoproterozoic–Paleozoic province currently producing hydrocarbons in Australia.

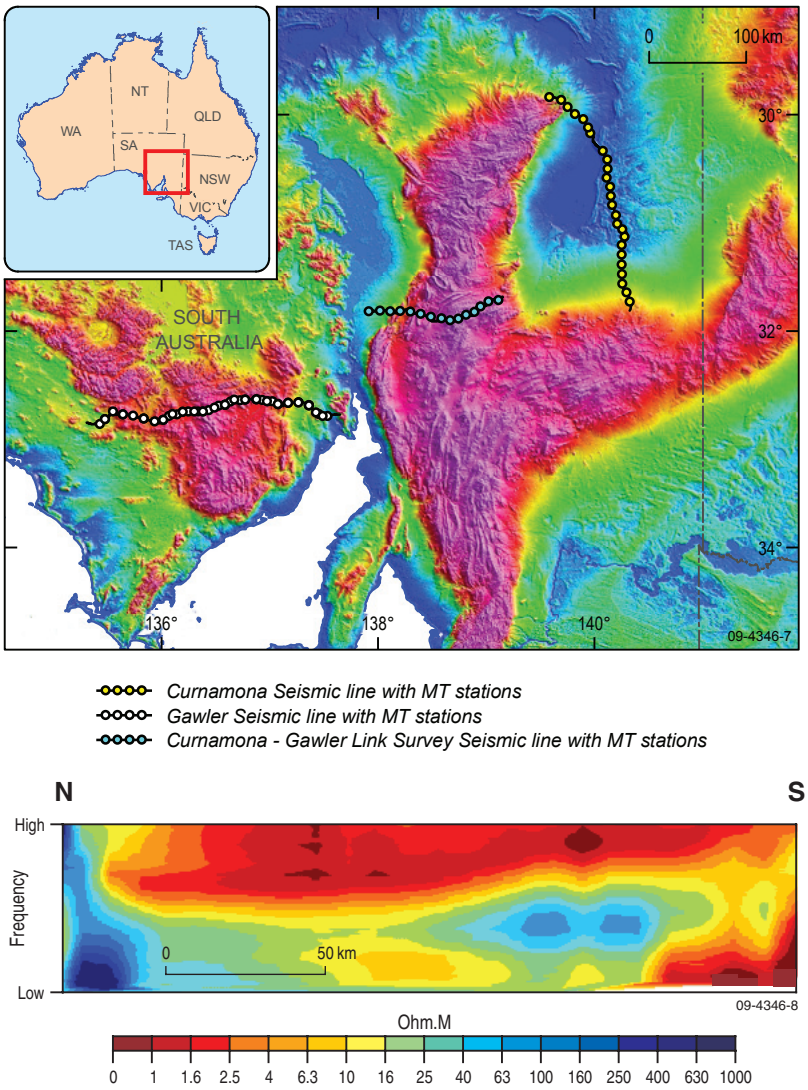


Figure 5. MT station locations in South Australia. Pseudosection of apparent resistivity from MT measurements along the Curnamona transect (yellow dots). North is to the left. Conductive near-surface sediments of the Frome Embayment are clearly imaged in the top of the section, south of the more resistive northeastern extremity of the Flinders Ranges. At the southern end of the transect the Willyama Supergroup appears conductive at depth.

The seismic survey was completed in December 2008 and follows the Adelaide–Alice Springs railway line. Reflection seismic, MT and gravity data were acquired. The seismic line will significantly contribute to understanding basin initiation, architecture and evolution. It is anticipated that the processed data will allow the delineation of structural styles in great detail and highlight unconformities and reactivated faults. The delineation of deep structures will lead to an improved understanding of the geological controls on the deposition of sedimentary strata and thermal history of potential hydrocarbon source rock intervals.

The AuScope contribution to the project, funding an additional 200 kilometres, enabled the acquisition of a continuous 634 kilometre long data transect from the Gawler Province to the Amadeus Basin. This line crosses the interpreted geodynamic boundary between the South Australian Craton and the North Australian Craton and is anticipated to stimulate further research into the fundamental structural architecture of the Australian continent.

The GOMA data are currently being processed with the seismic data scheduled for release in June 2010. Interpretation will involve

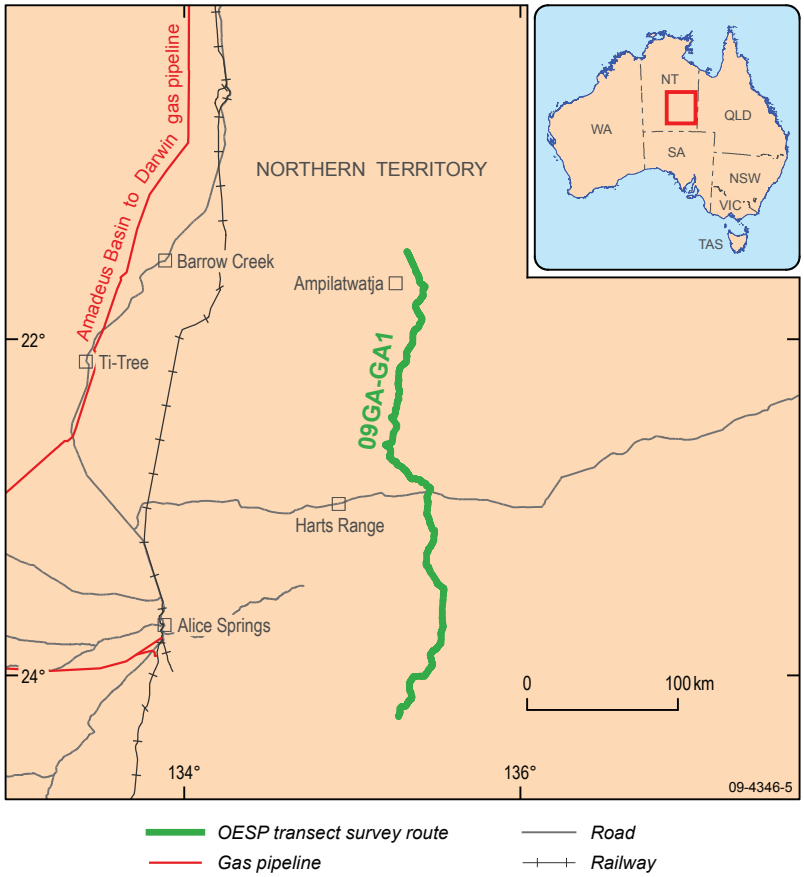


Figure 6. Location map for the Georgina–Arunta Seismic Line (09GA-GA1) in central Australia. Total line length is 373 kilometres.

geologists from Geoscience Australia, PIRSA, AuScope, University of Adelaide and others. The interpretation results will be released at a stakeholders' workshop coinciding with the PIRSA Explorers Day Seminar in Adelaide in December 2010.

Georgina–Arunta Seismic Line

The southern Georgina Basin in northern Australia has a demonstrated prospectivity for hydrocarbons, but exploration is still at a frontier stage, with minimal seismic data available. In July 2009 a deep crustal reflection seismic and MT transect (09GA-GA1) was completed across the basin in the Northern Territory (figure 6). Interpretation of results from the survey will provide an architectural framework for evaluating the geological history of the basin. This should lead to a better understanding the petroleum system(s) that operated in the area. The data will also assist in understanding the origins of base-metal mineralisation which occurs in this region.

To the south of the basin, the line also crosses the exhumed core of the Alice Springs Orogeny in the Arunta Region. This portion of the Arunta Region has numerous magmatic-hosted uranium prospects, but there is only a poor understanding of the development and setting of this mineralisation or its potential to form larger deposits. Preliminary images of the seismic data show reflections that may represent large-scale structures developed during the orogeny, and could provide an insight into the plumbing systems that generated uranium mineralization.

Seismic and MT data are currently being processed and interpretation is planned to commence in collaboration with the NTGS in late 2010. Interpreted results should be available at the 2011 AGES (Annual Geoscience Exploration Seminar) in Alice Springs.

National Geochemical Survey of Australia (NGSA)

The sample acquisition phase of this project is now complete and all 1314 samples have arrived at Geoscience Australia in Canberra. Sampling was successfully completed at 86 per cent of the planned sampling sites. Some sites in Western Australia and South Australia were not accessible because of cultural heritage issues. The sample medium chosen was the overbank sediment at the outlet of major drainage catchments.

Preparation of samples for assay at the Geoscience Australia laboratories is now well underway and analysis should be completed by June 2010. Preliminary results such as a Preliminary Soil pH map for the Australian continent are now available, and final data and interpretations will be released from June 2011 onwards. For a more detailed account of progress on the NGSA, please see the article on the Preliminary Soil pH map of Australia in this issue of *AusGeo News*.

Upcoming data acquisition

Kidson–Paterson Seismic Line

The Canning Basin in northwestern Australia represents a vast geological frontier. The Kidson Sub-basin is a southern depocentre (or area of maximum deposition) in the onshore Canning Basin and is thought to contain up to seven kilometres of Early Ordovician to Cretaceous sediments. This represents the most complete stratigraphy in the region as very little data from previous exploration efforts are available and are relatively old. Geological constraint is limited to a small number of exploration wells, most of which had been located without any reference to seismic information.

Since a thick sequence of Ordovician sediments is likely to include mature source rocks, the Kidson Sub-Basin may represent a major hydrocarbon province with possible analogies to those encountered in China's Tarim Basin. For this reason, the sub-basin is being targeted in a major deep reflection seismic acquisition project in 2010. This will be the final seismic acquisition by Geoscience Australia as part of the OESP.

Funding for the project has been secured, and includes a significant contribution from the Geological Survey of Western Australia (GSWA) under their Exploration Incentive Scheme (EIS). A proposed transect of over 750 kilometres along the Canning Stock Route (figure 7) extends from the Crossland Platform in the northwest to the Paterson Province in the southwest. Negotiation by Geoscience Australia and GSWA staff in late 2009 has ensured the cooperation of the region's traditional owners.

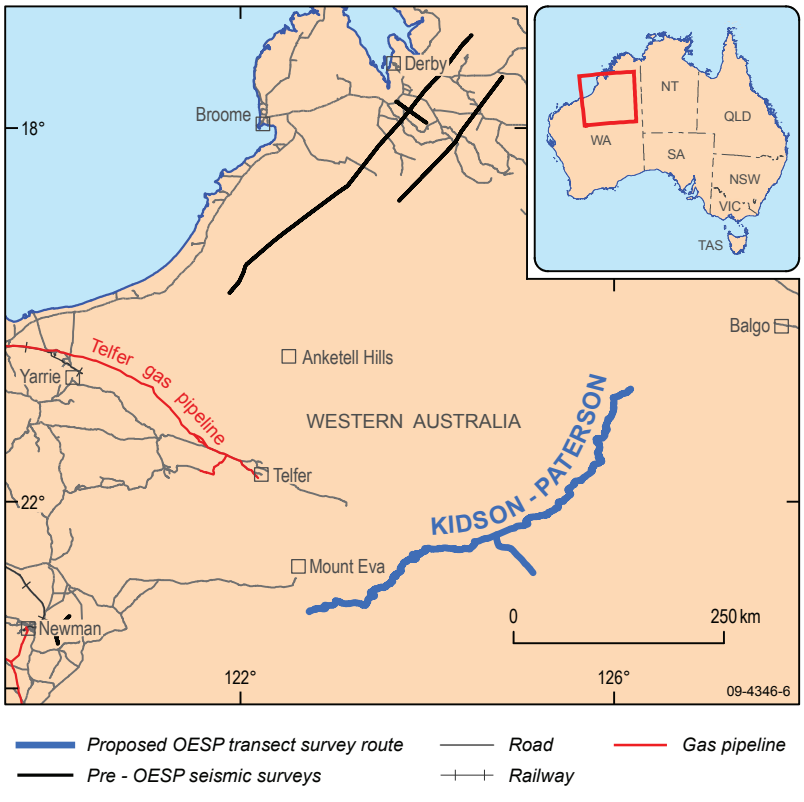


Figure 7. Location map for the planned Kidson–Paterson Seismic Line in north-western Australia. Length of the proposed line shown is 776 kilometres.

The Kidson–Paterson Seismic Line will be one of the most logistically difficult projects ever undertaken by Geoscience Australia. The region is extremely remote with poor roads and sparse infrastructure. The Canning Stock Route is very narrow and crosses a number of sand dunes which will present a challenge to moving seismic equipment and vibroseis trucks. Accommodation and messing for the acquisition crew will also be difficult because of lack of water and suitable campsites. Despite these challenges, a reconnaissance of the track has been undertaken and planning is well underway.

The acquisition crew is expected to mobilise in the Canning region in May 2010. The survey is expected to take four months to complete and will be the most expensive onshore seismic project Geoscience Australia has undertaken. Other seismic data acquisition being managed by Geoscience Australia in Western Australia during 2010 includes an AuScope–GSWA funded line in the Capricorn Region between the Pilbara and Yilgarn cratons (about 570 kilometres) and a GSWA-funded Line in the northern Yilgarn Craton (about 600 kilometres).

Conclusion

The OESP has now been underway for more than three years and has successfully released a number of datasets which demonstrate the relevance of its programs to the resource exploration sector. National and regional projects are now well advanced and most are processing, analysing, modelling and reporting on acquired data. Though the datasets and products are focussed on hydrocarbon, geothermal and uranium energy systems, they will also be useful to companies exploring for base-metals, gold, and other commodities. These outputs can also be applied to land-use management and groundwater assessments. Upcoming acquisition, particularly the Kidson–Paterson Seismic Line, will ensure that the OESP maintains its momentum through the full five-year program, and continues to assist and encourage explorers in the search for new energy resources.

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References

Brodie R & Sambridge M. 2006. A holistic approach to inversion of frequency domain airborne EM data. Geophysics 71: G301–G313.

Camuti K & Young D. 2009. Northern Exploration and Mining 2009 and North Queensland Seismic and MT Workshop. Australian Institute of Geoscientists Bulletin 49.

Chopping R & Henson PA. 2009. 3D map and supporting geophysical studies in the North Queensland region. Geoscience Australia Record 2009/029. Available at:
www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=69581

Kositcin N et al. 2009. Geodynamic synthesis of the North Queensland region and implications for metallogeny. Geoscience Australia Record 2009/30. Available at:
www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=69159

Minty B, Franklin R, Milligan P, Richardson M & Wilford J. 2009, The radiometric map of Australia. Exploration Geophysics 40: 325–334.

Roach I C. 2009. A drillhole database for the Paterson airborne electromagnetic survey, Western Australia. Geoscience Australia Record 2009/31.

Related articles/websites

Onshore Energy Security Program
www.ga.gov.au/minerals/research/oesp/index.jsp

Geophysical Archive Data Delivery System (GADDS) on the Geoscience Portal website
www.geoscience.gov.au/

A New Radiometric Map and Data Set for Australia: Implications for Uranium Exploration. Presentation by Dr Neil Williams, CEO Geoscience Australia
www.ga.gov.au/servlet/BigObjFileManager?bigobjid=GA14450

Geoscience Australia's Airborne Electromagnetics Project
www.ga.gov.au/minerals/research/national/aem/

Seismic Acquisition and Processing Project
www.ga.gov.au/minerals/research/national/seismic/

AusGeo News 92: New Radiometric Map of Australia
www.ga.gov.au/ausgeonews/ausgeonews200812/radiometrics.jsp

AusGeo News 92: Foundations of South Australia discovered
www.ga.gov.au/ausgeonews/ausgeonews200812/gawler.jsp

AusGeo News 95: Radiometric Map of Australia provides new insights into uranium prospectivity
www.ga.gov.au/ausgeonews/ausgeonews200909/radiometric.jsp

AusGeo News 96: Expanding our knowledge of North Queensland
www.ga.gov.au/ausgeonews/ausgeonews200912/northqld.jsp

AusGeo News 97: Preliminary Soil pH map of Australia
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