

Fieldnotes

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Government of Western Australia
Department of Mines and Petroleum

Geological Survey of
Western Australia



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Co-funded Exploration Drilling Program 2010–11



Applications open in February 2010

The Co-funded Exploration Drilling Program is the signature program in the five-year, \$80 million Exploration Incentive Scheme funded by Royalties for Regions. After a very competitive first round of co-funding for exploration drilling in 2009–10, GSWA will call for applications, beginning on 22 February 2010, for the 2010–11 round of co-funding. Applications will be made online and will close on 19 March 2010.

Over 160 applications, requesting a total of over \$15 million of co-funding were received in the 2009–10 round, with 35 projects receiving a total of \$3 million in support. In 2010–11, about \$5 million will be available to support exploration drilling.

There will be some minor changes to guidelines for the 2010–11 round of funding. These changes will include increasing the funding cap to

\$200 000 where the project consists of one hole only. The increase from the normal \$150 000 level of funding will provide increased support (still at 50%) for single deep holes and will be of particular interest to petroleum and geothermal explorers.

Other changes will include handicapping of second and subsequent applications from a single company if one application is successful, and the introduction of an online application process that will assist applicants to address the criteria used by the evaluation team in ranking applications.

In addition, there will be a \$200 000 maximum funding pool allocated to support drilling by bone fide prospectors. The co-funding will be limited to \$20 000 per applicant and will also support geochemical analyses based on the drilling. As it is anticipated that much of the drilling by prospectors will not be cored, supporting analyses will ensure a good return of data to the Department.

The changes to the program have been instituted as a result of industry feedback and were supported by the Co-funded Drilling Advisory Committee, made up of industry body representatives.

In 2010–11, the co-funded drilling program will, on a competitive basis, preferentially fund high-quality, technically and economically sound proposals that promote new exploration concepts and new exploration technologies.

For more information contact: Margaret Ellis, Coordinator Exploration Incentive Scheme (margaret.ellis@dmp.wa.gov.au) 08 9222 3509 or see the website at www.dmp.wa.gov.au/EIS.

Important dates for the 2010–11 Co-funded Exploration Drilling Program

22 February 2010	Opening date for lodgement of drilling proposals
19 March 2010	Closing date for lodgement of drilling proposals
Week commencing 21 June 2010	Announcement of successful proposals
21–30 June 2010	Co-funded Exploration Drilling Agreements signed by applicants and DMP
30 June 2011	Last date for acceptance of interim reports and invoices for 2010–11 drilling projects
30 September 2011	Last date for acceptance of final report (including core) for 2010–11 drilling projects

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A new view of GSWA's website

The GSWA part of the DMP website (www.dmp.wa.gov.au) is split into three sections – Prospectivity, Discover geology, and Products.

Prospectivity – Here you'll find latest releases from GSWA as well as information on mineralization and mineral prospectivity, exploration activities, and exploration potential.

Discover geology – In this section, you will find fact sheets and information on commodities and geological features of Western Australia, as well as guides to visiting geological sites and information on the processes we use to collect and publish geological data. This is intended for students and the public interested in expanding their knowledge of the rocks around us.

Products – In this section, you will find all of the GSWA products available for download, viewing online, or for purchase from our bookshop. This is also home to the Data and Software Centre, which enables the download of statewide spatial datasets and various spatial application software, including GeoVIEW.WA and the Mineral Exploration Reporting Templates Software.

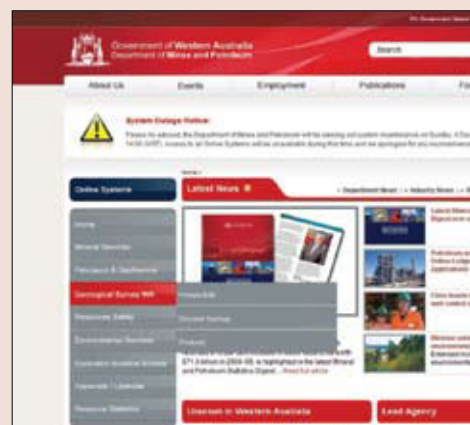
How to search for GSWA publications – You can access GSWA products in several ways:

1. Hover over 'Online Systems' and click on 'Publication Systems', then click on 'Geoscience Publications', and 'Access Geoscience Publications'. This takes you to the publication search facility.
2. Click on 'Geological Survey WA', click on 'Access Geoscience Products' (on the RHS) which takes you to the publication search facility where you can search for products using different search parameters.
3. Click on 'Online Systems', then 'Interactive Geological Map (GeoVIEW.WA)'. Click on 'Access GeoVIEW.WA', highlight an area, click on Kitcat search.
4. Use www.dmp.wa.gov.au/gswapublications which will take you directly to the GSWA search facility.

Once in the search facility, you can use a number of search parameters such as title, author, series, category, edition, series number, keywords etc. You can also select a particular cabinet from the dropdown list. Most products are online. Some products are just scanned covers to let you know where to buy them on www.dmp.wa.gov.au/ebookshop.

Once you are on a map or book, you can view, print, download, and copy and paste to other documents.

For more information, contact Ryan Aston (ryan.aston@dmp.wa.gov.au).



Earth systems:
change
sustainability
vulnerability
4-8 July 2010



australian earth sciences convention 2010

KEY DATES:

CONFERENCE DATES:
4-8 July, 2010

CALL FOR ABSTRACTS OPEN:
15 June 2009

SPEAKER ABSTRACT DEADLINE:
15 January 2010

AUTHOR NOTIFIED:
19 February 2010

In July 2010, an outstanding selection of national and international speakers, industry leaders, and key decision makers will meet in Canberra in the scenic Eastern Highlands, just a few hours drive from Australia's major ski fields. Canberra is not only the nation's capital and heart of policy

development, but it is also home of two of Australia's premier geoscience organisations – Geoscience Australia and the ANU's Research School of Earth Sciences (birthplace of the famous SHRIMP ion probes that have revolutionised Earth Sciences research over the past two decades).

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Abstracts are invited for a 20 minute oral presentation and/or poster presentation which incorporate the following themes:

- The Dynamic Earth – From Crust to Core
- Life and the Solar System
- Topical

Abstract guidelines

Abstracts can be submitted via the conference website
www.aesc2010.gsa.org.au
T + 61 2 6281 6624
F + 61 2 6285 1336
Email: aesc@conlog.com.au

Conference website: www.aesc2010.gsa.org.au Canberra, ACT Australia



View west down a gully exposing a typical cross-section through the Fraser Range Metamorphics. Dark layers are gabbroic rocks and light layers are the interleaved felsic rocks.



Close up of the contact between gabbroic and felsic rocks showing attenuated felsic wisps in the gabbroic rocks and strong fabric in the felsic rocks.

Frolicking in the Fraser

A group of geologists from GSWA's Albany–Fraser Mapping project and the west Musgrave Mapping project, and from Curtin University of Technology and Monash University, recently conducted a joint field trip to the eastern Albany–Fraser Orogen, east of Norseman and Kalgoorlie. The recent discovery of more than 5 Moz of gold at Tropicana and in the surrounding region has elevated this region to one of WA's most prospective greenfields regions, yet much of the regional geology is poorly understood. The Albany–Fraser Orogen has a known Proterozoic tectonic history that spans from at least c. 1700 Ma to c. 1140 Ma in at least three discrete, but poorly characterized stages or events. At least one of these is responsible for the gold mineralization and reworking of the southeastern margin of the Archean Yilgarn Craton.

It has been recognized for some time that the Albany–Fraser Orogen and the Musgrave Province (in central Australia) show some very close similarities, particularly in terms of the ages of tectonothermal events within the period from c. 1350 to c. 1120 Ma. GSWA's ongoing work in both regions has considerably enhanced our understanding of the timing, duration, and tectonic setting of events within this period, and the recent joint field trip was the first of several trips designed to test the possibility of a common tectonic link between the regions. It seems quite possible that the Albany–Fraser Orogen might hold some keys to a better understanding of the geological evolution of the Musgrave Province, and vice versa.

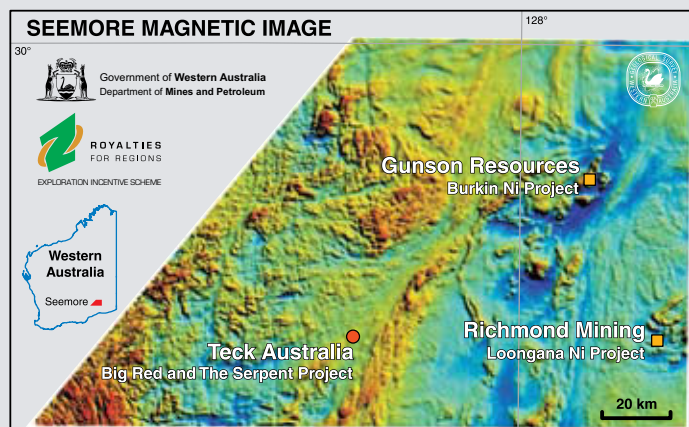
The field trip focused on the c. 1300 Ma Fraser Zone, a regionally extensive, northeast-trending zone dominated by metamorphosed gabbro and interlayered metamorphosed sedimentary rocks and granite. The Fraser Zone was previously interpreted by Condie and Myers (Australian Journal of Earth Science, 1999) to represent an arc setting, based on the geochemistry of the gabbro. Its chronological counterpart in the Musgrave Province is the 1345–1293 Ma Wankanki Supersuite, a voluminous sequence of granites and metamorphosed volcanic rocks with close geochemical characteristics to magmas that have formed the Andean arc, along the western edge of the South American continent. The field party found that much of the Fraser Zone is best interpreted as a lower crustal region of high (probably ultrahigh) temperature metamorphism, extensively intruded by sheets of gabbro. The felsic country rock to the gabbro sheets underwent partial melting and the granitic magmas produced were variably incorporated into partially crystallised gabbroic magmas to produce a wide spectrum of hybrid magmas of mafic to felsic composition. This scenario is typical of lower crustal 'hot zones' thought to form the roots to active convergent margins, and reflects an environment speculated to have also existed beneath the Musgrave Province during formation of the Wankanki Supersuite.

For more information, contact Catherine Spaggiari (Albany–Fraser) (catherine.spaggiari@dmp.wa.gov.au) or Hugh Smithies (Musgrave) (hugh.smithies@dmp.wa.gov.au).

Seemore of the Nullabor basement

As part of the Exploration Incentive Scheme (EIS), GSWA released the Seemore airborne geophysical survey. This is the first of a series of surveys at 200 m line-spacing that will cover the Eucla Basin. At half the usual spacing of GSWA's regional surveys, this latest release gives a remarkably detailed picture of Proterozoic basement rocks buried beneath sand and the relatively thin Cenozoic limestones of the Nullabor Plain.

A prominent shear zone running through the centre of the magnetic image separates probable granitic and gneissic rocks (which are a continuation of the 1345–1160 Ma Albany–Fraser Orogen to the west) from a region to the east where distinct patterns indicative of layering is interpreted as possible mafic–ultramafic intrusions. An age of 1410 Ma was obtained by GSWA from Helix drillcore at what is now Richmond Mining's Loongana Ni Project. Because they represented new targets in an under-explored part of WA, Gunson Resources' Burkin Ni Project and Teck Australia's Big Red and the Serpent Project were awarded funding under the EIS Co-funded Exploration Drilling program. The drillcore from these projects will help to further characterize the nature of these prospective rocks.



Images and data grids of all surveys can be downloaded from the Regional Geophysical Surveys page of the GSWA website <www.dmp.wa.gov.au/geophysics>.

For more information, contact Ian Tyler (ian.tyler@dmp.wa.gov.au).



East of Yalgoo

Results from the 2009 field season

Yilgarn Craton

In the Murchison, field mapping was completed on the Windimurra and Narndee Igneous Complexes. New SHRIMP geochronology has confirmed an age of c. 2800 Ma for the Narndee Igneous Complex, and samples from other mafic igneous complexes in the region have been collected and are being processed. The recently published new stratigraphy for the northern part of the Murchison Domain was incorporated into the latest GIS release for the region.

In the Eastern Goldfields, work has commenced on the implementation of a regional stratigraphy in the East Yilgarn GIS. Geologists from GSWA's Kalgoorlie office will use the vast amount of recently generated

geophysical, geochemical, and geochronological data to regularize existing stratigraphic nomenclature, and to extend a consistent stratigraphic system across the whole of the Eastern Goldfields Superterrane. The proposed stratigraphy will integrate new information generated from pmd*CRG projects, and the Australian Research Council (ARC) project studying the late basins in the Eastern Goldfields in which GSWA is participating.

Field mapping continued in the Bullfinch–Forrestania and Lake Johnston greenstone belts in the south Yilgarn. This mapping will reflect findings from a new ARC project, involving GSWA, which will study the tectonothermal evolution of the southern part of the Southern Cross Domain.



View to the south from the Jack Hills.



Oldest zircon locality, Jack Hills.

Gascoyne Province

Fieldwork concentrated on remapping the LOCKIER 1:100 000 map sheet in the southwestern part of the province. On LOCKIER, Gascoyne Province rocks are bisected by the east-southeast trending Chalba Shear Zone, which controlled much of the intracontinental reworking in the province.

North of the Chalba Shear Zone, the province was pervasively reworked at medium grade during the Mesoproterozoic. Granites intruded at c. 1660 Ma are strongly foliated to gneissic, and are deformed by megascopic upright folds with axial surfaces striking east-southeast. Preliminary U–Pb SIMS (SHRIMP) titanite dating of this fabric yielded a metamorphic age of c. 1280 Ma. Disrupted belts of quartzite and psammitic schist of the c. 2200 Ma Moogie Metamorphics, and granitic gneisses of the 1815–1770 Ma Moorarie Supersuite, are complexly refolded.

South of the Chalba Shear Zone, granitic gneisses of the 2660–2430 Ma Halfway Gneiss, the Moogie Metamorphics, and foliated granites of the Moorarie Supersuite, are also deformed by megascopic upright folds with axial surfaces striking east-southeast. However, field relationships suggest that these structures formed during the early stages of the 1815–1770 Ma Capricorn Orogeny, and are thus 500 million years older than similar structures north of the Chalba Shear Zone.



Strongly deformed c. 1660 Ma porphyritic monzogranite gneiss, including boudinaged amphibolite layers. High-strain deformation most likely occurred at c. 1280 Ma.

Edmund and Collier Basins

Fieldwork has focused on mapping Edmund and Collier Group and underlying Paleoproterozoic rocks on the TANGADEE, MOUNT EGERTON, and CALYIE 1:100 000 map sheets. Gold-bearing quartz veins in the Egerton Inlier on southern MOUNT EGERTON are hosted by low-grade pelitic and psammitic schist, and minor metadolerite, mafic schist, psephite, and metadolostone, that unconformably underlie the basal Edmund Group. This tightly folded succession is overturned on the southern side of the inlier. Much of the Egerton mineralization is centred on the contact between the metasedimentary rocks and a strongly foliated to mylonitic metadolerite. The host rocks are intruded by an undeformed, leucocratic, medium-grained monzogranite that marks the northeastern limit of the metadolerite.



Graded bedding in thick-bedded psammite; way up to the right. Egerton Inlier, southern Mount Egerton.

Western Amadeus Basin — a timely reassessment

A long-overdue field-based reassessment of the western Amadeus Basin is being undertaken by Peter Haines and Heidi Allen from GSWA's petroleum geology group. Most of the basin lies within the Northern Territory (NT), west of the border there is a thick Neoproterozoic section, with scattered thin Paleozoic pockets. Logistical difficulties, extensive sand cover, and a perception of low prospectivity (despite uranium deposits and producing oil and gas fields in the NT), have conspired to make this area one of the least known outcropping geological regions in Australia.

The season's focus was to compare key sections with the eastern Amadeus Basin. Some long-standing miscorrelations, based on very poorly exposed or unexposed relationships, have been corrected. The Neoproterozoic of the western Amadeus Basin is far more complete than previously thought, with two Neoproterozoic glacial units present, allowing enhanced correlations with Cryogenian (mid-Neoproterozoic) successions elsewhere in Australia and worldwide. Most of the Neoproterozoic stratigraphic units with demonstrated or suspected source rock potential in the NT are now recognized in Western Australia. If not reservoirs in the Amadeus Basin, they could provide hydrocarbon charge to the younger Canning Basin, which onlaps to the west.

Numerous stromatolite horizons are present, many not previously recognised, and preliminary identifications fit well with lithostratigraphic and sequence stratigraphic correlations, raising confidence in stromatolite-based biostratigraphy in the basin.

Four sandstone and conglomerate formations that cap the Neoproterozoic succession are younger (probably in part Cambrian) than previously thought, and are syn-orogenic foreland deposits shed during the Petermann Orogeny. Of these, the spectacular Sir Fredrick Conglomerate is a likely correlative of the Mount Currie Conglomerate, which forms the peaks of Kata Tjuta (Mt Olga) near Uluru in the NT.

For further information contact Peter Haines (peter.haines@dmp.wa.gov.au).



Ridges of Heavitree Quartzite forming the base of the Amadeus Basin succession.



Branching columnar stromatolites in the Bitter Springs Formation.



Core provides valuable information to companies

Geologists have long known the value of keeping core for analysing rocks. After drilling core, rather than leaving it as rubbish, companies are increasingly storing it in core libraries. To resolve the issue of core not being used effectively and valuable information being lost, the Kalgoorlie and Perth core libraries were set up in 2000 and 2003 respectively. The Perth Core Library (in Carlisle) has a floor area of 3000 square metres and a maximum capacity of 8640 pallets. It is currently at 40% capacity, mainly housing petroleum core. The Joe Lord Core Library (in Kalgoorlie) is a third of the size of the Perth Core Library with a floor area of 1000 square metres and can handle 2860 pallets of mineral exploration core. Both the Perth and Kalgoorlie facilities have a 15-year capacity before they will need to expand.

The main functions of the core libraries are the receipt of materials, storage of core, and services (viewing and sampling core). The facilities allow diverse industry groups to view mineral and petroleum core which is analysed, and eventually ends up on public department databases such as eSearch, WAMEX, GeoVIEW.WA, and WAPIMS.

The Perth Core Library is frequently used for workshops and training. Chris Brooks, acting manager, is excited about the interest that the workshops create around the core library, and the number of clients these workshops attract. 'We've been conducting a number of workshops per year since 2006 and they're getting more popular,' he said. A recent workshop was organised by the Petroleum Exploration Society of Australia (PESA) focusing on core from Triassic and Jurassic reservoirs, from fluvial, coastal-deltaic and shelf depositional systems. The 44 participants viewed suites of core enabling discussion of stratigraphic controls on hydrocarbon productivity.

Robert Seggie, Browse Studies lead and principal geologist at Woodside Energy Ltd, presented the workshop. He commented that most of the oil and gas reserves are situated off the coast of Western Australia in Triassic/Jurassic aged reservoirs. 'The sandstone and mudrocks contain the gas. This allows us to study changes in core and we can predict how wells will perform. Detailed examination of core helps minimise problems in the exploration process', he said. He added that geologists can find where the gas is and identify the best ways to get it out of the rock. 'The core tells us what volume of hydrocarbons there is and what you can sell.'

Seggie believes that this well-managed facility holds a world-class dataset. The oldest petroleum core at the Perth Core Library is 60 years

old, in good order and able to be studied for years to come. Core remains integral to ongoing exploration. 'Once people realise the value, more core will be obtained and better development will occur,' said Seggie.

Mike Doepel, managing director of SIPA Resources Ltd, donates much of the core he finds in the field for the benefit of his and other companies. SIPA has donated core from the Paraburdoo gold mine and joint venture with Newcrest over the past eight or nine years. 'This is an important new gold province discovered in the 1990s, which covers over 300 km. It's a new geological setting for Western Australia,' he said. His company provides legacy core so companies can review it in the light of changes in technology and geological understanding over the years. The newly installed HyLogger will be used to analyse all core to provide valuable mineralogical information that can be easily accessed. Advances in technology only serve to increase the knowledge gained from the core over the years, helping companies improve their knowledge and processes.

How do companies view core?

1. Send a request to the core library by email: corelibrary.requests@dmp.wa.gov.au with 'Request to view' in the subject line
2. You will be emailed an approval number
3. Contact core librarian and organise a time for viewing, giving at least one week's notice if possible
4. If a sample is needed, special permission can be given
5. Check if the core has been sampled before – previous analyses will be on the database.

What else is stored?

- Geochronology samples
- Geochemical samples
- Rock samples
- GSWA registered rock collection (from 1880s)
- Engineering core dating back to the 1940s

For more information, contact Chris Brooks (chris.brooks@dmp.wa.gov.au) or go to www.dmp.wa.gov.au/corelibrary.

Western Australia regional geophysics surveys 2009–10: January 2010 update



Airborne magnetic and radiometric surveys

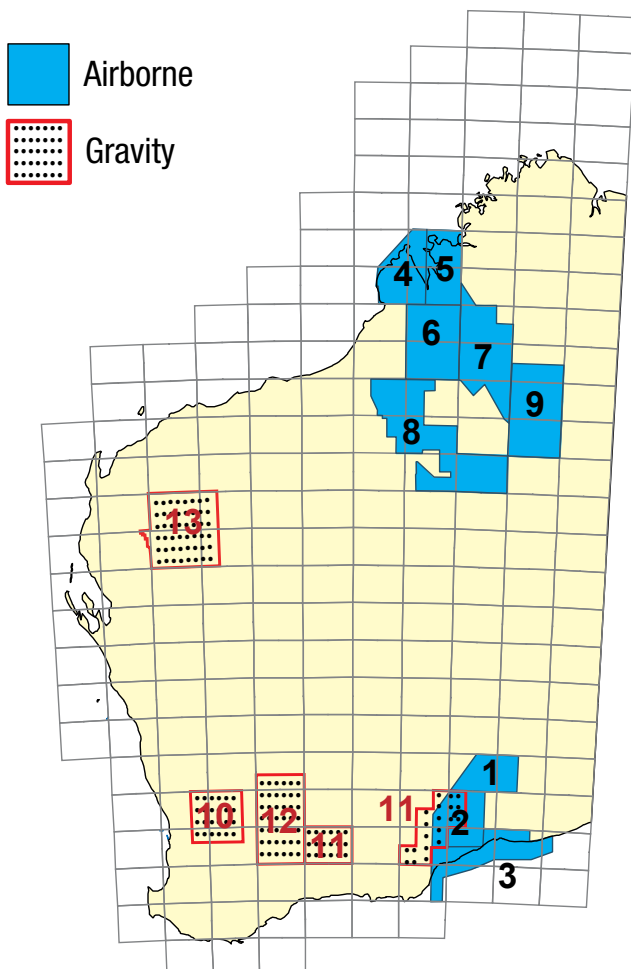
ID	Area/Name	Lines	Size (line-km)	Status	Start	End	Release
1	Seemore 2009	200 m; E/W	90 400	Released	Jun-09	Sep-09	22-Oct-09
2	Naretha 2009	200 m; E/W	125 200	Processing	Jun-09	Nov-09	Feb-10*
3	Eucla Coast 2009	200–400 m; N/S	121 000	Survey	Sep-09	Jan-10*	Mar-10*
4	Broome 2009	400 m; N/S	76 200	Released	Jul-09	Sep-09	03-Dec-09
5	Yampi–Derby 2009	400 m; N/S	66 700	Released	Jun-09	Sep-09	05-Nov-09
6	Mt Anderson – McLarty Hills 2009	400 m; N/S	99 000	Released	Jul-09	Sep-09	17-Dec-09
7	Crossland–Noonkanbah 2009	400 m; N/S	111 900	Processing	Aug-09	Nov-09	Feb-10*
8	Central Canning 2009	800 m; N/S	91 700	Released	Jun-09	Aug-09	17-Dec-09
9	Cornish–Helena 2009	400 m; N/S	129 500	Released	Jun-09	Oct-09	17-Dec-09

Ground gravity surveys

ID	Area/Name	Spacing	Size (stns)	Status	Start	End	Release
10	Cunderdin 2009	2.0 km grid	7 494	Released	Jan-09	Apr-09	3-Sep-09
11	South Yilgarn Margin 2009	2.5 km grid	6 125	Processing	Jul-09	Oct-09	Feb-10*
12	Southern Cross 2010	2.5 km grid	6 300	Survey	Jan-10	Apr-10*	Jun-10*
13	Gascoyne North 2010	2.5 km grid	7 400	Planning	Apr-10*	Jul-10*	Sep-10*

Information current at: 5 Jan 2010

* Estimated date



Data access

Download final data releases from the Geoscience Australia Data Delivery System at <www.ga.gov.au/gadds>.

Download preliminary and final grids and images from the GSWA website at <www.dmp.wa.gov.au/geophysics>.

Subscribe to the GSWA mailing list to keep informed of preliminary and final data release dates.

For more information, contact David Howard (david.howard@dmp.wa.gov.au).





Government of Western Australia
Department of Mines and Petroleum

Seminar and Poster Display

25 February 2010

8.00am – 5.00pm

Esplanade Hotel Fremantle



promoting the prospectivity of WA

GSWA will showcase to mineral and petroleum explorers highlights of its geological programs. GSWA will also demonstrate current exploration data and software available online.

In addition to updates from our regular mapping, mineralization, and petroleum programs, the activities of the \$80 million Exploration Incentive Scheme will be outlined, including the launch of the 2010–11 Government Co-funded Exploration Drilling Program.

Throughout the day there will be geological presentations and an extensive poster display. A feature of the day will be a panel discussion on the role and work programs of GSWA.

This seminar will follow the RIU Explorers Conference held on 23–24 February at the same venue.

For further information

Email: nell.stoyanoff@dmp.wa.gov.au • Phone: (08) 9222 3168

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presents



5th International Archean Symposium Evolving Early Earth

5-9 September 2010, Perth, Western Australia

Abstract deadline **12 February 2010**

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