



Stimulating greenfields exploration and the Exploration Incentive Scheme (EIS)

by

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In April 2009 the Western Australian Government announced Royalties for Regions funding for the five-year \$80 million Exploration Incentive Scheme (EIS) to encourage exploration in Western Australia for the long-term sustainability of the State's resources sector. EIS is managed by the Geological Survey of Western Australia, and the work program over the period 2008–09 to 2012–13 will be dominated by pre-competitive geoscience programs. The progress of the signature Co-funded Government–industry drilling program to assist mineral and energy explorers using innovative targeting methodologies in WA's underexplored greenfields areas, is described elsewhere (Ellis, this volume). About \$24 million of the funding will be of direct benefit to petroleum and energy explorers with the remainder primarily benefiting mineral explorers. The additional funds will ensure that GSWA remains firmly focused on encouraging mineral and energy exploration in underexplored greenfields areas of the State.

EIS has positioned GSWA to significantly increase its capacity to collect, interpret, and distribute up-to-date, relevant, high-quality pre-competitive geoscience datasets to the resources exploration industry in WA. It will allow us to apply new technologies to meet many of our objectives at a much faster rate than previously expected, and also to introduce emerging geoscience concepts and skills for underexplored regions in WA, as well as regions of known mineralization.

A focus for the acquisition of pre-competitive data will be the completion of the airborne magnetic and radiometric coverage of WA at 400 m line-spacing or better. This is long overdue, and equivalent data are generally available for other jurisdictions in Australia. The initial focus for 2008–09 and 2009–10 has been on northern Australia and the Eucla Basin. Nine surveys have been completed with six covering the central and northern Canning Basin and the adjacent Proterozoic basement of the Paterson Orogen in the east Pilbara and the King Leopold Orogen in the west Kimberley (Fig. 1). The remaining three, flown at half the usual spacing of GSWA's regional surveys, give a remarkably detailed picture of Proterozoic basement rocks buried beneath sand and the relatively thin Cenozoic limestones of the Eucla Basin, as shown on Figure 1. Drillcore from Gunson Resources' Burkin Nickel Project and Teck Australia's Big Red and the Serpent Project, funded under the EIS Co-

funded Government–industry drilling program, will help to further characterize the nature of these prospective rocks in what is clearly an underexplored part of WA.

The Kidson–Paterson deep-crustal seismic traverse will cross the Kidson Sub-basin of the Canning Basin, a frontier basin for hydrocarbon exploration. The traverse will be jointly funded with Geoscience Australia as part of their Onshore Energy Security Program (Stolz, this volume), and GSWA's contribution will be to ensure that the Proterozoic rocks of the Paterson Orogen are imaged. They contain world class gold–copper mineralization at Telfer, copper at Nifty, and uranium at Kintyre. Two further deep-crustal seismic traverses are planned for 2010–11, the first crossing the Paleoproterozoic and Mesoproterozoic rocks of the Capricorn Orogen between the Archean Pilbara and Yilgarn Cratons as part of a traverse co-funded with AuScope. The second, entirely funded under EIS, will cross the Narryer and Youanmi Terranes of the Yilgarn Craton. GSWA is collaborating with the Centre for Exploration Targeting (CET) to carry out a magnetotelluric (MT) survey from Hyden to Norseman, which crosses the southern part of the Southern Cross Domain and will image the Ida Fault at the boundary of the Youanmi Terrane with the Kalgoorlie Terrane. A further survey is planned in the Musgrave Province. MT surveys will be carried out in conjunction with the planned deep seismic traverses.

Ground gravity surveys at 2 km and 2.5 km spacing have been carried out around Cunderdin (including the Kauring Airborne Gravity Test Range) and the southeast margin of the Yilgarn Craton. Surveys are planned for the Southern Cross and Lake Johnston areas and the Gascoyne Province. There will also be a considerable expansion of our other datasets, with improved coverage of geology and regolith map layers planned in the Capricorn Orogen and in the Kimberley region. Soil-geochemistry surveys will target the northern and eastern margins of the Yilgarn Craton where deep weathering, regolith cover, and thin sedimentary basins obscure prospective Archean and Proterozoic bedrock.

GSWA will enhance our long-standing partnership with the John de Laeter Centre for Mass Spectrometry (JdeLCMS) to take advantage of expertise in SHRIMP phosphate geochronology developed at Curtin University and UWA to improve our understanding of very low- to moderate-

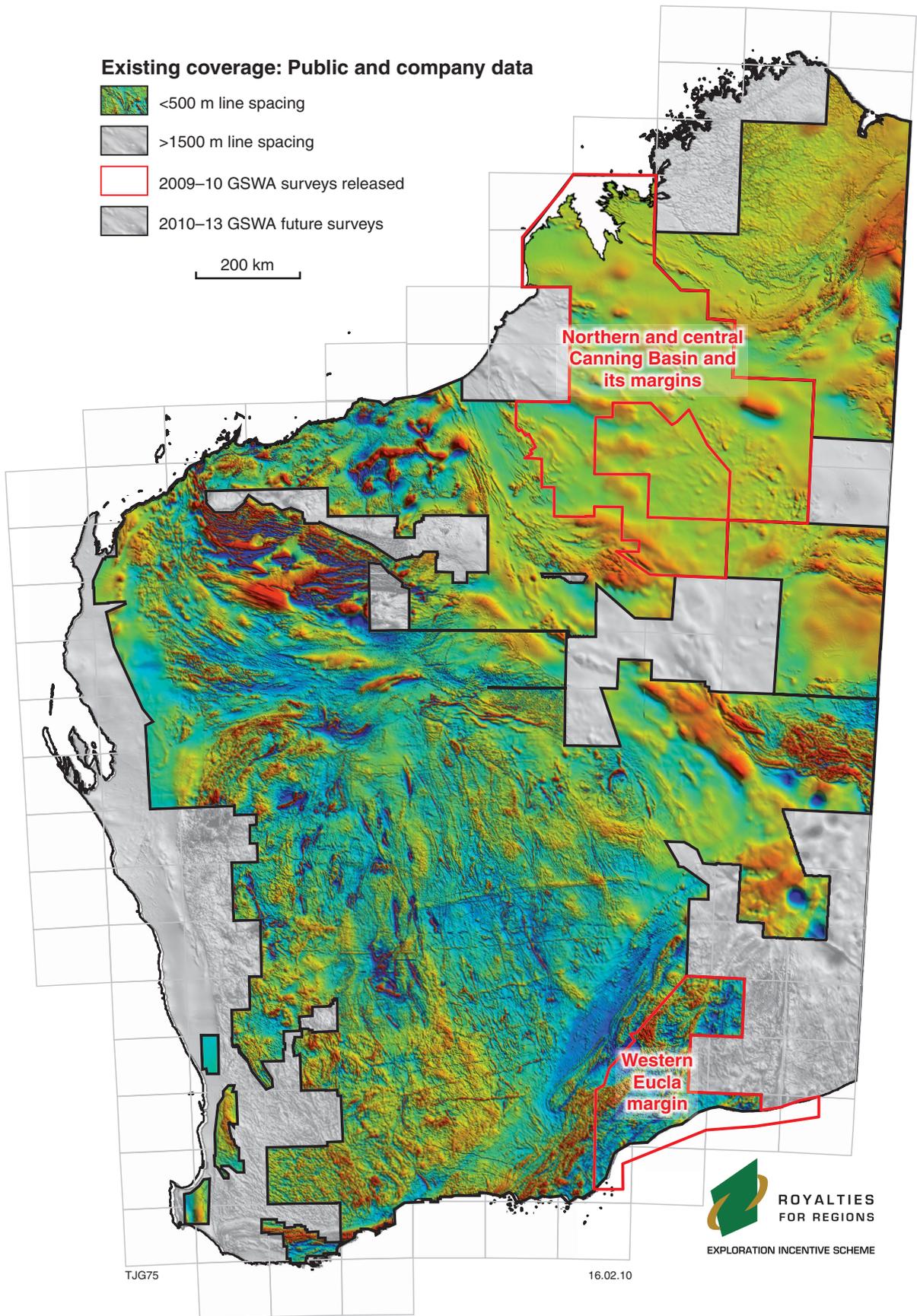
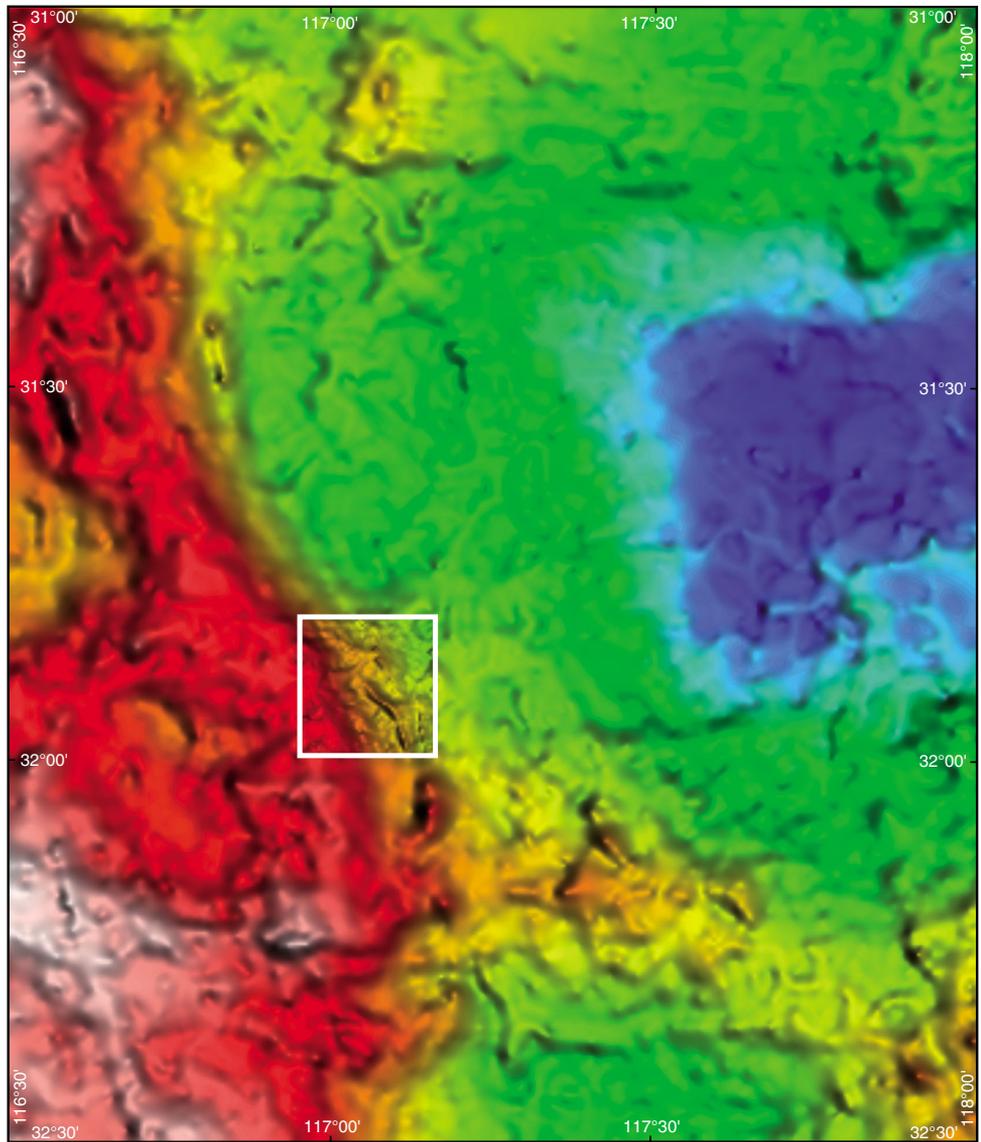


Figure 1. Aeromagnetic survey data for Western Australia. Newly released surveys are outlined in red



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SURVEY SPECIFICATIONS

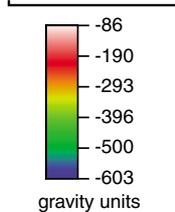
Gravity measurements made with a Scintrex CG-5 gravity meter.

Position and height data obtained using dual-frequency, geodetic grade GPS receivers.

Regional survey area:
143 km x 169 km, nominal 2 km grid.

 Airborne gravity test site:
20 km x 20 km, nominal 500 m grid.

25 km



gravity units

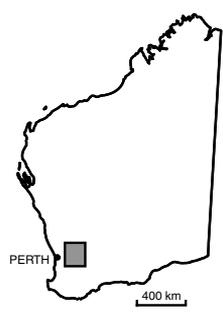



Figure 2. Cunderdin ground gravity survey, incorporating the Kauring airborne gravity test site

temperature events, including hydrothermal fluid flow and mineralization. In addition, we have expanded a program of isotopic analysis for whole rock Sm–Nd analyses, which will initially concentrate on refining the Nd isotope map of the Yilgarn Craton (Cassidy and Champion, 2007). Analysis of the Lu–Hf isotopic system in zircon previously dated using SHRIMP U–Pb geochronology is a relatively new technique that can be used as a tracer of interaction between the crust and the mantle. These techniques are important for regional-scale targeting linking large-scale mineralization to relatively juvenile magmas derived from underlying fertile, metasomatized upper mantle (Hronsky and Groves, 2009)

Within the EIS programs we are planning to modernize, expand, and integrate our systems to allow our geoscience databases to be accessed and interrogated online, and for our customers to be able to create their own, customized geoscience reports and maps. Upgrading of the petroleum and geothermal, as well as the mineral databases will streamline exploration reporting and information release. Of particular importance will be access to mineral drillhole information, and its related geochemistry. GSWA has purchased the entire TerraSearch surface and downhole geochemistry database for WA. The dataset covers large areas of the State and includes more than 1.1 million data points, most of which are multi-element geochemistry from drillholes. The exploration geochemistry data were captured from open-file company reports, and validated in terms of sample location and data quality.

There will be an expansion of cooperative projects between GSWA and other government geoscience organizations, including Geoscience Australia and CSIRO, and with university earth science departments and research centres of excellence such as the Centre for 3D Mineral Mapping (C3DMM), CET, WA Geothermal Centre of Excellence, and JdeLCMS. These projects will focus on the provision of strategically important information on mineral and petroleum systems, particularly for exploration targeting in underexplored greenfields regions, and in emerging areas such as tight gas, geothermal energy, and carbon dioxide geosequestration, where skills are in short supply. GSWA is already playing a key role in providing expert advice and assisting with the coordination of WA projects to identify the best places to sequester carbon dioxide both from coal-fired power plants and the LNG industry.

Our aim is to develop an integrated approach to the delivery of the new and expanded datasets and their interpretation — all based on development of the capability to model and visualize geological and geophysical data in 3D. Integration of the modelling of crustal architecture with geochronology, isotopic signatures, an understanding of geodynamic setting, and of the mineral systems present in an area will act as a powerful guide to exploration potential.

The challenge for GSWA, the resource exploration industry, and the research community that supports this vital sector of the Western Australian economy is to ensure that the datasets and products generated under EIS are effective in generating new exploration targets in underexplored regions, particularly under thin soil and sedimentary basin cover. The identified targets may then qualify for funding under the Government co-funded drilling scheme component of EIS. The export of WA's expertise and services to the resources sector worldwide will provide a long-term economic base for the State.

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