

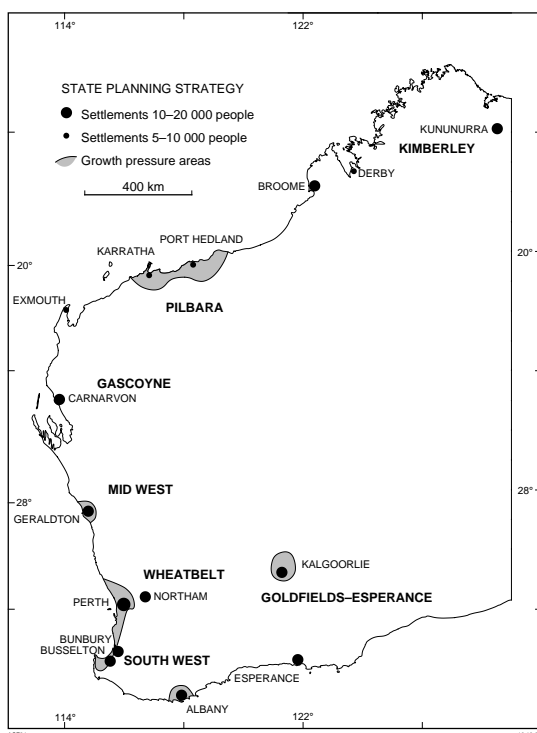
Urban geology in WA — a fresh start

Through the eyes of Government, the landscape of Western Australia may be a source of mineral and agricultural wealth, a setting for major infrastructure projects, a receptacle for rubbish, or a playground for the masses. These potentially conflicting landuses are nowhere more evident than in the urban and development areas that line our coast, and inland areas such as Kalgoorlie.

Our mineral, agricultural, and industrial wealth needs room to grow, just as the public needs space to breathe. Increasingly there is a need for better scientific information related to resource management in areas where resource and population pressures are

The State Planning Strategy includes, as one of its principles, the management and protection of resources. The priority management areas identified in this strategy are Perth–Bunbury–Busselton, Geraldton, Albany, Kalgoorlie, and Karratha – Port Hedland. Within each of these areas the pressures vary significantly. Geraldton is a major service centre with increasingly diverse economic opportunities, such as the Oakajee deep-water port project, whereas in the southwestern part of the State a balance needs to be struck between settlement growth and the management of natural resources.

Geological mapping of urban and development areas commenced in August 1998, building on the work of the urban and environmental geology 1:50 000 mapping that started with the GINGIN sheet in 1976, and ended with the draft COWARAMUP sheet several years ago. The first areas to be targeted will be KARRIDALE–LEEWIN in the Southwest Region and HOWATHARRA–GERALDTON in the Mid West Region. Future mapping will be in areas east of the Perth metropolitan area, around Kalgoorlie, and in selected coastal towns from the south coast to the Pilbara. ►



growing. The GSWA's urban and development areas geology mapping project will address a wide range of landuse issues through detailed geological mapping, both onshore and in near-shore shallow-marine environments, of areas of the State that are likely to see significant development. Landuse planning in these areas will benefit from the availability of new 1:50 000 series geological maps and digital datasets that are closely integrated through the Western Australian Land Information System (WALIS) with data from a wide range of Government agencies involved in the State Planning Strategy.

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- The mapping team, led by Dr Richard Langford, will initially comprise two field geologists supported by a cartographer. Mapping will be undertaken at 1:25 000 scale or larger, using digital orthophotography and differential global positioning to ensure the highest standards of field data positioning. The successful 1:50 000 urban and environmental geology series will be used as a model for the hard copy map, with seamless integration of digital compilation and spatial datasets leading to high-quality, printed maps.

Close links with other data-gathering agencies who will use the data have been established, and these include the Department of Land Administration, Agriculture Western Australia, and the Department of Conservation and Land Management. The customers for spatial data, including the mineral industry, local government agencies, urban infrastructure authorities, engineering and architectural service companies, primary producers, and tourism operators, will be able

to mix spatial data from GSWA (geology, regolith, mineral occurrences, basic raw materials) with soil, vegetation, infrastructure, and other landuse data from any of a wide range of sources.

A critical element in the success of any landuse planning strategy is good quality, up-to-date, pertinent scientific information. The GSWA has a pivotal role to play in providing geoscience information, and the urban and development areas geology project will ensure that our products are of direct relevance to landuse planning in areas with the greatest pressures.

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GSWA at WABS '98

The Geological Survey of Western Australia had a strong presence at the second Western Australian Basins Symposium (WABS) held from 30 August to 2 September at the Hyatt Regency, Perth. GSWA's Petroleum Initiatives teams were involved with 10 papers (as listed on the next page), out of a total of 51 papers, concentrating mainly on

the geology and hydrocarbon prospectivity of onshore sedimentary basins. In addition, staff from the Department's Petroleum Operations Division (POD) presented a paper.

The WAB symposium was the fourth on Western Australian sedimentary basins organized by

the W.A. branch of the Petroleum Exploration Society of Australia (PESA), since the first on the Canning Basin in 1984. The previous WABS volume (1994) is one of the key references for petroleum explorers in W.A., and the 1998 volume builds on that tradition and service. Over 500 representatives of industry (including both exploration and service companies), government agencies, and universities attended the 1998 symposium.

During the symposium John Gorter, exploration manager for Hardy Petroleum and chairman of the organizing committee of the symposium, publicly acknowledged the activity of the Geological Survey, particularly the usefulness of our stratigraphic drilling program in deepening knowledge of the petroleum geology of onshore basins in Western Australia.

The Department of Minerals and Energy had a booth at the symposium where key results from GSWA's work on the onshore



The relaxed and friendly atmosphere at our display booth at WABS '98.

Canning, Carnarvon, and Officer Basins, including the drilling program, were on display. At the booth, additional information supplied to interested explorers included advice on petroleum tenements supplied by the Petroleum Operations Division.

The most significant results presented by GSWA at the symposium were the discovery of good to excellent source rocks by GSWA's drilling program in the

Silurian and Upper Devonian strata of the Carnarvon Basin and the Neoproterozoic strata of the Officer Basin. In addition, the discovery of a large probable impact structure of Early Devonian to Early Jurassic age, located near the southern end of the Carnarvon Basin, was publicized for the first time during Robert Iasky's presentation of the structural interpretation of the Gascoyne Platform, Southern Carnarvon Basin.

Copies of the WABS 98 volume, which contains all papers presented at the symposium, are available for viewing in the DME library on the 5th floor of Mineral House. The volume can be purchased from the PESA W.A. branch (GPO Box T1786, Perth, W.A. 6001) or the Australian Mineral Foundation (79 Colin Street West Perth, W.A. 6005) for \$150 plus postage.

Presentations by GSWA staff members at WABS 98 were:

- *WAPIMS: a new petroleum exploration database for Western Australia* by J. H. Haworth and L. M. Arden
- *Petroleum geology of the Peedamullah Shelf, Northern Carnarvon Basin* by A. R. Yasin and R. P. Iasky
- *Petroleum generating potential and thermal history of the Palaeozoic Carnarvon Basin, Western Australia* by K. A. R. Ghori
- *Sequence stratigraphy and hydrocarbon potential of the Middle to Upper Devonian sequences in the Carnarvon Basin, Western Australia* by J. D. Gorter (Hardy Petroleum), A. J. Mory, and R. S. Nicoll (AGSO)
- *A structural interpretation of the Gascoyne Platform, Southern Carnarvon Basin, W.A.* by R. P. Iasky, A. J. Mory, and S. I. Shevchenko
- *Lower Palaeozoic correlation and thermal maturity, Carnarvon Basin, W.A.* by A. J. Mory, R. S. Nicoll (AGSO), and J. D. Gorter (Hardy Petroleum)
- *The Coolcalalaya Sub-basin: A forgotten frontier between the Perth and Carnarvon Basins, Western Australia* by A. J. Mory, R. P. Iasky, and S. I. Shevchenko
- *Dongara oil and gas field, Perth Basin* by G. K. Ellis (Hardy Petroleum) and R. H. Bruce (POD)
- *The Lennard Shelf revisited* by A. Crostella
- *Redefinition of the Grant Group and reinterpretation of the Permo-Carboniferous succession, Canning Basin* by S. N. Apak and J. Backhouse
- *Petroleum generating potential and thermal history of the Neoproterozoic Officer Basin, Western Australia* by K. A. R. Ghori

New Assistant Director appointed

In October 1998 Dr Rick Rogerson was appointed as GSWA's new Assistant Director (Mineral and Petroleum Resources Branch). Rick has been with GSWA since 1994 as Chief Geoscientist in the Mineral Resources Branch.

Rick graduated from Sydney University with a B.Sc.(Hons) and PhD in metamorphic and granitic petrology and structural geology, and worked as a Senior Tutor at the Geology Department, Institute of Technology in Sydney. From 1981 to 1994 he worked in the Papua New Guinea Department of Minerals and Energy. He was in charge of the Geological Mapping and Mineral District Studies Groups until 1993, when he became Acting Director of the Geological Survey of PNG and, subsequently, Acting Director of the Mining Division. He is the author of numerous notes, reports, and maps describing PNG's geology and resources.





Peeling back the edges: regional aeromagnetic surveys in eastern Western Australia

Increasing competition and continued technological developments have seen explorers expand their search for new mineral deposits beyond the traditional 'exposed' greenstones of the northeastern Yilgarn Craton. More attention is now being paid to the 'outer edges' of the craton, where the highly prospective Archaean basement rocks are overlain by the onlapping sedimentary rocks of the Earaheedy and Officer Basins.

The pattern of exploration tenement holdings in the northeastern Yilgarn demonstrates an unsurprising degree of correlation with magnetic trends visible on the regional airborne magnetic image of the State. This is testimony to the use that regional and detailed magnetic and other airborne geophysical survey techniques are being put to as pathfinders to the next generation of ore deposits. The magnetic data are useful not only for delimiting areas of shallow sedimentary cover and tracing the Archaean greenstones beneath them, but as a litho-structural mapping aid for Proterozoic and younger sedimentary-hosted mineral deposits.

In keeping with now-established practice, GSWA and the Australian Geological Survey Organisation (AGSO) are working closely together to ensure that State and Federal government funds directed to regional airborne surveys are used to maximum effect, and that the greatest area is covered at the lowest cost. Later this year, the exploration industry can expect to see a significant increase in the amount of low-priced airborne

magnetic data available for eastern Western Australia, as the results of current GSWA and AGSO data acquisition programs are released into the public domain.

In April and May 1998, AGSO flew a survey of almost 110 000 line kilometres over parts of the KINGSTON, ROBERT, THROSSELL, and RASON 1:250 000 sheets on the western flank of the southern Officer Basin (AUSGEO News, April 1998 — <http://www.agso.gov.au/information/ausgeonews/>). The new data will be combined with older, private company data to provide complete coverage at 400 m line spacing or closer over the four sheet areas. Data for the RASON and THROSSELL sheets were released on 20 October 1998

On the other side of the Officer Basin, 400 km to the northeast, GSWA and AGSO awarded tenders for surveys (to standard NGMA specifications) to fill the two 'holes' in the regional airborne magnetic coverage of the State.

The 50 000 line km survey over the RAWLINSON 1:250 000 sheet was flown by Tesla Airborne Geoscience between June and July 1998. The 80 000 line km survey over the WEBB and WILSON 1:250 000 sheets was awarded to the same company. Data acquisition commenced in August 1998 and should be completed in November 1998.

It is hoped that the results from these surveys will encourage companies to continue their efforts to explore these prospective frontier areas, despite the barriers posed by the lack of infrastructure and the difficulties of land access.

The GSWA-AGSO program of regional airborne magnetic and radiometric surveying is being complemented by a new thrust in GSWA to encourage greater use of the very large quantities of detailed airborne survey data generated over the years by private companies as part of their exploration activities. A new policy for the reporting of airborne geophysical surveys has been adopted and is designed to simplify reporting requirements and ensure that the data are as widely available as possible. Details of the policy are posted on DME's Internet site at <http://www.dme.wa.gov.au>. Paper copies may be obtained on request from GSWA. Companies are urged to comply with the new policy to their own ultimate benefit.

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Waigen Sub-basin gravity survey

A semi-detailed gravity survey was recently completed in the Waigen Sub-basin of the Officer Basin for the Geological Survey of Western Australia. The survey was designed to provide more detailed gravity data for the interpretation of structure and thickness of sedimentary rocks of the Officer Basin succession along the southern margin of the Musgrave Block.

The dataset from the Waigen Sub-basin is currently being interpreted by the Petroleum Initiatives Interior Basins Team to determine the best location for a stratigraphic test of the Neoproterozoic section of the Officer Basin. This stratigraphic test, to be drilled later this financial year, will be the first drillhole

designed to test for petroleum source rocks in the Waigen Sub-basin. There are no previous petroleum exploration, stratigraphic test, or mineral exploration drillholes in the Waigen Sub-basin. This is truly frontier exploration at its best!

The gravity survey operations and data processing were performed by Geotrex-Digheem for GSWA. Data acquisition commenced on 1 June 1998 and was completed on 18 June 1998. During this period a total of 1365 stations were observed. A Lacoste and Romburg Model G gravity meter was used for gravity acquisition, with station position and elevation determined using dual frequency Ashtech Z-12 GPS receivers. A Kawasaki KH-4

helicopter was used as the survey platform, and two GPS receivers mounted in the aircraft provided 100% redundancy and supplied a check of all elevations.

As the survey covered a number of sensitive Aboriginal sites, close liaison was maintained with the local aboriginal leaders and advisers, and a number of stations were skipped due to their proximity to sensitive sites.

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Kalgoorlie core library — site declaration

On Friday 16 October the Minister for Mines, Norman Moore MLC, inspected the site of the proposed Kalgoorlie regional core library facility and the Geological Survey of Western Australia's operational base.

The 1.7 hectare industrial site for the core library, at the corner of Broadwood and Hunter site in West Kalgoorlie, is ideally located near the airport close to exploration company bases and mineral industry service companies.

Sandover Pinder Pty Ltd - Architects has been appointed to design the core library facilities for Kalgoorlie and Perth (in Carlisle), and are working closely with the Department of Minerals and Energy to ensure that construction of the Kalgoorlie facility begins by mid-1999.



The Minister for Mines, Norman Moore MLC, with GSWA's new Assistant Director Resources, Dr Rick Rogerson (left), and the East Yilgarn Terrane Custodian, Dr Ivor Roberts (right).



Adding value to the regional geochemical mapping program: a matter of gravity

The collection of surface samples (regolith) as part of GSWA's regional regolith and geochemical mapping program offers the opportunity to obtain other data that are suited to capture at regularly spaced intervals, such as geophysical data.

In conjunction with the Australian Geological Survey Organisation (AGSO), GSWA initiated a program of gravity data capture on the COLLIER and WYLOO 1:250 000 map sheets in May and June 1998, as part of the regolith sampling program. The sheets were sampled using four two-person sampling crews transported by two Bell Jetranger helicopters. Each helicopter was fitted with a differential global positioning system (GPS), giving the required precision necessary for gravity surveys. The gravity meter was positioned in exactly the same position relative to the helicopter at each sample site, and the position of the helicopter was determined using the GPS. The gravity measurement was taken by the geologist, who also recorded regolith and geology characteristics, while the field assistant collected the regolith sample.

Previously, for regolith-only sampling, teams were spending about 12 minutes at each site; the acquisition of gravity data added about 3 minutes per site. Andrew Sanders, the map sheet coordinator for COLLIER and WYLOO, reported that the average daily rate of regolith-only sampling of 95 samples had been reduced to about 80 when gravity data were also collected. However, he maintained that the number of sample sites visited per day increased as sampling and helicopter crews become more accustomed to the changes in the program.



Helicopter gravity survey and regolith sampling operations.

Unfortunately, gravity data were only collected at sites on the first three days of the COLLIER program. Vibration in the tail of the helicopters resulted in loosening of the satellite receiver bracket. Due to air safety considerations, the receivers were removed. Despite this, Robert Iasky and Sergei Shevchenko, who have been running the geophysics side of the program, reported the capture of high-quality data. Refitting of the satellite receiver and flight testing was carried out before the commencement of the acquisition program on WYLOO in late May, and a complete gravity dataset for this sheet was successfully captured. Since then gravity acquisition has been successfully completed on AJANA and in the Fraser Range area.

Acquisition of gravity data is seen as an ongoing part of the regional regolith and geochemical mapping program, and is a demonstration of value adding with little increase in cost.

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Bush Telegraph — where we are working

<i>Location</i>	<i>Map sheets</i>	<i>Dates</i>	<i>Activities</i>	<i>Team members</i>	<i>Contact details</i>
Eastern Goldfields	Seamless geological database Phase 1: 19 × 1:100 000 sheet Phase 2: 18 × 1:100 000 sheets. MOUNT BELCHES and WOOLGANGIE 1:100 000 sheets	Aug–Nov 1998 Mar–Apr 1999 Aug–Nov 1998 Mar–Apr 1999	Field checking along 1:100 000 map boundaries for development of seamless GIS database Geological mapping	Ivor Roberts Bruce Groenewald Matt Painter	Ivor Roberts; ph: (08) 9021 9426 fax: (08) 9091 4499 i.roberts@dme.wa.gov.au Bruce Groenewald; ph: (08) 9021 9433 fax: (08) 9091 4499 b.groenewald@dme.wa.gov.au
Lennard Shelf, Canning Basin	LENNARD RIVER, NOONKANBAH, MOUNT RAMSAY, and parts of adjoining 1:250 000 sheets	Till end of October 1998	Geological mapping	Phillip Playford Roger Hocking Iain Copp	Phillip Playford; ph (08) 9222 3157 fax: (08) 9222 3633 p.playford@dme.wa.gov.au
Western Bangemall Basin	EDMUND 1:250 000 sheet ELLIOTT CREEK, ULLAWARRA CAPRICORN, and MAROONAH 1:100 000 sheets	Till end of October 1998	Mapping on CAPRICORN, ELLIOTT CREEK, and ULLAWARRA sheets completed by end of August 1998. Sampling of dolerite sills and selected rock units for geochronology and whole-rock geochemistry. Proposed activities for remainder of 1998 field season include mapping Bangemall Group rocks on MAROONAH and detailed stratigraphic logging of well-exposed sections on ELLIOTT CREEK and ULLAWARRA	Alan Thorne Iain Copp David Martin	Alan Thorne; ph (08) 9222 3335 fax (08) 92223633 a.thorne@dme.wa.gov.au
Nabberu and Lake Stanley region	RHODES, GRANITE PEAK, EARAHEEDY 1:100 000 sheets	Till end of October 1998	Geological mapping, sampling for igneous and sedimentary petrography, whole-rock geochemistry and geochronology. Studies of regional stratigraphy and tectonics. Studies of the Shoemaker Impact Structure with NASA and ANU	Franco Pirajno Roger Hocking Nick Adamides Amanda Jones	Franco Pirajno; ph. (08) 9222 3155 fax (08) 9222 3633 f.pirajno@dme.wa.gov.au
Central and north Pilbara	Fieldwork in progress on MARBLE BAR, MOUNT EDGAR, NULLAGINE, TAMBOURAH, and SATIRIST 1:100 000 sheets. Fieldwork completed on PATERSON 1:100 000 sheet (Paterson Orogeny)	Apr–Oct 1998	Geological mapping, sampling for petrography, geochemistry, and geochronology. Ground truthing of AGSO ternary radiometric images for Mount Edgar and Corunna Downs Granitoid Complexes	Arthur Hickman Leon Bagas Ian Williams Hugh Smithies Terry Farrell Martin van Kranendonk	Arthur Hickman; ph (08) 9222 3633, fax (08) 9222 3633 a.hickman@dme.wa.gov.au
Bangemall Basin Hamersley Range Southern Canarvon Basin Savory Basin Earaheedy Basin Fraser Range	COLLIER, WYLOO, and AJANA 1:250 000 map sheets, and six 1:100 000 sheets in the Fraser Range	Apr–Oct 1998	Sampling of regolith for chemistry and measurement of gravity on WYLOO and over six 1:100 000 map sheets over the Albany–Fraser belt completed, in a joint project with AGSO. Paul Morris will undertake a pilot program involving sampling of sandplain-dominated areas on the BULLEN 1:250 000 sheet in October, combining this with reconnaissance over the KINGSTON and STANLEY 1:250 000 sheets, which will be sampled in 1999	Paul Morris, Andrew Sanders Julian Coker Karen Pye Johnno King	Paul Morris; ph (08) 9222 3345, fax (08) 9222 3633 p.morris@dme.wa.gov.au
Gascoyne region, Glenburgh area	GLENBURGH and ERONG 1:100 000 sheets	April through to end of October 1998	Geological mapping, sampling for igneous and metamorphic petrography, whole-rock geochemistry, and geochronology	Ian Tyler, John Myers Steve Sheppard Sandra Occhipinti	Ian Tyler; ph (08) 9222 3605 fax (08) 9222 3633 i.tyler@dme.wa.gov.au
Marda-Diemals, northern part of the Southern Cross Province	Fieldwork completed on JOHNSTON RANGE 1:100 000 sheet. Currently mapping JACKSON, BUNGALBIN, and LAKE GILES 1:100 000 sheet	Till late November 1998 and March– June 1999	Mapping of the Marda calc-alkaline volcanic complex, and geochronological studies to determine the age of greenstone deposition. Future work will involve systematic 1:100 000 mapping in the Youanmi and Sandstone districts	Stephen Wyche She Fa Chen Angela Riganti John Greenfield	Stephen Wyche, ph (08) 9222 3606, s.wyche@dme.wa.gov.au Angela Riganti, ph (08) 9021 9434, a.riganti@dme.wa.gov.au





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