



CHASING THE SOURCE ROCKS

During 1995 and 1996 four continuously cored stratigraphic bores, Gneudna 1, Ballythanna 1, Mooka 1, and Barrabiddy 1 were drilled by GSWA in the onshore southern Carnarvon Basin to provide additional stratigraphic, geochemical and reservoir characterization data for the Devonian Gneudna and Permian Callytharra Formations. This drilling project was an integral part of the Petroleum Exploration Initiatives Program, which aims to review the petroleum prospectivity of onshore WA sedimentary basins.



Western Deep Hole Drilling Rig - used for Mooka 1 and Barrabiddy 1 stratigraphic core holes.

Although one of Australia's most famous oil discoveries was made at Rough Range, to the north in Cretaceous sediments, no significant hydrocarbons have been found in the thick underlying Palaeozoic sequences. Exploration programs carried out by industry during the 1960s and 1980s have done little to change the "frontier" status of the onshore Carnarvon Basin south of the areas adjacent to the coastline between Onslow and Rough Range.

In the Merlinleigh Sub-basin and Gascoyne Platform less than two dozen petroleum exploration wells have been drilled specifically to test Palaeozoic targets. In the light of modern technology and understanding, the lack of success in all of these wells can be

interpreted to be a result of poor trap integrity. Poor quality or inadequate seismic control has resulted in poor structural definition of these traps. Consequently, none of these wells can be considered a valid test of the hydrocarbon potential of the basin.

As a consequence of the lack of hydrocarbon shows in existing wells, the fundamental questions of whether hydrocarbons were ever generated and subsequently trapped and preserved is a critical issue in the prospectivity study of the basin.

To examine questions of presence and distribution of shales having geochemical characteristics suitable for the generation of hydrocarbons, all existing industry geochemical data was collated, and additional geochemical analysis was conducted on existing petroleum and mineral industry core and cuttings. These geochemical data, when viewed against the background of the regional stratigraphy, indicated that the Devonian Gneudna and Permian Callytharra Formations were the most likely units to develop attractive marine source-rock facies. ►

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◀ Hence the “chase for the source” began. Geochemical results from Gneudna 1, drilled adjacent to outcrop on the eastern flank of the basin, produced encouraging results from a thin shale interval within the Gneudna Formation and so provided the rationale to continue investigating this unit west of the outcrop belt. Results from Ballythanna 1, by comparison, suggest that the Callytharra Formation is unlikely to contain source rocks.

Two wells, Mooka 1 and Barrabiddy 1, were located approximately 130 km apart on the Wandagee Ridge based on palynology results from shallow water drilling and seismic data, respectively.

Mooka 1, although located 500 m from a water investigation bore that yielded Late Devonian palynomorphs, penetrated an older section (Kalbarri Group of probable Silurian age). Geochemical analyses show that this well does not contain source rocks.



Raza Yasin and Chris Brooks at Mooka 1 site with cores laid out following detailed description in tent laboratory.

Barrabiddy 1 was more successful and demonstrated the presence of approximately 500 m of Gneudna Formation of which the basal 160 m contained shale that could be sampled for source-rock studies. The remainder of the unit consists

of massive vuggy limestone. Preliminary geochemical analyses carried out to date indicate the presence of good source rock in thin intervals at 678 m and 713 m. Additional analyses are to be carried out to verify the preliminary results. □

TALC - A WINNER FOR THE STATE

Mineral Resources Bulletin 16, *Talc, Pyrophyllite and Magnesite in Western Australia* by P. B. Abeyasinghe, is the forerunner of several commodity reports — and the first such bulletin in the rejuvenated Mineral Resources Bulletin series. This volume compiles all the available information, both published and unpublished, to provide a comprehensive summary of the occurrence, mineralogy, uses, and geology of talc, pyrophyllite and magnesite.

Bulletin 16 is divided into two parts: the first deals with talc and pyrophyllite, and the second with magnesite. Most of the Bulletin is devoted to talc and magnesite—economically important minerals in Western Australia.

The economic viability of projects involving industrial minerals is strongly dependent on the location of a deposit in relation to infrastructure, to the availability of other competitive minerals, and to global production and usage trends. Such trends for both talc and magnesite are discussed at length in this publication.

Western Australia has two operating talc mines, at Three Springs near Geraldton, and at Mount Seabrook, 170 km northwest of Meekatharra. Talc production earned thirteen million dollars for the State in 1995–96, with the two mines mentioned producing 16 000 000 t.

Magnesite is not currently being mined, but inferred resources are large, both from residual deposits on Archaean ultramafic rocks and from the Pallinup Siltstone.

Talc from the Three Springs mine is high-grade steatite, greenish in colour and sold for various industrial uses. The Mount Seabrook talc is of sufficient quality and colour to satisfy the cosmetics market in Europe. □

Mineral Resources Bulletin 16 is a 117 page document which includes 33 figures and 45 tables. It can be purchased for \$40 from:

Information Centre
1st Floor, ‘Mineral House’
100 Plain Street, EAST PERTH, 6004.
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Profile - *Pathmasekara Abeysinghe*



Pathmasekara, or Abey as he is known, is the author of Mineral Resources Bulletin 16 and has been with the Survey for four years. He holds a Bachelor of Science degree in Geology, Chemistry and Pure Mathematics from the University of Sri Lanka, a Bachelor of Science (Hons) degree in Geology from the University of Tasmania and a PhD in Geology from La Trobe University, Victoria.

Abey began his career with the Geological Survey of Sri Lanka in 1969 as a Trainee Geologist and worked his way up to become a Senior Geologist. His work involved the planning and execution of projects on geological mapping, and the evaluation of industrial minerals and other ore deposits. During this time he also served as a Consultant Geologist and as a Lecturer at the University of Sri Lanka.

On arrival in Australia, Abey joined a consulting group and for one and a half years carried out exploration projects in Western Australia. In 1989, he was employed by Great Central Mines and was involved in the final exploration stage of the Plutonic gold deposit, a regional assessment of the Yandal Greenstone Belt and the early exploration phase of the Bronzewing and Jundee gold deposits.

After four years of service with Great Central Mines he joined the Geological Survey of Western Australia, where he is employed as an industrial minerals geologist. □



New Reporting Policy for airborne geophysical data

The GSWA has a new policy for the reporting of airborne geophysical digital data acquired by WA explorers. The aim of the policy, formulated by the Mining Industry Liaison Committee, is to simplify reporting requirements and promote the concept of multiclient surveys. The development of a register of surveys completed should assist in reducing the incidence of survey duplication. The end result is that more exploration dollars are freed up for drilling without compromising the pace of airborne geophysical data acquisition.

Essentially, companies will make one of three choices during planning of an airborne survey, where the survey type will need to be specified. The types are summarised as follows:

Multiclient

GSWA will be encouraging multiclient surveys, whereby the data will be lodged with an appropriate

identified party and be available for resale. Copyright of the data will remain with the client enterprise.

Open Range

If the area flown includes less than 30% of tenements held by the client enterprise, then the survey will be an open range type survey. The Director, GSWA, may request submission of the final located and gridded data within 12 months from the date field acquisition was completed. The data will remain confidential for 5 years (unless otherwise agreed to).

Tenement

Tenement surveys are those where the survey area includes 30% or more of tenements held by the client enterprise. As for open range surveys the Director may request submission of the digital data. It will remain confidential for 5 years or until the tenement is relinquished. Tenement and open range surveys

may be reclassified to multiclient within the confidentiality period, but the data submission may still be requested by the Director.

The Register

A register of airborne geophysical data acquisition will be maintained by GSWA. This register will be an index of the outlines of all new surveys flown, or proposed to be flown, within Western Australia with a pointer to the holder of the data. The index will be included within the GIS database called MAGIX, to be available to the public later this year. □



Growth of GSWA mapping budget

In the budget for 1997/98 Premier Richard Court announced the extension for a further 4 years (1997/98 – 2000/01) of funding (\$2.5 m) for the Accelerated Geological Mapping Initiative first introduced in 1993/94. An additional \$2.5 m was also provided for 4 years as from 1997/98 to further progress the geoscientific mapping programs throughout Western Australia. Undoubtedly this Government's initiatives have been very successful in accelerating the rate of release of standard field-based maps (at 1:100 000 and 1:250 000 scale) to industry in a much reduced time frame. The new generation mapping has been well received by industry because it incorporates interpretations based on new regional airborne geophysical data, the use of which has been made possible by funding of the initial Accelerated Geological Mapping Initiative (1993/94 – 1996/97).

These geophysical data are also being released in various forms compatible with a range of acquired copyrights. In addition, GSWA has embarked on new products specifically aimed at "mining" the data in statutory reports, particularly in the area of mineral occurrence mapping, which will further promote the prospectivity of WA. The new funding has come in part through substantial representations by the mining and exploration community to government, which indicate their perception that investment in geoscience, and particularly geological maps, represents not only a critical input in their exploration success, but also value-for-money. □

Footloose in the Horn of Africa:

Provision of advice on Mineral Sector Development

In November 1996, the Geological Survey of Western Australia (GSWA) was approached by the Snowy Mountains Engineering Corporation (SMEC) to work with them in developing a proposal to undertake an AusAID-funded feasibility study aimed at increasing the capacity of Ethiopia and Eritrea to manage their mineral industries.

AusAID accepted the joint proposal and in late January 1997, Rick Rogerson, a mineral sector specialist from the GSWA and Laurie Halloran, a human resource development specialist from SMEC, travelled to Eritrea on the first phase of a five-week study of the mineral sectors of both Eritrea and Ethiopia.

The brief was to assess management, administrative and institutional arrangements in each country, identify target groups for training, and assess Australia's capacity to assist each Government in managing its minerals sector. The proposal also required the current Director of GSWA, Dr Pietro Guj, to act as Director of the project. Two weeks were spent in Eritrea and three weeks in Ethiopia thoroughly examining Government institutions involved in the minerals industry, including government departments responsible for minerals matters, geological survey organizations, and tertiary education institutions.

While these tasks were relatively straightforward in Eritrea, where all relevant institutions are located within a 1 km radius of the centre of Asmara (Eritrea's capital), the situation in Ethiopia's capital city of Addis Ababa was not conducive to rapid information gathering.

For instance, the Department of Mineral Operations, which is responsible for regulating the minerals industry, is located 14 kilometres from the city centre in a semi-rural area and lacked telephone and fax communications for 10 days during the study team's visit.

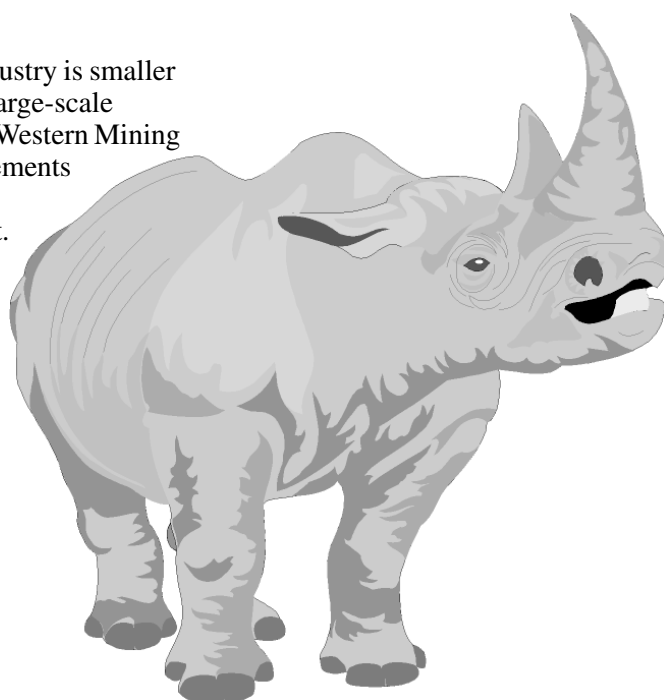
Separate reports on Ethiopia and Eritrea were required to be submitted within two weeks of the study team's return to Australia. If AusAID accepts these reports, the two representatives, Laurie and Rick, may be required to produce Terms of Reference and Scope of Services for the implementation of any future management contract associated with the proposed project.

The minerals industries in both countries are developing rapidly. Ethiopia in particular has a broad-based industry with one operating gold mine, over 50 exploration licences, many industrial minerals and construction material quarries (including an export dimension-stone industry), and a largely unregulated artisan-scale alluvial gold mining industry.

Eritrea's mineral industry is smaller and currently lacks large-scale mineral production. Western Mining hold exploration tenements over a prospective base-metals prospect.

The success of WA's regulatory regime in fostering mineral sector development is recognized internationally. Export of the core elements of our regulatory regime to developing countries with mineral potential will create opportunities for Australian-based companies to expand offshore in a familiar legal and administrative environment.

Since 1993, AusAID has supported an assistance project that resulted in the formation of the Eritrean Geological Survey. GSWA staff will remember that Michael Abraha, currently the Deputy Director of the Eritrean Geological Survey, was attached to DME during a three months study tour in 1995. Rick reports that Michael remains very impressed by the experience and knowledge he gained on the study tour and hopes that the GSWA might play some role in the forthcoming program of assistance funded by AusAID. □





Bush Telegraph

During April 1997, the MOUNT EGERTON and GLENBURGH 1:250 000 mapsheets will be sampled as part of the GSWA regolith geochemistry mapping program. However, unlike previous sheets, mapping will be supported by helicopter and carried out by 6 two-person sampling teams comprising GSWA geologists, and field assistants from both GSWA and the private sector. The total field party, including helicopter crew, will comprise 24 people and involve two helicopters working out of several base camps on both mapsheets. It is hoped that some 2000 samples will be collected during the month-long sampling exercise.

East Yilgarn Mapping Group

Southern Cross

In 1997 the Geological Survey will begin its new mapping initiative in the Southern Cross Province in the central part of Archaean Yilgarn Craton.

The Southern Cross Province contains significant deposits of gold, nickel and iron, and has the potential to be a larger producer of these commodities as well as copper, lead, zinc, silver and uranium. There are also occurrences of beryl, feldspar, lithium, manganese, magnesite, vanadium and tungsten. This study will investigate the regional stratigraphic and structural history, and its relationship to the mineralization. Rocks in the region have been metamorphosed at low to medium grades like those in the mineralized granite-greenstone terrains to the west in the Murchison Province, and to the east in the Eastern Goldfields Province.

Stephen Wyche and Shefa Chen will start work on the JOHNSTON RANGE and JACKSON 1:100 000 sheet areas in the northern part of the Southern Cross Province in 1997. Subsequent years will see the mapping extended to the north towards Sandstone and Youanmi. This program will involve field mapping in conjunction with the interpretation of newly acquired airborne geophysical data; interpretation of Landsat TM imagery; and petrological, geochemical, and geochronological studies. Products will include first-edition 1:100 000-scale geological maps; second-edition 1:250 000-scale geological maps; regional interpretive maps at 1:250 000 scale; an integrated GIS-based dataset incorporating geological, geophysical, mineralization and mineral exploration data; and reports and explanatory notes where appropriate.

Eastern Goldfields

Current GSWA activity in the Eastern Goldfields is directed towards the production of outstanding 1:100 000 map sheets. These will include the MILLROSE and WILUNA sheets in 1997. Other maps in progress include new editions of the EDJUDINA, MENZIES, DUKETON, and WILUNA 1:250 000 sheets. The Survey will also release during 1997 a series of mineral exploration and geological data packages like that already available for the SIR SAMUEL 1:100 000 sheet. GSWA geologists are also assisting the Australian Geological Survey Organisation (AGSO), through the National Geoscience Mapping Accord, in the upgrading of some 1:100 000-scale geological maps, and in various regional studies including a Yilgarn-wide granitoid study, a proposed new Eastern Goldfields deep crustal seismic traverse, and a regional gravity survey.

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Conferences

Greg Carlsen, Robert Iasky and Jean Johnston from GSWA attended the recent Australian Society of Exploration Geophysicists 12th International Geophysical Conference and Exhibition. The ASEG Conference was held at Darling Harbour in Sydney and attracted more than 600 delegates and about 150 exhibitors. It was divided into three streams: Petroleum Asia-Pacific; Minerals Asia-Pacific; and Geotechnical/environmental Asia-Pacific.

Greg Carlsen presented a paper on *Petroleum exploration in Proterozoic basins using potential fields data and stratigraphic coring*. Robert Iasky's paper was entitled *Structural interpretation of a sedimentary basin using high-resolution magnetic and gravity data*.

The Geological Survey's booth at the exhibition created interest amongst both mineral and petroleum explorers, although we suffered somewhat from a lack of enticements such as cappuccinos, wine, minties, hats and t-shirts all of which were available from neighbouring booths. Of particular interest were the aeromagnetic data for the West Pilbara and the new geological data package for Sir Samuel 1:100 000 sheet.

MAGIX news

A new database of available digital data from airborne geophysical surveys will be completed later this year. This is the GIS database called MAGIX which will be available for viewing at the Department's public counter. It is also planned to make the data available in digital form for inclusion in other GIS systems. The MAGIX database will contain the following data:

1. Located outlines of digital data held by the Geological Survey. The outlines can be interrogated for survey attributes and display a small image of the gridded data.
2. The register of proposed airborne geophysical surveys which have been lodged under the Department's new reporting policy,
3. The old MAGCAT index will be available as a discrete layer.
4. Multiclient survey outlines submitted by the airborne geophysical contracting companies.

For information contact: John Watt (08) 9222 3154

MAGCAT update

MAGCAT, the index of open-file airborne geophysical surveys, has been updated to include all open-file surveys available as at 6th January 1997. Existing licence holders may obtain a copy of the updated catalogue free of charge. This will be the final update for this index. New survey outlines will be included in the MAGIX database.

Appointment of Chief Geophysicist

Mr Andre (Andy) Lebel has been appointed to the position of Chief Geophysicist with the Geological Survey of Western Australia. Andy has had many years experience in Western Australian mineral exploration and in geotechnical and environmental geophysics. His contract with the Geological Survey will see him working mainly with the magnetic and radiometric data sets being acquired by the GSWA.

REGOLITH GEOCHEMISTRY DATA AVAILABLE

GOLDFIELDS, GLENGARRY and GASCOYNE REGIONS

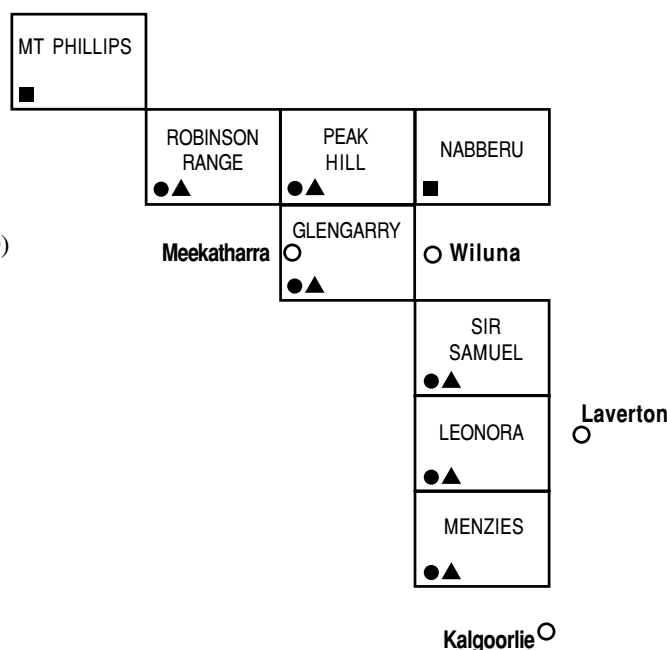
Regolith samples at a density of approximately one per 16 km² have been collected by the Geological Survey of W.A. and analysed for up to 48 components over eight 1:250 000 sheet areas.

Products:

- Regolith and element distribution maps, explanatory notes and digital analytical data (\$100)
- ▲ GIS datasets (\$100)
- Preliminary digital sample and analysis data (\$50)

Available from:

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Department of Minerals and Energy
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SOME RECENT PUBLICATIONS

RELEASE OF PRELIMINARY REGOLITH GEOCHEMISTRY ANALYTICAL DATA

Digital sample and analysis data on disk (CSV format)

MT PHILLIPS 1:250 000 sheet \$50.00 each
NABBERU 1:250 000 sheet \$50.00 each

GLENGARRY BASIN MAPPING RELEASE

Four 1:100 000 sheets released:

BRYAH (2646) map only \$10.00
DOOLGUNNA (2746) map only \$10.00
MOUNT BARTLE (2845) map only \$10.00
GLENGARRY (2645) map only \$10.00

PATERSON OROGEN MAPPING RELEASE

CONNAUGHTON (3542) map only \$10.00

To complement previously released GSWA 1:100 000 mapping on

BROADHURST, RUDALL and THROSSELL

1:100 000 WEST PILBARA TMI CONTOUR MAPS

FORTESCUE (2155)	DAMPIER (2256)	} Paper \$40.00 each Polyester \$120.00 each
PINDERI HILLS (2255)	ROEBOURNE (2356)	
MOUNT WOHLER (2455)	SHERLOCK (2456)	
PRESTON (2156)	COOYA POOYA (2365)	

Talc, pyrophyllite and magnesite in Western Australia

MINERAL RESOURCES BULLETIN 16 by P.B. Abeyasinghe \$40.00

SOON TO BE RELEASED

Eight 1:100 000 Geological Series Maps

EAST KIMBERLEY: **BOW** (4564) **TURKEY CREEK** (4563) **MCINTOSH** (4462)
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NORTH PILBARA: **DAMPIER** (2256) **SHERLOCK** (2456)

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