

# Offshore petroleum exploration opportunities on offer in Australia

Currently uptake of Australia's offshore petroleum exploration permits is at an all time record high with over 300 permits in operation. Indications are that this increase is likely to continue with an additional twenty six areas being awarded in the last twelve months. Each year the Australian Government releases new opportunities for offshore petroleum exploration. This annual release of offshore acreage is part of Australia's Offshore Petroleum Strategy, and all areas are available through a work program bidding system. Ninety percent of the new exploration areas offered in 2005 have been awarded with the remaining 10% still available for bidding until the 9th November 2006.

In 2006, 36 new areas are available; they are located in nine of Australia's offshore sedimentary basins. The period available for evaluation is either six or 12 months from the data of release with the closing date dependent upon the relative exploration maturity of the area. Acreage released in mature to sub-mature areas generally closes six months after release, and the block sizes are smaller than those in the immature to frontier areas. Frontier acreage is generally included in the

second closing allowing greater lead times for explorers to develop a pre-bid assessment. Closing dates for the 2006 release areas are either the 9th November 2006 or 10th May 2007 (Figure 1). The 2006 areas on offer include:

- Large shallow water frontier areas in the Northern Arafura Basin (Figure 2)
- Large deep water frontier areas in the South Eastern Terrace of the Gippsland Basin and in the Northern Sorrell Basin (Figure 3)
- Moderate to smaller blocks in the mist of large gas accumulations in the Browse and the Carnarvon Basins (Figures 2 & 4)
- Moderate sized blocks under various water depths, in the proven oil provinces of the Southern Carnarvon and Perth Basins (Figures 4 & 5)
- Small blocks in the oil rich Barrow and Exmouth Sub-basins of the Carnarvon Basin (Figure 4) and
- Shallow water blocks over the Bonaparte Basin (Figure 2) and the Eastern Otway, Gippsland and Bass Basins (Figure 3).

Geoscience Australia has a number of products that could assist explorers in reviewing potential

acreage. For more information on these products or services or about the Offshore Acreage Release phone Jenny Maher on +61 2 6249 9111 or email [jenny.maher@ga.gov.au](mailto:jenny.maher@ga.gov.au) or visit our website <http://www.ga.gov.au>

Information on the 2006 Release of Offshore Petroleum Exploration Areas can also be obtained from the Department of Industry & Resources website <http://www.industry.gov.au/petexp>

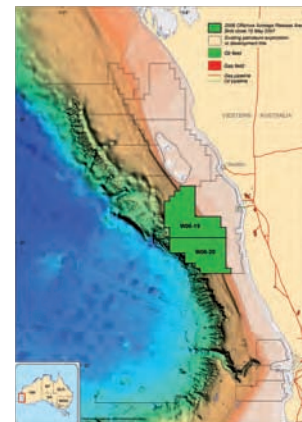


Figure 5. 2006 offshore release areas in the Perth Basin

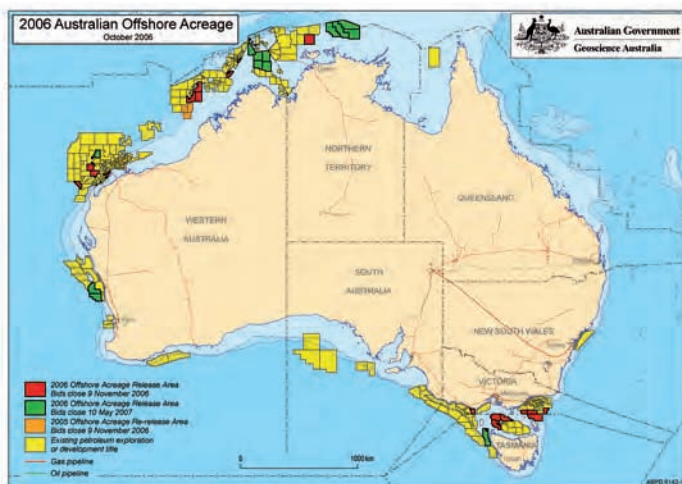


Figure 1. Overview of Australia's offshore petroleum exploration areas showing the 2006 release areas and available 2005 release areas

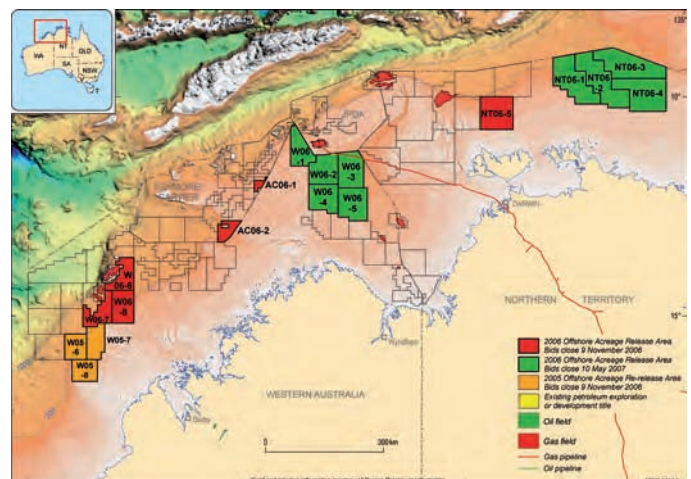


Figure 2. 2006 offshore release areas in northern Australia

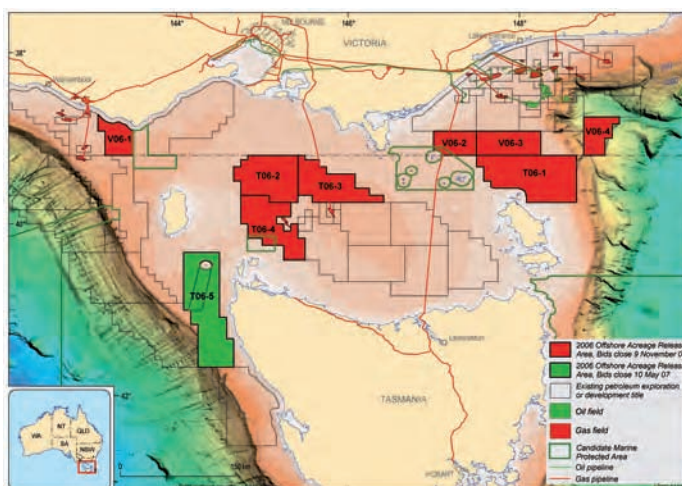


Figure 3. 2006 offshore release areas in south eastern Australia

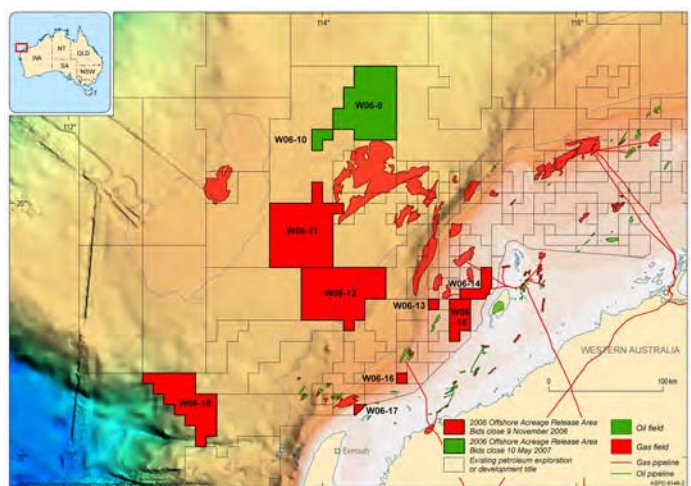


Figure 4. 2006 offshore release areas in the Carnarvon Basin



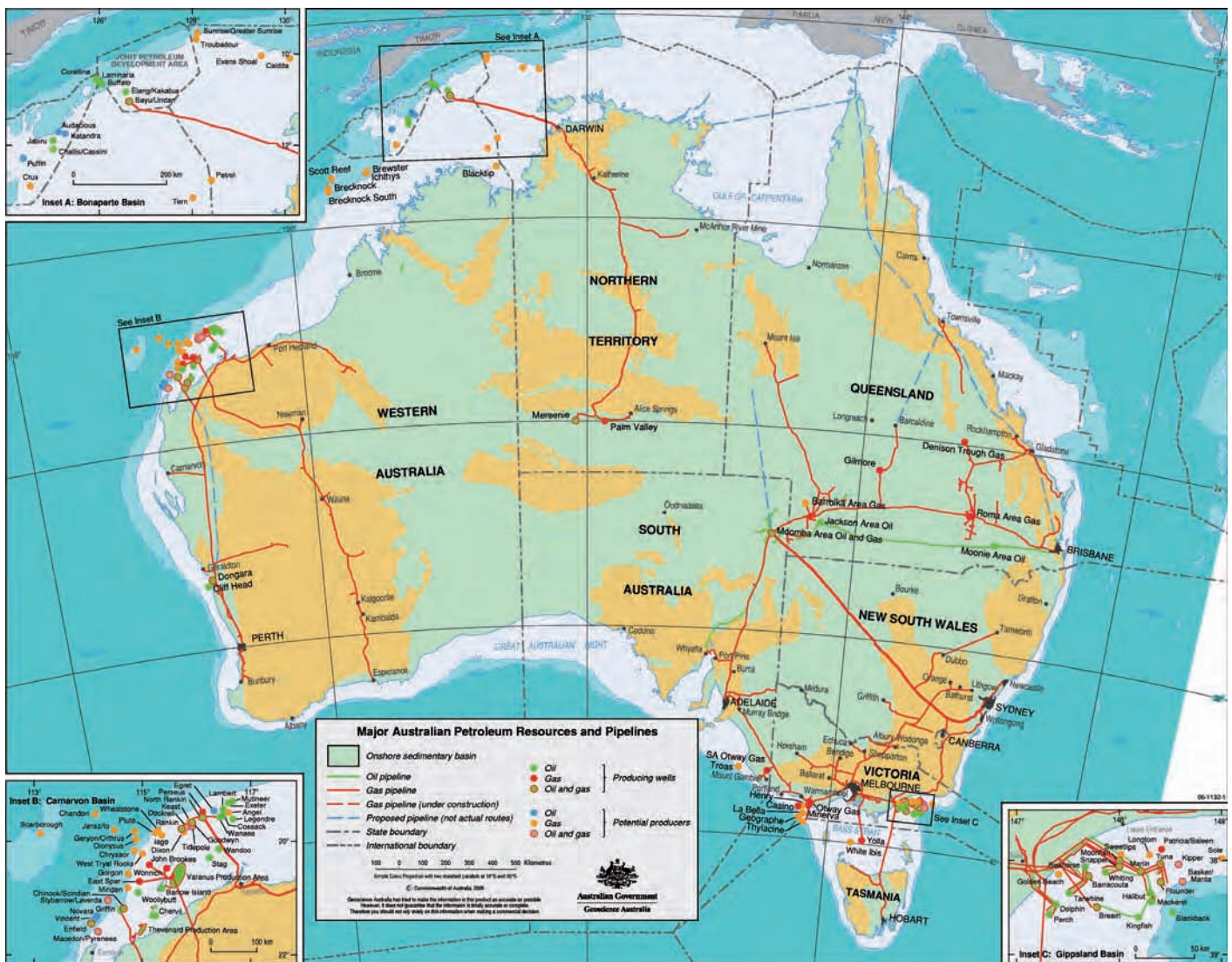


Figure 1. Map showing Australia's producing hydrocarbon fields, pipelines and potential producers.

## Australian petroleum exploration

Australia now has two LNG production hubs and a third in the planning stage. In 2006 a fifth train came on line at the Burrup Peninsula facility, located inboard of the Carnarvon Basin in Western Australia. The second hub at Wickham Point in Darwin Harbour, which is processing gas from the Timor Sea, commenced production in May 2006. A third hub for Browse Basin gas is now likely with appraisal of the Brecknock and Ichthys fields.

Giant gas fields continue to be found in the Carnarvon Basin. Chevron's Chandon gas discovery, located west of ExxonMobil's giant Jansz field and Woodside's Pluto gas discovery demonstrate that there are still significant hydrocarbon discoveries in Australia's offshore waters, and that the Carnarvon Basin is a world class hydrocarbon province.

The oil story in Australia is also encouraging with first production from the Cliff Head field in the Perth Basin commencing in 2006. Cliff Head was discovered in 2001, commenced production this May with better than expected production rates of over 12,000 barrels a day. Enfield, located in the Exmouth Sub-basin, also commenced production in mid 2006. The Crux condensate field in the northern Browse Basin

is currently being assessed for production as is the Puffin field in the Bonaparte Basin.

In the Gippsland Basin the Kipper gas field has been granted a production license and production testing has started from the Baska/Manta oil and gas field. Esso Australia Resources recently completed detailed field analyses of their holdings in the Bass Strait which has resulted in an addition of 700 Bcf of natural gas to the Gippsland Basin reserves. Whilst in the Bass Basin the Bass Gas Pipeline has been completed and gas is being pumped across the Strait to the Lang Lang processing plant in Victoria.

## New government initiatives

Australia has some 40 offshore basins that display signs of oil potential and half of them remain unexplored. In a high-cost, high-risk field, where global investment competition is fierce, The Australian Government has identified the importance of providing quality geoscientific information to assist in exploration of these resources. On the 14th August 2006 the Australian Prime Minister announced new program funding of \$134 million for Geoscience Australia as part of the government's new energy initiative. \$76.4 million will be used to

ensure that the global exploration industry has continued access to further up-to-date pre-competitive data over Australia's vast offshore areas. The funding covers the next five years and is for an expanded program to focus on new frontier offshore areas to be chosen in consultation with the industry. An additional \$59 million over five years has been allocated to identify potential onshore energy sources such as petroleum and geothermal energy.

This new funding builds on the \$61 million previously provided by the government to Geoscience Australia for pre-competitive data acquisition and remastering of existing seismic data for use in acreage release areas.

Public access to exploration and production data in Australia, including digital seismic tapes, wells reports and core and cuttings samples from wells is a result of legislation that initially subsidised exploration in return for lodgement and public availability of the data. When the subsidy was removed the requirement that data be lodged with government and made available for future exploration continued. These public data sets are available at the cost of transfer, after a relative brief confidentiality period.

Much of the seismic data archive has been remastered onto high density stable media using



the previous funding. Apart from the benefits of saving any data previously stored on deteriorating magnetic tapes, the borrowing of data is now cheaper, quicker and easier. This has led to a significant increase in borrowings of seismic data from the Geoscience Australia archive, with over 900 seismic surveys and 800 well reports accessed between May and September this year. For comparison, during the same period in 2005 around 300 surveys and 150 well reports were accessed.

Apart from preserving and improving access to data the funding has also enabled Geoscience Australia to re-process selected seismic surveys and collect new industry standard data in frontier basins.

## AVO studies on re-processed data

Geoscience Australia has reprocessed parts of four lines from the 2006 Acreage Release Areas, W06-7 and W06-11, to determine if modern Amplitude Versus Offset (AVO) compliant processing can identify potential anomalies. Data from the 1997 2D Zeus Seismic Survey line B97-27M over block W06-11 over the Exmouth Plateau, shows AVO anomalies including one that appears to be at the Jurassic level of the reservoir in the Jansz/lo supergiant gas field in the adjacent acreage to the north. Block W06-7 in the Caswell Sub-basin shows an AVO anomaly on seismic line P98-035 possibly at a similar stratigraphic zone to the Brecknock South 1 gas discovery 20 km to the north.

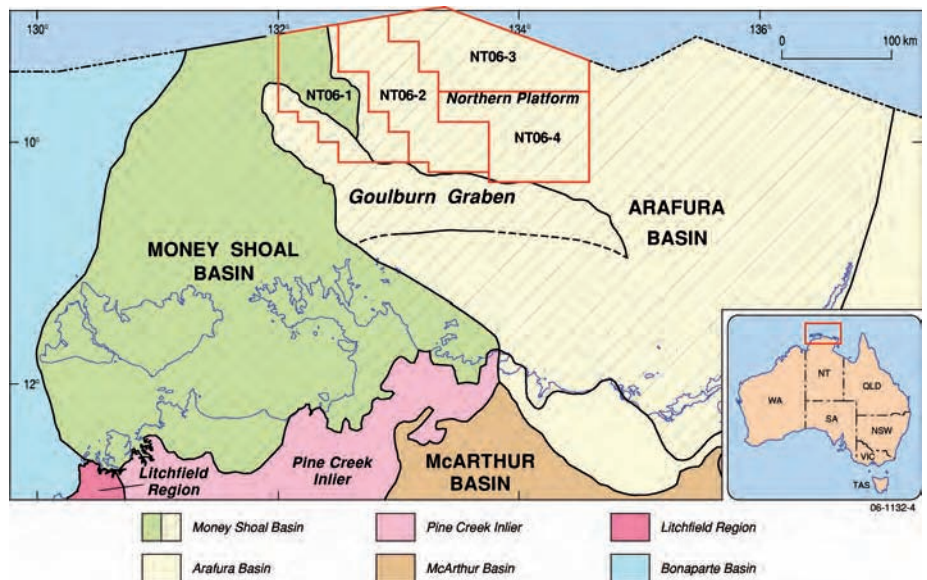


Figure 2. Structural elements of the Arafura Basin region.

Digital seismic field data and the reprocessed seismic data containing near, middle and far angle PreSTM stacks and PreSTM CMP gathers across the AVO anomalies are available from Geoscience Australia's Geophysical and Geological Repository, at the cost of transfer.

## New data in frontier basins

The Arafura Basin is a Neoproterozoic to Palaeozoic intracratonic basin that extends from onshore Northern Australia across the Arafura

Sea into Indonesian waters. It is overlain by the Mesozoic to Cenozoic Money Shoals Basin. The basins are located in shallow (<220 m deep) water and have been the target of limited exploration since the 1970's. Geoscience Australia, in consultation with industry, identified the northern Arafura Basin as a promising shallow-water frontier and has recently undertaken a regional geological framework study, which incorporated a hydrocarbon seepage survey. The survey collected a variety

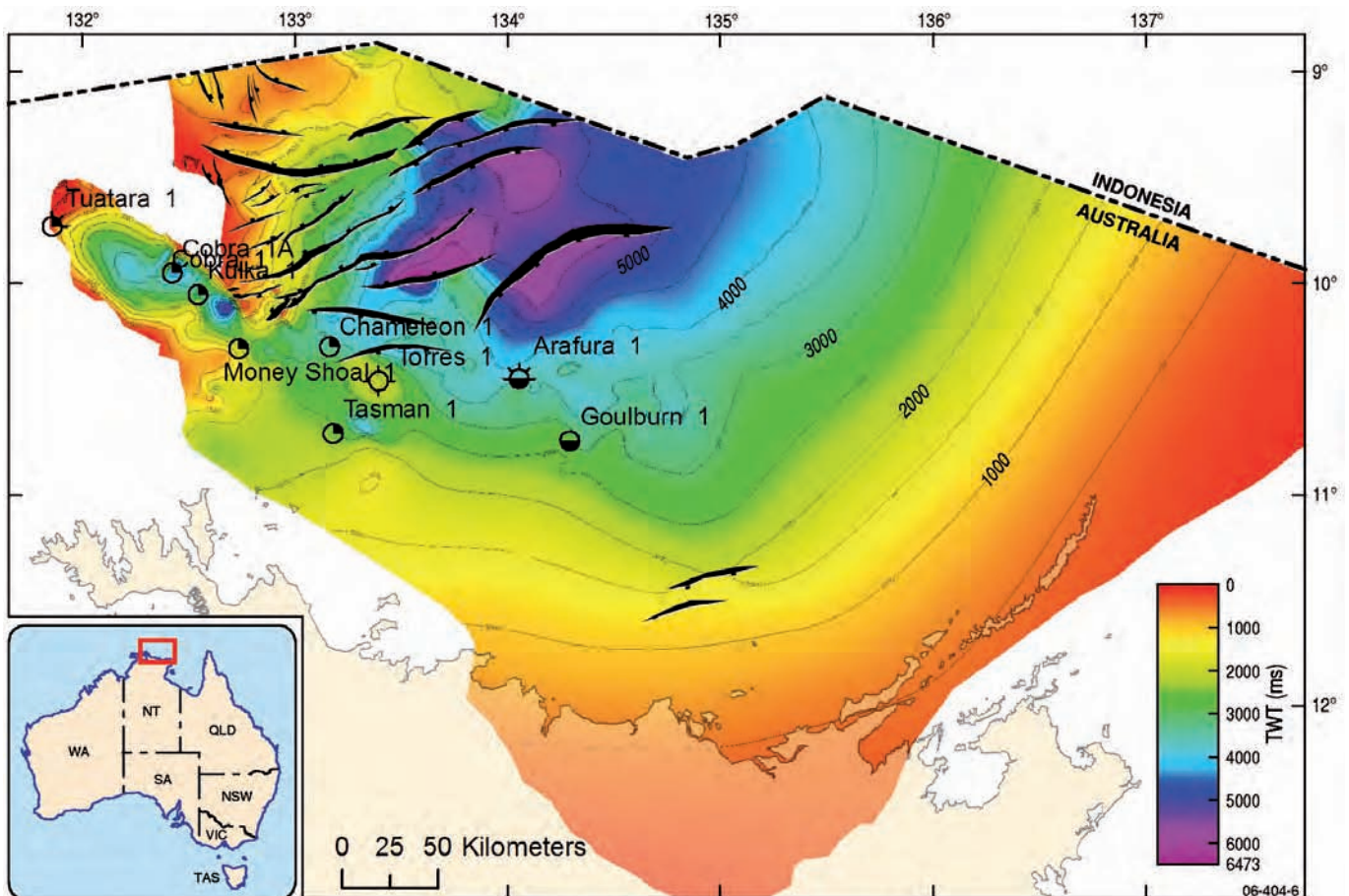


Figure 3. Sediment thickness map (in milliseconds two-way time) of the Arafura region, showing well locations in the Goulburn Graben and the distribution of Neoproterozoic faults.



of acoustic datasets (multibeam swath, echo sounder, side-scan sonar, sub-bottom profiles, seismic) and included an extensive sampling program of sediments, rocks, biological material, conductivity-temperature-depth (CTD) profiles, and video imagery. The acoustic dataset was used during the survey to map out appropriate sites for sampling using dredges, gravity cores, benthic sleds and sediment grabs.

The structure of the Arafura Basin is dominated by the northwest-trending, highly deformed Goulburn Graben. All exploration drilling in the basin has been restricted to this area, where large structures combined with a thick sedimentary section (up to about 10 kilometres of Arafura Basin sediments) provided exploration targets. Geoscience Australia's study has revealed that the area to the north and east of the Goulburn Graben (the 'Northern Platform') also contains thick sediments, but is less deformed. This area offers a wide range of different play types for exploration. Results of this framework study are recorded in Geoscience Australia's Report 2006/22.

Initial results from interpretation of a range of geophysical attributes within the sub-bottom profile data (collected during Geoscience Australia's seepage survey) and deep seismic data show a range of features that are indicative of the presence of hydrocarbons in the northern and northeastern basin. For example, high amplitudes near the tips of Cenozoic reactivation faults that affected Palaeozoic strata correspond to low frequencies in seismic data and nearby synthetic aperture radar (SAR) anomalies. Numerous enhanced reflectors with reversed polarity and low frequency indicative of shallow

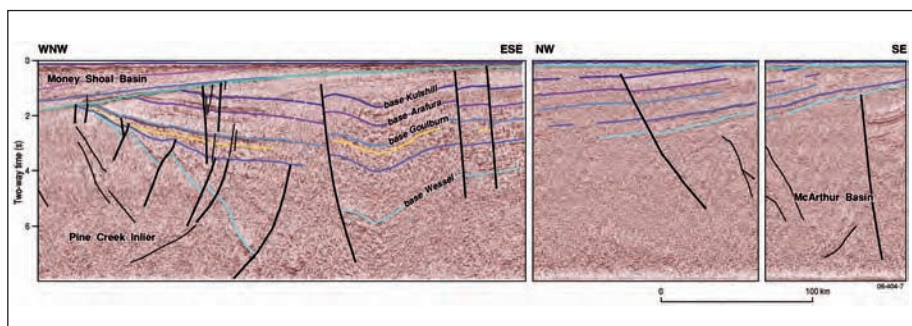


Figure 4. Composite seismic cross-section, northern Arafura Basin. Left hand seismic image courtesy of Veritas DGC.

gas were observed on sub-bottom profiles. Echosounder data revealed a possible active gas plume similar in character to a confirmed plume on the Yampi Shelf in the Browse Basin. Results from this seepage survey are reported in Geoscience Australia's Record 2006/19

Collaboration with UK consultant Dr Alan Judd, an international expert on shallow gas, allowed improved interpretation of shallow gas and fluid escape features observed in multibeam, side-scan, sub-bottom profile and seismic data. The integration of sample and survey datasets provided direct evidence of microbial gas within the upper few metres of sediment. However, attributes observed in both sub-bottom profiles and deeper seismic data, coupled with remote-sensing and survey data, provide strong indications of gas migrating throughout the upper 100 metres of sediment, likely sourced from much deeper within the stratigraphic section. This supports interpretations for the existence of an active petroleum system and reservoir hydrocarbons

in the northern Arafura Basin. Acreage over this region is currently on offer and bidding closes 10th May 2007.

Other frontier basins Geoscience Australia is currently investigating are the Mentelle Basin in southern Western Australia and the Capel and Faust Basins in the Tasman Sea. Identifying and assessing Australia's resources is the first step in developing them. By collecting new datasets and using the latest geophysical imaging and mapping techniques Geoscience Australia aims to attract exploration to new areas by enhancing the chances of discovery and reducing the risks to investors.

#### References:

Logan et al, 2006. Shallow gas and benthic habitat mapping, Arafura Sea – Geoscience Australia Marine Survey S282, Post-survey report. Geoscience Australia Record 2006/19  
Struckmeyer, H.I.M., 2006. Petroleum Geology of the Arafura and Money Shoal Basins. Geoscience Australia Record 2006/22. ■

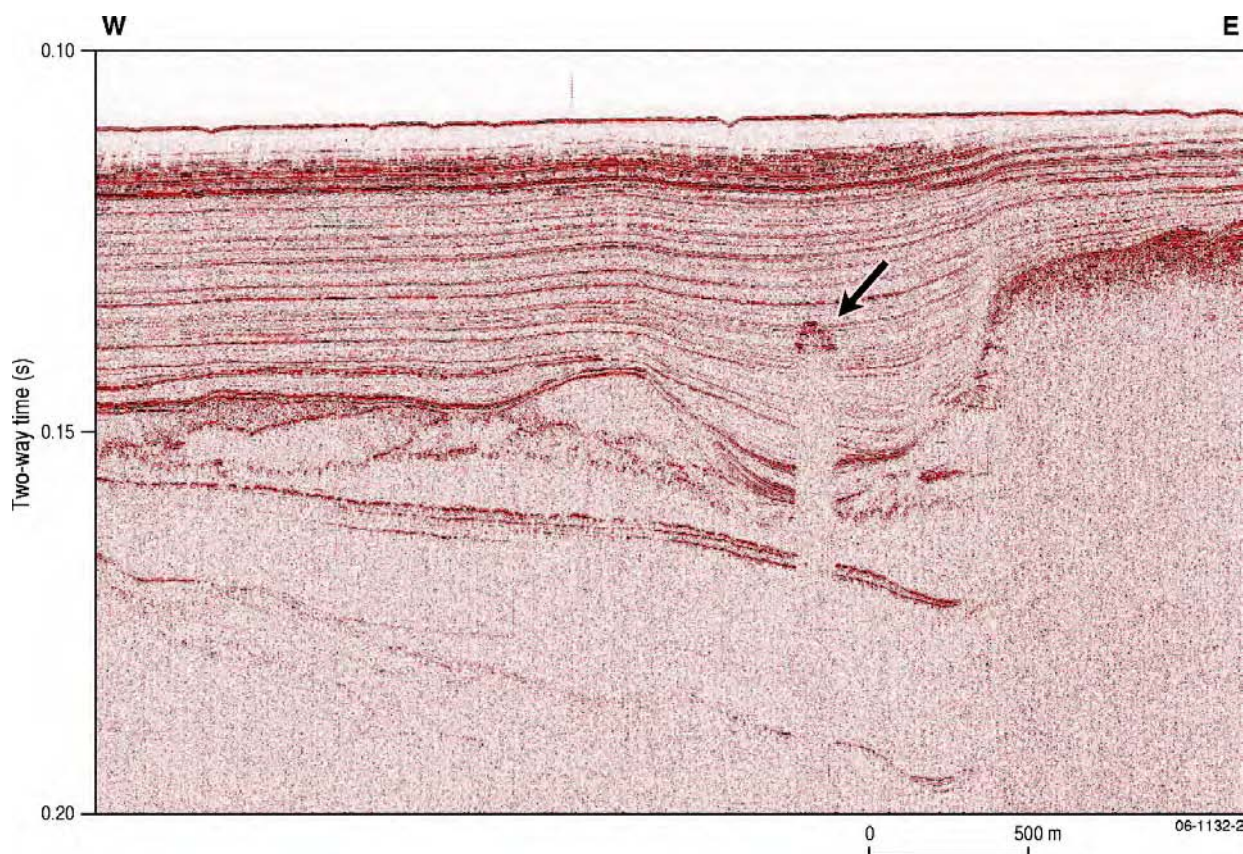


Figure 5. Portion of Topas sub-bottom profile showing enhanced reflectors (arrow) with reversed polarity and low frequency, indicative of possible shallow gas.