

Pre-Competitive Geoscience Data Acquisition

Basic data

- 4.1 A global leader in minerals exploration and mining observed that “collection and low-cost dissemination of geoscientific data by government agencies is critical for exploration success”.¹
- 4.2 Pre-competitive geoscience data acquisition in Australia refers to the collection, collation and integration of basic geoscientific data by government agencies, essentially Geoscience Australia and the states’ geological surveys. These strategic regional geoscientific research programs are generally aimed at upgrading historic data sets and filling data gaps by acquiring, efficiently and economically, modern geoscientific data at geologic province scale.² Generally the government agencies assigned priority to upgrading datasets over areas considered to be prospective but under-explored.
- 4.3 The dearth of exploration activity in some regions was partly related to the reality that the bedrock of vast tracts of the Australian continent is hidden by a thick layer of rock debris.³ This phenomenon prevents low-cost conventional exploration techniques being definitive. As a result, “only thirty percent of Australia’s rocks have been explored...”.⁴

1 Rio Tinto Exploration, *Submission No. 46*, p. 564.

2 Australia’s Mineral Exploration, *Prime Minister’s Science, Engineering and Innovation Council, Seventh Meeting 28, June 2001*, p. 9.

3 Metex Resources Limited, *Submission No. 14*, p. 114.

4 Eduard Eshuys, *Submission No. 32*, p. 429.

- 4.4 The cover sequence (or regolith) problem was exacerbated by the geophysical data coverage of the continent being grossly incomplete. Only about half of the continent is covered by high resolution magnetic and radiometric data and the gravity data sets are only available at reconnaissance scale over most of the continent.⁵
- 4.5 The importance of focussing on upgrading data coverage of areas affected by cover sequences was stressed by Earthsearch Consulting which advised that “the as yet ‘undiscovered’ world-class ore deposits are most probably concealed by barren soils or barren cover rock sequences”.⁶
- 4.6 Evidence was received on the need for, and importance of, pre-competitive data collection. Most of this evidence referred to the collection of onshore rather than offshore data. Onshore data is of primary use to the minerals sector, while offshore data is of most benefit to the petroleum sector. Comments in this chapter principally refer to pre-competitive onshore data collection, but in most cases apply equally to the offshore context. Where appropriate, reference is made to specific offshore initiatives.

History of Pre-Competitive Data Collection

- 4.7 The need for governments acquiring and providing pre-competitive geoscientific data has long been recognised. Basic pre-competitive regional mapping of the Australian continent by the states’ geological surveys has been continuous for more than 150 years. Government geological surveys in Queensland, for instance, commenced with Samuel Stutchbury’s lodgement of the first report by a government geologist, in October 1853.⁷
- 4.8 Modern “initiative-style” pre-competitive geoscientific data acquisition programs commenced only in the early 1990s with Minerals and Energy South Australia in 1992-93 beginning by conducting purpose-funded regional programs (“initiatives”) that were additional to core geological survey functions. The principal aim was to stimulate exploration by attracting new exploration investment to the respective state to target greenfields opportunities revealed through the interpretation of the new datasets. As an additional enticement to explorers, the government

5 Australian Geoscience Council Inc., *Submission No. 49*, p. 606.

6 Earthsearch Consulting Pty Ltd, *Submission No. 108*, p. 1576.

7 *Queensland Government Mining Journal*, Volume 103, No. 1211, June 2003, p. 4.

agencies over time gradually reduced the data supply charges to cost-of-transfer and eventually free-of-charge, to interested parties.⁸

4.9 Since 1992-93, all the Australian states have established initiatives and some are now into their second and third generations. Initiatives have accelerated the data modernisation process. In total the states have expended and committed more than \$270 million of additional funding to major data acquisition programs over the period 1992-2005.⁹

4.10 Indicative historic and current commitments by state governments on pre-competitive geoscientific data acquisition initiatives include:

- \$23.5 million by South Australia from July 1992 to June 1996, and \$23.2 million from July 1998 to June 2002;¹⁰
- \$29.5 million over 12 years to 2005 by Victoria;¹¹
- \$30 million over seven years for the “Exploration NSW” initiative by New South Wales;¹²
- a commitment by Queensland in its 2002-2003 budget to spend \$9.2 million over 4 years;¹³
- Tasmania provided \$1.5 million in the year to 30 June 2003 on data digital access and delivery;¹⁴
- Northern Territory is currently spending \$8.2 million on geoscientific databases;¹⁵
- Western Australia has spent \$24 million up to 2001-02 on pre-competitive petroleum data acquisition over frontier onshore sedimentary basins, and is continuing to spend at a rate of \$3.5 million per year for the foreseeable future.¹⁶

8 Victorian Government, *Submission No. 91*, p. 1456.

9 Queensland Government, *Submission No. 77*, p. 1047.

10 Primary Industry and Resources, *South Australian Exploration Initiative, Introduction*, http://www.pir.sa.gov.au/pages/minerals/initiatives/saei_intro.htm:sectID=200&tempID=7, accessed 2 September 2003; South Australian Department of Treasury and Finance, *Portfolio – Primary Industries and Resources, Output Class 1*, p. 2.5.

11 Victorian Government, *Submission No. 91*, p. 1456.

12 New South Wales Government, *Submission No. 85*, p. 1376.

13 Queensland Government, *Submission No. 77*, p. 1047

14 Tasmanian Government, *Submission No 86*, p. 1383

15 Northern Territory Government, *Submission No. 89*, p. 1420

16 Western Australian Government, *Submission No. 84*, p. 1359

Types of Pre-Competitive Data Collected

- 4.11 Pre-competitive data acquisition techniques include airborne geophysical surveying (principally magnetics, radiometrics, digital elevation data, some airborne electromagnetics and airborne gravity gradiometry), ground gravity and geochemical surveying, regional mapping and bedrock drilling. For each state, the objective is to acquire comprehensive high resolution suites of data describing the bedrock geology for all significant geological provinces. Geoscience Australia acquires data nationally in collaboration with the respective state geological surveys under the National Geoscience Agreement which ensures work programs are complementary and avoid duplication.¹⁷ The state geological surveys also collect data independently.
- 4.12 The pre-competitive geoscientific surveys do not focus on any particular commodity, deposit style or private company project area but seek to open up greenfields areas. Once collected the data sets are collated and integrated with any available legacy data by the public sector agency, and made available in packages to exploration companies at the cost of data transfer, or in digital form, free-of-charge.¹⁸ Typically only a minor amount of data interpretation is undertaken by the public sector entity as this is preferred by private companies. The Victorian Minerals and Energy Council stated that these pre-competitive data packages provide the fundamental building blocks upon which industry geologists develop the exploration concepts that can lead to new mineral discoveries.¹⁹
- 4.13 As well as having a promotional function, pre-competitive geoscience data collection initiatives undertaken by the Commonwealth and the states act to correct a number of market failures. These include:
- positive externalities, whereby the geological knowledge of a new deposit may increase the probability and reduce the costs of the discovery of an analogue;
 - public provision of geoscientific data, which acts to redress any advantage to a “free rider” deriving from another explorer’s work;
 - public good, that underpins policy-making decisions;

17 Geoscience Australia, *Submission No. 53*, p. 651.

18 Victorian Government, *Submission No. 91*, p. 1456.

19 Victorian Minerals and Energy Council, *Submission No. 63*, p. 868.

- reduction of risk and uncertainty right across the resources exploration industry, which may prevent exploration activity falling to inefficiently low levels;²⁰
 - harmonising of the data at provincial and continental level; and
 - equality of access to information, and efficiency of data distribution.²¹
- 4.14 Government surveys are not constrained by tenement boundaries. Hence, it is possible for government-run programs to capture operational efficiencies and scale economies in the performance of pre-competitive regional work. Also, being independent of market competition, government agencies are able to broker broad applications of new exploration technologies,²² concepts and methodologies without compromising companies' proprietary information.
- 4.15 Many resources industry submissions and witnesses concurred that the government geoscience agencies were highly competent (where excellence has been established²³), and hence were logically best suited to undertake the pre-competitive geoscientific surveys most efficiently and expeditiously.

Quality of Data Collected

- 4.16 On a global comparison basis, only relatively small Finland is supplying better quality data to exploration companies. Geoscience Australia commented that:
- Finland is a global quality best benchmark. But certainly the evidence that we have before us is that Australia is well covered with existing data — probably one of the best three countries would be my assessment....²⁴
- 4.17 Newmont Australia (the Australian subsidiary of the world's largest gold miner) said in evidence that it uses the availability and quality of pre-competitive geoscience data in Australia as an argument to support its budget bids when competing against other projects around the world, at

20 Minerals Council of Australia, *Submission No. 81*, p. 1163.

21 Geoscience Australia, *Submission No. 53*, p. 650.

22 NSW Department of Mineral Resources, *Submission No. 85*, p. 1379.

23 Eduard Eshuys, *Submission No. 32*, p. 434.

24 Geoscience Australia, *Transcript, 3 March 2003*, p. 282.

the company budget bidding process before management in Denver (USA).²⁵

We need the data sets to get over that first hurdle [preconceptions] and say, “Here’s the geology, here are all the major elements... and this property is worth spending dollars on.” This is particularly in greenfields exploration....²⁶

- 4.18 The Australian Petroleum Co-operative Research Centre submitted that most developed countries, and many developing countries, seek to provide ready access to pre-competitive data as a means of encouraging exploration. Less prospective countries (meaning Australia) need to level the playing field by offering high quality pre-competitive data. In this context, Geoscience Australia’s petroleum data are very highly regarded by the international petroleum sector:²⁷ Newmont Australia concurred that the quality of the pre-competitive data supplied by Geoscience Australia was first class. It also advised that the data “have been excellent” and that “[t]he stuff in Australia is as good as anything you would ever get anywhere in the world”.²⁸
- 4.19 The states’ geological surveys are also major providers of high quality pre-competitive geoscientific data with special mention being made by some witnesses of the South Australian and the Northern Territory efforts.
- 4.20 There was strong support for increased investment by government agencies in pre-competitive data acquisition. An experienced geologist submitted also that the level of funding should be increased by at least 50 percent, to provide an incentive for high quality geoscientific research and attract talented researchers.²⁹

Benefits of Pre-Competitive Data

- 4.21 Public provision of pre-competitive geoscience data is generally seen as essential to the recovery of greenfields exploration in Australia. Specifically, the significant benefits of government-funded provision of high-resolution integrated modern geoscientific data included:

25 Newmont Australia Limited, *Transcript*, 24 March 2003, p 393.

26 Newmont Australia Limited, *Transcript*, 24 March 2003, p. 394.

27 Australian Petroleum Cooperative Research Centre, *Submission No. 6*, p. 29.

28 Newmont Australia Limited, *Transcript*, 24 March 2003, p. 393.

29 Eduard Eshuys, *Submission No. 32*, p. 434.

- reduced risk associated with greenfields exploration;³⁰
- reduced expensive re-acquisition of data;³¹
- catalysed research, remapping and refinement;³²
- leveraged increased exploration spending;³³
- expedited discovery of new resources deposits;³⁴
- reduced duplication of surveying and hence decreased environmental impacts;³⁵
- established sophisticated information systems to provide data delivery to the exploration industry; and
- maintained Australia's international competitive edge.³⁶

4.22 The Committee notes concerns that the provision of free pre-competitive geoscience data may distort market decisions on where to explore, and hence may result in inefficiency of investment.³⁷ The Committee considers, however, that programs predicated on upgrading existing datasets to national uniformity and so rectify a market failure are unlikely to be distortionary. Further, the benefits flowing from the conduct of extensive pre-competitive data programs are likely to impact industry-wide.

Impact on Exploration

4.23 The South Australian Government estimates that its investment in the acquisition of pre-competitive geoscientific data directly stimulated private exploration investment by a factor of 3-5 times the cost of providing core data.³⁸ There is evidence based on a variety of measures, of increased exploration activity in that state directly attributable to the

30 Queensland Government, *Submission No. 77*, p. 1046.

31 South Australian Government, *Submission No. 70*, p. 969.

32 Victorian Minerals and Energy Council, *Submission No. 63*, p. 868.

33 Victorian Minerals and Energy Council, *Submission No. 63*, p. 869; South Australian Chamber of Minerals and Energy, *Submission No. 76*, p. 1023.

34 South Australian Government, *Submission No. 70*, p. 969.

35 South Australian Government, *Submission No. 70*, p. 969.

36 Minerals Council of Australia, *Submission No. 81*, p. 1163.

37 University of New South Wales, *Submission No. 11*, p. 53.

38 South Australian Government, *Submission No. 70*, p. 945.

release of certain initiative datasets that detailed aeromagnetic targets and the extent, under cover, of potential host rocks for a variety of minerals.³⁹

- 4.24 The Queensland Government estimates that for every dollar spent on initiative work, explorers spent another \$15.⁴⁰ Geoscience Australia cites studies that each pre-competitive dollar generated on average \$5 of private exploration expenditure.⁴¹
- 4.25 The governments of competing countries for exploration investment are also undertaking pre-competitive geoscientific surveys. The Minerals Council of Australia advised that all major mineral nations provide public geoscience data as a means to maintain or stimulate exploration expenditure. Public provision of geoscience data is a key facet of the competitive edge of Australia's mineral industry.⁴² The Western Australian Government warned that Australia is fast slipping behind other nations that also have good prospectivity (eg, Namibia, Brazil).⁴³ CSIRO Exploration and Mining stated that Australia had recently slid from first place to second behind Canada, on a ranking of preferred exploration destinations.⁴⁴
- 4.26 The Committee agrees that Australia needs to respond to this international challenge, by increasing its level of pre-competitive surveying in order to consolidate its competitive advantage internationally as the preferred exploration investment destination. This can be done by directly improving explorers' perception of prospectivity. Further, increasing the efficiency of exploration activities may lead to funds being diverted into drilling.⁴⁵
- 4.27 The continuation of pre-competitive geoscientific data acquisition programs is vital to the recovery and growth of resources exploration in Australia. Public sector spending on pre-competitive work significantly reduces the upstream investment risk associated with resources exploration over Australia's difficult exploration terrains, and hence encourages private exploration investment. The Committee recognises that, in order to maintain its competitiveness internationally, Australia

39 South Australian Government, *Submission No. 118*, p. 1662

40 Queensland Government, *Submission No. 77*, p. 1046; Minerals Council of Australia, *Submission No. 81*, p. 1163

41 Geoscience Australia, *Submission No. 53*, p. 652

42 Minerals Council of Australia, *Submission No. 81*, p. 1163

43 Western Australian Government, *Submission No.*, p. 1355

44 CSIRO Exploration and Mining, *Transcript, 3 March 2003*, p. 308

45 Western Australian Government, *Submission No.*, p. 1356-7

needs to continue to offer investors improved quality pre-competitive geoscientific datasets.

- 4.28 The budget of Geoscience Australia has been progressively reduced over recent years and industry representatives strongly urge that there be a boost to the funding of Geoscience Australia.⁴⁶ The Committee notes that Geoscience Australia received a boost in the 2003-4 budget of \$61 million. However this is earmarked for offshore petroleum data acquisition and management, and additional funding is still required to affect a turnaround in the leveraging impact on the private sector of Geoscience Australia's minerals data programs.
- 4.29 The Committee is reluctant simply to recommend additional funds for an agency in times of public fiscal restraint. However, the Committee is convinced that it is essential that adequate funds be provided to enable Geoscience Australia to continue to gather pre-competitive geoscience data, as a mechanism for increasing exploration activity, and so ensure that Australia maintains its position as a major minerals producing nation. Accordingly, the Committee makes the following recommendation.

Recommendation 6

- 4.30 **The Minister for Industry, Tourism and Resources seek additional funds to enable Geoscience Australia to accelerate onshore pre-competitive data acquisition programs.**
- 4.31 To capitalise on any further investment by the Commonwealth, the states should join the Commonwealth in boosting their pre-competitive programs in a co-ordinated national approach.

Initiatives to Improve Pre-competitive Data

- 4.32 Conclusively, pre-competitive geoscientific data induces exploration investment by reducing the exploration risk to the private sector. The minerals sector and the petroleum sector have different needs for pre-competitive data to ensure their medium-term resource exploration success.

46 Minerals Council of Australia, *Submission No. 81*, p. 1163; Eduard Eshuys, *Submission No. 32*, p. 434; NSW Department of Mineral Resources, *Submission No. 85*, p. 1379.

Minerals Exploration Data

4.33 The Committee sought evidence as to the type of pre-competitive geoscience information that, if made available, had the best chance of significantly improving future minerals exploration success. Emphasis was placed on methods that would assist to develop an understanding of the geologic settings of undiscovered blind mineral deposits.⁴⁷ This requires superior resolution geoscientific data for the explorable zone down to a depth of some 1000 metres.⁴⁸

Gravity Gradiometry

4.34 In gravity surveys rock densities are measured. Gravity responses will vary from station to station over a region reflecting the variations in the rock densities of the underlying geology. Anomalous gravity responses may indicate the presence of valuable mineral deposits.

4.35 Currently most of Australia's gravity datasets are the result of land-based surveys carried out on a coarse 11 kilometre grid pattern,⁴⁹ or are highly detailed but cover very restricted zones.⁵⁰ Surveying a national gravity grid at better than two kilometre centres would provide a quantum step change in the understanding of the geological framework of the continent.⁵¹

4.36 BHP Billiton has developed the first high resolution airborne gravity gradiometry system called Falcon™. This technology can generate high resolution national gravity gradiometry datasets, amongst others, which allow targeting of a range of mineral deposit types or environments. This technology, or similar, if employed at optimal survey specifications based on a 400 m grid, has the potential to survey the Australian landmass to produce a national high resolution dataset in a time and cost-effective manner and without the need for any ground access or disturbance.

4.37 It will be necessary to significantly increase the quality and quantity of pre-competitive geoscientific data acquisition in order to trigger a resurgence of private sector greenfields exploration activity. Improved

47 Northern Territory Government, *Submission No. 89*, p. 1419.

48 Northern Territory Government, *Submission No. 89*, p. 1419; NSW Department of Mineral Resources, *Submission No. 85*, p. 1379.

49 Government of South Australia, *Submission No. 119*, p. 1664.

50 Macdonald, James (2003) *BHP Billiton's Global Exploration Program*, Presentation at Geoscience Australia, Canberra 10 June 2003, BHP Billiton; Australian Geoscience Council, *Submission No. 49*, p. 606.

51 Government of South Australia, *Submission No. 119*, p. 1664.

pre-competitive geoscience information will help reduce the risks and costs of exploration, particularly for greenfields targets.

- 4.38 There will also be broader uses for the geoscience data acquired during pre-competitive geoscientific surveys. Airborne electromagnetics, magnetics, digital terrain model development (topography) and gravity gradiometry, will provide vital information in the understanding of other natural resources problems, especially dryland salinity.
- 4.39 The Committee recommends accordingly.

Recommendation 7

- 4.40 **The Minister for Industry, Tourism and Resources seek the collaboration of the states and the Northern Territory through the Ministerial Council on Minerals and Petroleum Resources, to conduct an airborne gravity gradiometry survey of the Australian landmass.**

Other Techniques

- 4.41 Earthsearch Consulting believes that ground truthing by drilling of selected geophysical anomalies located as a result of pre-competitive geophysical surveying is also a logical next step in a thorough pre-competitive geoscience data program.⁵² This point was echoed by an experienced exploration geologist who submitted that “all the money spent on...developing geoscience datasets, [and] geophysical surveys... is wasted if the targets developed are not adequately tested by drilling”.⁵³
- 4.42 There are also other data collection techniques, including deep seismic profiling surveys; high resolution airborne electromagnetic surveys; and systematic multi-element geochemical surveys (soil, stream, magnetic concentrate), geochronology and mineral system studies that have been proffered for inclusion in a suite of techniques for pre-competitive surveying.⁵⁴
- 4.43 The Committee is not equipped to determine the most appropriate technical approaches or to ensure what information will be of most value to the resources exploration industry. However, the Committee believes that the Commonwealth should, at least, consider a modest series of

52 Earthsearch Consulting Pty Ltd, *Transcript*, 12 May 2003, p. 481.

53 Dale Sims, *Submission No. 58*, p. 754.

54 Queensland Government, *Submission No. 77*, p. 1047. See also: CSIRO Exploration and Mining, *Submission No. 102*, p. 1552; Heron Resources Limited, *Submission No. 95*, p. 1483; CSIRO Exploration and Mining, *Submission No. 102*, p. 1552; Northern Territory Government, *Submission No. 89*, p. 1420.

ground truthing programs to test selected geophysical and geochemical anomalies definitively, and recommends accordingly.

Recommendation 8

- 4.44 The Minister for Industry, Tourism and Resources seek the collaboration of the states and the Northern Territory through the Ministerial Council on Minerals and Petroleum Resources, to conduct a series of ground truthing drill programs to definitively test selected geophysical and geochemical anomalies to maximise the worth of existing geoscientific datasets.**

Petroleum Exploration Data

- 4.45 Australia's ability to meet its petroleum liquids demand from known resources is steadily declining. The recent petroleum sector focus has been principally on shallow water mature offshore areas that were unlikely to yield material quantities of hydrocarbons. According to BHP Billiton, any significant crude oil resources in Australia were likely to be in unexplored frontier and deepwater basins.⁵⁵ Not surprisingly, these are high-risk areas for explorers.
- 4.46 The Australian Petroleum Cooperative Research Centre (APCRC) noted that the limited number of Australian petroleum juniors (compared to Canada, the UK and the USA) are in urgent need of low-cost publicly available data in order for them to be able to develop innovative exploration concepts.⁵⁶
- 4.47 The Committee is pleased to note that the Commonwealth announced in May 2003 that an extra \$61 million is to be allocated to Geoscience Australia over four years to provide pre-competitive geological and seismic data for offshore areas. Part of this funding will be allocated to geoscience data collection for greenfields or "frontier" areas.⁵⁷ The Committee believes this funding initiative reflects the importance of gathering pre-competitive geoscience data over Australia's offshore as well as onshore regions.

55 BHP Billiton, *Submission No. 57*, p. 738.

56 Australian Petroleum Cooperative Research Centre, *Submission No. 6*, p. 30.

57 Hon Ian Macfarlane MP, Media Release, 13 May 2003, *Major Investment in Offshore Oil Exploration*.

Co-ordination of Pre-competitive Programs

- 4.48 The Committee has made a number of recommendations to boost pre-competitive geoscience data acquisition. To maximise the benefits flowing from those data it will require co-ordination between the Commonwealth (Geoscience Australia) and states, and also close liaison with the minerals and petroleum sectors.
- 4.49 The Australian Geoscience Council suggested that an advisory panel comprising resources industry personnel be established to advise on the broadened Geoscience Australia pre-competitive program direction.⁵⁸ The Minerals Council of Australia was more forthright, and, in its opinion:
- increased funding [to Geoscience Australia should] be conditional on formal consultation with the minerals industry to focus...on the areas of the Geoscience Australia work program that will provide the greatest direct benefit to the minerals exploration industry in Australia.⁵⁹
- 4.50 The Committee supports the establishment of a co-ordination and liaison panel, particularly as it would strengthen relations between the resources industry and the government agencies. The Committee recommends accordingly.

Recommendation 9

- 4.51 **The Minister for Industry, Tourism and Resources establish an advisory board charged with the oversight of the strategic direction, monitoring of performance and quality control of Geoscience Australia's pre-competitive programs. Such a board should, ideally, include Northern Territory and state government representatives as well as representatives from appropriate minerals sector and petroleum sector peak bodies.**



58 Australian Geoscience Council, *Submission No. 107*, p. 1573.

59 Minerals Council of Australia, *Submission No. 81*, p. 1164.

