



Australian Mineral EXPLORATION



FEBRUARY 2002 | A REVIEW OF EXPLORATION FOR THE YEAR 2001

AUSTRALIAN GOVERNMENTS

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- Major advances were made in both exploration and project development at the mineral sands projects in the Murray Basin in New South Wales, Victoria and South Australia.
- Development decisions or commitments to proceed with mine development were made for gold, nickel, mineral sands, diamonds, tantalum, and magnesite prospects.

OVERVIEW

- The global downturn in mineral exploration continued in 2001 as planned world-wide expenditure fell to US\$2.2 billion from US\$2.6 billion in 2000.
- Australia is the world's leading exploration destination with 17.5% of world mineral exploration budgets.
- Mineral exploration in Australia in 2000–01 totalled \$683.3 million, the first increase (in current dollars) in exploration spending since 1996–97.
- Western Australia was the leading state for exploration with \$424.1 million spent.
- Gold was the major commodity targeted accounting for 54% of all exploration spending.
- Access to government-generated geoscientific data and information was improved with the development of the Australian geoscience web portal – www.geoscience.gov.au.
- Minotaur Resources Ltd reported significant copper-gold-uranium intersections from the Mt Woods Joint Venture, South Australia.
- Acclaim Exploration NL reported a nickel oxide intersection of 144 m at 1.4% Ni from Wingellina in the Giles Complex, Western Australia.
- Sipa Resources International NL reported high grade gold intersections at the Waugh prospect, Western Australia, including 15 m at 57.2 g/t Au from 21 m including 3 m at 233 g/t Au from 22 m.
- Newcrest Mining Ltd further enhanced its Cadia, New South Wales, operation with the first resource estimate of 200 million tonnes at 1.1 g/t Au and 0.41% Cu at the Cadia Far East deposit.

EXPLORATION REVIEW

Australian mineral exploration expenditure rose by 1% to \$683.3 million in 2000–01 according to the Australian Bureau of Statistics, the first increase in annual exploration spending since 1996–97. In constant 2000–01 dollars, spending was 4.7% lower than the previous year (Figure 1).

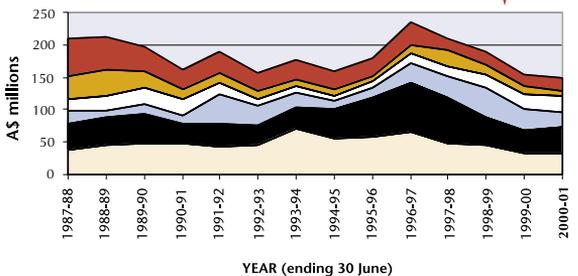
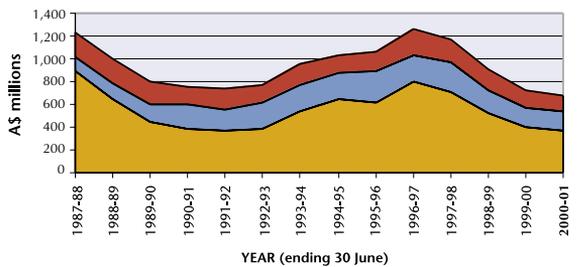


Figure 1: Australian mineral exploration expenditure in constant 2000–01 dollars. Based on Australian Bureau of Statistics data deflated by a Consumer Price Index provided by ABARE.

¹ All monetary references in this paper are to Australian dollars unless otherwise stated.

Spending rose in all jurisdictions except Victoria (Vic) where it fell 3.3% to \$32.7 million and in the Northern Territory (NT) it was down by 17.4% to \$47.5 million. Western Australia (WA) remained the main State targeted with 62.1% (\$424.1 million) of total spending, a marginal increase on the previous year's 61.4%. In Queensland (Qld), spending rose slightly (0.6%) to \$83.1 million. Spending in the other states was: New South Wales (NSW) \$57.2 million (up 1.8%), South Australia (SA) \$29.6 million (up 31.0%) and Tasmania (Tas) \$9.2 million (up 4.5%). The increase in SA primarily reflects increased exploration in the Gawler and Curnamona Cratons, and the Murray Basin.

Following a fall across all commodity groups in 1999–00, spending rose for all except gold, iron ore, and uranium in 2000–01. Gold remained the major target with \$370.2 million spent, but its share of exploration spending fell to 54.2% from 55.4% in the previous year. Spending on base metals (copper, lead, zinc, silver, cobalt, nickel) increased by 5.4% to \$165.4 million. Significant growth was also recorded for coal \$41.3 million (up 16.7%) and mineral sands which, at \$23.6 million (up 9.7%), was a record. Diamond expenditure rose 6.7% to \$31.8 million but uranium exploration fell 28.2% to \$8.4 million and iron ore was down 21.2% to \$23.4 million. The combined expenditure for all other commodities was \$19.3 million, an increase of 15.6%.

In 2000–01 exploration drilling totalled 5.82 million metres, which was 182 000 metres less (down 3%) than in 1999–00. Of the total, 1.61 million metres (28%) were on production leases, a similar proportion to the previous year.

Internationally, Australia maintained its position as the leading country for mineral exploration. The Metals Economics Group annual survey of world exploration budgets showed that Australia increased its share marginally to 17.5% (Figure 2) and that world exploration budgets in 2001 totalled US\$2.2 billion, down 15% on 2000.

Consolidation within the industry at both the international and national level continued throughout the year. A major change saw the merger of BHP and Billiton to create the world's second largest mining company. After year's end Newmont Mining Corp. successfully took over Australia's largest gold producer, Normandy Mining Ltd. With the acquisition of

Normandy, Newmont will become the world's largest gold producer. The merger of Barrick Gold Corp with Homestake Mining Corporation gave Barrick entry to Australian gold operations including the Super Pit at Kalgoorlie, WA. Some of the other substantial changes include: the merger of Delta Gold Ltd and Goldfields Ltd to form Aurion Gold; Sons of Gwalia Ltd's purchase of PacMin Mining Corporation Ltd from its Canadian parent Teck Cominco Ltd and Gold Fields Ltd's purchase of WMC's St Ives and Agnew gold operations in WA. Harmony Gold Co took over New Hampton Goldfields Ltd and has a takeover offer in progress for Hill 50 Gold NL.

There were many active exploration joint ventures during the year with an increasing number involving alliances between international miners and junior Australian companies. Examples include BHP Billiton Ltd and Minotaur Resources Ltd at Mt Woods, Lonmin Plc and Helix Resources in the Munni Munni platinum project, Inco Ltd and Platsearch NL, Inmet Mining Corp and Pilbara Mines Ltd, and Anglo American Australia Pty Ltd and Greenstone Resources NL. Also of interest is the three-year agreement between Grenfell Resources Ltd and BHP Billiton Ltd to deploy the new FALCON™ airborne gravity system to search for new deposits in Australia.

EXPLORATION OUTLOOK

Mixed signals concerning the outlook for exploration indicate that its future direction is far from clear. The Australian Bureau of Agricultural and Resource Economics (ABARE) believe a sustained period of higher mineral prices is necessary for a significant improvement in the outlook for exploration (Australia Commodities, December Quarter 2001 p. 593). ABARE expect price recovery to occur in late 2002. The small increase in Australian exploration spending for 2000–01 in current dollar terms was the first positive annual spending result since the last peak in 1996–97. However, ongoing industry rationalisation in Australia and globally is causing a reduction in the combined exploration budgets compared to the pre-amalgamation budgets of the individual companies.

A more positive prognosis is suggested by the listing of some 14 mineral resource companies on the Australia Stock Exchange (ASX) in 2001 and others listing on the London Alternative Investment Market (AIM). A number of companies are awaiting listing. Also, in November, the Australian Gold Council/Hartley Poynton Explorers Index hit a record high after rising 25% in the month. This compares with the S&P/ASX All Resources Index growth of only 5%. One of the key drivers of the increase in the Explorers Index was Minotaur Resources' exploration success in South Australia. These factors, combined with an anticipated

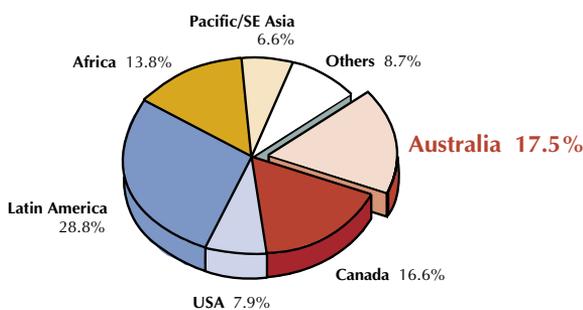


Figure 2: Distribution of world exploration budgets 2001. Source: Corporate Exploration Strategies 2001 Published by Metals Economics Group.

economic recovery in the US, and the expected lift in metal prices later in 2002, suggests a more positive outlook relative to recent years.

Australia's record of exploration successes continued with new resources being added to the national resource inventory. Exploration will continue to focus on the established mineral provinces such as the Yilgarn Craton, Mount Isa Inlier, Lachlan Fold Belt, Curnamona Craton and the Murray Basin but there is likely to be increased interest in newer provinces such as the Tanami-Arunta, Gawler Craton, Kimberley, and Musgrave Ranges in the light of recent exploration successes. The traditionally targeted commodities (gold, nickel, copper, zinc, mineral sands and diamond) will be the focus of attention and the current high levels of interest in mineral sands is expected to continue for the short to medium term. Interest in tantalum and PGMs is buoyant, and is likely to stay so in the short term at least.

GOVERNMENT INITIATIVES

Geoscience Australia and its State/Territory counterparts launched the Australian governments' geoscience web portal in November 2001. It provides a single entry point for users of Australian governments' geoscience data, information and services. Industry and other users may access information at a national level or satisfy their requirements for regional or local information via pathways provided to the relevant State/Territory datasets. Entry to the Australian geoscience web portal is via www.geoscience.gov.au.

In September, the then Minister for Industry, Science and Resources announced initiatives to promote the development of Australia's spatial information industry. Under the new policy, free online access will be progressively provided to a range of national spatial datasets including topography, geology and geophysics. For products not deliverable via the Internet, supply will be at a price based on the marginal cost of transfer.

Geoscience Australia and State and Northern Territory geological surveys have mapping programs to provide industry with new geoscientific data and information in proven and greenfields mineral provinces. Most States and the Northern Territory also have initiatives to boost mapping and provision of geoscientific information in their jurisdictions, including open file company reports of past exploration results, to help promote exploration investment. Details of these programs may be obtained by visiting the appropriate web sites accessible via the Australian geoscience web portal.

Figure 3: Selected mineral exploration projects, 2001. ➤

EXPLORATION HIGHLIGHTS & OVERVIEW

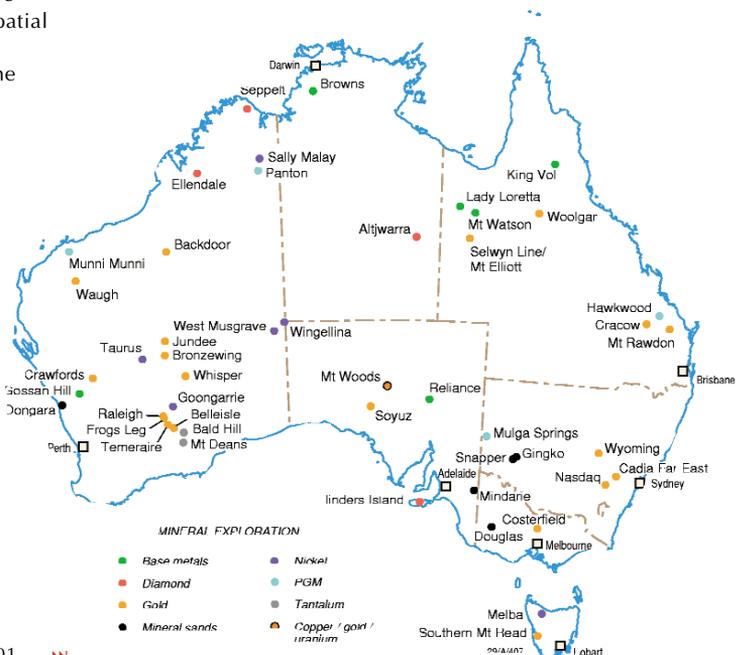
One of the most significant exploration results reported was the drill intersection of Olympic Dam-style copper-uranium mineralisation at the Mt Woods joint venture in South Australia's Gawler Craton. It has two important implications: it further demonstrates the potential of the Gawler Craton as an exploration target and it is a positive result for a junior (Minotaur) - major company (BHP Billiton) exploration joint venture.

Again, the Eastern Goldfields of Western Australia was the focus for successful gold exploration with extensions of existing deposits and encouraging new mineralisation being recorded, particularly at depth at, for example, Bronzewing and Jundee. In the Ashburton region, WA, high-grade gold intersections were reported at the Waugh prospect.

Nickel exploration in the Musgrave Ranges in Western Australia and South Australia continued to attract considerable attention and new drilling results from Wingellina were particularly encouraging.

Much attention was again directed to mineral sands deposits in the Murray Basin in New South Wales, Victoria and South Australia. Global resources for the area increased to about 80 million tonnes of heavy minerals as more former strandlines were discovered.

Diamond exploration in the Northern Territory received a substantial boost with the release of new data and easier access to government-held open-file data.



GOLD (including Gold-Copper)

Three features of gold exploration in 2001 stand out - the wide geographical spread of discoveries of new mineralisation across the continent, the continuing success in finding deep mineralisation beneath known mineralised bodies, and the variety of mineralisation styles encountered. These features highlight the continued attractiveness of Australia as a prime target for gold exploration.

- ▶ Minotaur Resources Ltd, operator of the **Mt Woods** Joint Venture, reported copper-gold intersections from the Prominent Hill Prospect half way between Olympic Dam and Coober Pedy, SA. A major intersection was 107 m at 1.94% Cu and 0.66 g/t Au which included 35 m at 3.86% Cu and 0.63 g/t Au. Deeper in the same hole an intersection of 57 m at 1.28% Cu, 0.66 g/t Au, 2.0 g/t Ag, 0.57% rare earths (cerium+lanthanum) and 495 ppm U was recorded. Copper mineralisation occurs as chalcocite disseminations and thin veins in a haematite matrix in the upper parts of the hole but at depth it is in chalcopyrite and bornite. This variation is similar to the copper zonation in the Olympic Dam deposit. The hole tested partially coincident gravity and magnetic anomalies. Further geophysical surveying along the 2 km gravity anomaly - interpreted to represent an iron oxide body - will support the next phase of drilling. The Mt Woods Joint Venture includes Minotaur (earning 19%), BHP Billiton (earning 51%) and Normandy Exploration Pty Ltd, Sons of Gwalia Ltd and Sabatica Pty Ltd.
- ▶ At Cadia, near Orange, NSW, Newcrest Mining Ltd encountered 100 m at 3.9 g/t Au and 0.32% Cu within a broader interval of 222 m at 2.3 g/t Au and 0.3% Cu at the **Cadia Far East** prospect. Newcrest subsequently announced an initial inferred resource of 200 Mt at grades of 1.1 g/t Au and 0.41% Cu for the prospect. Total resources for the Cadia system now stand at 18.8 Mozs Au and 2.35 Mt Cu.
- ▶ Sipa Resources International NL reported high grade intersections at depths of less than 30 m at the **Waugh** prospect, 3 km northeast of the Mount Olympus gold mine and 30 km south east of Paraburdoo, WA. Significant intersections include 3 m at 16.5 g/t Au from 1 m and 12 m at 44.0 g/t Au from 20 m including 3 m at 123 g/t Au. Subsequent drilling gave 15 m at 57.2 g/t Au from 21 m including 3 m at 233 g/t Au from 22 m and 16 m at 74.8 g/t Au from 41 m including 6 m at 186 g/t Au from 41 m.
- ▶ Ongoing work at Dioro Exploration NL's **Frog's Leg** deposit at the Mungari East Joint Venture near Kalgoorlie, WA, has more than doubled resources to 5.07 Mt at 4.6 g/t Au (0.75 Mozs). Work showed that mineralisation extends a further 400 m north of its previously known northern limit. Intersections reported from drilling testing that continuation of mineralisation included 3 m at 15.32 g/t Au and 12 m at 7.10 g/t Au. Preliminary assays from a diamond drill hole at Frog's Legs gave 6 m at 40.58 g/t Au.
- ▶ WMC Resources Ltd reported further quality intersections from the **Belleisle** prospect at Kambalda, WA, particularly 42 m at 16 g/t Au. WMC also reported that drilling 10 km to the northwest on the same structure yielded intersections including 29 m at 11 g/t Au and 24 m at 15 g/t Au close to the surface at the **Temeraire** Prospect. These properties have been sold to Gold Fields Ltd.
- ▶ Although mining has started on part of the **Raleigh** deposit near Kalgoorlie, WA, the East Kundana Joint Venture (Goldfields Ltd 51%, Tribune Resources NL 36.75% and Rand Mining NL 12.25%) reported further high grade drilling intercepts. This drilling was to test the extension of the orebody to a depth of 500 m and to obtain geotechnical data for an underground mining feasibility study. Intersections included 0.5 m at 39.5 g/t Au and 1.6 m at 75.09 g/t Au.
- ▶ Normandy Mining Ltd reported results from its **Bronzewing** and **Jundee** properties, WA, that continued a general trend for quality intersections in deep drilling. At Bronzewing, Normandy reported 5m at 5.5 g/t Au from work on the Pathfinder Fault and northeast of the Central Shoot 1.8 m at 7.5 g/t Au from 238 m and 6.1 m at 3.6 g/t from 329 m. At Jundee results from the Digger and Gateway structures included 1 m at 38.1 g/t from 384 m, 1.7 m at 280 g/t Au from 232 m and 2 m at 13.4 g/t Au from 404 m.
- ▶ A deep diamond drilling program at the **Whisper** project, near Laverton, WA, reported by Metex Resources Ltd gave good primary mineralisation grades. Intersections were 2 m at 2.75 g/t Au from 250 m, 7 m at 9.41 g/t Au from 254 m and 1 m at 3.46 g/t Au from 263 m. The mineralisation occurs in a banded carbonate rock, with up to 20% disseminated pyrite, that has been extensively intruded by felsic rocks. Delta Gold Ltd (now part of Aurion Gold) is Metex's joint venture partner.
- ▶ Selwyn Mines Ltd announced increased reserves for its **Mt Elliott** and **Selwyn Line** mines, 150 km southeast of Mt Isa, Qld. Reserves which total 16.61 Mt at 1.27% Cu and 1.38 g/t Au, are part of a measured and indicated resource of 22.5 Mt at 1.37% Cu and 1.69 g/t Au.
- ▶ At the **Mt Rawdon** mine, 70 km west southwest of Bundaberg, Qld, Equigold NL, reported a major increase in reserves to 45.85 Mt at 1 g/t Au and 3.7 g/t Ag for 1.44 Mozs of contained gold of which pit optimisation studies suggest 1.31 Mozs will be recoverable.
- ▶ Alkane Exploration Ltd has reported encouraging exploration results from the **Wyoming** prospect, 12 km north of its Peak Hill mine, NSW. Better intersections included 14 m at 3.29 g/t Au and 34 m at 1.98 g/t Au including 7 m at 7.06 g/t Au. The mineralisation is reportedly spatially associated with an anomalous arsenic trend along the contact between pelitic sediments and a volcanic/volcaniclastic sequence.
- ▶ Drilling by AGD Mining Ltd on behalf of itself and partner Deepgreen Minerals Corporation at **Costerfield**, Vic, resulted in high-grade gold-antimony intersections in six diamond drill holes over some 200 m of strike length. Included in the results were: 0.88 m at 43.1 g/t Au and 20.5% Sb, and 0.3 m at 9.2 g/t Au and 4.4% Sb. A measured and indicated resource of 242 300 t at 12.4 g/t Au and 6.4% Sb has been estimated.
- ▶ At the **Woolgar** project, 100 km north of Richmond, Qld, Strategic Minerals Corporation N.L. reported several very good intersections from the Explorer epithermal system including 6 m at 34.48 g/t Au from 36 m and 5 m at 6.7 g/t Au from 54 m.
- ▶ Grenfell Resources Ltd announced the discovery of a new gold-copper mineralised zone at its **Soyuz** prospect 25 km northwest of Tarcoola, SA, where 7 m at 4.83 g/t Au with minor copper and silver was intersected in a mineralised assemblage consistent with an iron oxide copper-gold system.
- ▶ Hill 50 Gold NL continued successful exploration adjacent to known deposits in its properties at Mount Magnet, WA. They reported a new deposit, **Crawfords**, in sheared komatiite and granodiorite 200 m west of the O'Meara deposit. Intersections reported included 12 m at 5.9 g/t Au from 22 m and 8 m at 10.4 g/t from 51 m. The company says that the new deposit will support an open pit mine.
- ▶ Gateway Mining N.L. reported 4 m at 4.90 g/t Au from 31 m at its **Nasdaq** prospect near Cowra, NSW, in a skarn which also has minor copper.

- » In the Telfer district, WA, Newcrest Mining Ltd recorded encouraging intersections from holes aimed at testing the down-plunge extension of the **Backdoor** mineralisation. Better intersections reported included 13 m at 6.6 g/t Au and 45 m at 2.8 g/t Au, both of which incorporate higher grade zones.
- » Sedimentary Holdings announced that the **Cracow** Joint Venture had encountered significant new gold intercepts some 800 m northwest of the Royal Shoot at Cracow, Qld. Intersections included 6 m at 5.2 g/t Au and 18.9 m at 4.3 g/t Au. Newcrest Mining Ltd and Sedimentary also announced that the combined resource estimate for the Crown and Royal shoots at the Cracow JV was 2.4 Mt of ore at 10 g/t Au (0.8 Mozs).
- » A currently unlisted subsidiary of Macmin Ltd announced encouraging results from a re-evaluation of samples generated by previous work at its **Southern Mt Read Volcanics** project south of Macquarie Harbour, Tas, including a drill intersection of 3 m at 17.5 g/t Au.

COPPER, LEAD, ZINC, SILVER

In addition to the significant copper-gold-uranium intersections at Mt Woods (see gold) very good results from Gossan Hill in the Murchison Province, WA, confirmed that the deposit is a significant Archaean volcanic-hosted massive sulphide deposit.

- » At **Gossan Hill**, 50 km southeast of Yalgoo, WA, Normandy Mining Ltd reported excellent exploration results with high grade mineralisation outlined in the new Amity, Catalpa and Hougomont orebodies. Normandy defined an inferred resource of 2.4 Mt at 14.7% Zn in the Amity body and 0.96 Mt at 17.7% Zn in the upper zone of the Catalpa orebody and potential for deeper ore is indicated by a drill intersection 400 m deeper which yielded 5.9 m at 29.6% Zn. In the Hougomont orebody, a zinc resource of 1.88 Mt at 19.4% Zn and 3.5 g/t Au has been delineated and there is an additional copper-rich zone with an inferred resource of 2.37 Mt at 3.1% Cu.
- » A new ore reserve estimate of 11.5 Mt at 15.5% Zn and 5.4% Pb was released for the **Lady Loretta** project, 130 km northwest of Mt Isa, Qld. Noranda Pacific Pty Ltd (75%) and Buka Minerals Ltd (25%) hold Lady Loretta.
- » The deepest hole drilled by Compass Resources NL at its **Browns** project,

65 km southeast of Darwin, NT, intersected high grade mineralisation returning 68 m from 387 m with a true width of 45 m. The intercept gave 0.44% Cu, 11.28% Pb, 0.11% Co, 0.09% Ni and 26 g/t Ag. Included were a number of higher grade intervals of up to 43.8% Pb and up to 2.58% Cu. Compass also announced that drilling on previously untested tenements surrounding Browns had intersected base metal mineralisation.

- » Kagara Zinc Ltd announced that exploration of the **King Vol** deposit, 160 km west of Cairns, Qld, resulted in a global resource estimate of 825 000 t at 20.3% Zn, 0.9% Cu, 1.0% Pb and 38 g/t Ag. Included in this resource is an indicated resource of 730 000 t at 20.4% Zn, 0.8% Cu, 1.0% Pb and 40 g/t Ag. The deposit is reportedly open along strike and down dip. Subsequent drilling yielded additional high grade intersections including 9 m at 20.6% Zn and 3.5% Cu and 6 m at 13% Zn and 1.6% Cu.
- » Successful exploration drilling (maximum hole depth of 25 m) by Matrix Metals Ltd at the **Mt Watson** project, 100 km northwest of Cloncurry, Qld and 25 km from its Mt Cuthbert mine yielded an indicated oxide resource of 837 000 t at 1.3% Cu. Mapping suggests that mineralisation extends over an area 350 m further east and 700 m further west.
- » High grade zinc intersections were reported by Perilya Ltd from its **Reliance** discovery in the Flinders Ranges, 450 km north of Adelaide, SA. Zones with visible zinc mineralisation yielded results including: 19 m at 36.5% Zn from 23 m, 19 m at 34.7% Zn from 44 m and 11 m at 36.6% Zn from 79 m.

DIAMOND

The release of high-resolution airborne geophysics over much of the North Australian Craton, mainly by the Northern Territory Geological Survey and easier access to open-file databases, created a mini diamond exploration boom in the Territory with the three major global diamond explorers (De Beers, Rio Tinto and BHP Billiton), and five junior companies (Tawana, Astro, Elkedra, Flinders, and Striker) now active in the region.

- » Kimberley Diamond Co (KDC) formally acquired the **Ellendale** mining area leases previously held by Argyle Diamond Mines and reported bulk sampling results from Ellendale pipes 4 and 9 that revealed higher grades near surface. KDC announced an initial resource for

Ellendale 4 of more than 2 million carats to a depth of 140 m (23 Mt at 8.8 carats/100t) including a higher grade zone of 444 000 t at 26.1 cts/100t to a depth of 3 m. KDC also reported the discovery of 11 new lamproite pipes in the Ellendale area.

- » Striker Resources NL announced results from initial resource drilling of its **Seppelt 1** pipe with an inferred resource to date of some 700 000 cts based on 1.7 Mt of kimberlite drilled to 140 m in the north lobe and 110 m in the south lobe and an inferred average grade of 40 cts/100t. Further bulk sampling and regional exploration for further pipes is planned.
- » Recently floated Elkedra Diamonds has taken out extensive tenement coverage over the **Altjawarra** Craton some 200 km northeast of Alice Springs, NT. Early work reported recovery of 11 diamonds (10 microdiamonds and 1 macrodiamond) from a 40 kg ant mound sample taken over a high-priority magnetic anomaly located northeast of the Mt Ultim target area.
- » Tawana Resources NL reported that a detailed gravity survey over its **Flinders Island** prospect on Flinders Island, SA, identified a gravity low anomaly over an area coincidental with an area of anomalous kimberlitic indicator minerals. Three diamonds were recovered later from loam sampling at the prospect.

NICKEL

The focus of attention in nickel exploration continued to be the mafic-ultramafic Giles Complex in WA and SA where the West Musgrave and Wingellina projects attracted considerable attention. There was continued exploration for komatiite-hosted nickel sulphide deposits in the Yilgarn and for lateritic nickel deposits in a number of provinces.

- » Preliminary interpretations by WMC Resources Ltd at the Nebo and Babel prospects in its **West Musgrave** project in the Giles Complex, WA, 100 km west of the WA/SA/NT border intersection, suggest that both prospects are part of the same mineralising system which has strike length exceeding 4.5 km. Significant variations in the thickness and grade of mineralisation have been reported and the company believes that a feeder conduit has been intersected. Further work is required to establish whether a significant tonnage of massive sulphide mineralisation occurs. Subsequent drilling at Babel



encountered a disseminated sulphide unit with a true thickness of up to 21 m and grades of up to 0.8% Ni, 1.4% Cu and 0.34 g/t Pt+Pd. Regional exploration in the project area has identified a number of gravity and geochemical anomalies for further work.

- ▶ Following an agreement with the Ngaanyatjarra Land Council, Acclaim Exploration NL began drilling at its **Wingellina** project southwest of the intersection of the WA/SA/NT borders. Intersections of 64 m at 2.1% Ni, 2 m at 3.1% Ni and 32 m at 1.32% Ni were reported. Drilling results reported after the end of the year were very encouraging with an intersection of 144 m of nickel oxide at a grade of 1.4% Ni. Acclaim also reported the discovery of a new thick basal ultramafic unit which will be explored for nickel in 2002.
- ▶ Sally Malay Mining Ltd has recorded a significant width of sulphide mineralisation in its infill drilling program at **Sally Malay**, 240 km south of Kununurra, WA. Reported intersections included 9 m averaging 2.09% Ni, and 34 m averaging 1.87% Ni. A revised resource estimate increased uncut resources by 10% to 3.74 Mt at 1.72% Ni, 0.72% Cu and 0.09% Co.
- ▶ Heron Resources Ltd reported encouraging drill results from its **Goongarrie** nickel laterite project 65 km north of Kalgoorlie, WA. Drill intersections, at a 0.75% Ni cut-off, include 81 m grading 1.24% Ni and 0.02% Co and 104 m grading 1.33% Ni and 0.09% Co from its Pamela Jean Zone.
- ▶ On its **Melba** project, northeast of Zeehan, Tas, Allegiance Mining NL intersected 5.8 m (2.5 m estimated true width) of 4.6% Ni, 1.8% Cu, 1.5 g/t Pt+Pd, and 0.17g/t Au, 30 m vertically beneath a massive sulphide outcrop assaying 10.7% Ni, 8.1% Cu, and 1.9 g/t Pt+Pd.
- ▶ Jubilee Mines NL reported intersections of massive and disseminated nickel sulphides at its **Taurus** prospect, 11 km southeast of its Cosmos nickel mine, 50 km north of Leinster, WA. Intersections of 9 m at 0.57% Ni and 0.2 m at 8.1% Ni were recorded

MINERAL SANDS

Exploration activity continued to centre on the coarse-grained strandlines in the Murray Basin in New South Wales, Victoria and South Australia. Global resources of the area have increased to about 80 Mt of heavy minerals (HM) as additional strandlines continue to be discovered.

- ▶ Basin Minerals Ltd increased the resource base for the **Douglas** project near Horsham, Vic., to 25 Mt at 4.1% HM at a cut-off of 1% HM. About 6 Mt of this resource in the Bondi and Bondi East strandlines has been upgraded to measured category, and is sufficient for a 10 year, Stage One operation. This stage will produce 300 000 t of product annually comprising 180 000 t of ilmenite, 75 000 t of zircon, 30 000 t of rutile and 15 000 t of leucoxene.
- ▶ BeMax Resources NL announced that its **Ginkgo** deposit, NSW, 120 km north of Mildura, contains a measured resource of 162 Mt at 3.56% HM plus an indicated resource of 43 Mt grading 1.99% HM. An Environmental Impact Statement for the proposed Ginkgo mine has been submitted for public comment. The company upgraded resources at its **Snapper** deposit, 10 km southwest of Ginkgo to 109 Mt grading 4.8% HM with low slimes content.
- ▶ Southern Titanium NL, as part of its bankable feasibility studies, has reported that resources at its **Mindarie** project, 120 km northeast of Adelaide, SA, have increased to 290 Mt grading 2.41% HM. Production is scheduled for 2003 at a possible rate of 17 600 t of rutile, 43 700 t of zircon, 14 800 t of leucoxene and 76 600 t of ilmenite.
- ▶ Drilling several strandlines, mapped using its magnetic mapping technique, resulted in Magnetic Minerals Ltd announcing that resources at its **Dongara** project, 35 km north of the Eneabba mine, WA, were 133 Mt at 4.8% HM. A pre-feasibility study was being undertaken.

PLATINUM GROUP METALS

- ▶ Helix Resources Ltd announced a new resource estimate for the **Munni** project, 45 km south of Karratha, WA. The resource, which covers a 1.35 km strike length of the Ferguson Reef in the project's Central Zone, stands at 1.3 Mozs of PGMs+Au, 43 000 t Cu and 23 000 t Ni in 13.5 Mt of ore. A budget of some \$5 million has been allocated to a feasibility study, scheduled for completion by March 2002, of not only the Central Zone but also eight target domains outlined by exploration during the year. In July, Lonmin Plc joined Helix as a joint venture partner in the project.
- ▶ At the **Panton** project, 50 km northeast of Halls Creek, WA, Platinum Australia Ltd announced a new resource of 64 Mt at 1.7 g/t PGM+Au for some 3.5 Mozs of PGM+Au. Included in the global resource is 1.46 Mt at 6.1 g/t

PGM+Au from the high grade Top Reef resource. A requirement of a bankable feasibility study, which commenced in July, was the development of a decline to obtain bulk samples for metallurgical work and to test mining conditions. Development of the decline was in progress at year's end and mining of the bulk sample was scheduled for completion by the end of January 2002. In August Lonmin Plc took a 24.4% interest in Platinum Australia Ltd.

- ▶ Other interesting PGM reports during the year included: Golden Cross Resources Ltd reported 4 m at 5.66 g/t Pt, 11.78 g/t Pd, 2.34% Ni, 3.18% Cu and 0.5 g/t Au, including 2 m at 10.91 g/t Pt, 22.63 g/t Pd, 4.45% Ni, 6.12% Cu and 0.94 g/t Au from its **Mulga Springs** prospect near Broken Hill, NSW; Pan Australian Resources N.L. reported 4 m at 2.9 g/t Pt+Pd+Au and 8 m at 2.2 g/t Pt+Pd+Au from its **Hawkwood** prospect, 170 km south of Gladstone, QLD.

TANTALUM

- ▶ Australasian Gold Mines NL reported encouraging exploration results from the **Mt Deans** prospect 10 km south of Norseman, WA. Drilling encountered significant tantalum intersections at depths of less than 30 m. Intersections include: 6 m at 117 g/t Ta₂O₅, 13 m at 210 g/t Ta₂O₅, 2 m at 375 g/t Ta₂O₅, 10 m at 184 g/t Ta₂O₅ and 20 m at 179 g/t Ta₂O₅. The mineralisation occurs in pegmatite veins associated with small granitic intrusions that post-date the tectonic events that facilitated the emplacement of gold mineralisation in the area.
- ▶ Following a program of sterilisation and resource delineation drilling at its **Bald Hill** tantalum project near Widgiemooltha, WA, newly floated Haddington International Resources Ltd reported a 14% increase in resources to 920 000 t at 477 ppm Ta₂O₅.

PROJECT DEVELOPMENT

GOLD

- ▶ Dominion Mining Ltd announced that it had reached agreement with BankWest for the provision of a \$10.5 million project debt facility for the development of the **Challenger** deposit 140 km northwest of Tarcoola SA, in the Gawler Craton. Stage 1 of the project is to produce 105 000 ozs over a 20 month period while laying the foundations for the transition to underground mining. The initial

capital cost of the project was estimated by Dominion at \$17.1 million.

- » Mining of the **Raleigh** deposit, at Kundana, WA, was commenced by Goldfields Ltd in that part of the deposit fully owned by Goldfields. Mining in the East Kundana Joint Venture area of the deposit is to proceed with ore being toll-treated at the Kundana Gold Pty Ltd treatment plant.
- » The Wildara Joint Venture (LionOre Mining International Ltd 60%, Dalrymple Resources N.L. 40%) has decided to proceed with mining of the **Thunderbox** deposit, 60 km south of Leinster, WA. With mining to commence in the second quarter of 2002, first gold production is scheduled for the fourth quarter 2002. Production in the first year is expected to be 220 000 ozs of gold followed by 150 000 ozs per year. Cost of the project is reported to be \$62 million.
- » AngloGold completed an upgrade of the **Sunrise Dam** treatment plant during the year with capacity increased from 2 to 2.5 million tonnes of ore per annum (Mtpa). This upgrade, which involved the installation of a new crushing circuit, ball mill and leach tanks, was part of a planned \$111 million expansion of annual production to 280 000-300 000 ozs.

- » At the **Ridgeway** project at Cadia, NSW, Newcrest Mining Ltd continued development of the underground mine. The operation is on target to meet the scheduled early 2002 commissioning.
- » The **Wallaby** mine development, 35 km south of Laverton, WA, continued on schedule with the first ore produced in October 2001. A draft scoping study examining the potential for longer term underground mining at Wallaby was completed and passed to the project owners (Delta Gold Ltd and Placer Dome Inc.) Preliminary results from the study were reportedly encouraging.
- » Further significant developments occurred in the Tanami, where Normandy commenced mining operations at **Groundrush** on the basis of measured and indicated resource of 4.9 Mt at 4.6 g/t for 0.73 Mozs.

BASE METALS

- » Rio Tinto Ltd announced that it would proceed with the second-stage development of the **Northparkes** copper-gold project near Parkes, NSW, at a cost of \$139 million. The development, referred to as Lift 2, will allow mining of 25 Mt of ore grading 1.2% Cu and 0.48 g/t Au.

NICKEL

- » Tectonic Resources NL commenced underground production from its **RAV 8** mine, east of Ravensthorpe, WA following the cessation of open cut mining in August. Underground mine production is forecast to last six months with the concentrates trucked to WMC refinery for processing.
- » Titan Resources purchased from WMC Resources the **North Widgiemooltha Block**, near Kambalda, WA. The area has an inferred resource of 2.18 Mt grading 2.1% Ni totalling some 44 000 t of contained nickel. The company will conduct a full feasibility study on the underground mining of the massive nickel sulphides at the 132N prospect.
- » Mincor Resources commenced production from its **Mittel** and **Wannaway** nickel mines near Kambalda, WA. Both mines were bought from WMC Resources. Ore is delivered to WMC's refinery, toll-treated, and sold to WMC Resources under a long-term off-take agreement. Production from both mines amount to about 10 000 t of nickel annually.
- » Jubilee Mines NL's feasibility study has confirmed the viability of developing the **Cosmos Deeps** deposit via a decline on the western side of the Cosmos open pit. Cosmos Deep reserves total 520 000 t grading 7.2% Ni. Underground mine production is expected to commence in September 2003.
- » Black Range Minerals has been granted development consent by the State Government of New South Wales for its **Syerston** lateritic nickel - cobalt - platinum project, 400 km northwest of Sydney, NSW. The project is expected to produce 20 000 t of Ni and 5 000 t of Co annually over a 36-year life subject to it being able to raise sufficient capital.

- » LionOre Australia (Nickel) Ltd produced its first nickel-in-concentrate in November from its **Emily Ann** nickel sulphide mine, 130 km west of Norseman, WA. At full production the mine will have a throughput of 250 000 tonnes per year (tpa) to produce 6 700 t of nickel-in-concentrates, which will be trucked to Esperance to be shipped to Canada for processing by Inco.

MAGNESIUM

- » Following the successful completion of its \$525 m share issue and the confirmation of the Ford Motor Company's 10-year take or pay magnesium supply agreement, site works on Australian Magnesium Corporation's \$1 300 million **Stanwell** magnesium project, near Rockhampton, Qld, are scheduled to commence in February 2002. In stage one of the project, AMC



» **Figure 4:** Selected mineral development projects, 2001



will produce 97 000 t annually of magnesium and magnesium alloys commencing in late 2004.

- ▶ Mt Grace Resources is to undertake a bankable feasibility study into its **Batchelor** magnesium metal project, NT, with plans to commence production in early 2003 at an anticipated annual capacity of 12 500 t of metal for stage one based on magnesite feedstock. The company has an option to purchase the Princhester magnesite deposit, 95 km north of Rockhampton, Qld, which contains 5.4 Mt of magnesite grading 46.8% MgO and low silica content.
- ▶ Pima Mining NL's wholly-owned subsidiary, **SAMAG** Ltd, was evaluating site options for its proposed 65 000 tpa magnesium smelter using the proven Dow technology. The proposed sites are either Port Pirie, SA or in New Zealand. The bankable feasibility study was nearing completion.

MINERAL SANDS

- ▶ Production from the **Wemen** project, near Robinvale, Vic, commenced in the April 2001.

Wemen, which is owned by RZM Pty Ltd and Sons of Gwalia Ltd, is the first mineral sands mine in the Murray Basin and has an annual production capacity of 23 600 t of rutile and 9 600 t of zircon.

- ▶ Mineral Deposits Ltd received Government approval to proceed with mining, already commenced, of the **Fullerton Extension** deposit, near Newcastle, NSW, which will extend mine life by 10 years.
- ▶ Doral Mineral Sands Pty has been granted environmental approval to develop a 100 000 tpa ilmenite and zircon mine at **Dardanup**, 15 km east of Bunbury, WA. Development of the mine, formerly owned by ISK Minerals Ltd, is expected to commence in 2002.

RARE EARTHS

- ▶ Lynas Corporation reported that it plans to mine and concentrate high-grade rare earths ore from the **Mount Weld** project, near Laverton, WA, and ship the concentrate to China for processing. The use of

tolling at a Chinese facility is expected to save \$75 million in capital expenditure as well as obtain access to a fully operational plant with proven technology.

TANTALUM

- ▶ Haddington International Resources Ltd commenced production at the **Bald Hill** mine in July. The project has a plant capacity of 200 000 tonnes of ore per year which will yield approximately 145 000 pounds of tantalite. Product is shipped to Sons of Gwalia Ltd.

URANIUM

- ▶ The Canadian-based company Southern Cross Resources Inc. received Commonwealth Government approval for its environmental plans for the **Honeymoon** in-situ leach uranium mine in South Australia. Production is expected to start in late 2002 and reach an annual output of 900 t uranium per year.

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