



Statistics Digest

Mineral and Petroleum Production

1998-99



DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

"Our Resources • Our People • Our Future"



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FOREWORD



L C Ranford
DIRECTOR GENERAL

A handwritten signature in cursive script that reads "Lee Ranford".

Welcome to the Department of Minerals and Energy's 1998-99 Statistics Digest. This publication contains the most comprehensive statistical information available on the Western Australian resource industry.

The statistics in this Digest show that in 1998-99 the total value of Western Australia's minerals and petroleum production fell by 6.3% to around \$16.7 billion. The overwhelming reason for the negative growth in 1998-99 was low global commodity prices coupled with inconsistent economic conditions in major overseas markets.

Production value has still come in at near record levels indicating that, despite the adversities encountered by the State's industry in 1998-99, it still remains resilient. It is also noteworthy that the period 1989-90 to 1998-99 averaged an annual growth rate in production value of 5%.

Despite the fall for 1998-99, the mineral and petroleum sectors still remain the pillar of the State's economy accounting for around 26% of Gross State Product, around 70% of its export income, around half of its private capital investment and around one-sixth, both direct and indirect, of its employment.

In a generally bleak year for the mining industry it was pleasing that a number of new projects were commissioned, such as those in the nickel industry, and that expansion of existing facilities was also taking place in the alumina and base metals sectors. Such developments arose because Western Australia's fundamental competitive position in world commodity markets has not changed and there is reason to look forward to a sustained recovery in world commodity markets in 2000.

Since June 1999 the outlook for global growth has improved significantly due to better than expected economic conditions in the Asian region. This is particularly good news for commodity prices, as long-term recovery does depend on increasing demand, which in turn, depends on rising global growth. It also augurs well for those Western Australian projects that had their development plans delayed by the Asian economic crisis.

To maintain Western Australia's position as one of the world's prominent players in international mineral markets it is important that the State continues to build on its existing advantages. The State's plans for further deregulation of the energy sector will assist its mining industry in taking up downstream processing opportunities. It is also important that, where possible, the State continues its endeavours to reduce uncertainties in the local operating environment. Native title issues continue to be of major concern to industry and these and other issues are discussed in this Digest.

It is not possible to prepare such a comprehensive range of information without assistance from outside the Department. I would like to thank the various resource companies, Australian Bureau of Agricultural and Resource Economics (ABARE), Australian Bureau of Statistics (ABS) and the Western Australian Treasury Department for their cooperation and help during the preparation of the Digest.

1. ECONOMIC AND SOCIAL ENVIRONMENT

1.1 Economy Review

1.1.1 World Economy

World economic growth slow-down

Based on IMF growth forecasts the world economy slowed in 1998-99. The 1998-99 outcome reflected the adverse effects of economic contractions in Japan, Russia and Latin America, as well as a slow-down in growth in Western Europe. However, since the March 1999 quarter, general world economic conditions have improved.

United States out-performs expectations

The underlying generator of world economic activity has been the United States, which during 1998-99 continued its remarkable combination of strong growth and very subdued inflation. With growth of 3.9% recorded for 1998-99 this represents the eighth consecutive year of economic growth. Growth has been driven by strong domestic demand with a booming sharemarket, which is fuelling consumer spending. However, net exports have detracted from growth. A number of factors point towards a moderation in the pace of domestic demand growth in the United States, namely moderating growth in the share market and rising interest rates. Growth of 2.2% is estimated in 2000.

The slow-down in the USA economy may be more abrupt than assumed if inflation picks up, the stockmarket undergoes a significant correction, or the private sector begins to correct its large savings shortfall more quickly than assumed by market analysts.

East Asian economies begin to recover

Western Australia's key East Asian export markets are starting to recover slowly from the Asian crisis. A number of countries are adopting and implementing structural reform initiatives to address their economies. Since the start of 1999 there has been an upward move in estimated growth patterns in important export markets.

South Korea's recovery, for example, has been particularly significant with a growth rate of 2.0% estimated for 1999, up from -5.5% in 1998. This is expected to increase to 4.6% in 2000. Singapore's and Malaysia's growth rates are estimated at 4.2% and 2.0% respectively in 2000, up from an estimated 0.5% and 0.9% respectively in 1999.

The Chinese economy is expected to slow with growth forecast at 6% in 2000, down from an estimated growth of 7% in 1999 and actual growth of 7.8% in 1998. Indonesia has the bleakest outlook of all Western Australia's East Asian trading partners. The IMF forecasts activity to contract by 4.0% in 1999, before growth resumes at a modest rate in 2000.

Japanese growth remains uncertain

The Japanese economy grew by 0.2% in the June 1999 quarter, but overall contracted by 1.4% in 1998-99. Private consumption and dwelling investment have provided a strong stimulus to domestic demand in the latter half of 1998-99, which is consistent with a recovery in consumer sentiment. Industrial production, however, appears to have stabilised in the first half of 1999, and leading indicators point to a further improvement in business conditions. In August 1999 Japan's industrial output rose by 4.6%, to a level not recorded since January 1998.

The consensus forecast (October 1999) is for the Japanese economy to grow by 0.8% in 1999 and 0.6% in 2000. The IMF also has forecast a return to positive growth for the Japanese economy with growth of 0.3% estimated in 2000. The announcement of financial reforms and additional economic stimulus packages in late 1998 seems to have been transmitted through to growth in the Japanese economy.

The introduction of European common currency

Western European economic activity remained modest growing by 2.0% in 1998-99, down from 2.9% in 1997-98. Similar to the United States, Europe has benefited from a strong domestic economy, with net exports detracting modestly from growth. Consumer confidence is high, and business investment, which had been falling, appears to have stabilised. European short-term interest rates converged with the introduction of the Euro at the start of 1999. Significantly, this meant a reduction in high interest rates in countries like Italy. In the short term export growth is likely to strengthen in response to improved conditions in Asia and a competitive Euro. Overall, growth in Western Europe is estimated at 2.0% in 1999, rising to 2.9% in 2000.

In Eastern Europe, the economies of Russia and Ukraine are anticipated to contract further in 1999. The IMF has estimated that the Russian economy will show a further slow-down in growth in 1999, after declining from around -4.8% in 1998.

1.1.2 Australian Economy

Australian economy remains strong

Following growth of 4.7% in 1997-98, the Australian economy grew by a robust 4.5% in 1998-99. Growth was largely driven by private consumption and dwelling investments. Business investment grew by 0.8% in 1998-99. This 1998-99 growth has occurred despite the adverse economic conditions recorded in Australia's key Asian export markets and the slow-down in the world economy.

However, the impact of the international downturn made itself evident through the sharp decline in commodity prices, resulting in below trend growth for Australia's export volumes and a subsequent decline in Australia's terms of trade. Fundamental to the performance of the Australian economy has been its fiscal and monetary policy, coupled with the benefits of on-going microeconomic reform. The current account deficit however is expected to remain high. Overall the Commonwealth Treasury has estimated that Australian growth will slow-down in 1999-00 to 3.0%. However, the evidence at the time of writing (15 October 1999) suggests that 1999-00 growth will be stronger than 3.0%.

Low inflationary pressures

Australia's inflation rate has continued to remain low, with the consumer price index increasing at an annual rate of 1.3% in 1998-99. Inflationary pressures are likely to remain low in the short term with inflation forecast at 1.7% in 1999-00. The introduction of a 10% Goods and Services Tax, commencing on 1 July 2000, has placed an element of uncertainty into predicting the future direction in the CPI and in particular to whether the impact will be one-off. Forecasts of the inflationary impact of the GST range from 1.5% to 4.2%.

Interest rates remain stable in 1998-99

In December 1998 the Reserve Bank cut official interest rates by 0.25 percentage points to 4.75%. Given the low inflation outlook, Australia's prime lending rates for business activities are assumed to rise slightly from their current levels in 1999-00. Analysts believe that the Reserve Bank will raise official interest rates over 1999-00 as part of a pre-emptive strike on inflation prior to the introduction of the Goods and Services Tax on 1 July 2000.

Australian dollar assumed to be stable

The Australian dollar traded across a broad range in 1998-99 averaging US\$0.63. It hit a low of around US\$0.55 in August 1998 and a high of around US\$0.66 in June 1999. In part, this reflected over 1998-99, changing perceptions in financial markets about the strength of world economic growth and the outlook for commodity prices and in particular its impact on the Australian economy. Overall, in 1998-99 the A\$ depreciated by 8% against the US\$.

In the short term as growth in the United States economy moderates, the US\$ is assumed to weaken against many international currencies, including the A\$. Nevertheless, some downward pressure on the Australian exchange rate is likely to remain as a result of the expected high current account deficit, which is estimated to reach 6% of Australian GDP in 1999-00. Given the Australian outlook for continued low inflation and favourable interest rates the A\$ is forecast by ABARE to appreciate by around 6% to average US\$0.67 in 1999-00. This higher A\$, however, is not expected to significantly affect the competitiveness of Australian exports in the international markets as the trade weighted index for the A\$ is expected to rise by a smaller amount (3.5%) in 1999-00.

1.1.3 Western Australian Economy

Western Australian growth slows

As business investment declined over 1998-99, after peaking at an exceptionally high level in early 1998, the pace of economic growth in Western Australia's economy is estimated to have slowed from 6.3% in 1997-98 to 2.1% in 1998-99. The primary cause for the fall was the lagged impact of the Asian economic crisis first recorded in mid-1997 on world growth and commodity prices which ultimately affected the State's key export sectors. This resulted in a 6.5% fall in business investment in 1998-99. The fall in commodity prices not only reduced the State's value of mineral and petroleum production by 6.3%, or about \$1.1 billion, but also contributed to some companies deferring their investment plans.

Like the rest of Australia, private consumption continues to grow at a robust rate in the State. Given the strength of the State's domestic economy, employment growth averaged 2.5% in 1998-99, compared to a national average of 2.2%. Western Australia's unemployment rate averaged 7.0% in 1998-99, compared to 7.6% for Australia. The State's unemployment rate has remained below the national average since October 1992.

In 1998-99 nominal exports fell by 4.3% and imports rose by 4.7%, resulting in the trade surplus falling by 9.8%. There were declines in the value of exports of gold, nickel, petroleum, wheat, LNG and wool. These declines were partially offset by increases in exports of, among other, elaborately transformed manufactures (ETMs) and base metals excluding nickel. Significantly, the import of gold for refinement and subsequent re-export has had a substantial impact on trade figures over the past two years, contributing to, and detracting from, growth in 1997-98 and 1998-99 respectively.

Overall, in 1998-99 Western Australia's trade surplus was \$13 billion compared with a national deficit of \$13 billion. This trade surplus is near record levels and has been achieved despite poor international commodity prices.

Positive State outlook

On the back of improving world economic conditions, particularly in the Asian region, the State's economy is expected to grow by 4.5% in 1999-00 and by 5% in 2000-01. Better than expected world growth conditions has already seen business investment in the State rise by 12.3% in the June 1999 quarter.

1.2 Economic Factors Affecting the Mining Industry

The downward pressure on world mineral and energy commodity prices that began in 1997 with the East Asian financial crisis continued for most of 1998-99. However, on the back of improving world economic conditions, world commodity prices have improved since June 1999.

The downward pressure on world mineral and energy commodity prices that began in 1997 with the East Asian financial crisis continued throughout most of 1998-99. The Asian crisis has represented the most significant shock to commodity markets since the dissolution of the Soviet Union and the global economic slow-down in the early 1990s. Japan's poor economic performance also continued to undermine commodity markets.

Nonetheless, despite the substantial fall in commodity prices since the onset of the Asian crisis, the decline in Australia's terms of trade – i.e. the ratio of export prices to import prices – has been relatively mild falling by around 5% in the period 1996-97 to 1998-99. This experience contrasts with the mid-1980s, when a sharp decline in commodity prices was associated with a reduction in Australia's terms of trade of about 15%.

In relation to world commodity prices many commentators have reached the consensus that in aggregate commodity prices reached their cyclical lows with the short-term outlook particularly bright. This change in sentiment, is largely a result of expected improvements in the world economy in 1999-00. In particular the pace of economic recovery in Asia is likely to strengthen over the short term with long-term sustained recovery dependent on a number of countries within that region undertaking significant financial and structural economic reform. In addition, there are tentative signs that Japan's economy is also improving.

Between May and September 1999, for example, average monthly US dollar denominated spot prices for metals on the London Metal Exchange increased by 58% for nickel, 26% for aluminium, 20% for zinc and 14% for copper. Prices in world energy markets, particularly for crude oil, also continued to strengthen. In terms of crude oil, the initial impact of the higher oil price was to add between one-quarter and one-half of a percentage point to the headline inflation rates of the world's major industrial countries. This indicates the importance of crude oil to production processes but this initial one-off inflationary impact will be offset, in the near term, once the oil price sets at around its new level.

Gold prices, until late September 1999, had been the general exception to the recovery in world commodity prices. European central banks' sales, and in particular the threat of these continuing at potentially high levels, has substantially dampened the international gold market over the last two years. In late September 1998, the 15 European central banks agreed to limit gold sales to approximately 400 tonnes a year over the next five years and cap the amount of gold they will lend to the market. This decision restored some confidence in the gold market and caused a surge in the gold price, with the price closing at around US\$330 per ounce on 5 October 1999, its highest level since late 1997.

Economic recovery in Asia provides positive outlook for the State's mineral and petroleum industries.

In 1998-99 the value of the State's mineral and petroleum exports was \$14.5 billion, meaning almost 87% of Western Australia's resource production was exported. The most important trading partners were Japan, which received 29% of Western Australia's mineral and petroleum exports, followed by South Korea (11%), the United States of America (8%), China (8%),

United Kingdom (6%), Taiwan (6%) and Singapore (5%). Therefore, in assessing the performance and outlook for Western Australia's mineral and petroleum sectors, the economic growth prospects for these economies is critical. A positive outlook for the Asian region and a return to growth for Japan in 2000 combined with stable growth for Europe and a reduction in growth for the USA to a more sustainable level augurs well for the State's resources sector.

The economies of the USA and China represent the greatest risks to the upbeat assessment for world economic growth and commodity prices for 2000.

The main risk to world economic growth and commodity prices in 2000 stems from the extent that the USA economy will slow. Analysts are in general agreement that the US economy cannot continue its combination of rapid growth, low unemployment and low inflation for much longer. There is also a general perception that the stockmarket is over valued. Critical to world growth and commodity price forecast scenarios is whether the Federal Chairman – Alan Greenspan, can effectively use monetary policy to manoeuvre growth in the USA economy to sustainable levels rather than creating an “economic shock” that sends it to a grinding halt.

China also represents a downside risk to the world economy. China's insistence that it will not devalue its currency has been a major factor behind the improving growth prospects for the Asian region. If China were to devalue its currency it is likely that this would trigger a new wave of currency devaluations in the Asian region. In the short term this would result in deteriorating demand conditions in the Asian region with consequent adverse impacts on world economic growth and commodity prices. Over 1998-99, despite increased deficit spending from the Chinese government, private sector demand still remains weak. China's trade performance has also continued to worsen and there is now some concern that continuing price deflation will adversely impact on China's capital-raising ability. Analysts believe that China will need to devalue its currency to restore its international competitiveness, but to date the Chinese government has insisted that it would not do so.

Australia's international competitiveness improved in 1998-99

The Australian dollar averaged US\$0.63 over 1998-99, down by nearly 8% on the 1997-98 average of US\$0.68. Whilst the underlying A\$/US\$ exchange rate is of importance when assessing the relative cost of Australian exports overseas, a far more critical indicator is the Trade Weighted Index (TWI). The TWI is the average value of the Australian dollar in relation to the currencies of Australia's major trading partners. This index effectively provides an indication of Australia's international competitiveness. In 1998-99 the TWI fell by 5% , indicating that the competitiveness of Australia's exports relative to our major trading partners increased.

Mining industry to benefit from the Goods and Services Tax (GST)

In August 1998 the Federal Coalition released its proposed tax reform package which, among others, included a 10% GST, abolition of wholesale taxes and reductions in personal income tax rates. In June 1999, after intense negotiations with the Democrats, the package was passed in the Senate after it was agreed that food would be removed from the GST base and changes would be made to the then proposed credit scheme for diesel fuel. Given that the changes will result in lower GST receipts that can be distributed by the Commonwealth to the States, in return for the latter's acceptance to remove a number of its taxes and charges on business, the timeframe for the removal of some of these has now shifted outwards.

The main benefits to the mining industry of the GST package result from:

- Exports are zero-rated for GST purposes. This means that no GST is paid on the final sale of those products; and
- Despite the changes to the initial diesel fuel credit scheme (outlined in August 1998) the mining industry will still benefit from lower diesel fuel excise. The initial diesel scheme would have effectively reduced the on-road diesel excise from 43 cents per litre to zero, and for larger transport users (including rail) from 43 cents per litre to 18 cents per litre. Following the Government's acceptance of the Democrats' changes vehicles used in urban areas have been prevented from claiming the rebate. The changes effectively reduce the diesel excise for on-road use of diesel by trucks operating outside the metropolitan area and major rail corridors from 43 cents a litre to 20 cents a litre. A 100% diesel excise rebate has also been given for rail transport and the off-road diesel subsidies to farmers and miners have been extended.

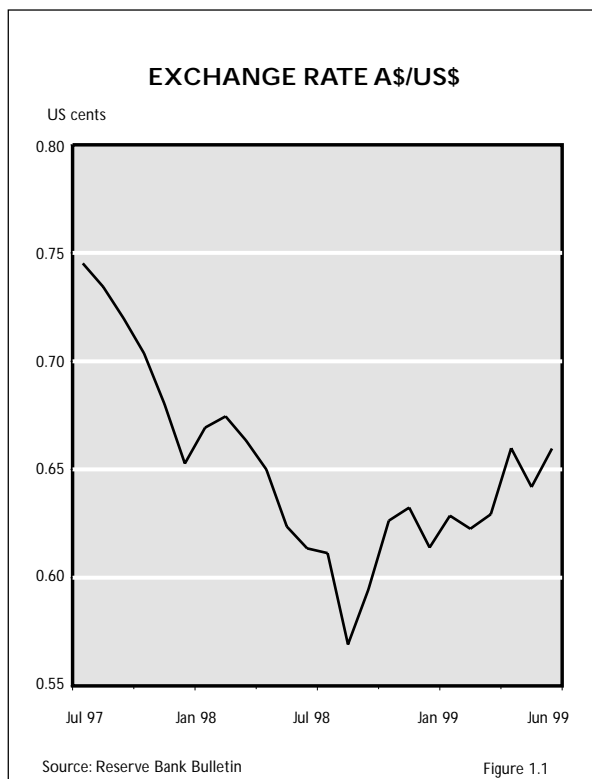
Benefits of the GST package for some producers could be negated through the abolition of accelerated depreciation.

In mid-1998 the Commonwealth Government appointed Mr John Ralph to conduct consultation on the business tax reform proposals released as part of the tax reform package. In March 1999 the Inquiry released a draft report which proposed a reduction in the corporate tax rate to 30%. This was to be funded primarily through the abolition of accelerated depreciation.

The State Government's submission to the draft report argued that the mining and petroleum industries were highly capital intensive and that the proposed abolition of accelerated depreciation concessions would adversely affect its international competitiveness. The State Government therefore argued for both a retention of accelerated depreciation and a lowering of the company tax rate to 30%.

However, the Ralph Inquiry's Final Report to the Commonwealth Government (handed over in July 1999) again recommended a reduction in the company tax rate to 30% and the scaling back of accelerated depreciation. On 21 September 1999 the Commonwealth Government provided its long awaited response to the Ralph Inquiry into business taxation. Its statement represented the "first stage" of its response to the Report. The "second stage" will involve an examination of the other recommendations contained in the Report on which Federal Cabinet is still assessing its position. The most notable of these is the Review's recommendation for a fundamental change in the method of determining taxable income for business. If adopted this recommendation would claw back a substantial proportion of the benefit derived to all companies by the proposed move to a 30% corporate tax rate.

In relation to the "first stage" of the reforms, which are yet to pass Parliament, the most notable changes



to the tax arrangements for mining companies are:

- The corporate tax rate will be reduced from 36% to 34% for the 2000-01 income tax year and to 30% thereafter.
- The immediate deductibility of expenditure on the removal of overburden has been retained. (The Commonwealth Government has rejected the Inquiry's recommendation for the abolition of the immediate deductibility of overburden removal expenditures.)
- Retaining the tax concessions for prospecting, exploration and research and development.
- From 1 July 2001, expenditures incurred by the mining industry, such as those for defending native title and mine closures will become immediately deductible. This is provided that such costs do not create or improve an asset. These so-called "black hole" costs are currently non-deductible.
- Only 50% of the capital gains of individuals will be subject to tax, while superannuation funds will have only two-thirds of their capital gains being taxed.
- Accelerated depreciation has been abolished for assets purchased after 9.45 a.m., 21 September 1999. Depreciation will be based on the "effective life" of the asset.

As a result of the removal of accelerated depreciation, less capital-intensive sectors, small companies and those companies not planning to undertake any large-scale capital investments will gain significantly from the proposed reduction in the company tax rate to 30%. Small companies will benefit from the Commonwealth Government retaining accelerated depreciation for companies with an annual turnover of less than \$1 million.

The decision to abolish accelerated depreciation will affect the economic viability of companies planning significant capital expenditures over the next few years. While these companies will obtain a partial benefit from a lower company tax rate this will not compensate them for the loss of accelerated depreciation. Loss of accelerated depreciation will reduce the internal rate of return of large-scale developments and its removal could render some projects uneconomic. Despite the proposed new arrangements for the tax treatment of capital gains, the attractiveness of these types of projects to investors will also be reduced. Overall the decision to abolish accelerated depreciation is expected to shift shareholder investments towards less capital-intensive sectors.

Also in defence of removing accelerated depreciation, the Commonwealth Government has indicated that overall the mining industry is "in front" thanks to the proposed 30% corporate tax rate and the benefits from the GST package that was passed by Parliament in June 1999.

It is nonetheless apparent that the benefits of the tax reform process initiated by the Commonwealth will be unequally spread across the mining industry. Companies planning large-scale capital expenditures will likely have the benefits derived from the proposed lowering in the company tax rate and the

GST package outweighed by the negative aspects of the 21 September 1999 tax reform changes.

In recognition of this, the Commonwealth Government has indicated that it is prepared to consider large capital intensive projects with long lives in the context of an expanded strategic investment co-ordination process, including consideration of targeted investment allowances. The full details of this scheme are yet to be released.

Markets unclear as to the inflationary impact of the GST package.

In late October 1999 there was considerable speculation as to whether the Reserve Bank would move to raise interest rates. The Reserve Bank had indicated that it believed that growth in the Australian economy was not slowing to the level needed to maintain inflation within its target range of 2% and 3%. If inflation is beyond this range the Reserve Bank's charter stipulates that rates may need to be increased. On 3 November 1999 the Reserve Bank lifted official interest rates by one-quarter of a percentage point, the first rise in rates in five years. Analysts believe that interest rates will rise by a further half a percentage point, as part of a pre-emptive strike on inflation, in the months prior to the introduction of the GST and accompanying personal income tax cuts.

Originally in August 1998 the Commonwealth Treasury indicated that the inflationary impact of the GST package for Australia would be one-off and be approximately 1.9%. However, initial price increases associated with the forward sales of goods and services (i.e. insurance premiums covering 2000-01) have been, in some cases, well above the August 1998 predictions of the Commonwealth Treasury. This has further fuelled market fears, when combined with improving world economic growth prospects, that the inflationary impact of the GST package could be above 3%. There are also concerns as to whether the inflationary impact will indeed be one-off.

Deregulation of the domestic gas market increases private sector involvement in that market.

The continued deregulation of the domestic gas market has brought about significant efficiency gains and cost reductions to the mining industry, particularly in the Goldfields, the Mid-West and the Pilbara regions. In addition, local towns have benefited through the opportunity to access gas as an alternative energy source.

The benefits of deregulation were highlighted throughout the year with the completion of Australian Gas Light Company's \$48 million Mid-West pipeline. The pipeline starts from a junction of the Dampier to Bunbury pipeline stretching 355 kilometres inland via Mt Magnet to the new Windimurra vanadium project. The second stage of the project is to extend the line to Cue and Meekatharra once further customers are secured.

In addition, Anaconda Nickel and StateWest Power have also reached agreement to build a \$100 million pipeline that joins from the Dampier to Bunbury pipeline, near Geraldton, to the Mt Margaret area. If proceeded with the pipeline could further reduce tariffs in the region. The new pipeline could also aid the development of additional projects in the region via the supply of competitively priced gas.

Epic Energy also completed construction of a 24 kilometre pipeline down the Burrup Peninsula. The pipeline will provide gas to BHP's Hot Briquetted Iron plant in Port Hedland.

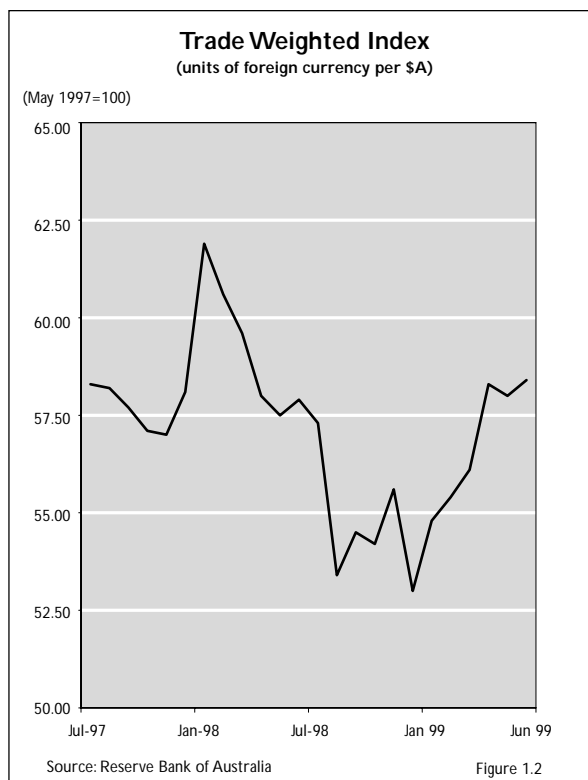
Federal Court rules on third party access to iron ore rail line.

In June 1999, the Federal Court ruled that the private rail line used to transport iron ore from Hamersley Iron's Pilbara mines to its Dampier port facility was an "integral part of its production process". The Court's decision effectively shielded access to the railway from Hamersley's competitors because under the Trade Practices Act access is denied to those components of a production process considered integral to the overall operation. The plaintiffs in this case were Robe River Limited and the National Competition Council (NCC).

Robe River had sought access to Hamersley's rail network because it wishes to develop its West Angelas iron ore project, which is located near the rail network. If it were to duplicate the rail-line the capital cost of the project could increase between \$300 million to \$450 million.

Under National Competition Policy it was initially believed that the transport components of a production process constituted a service and therefore access would be allowed under the Trade Practices Act. In effect the Court's decision redefines the conditions for granting access to infrastructure as it broadens the coverage of the term "integral production processes".

The outcome of this case has implications for Hancock Prospecting, which is pursuing development of its Hope Downs iron ore project and is likely to seek access to the rail network of BHP, Hamersley or Robe River. Hancock Prospecting and the NCC have indicated that they will appeal the Federal Court's decision, however, Robe River has decided not to partake in that legal action.



1.3 Social and Political Factors Affecting the Mining Industry

Native title continues to be a major issue impacting on the industry.

The Western Australian Government has been using the future act procedures of the Native Title Act (NTA) since the High Court Decision of 16 March 1995, which found the State's Land (Titles and Traditional Usage) Act 1993 to be inoperative.

In accordance with NTA procedures, native title claims covering more than 88% of the State had been registered with the National Native Title Tribunal (NNTT) by 30 September 1999. The distribution of these claims is such that about 98% of all mineral title applications in Western Australia must now be processed via the future act regime of the NTA.

In the period from 16 March 1995 to 30 September 1999, the Department referred 15,842 mining and petroleum tenement applications to the NTA future act procedures. Of these 7,980 (50%) have been cleared for grant after a delay of about 6 months.

In the case of prospecting, exploration and certain miscellaneous licences, the State seeks the Expedited Procedure to apply routinely to acts that do not have a significant impact on native title interests. Consistent with the Federal Court's decision of 1997 (the Dann decision) if an objection to this process is made by a registered native title claimant and the objection is upheld by the NNTT, then the matter must proceed in accordance with the right-to-negotiate procedure. Objections to the NTA Expedited Procedure (sought for all exploration titles in WA) were registered against 2,831 titles or 17% of those submitted.

In the case of mining leases and general purpose leases, all applications over areas that are the subject of a registered native title claim must undergo the right-to-negotiate procedure. The right-to-negotiate procedure involves negotiation meetings between parties in relation to the grant of tenements. These negotiations must be carried out in accordance with NTA procedures which require that negotiations be "in good faith" with a view to achieving an agreement with the tenement applicants and native title parties. Where no agreement results from negotiations within the prescribed six-month time frame, any of the parties may apply for a determination by the NNTT.

The delays experienced with mining leases have been much greater than compared to exploration licences. To 30 September 1999, 3,970 applications for mineral titles have become the subject of "normal" right-to-negotiate procedures under the NTA. Over this period 393 agreements have been finalised involving 319 mining leases.

Passage of the Commonwealth Government's Native Title Act Amendment Bill 1997 reduces native title applications but the area of the State under claim remains largely unchanged.

In July 1998, the Native Title Act Amendment Bill 1997 was passed by the Federal Parliament. It enables the State governments to establish their own procedures, subject to Federal Government approval, to deal with future acts on all land tenures including pastoral lease and vacant crown land.

In October 1999 the NNTT announced that there had been a 45% drop in the number of native title claims in Western Australia over the past year. This is mainly the result of the new registration test in the Federal Native Title Act that requires claimants to meet certain criteria before the right-to-negotiate

procedure of the Act can be triggered. Some of the conditions that need to be satisfied under the new registration test include:

- at least one member of the applicant group has or had a traditional physical connection with the area;
- no member of the native title claim group was a member of a native title claim group for a previous application; and
- the applicant was a member of the claim group and authorised to make the application on behalf of everyone else in the claim group.

While the new registration test has led to a consolidation of claimant groups the actual area of the State under claim has remained largely unchanged.

State Government yet to establish State Native Title Commission

In accordance with passage of the Commonwealth Government's Native Title Act Amendment Bill 1997, on 15 October 1998 three native title Bills were introduced into the Western Australian Parliament comprising:

- i The Titles (Validation) and Native Title (Effect of Past Acts) Bill 1998;
- ii The Native Title (State Provisions) Bill 1998; and
- iii The Acts Amendment (Land Administration, Mining and Petroleum) Bill 1998.

The Titles (Validation) and Native Title (Effect of Past Acts) Bill validates mining and petroleum grants made and confirms extinguishment of native title by past acts. The Bill ensures ongoing security of tenure and investment for titles issued under the Government's previous land titles regime. The Bill was passed by Parliament in mid-1999 with amendments leaving out some types of leases affecting approximately 1,300 leaseholders. Overall the new Act validated 9,000 land and mining titles that were issued between January 1994 and December 1996 (High Court's Wik Decision). A new Bill over-riding the amendments was introduced into Parliament in September 1999.

The Acts Amendment (Land Administration, Mining and Petroleum) Bill 1998 was passed by Parliament and assented to in December 1998. It provides consequential amendments to existing State acts and imposes native title liability compensation obligations on industry for future acts.

The Native Title (State Provisions) Bill reflects the Federal amendments to the Native Title Act. It provides substantive schemes for alternative consultation procedures on leasehold land (e.g. pastoral) in lieu of the right to negotiate, improved right-to-negotiate procedures on Crown land, and procedures to deal with infrastructure. It will also facilitate the establishment of a State Native Title Commission to administer these and other procedures. This Commission will, in due course, take over administration of the registration test future act process.

On 22 December 1998 the Premier "laid aside" the Native Title (State Provisions) Bill 1998 as the amendments proposed by the Legislative Council to that Bill were unacceptable to the Government. The failure to pass the latter Bill has resulted in native title matters remaining under Federal control.

It is expected that the Native Title (State Provisions) Bill 1998 will be re-introduced into the State's Parliament in the last quarter of 1999. In order for the Bill to pass Parliament the vote of the minor parties or the independent, the Hon Mark Nevill MLC, is required.

Commonwealth Senate rejects the Northern Territory's State-based native title regime and this could have implications for the States.

There is the possibility that even if the Native Title (State Provisions) Bill 1998 were passed by the State's Parliament, that the Commonwealth Senate would reject it. Under the Commonwealth's Native Title Act Amendment Bill 1997 Senate approval for State-based native title regime is required.

The Commonwealth Senate has already rejected the Northern Territory's (NT) native title regime, even though the NT Parliament had accepted that regime. The Labor and minor parties combined in the Senate to reject the NT model because they believe that under the Commonwealth Native Title Act there is a loophole that allows the States and Territories to water down their respective native title regimes at a later time without obtaining Commonwealth Senate approval for those actions. This issue has yet to be resolved.

New protocol for negotiating in "good faith" has been developed in Western Australia.

A new protocol for Western Australia's participation in the negotiation of mining and petroleum tenements has been developed in consultation with industry and Aboriginal representative bodies. This recognises that all parties, and not just the State Government, must negotiate in good faith. The establishment of the new protocol will enable companies to take their own initiative in negotiations and significantly increase the number of cases the Department of Minerals and Energy is able to support. The new protocol will also assist all parties to deal with a greater number of tenements in the negotiation process.

Miriuwung and Gajerrong Federal Court Decision may have implications for the resources sector.

On 24 November 1998 the Federal Court made its first court contested determination on native title in mainland Australia. The Court confirmed that native title could co-exist with other forms of land tenure. The native title claim by the Miriuwung and Gajerrong people covered 7,000 square kilometres of the East Kimberley. It included a claim over Lake Argyle and the Ord River and extended into the Northern Territory.

Virtually all the area claimed was allowed with a few exceptions. The Court decided, among others, that native title was extinguished over certain roads, community reserves, the Ord River dam and power station, telephone stations and, in general, the town of Kununurra.

The Court also ruled, among others, that the native title holders had access rights and the right to trade in resources and to receive a portion of resources taken from the area claimed.

The Court's decision may have ramifications for the State's Titles (Validation) and Native Title (Effect of Past Acts) Amendment Act 1998, mentioned above. As the Act extinguishes native title over most types of rural land tenures, the State could now become subject to compensation claims. The Commonwealth's Racial Discrimination Act 1975 provides the vehicle for indigenous people to claim compensation for the extinguishment of native title.

On 26 July 1999, the Federal Court commenced hearing an appeal against the Miriuwung and Gajerrong decision. The Western Australian and Northern

Territory governments in addition to Argyle Diamonds and two other companies lodged appeals. The Court will hear the appeals concurrently.

Second Western Australian Native Title Claim reaches the Federal Court

In mid-September 1999, the Federal Court commenced a hearing into a native title claim covering the Burrup Peninsula. The area is critical to future Western Australian LNG and pipeline developments. The claim, by the Ngaluma and Indjibandi people covers 17,000 square kilometres of land around Karratha, Roebourne, Wickham and Dampier. It excludes the towns of Dampier, Karratha, Wickham, the Karratha Industrial Estate, and Point Samson. An 8,000 square kilometre area of sea is also included in the claim.

The Framework Convention on Climate Change (FCCC) establishes the mechanism for international co-operative action on greenhouse gases

The Framework Convention on Climate Change (FCCC) established the mechanisms for international co-operative action on greenhouse. The Convention sets out a broad framework and initiated a process covering all aspects of climate change. The international commitments under the FCCC were concluded at the Third Conference of the Parties held at Kyoto, Japan in December 1997.

The FCCC provides a two-point strategy to combating greenhouse. Signatories to Annex 1 of the FCCC - which essentially are developed countries - are expected to be at the forefront of reducing their greenhouse gas emissions. Those countries that are not signatories to Annex 1 are expected at a later stage to pursue FCCC commitments (i.e. once they are considered to be developed countries).

Australia is a signatory to Annex 1 of the FCCC while its main competitors (i.e. China and India etc.) are not.

Kyoto outcome satisfactory for Australia

In regard to the Kyoto discussions, Australia was able to successfully lobby countries into supporting the concept of differentiation. Differentiation means that in deciding what contribution a country should make to the international effort to reduce greenhouse gas emissions, FCCC outcomes should take into consideration the individual circumstances of that country. In other words, Australia should not have to pay a higher economic price because it happens to be more economically dependent on industries that increase greenhouse gas emissions.

From an Australian perspective the Kyoto outcome was satisfactory. While the agreement, if ratified, will lead to a 5.2% reduction in world greenhouse emissions below 1990 levels by 2012, Australia was one of three countries permitted to increase emissions. Under the deal Australia is allowed an 8% increase in greenhouse emissions between 1990 and 2012. In total the European Union has agreed to cut its greenhouse gases by 8%, the USA by 7% and Japan 6% between 1990 and 2012.

All States and Territories are currently in the process of inputting in the revamped National Greenhouse Response Strategy (NGRS). That Strategy will indicate the manner in which Australia will achieve the 8% increase negotiated under the Kyoto Agreement.

The first stage of the process (now completed) was for the Commonwealth, States and Territories to agree to the principles which should underlie the

NGRS. The second stage (currently underway) is for the Commonwealth, States and Territories to develop 'Action Plans' for implementation of the NGRS by end-December 1999.

In developing 'State Action' Plans Western Australia is pursuing the concept of differentiation within the national context. Some of the State's export goods have high greenhouse emissions and the State's belief is that it should not be unduly penalised for producing these. The problem largely stems from the Kyoto outcome whereby greenhouse emissions are sourced back to the country where the product is produced rather than where it is consumed. For example even though LNG is exported and substitutes for dirtier energy sources abroad, the greenhouse emissions associated with its production are allocated to Australia, and this is despite the importing country benefiting from a general lowering of its emission levels through the take-up of LNG.

This case for differentiation for Western Australia became particularly apparent in August 1999 when the Industry and Waste Management Technical Panel, which was established by the Western Australia Greenhouse Council (WAGC) and made up of industry and State Government representatives, provided its Report to the WAGC. The study shows that if the Federal Government enforces the Kyoto target equally across all States and Territories this would lead to a loss in resource investments in Western Australia of up to \$10 billion. The Australian Greenhouse Office is yet to determine how the reduction target will be divided amongst States.

In addition, the Report found that Western Australia alone is forecast to account for around three-quarters of Australia's 8% permissible increase under Kyoto in 2012. This indicates that unless the Commonwealth Government enforces greenhouse policies beyond "no-regrets" then it will not be able to meet its Kyoto protocol commitments. In essence the Commonwealth Government will need to decide whether Australia should forego economic growth in pursuit of its Kyoto goals.

New Commonwealth Bill streamlines the State/ Commonwealth environmental approval process

The Environment Protection and Biodiversity Conservation Bill was passed by Federal Parliament in June 1999. Passage of the Act represents the most comprehensive reform of Australian environmental laws for 20 years.

Under the old system the Commonwealth's role in environmental impact assessments arose only when the proposal involved a Commonwealth Act or decision, such as an approval for Commonwealth funding, an export licence or foreign investment. The overall effect of the new Act is to clarify Commonwealth and State Government responsibilities, with Commonwealth assessment and approval processes triggered only by projects or activities that will have a significant impact on six matters of environmental significance. These include the Commonwealth marine environment, world heritage properties, the 1971 Ramsar convention on wetlands of international importance, nationally threatened species, migratory species and nuclear activities.

Under the new Act the Commonwealth Government will delegate the regulation of assessments to State Governments. This will occur after it completes a round of bilateral agreements with the States and Territories, aimed at setting the standard for State Government environmental assessment processes and management plans. This will ensure that consistent environmental evaluation

criteria and standards will be applied across Australia. The Commonwealth Government hopes to finalise a significant number of these bilateral agreements by the time the new Act comes into effect on 1 July 2000.

Essentially after 1 July 2000 if a business is planning to undertake a project with a potential impact on issues of national environmental significance, it will be able to, under the new Act, seek advice from the Federal Minister for the Environment on whether the activity will trigger Commonwealth involvement. If Commonwealth involvement is warranted, an accredited State process will conduct the assessment. If no accredited State process is in place then the environmental assessment will be evaluated by the Commonwealth. Nonetheless, under either approach it is the Federal Minister for the Environment who will grant final project approval.

Regional Forest Agreement finalised

In May 1998 the joint Western Australian - Commonwealth public consultation paper, "Towards a Regional Forest Agreement", was released. It marked the beginning of the final phase in the RFA's development, which commenced in 1992, when Commonwealth, State and Territory governments signed the National Forest Policy Statement.

The RFA for Western Australia encompasses most of the State's South-West region. It is an agreement between the State and Commonwealth governments on the future use and management (including exploration and mining) of the forests of Western Australia's South-West. The Agreement will be in place for 20 years, subject to five-yearly reviews.

The last stage of the RFA process entailed considering comments on the consultation paper and development of a preferred approach for submission to the Commonwealth and State governments. The Prime Minister and Premier signed the RFA in May 1999.

In light of considerable community pressure regarding logging in old growth forests, in July 1999 the State Government modified the RFA. The most notable modification was to bring forward an end to logging in old growth karri forests to 2003, when the contracts with timber companies expire.

2. REVIEW OF MAJOR MINERALS AND PETROLEUM IN WA

2.1 Overview and Outlook

In 1998-99 the total value of Western Australia's minerals and energy production fell by 6.3% to around \$16.7 billion.

The overwhelming reason for the negative growth in 1998-99 was low global commodity prices coupled with inconsistent economic conditions in major overseas markets.

Even an average 8% depreciation of the Australian dollar during 1998-99 (relative to 1997-98) did not offer sufficient relief to maintain overall production value at 1997-98 levels.

It is not surprising that the mining industry as a whole had lower profits in 1998-99. According to the ABS in 1998-99 average mining profits (before tax) fell by 6%. In addition manufacturing profits, which take into account basic metal industries and petroleum related products (i.e. LNG), also fell by around 6%.

Petroleum, the State's largest resource industry by value, weathered a period of record low prices during 1998-99, with the total value of petroleum production in Western Australia falling by nearly 18% to just under \$4.07 billion. Only the LNG and LPG sectors marginally increased physical production during the year with natural gas, crude oil and condensate output falling.

Iron ore production in 1998-99 decreased by nearly 6% to 141 million tonnes, but the value of production increased by 0.9% to \$3.96 billion. This result was due to a combination of higher prices attained at a previous round of negotiations with the Japanese in early 1998 and the depreciated Australian dollar. The lower volume was mainly due to unseasonable wet weather in the Pilbara.

The State's overall gold output dropped during 1998-99 by nearly 8% to just under 221 tonnes. The overwhelming factors for the lower production were interruptions and damage caused by Cyclone Vance in March 1999 in addition to the closure of some projects due to depleted reserves and/or high operating costs. Overall the value of production fell by just over 6.5% to \$3.24 billion.

Alumina production in 1998-99 increased by 4% to 8.9 million tonnes, outstripping the record high achieved in 1997-98. The value of production increased by just under 5% to reach a record \$2.37 billion.

Over 1998-99 Western Australia's production of nickel dropped by just under 7% to around 126,000 tonnes of contained metal. The value of production for the year declined by nearly 24% to \$876 million, highlighting the weakness of the world nickel price during the year.

The State's heavy mineral sands industry contracted slightly in 1998-99, with the value of production down by around 3% to approximately \$646 million. Within the overall decline in value terms for the industry, the rutile sector performed well, increasing production by 15%. Ilmenite production also increased slightly. All other sectors that make up the heavy mineral sands industry declined in terms of production and value over the year.

Both sales value and volume records were broken by the Western Australian diamond industry in 1998-99. The value of diamonds sold was up by an impressive 13% to just over \$610 million, whilst sales volume increased by 21% to approximately 51 million carats. The Argyle Joint Venture partners (Rio Tinto and Ashton Mining) have fared well over the last two years achieving price increases in comparison to the slump experienced in most parts of the gem market due, in particular, to weak sales in Asia.

The base metals (copper, lead and zinc) sector increased its value of production by 23% to around \$232 million in 1998-99. During the year there were substantial increases in the production and value of lead and zinc, but the copper sector contracted significantly, thus detracting from the overall result.

Another sector that experienced growth over 1998-99 was the salt industry. The salt industry increased production in 1998-99 by just under 5% to 8.6 million tonnes. The overall value of production increased by nearly 6% to \$200 million.

Despite the fall in 1998-99, overall, it is noteworthy that the period 1989-90 to 1998-99 averaged an annual growth rate in production value of 5%. It must also be emphasised that the production value for 1998-99 has still come in at near record levels, indicating that despite adversities the industry remains resilient.

Western Australia will continue to be a prominent player in international mineral markets. The outlook

for global growth has improved significantly during the last few months because of the improved prospects for Asian economies. This is particularly good news for commodity prices, as long-term recovery will depend on increasing demand, which in turn, depends on rising global growth. It also augurs well for those projects which had their development plans delayed by the Asian economic crisis.

Upward revisions in growth for Asia, Japan and the USA have prompted the IMF to raise its world economic growth forecast for 1999 and 2000 to 2.8% and 3.4% respectively.

Cutbacks in supply coupled with improvement in world demand conditions have contributed to a recovery of commodity prices in recent months particularly in the case of nickel, gold and copper. Oil prices have also recovered favourably since the reinforcement of production quotas on OPEC producers. Reflecting an improved international economic environment, average mining profits in Australia rose over the last two quarters of 1998-99 and this trend is expected to continue into 1999-00.

2.2. Petroleum

As a result of low prices for most of 1998-99, the total value of petroleum production in Western Australia fell by nearly 18% to just under \$4.07 billion. The petroleum sector still remains the State's leading resource industry.

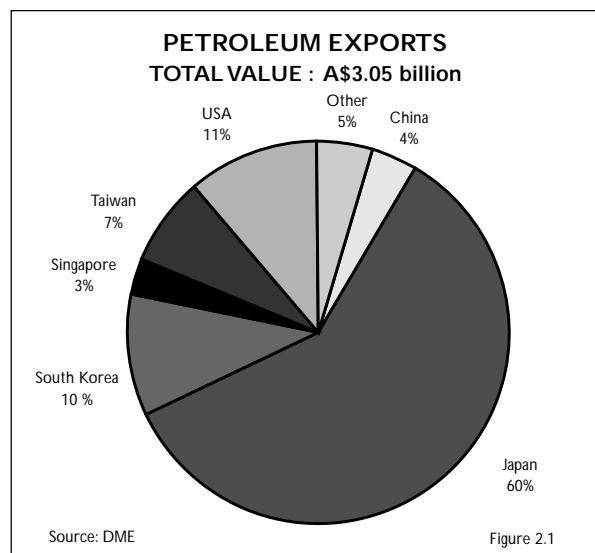
Approximately 75% (by value) of the State's petroleum production is exported. The major destinations are Japan (60%), USA (11%), South Korea (10%) and Taiwan (7%).

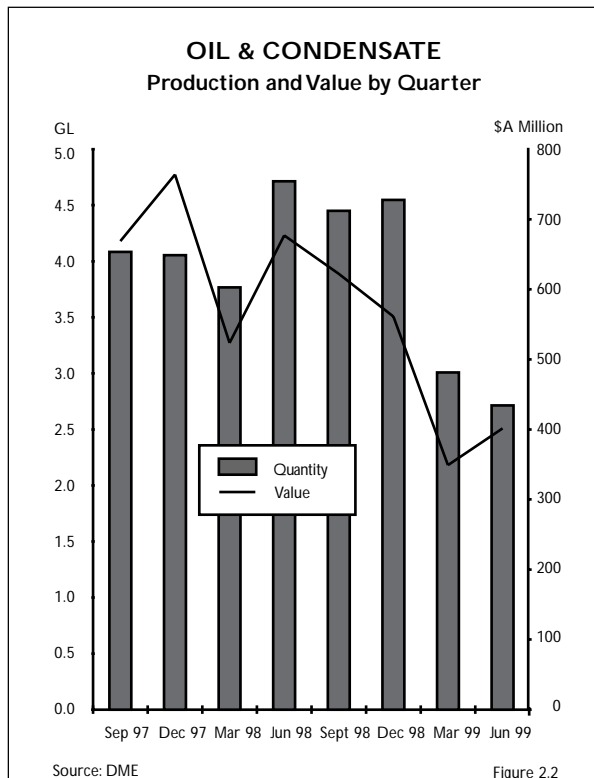
Western Australia remains the nation's largest petroleum producer, accounting for around 53% of its oil and condensate production as well as 56% of its gas production.

1998-99 Petroleum Industry Highlights

The petroleum sector weathered a period of record low prices during 1998-99. After declining almost continuously for 16 months, in early February 1999, the world average trade weighted price of crude oil bottomed at US\$9.50 a barrel – the lowest price in real terms since 1973. However, by early May 1999, prices had increased by more than 70%, to US\$16.20 per barrel. This initial recovery in price occurred in the weeks prior to and after the May 1999 announcement by OPEC cartel members, Norway and Mexico that they would restrict supply as a means to increase the oil price. Overall, oil prices were nearly 26% lower in 1998-99, at an average US\$13 per barrel.

LNG is Western Australia's most significant petroleum product. Output of LNG increased by 3% to a new record high of around 7.5 million tonnes. Despite





this, the value of LNG production fell by 10% to \$1.43 billion in 1998-99. Western Australia is regarded as a significant supplier on the world market, accounting for approximately 9% of world trade, with Japan being the major recipient of the State's LNG. A total of 135 LNG shipments were made during the year, with 130 going to Japan and 5 to the United States.

Crude oil production decreased by 7% during the year. Depressed oil prices exacerbated the drop in output with the value of production falling by 24% to \$1.19 billion. The decreased production was largely due to the shutdown of the Cossack Pioneer floating production vessel for six months. However, increased production from the Wandoo and Griffin projects in addition to the first full year of production from Apache Energy's Stag field ameliorated somewhat the fall in the State's oil production.

Condensate production dropped by nearly 18% in 1998-99, and when combined with poor oil prices its value fell by 30% to \$744 million. The drop in production was largely due to decreased output from the Goodwyn project due to technical difficulties with extraction and falling reserves from the North Rankin project. The State's future output of condensate though is likely to be aided by other developments in the North West Shelf Gas Project area.

Decreased sales contract volumes in addition to slightly higher prices resulted in natural gas production decreasing by 6% during the year. However, the value of production dropped by around 1% to \$550 million.

Liquefied petroleum gas (LPG) production increased marginally by 1% during the year to 648 thousand tonnes. Its associated value fell by 2.3% to \$148 million. Whilst the majority of LPG production is exported to Japan, other export destinations included China, South Korea and Lebanon.

World Oil Market Outlook

At the time of writing (West Texas - intermediate) oil was trading at around US\$23 per barrel (5 October 1999). This is largely due to the market's continued interpretation that the OPEC instigated supply cuts are being adhered to, with between 80% to 85% compliance by member countries. Nonetheless, international oil markets remain concerned that some members of the OPEC cartel will breach their respective quotas thus driving down the oil price. Based on past experiences it is plausible that once oil prices firm above US\$20 per barrel that some OPEC members will "cheat" by selling crude oil in excess of their allocated quotas.



In light of the OPEC supply restrictions and projected stronger demand for crude oil over 1999 and 2000, it is estimated that the oil price will average between US\$18-US\$19 per barrel for 1999-2000 before falling to US\$17 per barrel in 2000-01. In the longer term it is unlikely that OPEC can maintain its quotas to support oil prices at current levels. High crude oil prices will also increase the likelihood of increased production from non-OPEC cartel members. Non-OPEC cartel members currently account for around half of the world's oil production.

According to ABARE (September 1999) world oil production is estimated to be maintained at its 1997-98 level of around 74.9 million barrels per day (mbd) in 1998-99, rising to 75.5 mbd in 1999-00. Consumption is estimated to have risen by 1% in 1998-99 to 74.8 mbd with another rise of 1.7% to 76.1 mbd forecast for 1999-00.

State Outlook

Given the recent strength of the oil price, the continuation of the Asian economic recovery and the upbeat outlook for the world economy, Western Australia's petroleum industry is poised to undergo a period of continued growth and development.

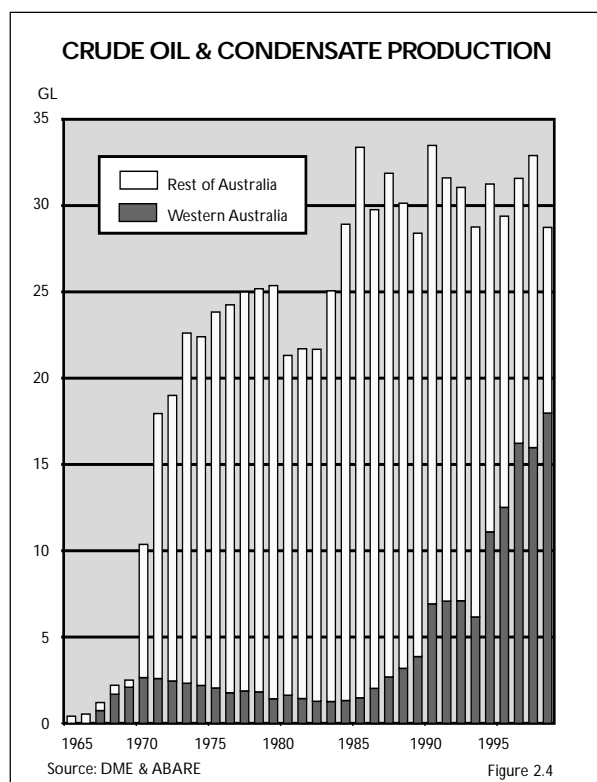
This was highlighted with the visit to Australia of China's President Jiang Zemin in September 1999. The visit focused mainly on the strengthening of commercial interests with the signing of five memorandums of understanding. The most significant were the negotiations over the possible sale of LNG to China, with potential sales commencing at 3 million tonnes of LNG a year from about 2004. This could be worth up to \$15 billion over 20 years.

Depending on the degree to which China decides to utilise LNG for power generation there is potential for sales to escalate to \$50 billion over 10 years. The State's Premier has indicated that this scenario would require investment in the LNG industry of around \$16 billion. It would provide the requisite impetus for the proposed expansion of the North West Shelf LNG project and the development of the Gorgon LNG project.

In 1998-99 Australia LNG was set up to market LNG from the North West Shelf Gas Project. It is a Perth-based consortium of BHP Petroleum, BP-Amoco, Shell, Chevron, Woodside and MIMI. At the time of writing the consortium was in the process of putting together a tender to supply a new Taiwanese power station. The contract would be for the supply of 1.8 million tonnes of LNG per year, worth up to \$9 billion over 20 years. In addition it is also examining the scope for supplying the burgeoning Chinese LNG market. If the consortium is able to secure any of these contracts the go-ahead for expanding the existing North West Shelf LNG project is likely. Currently expansion plans totalling \$7.8 billion are under consideration. If proceeded with a fourth and fifth train will be added to the existing LNG project.

The \$8 billion Gorgon project could also proceed if attempts by its partners - Texaco, Chevron, Mobil and Shell - to secure long-term contracts with large industrial gas customers within Western Australia succeed. Potential customers include Dow-Shell's \$3 billion Pilbara petrochemical plant, which is currently under consideration. The Gorgon partners have indicated however that they will still continue their efforts to secure long-term LNG customers from Korea, China and other parts of Asia. Significantly, on 23 September 1999 BP-Amoco acquired a 12.5% stake in the project.

Current forecasts indicate that crude oil production could decline after 2002 unless new fields are



discovered and/or come into production. Nonetheless, maintaining self-sufficiency in crude oil production has received a boost with Woodside's announcement in early October 1999 that it would proceed with development plans for the Legendre oilfields located in the North West Shelf area. The \$110 million project is expected to come on stream in 2001, with initial production commencing at 40,000 barrels per day. The project life is five to eight years. In addition to Legendre, Woodside's \$1.3 billion development of the Laminaria/Corrallina oil fields is proceeding on schedule. Production is anticipated at 170,000 barrels per day with the project coming on stream in late 1999.

With the availability of significant resources, Western Australia's gas production is dictated to a large extent by domestic demand in the power generation sector. The gas sector is anticipated to grow strongly over the next 10 years due to rising gas demand by the industrial sector.

In relation to the chemical sector, of particular relevance was the announcement by the State Government on 10 June 1998 that the Dow Chemical Company and Shell Chemicals Limited had won the right to develop proposals for the construction of a \$3 billion integrated petrochemical plant either on the Burrup Peninsula or Maitland industrial estate near Karratha. The consortium is currently assessing the feasibility of the project, including its infrastructure requirements.

2.3 Iron Ore

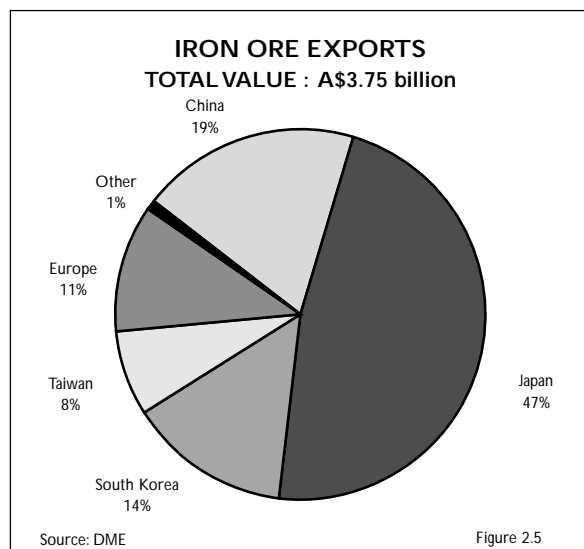
Iron ore production in 1998-99 decreased by nearly 6% to 141 million tonnes. However, its value of production increased by less than 1% to \$3.96 billion. This result was due to a combination of higher prices attained at a previous round of negotiations with the Japanese in early 1998 and the depreciated Australian dollar. The lower volume was mainly due to unseasonable wet weather in the Pilbara.

Iron ore is the State's most important export, by value, worth \$3.75 billion in 1998-99 or 26% of Western Australia's total mineral and petroleum exports. On a global scale, Western Australia is the world's third largest producer after China and Brazil. Almost all (i.e. 95%) of Western Australia's iron ore production was exported overseas, with 47% (by value) going to Japan, followed by China (19%) and South Korea (14%). Overall, Western Australia maintained its position as the world's largest iron ore exporter representing around 34% of the world's seaborne trade.

Western Australia accounts for approximately 98% of Australia's iron ore production.

1998-99 Iron Ore Industry Highlights

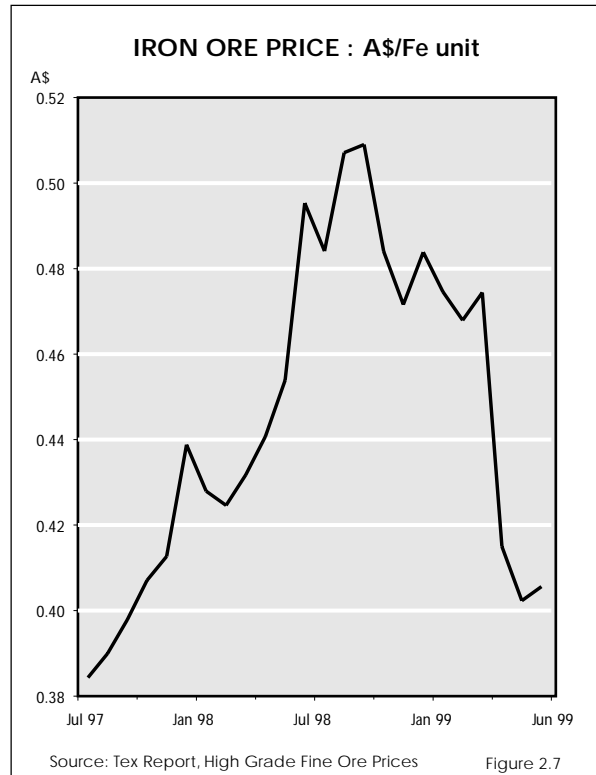
The 8% devaluation of the AS relative to the US\$ during 1998-99 was the most significant contributor to the slight increased value of production. For the Japanese fiscal year (JFY) (April 1998 to March 1999), BHP and Hamersley Iron both obtained a 2.9% and 2.8% increase in their US\$ lump and fine ore price respectively, while Robe River secured a 1.4% increase for its fine ore.



However, subsequent negotiations in 1999, saw the State's three major producers accept lower US\$ prices for 1999-00. BHP and Hamersley received an 11% and 10% cut in the price received for lump ore and fine ore respectively. North Limited's Robe River operations accepted a 13% cut due to its poorer quality product.

Due to a flat world steel and pig-iron market in the first half of 1998-99 iron ore markets began to come under increasing downward pressure. The price settlement discussed above underscore iron ore producers' recognition of extremely tough conditions facing the steel makers at the time of the negotiations. The State's iron ore producers anticipated the price cuts because iron ore prices are mainly determined on the basis of events occurring in the previous twelve months.

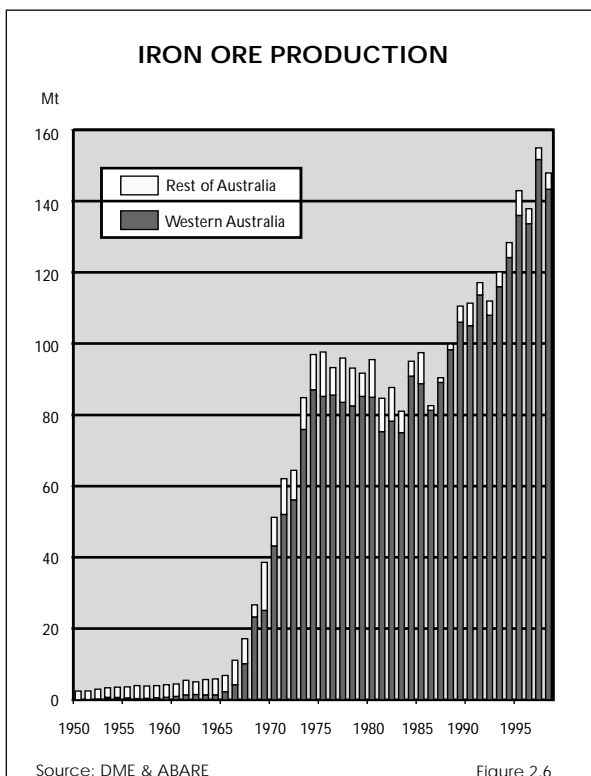
In the last half of 1998-99 BHP and Rio Tinto confirmed that discussions had taken place between the two parties concerning the possibility of a joint venture of their respective iron ore operations. The combined entity would, if proceeded with, produce an estimated 120 million tonnes of ore per annum. However, discussions for the \$14 billion merger project collapsed due mainly to disagreement between the two companies on the value to be ascribed to Hamersley's Pilbara iron ore assets.



On the local scene, one of the most significant developments in the State's iron ore industry was the completion of Hamersley Iron's \$700 million Yandicoogina (HiYandi) iron ore project. The mine is located approximately 90kilometres north-west of Newman. Hamersley commenced mining at HiYandi in August 1998 with the first shipment being loaded in January 1999. At full production the mine will produce up to 15 million tonnes per annum of sinter fines material.

Development of HiYandi also involved improving and expanding Hamersley's Dampier port facilities and to increase its capacity by some 10 million tonnes per annum. The expansion entailed maximising utilisation of existing equipment and infrastructure, installation of new equipment, construction of a lay-by berth at East Intercourse Island and dredging of loading basins at Parker Point. A railway line linking HiYandi to existing rail facilities was also constructed.

Another significant development was the commissioning of BHP's \$2.45 billion HBI iron ore processing project at Port Hedland. This is the first project of its type in Australia and represents one of the most significant value-adding projects ever undertaken in Western Australia's resources industry. The plant has a design capacity of up to 2.5 million



tonnes, worth about \$400 million, of HBI product per annum. The HBI product is a much sought after feedstock for electric arc furnaces. HBI is worth about US\$105 per tonne compared with US\$18 per tonne for iron ore fines and US\$23 per tonne for lump ore. The first shipment of briquettes left Finucane Island, Port Hedland on May 1999 bound for South Korea. The statistics in this Digest do not include production details or the value of HBI produced in 1998-99.

Internationally, analysts observed that the recession in Japan, Brazil and Russia resulted in record levels of steel imports into the United States in 1998-99. The European Union, which is normally a significant steel exporter, also became a net importer during this period. This was due to Asian countries with additional steel capacity being forced to turn to the world market after their own domestic consumption collapsed.

Outlook

World steel production is forecast to increase in the latter half of 1999 and into 2000, largely due to an expected strengthening in world economic conditions, with the ongoing Asian recovery a critical factor. However, despite rising steel output in late 1999, aggregate production for the year as a whole is still

forecast to be slightly less than in 1998. Steel consumption on the other hand is anticipated to increase in 2000, largely driven by an acceleration in world industrial activity.

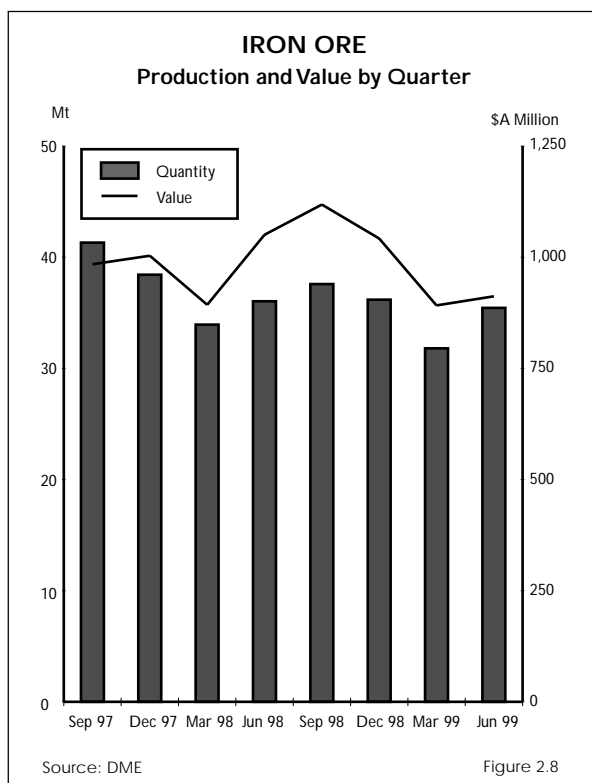
Despite the improving outlook for world steel consumption and production over the next year and a half, significant differences remain between the outlook for major steel producing regions. In addition, the distribution of world steel production and trade in the next year is expected to be affected by antidumping cases in the United States. Any restriction on access to the US market is expected to have significant ramifications for steel production in Russia and Japan.

Domestic demand for steel in Japan is expected to remain flat throughout 1999, due mainly to a subdued outlook in the manufacturing and construction sectors. However, a moderate increase in domestic demand is expected in 2000 because strengthening of industrial activity in Asia should lead to an overall increase in demand for Japanese steel. Tentative signs have also emerged that improved market conditions will also result in increased steel production from South Korea, China and Taiwan in 2000.

Steel exports from Russia are expected to fall as a result of declining domestic demand and export markets. Russia is also expected to bear the burden of the protectionist steel trade measures of the United States. As a result steel production in Russia and Eastern Europe is expected to contract.

Analysts are forecasting the world's seaborne trade of iron ore to increase by an estimated 3% to 430 million tonnes in 2000. As the outlook for steel production in Asia is picking up, Western Australian suppliers of iron ore are expected to account for the majority of the expected increase in iron ore trade in 2000. Overall, iron ore exports from Western Australia are expected to increase by approximately 8% to 145 million tonnes in 1999-2000. The improving world environment for steel will most likely translate into a better bargaining position for the State's iron ore producers at the next round of price negotiations with Japanese buyers, scheduled for the first quarter of 2000.

Global economic developments, particularly in Asia, have nevertheless forced a more critical consideration



of new iron ore projects and in particular, the move towards downstream processing. A plethora of new iron ore projects remain "under consideration" for development. However, the prospects for the development of Robe River's \$1 billion West Angelas project were boosted in late September 1999 with the expectation that letters of intent for iron ore supply could be signed by the end of the 1999 year.

2.4 Gold

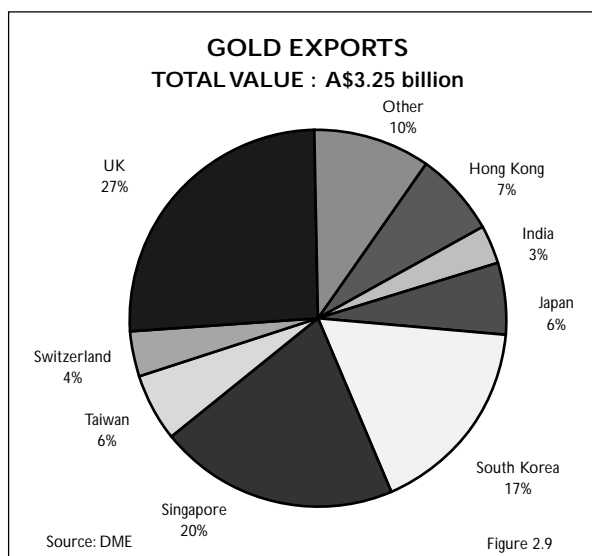
Negative market sentiment surrounding gold continued throughout 1998-99. This resulted in the industry continuing its moves to rationalise and amalgamate its operations as a means to reduce costs.

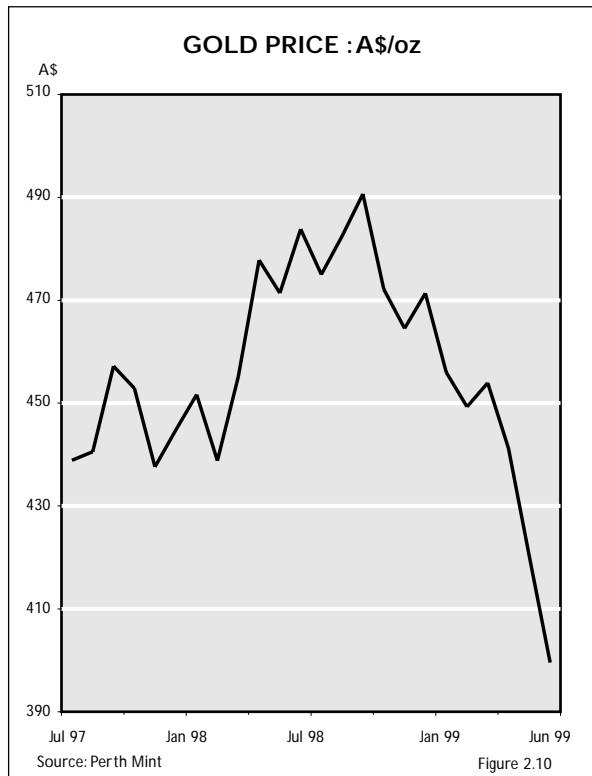
The State's overall gold output dropped during 1998-99 by around 8% to just under 221 tonnes. The overwhelming factors responsible for lower production were interruptions and damage caused by Cyclone Vance in March 1999 and closure of some projects due to depleted reserves and/or high operating costs. Overall the value of production fell by just over 6.5% to \$3.24 billion.

The international gold price averaged US\$286 per oz in 1998-99. This was down 7% on the previous year and, more notably, was 21% lower than its 1996-97 average price of US\$364 per ounce. As a result of the A\$ depreciating by 8% in 1998-99, the A\$ average gold price increased marginally to A\$456 per ounce, up from A\$454 per ounce in 1997-98.

In 1998-99 the State's gold exports amounted to A\$3.25 billion. This exceeded the value of production because previously stockpiled refined gold stocks were included in exports. Predominant gold export markets were the UK (27%), Singapore (20%) and South Korea (17%).

Western Australia accounts for around three-quarters of Australia's gold production.





1998-99 Gold Industry Highlights

Around 51% of Western Australia's gold output in 1998-99 was accounted for by the following 10 projects:

- Golden Mile (Normandy, Homestake) – 22.1 tonnes;
- Granny Smith (Placer, Delta) – 16.1 tonnes;
- St Ives (WMC) – 12.8 tonnes;
- Jundee – Nimary (Great Central Mines) – 11.5 tonnes;
- Telfer (Newcrest) – 10.9 tonnes;
- Kanowna Belle (North, Delta) – 9.4 tonnes;
- Bronzewing (Great Central Mines) – 8.5 tonnes;
- Plutonic (Homestake) – 7.5 tonnes;
- Boddington (Newcrest, Normandy, Arcacia) – 7.5 tonnes; and
- Tarmoola (Pacmin Mining) – 6.1 tonnes.

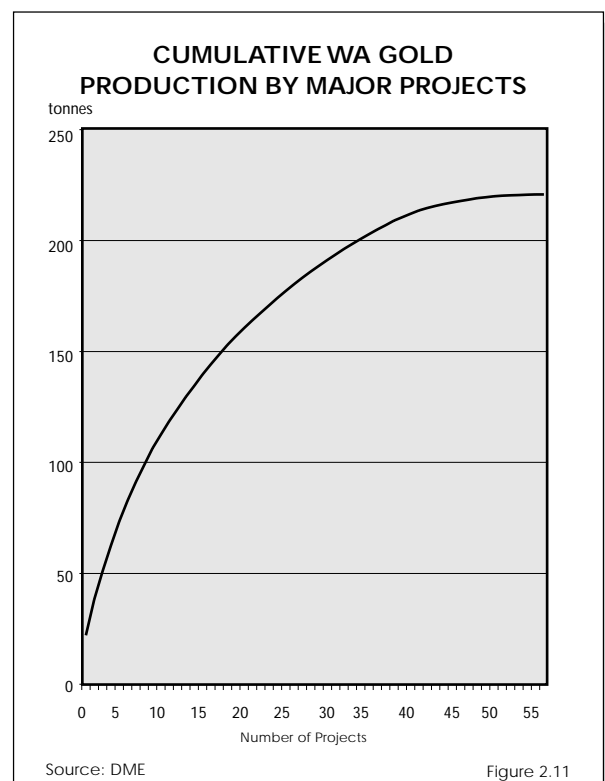
Over the last two years low US\$ gold prices have inevitably seen the gold mining industry in Western Australia undergo some rationalisation. This has manifested itself through tenement and lease rationalisation, closures and consolidation of operations, improvement to plant efficiencies and

processing capabilities and also expansion of some mining companies via corporate takeovers and acquisitions. These strategies were aimed at improving economies of scale in an effort by the industry to reduce costs.

As an illustration cash operating costs at the Tarmoola gold mine were reduced by 26% in 1998-99. These cost reductions in part contributed to lowering the cut-off grade of ore considered viable to mine. In total production rose by 45% and this led to the mine becoming one of the State's largest gold projects in 1998-99.

Takeover activity has seen an increased presence of overseas gold mining companies in the State's gold industry. This has been aided by the weakness in the A\$ over the last eighteen months, which has acted to increase the attractiveness of local gold companies to overseas buyers.

Takeovers and amalgamations also extended to the gold refining business. In October 1998 the Western Australian Government's Gold Corporation (GoldCorp) and Golden West Refining Corporation reached an agreement to establish one of Australia's largest refiners of gold and silver. The new joint venture company, with headquarters in Perth utilises



all the assets of Golden West and the Indonesian, Thai, Hong Kong and Australian assets of GoldCorp, with the exception of its coin and minting business.

On a national scale, the low gold price motivated the Australian gold industry in October 1998 to band together to form the Australian Gold Council (AGC). The Council's aim is to raise the profile of the gold industry on the national and international stages. It also plans to facilitate research into the economic and social contribution of the gold industry, address specific tax issues, produce publications, generate education initiatives and lobby the ASX to develop a world class gold index.

On the exploration front, poor international gold prices were the primary catalyst for a 28% fall in the State's gold exploration expenditure in 1998-99. Over the last two years, poor US\$ gold prices have resulted in the State's gold exploration expenditure falling from a peak of \$531 million in 1996-97 to its current level of \$331 million in 1998-99.

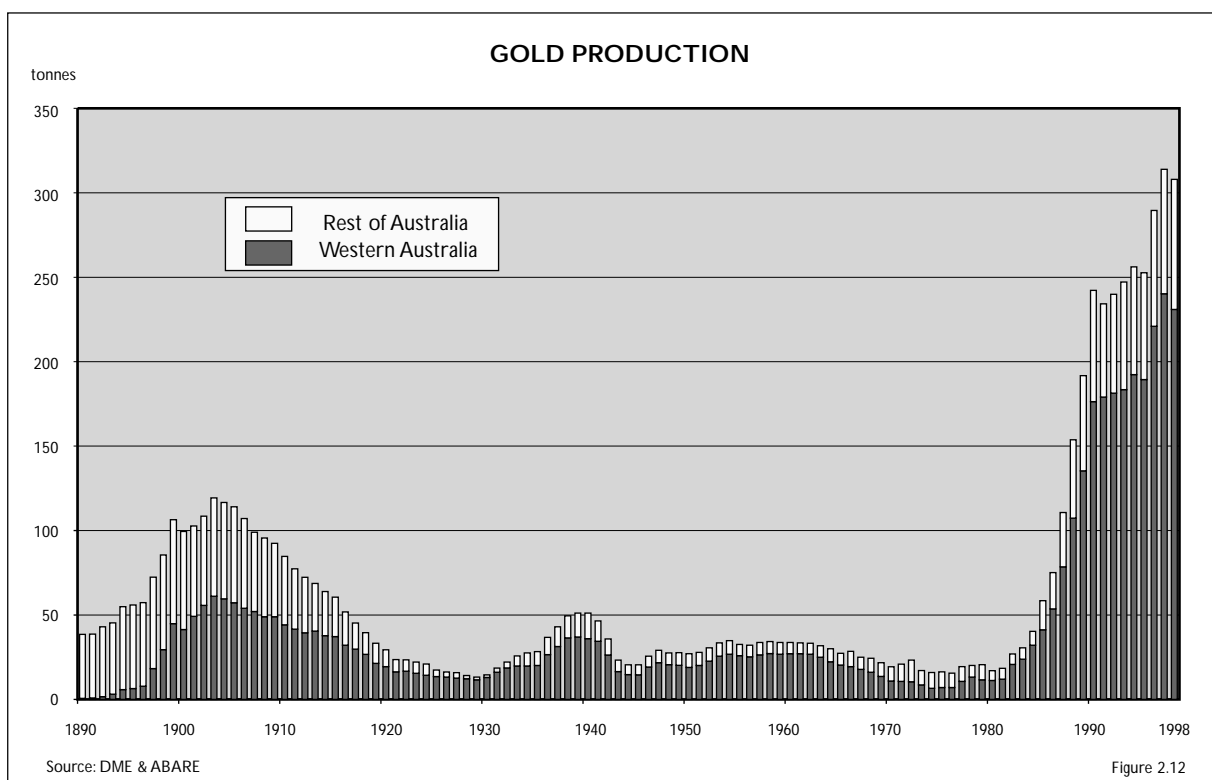
World Gold Market

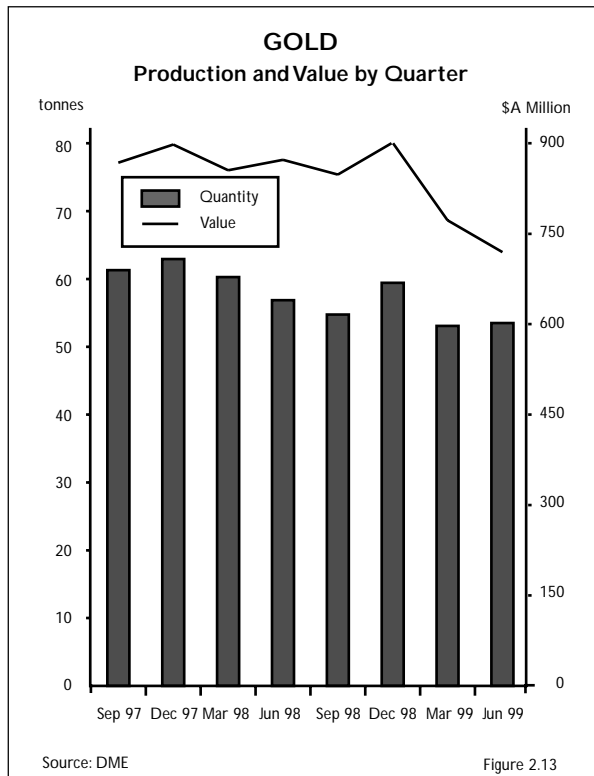
In 1998-99 the world's mine production of gold totalled 2,560 tonnes compared to demand of 3,900 tonnes. However, the supply shortfall was covered by sales of gold stocks held by private investors and, most

notably, central banks. Central banks' sales, and in particular the threat of these continuing at potentially high levels, has substantially dampened the international gold market over the last two years.

In 1998 aboveground world gold stocks held by the banking sector totalled around 30,000 tonnes. Of this about 12,000 tonnes are held by the member nations of the European Central Bank while USA banks hold another 8,000 tonnes. At the 1998-99 fabrication consumption rate of 3,900 tonnes, gold stocks held by the banking sector equate to eight years supply. This over-hang in supply is unique to gold in the commodity market and is increasingly being questioned by potential investors.

Over 1998-99 the general consensus among analysts was that member nations of the European Central Bank had gold reserves in excess of their requirements. This view gained impetus when the Bank of England announced in May 1999 its intention to sell by auction 415 tonnes of gold over the medium term. The Bank stated that it would sell 25 tonnes of gold every two months with the first sale taking place on 6 July 1999. When the announcement was made gold was trading at around US\$285 per ounce. The Bank's decision resulted in the gold price falling to a twenty-year low of US\$253 per ounce on 25 August 1999.





The Bank of England's decision had confirmed the perception within the international gold market that the European banks were beginning a strategy to divest themselves of gold. Prior to this considerable uncertainty had already existed within the gold market by the proposed sale of half, or about 1,300 tonnes, of the gold stocks held by the Swiss National Bank over the next 10 years. In addition the IMF had also proposed to sell around 300 tonnes of gold as a means to fund its debt relief commitment to those countries which qualify under its Heavily Indebted Poor Countries (HIPC) program.

Over 1998-99 the international gold market had been seeking a direction from, in particular, the European Central Bank as to the monetary role of gold within the central banks of member nations. Analysts believed that such a statement would provide the market a clear direction on gold's growth prospects, thus removing the main hurdle that had shadowed the market over the last two years. No such statement was made in 1998-99.

Outlook

In late September 1999 the international gold market was provided the requisite information that it had been seeking to restore confidence. Wim Duisenberg, president of the European Central Bank, stated that in

total the central banks of Western Europe would limit gold sales to 400 tonnes per annum for the next five years. The 400 tonne per annum limit would include the proposed Swiss gold sales and the remainder of those gold sales announced by the Bank of England in May 1999 which had yet to be sold. In addition he indicated that European Union member nations would not increase gold lending and derivative operations above current levels.

In early September 1999 the IMF also announced that it intended to fund its commitment to fulfilling its obligations under its HIPC program by selling gold to those countries meeting their scheduled debt repayments (such as Brazil and South Korea) and to then buy that gold back at market prices. The proceeds will be channelled to the HIPC program. Effectively these IMF gold sales will not enter the market place. Potentially the reasoning behind this IMF strategy is to increase the book value of that gold from US\$35 per ounce, being its purchase price under the Bretton Woods monetary system, to a price that reflects market value.

As a result of these key international statements the US\$ price of gold rose significantly in late September/early October 1999 with the price peaking at around US\$330 per ounce on 4 October 1999. This was its highest level since the latter half of 1997. Since then the US\$ gold price has settled at around US\$300 per ounce in late October 1999.

If the European central banks and IMF hold to these commitments the gold price is most likely to average around US\$300 per ounce for most of 1999-00. ABARE (September 1999) has estimated world mine production of gold at around 2,565 tonnes compared to demand of 4,150 tonnes for 1990-00. As a result there is ample scope for the market to absorb the proposed gold sales of the European central banks and the IMF without hindering the recovery in the gold price.

On the other hand the higher gold price could lead to central banks outside the European Union selling gold onto the market. It could also result in banks within the European Union taking advantage of the higher price and selling more gold onto the market.

On the local scene it is estimated that the State's gold output will remain at around its 1998-99 level in 1999-00.

Nationally ABARE has also forecast that Australia's gold production will remain at around its 1998-99 level in 1999-00.

In terms of State gold exploration expenditures these are dependent on the September 1999 commitments of the European central banks and the IMF coming to fruition. If US\$ gold prices remain buoyant (i.e. at or over US\$300 per ounce) in the December 1999 and March 2000 quarters then the likelihood is that the State's gold exploration expenditures will strengthen in the second half of 2000.

2.5 Alumina

Western Australia's alumina output increased by 4% in 1998-99 to achieve a new record of around 8.9 million tonnes. The value of this production in 1998-99 was a record \$2,367 million, a 5% increase on the previous financial year. Given lower US\$ alumina prices, the increase in value of production emanated from devaluation of the Australian currency over 1998-99 and higher export volumes.

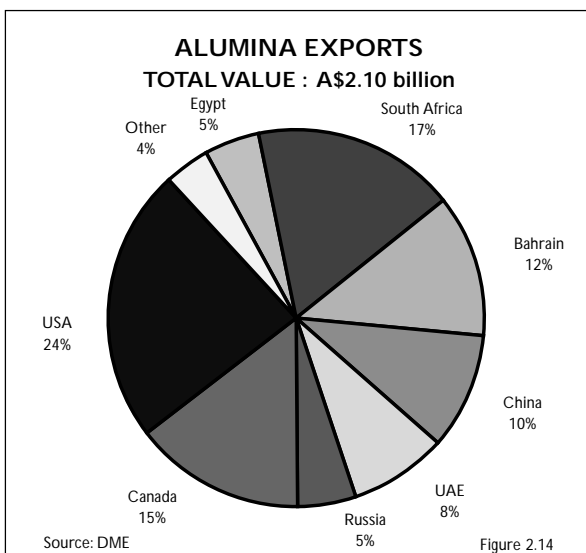
Over 88% of the State's alumina production was exported overseas. The main export destination was USA (24%), with other significant destinations being South Africa (17%), Canada (15%), Bahrain (12%) and China (10%).

Western Australia accounted for 63% of Australia's alumina production in 1998-99.

1998-99 Alumina Industry Highlights

The world alumina spot price averaged US\$166 per tonne in 1998-99. This was 12% down on the previous financial year reflecting weak demand for aluminium in Asia and reduced demand for alumina in light of production problems besetting numerous aluminium producers.

Asian demand has been very weak, due to sharply lower economic activity in a number of countries in the region. The price trend therefore reflected an underlying aluminium market surplus, as production increased faster than consumption. The beginning of 1999 in particular saw a depressed aluminium

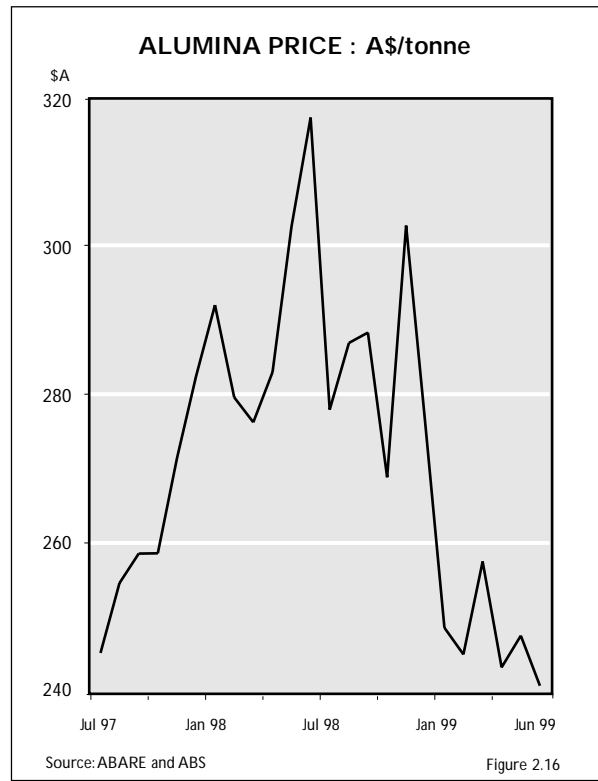


market, with oversupply of up to 500,000 tonnes and the lowest prices since the recession of the early 1990s. Overall, average LME aluminium prices declined by 15% to US\$1,277 per tonne in 1998-99, compared with US\$1,511 per tonne in 1997-98.

Weak Asian aluminium demand was however, partially offset by moderate to strong growth in aluminium demand in the United States and some European countries.

In analysing alumina demand, an important factor to consider is the growing importance of secondary aluminium as demonstrated by the fact that, it has grown in size from 27% of primary aluminium in 1988 to 34% in 1997. This has followed a trend of annual average growth of 5% over the past decade in the secondary aluminium market. The recycling of aluminium has become more widespread due to both environmental pressures and its low production cost relative to production of primary aluminium. Analysts point out that the increase in secondary production has reduced the rate at which new primary smelter capacity has been required.

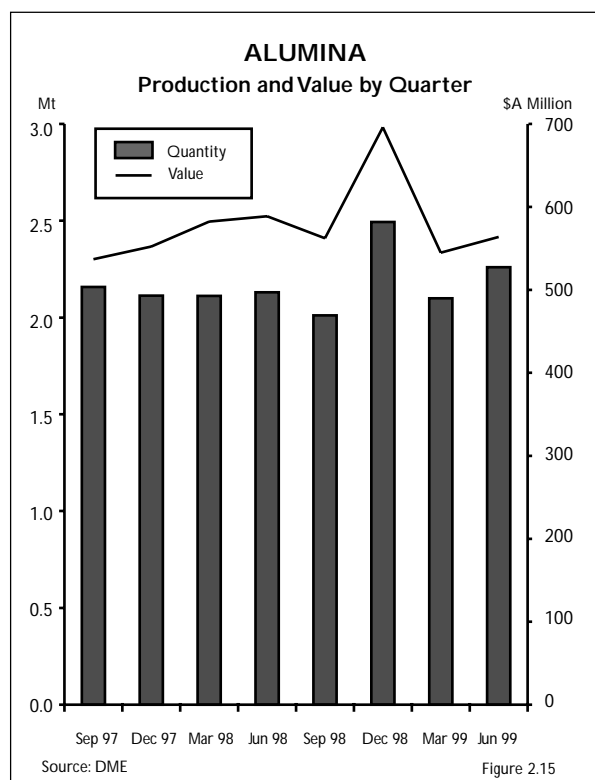
In 1998-99 work on the Worsley alumina refinery expansion project continued. By 30 June 1999 the engineering component of the project was about 98% finished with the construction phase about 46%



complete. This is the largest resource development project in the State's South-West region for over a decade. Completion of the Worsley refinery is forecast to increase alumina production from the present level of 1.8 million tonnes per year to 3.1 million tonnes per annum by the first half of 2000. Worsley also expects to reduce its operating costs by at least 10% to US\$92 per tonne thereby entrenching its position as one of the world's lowest cost alumina producers.

The State's other alumina producer, Alcoa, has completed work on its \$258 million Wagerup refinery expansion. The Wagerup refinery previously had a production capacity of 1.75 million tonnes a year and following the expansion capacity increased to 2.19 million tonnes per year. The expansion is the first stage of an overall program to enhance the Wagerup refinery's capacity to 3.3 million tonnes per annum. Alcoa's other two refineries in Western Australia are Pinjarra and Kwinana (capacity of 3.1 and 1.9 million tonnes respectively).

However, 1998-99 saw the final year of mining at Alcoa's Jarrahdale operation due to an exhaustion of economic reserves. Started in 1963, Jarrahdale was the oldest bauxite mine operated by Alcoa in Western Australia. It is planned that Alcoa's Huntly mine east of Pinjarra will be expanded to become a



20 million tonne per annum operation effectively absorbing Jarrahdale's output of 7 million tonnes per annum.

In other developments, Alichem continued work on its plans to establish Australia's first aluminium fluoride plant in Kwinana. A feasibility study for processing alumina hydrate to produce 40,000 tonnes per annum of aluminium fluoride has been completed. Alichem has been granted environmental approval for the project. Aluminium fluoride is an input into the production process for aluminium.

Outlook

The demand for bauxite and alumina is largely dependent on trends in the aluminium sector, as around 80% of bauxite and over 90% of alumina is ultimately consumed in the production of primary aluminium metal. Aluminium prices hit a six-year low in March 1999 but have rallied strongly since the alumina market was shocked into life in June 1999, when the massive 1 million tonne a year, Kaiser Aluminium Gramercy alumina refinery in the United States exploded. Aluminium prices have also been boosted by a general improvement in world and Asian economic conditions over 1999. Analysts have forecast that aluminium prices will rise to between US\$1,400 and US\$1,500 per tonne in 2000 and to between US\$1,450 and US\$1,550 per tonne in 2001. The outlook for the global alumina and aluminium industry is therefore positive in the short term.

In 1999-00 aluminium production and consumption are estimated to be relatively aligned at around 23 million tonnes.

In the medium term there remains some doubt as to whether both current and planned capacity will be able to keep pace with demand after 2001. Primary aluminium consumption has been forecast to rise more rapidly in the early years of the next decade, with growth averaging between 2% and 4% per year between 2000 and 2005. Nevertheless, there is estimated to be enough idle capacity, which could be started up relatively quickly, to produce another 600,000 tonnes of aluminium a year worldwide. However, this is a relatively high-cost operating capacity that had become dormant when aluminium prices fell markedly in 1998-99.

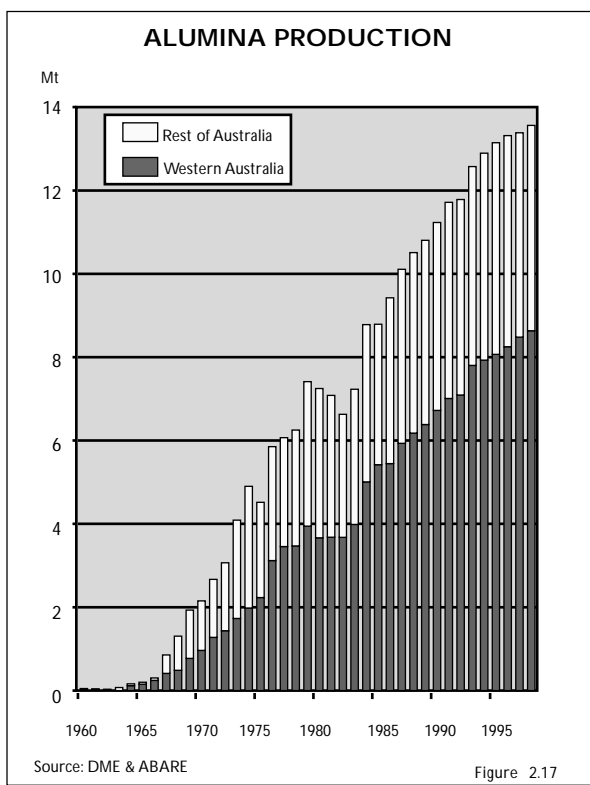
Aluminium production capacity has nonetheless improved with Australia, Iceland, Iran and China together adding almost 300,000 tonnes of (relatively low cost) new capacity in 1998-99. Another 750,000 tonnes are set to come on stream in China, Russia,

Iran Argentina and Dubai by the end of 2000.

In the global aluminium industry existing producers are currently jostling to merge their operations worldwide to take advantage of possible cost savings that could be promised by stronger aluminium markets. One of the two significant proposed mergers consists of Alcan Aluminium Ltd, Pechiney SA and Alusisse Lonza Group AG. This is a three-way merger aimed at creating the world's largest aluminium group with a combined 1998-99 revenue of around US\$17 billion. If proceeded with the new group will be called APA.

The second significant merger entails Alcoa's American parent company's US\$5.7 billion bid for rival US-based and global producer Reynolds Metals. The merger with Reynolds will deliver a 56% stake in Western Australia's recently expanded Worsley alumina refinery. When combined with Alcoa's other State alumina interests this would result in the proposed merger accounting for an estimated 63% of Australia's alumina production.

The two global mergers would result in the companies together controlling 30% of the world's aluminium metal production and over 50% of the world's alumina production and would constitute a dramatic change in make-up of the world's alumina industry. Anti-trust and competition regulators of the United States, Europe and Australia have not yet determined whether they will allow these mergers to proceed.



2.6 Nickel

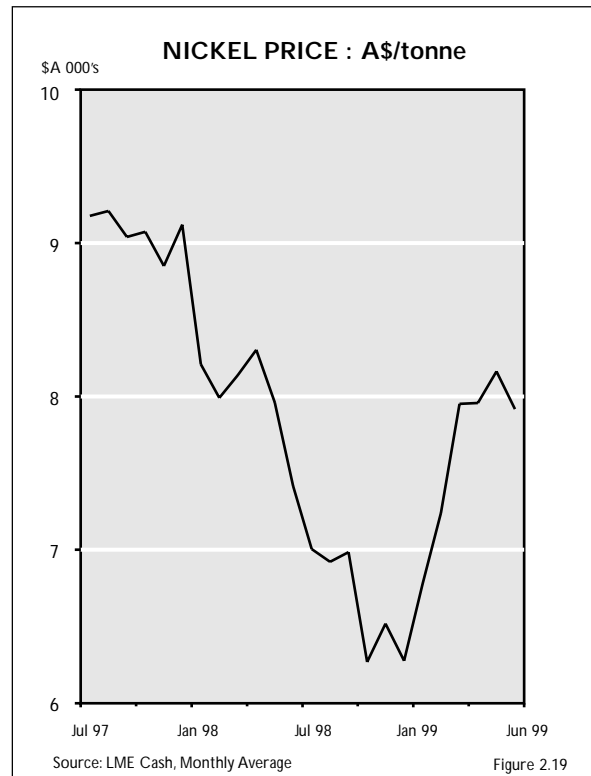
After 6 years of growth Western Australia's output of contained nickel metal was down by 7% to around 126,000 tonnes in 1998-99. In total poor world nickel prices and lower output caused the value of Western Australia's production to fall by 24% to \$876 million.

Western Australia accounted for around 97% of Australia's nickel production. Over 90% of the State's nickel production was exported overseas with the main export destinations being Europe (53%) and Japan (18%).

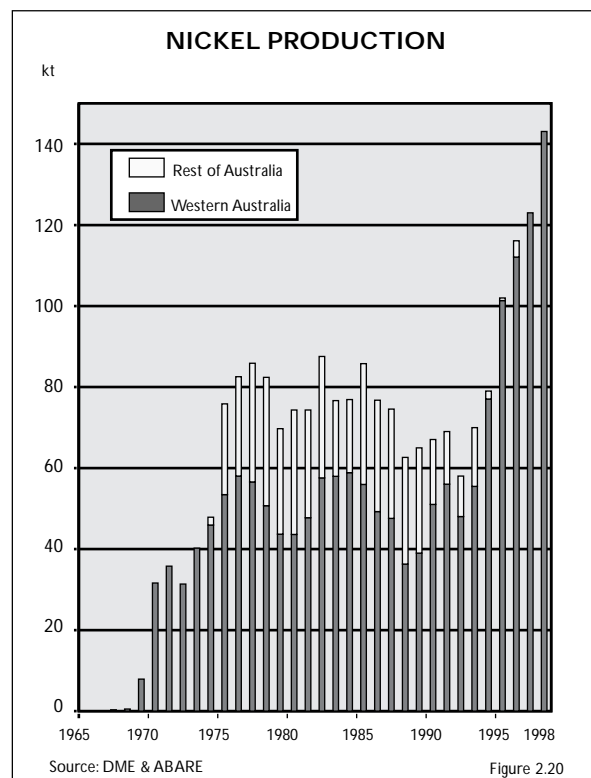
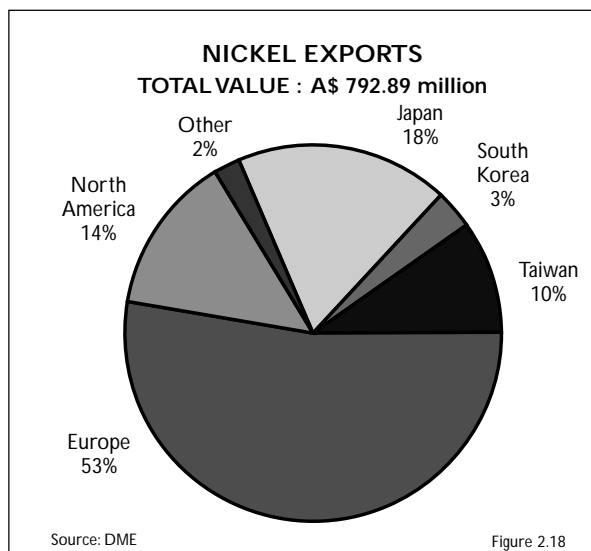
1998-99 Nickel Industry Highlights

The world's nickel industry experienced a fall in prices for the third consecutive year. The drop in price in 1998-99 again centred from concerns about the supply and demand imbalance in the industry. Since reaching a high of US\$8,130 per tonne (US\$3.69 per pound) in March 1997, the price of nickel has dropped considerably. By mid-December 1998, the LME nickel cash price was US\$3,725 per tonne (US\$1.69 per pound), down 54% from its March 1997 level. The December 1998 price was the lowest in 12 years and adjusted for inflation, the lowest on record. Overall, the world spot price averaged US\$4,507 per tonne (US\$2.04 per lb) in 1998-99, down 22% on 1997-98.

The nickel market has been in poor condition in recent years due to surplus stocks, lacklustre demand from stainless steel producers, the ready availability of nickel and steel scrap from Russia plus the imminent start up of new, low-cost nickel supplies, most of which will come from Western Australia.



International nickel producers responded to the record low prices by significantly reducing and restructuring the supply of nickel into the market. As a result nickel prices recovered in the first half of 1999. On 30 June 1999, the price of nickel had improved to US\$5,400 per tonne (US\$2.45 per pound).



Nickel prices have since firmed further, due to improving world economic conditions and the resulting increased demand for nickel, with the September 1999 price average being US\$7,031 per tonne (US\$3.19 per pound).

Western Australia's lower nickel output in 1998-99 was mainly due to WMC Nickel Operations reducing its nickel concentrate production at its Kambalda operations.

In September 1998, the significant fall in the price of nickel and the then poor outlook led WMC to announce the closure of three high-cost mines at its Kambalda nickel operation (Wannaway, Blair and Otter-Juan). These closures alone represent a cut in WMC's production of about 10,000 tonnes a year of contained metal, or approximately 10%. Further cutbacks in WMC's Kambalda operations were announced in March 1999 with the closure of the Long-Victor and Mariners underground mines. This cut another 10,000 tonnes of contained metal from WMC's output. These cuts left the Lanfranchi/Schmitz and Coronet sites as the last two producing nickel mines in WMC's Kambalda operations.

In addition, smelting operations at the Kalgoorlie Nickel Smelter were stopped in early January 1999 due to a furnace leak. Following an inspection it was

decided to bring forward the furnace reline. The decision to reline was based on safety and technical reliability. As a consequence of the furnace reline WMC's Mt Keith, Leinster, and Kambalda operations all took action to reduce, suspend or divert production of nickel. This is forecast to reduce WMC's contained metal production by 20% in 1999 to around 80,000 tonnes.

Due to the depletion of ore, in 1998-99 Outokumpu closed its Forrestania nickel mine. The processing plant will be moved to the company's Black Swan nickel mine, located 50 kilometres north-east of Kalgoorlie. In its seven-year mine life, Forrestania produced around 50,000 tonnes of contained nickel metal.

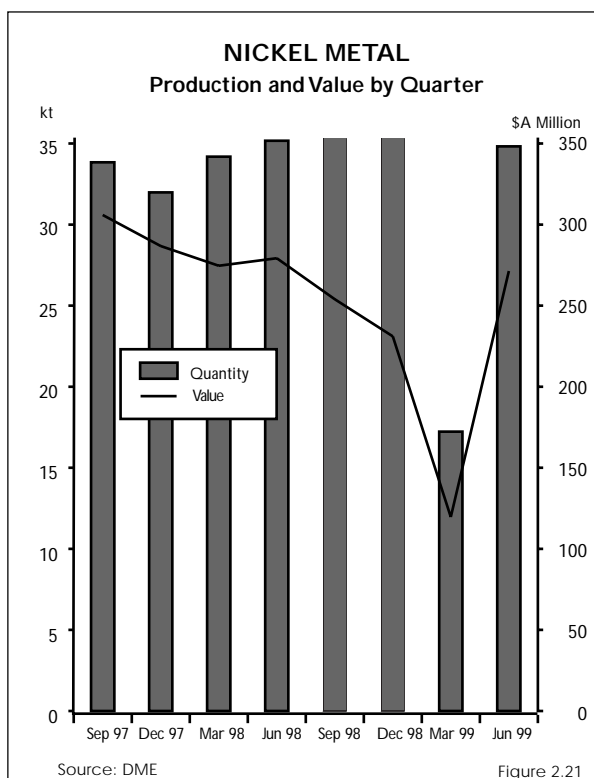
In other developments, Dominion Mining sold its dormant Yakabindie nickel project to North Ltd. Yakabindie is one of the world's largest undeveloped nickel projects and the sale to North included a licence for the use of the innovative activox processing technology.

A new project which added to output in 1998-99 was Black Swan Nickel's underground mine at Silver Swan, located near Kalgoorlie. The first full year's production from the project in 1998-99 saw it contribute 9,666 tonnes of contained nickel to the State's output.

Western Australia's three new lateritic nickel projects - Cawse, Bulong and Murrin Murrin all entered the final stages of commissioning in the first quarter of 1999. These projects which were previously all due to be commissioned in 1998 have experienced difficulties in the commissioning phases of their operations.

Centaur Mining's Cawse nickel project has been the first of the new operations to deliver product to the market. Notably, Cawse is the first plant worldwide to produce commercial quantities of nickel metal using an integrated process plant incorporating the pressure acid leach, solvent extraction and electro-winning process to treat lateritic ores. The Cawse operation has a designed annual capacity of around 9,000 tonnes of nickel metal and 2,000 tonnes of cobalt sulphide. Nickel production started in January 1999 with the first commercial shipment of nickel metal dispatched from the site in February 1999.

Preston Resource's Bulong operation is of similar size to Cawse with an annual capacity of 9,000 tonnes of nickel metal and around 1,000 tonnes of cobalt metal.



However, it produces nickel metal direct from high pressure acid leaching by hydrometallurgical processing without generating any intermediate solid phase – unlike Cawse and Murrin Murrin both of which require an intermediate solid product.

Anaconda Nickel's Murrin Murrin facility near Leonora is the largest of the new lateritic nickel operations. The construction of this project (i.e. Stage I) was completed in January 1999. It is expected that the plant will be running at maximum capacity by 2000, which will result in annual production of 45,000 tonnes of nickel metal and 3,000 tonnes of cobalt metal. This equates to 36% of the State's 1998-99 nickel output. The plant is designed to process 4.0 million tonnes of ore annually.

Anglo American has announced an interest in taking a 23% stake in Anaconda. At the time of publishing the Foreign Investment Review Board and Anaconda shareholders had not yet given approval. In addition, Glencore International is also interested in increasing its stake in Anaconda from its current level of 23%.

In Canada, Inco Limited and its subsidiary, Voisey's Bay Nickel Company Limited (VBNCL), remain committed to developing the huge nickel-copper-cobalt deposit in north-eastern Labrador. This project could account for around 10% of the world's nickel production. An impasse between Inco and the Provincial Governments of Newfoundland and Labrador over the scope of the project has delayed development. In addition Inco has also been reluctant to proceed with critical parts of the project until representatives of the aboriginal people in the region conclude their land claim negotiations with the Federal and Provincial Governments.

Outlook

In line with improving conditions in stainless steel markets, world nickel consumption is forecast to be around 1.1 million tonnes in 1999-00, up 4.3% on 1998-99. The strength of world demand for stainless steel, and hence nickel, will be primarily driven by Asia. In addition there is expected to be a recovery in steel output, and hence nickel demand, in the Asian region. ABARE has forecast that nickel metal consumption in China, South Korea and Taiwan will increase by 6%, to 190,000 tonnes, in 1999 and by a further 5%, to 200,000 tonnes, in 2000.

With the addition of new projects, Western Australia's output of nickel is set to rise significantly in the near

future. While the new laterite projects (Murrin Murrin, Cawse and Bulong) are likely to achieve throughput rates close to capacity in 2000 the resulting increase in the State's nickel product is expected to be absorbed into world nickel markets without any consequent adverse impacts on price. In effect the increase in the State's nickel production offsets the fall in production anticipated for some nickel producing countries. In Russia's case 1999-00 production cuts are compounded by forecast supply disruptions, as a result of an extreme northern winter, which from mid-October has frozen their shipping lanes due to build-up of pack ice.

According to ABARE world nickel production is anticipated to grow by 5.8% to 1.1 million tonnes in 1999-00. This equates to world demand. Favourable movements in the nickel price over the September 1999 quarter are anticipated to be maintained for the remainder of 1999-00. As a result various analysts have anticipated world nickel prices to average US\$6,500 per tonne in 1999-00, up from US\$4,507 in 1998-99.

In 1999-00 Western Australia's production of contained nickel metal is forecast to rise by around 25% to 160,000 tonnes. This reflects the commencement of production from the three new laterite nickel mines in Western Australia.

In the longer term, the State's production is also expected to be boosted if the proposed expansion of the new laterite projects and the development of additional new mines proceed. In the case of the Murrin Murrin project in particular, following the successful delineation of high grade ore at Murrin Murrin East, Anaconda Nickel Limited and Glencore International AG have committed to the expansion of the project (i.e. Stage II). Stage II will increase total capacity to 115,000 tonnes of nickel metal and 9,000 tonnes of cobalt metal per annum. This would result in Murrin Murrin becoming the second largest nickel operation in the world (the first being Canada's Sudbury nickel project) and entrench Western Australia's position as one of the world's largest nickel producing regions. It is expected that the expansion will be completed in late 2000. With Stage II total capital investment in Murrin Murrin will be over \$2 billion.

Also, the Cawse project is set for expansion. The Cawse Stage II Expansion timetable involves the completion of the pre-feasibility study by June 2000 and delivery

of a bankable feasibility study by June 2001. The production rates of the existing project are to be optimised as part of the pre-feasibility study. Based on operating experience and economies of scale, it is anticipated that, if proceeded with, there will be an autoclave throughput of approximately 4 million tonnes per annum producing over 45,000 tonnes per annum of nickel metal and at least 3,000 tonnes per annum of cobalt sulphide.

In terms of new projects, Jubilee Gold has secured financing for the construction and development of its \$52 million Cosmos nickel project, near Leinster. The costs of development for mining and construction of a nickel concentrator is estimated at \$38 million. Jubilee has an agreement to supply Inco Limited of Canada with about 30,000 tonnes of contained nickel over the current estimated three-year life of the Cosmos project. Mining is forecast to commence in the first half of 2000.

Also Comet Resources plans to develop a laterite nickel project about 35 kilometres from Ravensthorpe. The processing method will involve pressure acid-leaching of laterite ore at elevated temperatures and pressure. This will then be re-leached followed by solvent extraction and electro-winning to recover 25,000 tonne per annum of contained nickel. Cobalt will be precipitated at 1,900 tonne per annum of saleable sulphide product. Comet have negotiated an engineering procurement and construction (EPC) contract with Multiplex Constructions Pty Ltd for the engineering, construction, commissioning and ramp up of the project.

2.7 Heavy Mineral Sands

In 1998-99 the value of production for the State's heavy mineral sands industry contracted by 3% to \$646 million.

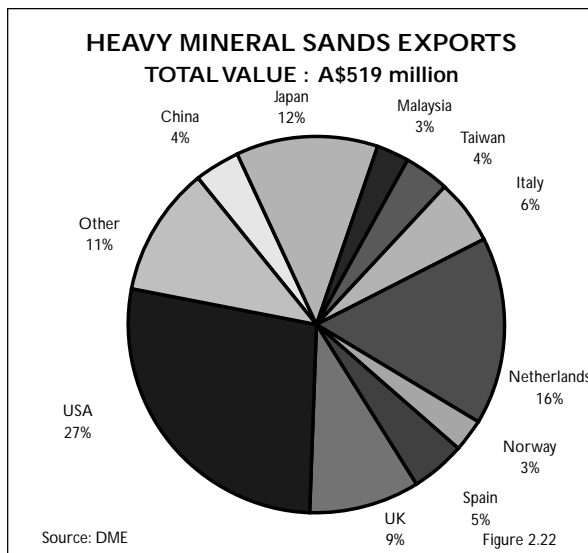
Around 80%, or \$519 million, of the State's mineral sands production was exported. The State's predominant export markets were the USA (27%), Netherlands (16%) and Japan (12%).

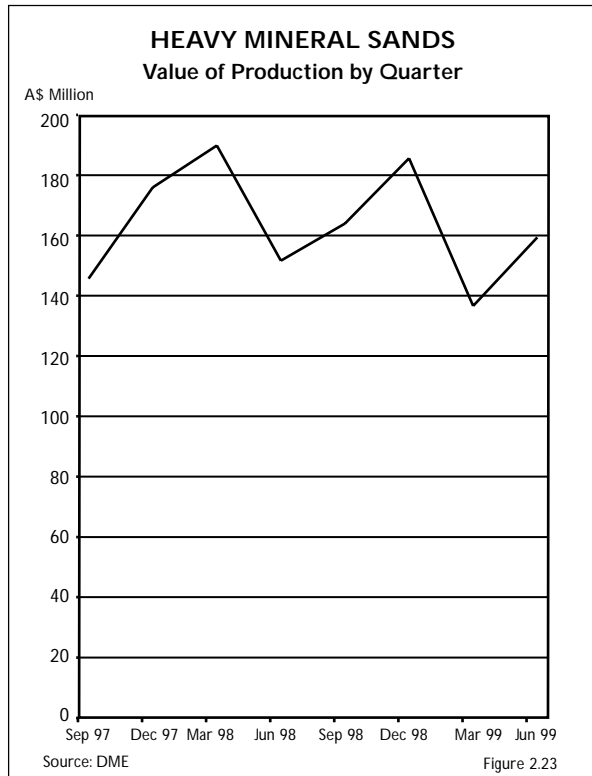
Western Australia continues to account for over half of the nation's mineral sands production.

1998-99 Heavy Mineral Sands Industry Highlights

The performance of the State's mineral sands industry sector was relatively mixed in 1998-99. The rutile sector performed well, increasing production by 15% to 120,000 tonnes, to achieve an increase in value by 16% to \$91 million. The production of ilmenite increased by less than 1%, but its value rose by 6% to \$159 million. This was due to average ilmenite prices (in Australian dollar terms) being up by 11% over 1997-98. All other sectors that make up the heavy mineral sands industry (i.e. garnet, leucosene, zircon and upgraded ilmenite) declined in both production and value terms in 1998-99.

Ilmenite is a major source of titanium dioxide pigments. Titanium dioxide pigments are mostly used to make paints and plastics, which are closely tied to the building and transportation sector. In 1998-99 the world market for heavy mineral sands was mixed. In Europe and USA, in particular, despite continuing growth in their economies their demand for mineral





sands products over 1998-99 remained static whilst Asian demand fell. Japanese pigment producers, in particular, have faced a slump in the construction, engineering and automobile production sectors, which has reduced demand. However in 1999-00 demand for titanium dioxide pigments is anticipated to strengthen in the Asian region whilst in Europe and the USA the market will remain tight.

In 1998-99 upgraded ilmenite output decreased by 34,000 tonnes or 7% to 433,000 tonnes. As a result of favourable contract prices received by producers, the value of this production was only slightly down by less than 1% to \$240 million. Despite the overall decrease in upgrade ilmenite production some increases in output did take place in specific operations such as Cable Sands' new Yarloop mining operation and Westralian Sands Capel mining operations. This is Westralian Sands second plant at North Capel and has more than doubled the company's upgraded ilmenite production.

The average AS price of rutile remained relatively unchanged in 1998-99, so based on a 15% rise in output, the value of the State's rutile output was up by 16% to \$91 million. Rutile is used as a natural feed stock for titanium metal production. Titanium metal products are used primarily because of their high strength-to-

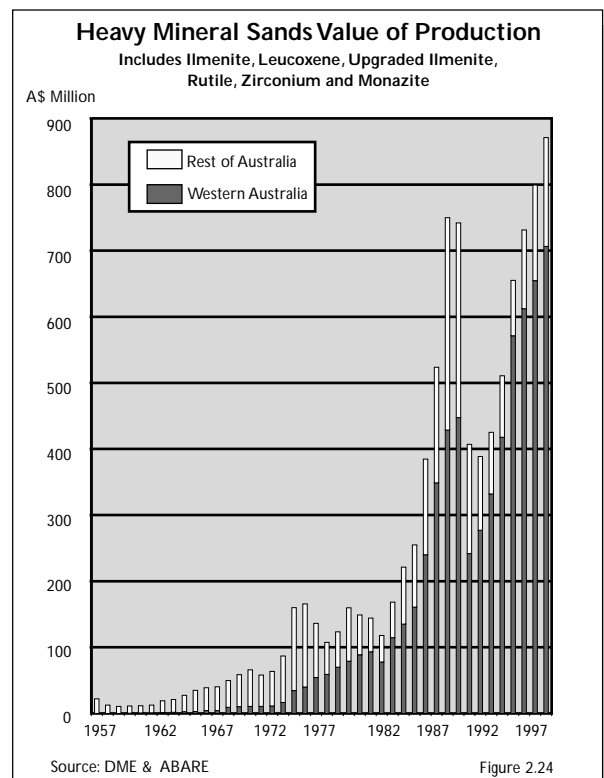
weight ratio and their corrosive resistance. Titanium metal demand fell in 1998-99 as a result of reduced aircraft and aerospace manufacturing in the USA and lower Asian demand.

In 1998-99 the State's leucoxene production decreased by 38% to 18,000 tonnes. With higher AS prices the value of this output decreased by 26% to \$8 million. Leucoxene is used in the production of fluxes for welding rods and as a metallurgical flux in iron and steel making.

In 1998-99 zircon production decreased by 12% to 285,000 tonnes. The average AS prices of zircon decreased by 12% in 1998-99, which combined with lower output, resulted in the value of the State's zircon output dropping by 20% to \$136 million. Increasing world supply of zircon from several international producers, particularly South Africa and the United States, combined with reduced demand from Asia was the primary catalyst for Australian producers receiving lower zircon prices in 1998-99.

Western Australia's heavy mineral sands industry underwent major consolidation in 1998-99, with the merger of RGC and Westralian Sands to create Iluka Resources.

Iluka Resources Limited will dominate the State's



mineral sands industry and in production terms is expected to rank amongst the world's largest producers accounting for approximately a third of the global titanium dioxide market. The merger brings not only increased market power but also a range of rationalisation measures aimed at reducing costs. Iluka plans to phase-out its high-cost dredge mining operations at Eneabba West in favour of using open pit mining at its southern (IPL) leases, and later at Pharaoh's Flats, north of Eneabba.

Whilst BHP's \$200 million Beenup project contributed to the State's 1998-99 growth in mineral sands output, it was nevertheless plagued with problems and was only able to operate at around 40% of its capacity. In April 1999 the operation was closed. The decision followed an extensive study into technical problems caused by the high clay content of the Beenup orebody which impacted on the management of tailings and the mine's ability to reach satisfactory levels of production.

In the first half of 1999, ISK, a Japanese mining company and Itochu Australia finalised a joint venture to develop a heavy mineral sands mine at Dardanup. The deposit has an anticipated life of at least nine years with mining expected to commence in 2000. Itochu will act as the marketing agent for the product. The mine will produce around 100,000 tonnes of ilmenite per annum and minor amounts of rutile and zircon.

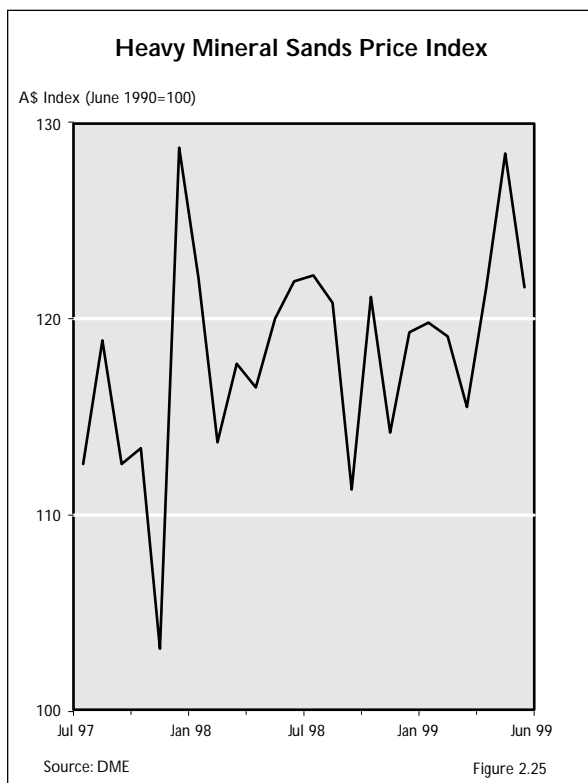
Outlook

On the back of a strengthening titanium dioxide pigment demand in Asia, the outlook for the State's mineral sands industry is positive. Production of synthetic rutile is expected to increase with Iluka Resources recommencing production at Yoganup while maintaining production at Eneabba. The State's rutile production is also forecast to increase. The State's ilmenite production is likely to remain constant due to rising production being offset by the closure of Beenup and lower production at Jangardup.

In 1999-00 world demand for ilmenite is expected to increase while world production is expected to contract. ABARE has forecast average A\$ ilmenite prices rising by 13% to A\$135 per tonne in 1999-00. A higher A\$, which is anticipated to appreciate in 1999-00 will result in average A\$ zircon and rutile prices falling by 2% and 7% respectively over the year. The price for upgraded ilmenite is expected to be

relatively flat.

There are a number of potential new mineral sands projects currently under consideration in Western Australia. These include Cable Sands' Jangardup South and Kemerton mines, Millennium Inorganic Chemicals' titanium dioxide pigment plant expansion at Kemerton and Tiwest's Kwinana pigment plant expansion. A decision to proceed on any of these developments is dependent on market factors and, in particular, for the general improvement to world economic conditions, apparent since March 1999, continuing over the medium term.



2.8 Diamonds

Both sales value and volume records were broken by the Western Australian diamond industry in 1998-99. The value of diamonds sold was up by an impressive 13% to just over \$610 million, whilst sales volume increased by 21% to approximately 51 million carats. A portion of these sales were sourced from stocks. All output was from the Argyle operation. Argyle produces 44% of the world's diamonds but only accounts for about 6% by value.

The Argyle Joint Venture partners (Rio Tinto and Ashton Mining) have fared well over the last two years in comparison to the slump experienced in most parts of the gem market due, in particular, to weak sales in Asia.

1998-99 Diamond Industry Highlights

In 1998-99 the increased sales volume and 8% depreciation of the Australian currency both played significant roles in boosting the value of the State's output, counteracting lower average US\$ diamond prices.

The type of diamonds marketed by the Argyle operation was also important in boosting physical sale quantities. Ironically, market developments stemming from the economic downturn in Asia have been a factor in the strong growth in demand for lower value diamond products. While strong demand continued from the US, a key market for the Argyle product, benefits have also arisen from "trading down" evident in the traditionally higher value markets of Japan, India and parts of South-East and East Asia.

In 1998-99 gem buyers in Asia continued to buy lower quality diamonds to help overcome the weaker purchasing power of their own currencies. Argyle was able to capitalise on this demand by offering better assortments to customers.

The global market situation for the diamond industry has improved somewhat over the first half of 1999. The high level of optimism has been driven by both the supply restraints imposed by the Central Selling Organisation (CSO) since the onset of the Asian economic crisis in late 1997 and lower supplies from non-CSO sources. Reduced supply coupled with continuing strong demand from the US and Europe has also reduced the level of CSO stockpiles. This supply-led recovery has boosted CSO sales to

US\$2.45 billion for the first half of 1999, 44% higher than in the corresponding period of last year. The total is not far short of the US\$2.88 billion sold in the first half of 1997, immediately prior to the onset of the Asian economic crisis. In addition, analysts believe that the CSO has almost exhausted its stockpiles of cheaper stones and this augurs well for Argyle as higher forecast Indian demand will lead to an increase in the price of cheaper quality diamonds.

The Indian diamond industry, the predominant market for Argyle goods, has shown steady growth through 1999. From January to May 1999, Indian rough diamond imports and polished diamond exports were up about 46% and 17% respectively compared to the corresponding period in 1998. The average price received by Argyle for its diamonds is about A\$12 carat. Argyle has also played a major part in proving and promoting Indian jewellery in American stores.

A recent round of drilling at Argyle has increased reserves by 45% to more than 71 million tonnes of gem-bearing material. This delineation of these additional reserves has supported the Argyle Joint Venture's decision to begin extending the giant open pit that if developed would extend the mine-life by at least 4 years to 2006. The first stage of the expansion involves a substantial cutback of an existing pit-wall. In addition, if given the go ahead, a second phase expansion of the pit will expose enough new ore to keep the mine operational for another seven to ten years. The second phase expansion, upon completion, still provides for the possibility of an underground operation. Prior to these expansion plans, ore reserves in the Argyle operation were scheduled for depletion in 2003.

On the exploration front one of the most significant diamond exploration announcements during the year occurred in June 1999 when Kimberley Resources announced it had discovered two new lamproite structures at the Blina diamond project at Ellendale in the Kimberleys. In addition in 1998-99 Striker Resources discovered 676 diamonds weighing 4.7 carats from the Beta Creek prospect in the State's northern Kimberley region.

During 1998-99 there were a number of new mines internationally that came into production, the most significant of which was the opening of Canada's Ekati mine. Ekati mine is a joint venture between BHP

(51%), Dia Met Minerals (29%), Charles Fipke (10%), and Stuart Blussom (10%). The mine, commissioned in the last quarter of 1998, is expected to produce about 3 million carats of good quality diamonds annually worth close to US\$400 million. Under a Memorandum of Understanding signed in March 1999, BHP and its joint venture partners have agreed to sell 35% of the mine production to the CSO for the next three years.

Outlook

Oversupply of diamonds has been reduced during 1998-99 and broad balance between overall production and retail demand is expected to occur in the near term. If economic conditions in the Asian region continue to improve Asia's demand for diamonds should increase in 1999-00. Nonetheless, given that the US market absorbs nearly half of the world's diamond production, the outlook for the diamond industry will depend on a continued demand for jewellery in the US market.

With the CSO about to exhaust its stockpiles of cheaper stones, higher demand in India will lead to an increase in the price of cheaper quality diamonds. The higher price is likely to be aided by an expected cut in Argyle's diamond production in 1999-00. This production cut is largely the result of mine disruptions caused by an expansion of the pit-wall at the mine. According to Ashton Mining in the nine months to 30 September 1999 Argyle's diamond production fell by a third when compared to the corresponding period in 1998.

2.9 Other Minerals

Coal

Western Australia's overall coal production increased by 2% to 5.8 million tonnes in 1998-99. Reflecting marginally lower energy prices, the value of production dropped by less than 1% to \$256 million. During 1998-99 operations at Wesfarmers' Premier Mine continued to see the consolidation of pits and the introduction of new coal-handling equipment. Coal production from the Premier mine will play an integral part in providing feedstock for the recently commissioned 300MW coal-fired power station at Collie. Wesfarmers' seven-year contract to supply the new Collie power station commenced in July 1999.

Base Metals

The total value of base metal production increased by 23% to \$232 million. The chief contributors to this were increases in zinc and lead production. However, the copper sector contracted significantly. Western Australia's zinc output was up by 71,000 tonnes, or 57% to 195,000 tonnes. The average price of zinc decreased by 19% to US\$998 per tonne in 1998-99. Nevertheless, the value of zinc production increased by 47% or \$55 million to \$172 million.

Zinc production in Western Australia has continued to come from two main sources, Normandy's Scuddles operation and Western Metals' Lennard Shelf mining operations which both significantly increased output in 1998-99. In late 1997 Normandy decided to develop the Gossan Hill mine situated 4 kilometres south-east of Scuddles and proceed with development of the zinc and copper orebodies. Ore production commenced in mid-1998 and the Golden Grove treatment plant upgrade was completed by October 1998 to a capacity of 1.2 million tonnes per year. This will extend operational life of Golden Grove to at least the year 2007.

Western Metals new stand-alone 1.5 million tonnes per year Pillara mine and processing plant was commissioned in 1998-99. The underground Pillara mine is located 60 kilometres west of Cadjebut. At full capacity Pillara will produce 165,000 tonnes of zinc concentrate and 35,000 tonnes of lead concentrate per annum. The Pillara mine is expected to mine ore until 2008.

The forecast by ABARE is for world mine production

of zinc to rise in 1999-00. The major contributions to the forecast increase are expected to emanate from Queensland (Cannington and Century), Ireland (Lisheen) and Alaska (Red Dog), although the former two will not reach full capacity until 2000. On the back of strengthening demand this production will be able to be absorbed in world markets. Overall US\$ zinc prices are estimated to rise by 10% in 1999-00 with prices maintained at that level in 2000-01.

Lead production for 1998-99 came in at over 50,000 tonnes, up a massive 91% on the previous year, due to increased production from Western Metals' Lennard Shelf operations. The associated value of production increased by 65% to just over \$17 million. World lead prices fell in 1998-99, averaging US\$513 a tonne for the year, down 10% on the previous year.

Copper production decreased by 17% during the year to come in at just over 24,000 tonnes. This was predominantly due to reduced copper production from the Golden Grove operation. The average world copper price in 1998-99 was down by around 20% (in US dollar terms) on the previous year which, when combined with decreased production, resulted in the value of the State's copper production dropping by 29% to \$43 million. In July 1998 WMC's Nifty mine was acquired by Straits Resources Ltd. The Nifty heap leach solvent - electro-winning (SX-EW) operation is similar in nature to Straits Resources Girilambone joint venture copper project in New South Wales. Straits Resources' plan to lift output from Nifty via a capital expenditure program and has also flagged the possibility of expanding the mine into an underground operation.

The world's base metal market has suffered dramatically in 1998-99 due mainly to poor demand. Subdued Asian demand, in addition to falling consumption in Europe, resulted in increased stockpiles of lead and copper with consequent adverse impacts on overall base metal prices. Nonetheless, in the June 1999 quarter base metal prices moved upwards due mainly to a restriction in the supply of base metals and improved demand conditions in world markets. For example copper prices were helped by a string of production cutbacks, mine closures and deferrals of new projects through 1998-99. However, there is an expectation that output from a substantial number of new and expected mines and smelters (e.g. Olympic Dam in South Australia; Andina,

Alumbrera, Collahuasi, Relincho, La Escondida and Los Pelambres in Chile; Gresik in Indonesia; and Port Kembla refurbishment in New South Wales) will outweigh those production losses. With copper and lead demand likely to improve, due to better than expected economic conditions for 1999-00, this increased production should be absorbed into the market. Overall as growth in Asia gains momentum copper and lead prices are expected to improve over 1999-00.

Salt

The State's salt production increased by 5% to 8.6 million tonnes. Thanks to the devaluation of the A\$ the value of this production increased by around 6% to \$200 million. In 1998-99 the expansion of Dampier Salt's operations near Karratha was completed. This boosted salt production capacity at Dampier from 2.5 million to 4 million tonnes per annum. Shark Bay Salt also started expansion of its primary ponds to increase production capacity. The State's salt production will also increase when the new Onslow salt project comes on-stream. The Dutch company Akzo Nobel has invested approximately \$80 million in the Onslow Salt project. It is expected to produce 2.5 million tonnes of salt per annum with first production, expected in late 1999.

Other

In 1998-99 the State's tantalite production increased by 12% to 415 tonnes. In combination with higher prices this translated to the value of sales increasing by a dramatic 58% to \$66 million. Tantalite is chiefly sourced from Sons of Gwalia's Greenbushes mine, as is spodumene, the production of which totalled 48,000 tonnes worth \$11 million in 1998-99. The Greenbushes mine is reportedly the world's largest hard rock tantalum resource and Sons of Gwalia also operates Australia's only tin smelter at Greenbushes. Tin production reached 596 tonnes worth \$5 million in 1998-99. Sons of Gwalia's tantalum production is forecast to increase in 1999-00 to over 450 tonnes due primarily to the upgrade of the Wodgina tantalum plant which is now nearing completion.

On the back of higher production the value of Western Australia's gypsum output increased by 51% to \$22 million in 1998-99. This was primarily due to increased shipments from the new Lake MacLeod Gypsum operation. Lake MacLeod Gypsum is 68%

owned by Rio Tinto and is an offshoot of the parent company, Dampier Salt. The gypsum and salt projects share an operational base and shipping port facilities at Lake MacLeod north of Carnarvon. Western Australia's total gypsum output in 1998-99 was 1.26 million tonnes. Lake MacLeod Gypsum accounted for well over 70% of this output, making it Australia's largest producer.

Although the State's sole manganese operation, at Woodie Woodie in the Pilbara, has been closed for much of the period since early 1997, the State recorded shipments in 1998-99 totalling 27 thousand tonnes worth \$3.4 million. These shipments were from stockpiles. However, owing to improved market conditions in May 1999 mining operations recommenced at the mine. The owners of the mine, Consolidated Minerals Limited, through their wholly owned subsidiary Pilbara Manganese Pty Ltd, has, among others, negotiated export contracts totalling 225,000 tonnes of its 1999-00 production to China (125,000 tonnes), Europe (70,000 tonnes) and Japan (30,000 tonnes).

Precious Metals Australia (PMA) and its joint venture partner, Glencore International, has developed a \$121 million project with a plant capacity to produce 7,200 tonnes per annum of vanadium pentoxide. The extraction technique is a salt-roast/water-leach process. The project was commissioned in October 1999. Vanadium is used in metal alloys, principally to strengthen steel. It will be Australia's only vanadium project and is forecast to produce 10% of the world's vanadium pentoxide. The main producers of vanadium are South Africa, Russia and China. PMA will manage and operate the project with Glencore International and PMA owning 51% and 49% respectively of the joint venture.

3. EXPLORATION, INVESTMENT AND EMPLOYMENT

Mineral Exploration

According to the Australian Bureau of Statistics (ABS), mineral exploration expenditure in Western Australia reached \$523 million in 1998-99. This was down by 21% on the 1997-98 level of \$660 million. Overall this is not a surprising result given record low commodity prices and near-record exploration levels over the past two years, with the record of \$692 million attained in 1996-97. In prior years mineral exploration expenditure for the State averaged \$490 million from 1993-94 to 1995-96.

Western Australia received approximately 62% of total Australian mineral exploration expenditure in both 1997-98 and 1998-99.

Depressed gold prices hampered the State's exploration effort in the sector with exploration expenditure falling by around 28% to \$331 million in 1998-99. It was therefore the dominant factor behind the fall in the State's exploration. Gold accounted for 63% of State's mineral exploration, down from 70% in 1997-98. Western Australia also received 68% of Australia's total gold exploration funds, down from 71% in 1997-98.

Some of the more recent gold exploration highlights included an announcement by the Placer Dome-Delta Gold Granny Smith joint venture of encouraging results from its Laverton gold project. Exodus Minerals also continued work on its Mikado deposit, 15 kilometres east of the Granny Smith gold mine. Results enhanced the deposit's potential to host an economic open-pit mine.

Base metals (i.e. ABS definition - copper, silver-lead-zinc, nickel and cobalt) exploration expenditure in Western Australia decreased by 22% to \$91 million in 1998-99. The 1998-99 expenditure accounted for 51% of Australia's total base metals exploration expenditure, down from 52% in 1997-98. Most of this expenditure is on nickel prospects, with copper-lead-zinc exploration believed to be stagnant or falling.

Nickel exploration highlights during the year included the news that Heron Resources' Goongarrie project now has an inferred mineral resource of more than 100 million tonnes of lateritic nickel. The Goongarrie

area forms part of the Centaur Mining and Exploration Limited strategic alliance tenements, to be included in the feasibility study for Cawse Stage II. Also, initial results from a drilling program conducted by GME Resources on its Mt Kilkenny tenement near Laverton, adjoining the southern Murrin Murrin tenements tend to indicate substantial lateritic nickel mineralisation. Further work is being undertaken. Exploration for lead and zinc was mainly centred around Western Metals Lennard Shelf operations during the year.

Expenditure on iron ore exploration increased by 33% to \$40 million in 1998-99. The State accounts for over 95% of Australian exploration expenditure on iron ore. A gradual depletion of reserves of low-phosphorous Brockman type ores is forcing the State's major iron ore producers to take a long-term view of the industry. In particular major producers are evaluating the economic potential of both Marra Mamba and Robe River pisolite resources in the State's Hamersley Basin.

State diamond exploration expenditure in 1998-99 totalled \$33 million, up from the 1997-98 level of \$31 million. Western Australia accounted for around 80% of Australia's total diamond exploration funds, up from 73% in 1997-98. Activity mainly centred in the Kimberley region.

Heavy mineral sands exploration expenditure came in at \$9 million in 1998-99. The State accounted for 46% of total Australian expenditure for mineral sands, down from over 60% in 1997-98.

The State's mineral sands exploration effort may be hindered in the near term as expenditures are directed to other areas perceived as having high prospectivity. During the year there were predictions that Victoria's Murray Basin, currently undergoing extensive exploration, could overtake Western Australia as the nation's largest producer of mineral sands in the next ten years. This was in light of several recent discoveries of high-grade heavy mineral sands deposits located near the surface that allows for low cost mining and processing. However, it is likely that because the Murray Basin is essentially a rutile-zircon province the distance in transporting low-value ilmenite to the nearest port would make it uneconomic.

Petroleum Exploration

According to the Australian Bureau of Statistics (ABS), the State's petroleum exploration expenditure in 1998-99 increased by 14% to \$531 million, compared to \$464 million in 1997-98. This increase is certainly surprising in light of record low oil prices during the year. Whilst the State's expenditure increased, national expenditure fell by 12% to \$868 million.

Consequently, Western Australia's share of Australia's petroleum exploration expenditure increased from 47% in 1997-98 to 61% in 1998-99. The amount quoted includes Area B expenditure on leases located within the Zone of Cooperation between Western Australia and Indonesia.

State petroleum exploration activity in 1998-99, was concentrated in the offshore Carnarvon, Bonaparte and Browse Basins. Some of the highlights during the year included the announcement by the Gorgon partners (i.e. Texaco, Chevron, Mobil, Shell and BP) that they had encountered gas in a new field west of the Gorgon field, located in the Carnarvon Basin. The discoveries add to the already significant resource base of the Gorgon, West Tryal Rocks, Spar, Chryasor and Dionysus fields. The estimated resources of these fields total more than 17.5 trillion cubic feet of hydrocarbon gas. The latest discoveries further support moves by the joint venture partners to commercialise the Gorgon area gas fields to supply international LNG and domestic natural gas markets.

Onshore exploration effort in Western Australia remains low. To assist in addressing the inequity between onshore and offshore exploration in Western Australia, the Department of Minerals and Energy's Geological Survey Division is undertaking an Onshore Petroleum Exploration Initiative program.

The Initiative aims to enhance petroleum prospectivity through the study of the onshore sedimentary basins of Western Australia. Funding for the six-year programs ends in the 1999-2000 financial year. The benefits of the program were highlighted in September 1999 with the announcement of the discovery of gas near the Western Australian-South Australian border, 190 kilometres east of Warburton. This is the first recorded gas discovery in the onshore Officer Basin in Western Australia. The bore hole (Vines 1), which was drilled to a depth of 2,017 metres, encountered

gas at a depth of 1,483 metres. Whilst this discovery is particularly encouraging to the State's onshore petroleum exploration industry further work will need to be carried out by petroleum companies to determine the commercial significance of this gas find.

In terms of the national total, 12% of exploration expenditures was spent on production leases in 1998-99, with the remainder going towards exploration permit areas. ABS data also shows that Australia-wide 79% of the exploration expenditure is directed offshore.

Over the year there was extensive media coverage of a bid by the Shell-Chevron-Cultus Joint Venture to abandon its work program commitment over a number of Exploration Permits, adjacent to the Cornea discovery, about 100 kilometres offshore, north-west of the Mitchell Plateau. In 1998 these tenements were awarded on the basis that 46 wells would be drilled. However, after drilling 11 wells without encountering any significant shows of hydrocarbons the Joint Venture partners applied for the surrender of those Exploration Permits without completing the remaining 35 wells. The cost of drilling the outstanding wells is estimated at \$70 million.

Through discussions with the Western Australian and Commonwealth Governments, an agreement with Shell was reached on how its share of the outstanding commitment funds will be spent. At the time of writing (30 September 1999), the State and Commonwealth had not reached an agreement with the other two joint venture partners, Chevron and Cultus.

Mining Investment

ABS private new capital expenditure statistics for 1998-99 indicate that mining accounted for 52% of Western Australia's total investment, compared to 66% in 1997-98. Total State investment decreased by 20% from the 1997-98 level of \$8.76 billion to \$6.97 billion in 1998-99. The actual level of mining investment in Western Australia was \$3.65 billion in 1998-99, down by 37% on the 1997-98 record amount of \$5.76 billion.

In 1998-99 Western Australia accounted for 42% of national mining investment of \$8.72 billion. This compares to the 1997-98 outcome when Western Australia accounted for 52% of Australia's mining investment of \$11.03 billion.

ABS mining investment figures, however, need to be treated cautiously as they do not capture all mining investment. Investment in downstream processing and some mineral projects (such as mineral sands and alumina) are categorised by the ABS as manufacturing investment. A breakdown of the manufacturing figures into resource processing and other categories is not available.

Western Australia has essentially completed one phase of another significant investment boom. The level of investment in the State's resource sector accelerated strongly from \$2.1 billion in 1991-92 to reach a record of \$5.76 billion in 1997-98. 1998-99 therefore can be interpreted as a return to somewhat "normal" levels of mining investment, with the 1998-99 outcome comparable to that of 1993-94. Prior to the take-off mining investment averaged \$2 billion per annum from 1986-87 to 1991-92.

The new highs reached in the 1990s mining investment cycle for the resources sector have been unique compared to previous cycles. Past investment booms have been associated with the discovery or viability of a single commodity, whilst the 1990s cycle has seen investments spread across most of the State's major mineral products with gold perhaps the most notable exception.

The diversity associated with the 1990s investment boom in the resources sector has cushioned the State somewhat from the risk associated with investment being undertaken in sharp bursts and targeted to one specific mineral.

Prominent examples of projects with significant investment in the 1990s include:

- The \$2.4 billion hot briquetted iron project in Port Hedland;
- Three new nickel laterite projects, Murrin Murrin (\$1 billion), Cawse (\$217 million) and Bulong (\$200 million);
- The \$700 million Yandicoogina iron ore project;
- The \$1.6 billion Goodwyn project, phase three; and
- The \$740 million Wanaea/Cossack project.

The Delta Electricity and Access Economics Investment Monitor for June 1999, indicated that there were approximately \$36.1 billion worth of mining projects in Western Australia either under construction, committed, under consideration or possible. Western Australia accounts for about 46% of such projects nation-wide. When including projects with linkages to mining, i.e. further processing and infrastructure projects, the Western Australian figure increases to around \$53 billion.

Focusing on the value of mineral and petroleum projects under construction or committed, the Investment Monitor for June 1999 recorded this at around \$3 billion. Some of the more notable projects include:

- The \$800 million expansion of the Worsley alumina refinery;
- The \$200 million development of the Lambert and Hermes fields by the North West Shelf Gas Project participants; and
- The \$874 million doubling of capacity of the Dampier to Bunbury gas pipeline by Epic Energy.

In the short to medium term mining investments are likely to rebound. The outlook for global growth has improved significantly during the last few months because of the improved prospects for Asian economies. This is particularly good news for commodity prices, as long-term recovery will depend on increasing demand, which in turn, depends on rising global growth. It also augurs well for those projects which had their development plans delayed by the Asian economic crisis.

Mining Employment

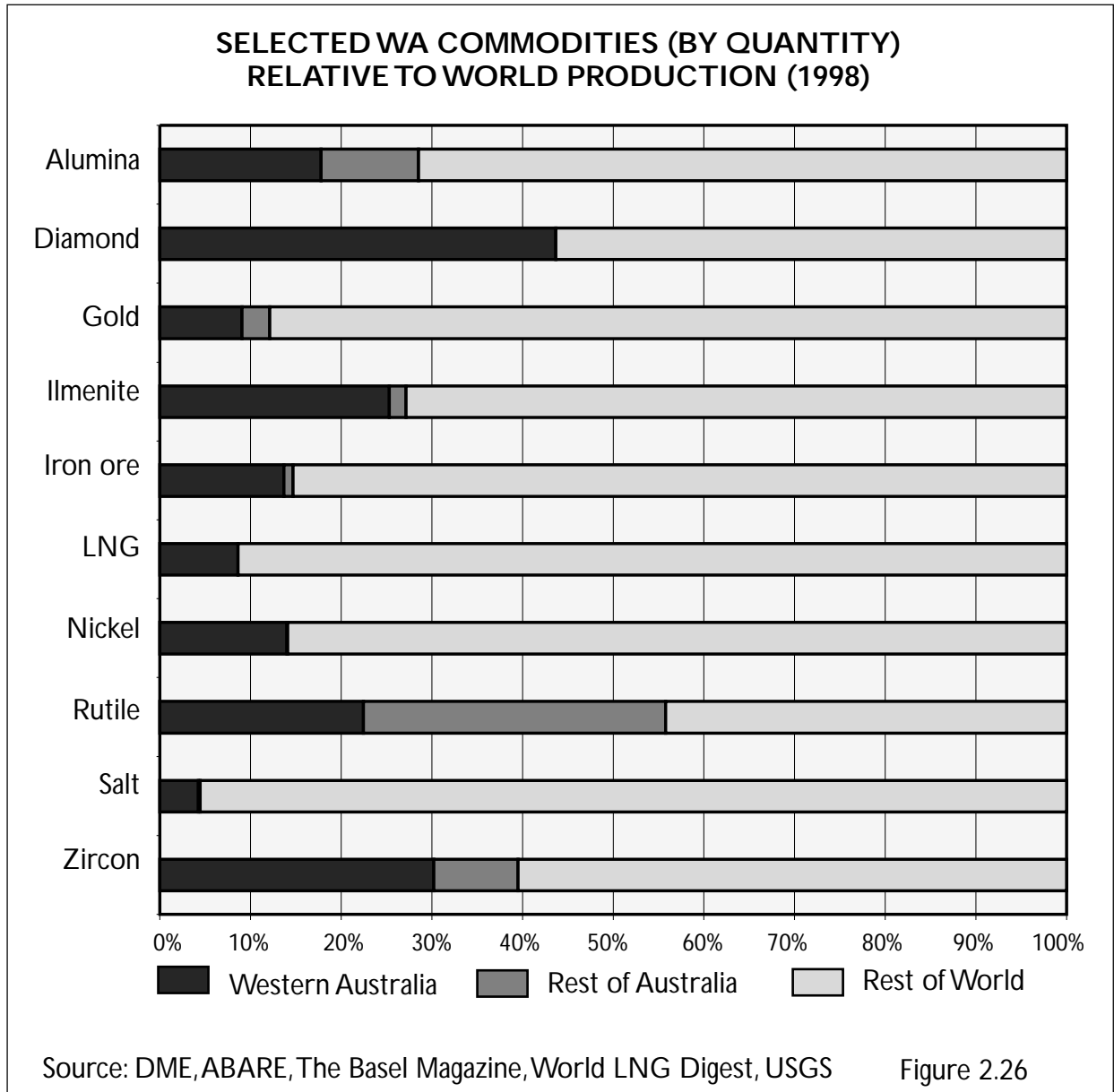
The Department of Minerals and Energy's official employment statistics are compiled from monthly industry returns and include contract labour working on the mine sites.

In 1998-99 employment in the State's mineral and petroleum industries increased by less than 0.5% to 45,003 persons. Overall, decreases in employment in some specific resource sectors were offset by increases in others.

Due mainly to the expansion of the Worsley and Wagerup alumina refineries, bauxite-alumina employment was up by 15%. The nickel industry also recorded a 5% increase in employment. This was mainly the result of completing the construction of the Murrin Murrin project.

In addition to these increases, more people were employed in the coal industry (up 26%), iron ore (up 1%), mineral sands (up 2%) and salt (up 3%).

The gold sector experienced a significant decrease in employment in 1998-99, with employment falling by 10% or 1,417 persons. Low US\$ gold prices over the last two years has seen the industry rationalise its activities, including closing high cost mines, as a means to reduce costs. The base metal sector also recorded an 11% fall in employment in 1998-99.



The latest comparable data shows that the Western Australian share (by quantity) of the world's output of the following products was: alumina 18%, diamonds 44% (mainly industrial grade), gold 9%, ilmenite 25%, iron ore 14%, LNG (World Trade) 9%, nickel 14%, rutile 22%, salt 4%, and zircon 30%.

TABLE 1 QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY/Mineral	UNIT	1997-98		1998-99	
		QUANTITY	VALUE (A\$)	QUANTITY	VALUE (A\$)
BASE METALS					
Copper Metal	t	29,434 (r)	61,121,739 (r)	24,435	43,445,500
Lead Metal	t	27,001	10,448,512 (r)	51,552	17,253,220
Zinc Metal	t	123,968 (r)	117,107,347 (r)	194,899	171,613,873
TOTAL BASE METALS			188,677,598 (r)		232,312,593
BAUXITE-ALUMINA					
Alumina	t	8,514,673	2,260,538,170	8,864,125	2,367,032,747
CHROMITE-PLATINOIDS					
Chromite	kg	16,115	3,658,408	30,052	6,528,156
CLAYS					
Attapulgite	t	24,023	4,362,859	11,688	1,220,812
Clay Shale	t	36,296	541,990	10,190	101,900
Fire Clay	t	72,975	87,570	74,032	88,838
Kaolin	t	280	31,649	1,776	216,398
White Clay	t	2,360	14,160	0	0
TOTAL CLAYS			5,038,228		1,627,948
COAL	t	5,708,548	257,282,501	5,796,622	256,340,925
CONSTRUCTION MATERIALS					
Aggregate	t	311,081 (r)	2,244,377 (r)	277,486	2,271,690
Gravel	t	182,618 (r)	1,022,704 (r)	248,415	1,636,297
Rock	t	425,434 (r)	2,670,997 (r)	309,932	2,089,376
Sand	t	1,788,494 (r)	8,426,742 (r)	1,771,955	7,925,158
TOTAL CONSTRUCTION MATERIALS			14,364,820 (r)		13,922,521
DIAMOND	ct	42,483,235	537,870,611	51,230,582	610,435,064
DIMENSION STONE					
Black Granite	t	958	287,457	0	0
Granite	t	391	80,800	3,686	655,800
Jasper	t	0	0	984	594,880
Spongolite	t	1,881	150,480	8,180	654,375
TOTAL DIMENSION STONE			518,737		1,905,055
GEM & SEMI-PRECIOUS STONE					
Chalcedony	kg	8,053	4,027	0	0
Chrysoprase	kg	21,536	8,936	0	0
TOTAL GEM & SEMI-PRECIOUS STONE			12,963		0
GOLD	kg	239,456 (r)	3,468,954,490 (r)	220,820 (e)	3,240,947,043 (e)
GYPSUM	t	834,946 (r)	14,337,774 (r)	1,255,485	21,613,497
HEAVY MINERAL SANDS					
Garnet	t	116,037	13,644,227	88,579	11,313,352
Ilmenite	t	1,313,266	149,137,955	1,319,856	158,587,045
Upgraded Ilmenite (a)	t	467,258	241,631,970	433,276	240,480,262
Leucoxene	t	28,346	10,986,255	17,513	8,130,865
Rutile	t	104,134	78,581,122	119,708	90,971,056
Zircon	t	321,381 (r)	169,129,893	284,533	136,065,790
TOTAL HEAVY MINERAL SANDS			663,111,422		645,548,370

TABLE 1 (Cont.) QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY/Mineral	UNIT	1997-98		1998-99	
		QUANTITY	VALUE (A\$)	QUANTITY	VALUE (A\$)
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	t	35,742	1,513,545	406	8,718
IRON ORE					
Domestic	t	7,738,897	206,647,943	7,144,618	207,872,396
Exported	t	142,003,028	3,724,124,135	133,879,796	3,756,961,692
TOTAL IRON ORE		149,741,925	3,930,772,078	141,024,414	3,964,834,088
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	t	3,624 (r)	86,372 (r)	3,086	67,892
Limesand-Limestone	t	2,579,643 (r)	11,791,428 (r)	3,046,105	13,867,322
TOTAL LIMESAND-LIMESTONE-DOLOMITE			11,877,800 (r)		13,935,214
MANGANESE ORE	t	86,297	9,394,938	27,414	3,415,875
NICKEL INDUSTRY					
Cobalt by-product	t	1,499	81,778,705	1,092	55,266,894
Nickel Concentrate	t	942,470	1,146,639,375	835,160	872,398,146
Nickel Metal	t	0	0	459	3,724,438
Palladium by-product	kg	668	6,785,327	791	9,233,230
Platinum by-product	kg	212	3,105,879	101	1,838,767
TOTAL NICKEL INDUSTRY			1,238,309,287		942,461,475
PETROLEUM					
Condensate	kl	6,758,554 (r)	1,065,843,094 (r)	5,554,129	743,906,225
Crude Oil	kl	9,852,490	1,567,158,552	9,162,536	1,189,443,528
LNG	Btu 10 ⁶	379,543,930	1,591,935,107	391,897,317	1,434,419,363
LPG - Butane	t	376,089	90,469,095	388,694	90,621,537
LPG - Propane	t	263,259 (r)	61,264,851 (r)	259,207	57,626,639
Natural Gas	'000m ³	6,881,954	557,469,068	6,439,699	549,830,769
TOTAL PETROLEUM			4,934,139,769 (r)		4,065,848,061
PIGMENTS					
Red Oxide	t	6,910	1,312,900	331	62,890
SALT	t	8,185,664	188,700,479	8,570,782	199,638,214
SILICA-SILICA SAND					
Silica	t	92,427	924,266	90,069	900,692
Silica Sand	t	729,084 (r)	6,917,165 (r)	492,965	5,207,652
TOTAL SILICA-SILICA SAND			7,841,431 (r)		6,108,344
SILVER	kg	56,893 (r)	13,346,063 (r)	66,045	14,524,095
TALC	t	191,297	15,059,872	181,609	14,579,938
TIN-TANTALUM-LITHIUM					
Spodumene	t	46,566	8,897,759	48,021	10,886,637
Tantalite	t	371	41,864,039	415	65,929,047
Tin Metal	t	481	3,622,811	596	4,999,060
TOTAL TIN-TANTALUM-LITHIUM			54,384,609		81,814,744
TOTAL VALUE			17,821,018,499 (r)		16,705,445,575(e)

Note: Quantities used in this table only apply to Minerals and Petroleum covered by the Mining Act 1978, the Petroleum Act 1967, the Petroleum (Submerged Lands) Act 1982 and relevant State Agreement Acts.

(a) Also known as synthetic rutile

(e) Estimate

(r) Revised from previous edition

1998-1999 STATISTICS DIGEST

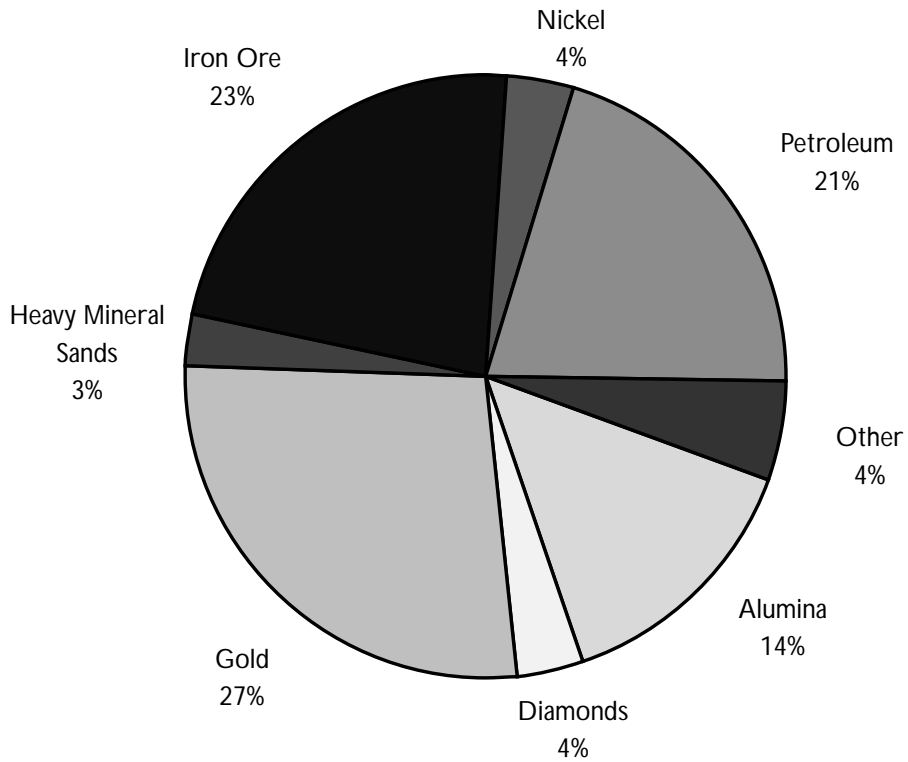
TABLE 2 QUANTITY AND VALUE OF SELECTED MAJOR COMMODITIES

	Unit	1989-90		1990-91		1991-92		1992-93	
		Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
ALUMINA	Mt	6.65	2,335.70	6.80	2,099.13	7.13	1,758.15	7.55	1,818.12
BASE METALS									
copper metal	kt	14.98	23.92	12.00	20.35	12.02	17.44	22.92	27.44
lead metal	kt	13.17	7.61	12.48	5.99	21.68	7.30	22.30	6.65
zinc metal	kt	45.88	59.76	75.20	76.39	142.92	125.58	127.96	104.11
TOTAL BASE METALS			91.29		102.73		150.32		138.20
COAL	Mt	4.16	183.70	5.22	232.92	5.49	243.54	5.43	244.77
DIAMOND	M ct	33.85	413.58	29.96	435.73	47.49	564.77	24.83	519.98
GOLD	tonnes	161.79	2,596.45	181.17	2,762.82	182.04	2,689.92	179.80	2,834.19
HEAVY MINERAL SANDS									
ilmenite	Mt	1.07	89.61	0.97	85.48	0.97	83.15	0.99	81.66
synthetic rutile	kt	284.11	131.11	263.41	131.71	305.12	153.12	361.42	168.55
rutile	kt	82.23	58.54	65.45	49.60	47.47	26.88	75.93	42.14
zircon	kt	300.26	175.19	208.42	100.80	226.93	61.11	302.46	49.19
other hms			18.78		20.45		12.04		10.29
TOTAL HEAVY MINERAL SANDS			473.23		388.04		336.30		351.83
IRON ORE	Mt	106.27	2,246.03	107.67	2,648.69	111.64	2,953.27	111.73	2,991.14
MANGANESE ORE	kt	273.00	1.20	160.32	25.59	395.30	71.86	251.53	46.89
NICKEL METAL	kt	47.83	585.97	54.49	595.88	50.17	489.51	53.27	472.17
PETROLEUM PRODUCTS									
condensate	Gl	1.60	235.65	1.87	370.95	2.00	338.98	2.00	363.04
crude oil	Gl	3.96	601.47	5.14	1,054.06	5.43	941.29	4.54	855.69
lng	btu 10 ¹²	104.17	336.09	184.93	836.40	219.70	846.33	254.47	1,025.06
lpg - butane	kt	0	0	0	0	0	0	0	0
lpg - propane	kt	0	0	0	0	0	0	0	0
natural gas	Gm ³	3.85	356.85	3.61	379.23	3.77	349.26	3.96	407.02
TOTAL PETROLEUM			1,530.06		2,640.64		2,475.86		2,650.81
SALT	Mt	5.93	124.11	6.41	136.97	6.93	153.14	6.63	158.38
OTHER			81.61		83.80		122.55		105.14
TOTAL			10,662.93		12,152.93		12,009.19		12,331.62

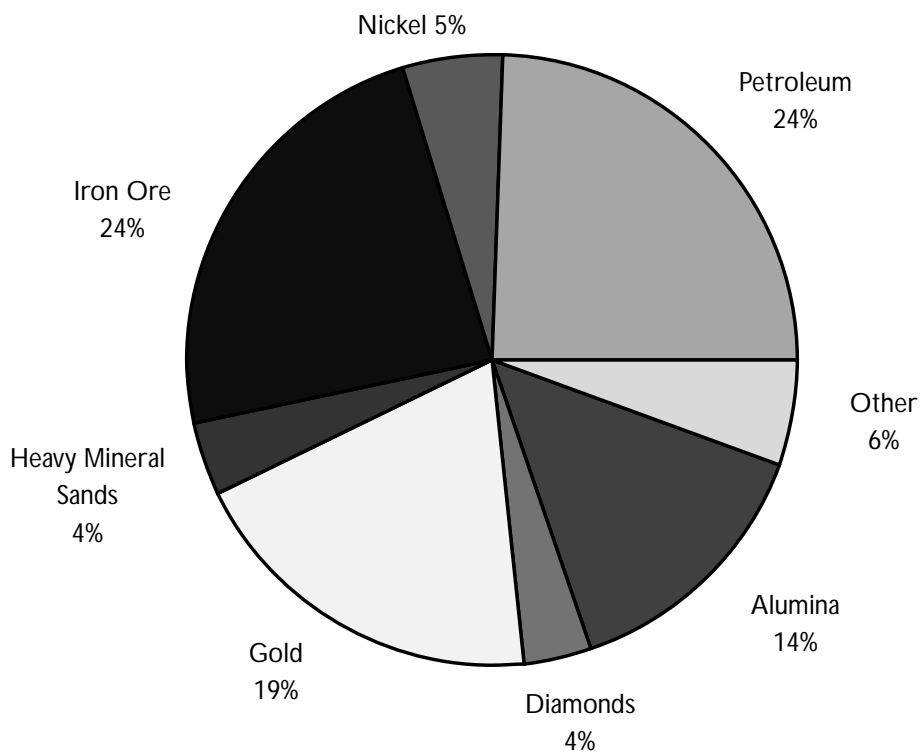
1998-1999 STATISTICS DIGEST

1993-94		1994-95		1995-96		1996-97		1997-98		1998-99	
Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
7.83	1,784.32	7.91	1,684.60	8.23	1,918.34	8.35	1,955.77	8.51	2,260.54	8.86	2,367.03
32.46	40.26	29.20	76.54	23.69	65.42	27.73	58.98	29.43	61.12	24.44	43.45
21.11	4.98	21.10	9.20	21.28	12.64	13.49	6.09	27.00	10.45	51.55	17.25
136.39	79.54	132.85	95.84	113.49	75.32	88.37	75.12	124.00	117.11	194.90	171.61
	124.78		181.58		153.38		140.19		188.68		232.31
5.15	236.29	5.86	274.75	5.90	270.36	5.56	257.30	5.71	257.28	5.80	256.34
28.86	476.75	23.93	480.03	33.52	525.21	52.52	395.79	42.48	537.87	51.23	610.44
193.60	3,415.06	187.85	3,132.87	205.89	3,404.65	228.02	3,409.61	239.46	3,468.95	220.82	3,240.95
1.07	92.32	0.99	89.65	1.10	111.18	1.10	117.28	1.31	149.14	1.32	158.59
332.99	153.94	396.28	184.63	408.52	199.57	413.46	205.20	467.26	241.63	433.28	240.48
68.93	35.76	107.78	56.13	119.14	75.06	110.96	77.74	104.13	78.58	119.71	90.97
349.13	63.10	477.05	129.77	410.03	181.21	324.09	177.99	321.38	169.13	284.53	136.07
	13.92		14.56		18.50		26.51		24.63		19.44
	359.04		474.74		585.52		604.72		663.11		645.55
119.69	2,865.16	133.13	2,794.31	132.90	2,924.06	141.29	3,159.65	149.74	3,930.77	141.02	3,964.83
315.79	42.01	71.91	8.84	347.04	41.34	324.11	37.62	86.30	9.39	27.40	3.42
61.11	458.62	92.99	897.12	103.30	1,097.30	114.10	1,051.11	135.19	1,146.64	125.77	876.12
2.35	348.71	2.64	398.34	4.65	685.74	5.73	943.15	6.76	1,065.84	5.55	743.91
5.33	815.33	9.90	1,559.65	9.65	1,535.67	10.47	1,915.93	9.85	1,567.16	9.16	1,189.44
296.36	1,015.68	356.11	1,262.51	379.79	1,350.92	370.50	1,528.77	379.54	1,591.94	391.90	1,434.42
0	0	0	0	100.24	22.71	209.69	59.67	376.09	90.47	388.69	90.62
0	0	0	0	87.02	19.73	185.74	55.66	263.26	61.26	259.21	57.63
4.46	413.37	5.37	445.71	6.31	454.76	6.89	534.65	6.88	557.47	6.44	549.83
	2,593.09		3,666.21		4,069.53		5,037.83		4,934.14		4,065.85
6.16	149.18	7.18	155.14	7.45	154.22	7.55	153.62	8.19	188.70	8.57	199.64
	119.68		164.52		192.44		192.18		234.85		242.97
12,623.90		13,914.71		15,336.36		16,395.39		17,821.02		16,705.45	

COMPARATIVE VALUE OF PRODUCTION
1993-94 Total : A\$12.624 billion



1998-99 Total : A\$16.705 billion



Source: DME

Figure 0.1

TABLE 3 QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE AS	Ref. (p.69)
BASE METALS			Cu tonnes		
Copper By-Product	Coolgardie		4,871	7,115,382	(a)
	Roebourne		1,262	1,474,144(a),(b)	
Total Copper By-Product			6,132	8,589,525	
Copper Concentrates	East Pilbara	13,711	Cu % 19.31	2,514,441	(a)
	Yalgoo	17,237	14.46	539,263	(a)
Total Copper Concentrates		30,948		3,053,704	
			Cu tonnes		
Copper Cathode	East Pilbara		13,163	31,802,270	(a)
Total Copper				43,445,500	
Lead	Derby-West Kimberley	76,645	Pb %	17,253,220	(a)
			67.26		
Zinc	Derby-West Kimberley	207,999	Zn %	99,901,519	(a)
			51.17		
	Yalgoo	210,689	41.99	71,712,354	(a)
Total Zinc		418,688		171,613,873	
TOTAL BASE METALS				232,312,593	(a)
BAUXITE - ALUMINA					
Alumina	Boddington	1,708,492		481,630,627	
	Murray	3,294,870		866,853,338	
	Serpentine-Jarrahdale	2,032,519		535,440,197	
	Warooka	1,828,244		483,108,586	
TOTAL BAUXITE - ALUMINA		8,864,125		2,367,032,747	(c),(j)
CHROMITE			Cr ₂ O ₃ %		
Chromite Ore	Meekatharra	75,385	39.86	6,528,156	
CLAY					
Attapulgitite	Mullewa	11,688		1,220,812	(a)
Clay Shale	Collie	10,190		101,900	(a)
Fire Clay	Chittering	74,032		88,838	(d)
Kaolin	Bridegetown-Greenbushes	1,776		216,398	(d)
TOTAL CLAY				1,627,948	
COAL	Collie	5,796,622		256,340,925	(e)
CONSTRUCTION MATERIALS					
Aggregate	Broome	12,561		348,696	
	Exmouth	56,797		681,563	
	Port Hedland Town	65,631		393,786	
	Roebourne	68,778		426,758	
	Wyndham-East Kimberley	73,719		420,887	
Total Aggregate		277,486		2,271,690	

TABLE 3 (cont.) QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE A\$	Ref. (p.69)
Gravel	Broome	5,790		23,333	
	Coolgardie	39,790		233,580	
	East Pilbara	18,025		94,575	
	Kalamunda	166,078		1,152,057	
	Kalgoorlie-Boulder	3,154		18,924	
	Port Hedland Town	1,454		14,536	
	Shark Bay	80		400	
	West Kimberley	10,800		86,400	
	Wyndham-East Kimberley	3,244		12,492	
Total Gravel		248,415		1,636,297	
Rock	Broome	5,021		262,377	
	Derby-West Kimberley	9		54	
	Kalgoorlie-Boulder	302,436		1,814,617	
	Wyndham-East Kimberley	2,466		12,328	
Total Rock		309,932		2,089,376	
Sand	Ashburton	44		1,540	
	Broome	13,323		107,486	
	Collie	16,577		99,458	
	Coolgardie	129,836		725,476	
	Dandaragan	5,732		71,826	
	Derby-West Kimberley	7,168		114,978	
	Kalgoorlie-Boulder	11,717		240,047	
	Leonora	9,115		45,572	
	Meekatharra	20,695		186,214	
	Menzies	1,277		6,385	
	Northam	14,459		43,377	
	Port Hedland Town	29,074		226,718	
	Roebourne	88,792		231,151	
	Wanneroo	1,412,213		5,924,180	
	Wyndham-East Kimberley	7,848		39,242	
	Yilgarn	4,085		20,429	
Total Sand		1,771,955		7,925,158	
TOTAL CONSTRUCTION MATERIAL				13,922,521	(d)
DIAMOND	Wyndham-East Kimberley	51,230,582	carats	610,435,064	(a)
DIMENSION STONE					
Granite	Ashburton	485		48,500	
	Coolgardie	479		111,620	
	Dundas	2,428		480,980	
	Roebourne	294		14,700	
Total Granite		3,686		655,800	
Jasper	Port Hedland Town	984		594,880	
Spongolite	Plantagenet	8,180		654,375	
TOTAL DIMENSION STONE				1,905,055	(d)

TABLE 3 (cont.)

QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE AS	Ref. (p.69)
GOLD			Au kg		
	Boddington		9,143	134,996,655	
	Coolgardie		29,407	431,798,400	
	Cue		5,858	86,139,593	
	Dundas		3,497	51,441,996	
	East Pilbara		12,452	182,880,696	
	Kalgoorlie-Boulder		46,566	684,367,168	
	Laverton		16,325	239,039,926	
	Leonora		40,947	600,386,054	
	Meekatharra		13,835	202,682,049	
	Menzies		1,998	30,160,384	
	Mt Magnet		6,849	100,186,216	
	Sandstone		2,759	41,386,919	
	Wiluna		15,940	233,216,465	
	Yalgoo		465	6,751,072	
	Yilgarn		14,779	215,513,450	
TOTAL GOLD			220,820	3,240,947,043	(f)
GYPSUM					
	Bruce Rock	1,208		9,664	(e)
	Carnarvon	974,619		18,536,229	(e)
	Dalwallinu	79,926		1,604,906	(e)
	Dandaragan	11,376		113,760	(e)
	Dundas	15,966		95,797	(e)
	Esperance	32,071		192,426	(e)
	Koorda	300		3,600	(e)
	Lake Grace	43,484		346,795	(e)
	Merredin	645		6,450	(e)
	Mt Marshall	1,977		18,720	(e)
	Nungarin	28,461		170,766	(e)
	Ravensthorpe	9,484		66,388	(d)
	Wyalkatchem	55,843		446,746	(e)
	Yilgarn	125		1,250	(e)
TOTAL GYPSUM		1,255,485		21,613,497	
HEAVY MINERAL SANDS					
Garnet Sand	Bunbury City	17		2,120	(g)
	Northampton	88,563		11,311,232	(e)
Total Garnet Sand		88,580		11,313,352	
			TiO ₂ %		
Ilmenite	Augusta-Margaret River	167,378	56.23	19,766,788	
	Bunbury City	502,414	56.24	67,325,306	
	Capel	380,120	55.13	45,658,211	
	Carnamah	259,208	58.26	24,570,069	
	Northampton	10,735	55.00	1,266,671	
Total Ilmenite		1,319,856		158,587,045	(a)

TABLE 3 (cont.) QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE A\$	Ref. (69)
			TiO ₂ %		
Upgraded Ilmenite	Capel	248,787	92.00	129,733,473	
	Carnamah	104,259	92.00	56,879,095	
	Dandaragan	80,230	92.00	53,867,694	
Total Upgraded Ilmenite		433,276		240,480,262	(a)
			TiO ₂ Tonnes		
Leucoxene	Bunbury City	4,259	3,918	3,078,335	
	Capel	1,958	1,801	1,332,879	
	Dandaragan	11,296	9,037	3,719,651	
Total Leucoxene		17,513	14,756	8,130,865	(a)
			TiO ₂ Tonnes		
Rutile	Bunbury City	5,917	4,816	4,342,630	
	Carnamah	92,483	73,309	72,199,186	
	Dandaragan	21,309	13,166	14,429,240	
Total Rutile		119,709	91,290	90,971,056	(a)
			ZrO ₂ Tonnes		
Zircon	Bunbury City	41,949	27,267	18,100,017	
	Augusta-Margaret River	445	289	215,092	
	Capel	15,481	10,063	7,049,438	
	Carnamah	123,986	80,591	58,911,164	
	Dandaragan	59,677	38,790	31,116,876	
	Capel	42,995	27,947	20,673,203	
Total Zircon		284,533	184,946	136,065,790	(a)
TOTAL HEAVY MINERAL SANDS				645,548,370	
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	Mukinbudin	406		8,718	(h)
IRON ORE					
			Fe%		
Domestic Ore	Ashburton	374,294	58.00	5,865,628	
	East Pilbara	6,770,324	62.56	202,006,768	
Total Domestic Ore		7,144,618	59.17	207,872,396	
			Fe%		
Exported Ore	Ashburton	74,272,020	57.29	2,041,812,689	
	Derby-West Kimberley	421,185	40.03	10,278,840	
	East Pilbara	57,736,222	60.69	1,672,695,880	
	Yilgarn	1,450,369	56.45	32,174,283	
Total Exported Ore		133,879,796		3,756,961,692	(a)
TOTAL IRON ORE		141,024,414		3,964,834,088	

TABLE 3 (cont.)

QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE A\$	Ref. (p.69)
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	Lake Grace	3,086		67,892	
Limesand-Limestone	Carnamah	21,952		87,808	
	Cockburn	1,749,650		5,161,467	
	Coorow	10,052		50,259	
	Dandaragan	20,080		90,362	
	Dundas	195,575		2,933,625	
	Exmouth	92,154		370,865	
	Gingin	37,224		588,856	
	Irwin	187,745		525,024	
	Kwinana	483,294		1,371,148	
	Manjimup	3,951		59,265	
	Shark Bay	1,283		160,375	
	Wanneroo	243,145		2,468,268	
	Total Limesand-Limestone		3,046,105		13,867,322
TOTAL LIMESAND-LIMESTONE-DOLOMITE				13,935,214	(d)
Mn%					
MANGANESE ORE	East Pilbara	27,414	48.52	3,415,875	(a)
Co Tonnes					
NICKEL INDUSTRY Cobalt By-Product	Coolgardie		1,006	50,764,690	(a)(b)
	Kalgoorlie-Boulder		20	363,625	(a)(b)
	Roebourne		66	4,138,579	(a)(b)
Total Cobalt By-Product			1,092	55,266,894	
Ni%					
Nickel Concentrates	Coolgardie	212,131	12.87	190,908,910	(i)
	Kalgoorlie-Boulder	59,960	18.18	75,463,752	(i)
	Kondinin	42,802	14.61	42,609,645	(i)
	Leonora	292,097	13.25	268,341,346	(i)
	Roebourne	43,667	10.10	32,291,452	(i)
	Wiluna	184,503	20.45	262,783,041	(i)
Total Nickel Concentrates		835,160		872,398,146	
Ni Tonnes					
Nickel Metal	Kalgoorlie-Boulder		459	3,724,438	(i)
Pd kg					
Palladium By-Product	Coolgardie		792	9,233,230	(a)(b)
Pt kg					
Platinum By-Product	Coolgardie		102	1,838,767	(a)(b)
TOTAL NICKEL INDUSTRY				942,461,475	

TABLE 3 (cont.) QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE AS	Ref. (p.69)
PETROLEUM		Kilolitres			
Condensate	Ashburton	221,094		29,988,670	(d)
	Carnamah	198		16,629	(d)
	Irwin	716		206,735	(d)
	Roebourne	5,332,121		713,694,192	(a)
Total Condensate		5,554,129		743,906,225	
		Kilolitres			
Crude Oil	Ashburton	4,454,764		601,106,101	
	Irwin	9,240		1,037,492	
	Roebourne	4,698,532		587,299,935	
Total Crude Oil		9,162,536		1,189,443,528	(a)
		Btu 10 ⁶			
Liquified Natural Gas	Roebourne	391,897,317		1,434,419,363	(j)
		Tonnes			
LPG - Butane	Roebourne	388,694		90,621,537	
		Tonnes			
LPG - Propane	Roebourne	259,207		57,626,639	
		'000 m ³			
Natural Gas	Ashburton	887,413		76,052,444	(j)
	Carnamah	43,991		6,626,028	(j)
	Irwin	136,875		16,867,597	(j)
	Roebourne	5,371,420		450,284,699	(j)
Total Natural Gas		6,439,699		549,830,769	
TOTAL PETROLEUM PRODUCTS				4,065,848,061	
PIGMENTS					
Red Oxide	Cue	331		62,890	
SALT					
	Carnarvon	1,287,801		32,876,666	
	Esperance	11,839		501,265	
	Port Hedland Town	3,004,368		61,608,906	
	Roebourne	3,370,019		84,000,994	
	Shark Bay	780,813		15,750,136	
	Wyalkatchem	170		13,552	
	Yilgarn	115,772		4,886,695	
TOTAL SALT		8,570,782		199,638,214	(a)
SILICA-SILICA SAND					
Silica	Moora	90,069		900,692	(a)
Silica Sand	Albany	90,672		1,360,110	(a)
	Cockburn	114,848		1,263,329	(a)
	Coolgardie	66,939		164,002	(a)
	Swan	220,506		2,420,211	(a)
Total Silica Sand		492,965		5,207,652	
TOTAL SILICA-SILICA SAND				6,108,344	

TABLE 3 (cont.)

QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE AS	Ref. (p.69)
SILVER BY-PRODUCT		Ag kg			
	Coolgardie	166		41,922	
	Derby-West Kimberley	4,770		797,491	
	East Pilbara	636		166,025	
	Statewide	27,169		6,471,163	
	Yalgoo	33,306		7,047,494	
TOTAL SILVER		66,046		14,524,095	
TALC	Meekatharra	6,579		460,496	
	Three Springs	175,030		14,119,442	
TOTAL TALC		181,609		14,579,938	(e)
TIN-TANTALUM-LITHIUM			Li ₂ O ₅ %		
Spodumene	Bridgetown-Greenbushes	48,021	7.03	10,886,637	(a)
			Ta ₂ O ₅ kg		
Tantalite	Bridgetown-Greenbushes	415	217,875	65,929,047	
			Sn Tonnes		
Tin	Bridgetown-Greenbushes		596	4,999,060	(a)
TOTAL TIN-TANTALUM-LITHIUM				81,814,744	
VALUE OF MINERALS				9,398,650,471	
VALUE OF PETROLEUM				4,065,848,061	
VALUE OF GOLD				3,240,947,043	
TOTAL VALUE				16,705,445,575	

TABLE 4 ROYALTY RECEIPTS 1997-98, 1998-99

MINERAL	1997-98	1998-99	1998-99 GROWTH	
	A\$	A\$	A\$	%
BASE METALS				
Copper	2,444,734	1,701,389	-743,344	(30)
Lead	256,316	841,126	584,810	228
Zinc	5,608,191	7,001,603	1,393,412	25
TOTAL BASE METALS	8,309,240	9,544,118	1,234,877	15
BAUXITE-ALUMINA				
Alumina	36,205,237	39,138,672	2,933,435	8
Gallium	42,343	0	-42,343	(100)
TOTAL BAUXITE-ALUMINA	36,247,580	39,138,672	2,891,092	8
CHROMITE				
Chromite Ore	171,283	339,834	168,551	98
CLAYS	257,791	80,067	-177,725	(69)
COAL	12,305,053	13,319,796	1,014,743	8
CONSTRUCTION MATERIALS				
Aggregate	94,087	91,126	-2,960	(3)
Gravel	62,025	86,311	24,286	39
Rock	128,660	96,831	-31,829	(25)
Sand	574,410	588,632	14,221	2
TOTAL CONSTRUCTION MATERIALS	859,182	862,900	3,718	0
DIAMOND	40,086,339	54,940,672	14,854,333	37
DIMENSION STONE	666	3,366	2,700	406
GEM, SEMI-PRECIOUS & ORNAMENTAL STONE	1,910	0	-1,910	(100)
GOLD	365,133	28,296,903	27,931,770	7,650
GYPSUM	175,072	489,113	314,041	179
HEAVY MINERAL SANDS				
Garnet	513,560	664,172	150,612	29
Ilmenite	9,190,945	8,364,656	-826,289	(9)
Leucoxene	563,291	321,241	-242,050	(43)
Rutile	3,756,738	3,823,478	66,739	2
Zircon	8,083,548	7,434,183	-649,365	(8)
TOTAL HEAVY MINERAL SANDS	22,108,082	20,607,730	-1,500,353	(7)
INDUSTRIAL PEGMATITE MINERALS				
Feldspar	115,362	692	-114,670	(99)
IRON ORE	197,744,007	208,344,284	12,185,084	6
LIMESAND-LIMESTONE-DOLOMITE				
Dolomite	715	1,393	678	95
Limesand-Limestone	388,397	1,090,599	702,203	181
TOTAL LIMESAND-LIMESTONE-DOLOMITE	389,112	1,091,992	702,881	181

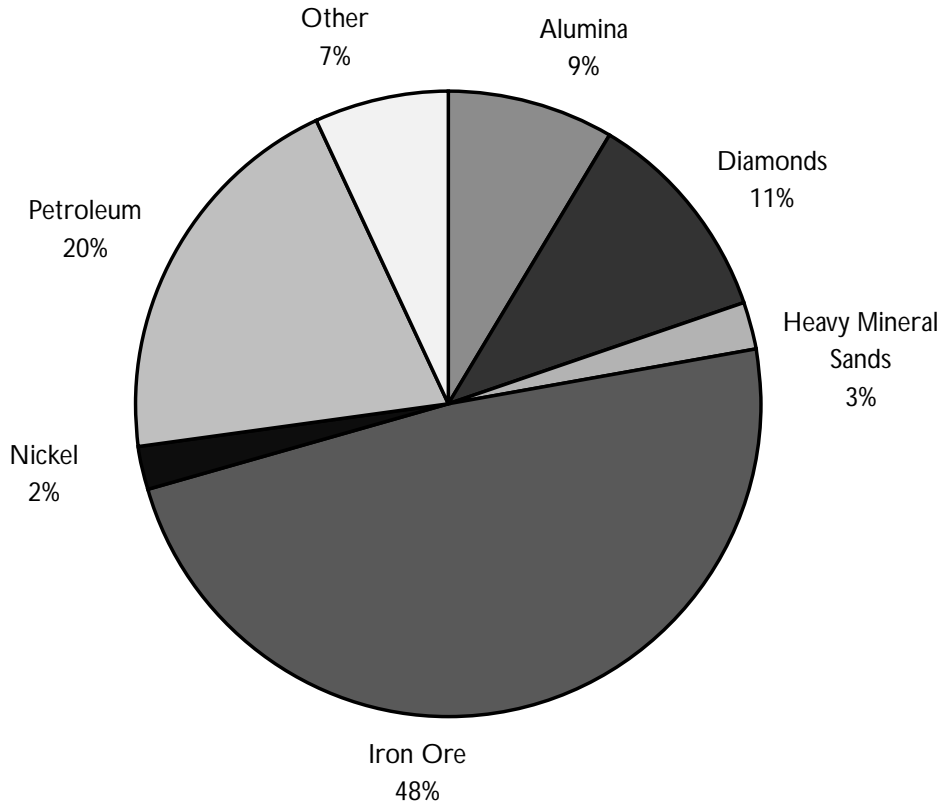
TABLE 4 (cont.)
ROYALTY RECEIPTS 1997-98, 1998-99

MINERAL	1997-98	1998-99	1998-99 GROWTH	
	A\$	A\$	A\$	%
MANGANESE	81,723	1,321,605	1,239,882	1,517
NICKEL				
Cobalt by-product	1,389,448	1,215,161	-174,287	(13)
Nickel	22,853,615	19,976,816	-2,876,800	(13)
Palladium by-product	97,324	203,473	106,150	109
Platinum by-product	116,438	68,958	-47,479	(41)
TOTAL NICKEL INDUSTRY	24,456,824	21,464,408	-2,992,416	(12)
PETROLEUM				
Condensate	56,684,536	39,253,515	-17,431,021	(31)
Liquified Natural Gas	90,611,328	73,278,518	-17,332,810	(19)
LPG - Butane	4,533,964	4,338,333	-195,631	(4)
LPG - Propane	3,298,684	3,079,318	-219,366	(7)
Natural Gas	29,747,543	23,899,820	-5,847,723	(20)
Oil	62,527,434	33,100,373	-29,427,061	(47)
TOTAL PETROLEUM	247,403,490	176,949,877	-70,453,612	(28)
PIGMENTS				
Red Oxide	50,730	18,060	-32,671	(64)
SALT	1,966,169	1,974,670	8,501	0
SILICA SAND	374,915	329,134	-46,555	(12)
SILVER	263,339	370,052	106,713	41
TALC	82,018	64,797	-17,220	(21)
TIN-TANTALUM-LITHIUM				
Spodumene	581,370	535,574	-45,796	(8)
Tantalite	910,228	1,592,433	682,206	75
Tin	87,317	124,539	37,222	43
TOTAL TIN-TANTALUM-LITHIUM	1,578,915	2,252,547	673,632	43
OTHER MINERALS				
Spongolite	774	34,036	33,262	4,297
TOTAL ROYALTY RECEIPTS	595,394,709	581,839,325	-11,970,576	(2)
IRON ORE ADDITIONAL RENTAL	26,838,558	23,632,728	-4,790,638	(18)
TOTAL REVENUE	622,233,267	605,472,053	-16,761,214	(3)

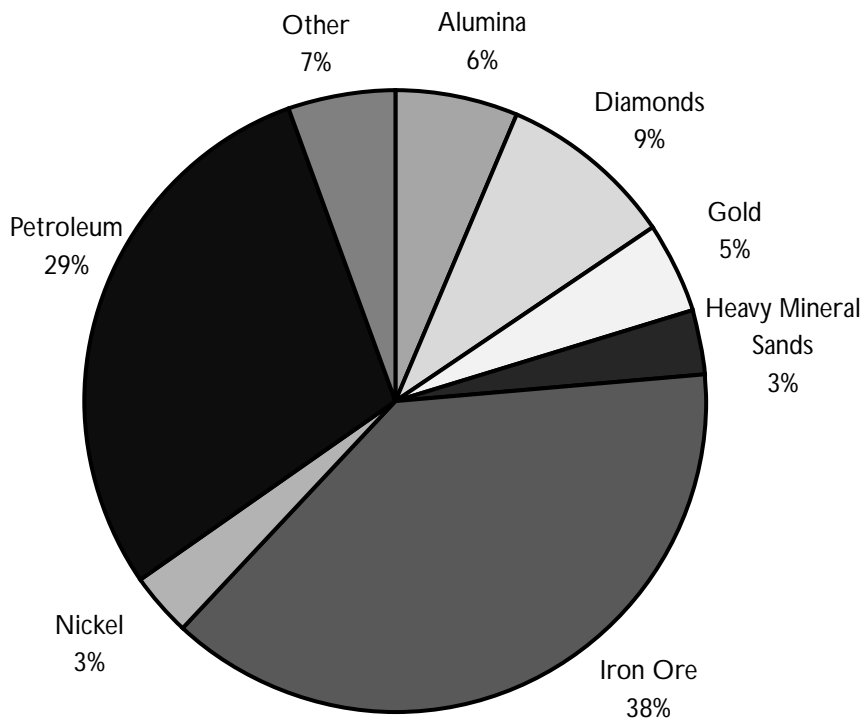
Note: All Royalty Receipts above are only those paid to Consolidated Revenue Fund

COMPARATIVE ROYALTY RECEIPTS

1993-94 Total : A\$359.30 million



1998-99 Total : A\$605.47 million



Source: DME

Figure 0.2

TABLE 5 AVERAGE NUMBER OF PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES

MINERAL/Company	Operating Site	1997-98	1998-99
BASE METALS			
Normandy Mining Ltd	Scuddles	344	384
Straits Resources Ltd	Nifty	256	253
Western Metals Ltd	Cadjebut	435	324
	Pillara	292	215
TOTAL BASE METALS		1,327	1,176
BAUXITE - ALUMINA			
Alcoa of Australia Ltd	Huntly	358	432
	Jarrahdale	252	147
	Kwinana Alumina Refinery	1,418	1,402
	Pinjarra Refinery	1,438	1,526
	Wagerup Alumina Refinery	899	1,188
	Willowdale	218	241
	Australian Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	80
Worsley Alumina Pty Ltd	Worsley Tunnel Road	155	187
	Worsley Refinery	1,221	1,765
TOTAL BAUXITE - ALUMINA		6,039	6,961
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja	353	345
Wesfarmers Coal Ltd	Central Services	44	43
	Premier/WCL	145	284
	Western No. 5	172	231
TOTAL COAL		714	903
DIAMOND			
Argyle Diamond Mines Pty Ltd	Lake Argyle	840	897
TOTAL DIAMOND		840	897
GOLD			
Amalg Resources NL	Burmill Plant	3	6
Australasian Gold Mines	Red White and Blue	54	0
Australian Resources Pty Ltd	Gidgee	164	99
	Mt McLure	164	169
Australian Gold Fields NL	Bannockburn	111	48
Australian Gold Resources Ltd	Perth Mint	69	63
Barmenco Pty Ltd	Two Boys	34	0
	Jenny Wren	0	25
	Karonie	12	15
Border Gold NL			
Camelot Resources NL	Mt Gibson	61	0
	Tarmoola	253	277
Centaur Mining & Exploration Ltd	Mt Pleasant	400	496
	Ora Banda	205	1
	Norseman	239	262
Como Engineers	O'Conner - Carbon Stripping Plant	5	5
Consolidated Gold NL	Bardoc - Davyhurst	117	74
	Miranda	62	59
Croesus Mining NL	Binduli	57	63
Dalrymple Resources NL	Sandstone	2	0
Delta Gold NL	Golden Feather Group	84	154
Equigold NL	Dalgaranga	88	131
Goldfields Kalgoorlie Ltd	Kundana	244	255

TABLE 5 (cont.) AVERAGE NUMBER OF PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES

MINERAL/Company	Operating Site	1997-98	1998-99
GOLD (Continued)			
Goldfields Kalgoorlie Ltd	Paddington	357	248
Golden West Refining Corporation Ltd	Kewdale - Golden West Refinery	31	24
Gold Mines of Australia	Youanmi	132	0
Great Central Mines NL	Bronzewing	326	288
	Jundee-Nimary	691	568
	Wiluna	435	454
Hedges Gold Pty Ltd	Hedges	133	82
Herald Resources Ltd	Sandstone	35	29
	Three Mile Hill	162	60
	Hill 50	222	341
Homestake Mining Company	Darlot	435	453
	Lawlers	205	217
	Mt Morgans	163	56
	Plutonic	439	430
	Badgebup	23	0
International Mineral Resources NL	Badgebup	23	0
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile - Superpit	1,256	1,228
Lionore Australia Pty Ltd	Bounty	244	229
Lynas Gold NL	Lynas Find	39	18
	Mt Olympus	0	56
Morning Star Mines NL	Hannan South	18	17
Mount Mine Joint Venture	Mount Group	5	7
Mt Lyell Mining Company Ltd	Reedy	75	0
New Hampton Goldfields NL	Dawns Hope	189	236
	Mt Martin	123	0
	New Celebration	215	204
Newcrest Mining Ltd	Telfer	597	585
	Daisy - Milano	9	0
Nickel Seekers NL	Daisy - Milano	9	0
Normandy Mining Ltd	Big Bell	337	426
	Kaltails	85	92
North Gold (WA) Ltd	Kanowna Belle	325	372
	Peak Hill	47	41
Osmere NL	Kookynie	50	0
Perilya Mines NL	Fortnum	107	108
Placer Dome Inc	Granny Smith	312	355
Resolute Ltd	Bullabulling	115	0
	Chalice	163	98
	Higginsville	175	0
	Marymia	72	0
	Barnicoat	101	16
Sons of Gwalia NL	Copperhead	118	158
	Cornishman	5	64
	Frasers	46	0

TABLE 5 (cont.) AVERAGE NUMBER OF PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES

MINERAL/Company	Operating Site	1997-98	1998-99
GOLD (Continued)			
Sons of Gwalia NL	Golden Pig and Frasers	45	69
	Marvel Loch	177	252
	Ruapehu	0	18
	Sons of Gwalia	170	231
	Yilgarn Star	290	181
St. Barbara Mines Ltd	Bluebird	331	115
Stockdale Prospecting Ltd	Sunrise Dam	155	196
Tectonic Resources NL	Mt Dimer	35	0
WMC Resources Ltd	Emu	319	581
	Kambalda/St. Ives	1,119	902
Worsley Alumina Pty Ltd	Boddington	515	577
TOTAL GOLD		14,201	12,784
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	203	150
Cable Sands Pty Ltd	Bunbury	332	327
GMA Garnet Pty Ltd	Narngulu Garnet Plant	24	23
	Port Gregory - Hutt Lagoon	20	19
Hanwah Advanced Ceramics Australia Pty Ltd	Rockingham Zirconia Plant	20	19
Iluka Resources Limited	Capel	730	879
	Eneabba	483	393
	Narngulu Synthetic Rutile Plants	226	178
	Narngulu Dry Plant	66	62
TiWest Pty Ltd	Chandala-Muchea	217	228
	Cooljarloo	145	228
TOTAL HEAVY MINERAL SANDS		2,466	2,506
IRON ORE			
BHP Iron Ore (Goldsworthy) Ltd	Finucane Island	462	300
	Yarrie	156	134
BHP Iron Ore (Jimblebar) Ltd	Jimblebar	128	132
BHP Iron Ore Ltd	Port Hedland HBI Plant	0	753
	Mt Newman Railway	606	499
	Mt Whaleback	1,578	1,362
	Nelson Point	1,277	942
	Orebody 25	95	130
	Port Hedland Harbour Tunnel	51	0
	Yandi	156	453
	Hamersley Iron Pty Ltd	Brockman No. 2 Detritals Group	118
Dampier Port Operations		877	915
Hismelt/Kwinana		118	143
Marandoo		208	193
Paraburdoo/Channar		649	573
Hamersley Railway		371	324
Tom Price		771	847
Yandicoogina		519	372
Koolyanobbing Iron Pty Ltd	Cockatoo Island	47	23
	Koolyanobbing	28	26
Robe River Mining Co. Pty Ltd	Cape Lambert	452	470
	Pannawonica Deepdale	370	317
	Robe River Railway	99	101
TOTAL IRON ORE		9,136	9,204

TABLE 5 (cont.) AVERAGE NUMBER OF PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES

MINERAL/Company	Operating Site	1997-98	1998-99
NICKEL			
Anaconda Nickel Ltd	Murrin Murrin Plant	914	1,299
Murrin Murrin Operations	Murrin Murrin	202	516
Centaur Mining & Exploration	Cawse	434	348
Outokumpu Mining Australia Pty Ltd	Black Swan	141	280
	Forrestania	181	164
Resolute Ltd	Bulong	296	267
Titan Resources NL	Radio Hill	25	64
Western Mining Corporation Ltd	Kalgoorlie Nickel Smelter	384	584
	Kambalda/Blair	1,063	669
	Kwinana Refinery	572	393
	Leinster	1,028	798
	Mt Keith	755	903
TOTAL NICKEL		5,995	6,285
PETROLEUM PRODUCTS			
Apache Energy Ltd	Campbell, Agincourt, East Spar, Harriet, Rosette, Sinbad, Tanami, Stag, Chervil, North Herald, South Pepper, Airlie Island	151	156
ARC	Dongara	7	7
BHP Petroleum (Australia) Pty Ltd	Griffin	58	78
	Tubridgi	0	28
Boral	Beharra Springs, Tubridgi	11	11
Kimberley Oil	Blina, Boundary, Lloyd, Sundown, West Terrace	4	4
Mobil Exploration & Producing Australia Pty Ltd	Wandoo	32	32
Phoenix	Woodada	5	5
Premier Oil Australia Pty Ltd	Mt Horner	6	7
West Australian Petroleum Pty Ltd (WAPET)	Barrow Island, Cowle, Crest, Roller-Skate, Saladin, Yammaderry	167	165
Woodside Energy Ltd	Cossack, Goodwyn, Hermes, North Rankin, Wanaea	1,333	1,289
TOTAL PETROLEUM PRODUCTS		1,774	1,782
SALT			
Cargill Salt Co.	Port Hedland	115	112
Dampier Salt Ltd	Dampier	231	238
	Lake MacLeod	147	158
Onslow Solar Salt Pty Ltd	Onslow	64	89
Shark Bay Salt JV	Useless Loop	98	78
TOTAL SALT		655	675
TOTAL CLAYS		69	59
TOTAL CONSTRUCTION MATERIALS		426	346
TOTAL DIMENSION STONE		78	68
TOTAL INDUSTRIAL PEGMATITE MINERALS		35	31
TOTAL LIMESTONE - LIMESAND		184	171
TOTAL MANGANESE ORE		57	18
TOTAL PHOSPHATE		156	184
TOTAL SILICA - SILICA SAND		233	227
TOTAL TALC		43	54
TOTAL TIN - TANTALUM - LITHIUM		279	296
ALL OTHER MATERIALS		106	376
TOTAL		44,813	45,003

(SOURCE:AXTAT REPORTING SYSTEM, MINING OPERATIONS DIVISION)

TABLE 6

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998-99

BASE METALS**Copper**

Murchison Zinc Co. Pty Ltd, 100 Hutt Street, Adelaide SA 5000, (08) 8303 1700: Golden Grove.

Newcrest Mining Ltd, Level 2, 30 Terrace Road, East Perth WA 6004 (08) 9270 7070,

<http://www.newcrest.com.au>: Telfer.

Straits Resources Ltd, 1 Alfred Street, Sydney NSW 2000, (02) 9252 2011, <http://www.straits.com.au>: Nifty.

WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000, <http://www.wmc.com.au>: Kambalda.

Lead - Zinc

Murchison Zinc Co. Pty Ltd, 100 Hutt Street, Adelaide SA 5000, (08) 8303 1700: Golden Grove.

Western Metals Ltd, 263 Adelaide Terrace, Perth WA 6000, (08) 9221 2555: Cadjebut.

BAUXITE - ALUMINA**Alumina**

Alcoa of Australia (WA) Ltd, cnr Davey and Marmion Streets, Booragoon WA 6154, (08) 9316 5111,

<http://www.alcoa.com/business/units/australia.asp>: Del Park, Jarrahdale, Willowdale, Huntly.

Worsley Alumina Pty Ltd, PO Box 344, Boddington WA 6225, (08) 9734 8311: Boddington.

CHROMITE**Chromite Ore**

Danelagh Resources Pty Ltd, 32 Kings Park Rd, West Perth WA 6005, (08) 9486 7640: Coobina.

CLAY**Attapulgit**

Hudson Resources Ltd, James St Narngulu, Geraldton WA 6530, (08) 9923 3604: Lake Nerramyne.

Clay Shale

Griffin Coal Mining Co. Ltd, 28 The Esplanade, Perth WA 6000, (08) 9261 2800: Collie.

Fire Clay

Midland Brick Co. Pty Ltd, Bassett Rd, Middle Swan WA 6056, (08) 9273 5522: Bullsbrook.

Kaolin

Gwalia Consolidated Ltd, 16 Parliament Place, West Perth WA 6005, (08) 9263 5555,

<http://www.sog.com.au>: Greenbushes.

COAL

Griffin Coal Mining Co. Ltd, 28 The Esplanade, Perth WA 6000, (08) 9261 2800: Collie.

Wesfarmers Coal Ltd, 276 Leach Highway, Myaree WA 6153, (08) 9333 0391: Collie.

CONSTRUCTION MATERIALS**Aggregate**

Pioneer Concrete (WA) Pty Ltd: 123 Burswood Rd, Victoria Park WA 6100, (08) 9311 8811: Learmonth.

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9212 2000: Boodarrie,

Burrup-Dampier.

Gravel

Boral Resources (WA) Ltd, 63 Abernethy Road, Belmont WA 6104, (08) 9333 3400,

<http://www.boral.com.au>: Grosmont.

WA Limestone Co, 41 Spearwood Ave, Bibra Lake WA 6163, (08) 9434 2299: Pickering.

Rock

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9212 2000: Kalgoorlie.

Sand

Boral Resources (WA) Ltd, 63 Abernethy Rd, Belmont WA 6104, (08) 9333 3400,

<http://www.boral.com.au>: Gnarlbine, Grosmont, Maitland River, Nickol Bay

Rocla Quarry Products, 1 Newburn Road, Kewdale WA 6105, (08) 9353 3030: Gnangarra.

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9212 2000: Comet Vale,

Pinnacles, Sandy Creek, Sandy Hill, Sullivan's Creek, Turner River, Warrawanda, Widgiemooltha.

DIAMONDS

Argyle Diamond Mines, 2 Kings Park Road, West Perth WA 6005, (08) 9482 1166,

<http://www.ashton.net.au/argyle/index.html>: Argyle.

TABLE 6 (cont.)

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998-99

DIMENSION STONE**Granite**

Fraser Range Holdings Ltd, Level 1, 220 St George's Terrace, Perth WA 6000, (08) 9322 9044: Drydens Find Granite, Mungari Granite.

Jasper

J. Van Uden, PO Box 723, Port Hedland, WA, 6721, (08) 9173 3375, Ord River.

Spongolite

Supersorb Minerals NL, 55 Collie Street, Albany WA 6330, (08) 9842 1955: Woogenellup.

GOLD

Acacia Resources Ltd, 60 City Road, South Melbourne VIC 3006, (03) 9684 4999,

<http://www.acacia.com.au>: Sunrise Dam.

Australian Resources Ltd, 100 Williams Street, East Sydney NSW 2001, (02) 9326 9277: Gidgee, Mt McClure.

Centaur Mining & Exploration Ltd, 210 Kings Way, South Melbourne VIC 3205, (03) 9234 1122,

<http://www.cme.com.au>: Mt Pleasant-Golden Kilometre, Ora Banda.

Central Norseman Gold Corp. NL, Level 37, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000,

<http://www.wmc.com.au>: Central Norseman.

Croesus Mining NL, 39 Porter Street, Kalgoorlie WA 6430, (08) 9091 2222,

<http://www.croesus.com.au>: Binduli.

Delta Gold NL, 99 Walker Street, North Sydney NSW 2060, (02) 9903 4000,

<http://www.deltagold.com.au>: Golden Feather.

Equigold NL, 7 Sleat Street, Applecross WA 6153, (08) 9316 3661: Dalgaranga.

Goldfields Kalgoorlie Ltd, Level 16, 1 Castlereagh Street, Sydney NSW 2000, (02) 9223 2400: Kundana, Paddington.

Great Central Mines NL, 210 Kings Way, Sth Melbourne VIC 3205, (03) 9234 1111,

<http://www.gcm.com.au>: Bronzewing, Jundee-Nimary, Wiluna.

Hill 50 Gold NL, 10 Ord Street, West Perth WA 6005, (08) 9485 0070. <http://www.hill50.com.au>: Hill 50-Mt Magnet.

Homestake Mining Company, 2 Mill Street, Perth WA 6000, (08) 9212 5777,

<http://www.homestake.com>: Darlot, Lawlers, Plutonic.

Kalgoorlie Consolidated Gold Mines Pty Ltd, Private Bag 27, Kalgoorlie WA 6430, (08) 9022 1100,

<http://www.kalgold.com.au>: Golden Mile.

Lionore Australia Pty Ltd, Level 2, 10 Ord Street, West Perth WA 6005, (08) 9481 5656: Bounty.

Lynas Gold NL, 50 Colin St, West Perth WA 6005, (08) 9481 3400, <http://www.lynasgold.com.au>: Paraburdoo.

Newcrest Mining Ltd, Level 2, 30 Terrace Road, East Perth WA 6004, (08) 9270 7070,

<http://www.newcrest.com.au>: New Celebration, Telfer.

New Hampton Goldfields NL, 9 Havelock Street, West Perth WA 6005, (08) 9321 0611,

<http://www.newhampton.com.au>: Jubilee

Normandy Mining Ltd, 100 Hutt Street, Adelaide SA 5000, (08) 8303 1700, <http://www.normandy.com.au>:

Big Bell.

North Ltd, 476 St Kilda Road, Melbourne VIC 3004, (03) 9207 5111, <http://www.north.com.au>: Kanowna Belle, Peak Hill.

Pacific Mining Corporation Ltd, 35 Ventnor Ave, West Perth WA 6005, (08) 9321 0616: Tarmoola.

Perilya Mines NL, 31 Ventnor Avenue, West Perth WA 6005, (08) 9423 1700, <http://www.perilya.com.au>: Fortnum.

Placer Dome Inc, 1 Alfred Street, Sydney Cove NSW 2000 (02) 9256 3800,

<http://www.placerdome.com.au>: Granny Smith.

Resolute Ltd, 28 The Esplanade, Perth WA 6000, (08) 9261 6100, <http://www.resolute-ltd.com.au>: Chalice.

Sons of Gwalia NL, 16 Parliament Place, West Perth WA 6005, (08) 9263 5555,

<http://www.sog.com.au>: Bullfinch, Marvel Loch-Southern Cross, Sons of Gwalia, Yilgarn Star.

St Barbara Mines Ltd, 2 The Esplanade, Perth WA 6000, (08) 9323 3333: Bluebird.

WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000, <http://www.wmc.com.au>: Agnew, Kambalda-St Ives.

Worsley Alumina Pty Ltd, PO Box 48, Boddington WA 6390, (08) 9883 8260: Boddington.

TABLE 6 (cont.)

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998-99

GYPSUM

Dampier Salt (Operations) Pty Ltd, 152 St George's Terrace, Perth WA 6000, (08) 9327 2257, <http://www.dampiersalt.com.au>: Lake MacLeod.
 Swan Cement Ltd, PO Box 528, Kwinana WA 6966, (08) 9499 2222: Lake Hillman.
 Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross WA 6153 (08) 9364 4951: Lake Cowcowing.

HEAVY MINERAL SANDS**Garnet Sand**

GMA Garnet Pty Ltd, PO Box 188, Geraldton WA 6530, (08) 9923 3644, <http://www.gmagarnet.com>: Port Gregory.

Ilmenite, Leucoxene, Rutile and Zircon

BHP Titanium Minerals Pty Ltd, PO Box 22, Karridale WA 6288, (08) 9758 2500, <http://www.bhp.com.au>: Beenup.
 Cable Sands (WA) Pty Ltd, PO Box 133, Bunbury WA 6230, (08) 9721 0200: Busselton, Jangardup, Waroona, Sandalwood.
 Iluka Resources Ltd, Private Mail Bag 5010, Geraldton WA 6530, (08) 9956 8444: Capel, Eneabba, Yoganup.
 TiWest Pty Ltd, 1 Brodie-Hall Drive, Bentley WA 6102, (08) 9365 1333: Cooljarloo.

IRON ORE

BHP Iron Ore (Goldsworthy) Ltd, 200 St George's Terrace, Perth WA 6000, (08) 9320 4444, <http://www.bhp.com.au>: Nimingarra-Yarrie.
 BHP Iron Ore (Jumblebar) Ltd, 200 St George's Terrace, Perth WA 6000, (08) 9320 4444, <http://www.bhp.com.au>: Jumblebar.
 BHP Iron Ore Ltd, 200 St George's Terrace, Perth WA 6000, (08) 9320 4444, <http://www.bhp.com.au>: Newman, Yandicoogina.
 Channar Mining Pty Ltd, 152 St George's Tce, Perth WA 6000, (08) 9327 2327: Channar.
 Hamersley Iron Pty Ltd, 152 St George's Terrace, Perth WA 6000, (08) 9327 2327: Brockman, Marandoo, Paraburdoo, Tom Price, Yandicoogina.
 Koolyanobbing Iron Pty Ltd, 1 William St, Perth WA 6000, (08) 9426 3388: Cockatoo Island, Koolyanobbing.
 Robe River Iron Associates, 12 St George's Terrace, Perth WA 6000, (08) 9421 4747: Pannawonica.

LIMESAND - LIMESTONE

Cockburn Cement Ltd, Russell Road, East Munster WA 6166, (08) 9411 1000: Cockburn,
 Dongara. Loongana Lime Pty Ltd, PO Box 808, Kalgoorlie WA 6430, (08) 9021 8055: Loongana.
 WA Limestone Co, 41 Spearwood Ave, Bibra Lake WA 6163, (08) 9434 2299: Postans.
 Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross WA 6153 (08) 9364 4951: Dongara-Denison, Cervantes, Lancelin, Yanchep.
 Limestone Resources Australia Pty Ltd, Parkland Road, Cnr Hasler Street, Osborne Park WA, 6017, (08) 9443 4244: Wanneroo, Moore River, Carabooda.

MANGANESE

Pilbara Manganese Pty Ltd, 62 Colin Street, West Perth WA 6005, (08) 9321 3633: Woodie Woodie.

NICKEL

Anaconda Nickel Ltd, Level 12, 2 Mill St, Perth WA 6000, (08) 9212 8400, <http://www.anaconda.com.au>: Murrin Murrin.
 Australian Nickel Mines, 1st Floor, 24 Outram St, West Perth WA 6005, (08) 9481 6040: Radio Hill.
 Black Swan Nickel Pty Ltd, Locked Bag 50, Kalgoorlie Business Centre, Kalgoorlie WA 6430 (08) 9024 0240: Black Swan, Silver Swan.
 Centaur Mining and Exploration Ltd, 23 Ventnor Avenue West Perth WA 6005, (08) 9481 7777, <http://www.cme.com.au>: Cawse.
 Outokumpu Australia Pty Ltd, 141 Burswood Road, Burswood WA 6100, (08) 9334 7333, <http://www.outokumpu.com>: Forrestania.
 Preston Resources Ltd, Level 1, 16 Ord Street, West Perth WA 6006, (08) 6322 4166, <http://www.prestonres.com.au>: Bulong.
 WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000, <http://www.wmc.com.au>: Kambalda, Leinster, Mt Keith.

TABLE 6 (cont.)

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998-99

PETROLEUM

- Apache Energy Ltd, Level 3, 256 St George's Terrace, Perth WA 6000, (08) 9422 7222: East Spar, Harriet, Stag, Airlie Island.
- ARC Energy NL, 35 Ventnor Avenue, West Perth WA 6005, (08) 9486 7333, <http://www.arcenergy.com.au>: Dongara.
- BHP Petroleum Pty Ltd, Central Park, 152-158 St George's Terrace, Perth WA 6000, (08) 9278 4888, <http://www.bhp.com.au>: Griffin.
- Boral Energy Resources Ltd, 339 Coronation Drive, Milton QLD 4064, (07) 3858 0600, <http://www.boral.com.au>: Beharra Springs, Tubridgi.
- Mobil Exploration & Producing Australia Pty Ltd, Level 29, QV1 Building, 250 St George's Terrace, Perth WA 6000, (08) 9424 9200: Wandoo
- Phoenix Energy Pty Ltd, 10th Floor, The Griffin Centre, 28 The Esplanade, Perth WA 6000, (08) 9261 2800: Woodada.
- Premier Oil Australia Pty Ltd, Level 3, 31 Ventnor Ave, West Perth 6005, (08) 9480 4100: Mt Horner.
- West Australian Petroleum Pty Ltd (WAPET), Level 24, QV1 Building, 250 St George's Terrace, Perth WA 6000, (08) 9263 6000: Barrow Island, Crest, Roller-Skate, Saladin.
- Woodside Energy Ltd, 1 Adelaide Terrace, Perth WA 6000, (08) 9348 4000, <http://www.woodside.com.au>: Cossack, Goodwyn, Hermes, North Rankin, Wanaea

PLATINUM

- WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000, <http://www.wmc.com.au>: Kambalda.

PALADIUM

- WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000, <http://www.wmc.com.au>: Kambalda.

SALT

- Cargill Salt, North West Coastal Hwy, Port Hedland WA 6721, (08) 9173 0200: Port Hedland.
- Dampier Salt (Operations) Pty Ltd, 152-158 St George's Terrace, Perth WA 6000, (08) 9327 2257, <http://www.dampiersalt.com.au>: Dampier, Lake MacLeod.
- Shark Bay Salt Joint Venture, 22 Mount Street, Perth WA 6000, (08) 9420 4320, <http://www.clough.com.au>: Useless Loop.
- WA Salt Supply Ltd, Cockburn Road, Hamilton Hill WA 6163, (08) 9430 5495: Lake Deborah East, Pink Lake.

SILICA - SILICA SAND**Silica**

- Simcoa Operations Pty Ltd, PO Box 1389, Bunbury WA 6231, (08) 9780 6666: Dalaroo.

Silica Sand

- Rocla Quarry Products, 1 Newburn Road, Kewdale WA 6105, (08) 9353 3030: Jandakot, Gngarra.
- The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9212 2000: Jandakot.
- TT Sand Pty Ltd, 55 St George's Tce, Perth WA 6000, (08) 9221 2304: Mindijup.
- WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000, <http://www.wmc.com.au>: Mt Burgess.

TALC

- Commercial Minerals Ltd, 26 Tomlinson Rd, Welshpool WA 6106, (08) 9362 1411: Mt Seabrook.
- WMC Ltd, PO Box 116, Three Springs WA 6519, (08) 9954 5047, <http://www.wmc.com.au>: Three Springs.

TIN - TANTALUM - LITHIUM**Spodumene**

- Sons of Gwalia Ltd, 16 Parliament Place, West Perth WA 6005, (08) 9263 5555, <http://www.sog.com.au>: Greenbushes, Wodgina.

Tantalite - Tin

- Sons of Gwalia Ltd, 16 Parliament Place, West Perth WA 6005, (08) 9263 5555, <http://www.sog.com.au>: Greenbushes, Wodgina.

ABBREVIATIONS, REFERENCES, UNITS AND CONVERSION FACTORS

As the document makes use of abbreviations and references, an explanation of each has been included below. A conversion table, relating the units by which various commodities are measured, has also been provided.

ABBREVIATIONS

cons	concentrates	n/a	not applicable
f.o.t.	free on truck	f.o.b.	free on board
f.o.r.	free on rail	¥	Japanese Yen
AS	Australian Dollar	US\$	United States Dollar
ABS	Australian Bureau of Statistics	GDP	Gross Domestic Product
AFR	<i>Australian Financial Review</i>	BMR	Bureau of Mineral Resources
CSO	Central Selling Organisation	HBI	Hot Briquetted Iron
DRI	Direct Reduced Iron	IMF	International Monetary Fund
RBA	Reserve Bank of Australia		
ABARE	Australian Bureau of Agricultural and Resource Economics		

REFERENCES

- (a) Estimated f.o.b. value.
- (b) Metallic by-product of nickel mining.
- (c) Value based on the average Australian value of Alumina as published by the ABS.
- (d) Value at works.
- (e) Estimated ex-mine value.
- (f) London PM Gold Fix price as supplied by WA Treasury Corp.
- (g) Estimated f.o.t. value.
- (h) Estimated f.o.r. value.
- (i) Estimated f.o.b. value based on the current price of nickel containing products.
- (j) Delivered/shipped value.
- (k) Metallic by-product of copper mining.
- (l) By-products of gold mining.
- (r) Revised from previous edition.

UNITS AND CONVERSION FACTORS

	Metric Unit	Symbol	Imperial Unit
Mass	1 gram	(g)	= 0.032151 troy (fine) ounce (oz)
	1 kilogram	(kg)	= 2.204624 pounds (lbs)
	1 tonne	(t)	= 1.10231 United States short ton [1 US short ton = 2,000 lbs]
	1 tonne	(t)	= 0.98421 United Kingdom long ton [1 UK long ton = 2,240 lbs]
Volume	1 kilolitre	(kl)	= 6.28981 barrels (bbls)
	1 cubic metre	(m ³)	= 35.3147 cubic feet (ft ³) [1 kilolitre (kl) = 1 cubic metre (m ³)]
Energy	1 kilojoule	(kj)	= 0.94781 British Thermal Units (Btu)

Energy Content

Coal	19.7 GJ/t
Condensate	32.0 MJ/L
Crude oil	37.0 MJ/L
LNG	25.0 MJ/L
Natural gas	38.2 MJ/m ³
LPG-butane	28.7 MJ/L (1tonne LPG-butane = 1,720 litres)
LPG-propane	25.4 MJ/L (1tonne LPG-propane = 1,960 litres)

Prefix

kilo (k)	10 ³
mega (M)	10 ⁶
giga (G)	10 ⁹
tera (T)	10 ¹²
peta (P)	10 ¹⁵

LOCAL GOVERNMENT BOUNDARIES

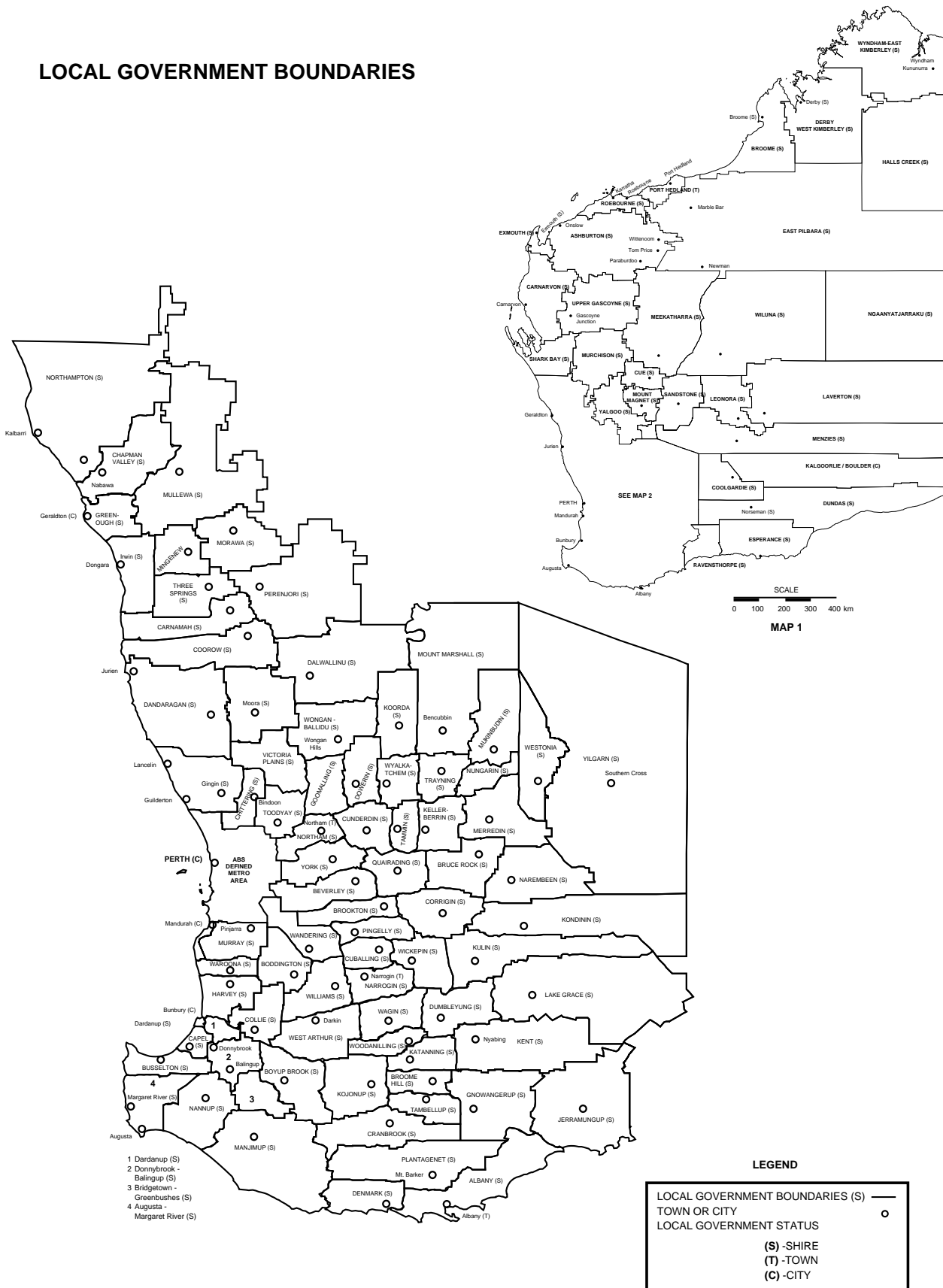


Figure 0.3

MAJOR MINERAL AND PETROLEUM PROJECTS IN WESTERN AUSTRALIA

- | | |
|-----------------------|------------------------|
| ▣ Base metals | ◇ Iron ore |
| △ Bauxite–Alumina | ▲ Nickel |
| ■ Coal | ★ Petroleum |
| ◆ Diamonds | ★ Salt |
| ● Gold | ○ Talc |
| □ Heavy Mineral Sands | ⊗ Tin–Tantalum–Lithium |
| + Gypsum | |

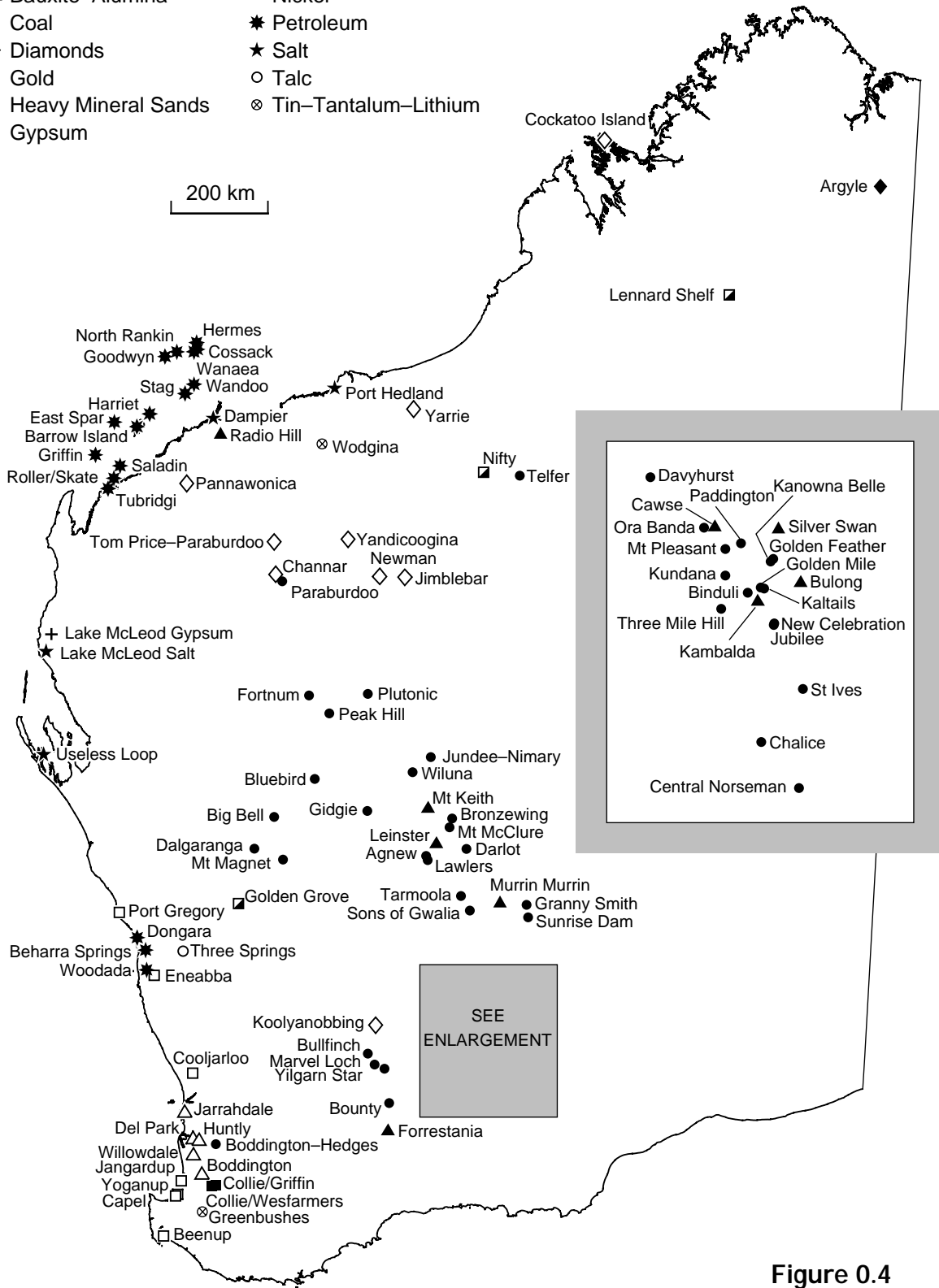


Figure 0.4

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**For further information on the mineral and
petroleum resources of Western Australia to
complement this publication please refer to:**

- Mineral and Petroleum Exploration and Development
- Atlas of Mineral Deposits and Petroleum Fields



"Our Resources • Our People • Our Future"

Corporate Policy, Planning and Services

Mineral House
Department of Minerals and Energy
100 Plain Street
East Perth WA 6004

Telephone local: (08) 9222 3102
International: 61 8 9222 3102

Facsimile local: (08) 9222 3838
International: 61 8 9222 3838

Email: j.gregory@dme.wa.gov.au