



### **CORRIGENDUM - Four Items**

*Page 5, last paragraph, first line* - Replace "*will be introduced into Parliament shortly*" with "have been passed by Parliament".

*Page 14, last paragraph, first line* - Replace "\$2,662 million" with "2,642 million".

*Page 26, seventh paragraph, first line* - Replace "*a 4.5 percent employment increase in the State's mineral and petroleum industry to 37,147 people*" with "a 4.3 percent employment increase in the State's mineral and petroleum industry to 37,076 people".

*Page 26, last paragraph, first line* - Replace "*The number of people employed in the petroleum industry grew slightly to 1,205 in 1994/95.*" with "Despite a 41.2 percent increase in the value of petroleum output in 1994/95, employment in the petroleum sector fell by 5.3 percent to 1,134."

Resource Centre  
Policy Branch  
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# 1994-95 STATISTICS DIGEST

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## FOREWORD

This issue of the Department of Minerals and Energy's Statistics Digest highlights the emergence of the petroleum sector as the State's leading resource industry, and moves by industry to process the State's iron ore resources further.

While this publication deals with the 1994/95 financial year, continuing developments are already producing some exciting statistics for the next year. The increase in oil production from the Carnarvon Basin during the third quarter of 1995 has allowed Western Australia to overtake Victoria's average production for the same period. With the Wanaea-Cossack project in the Carnarvon Basin reaching full production of around 115,000 barrels of oil per day (bopd) as this publication goes to press, Western Australia's oil production will be around 400,000 bopd by December 1995.

In addition to the increase in oil production, there are other exciting developments. BHP's announcement to proceed with its DRI plant means another very significant boost to the long-held goals of Government to achieve downstream processing of the State's resources.

In 1994/95 Western Australia's resources sector continued to underpin the State's economy, accounting for around 28 percent of State Gross Product and over 70 percent of its exports.

The value of production rose by 10 percent in 1994/95 to around \$13,870 million, primarily as a result of increased volumes of production and sales rather than price rises. The rise in value was mainly as a result of the strong increase in production of oil, nickel, LNG and mineral sands.

The major issue facing the mining and petroleum industry over the last year has been native title. The complexities of the processes involved in working with the Federal legislation have affected the granting of titles by the State. Despite this Western Australia continues to be an area of international interest for exploration, although exploration overseas by local companies is rising.

There have been some important additions to the State's 1994/95 mineral and petroleum production capacity. These include the Youanmi underground and Bronzewing open cut gold mines; Mt Keith nickel mine and the Marandoo iron ore operations. The Goodwyn A gas platform, the Griffin, Scindian, Roller and Skate oil and gas fields have enhanced petroleum production.

The outlook looks bright with a number of projects coming on stream in 1995/96. These include the North West Shelf LPG plant; a fines processing plant at Paraburdoo, the Jundee gold mine, the expansion of Western Mining's nickel operations and the Wanaea/Cossack oil and gas field.

Deregulation of the gas market, construction of the Goldfields gas pipeline coupled with continued strong Asian growth and favourable commodity prices, all suggest that the outlook for Western Australia's mineral and petroleum sectors is bright.

A handwritten signature in black ink, appearing to read 'K R Perry'.

**K R Perry**  
**DIRECTOR GENERAL**



## 1. ECONOMIC AND SOCIAL ENVIRONMENT

### 1.1 World Economic Overview

The major economies experienced stable economic growth in 1994/95, with the exception of Japan where growth remains subdued. Asian economies continued to grow strongly. The Organisation for Economic Co-Operation and Development (OECD) economies are expected to grow by around 2.5 percent in 1995, following growth of 2.9 percent in 1994. Asia recorded economic growth of 8.8 percent in 1994 and, according to the Australian Bureau of Agricultural and Resource Economics (ABARE), this is expected to moderate slightly to around 8.3 percent in 1995.

#### US Economy

The United States economy grew by 3.1 percent in 1994/95, but growth has significantly moderated over the latter half of the year. In response to concerns about this marked slowdown US monetary authorities lowered interest rates by 0.25 percentage points in early July 1995.

#### Japanese Economy

Japan recorded economic growth of 0.5 percent in 1994. Growth is forecast to rise to around 1.0 percent in 1995. Nevertheless to date, economic recovery has remained weak in Japan, despite significant economic stimulus measures by the Japanese Government's over the last three years. This has been mainly due to the sharp appreciation in the Yen in the first half of 1995, which increased by around 15 percent against the US dollar.

The vast amounts of bad loans, largely as a result of property and share market speculation in the 1980s, were officially estimated at Y50,000 billion (A\$670 billion) at September 1995. The financial sector has been further hit by the failure of two financial institutions in September 1995 (making a total of five over the last two years), disappointing ratings by Moody's Investors Service, and the disclosure of a colossal US\$1.1 billion (A\$1.5 billion) loss at Daiwa Bank from unauthorised trading in New York.

The Financial System Stabilisation Committee delivered its report to the Japanese Government in late September, outlining recommended corrective measures. The suggestions are made in very broad terms and the Government has promised to announce specific measures by the end of 1995.

#### Asian Economies

Asia's economic growth is beginning to be pushed along by higher domestic consumer spending, which is complimenting government investment and export oriented private investment. This purchasing power is building up momentum for greater consumption in Asia in the near future.

The World Bank has estimated that during the next decade, East Asia's booming economies will need to spend \$US1,500 billion to expand power, telecommunications, transport and other infrastructure. East Asian investors are also increasing their presence in European Union (EU) countries.

A growing European economic presence in Asia is expected to intensify already fierce rivalry for market share between the US, Japan, other Asian countries and Australia. East Asia is the fastest growing market for EU exports, absorbing 18% of sales to non-EU countries in 1994, up from 7% in 1980.

The Chinese market is singled out as the greatest opportunity for Europe to establish a significant trade presence in Asia. Liberalisation of the Chinese economy has contributed to the real growth rates of between 12% and 13% over the past few years and to total trade growing at twice this rate. However, concerns over China's inflation rate which on annualised basis in July 1995 was 16.7 percent could hinder China's future growth and stability.

The pull out by Elf-Acquitaine, a major French oil company, from a US\$2.5 billion refinery project in Shanghai has adversely affected China's allure as a centre for big-ticket foreign investment, particularly in the oil industry. Elf diplomatically cited restricted access to China's markets and an uncertain regulatory environment as the main reasons for their withdrawal.

Nevertheless China continues to attract vast volumes of foreign capital. By the end of 1994, China had approved US\$304 billion (A\$401 billion) in foreign investment since it started opening its economy in 1978, and had seen US\$95.5 billion of that realised in actual inflows up to December 1994.

Export growth in South Korea has been driving its exceptional economic growth, with growth of around 8.5 percent expected in 1994/95. In the first half of 1995 exports from South Korea expanded by 34% - the highest among the 25 OECD members and the newly industrialising economies. South Korea has emerged as the 11th largest world economy with a trade volume of US\$167.6 billion between January and August 1995. The country hopes to be among the world's top 10 trading nations by 1997.

Singapore's economy continues its upward growth and its labour market is at near capacity. Surprisingly Singapore's inflation rate of 2.6 percent for 1994/95 suggests that its tight labour market has not spilled over into higher wages and higher inflation levels.

Taiwan continued along a strong economic growth path, recording growth of 6.6 percent in 1994 with an expected rise of 7.0 percent in 1995. Foreign reserves are forecast to build to US\$100 billion this year, on the back of a 22.7% annual growth in exports. Taiwan has reaffirmed its place as the 14th biggest trading nation. Foreign investment rose by US\$100 million in 1994/95 to more than US\$1.7 billion. However, a strong leakage of investment from Taiwan to China is a concern as industries relocate. For example, it is estimated that in the first three quarters of 1995 about US\$20 billion of Taiwanese money has been reinvested into China. Despite these problems the economy is forecast to continue to grow by 7.0% in 1996.

## Western Europe

Growth of 2.9 percent was recorded in Western Europe in 1994. Similar growth is expected for 1995.

Growth in the United Kingdom has stabilised but there are emerging signs that inflationary pressures are beginning to build. UK growth is forecast to fall from 3.8 percent in 1994 to 2.8 percent in 1995.

Germany's strong and continued export growth has seen its economy come out of recession in 1993 to record growth of around 2.9 percent in 1994. Growth of 2.6 percent is expected for 1995. A cut in the official discount rate of 0.5 percentage points in August 1995 is expected to strengthen private consumption and business investment expenditure in 1996.

The change in Government in France following the elections has seen a reappraisal of French policy. In particular there are European concerns that France is beginning to hinder the development of the European Union and in particular European monetary union. Despite this the French economy is expected to grow by 2.9 percent in 1995, following growth of 2.8 percent in 1994.

## Other World Economies

The largest economies in Eastern Europe have recorded moderate growth in 1994/95 of around 3.5 percent. However the former Soviet Union has continued recession with growth falling by 15 percent in 1994 and expected to fall further in 1995.

Poland has lifted itself out of the economic ashes of the fall of European communism with a new economic order emerging in the country which is expected to push economic growth to 6.5% in 1995 and to 5% in 1996. Although starting from a low base, Poland's growth rate of 5.5% in 1994 was impressive for an economy which has undergone sweeping privatisation and makes it one of the fastest growing economies in Europe. Expansion was recorded in a range of industries, but a 24% rise in exports in 1994, and a 38% rise expected for 1995 has been the driving force behind the economic growth. A key factor in the country's export growth has been the nation's enormous gains in productivity. This has allowed Poland to quickly replace the old Soviet Union with the European Union as the major source of trade.

According to ABARE, Latin America is expecting growth of around 3.0 percent in 1995, following recorded growth of 4.7 percent in 1994.

## Outlook

In November 1995, the International Monetary Fund (IMF) lowered its growth forecast for

industrialised countries from 3% to 2.5% for 1995, with a further decline to 2.4% in 1996. This was based on assumed higher growth in Asia, little change in US growth, and a contraction of activity in Japan and Europe.

## **1.2 Review of the Western Australian and Australian Economy**

The Australian national economy grew strongly over the first half of the financial year and moderated over the remainder of the year. Overall, real gross domestic product increased by 4.5 percent in 1994/95. This was largely attributed to continued growth in private and public consumption and, encouragingly, business investment which grew by over 16 percent during the year.

Western Australia's economic growth continues to outpace that of all other States with gross state product growing by 5.7 percent in 1994/95. Private final consumption increased by 3.7 percent over the year and more significantly, business investment continued to grow strongly, increasing by over 21 percent during the year.

Employment in Western Australia increased by 4.9 percent in 1994/95. Western Australia's average unemployment rate fell from 8.9 percent in 1993/94 to 7.6 percent in 1994/95, the lowest rate in Australia.

Australia's employment growth was 4.0 percent over the corresponding period and its average unemployment rate fell to 9.0 percent in 1994/95.

There is emerging evidence that both the Australian and Western Australian economy are slowing with growth now considered to be at a more sustainable level. In particular, dwelling investment, building approvals and housing finance have continued to fall since the June quarter. Nevertheless business investment in Western Australia continues to grow strongly with a 6.5 percent rise recorded in the June quarter. Nationally, business investment fell by 0.9 percent over the same period.

The slowing GDP growth has begun to affect the Western Australian labour market, with the October 1995 unemployment rate of 7.3 percent being unchanged from that in June 1995.

Nationally the unemployment rate rose from 8.3 percent in June 1995 to 8.7 percent in October 1995.

In 1994/95 Australia's inflation rate rose by 3.2 percent while average weekly earnings rose by 3.4 percent. The corresponding growth rates for Western Australia were 3.5 percent and 5.5 percent respectively. While inflation accelerated in the September quarter, this reflected a number of once off factors such as increased taxes on tobacco, fuel and alcohol.

The 5.3 percent rise in Australia's weekly ordinary time earnings for fulltime adult workers for the year to September 1995 dashed any immediate hope of interest rate cuts as wages growth is now above the Reserve Bank's comfort limit. These higher wages, combined with higher material and import costs caused by a falling exchange rate in the first half of 1995, have generated upward movements in prices. Underlying inflation increased by 2.5 percent over 1994/95, after three years of rises of around 2 percent.

Recognising strengthening domestic expenditure and the associated rise in inflationary pressures, the Reserve Bank of Australia lifted interest rates in 1994/95. Three policy tightenings in the first half of 1994/95 raised official cash rates by a total of 2.75 percentage points.

Long term interest rates also rose in the first half of 1994/95, with increases due to concerns regarding overseas financial conditions, particularly those in the USA and medium term inflation fears in Australia. These fears were largely allayed in the second half of the year as domestic expenditure growth in Australia slowed and consequently long term rates eased.

In conjunction with a tighter monetary policy role by the Reserve Bank, the Commonwealth is attempting to reign in the Budget deficit, which stood at around \$11.6 billion in 1994/95. The Commonwealth has budgeted for a surplus of around \$0.7 billion for 1995/96.

The \$A gained ground against a number of currencies in the first half of 1994/95, in particular recording a large rise against the US dollar (Figure 1.1). In part the rise in the \$A to 77.7 US cents and 77.56 Yen in December 1994 was attributed to increases in Australia's interest

rates over the period and the positive outlook for commodity prices. Since then the Australian dollar depreciated, largely as a result of worsening balance of payments figures, finishing at 70.9 US cents and 60.08 Yen in June 1995 (Figure 1.2). The trade weighted index, which measures Australia's real exchange rate and provides an indication of its international competitiveness, fell to 48.4 in June 1995, down from 53.0 in June 1994. Australia's real exchange rate is now 10 percent lower than in 1990, which is a gain in international competitiveness according to this simple measure.

Australia's current account deteriorated significantly in 1994/95, rising by 55 percent to more than \$26 billion. The deterioration was mainly attributable to a significant increase in the merchandise trade deficit. This led to industry wide fears that the Reserve Bank would lift official interest rates in the second half of the 1994/95 year as a means to address the increased imbalance in Australia's external accounts. These pressures diminished somewhat with substantial improvements in the merchandise trade account in both August and September.

On the other hand Western Australia again recorded an overseas trade surplus at around \$11 billion. The value of total State trade increased from \$20.5 billion in 1993/94 to \$22.3 billion in 1994/95, with overseas exports rising by 5 percent to A\$16.5 billion.

Japan increased its relative share of Western Australia's total exports in 1994/95 to 31 percent, due mainly to increases in exports of gold and crude oil. South Korea remains second to Japan with 10 percent of total exports at \$1.7 billion, followed by Singapore (7 percent) and the USA (7 percent). Petroleum and mineral exports continue to account for more than 70 percent of State exports.

The outlook for the Australian and State economies is positive with growth forecast at 3.75 percent and 4.25 percent respectively. This relatively slower growth will reduce some of the pressure on the inflation rate and balance of payments, and reduce the need for interest rate rises.

## 1.3 Economic Factors Affecting the Mining Industry

The resurgence of the world economy was generally welcomed by the mining industry. In particular the increase in commodity prices gave the industry the confidence to expand and invest in new projects.

Western Australian mining industry competitiveness improved in 1994/95 with the further deregulation of the energy market and continuing labour market and financial reform.

The large rise in the Australian dollar over the first half of 1994 against the \$US and Japanese Yen reduced many of the gains derived by the mining industry through higher commodity prices. This position was reversed over the second half of the year when the Australian dollar depreciated.

As a result of Australian growth slowing to more sustainable levels, since June 1995 the Australian dollar has appreciated in value against all major international currencies. If this trend in the Australian dollar continues it will reduce the benefits to the mining industry of rising commodity prices as the rising \$A will reduce the \$A return on many of Western Australia's mineral and energy exports over 1995/96.

The rise in the corporate tax rate from 33 to 36 percent in 1995/96 will have some adverse impacts on the mining industry. Nevertheless, interest rates are expected to be largely unchanged in 1995/96, due to an expected containment of Australia's inflation rate and improvements in its trade accounts.

The 18 Asia-Pacific Economic Co-operation (APEC) nations have found the issue of trade liberalisation for "sensitive sectors" of particular economies, particularly the removal of agricultural protection policies, a stumbling block in their efforts to set up a truly free trade zone. The potential cost to Australian industry is that the full benefits of trade liberalisation, if compromises are made, may therefore be lost in a watered down version of APEC commitments.

The outlook for Western Australia's mining and petroleum industry is very bright. Commodity prices are expected to rise over the next year and export penetration on international markets,

particularly in Asia, is expected to improve. Moves to liberalise international trade, and particularly in the Asian region given its strong economic outlook, should be of benefit to the State's mining industry. Currently around 70 percent of the State's mineral and energy exports are to the Asian region.



The mining industry is in a good position to continue its strong growth and a number of major projects are currently being constructed or are committed with a value in the vicinity of \$A7,000 million.

## 1.4 Social Factors Affecting the Mining Industry

### Native Title Issues

Without doubt the major issue over the financial year has been native title and its impact on the mining and petroleum sectors.

The High Court decided on 16 March 1995 that the State's Lands (Titles and Traditional Usage) Act was invalid, and as a result the issuing of WA titles became subject to the full provisions of the Federal Native Title Act.

Uncertainties with the Federal Act has led to significant delays in mineral title approvals in

Western Australia. Between March 16 and the end of June 1995 mineral titles granted fell by 95 percent.

The issuing of Miners' Rights by the State was suspended between 16 March and 1 May, 1995 and the issuing of petroleum titles was also suspended from 16 March 1995 to September 1995. This allowed the State time to assess the implications of the High Court's decision. However, the issuing of prospecting and exploration licences continued.

The Western Australian Government has now implemented procedures consistent with the Federal Government's Native Title Act and informed petroleum and mineral explorers and miners of the new requirements. All title applications are advertised by the Department of Minerals and Energy (DME) and are then referred to the National Native Title Tribunal. If an Aboriginal group does not lodge a claim over the tenement within three months then DME may issue a title. Areas subject to a native title claim must be resolved by the National Native Title Tribunal (or a negotiated settlement acceptable to all parties is reached) before DME can issue a title to that area.

As at September 1995 current grants are now progressing at around the level prior to the High Court's decision in March 1995. Nevertheless, it is clear that approvals processes for the granting of Exploration Licences and Mining Leases have been significantly lengthened under the Federal Native Title Act.

The WA and Federal Governments are still negotiating establishment of a State based native title tribunal to complement the Federal Native Title Tribunal. It is intended that these State-based tribunals would run parallel to and act as an alternative to the Federal body. In October, 1995 the South Australian Government set up the first of such State based tribunal systems in Australia.

A key issue relevant to Western Australia is whether pastoral leases extinguish native title. This remains largely unresolved.

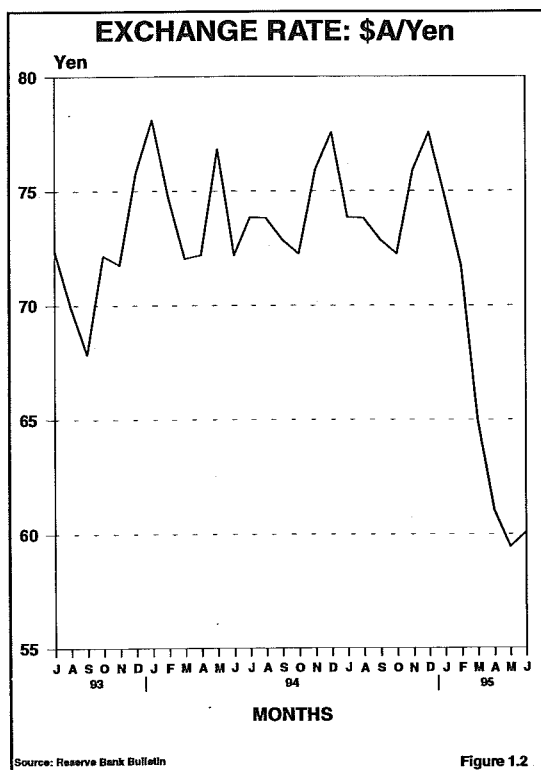
### Institutional Changes

Amendments to the State's Mining Act and Regulations will be introduced into Parliament

shortly. The amendments aim to reduce disputation and further encourage mineral exploration in the State. The changes include:

- special prospecting licenses ranging in tenure from three months to four years;
- the removal of legal restrictions on aerial surveys; and
- the introduction of a ballot system where competing tenement applications were lodged on ground previously relinquished or forfeited.

In early 1995 media speculation emerged that the Commonwealth was intending to introduce a Carbon Tax and was aiming to significantly modify the diesel fuel rebate scheme. Following strong lobbying by State governments and industry the Commonwealth rejected any suggestions of a Carbon Tax. Whilst only minor changes to eligibility criteria for the diesel fuel rebate scheme were introduced they are currently being examined by the Commonwealth Government (and Industry).



The Australian Mining Industry Council (AMIC) officially changed its name to the Minerals Council of Australia (MCA) at the beginning of June as part of a strategy to position the organisation for a more effective role as the minerals industry national representative body.

Following a comprehensive internal review, the Council aims to represent a broader range of members and to become more pro-active in its approach.

## Environmental Issues

The State Government has continued its policy of balancing environmental and development objectives. A policy for the management of the State's marine reserves, including mineral and petroleum exploration was adopted in 1994/95. As part of the process of adopting the policy the Government announced that future drilling exploration in the Ningaloo Marine Park was prohibited.

In May 1992 all Australian Governments signed the International Agreement on the Environment which amongst other things called for the establishment of a National Environment Protection Council with a goal to set nationally uniform standards for the environment. After the WA Government was satisfied that it would not become captive to an unsuitable set of standards determined by a majority of other State governments, State Cabinet agreed on 7 September 1995 that Western Australia join the National Environment Protection Council.

The Commonwealth has also attempted to increase its influence over environmental issues through its own Commonwealth Environmental Protection Agency (CEPA). Proposals to expand CEPA's brief to include projects that are considered inconsistent with Australia's international treaty obligations are being examined by the Commonwealth Government.

BHP's handling of the dispute over the OK Tedi mine in Papua New Guinea has prompted CEPA into the first phase of developing an environmental code which would cover Australian companies operating overseas. CEPA has indicated that consultation will take place with industry in the development of the code.

*A Code of Practice for Exploration in Environmentally Sensitive Areas* was developed in April 1995. The document aims to promote best practice management at all stages of mineral exploration and was jointly prepared by the Chamber of Mines and Energy's Conservation, Environment and Land Management Committee and Exploration Council in consultation with the

An interesting aspect of the trend towards increasing globalisation of mining operations, is the number of significant mergers which have taken place. The most telling example is the de facto merger of CRA and RTZ, announced in early October 1995. With a combined market capitalisation of A\$26.7 billion at the time of the announcement, this makes the CRA and RTZ conglomerate the world's largest mining group. Increased Australian mining industry competitiveness over the last decade has led to development opportunities for locally produced mining equipment. Australia's mining industry has long been a place for testing new equipment and a source of innovation. While only A\$798 million worth of mining products and services were exported in 1994/95 this is expected to increase dramatically over the remainder of the decade.

The "contracting industry" has been the growth industry of the early 1990's with Australian companies being able to compete for both Australian and overseas service provision contracts.

**RESERVES**

A Bureau of Resource Sciences report from Canberra released in September 1995 confirmed that while production of minerals and petroleum had increased rapidly in the past decade there was little indication that supplies were about to be exhausted in the near future. The report concluded that successful exploration had maintained Australia's position as one of the world's premier resource nations, despite continued high rates of production. New technology used in exploration and processing, as well as a better understanding of the way mineral deposits were formed, were given as the main reasons for Australia's impressive resource performance.

The nation holds the world's largest known economic reserves of silver, zinc, bauxite, iron ore, lead, uranium, mineral sands, and industrial diamonds.

As an indication of the size of Australia's mineral reserves, they include:

- 69 billion tonnes of black coal;
- 18 billion tonnes of iron ore;

Association of Mining and Exploration Companies (AMEC) and a number of State Government departments.

The concept of best practice management has become a part of environmental management techniques in the mining industry. To facilitate its use, advisory booklets titled "Best Practice in Environmental Management in Mining" were released by the MCA in September 1995. These booklets were produced by CEPA in conjunction with major mining companies and mineral industry associations.

**Globalisation**

Increasing economic liberalisation of many countries has stimulated numerous mining companies into taking a global view of their operations. Rapid global diffusion of technology and access to capital markets has also given additional impetus for companies to take advantage of mining opportunities presenting themselves overseas.

Australian mining companies are also maturing and over the last decade their have been moves by some of these companies to take advantage of "offshore" opportunities. Examples of Australian companies with a growing international presence involving world class operations include:

- BHP Minerals - Escondida copper mine in Chile
- CRA - gold and coal developments in Indonesia
- MIM and North Ltd - Alumbra gold/copper project in Argentina
- Newcrest Mining - exploration in Indonesia
- Aurora Gold - precious metals project in Kalimantan
- Delta Gold - discovery of Hartley platinum deposit in Zimbabwe
- Golden Shamrock - developed gold mine in Ghana.

The maturing nature of Australia's (and Western Australia's) mining industry has seen the industry grow and become the most competitive sector of the economy. It has been estimated by the State's Department of Productivity and Labour Relations that productivity levels in the State's mining industry are more than 50 percent higher than the State's next most productive sector. The State's mining industry is striving towards world's best practice.

- 2.5 billion tonnes of bauxite; and
- 3,434 tonnes of gold.

The known gold reserves are at an all time record high. Recent high levels of exploration are expected to uncover new resources and keep Australia as the world's third largest producer behind South Africa and the US.

## **Research**

WA's northern Goldfields have been chosen as the focus for a joint Federal and State Government study to identify the region's resource potential and infrastructure needs. The study aims to develop a co-ordinated approach between government and industry to develop processing opportunities and infrastructure. The northern Goldfields area was chosen for the study predominantly due to the development potential to be created by the Goldfields Gas Pipeline. The study will identify suitable cost sharing arrangements for mineral developments, such as a pool of companies contributing to major consolidated gold processing facilities or perhaps a new nickel smelter.

In addition, the Federal Government recently committed a further A\$1.8 million to the Australian Geological Survey Organisation to undertake exploration and collate resource data in the northern Goldfields. The allocation is to be spread over four years and is intended to enhance the future prospects for development of other projects in the area north of Wiluna.

Research into rehabilitation techniques for tailings dams which began in March 1994 is continuing. The joint three year project between the University of WA, the Australian Centre for Geomechanics and the Department of Minerals and Energy in WA is being funded by the gold mining industry and the State Government.

MAJOR MINERAL AND PETROLEUM PROJECTS  
IN WESTERN AUSTRALIA  
WITH AN ANNUAL VALUE OF PRODUCTION IN EXCESS OF \$10 MILLION

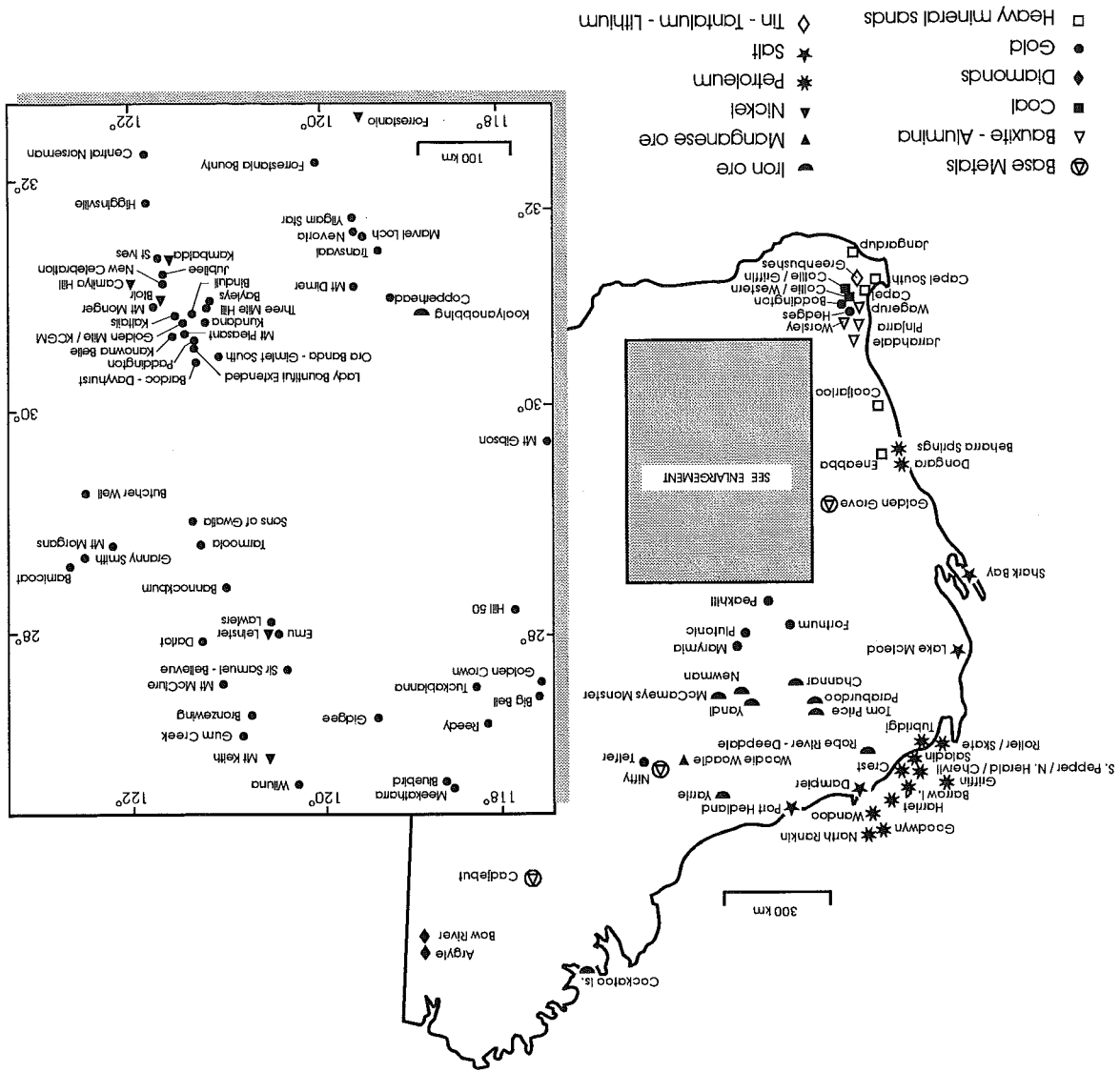


Figure 1.3

## 2. REVIEW OF MAJOR MINERALS AND PETROLEUM

### 2.1 Overview and Outlook

In 1994/95 the Western Australian mining industry again demonstrated that it is a major player in international resource markets. Constant improvements in technological capabilities and exploration techniques over the last 15 years has been reflected in a 5 fold increase in the value of mineral and energy production in that time.

The value of production rose by 9.9 percent in 1994/95 to around \$13,870 million. The rise was mainly attributable to the strong increase in production of oil, nickel, LNG and mineral sands.

In US\$ terms for the year, small price increases were recorded for most minerals including gold and oil with others, such as copper, zinc and nickel, recording substantial price rises. However much of the gains in prices over the first half of the year were countered by a stronger Australian dollar.

Western Australia is expected to continue to be a significant world player on many international commodity markets. Western Australia currently supplies (by quantity) around 12 percent of the world's iron ore production, 8 percent of its gold and LNG production, 18 percent of its alumina production and 40 percent of its diamond production. The State's prominence on the international minerals scene is expected to be maintained well into the 21st century.

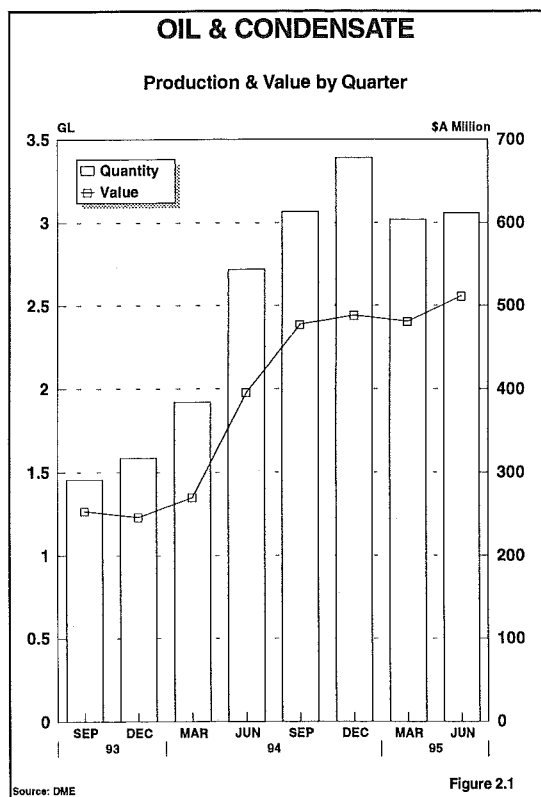
### 2.2 Petroleum

#### Introduction

The combined value of petroleum output rose by 41.2 percent to \$3,661 million, accounting for 26.4 percent of the value of Western Australia's total mineral production. This is the first time the value of petroleum was higher than the value of any other mineral in Western Australia.

Production from the North West Shelf area increased substantially in 1994/95 due to the addition of the Goodwyn A platform and the Griffin, Scindian, Roller and Skate oil fields. As a result oil production rose by 86 percent in 1994/95 to 9.9 million kl. LNG production rose by 20 percent.

On the back of increased production and firmer prices, the value of natural gas, condensate and crude oil produced rose by 52.0 percent to \$2,398 million (Figures 2.1 & 2.2). Also reflecting increased volume of production the value of LNG produced rose by 24.3 percent to a record of \$1,263 million.



The performance of the industry was impressive in 1994/95 with production increasing for most minerals, the most notable exception being gold.

In 1994/95 the industry as a whole had higher investment and exploration levels but profits were reduced.

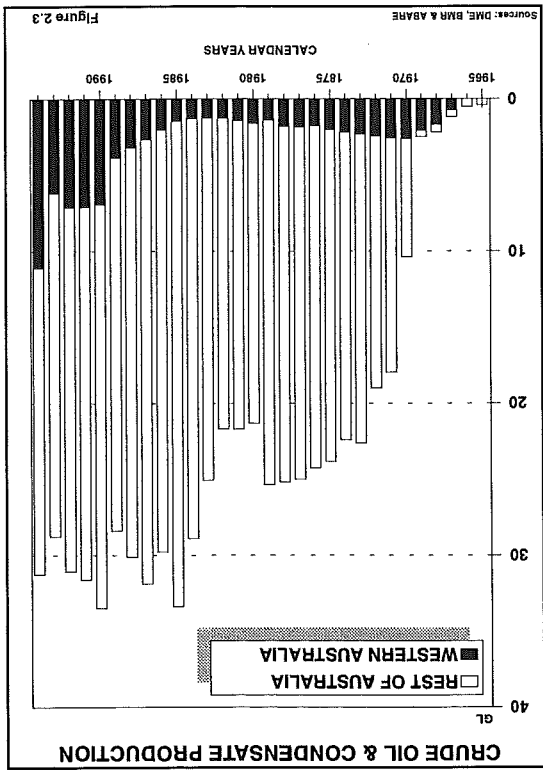
#### Other Petroleum Industry Highlights

Petroleum industry highlights include:

- WA oil production now accounts for approximately 45% (up from 36% in calendar year 1994) of total Australian crude oil and condensate production and about 51% of total gas production. (Refer Figure 2.3).

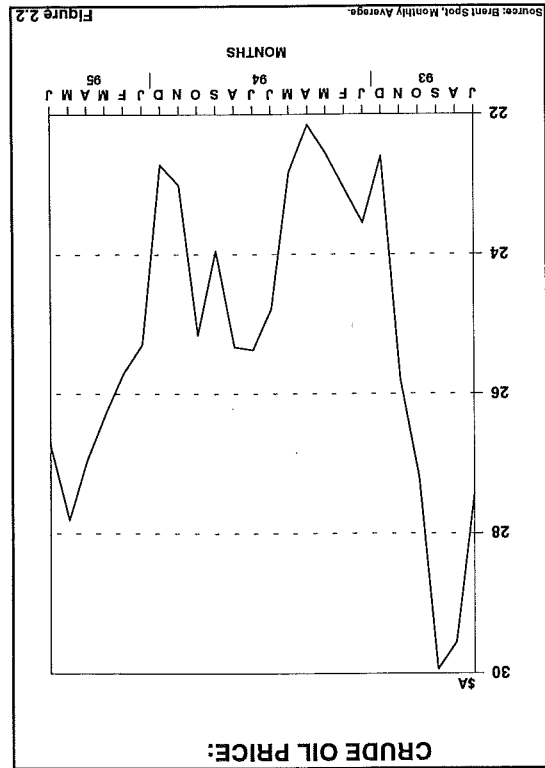
ABARE expects world oil production to grow by 2.1 percent in 1995/96. Half the increase in world oil consumption is expected to come from Asia, where it is forecast to grow by 7.3 percent in 1995/96. ABARE expects oil production (which grew by 2.8 percent in 1994/95) to grow by 2.3 percent in 1995/96. As a result of world oil supply growing a little faster than demand, oil prices are expected to fall slightly in 1996. Current world oil production is about 1 million barrels per day more than the Organisation of Petroleum Exporting Countries' (OPEC) ceiling of 24.52 million barrels per day. Most of this supply is coming from non OPEC members. The meeting of OPEC in Vienna on 21 November 1995 will be closely monitored by the

**World Petroleum Industry Outlook**



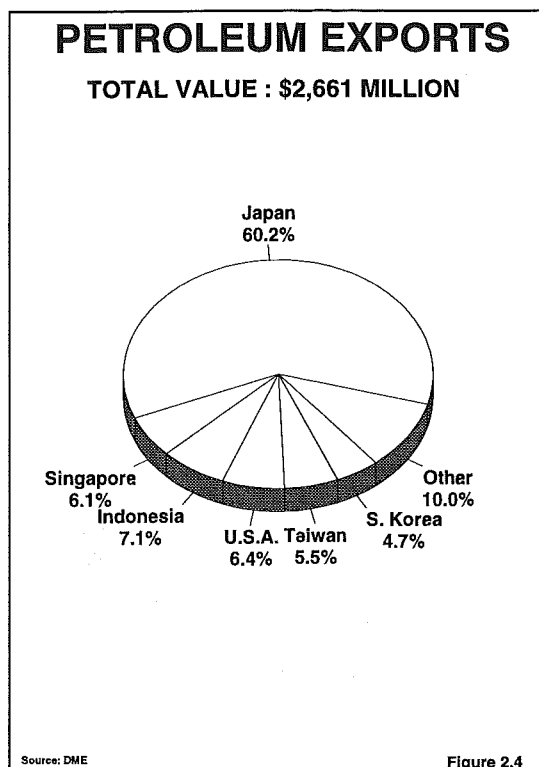
- \$100 million first phase of the Damper to Bunbury natural gas pipeline upgrade.
- A feasibility study was announced at the end of September by BHP into the development of a \$400 million methanol plant based on NWS natural gas.
- Significant gas discoveries were made at the Perseus and Chrysaor gas fields in 1994/95.

- The total value of State petroleum exports was \$2,661, with Japan accounting for 60.2 percent (Figure 2.4).
- The North West Shelf LNG project shipped its 500th cargo of LNG from Damper in September 1995.
- Woodside was awarded the contract to supply BHP's proposed DRI plant at Port Hedland, based on demand of 132TJ of natural gas per day.
- Construction of the 1400km A\$400 million Goldfields Gas Transmission pipeline began in June 1995 and has continued on schedule. Completion is scheduled for July 1996. A number of gas fired power stations are proposed on the supply route.
- Production from the Wanaea/Cossack oil and gas project commenced in November 1995.
- The State Government's deregulation of the gas industry, now allowing gas producers to deal directly with large industrial, commercial and domestic clients for energy supply, has lead to renewed interest in exploration areas closer to prospective clients in the south-west of the State.
- Alinta Gas awarded a \$6 million contract to Worley Ltd to be engineering consultant for the



international community. The setting of the new 1996 OPEC oil production ceiling will be important in negating the potential of oil price falls in 1996.

It has been recently suggested that a combination of Australia's LNG production capacity and Japanese technological prowess may aid in meeting China's energy demands. China is reportedly suffering severe energy shortages as a result of its spectacular economic growth rates.



## State Petroleum Outlook

The outlook for the petroleum industry in WA is extremely positive with many possible oil, gas delivery and gas processing projects on the horizon. These include:

- WMC's East Spar field is scheduled to begin production in early 1997 and expected to supply gas into the Goldfields gas pipeline. Current East Spar gas reserves are estimated at 10 billion cubic metres.
- Domestic gas demand is forecast to rise from the current level of 540 TJ/day to between 970TJ and 1,300TJ per day by 2004. Deregulation of the gas market and this resultant increased demand should lead to a further increase in exploration activity and a

continuance in the trend to prove up gas reserves.

- Full production from the \$610 million Wandoo oilfield now producing 17,000 barrels per day is expected in December 1996.
- Exciting developments are occurring in LNG with two potential projects being examined and potential new LNG markets opening up in Asia. Plans for a possible stand-alone nine million tonnes per annum LNG plant are being developed by WAPET for the Gorgon fields. At the same time, an integrated LNG project using gas from the Gorgon fields and the Rankin fields is being considered by NWS partners and the WAPET consortium. The eventual outcome of these corporate negotiations will probably not be known until early 1996. The commencement of one of these would see Western Australia becoming a major LNG player on international markets.

## 2.3 Gold

### Introduction

The volume of gold produced in Western Australia fell by 3.3 percent to 187 tonnes in 1994/95. This fall was entirely due to the disruptive effects of Cyclone Bobby on gold production in the March and June quarters. When combined with a higher Australian dollar the value of production fell by 8.6 percent to an estimated \$3,122 million (Figure 2.5).

Nevertheless gold production has risen strongly over the last 10 years and despite the decline in 1994/95, gold is Western Australia's second most valuable commodity. All the indications are that the industry will prosper and continue to make an important contribution to growth in this State.

Western Australia accounts for around 75 percent of Australia's gold production (Figure 2.6).

### Industry Highlights

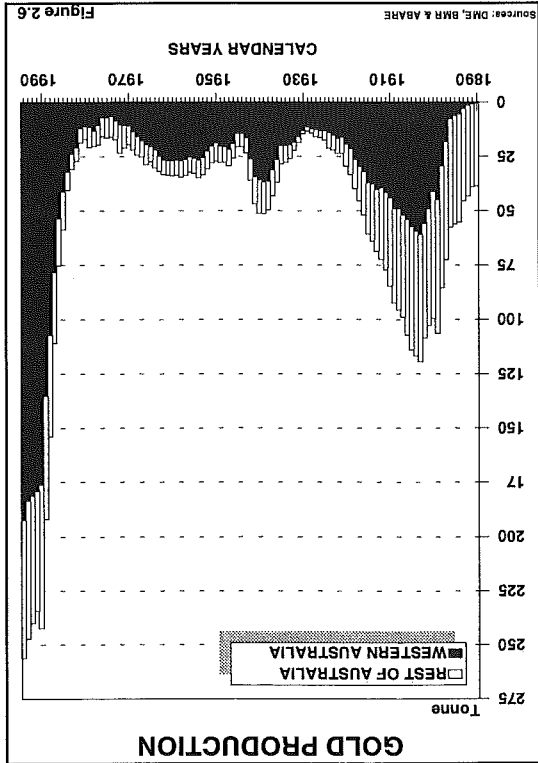
The 11 biggest producing projects in WA accounted for half of the State's gold production in 1994-95.

The trend for companies to increase viable gold reserves and reduce input costs has continued and has resulted in a number of changes in the State's gold industry including:

Asia continues to be the State's major gold export destination, accounting for more than 90 percent of gold exports in 1994/95 (Figure 2.8). In 1994/95 sales of gold stocks increased substantially, mainly because of the resumption of selling by central banks. The Belgian centralbank sold 175 tonnes, which constituted the majority of the 244 tonnes disposed of by official organisations.

Flooding caused by Cyclone Bobby in late February 1995 caused a number of the State's gold mines to close for periods ranging from one

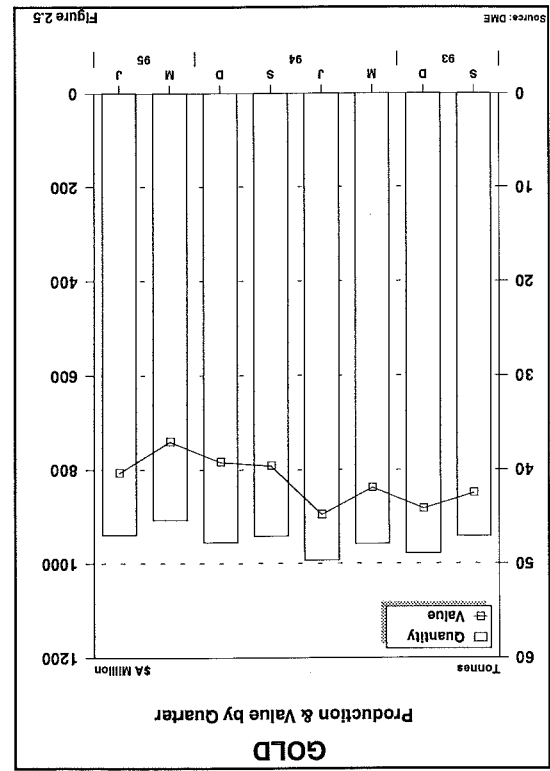
The gold price continued to trade in a unusually narrow band. The average gold price during 1994-95 was US\$384 per ounce with a high of US\$391 and a low of US\$377. In \$ terms, the average gold price was A\$519 per ounce with a high of A\$545 and a low of A\$486. This compared to a 1993-94 average gold price of A\$549 per ounce (Figure 2.7).



preparation for the Oroya cutback. The Mt Charlotte circuit was commissioned in late July 1995 and exceeded design throughput. In November 1994 the Kanowna Belle gold mine partners announced plans to proceed with underground operations. First production from the underground mine is expected in 1998.

In August 1995, Gold Mines of Kalgoorlie (GMK) and Homestake announced a major upgrade of resources at their Super Pit and nearby Mt Charlotte mines to a total resource base of 24 million ounces. The increase was a result of further exploration and pit optimisation modelling and has extended mine life to about 15 years. With on-going exploration this could be extended further.

All major elements of the A\$115 million expansion of the Rimiston treatment plant have been completed. The expansion from 5 million tonnes per annum to 9.1 million tonnes per annum was planned to coincide with the decommissioning of the Oroya mill in



Other gold projects which have come on stream in 1995 or expected to come on stream by the end of 1996 include Lynas Find, Nimary, Junde, Palm Springs and Chalice. Some of these have underground potential.

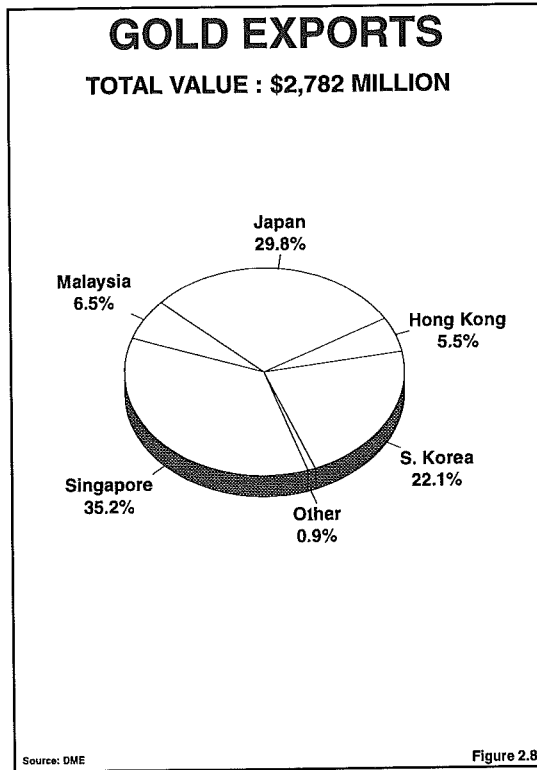
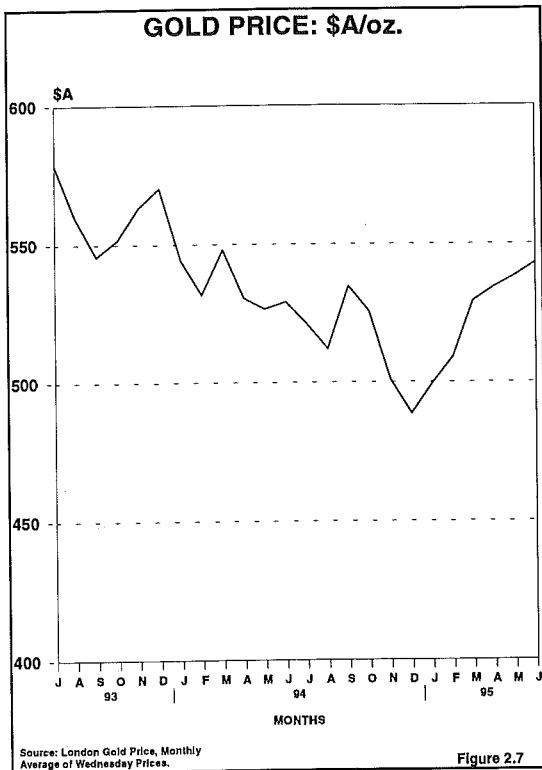
In late 1994 production commenced from the Youami underground project. The large Bronzewing open cut, in the Yandal belt, has also recently commenced production.

of attention.

- An increase in underground mining.
- More refractory ore being processed.
- The Yandal greenstone belt becoming a focus

day to over two weeks. The cost of Cyclone Bobby to the gold mining industry was conservatively estimated at more than A\$50 million.

suggests that sales of gold bullion for jewellery manufacture will maintain its 1995 recovery phase after recording falls in 1993 and 1994.



## Gold Outlook

Jewellery fabrication in India, the world's largest gold importer, and in South-East Asia helped to push up global gold sales to a record level of 1793 tonnes in the first half of 1995. Imports by Japan also grew rapidly. The Yen's strength against the US\$ made gold much cheaper and the Japanese began buying far larger quantities of precious metals after the Kobe earthquake. In Europe, those countries with hard currencies bought a significant tonnage of gold, while in the US demand from investment funds remained stable.

ABARE has estimated that world gold production will fall slightly in 1995, before rebounding in 1996 to record growth of 3.6 percent. As a result of a widening in world fabrication demand and world production gold prices are expected to firm slightly to around US\$400 in 1996.

Strong growth in Asian demand for gold will underpin growth in jewellery consumption and fabrication. Jewellery consumption is forecast by ABARE to grow by 7.4 percent in 1996. This

On the back of favourable international gold market conditions, Australian gold production is forecast to increase by 12 percent in 1995/96. This indicates the outlook for Western Australia's gold industry is bright for 1995/96.

## 2.4 Iron Ore

Despite a 11.2 percent rise in the volume of iron ore production to a record of 133 million tonnes, its value fell by 2.5 percent to \$2,794 million in 1994/95 as a result of declines in \$US contract prices and exchange rate effects (Figures 2.9 and 2.10).

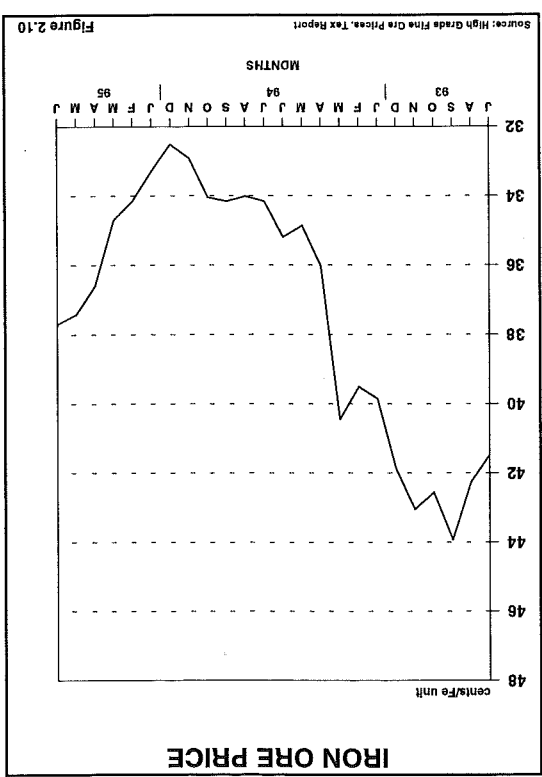
Western Australia accounts for more than 95 percent of Australia's iron ore production (Figure 2.11).

Iron ore exports totalled \$2,662 million in 1994/95 with Japan (46%), China (17%), Europe (15%) and South Korea (15%) the State's largest iron ore export markets (Figure 2.12).

The BHP proposed Direct Reduced Iron (DRI) plant will convert iron ore fines from the company's Newnan operations into direct reduced granules which are then briquetted (Hot Briquetted Iron (HBI)). Construction is set to start late 1995/early 1996, with the plant to be commissioned in 1997 and producing up to 2.5 million tonnes of DRI a year by 1998.

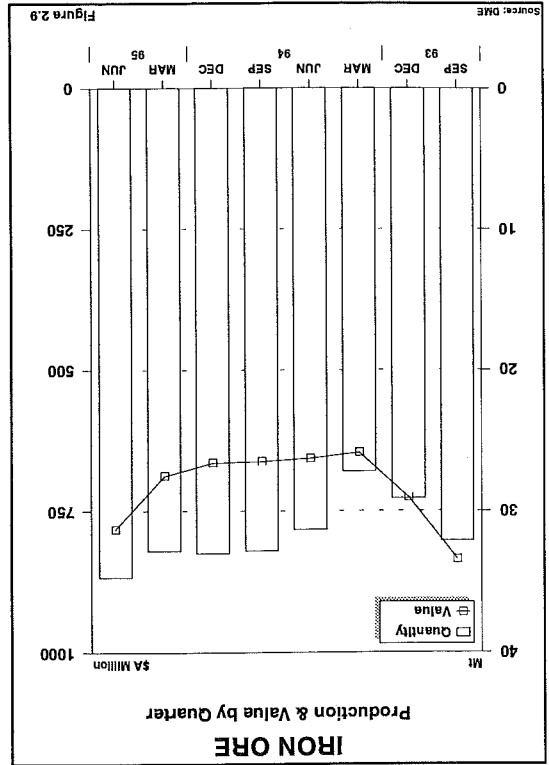
The deregulation of the gas market in 1994/95 could see significant iron ore processing projects come to fruition. BHP Minerals confirmed plans in June 1995 to spend almost \$1,500 million on the construction of Australia's first iron ore processing plant and associated facilities in the Pilbara.

Nevertheless, CRA Ltd subsidiary Hamersley Iron renewed two of its biggest long-term contracts with the Japanese steel mills in October 1995, eliminating a major hurdle to what is expected to be long and difficult iron ore price negotiations later this year. Hamersley revealed that it had signed a three-year deal worth A\$750 million at current prices for the supply of 28.5 million tonnes of iron ore to Japanese steel mills between April 1996 and March 1999. Hamersley Iron's Paraburdoo fines ore treatment plant is expected to start in late 1995.



Source: High Grade Fine Ore Prices, Tax Report  
Figure 2.10

The Japanese have signalled they will be pushing hard to achieve price reductions, when iron ore supply contracts are re-negotiated this year, because they believe they do not have the capacity to meet any demands for higher prices for coking coal and iron ore.

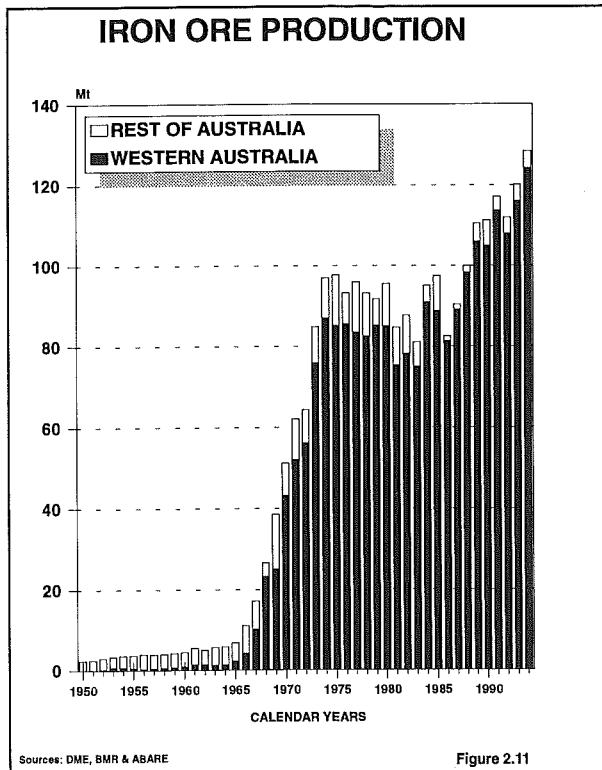


Source: DME  
Figure 2.9

In 1994/95 production commenced from the revamped Koolyanobbing and Cockatoo island projects. The A\$362 million Marandoo mine which will eventually replace Hamersley Iron's Tom Price operations was officially opened in October 1994. Work at Tom Price has extended the life of the mine by more than 10 years based on current production rates. CRA announced in August 1995 that its subsidiary Hamersley Iron was about to start a full feasibility study of its Yandicoogina iron ore deposit in the central Pilbara. Up to 300 million tonnes of ore has been identified for mining, meaning the project would be similar in size to Hamersley's Marandoo mine.

The 3,000th ship to take iron ore from Robe River Iron Associate's Cape Lambert port facilities was loaded in September 1995.

**Industry Highlights**



Deregulation of the State's gas market, technology improvements in the use of fine ore and a transport advantage over South American producers mean that the Pilbara is now well placed as a DRI producer for the Asian region.

Iron ore value added projects under consideration or investigation include:

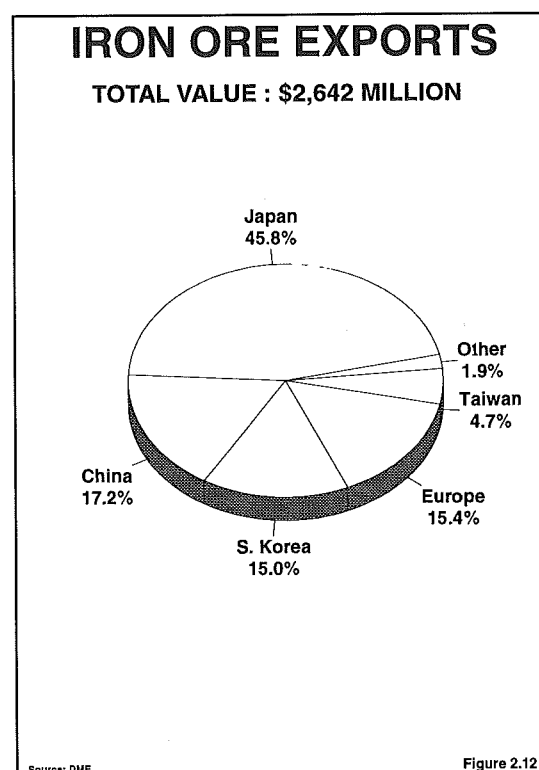
- The \$4.7 billion Mineralogy Project involving a HBI plant costing \$1.65 billion and a \$3.1 billion DRI and integrated steel plant.
- An Australian United Steel Industry (AUSI) proposal involves a \$1 billion DRI facility at Cape Lambert near Roebourne. The proposal involves a concentrator plant, pellet facility and a DRI facility capable of producing almost 3Mt of HBI.
- The Kingstream Resources project, a proposed steel plant at Narngulu, Geraldton is undergoing environmental review.

### Outlook

The outlook for the State's iron ore industry looks bright given the major growth in steel consumption expected in Asia over the next decade.

World steel production is forecast by ABARE to grow by 2.0 percent in 1996. Much of the growth is expected to come from China, where steel production is expected to rise by 2.3 percent in 1996.

Increased steel production will translate into stronger world iron ore demand. ABARE forecasts world iron ore production to increase by 3 percent and by 2 percent in 1995 and 1996 respectively. The increase in world iron ore production is expected to come mainly from Brazil, India and Australia.

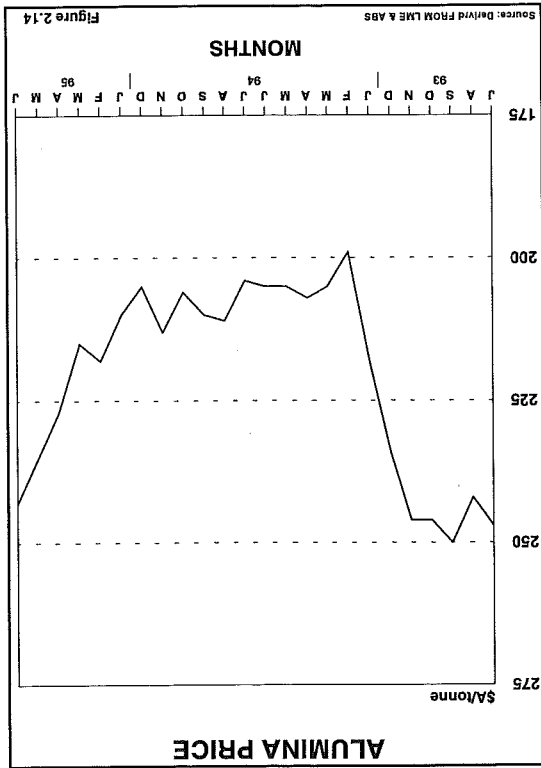


With the opportunities for the processing of the State's iron ore that are presenting themselves, it is not surprising that a number of companies are examining DRI options.

The world demand for DRI will be governed by technological shifts in steel making, particularly shifts to electric arc furnace steel making processes. Approximately 30 percent of Asian steel making processes by 2010 are forecast to be electric arc based, thus creating a strong demand for metallics, such as DRI and pig iron. It is this which is providing impetus for DRI/HBI facilities to be established in the Pilbara.

In 1994/95 Western Mining and the Aluminium Company of America signed an agreement which combines their bauxite/alumina and alumina chemical interests. The deal created a world wide enterprise from 1 January 1995 with annual revenues of around \$4 billion. As a result the merger created the world's biggest supplier of alumina and consolidates Australia's alumina and chemical operations into the mainstream of international alumina developments.

Under the agreement Western Mining acquired 40 percent of Alcoa's world-wide business interests in return for 9 percent shareholding in Alcoa of Australia to the Aluminium Company of America and a net payment of around \$370 million. The most important aspect of the arrangement is that Alcoa of Australia, which has developed high added value alumina chemical operations, will not be competing with its US shareholder in world markets.



Signatories to the Memorandum of Understanding, comprising the six leading aluminium producing countries, pledged a 10% cut in output to reduce the world stockpile of aluminium during 1995. This has been a significant factor in world primary aluminium stocks falling in 1994/95 and causing aluminium prices to rise in 1995.

Western Australia alumina production represents 61 percent of national alumina output (Figure 2.15).

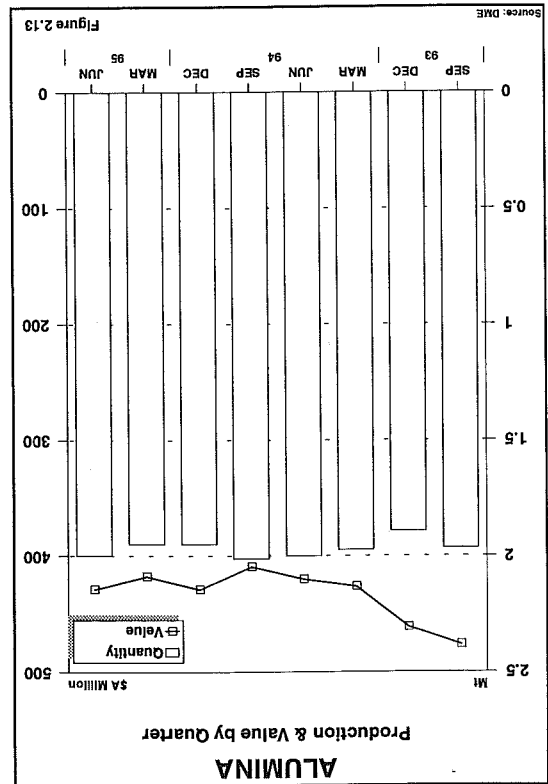
About 85 percent of the State's 1994/95 alumina production was exported overseas, largely as smelter grade product. The largest export markets for the State's alumina were the USA (26%), China (16%), Bahrain (12%) and United Arab Emirates (9%). (Refer to Figure 2.16).

A sustained increase in aluminium prices has occurred in 1994/95 and aluminium stocks are being drawn down. A continuance of this should see alumina prices rise in 1995/96 as alumina stocks fall.

**Industry Highlights**

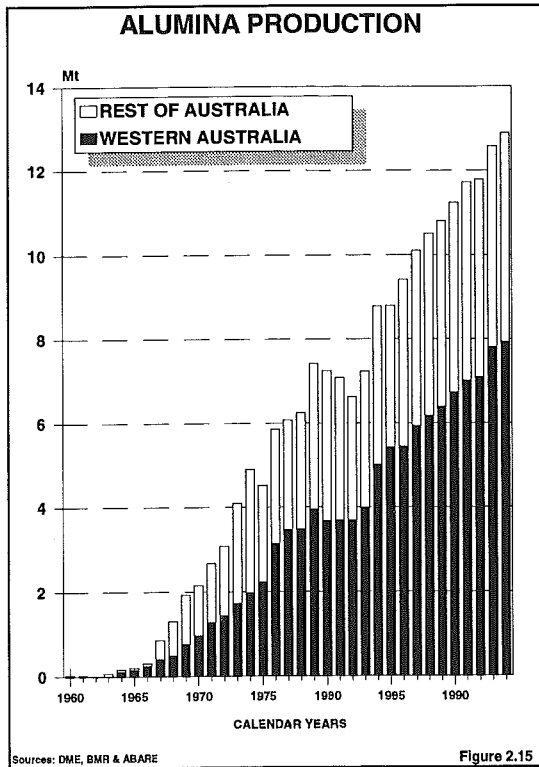
**2.5 Alumina Introduction**

Alumina production increased by around 1 percent to 7.9 million tonnes in 1994/95. However with lower average world alumina prices in 1994/95, primarily as a result of high alumina stocks on international markets, the value of alumina production fell by 5.6 percent to \$1685 million (Figure 2.13 & 2.14).



The construction of Alcoa's hydrated alumina project was completed in 1994/95 and the new facility has recently been commissioned.

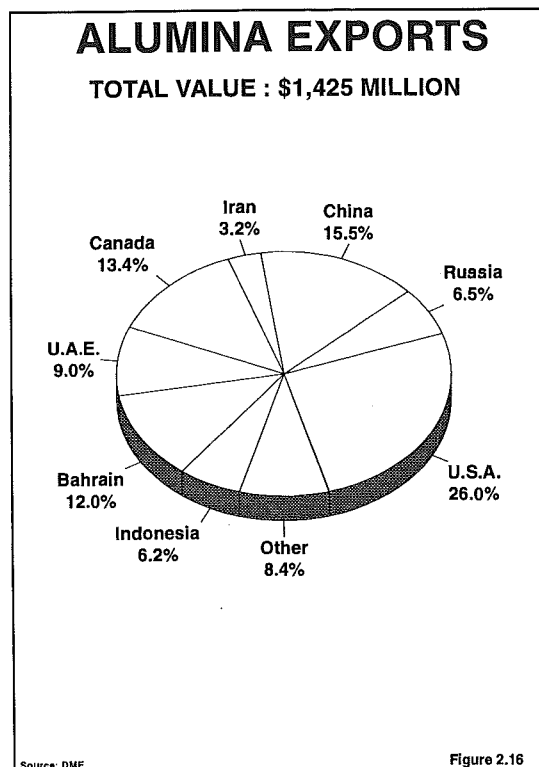
Project costs were A\$42.9 million and the facility is expected to produce A\$45 million of product per annum.



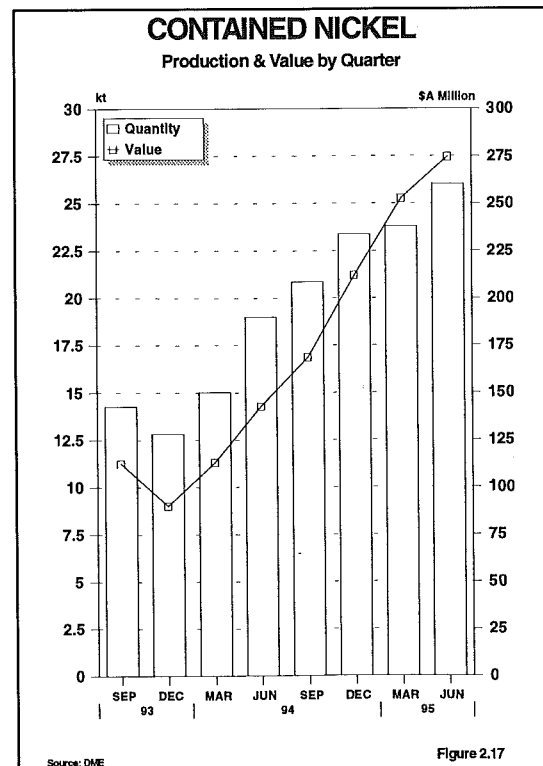
Alcoa, however, shelved indefinitely its plans for its proposed A\$960 million expansion of its Wagerup facilities which would have increased alumina output from its current level of 1.7 million tonnes to 3.3 million tonnes. Environmental approvals for the expansion were obtained in August 1995. The company believes international alumina conditions are currently not right for an investment decision of this magnitude to be undertaken.

The State's other alumina producer, Worsley, is currently undertaking a feasibility study of a \$580 million expansion of its refinery. As one of the world's three most efficient alumina refineries, the expansion, if given the go ahead, would add 650,00 tonnes to its current capacity of 1.5 million tonnes per annum.

A feasibility study by Australian Fused Materials Pty Ltd for a A\$20 million plant, generating 9000 tpa of abrasive grade white fused alumina, is almost completed and a decision is expected shortly. This plant would generate revenue of around A\$13 million per year when fully operational.



The product is expected to be sold predominantly into Asian and European speciality markets where it is to be used for water treatment, in paper manufacture and infillers.



Production from Voisey Bay could possibly take place before the year 2000 at a rate of around 60,000 tonnes per annum. This development would reinforce Canada as the largest and most important influence in the nickel industry in the next century.

There is also the threat of the Russian industry staging a major recovery which would further dampen prices.

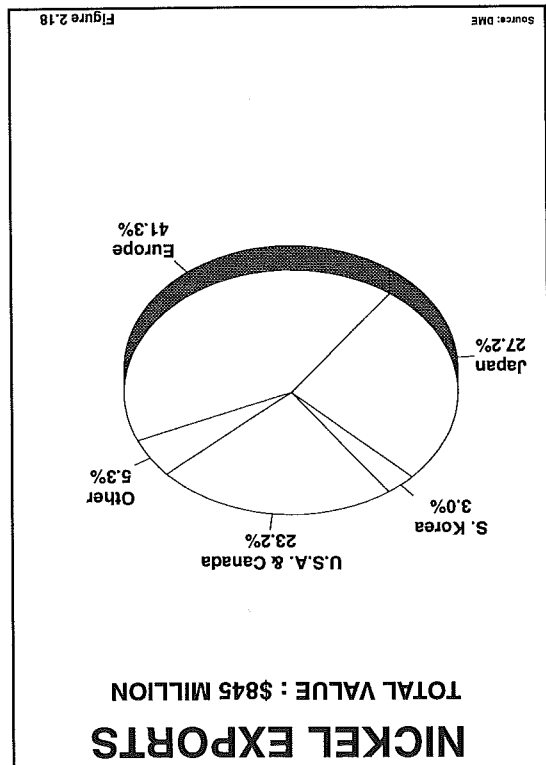
Western Australia accounted for more than 95% of Australia's nickel production in 1994-95 (Figure 2.20) and the State's nickel output is expected to rise further in 1995-96 when full year output is

amongst the lowest in the industry.

Production costs have been calculated as of copper and cobalt associated with the deposit, very significant and because of the large amounts of Labrador in eastern Canada. The discovery is grade, nickel deposit at Voisey Bay near the coast prices has been the discovery of a large, high A threat to the longer term buoyancy of nickel to the previous financial year (Figure 2.19).

1994-95 being over 30 percent higher compared to the previous financial year (Figure 2.19).

increase translated to average nickel prices over appreciation in the Australian currency, the over 1994-95. Even after allowing for from the CIS resulted in significantly higher prices Strong demand, coupled with faltering output



The most significant contribution to increased nickel output came from the commencement of production from Mt Keith in late 1994. The \$450 million Mt Keith project is the biggest segment of a major investment by WMC which also includes improvements in production from existing mines and upgrades of the Kalgoorlie nickel smelter and Kwinana nickel refinery.

Significantly, the development of Mt Keith, has elevated WMC to the status of the western world's third largest producer after Canada's Falconbridge and Inco. It has also placed Australia as the world's second largest producer behind Canada, excluding the CIS.

### Industry Highlights

North America (Figure 2.18).

The value of overseas nickel industry exports in 1994-95 increased by 64 percent to \$845 million. Japan and Europe accounted for about two thirds of our exports. The remainder went chiefly to

(Figure 2.17).

1994-95. This was 96 percent up on 1993-94 almost doubled, reaching \$897 million in higher nickel prices, the value of production metal and concentrate products. Thanks to reach 92,993 tonnes of contained nickel in matte, a dramatic 52 percent increase in 1994-95 to Western Australia's nickel production underwent

### Introduction

#### 2.6 Nickel

According to ABARE average spot prices for primary aluminium are forecast to increase by 10 percent in 1996, mainly due to a strengthening of economic activity in Japan, China and the former Soviet Union. World consumption of primary aluminium is forecast to increase by 2.3 percent in 1995 and 2.5 percent in 1996. Aluminium stocks are expected to fall further in 1996 and 1997 resulting in a firming in alumina prices.

There are encouraging signs in the State's alumina sector will prosper over the next few years.

### Outlook

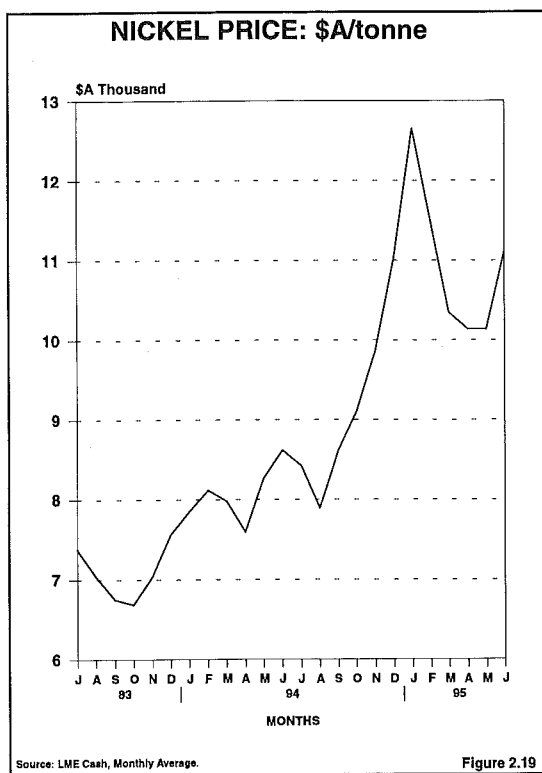
There are encouraging signs in the State's industry and international markets that the

achieved from Mt Keith and the improvements in existing projects. Output will also be boosted with the reopening of Carr Boyd in 1996. All these developments are expected to be accompanied by firm price at least in the short term.

## Outlook

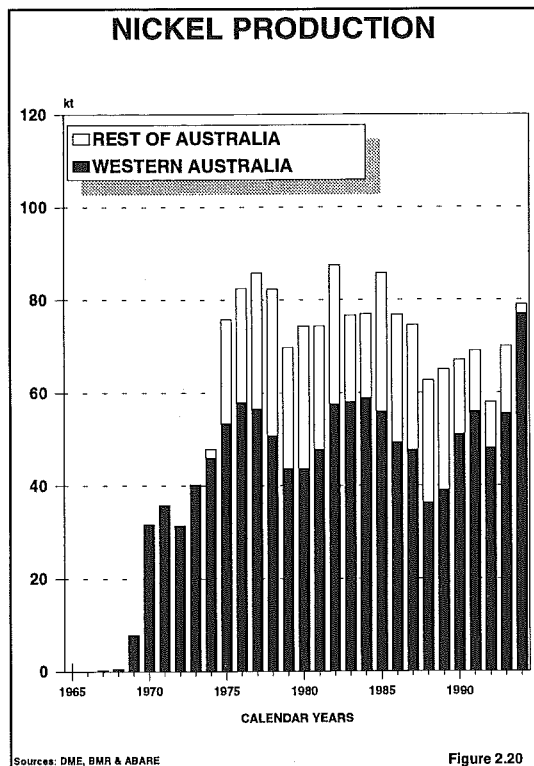
Higher nickel prices have stimulated much interest in Western Australian nickel projects including:

- *Mt Keith production expansion* from 28,000 to 42,000 tonnes per annum;
- *Honeymoon Well* a \$450 million project with production rivalling that of Mt Keith;



- *Murrin Murrin (Anaconda)* a \$450 million project with a possible nickel production rate of over 30,000 tonnes per annum;
- *Yakabindie (Dominion Mining-North Ltd)*, a \$400 million project envisaged to produce 21,000 tonnes of nickel per annum;
- *Bulong (Resolute Samantha)*. A nickel-cobalt deposit producing about 6,500 tonnes per annum;
- *Cause (Centaur Mining)* a potential project based on a 487,000 tonne nickel resource; and

- *Maggie Hayes (Forrestania Gold-Gencor Ltd)*, a relatively small deposit currently being evaluated involving the development of a bacterial oxidation ore treat process.



It must be remembered that while there are many projects being assessed, the nickel price is characterised by short, sharp price spikes followed by long flat periods. This makes it difficult for new entrants into the industry, especially those without significant financial backing.

## 2.7 Diamonds

### Introduction

Diamond production fell by 17 percent in 1994/95 as a result of an already oversupplied market; depressed international diamond prices and demand; and emergence of new international diamond producers. However, the value of State production increased by about 1 percent to \$480 million. Western Australia produces all of Australia's diamond production and as usual more than 75 percent of diamond sales went to the De Beers controlled Central Selling Organisation (CSO), with a majority of the remainder going to Belgium.

**Industry Highlights**

After six decades of dominating the diamond market, the CSO's hold has been weakened in the past few years. An unstable market developed in 1994/95 due to independent sales being made by producers in Russia, Angola and Zaire and continued increases in diamond stockpiles.

India has also publicly stated that its objective is to secure a bigger supply of larger diamond stones. Although India cuts around 70 percent of the world's supply of smaller stones, its overall share of the diamond processing market is 45 percent because the bigger stones are being cut in Belgium and Israel. An emerging threat of India breaking out of the CSO or develop parallel links to producers is a distinct possibility. The CSO responded swiftly to recent sales of diamonds by Russia directly to India by cutting the price of Indian diamond goods by around 10 percent. This action has also meant that Argyle's price for small diamond goods also fell by 10 percent.

The direct financial repercussions upon Argyle have been further exacerbated by the CSO deferring the purchase of 15 percent of its contract amounts from Argyle. As a result of growing financial pressure on Argyle, it has chosen to cut diamond production (by discarding diamonds less than 1.5 mm) in a bid to boost profitability. As a result diamond production for 1995/96 will be significantly lower.

Argyle's diamond selling contract with the CSO expires in June 1996. Argyle's two shareholders, Ashton (40 percent) and CRA (60 percent), are considering removing Argyle diamond production from the CSO and undertaking their own distribution system in a way that does not impact on the world diamond market. Argyle is also considering whether to mine its underground diamond deposits.

In 1994/95 Normandy Poseidon managed to extend the life of its Bow River alluvial operation. Nevertheless it is expected that this operation will close in 1995/96.

In 1994/95, CRA and WMC joined the search for diamonds off the north-west coast of Western Australia. WMC has earmarked A\$10 million to farm into the offshore tenements of Defiance

Mining - an area of more than 4,000 sq km of the Bonaparte Gulf.

CRA Exploration has joined Australian Kimberley Diamonds (AKD) and Zephyr Minerals Ltd to look for diamonds in the Cambridge Gulf of WA. Under the CRA deal, Zephyr and AKD can retain up to a 35% interest in the project or can decide to dilute to a 20% free carried interest through to a decision to mine.

Cambridge Gulf Exploration has also lodged applications for 21 mining leases within its Berkeley tenements in WA and is evaluating whether to carry out limited pilot mining to assist in identifying a proven resource.

**Outlook**

The outlook for the State's diamond industry is uncertain. The cuts in prices imposed by the CSO on Argyle's smaller, low quality diamonds has been viewed internationally as a step towards a price war with Russia. Russia is continuing to sell diamonds outside the CSO.

Argyle is facing a difficult decision over its move to underground mining. A move underground is essential to extend the life of its operations but the costs are large and the future diamond market is more uncertain now than when the original project was developed.

**2.8 Heavy Mineral Sands Introduction**

After facing weak demand from 1990/91 to 1993/94, the mineral sands industry recovered in 1994/95 with the value of production increasing by 32.2 percent to \$475 million. The price index for mineral sands continued to trend upwards in 1994/95 (Figure 2.21).

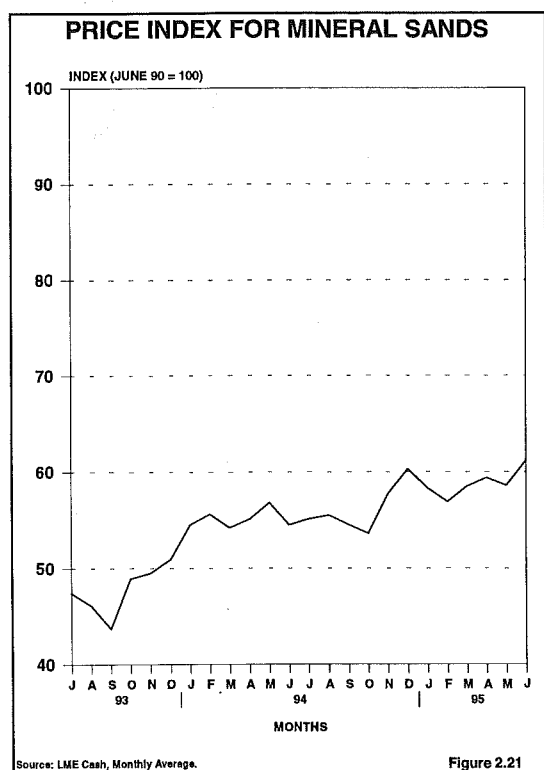
The value of mineral sand exports increased by 34 percent in 1994/95 to \$426 million. The main export destinations were USA (36%), Japan (15%) and the United Kingdom (10%). (Refer Figure 2.22).

**Industry Highlights**

The growth in the mineral sands industry is the result of a strengthening in international demand for titanium dioxide pigment and zircon.

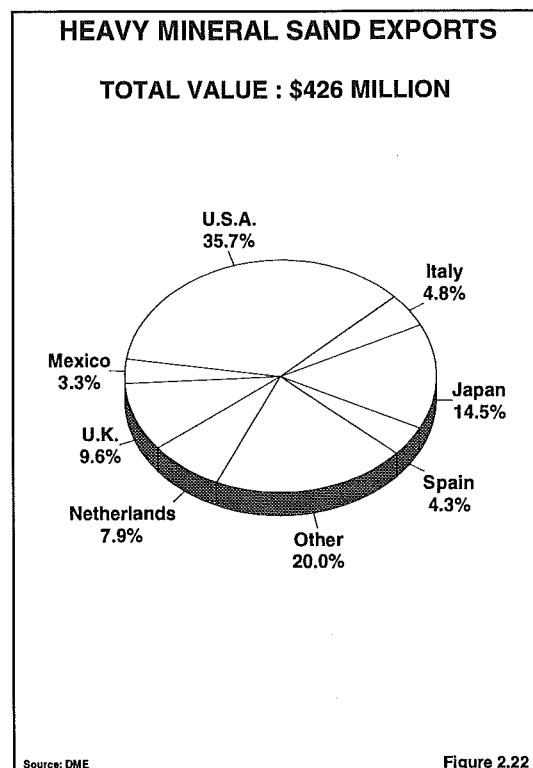
Increased world wide consumption of zircon, largely as a result of increased Chinese requirements, has led to the State's zircon production increasing by 37 percent to around 480,000 tonnes in 1994/95. On the back of stronger zircon prices, which increased by more than 50 percent, and increased production the value of zircon increased by 106 percent to \$130 million in 1994/95.

Despite ilmenite production falling by 7.7 percent to 987,018 tonnes (Figure 2.23), the value of titanium based products (ie. ilmenite, synthetic rutile, rutile and leucoxene) increasing by 17 percent to \$338 million in 1994/95. The increase in the further processing of the State's ilmenite to synthetic rutile (which increased by 19 percent to 396,275 tonnes) more than offset the fall in ilmenite production. Nevertheless, Western Australia continues to account for more than 85 percent of Australia's ilmenite production (Figure 2.24).



Construction of BHP's A\$200 million Beenup mineral sands mine was on budget and on schedule after six months of on-site activity which began in March 1995. Beenup is expected to commence production in late 1996 producing 600,000 tonnes of heavy minerals, mainly ilmenite, per year.

Rhone Poulenc Australia is undertaking a feasibility study for a proposed A\$50 million project rare earth processing plant near Pinjarra. The intention is to process up to 23,000 t/a of monazite, a by-product of the State's titanium minerals industry, to produce 23,000 t/a of rare earth nitrates. Following community concern over the transport of radioactive waste from Pinjarra to Mt Walton, located 100km north-west of Coolgardie, the level of environmental assessment for the project was set by Government to the highest level, being a Environmental Review and Management Program (ERMP). If approval for the plant and waste transport is achieved, the company plans to begin production in two years.



On the international front, the Western world's two largest producers of titanium will merge to create a company with a 24% share of the market in North America and Europe. IMI, the British engineering group, will transfer its titanium operations to Titanium Metals Corp, a US producer. The merged company will have combined annual sales of A\$309.4 million.

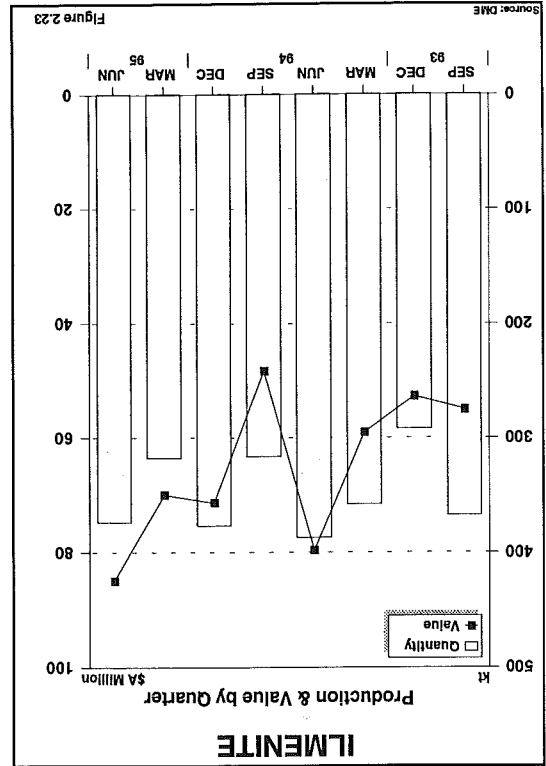
The main international rivals to the merged Timet-IMI operations will be three US producers, Oremet, RMI and Teledyne but their scope to consolidate may be limited.

The Timet-IMI merger simply means that the titanium industry is becoming more concentrated and that Australian producers of mineral sands, usually used as a feed stock for titanium production, will need to work harder to build long term relations with the fewer titanium metal producers.

Operations at the world's leading natural rutile mine in Sierra Leone, West Africa, have been suspended since rebel forces stormed the site in late January 1995. The security situation in the area continues to be unstable and re-occupation of the site by company personnel is still not yet possible.

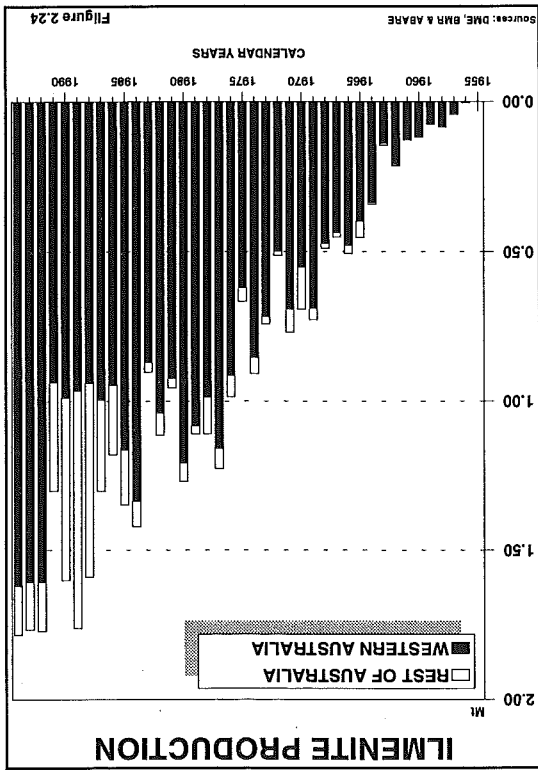
**Outlook**

The outlook for the State's heavy mineral sands industry is bright. Mineral sands prices are expected to remain firm and the State's heavy mineral production is expected to increase in 1995/96.



Source: DME Figure 2.23

In 1994/95 Western Metals (WML) purchased the Lennard Shelf assets of BHP and Shell, including its operation at Cadjetbut. As a source of ore production Cadjetbut is expected to be replaced by Goongewa by the end of 1995. WML is also considering development options for Kapok and the much larger Blendevale reserves over the next two years. Goongewa and Kapok are satellite deposits around the Cadjetbut deposit.



Source: DME, BMR & ARAH Figure 2.24

**Coal**  
Coal experienced a positive year with production and value increasing by 13.8 percent to 5.9 million tonnes and 12.3 percent to \$265 million respectively for 1994/95. The future of the coal industry in the Colliie region looks secure.

Construction of a 300 megawatt coal fired power station at Colliie has been supported by the Government with the power station expected to be operational in 1999. Development of the Western Collieries Premier open cut mine for dedicated supply to the new power station is expected to start shortly. Production from Griffin's Ewington II open cut mine is also expected to commence by mid-1996.

These developments should counter the reduction in production capacity associated with the closure of Colliie's underground mining operations.

**2.9 Other Minerals**  
**Base Metals**

Base metal prices for copper, lead and zinc, increased substantially in 1994/95 and as a result the value of base metal production increased by 33.6 percent to \$162 million.

## Salt

The value of production for salt is estimated to have increased by 4 percent to \$155 million, on the back of a 16.6 percent rise to 7.2 million tonnes in salt production and improved world demand in 1994/95.

## Other Developments

Gwalia Consolidated Ltd recently commissioned its new A\$17.5 million lithium carbonate plant at Greenbushes. The plant is expected to produce 5,000 t/pa of lithium carbonate powder.

Gwalia Consolidated's A\$10 million silica sands plant north of Kemerton has been recently given the green light. Initially the plant will produce 400,000 tonnes of silica sands per annum with the product likely to be shipped to Japan through a new berth at the Bunbury Port.

Western Australia may soon regain its lost gypsum export market worth up to A\$30 million a year. Because of the building boom in Asia, Asian demand for gypsum is growing by around 5% per annum and as a result Dampier Salt and Prima Resources are investigating the feasibility of developing their gypsum deposits at Lake McCleod, with a view of supplying the Asian market, particularly Japan.

CRA have begun a A\$4.5 million pre-feasibility study for its Kaolin deposits 65 km east of Narrogin. It is expected to be completed by the end of 1995.

It is expected that Archaean Gold NL will shortly confirm the potential of the Nimbus silver-gold discovery near Kalgoorlie.

### 3. EXPLORATION AND MINING INVESTMENT

#### Introduction

No-one would dispute that exploration is the life blood of the mining sector, as exploration provides the basis for the future growth of the industry.

The Australian Journal of Mining recently published an article which suggested that Australia was attracting a high proportion of the world's exploration funds.

On a global basis mineral exploration in 1994

was around US\$2.6 billion with the twelve largest mining companies accounting for 39 percent of the total. A number of these companies are

Australian. Mineral exploration budgets for the twelve largest mining companies ranged in

decreasing order from US\$130 million to US\$41

million for RTZ, CRA, Minoro Group, De Beers, BHP Minerals, Newmount Mining, Placer Dome, Lac, Metal Mining Agency of Japan, Western

Mining, Newcrest, and Freeport - McMoran.

It is particularly noteworthy that Australia

attracted 21 percent of global mineral exploration expenditures, being second only to South

America which attracted 26.5 percent. The United States was third and Canada fourth in attracting

15.7 percent and 13.6 percent respectively of the world's 1994 mineral exploration expenditure.

In 1994/95 the Department of Minerals and

Energy refocused its vision as "Western Australia to have the world's best exploration development and operating regime for minerals and petroleum projects". Given Western Australia has

historically attracted more than 50 percent of Australia's mineral exploration expenditure, the

State is in a good position to achieve this vision.

#### Mineral Exploration

Mineral exploration in Western Australia

increased by 9.2 percent in 1994/95 to \$495.5 million, sustaining the strong growth recorded in

1993/94.

The State continues to attract a major share of Australia's mineral exploration expenditure,

accounting for just over 55 percent of the nation's total.

Gold continues to dominate exploration figures, increasing by more than 20 percent in 1994/95 and making up 76 percent of the total. While no major discovery of a Kanowna Belle or

Bronzewing class was announced in 1994/95, the \$379 million expenditure on the search for gold continues to be fruitful in increasing the State's resources inventory by extending known ore

bodies, identifying new zones and discovering new satellite orebodies to existing mines and developments. In 1994 gold discoveries and

upgrades of resources added nearly 400 tonnes to contained in ground gold resources. While the cost of discovering gold has increased to around \$28/oz it remains on par to the overall average of the 1980s-90s gold boom.

Base metals exploration fell slightly to \$59

million, but remains at its relatively high historical level. This represents 12 percent of the State's total mineral exploration expenditure in 1994/95. With improved world prices, copper-lead-zinc

exploration has attracted renewed exploration interest particularly for established projects in the Kimberley, Rudall, Yilgarn and Northampton regions.

A resurgence in evaluation of mostly known

deposits of nickel is taking place as a result of price increases and reasonably optimistic medium

term forecasts of demand. Process technology advances are also playing important roles in the

evaluation of Bulong, and Murrin Murrin laterites, Yackabindie low grade sulphide and the Magpie Hays sulphide deposit.

As would be expected with the depressed nature of international diamond markets, diamond exploration expenditure fell in 1994/95 to \$35

million. Nevertheless Beta Creek - Lower Bulgurti (King George River) and Calwinyarada, are progressing with some success, but are not at an

advanced stage of the development - evaluation process. The entry of large mining companies, such as CRA into some of the offshore diamond joint ventures may provide an impetus for

defining offshore diamond prospectivity.

Iron ore exploration fell to below \$10 million for the year, despite a very high level of interest in this sector. However much of the effort is in

downstream processing. The iron ore exploration effort has identified potentially developable finds at Homestead and Mt Margaret, to the north of the Brockman operation. Detailed exploration is also being undertaken of the Yandicoogina deposits. A renewed interest in evaluating the potential for primary banded iron formation is taking place near Roebourne and Mt Gibson.

Western Australia remains the major focus of expenditure in Australia for heavy mineral sands and uranium. Manganese ore and platinoids are other commodities commanding attention; whilst CRA's kaolin search in the Wheatbelt-Darling Range is creating significant local interest.

### **Petroleum Exploration**

While there is a continued absence of official State petroleum exploration data, an estimate has nevertheless been prepared. The Department of Minerals and Energy has estimated petroleum exploration expenditure for Western Australia at \$285.8 million in 1994/95, representing about 42 percent of the nation's total.

Petroleum exploration activity has again been concentrated to the North West Shelf, with some interest in the Bonaparte Basin.

### **Investment**

Private capital investment expenditure in mining in 1994/95 is forecast to increase by about 10 percent to \$4000 million. Western Australia continues to account for more than half Australia's new capital expenditure on mining.

The Department of Resources Development advises that at present projects worth around \$7,000 million are either under construction or committed in Western Australia.. They also estimate that more than \$10,000 million of projects are under consideration or investigation.

## **4. EMPLOYMENT IN THE MINERALS AND PETROLEUM INDUSTRY**

Statistics compiled from industry returns showed a 4.5 percent employment increase in the State's mineral and petroleum industry to 37,147 people in 1994/95.

With the exception of the coal and iron ore, all other sectors of the State's mining and petroleum industries recorded a rise in employment in 1994/95. In particular employment growth was significant in the nickel, gold and mineral sands industries.

The coal industry recorded a 7.7 percent fall in employment. This is largely attributed to the closing of all underground coal operations in Collie in 1994.

Employment in the iron ore sector fell by 6.3 percent, largely as a result of BHP's planned program of staff rationalisation and introduction of more efficient work practices at its Newman/Port Hedland operations. This resulted in an employment reduction of 955 people.

The number of people employed in the petroleum industry grew slightly to 1,205 in 1994/95.

TABLE 4.1 QUANTITY AND VALUE OF MINERALS AND PETROLEUM

MINERAL	UNIT	QUANTITY	VALUE (\$A)	QUANTITY	VALUE (\$A)
1993-94					
1994-95					
<b>BASE METALS</b>					
Copper Metal	t	32,456 (r)	40,255,726 (r)	27,072	70,331,282
Lead Metal	t	21,113	4,981,363	21,255	8,932,364
Zinc Metal	t	136,385 (r)	79,541,654 (r)	114,879	82,593,764
<b>TOTAL BASE METALS</b>					
			124,778,743 (r)		161,857,410
<b>BAUXITE-ALUMINA</b>					
Alumina	t	7,830,064	1,784,319,220	7,906,987	1,684,604,310
<b>CLAYS</b>					
Attapulgite	t	20,351	6,044,132	18,796	4,662,524
Clay Shale	t	66,483	797,796 (r)	13,921	169,475
Fire Clay	t	27,766	33,320	31,778	38,134
Kaolin	t	3,563	243,900	4,225	250,392
White Clay	t	33,189	318,018	61,599	615,990
<b>TOTAL CLAYS</b>					
			7,437,166 (r)		5,736,515
<b>COAL</b>					
	t	5,152,574 (r)	236,288,139	5,863,747	265,328,700
<b>CONSTRUCTION MATERIALS</b>					
Aggregate	t	51,434	226,475	328,940	1,876,744
Gravel	t	106,280	525,788	143,237	730,670
Rock	t	144,732	2,054,589	47,001	692,168
Sand	t	2,434,032	9,927,160	1,927,572	9,090,488
Sandstone	t	0	0	92	21,823
<b>TOTAL CONSTRUCTION MATERIALS</b>					
			12,734,012		12,411,893
<b>DIAMOND</b>					
	ct	28,864,319	476,747,331	23,931,476	480,031,071
<b>DIATOMITE</b>					
	t	0	0	9,636	77,062
<b>DIMENSION STONE</b>					
Black Granite	t	1,762	485,121	571	171,408
Quartz Rock	t	995	44,753	0	0
<b>TOTAL DIMENSION STONE</b>					
			529,874		171,408
<b>GEM, SEMI-PRECIOUS &amp; ORNAMENTAL STONE</b>					
Agate	kg	23,236	16,741	10,287	14,812
Chalcedony	kg	23,775	19,020	0	0
Chrysoprase	kg	178,540	1,197,961	236,990	1,395,607
Malachite	kg	285	977	5,561	19,639
Variscite	kg	0	0	441	3,996
<b>TOTAL GEM, SEMI-PRECIOUS &amp; ORNAMENTAL STONE</b>					
			1,234,699		1,434,054
<b>GOLD</b>					
	kg	193,599 (r)	3,415,060,358 (r)	187,239 (e)	3,122,410,898 (e)
<b>GYPSSUM</b>					
	t	195,158	2,071,423	229,617	2,658,560
<b>HEAVY MINERAL SANDS</b>					
Garnet	t	55,962	5,320,446	71,070	6,752,553
Ilmenite	t	1,069,717	92,318,841	987,018	89,648,027
Upgraded Ilmenite (a)	t	332,994	153,940,432	396,275	184,625,545
Leucoxene	t	17,438	6,934,515	19,243	7,730,200
Monazite	t	5,848	1,667,044	300	82,525
Rutile	t	68,931	35,757,509	107,782	56,131,247
Zircon	t	349,134	63,098,512	477,052	129,771,749
<b>TOTAL HEAVY MINERAL SANDS</b>					
			359,037,299		474,741,846

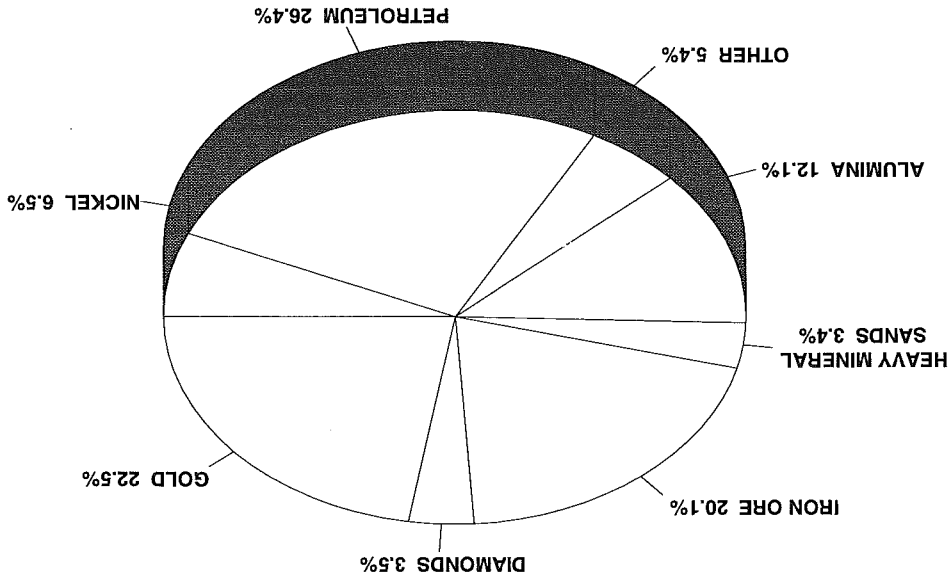
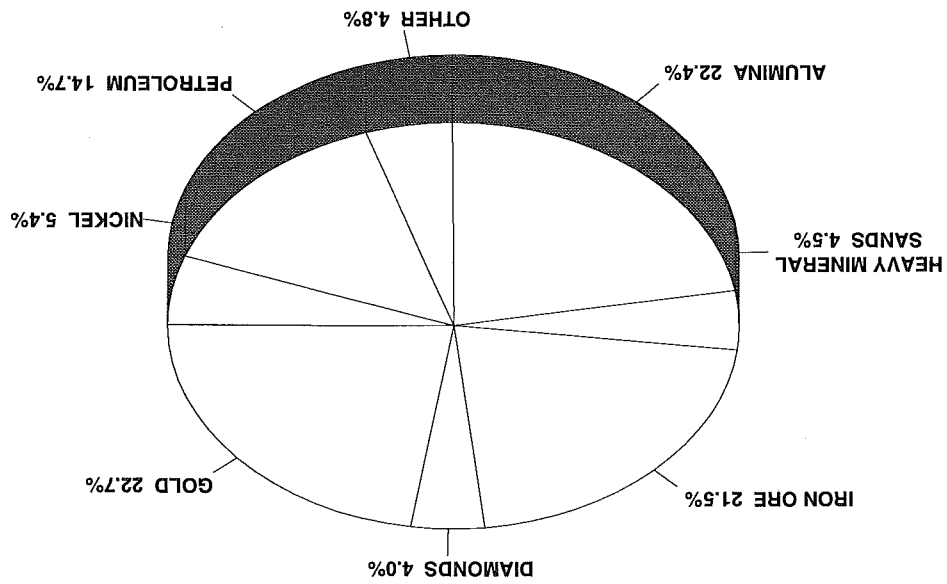
# 1994-95 STATISTICS DIGEST

TABLE 4.1 (cont)		QUANTITY AND VALUE OF MINERALS AND PETROLEUM			
		1993-94		1994-95	
MINERAL	UNIT	QUANTITY	VALUE (\$A)	QUANTITY	VALUE (\$A)
<b>INDUSTRIAL PEGMATITE MINERALS</b>					
Felspar	t	22,167	864,560	52,515	1,933,436
<b>IRON ORE</b>					
Domestic	t	6,049,806	156,792,953	6,628,986	152,208,376
Exported	t	113,640,430	2,708,362,762	126,498,792	2,642,098,607
<b>TOTAL IRON ORE</b>		<b>119,690,236</b>	<b>2,865,155,715</b>	<b>133,127,778</b>	<b>2,794,306,983</b>
<b>LIMESAND-LIMESTONE-DOLOMITE</b>					
Dolomite	t	2,500	25,000	3,950	39,500
Limesand-Limestone	t	2,147,271	14,764,597	2,192,241	14,607,207
<b>TOTAL LIMESAND-LIMESTONE-DOLOMITE</b>			<b>14,789,597</b>		<b>14,646,707</b>
<b>MANGANESE ORE</b>	t	<b>315,786 (r)</b>	<b>42,010,988 (r)</b>	<b>71,912</b>	<b>8,538,956</b>
<b>NICKEL INDUSTRY</b>					
Cobalt by-product	t	370	19,954,659	786	48,072,829
Nickel Concentrate	t	563,025	458,620,550	733,460	897,101,422
Palladium by-product	kg	373	2,576,698	514	3,100,988
Platinum by-product	kg	64	987,882	121	1,412,150
<b>TOTAL NICKEL INDUSTRY</b>			<b>482,139,789</b>		<b>949,687,389</b>
<b>PEAT</b>	t	<b>813</b>	<b>60,380</b>	<b>960</b>	<b>66,992</b>
<b>PETROLEUM</b>					
Condensate	kl	2,350,031	348,711,923	2,634,932	398,338,386
Crude Oil	kl	5,327,567	815,332,844	9,901,184	1,559,648,560
LNG	MMBtu	296,361,819	1,015,679,244	356,107,625	1,262,512,586
Natural Gas	'000m3	4,456,991	413,371,442	5,332,987	440,991,615
<b>TOTAL PETROLEUM</b>			<b>2,593,095,453</b>		<b>3,661,491,147</b>
<b>SALT</b>	t	<b>6,155,387</b>	<b>149,179,209</b>	<b>7,176,351</b>	<b>155,144,299</b>
<b>SILICA-SILICA SAND</b>					
Silica	t	78,235	788,096	82,046	820,477
Silica Sand	t	490,161	4,444,654	532,439	4,658,336
<b>TOTAL SILICA-SILICA SAND</b>			<b>5,232,750</b>		<b>5,478,813</b>
<b>SILVER</b>	kg	<b>75,207 (r)</b>	<b>15,777,870 (r)</b>	<b>57,912</b>	<b>12,231,206</b>
<b>TALC</b>	t	<b>141,057</b>	<b>10,043,030</b>	<b>112,724</b>	<b>8,517,234</b>
<b>TIN-TANTALUM-LITHIUM</b>					
Spodumene	t	47,787 (r)	10,245,802	71,875	11,561,445
Tantalite	t	246 (r)	14,278,830	379	31,839,882
Tin Metal	t	104 (r)	790,621	457	3,109,397
<b>TOTAL TIN-TANTALUM-LITHIUM</b>			<b>25,315,253</b>		<b>46,510,724</b>
<b>TOTAL VALUE</b>			<b>12,623,902,858 (r)</b>		<b>13,870,017,613 (e)</b>

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

- (a) Also known as synthetic rutile
- (e) Estimate
- (r) Revised from previous edition

### COMPARATIVE VALUE OF PRODUCTION 1989-90 TOTAL : \$10,438 MILLION 1994-95 TOTAL : \$13,870 MILLION



Source: DME

Figure 4.1

# 1994-95 STATISTICS DIGEST

<b>TABLE 5.1 QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA</b>					
Mineral	Local Government Area	Quantity Tonnes	Metallic Content	Value \$A	Ref
<b>BASE METALS</b>			Cu Tonnes		
Copper By-Product	Coolgardie		4,489,494	8,583,549	(a),(b)
			Cu %		
Copper Concentrates	East Pilbara	19,556	13.89	5,543,205	
	Meekatharra	18,633	19.16	5,940,519	
	Yalgoo	45,319	19.82	24,096,515	
		<b>83,508</b>		<b>35,580,239</b>	(a)
			Cu Tonnes		
Copper Cathode	East Pilbara		7,312,621	26,167,494	(a)
<b>Total Copper</b>				<b>70,331,282</b>	
			Pb %		
Lead	Derby-West Kimberley	26,700	79.61	8,932,364	(a)
			Zn %		
Zinc	Derby-West Kimberley	116,055	60.21	50,282,257	
	Yalgoo	109,717	41.02	32,311,507	
		<b>225,772</b>		<b>82,593,764</b>	(a)
<b>TOTAL BASE METALS</b>				<b>161,857,410</b>	
<b>BAUXITE - ALUMINA</b>					
Alumina	Boddington	1,661,387		352,042,194	
	Harvey	1,469,280		313,108,985	
	Murray	3,009,445		642,273,916	
	Serpentine-Jarrahdale	1,766,875		377,179,215	
		<b>7,906,987</b>		<b>1,684,604,310</b>	(c)
<b>CLAYS</b>					
Attapulgit	Mullewa	18,796		4,662,524	(a)
Clay Shale	Collie	13,921		169,475	(a)
Fire Clay	Chittering	31,778		38,134	(d)
Kaolin	Bridegetown-Greenbushes	3,361		224,472	
	Goomalling	864		25,920	
		<b>4,225</b>		<b>250,392</b>	(d)
White Clay	Swan	61,599		615,990	(d)
<b>TOTAL CLAYS</b>		<b>130,319</b>		<b>5,736,515</b>	
<b>COAL</b>	Collie	5,863,747		265,328,700	(e)
<b>CONSTRUCTION MATERIALS</b>					
Aggregate	Exmouth	2,321		26,684	
	Kalgoorlie-Boulder	70,632		423,792	

TABLE 5.1 (cont) QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA

Mineral	Local		Government Area	
	Quantity	Metallic Content	Tonnes	Value \$A
				Ref
<b>CONSTRUCTION MATERIALS (cont)</b>				
Aggregate (cont)			231,323	1,278,284
			24,664	147,984
				1,876,744
Gravel			328,940	
			8,398	36,634
			39,013	210,382
			1,700	8,500
			300	1,800
			56,473	282,365
			6,732	33,660
			192	960
			30,429	156,369
				730,670
Rock			143,237	
			41,279	650,136
			3,732	27,507
			75	1,650
			1,643	11,515
			272	1,360
				692,168
Sand			47,001	
			2,600	53,500
			21,753	87,988
			1,068,858	4,275,432
			22,158	88,631
			9,416	56,494
			124,843	685,055
			2,855	14,520
			970	5,820
			4,468	31,276
			6,148	36,888
			1,147	4,588
			6,899	46,260
			60,297	387,879
			6,776	33,880
			18,529	111,174
			2,520	12,600
			10,067	30,201
			324,784	1,914,871
			221,333	1,154,845

<b>TABLE 5.1 (cont) QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA</b>					
Mineral	Local Government Area	Quantity Tonnes	Metallic Content	Value \$A	Ref
<b>CONSTRUCTION MATERIALS (cont)</b>					
Sand (cont)	Swan	189		654	
	Wyndham-East Kimberley	6,400		38,400	
	Yilgarn	4,562		19,532	
		<b>1,927,572</b>		<b>9,090,488</b>	
Sandstone	Derby-West Kimberley	92		21,823	
<b>TOTAL CONSTRUCTION MATERIALS</b>				<b>12,411,893</b>	(d)
carats					
DIAMOND	Wyndham-East Kimberley	<b>23,931,476</b>		<b>480,031,071</b>	(a)
DIATOMITE	Dandaragan	<b>9,636</b>		<b>77,062</b>	
<b>DIMENSION STONE</b>					
Black Granite	Dundas	571		171,408	(d)
<b>GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE</b>					
		kg			
Agate	East Pilbara	10,287		14,812	
		kg			
Chrysoprase		236,990		1,395,607	
		kg			
Malachite	Meekatharra	5,561		19,639	
		kg			
Variscite	Meekatharra	441		3,996	
<b>TOTAL GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE</b>				<b>1,434,054</b>	(e)
<b>GOLD</b>					
			Au kg		
	Boddington		16,742.669	279,247,760	
	Coolgardie		23,294.237	388,546,896	
	Cue		6,279.621	104,990,739	
	Dundas		3,046.728	50,808,746	
	East Pilbara		13,491.132	225,077,223	
	Halls Creek		161.325	2,770,176	
	Kalg.-Boulder		43,086.274	717,870,903	
	Laverton		8,387.222	139,730,880	
	Leonora		22,721.727	379,046,399	
	Meekatharra		18,348.705	306,382,107	
	Menzies		1,157.899	19,296,400	
	Mt Magnet		5,492.381	91,731,439	
	Sandstone		3,513.088	58,464,460	
	Wiluna		3,035.081	50,616,873	
	Yalgoo		2,880.800	48,090,896	
	Yilgarn		15,599.800	259,739,001	
			<b>187,238.689</b>	<b>3,122,410,898</b>	(f)

TABLE 5.1 (cont) QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA

Mineral	Local		Government Area	
	Quantity	Value	Tonnes	\$A
GYPSUM				
Bruce Rock	3,080	18,480 (e)	69,271	1,704,452 (d)(e)
Dalwallinu			8,019	47,440 (e)
Dandaragan			1,264	13,677 (e)
Dundas			5,963	33,478 (e)
Esperance			26,895	134,475 (e)
Irwin			300	3,000 (e)
Koorda			32,544	209,525 (e)
Lake Grace			20	160 (e)
Merredin			29,533	174,798 (e)
Nungarin			8,255	53,760 (e)
Plantagenet			2,847	15,000 (e)
Ravensthorpe			40,226	239,115 (e)
Wyalkatchem			1,400	11,200 (e)
Yilgarn			229,617	2,658,560
HEAVY MINERAL SANDS				
Garnet Sand				
Bunbury City	44	5,080 (g)	71,026	6,747,473 (e)
Northampton				
Ilminte				
Bunbury City	353,447	33,506,203	57.11	33,506,203
Capel	386,370	36,096,465	54.82	36,096,465
Carnamah	154,029	11,952,130	58.77	11,952,130
Dandaragan	93,172	8,093,229	61.34	8,093,229
Upgraded Ilminte				
Capel	156,270	72,549,050	92.00	72,549,050
Carnamah	164,611	78,847,559	92.00	78,847,559
Dandaragan	75,394	33,228,936	92.00	33,228,936
Leucoxene				
Bunbury City	7,293	2,927,129	6,674	2,927,129
Capel	8,427	3,718,093	7,753	3,718,093
Dandaragan	3,523	1,084,978	3,214	1,084,978
Monazite				
Capel	300	82,525 (a)	31,545	82,525 (a)
Rutile				
Bunbury City	4,027	2,274,181	3,773	2,274,181
Carnamah	63,983	34,569,646	59,855	34,569,646

TABLE 5.1 (cont) QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA					
Mineral	Local Government Area	Quantity Tonnes	Metallic Content	Value \$A	Ref
<b>HEAVY MINERAL SANDS (cont)</b>					
Rutile (cont)	Dandaragan		TiO <sub>2</sub> Tonnes		
		39,772	37,746	19,287,420	
		<b>107,782</b>	<b>101,374</b>	<b>56,131,247</b>	(a)
Zircon	Bunbury City		ZrO <sub>2</sub> Tonnes		
		25,416	16,522	6,600,093	
		84,011	54,608	21,002,423	
		306,836	200,293	86,175,683	
		60,789	39,663	15,993,550	
		<b>477,052</b>	<b>311,086</b>	<b>129,771,749</b>	(a)
<b>TOTAL HEAVY MINERAL SANDS</b>				<b>474,741,846</b>	
<b>INDUSTRIAL PEGMATITE MINERALS</b>					
Felspar	Mukinbudin	6,084		220,763	
	Port Hedland	46,431		1,712,673	
		<b>52,515</b>		<b>1,933,436</b>	(h)
<b>IRON ORE</b>					
Domestic Ore	Ashburton	31,791	Fe%	1,178,100	
	East Pilbara	6,597,195	62.37	151,030,276	
		<b>6,628,986</b>		<b>152,208,376</b>	
Exported Ore	Ashburton	77,603,829	Fe%	1,563,235,685	
	East Pilbara	48,180,938	62.68	1,063,966,568	
	Yilgam	714,025	63.81	14,896,354	
		<b>126,498,792</b>		<b>2,642,098,607</b>	
<b>TOTAL IRON ORE</b>		<b>133,127,778</b>		<b>2,794,306,983</b>	(a)
<b>LIMESAND - LIMESTONE-DOLOMITE</b>					
Dolomite	Lake Grace	3,950		39,500	
Limesand - Limestone	Cockburn	1,713,000		9,067,000	
	Dandaragan	31,495		316,085	
	Dundas	75,538		1,133,056	
	Exmouth	442		7,264	
	Gingin	48,796		1,027,868	
	Irwin	7,721		23,162	
	Roebourne	420		23,000	
	Shark Bay	615		52,275	
	Wanneroo	314,214		2,957,497	
			<b>2,196,191</b>		<b>14,646,707</b>
<b>MANGANESE ORE</b>					
	East Pilbara	71,912	Mn %	8,538,956	(a)

TABLE 5.1 (cont) QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA

Mineral	Local	Quantity	Metallic	Value	Ref
	Government Area	Tonnes	Content	\$A	
NICKEL INDUSTRY	Cobalt By-Product	Coolgardie	Co Tonnes	786,330	48,072,829 (a),(b)
	Nickel Concentrates	Coolgardie	Ni %	12.02	296,525,215
		Kalgoorlie-Boulder		12.01	33,160,560
		Leonora		10.72	271,838,187
		Willuna		19.47	213,862,752
		Yilgarn		74,429	81,714,708
	Palladium By-Product	Coolgardie	Pd kg	514,332	3,100,988 (a),(b)
	Platinum By-Product	Coolgardie	Pt kg	121,386	1,412,150 (a),(b)
	PEAT	Manjimup		960	66,992 (d)
	PETROLEUM	Condensate	Carnamah	Kilolitres	417
Irwin				3,856	493,570 (d)
Roebourne				2,630,659	397,811,011 (a)
Crude Oil		Derby-West Kimberley		16,760	2,174,512
		Irwin		1,804,904	282,157,884
		Roebourne		8,079,520	1,275,316,164
Liquified Natural Gas			MMBtu	9,901,184	1,559,648,560 (a)
			'000 m³	356,107,625	1,262,512,586 (a)
		Ashburton		228,945	15,787,802 (f)
Natural Gas		Carnamah		44,135	5,976,973 (f)
	Irwin		296,674	34,484,105 (f)	
	Roebourne		4,763,233	384,742,735 (d),(f)	
TOTAL PETROLEUM			5,332,987	440,991,615	3,661,491,147
SALT	Carnarvon		1,236,189	27,367,060	
	Esperance		12,444	405,000	
	Lake Grace		260	7,800	
	Port Hedland		2,154,724	45,695,749	
	Roebourne		2,852,864	61,168,257	
	Shark Bay		822,243	16,547,713	

TABLE 5.1 (cont) QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA					
Mineral	Local Government Area	Quantity Tonnes	Metallic Content	Value \$A	Ref
<b>SALT (cont)</b>					
	Wyalkatchem	159		12,720	
	Yilgarn	97,468		3,940,000	
		<b>7,176,351</b>		<b>155,144,299</b>	(a)
<b>SILICA - SILICA SAND</b>					
Silica	Moora	82,046		820,477	(a)
Silica Sand	Canning	56,289		619,179	(a)
	Cockburn	273,946		3,013,406	(a)
	Collie	160		1,760	(a)
	Coolgardie	113,571		278,247	(a)
	Swan	62,405		578,303	(a)
	Wanneroo	26,068		167,441	(a)
<b>TOTAL SILICA - SILICA SAND</b>		<b>614,485</b>		<b>5,478,813</b>	
<b>SILVER: BY-PRODUCT</b>					
		Ag kg			
	Coolgardie	198.559		46,300	(a),(b)
	Meekatharra	3,313.401		708,157	(a),(l)
	State-Wide	27,524.565		5,712,415	
	Yalgoo	26,875.312		5,764,334	(a),(l)
		<b>57,911.837</b>		<b>12,231,206</b>	
<b>TALC</b>					
	Meekatharra	13,095		916,650	
	Three Springs	99,629		7,600,584	
		<b>112,724</b>		<b>8,517,234</b>	(e)
<b>TIN - TANTALUM - LITHIUM</b>					
Spodumene	Bridegetown-Greenbushes	71,875	Li <sub>2</sub> O %	11,561,445	(a)
			5.06		
Tantalite	Bridegetown-Greenbushes	240	Ta <sub>2</sub> O <sub>5</sub> kg	24,595,065	
			126,000		
			72,975		
	East Pilbara	139		7,244,817	
		<b>379</b>	<b>198,975</b>	<b>31,839,882</b>	(a)
Tin	Bridegetown-Greenbushes	n.ap.	Sn Tonnes	2,999,997	
			444		
			13		
	East Pilbara	n.ap.		109,400	
			<b>457</b>	<b>3,109,397</b>	(a)
<b>VALUE OF MINERALS</b>				7,086,115,568	
<b>VALUE OF PETROLEUM</b>				3,661,491,147	
<b>VALUE OF GOLD</b>				3,122,410,898	
<b>TOTAL VALUE</b>				<b>13,870,017,613</b>	

# 1994-95 STATISTICS DIGEST

Mineral	1993-94	1994-95	1994-95 GROWTH
	\$A	\$A	\$A
			%
<b>BASE METALS</b>			
Copper	1,219,422.40	2,151,997.61	932,575.21
Lead	230,893.97	401,294.28	170,400.31
Zinc	4,190,075.31	3,470,203.54	(719,871.77)
	5,640,391.68	6,023,495.43	383,103.75
<b>TOTAL BASE METALS</b>	5,640,391.68	6,023,495.43	383,103.75
<b>BAUXITE-ALUMINA</b>			
Alumina	30,737,151.47	27,484,829.44	(3,252,322.03)
	355,260.39	291,379.61	(63,880.78)
<b>CLAYS</b>	355,260.39	291,379.61	(63,880.78)
<b>COAL</b>	11,205,957.19	12,923,045.50	1,717,088.31
<b>CONSTRUCTION MATERIALS</b>			
Aggregate	60,515.10	69,003.60	8,488.50
Gravel	33,705.90	43,715.35	10,009.45
Rock	23,793.60	27,357.37	3,563.77
Sand	863,594.48	576,977.16	(286,617.32)
<b>TOTAL CONSTRUCTION MATERIALS</b>	981,609.08	717,053.48	(264,555.60)
<b>DIAMOND</b>	40,201,661.62	28,551,513.50	(11,650,148.12)
<b>DIATOMITE</b>	0.00	3,745.53	3,745.53
<b>DIMENSION STONE</b>	1,343.66	512.14	(831.52)
<b>GEM, SEMI-PRECIOUS &amp; ORNAMENTAL STONE</b>	59,307.20	57,478.83	(1,828.37)
<b>GOLD</b>	286,514.68	386,544.26	100,029.58
<b>GYPSUM</b>	63,191.63	61,371.73	(1,819.90)
<b>HEAVY MINERAL SANDS</b>			
Garnet	237,941.44	331,992.54	94,051.10
Ilmenite	4,601,392.92	4,856,638.42	255,245.50
Leucoxene	231,170.10	250,969.30	19,799.20
Monazite	112,151.61	35,733.75	(76,417.86)
Rutile	1,488,829.23	2,115,219.56	626,390.33
Zircon	2,339,675.99	4,279,428.13	1,939,752.14
<b>TOTAL HEAVY MINERAL SANDS</b>	9,011,161.29	11,869,981.70	2,858,820.41
<b>INDUSTRIAL PEGMATITE MINERALS</b>			
Felspar	56,644.92	108,262.35	51,617.43
<b>IRON ORE</b>	148,674,163.04	138,971,476.08	(9,702,686.96)
<b>LIMESAND-LIMESTONE-DOLOMITE</b>	218,720.44	236,595.01	17,874.57
<b>MANGANESE</b>	2,585,181.00	357,783.70	(2,227,397.30)

**ROYALTY RECEIPTS**

**TABLE 6.1**

# 1994-95 STATISTICS DIGEST

Mineral	ROYALTY RECEIPTS			
	1993-94 \$A	1994-95 \$A	1994-95 GROWTH	
			\$A	%
<b>NICKEL</b>				
Cobalt by-product	328,938.71	1,034,277.00	705,338.29	214.4
Nickel	7,908,429.93	17,680,335.11	9,771,905.18	123.6
Palladium by-product	46,801.09	66,577.55	19,776.46	42.3
Platinum by-product	20,395.30	29,588.08	9,192.78	45.1
<b>TOTAL NICKEL INDUSTRY</b>	<b>8,304,565.03</b>	<b>18,810,777.74</b>	<b>10,506,212.71</b>	<b>126.5</b>
<b>PEAT</b>	<b>1,919.08</b>	<b>2,033.25</b>	<b>114.17</b>	<b>5.9</b>
<b>PETROLEUM</b>				
Condensate	6,362,978.09	10,320,097.61	3,957,119.52	62.2
Liquified Natural Gas	20,387,570.67	35,094,125.79	14,706,555.12	72.1
Natural gas	9,964,699.21	14,506,869.12	4,542,169.91	45.6
Oil	36,171,071.09	53,815,903.76	17,644,832.67	48.8
<b>TOTAL PETROLEUM</b>	<b>72,886,319.06</b>	<b>113,736,996.28</b>	<b>40,850,677.22</b>	<b>56.0</b>
<b>SALT</b>	<b>1,349,803.55</b>	<b>1,545,680.88</b>	<b>195,877.33</b>	<b>14.5</b>
<b>SILICA SAND</b>	<b>279,142.27</b>	<b>292,861.21</b>	<b>13,718.94</b>	<b>4.9</b>
<b>SILVER</b>	<b>389,256.91</b>	<b>262,109.62</b>	<b>(127,147.29)</b>	<b>(32.7)</b>
<b>TALC</b>	<b>76,629.00</b>	<b>32,078.00</b>	<b>(44,551.00)</b>	<b>(58.1)</b>
<b>TIN-TANTALUM-LITHIUM</b>				
Spodumene	413,569.72	552,496.96	138,927.24	33.6
Tantalite	278,015.95	710,723.76	432,707.81	155.6
Tin	21,229.84	58,709.19	37,479.35	176.5
<b>TOTAL TIN-TANTALUM-LITHIUM</b>	<b>712,815.51</b>	<b>1,321,929.91</b>	<b>609,114.40</b>	<b>85.5</b>
<b>TOTAL ROYALTY RECEIPTS</b>	<b>334,078,709.71</b>	<b>364,049,535.18</b>	<b>29,970,825.48</b>	<b>9.0</b>
<b>IRON ORE ADDITIONAL RENTAL</b>	<b>25,225,946.18</b>	<b>26,435,373.32</b>	<b>1,209,427.14</b>	<b>4.8</b>
<b>TOTAL REVENUE</b>	<b>359,304,655.89</b>	<b>390,484,908.50</b>	<b>31,180,252.62</b>	<b>8.7</b>

# 1994-95 STATISTICS DIGEST

**TABLE 7.1 PERSONS EMPLOYED IN THE WA MINERALS & PETROLEUM INDUSTRIES AS AT JUNE 30 1995**

MINERAL/Company	PROJECT	1993-94	1994-95	
<b>BASE METALS</b>				
BHP Minerals Ltd	Cadjebut	160	153	
Murchison Zinc Co. Pty Ltd	Golden Grove	231	261	
Western Mining Corporation Ltd	Nifty	130	129	
<b>TOTAL BASE METALS</b>		<b>521</b>	<b>543</b>	
<b>BAUXITE - ALUMINA</b>				
Alcoa of Australia Ltd	Del Park-Huntley - Pinjarra	1,727	1,773	
	Jarrahdale/Kwinana	1,850	1,818	
	Wagerup/Willow Dale	941	930	
Australian Fused Materials Pty Ltd	East Rockingham	34	61	
Worsley Alumina Pty Ltd	Boddington/Worsley	1,205	1,238	
<b>TOTAL BAUXITE - ALUMINA</b>		<b>5,757</b>	<b>5,820</b>	
<b>COAL</b>				
Griffin Coal Mining Co. Ltd	Chicken Creek	55	0	
	Muja	396	367	
	Western Collieries Ltd	Central Services	29	28
		Western #2	4	0
		Western #5	336	362
<b>TOTAL COAL</b>		<b>820</b>	<b>757</b>	
<b>DIAMOND</b>				
Argyle Diamond Mines Pty Ltd	Lake Argyle	1,047	1,195	
Poseidon Ltd	Bow River	103	119	
<b>TOTAL DIAMOND</b>		<b>1,150</b>	<b>1,314</b>	
<b>GOLD</b>				
Australian Resources & Mining Co. NL	Gidgee	137	109	
	Mt McLure	145	191	
Aztec Mining Co Ltd	Bounty	332	314	
Burmine Ltd	Copperhead	107	116	
Central Norseman Gold Corp. NL	Central Norseman	258	277	
Coolgardie Gold NL	Greenfield	140	115	
Dominion Mining Ltd	Bannockburn	99	2	
	Meekatharra	183	138	
	Mt Morgans	165	254	
Goldfan Ltd	Three Mile Hill	170	197	
Great Central Mines NL	Bronzewing	174	237	
Hampton Australia Ltd	Jubilee	232	134	
Hedges Gold Pty Ltd	Hedges	90	89	
Kalgoorlie Consolidated Gold Mines Pty Ltd	Kalgoorlie	1,313	1,405	

TABLE 7.1 (cont) PERSONS EMPLOYED IN THE WA MINERALS & PETROLEUM INDUSTRIES AS AT JUNE 30 1995

MINERAL/Company		PROJECT	
		1993-94	1994-95
GOLD (cont)			
Gold Mines of Australia Ltd	Reedy	82	153
Mellita Mining NL	Orent Well	0	90
Mining Corporation of Australia Ltd	Mt Pleasant	225	86
Mt Edon Gold Mines (Australia) NL	Nevona	75	109
	Tarmoola	85	137
Newcrest Mining Ltd	Gimlet South	171	191
	New Celebration	359	264
	Telfer	810	783
Orle Resources Ltd	Mt Gibson	145	140
Pancontinental Pty Ltd	Kundana	173	200
	Paddington	239	364
Peko Gold Ltd	Peak Hill	80	84
	Kanowna Belle	127	149
Perilya Mines NL	Fortnum	88	123
Placer Pacific Pty Ltd	Granny Smith	338	326
Plutonic Operations Ltd	Bellevue	174	109
	Darlot	86	109
	Lawlers	132	158
	Plutonic	313	313
Posidon Ltd	Big Bell	245	292
	Golden Crown	60	135
	Katalls	119	114
Resolute Resources Ltd	Marymia	118	55
	Chalice	0	74
	Higginsville	144	194
	Hopes Hill	77	0
Sons of Gwalia NL	Barnicoat	58	84
	Sons of Gwalia	193	175
	Yilgarn	261	269
St Barbara Mines Ltd	Meekatharra	276	309
Western Mining Corporation Ltd	Emu	120	196
	Kambalda/St. Ives	768	910
	Lancefield	199	
	Hill 50	414	339
Westgold Resources NL	Tuckabianna	128	130
Wiluna Mines Ltd	Wiluna	176	248
Worsley Alumina Pty Ltd	Boddington	450	667
Yilgarn Star Pty Ltd	Yilgarn Star	139	196
All Other Operators		1,294	1,064
<b>TOTAL GOLD</b>		<b>12,574</b>	<b>13,010</b>

**TABLE 7.1 (cont) PERSONS EMPLOYED IN THE WA MINERALS & PETROLEUM INDUSTRIES AS AT JUNE 30 1995**

MINERAL/Company	PROJECT	1993-94	1994-95	
<b>HEAVY MINERAL SANDS</b>				
Cable Sands Pty Ltd	Bunbury	264	285	
Mineral Deposits Ltd	Beenup	0	46	
RGC Mineral Sands Pty Ltd	Capel	231	213	
	Eneabba	338	320	
	Narngulu	184	258	
TiWest Pty Ltd	Chandala-Muchea	147	197	
	Cooljarloo	105	122	
Westralian Sands Ltd	Capel	375	396	
All Other Operators		30	51	
<b>TOTAL HEAVY MINERAL SANDS</b>		<b>1,674</b>	<b>1,888</b>	
<b>IRON ORE</b>				
BHP Iron Ore (Goldsworthy) Ltd	Yarrie	157	152	
BHP Iron Ore (Jimblebar) Ltd	Jimblebar	68	74	
	Nimingarra/Port Hedland	328	321	
	Newman/Port Hedland	2,608	1,653	
BHP Iron Ore Ltd	Yandicoogina	95	159	
	Yampi	76	0	
BHP Minerals Ltd	Brockman	105	121	
	Dampier	910	1,236	
	Hismelt - Kwinana	200	91	
	Marandoo	115	154	
	Paraburdoo	600	611	
	Tom Price	769	849	
	Kooyanobbing Iron Pty Ltd	Cockatoo Island	0	32
		Kooyanobbing	0	31
Robe River Mining Co. Pty Ltd	Pannawonica/Cape Lambert	617	742	
<b>TOTAL IRON ORE</b>		<b>6,648</b>	<b>6,226</b>	
<b>NICKEL</b>				
Outokumpu Australia Ltd	Forrestania	204	242	
Western Mining Corporation Ltd	Kalgoorlie Nickel Smelter	366	442	
	Kambalda/Blair	1,303	1,214	
	Kwinana Refinery	359	520	
	Leinster	553	1,826	
	Mt Keith	1,059	434	
<b>TOTAL NICKEL</b>		<b>3,844</b>	<b>4,678</b>	
<b>PETROLEUM PRODUCTS</b>				
Ampolex Ltd	Wandoo	14	14	
Apache Energy Ltd	Harriet/Rosette	140	123	

TABLE 7.1 (cont) PERSONS EMPLOYED IN THE WA MINERALS & PETROLEUM INDUSTRIES AS AT JUNE 30 1995

MINERAL/Company	PROJECT	1993-94	1994-95
PETROLEUM (cont)			
BHP Petroleum (Australia) Pty Ltd	Griffin	59	51
Discovery Petroleum Ltd	Mt Horner	20	15
Minorra Resources NL	Blina/Sundown/West Terrace	2	2
West Aust Petroleum Pty Ltd	North West Area/Dongara	250	261
Western Mining Corp. Ltd	North Herald/South Pepper/Cherill	27	32
Woodside Offshore Pet. Pty Ltd	Goodwyn/Rankin/Burrup	680	630
All Other Operators		6	6
<b>TOTAL PETROLEUM PRODUCTS</b>		<b>1,198</b>	<b>1,134</b>
SALT			
Cargill Salt Co.	Port Hedland	115	114
Dampier Salt Ltd	Dampier	197	216
Shark Bay Salt JV	Lake Macleod	105	89
Other	Useless Loop	56	99
<b>TOTAL SALT</b>		<b>479</b>	<b>524</b>
<b>ALL OTHER MATERIALS (including Rock Quarries)</b>		<b>880</b>	<b>1,182</b>
<b>TOTAL</b>		<b>35,545</b>	<b>37,076</b>

(Source: AXIAT Reporting System, Mining Operations Division)

**TABLE 8.1****PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1994-95**  
address, telephone number: project**BASE METALS****Copper**

Murchison Zinc Co. Pty Ltd, c/o Normandy Mining Ltd, 100 Hutt St, Adelaide, S.A., (08) 303 1700: Golden Grove.

Newcrest Mining Ltd, 600 St Kilda Rd, Melbourne Vic, 3004, (03) 9522 5333: Telfer.

Western Mining Corp. Ltd, 250 St Georges Terrace, Perth 6000, (09) 442 2000: Nifty, Kambalda.

**Lead - Zinc**

Murchison Zinc Co. Pty Ltd, c/o Normandy Mining Ltd, 100 Hutt St, Adelaide 5000, S.A., (08) 303 1700: Golden Grove.

Westmet Metals Zinc NL, PO Box 534, Broome 6725, (091) 910 245: Cadjebut.

**BAUXITE - ALUMINA****Alumina**

Alcoa of Australia (WA) Ltd, cnr Davey & Marmion Sts Booragoon 6154, (09) 316 5111: Del Park, Jarrahdale, Willowdale.

Worsley Alumina Pty Ltd, PO Box 50, Boddington WA 6390, (098) 83 8005: Boddington.

**CLAY****Attapulgit**

Mallina Holdings Ltd, 249 Stirling Hwy, Claremont 6010, (09) 384 7077: Lake Nerramyne.

**Clay Shale**

Western Collieries Ltd, 40 The Esplanade, Perth 6000, (09) 327 4511: Collie.

**Kaolin**

Gwalia Consolidated Ltd, PMB 16, West Perth 6872, (09) 481 1988: Greenbushes.

**White Clay**

Metro Brick, Locked Bag 100, Midland 6056, (09) 250 2111: Middle Swan.

**COAL**

Griffin Coal Mining Co. Ltd, 28 The Esplanade, Perth 6000, (09) 325 8155: Collie.

Western Collieries Ltd, 40 The Esplanade, Perth 6000, (09) 327 4511: Collie.

**CONSTRUCTION MATERIALS****Aggregate**

The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Boodarrie, Boulder, Oscar Range.

**Gravel**

Vinci and Sons Pty Ltd, Lot 3 Pickering Brook Rd, Pickering Brook 6076, (09) 293 8295: Pickering Brook.

**Rock**

County B.S., c/o Pioneer Concrete, 123 Burswood Rd, Victoria Park 6100, (09) 311 8811: Yeeda Station.

**TABLE 8.1 (cont)**

**PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1994-95**  
address, telephone number: project

**CONSTRUCTION MATERIALS (cont)**

**Sand**

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Gnangarra, Jandakot.  
 Pioneer Concrete, 123 Burswood Rd, Victoria Park 6100, (09) 311 8811: Coolgardie.  
 The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Comet Vale, Maitland, Nickol Bay, Pinnacles,  
 Rocklea, Sandy Creek, Sullivan's Creek, Turner River, Warrawanda Creek, Widgiemooltha.

**DIAMOND**

Argyle Diamond Mines, 2 Kings Park Rd, West Perth 6005, (09) 482 1166: Argyle.  
 Poseidon Bow River Diamond Mines Ltd, 100 Hutt St, Adelaide, S.A., (08) 303 1700: Bow River.

**DIMENSION STONE**

**Black Granite**

Fraser Range Granite NL, 164 Burswood Rd., Victoria Park 6010, (09) 470 4487: Mt Malcolm.

**Quartz Rock**

Commercial Minerals Ltd, 26-28 Tomlinson Rd, Welshpool 6106, (09) 362 1411: Mukinbudin.

**GEM, SEMI-PRECIOUS & ORNAMENTAL STONE**

**Chrysoprase**

Gembank Ltd, 26-28 King St, Perth 6000, (09) 481 1401: Yerilla.

**GOLD**

Aberfoyle Ltd, 525 Collins St, Melbourne 3000, (03) 9270 6666: Bardoc-Davyhurst.  
 Australian Resources & Mining Co. NL, 20 Berry St, North Sydney, NSW 2060, (02) 955 1722: Gidgee, Mt McClure.  
 Burmine Ltd, Copperhead Mine, Bullfinch 6484, (090) 49 5066: Frasers, Copperhead.  
 Camelot Resources Ltd, 46-50 Kings Park Rd, West Perth 6005, (09) 321 0616: Mt Gibson.  
 Centaur Mining and Exploration Ltd, 580 St Kilda Rd, Melbourne Vic. 3004, (03) 9276 7870: Lady Bountiful Extended.  
 Central Norseman Gold Corp. NL, PO Box 56, Norseman 6443, (090) 39 1101: Central Norseman.  
 Coolgardie Gold NL, 56b Bayley St, Coolgardie 6429, (090) 26 6132: Bayley's Reward-Greenfields.  
 Consolidated Resources NL, 30 Ledger Rd, Balcatta 6021, (09) 345 1588: Nevoria.  
 Croesus Mining NL, 39 Porter St, Kalgoorlie 6430, (090) 91 2222: Binduli.  
 Dominion Mining Ltd, 10 Richardson St, West Perth 6005, (09) 426 6400: Mt Morgans.  
 Eltin Minerals Pty Ltd, 74 Gt Eastern Hwy, Stn Guildford 6055, (09) 334 8888: Grosmont-Norris.  
 Glengarry Resources NL, 646 Murray St, West Perth 6005, (09) 322 4929: Theil Well.  
 Gold Mines of Australia Ltd, 161 Great Eastern Hwy, Belmont 6104, (09) 479 0222: Reedy, Youanmi.  
 Great Central Mines NL, 580 St Kilda Rd, Melbourne 3004, (03) 9276 7888: Bronzewing.  
 Hampton Australia Ltd, 100 Hutt St, Adelaide, S.A., (08) 236 1700: Jubilee.  
 Hedges Gold Pty Ltd, Williams Rd, Boddington 6390, (09) 538 4512: Hedges.  
 Herald Resources Ltd, 40 Kings Park Rd, West Perth 6005, (09) 322 2788: Sandstone, Three Mile Hill.  
 Kalgoorlie Consolidated Gold Mines Pty Ltd, Fimiston, Kalgoorlie 6430, (090) 22 1100: Super Pit, Mt Charlotte, Mt Percy.

**TABLE 8.1 (cont)**

**PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1994-95**  
**address, telephone number: project**

**GOLD (cont)**

Kitchener Mining NL, 411 Collins St, Melbourne 3000, (03) 9629 6888: Bamboo Creek, Normay.

Lynas Gold NL, 40 Kings Park Rd, West Perth 6005, (09) 322 2788: Lynas Find.

Metall Mining Corp of Aust Pty Ltd, cnr Throssell & Forrest Sts. Kalgoorlie 6430, (090) 21 1766:: Round Dam, West Black Flag.

Mining Corporation of Australia Ltd, 229 Stirling Hwy, Claremont 6010, (09) 383 4321: Mt Pleasant-Golden Kilometre.

Mt Edon Gold Mines (Aust) NL, 30 Ledger Rd, Balcatta 6021, (09) 345 1588: Tarmoola-King Of The Hills.

Mt Burgess Gold Mining Co NL, 533 Hay St Perth 6000, (09) 221 1777, Butcher Well - Yundamindera.

National Resources Exploration Ltd, 106 Briggs St, Welshpool 6106, (09) 470 3555: Gullewa.

Newcrest Mining Ltd, 179 Gt Eastern Hwy, Belmont 6401, (09) 270 7070: New Celebration, Ora Banda, Orban JV, Telfer.

North Ltd, 476 St Kilda Rd, Melbourne Vic 3004, (03) 9207 5111: Kanowna Belle, Peak Hill.

Orion Resources NL, 16 Ogilvie Rd, Mt Pleasant 6153, (09) 364 8355: Burbidge-Great Victoria, Yilgarn Star.

Pancontinental Mining Ltd, PO Box 1161, Kalgoorlie 6430, (090) 24 2000: Kundana, Paddington.

Perilya Mines NL, 278 Stirling Hwy, Claremont 6010, (09) 385 2400: Fortnum.

Placer Pacific Ltd, PO Box 33, Laverton WA 6440, (090) 31 3111: Granny Smith.

Plutonic Resources Ltd, 100 Miller St, Nth Sydney 2060 (02) 9900 5000: Darlot, Lawlers, Plutonic, Sir Samuel-Bellevue.

Posgold Ltd, 100 Hutt St, Adelaide S.A., (08) 303 1700: Big Bell, Forrestania-Bounty, Golden Crown, Kaltails.

Precious Metals Australia Ltd, 37 St Georges' Tce, Perth 6000, (09) 221 3711: Palm Springs.

Ramsgate Resources Ltd, 229 Stirling Highway, Claremont 6010, (09) 383 4321: Grace Darling, Mt Monger-Randalls.

Resolute Samantha Ltd, 28 The Esplanade, Perth 6000, (09) 261 6100: Bullabulling, Chalice, Higgginville, Marymia Hill.

St Barbara Mines Ltd, 28 The Esplanade, Perth 6000, (09) 324 6350: Bluebird.

Sons of Gwalia NL, 16 Parliament Pl, West Perth 6005, (09) 481 1988: Barnicoat, Marvel Loch-Southern Cross, Sons of Gwalia.

Tectonic Resources Ltd, 100 Hay St, Subiaco 6008, (09) 388 3872: Mt Dimer.

Western Mining Corp. Ltd, 250 St Georges Terrace, Perth 6000, (09) 442 2000: Emu-Leinster, Hill 50-Mt Magnet, Kambalda-St Ives.

Westgold Resources NL, 108 St Georges' Tce, Perth 6000, (09) 324 2877: Tuckabianna.

Wiluna Mines Ltd, 10 Ord St West Perth 6005, (09) 481 2050: Jundee, Wiluna.

Worsley Alumina Pty Ltd, PO Box 48, Boddington 6390, (098) 83 8260: Boddington.

**GYPSUM**

H.B. Brady & Co. Pty Ltd, PO Box 42, Bayswater 6053, (09) 279 4422: Lake Brown.

Lake Hillman Mining Pty Ltd, Kalannie 6468, (096) 66 2045: Lake Hillman.

Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Lake Hillman.

Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross 6153, (09) 364 4951: Lake Cowcowing.

**HEAVY MINERAL SANDS**

**Garnet Sand**

GMA Garnet Pty Ltd, PO Box 188, Geraldton 6530, (099) 23 3644: Port Gregory.

**Ilmenite, Rutile, Zircon, Leucoxene & Monazite**

Cable Sands (WA) Pty Ltd, PO Box 133, Bunbury 6230, (097) 21 4111: Busselton, Jangardup, Waroona.

TABLE 8.1 (cont)

**PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1994-95**  
address, telephone number: project

**HEAVY MINERAL SANDS (cont)**

RGC Mineral Sands, PO Box 62, Geraldton 6530, (099) 568 822: Capel, Eneabba North, Eneabba West, Narngulu.

TiWest Pty Ltd, 1 Brodie Hall Dve, Bentley 6102, (09) 365 1390: Cooljarloo, Chandala.

Westralian Sands Ltd, PO Box 96, Capel 6271, (097) 27 2002: Yoganup, Yoganup Extended.

**INDUSTRIAL PEGMATITE MINERALS**

**Felspar**

Commercial Minerals Ltd, 26-28 Tomlinson Rd, Welshpool 6106, (09) 362 1411: Mukinbudin, Pippingarra.

**IRON ORE**

BHP Iron Ore (Goldsworthy) Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Nimingarra, Yarie.

BHP Iron Ore (Jimblebar) Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Jimblebar.

BHP Iron Ore Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Newman, Yandicoogina.

Channar Mining Pty Ltd, 152 St George's Tce, Perth 6000, (09) 327 2327: Channar.

Hamersley Iron Pty Ltd, 152 St George's Tce, Perth 6000, (09) 327 2327: Brockman, Marandoo, Tom Price, Paraburadoo.

Koolyanobbing Iron Pty Ltd, 56 Adelaide Tce, Perth WA 6000, (09) 268 3388: Cockatoo Island, Koolyanobbing.

Robe River Iron Associates, 12 St George's Tce, Perth 6000, (09) 421 4747: Pannawonica.

**LIMESAND - LIMESTONE**

Cockburn Cement Ltd, Russell Rd, East Munster 6166, (09) 411 1000: Cockburn Sound, Coogee.

Limestone Building Blocks Co. Pty Ltd, Hopkins Rd, Carabooda 6033, (09) 407 5005: Nowerup.

Loongana Lime Pty Ltd, PO Box 808, Kalgoorlie 6430, (090) 21 8055: Loongana.

Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Wanneroo.

Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross 6153, (09) 364 4951: Dandaragan, Gingin, Irwin, Yanchep.

**MANGANESE**

Portman Mining Ltd, 256 Adelaide Tce, Perth 6000, (09) 268 3333: Mt Sydney.

Valiant Consolidated Ltd, 250 St Georges' Tce, Perth 6000, (09) 321 3797: Pearana.

**NICKEL**

Outokumpu Australia Pty Ltd, 141 Burswood Rd., Burswood 6100, (09) 472 3144: Forrestania

Western Mining Corp. Ltd, 250 St Georges Terrace, Perth 6000, (09) 442 2000: Blair, Carnilya Hill, Kambalda, Leinster, Mt Keith.

**PEAT**

Peat Resources of Australia Pty Ltd, 665 Welshpool Rd, Wattle Grove 6107, (09) 453 6777: Manjimup.

**PETROLEUM**

Ampolex Ltd, 250 St George's Tce, Perth 6000, (09) 429 3200: Wandoo

Apache Energy Ltd, 256 St Georges' Tce, Perth WA 6000, (09) 422 7222: Campbell, Harriet, Rosette, Sinbad & Tanami.

BHP Petroleum Pty Ltd, 221 St Georges Tce, Perth 6000, (09) 426 5600: Griffin

TABLE 8.1 (cont)

**PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1994-95**  
address, telephone number: project

**PETROLEUM (cont)**

Consolidated Gas Pty Ltd, 325 Churchill Ave, Subiaco 6008, (09) 380 4920: Woodada.

Discovery Petroleum NL, 31 Ventnor Ave, West Perth WA, 6005, (09) 480 4100: Mt Horner.

Santos Ltd, 39 Grenfell St, Adelaide SA 5001, (08) 224 7162: Blina, Boundary, Lloyd, Sundown, West Terrace.

Sagasco Resources Ltd, 60 Hindmarsh Sq, Adelaide SA 5000, (08) 235 3737: Beharra Springs, Tubridgi.

West Aust. Petroleum Pty Ltd (WAPET), QV1, 250 St Georges Tce, Perth 6000, (09) 263 6000: Barrow Island, Cowle, Crest, Dongara, Mondara, Roller-Skate, Saladin, Yammaderry.

Western Mining Corp. Ltd, 250 St Georges Terrace, Perth 6000, (09) 442 2000: Chervil, North Herald, South Pepper, Airlie Is.

Woodside Offshore Pet. Pty Ltd, 1 Adelaide Tce, Perth 6000, (09) 224 4111: Cossak/Wanaea, Goodwyn, North Rankin.

**SALT**

Cargill Australia Ltd, PO Box 420, Port Hedland 6721, (091) 40 1255: Port Hedland.

Dampier Salt (Operations) Pty Ltd, 152-158 St George's Tce, Perth 6000, (09) 327 2299: Dampier, Lake Macleod.

Shark Bay Salt Joint Venture, 22 Mount St, Perth 6000, (09) 322 4811: Useless Loop.

WA Salt Koolyanobbing Pty Ltd, Cockburn Rd, Hamilton Hill 6163, (09) 430 5495: Lake Deborah East, Pink Lake.

**SILICA - SILICA SAND**

**Silica**

Simcoa Operations Pty Ltd, P.O. Box 1389, Bunbury 6231, (097) 912 588: Dalaroo.

**Silica Sand**

ACI Operations Pty Ltd, 35 Baille Rd, Canning Vale 6155, (09) 455 1111: Lake Gngangara.

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Jandakot, Gngangara.

Boral Resources WA Ltd, 136-138 Gt Eastern Hwy, South Guildford 6055, (09) 279 0000: Jandakot.

The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Jandakot.

Western Mining Corp. Ltd, 250 St Georges Terrace, Perth 6000, (09) 442 2000: Mt Burgess.

**TALC**

Gwalia Minerals NL, PMB 16, West Perth 6872, (09) 481 1988: Mt Seabrook.

Western Mining Corp. Ltd, PO Box 116, Three Springs 6519, (099) 54 5047: Three Springs.

**TIN - TANTALUM - LITHIUM**

**Spodumene**

Lithium Australia Ltd, PMB 16, West Perth 6872, (09) 481 1988: Greenbushes.

**Tantalite - Tin**

Goldrim Mining Australia Ltd, 562 Pacific Hwy, Belmont NSW 2280, (049) 477 288: Wodgina.

Gwalia Consolidated Ltd, PMB 16, West Perth 6872, (09) 481 1988: Greenbushes.

Pan West Tantalum Pty Ltd, 1 Alfred St, Sydney NSW 2000, (02) 934 8888: 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	f.o.t.	free on truck
f.o.b.	free on board	n.a.	not available
f.o.r.	free on rail	n.ap.	not applicable
\$A	Australian Dollar	\$US	United States Dollar
ABS	Australian Bureau of Statistics	LME	London Metals Exchange
AFR	<i>Australian Financial Review</i>	BMR	Bureau of Mineral Resources
ABARE	Australian Bureau of Agricultural and Resource Economics		

### REFERENCES

N.A. Not available for publication.

- (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) Value based on monthly production and average gold price of that month as supplied by GoldCorp.
- (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 value.
- (k) Metallic by-product of copper 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)	= 2.20462 pounds (lbs)
	1 tonne	(t)	= 1.10231 United States short ton (1 U.S. short ton = 2,000 lbs)
	1 tonne	(t)	= 0.98421 United Kingdom long ton (1 U.K. long ton = 2,240 lbs)
Volume	1 kilolitre	(kl)	= 6.28981 barrels (bbls)
	1 kilolitre	(kl)	= 1 cubic metre (m <sup>3</sup> )
	1 cubic metre (m <sup>3</sup> )		= 35.3147 cubic feet (ft <sup>3</sup> )
Energy	1 kilojoule	(kJ)	= 0.94781 British Thermal Units (Btu)
	1 gigajoule	(GJ)	= 0.94781 million British Thermal Units (MMBtu)
	1 petajoule	(PJ)	= 0.94781 million million British Thermal Units (MMBtu)
Prefix:	kilo (k)	10 <sup>3</sup>	
	mega (M)	10 <sup>6</sup>	
	giga (G)	10 <sup>9</sup>	
	tera (T)	10 <sup>12</sup>	
	peta (P)	10 <sup>15</sup>	



Policy and Planning Division

Mineral House  
100 Plain Street  
East Perth WA 6004  
Telephone: (09) 222 3106  
International: 61 9 222 3106

Facsimile: (09) 222 3410  
International: 61 9 222 3410

Email: [j.gibson@dme.wa.gov.au](mailto:j.gibson@dme.wa.gov.au)

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