ROYALTIES AND POLICY DEVELOPMENT DIVISION

# STATISTICAL DIGEST OF MINERAL AND PETROLEUM PRODUCTION 1989

DEPARTMENT OF MINES
WESTERN AUSTRALIA

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1989

ROYALTIES & POLICY DEVELOPMENT DIVISION

DEPARTMENT OF MINES

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# ABREVIATIONS, REFERENCES, UNITS AND CONVERSION FACTORS

As the following 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 |

## REFERENCES

:N.A Not available for publication
(a) Estimated F.O.B value.
(b) Metallic byproduct of copper mining.
(c) Value based on the average Australian Value of Alumina as published by the Bureau of Mineral Resources in the Australian Mineral Industry Review
(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 Gold Producers Association.
(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 nickel mining.

## UNITS AND CONVERSION FACTORS

| | Metric unit | Symbol | Imperial unit | Conversion factors: Multiply imperial unit by | Conversion factors: Multiply metric unit by |
|---|---|---|---|---|---|
| Mass | gram | g | troy (fine) ounce (oz) | 31.103522 | 0.032151 |
| | kilogram | kg | pound (lb) | 0.453592 | 2.204624 |
| | tonne | t | long ton (2240 lbs) | 1.016046 | 0.984207 |
| | tonne | t | short ton (2000 lbs) | 0.907185 | 1.102311 |
| Volume | kilolitre | kl | barrel (bbl) | 6.28981 | 0.158987 |
| | kilolitre | kl | cubic metre ($m^3$) | 1 | |
| Prefix | kilo (k) | $10^3$ | | | |
| | mega (M) | $10^6$ | | | |
| | giga (G) | $10^9$ | | | |
| | tera (T) | $10^{12}$ | | | |

## OVERVIEW

### 1.1 Review of World Economy

The air of caution which permeated the developed economies at the beginning of 1989 was sustained through the year. To the persistent structural problems of trade and financial imbalances was added the uncertainty generated by political upheaval and an unprecedented focusing on the environment.

Any increased economic growth dividends which were anticipated to flow from the thaw in super power relations were militated against by political events in the U.S.S.R., Eastern Europe and China.

The pro-democracy and nationalist movements which swept Eastern Bloc and the widespread push for political reform in China have had, and will continue to have, a significant direct and indirect economic impact on the OECD nations.

Several highly visible disasters during 1989 served to reinforce the almost universal awareness of the global environmental crisis.

Though there was some slowing towards the end of 1989, the OECD nations experienced a real rate of growth of 3.3% for the year. Among the major economies tight monetary policy remained the preferred management tool. Despite these policies inflation continued to threaten economic and future growth, particularly in the UK and Japan.

There was a continuing attempt to address current account imbalances through co-ordinated central bank intervention in foreign exchange markets. A lower $US was seen as the key to reducing the US trade deficit, and thus curtail protectionist sentiments in the US Congress. There emerged a global trend towards higher interest rates and a danger of deep recession in the US.

### 1.2 Review of Australian Economy

After a sustained period of growth, the Australian economy began to slow during the last few months of 1989. The September quarter National Accounts data revealed stable domestic demand, contracting private consumption and, with the exception of private non-residential building investment, reductions in all components of private investment. There was a downward trend in employment growth, building approvals, job vacancies and the production of consumer durables.

Overall, real GDP grew by 4.3%, a relatively strong result considering the CPI rise of 7.8% and the high interest rate policy which was pursued by the Government during 1989.

After three quarters of steadily widening deficits in the trade component of the current account, the import-export differential converged significantly in the December quarter. The trade balance narrowed, as a sharp fall in imports combined with a steady rise in exports.

The strong rises in 1988 for both rural and non rural commodity prices gave way to a period of moderating growth in 1989. In the minerals sector prices generally held up, though there was some weakening in base metals. The consistent performance of the minerals sector owed much to the residual strength of demand in the economies of Australia's trading partners and in the lagged effect of any softening in mineral prices. Strong gold prices in the latter part of the year and a gold-tax driven production surge partially offset any declines in the wider industry.

**1.3 Economic Factors Affecting the Mining Industry.**

Demand in international markets, the exchange rate and domestic interest rates continued to be the main determinants of the mining industry's health. Australia, as a relatively small open trading economy, was again buffeted by these external factors.

The slowing in the world's major economies, which became apparent during the latter part of 1989, did not impact significantly on Australian mineral producers. This was primarily because of the continuing relatively strong demand for mineral products in the economie's of this country's trading partners. Traditional manufacturing, as well as in-place capital and social infrastructure programmes, underpinned demand for Western Australian iron ore, alumina, LNG and mineral sands products. A secondary factor which tended to lag any demand effects in these markets was that sales are subject to long run contracts.

Mineral explorers had some relief from the relatively high values which applied to the $A during the last part of 1988. From May 1989 the $A traded in a narrow band of between 75 - 78 US cents.

During 1989 the major banks lending rates rose steadily in response to a gradual tightening of monetary policy. Demand management and the potential inflationary effects of a weakened $A, continued to drive monetary policy. Mining profits, generated by strong prices and a moderating $A were eroded by inflation and the costs associated with high interest rates.

While developments such as the Kemerton silicon smelter and the multistage Cooljarloo mineral sands project steadily increased downstream processing capacity, bulk minerals and energy were this State's major export earners.

The maturing of the Bass Strait fields, the widening deficit in national petroleum production and the high prospectivity of the north west offshore region all served to sharply increase petroleum exploration activity in Western Australia.

**1.4 Social and Political Factors Affecting the Mining Industry.**

During 1989 the complex and demanding issues relating to the environment dominated industry, government and general public concern. Reinforced by highly visible images of global pollution and land degradation, the environment became the nation's major social and political concern.

For the Australian mining and petroleum industry, rapidly changing circumstances will present both opportunities and threats.

It has been estimated that in the USA and Canada, base metals industries are spending approximately 6% of total value of production on pollution control. Australia's biggest minerals producers have addressed environmental regulations and tightening mine development requirements for decades. Most have comprehensive rehabilitation programmes in place. The higher costs of meeting environmental standards will impact on smaller companies, while the majority of larger operations already include these with project costs. Expertise in environmental assessment, protection and management by Australian companies will prove to be marketable, and possibly an extra source of export earnings.

On the demand side, the increased world requirement for cleaner energy will be a boon for Australian low sulphur steaming coal suppliers. Taiwan, Korea and even Europe will be growth areas for this product.

Although mining and petroleum industry members have generally proven to be responsible corporate citizens on environmental matters, they have been increasingly subject to politically generated uncertainty over altered development conditions and land access. These factors, particularly the latter, are as crucial to the long run viability of the industry as is a sound physical environment to the national economy.

# MINERAL AND PETROLEUM PRODUCTION

## MAJOR PROJECTS

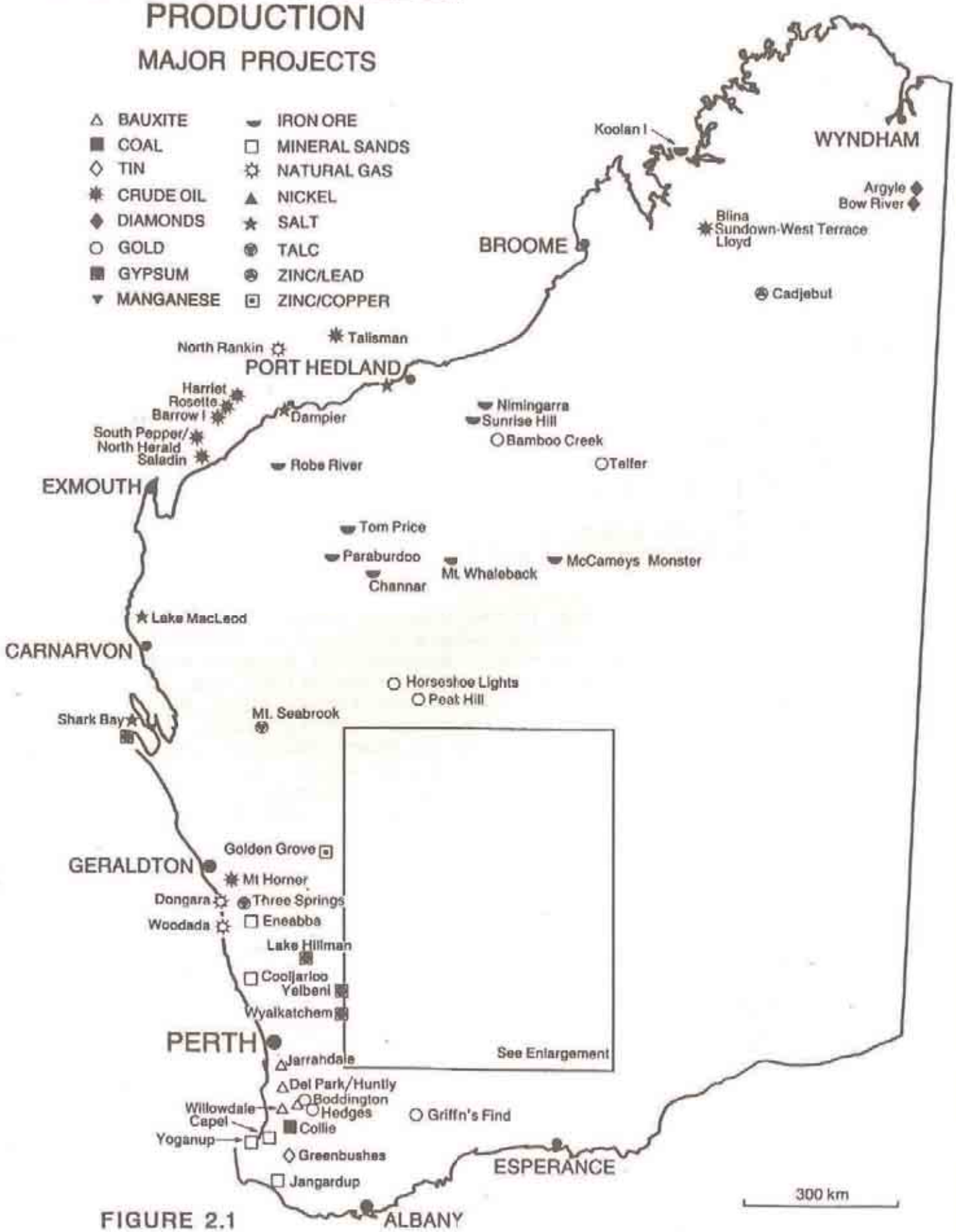



FIGURE 2.1

ENLARGEMENT (From previous page)


○ GOLD ▲ NICKEL ■ GYPSUM

## REVIEW OF MAJOR MINERALS AND PETROLEUM

### 2.1 Iron Ore.

The Western Australian iron ore production total of 106.5 mt for 1989 was a slight increase over the 98.3 mt produced in the previous year. The value of this output was up sharply to $2.12 billion, an increase of approximately $370 million over the 1988 total.

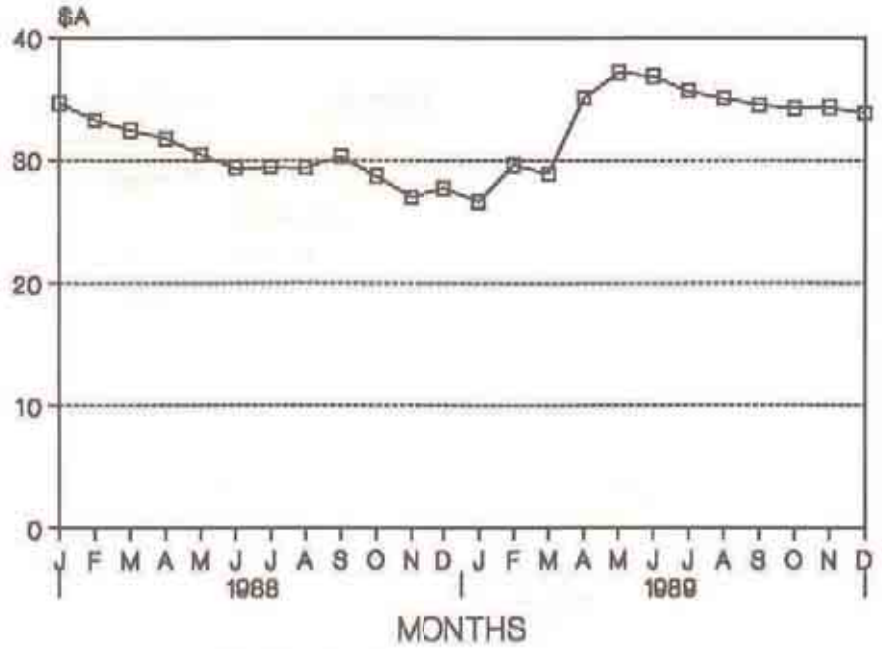
Demand for iron ore rose strongly during 1989 as world production of crude steel rose to the record amount of 780 mt. After nearly a decade of oversupply in international markets this development bouyed the iron ore industry and the strength of demand persisted through 1989.

An increase in Japanese contract prices and a lower $US/$A exchange rate were the determining factors in the greatly improved 1989 outcome.

A 15% rise in the contract price, negotiated in January 1989 and effective from April, was the first increase since 1982 and reflected a strong world wide demand for iron ore. Demand in the Japanese market was driven by traditional manufactured goods production and the construction of domestic social and capital infrastructure.

FIGURE 2.2

**IRON ORE PRICES: $A/tonne**




SOURCE: HIGH GRADE LUMP ORE PRICES.

The price increase combined with the lower raised $US/$A exchange rate (Figure 2.14) the returns to Western Australian producers. These effects can be seen through the trading period (Figure 2.2) in sharply rising followed by relatively stable, $A/tonne prices.

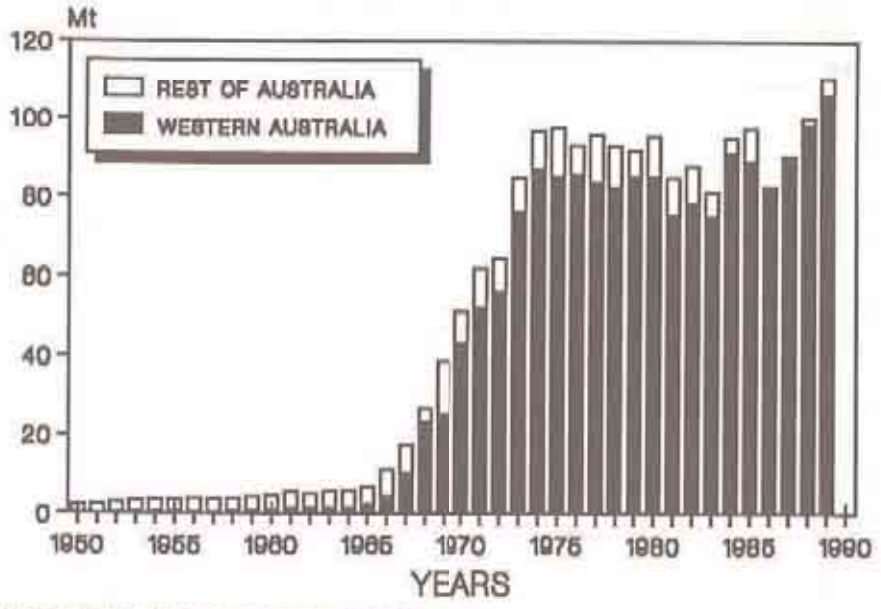
Mt Newman Mining Company Ltd's production was approximately 30% less than projected. This was due to a wall collapse in May, and industrial action by the workforce in September. Offsetting this result was a 20% increase in Hamersley Iron Pty Ltd's shipments for the year, as the company depleted its large Dampier stockpiles. The coming on stream of the Hamersley - Mt Channar joint venture (3 mta) in January 1990 should see Hamersley's total production rising marginally to approximately 50 mta.

The strength of demand was maintained and, following hard negotiations in late 1989, a new contract was signed which will deliver a further 16% price increase in the 1990 trading period. An expected fall in the exchange rate during early 1990 should provide an added fillip to the industry.

Western Australian production continued to provide the overwhelming proportion of the national output (Figure 2.3).

FIGURE 2.8

## IRON ORE PRODUCTION




SOURCES:DEPT OF MINES WESTERN AUSTRALIA,

BMR & ABARE

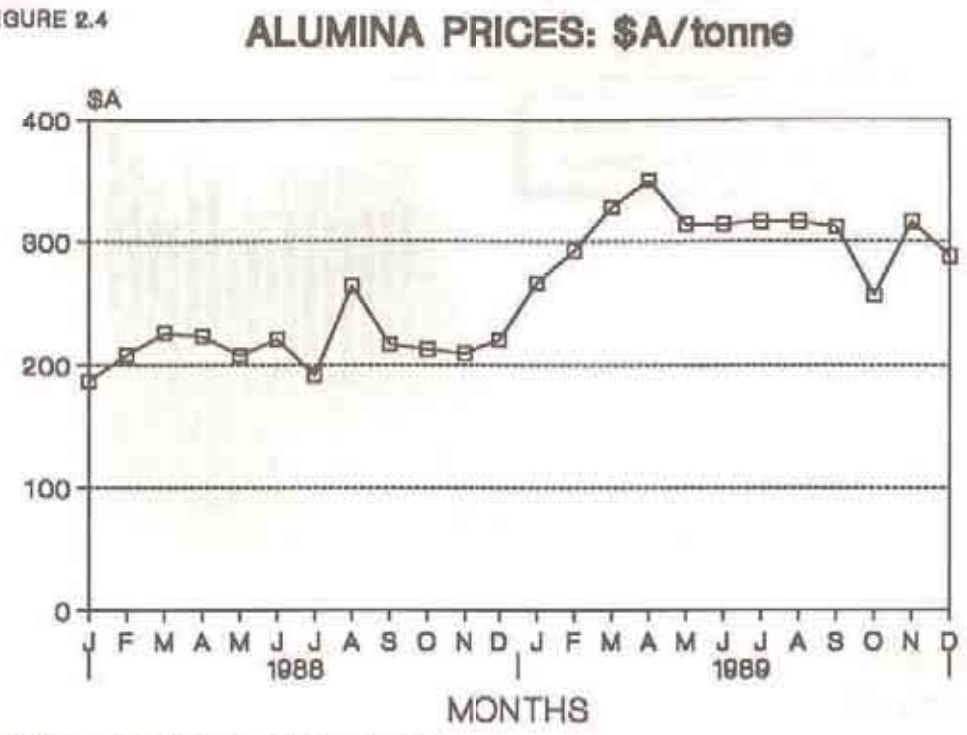
## 2.2 Alumina

During the past year the two Western Australian based producers increased output to 6.4mt, while the value of output soared to $2.11 billion. The strong price rise for alumina, which began in January 1989, was sustained and average prices remained over $300 per tonne throughout the year. The $2.11b result, a State record value of production, was a massive 62% increase on the solid 1988 outcome and represented a 91% increase over the past 3 years.

Sharply higher average contract prices for alumina were driven by strong demand and continuing tight supply (Figure 2.4). Japan and East Asia continued to be the main growth markets, as capital and social infrastructure priorities in the region continued to consume the product. The demand for alumina and primary aluminium remained high despite extensive recycling programmes. Aluminium consumption is predicted to grow by 2-3% during 1990.

The nature of the alumina market is such that the effect of rising aluminium stocks (through late 1988 and 1989) was lagged through the production process and the relatively infrequent price changes. During the September quarter the demand was so strong that small quantities sold on spot markets exceeded $US450 per tonne.

FIGURE 2.4



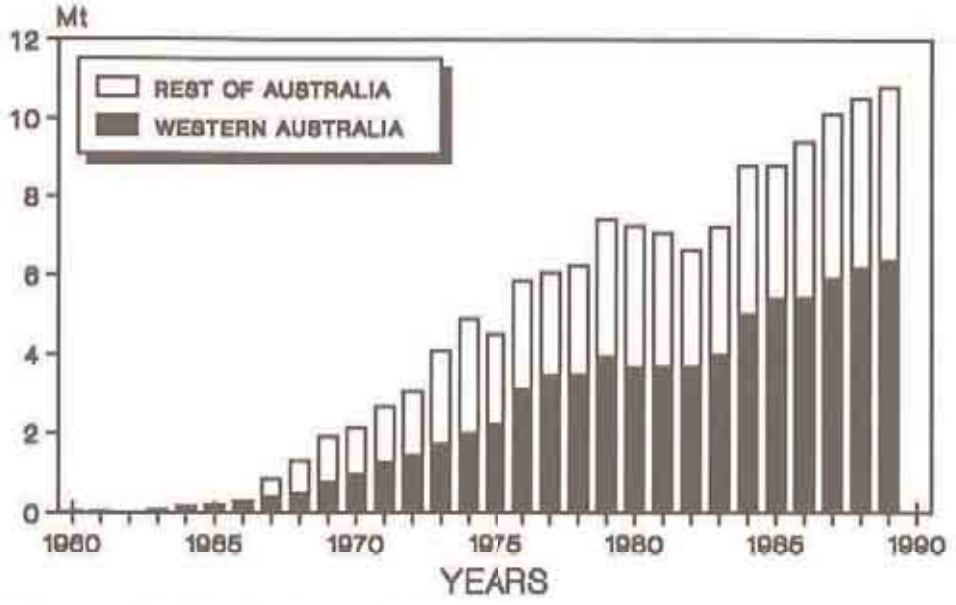

SOURCE: DERIVED FROM L.M.E. & A.B.S.

Western Australian refineries operated at capacity during the year. Over two thirds of the 1989 national alumina output was produced within the state (Fig 2.5).

The large economically recoverable bauxite resources, the scale of production and the technically advanced nature of the companies involved, continue to allow the State's producers to deliver at unit costs which are world competitive. Western Australian producers are well positioned with established, expanding markets in North America, Europe and the Middle East. Plans to expand capacity at Alcoa's Wagerup refinery are well advanced and Worsley Alumina has begun an 18 month programme to increase its annual throughput by 25%.

FIGURE 2.5

## ALUMINA PRODUCTION




SOURCES:DEPT OF MINES WESTERN AUSTRALIA,
BMR & ABARE.

### 2.3 Gold.

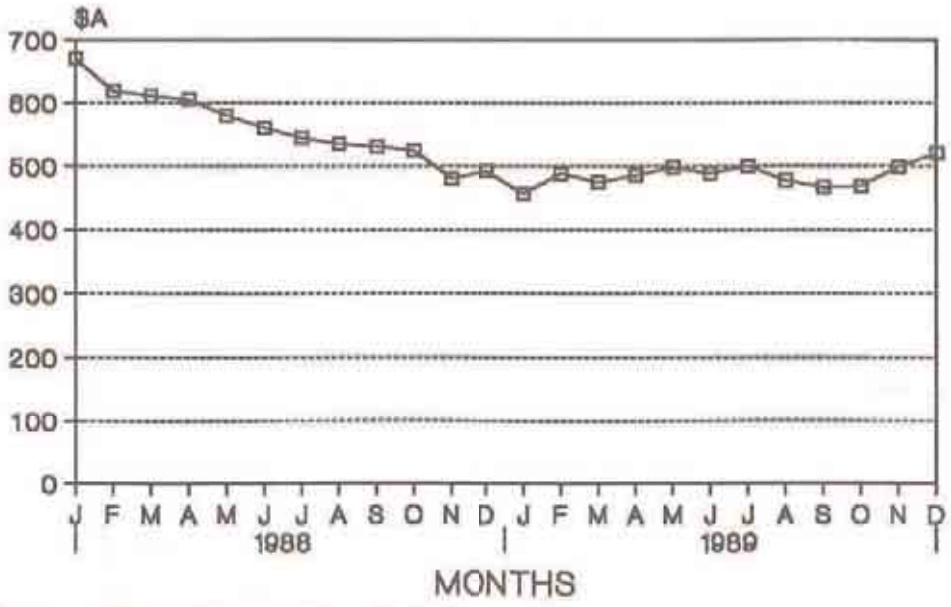
During 1989 Western Australian gold miners produced in excess of 135 tonnes of the precious metal. This represented an increase of over 26% on the 1988 output and a 73% rise over three years.

The value of gold production, based on the monthly average sale price at the Perth Mint, was $2.07 billion. Despite this 9% increase, and new record value of output, gold surrendered its position as Western Australia's most valuable export back to iron ore.
After a steady two year decline on world markets, the price of gold rose sharply in late 1989. In $A terms the price rose from $450 per ounce in September to trade in the $520-$530 per ounce range in late December (Figure 2.6). The volatile market was driven primarily by current and expected supply and demand fundamentals.

There were concerns that supply shortfalls could emerge as a result of declining South African and USSR outputs.

FIGURE 2.6

**GOLD PRICES: $A/oz.**




SOURCE: LONDON GOLD PRICE, MONTHLY AVERAGE OF WEDNESDAY PRICES.

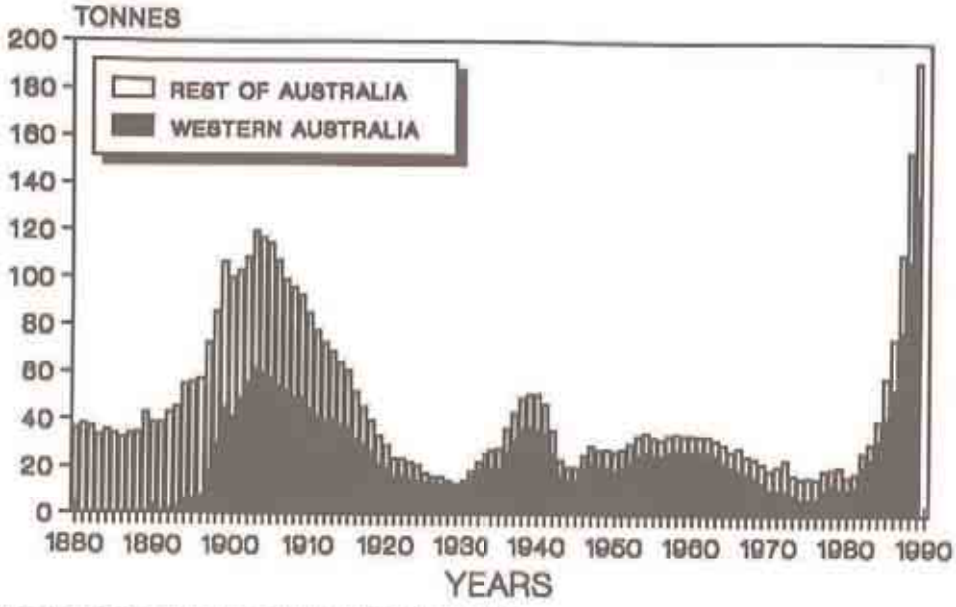
Demand strengthened in all world markets on the back of a renewed fear of inflation, particularly among the industrialized economies. Demand was also increased by the large insurance and other non-bank financial institutions in Japan and Taiwan which were given permission to significantly increase holdings of bullion. As a result of this policy change, there could be a market for an extra 300 tonnes of gold per year. Demand for gold jewellery rose sharply within the Soviet Union as political and economic uncertainty, and talk of a convertible rouble, kindled fears of massive inflation.

Industry analysts have reported that the high level of Western Australian goldmining activity during 1989 was driven mainly by producer attempts to maximise output before tax is imposed on the gold industry in January 1991. Analysts have also expressed concern at the extensive use of commodity loans, particularly in the past two years. As the gold loaned is drawn from Central bank reserves, they reason that the extra bullion being traded may have depressed the market price considerably. An additional worry is that smaller producers using these facilities became dangerously exposed as the price fell during much of the year.

The commitment of a large portion of output to servicing debt, the maturing of forward selling contracts and rising operating costs have meant that the recent price rises have come too late to save many smaller miners.

FIGURE 2.7

## GOLD PRODUCTION




SOURCES: DEPT OF MINES WESTERN AUSTRALIA,
BMR & ABARE

For the present growth in Western Australian production to continue the recent price rise will need to be sustained. A sustained price rise would particularly offset the tax effect, rising costs, low grades and the current fall in exploration expenditure. As it will be necessary for a significant proportion of the open pit operations to begin the transition to underground mining, this will present a financial and technical challenge to the industry. The large companies, which are able to finance new ventures from retained earnings, will be well placed to move operations underground.

The Granny Smith project, which is scheduled to begin production early in 1990 after a $95 million development phase, is one example of a long term industry participant. Further rationalisation and concentration of the Western Australian industry can be expected over the next 12 months as the aversion to debt financing and difficulties in equity capital raising continue.

Production from this State continued to comprise an overwhelming proportion of the national output. (Figure 2.7)

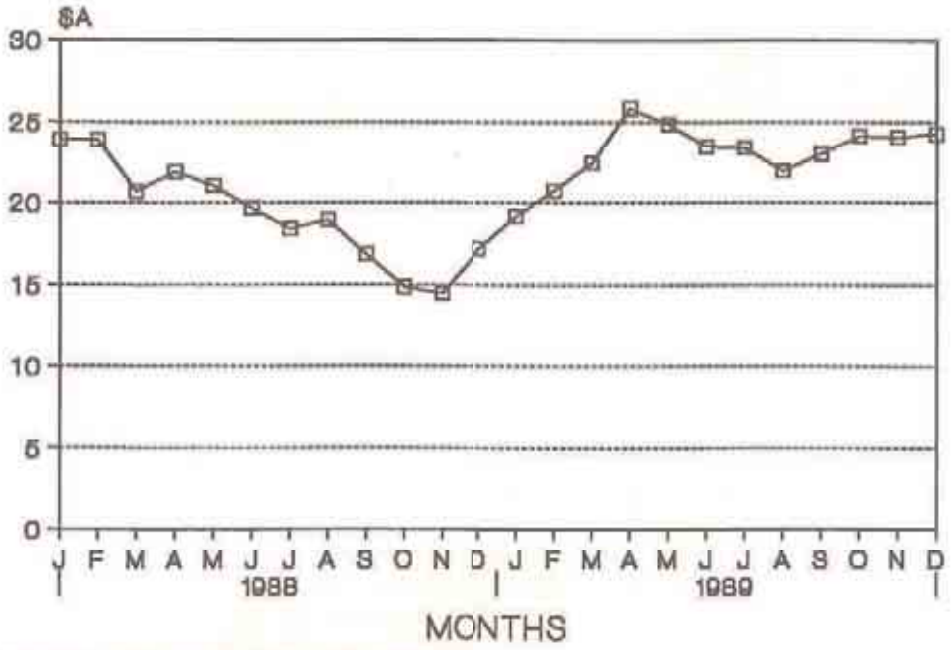
### 2.4 Petroleum

The price recovery in world crude oil prices, which began in the first quarter, was generally sustained during the year. Price rises were driven by a range of factors which included strong seasonal demand in OECD countries and supply shortfalls. An example of the latter was the halving of UK production for a year after the Alpha Piper disaster.

There was additional support to prices from the November 1988 and the June 1989 OPEC production agreements and some pressure, from falling revenues, for non-OPEC producers to support the cartel's output restraints. The world trade weighted average price eased in the September quarter but was still well above the late 1986 trough. (Figure 2.8). Demand for LPG and LNG continued to expand as the Japanese market for this energy source continued the 5% p.a. growth rate of recent years. Wesfarmers Kwinana LPG Plant, which exports 80% of all production, commenced operations in January.

FIGURE 2.8

**CRUDE OIL PRICES: $A/bbl**




SOURCE: BRENT SPOT, MONTHLY AVERAGE

The first shipments of LNG from the North West Shelf commenced ahead of schedule in July 1989. During the life of the NWS project, production is expected to represent up to 12% of the World's total LNG production.

Australian demand growth for petroleum products moderated during the year. A recent Australian Institute of Petroleum survey suggested that in the medium term domestic oil supplies for refinery feedstock will be contracting as the demand for petroleum products expands by 2% per year. Such a development would inevitably lead to greater reliance on imports. Western Australian crude oil production in 1989 was in excess of 2.5 gigalitres (Gl), a 450,000 Kl increase over the 1988 figure. The Talisman project, which came on stream in July 1989; and the other three major fields of: Barrow Island, Harriet and Herald/Pepper accounted for approximately 95% of the State total. Saladin, which began production in November, dominated the other six fields and, with large proven reserves, is set to become one of Western Australia's major producers.

Condensate and natural gas production from North Rankin, Dongara and Woodada increased only marginally during the period.

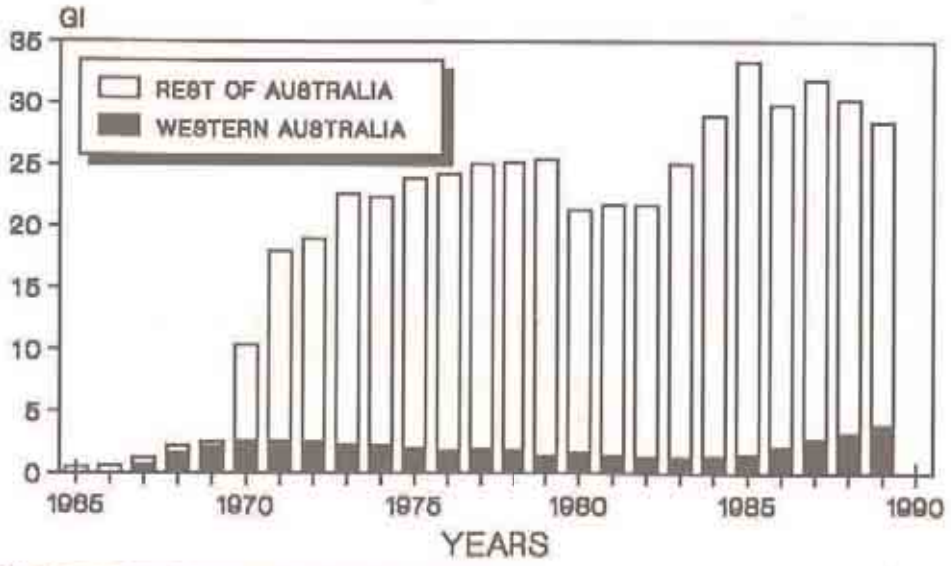
Woodside Petroleum's LNG tonnages to Japan began at a relatively low rate, with one shipment per month in July and August, before steadily stepping up output during the balance of the year.

Although some easing in oil prices is expected during the next 18 months, due to moderating demand growth in the major economies and the probability that OPEC will be unable to restrain production to agreed quota levels, the Western Australian petroleum industry should continue to expand steadily.

While the State's crude oil production remains a small portion of the national output (Figure 2.9), it did increase by 20% during 1989 and is set to increase further through the 1990's. There were significant gazettals of offshore and onshore exploration areas in April and August. These were primarily in the highly prospective Carnarvon and relatively less explored Perth Basins.

FIGURE 2.9

**PETROLEUM PRODUCTION**
**(Including CONDENSATE)**




SOURCES:DEPT OF MINES WESTERN AUSTRALIA

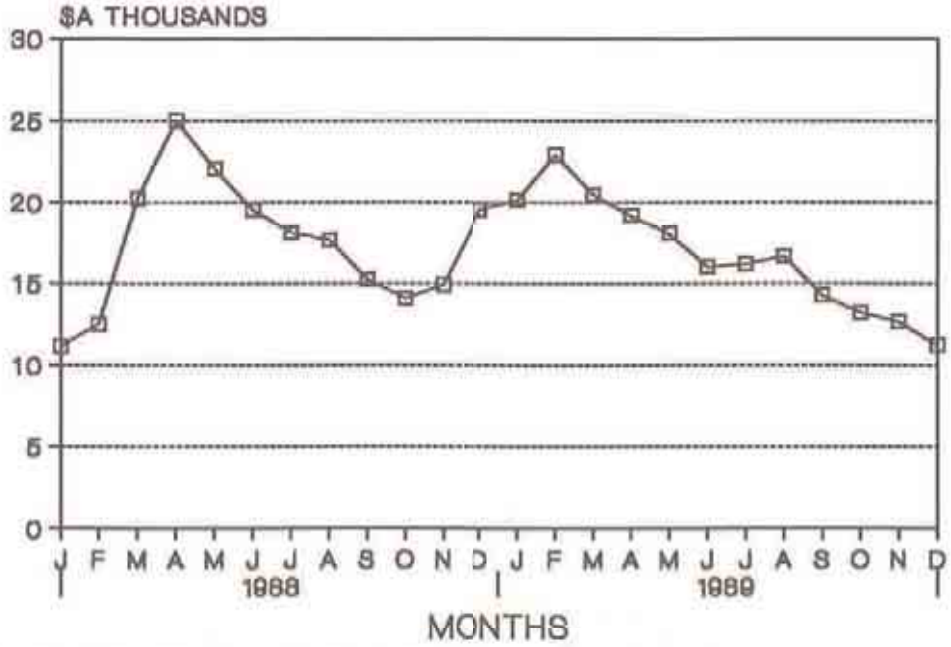
BMR & ABARE

In addition to the growth in the LNG market, there is an increasing world demand for the lighter low sulphur Australian crude. This demand is particularly strong in the East Asian region, being driven by a combination of domestic economic expansion and environmental considerations.

## 2.5 Nickel

The 1989 tonnage and value of nickel metal produced from Western Australian ores and concentrate rose considerably over the 1988 results. The amount of contained metal in the year's production approached 40,000 kt. Exports of metal and matte should realise in excess of $690m in the current trading period, a 40% increase over the preceding period.

FIGURE 2.10 **NICKEL PRICES: $A/tonne**




SOURCE: L.M.E CASH, MONTHLY AVERAGE.

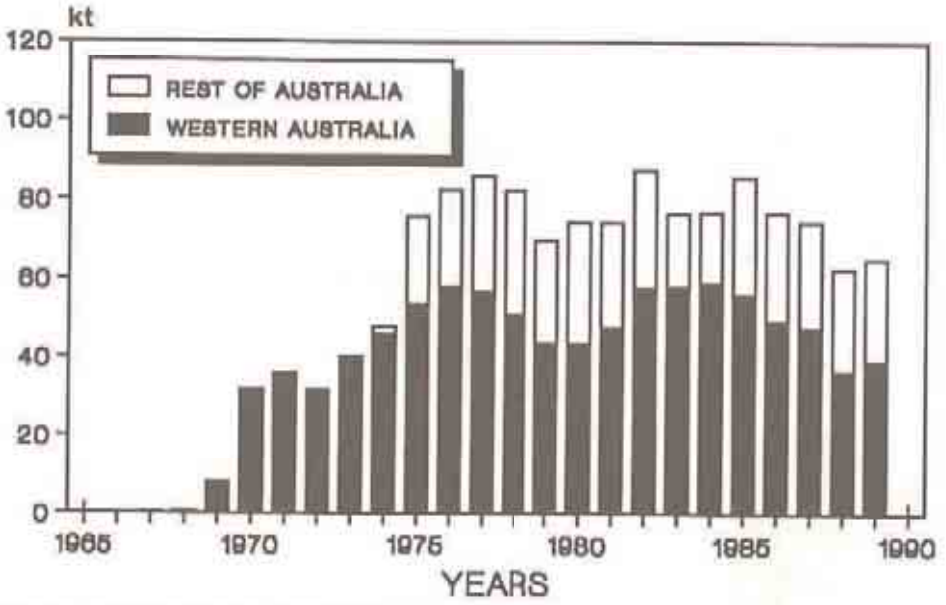
The London Metals Exchange (LME) indicator price for nickel fell steadily during the year due to a complete change in the metal's supply/demand balance (Figure 2.10). Until early 1989 demand growth had outstripped supply for over 12 months. Analysts predict that the slight surplus which has now opened up on world markets will wider further during 1990. While the stainless steel market is expected to expand significantly the demand for alloys, salt and powders will be sluggish and plating/construction steels is expected to decline.

Driven by these market fundamentals prices should trend downwards through 1990 before a modest recovery late in the year.

The essentially conservative production strategy followed by Western Mining Corporation (WMC) during the recent period of relatively high prices, and a weakening of the $A against the $US, should help the company during any immediate period of easing demand. Lower than planned output from the Kambalda mines and rising unit costs in the mature Windarra operation have meant that company stocks have been run down considerably. Over the next 12 months nickel output will expand through the Leinster and Kambalda operations as stocks are rebuilt and sales matched to production. In the event of a shortfall in production from these sources the company may recommission one or more of the five shut down mines in the Kambalda area.

FIGURE 2.11

**NICKEL PRODUCTION**



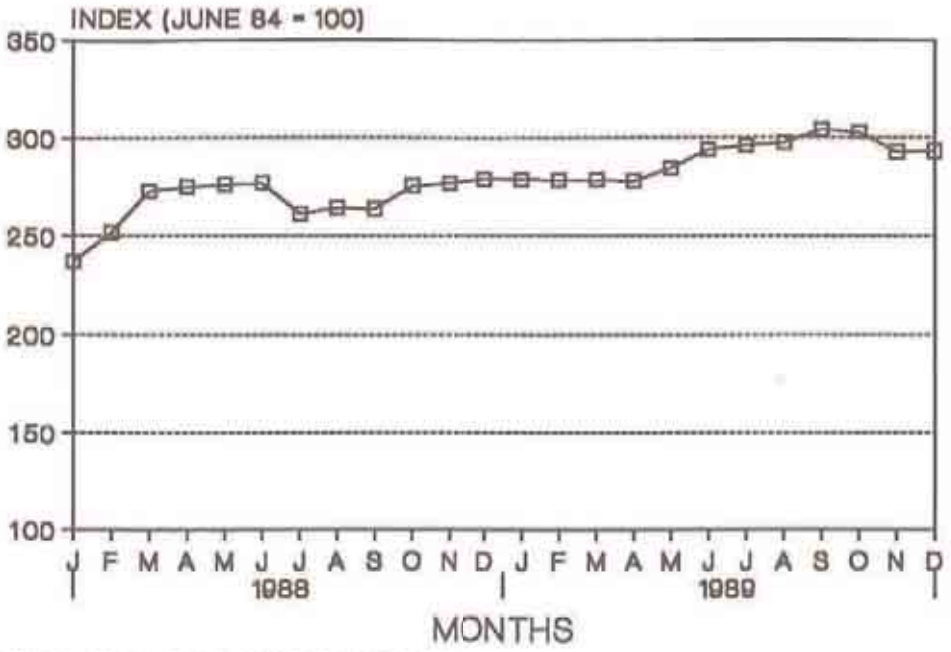

SOURCES:DEPT OF MINES WESTERN AUSTRALIA,
BMR & ABARE

During 1989 the amount of nickel metal produced from Western Australian mines, and exported in matte or in the fully refined form, continued the trend of recent years in making up approximately two thirds of the national output. (Figure 2.11).

## 2.6 Heavy Mineral Sands

During 1989 the Western Australian heavy mineral sands industry continued to expand steadily in both production and value terms. With the exception of a marginal decline in zircon, tonnages of all component mineral products improved over 1988 results.

FIGURE 2.12 **PRICE INDEX FOR MINERAL SANDS**




SOURCE: L.M.E. CASH, MONTHLY AVERAGE.

The largest production surge was in the mining and beneficiation of low grade ilmenite. The annual output of synthetic rutile produced by the upgrading of this resource increased by 50%. During the trading period, the production of upgraded ilmenite in the west of Australia increased by only 6%.

The total industry value of production was $469m, a 42% increase over the preceding year's outcome. Revenue from the sales of upgraded ilmenite and zircon registered the strongest increases.

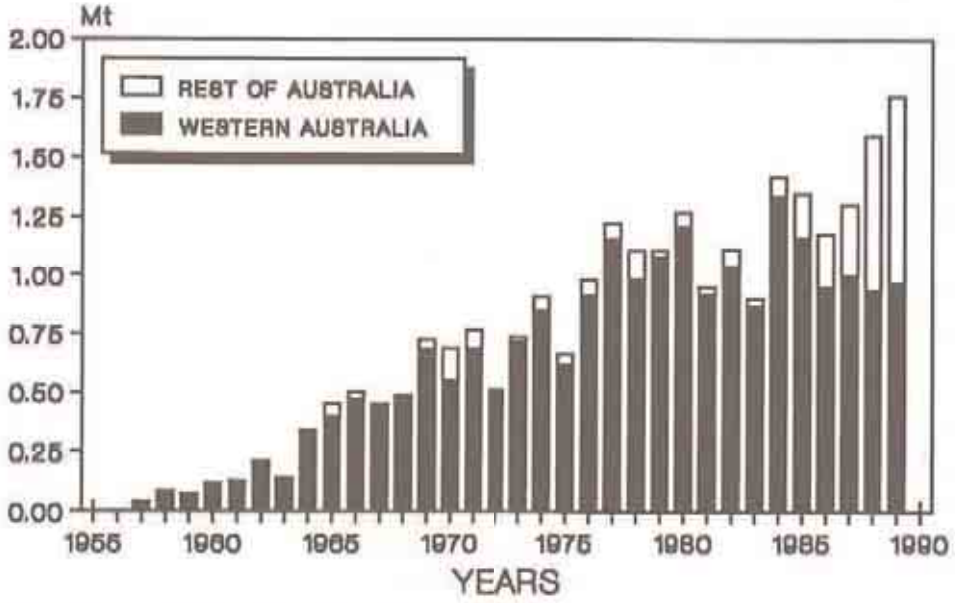
As the mineral sands industry exports the majority of its products to a large amount of specialised industries worldwide (titanium pigment, foundry, iron and steel), demand is closely associated with the economic conditions prevailing in those industries. One result of this is that the industry may experience significant and regular cycles of increasing and decreasing demand. Mineral sands producers in Western Australia have enjoyed a sustained upswing for the past 5 years. Most have operated at capacity during the last trading period as prices stabilised at historic highs (ilmenite, zircon) or continued to rise steadily (rutile, synthetic rutile). The continuing strength of demand and the favourable factors affecting the viability of Western Australian operations (mineral content, metallurgical properties, oxide coatings, overburden thickness, mining methods available) has generated increased exploration and investment in the south west.

Although garnet sand comprises only a small proportion of the total mineral sands industry in value of production terms (approximately $1.2 million in 1989), efforts to sell into North America have met with some success. Approximately 10,000 tonnes were sold into this market in 1989. Over 60% of current production is used domestically, mainly for grit blasting.

Mineral sands is one of the few Australian resource industries that has made the transition to downstream processing . This has been achieved through the production of titaniferous minerals (ilmenite, leucoxene, rutile), zircon and monazite. Local examples of this development are Z-Tech Pty Ltd's zirconia plant at Rockingham (commissioned May 1989) and the AMC Eneabba West and the massive Cooljarloo projects which are due to come on stream during 1990.

Using ilmenite production (73% of most deposits) as an indicator of industry activity, Western Australian producers continue to dominate the national output (Figure 2.13).

FIGURE 2.13 **ILMENITE PRODUCTION**




SOURCES:DEPT OF MINES WESTERN AUSTRALIA,
BMR & ABARE

## 2.7 Diamonds

Western Australian diamond production rose from 35.2 million carats (mct) in 1988 to 37.5 mct in 1989. The $428.4 million value of production was a significant rise over the preceding year's total of $302.5 million.

This 42% increase in the total value of production was a direct result of the output rise and the March 1989 15% rise in the international diamond price.

The Argyle project processed 4.9 mt of ore and won 34.3 mct of diamonds during the period. This project, the world's newest and biggest producer of diamonds, has increased output in each of the 7 years of its operation. The value of production was $406.9 million in 1989. Based on proven reserves, Argyle will continue operations into the first decade of the 21st century.

Bow River, the other East Kimberley producer, continued to expand their operations in 1989. Approximately 2.5 mt of ore was processed to yield 692,993 carats of diamonds. Calculated value of production from this rich alluvial deposit was $21.5 million.

Production from these two mines was not affected by the 2% fall in world sales of uncut diamonds reported for the year by the Central Selling Organisation. Rising international interest rates, the unexpected appreciation of the $US and the slowing down of world economic growth were given as the reasons for the drop in sales. 1989 was described as a year of 'consolidation' in diamond markets after the surge of growth in 1988.

Retail diamond jewellery sales increased marginally, however, there was an across the board slowing in demand for larger stones. While no serious weakness in the market is forecast for 1990, sales growth is predicted to be difficult.

Capital investment increased in tandem with output during 1989. Plant capacity expansion and hi tech diamond sorting machinery absorbed the $17m worth of new capital expenditure at the Argyle joint venture. Argyle is poised to establish a retail brand identity for its gem quality diamonds, which will allow a 25% price premium to be charged over similar unbranded stones. The marketing strategy, which guarantees size and quality, should increase long term demand and value added for the producer.

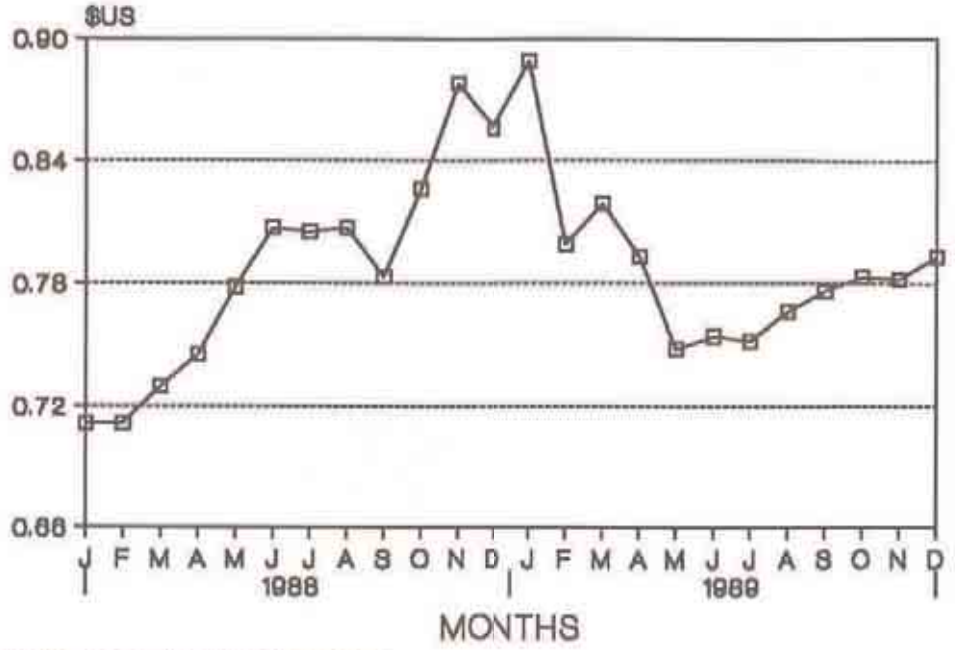
## 2.8 Summary and Outlook

During 1989 the Western Australian mineral and petroleum industries continued the steady growth of recent years. The volume and value of mineral resource exports more than offset a significant decline in rural export prices. The total estimated value of all minerals and petroleum products increased substantially, with a 31% rise being posted over the 1988 result.

With combined export receipts of our $6.2 billion the sectors of iron ore, gold and alumina were, by far, the strongest industry performers.

FIGURE 2.14

## EXCHANGE RATE: $A/$US




SOURCE: A.F.R., MONTHLY AVERAGE.

The surge in the value of petroleum products to over $1 billion was due to several factors. One was the combination of a small increase in crude and condensate output and stable prices during the trading period. The major influence was, however, the commencement of LNG export phase from the North West Shelf.

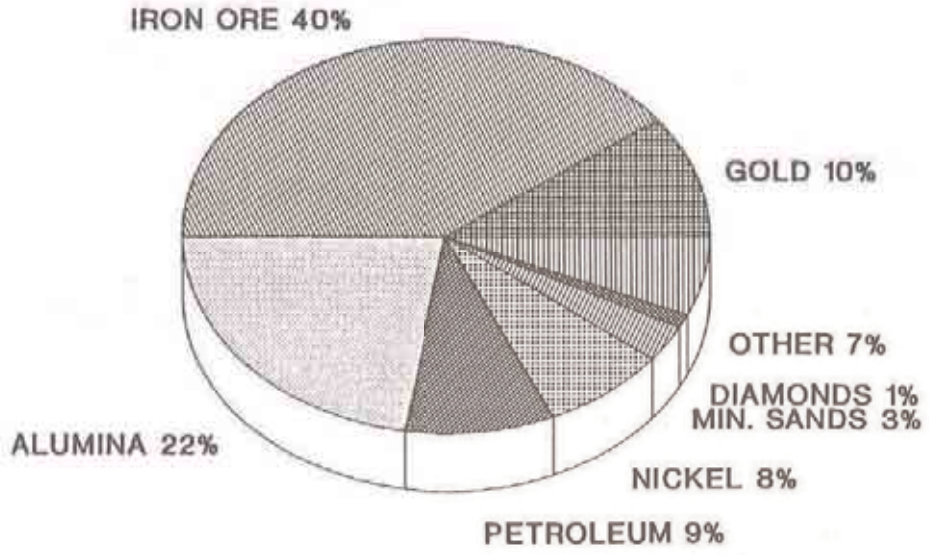
The price rises of recent years for mineral sands products will probably not be sustained. Demand on world markets should remain strong and, given the large economic reserves in Western Australia, production can be expected to expand in tandem with prices. Most of Australia's capacity expansion in this industry over the next few years will be in the south west of this State.

Even higher production is projected through 1990 for a wide range of Western Australian mineral resources commodities. This increase will be substantial for natural gas, gold, iron ore and mineral sands. Producers of crude oil, alumina, base metals and nickel are also likely to enjoy a steady, though moderate growth in demand.

# COMPARATIVE VALUE OF PRODUCTION

## 1984 VALUE OF PRODUCTION

TOTAL : $ 4,183.7 MILLION




## 1989 VALUE OF PRODUCTION

TOTAL : $ 9,339.9 MILLION

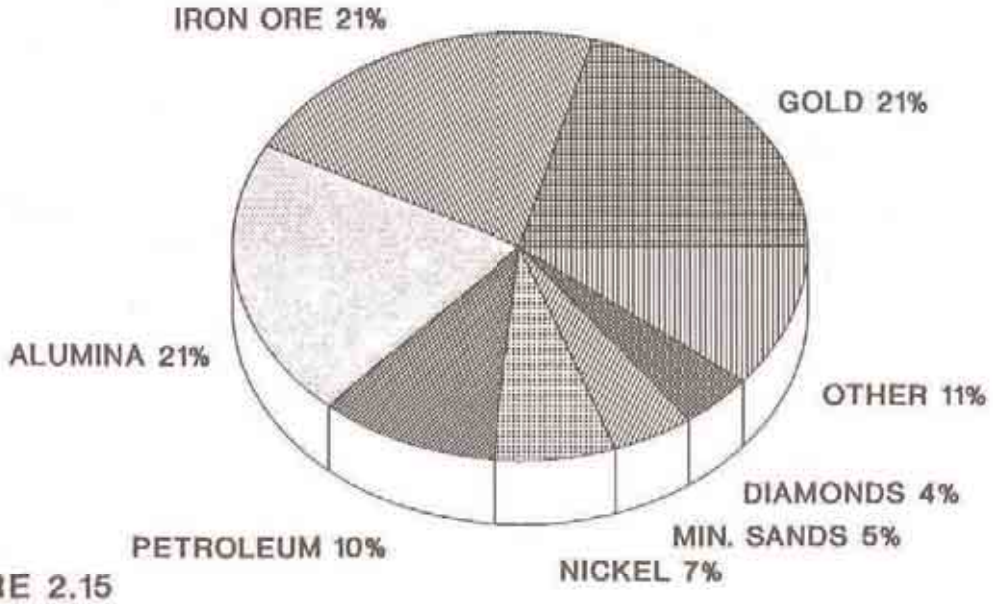



FIGURE 2.15

## TABLE 2.1
## QUANTITY AND VALUE OF MINERALS 1988, 1989

| MINERAL | UNIT QUANTITY | 1988 QUANTITY | 1988 VALUE($A) | 1989 QUANTITY | 1989 VALUE($A) |
|---|---|---|---|---|---|
| BASE METALS | | | | | |
| Copper | t | 7426 | 17755700 | 19574 | 42961217 |
| Lead | t | 0 | 0 | 7846 | 4422848 |
| Zinc | t | 20250 | 14698390 | 41930 | 54129508 |
| BARYTES | t | 9669 | 1160280 | 0 | 0 |
| BAUXITE - ALUMINA | | | | | |
| Alumina | t | 6176414 | 1301425700 | 6384796 | 2113116441 |
| CLAYS | | | | | |
| Attapulgite | t | 27221 | 2779727 | 35985 | 3885665 |
| Cement Clay | t | 22999 | 57499 | 23025 | 57564 |
| Clayshale | t | 383 | 765 | 0 | 0 |
| Fire Clay | t | 214533 | 409289 | 119778 | 143973 |
| Kaolin | t | 3891 | 197740 | 0 | 0 |
| White Clay | t | 1697 | 20364 | 1709 | 20503 |
| COAL | t | 3789743 | 158003510 | 3899815 | 166021091 |
| CONSTRUCTION MATERIALS | | | | | |
| Aggregate | t | 220304 | 1286308 | 172316 | 1026723 |
| Gravel | t | 24026 | 116680 | 27106 | 183631 |
| Rock | t | 153364 | (r) 1683493 | (r) 134927 | 1260593 |
| Sand | t | 539628 | (r) 1586184 | (r) 688514 | 1862027 |
| DIAMOND | ct | 35220858 | 302495527 | 35354780 | 414059647 |
| DIMENSION STONE | | | | | |
| Black Granite | t | 0 | 0 | 693 | 1039890 |
| Quartzite | t | 334 | 15035 | 1530 | 65971 |
| GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE | | | | | |
| Amethyst | kg | 70464 | 285926 | 34000 | 170000 |
| Emerald | grams | 1930 | 2200 | 550 | 2020 |
| Zebra Rock | kg | 0 | 0 | 1260 | 12600 |
| GOLD | kg | 107290 | 1913146088 | 135281 | 2077235128 |
| GYPSUM | t | 112017 | 1005163 | 162831 | 1340454 |
| HEAVY MINERAL SANDS | | | | | |
| Garnet | t | 19758 | 693761 | 29905 | 1211433 |
| Ilmenite | t | 939139 | 68289943 | 964711 | 77515856 |
| Upgraded Ilmenite (a) | t | 183499 | 69153310 | 262493 | 116052715 |
| Leucoxene | t | 12946 | 5297600 | 22498 | 10336566 |
| Monazite | t | 9573 | 7221337 | 11767 | 9134375 |
| Rutile | t | 91192 | 54011414 | 88972 | 58363779 |
| Xenotime | t | 0 | 0 | 20 | 105840 |
| Zircon | t | 368164 | 123873011 | 343761 | 187920082 |
| INDUSTRIAL PEGMATITE MINERALS | | | | | |
| Felspar | t | 21014 | 850089 | 7579 | 347385 |
| Mica | t | 3456 | 900710 | 57 | 16104 |
| IRON ORE | | | | | |
| Domestic | t | 5464527 | 93583305 | 4896894 | 85248527 |
| Exported | t | 92854562 | 1663694794 | 101598066 | 2037296340 |
| LIMESAND/LIMESTONE | t | 2138091 | 10322448 | 199271 | 9079987 |
| MANGANESE ORE | t | 0 | 0 | 11375 | 50000 |
| NICKEL | t | | | | |
| Cobalt by-product | t | 287 | 4456414 | 261 | 4472086 |
| Nickel Concentrate | t | 337723 | 480849980 | 385010 | 680387683 |
| Nickel Ore | t | 0 | 0 | 17101 | 10281141 |
| Palladium by-product | kg | 360 | 2118657 | 322 | 1917445 |
| Platinum by-product | kg | 73 | 1584833 | 60 | 1275979 |
| PEAT | t | 1151 | 67245 | 1266 | 75257 |
| PETROLEUM | | | | | |
| Condensate | kl | 1129983 | 146254032 | 1353130 | 197156051 |
| Crude Oil | kl | 2056808 | 246110792 | 2514049 | 373326999 |
| LNG M | Btu | 0 | 0 | 37683100 | 113427505 |
| Natural Gas | '000m3 | 3653278 | 301429132 | 3746692 | 321784219 |
| RARE EARTHS | | | | | |
| Gallium | kg | 0 | 0 | 22999 | 798936 |
| SALT | t | 5849966 | 98525973 | 5934417 | 111954464 |

| MINERAL | UNIT QUANTITY | 1988 QUANTITY | 1988 VALUE($A) | 1989 QUANTITY | 1989 VALUE($A) |
|---|---|---|---|---|---|
| SILICA | | | | | |
| sand | t | 343947 | 2682888 | 439838 | 3691905 |
| SILVER | kg | 20562 | 3395589 | 41212 | 6065909 |
| TALC | t | 182774 | 13261526 | 196100 | 13100250 |
| TIN - TANTULUM | | | | | |
| Spodumene | t | 27396 | 4772858 | 39105 | 7118550 |
| Tantalite | t | 76 | 8069190 | 137 | 16253892 |
| Tin | t | 375 | 2317099 | 229 | 2101456 |
| VERMICULITE | t | 1165 | 146416 | 306 | 54268 |
| TOTAL VALUE | | | 7132065914 | | 9339876123 |

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

(a) Also known as synthetic rutile.

TABLE 3.1

QUANTITY, VALUE & METALLIC CONTENT OF MINERAL AND PETROLEUM PRODUCTION BY LOCAL GOVERNMENT AREA

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| BASE METALS | | | | | |
| Copper by-product | Coolgardie | | Cu tonnes 2 278.518 | 5 800 206 | (a) (b) |
| Copper Concentrates | East Pilbara | 14 378 | 2 924.028 | 4 868 141 | |
| | Meekatharra | 41 908 | 8 988.035 | 24 633 865 | |
| | | 56 286 | 11 912.123 | 29 502 006 | (a) |
| Copper Ore | Meekatharra | 27 470 | 5 385.281 | 7 659 005 | |
| | Total Copper | | 19 574.281 | 42 961 217 | (a) |
| Lead | Derby-West Kimberley | 11 511 | 7 846 | 4 422 849 | |
| Zinc | Derby-West Kimberley | 84 394 | 41 931 | 54 129 508 | (a) |
| **Total Base Metals** | | | | 101 513 574 | |
| BAUXITE-ALUMINA | Harvey | 786 122 | | 264 569 890 | |
| | Murray | 2 886 708 | | 969 001 155 | |
| | Serpentine-Jarrahdale | 1 531 034 | | 513 664 012 | |
| | Boddington | 1 180 932 | | 365 881 382 | |
| **Total Bauxite-Alumina** | | 6 384 796 | | 2 113 116 441 | (c) |
| CLAY | | | | | |
| Attapulgite | Mullewa | 35 985 | | 3 885 665 | (a) |
| Cement Clay | Armadale | 23 025 | | 57 564 | (d) |
| Fire Clay | Victoria Plains | 300 | | 600 | |
| | Chittering | 119 478 | | 143 373 | |
| White Clay | Serpentine-Jarrahdale | 1 709 | | 20 503 | (d) |
| **Total Clay** | | 180 497 | | 4 107 705 | |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| Coal | Collie | 3 899 815 | | 166 021 091 | (e) |
| CONSTRUCTION MATERIALS | | | | | |
| Aggregate | Kimberley | 4 307 | | 17 228 | |
| | Port Hedland | 33 185 | | 454 974 | |
| | Derby-West Kimberley | 3 295 | | 17 793 | |
| | Kalgoorlie-Boulder | 131 529 | | 536 728 | |
| | **Total Aggregate** | 172 316 | | 1 026 723 | (d) |
| Gravel | Broome | 1 000 | | 3 600 | |
| | Coolgardie | 760 | | 3 800 | |
| | Kangin | 216 | | 1 081 | |
| | Kalamunda | 20 030 | | 100 150 | |
| | Paraburdoo | 1 800 | | 9 000 | |
| | Port Hedland | 3 300 | | 66 000 | |
| | **Total Gravel** | 27 106 | | 18 3631 | (d) |
| Rock | Roebourne | 36 255 | | 393 460 | |
| | Exmouth | 1 800 | | 18 000 | |
| | Broome | 96 872 | | 849 133 | |
| | **Total Rock** | 134 927 | | 1 260 593 | (d) |
| Sand | Broome | 8 493 | | 34 086 | |
| | Canning | 389 290 | | 583 937 | |
| | Coolgardie | 87 020 | | 441 028 | |
| | Dandaragan | 4 422 | | 5 643 | |
| | Gingin | 10 835 | | 65 009 | |
| | Leonora | 6 612 | | 40 601 | |
| | Meekatharra | 53 410 | | 267 582 | |
| | Menzies | 4 354 | | 21 768 | |
| | Northam | 35 556 | | 53 335 | |
| | Port Hedland | 10 028 | | 59 991 | |
| | Quinns Rock | 8 843 | | 5 527 | |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| Sand Continued | | | | | |
| | Roebourne | 23 465 | | 117 325 | |
| | Swan | 28 860 | | 115 440 | |
| | Wanneroo | 11 000 | | 19 125 | |
| | West Pilbara | 6 026 | | 30 130 | |
| | West Kimberley | 300 | | 1 500 | |
| | **Total Sand** | 688 514 | | 1 862 027 | (d) |
| **Total Construction Materials** | | 1 022 863 | | 4 332 974 | |
| DIAMOND | Wyndham-East Kimberley | 35 354 779 | | 414 059 647 | (a) |
| DIMENSION STONE | | | | | |
| Black Granite | Derby-West Kimberley | 693 | | 1 039 890 | (a) |
| Quartzite | Mukinbudin | 1 471 | | 63 611 | (d) |
| | Roebourne | 59 | | 2 360 | (a) |
| **Total Dimension Stone** | | 1723 | | 1 105 961 | |
| GEM, SEMI-PRECIOUS STONES | | | Kg | | |
| Amethyst | Upper-Gascoyne | | 34 000 | 170 000 | (e) |
| | | | Grams | | |
| Emerald | Menzies | | 550 | 2 020 | (d) |
| | | | Kg | | |
| Zebra Rocks | Wyndham - East Kimberley | | 1 260 | 12 600 | (e) |
| **Total Gem, Semi-Precious Ornamental Stones** | | | 184 620 | | |
| GOLD | | | Au Kg | | |
| | Boddington | | 15 648.151 | 240 275 958 | |
| | Coolgardie | | 8 881.439 | 136 373 701 | |
| | Cue | | 4 409.533 | 67 707 978 | |
| | Dundas | | 3 892.637 | 59 771 095 | |
| | East PIlbara | | 10 173.538 | 156 213 765 | |
| | Halls Creek | | 38.161 | 585 952 | |
| | Kalgoorlie-Boulder | | 34 243.384 | 525 804 096 | |
| | Lake Grace | | 384.176 | 5 898 995 | |
| | Laverton | | 3 374.955 | 51 822 130 | |
| | Leonora | | 3 302.363 | 204 256 593 | |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| GOLD Continued... | | | | | |
| | | | Au Kg | | |
| | Meekatharra | | 9 710.722 | 149 107 267 | |
| | Menzies | | 5 397.241 | 82 874 150 | |
| | Mt Magnet | | 5 071.244 | 77 868 497 | |
| | Port Hedland | | 6.757 | 103 754 | |
| | Ravensthorpe | | 128.756 | 1 976 883 | |
| | Roebourne | | 15.046 | 231 031 | |
| | Sandstone | | 3 638.800 | 55 873 455 | |
| | Upper Gascoyne | | 8.951 | 137 442 | |
| | Westonia | | 1 970.488 | 30 256 663 | |
| | West Pilbara | | 3.036 | 46 621 | |
| | Wiluna | | 3 793.060 | 58 242 102 | |
| | Yalgoo | | 2 122.476 | 32 490 422 | |
| | Yilgarn | | 9 066.584 | 139 216 579 | |
| **Total Gold** | | | 135 281.487 | 2 077 235 128 | (f) |
| GYPSUM | Carnamah | 4 326 | | 43 260 | (e) |
| | Dalwallinu | 56 073 | | 727 771 | (e) |
| | Esperance | 7 816 | | 48 343 | (e) |
| | Irwin | 531 | | 3 186 | (e) |
| | Kellerberrin | 13 480 | | 66 580 | (e) |
| | Lake Grace | 9 063 | | 43 805 | (e) |
| | Mukinbudin | 500 | | 3 000 | (e) |
| | Nungarin | 36 073 | | 194 406 | (e) |
| | Trayning | 2 033 | | 11 385 | (e) |
| | Wyalkatchem | 32 425 | | 198 718 | (e) |
| **Total Gypsum** | | 162 831 | | 1 340 454 | (e) |
| HEAVY MINERAL SANDS | | | | | |
| Garnet Sand | Capel | 1 073 | | 61 895 | (g) |
| | Northampton | 28 832 | | 1 149 538 | (e) |
| | **Total Garnet Sand** | 29 905 | | 1 211 433 | |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| | | | TiO2 tonnes | | |
| Ilmenite | Carnamah | 222 575 | 133 545.0 | | |
| | Capel | 252418 | 138 829.9 | | |
| | Waroona | 25422 | 13 982.1 | | |
| | **Total Ilmenite** | 964 711 | 286 357 | 77 515 856 | |
| | | | TiO2 tonnes | | |
| Upgraded Ilmenite | Capel | 163 217 | 150 159.64 | | |
| | Carnamah | 99 276 | 91 333.92 | | |
| | **Total Upgrade Ilmenite** | 262 493 | 241 493.56 | 116 052 715 | (a) |
| | | | TiO2 tonnes | | |
| Leucoxene | Capel | 22 498 | 20 596 | 10 336 566 | (a) |
| | | | ThO2 Units | | |
| Monazite | Capel | 2 237 | 21 041 | 2 610 273 | |
| | Carnamah | 8 530 | 55 447 | 6 524 102 | |
| | **Total Monazite** | 11 767 | 76 488 | 9 134 375 | (a) |
| | | | TiO2 tonnes | | |
| Rutile | Carnamah | 88 972 | 84 524 | 58 363 779 | (a) |
| | | | Y203 Kg | | |
| Xenotine | Capel | 20 | 6 400 | 105 840 | (a) |
| Zircon | Capel | 75 156 | 48 852 | 37 551 909 | (a) |
| | Carnamah | 268 025 | 185 678 | 149 983 973 | (a) |
| | Waroona | 580 | 382 | 384 200 | |
| | **Total Zircon** | 343 761 | 234 912 | 187 020 082 | |
| **Total Heavy Mineral Sands** | | | | 460 640 646 | |
| INDUSTRIAL PEGMATITE MINERALS | | | | | |
| Feldspar | Mukinbudin | 7 579 | | 347 385 | (h) |
| Mica | Port Hedland | 57 | | 16 104 | (e) |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| IRON ORE | | | | | |
| | | | Fe% | | |
| Interstate | Derby-West Kimberley | 1 302 471 | 66.50 | 14 327 181 | |
| | East Pilbara | 3 066 309 | 63.38 | 63 196 084 | |
| | Ashburton | 528 114 | 58.92 | 7 725 262 | |
| | | 4 896 894 | | 85 248 527 | |
| Export Ore | Derby-West Kimberley | 2 220 260 | 65.86 | 40 486 676 | |
| | East Pilbara | 31 469 184 | 62.16 | 672 057 031 | |
| | Ashburton | 67 858 648 | 61.20 | 1 323 533 024 | |
| | | 101 550 092 | | 2 036 077 031 | |
| | | | Fe% | | |
| Export Pellets | Ashburton | 22 985 | 63.19 | 610 264 | |
| **Total Iron Ore** | | 106 469 971 | | 2 121 935 822 | (a) |
| LIMESAND-LIMESTONE-DOLOMITE | | | | | |
| Dolomite | Lake Grace | 360 | | 7 200 | (e) |
| Limesand-Limestone | Cockburn | 1 484 015 | | 5 360 973 | (d) |
| | Dandaragan | 4 338 | | 26 028 | (d) |
| | Exmouth | 4 860 | | 48 600 | (d) |
| | Gingin | 25 433 | | 428 116 | (d) |
| | Irwin | 244 | | 1 344 | (d) |
| | Manjimup | 2 807 | | 28 070 | (d) |
| | Plantagenet | 1 139 | | 101 365 | (d) |
| | Roebourne | 186 | | 7 140 | (d) |
| | Wanneroo | 293 470 | | 2 614 186 | (d) |
| **Total Limesand-Limestone-Dolomite** | | 1 816 852 | | 8 624 676 | |
| MANGANESE ORE | East Pilbara | 11 375 | | 50 000 | (e) |
| NICKEL | | | | | |
| | | | Co. tonnes | | |
| by-product Cobalt | Coolgardie | | 261.268 | 4 472 086 | (a) (b) |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| | | | Pd Kg | | |
| by-product Palladium | Coolgardie | | 322.573 | 1 917 445 | (a) (b) |
| | | | Pt Kg | | |
| by-product Palladium | Coolgardie | | 60.437 | 1 275 979 | (a) (b) |
| | | | Ni tonnes | | |
| Nickel Concentrates | Coolgardie | 275 040 | 28 741.680 | 525 088 072 | |
| | Kalgoorlie-Boulder | 22 779 | 2 724.368 | 43 282 825 | |
| | Laverton | 50 486 | 4 361.990 | 70 202 824 | |
| | Leonora | 36 705 | 3 200.676 | 41 813 963 | |
| | **Total Nickel Concentrates** | 385 010 | | 680 387 683 | |
| | | | Ni tonnes | | |
| Nickel Ore | Leonora | 17 101 | 824.268 | 10 281 141 | |
| | **Total Nickel Production** | | 40 114.25 | 690 668 824 | (i) |
| PEAT | Manjimup | 1 266 | | 75 257 | (d) |
| PETROLEUM | | Kilolitres | | | |
| Condensate | Carnamah | 311 | | 52 925 | (d) |
| | Irwin | 392 | | 59 496 | (d) |
| | Roebourne | 1 352 430 | | 197 043 629 | (a) |
| | **Total Condensate** | 1 353 133 | | 197 156 051 | |
| Crude Oil | Derby-West Kimberley | 21 056 | | 2 465 149 | |
| | Irwin | 17 195 | | 2 067 527 | |
| | Roebourne | 2 475 798 | | 36 894 323 | |
| | **Total Crude Oil** | 2 514 049 | | 373 326 999 | |
| | | MM Btu | | | |
| L.N.G. | Roebourne | 37 683 100 | | 113 427 505 | (a) |
| | | '000 $m^3$ | | | |
| Natural Gas | Carnamah | 33 967 | | 2 624 946 | (a) |
| | Roebourne | 3 568 184 | | 305 822 219 | (a) |
| | Irwin | 144 541 | | 13 337 052 | (a) |
| | **Total Natural Gas** | 3 746 692 | | 321 784 218 | |
| **Total Petroleum** | | | | 1 005 694 774 | |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| RARE EARTHS | | | | | |
| Gallium | Murray | | Ga Kg 22 999 | 798 936 | (d) |
| SALT | Carnarvon | 1 057 335 | | 20 218 590 | (a) |
| | Port Hedland | 1 539 735 | | 27 433 886 | (a) |
| | Roebourne | 2 670 625 | | 51 799 315 | (a) |
| | Shark Bay | 666 594 | | 12 493 433 | (a) |
| | Wyalkatchem | 128 | | 9 240 | (e) |
| **Total Salt** | | 5 934 417 | | 111 945 464 | |
| SILICA-SILICA SAND | | | | | |
| Silica | Moora | 6 197 | | 61 967 | |
| Silica Sand | Canning | 215 912 | | 2 375 032 | (d) |
| | Cockburn | 148 623 | | 965 532 | (d) |
| | Coolgardie | 31 821 | | 77 964 | (d) |
| | Wanneroo | 37 285 | | 211 410 | (d) |
| | **Total Silca Sand** | 433 641 | | 3 629 938 | |
| **Total Silica-Silica Sand** | | 439 838 | | 3 691 905 | |
| SILVER | | | Ag Kg | | |
| by product copper | East Pilbara | | 406.942 | 68 942 | (a) |
| by product copper | Meekatharra | | 19 696.591 | 3 825 364 | (a) |
| by product nickel | Coolgardie | | 347.574 | 79 504 | (a) |
| by product gold | Mining Statewide | | 20 761.791 | 2 092 100 | (d) |
| **Total Silver** | | | 41 212.898 | 6 065 910 | |
| TALC | Meekatharra | 31 915 | | 3 801 150 | (a) |
| | Three Springs | 164 185 | | 9 299 100 | (a) |
| **Total Talc** | | 196 100 | | 13 100 250 | |
| TIN-TANTALUM-LITHIUM | | | | | |
| Spodumene | Bridgetown-Greenbushes | 39 105 | | 7 118 550 | (a) |

| Mineral | Local Government Area | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| | | | Ta205 kg | | |
| Tantalite | East Pilbara | | 10 862 | 540 362 | |
| | Bridgetown-Greenbushes | 511 | 126 268 | 15 713 530 | |
| | **Total Tantalite** | 511 | 137 130 | 16 253 892 | (a) |
| | | | Sn Tonnes | | |
| Tin | Bridgetown-Greenbushes | 325.300 | 224.820 | 2 047 456 | |
| | East Pilbara | | 5.000 | 54 000 | |
| **Total Tin** | | 325.330 | 229.820 | 2 101 456 | (a) |
| **Total Tin Tantalum-Lithium** | | | | 25 473 898 | |
| VERMICULITE | Ravensthorpe | 306 | | 54 268 | (e) |
| | **Total Value of Minerals** | | | 7 262 640 995 | |
| | **Total Value of Gold** | | | 2 077 235 128 | |
| | **TOTAL VALUE OF ALL MINERALS & PETROLEUM** | | | 9 339 876 123 | |

TABLE 4.1

QUANTITY, VALUE AND METALLIC CONTENT OF MINERAL AND PETROLEUM PRODUCTION BY MINERAL FIELD

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| BASE METALS | | | | | |
| | | | Cu tonnes | | |
| Copper by-product | Coolgardie | | 2 277.518 | 5 800 205 | (a) (b) |
| Copper Concentrates | Pilbara | 14 378 | 2 924.028 | 4 868 141 | (a) |
| | Peak Hill | 41 908 | 8 988.035 | 24 633 865 | (a) |
| | | 56 286 | 11 912.123 | 29 502 006 | |
| Copper Ore | Peak Hill | 27 471 | 5 385.281 | 7 659 005 | (a) |
| | Total Copper | | 19 574.281 | 42 961 217 | |
| Lead | West Kimberley | 11 511 | 7 846 | 4 422 849 | (a) |
| Zinc | West Kimberley | 84 394 | 41 931 | 54 129 508 | (a) |
| **Total Base Metals** | | | | 101 513 573 | |
| BAUXITE-ALUMINA | | | | | |
| Alumina | South West | 6 384 796 | | 2 113 116 441 | (c) |
| CLAY | | | | | |
| Attapulgite | South West | 35 985 | | 3 885 665 | (a) |
| Cement Clay | South West | 23 025 | | 57 564 | (d) |
| Fire clay | South West | 119 778 | | 143 973 | (d) |
| White Clay | South West | 1 709 | | 20 503 | (d) |
| **Total Clay** | | 180 497 | | 4 107 705 | |
| COAL | Collie | 3 899 815 | | 166 021 091 | (e) |
| CONSTRUCTION MATERIALS | | | | | |
| Aggregate | Pilbara | 33 185 | | 454 974 | Ref |
| | West Kimberley | 3 295 | | 17 793 | |
| | Kimberley | 4 307 | | 17 228 | |
| | East Coolgardie | 131 529 | | 536 728 | |
| | **Total Aggregate** | 172 316 | | 1 026 723 | (d) |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| CONSTRUCTION MATERIALS | | | | | |
| Gravel | West Pilbara | 1 800 | | 9 000 | |
| | Pilbara | 3 516 | | 67 081 | |
| | West Kimberley | 1 000 | | 3 600 | |
| | South West | 20 030 | | 100 150 | |
| | Coolgardie | 760 | | 3 800 | |
| | **Total Gravel** | 27 106 | | 183 631 | (d) |
| Rock | West Kimberley | 96 872 | | 849 133 | |
| | West Pilbara | 36 255 | | 393 460 | |
| | Ashburton | 1 800 | | 18 000 | |
| | **Total Rock** | 134 927 | | 1 260 593 | (d) |
| Sand | West Pilbara | 29 491 | | 147 455 | |
| | Peak Hill | 53 410 | | 267 582 | |
| | North Coolgardie | 4 354 | | 21 768 | |
| | Coolgardie | 87 020 | | 441 028 | |
| | West Kimberley | 8 793 | | 35 586 | |
| | Mt Margaret | 6 612 | | 40 601 | |
| | Kimberley | 11 000 | | 19 125 | |
| | South West | 477 806 | | 828 891 | |
| | Pilbara | 10 028 | | 59 991 | |
| | **Total Sand** | 688 514 | | 1 862 | (d) |
| **Total Construction Materials** | | 1 022 863 | | 4 332 974 | (d) |
| | | Carats | | | |
| DIAMONDS | Kimberley | 35 354 779 | | 414 059 647 | (a) |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| DIMENSION STONE | | | | | |
| Black Granite | West Kimberley | 693 | | 1 039 890 | (a) |
| Quartzite | South West | 1 471 | | 63 611 | (d) |
| | West Pilbara | 59 | | 2 360 | (d) |
| **Total Dimension Stone** | | | | 1 105 861 | |
| GEM, SEMI-PRECIOUS STONES | | | | | |
| | | | Kg | Value ($) | |
| Amethyst | Gascoyne | | 34 000 | 170 000 | (e) |
| | | | grams | | |
| Emerald | North Coolgardie | | 550 | 2 020 | (d) |
| | Menzies | | | | |
| | | | kg | | |
| Zebra Rock | Kimberley | | 1 260 | 12 600 | (e) |
| **Total Gem, Semi-Precious & Ornamental Stone** | | | | 184 620) | |
| | | | Au kg | | |
| GOLD | Ashburton | | 3.036 | 46 621 | |
| | Broad Arrow | | 12 203.691 | 187 386 588 | |
| | Coolgardie | | 9 331.526 | 143 284 749 | |
| | Dundas | | 3 492.673 | 53 629 681 | |
| | East Coolgardie | | 22 048.953 | 338 559 701 | |
| | East Murchison | | 13 760.150 | 211 285 872 | |
| | Gascoyne | | 9.612 | 147 588 | |
| | Kimberley | | 38.161 | 585 957 | |
| | Mt Margaret | | 9 965.721 | 153 022 753 | |
| | Murchison | | 16 177.169 | 248 398 982 | |
| | North Coolgardie | | 5 397.291 | 82 874 923 | |
| | North East Coolgardie | | 1 315.993 | 20 206 960 | |
| | Peak Hill | | 1 121.223 | 17 570 271 | |
| | Phillips River | | 128 747 | 1 976 902 | |
| | Pilbara | | 11 173.642 | 171 570 271 | |
| | South West | | 16 032.237 | 246 173 565 | |
| | West Pilbara | | 21.803 | 334 788 | |
| | Yalgoo | | 2 022.541 | 31 055 936 | |
| | Yilgarn | | 11 037.317 | 167 477 011 | |
| **Total Gold** | | | 35 281.487 | 2 077 235 128 | (f) |
| GYPSUM | South West | 123 422 | | 1 124 585 | |
| | Dundas | 7 816 | | 48 343 | |
| | Yilgarn | 31 593 | | 167 526 | |
| **Total Gypsum** | | 162 831 | | 1 340 454 | (e |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| HEAVY MINERAL SANDS | | | | | |
| Garnet Sand | South West | 29 905 | | 1211433 | (e) |
| | | | TiO2 tonnes | | |
| Ilmenite | Southwest | 964 711 | 537 600 | 77 515 856 | |
| | | | TiO2 tonnes | | |
| Ilmenite Upgraded | Southwest | 262 493 | 241 494 | 116 052 716 | |
| | | | TiO2 tonnes | | |
| Leucoxene | Southwest | 22 498 | 20 594 | 10 336 566 | (a) |
| | | | ThO2 Units | | |
| Monazite | Southwest | 11 767 | 76 488 | 9 134 374 | (a) |
| | | | TiO2 tonnes | | |
| Rutile | Southwest | 88 972 | 84 523 | 58 363 778 | (a) |
| | | | Y203 Kg | | |
| Xenotine | Southwest | 20 | 6 400 | 105 840 | (a) |
| | | | Zr02 tonnes | | |
| Zircon | Southwest | 343 761 | 234 912 | 187 920 082 | (a) |
| **Total Heavy Mineral Sands** | | | | 460 640 646 | |
| INDUSTRIAL PEGMATITE MINERALS | | | | | |
| Felspar | South West | 7 579 | | 347 385 | (h) |
| Mica | Pilbara | 57 | | 16 104 | (a) |
| **Total Industrial Pegmatite Minerals** | | | | 363 489 | |
| IRON ORE | | | | | |
| | | | Fe tonnes | | |
| Export Ore | West Pilbara | 67 858 648 | 41 761 784 | 1 323 533 024 | |
| | West Kimberley | 2 222 260 | 1 443 631 | 40 486 976 | |
| | Pilbara | 5 833 584 | 3 600 488 | 116 123 638 | |
| | Peak Hill | 25 635 600 | 16 295 575 | 555 933 393 | |
| | | 101 550 092 | 63 101 479 | 2 036 077 031 | |
| Export Pellets | West Pilbara | 22 985 | 14 538 | 610 264 | |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| Domestic Ore | | 528 114 | 310 920 | 7 725 262 | |
| | Peak Hill | 2 698 194 | 1 716 051 | 54 446 187 | |
| | Pilbara | 368 114 | 233 973 | 8 749 898 | |
| | West Kimberley | 1 302 471 | 866 143 | 14 327 181 | |
| | | 4 896 893 | 3 127 088 | 85 248 528 | |
| **Total Iron Ore** | | 106 469 971 | 66 243 106 | 2 121 935 822 | (a) |
| LIMESAND/LIMESTONE/DOLOMITE | | | | | |
| Dolomite | South West | 360 | | 7 200 | (e) |
| Limesand-Limestone | Ashburton | 4 860 | | 48 600 | (d) |
| | South West | 1 810 288 | | 8 560 082 | (d) |
| | West Pilbara | 517 | | 8 794 | (d) |
| **Total Limesand /Limestone & Dolomite** | | 1 817 164 | | 8 624 676 | |
| MANGANESE ORE | Pilbara | 11 375 | | 50 000 | (e) |
| NICKEL | | | Co tonnes | | |
| by-product Cobalt | Coolgardie | | 261.268 | 4 472 086 | (a) (b) |
| | | | Pd Kg | | |
| by-product Palladium | Coolgardie | | 322.573 | 1 917 445 | (a) (b) |
| | | | Pt Kg | | |
| by-product Palladium | Coolgardie | | 60.437 | 1 275 979 | (a) (b) |
| | | | Ni tonnes | | |
| Nickel Concentrates | East Coolgardie | 22 779 | 2 724.368 | 43 282 825 | |
| | Coolgardie | 275 040 | 28 741.680 | 525 088 072 | |
| | East Murchison | 36 705 | 3 200.676 | 41 813 963 | |
| | Mt. Margaret | 50 486 | 4 361.990 | 70 202 823 | |
| | | 385 010 | | 680 387 683 | |
| Nickel Ore | East Murchison | 17 101 | 824.268 | 10 281 141 | |
| **Total Nickel Production** | | | 40114 25 | 690 668 824 | (i) |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| PEAT | South West | 1 266 | | 75 257 | (d) |
| PETROLEUM | Basin | Kilolitres | | | |
| Condensate | Perth | 703 | | 112 422 | (d) |
| | Carnarvon | 1 352 430 | | 197 043 629 | (a) |
| | | 1 353 133 | | 197 156 051 | |
| | | Q tonnes | | | |
| Crude Oil | Perth | 17 195 | | 2 067 527 | |
| | Canning | 21 057 | | 2 465 150 | |
| | Carnarvon | 2 475 798 | | 368 794 323 | |
| | | 2 514 050 | | 373 327 000 | (a) |
| | | MM Btu | | | |
| L.N.G. | Carnarvon | 37 683 100 | | 113 427 505 | (a) |
| | | 000 $M^3$ | | | |
| Natural Gas | Carnarvon | 3 568 184 | | 305 822 219 | |
| | Perth | 178 508 | | 15 961 998 | |
| | | 3 746 692 | | 321 784 218 | |
| **Total Petroleum** | | | | 1 005 694 774 | |
| RARE EARTHS | | | | | |
| | | | Ga Kg | | |
| Gallium | South West | | 22 999 | 798 936 | (a) |
| SALT | Pilbara | 1 539 735 | | 27 433 886 | |
| | West Pilbara | 2 670 625 | | 51 799 315 | |
| | Gascoyne | 1 723 929 | | 32 712 023 | |
| | South West | 128 | | 9 240 | |
| **Total Salt** | | 5 934 417 | | 111 954 464 | (a) |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| SILICA-SILICA SAND | | | | | |
| Silica | South West | 6 197 | | 61 967 | |
| Silica Sand | Coolgardie | 31 821 | | 77 964 | |
| | South West | 401 820 | | 3 551 974 | |
| **Total Silica Silica Sand** | | 439 838 | | 3 691 905 | (d) |
| SILVER | | | Ag Kg | | |
| by product Copper | Peak Hill | | 19 696.591 | 3 825 364 | (a) (k |
| by product Copper | Pilbara | | 406.242 | 68 942 | (a) (k |
| by product Nickel | Coolgardie | | 347.574 | 79 504 | (a) (b |
| by product gold mining | Statewide | | 20 761.791 | 2 092 100 | (d) |
| **Total Silver** | | | 41 212.898 | 6 065 910 | |
| TALC | South West | 164 185 | | 9 299 100 | |
| | Peak Hill | 31 915 | | 3 801 150 | |
| | | - | - | - | - |
| **Total Talc** | | 196 100 | | 13 100 250 | |
| TIN-TANTALUM-LITHIUM | | | | | |
| Spodumene | Greenbushes | 39 105 | | 7 118 550 | (a) |
| | | | Ta 205 kg | | |
| Tantalite | Pilbara | | 10 862 | 540 362 | |
| | Greenbushes | 511 | 126 268 | 15713530 | |
| | Total Tantalite | 511 | 137 130 | 16 253 892 | (a) |
| | | | Sn Tonnes | | |
| Tin | Greenbushes | 325.300 | 5.000 | 2047456 | |
| | Pilbara | 0.000 | 224.820 | 54 000 | |
| | Total Tin | 325.300 | 229.820 | 2 101 456 | (a) |
| **Total Tin - Tantalum Lithium** | | | | 25 473 898 | |

| Mineral | Mineral-field | Quantity tonnes | Metallic Content | Value ($) | Ref |
|---|---|---|---|---|---|
| VERMICULITE | Phillips River | 306 | | 54 268 | (e) |
| | **Total Value of Minerals** | | | **7 262 640 995** | |
| | **Total Value of Gold** | | | **2 077 235 128** | |
| | **TOTAL VALUE OF ALL MINERALS & PETROLEUM** | | | **9 339 876 123** | |

**EMPLOYMENT IN THE WA MINING AND PETROLEUM INDUSTRIES**

During the last half of 1989 full time employment in the Western Australian mining and petroleum industries expanded moderately. The workforce engaged in exploration, development and production grew by 3% to approximately 35 000

The sectoral distribution of this relatively small employment growth was fairly even. The only sectors to stand out were those of heavy mineral sands and nickel. While Western Mining's strategy of steadily rebuilding stocks was the main determinant of the latter, the heavy mineral sands industry result was broadly commensurate with its investment and production capacity expansion. The rehabilitation and start up of the Leinster nickel project saw the workforce expand by 150 persons during the last six months of 1989.

Many of the jobs indirectly generated by the mining industry are in business supplying it with goods and services and in those engaged in downstream activites. Prominent among the former is the construction industry, which in turn has strong employment multipliers through brick, cement and steel fabrication. Services to mining also include wholesalers and retailers, banking and a wide range of financial activities. The mining industry's backward and forward linkages to the rest of the State's economy have historically been strong, this strength continues to be manifested in the broader labour market. The output and employment multipliers for the mining industry in Western Australia have been calculated as 2.0 and 2.9 respectively. On the basis of these calculations, for every $1 million of mineral production $2 million is added to gross state product and each mining job supports an extra 1.9 jobs in the wider economy.

Labour productivity in the broadly based Western Australian mining industry is marginally higher than measured levels in Australian mining generally. This outcome is a function of scale, skill levels and capital intensity of the industry within the State. The maintenance of low unit production costs - is critical to the competitiveness of mineral products in world markets (80% + of output exported), and to the profitability levels which are necessary to attract foreign capital investment.

The State-wide distribution of skilled workers and professionals, as a result of the mining industry's sustained growth, has had, and continues to have, a positive impact on regional development.

Through 1990 aggregate employment in the Western Australian mining and petroleum industries should remain strong. This is despite some softening in gold sector eimployment, as activity in that industry is influenced by the world price and the January 1991 Federal gold tax. The broad base of the industry and the scale and long lead time of projects already in place, will ensure the continuing strength of employment.

## NUMBER OF PERSONS EMPLOYED IN THE WESTERN AUSTRALIAN MINING & PETROLEUM INDUSTRIES AS AT JUNE 30 1990

| MINERAL<br>Company | LOCATION | 1988-89 | 1989-90 |
|---|---|---|---|
| **BASE METALS** | | | |
| BHP Minerals Ltd | Cadjebut | 154 | 186 |
| Murchison Zinc Co. Pty Ltd | Golden Grove | 99 | 284 |
| | | **253** | **470** |
| **BAUXITE - ALUMINA** | | | |
| Alcoa of Australia Ltd | Del Park-Huntley/Pinjarra | 1 780 | 1 853 |
| | Jarrahdale/Kwinana | 2 006 | 1 620 |
| | Wagerup/Willow Dale | 644 | 558 |
| Worsley Alumina Pty Ltd | Boddington/Worsley | 963 | 1 110 |
| | | **5 393** | **5 141** |
| **COAL** | | | |
| Griffin Coal Mining Co. Ltd | Collie | 552 | 558 |
| Western Collieries Ltd | Collie | 719 | 748 |
| | | **1 271** | **1 306** |
| **DIAMOND** | | | |
| Argyle Diamond Mines Pty Ltd | Lake Argyle | 729 | 828 |
| Poseidon Ltd | Bow River | 95 | 119 |
| | | **824** | **947** |
| **GOLD** | | | |
| Ashton Gold | Cork Tree Well | 102 | 124 |
| Australian Consolidated Minerals Ltd | Golden Crown | 75 | 91 |
| | Westonia | 120 | 60 |
| | Mt Pleasant | 111 | 119 |
| Australian Mine Management Pty Ltd | Racetrack/Royal Standard | - | 11 |
| Aztec Mining Co. Ltd | Bounty | 95 | 108 |
| Barrack Mine Management | Horseshoe Lights | 140 | 63 |
| | Wiluna | 124 | 184 |
| BHP Minerals Ltd | Gimlet South/Orban JV | 85 | 111 |
| Big Bell Mines Pty Ltd | Big Bell | 232 | 275 |
| Broken Hill Metals NL | Hopes Hill | 151 | 144 |
| Central Norseman Gold Corp. NL | Central Norseman | 384 | 399 |
| Coolgardie Gold NL | Greenfield | 89 | 101 |
| Dominion Mining Ltd | Labourchere/Nathans | - | 70 |
| | Meekatharra | 298 | 297 |
| | Mt Morgans | 97 | 163 |
| | Tower Hill | 77 | 81 |
| East Murchison Mining Pty Ltd | Gidgee | 97 | 139 |
| Forsayth Pty Ltd | Lawlers | 95 | 90 |
| | Mt Gibson | 143 | 277 |
| Hedges Gold Pty Ltd | Hedges | 114 | 113 |
| Hill 50 Gold Mine NL | Mt Magnet | 233 | 233 |
| Kalgoorlie Consolidated Gold Mines Pty Ltd | Kalgoorlie | 1 369 | 1 507 |
| Mawson Pacific Ltd | Edwards Find | 21 | 27 |
| | Marvel Loch | 110 | 138 |
| | Transvaal | 74 | 56 |
| Metana Minerals | Mt Magnet | 145 | 138 |
| | Reedy | 117 | 144 |
| | Rothsay | 51 | 77 |
| Newmont Holdings Pty Ltd | New Celebration | 216 | 310 |
| | Telfer | 492 | 525 |
| Pancontinental Goldmining Areas Pty Ltd | Paddington | 211 | 184 |
| Placer (Granny Smith) Pty Ltd | Granny Smith | - | 157 |
| Poseidon Ltd | Kaltails | 56 | 289 |
| | Karonie | 52 | 60 |
| Ross Atkins Mining | Ingliston | 129 | 141 |
| Sons of Gwalia NL | Sons of Gwalia | 103 | 152 |

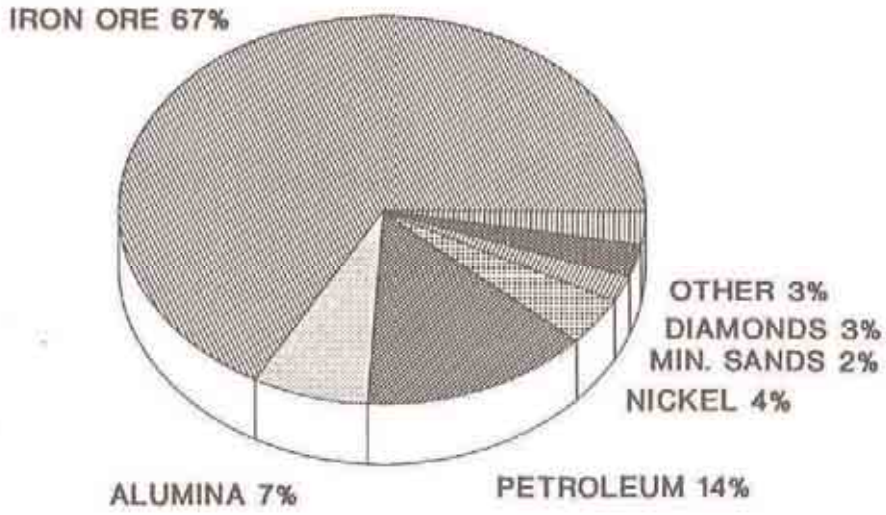
| MINERAL<br>Company | LOCATION | 1988-89 | 1989-90 |
|---|---|---|---|
| **GOLD - continued** | | | |
| Spargos Mining Pty Ltd | Bellevue | 219 | 178 |
| Western Mining Corporation Ltd | Emu | 111 | 120 |
| | Kambalda | 182 | 190 |
| | Lancefield | 111 | 115 |
| | Sand King | 50 | - |
| Worsley Alumina Pty Ltd | Boddington | 496 | 402 |
| All Other Operators | | 2 738 | 2 669 |
| | | **9 915** | **10 832** |
| **HEAVY MINERAL SANDS** | | | |
| Allied Eneabba Pty Ltd | Eneabba | 112 | 131 |
| Associated Minerals Consolidated Ltd | Capel | 195 | 237 |
| | Eneabba/Narngulu | 483 | 610 |
| Cable Sands Pty Ltd | Capel | 236 | 243 |
| Northern Metals and Oil Pty Ltd | Picton | 60 | 69 |
| Target Minerals NL | Port Gregory/Narngulu | 15 | 17 |
| TiWest Pty Ltd | Cooljarloo/Cataby | - | 178 |
| Westralian Sands Ltd | Capel | 477 | 530 |
| | | **1 578** | **2 015** |
| **IRON ORE** | | | |
| BHP Minerals Ltd | Yampi | 432 | 422 |
| Goldsworthy Mining Ltd | Pilbara/Port Hedland | 865 | 906 |
| Hamersley Iron Pty Ltd | Tom Price - Paraburdoo/Dampier | 2 906 | 3 168 |
| Hancock Mining Ltd | McCamey's | 37 | 56 |
| Mt Newman Mining Co. Ltd | Newman/Port Hedland | 3 585 | 3 657 |
| Robe River Mining Co. Pty Ltd | Panrawonica/Cape Lambert | 1 024 | 981 |
| | | **8 849** | **9 190** |
| **NICKEL** | | | |
| Western Mining Corporation Ltd | Kalgoorlie | 371 | 384 |
| | Kambalda | 1 806 | 1 810 |
| | Kwinana Refinery | 326 | 338 |
| | Leinster | 336 | 551 |
| | Mt Windarra | 432 | 344 |
| All Other Operators | | - | 18 |
| | | **3 271** | **3 445** |
| **PETROLEUM PRODUCTS** | | | |
| Barrack Energy Ltd | Mt Horner | 3 | 3 |
| Consolidated Gas Pty ltd | Woodada | 6 | 6 |
| Eromanga Energy Ltd | Blina/Sundown/Lloyd | 2 | 2 |
| Hadson Energy Pty Ltd | Harriet/Rosette | 80 | 74 |
| Marathon Petroleum Australia Ltd | Talisman | - | 4 |
| Oil Company of Australia NL | West Kora | - | 4 |
| West Australian Petroleum Pty Ltd | Barrow Island | 165 | 179 |
| | Dongara | 10 | 8 |
| | Saladin | - | 28 |
| Western Mining Corporation Ltd | North Herald/South Pepper | 27 | 157 |
| Woodside Offshore Petroleum Pty Ltd | North Rankin A/Burrup Peninsula | 1 381 | 1 404 |
| | | **1 674** | **1 869** |
| **SALT** | | | |
| Dampier Salt Ltd | Dampier | 179 | 178 |
| | Lake MacLeod | 99 | 114 |
| Leslie Salt Co. | Port Hedland | 112 | 120 |
| Shark Bay Salt JV | Useless Loop | 92 | 86 |
| | | **482** | **498** |
| **ALL OTHER MATERIALS**<br>(including Rock Quarries) | | **866** | **841** |
| **TOTAL** | | **34 376** | **36 554** |

(SOURCE: AXTAT REPORTING SYSTEM, MINING ENGINEERING DIVISION)

# COMPARATIVE ROYALTY RECEIPTS

## 1984 ROYALTY RECEIPTS

TOTAL : $ 125.5 MILLION




## 1989 ROYALTY RECEIPTS

TOTAL : $ 210.8 MILLION

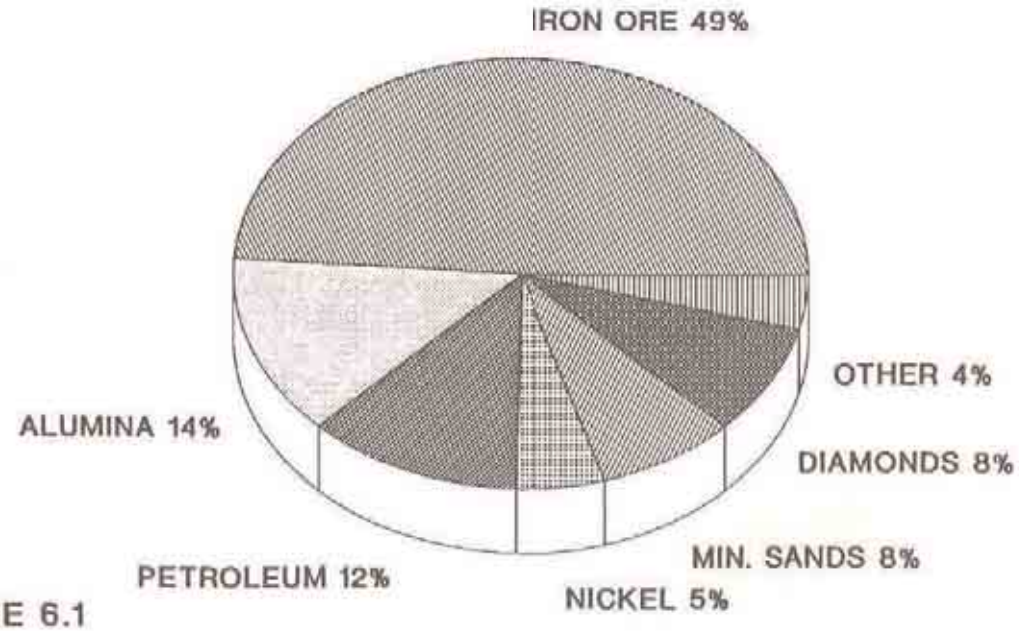



FIGURE 6.1

# ROYALTY RECEIPTS 1988,1989

| Mineral | 1988 ($A) | 1989 ($A) | Variance | up(down)% |
|---|---|---|---|---|
| BASE METALS | | | | |
| Copper | 289 044 | 1 927 053 | 1 638 008 | 566 |
| Lead | - | 38 855 | 38 855 | n.ap. |
| Zinc | 433 925 | 2 222 822 | 1 788 896 | 412 |
| BAUXITE-ALUMINA | | | | |
| Alumina | 15 693 843 | 28 799 883 | 13 106 039 | 83 |
| CLAYS | 147 072 | 128 374 | (18 697) | (12) |
| COAL | 1 573 163 | 1 876 931 | 303 767 | 19 |
| CONSTRCTION MATERIALS | | | | |
| Aggregate | 57 525 | 54 979 | (2 546) | (4) |
| Gravel | 5 956 | 7 330 | 1373 | 23 |
| Rock | 70 847 | 66 961 | (3 886) | (5) |
| Sand | 127 410 | 242 562 | 115 151 | 90 |
| Sandstone | 25 | - | (25) | (100) |
| DIAMOND | 9 971 532 | 17 415 031 | 7 443 498 | 74 |
| DIMENSION STONE | 486 | 526 | 40 | 8 |
| GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE | | | | |
| Amethyst | 15 069 | 19 140 | 4 070 | 27 |
| Beryl | - | 40 | 40 | n.ap. |
| Emerald | - | 165 | 165 | n.ap. |
| Zebra Stone | - | 944 | 944 | n.ap. |
| GOLD | 155 534 | 212 373 | 56 838 | 36 |
| GYPSUM | 32 087 | 51 389 | 19 302 | 60 |
| HEAVY MINERAL SANDS | | | | |
| Garnet | 32 279 | 55 357 | 23 078 | 71 |
| Ilmenite | 3 494 021 | 4 190 993 | 696 971 | 19 |
| Kyanite | 6 140 | - | (6140) | (100) |
| Leucoxene | 82 650 | 373 269 | 290 619 | 351 |
| Monazite | 355 191 | 424 612 | 69 421 | 19 |
| Rutile | 3 349 741 | 2 628 348 | (721 392) | (21) |
| Xenotime | - | 5 292 | 5 292 | n.ap. |
| Zircon | 5 679 290 | 8 891 463 | 3 212 172 | 56 |
| INDUSTRIAL PEGMATITE MINERALS | | | | |
| Felspar | 17 341 | 32 135 | 14 794 | 85 |
| Mica | 18 565 | 34 116 | 15 550 | 83 |
| IRON ORE | 99 783 895 | 102 392 765 | 2 608 869 | 2 |
| LIMESAND-LIMESTONE-DOLOMITE | | | | |
| Dolomite | 39 | - | (39) | (100) |
| Limesand-Limestone | 76 904 | 125 440 | 48 536 | 63 |
| MANGANESE | - | 3 750 | 3 750 | n.ap. |
| NICKEL | | | | |
| Cobalt by-product | 65 201 | 55 703 | (9 497) | (14) |
| Nickel | 6 574 034 | 10 694 293 | 4 120 259 | 62 |
| Palladium by-product | 19 135 | 21 984 | 2 848 | 14 |
| Platinum by-product | 19 135 | 21 984 | 2 848 | 14 |
| PEAT | 2 050 | 2 687 | 636 | 31 |
| PETROLEUM | | | | |
| Condensate | 1 265 505 | 1 475 678 | 210 173 | 16 |
| LNG | - | 532 542 | 532 542 | n.ap. |
| Natural gas | 3 906 030 | 4 020 966 | 114 935 | 2 |
| Oil | 23 259 324 | 19 362 387 | (3 896 936) | (16) |
| RARE EARTHS | | | | |
| Gallium | - | 94 811 | 94 811 | n.ap. |
| SALT | 986 434 | 1 082 142 | 95 708 | 9 |
| SILICA SAND | 185 896 | 223 771 | 37 874 | 20 |
| SILVER | 67 428 | 198 373 | 130 945 | 194 |
| TALC | 95 926 | 72 098 | (23 828) | (24) |
| TIN-TANTALUM-LITHIUM | | | | |
| Spodumene | 304 651 | 348 895 | 44 244 | 14 |
| Tantalite | 188 244 | 305 152 | 116 907 | 62 |
| Tin | 57 346 | 65 317 | 7 971 | 13 |
| VERMICULITE | 6 695 | 22 185 | 15 489 | 231 |
| **Total Value** | **178 472 629** | **210 823 890** | **32 351 260** | **18** |

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

PRINCIPAL MINERAL PRODUCERS 1989 Head office postal address, telephone number:minesite.

BASE METALS

**Copper**

Horseshoe Lights Gold Pty Ltd, 614 Newcastle St, Leederville 6007, (09) 427 6222: Horseshoe.
Newmont Australia Ltd, Level 18 AMP Tower, 535 Bourke St, Melbourne Victoria 3000, (03) 629 5191: Telfer.
Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Kambalda.

**Lead - Zinc**

BHP Minerals Ltd, Level 8, Forrest Centre, 221 St George's Tce, Perth 6000, (09) 426 5800: Cadjebut.

BAUXITE - ALUMINA

**Alumina**

Alcoa of Australia (WA) Ltd, PO Box 252, Applecross 6153, (09) 364 0111: Del Park, Jarrahdale, Willowdale.
Worsley Alumina Pty Ltd, PO Box 344, Collie 6225, (097) 34 3022: Boddington.

CLAY

**Attapulgite**

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

**Cement Clay**

Bell Basic Industries Ltd, 136 Great Eastern Hwy, South Guildford 6055, (09) 279 0000: Armadale.

**Fire Clay**

Midland Brick Co. Pty Ltd, Bassett Rd, Middle Swan 6056, (09) 274 5522: Bullsbrook.

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**

Leslie Salt Company (Inc), 225 St George's Tce, Perth 6000, (09) 325 4888: Pippingarra.
Vinci and Sons Pty Ltd, Lot 3 Pickering Brook Rd,Pickering Brook 6076, (09) 293 8295: Pickering Brook.

**Rock**

County B.S., C/- Specified Services, 123 Burswood Rd, Victoria Park 6100, (09) 362 1100: Yeeda Station.
Specified Services Pty Ltd, 123 Burswood Rd, Victoria Park 6100, (09) 362 1100: Mt Regal.

**Sand**

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Jandakot
Bebich M, P & Y, 167 East Rd, Wanneroo 6055: Gnangarra.
General Bulldozing Co. Pty Ltd, Koojan Ave, South Guildford 6055, (09) 2772900: Quinns Rock.
Ivanjah Pty Ltd, Lot 117 Coolgardie Rd, Kalgoorlie 6430, (090) 21 3961: Coolgardie.
Rule G.F. & J.K., Lot 141 Robinson St, Gingin 6503: Lancelin.
The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Boodarrie Station, Christmas Creek, Comet Vale, Karratha, Newman, Rocklea, Sullivan's Creek, Turner River, Warrawanda Creek, Widgiemooltha.
Tirad Pty Ltd, PO Box 126, Boulder 6432: Coolgardie.

DIAMOND

Argyle Diamond Mines, 2 Kings Park Rd, West Perth 6005, (09) 482 1188: Argyle.
Poseidon Ltd, 8 Kings Park Rd, West Perth 6005, (09) 480 3232: Lissadell.

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DIMENSION STONE

**Black Granite**

City West Holdings Ltd, C/- 102 Railway Pde, West Perth 6005, (09) 481 5760: Lennard.

**Quartzite**

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

GEM, SEMI-PRECIOUS & ORNAMENTAL STONE

**Amethyst**

Soklich F, Lot 326 Dale Pl, Orange Grove 6109, (09) 459 1449: Gascoyne.

**Emerald**

Mackay N.I., 91 Thomas St, Nedlands 6009, (09) 386 6206: Wonder Well.

**Zebra Rock**

Read J.W. & Hackett N.A., 16 Bedford St, Nedlands 6009, (09) 386 4423: Kununurra.

GOLD

Australian Consolidated Minerals Ltd, 233 Adelaide Tce, Perth 6000, (09) 325 7755: Golden Crown, Westonia.
Barrack Mine Management, 183 Great Eastern Hwy, Belmont 6104, (09) 479 9799: Horseshoe Lights, Wiluna.
BHP Minerals Ltd, 240 Hay St, Kalgoorlie 6430, (090) 24 2060: Gimlet South, Orban JV, Ora Banda Tailings.
Big Bell Mines Ltd, PO Box 2135, Geraldton 6530, (099) 64 1366: Big Bell.
Broken Hill Metals Ltd, 44 St George's Tce, Perth 6000, (09) 221 3032: Hopes Hill.
Central Norseman Gold Corp. NL, PO Box 56, Norseman 6443, (090) 39 1101: Central Norseman.
Dominion Mining Ltd, 10 Ord St, West Perth 6005, (09) 322 4617: Labourchere, Meekatharra, Mt Morgans, Tower Hill.
Forsayth Pty Ltd, 221 St George's Tce, Perth 6000, (09) 322 7211: Lawlers, Mt Gibson.
Golden Kilometre Mines JV, 4/100 Hay St, Subiaco 6008, (09) 382 3300: Mt Pleasant, Racetrack/Royal Standard.
Hedges Gold Pty Ltd, Cnr Davy and Marmion Sts, Boorugoon 6153, (09) 364 0111: Hedges.
Hill 50 Gold Mine NL, PO Box 83, Mt Magnet 6638, (09) 63 4104: Mt Magnet.
Kalgoorlie Cons. Gold Mines Pty Ltd, Boulder Block Rd, Boulder 6432, (090) 93 1000: Kalgoorlie/Boulder.
Mawson Pacific Ltd, 11 Ventnor Ave, West Perth 6005, (09) 321 8778: Edwards Find, Marvel Loch, Transvaal.
Metana Minerals, 191 Great Eastern Hwy, Belmont 6104, (09) 277 9944: Mt Magnet, Reedy, Rothsay.
Newmont Holdings Pty Ltd, 535 Bourke St, Melbourne 3000, (03) 62 5191: New Celebration, Telfer.
Pancontinental Goldmining Areas Pty Ltd, PO Box 1161, Kalgoorlie 6430, (090) 24 2000: Paddington.
Poseidon Ltd, PO Box 1143, West Perth 6005, (09) 384 5155: Kaltails, Karonie.
Sons of Gwalia NL, 38 Parliament Pl, West Perth 6005, (09) 481 1988: Sons of Gwalia.
Spargos Mining Pty Ltd, 50 Colin St, West Perth 6005, (09) 321 3277: Bellevue.
Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Emu, Kambalda, Lancefield, Sand King, Thiel Well.
Worsley Alumina Pty Ltd, PO Box 48, Boddington 6390, (098) 83 8260: Boddington.

GYPSUM

Endeavour Resources Ltd, 15th Floor, 108 St George's Tce, Perth 6000, (09) 324 6350: Wyalkatchem.
Green D.B., PO Box 51, Carnamah 6517: Carnamah.
H.B. Brady & Co. Pty Ltd, PO Box 42, Bayswater 6053, (09) 279 4422: Lake Brown.
Hillerman W, Wandel N, Sime K & A, PO Box 165, Esperance 6450: Esperance.
Nixon P.F. & R.S., PO Box 49, Kalannie 6468, (096) 66 2045 Lake Hillman.
Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Lake Hillman.

HEAVY MINERAL SANDS

Allied Eneabba Pty Ltd, 45 Stirling Hwy, Nedlands 6009, (09) 389 1222: Eneabba.
Associated Minerals Cons. Ltd, 45 Stirling Hwy, Nedlands 6009, (09) 389 1222: Capel, Eneabba.
Cable Sands (WA) Pty Ltd, PO Box 133, Bunbury 6230, (097) 21 4111: Capel.
Northern Metals & Oil Pty Ltd, PO Picton 6229, (097) 25 4899: Waroona.
Target Minerals NL, PO Box 188, Geraldton 6530, (099) 23 3644: Port Gregory.
Westralian Sands Ltd, PO Box 96, Capel 6271, (097) 27 2002 Yoganup.

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INDUSTRIAL PEGMATITE MINERALS

**Felspar**

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

**Mica**

Pilbara Mica Corporation Pty Ltd, PO Box 301, Bridgetown 6255: Pippingarra.

IRON ORE

BHP Minerals Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Koolan Island.
Goldsworthy Mining Ltd, 197 St George's Tce, Perth 6000, (09) 322 1788: Shay Gap.
Hamersley Iron Pty Ltd, 191 St George's Tce, Perth 6000, (09) 327 2327: Tom Price.
Hancock Mining Ltd, 28 Ventnor Ave, West Perth 6005, (09) 481 3888: McCameys.
Mt Newman Mining Co. Ltd, 200 St George's Tce, Perth 6000, (09)320 4666: Newman.
Robe River Mining Co. Pty Ltd, 12 St George's Tce, Perth 6000, (09) 421 4747: Pannawonica.

LIMESAND - LIMESTONE - DOLOMITE

**Dolomite**

Green K & P, PO Box 31, Newdegate 6355, (098)71 1547: Lake Magenta.

**Limesand - Limestone**

Chelmsford Pty Ltd, 3/104 Erindale Rd, Balcatta 6018, (09) 3453009: Wanneroo.
Cockburn Cement Ltd, Russell Rd, South Coogee 6166, (09) 410 1988: Cockburn Sound, Coogee.
Endeavour Resources Ltd, 15th Floor, 108 St George's Tce, Perth 6000, (09) 324 6350: Dandaragan, Dongara, Gingin, Irwin, Yanchep.
Henderson Nominees Pty Ltd, 19 Rangeview Road, Lansdale 6065, (09) 342 9988: Moore River.
Limestone Building Blocks Co. Pty Ltd, 41 Spearwood Ave, Bibra Lake 6163, (09) 418 4440: Nowerup.
Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Wanneroo.
Woodbridge Investments Pty Ltd, 6/154 Hampden Rd, Nedlands 6009: Mt Barker.

MANGANESE ORE

Mount Sydney Manganese Pty Ltd, C/- 124 Parry St, East Perth 6004, (09) 328 2622: Woodie Woodie.

NICKEL

Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Carnilya Hill, Kambalda, Leinster, Windarra.

PEAT

Magnet Industries Pty Ltd, 665 Welshpool Rd, Wattle Grove 6107, (09) 453 6777: Manjimup.

PETROLEUM

Barrack Energy Ltd, 30 Ord St, West Perth 6005, (09) 320 1777: Mt Horner.
Bond Corporation Pty Ltd, 108 St George's Tce, Perth 6000, (09) 324 6200: Harriet.
Consolidated Gas Pty Ltd, 174 Hamden Rd, Nedlands 6009, (09) 389 8344: Woodada.
Eromanga Pty Ltd, PO Box R204, Royal Exchange NSW 2000, (02) 2474605: Blina, Lloyd, Sundown/W Terrace.
Marathon Petroleum Aust. Ltd, PO Box 6192, East Perth 6004, (09)325 1988: Talisman.
West Aust. Petroleum Pty Ltd, 233 Adelaide Tce, Perth 6000, (09) 325 0181: Barrow Island,
Dongara, Saladin.
Western Mining Corp. Ltd, 28 Ventnor Ave, West Perth 6005, (09) 482 2444: Herald/Pepper.
Woodside Offshore Pet. Pty Ltd, 1 Adelaide Tce, Perth 6000, (09) 244 4111: North Rankin.

RARE EARTHS

**Gallium**

Rhone Poulenc Chimie Aust. Pty Ltd, 200 Adelaide Tce, Perth 6000,(09) 325 8500: Del Park.

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**SALT**

Dampier Salt (Operations) Pty Ltd, 177A St George's Tce, Perth 6000, (09) 327 2299: Dampier, Lake Macleod.
Leslie Salt Company (Inc), 225 St George's Tce, Perth 6000, (09) 325 4888: Port Hedland.
Shark Bay Salt Joint Venture, 22 Mount St, Perth 6000, (09) 322 4811: Useless Loop.

**SILICA - SILICA SAND**

**Silica**

Barrack Silicon Pty Ltd, 262 St George's Tce, Perth 6000, (09) 322 2288: Dalaroo.

**Silica Sand**

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Jandakot.
Australian Glass Manufacturing Co., 35 Baillie Rd, Canning Vale 6155, (09) 455 1111: Lake Gnangara.
Bell Basic Industries Ltd, 136 Great Eastern Hwy, Guildford 6055, (09) 279 0000: Jandakot.
The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Jandakot.
Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Mt Burgess.

**TALC**

Gwalia Minerals NL, 38 Parliament Pl, West Perth 6005, (09) 481 0023: Mt Seabrook.
Western Mining Corp. Ltd, PO Box 116, Three Springs 6519, (099) 54 5047: Three Springs.

**TIN - TANTALUM - LITHIUM**

**Spodumene**

Lithium Australia Ltd, 91 Kensington St, East Perth 6004, (09) 325 1966: Greenbushes.

**Tantalite - Tin**

Goldrim Mining Australia Ltd, 317 Hunter St, Newcastle NSW 2300, (049) 29 2433: Wodgina.
Greenbushes Ltd, 91 Kensington St, East Perth 6004, (09) 325 1966: Greenbushes.

**VERMICULITE**

Vermiculite Industries Pty Ltd, 15 Spencer St, Jandakot 6164, (09) 417 9900: Young River.