

CHAPTER 26

MINERAL INDUSTRY

Further detailed statistics and information on the subjects dealt with in this chapter are contained in the annual printed bulletin *The Australian Mineral Industry—Annual Review* and other publications issued by the Bureau of Mineral Resources, Geology and Geophysics, which also issues, in conjunction with the A.B.S., a quarterly publication, *The Australian Mineral Industry, (Quarterly Review and Statistics)* (10.17). The annual statistical bulletins *Mining Establishments, Summary of Operations (Preliminary)* (10.72), *Mining Establishments, Details of Operations* (10.60), *Mineral Production* (10.51), *Mineral Exploration* (10.41), and *Mining Industry, Foreign Ownership and Control* (10.42) of the A.B.S. contain economic statistics of the industry prepared and published as soon as possible after the data have been compiled. A monthly statistical bulletin *Minerals and Mineral Products* (10.19) is issued also, and other current statistics on mining or mine products are contained in the *Monthly Review of Business Statistics* (1.4), the *Digest of Current Economic Statistics* (1.5), and the monthly bulletin *Production Statistics* (12.14).

GENERAL

Geology

General geology

Most of the western and central part of the Australian continent consists of basement rocks of Precambrian age. Younger Palaeozoic rocks, mostly of geosynclinal origin, form a discontinuous belt several hundred miles wide extending from north Queensland to Tasmania. Mesozoic platform sediments form a broad zone separating the Palaeozoic and Precambrian rocks and extending from the Gulf of Carpentaria to central New South Wales. Cainozoic rocks occur mainly in Victoria, south-western New South Wales and southern South Australia, and as residual basalt cappings over extensive areas of the Palaeozoic rocks of eastern Australia.

Economic geology

Minerals of economic significance occur widely throughout the Precambrian and Palaeozoic rocks of the continent. Palaeozoic mineralisation is perhaps more varied, but the Palaeozoic deposits now being worked are in general smaller than those found in Precambrian rocks. Most of Australia's metallic mineral deposits occur within two broad regions, a region of Precambrian rocks in the west and central areas of the continent and a region of younger Palaeozoic rocks in the east.

The major deposits of metallic ore minerals, including those of iron, lead, zinc, silver, copper, uranium, nickel, and gold, are contained in the Precambrian rocks of the Australian shield. Smaller deposits of ores of tin, tungsten, tantalum, beryllium, manganese, cobalt, and mica are also contained in these rocks.

The mineralised Palaeozoic rocks contain major deposits of gold, now mostly worked out, and a few large copper and lead-zinc-silver ore occurrences. Smaller amounts of ores of tin, tungsten, molybdenum, bismuth, antimony, and ores of other metals also occur in these rocks.

Outside these two main categories, however, there are some metallic mineral deposits of considerable economic importance which were formed during the Tertiary Period. These include bauxite (the ore of aluminium) which occurs as a surface capping over rocks of various ages, the result of a long period of weathering and reworking. Extensive deposits of bauxite occur at Weipa on Cape York Peninsula in north Queensland, at Gove on the north-eastern tip of the Northern Territory, in the Darling Range in Western Australia and near Kalumburu in the north-west of Western Australia.

Other important deposits which are the results of weathering are the lateritic nickel deposits at Greenvale and Rockhampton in Queensland, and in the Kalgoorlie and Wingellina areas of Western Australia. Mineral sands, another important exception, contain rutile and ilmenite (ores of titanium), zircon (zirconium ore), monazite (thorium ore), and other minerals, and are particularly well developed on the coasts of central and northern New South Wales, southern Queensland and south-western Western Australia. The immediate source of the deposits of the eastern States is considered to be Mesozoic sedimentary rocks. The Western Australian deposits are thought to be derivatives of the Precambrian granites of the Australian shield.

Occurrences of fuel minerals (coal, oil and natural gas) are characteristically located in sedimentary basins. Large areas of Australia are covered by these basins, and more than twenty major sedimentary basins have been identified on the Australian mainland. In addition, sedimentary basins are known to exist in off-shore areas adjacent to the Australian coast. The individual basins range in area from 10,000 to 1,760,000 square kilometres and contain marine and continental sedimentary rocks ranging in maximum thickness from 300 to about 10,000 metres and including rocks of all ages from Proterozoic to Tertiary.

The main Australian deposits of black coal are in eastern Queensland and New South Wales. Most are Permian in age, although the deposits at Ipswich in Queensland are Triassic, and they predominantly have a bituminous rank; both coking and non-coking types occur. The extensive brown coal deposits of Victoria were formed during the Tertiary Period and are used to produce electricity for that State. The Late Triassic sub-bituminous coal at Leigh Creek is used to produce electricity in South Australia and Permian sub-bituminous coal is mined at Collie in Western Australia.

Crude oil and natural gas have been found in a number of sedimentary basins. In the Bowen-Surat Basin, Queensland, small commercial deposits of oil exist at the Moonie, Alton and Bennett fields, and commercial deposits of natural gas exist in the Roma and Rolleston areas. Gas from the Roma area is used to supply Brisbane. Small gas reserves are present at Gilmore in the Adavale Basin. Most of the oil reservoir rocks are of Lower Jurassic age, and the gas reservoir rocks are of Mesozoic and Permian age. In the Gippsland Basin, offshore from Victoria in Bass Strait, oil in commercial quantities has been discovered in the Kingfish, Halibut, Tuna, Barracouta and Mackerel fields and commercial natural gas in the Marlin, Barracouta, Snapper and Tuna fields. Cretaceous and Tertiary strata are the reservoir rocks. Eastern Victoria and Melbourne are now supplied with gas from Marlin and Barracouta fields; oil is being produced from Kingfish, Halibut and Barracouta. Commercial deposits of natural gas were discovered in the Cooper Basin, South Australia at Gidgealpa, Moomba, Daralingie, Toolachee, Merrimelia, Della, Strzelecki, Mudrangie, Packsaddle, Brolga, Coonatie, Fly Lake, Big Lake, Dullingari, Brumby, Kanowana and Burke, and gas and oil at Tirrawarra, Moorari and Fly Lake, all in South Australia, and gas accumulations at Wologolla, Durham Downs, Roseneath and Epsilon, Queensland. The reservoir rocks are of Permian age. In the Carnarvon Basin, Western Australia, commercial crude oil, mainly in the Cretaceous formations, and also to a lesser degree in the Jurassic rocks, is being produced from Barrow Island. Offshore, major gas deposits have been discovered at Goodwyn, Tidepole, West Tryal Rocks, Angel and North Rankin; minor gas accumulations occur at Dockrell and Rankin. Non-commercial oil was discovered at Rankin, Legendre, Madeleine, Eaglehawk, Egret, Lambert, Dockrell, Goodwyn and Tidepole. Further south, onshore in the Perth Basin, natural gas in commercially significant quantities was discovered in the Yardarino, Gingin, Dongara, Mondarra and Walyering areas, the reservoir rocks being of Lower Jurassic, Lower Triassic and Permian ages. The evaluation of the size of the Scott Reef gas discovery in the Brause Basin in reservoirs of Lower to Middle Jurassic, and Upper Triassic age is dependent upon the drilling of at least one other well. Natural gas was encountered in the offshore Bonaparte Gulf Basin in the Petrel, Tern, Sunrise, Troubadour and Puffin prospects and onshore at Bonaparte and Keep River. Natural gas was discovered in large quantities in formations of Ordovician age at Mereenie and Palm Valley in the Amadeus Basin, Northern Territory. The lower gas accumulation at Mereenie is underlain by oil in the same Pacoota Sandstone reservoir.

The most important non-metallic minerals mined in Australia are asbestos, clays, sand and gravel, limestone, gypsum, salt and silica.

Opal is found in the flat-lying sedimentary beds of the Great Artesian Basin in Queensland, New South Wales and South Australia and was formed during the Tertiary Period. The other important gemstone produced is sapphire from alluvial wash near Inverell and Glen Innes in New South Wales and Anakie in Queensland.

A table showing most of the larger mineral deposits now being mined in Australia according to the age of the geological formation in which they are found is shown on page 927.

PRINCIPAL AUSTRALIAN MINERAL DEPOSITS

| <i>Age of geological formation in which located</i> | <i>Metal or mineral</i> | <i>State or Territory</i> | <i>Locality</i> |
|----------------------------------------------------------|-------------------------|--------------------------------------------------------|------------------------------------------------------------------------------|
| Precambrian (more than 570 million years old) | Copper | Queensland Western Australia Northern Territory | Mount Isa, Gunpowder Golden Grove Tennant Creek |
| | Gold | Western Australia | Kalgoorlie, Telfer and other localities |
| | Iron | South Australia Western Australia | Middleback Ranges Yampi Sound, Pilbara and Yilgarn regions |
| | Lead-silver-zinc | New South Wales Northern Territory Queensland | Broken Hill McArthur River Mount Isa |
| | Nickel | Western Australia | Kambalda, Windarra, Scotia, Nepean, Agnew, Forrestania, Spargoville |
| | Tin (lode) Uranium | Western Australia Northern Territory | Greenbushes Nabarlek, Ranger, Koon- garra, Jabiluka |
| Palaeozoic (between 235 and 570 million years old) | Black coal | New South Wales Queensland Western Australia | Hunter Valley, Lithgow, South Coast Bowen Basin, Blair Athol Collie |
| | Copper | New South Wales | Cobar, Woodlawn |
| | Copper-gold | Tasmania | Mount Lyell |
| | Iron | Tasmania | Savage River |
| | Lead-silver-zinc | New South Wales Tasmania | Elura Rosebery, Que River |
| | Phosphate | Queensland | Duchess, Lady Annie, Ardmore, Yelvertoft |
| | Tin (lode) | Queensland New South Wales Tasmania | Herberton Ardlethan Renison, Luina and north-east of State |
| | Tungsten | Tasmania | King Island and north-east of State |
| | Black coal | Queensland South Australia | Ipswich, Callide Leigh Creek |
| | Manganese | Northern Territory | Groote Eylandt |
| Cainozoic (less than 65 million years old) | Bauxite | Queensland Northern Territory Western Australia | Weipa, Aurukun Gove Darling Range |
| | Brown coal | Victoria | Gippsland |
| | Mineral sands | New South Wales Queensland Western Australia | North coast South coast South-west coast |
| | Nickeliferous laterite | Queensland | Greenvale |
| | Tin (alluvial) | New South Wales Queensland Tasmania | Tingha Herberton North-east of State |
| | Uranium | Western Australia | Yeelirrie |

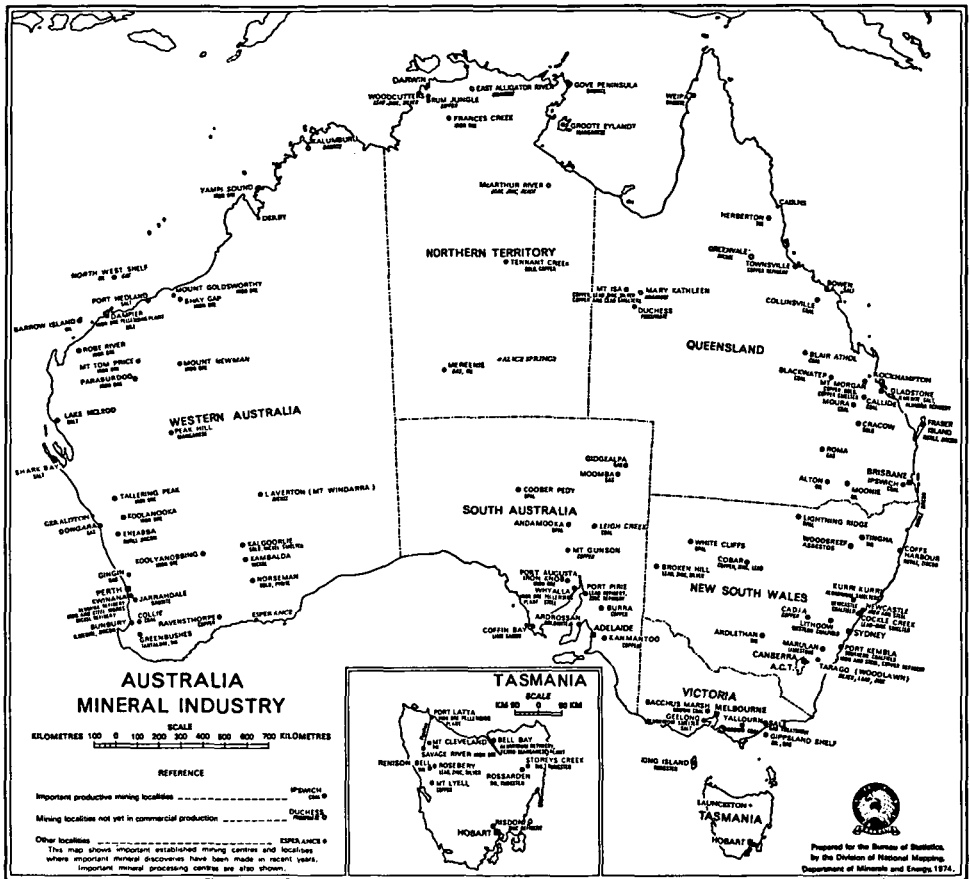


PLATE 57

Mineral resources

Australia is self-sufficient in most minerals of economic importance and much more than self-sufficient in some. The following table summarises, in a general way, known reserves and production of the principal metals and minerals in relation to Australian consumption of these commodities and present export availability. Many qualifications are necessary to a simple summary of this kind, and the table should be read in conjunction with the following detailed notes on principal minerals.

RESERVES OF MINERALS: AUSTRALIA

(Source: Bureau of Mineral Resources, Geology and Geophysics)

| <i>Production</i> | <i>Reserves adequate</i> | <i>Reserves uncertain</i> | <i>Reserves negligible</i> |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Production sufficient for domestic demand and exports | Aluminium (bauxite) Barite Bismuth Cadmium Coal (black) Cobalt Copper Gold Gypsum Iron ore Lead Manganese ore (metallurgical) Natural gas Nickel Opal Phosphate Salt Silver Thorium (monazite) Tin Titanium (ilmenite and rutile) Tungsten Zinc Zirconium (zircon) | Antimony Beryllium Glass sands Talc Tantalum | |
| Production sufficient for domestic demand | Clays (except light grade china clay) Coal (brown) Dolomite | | |
| Production not sufficient for domestic demand | Asbestos (chrysotile) Felspar Lithium Sulphides (as source of sulphur) Limestone | Abrasives Arsenic Bentonite China clay Chromium Crude oil Diatomite Fluorite Magnesite Mercury Mineral pigments Molybdenum Platinum Potassium salts Sillimanite | |
| Production nil | Vanadium | Diamonds Graphite Manganese ore (chemical) Vermiculite | Asbestos (crocidolite) Borates Nitrates Sulphur |

Individual minerals

NOTE. For further information on recent developments see pages 969-72.

Bauxite. As a result of discoveries in the Weipa and Aurukun areas, Queensland, Gove, Northern Territory, and in the Darling Range and Kimberley area in Western Australia, Australia's reserves of bauxite are known to be very large, perhaps the largest in the world. Total reserves in the Weipa and Aurukun areas are believed to be in excess of 3,000 million tonnes, while proved reserves at Gove are reported to be 250 million tonnes of bauxite. In the Darling Range, reserves of economic grade bauxite are estimated to be about 1,000 million tonnes spread over several locations. Another significant deposit of 235 million tonnes has been proved in the Mitchell Plateau area in the Kimberley District of Western Australia.

Coal. Australia has coal resources of all types adequate to provide for future domestic requirements and a substantial export surplus. Australia's coal reserves are concentrated mainly in the mainland eastern States. The bituminous coal is located mainly in New South Wales and Queensland; Victoria has very substantial brown coal reserves in the Latrobe Valley. The value of coal production in 1975 was the greatest of all mine products, and the value of coal exports was second only to iron ore and pellets. Resources of black coal in Eastern Australia were estimated in 1975 to be not less than 200,000 million tonnes of which *in situ* reserves were 34,739 million tonnes.

Copper. The principal deposit of this metal is at Mount Isa, Queensland where ore reserves were estimated at 140 million tonnes in 1975 containing 4.197 million tonnes contained copper. Other important deposits are situated at Cobar, New South Wales; Gunpowder, Queensland; Mount Lyell, Tasmania; Kanmantoo and Mount Gunson, South Australia; and at Tennant Creek, Northern Territory. Copper concentrates are produced as by-products of nickel concentrate production at Kambalda, Western Australia; silver-lead-zinc concentrate production at Broken Hill, New South Wales; tin concentrate production at Luina, Tasmania and lead concentrate production at Rosebery, Tasmania.

Crude Oil. The aggregate recoverable reserves of crude oil in Australia in commercially viable fields at the end of 1975 were estimated to be 243 million cubic metres. The largest reserves (213.5 million cubic metres) are in the offshore Gippsland Basin fields (Barracouta, Marlin, Halibut, Kingfish, Tuna, Mackerel), Victoria, followed by those in the Barrow Island field in the Carnarvon Basin, Western Australia (21.34 million cubic metres), the Tirrawarra, Moorari and Fly Lake fields in the Cooper Basin, South Australia (7.65 million cubic metres), the Moonie, Alton and Bennett fields in the Surat Basin, Queensland (240,000 cubic metres) and in the Dongara and Yardarino fields in the Perth Basin, Western Australia (230,000 cubic metres). To the end of 1975 the cumulative production of crude oil from fields declared commercially viable in Australia accounted for 122.15 million cubic metres representing a 33.5 per cent depletion of the initial estimates of reserves in all commercially viable crude oil fields in Australia.

The Queensland oil reserves, mainly those in the Moonie field, are depleted by nearly 93 per cent, those in the Carnarvon Basin fields by 47 per cent and the offshore Gippsland Basin reserves by 32 per cent.

Gold. Australia's gold resources are heavily concentrated in Western Australia, mainly in the Kalgoorlie-Coolgardie area, but small deposits of gold-bearing ore occur in all States. In addition, gold is commonly obtained as a by-product of other mining activities, particularly copper mining. Economic gold ore reserves at Kalgoorlie were estimated at 3.7 million tonnes in early 1976.

Iron ore. Very extensive deposits of iron ore have been discovered, establishing Australia as one of the most important iron ore provinces in the world. The largest deposits are located in the Hamersley and Ophthalmia Ranges in the Pilbara region of north-west Western Australia, and are being worked at Mount Tom Price, Paraburdoo, Mount Whaleback, and Robe River. Other commercially important deposits of iron ore are situated in the Savage River area of Tasmania, in the Middleback Ranges of South Australia, and in the Mount Goldsworthy, Shay Gap, Yampi Sound, and Koolyanobbing areas in Western Australia. These deposits are adequate to supply the estimated needs of the Australian iron and steel industry far into the future, as well as providing a large export availability. Reserves and paramarginal resources in Australia are estimated to be 35,000 million tonnes. An assessment of iron ore resources is given in *The Australian Mineral Industry Quarterly Review* Vol. 27, No. 2.

Lead-zinc-silver. Australia has been a major producer of lead, zinc and silver since the discovery of ore at Broken Hill, New South Wales in 1883. Australian reserves of contained lead are 13.9 million tonnes, contained zinc 19.3 million tonnes, and contained silver 24.2 million kilograms. Lead and zinc concentrates are being produced with copper concentrates at Cobar, New South Wales. Reserves of lead-zinc-silver ore at Broken Hill currently exceed 17 million tonnes assaying about 11 per cent lead, 11 per cent zinc and 100 grams of silver per tonne. Reserves at another major producing mine, Mount Isa in Queensland, are 51 million tonnes assaying 7 per cent lead 6.6 per cent zinc and

153 grams silver per tonne. Development of a new mine is underway at Hilton, near Mount Isa with reserves of 37 million tonnes of ore, assaying 7.7 per cent lead, 9.6 per cent zinc and 180 grams silver per tonne. Reserves at the Lady Loretta deposit, near Mount Isa, are 8.7 million tonnes of ore assaying 6.7 per cent lead, 18.1 per cent zinc and 109 grams silver per tonne. The capacity of the mine at Rosebery in Tasmania (reserves of 8.4 million tonnes, 5 per cent lead, 17.3 per cent zinc and 148 grams silver per tonne) has been increased. Development of the McArthur River deposit in Northern Territory (reserves of 190 million tonnes, 4.1 per cent lead, 9.5 per cent zinc and 44 grams silver per tonne) is dependent on the solution of complex metallurgical problems. A deposit discovered near Tarago, near Goulburn, N.S.W. at Woodlawn could commence production in 1978; reserves are estimated at 9 million tonnes assaying 3.0 per cent lead, 7.5 per cent zinc and 1.5 per cent copper.

Manganese. Known reserves of manganese, exceed domestic requirements and Australia is a major exporter. The principal deposit is currently being worked at Groote Eylandt in the Gulf of Carpentaria.

Mineral Sands. Ores of titanium (rutile and ilmenite), zirconium (zircon) and thorium and rare earths (monazite) occur in mineral sands over extensive areas of the north and central coasts of New South Wales, the south and central coasts of Queensland, and the south-western coast of Western Australia and at Eneabba, 270 kilometres north of Perth. Resources are large by world standards and easily workable. Australia's reserves of rutile and zircon represent a large proportion of the world's reserves of these minerals. In 1974 Australia was responsible for about 95 per cent of the world's supplies of rutile, 70 per cent of zircon, 33 per cent of monazite and 22 per cent of ilmenite.

Natural gas. The initial recoverable reserves of natural gas in commercially viable fields, both in the offshore and onshore accumulations were estimated at the end of 1975 at 349.18 thousand million (billion) cubic metres. Of this amount 23.1 billion cubic metres, or 7 per cent, have been produced; the remaining reserves at 31 December 1975 were, therefore 326.08 billion cubic metres. The largest remaining gas reserves (211.14 billion cubic metres) are in the offshore Gippsland Basin, Victoria. Production commenced from here in 1969, and gas is supplied to Melbourne, Geelong and Ballarat—Bendigo areas and a Melbourne-Benalla-Wodonga-Albury pipeline is planned. The 93.86 billion cubic metres of gas reserves in the Cooper Basin, South Australia, had been committed for the supply of the Adelaide, South Australia and the New South Wales markets. The supply of the Adelaide market commenced in November 1969. The 1,370 kilometre pipeline to Sydney was opened in 1976. The small gas reserves in the Roma area in Queensland and Dongara-Mondarra-Gingin area in Western Australia have been supplying the Brisbane and Perth-Pinjarra areas since 1969 and 1971 respectively.

Natural gas liquids. The Australian reserves of natural gas liquids in commercial viable fields, i.e. condensate and LPG (liquified petroleum gas), remaining at the end of 1975 were estimated at 134.51 million cubic metres. On the whole these reserves are distributed proportionately to the reserves of natural gas, the largest being in the offshore Gippsland Basin and the Cooper Basin. A separate 'liquids' pipeline for the transmission of NGL and crude oil from the Cooper Basin fields to Red Cliffs near Port Pirie, South Australia, has been under consideration for some time.

Nickel. In the Kalgoorlie-Widgiemooltha area of Western Australia more than 30 nickel sulphide ore bodies have been found since the original discovery of nickel ores was made at Kambalda in 1966. Total ore reserves in the Kalgoorlie area are more than 34 million tonnes, averaging 2.8 per cent nickel. Other large but low-grade ore bodies have been found between Leonora and Wiluna; the largest of these is Mount Keith where ore reserves are estimated to be 290 million tonnes averaging 0.6 per cent nickel. In the Leonora-Wiluna area at Agnew the ore body is estimated to contain at least 45 million tonnes of ore averaging over 2.0 per cent nickel.

A nickel refinery has been built at Kwinana, Western Australia, with an annual capacity of 30,000 tonnes. The smelter at Kalgoorlie now has a capacity to treat 350,000 tonnes of nickel concentrate per annum. The matte produced is processed at the Kwinana and overseas refineries. Bulk oxygen in the smelter is expected to increase throughput by 75 per cent.

Production from lateritic nickel deposits at Greenvale in Queensland commenced in 1974. The ore is refined near Townsville at Yabulu. Other large, but at present uneconomic, deposits of this type are known at Wingellina, near the border of South Australia and Western Australia, at the Ora Banda district northwest of Kalgoorlie and at Marlborough in Queensland.

Phosphate. Major deposits of phosphate rock are known in northwest Queensland and in the Northern Territory with reserves exceeding 3,300 million tonnes of average grade 7.3 per cent phosphorus. Production from the northwest Queensland deposits commenced in 1975.

Tin. The main deposits of tin now being exploited are in the Herberton field inland from Cairns, Queensland; north-west and north-east Tasmania; in the south-west of Western Australia; and at Ardlethan and in the New England area, in New South Wales.

Tungsten. The main deposits of tungsten ores are in north-eastern Tasmania (wolfram) and on King Island (scheelite). Australia's own requirements are small, and production is principally for export. Australian production of tungsten concentrates could be doubled by the late 1970s when the planned increases in production at King Island take effect. A major expansion program at the wolfram mine at Mareeba, Queensland, will be completed at the end of 1976.

Uranium. Exploration and development work continued in the Alligator River's uranium province in the Northern Territory. The four major deposits at Nabarlek, Koongarra, Ranger and Jabiluka have reserves in excess of 310,000 tonnes uranium.

Other important deposits have been outlined at Yeelirrie, Western Australia (42,000 tonnes uranium) and at the Beverley deposit (13,500 tonnes uranium) in the Lake Frome region, South Australia. At Mary Kathleen, Queensland, recoverable reserves have been estimated at almost 8,500 tonnes uranium; uranium oxide production commenced in 1976.

There has been no production of uranium oxide since 1971 in Australia.

A pilot plant for uranium oxide production will be constructed by 1978 using ore from Yeelirrie. The company hopes to be in full commercial production in 1980-81.

Administration

All mineral rights in Australia are vested in the Crown except on land which was granted before the Crown began to reserve mineral rights. In practice these private mineral rights are important only in the New South Wales coalfields. In the States, rights are held by the State Governments and in the Territories of the Commonwealth these rights are vested in the Commonwealth Government. The Commonwealth Government is able also to influence over-all development and production activity in the mineral industry by virtue of its statutory powers with respect to international trade, customs and excise, taxation, and loan raisings. Certain specially formed bodies such as the Joint Coal Board and the Australian Atomic Energy Commission have been given administrative responsibility in defined areas.

Control of mining

Each State or Territory has its own mining Acts or Ordinances and regulations governing the prospecting for and working of mineral deposits. Before the commencement of the Acts mentioned in the next paragraph these Acts, etc., were similar in principle, but different in detail. They all made provision for miner's rights to prospect and for small mining leases for mineral production. The principles embodied in these Acts, etc., were established many years ago when mining operations were generally small scale and labour-intensive. Although amendments had been enacted to modernise the legislation, it was generally inadequate for the large scale capital intensive operations often involved with modern mineral development. For this reason a large enterprise may take the course of acquiring mining titles by negotiation with the appropriate Minister for Mines and having the agreed terms and conditions embodied in an Act of the State Parliament. This method of acquisition has been used in several cases where the leasing company undertook an obligation (such as the erection of a large treatment works) in return for leases over large areas for a long period, and has become more common in recent years (e.g. iron ore in Western Australia, coal and bauxite in Queensland, bauxite in the Northern Territory).

Two States have brought into operation new mining acts, i.e. *The Queensland Mining Act of 1968 to 1971* which commenced on 1 January 1972 and *The South Australian Mining Act, 1971* which commenced on 3 July 1972. These Acts are simpler and more suited to modern conditions than the mining acts which they replaced. Western Australia and New South Wales introduced Bills for new mining acts into their respective Parliaments in 1972. The New South Wales Act was passed in 1973 and became operative in March 1974. The proposed Western Australian legislation was still in the form of a bill in March 1976.

AREAS OCCUPIED UNDER MINING ACTS AND ORDINANCES^(a)
(*000 hectares)

| <i>Year</i> (31 December) | <i>N.S.W.</i> (b) | <i>Vic.</i> (c) | <i>Qld</i> (d) | <i>S.A.</i> (b) | <i>W.A.</i> | <i>Tas.</i> | <i>N.T.</i> (b) | <i>Total</i> |
|------------------------------|-------------------|-----------------|----------------|-----------------|-------------|-------------|-----------------|--------------|
| 1971 . . . | 464 | 498 | 1,589 | 55 | 3,165 | 25 | 41 | 5,837 |
| 1972 . . . | 656 | 133 | 1,405 | 59 | 1,721 | 26 | 48 | 4,048 |
| 1973 . . . | (e)1,115 | 25 | 1,258 | 58 | 1,850 | 36 | 51 | 4,393 |
| 1974 . . . | n.a. | 24 | 1,217 | 48 | 1,653 | 36 | 59 | n.a. |
| 1975 . . . | n.a. | 24 | 1,294 | 43 | 1,297 | n.a. | 62 | n.a. |

(a) Excludes areas held under special arrangements; see following text. (b) At 30 June. (c) Includes land held under *Extractive Industries Act 1966*. (d) Excludes lands held under miners' rights and dredging claims. (e) Figures not comparable with previous years; Includes some new coal titles, as defined by the *Coal Mining Act 1973*.

Control of exploration

This section refers in general to the exploration for all types of mineral deposits in Australia. Additional information relating to the search for petroleum is set out in the following section.

As a result of the introduction of large scale modern prospecting methods (particularly airborne prospecting), the small prospecting areas referred to in the previous section were found to be unsuitable in some instances, and steps have been taken in the States and Territories to ensure the availability of large areas for prospecting by interested persons. Large areas may be made available by provision within the Mining Acts or Ordinances for the issue of authorities to prospect over an area defined by a written agreement which also sets out provisions as to the amount of money to be spent, methods of prospecting, tenure of the agreement, etc.

The tenure of such areas is limited, usually to one or two years only, and, if renewed for a further period, is only over an area selected from the larger area (usually 50 per cent) as a result of work done during the life of the initial agreement. It does not give the holder any rights over, or authorities to prospect on, land already held under a mining title within the agreed area. Unless specifically stated in an agreement, the discovery of minerals, whether inside or outside an area covered by an authority to prospect, gives the discoverer no legal rights except the right to apply for a mining lease over the area in which the discovery was made. Suitable prospects are converted to mining tenements by making application for lease under the appropriate mining Act.

Control of petroleum exploration

On-shore. In Australia all petroleum is the property of the Crown. Consequently, full control of petroleum mining rights is vested in the Government or Administration of each State or Territory. Any company, organisation or individual proposing to undertake petroleum exploration or development must first satisfy the Government concerned that the necessary financial and technological resources are available to carry out the operation.

There are three main types of petroleum titles:

- (a) the permit, covering initial geological, geophysical and exploration drilling;
- (b) the licence (in Victoria only), which covers detailed surveys and drilling; and
- (c) the lease, which covers development operations and production.

Further details of the petroleum legislation are given in Year Book No. 55, pages 996-7. The States of Western Australia and South Australia recently issued some revisions to their on-shore legislation, for details of which direct reference should be made to the State concerned.

Off-shore. The *Petroleum (Submerged Lands) Act 1967* is the instrument whereby the control and safeguarding of the exploration and exploitation of petroleum resources on the territorial sea-bed and on the continental shelf are assured. Complementary legislation has been passed by each State Government and by the Commonwealth Government.

The legislation provides for a two-stage system of titles: the exploration permit, which covers all forms of exploration including drilling; and the production licence, which covers development and exploration. Royalty is generally shared between State and Commonwealth Governments on a 60 : 40 basis, however, overriding royalty is payable to the State under certain conditions. Mineral royalty receipts of government under these Acts are included in the table on page 934.

AREAS OCCUPIED UNDER PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

| Year (31 December) | N.S.W. | Vic. | Qld | S.A.(a) | W.A. | Tas. | N.T.(a) | Total |
|---------------------------------------|---------|--------|-----------|---------|---------|-------|---------|--------|
| ON-SHORE AREAS (square kilometres) | | | | | | | | |
| 1971 . . . | 196,145 | 47,892 | 885,596 | 569,710 | n.a.(b) | 596 | 149,530 | n.a. |
| 1972 . . . | 86,728 | 51,442 | 1,296,085 | 567,187 | n.a.(b) | .. | 149,530 | n.a. |
| 1973 . . . | 158,164 | 34,582 | 692,500 | 599,293 | n.a.(b) | 16 | 163,504 | n.a. |
| 1974 . . . | 101,564 | 20,064 | 618,600 | 596,415 | n.a.(b) | .. | 152,422 | n.a. |
| 1975 . . . | 44,612 | 9,704 | 532,500 | 290,900 | n.a.(b) | | 127,040 | n.a. |
| OFF-SHORE AREAS (5 minute blocks) (c) | | | | | | | | |
| 1971 . . . | 782 | 1,178 | 2,918 | 3,089 | 8,727 | 1,703 | 3,534 | 21,931 |
| 1972 . . . | 503 | 1,178 | 2,918 | 3,089 | 10,171 | 1,498 | 3,535 | 22,892 |
| 1973 . . . | 433 | 1,178 | 2,918 | 3,089 | 9,828 | 1,498 | 4,283 | 23,227 |
| 1974 . . . | 53 | 939 | 2,221 | 2,685 | 8,032 | 475 | 9,024 | 23,429 |
| 1975 . . . | .. | 529 | 1,954 | 1,398 | 2,231 | | 6,843 | |

(a) At 30 June. (b) Available only in terms of 5 minute blocks of which there were 6,510 at 31 December 1971, 8,036 at 31 December 1972, 7,260 at 31 December 1973, 5,413 at 31 December 1974, and 1,679 at 31 December 1975. (c) Area bounded by 5 minutes of latitude and 5 minutes of longitude; figures include partial blocks.

Mineral royalties

The collection by governments of royalties for the production of minerals within their area of authority is an internationally accepted practice. In Australia the responsibility for mineral royalties is largely a State concern, and all States currently collect some form of mineral royalty payments. In the past most States have relied on an established system of standard rates which were uniform for all producers of any particular mineral in the State concerned. These charges were either a fixed monetary amount per tonne (e.g. 5c per tonne on gypsum mined in New South Wales) or an *ad valorem* royalty (e.g. 1.5 per cent of gross value of gold produced in New South Wales).

In recent years there has been an important basic change in the system of establishing royalty commitments, and it is now quite common for State Governments to negotiate special royalty rates with companies which are seeking mineral leases for large scale developments. These royalty rates may vary, depending on whether production is for export or for domestic processing. The rates for a particular mineral may also vary between producers. Important examples of this type of royalty agreement are the iron ore development agreements in Western Australia and coal development agreements in Queensland. Mineral royalties received by Governments in recent years are shown in the table below.

MINERAL ROYALTY RECEIPTS: GOVERNMENTS
(\$'000)

| | 1969-70 | 1970-71 | 1971-72 | 1972-73 | 1973-74 |
|----------------------------|---------------|---------------|---------------|---------------|---------------|
| New South Wales(a) | 13,558 | 17,819 | 10,237 | 9,592 | 13,496 |
| Victoria(b) | 2,736 | 12,239 | 16,875 | 18,025 | 23,922 |
| Queensland(a) | 3,039 | 5,483 | 3,805 | 3,525 | 4,319 |
| South Australia | 1,557 | 1,798 | 1,821 | 1,807 | 1,944 |
| Western Australia | 15,700 | 22,347 | 25,247 | 27,666 | 33,615 |
| Tasmania(c) | 424 | 410 | 489 | 498 | 506 |
| Northern Territory | 449 | 431 | 634 | 910 | (d)242 |
| Commonwealth Government(e) | 492 | 5,024 | 7,567 | 7,896 | 10,786 |
| Total | 37,953 | 65,552 | 66,676 | 69,921 | 88,831 |

(a) Includes royalty on sand and gravel from Crown lands. (b) Includes royalty on brown coal paid by State Electricity Commission and royalties received under the *Petroleum (Submerged Lands) (Royalty) Act 1967*. (c) Includes rent and fees from mineral lands and royalties on iron ore. (d) Excludes Aboriginal Benefits Trust Fund royalties from mining operations for which details are not available. (e) Includes royalties received under the *Petroleum (Submerged Lands) (Royalty) Act 1967*.

Control of Exports

The Commonwealth Government maintains export controls over certain metals, petroleum and petroleum products and all raw and semi-processed minerals. These controls are administered under the authority of the Customs (Prohibited Exports) Regulations as amended from time to time by Statutory Rules. The authorities having jurisdiction over such exports are set out below together with listings of the goods subject to control. A clearance to export is needed in each case.

Minister for National Resources—An amendment to the Customs (Prohibited Exports) Regulations on 22 February 1973 (Statutory Rule No. 39 of 1973), and further amended by Statutory Rules 1973/248 and 1974/46, provides that the exportation from Australia of the following goods is prohibited unless approval in writing is issued by the Minister for National Resources or by an authorized person.

- (a) ores containing copper or tin, whether or not they have been subjected to processing or treatment; mineral or metallic substances produced in the course of processing or treatment of those ores; copper anodes, copper cathodes; copper ingots, copper rods, copper scrap and copper refinery shapes in the form of ingots, wire bars, billets, cakes, rolling blocks or ingot bars; copper alloys in the form of ingots, billets, cakes, rolling blocks or ingot bars and copper alloy scrap; substances (being residues, speiss, slag, dross, scale, sweepings, ash, sludge, slime, dust and wastes) produced in the course of the processing and treatment of copper and copper alloys; copper sulphate; copper oxide; refined tin in the form of ingots or in any other refinery form;
- (b) alumina;
- (c) petroleum and petroleum products;
- (d) all other minerals including those other minerals that have been subjected to processing or treatment; substances produced in the course of processing or treatment of those other minerals but not including refined products obtained by or from processing or treatment of those other minerals and goods into which products, whether refined or not, obtained by or from processing or treatment of those other minerals have been converted.

In addition, the export of metals and minerals of atomic energy significance are also controlled, viz.: minerals containing uranium and thorium, uranium, thorium, beryllium and lithium metals, compounds and alloys; hafnium-free zirconium metal, alloys and compounds, nickel metal in certain forms.

Department of Primary Industry—phosphate rock, phosphate and superphosphate, and fertilisers containing phosphate or superphosphate.

Joint Coal Board

The Joint Coal Board was established in 1946 under joint legislation of the Commonwealth Government and of the State of New South Wales to carry out special administrative functions in regard to the New South Wales black coal mining industry. A summary of these functions is given below.

- (i) To ensure that coal is produced in the State of New South Wales in such quantities and with such regularity as will meet requirements throughout Australia and in trade with other countries;
- (ii) to ensure that the coal resources of the State are conserved, developed, worked and used to the best advantage in the public interest;
- (iii) to ensure that coal produced in the State is distributed and used in such manner, quantities, classes and grades, and at such prices as are calculated best to serve the public interest and secure the economical use of coal and the maintenance of essential services and industrial activities; and,
- (iv) to promote the welfare of workers engaged in the coal industry in the State.

Queensland Coal Board

The Queensland Coal Board carries out research and sampling tests of Queensland coals. It also makes funds available to colliery proprietors for equipment and makes grants and/or loans for the provision of amenities for employees and for communities in coal mining districts.

Australian Atomic Energy Commission

During 1953, legislation was enacted to set up an Atomic Energy Commission which is responsible, in an overall sense, for the production and utilisation of uranium in Australia. This Act, the *Atomic*

Energy Act 1953, superseded the *Atomic Energy (Control of Materials) Act 1946*, but retains a provision of that Act which provides for the control of substances which could be used for production or use of atomic energy.

The functions of the Commission fall under two main headings. Firstly, it is responsible for undertaking and encouraging the search for and mining of uranium and is empowered to co-operate with the appropriate authorities of the States in connection with these and related matters. Secondly it is authorised to develop the practical uses of atomic energy by constructing and operating plant for this purpose, carrying out research and generally fostering the advancement of atomic energy technology. The Commission operates under the direction of the Minister for National Resources.

Government assistance

The Commonwealth Government and the various State Governments provide assistance to the mineral industry in a variety of ways. The main forms of assistance are discussed below.

Commonwealth Government assistance

Assistance provided by the Commonwealth Government takes the form of income taxation concessions, subsidies, bounties, and technical assistance mainly through the work of the Bureau of Mineral Resources and the Commonwealth Scientific and Industrial Research Organization. A table showing direct Commonwealth Government payments to sectors of the mineral industry is included on page 938.

Income taxation concessions. Income derived from mining principally for gold in Australia is exempt from tax. The exemption is also available in respect of income derived from mining principally for gold and copper if the value of the gold obtained is not less than 40 per cent of the value of the total output.

Special deductions for capital expenditure incurred in the discovery and mining of petroleum (including natural gas) are allowable to a company deriving income from the sale of petroleum and products of that petroleum, mined by the company in Australia. Capital expenditure allowable to petroleum mining companies includes, broadly, the cost of exploratory surveys, drilling and well-head plant, access roads and expenditure on housing and welfare. In effect, a company is entitled to these deductions only when it produces Australian petroleum in commercial quantities because the special deductions are allowable only from income derived from the company's Australian produced petroleum or associated products. While the special deductions for exploration expenditure are allowable immediately against petroleum income, the deductions for capital expenditure on development are allowable over the life of the oil or gas field, or twenty-five years, whichever is the lesser.

A company mining or prospecting for minerals other than petroleum and gold may also be allowed special deductions for capital expenditure. Broadly, allowable capital expenditure includes expenditure on exploration and prospecting, preparation of a site for extractive mining operations, buildings, other improvements and plant necessary for those operations, access roads, certain treatment plant and housing and welfare.

The allowable capital expenditure of a general mining company, other than costs of exploration, may be deducted over the life of the mine, or twenty-five years, whichever is the lesser. Expenditure incurred by a mining company in exploring for general minerals is allowable as an immediate deduction against net income derived from mining operations. Annual deductions for depreciation on mining plant may be allowed in lieu of spreading the cost over the life of the mine. Exploration plant may also be deducted under the depreciation provisions of the law.

Special deductions are allowable for capital expenditure incurred on certain transport facilities used primarily and principally in relation to minerals mined in Australia, for the transport of raw minerals and certain specified products obtained from the processing of such minerals, or for transporting petroleum between the oil or gas field and a refinery or other terminal. The special deduction applies to expenditure incurred on a railway, road, pipeline or similar transport facility. Allowable expenditure on transport facilities is deductible in equal annual instalments over a period of twenty years. The extension of these concessions to mining and exploration activities carried on in Papua New Guinea was generally withdrawn from the time Papua New Guinea attained independence (16 September 1975).

Petroleum search subsidy. The petroleum search subsidy scheme, introduced in 1957, was terminated on 30 June 1974. During the years that the scheme was in operation, various amendments to the Act and Regulations altered the rates of subsidy and the types of operations to which subsidies were applicable. The last amendment to the Act, introduced in 1969, extended the duration of the Act to 30 June 1974, and restricted the general availability of subsidy to onshore areas; operations in

offshore areas were only subsidised if there was an Australian financial interest in the operation and the rate of subsidy approved had regard to the extent of that interest. In March 1972, the subsidy for approved onshore geophysical operations was increased to 50 per cent of acceptable costs of the operation. For all other approved operations the maximum subsidy was 30 per cent of acceptable costs. Details of amendments to the Petroleum Search Subsidy Act are given on page 1001 of Year Book No. 55. Subsidy payments made under the Act for the years 1969 to 1975 are shown in the table on page 938.

Pricing of Australian crude oil. The Commonwealth Government announced a new approach to the pricing of Australian crude oil from 18 September 1975 to provide the maximum practicable incentive for exploration of new oil fields and to give existing producers from known discoveries a fair return on their investment which would ensure that all economically recoverable oil is produced from known oil fields.

This policy differentiates between oil produced from fields discovered in the future and oil produced from fields already discovered.

Oil from newly discovered fields will attract a price at the nearest refinery port equivalent to the landed cost of imported crude oil from time to time. On the basis of the present landed cost this would mean, after allowance for the \$2.00 per barrel excise on oil production, a return of around \$6.90 per barrel to producers of new oil.

The prices for oil produced from the following fields are as follows:

Gippsland/Bass Strait. Increase of 23 cents per barrel to \$2.33 for all production from 18 September 1975.

Barrow. Increase of 50 cents per barrel to \$2.73 from 18 September 1975, then further increases to \$2.88 from 18 September 1976 and \$3.17 from 18 September 1977.

Moonie. Increase of 85 cents per barrel to \$3.00 from 18 September 1975, then further increases to \$4.35 from 18 September 1976 and \$5.25 from 18 September 1977.

The varying prices have regard to the varying costs of the respective producers. The pricing levels indicated above for oil from fields already discovered will apply for 3 years. The pricing levels to apply from September 1978 to September 1980 will be reviewed by the Industries Assistance Commission, which will also be asked to make recommendations on all aspects of Australian crude oil policy after 1980, when the present indigenous crude oil absorption arrangements expire.

Assistance to the gold-mining industry. Assistance to the gold-mining industry by subsidy was introduced at a time of rising costs in the industry and fixed official world price for gold. Because many producers were faced with the likelihood of closing down, the Government decided to subsidise marginal producers in Australia and Papua New Guinea. Under the *Gold-Mining Industry Assistance Act 1954* a producer, the value of whose gold output exceeded 50 per cent of the total value of his mine output, was eligible for assistance, subject to certain conditions, on the production of gold from 1 July 1954. The assistance scheme was reviewed on a number of occasions since the Act was originally passed, and some liberalisations were approved, including increases in the rates of subsidy payable authorised in amendments passed in 1957, 1959, 1965 and 1972.

Under the Act in 1974 and 1975 the subsidy payable to small producers whose annual deliveries did not exceed 500 fine oz was \$6 per fine oz, irrespective of cost of production. For large producers, subject to certain provisions, the rate of subsidy payable was an amount equal to three-quarters of the excess of the average cost of production over \$27 per fine oz, with a maximum amount of subsidy of \$12 per fine oz. A producer whose deliveries during the year exceeded 500 fine oz could elect to be treated as a small producer. In this case the subsidy rate payable per fine oz on total deliveries was \$6 reduced by 1c for each fine oz by which deliveries exceeded 500 fine oz. The benefit under this provision terminated when deliveries in a year reached 1,100 fine oz. Where a producer received an amount in excess of \$31.25 per fine oz on market sales of gold, the subsidy payable was, with effect from 1 January 1972, reduced by fifty per cent of the amount of the excess. Increases in the market price of gold since 1972 have resulted in a decline in subsidy payments in succeeding years.

Payments under the Act applied to production until 30 June 1975 when the application of the Act expired. The amounts paid to gold producers in recent years are shown in the table below.

Assistance to the producers of sulphuric acid and iron pyrites. The *Sulphuric Acid Bounty Act 1954* and the *Pyrites Bounty Act 1960* expired on 31 May 1972. The Acts provided for payment of bounty on sulphuric acid produced from prescribed Australian materials, and to producers of iron pyrites. Payments under these Acts for recent years are shown in the table below.

Payments to producers of phosphate fertilisers. The *Phosphate Fertilisers Bounty Act 1963* provides for a bounty to be paid on superphosphate and ammonium phosphate manufactured and used in Australia as a fertiliser. (This includes approved trace elements, compounds or substances when added to superphosphate). Bounty is payable on the soluble content of phosphorus pentoxide. A standard grade of superphosphate containing between 19.5 and 20.5 per cent soluble content of phosphorus pentoxide qualifies for full bounty of \$11.81 per tonne. Outside this range, bounty is payable at \$59.05 per tonne of contained phosphorus pentoxide. The intention of this Act is to assist consumers of phosphate fertilisers (primary producers). The Act expired on 31 December 1974 but the Government has re-introduced the bounty from 11 February 1976 to 30 June 1977. Payments under the Act, are set out in the following table.

**COMMONWEALTH GOVERNMENT PAYMENTS TO THE MINERAL
INDUSTRY AND TO THE MANUFACTURING INDUSTRY FOR
PRODUCTS OF MINERAL ORIGIN: AUSTRALIA**
(S'000)

| Year | Petroleum exploration (a) | Gold mining(b) | Pyrites mining(c) | Sulphuric acid production (d) | Phosphate fertiliser production (e) |
|------|---------------------------------|-------------------|----------------------|----------------------------------------|----------------------------------------------|
| 1971 | 8,468 | (f)2,162 | 568 | 489 | 40,815 |
| 1972 | 8,422 | (f)1,185 | 962 | 527 | 49,137 |
| 1973 | 9,611 | (f)49 | .. | .. | 66,962 |
| 1974 | 7,397 | (g)-1 | .. | .. | 29,507 |
| 1975 | 3,039 | .. | .. | .. | .. |

(a) *Petroleum Search Subsidy Act 1959*. Includes payments in Papua New Guinea; see also the table on page 964. (b) *Gold-Mining Industry Assistance Act 1954*. This Act expired 30 June 1975. (c) *Pyrites Bounty Act 1960*. This Act expired on 31 May 1972. (d) *Sulphuric Acid Bounty Act 1954*. This Act expired on 31 May 1972. (e) *Phosphate Fertilisers Bounty Act 1963*. (f) Includes payment in Papua New Guinea. (g) Repayment of advance.

Bureau of Mineral Resources, Geology and Geophysics. The functions of BMR are as follows:

- (i) as a primary function, to obtain, study, publish and provide basic geological and geophysical information necessary for the exploration and development of the nation's mineral resources; this to be done where appropriate in co-operation with State and Territorial authorities;
- (ii) to undertake experimental studies and research into geology and geophysics in order to support the function of obtaining basic information;
- (iii) to make basic investigations of the earth's magnetic and gravitational fields and in seismology and vulcanology;
- (iv) to complement the work of the State and Territorial authorities by undertaking geological and geophysical investigations into the occurrence and distribution of underground water;
- (v) to undertake geological and geophysical investigations on behalf of other Commonwealth Government Departments and authorities including the provision of resident staff by arrangement with the Territories;
- (vi) to obtain basic information on, and review the mineral resources of Australia and its Territories; to study the various sectors of the mineral industry both in the national and international spheres; to publish and provide information about the mineral industry;
- (vii) to undertake such investigations in mining engineering and petroleum technology as are relevant to (i) and (vi) above;
- (viii) to prepare advice for Government on the mineral industry, including the exploration and development of mineral resources in the national interest;
- (ix) when directed by Government, to administer schemes for the assistance of sectors of the mineral industry and to undertake special mineral projects.

BMR comprises five branches under the Director: Operations, Mineral Resources, Geological, Geophysical, and Petroleum Exploration. The Operations Branch consists of four sections, Planning and Co-ordination, Publications and Information, Automatic Data Processing Applications and Administrative. It carries out central office functions, including planning and control of program, assessment of results, co-ordination of activities, liaison, distribution of information and provision of ADP services. The Mineral Resources Branch comprises the sections Mineral Economics, Mining Engineering, and Petroleum Technology, and is concerned largely with those aspects of

BMR's work which involve studies of the mineral industry as a whole, and the preparation of advice and reviews for the Government, industry and the public. The Geological and Geophysical Branches are responsible for the principal field activities of BMR, and the operation of observatories, while the Petroleum Exploration Branch is concerned with the technical administration of the *Petroleum (Submerged Lands) Act 1967* and the assessment of sedimentary basins in Australia and its Territories. The establishment of BMR is 636 officers (at 31 December 1975) and includes 270 professional officers (geologists, geophysicists, chemists, engineers and mineral economists).

BMR maintains a laboratory in Canberra which is engaged on geochemical, geochronological and petroleum technological studies and basic research into the design and testing of geophysical equipment. It also maintains geophysical observatories at Toolangi (Victoria), Mundaring (Western Australia), Port Moresby (Papua New Guinea), Mawson (Antarctica), and Macquarie Island. The geophysical observatories are engaged in magnetic, ionospheric, and seismic investigations and are base stations for field operations.

State Government assistance

In addition to free assays and determinations of rocks and minerals carried out for prospectors by the Mines Departments of the States and Territories, technical officers of these departments provide advice to the mining and allied industries where required, carry out field examinations of mining prospects, advise on exploration and development, select sites for water supply, and in general give a free technical service to the mining industry.

New South Wales. The State Mines Department renders scientific, technical and financial assistance to the mining industry. Grants are made to cover up to half the cost of prospecting and drilling operations. These grants are repayable if sufficient pay minerals are discovered or if certain other conditions are met. A quantity of equipment is also available for hire in several localities. The Department has itself undertaken a program of contract drilling to investigate the existence of mineral deposits in the State (including the testing and proving of coal resources). Expenditure on financial assistance in 1974-75 amounted to \$523,636 including \$154,034 on the Department's own drilling program.

Victoria. The Mines Department conducts geological and mineral surveys and produces geological maps and issues scientific and technical reports thereon. Extensive rotary, percussion and auger drilling operations are carried out and in conjunction with these, sedimentary basin studies are made to evaluate petroleum, mineral and groundwater potential. A comprehensive library and a geological museum are maintained and a core library retains cores and cuttings from drilling operations. The administration of petroleum, pipeline, mining and extractive industry legislation ensures that petroleum exploration and production, both on-shore and off-shore, mining and quarrying are carried on in a safe and effective manner. Technical and drilling assistance and loans or grants are available for mineral exploration and prospecting and for approved development operations. Six stamp batteries provide an ore crushing service to enable test crushings to be made at nominal cost. Information is available on mining law and mineral statistics. Assays of ores, analytical services, advice on metallurgical treatments, industrial pollution and chemical problems are available together with information on the manufacture, handling and use of explosives and inflammable liquids. Financial assistance is available to municipalities to reclaim mine-damaged land, in areas where a Reclamation Committee recommends such action.

Queensland. The Department of Mines provides assistance to mining by way of geological services, grants for construction and maintenance of roads in mining areas, repayable advances or subsidies for mine development, hiring of equipment, and assistance to prospectors. The Department maintains a concentration plant for tin ores at Irvinebank, an assay office at Cloncurry and diamond drilling plants in various parts of the State. The Queensland Coal Board carries out research and sampling tests of Queensland coals. It also makes funds available to colliery proprietors for equipment and makes grants and/or loans for the provision of amenities for employees and for communities in coal mining districts.

South Australia. The Department of Mines provides the following services and facilities to the mineral industry: (i) drilling and testing of mineral deposits, geophysical investigations, well logging development of sub-surface water supplies for farming, pastoral, irrigation, and mining purposes; (ii) geological examination of mineral deposits, ground water supplies, dam foundation and drainage problems, and publication and issue of geological bulletins and maps. It also provides, through the Australian Mineral Development Laboratories, facilities for chemical, metallurgical, analytical and assay investigations, testing and treatment of ores and minerals, and petrographic, mineragraphic and radiometric determinations. Pilot scale metallurgical and chemical treatment plants are maintained and operated for the development of mineral extraction processes.

Western Australia. Prospectors receive assistance of either \$15 or \$17.50 a week according to the prospecting locality. North of the 26th parallel and within a defined area south of this, lying largely outside the agricultural areas, assistance is given to the extent of \$17.50 a week. In the remainder of the State prospectors receive \$15 a week. Provision is also made for the supply of some tools required for prospecting. There are sixteen State batteries operating intermittently throughout the goldfields for the treatment of ore from prospectors and small mine owners at a nominal charge. A cartage subsidy is also granted to such operators sending gold and lead ores to State batteries for treatment. Provision is made for loans to mine-owners who require assistance to develop mines.

Tasmania. The Department of Mines provides financial assistance to mining lessees for the purchase of plant and machinery, for sinking, repairing or de-watering of shafts, for construction of dams and water races, for testing and proving a deposit of any mining product, for developmental work, and for diamond and other types of drilling. The Department has available for hire, percussion and diamond drills for exploration, as well as a complete plant for small shaft sinking and tunnelling. Other assistance is rendered to the industry in the form of geological and engineering advice, through ore-dressing research into metallurgical recoveries, and the selection and design of treatment plant.

Northern Territory. To encourage the development of the mining industry the Mines Branch of the Department of the Northern Territory operates two batteries for the treatment of ores for miners. The Tennant Creek Battery is treating parcels of gold ore. The Mount Wells Battery is crushing parcels of gold, tin, lead, copper and wolfram ore, including experimental work for more complex ores. The crushing charges are subsidised by the Government. Mining plant such as drills, compressors, pumps, and small hoists are available for hire to prospectors. Financial assistance is available to prospectors for mine development such as shaft sinking, driving, rising or winzings, and cartage subsidies. Roads and water supply services are provided and maintained for mines under active development throughout the Northern Territory.

The Northern Territory Geological Survey undertakes geological and geophysical investigations including some engineering geology projects, and is also available to assist with the evaluation of individual mineral occurrences for prospectors and exploration companies. Technical libraries and collections of drill cores and cuttings are maintained in Darwin, Alice Springs and Tennant Creek.

Research

Research investigations into problems of mining, ore-search, ore-dressing and metallurgy are conducted by Government bodies, by universities, by private enterprise, and by combined efforts of these bodies. A summary of their functions follows. (For further information on research see Chapter 28 Science and Technology).

Australian Atomic Energy Commission

The Australian Atomic Energy Commission conducts research at its laboratories at Lucas Heights in Sydney on the development of nuclear power, including research on nuclear materials and on metals and ceramics used for nuclear power.

The Australian Mineral Development Laboratories

Technical consulting, contract research and process design for the mineral and associated industries is undertaken by The Australian Mineral Development Laboratories (Amdel), at Adelaide. This organisation is controlled by a council comprising representatives of the mineral industry, the South Australian Government and the Commonwealth Government. Extensive facilities are available in the fields of analytical chemistry, mineralogy and petrology, chemical metallurgy and mineral engineering, operations research/computer services and materials technology. Both long and short term applied research is carried out and all investigations are conducted on a strictly confidential basis. Services in the field of pollution and environmental control are also available through the Amdel group (Aspect).

The Baas Becking Geobiological Research Laboratory

In 1965 the Baas Becking Geobiological Research Laboratory was established in the Bureau of Mineral Resources Building in Canberra, under the joint sponsorship of the Commonwealth Scientific and Industrial Research Organization, the Bureau of Mineral Resources, and the Australian Mineral Industries Research Association (see Research by private enterprise, page 942). The broad objective of the research work is to investigate the biological and chemical processes associated with the formation of mineral deposits of the stratiform type.

Emphasis is placed on investigations to establish the relationship of biological factors to the natural physico-chemical environment with particular reference to the possible role of these factors in the formation and transformation of sulphide minerals. Investigations have included the response of micro-organisms to heavy metals; biochemistry and physiology of oxidative and reductive sulphur transformations; role of organisms in the concentration of mineral elements; physico-chemistry of low-temperature mineral synthesis; and mobility of sulphides under the influence of temperature and pressure and the interaction of mineral types.

Bureau of Mineral Resources, Geology and Geophysics

The Bureau of Mineral Resources is the largest geoscience research organisation in Australia. Its work is directed towards an integrated study of the origin, composition and structure of the rocks forming the Australian continent—to the lower limits of the continental slope—particularly as these affect the genesis and distribution of mineral deposits. The main effort is in field research supported and complemented by laboratory and office studies. BMR's activities include:

- Geological, geophysical, and geochemical surveys to provide the basic information for further studies.
- Compilation, review, and synthesis of information on and detailed investigations of sedimentary basins and metallogenic provinces, leading to an understanding of their origin and history, and to assessment of their prospectiveness.
- Studies of specific commodities, including research into the occurrence and origin of their deposits, assessment of potential for new discoveries, resource inventories, and market trends.
- Engineering geology, urban geology and hydrogeological investigations.
- Maintenance of seismological and magnetic observatories, and related studies.
- Assessment of geophysical techniques in Australian conditions, and development of new techniques and equipment.
- Fundamental geoscience research, with an orientation to the activities listed above.
- Provision and dissemination of the results of BMR's work and information on the geosciences generally.

For details of the functions of the Bureau of Mineral Resources, Geology and Geophysics, see page 938.

Commonwealth Scientific and Industrial Research Organization

Mineral research by the Commonwealth Scientific and Industrial Research Organization is undertaken mainly in the Minerals Research Laboratories comprising the Divisions of Chemical Engineering, Mineral Chemistry, Mineralogy, and Mineral Physics and Process Technology. Major laboratories are located at Clayton (Vic.), Port Melbourne, Sydney and Perth. Current research program objectives and sub-program titles are:

- (a) *Exploration methods.* To improve and develop procedures for locating mineral deposits (geochemical techniques, geophysical techniques, geological pattern recognition).
- (b) *Mineralisation.* To improve methods of recognising and defining the nature and economic significance of specific types of mineralisation (nickel deposits, other deposits, hydrogeochemistry, geobiology, mineralogical research techniques).
- (c) *Mining and concentration.* To identify, and utilise in practice, those properties of minerals and rocks that will increase the overall efficiency of their mining, concentration and handling (rock properties, mineral dressing, transport and fill, iron ores).
- (d) *Process metallurgy and engineering.* To initiate or improve methods for the scientific development of Australia's natural resources (process control, process development, structures and bonding, hydrometallurgy and pyrometallurgy).
- (e) *Environment.* To protect and improve the quality of the human and natural environment by applying the skills and expertise available in the Minerals Research Laboratories (air quality, solid and liquid wastes).
- (f) *Energy.* To support national plans developed to ensure the availability of energy in forms required by consumers and based on indigenous resources (coal utilisation, coal and oil resource characterization, coal winning, low energy metallurgy, storage and conversion).

The minerals industry provides strong support in the form of co-operative research planning, collaborative investigation of specific projects, and financial grants for appropriate developmental work.

National Coal Research Advisory Committee

The National Coal Research Advisory Committee was established in December 1964, following agreement between the Commonwealth Government, State Governments and private industry, for increased applied research in Australia into coal utilisation. This was later extended to cover research

into coal winning and beneficiation. Initially a pool of funds amounting to \$520,000 per annum was jointly contributed for the sponsorship of this research. These funds were allocated on the advice of the Committee, whose membership was representative of the contributing groups. This agreement was terminated on 30 June 1969, and a new National Coal Research Advisory Committee was nominated by the Commonwealth Government alone. A sum of up to \$260,000 per year for up to three years was set aside by the Government for allocation on the advice of this Committee.

As from 30 June 1972, the scheme of assistance to coal research was extended for a further five years, with yearly allocations of \$260,000. In 1974-75 the yearly allocation was increased by \$100,000 to \$360,000 for the specific purpose of initiating an 'oil-from-coal' research program in Australia. The allocation of \$360,000 was maintained in 1975-76.

The major beneficiary under this scheme is the Australian Coal Industry Research Laboratories; other beneficiaries are University Departments.

The functions of the Committee are:

- (a) To keep under review all coal research carried on throughout Australia and overseas, in relation to conservation, winning, beneficiation and utilisation.
- (b) To reach conclusions on scientific, technical and economic grounds as to the directions in which this research in Australia should be strengthened.
- (c) To review annually all relevant research programs in Australia, and to recommend to the Minister for National Resources those programs that should be supported, and the amount of financial contributions which should be made to each of them from the funds provided.

University Research

The various universities in Australia carry out research into various aspects of the mineral industry such as geology, ore mineralogy and genesis, mining techniques, mineral processing, extractive metallurgy, and materials and metals technology.

Research by private enterprise

Most large mining and smelting companies have laboratories dealing with their own individual problems. Private industry formed the Australian Mineral Industries Research Association in 1959 to provide industry with representation in the management of the Australian Mineral Development Laboratories. The Association now finances research work into geology, mining and mineral processing at Universities, CSIRO and the Australian Mineral Development Laboratories. Membership of the Association at 30 June 1975 was: full members 50, associate members 22, registered divisions 11. Expenditure on research projects during the year 1974-75 was \$421,364.

International relations

Because Australia is a large supplier of certain minerals to the rest of the world and because the welfare of the domestic industry depends to a large extent on the maintenance of a high level of exports, international relations are of considerable importance to the industry, and the Commonwealth Government takes an active role in international consultations and discussions relating to minerals. The most important international commitments are discussed below.

International Tin Agreement

The first International Tin Agreement (of the post-war period) was in operation for five years from 1 July 1956 to 30 June 1961. This Agreement was subsequently replaced by the Second and Third International Tin Agreements, which came into force on 21 February 1962 and 21 March 1967, respectively. Details of these Agreements are given in Year Book No. 57, pages 911-12.

Australia has signed and ratified the Fourth International Tin Agreement which came into operation on 1 July 1971 for a period of 5 years. Australia joined the Fourth Agreement as a 'producing' (i.e. exporting) member, whereas in the past Agreements Australia's status had been that of a 'consuming' (i.e. importing) member. This stems from the fact that Australia's tin production has increased significantly over recent years making it a net exporter of tin.

The objectives of this Agreement are the same as for its predecessors. Producing countries are required to contribute to a buffer-stock-equivalent in cash or tin up to 20,000 tonnes of tin metal, which is used to buffer short-term fluctuations in the world market price. In the event of persistent market disequilibrium through causes beyond the ability of the buffer stock mechanism to control, the agreement also provides for the regulation of exports and stocks to stabilise the market. The main provisions of the Fourth Agreement are substantially the same as those of the Third. However, the Buffer Stock Manager, a paid Council employee charged with operating the buffer stock, has been given somewhat greater flexibility in reacting to market situations.

The International Tin Agreement is operated by the International Tin Council, which is made up of the following Governments: *Producers*—Australia, Bolivia, Indonesia, Malaysia, Nigeria (Federal Republic of), Thailand, Zaire (Republic of). *Consumers*—Austria, Belgium-Luxembourg, Bulgaria, Canada, Czechoslovakia, Denmark, France, Germany (Federal Republic of), Hungary, India, Italy, Japan, Korea (Republic of), Netherlands, Poland, Romania, Spain, Turkey, United Kingdom, Union of Soviet Socialist Republics and Yugoslavia. The producing countries hold a total of 1,000 votes, distributed so that each country receives five initial votes and an additional number corresponding to its percentage as laid down by the Agreement. The consuming countries hold a total of 1,000 votes also distributed so that each country receives five initial votes and an additional number proportionate to quantities consumed. The allocation of votes in each category is periodically reviewed.

The International Tin Agreement establishes floor and ceiling prices for tin and, by the medium of a buffer stock and remedial trading on the London Metal Exchange, aims at confining the price within these limits. Because of a world over-supply situation of tin, the Council imposed export controls on producer members for the period January–September 1973.

International Lead-Zinc Study Group

With the cessation of stockpile buying of lead and zinc by the United States Government in 1958, world producers were faced with the prospect of a serious imbalance between world supply and demand for these metals. To meet this problem a series of meetings of interested governments was held, at which Australia was represented. These meetings culminated in the formation of the International Lead-Zinc Study Group which was established in January 1960. The Study Group comprises the following Governments: Algeria, Australia, Austria, Belgium, Bulgaria, Canada, Czechoslovakia, Denmark, Finland, France, the Federal Republic of Germany, Hungary, India, Italy, Japan, Mexico, Morocco, the Netherlands, Norway, Peru, Poland, the Republic of South Africa, Spain, Sweden, Tunisia, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, the United States of America, Yugoslavia and Zambia. The Group provides opportunities for inter-governmental consultations on international trade in lead and zinc and for studies of the world situation in lead and zinc having regard especially to the desirability of providing continuous accurate information regarding the supply and demand position and its probable development.

MINERAL INDUSTRY STATISTICS

Statistics presented in this chapter refer mainly to the mining industry, mineral production, mineral exploration, and overseas participation in the Australian mining industry. In addition to the mining industry, data relating to mineral processing and treatment and overseas trade are included to give more information about the mining industry and other associated activities in the Australian economy.

Mining industry statistics

This section contains statistics of the mining industry for all States and Territories and Australia obtained from the annual Mining Censuses.

Prior to 1968–69 the Annual Mining and Quarrying Census related to years ended 31 December. However, commencing with 1968–69, the Mining Census was changed to a year ended 30 June to conform with the period covered by other economic censuses in Australia. There are several other differences between the censuses of 1968–69 and later years, and those for earlier years (mainly in definition, scope and coverage) and as a result the statistics obtained for 1968–69 and later, are not strictly comparable with those for earlier years. Further information regarding these differences is given in Year Book No. 57, pages 912–914. Mining industry statistics for years prior to 1968–69 are also contained in Year Book No. 57 and earlier issues.

For the year ended June 1969, the Mining Census (including quarrying) was conducted for the first time on an integrated basis with Censuses of Manufacturing, Electricity and Gas, Retail Trade and Selected Services, and Wholesale Trade.

Briefly, the integration of these economic censuses was designed to increase substantially the usefulness and comparability of economic statistics collected and published by the ABS, and to form a basis for the sample surveys which supply current economic statistics from quarter to quarter, particularly those which provide data for the quarterly national income and expenditure estimates. A detailed description of the integrated censuses is contained in Chapter 31, Year Book No. 56.

For 1969-70 and subsequent years the annual Mining Census has been conducted on the same basis as that for 1968-69.

The table below shows key items of data for Australia for 1974-75 and summary data for 1970-71 to 1973-74. Each following table shows statistics for a particular item for all States and Territories and Australia for 1974-75 and summary data for 1970-71 to 1973-74, and is preceded by an explanation of the item.

**MINING ESTABLISHMENTS: SUMMARY OF OPERATIONS BY INDUSTRY SUB-DIVISION
AUSTRALIA**

| Industry sub-division | ASIC code(a) | Number of establishments operating at end of June | Persons employed at end of June(b) | | | Wages and salaries | Turn-over | Stocks at 30 June | | Purchases, transfers in and selected expenses | Fixed capital expenditure (outlay on fixed tangible assets less disposals) | |
|---------------------------------------------------|--------------|---------------------------------------------------|------------------------------------|---------|--------|--------------------|-----------|-------------------|---------|-----------------------------------------------|----------------------------------------------------------------------------|----------------|
| | | | Males | Females | Total | | | Opening | Closing | | Value added | less disposals |
| 1974-75 | | No. | No. | No. | No. | \$'000 | \$'000 | \$'000 | \$'000 | \$'000 | \$'000 | \$'000 |
| Metallic minerals . . . | 11 (c)208 | 12 | 32,570 | 2,502 | 35,072 | 336,220 | 1,811,929 | 159,578 | 212,586 | 630,049 | 1,234,887 | 274,993 |
| Coal | 12 132 | | | | | | | | | | | |
| Crude petroleum including natural gas . . . | 13 9 | 14 (c)697 | 24,193 | 483 | 24,676 | 265,190 | 1,574,089 | 57,299 | 90,329 | 400,519 | 1,206,599 | 186,972 |
| Construction materials . . . | 14 (c)697 | | | | | | | | | | | |
| Other non-metallic minerals | 15 (c)269 | | 6,050 | 512 | 6,562 | 52,980 | 238,565 | 15,374 | 23,031 | 96,834 | 149,389 | 19,177 |
| 1971-72(c) | | | 2,634 | 178 | 2,812 | 22,214 | 93,047 | 10,039 | 14,487 | 47,300 | 50,195 | 15,032 |
| Total mining, excluding services to mining | | | | | | | | | | | | |
| 1974-75(c) | | 1,315 | 65,447 | 3,675 | 69,122 | 676,604 | 3,717,629 | 244,290 | 340,432 | 1174,702 | 2,641,069 | 496,174 |
| 1973-74(c) | | 1,315 | 61,006 | 3,050 | 64,056 | 481,006 | 2,798,062 | 216,389 | 242,586 | 828,164 | 1,996,096 | 338,573 |
| 1972-73(c) | | 1,330 | 60,140 | 2,920 | 63,060 | 402,894 | 2,265,129 | 210,951 | 211,775 | 668,651 | 1,597,301 | 322,930 |
| 1971-72(c) | | 1,410 | 60,222 | 2,957 | 63,179 | 373,999 | 1,994,261 | 165,244 | 211,178 | 611,888 | 1,428,307 | 482,611 |
| 1970-71 | | 1,512 | 59,816 | 2,826 | 62,642 | 325,178 | 1,814,918 | 142,298 | 157,365 | 540,490 | 1,289,495 | 520,575 |

(a) Australian Standard Industrial Classification. (b) Includes working proprietors. (c) Excludes some very small insignificant establishments. Other than "Number of establishments", these exclusions do not effect any figures by more than one per cent.

Number of establishments

The following table shows the number of establishments operating at end of June. These relate to mining establishments as such and do not include the numbers of separately located administrative offices and ancillary units.

MINING ESTABLISHMENTS: NUMBER OF ESTABLISHMENTS OPERATING AT END OF JUNE BY INDUSTRY SUB-DIVISION

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|---------------------------------------------------|--------------|--------|-------|--------|------|-------|-------|------|--------|----------|
| 1974-75 | | | | | | | | | | |
| Metallic minerals . . . | 11 (b)59 | 7 | (b)40 | 7 | 69 | (b)16 | 10 | .. | .. | (b)208 |
| Coal | 12 95 | | | | | | | | | |
| Crude petroleum including natural gas | 13 .. | 2 | 4 | 1 | 2 | .. | .. | .. | .. | 9 |
| Construction materials . . . | 14 (b)205 | | | | | | | | | |
| Other non-metallic minerals | 15 (b)130 | | 38 | 30 | 28 | 30 | 13 | .. | .. | (b)269 |
| Total mining, excluding services to mining | | | | | | | | | | |
| 1975 | | (b)489 | 265 | (b)257 | 91 | 134 | (b)56 | 15 | 8 | (b)1,315 |
| 1974 | | (b)498 | 275 | (b)241 | 86 | 138 | (b)56 | 15 | 6 | (b)1,315 |
| 1973 | | (b)532 | 261 | (b)240 | 94 | 131 | 48 | 15 | 9 | (b)1,330 |
| 1972 | | (b)572 | 264 | 266 | 104 | 115 | 53 | 26 | 10 | (b)1,410 |
| 1971 | | 614 | 266 | 292 | 122 | 122 | 64 | 24 | 8 | 1,512 |

(a) Australian Standard Industrial Classification. (b) Excludes some very small, insignificant establishments.

Employment

The statistics of the number of persons employed shown in the following table relate to working proprietors at the end of June and employees on the payroll of the last pay period in June, including those working at separately located administrative offices and ancillary units in the State. Note that persons employed in each State (and their wages and salaries) relate to those employed at establishments, administrative offices or ancillary units located in the State, even though the administrative offices or ancillary units may have served establishments located in another State.

**MINING ESTABLISHMENTS: MALES, FEMALES AND PERSONS EMPLOYED(a)
BY INDUSTRY SUB-DIVISION, AT END OF JUNE 1975**

| Industry sub-division | ASIC code(b) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|----------------------------------------------------|--------------|--------|--------------|----------------|------------|---------------|--------------|-------------|--------|----------------|
| MALES EMPLOYED | | | | | | | | | | |
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 6,176 | 2661 | 8,334 5,252 | 1,798 | 11,586 957 | 3,924 (c) | 1,031 .. | .. | 32,570 |
| Coal | 12 | 14,962 | | | | | | | | |
| Crude petroleum including natural gas | 13 | 1,752 | 1,866 233 | 1,181 (c) | 509 309 | 414 673 | 163 (c) | 64 | 101 | 6,050 2,634 |
| Construction materials | 14 | 1,004 | | | | | | | | |
| Other non-metallic minerals | 15 | | | | | | | | | |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1975 | | 23,894 | 4,760 | 15,119 | 2,616 | 13,630 | 4,232 | 1,095 | 101 | 65,447 |
| 1974 | | 22,582 | 4,796 | 13,595 | 2,302 | 12,102 | 4,139 | 1,415 | 75 | 61,006 |
| 1973 | | 22,843 | 5,132 | 12,955 | 2,354 | 11,221 | 4,150 | 1,409 | 76 | 60,140 |
| 1972 | | 24,192 | 5,560 | 12,308 | 2,293 | 9,816 | 4,449 | 1,513 | 91 | 60,222 |
| 1971 | | 24,640 | 5,189 | 11,859 | 1,866 | 10,285 | 4,463 | 1,427 | 87 | 59,816 |
| FEMALES EMPLOYED | | | | | | | | | | |
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 219 | 159 | 664 105 | 197 | 1,144 13 | 211 (c) | 84 .. | .. | 2,502 |
| Coal | 12 | 186 | | | | | | | | |
| Crude petroleum including natural gas | 13 | 92 | 206 13 | 91 (c) | 43 7 | 72 72 | 4 (c) | 1 | 3 | 512 178 |
| Construction materials | 14 | 64 | | | | | | | | |
| Other non-metallic minerals | 15 | | | | | | | | | |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1975 | | 561 | 378 | 882 | 247 | 1,301 | 218 | 85 | 3 | 3,675 |
| 1974 | | 579 | 354 | 738 | 177 | 943 | 178 | 80 | 1 | 3,050 |
| 1973 | | 576 | 394 | 733 | 196 | 780 | 176 | 64 | 1 | 2,920 |
| 1972 | | 662 | 455 | 735 | 218 | 621 | 191 | 74 | 1 | 2,957 |
| 1971 | | 642 | 394 | 690 | 128 | 704 | 197 | 68 | 3 | 2,826 |
| PERSONS EMPLOYED | | | | | | | | | | |
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 6,395 | 2820 | 8,998 5,357 | 1,995 | 12,730 970 | 4,135 (c) | 1,115 .. | .. | 35,072 |
| Coal | 12 | 15,148 | | | | | | | | |
| Crude petroleum including natural gas | 13 | 1,844 | 2,072 246 | 1,272 (c) | 552 316 | 486 745 | 167 (c) | 65 | 104 | 6,562 2,812 |
| Construction materials | 14 | 1,068 | | | | | | | | |
| Other non-metallic minerals | 15 | | | | | | | | | |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1975 | | 24,455 | 5,138 | 16,001 | 2,863 | 14,931 | 4,450 | 1,180 | 104 | 69,122 |
| 1974 | | 23,161 | 5,150 | 14,333 | 2,479 | 13,045 | 4,317 | 1,495 | 76 | 64,056 |
| 1973 | | 23,419 | 5,526 | 13,688 | 2,550 | 12,001 | 4,326 | 1,473 | 77 | 63,060 |
| 1972 | | 24,854 | 6,015 | 13,043 | 2,511 | 10,437 | 4,640 | 1,587 | 92 | 63,179 |
| 1971 | | 25,282 | 5,583 | 12,549 | 1,994 | 10,989 | 4,660 | 1,495 | 90 | 62,642 |

(a) At end of June; includes working proprietors. (b) Australian Standard Industrial Classification. (c) Not available for publication.

Mining accidents

Particulars of numbers of persons killed and injured in accidents in mines and associated treatment plants are recorded by State Mines Departments. Numbers injured are not reported on a uniform basis in all States, as varying criteria are used in determining what constitutes injury. A table setting out mining accidents by States is shown below.

MINING ACCIDENTS(a)

| | Metal mining | | Fuel mining | | Construction material quarrying(b) | | Non-metal (excluding fuel) mining | | Total mining and quarrying | |
|----------------------------------------|----------------------|---------|----------------------|---------|------------------------------------|---------|-----------------------------------|---------|----------------------------|---------|
| | Number of casualties | | Number of casualties | | Number of casualties | | Number of casualties | | Number of casualties | |
| | Killed | Injured | Killed | Injured | Killed | Injured | Killed | Injured | Killed | Injured |
| 1974-75— | | | | | | | | | | |
| New South Wales | 1 | 173 | 12 | 53 | 1 | 7 | .. | 15 | 14 | 248 |
| Victoria | 1 | .. | .. | 32 | .. | (c)42 | .. | (c)1 | 1 | (c)75 |
| Queensland | 2 | 162 | 4 | 242 | .. | 7 | .. | 8 | 6 | 419 |
| South Australia | .. | 35 | .. | 5 | 1 | 17 | .. | 2 | 1 | 59 |
| Western Australia | (c)13 | (c)534 | 1 | 143 | 1 | 10 | 1 | 23 | (c)16 | (c)710 |
| Tasmania | 4 | 192 | .. | 2 | .. | 1 | .. | 1 | 4 | 196 |
| Northern Territory | 1 | 34 | .. | .. | .. | .. | .. | .. | 1 | 34 |
| Australian Capital Territory | .. | .. | .. | .. | (b) | (b) | .. | .. | (b) | (b) |
| Australia(b)(c) | 22 | 1,130 | 17 | 477 | 3 | 84 | 1 | 50 | 43 | 1,741 |
| 1973-74(b) | 19 | 1,046 | 10 | 478 | 6 | 111 | 3 | 50 | 38 | 1,685 |

(a) See text regarding comparability between States. (b) Mining accident data for construction material quarrying in the A.C.T. are not available. (c) These figures include some accidents in the mineral processing industry, and, in Western Australia, in electricity generating plants at the mine site.

Wages and salaries

The following table shows the wages and salaries of all employees of the establishment, including those working at separately located administrative offices and ancillary units in the State. Drawings of working proprietors are not included.

MINING ESTABLISHMENTS: WAGES AND SALARIES BY INDUSTRY SUB-DIVISION
(\$'000)

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|-------------------------------------------------|--------------|---------|--------|---------|--------|---------|--------|--------|--------|---------|
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 59,779 | 31,080 | 88,804 | 16,706 | 117,158 | 40,993 | 15,387 | .. | 336,220 |
| Coal | 12 | .. | | 58,385 | | .. | 8,445 | (b) | .. | .. |
| Crude petroleum including natural gas | 13 | 164,074 | .. | (b) | .. | .. | .. | .. | .. | 265,190 |
| Construction materials | 14 | 15,522 | 16,033 | 9,208 | 4,179 | 5,580 | 1,041 | .. | 897 | 52,980 |
| Other non-metallic minerals | 15 | 7,613 | 2,125 | (b) | 2,272 | 6,781 | (b) | 526 | .. | 22,214 |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1974-75 | | 246,988 | 49,238 | 159,420 | 23,158 | 137,964 | 43,026 | 15,913 | 897 | 676,604 |
| 1973-74 | | 171,521 | 39,337 | 114,602 | 15,115 | 96,255 | 30,623 | 12,937 | 616 | 481,006 |
| 1972-73 | | 149,950 | 33,154 | 95,039 | 13,367 | 71,946 | 28,091 | 10,843 | 503 | 402,894 |
| 1971-72 | | 147,098 | 32,194 | 83,087 | 12,255 | 62,388 | 26,458 | 10,066 | 453 | 373,999 |
| 1970-71 | | 131,973 | 27,518 | 69,211 | 8,459 | 55,941 | 22,641 | 8,702 | 471 | 324,915 |

(a) Australian Standard Industrial Classification. (b) Not available for publication.

Turnover

The following table shows turnover (sales of minerals and other goods whether produced by the establishment or not, plus transfers out of minerals and other goods to other establishments of the same enterprise, plus all other operating revenue from outside the enterprise, such as commission, repair and service revenue). This item excludes rents, leasing revenue, interest, royalties, and receipts from the sale of fixed tangible assets.

MINING ESTABLISHMENTS: TURNOVER, BY INDUSTRY SUB-DIVISION
(\$'000)

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|---------------------------------------------|--------------|---------|---------|--------------------|---------|-------------------|----------------|--------|--------|-----------|
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 247,082 | 474,209 | 375,766 466,423 | 83,089 | 915,753 52,594 | 120,489 (b) | 89,589 | .. | 1,811,929 |
| Coal | 12 | 557,381 | | | | | | | | |
| Crude petroleum including natural gas | 13 | .. | 76,044 | (b) | 15,142 | 18,826 | 4,871 | .. | .. | 1,574,089 |
| Construction materials | 14 | 74,894 | 42,670 | (b) | 14,967 | 23,489 | (b) | 2,006 | 4,111 | 238,565 |
| Other non-metallic minerals | 15 | 31,179 | 10,197 | (b) | 14,967 | 23,489 | (b) | .. | .. | 93,047 |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1974-75 | | 910,536 | 560,449 | 899,390 | 113,198 | 1,010,661 | 127,688 | 91,596 | 4,111 | 3,717,629 |
| 1973-74 | | 591,702 | 467,661 | 656,858 | 110,324 | 736,124 | 144,917 | 87,665 | 2,813 | 2,798,062 |
| 1972-73 | | 499,187 | 377,783 | 462,594 | 108,608 | 653,049 | 95,350 | 66,010 | 2,547 | 2,265,129 |
| 1971-72 | | 483,654 | 336,464 | 345,568 | 96,034 | 593,944 | 88,675 | 47,747 | 2,176 | 1,994,261 |
| 1970-71 | | 473,497 | 270,659 | 323,536 | 96,856 | 527,107 | 78,057 | 41,336 | 2,187 | 1,813,235 |

(a) Australian Standard Industrial Classification. (b) Not available for publication.

Purchases, transfers in and selected expenses

The following table shows the total of purchases of electricity, fuels, stores and other materials, transfers in of goods from other establishments of the same enterprise, charges for processing and other commission work and payments to mining contractors, repair and maintenance expenses, outward freight and cartage, motor vehicle running expenses and sales commission payments.

MINING ESTABLISHMENTS: PURCHASES, TRANSFERS IN AND SELECTED EXPENSES
BY INDUSTRY SUB-DIVISION,
(\$'000)

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|--------------------------------------------|--------------|---------|--------|-------------------|--------|------------------|---------------|--------|--------|-----------|
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 69,784 | 51,664 | 87,781 135,155 | 35,053 | 361,872 7,254 | 53,984 (b) | 26,709 | .. | 630,049 |
| Coal | 12 | 200,704 | | | | | | | | |
| Crude petroleum including natural gas | 13 | .. | 35,723 | (b) | 4,447 | 8,055 | 2,553 | .. | .. | 400,519 |
| Construction materials | 14 | 25,776 | 18,211 | (b) | 8,583 | 7,787 | (b) | 717 | 2,961 | 96,834 |
| Other non-metallic minerals | 15 | 17,101 | 5,965 | (b) | 8,583 | 7,787 | (b) | .. | .. | 47,300 |
| Total mining, excluding services to mining | | | | | | | | | | |
| 1974-75 | | 313,366 | 93,352 | 248,880 | 48,082 | 384,968 | 57,276 | 27,426 | 1,352 | 1,174,702 |
| 1973-74 | | 203,280 | 77,247 | 168,155 | 43,893 | 250,441 | 62,200 | 22,041 | 906 | 828,164 |
| 1972-73 | | 180,214 | 60,666 | 141,686 | 36,041 | 200,942 | 31,765 | 16,430 | 907 | 668,651 |
| 1971-72 | | 181,356 | 53,953 | 117,519 | 33,922 | 179,725 | 29,948 | 14,669 | 796 | 611,888 |
| 1970-71 | | 183,509 | 52,470 | 83,101 | 31,894 | 146,904 | 21,408 | 19,989 | 921 | 540,195 |

(a) Australian Standard Industrial Classification. (b) Not available for publication.

Stocks

Statistics on the value of closing stocks are shown in the following table. Figures include stocks of materials, fuels, etc., and mine products and work-in-progress of the establishment whether located at the establishment or elsewhere.

MINING ESTABLISHMENTS: CLOSING STOCKS AT END OF JUNE BY INDUSTRY
SUB-DIVISION
(\$'000)

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|--------------------------------------------|--------------|--------|--------|------------------|--------|-----------------|---------------|--------|--------|---------|
| CLOSING STOCKS | | | | | | | | | | |
| 1975 | | | | | | | | | | |
| Metallic minerals | 11 | 44,828 | 10,646 | 39,273 33,559 | 17,027 | 83,693 2,347 | 17,172 (b) | 17,146 | .. | 212,586 |
| Coal | 12 | 36,872 | | | | | | | | |
| Crude petroleum including natural gas | 13 | .. | 4,552 | (b) | 1,213 | 2,482 | 419 | .. | .. | 90,329 |
| Construction materials | 14 | 10,415 | 3,265 | (b) | 1,911 | 5,278 | (b) | 382 | 303 | 23,031 |
| Other non-metallic minerals | 15 | 3,166 | 1,932 | (b) | 1,911 | 5,278 | (b) | .. | .. | 14,487 |
| Total mining, excluding services to mining | | | | | | | | | | |
| 1975 | | 95,281 | 17,131 | 78,142 | 20,231 | 93,799 | 18,017 | 17,528 | 303 | 340,432 |
| 1974 | | 65,653 | 15,421 | 56,849 | 10,817 | 65,785 | 15,570 | 12,379 | 111 | 242,586 |
| 1973 | | 69,973 | 15,888 | 38,261 | 9,186 | 57,461 | 12,933 | 7,847 | 226 | 211,775 |
| 1972 | | 64,444 | 16,003 | 38,567 | 8,156 | 60,489 | 14,391 | 8,897 | 230 | 211,178 |
| 1971 | | 46,084 | 13,268 | 28,357 | 5,649 | 45,225 | 12,502 | 6,114 | 167 | 157,365 |

(a) Australian Standard Industrial Classification. (b) Not available for publication.

Value added

The following table shows value added, calculated as the value of turnover (sales plus transfers out and other operating revenue) and closing stocks less purchases plus transfers in and selected expenses and opening stocks.

**MINING ESTABLISHMENTS: VALUE ADDED, BY INDUSTRY SUB-DIVISION
(\$'000)**

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|----------------------------------------------------|--------------|---------|---------|--------------------|--------|---------|---------------|--------|--------|-----------|
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 186,024 | 422,823 | 293,650 343,810 | 57,296 | 580,326 | 68,569 (b) | 67,786 | .. | 1,234,887 |
| Coal | 12 | 372,699 | | | | | | | | |
| Crude petroleum including natural gas | 13 | .. | 40,755 | 26,152 | 10,857 | 11,661 | 2,389 | .. | 2,961 | 149,389 |
| Construction materials | 14 | 53,188 | | | | | | | | |
| Other non-metallic minerals | 15 | 15,072 | 4,935 | (b) | 6,733 | 16,821 | (b) | 1,420 | .. | 50,195 |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1974-75 | .. | 626,983 | 468,513 | 671,336 | 74,886 | 654,282 | 72,903 | 69,205 | 2,961 | 2,641,069 |
| 1973-74 | .. | 384,563 | 389,313 | 503,099 | 67,830 | 493,992 | 85,321 | 70,193 | 1,785 | 1,996,096 |
| 1972-73 | .. | 322,291 | 316,619 | 322,103 | 73,822 | 449,553 | 62,186 | 49,084 | 1,644 | 1,597,301 |
| 1971-72 | .. | 320,351 | 283,445 | 239,208 | 64,707 | 424,008 | 59,317 | 35,826 | 1,444 | 1,428,307 |
| 1970-71 | .. | 290,853 | 217,953 | 245,746 | 65,665 | 386,444 | 58,095 | 22,161 | 1,236 | 1,288,154 |

(a) Australian Standard Industrial Classification. (b) Not available for publication.

Fixed capital expenditure

Figures in the following table relate to fixed capital expenditure. Such figures are calculated by deducting disposals of fixed tangible assets from the total outlay on new and second-hand tangible assets.

**MINING ESTABLISHMENTS: FIXED CAPITAL EXPENDITURE (OUTLAY ON FIXED TANGIBLE ASSETS LESS DISPOSALS) BY INDUSTRY SUB-DIVISION
(\$'000)**

| Industry sub-division | ASIC code(a) | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|----------------------------------------------------|--------------|--------|--------|------------------|--------|---------|---------------|--------|--------|---------|
| 1974-75— | | | | | | | | | | |
| Metallic minerals | 11 | 18,335 | 76,880 | 67,975 39,431 | 20,789 | 142,807 | 18,129 (b) | 14,700 | .. | 274,993 |
| Coal | 12 | 57,765 | | | | | | | | |
| Crude petroleum including natural gas | 13 | .. | 6,847 | 3,005 | 1,971 | 1,582 | 737 | .. | 275 | 19,177 |
| Construction materials | 14 | 4,627 | | | | | | | | |
| Other non-metallic minerals | 15 | 2,155 | 450 | (b) | 2,335 | 2,744 | (b) | (-) | 32 | 15,032 |
| Total mining, excluding services to mining— | | | | | | | | | | |
| 1974-75 | .. | 82,882 | 84,177 | 117,774 | 25,094 | 151,872 | 19,430 | 14,668 | 275 | 496,174 |
| 1973-74 | .. | 41,975 | 44,013 | 113,007 | 23,327 | 96,862 | 13,159 | 6,155 | 74 | 338,573 |
| 1972-73 | .. | 41,566 | 25,920 | 128,696 | 16,062 | 87,785 | 12,482 | 10,341 | 77 | 322,930 |
| 1971-72 | .. | 76,963 | 32,335 | 155,810 | 12,082 | 167,174 | 16,532 | 21,672 | 44 | 482,611 |
| 1970-71 | .. | 76,994 | 80,389 | 103,454 | 14,665 | 186,643 | 25,967 | 31,837 | 610 | 520,561 |

(a) Australian Standard Industrial Classification. (b) Not available for publication.

Mineral production

This section contains details of the output (quantities and values) of minerals during the year ended June 1975 for all States and Territories and Australia, together with information for Australia for the four preceding years.

Minerals are classified into five major groups, namely metallic minerals, coal, crude petroleum (including natural gas), construction materials and other non-metallic minerals. In the statistics published in this section the minerals are arranged in these five groups.

Mineral production statistics are derived from data collected in the annual mining census (which since 1968-69 has been collected on a June year basis), and in returns to the various State Mines Departments, supplemented in some cases by information made available by the Department of National Resources and by data compiled by the Australian Bureau of Statistics from other sources.

Scope of mineral statistics and relation to mining industry statistics

The statistics of mineral production for the years ended June 1969 and later years apart from the change to a June year basis, are comparable with those for earlier years. Although the integration of the mining census for 1968-69 with other economic censuses conducted in that year (manufacturing, electricity and gas, retail trade, and wholesale trade) was accompanied by major changes in the scope of the mining census and thus in the scope of the mining industry statistics, these changes had little effect on the scope of the mineral production statistics now published. This is because mineral

production data were collected, not only from establishments coming within the scope of the mining census as now defined, but also from those establishments classified as non-mining establishments which, as a subsidiary activity, carried out mining or quarrying activities (e.g. brick and cement manufacturing establishments extracting clays, limestone), and from itinerant and part-time miners.

However, as in past years, coverage is deficient in the case of some minerals, principally because of the difficulties in obtaining complete lists of producers and collecting satisfactory returns.

Principles for measuring output of minerals

The quantities of individual minerals produced are recorded, in general, in the form in which the minerals are dispatched from the mine or from associated treatment works in the locality of the mine. Thus, for metallic minerals, the output is recorded as ore if no treatment is undertaken at or near the mine, and as concentrate if ore dressing operations are carried out in associated works in the locality of the mine. In addition to the basic quantity data, the content of metallic minerals (based on assay) are recorded. No allowance has been made for losses in smelting and refining and the quantities shown are therefore, in general, greater than the contents actually recoverable.

The output of individual minerals is valued at the mine or at associated treatment works in the locality of the mine. This valuation is derived, in general, by valuing the quantity produced during the year at the unit selling value (including any subsidy) less any transport costs from the mine or associated treatment works to the point of sale. For some metals, however, special values of output, based on actual or estimated realisations are supplied by certain large mineral producers.

It should be noted that, commencing with the year 1968-69, the output of minerals by enterprises for their own consumption in Australia has been valued on a different basis to that used in previous years. The effect of these changes is that the overall value of coal produced in 1968-69 and later years is somewhat lower and the value of certain other minerals somewhat higher than if the earlier valuation methods had been retained.

Quantity of minerals produced

The following tables show particulars of the quantities of minerals produced during 1974-75 and earlier years *together with details of the aggregate quantity of each metal, metallic oxide or elements contained in the various metallic minerals produced.*

QUANTITY OF MINERALS PRODUCED AND METALLIC CONTENTS OF ORES CONCENTRATES ETC 1974-75

| Mineral | | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|---------------------------------------------------------|-------------|--------|------|---------|--------|--------|----------|---------|--------|---------|
| METALLIC MINERALS | | | | | | | | | | |
| Antimony concentrate . . . | tonnes | 1,555 | .. | .. | .. | .. | .. | .. | .. | 1,555 |
| Antimony content . . . | " | 990 | .. | .. | .. | .. | .. | .. | .. | 990 |
| Antimony ore . . . | tonnes | (a) | (a) | .. | .. | .. | .. | .. | .. | (a) |
| Antimony content . . . | " | 7 | (a) | .. | .. | .. | .. | .. | .. | (a) |
| Bauxite . . . | '000 tonnes | 10 | .. | 10,849 | .. | 7,115 | .. | 4,231 | .. | 22,205 |
| Alumina (Al ₂ O ₃) content . . . | " | 4 | .. | (a) | .. | (a) | .. | (a) | .. | (a) |
| Beryllium ore . . . | tonnes | .. | .. | .. | .. | 6 | .. | .. | .. | 6 |
| Beryllium oxide (Be O) content . . . | m.t.u. | .. | .. | .. | .. | 72 | .. | .. | .. | 72 |
| Bismuth concentrate . . . | tonnes | 4 | .. | .. | .. | .. | .. | 4,384 | .. | 4,388 |
| Bismuth content . . . | kg | 2 | .. | .. | .. | .. | .. | 690,486 | .. | 690,488 |
| Copper content . . . | tonnes | .. | .. | .. | .. | .. | .. | 575 | .. | 575 |
| Gold content . . . | '000 grams | .. | .. | .. | .. | .. | .. | 974 | .. | 974 |
| Selenium content . . . | tonnes | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Silver content . . . | '000 grams | .. | .. | .. | .. | .. | .. | 396 | .. | 386 |
| Copper concentrate . . . | tonnes | 38,996 | .. | 663,045 | 32,683 | .. | 101,672 | 57,666 | .. | 894,062 |
| Copper content . . . | " | 9,730 | .. | 166,364 | 8,931 | .. | 25,824 | 9,408 | .. | 220,257 |
| Bismuth content . . . | kg | .. | .. | .. | .. | .. | .. | 484,060 | .. | 484,060 |
| Gold content . . . | '000 grams | .. | .. | 1,106 | 50 | .. | 508 | 858 | .. | 2,522 |
| Lead content . . . | tonnes | 599 | .. | .. | .. | .. | .. | .. | .. | 599 |
| Silver content . . . | '000 grams | 7,173 | .. | 23,636 | 1,254 | .. | 5,373 | 1,564 | .. | 39,000 |
| Zinc content . . . | tonnes | 1,800 | .. | .. | .. | .. | .. | .. | .. | 1,800 |
| Copper ore . . . | tonnes | 174 | .. | 15,162 | .. | .. | .. | .. | .. | 15,336 |
| Copper content . . . | " | 27 | .. | 969 | .. | .. | .. | .. | .. | 996 |
| Gold content . . . | '000 grams | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Copper ore for fertilizer . . . | tonnes | .. | .. | .. | 1,000 | .. | .. | .. | .. | 1,000 |
| Copper content . . . | " | .. | .. | .. | 8 | .. | .. | .. | .. | 8 |
| Copper oxide . . . | tonnes | 21 | .. | .. | 1,425 | .. | .. | .. | .. | 1,446 |
| Copper content . . . | " | 16 | .. | .. | 1,095 | .. | .. | .. | .. | 1,111 |
| Copper precipitate . . . | tonnes | 16 | .. | 24 | 4 | .. | .. | .. | .. | 44 |
| Copper content . . . | " | 10 | .. | 19 | 3 | .. | .. | .. | .. | 32 |
| Gold bullion(b) . . . | '000 grams | 11 | 249 | 921 | .. | 8,298 | 2 | 3,422 | .. | 12,903 |
| Gold content . . . | " | 11 | 218 | 274 | .. | 6,257 | 2 | 3,260 | .. | 10,022 |
| Silver content . . . | " | 1 | .. | 539 | .. | 1,474 | .. | .. | .. | 2,014 |
| Iron ore . . . | '000 tonnes | .. | .. | .. | 5,448 | 90,659 | (c)2,052 | .. | .. | 98,159 |
| Iron content . . . | " | .. | 292 | .. | 1,853 | 57,289 | 1,426 | .. | .. | 60,860 |
| Iron oxide(d) . . . | tonnes | 25,328 | .. | 26,569 | .. | .. | 10,989 | .. | .. | 62,886 |

For footnotes see end of table.

QUANTITY OF MINERALS PRODUCED: AND METALLIC CONTENTS OF ORES
CONCENTRATES ETC., 1974-75—continued

| Mineral | | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | A.C.T. | Aust. |
|---------------------------------|------------|---------|------|---------|--------|---------|-----------|------|--------|-----------|
| Lead concentrate | tonnes | 330,125 | .. | 271,871 | .. | 18 | 12,457 | 741 | .. | 615,212 |
| Lead content | " | 247,617 | .. | 134,354 | .. | 10 | 8,648 | 219 | .. | 390,848 |
| Antimony content | " | 675 | .. | .. | .. | .. | .. | .. | .. | 675 |
| Cadmium content | " | 52 | .. | 5 | .. | .. | .. | .. | .. | 57 |
| Copper content | " | 2,794 | .. | 801 | .. | .. | 31 | 53 | .. | 3,679 |
| Gold content | '000 grams | 230 | .. | .. | .. | .. | 30 | 123 | .. | 383 |
| Silver content | " | 244,472 | .. | 306,343 | .. | .. | 9,383 | 193 | .. | 560,391 |
| Sulphur content | tonnes | 49,015 | .. | .. | .. | .. | 2,138 | .. | .. | 51,153 |
| Zinc content | " | 11,582 | .. | 18,244 | .. | .. | 1,301 | .. | .. | 31,127 |
| Lead-copper concentrate | tonnes | .. | .. | .. | .. | .. | 19,952 | .. | .. | 19,952 |
| Lead content | " | .. | .. | .. | .. | .. | 4,207 | .. | .. | 4,207 |
| Copper content | " | .. | .. | .. | .. | .. | 2,652 | .. | .. | 2,652 |
| Gold content | '000 grams | .. | .. | .. | .. | .. | 913 | .. | .. | 913 |
| Silver content | " | .. | .. | .. | .. | .. | 45,211 | .. | .. | 45,211 |
| Sulphur content | tonnes | .. | .. | .. | .. | .. | 6,055 | .. | .. | 6,055 |
| Zinc content | " | .. | .. | .. | .. | .. | 2,409 | .. | .. | 2,409 |
| Lead ore(e) | tonnes | 142 | .. | 47,400 | 20 | .. | .. | .. | .. | 47,562 |
| Lead content | " | 13 | .. | 2,607 | 6 | .. | .. | .. | .. | 2,626 |
| Copper content | " | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Silver content | '000 grams | .. | .. | 2,939 | .. | .. | .. | .. | .. | 2,939 |
| Zinc content | tonnes | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Lead zinc middlings | tonnes | 10,654 | .. | .. | .. | .. | .. | .. | .. | 10,654 |
| Lead content | " | 2,371 | .. | .. | .. | .. | .. | .. | .. | 2,371 |
| Antimony content | " | 10 | .. | .. | .. | .. | .. | .. | .. | 10 |
| Cadmium content | " | 21 | .. | .. | .. | .. | .. | .. | .. | 21 |
| Copper content | " | 128 | .. | .. | .. | .. | .. | .. | .. | 128 |
| Gold content | '000 grams | 28 | .. | .. | .. | .. | .. | .. | .. | 28 |
| Silver content | " | 16,842 | .. | .. | .. | .. | .. | .. | .. | 16,842 |
| Sulphur content | tonnes | 3,036 | .. | .. | .. | .. | .. | .. | .. | 3,036 |
| Zinc content | " | 3,359 | .. | .. | .. | .. | .. | .. | .. | 3,359 |
| Manganese ore— | | | | | | | | | | |
| Metallurgical grade | tonnes | .. | .. | .. | .. | .. | 1,409,683 | .. | .. | 1,409,683 |
| Manganese content | " | .. | .. | .. | .. | .. | 666,780 | .. | .. | 666,780 |
| Other grades | tonnes | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Manganese content | " | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Mineral sands(f)— | | | | | | | | | | |
| Ilmenite concentrate | (g) tonnes | 17,607 | .. | .. | 90 | 873,393 | .. | .. | .. | 891,090 |
| Titanium dioxide content | " | 7,923 | .. | .. | 49 | 495,610 | .. | .. | .. | 503,582 |
| Leucoxene concentrate | tonnes | .. | .. | .. | .. | 17,559 | .. | .. | .. | 17,559 |
| Titanium dioxide content | " | .. | .. | .. | .. | 15,642 | .. | .. | .. | 15,642 |
| Monazite concentrate | tonnes | 822 | .. | 23 | .. | 2,526 | .. | .. | .. | 3,371 |
| Monazite content | " | 742 | .. | 15 | .. | 2,351 | .. | .. | .. | 3,108 |
| Rutile concentrate | tonnes | 183,096 | .. | 120,959 | 188 | 25,118 | 4,844 | .. | .. | 334,205 |
| Titanium dioxide content | " | 175,775 | .. | 115,981 | 180 | 23,917 | 4,643 | .. | .. | 320,496 |
| Xenotime concentrate | tonnes | .. | .. | .. | .. | 16 | .. | .. | .. | 16 |
| Yttrium oxide content | kg | .. | .. | .. | .. | 4,880 | .. | .. | .. | 4,880 |
| Zircon concentrate | tonnes | 189,854 | .. | 107,570 | 126 | 87,641 | 7,560 | .. | .. | 392,751 |
| Zirconium dioxide content | " | 187,957 | .. | 71,644 | 83 | 57,535 | 4,972 | .. | .. | 322,191 |
| Nickel concentrate | tonnes | .. | .. | .. | .. | 405,380 | .. | .. | .. | 405,380 |
| Nickel content | " | .. | .. | .. | .. | 49,106 | .. | .. | .. | 49,106 |
| Cobalt content | " | .. | .. | .. | .. | 79 | .. | .. | .. | 79 |
| Copper content | " | .. | .. | .. | .. | 4,449 | .. | .. | .. | 4,449 |
| Palladium content | kg | .. | .. | .. | .. | 147 | .. | .. | .. | 147 |
| Platinum content | " | .. | .. | .. | .. | 62 | .. | .. | .. | 62 |
| Nickel ore | tonnes | .. | .. | 1,042 | .. | .. | .. | .. | .. | 1,042 |
| Nickel content | " | .. | .. | (a) | .. | .. | .. | .. | .. | (a) |
| Pyrite concentrate | tonnes | .. | .. | 592 | .. | .. | 218,474 | .. | .. | 219,066 |
| Sulphur content | " | .. | .. | 278 | .. | .. | 103,848 | .. | .. | 104,126 |
| Tantalite-columbite concentrate | kg | .. | .. | .. | .. | 178,700 | .. | .. | .. | 178,700 |
| Tantalite-columbite content | " | .. | .. | .. | .. | 53,734 | .. | .. | .. | 53,734 |
| Tin concentrate | tonnes | 3,475 | 5 | 2,489 | .. | 982 | 12,597 | 4 | .. | 19,552 |
| Tin content | " | 1,854 | 4 | 1,681 | .. | 690 | 5,863 | 3 | .. | 10,095 |
| Tin-copper concentrate | tonnes | .. | .. | .. | .. | .. | 2,506 | .. | .. | 2,506 |
| Tin content | " | .. | .. | .. | .. | .. | 73 | .. | .. | 73 |
| Copper content | " | .. | .. | .. | .. | .. | 522 | .. | .. | 522 |
| Tungsten concentrates— | | | | | | | | | | |
| Scheelite concentrate | tonnes | .. | .. | .. | .. | .. | 1,672 | .. | .. | 1,672 |
| Tungstic oxide content | m.t.u. | .. | .. | .. | .. | .. | 120,700 | .. | .. | 120,700 |
| Wolfram concentrate | tonnes | .. | .. | 214 | .. | .. | 310 | .. | .. | 524 |
| Tungstic oxide content | m.t.u. | .. | .. | 13,862 | .. | .. | 23,000 | .. | .. | 36,862 |
| Wolfram ore | tonnes | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tungstic oxide content | m.t.u. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Zinc concentrate | tonnes | 549,874 | .. | 220,945 | .. | .. | 108,793 | .. | .. | 879,612 |
| Zinc content | " | 285,097 | .. | 114,856 | .. | .. | 57,747 | .. | .. | 457,700 |
| Cadmium content | " | 946 | .. | 442 | .. | .. | 135 | .. | .. | 1,523 |
| Cobalt content | " | 116 | .. | .. | .. | .. | 351 | .. | .. | 116 |
| Copper content | " | 830 | .. | .. | .. | .. | 116 | .. | .. | 170 |
| Gold content | '000 grams | 54 | .. | .. | .. | .. | .. | .. | .. | 1,181 |
| Lead content | tonnes | 6,000 | .. | 4,655 | .. | .. | 5,207 | .. | .. | 15,862 |
| Manganese content | " | 5,884 | .. | .. | .. | .. | 262 | .. | .. | 6,146 |
| Mercury content | kg | .. | .. | .. | .. | .. | 86 | .. | .. | 86 |
| Silver content | '000 grams | .. | .. | 28,104 | .. | .. | 13,320 | .. | .. | 41,424 |
| Sulphur content | tonnes | 173,022 | .. | 70,702 | .. | .. | 35,191 | .. | .. | 278,915 |
| Zinc ore | tonnes | .. | .. | .. | 33,493 | .. | .. | .. | .. | 33,493 |
| Zinc content | " | .. | .. | .. | 11,779 | .. | .. | .. | .. | 11,779 |

For footnotes see end of table

QUANTITY OF MINERALS PRODUCED AND METALLIC CONTENTS OF ORES
CONCENTRATES ETC., 1974-75—*continued*

| <i>Mineral</i> | | <i>N.S.W.</i> | <i>Vic.</i> | <i>Qld</i> | <i>S.A.</i> | <i>W.A.</i> | <i>Tas.</i> | <i>N.T.</i> | <i>A.C.T.</i> | <i>Aust.</i> |
|-----------------------------------------|-------------|---------------|-------------|------------|--------------|-------------------|-------------|-------------|------------------|--------------|
| COAL | | | | | | | | | | |
| Black coal— | '000 tonnes | 42,482 | .. | 23,845 | 1,798 | 1,879 | 138 | .. | .. | 70,142 |
| Bituminous | " | 42,482 | .. | 22,855 | .. | .. | 138 | .. | .. | 65,475 |
| Sub-bituminous | " | .. | .. | 990 | 1,798 | 1,879 | .. | .. | .. | 4,667 |
| Brown coal (lignite)(<i>h</i>) | " | .. | 24,441 | .. | .. | .. | .. | .. | .. | 24,441 |
| Brown coal briquettes | " | .. | 1,092 | .. | .. | .. | .. | .. | .. | 1,092 |
| PETROLEUM(<i>i</i>) | | | | | | | | | | |
| Crude oil | '000 cu m | .. | 20,930 | 71 | .. | 2,095 | .. | .. | .. | 23,096 |
| Natural gas | mil. cu m | .. | 2,284 | 265 | 1,263 | 822 | .. | .. | .. | 4,633 |
| Natural gas condensate(<i>j</i>) | cu m | .. | .. | 2,684 | .. | 5,035 | .. | .. | .. | 7,719 |
| Ethane(<i>k</i>) | '000 cu m | .. | 63,677 | .. | .. | .. | .. | .. | .. | 63,677 |
| Liquefied petroleum gases(<i>k</i>)— | | | | | | | | | | |
| Propane | '000 cu m | .. | 1,025 | .. | .. | 1 | .. | .. | .. | 1,026 |
| Butane | '000 cu m | .. | 1,147 | .. | .. | 1 | .. | .. | .. | 1,148 |
| CONSTRUCTION MATERIALS(<i>l</i>) | | | | | | | | | | |
| Sand | '000 tonnes | 9,115 | 7,541 | 4,789 | 2,419 | n.a. | 219 | 166 | 558 (<i>m</i>) | 24,807 |
| Gravel | " | 3,814 | 4,732 | 5,256 | 638 | n.a. | 1,004 | 1,156 | 715 (<i>m</i>) | 17,315 |
| Dimension stone | " | 12 | 12 | .. | 43 | 94 | 1 | .. | 1 | 163 |
| Crushed and broken stone | " | 13,125 | 18,382 | 9,661 | 8,735 | 5,396 | 1,429 | 367 | 242 | 57,337 |
| Other (decomposed rock, etc.) | " | 26,112 | 6,136 | 764 | 597 | .. | 56 | .. | 32 | 33,697 |
| OTHER NON-METALLIC MINERALS | | | | | | | | | | |
| Asbestos | tonnes | 36,558 | .. | .. | .. | .. | .. | .. | .. | 36,558 |
| Barite | " | 591 | .. | .. | 7,273 | 4,149 | .. | .. | .. | 12,013 |
| Carbon dioxide | " | .. | .. | .. | (<i>a</i>) | .. | .. | .. | .. | (<i>a</i>) |
| Clays— | | | | | | | | | | |
| Brick and shale | '000 tonnes | 2,873 | 1,970 | 842 | 671 | 1,348 | 140 | .. | .. | 7,844 |
| Other | " | 469 | 301 | 202 | 151 | 114 | 74 | .. | .. | 1,311 |
| Diatomite | tonnes | 356 | 4,979 | 700 | .. | .. | .. | .. | .. | 6,035 |
| Dolomite | " | 874 | .. | 10,999 | 393,469 | .. | 6,199 | .. | .. | 411,541 |
| Felspar (including cor-nish stone) | " | 2,021 | .. | .. | 1,788 | 469 | .. | .. | .. | 4,278 |
| Fluorspar | " | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Garnet concentrate | " | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Gypsum | " | 44,615 | 54,139 | .. | 784,437 | 124,471 | .. | .. | .. | 1,007,662 |
| Limestone (including shell and coral) | '000 tonnes | 3,706 | 2,140 | 1,876 | 1,535 | 1,272 | 580 | .. | .. | 11,109 |
| Lithium ores | tonnes | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Lithia (Li ₂ O) content | m. t. u. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Magnesite, crude | tonnes | 18,687 | .. | .. | 363 | 17,223 | .. | .. | .. | 36,273 |
| Mineral pigments—red ochre | " | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Peat(<i>n</i>) | " | 2,324 | .. | .. | .. | 670 | 390 | .. | .. | 3,384 |
| Pebbles—for grinding | " | .. | .. | .. | 22 | .. | 976 | .. | .. | 998 |
| Perlite | " | .. | .. | 3,555 | .. | .. | .. | .. | .. | 3,555 |
| Phosphate rock | " | .. | .. | 35,485 | 1,531 | .. | .. | .. | .. | 37,016 |
| Pyrophyllite | " | 14,264 | .. | .. | .. | .. | .. | .. | .. | 14,264 |
| Salt | '000 tonnes | .. | 114 | 92 | 698 | (<i>o</i>)4,153 | .. | .. | .. | 5,057 |
| Silica | tonnes | 438,761 | 142,550 | 671,730 | 72,571 | 30,511 | 32,178 | .. | .. | 1,388,301 |
| Sillimanite | " | .. | .. | .. | 703 | .. | .. | .. | .. | 703 |
| Talc (including steatite and chlorite) | " | 4,254 | .. | .. | 15,842 | 51,976 | .. | .. | .. | 72,072 |
| Vermiculite | " | .. | .. | .. | .. | n.a. | .. | .. | .. | n.a. |

(*a*) Not available for publication. (*b*) Includes alluvial gold. (*c*) Iron concentrate. (*d*) For cement manufacture, coal washing. (*e*) Includes silver-lead ore, silver-lead slimes and lead slag. (*f*) Details relating to rutile-zircon concentrates produced in one State and finally separated in another State are included in separated form in the data of the State of origin. The ilmenite figure includes that from which titanium dioxide is not commercially extractable. (*g*) Includes beneficiated Ilmenite. (*h*) In addition 2,900,000 tonnes of brown coal valued at \$4,785,000 was used in making briquettes. (*i*) Source: Department of National Resources and State Mines Departments. (*j*) Sales—excludes condensate blended with other petroleum products. (*k*) Excludes refinery production. (*l*) Incomplete see individual States. (*m*) Incomplete, excludes Western Australia. (*n*) Comprises peat for fertiliser and peat moss. (*o*) Includes langbeinite.

QUANTITY OF MINERALS PRODUCED AND METALLIC CONTENTS OF ORES
CONCENTRATES ETC.: AUSTRALIA

| <i>Mineral</i> | | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
|-------------------------------------------------------------|-------------|---------|---------|------------|---------|---------|
| METALLIC MINERALS | | | | | | |
| Antimony concentrate | tonnes | 887 | 611 | 1,440 | 1,346 | 1,555 |
| Antimony content | " | 424 | 338 | 930 | 860 | 990 |
| Antimony ore | tonnes | 2,934 | (a) | (a) | (a) | (a) |
| Antimony content | " | 278 | (a) | (a) | (a) | (a) |
| Bauxite | '000 tonnes | 11,043 | 13,697 | 14,702 | 18,545 | 22,205 |
| Alumina (Al ₂ O ₃) content | " | (a) | (a) | (a) | (a) | (a) |
| Beryllium ore | tonnes | 28 | 61 | 118 | 180 | 6 |
| Beryllium oxide (BeO) content | mtu | 338 | 678 | 1,386 | 2,123 | 72 |
| Bismuth concentrate | tonnes | 1,896 | 1,281 | 1,609 | 2,701 | 4,388 |
| Bismuth content | kg | 232,936 | 325,474 | 343,349 | 444,473 | 690,488 |
| Copper content | tonnes | 110 | 114 | 157 | 400 | 575 |
| Gold content | '000 grams | 1,004 | 2,239 | 2,026 | 956 | 974 |
| Selenium content | tonnes | .. | 36 | 31 | 5 | .. |
| Silver content | '000 grams | 175 | 436 | 520 | 274 | 386 |
| Copper concentrate | tonnes | 662,030 | 636,018 | 824,772 | 938,235 | 894,062 |
| Copper content | " | 161,575 | 159,239 | 186,763 | 233,371 | 220,257 |
| Bismuth content | kg | 5,080 | 22,353 | 12,100 | 580,664 | 484,060 |
| Gold content | '000 grams | 2,800 | 2,985 | 2,463 | 3,402 | 2,522 |
| Lead content | tonnes | 777 | 341 | 633 | 754 | 599 |
| Palladium content | '000 grams | 2 | .. | .. | .. | .. |
| Platinum content | " | 1 | .. | .. | .. | .. |
| Silver content | " | 35,343 | 32,342 | 38,343 | 40,900 | 39,000 |
| Zinc content | tonnes | 1,850 | 994 | 2,058 | 2,324 | 1,800 |
| Copper ore | tonnes | 30,783 | 18,890 | 12,504 | 23,252 | 15,336 |
| Copper content | " | 1,816 | 1,261 | 946 | 1,407 | 996 |
| Gold content | '000 grams | 1 | .. | 1 | .. | .. |
| Silver content | " | 102 | 84 | .. | .. | 18 |
| Copper ore for fertilizer | tonnes | 304 | 152 | 3,048 | 1,516 | 1,000 |
| Copper content | " | 26 | 7 | 24 | 6 | 8 |
| Copper oxide | tonnes | .. | 663 | 976 | 861 | 1,446 |
| Copper content | " | .. | 509 | 752 | 663 | 1,111 |
| Copper precipitate | tonnes | 278 | 247 | 170 | 173 | 44 |
| Copper content | " | 179 | 179 | 130 | 128 | 32 |
| Gold content | '000 grams | 3 | .. | .. | .. | .. |
| Silver content | " | .. | .. | .. | .. | .. |
| Gold bullion (b) | '000 grams | 18,854 | 20,762 | 17,930 | 13,906 | 12,903 |
| Gold content | " | 14,053 | 16,179 | 13,938 | 10,412 | 10,022 |
| Silver content | " | 4,034 | 3,769 | 3,264 | 2,519 | 2,014 |
| Gold ore | tonnes | 1,087 | .. | .. | 116 | 236 |
| Gold content | '000 grams | 3 | .. | .. | 1 | 2 |
| Iron ore (c) | '000 tonnes | 57,110 | 62,103 | 74,645 | 91,508 | 98,159 |
| Iron content | " | 36,107 | 39,255 | 47,204 | 57,801 | 60,860 |
| Iron oxide (d) | tonnes | 64,080 | 66,908 | 86,569 | 71,117 | 62,886 |
| Lead concentrate | tonnes | 631,722 | 622,592 | (e)582,178 | 563,036 | 615,212 |
| Lead content | " | 392,834 | 395,186 | 356,695 | 345,290 | 390,848 |
| Antimony content | " | 662 | 711 | 619 | 574 | 675 |
| Cadmium content | " | 89 | 83 | 53 | 47 | 57 |
| Copper content | " | 3,258 | 3,603 | 3,176 | 2,988 | 3,679 |
| Gold content | '000 grams | 324 | 382 | 312 | 276 | 383 |
| Silver content | " | 588,128 | 540,465 | 490,615 | 497,096 | 560,391 |
| Sulphur content | tonnes | 50,356 | 56,831 | 50,826 | 44,236 | 51,153 |
| Zinc content | " | 32,047 | 33,922 | 31,786 | 29,758 | 31,127 |
| Lead-copper concentrate | tonnes | 10,227 | 18,025 | 16,605 | 19,919 | 19,952 |
| Lead content | " | 3,018 | 5,126 | 5,034 | 5,138 | 4,207 |
| Copper content | " | 1,234 | 2,133 | 1,828 | 2,350 | 2,652 |
| Gold content | '000 grams | 750 | 1,260 | 1,038 | 972 | 913 |
| Silver content | " | 28,824 | 49,602 | 49,357 | 53,034 | 45,211 |
| Sulphur content | tonnes | 2,845 | 5,005 | 4,427 | 5,673 | 6,055 |
| Zinc content | " | 11,278 | 2,360 | 2,333 | 2,657 | 2,409 |

For footnotes see end of table.

QUANTITY OF MINERALS PRODUCED AND METALLIC CONTENTS OF ORES, CONCENTRATES, ETC.: AUSTRALIA—*continued*

| <i>Mineral</i> | | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
|-------------------------------------------|------------|---------|------------|------------|------------|------------|
| METALLIC MINERALS—<i>continued</i> | | | | | | |
| Lead ore (<i>f</i>) | tonnes | 36,333 | 31,284 | 39,760 | 32,711 | 47,562 |
| Lead content | " | 2,020 | 1,774 | 2,553 | 1,847 | 2,613 |
| Copper content | " | .. | .. | 4 | .. | .. |
| Silver content | '000 grams | 2,337 | 2,044 | 3,480 | 2,153 | 2,939 |
| Zinc content | tonnes | 27 | 18 | 63 | .. | .. |
| Lead-zinc middlings | tonnes | 23,400 | 20,055 | 26,553 | 11,609 | 10,654 |
| Lead content | " | 6,560 | 4,910 | 5,733 | 2,136 | 2,371 |
| Antimony content | " | 22 | 26 | 34 | 12 | 10 |
| Cadmium content | " | 7 | 22 | 29 | 22 | 21 |
| Copper content | " | 92 | 133 | 175 | 134 | 128 |
| Gold content | '000 grams | 21 | 17 | 23 | 22 | 28 |
| Silver content | " | 24,660 | 16,746 | 23,880 | 15,643 | 16,842 |
| Sulphur content | tonnes | 1,749 | 4,309 | 5,515 | 3,223 | 3,036 |
| Zinc content | " | 5,109 | 5,373 | 8,038 | 4,011 | 3,359 |
| Manganese ore— | | | | | | |
| Metallurgical grade | tonnes | 785,840 | 1,163,614 | 1,295,357 | 1,619,168 | 1,409,683 |
| Manganese content | " | 367,475 | 554,616 | 624,042 | 765,146 | 666,780 |
| Other grades | tonnes | 315 | 96 | 16 | 17 | .. |
| Manganese content | " | 82 | 28 | 4 | .. | .. |
| Mineral sands (<i>g</i>)— | | | | | | |
| Ilmenite concentrate | tonnes | 886,758 | (h)705,259 | (h)720,996 | (h)676,566 | (h)891,090 |
| Titanium dioxide content | " | 482,382 | 398,243 | 396,514 | 337,363 | 503,582 |
| Leucoxene concentrate | tonnes | 12,863 | 12,541 | 10,465 | 11,374 | 17,559 |
| Titanium dioxide content | " | 11,304 | 11,112 | 9,336 | 10,128 | 15,642 |
| Monazite concentrate | tonnes | 4,146 | 5,148 | 4,534 | 4,052 | 3,371 |
| Monazite content | " | 3,842 | 4,735 | 4,148 | 3,715 | 3,108 |
| Rutile concentrate | tonnes | 374,768 | 355,675 | 318,698 | 308,050 | 334,205 |
| Titanium dioxide content | " | 359,512 | 343,378 | 305,962 | 295,514 | 320,496 |
| Xenotime concentrate | tonnes | 42 | 14 | 17 | 10 | 16 |
| Yttrium oxide content | kg | 9,647 | 3,658 | 4,318 | 4,378 | 4,880 |
| Zircon concentrate | tonnes | 417,974 | 390,515 | 373,024 | 347,014 | 392,751 |
| Zirconium dioxide content | " | 277,877 | 258,767 | 247,545 | 290,519 | 322,191 |
| Molybdenite concentrate | tonnes | 61 | 18 | .. | 8 | .. |
| Molybdenum disulphide | kg | 51,818 | 15,676 | .. | 7,360 | .. |
| Nickel concentrate | tonnes | 304,046 | 299,144 | 268,349 | 323,142 | 405,380 |
| Nickel content | " | 34,917 | 35,559 | 36,104 | 42,247 | 49,106 |
| Cobalt content | " | 336 | 167 | 203 | 109 | 79 |
| Copper content | " | 2,938 | 2,590 | 2,659 | 3,407 | 4,449 |
| Palladium content | kg | 28 | .. | .. | 71 | 147 |
| Platinum content | " | .. | .. | .. | 17 | 62 |
| Nickel ore | tonnes | .. | .. | (a) | .. | 1,042 |
| Nickel content | " | .. | .. | (a) | .. | (a) |
| Pyrite concentrate | tonnes | 235,355 | 261,481 | 198,096 | 239,274 | 219,066 |
| Sulphur content | " | 110,375 | 120,586 | 93,839 | 114,340 | 104,126 |
| Gold content | kg | .. | .. | .. | .. | .. |
| Silver content | " | .. | .. | .. | .. | .. |
| Tantalite-columbite concentrate | kg | 158,786 | 162,019 | 236,831 | 231,520 | 178,700 |
| Tantalite-columbite content | " | 63,230 | 76,217 | 84,744 | 91,108 | 53,734 |
| Tin content | tonnes | (a) | .. | .. | .. | .. |
| Tin concentrates | tonnes | 15,951 | 19,722 | 22,513 | 20,040 | 19,552 |
| Tin content | " | 8,749 | 10,912 | 11,625 | 10,518 | 10,095 |
| Copper content | " | .. | .. | .. | 6 | .. |
| Tantalite-columbite content | kg | (a) | .. | .. | (a) | .. |
| Tin-copper concentrate | tonnes | 4,367 | 5,187 | 4,586 | 3,241 | 2,506 |
| Tin content | " | 174 | 157 | 129 | 81 | 73 |
| Copper content | " | 836 | 977 | 878 | 652 | 522 |

For footnotes *see* end of table

QUANTITY OF MINERALS PRODUCED AND METALLIC CONTENTS OF ORES, CONCENTRATES, ETC.: AUSTRALIA—*continued*

| <i>Mineral</i> | | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
|-------------------------------------------|-------------|---------|---------|---------|---------|---------|
| METALLIC MINERALS—<i>continued</i> | | | | | | |
| Tungsten concentrates— | | | | | | |
| Scheelite concentrate | tonnes | 1,287 | 1,842 | 1,789 | 1,630 | 1,672 |
| Tungstic oxide content | m.t.u. | 90,374 | 135,347 | 131,973 | 117,100 | 120,700 |
| Wolfram concentrate | tonnes | 1,076 | 841 | 761 | 374 | 524 |
| Tungstic oxide content | m.t.u. | 75,681 | 61,025 | 55,528 | 25,676 | 36,862 |
| Bismuth content | " | .. | .. | .. | .. | .. |
| Wolfram ore | tonnes | .. | .. | 122 | .. | .. |
| Tungstic oxide content | m.t.u. | .. | .. | 100 | .. | .. |
| Zinc concentrate | tonnes | 770,887 | 867,143 | 865,248 | 768,753 | 879,612 |
| Zinc content | " | 403,757 | 454,874 | 462,717 | 405,526 | 457,700 |
| Cadmium content | " | 1,369 | 1,520 | 1,547 | 1,361 | 1,523 |
| Cobalt content | " | 110 | 116 | 107 | 92 | 116 |
| Copper content | " | 900 | 1,167 | 1,226 | 1,156 | 1,181 |
| Gold content | '000 grams | 125 | 188 | 201 | 198 | 170 |
| Lead content | tonnes | 11,223 | 13,431 | 14,360 | 15,266 | 15,862 |
| Manganese content | " | 6,155 | 7,711 | 8,443 | 5,426 | 6,146 |
| Mercury content | kg | 662 | 483 | 512 | 313 | 86 |
| Silver content | '000 grams | 47,574 | 54,677 | 61,023 | 62,717 | 41,424 |
| Sulphur content | tonnes | 239,922 | 273,583 | 324,960 | 241,868 | 278,915 |
| Zinc ore | tonnes | 254 | .. | .. | 18,315 | 33,493 |
| Zinc content | " | 76 | .. | .. | 3,010 | 11,779 |
| COAL | | | | | | |
| Black coal | '000 tonnes | 49,720 | 53,549 | 59,755 | 59,344 | 70,142 |
| Semi-anthracite | " | 1 | .. | .. | .. | .. |
| Bituminous | " | 46,460 | 50,340 | 56,444 | 55,924 | 65,475 |
| Sub-bituminous | " | 3,259 | 3,208 | 3,311 | 3,420 | 4,667 |
| Brown coal (lignite)(i) | " | 19,168 | 19,998 | 20,922 | 23,258 | 24,441 |
| Brown coal briquettes | " | 1,391 | 1,308 | 1,228 | 1,164 | 1,092 |
| PETROLEUM (j) | | | | | | |
| Crude oil | '000 cu m | 14,937 | 19,038 | 20,669 | 23,096 | 23,096 |
| Natural gas | mil. cu m | 1,961 | 2,628 | 3,713 | 4,360 | 4,633 |
| Natural gas condensate(k) | cu m | 1,433 | 6,125 | 9,532 | 8,181 | 7,719 |
| Ethane(e) | '000 cu m | 5,380 | 3,087 | 27,436 | 46,176 | 63,677 |
| Liquefied petroleum gases(l)— | | | | | | |
| Propane | '000 cu m | 347 | 577 | 798 | 1,124 | 1,026 |
| Butane | '000 cu m | 393 | 662 | 988 | 930 | 1,148 |
| CONSTRUCTION MATERIALS(m) | | | | | | |
| Sand | '000 tonnes | 17,413 | 19,501 | 21,869 | 24,684 | 24,807 |
| Gravel | " | 12,993 | 12,871 | 14,520 | 15,982 | 17,315 |
| Dimension stone | " | 186 | 410 | 288 | 119 | 163 |
| Crushed and broken stone | " | 50,419 | 50,475 | 51,037 | 54,803 | 57,337 |
| Other | " | 28,208 | 26,405 | 42,113 | 33,264 | 33,697 |

For footnotes see end of table

QUANTITY OF MINERALS PRODUCED AND METALLIC CONTENTS OF ORES, CONCENTRATES, ETC.: AUSTRALIA—*continued*

| <i>Mineral</i> | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 | |
|--------------------------------------------------|-------------|---------|-----------|-----------|-----------|-----------|
| OTHER NON-METALLIC MINERALS | | | | | | |
| Asbestos | tonnes | 751 | 3,077 | 32,358 | 37,651 | 36,558 |
| Barite | " | 54,008 | 23,750 | 23,175 | 6,436 | 12,013 |
| Carbon dioxide | " | (a) | (a) | (a) | (u) | (a) |
| Clays— | | | | | | |
| Brick and shale | '000 tonnes | 7,078 | 7,872 | 8,098 | 9,246 | 7,844 |
| Other(n) | " | 1,410 | 1,209 | 1,321 | 1,382 | 1,311 |
| Diatomite | tonnes | 2,399 | 1,758 | 4,792 | 8,313 | 6,035 |
| Dolomite | " | 319,656 | 390,832 | 402,312 | 421,471 | 411,541 |
| Felspar (including cornish stone) | " | 3,382 | 2,948 | 2,916 | 3,049 | 4,278 |
| Fluorspar | " | 1,001 | 380 | 1,700 | 874 | .. |
| Garnet concentrate | " | 422 | 525 | 111 | 109 | .. |
| Gypsum | " | 952,901 | 1,010,573 | 961,717 | 1,192,855 | 1,007,662 |
| Limestone (including shell and coral) | '000 tonnes | 10,447 | 10,154 | 10,960 | 11,312 | 11,209 |
| Lithium ores(o) | tonnes | 739 | 1,930 | 695 | 1 | .. |
| Lithia (Li ₂ O) content | mtu | 3,102 | 8,108 | 2,828 | 4 | .. |
| Magnesite, crude | tonnes | 19,664 | 18,684 | 21,822 | 20,543 | 36,273 |
| Mineral pigments—red ochre | " | 702 | 23 | 625 | 608 | .. |
| Peat(p) | " | 3,678 | 4,489 | (a) | 3,747 | 3,384 |
| Pebbles—for grinding | " | 1,677 | 1,927 | 1,509 | 1,611 | 998 |
| Perlite | " | 1,773 | 295 | 1,834 | 1,739 | 3,555 |
| Phosphate rock | " | 9,164 | 2,512 | 1,494 | 1,484 | 37,016 |
| Pyrophyllite | " | 6,828 | 6,972 | 12,718 | 11,357 | 14,264 |
| Salt | '000 tonnes | 3,774 | 3,503 | 3,671 | 4,683 | 5,057 |
| Silica | tonnes | 955,048 | 1,012,445 | 1,168,819 | 1,385,013 | 1,388,301 |
| Sillimanite | " | 1,139 | 654 | 654 | 719 | 703 |
| Talc (including steatite and chlorite) | " | 44,532 | 43,997 | 47,927 | 63,068 | 72,072 |
| Vermiculite | " | 360 | 171 | 636 | n.a. | n.a. |

(a) Not available for publication. (b) Includes alluvial gold. (c) Includes iron concentrate. (d) For cement manufacture, coal washing. (e) Excludes Western Australian production. (f) Includes silver-lead ore, silver-lead slimes and lead slag. (g) Details relating to rutile-zircon concentrates produced in one State and finally separated in another State are included in separated form in the data of the State of origin. (h) Includes Beneficiated Ilmenite. Also includes ilmenite from which titanium dioxide is not commercially extractable. (i) Excludes brown coal used for briquette production. (j) Source: Department of National Resources and State Mines Departments. (k) Sales—excludes condensate blended and other petroleum products. (l) Excludes refinery production. (m) Incomplete see individual States. (n) Incomplete owing to difficulties of coverage. (o) Used mainly for non-metallic purposes. (p) Comprises peat for fertiliser and peat moss.

NOTE. Particulars of the production of uranium concentrate are not available for publication.

CONTENTS OF METALLIC MINERALS PRODUCED, 1974-75

| <i>Contents of metallic minerals produced</i> | <i>N.S.W.</i> | <i>Vic.</i> | <i>Qld</i> | <i>S.A.</i> | <i>W.A.</i> | <i>Tas.</i> | <i>N.T.</i> | <i>Aust.</i> |
|--------------------------------------------------------------------------------------------------|---------------|-------------|------------|-------------|-------------|-------------|-------------|--------------|
| Alumina (Al ₂ O ₃) | '000 tonnes | 4 | .. | (a) | .. | (a) | .. | (a) |
| Antimony | tonnes | 1,682 | (a) | .. | .. | .. | .. | (a) |
| Beryllium oxide (BeO) | mtu(b) | .. | .. | .. | 72 | .. | .. | 72 |
| Bismuth | kg | 2 | .. | .. | .. | .. | 1,238,835 | 1,238,837 |
| Cadmium | tonnes | 1,019 | .. | 447 | .. | 135 | .. | 1,601 |
| Cobalt | " | 116 | .. | 860 | .. | 79 | .. | 1,055 |
| Copper | " | 13,535 | .. | 168,153 | 10,037 | 4,449 | 29,380 | 10,036 |
| Gold | '000 grams | 335 | 218 | 1,380 | 52 | 6,292 | 1,569 | 5,216 |
| Iron(c) | '000 tonnes | .. | .. | .. | 1,853 | 57,289 | 1,426 | .. |
| Lead | tonnes | 256,587 | .. | 141,616 | 6 | 10 | (d)18,062 | 219 |
| Manganese(e) | " | 5,884 | .. | .. | .. | .. | 262 | 666,780 |
| Manganese dioxide (MnO ₂)(f) | " | .. | .. | .. | .. | .. | .. | .. |
| Mercury | kg | .. | .. | .. | .. | 86 | .. | 86 |
| Monazite | tonnes | 742 | .. | 15 | .. | 2,351 | .. | 3,108 |
| Nickel | " | .. | .. | .. | .. | 49,106 | .. | 49,106 |
| Palladium | kg | .. | .. | .. | .. | 147 | .. | 147 |
| Platinum | kg | .. | .. | .. | .. | 62 | .. | 62 |
| Selenium | kg | .. | .. | .. | .. | .. | .. | .. |
| Silver | '000 grams | 269,196 | .. | 361,598 | 1,254 | 1,614 | 73,287 | 2,143 |
| Sulphur(g) | tonnes | 225,073 | .. | 70,980 | .. | .. | 147,232 | .. |
| Tantalite-columbite (Ta ₂ O ₅ + Nb ₂ O ₅) | kg | .. | .. | .. | .. | 53,734 | .. | 53,734 |
| Tin | tonnes | 1,854 | 4 | 1,681 | .. | 690 | 5,936 | 3 |
| Titanium dioxide (TiO ₂) | " | 183,698 | .. | 115,981 | 229 | 535,169 | 4,643 | .. |
| Tungstic oxide (WO ₃) | mtu(b) | .. | .. | 13,862 | .. | .. | 143,700 | .. |
| Yttrium oxide (Y ₂ O ₃) | kg | .. | .. | .. | .. | 4,880 | .. | .. |
| Zinc | tonnes | 301,838 | .. | 133,100 | 11,779 | .. | 61,457 | .. |
| Zirconium dioxide (ZrO ₂) | " | 187,957 | .. | 71,644 | 83 | 57,535 | 5,010 | .. |

(a) Not available for publication. (b) Metric ton unit (mtu) equals 10 kilograms. (c) Excludes iron content of iron oxide not intended for metal extraction. (d) Contained in iron concentrate. (e) Content of metallurgical grade manganese ore and zinc concentrate. (f) Content of manganese ore of other than metallurgical grade. (g) Sulphur content of pyrite and other minerals from which sulphur is recovered.

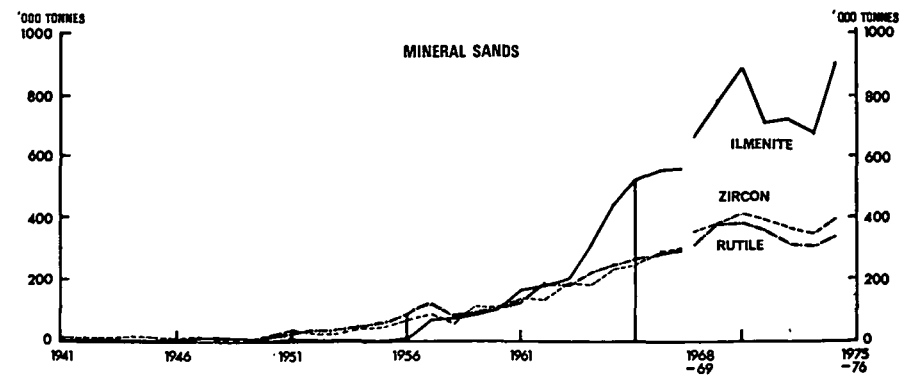
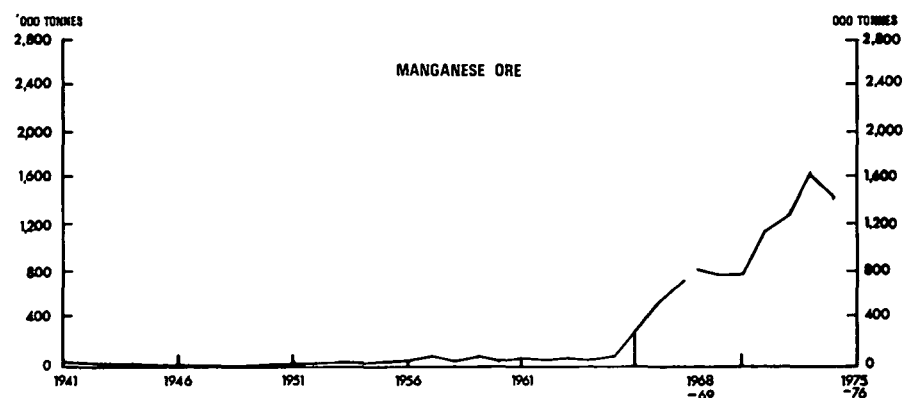
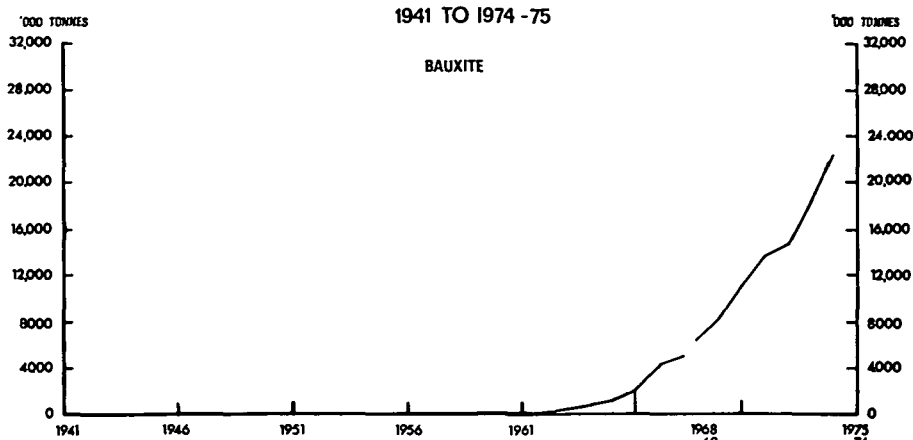
CONTENTS OF METALLIC MINERALS PRODUCED: AUSTRALIA

| <i>Contents of metallic minerals produced</i> | <i>1970-71</i> | <i>1971-72</i> | <i>1972-73</i> | <i>1973-74</i> | <i>1974-75</i> |
|--------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|
| Alumina (Al ₂ O ₃) | '000 tonnes | (a) | (a) | (a) | (a) |
| Antimony | tonnes | 1,386 | 1,120 | (a) | (a) |
| Beryllium oxide (BeO) | mtu(b) | 338 | 678 | 1,386 | 2,123 |
| Bismuth | '000 grams | 238,016 | 347,778 | 355,449 | 1,025,137 |
| Cadmium | tonnes | 1,465 | 1,625 | 1,629 | 1,430 |
| Cobalt | " | 446 | 283 | 310 | 201 |
| Copper | " | 172,965 | 171,920 | 198,718 | 246,669 |
| Gold | '000 grams | 19,103 | 23,253 | 20,002 | 16,271 |
| Iron(c) | '000 tonnes | 36,107 | 39,255 | 47,204 | 57,801 |
| Lead | tonnes | 416,432 | 420,797 | 385,008 | 370,431 |
| Manganese(d) | " | 373,630 | 562,327 | 632,485 | 770,572 |
| Manganese dioxide (MnO ₂)(e) | " | 82 | 28 | 4 | .. |
| Mercury | kg | 662 | 483 | 512 | 313 |
| Molybdenum disulphide (MoS ₂) | " | 51,818 | 15,676 | .. | 7,360 |
| Monazite | tonnes | 3,842 | 4,735 | 4,148 | 3,715 |
| Nickel | " | 34,917 | 35,559 | 36,104 | 42,247 |
| Palladium | grams | 1,758 | .. | .. | 71,000 |
| Platinum | " | 29,484 | .. | .. | 17,000 |
| Selenium | tonnes | .. | 36 | 31 | 5 |
| Silver | '000 grams | 731,178 | 700,165 | 670,482 | 674,359 |
| Sulphur(f) | tonnes | 405,247 | 460,313 | 479,567 | 409,340 |
| Tantalite-columbite (Ta ₂ O ₅ + Nb ₂ O ₅) | '000 grams | 63,799 | 76,217 | 84,744 | (a) |
| Tin | tonnes | 8,923 | 11,070 | 11,754 | 10,599 |
| Titanium dioxide (TiO ₂) | " | 853,198 | 752,733 | 711,812 | 679,000 |
| Tungstic oxide (WO ₃) | mtu(b) | 166,061 | 196,372 | 187,601 | 142,776 |
| Yttrium oxide (Y ₂ O ₃) | '000 grams | 9,647 | 3,658 | 4,318 | 4,278 |
| Zinc | tonnes | 444,144 | 497,541 | 506,996 | 441,286 |
| Zirconium dioxide (ZrO ₂) | " | 277,877 | 258,767 | 247,545 | 290,519 |

(a) Not available for publication. (b) Metric ton unit (mtu) equals 10 kilograms. (c) Excludes iron content of iron oxide not intended for metal extraction. Includes iron contained in iron concentrate. (d) Content of metallurgical grade manganese ore and zinc concentrate. (e) Content of manganese ore of other than metallurgical grade. (f) Sulphur content of pyrite and other minerals from which sulphur is recovered.

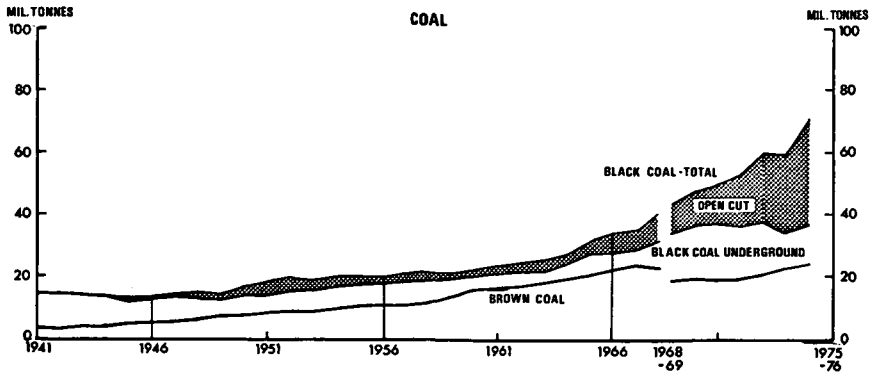
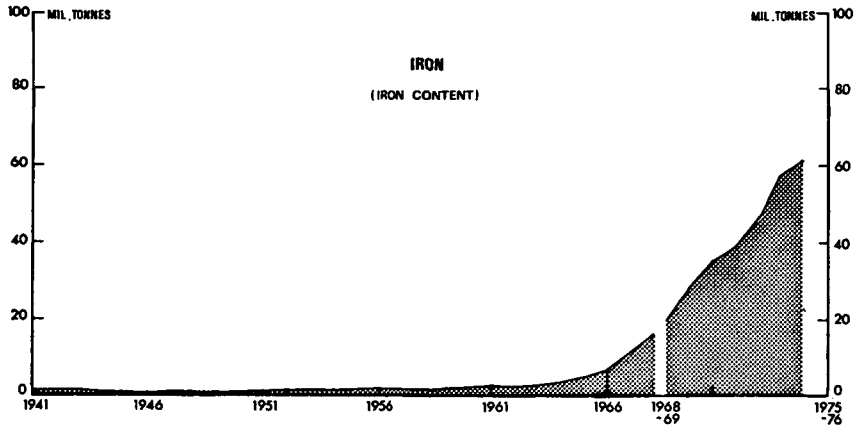
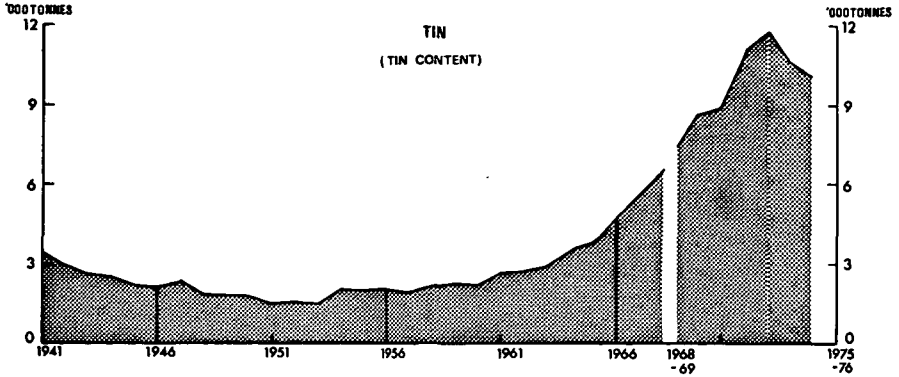
NOTE. Particulars of production of uranium oxide (U₃O₈) are not available for publication.

MINE PRODUCTION OF PRINCIPAL METALS: AUSTRALIA



Note. Prior to 1968-69 mineral figures were collected on a calendar year basis.

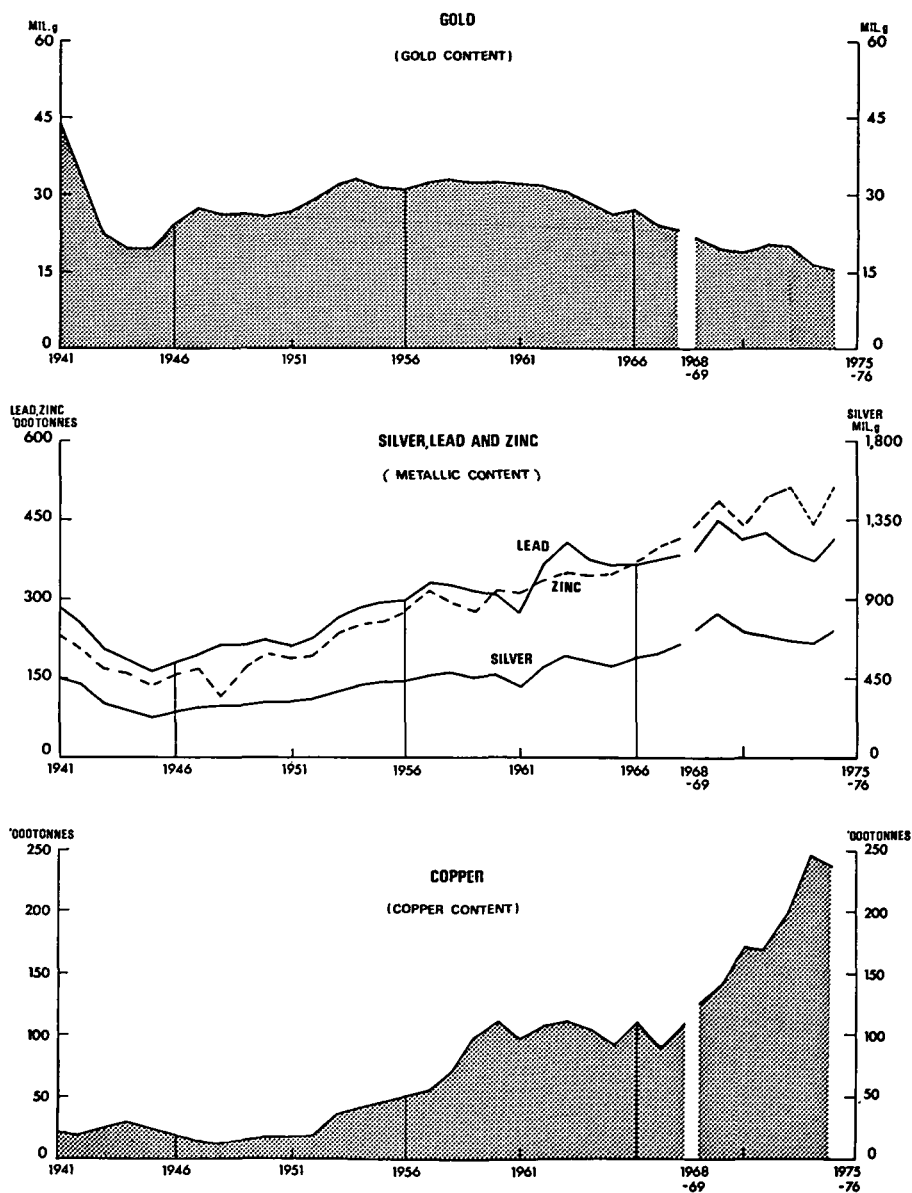
MINE PRODUCTION OF PRINCIPAL METALS
AND PRODUCTION OF COAL
AUSTRALIA 1941 TO 1974-75



Note. Prior to 1968-69 mineral figures were collected on a calendar year basis.

MINE PRODUCTION OF PRINCIPAL METALS: AUSTRALIA

1941 TO 1974-75



Note. Prior to 1968-69 mineral figures were collected on a calendar year basis.

Value of minerals produced

The following table shows the value of minerals produced in the past five years.

VALUE OF MINERALS PRODUCED: AUSTRALIA
(\$'000)

| <i>Mineral</i> | <i>1970-71</i> | <i>1971-72</i> | <i>1972-73</i> | <i>1973-74</i> | <i>1974-75</i> |
|-------------------------------------------|----------------|----------------|----------------|------------------|------------------|
| METALLIC MINERALS | | | | | |
| Antimony— | | | | | |
| Concentrate | 422 | 176 | 546 | 932 | 1,904 |
| Ore | 83 | (a) | (a) | (a) | (a) |
| Bauxite | (a) | (a) | (a) | (a) | (a) |
| Beryllium ore | 9 | 16 | 23 | 23 | 1 |
| Bismuth concentrate | 2,672 | 5,066 | 6,813 | 7,609 | 14,085 |
| Copper— | | | | | |
| Concentrate | 129,752 | 114,956 | 154,748 | 267,873 | 168,047 |
| Ore(b) | (c) | 947 | 701 | (a) | 766 |
| Ore for fertiliser | 18 | 6 | 9 | 5 | 3 |
| Oxide | .. | 475 | 757 | 982 | 1,406 |
| Precipitate | 148 | 134 | 101 | 168 | 31 |
| Gold— | | | | | |
| Bullion(c) | 17,779 | 21,435 | 25,730 | 26,839 | 43,139 |
| Ore | 3 | .. | .. | 3 | 8 |
| Iron ore | 343,682 | 372,483 | 395,189 | 427,518 | 613,169 |
| Iron oxide | 754 | 773 | 1,150 | (a) | 855 |
| Lead concentrate | 75,825 | (d)69,340 | (d)72,060 | 110,875 | 124,519 |
| Lead-copper concentrate | 3,031 | 4,444 | 6,089 | 8,799 | 7,609 |
| Lead ore(e) | 398 | 321 | 494 | 403 | 579 |
| Lead-zinc middlings | 2,269 | 1,846 | 2,560 | 2,002 | 2,422 |
| Manganese ore | 10,852 | (a) | (a) | (a) | (a) |
| Mineral sands— | | | | | |
| Ilmenite concentrate | 7,434 | (f)8,071 | (f)8,155 | (f)7,953 | (f)14,270 |
| Leucoxene concentrate | 975 | 1,089 | 722 | 1,060 | 2,079 |
| Monazite concentrate | 530 | 608 | 551 | 542 | 515 |
| Rutile concentrate | 37,214 | 41,023 | 36,510 | 36,750 | 53,669 |
| Xenotime concentrate | 54 | 18 | 22 | 7 | 12 |
| Zircon concentrate | 13,207 | 12,503 | 11,821 | 16,726 | 58,128 |
| Molybdenite concentrate | 85 | 17 | .. | 6 | .. |
| Nickel concentrate | (a) | (a) | (a) | (a) | (a) |
| Nickel ore | .. | .. | (a) | .. | (a) |
| Pyrite concentrate | 2,190 | 2,230 | 139 | 238 | 441 |
| Tantalite-columbite concentrate | 936 | 835 | 670 | 777 | 942 |
| Tin concentrate | 25,533 | 30,406 | 32,282 | 43,448 | 49,138 |
| Tin-copper concentrate | 905 | 659 | 516 | 860 | 390 |
| Tungsten ores and concentrates | 9,044 | 7,979 | 5,550 | 5,292 | 11,385 |
| Zinc concentrate | 43,548 | 63,393 | 61,820 | 97,122 | 138,385 |
| Zinc ore | 2 | .. | .. | 1,551 | 2,780 |
| <i>Total metallic minerals</i> | <i>845,423</i> | <i>921,642</i> | <i>995,366</i> | <i>1,281,782</i> | <i>1,573,087</i> |
| COAL | | | | | |
| Black coal | 283,245 | 330,504 | 390,980 | 449,855 | 874,879 |
| Brown coal (lignite)(g) | 19,052 | 21,768 | 24,716 | 27,251 | 40,556 |
| Brown coal briquettes | 10,614 | 11,280 | 9,173 | 11,011 | 11,391 |
| <i>Total coal</i> | <i>312,911</i> | <i>363,553</i> | <i>424,869</i> | <i>488,116</i> | <i>926,827</i> |
| PETROLEUM(h) | | | | | |
| <i>Petroleum</i> | <i>216,722</i> | <i>271,981</i> | <i>311,903</i> | <i>378,750</i> | <i>446,298</i> |

For footnotes see next page.

VALUE OF MINERALS PRODUCED: AUSTRALIA—*continued*
(\$'000)

| <i>Mineral</i> | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
|-------------------------------------------------------|------------------|------------------|------------------|------------------|------------------|
| CONSTRUCTION MATERIALS(f) | | | | | |
| <i>Construction materials</i> | 144,708 | 159,031 | 170,484 | 196,611 | 238,044 |
| OTHER NON-METALLIC MINERALS | | | | | |
| Asbestos | 170 | (j)453 | 3,256 | 4,140 | 7,960 |
| Barite | 476 | 202 | 208 | 98 | 303 |
| Carbon dioxide | 42 | 38 | 47 | 52 | 45 |
| Clay— | | | | | |
| Brick clay and shale | 7,105 | 8,408 | 9,355 | 11,153 | 10,241 |
| Other clays | 2,648 | 2,385 | 2,682 | 3,880 | 4,373 |
| Diatomite | 20 | 17 | 43 | 70 | 45 |
| Dolomite | 747 | 844 | 888 | 1,087 | 991 |
| Felspar (including cornish stone) | 45 | 38 | 35 | 48 | 87 |
| Fluorspar | 32 | 22 | 79 | 49 | .. |
| Garnet concentrate | 6 | 8 | 2 | 2 | .. |
| Gems | 17,830 | 27,262 | 40,911 | 47,262 | 37,032 |
| Gypsum | 2,577 | 2,819 | 2,826 | 3,665 | 3,176 |
| Limestone (including shell and coral) | 15,110 | 15,135 | 16,932 | 20,794 | 24,221 |
| Lithium ores | 12 | 30 | 11 | .. | .. |
| Magnesite, crude | 233 | 236 | 318 | 291 | 722 |
| Mineral pigments—red ochre | 7 | .. | 10 | 6 | .. |
| Peat(k) | 62 | 87 | (a) | 143 | 146 |
| Pebbles—for grinding | 30 | 38 | 36 | 43 | 27 |
| Perlite | 18 | 3 | 18 | 11 | 32 |
| Phosphate rock | 27 | 10 | 6 | 6 | 1,190 |
| Pyrophyllite | 68 | 58 | 112 | 103 | 156 |
| Salt | 11,563 | 11,804 | 12,655 | 16,410 | 21,951 |
| Silica | 3,276 | 3,555 | 4,484 | 5,353 | 6,301 |
| Sillimanite | 27 | 17 | 17 | 19 | 22 |
| Talc (including steatite and chlorite) | 732 | 782 | (a) | 1,363 | 1,348 |
| Vermiculite | 2 | 1 | 35 | (a) | (a) |
| <i>Total other non-metallic minerals</i> | 62,866 | 74,253 | 95,943 | 116,062 | 120,381 |
| TOTAL | | | | | |
| Total, all minerals and construction materials | 1,582,632 | 1,790,460 | 1,998,565 | 2,462,738 | 3,304,637 |
| <i>Of which—</i> | | | | | |
| New South Wales | 392,265 | 427,306 | 454,302 | 503,913 | 784,097 |
| Victoria | 249,422 | 312,375 | 349,973 | 432,379 | 522,696 |
| Queensland | 293,751 | 318,835 | 399,192 | 583,483 | 807,952 |
| South Australia | 92,524 | 94,169 | 116,807 | 116,639 | 125,966 |
| Western Australia | 446,507 | 510,409 | 536,414 | 604,288 | 860,443 |
| Tasmania | 74,169 | 81,972 | 84,863 | 117,589 | 117,756 |
| Northern Territory | 32,274 | 43,554 | 54,923 | 102,114 | 87,156 |
| Australian Capital Territory | 1,719 | 1,839 | 2,093 | 2,333 | 3,570 |

(a) Not available for publication. (b) Includes value of copper slag. (c) Includes alluvial gold. (d) Excludes value of Western Australian production. (e) Includes value of silver-lead ore, silver-lead slimes and lead slag. (f) Includes beneficiated ilmenite. (g) Excludes value of coal used in making briquettes. (h) The values shown are estimates based on prices prescribed in legislation quoted market prices and information from government departments. Includes values for crude oil, natural gas, natural gas condensate, ethane, propane and butane. (i) Incomplete owing to difficulties of coverage in some States. (j) Excludes Western Australian production. (k) Comprises peat for fertiliser and peat moss.

Foreign ownership and control of the mining industry in Australia

Summary information on foreign ownership and control of mining industry in Australia is shown in Chapter 11. More detailed Statistics are available in *Foreign Ownership and Control of the Mining Industry (Advance Release)* (10.73) and *Foreign Ownership and Control of the Mining Industry* (10.42).

Mineral exploration (other than for petroleum)

Definition

Exploration consists of the search for and/or appraisal of new ore occurrences and known deposits of minerals (including extensions to deposits being worked) by geological, geophysical, geochemical and other methods (including drilling). Exploration for water is excluded. The construction of shafts and adits is included if primarily for exploration purposes. Excluded are mine development activities carried out primarily for the purpose of commencing or extending mining or quarrying operations (including the construction of drives, shafts, winzes, etc., in underground mines, and the preparation of quarrying sites, including overburden removal, for open-cut extraction).

Sources of statistics

The statistics of exploration for minerals *other than petroleum* are derived from the annual mineral exploration census, which is carried out by the Australian Bureau of Statistics in each State and the Northern Territory, except in New South Wales where the census is conducted jointly with the State Mines Department.

Classification

The data obtained in the mineral exploration census are divided into the following categories:

(a) *Private exploration on production leases*—relates to exploration carried out on the production lease by privately operated mines currently producing or under development for the production of minerals.

(b) *Other private exploration*—relates to exploration carried out by private enterprises on areas covered by exploration licences, authorities to enter, authorities to prospect and similar licences and authorities issued by State governments' for exploration of minerals. Also included is exploration by private enterprises which is not directly connected with areas under lease, licence, etc.

(c) *Exploration by government*—relates to exploration of minerals carried out by:

- (i) State Mines Departments and business undertakings operated by State and local government authorities.
- (ii) Commonwealth Government (Bureau of Mineral Resources, Geology and Geophysics, The Joint Coal Board, The Atomic Energy Commission, The Petroleum and Mineral Authority and The Mines Branch of the Department of the Northern Territory).

Expenditure, metres drilled, etc., States and Northern Territory

The following tables show expenditure and metres drilled, etc., on mineral exploration other than for petroleum during the last five years.

MINERAL EXPLORATION (OTHER THAN FOR PETROLEUM)

| EXPENDITURE (\$'000) | | | | | |
|----------------------------------------------------|----------------|----------------|----------------|----------------|----------------|
| | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
| PRIVATE EXPLORATION | | | | | |
| New South Wales | 21,238 | 15,093 | 12,673 | 11,544 | 11,866 |
| Victoria | 1,853 | 1,258 | 1,939 | 2,524 | 2,046 |
| Queensland | 32,662 | 22,119 | 15,465 | 15,395 | 21,654 |
| South Australia | 6,220 | 4,057 | 5,263 | 4,485 | 4,921 |
| Western Australia | 86,082 | 62,823 | 51,121 | 54,056 | 57,143 |
| Tasmania | 4,397 | 3,478 | 3,392 | 4,194 | 5,565 |
| Northern Territory | 8,610 | 8,233 | 9,885 | 9,429 | 6,603 |
| <i>Total</i> | <i>161,063</i> | <i>117,061</i> | <i>99,738</i> | <i>101,628</i> | <i>109,827</i> |
| GOVERNMENT EXPLORATION(a) | | | | | |
| Commonwealth Government | 3,928 | 4,603 | 5,061 | 5,292 | 5,474 |
| State Mines Departments | 3,386 | 3,732 | 4,341 | 5,619 | 7,112 |
| <i>Total</i> | <i>7,314</i> | <i>8,334</i> | <i>9,402</i> | <i>10,911</i> | <i>12,586</i> |
| TOTAL EXPENDITURE | | | | | |
| On drilling | 45,106 | 32,905 | 29,073 | 28,824 | 36,172 |
| Other | 123,272 | 92,490 | 80,067 | 83,714 | 86,242 |
| <i>Australia</i> | <i>168,377</i> | <i>125,396</i> | <i>109,140</i> | <i>112,539</i> | <i>122,413</i> |
| METRES DRILLED (^{'000} metres) | | | | | |
| | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
| PRIVATE EXPLORATION | | | | | |
| New South Wales | 473 | 360 | 291 | 333 | 289 |
| Victoria | 29 | 17 | 21 | 39 | 40 |
| Queensland | 821 | 567 | 602 | 360 | 441 |
| South Australia | 195 | 123 | 343 | 207 | 199 |
| Western Australia | 1,955 | 1,996 | 1,393 | 1,255 | 1,266 |
| Tasmania | 73 | 60 | 60 | 96 | 80 |
| Northern Territory | 128 | 113 | 171 | 112 | 86 |
| <i>Total</i> | <i>3,674</i> | <i>3,235</i> | <i>2,880</i> | <i>2,403</i> | <i>2,401</i> |
| GOVERNMENT EXPLORATION(a) | | | | | |
| Commonwealth | 3 | 2 | .. | 19 | 11 |
| State Mines Departments | 84 | 71 | 70 | 89 | 97 |
| <i>Total</i> | <i>86</i> | <i>73</i> | <i>70</i> | <i>108</i> | <i>108</i> |
| TOTAL METRES DRILLED | | | | | |
| Drilled—core | 949 | 794 | 769 | 657 | 733 |
| non-core | 2,811 | 2,514 | 2,181 | 1,854 | 1,775 |
| <i>Australia</i> | <i>3,760</i> | <i>3,308</i> | <i>2,949</i> | <i>2,511</i> | <i>2,509</i> |

(a) Statistics for 1973-74 and 1974-75 are not comparable in some respects with those for previous years; for details see the bulletin *Mineral Exploration 1974-75* (10.41).

Petroleum exploration

Source of statistics

These statistics were collected and compiled by the Bureau of Mineral Resources, Geology and Geophysics, Canberra. Statistical and other information relating to petroleum exploration is published by the Bureau of Mineral Resources in *The Petroleum Newsletter* (issued quarterly) and *The Australian Mineral Industry—Annual Review*.

Scope

Petroleum exploration consists of the search for, and/or appraisal of, deposits of crude oil and/or natural gas and natural gas liquids by geological, geophysical, geochemical, and other exploration methods, including drilling. Included in the expenditure are the costs of drilling exploratory oil and/or gas wells and the testing of such wells. Also included are the cost of access roads, site construction, permits, licences and similar fees, relevant office buildings and furniture, transportation equipment, storage facilities, plant and equipment, and review work, where these are undertaken primarily for purposes of exploration for deposits of petroleum. Details of developmental oil and/or gas wells are excluded.

Operations

The following tables show particulars of expenditure, and wells and metres drilled in petroleum exploration in recent years.

EXPENDITURE ON PETROLEUM EXPLORATION BY PRIVATE ENTERPRISE AND BY GOVERNMENTS: AUSTRALIA (\$'000)

| | 1970 | 1971 | 1972 | 1973 | 1974 |
|----------------------------------------------------|---------------|---------------|----------------|---------------|---------------|
| PRIVATE SOURCES(a) | | | | | |
| Utilised in— | | | | | |
| New South Wales | 2,597 | 287 | 200 | 494 | 170 |
| Victoria | 11,538 | 1,453 | 15,076 | 15,206 | 10,613 |
| Queensland | 5,474 | 3,011 | 3,085 | 2,546 | 2,860 |
| South Australia | 6,431 | 7,084 | 9,804 | 1,871 | 2,205 |
| Western Australia | 29,557 | 41,872 | 57,903 | 52,364 | 45,281 |
| Tasmania | 4,708 | 1,939 | 991 | 60 | 110 |
| Northern Territory | 13,753 | 17,250 | 10,350 | 13,095 | 23,047 |
| <i>Total</i> | <i>74,059</i> | <i>72,896</i> | <i>97,408</i> | <i>85,636</i> | <i>84,286</i> |
| GOVERNMENT SOURCES | | | | | |
| Payments under <i>Petroleum Search Subsidy Act</i> | | | | | |
| 1959— | | | | | |
| Utilised in— | | | | | |
| New South Wales | 406 | 225 | 64 | 22 | 130 |
| Victoria | 732 | 231 | 570 | 546 | 624 |
| Queensland | 1,623 | 500 | 367 | 825 | 823 |
| South Australia | 923 | 537 | 611 | 414 | 187 |
| Western Australia | 4,604 | 3,590 | 4,209 | 5,230 | 2,642 |
| Tasmania | 395 | 208 | 16 | 59 | 569 |
| Northern Territory | 1,061 | 695 | 380 | 508 | 273 |
| <i>Total subsidy payments</i> | <i>9,744</i> | <i>5,986</i> | <i>6,218</i> | <i>7,604</i> | <i>5,248</i> |
| Utilised for— | | | | | |
| Geophysical | 2,924 | 2,470 | 3,230 | 3,267 | 1,779 |
| Drilling | 6,820 | 3,517 | 2,987 | 4,337 | 3,469 |
| Other Government sources— | | | | | |
| Commonwealth Government(a) | 3,216 | 3,913 | 3,984 | 4,178 | 3,457 |
| State Government | 456 | 458 | 564 | 702 | 1,011 |
| <i>Total other Government sources</i> | <i>3,672</i> | <i>4,371</i> | <i>4,548</i> | <i>4,880</i> | <i>4,468</i> |
| <i>Total Government sources</i> | <i>13,416</i> | <i>10,357</i> | <i>10,766</i> | <i>12,484</i> | <i>9,716</i> |
| TOTAL FUNDS, PRIVATE AND GOVERNMENT | | | | | |
| <i>Grand total</i> | <i>87,475</i> | <i>83,254</i> | <i>108,174</i> | <i>98,120</i> | <i>94,002</i> |

(a) Excludes payments under the *Petroleum Search Subsidy Act* 1959.

SUMMARY OF EXPLORATION WELLS AND METRES DRILLED IN PETROLEUM EXPLORATION, 1974

| | | N.S.W. | Vic. | Qld | S.A. | W.A. | Tas. | N.T. | Total |
|-------------------------------------------------------------------------|------------|--------------|---------------|---------------|--------------|---------------|--------------|---------------|----------------|
| Wells— | | | | | | | | | |
| Drilled (i.e. those which reached final depth)— | | | | | | | | | |
| As oil producers | No. | .. | .. | .. | .. | .. | .. | 1 | 1 |
| As gas producers | No. | 1 | .. | 1 | .. | 1 | .. | 1 | 4 |
| As oil and gas producers | No. | .. | 2 | .. | .. | 1 | .. | .. | 3 |
| Plugged and abandoned | No. | 1 | 3 | 8 | 1 | 19 | 4 | 7 | 43 |
| Total | No. | 2 | 5 | 9 | 1 | 21 | 4 | 9 | 51 |
| Average final depth of wells drilled | m | 890 | 2,861 | 2,157 | 2,436 | 2,365 | 2,379 | 3,161 | 2,321 |
| Drilling still in progress at 31 December (uncompleted holes) | No. | .. | .. | .. | .. | .. | .. | 2 | 2 |
| Wells drilled or drilling over 3,000 metres | No. | .. | 1 | 1 | .. | 8 | 1 | 5 | 16 |
| Metres drilled— | | | | | | | | | |
| Completed wells | m | 1,130 | 14,303 | 17,457 | 2,436 | 46,203 | 9,516 | 27,211 | 118,256 |
| Uncompleted holes | m | .. | .. | .. | .. | .. | .. | 3,028 | 3,028 |
| Total | m | 1,130 | 14,303 | 17,457 | 2,436 | 46,203 | 9,516 | 30,239 | 121,284 |

SUMMARY OF EXPLORATION WELLS AND METRES DRILLED IN PETROLEUM EXPLORATION: AUSTRALIA

| | | 1970 | 1971 | 1972 | 1973 | 1974 |
|-------------------------------------------------------------------------|------------|----------------|----------------|----------------|----------------|----------------|
| Wells— | | | | | | |
| Drilled (i.e. those which reached final depth)— | | | | | | |
| As oil producers | No. | 2 | 1 | 3 | 1 | 1 |
| As gas producers | No. | 15 | 12 | 17 | 8 | 4 |
| As oil and gas producers(a) | No. | .. | .. | .. | 2 | 3 |
| Plugged and abandoned | No. | 108 | 62 | 82 | 49 | 43 |
| Total | No. | 125 | 75 | 102 | 60 | 51 |
| Average final depth of wells drilled | m | 1,634 | 2,274 | 2,213 | 2,441 | 2,321 |
| Drilling still in progress at 31 December (uncompleted holes) | No. | 8 | 8 | 9 | 7 | 2 |
| Wells drilled or drilling over 3,000 metres | No. | 19 | 23 | 20 | 22 | 16 |
| Metres drilled— | | | | | | |
| Completed wells | m | 192,552 | 153,344 | 204,836 | 127,978 | 118,256 |
| Uncompleted holes | m | 16,066 | 15,199 | 19,595 | 12,860 | 3,028 |
| Total | m | 208,618 | 168,543 | 224,431 | 140,838 | 121,284 |

(a) This breakdown not available prior to 1973.

Mineral processing and treatment

The extraction of minerals from ore deposits, as in mining and quarrying, is only part of the wider field of mineral technology. It is only in rare instances that minerals can be used directly in the form in which they are produced by mines, and, much more commonly, minerals must undergo considerable processing and treatment before their full utility and value can be realised. Examples of this processing and treatment are the smelting and refining of metals, the production of coke from coal, the refining of oil, and the treatment of non-metallic minerals as in the production of superphosphate and other chemicals and building materials like bricks and cement. The sectors of the economy which carry out this work are classified for statistical purposes to the manufacturing industry, and particulars relating to those activities which principally involve mineral processing and treatment—i.e. the treatment of non-metalliferous mine and quarry products, the manufacture of mineral oils and chemical fertilisers, the smelting, converting, refining and rolling of iron and steel, the extracting and refining of other metals, and the manufacture of alloys are given in Chapter 21, Manufacturing Industry.

Principal products

The following table shows particulars of the production of certain important manufactured products of mineral origin during recent years.

**PRODUCTION OF PRINCIPAL MANUFACTURED PRODUCTS
OF MINERAL ORIGIN: AUSTRALIA**

| <i>Commodity</i> | | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
|----------------------------------------|-------------|-----------|-----------|-----------|-----------|-----------|
| METALS(a) | | | | | | |
| Non-ferrous— | | | | | | |
| Alumina | tonnes | 2,404,651 | 2,825,588 | 3,526,898 | 4,516,376 | 5,073,280 |
| Refined aluminium | " | 218,244 | 212,461 | 207,531 | 208,756 | 222,876 |
| Blister copper(b) | " | 130,199 | 144,791 | 149,512 | 184,952 | 189,257 |
| Refined copper | " | 115,321 | 130,827 | 136,792 | 149,300 | 178,451 |
| Lead bullion (for export)(b) | " | 179,424 | 141,582 | 138,798 | 149,257 | 149,876 |
| Refined lead | " | 154,937 | 190,638 | 173,561 | 201,022 | 170,508 |
| Refined zinc | " | 253,761 | 274,245 | 302,536 | 281,586 | 243,209 |
| Refined tin | " | 5,942 | 6,391 | 7,301 | 6,509 | 5,973 |
| Ferrous— | | | | | | |
| Pig iron(c) | '000 tonnes | 6,240 | 6,006 | 7,021 | 7,444 | 7,591 |
| Steel ingots(c) | " | 6,800 | 6,480 | 7,209 | 7,504 | 8,017 |
| Precious— | | | | | | |
| Refined gold(d) | '000 grams | 14,426 | 16,394 | 14,689 | 11,106 | 10,744 |
| Refined silver | " | 253,852 | 273,142 | 247,933 | 259,221 | 272,855 |
| FUELS | | | | | | |
| Coal products— | | | | | | |
| Metallurgical coke | '000 tonnes | 4,542 | 4,136 | 4,926 | 4,921 | 5,497 |
| Brown coal briquettes | " | 1,398 | 1,308 | 1,221 | 1,164 | 1,092 |
| Petroleum products— | | | | | | |
| Motor spirit | mil. litres | 10,138 | 10,609 | 11,157 | 12,200 | 12,508 |
| Furnace fuel | '000 tonnes | 5,791 | 5,015 | 5,042 | 5,265 | 4,656 |
| Automotive distillate | " | 3,177 | 3,426 | 3,707 | 4,265 | 4,682 |
| Industrial diesel fuel | " | 1,120 | 1,112 | 1,055 | 1,276 | 1,110 |
| BUILDING MATERIALS | | | | | | |
| Clay bricks | millions | 1,669 | 1,744 | 1,881 | 2,050 | 1,713 |
| Portland cement | '000 tonnes | 4,685 | 4,884 | 5,097 | 5,412 | 5,086 |
| Plaster of paris | " | 309 | 315 | 342 | 361 | 336 |
| Plaster sheets | '000 sq m | 34,365 | 34,315 | 39,151 | 44,105 | 42,008 |
| CHEMICALS | | | | | | |
| Sulphuric acid | '000 tonnes | 1,612 | 1,756 | 2,266 | 2,434 | 1,770 |
| Caustic soda | tonnes | 119,678 | 127,857 | 123,219 | 140,578 | 139,206 |
| Superphosphate(e) | '000 tonnes | 3,115 | 3,508 | 4,962 | 5,288 | 3,309 |

(a) Excludes secondary metal with the exception of pig iron and steel ingots. (b) Metallic content. (c) Year ended 31 May. (d) Newly-won gold of Australian origin. (e) Includes double and triple superphosphate and ammonium phosphate expressed in terms of single superphosphate i.e. 22% P₂O₅ equivalent.

Overseas trade

Exports and imports

Data of imports and exports of minerals and mineral products have been extracted from the official trade statistics compiled in the Australian Bureau of Statistics. Particulars of the quantities and values (\$f.o.b. port of shipment) of the principal minerals and mineral products exported from and imported into Australia during recent years are shown in the following table.

**EXPORTS AND IMPORTS OF PRINCIPAL MINERALS AND MINERAL PRODUCTS
AUSTRALIA**

| Commodity(a) | Quantity | | | Value (\$'000 f.o.b.) | | | |
|---------------------------------|-------------|---------|---------|-----------------------|---------|---------|---------|
| | 1972-73 | 1973-74 | 1974-75 | 1972-73 | 1973-74 | 1974-75 | |
| EXPORTS(b) | | | | | | | |
| Non-ferrous— | | | | | | | |
| Copper— | | | | | | | |
| Concentrate | tonnes | 164,451 | 175,510 | 146,744 | 32,267 | 57,755 | 44,145 |
| Blister | " | 7,728 | 10,426 | 15,196 | 9,896 | 21,856 | 20,853 |
| Refined | " | 49,967 | 50,678 | 93,862 | 44,729 | 76,850 | 93,800 |
| Matte, slags, etc. | " | 9,829 | 8,392 | 23,496 | 2,640 | 2,440 | 3,859 |
| Lead— | | | | | | | |
| Concentrate | " | 74,145 | 77,678 | 42,192 | 12,441 | 19,445 | 13,223 |
| Bullion | " | 142,270 | 147,820 | 152,754 | 44,940 | 73,059 | 82,264 |
| Refined | " | 149,691 | 134,231 | 124,766 | 36,400 | 43,671 | 47,435 |
| Slags and residues | " | 6,628 | 44,825 | 25,406 | 1,064 | 2,644 | 2,261 |
| Zinc— | | | | | | | |
| Concentrate | " | 289,836 | 426,272 | 398,622 | 21,508 | 45,560 | 58,311 |
| Refined | " | 203,777 | 164,404 | 140,429 | 61,979 | 69,331 | 78,526 |
| Slags and residues | " | 5,011 | 6,758 | 5,454 | 617 | 1,647 | 1,799 |
| Tin— | | | | | | | |
| Concentrate | " | 11,290 | 7,982 | 13,700 | 11,739 | 13,530 | 25,625 |
| Refined | " | 3,939 | 2,409 | 2,394 | 12,026 | 7,641 | 11,044 |
| Aluminium— | | | | | | | |
| Alumina | '000 tonnes | 2,966 | 3,951 | 4,472 | 155,453 | 196,078 | 297,873 |
| Refined | tonnes | 81,344 | 45,834 | 64,064 | 30,767 | 20,727 | 37,536 |
| Ferrous and alloy— | | | | | | | |
| Iron ore— | | | | | | | |
| Pellets | '000 tonnes | 7,987 | 9,519 | 7,747 | 76,494 | 89,905 | 101,747 |
| Fines | " | 25,178 | 31,874 | 36,196 | 126,313 | 154,078 | 237,477 |
| Lump | " | 33,171 | 36,871 | 41,404 | 236,285 | 248,098 | 365,783 |
| Tungsten— | | | | | | | |
| Scheelite concentrate | tonnes | 1,553 | 1,658 | 1,924 | 3,019 | 3,419 | 8,686 |
| Wolfram concentrate | " | 818 | 382 | 469 | 1,734 | 792 | 2,106 |
| Pig iron | " | 687,124 | 957,805 | 558,507 | 27,286 | 60,081 | 62,012 |
| Steel ingots, blooms | " | 743,169 | 747,572 | 1,132,954 | 48,377 | 64,059 | 149,322 |
| Mineral sands— | | | | | | | |
| Ilmenite concentrate | " | 521,823 | 710,570 | 628,459 | 5,731 | 8,136 | 7,658 |
| Rutile concentrate | " | 338,760 | 359,043 | 338,087 | 39,750 | 45,324 | 56,780 |
| Zircon concentrate | " | 419,962 | 401,545 | 388,926 | 15,131 | 18,616 | 56,972 |
| Precious— | | | | | | | |
| Gold, refined | '000 grams | 10,136 | 4,344 | 2,940 | 18,239 | 13,660 | 10,973 |
| Silver, refined | " | 181,014 | 112,894 | 143,301 | 8,731 | 8,212 | 14,119 |
| Coal, black | '000 tonnes | 25,751 | 27,755 | 32,652 | 290,703 | 347,992 | 660,511 |
| Crude oil(c) | '000 cu m | 330 | 288 | 234 | 4,910 | 8,520 | 14,388 |

IMPORTS

| | | | | | | | |
|---------------------------------------|---------------|---------|-----------|---------|--------|---------|---------|
| Tin, refined | tonnes | 65 | 67 | 26 | 203 | 337 | 140 |
| Nickel (pigs, anodes, etc.) | " | 1,060 | 2,687 | 1,050 | 2,677 | 5,474 | 3,410 |
| Ferro-alloys | " | 27,203 | 46,335 | 43,287 | 7,801 | 12,570 | 21,210 |
| Gold— | | | | | | | |
| Unrefined bullion(d) | '000 grams | 3,091 | 2,697 | 2,809 | 5,205 | 7,265 | 8,744 |
| Refined | " | 160 | 7 | 24 | 233 | 21 | 108 |
| Crude oil(e) | '000 cu m | 9,316 | 10,139 | 9,552 | 99,384 | 244,062 | 475,080 |
| Asbestos | tonnes | 62,905 | 56,839 | 51,194 | 9,909 | 8,216 | 11,195 |
| Diamonds— | | | | | | | |
| Industrial | metric carats | 807,960 | 1,084,883 | 928,558 | 3,099 | 3,717 | 3,420 |
| Gemstone | " | 59,416 | 90,196 | 69,091 | 9,346 | 14,734 | 14,307 |
| Phosphate rock | '000 tonnes | 2,282 | 3,104 | 2,639 | 22,647 | 35,232 | 74,059 |
| Potassium fertilisers | tonnes | 165,412 | 190,596 | 211,108 | 4,701 | 5,220 | 9,523 |
| Sulphur | " | 498,275 | 608,010 | 925,747 | 6,660 | 8,329 | 14,899 |

(a) In addition to the commodities listed, significant quantities of bauxite and nickel ores and concentrates are exported but details are not available for publication. (b) Quantities shown for metallic minerals are gross quantities, not metallic contents. (c) Includes also partly refined oil, topped crudes and enriched crudes. (d) Gold content. (e) Includes also partly refined oil, topped crudes, enriched crudes and refinery feed stock.

Considerable quantities of metallic ores, concentrates, slags, and residues are exported from Australia for refining overseas. The following table shows selected items exported during 1974-75 and their principal metallic content as estimated by assay.

PRINCIPAL METALLIC CONTENTS OF SELECTED ORES AND CONCENTRATES ETC., EXPORTED FROM AUSTRALIA, 1974-75

| Ores and concentrates, etc. | Metallic contents—estimated from assay | | | | | | | |
|-------------------------------|----------------------------------------|----------------|----------------|--------------|---------------|-----------------|--------------|----------------|
| | Copper | Lead | Zinc | Tin | Iron | Tungstic oxides | Gold | Silver |
| | tonnes | tonnes | tonnes | tonnes | '000 tonnes | tonnes | '000 grams | '000 grams |
| Copper concentrate | 38,895 | 46 | .. | .. | .. | .. | 2,722 | 6,226 |
| Blister copper | 14,895 | .. | .. | .. | .. | .. | 1,889 | 3,036 |
| Copper matte, slags, etc.(a) | 3,630 | 5,637 | .. | .. | .. | .. | 614 | 9,199 |
| Lead concentrate | 2,417 | 20,311 | 6,791 | .. | .. | .. | 1,960 | 73,780 |
| Lead bullion | 5 | 151,297 | .. | .. | .. | .. | .. | 302,972 |
| Lead slags and residues | 796 | 7,545 | 61 | 79 | .. | .. | 89 | 15,001 |
| Zinc concentrate | .. | 1,747 | 231,664 | .. | .. | .. | .. | 41,342 |
| Zinc slags and residues | .. | .. | 4,399 | .. | .. | .. | .. | .. |
| Tin concentrate | .. | .. | .. | 5,414 | .. | .. | .. | .. |
| Iron ore— | .. | .. | .. | .. | .. | .. | .. | .. |
| Pellets | .. | .. | .. | .. | 4,808 | .. | .. | .. |
| Fines | .. | .. | .. | .. | 22,254 | .. | .. | .. |
| Lump | .. | .. | .. | .. | 26,591 | .. | .. | .. |
| Scheelite concentrate | .. | .. | .. | .. | .. | 1,319 | .. | .. |
| Wolfram concentrate | .. | .. | .. | .. | .. | 384 | .. | .. |
| Total metallic content | 60,638 | 186,583 | 242,915 | 5,493 | 53,653 | 1,703 | 7,274 | 451,556 |

(a) Includes copper matte, copper slags and residues and copper-lead dross and speiss.

Prices

The following table shows average prices of some principal refined metals and ores and concentrates on Australian and certain major overseas markets. Prices of minerals such as iron ore, coal and bauxite are not shown, as these minerals are commonly sold on a contract basis rather than on an open market basis.

AVERAGE DAILY PRICES OF SELECTED METALS AND METALLIC ORES AND CONCENTRATES: AUSTRALIAN AND OVERSEAS MARKETS

(Source: Bureau of Mineral Resources, Geology and Geophysics)

| Period | METALS(a) | | | | | | | | | |
|----------|-------------------|--------------------------|-------------|-------------------|-----------------|-----------------------------|-------------------|----------------|----------------------------|-------|
| | Tin | | Nickel | | Aluminium | | Gold | | Silver | |
| | Aust. (\$A—tonne) | L.M.E. (£Stg—metric ton) | (\$U.S.—lb) | Aust. (\$A—tonne) | U.S.A. (USc—lb) | Premium markets (\$A—f. oz) | U.K. (\$US—f. oz) | Aust. (\$A—kg) | U.K. (Stg new pence—f. oz) | |
| 1972-73 | (b)3,291.2 | 1,630.5 | 627.7 | (c)1,371.8 | (b)578.0 | 24.3 | 58.40 | 77.92 | (d)156.6 | 83.6 |
| 1973-74 | 4,774.1 | 2,882.8 | 957.0 | 1.59 | 585.0 | 28.2 | 88.47 | 130.76 | 82.5 | 162.8 |
| 1974-75 | 5,715.8 | 3,246.7 | 1,022.3 | 1.93 | 671.0 | 38.1 | 121.54 | 167.76 | 104.9 | 187.9 |
| 1974-75— | | | | | | | | | | |
| Highest | 6,991.0 | 4,195.0 | 1,310.0 | 2.01 | 707.0 | 39.0 | 132.02 | 195.25 | 119.8 | 220.8 |
| Lowest | 5,262.0 | 2,925.0 | 910.0 | 1.85 | 591.0 | 33.5 | 92.63 | 131.50 | 89.3 | 158.7 |

| Period | Copper | | Lead | | U.S.A. (USc—lb) | Zinc | | Prod. (£Stg—ton) | U.S.A. (USc—lb) |
|----------|-------------------|--------------------------|-------------------|--------------------------|-----------------|-------------------|--------------------------|------------------|-----------------|
| | Aust. (\$A—tonne) | L.M.E. (£Stg—metric ton) | Aust. (\$A—tonne) | L.M.E. (£Stg—metric ton) | | Aust. (\$A—tonne) | L.M.E. (£Stg—metric ton) | | |
| 1972-73 | 990.3 | 508.6 | (b)250.0 | 137.8 | 15.63 | (b)355.5 | 177.2 | 174.3 | 19.41 |
| 1973-74 | 1,428.8 | 980.7 | 358.4 | 237.4 | 18.48 | 454.2 | 582.0 | 282.4 | 27.45 |
| 1974-75 | 1,050.5 | 598.3 | 366.6 | 216.5 | 23.95 | 612.8 | 359.1 | 353.6 | 38.55 |
| 1974-75— | | | | | | | | | |
| Highest | 1,480.0 | 852.5 | 380.0 | 246.0 | 24.50 | 640.0 | 501.0 | 360.0 | 40.00 |
| Lowest | 900.0 | 497.8 | 290.0 | 143.0 | 19.00 | 519.0 | 300.5 | 330.0 | 34.50 |

For footnotes see next page

AVERAGE DAILY PRICES OF SELECTED METALS AND METALLIC ORES AND CONCENTRATES: AUSTRALIAN AND OVERSEAS MARKETS—*continued*

ORES AND CONCENTRATES

| Period | Tin | Wolfram | Ilmenite | | Rutile | | Zircon | |
|---------------------|--------------------|--------------------|--------------------|---------------------------------|------------------------|---------------------------------|------------------------|---------------------------------|
| | Aust. (\$A—mtu) | U.K. (£Stg—mtu) | Aust. (\$A—ton) | Europe (£Stg— metric ton) | Aust. (\$A— ton) | Europe (£Stg— metric ton) | Aust. (\$A— ton) | Europe (£Stg— metric ton) |
| 1972-73 | 27.93 | 14.00-19.15 | 10.5-12.0 | 9.35-11.32 | 115-125 | 64.00-87.00 | 35-39 | 26.82-38.00 |
| 1973-74 | 42.43 | 15.70-45.50 | 10.5-12.0 | 9.35-11.32 | 125-130 | 127.00-240.00 | 45-50 | 45.00-240.00 |
| 1974-75 | 48.58 | 37.00-50.25 | 11.0-12.0 | 13.00-18.00 | (e) | 200.00-330.00 | (e) | 170.00-330.00 |
| 1974-75— Highest | 52.88 | 50.25 | 12.0 | 18.00 | (e) | 330.00 | (e) | 330.00 |
| Lowest | 46.06 | 37.00 | 11.0 | 13.00 | (e) | 200.00 | (e) | 170.00 |

(a) Where a daily price does not actually exist for a commodity, daily prices have been imputed from price data which are available. (b) \$ per ton. (c) \$ Stg per metric ton. (d) Ac per f.oz. (e) No price quoted.

Details on monthly prices, and price specifications relating to each commodity in the table are contained in each issue of the bulletin, *Minerals and Mineral Products* (10.19).

 REVIEW OF RECENT DEVELOPMENTS IN THE
 AUSTRALIAN MINERAL INDUSTRY

Major developments in the Australian mineral industry, particularly during the last year, are reviewed briefly in subsequent parts of this section. Additional information on developments in the industry is available in *Australian Mineral Industry 1973 Review* published by the Bureau of Mineral Resources, Geology and Geophysics. That publication contains comprehensive reviews of mineral commodities of importance to the Australian economy, as well as a general review of the industry's performance during the year.

General Review of 1974

The worldwide resurgence of demand for mineral commodities, which was observed in 1973 and attributed to accumulation of consumer stocks ahead of inflation, was followed in 1974 by a period of recession in the mining industry. The major factor contributing to the recession was continuing inflation of costs both in the mining industry and in the consumer industries. Manufacturers faced with liquidity problems reduced mineral inventories, and stocks held by producers and in terminal markets rose to record levels.

However, with the exception of iron and steel, the Australian mineral industry continued to expand in 1974, and at a considerably faster rate than in the two preceding years. The annual rate of growth in the value of mineral output was about 24 per cent compared with 18 per cent in 1973 and 13 per cent in 1972 although the index of mineral output at constant prices indicated slower growth rates for these years (5, 16 and 8 per cent respectively). The increased rate of growth in 1974 resulted mainly from buoyant overseas markets in the first half of the year, and, despite falling demand for many metals in the second half of the year, continuing strong demand for coal and mineral sands. Devaluation of the \$A in September 1974 also contributed to the higher growth rate.

The ex-mine value of minerals produced in 1974 was a record \$2,732 million, exceeding the previous record, in 1973, by \$528 million or 24 per cent. The increase was largely the result of increased production of black coal, iron ore, copper ores and concentrates, construction materials, lead and zinc ores and concentrates, and nickel ores and concentrates, and record prices for many minerals on world markets.

The index of mineral output at constant prices indicated an increase in the quantum of production of 5 per cent. Value added by the mining industry (i.e. excluding smelting and refining) in 1973-74 was \$1,985 million compared with \$1,597 million in the previous fiscal year, an increase of 24 per cent.

Mines and quarries (except gold) became the largest single export-earning group in 1969-70 but in 1974-75 was exceeded slightly (by 0.1 per cent) by 'Agriculture' which more than doubled its earnings largely because of high world prices for sugar and cereal grains. However 'Mines and quarries' accounted for a record 26.9 per cent of total exports although this was achieved partly at the expense of 'Wool' and 'Other pastoral' exports whose combined relative contribution fell from 32.8 per cent in 1973-74 to 16.5 per cent in 1974-75.

The import bill for mineral primary products in 1974 rose dramatically by 169 per cent from \$215 million to \$580 million; this was primarily because of a fourfold increase in the value of crude oil imports which rose from \$114 million (53 per cent of total imports) in 1973 to \$420 million (72 per cent) in 1974. In 1974, imports of mineral primary products accounted for 7.5 per cent of the total value of merchandise imports, compared with 4.5 per cent in 1973.

Despite the increase in the value of mineral imports the surplus in the balance of trade in minerals (excluding gold) increased by 24 per cent from \$1,475 million in 1973 to \$1,826 million in 1974.

Results of the 1973-74 economic census show that value added by the mining industry (Australian Standard Industrial Classification sub-divisions 11-15 incl.), was \$1,985 million. Value added by smelting and refining (ASIC classes 1911, 1912 and 2921 to 2926 inclusive of the Manufacturing Industries division) was \$968 million for the same period.

Bauxite

The history of the aluminium industry and recent significant developments in the industry were reviewed in previous issues of the Year Book (No. 51, page 1168 and No. 52, page 1048).

In 1974 bauxite production capacity at Weipa, Queensland, increased to 10.5 million tonnes per annum following completion of a further stage in the development of the mine and associated township, and of ore treatment and loading facilities. Approximately 4 million tonnes from Weipa were used by the Gladstone, Queensland, alumina refinery in 1974; the remaining production is available for export.

A firm decision has not yet been made to proceed with the bauxite/alumina projects in Western Australia to mine bauxite from the Mount Saddleback area. The plan to mine bauxite in the Chittering area and for a refinery to be built near Muchea has been abandoned.

Alumina

Rated capacity of the alumina plant at Gladstone, Queensland, is now 2,000,000 tonnes per annum, at Gove, Northern Territory, 1,000,000 tonnes and at Kwinana, Western Australia, 1,400,000 tonnes. Bauxite supplies for the Kwinana refinery are obtained from deposits 50 km away at Jarrahdale, Western Australia, the reserves of which are assessed as at least 500 million tonnes. The alumina plant at Pinjarra, Western Australia, has a rated annual capacity of 1,000,000 tonnes and uses bauxite from Del Park. This is to be expanded to 2,000,000 tonnes by the end of 1977. North of the Mitchell Plateau, at Cape Bougainville, a bauxite deposit of 995 million tonnes averaging 36 per cent total alumina has been outlined.

The Queensland Government approved draft legislation in November 1975 for the establishment of an alumina refinery based on bauxite to be mined at Aurukun, south of Weipa.

Copper

Mine production of copper at Mount Isa decreased to 136,000 tonnes in 1975. The mine at Mount Morgan, Queensland, is expected to close at the end of 1976 because reserves are nearly exhausted. Mine production increased at the Mammoth Mine, at Gunpowder, Queensland, in line with current expansion plans to lift production to 600,000 tonnes of ore per year.

Copper mining and smelting ceased in February 1975 at Tennant Creek, Northern Territory, because of technical and economic difficulties.

The mine at Mount Gunson, South Australia, continued to expand, becoming the fifth largest Australian copper producer in its first full year of operation.

A major copper lode has been outlined by drilling at Golden Grove, Western Australia, and a second deeper lode is indicated. Resource potential is assessed at 13.5 million tonnes with an average grade of 3.5 per cent copper.

Iron

The major development of recent years has been the establishment in Australia of a large scale iron ore export industry based principally on steelmaking requirements in Japan. Exports of iron ore and iron-ore pellets in 1974 to Japan and elsewhere were 83.4 million tonnes valued at \$588 million.

A magnetite beneficiation plant of 1.3 million tonnes per year capacity was commissioned in 1975 at Whyalla, South Australia.

In 1975 production and shipment capacity for pellets and fines shipped out of Cape Lambert from the Robe River deposits was increased to 5 million tonnes per year and 9.4 million tonnes per year respectively. The Mount Newman Consortium's program to expand production and shipment capacity to 40.6 million tonnes by 1976 was continued.

Silver, lead and zinc

Production of lead and zinc metal rose in 1975 to 390,000 tonnes and 460,000 tonnes respectively.

A summary of the Australian lead and zinc industry from 1953 to 1973 was published in the *Australian Mineral Industry Quarterly Review* Vol. 27, No. 4.

Two new silver-lead-zinc discoveries were reported in 1975. These were at Elura, near Cobar, New South Wales, where resources of 22 million tonnes averaging 5.6 per cent lead, 8.6 per cent zinc and 135 grams silver per tonne are indicated; and at Que River, north of Rosebery, Tasmania, the deposit has estimated resources of 4.2 million tonnes averaging over 0.36 per cent copper, 6.5 per cent lead, 11.6 per cent zinc, 107 grams silver and 2 grams of gold per tonne, and 0.64 million tonnes of 1.7 per cent copper, 3 per cent lead, 5.3 per cent zinc and 55 grams silver per tonne.

Deep drilling at the North Mine, Broken Hill, New South Wales, encountered lead-zinc-silver mineralization.

At the McArthur River deposit, Northern Territory, a two year testing program has commenced to obtain information for a comprehensive feasibility study of the deposit.

Black coal

There has been a significant revival in the Australian black coal industry in recent years as a result of increased exports and increased consumption of black coal in iron and steel production and electricity generation. These increases have more than balanced reduced consumption in some applications due to competition from fuel oil.

The expansion of the export trade has been of major significance. In 1955 exports were about 200,000 tonnes valued at about \$1.7 million; in 1975 exports were 29.9 million tonnes valued at \$780 million. These increased exports have been largely to Japan for use in the iron and steel industry and to Europe (steaming coal). As a result of this increased demand, new mines have been opened and others are under development in Queensland and New South Wales, and many established mines are being expanded. Exploration for coal has been stimulated and further rich deposits of coking coal and steaming coal have been located, particularly in Queensland.

Petroleum

At the end of 1975 there were seven oil fields in production: Moonie, Alton and Bennett in Queensland; Barrow Island in Western Australia; and Barracouta, Halibut and Kingfish in the Gippsland Shelf area offshore from Victoria in Bass Strait. The production of crude oil from these in 1975 amounted to 23,900,000 cubic metres representing 71 per cent of the year's total input to Australian refineries of crude oil and other feedstock of 33,600,000 cubic metres. The average daily production of 65,300 cubic metres in 1975 was about 6 per cent higher than the 61,400 cubic metres daily average in 1974. Natural gas production in 1975 amounted to 5,285 million cubic metres, 13 per cent more than in 1974. About 10 per cent of the 1975 total production was used in the field and processing plants and the balance was sold mainly as fuel to markets in Victoria, South Australia, Western Australia and Queensland.

Discoveries made in 1975 included one of oil (non-commercial) at Tidepole in the Dampier Sub-basin of the Carnarvon Basin, on the Northwest Shelf, offshore from Western Australia, and two of natural gas, one at Tidepole, and one at Sunrise, in the offshore part of the Bonaparte Gulf Basin.

The provisional figure for metres drilled in petroleum exploration and development in Australia in 1975 was 58,576 metres, which is some 79,950 metres (about 58 per cent) less than the metres drilled in the previous year. About 48,228 metres of the 1975 total was attributable to exploration drilling, of which 35,652 metres were drilled offshore. Of the 29 wells completed in 1975, 25 were exploration wells, of which 19 were offshore. In comparison with the previous year there was a decline of 27 in the number of exploration wells and 19 development wells; there was a decline of 12 in the number of offshore exploratory wells. Of the exploration wells drilled, 1 was completed as a potential oil and gas producer and 2 as gas producers; of the development wells 4 were completed as potential gas producers.

Nickel

Output from Australia's major nickel mining operation at Kambalda in Western Australia has grown to more than 37,000 tonnes of contained nickel per annum. Mines at Nepean, Scotia, Redross and Spargoville (Location 3) produce more than 8,000 tonnes contained nickel per annum. Production at the Mount Windarra mine was 12,000 tonnes of contained nickel in 1975.

The Agnew, Western Australia, project seems likely to proceed to the detailed design stage in August 1976 with a view to commencing production in 1978. A nickel sulphide concentrate will be produced for sale and planned output is about 10,000 tonnes of nickel metal in concentrates.

Mineral sands

The history of the mineral sands industry and an assessment of resources is presented in the *Australian Mineral Industry—Quarterly Review* Vol. 25 No. 1.

Two mines commenced production on a commercial scale at Eneabba, Western Australia, in the later part of 1974. Two additional plants are expected to come on stream in 1976. By the end of 1976, installed capacity of about 150,000 tonnes of rutile per year should be available in the Eneabba-Jurien Bay area. A commercial 30,000 tonnes per annum upgrading plant was commissioned at Capel in June 1974 and by year end had achieved better than rated capacity.

Phosphate

Production of "direct shipping" grade rock commenced from the Duchess desposits in 1975; with the completion of a 68 km spur in 1976, the production will rise to 1 million tonnes per year and is expected to be expanded to 3 million tonnes by 1977.

Manganese

The program to expand production at Groote Eylandt from 1.3 million tonnes per year to 2 million tonnes per year was continued during 1975 and should be completed in early 1976.