# THE MINERAL INDUSTRY OF

# SOUTH AFRICA

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The Republic of South Africa remained one of the world's foremost mining and mineral processing nations in 1996. South Africa had the largest production of gold and was the largest or among the dominant producers of many other mineral commodities. The most important mineral commodities produced in South Africa, in terms of value, continued to be gold, coal, and platinum-group metals (PGM). Additionally, world-class output of metallic minerals included ores and/or smelted products of antimony, chromium, iron, manganese, titanium, uranium, vanadium, and zirconium. Important output of industrial minerals included andalusite, asbestos, diamond, dimension stone, fluorspar, phosphate rock, and vermiculite. South Africa was a major producer and the world's third largest exporter of coal. It was also the largest producer of liquid fuels and petrochemicals derived from coal. South Africa's well developed railway and port infrastructure served the domestic minerals industry and those in neighboring countries. Summarizing for the year, South Africa produced about 58 different mineral commodities from over 700 mines and quarries, to include about 50 gold operations, 60 coal mines, and over 60 diamond operations (Mining Journal Ltd., 1997; Verster and van Luitingh, 1997). South Africa's gross domestic product (GDP) in 1996 was about $115 billion, and total exports of all goods were valued at $28 billion[1] (United Nations Monthly Bulletin of Statistics, 1997). Mineral commodities continued to be the cornerstone of the South African economy. According to the South African Chamber of Mines, the mineral industry contributed about 8% to the GDP, or about 15% if the industry's downstream effects are taken into consideration.

Removal of economic sanctions against South Africa in 1994 has led to improved trade relations with a number of countries and opened the doors for more foreign investment by South African mining companies, particularly in other areas of Africa. South African mineral commodities were exported to about 80 countries in 1996. Additionally, the removal of economic sanctions has helped to facilitate foreign investment in South Africa.

Total sales of crude or primary minerals in 1996, as reported by the South African Minerals Bureau, amounted to about $15.2 billion. Export sales of mined and quarried commodities accounted for about $12.1 billion of this, including gold valued at $6.1 billion, coal valued at $1.9 billion, and PGM valued at $1.8 billion (South African Minerals Bureau, 1996). South Africa also had important production of a number of secondary or processed mineral commodities, notably ferroalloys and steel, cement, manufactured fertilizers, and refined petroleum products (from coal and crude petroleum). Almost 90% of South Africa's electricity was generated from coal and about 6% from uranium (U.S. Department of Energy/Energy Information Administration, 1997).

[1]Where necessary, values have been converted from South African rands (R) to U.S. dollars at the rate of R4.29=US$1.00 for 1996.

## Government Policies and Programs

The Department of Mineral and Energy Affairs (DMEA), within the Ministry of Mineral and Energy Affairs, was the primary Government entity responsible for oversight of the country's mineral industry. Within DMEA were the Mineral Rights and Management Services Chief Directorate, which was responsible for liaison and information and the registration of mining titles; the Minerals Bureau Directorate, which was responsible for collecting, classifying, and analyzing mineral data; and the Energy Chief Directorate, which promoted the optimum utilization of energy resources. The Government Mining Engineer and the Mining Branch were responsible for mine health and safety issues. Nine Regional Directorates issued prospecting permits, inspected mineral operations and mine rehabilitation sites, and ensured compliance with environmental regulations.

The Council for Mineral Technology (Mintek) and the Council for Scientific and Industrial Research (CSIR) conducted minerals, mineral processing, and environmental research. The former Chamber of Mines Research Organization was incorporated as the Mining Technology arm of the CSIR. The African National Congress Minerals and Energy Policy Centre continued to act as an advisory think tank to the Government.

Mining and minerals policy continued to be under review in 1996, with no amendments to the existing laws by yearend. The mineral industry awaited reforms to the tax system and labor reform (Mining Journal Ltd., 1997). The South African mineral industry operated under substantially the same laws in 1996 as in 1993. These include the Mining Titles Registration Act, 1967; Mining Rights Act, 1967; Central Energy Fund Act, 1977; Petroleum Products Act, 1977; Nuclear Energy Act, 1982; Diamonds Act, 1986; Electricity Act, 1987; Mineral Technology Act, 1989; Minerals Act, 1991; and Minerals Amendment Act, 1993. The Liquid Fuels and Oil Act, 1947, was repealed by the Liquid Fuels and Oil Repeal Act, 1993. Revisions to the Nuclear Energy Act, 1982, as amended in the Nuclear Energy Act, 1993, came into effect during 1994. A number of these laws were expected to be subject to review.

In May 1995, one of the country's worst mining tragedies

occurred at Vaal Reefs Gold Mine where 104 men lost their lives due to a locomotive falling down a mine shaft. Pursuant to the accident, the Vaal Reefs Commission of Inquiry suggested several mine safety measures be incorporated into law. The Vaal Reefs Commission highlighted the high illiteracy rate among miners as a problem that needed to be addressed through additional remedial and safety training. As a result, a new Mine and Safety Act was passed in June 1996. Under the new law, mine managers have increased responsibilities for the environmental, health, and safety of the mine and mine labor.

Among Chamber of Mines members, gold mine fatalities dropped to 304 in 1996 from 401 deaths in 1995. Fatalities at gold operations traditionally represent the highest proportion in the South African mining industry. The buildup and release of natural earth stresses associated with deep to ultradeep (1,000 meters (m) to 3,800 m) mining and the related seismic events or rockbursts have been a major cause of fatalities. For example, on November 18, 1996, a 3.1 Richter Scale seismic event occurred at Western Deep Levels' East Mine at a depth of 3,200 m causing 1 fatality with 19 injured. Gold production was not adversely affected.

**Environmental Issues**

New mining projects were under increased environmental scrutiny. Reclamation plans and environmental impact statements are required for existing and proposed mineral operations. Emissions were being reduced at the country's smelters. A number of gold mines' tailings piles were being reprocessed. Feasibility studies were underway to install scrubbers at the country's many large coal-fired powerplants, although the cost of such retrofits was expected to be prohibitive. Underground development was being considered for the Gamsburg zinc deposit that could more economically be mined as an open pit. An independent committee recommended against the issuance of a mining permit for the St. Lucia titaniferous sands project in an environmentally sensitive part of the northern Natal coastline, with the Government concurring with this recommendation and denying the permit. A proposed new steel plant for Saldanha Bay was opposed on environmental grounds, but subsequently received approval to proceed. South Africa's steel recycling program had a 51% recovery rate in 1996, third globally after Japan and Germany (U.S. Embassy, 1997a).

According to the South African Minerals Bureau, diamond mining is not as environmentally threatening as the mining of other commodities. Fragile environments can be disturbed however, but larger mining companies, such as De Beers Consolidated Mines (De Beers), utilize technologies to mitigate environmental damage due to diamond mining. Small-scale diamond miners are less able to heed environmental restrictions (Damarupurshad, 1997).

In August 1995, the Department of Environmental Affairs and Tourism initiated a Consultative National Environmental Policy Process, referred to as CANAPE, to review the state of the environment in South Africa and to recommend a new environmental policy for the country. Subsequently, a draft Green Paper was submitted for public discussion and comment in October 1996 (South African Department of Environmental Affairs and Tourism, 1996). CANAPE was to convene another conference to discuss the issues identified in the Green Paper with all relevant parties. An environmental policy White Paper was then to be drafted by the Government and was expected to be submitted for Cabinet and Parliamentary approval by mid-1997.

**Production**

South Africa in 1996 was one of the largest and most diverse minerals producers in the world. As shown in table 1, output levels in 1996 were mixed. Gold production has steadily decreased since 1993. In the major metals sector, production of chromed, iron ore, pig iron, and steel decreased, while aluminum, ferrochrome, ferromanganese, and manganese ore saw increases for the year. Among other mineral commodities, output of diamond, silicon ferroalloys, uranium, and vanadium remained static or experienced minor increases in 1996. Output of lead and nickel also experienced minor increases.

In the industrial minerals sector, vermiculite production dropped by up to 10% along with ongoing declines in asbestos production, in step with an ever diminishing world market. Cement production, a useful leading economic indicator, decreased 16% in response to a slowdown in domestic housing starts.

**Trade**

The South African Minerals Bureau compiles production, trade, and value data for most crude or primary minerals and for selected processed mineral products. The following data are from the South African Minerals Bureau, unless otherwise indicated.

Exports accounted for about 79% of total primary minerals sales revenues of $15.2 billion in 1996. The $12.1 billion in these primary mineral exports approached 43% of the total value of all exports. The relative contribution of mining to total export revenues has been declining as the manufacturing sector of the economy has expanded over the past 10 years. The South African Minerals Bureau estimated that the inclusion of the various processed mineral products, such as ferroalloys and steel, would raise the contribution of the minerals sector to well over 50% of total export revenues.

Primary mineral exports were led by gold valued at $6.1 billion. Following gold, the most valuable crude mineral exports were coal valued at $1.9 billion and PGM valued at $1.8 billion. The expanded Richards Bay Coal Terminal shipped 60.2 million tons of coal in 1996, maintaining South Africa's position as third largest coal exporter in the world. Other mineral exports, in order by value, were iron ore at $302 million, copper at $165 million, nickel at $151 million, and manganese ore at $125 million. Although individual data were officially withheld, exports of diamond, titanium, and zirconium minerals accounted for most of the $1.2 billion reported by the South African Minerals Bureau as "miscellaneous" mineral

exports. Other mineral exports for 1996 were chrome ore valued at $99 million, lead valued at $44 million, and asbestos at $22 million.

In the value-added sector of the mineral industry, 1996 exports of processed mineral products such as chrome alloys and manganese alloys were valued at $563 million and $364 million, respectively. South African steel, including stainless steel, exports were valued at about $1.8 billion in 1996. Major destinations for processed mineral exports in 1995, the last year for which data were available, were Europe at 38.4% by value, the Pacific Rim countries at 37.7%, and North America and Central America at 17.6%. Exports within Africa account for less than 1% of South African mineral export trade. With the end of economic sanctions, South African intraregional trade in Africa is expected to increase although the markets remain comparatively small.

Although South Africa is relatively self-sufficient in the vast majority of its mineral needs, some mineral commodities are imported. In 1995, the last year for which data were available, significant mineral imports by value were diamonds, precious metals, alumina, certain ferroalloys, nickel, coking coal, magnesite, magnesia, and sulfur.

## Structure of the Mineral Industry

The South African minerals and energy industries operates on a free enterprise, market- driven basis. Government involvement in these sectors is minimal and is primarily confined to ownership of the national electric utility, Eskom, and the national oil and gas exploration company, Soekor, including additional subsidies provided to the parastatals, Mossgas and Sasol's synthetic fuels programs. With the end of economic sanctions and freer access to world petroleum supplies, these state-owned energy companies are now being considered for privatization.

In South Africa, the bulk of mineral land holdings and production are controlled by five mining investment houses, Anglo American Corporation (AAC) (including Johannesburg Consolidated Investment Limited (JCI)), Gold Fields of South Africa (GFSA), Gencor Limited (formerly General Mining and Finance Corp.), Rand Gold and Exploration Co, (formerly Rand Mines), and Anglovaal. These houses also had major holdings in most other sectors of the South African economy. The legal and regulatory framework that favored this arrangement was expected to be reevaluated by the new Government. The overall structure and ownership of the minerals industry, as of the end of 1996, is summarized in table 2.

During the year, the major mining houses continued to divest themselves of their nonmining subsidiaries—a process of corporate restructuring, locally referred to as "unbundling." Companies were cognizant of overseas expansion opportunities and black empowerment—a process greatly aided by the removal of economic sanctions against South Africa following the 1994 election victory of the African National Congress. In May 1995, AAC unbundled its holdings in JCI into three separate companies: JCI Limited, with interests in gold, ferrochrome, and coal and base metals; JCI's and AAC's platinum holdings becoming Anglo American Platinum Corp. (Amplats), forming the world's largest PGM producer; and Johnnies Industrial Corp. (Johnnic), containing its nonmining industrial holdings. JCI and Johnnic were placed on the market for purchase by black-owned businesses. A black business group, National Empowerment Consortium, purchased 20% of Johnnic for $325 million. In November 26, 1996, the black-owned Capital Alliance, the financial arm of the African Mining Group, purchased 34.9% of JCI for $610 million (du Plessis, 1996). Additionally, AAC renamed the company's gold and uranium division to Anglogold. Anglovaal Ltd. divided its assets into two new companies in 1996. The first company, Avmin, will manage all of Anglovaal's strategic mineral and mining investments. The second company, Avgold, will manage most of Anglovaal's gold properties and exploration activities. Randgold Resources unbundled the last of its assets in 1996 (Mining Journal, 1996a).

The major mining houses are the principal members of the Chamber of Mines of South Africa. Other Chamber of Mines members included the majority of remaining gold and coal mines and a number of producers of other mineral commodities. The Chamber of Mines was responsible for a variety of advisory and service functions and represents about 85% of the mining interests in South Africa. One of the main activities of the Chamber was the annual wage negotiations between member mines and the National Union of Mineworkers. The Rand Refinery, the largest gold refinery in the world, was affiliated with the Chamber.

The largest foreign-owned mining group operating in South Africa was Rio Tinto. Plc. (RTZ) of the United Kingdom, which jointly owned, with AAC, the Palabora copper mine in northeastern Transvaal, one of the largest copper mines in the world. RTZ was also a 50% shareholder in Richards Bay Minerals Ltd. (RBM), a major world producer of mineral sands, with operations in the coastal areas of KwaZulu-Natal Province.

According to the Minerals Bureau, the overall South African mining industry employed an average of 536,475 workers in 1996—down about 59,000 employees from the 1995 level. Employment in the mining industry represented about 3.5% of the country's economically active population. The gold industry was the largest employer within the mining sector with 63.1% of the total employees. Total remuneration paid to the mining workforce in 1996 was 14.5 billion rands, equivalent to $3.4 billion. Employment at Chamber of Mines-controlled gold mines in 1996 dropped to 342,439, down from a peak employment level of 534,255 in 1986.

## Commodity Review

### *Metals*

**Aluminum.—**South Africa has no economically exploitable deposits of bauxite and no alumina production capacity. All alumina feedstock for the production of aluminum metal is imported. Primary aluminum production continued to be entirely by Aluminum South Africa (Pty.) Ltd. (Alusaf) at Richards Bay, including the Bayside smelter and the new

Hillside smelter. Production of aluminum metal increased in 1996 to about 70% of Alusaf's total installed aluminum production capacity of 876,000 metric tons per year (t/yr). Alusaf began production from its new $1.5 billion, 466,000-t/yr aluminum smelter at Hillside, adjacent to its Bayside smelter in July 1996. The Hillside project is one of the largest greenfield aluminum smelters ever built. Gencor Ltd., the controlling owner, had signed alumina supply contracts with Alcoa of Australia Ltd. and Billiton to supply 500,000 t/yr for 20 years and 400,000 t/yr for 15 years, respectively. In turn, Alcoa and Billiton would be major consumers of the smelter's output. Shiploading and unloading facilities at Richards Bay were upgraded in anticipation of an eventual influx of 1.34 million metric tons per year (Mt/yr) of alumina and 200,000-t/yr petroleum coke, compared with current imports of 340,000 t/yr and 30,000 t/yr, respectively.

**Antimony.—**Consolidated Murchison Ltd., is South Africa's only producer of antimony (as stibnite concentrate), with its national output the fourth largest in the world after China, Russia and Bolivia. However, for the last quarter of 1996, Consolidated Murchison reported that revenue declined by 14% owing to the drop in the world price for antimony. The drop in revenue occurred despite an 18% increase in the volume of antimony sold. By yearend 1996, Consolidated Murchison had planned to proceed with an approximately $16 million investment to develop additional ore reserves through its Beta Shaft. However, declining ore grades and difficult mining conditions coupled with funding shortfalls, and the need for the company to show sustained improvement in revenue, have stalled development of the Beta Shaft project. Current mine reserves are expected to be depleted within 6 years at the current combined production rate of 37,000 metric tons (t) of antimony and byproduct gold ore per month. In recent years, most or all of Murchison's concentrates have been sold to the adjacent Antimony Products (Pty.) Ltd. plant for conversion to antimony oxide.

**Chromite.—**Chromite production declined slightly during the year, owing to the uncertain fluctuation of the chrome price on world markets. Production was from more than 20 mines exploiting the Bushveld Ultramafic Complex. About 26% of the ore was exported and the remainder went to supply domestic ferrochrome smelters. Domestic consumption of chromed ore was the highest in the world. Within South Africa, this consumption fed the world's leading ferrochrome industry, as well as a world-class chrome chemicals and refractories industry. Chrome ore sales were valued at $189 million in 1996, of which $99 million was export revenue (South Africa Minerals Bureau, 1996).

Chromecorp. Holdings Ltd., Gencor's Samancor Ltd., and Consolidated Metallurgical Industries (CMI) were the largest chromed producers in the country. In 1996, Chromecorp planned to double output from its Wonderkop furnace complex to 320,000 t/yr. The company was actively developing new ferrochrome markets in Asia. During the year, Samancor had initiated divesting of nonmining assets. CMI increased its annual production capacity from 360,000 t/yr to 430,000 t/yr in 1996 (Mining Journal Ltd., 1997). The South African chromed industry did not promote further export growth of metallurgical ore to feed foreign ferrochrome industries in order to avoid competition with its own substantially vested domestic industry (South Africa Minerals Bureau, 1996).

**Copper.—**The Palabora Mine was by far the largest copper producer in the country. Output of ore from the 100,000-metric-tons (80,000 t ore)-per-day (t/d) mine complex increased slightly and mill output for the year was a record 143,365 t of copper-in-concentrate. Both production of copper cathode, at 104,300 t, and sales were down from that of 1995. The mine also produced baddeleyite, nickel sulfate, uranium oxide, phosphate concentrates, and vermiculite, as well as modest amounts of precious metals contained in refinery tankhouse slimes. Open pit operations were slated for closure in 2002. Thereafter, it was proposed to carry on mining underground. The $349 million Palabora Underground Mining Project was on schedule during the year. Construction of the exploration shaft began at midyear, with work on the production and service shafts to begin in mid-1997. Full production from the underground operations was to occur in 2002, with planned production of 30,000 t/d of copper ore over 20 years (Palabora Mining Company Limited, 1996). Apart from two other copper companies, the metal was produced in small amounts by the country's PGM mines.

**Gold.—**Gold production in South Africa continued to decline in 1996. According to the Chamber of Mines, South Africa's gold industry had its lowest level of output since 1956. South Africa's share of global gold production for the year was about 21%, the country's lowest percentage since 1903. However, South Africa remained the global leader in gold production. The factors accounting for South Africa's declining gold production were numerous and synergistic in their effects. Restructuring and streamlining of the South African gold industry, increased mining costs, mine labor unrest, and declining ore grades were all major factors contributing to decreased gold output. Starting in 1994, an additional factor was the increase in public holidays and concomitant decreases in the average number of work shifts for miners. These issues remained largely unresolved as of yearend (Chamber of Mines of South Africa, 1997; Mining Journal Ltd., 1997).

An important contribution to the fall in gold output was declining ore grades. For members of the Chamber of Mines, the average grade of ore milled in 1996 was 4.91 grams per metric ton (g/t) gold. Though this was a 0.04 g/t increase from that of 1995; there has been a general grade decline totaling about 60% from the late 1960's.

Working costs for the gold industry slowed from the meteoric increases typical of prior years. For Chamber members, working costs (in rands) in 1996 rose almost 12% per metric ton of ore milled and 8% per kilogram (kg) of gold recovered. Increases reflected generally high inflation levels (including higher wages) and, notwithstanding labor-intensive mining methods, the great technical difficulties of mining at extreme

depths. Total working profit for Chamber members increased by about 48% to about $1.2 billion in 1996. According to the Chamber of Mines, containment in working costs and the devaluation of the rand against the U.S. dollar contributed to the improvement in revenue. The number of mines in a marginal position dropped from 15 mines in 1995 to 7 mines in 1996, owing to increased profits among most gold mines. Continuing to mitigate cost increases was the fact that costs were denominated in rands and gold sales were in dollars.

Traditionally, at times of low gold prices, South African producers have concentrated on mining their higher grade reserves and exploited lower grade material only when prices improved. With relatively stagnant and/or low gold prices since the mid-1980's, there has been rapid depletion of relatively high-grade ores at most mines. This has led to the industry becoming cognizant of mining methods that would render remaining low-grade resources uneconomic. Particularly vulnerable were very deep resources and those very distant to the ore-hoisting shafts—the latter problem sometimes has been overcome by merging adjacent mines.

The continued unbundling of assets by major South African mining companies, discussed earlier in the Structure of the Mineral Industry section, was the main highlight for the gold industry during the year. Utilization of new technologies to mine increasingly deeper gold reserves also highlighted the year. Anglogold planned to launch new deep to ultradeep mining (2,000 to 5,000 m deep) technology to access Ultra Deep Levels gold reserves to the south of the company's Elandsrand property. Anglogold's new technology would allow the sinking of two mine shafts on the property to levels 3,400 to 5,000 m deep. The cost for each shaft complex would be about $1.2 billion each (Mining Journal Ltd., 1997).

JCI initiated two important projects during the year. In July 1996, the company announced plans to proceed with infrastructure development for the exploitation of the South Reef at Randfontein's Doornkop Shaft (JCI Ltd., 1996). The second project was at JCI's HJ Joel gold mine, which began sinking operations of the No. 1 shaft in August 1996. The shaft will be constructed to a depth of 1,673 m, with commissioning of the structure in the year 2001. Estimated cost for the shaft construction is $302 million. Profits at HJ Joel were expected to improve with the initiation of new mining methods and equipment upgrades. The construction of the new No. 1 shaft was to be funded from revenues from current operations. Management at HJ Joel had considered forward selling of gold production through the year 2001 to finance the shaft project. This forward selling concept, termed "hedging," was abandoned owing to a volatile currency market. Various other South African gold producers have considered hedging, but have also been dissuaded by market volatility (Mining Journal, 1996b).

At yearend, Randgold announced that it would proceed with development of a commercial-scale gold refinery to be built at the Harmony Mine. This follows Randgold and Mintek's successful development and testing of a pilot plant. The refinery will use a solvent extraction process for the chemical refining of gold to 99.99% purity. Mintek will design, construct, and commission the 2-metric-ton-per-month gold plant slated for completion in 1997. Randgold expected that a local gold jewelry industry may be developed at the site (U.S. Embassy, 1996b).

Gold theft and smuggling continued to plague the South African industry during the year. The estimated loss of revenue from gold smuggling was $350 million per year (The Mail & Guardian, 1996).

**Iron and Steel.—**Iron Ore.—Iron ore production in South Africa declined slightly in 1996, owing to bottlenecking and capacity constraints on the 861-kilometer (km) railway line from Iscor Ltd.'s (Iscor) Sishen Mine to the port at Saldanha Bay. Two primary types of iron ore are produced in South Africa, hematite and magnetite, with production for the year at about 28.8 Mt and 2.1 Mt, respectively. Iron ore exports, primarily hematite, amounted to about 19.3 Mt, worth about $287 million (U.S. Embassy, 1997a; South Africa Minerals Bureau, 1996).

Iscor was South Africa's largest iron ore producer—its two iron mines, Sishen and Thabazimbi—accounted for about 81% of the country's total output. For the year, the Sishen Mine produced 23 million metric tons (Mt) of ore and the Thabazimbi Mine produced 2.5 Mt of ore. Sishen contains about one-half the world's known reserves of lumpy iron ore, grading 65% iron. Iscor plans to increase output at Sishen to 32 Mt/yr by replacing the present 6-day workweek with a 7-day workweek. Iron ore grades from the Thabazimbi Mine are about 60%. Iscor was reviewing mining operations at Thabazimbi and is considering the possibility of conversion to a calcite mine at the end of the mine's predicted 12 to 18 year iron ore mining life (U.S. Embassy, 1997a; South Africa Minerals Bureau, 1996).

Increasing the railing capacity along the route from the Sishen Mine to the port at Saldanha Bay from 18 Mt to 32 Mt was under consideration. Stakeholders in the railway include Orex, a transportation subsidiary of Spoornet; Portnet; and the mining companies Iscor and Associated Manganese. A feasibility study for the railway upgrade was to be discussed by the stakeholders in 1997 (U.S. Embassy, 1997b; South Africa Minerals Bureau, 1996).

The other major iron mine in South Africa was Highveld Steel and Vanadium Corp. Ltd.'s (Highveld) Mapochs Mine. Production of magnetite from the Mapochs Mine was slightly more than 2 Mt for 1996, a decline from that of 1995 (U.S. Embassy, 1997b; South African Minerals Bureau, 1996).

Steel.—South African crude steel production dropped by about 6% from the production level of 1995. Iscor's production dropped, but still accounted for over 86% of the country's total South African crude steel production; the company remained the largest steelmaker in Africa. Iscor indicated that construction on its new steel plant at Saldanha Bay was 40% complete by yearend. The plant would have production capacity of 1.25 Mt/yr of hot rolled coil steel and would be South Africa's first export-focused steel plant. Commissioning of the plant is scheduled for 1998. The plant would use iron ore (pellets) instead of scrap and, while initial feed would be imported, the plant eventually would be supplied from the Sishen Mine. The other major steel producer in South Africa, Highveld, suffered production declines during the year, owing to a labor strike in

November 1996.

During the year, a variety of expansion projects were underway in South Africa's stainless steel sector. By 1998, the total planned production capacity of 1.15 Mt/yr for stainless steel in South Africa should solidify the country's place as a major global player in the industry. The installed capacity would account for about 7.5% of global stainless steel production of 16 Mt/yr (U.S. Embassy, 1997b).

Commencing production in February 1996, the new Columbus Stainless Steel plant produced 314,000 t of slab steel and 121,400 t of plate, cold rolled coil, and sheet in 1996. The plant, a joint venture among Samancor, Highveld, and the Investment Development Corporation of South Africa (IDC) (33.3% each), will eventually have a total capacity of 550,000 t/yr of stainless steel, predominantly for export. Production at full capacity had not as yet been achieved, due in part to technical problems at the plant. Target production for 1997 at Columbus was 480,000 t (U.S. Embassy, 1997b).

Iscor's conversion of its Pretoria steel plant to stainless steel output was completed during the year, with a design capacity of 400,000 t/yr of flat-rolled products. Additionally, the company's conversion of its Durban plant to a stainless steel micromill was complete and opened in September 1996. Production capacity of about 100,000 t/yr stainless steel long products was anticipated. The mill was the only stainless steel long-product producer in Africa.

Ferroalloys.—Ferrochrome.—South African ferrochromium production increased during the year to about 1.4 Mt with a total sales value of $614 million. Total export volume for South African ferrochrome exceeded 1.3 Mt in 1996, valued at $563 million. Additionally, local sales and production of ferrochrome have increased substantially in recent years to supply the growing domestic stainless steel industry. South Africa's production of ferrochrome represented 36% of the world total in 1996. Installed production capacity for South African ferrochrome exceeds 2.5 Mt (South Africa Minerals Bureau, 1996).

Ferromanganese.—South Africa's production of ferromanganese alloys grew to 842,000 t in 1996, with 661,000 t of the total being exported. Total sales value for ferro-manganese increased to $415 million during the year, of which $364 million were export earnings. New production capacity for South African ferromanganese had been commissioned and was scheduled for startup in 1998, the first such major investment in the industry since 1980 (Armitage and Bates, 1997).

**Nickel.—**South Africa's nickel output is mostly a byproduct of PGM production, with some byproduct production from the Palabora copper mine. Output increased marginally in 1996. With the anticipated growth in demand from stainless steel producers in South Africa and worldwide, Anglovaal in conjunction with AAC speeded its evaluation of its Slaaihoek nickel-cobalt-copper-PGM project. The deposit is hosted by the Uitkomst Mafic Complex near Barberton in the Eastern Transvaal. Anglovaal reported that initial feasibility studies have been positive and during the year the company decided to start early exploitation of a portion of the deposit. A new vertical shaft was drilled to access the Massive Sulphide Body (MSB) of the mafic complex with initial production at the MSB of 36,000 t/yr of concentrate to commence in 1997 (Anglovaal Limited, 1996).

**Platinum-Group Metals (PGM).—**South Africa continued to be the world's largest primary producer of PGM and had almost 90% of world reserves. Production of PGM increased in 1996, maintaining an upward trend over the last 4 years. During the year, South Africa produced approximately 70% of total world PGM supply. Lower prices for PGM coupled with increased global demand for these metals resulted in sales revenues valued at about $1.8 billion—virtually all reported as exports. Included within total PGM in table 1 are the other important byproduct metals, palladium and rhodium. During the year, South Africa produced approximately 25% of global palladium supply and about 75% of global rhodium supply (Chamber of Mines of South Africa, 1997; South African Minerals Bureau, 1996). Production of PGM in South Africa originates almost exclusively from mines of the Bushveld Ultramafic Complex, north of Pretoria (Mining Journal Ltd., 1997). In South Africa, Rustenburg Platinum Holdings Limited (RPH), with controlling ownership by AAC and Amplats, is the largest platinum producer in the world. The other dominant platinum producer is Gencor's Impala Platinum (Implats), the second largest platinum producer in the world.

Several controversies resonated throughout the South African platinum industry during the year. A possible merger of Implats with Lonrho's Eastern and Western Platinum mines was thwarted during the year by the European Commission (EC). The EC cited the problematic creation of a duopoly as a reason for the preventative measure. Implats was also in litigation with the Bafokeng Tribe over the Tribe's desire for increased royalty payments from Implats. Implats currently mines most of its PGM on lands owned by the Bafokeng Tribe. The issue remained unresolved in 1996 (Gencor Limited, 1996; Mining Journal Ltd., 1997). Additionally, Implats was beset by labor strikes during the year and experienced a furnace collapse. The furnace, normally accounting for approximately 80% of Implats production, took 6 weeks to repair (U.S. Embassy, 1996a). RPH's mining operations were affected by a labor strike between June and August 1996. The strike, involving about 19,000 employees, resulted in a production loss of over 2,800 kg of refined platinum (Mining Journal Ltd., 1997).

Beset by labor unrest during the year, GFSA's Northam platinum mine appeared to be overcoming ongoing technical and grade-control problems. The Northam platinum mine is the deepest and hottest temperature platinum mine in the world. The company cited revised mine planning, improved understanding of Merensky Reef geology, and the utilization of hydropower technology as reasons for the mine's improved financial performance in 1996. By December 1996, the Northam Mine had achieved its targeted production rate of 150,000 metric tons per month of ore (Gold Fields of South Africa Limited, 1996). For the year, Implats reported that the company's Enhanced Precious Metals Refinery project was on

schedule and within budget (Gencor Limited, 1996).

**Titanium and Zirconium.—**Richard Bay Minerals' Tisand (Pty.) Ltd. (RBM), owned jointly by Gencor and RTZ, produced ilmenite, rutile, and zircon from beach sands north of Richards Bay. A sister company, Richards Bay Iron and Titanium (Pty.) Ltd. produced an 85% titanium dioxide slag from ilmenite concentrates at the Richards Bay smelter, as well as low-manganese pig iron. RBM was the largest titanium mineral producer in the country. Titaniferous magnetite also was recovered at the Phalaborwa carbonatite as a byproduct of copper and phosphate rock production, and titaniferous slag was produced with magnetite ores from the Mapochs Mine by the Highveld steel plant.

During the year, titanium slag produced reached about 1 Mt, with 50,000 t of the latter processed domestically, the remaining 950,000 t was exported. Export destinations were mainly the United States, Europe, and Asia (Mining Journal Ltd., 1997).

Proposals by RBM to mine the large titaniferous sands resources at St. Lucia, north of Richards Bay in KwaZulu-Natal, came under increasing pressure from South African and international environmental groups. These groups offered alternatives to mining the area, notably, a proposal to establish the sensitive ecosystem as a World Heritage site. In a ruling in early 1996 the Government denied the mining permit.

In 1996, AAC's Namakwa Sands project experienced technical problems with the production circuit, including a titanium slag furnace breakdown in November. As a result, production of titanium slag was only 50,000 t during the year. Subsequently, the company reported that the technical problems had been overcome (Mining Journal Ltd., 1997).

Iscor announced that it was conducting environmental impact assessments for its heavy minerals project in the Northern Province, to include the mining area and central processing complex in KwaZulu-Natal. The company reported that the final Impact Assessment Report was being prepared (Iscor Limited, 1996).

Zirconium is produced as a zircon byproduct of Richards Bay and Namakwa Sands mineral sands mining. Palabora Mining Co. Ltd. produces 70% of the world's baddeleyite, which is a zirconium sulfate mineral used in specialized applications in the refractory, ceramics, tanning industries, and in kidney dialysis machines. During the year, the Palabora Mining Co. Ltd. decided to proceed with plans to produce zirconium basic sulfate (ZBS) from zircon sands. The ZBS project, at an estimated cost of $14 million, was on schedule with production to commence in August 1997. Full production capacity was expected to be at 7,895 t/yr, containing 38% $ZrO_2$ by 1999 (Palabora Mining Company Limited, 1996).

**Uranium.—**Uranium production, largely a coproduct of a three Witwatersrand gold mines, showed a slight increase in 1996. Approximately 100,000 kg of uranium oxide was also produced by the Palabora copper mine.

**Vanadium.—**Vanadium was produced from titaniferous magnetite mined from the Bushveld Ultramafic Complex. Output of vanadium declined slightly in 1996. The largest producer was Highveld Steel and Vanadium Corp. Highveld's main products were vanadium slag and vanadium pentoxide flake, although modest amounts of vanadium trioxide also was produced, as was a small amount of ferrovanadium. Rhombus Exploration (Rhoex) was the other major South African producer of vanadium. During the year, Switzerland's Glencore International purchased an 80% stake in Rhoex and acquired 100% ownership of Vantech of South Africa. These actions have fueled speculation that Glencore International may merge these acquisitions in 1997, resulting in control of about one-third of South Africa's vanadium export market (Mining Journal Ltd., 1997).

### *Industrial Minerals*

The value of total sales of industrial minerals produced in South Africa was about $791 million for 1996. Approximately 69% of those sales were on the domestic market. In terms of sales, the three dominant industrial mineral commodities were aggregate and sand, limestone and dolomite, and phosphate rock. The largest domestic consumers of South Africa's industrial minerals were the building and construction sectors, metallurgical sectors, and agricultural sectors (Botha, Verster, and Munzhelele, 1997).

**Cement.—**Cement was produced by Pretoria Portland Cement Co. Ltd., Alpha Ltd., and Blue Circle Cement (Pty.) Ltd. The three companies had equal interest in Natal Portland Cement Co. (Pty.) Ltd., which served much of the Natal market. These companies comprised a cartel, the South African Cement Producers Association (SACPA). In 1995, following a 2-year investigation of the cartel's pricing and supply practices, the South African Competition Board recommended that the cartel be disbanded. Subsequently, SACPA was disbanded in September 1996. It was unclear what the effect of disbanding would be, but the producers were planning to increase output capacity in anticipation of major housing projects sponsored by the new Government.

**Diamond.—**South Africa's rough diamond production increased slightly in 1996. As in years past, De Beers dominated the sector with more than 94% of total production. According to the South Africa Minerals Bureau, of the total of 66 officially permitted diamond mines in South Africa, 49 produced diamonds during the year. Total production by De Beers increased to 9.39 million carats, up by 336,036 carats from that of 1995. Much of the De Beer's increase was from the Venetia, Finsch, and Namaqualand Mines. The increases were notwithstanding De Beers imposing production quotas on its operations, to thwart sales of Russian diamonds outside the auspices of De Beers' Central Selling Organization. The sector contributions to diamond production for the year were as follows: kimberlite diamond production at 8.86 million carats, alluvial diamond production at 1.03 million carats, and marine diamond production at 51,669 carats (Damarupurshad, 1996).

De Beers' future expansion plans centered on increasing

operational depths at its existing South African underground mines, to include reopening older workings, in an effort to extend mine life and create jobs. Additional expansion options included streamlining mining processing operations, and increasing the number of shifts at the mines (Mining Journal Ltd., 1997).

### *Mineral Fuels*

Except for a minor amount of gas condensate, South Africa produced no crude petroleum during the year, and only a limited amount of natural gas. Most of the country's primary energy needs were supplied by coal; most electricity was generated by coal-fired power stations, and coal was also the raw material for South Africa's production of synthetic fuels. The Southern Oil Exploration Co. (Soekor), the state-owned petroleum exploration company, controlled all offshore oil and gas prospects.

To date, onshore hydrocarbon discoveries were insufficient and uneconomic. Soekor was to bring on-stream South Africa's first offshore oilfield development by mid-1997. Soekor estimated that the offshore Oribi Field, 140 km southwest of Mossel Bay, had reserves of 20 million barrels of crude oil, and had targeted a production of 20,000 barrels per day (bbl/d) from two wells (Knott, 1997).

South Africa's total throughput refining capacity for crude oil was 465,000 bbl/d from four refineries. As of yearend 1996, South Africa consumes about 450,000 bbl/d of liquid hydrocarbons, of which about 255,000 bbl/d are imported. The remaining 195,000 bbl/d that are consumed were synfuels produced from coal and natural gas (Knott, 1997).

South Africa's synfuels program has been in place for many years. Owing to the comparatively high cost of synfuels compared with conventional crude oil products, the Government emplaced various tariffs and controls on the petroleum marketing sector. It was generally agreed by industry observers that the South African energy industry and tariff system was in need of restructuring and/or privatization. (Knott, 1997).

**Coal.—**South Africa remained the fifth largest coal-producing country in the world and the third largest coal exporter. After gold, coal was South Africa's second largest export. Coal exports were 60.2 Mt, valued at $1.9 billion were shipped, primarily through the Richards Bay Coal Terminal (RBCT). South Africa was the world's largest steam coal exporter after Australia. Total steam coal exports for 1996 represent 21% of the global total or 55.8 Mt. Bituminous coal accounted for more than 98% of South African production. Of the 146.4 Mt of coal consumed domestically, 73.2 Mt went to the electricity sector, 55.6 Mt to the industrial sector, 5.8 Mt for metallurgical purposes, and 5.8 Mt for small consumers (Chamber of Mines of South Africa, 1996).

Three companies, Ingwe Coal Corp., Anglo American Coal Corp. Ltd., and Sasol Mining (Pty.) Ltd. (Sasol), continued to account for more than 80% of the country's coal production. Ingwe was formed through the merger of Trans-Natal Coal Corp. Ltd. and Randcoal in 1994. Other producers included Iscor Ltd., which mined coal for its own internal use. There were numerous independent medium to small coal companies. Although the 76 coal operations within the 19 coalfields of South Africa were spread over an area of 300,000 square kilometers, the main coal-producing area was the Witbank Basin, which accounted for approximately 42% of the country's output. About 65% of the coal was produced from underground mining operations, with the remainder coming from open pit mines. Most open pit mines were less than 70 m deep.

**Synfuels.—**Total throughput production capacity for synfuels in South Africa was about 195,000 bbl/d. The Government was considering plans to privatize the costly $4 billion, Mossgas oil-from-gas project, and Sasol's plants producing oil and petrochemicals from coal. These companies' fuel production was considered too expensive in light of ready access to imported fuels occasioned by the removal of economic sanctions against South Africa. The Government was also reducing the tariff subsidies available to Sasol. The basis for subsidies for synthetic fuels was reduced to a floor price of $18 per barrel of petroleum in 1996, with the subsidy to be phased out entirely by July 1999 (Knott, 1997).

## Reserves

South Africa's mineral reserves are large and diverse and reflect the country's complex geology. A detailed account of the geology of many of South Africa's ore deposits are available from the Geological Society of South Africa and a useful background geologic summary is given in Mining Magazine (Anhaeusser and Maske, 1986; Mining Magazine, 1995). The bulk of South Africa's mineral production is from the northern half of the country. Table 3 gives the reserve base for a number of South Africa's major minerals; diamond reserve data are unavailable. Although data are incomplete for the world, for many of the minerals shown, South Africa's reserves appear to rank among the top five countries and would rank first in the world for andalusite, chromite, gold, manganese, PGM, and vanadium.

## Infrastructure

The country has a well developed and extensive road and railroad infrastructure, serving not only South Africa but also the surrounding region. Roadways totaled 182,329 km of which 55,428 km were paved. Railroad infrastructure totaled 21,431 km of which 9,087 km was electrified (CIA World Factbook, 1996).

A number of ports handled minerals, notably Cape Town, Durban, Richards Bay, Port Elizabeth, Mossel Bay, East London, and Saldanha Bay. In addition to fulfilling the requirements of South Africa itself, the country's ports also served as outlets for landlocked countries such as Botswana, Lesotho, Swaziland, Zambia, and Zimbabwe. South Africa was also a regional supplier of electricity and petroleum products, two of a number of examples of the dependence of neighboring

countries on South Africa's infrastructure and transportation networks.

Richards Bay handled the greatest volume of cargo among South African ports. The RBCT had a coal export capacity of about 60 Mt/yr. Coal exports through Durban were only a fraction of those through RBCT. Durban's port facilities were designed mainly for small consignments of high-quality lump bituminous coal and anthracite that cannot be properly handled at Richards Bay.

South Africa continued to maintain reserve stocks of crude oil to counter possible interruptions in imports. The size of the these reserves has been decreased since 1991 to the current 45 million barrels. Storage areas for the reserves are at tank farms at Saldanha Bay and abandoned gold mines in the Ogies area.

South Africa's national electrical power utility, Eskom, had a nominal capacity of 38,497 megawatts, predominantly from coal-fired sources, with a small percentage of electricity being generated from nuclear sources. Total electrical power produced by Eskom in 1996 was 165,370 gigawatt-hours of electricity (Eskom, 1997).

## Outlook

Significant labor issues, such as housing of migrant workers, wages, job training, and work schedules, will likely continue into 1997. Improving mine safety coupled with trade unions demanding a greater say in mining practices will remain important issues for the mining industry. Wildcat strikes and other labor disturbances were ongoing in 1996. The unresolved matters of balancing new holidays with the industry's requested elimination of the ban on Sunday mining, reform of mining rights, and the tax structure were additional unresolved issues.

Increased attention was expected to be given to environmental issues, which also would be factors in projects requiring financing from international lending institutions. The major mining houses will likely continue to increase their holdings and activities overseas, including the forming of strategic alliances with major overseas customers.

The Chamber of Mines expected no further declines in gold production with a stabilization at 500,000 kg for 1997 (Mining Journal Ltd., 1997). For 1997, the Minerals Bureau predicted that total ferrochrome sales would exceed $900 million (South African Minerals Bureau, 1996). The Minerals Bureau also has forecast a rise in industrial minerals export earnings through the turn of the century. This forecast is based on the anticipated continuing depreciation in the exchange rate of the rand against the dollar and strong growth in export volumes of fluorspar, granite, phosphate rock, phosphoric acid export earnings, and vermiculite. This projection would be relatively unaffected by the anticipated drop in export earnings for asbestos (South African Minerals Bureau, 1996).

South Africa appeared to be entering a phase of rapid expansion of value-added mineral processing capacity, especially for metals. In this regard, if labor and energy costs remained low and world markets remained buoyant, South Africa had the potential to greatly increase its market share for many commodities.

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Internet: http://www.anc.org.za/num

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity | | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|
| METALS | | | | | | |
| Aluminum metal, primary | | 172,795 | 174,700 | 172,111 | 195,292 | 617,000 |
| Antimony concentrate: 2/ | | | | | | |
| Gross weight e/ | | 6,465 3/ | 7,182 3/ | 7,800 | 9,550 | 8,860 |
| Sb content | | 3,779 | 4,111 | 4,534 | 5,537 | 5,137 |
| Cadmium, Cd content of cadmium cake | | 60 | 70 e/ | -- | -- | -- |
| Chromite, gross weight: | | | | | | |
| More than 48% chromic oxide | thousand tons | 18 | 4 | -- | 16 | -- |
| 44% to 48% chromic oxide | do. | 1,904 | 1,808 | 1,612 | 1,792 | 1,862 |
| Less than 44% chromic oxide | do. | 1,441 | 1,014 | 2,030 | 3,296 | 3,155 |
| Total 4/ | do. | 3,363 | 2,827 | 3,642 | 5,104 | 5,017 |
| Cobalt: | | | | | | |
| Mine output, Co content | | 343 | 265 | 358 | 288 | 350 |
| Refinery output: | | | | | | |
| Metal, powder | | 65 | 71 r/ | 44 r/ | 32 3/ | 42 e/ |
| Sulfate, contained cobalt | | 169 r/ | 172 r/ | 214 r/ | 158 3/ | 200 e/ |
| Total | | 234 | 243 r/ | 258 r/ | 190 | 242 |
| Columbium and tantalum: Columbite-tantalite concentrate: | | | | | | |
| Gross weight | kilograms | 31 | -- | -- | -- | -- |
| Cb content e/ | do. | 11 | -- | -- | -- | -- |
| Ta content e/ | do. | 9 | -- | -- | -- | -- |
| Copper: | | | | | | |
| Mine (company output), Cu content | | 176,074 | 166,348 | 165,213 | 165,573 | 152,595 |
| Metal: | | | | | | |
| Smelter | | 158,700 | 156,600 | 154,700 | 151,200 | 141,730 |
| Refined, primary | | 120,100 | 127,900 | 129,600 | 124,300 | 116,000 |
| Gold, primary | kilograms | 614,071 | 619,201 | 580,201 | 523,809 | 497,853 |
| Iron and steel: | | | | | | |
| Ore and concentrate: | | | | | | |
| Gross weight | thousand tons | 28,226 | 29,385 | 30,489 | 31,946 | 30,830 |
| Fe content | do. | 18,347 | 19,100 e/ | 18,903 | 19,806 | 19,115 |
| Metal: | | | | | | |
| Pig iron | do. | 6,498 | 6,121 | 6,047 | 6,224 | 6,014 |
| Direct-reduced iron | do. | 854 | 833 | 980 | 950 | 960 |
| Ferroalloys, electric arc furnace: | | | | | | |
| Chromium ferroalloys | do. | 771 | 834 | 1,104 | 1,341 | 1,383 |
| Ferromanganese | do. | 270 | 393 | 591 | 480 | 547 e/ |
| Ferrosilicon | do. | 64 | 99 | 120 | 90 | 180 e/ |
| Ferrovanadium e/ | do. | 1 | 1 | 1 | 1 | 1 |
| Silicomanganese | do. | 267 | 268 | 290 | 280 e/ | 150 e/ |
| Silicon metal | do. | 35 | 38 | 36 | 30 | 35 e/ |
| Crude steel | do. | 9,061 | 8,726 | 8,320 | 8,511 | 7,968 |
| Lead: | | | | | | |
| Concentrate, Pb content | | 75,806 | 100,171 | 95,824 | 88,449 | 88,613 |
| Smelter, secondary | | 29,000 | 31,800 | 31,900 | 32,100 | 33,000 |
| Manganese: | | | | | | |
| Ore and concentrate, gross weight: | | | | | | |
| Metallurgical: | | | | | | |
| More than 48% manganese | thousand tons | 1,331 | 1,239 | 1,533 | 1,708 | 1,845 |
| 45% to 48% manganese | do. | 279 | 237 | 67 | 106 | 86 |
| 40% to 45% manganese | do. | 273 | 299 | 196 | 191 | 118 |
| 30% to 40% manganese | do. | 491 | 665 | 1,006 | 1,145 | 1,133 |
| Total metallurgical 4/ | do. | 2,375 | 2,440 | 2,801 | 3,151 | 3,182 |
| Chemical: | | | | | | |
| More than 65% manganese dioxide | do. | 16 | -- | -- | -- | -- |
| 35% to 65% manganese dioxide | do. | 73 | 67 | 50 | 48 | 58 |
| Total chemical | do. | 89 | 67 | 50 | 48 | 58 |
| Grand total | do. | 2,464 | 2,507 | 2,851 | 3,199 | 3,240 |
| Metal, electrolytic e/ | do. | 35 | 35 | 35 | 35 | 35 |
| Nickel: | | | | | | |
| Mine output, concentrate, nickel content e/ | | 28,400 3/ | 30,800 | 31,800 | 30,700 | 33,613 3/ |
| Metal, electrolytic | | 27,621 | 29,868 | 30,751 | 29,803 | 33,362 |

See footnotes at end of table.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity | | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|
| METALS--Continued | | | | | | |
| Platinum-group metals | kilograms | 152,891 | 176,167 | 183,926 | 184,377 | 188,959 |
| Silver | do. | 182,723 | 192,418 | 197,767 | 174,279 | 166,536 |
| Thorium, monazite concentrate, gross weight e/ | | 400 | 400 | 131 3/ | -- | -- |
| Tin: | | | | | | |
| Cassiterite concentrate: | | | | | | |
| Gross weight e/ | | 1,500 | 1,200 | -- r/ | -- | -- |
| Sn content | | 592 r/ | 452 | -- r/ | -- | -- |
| Metal: | | | | | | |
| Primary 5/ | | 592 | 452 | 43 | -- | -- |
| Secondary e/ | | 60 | 50 | 50 | -- | -- |
| Titanium: e/ | | | | | | |
| Rutile concentrate | | 85,000 | 86,000 | 78,000 | 90,000 | 90,000 |
| Titaniferous slag 6/ | thousand tons | 929 | 937 | 819 | 990 | 1,000 e/ |
| Uranium oxide | | 2,222 | 2,008 | 2,069 | 1,702 | 1,706 |
| Vanadium, vanadium metal content | | 14,285 | 15,051 | 15,656 | 16,298 | 15,685 |
| Zinc: | | | | | | |
| Concentrate: | | | | | | |
| Gross weight e/ | | 133,892 3/ | 140,000 | 140,000 | 130,000 | 142,000 |
| Zn content | | 71,928 | 77,096 | 76,361 | 70,241 | 76,853 |
| Metal, smelter | | 83,208 | 96,154 | 93,850 | 98,782 | 101,100 |
| Zirconium concentrate (baddeleyite and zircon) e/ | | 243,000 | 243,000 | 240,000 | 260,000 | 260,000 |
| INDUSTRIAL MINERALS | | | | | | |
| Aluminosilicates: | | | | | | |
| Andalusite | | 230,333 | 187,708 | 206,291 | 206,378 | 228,010 |
| Sillimanite | | 632 | 569 | 525 | 317 | 303 |
| Asbestos | | | | | | |
| Amosite | | 5,132 | -- | -- | -- | -- |
| Chrysotile | | 103,660 | 92,380 | 85,857 | 81,246 | 51,776 |
| Crocidolite | | 24,476 | 11,614 | 6,273 | 7,396 | 5,344 |
| Total | | 133,268 | 103,994 | 92,130 | 88,642 | 57,120 |
| Barite | | 3,570 | 2,000 | 1,945 | 6,048 | 7,428 |
| Calcite | | 13,764 | 14,094 | 14,660 | 10,666 | 10,700 |
| Cement, hydraulic | thousand tons | 7,028 | 7,356 | 7,905 | 9,071 | 7,668 |
| Clays: | | | | | | |
| Attapulgite | | 8,235 | 7,032 | 10,230 | 8,049 | 14,318 |
| Bentonite | | 43,977 | 50,441 | 71,773 | 70,927 | 48,076 |
| Fire clay | | 86,195 | 91,839 | 110,131 | 74,751 | 101,452 |
| Flint clay, raw and calcined | | 123,721 | 89,352 | 131,590 | 118,688 | 113,645 |
| Kaolin | | 131,765 | 147,349 | 131,863 | 146,587 | 146,496 |
| Brick clay, local sales | thousand tons | 1,072 | 1,028 | 1,386 | 2,909 | 3,013 |
| Diamond, natural: | | | | | | |
| Gem e/ | thousand carats | 4,600 | 4,600 | 4,900 | 4,300 | 4,400 |
| Industrial e/ | do. | 5,556 | 5,724 | 5,954 | 5,383 | 5,546 |
| Total | do. | 10,156 | 10,324 | 10,854 | 9,683 | 9,946 |
| Diatomite | | 576 | -- | -- | -- | -- |
| Feldspar | | 49,425 | 56,761 | 37,156 | 47,874 | 54,193 |
| Fluorspar: | | | | | | |
| Acid-grade | | 230,790 r/ | 194,778 r/ | 166,761 | 177,000 | 205,344 |
| Ceramic-grade e/ | | 6,000 | 3,800 | -- | -- | -- |
| Metallurgical-grade e/ | | 23,000 | 19,000 | 7,497 | 18,794 | 12,000 |
| Total | | 259,790 r/ | 217,578 r/ | 174,258 | 195,794 | 217,344 |
| Gemstones, semiprecious: | | | | | | |
| Rose quartz | kilograms | 100,834 | 85,500 | -- | -- | -- |
| Tiger's eye | do. | 620,827 | 548,386 | 531,418 | 242,552 | 250,435 |
| Gypsum, crude | | 333,771 | 284,389 | 304,337 | 288,178 | 340,688 |
| Industrial or glass sand (quartz) | thousand tons | 1,750 | 1,738 | 1,920 | 2,180 | 2,167 |
| Lime 5/ | do. | 1,686 | 1,599 | 2,891 | 1,688 | 1,650 |
| Magnesite, crude | | 60,085 | 67,403 | 71,726 | 84,639 | 71,358 |
| Mica, scrap and ground | | 2,079 | 1,991 | 1,973 | 2,137 | 1,515 |

See footnotes at end of table.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity | | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|
| INDUSTRIAL MINERALS--Continued | | | | | | |
| Nitrogen: N content of ammonia | | 540,500 | 683,400 | 754,000 | 758,500 | 769,800 |
| Perlite | | 97 | 328 | 914 | 1,338 | 1,300 |
| Phosphate rock: | | | | | | |
| Gross weight | thousand tons | 3,080 | 2,466 | 2,545 | 2,787 | 3,077 |
| Phosphorus pentoxide content e/ | do. | 1,201 | 962 | 995 | 1,087 | 1,200 |
| Pigments, mineral, natural: | | | | | | |
| Ochers | | 890 | 1,175 | 1,789 | 2,316 | 484 |
| Oxides | | 224 | 11 | 295 | 2,940 | 159 |
| Total | | 1,114 | 1,186 | 2,084 | 5,256 | 643 |
| Salt | | 701,991 | 613,301 | 414,463 | 311,388 | 253,403 |
| Sodium sulfate, natural | | 37,169 | 36,380 | 44,544 | 43,971 | 46,947 |
| Stone, n.e.s.: | | | | | | |
| Dimension: | | | | | | |
| Granite and norite 5/ | | 574,747 | 528,310 | 618,781 | 812,220 | 635,005 |
| Marble 7/ | | 17,245 | 20,615 | 12,450 | 5,837 | 689 |
| Slate 5/ | | 26,344 | 22,019 | 15,501 | 11,891 | 11,940 |
| Crushed and broken: | | | | | | |
| Limestone and dolomite | thousand tons | 19,782 | 18,215 | 19,548 | 19,738 | 22,038 |
| Nepheline syenite | | 174,864 | -- | 98,667 | 145,459 | 145,000 |
| Quartzite 5/ | thousand tons | 8,162 | 8,224 | 9,258 | 9,123 | 8,515 |
| Shale: | | | | | | |
| For cement | do. | 301 | 331 | 371 | 325 | 383 |
| Other 5/ | do. | 3,254 | 2,767 | 2,157 | 3,248 | 3,000 e/ |
| Total | do. | 3,555 | 3,098 | 2,528 | 3,573 | 3,383 |
| Aggregate and sand, n.e.s. | do. | 19,477 | 15,824 | 18,294 | 20,594 | 20,792 |
| Sulfur: | | | | | | |
| S content of pyrite | do. | 296 | 323 | 252 | 159 | 184 |
| Byproduct: | | | | | | |
| Metallurgy e/ | do. | 56 | 82 | 118 | 117 | 91 |
| Petroleum | do. | 166 | 171 | 209 | 233 | 200 |
| Total 4/ | do. | 518 | 575 | 579 | 509 | 475 |
| Talc and related materials: | | | | | | |
| Talc | | 13,882 | 8,798 | 8,202 | 9,173 | 16,397 |
| Pyrophyllite (wonderstone) | | 3,053 | 4,287 | 5,507 | 5,519 | 2,140 |
| Vermiculite | | 170,399 | 211,143 | 223,478 | 221,748 | 186,082 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal (salable product): | | | | | | |
| Anthracite | thousand tons | 3,345 | 3,246 | 2,225 | 2,137 | 2,513 |
| Bituminous | do. | 171,047 | 178,980 | 193,625 | 204,073 | 204,468 |
| Total | do. | 174,392 | 182,226 | 195,850 | 206,210 | 206,981 |
| Petroleum refinery products: | | | | | | |
| Liquefied petroleum gases | thousand 42-gallon barrels | 1,543 | 2,460 | 1,825 | 3,285 r/ | 3,300 e/ |
| Gasoline | do. | 54,545 | 57,446 | 59,860 | 73,730 r/ | 74,000 e/ |
| Jet fuel | do. | 6,480 | 6,346 | 7,665 | 8,760 r/ | 9,000 e/ |
| Kerosene | do. | 3,906 | 4,678 | 5,475 | 7,300 4/ | 7,300 e/ |
| Distillate fuel oil | do. | 33,943 | 31,136 | 35,770 | 50,005 r/ | 50,000 e/ |
| Residual fuel oil | do. | 15,884 | 16,000 e/ | 20,075 | 22,995 4/ | 23,000 e/ |
| Lubricants (including greases) | do. | 2,240 | 2,503 | 1,280 | 3,000 r/ e/ | 3,000 e/ |
| Bitumen | do. | 1,739 | 1,784 | 895 | 2,000 r/ e/ | 2,000 e/ |
| Other e/ 8/ | do. | 686 3/ | 700 | 380 3/ | 4,855 r/ | 4,900 e/ |
| Total 9/ | do. | 120,966 | 123,053 | 133,225 | 175,930 r/ | 176,500 e/ |

e/ Estimated. r/ Revised.

1/ Table includes data available through Jan. 31, 1998.

2/ Data are for the year ending June 30 of that stated.

3/ Reported figure.

4/ Data may not add to totals shown because of independent rounding.

5/ Domestic sales plus exports.

6/ Except for about 45,000 t/yr slag derived from titaniferous magnetite by Highveld Steel, titaniferous slag is all from the smelting of ilmenite and likely represents most of that mineral's production, for which data are unavailable.

7/ Converted from reported cubic meters using 1 cubic meter = 2.7 tons.

8/ Includes naphthas, paraffin wax, petroleum coke, petrochemical feedstocks, unfinished oils, white spirits, and blending compounds.

9/ Excludes refinery fuel and losses.

TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 1996

(Thousand metric tons unless otherwise specified)

| Major commodities | Major operating companies and major equity owners 1/ | Location of main facilities | Annual capacity |
|---|---|---|---|
| Aluminum | Aluminium South Africa (Pty.) Ltd. (Gencor, 48%; IDC, 34%; other, 18%) | Bayside smelter at Richards Bay<br>Hillside smelter at Richards Bay | 210 hot metal.<br>466 hot metal. |
| Andalusite | Rhino Andalusite Mines (Pty.) Ltd. (Anglovaal Ltd., 77%) | Timeball Mine, near Thabazimbi | 120. |
| Do. | Damrec of France (private, 100%) | Annesley Mine at Penge, 50 kilometers north of Steelpoort | 75. |
| Do. | do. | Andafrax Mine at Groot Marico, 60 kilometers west of Rustenburg | 12. |
| Do. | Cullinan Minerals Ltd. (South African Mutual Life Insurance, 44%; Fermain Nom Ltd., 8%; AAC) | Krugerspost Mine, near Lydenburg | 50. |
| Do. | Verref Mining (Pty.) Ltd. (AAC) | Havercroft Mine at Penge, 50 kilometers north of Steelpoort | 36. |
| Do. | Hoogenoeg Andalusite (Pty.) Ltd. | Hoogenoeg Mine, 60 kilometers northeast of Potgietersrus | 15. |
| Antimony | Consolidated Murchison Ltd. (JCI, 24.1%; Middle Witwatersrand, 5.5%; Anglovaal Ltd., 2.4%) | 50 kilometers west of Phalaborwa | 9.5 Sb concentrate. |
| Asbestos | Gencor Ltd. (Gencor Beherend Bpk, 54.8%; AAC, 0.9%) | Penge Mine, 50 kilometers north of Steelpoort | 48 (amosite). |
| Do. | do. | Klipfontein Mine, near Sishen | NA (crocidolite). |
| Do. | Anglo Dutch Exploration & Mining Co. (Pty.) Ltd. | Stella Mine, 25 kilometers east of Barberton | NA (chrysotile). |
| Cement | Alpha Ltd. (AAC) | Dudfield plant near Lichtenburg | 1,830. |
| Do. | do. | Ulco plant 60 kilometers northwest of Kimberley | 1,241 |
| Do. | Blue Circle Cement (Pty.) Ltd. (BCC) | Plant at Lichtenburg | 2,000. |
| Do. | Natal Portland Cement Co. (Pty.) Ltd. (AAL, 33.3%; BCC, 33.3%; Pretoria Portland Cement, 33.3%) | Simumu plant, 125 kilometers southwest of Durban | 580. |
| Do. | Pretoria Portland Cement Co. Ltd. (Barlow Rand Group, 60.3%) | De Hoek, Herculese, Jupiter, Slurry, Riebeeck West, and Port Elizabeth | 4.59 Mt (combined), clinker. |
| Chromite | Samancor Ltd. (Gencor, 41%; Delauney Ltd., 24.9%; De Beers, 8.7%) | Winterveld and Tweefontein Mines at Steelpoort | 960 ore. |
| Do. | do. | Montrose Mine, near Lydenburg | 360 ore. |
| Do. | do. | Mooinooi Mine, 30 kilometers west of Brits | 580 ore. |
| Do. | do. | Millsell Mine, 8 kilometers east of Rustenburg | 300 ore. |
| Do. | do. | Elandsdrift Mine, near Brits | 420 ore. |
| Do. | Consolidated Metallurgical Industries (Pty.) Ltd. (JCI, 49.9%; AAC, 26.4%) | Purity Mine, near Rustenburg | 360 ore; 252 concentrate. |
| Do. | Lavino South Africa (Pty.) Ltd. (Anglovaal Ltd., 51%; Middle Witwatersrand, 49%) | Grootboom Mine, near Lydenburg | 500 ore. |
| Do. | Dilokong Chrome Mine (Pty.) Ltd. (Mining Corp. Ltd., 100%) | Dilokong Mine, near Lydenburg | 480 ore. |
| Do. | Chromecorp Technology (Pty.) Ltd. (CI Chromeinvest AG, Germany, 50%; Investinox AG, Germany, 50%) | Chroombronne Mine, near Rustenburg | 576 ore; 432 concentrate. |
| Coal | Anglo American Coal Corp. Ltd. (AAC, 51.4%; ASA Ltd., 2.2%) | 13 collieries in the eastern Transvaal and Natal | 46,000 anthracite and bituminous. |
| Do. | Ingwe Coal Corp. (Trans-Natal Corp. Ltd.; 49.1%; Rand Mines Ltd., 45.9%; other, 5%) | 12 collieries in the eastern Transvaal and Natal | 59,000 anthracite and bituminous. |
| Do. | Duvha Opencast Services (Pty.) Ltd. (Rand Mines Ltd., 71%) | Duvha Colliery, 18 kilometers southeast of Witbank | 11,000 bituminous. |
| Do. | Sasol Mining (Pty.) Ltd. | Sigma Mine, 75 kilometers south of Johannesburg | 7,000 bituminous. |
| Do. | do. | Secunda Collieries, 75 kilometers south of Witbank | 31,000 bituminous. |

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 1996

(Thousand metric tons unless otherwise specified)

| Major commodities | | Major operating companies and major equity owners 1/ | Location of main facilities | Annual capacity |
|---|---|---|---|---|
| Coal--Continued | | Iscor Ltd. (De Beers, 3.4%; AAC, 0.7%) | Grootegeluk Mine, 120 kilometers north of Thabazimbi | 6,300 bituminous; 1,700 coking coal. |
| Do. | | do. | Durnacol Mine at Dannhauser, 40 kilometers south of Newcastle | 1,200 coking coal. |
| Do. | | do. | Hlobane Mine, 100 kilometers east of Newcastle | 700 coking coal. |
| Do. | | do. | Tshikondeni Mine in Venda, about 100 kilometers southeast of Messina | 200 coking coal. |
| Copper | | Palabora Mining Co. Ltd. (Rio Tinto Zinc Corp. plc, 38.9%; AAC, 19.1%; De Beers, 9.5%) | Palabora Mine and plant at Phalaborwa | 130 metal. |
| Do. | | O'Okiep Copper Co. Ltd. (GFSA, 82%; Mellon Securities Trust Co., 18%) | O'Okiep copper mine, 20 kilometers north of Okiep | 40. |
| Do. | | Black Mountain Mineral Development Co. (Pty.) Ltd. (GFSA, 55.4%; Phelps Dodge Corp., 44.6%) | Black Mountain Mine, 100 kilometers northwest of Okiep | 2.5 Cu in concentrate. |
| Diamond | million carats | De Beers (Anglo American Investment Trust Ltd., 25.8%; AAC, 6.9%) | Finsch Mine, 100 kilometers west of Kimberley | 3.5. e/ |
| Do | do. | do. | Kimberley Mines, Kimberley | 0.8. e/ |
| Do. | do. | do. | Koffiefontein Mine, 70 kilometers south of Kimberley | 0.25. e/ |
| Do. | do. | do. | Namaqualand Mines, 50 kilometers north of Port Nolloth | 1.0. e/ |
| Do. | do. | do. | Premier Mine, 70 kilometers east of Pretoria | 1.7. e/ |
| Do. | do. | do. | Venetia Mine, 150 kilometers north of Potgietersrus | 5. e/ |
| Fluorspar | | Vergenoeg Mining Corp. (Pty.) Ltd. (Bayer AG, Germany, 100%) | Vergenoeg Mine, 90 kilometers east of Pretoria | 200 acid- and metallurgical-grade fluorspar. e/ |
| Do. | | Phelps Dodge Mining (Pty.) Ltd. (Phelps Dodge Corp., U.S., 100%) | Witkop Mine, 130 kilometers west of Johannesburg | 75 acid-grade fluorspar. e/ |
| Do. | | Van Den Heever Vloeispaat Werke | Van Den Heever Mine, 120 kilometers west of Johannesburg | 50. e/ |
| Gold: | tons | AAC (De Beers, 38.7%; ASA Ltd., 0.1%) | Freegold near Welkom, Vaal Reefs near Klerksdorp, Western Deep Levels, 70 kilometers southwest of Johannesburg | 260 Au. |
| Do. | do. | GFSA (GFSA Holdings Ltd., 43%; Anglo American Gold Investment Co., 10.8%; AAC, 8.9%; De Beers, 1.3%) | East Driefontein and West Driefontein, 65 kilometers southwest of Johannesburg; Kloof, 55 kilometers southwest of Johannesburg; and others | 125 Au. |
| Do. | do. | Gencor (Gencor Beherend Bpk, 54.8%; AAC, 0.9%) | Buffelsfontein near Klerksdorp; Beatrix, 35 kilometers southeast of Welkom; Winkelhaak, 120 kilometers southeast of Johannesburg; others | 90 Au. |
| Do. | do. | Rand Mines Ltd. | Harmony Mine, 20 kilometers southeast of Welkom and others | 55 Au. |
| Do. | do. | Anglovaal Ltd. (Anglovaal Holdings Ltd., 49.7%;, South African Mutual Life Insurance, 10.7%) | Hartebeestfontein Mine near Klerksdorp and others | 45 Au. |
| Do. | do. | JCI (AAC, 39.8%; South African Mutual Life Insurance, 8.9%; De Beers, 8.4%) | Randfontein Mine, 20 kilometers west of Johannesburg; Western Areas Mine, 30 kilometers southwest of Johannesburg; and others | 41 Au. |
| Iron and steel: | | | | |
| Iron ore | | Iscor Ltd. (De Beers, 3.4%; AAC, 0.7%) | Sishen Mine at Sishen | 21,500 ore. |
| Do. | | do. | Thabazimbi Mine at Thabazimbi | 2,500 ore. |
| Do. | | Highveld Steel and Vanadium Corp. Ltd. (Anglo American Industrial Corp. Ltd., 51.8%) | Mapochs Mine at Roossenekal, 60 kilometers west of Lydenburg | 3,000 titaniferous and vanadiferous magnetite ore. |

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 1996

(Thousand metric tons unless otherwise specified)

| Major commodities | Major operating companies and major equity owners 1/ | Location of main facilities | Annual capacity |
|---|---|---|---|
| Iron and steel--Continued: | | | |
| Ferroalloys 2/ | Ferrometals Ltd. (Samancor Ltd., 100%) | Witbank | 320 ferrochromium. |
| Do. | Tubatse Ferrochrome (Pty.) Ltd. (Samancor Ltd., 100%) | Steelpoort | 300 ferrochromium. |
| Do. | Batlhako Ferrochrome (Pty.) Ltd. (Samancor Ltd., 100%) | Ruighoek Mine site, 80 kilometers southwest of Thabazimbi | 20 ferrochromium. |
| Do. | Samancor Ltd. (100%) | Middelburg | 234 ferrochromium. |
| Do. | do. | Krugersdorp, 30 kilometers west of Johannesburg | 120 ferrochromium. |
| Do. | Consolidated Metallurgical Industries (Pty.) Ltd. (JCI, 49.9%; AAC, 26.4%) | Lydenburg | 210 ferrochromium. |
| Do. | do. | Purity, at Rustenburg | 120 ferrochromium. |
| Do. | Chromecorp Technology (Pty.) Ltd. (CI Chromeinvest AG, Germany, 50%; Investinox AG, Germany, 50%) | Rustenburg | 200 ferrochromium. |
| Do. | Feralloys Ltd. (Associated Manganese Mines of South Africa Ltd., 100%) | Machadadorp, 80 kilometers east of Middelburg | 110 ferrochromium. |
| Do. | do. | Cato Ridge, 75 kilometers west of Durban | 130 high-carbon ferromanganese. |
| Do. | Metalloys Ltd. (Samancor Ltd., 100%) | Meyerton plant, 50 kilometers south of Johannesburg | 532 high-carbon ferromanganese; 200 silicomanganese. |
| Do. | Manganese Metal Co. (Pty) Ltd. (Samancor Ltd., 45.9%) | Plants at Krugersdorp and Nelspruit | 38 electrolytic manganese (total). |
| Do. | Transvaal Alloys Pty. Ltd., (Highveld Steel and Vanadium Corp., 100%) | Witbank | 20 low-carbon ferromanganese; 175 silicomanganese. |
| Steel | Iscor Ltd. (De Beers, 3.4%; AAC, 0.7%) | Plant at Vanderbijlpark | 4,300. |
| Do. | do. | Newcastle plant | 2,000. |
| Do. | do. | Pretoria plant | 800. |
| Do. | do. | Cisco plant near Cape Town | 150. |
| Do. | do. | Corex plant in Pretoria | 300. |
| Do. | do. | Ex-Usko plant in Vereeniging | 450. e/ |
| Do. | Highveld Steel and Vanadium Corp. Ltd. (Anglo American Industrial Corp. Ltd., 51.8%; De Beers, 3.8%) | Witbank | 1,000. |
| Do. | Columbus Stainless, Ltd. (AAC and De Beers, 33.3%; Gencor, 33.3%; IDC, 33.3%) | Stainless steel plant at Middelburg | 660 |
| Manganese | Associated Manganese Mines of South Africa Ltd. (Associated Ore and Metal Corp. Ltd., 45%; Anglovaal Ltd., 44%) | Blackrock, Gloria, N'Chwaning Mines near Hotazel, 70 kilometers north of Sishen | 1,500 ore. |
| Do. | Samancor Ltd. (100%) | Mamatwan and Wessels Mines near Hotazel | 3,000 ore. |
| Petroleum products million 42-gallon barrels | Shell and British Petroleum South Africa Petroleum Refineries Pty. Ltd. (Shell South Africa, 50%; British Petroleum Co., 50%) | Sanref refinery in Durban | 73 crude. |
| Do. | Caltex Oil SA Pty. Ltd. (private, 100%) | Refinery in Cape Town | 33 crude. |
| Do. | National Petroleum Refiners of South Africa Pty. Ltd. (SASOL, 100%) | Refinery in Secunda, 100 kilometers southeast of Johannesburg | 28 crude. |
| Do. | Genref (Engen Ltd., 62%) | Refinery in Durban | 24 crude. |
| Phosphate | Phosphate Development Corp. Ltd. (Foskor Ltd.) (IDC, 100%) | Foskor mine and plant at Phalaborwa | 3,800. e/ 3/ |
| Platinum-group metals tons | Rustenburg Platinum Mines Ltd. (JCI, 32.6%; AAC, 23.9%; Lydenburg Platinum Ltd., 8.3%; ASA Ltd., 0.8%) | Rustenburg Mine near Rustenburg, Union and Amandelbult Mines about 50 kilometers south of Thabazimbi | 70 PGM. e/ |
| Do. do. | Lebowa Platinum Mines Ltd. (Rustenburg Platinum Holdings, 21.5%; JCI, 20.1%; Lydenburg Platinum Ltd., 20.1%; AAC, 14.4%) | Atok Mine, 70 kilometers east of Potgietersrus | 10 PGM. e/ |

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 1996

(Thousand metric tons unless otherwise specified)

| Major commodities | | Major operating companies and major equity owners 1/ | Location of main facilities | Annual capacity |
|---|---|---|---|---|
| Platinum-group metals--Continued | tons | Potgietersrust Platinums Ltd. (JCI, 30.23%; AAC, 22.65%) | Open pit mine near Potgietersrus | 10 PGM (in concentrates.) |
| Do. | do. | Impala Platinum Ltd. (Gencor, 40.7%; Genbel Investments Corp. Ltd., 10.8%) | Bafokeng North, Bafokeng South, Wildebeestfontein North, and Wildebeestfontein South Mines, 20 kilometers north of Rustenburg | 35 PGM. e/ |
| Do. | do. | Eastern Platinum Ltd. (Lonrho Plc., 73%; Impala Platinum Holdings Ltd., 27%) | 40 kilometers northeast of Rustenburg | 3 PGM. e/ |
| Do. | do. | Western Platinum Ltd. (Lonrho Plc., 73%; Impala Platinum Holdings Ltd., 27%) | 20 kilometers east of Rustenburg | 10 PGM. e/ |
| Do. | do. | do. | Karee Mine, 25 kilometers northeast of Rustenburg | 5 PGM. e/ |
| Do. | do. | Barplats Investments Ltd. (Impala Platinum Holdings Ltd., 38%; Rand Mines Ltd., 30.6%; Vansa Vanadium, 3.2%) | Crocodile River Mine near Brits | 10 PGM. |
| Do. | do. | Northam Platinum Ltd. (GFSA, 63%; New Wits Ltd., 3.1%) | Northeast of Northam, 20 kilometers south of Thabazimbi | 10 PGM. e/ |
| Pyrophyllite | | Wonderstone 1937 Ltd. (Associated Ore and Metal Co. Ltd., 100%) | Gestoptefontein Quarry near Ottosdal, 70 kilometers west of Klerksdorp | 2. e/ |
| Titanium: | | | | |
| Mineral concentrates | | Tisand (Pty.) Ltd./Richards Bay Minerals (Rio Tinto Zinc Corp. Plc., 50%; Gencor, 50%) | Opencast operations near Richards Bay | 125 rutile concentrate e/; 1,280 ilmenite concentrate. e/ |
| Do. | | Namakwa Sands project (AAC, 80%; De Beers, 20%) | Opencast mine near Koekenaap, 300 kilometers north of Cape Town | 16 rutile concentrate; 220 ilmenite concentrate. 4/ |
| Titanium slag | | Richards Bay Iron and Titanium Corp./ Richards Bay Minerals (Rio Tinto Zinc Corp. plc, 50%; Gencor, 50%) | Smelter at Richards Bay | 1,000 slag. |
| Do. | | Namakwa Sands project (AAC, 80%; De Beers, 20%) | Smelter near Koekenaap, 300 kilometers north of Cape Town | 195 slag; 4/ 120 pig iron |
| Do. | | Highveld Steel and Vanadium Corp. Ltd. | Steel plant at Witbank | 48 slag. e/ |
| Uranium | tons | Vaal Reefs Exploration and Mining Co. Ltd. (Anglo American Gold Investment Co., 16.8%; AAC, 10.8%; ASA Ltd., 3.1%) | Mine and plant near Klerksdorp | 2,000 uranium oxide. e/ |
| Do. | do. | Hartebeestfontein Gold Mining Co. Ltd. (Zandpan Gold Mining Co. Ltd., 19.6%; Anglo American Gold Investment Co., 15.5%; AAC, 7.5%; Anglovaal Ltd., 4.6%) | Mine and plant, 5 kilometers southeast of Klerksdorp | 400 uranium oxide. e/ |
| Do. | do. | Western Areas Gold Mining Co. Ltd. (Elsburg Gold Mining Co. Ltd., 48.7%; JCI, 6.5%) | Western Areas Mine, 30 kilometers southwest of Johannesburg | 500 uranium oxide. e/ |
| Do. | do. | Palabora Mining Co. Ltd. | Palabora Mine and plant at Phalaborwa | 200 uranium oxide. e/ |
| Vanadium | do. | Highveld Steel and Vanadium Corp. Ltd. | Mapochs Mine near Lydenburg | 25,000 vanadium pentoxide. e/ |
| Do. | do. | do. | Highveld steel plant in Witbank | 17,000 vanadium pentoxide. |
| Do. | do. | do. | Highveld Vantra plant in Witbank | 8,000 vanadium pentoxide. |
| Do. | do. | Vametco Minerals Corp. (Strategic Metals Corp., USA, 100%) | Krokodilkraal Mine and plant near Brits | 5,000 vanadium pentoxide. e/ |
| Do. | do. | Transvaal Alloys Pty. Ltd., (Highveld Steel and Vanadium Corp. Ltd., 100%) | Wapadskloof Mine and plant, 60 kilometers northeast of Middelburg | 2,250 vanadium pentoxide. e/ |
| Do. | do. | Vanadium Technology Ltd. (Chromecorp Technology (Pty.) Ltd., 100%) | Kennedy's Vale (ex-Vansa Vanadium) Mine and plant, near Lydenburg | 3,600 vanadium pentoxide. |
| Do. | do. | Rhombus Vanadium Holdings Ltd. (Rhombus Exploration Ltd., 50%; Usko Ltd., 50%) | Ba-Mogopa Mine and Usko plant near Brits | 13,500 vanadium pentoxide. e/ |
| Vermiculite | | Palabora Mining Co. Ltd. | Palabora Mine and plant at Phalaborwa | 230. e/ |
| Zinc | | Zinc Corp. of South Africa Ltd. (GFSA, 56%; Iscor Ltd., 35%) | Struisbult Springs Works in Springs, southeast of Johannesburg | 90 Zn. |
| Do. | | Black Mountain Mineral Development Co. (Pty.) Ltd. | Black Mountain Mine near Aggeneys, 100 kilometers northeast of Okiep | 26 Zn (in concentrate). |

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 1996

(Thousand metric tons unless otherwise specified)

| Major commodities | Major operating companies and major equity owners 1/ | Location of main facilities | Annual capacity |
|---|---|---|---|
| Zirconium | Tisand (Pty.) Ltd./Richards Bay Minerals | Opencast mines near Richards Bay | 300 zircon concentrate. |
| Do. | Namakwa Sands project (AAC, 80%; De Beers, 20%) | Opencast mine along coast about 300 kilometers north of Cape Town | 140 zircon concentrate. |
| Do. | Palabora Mining Co. Ltd. | Palabora Mine and plant at Phalaborwa | 13.2 baddeleyite. e/ |
| Do. | Phosphate Development Corp. Ltd. | Plant at Phalaborwa | 12.5 baddeleyite. e/ |

e/ Estimated.

1/ Abbreviations of company names used are as follows: Anglo American Corp. of South Africa Ltd. (AAC); De Beers Consolidated Mines Ltd. (De Beers); General Mining, Metals and Minerals Ltd. (Gencor); Gold Fields of South Africa Ltd. (GFSA); Investment Development Corp. of South Africa (IDC); and Johannesburg Consolidated Investment Co. Ltd. (JCI).

2/ Depending on markets furnace capacity can switch between FeCr and FeMn.

3/ Most of Foskor's phosphate output is from phosphate concentrates supplied by the neighboring Palabora copper mine.

4/ Full capacity shown will be reached in 2000.

TABLE 3
SOUTH AFRICA: RESERVE BASE OF MAJOR MINERALS 1/ FOR 1996

(Million metric tons unless otherwise specified)

| Commodity | | Reserve base |
|---|---|---|
| Andalusite 2/ | | 51 |
| Antimony | thousand tons | 250 |
| Asbestos, fiber | | 8.2 |
| Chromium, ore | | 3,200 |
| Coal, recoverable | | 55,300 |
| Cobalt | thousand tons | 15 |
| Copper | | 13 |
| Fluorspar | | 36 |
| Gold | thousand tons | 40 |
| Iron ore | | 5,900 |
| Lead | | 3 |
| Manganese | | 4,000 |
| Nickel | | 11.8 |
| Phosphate rock, concentrates | | 2,310 |
| Platinum-group metals | thousand tons | 62.8 |
| Silver | do. | 10 |
| Titanium | | 72 |
| Uranium 3/ | thousand tons | 179.1 |
| Vanadium | | 12.5 |
| Vermiculite | | 80 |
| Zinc | | 15 |
| Zirconium | | 14.3 |

1/ Metallic minerals are contained metal.

2/ Includes the alumino-silicate, sillimanite.

3/ Recoverable at a cost of less than $80 per kilogram.

Source: Chamber of Mines Statistical Tables 1996, p. 4. (Minerals Bureau December 31, 1996 estimates.)