THE MINERAL INDUSTRY OF

ARGENTINA

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The Republic of Argentina, which is located in southern South America, has an area of about 2.77 million square kilometers (km^2) with a population of about 37 million. The gross domestic product (GDP) in 2001 was $268.4 billion[1] ($389.7 billion in terms of 2001 purchasing power parity) (International Monetary Fund, 2002§[2]). In real terms, the GDP decreased by 4.5% from that of 2000 after a decrease of 0.8% in 2000 from that of 1999. Mining (including petroleum) and quarrying, which in real terms accounted for 1.9% of the GDP, increased by 4.4%. The growth in mining and quarrying was due to the contribution of the petroleum sector. The contribution of nonfuel minerals was less than 0.5% of the GDP, which was a decrease from that of 2000. Construction decreased by 12.1%, and manufacturing decreased by 7.5% (Ministerio de Economía, 2002a§). Consumption and investment decreased by 5.2% and 15.9%, respectively. In 2001, the general price level, as measured by the consumer price index, decreased by 1.1% (Ministerio de Economía, 2002b§).

Investment in the nonfuel mineral mining sector decreased to $267 million from $371 million in 2000. This was significantly lower than in 1996 and 1997 when investment totaled $818 million and $788 million, respectively, but was almost more than four times the investment level of 1994 (Mayoral, 2002, p. 12).

In December, the President of Argentina was forced to resign after 2 days of public protests over the Government's economic policies (Financial Times, 2001c). The protests came after 42 months of economic recession. An interim President was installed for a period of 60 days, with national elections scheduled for March 2002 (Financial Times, 2001b). On December 23, in response to the public unrest, the Government suspended payment of its $155 billion foreign debt. The Government planned to use the savings to fund emergency social spending (Financial Times, 2001d). Instability continued through yearend. After the Government introduced a third currency as part of an economic recovery plan, fears of inflation and continued bank controls imposed by the Government resulted in new protests and the resignation of the entire President's Cabinet (Financial Times, 2001a).

Government Policies and Programs

Argentina's legal framework for mining covered an abstract of the Mining Code, the Legal Framework for Investment in Argentina, Mining Investment Law No. 24.196, Regulating Law of Mining Investment (Decree No. 2.686/93), Mining Reorganization Law No. 24.224, Federal Mining Agreement Law No. 24.228, VAT Funding Law No. 24.402, Regulation of Law No. 24.402 (Decree No. 779/95), Mining Updating Law No. 24.498, Environmental Protection for the Mining Industry Law No. 24.585, and Royalty Law No. 25.161.

Some of the important features of Mining Investment Law No. 24.196 include fiscal stability for 30 years, exemption on tariffs on capital goods, double deduction on exploration expenses, and accelerated amortization. The law limits royalties to 3% at the mouth of mine. The Federal Mining Agreement Law (No. 24.228) began the effort to harmonize the Provincial mining procedures, established public bidding for large-scale mining, and formalized the commitment to modernize the mining cadastre. Law No. 24.498 eliminated the mining register and reinstated the concession system to the nuclear minerals.

The Mining Code, which was approved by the Argentine Congress on May 21, 1997, regulates the rights, obligations, and procedures for the acquisition, exploration, exploitation, and use of mineral substances.

In January, the Government approved Decree No. 111 to replace article 5 of the Decree No. 2.686/93 and the regulation of law No. 24.196. The new decree intended to modernize regulation to adapt to new technical requirements and to address the issues that may result from Argentina's integration with neighboring countries on mining, which began with the ratification of the treaty between Argentina and Chile on mining integration and complementation as approved by law No. 25.243 of 2000.

Environmental Issues

The Environmental Protection Mining Code, law No. 24.585, which was enacted on November 21, 1995, provides investors with the appropriate legal framework and requires that each Provincial government create an enforcement authority within their jurisdiction. The law introduces the concept of sustainable development and sponsors a preventive environmental mechanism in the mining sector.

The environmental framework that relates to mining activities was completed with the establishment of Provincial Environmental Management Units, which are responsible for assisting the Provincial enforcement authority in all aspects that relate to the code, specifically in assessing the environmental impact reports presented and in monitoring mining projects.

Production

Preliminary data indicate that mineral production totaled $1.03 billion. Metal production (including lithium) was 57.5%

[1]Where necessary, values have been converted from Argentine pesos to U.S. dollars at the rate of 0.99945 peso=US$1.00.

[2]References that include a section twist (§) are found in the Internet References Cited section.

of the total. Copper and gold concentrates were the largest contributors to the value of metal production with 76.3% of the total. The value of metal production has increased more than sevenfold since 1997 (Mayoral, 2002, p. 2).

According to U.S. Geological Survey (USGS) data, Argentina was Latin America's third largest producer of aluminum. The Instituto Latinoamericano del Fierro y el Acero (Latin American Institute of Iron and Steel) ranked Argentina as the third largest crude steel and the fourth largest producer of primary iron (pig iron and direct-reduced iron) in Latin America with 7.9% and 6.6%, respectively, of the regional production (Instituto Latinoamericano del Fierro y el Acero, 2002§).

USGS data indicate that Argentina was one of six Latin American producers of mine lead and zinc in 2001. Although Argentina produced less than 10% of lead in the region, only Mexico mined more lead in the area. Argentina also produced about 5% of the region's zinc mine output. It became the fourth largest producer of ammonia in the Latin America and Caribbean region with the completion of a new ammonia plant; the country's production more than doubled during the year and represented 10% of the region's output. Argentina was also the fourth largest producer of silver in Latin America and a significant producer of gold (table 1).

Argentina was the third largest producer of crude petroleum in Latin America and a significant regional supplier of natural gas.

Trade

In 2001, the total value of mineral imports (including portland cement) to Argentina decreased by 13.5% to $483.4 million. About 60.5% of the mineral imports were from countries ascribed to the Mercado Común del Cono Sur (Southern Cone Common Market) (MERCOSUR) (Brazil, Paraguay, and Uruguay). The highest value of mineral imports was for calcined alumina with a total $92.1 million, followed by agglomerated ($76.0 million) and nonagglomerated ($69.6 million) iron ore. The value of mineral exports increased by 6.1% to $754.2 million. Almost 90% of the mineral export value was from metals. In terms of value, copper concentrate and associated minerals ranked as the leading export with $399 million, or 53% of total mineral exports. The second largest mineral export was gold and silver alloys at $99.3 million followed by nonalloyed aluminum at $99 million. Exports of lithium chloride and lithium carbonate totaled $26.9 million; of this total, 90% of the value was for lithium chloride (Lic. César Massaccesi, Dirección Nacional de Minería, written commun., May 30, 2002).

Structure of the Mineral Industry

Argentina's highest Government office with responsibility for the mining sector is the Secretaría de Industria, Comercio y Minería, which was transferred to the Ministerio de la Producción in early 2002. This Ministry was created to replace the Ministerio de Infraestructura y Vivienda, where the Secretaría resided for about a year. The Secretaría is responsible for developing the country's mineral policy, promoting the growth of the mineral sector, and creating the conditions to encourage investment in the area. It also has the authority to carry out regulations and legislation relevant to the mineral sector and is the authority with responsibility to negociate national and international agreements on behalf of the Government. As the Government entity to which the Servicio Geológico Minero Argentino (SEGEMAR) reports, the Secretaría also is responsible for promoting geological and mining studies with the purpose of planning the use of the mineral resources of the country (Ministerio de la Producción, undated§). SEGEMAR, which was formed under Decree 660/1996, is charged with managing a variety of geologic programs and services based on scientific studies. Its objectives include the coordination and actualization of Argentina's geologic information, contribution to the discovery of resources, and the offering of technical assistance to the small and medium mining sectors (Panorama Minero, 2001b).

The Dirección Nacional de Minería reports to the Secretaría de Industria, Comercio y Minería through the Subsecretaría de Minería. This agency is responsible for administrating law 24.196 and its modifications. The Dirección is also charged with coordinating and developing Argentina's short- and long-term strategic mining plans and acting as an advisor to the Subsecretaría on technical and legal matters that affect the mining sector. It also is responsible for promoting actions to maintain a dynamic small and medium mining sectors. The Dirección processes and disseminates all mining statistics.

In addition to the Federal Government, the Provincial governments have offices in charge of mining issues. They are the entities responsible for awarding the mineral concessions in accordance to the Mining Code. They also ensure that the mines are adhering to the environmental protection law and apply Provincial regulations.

The mineral industry in the private sector comprises several mining and manufacturing companies, such as Aluminio Argentino S.A.I.C. (ALUAR), Borax Argentina, S.A., Cementos Loma Negra C.I.A. S.A., Cía. Minera Aguilar, Cía. Minera Tea S.A.M.I.C.A.F., Sulfacid S.A.C.I.F., Minera Alumbrera Limited, Cerro Vanguardia S.A., FMC Minera del Altiplano S.A, and others (table 2).

The nature of Argentina's mining sector changed drastically after the new copper and gold producer Minera Alumbrera came onstream. The value of metal production has increased significantly in recent years; and despite Argentina's economic crisis, activity in the study of large-scale metal projects continued in 2001. The Government continued its efforts to increase interest in the sector by offering fiscal incentives and promoting foreign investment, providing assistance to the small and medium mining producers who were at the center of Argentina's mineral production and planning to invest in the country's infrastructure.

At the beginning of the year, 10.9 million people were employed nationwide, 36,000 of whom worked in metallurgical plants; 21,000, in the oil and gas industry; 16,000, in the mining sector; and 7,000, in the cement industry.

Commodity Review

Metals

Aluminum.—ALUAR was Argentina's sole producer of primary aluminum. The smelter was located in Puerto Madryn

in Chubut Province. Aluminum capacity was increased to 260,000 metric tons per year (t/yr) in 1999 from 187,000 t/yr. In 2001, production decreased to an estimated 255,000 metric tons (t) after an increase of almost 27% in 2000. The decision to expand the smelter capacity to 400,000 t was delayed. The company announced that no decision would be made until electricity supply issues were resolved. The local and national governments had proposed a link to support the additional smelter capacity, but at yearend, it was uncertain if the link was possible.

The majority of Argentina's aluminum production was geared to the export market. In 2000, almost 80% of the production was exported, mainly to Europe (30%), Japan (30%), the United States (30%), and Latin America (10%). The percentage of aluminum production exported in 2001 was expected to increase (Metal Bulletin, 2001).

Copper and Gold.—Copper production in Argentina increased by more than 30% in 2001 to 191,566 t. The sole copper producer was Minera Alumbrera Ltd. [owned by M.I.M. Holding Limited (50%) of Australia, Rio Tinto plc (25%), and BHP Billiton plc (25%)]. The Bajo de la Alumbrera open pit mine is located in Catamarca Province and has been in production since 1998. The significant production increase during the year was due in large part to increased ore grade and higher recovery rates (Panorama Minero, 2002). Bajo de la Alumbrera products included copper and gold concentrates, which were shipped for export from Puerto San Martín in the Province of Santa Fe. In addition, doré (gold and silver) also was produced at the mine site facility. In the 6 months ending on December 31, the average grade of copper produced was 0.74% compared with 0.64% during the same period in 2000. For the same period, gold grade increased to 1.05 grams per metric ton (g/t) compared with 0.80 g/t in the last 6 months of 2000. Recovery for copper and gold increased to 92.9% and 76.7%, respectively. Recoveries for the last 6 months of 2000 were 90.1% for copper and 72.4% for gold (M.I.M. Holding Limited, 2002§).

Gold production increased by 18% to 30,630 kilograms (kg). Most of the production was from the Bajo de la Alumbrera and the Cerro Vanguardia mines.

In June, Noranda Inc. of Canada signed an agreement with Cambior Inc. of Canada and Cía Minera del Sur S.A. (COMSUR) of Bolivia to purchase El Pachón copper project near the Chilean border in the Province of San Juan (Cambior Inc., 2001; Noranda Inc., 2001). Cambior and COMSUR each had a 50% interest in El Pachón. The sale was concluded in September. Noranda agreed to pay $30 million, $2 million of which would be paid within 4 years from the transaction closing date or when making a decision on production.

According to Noranda, a feasibility study conducted in 1997 by Cambior estimated that El Pachón reserves were 880 million metric tons (Mt) at a grade of 0.62% copper, using a cut-off grade of 0.40%, and at a price of $1.00 per pound (Noranda Inc., 2001). The deposit, which would be mined by surface methods, also contained recoverable amounts of molybdenum and precious metals. Production from El Pachón was planned to be 250,000 t/yr. Noranda believed the deposit's economics would improved with the Mining Integration Treaty between Argentina and Chile, which was signed in 2000.

Gold and Silver.—The gold and silver producer Cerro Vanguardia S.A., which was located in Santa Cruz Province, Patagonia, produced about 9,100 kg of gold (reported as 292,451 ounces) and 65,600 kg of silver (reported as 2.11 million ounces) (Panorama Minero, 2002). The company was a joint venture of AngloGold Limited (46.25%), Perez Companc S.A. (46.25%), and the Government of Santa Cruz Province (7.5%). The open pit mine was commissioned in 1998, and ore was processed by conventional cyanidation Merrill Crow, carbon-in-leach method. After thickening, the resulting precipitate was smelted to produce doré bars. Although the company has the rights to operate the deposit for 40 years, the mine life was estimated to be 8 years at yearend 2001.

Yamana Resources Inc. of Canada announced that it had begun production from its high-grade underground (near surface) Martha mine in its Bacon property in the Province of Santa Cruz. The mine is located along Bacon's principal silver-bearing structure, the Martha vein. The company also owned several adjoining properties (Argenta, Bola, Grillo, and Malbec). Yamana Resources announced that the first shipment of high-grade gold and silver ore from the Martha mine was delivered to Noranda's Horne smelter in Quebec at the end of February. The 175-t shipment contained about 17,600 g/t silver and 27 g/t gold. The company was planning to produce about 101,000 kg of silver equivalent (reported as 3.25 million ounces) by October. The mine had to be closed for 2 months, however, because of severe weather conditions; production resumed in September. Because of the temporary mine closure and lower-than-expected ore grade, production was only about 46,700 kg of silver equivalent (reported as 1.5 million ounces) by the time of reopening and was expected to reach only 90,200 kg of silver equivalent (reported as 2.9 million ounces) by January 2002; this was 89% of earlier estimates for the period ending in October 2001. In November, Yamana suspended mine operations. Management announced that the mine would not be restarted until an equity partner with mining experience was found (Metals & Minerals Latin America, 2001b, e-f; Yamana Resources Inc., 2001a, b, 2001§).

In December, Barrick Gold Corporation and Homestake Mining Company merged (Barrick Gold Corp., 2001a). Prior to the merger, Barrick and Homestake were joint-venture owners of the Veladero gold project in San Juan Province. In June, Homestake had increased its production plans for Veladero to 19,300 kilograms per year (kg/yr) (reported as 621,000 ounces per year) for a period of 11.5 years. The original plan called for a production level of about 15,600 kg/yr (reported as 500,000 ounces per year). This modification would increase the project cost to $608 million and would reduce the cash cost from $160 per ounce of gold equivalent to $117 per ounce (Metals & Minerals Latin America, 2001c). Feasibility studies for the project were scheduled for 2002 and 2003. Construction was to begin in 2004 (Panorama Minero, 2002). This was a delayed from earlier schedules when the project was due to begin the production phase in 2003 (Metals & Minerals Latin America, 2001d). In July, Barrick announced that probable gold reserves at Veladero had been increased to almost 250,000 kg (reported as 8 million ounces) (Barrick Gold Corporation, 2001b). Silver

reserves were estimated to be 4.05 million kilograms (Mkg) (Metals & Minerals Latin America, 2001c). Metallurgical testing and technical studies at Veladero continued during the year. In addition to Veladero, Barrick was involved in the Pascua-Lama project on the border of Argentina and Chile; the development of this project was delayed because of low gold prices.

In May, Brancote Holdings PLC of the United Kingdom acquired the services of Pinock Allen & Holt, which was a U.S. engineering consulting firm, to prepare a prefeasibility study on the Esquel gold project, which is located in the Province of Chubut. Brancot held a 74% interest in the project through Mineral El Desquite S.A. at the time the study began. At that time, resources were estimated to be about 130,000 kg of gold and 240,000 kg of silver (reported as 4.2 million ounces of gold and 7.8 million ounces of silver) (Metals and Minerals Latin America, 2001a). The parameters of the study included construction of an open pit and an ore processing plant with a nominal rate of 1.8 million metric tons per year beginning in 2004. The plan called for a facility with the capacity to produce about 15,600 kg/yr of gold (reported at 500,000 ounces per year) for 10 years. The study recommended a process with gravity concentration and whole ore carbon in leach. With this process, the recovery rate was estimated to be 89% for gold and 73% for silver. The final product, doré, would be refined elsewhere. The cost for the plant and infrastructure was estimated to be $131.6 million. Base operating cost estimates totaled $111 per ounce, which included royalties and taxes. In November, Brancote increased its equity in the property to 76.4% by purchasing Villagarden S.A., which held 2.4% of Minera El Desquite. At yearend, Brancote was beginning the selection process for an engineering company to conduct a full feasibility study on the project (Brancote Holding PLC, 2001a, b).

In March, Minera Andes Inc., which was an exploration company with about 175,000 hectares (ha) of exploration land in Argentina, announced that it signed a joint-venture agreement with Mauricio Hochschild & Cía. Ltda. (MHC) of Peru for exploring and possibly developing the 88,000-hectare (ha) epithermal gold-silver El Pluma-Cerro Saavedra area in the Province of Santa Cruz, which includes the high-grade gold and silver vein system target Huevos Verdes. The agreement gave MHC (the operator) the option to acquire 51% interest in the project in 3 years if the company spent $3 million, with an annual expenditure of at least $100,000 in other targeted areas in El Puma-Cerro Saavedra. MHC began core drilling in Huevos Verdes in May to confirm previous reverse-circulation drilling results and to expand on the work by in-fill and step-out drilling. Minera Andes reported that MHC's exploration program completed in August included 30 drill holes for 5,111 meters (m). Of the 22 holes that intercepted the mineralized vein structure, 12 had significant gold and silver values up to 7.49 g/t gold and 822 g/t silver. MHC reported that Huevos Verdes consists of two principal vein segments, the 1.7-kilometer (km)-long Huevos Verdes North and the 0.55-km-long Huevos Verdes South. The two segments are separated by a west-northwest trending dilation zone. The program defined two ore shoots, the Huevos Verdes Central and the Huevos Verdes North. In October, MHC began another phase of work at Huevos Verdes. The program included prospecting, mapping, and sampling of six primary targets 15 to 40 km southwest from the high-grade gold-silver discovery at Huevos Verdes–La Josefina, La Magdalena, Las Margaritas, La Unión, Puesto Blanco, and Puesto Chivares (Minera Andes Inc., 2001a, b, d, e). Plans for Huevos Verdes included building a 50-metric-ton-per-day (t/d) pilot plant to be completed in 2002 and production of 500 t/d in 3 years.

Exploration work continued on the Manantial Espejo silver and gold project in Santa Cruz Province in 2001. A 5,000-m drilling program was completed in November. At yearend, Manantial Espejo was a joint venture between the two Canadian companies Black Hawk Mining Inc. (90%) and Silver Standard Resources Inc. (10%) that conducted the program. In addition to the 10% direct interest, Silver Standard had the option to acquire an additional 40% in the project (Silver Standard Resources Inc., 2001a). In August, Silver Standard announced that measured and indicated resources at Mantantial Espejo had been increased by 9.9% in terms of silver equivalent. Increased resources from the Karina-Unión vein system increased the project's total resources to a reported 4.39 Mt at a grade of 263.8 g/t silver and 4.51 g/t gold. Inferred resources totaled 1.59 Mt at a grade of 258.2 g/t silver and 3.65 g/t gold (Silver Standard Resources, Inc., 2001c).

In December, Silver Standard also acquired the Diablillos silver and gold project on the Puna Plateau in Salta Province from Pacific Rim Mining Corp. (Silver Standard Resources, Inc., 2001b). Inferred resources at the 13,600-ha property were estimated to be 2.9 Mkg of silver (reported as 93.8 million ounces) and about 25,300 kg of gold (reported as 815,000 ounces of gold) (Silver Standard Resources, Inc., 2001b, d).

Iron and Steel.—Argentina's production of primary iron and steel decreased by 11.5% and 8.3%, respectively. The industry was affected by the country's economic crisis, which, in turn, severely affected the construction and the automotive sectors. The situation was aggravated by the condition of the international iron and steel market, which was plagued by oversupply and low prices.

Argentina's largest steel producer Siderar S.A.I.C. had a plant at Centro Siderúrgico General Savio in the Province of Buenos Aires. Siderar's crude steel production capacity was 2.2 Mt (Siderar S.A.I.C., undated§). During the 6 months ending on December 31, Siderar had a loss of $99.7 million. The company operated at 75% of its production capacity, which was the lowest of the company's history, and a reduction in domestic sales of 26% when compared with the same period in 2000 (Siderar S.A.I.C., 2002, p. 1-2). The company exports sales also were reduced significantly (19%). The company's finances were worsened by its investment through Grupo Amazonia in Venezuela's steel producer Siderúrgica del Orinoco C.A. (Sidor). Siderar and Sidor had began efforts to restructure the latter's debt payment before yearend. Siderar's loss that resulted from its participation in Sidor totaled $31.6 million by December 31 (Siderar S.A.I.C., 2002, p. 5).

Citing a 50% decrease in construction since August of 2001 and a 40% decrease in the automotive industry during the same period while the interest rates remained at the high level of more than 30%, Acindar Industria Argentina de Aceros S.A.

announced that it was forced to suspend its payments of principal and interest on its debt (Acindar Industria Argentina de Aceros S.A., 2001). The company operated at about 65% of capacity for the second half of the year (Acindar Industria de Aceros S.A., 2002, p. 5). The strategic alliance formed by Acindar and Belgo-Mineira Uruguay S.A. (BMU) [a company controlled by Companhia Siderurgica Belgo Mineira (BELGO MINEIRA)] in 2000 was beneficial to Acindar in 2001. Because of this alliance, the company was able to evaluate its process, to reduce production cost, to direct more of its production to the export market, and to reduce its loses. Acindar increased its exports outside of MERCOSUR by 24.8% to 96,000 t (Acindar Industria de Aceros S.A., 2002, p. 9). New market areas were developed, especially the European Union. For the last 6 months of the year, however, export prices were 21.8% lower than during the last 6 months of 2000. During that time, the company ended with a loss of $85.8 million and an accumulated loss of $199.7 million (Acindar Industria de Aceros S.A., 2002, p. 19).

Lead and Zinc.—Cía. Minera Aguilar S.A. was the only producer of lead and zinc in Argentina. It also produced silver as a byproduct. The entire mine production of lead and zinc in Argentina was from Mina Aguilar, which is located 255 km from Salvador de Jujuy and has been in production for 70 years. In 2001, mine production of lead decreased by 12.6% to 12,334 t, while the production of zinc increased by 14% to 39,703 t. Exploration work continued at the Aguilar and the Esperanza deposits. The company planned for the Esperanza deposit, which has been in production since 1992, to be the principal source of production for the near future. The company's exploration budget for 2001 was $2 million. Plans for the year included a 20,000-m drilling program (Panorama Minero, 2001c).

In an effort to reduce energy costs by 60%, Minera Aguilar began construction of a natural gas pipeline from Las Cruces to the mine and a new 4,916-kilowatt powerplant, which was scheduled to be completed in 2002. The powerplant would be located near a new mineral processing plant. The costs for the pipeline and the plant were estimated to be more than $5 million. The new processing plant would reduce production costs by eliminating the secondary crushing step, and ultrasonic sensors were to be installed to ensure consistent mineral feed to the plant (Panorama Minero, 2001c).

Lead and silver concentrates were refined at Minera Aguilar's lead and silver refinery in the Palpalá Industrial Park. The refinery processed about 1,500 metric tons per month of lead and silver concentrates. The refinery, which began production in 1999, produced 35-kg lead ingots with a 99.9% purity. The ingots were exported mainly to Brazil. The refinery also produced silver with a 99.94% purity, which was exported to Europe (Panorama Minero, 2001d).

Zinc concentrate from Minera Aguilar was refined by Sulfacid S.A.F. y C. at its electrolytic refinery in Fray Luis Beltrán in the Province of Santa Fe. The refinery began its operations with a sulfuric acid plant in the 1950s and began production of electrolytic zinc in 1963. The plant also produced cadmium metal. The plant had a zinc production capacity of 39,600 t/yr and a sulfuric acid capacity of 72,000 t/yr (Panorama Minero, 2001e).

Platinum-Group Metals.—In April, Consolidated JABA Inc. and Southwestern Resources Corporation began exploration on their joint-venture, 191,800-ha Tecka platinum and palladium property in the Province of Chubut; the property is in one of the largest unexplored layered ultramafic intrusive complexes in the world. Southwestern Resources (the operator) held a 45% interest in the project and had the option to earn up to a 71% interest in 3 years. The joint venture received an exploration permit for this area in February. It also applied for an exploration permit for an additional area of 87,500 ha. Exploration lead to the discovery of two sulfide zones in the transition between the ultramafics and mafics within the central portion of the complex. Mapping and sampling of the project was focused in La Pilila and the Quichaura areas. The first phase of exploration concentrated in the upper portion of the complex. The joint venture began the second phase of exploration in November. Plans for the second phase of exploration were to concentrate on defining the lowermost units of the complex and to prospect within the transition zone (Consolidated JABA Inc. and Southwestern Gold Corporation, 2001a-d).

Uranium.—The Comisión de Energía Atómica (CNEA) requested the Federal Government of Argentina to pass a decree to authorize the CNEA to form a joint venture with the private sector and to solicit bids for the development of the Cerro Solo uranium deposit. The CNEA was planning to have a 20% to 30% participation in the company (LATINOMINERIA, 2001). Recoverable uranium resources were estimated to be 4,600 t with an average content of 0.3% to 0.5% uranium. Inferred resources of molybdenum and rhenium anomalies also were found in the deposit (Comisión Nacional de Energía Atómica, undated§). In 1999, the CNEA had solicited bids for a feasibility study and exploration of the outlying area of the deposit from the private local and international companies with the private sector without success.

Industrial Minerals

Boron Minerals.—In 2001, Argentina, which was the leading producer of boron minerals in South America, produced about 500,000 t of crude minerals. The largest producer was Borax Argentina, S.A. (a subsidiary of the Rio Tinto Borax of the United Kingdom). Company production was from three mines and plants (Tincalayu and Sijes in Salta Province and Porvenir in Yujuy Province) and the Campo Quijano refinery in Salta Province. Tincalayu was Borax Argentina's largest mine. The main boron minerals produced from these mines were tincal, ulexite, colemanite, hydroboracite, and kernite (Rio Tinto Borax, undated§). The Porvenir mine is in the Salar Huaytuquina. Production from this mine was about 800 t/d. Its plant at Campo Quijano had a production capacity of 80 t/d of ulexite with a content of 37% boric oxide (Panorama Minero, 2001a, p. 160).

Other boron mineral producers in Argentina included Procesadora de Boratos S.A. in the Province of Jujuy and Fernández Sola S.A, Francisco Cruz, Minera Santa Rita,

Norquímica S.A., Ulex. S.A., and Viento Blanco S.R.L. in the Province of Salta (Panorama Minero, 2001a, p. 185). A significant portion of boron minerals and boric acid produced in Argentina was exported mainly to Brazil for ceramics, glass, and agricultural markets (Industrial Minerals, 2001a).

Potash.—Minera Tea S.A.M.I.C.A.F. and Potasio Río Colorado S.A. were searching for a foreign partner to form a joint venture to develop the Río Colorado potash mine in the Provinces of Mendoza and Neuqén. By mid-2001, investment in the property totaled $25 million, and a feasibility study had been completed. Plans for the property included initial production of 500,000 t of potassium chloride for 5 years and would increase to 1 Mt thereafter. The total cost of the project was estimated to be $300 million. Plans called for most of the production (95%) to be exported to Brazil (Industrial Minerals, 2001b).

Mineral Fuels

Natural Gas.—In 2001, gross production of natural gas increased by 2.3% to about 45.9 billion cubic meters. The Secretaría de Energía y Minería reported proven reserves of 777.6 billion cubic meters of natural gas, 51.3% of which was located in the Neuquén Basin in central Argentina (Secretaría de Energía y Minería, 2001, p. 5). Repsol-YPF (the company that resulted from the merger of Spain's oil producer Repsol and Argentina's Yacimientos Petrolíferos Fiscales in 1999), Total Austral S.A., and Pluspetrol S.A. produced about 58% of Argentina's natural gas (Secretaría de Energía y Minería, 2001, p. 5; U.S. Department of Energy, 2001§). About 56% of the production was from the Neuquén Basin followed by the Austral Basin with 19% of the production (Secretaría de Energía y Minería, 2001, p. 5). About 87% of Argentina's natural exports went to Chile in 2001.

Petroleum.—Argentina was the fourth largest producer of crude petroleum in Latin America with an output of about 284 million barrels (Mbbl), which was a slight increase compared with that of 2000 when production was 281 Mbbl; only Mexico, Venezuela, and Brazil had higher production (Secretaría de Energía y Minería, 2002). Proven reserves of crude petroleum at yearend 2000 (the most recent year for which information is available) totaled 2.97 billion barrels (Secretaría de Energía y Minería, 2001, p. 2). Production was distributed among 11 sedimentary basins, 5 of which were producers. Most of Argentina's oil is produced in two onshore basins—Neuquén and Golfo San Jorge in the southeast. The Neuquén and the Golfo San Jorge basins produced 49% and 33%, respectively, of Argentina's total production in 2001 (Secretaría de Energía y Minería, 2002, p. 1). Other producing basins were Austral, Cuyana, and Noroeste (Northwest). To date, there has been little activity offshore.

Repsol-YPF, which was the largest producing company, produced about 36% of Argentina's production of crude petroleum. The second largest operator was PECOM Energy S.A. with 11.5% of the production. The third largest producer was Chevron San Jorge S.A. (formerly Petrolera Argentina San Jorge) with 10.1% of the production (Secretaría de Energía y Minería, 2002, p. 1). The main importer of Argentina's crude petroleum was Chile with 54% of the total. The United States and Brazil received 17.5% and 17%, respectively.

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TABLE 1
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000 e/	2001 e/
METALS						
Aluminum:						
Primary		187,200	186,702	206,400	261,800 3/	255,000
Secondary		15,800	16,000	16,000	16,000	16,000
Cadmium concentrate:						
Gross weight		136	145	140	137 3/	160 3/
Cd content		45	34	--	-- 3/	34 3/
Copper:						
Mine output, Cu content		30,421	170,273	210,126	145,197 3/	191,566 3/
Refined e/		16,000 3/	16,000	16,000	16,000	16,000
Gold, mine output, Au content	kilograms	2,289	20,400	38,515	25,954 3/	30,630 3/
Iron and steel:						
Metal:						
Pig iron	thousand tons	2,066	2,122	1,985	2,188 3/	1,909 3/
Sponge iron (direct reduction)	do.	1,501	1,538	989	1,420 3/	1,280 3/
Total	do.	3,567	3,660	2,974	3,608 3/	3,189 3/
Ferroalloys, electric furnace:						
Ferromanganese		8,381	5,016	-- r/	-- r/	--
Ferrosilicomanganese		26,134	25,388	-- r/	4,900 r/	5,000
Ferrosilicon		17,835	11,245	2,568	2,500	2,500
Total		52,350	41,649	2,568 r/	7,400 r/	7,500
Steel, crude	thousand tons	4,169	4,216	3,805	4,474 3/	4,107 3/
Semimanufactures 4/	do.	4,258	4,131	3,730	4,174 3/	4,000
Lead:						
Mine output, Pb content		13,760	15,004	15,256	14,115 3/	12,334 3/
Smelter, primary		14,200 e/	14,150	14,200	14,200	14,200
Refined:						
Primary		3,282	300	500	8,665 3/	9,473 3/
Secondary		28,834	30,057 r/	25,195	27,000 r/ 3/	25,000
Total		32,116	30,357 r/	25,695	35,665 r/ 3/	34,473 3/
Silver, mine output, Ag content	kilograms	52,550	35,768	73,785	78,271 3/	152,802 3/
Uranium, mine output, U_3O_8 content	do.	28,000	7,000	4,000	-- 3/	--
Zinc:						
Mine output, Zn content		33,357	35,560	34,192	34,858 3/	39,703 3/
Metal, smelter:						
Primary		38,672	38,677	40,223	36,359 3/	39,727 3/
Secondary		3,100	3,100 e/	3,220	2,910 3/	3,180 3/
Total		41,772	41,777	43,443	39,269 3/	42,907 3/
INDUSTRIAL MINERALS						
Asbestos		264	309	259	254	250
Barite		9,532	1,833	4,365	4,500	4,500
Boron materials, crude		422,556	276,811	245,450	580,000	500,000
Cement, hydraulic	thousand tons	6,858	7,091	7,187	7,150 3/	7,000
Clays:						
Ball clay (plastic clay) e/	do.	90	--	--	--	--
Bentonite		104,880	131,320	128,809	122,000	120,000
Common		3,943,967	2,142,976	2,294,857	2,300,000	2,300,000
Foundry earth e/		100,000	100,000	100,000	100,000	100,000
Fuller's earth (decolorizing clay) e/		1,500	1,500	1,500	1,500	1,500
Kaolin		47,365	46,832	52,665	50,000	50,000
Diatomite		7,387	25,430	34,056	35,000	35,000
Feldspar		79,988	42,468	62,926	61,000	61,000
Fluorspar		12,172	61,468	12,704	11,200	11,000
Gypsum, crude		729,495	650,356	647,001	514,000	500,000
Lithium, spodumene, amblygonite, gross weight e/		697	700	700	700	700
Mica		2,792	3,480	3,097	3,100	3,100
Nitrogen, N content of ammonia		107,000 e/	86,300	87,700	189,800 3/	596,600 3/
Perlite		27,578	21,495	21,008	17,521 3/	17,000
Phosphates, Thomas slag e/ 5/		50	50	50	50	50
Pumice		10,545	18,000	17,662	16,000	16,000
Salt		857,724	871,748	1,263,423	1,000,000	1,000,000

See footnotes at end of table.

TABLE 1--Continued
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1997	1998	1999	2000 e/	2001 e/
INDUSTRIAL MINERALS--Continued						
Sand and gravel:						
Sand:						
Construction		18,557,933	15,291,886	19,424,118	17,000,000	17,000,000
Silica sand (glass sand)		145,034	461,505	262,640	280,000	280,000
Gravel		6,062,000	6,000,000	6,962,668 r/	7,000,000 r/	7,000,000
Stone:						
Basalt		1,774,465	1,800,000 e/	1,025,000	700,000	700,000
Calcareous:						
Calcite, nonoptical		46,483	31,304	30,000 e/	30,000	30,000
Calcium carbonate (chalk) e/		20,000	20,000	30,000	30,000	30,000
Dolomite		802,509	536,667	715,273	759,700 3/	760,000
Limestone		13,539,137	13,077,985	12,355,000	13,000,000	13,000,000
Marble, onyx, travertine		44,045	305,374	247,040	218,800 3/	220,000
Flagstone		77,128	171,884	85,520	77,000	75,000
Granite:						
In blocks		95,013	56,724	68,350	70,000	70,000
Crushed		11,052,012	11,509,002	11,554,211	11,000,000	11,000,000
Quartz, crushed		117,546	49,704	98,368	95,000	95,000
Quartzite, crushed		954,491	436,084	400,000	400,000	400,000
Rhodochrosite		14	15	23	25	25
Gemstones (agate, amethyst, apolo, tourmaline, etc.)	kilograms	13,420	13,500	8,134	7,600	7,500
Sandstone e/		200	200	200	200	200
Serpentine, crushed		141,410	165,372	161,342	142,000	140,000
Shell, marl		233,929	173,601	176,180	175,000	175,000
Tuff, (tosca)	thousand tons	6,183	6,300	2,455	1,800	1,800
Strontium minerals, celestite		1,905	2,146	2,141	2,200	2,200
Sulfates, natural:						
Magnesium (epsomite)		7,200	750	6,900	7,000	7,000
Sodium (mirabilite)		9,133	4,992	6,879	7,000	7,000
Talc and related materials:						
Pyrophyllite		3,858	3,480	3,400	3,400	3,400
Steatite e/		300	300	300	300	300
Talc		4,772	14,585	10,542	10,000	10,000
Total		8,930	18,365	14,242	13,700	13,700
Vermiculite		822	903	2,800	2,800	2,800
Zeolite e/		90	90	150	150	150
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural (asphaltite):						
Natural (asphalite)		310	1,917	60	100	100
Byproduct of refinery		590,042	826,368	743,125	532,922 3/	393,681 3/
Coal, bituminous	thousand tons	250	300	354	360	360
Coke, all types, including breeze	do.	1,337 r/	1,433 r/	1,482 r/	1,496 r/ 3/	1,556 3/
Gas, natural:						
Gross	million cubic meters	37,074	38,723	42,418 r/	44,870 3/	45,916 3/
Marketed	do.	30,670	33,130	34,559 r/	37,412 r/ 3/	37,154 3/
Natural gas liquids	thousand 42-gallon barrels	16,100	16,100 e/	16,300 e/	18,200 3/	18,000 3/
Peat, agricultural (turba)		9,073	9,652	10,542	10,000	10,000
Petroleum:						
Crude	thousand 42-gallon barrels	304,444 r/	309,128 r/	292,521 r/	280,944 r/ 3/	284,055 3/
Refinery products:						
Liquefied petroleum gas	do.	9,181 r/	10,562 r/	11,455 r/	12,418 r/ 3/	12,966 3/
Motor gasoline	do.	62,925 r/	67,359 r/	70,299 r/	64,853 r/ 3/	59,655 3/
Aviation gasoline	do.	21,165 r/	12,705 r/	686 r/	107 r/ 3/	10,000
Jet fuel	do.	9,617 r/	11,449 r/	12,496 r/	12,153 r/ 3/	10,580 3/
Kerosene	do.	1,276 r/	1,138 r/	1,055 r/	667 r/ 3/	570 3/
Distillate fuel oil	do.	77,367 r/	79,216 r/	80,501 r/	77,874 r/ 3/	77,321 3/
Residual fuel oil	do.	11,791 r/	11,587 r/	11,806 r/	10,628 r/ 3/	12,149 3/
Lubricants	do.	1,348 r/	1,574 r/	1,311 r/	2,141 r/ 3/	2,246 3/
Other	do.	16,130 r/	18,981 r/	19,232 r/	19,146 r/ 3/	22,171 3/
Refinery fuel and losses	do.	3,041 r/	4,003 r/	5,432 r/	5,039 r/ 3/	5,050 3/
Total	do.	207,759 r/	210,568 r/	203,409 r/	194,948 r/ 3/	202,608 e/

See footnotes at end of table.

TABLE 1--Continued
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

e/ Estimated. r/ Revised. -- Zero.
1/ Table includes data available through June 2002.
2/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.
3/ Reported figure.
4/ Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.
5/ Thomas slag production was estimated from the Thomas crude steel reported in La Siderurgia Argentina annual, published by the Instituto Argentino de Siderurgia.

TABLE 2
ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Aluminio Argentino S.A.I.C. (Government, 52.1%; private, 47.9%)	Puerto Madryn, Chubut Province	260.
Boron	Borax Argentina S.A. (Rio Tinto Borax, 100%)	El Porvenir mine and plant, Jujuy Province, and Sije and Tincalayu mines and plants and Campo Quijano refinery, Salta Province	615. 1/
Do.	Procesadora de Boratos S.A. (Ferro Corp., U.S.A.; JEM Resources, Canada)	Loma Blanca, Jujuy and plant at Papalá	36 plant.
Do.	Ulex S.A. (private, 100%)	Pastos Grandes, Salta Province	2. 1/
Do.	Norquímica S.A.	Salta Province	5 boric acid.
Cement	Cementos Loma Negra C.I.A.S.A. (private, 100%)	Buenos Aires, Córdoba, Corrientes, Salta, San Juan, Mendoza, and Jujuy Provinces	6,000.
Coal	Yacimientos Carboníferos Fiscales (Government, 100%)	Río Turbio, Santa Cruz Province	210.
Copper and gold 2/	Minera Alumbrera Limited (M.I.M. Holdings Ltd. of Australia, 50%; Rio Tinto plc., 25%; BHP Billiton Plc, 25%)	Bajo de La Alumbrera mine, Belén Department, Catamarca Province	180 Cu; 20,000 Au.
Gold and silver kilograms	Cerro Vanguardia S.A. (AngloGold Limited, 46.25%; Pérez Companc S.A., 46.25%, Government of Santa Cruz Province, 7.5%)	Cerro Vanguardia mine, Santa Cruz Province	100,000 Ag, 10,000 Au.
Do.	Yacimientos Mineros de Agua de Dionisio (Government, 100%)	Farallón Negro, Hualfín, and Belén, Catamarca Province	4,600 Au, 50,000 Ag.
Do.	Small mines (private, 100%)	Various in Jujuy Province	5,000 Ag.
Lead, silver, and zinc 2/	Cía. Minera Aguilar, S.A. (owned by Cia. Minera del Sur) (private, 100%)	Estación Tres Cruces, El Aguilar, Jujuy Province	49,800 Ag, 24 Pb.
Lead and silver refinery 2/	Cía Minera Aguilar S.A.	Refinería Aguilar, Palpalá Industrial Park, Jujuy Province	15 Pb, 18,000 Ag.
Natural gas million cubic meters	Transportadora de Gas del Sur, S.A., and Transportadora de Gas del Norte (private, 100%)	Neuquén, Santa Cruz, Tierra del Fuego, Salta, and Río Negro Provinces	46,000.
Petroleum million barrels	Repsol-YPF	Chubut, Santa Cruz, Neuquén, Río Negro, La Pampa, Mendoza, Salta, Tierra del Fuego, Jujuy, and Formosa Provinces	366.
Steel	Siderar S.A.I.C. (Techint Group, 53%; Inversora Siderúrgica Argentina, S.A., 11%; Usiminas, 5%; Compahnia Vale do Rio Doce, 5%)	7 kilometers from San Nicolás de los Arroyos, Buenos Aires Province	2,200 steel; 1,100 pig iron.
Do.	Acindar Industria Argentina de Aceros, S.A. (private, 100%)	Plant Nos.1 and 3, Buenos Aires Province, and Plant No. 2, near Río Paraná, Santa Fé Province	1,500 steel; 1,000 direct-reduced iron. 3/
Do.	Siderca S.A.I.C. (Techint Group)	Buenos Aires Province	900; 670 direct-reduced iron. 3/
Uranium (ore)	Empresa Nuclear Mendoza (subsidiary Nucleoélectrica Argentina S.A.)	Sierra Pintada, San Rafael, Mendoza Province	160.
Zinc refinery	Cía. Sulfacid S.A.C.I. and Cía Minera Aguilar S.A.	Near Rosario on the Paraná River, Santa Fe Province	40.

1/ Crude minerals.
2/ Gold and silver data reported in kilograms.
3/ Iron produced by direct reduction.