

Copper

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Copper prices, which weakened in the third quarter of 1997 due to rising inventories and expectations of further increases in world copper mine production capacity, declined dramatically in the fourth quarter due to concerns related to demand in Southeast Asia. The uncertainty about Southeast Asian demand continued to impact negatively on the copper market through the first quarter of 1998 despite increased Chinese purchases, the announcement of some production cutbacks and project deferrals, optimistic short-term consumption forecasts for the United States, and a shortage of copper scrap.

CANADIAN DEVELOPMENTS

In 1997, Canadian copper mine production (recoverable copper in concentrate plus SX-EW output) decreased to 657 500 t from 688 400 t in 1996. Refined copper production totalled 560 300 t in 1997, compared to 559 200 t in 1996 (this includes refined copper from both primary and secondary material).

British Columbia

In March 1998, Royal Oak Mines Inc. reported that the cost of its Kemess gold-copper project had escalated from C\$430 million to \$470 million. The company subsequently announced that it had obtained US\$120 million to refinance and fund the completion of the project. Royal Oak anticipated that start-up would begin in late April 1998. Annual output at Kemess is expected to be about 7800 kg of gold and about 27 000 t of contained copper over an estimated mine life of 16 years.

Princeton Mining Corporation began production at its 60%-owned Huckleberry mine in September and made its first concentrate shipment to Japan in November. The mine is expected to produce an average of 37 000 t of contained copper, 218 kg of gold, 11 800 kg of silver and 670 t of molybdenum annually.

Imperial Metals Corporation began operations at its 55%-owned Mount Polley mine in June and made its first shipment of concentrate to Japan in October. The mine, which was developed at a cost of \$123.5 million, is expected to produce about 3100 kg/y of gold during its first four years of operation, and an average of 12 700 t/y of copper in concentrate during the entire mine life of at least 12 years. Its reserves total 82 Mt grading 0.3% copper and 0.42 g/t gold.

In February 1998, Imperial Metals and Princeton Mining announced that the companies had agreed to a merger in order to significantly reduce costs through improved efficiency, better economies of scale, and a reduction of overhead. In March 1998, the two companies were reportedly seeking concessions on the cost of power and on property and equipment taxes for their respective mines.

In February 1998, Boliden Limited completed a \$513 million takeover of Westmin Resources Limited. In March 1998, Boliden and Westmin announced that they would suspend mining operations at the Gibraltar mine in December 1998 due to low ore grades and low copper prices. In 1997, Gibraltar produced approximately 33 000 t of copper at a cash production cost of more than US\$2000/t (US90¢/lb).

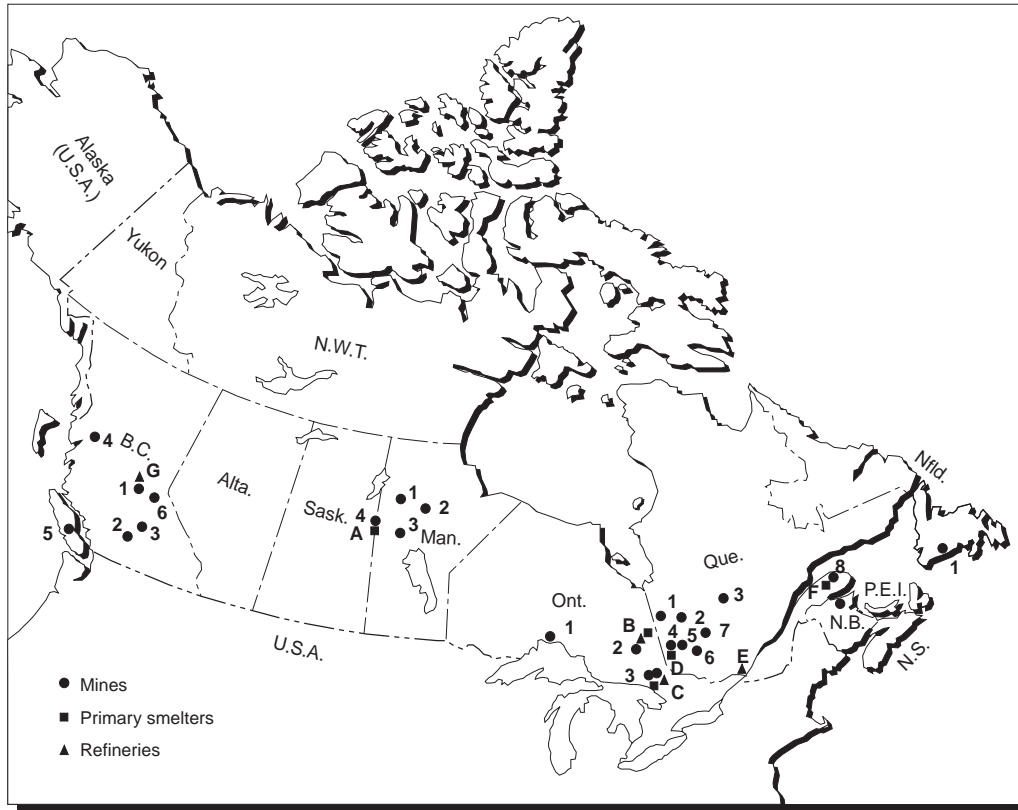
In September 1997, Westmin and its Myra Falls employees agreed to a new collective agreement after a one-day strike. In November, Westmin announced that recent surface drilling on the Extension Zone, located between the Battle Zone and the H-W Main Zone at Myra Falls, had yielded numerous intersections of high-grade massive sulphides.

In March 1998, Redfern Resources Ltd. received B.C. government approval for the development of its Tulsequah Chief polymetallic project. The operation is expected to produce 52 600 t/y of zinc, 10 500 t/y of copper and 4900 t/y of lead, plus gold and silver. The deposit hosts mineable reserves of 7.9 Mt grading 6.4% zinc, 1.3% copper, 1.2% lead, 2.4 g/t gold and 101 g/t silver.

Manitoba/Saskatchewan

Hudson Bay Mining and Smelting Co. Limited (HBMS) announced in early 1998 that it had discovered new reserves near Flin Flon that could extend mining operations beyond the previously expected

Figure 1
Copper Producers in Canada, 1997



MINES

British Columbia

1. Westmin Resources Limited (McLeese Lake)
2. Highland Valley Copper¹
3. Afton Operating Corporation (Ajax mine)
4. Princeton Mining Corporation (Huckleberry)
5. Westmin Resources Limited (Myra Falls)
6. Imperial Metals Corporation (Mount Polley)

Saskatchewan

Hudson Bay Mining and Smelting Co., Limited (Flin Flon)

Manitoba

1. Hudson Bay Mining and Smelting Co., Limited (Ruttan mine)
2. Inco Limited (Thompson mine)
3. Hudson Bay Mining and Smelting Co., Limited (Photo Lake mine)
4. Hudson Bay Mining and Smelting Co., Limited (Flin Flon area mines)

Ontario

1. Inmet Mining Corporation (Winston Lake mine)
2. Falconbridge Limited (Timmins)
3. Falconbridge Limited (Sudbury area)
Inco Limited (Sudbury area)

Quebec

1. Les Mines Selbaie
2. Noranda Inc. (Matagami Division)
3. MSV Resources Inc.
Campbell Resources Inc.
4. Cambior inc., (Bouchard-Hébert mine)

Quebec (cont'd)

5. Agnico-Eagle Mines Limited (La Ronde mine)
Barrick Gold Corporation (Bousquet mine)
6. Aur Resources, Inc., Novicourt Inc., Teck Corporation (Louvicourt mine)
7. Cambior inc. (Gonzague Langlois mine)
8. Noranda Inc., Division Mines Gaspé

New Brunswick

Noranda Inc. (Heath Steele mine)
Noranda Inc. (Brunswick mine)

Newfoundland

1. Royal Oak Mines Inc. (Hope Brook mine)

Primary SMELTERS

- A. Hudson Bay Mining and Smelting Co., Limited (Flin Flon)
- B. Falconbridge Limited (Timmins)
- C. Inco Limited (Sudbury area)
Falconbridge Limited (Sudbury area)
- D. Noranda Inc. (Noranda)
- F. Noranda Inc. (Gaspé)

REFINERIES

- B. Falconbridge Limited (Timmins)
- C. Inco Limited (Sudbury area)
- E. Noranda Inc. (CCR Division)
- G. Gibraltar Mines Limited (SX-EW)

¹ Highland Valley Copper is a partnership of Cominco Ltd., Teck Corporation and Rio Algom Limited.

closure date of 2004. During 1997, HBMS began development work on its Konuto Lake copper mine near Flin Flon. The mine, which is expected to begin production in early 1999, will produce 10 000 t/y of copper and 1000 t/y of zinc for five years.

In early 1998, HBMS workers, represented by the United Steelworkers of America and the International Association of Machinists, agreed to a 15-year no-strike guarantee. In exchange for the agreement, the company stated that it will seek approval from its parent company, Minorco SA, to invest \$1 billion for the development of new mining operations at Flin Flon, Leaf Rapids and Snow Lake.

Ontario

In June 1997, Inco Limited's Sudbury operations were shut down by a 26-day labour strike. The strike was settled when employees accepted a new compensation package that included improvements to wages, vacation bonus, pensions and contracting out. Later in the summer, Falconbridge Limited's Sudbury operations were also affected by a 23-day strike. On August 24, workers ratified a new collective agreement that provided for a 30¢/h wage increase along with pension and sickness/accident benefit improvements.

In November, Inco announced that it was implementing a comprehensive operational restructuring to maximize profitability and cash flow in an environment of lower metal prices. With the measures outlined in November and further actions that were announced in February 1998, Inco will reduce its Ontario Division work force by about 1000, or approximately 16%, and will implement cuts to planned capital expenditures. While the company stated that it did not plan to reduce nickel output, Inco announced that it will close high-cost mines in its Ontario Division, including McCreeley West, Levack and Little Stobie. Inco also announced that it will increase production at its McCreeley East mine.

In February 1998, Inco and Falconbridge announced that they had held discussions on possible joint undertakings to reduce costs at their Sudbury area mining operations.

Inco announced in October 1997 that it had discovered new areas of mineralization located near existing mines at its Ontario Division. These include discoveries in the vicinity of the Division's Copper Cliff South mine and the Victor deposit on the east rim of the Sudbury Basin.

At the end of October, Falconbridge suspended operations for four days at its Kidd Creek mine due to movement in the east wall of the mine's open pit. The company reported that part of the infrastructure in the upper mine was damaged and would have to be redeveloped. Falconbridge also announced that it would close its Kidd Creek smelter for two weeks

beginning on March 30, 1998, due to production problems at the Kidd Creek mine caused by the October incident. At the end of 1997, Falconbridge reported that Kidd Creek reserves had increased by 2.9 Mt.

Quebec

At Cambior inc.'s Gonzague Langlois (formerly Grevet) zinc-copper mine near Lebel-sur-Quévillon, operations resumed in July. Production had been suspended in late 1996 due to weak zinc markets and higher mining dilution.

MSV Resources Inc. closed its Copper Rand and Portage mines in October due to the depletion of ore reserves. The Copper Rand mine could re-open in 1999 if the company proceeds with a development program.

In December, Falconbridge reported that concentrate production had begun at its \$500 million Raglan nickel-copper mine on the Ungava Peninsula, three months ahead of schedule. The mine, which was expected to achieve commercial production by the end of the first quarter of 1998, will produce about 20 800 t/y of nickel and 5200 t/y of copper in concentrate.

In the third quarter of 1997, Noranda Inc. announced that it would make an additional capital investment at its copper refinery (CCR Division) in Montréal-Est that will enable the plant to process copper anodes containing a higher level of impurities. Together with other previously announced projects, the cost to modernize this facility will total \$136 million.

Newfoundland

At the Voisey's Bay nickel-copper-cobalt project in Labrador, Inco reported in October 1997 that proven reserves and indicated or inferred resources totalled 116 Mt. While the Ovoid section was reported to have an average copper grade of 1.68% copper, average copper grades in other sections were significantly lower. Two of the largest, the Eastern Deeps and Reid Brook zones, were reported to contain 0.60% and 0.65% copper respectively.

In order to facilitate continuing exploration work at Voisey's Bay, Inco had planned to construct a temporary road and airstrip at the site. However, the Court of Appeal of the Province of Newfoundland effectively blocked this work when it ruled that all elements of the project should be subject to an environmental review process.

On September 19, 1997, Inco announced that it believed that initial production from the Voisey's Bay mine and mill facilities would be delayed by at least one year. The company had previously announced that production would begin in late 1999. Inco reported that, due to delays in the environmental review and approval process, the necessary environmental approvals for the mine and mill facilities

would not be obtained until late 1998 at the earliest. With a downturn in metal prices, Inco announced in February 1998 that both the scale and timing of the Voisey's Bay development were under review. According to earlier documentation prepared by the company, the expected annual capacity of the mine/mill project would be 122 500 t of nickel, 90 700 t of copper and 3200 t of cobalt. (For further information on the Voisey's Bay project, refer to the chapter on nickel.)

Yukon

Cominco Ltd. continued exploration work on its Kudz Ze Kayah property in the Finlayson Lake area, 115 km southeast of Ross River. Project permitting was expected to be completed by the end of 1997 although, at the time of writing, the project had not yet received the necessary approvals. The deposit contains a mineable open-pit reserve of 11.3 Mt grading 5.9% zinc, 0.9% copper, 1.5% lead, 133 g/t silver and 1.3 g/t gold.

At the Wolverine deposit, located about 20 km east of Kudz Ze Kayah, Westmin Resources Limited and Atna Resources Ltd. reported the discovery of the new Sable Zone and thicker-than-expected precious-metal-rich massive sulphides on the eastern edge of the Wolverine deposit. The companies reported that there were metallurgical concerns about the expected high level of selenium in Wolverine's concentrates. Further efforts will be made to address this issue. At the beginning of 1998, the Wolverine deposit had a mineral resource of 6.2 Mt grading 1.76 g/t gold, 370.9 g/t silver, 1.33% copper, 1.55% lead and 12.6% zinc.

ASARCO Incorporated and Minto Explorations Ltd. announced in March 1998 that they were postponing development of their Minto copper-gold-silver mine in the Yukon until early in 2000. The companies blamed the postponement on delays in receiving final permits and low copper prices. The mine is expected to produce about 12 000 t/y of copper, 300 kg/y of gold and 5000 kg/y of silver in concentrate.

Columbia Gold Mines Ltd. reported promising exploration results on the Kona deposit at its Fyre Lake volcanogenic massive sulphide copper-gold-cobalt project located in the Finlayson Lake area. The company expects to undertake further work at the site in 1998.

WORLD DEVELOPMENTS

World mine production of copper was estimated at about 11.35 Mt in 1997, compared to 11.0 Mt in 1996 (Table 3). During 1997, world production of refined copper (which includes refined copper from both primary and secondary material) increased to about 13.5 Mt from 12.6 Mt in 1996 (Table 4).

Argentina

The Bajo de la Alumbrera copper-gold mine, a joint venture between M.I.M. Holdings Limited (50%), North Limited (25%) and Rio Algom Limited (25%), began production in August and was expected to reach commercial production levels in February 1998. Over its 20-year life, the US\$1.2 billion mine is expected to produce an average of 180 000 t/y of copper and almost 20 000 kg/y of gold. In March 1998, North Limited announced that the mine was producing copper at a cash cost of about US38¢-40¢/lb.

At the beginning of 1998, there were press reports of a disagreement between the Argentinian federal government and the province of Catamarca with regard to mining royalties. According to the reports, Catamarca wanted to assess the Bajo de la Alumbrera copper-gold mine a 3% royalty without making any allowances for production costs.

Cambior inc. completed a feasibility study at its 50%-owned El Pachón project, which hosts reserves of 882 Mt grading 0.62% copper with recoverable molybdenum and precious metals. The study indicated that mine cash costs would be US28¢/lb of copper for an operation that would produce 250 000 t/y of copper in concentrate. Capital costs for the project are estimated at US\$810 million. To facilitate the efficient operation of the El Pachón mining project, the governments of the Republic of Chile and the Republic of Argentina signed the El Pachón Protocol for Cooperation at the beginning of 1997, which will permit access through Chile for the supply of services and transport of concentrate to market. In February 1998, Cambior announced that it was deferring this project due to low metal prices.

Elsewhere in Argentina, The Broken Hill Proprietary Company Limited (B.H.P.) (70%) and Northern Orion Explorations Ltd. (30%) continued work on their Agua Rica property in Catamarca Province. An initial feasibility study of the project suggests that production could begin late in 2002 with annual production totalling 220 000 t of copper and almost 3900 kg of gold. A full feasibility study is expected to be completed by the end of 1998.

Northern Orion Explorations Ltd. also expects to complete a feasibility study on its San Jorge copper-gold deposit by the end of 1998. The company's preliminary reserve estimate for San Jorge was 146 Mt grading 0.5% copper.

Chile

In early 1998, The Comisión Chilena del Cobre (Cochilco) released a forecast suggesting that Chilean copper production will increase to 3.69 Mt in 1998, an increase of 9.8% over 1997.

The Corporacion Nacional del Cobre de Chile (Codelco-Chile), the state-owned copper producer, reported that its new Radomiro Tomic mine near Chuquicamata began production in December 1997. This mine is expected to produce 150 000 t/y of copper cathode. While Codelco-Chile had considered an expansion that would eventually increase production to 250 000 t/y, it announced in early 1998 that this project would be deferred because of a lower budget allocation from the government. Codelco-Chile also announced that it was delaying an expansion at its El Teniente Division by one year. The project, which will raise output to 500 000 t/y of copper from about 350 000 t/y, is now expected to be completed in 2001. In September, Codelco-Chile announced that it was about to bring its new Esmeralda mine at El Teniente into production. Esmeralda is expected to produce about 58 000 t/y of copper by the year 2000, and to increase its production level to 164 000 t/y in 2005.

While Codelco-Chile has delayed capacity expansion projects, it announced that it will proceed with environmental improvement projects, including the reduction of arsenic emissions at Chuquicamata and sulphuric acid emissions at its Potrerillos smelter.

Minera Escondida Limitada reported that it would close its Coloso copper anode plant at the end of May 1998 due to poor market conditions. The plant, which utilizes an ammonia-based solvent extraction process, had been hampered by technical problems that prevented it from reaching its 80 000-t/y design capacity.

Minera Los Pelambres, a joint venture between Antofagasta Holdings plc (Luksic Group), Nippon Mining & Metals Co. Ltd. and Mitsubishi Materials Corporation, is proceeding with a US\$1.3 billion project that will produce 260 000 t/y of copper in concentrate by the end of 1999. The existing 23 000-t/y copper operation at the site, operated by Minera El Chacay, is expected to cease operations by the end of April 1998 to make way for the Los Pelambres development.

Equatorial Mining NL of Australia and Antofagasta Holdings plc were reported to be seeking US\$200 million to finance the El Tesoro copper project in northern Chile. This SX-EW development, which would produce about 75 000 t/y over 18 years, could begin production in late 1999.

In July, Nittetsu Mining Co., Ltd. and Itochu Corp. announced that they would participate with El Bronce SA to develop the 90 000-t/y El Bronce mine. The project, which is expected to be completed in 2000, is located near Tierra Amarilla, 600 km north of Santiago.

Phelps Dodge Corporation (80%) and Sumitomo Metal Mining Co. Ltd. (20%) expected that an expansion of their La Candelaria mine, from 115 000 t/y to

over 170 000 t/y of copper, would reach commercial production by the end of 1997.

Development work on the US\$1.76 billion Collahuasi copper mine project was reported to be about three months ahead of schedule, with cathode production expected to begin in May 1998 and concentrate production expected to start in the third quarter of 1998. Annual output at Collahuasi is expected to total 330 000 t of copper in concentrate and 50 000 t of copper cathode. The Collahuasi project is owned by Falconbridge (44%), Minorco SA (44%) and a consortium of Japanese companies (12%) that includes Mitsui and Co., Ltd., Nippon Mining & Metals, and Mitsui Mining & Smelting Co. Ltd.

Westmin Resources (Boliden Limited) reported that its US\$244 million Lomas Bayas open-pit copper project was ahead of schedule and under budget, and that production would begin in May 1998. Its annual output is expected to total 60 000 t of cathode copper. The company reported that Lomas Bayas will be a low-cost operation (estimated at US50¢/lb of copper over the life of the mine) due to its favourable location, low stripping ratio and high copper recovery.

Westmin Resources announced that reserves at Lomas Bayas had increased to 479.1 Mt grading 0.332% copper, while geological reserves at the adjacent Fortuna de Cobre deposit had increased to 592.2 Mt grading 0.272% copper. As a result of the additional reserves, Westmin plans to proceed with preliminary work for a possible expansion of Lomas Bayas to 150 000 t/y of copper.

In February 1998, Placer Dome Inc. concluded a transaction with Bema Gold Corporation and Arizona Star Resource Corp. whereby Placer Dome acquired a 51% interest in the Aldebaran property in northern Chile, which contains the Cerro Casale gold-copper deposit. A pre-feasibility study for an open-pit mine at Cerro Casale estimated that the deposit contains 791 Mt of sulphide material grading 0.71 g/t gold and 0.29% copper, as well as 56 Mt of oxide material grading 0.84 g/t gold and 0.29% copper. Under the terms of the agreement, Placer Dome committed to complete a feasibility study within two years. The company will also conduct exploration work on other known mineralized targets on the Aldebaran property.

In September, Barrick Gold Corporation reported that it was closing its El Indio gold mine due to high operating costs. El Indio produced about 35 000 t/y of by-product copper.

At the Andacollo copper mine, Aur Resources Inc. and Compania Minera del Pacifico S.A. plan to undertake a pre-feasibility study on a large primary copper deposit that underlies the oxide/supergene deposit which is currently being mined. The Andacollo mine, which first began production in 1996, produces about 20 000 t/y of copper cathode.

In January 1998, Outokumpu Oyj announced that it would proceed with a copper smelter/refinery in Chile despite the withdrawal of Empresa Nacional de Electricidad SA (Endesa) from the project. Earlier reports had suggested that the smelter would produce 350 000 t/y of copper. In February 1998, Hyundai Corporation announced that it was postponing a decision to participate in another smelter/refinery project in northern Chile due to the Asian financial crisis.

In March 1998, Noranda Inc. announced that it had agreed to purchase the 75% interest in the 158 000-t/y smelter of Fundicion Refimet SA that it did not already own. This includes a 25% interest held by Barrick Chile Limitada, a subsidiary of Barrick Gold Corporation, and a 50% interest held by Inversiones Mineras del Pacifico. Noranda also announced plans to increase the smelter's capacity by 100 000 t/y.

Peru

Empresa Minera Mantos Blancos announced in February 1998 that a feasibility study on its Quellaveco copper project would not be completed by June 1998 as originally planned. The company cited lower copper prices for the delay. Preliminary plans for the project had suggested that this operation would produce about 200 000 t/y of copper in concentrate.

Southern Peru Copper Corporation (SPCC) expects to complete a US\$245 million expansion of its Cuajone mine in the first quarter of 1999 that will increase capacity from 64 000 t/d to 96 000 t/d. SPCC is also proceeding with a modernization and expansion of its Ilo smelter that will cost almost US\$800 million.

In early 1998, Rio Algom and Inmet Mining Corporation reported that they had completed a feasibility study on their Antamina copper-zinc deposit that confirmed the viability of the project. The operation, which would produce over 270 000 t/y of copper and 160 000 t/y of zinc, would cost an estimated US\$2.2 billion to develop. The study estimated its copper cash costs at US40¢/lb. Reserves at Antamina were reported to be 500 Mt grading 1.2% copper, 1.1% zinc and 13 g/t silver. Inmet Mining subsequently announced that it wanted to sell its 50% interest in the project since it did not have the financial capability to finance its share of the development costs.

In February 1998, Cambior announced that it was deferring its La Granja copper project due to low metal prices. Cambior had been expected to complete a feasibility study on the project by the end of 1997. Estimated reserves at La Granja total 2.3 billion t grading 0.59% copper.

Early in 1998, Cyprus Amax Minerals Company announced that it was deferring development of its Cerro Negro copper oxide deposit that lies adjacent to the company's Cerro Verde operation.

Panama

In February 1998, Teck Corporation completed a feasibility study on the Petaquilla copper property. The study indicated that a 90 000-t/d operation would provide a net present value of US\$335 million using a debt-to-equity ratio of 60:40 and a 10% discount rate. The study used a price of US\$1.10/lb for copper and US\$375/oz for gold. Measured and indicated mineable reserves at the Petaquilla, Botija and Valle Grande deposits total 1.11 billion t grading 0.09 g/t gold, 0.5% copper and 0.0097% molybdenum.

According to a press report, the president of Teck Corporation stated that current copper prices did not justify the US\$1 billion capital cost for the project. However, he was reported to have stated that Petaquilla would be a good project at a higher copper price and a lower capital cost. Petaquilla is owned 52% by Adrian Resources Ltd. and 48% by Inmet Mining. Teck Corporation can acquire one half of Adrian's interest in the property by funding Adrian's share of development costs.

Mexico

Western Copper Holdings Limited and Teck Corporation reported promising exploration results at their San Nicolas deposit located southeast of the city of Zacatecas. Further exploration work is planned in 1998.

United States

Kennecott Corporation reported in September that its new 280 000-t/y Bingham Canyon smelter in Utah was operating at full capacity. Earlier in the year, the company carried out a number of modifications to the facility to rectify various technical problems that arose during commissioning in 1996.

B.H.P. announced in February 1998 that it was closing its 70 000-t/y Pinto Valley sulphide operation. The company plans to continue leaching operations at the site, which yields about 16 000 t/y of copper cathode.

In September, BHP Copper Group signed a purchase agreement for Inmet Mining Corporation's 68 000-t/y Copper Range copper refinery in White Pine, Michigan. The Group's ownership was expected to begin in January 1998. BHP Copper also announced that it would continue to toll and refine anodes for White Pine's current customer, HBMS. Earlier in the year, Inmet Mining announced that it had decided to abandon its proposed solution mining project at the White Pine mine and that it would proceed with the orderly permanent closure of these operations.

In January 1998, Cyprus Amax Minerals Company announced that it was cutting production at its Sierrita and Bagdad mines in Arizona due to lower metal prices. The reductions are expected to account for about 27 000 t/y of copper production.

Phelps Dodge Corporation announced in February 1998 that it had successfully acquired Cobre Mining Company, which operates the Continental copper mine in New Mexico. The mine has a capacity of about 32 000 t/y of copper.

Cambior inc. announced in February 1998 that it was deferring development of its Carlota copper project in the Miami-Globe region of Arizona due to low metal prices. The mine is expected to have a capacity of over 30 000 t/y of copper cathode.

In September, Franklin Smelting and Refining Corp. suspended operations at its 16 000-t/y secondary copper smelter in Philadelphia due to financial problems.

Australia

The joint-venture company Port Kembla Copper, which is owned 52.5% by Furukawa Co. Ltd., 20% by Nittetsu Mining Co. Ltd., 17.5% by Nissho Iwai Corporation and 10% by Itochu Corp., is expected to complete a modernization and expansion of its Port Kembla copper smelter in mid-1999. The smelter was idled by its previous owners in January 1995.

M.I.M. Holdings Limited is proceeding with construction of its new Enterprise copper mine at Mount Isa. Full production is expected to be reached by the end of 1999. M.I.M. is also proceeding with an expansion of its copper-smelting capacity at Mount Isa to 250 000 t/y, and an expansion of its Townsville copper refinery to 255 000 t/y.

M.I.M. and Savage Resources Ltd. began production at their Ernest Henry copper-gold mine in northwestern Queensland in August. The open-pit mine will produce about 95 000 t/y of copper in concentrate and 3700 kg/y of gold.

Western Mining Corporation is proceeding with an expansion of its Olympic Dam copper-uranium mine and copper smelter that will increase production to 200 000 t/y of copper. The company expects that construction at the smelter will be completed by the end of 1998.

Newcrest Mining Limited expects to commission its Cadia gold-copper mine in New South Wales by the end of July 1998. The operation will produce about 9000 kg/y of gold and 23 000 t/y of copper in concentrate over a 12-year mine life.

In January 1998, the Cobar mine of Golden Shamrock Mines Inc. in New South Wales was closed due to depressed copper prices. The mine produced about 30 000 t/y of copper in concentrate.

Aberfoyle Limited announced that it expected the capacity expansion at its Gunpowder mine to 44 000 t/y of copper cathode to be completed in the third quarter of 1998.

Indonesia

P.T. Freeport Indonesia Company (PTFI), owned by Freeport-McMoRan Copper & Gold Inc. and Rio Tinto plc, expects to complete a major mine and mill expansion at its copper-gold operations in Irian Jaya from 115 000 t/d to about 200 000 t/d by the end of the first quarter of 1998. The company expects that 1998 sales will total about 770 000 t of copper in concentrate. PTFI also reported that it had received environmental and government approvals to proceed with a further expansion to 300 000 t/d. At the end of 1997, PTFI's proven and probable reserves totalled 2.17 billion t grading 1.2% copper, 1.2 g/t gold and 3.95 g/t silver.

Mitsubishi Materials Corporation (75%) and Freeport-McMoRan (25%) expect that their new 200 000-t/y copper smelter/refinery at Gresik in East Java will begin commercial operations in December 1998.

Papua New Guinea

Highlands Pacific Ltd. reported in January 1998 that it had entered into an agreement with a subsidiary of Cyprus Amax Minerals Company whereby the latter will acquire up to 75% of Highlands' 86% interest in the promising Frieda River gold-copper prospect. Under the terms of the agreement, the Cyprus subsidiary would provide US\$32 million to enable a final feasibility study to be completed by the end of the year 2000.

In September, Ok Tedi Mining Limited, owned 52.6% by B.H.P., 17.4% by Inmet Mining Corporation and 30% by the government of Papua New Guinea, invoked force majeure on copper shipments from its mine due to low water levels on the Fly River. In the first quarter of 1998, rainfall in the area allowed limited shipments of copper concentrate to resume. B.H.P. expected that production at the mine would resume at the end of March 1998.

In January 1998, a permanent cease-fire was arranged between the government of Papua New Guinea and rebels on Bougainville Island. Bougainville's Panguna copper mine was closed in 1989 as the result of a secessionist rebellion. Recoverable ore reserves at Panguna total 496 Mt grading 0.42% copper and 0.55 g/t gold.

Philippines

Atlas Consolidated Mining and Development Corp. reported that it will begin work in early 1998 on the rehabilitation of its copper mine on the island of Cebu. The mine has been closed since January 1994.

Elsewhere in the country, Philippine Associated Smelting & Refining Corp. (PASAR) was affected by a labour strike that lasted from August 25 to September 3, 1997.

Republic of Korea

LG Metals Corp. reported in early 1998 that its new 160 000-t/y smelter/refinery at Onsan had commenced production. With the inauguration of the new facility, the company's smelting and refining capacity will increase to 310 000 t/y and 420 000 t/y, respectively.

People's Republic of China

In January 1998, it was reported that China's State Council had approved the construction of the new Dongguashan mine. According to an earlier report, Dongguashan will produce about 31 000 t/y of copper in concentrate.

During 1997, a number of other copper mine projects were reported. These include the 6300-t/y Saishitang mine in Qinghai Province, the 20 000-t/y Yulong project in Tibet, the Tangdan mine and the second phase of the Dahongshan mine in Yunnan Province, which will account for about 18 000 t/y of copper output, and the expansion of the Lala mine in Sichuan Province.

In December, China National Nonferrous Metals Industry Corporation (CNNC) reported that the 100 000-t/y Daye smelter had been completed. The smelter utilizes Noranda Inc.'s continuous copper smelting technology.

Thailand

Although Thai Copper Industries Public Company Limited was expected to bring its new 165 000-t/y smelter/refinery complex into production by the end of 1998, industry sources reported that financial difficulties had forced a halt to its construction.

Myanmar

Indochina Goldfields, through a subsidiary, Ivanhoe Myanmar Holdings, Ltd., plans to develop an open-pit mine that will produce 25 000 t/y of copper cathode from the Sabetaung and Kyisintaung deposits near the town of Monywa. Production is expected to begin in mid-1998. A future expansion of the operation is also being considered.

India

Mitsubishi Materials Corporation announced that it would not be taking a direct stake in Metdist Ltd.'s 150 000-t/y smelter/refinery project in the state of Gujarat, although it may supply its continuous copper smelting process technology for this facility. The project, which was originally scheduled to begin production early in 1998, has yet to secure bank financing and the necessary government approvals.

In July, Sterlite Industries (India) Limited was forced to close its new 100 000-t/y smelter at Tuticorin in the state of Tamil Nadu due to gaseous emissions in the vicinity of the plant. The plant, which was subsequently exonerated of blame for this gas leak, resumed production in mid-August. However, at the end of the month, the smelter was again closed due to an explosion in a rotary holding furnace. It resumed production in November.

According to press reports, the 100 000-t/y Birla Copper smelter and refinery of Indo Gulf Fertilizers & Chemicals Corporation was expected to begin production in March or April 1998.

According to a report prepared for the International Copper Study Group, demand for copper alloys in India is expected to increase from 321 000 t in fiscal year 1995/96 to almost 700 000 t in fiscal year 2005/06.

Pakistan

In early 1998, it was reported that Saindak Metal and Metallurgical Construction Co. of China had signed an agreement to recommission the 16 000-t/y Saindak copper mine/smelter operation. Production was suspended in 1997 due to a shortage of operating capital.

Iran

Svedala Industri of Sweden was reported to have won several contracts for processing equipment in 1997. Projects include the 45 000-t/y Soongoon copper mine project in Azarbaijan Province in northwestern Iran, the Meydouk mine project in Kerman Province in the southeast, and the expansion of the concentrator at Sar Cheshmeh.

In July, a consortium comprised of B.H.P., M.I.M. and Tomen Corporation signed a US\$70 million contract with National Iranian Copper Industries Co. (Nico) for the expansion of the Sar Cheshmeh smelter that will increase its smelting and refining capacity from 100 000 t/y to 200 000 t/y. Also in July, Nico was reported to have inaugurated production at its new SX-EW facility at Sar Cheshmeh, which will eventually produce 14 000 t/y of copper cathode.

Yugoslavia

The Yugoslav State copper producer RTB Bor plans to proceed with a modernization and expansion of its smelter located at Bor in eastern Serbia. Financing for the project, which will increase smelting capacity from 200 000 t/y to 250 000 t/y, will be provided by the government of Yugoslavia and the Greek company, Mytilineos. RTB Bor and Mytilineos signed a long-term business cooperation agreement in February 1998.

Bulgaria

Union Minière Bulgaria JSC announced in January 1998 that it had increased its stake in the MDK Pirdop copper smelter to 97.5% from 56%. The new operating company, Union Minière Pirdop Copper, expects to produce between 100 000 and 110 000 t of copper in 1998 and to increase production to 185 000 t/y within five years.

Homestake Mining Company signed an agreement with Navan Resources Plc to participate in a major expansion of the Chelopech gold-copper mine that will boost production to almost 5000 kg/y of gold and 18 000 t/y of copper while at the same time lowering the arsenic content of the copper concentrate.

Portugal

Workers at the Neves Corvo mine staged a week-long strike in November to back demands for improved working conditions. The mine is owned by state-owned Sociedad Minera de Neves-Corvo (Somincor) and Rio Tinto plc.

Zambia

The government of Zambia reported that it expected to complete the privatization of Zambia Consolidated Copper Mines Limited (ZCCM) in early 1998.

During 1997, the Kafue Consortium, comprised of Noranda Inc., Avmin Limited (the mining division of Anglovaal Group), Phelps Dodge Mining Company and the Commonwealth Development Corporation, was involved in extensive negotiations regarding the purchase of the mining and metallurgical assets of ZCCM's Nkana and Nchanga divisions. However, in March 1998, the consortium reported that the Zambian government had rejected its offer for the two divisions.

Other elements of the ZCCM privatization included the purchase of the processing rights to the Nkana slag dump by Colossal Resources Corp. and its affiliate Qasim Mining Enterprises, and the purchase of the Chibuluma mine by the Metorex consortium comprised of Metorex, Maranda Mines Ltd., Crew Development Corporation, and Genbel Securities. In addition, an 85% interest in the Luanshya/Baluba mining and metallurgical complex was sold to Metal Distributors Ltd., which is part of the Binani Group of India, while the Chambishi copper mine and concentrator was purchased by Foreign Engineering & Construction Corp. of China.

In March 1998, Falconbridge announced that it was withdrawing from the consortium involved with the Konkola project, which consisted of Falconbridge and Zambia Copper Investments Limited, a unit of Anglo American Corporation of South Africa Limited. At the time of the announcement, the consortium was in

the process of finalizing a feasibility study for the project. Falconbridge explained that the Konkola project did not provide sufficient returns to justify further investment. The Konkola Deep deposit, which hosts ore reserves of 340 Mt grading 3.8% copper, was expected to support a 180 000-t/y copper mining operation. Anglo American had estimated that development costs for the project would be between US\$700 million and \$800 million.

In January 1997, Cyprus Amax Minerals Company purchased an 80% interest in the Kansanshi copper mine. Recent exploration at the mine has delineated reserves of almost 200 Mt grading 1.5% copper. In January 1998, ZCCM announced that it was closing the remaining small-scale mining operations at the Kansanshi mine due to low metal prices.

First Quantum Minerals Ltd. expects to begin production in 1998 at its Bwana Mkubwa mine tailings project. Production is expected to be about 10 000 t/y of copper over a five-year period.

Democratic Republic of the Congo

In early 1998, a consortium comprised of Anglo-American Corporation of South Africa Limited, Iscor Ltd., Union Minière SA, First Quantum Minerals Ltd., CNNC, and an Angolan group was reported to have signed an agreement with La Générale des carrières et des Mines (Gécamines), the state-owned mining corporation, to develop mines in the southern Kolwezi area. In February 1998, Iscor Ltd. announced that it hoped to formalize an agreement valued at 400 million rand to refurbish the Kamoto copper and cobalt plant. The company reported that the facility was currently operating at about 20% of its capacity.

Late in 1997, Gécamines cancelled a tender with American Mineral Fields Inc. for the Kolwezi copper-cobalt tailings project. In April 1997, American Mineral Fields signed a US\$1 billion agreement for the project with the rebel forces of Laurent Kabila. However, this agreement was not subsequently ratified by the new government. Gécamines was reported to have stated that American Mineral Fields' bid did not satisfy the government's financial demands or the higher interests of the state.

In September 1997, First Quantum Minerals Ltd. was granted the right to conduct feasibility studies on two tailings deposits (Luilu and Kingamyambo) in the Kolwezi District. The Luilu deposit is estimated to contain 20-30 Mt of tailings grading approximately 2-3% copper and 0.2-0.4% cobalt, while the Kingamyambo deposit contains 15-25 Mt grading between 1% and 2% copper and between 0.1% and 0.3% cobalt.

In December 1996, Tenke Mining Corp. (formerly Consolidated Eurocan Ventures Ltd.) purchased a 55% interest in the Tenke Fungurume copper deposit

for US\$250 million. The company expects to complete a feasibility study on the project by June 1998. Tenke Fungurume is estimated to contain a resource in excess of 500 Mt grading 3.6% copper and 0.28% cobalt.

International Panorama Resource Corp. reported that it was scaling back its Kakanda tailings project due to the deterioration of copper markets. The revised project, which will recover 9500 t/y of copper and 1000 t/y of cobalt, is expected to cost US\$90 million.

International Copper Study Group

The International Copper Study Group (ICSG) held two meetings in 1997. At its June meeting, the ICSG secretariat reported that the project entitled *Energy Efficiency: Strengthening Emerging Economies by Promoting Copper Use* was approved for co-funding by the Common Fund for Commodities (CFC). Both the CFC and the International Copper Association, Ltd. (ICA) will contribute about US\$1.1 million toward the project. The ICSG will act as the supervising agency. The project is expected to begin in early 1998.

In November, the ICSG approved a major study of copper scrap in China where the lack of accurate statistics has hampered accurate market forecasting by industry. This study is expected to begin in the second quarter of 1998.

The ICSG will hold two meetings in Lisbon during 1998. The first will be held from June 22 to 25, 1998.

India joined the ICSG in 1997, bringing the number of members to 24.

CONSUMPTION AND USES

World copper consumption was estimated at about 13.15 Mt in 1997 compared to 12.6 Mt in 1996 (this includes refined copper from both primary and secondary material). Canadian refined copper consumption was estimated to have increased to 224 600 t in 1997 from 218 300 t in 1996.

In 1997, it was estimated that over 3 Mt of copper scrap was used directly by consumers worldwide. According to an annual survey conducted by Natural Resources Canada, 38 600 t of contained copper in scrap was consumed directly by Canadian manufacturers in 1996.

Table 8 presents preliminary end-use data for 1995 and 1996 for the United States collected by the Copper Development Association Inc. (detailed copper consumption statistics are not officially collected in Canada).

MARKETS

In Canada, copper tube and fittings are now being used in houses and other buildings to carry natural gas. The growth of this market has been dramatic, with copper quickly becoming the preferred material, replacing steel pipe. This market is being heavily promoted by the Canadian Copper and Brass Development Association (CCBDA) with the financial support of the ICA. The CCBDA will make special promotional efforts in areas of eastern Canada that have recently gained, or will soon gain, access to natural gas distribution. The CCBDA and the Copper Development Association Inc. of the United States have also jointly undertaken major North American initiatives on the promotion of plumbing tube and fittings as well as architectural applications.

The CCBDA is also actively involved in the promotion of electrical wire and cable, with particular emphasis on the use of larger conductors to improve energy efficiency and power quality, and on industrial and commercial power cable for building applications.

In recent years, copper has benefited from increasing consumer demand for large and small appliances, household convenience items, computers, and automotive options. In North America, there has been a noticeable increase in the intensity of copper use in residential applications. Part of this change is attributable to the construction of larger houses and the growth of home-based offices. In many homes there is a need for multiple phone lines to handle faxes, modems and security systems.

Although the use of fibre-optic cable in the communications and telecommunications sectors has increased in recent years, the development of new technologies has permitted copper wire to remain competitive, particularly in low-density applications, including communication connections to individual homes and for internal network links such as desk-to-desk telephone and computer connections. According to a recent press report, the market for short cables, which are used to interconnect telephones, computers and other electronic devices, has experienced double-digit growth rates for several years in the North American, European and Asian markets.

The use of additional electronics has stimulated growth in demand for copper wire from the automotive industry in recent years. However, the introduction of multiplex electronic systems could limit copper demand in this application.

Aluminum has largely replaced copper in the original-equipment automotive radiator market, particularly in the United States. However, the ICA has reported that copper still accounts for about two thirds of the global radiator market. According to the ICA, copper is particularly dominant in heavy-duty applications and in the after-market where the metal has an 80%

market share. The ICA estimates that worldwide copper usage for radiators is about 190 000 t/y.

With technological advances and design innovations, new brazed copper-brass radiators have been developed that are 35% to 40% lower in weight than traditional copper-brass radiators. According to the ICA, these brazed radiators are produced more easily and at a lower cost than comparable aluminum radiators.

A number of other promising new markets for copper could also provide significant growth opportunities. These include the use of copper as an additive in roofing shingles to prevent the formation of algae and fungus, as well as use in fire suppression systems, natural gas systems, solar power generation equipment, and the storage of spent nuclear fuel.

HEALTH

Although copper toxicity is recognized at elevated intake/exposure levels, the element is an essential nutrient for human health. At a Task Group meeting of the International Programme on Chemical Safety (IPCS) held in Brisbane in June 1996, there was a recognition that copper is an essential trace element for human health and that there are greater risks, in Europe and the Americas in particular, of health effects from copper deficiency than from excess copper intake.

The U.S. National Academy of Sciences/National Research Council has recommended a daily intake of 0.4-0.6 mg for children up to six months of age, increasing progressively to 1-2 mg for children up to 10 years of age. For adolescents and adults, the recommended range is 1.5-2.5 and 1.5-3.0 mg respectively. The World Health Organization (WHO) has suggested a recommended daily intake of copper of 80 micrograms (μg)/kg for infants and young children, and 40 $\mu\text{g}/\text{kg}$ and 30 $\mu\text{g}/\text{kg}$ for older children and adult males respectively.

Acute copper poisoning is infrequent in humans, largely restricted to the voluntary or accidental ingestion of copper salts. According to the Copper Development Association Inc., the WHO and the U.S. Food and Agricultural Administration (FAA) are likely to suggest that the population's mean intake of copper should not exceed 12 mg/d for adult males and 10 mg/d for adult females. These levels are regarded as the lowest intakes likely to produce the slightest biochemical evidence of undesirable effects in all but a small number of the population.

Many regulatory agencies, including Health Canada, have chosen 1 part per million (ppm) as the maximum desirable concentration of copper in drinking water. It signifies more of an aesthetic limit than a health limit; water containing more than 1 ppm can stain laundry, and persons with a keen sense of taste may perceive a metallic flavour in the water.

In 1993, the WHO included copper in a group of chemicals of health significance in drinking water and recommended a guideline value of 2 mg/L. The recommendation was deemed provisional due to uncertainties regarding copper toxicity in humans. As a result, scientific discussions were conducted internationally, and the WHO revised its recommendation in 1997 with the guideline value of 2 mg/L for copper now defined on the basis of the potential for acute gastrointestinal effects. The recommendation remains provisional in view of the remaining uncertainties regarding copper toxicity in humans.

RECYCLING

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal came into force in May 1992 and, as of March 1998, approximately 117 countries had ratified the Convention, with the United States being the most notable exception. The Convention is an environmental agreement designed to restrict the transboundary movement of hazardous wastes to protect countries (particularly developing countries) that may not have the capability and technology to properly manage the waste.

In September 1995, the third Conference of Parties (COP) adopted an amendment decision to the Convention that bans, for ratifying countries, all movements of hazardous wastes from countries listed in Annex VII and destined for final disposal in countries not listed in Annex VII. In addition, ratifying countries listed in Annex VII will also ban the export of hazardous wastes destined for recovery operations in countries not listed in Annex VII by December 31, 1997. Annex VII countries include parties and other states that are members of the Organization for Economic Co-operation and Development (OECD), the European Union and Liechtenstein. As of March 1997, seven member countries (Finland, Norway, Denmark, Sweden, Luxembourg, Spain and the United Kingdom) had ratified the "ban" amendment. This amendment will require the ratification of 65 countries to enter into force.

Since the third COP, the Technical Working Group of the Basel Convention has provisionally compiled two lists of recyclable materials: List A recyclables, which will be considered as being subject to bans, and List B recyclables, which will be considered to be beyond the scope of the Basel Convention.

The 4th COP to the Basel Convention was held February 23-27, 1998, in Malaysia. The COP agreed to amend the Convention to include two new annexes. The first annex comprises a list of hazardous wastes that will become subject to the movement "ban" agreed to at the third COP if and when it enters into force. Canada has not, as yet, made a decision on ratification of this movement "ban." The second annex comprises a list of materials that are generally considered not to be hazardous, and will be considered to be beyond the scope of the Basel Convention. Most

recyclable metals are included on the second non-hazardous annex list. The COP further agreed to extend the mandate of the Technical Working Group to formally establish a review mechanism to revise and update the new annexes as may be required.

The 4th COP reviewed the requests submitted by Monaco, Israel and Slovenia to accede to Annex VII. Annex VII countries may trade hazardous recyclables amongst themselves, but trade with non-Annex VII countries is prohibited. The COP rejected all accession requests to join Annex VII prior to the Basel "ban" entering into force. Many countries were of the opinion that allowing countries to join Annex VII would only serve to weaken the Basel "ban" amendment. The COP further refused to develop technical criteria that could assist countries in a self-evaluation of their hazardous waste management capacities. The development of technical criteria was perceived as a step towards allowing countries to join Annex VII and was rejected by most member countries.

The specific copper compounds currently included on the amended Annex VII that will become subject to the Basel "ban" amendment if and when it comes into force include:

- ashes and residues from the incineration of insulated copper wire;
- dusts and residues from gas cleaning systems of copper smelters;
- spent electrolytic solutions from copper electrorefining and electrowinning operations;
- spent etching solutions containing dissolved copper; and
- waste cupric chloride and copper cyanide catalysts.

As a result of the decline in copper prices in the second half of 1997, shortages of secondary raw materials were reported, particularly in Europe. Secondary producers in Germany, France and Italy expected that the reduced availability of scrap would result in a significant reduction in secondary output during 1998.

STOCKS

Combined copper stocks on the London Metal Exchange (LME), the Commodities Exchange, Inc. (COMEX) and the Shanghai Metal Exchange increased throughout 1997 to reach 457 000 t at the end of December. At the end of December 1996, stocks stood at 177 000 t.

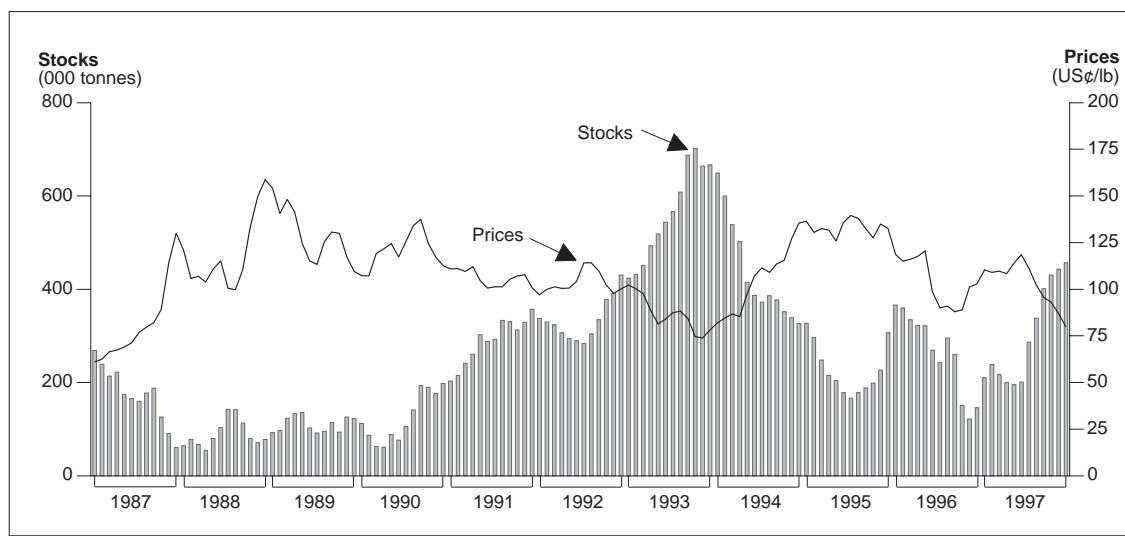
At the end of December 1997, total copper stocks, including those at producers, merchants, consumers and exchanges, totalled 1 003 800 t compared to 667 700 t at the end of 1996. Figure 2 shows both total copper stocks and prices for the period 1987-97.

PRICES

Copper prices on the LME averaged US\$2276/t (\$1.03/lb) in 1997 (Figure 2) compared to US\$2294/t (\$1.04/lb) in 1996.

In 1997, Canadian producers sold refined copper in the United States at COMEX (high grade first position close) plus a premium of US3.3¢/lb, while in Canada prices were set at the Canadian dollar equivalent of COMEX plus 4.5¢/lb. In the first quarter of

Figure 2
Copper Prices¹ and Exchange² Stocks, 1987-97



Source: Natural Resources Canada.

¹ Average monthly LME cash prices. ² Combined exchange stocks at end of the month.

1998, premiums fell to US\$3.0¢/lb in the United States and 4.2¢/lb in Canada. In the second quarter of 1998, premiums were expected to increase to US\$3.2¢/lb in the United States and 4.5¢/lb in Canada. For sales in Europe in 1997, Canadian producers established a price of LME (Grade A Settlement Price) plus an average premium of US\$27-\$30/t. The same premiums were expected to apply in 1998.

As a result of trading losses by Sumitomo Corp. of at least US\$2.6 billion, which came to light in June 1996, the Securities and Investment Board in the United Kingdom issued a number of recommendations to the LME. This plan included calls for enhanced market monitoring, increased market transparency, more tightly controlled and transparent warehousing arrangements, a review by the LME of its governance, and an increase in the role of the LME executive.

TREATMENT AND REFINING CHARGES

At the time of writing, it was reported that negotiations for 1998 benchmark smelting and refining charges were deadlocked due to a sharp fall in copper prices, uncertainties regarding copper demand in Southeast Asia, and a tightening spot market for copper concentrates. Earlier reports had suggested that 1998 charges would follow the pattern of the agreement with Freeport-McMoRan Copper & Gold Inc. for terms of US\$102.50/dry metric tonne (dmt) and 10.25¢/lb for material grading 30% copper. In early 1998, spot treatment and refining charges were reported to have fallen to below US\$70/dmt and 7¢/lb. Benchmark charges in 1997 were US\$105/dmt and 10.5¢/lb. In 1996, the benchmark was roughly US\$95/dmt and 9.5¢/lb.

OUTLOOK

As a result of the financial crisis in Asian markets in the fourth quarter of 1997, it is expected that overall copper consumption in Asia will post little or no growth in 1998, and that the largest declines will occur in Indonesia, Thailand and the Republic of Korea.

Despite the forecast slowdown of certain Southeast Asian economies, world consumption of refined copper in 1998 will increase to about 13.4 Mt from 13.15 Mt in 1997. It is expected that copper consumption in the longer term will grow at an annual average rate in excess of 3.0%.

While copper consumption in 1998 is forecast to remain strong in North America and Europe, the combination of the Asian downturn and major increases in copper mine production capacity, particularly in South America, will exert downward pressure on world prices. However, at the time of writing, there was some speculation that increased

demand in China during 1998 could help support copper prices.

Although forecast production will likely outpace consumption for the remainder of the decade, it is possible that not all of the capacity expansion projects under consideration will proceed as currently envisaged. Moreover, it is possible that producers will announce further closures of high-cost mining operations.

Copper is expected to trade within a range of between US\$1700 and \$1900/t through 1998 and 1999. In the longer term, copper prices are expected to trade in a range between \$2000 and \$2400/t (in constant 1997 dollars).

With the start-up of several new mines in the 1997-99 period, Canadian mine production of copper is expected to reverse the downward trend that has persisted through most of the 1990s. The additions to capacity include the Minto development in the Yukon, the Huckleberry, Kemess and Mount Polley projects in British Columbia, and the Raglan mine development in Quebec. In the longer term, a number of other Canadian projects offer significant potential for additional production capacity. These include the Casino, Fyre Lake, Kudz Ze Kayh and Wolverine prospects in the Yukon; Red Chris, Prosperity and Tulsequah Chief in British Columbia; the Mines Gaspé project in Quebec; and the Voisey's Bay property in Newfoundland/Labrador. It is expected that Canada's average mine production of copper during the first half of the next decade will exceed 850 000 t/y.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of March 31, 1998.

TARIFFS

Item No.	Description	Canada			United States	EU	Japan ¹
		MFN	GPT	USA	Canada	MFN	WTO
2603.00	Copper ores and concentrates						
2603.00.00.10	Copper content	Free	Free	Free	Free	Free	Free
2825.50	Copper oxides and hydroxides	Free	Free	Free	Free	3.2%	5.2%
28.33	Sulphates; alums; peroxosulphates (persulphates)						
	Other sulphates:						
	Of copper						
2833.25	Cupric sulphate	Free	Free	Free	Free	3.2%	4.2%
2833.25.10							
2833.25.90	Other copper sulphates	5.5%	Free	Free	Free	3.2%	4.2%
74.01	Copper mattes; cement copper (precipitated copper)						
7401.10	Copper mattes	Free	Free	Free	Free	Free	Free
7401.20	Cement copper (precipitated copper)	Free	Free	Free	Free	Free	Free
7402.00	Unrefined copper; copper anodes for electrolytic refining	Free	Free	Free	Free	Free	4.7%
74.03	Refined copper and copper alloys, unwrought						
	Refined copper:						
	Cathodes and sections of cathodes	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7403.11		Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7403.12	Wire-bars	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7403.13	Billets	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7403.19	Other	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
	Copper alloys:						
7403.21	Copper-zinc base alloys (brass)	Free	Free	Free	Free	Free	8.4 yen/kg
7403.22	Copper-tin base alloys (bronze)	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7403.23	Copper-nickel base alloys (cupro-nickel) or copper-nickel-zinc base alloys (nickel-silver)	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7403.29	Other copper alloys (other than master alloys of heading no. 74.05)	Free	Free	Free	Free	Free	8.4-14.22 yen/kg
7404.00	Copper waste and scrap	Free	Free	Free	Free	Free	Free
7405.00	Master alloys of copper	Free	Free	Free	Free	Free	4.2%
74.06	Copper powders and flakes	Free	Free	Free	Free	0.6-2.5%	4.7%
74.07	Copper bars, rods and profiles	Free-3%	Free	Free	Free	5.3%	4.1-4.7%
74.08	Copper wire	Free-3%	Free	Free	Free	5.3%	4.1-4.7%
74.09	Copper plates, sheets and strip, of a thickness exceeding 0.15 mm	Free	Free	Free	Free	5.3%	4.1-4.4%
74.10	Copper foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials) of a thickness (excluding any backing) not exceeding 0.15 mm	Free	Free	Free	Free	5.7%	4.2-4.4%
74.11	Copper tubes and pipes	2-2.5%	Free	Free	Free	5.3%	4.4-5.1%
74.12	Copper tube or pipe fittings (for example, couplings, elbows, sleeves)	3%	Free	Free	Free	5.7%	2.3%
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated	3%	Free	Free	Free	Free-5.7%	4.7%
74.14	Cloth (including endless bands), grill and netting, of copper wire; expanded metal of copper	3%	Free	Free	Free	5.2%	2-2.3%
74.15	Nails, tacks, drawing pins, staples (other than those of heading no. 83.05) and similar articles, of copper or of iron or steel with heads of copper; screws, bolts, nuts, screw hooks, rivets, cotters, cotter-pins, washers (including spring washers) and similar articles, of copper	Free-3%	Free	Free	Free	3.8-5%	2.3%
7416.00	Copper springs	3%	Free	Free	Free	5%	2.3%
7417.00	Cooking or heating apparatus of a kind used for domestic purposes, non-electric and parts thereof, of copper	3%	Free	Free	Free	Free	2.3%
74.18	Table, kitchen or other household articles and parts thereof, of copper; pot scourers and scouring or polishing pads, gloves and the like, of copper; sanitary ware and parts thereof, of copper	3%	Free	Free	Free	3.8%	2-3%
74.19	Other articles of copper	Free-9.5%	Free-5%	Free	Free	3.8%	2.3-4%

Sources: Customs Tariff, effective January 1998, Revenue Canada; Harmonized Tariff Schedule of the United States 1998; Worldtariff Guidebook on Customs Tariff Schedules of Import Duties of the European Union (37th Annual Edition: 1997); Custom Tariff Schedules of Japan, 1997.

¹ WTO rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, COPPER PRODUCTION AND TRADE, 1996 AND 1997

Item No.	1996		1997P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
SHIPMENTS¹					
Newfoundland	5 159	16 281	313	1 001	
New Brunswick	12 431	39 233	13 185	42 127	
Quebec	130 029	410 372	126 002	402 578	
Ontario	221 341	698 551	235 479	752 354	
Manitoba	53 707	169 500	51 767	165 395	
British Columbia	229 831	725 348	219 731	702 040	
Total	652 499	2 059 285	646 477	2 065 493	
Refinery output	559 200	..	559 233	..	
EXPORTS					
2603.00.10	Copper ores and concentrates				
	Copper content				
	Japan	265 284	379 991	311 246	364 526
	China	31 101	43 753	66 668	68 262
	Philippines	34 402	31 333	55 296	50 963
	Korea, Republic of	38 635	49 884	46 943	45 918
	Mexico	10 499	10 332	10 499	10 974
	Peru	3 899	13 924	1 456	2 780
	Other countries	2 380	5 518	426	941
Total		386 200	534 735	492 534	544 364
2604.00.00.10,	Other ores and concentrates				
2607.00.00.10,	Copper content				
2608.00.00.10,	Korea, Republic of	-	-	3 507	4 129
2616.10.00.10	Belgium	-	-	1 842	2 346
	France	-	-	481	584
	Finland	5 048	5 642	-	-
	Other countries	15	49	2	3
Total		5 063	5 691	5 832	7 062
2620.30	Copper ash and residues				
	United States	274	675	227	396
Total		274	675	227	396
2825.50	Copper oxides and hydroxides				
	United States	2	10	5	4
Total		2	10	5	4
2833.25	Copper sulphates				
	United States	4 239	5 253	3 421	4 794
	China	-	-	20	27
Total		4 239	5 253	3 441	4 821
7401.10	Copper mattes				
	Norway	15 988	48 966	16 073	48 619
	United Kingdom	2 326	8 685	1 108	3 553
	Peru	...	5	-	-
Total		18 314	57 656	17 181	52 172
7402.00	Copper anodes				
	United States	80 083	320 810	74 848	304 440
	Other countries	1	4	16	38
Total		80 084	320 814	74 864	304 478

TABLE 1 (cont'd)

Item No.		1996		1997p	
		(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)					
7403.11 to 7403.19	Refined copper and copper alloys, unwrought				
	United States	278 284	951 280	284 899	936 441
	United Kingdom	53 056	174 805	48 104	118 218
	Colombia	14 032	57 710	15 400	64 447
	France	11 559	39 564	12 731	40 607
	Saudi Arabia	6 300	20 976	5 799	18 811
	Taiwan	6 432	20 642	4 752	13 307
	Sweden	3 713	12 135	3 783	11 634
	Italy	5 445	18 270	3 527	11 217
	Other countries	5 517	18 958	2 216	8 173
	Total	384 338	1 314 340	381 211	1 222 855
7403.21 to 7403.29	Other copper alloys				
	United States	449	1 726	395	1 431
	Other countries	138	229	—	—
	Total	587	1 955	395	1 431
7404.00	Copper waste and scrap				
	United States	98 428	242 218	111 171	263 590
	Hong Kong	4 776	9 845	3 816	5 909
	India	3 115	4 149	2 791	4 180
	Japan	1 234	2 856	1 568	2 459
	Korea, Republic of	374	854	606	1 358
	China	1 412	2 145	942	1 192
	Italy	734	1 466	463	838
	Other countries	3 171	2 723	3 935	2 428
	Total	113 244	266 256	125 292	281 954
7405.00	Master alloys of copper				
	United States	1 083	1 646	340	513
	Taiwan	1	11	—	—
	Total	1 084	1 657	340	513
7406.10, 7406.20	Copper powders and flakes				
	United States	58	635	313	1 674
	Taiwan	60	620	62	588
	Other countries	109	760	42	361
	Total	227	2 015	417	2 623
7407.10 to 7407.29	Copper and copper alloy rods and profiles				
	United States	9 281	43 471	10 010	46 300
	Ireland	848	3 234	183	699
	Colombia	519	2 134	—	—
	Other countries	44	308	—	—
	Total	10 692	49 147	10 193	46 999
7408.11 to 7408.29	Copper and copper alloy wire				
	United States	54 621	186 020	51 621	177 381
	Cuba	4	38	9	32
	Germany	3	33	5	29
	Korea, Republic of	36	306	—	—
	Kuwait	30	227	—	—
	Other countries	56	148	15	65
	Total	54 750	186 772	51 650	177 507

TABLE 1 (cont'd)

Item No.	1996		1997p		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
EXPORTS (cont'd)					
7409.11 to 7410.22	Copper and copper alloy plates, sheets, strip and foil				
	United States	10 187	56 234	10 370	56 988
	Saudi Arabia	1 069	5 848	1 187	5 618
	United Kingdom	561	2 326	568	2 269
	India	147	678	283	1 314
	Phillipines	36	196	285	1 278
	Other countries	1 234	7 175	984	5 489
	Total	13 234	72 457	13 677	72 956
7411.10 to 7411.29	Copper and copper alloy tubes and pipes				
	United States	16 834	97 176	17 185	101 065
	Israel	824	3 813	435	1 990
	Chile	—	—	45	307
	Ireland	—	—	45	190
	Netherlands	37	195	26	184
	Other countries	107	639	109	583
	Total	17 802	101 823	17 845	104 319
7412.10, 7412.20	Copper and copper alloy tube and pipe fittings				
	United States	..	16 117	..	16 500
	Germany	..	3 921	..	5 546
	Spain	..	2 934	..	3 935
	United Kingdom	..	3 369	..	2 907
	France	..	417	..	1 463
	Sweden	..	1 332	..	1 425
	Greece	..	1 921	..	585
	Other countries	..	3 557	..	2 456
	Total	..	33 568	..	34 817
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated				
	United States	52	226	114	518
	Other countries	85	911	7	42
	Total	137	1 137	121	560
7414.10, 7414.90, 7415.10 to 7415.39, 7419.10 to 7419.99	Copper, other items of				
	United States	..	27 149	..	25 848
	China	..	574	..	3 282
	Saudi Arabia	..	810	..	44
	Other countries	..	1 596	..	947
	Total	..	30 129	..	30 121
IMPORTS²					
2603.00.00.10	Copper ores and concentrates				
	Copper content				
	United States	83 035	158 754	80 852	134 296
	Chile	32 854	77 800	16 948	31 784
	Portugal	3 957	13 096	10 886	24 606
	Indonesia	5 656	14 500	3 273	14 708
	Switzerland	—	—	6 183	13 570
	Bulgaria	3 753	9 272	9 938	12 210
	Zambia	—	—	1 408	4 908
	Other countries	5 501	11 140	8 879	11 690
	Total	134 756	284 562	138 367	247 772

TABLE 1 (cont'd)

Item No.	1996		1997P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS (cont'd)					
2604.00.00.10,	Other ores and concentrates				
2607.00.00.10,	Copper content				
2608.00.00.10,	United States	443	911	910	1 401
2616.10.00.10	Mexico	225	642	132	347
	Peru	66	140	4	11
	Other countries	1	2	-	-
	Total	735	1 695	1 046	1 759
2620.30	Copper ash and residues				
	United States	15 583	22 887	22 916	39 434
	Sweden	-	-	6 844	5 806
	Finland	2 507	1 063	1 820	1 143
	United Kingdom	408	2 366	79	717
	Australia	19 640	19 998	-	-
	Other countries	1 044	998	624	502
	Total	39 182	47 312	32 283	47 602
2825.50	Copper oxides and hydroxides				
		1 187	4 079	1 655	5 108
2833.25	Copper sulphates				
		9 574	10 552	12 595	13 124
7401.10	Copper mattes				
		10 964	30 747	8 802	22 039
7402.00	Copper anodes				
		17 506	55 757	27 341	83 350
7403.11 to 7403.19	Refined copper and copper alloys, unwrought Refined copper				
	Total	28 700	94 138	22 398	70 414
7403.21 to 7403.29	Refined copper and copper alloys, unwrought Other copper alloys				
	Total	5 284	17 348	6 790	21 678
7404.00	Waste and scrap, copper or copper alloy				
	United States	146 498	295 260	159 572	311 876
	Finland	507	1 151	4 231	14 079
	Bulgaria	-	-	1 974	7 322
	Russia	2 325	1 952	5 496	5 087
	Other countries	3 974	7 314	1 596	3 388
	Total	153 304	305 677	172 869	341 752
7405.00	Master alloys of copper				
		79	364	100	429
7406.10, 7406.20	Copper powders and flakes				
	Total	1 764	10 215	1 534	8 416
7407.10 to 7407.29	Bars, rods and profiles of refined copper				
	United States	26 251	96 789	31 462	112 426
	Poland	2 494	6 957	3 249	7 524
	Turkey	1 313	3 532	2 578	7 273
	Germany	274	1 340	333	1 521
	France	219	754	278	990
	Other countries	1 134	5 062	1 128	4 658
	Total	31 685	114 434	39 028	134 392
7408.11 to 7408.29	Copper and copper alloy wire				
	Total	18 295	73 081	25 407	96 261

TABLE 1 (cont'd)

Item No.	1996		1997P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS (cont'd)					
7409.11 to 7409.90, 7410.11 to 7410.22	Copper and copper alloy plates, sheets, strip and foil Total	24 836	142 592	31 770	188 517
7411.10	Pipes and tubes, refined copper	7 900	36 722	8 692	39 025
7411.21	Pipes and tubes, copper-zinc base alloy	3 545	23 495	3 763	23 557
7411.22	Pipes and tubes, copper-nickel base alloy or copper-nickel-zinc base alloy	324	2 297	441	3 328
7411.29	Plates and tubes, copper alloy, n.e.s.	910	4 969	1 136	6 122
7412.10	Fittings, pipe or tube, of refined copper	310	4 456	386	6 502
7412.20	Fittings, pipe or tube, copper alloy	3 495	44 434	3 895	53 874
7413.00	Stranded wire, cable, plaited bands and the like, of copper, not electrically insulated	3 248	15 649	3 804	18 439
7414.90	Cloth, grill and netting of copper wire and expanded metal of copper	134	691	110	425
7415.10	Nails, tacks, drawing pins, staples and similar articles of copper or of iron or steel with copper heads	83	536	90	595
7415.21	Washers, copper, including spring washers	207	1 335	302	1 828
7415.29	Articles of copper, not threaded, n.e.s., similar to those of headings 7415.10 and 7415.21	292	1 829	304	1 685
7415.31	Screws, copper, for wood	22	106	154	298
7415.32	Screws, bolts and nuts of copper, excluding wood screws	718	4 648	951	4 385
7415.39	Articles of copper, threaded, n.e.s., similar to bolts, nuts and screws	439	2 722	793	4 208
7416.00	Copper springs	..	331	..	398
7419.10	Chain and parts thereof of copper	90	655	124	920
7419.91	Articles of copper, not further worked than cast, moulded, stamped or forged	993	7 351	1 752	14 877
7419.99	Articles of copper, n.e.s.	..	35 549	..	37 745

Sources: Natural Resources Canada; Statistics Canada.

– Nil; .. Not available or not applicable; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; P Preliminary.

1 Anode copper recovered in Canada from domestic concentrates plus exports of payable copper in concentrate and matte.

2 Imports from "other countries" may include re-imports from Canada.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, COPPER PRODUCTION, TRADE¹ AND CONSUMPTION, 1975, 1980 AND 1985-97

	Production		Concentrates and Matte	Exports		Imports Refined	Consumption ³ Refined
	Shipments ²	Refinery Output		Refined	Total		
	(tonnes)						
1975	733 826	529 197	314 518	320 705	635 223	10 908	196 106
1980	716 363	505 238	286 076	335 022	621 098	13 466	208 590
1985	738 637	499 626	320 619	280 033	600 652	19 131	222 466
1986	698 527	493 445	341 390	306 822	648 212	20 901	225 586
1987	794 149	491 124	381 126	288 800	669 926	16 583	231 288
1988	758 478	528 723	348 404	268 680	617 084	4 659	236 280
1989	704 432	515 216	348 739	321 690	670 429	4 408	213 046
1990	771 433	515 835	374 875	335 941	710 816	2 611	180 605
1991	780 362	538 339	348 080	377 985	726 065	2 321	159 170
1992	761 694	539 302	346 842	385 761	732 603	8 916	156 132
1993	709 650	561 580	319 840	408 364	728 204	21 155	185 565
1994	590 784	549 869	237 554	388 568	626 122	19 593	199 349
1995	700 843	572 616	274 457	409 361	683 818 ^r	24 312	189 686
1996	652 499	559 200	409 577	384 338	793 915	28 700	218 280
1997 ^p	646 477	559 233	515 547	381 211	896 758	22 398	224 607

Sources: Natural Resources Canada; Statistics Canada.

^p Preliminary; ^r Revised.

¹ Beginning in 1988, Exports and Imports are based on the new Harmonized System and may not be in complete accordance with previous method of reporting. ² From 1975 to 1988, anode copper recovered in Canada from domestic concentrate plus exports of payable copper in concentrates and matte. Starting in 1989 to date, recoverable copper in concentrate shipped. ³ Producers' domestic shipments of refined copper plus imports of refined shapes.

TABLE 3. WORLD MINE PRODUCTION OF COPPER, 1996 AND 1997

	1996	1997 ^p
	(000 t)	
Australia	547	569
Canada	688	658
Chile	3 116	3 392
China	439	426
Indonesia	526	535
Kazakstan	238	314
Mexico	341	354
Papua New Guinea	187	119
Peru	468	491
Poland	422	414
Russia	523	520
South Africa	188	186
United States	1 918	1 926
Zambia	334	351
Other	1 109	1 096
Total	11 044	11 351

Source: International Copper Study Group.

^p Preliminary.

TABLE 4. WORLD REFINERY PRODUCTION OF COPPER, 1996 AND 1997

	1996	1997 ^P
	(000 t)	
Australia	311	295
Belgium/Luxembourg	354	378
Brazil	172	176
Canada	559	560
Chile	1 748	2 117
China	1 119	1 230
Germany	671	674
Japan	1 251	1 280
Kazakstan	267	303
Korea, Republic of	244	264
Mexico	211	254
Peru	338	385
Philippines	156	147
Poland	425	441
Russia	570	580
Scandinavia	272	273
Spain	264	278
United States	2 341	2 435
Zambia	334	339
Other	1 014	1 054
Total	12 621	13 513

Source: International Copper Study Group.
^P Preliminary.

TABLE 5. WORLD REFINED COPPER CONSUMPTION, 1996 AND 1997

	1996	1997 ^P
	(000 t)	
Belgium/Luxembourg	356	360
Brazil	235	257
Canada	218	225
China	1 310	1 324
France	528	541
Germany	1 055	1 071
Italy	504	519
Japan	1 479	1 441
Korea, Republic of	578	635
Poland	225	234
Russia	160	165
Scandinavia	254	277
Spain	191	203
Taipei, China	545	593
United Kingdom	396	408
United States	2 622	2 784
Other	2 210	2 386
Total	12 612	13 146

Source: International Copper Study Group.
^P Preliminary.

TABLE 6. COPPER AND COPPER-NICKEL SMELTERS IN CANADA, 1997

Company and Location	Product	Rated Annual Capacity ¹	Feed Material	Remarks
		(000 tonnes)		
Falconbridge Limited Falconbridge, Ontario	Copper-nickel matte	23	Nickel-copper concentrates	Copper-nickel concentrate processed in fluid bed roasters and an electric furnace; 1800-t/d sulphuric acid plant treats roaster gases. Matte from the smelter is refined in Norway.
Inco Limited Sudbury, Ontario	Molten "blister" copper, nickel sulphide and nickel sinter for the company's refineries; nickel oxide sinter for market, soluble nickel oxide for market	135	Bulk nickel-copper concentrates, scrap	Oxygen flash-smelting of copper sulphide concentrate. Copper converters produce blister copper. Oxygen flash furnace for smelting of nickel-copper concentrate; converters for production of nickel-copper Bessemer matte. Production of matte followed by matte treatment, flotation, separation of copper and nickel sulphides, then by roasting to make nickel oxides for refining and marketing. Oxygen flash conversion of copper sulphide to semi-blister followed by pyrorefining to blister copper.
Falconbridge Limited Timmins, Ontario	Molten "blister" copper	128	Copper concentrates, scrap	Mitsubishi-type smelting, separation and converting furnaces. Hazelett continuous cast anodes. Incremental expansion under way.
Noranda Inc. Horne smelter Rouyn-Noranda, Quebec	Copper anodes	200	Copper concentrates, scrap	One continuous Noranda process reactor, five converters and an acid plant.
Noranda Inc. Gaspé smelter Murdochville, Quebec	Copper anodes	110	Copper concentrates	Green charge reverberatory furnace, two converters, one rotary anode furnace and an acid plant. Additional converter being installed.
Hudson Bay Mining and Smelting Co., Limited (HBMS) Flin Flon, Manitoba	Copper anodes	85	Copper concentrates	Five roasting furnaces, one reverberatory furnace and two converters. Project to replace concentrate roasting and calcine smelting with Noranda continuous converter technology has been postponed.

Source: Data were provided by the companies listed.

¹ Copper in matte, blister and anode.

TABLE 7. COPPER REFINERIES IN CANADA, 1997

Company and Location	Rated Annual Capacity	Remarks
	(tonnes)	
Noranda Inc. CCR Division Montréal-Est, Quebec	365 000	Refines anodes from Noranda's Horne and Gaspé smelters, and also from purchased scrap and anode scrap. Precious metals, selenium and tellurium are recovered from slimes.
Inco Limited Copper Cliff, Ontario	175 000	Cast and refines anodes from molten converter copper from the Copper Cliff smelter, and also refines purchased scrap. Gold, silver, selenium and tellurium cake are recovered from anode slimes. Recovers and electrowins copper from Copper Cliff nickel refinery residue.
Inco Limited Copper Cliff, Ontario	15 000	Electrowinning plant processes copper-bearing fluids.
Falconbridge Limited Timmins, Ontario	114 000	Refines anodes from the Kidd Creek smelter. Incremental expansion is under way.
Gibraltar Mines Limited McLeese Lake, British Columbia	2 000	Dissolved copper-in-solution from heap leaching operations is treated in a solvent extraction plant and then electrowinned to produce copper cathode.

Source: Data were provided by the companies listed.

TABLE 8. U.S. SUPPLY OF WIRE MILL, BRASS MILL, FOUNDRY AND POWDER PRODUCTS, AND THEIR CONSUMPTION IN END-USE MARKETS, 1995 AND 1996

United States	1995	1996 ^p
	(000 t)	
SUPPLY		
Domestic mill products		
Building wire	521	532
Magnet wire	305	297
Telecommunications cable	191	189
Power cable	131	135
Automotive wire and cable	122	131
Electronic wire and cable	111	114
Other wire and cable	220	227
Strip, sheet, plate and foil	505	529
Rod and bar	478	497
Tube and pipe	723	799
Mechanical wire	40	43
Foundry products	174	165
Powder products	21	21
Total, domestic mill products	3 312	3 420
Imported mill products	33	23
Total supply	3 344	3 443
USES		
Building construction	1 367	1 466
Electrical/electronic products	805	824
Industrial machinery/equipment	428	413
Transportation equipment	406	417
Consumer and general products	338	323
Total	3 344	3 443

Source: Copper Development Association Inc.

^p Preliminary.

Note: Numbers may not add to totals due to rounding.

**TABLE 9. YEARLY AVERAGE
COPPER PRICES,¹ 1980-97**

Year	LME
(current US¢/lb)	
1980	99.0
1981	79.0
1982	67.1
1983	72.1
1984	62.5
1985	64.3
1986	62.3
1987	80.9
1988	117.9
1989	128.9
1990	121.0
1991	106.2
1992	103.7
1993	86.8
1994	104.7
1995	132.9
1996	104.1
1997	103.2

Source: International Copper Study Group.

¹ Settlement price for highest grade of copper sold.

TABLE 10. MONTHLY AVERAGE COPPER PRICES, 1996 AND 1997

	LME ¹		COMEX ²	
	1996	1997	1996	1997
(current US¢/lb)				
January	118.6	110.4	118.1	108.3
February	115.1	109.1	116.7	110.2
March	116.1	109.8	118.2	114.8
April	117.7	108.4	119.3	110.0
May	120.5	114.0	123.3	115.3
June	98.5	118.5	104.5	117.6
July	90.0	111.1	90.7	109.9
August	91.1	102.1	92.1	102.1
September	88.0	95.6	90.5	95.1
October	88.9	93.1	93.5	93.1
November	101.2	87.0	100.8	87.6
December	102.8	79.9	102.8	79.3

Source: International Copper Study Group.

¹ LME cash price for Grade A copper. ² COMEX First Position Grade A price.