

Canadian Reserves of Selected Major Metals, and Recent Production Decisions

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RESERVES OF SELECTED MAJOR METALS

In 2000, Canadian reserves of copper, nickel, lead, zinc, molybdenum, silver and gold decreased because there were no decisions to bring new mines into production and the amount of new ore discovered at existing mining operations was insufficient to replace the quantity of ore that was mined during the year (Table 1). This continued a trend of declining ore reserves that began in the early 1980s for base metals and in the late 1980s for gold. During 2000, improving prices for copper, nickel and zinc were overwhelmed by deteriorating prices for lead, molybdenum and silver, together with the stagnant price of gold.

In Canada during 2000, there were no announcements of new production decisions for the seven metals reviewed in this chapter. Given that metal prices were generally depressed during 2001, it is probable that Canadian ore reserve levels for the major metals will continue to decline in the immediate future. The Voisey's Bay nickel-copper-cobalt deposit in Labrador is not presently included in Canadian reserves because there are major issues to be resolved before production can begin. When a production decision is made, it will result in significant increases in the reserves of nickel and copper.

Reserves Policy

Canadian reserves are estimated from information contained in annual and other corporate reports, and from the responses of mining companies to the annual Federal-Provincial Survey of Mines and Concentrators.

Reserves reported here include only metal contained in material that is classified by companies as "proven" or "probable" (or their equivalents) at producing mines and in deposits that are firmly committed to production (Table 2). Metal contained in mineral resources classified by companies as "possible" (or its equivalents) is not included in national totals, nor is metal contained in deposits that have not advanced beyond the deposit appraisal phase (Figure 1). When available, only metal contained in mineable ore is included in Canadian totals to exclude losses inherent in the mining process. Every effort is made to achieve, from year to year, consistency in the reserves reported here; however, consistency ultimately depends on industry practice, which has evolved over the years. Imperial units reported by companies have been converted to metric units and the results have been rounded to the appropriate number of significant digits.

Reserves by Commodity

Gold

There were 1142 t of gold contained in Canadian mine reserves in December 2000. This represents a decrease of 14% (183 t) compared to December 1999. The major components of this decrease were the exhaustion of the Brewery Creek mine in the Yukon, the Golden Bear mine in British Columbia, and the Keystone mine in Manitoba, together with the depletion of reserves without sufficient replacement at most of the other gold mines in Canada. The only notable increase in gold reserves was reported at the Red Lake mine (+21 t) in Ontario.

Silver

There were 13 919 t of silver contained in Canadian mine reserves in December 2000. This represents a decrease of 9% (1451 t) compared to December 1999. The major components of this decrease were the closure of the Brewery Creek mine in the Yukon and the Keystone mine in Manitoba, together with the depletion without sufficient replacement of reserves at most of the silver-producing mines in Canada. None of the silver-producing mines reported significant increases in their reserves during 2000.

Figure 1
Generalized Model of the Mineral Resource Development and Mining Process

| PHASE | MINERAL RESOURCE ASSESSMENT | MINERAL EXPLORATION | | | | | MINERAL DEPOSIT APPRAISAL | | | | MINE COMPLEX DEVELOPMENT | MINE PRODUCTION | ENVIRONMENTAL RESTORATION |
|--|---|--|--|---|---|---|---|---|--|--|--|---|--|
| | | GRASSROOTS EXPLORATION | | | | | DA-1 | DA-2 | DA-3 | DA-4 | | | |
| | MRA | EX-1 | EX-2 | EX-3 | EX-4 | EX-5 | | | | | | | |
| STAGE | Various surveys, research and synthesis. | Exploration planning. | Regional reconnaissance and surveys. | Prospecting and ground surveys of anomalies. | Verification of anomalies and showings. | Discovery and delimitation of a mineral deposit. | Mineral deposit definition. | Project engineering. | Project economics. | Feasibility study, production decision. | Mine development, construction of processing plant and infrastructure. | Production, marketing and renewal of reserves. | Mine complex closure and decommissioning, site restoration. |
| OBJECTIVES | Supply information and tools required to develop the mineral potential of the nation for economic benefit, in the perspective of sustainable development. | Select target commodities. Establish exploration objectives and strategies. Select target areas and sites. Acquire claims or permits if appropriate. | Seek anomalies of interest over wide areas by various survey methods. Select the more promising targets. Acquire claims or permits. | Confirm the presence, exact location and characteristics of anomalies. Acquire claims, leases and properties. | Investigate the cause of anomalies. Find mineral showings. Acquire additional claims, leases and properties. | Discover, delimit and interpret grade, quality and tonnage of a new mineral deposit. Determine if it constitutes a mineral resource of "potential economic interest" to justify more intensive and detailed work. | Define the limits, controls and internal distribution of grades, mineralogy and mineral processing characteristics of the deposit. Acquire all data required for project engineering and cost estimation. | Determine, in an iterative fashion, the design, plans, schedules, capital cost and operating cost estimates for all aspects of the project. Establish technical feasibility and costs thoroughly and realistically. | Obtain all the information required and determine, based on corporate objectives, parameters for the economic, financial and social-political evaluation of the project. | Diligently validate and integrate project data, interpretations, estimations, plans and evaluations to achieve MCD and production objectives. Decide on whether to undertake the mining project. Obtain permits and financing. | Complete mine development and construction on schedule and within budgets and specifications. Ensure efficient and timely mine complex start-up according to schedule, specifications and cash flow forecasts. | Achieve commercial production on schedule and meet cash flow forecasts and quality specifications. Achieve mine profitability and company survival in the perspective of sustainable development. | Restore mine site, outside plant and infrastructure to environmentally acceptable condition. Ensure the future quality of the environment. |
| EVALUATION METHODS | Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes, universities and industry. | Metal and mineral market research. Review of geological and ore deposit information and of the legal, fiscal and socio-political context in various areas. | Remote sensing, aerial photography and airborne geophysics. Prospecting, geology and geochemistry. Appraisal, rating and selection of anomalies. | Ground, geological, geochemical and geophysical prospecting and surveys. Compilation, appraisal and selection of significant anomalies. | Geological mapping and other surveys. Trenching, drilling and sampling. Appraisal of results, recommendations for further work, and selection of new targets. | Stripping, trenching, mapping, sampling, drilling and down-hole geophysics. Initial mineral processing tests. Environmental and site surveys. Mineral resource estimation and inventory. | Detailed mapping, sampling and drilling on surface or from underground. Systematic mineralogy and mineral processing tests. Detailed environmental and site surveys. Pre-feasibility studies. | Pilot tests, engineering design and planning. Capital and operating costs for mining, mineral processing, infrastructure, environmental protection and restoration. Technical risk analysis. Pre-feasibility studies. | Market, prices, product development and financial studies. Environmental, economic, financial, and socio-political risk analysis. Pre-feasibility studies. | Exhaustive due diligence review of all data, interpretations, plans and estimates. Evaluation of profitability, given the geological, technical, financial and qualitative risks, and the up-side factors. | Project management methods in a quality assurance perspective. Training program for personnel and detailed start-up plan to meet the requirements of this demanding period. | Production management methods to ensure continuous quality and efficiency improvements. Exploration, deposit appraisal and development of new zones or deposits on-mine-site and off-mine-site. | Mine closure and decommissioning. Environmental restoration and monitoring. |
| RESULTS | Maps, data bases, tools and models. | Exploration projects. | Regional anomalies. | Local anomalies. | Mineral showings. | Mineral deposit. | Deposit appraisal project. | | | Mining project. | Mining complex. | Mineral production. | Restored site. |
| MINERAL INVENTORY | UNDISCOVERED MINERAL POTENTIAL | | | | | INFERRED RESOURCE | DELIMITED MINERAL RESOURCE | | | | MINERAL RESERVE | | |
| | SPECULATIVE | | HYPOTHETICAL | | | | INDICATED | INDICATED AND MEASURED | | | PROVEN AND PROBABLE | | |
| ESTIMATION ERROR (targeted margin of error of tonnage/grade estimates at the 90% confidence level) | | | | | | ± 100% | ± 50% | Indicated: ± 50 to ± 30% Measured: ± 20 to ± 10% (often several sample grid dimensions are used in each category) | | | Proven (feasibility: ± 10%; mining: ± 5%) | | |
| INVESTMENTS | Moderate | Low, but increasing multiple investments. | | | | | Larger and increasing multiple investments. | | | | Very large industrial investment. | | Full compliance |
| RISK LEVEL | Low | Very high, but decreasing risk of failure and financial loss. | | | | | High, but decreasing risk of failure. | | | | Moderate to low industrial risk. | | |

Sources: Modified by D.A. Cranstone, A. Lemieux and M. Vallée, February 25, 1994, from M. Vallée, 1992, Guide to the Evaluation of Gold Deposits, CIM Special Volume 45, p. 4, and SOQUEM Annual Report, 1976-77, pp. 4 and 5. Revised by M. Vallée and G. Bouchard, January 2001.

Zinc

During 2000, Canadian reserves of zinc declined by about 1.3 Mt (13%) to a year-end total of about 8.9 Mt. Zinc reserves decreased at almost all of the zinc producers. The only zinc mines to report an increase in ore reserves during 2000 were the Trout Lake and Chisel Lake North mines in Manitoba.

Lead

Canadian reserves of lead decreased by approximately 17% during 2000 to 1 315 000 t. This was largely because of the production without replacement of ore at the Brunswick No. 12 mine (-155 000 t) in New Brunswick, at the Sullivan mine (-94 000 t) in British Columbia, and the cessation of lead production at the Kidd Creek mine in Ontario.

Copper

In December 2000, Canadian reserves of copper were estimated at about 7.4 Mt, or down by about 4% (-345 000 t) from a year earlier. Copper reserves were reduced at the Louvicourt mine in Quebec (-70 000 t) and at the Mount Polley mine (-63 000 t) in British Columbia. Copper reserves were increased slightly at the Highland Valley Copper mine (+17 000 t) in British Columbia.

Molybdenum

Canadian reserves of molybdenum stood at 97 000 t in December 2000, or about 18% lower than in the previous year. This was principally due to the reduction of reserves at the Highland Valley Copper mine (-19 000 t). All of the molybdenum mines are in British Columbia.

Nickel

In December 2000, there were some 4.8 Mt of nickel contained in Canadian mine reserves, down by approximately 4% from 1999 levels. This decrease is due largely to reduced reserves at Inco Limited's Ontario Division (-138 000 t).

Inco had some 3.9 Mt of nickel in Canadian reserves at the end of 2000, or about 81% of the national total. It is expected that development of the copper-nickel-cobalt deposits at Voisey's Bay in Labrador will make major additions to Canada's mineable reserves of these metals in the near future.

Canadian Reserves by Province and Territory

Four provinces (Ontario, British Columbia, New Brunswick and Quebec) held dominant positions in terms of Canada's proven and probable mineable reserves of major metals in December 2000 (Table 4).

Ontario had 69% of the nickel, 52% of the gold and 50% of the copper, plus 21% of the silver and 19% of the zinc.

British Columbia had 100% of the molybdenum, 33% of the copper and 27% of the silver, plus 4% of the lead, 7% of the zinc and 16% of the gold.

New Brunswick had 85% of the lead, 32% of the zinc and 24% of the silver, plus 2% of the copper.

Quebec had 26% of the zinc, 23% of the gold, 8% of the copper, 12% of the nickel and 23% of the silver.

Manitoba had 20% of the nickel, 13% of the zinc and 6% of the gold, plus 7% of the copper and 4% of the silver.

Newfoundland and Labrador had less than 1% of the gold.

The Northwest Territories had 1% of the gold.

Nunavut had 4% of the lead, 4% of the zinc, 1% of the gold and less than 1% of the silver.

Canadian Reserves by Industry

Canadian mines are, to a large extent, polymetallic, a complexity that the Standard Industrial Classification (SIC) tends to oversimplify (Table 5).

Current mine reserves of gold in Canada are distributed through the various SIC classes as follows: gold mines, 81%; copper and copper-zinc mines, 15%; nickel-copper mines, 3%; and zinc-lead-silver mines, 1%.

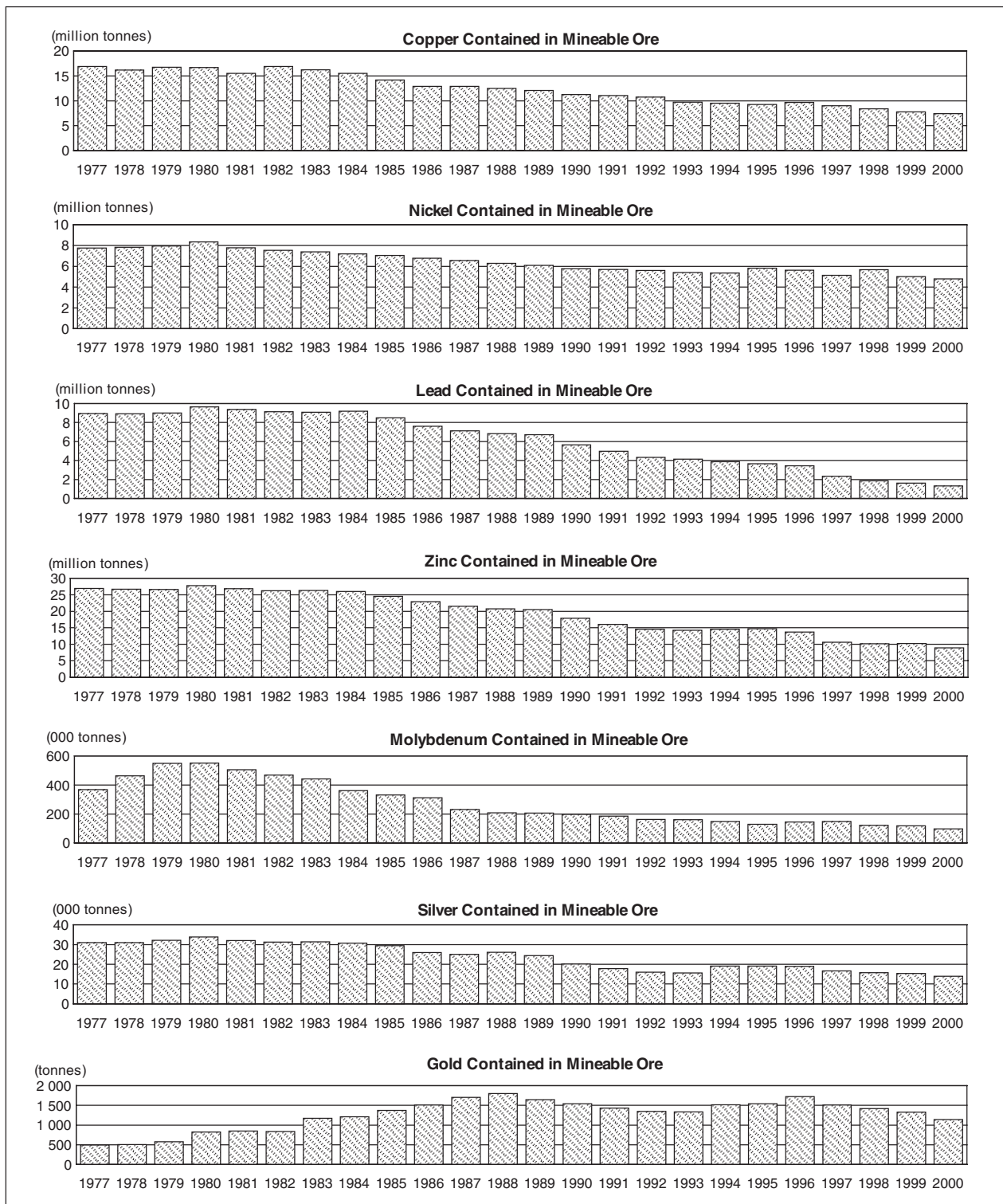
Current mine reserves of silver in Canada are distributed through the various SIC classes as follows: gold mines, 38%; copper and copper-zinc mines, 28%; nickel-copper mines, 8%; and zinc-lead-silver mines, 26%.

Current mine reserves of copper in Canada are distributed through the various SIC classes as follows: gold mines, 2%; copper and copper-zinc mines, 52%; nickel-copper mines, 44%; and zinc-lead-silver mines, 2%.

Current mine reserves of molybdenum in Canada are contained in the SIC classes as follows: copper and copper-zinc mines, 24%; and molybdenum mines, 75%.

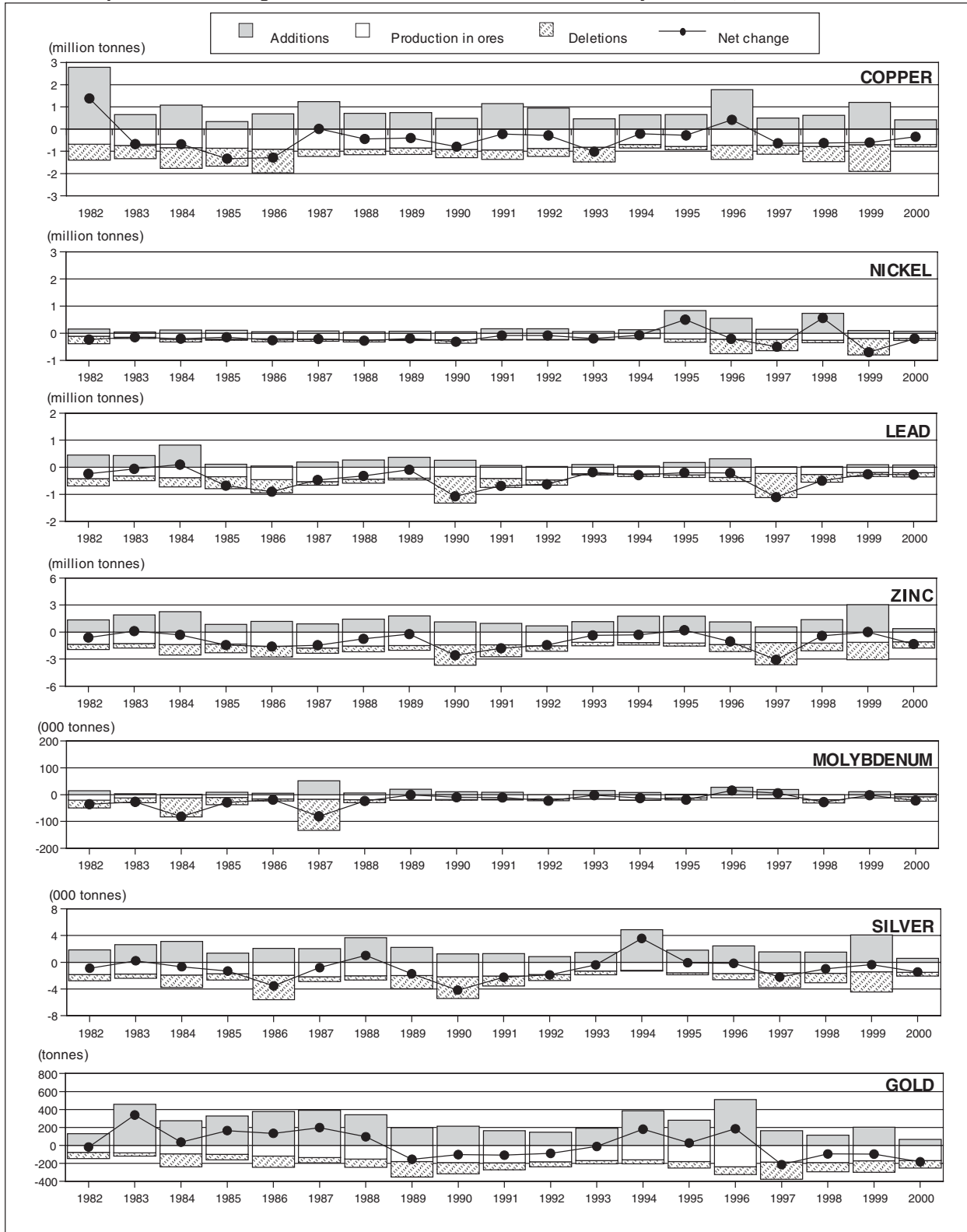
Current mine reserves of nickel in Canada are contained 99% in the SIC class of nickel-copper mines and 1% in the SIC class of miscellaneous metal mines.

Figure 2
Canadian Reserves of Selected Major Metals, 1977-2000
 Metal Contained in Proven and Probable Mineable Ore in Operating Mines and Deposits Committed to Production, as at December 31 of Each Year



Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.
 Note: This series was revised during 1996.

Figure 3
Main Components of Change in Canadian Reserves of Selected Major Metals, 1982-2000



Source: Natural Resources Canada.

Current mine reserves of lead in Canada are contained in the SIC classes as follows: copper and copper-zinc mines, 7%; and zinc-lead-silver mines, 93%.

Current mine reserves of zinc in Canada are contained in the SIC classes as follows: gold mines, 15%; copper and copper-zinc mines, 45%; and zinc-lead-silver mines, 40%.

Apparent Life of Canadian Reserves

The apparent life (life index) of mine reserves is usually calculated by dividing the total amount of metals remaining in mine reserves at the end of a given year by the corresponding amount of metals contained in the ores produced during that year. Similar calculations are often applied at the national level.

At the national level, life indices are but a very rough measure of the expected life of aggregate mine reserves and they are often misleading unless abnormal situations are recognized. Life indices based on proven and probable reserves do not make allowances for inferred extensions to reserves at current mines, gross additions that will accrue to current reserves from the likely development, in the foreseeable future, of known orebodies for which a production decision has yet to be made, or expected changes in production rates. Furthermore, life indices tend to overstate the apparent life of reserves when, for example, annual production is abnormally low due to strikes, cutbacks or suspensions at large establishments, or when significant increases in capacity resulting from new production decisions will be coming on stream, but only several years hence.

The apparent life indices for the major metals in Canada at the end of 2000 were 24 years for nickel, 12 years for molybdenum, 11 years for copper, 9 years for silver, 8 years for zinc, 7 years for gold and 7 years for lead.

Reserve Trends

Figure 2 and Table 6 show how Canadian reserves of copper, nickel, lead, zinc, molybdenum and silver have declined since the early 1980s. In contrast, gold reserves increased substantially until 1988 before beginning to decline. At the end of 2000, Canadian reserves of copper, nickel, lead, zinc, molybdenum, and silver were all lower than at any time since Natural Resources Canada began keeping records (1977), and reserves of gold were lower than in any year since 1982.

The annual aggregate change in Canadian reserves is the net result of three main factors affecting individ-

ual mines (Figure 3): additions to reserves, deletions to reserves, and production. Additions to reserves are the result of new discoveries; of new geological, metallurgical, production or other information; of a decrease in production costs; or of a rise in commodity prices, all of which increase the quantity of mineral resources that are profitable to mine. Deletions to reserves are the result of new geological, metallurgical, production or other information; of increases in costs; or of decreases in commodity prices, all of which reduce the quantity of mineral resources previously counted in mine reserves that are now expected to be mined at a profit. Production is normally the main factor reducing the reserves at individual mines but, in 2000, low metal prices were a significant factor in the reduction of ore reserves at producing mines.

RECENT PRODUCTION DECISIONS

Several criteria need to be met for a project to be considered here to have reached the production decision stage. In general, there needs to have been a positive production feasibility study, all of the necessary permits must have been obtained, financing must have been arranged, and directors must have approved construction.

During 2000, there were no new production decisions for deposits of copper, nickel, lead, zinc, molybdenum, silver or gold.

Inco Limited's Voisey's Bay deposit in Labrador is poised for a production decision, but it is not included as a 2001 production decision because not all of the necessary permits and agreements were in place at that time.

OUTLOOK

Given that the only new production decision during 2001 was the Hammerdown mine (6 t of gold) in Newfoundland and Labrador and that prices of most of the metals covered in this chapter remained low during 2001, it is probable that mine reserves of precious metals and base metals will decline further during 2001.

At the Voisey's Bay nickel-copper-cobalt deposit, Inco has established proven reserves of 31 Mt grading 2.9% nickel, 1.7% copper and 0.14% cobalt. If these figures are confirmed and the obstacles to production are resolved, Voisey's Bay will increase Canada's nickel reserves by 899 000 t (about 19% of present reserves) and the reserves of copper by 527 000 t (about 7% of present reserves).

Notes: (1) Information in this review was current as of February 11, 2002. (2) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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TABLE 1. MAIN COMPONENTS OF CHANGE DURING 2000 IN CANADIAN RESERVES OF SELECTED MAJOR METALS

| Metal | Units | Revised Opening Metal Balance, January 2000 | Metal in Ore Mined Ore Mined During 2000 | Metal Apparently Written Off During 2000 | Metal in New Reserves Found During 2000 | Net Change During 2000 | Closing Metal Balance, December 2000 | % Change During 2000 |
|------------|-------|---|--|--|---|------------------------|--------------------------------------|----------------------|
| Copper | 000 t | 7 761 | -690 | -117 | 414 | -345 | 7 419 | -4 |
| Nickel | 000 t | 4 983 | -200 | -69 | 68 | -201 | 4 782 | -4 |
| Lead | 000 t | 1 586 | -202 | -152 | 88 | -271 | 1 315 | -17 |
| Zinc | 000 t | 10 210 | -1 089 | -697 | 362 | -1 335 | 8 876 | -13 |
| Molybdenum | 000 t | 118 | -8 | -17 | 3 | -22 | 97 | -18 |
| Silver | t | 15 371 | -1 490 | -565 | 523 | -1 451 | 13 919 | -9 |
| Gold | t | 1 326 | -170 | -81 | 66 | -183 | 1 142 | -14 |

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

- Nil.

Note: May not balance due to rounding.

TABLE 2. TONNAGES AND GRADES OF OPERATIONS INCLUDED IN CANADIAN RESERVES OF SELECTED MAJOR METALS, AS AT JANUARY 1, 2001

Tonnages classified by companies as "possible" are not included where they are reported separately from proven and probable tonnages, nor are tonnages for deposits for which there is no firm production decision. Data reported in imperial units were converted to metric units and rounded to the corresponding number of significant digits. Confidential data have been suppressed from the details of this report.

| | Tonnes | Grade | | | | | | |
|----------------------------------|------------|-------|------|------|-------|-----|--------|-------|
| | | Cu | Ni | Pb | Zn | Mo | Ag | Au |
| | | (%) | (%) | (%) | (%) | (%) | (g/t) | (g/t) |
| NEWFOUNDLAND AND LABRADOR | | | | | | | | |
| Nugget Pond | | | | | | | | |
| Richmont Mines Inc. | | | | | | | | |
| Proven and probable | 105 233 | | | | | | | 8.57 |
| NEW BRUNSWICK | | | | | | | | |
| Brunswick No. 12 Underground | | | | | | | | |
| Noranda Inc. | | | | | | | | |
| Proven and probable | 32 217 000 | 0.38 | | 3.47 | 8.75 | | 104.00 | 0.07 |
| QUEBEC | | | | | | | | |
| Beaufor | | | | | | | | |
| Richmont Mines Inc. | | | | | | | | |
| Louvem Mines Inc. | | | | | | | | |
| Proven | 303 000 | | | | | | 0.50 | 7.40 |
| Probable | 768 000 | | | | | | 0.50 | 7.60 |
| Bell Allard | | | | | | | | |
| Noranda Inc. | | | | | | | | |
| Proven | 2 552 000 | 1.18 | | | | | 36.00 | 0.60 |
| Probable | 357 000 | 1.62 | | | 14.17 | | 51.00 | 0.60 |
| Bouchard-Hébert | | | | | | | | |
| Cambior inc. | | | | | | | | |
| Proven and probable | 4 414 000 | 0.70 | | | 4.90 | | 36.00 | 1.10 |
| Bousquet No. 2 | | | | | | | | |
| Barrick Gold Corporation | | | | | | | | |
| Proven | 330 215 | 0.20 | | | | | .. | 5.44 |
| Probable | 1 319 954 | 0.20 | | | | | .. | 5.44 |
| Doyon | | | | | | | | |
| Cambior inc. | | | | | | | | |
| Proven and probable | 7 500 000 | | | | | | .. | 6.00 |
| Francoeur | | | | | | | | |
| Richmont Mines Inc. | | | | | | | | |
| Proven and probable | 129 727 | | | | | | 0.45 | 7.54 |
| Gallen | | | | | | | | |
| Noranda Metallurgy Inc. | | | | | | | | |
| Probable | 75 000 | 0.05 | | | 1.56 | | 31.00 | 1.00 |
| Joe Mann | | | | | | | | |
| Campbell Resources Inc. | | | | | | | | |
| Proven | 214 277 | | | | | | 4.98 | 8.90 |
| Probable | 83 007 | | | | | | .. | 10.89 |
| Kiena | | | | | | | | |
| McWatters Mining Inc. | | | | | | | | |
| Proven and probable | 2 100 000 | | | | | | 0.70 | 3.74 |
| Langlois | | | | | | | | |
| Cambior inc. | | | | | | | | |
| Proven and probable | 3 892 000 | 0.60 | | | 10.20 | | 49.00 | 0.10 |
| LaRonde | | | | | | | | |
| Agnico-Eagle Mines Limited | | | | | | | | |
| Proven and probable | 30 532 210 | 0.32 | | | 4.40 | | 72.78 | 3.11 |
| Louvicourt | | | | | | | | |
| Aur Resources Inc. | | | | | | | | |
| Novicourt Inc. | | | | | | | | |
| Teck Corporation | | | | | | | | |
| Proven | 5 408 000 | 3.21 | | | 1.78 | | 27.00 | 0.90 |
| Probable | 204 000 | 2.27 | | | 0.55 | | 18.00 | 0.50 |
| Raglan | | | | | | | | |
| Falconbridge Limited | | | | | | | | |
| Proven | 6 565 000 | 0.77 | 2.94 | | | | | |
| Probable | 12 937 000 | 0.79 | 2.81 | | | | | |

TABLE 2 (cont'd)

| | Tonnes | Grade | | | | | | |
|---|-------------|-------|------|-----|------|-----|-------|-------|
| | | Cu | Ni | Pb | Zn | Mo | Ag | Au |
| | | (%) | (%) | (%) | (%) | (%) | (g/t) | (g/t) |
| QUEBEC (cont'd) | | | | | | | | |
| Selbaie A1 Open Pit | | | | | | | | |
| Billiton Metals Canada Inc. (Gencor Ltd.) | | | | | | | | |
| Proven and probable | 11 700 000 | 0.35 | | .. | 1.26 | | 23.00 | 0.27 |
| Sigma No. 1 | | | | | | | | |
| McWatters Mining Inc. | | | | | | | | |
| Proven | 9 600 000 | | | | | | 0.30 | 2.60 |
| Probable | 5 479 000 | | | | | | 0.30 | 2.64 |
| Sleeping Giant | | | | | | | | |
| Aurizon Mines Ltd. | | | | | | | | |
| Cambior inc. | | | | | | | | |
| Proven | 192 000 | | | | | | .. | 10.30 |
| Probable | 148 000 | | | | | | 12.00 | 12.00 |
| Troilus | | | | | | | | |
| Inmet Mining Corporation | | | | | | | | |
| Proven | 9 100 000 | 0.10 | | | | | 1.10 | 0.90 |
| Probable | 21 500 000 | 0.10 | | | | | 1.10 | 1.10 |
| ONTARIO | | | | | | | | |
| Campbell | | | | | | | | |
| Placer Dome North America | | | | | | | | |
| Proven | 1 847 000 | | | | | | 1.00 | 14.70 |
| Probable | 1 352 000 | | | | | | .. | 16.00 |
| David Bell | | | | | | | | |
| Homestake Canada Inc. | | | | | | | | |
| Teck Corporation | | | | | | | | |
| Proven | 3 664 000 | | | | | | 1.50 | 10.35 |
| Dome (including Paymaster) | | | | | | | | |
| Placer Dome North America | | | | | | | | |
| Proven | 10 008 000 | | | | | | 0.20 | 1.20 |
| Probable | 17 704 000 | | | | | | 0.20 | 2.00 |
| Eagle River | | | | | | | | |
| River Gold Mines Ltd. | | | | | | | | |
| Proven and probable | 1 211 000 | | | | | | 1.00 | 10.14 |
| Edwards | | | | | | | | |
| River Gold Mines Ltd. | | | | | | | | |
| VenCan Gold Corporation | | | | | | | | |
| Proven and probable | 96 000 | | | | | | 1.00 | 11.31 |
| Falconbridge Sudbury Integrated Nickel Operations | | | | | | | | |
| Falconbridge Limited | | | | | | | | |
| Proven | 10 178 000 | 1.30 | 1.61 | | | | | |
| Probable | 10 009 000 | 1.37 | 1.37 | | | | | |
| Glimmer | | | | | | | | |
| Exall Resources Limited | | | | | | | | |
| Glimmer Resources Inc. | | | | | | | | |
| Mineable | 777 782 | | | | | | | 8.91 |
| Golden Giant | | | | | | | | |
| Newmont Mining Corporation | | | | | | | | |
| Proven and probable | 4 779 000 | | | | | | 1.00 | 9.81 |
| Holloway | | | | | | | | |
| Battle Mountain Gold Company | | | | | | | | |
| Teddy Bear Valley Mines, Limited | | | | | | | | |
| Proven and probable | 3 981 634 | | | | | | 0.65 | 6.69 |
| Holt-McDermott | | | | | | | | |
| Barrick Gold Corporation | | | | | | | | |
| Proven | 327 494 | | | | | | 0.62 | 6.31 |
| Probable | 1 566 708 | | | | | | 0.65 | 6.75 |
| Hoyle Pond | | | | | | | | |
| Kinross Gold Corporation | | | | | | | | |
| Proven | 362 000 | | | | | | 0.05 | 12.20 |
| Probable | 568 000 | | | | | | 0.05 | 12.40 |
| Inco Ontario Division | | | | | | | | |
| Inco Limited | | | | | | | | |
| Proven | 86 000 000 | 1.13 | 1.27 | | | | .. | 0.15 |
| Probable | 139 000 000 | 1.29 | 1.32 | | | | .. | .. |

TABLE 2 (cont'd)

| | Tonnes | Grade | | | | | | Au (g/t) |
|---|------------|-----------|-----------|-----------|-----------|-----------|-------------|-------------|
| | | Cu (%) | Ni (%) | Pb (%) | Zn (%) | Mo (%) | Ag (g/t) | |
| ONTARIO (cont'd) | | | | | | | | |
| Kidd Creek | | | | | | | | |
| Falconbridge Limited | | | | | | | | |
| Proven | 16 971 000 | 2.27 | | | 5.62 | | 70.00 | |
| Probable | 10 285 000 | 2.25 | | | 6.98 | | 54.00 | |
| Lac des Iles | | | | | | | | |
| North American Palladium Ltd. | | | | | | | | |
| Proven | 61 534 000 | 0.06 | 0.05 | | | | | 0.12 |
| Probable | 34 509 000 | 0.05 | 0.05 | | | | | 0.12 |
| Musselwhite | | | | | | | | |
| Placer Dome North America | | | | | | | | |
| TVX Gold Inc. | | | | | | | | |
| Proven | 11 544 000 | | | | | | | 5.58 |
| Probable | 2 664 700 | | | | | | | 4.80 |
| Red Lake | | | | | | | | |
| Goldcorp Inc. | | | | | | | | |
| Proven | 969 781 | | | | | | 6.86 | 50.40 |
| Probable | 1 908 717 | | | | | | 3.43 | 32.57 |
| Williams | | | | | | | | |
| Homestake Canada Inc. | | | | | | | | |
| Teck Corporation | | | | | | | | |
| Proven (underground) | 9 950 000 | | | | | | 0.70 | 6.19 |
| Proven (open pit) | 807 000 | | | | | | 0.10 | 1.60 |
| Probable (underground) | 7 402 000 | | | | | | 0.70 | 5.04 |
| Probable (open pit) | 4 592 000 | | | | | | 0.30 | 2.21 |
| MANITOBA | | | | | | | | |
| 777 | | | | | | | | |
| Hudson Bay Mining and Smelting Co., Limited | | | | | | | | |
| Proven and probable | 9 200 000 | 2.80 | | | 4.40 | | 33.00 | .. |
| Bissett | | | | | | | | |
| Harmony Gold Mining Company Limited | | | | | | | | |
| Mineable | 1 850 000 | | | | | | .. | 6.50 |
| Callinan | | | | | | | | |
| Hudson Bay Mining and Smelting Co., Limited | | | | | | | | |
| Proven and probable | 2 800 000 | 1.20 | | | 5.00 | | .. | 2.00 |
| Chisel Lake North | | | | | | | | |
| Hudson Bay Mining and Smelting Co., Limited | | | | | | | | |
| Proven and probable | 2 400 000 | .. | | 0.20 | 10.50 | | .. | |
| Inco Manitoba Division | | | | | | | | |
| Inco Limited | | | | | | | | |
| Proven | 22 000 000 | 0.15 | 2.37 | | | | .. | 0.04 |
| Probable | 20 000 000 | 0.13 | 2.14 | | | | .. | 0.04 |
| New Britannia | | | | | | | | |
| High River Gold Mines Ltd. | | | | | | | | |
| TVX Gold Inc. | | | | | | | | |
| Reserves | 2 202 000 | | | | | | 0.50 | 6.90 |
| Ruttan | | | | | | | | |
| Hudson Bay Mining and Smelting Co., Limited | | | | | | | | |
| Proven and probable | 6 700 000 | 1.00 | | | 1.70 | | .. | 0.44 |
| Trout Lake | | | | | | | | |
| Hudson Bay Mining and Smelting Co., Limited | | | | | | | | |
| Proven and probable | 4 800 000 | 1.30 | | | 4.40 | | .. | 1.33 |
| SASKATCHEWAN | | | | | | | | |
| Konuto Lake | | | | | | | | |
| Hudson Bay Mining and Smelting Co., Limited | | | | | | | | |
| Proven and probable | 900 000 | 4.30 | | | 1.60 | | .. | 2.35 |
| Seabee | | | | | | | | |
| Claude Resources Inc. | | | | | | | | |
| Mineable | 579 349 | | | | | | 0.20 | 7.54 |

TABLE 2 (cont'd)

| | Tonnes | Grade | | | | | | Au (g/t) |
|--|-------------|-----------|-----------|-----------|-----------|-----------|-------------|-------------|
| | | Cu (%) | Ni (%) | Pb (%) | Zn (%) | Mo (%) | Ag (g/t) | |
| BRITISH COLUMBIA | | | | | | | | |
| Endako | | | | | | | | |
| Nissho Iwai Corporation | | | | | | | | |
| Thompson Creek Mining Limited | | | | | | | | |
| Proven and probable | .. | | | | | 0.07 | | |
| Denak | .. | | | | | 0.08 | | |
| Low-grade stockpile | .. | | | | | 0.04 | | |
| Eskay Creek | | | | | | | | |
| Prime Resources Group Inc. | | | | | | | | |
| Reserves | 1 466 918 | | | | | | 2 026.29 | 44.91 |
| Highland Valley Copper | | | | | | | | |
| Cominco Ltd. | | | | | | | | |
| Highmont Mining Company | | | | | | | | |
| Billiton Copper Holdings Inc. | | | | | | | | |
| Teck Corporation | | | | | | | | |
| Proven | 336 100 000 | 0.42 | | | | .. | .. | .. |
| Probable | 52 500 000 | 0.44 | | | | .. | 1.00 | 0.01 |
| Huckleberry | | | | | | | | |
| Mitsubishi Corporation, Dowa Mining Co., Ltd., | | | | | | | | |
| Furukawa Co. Ltd., Marubeni Corporation | | | | | | | | |
| Imperial Metals Corporation | | | | | | | | |
| Probable | 56 498 000 | 0.49 | | | | 0.01 | 2.81 | 0.06 |
| Kemess South | | | | | | | | |
| Northgate Exploration Limited | | | | | | | | |
| Proven | 145 911 264 | 0.23 | | | | | | 0.65 |
| Mount Polley | | | | | | | | |
| Imperial Metals Corporation | | | | | | | | |
| Sumitomo Corporation | | | | | | | | |
| Probable | 30 245 122 | 0.36 | | | | | | 0.37 |
| Myra Falls | | | | | | | | |
| Boliden Westmin (Canada) Limited | | | | | | | | |
| Proven and probable | 7 716 000 | 1.30 | | | 6.60 | | .. | 0.60 |
| Sullivan | | | | | | | | |
| Cominco Ltd. | | | | | | | | |
| Proven | 1 800 000 | | | 3.20 | 6.60 | | 9.48 | |
| NORTHWEST TERRITORIES | | | | | | | | |
| Con | | | | | | | | |
| Miramar Mining Corporation | | | | | | | | |
| Proven | 848 000 | | | | | | 3.00 | 12.00 |
| Probable | 290 000 | | | | | | 3.00 | 12.00 |
| Giant Open Pit-Giant Underground | | | | | | | | |
| Miramar Mining Corporation | | | | | | | | |
| Proven | 35 000 | | | | | | 2.00 | 14.00 |
| Probable | 82 000 | | | | | | 3.00 | 12.20 |
| NUNAVUT | | | | | | | | |
| Lupin | | | | | | | | |
| Echo Bay Mines Ltd. | | | | | | | | |
| Proven and probable | 1 522 256 | | | | | | .. | 8.88 |
| Nanisivik | | | | | | | | |
| Nanisivik Mines Ltd. | | | | | | | | |
| Proven and probable | 2 868 000 | | | 0.40 | 6.90 | | 28.00 | |
| Polaris | | | | | | | | |
| Cominco Ltd. | | | | | | | | |
| Pine Point Mines Limited | | | | | | | | |
| Proven | 1 400 000 | | | 2.90 | 12.10 | | | |

Source: Natural Resources Canada, based on published company reports.

.. Not available in published reports or estimated by author.

Notes: One tonne (t) = 1.1023113 short tons. One gram per tonne (g/t) = 0.02916668 troy ounces per short ton.

TABLE 3. PRODUCTION DECISIONS ADDED TO CANADIAN RESERVE TOTALS AS AT DECEMBER 31, 2000

| Project | Operators and Major Partners | Province | Metals |
|---|------------------------------|----------|--------|
| There were no production decisions in 2000. | | | |

Source: Natural Resources Canada, based on company reports.

TABLE 4. CANADIAN RESERVES OF SELECTED MAJOR METALS BY PROVINCE AND TERRITORY, AS AT DECEMBER 31, 2000

Metal Contained in Proven and Probable Mineable Ore ⁽¹⁾ in Operating Mines ⁽²⁾ and Deposits Committed to Production

| Metal | Units (3) | Nfld. | N.S. | N.B. | Que. | Ont. | Man. | Sask. | B.C. | Yukon | N.W.T. | Nunavut | Canada (5) |
|------------|-----------|-------|------|-------|-------|-------|-------|-------|-------|-------|--------|---------|------------|
| Copper | 000 t | – | – | 122 | 597 | 3 705 | 485 | 39 | 2 474 | – | – | – | 7 419 |
| Nickel | 000 t | – | – | – | 557 | 3 276 | 949 | – | – | – | – | – | 4 782 |
| Lead | 000 t | – | – | 1 118 | 82 | – | 5 | – | 58 | – | – | 52 | 1 315 |
| Zinc | 000 t | – | – | 2 819 | 2 274 | 1 672 | 1 122 | 14 | 628 | – | – | 367 | 8 876 |
| Molybdenum | 000 t | – | – | – | – | – | – | – | 97 | – | – | – | 97 |
| Silver | t | – | – | 3 351 | 3 185 | 2 919 | 615 | 8 | 3 768 | – | 4 | 82 | 13 919 |
| Gold (4) | t | 1 | – | 2 | 260 | 596 | 65 | 6 | 184 | – | 15 | 14 | 1 142 |

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

– Nil or less than one unit.

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes geological reserves for some mines that do not report mineable ore. (2) Includes metal in mines where production has been suspended temporarily. (3) One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces. (4) Excludes metal in placer deposits because reserves data are generally unavailable. (5) May not balance due to rounding at the provincial/territorial level.

TABLE 5. CANADIAN RESERVES OF SELECTED MAJOR METALS BY INDUSTRY, AS AT DECEMBER 31, 2000

Metal Contained in Proven and Probable Mineable Ore ⁽¹⁾ in Operating Mines ⁽²⁾ and Deposits Committed to Production

| SIC no. (5) | | Copper, Copper- | | Nickel-Copper | Zinc-Lead- | Molybdenum | Miscellaneous | Canada (6) |
|-------------|-------------|-----------------|------------|---------------|--------------|------------|---------------|------------|
| | | Gold Mines | Zinc Mines | Mines | Silver Mines | Mines | Metal Mines | |
| | | 611 | 612 | 613 | 614 | 615 | 619 | |
| | (Units (3)) | | | | | | | |
| Copper | 000 t | 132 | 3 836 | 3 246 | 153 | – | 54 | 7 419 |
| Nickel | 000 t | – | – | 4 734 | – | – | 48 | 4 782 |
| Lead | 000 t | – | 87 | – | 1 228 | – | – | 1 315 |
| Zinc | 000 t | 1 343 | 4 031 | – | 3 521 | – | – | 8 876 |
| Molybdenum | 000 t | – | 23 | – | – | 73 | – | 97 |
| Silver | t | 5 324 | 3 858 | 1 143 | 3 607 | – | – | 13 919 |
| Gold (4) | t | 921 | 168 | 35 | 7 | – | 12 | 1 142 |

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

– Nil or less than one unit.

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. (2) Includes metal in mines where production has been suspended temporarily. (3) One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces. (4) Excludes metal in placer deposits because reserves data are generally unavailable. (5) SIC Standard Industrial Classification.

(6) May not balance due to rounding at the SIC level.

TABLE 6. CANADIAN RESERVES OF SELECTED MAJOR METALS AS AT DECEMBER 31 OF EACH YEAR, 1977-2000Metal Contained in Proven and Probable Mineable Ore⁽¹⁾ in Operating Mines⁽²⁾ and Deposits Committed to Production

| Year | Copper | Nickel | Lead | Zinc | Molybdenum | Silver | Gold (3) |
|------|---------|---------|---------|---------|------------|--------|----------|
| | (000 t) | (000 t) | (000 t) | (000 t) | (000 t) | (t) | (t) |
| 1977 | 16 914 | 7 749 | 8 954 | 26 953 | 369 | 30 991 | 493 |
| 1978 | 16 184 | 7 843 | 8 930 | 26 721 | 464 | 30 995 | 505 |
| 1979 | 16 721 | 7 947 | 8 992 | 26 581 | 549 | 32 124 | 575 |
| 1980 | 16 714 | 8 348 | 9 637 | 27 742 | 551 | 33 804 | 826 |
| 1981 | 15 511 | 7 781 | 9 380 | 26 833 | 505 | 32 092 | 851 |
| 1982 | 16 889 | 7 546 | 9 139 | 26 216 | 469 | 31 204 | 833 |
| 1983 | 16 214 | 7 393 | 9 081 | 26 313 | 442 | 31 425 | 1 172 |
| 1984 | 15 530 | 7 191 | 9 180 | 26 000 | 361 | 30 757 | 1 208 |
| 1985 | 14 201 | 7 041 | 8 503 | 24 553 | 331 | 29 442 | 1 373 |
| 1986 | 12 918 | 6 780 | 7 599 | 22 936 | 312 | 25 914 | 1 507 |
| 1987 | 12 927 | 6 562 | 7 129 | 21 471 | 231 | 25 103 | 1 705 |
| 1988 | 12 485 | 6 286 | 6 811 | 20 710 | 208 | 26 122 | 1 801 |
| 1989 | 12 082 | 6 092 | 6 717 | 20 479 | 207 | 24 393 | 1 645 |
| 1990 | 11 261 | 5 776 | 5 643 | 17 847 | 198 | 20 102 | 1 542 |
| 1991 | 11 040 | 5 691 | 4 957 | 16 038 | 186 | 17 859 | 1 433 |
| 1992 | 10 755 | 5 605 | 4 328 | 14 584 | 163 | 15 974 | 1 345 |
| 1993 | 9 740 | 5 409 | 4 149 | 14 206 | 161 | 15 576 | 1 333 |
| 1994 | 9 533 | 5 334 | 3 861 | 14 514 | 148 | 19 146 | 1 513 |
| 1995 | 9 250 | 5 832 | 3 660 | 14 712 | 129 | 19 073 | 1 540 |
| 1996 | 9 667 | 5 623 | 3 450 | 13 660 | 144 | 18 911 | 1 724 |
| 1997 | 9 032 | 5 122 | 2 344 | 10 588 | 149 | 16 697 | 1 510 |
| 1998 | 8 402 | 5 683 | 1 845 | 10 159 | 121 | 15 738 | 1 415 |
| 1999 | 7 761 | 4 983 | 1 586 | 10 210 | 119 | 15 368 | 1 326 |
| 2000 | 7 419 | 4 782 | 1 315 | 8 876 | 97 | 13 919 | 1 142 |

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. (2) Includes metal in mines where production has been suspended temporarily. (3) Excludes metal in placer deposits because reserves data are generally unavailable.

Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces.