

# Canadian Reserves of Selected Major Metals, Recent Production Decisions, and Deposits Promising for Future Production

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## RESERVES OF SELECTED MAJOR METALS

Levels of Canadian reserves of gold and silver in ores were up significantly in December 1994 compared with revised figures for 1993; the rate of decline in reserves of copper, nickel and zinc slowed down appreciably such that the levels of these reserves at the end of 1994 were comparable to those at the end of 1993 (Table 1).

Given the new production decisions announced during 1995, those expected in 1996 and beyond, the high level of mineral deposit appraisal activity that is taking place, and the large number of projects that have advanced to the production feasibility stage, reserve levels for some of the major metals appear poised to hold or increase again in the foreseeable future.

### 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 so as 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 more than 1500 t of gold contained in Canadian mine reserves in December 1994. This represents an increase of more than 10% compared with revised totals for December 1993 and the first annual increase since 1988. During 1994, additions to reserves resulting from new mines committed to production and from other additions resulting from exploration and development at established mines more than replaced both the gold contained in the ore mined and the gold written off from reserves during the year.

The gold reserves of seven projects, for which production decisions were announced during 1994, were added to Canadian totals at year-end (Table 3). The largest single gross addition, more than 70 t of gold, resulted from the inclusion in national totals of the reserves from Prime Resources Group Inc.'s Eskay Creek project located north of Stewart in British Columbia. The commitment to production of Inmet Mining Corporation's Troilus (Lac Frotet) property, north of Chibougamau, Quebec, resulted in an additional gross addition of some 60 t to Canadian totals; the production decision at Hemlo Gold Mines Inc.'s Holloway project, north of Kirkland Lake in Ontario, added a further 39 t.

There are several projects under way at established gold mines in Canada that will soon add to Canadian reserves of gold. For example, Barrick Gold Corporation and Cambior inc. are spending \$24 million to deepen, by the end of 1996, the shaft at their Doyon mine in Quebec; this project will provide access to a zone located to the west of the Doyon Fault where 5 Mt of gold-bearing resources are indicated. Placer Dome Canada Limited is spending \$35 million to deepen the shaft at its Campbell mine in Balmer town, Ontario; this project will provide access, by 1997, to over 560 000 t of gold-bearing resources in

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

PHASES	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				DEVELOPMENT OF MINE COMPLEX	MINERAL PRODUCTION	ENVIRONMENTAL RESTORATION
	MRA	EX-1	EX-2	EX-3	EX-4	EX-5	DA-1	DA-2	DA-3	DA-4	MC	MP	ER
STAGES	Surveys, research, synthesis.	Exploration planning.	Regional reconnaissance and surveys.	Prospecting and ground survey of anomalies.	Verification of anomalies and showings.	Discovery and delimitation.	Deposit definition.	Project engineering.	Project economics.	Feasibility study. Production decision.	Construction of plant and infrastructure. Mine preparation.	Production, marketing, new development.	Mine closure. Site reclamation and restoration.
OBJECTIVES	Supply information and tools required to develop the mineral potential of the nation for economic benefit, in the perspective of sustained development.	Select target commodities. Establish exploration objectives and strategies. Select target areas.	Find regional and more localized anomalies. Select significant targets.	Acquire properties. Confirm presence, exact location and characteristics of anomalies.	Acquire additional properties as required. Verify and confirm anomalies. Find mineral showings.	Discover, confirm and delimit a mineral deposit of economic interest. Evaluate technical and economic potential in a preliminary fashion.	Define the grade, limits, internal distribution, controls and the mineralogy-processing parameters of a mineral deposit. Acquire data to support engineering planning.	Establish technical feasibility. Prepare realistic plans, schedules, investment-cost and operating-cost estimates for all aspects of a project.	Establish parameters for economic and financial evaluation.	Ensure validity of project data, assumptions and evaluation results. Decide whether or not to undertake a mining project at this time. Obtain the required permits. Obtain financing.	Complete mine development and construction on schedule and within budget. Ensure efficient and timely mine and concentrator start-up.	Achieve planned rate and specifications of commercial production on schedule and within budget. Achieve mine profitability, company survival and sustained development.	Restore mine site to an environmentally acceptable condition.
EVALUATION METHODS	Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes and universities.	Metal and mineral market research. Review of geological and ore deposit information for various areas. Review legal and political context. Use of deduction and intuition.	Satellite imagery, aerial photography and airborne geophysics. Prospecting, geology, and geochemistry. Appraisal, rating and selection of anomalies.	Ground-based geological, geochemical and geophysical prospecting and surveys. Review and selection of significant anomalies.	Geological mapping and other surveys. Trenching and sampling. Review of results and selection of targets.	Stripping, trenching, detailed mapping, sampling, drilling and down-hole geophysics. Preliminary deposit inventory and evaluation. Environmental characterization and site surveys.	Detailed mapping, sampling and drilling on surface or from underground. Systematic mineral processing tests. Detailed environmental and site surveys.	Pilot tests and engineering studies. Design and cost estimation for mining, ore concentration, metal extraction, infrastructure, protection of the environment and restoration.	Market, price, cost and other financial studies. Technical, environmental, economic, financial, social and political risk analysis.	Exhaustive due diligence review of geological, engineering, environmental, economic, legal and site data. Evaluation of profitability, risks and up-side factors of a project.	Project and quality management methods. Training program for personnel and detailed start-up plan.	Production management using continuous quality improvement methods. Exploration, appraisal and development of new ore zones, both on-property and off-property.	Mine closure and decommissioning. Environmental restoration and monitoring.
RESULTS	Geoscientific, mineral and economic databases, maps and models.	Exploration projects.	Regional anomalies.	Local anomalies.	Mineral showings.	Mineral deposit.	Deposit appraisal project.			Mining project.	Mining plant.	Mineral production.	Restored site.
FEASIBILITY STUDIES						Expected margin of error of estimates at the 90% confidence level:							
						± 100%	± 60%	± 40%	± 20%	± 10%	± 5%	Full compliance	
INVESTMENT AND RISK	Moderate	Low but increasing investment. Very high, but decreasing risk of failure and financial loss.				Much larger and increasing investment. High, but decreasing risk of failure.				Large industrial investment. Low to moderate industrial risk.			
MINERAL INVENTORY	Undelimited mineral resources					Delimited mineral resources					Ore reserves	Delimited mineral resources	
	Speculative	Hypothetical			Inferred	Indicated and measured				Proven and probable			

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. 4-5. Revised by M. Vallée March 8, 1996.

the mine. As a result of development drilling which indicates that substantial new resources are present at depth, Goldcorp Inc. announced in early 1996 that it planned to triple gold production to 150 000 oz/y at its Red Lake (Arthur W. White) mine, also located in Balmertown. Miramar Mining Corporation reported in early 1995 that it had added another 300 000 t of gold-bearing ore to reserves; the company is also exploring for additional reserves in the immediate vicinity of the mine. In addition, Echo Bay Mines Ltd. expects to develop additional reserves in the Centre and West zones at its Lupin mine in the Northwest Territories; that operation is North America's northernmost gold mine.

### **Silver**

Canadian reserves of silver also increased during 1994. They rose to more than 19 000 t, or up by more than 20% from the previous year's level. Counting for the first time in Canadian totals the 3160 t of silver reserves at the Eskay Creek project that were committed to production during 1994 was the main reason why Canadian reserves of silver increased during that year. Prime Resources announced, in February 1996, that it had found two new zones at Eskay Creek and that it was planning a \$1.6 million program to assess the resources in these zones during the year.

### **Zinc**

Canadian reserves of zinc increased somewhat during 1994. They rose to 14.5 Mt at year-end, up by 0.3 Mt, or about 2% compared to the previous year. Two properties committed to production during 1994 made significant gross additions to zinc reserves: Cambior's Grevet project in the Lebel-sur-Quévillon region of Quebec added over 0.9 Mt, and Cambior's Bouchard-Hébert project (formerly known as the Mobrún 1100 lens), northeast of Rouyn-Noranda, added a further 0.4 Mt.

Reserves decreased at most of the other zinc-producing mines in Canada. The most notable reductions occurred at Brunswick Mining and Smelting Corporation Limited's No. 12 mine in Bathurst, New Brunswick, and at Cominco Ltd.'s Sullivan mine in Kimberley, British Columbia. Operations at these two mines are at an advanced stage and, as a consequence, reserves have been falling gradually for several years. Sullivan has been in operation since 1909, and Brunswick since 1964.

There is considerable potential, however, to extend the life of the Kidd Creek operation located in Timmins, Ontario, well into the twenty-first century. Falconbridge Limited planned, starting in July 1995, 12 months of drilling from the 2070-m level to explore and evaluate massive and stringer sulphides that have been traced to a depth of 2985 m; there is potential for more mineralization at depth because the lower limits of the Kidd Creek deposit have not yet

been reached. Furthermore, multi-disciplinary research conducted by the Geological Survey of Canada, the Ontario Geological Survey, and Falconbridge has resulted in a new geological model for the occurrence of the Kidd Creek deposit. The implication of this model is that other areas of the Canadian Shield are now believed to have the potential to host large orebodies comparable to Kidd Creek.<sup>1</sup>

### **Lead**

Canadian reserves of lead stood at some 3.9 Mt in December 1994, down by about 0.3 Mt, or 7%, compared with revised totals for 1993. Only one mine reported a relatively modest net increase in lead reserves during 1994. Production was the principal reason why Canadian lead reserves decreased during 1994.

### **Copper**

In December 1994, Canadian reserves of copper were estimated at some 9.5 Mt, or down by 2% from a revised figure of about 9.7 Mt a year earlier. Aggregate Canadian production and a revision to the mining plan at the Highland Valley mine near Kamloops, in British Columbia, were the main causes of the reduction in Canadian copper reserves during 1994. Highland Valley is owned by Cominco Ltd., Highmont Mining Company, Rio Algom Limited and Teck Corporation.

There are several projects under way at copper mining operations in Canada that have the potential to add to Canadian copper reserves in the short term. At the Similco operation in British Columbia, Princeton Mining Corporation is assessing a second phase of production from its Ingerbelle open pit as well as an expansion to its No. 3 open pit. Princeton is also looking at the economics of the Alabama deposit for which additional drilling would be required to upgrade copper-gold resources to reserves and to complete a detailed pit design. The company has several other promising exploration targets on its Similco property, including the Mill zone, the Oronoco-Duke of York zone and the P4 zone. Also in British Columbia, Gibraltar Mines Limited announced in April 1995 that copper-bearing reserves at the Pollyanna zone had been increased by 10 Mt. In Chibougamau, Quebec, MSV Resources Inc. has discovered several new copper-gold zones at its Copper Rand and Portage mines. Copper-gold resources in excess of 4 Mt were found during 1995, and more are expected to be found during 1996.

### **Molybdenum**

Canadian reserves of molybdenum stood at almost 150 000 t in December 1994, or about 8% lower than in the previous year. The decrease occurred because 1994 production was only partially replaced by new-found ore. Four Canadian mines, all located in

British Columbia, produced ore containing molybdenum during 1994. Apart from Placer Dome's Endako mine, which produces only molybdenum, the other mines which produce that metal in Canada produce it as a by-product of copper mining.

### **Nickel**

In December 1994 there were some 5.3 Mt of nickel contained in Canadian mine reserves, down by only slightly more than 1% from the levels of 1993. Inco Limited had some 4.9 Mt of nickel in Canadian reserves at the end of 1994, more than 90% of the national total. As at December 1994, about 70% of Inco's total worldwide reserves of nickel were located in Canada.

Inco appears to have replaced about half of the 133 000 t of nickel that it mined in Canada during 1994 such that its aggregate reserves in the Sudbury area of Ontario and at Thompson, in Manitoba, decreased by about 70 000 t. Considerable potential remains for additions to reserves at each of these two operations.

Inco is exploring its Victor deposit, which is believed to be the most important discovery made in the Sudbury Basin in more than 50 years. To date, that deposit appears to contain some 36 Mt of high-grade nickel, copper and platinum group resources. The company has also discovered nickel, copper and precious-metal mineralization near its Whistle mine on the North rim of the Sudbury Basin. In Manitoba, Inco discovered, in 1992, the Pipe Deep deposit located down plunge from the small past-producing Pipe No. 1 mine, and some 30 km southwest of its Thompson mining and metallurgical complex. Underground development of Inco's Thompson 1-D orebody is providing further access for additional exploratory drilling that is likely to add significantly to the reserves of that deposit.

In December 1993, Falconbridge intersected, at its Nickel Rim property in the Sudbury area, an exceptionally high-grade horizon grading more than 25% copper; that horizon, which also contains nickel, platinum and palladium, may be the down-dip extension of Inco's Victor deposit. These are significant developments that will eventually add to the levels of Canadian reserves of nickel.

### **Canadian Reserves by Province and Territory**

Three provinces held dominant positions in terms of Canada's proven and probable mineable reserves of major metals in December 1994 (Table 4). New Brunswick had more than half of the lead contained in Canadian reserves, almost 40% of the zinc and 30% of the silver; Ontario had three quarters of the nickel, more than half of the gold, and almost half of the copper; and British Columbia had all of the

molybdenum, more than 30% of the copper, and more than one quarter of the silver.

Because of production decisions made during 1994, British Columbia doubled its share of total Canadian reserves of gold and silver, and Quebec doubled its share of Canadian zinc reserves. In addition, zinc reserves in Quebec doubled to 2.3 Mt, those of silver increased by more than 75% to almost 2380 t, those of copper rose by about 35% to about 1.3 Mt, and those of gold increased by almost 25% to over 330 t. In British Columbia, reserves of silver increased by more than 150% to over 5000 t, and those of gold increased by over 100% to almost 150 t.

### **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). More than 80% of current mine reserves of gold in Canada are contained in the ores at mines classified as gold mines; the balance is contained in base-metal ores.<sup>2</sup> At the beginning of 1994, the expected long-term average recovery of gold in concentrator products was about 85% because of the current mix of gold mines, which yield high gold recoveries, and base-metal mines, which produce gold as a by-product and for which recoveries are much lower than for gold mines. At the beginning of 1994, the expected long-term average recovery in concentrates of both copper and zinc from reserves was about 90%; that of nickel, about 85%; that of lead, close to 80%; that of silver, over 70%; and that of molybdenum, almost 65%.

### **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.<sup>3</sup>

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.

## Reserve Trends

Reserves at most mines change slightly from year to year. It is usually a small number of mining operations with large changes in reserves that affect the overall direction of national trends.<sup>4</sup>

From the late 1970s to the early 1980s, Canadian reserves of gold and molybdenum rose substantially, while those of copper, nickel, zinc, lead and silver held relatively constant or rose slightly (Figure 2, Table 6). However, beginning in the early 1980s, reserves of base metals decreased each year. In contrast, reserves of gold kept on rising until the end of 1988, but from 1989 reserves of gold also fell each year. Substantial increases during 1994 in gold and silver reserves represent a significant departure from past reserve trends in Canada.

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

However, in practice, there are considerably more factors that influence reserve levels at individual mines. For example, temporary suspensions of production maintain mine reserves, a situation that occurred in the Yukon during 1994 because production at both the Faro mine and the Sa Dena Hess mine was suspended. As well, strategic decisions, such as focussing on long-term exploration programs at mine sites rather than on developing additional ore immediately, can result in decreases in reserves in the short term, but in large increases in reserves in the longer term.

## RECENT PRODUCTION DECISIONS

Apart from the likely additions to reserves that will result from development and exploration currently taking place at existing mines or from discoveries made elsewhere, production decisions announced during 1995 will maintain Canadian reserves of some metals at close to their current levels, if not increase them somewhat over the next few years.

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 1995, six precious-metal and ten base-metal production decisions were announced in Canada (Table 7). Measured in terms of metal contained in ores at 1994 production rates, these production decisions will result in gross additions to Canadian reserves, as at December 1995, equivalent to about two years' worth of nickel production, one year's worth of zinc production, and half a year or more of lead, silver, gold and copper production.

Several production decisions are expected during 1996 and in subsequent years, which is reflected in the higher levels of mine investment expected in the foreseeable future in Canada.<sup>5</sup>

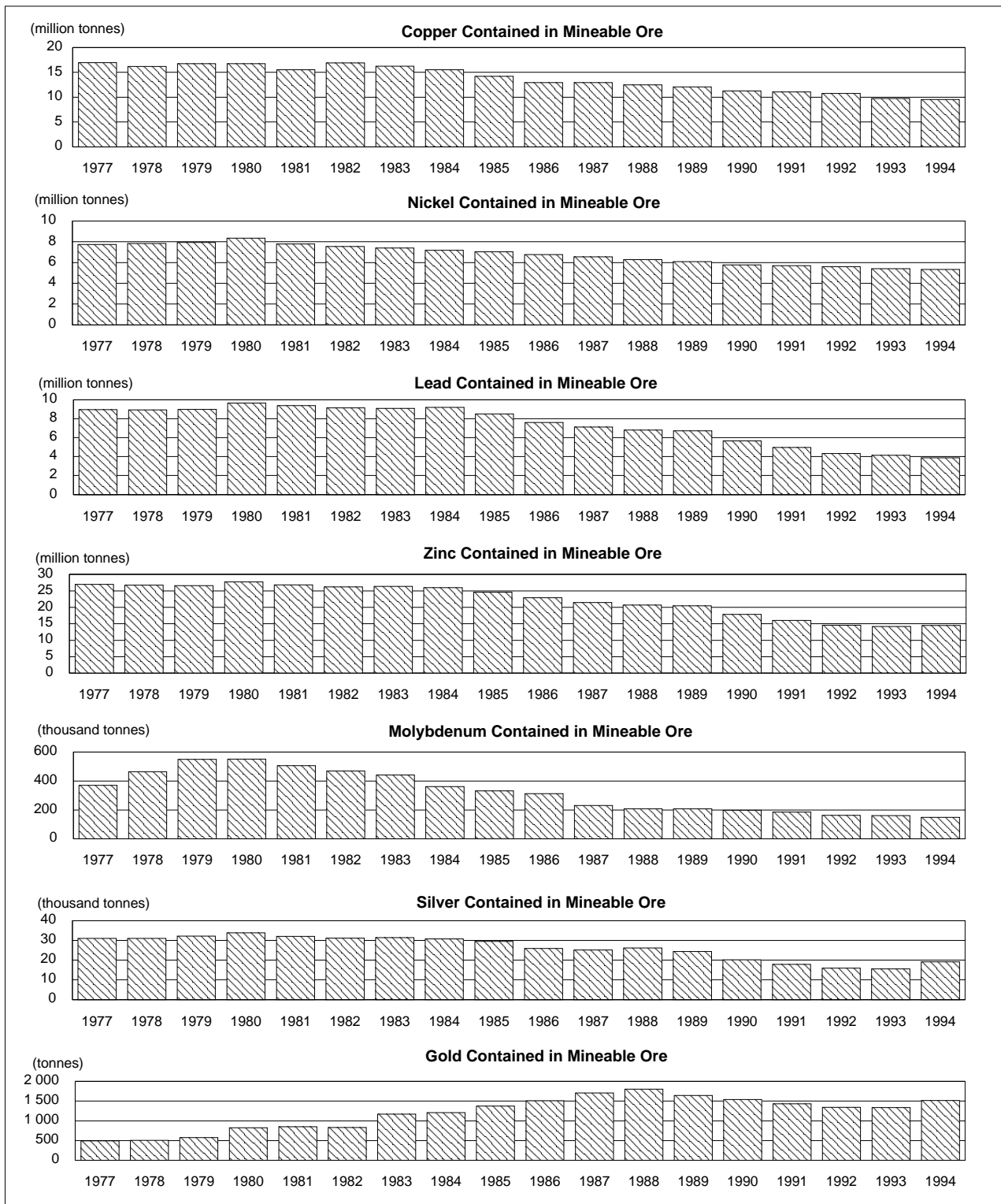
## DEPOSITS PROMISING FOR FUTURE PRODUCTION

In November 1995, there were more than 4500<sup>6</sup> known mineral projects in Canada. Each of these projects is at a stage of evolution in the continuum that ranges from the conceptualization of exploration programs through mineral production (Figure 1). The number of mining projects where a mineral deposit has been discovered is but a fraction of the total number of mining projects in Canada. Future mineral production will draw not only on current reserves and likely extensions to producing orebodies, but also on some of the hundreds of known but as yet undeveloped deposits that occur throughout Canada, as well as on discoveries yet to be made.

Deposit appraisal includes all of the activities in the process of mineral resource development that must be carried out from the time that a mineral deposit is discovered until sufficient information has been obtained to decide whether or not a production decision is warranted (Figure 1). During 1994, there was a significant increase in the number of metal-bearing mineral deposits for which companies reported significant deposit appraisal results. This high level of activity continued during 1995 (Table 8, Figure 4). As a result, in early 1996, there were at least 144 such deposits containing one or more of antimony, bismuth, cobalt, copper, gallium, gold, indium, iron, lead, lithium, magnesium, molybdenum, nickel, palladium, platinum, silver, titanium, tungsten, vanadium and zinc, about the same number as in early 1995. Of these 144 deposits, 36 are in British Columbia, 30 are in Quebec, and 25 are in Ontario.

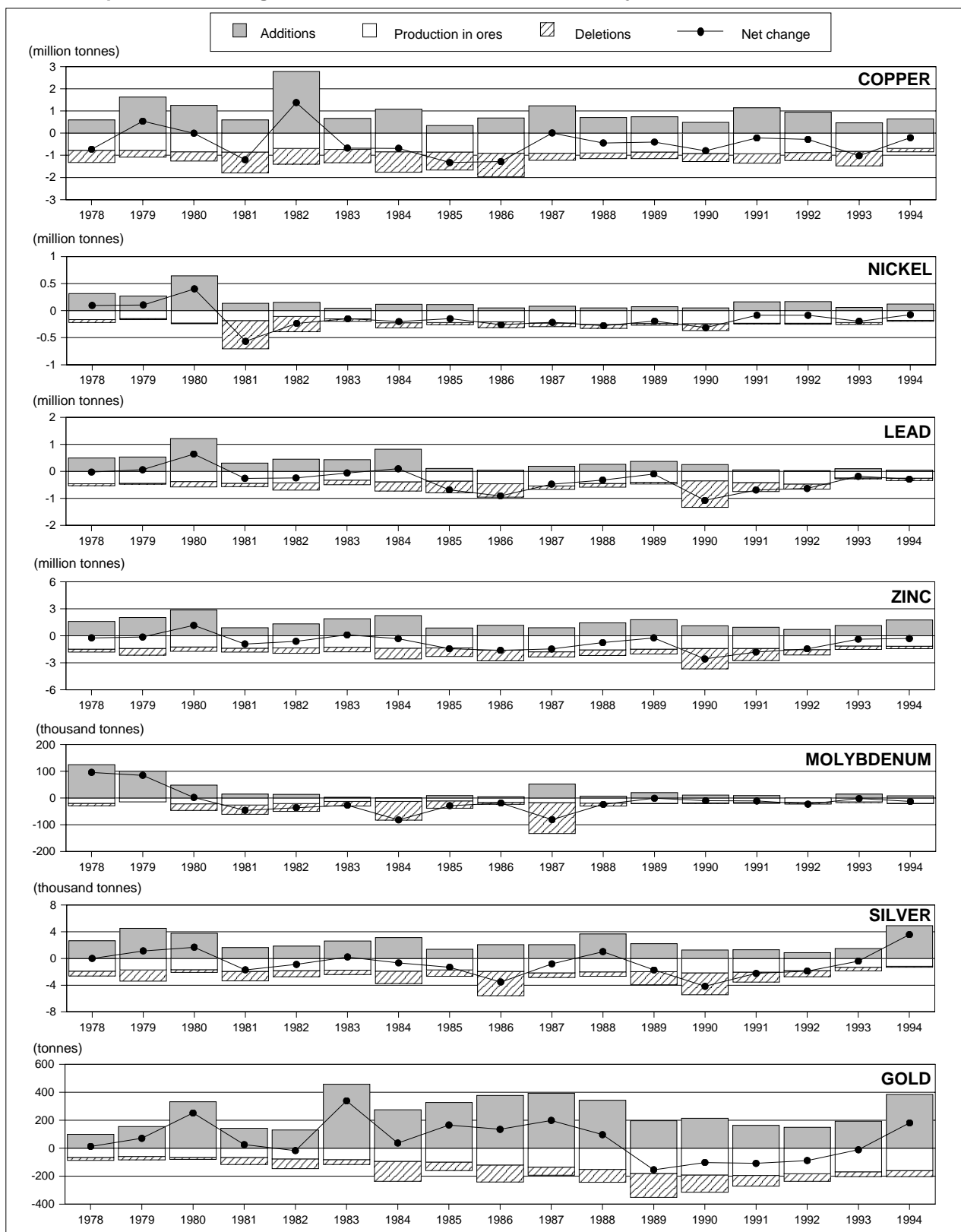
On the basis of in-situ values,<sup>7</sup> 60, or about 40%, of the 144 deposits undergoing appraisal in January 1996 are base-metal deposits. That proportion had been at a low of 13% in early 1989 as a result of the

**Figure 2**  
**Canadian Reserves of Selected Major Metals, 1977-94**  
 Metal Contained in Proven and Probable Mineable Ore in Operating Mines and Deposits Committed to Production, as at December 31 of Each Year



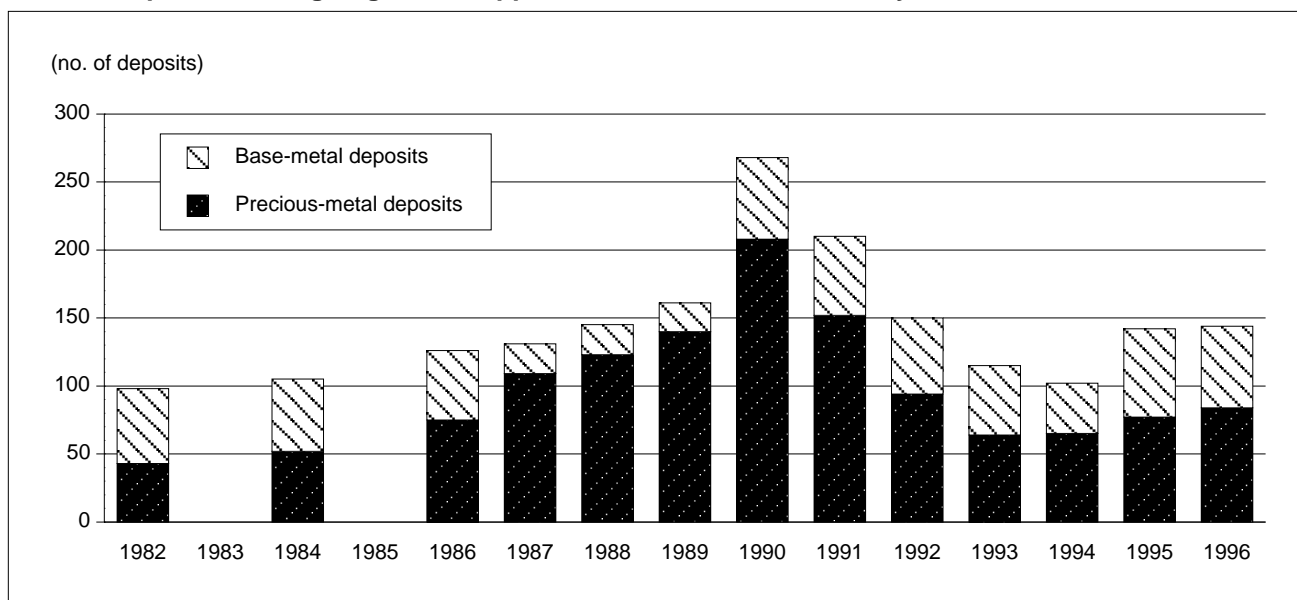
Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.  
 Note: This series was revised during 1995.

**Figure 3**  
**Main Components of Change in Canadian Reserves of Selected Major Metals, 1978-94**



Source: Natural Resources Canada.

**Figure 4**  
**Mineral Deposits Undergoing Active Appraisal in Canada as at January 1 of Each Year, 1982-96**



Source: Natural Resources Canada, based on company reports.

Notes: Deposit appraisal includes all of the activities in the process of mineral resource development that must be carried out from the time that a mineral deposit is discovered until sufficient information has been obtained to decide whether or not a production decision is warranted. These deposits contain one or more of copper, nickel, lead, zinc, molybdenum, silver and gold and may also contain other mineral commodities such as antimony, bismuth, cobalt, chromium, gallium, indium, iron, lithium, magnesium, palladium, platinum, titanium, tungsten and vanadium. Data for 1983 and 1985 were not compiled.

unprecedented high level of gold exploration activity occurring in Canada during the mid-to-late 1980s.

There were at least 84 precious-metal deposits undergoing appraisal in Canada in early 1996. From early 1982 to early 1990, the number of precious-metal deposits undergoing appraisal had increased steadily each year to a high of over 200. In early 1996, almost 60% of all mineral deposits actively being appraised were precious-metal deposits.

On a commodity basis, copper accounted for roughly one third of the gross in-situ value of the estimated mineral inventory reported by companies in the 144 known metal-bearing deposits undergoing appraisal in January 1996; gold and nickel each accounted for about one quarter.

However, in addition to the deposits considered here promising for future production, there are many others in Canada for which there are no recent public reports of mineral deposit appraisal progress.<sup>8</sup> Some of these deposits are also likely to be developed into mines in the future.

### Advanced Projects

In early 1996, studies to assess the feasibility of making a production decision had been initiated or completed on at least 20 metal-bearing projects in

Canada (Table 8). Some of these projects had, in fact, advanced beyond the feasibility stage and were awaiting the final environmental approvals required to begin construction.

In December 1995, Richmond Mines Inc. and Novéder Inc. were recalculating, on the basis of recent drilling, the reserves at their **Nugget Pond** gold project located in Newfoundland; the results of that recalculation will be incorporated into an ongoing final feasibility study. A production decision is expected in early 1996, and production would start later in the year. At the **Voisey's Bay** nickel-copper-cobalt project, partners Diamond Fields Resources Inc., Inco and Teck have appointed Teck as the primary contractor to carry out a mine and mill feasibility study; that study is expected to be completed at the end of June 1996. Already, at the end of 1995, sites for a dock, a port, a camp, an airstrip and processing facilities had been surveyed. In addition, a 35-t bulk sample was being tested, and results were expected in March 1996. Current expectations are that 100 Mt of mineral resources will be delineated at Voisey's Bay.

In Murdochville, Quebec, Noranda Mining and Exploration Inc. has budgeted \$4 million to build a pilot plant to assess the feasibility of recovering copper from its **Copper Mountain** oxide stockpiles using solvent extraction and electrowinning (SX/EW) technology; a decision on the feasibility of building a



full-scale plant is expected in 1997. Noranda is also spending \$33 million to build a pilot plant to assess the feasibility of producing magnesium from its **Magnola** asbestos tailings project in the Thetford Mines area. Tiomin Resources Inc. and its Saudi Arabian partner, Shairco, are assessing the feasibility of recovering ilmenite, magnetite, zircon and garnet from the heavy mineral sands of their **Natashquan** project located on the north shore of the Gulf of St. Lawrence; the main products from this project will be synthetic rutile (TiO<sub>2</sub>) and metallized iron. That feasibility study is expected to be completed in the second half of 1996.

In Ontario, Consolidated Professor Mines Limited has continued engineering work to update the feasibility study of its **Duport (Shoal Lake)** gold project in Ontario; the company plans to update that study once the project review and permitting process are under way. In early February, Royal Oak Mines Inc. announced its intention to take over Consolidated Professor and to bring the Duport deposit to production. Pangea Goldfields Inc. has announced that it plans to proceed with a full feasibility study at its **Fenn Gib** gold project located in the Matheson area of Ontario; that study is expected to be completed during the summer of 1996. Placer Dome announced, in February 1996, a production decision for its **Musselwhite** gold project, north of Pickle Lake.

In Saskatchewan, Greater Lenora Resources Corporation has completed a feasibility study on its **Goldfields** project; the permitting process is under way and the company was, in December 1995, seeking debt financing for mine construction. Golden Rule Resources Ltd. received, in early February 1996, provincial approval for its **Komis** gold project located north of La Ronge; negotiations to finance construction were in progress in late December 1995.<sup>9</sup>

In British Columbia, Teck planned to review and update the feasibility study for the **Cirque** zinc-lead-silver deposit which it owns jointly with Cominco and Korea Zinc Co.; a mine development certificate for Cirque was issued in 1992. On the **Huckleberry** copper-gold-silver-molybdenum project, a feasibility study was completed in October 1995; the partners, Princeton Mining Corporation, Mitsubishi Materials Corporation, Dowa Mining Co. Ltd. and Furakawa Co. Ltd., received provincial environmental approval for their project in December 1995 and are awaiting federal approval under the *Canadian Environmental Assessment Act*. Production could start in mid-1997; this 15 500-t/d project has an estimated capital cost of \$137 million. Royal Oak has appointed contractors for engineering and procurement for its **Kemess** gold-copper project; this 40 000-t/d project is awaiting certification, and production is expected in late 1997. A feasibility study on the **Mount Polley** gold-copper project was completed in early 1995; partners Imperial Metals Corporation and Sumitomo Corp. expect to start production from this \$102 million project in 1997. Redfern Resources reported, in January

1996, that a positive feasibility study for its **Tulsequah Chief** copper-lead-zinc-silver-gold project had been received from its consulting engineers; this project, for which the capital cost is estimated at \$172 million, is now at the project report stage under British Columbia's *Environmental Assessment Act*.

In the Yukon, Cominco is assessing the feasibility of bringing its **ABC (Kudz Ze Kayah)** zinc-lead-copper-silver-gold project to production, perhaps as early as 1997. Anvil Range Mining Corporation has scheduled, for production in 2001, its **DY** zinc-lead-silver-gold deposit at its Faro operations. Finally, permitting and financing on Western Copper Holdings Limited's **Williams Creek** (Carmacks) gold-copper project is in progress, and production from this heap-leach SX/EW project is planned for 1997.

## OUTLOOK

During 1994, the rate of decline in mine reserves of a number of major metals flattened out, and reserves of precious metals rose for the first time in six years or more. Since 1994, companies appear to have markedly increased their efforts at appraising the economic viability of a substantial number of promising polymetallic metal deposits, and more than 20 such projects have reached the advanced stages of economic assessment that are the precursors to a production decision.

There are several projects for which production decisions were made during 1995 and several others for which production decisions are expected in 1996 and beyond. The economic impact of these projects is reflected in surveys of capital investment intentions that predict rising levels of capital expenditures in Canada. Furthermore, there have been a number of recent new mineral discoveries in Canada, such as the spectacular nickel-copper-cobalt find at Voisey's Bay in Labrador, that will eventually be developed into mines.

As a result, levels of Canadian reserves of a number of the major metals are likely to hold or even increase in the foreseeable future.

## REFERENCES

- <sup>1</sup> "Geological Studies Shed Light on Kidd Creek Mine," *The Northern Miner*, December 25, 1995, p. 5.
- <sup>2</sup> The distribution of gold in reserves as at December 1988 and the expected long-term recoveries of the contained gold in concentrator products for conventional gold mines, for mines producing gold as a by-product of base-metal mining, and for tailings and other wastes being reprocessed can be found in A. Lemieux, "Canadian Mine Reserves, Development and Promising Deposits" in *Canadian Minerals Yearbook 1988*, Energy, Mines and Resources Canada, Ottawa, p. 6.7.

**3** An analysis of the life index of Canadian reserves of copper, nickel, lead, zinc, molybdenum, silver and gold as at December 1994 and based on 1994 metal production rates in ores can be found in André Lemieux, "Canadian Reserves of Selected Major Metals, Recent Production Decisions, Mine Investment, and Deposits Promising for Future Production" in *Canadian Minerals Yearbook 1994*, Natural Resources Canada, Ottawa, pp. 4.4 and 4.5.

**4** The distribution of net changes in mine-by-mine reserves of Canadian gold mines during 1988 can be found in André Lemieux, "Canadian Reserves, Mine Investment, New Projects and Promising Deposits" in *Canadian Minerals Yearbook 1989*, Energy, Mines and Resources Canada, Ottawa, p. 5.25.

**5** An analysis of mine investment in Canada over the interval 1969-95 can be found in André Lemieux, "Canadian Reserves of Selected Major Metals, Recent Production Decisions, Mine Investment, and Deposits Promising for Future Production" in *Canadian Minerals Yearbook 1994*, Natural Resources Canada, Ottawa, pp. 4.5-4.13.

**6** MIN-MET CANADA database, A.MacG. ROBERTSON INFODATA Inc., Vancouver, British Columbia. Used under licence.

**7** The distribution of the in-situ value of individual mineral deposits as well as the distribution of the in-situ value per tonne of mineralized material contained in individual mineral deposits considered, in January 1994, promising for future production can be found in André Lemieux, "Canadian Reserves, Mine Investment, New Projects and Promising Deposits" in *Canadian Minerals Yearbook 1993*, Natural Resources Canada, Ottawa, p. 5.14.

**8** Information on selected Canadian mineral deposits for which there are no public reports of current appraisal activity can be found in *Canadian Mineral Deposits Not Being Mined in 1989*, Mineral Bulletin MR 223, Energy, Mines and Resources Canada, Ottawa, 1990.

**9** Construction of the Komis gold mine began on February 15, 1996.

*Note: Information in this review was current as at mid-February 1996.*

**TABLE 1. MAIN COMPONENTS OF CHANGE DURING 1994 IN CANADIAN RESERVES OF SELECTED MAJOR METALS**

Metal	Units	Revised Opening Metal Balance, January 1994	Metal in Ore Mined During 1994	Metal Apparently Written Off During 1994	Metal in New Reserves Found During 1994	Net Change During 1994	Closing Metal Balance, December 1994	% Change During 1994
Copper	000 t	9 740	-690	-154	637	-207	9 533	-2
Nickel	000 t	5 409	-179	-18	122	-74	5 334	-1
Lead	000 t	4 149	-251	-81	44	-288	3 861	-7
Zinc	000 t	14 206	-1 164	-283	1 756	309	14 514	2
Molybdenum	000 t	161	-20	-1	8	-13	148	-8
Silver	t	15 576	-1 185	-134	4 889	3 570	19 146	23
Gold	t	1 333	-161	-43	384	180	1 513	14

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

Note: May not balance due to rounding.



TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>QUEBEC (cont'd)</b>								
Doyon								
Barrick Gold Corporation								
Cambior inc.								
Proven	3 295 000						..	6.2
Low-grade stockpiles	1 000 000						..	0.99
Probable	4 371 000						..	6.2
Eastmain								
MSV Resources Inc.								
Mineable	906 013	..					..	10.
Francoeur								
Richmont Mines Inc.								
Proven	416 159						..	7.44
Probable	484 880						..	6.
Grevet								
Cambior inc.								
Probable-possible mineable	10 965 000	0.45			8.5		34.	0.1
Isle Dieu Mattagami								
Noranda Mining and Exploration Inc.								
..	..	..		..	..		..	..
Joe Mann								
Campbell Resources Inc.								
Proven geological	759 000	0.30					..	8.91
Probable	357 000	0.26					..	8.67
Joubi-Dubuisson								
Western Quebec Mines Inc.								
Proven Joubi	335						..	6.75
Proven Dubuisson Est	315						..	5.31
Probable Joubi	200						..	12.55
Probable Dubuisson Est	74 085						..	5.97
Kiena								
Placer Dome Canada Limited								
Proven-probable	3 854 000						..	5.1
Louvicourt								
Aur Resources Inc.								
Novicourt Inc.								
Teck Corporation								
Mineable	13 860 000	3.83			1.75		31.98	0.93
Mouska								
Cambior inc.								
Proven mineable	86 000						..	7.2
Probable mineable	197 000						..	8.2
Murdochville Townsite								
Noranda Mining and Exploration Inc.								
..	..	..					..	..
Needle Mountain Open Pit								
Noranda Mining and Exploration Inc.								
..	..	..					..	..
Needle Mountain Underground								
Noranda Mining and Exploration Inc.								
Proven mineable	243 000	1.70					5.8	..
Norita East								
Noranda Mining and Exploration Inc.								
..	..	..		..	..		..	..
Portage								
MSV Resources Inc.								
Proven-probable mineable	756 200	1.67					..	4.49
Selbaie (Detour) A1 Open Pit								
Billiton Metals Canada Inc. (Gencor Ltd.)								
..	..	..		..	..		..	..
Sigma No. 1								
Placer Dome Canada Limited								
..	..	..					..	..

TABLE 2 (cont'd)

	Tonnes	Grade						Au (g/t)
		Cu (%)	Ni (%)	Pb (%)	Zn (%)	Mo (%)	Ag (g/t)	
<b>QUEBEC (cont'd)</b>								
Sigma No. 2								
Placer Dome Canada Limited								
..	..						..	..
Silidor								
Cambior inc.								
Hemlo Gold Mines Inc.								
Proven mineable	296 000						..	5.1
Probable mineable	1 127 000						..	4.8
Sleeping Giant								
Aurizon Mines Ltd.								
Cambior inc.								
Proven mineable	180 000						..	9.74
Probable mineable	414 000						..	10.52
Troilus (Lac Frotet)								
Inmet Mining Corporation								
Proven-probable mineable	42 900 000	0.12					1.37	1.4
<b>ONTARIO</b>								
Bell Creek								
Kinross Gold Corporation								
Proven mineable	61 000						..	8.2
Campbell								
Placer Dome Canada Limited								
Proven-probable	4 077 000						..	19.1
Cheminis								
Northfield Minerals Inc.								
..	..						..	..
Craig								
Falconbridge Limited								
..	..	..	..				..	..
David Bell								
Homestake Canada Inc.								
Teck Corporation								
Proven-probable	4 956 000						..	10.9
Detour Lake								
Placer Dome Canada Limited								
Proven-probable	5 150 000						..	5.1
Dome (including Paymaster)								
Placer Dome Canada Limited								
Proven-probable	33 253 000						..	3.
Eagle River								
River Gold Mines Ltd.								
Proven No. 8	29 951						..	15.11
Probable No. 8	110 687						..	15.41
Probable No. 6	179 962						..	19.37
Probable No. 2	101 845						..	17.73
Fraser								
Falconbridge Limited								
..	..	..	..				..	..
Geco								
Noranda Mining and Exploration Inc.								
Proven mineable	1 054 000	2.00		..	2.6		40.8	..
Golden Giant								
Hemlo Gold Mines Inc.								
Proven mineable	9 447 000						..	11.
Probable mineable	1 135 000						..	14.
Golden Patricia								
Barrick Gold Corporation								
Proven-probable	166 000						..	15.5

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>ONTARIO (cont'd)</b>								
Holloway								
Hemlo Gold Mines Ltd.								
Teddy Bear Valley Mines Ltd.								
Proven mineable	2 063 000						..	7.9
Probable mineable	3 768 000						..	6.2
Holt-McDermott								
Barrick Gold Corporation								
Proven-probable	2 512 000						..	7.82
Hoyle Pond								
Kinross Gold Corporation								
Proven	241 000						..	15.55
Probable	65 000						..	7.92
Inco Ontario Division								
Inco Limited								
..	..	..	..				..	..
Kerr Addison								
AJ Perron Gold Corp.								
Proven-probable	410 810						..	3.98
Kidd Creek No. 1								
Falconbridge Limited								
..	..	..		..	..		..	
Kidd Creek No. 2								
Falconbridge Limited								
..	..	..		..	..		..	
Kidd Creek No. 3								
Falconbridge Limited								
..	..	..		..	..		..	
Lac-des-Îles (palladium-platinum)								
North American Palladium Ltd.								
Sheridan Platinum Group, The								
Mineable Roby and C zones	11 000 000	0.1	0.1					0.38
Lake Shore (tailings)								
Kinross Gold Corporation								
Mining reserves	724 000							2.5
Lindsley (Thayer Lindsley)								
Falconbridge Limited								
..	..	..	..				..	..
Lockerby								
Falconbridge Limited								
..	..	..	..				..	..
Macassa								
Kinross Gold Corporation								
Proven-probable mining reserves	1 582 900						..	17.
Red Lake (Arthur W. White)								
Goldcorp Inc.								
Proven	1 000 000						..	11.
Probable	1 340 000						..	10.
Royal Oak Ontario Division								
Royal Oak Mines Inc.								
Mineable	8 526 000						..	2.3
Strathcona								
Falconbridge Limited								
..	..	..	..				..	..
Williams								
Homestake Canada Inc.								
Teck Corporation								
Proven-probable	30 891 000						..	5.69
Winston Lake								
Inmet Mining Corporation								
Proven-probable	670 000	0.90			11.90		26.5	1.15

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>MANITOBA</b>								
Callinan Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
Chisel Lake North Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
Chisel Lake Underground Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
Inco Manitoba Division Inco Limited								
..	..	..	..		..		..	..
Keystone Black Hawk Mining Inc. Granduc Mining Corporation Proven-probable B.T.	700 000						..	2.7
New Britannia (Nor-Acme/Snow Lake) High River Gold Mines Ltd. TVX Gold Inc. Mineable	4 100 000						..	6.5
Ruttan Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
Trout Lake Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
Westarm Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
<b>SASKATCHEWAN</b>								
Contact Lake Cameco Corporation Uranerz Exploration and Mining Limited Mineable Contact Lake	1 304 000						..	8.02
Seabee Claude Resources Inc.								
..	..						..	..
<b>BRITISH COLUMBIA</b>								
Afton Teck Corporation Mineable	13 200 000	0.42					..	0.31
Endako Placer Dome Canada Limited Proven-probable	117 591 000					0.077		
Eskay Creek Prime Resources Group Inc. Proven-probable	1 080 000	0.280					2 930.	65.5
Gibraltar Dumps (biological leach cathode) Gibraltar Mines Limited								
..	..	..						

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>BRITISH COLUMBIA (cont'd)</b>								
Gibraltar Open Pit								
Gibraltar Mines Limited								
Proven Gibraltar East	55 267 000	0.281				0.010	..	
Proven Granite Lake	68 170 000	0.311				0.010	..	
Proven Pollyanna	29 796 000	0.294				0.009	..	
Probable Gibraltar East	5 375 000	0.214				0.007	..	
Probable Granite Lake	5 962 000	0.239				0.007	..	
Probable Pollyanna	1 718 000	0.218				0.007	..	
Goldstream								
Goldnev Resources Inc.								
Imperial Metals Corporation								
Mined out	3 761	4.87			1.92		..	..
Developed panels	108 674	4.39			2.87		..	..
Highland Valley								
Cominco Ltd.								
Highmont Mining Company								
Rio Algom Limited								
Teck Corporation								
Measured-indicated	539 700 000	0.420				0.0073	..	0.03
Island Copper								
BHP Minerals Canada Ltd.								
..	..	..				..	..	..
Mascot (tailings heap leach)								
Candorado Operating Company Ltd.								
..	..							..
Myra Falls								
Westmin Resources Limited								
Proven-probable mineable H-W	5 615 240	1.5		..	3.9		33.3	1.9
Proven-probable mineable Gap zone	713 475	1.5		..	10.6		121.2	2.5
Proven-probable mineable Battle zone	2 546 442	2.0		..	10.6		20.3	1.
Proven-probable mineable Gopher zone	371 780	1.8		..	10.5		11.7	1.
Proven-probable mineable Gnu zone	334 580	1.3		..	9.0		27.5	0.03
Proven-probable mineable W37 zone	136 300	1.4		..	3.2		1.2	1.05
Nickel Plate Open Pit								
Homestake Mining Company								
Proven-probable	2 621 000						..	2.6
Premier								
Westmin Resources Limited								
Proven-probable geological	113 225						85.82	8.23
QR (Quesnel River)								
Kinross Gold Corporation								
Proven	132 000						..	4.32
Stockpiles	46 000						..	2.72
Probable	1 177 000						..	4.8
Similco								
Princeton Mining Corporation								
Ingerbelle stockpiles	6 651 000	0.244					..	..
Salvage from mined pits	950 000	0.478					..	..
Pit 3 - low strip reserves	237 000	0.455					..	..
Virginia - low strip reserves	1 305 000	0.420					..	..
Ingerbelle, Phase I	10 800 000	0.320					..	..
Snip								
Cominco Ltd.								
Prime Resources Group Inc.								
Measured-indicated	502 000						..	27.3
Sullivan								
Cominco Ltd.								
Measured-indicated	13 000 000			4.5	7.9		26.	



TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
<b>BRITISH COLUMBIA (cont'd)</b>								
Table Mountain (Erickson Creek)								
Cusac Industries Ltd.								
Proven Main mine	16 653						..	9.15
Proven West Bain	2 000						..	17.
Proven West Bain (East)	2 300						..	10.8
Probable Main mine	55 522						..	10.
Probable Heather	500						..	10.
Probable Michelle high grade	22 000						..	28.
Probable Katherine	1 340						..	14.
<b>YUKON TERRITORY</b>								
Faro								
Anvil Range Mining Corporation								
Stockpiled	2 598 000			1.96	2.89		17.9	0.19
Proven Vangorda	1 005 000			3.60	4.40		47.	0.93
Probable Grum	24 760 000			2.74	4.54		45.9	0.69
Sa Dena Hes (Mount Hundere)								
Cominco Ltd.								
Teck Corporation								
Mineable	1 750 000			3.4	12.1		51.	
<b>NORTHWEST TERRITORIES</b>								
Colomac								
Royal Oak Mines Inc.								
Mineable	11 842 000						..	1.8
Con								
Miramar Mining Corporation								
Proven-probable	3 626 878						..	11.
Giant Open Pit-Giant Underground								
Royal Oak Mines Inc.								
Proven-probable mineable	2 173 000						..	10.9
Lupin								
Echo Bay Mines Ltd.								
Proven-probable	2 300 000						1.8	9.91
Nanisivik								
Nanisivik Mines Ltd.								
Proven	1 300 000			0.3	8.4		41.	
Probable	1 347 000			0.2	6.7		31.	
Polaris								
Cominco Ltd.								
Teck Corporation								
Measured-indicated	7 600 000			3.6	13.6			
Ptarmigan-Tom								
Tremanco Resources Ltd.								
Measured-indicated	80 000						..	7.44

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

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

Notes: One tonne (t) = 1.102 311 3 short tons. One gram per tonne (g/t) = 0.029 166 68 troy ounces per short ton.

**TABLE 3. PRODUCTION DECISIONS ADDED TO CANADIAN RESERVE TOTALS AS AT DECEMBER 31, 1994**

Project	Operators and Major Partners	Province	Metals
Bouchard-Hébert <sup>1</sup>	Cambior inc.	Que.	Zinc, copper, silver, gold
Donalda	Orco Resources Inc.	Que.	Gold, silver
Eastmain	MSV Resources Inc.	Que.	Gold, copper, silver
Grevet	Cambior inc.	Que.	Zinc, copper, silver, gold
Troilus (Lac Frotet)	Inmet Mining Corporation <sup>2</sup>	Que.	Gold, copper, silver
Eagle River	River Gold Mines Ltd.	Ont.	Gold, silver
Holloway	Hemlo Gold Mines Inc. and Teddy Bear Valley Mines, Limited	Ont.	Gold, silver
McCreedy East	Inco Limited	Ont.	Nickel, copper, cobalt, precious metals
New Britannia (Nor-Acme)	TVX Gold Inc. and High River Gold Mines Ltd.	Man.	Gold, silver
Contact Lake	Cameco Corporation and Uranerz Exploration and Mining Limited	Sask.	Gold, silver
Eskay Creek <sup>3</sup>	Prime Resources Group Inc.	B.C.	Gold, silver
Ingerbelle East, phase 1	Princeton Mining Corporation	B.C.	Copper, gold, silver
QR	Kinross Gold Corporation	B.C.	Gold, silver

Source: Natural Resources Canada, based on company reports.

<sup>1</sup> Previously known as the Mobrún 1100 lens. <sup>2</sup> Formerly Metall Mining Corporation. <sup>3</sup> Also contains zinc, lead and copper.

**TABLE 4. CANADIAN RESERVES OF SELECTED MAJOR METALS BY PROVINCE AND TERRITORY, AS AT DECEMBER 31, 1994**

Metal Contained in Proven and Probable Mineable Ore<sup>1</sup> in Operating Mines<sup>2</sup> and Deposits Committed to Production

Metal	Units <sup>3</sup>	Nfld.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	B.C.	Y.T. <sup>5</sup>	N.W.T.	Canada <sup>6</sup>
Copper	000 t	2	—	197	1 252	4 583	416	—	3 083	—	—	9 533
Nickel	000 t	—	—	—	—	3 950	1 384	—	—	—	—	5 334
Lead	000 t	—	—	2 067	23	55	8	—	606	825	277	3 861
Zinc	000 t	—	—	5 230	2 297	1 727	937	—	1 642	1 451	1 230	14 514
Molybdenum	000 t	—	—	—	—	—	—	—	148	—	—	148
Silver	t	1	—	5 829	2 376	3 992	440	1	5 068	1 324	116	19 146
Gold <sup>4</sup>	t	11	—	40	334	785	57	15	145	18	108	1 513

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

— Nil or less than one unit.

<sup>1</sup> 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. <sup>2</sup> Includes metal in mines where production has been suspended temporarily. <sup>3</sup> One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces. <sup>4</sup> Excludes metal in placer deposits because reserves data are generally unavailable. <sup>5</sup> Includes the Sa Dena Hes (Mount Hundere) mine where production was suspended in December 1992. <sup>6</sup> May not balance due to rounding at the provincial level.

**TABLE 5. CANADIAN RESERVES OF SELECTED MAJOR METALS BY INDUSTRY, AS AT DECEMBER 31, 1994**Metal Contained in Proven and Probable Mineable Ore<sup>1</sup> in Operating Mines<sup>2</sup> and Deposits Committed to Production

SIC no. <sup>5</sup>	Gold Mines	Copper, Copper-Zinc Mines	Nickel-Copper Mines	Zinc-Lead-Silver Mines	Molybdenum Mines	Miscellaneous Metal Mines	Canada <sup>6</sup>	
	0611	0612	0613	0614	0615	0619		
(Units <sup>3</sup> )								
Copper	000 t	136	5 256	3 857	274	–	10	9 533
Nickel	000 t	–	–	5 324	–	–	10	5 334
Lead	000 t	–	122	–	3 739	–	–	3 861
Zinc	000 t	–	5 182	–	9 332	–	–	14 514
Molybdenum	000 t	–	57	–	–	91	–	148
Silver	t	3 550	5 764	1 915	7 918	–	4	19 146
Gold <sup>4</sup>	t	1 248	106	85	70	–	–	1 513

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

– Nil or less than one unit.

<sup>1</sup> 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. <sup>2</sup> Includes metal in mines where production has been suspended temporarily. <sup>3</sup> One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces.<sup>4</sup> Excludes metal in placer deposits because reserves data are generally unavailable. <sup>5</sup> SIC Standard Industrial Classification. <sup>6</sup> May not balance due to rounding at the level.**TABLE 6. CANADIAN RESERVES OF SELECTED MAJOR METALS AS AT DECEMBER 31 OF EACH YEAR, 1977-94<sup>a</sup>**Metal Contained in Proven and Probable Mineable Ore<sup>1</sup> in Operating Mines<sup>2</sup> and Deposits Committed to Production

Year	Copper	Nickel	Lead	Zinc	Molybdenum	Silver	Gold <sup>4</sup>
	(000 t) <sup>3</sup>	(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

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

<sup>a</sup> This series was revised during 1995.<sup>1</sup> 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. <sup>2</sup> Includes metal in mines where production has been suspended temporarily. <sup>3</sup> One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces.<sup>4</sup> Excludes metal in placer deposits because reserves data are generally unavailable.

TABLE 7. PRODUCTION DECISIONS ANNOUNCED IN CANADA DURING 1995

Companies	Projects	Metals	Start-Up Year	Incremental Capital Cost (\$ millions)
<b>PRECIOUS METALS</b>				
Electra Mining Consolidated Ltd. and Raymo Processing	New 4000-t outdoor <b>tailings</b> vat leaching operation, <b>Rambler mine</b> , Baie Verte area, Newfoundland.	Gold	1996	1.8
Aurizon Mines Ltd. and Louvem Mines Inc.	New 300-t/d <b>Beaufor</b> underground mine, Val-d'Or area, Quebec. Ore will be processed at the Camflo concentrator.	Gold, silver	1996	2.5
Rea Gold Corporation	Reactivation, at 1000 t/d, of the <b>Bissett (San Antonio)</b> mine and concentrator, Bissett area, Manitoba.	Gold, silver	1997	37.
Granduc Mining Corporation and Black Hawk Mining Inc.	New 1100-t/d <b>Farley Lake (Keystone Project)</b> open-pit mine, Lynn Lake area, Manitoba.	Gold, silver	1996	4.7
International Avino Mines Ltd. and Bralorne Pioneer Gold Mines Ltd.	Reactivation, at 400 t/d, of the <b>Bralorne</b> concentrator and underground mine, Gold Bridge area, British Columbia. The Bralorne mine was previously in operation from 1932 to 1971.	Gold, silver	1996	5. to 7.
Loki Gold Corporation	New 80 000-oz/y <b>Brewery Creek</b> open-pit heap-leach operation, Dawson City area, Yukon Territory.	Gold	1996	41.
<b>BASE METALS</b>				
Ming Minerals Inc.	Development of the <b>Ming West</b> underground zone and reactivation, at 450-500 t/d, of the <b>Rambler</b> concentrator, Baie Verte area, Newfoundland.	Copper, silver, gold	1995	2.6
Breakwater Resources Ltd.	Reactivation of the <b>Caribou</b> underground mine, and reactivation, at 3000 t/d, of the Caribou concentrator and new <b>Restigouche</b> open-pit mine, Bathurst area, New Brunswick.	Zinc, lead, silver, gold	1996	54.4
Falconbridge Limited	New 2400-t/d <b>Raglan</b> concentrator and underground mine, Ungava Peninsula, Quebec.	Nickel, copper, cobalt, platinum group metals	1998	486.
Noranda Mining and Exploration Inc.	New 2000-t/d <b>Bell Allard</b> underground mine, Matagami area, Quebec. Ore will be processed at the Matagami Lake concentrator.	Zinc, copper, silver, gold	1998	84.
Noranda Mining and Exploration Inc.	Development of the <b>E34 Zone</b> , Murdochville townsite mine, Murdochville, Quebec.	Copper, silver, gold	1997	9.5
Black Hawk Mining Inc.	Reactivation, at 300 t/d, of the <b>Redstone</b> underground mine, Timmins area, Ontario.	Nickel, cobalt	1995	1.
Ego Resources Limited	New 1600-lb/d <b>Cobatec</b> hydrometallurgical plant, Cobalt, Ontario.	Cobalt	1995	14.
Inmet Mining Corporation	New <b>Pick Lake</b> underground mine, Schreiber area, Ontario. Ore will be processed at the Winston Lake concentrator.	Zinc, copper, silver, gold	. .	. .
Falconbridge Limited	Re-opening of the <b>Lockerby</b> underground mine, Sudbury area, Ontario.	Nickel, copper, cobalt, precious metals	1998	47.
Hudson Bay Mining and Smelting, Co. Limited	New 500-t/d <b>Photo Lake</b> underground mine, Snow Lake area, Manitoba.	Copper, zinc, silver, gold	1995	. .

Source: Natural Resources Canada, based on company reports.  
. . Not available.

TABLE 8

**CANADIAN DEPOSITS OF SELECTED MAJOR METALS  
UNDERGOING ACTIVE APPRAISAL AS AT JANUARY 1996**  
(The metal in these deposits is not counted in Canadian reserves.)

- DEPOSITS: Individual deposits have been selected on the basis of public information. Deposits committed for production prior to January 1, 1996, are not included.
- TONNAGES and GRADE: As reported by companies or, where necessary, from the secondary source that appeared to be the most reliable. Data reported in imperial units were converted to metric units and rounded to the corresponding number of significant digits. Tonnages and grade descriptions such as "probable and possible" are those reported by companies.
- COMPANIES: Where two or more companies are identified with a deposit, the first is usually the operator.

Deposits and Companies	Tonnage and Grade Description	Tonnage <sup>1</sup>	Grade <sup>2</sup>							Comments
			Cu	Ni	Pb	Zn	Mo	Ag	Au	
		(tonnes)	(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)	
<b>NEWFOUNDLAND</b>										
<b>Beaver Brook (antimony)</b> Roycefield Resources Ltd.	-	919 000	-	-	-	-	-	-	..	Tonnage increased substantially during 1995. Planning, in August 1995, an exploration decline. Deposit grades 4.58% <b>antimony</b> .
<b>Duck Pond (Tally Pond)</b> Noranda Mining and Exploration Inc., Brunswick Mining and Smelting Corporation Limited	Geological	5 500 000	3.4	-	1.2	7.1	-	71.3	-	Extended mineralized horizon during 1994. Planned additional drilling during 1995.
<b>Nugget Pond</b> Novéder Inc., Richmont Mines Inc.	-	416 168	-	-	-	-	-	-	14.3	Richmont acquired 60% interest in May 1995. Planned, in July 1995, to complete a feasibility study before year-end for production in late 1996.
<b>Pine Cove (indoor vat leach)</b> NovaGold Resources Incorporated	Mineable	1 641 000	-	-	-	-	-	-	3.62	Capital cost of a 1500-t/d vat-leaching operation estimated at \$13 million. Seeking a joint-venture partner to provide project financing.
<b>Rendell Jackman - Hammerdown and Rumbullion zones</b> Major General Resources Ltd.	-	562 490	-	-	-	-	-	-	13.23	Preliminary evaluation prepared in October 1994 estimated the capital costs of a 400-t/d underground operation at \$22 million. Planned, in August 1995, an underground bulk sample.
<b>Voisey's Bay</b> Diamond Fields Resources Inc., Inco Limited, Teck Corporation	Mineable Ovoid zone Potential Eastern Deeps zone	31 700 000 45 000 000	1.68 ..	2.83 ..	- -	- -	- -	- -	- -	Discovered in late 1994. Teck was appointed, in August 1995, primary contractor for the project. Feasibility study of producing at a minimum annual rate of 130 million lb of nickel, 90 million lb of copper and 3 million lb of cobalt from an open pit is expected to be completed in 1996. Production could begin before the end of the decade. The tonnage also grades 0.12% <b>cobalt</b> .
<b>NEW BRUNSWICK</b>										
<b>Canoe Landing Lake</b> Nebex Resources Ltd.	Geological	20 000 000	0.56	-	0.64	1.8	-	32.	1.2	A 13-hole drilling program outlined 2.4 Mt grading 0.69% copper, 2.51% zinc, 0.7% lead, 46 g/t silver and 1.4 g/t gold. Planned, in April 1995, additional drilling.
<b>Half Mile Lake</b> Noranda Mining and Exploration Inc., Conwest Exploration Company Limited, Brunswick Mining and Smelting Corporation Limited	Possible mineable	6 528 000	0.09	-	3.23	9.13	-	39.48	-	Located 20 km from Heath Steele concentrator. In-fill drilling and engineering evaluation of deposit carried out in late 1994.

TABLE 8 (cont'd)

Deposits and Companies	Tonnage and Grade Description	Tonnage <sup>1</sup>	Grade <sup>2</sup>							Comments
			Cu	Ni	Pb	Zn	Mo	Ag	Au	
		(tonnes)	(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)	
<b>NEW BRUNSWICK (cont'd)</b>										
<b>Heath Steele mine area</b> Brunswick Mining and Smelting Corporation Limited	Geological	19 280 000	0.6	–	2.6	7.2	–	52.	–	Potential feed for Heath Steele operation.
<b>Mount Pleasant mine</b> Adex Mining Corp. (bio-oxidation)	Proven-possible	16 100 000	0.07	–	–	0.41	0.066	–	–	A pre-feasibility study completed, in 1994, by D.M. Fraser Services Inc. estimated the capital cost of re-opening the mine at 2000 t/d at \$46 million. Testing a bulk sample as at fourth quarter 1995. The proven-possible tonnage also grades 0.29% tin, 0.07% bismuth, 1.88 g/t indium, and 0.17% tungsten. There is also some gallium. The company reports that Mount Pleasant contains the world's largest indium reserves, North America's largest tin reserves and one of the largest reserves of bismuth. The deposit also contains an additional 38 Mt in the drill-indicated category.
<b>Taylor Brook</b> Stratabound Minerals Corp.	–	295 000	–	–	..	2.3k	–	14.	–	Discovered another zone in summer of 1995. Reported, in December 1995, that strike and down-dip extent of deposit had been increased.
<b>QUEBEC</b>										
<b>Akasaba mine</b> Cambix Exploration Inc.	Resource	254 750	–	–	–	–	–	..	6.3	Produced 262 500 t grading 5.1 g/t during 1960s. Planned, in May 1995, further drilling.
<b>Aldermac</b> AJ Perron Gold Corp.	Diluted inventory	1 373 000	1.8	–	–	4.6	–	35.0	0.55	Potential feed for Kerr Addison mill in Ontario.
<b>Arntfield</b> AJ Perron Gold Corp., Noranda Mining and Exploration Inc., Cangold Resources Inc.	Diluted inventory	633 000	–	–	–	–	–	–	4.83	Down-dip extension of Francoeur mine.
<b>Aubelle</b> J.A.G. Mines Ltd.	Measured-indicated-possible	353 700	–	–	–	–	–	..	4.2	Planned, in August 1995, additional drilling.
<b>AurBel (Lac Herbin)</b> Aur Resources Inc.	Preliminary inventory	363 000	–	–	–	–	–	..	6.9	Considering, in August 1995, an underground exploration program in 1996.
<b>Benoist (Lac Pusticamica)</b> Murgor Resources Inc., Freewest Resources Inc.	Drill-indicated probable	482 104	0.27	–	–	–	–	12.1	5.47	Discovered in 1992. Planned, in spring 1995, further drilling during 1996.
<b>Bourlamaque-Nord (Wrightbar Mine)</b> Corporation Lithos	–	276 380	–	–	–	–	–	..	7.78	Bulk sampling during 1995. Planned, in August 1995, to prepare a new resource calculation in the fall of 1995.
<b>Cabre</b> BHP Minerals Canada Ltd., Southern Africa Minerals Corp.	Resource	1 100 000	1.31	–	–	5.54	–	10.	0.3	Reported, in November 1995, the discovery of two new zones.
<b>Casa Berardi - North zone</b> TVX Gold Inc., Golden Knight Resources Inc.	Geological resource	360 000	–	–	–	–	–	–	6.2	New discovery during 1992 on north side of Casa Berardi fault.

<b>Casa Berardi - Principal</b> TVX Gold Inc., Golden Knight Resources Inc.	Mineable	1 971 277	-	-	-	-	-	-	6.2	Located between Casa Berardi Est and Casa Berardi Ouest mines. Started a \$22 million underground development program in mid-1994 that includes an exploration and haulage tunnel linking both mines to the Principal deposit.
<b>Cedar Bay mine</b> MSV Resources Inc.	Mineable	267 000	0.97	-	-	-	-	..	5.5	In production 1957-90. Completed, as at May 1995, preliminary technical studies for re-opening the mine and integrating it into the Copper Rand operation. Planned to follow up with an economic analysis.
<b>Chevrier (Obatogamau)</b> GéoNova Explorations inc., Inmet Mining Corporation	Geological resource	1 060 000	-	-	-	-	-	..	6.36	Planned, in October 1995, definition drilling during 1996.
<b>Coleraine - Hall</b> Coleraine Mining Resources Inc.	-	1 032 574	-	-	-	-	-	-	-	The company has an agreement with EGE Metals Industry of Turkey for the possible supply of chromite concentrates for a period of 10 years. The Hall deposit grades 4.5% <b>Cr<sub>2</sub>O<sub>3</sub></b> and 0.17 g/t <b>platinum</b> .
<b>Concession no. 391</b> Patrick Sheridan, Corporation Lithos	Geological	904 607	-	-	-	-	0.162	-	-	Tonnage and grade determined based on drilling in 1969. Planned, at May 1995, additional drilling. The deposit also grades 0.053% <b>bismuth</b> .
<b>Copper Mountain mine (Oxide)</b> Noranda Mining and Exploration Inc.	Probable mineable	19 496 000	0.44	-	-	-	-	..	-	Planned, in August 1995, to construct a \$4 million SX-EW pilot plant to recover copper from oxide ore and assess the feasibility of a commercial-scale plant. A decision on the commercial-scale plant is expected in 1997.
<b>Corner Bay - Main zone</b> MSV Resources Inc., Cache Explorations Inc.	Probable and possible	960 601	5.28	-	-	-	-	-	-	Pre-feasibility study estimated the cost of developing an 800-t/d underground mine at \$15 million. Planned, in May 1995, to begin building infrastructure for a 200 000-t/y underground mine.
<b>Desjardins</b> GéoNova Explorations inc.	Geological	691 000	-	-	-	-	-	..	4.53	Planned, in early 1995, additional drilling during 1995.
<b>Dalquier (Amos)</b> Aur Resources Inc., Jonpol Explorations Limited	-	3 103 151	1.26	-	-	0.843	-	1.	0.0039	Discovered a fourth mineralized zone during 1994. Drilling as at August 1995.
<b>Douay - West zone</b> Société d'Exploration Minière Vior Inc.	-	415 000	-	-	-	-	-	-	6.27	Reported, in mid-1995, a new resource calculation.
<b>Duquesne West - Shaft and Fox zones</b> Globex Mining Enterprises Inc., Santa Fe Canadian Mining Ltd.	Inferred resource	642 442	-	-	-	-	-	..	12.1	Resource estimate announced in September 1995.
<b>East Amphi</b> Placer Dome Canada Limited, Breakwater Resources Ltd.	Drill-indicated inventory	866 188	-	-	-	-	-	..	10.38	Drilling as at mid-1995. Planned mapping and trenching during summer of 1995.
<b>Goldex - Extension zone</b> Goldex Mines Limited	Inventory	23 000 000	-	-	-	-	-	..	2.5	Deepened shaft during 1994. Processing, as at November 1995, a 30 000-t bulk sample.
<b>Hebecourt mine (New Inesco)</b> Espalau Mining Corporation, AJ Perron Gold Corp.	Diluted inventory	1 108 000	2.80	-	-	-	-	-	-	Companies planned, in September 1995, to bring the mine back into production.
<b>Magnola</b> Noranda Mineral and Exploration Inc.	-	..	-	-	-	-	-	-	-	Company and three partners announced, in the first quarter of 1995, the construction of a \$33 million pilot plant to test a process to recover <b>magnesium</b> from asbestos tailings. Commercial production could start in 1997.

TABLE 8 (cont'd)

Deposits and Companies	Tonnage and Grade Description	Tonnage <sup>1</sup>	Grade <sup>2</sup>							Comments
			Cu	Ni	Pb	Zn	Mo	Ag	Au	
		(tonnes)	(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)	
<b>QUEBEC (cont'd)</b>										
<b>McWatters mine</b> BLM Service Group, Ecuador Mining Co. Inc., McWatters Mining Inc.	Probable and possible	1 152 000	-	-	-	-	-	..	6.2	In production 1933-44. Discovered new veins in fall of 1995. Planned, as at December 1995, a 26 000-t bulk sample.
<b>Natashquan (mineral sands)</b> Tiomin Resources Inc., Shairco (Saudi Arabia)	Drill indicated	2 100 000 000	-	-	-	-	-	-	-	The deposit grades 6% heavy minerals ( <b>ilmenite</b> , <b>magnetite</b> , <b>zircon</b> and <b>garnet</b> ). Pre-feasibility study prepared in June 1994 by Met-Chem Engineers estimated the capital cost of a dredge mine and mineral processing facility at US\$260 million. Feasibility study under way, in August 1995, to determine capital and operating costs to ±10%. The deposit could be in production by 1998.
<b>Norebec-Manitou (tailings)</b> ITEC-Mineral Inc.	-	10 000 000 <sup>e</sup>	-	-	-	-	-	..	5. <sup>e</sup>	Completed, during 1994, testing of pilot plant. Planned, in early 1995, to increase production to 5000 t/d.
<b>O'Brien mine (bio-leaching)</b> Radisson Mining Resources Inc., Breakwater Resources Ltd.	-	1 030 000	-	-	-	-	-	..	6.5	Announced, in September 1995, the preliminary results of bio-leaching as a pre-treatment for the flotation of sulphide concentrates. Planned to conduct batch and continuous process tests by end of 1995.
<b>Philibert</b> Cambix Exploration Inc.	Geological	1 393 000	-	-	-	-	-	-	5.1	Planned, in May 1995, further exploration during 1995.
<b>Sirmac-Dyke no. 5</b> Corporation Lithos	-	289 000	-	-	-	-	-	-	-	Dyke no. 5 grades 2.04% Li <sub>2</sub> O. Two new dykes were discovered during 1994.
<b>Veza</b> Agnico-Eagle Mines Limited	-	2 520 000	-	-	-	-	-	-	5.1	Processed an 11 000-t bulk sample during summer of 1995. Deepening shaft as at August 1995. Potential feed for the Eagle mill in Joutel starting in late 1996.
<b>ONTARIO</b>										
<b>Amalgamated Kirkland</b> Cyprus Amax Minerals Company, Queenston Mining Inc.	Geological	1 700 000	-	-	-	-	-	..	5.5	Resource estimate reported in January 1995. Planned, as at November 1995, additional drilling during 1996.
<b>Aquarius mine</b> Echo Bay Mines Ltd., ASARCO Incorporated	Proven-probable	162 000	-	-	-	-	-	..	6.2	Announced, in February 1995, the discovery of an additional resource which may be mineable by open pit.
<b>Armistice</b> Armistice Resources Ltd.	-	324 054	-	-	-	-	-	..	6.11	Results of bulk sample test reported in August 1995. Drilling as at November 1995.
<b>Duport (Shoal Lake)</b> Conwest Exploration Company Limited, Consolidated Professor Mines Limited	Geological	1 800 000	-	-	-	-	-	-	12.	Capital cost of 450-t/d operation estimated at \$50 million. Planned, in March 1995, to update the project feasibility study.
<b>Fenn-Gib</b> Pangea Goldfields Inc.	Drill-indicated probable	40 600 000	-	-	-	-	-	-	1.33	Resource estimate increased in September 1995. Planned, as at November 1995, to complete a feasibility study in the summer of 1996.



<b>Garrison Twp.</b> Hillsborough Resources Limited, Jonpol Explorations Limited, T & H Resources Ltd.	Drill indicated	952 700	-	-	-	-	-	..	6.2	Permitting under way, in May 1995, to develop 180 000 t grading 8.6 g/t gold.
<b>Hemlo Interlake</b> Franco-Nevada Mining Corporation Limited	Geological	8 600 000	-	-	-	-	-	..	6.34	Down-dip extension of Hemlo orebody.
<b>Hislop</b> Stroud Resources Ltd.	-	1 014 465	-	-	-	-	-	-	6.31	Seeking project financing as at first quarter 1995.
<b>Hoyle Township</b> Black Hawk Mining Inc.	Drill inferred	697 484	-	-	-	-	-	..	11.28	Resource estimate announced in November 1995.
<b>Karl-Zeemel</b> Placer Dome Canada Limited, TVX Gold Inc.	-	327 000	-	-	-	-	-	..	4.6	Proximal to Musselwhite deposit. Planned, as at December 1995, to drill during 1996.
<b>Madsen mine</b> Madsen Gold Corp.	Proven-probable mineable	823 600	-	-	-	-	-	-	9.91	In production 1938-76. Preliminary capital cost of a 40 000-oz/y operation estimated at \$10 million. Transported the Dona Lake concentrator to the Madsen mine site. Subsurface drilling as at October 1995.
<b>Matachewan mine</b> Royal Oak Mines Inc.	Inventory	11 620 000	-	-	-	-	-	-	3.4	Planned to conduct advanced exploration and engineering design during 1995.
<b>Montcalm</b> Outokumpu Mines Ltd.	Indicated and inferred resources	7 400 000	0.7	1.6	-	-	-	-	-	Resource increased during 1994. Planned, as at November 1995, to complete a decline by mid-1997.
<b>Moss Lake</b> Moss Lake Gold Mines Ltd.		60 000 000	-	-	-	-	-	-	1.1	Planned, as at November 1995, a winter drilling program to assess the potential of mining higher-grade portions of the deposits.
<b>Musselwhite<sup>a</sup> - T. Antiform</b> Placer Dome Canada Limited, TVX Gold Inc.	Measured and drill-indicated resource	11 025 000	-	-	-	-	-	-	9.	Building a 45-km all-weather access road to the property. Results of feasibility study expected by end of November 1995. A production decision could be made by year-end 1995.
<b>Nickel Rim</b> Falconbridge Limited	Undiluted inventory	520 000	25.53	4.13	-	-	-	-	-	Discovery reported in 1993. Deposit also grades 9.8 g/t <b>platinum</b> and 8.4 g/t <b>palladium</b> .
<b>Pamour mine - west of concentrator</b> Royal Oak Mines Inc.	Geologic potential	1 500 000	-	-	-	-	-	..	0.06	Discovered during 1993.
<b>Red Lake - East Bay</b> Goldcorp Inc.	Possible	540 000	-	-	-	-	-	..	8.78	Proximal to Red Lake mine. Extended ore zone during 1993.
<b>Sabin</b> Noranda Mining and Exploration Inc., Major General Resources Ltd.	Inventory	196 000	0.8	-	-	3.2	-	-	-	Drilled in early 1995. Planned, as at May 1995, further drilling.
<b>Sangold</b> Marshall Minerals Corp.	Preliminary	100 000	-	-	-	-	-	..	5.1	Drilled during 1994. Planned, as at early 1995, further work on property.
<b>Springpole</b> Sante Fe Canadian Mining Ltd., Gold Canyon Resources Inc.	-	24 000 000	-	-	-	-	-	-	1.2	Announced, in October 1995, the discovery of two new gold zones. Planned, as at November 1995, additional work in January 1996.
<b>Thorne - Kapika zone</b> Band-Ore Resources Ltd.	-	263 000	-	-	-	-	-	-	2.5	Discovered two new zones during 1995.
<b>Upper Beaver mine</b> Royal Oak Mines Inc., Queenston Mining Inc.	Geological	180 000	1.2	-	-	-	-	-	7.9	Carried out a \$265 000 exploration program in spring of 1995. Waiting, in August 1995, on assay results.
<b>Victor</b> Inco Limited	Geological	36 000 000	6. <sup>e</sup>	2. <sup>e</sup>	-	-	-	..	1. <sup>e</sup>	Planned in November 1994, a \$72 million program of underground exploration over the next three years. Also contains <b>platinum</b> and <b>palladium</b> .

TABLE 8 (cont'd)

Deposits and Companies	Tonnage and Grade Description	Tonnage <sup>1</sup>	Grade <sup>2</sup>							Comments
			Cu	Ni	Pb	Zn	Mo	Ag	Au	
		(tonnes)	(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)	
<b>ONTARIO (cont'd)</b>										
<b>Victoria Creek</b> Sudbury Contact Mines Limited	Inferred resource	4 280 000	-	-	-	-	-	..	4.53	Applying, in January 1995, for permits to sink a shaft by late 1995 or early 1996. Drilling as at August 1995.
<b>MANITOBA</b>										
<b>Fer - Fer zone</b> Canmine Resources Corporation	Geological	1 700 000	0.61	-	0.34	3.21	-	15.4	1.	Planned, as at April 1995, additional drilling.
<b>Fer - Island Lake zone</b> Canmine Resources Corporation	Geological	300 000	1.	-	..	5.02	-	17.8	0.2	-
<b>Keystone - MacLellan mine (Nisku)</b> Granduc Mining Corporation, Black Hawk Mining Inc.	Mineable	413 000	-	-	-	-	-	-	6.10	In production 1986-89. Pre-feasibility study completed summer 1995. Announced, in October 1995, that production decision was being deferred to focus on the development of Farley Lake.
<b>Minago</b> Black Hawk Mining Inc.	Geological	10 502 000	..	1.19	-	-	-	..	..	Feasibility study, prepared in 1991 by Fluor Daniel Wright Engineers Limited, estimated the capital cost of a 3200-t/d operation at \$120 million. Also contains <b>cobalt</b> . Looking for partner.
<b>Pipe Deep</b> Inco Limited	Resource	4 000 000	..	2.32	-	-	-	..	..	Discovered 1994. Also contains <b>cobalt</b> and <b>platinum group metals</b> . Exploration expected to continue into 1995.
<b>Pipestone Lake</b> Gossan Resources Ltd., Cross Lake Mineral Exploration Inc.	-	449 000 000	-	-	-	-	-	-	-	Discovery announced 1993. Deposit grades 4.42% <b>TiO<sub>2</sub></b> . The main zone contains 23 Mt grading 8.72% <b>TiO<sub>2</sub></b> , 42.75% <b>Fe<sub>2</sub>O<sub>3</sub></b> and 0.58% <b>V<sub>2</sub>O<sub>5</sub></b> to 300 m. US\$200 million required to develop. Detailed geological mapping under way during summer 1995.
<b>Puffy Lake mine</b> Pioneer Metals Corporation	Recoverable proven and probable	855 100	-	-	-	-	-	-	6.7	Feasibility study prepared in summer of 1993 estimated the capital costs of a 1000-t/d operation at \$8.4 million. In-fill drilling carried out in February 1995. Planned, in April 1995, a bulk sample test.
<b>Tartan Lake mine</b> Granges Inc.	-	375 000	-	-	-	-	-	..	6.27	Discovered West zone in early 1995.
<b>SASKATCHEWAN</b>										
<b>Goldfields - Athona and Box</b> Greater Lenora Resources Corp.	Mineable	16 600 000	-	-	-	-	-	-	1.7	Feasibility study prepared by H.A Simons Ltd. estimated the capital cost of a 6000-t/d operation at \$66.1 million. Construction could start in early 1996 for production in the summer of 1997.
<b>Hanson Lake (McIlvenna Bay)</b> Cameco Corporation, Billiton Metals Canada Inc.	Geological	13 080 000	1.26	-	-	4.95	-	24.3	0.52	Pre-feasibility study prepared in 1989 estimated the capital cost of a 2700-t/d operation at \$90 million. Cameco owns 67.1% of the project.
<b>Key Lake mine (tailings)</b> Cameco Corporation	-	3 000 000	-	..	-	-	-	-	-	Key Lake tailings also contain <b>cobalt</b> . The capital cost of an operation to extract 580 000 lb of cobalt and 7 million lb of nickel per year for 11 years is estimated at \$45 million. Production could begin in 1997.

<b>Komis<sup>b</sup></b> Waddy Lake Resources Inc., Golden Rule Resources Ltd.	Proven and probable mineable	687 320	-	-	-	-	-	-	10.	Submitted environmental impact statement in August 1995. Results of a feasibility study announced in August 1995 estimated the capital cost of a 400 t/d underground operation using the Jolu concentrator at \$9.8 million. Production could begin in early 1996.
<b>Weedy Lake - B zone</b> Tyler Resources Inc., Golden Rule Resources Ltd., Cameco Corporation	Inferred geological	314 000	-	-	-	-	-	-	4.8	Proximal to Komis deposit.
<b>Weedy Lake - Golden Heart</b> Tyler Resources Inc., Golden Rule Resources Ltd., Cameco Corporation	Geological	687 010	-	-	-	-	-	-	10.	Proximal to Komis deposit. Drilling as at December 1995.
<b>BRITISH COLUMBIA</b>										
<b>AKIE</b> Inmet Mining Corporation, Ecstall Mining Corporation	High-grade core	12 000 000	-	-	-	10.k	-	-	-	Drilling suspended in December 1995 due to inclement weather.
<b>Blackdome mine</b> Aurizon Mines Ltd., Claimstaker Resources Ltd.	Possible	72 800	-	-	-	-	-	..	14	Rehabilitating mine as at May 1995. Underground program under way as at November 1995.
<b>Brett mine</b> Huntington Resources Inc.	-	30 000 <sup>e</sup>	-	-	-	-	-	-	25.5 <sup>e</sup>	Producing under a bulk-sampling permit.
<b>Bronson Slope</b> International Skyline Gold Corporation	Drill-indicated geological resource	102 000 000	0.15	-	-	-	0.007	4.08	0.72	Discovered in 1993. Reported what may be a new mineralized zone in October 1995. Planned, as at October 1995, additional drilling.
<b>Cirque (Stronsay)</b> Teck Corporation, Cominco Ltd., Korea Zinc Co. Ltd.	Mineable North Cirque South Cirque	25 000 000 12 000 000	-	-	2.3 ..	8.5 ..	-	51. ..	-	Mine development certificate issued in 1992. Planned to review and update feasibility study during 1995.
<b>Debbie - 900 zone</b> White Hawk Ventures Inc., Westmin Resources Limited	-	24 619	-	-	-	-	-	-	11.62	Underground development completed during 1994. Plan to process at Premier concentrator.
<b>Ecstall - Red Gulch</b> Atna Resources Ltd.	Indicated	7 000 000	0.6	-	-	2.5	-	20.	0.5	Previously explored as a potential source of <b>sulphur</b> . Acquired from Falconbridge during 1993. Planned, in June 1995, further exploration in August or September 1995.
<b>Engineer mine</b> Winslow Gold Corp.	Indicated	50 000	-	-	-	-	-	-	..	Planned as at December 1995, additional surface and underground exploration.
<b>Evening Star mine</b> Pacific Vangold Mines Ltd.	Drill indicated	90 922	-	-	-	-	-	-	11.	Minor production between 1890 and 1939. Mining at 100 t/d as at September 1995.
<b>Expo - Hushamu zone</b> Jordex Resources Inc.	Proven and probable	173 000 000	0.272	-	-	-	0.009	-	0.3	Located 28 km from Island Copper concentrator. Preliminary capital cost estimated at \$170 million-\$195 million. Looking for partner.
<b>Fairview mine - Silver Crown adit</b> Oliver Gold Corporation	Geological	42 260	-	-	-	-	-	44.8	22.62	Company intended, as at April 1995, to develop a small-scale mining operation.
<b>Getty North</b> Getty North Corp.	Oxide resource	12 000 000	0.5	-	-	-	-	-	-	Reported, in April 1994, leach test recoveries of 67.5% to 92%. Seeking \$4 million to advance project to feasibility stage. Proximal to Highland Valley operation.
<b>Giant Copper - AM Breccia</b> Imperial Metals Corporation	Indicated open-pit	20 700 000	0.75	-	-	-	-	12.41	0.411	Reported, in November 1995, the discovery of a new zone. Planning additional drilling in spring of 1996.

TABLE 8 (cont'd)

Deposits and Companies	Tonnage and Grade Description	Tonnage <sup>1</sup>	Grade <sup>2</sup>							Comments
			Cu	Ni	Pb	Zn	Mo	Ag	Au	
		(tonnes)	(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)	
<b>Golden Bear mine - Ursa</b> North American Metals Corp.	Drill indicated	209 000	-	-	-	-	-	..	23.3	Reported, in October 1995, that Strathcona Mineral Services had been retained to assess the feasibility of mining the Ursa zone.
<b>Golden Bear mine - Grizzly</b> North American Metals Corp.	Proven-probable	153 000	-	-	-	-	-	..	20.5	Resource estimate reported November 1995.
<b>Golden Bear mine - Kodiak A</b> North American Metals Corp.	Geological	543 000	-	-	-	-	-	-	4.4	Strathcona Mineral Services assessing feasibility of mining deposit.
<b>Harmony (Cinola)</b> Misty Mountain Gold Limited	-	31 300 000	-	-	-	-	-	-	2.2	Drilling as at November 1995.
<b>Huckleberry - Main and East Zones</b> Princeton Mining Corporation, Mitsubishi Materials Corporation, Dowa Mining Co., Ltd., Furakawa Co. Ltd.	Mineable	90 900 000	0.512	-	-	-	0.014	2.81	0.062	Feasibility study completed in October 1995 by H.A. Simons Ltd. estimated the capital cost of 15 500-t/d open-pit operation at US\$100 million. Provincial approval to develop mine received in December 1995. Production could start in late 1997.
<b>JD - Finn zone</b> AGC Americas Gold	Preliminary possible resource	148 000	-	-	-	-	-	-	4.5	Drilled during 1995. Expected, as at September 1995, to upgrade the resource estimate.
<b>Kemess-North</b> Royal Oak Mines Inc.	Geological	157 000 000	0.18	-	-	-	-	-	0.38	Proximal to Kemess-South.
<b>Kemess-South</b> Royal Oak Mines Inc.	Mineable	200 440 000	0.224	-	-	-	-	-	0.629	Pre-feasibility study prepared in 1993 by Kilborn Engineering Pacific Ltd. estimated the capital cost of a 40 000-t/d open-pit operation at \$374 million. Planned, in October 1995, to extract and test a bulk sample by January 1996. Contractors for engineering, procurement and construction have been appointed. Production could start in late 1997.
<b>Kerr and Sulphurets</b> Placer Dome Canada Limited	-	174 181 000	0.6 <sup>e</sup>	-	-	-	-	2. <sup>e</sup>	0.5	Sulphide claims of the Sulphurets deposit acquired in 1991.
<b>Ladner Creek mine (tailings)</b> Athabaska Gold Resources Ltd.	-	800 000	-	-	-	-	-	-	1.7	Metallurgical testing of tailings in progress as at November 1995.
<b>Lorraine</b> Lysander Gold Corporation, Kennecott Canada Inc.	Potential	9 000 000	0.67	-	-	-	-	-	0.2	Waiting on further drilling results as at October 1995.
<b>Mt. Polley</b> Imperial Metals Corporation, Sumitomo Corp.	Mineable (S-19 Pit)	49 000 000	0.383	-	-	-	-	-	0.556	Mine development certificate issued in 1992. Feasibility study completed in February 1995 estimated the capital cost of a 14 000-t/d operation at \$102 million. Production could start in 1997.
<b>Old Nick mine</b> Gold City Mining Corporation, Phoenix Gold Resources Ltd., Sway Resources Inc.	-	100 000 000	-	0.22	-	-	-	-	-	The deposit also contains <b>cobalt</b> . Bench-scale agitated leach tests reported in October 1995. Planned, in October 1995, to conduct column leach tests.
<b>Phoenix mine (tailings)</b> Kettle River Resources Ltd.	-	13 122 679	0.106	-	-	-	-	3.3	0.3	Flotation plant operated 1959-78. Testing, as at September 1995, the viability of recovering gold, magnetite, garnet and wollastonite from tailings.

<b>Polaris Taku mine</b> Canarc Resources Corp.	Drill indicated	2 400 000	-	-	-	-	-	-	15.	In production 1937-51. Increased resource estimate in January 1995. Planned, as at November 1995, additional drilling.
<b>Porcher Island mine</b> Westmin Resources Limited, Cathedral Gold Corporation	Accessible reserves	136 000	-	-	-	-	-	-	8.6	In production during 1930s. Study of feasibility of shipping ore by barge to Premier mill completed in early 1995.
<b>Prosperity (Fish Lake)</b> Taseko Mines Limited	Mineable	675 000 000	0.236	-	-	-	-	..	0.434	Kilborn Engineering Pacific Ltd. prepared, in July 1994, a pre-feasibility study for a 60 000-t/d open-pit operation with an estimated capital cost of US\$336 million. Company seeking a buyer for the property.
<b>Rainbow - No. 2 Main zone</b> Teck Corporation, Getchell Resources Inc.	Potential	14 100 000	0.5	-	-	-	..	..	..	Proximal to Teck's Afton mine. Reported, in November 1995, the discovery of a new zone.
<b>Red Chris - Red Chris</b> American Bullion Minerals Ltd., Teck Corporation	Resource	200 000 000	0.5	-	-	-	-	-	0.4	Results of pre-feasibility study, conducted by Fluor Daniel Wright, expected in early 1996.
<b>Red Chris - Yellow Chris</b> American Bullion Minerals Ltd., Teck Corporation	Potential	80 000 000	..	-	-	-	-	-	..	Contains Gully and Far West deposits.
<b>Red Mountain - Marc and AV zones</b> Royal Oak Mines Inc.	Indicated and inferred geologic resource	2 500 000	-	-	-	-	-	38.1	12.8	Application for mine development certificate submitted in May 1993. Royal Oak planned, in August 1995, to acquire property from Barrick Gold Corporation. Subject to a feasibility study, production could begin in 1998. Capital cost estimated at \$100 million.
<b>Similco mine - Alabama</b> Princeton Mining Corporation	Preliminary geological	21 600 000	0.312	-	-	-	-	-	0.16	Proximal to Similkameen concentrator. Drilling as at spring of 1995 in order to define reserves.
<b>Taurus mine</b> Cyprus Canada Inc., International Taurus Resources Inc., Cusac Gold Mines Ltd.	Geological resource	118 000 000	-	-	-	-	-	-	0.99	In production 1981-88. Metallurgical tests in progress as at October 1995.
<b>Tulsequah Chief mine</b> Redfern Resources Ltd.	Mineable	7 150 000	1.24	-	1.18	6.32	-	99.33	2.41	Last produced during the 1950s. Results released in July 1995 of a feasibility study prepared by Rescan Engineering Ltd. estimated the capital cost of a 900 000-t/y underground operation at \$160 million. Studies required to apply for a mine development certificate were in progress as at July 1995. The adjacent Big Bull mine contains a resource of 700 000 t.
<b>YUKON TERRITORY</b>										
<b>ABM (Kudz Ze Kayah)</b> Cominco Ltd.	Possible resource	13 000 000	1.	-	1.3	5.5	-	125.	1.2	Discovered in 1994. Possible production decision by end of 1995 for a 2700-t/d operation with capital costs of some \$100 million to be in operation by fall of 1997.
<b>Canalask</b> Cachet Entreprises Corp., Expatriate Resources Ltd.	-	398 235	-	1.35	-	-	-	-	-	Drilled in late 1994. Planned, in April 1995, additional geophysical surveys.
<b>Casino (oxide and sulphide)</b> Pacific Sentinel Gold Corp.	Mineable - open pit	178 200 000	0.303	-	-	-	0.028	-	0.376	Metallurgical test results for the hypogene and supergene zones reported in fall of 1995.
<b>Dy (underground)</b> Anvil Range Mining Corporation	Probable	9 390 000	-	-	5.50	6.62	-	80.3	0.82	Production expected in 2001 at a capital cost of \$40 million.
<b>Elsa - Bellekeno mine</b> United Keno Hill Mines Limited	Measured, indicated and inferred resources	255 245	-	10.87	7.86	-	-	1196.	0.2	Resource estimate increased during 1995. Drifting as at August 1995.

TABLE 8 (cont'd)

Deposits and Companies	Tonnage and Grade Description	Tonnage <sup>1</sup>	Grade <sup>2</sup>							Comments
			Cu	Ni	Pb	Zn	Mo	Ag	Au	
		(tonnes)	(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)	
<b>YUKON TERRITORY (cont'd)</b>										
<b>Elsa - Silver King mine</b> United Keno Hill Mines Limited	Measured, indicated and inferred resources	72 134	-	3.27	0.61	-	-	1 165.	0.3	Work in progress, as at August 1995, for the submission of an application to mine.
<b>Grew Creek (oxide)</b> YGC Resources Ltd.	-	200 000	-	-	-	-	-	..	15.	Start-up costs were estimated in 1994 at \$5 million. Drilling as at September 1995.
<b>Ketza River mine</b> Whaton River Minerals Ltd., YGC Resources Ltd.	Proven, probable and possible	191 000	-	-	-	-	-	..	11.	Discovered Forks oxide zone in summer of 1995. Re-logging core as at September 1995. Planned, as at November 1995, additional drilling in 1996.
<b>La Forma mine (Mount Freegold)</b> Redell Mining Corp.	-	450 000	-	-	-	-	-	-	11.	Planned, as at May 1995, a 117 000-t bulk test during 1995/96.
<b>Mel</b> International Barytek Resources Ltd., Breakwater Resources Ltd.	Drill indicated	6 778 000	-	-	2.03	7.10	-	-	-	Increased estimate of mineral inventory during 1994 on the basis of deep drilling. The deposit also grades 54.69% <b>barite</b> .
<b>Minto</b> Minto Explorations Ltd.	Proven and probable	6 550 000	1.873	-	-	-	-	8.2	0.51	Capital cost of a 1300-t/d operation estimated at \$25 million. Permitting in progress as at May 1995.
<b>Mount Nansen</b> B.Y.G. Natural Resource Inc.	Proven, probable and possible	1 009 403	-	-	-	-	-	148.	7.38	Discovered, in the fall of 1995, extensions to two zones. Seeking financing as at November 1995.
<b>Williams Creek</b> Thermal Exploration Company, Western Copper Holdings Limited	Diluted oxide reserve	14 110 000	1.01	-	-	-	-	-	0.51	Feasibility study, prepared in 1994, by Kilborn Engineering Pacific Ltd. estimated the capital cost of a 5800-t/d heap leach SX/EW operation at \$62 million. Permitting and financing in progress as at August 1995. Production could start in 1997. Partners agreed, in May 1995, to merge.
<b>NORTHWEST TERRITORIES</b>										
<b>Crestaurem mine</b> Tremingo Resources Ltd., Royal Oak Mines Inc.	Drill indicated	290 000	-	-	-	-	-	-	7.5	In production 1949-69. Planned, as at September 1994, to bring into production and process at Ptarmigan concentrator.
<b>Damoti Lake</b> Consolidated Ramrod Gold Corporation, Gitennes Exploration Inc.	Drill-indicated resource	1 700 000 <sup>e</sup>	-	-	-	-	-	..	11.	Ten gold-bearing zones have been discovered. Planned, as at November 1995, additional drilling.
<b>Discovery mine - Ormsby zone</b> GMD Resource Corp.	Proven, probable and possible	2 298 000	-	-	-	-	-	-	21.	In production 1949-69. Increase in resource estimate reported in November 1995.
<b>Heninga Lake</b> Inco Limited, Breakwater Resources Ltd.	-	1 760 000	1.19	-	-	7.7	-	79.5	0.34	Optioned to Inco in early 1995.
<b>Izok Lake (including Inukshuk)</b> Inmet Mining Corporation	Probable mineable open-pit and underground	16 500 000	2.2	-	1.1	11.4	-	60.	0.1 <sup>e</sup>	Pre-feasibility study prepared in early 1993 estimated the capital costs of a 3000-t/d operation at \$350 million. Discussions with respect to government support for an all-weather road and a port in progress during 1995.
<b>Kim-Cass</b> Royal Oak Mines Inc.	-	3 357 000	-	-	-	-	-	-	2.7	Optioned to Royal Oak in 1994. Proximal to Colomac concentrator.

<b>Meadowbank - Third Portage</b> Cumberland Resources Ltd., Comaplex Resources International Ltd.	Probable and possible resource	973 944	-	-	-	-	-	-	6.5	Resource estimate calculated in 1992. Drilling as at May 1995.
<b>Meadowbank - Goose Island</b> Cumberland Resources Ltd., Comaplex Resources International Ltd.	-	450 970	-	-	-	-	-	-	13.	Assay results reported in May 1995.
<b>Meliadine - Discovery Zone</b> Cumberland Resources Ltd., Comaplex Resources International Ltd.	Inventory	670 000	-	-	-	-	-	-	9.6	Planned, as at September 1995, to recalculate resource estimate. Two new zones reported in October 1995.
<b>Meliadine - West MEG</b> Cumberland Resources Ltd., Comaplex Resources International Ltd.	Inventory	290 000	-	-	-	-	-	-	9.3	Drilled during 1994.
<b>Nicholas Lake - main showing</b> Athabaska Gold Resources Ltd.	Proved, probable and potential	653 000	-	-	-	-	-	-	16.	Results of 1990 pre-feasibility study estimated the capital cost of a 350-t/d operation at \$18 million. Royal Oak Mines Inc. agreed, in September 1995, to purchase Athabaska's interest in the property.
<b>Prairie Creek mine</b> San Andreas Resources Corp., Titan Pacific Resources Ltd.	Geological resource	10 600 000	0.4 <sup>e</sup>	-	11.3	13.1	-	188.	-	Resource estimate increased in November 1995. Planned additional drilling in 1996.
<b>Southwin (Cache)</b> Cyprus Canada Inc., Noble Peak Resources Ltd.	Possible	363 000	-	-	-	-	-	-	9.3	Resource estimate doubled during 1994.
<b>Ulu</b> BHP Minerals Canada Ltd.	Resource	1 700 000	-	-	-	-	-	. .	11.	Echo Bay Mines Ltd. planned, as at November 1995, to acquire the Ulu deposit.

Source: Natural Resources Canada, February 21, 1996.

- Nil or unknown; . . Not available.

<sup>a</sup> Musselwhite was committed to production in mid-February 1996. <sup>b</sup> Construction of the Komis mine began in mid-February 1996. <sup>e</sup> Author's estimate. <sup>k</sup> Combined lead and zinc grade.

<sup>1</sup> One tonne = 1.1023113 short tons. <sup>2</sup> One gram per tonne (g/t) = 0.02916668 troy ounces per short ton.