

# Canadian Mine Openings, Closings, Expansions, Extensions and New Mine Developments

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## **OVERVIEW**

After four consecutive years of a gold and base-metal mining downturn, mine openings and closings in Canada were more balanced in 2002, halting a downward trend in mine openings that began in the second half of 1997. However, as the mines that closed were, on average, larger than those opened in the year, employment and production were still negative in 2002. The nine mines opened during the year consisted of one new mine (gold) and eight re-openings (four gold, two base-metal, one uranium and one tungsten) (Tables 1 and 2). Of the nine mine closings, six were permanent closures (one gold, four base-metal and one uranium) and three were production suspensions (one gold, one uranium and one industrial mineral). One of the re-opened mines (a base-metal mine) and two of the closed mines (a base-metal mine and a uranium mine) were wholly owned and operated by foreign companies while another uranium mine at which production was suspended is foreign controlled.

The only new mine opened in 2002 was the 200-t/d Mishi open-pit gold mine in northern Ontario. With an estimated output of 7000 oz of gold annually, it is the smallest gold mine in Canada. However, the Mishi mine is a part of the Mishi-Magnacon complex, which may lead to it being expanded into a significantly larger gold operation in the future.

During 2002, six significant underground mines closed in Canada. In Quebec, the Bousquet No. 2 gold-copper mine closed in December because of ore depletion. The mine was brought on stream in 1989. The Bousquet No. 1 mine had been developed earlier for production in 1979. The two mines were consolidated in 1996 with the remaining ore at No. 1 mined through the No. 2 mine. Since 2000, production from the Bousquet complex has been essen-

tially from the No. 2 mine. With an ore capacity of 2450 t/d, an annual gold output exceeding 150 000 oz and a work force of over 300 during normal years of operation, the Bousquet No. 2 mine was one of the most important gold producers in the Abitibi region of Quebec. In Ontario, the Crean Hill nickel-copper mine was mined out and closed in June. It first began production in 1905 and was one of Inco Limited's oldest mines in the Sudbury area. In Saskatchewan, ore reserves were exhausted at the Cluff Lake uranium mine in December. Developed for production in 1980, it was the only uranium mine in Canada that was wholly owned and operated by a foreign company, the French-controlled COGEMA Resources Inc. It is also the only uranium mine situated in northwestern Saskatchewan. The 5800-t/d Ruttan copper-zinc mine in northern Manitoba closed in June after some 30 years of operation due to the depletion of mineable ore reserves. The mine first began production in 1973 and, with a regular work force of some 435 over the years, it had been one of the largest employers in the region. In Nunavut, both the Nanisivik zinc-silver mine on Baffin Island and the Polaris zinc-lead mine on Little Cornwallis Island in the Arctic closed in September as a result of ore depletion. The Nanisivik mine first came into production in 1976 while the Polaris mine came on stream in 1981. Up to the time of its closure, the Polaris mine was the world's most northerly base-metal mine. The two mines employed some 420 in 2002 and were the only base-metal mines in Nunavut.

There were three production suspensions in 2002, negatively affecting some 300 mining jobs. The Hurley slate mine in Newfoundland and Labrador, one of the largest industrial mineral mines in the province, shut down in August due to a licensing dispute between the mine's owner and the Province; production was suspended at the Kiena gold mine in Quebec in September because of high costs; and the McClean Lake uranium mine in northeastern Saskatchewan closed as the result of a federal court order to suspend the operating licence for its ore treatment plant.

In addition to the above production suspensions and mine closures, lower production levels and cutbacks continued at several mines in 2002, especially at gold, base-metal, coal and uranium mines, creating additional employment losses during the year. However, job losses through lower

production and cutbacks amounted to less than 200 in 2002 and were largely offset by mine expansion and mine-life extension activities.

Although cost-cutting measures continued at all mines across Canada in 2002, efforts to cut costs through innovation, joint operation, and consolidation of mining operations through mergers and takeovers appeared to taper off in the year, in contrast to the global trends observed since 2000 when gold, zinc, copper and iron ore prices were particularly weak. Nevertheless, two major mergers or takeovers that affected Canadian mining were completed in the first half of 2002. One was the \$4.5 billion takeover of Australia's Normandy Mining Ltd. and Canada's Franco-Nevada Mining Corporation Limited by Denver-based Newmont Mining Corporation. The other was the merger of Kinross Gold Corporation, Echo Bay Mines Ltd. and TVX Gold Inc. As well, Placer Dome Inc. and Kinross agreed to form the Porcupine Joint Venture in Ontario. While the Newmont takeover of Franco-Nevada increased the mining interests of Newmont in Canada, the three-way Kinross-Echo Bay-TVX Gold merger reduced foreign mining holdings in Canada. The Placer Dome-Kinross joint project in Ontario is expected to boost mining in the Porcupine gold camp. At least three existing and former Kinross gold mines and Placer Dome's Dome mine, which is scheduled to close in 2005, will likely be maintained, expanded or redeveloped for re-opening. As of December 31, 2002, the Pamour mine and mill will shut down to prepare for redevelopment for re-opening in 2005. As well, the Dome mill will be expanded to accommodate all ores from the joint venture.

There were at least 13 significant mine expansion and extension projects across Canada during the year (Table 2), including 5 precious-metal, 6 base-metal, 1 iron ore and 1 diamond mine. Two of these were new projects and 11 were existing projects that began in recent years. The new projects were the mill expansion at the Troilus gold mine in Quebec and the deepening of the shaft at the Garson nickel-copper mine in Ontario. Existing programs continued at: the Carol Lake iron-ore operation in Labrador; the LaRonde gold-zinc-copper-silver mine and the Niobec niobium mine in Quebec; the Musselwhite and Red Lake gold mines, the Kidd Creek zinc-copper-silver mine, the Creighton and McCreedy East nickel-copper mines and the Lac des Iles palladium-platinum-gold-copper-nickel mine in Ontario; the Birchtree nickel-copper mine in Manitoba; and the Ekati diamond mine in the Northwest Territories. Seven of the thirteen projects (Niobec, Troilus, Musselwhite, Red Lake, Lac des Iles, Garson and Birchtree) were completed in 2002.

The total capital cost for bringing the only new metal mine into production in 2002 was estimated at less than \$1 million, the lowest in more than a decade. However, an estimated \$68 million was spent on mine re-openings. In contrast, over \$450 million is estimated to have been spent

by companies on major mine expansions and mine-life extensions, one of the highest totals in over a decade. Given the generally depressed mineral commodity prices and market conditions of recent years, this indicates that relatively high levels of mine-site capital investment, compared with off-site exploration spending, have been maintained in Canada in recent years. It reflects the necessity, despite difficult market conditions, for current producers to maintain, and in some cases expand, production capability through mine-site development to lower production costs, allowing these producers to better position themselves for the up-cycles. For 2003, capital investment is expected to be higher as more mines are expected to open or re-open.

## REGIONAL PERSPECTIVE

During 2002, six provinces and two territories were affected by mine openings or closings. In terms of employment, ore capacity and production losses, Nunavut suffered the most, followed by Saskatchewan and Manitoba. In terms of the overall impact on mining, Canada's territories, where gold and base-metal mining once flourished, now have no base-metal mines north of the 60<sup>th</sup> parallel.

### Newfoundland and Labrador

On August 16, 2002, production was suspended at the Hurley slate mine near Trinity Bay due to a licensing dispute between the mine's owner and the Newfoundland and Labrador government that originated from unclear ownership of the mine property. About 48 mining jobs were affected. The Hurley open-pit mine, owned and operated by Hurley Slate Works Inc., was brought on stream in 2000. With a production capacity of 70 t/d, it had been one of the largest industrial mineral mines in the province and the most significant dimension stone producer in the Trinity Bay area.

### Quebec

In Quebec, three gold mines re-opened and two closed. The 1100-t/d Beaufor underground mine, where production had been suspended since August 2000 because of pillar instability, resumed production in January at an estimated capital cost of less than \$5 million. The mine employs some 100 miners. Gold production in 2002 was 56 065 oz at a cash cost of US\$163/oz. Based on mineable reserves of 246 000 oz and production rates at the start of 2003, the remaining mine life is estimated at four to five years. The Sigma-Lamaque open-pit mine near Val-d'Or closed in February 2001 because of high costs and re-opened in November 2002 after successful restructuring and refinancing involving SOQUEM Inc., Investissement Québec, and Canada Economic Development, as well as substantial redevelopment and expansion

of its mill from 3000 t/d to 5000 t/d. The capital costs for redeveloping and re-opening were estimated at \$34 million. As of early 2003, the mine maintained a work force of some 105 and the mine plan was to produce 110 000 oz of gold in 2003 at a cash cost of US\$210/oz. Campbell Resources Inc. re-opened the 1170-t/d Joe Mann underground mine near Chibougamau in March. This followed encouraging results from a 17-month exploration and 4-month redevelopment program following a June 2001 three-way merger with MSV Resources and GeoNova Explorations Inc. Employing 175 miners, the mine produces copper as a by-product.

In September, production at the 2000-t/d Kiena gold mine near Val-d'Or was suspended due to high costs. About 75 jobs were affected. However, recent successes in both surface and underground exploration have been encouraging, with increased resources added to the measured and indicated categories for the Hanging Wall zone and the newly identified P-zone, which has now been traced for over 1.2 km along strike. These results will boost the potential for redevelopment of the Kiena orebody. In production since 1989, the 2450-t/d Bousquet (essentially Bousquet No. 2) gold-copper mine near Cadillac closed in December due to depletion of economic ore reserves. Some 190 workers lost their jobs. A planned closure of the Jeffrey asbestos mine in the Eastern Townships in October was averted due to the intervention of the United States' NASA space shuttle program, which offered a multi-million-dollar contract for an asbestos supply from the mine through ATK Thiokol Propulsion, the supplier of thermal insulant for the space shuttle's solid rocket boosters. However, the contract only required the supply of the high-grade chrysotile asbestos fibre "plastibest" from the Jeffrey mine for a four-month period to allow a stockpile of the fibres sufficient for rocket booster application until 2020 by NASA. Production was subsequently suspended at the Jeffrey mine in April 2003.

Overall, in 2002, Quebec mining fared relatively well with a net gain of some 2800 t of daily ore capacity and the addition of 115 direct mining jobs from mine openings and closings, compared with a net loss of 4400 t of ore capacity and 180 jobs in 2001. However, with the permanent closure of the Bousquet mine and no new mines being developed, Quebec continued to suffer from the recent decline of its gold and base-metal mining industry, which started in 1999 when one base-metal and four gold mines were closed.

## Ontario

In Ontario, three mines (two gold and one base-metal) opened and one mine (base-metal) closed in 2002. The mines that opened include the small Mishki open-pit gold mine that was mentioned earlier. In addition, the 900-t/d Macassa underground gold mine near Kirkland Lake re-opened in May. However, the mine did not achieve

sustained production at near-commercial level in 2002. Gold production was last suspended at the mine in June 1999 by the former owner, Kinross Gold Corporation, due to weak gold prices and ground stability problems. Foxpoint Resources Ltd. acquired the mine in December 2001. In October 2002, Foxpoint changed its name to Kirkland Lake Gold Inc. While production since the resumption of mining in May came mainly from surface ore stockpiles, underground production from Shaft No. 3 was initiated in January 2003. In February 2003, a significant high-grade north-south trending zone, dubbed the "D zone," was discovered. This zone, which is perpendicular to the main east-west trending ore structure of the mine, has been a new focus for exploration. Mining was halted temporarily in early March 2003 due to a failure of the pillar between an existing ore pass and Shaft No. 3. Gold production is forecast to be between 50 000 and 70 000 oz in 2003. As of January 2003, ore reserves were sufficient to sustain production at the current rate for at least six years. The mine has the potential to increase employment beyond the current estimated 50 with increased production. In October 2002, the 1600-t/d Gertrude open-pit nickel-copper mine in Sudbury re-opened after a shut-down of one year. The mine, employing an estimated 120 workers, has ore reserves to sustain production to at least 2004. While gaining the Gertrude mine for production in 2002, Inco closed the larger 1900-t/d Crean Hill nickel-copper mine, also located in Sudbury. The Crean Hill mine, which first began production in 1905, closed in June due to ore depletion, eliminating some 150 jobs. Overall, in 2002, Ontario incurred small net gains of 800 t/d of ore production capacity and 30 direct mining jobs as a result of mine openings and closings.

## Manitoba

During 2002, one mine closed in Manitoba and there were no new mine openings or re-openings. In June, the 5800-t/d Ruttan underground copper-zinc mine near Leaf Rapids in northern Manitoba closed after 30 years of operation due to ore depletion, followed by the closure of the Ruttan concentrator in July, causing the loss of 360 mining jobs. The Ruttan mine was the largest copper-zinc mine, but had the lowest grades in the province. With the closure of Ruttan, there are only three copper and zinc mines left in the province, namely, the 2500-t/d Trout Lake copper-zinc mine and the 1700-t/d Callinan zinc-copper mine near Flin Flon and the 510-t/d Chisel North zinc-copper mine near Snow Lake.

The Chisel North zinc-copper mine near Snow Lake formally began production in July 2000. However, the official opening of the mine by the company was held a year later on June 1, 2001. The mine is a part of the \$400 million "777 Project" centred at Flin Flon, under development by Hudson Bay Mining and Smelting Co., Limited. A second mine under the project is the larger 777 mine, which is scheduled to begin production in 2004.

In addition to the two mines, the 777 project would result in an upgraded and more environmentally friendly copper smelter, an expansion of the Flin Flon concentrator, a new-technology electrolytic zinc cellhouse, and many productivity improvements.

## Saskatchewan

In 2002, one mine re-opened, one mine suspended production and one mine closed in northern Saskatchewan, all of which were uranium mines. The Eagle Point underground mine at Rabbit Lake, where production had been suspended since March 1999 due to weak uranium prices, resumed mining activities in June, followed by uranium production in August as uranium prices and market outlook continued to improve since the fourth quarter of 2001. The mine currently employs a work force of 150 and is the only uranium mine in Cameco Corporation's Rabbit Lake operation. On September 23, production at the McClean Lake mine was suspended by a Federal Court ruling that quashed the operating licence for the mine's ore-processing plant as the result of a complaint filed by the Inter-Church Uranium Committee Educational Co-operative against the Canadian Nuclear Safety Commission (CNSC). The McClean mine was brought on stream in 1999 by joint-venture partners COGEMA Resources Inc. (CRI), Denison Energy Inc. and OURD (Canada) Co. Ltd. CRI is a wholly owned subsidiary of the Paris-based, French government-controlled COGEMA S.A., whereas OURD (Canada) is wholly owned by OURD of Japan. Mining at McClean Lake was completed in 2001 when the Sue C open pit, the last pit of the mine, was mined out. Mine reclamation has already begun. However, ore stockpiles, including those from the previously mined-out JEB deposit, will provide sufficient feed to the mill for uranium concentrate production for several more years. The 800-t/d Cluff Lake underground mine, owned and operated by CRI, closed in December after all mineable reserves were exhausted. The mine first began production in October 1980 and had been producing some 1000-2000 t of uranium concentrates ( $U_3O_8$ ) annually. Mine-site reclamation is progressing throughout 2003. As a result of this closure, the province incurred net losses of some 500-t/d of uranium ore production capacity and 225 mine jobs in 2002.

Early in the second quarter of 2003, unexpected inflows of water outstripped the underground pumping capacity of the McArthur River uranium mine and forced the mine to suspend production. By mid-June, remedial work indicated that mine production could resume in early July. Underground drilling successes in the No. 3 and No. 4 zones and reinterpretation of existing drill data for the No. 1 and No. 2 zones, for which ore grades were underestimated, resulted in the outlining of additional ore reserves in 2001 for this operation, which is located some 280 km north of La Ronge. In late January 2001, mine reserves were re-established at 845 000 t grading 21.18%  $U_3O_8$  compared with 668 000 t grading 17.33%  $U_3O_8$  at

the end of 1999 when the mine began production. This resulted in a 50% increase in uranium reserves and an additional eight years to the 10-plus years of originally expected mine life at the mine. The McArthur River mine is the world's largest and highest grade uranium mine.

## British Columbia

One mine re-opened and no mines closed in British Columbia in 2002. The 4000-t/d Myra Falls zinc-copper-gold-silver mine near Campbell River on Vancouver Island resumed production in March following the implementation of an action plan, during a four-month shut-down, to lower costs and make production considerably more efficient. Employing some 360 workers, the mine, as of January 2003, has sufficient ore reserves to support production for another six years at the current rate of production. In addition, the mine hosts 4.6 Mt of measured and indicated resources with slightly higher ore grades. The mine was formerly owned and operated by Boliden Limited, which was redomiciled to Sweden and reintegrated into the Stockholm-based parent company Boliden AB in December 2001. Overall in 2002, the re-opening of the Myra Falls base-metal mine resulted in net gains in ore capacity and mining jobs in the province.

## Northwest Territories

There was one mine opening and no mine closings in the Northwest Territories in 2002. After having been dormant for 16 years, the 1000-t/d CanTung tungsten mine re-opened in January, creating 175 mining jobs. The mine attained commercial production in April. First brought on stream in 1962, the mine was placed into care and maintenance in 1986 due to the collapse of tungsten prices as a result of Chinese tungsten flooding the world market. The re-opening of the CanTung mine, at an estimated capital cost of \$10 million, resumes its position as North America's leading producer of high-grade, clean tungsten concentrates. Annual production, planned at 3000 t of tungsten concentrates, is sold under a three-year contract to the Sweden-based drill equipment maker Sandvik AB and Germany-based Siemens AG subsidiary Osram Sylvania Products. Sandvik and Osram Sylvania are among the world's leading producers of cemented carbides and consumers of tungsten concentrates. As of July 2002, the remaining mine life was estimated to be more than three years. In addition to owning the CanTung mine, North American Tungsten Corporation also owns the world-class MacTung deposit in the Northwest Territories. These assets represent the Western World's largest high-grade tungsten reserves and comprise some 15% of the world's proven tungsten resource base.

## Nunavut

Nunavut was hit hard by two important mine closures in 2002, both base-metal mines. The 2300-t/d Nanisivik

zinc-silver mine, located in northwestern Baffin Island, closed at the end of September, laying off some 200 miners. The closure was at least a year earlier than originally planned because of a decision to deplete economic ore reserves early in response to lingering unfavourable prices for zinc and silver. The mine first began production in 1976. The 2850-t/d Polaris zinc-lead mine also closed in September after 21 years of operation because of ore depletion, eliminating some 220 mine jobs. The Polaris mine, located on Little Cornwallis Island, was the world's most northern base-metal mine. Both the Nanisivik and the Polaris mines were important zinc producers for Canada and the only zinc mines north of the 60<sup>th</sup> parallel. Their closure has left Nunavut entirely without base-metal mines and has contributed to the continued decline in Canada's zinc production and reserves base. With no mine openings in 2002, the Lupin gold mine was the only mine remaining in Nunavut at the end of the year.

## MINE EXPANSIONS AND EXTENSIONS

Despite continued low prices for many mineral commodities in 2002, at least thirteen significant mine expansion and extension projects, mostly at precious-metal and base-metal mines, were either started, continued or further expanded during the year (Table 2). One of these projects was located in Newfoundland and Labrador, one in Manitoba, three in Quebec, seven in Ontario, and one in the Northwest Territories. Two of these projects were new starts and the rest were continuations of existing programs, including seven world-class mines. Five expansion and three mine-life extension projects were concluded in 2002.

### Newfoundland and Labrador

Iron Ore Company of Canada's \$1.1 billion, six-year expansion and modernization program that started in October 1998 for its mine, concentrator and pellet plants in Labrador and Quebec continued at low gear throughout 2002 as iron ore prices stabilized. As a result, completion of a \$361.5 million program to reactivate a pellet plant at Sept-Îles, Quebec, was again postponed. The plant, which was mothballed in 1982, was originally scheduled to re-open in 2002 with the creation of 140 long-term jobs. Iron ore prices improved significantly in the first half of 2003 and may allow owner Rio Tinto plc to review its decision to re-open the Sept-Îles plant. Better prices would be needed to put the overall investment program back on track.

### Quebec

The US\$218 million, two-phase expansion program that started in 1997 at the LaRonde gold mine in Quebec continued in 2002. Phase 1 of the expansion program, which included completion of the sinking of the Penna shaft to a depth of 7065 ft and the expansion of mill capacity to

4550 t/d from 3265 t/d in 2000, enabled record gold production of 260 000 oz in 2002, an increase of 11% over 2001 and a nearly 50% increase over 2000. Phase 2, started in 2001, has resulted in the completion of a further 40% mill capacity expansion to 6350 t/d in October 2002 and substantial underground development. Capital expenditures for expansion of the LaRonde mine totalled \$61.4 million, compared with \$36.3 million in 2001 (\$68 million in 2000 and \$69 million in 1999). The program will focus on the development of new ore and underground infrastructure in 2003 and 2004, leading to further production increases in those years. However, development glitches (mostly ore access and mill and mechanical problems) in 2002 and a massive rock fall in March 2003 caused gold production to be lower than expected in 2002 and in the first quarter of 2003, along with higher production costs. Consequently, gold production in 2003 is forecast to be lower than the 340 000 oz planned, at 300 000 oz, but would still be higher than in 2002. As of December 31, 2002, proven and probable reserves stood at 37.8 Mt (4.8 Mt higher than 2001) grading 3.347 g/t gold, 3.42% zinc, 0.375% copper and 69.776 g/t silver (containing 4.07 million oz of gold). In addition, the mine hosts an indicated resource of 588 000 t grading 3.9 g/t gold, 14.9 g/t silver, 0.17% copper and 0.55% zinc (containing 75 000 oz of gold), and an inferred resource of 20.9 Mt grading 5.9 g/t gold, 13 g/t silver, 0.33% copper and 0.08% zinc (containing 3.978 million oz of gold). With the gold contents of reserves and resources amounting to over 8 million oz, LaRonde is the largest gold deposit in Canada and one of the largest in the world. Exploration and development work will continue at the mine with a focus on Zone 7 and Zone 20 North, and at El Coco, Goldex and the recently acquired nearby Lapa property.

At the Niobec niobium mine near Chicoutimi, a \$15.7 million, two-phase capital program that began in 1998 to develop deep ore and expand production capacity was completed in 2002. In 2002, capital expenditures amounted to \$2.4 million, compared with \$2 million in 2001 (\$6.2 million in 2000 and \$3.8 million in 1999). Capital expenditures in 2003 are estimated at \$3.8 million, mainly for underground infrastructure development and the construction of a new tailings pond. During 2002, mill capacity was increased to 3400 t/d from 2700 t/d in 2001 (2400 t/d in 2000). Production in 2002 was estimated at about 3000 t of niobium. As of December 31, 2002, proven and probable reserves stood at 23.8 Mt grading 0.65% Nb<sub>2</sub>O<sub>5</sub>, a 26% increase in the Nb<sub>2</sub>O<sub>5</sub> content over 2001 (18.2 Mt grading 0.68% Nb<sub>2</sub>O<sub>5</sub>), thereby extending the mine life to at least 18 years at the current rate of production. Niobec is the only producer of niobium and ferri-niobium in North America and is one of three important producers in the world, constituting about 15% of the world market for niobium.

In 2002, the Troilus gold mine near Chibougamau expanded its mill capacity to 16 000 t/d from 10 000 t/d in

2001 and increased gold production to 164 900 oz (from 162 000 oz in 2001). The production increase was the result of a higher throughput that more than offset the disadvantages caused by the mining of a lower-grade ore and a lower gold recovery rate. Cash production costs were higher at US\$247/oz (US\$232/oz in 2001), due mainly to the higher mining costs associated with higher stripping requirements. The newly developed, small, but higher-grade, J-4 zone began production in the fourth quarter, supplementing mill feed that previously came solely from the "87" main pit. Total capital expenditures for new ore development and mill expansion amounted to \$8.3 million in 2002. A revised proven and probable reserves estimate for December 31, 2002, of 42.5 Mt grading 0.9 g/t gold (1.04 million oz) and 0.09% copper (32 000 t), effectively doubled a previous estimate of gold and copper reserves of 55 000 oz and 18 000 t, respectively, thus doubling the mine life to eight years and pushing its closure date to 2010.

## Ontario

A \$220 million expansion program that started in 2000 at the Lac des Iles palladium mine near Thunder Bay was completed in 2002. A new concentrator, which was completed in June 2001, increased the mine's ore throughput capacity more than sixfold to 15 000 t/d from 2400 t/d. Although a number of milling and concentrator circuit-related problems have reduced throughput performance and recovery to below the designed rates in 2001, most of the problems have since been corrected and annual palladium production from the mine increased to 220 000 oz, or about 5% of the world's production of palladium in 2002. During 2002, exploration continued in the faulted extension of the Main High Grade zone, dubbed the "Offset High Grade" zone, at depth. This zone was discovered in 2001. As of December 31, 2002, ore reserves at the mine were estimated at 88 Mt grading 1.53 g/t palladium (4.3 million oz), 0.17 g/t platinum, 0.12 g/t gold, 0.06% copper and 0.05% nickel. Measured and indicated resources stood at 65.9 Mt grading 1.58 g/t palladium (3.3 million oz), 0.17 g/t platinum, 0.11 g/t gold, 0.05% copper and 0.05% nickel. A further 73 Mt were classified as inferred, grading 1.57 g/t palladium, 0.15 g/t platinum, 0.10 g/t gold, 0.05% copper and 0.05% nickel. The mine life, based on current reserves and rate of production, will be at least 16 years from the start of 2003. At full production, beginning in the second half of 2003, annual mine output is expected to be 250 000 oz of palladium, 23 000 oz of platinum, 18 000 oz of gold, 6 million lb of copper and 2 million lb of nickel. The average cash cost over the mine life, net of by-product credits and royalties, is estimated at US\$200/oz of palladium. The mine currently employs a work force of 275, compared with 130 prior to the expansion. The Lac des Iles mine is Canada's only primary palladium mine.

The production expansion program at the Musselwhite mine in northwestern Ontario that began in 2001 was com-

pleted in 2002, with the mill capacity increased to 4000 t/d from 3300 t/d and the installation of an underground jaw crusher and conveyors to bring ore to the surface from the 460-m level. As well, the tailings treatment capacity was increased. However, due to unexpected production interruptions and delays in commissioning the new underground crusher and conveyor system, gold production was lower in the year at 209 600 oz, compared to 233 800 oz in 2001. In 2003, production is forecast to be 236 450 oz of gold from 1.436 Mt of ore throughput. The mine plan includes seven ore deposits: T Antiform, OP, PQ, Esker, West Anticline, Intraformational and the West Zone. As of December 31, 2002, proven and probable reserves stood at 8.11 Mt grading 5.4 g/t gold (1.419 million oz). Measured and indicated resources were 3.108 Mt grading 7.1 g/t gold. In addition, there were 2.245 Mt of inferred resources grading 7.6 g/t gold. Based on current reserves, the mine is expected to last until 2011.

Continued successes in mine-site exploration and development since the re-opening of the Red Lake gold mine at Balmertown in 2000 have again led to an upward adjustment to the mine's ambitious mine expansion and extension program in 2002. The Red Lake mine produced 85 115 oz of gold in 2000 in its first year of resuming production. In 2002, gold production, mainly from the High Grade Zone (HGZ), was a record 525 000 oz (503 385 oz in 2001) at a cash cost of US\$65/oz (US\$59/oz in 2001), more than double the original feasibility study's forecast annual production of 240 000 oz (at a cash cost of US\$88/oz), maintaining the Red Lake mine as the largest gold-producing mine and one of the two lowest-cost gold mines (the other being the Eskay Creek mine in British Columbia) in Canada. The mine's High Grade Zone represents the richest gold deposit in the world. For 2003, gold production is forecast at over 500 000 oz at a cash cost of less than US\$70/oz. As of December 31, 2002, proven and probable reserves in the High Grade Zone were 1.775 Mt grading 80.57 g/t (2.35 oz/short ton), for a total of 4.594 million oz, a 21% increase in gold content over 2001. In addition, proven and probable reserves in the sulphide zones totalled 1.368 Mt grading 12 g/t (0.35 oz/st) gold, or 533 000 oz. The combined measured and indicated resource also increased to 957 000 t grading 22.28 g/t (0.65 oz/st) gold. In addition, the mine hosts an inferred resource of 748 000 t grading 39.43 g/t (1.15 oz/st) gold. Although the mine has just completed a major expansion program in 2002 and is continuing with a \$12 million exploration program to expand reserves and resources, it is poised for another major expansion. In February 2003, owner and operator Goldcorp Inc. announced a new US\$85 million program to expand the production capacity at the Red Lake mine over the next three years. The expansion plan will include a new shaft to increase the hoisting capacity by more than 200% to 4000 st/d, of which 2500 st/d could be ore capacity.

At the Kidd Creek copper-zinc-silver mine in Timmins, the development of Mine D, a \$640 million deep develop-

ment program to extend the mine life, continued in 2002. The two-stage development continued to extend the section between 2100 m (6800 ft) and 3100 m (10 000 ft) for access to an additional 10 Mt of reserves and 14.1 Mt of resources. While Stage 1 of the development will take the mine to the 2700-m level, Stage 2 will extend the mine down to 3100 m, making Kidd Creek the deepest base-metal mine in the world. Stage 1 involves the development of 15.7 Mt of ore grading 2.82% copper, 5.74% zinc and 58 g/t silver, whereas ore for Stage 2 development is estimated at 10.5 Mt grading 2.20% copper, 5.27% zinc and 97 g/t silver. As of December 31, 2002, total proven and probable reserves at the Kidd Creek mine, including Mine D, were 23.7 Mt grading 2.11% copper, 6.30% zinc and 66.46 g/t silver. The mine also hosted a small indicated resource of 100 000 t grading 2.96% copper, 6.79% zinc and 50 g/t silver, and an inferred resource of 14.1 Mt grading 3.40% copper, 4.90% zinc and 91 g/t silver, which came essentially from Mine D. In 2002, the overall cash operating costs at the Kidd Creek mine averaged US\$0.62/lb of copper, net of by-product credits. Work has begun to sink a new underground shaft from about 1460 m to 3100 m. Production from Mine D is scheduled to begin in 2004 and is expected to reach 550 000 t in 2005. Ore production from Mine D will increase the overall ore throughput from the Kidd Creek mine to approximately 2.4 Mt from the 2002 rate of 2 Mt. The Mine D project at Kidd Creek is by far the largest deep ore development and mine extension project in Canada. It is expected to extend the overall mine life of the Kidd Creek mine beyond 10 years.

In the Sudbury Basin, Inco Limited's three production expansion and mine-life extension programs for its nickel-copper operations continued throughout 2002. At the Creighton mine, the first phase of the US\$125 million Creighton Deep project, which began in 2001, involves the development of proven reserves of 2.8 Mt grading 3.45% nickel and 2.97% copper between the 7400-ft and 7660-ft levels from 2001 to 2013. Production from ore developed in Phase 1 already began in 2001. In the second phase, development will extend down to the 8180-ft level to mine some 3.1 Mt of probable reserves grading 3.62% nickel and 3.25% copper between 2005 and 2019. When fully on stream, annual production of the mine is expected to be 10 900 t of nickel, 9500 t of copper and 28 000 oz of platinum group metals. The deep development project at Creighton is one of the company's most significant mine extension and expansion projects in Ontario in recent years. The Creighton mine, discovered in 1856 and brought on stream in 1901, celebrated a century of continuous production in 2001. It is Inco's oldest operating mine and the deepest nickel mine in the world. In 2002, Inco took a decision to deepen the Garson mine in Sudbury by announcing a \$60 million (US\$43 million) capital program to access ore located between 1360 and 1550 m below surface. The program, substantially completed in the year, is expected to extend the mine life at Garson

from one year to nine years. Production is also expected to increase from some 1900 t/d to 2100 t/d. At the McCreedy East mine, a four-year, \$46 million (US\$33 million) capital program initiated in June 2000 to develop a nearby newly discovered high-grade nickel deposit reached the halfway mark in 2002. It involves mine development of the Main and adjacent West orebodies containing 8 Mt grading 1.88% nickel, 0.84% copper and 0.91 g/t platinum group metals. Mine production is expected to increase to 4350 t/d from the current 2700 t/d when full production is reached in late 2004, with metal production of 22 million kg (48 million lb) of nickel and 42 million kg (92 million lb) of copper annually, up from the current 13 million kg (29 million lb) of nickel and 39 million kg (82 million lb) of copper. The mine has other mineral zones and has the potential to extend its current life of 15 years. The McCreedy East mine, which also underwent a \$194 million expansion between 1997 and 1999, is one of Inco's four key mines in Ontario and one of the company's lowest-cost mines in the province. The other three are the Creighton, Copper Cliff North and Copper Cliff South mines. In 2002, Inco's capital development expenditures for expansion and mine-life extension of its Sudbury mines totalled some \$90 million (\$97 million in 2001).

## Manitoba

A US\$48 million (\$70.4 million) capital program that began in 2001 to deepen the Birchtree nickel mine near Thompson in order to expand production and extend the mine life was completed in 2002. The two-year program has deepened the mine and increased the daily production capacity to 3175 t from 1635 t while reducing costs by 25%. Capital investment in 2002 is estimated at \$35 million. The mine is expected to reach full production in 2004. A redesigned mine development plan, by a joint Inco and union team, could see further lowering of costs and accelerated cash flow. As well, deepening the mine has increased ore reserves to 13.6 Mt grading 1.79% nickel. The Birchtree mine operated from 1966 to 1977, returning to production most recently in 1989. Inco is also studying the deepening of its Thompson 1-D orebody and is re-surveying the entire Thompson nickel belt. These activities are all part of Inco's strategy to focus on discovering new mineralization at or near existing mines and previously known deposits.

## Northwest Territories

The original mining plan at the Ekati diamond mine in the Lac de Gras area involving five pipes (Panda, Koala, Misery, Sable and Fox) was revised since the discovery of several higher-grade pipes on the property between 1993 and 1999. Consequently, a new mine plan took into consideration the new pipes that are closer to the central mill site, such as the Koala North, Lynx, Jay, Beartooth and Pigeon pipes. Priority was given to the development of

the Misery pipe as the Ekati mine's second open-pit operation, followed by the Koala North underground operation. With diamond production from the Misery pipe beginning in December 2001 and from Koala North commencing in August 2002, as well as from other pipes in the planned sequence, production capacity at the Ekati mine is gradually increasing towards the planned 18 000-t/d level for 2008 from the current 9000 t/d.

## Others

In addition to the above major projects, several mines across Canada have also undergone relatively significant expansion or mine-life extensions in 2002. In Quebec, significant deep drilling and development work was carried out at the Doyon Division gold mines near Cadillac. Capital expenditures totalled \$8.1 million in 2002, slightly higher than in 2001. Proven and probable reserves at year-end 2002 stood at 8 Mt grading 5.3 g/t gold (1.4 million oz). As a result of the increased deep drilling, measured and indicated resources were increased to 1.9 Mt grading 3.6 g/t gold and inferred resources amounted to nearly 6.3 Mt grading 5.2 g/t gold. At the Sleeping Giant gold mine north of Amos, the newly discovered Zone 8 was extended by more than 150 m towards the south and the presence of the vein at depth was confirmed in 2002. In Manitoba, as part of the \$400 million 777 project to develop two new mines (the Chisel North mine and the 777 mine), expansion of the Flin Flon concentrator and the new 777 shaft were completed in 2002. In Alberta, a decision to postpone the development of the Cheviot coal project near Hinton has also led to the need for the further postponement of a planned closure at the nearby Luscar coal mine to the end of 2003. The Eskay Creek mine had its best production year despite lower grades and a strike at one of the mine's key third-party smelters. Gold production in 2002 increased to 359 000 oz, a 12% increase over 2001, as cash costs decreased by 18% to US\$40/oz, the lowest gold mine production cost in Canada. To mitigate the impact of the third-party smelter strike that began in July 2002, the mine optimized its milling capacity, increasing throughput (by 12%), re-sequencing the mining efforts to source higher-grade ore, and arranging for increased sales to its other main smelter. As of December 31, 2002, proven and probable ore reserves were 1.3 Mt grading 34.217 g/t (0.998 oz/st) gold for 1.43 million oz of gold. The reserves also contain 64.4 million oz of silver.

Overall, in addition to new mine developments, the major mine expansion and extension programs described above continue to indicate that, due to difficult times in recent years brought about by lingering weak metal prices and financing difficulties, mining companies in Canada have been concentrating their financial resources on mine-site exploration instead of off-site exploration and the development of new mines. The results also show that these companies were able to continue to discover new ore at existing mines. The successes of such discoveries and

follow-up developments have enabled the mines to extend their lives and expand production, which in turn have enabled the mines to reduce production costs and to stay competitive and economically viable. Although most expansion or extension projects seldom result in large increases in new mining jobs, over 150 new jobs were created from such projects in 2001 and 2002, most significantly at the LaRonde and Lac des Iles mines, and more than 300 mine jobs were saved at a number of mines, notably at the Garson, Birchtree and Luscar mines, which otherwise would have closed or been at risk of closing. These events were sufficient to mitigate job losses due to production cutbacks and production losses due to other reasons at many gold, base-metal, uranium and coal mines in 2002.

## IMPACT

In 2002, the small new mine (Mishi) brought on stream some 200 t of daily ore production capacity and created some 10 mining jobs, the smallest amount of daily ore capacity and lowest number of new jobs from new mine openings in more than a decade. However, the eight mines that re-opened resulted in 16 000 t/d of ore capacity and nearly 1200 jobs. In contrast, almost 18 500 t/d of ore capacity and over 1600 jobs were lost from six mine closures and three production suspensions, resulting in net losses of nearly 1500 t of daily ore capacity and 330 direct mining jobs. These losses, however, represented some of the smallest net losses in recent years. The largest contributors to the overall job loss were the Ruttan, Polaris, Nanisivik, Bousquet and Cluff Lake mines, which together constituted 72% of the total net job loss. The same five mines also accounted for 77% of the net capacity loss.

In addition, production losses and cutbacks have again resulted in significant job losses during the year, especially at gold, base-metal, uranium and coal mines. In 2002, such job losses were estimated at less than 200, a level similar to 2001. This, however, makes 2002 the sixth consecutive year of job losses due to production losses and cutbacks at producing mines across Canada.

Mine openings ensure immediate access to new or redeveloped sources of economic mineral supply, new production capacity and capability, and new mining jobs. They also reflect Canada's mine-building ability and its attractiveness in the face of global competition and globalization. Although the number of mine openings equalled the number of mine closings in 2002, the recent trend in which base-metal mines are fewer or lacking in both number and size has persisted and has reached the lowest level in more than a decade. However, gold, uranium and tungsten mine re-openings during the year provided desperately needed additions to Canada's total metallic mineral production capability. Overall, while production from the small new gold mine in 2002 is expected to add only



7000 oz of gold annually (Table 3) to Canada's total gold production, mine re-openings in 2002 will have a more beneficial impact on the regions across Canada. The re-opening of the Beaufor, Sigma Lamaque and Joe Mann gold mines in the Abitibi Greenstone Belt of Quebec provided a much-needed boost to mining in this depressed region where mine employment and mining capacity losses continued to mount in recent years as a result of mine closures continuing to outnumber mine openings since 1999. The re-opening of the Eagle Point uranium mine in northeastern Saskatchewan not only revived mining in the Rabbit Lake uranium camp, which had been dormant since 1999, but also offset the negative impact of the closure of the Cluff Lake uranium mine in northwestern Saskatchewan in 2002. In British Columbia, the re-opening of the Myra Falls zinc-copper mine revived the only current metal mining camp on Vancouver Island. As well, the re-opening of the CanTung tungsten mine in the Northwest Territories near the Yukon border has put Canada back on the world map as an important tungsten producer.

Table 4 shows that new mines and mine re-openings in 2002 have added 10.34 t (333 000 oz) of gold, 23.25 t (750 000 oz) of silver, 15 700 t of copper, 5000 t of nickel, 60 000 t of zinc, 2700 t (6 million lb) of  $U_3O_8$  and 3000 t of tungsten to Canada's total annual mineral and metal production. They also added over 81.41 t (2.62 million oz) of gold reserves, 334.9 t (10.76 million oz) of silver reserves, 116 500 t of copper, 10 000 t of nickel, 5.53 Mt of zinc, 47 000 t of lead, 9000 t of uranium and 10 000 t of  $WO_3$  to Canada's total reserves of these metals and minerals. Except for gold and tungsten, reserves from mine openings in 2002 would be insufficient to replenish depleted mine reserves due to production or to stem the recent and alarming decline in Canada's once mighty base-metal production capability.

## NEW DEVELOPMENTS EXPECTED TO BECOME MINES IN 2003

Preliminary estimates, based on mine development activities in 2002 and in the first half of 2003, indicate that three mines, two of which will be new mines, could come on stream in 2003. Among the most promising new mines are Melford (gypsum) in Nova Scotia and Diavik (diamonds) in the Northwest Territories. In fact, the world-class Diavik mine, developed at a total cost of \$1.2 billion, began diamond production in February 2003. In addition, the McCreedy West mine redevelopment project in Ontario is expected to begin nickel production from its Phase 1 mining program in the second half of 2003.

In addition, several existing mine expansion and extension projects, as well as new ones that were initiated in 2002, are expected to continue in 2003 with others likely to be announced during the year. These mine expansions and

mine-life extensions, together with new mine developments, are central to sustaining mine production in Canada. In the face of still weak prices for a number of minerals and metals and without having to resort to significant layoffs, mine expansion remains an effective option by which production costs can be lowered and productivity increased at an existing mine. Such an option is especially beneficial for mines that have significant recent new mine-site ore discoveries, for example, the LaRonde, Troilus and Niobec mines in Quebec; the Red Lake, Musselwhite, Lac des Iles, Kidd Creek, Creighton and McCreedy East mines in Ontario; the Birchtree mine in Manitoba; and the Ekati mine complex in the Northwest Territories, all of which have been discussed above, as well as many others that are still in the planning stages.

## OUTLOOK

With the exception of zinc and lead, precious-metal and base-metal prices strengthened in 2002 in response to increased global demand, setting the stage for a significant metal price recovery and acting as a catalyst for exploration and new mine development across Canada. Both exploration spending and capital investment in new mine developments, mine redevelopments for re-opening, and expansions and mine-life extensions were up in 2002 compared with 2001. While total exploration expenditures increased to \$573 million in 2002 from \$513 million in 2001, total mine complex development expenditures dropped to \$2.1 billion from \$2.6 billion in 2001, and exploration (less than \$140 million) and capital development expenditures (around \$260 million) on base metals remained at low levels in 2002, as in 2001. Base-metal mine reserves, particularly copper and zinc, reached alarming levels in 2002, bringing Canada's mine production capability for these metals to its lowest level since 1981. This has come as no surprise as closures of larger base-metal mines continued to outnumber openings. As well, the recent decline in mine openings has resulted in shrinking the number of principal producing metal mines in Canada to below 70 in 2001 and 2002, the lowest level in more than two decades, continuing the erosion of Canada's base-metal and overall metal mine production capabilities – a major feedstock for the downstream economy. With the exception of nickel, Canada's traditionally strong base-metal mining, especially of copper and zinc, has fallen prey not only to global competition, but also to weak prices over the years, resulting in years of neglect in base-metal exploration and development. Prior to 1998, Canada ranked third in the world in copper production. As the result of a continuous decline in mine production and reserves, copper production in Canada had fallen to sixth place by 2002. The situation for Canadian zinc is worse. In 2002, Canada slipped again in world rank for zinc production, dropping to fourth from the number one position it held prior to 1997. Sustained increases in both exploration and mine development activities and expenditures

are needed to enable Canada to rebuild its lost base-metal production capabilities and to regain its lost world market shares.

While the outlook for metals in general has brightened, many Canadian mines are aging and production costs are increasing. To better prepare and position themselves for the next up-cycle in metals and minerals, Canadian companies need to continue to find innovative ways to stay competitive in the global market. In recent years, Canadian companies have acted more swiftly to market conditions by closing down high-cost mines, consolidating operations, cutting back on production and work force, imposing or extending temporary shut-downs, revamping mining methods, introducing innovations, expanding production capacity, or postponing mine openings and developments, as well as undertaking combinations of these and other measures. However, many mines appear to have reached the end of their mine lives or their limits for further technical or economic improvements and the costs of further improvement would likely outweigh the anticipated benefits. In these cases, mine closure or temporary shut-down become inevitable options. This situation has also resulted in accelerated production and premature mine closures, such as in the cases of the Sullivan mine in 2001, the Nanisivik and Ruttan mines in 2002, and Obed Mountain and Magnola in 2003.

Currently, the most damaging factor for mine development and mine openings in Canada is still the economic uncertainty in the United States, Japan and Western Europe, although the situation has improved since 2001. Since the current economic slowdown in the United States, which set in during the second half of 2000, there have been no convincing signs of sustained economic recovery. On the contrary, the budget deficit in the United States is mounting. It reached US\$450 billion in 2002 and the forecast for 2003 is higher. This has affected mineral trade and demand for metals in North America and Western Europe. As well, the long-awaited economic recovery in Japan, since the metal downturn that started in 1997, is slow in coming, although there were positive signs in 2002.

The only bright sign has been a steadily strong demand from China for key industrial minerals and metals. In fact, the strong demand from China has offset much of the overall negative impact from the American and Japanese economic malaise and has helped to strengthen key industrial metal prices such as nickel, copper and iron prices and to prevent the weakening of zinc and lead prices. While the renewed International Monetary Fund-European Central Bank agreement to limit gold sales by central banks and the weak U.S. dollar provided a boost to gold prices, the recent success in China's gold liberalization policy, resulting in the launch of the Shanghai gold market and stock exchange in 2001 and in allowing private ownership of gold bullion in 2002, has also helped strengthen the world gold price, which reached over US\$347/oz at

year-end 2002 and continued its upward climb in the first half of 2003. Although the slow economic recovery in the United States will continue to have a dampening effect on the growth in demand for industrial metals and thus the price recovery of these metals, as long as the U.S. dollar remains weak, gold prices can be expected to remain strong. The SARS outbreak in March and throughout the second quarter of 2003 has put considerable doubt on the momentum of the increasing demand for metals from China. However, by the end of June, news on the containment of SARS in China had revived hopes that demand for metals from this country will likely continue its upward trend and key metal prices, especially for nickel, copper, zinc and iron ore, will continue to recover in the foreseeable future. As a result, many new mine development and redevelopment projects in Canada that were shelved since 1997, and that were subsequently revived for development since early 2000 but were again negatively affected and quietly postponed, will again be revived.

As a result of the successful substitution of platinum for palladium in catalytic converters in the automobile industry since 2001, palladium prices have plummeted and platinum prices have shot up considerably, quadrupling that of palladium since 2002. The auto industry is now contemplating a switch back to palladium. As the U.S., Japanese and European economies recover, albeit slowly, increases in automobile output will continue to boost the use of either platinum or palladium and, in fact, the entire platinum metals group, which will continue to fuel exploration and development of platinum group metal (PGM) projects. In Canada, PGMs are commonly associated with nickel deposits. As a result of favourable prices, there have been an increasing number of discoveries of high-grade PGM deposits, notably in Ontario and Quebec.

As for other minerals and metals that are most likely to affect the outcome of mine developments and mine openings and closures in Canada, diamonds, coal and uranium will continue to play an important role. While the outlook for coal is mixed, the outlooks for both diamonds and uranium remain bright. Although demand for thermal coal has declined in recent years due to severe global competition and increased environmental restrictions, metallurgical coal use has strengthened as a result of increased demand for steel since 2001. The trends are likely to continue throughout 2003 as global industrial demand has shown signs of recovery after SARS. As well, increased demand for cleaner energy, especially since the California power shortage in 2001, has put upward pressure on nuclear reactors and hence uranium prices, thereby increasing the price outlook for uranium. Strong demand for high-quality gem diamonds continues to fuel exploration for and development of diamond projects in Canada. With two world-class diamond mines, namely, Ekati and Diavik, in production, and the Snap Lake, Victor and Jericho projects at the environmental permitting stage, Canada is poised to move up among the top diamond pro-

ducers in the world. Should the Snap Lake, Victor and Jericho projects be developed into mines as planned, Canada is expected to become the third largest diamond producer in the world by 2007. With numerous existing and new discoveries, Canada's diamond future is bright.

Mine openings are expected to again be outnumbered by mine closings in 2003 due to some delays and postponements in planned mine openings. However, given the overall improved demand and price outlook for key industrial minerals and metals, the prospects for mining, mine re-openings and new mine developments that have been committed for production and those that are moving toward the development stage have greatly improved.

*Notes: (1) Information in this review, based mostly on company reports and communications with companies, was current as of June 30, 2003. (2) This and other reviews, including previous editions, are available on the Internet at [www.nrcan.gc.ca/mms/cmy/2002cmy\\_e.html](http://www.nrcan.gc.ca/mms/cmy/2002cmy_e.html).*

#### Note to Readers

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**TABLE 1. MINE OPENINGS AND CLOSINGS IN CANADA, 2002**

Province/ Territory	New Mines			Mines Re-Opened			Mines Suspended			Mines Closed		
	Precious Metals	Base Metals	Other Minerals/ Metals	Precious Metals	Base Metals	Other Minerals/ Metals	Precious Metals	Base Metals	Other Minerals/ Metals	Precious Metals	Base Metals	Other Minerals/ Metals
Newfoundland and Labrador	-	-	-	-	-	-	-	-	1	-	-	-
Quebec	-	-	-	3	-	-	1	-	-	1	-	-
Ontario	1	-	-	1	1	-	-	-	-	-	1	-
Manitoba	-	-	-	-	-	-	-	-	-	-	1	-
Saskatchewan	-	-	-	-	-	1	-	-	1	-	-	1
British Columbia	-	-	-	-	1	-	-	-	-	-	-	-
Northwest Territories	-	-	-	-	-	1	-	-	-	-	-	-
Nunavut	-	-	-	-	-	-	-	-	-	-	2	-
Canada, total by commodity group	1	-	-	4	2	2	1	-	2	1	4	1
Total Canada	1			8			3			6		

Source: Natural Resources Canada, based on company reports.

- Nil.

TABLE 2. MINE OPENINGS, RE-OPENINGS, EXPANSIONS, EXTENSIONS, SUSPENSIONS AND CLOSURES IN CANADA IN 2002

Mining Project/Remarks	Location	Province/ Territory	Capacity (t/d)	Employment During Mine Life	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Company
<b>NEW MINES</b>								
<b>Precious Metals</b>								
Mishi	Wawa	Ont.	200	(e) 10	August	O/P	Gold	River Gold Mines Ltd.
Remarks: Gold production at the small Mishi mine began in August 2002. Initial open-pit mining produced 2800 oz of gold from 20 000 t of ore grading 4.4 g/t gold. By year-end, an additional 26 500 t of ore grading 3.8 g/t gold was stockpiled at the Eagle River mill. Annual gold production is estimated to be about 7000 oz. As of December 31, 2002, proven and probable reserves stood at 210 000 t grading 3.1 g/t gold, sufficient for three years of production at a stripping ratio of less than 1:1. The capital cost to production is estimated at less than \$1 million. The mine will operate on a seasonal basis. Beneath the open pit is an indicated resource of 1 043 000 t grading 5.1 g/t gold. River Gold Mines Ltd. intends to develop this underground resource for production over the next two years. The Mishi mine is part of the Mishi-Magnacon Complex. The company is planning a \$3 million dewatering, drilling and development program at the Magnacon property, in which the Magnacon mine produced some 34 000 oz of gold between 1989 and 1990.								
<b>RE-OPENINGS</b>								
<b>Precious Metals</b>								
Beaufor	Val-d'Or	Que.	1 100	(e) 100	January	U/G	Gold	Richmont Mines Inc. and Louvem Mines Inc.
Remarks: The mine was first developed for production in January 1996. Mining was suspended in August 2000 due to pillar stability problems. Following completion of underground work to secure the mine, production resumed in January 2002. Gold production in 2002 was 56 065 oz at a cash cost of US\$163/oz. Gold recovery reached 99%. As of December 31, 2002, proven and probable reserves at the mine stood at 1 012 400 t grading 7.54 g/t gold, for a total of 246 000 oz. In addition, there were some 730 280 t of mineral resources grading 7.20 g/t gold (or 171 000 oz). Based on mineable reserves and production rate at the start of 2003, the remaining mine life is estimated at 4-5 years.								
Sigma-Lamaque	Val-d'Or	Que.	5 000	(e) 105		O/P	Gold	McWatters Mining Inc.
Remarks: Redevelopment work and expansion of milling capacity from 3000 t/d to 5000 t/d at the Sigma-Lamaque Complex were completed with production resuming on November 27, 2002, at a capital cost of \$34 million. Commercial production at the 72% mill capacity level was reached on April 1, 2003. On April 3, 2003, McWatters Mining Inc. also completed the acquisition of the remaining 40% interest in the Complex that was held by SOQUEM INC. and the purchase of the East Malartic milling facilities, including 60 km <sup>2</sup> of mining properties, from Barrick Gold Corporation. From November 27, 2002 to March 31, 2003, the mine produced 20 392 oz of gold at a gold recovery rate of 95%. Production for 2003 is expected to reach 100 000 to 110 000 oz of gold at a cash operating cost of US\$200-\$210/oz. Proven and probable ore reserves at the end of 2002 were 14.965 Mt grading 2.61 g/t gold, or 1.258 million oz, sufficient for at least another 10 years of mine life at the current rate of production. Measured and indicated resources stood at 8.183 Mt grading 3.60 g/t gold (956 000 oz). In addition, an inferred resource stood at 11.505 Mt grading 4.91 g/t gold (1.815 million oz). The Sigma mine began production in March 1937. McWatters purchased the mine from Placer Dome Inc. in September 1997. In the third quarter of 2000, the underground operation was closed, followed by the suspension of production at the open-pit operation in February 2001, both due to high costs.								
Joe Mann	Chibougamau	Que.	1 170	175	March 31	U/G	Gold, copper	Campbell Resources Inc.
Remarks: Production was suspended at the Joe Mann gold mine near Chibougamau between November 2000 and March 2002 due to high costs. A 17-month exploration program and a 4-month redevelopment program that began in November 2001 by Campbell Resources Inc., following a three-way merger with MSV Resources Inc. and GéoNova Explorations Inc. on June 30, 2001, have resulted in a significant reduction in operating costs. Production at the mine resumed at the end of March 2002, with expected yields of 56 000 oz of gold and 1.2 million lb of copper in 2002, with gold production at a cash operating cost of US\$200/oz. Total capital investment to redevelop the Joe Mann mine for production is estimated at \$10 million. At the start of production at the end of March 2002, proven and probable reserves were 1 228 300 t grading 10.41 g/t (0.3038 oz/st) gold and 0.265% copper.								
Macassa	Kirkland Lake	Ont.	(e) 900	(e) 50	May 14	U/G	Gold	Kirkland Lake Gold Inc.
Remarks: In June 1999, production at the Macassa gold mine near Kirkland Lake, Ontario, was suspended by the previous owner, Kinross Gold Corporation, due to low gold prices. On December 14, 2001, Foxpoint Resources Ltd. acquired the mine and mill along with four contiguous properties from Kinross and subsequently re-opened the mine in May 2002. The cost of re-opening is estimated to be about \$1 million. In October 2002, the company changed its name to Kirkland Lake Gold Inc. While production since the start of mining in May came mainly from surface ore stockpiles, underground production from Shaft No. 3 was initiated in January 2003. In February 2003, a significant high-grade mineralized zone dubbed "D zone" was discovered about 500 ft from Shaft No. 3. While most ore zone structures in the Kirkland Lake Camp are east-west trending, this zone is north-south trending. The company has since been able to expand on this new D zone. In early March, underground production was suspended due to the failure of the pillar between an existing ore pass and Shaft No. 3. As of January 8, 2003, proven and probable reserves at the mine were estimated at 725 750 t grading 15.42 g/t gold (359 800 oz). Measured and indicated resources totalled 2.783 Mt grading 10.62 g/t gold (944 700 oz). In addition, there was an inferred resource of 407 300 t grading 9.25 g/t gold (121 200 oz). Gold production is forecast to be 50 000 to 70 000 oz in 2003.								
<b>Base Metals</b>								
Gertrude	Sudbury	Ont.	(e) 1 600	(e) 120	October	O/P	Nickel, copper, platinum group metals (PGM)	Inco Limited

Remarks: The Gertrude mine began limited production in 1997, followed by a shut-down in 1998 and 1999, and re-opened for commercial production in 2000. Production was again suspended in 2001 and resumed in October 2002. The cost of re-opening is estimated to be \$1 million. Annual ore throughput is estimated to be 500 000 t. The open-pit reserves are expected to last beyond 2004. Mining is carried out entirely through contract mining. The Gertrude open pit is a flywheel operation subject to standby at any time.

Myra Falls	Campbell River	B.C.	4 000	360	March	U/G	Zinc, copper, gold, silver	Boliden AB
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Remarks: Production at the Myra Falls operations first began at the Lynx open-pit mine in December 1966, followed by underground production at the Myra mine in 1972, at the Lynx mine in 1975 and at the H-W mine in 1985. Both the Lynx and Myra mines have since been mined out. Current production comes from the H-W and the Battle and Gap zones, which were discovered in 1979 and 1991, respectively. In the first quarter of 1998, Boliden acquired the Myra Falls operations by purchasing Westmin Resources Limited and created Boliden Westmin (Canada) Limited to oversee the operations. In mid-December 1998, production at Myra Falls was temporarily suspended to address challenging ground conditions in the Battle zone and full production resumed in March 1999. Operation again was suspended in December 2001 but resumed in March 2002 after the implementation of an action plan that will lower costs and make production considerably more efficient. As of December 31, 2002, proven and probable reserves at the Myra Falls mine were 8.267 Mt grading 1.25% copper, 6.70% zinc, 0.57% lead, 1.22 g/t gold and 40.51 g/t silver, sufficient to support production at the current rate for another six years. The mine also hosts 4.579 Mt of measured and indicated resources grading 1.32% copper, 7.41% zinc, 0.7% lead, 1.72 g/t gold and 61 g/t silver.

#### Other Minerals/Metals

Eagle Point	Rabbit Lake	Sask.	(e) 600	(e) 150	August	U/G	Uranium	Cameco Corporation
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Remarks: Mining resumed at the Eagle Point uranium mine at Rabbit Lake, Saskatchewan, in June 2002 followed by uranium production in August. The restart of mining, estimated at a cost of over \$5 million, however, did not go as smoothly as planned due to equipment problems and poor ground conditions. In 2002, the mine produced 98 227 t of ore grading 0.76% U<sub>3</sub>O<sub>8</sub>, yielding 1.1 million lb of U<sub>3</sub>O<sub>8</sub>, which was less than the planned amount of 3 million lb. In 2003, the mine is expected to produce 6 million lb of uranium from its remaining reserves of about 17.6 million lb U<sub>3</sub>O<sub>8</sub>. Prospects for additional reserves are being explored where extensions to known orebodies have been identified.

CanTung	Cantung	N.W.T.	1 000	175	January 21	U/G	Tungsten	North American Tungsten Corporation Ltd.
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Remarks: Tungsten production resumed at the CanTung mine in the Northwest Territories on January 21, 2002, after a 16-year production suspension. The mine was shut down due to the collapse of tungsten prices as a result of market flooding by imports from China. The re-opening of the CanTung mine resumes its position as the Western World's largest producer of high-grade, clean tungsten concentrates. Annual output is planned at 3000 t (300 000 metric tonne units or mtu, where 10 kg = 1 mtu) of tungsten concentrates. Sweden-based drill equipment maker Sandvik AB and Germany-based Siemens AG subsidiary Osram Sylvania Products, Inc. agreed to purchase the mine's full production for three years and provided a \$4.5 million loan to cover part of the start-up costs. Sandvik and Osram Sylvania are among the world's leading producers of cemented carbides and consumers of tungsten concentrates. The CanTung mine first began production in 1962 and was placed into care and maintenance in 1986. The capital cost for re-opening the mine in early 2002 is estimated at \$10 million. As of December 2002, proven and probable ore reserves were estimated at about 560 000 t grading 1.82% WO<sub>3</sub>, sufficient to maintain full production for more than three years. In addition to owning the CanTung mine, North American Tungsten Corporation Ltd. also owns the world-class MacTung deposit in the Northwest Territories. These assets represent the Western World's largest proven high-grade tungsten reserves and comprise some 15% of the world's proven resource base.

#### EXPANSIONS AND EXTENSIONS

##### Precious Metals

LaRonde	Val-d'Or	Que.	6 350	500	1997-2004	U/G	Gold, zinc	Agnico-Eagle Mines Limited
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Remarks: In 2002, Agnico-Eagle Mines Limited completed the expansion of the production capability of its LaRonde gold mine near Val-d'Or, Quebec, with mill capacity increased 40% from 4530 t/d to 6350 t/d and gold reserves increased by 23% from 3.3 million oz in 2001 to 4 million oz at a capital cost of \$61.4 million. When added to the inferred resources of 4 million oz, this makes LaRonde the largest gold deposit in Canada and one of the largest in the world. The mine also saw record gold production of 260 000 oz from a 2-Mt ore throughput in 2002 as a result of the expansion. However, underground expansion is expected to continue in 2003 with a focus on developing ore and infrastructure above the 215 level (2150 m or 7050 ft) below the surface to further increase production in 2003 and 2004. Overall in 2002, while ore grade, metallurgical recoveries, and processing and hoisting capacity have improved, there were operational problems including fewer gold-copper mining blocks for access at depth as expected due to a mechanical failure affecting the development of high-grade areas. Development delays caused by a massive rock fall in one of the high-grade stope areas in March 2003 also resulted in lower production early in the year. As well, cash operating costs averaged US\$141/oz, 7% higher than in 2001 (US\$132/oz). Total cash costs amounted to US\$182/oz, a 17% increase from US\$155/oz in 2001. As of December 31, 2002, ore reserves stood at 37.823 Mt grading 3.347 g/t gold, 69.776 g/t silver, 0.375% copper and 3.42% zinc. The current exploration focus is on deep exploration drilling in Zone 20 North, which is wide open below the 215 level with known thicker mineralization and a strong indication of better gold grades.

Troilus	Chibougamou	Que.	16 000	285	2002	O/P	Gold	Inmet Mining Corporation
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Remarks: In 2002, the Troilus gold mine near Chibougamou, Quebec, substantially enhanced its operation through a series of improvements including an expansion of its mill capacity to 16 000 t/d from 10 000 t/d, better mining efficiency in the main pit, and improved grade controls at a capital cost of \$8.3 million. The mine produced 165 000 oz of gold in 2002 at a cash cost of US\$247/oz. Additional in-fill drilling was recently completed on the J-4 zone located 1000 m from the main 87 open pit. These developments have resulted in a revision to the mine reserves and life-of-mine plan. Revised proven and probable reserves at Troilus as at December 31, 2002, were 42.5 Mt grading 0.9 g/t gold (or 1.04 million oz) and 0.09% copper (32 000 t), doubling a previous estimate of gold and copper reserves of 55 000 oz of gold and 18 000 t of copper. The new pit designs are based on a gold price of US\$325/oz and a copper price of US\$0.90/lb with a mining dilution of 5%. The average life-of-mine cash cost of gold production is estimated at US\$240/oz with a break-even cash cost at US\$270/oz. The increased mine reserves effectively doubled the mine life at Troilus to eight years to 2010.

TABLE 2 (cont'd)

Mining Project/Remarks	Location	Province/ Territory	Capacity  (t/d)	Employment During Mine Life	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Company
Lac des Iles	Thunder Bay	Ont.	15 000	275	2000-2002	O/P	Palladium, platinum, gold, copper, nickel	North American Palladium Ltd.
<p>Remarks: Reflecting a successful expansion of mine reserves in 1999, North American Palladium Ltd. launched a \$220 million, three-year capital program in 2000 to expand production at its Lac des Iles mine located 985 km north of Thunder Bay, Ontario. A new concentrator, which was completed in June 2001, boosted the ore throughput capacity from 2400 t/d to 15 000 t/d. In 2002, the mine produced 220 000 oz of palladium, compared with 95 116 oz in 2000 before the expansion. Annual palladium production from the mine was expected to increase to 250 000 oz, or 5% of the world's annual palladium supply, by 2002. Total capital expenditures in 2002 were estimated at \$70 million. A new, larger pebble crusher was installed in October 2001. This, together with modifications to the grinding and flotation circuits, the contracting out of fine-ore crushing, and the installation of a new liner in the semi-autogenous mill completed in 2002, has improved mill throughput and recoveries. However, in the long run, a secondary crusher, modifications to the grinding circuit, and possibly an expansion of the flotation circuit would be needed. The mine produces a single bulk concentrate containing palladium, platinum, gold, copper and nickel. The concentrate is trucked to Sudbury, Ontario, for smelting by Inco Limited and Falconbridge Limited, and is then shipped to these companies' respective European operations for refining. In 2002, exploration continued in the "Offset High Grade" zone, which is a faulted extension of the Main High Grade zone at depth discovered in 2001. The intercepts within this zone were exceptional with an average palladium grade of 5.2 g/t over a true thickness of 23 m. As of December 31, 2002, ore reserves were 93.5 Mt grading 1.53 g/t palladium (4.6 million oz), 0.17 g/t platinum, 0.12 g/t gold, 0.06% copper and 0.05% nickel. Measured and indicated resources totalled 65.9 Mt grading 1.58 g/t palladium (3.3 million oz), 0.17 g/t platinum, 0.11 g/t gold, 0.05% copper and 0.05% nickel. In addition, inferred resources totalled 73 Mt grading 1.57 g/t palladium, 0.15 g/t platinum, 0.10 g/t gold, 0.05% copper and 0.05% nickel. At full production, starting in the second half of 2003, annual output is expected to be 250 000 oz of palladium, 23 000 oz of platinum, 18 000 oz of gold, 6 million lb of copper and 2 million lb of nickel at a cash cost of US\$200/oz of palladium. The mine currently employs 275 people, compared to 130 prior to the expansion. The Lac des Iles mine is Canada's only primary palladium mine.</p>								
Musselwhite	Opapimiskan Lake	Ont.	4 000	266	2001-2002	O/P and U/G	Gold	Placer Dome Inc. and Kinross Gold Corporation
<p>Remarks: The Musselwhite gold mine, near Opapimiskan Lake in northern Ontario, first began production on April 1, 1997. The mine produced 209 460 oz of gold in 2002. Between production start-up in April 1997 and December 31, 2002, the mine produced 1 453 200 oz of gold from more than 7 Mt of ore mined. An expansion to take the mine and mill to 4000 t/d from 3300 t/d began in 2001 and was completed in June 2002. Capital costs for the expansion were estimated at about \$5 million. The installation of an underground jaw crusher and conveyors to bring ore to surface from the 460-m level, as well as improvements in the mill and tailings treatment reactor tank, helped boost the ore capacity. In 2003, production is forecast at 236 450 oz of gold from 1 436 000 t of ore throughput. As of December 31, 2002, proven and probable reserves stood at 8.11 Mt grading 5.4 g/t gold, containing 1.419 million oz. Measured and indicated resources were 3.108 Mt grading 7.1 g/t gold. In addition, there were 2.245 Mt of inferred resources grading 7.6 g/t gold. Based on current mineral reserves, Musselwhite has an expected mine life through to 2011. The mine plan includes seven ore deposits: T Antiform, OP, PQ, Esker, West Anticline, Intraformational and the West Zone. The mine employs 266 full-time employees and 101 First Nation contractors for support services.</p>								
Red Lake	Balmertown	Ont.	550	(e) 175	2000-2002	U/G	Gold	Goldcorp Inc.
<p>Remarks: Since the re-opening of the Red Lake mine in August 2000, both production and ore reserves at the mine have grown considerably. In 2001, gold production from the mine, mainly from the High Grade Zone, was a record 503 385 oz at a cash cost of US\$59/oz, making Red Lake the largest gold-producing mine in Canada. This was followed by a further increase to 525 000 oz in 2002 at a cash cost of US\$65/oz. For 2003, gold production from the Red Lake mine is forecast at over 500 000 oz at a cash cost of less than US\$75/oz. Gold reserves also increased steadily since the mine's re-opening in 2000. As of December 31, 2002, proven and probable reserves in the High Grade Zone (HGZ) were 1.775 Mt grading 80.57 g/t (2.35 oz/st) gold, for a total of 4.594 million oz, a 21% increase in gold content over 2001. The HGZ represents the richest gold deposit in the world. In addition, proven and probable reserves in the sulphide zones totalled 1.368 Mt grading 12 g/t (0.35 oz/st) gold, or 533 000 oz. The mine also hosts a combined measured and indicated resource of 0.957 Mt grading 22.28 g/t (0.65 oz/st) gold and an inferred resource of 0.748 Mt grading 39.43 g/t (1.15 oz/st) gold. Currently, the Red Lake mine is in the midst of a US\$12 million exploration program to expand reserves and resources, the largest ever undertaken at the mine. Although the mine completed a three-year expansion program in 2002 (with an estimated \$4 million capital cost in 2002), it is poised for further expansion. In February 2003, owner Goldcorp Inc. announced a new US\$85 million program to expand production capacity at the Red Lake mine over three years. A planned new shaft will increase the hoisting capacity by more than 200% to 4000 st/d, of which 2500 st/d could be ore.</p>								
<b>Base Metals</b>								
Niobec	Chicoutimi	Que.	3 400	218	1998-2002	U/G	Niobium, ferroniobium	Cambior Inc. and Mazarin Inc.
<p>Remarks: As part of the current \$15.7 million expansion program at the Niobec niobium mine near Chicoutimi, Quebec, mill capacity has been increased to 3400 t/d from 2700 t/d with mine reserves increased by 26% during 2002. At year-end 2002, total proven and probable reserves stood at 23.8 Mt grading 0.65% Nb<sub>2</sub>O<sub>5</sub>. More than 90% of the reserves are located above level 1450 and can be mined using the current underground infrastructure, reducing the development expenditures for their extraction. The increase in reserves effectively extended the mine life to at least 18 years at the current mining rate. Further extension of mine life is possible as the deposit is open at depth. In 2002, capital expenditures amounted to about \$2.4 million. Planned capital expenditures for 2003 are estimated at \$3.8 million, mainly for underground infrastructure development and the construction of a new tailings pond. Niobec is the only producer of niobium in North America and is the third largest producer in the world. The Niobec mine produces a pyrochlore concentrate, which is transformed into ferroniobium grading 66% niobium using an aluminothermic converter. Ferroniobium is used as a micro-alloy additive to improve the mechanical properties and corrosion resistance of steel.</p>								

Kidd Creek	Timmins	Ont.	12 500	603	2000-2004	U/G	Copper, zinc, silver	Falconbridge Limited
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Remarks: The development of the \$640 million Mine D deep mine project at the Kidd Mining Division in Timmins, Ontario, continued in 2002. The project, which began in late 2000, aims to extend the mine life at the Kidd Creek mine beyond 10 years by deepening the mine from a depth of 6800 ft to 10 000 ft, giving access to an additional 10.3 Mt of reserves and 14.1 Mt of resources. Production from Mine D is scheduled to begin in 2004 and is expected to ramp up to 750 000 t in 2005. Mine D development is being carried out in two stages. The Stage 1 portion of the mine, from 2100 m to about 2700 m, contains about 15.7 Mt of ore grading 2.82% copper, 5.74% zinc and 58 g/t silver. The Stage 2 portion, further down to 3100 m deep, contains 10.5 Mt grading 2.20% copper, 5.27% zinc and 97 g/t silver. As of December 31, 2002, total proven and probable reserves at the Kidd Creek mine stood at 23.7 Mt grading 2.11% copper, 6.30% zinc and 66.46 g/t silver. In addition, there were 100 000 t of indicated resources grading 2.96% copper, 6.79% zinc and 50 g/t silver, and 14.1 Mt of inferred resources grading 3.40% copper, 4.90% zinc and 91 g/t silver. In 2002, the overall cash operating costs of the Kidd Creek mine averaged US\$0.62/lb of copper, net of by-product credits. Capital costs in 2002 were estimated at about \$100 million.

Creighton	Sudbury	Ont.	(e) 3 500	525	2001-13 (Phase 1), 2005-19 (Phase 2)	U/G	Nickel, copper, cobalt, precious metals	Inco Limited
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Remarks: A US\$125 million, two-phase capital program to extend the mine life and to expand mine production at the Creighton nickel mine in Sudbury, Ontario, continued in 2002. Capital expenditures in 2002 were estimated at about \$10 million. The Creighton Deep project, which was announced by Inco Limited in April 1998, aims to develop a 6-Mt high-grade, low-cost nickel-copper deposit at depth at the Creighton mine over the next two decades. Phase 1 of the project, from 2001 to 2013, which involves mine development between the 7400-ft and 7660-ft levels, will develop proven reserves of 2.8 Mt grading 3.45% nickel and 2.97% copper located between the two levels. Production from this ore has already begun. In Phase 2, development will extend to the 8180-ft level between 2005 and 2019, during which some 3.1 Mt of probable reserves grading 3.62% nickel and 3.25% copper will be developed and mined. In contrast, the current average grades of the Ontario Division mines are 1.3% nickel and 1.2% copper. When Creighton Deep is fully operational (originally planned for 2002), annual production is expected to be 10 900 t of nickel, 9500 t of copper and 28 000 oz of platinum group metals. The Creighton orebody was discovered in 1856. The mine, which began production in 1901, celebrated a century of continuous production in 2001. Creighton is Inco's oldest operating mine.

Garson	Sudbury	Ont.	1 900	(e) 150	2002	U/G	Nickel, copper, cobalt, precious metals	Inco Limited
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Remarks: In 2002, Inco decided to deepen the Garson mine in Sudbury to access ore located between 1360 m and 1550 m below surface, thereby extending the mine life from one year to nine years. Production is also expected to increase from some 1900 t/d to about 2100 t/d. Capital costs for this development are estimated at US\$43 million (\$60 million). The Garson mine first began production in 1907. Production was suspended in 1986 due to ground stability problems. The mine re-opened in late 1993. Ore is processed at the Clarabelle mill.

McCreedy East	Sudbury	Ont.	2 700	180	2000-2004	U/G	Nickel, copper, cobalt, precious metals	Inco Limited
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Remarks: The discovery of a high-grade nickel deposit near the McCreedy East mine in Sudbury, Ontario, prompted Inco Limited to announce a \$48 million (US\$33 million) capital program to develop the orebody in June 2000. It will involve the development of the Main and adjacent West orebodies containing 8 Mt grading 1.88% nickel, 0.84% copper and 0.91 g/t platinum group metals. Mine production is expected to increase to 4350 t/d from the current 2700 t/d when full production is reached in late 2004. At this rate, metal production will be 22 million kg (48 million lb) of nickel and 42 million kg (92 million lb) of copper annually, up from the current 13 million kg (29 million lb) of nickel and 37 million kg (82 million lb) of copper. Capital costs for the 2002 expansion were estimated at about \$12 million. The expansion of the McCreedy East mine will provide Inco's Ontario Division with another source of low-cost production for at least another 15 years. Further mine-life extensions are likely as the mine hosts other mineral zones with excellent potential. The McCreedy East mine is one of Inco's most productive mines with ore handling and materials transportation accessible by existing infrastructure at the company's nearby Coleman mine. It has been designated by Inco as one of four key mines in its Ontario Division. The other three, Creighton, Copper Cliff North and Copper Cliff South, are all in the Sudbury area. All four are the company's lowest-cost mines in Ontario.

Birchtree	Thompson	Man.	3 175	150	2001-02	U/G	Nickel, copper, cobalt, precious metals	Inco Limited
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Remarks: A US\$48 million (\$70.4 million), two-year capital program announced by Inco Limited in February 2000 to extend the life of the Birchtree nickel mine near Thompson, Manitoba, to 2016 was completed in 2002. The project was expected to deepen the mine and increase production to 3175 t/d from 1635 t/d while reducing costs by approximately 25%. As a result, ore reserves also increased to 13.6 Mt grading 1.79% nickel. The mine is expected to reach full production in 2004. A joint effort by a company/union co-design team made the deepening financially viable by redesigning the mine development plan to further lower costs and accelerate cash flow. The Birchtree mine operated from 1966 to 1977, returning to production most recently in 1989. Inco is also studying the deepening of its Thompson 1-D orebody and is re-surveying the entire Thompson Nickel Belt. Both activities are part of Inco's overall exploration strategy to focus on discovering new mineralization near current mines and previously known deposits. This strategy has proven to be successful in recent years.

#### Other Commodities

Carol Lake	Labrador City	N.L.	(e) 49 500 (conc. and pellet)	..	1998-2003	O/P	Iron	Iron Ore Company of Canada
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Remarks: The six-year, \$1.1 billion comprehensive capital investment program that started in October 1998 continued in 2002, albeit at a slower rate. About \$650 million, or 60%, of the investment will be spent on upgrading and expanding the company's Carol Lake mine, concentrator and pellet plant near Labrador City. Another \$361.5 million will be spent on reactivating the pellet plant at Sept-Îles, Quebec, which was mothballed in 1982. However, completion of the Sept-Îles iron ore pellet plant, originally scheduled for 2002, was postponed due to poor iron ore market conditions in the first half of 2001. Stabilization of iron ore prices in 2002 followed by further improvement in 2003 may offer hope for work resumption at the Sept-Îles plant and for putting the overall investment program on track.

TABLE 2 (cont'd)

Mining Project/Remarks	Location	Province/ Territory	Capacity  (t/d)	Employment During Mine Life	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Company
Ekati	Lac de Gras	N.W.T.	9 000	650	2001-08	O/P and U/G	Diamonds	BHP Billiton Diamonds Inc., Charles E. Fipke and Stewart Blusson

Remarks: The Ekati diamond mine, located in the Lac de Gras area of the Northwest Territories, began production on October 14, 1998. The mine was developed at a capital cost of US\$700 million. Although it is generally referred to as the Ekati mine, it is a mining complex that initially consisted of five diamond-bearing kimberlite pipes, namely, Panda, Koala, Misery, Sable and Fox. The five pipes were approved by the federal government to be developed as five mines for production between 1998 and 2008, sharing one common mill at the Panda site. Mine reserves and resources initially totalled some 133 Mt, with 78 Mt scheduled to be mined over a 17-year initial mine life. Given the discovery of additional pipes, several of them higher-grade, the mine plan was revised to take into consideration the new pipes that are closer to the central mill site, such as the Koala North, Lynx, Jay, Beartooth and Pigeon pipes that were discovered between 1993 and 1999. As a result of the mine plan revision, priority was given to the development of the Misery pipe as the Ekati mine's second open-pit operation, followed by the Koala North underground operation. With the diamond production from the Misery pipe that began in December 2001 and from the Koala North underground mine that started in August 2002, as well as other pipes in the planned sequence, the production capacity at the Ekati mine is inching towards the planned 18 000 t/d from the current 9000 t/d. The capital costs of developing the new production capabilities in 2002 were estimated at \$50 million.

#### PRODUCTION SUSPENSIONS

##### Precious Metals

Kiena	Val-d'Or	Que.	2 000	(e) 75	September	U/G	Gold	McWatters Mining Inc.
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Remarks: Production at the Kiena gold mine near Val-d'Or, Quebec, was suspended in late September 2002 due to high costs. However, recent successes from both surface and underground exploration have been encouraging. From a Phase 1 underground exploration program completed in December 2002, McWatters Mining Inc. has delineated a measured and indicated resource of 2.9 Mt grading 4.26 g/t gold (396 000 oz) contained in the Hanging Wall zone. The second phase has now established several zones in the Hanging Wall zone, including the P-zone, which was identified in Phase 1 and has been traced for over 1.2 km along strike.

##### Other Minerals/Metals

Hurley	Trinity Bay	N.L.	(e) 70	(e) 48	August 16	O/P	Slate	Hurley Slate Works Inc.
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Remarks: Production at the Hurley slate mine was suspended in August 2002 due to a licensing dispute with the Newfoundland and Labrador government. The mine was brought on stream in 2000 as a significant dimension stone producer in the Trinity Bay area and is one of the largest industrial mineral producers in the province. The operation is seasonal. Owner Hurley Slate Works Inc. expects to obtain the licensing permit and to restart production in 2003.

McClellan Lake	McClellan Lake	Sask.	300	175	September 23	O/P	Uranium	COGEMA Resources Inc., Denison Energy Inc. and OURD (Canada) Co., Ltd.
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Remarks: Uranium production at the McClellan mine in northern Saskatchewan was suspended due to a September 23, 2002, Federal Court ruling that quashed the operating licence for the mine's ore processing plant. The ruling was the result of a complaint filed by the Inter-Church Uranium Committee Educational Co-Operative against the Canadian Nuclear Safety Commission (CNSC). The licence was issued to COGEMA Resources in June 1999, the year production began at McClellan Lake, and renewed for a four-year term ending on August 31, 2002, with an increasing uranium production limit of 3077 tU/y. Mining at McClellan Lake was completed in 2001 when the Sue C open pit - the last pit of the mine - was mined out and mine-site reclamation has already begun. However, ore stockpiles, including those from the previously mined-out JEB deposit, will provide sufficient feed to the mill for uranium concentrate production for several years. The McClellan Lake mill will process ore from the Cigar Lake, currently under development, and Midwest mines when they begin production. The facilities received ISO 14001 certification in 2001 and are recognized as a model of environmental and safety management. The McClellan Lake uranium deposit was discovered in 1979 and has approximately 20 000 t of reserves at an ore grade of 2.8% U.

#### MINE CLOSURES

##### Precious Metals

Bousquet (Bousquet No. 2)	Cadillac	Que.	2 450	(e) 190	December	U/G	Gold	Barrick Gold Corporation
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Remarks: Production at the Bousquet gold mine near Cadillac, Quebec, ceased in December 2002 due to the depletion of economically mineable ore. In production since 1989, the Bousquet No. 2 mine was one of several Abitibi properties acquired when Barrick Gold Corporation purchased Lac Minerals Ltd. in 1994. At that time, it was known as the Bousquet Complex with the Bousquet No. 1 mine in production. Ore from the Complex was trucked to Barrick's 2700-t/d East-Malartic mill for processing.



**Base Metals**

Crean Hill	Sudbury	Ont.	1 900	(e) 150	June	U/G	Nickel, copper, cobalt, PGM	Inco Limited
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Remarks: In June 2002, Inco Limited closed its Crean Hill nickel-copper mine in Sudbury as economic ore was depleted. The mine first began production in 1905.

Ruttan	Leaf Rapids	Man.	5 800	(e) 360	June	U/G	Copper, zinc	Hudson Bay Mining and Smelting Co., Limited
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Remarks: The Ruttan copper-zinc mine near Leaf Rapids, Manitoba, closed in June 2002 due to depletion of mineable reserves. Mine production first began in 1973. Decommissioning and rehabilitation are being carried out by owner and operator Hudson Bay Mining and Smelting Co., Limited.

Nanisivik	Nanisivik	Nun.	2 300	200	September	U/G	Zinc, silver	Breakwater Resources Ltd.
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Remarks: The Nanisivik zinc-silver mine on northern Baffin Island, Nunavut, was permanently closed in September 2002. The mine first began production in October 1976. Breakwater Resources Ltd. acquired the mine in July 1996 from AEC West Ltd. (formerly Conwest Exploration Company Limited) and operated the mine through CanZinco Ltd., a wholly owned subsidiary. The closure was the result of a new mine plan that eliminated mining of the lower-grade portion of the orebody, due largely to lingering low zinc and silver prices.

Polaris	Little Cornwallis Island	Nun.	2 850	220	September	U/G	Zinc, lead	Cominco Mining Partnership and Teck Cominco Limited
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Remarks: The Polaris zinc-lead mine on Little Cornwallis Island, Nunavut, closed in September 2002 after 21 years of operation due to ore depletion. The mine was the world's most northerly base-metal mine. A two-year, \$53 million mine decommissioning and reclamation program, under way since October 2002, is expected to be completed in the third quarter of 2004.

**Other Minerals/Metals**

Cluff Lake	Cluff Lake	Sask.	800	(e) 200	December	U/G	Uranium	COGEMA Resources Inc.
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Remarks: Uranium production from the Cluff Lake mine ceased at the end of 2002 due to ore depletion. The mine first began production in 1980 and had been producing 1000 to 2000 t of uranium concentrates each year. Cumulative production to the end of 2000 exceeded 20 000 t of uranium concentrates (U<sub>3</sub>O<sub>8</sub>). Mine-site reclamation is in progress in 2003.

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Source: Natural Resources Canada, based on published reports and communications with companies and provinces/territories.

. . Not available; (e) Estimated; O/P Open pit; U/G Underground.

**TABLE 3. NEW PRODUCTION FROM MINE OPENINGS IN CANADA IN 2002**

Mining Project	Main Commodities	Estimated Annual Production							
		Gold		Silver		Copper	Nickel	Zinc	Other Minerals/Metals
		(g)	(oz)	(g)	(oz)	(t)	(t)	(t)	
<b>NEW OPERATIONS</b>									
<b>Precious Metals</b>									
Mishi open-pit	Gold	217 000	7 000	–	–	–	–	–	–
<b>RE-OPENINGS</b>									
<b>Precious Metals</b>									
Beaufor	Gold	1 736 000	56 000	–	–	–	–	–	–
Sigma Lamaque	Gold	3 420 000	110 000	–	–	–	–	–	–
Joe Mann	Gold	2 294 000	74 000	–	–	725	–	–	–
Macassa	Gold	1 866 000	60 000	–	–	–	–	–	–
<b>Base Metals</b>									
Gertrude	Nickel, copper	–	–	–	–	5 000	5 000	–	–
Myra Falls	Zinc, copper, gold, silver	806 000	26 000	23 250 000	750 000	10 000	–	60 000	–
<b>Other Minerals/Metals</b>									
Eagle Point	Uranium	–	–	–	–	–	–	–	2 700 t U <sub>3</sub> O <sub>8</sub> (6 million lb U <sub>3</sub> O <sub>8</sub> )
CanTung	Tungsten	–	–	–	–	–	–	–	3 000 t tungsten concentrates
Planned total		10 339 000	333 000	23 250 000	750 000	15 725	5 000	60 000	2 700 t U <sub>3</sub> O <sub>8</sub> (6 million lb U <sub>3</sub> O <sub>8</sub> ) 3 000 t tungsten

Source: Natural Resources Canada, based on company reports and communications with companies.

– Nil.

Note: 2002 diamond production from the new Misery and Koala North underground kimberlite pipes at the Ekati mine in the Northwest Territories is not included in the above table.

**TABLE 4. NEW ORE RESERVES FROM MINE OPENINGS IN CANADA IN 2002**

Mining Project	Main Commodities	Proven-Probable Ore Reserves (e)		In-Situ Metal Reserves								
		Tonnage	Grade	Gold	Gold	Silver	Silver	Copper	Nickel	Zinc	Lead	Other Minerals/Metals
		(t)		(g)	(oz)	(g)	(oz)	(t)	(t)	(t)	(t)	(t)
<b>NEW OPERATIONS</b>												
<b>Precious Metals</b>												
Mishi open pit	Gold	210 000	3.1 g/t gold	651 000	21 000	-	-	-	-	-	-	-
<b>RE-OPENINGS</b>												
<b>Precious Metals</b>												
Beaufor	Gold	1 012 400	7.54 g/t gold	7 633 500	245 400	-	-	-	-	-	-	-
Sigma Lamaque	Gold	14 965 000	0.5 g/t gold	39 058 600	1 258 000	-	-	-	-	-	-	-
Joe Mann	Gold	1 228 300	10.41 g/t gold	12 786 600	411 100	-	-	3 250	-	-	-	-
Macassa	Gold	725 750	15.42 g/t gold	11 191 000	359 800	-	-	-	-	-	-	-
<b>Base Metals</b>												
Gertrude	Nickel, copper	1 200 000	1% nickel 1% copper	-	-	-	-	10 000	10 000	-	-	-
Myra Falls	Zinc, copper, lead, gold	8 267 000	6.7% zinc 1.25% copper 0.57% lead 1.22 g/t gold 40.51 g/t silver	10 085 700	324 200	334 896 000	10 767 000	103 300	-	5 538 900	47 100	-
<b>Other Minerals/Metals</b>												
Eagle Point	Uranium	1 570 630	0.76% U <sub>3</sub> O <sub>8</sub>	-	-	-	-	-	-	-	-	9 000 tU
CanTung	Tungsten	560 000	1.82% WO <sub>3</sub>	-	-	-	-	-	-	-	-	10 000 t WO <sub>3</sub>
Total				81 406 400	2 619 500	334 896 000	10 767 000	116 550	10 000	5 538 900	47 100	9 000 tU 10 000 t WO <sub>3</sub>

Source: Natural Resources Canada, based on company reports and communications with companies.

- Nil; (e) Estimated.

Note: Diamond ore reserves of the Misery and Koala North kimberlite pipes (brought into production in 2001 and 2002, respectively) at the Ekati mine in the Northwest Territories are not included in the above table.