

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

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## OVERVIEW

The current metal downturn that began with a dramatic drop in the price of gold in late 1996 continued in 1998, causing more mines to close than open. During the year, 9 mining operations came on stream (including 5 new mines and 4 re-openings) and 17 mines closed (including 8 closures and 9 suspensions) (Tables 1 and 2). The 5 new mines consisted of 1 gold-copper mine, 1 copper-zinc mine, 2 industrial mineral mines and, for the first time in Canadian history, a diamond mine. The re-openings included 3 gold mines and 1 coal mine. The 17 mine closings included the production suspension at 2 gold mines, 6 base-metal mines and a wollastonite mine, and the permanent closure of 3 gold mines, 4 base-metal mines and an iron mine. Four of the mine openings (2 new mines and 2 re-openings) and 6 of the mine closings involved Canadian and foreign joint ventures or were foreign-controlled operations. In addition, 6 Canadian junior companies joined the rank of producer in Canada in 1998.

The new mines opened in 1998 were: the Collier Point barite mine in Newfoundland, the Konuto Lake (Denare Beach) copper-zinc mine in Saskatchewan, the Kemess South (also commonly referred to as Kemess) gold-copper mine and the Cassiar asbestos tailings operation in British Columbia, and the Ekati diamond mine in the Northwest Territories. Mines re-opened during the year included the Madsen gold mine in Ontario, the Bissett (formerly San Antonio) gold mine in Manitoba, the Costello coal mine in Saskatchewan, and the Blackdome gold mine in British Columbia.

The most important new mines in 1998, in terms of value of expected production and employment, were Kemess in British Columbia and Ekati in the North-

west Territories. Significant re-openings were Madsen in Ontario, Bissett in Manitoba, and Costello in Saskatchewan. In addition, the zinc circuit at the LaRonde gold-zinc mine in Quebec was brought on stream. The 52 000 t/y of zinc output capacity provided by the zinc circuit is equivalent to a significant new zinc mine in the province.

Eight significant mines closed during 1998. In Ontario, the Shebandowan nickel-copper mine near Thunder Bay closed in the second quarter; the Whistle mine, also a nickel and copper producer, at Sudbury closed in the summer; and the Winston Lake zinc-copper mine near Schreiber closed in December. All three closures were due to low metal prices and high costs. As well, the George MacLeod iron mine near Wawa closed in May due to high costs and a resulting lack of competitiveness, while the Photo Lake copper-zinc mine near Snow Lake, Manitoba, closed in September and the Contact Lake gold mine near La Ronge, Saskatchewan, closed in June, both as a result of ore depletion. In British Columbia, the QR gold mine near Quesnel closed in April due to declining gold prices and high production costs. The Klondike mine, a significant placer operation near Dawson City, Yukon, closed in January due to the depletion of economic ore reserves.

In addition to these production suspensions and mine closures, numerous production cutbacks and project postponements that started in 1997 continued throughout 1998 as metal prices declined further, creating substantial employment losses in the year. Job losses through production cutbacks amounted to at least 700 in 1998, the largest such losses since 1991/92 when 65 mines closed.

Despite weak metal prices, there were at least 12 metal mine expansion and mine extension projects of significance across Canada in 1998 (Table 2). Most of these projects marked the continuation of existing programs that began in recent years, but several were further expansions or extensions and one was a new announcement. The more important of these existing programs were the Carol Lake and Wabush Mines iron ore operations in Labrador; the Copper Rand 5000 gold-copper project, and the Doyon, Joe Mann, Kiena, LaRonde and Sigma (the Sigma-Lamaque complex) gold mines in Quebec; and the

Campbell and Red Lake gold mines, as well as the McCreedy East nickel-copper mine, in Ontario. The most significant new expansion and extension program announced in 1998 was at the Creighton nickel-copper mine in Ontario.

Although fewer mines came on stream in 1998 than in 1997, the total capital cost for new and re-opened mines in 1998 is estimated to have been more than \$1.4 billion, marginally lower than the \$1.5 billion for those opened in 1997. This relatively high level of capital cost for mines opened in 1998 mostly represents the capital investment for developing two large mines: the Kemess South gold-copper mine in British Columbia and the Ekati diamond mine in the Northwest Territories. At least another \$250 million is estimated to have been spent on mine expansions and extensions, about the same as in 1997. Preliminary estimates indicate that average annual capital spending will be lower in 1999, 2000 and 2001, but will likely still be in the neighbourhood of \$800 million to \$1 billion. Capital investment is expected to increase in the year 2002.

## REGIONAL PERSPECTIVE

During 1998, as in 1997, seven provinces and both territories were affected by mine openings or closings. New Brunswick, Ontario and the Yukon were particularly hard hit as mine closings exceeded mine openings, resulting in large net losses in ore capacity and employment. Of the 9 mine openings in the year, 5 were new mines. These include 2 in British Columbia and 1 in each of Newfoundland, Saskatchewan and the Northwest Territories. In addition, 1 mine re-opened in each of Ontario, Manitoba, Saskatchewan and British Columbia. Of the 17 mine closings, 4 mine closures occurred in Ontario and 1 in each of Manitoba, Saskatchewan, British Columbia and the Yukon. As well, 2 suspensions occurred in each of New Brunswick, the Yukon and the Northwest Territories, and 1 in each of Newfoundland, Quebec and British Columbia. However, because the opening or closure of a larger mine will have more effect on production and employment than that of a smaller mine, the impact of mine openings and closings varied considerably from province to province. Overall, Saskatchewan and British Columbia benefited the most from mine openings, while Ontario, New Brunswick and the Yukon were the hardest hit by mine closures or production suspensions at relatively large mines. The social and economic benefits from the opening of the Ekati diamond mine in the Northwest Territories were reduced by the temporary closings of two significant gold mines: the Lupin and the Con mines. The Con mine has since re-opened, in May 1999, and the Lupin mine is currently expected to re-open in 2000.

In Newfoundland, the small Collier Point barite mine near Trinity Bay was opened in the summer by

Phoenix Minerals Corporation and Newfoundland Barite Ltd. Full capacity is 10 000 t/y of barite product. The mine is Newfoundland's first barite producer to supply the east coast drilling industry in recent years. Production was suspended at the Beaver Brook antimony mine near Glenwood in February, after 14 months of operation, due to poor market conditions. As a result, the province incurred net losses of 575 t/d of ore production capacity and 70 mining jobs. The Nugget Pond mine near Baie Verte, the only operating gold mine in the province, produced 44 000 oz of gold in 1998 at an estimated cash cost of about US\$148/oz, one of Canada's lowest-cost gold mines.

In New Brunswick, production at both the Caribou and Restigouche zinc-lead-silver-gold mines was suspended in August due to low metal prices and low metal recoveries. With no mine openings, the province suffered net losses of 3000 t/d of ore capacity and some 280 mining jobs. Only a year ago, the province lost its 10 500-t/d Potacan potash mine and 550 mining jobs due to irreversible flood damage. The Caribou mine near Bathurst, dormant since October 1990, was last re-opened in August 1997, along with the new Restigouche mine nearby. Since the suspensions, owner Breakwater Resources Ltd. has conducted technical and economic studies to determine the possibility of re-opening both mines. The conclusion is that in addition to the need for higher metal prices, the primary grinding and flotation capacities will have to be increased and a re-opening feasibility study is under way.

In Quebec, there was one mine suspension and no mine openings in 1998. At Lac-Saint-Jean, the 550-t/d St. Onge wollastonite mine suspended operations in June due to low wollastonite prices and the need to modify production objectives. About 20 of the 75 mine workers were kept on site to prepare for re-opening in the summer of 2000. A new zinc circuit was brought on stream in September 1998 at the LaRonde gold-zinc mine near Val-d'Or. The circuit has an estimated 2450 t/d of zinc ore capacity, with planned output of 52 000 t/y of zinc, a significant addition to zinc production capability. In 1998, the LaRonde mine produced 150 000 oz of gold. The value of the zinc to be produced will equal that of gold, and the design capacity will double mine revenues by the summer of 1999. From its mine openings and closings in 1998, Quebec incurred net gains of some 1900 t/d of ore production capacity and no employment losses.

In Ontario, one mine re-opened and four closed. The 500-t/d Madsen gold mine near Red Lake resumed production in July. Production first began in 1938 and ceased in 1976. The mine was redeveloped and re-opened by Madsen Gold Corp. in June 1997, but was soon put on care and maintenance due to low gold prices. Claude Resources Inc. of Saskatoon

acquired Madsen Gold in April 1998 and resumed mining, focusing on the Austin and McVeigh zones. Ore from the McVeigh zone is expected to boost ore throughput to 725 t/d from 500 t/d in 1999.

Three of the four mine closures in Ontario in 1998 were base-metal mines. These include the Shebandowan mine near Thunder Bay in the second quarter and the Whistle mine in Sudbury in the summer. Both were nickel-copper producers that were closed because of low metal prices and high costs. Production at the Winston Lake zinc-copper mine, near Schreiber, was suspended in December 1998 and, in February 1999, the company decided to close the mine permanently as further developing the nearby Pick Lake deposit would not yield a profitable operation. The George W. MacLeod iron mine near Wawa closed in May due to high costs and a lack of competitiveness. This marked the end of iron mining in the province. Ontario thereby incurred net losses of some 8100 t/d of ore production capacity and some 430 mining jobs.

In Manitoba, one mine re-opened and one closed in 1998. The 900-t/d Bissett (formerly San Antonio) gold mine northeast of Winnipeg was reactivated for production in June. The mine was last re-opened in July 1997 by Rea Gold Corporation, with production suspended six months later when Rea Gold went bankrupt. In the spring of 1998, Harmony Gold (Canada) Inc., a South African-controlled company, acquired the Bissett mine and resumed production in June. The 500-t/d, high-grade Photo Lake copper-zinc mine near Snow Lake, where production began in mid-1995, closed in September due to ore depletion. All employees at the mine were relocated to the company's new mine at Konuto Lake, Saskatchewan, 120 km west of Snow Lake.

In Saskatchewan, two mines opened and one closed in 1998. The 600-t/d Konuto Lake (also known as Denare Beach) copper-zinc mine near Creighton, Saskatchewan, came on stream in September and is expected to produce 5500 t of copper and 1500 t of zinc annually. The Costello coal mine near Estevan re-opened in January. The mine was redeveloped to replace the nearby Utility mine, which is expected to be mined out in early 1999. Annual production at Costello will be 2.3 Mt of lignite A, sufficient for more than 30 years' supply to the nearby Saskatchewan Power Corporation's power plant at Estevan. The mine is part of the Boundary-Dam East mining complex, which combines the Costello and Shand mines.

The Contact Lake gold mine, near La Ronge, closed in June due to ore depletion after three and a half years of production. In 1998, it produced 29 000 oz of gold at a cash cost of US\$170/oz, making it one of Canada's lowest-cost gold producers. Overall, Saskatchewan fared best among all provinces and territories in 1998 with net gains of nearly 8100 t/d of ore capacity and 225 mining jobs.

After a considerable struggle with financing, the 40 000-t/d Kemess South gold-copper mine in central British Columbia came on stream in May 1998, creating 350 mining jobs. Developed at a capital cost of \$470 million, the mine is the largest new mine in Canada since the Highland Valley Copper mine, which was formed over a long period of time by combining several mines, also in British Columbia. Planned annual production from Kemess was 250 000 oz of gold and 60 million lb of copper. Financial difficulties continued to plague the operation after start-up, a result of declining gold and copper prices and cost overruns caused by unforeseen construction-related problems. In February 1999, owner and operator Royal Oak Mines Inc. sought bankruptcy protection and subsequently went into receivership in April. The mine is currently being operated by the receiver, PricewaterhouseCooper Ltd. until it can be sold to help satisfy the company's \$665 million debt.

During 1998, in northern British Columbia, the Cassiar asbestos mine tailings operation was brought on stream in July to process asbestos tailings left from the former Cassiar mine, which closed in 1989 due to ore depletion. In 1998, production was an estimated 4000 t of chrysotile fibre, and is expected to increase to 10 000 t in 1999. The 17 Mt of mine tailings (4.5% asbestos fibre) are estimated to be sufficient for 13 years of production. In addition, there was 6 Mt of stockpiled ore grading 5-6% asbestos. Tailings were reprocessed by a dry mill in 1998 but a wet mill is to be constructed in 1999. There is good potential to reactivate the nearby McDame underground asbestos mine for production in the future, and there is also a plan to build an on-site test plant to extract magnesium from asbestos tailings.

The 180-t/d Blackdome gold mine near Clinton re-opened in October 1998. Economic ore had been mined out by December 1990 and the mine closed, but continued exploration has led to the discovery of additional high-grade ore. Redevelopment of the mine began in 1997, and the mine is expected to produce 12 000 oz of gold annually. The 1000-t/d QR underground gold mine near Quesnel closed in April 1998 after less than three years of production due to high costs, lower-than-expected grades, and declining gold prices. About 90 workers were laid off. Mining had begun as an open-pit operation, which was completed in 1997, and then shifted to underground. The majority of the reclamation work is scheduled for completion in 1999.

Production was suspended at the 4000-t/d Myra Falls underground mine near Campbell River in mid-December due to ground problems within the Battle and Gap zones. Poor ground conditions had resulted in higher dilution and lower head grades. About 270 of the 360 workers were kept on site during the suspension to carry out remedial and development work,

and the mine was successfully re-opened on April 1, 1999. Overall in 1998, British Columbia incurred net gains of some 35 000 t of daily ore production capacity and 30 mining jobs.

The Yukon's economy suffered a serious blow in 1998 as three mines closed and no mines opened. Production at the 12 000-t/d Grum and Vangorda zinc-lead-silver mines at Faro was suspended in January after three months of shaky operation since the most recent re-opening in October 1997. The mine closures occurred when Anvil Range Mining Corporation, the majority owner and operator, went into receivership. All 386 workers were laid off. Low grades, high costs and low metal prices have rendered the mines uneconomic. As well, the 1500-t/d Klondike gold mine near Dawson City, a significant placer gold operation in the territory, ceased production in January due to the depletion of ore reserves. As a result, the Yukon ended 1998 with a 13 500-t/d reduction in ore capacity and some 400 fewer mining jobs, a loss of about three quarters of territorial mining revenue and jobs.

In the Northwest Territories, Canada's first diamond mine, the Panda open-pit mine at Lac de Gras, opened in October. Panda is one of five diamondiferous kimberlite pipes currently scheduled for production at the Ekati diamond mining complex. The five pipes, Panda, Misery, Koala, Sable and Fox, are to be developed as five separate mines between 1998 and 2008. Ore production from the Panda pit will reach 9000 t/d in 1999, with an annual diamond production of 3 Mct of gem-quality diamonds. By 2008, all five pipes will be in production with ore throughput expected to double to 18 000 t/d and diamond production to double. The capital cost of developing these five pipes has been estimated at US\$700 million. Although 78 Mt of ore are scheduled to be mined over a 17-year initial mine life, the five pipes have combined ore reserves and additional resources of 133 Mt. In addition, several diamondiferous pipes have been discovered on the property, including three that are in the vicinity of the Panda pit, namely the Koala North, Beartooth and Pigeon, and these could become additional sources of ore for the Panda mill. Therefore, the overall mine life of the Ekati operation could exceed 25 years. The Ekati mining complex is expected to create 830 mining jobs. Currently, 650 jobs have been created at Panda.

Elsewhere in the Northwest Territories, production at both the 810-t/d Con gold mine at Yellowknife and the 2085-t/d Lupin gold mine at Contwoyto Lake were suspended in 1998, affecting 840 mine workers. The net result of mine openings and closures in the Northwest Territories was a net gain of 6100 t/d of ore production capacity but a net loss of 190 mining jobs. Fortunately, the Con mine re-opened after the strike at the mine ended in May 1999. As well, based on a recent study by Echo Bay Mines Ltd., the Lupin

mine, which was closed due to high costs and low gold prices, could be re-opened in 2000 under a new mining schedule and cost structure.

## MINE EXPANSIONS AND EXTENSIONS

Despite low metal prices, at least 12 significant gold and base-metal mine expansion and extension projects were initiated or undertaken in 1998 (Table 2): 6 in Quebec, 5 in Ontario, and 1 in Saskatchewan. The majority of these projects involved the completion of existing programs and several further extensions at gold mines.

In Quebec, as new ores continued to be found at depth and in the vicinity of mine sites, expansion and extension programs at the Doyon, Joe Mann, Kiena, LaRonde and Sigma mines were extended beyond originally scheduled completion dates. Deep ore development progressed well at the Copper Rand 5000 project, but production start-up has now been rescheduled to the year 2001. The most important production expansions and mine life extensions occurred at the Doyon and LaRonde mines. Early in 1998, Cambior inc. acquired the other 50% interest in the Doyon mine (at Cadillac) from Barrick Gold Corporation. Cambior now owns 100% of the mine and has become the operator. During 1998, Cambior's Mouska gold mine was integrated with the Doyon mine to form the Doyon Division. At the start of 1999, ore reserves at the Doyon Division stood at 11.1 Mt grading 7.4 g/t gold, or a total of 2.6 million oz of gold. Gold production at Doyon in 1998 was 239 600 oz at a cash cost of US\$226/oz. In 1999, production is forecast to be 260 000 oz at a cash cost of US\$200/oz. In 1998, capital development at the mine totaled \$26 million, with another \$25 million planned for 1999 that includes the sinking of an internal shaft at Mouska and further underground exploration and development at both Mouska and Doyon. The \$256 million, four-year expansion and extension program at the LaRonde gold mine at Val-d'Or, which began in 1997, continued in 1998. Besides the development of new ore zones discovered in recent years, the program includes shaft sinking and mill expansion. Gold production at LaRonde was 150 000 oz in 1998 at a cash cost of US\$213/oz. By 2001, the mine is expected to produce 220 000 oz of gold at an average cost after zinc, copper and silver credits of US\$125/oz, making LaRonde one of the lowest-cost gold mines in Canada.

In October 1998, the Iron Ore Company of Canada announced a \$1.1 billion, six-year capital investment program. Approximately 60% (or \$650 million) of that investment will be spent on the company's Carol Lake (Labrador West) mine, concentrator and pellet plant operations, with the remainder being spent on reactivating the pellet plant at Sept-Îles in Quebec. The bulk of the investment will be spent on plants

and related equipment, an expansion of hydro-electric capacity, and locomotives. However, a small portion of this capital will be used to upgrade mining equipment and for expanding iron ore production.

In Ontario, new ores continued to be found at various mines, with significant developments at the Campbell and Red Lake gold mines in the Red Lake area and at the Copper Cliff North, Copper Cliff South and McCreedy East nickel-copper mines in Sudbury, where deep ore was discovered. In April 1998, Inco Limited announced a US\$125 million, two-phase expansion and extension program at the Creighton nickel-copper mine in Sudbury that will extend the mine life at Creighton by two decades. Phase 1, currently under way, will develop proven reserves of 2.8 Mt grading 3.45% nickel and 2.97% copper located between the 7400 and 7660 levels. Production from this ore is scheduled to start in 2001 and continue through 2013. Phase 2 will develop 3.1 Mt of probable reserves grading 3.62% nickel and 3.25% copper that are situated between the 7660 and 8180 levels for production between 2005 and 2019. Creighton along with Copper Cliff North, Copper Cliff South and McCreedy East have become the four key and lowest-cost mines in Inco's Ontario Division. At the Red Lake mine, an aggressive ore development and production expansion program went into high gear after a new High Grade Zone was discovered in early 1998. The mine is now scheduled to re-open in late 2000. The capital cost for redeveloping and re-opening the mine is estimated at US\$56 million. Gold production is projected to be 240 000 oz/y at a cash cost of US\$88/oz, which would make this the lowest-cost gold mine in Canada when it re-opens next year. The development of new ore zones continued at the Campbell mine where the Reid shaft was commissioned in mid-1998. Overall, the four-year US\$51 million expansion and mine life extension program initiated in 1995 is scheduled for completion in 1999. The mine is expected to maintain the current 300 000-oz/y gold production level in 1999 at a cash cost of US\$140/oz, maintaining Campbell's status as one of the lowest-cost gold producers in Canada.

## IMPACT

In 1998, the number of mine closings in Canada was nearly double the number of mine openings. Although there was a substantial net gain in ore production capacity, there was a significant net loss in direct mining jobs. New mines and re-openings brought on stream some 58 900 t/d of ore production capacity and created 1646 mining jobs. However, about 35 300 t/d of ore production capacity and 2430 jobs were lost from mine closures and production suspensions. This amounted to a net gain of 23 600 t/d of ore production capacity and a net loss of some 780 jobs. Most of the net gain in ore production

capacity came from two large new mines: the 40 000-t/d Kemess South gold-copper mine in British Columbia and the 9000-t/d Panda (Ekati) diamond mine in the Northwest Territories. Although the two mines contributed 60% of new mining jobs in Canada in 1998, they were insufficient to offset the aggregate effect of job losses from 17 mine closings. There were substantial additional job losses that resulted from production cutbacks by mines in 1998, especially gold, base-metal and coal mines. Total job losses due to production cutbacks during the year amounted to more than 700, compared with 500 in 1997. Although a significant number of jobs were created each year since 1994 from mine expansions and extensions, fewer than 100 jobs were estimated to have been created this way in 1998 to help offset the negative impact of job reductions through production cutbacks. Many mines have managed to maintain the employment of a number of mine workers whose jobs would otherwise have been eliminated through production cutbacks had an expansion or extension not taken place at these mines.

Mine openings in 1998 are expected to contribute significantly to Canada's total minerals and metals production. At full capacity, production from new and re-opened mines in 1998 is expected to be some 11.9 t (384 000 oz) of gold, 32 700 t of copper, 1500 t of zinc and 3 Mct of diamonds annually (Table 3). While most of the new gold and copper production (65% and 83%, respectively) comes from the Kemess South mine in British Columbia, all of the new coal production comes from the Costello mine in Saskatchewan and all of the diamond production comes from the Ekati (Panda) mine in the Northwest Territories. During the year, Canada also began producing primary barite for drilling by the oil industry. As well, asbestos production was revived in British Columbia. All of this new production is essential to offset production losses from mine closings and to maintain Canada's mineral production from existing mines. Most of the new mines are expected to produce into the next century.

Table 4 shows that new and re-opened mines in 1998 have also added over 140 t, or 5 million oz, of gold reserves; 14.5 t, or 467 000 oz, of silver reserves; 490 000 t of copper reserves; and 12 600 t of zinc reserves to Canada's total reserves of these metals. In addition, some 14.5 Mct of diamond reserves, 80 Mt of coal reserves and 100 000 t of barite reserves were added. All new metal and coal reserves are essential for replenishing reserves that have been depleted due to production and for sustaining Canada's minerals and metals production capability. The start of diamond production from the Panda pit in 1998 not only boosted Canada to the rank of diamond producer, but the significant amounts of gem-quality diamond reserves at the Panda pipe and at the overall Ekati diamond

complex, together with those at other Canadian diamond developments, will enable Canada to become one of the world's top diamond producers in the foreseeable future.

## NEW DEVELOPMENTS EXPECTED TO BECOME MINES IN 1999

The data presented above indicate that the overall decline in metal prices that began in 1997 persisted in 1998 and has resulted in fewer mine openings than closings and more postponements of mine developments in 1998. At the beginning of 1999, preliminary estimates indicate that some 10 mines could come on stream during the year. Among the most promising new mines are the Buchans (barite), Midatlantic (limestone/dolomite) and Shabogamo (silica) mines in Newfoundland; the Bell Allard (zinc-copper) and East Amphi (gold) mines in Quebec; the Kapuskasing (phosphate) mine in Ontario; and the McClean Lake and McArthur River (uranium) mines in Saskatchewan.

Two mining operations at which production was suspended re-opened in the early part of 1999. These are the Myra Falls zinc-copper mine (which also has significant by-production of lead, silver and gold) in British Columbia and the Con gold mine in the Northwest Territories (the Myra Falls mine re-opened in early April and the Con mine re-opened in May 1999). In addition, several previous mine expansion and extension projects, including ones that were initiated in 1998, are expected to continue in 1999, with others likely to be announced during the year. These expansions and extensions, together with new mine developments, are central to sustaining mining and production in Canada. In the face of weak commodity prices and without having to resort to layoffs, mine expansion is one of a few options by which production costs can be lowered and productivity increased at an existing mine. This is especially beneficial for mines that have significant new ore discoveries, for example, the Doyon and LaRonde mines in Quebec and the Campbell, Red Lake, Copper Cliff North, Copper Cliff South and Creighton mines in Ontario.

## OUTLOOK

During 1998, mine openings and mine developments were postponed in Canada as the down-cycle in metal prices affected all of the major metals. Coal mining was also affected by depressed coal prices. Gold mines and gold development projects were the hardest hit, followed by copper, nickel and coal projects. Gold sales by central banks, oversupply, and the lingering Asian crisis continued to put downward pressure on gold, base-metal and coal prices and made

project financing difficult for most companies. Companies responded by closing high-cost mines, cutting back on production to keep marginal operations afloat (this included extended summer shut-downs), and postponing mine openings and developments. Some 10 mines are likely to open and 18 are likely to close in 1999 with a considerable net loss in mining employment. The capital investment for mines to open in 1999 is estimated at \$800 million, considerably lower than the \$1.5 billion for 1997 and \$1.4 billion for 1998.

As gold prices seem likely to remain weak for the foreseeable future, few gold mines are expected to open in 1999.

Several important new mines are expected to come on stream in 1999. These include the Bell Allard zinc-copper mine in Quebec and the McClean Lake and McArthur River uranium mines in Saskatchewan. While both the McClean Lake and McArthur River uranium deposits are world-class, McArthur River is the world's largest and richest uranium deposit. With mineable reserves of at least 73 000 tU in ore grading 16% uranium and geological reserves of 87 000 tU in material averaging 10% uranium, production is planned at an annual rate of 6920 tU (18 million lb U<sub>3</sub>O<sub>8</sub>) by the year 2000.

Because major Western economies remain strong and there are signs of Asian recovery in the first half of 1999, demand for metals could begin some modest recovery in 2000. This demand, to some extent, is expected to be augmented by a reduction in metal inventories that should result from mine closures around the world since 1997. But demand for gold is likely to remain weak due to oversupply from mine production, which has resulted in part from a stronger-than-expected resistance by companies to mine closures, continued gold sales by central banks, and possible gold sales by the International Monetary Fund (IMF). Unless gold sales by central banks and the IMF can be properly regulated, and with demand from Asia rising significantly because of expected economic recovery, weak gold prices will likely continue in the foreseeable future to help offset the impact of these gold sales. Overall, the number of Canadian mine openings in 2000 and 2001 is forecast to be about 14 and 18, respectively, with capital investments in those years of some \$1 billion and \$800 million respectively. The \$720 million Magnola magnesium project in Quebec's Eastern Townships, which is scheduled to begin production in 2000, contributes to the higher capital investment in 2000 than in 2001. With fewer mines expected to close during those two years (about 12 in 2000 and 14 in 2001), the Canadian mining industry could expect net gains in production capacity and new jobs. The net gains from mine openings should contribute significantly to tax revenues and spin-off social and economic benefits for Canadians. As many important

new mines, including several large and world-class industrial mineral, coal, uranium and diamond mines, are under development and are expected to come on stream between 1999 and 2002, Canadian mining will recover from the current downturn and become more diversified.

*Note: Information in this review was current as of May 15, 1999.*

**TABLE 1. MINE OPENINGS AND CLOSINGS IN CANADA, 1998**

Province/ Territory	New Mines			Mines Re-Opened			Mines Suspended			Mines Closed		
	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals
Newfoundland	-	-	1	-	-	-	-	1	-	-	-	-
New Brunswick	-	-	-	-	-	-	-	2	-	-	-	-
Quebec	-	-	-	-	-	-	-	-	1	-	-	-
Ontario	-	-	-	1	-	-	-	-	-	-	3	1
Manitoba	-	-	-	1	-	-	-	-	-	-	1	-
Saskatchewan	-	1	-	-	-	1	-	-	-	1	-	-
British Columbia	1	-	1	1	-	-	-	1	-	1	-	-
Yukon	-	-	-	-	-	-	-	2	-	1	-	-
Northwest Territories	-	-	1	-	-	-	2	-	-	-	-	-
Canada, total by commodity group	1	1	3	3	-	1	2	6	1	3	4	1
Total Canada		5			4			9			8	

Source: Natural Resources Canada, based on company reports.  
- Nil.

TABLE 2. MINE OPENINGS, RE-OPENINGS, EXPANSIONS, EXTENSIONS, SUSPENSIONS AND CLOSURES IN CANADA IN 1998

Mining Project	Location	Province/ Territory	Ore Capacity  (tonnes/day)	Employment during Mine Life <sup>1</sup>	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
<b>NEW OPERATIONS</b>									
<b>Precious Metals</b>									
Kemess	N-central B.C.	B.C.	40 000	350	May 13	O/P	Gold, copper	Royal Oak Mines Inc.	The Kemess South gold-copper mine began production in May 1998. The mine was developed at a capital cost of \$470 million, which was 9.3% higher than first estimated due to unforeseen construction-related issues. Planned production was 250 000 oz of gold and 60 million lb of copper per year. Although commercial production was achieved in the summer months, the mine has yet to reach full production. At the start of production, ore reserves stood at slightly over 200 Mt grading 0.629 g/t gold and 0.224% copper. Due to low gold and copper prices and financial difficulties, the owner, Royal Oak Mines Inc., sought bankruptcy protection in February 1999 and was put into receivership in early May. Currently, the mine is operated by the receiver PricewaterhouseCooper Ltd. until it can be sold to help satisfy the company's \$665 million debt. Royal Oak's Timmins Division gold mines (the Pamour and Nighthawk mines) and two advanced development projects (the Matachewan and Duport projects) in Ontario, and the Giant gold mine in Yellowknife, N.W.T., are also for sale.
<b>Base Metals</b>									
Konuto Lake (Denare Beach)	Creighton	Sask.	600 <sup>e</sup>	150	September	U/G	Copper, zinc	Hudson Bay Mining and Smelting Co., Limited	The project was advanced to the development stage prior to 1998. The mine began production in September 1998. It reached commercial production at the beginning of April 1999. Ore is milled at the company's concentrator at Flin Flon, Manitoba. For 1999, production is estimated at 8500 t of copper. As of January 1, 1999, ore reserves stood at 1.05 Mt grading 4% copper, 1.2% zinc, 8.3 g/t silver and 1.8 g/t gold. Developed at a capital cost of \$23.4 million, the mine has an estimated mine life of about five years. The mine essentially replaces the company's Photo Lake copper-zinc mine near Snow Lake, Manitoba, which ceased production in September 1998. The mine also absorbed the work force at Photo Lake.



**Other Minerals**

Collier Point	Trinity Bay	Nfld.	75 <sup>e</sup>	11	Summer	O/P	Barite	Phoenix Minerals Corp. and Newfoundland Barite Ltd.	Mining at Collier Point began in the early summer of 1998. The mine produced 7400 t of barite in 1998. Production is expected to reach the designed capacity of 10 000 t/y of barite. This small but locally important operation is the first barite producer in Newfoundland to supply the oil drilling industry in recent years.
Cassiar tailings	Cassiar	B.C.	150 <sup>e</sup>	50 <sup>e</sup>	July	Tailings and later U/G	Asbestos	Minroc Mines Inc.	Minroc Mines Inc., formerly Mineral Resources Corporation, became the new owner of the property by acquiring Cassiar Chrysotile Inc. in May 1998. Production began in July 1998 at the Cassiar mine site from the reprocessing of asbestos tailings. Planned production in 1998 was 4000 t of chrysotile fibre for export to Japan, India and other Asian markets. As of July 1, 1998, asbestos tailings reserves at Cassiar stood at 17 Mt grading 4.5% asbestos, sufficient for 13 years of production. In addition, there are 6 Mt of stockpiled ore grading 5-6% asbestos. The company plans to reactivate the nearby McDame underground mine for production. As well, tests are under way to produce magnesium from asbestos tailings on site.
Panda (Ekati mine)	Lac de Gras	N.W.T.	9 000	650	October 14	U/G	Diamonds	BHP Diamonds Inc., Charles Fipke and Stewart Blusson	The Panda open-pit mine, Canada's first diamond mine, opened for production on October 14, 1998. Panda is one of five diamondiferous kimberlite pipes of the Ekati mining complex which, now generally referred to as the Ekati mine, consisted of four other pipes: 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. Initial estimates put the total reserves and resources for all pipes at 133 Mt. About 78 Mt of ore are scheduled to be mined over the 17-year initial life of the project. Given that additional pipes have been discovered and several of them are higher-grade, the project can reasonably be expected to have a life of 25 years or more. The overall capital cost to production is estimated at US\$700 million. The current ore production rate at Panda is 9000 t/d. This rate is expected to increase to 18 000 t/d by the year 2008 when all five pipes are in production. At full production, the Panda pit is expected to produce 3 Mct of diamonds per year.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity  (tonnes/day)	Employment during Mine Life <sup>1</sup>	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
<b>RE-OPENINGS</b>									
<b>Precious Metals</b>									
Madsen	Red Lake	Ont.	500	80 <sup>e</sup>	July 23	U/G	Gold	Claude Resources Inc.	The Madsen gold mine first opened in 1938. Operations were suspended in 1976 due to insufficient workings being developed to sustain production. Madsen Gold Corp. re-opened the mine in June 1997, but the mine was soon put on care and maintenance due to the low gold price and production difficulties that arose from insufficient development. In April 1998, Claude Resources Inc. acquired Madsen Gold Corp. and assumed mine operations. However, the original mining plan, which focused on the past workings of the main Austin zone, had to be redesigned to meet production needs. Complementary feedstock from the newly developed McVeigh zone is expected to boost ore production to the 725-t/d level from the 500-t/d level by the first quarter of 1999. Currently, ore reserves are estimated at about 1.1 Mt grading 9.26 g/t gold.
Bissett (formerly San Antonio)	170 km NE of Winnipeg	Man.	900	150	June	U/G	Gold	Harmony Gold (Canada) Inc.	The Bissett gold mine was previously redeveloped between 1995 and 1997 and was re-opened in July 1997 by Rea Gold Corporation. Production was suspended when Rea Gold declared bankruptcy in December 1997. Harmony Gold (Canada) Inc., a South African-controlled company, acquired the mine in the spring of 1998 and it was re-opened in June of the same year. About \$10 million was invested in additional development, equipment and infrastructure to bring the mine back into production. At the start of 1998, ore reserves were estimated at about 2.1 Mt grading 8.2 g/t gold. Production is planned at 60 000 troy oz of gold per year. The mine life is estimated at 10 years.
Blackdome	Clinton	B.C.	180	80 <sup>e</sup>	October	U/G	Gold	Claimstaker Resources Ltd., MCM Minerals Ltd. and Petro Plus Inc.	The mine was first brought on stream in the spring of 1986 by Blackdome Mining Corporation. Originally outlined ore reserves were depleted in December 1990. Claimstaker Resources Ltd. acquired the property in 1995. A positive feasibility study was completed in September 1997 and the mine was re-opened for production in October 1998. Gold production is expected to be 12 000 oz annually. At the start of 1998, ore reserves stood at 200 464 t grading 15.3 g/t gold.
<b>Other Minerals</b>									
Costello	Estevan	Sask.	7 500 <sup>e</sup>	125 <sup>e</sup>	January	Strip	Coal	Saskatchewan Power Corporation and Luscar Ltd.	Production at the Costello mine re-started in January 1998 and was gradually increasing throughout the year. The mine was redeveloped to replace the nearby Utility mine where coal reserves are expected to be depleted by early 1999. Coal (lignite A) production from the mine is expected to be about 2.3 Mt/y. At the start of 1998, coal reserves stood at an estimated 80 Mt of lignite. The mine is now a part of the Boundary-Dam East mining complex, which combines the Costello and Shand mine operations.

**EXPANSIONS AND EXTENSIONS**

**Precious Metals**

Copper Rand 5000	Chibougamau	Que.	3 000	2 000 <sup>e</sup>	1997-2001	U/G	Gold, copper	MSV Resources Inc.	Due to weak metal prices, production at the Copper Rand mine was suspended in November 1997. However, since April 1997, more than substantial amounts of ore between the 4000 and 5000 levels were outlined. At the beginning of 1999, ore reserves stood at 2.19 Mt grading 1.71% copper, 3.737 g/t gold and 7.61 g/t silver. Indicated resources of 2.57 Mt of similar grades also exist. Currently, the project is under development for production in 2001. The capital cost to production is estimated at \$40 million. Rehabilitation work on shaft No. 4 began in October 1998.
Doyon	Cadillac	Que.	3 500	453	1994-2001	U/G	Gold	Cambior inc.	In early 1998, Cambior inc. purchased the remaining 50% interest in the Doyon mine from Barrick Gold Corporation. As a result, Cambior now owns 100% of the mine and has become the its operator. During 1998, the company's Mouska mine was integrated with the Doyon mine and definition drilling has extended existing ore reserves by 12%. At the beginning of 1999, ore reserves at the Doyon Division mines stood at 11.1 Mt grading 7.4 g/t gold or 2.6 million oz of gold in situ. Capital expenditures in 1998 totaled \$26 million. The mine produced 239 600 oz of gold in 1998 at a direct mining cost (cash cost equivalent) of US\$226/oz. The plan for 1999 is to increase production to 260 000 oz at a direct mining cost of US\$200/oz, with a further 43 700 oz of gold from the Mouska mine. Capital expenditures for 1999 by the Doyon Division are targeted at \$25 million, including the sinking of an internal shaft at Mouska and further underground exploration and development.
Joe Mann	Chibougamau	Que.	2 700	257	1996-1999	U/G	Gold, copper	Campbell Resources Inc.	A \$13.5 million, 18-month capital program, which began in 1997, to deepen the main shaft by 300 m and to develop the West zone was completed in 1998. As well, underground drilling was initiated to delineate a newly discovered mineralized area 300-400 m east of the existing mine shaft. Underground drilling confirmed the zones in the area are open to the east and downdip. The average grades drilled range from 2.7 to 27.6 g/t gold. In addition, surface drilling confirmed the mine's Main zone at a depth of between 900 and 1050 m, with two zones appearing to be the extension of a new zone discovered between the 2500 and 2575 levels. Development on this level is expected to reach the updip extension of those zones by the end of the second quarter of 1999. The mine produced 70 100 troy oz of gold in 1998, down slightly from the previous year, but cash costs fell to US\$257/oz from US\$264/oz.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment during Mine Life <sup>1</sup>	Date of Opening, Re-Opening, Expansion, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
<b>EXPANSIONS AND EXTENSIONS (cont'd)</b>									
<b>Precious Metals (cont'd)</b>									
Kiena	Val-d'Or	Que.	1 700	195	1997-1999	U/G	Gold	McWatters Mining Inc.	Since acquiring the Kiena and Sigma mines from Placer Dome Inc. in September 1997, McWatters Mining Inc. has embarked on a US\$23 million program to reduce costs, develop newly discovered deep ore zones, and extend the mine life by 10 years. In 1998, McWatters produced a total of 169 255 troy oz of gold from the Kiena and Sigma (Sigma-Lamaque) mines and from preproduction at the East Amphi mine at a cash operating cost of US\$255/oz and a total production cost of US\$281/oz. In the recent fourth quarter at Kiena, gold production totaled 22 203 oz at a cash operating cost of US\$211/oz, whereas the Sigma-Lamaque complex produced 20 152 oz at US\$330/oz (see Sigma below).
LaRonde	Val-d'Or	Que.	1 800	296	1997-2000	U/G	Gold, zinc, copper, silver	Agnico-Eagle Mines Limited	Exploration drilling continued to extend mineralization at the LaRonde mine at depth in 1998. The newly discovered 20N zone had been traced over a vertical distance of more than 1600 m and the zone remains open at depth and to the west. As a result, reserves and resources above the 10th level now exceed 14 Mt grading 1.37 g/t gold, 79.5 g/t silver, 0.17% copper and 6.55% zinc; reserves below the 10th level total 10.6 Mt grading 4.45 g/t gold, 87.4 g/t silver, 0.58% copper and 4.76% zinc. As well, a new zinc circuit was brought on stream in September 1998 to process zinc ore at the mine. At full production, this circuit is expected to produce 52 000 t of zinc annually. Since 1997, the mine has embarked on a \$256 million expansion program, which includes mill expansion and shaft sinking. By year-end 1998, about \$193 million remained to be spent over the next three and a half years. The project currently under way is expected to increase gold production to 220 000 oz/y by 2001 at an average production cost of US\$125/oz after zinc, copper and silver credits. In 1998, gold production at LaRonde was 150 000 oz at a cash operating cost of about US\$213/oz. Agnico-Eagle is contemplating a second expansion program that could increase gold production to more than 280 000 oz/y at an average cost of US\$100/oz.

Sigma	Val-d'Or	Que.	1 200	300 <sup>e</sup>	1997-1999	O/P and U/G	Gold	McWatters Mining Inc.	The mine was acquired by McWatters Mining Inc., along with the Kiena mine, from Placer Dome Inc. in September 1997. The Sigma mine complex, now referred to as the Sigma-Lamaque complex, consists of the Sigma No. 1 underground mine and the Sigma No. 2 and No. 3 open-pit mines. Since the acquisition, the company has embarked on a US\$23 million cost-cutting, mine-life extension program at both Sigma and Kiena (see Kiena above). By the end of the first quarter of 1999, about \$9.7 million had already been spent on underground exploration and development and on modern mining equipment at Sigma-Lamaque. These efforts have boosted underground reserves and resources at the complex by 30%, and a construction program has increased the daily ore production capacity from the underground operations to 1200 t from 700 t. During 1998, \$8.3 million was spent. New resources added include the Sigma 2000 discovery. In February 1999, mining was suspended at the underground operation for an anticipated five-month period. About 179 of the complex's 250 employees were laid off. During the shut-down, the company will undertake a feasibility study to prove the viability of an operation at Sigma-Lamaque that would coordinate both open-pit and underground mining to produce 100 000 oz of gold annually at a cash cost of US\$200/oz over 10 years.
Campbell	Balmertown	Ont.	1 585	380	1997-1999	U/G	Gold	Placer Dome Inc.	In 1998, deep ore development and shaft extension continued at the Campbell mine. Final completion of a four-year US\$51 million depth development program that began in 1995 is expected to be completed in mid-1999. The new Reid shaft will reach a depth of 1900 m below surface to access ore below the current workings; to provide a second, more efficient underground access; and to allow for exploration drilling to greater depths. A significant part of the mine property remains to be explored and a number of existing zones are likely to be expanded. Production at the mine decreased by 14% to 68 379 oz in the first quarter of 1999 compared with 1998 due to a lower head grade; the cash production cost was marginally lower at US\$132/oz compared with US\$135/oz in the same period a year earlier. However, cash and total costs are expected to rise modestly due to higher mill costs and with the mid-year commissioning of the new shaft (the Reid shaft). The mine is expected to sustain its current rate of production of at least 300 000 troy oz of gold per year well into the next decade at the 1999 cash production cost of about US\$140/oz.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment during Mine Life <sup>1</sup>	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
<b>EXPANSIONS AND EXTENSIONS (cont'd)</b>									
<b>Precious Metals (cont'd)</b>									
Lac-des-Îles	Thunder Bay	Ont.	2 650	145 <sup>e</sup>	1998-1999	O/P	Palladium, platinum group metals, nickel, copper, gold	North American Palladium Ltd.	Encouraged by positive results of a scoping study, the company is considering an expansion of the open-pit operation. The producer has budgeted \$1.5 million for further diamond drilling and metallurgical work to confirm mineable reserves and resources. Currently, production came from the Roby zone which, at the end of 1998, hosted ore reserves of 7.8 Mt grading a combined platinum group metals (PGM) grade of 4.217 g/t. The mine is Canada's only primary producer of palladium.
Red Lake	Balmertown	Ont.	550	250 <sup>e</sup>	1998-2000	U/G	Gold	Goldcorp Inc.	Significant exploration success since 1995 has led to the continuous extension of ore reserves at the Red Lake gold mine. Although the mine's production has been suspended since June 1996 by a strike, underground exploration continues to discover and delineate high-grade ore. The current focus is on the recently discovered High Grade Zone. At the end of 1998, gold reserves in the zone were increased by 47% to 1.89 million oz with an average cut grade of 46.63 g/t (1.36 oz/st) and an average uncut grade of 90.17 g/t (2.63 oz/st). A feasibility study completed in the fall of 1998 indicated that the mine can be redeveloped for production in the last quarter of 2000 at a capital cost of US\$56.2 million (\$4.4 million in 1998, \$51.1 million in 1999 and \$0.7 million in 2000; \$15 million of the total is for a new milling and concentrating plant). Gold production is expected to be 240 000 oz/y, quadrupling the level prior to the strike, at a cash cost of US\$88/oz and a total operating cost of US\$137/oz over a 6.5-year mine life. In addition, 35 000 oz/y is expected to be recovered upon installation of a refractory treatment process. The mining rate will likely be maintained at the 550-t/d level. In the meantime, exploration continues to expand ore reserves in the "sulphide-style" and the "high grade-style" mineralized zones laterally and at depth.

Seabee	La Ronge	Sask.	600	150	1998-1999	U/G	Gold	Claude Resources Inc.	In 1998, production from the mine reached a record 60 200 troy oz of gold at a cash operating cost of US\$168/oz, a 22% cost reduction from 1997. At the start of 1999, ore reserves stood at 559 800 t grading 8.97 g/t gold. Mining during the year was primarily focused on the 2C zone between the 110- and the 340-m levels, as well as mining on the 2H zone. Considerable development occurred on the Currie Rose property immediately west of the mine between the 110- and 290-m levels. Claude Resources Inc. now owns 100% of the Currie Rose property subject to a 30% net profits interest payable to Currie Rose Resources Inc., after pay-out of development and exploration expenditures incurred by Claude Resources Inc. to bring the property into production. The Currie Rose project was brought on stream in early 1999 with a mining rate of no less than 30 000 t/y of ore. The ore mined will be treated at Seabee. In March 1999, the combined Seabee and Currie Rose reserves stood at 560 000 t averaging 8.29 g/t gold, with an additional 349 000 t in the possible category. During 1998, Claude Resources also successfully acquired Madsen Gold Corp. and assumed development and production at the Madsen gold mine near Red Lake in northern Ontario.
<b>Base Metals</b>									
Creighton	Sudbury	Ont.	3 500*	525	1998-2001 (Phase 1) 2001-2005 (Phase 2)	U/G	Nickel, copper, cobalt, precious metals	Inco Limited	In April 1998, Inco Limited announced a two-phase, US\$125 million project to develop a 6-Mt high-grade, low-cost nickel-copper deposit at the Creighton mine over the next two decades. The first phase, currently under way, will develop proven reserves of 2.8 Mt grading 3.45% nickel and 2.97% copper located between the 7400 and 7660 levels. Production from this ore is expected to begin in 2001 and continue through 2013. The second phase involves the development of 3.1 Mt of probable reserves grading 3.62% nickel and 3.25% copper. This ore, situated between the 7660 and 8180 levels, is expected to be mined between 2005 and 2019. In contrast, the average grade of the Ontario Division mines is 1.3% nickel and 1.1% copper. When in full production, this Creighton Deep project is expected to produce 10 900 t of nickel, 9500 t of copper and 28 000 oz of platinum group metals annually.
McCreedy East	Sudbury	Ont.	1 800	180	1996-1999	U/G	Nickel, copper, cobalt, precious metals	Inco Limited	A \$194 million capital program to fully develop the mine and to expand capacity since its opening in 1996 continued in 1998. By the end of 1998, mine production had exceeded the year's target of 1800 t/d ore throughput. It is estimated that, by the end of 1999 or early 2000, major development work at the mine would be completed and daily ore capacity could exceed 2700 t. Inco has designated McCreedy East 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. When in full production, McCreedy East could produce some 14 500 t/y (32 million lb) of nickel, and will be one of the lowest-cost nickel-copper producers in the company's Ontario Division.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment during Mine Life <sup>1</sup>	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
<b>SUSPENSIONS</b>									
<b>Precious Metals</b>									
Con	Yellowknife	N.W.T.	810	340	May 14	U/G	Gold	Miramar Mining Corporation	Production was suspended on May 14, 1998, due to a labour dispute. The strike ended in April 1999 and production resumed immediately. A new operating plan calls for an annualized rate of gold production of approximately 100 000 troy oz/y. Gold production will come from a combination of free mill and refractory ores and will be supplemented by gold recovered from the reprocessing of roaster sludges. The company believes production can be maintained at this level for approximately five years without any significant capital expenditures or capital development. At the end of April 1999, free-milling ore reserves stood at 1 Mt grading 12 g/t (0.35 oz/st) gold. In addition, the mine has a block of mixed free-mill and refractory ores of 0.45 Mt grading 10 628 g/t (0.31 oz/st) gold. The mine is expected to maintain ore production at a rate of about 800 t/d (540 t/d for free-mill ore and 270 t/d for refractory ore), a reduction from its design capacity of 1270 t/d.
Lupin	Contwoyto	Nunavut	2 085	500	January 7	U/G	Gold	Echo Bay Mines Ltd.	Production was suspended in January 1998 due to low gold prices and high operating costs. A preliminary re-engineering study completed in the third quarter of 1998 indicated that under a new cost structure, Lupin can accomplish a life-of-mine average cash operating cost of US\$245-\$255/oz in current dollars. Cost reductions could be made by mining 18% fewer tonnes, using a smaller work force, and constructing a winze to gain access to ore below the 1130-m level without affecting the head grade or ore reserves. However, annual production will likely fall to 150 000 troy oz of gold. Lupin contains the Centre, West and McPherson zones, all of which are open at depth and have the potential to extend mine life. However, the decision to re-open the mine will depend on the gold price. During 1998, limited drilling was carried out to evaluate the McPherson zone, which was discovered in 1997. However, the company later decided that further work on the zone would best be funded by cash flows from production when the mine re-opens, possibly in 2000.
<b>Base Metals</b>									
Beaver Brook	Glenwood	Nfld.	600	80	February	U/G	Antimony	Roycefield Resources Ltd.	Production at the mine was suspended in February 1998 due to low antimony prices. The Beaver Brook antimony deposit was discovered in 1989 and was brought on stream in November 1997 at an estimated capital investment of \$14.6 million. Roycefield had estimated that at full production the mine could supply approximately 5% of the world's antimony market for 20 years.



Caribou and Restigouche	Bathurst	N.B.	3 000	280	August 2	U/G and O/P	Zinc, lead, silver, gold	Breakwater Resources Ltd.	Production at the two mines was suspended in August 1998 due to low metal prices. The company has since conducted technical and economic studies that included further pilot plant testing to determine the possibility of re-opening the mines. The results indicate that, in addition to higher metal prices, the flotation capacity in the mill will have to be expanded and the primary grind increased. A re-opening feasibility study is currently under way by company personnel. The mines had been plagued by lower-than-expected mill recoveries since its re-opening in August 1997. Breakwater Resources Ltd. acquired the Caribou mine in 1990 from East West Caribou Mining Limited and suspended the operations in October of that year due to poor metallurgical recovery and low metal prices.
Grum and Vangorda	Fargo	Yukon	12 000	386	January 16	O/P	Zinc, lead, silver, gold	Anvil Range Mining Corporation, Cominco Ltd. and Hyundai Corporation	Production was suspended in January 1998 due to low metal prices. Subsequently, an attempt by Anvil Range Mining Corporation to restructure the debt payment plan with debt holders, including partner Cominco Ltd., failed and Anvil Range is now in receivership. The Vangorda pit was mined out in early 1998 with a small amount of ore stockpiled on site. In addition, about six years of ore reserves remain at the Grum mine. Operations at the two mines were last suspended in December 1996. Production resumed in October 1997 after Cominco Ltd. acquired a 28% interest in Anvil Range in February 1997.
Myra Falls	Campbell River	B.C.	4 000	360	Mid-December	U/G	Zinc, copper	Boliden Limited	Production at Myra Falls was suspended in mid-December 1998 due to ground problems within the Battle and Gap zones of the mine. Poor ground conditions had led to the dilution of ore and lower head grades. About 270 of the 360 workers were kept on site during the suspension to carry out stope-and-access route rehabilitation and development. The work was successful and the mine re-opened on April 1, 1999. The capital cost for this work is estimated at \$9.8 million. However, some rehabilitation work remains to be done; therefore, Boliden Limited is predicting the mine will be running at 75-85% of capacity in the second quarter of 1999, with full production expected in the third quarter. At full production, zinc output from the mine will be 110 000 t of zinc annually. Boliden acquired the Myra Falls operations in January 1998 through a \$520 million acquisition of two-thirds controlling interest in Westmin Resources Limited of Vancouver. By winning control of Westmin, Boliden also picked up the company's Gibraltar copper-molybdenum mine in B.C., which closed in February 1999 because of low copper prices. Currently, Taseko Mines Limited is acquiring the mine and intends to resume production.

TABLE 2 (cont'd)

Mining Project	Location	Province/Territory	Ore Capacity (tonnes/day)	Employment during Mine Life <sup>1</sup>	Date of Opening, Re-Opening, Expansion, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
<b>Other Minerals</b>									
St. Onge	Lac-Saint-Jean	Que.	550	75	June 1	O/P	Wollastonite	Orleans Resources Ltd.	Production at the mine was suspended on June 1, 1998, due to the low wollastonite price and the need to modify production objectives. There was sufficient inventory to meet short-term sales demand. About 20 workers were kept on site to provide sales support and to prepare for the resumption of production. The mine began production in November 1997 from one of the largest wollastonite deposits in the world and was Canada's first wollastonite mine. Upon re-opening the mine in the summer of 2000, the mine is expected to be able to supply the market with three types of high-acicularity concentrates of different grades. Wollastonite concentrate production will likely be maintained at the 50 000-t/y level. The capital cost for re-opening the mine is estimated at \$8 million.
<b>CLOSURES</b>									
<b>Precious Metals</b>									
Contact Lake	La Ronge	Sask.	700	50	June	U/G	Gold	Cameco Corporation and Uranerz Exploration and Mining Limited	The mine was closed in June 1998 due to ore depletion. Mining ceased in April 1998 and milling was completed in June. Production in 1998 was 29 000 troy oz of gold at a cash cost of approximately US\$170/oz. Decommissioning of the site will continue in 1999. The first commercial production at the mine began in January 1995.
QR	Quesnel	B.C.	1 000	90	April	O/P and U/G	Gold	Kinross Gold Corporation	Due to declining gold prices, the company decided to close the mine. Underground production ceased in February 1998 and milling of stockpiled ore was completed in April. The open-pit operations were completed in 1997. Initial site stabilization work was completed in 1998. The majority of the closure reclamation work is scheduled for completion in 1999. The mine first began production in May 1995.
Klondike	Dawson City	B.C.	1 500 <sup>e</sup>	24	January	Placer	Gold	Teck Corporation	The mine was closed in January 1998 due to the depletion of placer gold ore reserves. Although small, scattered pockets of pay gravel remain, some of which could be mined by local operators, and the mine is under Temporary Closure Permit, it is not expected to re-open. The mine first began production in April 1980.

**Base Metals**

Shebandowan	Thunder Bay	Ont.	2 540	300	Second Quarter	U/G	Nickel, copper, cobalt, platinum group metals, gold, silver	Inco Limited	The mine was closed in the second quarter of 1998 due to low metal prices and high costs. The move is part of Inco's focus on profitable mine production, including the closing or phasing out of higher-cost mines. About 300 contract employees at the mine were affected. The mine first began production in 1972. Production was suspended in May 1992 due to poor market conditions. Production resumed in October 1995. Annual output from the mine was 5400 t of nickel.
Whistle	Copper Cliff	Ont.	2 000	55	Summer	U/G	Nickel, copper, cobalt, platinum group metals, gold, silver	Inco Limited	The mine was closed in 1998 for the same reason as for the Shebandowan mine above. Some 55 workers were affected. The mine produced from 1988 to 1991; it re-opened in 1994. Its annual production was about 4100 t of nickel.
Winston Lake	Schreiber	Ont.	900	162	December 4	U/G	Zinc, copper	Inmet Mining Corporation	The mine was closed in December 1998 due to low metal prices. A subsequent study that included additional underground drilling and further evaluation of the development at the nearby Pick Lake deposit failed to prove the operation economic for production resumption in the foreseeable future. The company has since decided to permanently close the mine, which first began production in April 1988.
Photo Lake	Snow Lake	Man.	500	43	September	U/G	Copper, zinc, gold, silver	Hudson Bay Mining and Smelting Co., Limited	The mine closed in September 1998 due to ore depletion. Workers at the mine were relocated to the Konuto Lake mine, the company's new mine at Creighton, Saskatchewan. The Photo Lake mine first began production in mid-1995.
<b>Other Minerals</b>									
George MacLeod	Wawa	Ont.	3 150 <sup>e</sup>	225	May 16	U/G	Iron	Algoma Steel Inc.	Due to high costs and a resulting lack of competitiveness, the company decided to close the mine in 1998. The company was paying \$8 million-\$12 million more for iron ore produced from the mine than from its Tilden mine in Michigan. All of the approximately 200 workers at the mine have been offered jobs at the company's mill at Sault Ste. Marie, Ontario, where the company is headquartered. Algoma Steel will now rely completely on the Tilden mine for iron ore supply. It holds a 45% interest in the Tilden mine and Stelco Inc. owns another 15%.

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

<sup>e</sup> Estimated.

O/P open-pit; U/G underground; st Short ton.

<sup>1</sup> Employment refers to workers on the company's payroll and to contract workers at an operation, or at an operation prior to its closure.

Note: A mine that closed and re-opened in the same year is shown under both categories.

**TABLE 3. NEW PRODUCTION FROM MINE OPENINGS IN CANADA IN 1998**

Mining Project	Main Commodities	Estimated Annual Production <sup>1</sup>					
		Gold	Gold	Copper	Zinc	Diamonds	Other Minerals
		(g)	(oz)	(t)	(t)	(ct)	
<b>NEW OPERATIONS</b>							
<b>Precious Metals</b>							
Kemess	Gold, copper	7 775 870	250 000	27 200	–	–	–
<b>Base Metals</b>							
Konuto Lake (Denare Beach)	Copper	–	–	5 500	1 500	–	–
<b>Other Minerals</b>							
Collier Point	Barite	–	–	–	–	–	10 000 t barite
Cassiar tailings	Asbestos	–	–	–	–	–	50 000 t asbestos (by 2000)
Panda (Ekati mine)	Diamonds	–	–	–	–	3 000 000	
<b>RE-OPENINGS</b>							
<b>Precious Metals</b>							
Madsen	Gold	1 555 170	50 000	–	–	–	–
Bissett (formerly San Antonio)	Gold	1 866 200	60 000	–	–	–	–
Blackdome	Gold	746 480	24 000	–	–	–	–
<b>Other Minerals</b>							
Costello (now part of Boundary-Dam East)	Coal						2.3 Mt thermal coal
Planned total		11 943 720	384 000	32 700	1 500	3 000 000	

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

– Nil.

<sup>1</sup>Panda was the first of five diamondiferous kimberlite pipes of the Ekati diamond mining complex to come on stream in Canada, to be followed by Koala and Misery in 2002, Sable in 2007 and Fox in 2008. Production will increase as the remaining four pipes are brought on stream and will double its current level by 2008.

TABLE 4. NEW ORE RESERVES FROM MINE OPENINGS IN CANADA IN 1998

Mining Project	Main Commodities	Proven-Probable Ore Reserves <sup>1</sup>		In-Situ Metal Reserves						
		Tonnage	Grade	Gold	Gold	Silver	Silver	Copper	Zinc	Other Minerals
		(tonnes)		(g)	(oz)	(g)	(oz)	(t)	(t)	
<b>NEW OPERATIONS</b>										
<b>Precious Metals</b>										
Kemess	Gold, copper	200 440 000	0.224% copper 0.629 g/t gold	126 076 760	4 053 460	–	–	448 980	–	–
<b>Base Metals</b>										
Konuto Lake (Denare Beach)	Copper	1 050 000	4% copper 1.2% zinc 1.84 g/t gold 8.345 g/t silver	1 932 000	62 110	8 762 250	281 700	42 000	12 600	
<b>Other Minerals</b>										
Collier Point	Barite	100 000 <sup>e</sup>	Barite	–	–	–	–	–	–	100 000 t barite
Cassiar tailings	Asbestos	14 000 000	3.5% asbestos (recoverable fibre)	–	–	–	–	–	–	490 000 t asbestos
Panda (Ekati mine)	Diamonds	12 600 000	1.09 c/t diamonds - OP	–	–	–	–	–	–	13 734 000 ct diamonds
		800 000	0.97 c/t diamonds - U/G	–	–	–	–	–	–	776 000 ct diamonds
<b>RE-OPENINGS</b>										
<b>Precious Metals</b>										
Madsen Bissett (formerly San Antonio)	Gold	1 100 000	9.26 g/t gold	10 186 000	327 480	–	–	–	–	–
	Gold	600 000 <sup>e</sup>		–	600 000	–	–	–	–	–
Blackdome	Gold	155 930	14.8 g/t gold 37 g/t silver	2 307 760	74 200	5 769 400	185 490	–	–	–
<b>Other Minerals</b>										
Costello (now part of Boundary-Dam East)	Coal	80 000 000	Lignite A	–	–	–	–	–	–	80 000 000 t lignite A
Total				140 502 520	5 117 250	14 531 650	467 190	490 980	12 600	

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

– Nil; <sup>e</sup> Estimated.

<sup>1</sup> Panda was the first of five diamondiferous kimberlite pipes of the Ekati mining complex to come on stream in Canada, to be followed by Koala and Misery in 2002, Sable in 2007 and Fox in 2008. At the end of 1998, total mineable reserves and additional resources for the five pipes stood at 133 Mt. Total capital cost for developing the five pipes will be US\$700 million and the overall employment will be 830 direct jobs.