Canadian Mineral Exploration and Discovery Analysis

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CANADA'S STANDING AS A WORLD EXPLORATION TARGET

Exploration expenditures in Canada in 1994 totalled $628 million. Canada remained one of the world's top targets (second after Australia) for mineral exploration that year. In 1995, Canada, with exploration expenditures of $764 million (preliminary), again ranked second after Australia in terms of planned exploration expenditures, thus continuing the close contest of the past three decades or more between these two countries. Based on official Canadian and Australian government surveys of company exploration expenditures, Canada ranked first every year from 1981 through 1990, and probably also in 1991. Canada ranked second, after Australia, from 1992 through 1995 (Figure 1). Company exploration spending intentions for Canada for 1996 total $945 million. No single country other than Australia will even come close to challenging Canada for first position in 1996.

In recent years, there has been considerable discussion concerning Canada's relative share of worldwide non-petroleum mineral exploration activity. Discussion has centred around the results of the proprietary annual survey of worldwide mineral exploration budgets prepared by the Metals Economics Group (MEG) of Halifax, Nova Scotia. Data from this survey have generally ranked Canada lower than do the official Canadian exploration statistics. MEG results ranked Canada first in 1991, third in 1992, fourth in 1993, fifth in 1994 and third in 1995.

The MEG survey of exploration budgets for 1995 contains 579 pages, covers almost all countries, and provides a wealth of detailed information on exploration activity and exploration companies. The survey is invaluable because it provides the only available source of information on exploration for nearly all countries in the world. The exploration expenditure statistics available in the public domain for the United States for the years 1970 through 1979 are rough estimates and, as a result, the relative position of the United States among the top three contenders for global exploration investment (Figure 1) is uncertain for the years 1970-79. U.S. exploration statistics

Figure 1
Top Three Country Destinations of Mineral Exploration Capital from Worldwide Sources, 1970-95

Year	Rank		
	First	Second	Third
1995	Australia	**Canada**	United States
1994	Australia	**Canada**	United States
1993	Australia	**Canada**	United States
1992	Australia	**Canada**	United States
1991	**Canada**	Australia	United States
1990	**Canada**	Australia	United States
1989	**Canada**	Australia	United States
1988	**Canada**	Australia	United States
1987	**Canada**	Australia	United States
1986	**Canada**	Australia	United States
1985	**Canada**	Australia	United States
1984	**Canada**	Australia	United States
1983	**Canada**	Australia	United States
1982	**Canada**	Australia	United States
1981	**Canada**	Australia	United States
1980	Australia	**Canada**	United States
1979	Australia	United States	**Canada**
1978	Australia	United States	**Canada**
1977	United States	**Canada**	Australia
1976	**Canada**	United States	Australia
1975	United States	**Canada**	Australia
1974	**Canada**	United States	Australia
1973	Australia	United States	**Canada**
1972	United States	Australia	**Canada**
1971	United States	**Canada**	Australia
1970	**Canada**	United States	Australia

Source: Natural Resources Canada, based on official Canadian and Australian statistics and the best available data for the United States. Australian expenditures were 6.5% higher than those for Canada in 1983 and 3.3% higher in 1991; however, correcting the reported Australian totals for substantial mine development expenditures, which are not included in Canadian statistics, would rank Canada first in 1983 and 1991. No data are available for the former Soviet Union.

for the years 1980 through 1991 are from incomplete annual surveys carried out by the American Bureau of Metal Statistics Inc. for the Society of Economic Geologists. However, the latter survey no longer yields useful exploration data; therefore, since 1992, the MEG survey is the only source of aggregate exploration statistics for the United States.

Statistics provided by Canada's federal-provincial exploration survey are a much more complete source of information for ranking Canadian exploration activity, as are similar statistics published by the Australian Bureau of Statistics for ranking Australian activity. However, even the official Canadian and Australian exploration expenditure statistics are not completely comparable because Australian exploration statistics include some costs that Canadian statistics exclude. It is clear that, relative to Canadian exploration statistics, annual Australian exploration expenditures are overstated because of the different methodologies used.

Canadian exploration statistics exclude the search for extensions to orebodies at producing mines, but the statistics prepared by Australia take such activity into account, including the cost of any necessary underground workings. This difference probably increases Australian exploration statistics by several tens of millions of dollars annually, or perhaps even more. In addition, Canadian exploration statistics clearly exclude the cost of pre-feasibility and feasibility studies, as well as the cost of technical and engineering studies. Although such costs are not meant to be included in Australian totals, the instructions provided on the Australian survey questionnaire do not make this prohibition clear.

MEG results understate Canada's share of worldwide exploration activity. There are several reasons for this. First, MEG results account for only 50-55% of total Canadian exploration expenditures because this survey covers only some 49 companies exploring in Canada and some 150 companies worldwide, substantially fewer than the 700 or more companies currently engaged as project operators in mineral exploration in Canada.

Secondly, MEG has used ever-higher exploration budget cutoffs to limit the universe of companies that it has surveyed in successive years. For 1995, companies surveyed were restricted to those having total worldwide exploration budgets of at least US$3 million, equivalent to C$4.1 million, which is a rather high cut-off. For 1994 the cut-off was US$2 million and, in prior years, the cutoff had been US$1 million.

The MEG survey cut-off of US$3 million substantially underestimates exploration activity in both Canada and Australia. This is because the contribution made by junior exploration companies is so much greater in Canada and Australia than it is in other countries. Both Canada and Australia have hundreds of producing or non-producing (junior) companies that individually spend less than US$3 million annually on exploration, but that, as a group, account for a substantial amount of exploration activity. For example, in 1995, MEG reported two aggregate exploration budgets for Canada: US$293.2 million on the basis of 49 company returns, and US$328 million on the basis of an allocation to Canada of 12.2% (US$2.69 billion) of total world exploration budgets. The US$328 million is based on a pro-rated portion of the budgets of companies that did not, in their responses, allocate their worldwide exploration budgets by country. A thorough comparison of the companies surveyed by MEG for 1995 with individual company spending intentions for Canada from the 1995 federal-provincial exploration survey shows that some 650 companies that had exploration expenditures in Canada were not included in the MEG survey. According to Canadian statistics, these companies had planned, in aggregate, to spend US$171.5 million exploring for those mineral commodities surveyed by MEG. The resulting underestimation of total exploration activity is most likely greater in the case of Canada than in the case of Australia.

Thirdly, the MEG survey does not cover exploration for all of the mineral commodities sought by companies. For example, uranium is not covered, but companies intended to spend C$40 million (US$29 million) on uranium exploration in Canada during 1995, more than half of the total world uranium exploration budgets compiled by the International Atomic Energy Agency. Although Australia, Canada and the United States are the front-runners in terms of total world mineral exploration, no uranium exploration expenditures were expected to be made in Australia in 1995, while those in the United States were expected to be less than C$4 million (US$2.9 million). As a consequence of the limited commodity coverage, Canadian exploration budgets reported by MEG tend to underestimate Canadian exploration activity relative to that in other countries, and especially in the other two most important exploration countries.

Fourthly, worldwide exploration budgets compiled by MEG are not comparable across all companies. In addition to surface exploration, some companies include the search for extensions to orebodies in producing mines in the budgets that they report, and still others include the cost of feasibility and engineering studies. Because of these inconsistencies it is difficult to assess the validity of comparisons across countries.

Fifthly, some MEG rankings compare total exploration budgets in individual countries such as Australia, Canada and the United States with those in vast geographical regions such as Latin America, Africa, Pacific and "Rest of World." Some of these comparisons are arbitrary. Latin America consists of more than 20 separate countries which jointly have an area, on two continents, that is more than double that of each of Canada, the United States and Australia. Latin America also has a mineral industry with an annual value of non-petroleum mineral production that is almost double that of Canada and,

therefore, it would not be unexpected for total Latin American exploration expenditures to be double those of Canada; however, when all companies are taken into account, this does not yet seem to be the case.

Until 1995, MEG's "Rest of World" had an area about ten times that of Canada, ten times that of the United States and about twelve times that of Australia. However, in 1995, MEG, in a further change of methodology, separated Africa from "Rest of World" and, as a result, the area of "Rest of World" decreased by 30%. This change helped to shift Canada's position in terms of exploration activity (according to MEG) from fifth in 1994 to third in 1995. However, if Canada, the United States and the Central American portion of Latin America had, for example, been combined into a region called North America, then North America would be first in terms of worldwide exploration activity. This indicates the problems of comparing individual country expenditures with expenditures by geographical region.

CHANGING EXPLORATION EXPENDITURES - CANADA VERSUS THE WORLD

Exploration expenditures have been increasing annually since 1992, both in Canada and in the world as a whole. Table 1 compares percentage increases in exploration expenditures or budgets in Canada (from the federal-provincial exploration survey) and in the remainder of the world (from MEG) since 1992. Although the percentage comparisons are not exact because of the changing annual budget cut-offs used in successive MEG surveys and because MEG does not include exploration budgets for all commodities, the data in Table 1 make it clear that, since 1992, Canada has almost certainly increased its share of world mineral exploration expenditures.

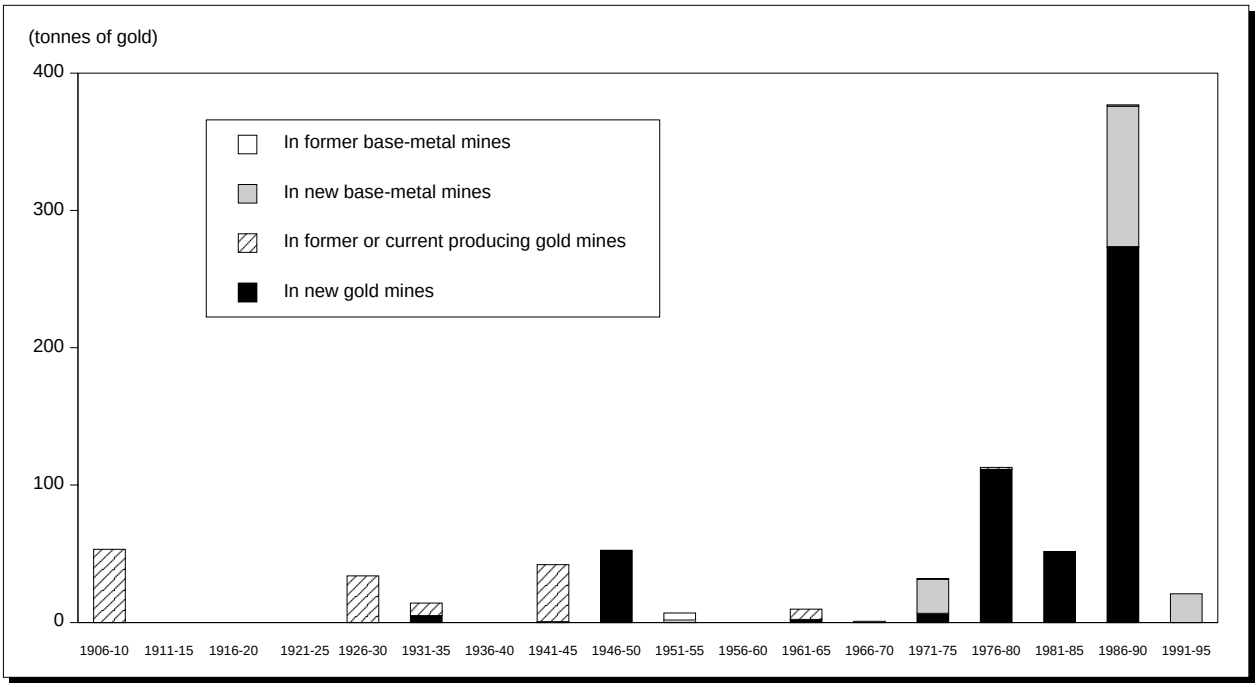
DISCOVERY ANALYSIS - MINES COMMITTED FOR PRODUCTION IN CANADA, JANUARY 1, 1990 - MARCH 31,1996

Production decisions for more than 60 base-metal and precious-metal mines in Canada were announced over the 63-month period from January 1, 1990 to March 31, 1996. The majority of these were new mines on deposits that had not previously been mined, but a few were re-openings of former mines, some of which had been out of production for as long as 30 or 40 years (Table 2). An analysis of tonnages of copper, nickel, zinc, lead, silver and gold contained in current ore reserves at these mines (plus cumulative production since January 1990) by five-year discovery periods is portrayed in Figures 2 to 7. These tonnages are not all there will ultimately be, as Canadian base-metal mines typically yield about double the amount of metal contained in ore reserves at the commencement of production and Canadian gold mines typically yield triple or more.

Much of the gold in mining projects in Canada announced in the 1990s is in deposits that were discovered in the 1980s and 1990s, but a considerable amount of it is in deposits discovered many years ago (Figure 2). Much of the copper is in orebodies discovered during the most recent decade (Figure 3), while much of the nickel is in the Raglan nickel deposits, discovered in the early 1960s, and in the McCreedy East deposit discovered in the early 1970s (Figure 4). Much of the zinc is in deposits discovered during the most recent decade and during the early 1970s (Figure 5), while much of the lead is in deposits discovered during the early 1970s and the early 1950s (Figure 6), and much of the silver is in deposits discovered during the second half of the 1980s (Figure 7).

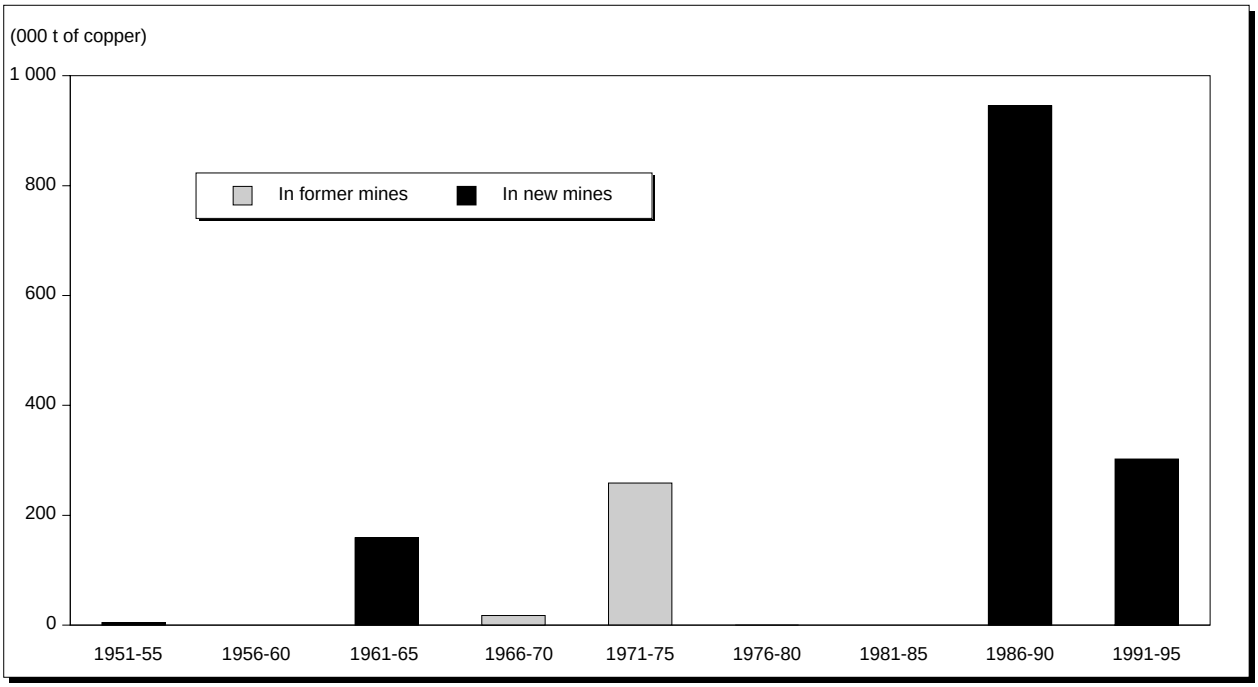
There are still a considerable number of already discovered Canadian mineral deposits, some of them with considerable economic potential that, while awaiting production decisions, seem likely to become mines and thereby add substantial quantities of metals to the more recent discovery periods in Figures 2 to 7. The known metal contents of most of these deposits, some of them originally discovered in the 1980s or, in some cases, in earlier years, have been enlarged or the known deposit grades have been increased in more recent years by substantial additional exploration expenditures. These more promising discoveries (many of which are likely to be committed for production relatively soon), by discovery year, include: 1995, Wolverine, Yukon (zinc-copper-lead-silver-gold); 1994, Voisey's Bay, Newfoundland/ Labrador (nickel-copper-cobalt), and ABM, Yukon (zinc-lead-silver); 1993, Nickel Rim, Ontario (copper-nickel), and Pipe Deep, Manitoba (nickel); 1990, Victor Deep, Ontario (copper-nickel), and Kemess South, BritishColumbia (copper-gold); 1988, McIlvenna Bay (Hanson Lake), Saskatchewan (zinc-copper), Kerr, B.C. (gold), Mt. Milligan, B.C. (copper-gold), and Nicholas Lake, Northwest Territories (gold); 1987, Nighthawk Lake, Ontario (gold); 1975, Izok Lake, Northwest Territories (zinc-copper); 1973, Duport, Ontario (gold), and Red Chris, B.C. (copper-gold); 1971-73, DEF/Minto,Yukon (copper-gold-silver); 1970, Williams Creek, Yukon (copper); 1966, Prairie Creek, Northwest Territories (zinc-lead-silver); 1965, Mt. Polley, B.C. (copper-gold); 1963, Huckleberry, B.C. (copper-gold); 1934/35, Box mine and Athona deposit, Saskatchewan (gold); 1934, Madsen mine, Ontario (gold); and 1929, Tulsequeh Chief mine, B.C., (zinc-copper-lead-silver-gold). Jointly these promising undeveloped deposits contain substantial quantities of metal. Recent size estimates for the Voisey's Bay deposit have indicated that this one deposit probably contains a tonnage of nickel equivalent to 20-25 years of recent Canadian annual nickel production and a tonnage of copper equivalent to 4-5 years of recent Canadian annual copper production.

Figure 2 - GOLD
Production Decisions Announced in Canada from January 1, 1990 to March 31, 1996
Tonnages of Gold Contained in Ore Reserves by Five-Year Discovery Periods, 1906-95



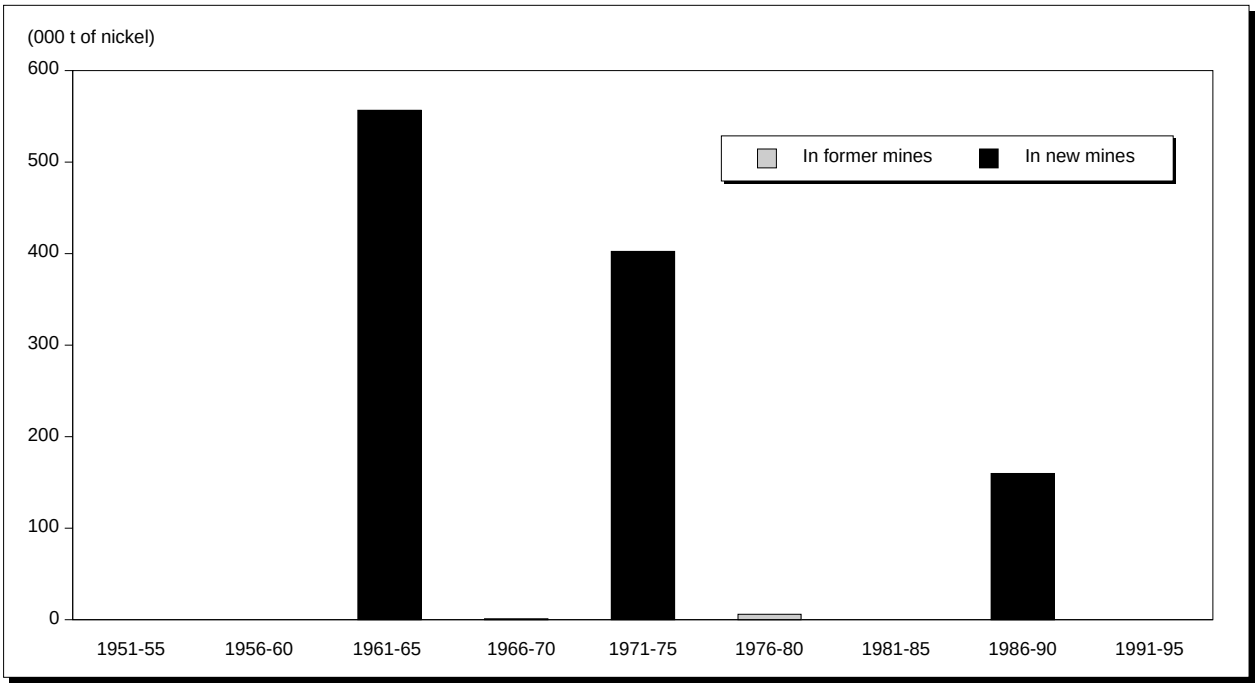
Source: Natural Resources Canada.

Figure 3 - COPPER
Production Decisions Announced in Canada from January 1, 1990 to March 31, 1996
Tonnages of Copper Contained in Ore Reserves by Five-Year Discovery Periods, 1951-95



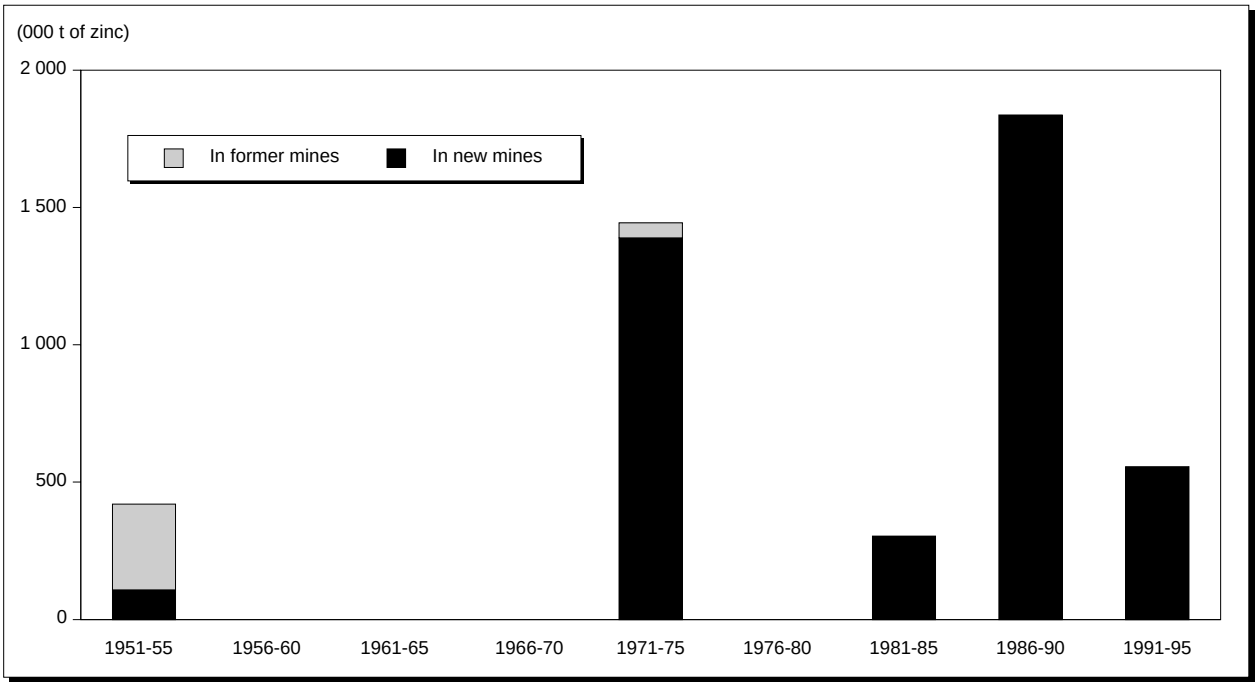
Source: Natural Resources Canada.

Figure 4 - NICKEL
Production Decisions Announced in Canada from January 1, 1990 to March 31, 1996
Tonnages of Nickel Contained in Ore Reserves by Five-Year Discovery Periods, 1951-95



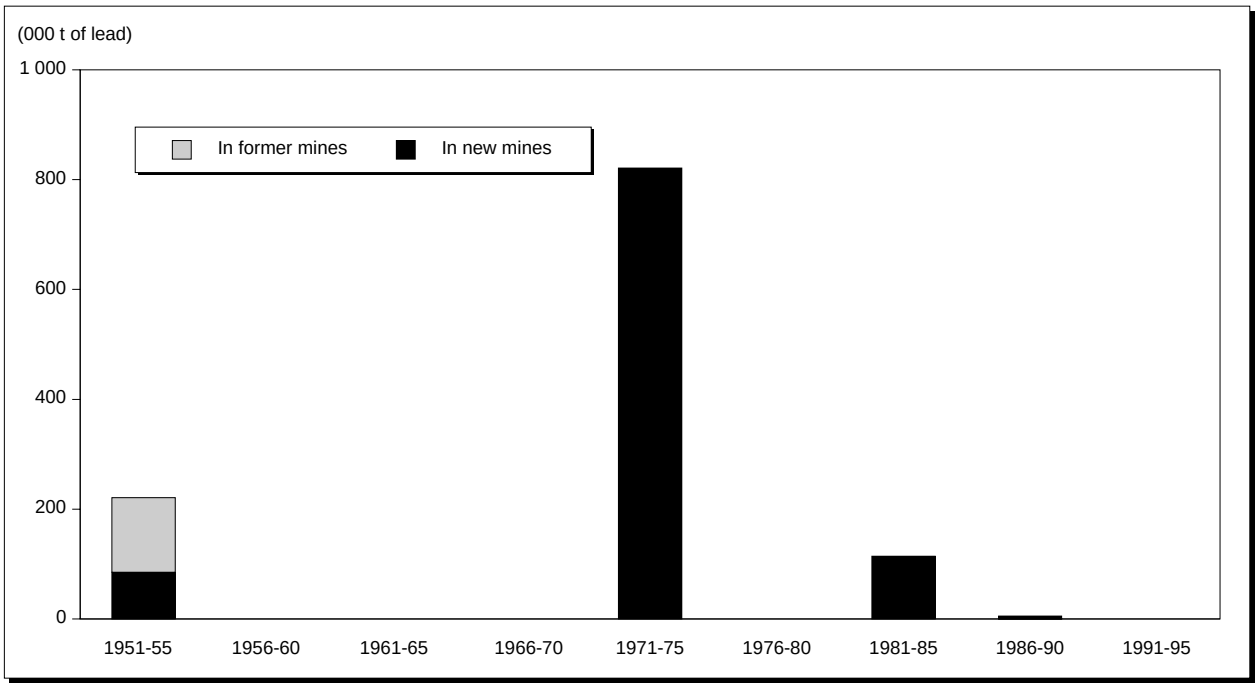
Source: Natural Resources Canada.

Figure 5 - ZINC
Production Decisions Announced in Canada from January 1, 1990 to March 31, 1996
Tonnages of Zinc Contained in Ore Reserves by Five-Year Discovery Periods, 1951-95



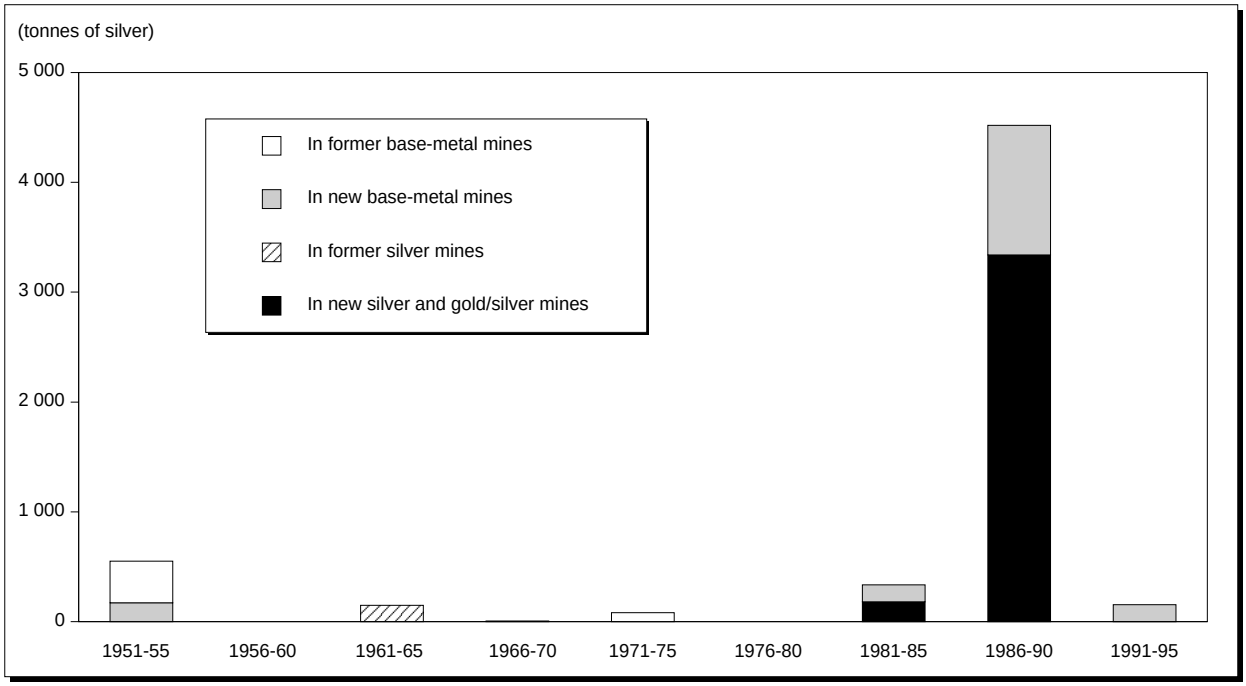
Source: Natural Resources Canada.

Figure 6 - LEAD
Production Decisions Announced in Canada from January 1, 1990 to March 31, 1996
Tonnages of Lead Contained in Ore Reserves by Five-Year Discovery Periods, 1951-95



Source: Natural Resources Canada.

Figure 7 - SILVER
Production Decisions Announced in Canada from January 1, 1990 to March 31, 1996
Tonnages of Silver Contained in Ore Reserves by Five-Year Discovery Periods, 1951-95



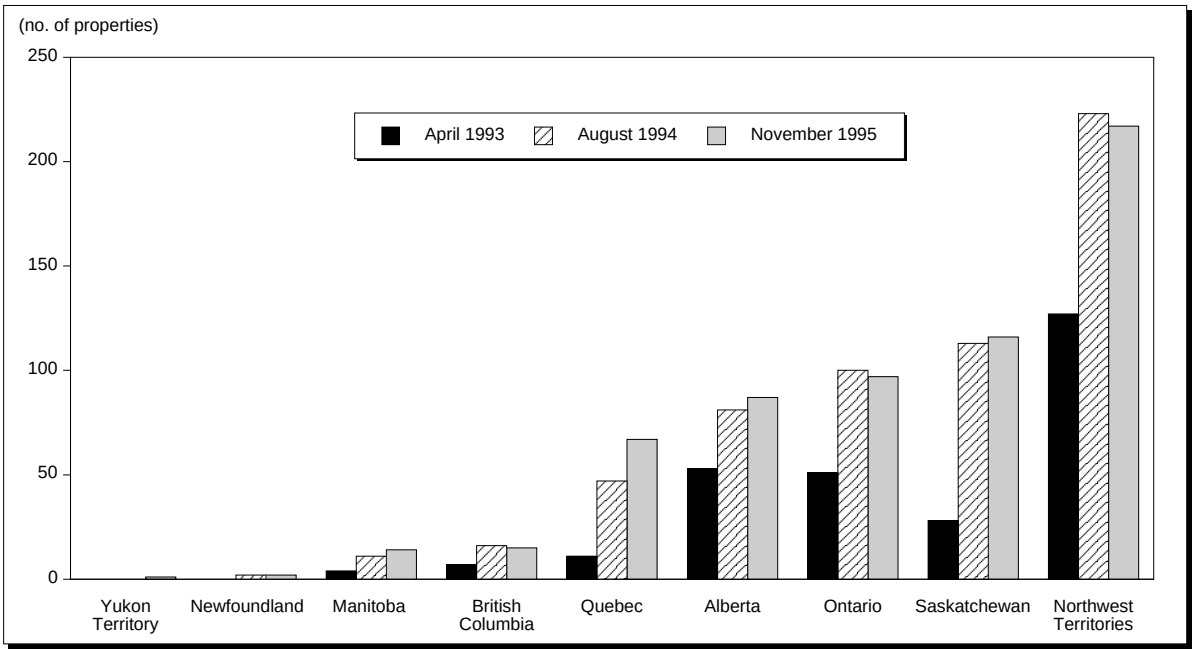
Source: Natural Resources Canada.

DIAMOND EXPLORATION HIGHLIGHTS

In November 1995, there were 616 diamond exploration properties in Canada. More than one-third of these properties were in the Northwest Territories. Saskatchewan, Ontario, Alberta and Quebec are the other principal provinces for diamond exploration. There was also some activity in British Columbia, Manitoba, Labrador and the Yukon (Figure 8).

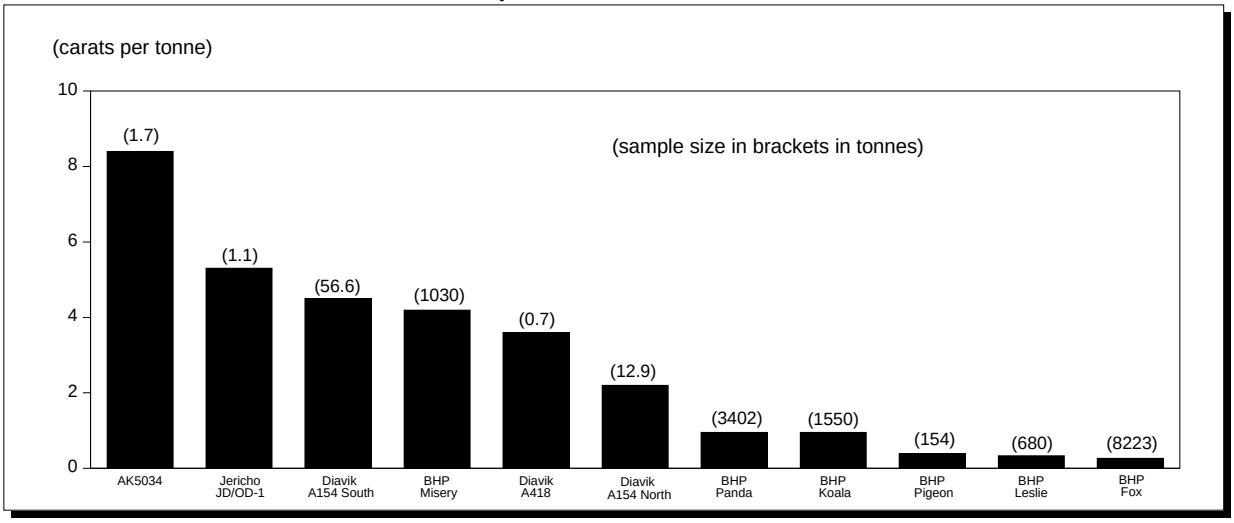
The four Canadian diamond properties, all of them in the Northwest Territories, that currently appear to have the highest production potential (BHP-Lac de Gras, Diavik, the AK property and the Jericho project

Figure 8
Exploration for Diamonds in Canada
Regional Distribution of Properties



Source: Natural Resources Canada, based on MIN-MET CANADA database, and used under licence.

Figure 9
Grade of Selected Canadian Diamond Deposits



Source: Natural Resources Canada, based on published data.

property) are described below in more detail. The omission of other diamond properties from this list does not imply that they lack economic potential, but only that currently published information does not clearly indicate that such properties have significant economic potential. Available diamond content information for diamondiferous kimberlite deposits on the four above-mentioned properties is provided in Figure 9. Grades for several of the kimberlites are based on samples of only a few tonnes and are likely to change as larger bulk samples are taken on these pipes.

Comparison of Recoverable Grades and Values of Canadian Diamond Deposits to World Diamond Mines

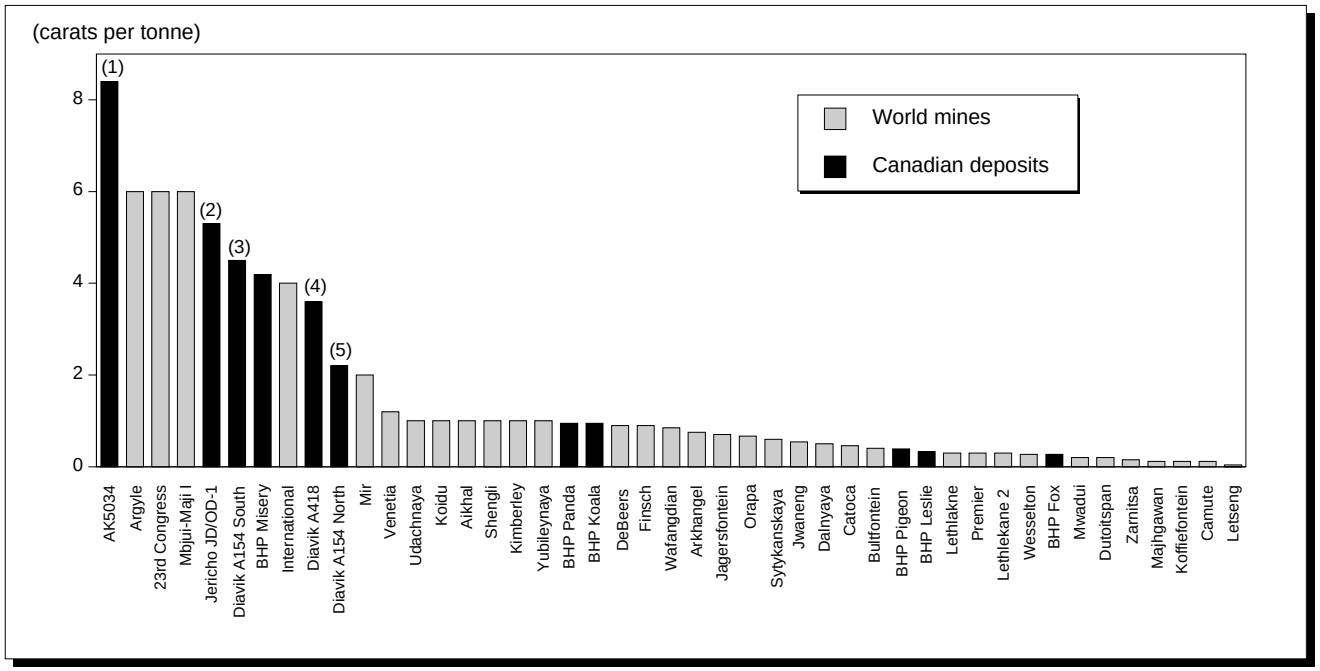
Recoverable diamond contents of more than half of the known Canadian diamond deposits are among the world's highest (Figure 10). Similarly, per tonne recoverable values of a number of the Canadian deposits for which such information is currently available are also high (Figure 11).

BHP Diamonds Inc./Blackwater Group's Lac de Gras Property

In 1995, exploration continued on the Lac de Gras property of BHP and its associates in the Northwest Territories. A total of 57 kimberlite intrusions have now been found on this property, 42 of which are known to contain diamonds, and exploration for additional kimberlites continues. BHP has now spent between $150 million and $200 million on the property, much of it on exploration, bulk sampling using diamond drilling and/or underground workings, feasibility studies and environmental studies.

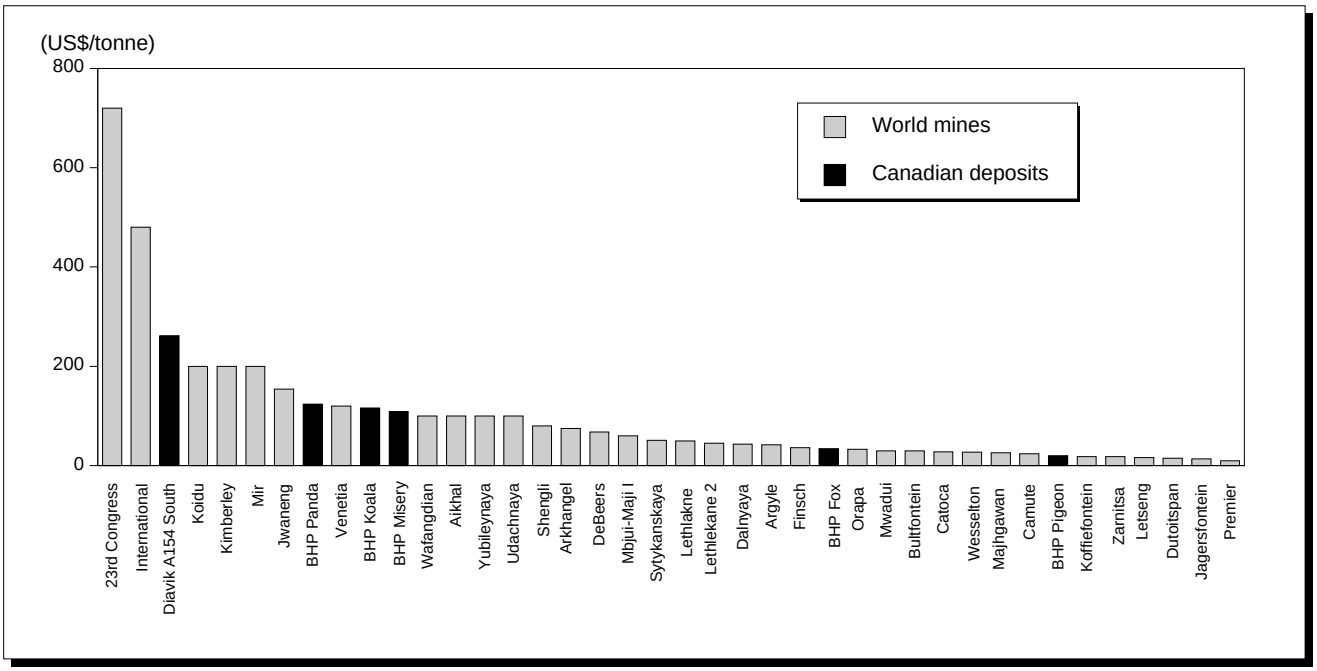
BHP now owns 51% of the property and the Blackwater Group (Dia Met Minerals Ltd. (29%), Charles E. Fipke (10%) and Stewart Blusson (10%)) owns the remaining 49%. The project operator, BHP, has not yet published ore reserves data for the five diamond pipes it currently plans to mine. Table 3 lists the available bulk sample results for combined bulk sample data from each pipe for the Panda, Misery, Koala, Fox and Leslie pipes and for the lower-grade Pigeon

Figure 10
Recoverable Grades From World Diamond Mines and Canadian Diamond Deposits



Source: Natural Resources Canada, based on published data.
(1) AK-5034 grade based on a sample of only 1.7 t of drill core. (2) Jericho JD/OD-1 grade based on a sample of only 1.1 t of drill core. (3) Diavik A154 South grade based on a sample of 56.6 t of drill core. (4) Diavik A418 grade based on a sample of only 0.7 t of drill core. (5) Diavik A154 North grade based on a sample of only 12.9 t of drill core.

Figure 11
Recoverable Values of World Diamond Mines and Canadian Diamond Deposits



Source: Natural Resources Canada, based on published data.

pipe (not currently scheduled for mining). Bulk samples were also taken and tested from four other pipes during 1995 (Cub, Grizzly, Arnie and Mark), but diamond contents and initial quality assessment of the diamonds recovered indicate that these four pipes are of insufficient economic value to warrant additional work at this time. This has also been the case for several other pipes from which small bulk samples have previously been taken.

An Environmental Impact Statement for the proposed mining project was submitted to the federal Environmental Assessment Panel in July 1995. Final results of this review are not currently expected until later in 1996. As substantial quantities of construction supplies would have had to have been shipped over the winter road in the 1995/96 winter season for the property to be ready for production in 1997, it seems unlikely that production will actually begin until 1998.

Current plans are that the operation will process 9000 t/d of ore for the first 9 years of production, increasing to 18 000 t/d for the subsequent 16 years. These proposed ore throughput rates suggest that jointly the Panda, Misery, Koala, Fox and Leslie pipes have ore reserves totalling some 130 Mt. The average value per tonne of each of the Panda, Misery and Koala deposits is in excess of US$100/t (Table 3), which indicates that these three deposits appear to be among the world's highest-grade diamond deposits in terms of per-tonne values (Figures 10 and 11, Table 4). Projected revenue for this project is in the range of $500 million per year over the currently planned 25 years of operation.

Aber Resources Limited - Kennecott Canada Inc.'s Diavik Property

A total of 41 kimberlite pipes have been discovered on the combined diamond properties of these companies of which 13 are known to contain diamonds. Notable results have been obtained by drilling of the A-154 South kimberlite, including the recovery of a 1.76-ct diamond. A one-kilometre-long decline has been driven to a depth of 155 m below the ground surface, and a 3000-t bulk sample was being taken during the winter of 1995/96 with the goal of recovering at least 10 000 ct of diamonds for valuation. A total of $23.5 million is being spent on this phase of the project. An estimated resource of 8.4 Mt, to a depth of 250 m (and as much as 20 Mt if the ore is projected to a depth of 650 m), with an average diamond value of $77.68/ct and ore valued at $350/t (this is based on a 56.6-t mini-bulk sample that yielded 255.6 ct of diamonds, 4.5 ct/t), makes this deposit potentially one of the world's highest grade diamond deposits. The bulk sample is being shipped to Kennecott's diamond processing plant in Yellowknife where processing of it was expected to have been completed by the end of April 1996. The first 46 t of this bulk sample (which was diluted with wallrock and grout cement) yielded

1.8 ct of diamonds per tonne; a subsequent 164.4 t yielded 4.2 ct/t. The largest diamond recovered from these 46 t weighs 5.5 ct and the largest gem-quality diamond recovered weighs 4.05 ct.

Within 750 m of the A-154 South pipe are the A-154 North and A-418 kimberlite pipes. A-154 North has a preliminary resource of 5.3 Mt, to a depth of 250 m, grading 2.2 ct/t. A 0.707-t sample from A-418 had a grade of 3.6 ct/t, with the largest diamond recovered weighing 0.41 ct. The proximity of A-154 North and A-418 to the A-154 South kimberlite should enable underground sampling of these two kimberlites from the original A-154 decline. Their proximity will also make the economics of underground mine development more attractive.

If the results of the 1996 underground bulk sample on A-154 South continue to confirm the results of the mini-bulk sample taken in 1995, it seems highly likely that Kennecott will have at least one future high-grade diamond mine, and probably more, on the Diavik property. The major uncertainty for the development of these mines is the cost of the major dike that would have to be constructed to permit open-pit mining beneath the waters of Lac de Gras.

Early in 1996, mini-bulk samples, of approximately 50 t each, were to be collected using large-diameter core drilling of the A-418, A-154 North and A-21 kimberlites.

AK Property, 5034 Kimberlite

On the AK property, 150 km southeast of Lac de Gras, Mountain Province Mining Inc. (50%), together with its partners Glenmore Highlands Inc. (40%) and Camphor Ventures Inc. (10%), have drilled the 5034 kimberlite pipe. The drilling done to date has indicated an estimate of 18.3 Mt of diamondiferous kimberlite to a depth of 300 m. A 1.703-t sample of this kimberlite, comprising a composite sample of core from the 15 drill holes processed up to August 29, 1995, has yielded 8.4 ct of recovered diamonds per tonne, of which 7.5 ct comprise macrodiamonds larger than 1 mm in diameter. While these results are highly encouraging, the sample is too small to provide reliable information on the distribution of sizes, qualities and values of diamonds typically contained in the 5034 kimberlite. An initial 100-t bulk sample was to be taken during the early winter of 1995/96 using a large-diameter diamond drill to provide additional information on the diamond content of the pipe.

Jericho Project, Northwest Territories

Lytton Minerals Limited and its various partner companies have discovered a total of five diamond-bearing kimberlite pipes on their various properties in the Northwest Territories. Kimberlite core from six delineation drill holes into the JD/0D-1 kimberlite pipe, which is owned by Lytton and New Indigo Resources Inc., weighing a total of 1.115 t, has yielded 5.320 ct of recovered diamonds per tonne. Of these diamonds, 4.882 ct are macrodiamonds and the balance are microdiamonds. The diamond content of this small sample is exceptionally high, but a much larger bulk sample will be needed to determine whether this is an economical deposit.

Macrodiamonds 1.0-2.0 mm in size account for 3.610 ct and those greater than 2.0 mm account for 1.165 ct. Eighty percent of the diamonds were reported to be of gem quality. Delineation drilling is continuing on the JD/0D-1 kimberlite and on the JD/0D-2 kimberlite located a short distance to the north. A large-diameter drill has been operating on the property since August 11, 1995, accumulating core for an initial 100-t bulk sample of the JD/0D-1 kimberlite.

Note: Information in this review was current as of April 15, 1996.

TABLE 1. RATE OF GROWTH OF EXPLORATION EXPENDITURES: CANADA COMPARED TO THE WORLD, 1991-96

Year	Exploration Expenditures in Canada[1]	Growth Compared to Low Year 1992[3]	Exploration Budgets in the Remainder of the World[2]	Growth Compared to Low Year 1992[3]
	(C$ millions)	(percent)	(US$ millions)	(percent)
1991	531.8	–	1 846	–
1992	385.3	–	1 610	–
1993	477.3	+24	1 900	+18
1994	628.1	+63	2 130	+32
1995	763.5[a]	+98	2 690	+67
1996	945.2[b]	+145	..	..

Source: Natural Resources Canada.
.. Not available.
[a] Based on preliminary exploration survey. [b] Based on company spending intentions.
[1] Federal-provincial exploration survey.
[2] Metals Economics Group survey.
[3] For example, the growth in Canadian expenditures in 1994 ($628.1 million) compared to 1992 ($385.3 million) is (628.1 – 385.3) x 100% = 63%.
385.3

TABLE 2. BASE AND PRECIOUS METAL MINE PRODUCTION DECISIONS ANNOUNCED BETWEEN JANUARY 1, 1990 AND MARCH 31, 1996

Mine	Discovery Year
BASE-METAL MINES	
Newfoundland	
Ming*	1970
Ming West	1988
New Brunswick	
Captain North	1988
Caribou*	1955
Restigouche	1955
Quebec	
Bell Allard South	1992
Grevet	1988
Louvicourt	1988
Mobrun 1100	1988
Raglan	1963/1964
Ontario	
Langmuir No. 1*	1966
Lac-des-Îles	1973
Lindsley	1987
McCreedy East	Pre-1975[a]
McCreedy East Footwall Zone	1990
Pick Lake	1990
Redstone*	1977
Manitoba	
Photo Lake	1993
Saskatchewan	
Konutu Lake	1994
British Columbia	
Goldstream*	1974
Ingerbelle East	1992 (?)
Virginia	1989
Yukon	
Grum	1973
Sa Dena Hess	1985
GOLD MINES	
Quebec	
Astoria	1984 (1945?)
Beaufor	1931
Casa Berardi Principale Zone	1984
Donalda*	1986
Eastmain	1982
Granada	1927
Joubi	1965 (?)
McWatters*	1987 (1932)

TABLE 2 (cont'd)

Mine	Discovery Year
GOLD MINES (cont'd)	
Quebec (cont'd)	
Mouska	1973 (?)
Norlartic	1981
Simkar* (Louvicourt Goldfields)	1944
Sleeping Giant*	1990
Troilus	1987
Wrightbar*	1986
Ontario	
Cheminis*	1983
Dome Open Pit*	1909
Eagle River	1987
Hislop East	1946 (?)
Holloway	1989
Musselwhite	1980
Manitoba	
Bissett (San Antonio)*	1927
Burnt Timber	1988
Farley (Keystone)	1986
New Britannia*	1941
Saskatchewan	
Contact Lake	1987
Jasper	1987
Komis	1980
Seabee	1949
British Columbia	
Bralorne-Pioneer*	1932/1900
Eskay Creek	1988
Johnny Mountain	1984
QR	1979
Snip	1986
Table Mountain	1980
Yukon	
Brewery Creek	1989
Mount Nansen*	1964
Northwest Territories	
Colomac*	1945

Source: Natural Resources Canada.
(?) Discovery year somewhat uncertain.
a Included in 1971-75.
***** Re-opening of former mine.

TABLE 3. BHP MINERALS CANADA LTD./BLACKWATER GROUP BULK SAMPLE DIAMOND EVALUATIONS FOR SIX DIAMOND DEPOSITS ON THE LAC DE GRAS PROPERTY

Pipe	Total Tonnes Sampled	Total Carats Recovered	Average Grade	Average Value	Average Value
			(carats/tonne)	(US$/carat)	(US$/tonne)
Panda	3 402	3 244	0.95	130	124
Misery	1 030	4 313	4.19	26	109
Koala	1 550	1 465	0.95	122	116
Fox	8 223	2 199	0.27	125	34
Leslie	680	223	0.33	..	..
Pigeon[1]	154	60	0.39	51	20

Source: Natural Resources Canada, from company reports.
.. Not available.
[1] The Pigeon deposit is not currently scheduled for mining.

TABLE 4. AREA, GRADE AND VALUE OF THE WORLD'S ECONOMIC KIMBERLITES

Pipe	Area	Grade	Average Value		Deposit Size: Economic Tonnage to a Depth of 120 m
	(ha)	(carats/t)	(US$/carat)	(US$/tonne)	(million tonnes)
Bultfontein	9.7	.40	75	30	24
Camute	9.3	.12	200	24	23
Dutoitspan	10.8	.20	75	15	26
Finsch	18.0	.90	40	36	44
Jagersfontein	10.0	.70	200	14	24
Jwaneng	45.0	.54	100	154	110
Koffiefontein	10.3	.12	150	18	25
Lethlakne	11.6	.30	150	50	28
Letseng	16.0	.04	400	16	10
Majhgawan	12.0	.12	220	26	16
Premier	32.2	.30	35	10	78
Udachnaya	20.0	1.00	100	100	49
Venetia	12.7	1.20	100	120	31
Yubileynaya	40.0	1.00	100	100	98
Wesselton	8.7	.27	100	27	21
Zarnitsa	21.5	.15	120	18	24
Argyle	46.0	6.00	7	42	45
Arkhangel	118.0	.75	100	75	116
Catoca	66.0	.46	60	28	65
Mbjui-Maji I	18.6	6.00	10	60	18
Mwadui	146.0	.20	150	30	143
Orapa	106.0	.67	50	33	104
Mir	6.9	2.00	100	200	17
Sytykanskaya	6.0	.60	85	51	15
Dalnyaya	5.4	.50	85	43	13
DeBeers	5.1	.90	75	68	12
Kimberley	3.7	1.00	200	200	9
Lethlekane 2	3.6	.30	150	45	9
Aikhal	3.0	1.00	100	100	7
Dokolwayo	2.8	..	..	..	..
International	1.7	4.00	120	480	4
23rd Congress	1.5	6.00	120	720	3
Wafangdian	1.5	.85	120	100	3
Shengli	0.4	1.00	80	80	1
Koidu	0.4	1.00	200	200	1

Source: Adapted from A. Janse, 1993, "The Aims and Economic Parameters of Diamond Exploration"; paper in "Diamonds: Exploration, Sampling and Evaluation," published by the Prospectors and Developers Association of Canada, Toronto.
.. Not available.