

# ALASKA'S MINERAL INDUSTRY 2000: A SUMMARY

by D.J. Szumigala and R.C. Swainbank



*Sam Dashevsky (Northern Associates Inc.) and Melanie Werdon (DGGS) touring the Delta mineral belt. Photo by David Szumigala.*

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by  
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## INTRODUCTION

This summary of Alaska's mineral industry for 2000 was made possible by information provided through phone interviews and replies to about 1,050 questionnaires sent to the mineral industry and compiled by the Division of Geological & Geophysical Surveys (DGGS) in the Department of Natural Resources (DNR), and the Division of Community & Business Development (DCBD) in the Department of Community & Economic Development (DCED). Estimates used in this summary are conservative, as data for 2000 are still incomplete and employment data are not available at this time.

The preliminary estimate for the value of the industry in 2000 is \$1.249 billion, of which \$31.2 million was exploration investment, \$137.1 million was development expenditure, and \$1,080.7 million was the gross value of the mineral products. Table 1 shows the annual values of the industry and components since 1981.

Preliminary estimates indicate that \$31.2 million was spent on mineral exploration in Alaska in 2000, and about 57 percent of that total was spent in the eastern interior region. Exploration highlights include continued thick base-metal drill intercepts reported from the Anarraaq deposit near the Red Dog Mine, significant PGE programs by several companies conducted in the southcentral and southeastern regions of Alaska, polymetallic mineralization discovered at the Road Metal prospect near Northway, Alaska, and lode gold mineralization encountered at several more prospects in the Goodpaster mining district. The Pogo deposit advanced towards the development phase and other prospects on the Pogo property were drill-tested.

The True North deposit near the Fort Knox Mine continued through the permitting stage and received final permits late in the year. Cominco continued a major optimization project at the Red Dog mill. The Red Dog zinc-lead-silver mine near Kotzebue and the Greens Creek polymetallic mine near Juneau posted record production levels, while the Fort Knox gold mine near Fairbanks and the Usibelli Coal Mine

near Healy continued producing at levels comparable with past years.

## EXPLORATION

Although the estimated exploration investment of \$31.2 million in 2000 was down 40 percent from the \$52.3 million spent in 1999, much of the decline resulted from the fact that activity at the Pogo mine site near Delta and also at True North near Fairbanks was considered to be development, rather than exploration. Likewise, although only 5,572 mining claims were located in 2000, down 59 percent from the 13,573 reported in 1999, many of the most prospective areas of recent exploration had

Table 1. Total value of the mineral industry in Alaska by year (in millions of dollars)

	Exploration (expenditure)	Development (expenditure)	Production (value)	Total
1981	\$ 76.0	\$ 26.4	\$ 188.6	\$ 291.0
1982	45.0	41.6	196.4	283.0
1983	34.1	27.8	232.4	294.3
1984	22.8	53.6	199.4	275.8
1985	9.2	34.1	226.6	269.9
1986	8.9	24.3	198.5	231.7
1987	15.7	100.3	202.4	318.4
1988	45.5	275.0	232.2	552.7
1989	47.8	134.3	277.0	459.1
1990	63.3	14.3	533.0	610.6
1991	39.9	25.6	546.5	612.0
1992	30.2	30.0	560.8	621.0
1993	30.3	27.7	448.7	506.7
1994	31.1	44.9	507.5	583.5
1995	34.3	148.6	537.2	720.1
1996	44.6	394.0	590.4	1,029.0
1997	57.8	168.4	936.2	1,162.4
1998	57.3	55.4	920.2	1,032.9
1999	52.3	33.8	1,032.9	1,119.0
2000	31.2	137.1	1,080.7	1,249.0
<b>TOTAL</b>	<b>\$777.30</b>	<b>\$1,797.20</b>	<b>\$9,647.60</b>	<b>\$12,222.10</b>

SOURCE: Alaska's mineral industry reports published annually by DGGS.

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been acquired either by claims or prospecting sites in the previous three or four years. New federal mining claims staked in Alaska during 2000 numbered 557—an 80 percent increase from the 308 federal claims staked in 1999. Approximately 400 new state prospecting sites were filed during 2000, down 80 percent from 1999 levels. Table 2 lists exploration expenditures by commodity.

#### NORTHERN REGION

Cominco American Inc., a wholly owned subsidiary of Cominco Ltd., continued exploration in the area around the Red Dog Mine. The western Brooks Range region has the world's largest known zinc resources, estimated at 25 million tons of zinc in four deposits near Red Dog. Four out of the eight largest known zinc deposits in the world are located in the Red Dog area. The zinc resource number does not include resources at the Su-Lik and Anarraaq deposits. The second-largest area with known zinc resources, in Australia, contains an estimated 17 million tons of zinc.

Cominco conducted gravity surveys on their land package of state mining claims and NANA Regional Corp.-owned lands. Previous gravity work had outlined several large anomalies comparable in size to Anarraaq, as well as several smaller, intense anomalies. Drilling of the Anarraaq deposit resumed in early June and the east-

ern and southwestern margins of the deposit were defined by the drilling. Sixteen holes were completed in the Anarraaq area during 2000 and seven holes were considered barren. Six holes had zinc ore intercepts ranging from 11 to 65 feet thick. Three holes had ore intercepts greater than 100 feet wide. Hole 923 intersected a 197-foot interval (180 feet of true thickness) beginning at 2,208-foot depth averaging 20 percent zinc, 6 percent lead, and 4.0 ounces per ton silver. Hole 933 had a 202-foot-thick intercept starting at 2,202-foot depth with average grades of 16 percent zinc, 5 percent lead, and 3.1 ounces per ton silver. Hole 946 had a 118-foot-thick intercept beginning at 2,080-foot depth with average grades of 14 percent zinc, 4 percent lead, and 1.9 ounces per ton silver. Ore at the Anarraaq deposit seems to have higher iron content than ore from the Red Dog Mine. Cominco is currently calculating a resource value based on completed drilling at Anarraaq, but preliminary estimates are that the Anarraaq deposit contains over 80 million tons of sulfides with a billion tons of barite overlying the sulfide mineralization.

Quaterra Resources Inc. targeted mafic and ultramafic rocks in the Asik Mountain area about 35 miles north of Kotzebue and 45 miles south of the Red Dog Mine for a platinum-group-element exploration program. Quaterra's interest in Asik Mountain was triggered by a 1991 report with reported analyses from six samples taken in the north-

Table 2. *Reported exploration expenditures in Alaska by commodity, 1982–2000*

	Base metals	Polymetallic <sup>a</sup>	Precious metals	Industrial minerals	Coal and peat	Other	Total
1982	\$31,757,900	\$ N/A	\$ 10,944,100	\$ --	\$ 2,900,000	\$ 15,300	\$ 45,617,300
1983	9,758,760	N/A	20,897,555	2,068,300	1,338,454	70,000	34,133,069
1984	4,720,596	N/A	14,948,554	270,000	2,065,000	279,500	22,283,650
1985	2,397,600	N/A	6,482,400	--	270,000	--	9,150,000
1986	1,847,660	N/A	6,107,084	170,000	790,000	--	8,914,744
1987	2,523,350	N/A	11,743,711	286,000	1,150,000	31,000	15,734,061
1988	1,208,000	N/A	41,370,600	160,200	2,730,000	--	45,468,800
1989	3,503,000	N/A	43,205,300	125,000	924,296	5,000	47,762,596
1990	5,282,200	N/A	57,185,394	370,000	321,000	97,000	63,255,594
1991	4,789,500	N/A	34,422,039	92,000	603,000	2,000	39,908,539
1992	1,116,000	3,560,000	25,083,000	25,000	425,000	--	30,209,000
1993	910,000	5,676,743	23,382,246	163,500	--	125,000	30,257,489
1994	600,000	8,099,054	18,815,560	225,000	2,554,000	810,000	31,103,614
1995	2,770,000	10,550,000	20,883,100	100,000	--	3,000	34,306,100
1996	1,100,000	11,983,364	31,238,600	400,000	--	--	44,721,964
1997	1,700,000	22,347,000	32,960,500	80,000	720,000	--	57,807,500
1998	1,000,000	13,727,000	42,441,000	12,000	87,000	--	57,267,000
1999	3,869,000	3,168,000	44,891,000	1,000	--	410,000	52,339,000
2000	5,350,000	3,900,000	21,169,500	58,500	--	691,000	31,169,000
<b>TOTAL</b>	<b>\$86,203,566</b>	<b>\$83,011,161</b>	<b>\$508,171,243</b>	<b>\$4,606,500</b>	<b>\$16,877,750</b>	<b>\$2,538,800</b>	<b>\$701,409,020</b>

<sup>a</sup>Polymetallic deposits considered as a separate category for the first time in 1992.

N/A = Not available.

-- Not reported.

central part of the ultramafic complex ranging from 510 to 1,605 parts per billion platinum and 480 to 1,112 parts per billion palladium. Quaterra consultants completed reconnaissance mapping and sampling of the area during late August. A total of 106 rock, soil, and stream-sediment samples were collected and analyzed. The maximum values obtained were 450 parts per billion palladium in a gabbro and 195 parts per billion platinum in a troctolite. The ultramafic body was discovered to be significantly larger than previously mapped and could contain rocks with higher platinum–palladium values. Sample results are sufficiently encouraging to warrant further fieldwork next year if suitable arrangements can be worked out with NANA Regional Corp.

Silverado Gold Mines Ltd. drilled portions of Nolan Creek during exploration for additional gold placer resources and may have encountered a virgin stretch of the Nolan deep channel in two drill holes. Silverado's drilling, geophysical, and geological evidence suggests that the ancient deep channel is at least several hundred feet west of a line of drift shafts sunk prior to 1920.

### Western Region

Consolidated Aston Resources Ltd. completed an extensive exploration program on the Mt. Distin project during 2000. Exploration included geologic mapping, rock chip sampling, conventional and Mobile-Metal-Ion (MMI) soil sampling, and approximately 1,640 feet of core drilling. Mapping, soil sampling, and drilling on the Bulk Gold property (under lease from Altar Resources) discovered two stratiform, disseminated, sericite–pyrite–arsenopyrite–stibnite mineralized zones and a new fault zone with strong soil anomalies (up to 0.034 ounces per ton gold, 442 parts per million arsenic, and 393 parts per million antimony). MMI sampling on portions of the Lost and Midas Well claim blocks identified two large areas of gold anomalies warranting additional work. Consolidated Aston drilled three core holes at the Grouse Creek prospect and three core holes at the Big Pig prospect on the Bulk Gold property. The best drill results were from DDH BG–1, a 284-foot hole that intersected an intensely brecciated, stibnite-cemented, dolomitized massive marble bed with disseminated gold and antimony mineralization from the collar to 67-foot depth. Assay results include a 48-foot-thick zone averaging 0.017 ounces per ton gold from 10 feet to 58 feet, including 15 feet averaging 0.03 ounces per ton gold. Maximum metal values in the Grouse Creek drillholes were 0.008 ounces per ton gold, 4,172 parts per million arsenic, and 117 parts per million antimony.

NovaGold Resources Inc. continued assessment of the Rock Creek property near Nome. Two main ore types were selected for bench and pilot-scale metallurgical tests. Shear vein mineralization consisting of pyrite, arsenopyrite, and sulfosalt minerals in quartz and clay gouge averaged 90.7

percent recovery using cyanide and 37.4 percent of the gold was recovered in a gravity concentrate at a-65-mesh grind. Tension vein mineralization consisting of free gold in quartz with pyrite–arsenopyrite selvages averaged 98.1 percent recovery using cyanide and 86.2 percent of the gold was recovered in a gravity concentrate. NovaGold also conducted an extensive reverse-circulation drilling program during 2000. Drilling highlights are: 100 feet averaging 0.125 ounces per ton gold (hole RR–011), 100 feet averaging 0.079 ounces per ton gold, including 45 feet averaging 0.13 ounces per ton gold (hole RR–002), 95 feet averaging 0.15 ounces per ton gold (hole RR–015), and 90 feet averaging 0.087 ounces per ton gold, including 30 feet averaging 0.175 ounces per ton gold and 25 feet averaging 0.25 ounces per ton gold (hole RR–003). The 30-hole, phase 1 drill program was designed to increase drillhole density to a 100-foot by 300-foot grid pattern. Drilling indicated that mineralization continues to the south of previously known extents.

Quaterra Resources Inc. staked seven 160-acre state mining claims at the Big Bar prospect about 110 miles northeast of Nome on the Seward Peninsula for potential volcanogenic massive sulfide mineralization. Anaconda Minerals Co. identified the prospect in 1982 and completed mapping, soil sampling, and limited ground geophysics (magnetics, gravity, IP, MaxMin EM) before dropping the claims without drilling in 1985. The few completed lines of geophysics identified an IP anomaly with a coincident magnetic high upslope from a copper anomaly. A large geochemical anomaly, favorable host rocks, deep weathering and gossan fragments are all positive indicators.

RPG Ltd, a wholly owned subsidiary of Altar Resources, was granted an exploration license to the Golden Peninsula property owned by Bering Straits Native Corp. This property, near Nome, has historic gold placer production. RPG conducted a panning program across the property and identified five areas with strong lode gold potential.

North Star Exploration Inc. completed 2,776 feet of core diamond drilling in four holes at the Kaiyah epithermal silver–gold deposit immediately west of the Yukon River, and one hole at the SC 'sinter' state prospecting sites near the center of the Poison Creek caldera. Drilling explored subsurface extensions of two major east–west-trending vein systems: (1) the "Main" vein at VABM Kaiyah; and (2) the "South" vein, which outcrops about 250 yards south of Kaiyah summit. All four holes intersected classic epithermal mineralization with advanced argillic alteration, polymodal quartz vein swarms, and locally abundant polymetallic sulfides. Drilling also encountered several large, mineralized dikes that cut the layered rock section. A significant narrow intercept (0.077 ounces per ton gold and 0.58 ounces per ton silver over two feet) was present in hole KAI–00–04. Several zones of argillic alteration, sulfides, and polymodal quartz vein swarms encountered anomalous

gold, silver, copper, arsenic, antimony, and lead values in drill hole 2.

Drilling of two holes totaling 1,091 feet was completed by North Star on the Indian River Trend (IRT) mineralization, about 20 miles east-northeast of the village of Hughes. The drill program was designed to test an east-west trending zone of high-level felsic intrusive rocks with significant indications of gold-polymetallic mineralization. Chalcopyrite and pyrite were found throughout much of the core and associated alteration minerals may include gypsum. Further interpretations await assay results.

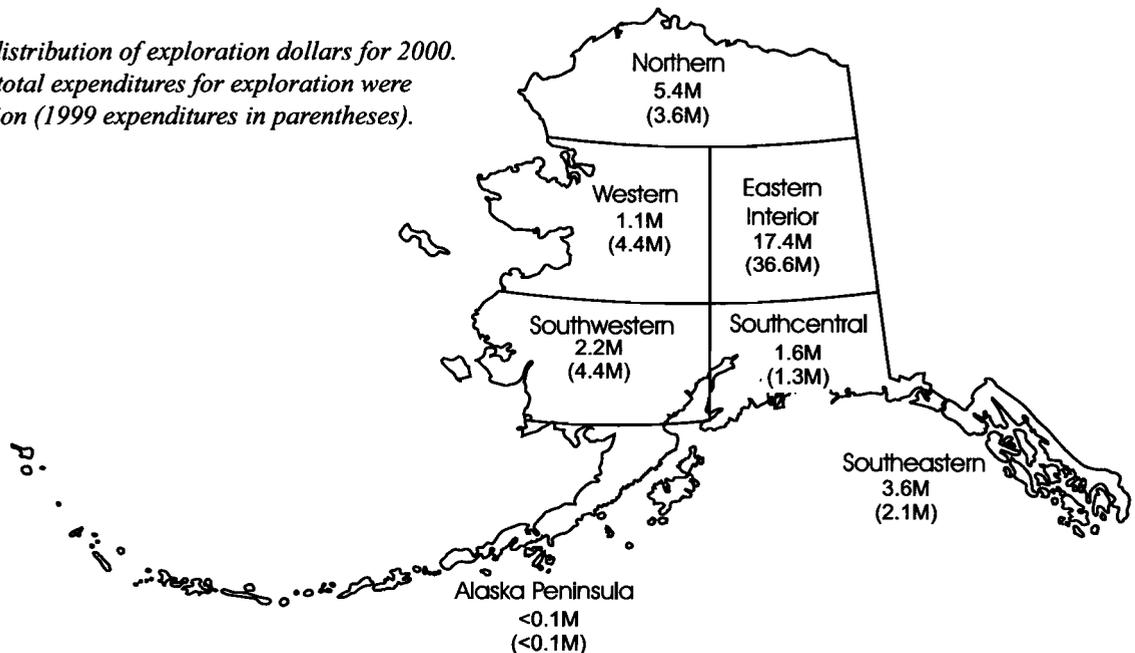
Platinum-Palladium Holdings Inc., the newly formed subsidiary of North Star Exploration Inc., focused platinum-group elements (PGE) exploration in the Rampart-Livengood districts of interior Alaska, the Farewell district of the western Alaska Range, and the Dime Creek/Koyuk district of the eastern Seward Peninsula. PGEs were recovered in the Dime Creek region from streams draining bedrock similar to bedrock that hosts PGE deposits in the Russian Far East. Ultramafic plutons intruded a major suture that separates two tectonostratigraphic terranes. Platinum-Palladium conducted a reconnaissance program and located platinum in pan concentrates in two drainages. Platinum grains, and up to several hundred grains of gold, were found in panned concentrates from three locations in the drainage system. Approximately 35 mafic and ultramafic rock samples were collected for analysis. Results of pan concentrate sampling included values up to 0.07 and 0.12 ounces per ton platinum and 1.31 and 1.39 ounces per ton gold.

Platinum-Palladium Holdings Inc. reported ore grade levels of PGEs in two target types from the Farewell property: (1) sill-form differentiated mafic-ultramafic intrusions, related to the Triassic Nikolai terrane, and (2) differentiated composite plutons with mafic-ultramafic components. Platinum-Palladium conducted a reconnaissance field program in the 2000 field season and located significant platinum and palladium (up to 0.058 ounces per ton platinum-palladium) at the Roberts PGM prospect. A total of three target areas are held under Alaska state claims and prospecting sites. At Farewell, a sulfide-rich, copper-stained, 25-35-foot-thick, shallow dipping mafic sill outcrop (a dark lenticular intrusion) was traced and sampled over a distance of 1,500 feet. Of the twenty-seven 3- to 8-foot rock chip samples taken from outcrop and rubble crop exposures, 17 samples contained 0.005 to 0.058 ounces per ton combined platinum and palladium as well as up to 0.48 percent copper, 117 parts per million cobalt, and 0.48 percent nickel. Sampling of another mafic intrusion 2.5 miles further to the south yielded high copper-cobalt-nickel values including 0.001 ounces per ton combined PGE in one sample.

### Eastern Interior Region

The eastern interior region of Alaska experienced about 57 percent of the total mineral exploration expenditures in 2000, continuing a trend developed over the last few years. The most active areas of Alaska's interior were the Fairbanks mining district and the Goodpaster mining district.

*Regional distribution of exploration dollars for 2000. Statewide total expenditures for exploration were \$31.2 million (1999 expenditures in parentheses).*



Kinross Gold Corp. and Teryl Resources Corp. completed an extensive drill program on the Gil Claims near Fairbanks. The Gil claims are adjacent to Fort Knox Mine, owned by Kinross Gold Corp., and Kinross Gold has an 80 percent working interest in the Gil joint venture property. Mineralization at the Main Gil prospect is in excess of 2,500 feet along strike and has been drill tested to a depth of 600 feet. Mineralization is primarily stratabound within a metamorphic package and is hosted in two or possibly three calc-silicate horizons. Mineralization at the North Gil prospect is primarily as quartz veining within the metamorphic rock package.

Kinross's 45,530-foot drill program consisted of 33 core holes for a subtotal of 15,762 feet and 95 reverse-circulation (RC) drill holes for a subtotal of 29,768 feet. The program's goal was to test the expansion of the Gil Main Zone, define a resource on the North Gil prospect, and to test other geochemical and geophysical targets. In the Phase 1 drill program, 21 drill holes intersected significant gold mineralization. Phase 2 drilling concentrated on in-fill and step-out drilling at both the North Gil and the Main Gil zones. Selected Main Gil prospect gold drill intercepts include 80 feet of 0.036 ounces per ton, 105 feet of 0.04 ounces per ton, 15 feet of 0.176 ounces per ton, 120 feet of 0.045 ounces per ton, 65 feet of 0.12 ounces per ton, and 50 feet of 0.065 ounces per ton. Selected North Gil prospect gold drill intercepts include 110 feet of 0.1217 ounces per ton, 65 feet of 0.1237 ounces per ton, 50 feet of 0.035 ounces per ton, 40 feet of 0.24 ounces per ton, 20 feet of 0.15 ounces per ton, and 15 feet of 0.33 ounces per ton. One drill hole at the Slippery Creek prospect intersected 15 feet of 0.027 ounces per ton gold.

Kinross also worked on a number of other projects throughout the Fairbanks area. Work continued on evaluating the Ryan Lode property on Ester Dome, with extensive drilling to test previously defined gold and silver resources. Kinross also conducted a drilling program on the Amanita property south of Fort Knox Mine and the Steamboat Creek property between True North and Fort Knox. Kinross also conducted metallurgical tests and remediation work at the Ryan Lode property.

International Freegold Mineral Development Inc. (Freegold) drilled one core hole to a 1,000-foot depth on the Cleary Hill mine prospect within its Golden Summit project area of the Fairbanks mining district. The purpose of this program was to test for both high-grade vein occurrences and bulk-tonnage gold mineralization in surrounding country rock. Hole CHD00-1, to the south of the Wyoming vein, intercepted a new significant gold-bearing zone. Based on historical surface and subsurface data, the newly discovered zone (218-282 feet), named the Currey Zone, strikes east-west, has a moderate south dip and a true thickness of approximately 63 feet. The Currey Zone projects to the surface approximately 220 feet north of the collar of

hole CHD00-1. There is no known surface expression of the Currey Zone. Strong pervasive quartz veining and flooding, pervasive sericite alteration, and poly-phase hydrothermal brecciation mark gold mineralization in the Currey Zone. Gold mineralization averages 0.143 ounces per ton over the 64-foot intercept. Anomalous gold values are associated with highly anomalous arsenic and antimony with lesser lead and silver. Fragments of previously altered and quartz-veined intrusive rock are present in the core and suggest a possible igneous genetic relationship at depth. Several other +0.03 ounces per ton gold intervals were intercepted in hole CHD00-1, including 2 feet grading 2.5 ounces per ton at 520 feet from a sulfide- and sulfosalt-bearing quartz vein. This 2-foot intercept correlates with the down dip extension of either the "J" vein or the Colorado vein, neither of which have been intercepted in previous drilling.

Many properties were staked in 1998 and 1999 in the rush to acquire a land position near the Pogo property. Low gold prices hindered junior mining companies from raising venture capital to explore these claims. However, several companies were able to raise funds for exploration during 2000. These exploration programs advanced some properties to the drilling phase of exploration. Gold mineralization was encountered during drilling at several properties. The drilling is significant because it indicates that potential gold mineralization is more widespread than in the immediate area surrounding the Pogo property.

Teck Corp. and partner Sumitomo Metal Mining America Inc. conducted extensive exploration on the Pogo property in the Goodpaster mining district east of Fairbanks. Teck and Sumitomo have outlined 5.6 million ounces at the Pogo gold deposit and the main occurrence was advanced to development status. Exploration work continued on other parts of the 72-square-mile property. The summer surface exploration program included over 25,000 feet of core drilling at other prospects. Recent work by Teck intersected gold mineralization during exploration drilling along the 8-mile-long Pogo Trend. Drilling at Hill 4021 totaled 11,200 feet, tested 3,000 feet of strike length, and encountered gold mineralization, including 15.5 feet of 0.71 ounces per ton gold.

International Bravo Resource Corp. completed exploration on the East Divide, West Pogo, and Central properties held under option from a subsidiary company of North Star Exploration Inc. The East Divide property is approximately 16 miles southeast of Teck's Pogo gold prospect and was the site of most of Bravo's work. The East Divide property features an intrusion-hosted, structurally controlled, gold-bearing sheeted vein system extending at least 4,000 feet in an east-west direction and from 1,000 to 2,000 feet wide at the southern margin of a zoned pluton. Visible sulfides associated with gold-quartz mineralization consist of pyrite, chalcopyrite, molybdenite, and bismuthinite.

International Bravo identified numerous sub-parallel gold-bearing sheeted quartz vein systems, three of which yielded impressive gold results. The overall system of sheeted quartz veins, measuring approximately 820 feet wide by 1,640 feet long and remaining open along strike, contains east-west trending, steeply dipping vein zones varying from five feet to over 100 feet thick within intrusive rocks. One sheeted quartz vein system assayed 0.31 ounces per ton gold over 32.8 feet, with a weighted average of 0.165 ounces per ton gold over a 65.6-foot zone. Gold mineralization is associated with anomalous silver, copper, and bismuth values. Drilling of two 330-foot diamond drill holes at East Divide intersected porphyry-hosted veinlets and fractures carrying quartz and sulfide mineralization. Mineralized quartz veins, as observed in surface exposures, were not intersected in drilling. Anomalous gold values reach 0.029 ounces per ton over three- to six-foot intervals.

Prospecting and sampling were also completed on the West Pogo and Central properties by International Bravo. The West Pogo claims are immediately adjacent to the western end of the principal Teck-Sumitomo Pogo property, approximately two miles west of the Pogo deposit. West Pogo covers an elongated, northwest-trending, zoned pluton that has intruded metamorphic rocks. Exploration by Bravo this summer included detailed mapping and sampling. The Central property is six miles southeast of the Pogo property. Exploration by Bravo this summer included prospecting and reconnaissance soil and rock sampling. Results were disappointing and Bravo relinquished its option on the West Pogo and Central properties.

Western Keltic Mines Inc. and Rimfire Minerals Corp. conducted exploration at their Goodpaster Gold Project, located east of the Pogo property. The exploration program included diamond drilling, soil sampling, and ground-based magnetometer and VLF surveys funded through a financing and option agreement with Barrick Gold Corp. The exploration program focused within the Boundary and Southeast Surf areas where soil sampling in 1999 outlined broad, gold and pathfinder element anomalies and rock samples returned gold values grading up to 0.75 ounces per ton. A total of 770 samples consisting of 60 rock and 710 soil samples were collected at the Boundary and South East Surf prospects during 2000. Geophysics (15 miles of ground magnetic and 8.7 miles of VLF-EM surveys) point to a relatively strong magnetic high centered over a coincident gold-arsenic-bismuth soil anomaly extending at least 3,000 feet by 1,000 feet at the Boundary prospect. Two hundred fifty soil samples, 10.5 miles of ground magnetic survey and 6.2 miles of VLF-EM survey collected on the Southeast Surf anomaly define a gold-arsenic-bismuth anomaly over an area of 4,200 feet by 3,300 feet. Most of the gold anomaly lies within or straddles a porphyritic intrusion. The geophysi-

cal surveys confirm that the Spur Zone of the Southeast Surf anomaly is centered on a significant magnetic low.

Western Keltic and Rimfire completed a four-hole, 2,714-foot core drill program on the Boundary prospect. One hole did not intercept any significant mineralization. Visible gold was observed in the remaining three holes. Selected highlights include BND00-04, which intersected 1.6 feet grading 0.71 ounces per ton gold in quartz veinlets and BND00-01, which intersected 8 feet assaying 0.07 ounces per ton gold. Drilling revealed three styles of gold mineralization and shows that the extensive area of quartz stockwork gold mineralization is more widespread than indicated by surface sampling. The highest gold values are hosted in 1- to 5-centimeter-wide quartz-pyrite-pyrrhotite veinlets that locally contain visible gold intergrown with bismuthinite. Broader zones of elevated gold values are found in quartz-sericite altered or sheared gneiss locally cut by hairline quartz-pyrite-calcite stringers. Less commonly, quartz-pyrite-bismuthinite/arsenopyrite/gold veinlets occur in pegmatitic marginal phases of granitic dikes.

Hyder Gold Inc., in partnership with Rimfire Minerals Corp., completed a five-hole, 900-foot, diamond-drilling program on the Eagle property, 19 miles southwest of Teck-Sumitomo's 5.6-million-ounce Pogo gold deposit. The core drill program tested portions of a 2-mile by 1-mile gold soil geochemical anomaly. The most significant hole, EA00-03, was drilled 260 feet east of a soil sample that returned 0.009 ounces per ton gold along with anomalous arsenic, bismuth, and tungsten. A 61.5-foot section in the mid part of the hole averaged 0.013 ounces per ton gold, including three samples containing greater than 0.029 ounces per ton gold. Elevated gold results are present from the first sample to the last sample of this 172-foot hole. Hole EA00-03 encountered weakly porphyritic granite that was consistently cut by quartz, quartz-calcite and, less commonly, quartz-pyrite-arsenopyrite veinlets. The other four holes, the nearest of which is 2,100 feet west of EA00-03, did not contain comparable gold results. Hyder returned the Ogo, Fire, Bou, and Top claims to Rimfire at the end of the season.

Copper Ridge Explorations Inc. continued exploration on the Ogo project. A total of 1,227 soil samples were collected on a grid basis, ranging from 200 foot square spacing to 400 feet; 27 rock samples were also collected. The most promising results are from the West Grid Area. The highest value is 125 parts per billion gold with coincident anomalous arsenic and antimony.

NovaGold Resources Inc. continued to evaluate data from the Caribou project near the Salcha River. NovaGold is currently looking for a joint venture partner to fund further exploration on this property.

Barrick Gold Corp. signed a deal with the Alaska Mental Health Trust Land Office to explore Mental Health Trust

lands in the upper Salcha River basin. This area, in the Goodpaster mining district, may be named the Radio property. Barrick also staked claims in the area.

Sumitomo Metal Mining America Inc. continued exploration of the Stone Boy property, completing 13,000 feet of core drilling during 2000.

Achieva Development Corp. collected 24 samples from properties in the Ladue River area. No anomalous geochemical results were received. The company expects to conduct further exploration on the property in 2001. Achieva also staked the Mac and Dall claims in the Tanana uplands and prospecting sites in the Shaw Creek area of the Big Delta Quadrangle.

AngloGold USA conducted exploration programs on properties optioned from Canada Fluorspar Inc. (formerly Blue Desert Mining Inc.). AngloGold can earn a 60 percent interest in the Gobi, Mojave, and Sahara properties near Teck's Pogo property. These early stage properties are considered prospective for intrusion-associated gold mineralization. Bedrock trenching of an area with anomalous gold-in-soil samples confirmed lode gold mineralization on the Gobi property.

In July, Abacus Minerals Corp. signed a letter of intent with Engineer Mining Corp. for an option to earn 51 percent interest of the ER property near Pogo. A total of 33 stream-sediment, 14 soil, and 19 rock samples were collected on the property. A quartz vein rock sample from talus assayed 0.044 ounces per ton gold.

Fairfields Minerals conducted a soil geochemical program on the Shawnee property in the Goodpaster mining district. A gold anomaly was discovered during the work. Fairfields dropped the nearby Rock Creek property.

El Niño Ventures Inc. entered into a lease/purchase option agreement with Anglo Alaska Gold Corp. to acquire the Sassy gold property just north of Teck-Sumitomo's Pogo property. No work was announced during 2000.

Williams Creek Exploration conducted a geochemical soil survey on claims in the Goodpaster area. No anomalies were detected and no further work is planned.

Grayd Resource Corp. acquired all of North Pacific Mining Corp.'s right, title, and interest in Royalties on the Delta claims. Grayd now controls most of the Delta mineral belt near Tok, Alaska, with claims over approximately 38 square miles. An inferred resource of 19.1 million tons averaging 0.6 percent copper, 2 percent lead, 4.7 percent zinc, 2.13 ounces per ton silver, and 0.055 ounces per ton gold within eight deposits has already been delineated on the Delta claims. Many of the deposits are still open, and there are a number of untested and partially tested targets that require further exploration.

Exploration work on Grayd's White Gold property in the Delta mineral belt yielded promising results. Highest values from a soil-sampling program contain 0.187 ounces

per ton gold. Results from a recent trenching program following the soil anomalies include 0.025 ounces per ton gold over 32 feet true width and another interval averaging 3.37 ounces per ton gold over 3.2 feet at the Low showing. Gold mineralization is hosted in graphitic schist with arsenopyrite and stibnite mineralization. A trench at the Goldberg area exposed silicified schist with sporadic amounts of arsenopyrite that yielded 56 feet averaging 0.28 ounces per ton gold, with most samples exceeding 0.029 ounces per ton gold and one sample assaying 3.37 ounces per ton gold. A grab sample of schist with quartz veins from the Goldberg Saddle area assayed 0.67 ounces per ton gold. Hand trenching at the Shalosky showing exposed quartz-sericite altered rock that averaged 0.114 ounces per ton gold over 54 feet, with strike extents of the zone covered in overburden. Hand trenching at the newly discovered Kokanee Hill showing encountered 0.152 ounces per ton gold in 32 feet of mineralized and altered rock. A soil grid was completed over the Kokanee Hill area and most of the 54 soil samples contained gold values greater than 0.003 ounces per ton. Inmet Mining Corp. also conducted exploration, including drilling, at the AR property within the Delta mineral belt.

Teck signed a joint venture deal with Kennecott Exploration on the Napoleon property in the Fortymile mining district. Teck's exploration program included soil sampling and geophysics in an attempt to further define gold mineralization discovered by Kennecott's 1999 mapping, sampling, and drilling program. Teck also continued a regional exploration program focused in the eastern interior region of Alaska.

Kennecott Exploration Co. conducted a major exploration program in the Uncle Sam area between the Richardson mining district and the Pogo property. Geologic mapping, geochemical sampling, and core drilling subprograms evaluated extensive claim holdings staked and acquired by Kennecott in 1999. Great American Minerals Exploration Inc. was also active in the Uncle Sam area.

Placer Dome Exploration Inc. continued a second year of exploration on Tri-Valley Corp.'s 36-square-mile Buck and Buckeye portions of Tri-Valley's 51-square-mile Richardson project in the Richardson mining district. Placer Dome's exploration program included several core holes. Tri-Valley continued exploration on the retained 14.5-square-mile portion of the claim block in conjunction with Moscow-based TsNIGRI. Tri-Valley identified two new gold-bearing zones and plans to have a reverse-circulation drilling program in 2001.

North Star Exploration Inc. and its subsidiary, Zeus Exploration Inc., were active across most of the eastern interior region. Major projects were conducted near Northway and in the Tofty-Hot Springs placer district. North Star identified a potential mineralized area that measures about 1,200 feet by 4,000 feet immediately north of

the Alaska Highway. The gold-polymetallic mineralized zone was first discovered in road cuts at Northway Junction along the Alaskan Highway. Mineralized rocks are exposed for a distance of over 1,600 feet and soil auger samples and ground magnetic surveys extended the target 2,000–5,000 feet to the northeast. Water wells tested in the area had high concentrations of arsenic and lead. North Star Exploration reported assay results from two of five drill holes testing a large soil and geophysical anomaly at their Northway Project near the Alaska–Yukon border. Selected highlighted assays include 75.6 feet of 0.045 ounces per ton gold, 9.7 feet of 0.435 ounces per ton gold and 24 ounces per ton silver, and 2.8 feet of 1.382 ounces per ton gold and 82 ounces per ton silver.

The Tofty/Manley exploration program was designed to drill-test a northeast-trending aeromagnetic anomaly that parallels the Sullivan bench in the Tofty–Hot Springs placer district, which has accounted for more than 550,000 ounces of historic placer gold production. Earlier research conducted by the U.S. Bureau of Mines indicates that a niobium-bearing carbonatite dike occurs in the area of this aeromagnetic anomaly. North Star's 2000 exploration work included cutting nine trenches with abundant visible gold. An 8-hole program with a total of 2,723 feet of core drilling was completed and one hole may have cut 159 feet of magnetite-rich, possibly niobium-bearing carbonatite. Assay and probe results are in process, but preliminary assays indicate anomalous niobium and rare-earth concentrations associated with magnetite.

Two short holes totaling 631 feet were drilled at Elephant Mountain near Rampart by North Star to test possible northern extensions of intrusive-hosted gold-polymetallic mineralization. Arsenopyrite and silicified granite were present in both holes.

Platinum–Palladium Holdings Inc. began a grassroots program that focused on platinum group elements (PGE). Platinum–Palladium concentrated on the Rampart–Livengood districts of interior Alaska as one of three areas across Alaska with high potential for economic PGE mineralization. Bulk stream sediment sampling (for preparation of heavy mineral concentrates), pan concentrate sampling of streams, and geologic traverses were conducted as part of the 2000 reconnaissance field program. Favorable areas were defined with strongly differentiated, layered gabbroic to ultramafic cumulate rocks, many with trace amounts of pyrrhotite and chalcopyrite. No analytical results have been announced.

Ventures Resource Corp. released drilling results from the Flanders drill target on the Seventymile property near Eagle. Six holes (FD00–1 to FD00–6) were drilled for a total of 3,429 feet. Select highlights include FD00–4 where 3.6 feet of 6.01 ounces per ton gold and FD00–5 where 1.1 feet of 0.48 ounces per ton gold were intersected. No significant results were reported in FD00–1 or FD00–2. Results from drill hole FD00–6 included 16 feet of

0.25 ounces per ton gold, including 3 feet of 0.64 ounces per ton and 2 feet of 0.96 ounces per ton gold. Holes 3, 4, and 6 contained more than one significant intersection, generally ranging from 1 to 4.3 feet grading 0.1 to 0.48 ounces per ton. Mineralization occurs as coarse-grained native gold in a series or swarm of gently north-dipping, quartz–carbonate veins hosted by Triassic metabasalt and greenstone. Ventures plans to drill 15,000 feet in 2001 at the Flanders property.

Ventures Resource Corp. announced the staking of gold targets in 13 claim blocks (30,000 acres) on public land adjacent to the company's 980,000-acre Veta property in the Fortymile mining district. The claim blocks are on clusters of gold anomalies in the eastern 15 miles of a zone 40 miles across and include the Taz Creek, Willow Creek, Fortyfive Pup, and Gold Creek areas. The gold targets are defined by strongly anomalous panned concentrate sample values from 100 to 10,000 parts per billion gold and stream silt–sand sample values from 30 to over 2,000 parts per billion gold.

Ventures Resource Corp. also announced drill results from its 2000 exploration program at Lead Creek, on its Champion property. Results from four drill holes include a 31.5 foot section grading 23.3 ounces per ton silver, 6.4 percent lead and 0.5 percent zinc in hole LC–14. In drillhole LC–13, 590 feet to the northwest, a 6.3-foot oxidized and leached interval intersected with 5.6 ounces per ton silver. Mineralization is hosted in a silicified limestone breccia unit with local skarn development and mineralization is open in all directions. Ventures plans to drill 5,000 feet at Lead Creek during 2001.

Newmont Alaska Ltd. continued work in the Circle mining district on the Gold Dust property optioned from Great Quest Metals Ltd. Newmont drilled two diamond drill holes totaling 827 feet in 2000 to test a coincident gold–arsenic soil anomaly in the northeastern corner of the property, but did not drill the previously identified Central Zone. Both holes intersected anomalous gold. Newmont dropped its option on the property at the end of the field season. On-Line Exploration Services Inc. also conducted an exploration program in the Circle mining district on the IC property at the headwaters of Independence Creek.

Usibelli Coal Mine Inc. was the successful bidder for 12,400 acres of state coal leases known as the Jumbo Dome leases. The lease area is adjacent to the company's existing leases and acquisition of the leases is expected to expand the company's existing coal reserves. Coal in the Jumbo Dome area has low sulfur, low nitrogen, and high calcium contents, which are desirable environmental attributes.

A number of placer miners reported minor exploration expenditures from across the region. Placer mining has been especially hard hit by low gold prices and placer exploration is a very minor percentage of overall exploration expenditures.

### Southcentral Region

MAN Resources Inc. and Nevada Star Resource Corp. continued evaluation of an 80,000-acre property in the Alaska Range for platinum-group-element (PGE) potential. Over 1,700 surface samples were collected in 2000. Geologic mapping has outlined the Fish Lake ultramafic body, occurring over a 27-mile by 1.2-mile area, as the largest ultramafic intrusion in the Cordillera. Another ultramafic body, Tangle, was discovered to the south of the Fish Lake body. Overall, five mafic-ultramafic intrusions are present in the central Alaska Range and litho-geochemical studies suggest that the intrusions are comagmatic with the Nikolai flood basalts. A drilling program on selected targets is planned for 2001.

Shear Minerals Ltd., in partnership with Shulin Lake Mining Inc., conducted an extensive exploration program for diamond-bearing kimberlitic/lamproitic intrusions and base and the precious-metal potential at the Shulin Lake property approximately 25 miles southwest of Talkeetna. Geologic units in the area are Tertiary sandstone, siltstone, and coalbeds overlain by thin, glacially-derived gravel/till. APEX Geoscience Ltd. and On-Line Exploration Services Inc. conducted a prospecting, geological mapping, and sampling program. Over 100 till, rock, stream-sediment, and heavy mineral pan concentrate samples were collected; gold occurred in both gravel and bedrock samples. Samples analyzed by Saskatchewan Research Council contain potential diamond indicator minerals including magnesium-rich olivine, pyrope garnet (one definite), chrome diopside, chromite (possible picroilmenite), and eclogitic garnet. Diamond-inclusion chemistry on chromite grains suggests a 'mantle-derived' signature. The property contains a large 2–3-mile-diameter circular positive magnetic anomaly that is interpreted to be a high-level intrusion. Review of geophysical data shows a number (in excess of 20) of high-frequency anomalies that may be shallowly emplaced kimberlite, lamproite, or other alkaline ultramafic intrusions. A large basement magnetic-high anomaly centered over the property is coincident with drainage patterns as well as possibly the localization of four smaller lakes. Several samples with anomalous diamond indicator minerals have been identified near several interesting high-frequency shallow magnetic targets. Shear plans to drill-test selected high-priority targets in early 2001.

International Freegold Mineral Development Inc. (Freegold) staked 5,600 acres and acquired an additional 36 square miles through an option agreement with Ahntna Minerals Inc. in the Tonsina area. Fieldwork focused on defining the extent of PGE mineralization. The best sample from the property assayed 0.62 ounces per ton combined platinum-palladium.

Latitude Minerals Corp. conducted a preliminary helicopter reconnaissance program on the Tonsina Platinum-Palladium property. Latitude was granted the

right to acquire a 90 percent interest from WGM for 16 prospecting sites and 46 state claims totaling 4,400 acres within nine miles of the Richardson Highway and about 50 miles northeast of Valdez. The property covers a large layered mafic-ultramafic complex, which has dunite at the base grading upward through pyroxenite, websterite, gabbro, and norite. Layered chromite bands occur throughout the layered dunite and pyroxenite series and some of these layers are enriched with respect to PGE. Geological and geophysical evidence indicates that the total strike length of the complex is in excess of 10 miles. Preliminary surface samples from Dust Mountain contain assays up to 0.347 ounces per ton palladium and 0.260 ounces per ton platinum. Preliminary samples collected from Sheep Mountain contained up to 0.043 ounces per ton combined platinum-palladium.

### Southeastern Region

Kennecott Minerals, the operator of the Greens Creek polymetallic mine, conducted exploration drilling on 7,500 acres of land at the northern end of Admiralty Island acquired in an agreement with the U.S. government. Most of the drilling was performed at Cub Creek, Killer Creek, Lower Zinc Creek, and the northeastern tip of the island.

Santoy Resources Ltd. acquired the Salt Chuck property on Prince of Wales Island from Stealth Ventures Inc. and conducted a surface and underground sampling program for platinum-group and base metals. The Salt Chuck mafic-ultramafic complex forms an elongated, concentrically zoned, northwest-trending body approximately 4.4 miles long and 1 mile wide. All known mineralization occurs along contacts between plug-like bodies of pyroxenite intruding gabbro. Ninety-six samples were collected from the underground workings of the historic Salt Chuck Mine, with a sample width of 5 feet. Weighted average grade of all underground sampling in the 494 feet of workings on the 300 level was 0.53 percent copper, 0.059 ounces per ton palladium, and 0.019 ounces per ton gold. Palladium values are significant even in areas with extremely low copper values. According to new interpretations, no surface sampling or mapping has been conducted where the underground mineralization projects to the surface. A total of 686 soil samples were taken at a 164-foot spacing along grid lines spaced 328 feet apart in the North Pole Hill area. Geological mapping and a ground magnetometer survey totaling 15 line miles were also undertaken in the same area. The north flank of North Pole Hill represents a 4,200-foot long target in which extensive copper and palladium soil anomalies are underlain by favorable geology and coincident positive magnetic response. The eastern portion of this target is also underlain by a strong IP chargeability anomaly. One known prospect, Geoff Showing, occurs within the eastern North Pole Hill area and sample values of 1.1 percent copper and 0.006 ounces

per ton palladium were reported. A grab sample from a small dump next to a previously unknown adit returned values of 2.67 percent copper, 0.018 ounces per ton palladium, 0.071 ounces per ton gold and 0.409 ounces per ton silver.

International Freegold Mineral Development Inc. (Freegold) worked on its 100-percent-owned Union Bay platinum-group-element (PGE) property in southeastern Alaska during September and October. The Union Bay complex is one of several zoned Ural-Alaska type mafic-ultramafic complexes in southeastern Alaska and it ranges from a dunite core through wehrlite and magnetite-bearing olivine clinopyroxenite to hornblendite and gabbro on the margins. Previous work done on the property indicated the presence of anomalous chromite in dunite and the presence of up to 0.57 ounces per ton platinum and 0.143 ounces per ton gold in pan concentrates from streams draining the north side of the property. Broad-scale reconnaissance mapping and sampling identified three areas of the property where potential PGM-enriched mineralization was detected. Rock samples from these areas returned values ranging up to 0.54 ounces per ton platinum plus palladium from outcrops on the property. Three contiguous 5-foot chip samples returned 0.098, 0.176, and 0.505 ounces per ton combined platinum and palladium. Of the 212 rock samples collected during 2000, 38 returned assays greater than 100 parts per billion platinum and palladium and 17 of these samples returned platinum plus palladium values greater than 1,000 parts per billion. Twelve samples containing anomalous platinum plus palladium values were reanalyzed and contain anomalous chromium (up to 15,492 parts per million) and nickel (up to 675 parts per million), with variable but generally low copper (up to 52 parts per million) values and these samples also contain up to 233 parts per billion iridium, 700 parts per billion osmium and 170 parts per billion rhodium. Gold values were uniformly low (less than 30 parts per billion). Anomalous PGE mineralization is associated with magnetite and/or chromite-bearing pyroxenite and olivine pyroxenite units in at least three areas of the property. Following initial sample results, Freegold increased its holdings in the area to over 2,500 acres.

Red Diamond Mining Co. examined the CJ property on Prince of Wales Island for sediment-hosted, structurally controlled gold vein system potential; the Mammoth property, about one mile northwest of Kennecott's Greens Creek Mine, for volcanogenic massive sulfide mineralization potential; and the Big Ledge property, on western side of Chatham Strait approximately 20 miles southwest of the Greens Creek Mine, for mafic dike-hosted nickel-copper-PGE mineralization. Red Diamond has a 100 percent operating interest on all three properties. Recent sampling results from the Big Ledge property include nickel values

exceeding 7 percent and copper values exceeding 4 percent, with elevated silver values and palladium values over 1 part per million. Continuous chip sampling across a 40-foot-thick mafic dike with stringers, clots, and disseminated pyrrhotite, pentlandite, chalcopyrite, and pyrite yielded a weighted average of 0.84 percent nickel and 0.91 percent copper.

## DEVELOPMENT

Development expenditures in 2000 are estimated to be \$137.1 million, in large part due to activity at Red Dog, Greens Creek, Fort Knox, Pogo, and Kensington. The 405 percent increase from the \$33.8 million invested in development in 1999 more than compensates for the decline in exploration expenditures.

Cominco invested about \$100 million in 2000 for the Mill Optimization Project (MOP) that included \$44 million for a NANA/VECO joint venture to construct two modules in Anchorage. The larger module for concentrate flotation weighed 3,000 tons, and the smaller powerhouse module weighed 1,000 tons. These were barged to the port near Kivalina, then transported 52 miles to the mine by special Scheuerle module-carriers contracted from the Prudhoe Bay oilfield. When complete, the MOP will increase mill throughput by about 8 percent. This follows completion of the Production Rate Increase (PRI) in 1998, which increased throughput from about 2.53 million tons in 1996 to 3.3 million tons in 1999. Further details about the Red Dog Mine are available in the May 1998 issue of *Engineering & Mining Journal*.

Fairbanks Gold Mining Inc. (FGMI), a subsidiary of Kinross Gold Corp., continued optimization of the Fort Knox gold mine 25 miles northeast of Fairbanks. Development in the immediate vicinity of the mine included raising the tailing dam and in-pit drilling. Drilling, both reverse-circulation and core, continued at the Ryan Lode near Ester, and at the True North mine about 8 miles northwest of Fort Knox. FGMI is preparing to mine the True North deposit and truck about 10,000 tons per day of the 0.063-ounce-per-ton oxide ore to the existing mill to blend with about 30,000 tons of the 0.025-ounce-per-ton material from the existing pit.

Public meetings and permitting for the True North Mine began in the early spring and continued through much of the year. The State Department of Natural Resources issued a permit on December 20, authorizing construction to begin on January 20, 2001. The True North deposit is expected to provide 100 jobs with a \$5.4 million payroll and have a \$25 million positive annual economic impact to the Fairbanks North Star Borough.

Activity by Teck Corp. at the Teck-Sumitomo Pogo mine site northeast of Delta Junction included completion

of the incline and drive into the Liese 1 zone, the uppermost of the two stacked gold-bearing zones that are presently proposed for mining. Underground drilling provided for better definition of the Liese 1 and 2 zones, and also explored the deeper L3 zone. Teck also completed pilot-scale metallurgical testing on a 50-ton ore sample. Concurrent with the physical development, Teck also continued baseline environmental studies, public information meetings, and agency reviews required for permitting. A Draft Scoping Document for the Pogo Mine Project Environmental Impact Statement was submitted in August, and the permitting process is expected to continue through 2001. The U.S. Environmental Protection Agency is the lead permitting agency, in cooperation with the Alaska Department of Natural Resources. Teck is proposing an underground mine that would initially produce 2,500 tons per day and 375,000 ounces of gold annually, with a ramp-up to 3,500 tons per day producing 500,000 ounces of gold annually. Construction would take two to three years after receiving permits, would require up to 500 workers, and would require an estimated capital investment between \$200 million and \$300 million. The mine would have an assumed operating life of 12 years based on current reserves.

Usibelli Coal Mine Inc. continued planning to move its operations from the Poker Flats pit across Hoseanna Creek to the Two Bull Ridge area. The Two Bull Ridge area includes more than 2,500 acres of permitted land for mining that is expected to produce two million tons of coal per year over a 20-year mine life. The coal seams at Two Bull Ridge are relatively flat-lying and consist of the 24-foot-thick 3 seam, the 38-foot-thick 4 seam, and the 21-foot-thick 6 seam. The 3 coal seams have been defined by over 60,000 feet of drilling in over 300 holes to date. Usibelli is looking at reopening mining in the Rosalie Mine area near the townsite of Usibelli, with 6 million tons of coal reserves, and was also involved in acquiring leases near Jumbo Dome for future operations.

About 9,900 feet of development declines and inclines were created at the Greens Creek Mine in 2000, and 82,300 feet of development drilling was completed. Greens Creek is about 20 miles west of Juneau,

At Coeur Alaska's Kensington gold mine about 50 miles north of Juneau, development activity consisted of investigation of alternative methods of tailings management, including on-land tailings disposal, and agency discussions related to those options.

Kvaerner Environmental completed the closeout of the historic Alaska-Juneau Mine near downtown Juneau in July 2000, finalizing an effort that began in July 1997. The company was awarded the Governor's Award for mine reclamation.

## PRODUCTION

The total value of production in Alaska in 2000 is estimated to be about \$1,080.7 million, of which about \$979 million was for metals, \$62 million was for industrial materials, and \$39 million was for coal and peat (table 3). As usual, zinc (\$683 million) was the most valuable commodity, followed by gold (\$152 million), silver (\$90 million), lead (\$52 million), and copper (\$2 million).

Production at Cominco's Red Dog Mine increased to 585,030 short dry tons of contained zinc, 91,557 short dry tons of lead, and an estimated 5.843 million ounces of contained silver. The average head grade of the 3,365,508 short dry tons milled was 21.0 percent zinc, 4.7 percent lead, and 2.48 ounces per ton silver. The estimated silver production assumes 70 percent recovery, as in 1997, the last year that silver recovery was reported.

Production of sand and gravel was boosted by British Petroleum's (BP) construction of the Northstar gravel island in the Beaufort Sea, but construction in the several villages of northwestern Alaska was also robust.

Mining resumed at the Illinois Creek hardrock open-pit gold-silver mine in July when American Reclamation Group LLC began a program of "mining-to-reclaim" under an agreement with the State of Alaska. Production during 2000 was from 357,000 tons of ore placed on the leach pad; 600,000 tons of waste was utilized as backfill in the Central Pit. Reclamation of the camp area was initiated, and several tons of excess chemicals were removed from the mine site.

Fort Knox Mine, about 25 miles northeast of Fairbanks, was the largest operating gold mine, mining 35.6 million tons, and milling 15 million tons of ore to produce 362,959 ounces of gold. The gold is hosted in veins within a 93-million-year-old multi-phase granitic intrusion. Fairbanks Gold Mining Inc., the operating arm of Kinross Gold Corp., plans to supplement the ore from the open pit with ore from satellite deposits such as True North about 8 miles northwest of the mill, and the Gil properties about 8 miles to the northeast.

Proven and probable reserves at Fort Knox at the end of 2000 were 138.4 million tons containing 3.686 million ounces of gold. Measured and indicated resources were 34.45 million tons containing 963,000 ounces.

The Usibelli Coal Mine at Healy produced 1,473,355 million tons of coal, of which 708,000 tons were exported to Korea on the Alaska Railroad through the port of Seward.

Greens Creek Mine, 20 miles west of Juneau, milled a record 619,438 tons of ore to produce concentrates containing 84,082 tons of zinc, 31,677 tons of lead, 12,424,093 ounces of silver and 128,709 ounces of gold. The mine is 70.27 percent owned by Kennecott Minerals Co. and 29.73 percent by Hecla Mining Co.

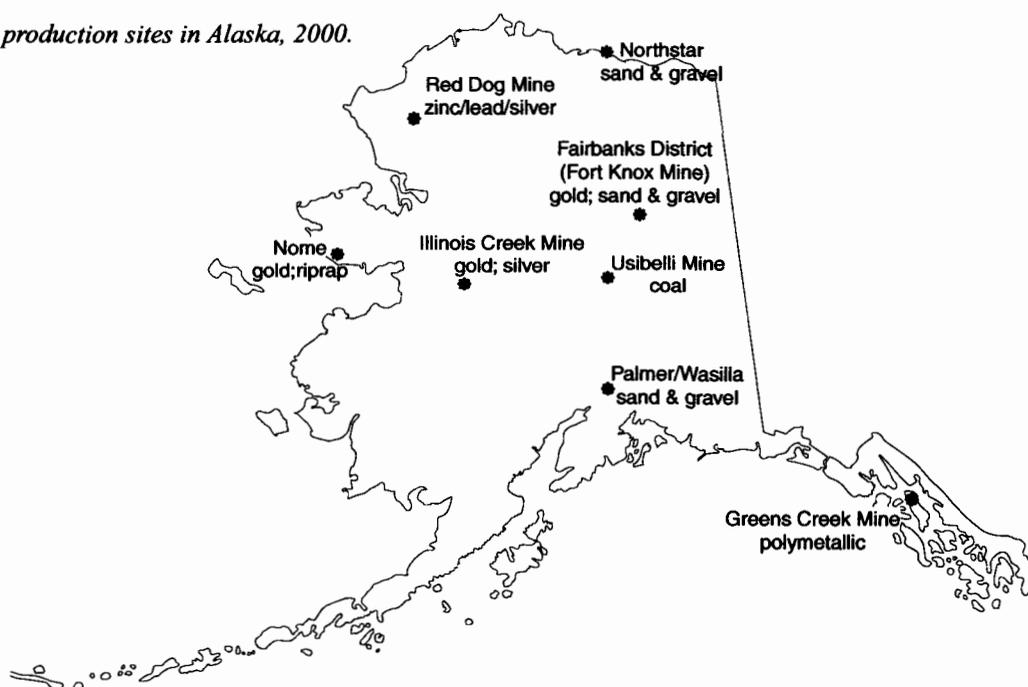
Table 3. Estimated mineral production in Alaska, 1998–2000<sup>a</sup>

	Quantity			Estimated values <sup>b</sup>		
	1998	1999	2000	1998	1999	2000
<b>Metals</b>						
Gold (ounces)	594,191	517,890 <sup>c</sup>	546,000	\$174,621,000	\$144,262,000	\$152,389,000
Silver (ounces)	14,856,000	16,467,000	18,226,615	82,154,000	85,628,000	90,404,000
Copper (tons)	1,900	2,100	1,400	2,850,000	2,982,000	2,296,000
Lead (tons)	102,887	125,208	123,224	49,386,000	57,596,000	51,754,000
Zinc (tons)	549,348	643,642	669,112	505,400,000	630,769,000	682,494,000
<b>Subtotal</b>				<b>\$814,411,000</b>	<b>\$921,237,000</b>	<b>\$979,337,000</b>
<b>Industrial minerals</b>						
Jade and soapstone (tons)	2.0	2.0	2.0	\$ 25,000	\$ 25,000	\$25,000
Sand and gravel (million tons)	12.40	10.6	11.0	57,280,000	52,418,000	50,820,000
Rock (million tons)	1.64	2.34	1.5	14,041,000	18,010,000	11,550,000
<b>Subtotal</b>				<b>\$ 71,346,000</b>	<b>\$ 70,453,000</b>	<b>\$62,395,000</b>
<b>Energy minerals</b>						
Coal (tons)	1,339,000	1,560,000	1,473,000	\$ 35,233,000	\$ 41,048,000	\$38,768,000
Peat (cubic yards)	38,000	38,000	40,000	190,000	165,000	174,000
<b>Subtotal</b>				<b>\$ 35,423,000</b>	<b>\$ 41,213,000</b>	<b>\$38,942,000</b>
<b>TOTAL</b>				<b>\$921,180,000</b>	<b>\$1,032,903,000</b>	<b>\$1,080,674,000</b>

<sup>a</sup>Production data from DGGs questionnaires, phone interviews with mine and quarry operators, Alaska Department of Transportation and Public Facilities, and federal land management agencies.

<sup>b</sup>Values for selected metal production based on average prices for each year; for 2000—gold (\$279.10/ounce) unless other value provided by operator; silver (\$4.96/ounce); copper (\$0.82/lb); zinc (\$0.51/lb); lead (\$0.21/lb). All other values provided by mine operators. Values rounded to nearest \$1,000.

Selected significant production sites in Alaska, 2000.



## DRILLING

Preliminary drilling values are 416,017 feet of core drilling and 143,118 feet of reverse-circulation drilling. These values compare to 1999 values of 369,863 feet of core drilling and 78,934 feet of reverse-circulation drilling. Tables 4 and 5 summarize the drilling activity in the state during 2000 by region and type of drilling.

Table 4. *Drilling footage by region in Alaska, 2000*

Type of drilling	Northern	Western	Eastern interior	South-central	South-western	South-eastern	TOTAL
Placer subtotal	--	--	15,480	--	--	--	15,480
Coal subtotal	--	--	--	--	--	--	--
Hardrock core	102,600	5,509	174,438	--	4,594	128,876	416,017 <sup>a</sup>
Hardrock rotary	--	15,000	112,638	--	--	--	127,638
<b>Hardrock subtotal</b>	<b>102,600</b>	<b>20,509</b>	<b>287,076</b>	<b>--</b>	<b>4,594</b>	<b>128,876</b>	<b>543,655</b>
<b>TOTAL (feet)</b>	<b>102,600</b>	<b>20,509</b>	<b>302,556</b>	<b>--</b>	<b>4,594</b>	<b>128,876</b>	<b>559,135</b>

-- = Not reported.

<sup>a</sup>112,400 feet of core drilling was underground.

Note: Blasthole drilling not reported.

Table 5. *Drilling footage reported in Alaska, 1982–2000*

Year	Placer Exploration	Placer Thawing	TOTAL PLACER	TOTAL COAL	TOTAL HARDROCK	Hardrock Core <sup>a</sup>	Hardrock Rotary <sup>a</sup>	TOTAL FEET
1982	30,000	94,000	124,000	80,000	200,000	--	--	404,000
1983	23,000	30,000	53,000	12,000	180,500	--	--	245,500
1984	31,000	98,000	129,000	25,700	176,000	--	--	330,700
1985	46,000	34,000	80,000	8,700	131,700	--	--	220,400
1986	32,400	227,000	259,400	28,800	50,200	--	--	338,400
1987	50,250	130,000	180,250	19,900	115,100	95,600	19,500	315,250
1988	152,000	300,000	452,000	26,150	353,860	223,630	130,230	832,010
1989	97,250	210,000	307,250	38,670	332,230	242,440	89,790	678,150
1990	78,930	105,000	183,930	18,195	760,955	648,600	112,355	963,080
1991	51,247	130,000	181,247	16,894	316,655	205,805	110,850	514,796
1992	6,740	65,000	71,740	12,875	359,834	211,812	148,022	444,449
1993	25,216	--	25,216	--	252,315	124,325	127,990	277,531
1994	21,000	--	21,000	8,168	438,710	347,018	91,692	467,878
1995	27,570	--	27,570	--	415,485	363,690	51,795	443,055
1996	61,780	--	61,780	8,500	658,857	524,330	134,527	729,137
1997	38,980	--	38,980	13,998	704,510	523,676	180,834	757,488
1998	33,250	--	33,250	2,300	549,618	505,408	45,670	585,168
1999	6,727	--	6,727	--	448,797	369,863 <sup>b</sup>	78,934	455,524
2000	15,480	--	15,480	--	--	416,017 <sup>c</sup>	127,638	559,135

<sup>a</sup>Core and rotary drilling not differentiated prior to 1987.

<sup>b</sup>108,022 feet of core drilling was underground.

<sup>c</sup>112,400 feet of core drilling was underground.

-- = Not reported.

Note: Blasthole drilling not reported. Approximately 4,920,000 feet in 1999. Auger or rotary drilling footages for sand and gravel not included in totals.

## GOVERNMENT AFFAIRS

Significant changes were made to the statutes governing location and recording of state mining claims and prospecting sites in 2000, effective August 31. The allowable time between location in the field and recording at the Recorder's Office was reduced from 90 days to 45. Mining claim law was expanded to include the option of filing a 160-acre claim. Rental costs for the larger claims are four times those for the standard 40-acre claim, but the costs of staking, recording, and management are reduced for the larger claim.

For the first time in eight years there was no mineral-related airborne geophysical survey by the Division of Geological & Geophysical Surveys (DGGS) in 2000, but crews were field checking the 1998 Fortymile and 1999 Pogo area surveys. The Division of Mining, Land & Water continued its joint-venture work with the U.S. Geological Survey in the Pogo area. The U.S. Bureau of Land Management, assisted by DGGS, released the results of its April airborne geophysical survey of the Aniak district, which includes the 11.5-million-ounce Donlin Creek gold prospect, in September.

Payments of taxes to municipalities increased 4.5 percent from \$8.8 million in 1999 to \$9.2 million in 2000.

In 1999 the State Division of Geological & Geophysical Surveys (DGGS) contracted for an airborne geophysical survey of about 1,070 square miles northwest of the Pogo deposit. Results of the Salcha River-Pogo (SRP) geophysical survey were released in early 2000. DGGS geologists spent three weeks conducting geologic ground-truthing, including geologic mapping and geochemical sampling, in the SRP area.

A team of DGGS geologists continued geologic investigations in the Fortymile area within the area of a 1998 airborne geophysical survey. Geological mapping was completed in the Eagle A-2 quadrangle and geochemical results from the 2000 season's work were released. A new geologic map of the Eagle A-2 quadrangle will be released by DGGS in June 2001.

The State Division of Mining, Land & Water Management, working with the U.S. Geological Survey, continued studies of the natural water quality in the Goodpaster River drainage.

The Alaska Department of Natural Resources presented reclamation awards in 2000 to Kvaerner Environmental,

Fairbanks Gold Mining Inc., and the Alaska Department of Fish & Game's Northern Habitat Division for outstanding reclamation projects. Kvaerner fulfilled all abandonment responsibilities incurred by Echo Bay Alaska's lease of the Alaska-Juneau Gold Mine from 1985 to 1997. Kvaerner operated the closeout phase of the project from 1997 to 2000 and completed all legal and regulatory requirements along with various contractual obligations. Kvaerner obtained an EPA NPDES permit to legally discharge over 180 million gallons of water, removed and remedied various historic oils and greases, completed a cement stabilization program of historic mine septic tank sludge, and prepared and executed a detailed mine closure plan. Kvaerner was able to bring a highly contentious and emotionally charged project to successful completion within a reasonable timeframe by using creative solutions and working with citizens of the city and borough of Juneau.

Fairbanks Gold Mine Inc. established a wetlands complex as part of the reclamation plan for the Fort Knox Mine in the area of Fish Creek between the tailings dam and the freshwater reservoir. The wetlands construction goes significantly beyond legal requirements and exponentially increased the Arctic grayling and burbot population in the channel and pond complex. The Alaska Department of Fish & Game's Northern Habitat Division worked as a partner with Fairbanks Gold Mine Inc. and was recognized for the quality of their technical advice and the ability of the staff to transcend their role as a regulatory agency to become a partner in the construction of the wetlands complex.

The Alaska Department of Transportation & Public Facilities began a \$2 million regional transportation study of northwestern Alaska that covers an area from St. Michaels, near the mouth of the Yukon River, to the North Slope. The study is an important step towards securing federal and state funds for public infrastructure in this area that includes mineral deposits on the Seward Peninsula, the western Arctic coalfield, the Noatak (Red Dog) mining district and the Ambler Mineral Belt. All options for transportation are being considered, including a freight railroad that could connect to interior Alaska or the western coast near the Red Dog port or on Norton Sound on the south side of the Seward Peninsula.



**DEPARTMENT OF NATURAL RESOURCES**  
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**DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT**  
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