ALASKA'S Mineral Industry 1996: A Summary

by R.C. Swainbank, T.K. Bundtzen, A.H. Clough, and M.W. Henning

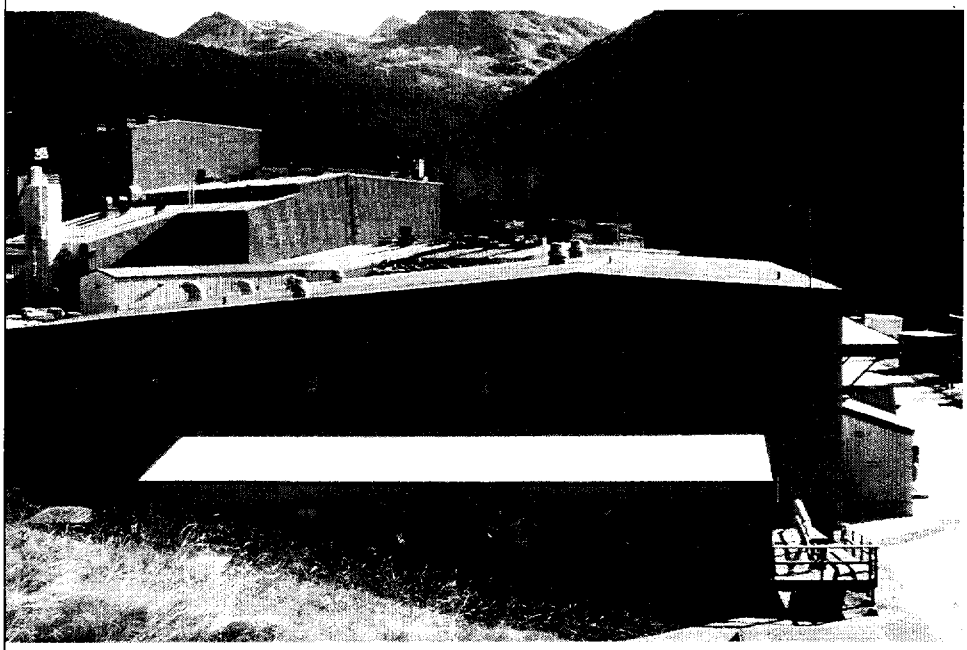

Photo of mill and mine infrastructure at Kennecott Greens Creek Mining Company silver-polymetallic mine on northern Admiralty Island. The mine reopened in July 1996 and is expected to be one of the nation's largest producers of silver and zinc. Photo by T.K. Bundtzen

***PRODUCTION**—In 1996, the value of production from Alaska's mineral industry increased 9 percent from 1995 levels to $591.0 million. Red Dog lead-zinc-silver mine continued to be the world's largest producer of zinc. Nixon Fork mine became the state's number one gold producer. Production began at the Fort Knox gold deposit near Fairbanks and resumed at the Greens Creek polymetallic mine near Juneau.*

***DEVELOPMENT**—Expenditures reached a record $393.8 million in 1996, up from $148.6 million in 1995. Development work at the Red Dog, Illinois Creek, Fort Knox, and Greens Creek mines accounted for over 90 percent of the total.*

***EXPLORATION**—Grass-roots exploration increased from $34.3 million in 1995 to $44.5 million in 1996, a 30 percent increase. The largest increases in activity took place in the Eastern Interior and Southwestern regions.*

***EMPLOYMENT**—Mineral activities supplied about 3,760 full-time jobs in 1996, up 10 percent from 1995 levels.*

***GOVERNMENT ACTIONS**—State Department of Environmental Conservation Commissioner Michelle Brown announced an agreement with the U.S. Environmental Protection Agency to allow the state to certify general NPDES permits for placer mines. Alaska Gold Company received a state award for outstanding reclamation of mined lands.*

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by R.C. Swainbank,[1] T.K. Bundtzen,[2] A.H. Clough,[3] and M.W. Henning[4]

INTRODUCTION

This preliminary summary of Alaska's mineral industry for 1996 is made possible by information provided on mineral questionnaires returned to the Division of Geological & Geophysical Surveys. The final report will be available later in the year when all questionnaires are returned. As in past years this is a cooperative venture between the Division of Geological & Geophysical Surveys (DGGS) and the Division of Mining & Water Management (DMWM) in the Department of Natural Resources (DNR) and the Division of Trade & Development (DTD) in the Department of Commerce & Economic Development (DCED).

The year 1996 saw increases in all three mine-related activity categories: exploration increased 30 percent over the 1995 value to $44.5 million, development was up 165 percent to $393.8 million, and production increased 10 percent to $591 million. For the first time the cumulative value of the Alaska mineral industry, as measured by the sum of exploration and development expenditures and the value of production, exceeded $1 billion (table 1).

Promising Alaska exploration and development projects include the Kensington gold mine near Juneau, the True North gold property near Fairbanks, the Donlin Creek gold prospect near Flat, the Pogo gold prospect near Delta Junction, and the Calder limestone and the Niblack polymetallic projects on Prince of Wales Island.

EMPLOYMENT

The Alaska mineral industry provided an estimated 3,760 full-time equivalent jobs in 1996, an increase of 355 or 10 percent from the 3,405 Alaskan mine-related jobs in 1995 (table 2). Most of the job increase is attributed to: (1) new hardrock mine employment at the Greens Creek polymetallic mine near Juneau and the Nixon Fork gold-copper mine near McGrath; (2) mineral development projects at the Red Dog lead-zinc-silver mine near Kotzebue, the Illinois Creek gold project near Galena, and the Fort Knox gold project near Fairbanks; and (3) new exploration jobs statewide. Contrasting the increases in hardrock mineral-related job opportunities was a decrease in employment at placer gold mines.

PRODUCTION

The value of 1996 Alaska mineral production is estimated at $591.0 million, an increase of $53.8 million or nearly 10 percent above the 1995 value (table 3). Metals again dominated mineral production and accounted for 84 percent of total 1996 Alaska mineral industry value. Overall value for metallic products climbed from $442.7 million in 1995 to $494.8 million in 1996, a 12 percent increase. About 390 tons (354 tonnes) of copper was reported as a byproduct in two new hardrock mines—the first copper credited from Alaskan mines in nearly four decades.

The value of industrial and energy minerals output totaled $96.3 million, about the same level as the previous year.

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	44.5	393.8	591.0	**1,029.3**
TOTAL	**$578.6**	**$1,402.3**	**$5,678.2**	**$7,659.1**

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

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[2]Alaska Division of Geological & Geophysical Surveys, 794 University Ave., Suite 200, Fairbanks, Alaska 99709-3645.
[3]Alaska Division of Trade and Development, 9th Floor, State Office Bldg., Juneau, Alaska 99811.
[4]Alaska Division of Mining & Water Management, 3601 C Street, Suite 800, Anchorage, Alaska 99503.

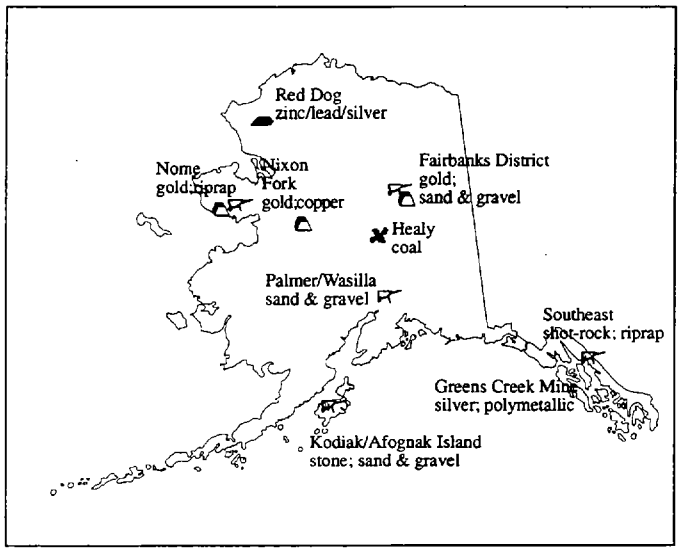
Metals

During 1996 Cominco Alaska Inc. mined 2,312,600 tons (2,098,000 tonnes) of lead-zinc-silver ore at the Red Dog open-pit mine north of Kotzebue in the northern region. Cominco shipped 646,800 tons (586,700 tonnes) of zinc concentrate, and 118,500 tons (107,500 tonnes) of lead concentrate from the port site near Kivalina to Canadian, Circum-Pacific, and European smelters. Red Dog remained the world's largest zinc producer and accounted for approximately 7 percent of the world's mine-produced zinc. Improved performance of the mill resulted in a 2 percent increase in concentrate output from 1995 to 1996 even though the amount of ore processed during the same time period decreased by 7 percent (table 4).

Approximately 80 percent of the 417 employees on the Red Dog payroll are Alaskan residents; about 50 percent are shareholders of NANA Corp., the owner of the deposit.

Kennecott Greens Creek Mining Co. reopened the Greens Creek polymetallic mine on Admiralty Island near Juneau in July 1996, nearly six months ahead of schedule. The underground mine had operated from 1989 to the first quarter of 1993, but closed down due to low metal prices. From July 1996 to the end of December, Kennecott mined 135,000 tons (122,470 tonnes) of ore and produced approximately 43,000 tons (39,010 tonnes) of concentrates that contained (payable) 2,476,000 ounces (77,004 kilograms) silver, 7,480 ounces (233 kilograms) gold, 9,100 tons (8,255 tonnes) zinc, 4,200 tons (3,810 tonnes) lead and 213.2 tons (193.4 tonnes) copper.

About 265 people worked at Greens Creek Mine during the 1996 mine production phase. The Kennecott employee base includes underground miners, mill employees, geologists, mining and environmental engineers, and management and transportation infrastructure staff. Greens Creek Mine is expected to annually produce 62,000 ounces (1,928 kilograms) gold, 11 million ounces (342,139 kilograms) silver, 40,000 tons (36,290 tonnes) zinc, 20,000 tons (18,144 tonnes) lead, and byproduct copper when



Selected significant mine production sites in Alaska, 1996.

Table 2. *Estimated Alaska mine employment, 1990–96*[a]

	1990	1991	1992	1993	1994	1995	1996
Gold/silver/mining							
Placer	1,151	1,240	1,251	1,205	1,150	975	825
Lode	N/A	N/A	N/A	N/A	--	38	138
Polymetallic	265[b]	35[b]	240[b]	26	--	--	68
Base metals	350	331	349	376	311	397	407
Recreational	315	320	325	270	280	255	260
Sand & gravel	645	685	640	580	640	577	570
Building stone	160	165	145	205	210	200	200
Coal	115	115	115	109	115	120	115
Peat	N/A	45	40	49	55	30	38
Tin, jade, soap-stone, ceramics, platinum	40	25	20	20	25	20	20
Mineral development	95	133	164	132	115	637	862
Mineral exploration	374	268	137	164	182	157	257
TOTAL	**3,510**	**3,362**	**3,426**	**3,136**	**3,083**	**3,406**	**3,760**

[a]Calculated on a 260-day work year.
[b]Revised estimate based on new company data.
N/A = Not available.
-- Not reported.

in full production, which will make it one of the largest silver mines in North America.

Based on information supplied in DGGS questionnaires, Alaska Placer Mining Application (APMA) submittals, and phone surveys, an estimated 144 placer and three lode mines produced 161,565 ounces (5,024 kilograms) gold worth $61.0 million in 1996, an increase of 14 percent in quantity and 13 percent in value from 1995 levels. Broken down, 62,065 ounces (1,930 kilograms) gold or 38 percent was derived from

Table 3. *Estimated mineral production in Alaska, 1994–96*[a]

	Quantity			Estimated values[b]		
Metals	**1994**	**1995**	**1996**	**1994**	**1995**	**1996**
Gold (ounces)	182,100	141,882	161,565	$ 70,290,600	$ 56,043,390	$ 60,967,980
(kilograms)	5,663	4,410	5,024			
Silver (ounces)	1,968,000	1,225,730	3,676,000	10,391,040	6,655,714	19,078,440
(kilograms)	61,205	38,120	114,324			
Platinum (ounces)	5	1	NR	2,065	430	NR
(grams)	158	31	NR			
Copper (tons)	NR	NR	390	NR	NR	803,400
(tonnes)	NR	NR	354			
Lead (tons)	36,447	58,530	70,086	25,512,900	34,428,600	52,284,000
(tonnes)	33,065	53,098	63,582			
Zinc (tons)	329,003	359,950	366,780	296,102,700	345,552,000	361,646,000
(tonnes)	298,472	326,547	332,743			
Tin (pounds)	W	W	NR	W	W	NR
(kilograms)	W	W	NR			
Subtotal				**$402,229,305**	**$442,680,134**	**$494,779,820**
Industrial minerals						
Jade and soapstone (tons)	2.3	2.0	2.0	$ 20,000	$ 25,000	$ 25,000
(tonnes)	2.1	1.8	1.8			
Sand and gravel (million tons)	13.5	9.8	10.0	40,950,651	30,886,821	33,650,000
(million tonnes)	12.3	8.9	9.2			
Building stone (million tons)	3.8	2.8	3.0	27,038,008	22,163,703	24,400,000
(million tonnes)	3.5	2.6	2.7			
Subtotal				**$ 68,008,659**	**$ 53,075,524**	**$ 58,075,000**
Energy minerals						
Coal (tons)	1,490,000	1,670,000[c]	1,481,000	$ 36,750,000	$ 41,300,000	$ 38,000,000
(tonnes)	1,351,730	1,487,808	1,343,563			
Peat (cubic yards)	87,900	35,000	38,000	439,500	157,500	175,000
(cubic meters)	67,208	26,761	29,055			
Subtotal				**$ 37,189,500**	**$ 41,457,500**	**$ 38,175,000**
TOTAL				**$507,427,464**	**$537,213,158**	**$591,029,820**

[a]Production data from DGGS questionnaires, phone interviews with mine and quarry operators, Alaska Department of Transportation and Public Facilities, and federal land management agencies.

[b]Values for selected metal production based on average prices for each year; for 1996—gold ($377.36/ounce); silver ($5.19/ounce); copper ($1.03/lb); zinc ($0.49/lb); lead ($0.37/lb). All other values provided by mine operators.

[c]Adjusted from new company data.

NR = None reported.

W = Withheld.

Table 4. *Reported mineral development expenditures and employment in Alaska by commodity and region, 1996*

	Northern	Western	Eastern interior	South-central	South-eastern	Total
			Development expenditures			
Base metals	$60,000,000	$ --	$ --	$ --	$ --	$ 60,000,000
Polymetallic	--	--	--	--	60,100,000	60,100,000
Precious metals-						
Placer	50,000	830,000	1,192,000	--	--	2,072,000
Lode	--	31,800,000	217,000,000	--	22,000,000	270,800,000
Coal and peat	--	--	100,000	300,000	--	400,000
Industrial minerals	--	--	--	--	400,000	400,000
TOTAL	**$60,050,000**	**$32,630,000**	**$218,292,000**	**$300,000**	**$82,500,000**	**$393,772,000**
			Development employment			
Employment						
Workdays	40,030	13,647	121,650	900	47,800	224,027
Workyears[a]	154	52	468	4	184	862
Number of companies reporting[b]	3	5	7	2	4	20

-- No expenditures reported.
[a]Based on 260-day workyear.
[b]Some companies active in more than one area.

lode mines and 99,500 ounces (3,094 kilograms) gold or 62 percent was from placer sources. The number of operating placer mines was about the same as the previous year. However, the big drop in placer production—from 135,642 ounces (4,218 kilograms) gold in 1995 to 99,500 ounces (3,094 kilograms) gold in 1996—was mainly due to the 1995 closure of Cambior Alaska's Valdez Creek mine near Cantwell, the state's largest gold mine for 12 years. The placer industry, which provided 825 jobs in 1996, has stabilized and is not expected to decline further.

Nixon Fork Mining Co., the operating subsidiary for Consolidated Nevada Goldfields Inc., mined and milled 39,900 tons (36,197 tonnes) of ore and produced 38,500 ounces (1,197 kilograms) gold and 354,000 pounds (160,574 kilograms) of byproduct copper at the Nixon Fork Mine. Nixon Fork, about 28 miles (45 kilometers) northeast of McGrath in the western region, became Alaska's largest gold mine in 1996. The company employed 71 year-round employees that operate on a two week-one week swing-shift schedule. An estimated 65 percent of the employees are Alaskan residents, and 10 percent are from nearby villages. The operation is entirely supported by aircraft, and the gold-copper concentrates are flown from the mine site by Woods Air Service (Palmer, Alaska) en route to the smelting facilities of Dallo Inc. at Kosaka, Japan.

Fairbanks Gold Mining Inc. (FGMI), operating subsidiary for Amax Gold Inc., initiated gold production at the Fort Knox gold mine 15 miles (24 kilometers) northeast of Fairbanks in the eastern interior region. From mid-November to the end of December, FGMI mined and milled 769,728 tons (698,300 tonnes) of ore and recovered 16,085 ounces (500 kilograms) of refined gold during the initial "blowing in" of the mine's production components. On December 20, 1996, the company poured 2,128.1 ounces (66 kilograms) gold of approximately 930 fineness in three bars during a ceremony attended by state officials, Fairbanks North Star Borough (FNSB) Assembly members, Alaska legislators, and media. At year's end, FGMI provided 243 year-round jobs that paid an average of $17.50 per hour plus $5.50 an hour in benefits. About $76 million will be added to the Alaskan economy annually, which includes a $300,000 weekly payroll and a multi-million dollar electric bill paid to Golden Valley Electric Association. About $1.46 million in mine property tax was paid to the FNSB in 1996. Property taxes to be paid in 1997 are projected to be approximately $4 million. The Fort Knox Mine is largely on Alaska State lands that were included in the 1994 Alaska Mental Health Trust (AMHT) lands court-approved settlement. The AMHT Land Office within the Department of Natural Resources actively manages AMHT land resources (including Fort Knox lands) on behalf of the AMHT

Authority for revenue generation and protection of land values.

Alaska Gold Co. processed 650,000 cubic yards (497,000 cubic meters) of pay gravels and produced 23,500 ounces (731 kilograms) gold from open-pit mining operations in the Cape Nome district in the western region. The company has mothballed Dredges 5 and 6, but is exploring the possibility of reactivating one of their dredges in 1998. Only one Alaskan bucketline dredge—the two-cubic-foot bucket capacity unit of N.B. Tweet and Sons Inc. in the Kougarok district—produced gold in 1996. Floating, bucketline stacker gold dredges have operated every year in Alaska since 1905.

Polar Mining Inc. (PMI), Alaska's fourth largest gold mine in 1996, mined a total 3,270,560 cubic yards (2,500,670 cubic meters) of overburden and processed 527,000 cubic yards (402,950 cubic meters) of pay gravel at their Lower Goldstream Mine operation in the Fairbanks district in the eastern interior region. The company ceased sluicing operations in August, and moved the mine infrastructure to newly acquired placer property in upper Goldstream Creek near Fox. PMI, which provided 38 full-time jobs in 1996, reported lower-than-projected 1996 gold output, but expects to improve gold production at their new mine site near Fox in 1997.

Cripple Creek Venture (CCV), a joint venture between mine operator Yellow Eagle Mining Inc. (YEMI) and Exploration Orbite V.S.P.A. Inc., developed Alaska's first new large-scale placer mine near Ester in the Fairbanks district; active mining took place from June to November, 1996. The washing plant and other infrastructure were purchased by YEMI from Cambior's Valdez Creek placer mine, which was Alaska's largest gold mine from 1984-1995. YEMI employed 28 seasonal workers in 1996, and expects to expand mine operations and provide 36 seasonal jobs in 1997.

The ten top Alaskan gold producers in 1996 were: Nixon Fork Mining Co. (McGrath-McKinley district); Alaska Gold Co. (Cape Nome district); Fairbanks Gold Mining Inc. (Fairbanks district); Polar Mining Inc. (Fairbanks district); Alaska Placer Development (Livengood-Tolovana district); Kennecott Greens Creek Mining Co. (Juneau-Admiralty district); Yellow Eagle Mining Inc. (Fairbanks district); the Clark-Wiltz Partnership (Innoko-Tolstoi district); Little Eldorado Group (Fairbanks district); and Ed Lapp and Sons Inc. (Circle district). These companies produced 119,337 ounces (3,711 kilograms) gold or 74 percent of the statewide total for the year.

Industrial Minerals

The value of Alaska's industrial minerals advanced from $53.1 million in 1995 to $58.1 million in 1996, a 9 percent increase. The total included 10.1 million tons (9.2 million tonnes) of sand and gravel worth $33.7 million; 3.0 million tons (2.7 million tonnes) of stone worth $24.4 million; and $25,000 worth of jade and soapstone. More sand and gravel was used for North Slope petroleum development (northern region) than in the previous several years; examples include British Petroleum's work at Milne Point and Atlantic Richfield Co.'s work on the Colville River Delta. Crushed stone usage at the Illinois Creek and Fort Knox gold development projects in the western and eastern interior regions respectively, accounted for over half of the statewide totals.

The Alaska Department of Transportation and Public Facilities (DOTPF) subcontracted sand and gravel and stone emplacement work at several airports in the western and eastern interior regions and finished the Taylor Highway upgrade project from Mile 3 to 31.

Industrial minerals use in the southcentral, southwestern, Alaska Peninsula, and southeastern regions was maintained at levels similar to those of 1995.

Sealaska Corp. initiated a promising new industrial mineral export project at their limestone property near Calder on Prince of Wales Island in the southeastern region. Mining and processing of a 13.3 million ton (12.1 million tonne) calcium carbonate deposit is expected to begin in the first quarter of 1997. Initial products will consist of: (1) ground calcium carbonate for horticultural, environmental, and industrial applications; and (2) crushed and screened material for wallboard, roofing, and animal feed manufacturing. The significance of Sealaska's ground-breaking effort is that it will be the first project in nearly 20 years to export industrial minerals to markets outside the boundaries of the state.

Coal, Peat, and Topsoil

The value of coal and peat declined from $41.5 million in 1995 to $38.2 million in 1996, an 8 percent decrease. Usibelli Coal Mine Inc. (UCM) again operated Alaska's only coal mine in the Nenana Coal Field near Healy, Alaska, in the eastern interior region. The company extracted 1,143,000 tons (1,036,930 tonnes) coal from their Poker Flats pit and 338,000 tons (306,635 tonnes) coal from their Gold Run Pass pit. About half of the coal is used in six interior power plants; the remaining tonnage is exported via the Port of Seward and Alaska Railroad to the Korean Electric Power Co. in Honam, South Korea. UCM employed about 115 during the year.

Peat and top soil production, which is used exclusively for horticultural purposes, was reported from eight Anchorage, Palmer, Wasilla, Delta Junction, and Fairbanks companies. Great Northwest Inc. in Fairbanks, Sunshine Services of Delta Junction, and Landscape Supply Corp. in Wasilla were among the top producers in 1996.

DEVELOPMENT

Construction activities at the Red Dog Mine near Kotzebue, the Fort Knox Mine near Fairbanks, the Illinois Creek Mine near Galena, the Nixon Fork Mine near McGrath, and the Greens Creek, Kensington and Alaska-Juneau mines near Juneau increased development expenditures in 1996 to $394 million, compared with $148.6 million in 1995. The 1996 mineral development cost estimate exceeds the previous high of $275 million spent in 1988, when the Red Dog and Greens Creek mines were under construction (table 5).

Northern Alaska

At the Red Dog Mine, Cominco Alaska Inc. will spend $200 million to upgrade mine and mill infrastructure. The project will also expand the concentrate storage and loading facilities at the port near Kivalina. It is anticipated that this upgrade will allow mine output to expand by 35 percent by 1999.

Western Alaska

Alaska Gold Co. initiated a substantial development program in conjunction with its open-pit mining operation at Nome. Offshore gold potential attracted Nova Natural Resources Corp. to Nome, and it is developing a remote-controlled cutter-head suction dredge similar to that recommended by Westgold shortly before the BIMA dredge shut down in 1990.

USMX Inc. conducted the largest development project in the region and used C-130 and C-133 aircraft to fly 65,000 tons of supplies and equipment to the Illinois Creek Mine construction site from Galena. By the end of the year the camp was expanded, the limestone kiln was completed, the pit was readied for mining, and the heap leach liner was installed.

Further east, near McGrath, Consolidated Nevada Goldfields Corp. (CNGC) continued to develop more reserves using surface and underground drilling at its Nixon Fork Mine, though most of the development occurred in 1995. Late in the year CNGC announced that exploration added gold reserves that were approximately equal to the amount that was mined and processed in 1996.

Eastern Interior Alaska

The major mine construction project in this area was Fort Knox Mine, which was developed by Amax Gold Inc. A workforce of up to 800 completed the powerline to the site, the freshwater dam and tailings dam, the in-pit crusher, coarse-ore conveyor, apron feeders, and all components of the mill. Total costs for the entire 27-month mine development project has been estimated to be $370 million, and the first gold bars were poured on December 20, 1996.

Usibelli Coal Mine Inc. reported a modest reverse-circulation drilling program at its Two Bull Run coal lease near Healy, and Yellow Eagle Mining Inc. developed a substantial placer gold mine west of Fairbanks near Ester. Polar Mining also started to develop a new mine site north of Fairbanks near Fox, and several smaller placer gold mines reported development expenditures, mainly for stripping frozen overburden.

Table 5. *Reported mineral development expenditures in Alaska by commodity, 1982–96*

	Base metals	Polymetallics	Precious metals	Industrial minerals	Coal and peat	TOTAL
1982	$ 10,270,000	N/A	$ 19,320,000	$ 4,251,000	$ 7,750,000	$ **41,591,000**
1983	19,500,000	N/A	7,112,500	1,000,000	250,000	**27,862,500**
1984	10,710,500	N/A	15,058,555	579,000	27,000,000	**53,348,055**
1985	13,000,000	N/A	16,890,755	1,830,000	2,400,000	**34,120,755**
1986	3,260,800	$ 8,000,000	12,417,172	124,000	530,000	**24,331,972**
1987	38,080,000	48,000,000	13,640,848	188,000	342,000	**100,250,848**
1988	165,500,000	69,000,000	40,445,400	- -	- -	**274,945,400**
1989	118,200,000	411,000	6,465,350	7,000,000	2,196,000	**134,272,350**
1990	- -	4,101,000	7,136,500	30,000	3,079,000	**14,346,500**
1991	- -	8,000,000	14,994,350	262,000	2,318,000	**25,574,350**
1992	80,000	4,300,000	23,151,300	404,000	1,655,000	**29,590,300**
1993	- -	10,731,136	15,103,000	433,500	1,400,000	**27,667,636**
1994	10,000,000	5,000,000	27,392,850	5,000	2,545,000	**44,942,850**
1995	11,200,000	9,590,000	127,165,750	426,000	200,000	**148,581,750**
1996	60,000,000	60,100,000	272,872,000	400,000	400,000	**393,772,000**
TOTAL	**$459,801,300**	**$227,233,136**	**$619,166,330**	**$16,932,500**	**$52,065,000**	**$1,375,198,266**

N/A = Figures not available prior to 1986.
- - Not reported.

Southeastern Alaska

Coeur Alaska Inc. and Echo Bay Mines Alaska Inc. both reported the permitting of their Kensington and Alaska-Juneau (A-J) mines respectively as development activity in 1996. At the Kensington Mine there was renewed permitting to allow discharge of treated effluent into Sherman Creek, and continuing engineering studies throughout the year. Echo Bay completed another feasibility study of the A-J project, and concluded that the more selective mining method proposed would not be economic. Hence, on December 31, Echo Bay Alaska decided to take a write-off of its entire $57 million investment, and create a $20 million fund to cover the estimated reclamation and closure costs.

Kennecott Greens Creek Mining Co. (KGCMC) reopened the Greens Creek Mine on Admiralty Island. KGCMC developed the new southwest orebody, redesigned the mill, and built a new tailings facility. At mid-year, Kennecott initiated production and anticipated full-scale operations in 1997.

EXPLORATION

The minimum exploration expenditures throughout Alaska in 1996 were $44.5 million, up 30 percent from the $34.3 million spent in 1995. Table 6 shows expenditures by region and commodity, and table 7 shows the trends over the last 15 years.

Northern Alaska

Drilling by Cominco Alaska Exploration Inc. at the Red Dog Mine intercepted 190 feet (58 meters) of 12 percent zinc, 4 percent lead, and 2 ounces of silver per ton (68.62 grams per tonne) in hole 483 at about 600 feet (183 meters) depth immediately north of the Aqqaluk deposit which was discovered in 1995. A second hole (635) about 400 feet (122 meters) from hole 483, cut 110 feet (33 meters) of 20 percent zinc, 4 percent lead, and 3 ounces of silver per ton (103 grams per tonne) at 725-835 feet (221-255 meters) below the surface. Definition drilling of the new ore horizon will continue in 1997.

Far North leased 50 percent of about 50,000 acres (20,235 hectares) in the Chandalar Lake area in the eastern Brooks Range to a joint venture between Footwall Explorations Inc. and Newcoast America Inc. Kennecott Exploration Co. conducted a fixed-wing airborne geophysical survey of part of the Ambler copper belt on the south flank of the central Brooks Range.

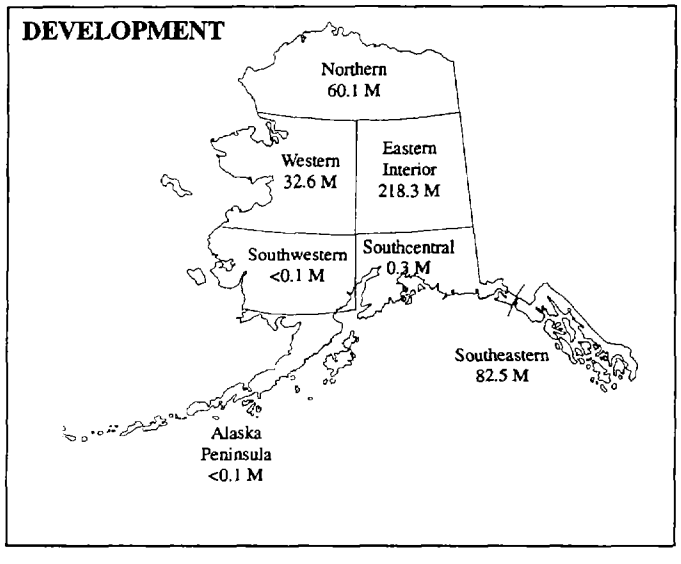
WGM of Anchorage, with funding from Ventures Resource Corp., conducted a wide-ranging grassroots exploration program in the area east of Wiseman.

Western Alaska

Exploration expenditures in 1996 were $3.8 million, slightly less than the $4.7 million spent the year before.

Kennecott Exploration also conducted an airborne geophysical survey in the Candle area of the Seward Peninsula, but most of their efforts were spent drilling the Aurora, Lindblom, and Bonanza Hill properties and trenching mineralized zones at the Mt. Distin property. All this activity was on land owned or controlled by the Bering Straits Native Corp. (BSNC). Cominco American explored BSNC land in the Aurora trend northwest of Nome. The Alaska Gold Co. conducted an active exploration program, including 30,000 feet (9,144 meters) of reverse-circulation drilling, near Nome. Nova Natural Resources Corp. was pursuing sub-sea placer operations in the Nome area with a mobile suction dredge similar to the "Tamrod" that was tested by Westgold a few years ago.

In the McGrath area there was a flurry of exploration and staking spurred by the exploration at Donlin Creek, near Crooked Creek. ASA Inc. continued exploration near Von Frank Mountain and elsewhere in the Kuskokwim Mountains, and Consolidated Nevada Goldfields Corp. (CNGC) had an active exploration program in conjunction with its mining at the Nixon Fork Mine. In the immediate vicinity of the mine, gold reserves were increased by 38,145 ounces (1,186 kilograms). As a result of an airborne geophysics program of their 56,000 acre (22,663 hectare) landholdings, a large target with a signature similar to the Nixon



Regional distribution of development dollars for 1996. Statewide total expenditures for development were $393.8 million.

Fork Mine was found six miles from the mine at Eagle Creek, and skarn-type gold mineralization was confirmed through surface work. Near the Nixon Fork Mine porphyry-type gold mineralization was drilled in the Nixon Fork stock; one hole yielded 188 feet (57 meters) of 0.03 ounces per ton (1.03 grams per tonne) gold. Much of the land explored near the Nixon Fork Mine was leased from Doyon Ltd.

Eastern Interior Alaska

Exploration increased dramatically in the eastern interior with activity reported from Tanana in the west to

Table 6. *Reported exploration expenditures and employment in Alaska, 1996*

	Northern	Western	Eastern interior	South-central	South-western	Alaska Peninsula	South-eastern	Total
Exploration expenditures								
Base metals	$ 600,000	--	500,000	--	--	--	--	$ 1,100,000
Polymetallic	435,000	$1,000,000	$ 3,568,364	$ 400,000	$ 150,000	--	$ 6,430,000	11,983,364
Precious metals								
Placer	210,000	1,042,600	276,000	64,000	26,000	$ 500,000	21,000	2,139,600
Lode	--	1,720,000	13,967,000	1,432,000	11,420,000	--	300,000	28,839,000
Coal and peat	--	--	--	--	--	--	--	--
Industrial minerals	--	--	--	--	--	--	400,000	400,000
Other[a]	--	--	--	--	--	--	--	--
TOTAL	**$1,245,000**	**$3,762,600**	**$18,311,364**	**$1,896,000**	**$11,596,000**	**$500,000**	**$7,151,000**	**$44,461,964**
Exploration employment								
Employment								
Workdays	1,880	4,893	21,105	2,001	20,795	500	15,572	**66,926**
Workyears[b]	7	19	81	8	80	2	60	**257**
Number of companies reporting[x]	7	14	27	10	8	1	8	**75**

-- Not reported.
[a]Jade, platinum, gemstones.
[b]Based on 260-day workyear.
[c]Some companies were active in several areas.

Table 7. *Reported exploration expenditures in Alaska by commodity, 1982–96*

	Base metals	Polymetallic[a]	Precious metals	Industrial minerals	Coal and peat	Other	Year's 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	30,978,000	400,000	--	--	**44,461,364**
TOTAL	**$74,284,566**	**$39,869,161**	**$366,448,643**	**$4,455,000**	**$16,070,750**	**$1,437,800**	**$502,565,920**

[a]Polymetallic deposits considered as a separate category for the first time in 1992.
N/A = Not available.
-- Not reported.

the Canadian border in the east. Expenditures were at least $18.3 million, up 72 percent from $10.6 million in 1995.

Much of the mineral exploration took place near Fairbanks. The largest program was that of Newmont Exploration Ltd. at the True North gold property about 15 miles (24 kilometers) north of Fairbanks; this project is a joint venture owned by La Teko Resources Ltd. Gold at True North is associated with quartz-carbonate veins in carbonaceous schists and quartzite associated with calcareous eclogites in the Chatanika Terrane. The style of mineralization is thought to be different from the igneous-hosted gold at Fort Knox, about 8 miles (13 kilometers) to the southeast, although altered igneous rocks close to True North contain some gold. The drilling was directed to prove continuity of mineralization within the 5,000 by 2,500 foot (1,524 by 752 meters) core area, and to determine the limits of mineralization. A $2.5 million payment was made to La Teko at year end as part of the buy-in agreement whereby Newmont can earn 65 percent of the deposit.

Placer Dome U.S. Inc., Silverado Mines U.S. Inc., International Freegold Development Corp. and La Teko have claim blocks strategically covering the northeast and southwest extensions of the thrust contact of the Chatanika Terrane, which is complicated by northwest-trending high-angle faults. At year end Silverado Mines U.S. Inc. had an Agreement in Principle with Homestake Mining Co. to sell the holdings near True North attesting to the interest in the type of mineralization at True North.

Silverado Mines U.S. Inc. was very active trenching and drilling the St. Paul, Rhyolite, and other targets in its Ester Dome property six miles (10 kilometers) west of Fairbanks, and staked a large group of claims north of the Chatanika River, about 15 miles (24 kilometers) northwest of Ester Dome.

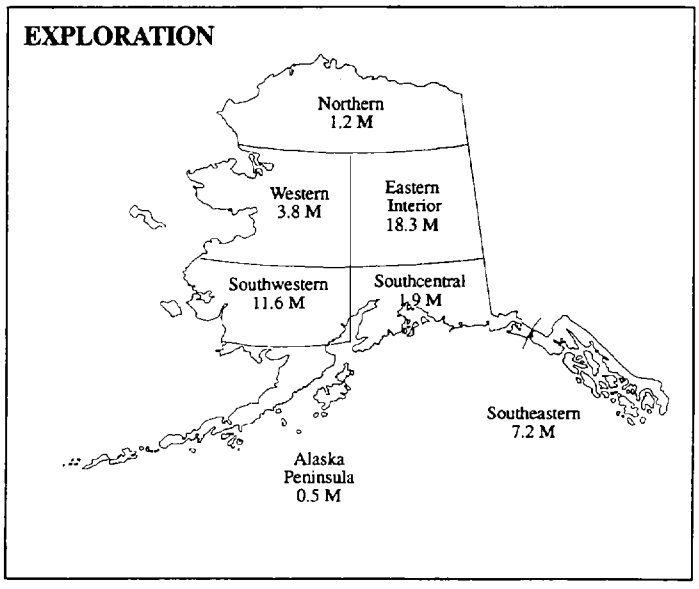
Ryan Lode Mines Inc., a wholly-owned subsidiary of La Teko Resources Ltd., also actively explored their holdings at Juniper Creek about 15 miles (24 kilometers) northeast of True North, and on adjacent land leased from the University of Alaska. They also researched various reclamation methods at the Ryan Lode Mine on Ester Dome.

International Freegold Development Corp. drilled several targets within its Golden Summit holdings which extend from north of the Fort Knox Mine to the True North property. Avalon Development Co., as operator, drilled 20,000 feet (6,096 meters) on the Dolphin prospect, where gold is associated with sulfides in and adjacent to a small, 91-million-year-old granitic stock. The nearby Cleary Hill high-grade gold mine was also drilled by Avalon, but results have not been released. The Too Much Gold zone about 4 miles (6 kilometers) east of the Cleary Hill Mine was also drilled in 1996, and results confirm that the gold is contained in a shallow-dipping zone in sericitized schist. Regional exploration has detected several new targets within the Golden Summit claim group for exploration in 1997.

Placer Dome U.S. Inc. drilled its holdings in the Chatanika Terrane southwest and northeast of True North, but no results have been announced.

American Copper & Nickel Corp. (ACNC) concentrated most of its activity in the Delta Belt polymetallic targets southwest of Tok, including large-loop (UTEM) geophysical surveys and 14,000 feet (4,267 meters) of core drilling in very steep terrain. At its Nikolai copper-nickel prospect near Summit Lake south of Delta Junction, ACNC conducted UTEM and mapping/geochemical programs in preparation for a 1997 drilling program. Selected grab samples from the Nikolai prospect contain up to 6.9 percent nickel, 3.3 percent copper, 0.3 percent cobalt, 0.09 ounces per ton (3.09 grams per tonne) palladium and 0.46 ounces per ton (15.6 grams per tonne) platinum.

WGM Inc., in a joint venture funded by Sumitomo Metal Mining Canada Ltd. and the Metal Mining Agency of Japan (MMAJ), continued drilling at the Pogo gold prospect northeast of Delta Junction in late 1995. MMAJ had announced several high-grade gold intercepts, including 1.83 ounces per ton (62.8 grams per tonne) gold over 22 feet (6.7 meters) and 0.19 ounces per ton (6.5 grams per tonne) gold over 79 feet (24 meters) in an apparently flat-lying quartz deposit about 600 feet (183 meters)



Regional distribution of exploration dollars for 1996. Statwide total expenditures for exploration were $44.5 million.

below the surface. A 1996 drilling program found one 34 foot (10.4 meter) intercept that contained 0.93 ounces per ton (31.8 grams per tonne) gold with 3.3 feet (1 meter) of 9.43 ounces per ton (322.9 grams per tonne) gold.

WGM Inc. also actively explored prospects west of Tanana and in the Seventymile and Fortymile drainages on land owned by the Doyon Ltd., a regional Native corporation, with funds provided by Ventures Resource Corp.

Significant claim staking activity occurred in the Richardson district 30 miles (48 kilometers) west of Delta. Cyprus-Amax Gold, Kennecott Exploration, and several individuals staked hundreds of claims around the core claims held by Tri-Valley Corporation in this prospective epithermal gold-silver district.

Kennecott Exploration was also exploring near Livengood, about 80 miles (128 kilometers) north of Fairbanks. Cyprus-Amax was active in the Fairbanks area. A small drilling program was undertaken at the Liberty Bell gold-arsenic-copper deposit near Healy by lessees of Pacific Northwest Resources Co. The Dry Creek polymetallic massive sulfide deposit near Wood River was drilled by Grayd Resources.

ASA Inc. got a late start, but managed a modest drill program in the Rampart area on Doyon Ltd. land before freeze-up.

Reliance Geological Services spent most of the summer on the Taurus porphyry copper-gold prospect near the Canadian border north of Tok conducting geochemical and geophysical surveys, and a drill program for Cross Canada International Resources.

Southcentral Alaska

Mineral exploration activities in the southcentral region focused on evaluation of hardrock mineral deposits. Expenditures in 1996 were $1.9 million, or double the amount spent in 1995. The State of Alaska invested in a high definition airborne geophysical survey of the Upper Chulitna and the Petersville-Collinsville areas in 1996. Results of the Chulitna survey were released February 7, 1997, and the Petersville survey results were released March 12.

Addwest Minerals continued its exploration around Mines Trust's Golden Zone Mine in the Upper Chulitna district, flying airborne geophysics and drilling both core and reverse circulation holes.

Further east, International CanAlaska Resources Ltd. managed a small drill program at its Rainbow Hill property above Valdez Creek before winter set in. There was also renewed interest in the Pass Creek (Denali Copper) prospect near the head of Valdez Creek, but the results of Trabits Minerals activity are unknown.

Southwestern Alaska

This area saw some of the most active exploration in 1996, with reported expenditures of $11.6 million, a fourfold increase over the $2.45 million spent in 1995.

Placer Dome U.S. Inc. conducted an aggressive $9.67 million exploration effort at the Donlin Creek prospect in the Kuskokwim mineral belt, including construction of an 80-person camp, a 4,921-foot (1,500-meter) airstrip to accommodate Hercules C-130 aircraft, and completion of a 133,000 foot (40,540 meter) drill core program in 109 holes. Earlier exploration by Westgold Inc. looked at seven areas of alteration or mineralization in 65-million-year-old plutonic rocks; individual deposits are named the Lewis, Rochelieu, Far Side, Dome, Quartz, Queen, and Snow. Based on their combined 1995 and early 1996 results, Placer Dome estimated a resource of 3.6 million ounces (111,972 kilograms) of gold exists adjacent to the Lewis and Rochelieu mineralized areas. Placer Dome U.S. Inc. plans to drill additional footage in 1997 to further define and upgrade the gold resource estimate. Donlin Creek is on land owned by the Calista Native Corp., and Calista shareholders were a large part of the workforce.

Other companies active in the Kuskokwim mineral belt include Cominco American Inc., Teck Corp., and a WGM Inc./Ventures Resource Alaska Corp. joint venture. The latter group were also active on Doyon Ltd. land to the northeast.

The Calista Corp., another Native corporation, also had an exploration program at Goodnews Bay and at another undisclosed location.

Late in the year Cominco increased its holdings in the vicinity of its Pebble Copper porphyry copper-gold prospect near Lake Iliamna.

Southeastern Alaska

The pace of exploration was less hectic in southeastern Alaska in 1996 than in the early 1990s, and was less dominated by a few operations. About $7.2 million was spent, only half the $12.2 million exploration reported in 1995.

American Copper & Nickel Corp. had a robust program at Hetta Inlet on land leased from the Sealaska Native Corp., but despite aggressive geophysical, geochemical, geologic, and drilling programs could not discover an orebody, and released the land to Sealaska.

Teck Corp. conducted a large drill program at the Abacus/Pamicon Niblack property on southern Prince of Wales Island, and continued to identify wide intercepts of good grade in a series of occurrences within the polymetallic property. Teck Corp. announced late in the year that one ore zone in the Niblack deposit contained 1.8 million tons (1.63 million tonnes) grading 0.12 ounces per ton (4.1 grams per tonne) gold,

1.37 ounces per ton (46.9 grams per tonne) silver, 1.50 percent copper, and 2.64 percent zinc.

Sealaska Corp. announced late in the year that it will develop its Calder limestone quarry in 1997, with the town of Klawock benefiting from construction of much of the processing and shipping facility.

Westmin Resources Ltd. conducted an exploration program to include drilling on Zarembo and Woewodski Islands near Wrangell. Westmin and Kennecott Exploration explored the Mansfield Peninsula of northern Admiralty Island and looked for Greens Creek style mineralization. As part of their work, Kennecott flew an airborne electromagnetic (EM) survey late in the season.

Elsewhere in the Mansfield Peninsula, Alaska Dano Mining Co. conducted surface exploration on their patented claims between Hawk Inlet and Funter Bay and also restaked adjacent federal lands.

In northern Southeast, Katzehin Exploration conducted reconnaissance exploration adjacent to the Katzehin River valley, across Lynn Canal from Haines. Katzehin was reported to be looking for shear-hosted gold deposits with limited success.

DRILLING

Table 8 summarizes drill activity in the state in 1996. Although there was no placer thawfield drilling, most regions reported considerable hardrock drill activity, and all was core drilling in the northern, southwestern, and southeastern regions. The total footage drilled, 729,000 feet (222,241 meters), is more than any year since 1990. After a lapse of several years, placer drilling increased substantially, mainly due to activity by Alaska Gold Co. near Nome and Polar Mining near Fairbanks. Continuing the trend of the last few years, very little exploration or development drilling was reported from coal projects (table 9). Hardrock drilling reached a near record in 1996. Core drilling, of which 215,000 feet (65,532 meters) was underground, surpassed reverse circulation drilling, except in western, eastern interior, and southcentral Alaska. This probably reflects the ease of access in these areas.

GOVERNMENT ACTIONS

The total number of active Alaska state claims increased from 25,106 in 1995 to 38,700 in 1996, a 54 percent increase. The total number of active federal claims remained at about the same level of approximately 8,000 during both 1995 and 1996.

The state DMWM completed permitting requirements for the Illinois Creek heap-leach gold project near Galena, which should reach production by the second quarter of 1997.

The state DMWM gave the Alaska Gold Co. an award for outstanding reclamation of formerly mined lands in the Cape Nome district. Sixteen Alaskan mineral firms have received state mine reclamation awards in the last three years.

Ryan Lode Mines Inc., the State Department of Environmental Conservation (DEC), and the Fairbanks Municipal Utilities System (MUS) worked on a demonstration project that utilized Fairbanks sewer sludge to reclaim mine tailings on Ester Dome near Fairbanks. The successful completion of the project indicated that this application could substantially reduce mine reclamation costs and provide a use for sewage treatment products in other parts of the State.

Table 8. *Drilling footage by region in Alaska, 1996*

Type of drilling	Northern	Western	Eastern interior	South-central	South-western	Alaska Peninsula	South-eastern	TOTAL
Placer exploration	--	51,700	10,080	--	--	--	--	**61,780**
Placer thawfield	--	--	--	--	--	--	--	--
Placer subtotal	--	**51,700**	**10,080**	--	--	--	--	**61,780**
Coal subtotal	--	--	**8,500**	--	--	--	--	**8,500**
Hardrock core	33,790	31,000	79,698	7,000	133,000	--	239,842	**524,330**[a]
Hardrock rotary	--	43,000	83,827	7,700	--	--	--	**134,527**
Hardrock subtotal	**33,790**	**74,000**	**163,525**	**14,700**	**133,000**	--	**239,842**	**658,857**
TOTAL (feet)	**33,790**	**125,700**	**182,105**	**14,700**	**133,000**	--	**239,842**	**729,137**
TOTAL (meters)	**10,232**	**38,313**	**55,506**	**4,481**	**40,272**	--	**73,104**	**222,241**

-- Not reported.
[a]215,000 feet of core drilling was underground.

Table 9. *Drilling footage reported in Alaska, 1982–96*

Year	Placer Exploration	Placer Thawing	**TOTAL PLACER**	**TOTAL COAL**	**TOTAL HARDROCK**	Hardrock Core[a]	Hardrock Rotary[a]	**TOTAL FEET**	**TOTAL METERS**
1982	30,000	94,000	**124,000**	**80,000**	**200,000**	--	--	**404,000**	**123,139**
1983	23,000	30,000	**53,000**	**12,000**	**180,500**	--	--	**245,500**	**74,828**
1984	31,000	98,000	**129,000**	**25,700**	**176,000**	--	--	**330,700**	**100,797**
1985	46,000	34,000	**80,000**	**8,700**	**131,700**	--	--	**220,400**	**67,177**
1986	32,400	227,000	**259,400**	**28,800**	**50,200**	--	--	**338,400**	**103,144**
1987	50,250	130,000	**180,250**	**19,900**	**115,100**	95,600	19,500	**315,250**	**96,088**
1988	152,000	300,000	**452,000**	**26,150**	**353,850**	223,630	130,230	**832,000**	**253,593**
1989	97,250	210,000	**307,250**	**38,670**	**332,230**	242,440	89,790	**678,170**	**206,700**
1990	78,930	105,000	**183,930**	**18,195**	**760,955**	648,600	112,355	**963,080**	**293,547**
1991	51,247	130,000	**181,247**	**16,894**	**316,655**	205,805	110,850	**514,796**	**156,910**
1992	6,740	65,000	**71,740**	**12,875**	**359,834**	211,812	148,022	**444,449**	**135,502**
1993	25,216	--	**25,216**	--	**252,315**	124,325	127,990	**277,531**	**84,591**
1994	21,000	--	**21,000**	**8,168**	**438,710**	347,018	91,692	**467,878**	**141,781**
1995	27,570	--	**25,570**	--	**415,485**	363,690	51,795	**443,055**	**135,043**
1996	61,780	--	**61,780**	**8,500**	**658,857**	524,330[b]	134,527	**729,137**	**222,241**

[a]Core and rotary drilling not differentiated prior to 1987.
[b]215,000 feet of core drilling was underground.

The Alaska Department of Natural Resources (DNR) contracted Dighem Surveys and Processing to conduct airborne geophysical surveys in the Chulitna and Yentna mining districts of southcentral Alaska, part of the Rampart mining district in the eastern interior region, and the Bethel Basin in the southwestern region. Maps of the Upper Chulitna, Rampart-Manley (extended area), and Petersville/Collinsville areas were released to the public in February and March of 1997. DNR also initiated a coalbed methane study, which is designed to investigate the potential to extract methane gas from coalbeds for use in remote Alaskan bush areas. DGGS also geologically mapped the Rampart district and the southern Ruby-Poorman district; preliminary summaries of both studies will be released in 1997.

The State Department of Environmental Conservation (DEC), the Alaska Miners Association (AMA), and environmental groups debated changes in the National Pollution Discharge Elimination System (NPDES) permit for placer mines that were submitted by Region 10 of the U.S. Environmental Protection Agency (EPA). Of particular concern to miners was how the NPDES modifications would affect the ability of small suction dredge operators to mine in such areas as the historic Nolan, Fortymile, and Sunrise districts in the northern, eastern interior, and southcentral regions. In November DEC Commissioner Michelle Brown announced an agreement reached between federal and state agencies and special interest groups that would allow the state to certify new federal "general" NPDES permits without having to go through the costly "individual" NPDES permit process.

Governor Tony Knowles created a special water quality working group to study and make recommendations for 12 natural resource-related criteria regulated by state and federal agencies. These include arsenic, acute toxicity, dissolved metals, and petroleum (hydrocarbon) residuals levels—all of which affect mine-related activities.

During 1996 the Alaska Legislature and Governor enacted legislation which extended the allowable underground mine shifts from 8 hours to 10 hours.

Placer Dome U.S. Inc. 100-person exploration camp at Donlin Creek in southwestern Alaska. The company outlined a reserve of 3.6 million ounces (111,960 kilograms) of gold in 1996 and will continue an extensive drill program in 1997. The deposit is owned by Calista Corp. Photo courtesy of Placer Dome U.S. Inc.

DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys
Division of Mining & Water Management

DEPARTMENT OF COMMERCE AND ECONOMIC DEVELOPMENT
Division of Trade and Development