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Alaska's Mineral Industry 2004

Construction of mill facilities at the Pogo gold project. The mill bench was leveled by May 2004, first steel was erected on the mill building in August 2004, and interior concrete work began late in 2004. Photo provided by DNR-ML&W.

Division of Geological & Geophysical Surveys
in cooperation with
Office of Economic Development and
Division of Mining, Land & Water

Alaska's Mineral Industry 2004

by
D.J. Szumigala and R.A. Hughes

Division of Geological & Geophysical Surveys

SPECIAL REPORT 59

STATE OF ALASKA
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EXECUTIVE SUMMARY

Alaska's Mineral Industry 2004 is the twenty-fourth in a series of annual reports. The reports are a cooperative venture between the Division of Geological & Geophysical Surveys and the Division of Mining, Land & Water in the Department of Natural Resources and the Office of Economic Development, Department of Commerce, Community & Economic Development.

The 2004 cumulative value of Alaska's mineral industry is $1.618 billion, divided between exploration and development investments, and the gross value of the mineral products. This is a new record value and the ninth straight year that Alaska's mineral industry topped $1 billion.

Exploration expenditures in Alaska during 2004 were $70.8 million, more than double the $27.6 million spent in 2003. Exploration occurred across Alaska; $38 million (or 59 percent of exploration funds) were spent in southwestern Alaska. Fifteen exploration projects had budgets greater than $1 million. Gold remained a major exploration commodity, but exploration for copper–gold porphyry systems was the major exploration target in 2004. Base metal exploration expenditures increased significantly from 2003 levels. Platinum-group-element exploration remained steady.

Development expenditures were the third highest since records were kept in 1981 and amounted to $209.1 million. Precious metal development expenditures were up considerably. The increase is primarily due to construction at Teck's Pogo project, which was fully permitted in mid 2004. Other significant investments were at Fort Knox Mine, Greens Creek Mine, Kensington Project, and Usibelli Coal Mine, and in the sand and gravel industry.

The value of mineral production for 2004 was $1,338.7 million, a $338.0 million improvement compared to 2003 and a record production value. Metal production volumes from hard-rock sources were down compared to 2003; however, metal value increases overcame production shortfalls. Metals, with a value of $1,077.5 million, accounted for 80.5 percent of the total value of production. Zinc continued to be the most valuable product by a significant margin, followed by gold, lead, and silver. Production of sand and gravel in 2004 was 19.6 million tons, up considerably from 11.9 million tons in 2003. Rock production was 7.3 million tons, also up considerably from 861,400 tons in 2003. Placer gold production was 28,074 ounces for 2004, an increase of 4,474 ounces from 2003 placer production. Coal production was 1,450,000 tons, up 362,000 tons from 2003. Peat production was up considerably for 2004 at 208,032 cubic yards.

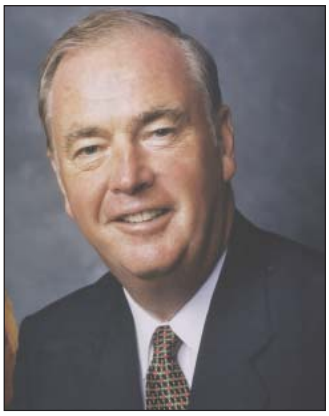
The export of minerals topped $500 million in 2004 for the first time in Alaska history. One-quarter of Alaska's mineral exports head to Canada, one-third are sold to Europe, and 40 percent are bound for Asia, primarily Korea, Japan, and China.

The total mineral industry employment in 2004 is estimated to be 3,048 full-time-equivalent jobs, an increase of 1,142 jobs from the 2003 total of 1,906 jobs and an increase of 224 jobs from the 2002 employment total. Most of the increase was in the exploration, development, and industrial minerals production sectors.

About 2,628 new state mining claims (343,800 acres), 141 new state prospecting sites (22,560 acres), and 66 new federal claims (1,320 acres) were staked in 2004. Approximately 3.3 million acres of Alaska were covered by claims or prospecting sites in 2004. Large blocks of state mining claims were staked in 2004, including approximately 137 square miles of claims in the Pebble area, approximately 34 square miles of claims in the Pogo area, 31.5 square miles of claims in the Kahiltna River area, and approximately 169 square miles of claims in the Skwentna River–Happy River–Rainy Pass Lodge area.

Drilling was conducted during all phases of mining in Alaska during 2004. Drilling totals for 2004 are 415,628 feet of core drilling, 36,024 feet of reverse-circulation drilling, and 107,526 feet of placer auger/churn drilling. The largest drilling program was conducted by Northern Dynasty Minerals Ltd. at the Pebble property in southwestern Alaska.

GOVERNOR'S FOREWORD



I am pleased to report the continued vitality of Alaska's mineral industry. Mining and mineral activities topped the billion-dollar mark in Alaska during 2004 with a record value of $1.62 billion. I congratulate everyone involved in mining, mineral project development, and mineral exploration for their achievements.

Mining is an important part of our history and it is just as important for our future. Mining provides many Alaskans, especially rural residents, with quality, good-paying jobs. More than 3,000 jobs were attributed directly to the mineral industry in 2004, a number that will only grow as more mines come online. High metal and coal prices, with worldwide interest in investing in Alaska's mineral projects, have brought buoyant optimism to Alaska. Alaska is underexplored and ranks as one of the best places in the world for mineral investment. Recent large mineral discoveries prove that Alaska is the right place to explore for world-class mineral deposits. I remain confident that more discoveries will follow.

The State of Alaska is promoting responsible resource development and backing up that promotion with actions to improve the regulatory and business climate. My administration is focused on providing a more streamlined process for permitting mines, while maintaining the high environmental standards that make Alaska's mines world leaders. DNR, through the Large Mine Permitting Unit, continues to lead and coordinate the state's efforts for responsible development of our mineral resources.

There are a number of mining projects near development in Alaska that provide good cause for optimism. The Pogo gold mine near Delta Junction is on track to begin production early in 2006. The Kensington gold project near Juneau received all state and federal permits in 2004 for mining and has begun construction, though environmental groups continue to raise legal obstacles. Northern Dynasty announced in January 2004 that its Pebble Project copper–gold deposit contains 26.5 million ounces of gold and 16.5 billion pounds of copper, and new exploratory drilling indicates the deposit may be even richer. Developing Pebble will take significant investment, and the state will ensure that Lake Iliamna's world-class salmon streams are protected throughout the development and long anticipated life of this project. The Donlin Creek gold project near Aniak also is near a development decision and the proposed mine would be an economic boost to southwestern Alaska. Other gold mine development projects in western Alaska, the Rock Creek property near Nome and the Nixon Fork property near McGrath, are also near permitting and development phases.

This is truly an invigorating time for Alaska mining! I look forward to even more progress in the coming year.

Governor Frank H. Murkowski

COMMISSIONERS' FOREWORDS

Alaska's mineral industry continues to grow in value, setting a record value of $1.62 billion in 2004. I join Governor Frank H. Murkowski in congratulating the mining community of Alaska for this significant achievement. Mining in Alaska has surpassed the $1 billion value benchmark for nine consecutive years and is projected to exceed $2 billion in a few years. While booming metal prices have contributed greatly to this record value, I also believe that Alaska's streamlined policies and regulations, as part of the governor's vision to encourage business development in Alaska, have also been a significant factor.

The international mining community has seen the changes and reacted positively. Development of the Pogo gold project in Interior Alaska during 2004, completing permits for expansion of the Greens Creek Mine tailings facility in southeastern Alaska, issuing all state permits necessary for development of the Kensington gold project in southeastern Alaska, and updating permits for the Red Dog zinc–lead–silver mine are all significant achievements. I expect Alaska to continue to be a magnet for mineral investment and responsible mineral development.

COMMISSIONERS' FOREWORDS

One indication of the increased growth and stability of Alaska's mineral industry is taxes paid by the mining industry. The mineral industry paid a total of $26.6 million to the state of Alaska and Alaska municipalities in 2004. These payments increased by almost $8 million (43 percent) above 2003 values. Mining license taxes more than tripled from 2003, largely due to profitability of Red Dog Mine. Mines are important economic engines in all parts of Alaska; they are especially important in rural Alaska. Mining companies were the largest taxpayers in the City and Borough of Juneau and the Fairbanks North Star, Denali, and Northwest Arctic boroughs, with total payments of almost $11 million.

We have seen many positive changes in DNR during 2004 that affect the mining industry. The Division of Geological & Geophysical Surveys (DGGS) continues to provide high-quality geologic information vital for mineral exploration in Alaska. DGGS released new detailed geologic maps and geochemical data for the central Livengood Quadrangle northwest of Fairbanks and a detailed bedrock geologic map for the central Big Delta Quadrangle that includes the area surrounding the Pogo gold project. DGGS also conducted geologic mapping and geochemical sampling in the Big Hurrah and Council areas of the Seward Peninsula as part of the state-funded Alaska Airborne Geophysical/Geological Mineral Inventory Program. All three areas have had multi-million dollar exploration programs by the mineral industry during the last several years. I believe that this investment by private industry is a direct result of the state's investment in acquiring geophysical data followed by geologic mapping as "ground-truthing," and the state's program should continue to attract investment in these areas for many years.

Changes in the permitting process to streamline procedures and make them more accountable resulted in moving the Alaska Coastal Management Program and Division of Habitat to DNR in 2004. In July 2004 the Governor's Office formed several sub-cabinets to allow commissioners to deal with issues or to push for process improvements. A Natural Resources Development Policy sub-cabinet, comprising DNR (as lead), Department of Environmental Conservation, Department of Transportation & Public Facilities, Department of Law, Department of Fish & Game, Department of Commerce, Community & Economic Development, Department of Labor, and the Washington, D.C., Governor's Office, was formed to promote resource development. DNR also revised financial assurance requirements for large mine operators, to allow sinking trust funds to be established and to require total financial assurance in the amount needed to reclaim a large lode mine site. I believe these changes will shorten the permitting process without compromising the high environmental standards that make Alaska's hard rock mines showcase examples of "doing it right."

The State of Alaska filed 13 applications covering 31 water bodies for Recordable Disclaimers of Interest with BLM to establish that the federal government does not own these lands. To date, BLM has issued a disclaimer for portions of the Black River and four of its tributaries, the Klutina River, Klutina Lake, Kvichak Lake, and Lake Iliamna. These are the first three disclaimers in the United States to be issued. This is an important process to remove land conflicts that may hinder development and to ensure that the state establishes control on all of its lands. The State of Alaska is also working to finalize land transfers from the federal government to Alaska Native allottees, Alaska Native corporations, the State of Alaska, municipalities, the Alaska Mental Health Land Trust, and the University of Alaska. Federal legislation (Senate Bill 1466) proposes changes for streamlining steps in the land transfer process that have proven over time to be problematic or inefficient. DNR's BLM Conveyance Project is working to accelerate the remaining land transfers, in order of priority of entitlement, to individual Alaska Native allottees, Alaska Native corporations, and then to the State of Alaska by 2009, the 50th anniversary of Alaska statehood. Our goals for settling these land ownership issues include securing land tenure for mining industry projects and resolving some access issues for Alaska.

Governor Murkowski signed a Memorandum of Understanding (MOU) with representatives of Taiwan's government to jump-start development of Alaska's vast Cook Inlet coal deposits. A second MOU signed with Taiwan established a Taiwan–Alaska Trade and Investment Cooperation Council. These MOUs recognize the importance of Alaska's vast natural resources to Pacific Rim trading partners.

I am proud of the achievements that DNR has made over the past several years. I will continue to work within DNR and with the mining community to provide efficient and responsible management of Alaska's land, natural resources, and vast mineral resources. I look forward to welcoming more mining companies to Alaska as they seek to invest in their companies' futures by investing in Alaska.

Thomas E. Irwin, Commissioner, Department of Natural Resources

COMMISSIONERS' FOREWORDS

The Department of Commerce, Community & Economic Development (Commerce) is pleased to participate with the Department of Natural Resources (DNR) to bring you this twenty-fourth annual report on Alaska's mineral industry.

This report clearly shows that the Alaska mineral industry continues to mature and expand. The Department of Commerce is proud to contribute to the important industry growth by promoting and assisting responsible development of Alaska's vast and diverse mineral resources.

In 2004, for the ninth consecutive year, the total value of the industry exceeded $1 billion. Rising metal prices bode well for the profitability of future and now-producing mines, for moving existing projects forward, and for enticing exploration for new and existing discoveries in the state. The reported value of industrial minerals production was up considerably as a result of a booming construction industry and better data collection.

Existing projects provided more than 3,000 high-paying jobs in 2004, a reported increase of more than 1,000 jobs from 2003. This increase reflects efforts to respond to the increased demand for mineral products and better reporting from the rock, sand, and gravel industry. Significant improvements in job opportunities are expected in future years in response to a number of major projects now in progress.

Pogo Mine construction continued for the year and into 2005 and will be commissioned in 2006. Kensington received its final permits in mid-2005, has started construction, and is expected to be commissioned in 2006. Rock Creek/Big Hurrah and Nixon Fork are in advanced stages of exploration and development with mine construction decisions expected in 2006. Placer Dome/NovaGold's advanced-stage Donlin Creek gold exploration project is moving forward with feasibility, advanced ore definition and engineering.

In the longer term, the Pebble Copper project in southwestern Alaska and the intense exploration that this project has attracted to the area, projects along the south flank of the Brooks Range, projects in the Goodpaster district near Pogo, and others, promise exciting future opportunities. The statewide minerals industry is forecast to grow by approximately $1 billion annual value in the next 7 to 10 years.

The Murkowski administration continues to provide a favorable business climate for statewide mineral industry growth. Our taxation and fee structure is fair and stable and the regulatory structure is progressive. Further direct support through incentives, information, and technical support provides a valuable asset for companies active in Alaska mineral development.

William C. Noll, Commissioner of Commerce, Community and Economic Development

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Alaska's Mineral Industry 2004

D.J. Szumigala[1] and R.A. Hughes[2]

INTRODUCTION

This summary of Alaska's mineral industry activity for the year 2004 is the twenty-fourth in the series of annual reports, and is made possible by information provided through phone interviews, many replies to more than 1,000 questionnaires sent to participants in the mineral industry, press releases, and other sources of information. This report is part of a cooperative venture between the Division of Geological & Geophysical Surveys (DGGS) and the Division of Mining, Land & Water (DMLW) in the Department of Natural Resources (DNR) and the Office of Economic Development, Department of Commerce, Community and Economic Development (Commerce). Funds for printing the report are provided by Commerce. Information in this report supercedes data previously published in DGGS Information Circular 51.

Figure 1 shows the regions of the state used in this and subsequent sections. Table 1 and figure 2 show the estimated value of the mineral industry in Alaska per year between 1981 and 2004, as divided between exploration and development investments, and the gross value of the mineral products. Company information is used to define the exploration and development parameters. Average metal prices are calculated from the daily London PM closing price for gold, and from the average weekly spot price on the London Metal Exchange for the other metals. These prices are used to calculate the value of metals produced in the state, but do not take into account the costs of mining or transportation, or smelter charges and penalties. Coal prices are estimated from average coal prices for similar-grade material around the Pacific Rim. Industrial material prices are based on regional rates provided by some operators.

The total value of the Alaska mineral industry is $1.618 billion for 2004, the ninth straight year topping $1 billion (table 1). The 2004 cumulative value of Alaska's mining industry is an increase of about $550 million from the $1.067 billion reported in 2003. The 2004 cumulative value is a new record and tops the previous record set in 2000 by $335 million. Increases in expenditures for exploration and development and the value of production compared to 2003 and previous years contributed to the record year.

Exploration investment in Alaska increased more than 250 percent from the previous year ($70.8 million in 2004 versus $27.6 million in 2003 and $26.5 million in 2002). Exploration occurred across Alaska, but $38 million (or 59 percent of the exploration funds) were spent in southwestern Alaska. Fifteen exploration projects had budgets greater than $1 million. Several large projects, notably Northern Dynasty Minerals Ltd.'s Pebble copper–gold project in southwestern Alaska, Kinross Gold Corp.'s Fairbanks mining district projects in the Interior, and Freegold Ventures Limited–Pacific North West Capital Corp.–Lonmin PLC's Union Bay platinum–nickel–copper project in southeastern Alaska accounted for most of the exploration expenditures and drill footage. Advanced exploration projects include Placer Dome Inc.–NovaGold Resources Inc.–Calista Corp.'s 23-million-ounce Donlin Creek intrusion-hosted gold project and Northern Dynasty's Pebble copper–gold porphyry project in southwestern Alaska, with announced resources of 26.5 million ounces of gold and 16.5 billion pounds of copper.

Development expenditures were the third highest since records were kept in 1981 and amounted to $209.1 million; development expenditures in 2003 totaled only $39.2 million. Precious metal development expenditures were up considerably and are highlighted by the development of the Pogo project and complemented by significant expenditures at the Fort Knox mine. The increase is primarily due to construction at the Teck Pogo project, which was fully permitted in mid 2004. Other significant investments

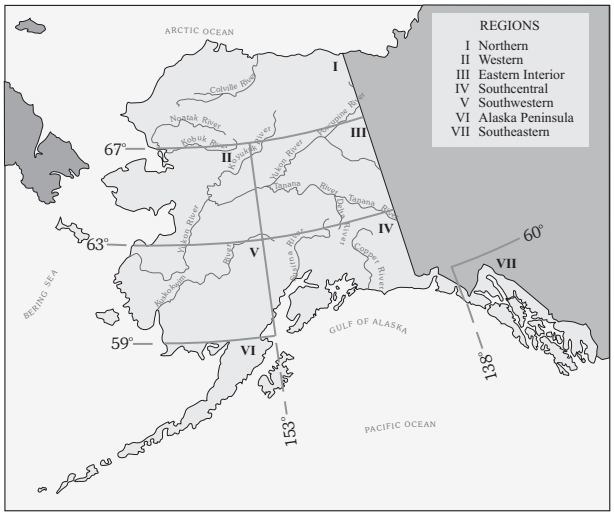


Figure 1. *Regions of mineral activity as described in this report*.

[1]Alaska Division of Geological & Geophysical Surveys, 3354 College Rd., Fairbanks, Alaska 99709-3707

[2]Alaska Department of Commerce, Community & Economic Development, Office of Economic Development, 211 Cushman St., Fairbanks, Alaska 99701

are noted at Fort Knox Mine, Greens Creek Mine, Kensington Project, Usibelli Coal Mine, and in the sand and gravel industry. Teck Pogo Inc. began construction at the Pogo project after receiving its final permits; the all-weather 50-mile road was completed between the Richardson Highway and the project site; the power transmission line from Golden Valley Electric Association facilities near the Richardson Highway was constructed, with power due to be delivered in early 2006; and mill and infrastructure facilities were partially constructed. Fairbanks Gold Mining Inc. acquired capital equipment and undertook advanced stripping at the Fort Knox Mine. Coeur Alaska Inc. continued development investment at Kensington Project in anticipation of permit appeal resolution in early 2005. The U.S. Forest Service record of decision was issued on December 17 but appealed by the Southeast Alaska Conservation Council (SEACC), which filed an appeal on the last day of the appeal process. Greens Creek Mine Co. undertook tailings storage improvements and investments in underground development during the year. Usibelli Coal Mine Inc. invested in equipment and advanced stripping. The acquisition of a large cutter-head floating dredge by a Fairbanks gravel producer was a highlight for the sand and gravel industry.

The value of mineral production for 2004 was $1,338.7 million compared to 2003 at $1,000.7 million, a $338.0 million improvement. Increased value for metals production offset reduced volumes of production for all metal commodities. Gold prices were 12.75 percent higher in 2004 at $409.72 per ounce, silver 36.68 percent higher at $6.67 per ounce, lead 5.26 percent higher at $0.40 per pound, and zinc 23.68 percent higher at $0.47 per pound. Hard rock metal production volumes were down for all commodities; placer gold production increased by about 4,500 ounces. Hard rock metals production shortfalls follow: Gold, 71,683 ounces; silver, 1,641,830 ounces; lead, 11,683 tons; and zinc, 34,754 tons. Fairbanks Gold reported the most significant gold production shortfall due to delaying mining at True North to facilitate stripping at Fort Knox. Ore grades at both Red Dog and Greens Creek mines were down slightly, thereby affecting lead, zinc, and silver values. Increased production volumes of rock, sand, gravel, and coal are noted and helped offset the losses in production volumes in the metals sector. Placer gold production for 2004 increased by 4,474 ounces to 28,074 ounces from 2003 at 23,600 ounces.

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

	Exploration (expenditure)	Development (expenditure)	Production (value)	Total (calculated)
1981	76.3	24.7	188.6	289.6
1982	45.6	41.6	196.4	283.6
1983	34.1	27.9	212.4	274.4
1984	22.3	53.4	199.4	275.1
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	29.6	560.8	620.6
1993	30.3	27.7	448.7	506.7
1994	31.1	45.0	507.5	583.6
1995	34.3	148.6	537.2	720.1
1996	44.7	394.0	590.4	1,029.1
1997	57.8	168.4	936.2	1,162.4
1998	57.3	55.4	921.2	1,033.9
1999	52.3	33.8	1,032.9	1,119.0
2000	34.9	141.7	1,106.4	1,283.0
2001	23.8	81.2	917.3	1,022.3
2002	26.5	34.0	1,012.8	1,073.3
2003	27.6	39.2	1,000.7	1,067.5
2004	70.8	209.1	1,338.7	1,618.6
TOTAL	**$930.2**	**$2,163.2**	**$13,923.8**	**$17,017.2**

Source: Alaska's Mineral Industry reports published annually by DGGS/Commerce.

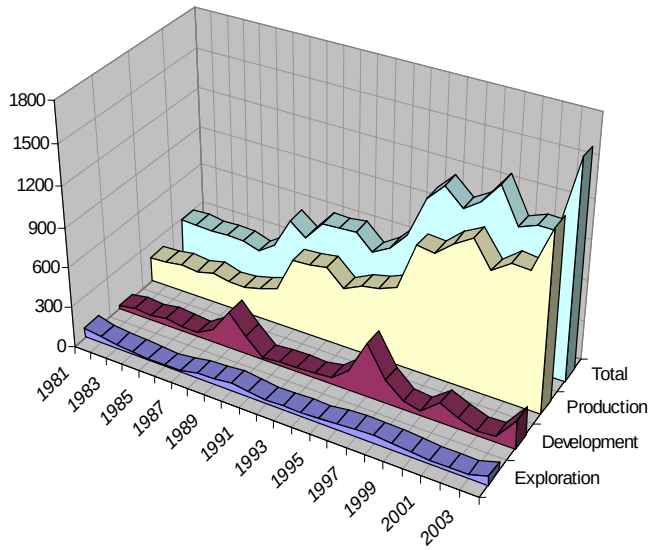


Figure 2. *Alaska's mineral industry total value, 1981–2004.*

EMPLOYMENT

Table 2 lists estimated employment in the Alaska mineral industry for the past 8 years. Figure 3 displays employment within various segments of Alaska's mineral industry. The total mineral industry employment in 2004 is estimated to be 3,048 full-time-equivalent jobs, an increase of 1,142 jobs from the estimated 2003 total of 1,906 jobs and an increase of 224 jobs from the 2002 employment total. Most of the increase was in the exploration, development, and industrial minerals production sectors. It is expected that the number of jobs in the development sector will increase for 2005 as more large mining projects transition into the construction phase. Lode gold mining jobs will increase in 2005 and 2006 when several mining projects begin production. A worldwide shortage of experienced miners and mine employees may also affect the growth of lode mining in Alaska. Higher metal prices may also spur more placer gold mining, but higher fuel costs may limit that change.

ACKNOWLEDGMENTS

This report on the Alaska mineral industry is intended to provide current, accurate, and technically reliable information. The authors wish to thank all companies, agencies, and individuals that responded to the questionnaires or phone calls and provided information about their activities and operations. Without their voluntary and timely information this report would not be possible.

DGGS mailed more than 1000 questionnaires in December 2004 and received 110 responses. Another set of questionnaires was mailed in early 2005. Dave Szumigala (DGGS) and Rich Hughes (Commerce) prepared the body

Table 2. *Estimated Alaska mine employment, 1997–2004*[a]

	1997	1998	1999	2000	2001	2002	2003	2004
Gold/silver mining								
Placer	780	710	591	470	176	148	82	64
Lode	415	345	296	274	337	413	325	433
Polymetallic mining	230	275	275	275	275	262	295	265
Base metals mining	478	466	549	556	559	580	388	508
Recreational mining	270	255	240	250	210	180	175	175
Sand and gravel	700	658	590	603	556	702	349	567
Rock	123	121	128	150	137	177	35	475
Coal	118	128	121	121	121	100	65	90
Peat[b]	42	40	38	36	32	21	20	4
Tin, jade, soapstone, ceramics, platinum	20	20	20	20	20	20	20	0
Mineral development	409	177	135	345	333	135	64	283
Mineral exploration	277	282	183	83	79	86	88	184
TOTAL	**3,862**	**3,477**	**3,166**	**3,183**	**2,835**	**2,824**	**1,906**	**3,048**

[a]Reported man-days are calculated on a 260-day work year to obtain average annual employment unless actual average annual employment numbers are provided.
[b]This figure does not include all of the man-days associated with peat operations; most of those man-days are included in sand and gravel numbers.

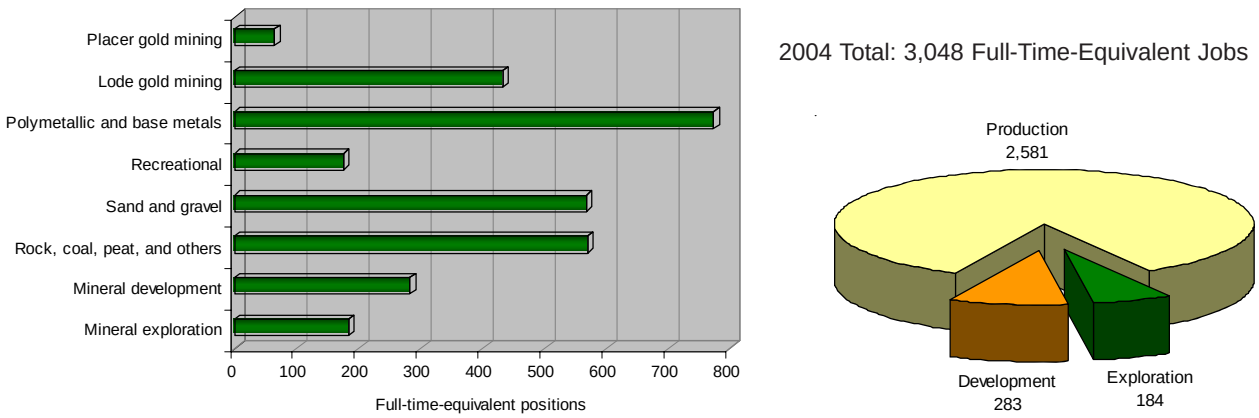


Figure 3. *2004 mineral industry employment by category.*

of the text, tables, and appendices with information supplied by many individuals and with the assistance of staff from other agencies. Where appropriate, these people have been acknowledged in the text. Information and text previously compiled for DGGS Information Circular 51 were used extensively.

The cover design is by Joni Robinson, and the graphic illustrations are modified from earlier versions made by Fred Sturmann and Joni Robinson of DGGS. Paula Davis (DGGS) edited the final version, and Joni Robinson completed the layout and design. The Office of Economic Development paid printing costs.

EXPLORATION

Exploration expenditures in Alaska during 2004 were at least $70.8 million, more than double the $27.6 million spent in 2003. At least 15 projects had exploration expenditures of $1 million or more. As in years past, most exploration funds (approximately 75 percent) were derived from Canadian sources. Seven percent of the exploration funds were from non-U.S. and non-Canadian sources.

Exploration was conducted throughout Alaska, but the largest projects were located in southwestern Alaska, eastern Interior Alaska, and southeastern Alaska. Several large projects, notably Northern Dynasty Minerals Ltd.'s Pebble copper–gold project in southwestern Alaska, Kinross Gold Corp.'s Fairbanks mining district projects in the Interior, Kennecott Minerals Co.'s exploration program at Greens Creek Mine, and Freegold Ventures Ltd.–Pacific North West Capital Corp.–Lonmin PLC's Union Bay platinum–nickel–copper project in southeastern Alaska, accounted for most of the exploration expenditures and drill footage.

Advanced exploration projects include Placer Dome Inc.–NovaGold Resources Inc.–Calista Corp.'s 23-million-ounce Donlin Creek intrusion-hosted gold project and Northern Dynasty's Pebble copper–gold porphyry project in southwestern Alaska, with announced resources of 26.5 million ounces of gold and 16.5 billion pounds of copper. Announced resources for the Pebble project spurred a mining claim staking rush late in 2003, with more than 300 square miles staked and subsequently explored for copper–gold porphyries during 2004. Continued exploration around the Fort Knox and Greens Creek mines made significant discoveries that extended mine resources. AngloGold Ashanti led exploration for intrusion-related gold deposits in Interior Alaska with projects in the Livengood and Goodpaster districts, and several companies continued projects in the Fairbanks district. Base-metal exploration was led by NovaGold Resources Inc.'s exploration of the Arctic volcanogenic massive sulfide (VMS) deposit in the Brooks Range. Platinum and associated metals exploration continued at the MAN project in the Alaska Range by Anglo American Exploration Ltd. and Nevada Star Resource Corp., and at Union Bay in southeastern Alaska by Lonmin, Pacific North West Capital, and Freegold Ventures.

According to the Metals Economics Group (MEG), the worldwide budget for hardrock mineral exploration increased by 58 percent in 2004 over 2003. This reverses a 5-year period of declining exploration spending. Also reversing a declining trend, the largest percentage increase in exploration budgets in 2004 compared to 2003 took place in the United States (85 percent) and the Pacific Rim region (69 percent). The top four geographic areas for exploration in 2004 were Latin America ($774 million), Canada ($696 million), Africa ($572 million), and Australia ($522 million). The United States was fifth with $284 million compared to $153 million in 2003. The bulk of the U.S. increase is in Alaska and Nevada. Alaska's mineral exploration is about 25 percent of the total exploration budget for the United States.

Increased exploration expenditures in Alaska mirror mineral exploration budget increases worldwide. The increases in worldwide exploration expenditures were due to a combination of increased spending by major mining companies, a significant reduction in the negative influence of industry consolidation from peak years 2000 and 2001, and higher spending by junior mining companies in response to stronger gold and base-metal prices. The stronger Canadian dollar and attractive tax incentives for investors in Canada-based projects likely limited even more investment in Alaska.

Exploration expenditures and employment by region are detailed in table 3. Exploration expenditures by commodity are listed in table 4 and shown in figure 4. Figure 5 is a graph of mineral exploration expenditures in Alaska from 1956 to 2004. Exploration expenditures per year are shown with raw (not adjusted for inflation) and adjusted (inflation adjusted to 2004 dollars) values. The locations of significant exploration projects in Alaska during 2004 are shown in figure 6. Gold remained a major exploration commodity, but exploration for copper–gold porphyry systems (grouped with polymetallic deposits) was the major exploration target in 2004 (table 4). Base metal exploration expenditures increased significantly from 2003 levels. Platinum-group-element exploration remained steady.

Table 5 summarizes the number of new and active (new plus existing) mining claims per year, from 1991 to 2004. The table lists the number of 20-acre federal mining claims,

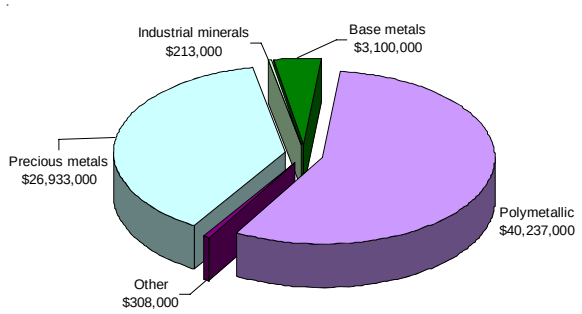


Figure 4. *2004 exploration expenditures by commodity.*

160-acre state prospecting sites, and 40- or 160-acre state mining claims. About 2,628 new state mining claims (343,800 acres), 141 new state prospecting sites (22,560 acres), and 66 new federal claims (1,320 acres) were staked in 2004. State claim staking decreased slightly from 2003 levels, while the number of new federal mining claims dropped drastically from 2003 levels to the lowest value in the past 25 years. However, the number of active 160-acre state claims doubled from 2003 to 2004. The amount of land in Alaska under claim increased from 2003 to 2004, with approximately 3.3 million acres of land covered by claims and prospecting sites in 2004. This acreage is an increase of 14 percent from 2003 levels, but still 11 percent below the 3.7 million acres under claim in 1999. Alaska had 8,313 active federal claims in early 2005.

Prospecting sites and mining claims were staked across Alaska, with detailed information listed in Appendices A and B. Several large blocks of mining claims were staked in 2004. Alaska Earth Resources Inc. staked approximately 137 square miles of state mining claims in the Pebble area. AngloGold USA Exploration Inc. added approximately 34 square miles of claims to their holdings in the Pogo area, and staked claims in the Livengood area and the South Fork of the Kuskokwim River in the Revelation Mountains. Kennecott Exploration Co. and Alaska Earth Resources staked approximately 169 square miles of state mining claims in the Skwentna River-Happy River-Rainy Pass Lodge area. On-Line Exploration Services staked 31.5 square miles of state mining claims for Shulin Lake Mining Inc. in the Kahiltna River area.

The largest groups of claims (mostly state claims) in Alaska are staked in the Fairbanks, Pogo, Tangle Lakes (Denali Block), and Pebble areas. Mining claims in the Fairbanks area cover 133,480 acres, or more than 208 square miles. Placer claims account for 25 percent of the total claim acreage in the Fairbanks area. Claims in the Pogo area now cover in excess of 540 square miles. Mining claims in the Tangle Lakes area near the Fish Lake ultramafic complex cover more than 350 square miles. Mining claims in the Pebble area now encompass more than 715 square miles.

Alaska suffered through a record fire season during 2004, with over 681 fires and over 6.5 million acres of forested land burned. Most of the state had poor air quality and visibility for much of the summer from these forest fires, but the Eastern Interior Region suffered the most damage to mining and mineral facilities. Fort Knox Mine was evacuated for several days for a loss of at least $250,000 in mineral production. The camp, work areas, and airstrip at the Pogo Project were threatened by fire and development activities were suspended during the most active periods of fire. At least one mineral exploration camp was completely destroyed by forest fire, innumerable exploration projects were hampered by poor visibility and dangerous flying conditions, and some exploration or mining projects were suspended or cancelled.

Table 3. *Reported exploration expenditures and employment in Alaska, 2004*

	Northern	Western	Eastern interior	South-central	South-western	South-eastern	Alaska Peninsula	Total
				Exploration expenditures				
Placer	$1,849,600	$ 107,000	$ 166,500	$ 60,600	$ 10,000	$ 35,000	$ 0	**$ 2,229,000**
Lode	$3,905,000	$5,540,000	$7,133,000	$4,326,000	$40,551,000	$7,077,000	$51,000	**$68,583,000**
TOTAL	**$5,754,600**	**$5,647,000**	**$7,299,500**	**$4,386,600**	**$40,561,000**	**$7,112,000**	**$51,000**	**$70,812,000**
				Exploration employment				
Employment								
Workdays	3,421	4,500	7,059	3,303	22,690	6,764	20	47,737
Workyears[a]	14	18	28	13	88	27	0	184
Companies reporting[b]	7	13	32	26	11	13	1	103

[a]Based on 260-day workyear.
[b]Some companies were active in several areas.

NORTHERN REGION

NovaGold Resources Inc. completed extensive structural mapping, along with relogging and resampling of the existing historic core to update and refine the three-dimensional model of the Arctic deposit in the Ambler massive-sulfide district of the western Brooks Range (fig. 7). The Ambler volcanogenic massive sulfide belt has been largely unexplored since the early 1980s. NovaGold is acquiring a 51 percent interest in the Ambler property, which contains all the currently reported resources, through an option agreement with subsidiaries of Rio Tinto PLC. Under the terms of the agreement, NovaGold can earn a 51 percent interest by matching Kennecott's expenditures on the property totaling $20 million before 2016. NovaGold, through its option agreement with Rio Tinto PLC, controls the claims covering the majority of the prospective belt.

NovaGold's recent work included defining the structural framework of the mineralization, better determining the precious metal distribution and zonation patterns, and defining the mineralized and alteration packages, particularly quantifying the alteration associated with the higher grade mineralization. Ongoing modeling suggests that the deposit occurs as at least two extensive and continuous ore horizons along both limbs of a relatively flat-lying fold. The mineralized horizons in the upper limb of the fold crop out just below a prominent topographic ridge on the east side of the deposit and roughly parallel that surface, dipping to the west at about 500-foot depth. Mineralization has been intercepted over a 0.36-square-mile area and remains open toward the south and east on the lower side of the fold.

NovaGold drilled 9,768 feet of core in 11 holes on the Arctic deposit. Drill holes AR04-78, AR04-79, and AR04-83 intersected particularly wide intervals of high-grade mineralization. Drill results include: Drill hole AR04-78 intersected two high-grade massive-sulfide horizons with a composite mineralized interval totaling 85.3 feet of 8.0 percent copper equivalent. Drill hole AR04-79 intersected four high-grade massive-sulfide horizons with

Table 4. *Reported exploration expenditures in Alaska by commodity, 1982–2004*

	Base metals	Polymetallic[a]	Precious metals[b]	Industrial minerals	Coal and peat	Other[c]	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	8,545,000	3,933,000	21,579,000	58,500	- -	736,100	**34,851,600**
2001	4,810,000	1,977,000	15,820,000	50,000	10,000	1,106,000	**23,773,000**
2002	1,700,000	5,162,000	17,342,000	185,000	- -	2,113,000	**26,502,000**
2003	262,000	7,081,000	19,726,000	- -	W	533,000	**27,602,000**
2004	3,100,000	40,237,000	26,954,000	213,000	50,000	258,000	**70,812,000**
TOTAL	**$99,270,566**	**$137,501,161**	**$588,422,743**	**$5,054,500**	**$16,937,750**	**$6,593,900**	**$853,780,620**

[a]Polymetallic deposits considered as a separate category for the first time in 1992.
[b]Approximately $3.3 million spent on platinum-group-element exploration during 2004 ($2.4 million in 2003, $650,000 in 2002, $2 million in 2001).
[c]Includes diamonds and tantalum.
N/A = Not available.
- - Not reported.
W - Withheld, data included in other

composite mineralized intervals totaling 159.5 feet of 8.9 percent copper equivalent, including a 90.5-foot intercept grading 0.07 ounces of gold per ton, 2.31 ounces of silver per ton, 5.5 percent copper, 7.9 percent zinc, and 1.3 percent lead, equaling 11.6 percent copper equivalent. Drill hole AR04-82 intersected two massive-sulfide intervals with composite mineralized intervals totaling 37.4 feet of 6.9 percent copper equivalent and drill hole AR04-83 intersected two massive-sulfide horizons with composite mineralized intervals totaling 60.7 feet of 9.4 percent copper equivalent. Four of five initial drill holes intersected the mineralized horizon, confirming the geologic model for the deposit. Drill hole AR04-81 did not intercept any significant mineralization due to a likely fault offset of the zone.

Teck Cominco restarted drilling for extensions of the Red Dog and associated sedimentary-exhalative zinc–lead–silver deposits in northwestern Alaska. Previous drilling had discovered rich zinc–lead–silver deposits north–northwest of the Red Dog Mine coincident with gravity anomalies. Limited exploration in the Red Dog district included a drill hole north of the Anarraaq deposit, which intersected 115 feet of 14.7 percent zinc. No other results were announced from the seven-hole program. Additional exploration in the Red Dog camp is planned for 2005.

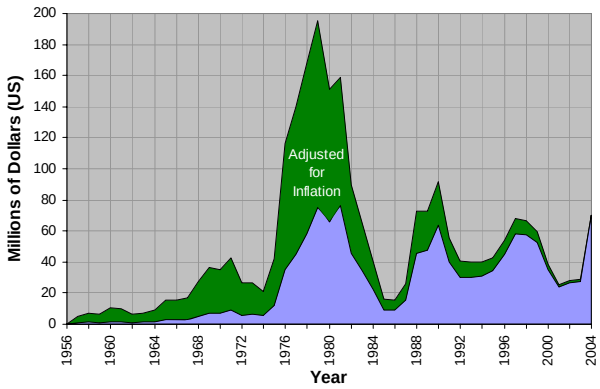


Figure 5. *Alaska mineral exploration expenditures 1956–2004.*

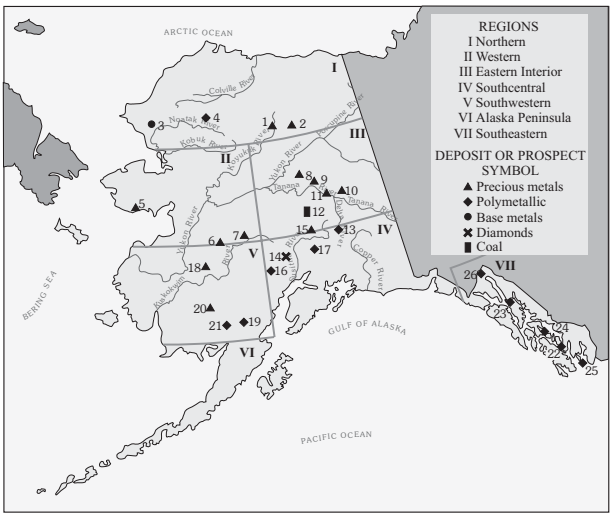
I Northern Region
1. Nolan Creek—Silverado Gold Mines Ltd.
2. Little Squaw Mine—Little Squaw Gold Mining Co.
3. Red Dog Mine—Teck Cominco Alaska Inc.
4. Ambler Project – NovaGold Resources Inc.

II Western Region
5. Big Hurrah Mine— NovaGold Resources Inc.
6. Ganes Creek—Full Metal Minerals Ltd.
7. Nixon Fork Mine—St. Andrew Goldfields Ltd.

III Eastern Interior Region
8. Livengood District—AngloGold (USA) Exploration Inc.
9. Fairbanks District
   a. Fort Knox-True North & District—Kinross Gold Corp.
   b. Golden Summit—Freegold Ventures Ltd./ Meridian Gold Inc.
   c. West Ridge—Teryl Resources Corp.
   d. Fish Creek—Teryl Resources Corp./Linux Gold Corp.
10. Pogo—Goodpaster mining district
    a. ER and Eagle—AngloGold (USA) Exploration Inc./Rimfire Minerals Corp.
11. Richardson district—Tri-Valley Corp.
12. Jumbo Dome—Usibelli Coal Mine Inc.

IV Southcentral Region
13. MAN—Anglo American Exploration (Canada) Ltd., Nevada Star Resources Inc.
14. Shulin Lake—Golconda Resources Ltd./Shulin Lake Mining Inc./Shear Minerals Ltd.
15. Gold Hill—Max Resource Corp.
16. Whistler—Kennecott Exploration Co.
17. Gunsite—Full Metal Minerals Ltd.

Figure 6. *Selected exploration projects in Alaska, 2004.*



V Southwestern Region
18. Donlin Creek—Placer Dome Inc.
19. Pebble area
    a. Pebble—Northern Dynasty Minerals Ltd.
    b. Big Chunk—Liberty Star Gold Corp.
    c. Pebble South— Full Metal Minerals Ltd.
20. Shotgun—TNR Gold Corp.
21. Iliamna—Geocom Resources Inc.

VI Alaska Peninsula Region

VII Southeastern Region
22. Union Bay—Lonmin PLC/Pacific North West Capital Corp./Freegold Ventures Ltd.
23. Greens Creek Mine—Kennecott Minerals Co.
24. Woewodski Island—Olympic Resources Group LLC/ Bravo Venture Group Inc.
25. Duke Island—Quaterra Resources Inc.
26. Palmer—Toquima Mineral Corp.

Table 5. *Summary of claim activity by acres, 1991–2004*

Year	State Claims				State Prospecting Sites		Federal Claims	
	New 40 acre	New 160 acre	Total (Active) 40 acre	Total (Active) 160 acre	New	Total (Active)	New	Total (Active)
1991	3,277	0	38,485	0	747	1,735	1,299	23,222
1992	2,650	0	36,947	0	454	1,490	695	20,254
1993	2,110	0	34,908	0	1,412	2,281	601	9,298
1994	4,064	0	35,184	0	810	2,449	341	8,495
1995	4,508	0	31,796	0	1,030	2,850	376	7,766
1996	9,496	0	37,843	0	2,082	3,735	681	9,346
1997	8,671	0	44,001	0	2,474	5,328	1,872	11,320
1998	9,785	0	50,738	0	3,194	7,276	427	11,033
1999	11,977	0	57,012	0	1,755	7,652	308	10,176
2000	4,472	614	54,773	614	1,142	5,860	523	7,805
2001	859	907	49,361	1,501	27	3,131	464	8,248
2002	745	826	43,380	2,175	61	2,165	261	8,100
2003	857	2,602	37,151	4,358	101	1,871	676	8,424
2004	639	1,989	33,452	9,760	141	1,581	66	8,313

Federal claims = 20 acres, State claims = 40 acres or 160 acres, State prospecting sites = 160 acres.
Information provided by Jack Davis (Land Records Information Section, DNR) and Robert Brumbaugh, Karon Goslin, and John Hoppe (USBLM). Table has been reorganized to conform with computer records available after 1990.

Little Squaw Gold Mining Co. explored its wholly owned gold mining claims at Chandalar, Alaska. Little Squaw expanded its mining claims position from 8,550 acres to 9,830 acres (15.4 square miles), largely to cover important outlying gold prospects. Pacific Rim Geological Consulting was hired to provide a technical analysis of potential placer and lode gold deposits in the Chandalar area and completed an initial structural geology study of the Chandalar district using high altitude aerial photography. Numerous pronounced linears interpreted to represent deep-seated faults were identified. Some of the linears form horst and graben-like features, suggesting block faulting. Major structural intersections are believed to be a controlling factor in the emplacement of the Chandalar district gold mineralization.

Figure 7. *An extensive network of roads access drilling and exploration sites on the Arctic property in the Ambler mineral district. The drainage in the center of the photo bisects the known massive-sulfide mineralization. Photo provided by NovaGold Resources Inc.*

Fifty-nine linear intersections were identified, and ten were selected for priority field examination. Results from recent sampling of the Little Squaw vein include a grab sample of quartz veining in a trench that assayed 5.24 ounces of gold per ton, a channel sample in a tunnel below that trench that yielded 19.98 ounces of gold per ton over 3.54 feet of true width, and another channel sample of ribbon quartz taken ten feet farther along the tunnel that assayed 5.16 ounces of gold per ton over 0.85 feet (fig. 8). Two recent grab samples from the Mikado mine dump assayed 23.28 ounces of gold per ton with 5.24 ounces of silver per ton and 1.57 ounces of gold per ton with 0.83 ounces of silver per ton.

Several prospects of previously unevaluated or unknown gold mineralization have been found, with the most significant prospects being the Crystal, Pioneer, and the Rock Glacier prospects. The Crystal prospect was relocated this year, with the old 8-foot-deep shaft and associated trenches completely caved in, but the Crystal quartz veins can be traced over a strike length of at least 400 feet. The main quartz vein at the Crystal prospect is at least 5 feet thick, and has a 0.67-foot-thick footwall of ribbon quartz that assayed 3.64 ounces of gold per ton.

At the Pioneer prospect, channel sampling of a quartz vein partially exposed in an old working yielded an assay of 2.30 ounces of gold per ton over a width of 2.5 feet. A

Figure 8. *Sampling historic underground workings at the 100 Level of the Little Squaw Mine. The back (roof) of the adit is massive white quartz vein, with a banded quartz-gold footwall zone (right) of the Little Squaw Vein. The vein is 4 feet thick at this location and the view is along strike looking west. The white bars represent sample areas. Samples LS1621 and LS1622 contained only trace amounts of gold, and sample LS1620 assayed 89.12 ounces of gold per ton. Photo provided by James Barker and Little Squaw Gold Mining Co.*

grab sample 15 feet away consisting of quartz vein float assayed 2.16 ounces of gold per ton. This prospect contains very high-grade gold values of unknown extent, and it is also associated with a major shear zone at least 3 miles long. Anomalous soil samples in the Pioneer prospect area range between 0.0035 and 0.018 ounces of gold per ton and are interpreted to define a vein strike length in excess of 1,500 feet with at least 150 feet of vertical relief.

The Rock Glacier prospect is a previously unreported area of widespread quartz in debris of a large rock glacier. Random chip samples of cobbles of vein quartz are highly anomalous in gold with assays up to 0.19 ounces of gold per ton. Some of the quartz boulders are up to three by nine feet in size. Stream-sediment samples from the stream draining the rock glacier are also highly anomalous in gold, assaying 0.013 ounces of gold per ton. The rock glacier covers a portion of the strike length of the Eneveloe shear zone, and the rock glacier may cover a significant zone of gold mineralization. Soil samples taken from a possible source area have gold anomalies indicating a swarm of six or more buried veins with assays between 0.0053 and 0.013 ounces of gold per ton. A series of previously unreported and closely spaced gold–quartz veins on a ridge opposite the Rock Glacier gold anomaly were found at the new Uranus prospect and an aggregate sample of this material assayed 1.47 ounces of gold per ton. Additional work included soil sampling at the Big Tobin prospect where mineralized shear zones may be an extension of the Mikado mineralized vein system; quartz vein sampling at the McLellan prospect of five previously unreported quartz veins that may be a faulted offset extension of the Crystal vein; and rock sampling of unusual silver–bismuth–lead-rich mineralization in quartz veins at old prospect pits and caved adits at the Prospector East prospect, with an assay of 23.8 ounces of silver per ton, 0.08 ounces of gold per ton gold and 11.7 percent lead from a grab sample. Minimal work was completed on the Summit, Drumlummon, Pallasgren, and Jackpot prospects.

Silverado Gold Mines Ltd. continued a hard rock exploration program at the Nolan Creek property near Coldfoot on the Solomon Shear, a northeast–southwest-trending structure that may be the source of placer gold in the area. Beginning in November 2003 and continuing through January 2004, Silverado completed five rotary drill holes planned to cross cut into a section of the shear at a low angle. A significant gold–arsenic–antimony anomalous trend was confirmed by soil sampling during the 2004 summer lode exploration program. Soil samples, including 117 organic soil samples and 108 C-horizon soil samples, were taken with a power auger. An anomalous trend in the soil samples is defined by gold values from 10 to 35 parts per billion, arsenic from 90 to 860 parts per million (ppm) and antimony from 35 to 250 ppm. The trend is confirmed by arsenic in organic horizon soil samples ranging from 80 to 600 ppm.

A ground electromagnetic survey (VLF-EM) was conducted along this trend and beyond over 12 line miles. The fraser-filtered results show an electromagnetic conductor pattern coincident with the geochemical trend. Silverado also sampled streams being fed by the shear zone and collected 75 stream-sediment samples. Assays of panned concentrates from stream sediments showed 37 of 75 samples containing from 0.03 to 3 ounces per ton gold. Some of these results confirmed the anomalous trend in the soils while other results showed additional areas of the property to be favorable for future follow-up. Silverado planned and completed several thousand feet of trails and trenches over the Solomon Shear. Quartz–carbonate altered rock was exposed in three zones up to 100 feet wide in the trenches and these altered zones had anomalous arsenic and antimony values with gold values up to 0.050 ounces of gold per ton. No exploration work was completed on the Nolan Deep Channel placer gold deposits during 2004.

WESTERN REGION

The Seward Peninsula was the center of activity for the western region of Alaska. NovaGold Resources continued advanced exploration on the Rock Creek gold property near Nome and is currently studying taking this project to the development phase. NovaGold completed

19,427 feet of infill drilling and 3,250 feet of trenching at the Rock Creek property for an updated geologic and mineralization block model (fig. 9). NovaGold also conducted trenching and drilling (reverse-circulation and core) at the historic Big Hurrah Mine in the Solomon mining district east of Nome. Drilling found zones of quartz veining with coarse, visible gold. Historic exploration at the Big Hurrah property identified multiple shallow mineralized quartz veins and zones with past production of 5,000 ounces of gold at an average grade of 1 ounce of gold per ton. DGGS conducted geologic mapping and geochemical sampling around the Big Hurrah area and in the Council area as part of an integrated program following up the airborne geophysical survey results released by DGGS in 2003.

St. Andrew Goldfields Ltd., in a joint-venture agreement with Mystery Creek Mining, continued exploration work on the historic Nixon Fork gold–copper mine near McGrath. Work included drilling to explore and expand known gold resources at the mine, exploration drifting, and other studies to reopen this mine, possibly in late 2005. Aeroquest Ltd. completed a 700-line-mile time-domain aeromagnetic and electromagnetic geophysical survey over the Nixon Fork area. Results of this survey will be incorporated into the existing Geoinformatics three-dimensional database and three-dimensional models of the area and the targets generated will form part of an expanded exploration program for 2005. Extensive drilling was completed throughout the Nixon Fork property. Work toward the plan of operations, water, and air quality permits continued all year. It is anticipated that these permits will be issued in the first half of 2005. Underground development and stope preparation are planned to start in the second half of 2005. Mining operations are planned at an annual rate of 66,000 tons, with an estimated 50,000 ounces of gold produced per year. The existing metallurgical circuit was extensively revised through metallurgical test work and engineering to permit the production of gold dore and saleable copper products on site with improved metallurgical recoveries. The re-treatment of the existing mine tailings was designed and engineered using portions of the new metallurgical circuit. (fig. 10).

Underground definition and exploration drilling began in January 2004 and continued throughout the year totaling 48,076 feet. Definition drilling from the newly constructed 185DDS and two older drill stations focused on the C3000 and C3300 mineralized areas (these two areas accounted for the bulk of the ore mined previously at Nixon Fork) (fig. 11). One hundred eight drill holes totaling 35,474 feet were drilled across inferred extensions of these mineralized areas at an optimal drill spacing of 23 feet along strike and 49 feet along plunge/dip. Some highlights of the drilling include 15 feet of 10.2 ounces of gold per ton in hole DH-83, 5 feet of 1.20 ounces of gold per ton in hole DH-92, 10.5 feet of 1.29 ounces of gold per ton in hole DH-109, and 11.1 feet of 0.67 ounces of gold per ton in hole DH-112. Drilling of the C3300 chute confirmed the vertical continuity of this zone from the surface (1,300 feet above sea level) to 280 feet above sea level. Drilling of the C3000 chute confirmed the vertical continuity from the lowest mined level (525 feet above sea level) down to the 280-foot level and closed it off at depth discounting previously inferred resources below this level of the mine. Underground mapping and drilling from the 185 level drilling platform also identified significant sheeted

Figure 9. *Driller holding a core sample at the Rock Creek gold property. Photo provided by NovaGold Resources Inc.*

Figure 10. *Auger drilling historic tailings at the Nixon Fork Mine for metallurgical and geochemical testing. St. Andrew Goldfields Ltd. plans to reprocess the tailings from past mining operations and recover additional gold. Photo provided by St. Andrew Goldfields Ltd.*

Figure 11. *Downhole testing of rock and water properties during 2004 drilling program at the Nixon Fork Mine. St. Andrew Goldfields Ltd. continued to conduct geological and environmental studies at the Nixon Fork Mine. Photo provided by St. Andrew Goldfields Ltd.*

quartz–arsenopyrite–pyrite veins with sericitic selvages that are thought to be responsible for mineralization in the C3000 and C3300 areas.

Additional underground drilling at Nixon Fork included 13 holes totaling 2,425 feet directed at deep levels of the C3004 zone and 15 holes totaling 9,118 feet directed at the J2100 and J2200 zones (e.g., J5A area). Drilling in the C3004 area did not hit any significant mineralization, essentially closing off this zone at depth. The drilling aimed at the J5A area indicated vertical continuity of nearly all of the previously defined mineralized zones and extended these zones at depth. Drilling in the J5A area continued into 2005 and provided enough data to re-evaluate the geological features responsible for gold resources located along the northern contact of the Mystery Creek Pluton. The highlights of drilling at J5A were the identification of (1) significant feeder structures within the quartz monzonite (e.g., quartz–arsenopyrite–pyrite veins with sericitic selvages) inferred to be conduits for hydrothermal fluids responsible for gold mineralization in the skarn in this area, and (2) a single permissive lithological unit in recrystallized Paleozoic carbonates believed to be responsible for hosting gold mineralization in at least three mineralized skarn bodies correlated over a distance of 2,625 feet along strike (Mystery Mine-M1100; J5A-J2201; and Crystal Mine-C3000 and C3300). Roscoe Postle Associates Inc. of Toronto is preparing an updated reserve and resource statement to incorporate the 2004 exploration drilling results. St. Andrew planned to continue the underground drilling program through the winter.

A minor amount of surface exploration was carried out at the Nixon Fork property during 2004. This work concentrated primarily on the Whalen/North Star areas located along the southwestern contact of the Mystery Creek Pluton. Exploration in this area included the review of all available data, 2,050 feet of trenching, surface and trench mapping, collection of 174 rock samples, and 210 feet of surface drilling in one hole beneath the North Star Shaft. Surface trenching and sampling results from the Whalen area include intercepts and grades ranging from 1.3 feet assaying 0.028 ounces of gold per ton to 3.28 feet assaying 0.573 ounces of gold per ton and 2.6 percent copper and 4 feet assaying 0.308 ounces of gold per ton and 2.38 percent copper. Results from samples taken from old workings in the Whalen Glory Hole range from 1.1 feet assaying 0.586 ounces of gold per ton and 0.42 ounces of silver per ton to 1.3 feet assaying 1.31 ounces of gold per ton and over 3 ounces of silver per ton. The work done at the Whalen/North Star areas indicates the likelihood of near-surface mineable mineralization, vertical continuity of known skarn zones, and the possibility of a large high-grade placer deposit downslope from this area. Additionally, this work outlined controls for mineralization at the Whalen/North Star areas that are similar to controls along the northern contact of the Mystery Creek Pluton.

Full Metal Minerals Ltd. continued exploration at the Ganes Creek property near McGrath. Fieldwork included collecting 1,316 soil samples over a 164-foot by 328-foot spaced soil grid over three placer gold producing creeks east of the main Ganes Creek channel. Interpretation of geochemical results from this and previous work identified several northeast-trending gold-anomalous zones, including a 3.5-mile-long anomaly proximal to a major fault zone. Prospecting work, including collecting 387 rock samples for geochemical testing, identified new showings and potential drill targets. A grab sample of highly carbonate altered and quartz-veined mafic intrusive rock from the old working of the Independence Mine assayed 1.43 ounces of gold per ton, and nearby samples of narrow quartz breccia zones exposed in trenches assayed from 0.17 to 0.26 ounces of gold per ton. At the Katz prospect, results from 14 samples collected over 16 feet from the end of a historic exploration drift range up to 0.28 ounces of gold per ton, with an average value of 0.11 ounces of gold per ton. Samples from the dump at the Katz prospect assayed up to 0.64 ounces of gold per ton. Elsewhere on the Ganes Creek property, geochemical results from numerous samples from quartz subcrop and float occurrences range from 0.14 to 0.23 ounces of gold per ton. These rock geochemical results are proximal to gold in soil anomalies. Interpretation of geochronological data from hornblende and chrome white mica indicates that dike intrusion and hydrothermal alteration occurred from 69.2 to 67.8 Ma.

EASTERN INTERIOR REGION

Kinross Gold Corp. continued exploration in the Fairbanks mining district with extensive drilling around the Fort Knox and True North gold deposits, focused on the conversion of resources to reserves and outlining the limits of gold mineralization (fig. 12). Kinross continued to find additional mineralization below the current Fort Knox pit. For example, hole FC-716 drilled in the east-central portion of the pit to test the extension of mineralization beneath the current ultimate pit, cut two strong zones of mineralization grading 0.316 ounces of gold per ton over 65 feet followed by 0.273 ounces of gold per ton over 35 feet. Kinross also conducted exploration elsewhere in the Fairbanks mining district.

Figure 12. *Reverse-circulation drilling by G.F. Back Inc. as part of Fairbanks Gold Mining Co.'s exploration of the Fairbanks mining district. Photo provided by Fairbanks Gold Mining Co.*

The Kinross/Teryl Resource Corp. Gil Joint Venture exploration program consisted of geologic mapping, excavating four trenches totaling 1,020 feet, drilling 18 reverse-circulation drill holes totaling 4,175 feet, and collecting more than 1,000 rock and soil samples for assays. Significant drilling results include hole 2000-GEC-120 with 30 feet grading 0.052 ounces of gold per ton, hole GER03-366 with 15 feet grading 0.101 ounces of gold per ton, hole GVR04-467 with 25 feet of 0.139 ounces of gold per ton, and hole GVR04-484 with 20 feet grading 0.275 ounces of gold per ton. Work at the Gil property, held jointly with Teryl Resources Corp., also was designed to gauge the feasibility of mining this gold resource as another satellite deposit for the Fort Knox Mine Complex. New exploration targets consisting of anomalous gold values associated with calc–silicate rocks and/or quartz veining were generated in the Main Gil area and at the Sourdough Ridge prospect.

Teryl Resources Corp. worked on several projects in the Fairbanks mining district. Teryl collected a total of 161 power auger soil samples and 14 shovel samples on a small grid over the southern part of the West Ridge claims adjacent to and within the one-quarter mile square block of State Trust land leased last year. Sample results included anomalous gold (greater than 100 parts per billion gold up to 981 parts per billion gold; up to 0.029 ounces of gold per ton) associated with elevated arsenic, antimony, lead, bismuth, and tungsten levels in four discrete areas. The soil grid was extended onto the northwestern portion of the Fox Creek claims after interpretation of the geochemical results. Teryl drilled six reverse-circulation holes at West Ridge on the Old Glory prospect, with anomalous gold mineralization in all holes and the best intercept of 35 feet grading 0.049 ounces of gold per ton in hole WRR0404. Teryl also drilled two reverse-circulation drill holes for a total of 587 feet of drilling in the Fox Creek area. The holes were largely drilled through quartzite and quartz–mica schist, with short intervals of pyrite- and molybdenite-bearing granite and hornfels. Hole FC04-02 had two 5-foot intervals of anomalous gold mineralization: 0.037 ounces of gold per ton from 30 to 35 feet and 0.072 ounces of gold per ton from 180 to 185 feet. Both gold-bearing intervals were hosted in altered metasediments containing minor quartz veinlets. Elevated gold values were associated with anomalous arsenic (up to 0.57 percent), molybdenum (up to 82 parts per million) and tungsten (up to 40 parts per million). On the Fish Creek property, a 50 percent option from Linux Wizardry Systems Inc., a total of 20 placer holes (shallow, larger diameter reverse-circulation holes) were completed and two deeper reverse-circulation holes were drilled to test a gold target in a granite body.

Freegold Ventures Ltd. (Freegold), in a joint-venture agreement with Meridian Gold Inc., continued exploration on the Golden Summit project on Cleary Summit in the Fairbanks mining district. Channel sample results from 2004 trenching include 130 feet grading 0.04 ounces of gold per ton in the Zeba trench, 60 feet grading 0.031 ounces of gold per ton in the East trench, and 30 feet grading 0.047 ounces of gold per ton in the 7E trench. Six core holes were drilled to confirm both the structural and grade continuity of a portion of the Cleary Hill vein system. Drilling highlights include a 6-foot interval of 0.283 ounces of gold per ton from an unknown vein in hole CHD 200401 at a depth of 125.5 feet, and a 10.5-foot interval grading 0.449 ounces of gold per ton from the Cleary Vein in hole CHD 200403 at a depth of 567 feet. Gold mineralization in the 2004 drill holes consisted of fine-grained and visible free gold associated with quartz veins, stockworks, and quartz-rich shear zones containing 1–3 percent pyrite, arsenopyrite and jamesonite. The core sample results confirm that the old mine drawings from the 1940s accu-

rately portray the trend of high-grade mineralization associated with the Bankers Stope chute on the Cleary Hill vein. These cross section drawings also indicate several other mineralized vein systems that remain exploration targets.

Freegold concluded an agreement with Nautilus Alaska Inc. in mid-year to acquire Nautilus's rights to a 20-year lease on the Tolovana gold property on Cleary Summit. Freegold's Tolovana program consisted of 3,584 feet of diamond core drilling in seven holes completed in November that was designed to follow up promising geochemical results of 1,760 feet of trenching and sampling completed during August. Stockwork vein mineralization is known within the granodiorite intrusion, immediately south of the Tolovana Vein where previous drilling intersected high-grade gold values. Significant drilling results include hole TLD0401 with 5 feet grading 0.559 ounces of gold per ton and 10.5 feet grading 0.079 ounces of gold per ton; hole TLD0402 with 13.5 feet grading 0.052 ounces of gold per ton and 4.5 feet grading 0.310 ounces of gold per ton; hole TLD0403 with 17 feet grading 0.085 ounces of gold per ton; hole TLD0404 with 40 feet grading 0.088 ounces of gold per ton and 59.5 feet grading 0.048 ounces of gold per ton; and hole TLD0406 with 5 feet grading 0.073 ounces of gold per ton. The 2004 drill results from the Tolovana prospect suggest that high-grade mineralization hosted in metamorphic rocks (sericitically altered metasedimentary units of the Fairbanks Schist and quartz stockwork veined Chatanika Terrane schist) is concentrated on the eastern side of the vein system (holes TLD0401 and TLD0402) while mineralization on the central and western portions of the prospect are closely associated with or hosted by mid-Cretaceous granodiorite of the Dolphin stock. Gold in south-dipping quartz veins and polyphase vein breccias is associated with elevated arsenic and sporadic anomalous lead, antimony, and tungsten. Mineralization at the Dolphin prospect remains open to the southwest and at depth. Mineralization along the Tolovana vein system remains open at depth and along strike, particularly to the east toward the projected intersection of the Tolovana and Cleary Hill veins.

AngloGold USA Exploration Inc. (AngloGold) and partner Rimfire Minerals Corp. conducted exploration on the ER, Eagle, and Beverly gold projects in the Goodpaster area just west of the Pogo gold property. AngloGold, the operator of all three projects, conducted diamond drilling and groundwork at the ER and Eagle joint ventures and soil geochemical sampling at the Beverly project. At the ER property, 20.3 line miles of natural source audio magneto telluric (NSAMT) ground geophysical surveys, 234 soil samples and three diamond drill holes totaling 3,271 feet were completed. Two drill holes intersected numerous gold-bearing quartz veins and defined a northwest-trending vein structure that is open to the northwest and downdip. Hole ER04-7, following up a 2003 drillhole intercept of 1.6-foot zone assaying 1.838 ounces of gold per ton, intersected a 4.25-foot zone assaying 0.120 ounces of gold per ton. At the Eagle property, AngloGold collected 485 soil geochemical samples and extended the soil grid to 3.6-mile length and widths varying from 0.42 to 1.1 miles, conducted electromagnetic and radiometric geophysical surveys, and drilled nine diamond drill holes totaling 9,115 feet. Drilling found a total of 26 intersections from 0.65 to 5 feet in width, assaying from 0.03 to 0.41 ounces of gold per ton, and results indicate widespread granite-hosted quartz-sulfide stockwork mineralization. A deep penetrating electromagnetic (EM) survey was carried out late in the season that defined a strong northeast fault zone coincident with anomalous geochemistry. Stream-sediment sampling and soil geochemical sampling at the Beverly project had discouraging results and the property was dropped. Reconnaissance work by AngloGold identified three new gold targets in the Pogo area and drilling of these targets was planned for 2005. In March 2004 Rimfire Minerals Corp. added 42 claims to the Boundary property and 16 claims to the SE Surf property. Planned exploration by Rimfire on the Scot property was cancelled as a result of forest fires in the area.

AngloGold USA Exploration Inc. also conducted exploration, including drilling, on the Livengood project centered on Money Knob near Livengood. AngloGold has drilled 12 holes totaling 10,000 feet over the past 2 years, focused on high-grade gold structures in a Cretaceous intrusion. Drilling results to date confirm the presence of a large, low-grade, intrusion-related gold system with bonanza gold potential. Follow-up drilling was planned for the 2005 field season.

St. Andrew Goldfield Ltd. continued data analysis at the Uncle Sam project in the Richardson district. Gold mineralization is predominantly shear hosted in the metamorphic country rock with additional local zones of hydrothermal breccia and sulfide veining. Tri-Valley Corp. continued exploration on the Democrat property in the Richardson mining district. Tri-Valley Corp. also formed a mining subsidiary, Select Resources Corp., and Select Resources acquired a 34-square-mile area of interest on several gold, silver, and copper mineralization anomalies surrounding Shorty Creek near Livengood in December 2004.

Golden Spirit Minerals Ltd. finalized an agreement in October 2004 to acquire a 90 percent interest in five State of Alaska mining claims near Ester Creek and worked on the 4-square-mile Ester Creek property on the south flank of Ester Dome, including sampling and mapping altered bedrock fragments and intrusions. Golden Spirit discovered a strongly altered, sheared, and crushed quartz vein zone associated with an altered felsic dike in an area of old prospect trenches. Sample results across 10.5 feet of

the structure returned a weighted average of 2.11 ounces of gold per ton.

Ventures Resource Corp. terminated its exploration agreement with Doyon Ltd. on a large land holding extending from the Alaska–Yukon border into southwestern Alaska. Doyon representatives are looking for joint-venture deals to continue exploration and development of significant mineral-rich lands in their 12.5 million acres of land holdings.

Numerous placer miners across the Interior conducted minor exploration for placer gold. Most of the exploration was done on actively producing properties and most of the work was in the Fairbanks mining district.

Usibelli Coal Mine Inc. explored their coal leases on Jumbo Dome, approximately 9 miles north of the Two Bull Ridge Mine. Usibelli opened two large trenches and took two large bulk samples of coal from three coal seams (fig. 13). Analyses of the coal indicated very good quality, with approximately 4 percent ash content and 0.11 percent sulfur. These results are encouraging for the proposed Emma Creek Energy Project, a mine-mouth coal-fueled power plant envisioned for the Jumbo Dome area.

SOUTHCENTRAL REGION

Nevada Star Resource Corp focused its exploration work in 2004 on the northern sections of the MAN property in the Delta River mining district. In particular, exploration work focused on the Canwell, Rainy, Eureka (includes Telephone Hill), and Broxson (includes Ghezzi and Broxson Gulch) areas. Work included 3D mag-inversion, UTEM data interpretation, gravity work, min/max electromagnetic studies, and rock and soil sampling. The results from this and other data were used to identify four primary drill targets. Soil sampling along with 14.3 line miles of Max-Min geophysics and 7 line miles of ground magnetics over the Canwell prospect revealed a 5+ line-mile-long Max-Min conductor along the eastern margin of the Canwell mafic–ultramafic complex. This anomaly extends north of the Odie showing. Nevada Star completed a six-hole, 2,275-foot reverse-circulation drilling program on the Canwell intrusion (area 4) of the MAN property in the Delta River mining district. The drilling program targeted several conductors identified from exploration work completed on the Canwell intrusion earlier in the summer. Drilling intercepted variably serpentinized gabbro, pyroxenite, and dunite in the Canwell complex and younger intermediate intrusions on the eastern margin of the Canwell complex. Platinum and palladium values ranged from less than detection limits to highs of 174 and 128 parts per billion, respectively. Copper values ranged from 8 to 1,795 ppm (up to 0.18 percent), while nickel values ranged from 9 to 6,220 ppm (up to 0.62 percent). Platinum and palladium strongly correlate with each other and with nickel. Elevated platinum and palladium values are preferentially hosted in dunite-rich rock units while more differentiated gabbroic rock units contain only background levels of platinum and palladium.

Limited rock sampling at the Ghezzi copper–gold prospect on the MAN property confirmed and expanded past trench samples, with samples of leucogabbro, basalt, and limestone containing up to 4.2 percent copper and 0.06 ounces of gold per ton. High-grade copper and/or gold values at the Ghezzi prospect have now been identified over an area measuring 2,757 feet by 3,282 feet. Geologic mapping and rock and soil sampling were also conducted in 2004 on the Broxson Gulch prospect in the north-central part of the project. Work focused on a prominent ridge northwest of the old Broxson Gulch placer gold workings and revealed the presence of widespread anomalous gold, arsenic, and copper with sporadic anomalous silver, lead, and zinc. Rock samples collected in 2004 returned anomalous copper (high of 2.7 percent, average of 287 ppm [0.029 percent]), gold (high of 0.17 ounces of gold per ton, average of 94 ppb [0.0027 ounces of gold per ton]), and arsenic (high of 1,285 ppm [0.13 percent], average of 45 ppm [0.0045 percent]). Higher metal values were associated with feldspar porphyry, hornfels, and calc-silicate rocks. A total of 1.7 line miles of Max-Min geophysics were completed on the Rainy prospect and rock samples were collected, including a magnetite-bearing dunite with anomalous gold, platinum, and palladium values. Exploration efforts at the Telephone Hill prospect consisted

Figure 13. *Tim Venechuk, Usibelli Coal Mine chief surveyor, and Rick Stickle, UCM operator, discuss trail building in the Jumbo Dome area (Jumbo Dome is in the background). Global Positioning System (GPS) technology was used to survey the access trail from the Usibelli Mine to the Jumbo Dome coal leases. Photo by Chris Arend, courtesy of Usibelli Coal Mine Inc.*

entirely of ground geophysics, including 4.9 line miles of Max-Min geophysics, 5.3 line miles of ground magnetics and 0.8 line miles of gravity surveys.

The southern section of the MAN property is under joint venture with Anglo American Exploration (Canada) Ltd. (AAEC), which began its own exploration program in the spring, pursuant to its agreement with Nevada Star. AAEC is a wholly owned indirect subsidiary of Anglo American PLC, a global leader in the mining and natural resource sector. Under the terms of the joint-venture agreement, AAEC can earn a 51 percent interest in the southern portion of the MAN property by spending a total of $12 million over a 5-year earn-in period. AAEC has the right to increase its interest by an additional 19 percent by completing a feasibility study, and an additional 5 percent by arranging production financing for both AAEC and Nevada Star. Anglo American focused on the major Fish Lake and Dunite Hill intrusions. Anglo American's exploration program included a 1,550 line mile airborne magnetic and electromagnetic survey with Anglo's proprietary Spectrem technology, geologic mapping, prospecting, geochemical sampling including 2,922 soil sample sites, and ground geophysics. Data from the airborne geophysical survey were combined with existing data from previous exploration programs and used to guide the ground program with the goal of identifying drill targets for a winter drilling program. Anglo American's assay results of massive-sulfide samples from the Tres Equis area include grab sample MAN-R-73251 with 6.68 percent nickel, 1.02 percent copper, 0.42 percent cobalt and 0.041 ounces per ton palladium, and sample MAN-R-73279 with 5.79 percent nickel, 5.45 percent copper, 0.33 percent cobalt, and 0.030 ounces per ton palladium.

Golconda Resources Ltd. identified numerous intrusion-style magnetic anomalies, both small stocks or pipes and dikes, while re-evaluating their airborne magnetic survey flown over the Shulin Lake diamond property near Talkeetna. Five holes (DSL 18–DSL 22) were drilled to test the anomalies and 19 selected core samples were sent to Lakefield Research for caustic fusion and diamond recovery. Hole 22, drilled in March, was situated at the rim of one of these pipe-like features as outlined by the magnetic survey. Material from this hole recovered three micro diamonds in a 21.4-pound sample of unconsolidated material. The three fragments of transparent, white diamonds have the following dimensions: 0.66 x 0.43 x 0.41 mm; 0.29 x 0.20 x 0.10 mm; and 0.17 x 0.14 x 0.08 mm. The total weight was reported at 0.001 carats. The diamond drill bits used in the drilling program were certified to contain no natural diamonds. Other samples from this hole (DSL 22) and the two nearest holes (DSL 17 and DSL 20) were sent for caustic dissolution and diamond testing. Results are expected in early January 2005. Purple and orange garnets were observed while inspecting the fusion residues from the samples submitted for micro diamond testing, and were sent to RL Barnett Geological Consulting Inc., for microprobe analysis. Five purple garnets submitted were G-9 garnets and 12 orange garnets were high magnesium pyropes (19–20% MgO), with high titanium content indicating a strong eclogitic component. Of particular importance is that a low manganese content shows that these fall into the field of diamond-associated garnets (diamond-associated garnets are those included in diamonds, occurring in diamond-bearing samples, or occurring inside the diamond stability field). Also, the calcium/chrome ratio is that of garnets associated with diamonds and not with graphite. The geochemistry of the garnets compares well with other eclogitic-dominated diamond systems. Although diamond-inclusion chromites and other indicator minerals had been detected by microprobe before, this is the first time that pyrope garnets have been found on the Shulin Lake property. More drilling was expected at Shulin Lake in early February.

Exploration was also conducted on Full Metal Minerals Ltd.'s Gunsite copper–gold porphyry prospect located in the Talkeetna Mountains approximately 89 miles north of Anchorage, within 15 miles of an all-weather road. Underlain by a Cretaceous dioritic batholith, the property hosts high-grade intrusion-hosted copper–gold mineralization in subhorizontal fractures and veins over a 4-square-mile area. Mineralization consists of both structurally controlled and disseminated porphyry-type copper–gold styles. Four areas of high-grade copper–gold mineralization are present on the property. Full Metal completed a six-hole, 2,408-foot diamond-drilling program. Drilling intersected local zones of copper–gold mineralization, including 19 feet of 0.06 ounces of gold per ton, 0.22 ounces of silver per ton, and 1.82 percent copper. Several of the drill holes intersected an extensive east–west-trending fault zone running parallel to the surface exposure, which appears to truncate the mineralized zones.

Full Metal Minerals optioned the Lucky Shot Mine in the Willow Creek mining district for a 100 percent interest by making claim rental payments of $55,000 and performing $1 million in exploration over 3 years. The Lucky Shot property is located 37 miles north of Anchorage in an area with excellent access to roads and power. Gold mineralization is hosted in polymetallic quartz veins (gold–pyrite–arsenopyrite–sphalerite–chalcopyrite–tetrahedrite) cutting the granitic to tonalitic Late Cretaceous Willow Creek Pluton. Historic production is approximately 650,000 ounces of gold from the Lucky Shot and Independence Mine areas, at grades from 2 to 4 ounces of gold per ton (fig. 14). Full Metal subsequently optioned a 60 percent working interest in the Lucky Shot property to Aurora Gold Corp. Full Metal also optioned a 70 percent working interest in the Gunsite property, and a 70 percent working interest in the Zackly property to Aurora Gold

Figure 14. *A Full Metal Minerals Ltd. geologist samples a gold-bearing quartz vein in the underground workings at the Independence Mine near Hatcher Pass. Photo provided by Full Metal Minerals Ltd.*

Corp. The Zackly property, consisting of 29 mining claims, is a copper–gold skarn associated with a Cretaceous quartz monzonite body and the property is located 5 miles north of the seasonal Denali Highway.

Kennecott Exploration Co. explored the Whistler copper–gold porphyry prospect near Rainy Pass. Fine-grained feldspar–hornblende porphyritic Tertiary/Cretaceous andesite intrudes sedimentary rocks of the Mesozoic Kahiltna Terrane at this prospect. Cominco Inc. previously identified mineralization as stockwork chalcopyrite–magnetite quartz veinlets with elevated gold values; vein- and joint-controlled sulfide–barite–quartz mineralization; and chalcopyrite with minor sphalerite in silicified andesite. Kennecott's 2004 work included staking mining claims, geochemical sampling, geologic mapping, and geophysics. Kennecott drilled 6,570 feet of core, but results were not available (fig. 15).

Max Resource Corp. optioned the Gold Hill property, only 10 miles from a paved highway to Cantwell in the Valdez Creek area, from Zazu Exploration Inc. and staked additional claims west of the property over mineralized outcrops. Past sampling during a regional sampling program by the U. S. Bureau of Mines found values up to 0.25 ounces of gold per ton in this area. Significant sample results from work on the new claims in the Gold Creek area include a sample containing 0.25 ounces of gold per ton and 0.57 percent copper. Max Resource conducted a 7-hole, core drilling program designed to test high-grade gold mineralization previously drilled by Amax Gold Exploration Co. and General Crude Oil Minerals Co. Previous drilling results included 5 feet of 0.44 ounces of gold per ton, 5 feet of 0.23 ounces of gold per ton, 5 feet of 0.67 ounces of gold per ton, 4 feet of 0.46 ounces of gold per ton, and 3.6 feet of 1.58 ounces of gold per ton. New confirmation assays of pulps saved from the previous drilling confirm the previous assays and show the variation in gold value within the same sample. Significant drilling results from the 2004 program include 6 feet grading 0.054 ounces of gold per ton from 29 to 35 foot depth, 5 feet grading 0.15 ounces of gold per ton from 125 to 130 foot depth, and 5 feet grading 0.05 ounces of gold per ton and 0.47 percent copper from 175 to 180 foot depth in hole 04-1; 5 feet grading 0.04 ounces of gold per ton from 50 to 55 foot depth in hole 04-5; 15 feet grading 0.08 ounces of gold per ton from 130 to 145 foot depth in hole 04-6; and 5 feet grading 0.07 ounces of gold per ton from 40 to 45 foot depth, and 5 feet grading 0.05 ounces of gold per ton from 80 to 85 foot depth in hole 04-7.

Max Resource confirmed the original gold values from previous drilling by Amax, and identified at least four additional zones and structures. The new zones include a major structure with approximately 3 feet of mineralization grading 0.42 ounces of gold per ton and 0.18 percent copper, and a sheeted vein zone where values of 0.23 ounces of gold per ton and 1.1 percent copper were found in fractures. Petrographic work indicated that the drill core is almost all diorite to intermediate composition plutonic rocks. Polished section work showed that gold is found in a free state and is related to the intrusions. Pyrite, arsenopyrite, pyrrhotite, chalcopyrite, molybdenum, native copper, and gold are found in veins and as disseminations in the host rocks.

Freegold terminated its right to acquire up to a 65 percent interest in the Rainbow Hill project in the Valdez Creek area.

Figure 15. *A NANA–Dynatec Drilling LLC LF-70 core drill rig onsite in the Alaska Range near the Rainy Pass Lodge. Photo by Russ Franklin, Kennecott Exploration Co.*

SOUTHWESTERN REGION

The Donlin Creek gold project near Aniak dominated Alaska's exploration sector over the past several years and is now in the advanced exploration or early feasibility (development) phase. A new resource announced in late 2002 increased inferred gold resources by nearly 40 percent to 14.8 million ounces grading 0.102 ounces per ton, with a measured and indicated resource of 8.3 million ounces of gold grading 0.102 ounces per ton, using a 0.058 ounces per ton gold cut-off grade. The Donlin Creek deposit is ranked as the 22nd largest gold deposit in the world, with 23 million ounces of gold resources.

Placer Dome Inc. exercised its back-in right to earn a 70 percent ownership of the Donlin Creek project and feasibility/engineering studies are underway. Other joint-venture owners are NovaGold Resources Inc. and Calista Corp. The current timetable, assuming a positive feasibility study, projects production to begin in 2009 or 2010. The greatest challenge to this project is the requirement for 60–80 megawatts of electrical power needed to process the sulfide-rich ore and for other mining facilities. A port on the Kuskokwim River and a 15-mile road connecting the port to the mine site will also be required. Work in 2004 consisted of a preliminary assessment on the viability and economics of the project, including 3,500 feet of reverse-circulation drilling and 8,000 feet of core drilling. Based on this work, Placer Dome is committing $11 million to the development of the project in 2005. About half of the funds will be used for drilling to reclassify a portion of the inferred gold mineral resource to a measured and indicated gold mineral resource. Work on design concepts, infrastructure planning, power supply, and geotechnical requirements are also ongoing. Baseline environmental studies are being completed in order to begin the permitting process in 2005.

Northern Dynasty Minerals Ltd.'s Pebble property near Iliamna in southwestern Alaska was Alaska's largest exploration project in 2004. Based on an independent mineral resource estimate by Norwest Corp., Northern Dynasty announced in January 2004 that the Pebble deposit contains 26.5 million ounces of gold and 16.5 billion pounds of copper in 3.02 billion tons of ore grading 0.55 percent copper-equivalent. The Pebble deposit is the largest gold resource and the second-largest copper resource in North America, and the fifth-largest copper porphyry deposit in the world, according to ranking by the Metal Economics Group in December 2003.

Northern Dynasty's 2004 exploration program included comprehensive drilling to upgrade the Pebble resource to measured and indicated categories, baseline environmental and socioeconomic studies to support state and federal project permit applications, as well as site testing and engineering studies directed toward completion of a bankable feasibility study in 2005. In-fill drilling was designed to upgrade resources to measured and indicated categories to finalize open pit mine planning.

More exploration drilling was designed to further define the extent of the deposit and its higher-grade areas; Northern Dynasty Minerals completed more than 157,614 feet of core drilling in 227 holes during 2004 on this copper–gold–molybdenum porphyry deposit hosted in granitic rocks (fig. 16). In-fill drilling totaled 101,539 feet in 122 holes, metallurgical and process design drilling totaled 21,335 feet in 26 holes, geotechnical drilling totaled 32,502 feet in 70 holes, and exploration drilling totaled 13,815 feet in 9 holes. Highlight results of the in-fill and exploration drilling include hole 4137 with a 460-foot intercept of 0.016 ounces of gold per ton, 0.52 percent copper and 0.028 percent molybdenum; hole 4142 with a 340-foot intercept of 0.032 ounces of gold per ton, 0.52 percent copper, and 0.018 percent molybdenum; hole 4145 with an 850-foot intercept of 0.020 ounces of gold per ton, 0.55 percent copper, and 0.037 percent molybdenum; hole 4147 with a 330-foot intercept of 0.029 ounces of gold per ton, 0.42 percent copper, and 0.011 percent molybdenum; hole 4187 with a 250-foot intercept of 0.014 ounces of gold per ton, 0.86 percent copper, and 0.063 percent molybdenum; hole 4189 with a 211-foot intercept of 0.021 ounces of gold per ton, 0.81 percent copper, and 0.081 percent molybdenum; hole 4199 with a 172-foot intercept of 0.019 ounces of gold per ton, 0.65 percent copper, and 0.013 percent molybdenum; hole 4218 with a 130-foot intercept of 0.036 ounces of gold per ton, 0.64 percent copper, and 0.008 percent molybdenum; and hole 4271 with a 479-foot intercept of 0.026 ounces of gold per ton, 0.070 percent copper, and 0.013 percent molybdenum.

Northern Dynasty Minerals Ltd. discovered a new higher-grade, laterally extensive gold–copper–molybdenum zone by drilling on the east side of the Pebble deposit.

Figure 16. *A driller wrestles with drill pipe at the Pebble property. Drilling is the dominant exploration tool used to identify mineralization in this region of Alaska. Photo courtesy of Northern Dynasty Minerals Ltd.*

This discovery, which demonstrates that there are multiple sources of mineralization, has significant implications for the deposit model and mine operations being planned. This mineralization, called the East Zone, presently includes holes 4136, 4137, 4149, 4155, 4181, 4188, 4210, 4250 4284, 4292, 4293, 4300, 4301, 4302, and 4303, which were drilled over an area of 2,000 feet by 2,000 feet. Significant drill results include hole 4293 with a 537-foot intercept of 0.025 ounces of gold per ton, 0.61 percent copper, and 0.020 percent molybdenum; hole 4300 with a 433-foot intercept of 0.029 ounces of gold per ton, 0.66 percent copper, and 0.017 percent molybdenum; and hole 4303 with a 282-foot intercept of 0.025 ounces of gold per ton, 0.75 percent copper, and 0.018 percent molybdenum. A tabulation of assay results for East Zone drill holes is shown in table 6. As presently defined, the East Zone is open to the north, south and east and to depth. Although there are a number of similarities with the geology and alteration in the central portion of the Pebble deposit, the favorable alteration and mineralization in the East Zone has been observed in drill holes to at least 2,379 feet in depth, much deeper than the mineralization in the Central Zone. The East Zone underlies unmineralized and unaltered Tertiary rocks that are absent at its western extent and progressively increase to a maximum thickness of 1,028 feet to the east. Drill hole 4300, which was completed furthest to the east, intersected the strongest mineralization. Many holes bottomed in mineralization with a general strengthening in molybdenum content to the east and at depth. An inferred eastern source area for the East Zone mineralization by Northern Dynasty requires substantial additional drilling to establish its full potential.

Northern Dynasty also discovered another porphyry copper–gold system about 9 miles southwest of the Pebble deposit. One core hole, drilling a 2.2-mile by 0.6-mile induced polarization geophysical anomaly, had a 170-

Table 6. *Northern Dynasty Minerals Ltd. - Pebble Project, East Zone 2004 Assay Results*

Drill Hole Number		From feet	To feet	Intercept feet	Gold (Au) oz. per ton	Copper (Cu) %	Molybdenum (Mo) %	CuEQ[a]
4136		490.2	1029.9	540	0.012	0.42	0.020	0.79
4136	including	770.1	990.2	220	0.017	0.48	0.020	0.97
4137		105.0	1252.0	1147	0.011	0.36	0.022	0.73
4137	including	546.9	1017.1	470	0.016	0.52	0.028	1.02
4149		563.0	1553.2	990	0.014	0.46	0.026	0.92
4149		563.0	1338.0	775	0.016	0.51	0.027	1.01
4155		609.0	1019.1	410	0.012	0.46	0.018	0.83
4181		528.9	899.0	370	0.022	0.33	0.022	0.92
4188		595.5	1399.0	804	0.016	0.47	0.031	1.00
4188	including	709.0	1209.0	500	0.019	0.57	0.032	1.16
4210		606.0	1208.1	602	0.013	0.53	0.018	0.90
4210	including	606.0	928.2	322	0.015	0.65	0.021	1.09
4250		841.6	998.1	157	0.017	0.43	0.012	0.85
4284		813.7	1809.1	995	0.014	0.47	0.018	0.88
4284	including	813.7	1189.0	375	0.019	0.62	0.022	1.15
4284	including	1189.0	1809.1	620	0.011	0.38	0.016	0.71
4292		695.6	2142.2	1447	0.011	0.43	0.029	0.84
4292	including	695.6	1119.1	424	0.016	0.57	0.021	1.04
4292	including	1979.1	2142.2	163	0.014	0.53	0.023	0.97
4293		812.0	2349.2	1537	0.017	0.43	0.026	0.95
4293	including	812.0	1349.1	537	0.025	0.61	0.020	1.26
4300		995.5	2362.0	1367	0.019	0.46	0.033	1.06
4300	including	995.5	1429.2	434	0.029	0.66	0.017	1.38
4300	including	2058.2	2362.0	304	0.015	0.31	0.081	1.09
4301		1005.0	1220.2	215	0.029	0.73	0.016	1.46
4302		961.0	2118.2	1157	0.016	0.43	0.020	0.90
4302	including	961.0	1349.1	388	0.020	0.52	0.020	1.05
4302	including	1528.9	1939.1	410	0.017	0.41	0.025	0.91
4303		1027.6	2259.0	1231	0.015	0.47	0.027	0.94
4303	including	1027.6	1309.1	282	0.025	0.75	0.018	1.41
4303	including	2119.2	2259.0	140	0.016	0.35	0.042	0.94

All information from Northern Dynasty Minerals Ltd. press releases.

[a]Copper equivalent calculations use metal prices of $0.80/lb for copper, $350/oz for gold and $4.50/lb for molybdenum. CuEQ = Cu % + (Au oz. per ton x 0.0292 x 11.25/17.64) + (Mo % x 99.23/17.64)

foot mineralized intercept grading 0.006 ounces of gold per ton, 0.22 percent copper, and 0.018 percent molybdenum. In addition to exploration and in-fill drilling, geotechnical drilling tested sites for tailings impoundment, surface facilities, and open-pit mine design. Extensive large-diameter core drilling collected larger composite samples for metallurgical and process testing.

More than a dozen consulting firms, multiple helicopters, and seven drill rigs operated at the Pebble property during 2004 (figs. 17 and 18). At the peak of activity, about 100 people were working on the project, 70 of them residents of Alaska. Northern Dynasty also opened an office in Anchorage last summer. Roscoe Postle and Associates Inc. are currently undertaking a new resource estimate for the Pebble deposit. As currently defined, the Pebble deposit is open to the east, west and to depth, with higher-grade mineralization open to the south and southeast. Current assessments of the optimal milling capacity for the Pebble project range from 100,000 to 200,000 tons per day over a 30- to 60-year mine life.

Figure 17. *Kerwin Krause, a DNR Division of Mining, Land, & Water geologist, and Rich Moses, manager of the Pebble project, discussing 2004 exploration plans. Photo by Stan Foo, provided by DNR-ML&W.*

Figure 18. *A scientist conducting wetlands studies at the Pebble property. More than 100,000 acres, 1,800 field plots, and 4,500 photos were surveyed and collected during 2004 by Northern Dynasty Minerals Ltd. contractors. Photo provided by Northern Dynasty Minerals Ltd.*

A preliminary assessment report was prepared in order to quantify the Pebble project's cost parameters and to provide guidance for the ongoing engineering work that will ultimately define the optimal scale of production. Preliminary forecasts and estimates in the report were developed to an order of magnitude level and are not based on systematic engineering studies. The preliminary assessment report indicates that the Pebble gold–copper–molybdenum porphyry deposit would be developed by conventional, large-scale, open-pit mining methods. Four open-pit stages were designed using the block model established by Norwest Corp. for the February 2004 inferred mineral resource estimate of the Pebble deposit.

Processing of mill feed from the open pit will produce a flotation copper sulfide concentrate with gold and silver values as well as a separate molybdenum sulfide concentrate. Estimated metal recoveries of 88 percent for copper, 76 percent for gold and silver, and 60 percent for molybdenum were utilized in the financial modeling. The preliminary assessment report examined three production rate scenarios: 110,000 tons per day, 220,000 tons per day, and a phased expansion from 110,000 tons per day to 220,000 tons per day in year six. These analyses show that at the lowest production rate considered, the Pebble project would produce an annual average of 256 million pounds of copper, 365,000 ounces of gold, 8 million pounds of molybdenum, and 1.4 million ounces of silver during the first 10 years of a 62-year mine life. At the largest scale studied, the project would produce an annual average of 470 million pounds of copper, 674,000 ounces of gold, 15 million pounds of molybdenum, and 2.5 million ounces of silver during the first 10 years of a 31-year mine life. Waste-to-ore stripping ratio for all three scenarios is 0.23 to 1. Copper concentrates would be transported via a concentrate pipeline to a storage and dewatering port facility on tidewater on Cook Inlet. Molybdenum sulfide concentrate would be packaged and shipped to market separately. Capital cost estimates range from $1.0 billion for a 110,000-tons-per-day facility to $1.5 billion for a 220,000-tons-per-day facility. Life of mine-sustaining capital estimates range from a total of $276 million for a 110,000-tons-per-day project to a total of $197 million for a 220,000-tons-per-day project. An additional capital cost of $103 million is estimated for construction of a seaport and an 86-mile access road from the port to the mine.

The proposed Pebble mine facilities would need an estimated 150 to 200 megawatts of electricity. A number of options for electric power to the project and neighboring villages are currently being evaluated. These options include connecting to the State's existing power

transmission grid, either through a combined 70-mile overland route and a 41-mile submarine connection to the Kenai Peninsula or a 210-mile overland route on the west side of Cook Inlet. An alternative to a transmission grid connection would involve the establishment of new generation facilities close to the mine or port area.

Northern Dynasty exercised its option to acquire 80 percent of the resource lands from Teck Cominco American Inc. in late 2004. In addition, Northern Dynasty exercised its option to acquire up to a 50 percent interest in the extensive surrounding exploration lands. Teck Cominco has a 90-day right to form a 50 percent joint venture on the exploration lands or sell its 50 percent interest in the exploration lands to Northern Dynasty for $4 million, in cash or shares at Northern Dynasty's election, and it will then retain a 5 percent after-payback net profits interest. As a consequence of exercising the Teck Cominco options, Northern Dynasty also has a 90-day period to elect whether to also acquire the 20 percent carried interest in the Pebble Project, held by a related party, for share consideration equal to the independently appraised value of the 20 percent interest. By exercising all of its options the company can acquire up to a 100 percent interest in the resource lands (with no back-in right or royalty) and up to a 50 percent interest in the surrounding exploration lands.

The Alaska Department of Transportation & Public Facilities (DOT) is investigating potential port sites at Iniskin Bay and Iliamna Bay on Cook Inlet, to facilitate shipping of copper–gold–silver and molybdenum concentrates to offshore smelters from the Pebble area. These port sites are approximately 65 miles from the Pebble deposit. A $500,000 contract was awarded to Peratrovich, Nottingham and Drage (PND Inc.), an Anchorage engineering consulting firm, to survey possible road routes and port sites, while an economic assessment contract was awarded to Northern Economics Inc. Various road corridor options leading from the potential port sites to the Pebble deposit, with connections to local villages, are also under active evaluation. A report outlining the findings and recommending the preferred port site and road corridor was prepared in 2004 as part of the State of Alaska's Southwest Regional Transportation Plan. After the port site and road route have been selected, the State will commission more detailed studies to facilitate design, engineering, permitting, and construction.

The extensive work at the Pebble property during the past several years and the announced discoveries in 2003 spurred a mining claim staking rush late in 2003, with more than 300 square miles staked around Pebble. Some of the land staked was subsequently explored during 2004 for copper–gold porphyry deposits.

Liberty Star Gold Corp., a newly formed exploration company, explored their large claim block, with 981 mineral claims, spanning 237 square miles, composing the Big Chunk group. The Big Chunk claims adjoin Northern Dynasty's Pebble Project on the north border, forming a large donut shape and adjoining their border to the southeast. The claims were staked based on a caldera model for the Pebble mineralization. McPhar Geosurveys Ltd. completed a detailed airborne magnetic survey covering 1,408 square miles (12,500 flight line miles at a terrain clearance of 295 feet and a line spacing of six lines per mile with a fixed-wing aircraft) prior to fieldwork by a crew of 15 geologists. Geologic, geostructural, space imagery, and detailed aeromagnetic studies resulted in the identification of 21 anomalies representing potential mineral centers. Field crews collected 9,303 samples of various types including rock, soil, vegetation, stream sediments and water. Zonge Engineering and Research Organization Inc. completed a 25-mile induced polarization (IP) electrical survey and 18 square miles of dipole–dipole survey over selected areas of the property. White Sox, a significant IP anomaly found in the northern portion of the Big Chunk property, about 9 miles northeast of the Pebble project, was the target of a four-hole, 1,329-foot diamond drill program.

Drilling was completed by Quest Drilling using a helicopter portable LF-70 hydraulic drill. Altered and mineralized sedimentary rocks cut by porphyry dikes and quartz veins were intersected in the drilling. Mineralization consisted principally of pyrite, chalcopyrite, and molybdenite as fracture fillings and disseminations in intrusive and sedimentary host rocks, with some quartz stockwork veinlets. Mineralization was strongest within and around the altered intrusive dikes and sills and spatially associated with quartz veining and chlorite alteration. Drill hole BC1003 contains the strongest mineralization, with several zones of chalcopyrite and molybdenite. Trace amounts of chalcopyrite were noted in the other drill holes. All holes intercepted measurable but low-grade gold ranging up to 0.00013 ounces of gold per ton in BC-1; copper ranged from 0.0048 percent to about 0.06 percent in drill hole BC-3; molybdenum ranged from 0.000038 percent in BC-1 to about 0.03 percent in BC-3. Drill hole BC-3 (closer to the mineral center) had about 0.05 percent copper over 26.6 feet between 232 and 259 feet, and about 0.06 percent copper over 9.8 feet at a depth of 138 feet. Liberty Star concluded that holes BC-1 and BC-4 are in the low copper–molybdenum pyrite halo and holes BC-2 and BC-3 are in the propylitic–phyllic alteration boundary and outer metal halo and closer to the porphyry center. The porphyry system is interpreted to be more than 1 mile wide, 3 miles long, and open to the northeast, east, and south.

Geocom Resources Inc., as operator in a joint-venture agreement with TNR Gold Corp. and BHP Minerals International Exploration Inc., completed a detailed geophysical survey over the H claim block of the Iliamna Project. The survey consisted of a three-dimensional induced polarization–resistivity study of the area drilled in

2003 by Geocom. Twenty-eight miles of grid were surveyed, encompassing the area surrounding the two discovery diamond drill holes completed in 2003. The survey successfully delineated several anomalies considered to reflect sulfide mineral concentrations and potential drill targets. Geocom drilled 3,303 feet of core at four locations on the H claim block. Two of the target areas were adjacent to drill holes completed in 2003, and two additional targets identified in the geophysical study were drilled. Geologic logs show that pyrite–chalcopyrite–pyrrhotite–molybdenum mineralization was intersected in all four widely spaced holes. Geochemical results from the drilling include grades of 0.00023 to 0.0014 ounces of gold per ton, up to 0.023 percent copper, and up to 2.5 ppm molybdenite. In conjunction with the two holes drilled in 2003, the mineralized area now covers a minimum of 2,296 feet by 4,921 feet. Disseminated porphyry-style and fracture-controlled copper–gold mineralization were intersected in both a granodiorite intrusive rock and the enclosing metamorphic country rocks. At the D claim block of the Iliamna Project, Geocom intended to conduct additional geophysical studies after freeze-up to better delineate drill targets and a reliable estimate of depth to bedrock. Drilling on the D claims is planned for the 2005 field season.

TNR Gold Corp. explored on the Shotgun project and focused on areas with geology and geochemistry similar to that of the area now called the Main Shotgun Zone. This exploration resulted in the acquisition of 14,080 acres of new mineral claims. The new areas follow a north–south trend from the Main Shotgun Zone and are called the Shot, King, and Winchester areas. Like the Main Shotgun Zone, all contain intrusions hosted in hornfelsed Kuskokwim Group graywacke and shale. Geochemical characterization of these areas based on samples collected this season is underway. Follow-up exploration on the new properties identified new drill targets for the 2005 exploration season in addition to extension drilling on the Main Shotgun Zone. Drilling is expected to commence in early summer 2005.

Full Metal Minerals Ltd. completed an exploration program at the Pebble South property, 27 miles west of the town of Iliamna and 10 miles west of the Pebble property. At Pebble South, more than 1,400 samples (944 soil, 316 stream, and 211 rock) were collected, 30 line miles of two-dimensional IP (induced polarization) geophysics were completed and 20 line miles of ground magnetics were completed on the property. Mineralized areas along the Pebble Copper trend are often covered by Tertiary volcanic rocks or found in valley lowlands veneered by glacial cover. Due to the overburden cover, IP geophysics was selected as the best method for identifying mineralized zones in covered areas. During this work, at least 11 significant IP chargeability anomalies were identified (fig. 19). Two high-priority drill targets include the Boo prospect and the TYP prospect. The Boo prospect, with two 0.75-mile-long zones of high chargeability coupled with moderate to low resistivity, lies along the extension of the southwest-trending Pebble IP anomalies. At the TYP prospect, 8 miles north of the Boo prospect and northwest of the Pebble deposit, a 0.36-mile-long zone of moderately high chargeability was identified at the western margin of the Kaskanak Batholith. Exposures of rhyolite and mineralized granodiorite occur within a 1-mile-long by 0.5-mile-wide copper–molybdenum–gold geochemical anomaly (consisting of 70 to 340 ppm copper in soils and rock, with up to 99 ppm molybdenum and 160 ppb gold) at the TYP prospect. Geologic mapping of rubblecrop southwest of the TYP prospect identified Kaskanak Batholith-marginal phases of potassium-flooded quartz monzonite porphyry.

Full Metal Minerals Ltd. has an option to earn 100 percent interest in the Kamishak property, about 25 miles west of Kamishak Bay on the west side of Cook Inlet. The mineral target is a Jurassic biotite–hornblende quartz dioritic intrusion with porphyry-style alteration and copper–gold mineralization, including mineralized breccias and a diatreme. The intrusion has an associated highly magnetic feature. Full Metal collected 314 stream-sediment samples and 53 rock samples while looking for a larger copper–gold porphyry system near the known breccia zones. Several low-level geochemical anomalies were identified and additional mining claims were staked, with the expanded property consisting of 49 State mining claims covering 2 square miles.

Furio Resources Inc. acquired 25 mining claims in the Pebble area that had been staked by Alaska Earth Resources Inc. Furio plans to conduct an airborne geophysical survey over the 4,000-acre property in 2005.

Figure 19. *David Lappi, Graham McDonald, and Rob Retherford preparing for geologic field work at Full Metal Minerals Ltd.'s Pebble South property. Photo provided by Full Metal Minerals Ltd.*

Figure 20. *June McAtee, Vice president of Calista Corp. Land Department, and Michelle Pearson, Calista geologist, examine gold mineralization at the Wallace prospect, Nyac mining district. Photo by Jeff Foley, Calista Corp.*

Calista Corp. sampled the Wallace gold prospect in the Nyac mining district (fig. 20). Rock samples of quartz–chlorite–calcite-veined, sericitically altered granodiorite porphyry dikes contain up to 7 ounces of gold per ton and anomalous soil samples in the same area range from 0.001 to 0.01 ounces of gold per ton. The veins occasionally contain blebs and crystals of native gold, tellurobismuthite and tetradymite.

ALASKA PENINSULA REGION

A letter of intent dated July 13, 2004, between Full Metal Minerals Ltd. and Alaska Earth Resources Inc. (AERI) granted Full Metal an option to acquire a 100 percent interest in the Port Moller Property. Full Metal paid AERI the sum of $10,000 (first signature payment) upon execution, and will pay the sum of $10,000 (second signature payment) upon either the signing of Full Metal's Exploration Agreement and Surface Access Agreement with the Aleut Corp. and the Shumagin Corp., respectively, or March 31, 2005, whichever occurs first. Full Metal shall pay an annual fee of $20,000 to AERI for each of the first 4 project years. Full Metal will issue 200,000 shares to AERI, (50,000 first year, upon signing an exploration and development lease with the Aleut Corp, and Shumagin Corp., respectively), and incur $525,000 in exploration expenditures ($75,000 in the first year). Through this agreement, Full Metal has an exclusive option with the Aleut Corp., a Native-owned Alaskan corporation, to explore Native-owned lands in the Port Moller Quadrangle, encompassing the western Alaskan Peninsula and the eastern Aleutian Islands. Additionally, Shumagin Village Corp., the owner of surface rights in certain areas of the Port Moller region, has granted permission for trespass and exploration on their lands. The two most advanced epithermal gold projects in the Port Moller Quadrangle include Centennial, on Popov Island adjacent to Sand Point, with 7 million tons averaging about 0.04 ounces of gold per ton in an intermediate sulfidation system occurring as quartz stockworks with pyrite and rare visible gold located below a capping basalt; and the Shumagin and Apollo low-sulfidation, epithermal gold prospects on Unga Island. At the Apollo mine, approximately 145,000 ounces of gold were mined from ore averaging 0.29 ounces of gold per ton from 1891 to 1904. The area also includes the Pyramid porphyry project with 19 historic shallow drill holes (5,563 feet total) identifying a near-surface zone of copper and molybdenum mineralization consisting largely of chalcocite-enriched rock. Full Metal performed some reconnaissance exploration in the Port Moller region during 2004.

SOUTHEASTERN REGION

In southeastern Alaska, Pacific North West Capital, Freegold Ventures, and Lonmin PLC explored the Union Bay project near Ketchikan. The 2004 fieldwork program consisted of further reconnaissance rock chip sampling, 1,200 line miles of combined airborne magnetic and multifrequency electromagnetic surveys, and 5,973 feet of diamond core drilling in ten holes. Exploration work focused on the Continental zone where rock cut samples returned encouraging results in 2003. Initial 2004 field work returned significant platinum values from grab samples of ultramafic rock units located along strike of the PGE-bearing rocks on the Continental zone. Initial reconnaissance efforts traced the prospective magmatic units that are favorable for PGE mineralization over a composite strike length of approximately 3.5 miles. These units remain open along strike and at depth. Drilling results at the Continental zone indicate the favorable magmatic horizon can be traced chemically and physically. The favorable magmatic unit consists of mixed pyroxenite and wehrlite containing variable amounts of magnetite. Similar conclusions were drawn from surface sampling at Continental in 2003. A Phase 2 program followed the earlier drilling and included additional drilling on targets generated from the airborne magnetic surveys and ground follow-up.

Kennecott Minerals Co. continued exploration to expand ore zones at Greens Creek Mine. Exploration drilling and drifting continues to evaluate targets to the west of the known ore bodies on the west side of the Gallagher fault. Underground drilling targeted the mineralization intersected west of the Gallagher fault in early 2004. Nine holes were drilled and all intersected significant mineralization. Two zones of mineralization were intersected in a number of the holes, with the longest continuous intercept of mineralization being more than 280 feet in length. As-

say results for the holes are still pending, however the sections have coarse-grain galena, sphalerite, and, rarely, prousite, as well as electrum and acanthite, which is usually an indication of promising precious metal grades. Drift access, which will establish a new exploration platform to test this significant new target area, is being developed and should be completed early next year. Surface exploration continued to evaluate favorable mine stratigraphy on the property. Drilling was completed on six targets and detailed geological mapping, geochemical soil sampling, and geophysics continued on other prospects, with geophysics along new gridlines at two prospects. Encouraging results were obtained in Lower Zinc Creek where drilling returned the first mineralized intercepts outside of the immediate mine area.

Bravo Venture Group, in a joint-venture agreement with property owner Olympic Resources Group, continued volcanogenic massive sulfide (VMS) lead–zinc–silver–copper mineralization exploration and drilling at the Mad Dog and Brushy Creek prospects on Woewodski Island. Exploration has drill tested only four of 13 VMS and gold prospects on the property, with the Mad Dog, Brushy Creek, Lost Lake, and East Lake prospects drilled in 2004. Significant intercepts from drillhole MD04-01 include 17.5 feet, from 99.4 to 117.1 feet, of 12.75 ounces of silver per ton, 3.79 percent lead, and 18.45 percent zinc; and 55.8 feet, from 133.5 to 189.3 feet, of 6.5 ounces of silver per ton, 0.97 percent lead, and 11.27 percent zinc. The best mineralized intercepts from holes MD04-02 and MD04-03 are 8.5 feet of 7.61 ounces of silver per ton, 0.89 percent lead, and 14.8 percent zinc; 6 feet of 10.53 ounces of silver per ton, 3.78 percent lead, and 10.95 percent zinc; and 3 feet of 11.20 ounces of silver per ton, 1.72 percent lead, and 19.45 percent zinc.

Higher grade intercepts of drill holes MD04-05 and MD04-07 at the Mad Dog prospect include 9.3 feet of 0.064 ounces of gold per ton, 3.27 ounces of silver per ton, and 10.6 percent zinc; and 5.9 feet of 5.16 ounces of silver per ton, 1.13 percent lead, and 7.97 percent zinc. Interlayered fine-grained tuffs, sulfides, and cherty argillites were intersected in both drill holes at the Brushy Creek prospect and the best drill intercept was 6.0 feet of 0.60 ounces of silver per ton, 0.16 percent lead, and 0.73 percent zinc from drill hole BR04-01. Thick intervals of high-grade zinc and silver mineralization identified at the Mad Dog prospect highlight the exploration potential of the VMS stratigraphy throughout the island. Multiple targets remain along strike from zones of known massive-sulfide mineralization at the Lost Lake, East Lake, and Brushy Creek prospects. Drilling at the Lost Lake prospect in 2004 intersected 4.25 feet of mineralization grading 2.0 ounces of silver per ton and 16.2 percent zinc, and 3 feet of mineralization grading 2.4 ounces of silver per ton and 9.5 percent zinc. Drilling in 2004 at the East Lake prospect intersected 7 feet of VMS mineralization grading 0.06 ounces of gold per ton and 3.3 percent zinc. New gold-bearing quartz vein occurrences were identified in the southwestern part of the island. The quartz veins are hosted in multiple widely spaced, east–northeast-trending sub-parallel structures up to 30 feet wide, which can be traced in outcrop, float, and soil anomalies for up to 1,600 feet along a north–northeast trend. Sixty-nine rock samples were collected from outcrops and float, and results from 12 samples exceeded 0.29 ounces of gold per ton. Two of the four gold occurrences now known were previously unrecognized and rock samples from outcrops at the Blue Quartz occurrence contain up to 2.02 ounces of gold per ton.

Toquima Mineral Corp. conducted a mapping, prospecting, and sampling program on the Palmer property. Work included prospecting and mapping new exposures in areas of glacial retreat, as well as infill mapping and drill site evaluation within the Glacier Creek prospect area, with the objective of refining proposed drill targets and ensuring that construction of drill pads would be feasible. Other work included prospecting, mapping, and soil sampling near the RW and Main zone horizons, with a focus on the stratigraphy in the overturned footwall, below the main showing areas. The mapping, prospecting, and sampling work done in 2004 identified new areas of base-metal rich sulfide mineralization, refined the geological interpretation, and identified drill targets.

Snow Lion Mining Co. brought a track excavator via helicopter onto their Nugget Hill property on Porcupine Creek near Haines. The partners excavated along an intersection of faults to expose gold mineralization within a breccia pipe. Samples were collected for geochemical testing.

DEVELOPMENT

Development investment amounting to $209.1 million for 2004 was significantly higher than for 2003 at $39.3 million. The increase is primarily due to construction at the Teck Pogo project, which was fully permitted in mid-2004. Other significant investments are noted at Fort Knox Mine, Red Dog Mine, Greens Creek Mine, Kensington, Usibelli Coal Mine, at various sand and gravel projects, and for placer gold projects. Employment attributed to development is estimated at 283 jobs for 2004; this is up compared to 2003 at 64 jobs.

Table 7 shows development investment and regional employment. Table 8 compares the 2004 investment with that of the previous 22 years. Figure 21 shows the locations of selected development projects.

Table 7. *Reported mineral development expenditures and employment in Alaska by commodity and region, 2004*

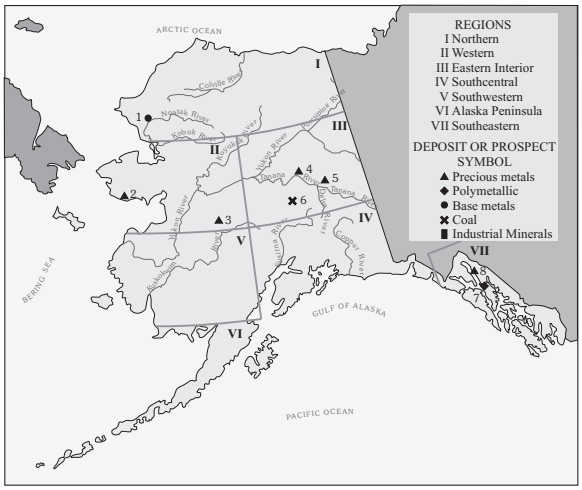
	Northern	Western	Eastern Interior	South-central	South-western	Peninsula	South-eastern	Total
Development Expenditures								
Base metals	$17,700,000	$ 0	$ 0	$0	$0	$ 0	$ 0	**$17,700,000**
Polymetallic	0	15,000	0	0	0	0	6,200,000	**6,215,000**
Precious metals								
Placer	120,000	4,401,500	212,250	112,300	0	0	200,000	**5,046,050**
Lode	0	4,128,000	160,761,031	105,000	0	0	7,400,000	**172,394,031**
Coal and peat	0	0	2,760,000	0	0	0	0	**2,760,000**
Industrial minerals	0	0	3,390,000	1,166,034	0	100,000	335,400	**4,991,434**
TOTAL	**$17,820,000**	**$8,544,500**	**$167,123,281**	**$1,383,334**	**$0**	**$100,000**	**$14,135,400**	**$209,106,515**
Development Employment								
Employment								
Workdays	207	2,510	64,434	835	0	45	5,440	73,471
Workyears[a]	1	10	248	3	0	0	21	283
No. of companies reporting[b]	25	1	14	5	2	1	0	48

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

Table 8. *Reported mineral development expenditures in Alaska by commodity, 1982–2004*

	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	273,042,000	495,000	400,000	**394,037,000**
1997	133,880,000	7,300,000	26,299,000	500,000	410,000	**168,389,000**
1998	28,000,000	5,600,000	15,602,000	5,355,000	850,000	**55,407,000**
1999	12,500,000	2,500,000	15,864,000	400,000	2,575,000	**33,839,000**
2000	100,000,000	16,400,000	24,699,000	611,000	- -	**141,710,000**
2001	43,800,000	3,300,000	32,719,000	300,000	1,040,000	**81,159,000**
2002	- -	5,700,000	26,655,000	250,000	1,450,000	**34,055,000**
2003	- -	- -	38,839,332	315,000	- -	**39,154,332**
2004	17,700,000	6,215,000	177,440,081	4,991,434	2,760,000	**209,106,515**
TOTAL	**$795,681,300**	**$274,248,136**	**$977,453,743**	**$29,749,934**	**$61,150,000**	**$2,138,283,113**

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



I Northern Region
1. Red Dog Mine—Teck Cominco Alaska Inc. (mill, tailings dam)

II Western Region
2. Nome area
   a. Rock Creek Project—NovaGold Resources Inc. (permitting, drilling)
   b. Several open-pit and placer mines
3. Bear Creek Project—Alamin Mining Co. (dredge acquisition and move)

III Eastern Interior Region
4. Fairbanks area
   a. Fort Knox Mine—Kinross Gold Corp. (stripping)
   b. Several open-pit and underground placer gold mines
   c. Several rock, sand, and gravel operations (equipment)
5. Pogo Project—Teck Cominco Alaska Inc./ Sumitomo Metals Mining America Inc. (road, power line, underground, and site construction)
6. Usibelli Coal Mine— Usibelli Coal Mine Inc. (stripping and equipment)

IV Southcentral Region

V Southwestern Region

VI Alaska Peninsula Region

VII Southeastern Region
7. Greens Creek Mine—Kennecott Minerals Co./ Hecla Mining Co. (access drifting, tailings storage)
8. Kensington Project—Coeur Alaska Inc. (permitting, resource definition)

Figure 21. *Selected mineral development projects in Alaska, 2004.*

Figure 22. *Alamin Mining Co.'s Bear Creek project using a 14-inch suction dredge equipped with a backhoe-type excavator to loosen muck. The dredge is 105 feet long from suction tip to end of tail race and 28 feet wide. The 300-horsepower pump motor can pump 4,000 gallons per minute. Gold recovery will be undertaken on the dredge. Photo provided by Alamin Mining Co.*

NORTHERN REGION

Total expenditures in the region amounted to $17.8 million with Teck Cominco spending a significant proportion of the total. Minor expenditures were reported for placer mine development.

Teck Cominco undertook capital improvement expenditures during 2004 amounting to $17.7 million. Teck Cominco's 100 percent owned Red Dog project is located in northwest Alaska and is the largest zinc mine in the world. Recommendations from an energy audit were implemented during the year and electricity consumption was reduced by about 5 percent at the mine and 30 percent at the port. Concentrator process enhancement included the installation of a more advanced air dispersion system on zinc flotation columns, "expert system" control equipment on the grinding and flotation circuits, and cameras to control flotation reagent additions. The Environmental Management System was certified compliant with the ISO 14001 standard. Tailings back dam investigations and design efforts were undertaken during the year to include the main and a back dam to prevent tailings from flowing into the Bons Creek drainage.

Silverado Gold Mines Ltd. suspended development activity at the Nolan Creek project during 2004 but has announced intentions to conduct winter 2005–06 open pit mining at the confluence of Fay and Nolan creeks. A drill-indicated resource has been defined at this location amounting to approximately 2,081 ounces of placer gold.

WESTERN REGION

Development expenditures were reported for both lode and placer operations in the region. At least six projects reported improvements, with total expenditures in the region amounting to $8.54 million.

Several placer gold projects reported development expenditures. One of the larger projects was Alamin Mining's Bear Creek project near McGrath in the Innoko Mining District. A large suction dredge was acquired and moved to the project (fig. 22). Other expenditures were made to improve the airport, infrastructure, and acquire support equipment for the operation. NovaGold continued investigation of placer potential in the Nome area.

Other projects bought equipment and undertook advance stripping in preparation for subsequent mining efforts.

NovaGold Resources continued development activity at their Rock Creek and Big Hurrah projects. Rock Creek is 7 miles north of the City of Nome and is accessed by state-maintained roads. Construction of a new segment of the road to the project area by the State of Alaska as part of its Road to Resources program was commenced during the year; the road will be completed during 2005. Company activity comprised permitting and feasibility study activities at both projects. Norwest Corp. and AMEC E&C Ltd. completed extensive in-fill drill work and detailed engineering in preparation for a final feasibility study. The 2004 drill program included 20,000 feet of drilling in 82 core and rotary holes for in-fill and resource estimation work. The current measured and indicated gold resource at Rock Creek is 7.1 million tons of ore with a grade of 0.0787 ounces per ton; an additional 3.2 million tons of inferred resource with a grade of 0.095 ounces per ton complements the resource. The nearby Saddle deposit contains an inferred resource of 4.0 million tons of material with a grade of 0.064 ounces per ton. As currently envisioned, the Rock Creek project will be developed into a conventional open pit mine producing approximately 100,000 ounces of gold per year at a cash cost of $200–250 per ounce. Construction costs are estimated between $40 and $50 million. Rock Creek will employ between 120 and 130 workers for the full year. Drilling in 2004 at Big Hurrah was designed to confirm historic work and form the basis for a new resource estimate on the property; this effort is detailed in the exploration section. The effort included nearly 10,800 feet of drilling in 62 core and rotary holes. Historic effort indicates that the Big Hurrah deposit contains approximately 100,000 ounces of gold at a much higher grade than the Rock Creek deposit. Big Hurrah will be mined to provide approximately 1,100 tons per day to the Rock Creek mill, processing a total of 7,700 tons per day; the remainder of the feed will be from Rock Creek. The mining workforce at Big Hurrah will be approximately 50 persons and the deposit will be mined for approximately 180 days per year. Total expenditures at both projects during 2004 amounted to $5.0 million.

EASTERN INTERIOR REGION

This region was once again the most active region in terms of the number of development projects and the development expenditures. Total development expenditures amounted to $167.1 million, most of which was at the Teck Pogo project. Other development expenditures were noted for placer, sand and gravel, and at Usibelli Coal Mine.

Teck Pogo began construction at the Pogo project, located near Delta Junction, after receiving its final permits at mid-year. An all-weather 50-mile road between the Richardson Highway and the project site was completed; the power transmission line from GVEA facilities near the Richardson Highway was constructed with the line to be energized in early 2006; and mill and infrastructure facilities were partially constructed (fig. 23). Total development expenditure was reported to be $127 million for the year. The forecast cost for the total project is $321 million. The project will consist of an underground mine and 2,750-ton-per-day mill expected to produce an average of 400,000 ounces of gold per year over a 10-year mine life. The proposed mining methods are cut and fill and drift and fill. The mill will utilize conventional milling, and gravity and carbon-in-pulp technology. The gold from both the gravity and the carbon-in-pulp circuits will be produced as doré bullion. Commissioning of production should be in early 2006 and employ approximately 300 workers. The project is 40 percent owned by Teck Cominco (the operator), 51 percent by Sumitomo Metals Mining, and 9 percent by Sumitomo Corp.

Fairbanks Gold, a wholly-owned subsidiary of Kinross Gold Mining Inc., acquired capital equipment and undertook advanced stripping at the Fort Knox mine. The company suspended mining at True North in order to provide manpower and equipment to development efforts at Fort Knox. New mine equipment put into service during 2004 included six 789 Caterpillar haulage trucks, one 992G Cat front end loader, one 994D Cat front end loader, one Hitachi EX 3600 hydraulic shovel, one 16G Cat motor grader, one DM45 Ingersoll Rand drill, and one ANFO truck. The company purchased and installed a computerized GPS Dispatch System by Modular Mining Systems, Tucson, Arizona; significant improvements in equipment control have been reported, with resulting improvements in productivity. Total capital expenditures amounted to $33.8 million.

Figure 23. *The 1875 portal to underground workings at the Pogo gold project. Photo by Rich Hughes.*

Usibelli Coal Mine invested in equipment and advanced stripping for mining at their Two Bull Ridge site. Usibelli has about 32,500 acres of land in Interior Alaska under state lease or sub-lease. About 50 million tons of coal are permitted for mining, while more than 100 million tons of proven coal reserves are controlled by the company.

Total rock, sand, and gravel capital investment for 2004 amounted to $3.9 million. The acquisition of a large cutter-head floating dredge by Exclusive Landscaping & Paving, a Fairbanks gravel producer, was a highlight for this industry (fig. 24). Other notable capital investments were reported.

Other expenditures were reported by placer miners amounting to $212,250.

SOUTHCENTRAL REGION

Development expenditures amounted to $1.38 million and were recorded for sand and gravel, placer gold, and for a lode gold project.

Sand and gravel producers invested in advanced stripping and equipment acquisition. Total reported expenditures amounted to $1.17 million.

Gold Cord Development Corp. drove 105 feet of development drift at their Gold Cord mine in the Willow Creek mining district.

ALASKA PENINSULA REGION

Rock, sand, and gravel development investment was reported in the amount of $100,000.

SOUTHEASTERN REGION

Total development expenditures reported for the region amounted to $14.14 million. Commodities experiencing development activity included lode gold, polymetallics, rock, sand and gravel, and placer gold.

Coeur Alaska continued development investment at the Kensington gold project in anticipation of receipt of permit appeal resolution in early 2005. The property is located on the east side of Lynn Canal between Juneau and Haines. Expenditures for 2004 were $7.4 million to continue permitting, updating feasibility activities, and conducting ongoing resource definition. The USFS record of decision was issued on December 17 but appealed by the Southeast Alaska Conservation Council (SEACC), who filed an appeal on February 7, the last day of the appeal process. Receipt of final permits is expected in mid-2005 with construction to be commissioned immediately thereafter. Construction costs are estimated to be $91.5 million. Construction is estimated to take 18 months with commercial production scheduled during 2006. Annual production will be 100,000 ounces of gold for an initial mine life of 10 years. The operating workforce will be 200 workers with production cash costs forecast to be $220 per ounce. Snowden Mining Industry Consultants provided review and update of the mineralization model and provided a new estimate of reserves and mineralized material. The project contains a probable reserve of 4,206,000 tons of ore at a grade of 0.25 ounces of gold per ton. An estimated additional 3,116,000 tons at a grade of 0.27 ounces per ton of mineralized material has been identified. Coeur will be undertaking a $2.6 million drilling program during 2005 to convert 300,000 to 400,000 ounces of gold currently reported as mineral resources to reserves.

Kennecott Greens Creek undertook tailings storage improvements, and investments in underground development during the year. Expenditures of $6.2 million were reported. The Greens Creek project is located on Admiralty Island, near Juneau. Kennecott (Rio Tinto), the operator, and Hecla Mining Company are joint owners of Greens Creek at 70.3 percent and 29.7 percent, respectively.

Development expenditures for rock, sand, and gravel projects amounted to $335,400 and was mostly applied to advanced stripping.

Figure 24. *Floating dredge acquired by Exclusive Landscaping & Paving Inc. to extract sand and gravel. The 204 Marlin Dredge has a 16-inch intake pipe and can produce 500 to 1,000 tons of material per hour and can dig to a 100-foot depth. A two-man crew operates the dredge and it was commissioned at Exclusive's pit in the Fairbanks area during 2004. Photo provided by Exclusive Landscaping & Paving Inc.*

PRODUCTION

Production values amounting to $1,338.7 million for 2004 also increased significantly over 2003 at $1,000.7 million. The increase is due to improved metal prices, which are up significantly over 2003, and to improved industrial mineral and placer gold production. Metal production volumes from hard-rock sources were down compared to 2003; however, metal price improvements clearly overcame production shortfalls. Gold prices were 12.75 percent higher in 2004 at $409.72/ounce, silver 36.68 percent higher at $6.67/ounce, lead 5.26 percent higher at $0.40/pound, and zinc 26.05 percent higher at $0.47/pound. Metals production shortfalls follow: Gold, 71,683 ounces; silver, 1,642,000 ounces; lead, 11,683 tons; and zinc, 34,754 tons. Fairbanks Gold reported the most significant gold production shortfall due to delaying mining at True North to facilitate stripping at Fort Knox. Ore grades and recoveries at both Red Dog and Greens Creek were down slightly, thereby affecting lead, zinc, and silver values. The rock, sand, and gravel industry's production was up considerably compared to 2003. This is believed to be due to the combination of better reporting and to increased production in 2004. Usibelli Coal Mine production was up for 2004 due to a full year of shipping to Korea and two test shipments to Chile.

Table 9 shows the quantity and value of metal and material production from 2002 to 2004. Table 10 lists the miners and mines that were reportedly producing metal in 2004. Figures 25, 26, and 27 show the historic production of sand and gravel, gold, and coal. Selected production sites are shown in figure 28.

Metals, with a value of $1,077.5 million, accounted for 80.5 percent of the total value of production. Zinc continued to be the most valuable product by a significant margin, reporting 49 percent of the total and 60.5 percent of the metal value. This was followed by gold at 14.3 percent of the total and 17.9 percent of the metal value. Lead moved from last to third in value for 2004 at 9.0 percent of the total and 11.2 percent of the metal value. Silver was a close fourth in total value at 8.5 percent of total and 10.5 percent of metal value.

Table 9. *Estimated mineral production in Alaska, 2002–2004*[a]

	Quantity			Estimated Values[b]		
Metals	**2002**	**2003**	**2004**	**2002**	**2003**	**2004**
Gold (ounces)	562,094	528,191	456,508[c]	174,283,000	191,934,000	192,343,315
Silver (ounces)	17,858,183	18,589,100	16,947,270	82,326,000	95,300,000	113,056,930
Copper (tons)[d]	1,600	0	0	2,272,000	0	0
Lead (tons)	146,462	162,479	150,796	61,514,000	64,279,000	120,636,822
Zinc (tons)	718,106	714,769	680,015	502,674,000	536,348,000	651,432,200
Subtotal				**$823,069,000**	**$887,861,000**	**$1,077,469,267**
Industrial Minerals						
Jade and soapstone (tons)[e]	2.0	0.0	0.0	25,000	0	0
Sand and gravel (million tons)	22.4	11.9	19.6	120,698,000	64,140,000	101,507,347
Rock (million tons)	3.2	0.9	7.3	31,442,000	10,406,000	106,207,814
Subtotal				**$152,165,000**	**$74,546,000**	**$207,715,161**
Coal (tons)	1,158,000	1,088,000	1,450,000	37,400,000	38,080,000	50,750,000
Peat (cubic yards)	35,000	35,000[c]	208,032	175,000	175,000	2,732,554
Subtotal				**$37,575,000**	**$38,255,000**	**$53,482,554**
TOTAL				**$1,012,809,000**	**$1,000,662,000**	**$1,338,666,982**

[a]Production data from DGGS questionnaire, phone interviews with mine and quarry operators, ADOT&PF, municipalities, Regional Corporations, and state and federal land management agencies.
[b]Values for selected metal production was based on average prices for each year; for 2004 — $409.72/ounce (unless other values were provided by the operator), silver $6.67/ounce; lead $0.40/lb, zinc $0.47/lb (Red Dog - $0.48/lb); rounded to nearest $1,000. Lode production for 2004 was 428,434 oz; balance is placer.
[c]Projected only; no reports from producers, 2004 numbers from producers.
[d]Greens Creek has historically been credited with a small copper concentrate production; no credit was experienced for 2003 and 2004 production.
[e]Jade and soapstone credit has been dropped in 2003 and 2004.

Table 10. *Companies and individuals reported to be producing metal in Alaska, 2004*

Operator	Creek	District	Type[a]
	Northern Region		
Armstrong, Jay & Jerome	Gold Creek	Koyukuk	O/P Placer
Boulder Creek Mining, Michael Shupe	Boulder Creek	Koyukuk	O/P Placer
John Hall, Compass Mining Inc.	Koyukuk	Koyukuk	O/P Placer
Robert Wright	Magnet/Gold	Koyukuk	O/P Placer
Paradise Valley Inc. (Manns, Mick)	Birch/Flat Creeks	Koyukuk	O/P Placer
Overton, Jules	Gold Bottom Gulch	Koyukuk	O/P Placer
Teck Cominco Alaska Inc.	Red Dog	Noatak	HR O/P (zinc/ lead/silver)
Weisz, Larry	Hammond River	Koyukuk	O/P Placer
	Western Region		
American Reclamation Group, LLC	Illinois Creek	Kaiyuh	HP O/P (gold/ silver)
Anderson, Ralph	Dry Creek	Nome	O/P Placer
Barry Clay	Swift Creek	Ruby	O/P Placer
Craig Coggins	Offshore	Cape Nome	S/D
Doug Clark	Boob Creek	Iditarod	O/P Placer
Jim Hansen	Mystery Creek	Cape Nome	O/P Placer
Little Creek Mining, Paul Sayer	Little Creek	Innoko	O/P Placer
Pomrenke, Steve	Anvil Creek	Nome	O/P Placer
Rosander Mining	Colorado	McGrath	O/P Placer
Taiga Mining	Aloha Creek	Koyukuk	O/P Placer
Tweet, N. B. & Sons	Kougarok	Nome	O/P Placer
	Eastern Interior		
Alan Las	No Grub	Fairbanks	O/P Placer
Aurora Mining Company		Circle	O/P Placer
B & G Resources	Greenhorn Gulch	Circle	O/P Placer
Berry Enterprises	Ketchum Creek	Circle	O/P Placer
Blue Skies Mining, Don Kiehl	Gold King Creek	Bonnifield	O/P Placer
Boyd Blair Recoverable Living Trust	Eva	Bonnifield	O/P Placer
C.J. Hill	Lost Chicken	Fortymile	O/P Placer
Charles Hammond		Fortymile	O/P Placer
Cy Bras	Canyon Creek	Fortymile	O/P Placer
D. Harvey Bickell	Walker Fork	Fortymile	O/P Placer
David Howland	Chistochina	Chistochina	O/P Placer
Dawn Lines	N. Fork Harrison	Circle	O/P Placer
de Lima Placers	American Creek	Tofty	O/P Placer
Depem Mining, Donald Stein	Gilmore Creek	Fairbanks	O/P Placer
Double J Mining, Judd Edgerton	Napoleon Creek	Fortymile	O/P Placer
Earthmovers of Fairbanks, Inc.	Fairbanks Creek	Fairbanks	O/P Placer
Eric Kile	Canyon Creek	Fortymile	O/P Placer
Fairbanks Gold Mining Company, Inc.	Fort Knox Mine	Fairbanks	HR O/P (gold)
GeoQuest	Chicken Creek	Fortymile	O/P Placer
George Seuffert	Chicken Creek	Fortymile	O/P Placer
Gordon Fulton	Circle	Circle	O/P Placer
Hard Head Mining	Fortymile	Fortymile	O/P Placer
Hayden Mining, Forest Hayden	Baby Creek	Fortymile	O/P Placer
Harrison Creek Mining Co.	Harrison Creek	Circle	O/P Placer
Hopen Operations	Cleary Creek	Fairbanks	O/P Placer
Interior Alaskana, Nancy Loud	S. Fork Harrison	Circle	O/P Placer
James Wilde	Switch/Deadwood	Circle	O/P Placer
Keller, Robert	Thistle	Bonnifield	O/P Placer

[a]O/P=Open-pit; HR=Hard-rock; U/G=Underground; S/D=Suction Dredge.

large operations. Hard-rock (lode) gold production decreased from 504,591 ounces in 2003 to 428,434 ounces in 2004. Placer gold production increased from 23,600 ounces in 2003 to 28,074 ounces in 2004. The decrease in hard-rock production principally reflects a lower output from Fort Knox for the second year in a row. Production is expected to be about the same for 2005 but will begin to increase in 2006 as Pogo, Kensington, and Rock Creek/Big Hurrah operations are commissioned.

Tables 14 and 15 show the value and regional importance of sand, gravel, and rock production. Production of sand and gravel in 2004 was 19.6 million tons, up considerably from 2003 at 11.9 million tons. Rock production in 2004 was 7.3 million tons, also up considerably from 2003 at 861,400 tons. The numbers are believed to be reasonably complete although were very difficult to obtain.

Coal production from Usibelli Coal Mine in 2004 was 1,450,000 tons, up considerably from 2003 at 1,088,000 tons. Exports were reported to be 601,000 tons. Shipments to Korea increased considerably from a low in 2003 of 231,500 tons to 496,000 tons in 2004. Test shipments of 105,000 tons were made to Chile through Glencore Ltd. for power plant use. The balance of the production was consumed by local power plants.

Peat production was up considerably for 2004 at 208,032 cubic yards. The 2003 production reported was suspect at an estimated 35,000 cubic yards. One producer reported production of 60,000 yards of peat in 2003, but failed to report that production at that time; this production has been included in the 2004 numbers.

The export of minerals topped $500 million in 2004 for the first time in Alaska history (table 16, fig. 29). This amount is double the $249 million exported only 8 years ago in 1996. International mineral sales increased 9 percent in 2003 and an impressive 22 percent in 2004. One-quarter of Alaska's mineral exports head to Canada, one-third are sold to Europe, and 40 percent are bound for Asia, primarily Korea, Japan, and China.

NORTHERN REGION

Teck Cominco Ltd.–NANA Regional Corp.'s Red Dog Mine near Kotzebue in northwestern Alaska milled 3,250,000 tons of ore in 2004, down 227,700 tons from 2003 (table 17). Ore grade for 2004 was 22.0 percent zinc and

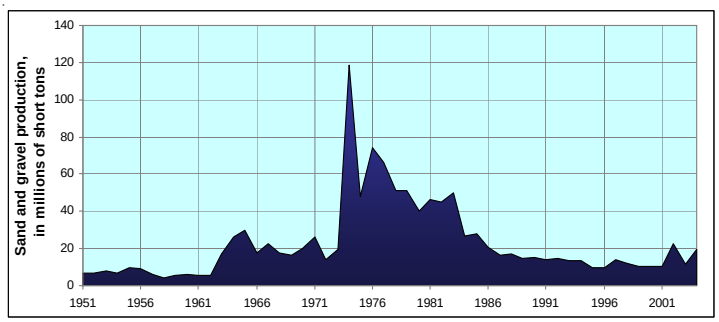


Figure 25. *Sand and gravel production in Alaska 1950–2004.*

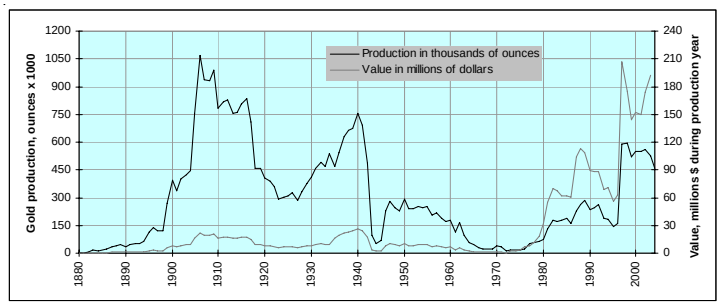


Figure 26. *Amount of value of gold production in Alaska, 1880–2004.*

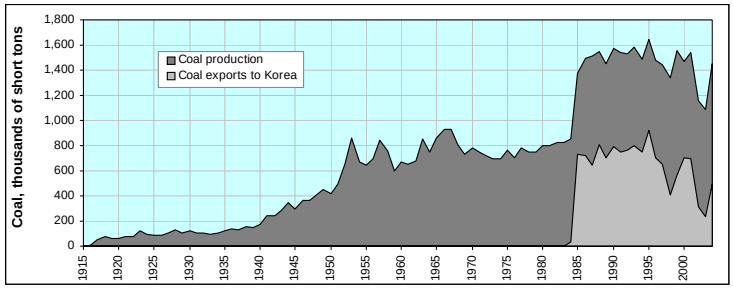


Figure 27. *Coal production in Alaska, 1915–2004, including exports to Korea.*

Table 11. *Average metal prices, 1994–2004*

	Gold $/oz	Silver $/oz	Copper $/lb	Lead $/lb	Zinc $/lb
1994	386.00	5.41	1.05	0.35	0.45
1995	395.00	5.43	1.33	0.34	0.48
1996	387.60	5.19	1.03	0.37	0.49
1997	330.76	4.91	1.03	0.28	0.59
1998	293.88	5.53	0.75	0.24	0.46
1999	278.70	5.20	0.71	0.23	0.49
2000	279.10	4.96	0.82	0.21	0.51
2001	271.04	4.37	0.71	0.22	0.40
2002	310.06	4.61	0.71	0.21	0.35
2003	363.38	4.88	0.81	0.23	0.38
2004	409.72	6.67	1.29	0.40	0.47

Table 10. *Companies and individuals reported to be producing metal in Alaska, 2004—continued*

Operator	Creek	District	Type[a]
Koppenberg Mining & Manufacturing	Faith Creek	Circle	O/P Placer
Lapp & Son Mining	Ketchum Creek	Circle	O/P Placer
Leo Regner	Lilliwig	Fortymile	O/P Placer
Olson, Gordon	Jack Wade	Fortymile	O/P Placer
Owen Mining, Jeff Owen	Davis	Fortymile	O/P Placer
Pat McCloskey	Deadwood	Circle	O/P Placer
Polar Mining Inc.	Goldstream Creek	Fairbanks	O/P Placer
Randy Renfro	Fortymile	Fortymile	O/P Placer
Rudd Van Dyke	Fortymile	Fortymile	SD
Sheldon Maier	Montana	Fortymile	O/P Placer
Steve Losonsky	Hunter/Dawson	Rampart	O/P Placer
Treesh Mining, James Treesh	Fortymile	Fortymile	O/P Placer
Wilde, James		Circle	O/P Placer
Wilder, Richard	Little Boulder	Hot Springs	O/P Placer
Wilkinson, Fred	Ketchum Creek	Circle	O/P Placer
	Southcentral Region		
Girdwood Mining Company	Crow Creek	Anchorage	O/P Placer
Larry Smith		Seward	O/P Placer
North American Mining	Willow	Yentna	O/P Placer
Todd Bauer	Gold Creek	Talkeetna	O/P Placer
	Southwestern Region		
Lyman, Resources (Spencer & Carolyn)	Queen Creek	Aniak	O/P Placer
Matter, Mark	Marvel Creek	Aniak	O/P Placer
Nyac Mining Co.	Bear Creek	Aniak	O/P Placer
	Southeastern Region		
Chilkat Mining	Porcupine Creek	Juneau	O/P Placer
Kennecott/Hecla	Greens Creek Mine	Admiralty Island	HR U/G (zinc/ lead/silver/gold)
John Schnabel, Big Nugget Mines	Porcupine Creek	Porcupine	O/P Placer

[a]O/P=Open-pit; HR=Hard-rock; U/G=Underground; S/D=Suction Dredge.

Table 11 shows the average metal values used in this report over the last 11 years. In some cases the actual prices received by the producers were reported and were used in the report. Across-the-board metal price increases are noted from those experienced in 2003; those increases contributed substantially to the value of production in spite of notable reductions in quantities of metals produced. The metal price increases were: Gold, 12.75 percent; silver, 36.68 percent; lead, 5.26 percent; and zinc, 26.05 percent.

The production estimates included in this report are from 227 questionnaires returned by miners, Native organizations, governmental agencies, municipalities, and service companies, complemented by well over 200 telephone calls and nearly the same number of e-mails sent to probable producers. Additional information was derived from State of Alaska Annual Placer Mining Applications (APMAs) submitted to the DMLW, from corporations' annual and 10K reports, from NPDES permits provided for suction dredgers and not otherwise permitted, and so forth.

The authors wish to thank the Alaska Railroad Corporation, the Alaska Mental Health Trust Land Office, the Alaska Department of Transportation & Public Facilities, the Alaska Division of Mining, Land & Water, municipalities, the U.S. Forest Service, the U.S. Bureau of Land Management, Native regional corporations and the U.S. Environmental Protection Agency for providing information for this section of the report.

Some respondents reported costs and unit values for production. In general, however, metal values were computed from weekly averages on the London Metal Exchange, and do not take into account mining, shipping, smelting, and other costs incurred by the reporting producer/company.

Tables 12 and 13 show gold production by region of the state, and the placer production by small, medium, and

6.0 percent lead compared to 2003 values of 21.7 percent and 6.2 percent lead, respectively. Resulting metal production for 2004 was lower than in 2003 as a result of lower feed volume to the mill circuits; 610,900 tons zinc and 128,970 tons lead were produced. Silver production was 7,222,270 ounces calculated at 56.0 ounces per ton of lead metal produced. This is down slightly from 2003 at 7,701,000 ounces of silver. Employment was 508 persons average for the year; this number includes contractors to and employees of Teck Cominco's Red Dog operation. Approximately 53 percent of the employees are NANA shareholders.

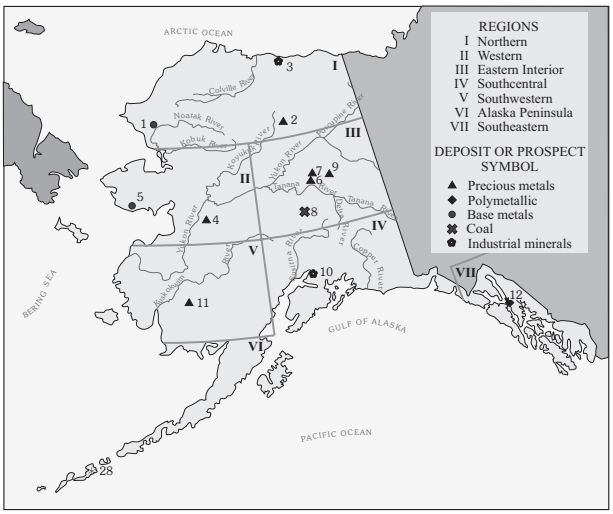
Approximately 25 percent of the zinc concentrate produced at Red Dog is shipped to metallurgical facilities at Trail, British Columbia, and the balance to customers in Asia and Europe. The lead concentrate production is shipped to customers in Asia and Europe. The majority of concentrate sales are pursuant to long-term contracts at market prices subject to annually negotiated treatment and refining charges. The balance is sold on the spot market at

I Northern Region
1. Teck Cominco Alaska Inc. Red Dog Mine, Noatak district—zinc–lead–silver (germanium)
2. Gold placer mines—gold
3. Prudhoe Bay and Kuparuk pits (numerous)—sand and gravel

II Western Region
4. American Reclamation Group LLC Illinois Creek Mine, Koyukuk–Hughes district—gold–silver
5. Nome—placer gold, sand and gravel

III Eastern Interior Region
6. Polar Mining Inc., Fairbanks district—gold–silver–screened aggregate
7. Kinross Gold Corp. Fort Knox Mine, True North Mine, Fairbanks district—gold–silver; placer mines
8. Usibelli Coal Mine Inc., Bonnifield district—coal
9. Earth Movers of Fairbanks Inc., Fairbanks district—gold placer

IV Southcentral Region
10. Palmer–Anchorage district—sand and gravel



V Southwestern Region
11. Nyac Mining Co., Nyac district—gold–silver

VI Alaska Peninsula Region

VII Southeastern Region
12. Kennecott Minerals Co./Hecla Mining Co., Greens Creek Mine, Juneau–Admiralty district—silver–zinc–gold–lead–copper

Figure 28. *Selected production projects, 2004.*

Table 12. *Reported refined gold production, number of operators, and industry employment in Alaska, 2002–2004*[a]

Region	Number of operators			Production in ounces of gold			Number of employees		
	2002	2003	2004	2002	2003	2004	2002	2003	2004
Northern	9	6	6	685	8,051	198	16	36	8
Western	8	6	11	35,465	15,063	16,546	63	13	28
Eastern Interior	22	40	42	421,364	403,379	351,937	415	342	459
Southcentral	3	6	4	153	650	262	11	3	2
Southwestern	6	6	3	1,733	1,833	1,346	14	7	1
Southeastern	2	2	3	102,694	99,215	86,196	281	297	267
TOTAL	**50**	**66**	**69**	**562,094**	**528,191**	**456,485**	**800**	**697**	**762**

[a]2004 production includes 428,434 ounces of gold from hardrock mines and 28,074 ounces of gold from placer sources.

Table 13. *Production for selected Alaska placer gold mines, 1998–2004*

Mine size	1998	1999	2000	2001	2002	2003	2004
			Number of mines				
Small[a]	45	38	60	33	43	58	60
Medium[b]	11	13	14	5	4	4	5
Large[c]	7	7	4	4	2	2	3
TOTAL	**63**	**58**	**78**	**42**	**49**	**64**	**68**
			Production in ounces				
Small[a]	10,159	4,710	8,981	5,048	9,931	8,124	7,621
Medium[b]	12,833	13,218	15,186	6,234	4,739	4,976	4,504
Large[c]	72,307	52,300	22,147	11,559	7,711	10,500	15,950
TOTAL	**95,299**	**70,228**	**46,314**	**22,841**	**22,381**	**23,600**	**28,074**

[a]<650 oz gold/yr.
[b]650-2,500 oz gold/yr.
[c]>2,500 oz gold/yr.

Table 14. *Reported sand and gravel production and industry employment in Alaska by region, 2004*

Region	Companies and agencies reporting[a]	Tons	Estimated unit value ($/ton)[b]	Total value	Estimated number of employees
Northern	3	1,253,510	17.95	22,504,875	182
Western	6	2,062,292	4.37	9,003,734	54
Eastern Interior	21	4,295,746	3.28	14,089,743	93
Southcentral	26	8,823,269	4.80	42,353,456	167
Southwestern	4	1,929,672	3.29	6,345,912	41
Alaska Peninsula	1	13,500	8.00	108,000	0
Southeastern	10	1,198,105	5.93	7,101,628	30
TOTAL	**71**	**19,576,092**	**5.19**	**101,507,347**	**567**

[a]From 19 returned questionnaires, over 100 telephone surveys, follow up fax questionnaires, over 100 emails to probable producers, etc. Data were also returned from the Alaska Railroad, Alyeska Pipeline, DML&W, DOT&PF, USFS, BLM, USFS, Regional Corporations, and others.
[b]Values are based on estimates from producers.

Table 15. *Reported rock production and industry employment in Alaska by region, 2004*[a]

Region	Companies and agencies reporting[b]	Tons	Estimated unit value ($/ton)[c]	Total value	Estimated number of employees
Northern	1	15,525	15.00	232,875	1
Western	3	3,223,784	14.96	48,226,547	182
Eastern Interior	7	1,101,450	21.28	23,438,987	184
Southcentral	14	1,095,413	15.09	16,525,640	50
Southwestern	1	68,634	15.00	1,029,510	4
Alaska Peninsula	3	42,000	15.46	649,500	1
Southeastern	8	1,763,244	9.04	15,947,255	53
TOTAL	**37**	**7,310,050**	**14.51**	**106,050,314**	**475**

[a]Includes shot rock, crushed stone, D-1, riprap, and modest quantities of ornamental stone.
[b]From returned DGGS questionnaires, over 100 telephone surveys, follow up fax questionnaires, over 100 emails to probable producers,etc. Data were also returned from the Alaska Railroad, Alyeska Pipeline, DML&W, DOT&PF, USFS, BLM, USFS, Regional Corporations, and others.
[c]Values are based on estimates from producers.

prices based on prevailing market quotations. Because the shipping season at Red Dog is restricted to approximately 100 days per year because of sea ice conditions, Red Dog's sales are seasonal with the majority of sales in the last 5 months of each year. Concentrate is stockpiled at the port facility and is typically shipped between July and October.

Placer gold production was reported from six placer mines in the northern region, most of them in the Koyukuk drainage around Wiseman. The largest in the area during 2003, the Nolan Mine of Silverado Green Fuels Inc., did not operate during the year other than to conduct some exploration and maintenance activity. Employment was estimated to be 5 persons.

Production of sand and gravel in the region was 1.25 million tons. This was down from the 2003 production of 1.9 million tons. Employment was reported to be 182 persons for the year.

Rock production for the region was 15,525 tons and the average employment was 1 person.

Table 16. *Alaska International mineral exports*

	Export value (millions)
1996	$249
1997	$369
1998	$317
1999	$359
2000	$293
2001	$329
2002	$380
2003	$414
2004	$505

Source: U.S. Census Bureau, Origin of Movement Series

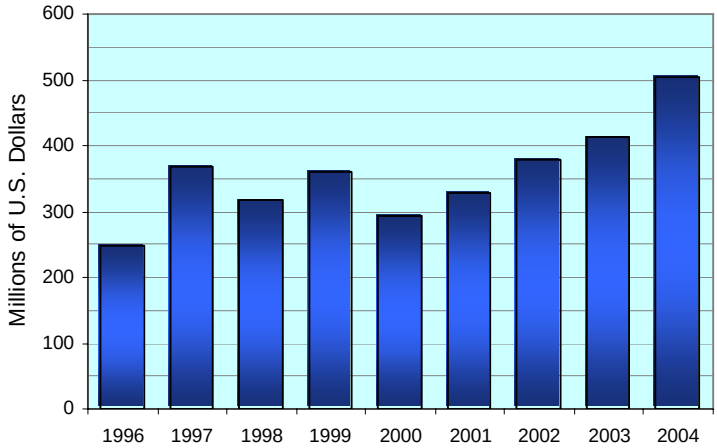


Figure 29. *Alaska international mineral exports.*

Table 17. *Red Dog Mine production statistics, 1989–2004*[a]

	Tons Milled	Ore Grade Zinc %	Ore Grade Lead %	Ore Grade Silver oz/ton	Total Tons Concentrate Produced[b]	Contained Tons Zinc	Contained Tons Lead	Million Ounces Silver[c]	Employees
1989	33,300	20.4	7.6	3.6	8,532	- -	- -	- -	228
1990	996,700	26.5	8.5	3.6	443,600	191,981	31,187	- -	350
1991	1,599,300	22.5	6.6	2.8	521,400	234,510	43,815	- -	331
1992	1,582,000	19.9	6.0	2.9	474,900	231,363	15,960	- -	349
1993	1,874,600	18.4	5.7	2.8	539,800	255,149	24,788	- -	376
1994	2,339,500	18.8	5.7	2.8	658,000	328,160	32,775	- -	391
1995	2,485,900	19.0	5.8	2.8	753,600	358,676	55,715	3.615	397
1996	2,312,600	18.7	5.0	2.8	765,300	357,680	65,886	4.304	417
1997	2,127,000	20.3	5.2	2.9	799,400	373,097	69,284	4.273	479
1998	2,752,587	21.4	5.2	2.7	1,015,773	490,461	80,193	5.202	466
1999	3,282,788	21.3	5.2	2.7	1,207,160	574,111	97,756	6.205	539
2000	3,365,508	21.0	4.7	2.5	1,211,539	585,030	91,557	5.843	536
2001	3,560,430	19.8	5.0	2.5	1,215,837	570,980	105,000	5.898	559
2002	3,489,600	21.1	5.4	2.7	1,366,480	637,800	118,880	6.750	560
2003	3,476,689	21.7	6.2	3.1	1,397,246	638,569	137,679	7.701	388
2004	3,250,000	22.0	6.0	3.0	1,242,000	610,900	128,970	7.222	508

[a]Revised slightly from Special Report 50, Alaska's Mineral Industry 1995 (Bundtzen and others), based on new company data.
[b]Totals for years 1990 through 1995 include bulk concentrate.
[c]Estimate is calculated at 56 oz per ton of lead metal produced.
- - = No data.

WESTERN REGION

American Reclamation Group LLC continued leaching gold at the Illinois Creek Mine; however, this operation has entered its final reclamation phase and little or no production will be experienced during 2005. Average mine employment fell to 5.7 persons for the year compared to 2003 at 9 persons.

Ten placer gold mines reported production in the region for 2004. Reported production was 12,446 ounces of gold. This is an increase in volume by 11,143 ounces over that reported for 2003—believed to be an increase due to better reporting and some increase in volume. Employment was reported to be 22 persons.

Sand and gravel production for the region was reported to be 2.06 million tons; employment was 54 persons.

Rock production for the region was reported to be 3.2 million tons (fig. 30). Employment was estimated to be 182 persons.

EASTERN INTERIOR REGION

Fairbanks Gold Mining Inc. (FGMI), a wholly owned subsidiary of Kinross Gold Corp., is the operator of Fort Knox Mine and the satellite True North Mine. Fort Knox is located about 15 miles northeast of Fairbanks True North is about 6 miles northwest of Fort Knox. FGMI recovered 338,334 ounces of gold during 2004, down 53,497 ounces from the 391,831 ounces produced during 2003 (table 18). The shortfall was primarily due to lower ore grade resulting from a curtailment of operation at True North to accelerate stripping at Fort Knox. Operating equipment and manpower was moved to the latter operation to facilitate the stripping operation. Mill throughput was 14,593,820 tons with an average recoverable head grade of 0.0232 ounces/ton. Total mined material for 2004 amounted to 47,950,000 tons, including 26,594,000 tons of stripped material. Employment averaged 427 persons during the year. See table 18 for further information.

The region continues to host the largest number of placer mines in the State. About 41 mines reported placer gold production amounting to 13,603 ounces of gold, up slightly from 2003 at 11,548 ounces. Total employment for the placer mines in the region is estimated to be 32 full-time jobs.

Usibelli Coal Mine (UCM) mined for the entire year at their Two Bull Ridge site. Total coal production amounted to 1,450,000 tons. Production for 2003 was 1,088,000 tons. Exports were reported to be 601,000 tons. Shipments to Korea increased considerably from 231,500 tons in 2003 to 496,000 tons in 2004. Test shipments amounting to 105,000 tons were made to Chile through

Figure 30. *Loading granitic orthogneiss boulders on semi trailers at the Cape Nome Quarry. The rock is trucked to Nome for use in stream bank armoring, seawall construction, and other projects in Nome and other communities on the Seward Peninsula. Photo by David Szumigala.*

Table 18. *Fort Knox Gold Mine production statistics, 1996-2004*

	Tons Mined (ore + waste)			Tons Milled (ore)			Ounces	Employ-
	Fort Knox	True North[a]	Total	Fort Knox	True North[a]	Total	Produced	ment
1996	16,684,000		16,684,000	769,700		769,700	16,085	243
1997	32,380,000		32,380,000	12,163,151		12,163,151	366,223	249
1998	33,294,000		33,294,000	13,741,610		13,741,610	365,320	245
1999	30,350,000		30,350,000	13,819,010		13,819,010	351,120	253
2000	35,600,000		35,600,000	15,000,000		15,000,000	362,929	253
2001	25,957,900	8,448,400	34,406,300	13,282,614	2,377,386	15,660,000	411,220	360
2002	24,583,500	11,461,000	36,044,500	11,887,200	3,371,800	15,259,000	410,519	360
2003	30,597,940	12,707,100	43,305,040	11,473,000	3,611,682	15,084,682	391,831	316
2004	44,187,000	3,763,000	47,950,000	12,917,966	1,675,854	14,593,820	338,334	427

[a]True North began production in 2001.

Glencore Ltd. for power plant use. The balance of the production was consumed by local power plants. Employment was reported to be 90 persons working a 225-day year.

Sand and gravel production amounted to a reported 4.3 million tons for 2004 compared to 3.4 million tons in 2003. This is up considerably and reflects expanded construction activity in the region. Employment was reported to be 93 full-time jobs.

Rock production amounted to 1.1 million tons for the year compared to a production of 647,000 tons for 2003. Employment was 184 full-time jobs.

Peat (top soil) production was 47,494 cubic yards reflecting a high volume of landscaping efforts in the Interior. Manpower for this production was 2 full-time jobs – this is believed to be short of actual; where peat/topsoil production is concurrent with sand and gravel operation, the numbers may have been reported with the latter's production.

SOUTHCENTRAL REGION

Rock, sand, gravel, and peat/topsoil production was the highlight of this region (fig. 31). Southcentral Alaska was the largest producer of these products with 47 reports by product received, some producing more than one of the products. Sand and gravel production amounted to 8,823,300 tons and provided 167 full-time jobs. Rock production was 1,095,413 tons and provided 50 full-time jobs. Peat/top soil production amounted to 160,538 cubic yards and provided three full-time jobs; the employment number for peat/top soil is believed to be understated and is probably allocated to other concurrently produced products.

Placer production from this region was down from 2003.

SOUTHWESTERN REGION

Placer gold production from the region amounted to 1,346 ounces from three operations (fig. 32).

Rock, sand, and gravel production was reported from five operations. Total sand and gravel production amounted to 1,929,672 tons and provided 41 full-time jobs. Rock production amounted to 68,600 tons and provided four full-time jobs.

ALASKA PENINSULA REGION

Rock, sand, and gravel production was reported from four operations. Total volume of material amounted to 55,500 tons and provided one full-time job. No other mining activity was reported from the region.

SOUTHEASTERN REGION

The southeastern region reported polymetallic, rock, sand and gravel, and placer gold production. Total mineral industry production employment for the region was approximately 350 full-time jobs.

The Greens Creek polymetallic mine reported a mill throughput of 805,789 tons, an all-time record production for the operation (table 19). This was 24,589 tons more than in 2003, also a record year at that time. Greens Creek is operated by Kennecott Minerals Company, which owns 70.3 percent; Hecla Mining Company owns the remaining 29.7 percent. Head grade of the ore was 16.65 ounces

Figure 31. *Quality Asphalt's sand and gravel operation north of Wasilla. Sized product is loaded directly into railroad cars for transport to Anchorage. Photo by Rich Hughes.*

Figure 32. *Placer gold mining on upper Bear Creek by Nyac Mining Co. Photo provided by Jeff Foley, Calista Corporation.*

per ton silver, 11.1 percent zinc, 4.1 percent lead, and 0.163 ounces per ton gold. Metal production (contained in concentrates) was 9,707,000 ounces of silver, 69,115 tons of zinc, 21,826 tons of lead and 86,000 ounces of gold. Employment was 265 full-time jobs compared to 295 for 2003. See table 19. Rich Heig, general manager of the Greens Creek Mine, was named mine manager of the year in the Mining Magazine awards for 2004 presented at MINExpo in Las Vegas.

Currently, Greens Creek is mining approximately 2,200 tons of ore per day from underground operations. Ore from the underground trackless mine is milled at the mine site. The mill produces gold doré from gravity concentrates, lead, zinc, and bulk concentrates. Generally, the mine ships concentrates to Korea, Japan, Mexico, and Canada for smelting and metals recovery (fig. 33).

Rock, sand, and gravel operations produced 2,961,349 tons of material during the year. At least 18 different operations were involved. Production was higher than in 2003 by 1,837,149 tons. Employment was reported to be 83 full-time jobs. No peat/top soil production was reported.

Table 19. *Greens Creek Mine production statistics, 1989–2004*

			Contained Metal					
	Tons Milled	Tons Concentrate	Zinc	Tons Lead	Ounces Copper[a]	Gold	Silver	Employees
1989	264,600	- -	18,007	9,585	- -	23,530	5,166,591	235
1990	382,574	- -	37,000	16,728	- -	38,103	7,636,501	265
1991	380,000	- -	41,850	16,900	- -	37,000	7,600,000	238
1992	365,000	113,827	40,500	16,500	- -	32,400	7,100,000	217
1993[b]	77,780	- -	9,500	3,515	- -	7,350	1,721,878	217
1994[c]	- -	- -	- -	- -	- -	- -	- -	- -
1995[c]	- -	- -	- -	- -	- -	- -	- -	- -
1996[b]	135,000	43,000	9,100	4,200	193	7,480	2,476,000	265
1997	493,000	- -	46,000	19,000	1,300	56,000	9,700,000	275
1998	540,000	- -	58,900	22,700	1,300	60,572	9,500,000	275
1999	578,358	- -	68,527	25,503	1,400	80,060	10,261,835	275
2000	619,438	- -	84,082	31,677	1,400	128,709	12,424,093	275
2001	658,000	- -	63,903	22,385	1,400	87,583	10,900,000	275
2002	733,507	217,200	80,306	27,582	1,600	102,694	10,913,183	262
2003	781,200	- -	76,200	24,800	- -	99,000	11,707,000	295
2004	805,789	- -	69,115	21,826	- -	86,000	9,707,000	265

[a]No copper credits in 2003 and 2004.
[b]Part-year production.
[c]No production in 1994 and 1995 due to mine closure.
- - Not reported.

Figure 33. *The ore concentrate loading marine terminal at Greens Creek Mine on Admiralty Island. Concentrates are trucked 9 miles from the mine site to the terminal. The Hawk Inlet camp is shown behind the loading facilities. Photo courtesy of Greens Creek Mining Co.*

DRILLING

Drilling was conducted during all phases of mining (exploration, development, and production) on various projects across Alaska during 2004. Companies with significant drilling programs in Alaska during 2004 are listed in table 20. Tables 21 and 22 summarize the drilling activity in the state during 2004 by region and type of drilling. Drilling totals for 2004 are 415,628 feet of core drilling, 36,024 feet of reverse-circulation drilling, and 107,526 feet of placer auger/churn drilling (fig. 34). There was no drilling reported for coal operations. The 2004 drilling footage increased 46 percent from the 2003 value.

Major drill programs were conducted by Northern Dynasty Minerals Ltd. at the Pebble property, by Kinross Gold Corp. (Fairbanks Gold Mining Inc.) in the Fairbanks mining district including Fort Knox and True North mines, by AngloGold USA Exploration Inc. at several properties near Livengood and Pogo, by Kennecott Minerals Co. at Greens Creek Mine, by Meridian Gold Inc./Freegold Ventures Ltd. on the Golden Summit property, by NovaGold Resources Inc. at the Rock Creek, Big Hurrah, and Arctic properties, by Teck Cominco Alaska Inc. in the Red Dog area, by Kennecott Exploration Co. at the Whistler property, by Freegold Ventures Ltd./Pacific North West Capital Corp./Lonmin PLC at the Union Bay property, and by St. Andrew Goldfields Ltd./Mystery Creek Resources Inc. at the Nixon Fork property.

Table 20. *Companies reporting significant drilling programs in Alaska, 2004.*

AngloGold USA Exploration Inc.
Bravo Venture Group Inc. & Olympic Resources Group LLC
Earth Movers of Fairbanks Inc.
Freegold Ventures Ltd.
Geocom Resources Inc.
Kennecott Exploration Co.
Kennecott Minerals Co. & Hecla Mining Co.
Kinross Gold Corp. (Fairbanks Gold Mining Inc.)
Liberty Star Gold Corp.
Lonmin PLC & Freegold Ventures Ltd & Pacific North West Capital Corp.
Max Resource Corp.
Meridian Gold Inc. & Freegold Ventures Ltd.
Nevada Star Resource Corp.
Northern Dynasty Minerals Ltd.
NovaGold Resources Inc.
St Andrew Goldfields Ltd. & Mystery Creek Resources Inc.
Teck Cominco Alaska Inc.
Teryl Resources Corp.
Todd Bauer

Figure 34. *Reverse-circulation drilling at Rock Creek deposit near Nome. Photo provided by NovaGold Resources Inc.*

Table 21. *Drilling footage by region in Alaska, 2004*

Type of drilling	Northern	Western	Eastern Interior	South-central	South-western	South-eastern	TOTAL
Placer subtotal	100,000	1500	5,426	500	100	- -	107,526
Coal subtotal	- -	- -	- -	- -	- -	- -	- -
Hardrock core	29,168	64,480	49,033	14,328	165,746	92,873	415,628
Hardrock rotary	- -	6,832	14,417	6,775	8,000	- -	36,024
Hardrock subtotal	**29,168**	**71,312**	**63,450**	**21,103**	**173,746**	**92,873**	**451,652**
TOTAL (feet)	**129,168**	**72,812**	**68,876**	**21,603**	**173,846**	**92,873**	**559,178**

- - = Not reported.
Drill footages do not include sand and gravel drilling.
No drilling reported for Alaska Peninsula in 2004.

Table 22. *Drilling footage reported in Alaska, 1982–2004*

Year	Placer Exploration	Placer Thawing	TOTAL PLACER	TOTAL COAL	TOTAL HARDROCK	Hardrock Core[a]	Hardrock Rotary[a]	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	78,934	**455,524**
2000	15,480	- -	**15,480**	- -	**546,268**	418,630	127,638	**561,748**
2001	1,100	- -	**1,100**	**36,151**	**316,068**	240,318	75,750	**353,319**
2002	1,250	- -	**1,250**	- -	**488,902**	385,290	103,612	**490,152**
2003	10,108	- -	**10,108**	**2,000**	**370,634**	270,456	100,178	**382,742**
2004	107,526	- -	**107,526**	- -	**451,652**	415,628	36,024	**559,178**

[a]Core and rotary drilling not differentiated prior to 1987.
- - = Not reported.

GOVERNMENT ACTIONS

The Alaska Division of Geological & Geophysical Surveys (DGGS) conducted geologic mapping and geochemical sampling around the Big Hurrah area and in the Council area as part of an integrated program following up the airborne geophysical survey results previously released by DGGS in 2003 (fig. 35). DGGS also contracted for and worked on a 220-square-mile airborne magnetic and electromagnetic geophysical survey in the southern Goodpaster region of the Big Delta Quadrangle (table 23). The data from this survey will be released in early 2005. The U.S. Bureau of Land Management (BLM) did not fund any geophysical surveys in Alaska during 2004, but past survey work is listed in table 24.

DGGS released new trace-element geochemical data and whole-rock geochemical data for surface rock samples collected over 130 square miles of the central Livengood Quadrangle in 2001 and 2003. One highly anomalous sample from a known prospect yielded slightly more than 1 ounce per ton gold. DGGS also released new 1:50,000-scale geologic maps of the Livengood area as part of an integrated program following up the airborne geophysical survey results previously released by DGGS in 1999.

DGGS also released a new bedrock geologic map of the Salcha River–Pogo area, located in the central Big Delta Quadrangle of Alaska. The 1:63,360-scale bedrock geologic map, which covers approximately 435 square miles within parts of the Fairbanks and Goodpaster mining districts, provides ground-truth geologic mapping of the southern portion of the Salcha River–Pogo airborne geophysical survey (helicopter-based aeromagnetic, radiometric, and electromagnetic data) released by DGGS in 2000 as part of the State-funded Alaska Airborne Geophysical/Geological Mineral Inventory Program. The bedrock geologic map contains information derived from fieldwork conducted during the summers of 2000–2002 by mineral-resource personnel from DGGS and the University of Alaska Fairbanks.

Jerry Birch and Kevin Greenfield of Taiga Mining Co. Inc. were awarded the 2004 annual state reclamation award by the Alaska Department of Natural Resources (DNR) in

Table 23. *Detailed state airborne geophysical surveys and follow-up geologic ground-truth mapping as of December 2004*[a]

Nome District western core area	494 sq. miles	Airborne geophysical/ground-truth geological mapping
Nyac District core area	183 sq. miles	Airborne aeromagnetic mapping
Circle District core area	338 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Valdez Creek District	75 sq. miles	Airborne geophysical mapping
Fairbanks District	626 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Richardson District	137 sq. miles	Airborne geophysical mapping
Rampart/Manley-Tofty	1,017 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Upper Chulitna District	364 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Petersville-Collinsville District	415 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Iron Creek District	689 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Ruby District	591 sq. miles	Airborne geophysical mapping/ground-truth geologic map
Fortymile District	1,036 sq. miles	Airborne geophysical mapping/ground-truth geologic maps
Livengood District	229 sq. miles	Airborne geophysical mapping (ground-truth in 2003)
SalchaRiver/North Pogo	1,032 sq. miles	Airborne geophysical mapping/ground-truth geologic maps
Southeast extension of Salcha River/Pogo	91 sq. miles	Airborne geophysical mapping (released winter 2002)
Liberty Bell	276 sq. miles	Airborne geophysical mapping (released winter 2002)
Broad Pass	304 sq. miles	Airborne geophysical mapping (released winter 2002)
Council	618 sq. miles	Airborne geophysical mapping (released winter 2003)
South extension of Salcha River/Pogo	210 sq. miles	Airborne geophysical mapping (expected release winter 2005)
Total: 13 years $5.3 million	**8,725 sq. miles**	**1.5% of Alaska's total area**

[a]Projects funded by the Alaska State Legislature. Projects concentrate on state, Native, state-selected, and Native-selected lands and are managed by DGGS.
Note: Surveys listed above are complete except where noted. Additional areas will be scheduled for surveying at later dates contingent on future funding.

Table 24. *Detailed federal airborne geophysical survey work as of December 2004*[a]

Wrangell/Stikine[b]	1,111 sq. miles
Koyukuk/Wiseman	533 sq. miles
Ketchikan[c]	605 sq. miles
Aniak	1,240 sq. miles
Delta River	603 sq. miles
Sleetmute	641 sq. miles
Total: 7 years $2.04 million	**4,733 sq. miles**[d]

[a]Projects funded mainly by U.S. Bureau of Land Management with contributions by DGGS, local and state governments, and private corporations. Projects concentrate mainly on federal land. Data are released through DGGS. Geophysical survey work does not include geologic mapping.
[b]Major funding came from BLM and the City of Wrangell.
[c]Major funding came from BLM and Ketchikan Gateway Borough. Sealaska Corp., Alaska State Mental Health Land Trust Office, the City of Coffman Cove, and the City of Thorne Bay also contributed funds. Sealaska Corp. also contributed previously acquired geophysical data.
[d]0.5% of Alaska's total area

Figure 35. *DGGS geologist David Szumigala examining Casadepaga Schist at the "Glaucophane Volcano," Solomon Quadrangle, Seward Peninsula. Photo by Melanie Werdon, DGGS.*

recognition of Taiga's excellent reclamation work on Bear Creek and its tributaries Ida and Dry creeks. The U.S. Bureau of Land Management (BLM) recommended Taiga Mining based on Taiga's mining and reclamation plans that have created stream valleys with adequate floodplain widths and channel locations such that streams were re-established with uniform slopes and appropriate widths and depths. These efforts have reduced the stream head-cutting, lateral migration, and subsequent sedimentation typical of new channels. The establishment of riparian vegetation within the active floodplain of Ida Creek is indicative of this channel's stability. Taiga Mining Co. Inc. has been mining in the Bear Creek Watershed for more than the last decade. To date, approximately 200 acres have been mined and reclaimed. Bear Creek is within BLM's Hogatza River Area of Critical Environmental Concern, a special management area created for its exceptional summer-run chum salmon spawning habitat.

DNR released "LAS Mapper," an Internet mapping service. This mapping tool allows access to the Land Administration System (LAS) spatial and tabular data via an interactive map-based interface. DNR adjudicators have maintained a case file-based system within the Land Administration System for nearly 20 years. The LAS Mapper uses the latest Internet mapping technology, allowing a person to view directly the database of permits, leases, land sales, and other land status information used to create Land Status Plats.

DNR continued working as a cooperating agency with the U.S. Forest Service and U.S. Environmental Protection Agency on the necessary permits for the expansion of the Greens Creek tailings facility in southeastern Alaska. This successful expansion required the approval of a revised solid waste permit from DEC as well as additional revisions to the financial assurances. Work is also in progress to update permits for the Red Dog zinc mine. DNR worked with the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers on permitting issues for Coeur Alaska Inc.'s Kensington Project, including preparing draft decisions on several state leases and permits related to the project.

The Alaska Department of Transportation & Public Facilities (DOT&PF) is continuing the Industrial Roads Program, as part of the Resource Transportation Analysis, with a 5-year review of industrial development roads begun in 2000. A phase 1 review is complete and mine road and port projects being studied in phase 2 include the Delong Mountain terminal port expansion for the Red Dog Mine, an access road for a potential coal mine at the Point Lay Deadfall Syncline, the Noatak airport and Red Dog Mine access road, the Nome Glacier Creek Road to Rock Creek Mine, Yukon–Kuskokwim rivers ports and roads, and the Pebble project port and road. DOT&PF is working with Arctic Slope Regional Corp., NANA Corp., and Teck Cominco on finding a route, approximately 90 miles long, between the Deadfall Syncline high-rank coal deposits and the Delong Mountains terminal, with the goal of moving 1 million to 2 million tons of coal a year. The Nome Glacier Creek Road realignment project is a two-season construction project to be completed in 2005 and it will provide improved access to the proposed Rock Creek Mine. An environmental impact statement was begun in September for a Yukon River–Kuskokwim River transportation corridor, with a draft EIS expected in December 2005 and construction tentatively scheduled for 2007. A draft reconnaissance engineering review for a transportation corridor, road, and port to the Pebble project was begun in November by DOT&PF, with a benefit/cost analysis scheduled to begin in February 2005.

The U.S. Geological Survey (USGS), in cooperation with other agencies, continued a 5-year project titled "Tintina metallogenic province integrated studies on geological framework, mineral resources, and environmental signatures." Fieldwork began with studies of the Black Mountain–Tibbs Creek area of the Big Delta B-1 Quadrangle, including geologic mapping, and baseline geochemistry and biogeochemistry studies. The USGS continued compiling non-rock and lithochemical data scheduled for release in late 2003. The Minerals Program of the USGS began a new project titled "Regional geologic and mineral deposit data for Alaskan economic development". This project focuses on the Seward Peninsula and the central part of southwestern Alaska, with 20 days of fieldwork including geologic mapping and stream sediment sampling in the Taylor Mountain Quadrangle (fig. 36).

The USGS, DGGS, and BLM continued a number of cooperative projects under the Minerals Data and Information Rescue in Alaska (MDIRA) program. DGGS continued work on the Alaska Resource Database Files (ARDF) project. Other DGGS-managed, MDIRA-funded projects include compilation of Alaskan bedrock and surficial geology map index project, compilation of DGGS lithochemical data, and building a comprehensive database system at DGGS. Other MDIRA-funded projects are in progress at other divisions of DNR, the University of Alaska Fairbanks, and with private contractors.

Another significant Minerals Data and Information Rescue in Alaska (MDIRA) milestone was achieved with virtually all U.S. Geological Survey Bulletins and Professional Papers for Alaska now viewable and retrievable online through the DGGS web site. The collection includes about 700 text reports, consisting of approximately 55,000 pages of text, photographs, data tables, and small (page-sized or up to 11 x 17 inch) illustrations. DGGS has begun a similar project that will include Alaska-related USGS Open-File Reports, Miscellaneous Field Studies, Geologic Quadrangle Maps, Miscellaneous Investigations/Geologic

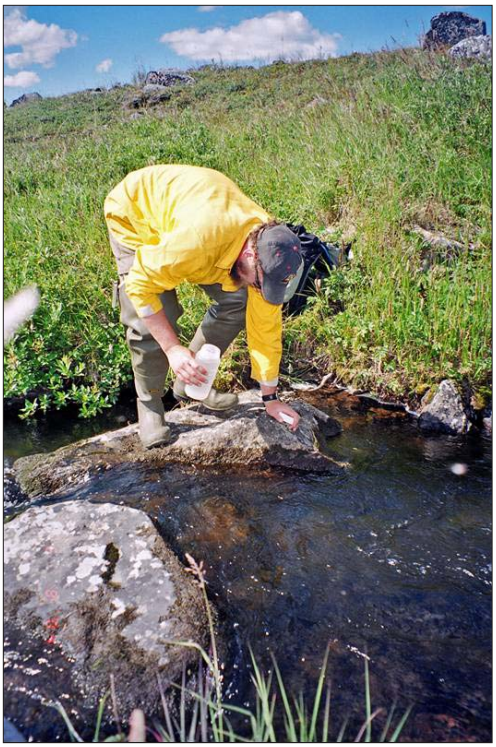


Figure 36. *USGS scientist collecting a stream water sample in the Taylor Mountains Quadrangle. The USGS collected 86 stream-sediment, stream-water, and panned concentrate samples to determine element baselines, distributions, and potential anomalies, and to understand geochemical cycling of elements and processes that determine the element distributions. Photo provided by Minerals Program, Alaska Branch, U.S. Geological Survey.*

Investigations, Mineral Investigations Resources Maps, and various other short-series USGS publications.

The Bureau of Land Management conducted the last year of an extensive field program in the Delta River mining district of eastern and southcentral Alaska (fig. 37). Lode, placer, industrial, and coal sites were visited, geochemical samples were collected, and the analytical results were published. Results from this work are expected to be published in 2005. Fieldwork on the Aniak mining district study consisted of a five-week field season, focusing on property examinations and sample collection in the central one-third of the district (fig. 38). BLM geologists succeeded in visiting 86 mineral occurrences in the central part of the study area and collected 287 samples. Work began around the historic mining town of Flat, proceeded south through Granite Creek and Julian Creek areas, then to the vicinity of Donlin Creek. The district evaluation then concentrated on the Red Devil area mercury deposits. The gold and mercury occurrences in west-central Sleetmute Quadrangle (Kolmakof, Mountain Top, Gold Run, and Murray Gulch) were then evaluated. A small crew was able to visit the Forty-Seven Creek and the Taylor Mountain area, extending this summer's fieldwork to the southern district boundary. Summaries of the fieldwork and analytical results were published in early 2005.

In July 2004 the Governor's Office formed several subcabinets to allow commissioners to deal with issues or to push for process improvements. A Natural Resources Development Policy subcabinet, comprising DNR (as lead), Department of Environmental Conservation, Department of Transportation & Public Facilities, Department of Law, Department of Fish & Game, Department of Commerce, Community, & Economic Development, Department of Labor, and the Washington, D.C., Office of the Governor's has been formed to promote resource development.

Figure 37. *The 2004 field crew for the U.S. Bureau of Land Management (BLM) program in the Delta River Mining District. Photo provided by Peter Bittenbender, U.S. BLM Solid Minerals Branch.*

Figure 38. *John Hoppe, BLM geologist, examines copper mineralization at the western Candle Hills occurrence in the Aniak mining district as part of a district-wide mineral evaluation program. The Takotna Mountains are in the background. Photo by Joe Kurtak, BLM Solid Minerals Branch.*

Alaska House Bill 556, by the House State Affairs committee, gave the Alaska Industrial Development and Export Authority (AIDEA) authorization to issue up to $20 million in debt for facilities to support the development of the Kensington mine near Juneau. The tax-exempt bonds will help reduce construction costs of a port development project at Slate Creek Cove and Cascade Point on Lynn Canal. AIDEA would own the docks.

Alaska Senate Bill 295 extended the termination date of the Navigable Waters Commission for Alaska until September 18, 2006. The commission is charged with expediting the process of settling title to the state's submerged lands. However, it is composed of state and federal members, and requires authorization by both the State and U.S. Congress. Alaska Senate Bill 305 asserted the state's title to submerged lands in three ways: it gives general notice that the State of Alaska claims title to navigable waters in Alaska; it provides authority for the state to identify, in accordance with applicable federal and state laws, which water bodies are navigable and which are not; and it requires the Commissioner of Natural Resources to notify Native corporations that they can obtain non-submerged acreage for submerged lands they may have received under the Alaska Native Claims Settlement Act.

The State of Alaska filed 13 applications covering 31 waterbodies for Recordable Disclaimers of Interest with the U.S. Bureau of Land Management. To date, BLM has issued a disclaimer for portions of the Black River and four of its tributaries, the Klutina River, Klutina Lake, Kvichak Lake, and Lake Iliamna. These are the first three disclaimers in the United States to be issued. A Disclaimer of Interest is a document issued by the federal government that confirms there is no federal ownership of certain lands. In this case, the federal government agrees there is no interest in the beds of these navigable rivers and lakes.

Governor Frank H. Murkowski was appointed chairman of the National Governors' Association Committee on Natural Resources. The Committee on Natural Resources is one of the organization's four standing committees and has jurisdiction over agriculture, energy, the environment, and natural resource issues. Key issues the committee will focus on include the Clean Air Act, clean and safe drinking water, ocean policy, electric industry restructuring, energy issues, and the Endangered Species Act.

Governor Murkowski signed a Memorandum of Understanding (MOU) in September with high-ranking representatives of Taiwan's government to jump-start development of Alaska's vast Cook Inlet coal deposits. Taiwan's state energy utility, Taipower, could use up to 4 million tons per year of processed coal, while other coal users like China Steel and private companies like Formosa Plastics could have significant additional requirements for Alaska coal, according to information from the Taiwan delegation. The construction of a mine, dock, and processing plant required west of Anchorage would be an estimated $1 billion construction project, generating more than 600 construction jobs and 250 permanent jobs. The governor, along with the Alaska Support Industry Alliance, also signed a second MOU with Taiwan that establishes a Taiwan–Alaska Trade and Investment Cooperation Council. The Council will focus on the areas of energy, fisheries, tourism, and agriculture. Each side will have two representatives—one from the private sector and another from the government—to serve as the council's co-chairs. The 14-member delegation was headed by Ning–Hsiang Kang, Senior Advisor to the President of Taiwan, and visited Alaska for five days.

The State of Alaska received a proposal in December 2003 from BP, ConocoPhillips, and Exxon to construct a gas pipeline from the North Slope to southern markets. The state previously presented its comprehensive proposal for the gas pipeline project to the three major oil producers. The producers came back with a comprehensive, joint response to the state's proposal on Wednesday, December 15. Governor Murkowski had earlier announced his support for the concept of the state taking an equity ownership share of the gas pipeline and sharing in the shippers' risk in the project. The state's current Stranded Gas negotiations involve those key elements. Equity ownership could mean billions of dollars more to the state.

The state reviewed and accepted TransCanada Corp.'s application in June 2004 under the Stranded Gas Development Act, making it the third such application being negotiated with companies interested in building a pipeline to move Alaska's North Slope gas to market.

Calgary-based pipeline operator TransCanada and its wholly owned subsidiary, Alaskan Northwest Natural Gas Transportation Co., propose negotiating a contract covering a 48-inch steel pipeline from the North Slope to the Alaska–Yukon Territory border, where 4.5 billion cubic feet per day of gas would feed into the Canadian portion of the project for distribution across North America. In addition to TransCanada, the state is actively negotiating with two other sponsor groups, including the three major North Slope producers (BP, ConocoPhillips, and Exxon Mobil), and Enbridge, another Canadian pipeline company.

The Alaska Coastal Management Program was moved to DNR in 2004 to streamline its procedures and make them more objective and accountable. The program, as revised by state regulations, has been submitted to the U.S. National Oceanographic and Atmospheric Administration (NOAA), the Office of Oceans and Coastal Resource Management, for program approval on or before June 30, 2005.

DNR revised financial assurance requirements for large mine operators, to allow sinking trust funds to be established and to require total financial assurance in the amount needed to reclaim a large lode mine site, rather than the previous $750 per acre rule (this amount still holds for placer mines).

More than 6.4 million acres (in excess of 10,000 square miles) of Alaska burned during 2004. Wildfires threatened communities and mining operations across the state and particularly in the Eastern Interior region. The National Guard was mobilized to assist federal and state firefighters. No serious accidents resulted from the fires, but several mining projects were partially to completely burned. Alaska's fire policies are currently under review.

The State of Alaska is working to finalize land transfers from the federal government to Alaska Native allottees, Alaska Native corporations, the State of Alaska, municipalities, the Alaska Mental Health Land Trust, and the University of Alaska. Federal legislation, Senate Bill 1466, proposes changes for streamlining steps in the land transfer process, that have proven over time to be problematic or inefficient. The state's BLM Conveyance Project is working to accelerate the remaining land transfers, in order of priority of entitlement, to individual Alaska Native allottees, Alaska Native corporations, and to the State of Alaska by 2009, the 50th anniversary of Alaska statehood.

The University of Alaska dissolved the School of Mineral Engineering and consolidated its three departments—mining engineering, petroleum engineering, and geological engineering—with three other engineering departments into a new College of Engineering and Mining. The engineering programs continue to be taught at the University of Alaska Fairbanks campus.

The State-owned Alaska Railroad made a record $15.4 million in profits during 2004 on total revenue of $129.5 million. Revenue from shipping freight, the railroad's core business, was up 1.5 percent from the prior year, totaling $86.5 million. The railroad hauled 3.1 million tons of gravel and rock in 2004, down 21 percent from 2003. An increase in coal shipments helped offset the decline in gravel haulage, with the railroad hauling 774,000 tons of coal in 2004, up 12 percent from 2003.

The mineral industry paid a total of $26.6 million to the state of Alaska and Alaskan municipalities in 2004 (table 25). These payments increased by almost $8 million (43 percent) above 2003 values. Mining license taxes more than tripled from 2003, largely due to profitability of Red Dog Mine. Mining companies were the largest taxpayers in the City and Borough of Juneau and the Fairbanks North Star, Denali, and Northwest Arctic boroughs, with total payments of almost $11 million.

Kennecott Greens Creek Mining Co. received a first place national award among underground metal mines for its 2003 safety record. The award was given by the U.S. Department of Labor's Mine Safety and Health Administration, in partnership with the Bituminous Coal Operators' Association and the National Mining Association as part of the Sentinels in Safety Program. To qualify for the award, a mine must complete at least 30,000 employee work-hours during a year without a lost-time injury or fatality.

The U.S. Supreme Court, in a 5–4 decision, determined that the U.S. Environmental Protection Agency (EPA) properly overruled the state of Alaska's decision to let the Red Dog Mine put less than state-of-the-art pollution control technology on a new power generator in 1999. The state operates an air pollution-permitting program required by the federal Clean Air Act with oversight from the federal EPA. Officials at the Alaska Department of Environmental Conservation say that the court decision could undermine the predictability and stability of the state's air quality regulations.

2005 OUTLOOK

The 2005 outlook is positive for Alaska's mining industry. Increased metal prices will continue to improve the bottom line for Alaska's metal producers and increase funds available for exploration. Exploration and development expenditures are expected to increase fairly significantly. Although no significant increase in production volumes are expected, the value of production should improve with continued metal price increases.

Exploration is expected to continue at levels similar to those in 2004. Alaska has world-class mineral deposits and Alaska's major mines are showcase examples of modern mining.

Mineral development expenditures will be high in 2005. Construction for the Pogo project by Teck Cominco Ltd., should be completed by the end of the year with

production expected to begin at that time or early in 2006. Coeur Alaska should receive permits to begin construction at the Kensington project at Berner's Bay north of Juneau. It is not certain at this time whether construction will be started in 2005; the permit appeal process will have to be resolved. Ongoing feasibility studies by NovaGold Resources should lead to a development decision at Rock Creek. Fairbanks Gold will continue stripping of Fort Knox to provide for mining higher grade ores.

The outlook for increasing production amounts is not significantly improved for 2005. However continued improvements in metal prices, as a result of China's high consumption, should result in continued improvements in the value of production. Precious metal prices are expected to continue a moderate improvement. Coal production should be about the same or slightly higher. Pogo, Rock Creek and Nixon Fork gold projects will not be commissioned until 2006, therefore no contribution is expected for 2005. Some increase in placer mine production should be experienced due to the gold price increase and the activation of new mines. Rock, sand, and gravel production should be substantially the same as in 2004. Peat and top soil production should also remain approximately the same or increase slightly due to the high home construction efforts in progress as a result of the favorable housing market.

Table 25. *Revenues paid to the State of Alaska and municipalities by Alaska's mineral industry, 1999–2004*[a]

	1999	2000	2001	2002	2003	2004
State mineral rents and royalties						
State claim rentals[b]	$ 1,982,453	$ 1,975,376	$ 1,736,522	$ 1,908,228	$ 2,129,440	$ 2,657,939
Production royalties	14,214	6,175	1,933	23,447	270,734	162,637
Annual labor	90,720	79,907	103,274	124,741	224,519	226,191
Subtotal	**2,087,387**	**2,061,458**	**1,841,729**	**2,056,416**	**2,624,693**	**3,046,767**
State coal rents and royalties						
Rents	205,983	233,249	198,545	256,927	237,912	236,532
Royalties	2,615,858	1,482,803	1,168,043	860,633	1,064,208	1,239,257
Bonus		372,000	0	0	0	0
Offshore Prospecting Permits	0	0	0	0	0	0
Subtotal	**2,821,841**	**2,088,052**	**1,366,588**	**1,117,560**	**1,302,120**	**1,475,789**
State material sales						
Mental Health	32,407	33,928	118,545	151,993	134,512	76,267
Division of Land	586,550	449,343	1,515,769	1,595,708	542,311	467,360
SPCO	28,941	41,395	12,894	24,725	208,309	112,047
Subtotal	**647,898**	**524,666**	**1,647,208**	**1,772,426**	**885,132**	**655,674**
State mining miscellaneous fees						
Filing Fees	4,288	5,400	3,000	3,000	4,700	1,300
Penalty Fees	8,000	0	0	450	0	26,110
Explore incentive app filing fee	3,000	0	0	0	0	0
Bond pool payment	70,692	50,100	53,866	45,208	44,878	35,426
Surface coal mining app fee	2,500	1,830	3,700	2,530	1,005	3,116
APMA mining fees	19,288	18,550	13,175	11,975	15,113	27,150
Subtotal	**107,768**	**75,880**	**73,741**	**63,163**	**65,696**	**93,102**
Mining license[cd]	**3,445,904**	**1,857,134**	**486,430**	**396,254**	**3,244,683**	**10,317,238**
State total	**9,110,798**	**6,607,190**	**5,415,696**	**5,405,819**	**8,122,324**	**15,558,570**
Payments to Municipalities	**8,818,819**	**9,196,500**	**9,763,220**	**9,703,208**	**10,510,048**	**10,999,663**
TOTAL	**$17,929,617**	**$15,803,690**	**$15,178,916**	**$15,109,027**	**$18,632,372**	**$26,588,233**

[a]Does not include state corporate income taxes, that are not released for this study.
[b]Includes upland lease and offshore lease rentals.
[c]Includes metals, coal and material.
[d] Mining license tax has been adjusted to final numbers 1999 to 2003; payments are made in the year following report end date, but not adjusted to final until the next succeeding year. Final numbers for 2004 will not be available until 2006.

APPENDIX A

New claims staked in Alaska 2000-2004

Quad no.	Quadrangle name[a]	New federal mining claims					New state mining claims				
		2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
18	De Long Mountains	0	0	0	0	0	72	79	0	0	0
23	Phillip Smith Mountains	0	0	0	0	0	0	0	1	0	0
26	Noatak	0	0	0	0	0	216	112	0	0	0
27	Baird Mountains	0	10	0	0	0	1	0	8	0	60
28	Ambler River	0	0	0	0	0	95	0	0	0	0
30	Wiseman	15	12	12	45	16	33	6	14	54	13
31	Chandalar	10	7	15	26	16	8	14	26	90	25
32	Christian	0	0	0	0	0	0	0	0	0	0
36	Selawik	0	0	0	0	0	0	2	0	0	0
37	Shungnak	0	0	0	0	0	0	14	0	0	0
38	Hughes	0	0	0	0	0	0	1	0	0	3
39	Bettles	1	15	3	15	0	0	0	0	0	0
43	Teller	0	0	0	0	0	0	96	60	2	20
44	Bendeleben	0	0	0	0	0	64	17	52	53	226
45	Candle	0	27	0	0	0	26	51	48	11	290
47	Melozitna	0	0	0	0	0	1	11	0	0	0
48	Tanana	0	0	0	1	0	134	27	43	32	64
49	Livengood	0	0	0	0	0	186	54	151	111	168
50	Circle	0	0	0	0	0	551	111	136	180	185
52	Nome	0	0	0	0	0	9	38	13	13	9
53	Solomon	0	0	0	0	0	39	25	11	6	45
55	Nulato	0	0	0	0	0	28	32	0	40	0
56	Ruby	0	0	0	0	0	4	0	0	1	9
57	Kantishna River	0	0	0	0	0	0	0	0	0	0
58	Fairbanks	0	0	0	0	0	28	55	49	114	127
59	Big Delta	0	0	0	0	0	1,547	112	110	478	694
60	Eagle	0	0	0	0	0	761	90	58	78	294
64	Ophir	0	0	0	0	0	12	3	40	14	43
65	Medfra	0	0	0	0	0	0	1	12	6	0
67	Healy	0	0	0	0	0	12	73	139	15	237
68	Mt. Hayes	8	47	36	21	24	517	268	175	471	208
69	Tanacross	0	0	0	0	0	140	46	0	20	33
73	Iditarod	0	0	0	0	0	0	8	28	13	213
74	McGrath	0	0	0	0	0	0	23	117	0	142
75	Talkeetna	0	0	0	0	0	123	65	81	171	333
76	Talkeetna Mountains	0	0	0	0	0	59	17	37	0	78
77	Gulkana	0	0	2	8	0	0	0	0	0	0
78	Nabesna	0	0	0	0	0	0	0	0	0	1
81	Russian Mission	0	0	0	0	0	4	0	5	0	0
82	Sleetmute	0	0	0	0	0	0	0	6	28	6
83	Lime Hills	0	0	0	0	0	0	4	0	5	272
84	Tyonek	0	0	0	0	0	3	2	0	57	656
85	Anchorage	0	0	0	0	0	43	35	48	104	86
86	Valdez	0	0	0	0	0	153	0	9	1	4
91	Bethel	0	0	0	0	0	0	0	0	0	8
92	Taylor Mountains	0	0	0	0	0	12	0	0	2	110
93	Lake Clark	0	0	0	0	0	0	8	2	501	522
95	Seward	24	16	17	21	10	13	5	14	6	21
96	Cordova	0	0	1	0	0	0	0	0	0	0
97	Bering Glacier	0	0	0	0	0	2	3	0	0	0
101	Goodnews Bay	0	0	0	0	0	0	0	0	0	12
102	Dillingham	63	0	0	0	0	121	87	0	34	16
103	Iliamna	0	0	0	0	0	2	134	36	720	1,239
104	Seldovia	0	0	0	0	0	0	0	0	0	3

Quad no.	Quadrangle name	New federal mining claims 2000	2001	2002	2003	2004	New state mining claims 2000	2001	2002	2003	2004
109	Skagway	0	0	0	0	0	1	12	1	1	0
112	Juneau	1	0	33	68	0	0	1	6	6	6
114	Sitka	0	0	0	9	0	0	0	0	0	0
116	Port Alexander	2	0	0	0	0	0	0	0	0	0
117	Petersburg	0	6	141	39	0	0	1	0	3	0
118	Bradfield Canal	0	0	0	0	0	0	0	2	0	0
119	Craig	399	223	0	380	0	0	7	0	3	2
120	Ketchikan	0	0	0	0	0	0	0	2	0	2
121	Dixon Entrance	0	0	5	0	0	0	0	0	0	0
122	Prince Rupert	0	95	4	30	0	0	11	0	0	0
130	Karluk	0	0	0	0	0	0	5	18	0	18
135	Trinity Islands	0	0	0	0	0	66	0	13	11	391
138	Port Moller	0	0	0	0	0	0	0	0	0	0
	TOTALS	**523**	**464**	**261***	**663**	**66**	**5,086**	**1,766**	**1,571**	**3,459**	**6,965**

Source: Data provided by Alaska Department of Natural Resources Land Records Information Section and U.S. Bureau of Land Management.

[a]Unlisted quadrangles did not have any staked mining claims between 2000 and 2004.

*Eight federal claims extend over 2 quadrangles.

APPENDIX B
Prospecting sites in Alaska 1998–2004

Quad no.	Quad name[a]	1998 New	1998 Total	1999 New	1999 Total	2000 New	2000 Total	2001 New	2001 Total	2002 New	2002 Total	2003 New	2003 Total	2004 New	2004 Total
17	Point Hope	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	De Long Mountains	0	0	27	27	72	99	0	99	0	91	0	91	0	91
26	Noatak	0	0	0	0	1	1	0	1	0	1	0	0	0	0
27	Baird Mountains	0	32	0	32	0	32	0	22	0	22	0	22	0	22
30	Wiseman	31	38	0	29	11	13	0	13	0	13	0	2	0	2
31	Chandalar	14	46	14	24	0	23	0	11	0	11	0	11	0	11
36	Selawik	1	6	1	7	0	7	3	7	0	7	0	7	0	7
38	Hughes	0	9	1	10	0	8	0	8	0	8	0	8	0	8
41	Fort Yukon	0	0	0	0	0	0	3	3	0	0	0	0	0	0
42	Black River	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	Teller	0	0	0	0	15	15	0	15	0	15	0	0	0	0
44	Bendeleben	4	143	7	136	0	60	0	44	0	37	0	37	0	37
45	Candle	0	20	6	26	32	46	0	38	0	32	0	0	0	0
47	Melozitna	0	192	144	336	0	144	0	128	0	0	0	0	0	0
48	Tanana	5	289	97	337	27	123	2	107	0	30	4	8	0	7
49	Livengood	111	322	20	147	24	123	0	36	7	15	7	22	0	22
50	Circle	201	528	82	443	32	302	5	138	9	92	1	69	3	71
52	Nome	16	125	21	83	37	102	1	87	0	66	0	30	0	30
53	Solomon	5	53	10	40	0	28	0	23	0	13	0	14	0	14
55	Nulato	2	4	22	26	6	32	0	30	0	16	0	2	0	2
56	Ruby	37	113	8	95	0	48	0	11	0	3	0	3	0	3
57	Kantishna River	0	4	0	4	0	4	0	4	0	4	0	4	0	4
58	Fairbanks	49	149	19	105	0	72	2	32	2	21	10	26	19	45
59	Big Delta	1,968	2,301	967	3,152	405	2,823	2	914	0	556	1	510	33	190
60	Eagle	220	336	27	282	76	316	0	142	1	108	0	32	6	38
64	Ophir	0	53	1	39	177	182	0	182	0	181	0	181	1	106
65	Medfra	0	21	2	10	0	3	0	1	0	1	2	3	0	3
66	Mt. McKinley	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	Healy	245	748	16	597	13	101	0	48	0	34	0	26	8	34
68	Mt. Hayes	73	435	25	408	46	322	8	269	0	256	33	289	2	291
69	Tanacross	22	91	155	219	0	185	0	147	2	2	0	2	0	2
73	Iditarod	0	207	16	180	0	165	4	169	3	152	0	152	0	152
74	McGrath	2	204	16	158	52	65	0	65	0	57	0	5	2	7
75	Talkeetna	63	331	19	282	58	93	0	84	27	80	0	54	0	54
76	Talkeetna Mountains	64	94	2	94	4	81	0	50	4	52	38	86	67	153
77	Gulkana	0	8	0	8	3	3	0	3	0	3	0	3	0	3
78	Nabesna	0	0	0	0	4	4	0	4	0	4	0	4	0	4
81	Russian Mission	0	46	0	46	0	46	0	46	0	46	0	46	0	46
82	Sleetmute	0	46	0	46	0	26	0	26	0	26	0	26	0	26

APPENDIX B
Prospecting sites in Alaska 1998-2004
(continued)

Quad no.	Quad name	1998 New	1998 Total	1999 New	1999 Total	2000 New	2000 Total	2001 New	2001 Total	2002 New	2002 Total	2003 New	2003 Total	2004 New	2004 Total
83	Lime Hills	0	9	0	0	0	0	0	0	0	0	0	0	0	0
84	Tyonek	0	20	0	14	0	0	0	0	0	0	4	4	0	4
85	Anchorage	5	64	10	64	3	62	0	61	1	54	0	51	0	51
86	Valdez	0	16	0	16	25	41	0	41	0	41	0	26	0	26
91	Bethel	0	12	18	22	0	18	0	10	0	0	0	0	0	0
92	Taylor Mountains	32	38	0	32	0	0	0	0	0	0	0	0	0	0
95	Seward	1	20	2	5	0	2	0	2	0	0	0	0	0	0
97	Bering Glacier	2	2	0	2	0	2	0	0	0	0	0	0	0	0
102	Dillingham	0	48	0	44	0	0	0	0	0	0	0	0	0	0
103	Iliamna	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	Seldovia	0	0	0	0	0	1	0	1	0	1	0	1	0	1
105	Blying Sound	0	7	0	0	0	0	0	0	0	0	0	0	0	0
109	Skagway	4	10	0	4	0	0	0	0	0	0	0	0	0	0
117	Juneau	0	5	0	5	0	5	0	5	0	5	0	5	0	5
123	Sitka	0	0	0	0	0	0	0	0	0	0	0	0	0	0
128	Trinity Islands	17	31	0	17	14	28	0	0	5	5	0	5	0	5
136	Craig	0	0	0	0	4	4	0	4	0	4	0	4	0	4
137	Ketchikan	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**3,194**	**7,276**	**1,755**	**7,652**	**1,142**	**5,860**	**27**	**3,131**	**61**	**2,165**	**101**	**1,871**	**141**	**1,581**

Source: Data provided by Alaska Department of Natural Resources Land Records Information Section.
[a]Unlisted quadrangles did not have any prospect sites staked during 1998-2004.

APPENDIX C

Selected significant mineral deposits and mineral districts in Alaska[a]

The alphabetized list of mineral deposits and mineral districts is keyed to the list of explanatory paragraphs that follow. For example, The Lik deposit in the alphabetized list is "**Lik,** 1, (fig. C-1)." This says that the location of Lik is shown as number 1 in figure C-1.

Alaska-Juneau, 100, (fig. C-3).
Anderson Mountain, 54, (fig. C-1).
Aniak district, 84, (fig C-3).
Apex-El Nido, 104, (fig. C-3).
Apollo-Sitka mines, 86, (fig. C-3).
Arctic, 9, (fig. C-1).
Avan Hills, 12, (fig. C-3).
Baultoff, 75, (fig. C-2).
Bear Mountain, 21, (fig. C-2).
Big Creek/Ladue, 58, (fig. C-1).
Big Hurrah, 32, (fig. C-3).
Binocular and other prospects, 72, (fig. C-1).
Bohemia Basin, 103, (fig. C-3).
Bokan Mountain, 122, (fig. C-3).
Bonanza Creek, 45, (fig. C-2).
Bond Creek, 73, (fig. C-2).
Bonnifield district massive sulfide deposits, 54, (fig. C-1).
Bornite, 8, (fig. C-1).
Brady Glacier, 98, (fig. C-3).
BT, 54, (fig. C-1).
Buck Creek, 23, (fig. C-2).
Calder Mine, 133, (fig C-2).
Canwell and Nikolai Complex, 140 (fig. C-3)
Cape Creek, 22, (fig. C-2).
Carl Creek, 74, (fig. C-2).
Casca VABM, 53, (fig. C-1).
Castle Island, 111, (fig. C-1).
Chandalar mining district, 17, (fig. C-3).
Chichagof, 101, (fig. C-3).
Chistochina, 68, (figs. C-2, C-3).
Circle mining district, 52, (fig. C-3).
Claim Point, 82, (fig. C-3).
Coal Creek, 63, (fig. C-2).
Copper City, 119, (fig. C-1).
Cornwallis Peninsula, 110, (fig. C-1).
Council mining district, 33, (fig. C-3).
Delta massive sulfide belt, 55, (fig. C-1).
Denali prospect, 67, (fig. C-1).
Dolphin, 49e, (fig. C-3).
Donlin Creek, 137, (fig. C-3).
Drenchwater, 3, (fig. C-1).
Dry Creek, 54, (fig. C-1).
Duke Island, 141 (fig. C-3)
Eagle Creek, 34, (fig. C-3).
Ear Mountain, 25, (fig. C-2).
Ellamar, 78, (fig. C-1).
Ernie Lake (Ann Creek), 15, (fig. C-1).
Esotuk Glacier, 20, (fig. C-2).
Fairbanks mining district, 49, (fig. C-3).
Fairhaven/Inmachuk district, 39, (fig. C-3).
Fort Knox, 49a, (fig. C-3).
Fortymile mining district, 60, (fig. C-3).
Frost, 7a, (fig. C-1).
Funter Bay mining district, 99, (fig. C-3).
Galena Creek, 21a, (fig. C-1).
Gil Claims, 49f, (fig. C-3).
Ginny Creek, 4, (fig. C-1).
Golden Zone mine, 64, (figs. C-1, C-3).
Goodnews Bay, 85, (fig. C-3).
Grant Mine, 49c, (fig. C-3).
Greens Creek, 105, (fig. C-1).
Groundhog Basin, 112, (fig. C-1).
Haines Barite/Palmer, 95, (fig. C-1).
Hannum, 27, (fig. C-1).
Hirst Chichagof, 101, (fig. C-3).
Horsfeld, 76, (fig. C-2).
Hot Springs mining district, 47, (figs. C-2, C-3).
Hyder mining district, 117, (figs. C-1, C-2).
Iditarod district, 43, (fig. C-3).
Illinois Creek, 132, (figs. C-1, C-3).
Independence, 79, (fig. C-3).
Independence Creek, 28, (fig. C-1).
Inmachuk River, 39, (fig. C-3).
Innoko-Tolstoi mining district, 44, (fig. C-3).
Ivanof, 88, (fig. C-2).
Jimmy Lake, 94, (fig. C-1).
Johnson River, 125, (fig. C-3).
Jualin, 128, (fig. C-3).
Jumbo, 118, (fig. C-1).
Kaiyah, 138, (fig. C-3).
Kantishna mining district, 61, (fig. C-3).
Kasaan Peninsula, 114, (fig. C-1).
Kasna Creek, 92, (fig. C-1).
Kemuk Mountain, 123, (fig. C-3).
Kennecott deposits, 71, (fig. C-1).
Kensington, 127, (fig. C-3).
Kivliktort Mountain, 5a, (fig. C-1).
Klery Creek, 14, (fig. C-3).
Klukwan, 96, (fig. C-3).
Kougarok Mountain, 26, (fig. C-2).
Koyukuk-Hughes mining district, 42, (fig. C-3).
Koyukuk-Nolan mining district, 16, (fig. C-3).
Latouche, Beatson, 80, (fig. C-1).
Liberty Belle, 54, (fig. C-1).
Lik, 1, (fig. C-1).
Livengood-Tolovana mining district, 48, (fig. C-3).
Lost River, 24, (fig. C-2).
Lucky Shot, 79, (fig. C-3).
McLeod, 124, (fig. C-2).
Mertie Lode, 99, (fig. C-3).
Midas mine, 77, (fig. C-1).
Mike deposit, 90, (fig. C-2).
Mirror Harbor, 102, (fig. C-3).
Misheguk Mountain, 13, (fig. C-3).
Mosquito, Peternie, 56, (fig. C-2).
Mt. Prindle, 50, (fig. C-3).
Nabesna mine, 69, (fig. C-3).
Niblack, 121, (fig. C-1).
Nim prospect, 65, (fig. C-1).
Nimiuktuk River, 126, (fig. C-1).
Nixon Fork, 135, (fig. C-3).
Nome mining district, 30, (fig. C-3).
Nunatak, 97, (fig. C-2).
Omalik, 35, (fig. C-1).
Omar, 7, (fig. C-1).
Orange Hill, 73, (fig. C-2).
Pebble Copper, 129, (fig. C-1).
Placer River, 38, (fig. C-2).
Pleasant Creek, 53, (fig. C-1).
Pogo, 130, (fig. C-3).
Poovookpuk Mountain, 40, (fig. C-2).
Porcupine Lake, 18, (fig. C-2).
Purcell Mountain, 41, (fig. C-2).
Pyramid, 87, (fig. C-2).
Quartz Creek, 37, (fig. C-1).
Quartz Hill, 120, (fig. C-2).
Red Bluff Bay, 109, (fig. C-3).
Red Devil, 83, (fig. C-3).
Red Dog, 2, (fig. C-1).
Red Mountain, 82, (fig. C-3).
Rex deposit, 91, (fig. C-2).
Rock Creek, 31, (fig. C-3).
Rua Cove, 81, (fig. C-1).
Ruby mining district, 46, (fig. C-3).
Ryan Lode, 49b, (fig. C-3).
Salt Chuck, 115, (fig. C-3).
Sheep Creek, 54, (fig. C-1).
Shotgun Hills, 131, (fig. C-3).
Shulin Lake, 139 (fig. C-3)
Sinuk River region, 29, (fig. C-1).
Slate Creek, 59, (fig. C-3).
Sleitat Mountain, 93, (fig. C-2).
Smucker, 11, (fig. C-1).
Snettisham, 107, (fig. C-3).
Snipe Bay, 113, (fig. C-3).
Solomon mining district, 33, (fig. C-3).
Spirit Mountain, 70, (fig. C-3).
Stampede mine, 62, (fig. C-3).
Story Creek, 5, (fig. C-1).
Sumdum, 106, (fig. C-1).
Sun, 10, (fig. C-1).
Taurus, 57, (fig. C-2).
Three Castle Mountain, 53, (fig. C-1).
Tracy Arm, 108, (fig. C-1).
True North, 49d, (fig. C-3).
Twin Mountain, 51, (fig. C-2).
Union Bay, 116, (fig. C-3).
Valdez Creek district, 66, (fig. C-3).
Vinasale Mountain, 134, (fig. C-3).
Virginia Creek, 54, (fig. C-1).
Von Frank Mountain, 136, (fig. C-3).
War Baby, 79, (fig. C-3).
Weasel Mountain, Bee Creek, 89, (fig. C-2).
Whoopee Creek, 6, (fig. C-1).
Willow Creek, 79, (fig. C-3).
Wind River, 19, (fig. C-1).
Windy Creek, 36, (fig. C-2).
Zackly, 67a, (fig. C-1).

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[a]This generalized summary does not describe all of the known 6,400 mineral deposits in Alaska.

NOTE: In cooperation with DGGS and the Russian Academy of Sciences, the USGS published Open-File Report 93-339 (Nokleberg and others, 1993), *Metallogenesis of mainland Alaska and the Russian northeast*, which describes 273 lode deposits and 43 significant placer districts in Alaska.

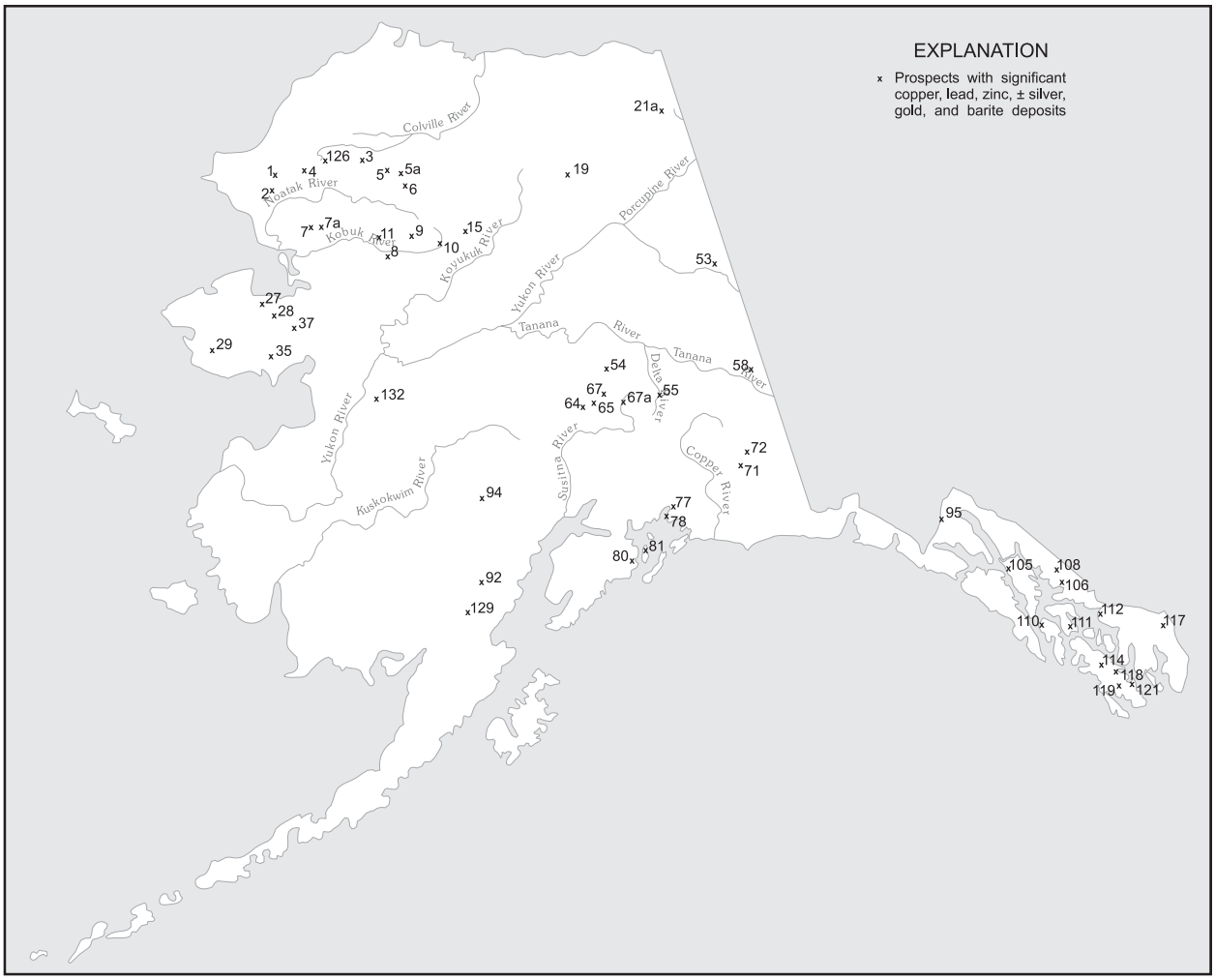


Figure C-1. *Significant copper, lead, zinc with credits of silver, gold, and barite deposits in Alaska, 2004.*

Map no.

1 **Lik**—Major stratabound massive sulfide (Zn–Pb–Ag–Ba) deposit in black shale and chert. Proven reserve (Lik) estimate of 24 million tons of 9% Zn, 3.1% Pb, and 1.4 oz/ton Ag (fig. C-1).

2 **Red Dog**—At least five major stratabound massive sulfide deposits hosted in Pennsylvanian or Mississippian shale; similar to locality 1. Mining from 1989 to 2004 produced 6.4 million tons of Zn, 1.1 million tons of Pb, and 65.3 million oz Ag. Deposits, with announced reserves from 2000, include: (a) The Main deposit at Red Dog contains 46.2 million tons of proven ore grading 19.2% Zn, 5.2% Pb, with 2.92 oz/ton Ag. (b) The Aqqaluk deposit contains probable, indicated, and inferred reserves of 73.0 million tons grading 15.2% Zn, 4.03% Pb, and 2.17 oz/ton Ag. (c) The Qanaiyaq (formerly named Hilltop) deposit with an indicated reserve is 10.6 million tons grading 17.8% Zn, 5.5% Pb, and 3.41 oz/ton Ag. (d) Inferred resource in the Paalaaq deposit is 14.3 million tons of 15.0% Zn, 4.0% Pb, and 2.63 oz/ton Ag. (e) Anarraq deposit discovered in 1999 has an inferred reserve of 19.0 million tons of 15.8% Zn, 4.8% Pb, and 2.07 oz/ton Ag (fig. C-1).

3 **Drenchwater**—Mississippian and Pennsylvanian shales and cherts contain three stratabound base metal occurrences spatially related to acid volcanics. The lowest unit, a siliceous mudstone, contains a 2 ft layer with up to 23% Zn. An overlying gray chert contains up to 11% Zn and up to 5% Pb with some Ag in fracture fillings. At the top of the overlying tuffaceous layer, Ag-bearing Zn and Pb mineralization outcrops discontinuously for at least 6,500 ft, and contains up to 26% Zn and 51% Pb in grab samples (fig. C-1).

4 **Ginny Creek**—Epigenetic, disseminated Zn–Pb–Ag deposits with barite in sandstone and shale of Late Devonian through Early Mississippian Noatak Sandstone. Random grab samples of float contain 0.3% to 3.0% Zn and highly variable amounts of Pb and Ag (fig. C-1).

5 **Story Creek**—Epigenetic replacement deposits of Zn–Pb–Ag–Cu–Au hosted in brecciated zones in Devonian Kanayut Conglomerate or Lower Mississippian Kayak

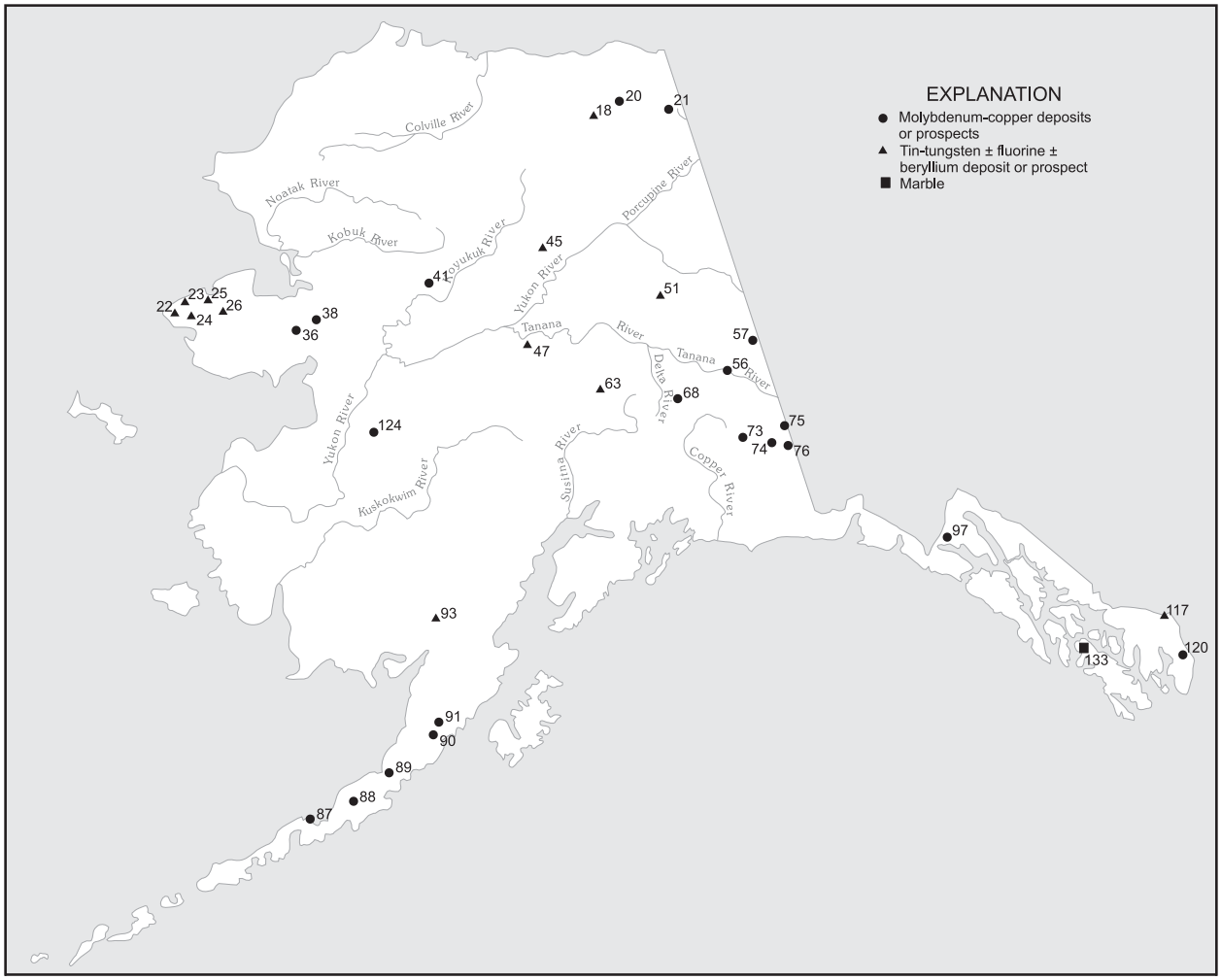


Figure C-2. *Significant molybdenum–copper and tin–tungsten with credits of fluorite and beryllium deposits in Alaska, 2004.*

Shale. Grab samples of high-grade material contain up to 0.43% Cu, 34% Pb, 28.8% Zn, 0.04 oz/ton Au, and 30 oz/ton Ag (fig. C-1).

5a **Kivliktort Mountain**—Mineralized float is widespread on the north flanks of the mountain, apparently spatially related to the contact between shales at the base of the hills and coarse-grained siliceous clastic rocks on the upper slopes. Rock samples containing up to 30% Zn have been reported (fig. C-1).

6 **Whoopee Creek**—Epigenetic replacement deposits of Zn–Pb–Cu–Ag–Au–Cd in breccia zones in Devonian Kanayut Conglomerate or Lower Mississippian Kayak Shale. Random grab samples of mineralized material contain 0.24% Cu, 0.37% Cd, 46% Zn, 44% Pb, 0.14 oz/ton Au, and 14.8 oz/ton Ag (fig. C-1).

7 **Omar**—Epigenetic replacement deposits of Paleozoic age; include bedded barite occurrences. Grab samples contain 15.3% Cu, 0.15% Pb, 0.95% Zn, 0.05% Co, and 0.3 oz/ton Ag. BLM estimates 35 million tons of 4% Cu (fig. C-1).

7a **Frost**—Possible 9 million tons of barite in pods, lenses, and wavy-banded quartz-calcite-barite veins. Chalcopyrite and galena occur in veins which cross cut Paleozoic limestone and dolomite for a minimum distance of 1 mi. Selected samples contain up to 13.2% Zn (fig. C-1).

8 **Bornite**—Major stratabound Cu–Zn deposit in brecciated carbonate rock of Devonian age; 5.0 million ton orebody contains 4.0% Cu and accessory Zn and Co. Larger reserve estimate of 40 million tons of about 2% Cu and undisclosed amount of Zn and Co. At grade of 1.2% Cu, reserves are 100 million tons (fig. C-1).

9 **Arctic**—Major volcanogenic (Cu–Zn) massive sulfide deposit hosted in sequence of metarhyolite, metatuff, and graphitic schist of Devonian age; indicated reserves of 40 million tons grade 4.0% Cu, 5.5% Zn, 0.8% Pb, 1.6 oz/ton Ag, and 0.02 oz/ton Au (fig. C-1).

10 **Sun**—Major (Cu–Pb–Zn–Ag) massive sulfide deposit in sequence of middle Paleozoic metarhyolite and metabasalt. Average grades are 1 to 4% Pb, 6 to 12% Zn, 0.5 to 7% Cu, 3 to 11 oz/ton Ag (fig. C-1).

11 **Smucker**—Middle Paleozoic volcanogenic massive sulfide deposit; 3,000 ft long and up to 190 ft wide; contains significant tonnage of Cu–Pb–Zn ore that grades 1.5% Pb, 5 to 10% Zn, 3 to 10 oz/ton Ag, with minor Au (fig. C-1).

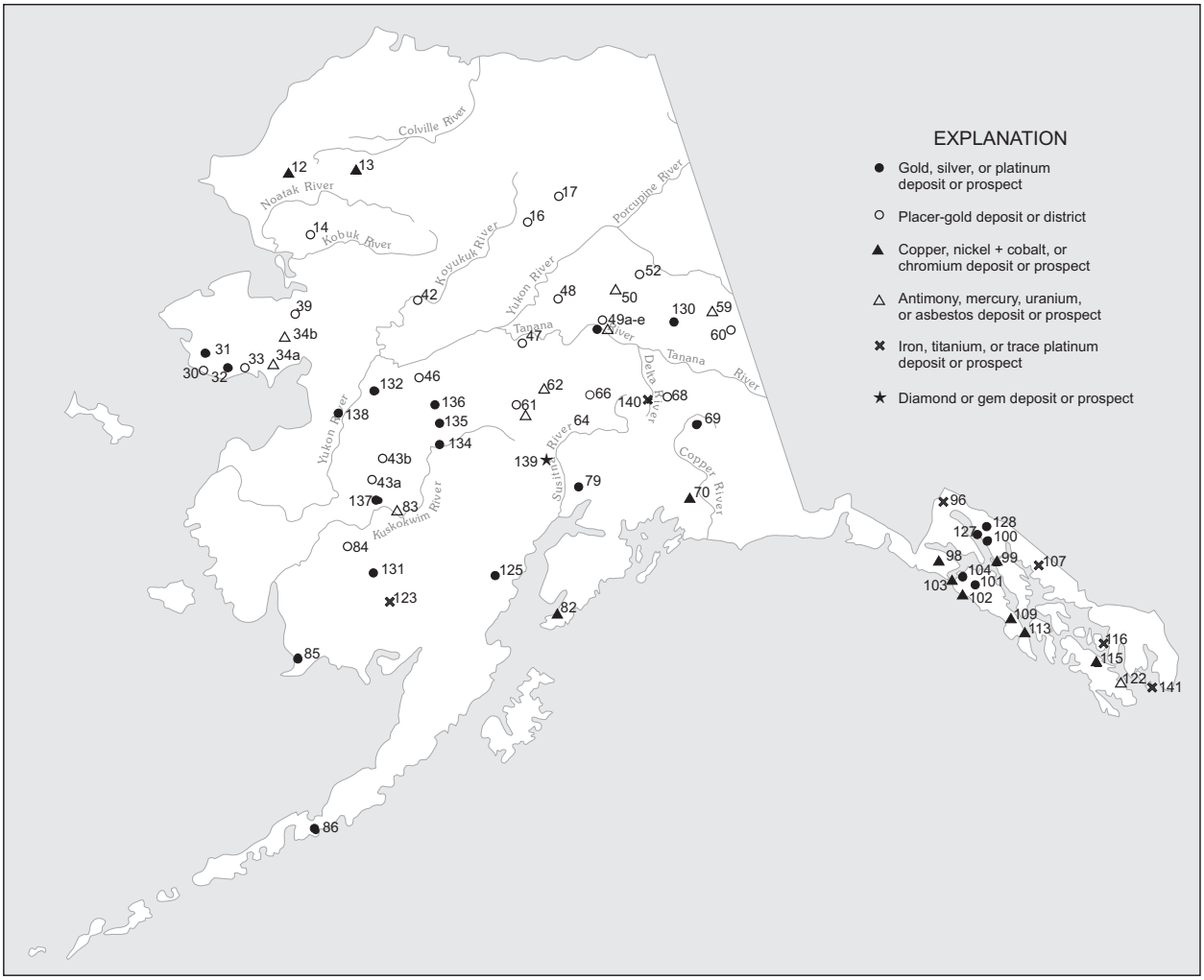


Figure C-3. *Significant gold, silver, platinum, and strategic mineral deposits in Alaska, 2004.*

12 **Avan Hills**—Disseminated chromite in layered ultramafic rocks; grab samples contain up to 4.3% Cr with 0.015 oz/ton PGM (fig. C-3).

13 **Misheguk Mountain**—Chromite occurrences similar to those in Avan Hills (fig. C-3).

14 **Klery Creek**—Lode and placer Au deposits worked intermittently from 1909 through 1930s. Total production through 1931, mostly from placer deposits, estimated at 31,320 oz Au (fig. C-3).

15 **Ernie Lake (Ann Creek)**—Stratabound massive sulfide occurrence in metarhyolite, metatuff, and marble. Gossan zones strongly anomalous in Cu–Pb–Zn and Ag (fig. C-1).

16 **Koyukuk–Nolan mining district**—Major placer Au district; from 1893 to 2004 produced an estimated 345,732 oz Au. Gold placers in Nolan Creek mined on surface and underground, both sources of large gold nuggets. Significant deep placer reserves remain (fig. C-3).

17 **Chandalar mining district**—Major Au-producing district; substantial production in excess of 65,860 oz Au through 2004 from lode and placer sources; lode Au found in crosscutting quartz veins that intrude schist and greenstone. Active development of placer deposits and lodes in progress. Inferred lode reserves estimated to be 45,000 tons with grade of 2 oz/ton Au (fig. C-3).

18 **Porcupine Lake**—Stratiform fluorite occurrences and argentiferous enargite, tetrahedrite associated with felsic volcanic rocks of late Paleozoic age. Reported grades of up to 30% fluorite (CaF2) reported, with grab samples of 4.8% Cu (fig. C-2).

19 **Wind River**—Stratabound Pb–Zn massive sulfide prospects; reported grades of up to 5% Pb (fig. C-1).

20 **Esotuk Glacier**—Disseminated Mo–Sn–W–Pb–Zn mineralization in skarns associated with Devonian(?) schistose quartz monzonite. Grab samples contain up to 0.08% Sn and 0.15% W (fig. C-2).

21 **Bear Mountain**—Major stockwork Mo–W–Sn occurrence in intrusive breccia. Rock samples containing up to 0.8% Mo and 0.6% W occur within a 35-acre area where soil samples average more than 0.2% MoS2, and an adjacent 25-acre area where rubble contains wolframite has soils averaging greater than 0.12% WO3. Rubble crop in this area indicates a Tertiary

porphyry system as the source of the Mo and W (fig. C-2).

21a **Galena Creek**—Steeply dipping veins contain up to 21% Cu, 3.5% Zn, and 1.3% Pb with 5.5 oz/ton Ag on the east side of the creek, and on the ridge west of the creek a large area of disseminated mineralization and veinlets contains predominantly Zn (fig. C-1).

22 **Cape Creek**—Major placer Sn producer. More than 500 tons Sn produced from 1935 to 1941; from 1979 to 1990, produced 1,040 tons Sn. Derived from Cape Mountain in contact zone of Cretaceous granite and limestone (fig. C-2).

23 **Buck Creek**—Major placer Sn producer. More than 1,100 tons Sn produced from 1902 to 1953 (fig. C-2).

24 **Lost River**—Major Sn, fluorite, W, and Be deposit associated with Cretaceous Sn granite system. More than 350 tons Sn produced from skarn and greisen lode sources. Measured reserves amount to 24.6 million tons that grade 0.15% Sn, 16.3% CaF2, and 0.03% WO3, based on 45,000 ft of diamond drilling (fig. C-2).

25 **Ear Mountain**—Placer Sn district and Sn–Cu–Au–Ag–Pb–Zn skarn mineralization of Cretaceous age. Area also anomalous in U (fig. C-2).

26 **Kougarok Mountain**—Sn deposit hosted in quartz–tourmaline–topaz greisen of Cretaceous age. Grades may average 0.5% Sn and 0.01% Ta and Nb, but a high-grade resource of 150,000 tons grading 1% + Sn was identified, with incrementally higher tonnage at lower grades (fig. C-2).

27 **Hannum**—Stratiform, carbonate-hosted Pb–Zn–Ag massive sulfide deposit of mid-Paleozoic age in heavily oxidized zone that ranges from 30 to 150 ft thick. Mineralized zone reported to assay up to 10% Pb, 2.2% Zn, 0.04 oz/ton Au, and 1.76 oz/ton Ag (fig. C-1).

28 **Independence Creek**—Pb–Zn–Ag massive sulfide deposit; high-grade ore shipped in 1921 contained 30% Pb, 5% Zn, up to 150 oz/ton Ag. Mineralization restricted to shear zone in carbonates (fig. C-1).

29 **Sinuk River region**—Several Pb–Zn–Ag–Ba–F bearing massive sulfide deposits and layered Fe deposits in carbonate and metavolcanic rocks of Nome Group. Mineralized zones extend for over 8,000 ft along strike (fig. C-1).

30 **Nome mining district**—Major placer Au producer. Production from 1897–2004 in excess of 4,991,256 oz Au, all from placers. Past Sb and W production (fig. C-3).

31 **Rock Creek**—550,000 oz Au resource, with about 11.79 million tons grading 0.059 oz/ton Au in vein swarms and stringers in an area 1,500 ft long, 500 ft maximum width and 300 ft deep (fig. C-3).

32 **Big Hurrah**—Epigenetic vein deposit in black slate and metasedimentary rocks of the Solomon schist. Deposit contains some W mineralization and has produced over 27,000 oz Au from nearly 50,000 tons milled ore. Proven, inferred, and indicated reserves total 104,000 tons that grade 0.61 oz/ton Au, 0.55 oz/ton Ag, and credits of WO3 (fig. C-3).

33 **Solomon and Council mining districts**—Major placer Au districts; produced over 1,046,513 oz through 2004. Three structurally controlled Au deposits in Bluff area—Daniels Creek, Saddle, and Koyana Creek—contain minimum inferred reserves of 6.5 million tons grading 0.1 oz/ton Au (fig. C-3).

34a **Eagle Creek**—U prospect in Cretaceous Kachauik alkalic intrusive rocks. Highly anomalous U concentrations up to 1,000 ppm reported (fig. C-3).

34b **Death Valley**—Sandstone-type U prospect with predominantly epigenetic mineralization. Over 11,000 feet of drilling defined a minimum reserve of 1 million pounds of U_3O_8 with average grade of 0.27% U_3O_8 and 9.9 foot thickness within 200 feet of surface (fig. C-3).

35 **Omalik**—Vein-type Pb–Zn–Ag massive sulfide prospect in Paleozoic carbonate rocks; from 1881 to 1900, produced 400 tons of Pb–Zn ore that averaged about 10% Pb and 40 oz/ton Ag. Grades of oxidized Zn ore reported to be up to 34% Zn (fig. C-1).

36 **Windy Creek**—Disseminated Mo–Pb–Zn mineralization in quartz veins and skarn with reported values as high as 0.15% Mo (fig. C-2).

37 **Quartz Creek**—Significant Pb–Zn–Ag mineralization; reported grades of 15% combined Pb–Zn and 10 oz/ton Ag (fig. C-1).

38 **Placer River**—Significant Mo–F mineralization disseminated in intrusive rocks. Reported values of 0.2% Mo (fig. C-2).

39 **Fairhaven/Inmachuk district**—Placer deposits with 348,089 oz production from 1902–2004; significant reserves remaining in a large ancestral channel system. Large base metal sulfide concentrations and U values in concentrates (fig. C-3).

40 **Poovookpuk Mountain**—Porphyry Mo mineralization. Reported grades of up to 0.25% Mo (fig. C-2).

41 **Purcell Mountain**—Mo and Ag occurrences associated with Cretaceous alkalic igneous plutons, alaskite, and bostonite dikes (fig. C-2).

42 **Koyukuk–Hughes mining district**—Production of 275,904 oz Au from 1930 to 2004, mainly from Alaska Gold Co. dredge at Hogatza; dredge reactivated from 1981 to 1984, and reactivated again in 1990. Non-float mechanized operation on Utopia Creek produced significant amount of placer Au from 1930 to 1962 (fig. C-3).

43 **Iditarod district**—Major placer Au district; produced 1,562,722 oz Au through 2004. Significant reserves of lode Au and lode W at Golden Horn deposit Chicken Mountain, and other known lodes in region associated with shear zones and monzonite intrusive rocks of Late Cretaceous age (fig. C-3).

44 **Innoko–Tolstoi mining district**—Major placer Au district with significant lode Au–Sb–Hg potential; lode sources are Late Cretaceous volcanic-plutonic complexes and dike swarms that intrude Mesozoic flysch; mining district produced 728,452 oz Au through 2004, almost all from placer deposits (fig. C-3).

45 **Bonanza Creek**—Skarn-type W mineralization along intrusive contact; no published information available (fig. C-2).

46 **Ruby mining district**—Placer Au–Sn district; produced more than 477,526 oz Au from 1931 to 2004; mining

district also contains Pb–Ag prospects with grades reportedly as high as 82 oz/ton Ag (fig. C-3).

47 **Hot Springs mining district**—Placer Au–Sn district; produced more than 578,085 oz Au and over 720,000 lb cassiterite through 2004. Includes Eureka and Tofty subdistricts. Magnetite-rich, niobium-bearing carbonatite sill in the Tofty area contains geochemically anomalous Nb, REE, P, and Y (figs. C-2, C-3).

48 **Livengood–Tolovana mining district**—Placer Au district; produced more than 529,513 oz Au since discovery in 1914 to 2004. Substantial reserves remain mainly on Livengood Bench, a Pliocene ancestral channel (fig. C-3).

49 **Fairbanks mining district**—Nationally ranked Au-producing district; largest producer in Alaska. Produced about 8,181,517 oz Au from placer deposits (1902–2004). Major lode Au and lode Sb producer; produced more than 3,318,129 oz Au and over 2000 tons Sb from veins and shear zones through 2004. Production of W exceeded 4,000 short ton units since 1915, all derived from skarn near Cretaceous quartz monzonite (fig. C-3).

49a **Fort Knox**—Disseminated Au deposit within granodiorite/quartz monzonite pluton near Fairbanks. Proven and probable reserves as of December 31, 2004, open at depth, are 1,540,000 oz of Au in 71.42 million tons of rock at an average Au grade of 0.022 oz/ton. Measured and indicated resources are 8.43 million tons containing 182,000 ounces of gold. Fairbanks Gold Mining Inc. at Fort Knox and True North mines produced 3,013,581 oz of Au from 1996 to 2004. (fig. C-3).

49b **Ryan Lode**—Based on a 0.015 oz/ton cutoff, total reserves in the metasediment-hosted Ryan Lode and subparallel igneous-hosted Curlew Shear are 822,200 oz of Au in 14.6 million tons of rock. A geologic resource of about 2.4 million oz occurs within the total shear zone system (fig. C-3).

49c **Grant Mine**—Series of subparallel Au-bearing quartz veins in schist and quartzite of Ester Dome based on exploration in 1990. Indicated reserves of the O'Dea vein system are 212,000 tons of 0.36 oz/ton Au. Other similar vein systems are found nearby (fig. C-3).

49d **True North**—Au occurs in siderite-quartz veins in carbonaceous quartzite and schist within a terrane containing eclogitic rocks. Proven and probable reserves as of December 31, 2002 are 305, 748 oz Au in 7.12 million tons of rock at a grade of 0.043 oz/ton Au, with measured and indicated resource of 37,086 oz Au at grade of 0.041 oz/ton Au in 907,201 tons of rock. 11.04 million tons of 0.04 oz/ton ore were processed at Fort Knox mill from 2001 through 2004 (fig. C-3).

49e **Dolphin—**Mineralized intermediate intrusion contains anomalous Au, As, Bi and Sb. Discovery hole in 1995 intercepted 330 ft of 0.049 oz/ton Au (fig. C-3).

49f **Gil Claims**—Gold occurs in two calc-silicate zones within Paleozoic schist units. Gold enrichment occurs along iron-stained shears and within quartz-calcite veinlets. Drilling has identified an in-place Au resource of 433,000 oz at an average grade of 0.04 oz/ton Au (fig. C-3).

50 **Mt. Prindle**—Significant U-rare-earth mineralization in Mesozoic alkaline igneous rocks. Rock geochemical values of up to 0.7% U; up to 15% rare-earth elements reported (fig. C-3).

51 **Twin Mountain**—Significant W mineralization associated with skarn development along contact zone of quartz monzonite stock of Cretaceous age (fig. C-2).

52 **Circle mining district**—Currently one of Alaska's largest producing placer Au districts; produced more than 1,067,386 oz Au since discovery in 1893 to 2004. Has significant potential for Sn, W, and Au mineralization from variety of lode sources (fig. C-3).

53 **Three Castle Mountain, Pleasant Creek, Casca VABM**—Stratabound Pb–Zn massive sulfide mineralization. Reported grades of up to 17% Zn and 2% Pb (fig. C-1).

54 **Bonnifield district massive sulfide deposits (Anderson Mountain, Dry Creek, Sheep Creek, Virginia Creek, BT, Liberty Bell)**—Significant volcanogenic Cu–Pb–Zn–Ag massive sulfide deposits of Devonian to Mississippian age. Potential for high-grade deposits reported. Includes Liberty Bell stratabound Au–B deposit and mineralization in Sheep Creek; latter contains Sn as well as base metals (fig. C-1).

55 **Delta massive sulfide belt**—Contains at least 30 known volcanogenic massive sulfide deposits and occurrences. Grades from 0.3 to 1.1% Cu, 1.7 to 5.7% Zn, 0.5 to 2.3% Pb, 0.7 to 2.0 oz/ton Ag, and 0.018 to 0.061 oz/ton Au; estimated potential reserve of 40 million tons for all deposits. Recent exploration has identified several gold prospects associated with silicified structures in the White Gold trend (fig. C-1).

56 **Mosquito, Peternie**—Porphyry Mo prospects of early Tertiary age; reported grades of up to 0.17% Mo (fig. C-2).

57 **Taurus**—Significant major porphyry Cu–Au prospect of Paleocene age. East Taurus Zone contains inferred reserves of 140 million tons grading about 0.30% Cu and 0.01 oz/ton Au, and 0.03% Mo (fig. C-2).

58 **Big Creek/Ladue**—Stratabound Pb–Zn–Ag massive sulfide prospects in metavolcanic rocks (fig. C-1).

59 **Slate Creek**—At least 55 million tons of 6.3%, high-quality chrysotile asbestos in serpentinized ultramafic rocks of Permian(?) age (fig. C-3).

60 **Fortymile mining district**—Major placer Au district. Produced over 552,405 oz placer and very minor lode Au since discovery in 1883 to 2004, the longest continuous production of Au (120 years) of any Alaskan mining district (fig. C-3).

61 **Kantishna mining district**—Major placer Au and lode Ag–Au–Pb–Zn–Sb–W district. Produced 99,307 oz placer and lode Au, about 307,000 oz lode Ag, and 2,500 tons Sb from shear zones and vein deposits hosted in metamorphic units of Yukon-Tanana terrane. Nearly 90 lode deposits have been identified; potential exists for significant Ag–Au–Pb–Zn resources. Metalliferous stratabound base metal deposits occur in schist and quartzite (fig. C-3).

62 **Stampede mine**—Major Sb deposit; produced more than 1,750 tons Sb from large shear zone in polymetamorphic rocks of Yukon–Tanana terrane (fig. C-3).

63 **Coal Creek**—Greisen-hosted Sn–Cu–W deposit in "McKinley" age pluton (55 million years old). Reported reserves of 5 million tons of ore that grade 0.28% Sn and 0.3% Cu with credits of W, Ag, and Zn (fig. C-2).

64 **Golden Zone mine**—Major Au–Cu–Ag deposits in Late Cretaceous breccia pipe and skarn deposits. Produced more than 1,581 oz Au, 8,617 oz Ag, and 21 tons Cu. On the basis of recent (1994) drilling, the Pipe, Bunkhouse, and Copper King deposits contain 13.3 million tons grading 0.095 oz/ton Au (figs. C-1, C-3).

65 **Nim Prospect**—Porphyry Cu–Ag–Au deposit of Late Cretaceous age. Reported grades of up to 5.0% Cu and 9 oz/ton Ag (fig. C-1).

66 **Valdez Creek district**—About 509,132 oz Au production through 2004. Cambior Alaska Inc., the largest placer mine in Alaska, operated in this district until September 1995 (fig. C-3).

67 **Caribou Dome** (**Denali)**—Ten identified stratabound Cu deposits in volcanic sedimentary rocks of Triassic age. Proven and probable ore is 700,000 tons grading 6% Cu with Ag credits, with indicated resources that may contain 2 million tons ore over strike length of 4,000 feet (fig. C-1).

67a **Zackly**—Disseminated Cu and Au in garnet-pyroxene skarn and marble. Reserves are estimated at 1.4 million tons grading 2.6 percent Cu and 0.175 oz/ton Au (fig. C-1).

68 **Chistochina**—Porphyry Cu prospects of Tertiary age and placer Au district; produced more than 181,488 oz Au and small amount Pt from placer deposits (figs. C-2, C-3).

69 **Nabesna mine**—Classic high-grade Au skarn that envelopes quartz diorite of Jurassic(?) age; produced over 66,500 oz Au from about 88,000 tons of ore from 1930 to 1941 (fig. C-3).

70 **Spirit Mountain**—Massive and disseminated Cu–Ni mineralization in mafic-ultramafic complex (fig. C-3).

71 **Kennecott deposits**—Major stratiform Cu–Ag massive sulfide deposits localized near contact between Chitistone Limestone and Nikolai Greenstone of Triassic age; contained some of highest grade Cu lodes mined in North America. From 1911 to 1938, produced more than 600,000 tons Cu and 10 million oz Ag from 4.8 million tons ore. Some reserves remain (fig. C-1).

72 **Binocular and other prospects**—Kennecott-type Cu–Ag massive sulfide deposits (fig. C-1).

73 **Bond Creek–Orange Hill**—Two major porphyry Cu–Mo deposits of Late Cretaceous age; reported inferred reserves of 850 million tons ore that grade 0.3 to 0.5% Cu and 0.03% Mo (fig. C-2).

74 **Carl Creek**—Porphyry Cu prospect in altered intrusive complex; similar to locality 73 (fig. C-2).

75 **Baultoff**—Porphyry Cu prospect in altered intrusive rocks; inferred reserves of 145 million tons of 0.20% Cu; similar to locality 73 (fig. C-2).

76 **Horsfeld**—Porphyry Cu prospect of Late Cretaceous age (fig. C-2).

77 **Midas mine**—Significant stratabound Cu (Ag–Au–Pb–Zn) massive sulfide deposit in volcanic sedimentary rocks of Tertiary Orca Group. Produced more than 1,650 tons Cu from 49,350 tons ore (fig. C-1).

78 **Ellamar**—Stratabound Cu–Zn–Au massive sulfide deposit in sediment of Eocene(?) Orca Group. Produced more than 8,000 tons Cu, 51,307 oz Au, and 191,615 oz Ag from about 301,835 tons ore (fig. C-1).

79 **Willow Creek, Independence, Lucky Shot, War Baby**—Major lode Au deposits (Ag–Cu–Pb–Zn–Mo) in veins cutting Mesozoic quartz diorite. Produced more than 606,400 oz Au from lode sources and about 55,600 oz Au from associated placer deposits (fig. C-3).

80 **Latouche, Beatson**—Major stratabound Cu–Zn–Ag massive sulfide deposits in Orca Group sedimentary rocks and mafic volcanic rocks. Produced more than 10,250 tons Cu from 6 million tons ore. Inferred reserves of 5 million tons ore that grade 1% Cu, 1.5% Pb+Zn (fig. C-1).

81 **Rua Cove**—Major stratabound Cu–Zn massive sulfide deposit in complex ore shoots enclosed in mafic volcanic rocks of Orca Group. Reported reserves of over 1.1 million tons ore that grade 1.25% Cu (fig. C-1).

82 **Red Mountain and Claim Point**—Significant Cr occurrences associated with Jurassic layered ultramafic complexes at Red Mountain near Seldovia. More than 39,951 tons of metallurgical-grade ore shipped through 1976; huge low-grade Cr resource may remain, of which 30 million tons grade 5.1% Cr2O3 (fig. C-3).

83 **Red Devil**—Major Hg–Sb deposit; high-grade epithermal Hg–Sb deposit hosted in shear zones in Kuskokwim Group sedimentary rocks. More than 35,000 flasks Hg produced from 75,000 tons ore (fig. C-3).

84 **Aniak district**—Significant placer Au district with 587,206 oz Au produced through 2004, mainly from the Nyac and Donlin Creek areas (fig. C-3).

85 **Goodnews Bay**—Major placer Pt district; estimated to have produced over 555,000 oz refined PGE metals from 1934 to 1976; one of the largest known PGE metal resources in United States. Possible resources of 60 million yd3 of deep, PGE-bearing gravels remain. Lode source believed to be Alaskan-type zoned ultramafic complex of Jurasssic or Cretaceous age. Possible significant offshore placer potential (fig. C-3).

86 **Apollo–Sitka mines**—Major lode Au deposits; produced more than 107,600 oz Au from ore that averaged about 0.22 oz/ton Au. Inferred reserves are 748,000 tons grading 0.76 oz/ton Au, 2.16 oz/ton Ag, with base metal credits (fig. C-3).

87 **Pyramid**—Late Tertiary porphyry Cu–Mo deposit; inferred reserves of 125 million tons ore that grade 0.4% Cu and 0.03% Mo reported (fig. C-2).

88 **Ivanof**—Late Tertiary porphyry Cu prospect; grades of up to 0.72% Cu reported. Potential for large tonnages (fig. C-2).

89 **Weasel Mountain, Bee Creek**—Porphyry Cu–Mo prospect of late Tertiary to Quaternary age; grades of up to 0.48% Cu and 0.035% Mo reported. Potential for moderate tonnages of low-grade mineralization (fig. C-2).

90 **Mike deposit**—Porphyry Mo prospect of late Tertiary age; grades up to 0.21% Mo. Potential for large tonnages of low-grade Mo mineralization (fig. C-2).

91 **Rex deposit**—Porphyry Cu prospect similar to locality 90; grades up to 0.3% Cu. Potential for moderate reserves of low-grade mineralization (fig. C-2).

92 **Kasna Creek**—Major stratiform Cu–Pb–Zn and skarn-sulfide deposits of Mesozoic age in mafic, volcanic, and sedimentary rocks; reported reserves of over 10 million tons ore that grade more than 1% Cu (fig. C-1).

93 **Sleitat Mountain**—High-grade east-west-trending, Sn–W–Ag topaz–quartz greisen system hosted in 59-million-year-old granite and in hornfels. Zone up to 3,000 ft long and 500 ft wide. One drill-hole with 85 ft of 1.8% Sn, and 0.4% W. Inferred resources up to 106,000 tons Sn in 29 million tons ore (fig. C-2).

94 **Jimmy Lake**—Complex Cu–Ag–Sn mineralization of late Tertiary(?) age; reported grades of up to 105 oz/ton Ag and 3% Cu (fig. C-1).

95 **Haines Barite/Palmer**—Major stratiform Ba–Pb–Zn–Cu–Ag deposit in pillow basalt-dominated section of Paleozoic or Triassic age; consists of 48- to 60-ft-thick zone of 60% barite with upper zone (2 to 8 ft thick) of massive sulfides that contain 2% Pb, 3% Zn, 1% Cu, up to 4 oz/ton Ag, and 0.12 oz/ton Au. Estimated to contain 750,000 tons of 65% barite with Zn and Ag credits (fig. C-1).

96 **Klukwan**—Major Fe–Ti deposits in zoned ultramafic complex of Mesozoic age; reported to contain 3 billion tons of material grading 16.8% Fe and 1.6 to 3.0% Ti (fig. C-3).

97 **Nunatak**—Porphyry Mo deposit; reported reserves of 2.24 million tons ore grading 0.067% Mo, 0.16% Cu, and 129.5 million tons of 0.026% Mo, 0.18% Cu (fig. C-2).

98 **Brady Glacier**—Major Ni–Cu deposit in layered gabbro–pyroxenite complex of Tertiary age. Proven reserves of 100 million tons ore that grade 0.5% Ni, 0.3% Cu reported and about 0.03% Co; also contains PGE concentrations (fig. C-3).

99 **Mertie Lode and Funter Bay mining district**—Contains substantial reserves of lode Au mineralization. Past production totaled about 15,000 oz Au. Deposits also contain significant Ni–Cu and Pb–Zn–Ag mineralization. Funter Bay deposit contains reported reserves of 560,000 tons that grade 0.34% Ni, 0.35% Cu, and 0.15% Co in gabbro-pipe system (fig. C-3).

100 **Alaska–Juneau**—Major lode Au deposit that consists of 100- to 300-ft-wide zone that contains en echelon, Au–bearing quartz veins in metamorphic rocks; produced more than 3.52 million oz Au from 88.5 million tons ore from 1893 to 1944. Reserves (all categories) of 105.7 million tons of 0.05 oz/ton Au (fig. C-3).

101 **Chichagof and Hirst Chichagof**—Major lode Au deposits in quartz veins that cut Mesozoic graywacke; produced more than 770,000 oz Au, most of which was produced at Chichagof Mine. Inferred leased reserves estimated to be 100,000 oz Au (fig. C-3).

102 **Mirror Harbor**—Ni–Cu mineralization in layered gabbro complex of Mesozoic age; reported proven reserves of 8,000 tons of 1.57% Ni and 0.88% Cu and reported inferred reserves of several million tons ore that grade 0.2% Ni and 0.1% Cu (fig. C-3).

103 **Bohemia Basin**—Major Ni–Cu–Co mineralization in layered mafic complex similar to locality 102; reported reserves of 22 million tons ore that grade 0.33 to 0.51% Ni, 0.21 to 0.27% Cu, and 0.02% Co, all of which are recoverable with standard flotation technology (fig. C-3).

104 **Apex–El Nido**—Significant lode Au–W deposits occurring as cross-cutting veins in graywacke; produced more than 50,000 oz Au (fig. C-3).

105 **Greens Creek**—Major sediment-hosted Pb–Zn–Cu–Ag–Au volcanogenic massive sulfide deposit of Devonian or Triassic age. Production from 1989 to 1993 and 1996 to 2004 is 702,990 tons of Zn, 262,901 tons of Pb, over 8,600 tons of Cu, 116.8 million oz of Ag, and 846,481 oz of Au. 2004 reserve estimate is 7.93 million tons grading 0.115 oz/ton Au, 14.1 oz/ton Ag, 11.4% Zn, and 3.9% Pb, and 10.2% Zn. Inferred resources are 2.6 million tons grading 11.1% Zn, 4.0% Pb, 0.13 oz/ton Au, and 14 oz/ton Ag. (fig. C-1).

106 **Sumdum**—Volcanogenic Cu–Pb–Zn massive sulfide deposit in Mesozoic metamorphic complex with potential strike length of over 10,000 ft. Inferred reserves of 26.7 million tons ore that grade 0.57% Cu, 0.37% Zn, and 0.3 oz/ton Ag reported (fig. C-1).

107 **Snettisham**—Fe–Ti deposit in mafic zoned intrusive complex; reported grades of about 18.9% Fe and 2.6% Ti (fig. C-3).

108 **Tracy Arm**—Stratabound Cu–Zn–Pb massive sulfide prospect in Mesozoic schist; over 1,100 ft long and up to 12 ft thick. Reported grades of 1.5% Cu, 3.9% Zn, 0.76 oz/ton Ag, and 0.013 oz/ton Au (fig. C-1).

109 **Red Bluff Bay**—Significant chrome mineralization in Mesozoic ultramafic complex (probably ophiolite); reported reserves of 570 tons of material that grade 40% Cr and 29,000 tons that grade 18 to 35% Cr (fig. C-3).

110 **Cornwallis Peninsula**—Volcanogenic Cu–Pb–Zn–Ag–Ba massive sulfide deposit of Triassic(?) age; reported grades of up to 20% Pb–Zn and 23 oz/ton Ag (fig. C-1).

111 **Castle Island**—Stratiform barite deposit of Triassic age hosted in carbonate and pillow basalt; about 856,000 tons of raw and refined barite produced from 1963 to 1980; also contains Zn, Pb, and Cu sulfides. Reported to be mined out (fig. C-1).

112 **Groundhog Basin**—Area with several massive sulfide prospects in Mesozoic schist and gneiss whose origins are possibly plutonic associated. Reported grades of up to 8% Pb, 29 oz/ton Ag, and 0.5 oz/ton Au. Sn has also been recently identified. Area also contains potential for porphyry Mo deposits (fig. C-1).

113 **Snipe Bay**—Ni–Cu deposit in zoned mafic-ultramafic complex; inferred reserves of 430,000 tons of 0.3% Ni, 0.3% Cu, and 0.13 oz/ton Ag reported (fig. C-3).

114 **Kasaan Peninsula**—Major skarn-type Cu–Fe-Au massive sulfide deposit of Jurassic age; area has

produced over 14,000 tons Cu, and 55,000 oz Ag. Reported reserves of 4 million tons ore that grade 50% Fe and less than 2% Cu (fig. C-1).

115 **Salt Chuck**—Cu–PGM–Ag–Au deposit in contact zone between pyroxenite and gabbro within Alaskan-type zoned mafic-ultramafic pluton. From 1900 to 1941, 2,500 tons Cu, over 20,000 oz PGM, and Au and Ag credits were produced from 325,000 tons ore (fig. C-3).

116 **Union Bay**—Significant Fe–Ti-(V) mineralization in zoned, Ural-Alaska type ultramafic complex. At least 7 zones of PGE–magnetite hydrothermal mineralization associated with pyroxene veins that crosscut magmatic layering (fig. C-3).

117 **Hyder mining district**—Area produced more than 25,000 tons high-grade W–Cu–Pb–Zn–Ag ore from 1925 to 1951 from crosscutting ore shoots in Texas Creek granodiorite of Tertiary age. Area contains potential for porphyry Mo–W mineralization and massive sulfide–skarn Pb–Ag–Au–W deposits (figs. C-1, C-2).

118 **Jumbo**—Cu–Fe–Mo–Ag skarn deposit; produced more than 5,000 tons Cu, 280,000 oz Ag, and 7,000 oz Au from 125,000 tons ore. Zoned magnetite–Cu skarns are associated with epizonal granodiorite pluton of Cretaceous age. Reported reserves of 650,000 tons ore that grade 45.2% Fe, 0.75% Cu, 0.01 oz/ton Au, and 0.08 oz/ton Ag (fig. C-1).

119 **Copper City**—Stratiform Cu–Zn–Ag–Au massive sulfide deposit in late Precambrian or earliest Paleozoic Wales Group. Reported grades of up to 12.7% Cu, 2.7% Zn, 2.5 oz/ton Ag, and 0.2 oz/ton Au (fig. C-1).

120 **Quartz Hill**—A porphyry Mo deposit hosted in a 25-million-year-old composite felsic pluton. Probable reserves are 232 million tons with a grade of 0.22% MoS2, and possible reserves are 1.2 billion tons with 0.12% MoS2 (fig. C-2).

121 **Niblack**—Volcanogenic Cu–Pb–Au–Ag massive sulfide deposit hosted in Precambrian(?) Wales Group or Ordovician to Silurian Descon Formation; produced more than 700 tons Cu, 11,000 oz Au, and 15,000 oz Ag. Resource of 2.78 million tons at 3.22% Zn, 1.70% Cu, 0.93 oz/ton Ag and 0.081 oz/ton Au. (fig. C-1).

122 **Bokan Mountain**—Numerous U–Th prospects associated with Jurassic peralkaline intrusive complex; from 1955 to 1971, produced more than 120,000 tons ore that graded about 1% U3O8. Contains inferred reserves of about 40 million tons of 0.126% Nb and up to 1% REE metals (fig. C-3).

123 **Kemuk Mountain**—Magmatic Fe–Ti deposit hosted in Cretaceous(?) pyroxenite. Inferred reserves of 2.4 billion tons that average 15 to 17% Fe, 2 to 3% TiO2, and 0.16% P2O5 (fig. C-3).

124 **McLeod**—Porphyry Mo deposit that contains quartz-molybdenite fissure veins in quartz-feldspar porphyry. Chip samples contain up to 0.09% Mo (fig. C-2).

125 **Johnson River**—Epigenetic(?) quartz-sulfide stockwork or massive sulfide deposit hosted in volcaniclastic, pyroclastic, and volcanic rocks of Jurassic Talkeetna Formation. Deposit has drilled-out reserves at a $45/ton cutoff with no cut of high Au assays, 1,099,580 tons grading 0.32 oz/ton Au, 0.24 oz/ton Ag, 0.76% Cu, 1.17% Pb, and 8.37% Zn (fig. C-3).

126 **Nimiuktuk River**—Small hill of massive, high-grade barite estimated to contain at least 1.5 million tons barite. Widespread stream-sediment Ba anomalies in area indicate further barite potential (fig. C-1).

127 **Kensington**—Stockwork quartz veins in sheared and chloritized quartz diorite produced 10,900 tons grading 0.18 oz/ton Au prior to 1930. Recent estimates indicate at least 4.21 million tons grading 0.25 oz/ton Au for 1,050,000 oz Au of proven and probable reserves. Subparallel Horrible vein system contains 3.93 million tons grading 0.11 oz/ton Au (fig. C-3).

128 **Jualin**—Five quartz-fissure veins in Cretaceous quartz diorite, more than 15,000 ft of underground workings; produced 48,387 oz Au, mainly prior to 1930. Reserves estimated at 1.07 million tons of 0.349 oz/ton Au (fig. C-3).

129 **Pebble (Copper)**—Cu–Au porphyry with resource of 3 billion tons grading 0.27% Cu, 0.0088 oz/ton Au and 0.015 % Mo.2003 resource estimate is 26.5 million ounces of gold and 16.5 billion pounds of copper, making this the world's 3rd largest Cu-Au porphyry deposit. Mineralized system extends over 35 square mile area and includes other Cu–Au–Mo porphyry, Cu–Au skarn, and Au vein prospects (fig. C-1).

130 **Pogo**—Au hosted in at least three sub-parallel and tabular, gently dipping, quartz vein zones hosted by Paleozoic gneisses intruded by Cretaceous felsic plutonic rocks. Au in the 3 ft to 60 ft thick quartz bodies has a strong correlation with Bi. A mining reserve for the Liese L1 and L2 zones is 7.7 million tons at an average grade of 0.47 oz/ton, for a total of 3.63 million oz at a 0.1 oz/ton cut-off grade. Other high-grade Au targets have been identified along an 8-mi-long trend southeast of the Liese zones (fig. C-3).

131 **Shotgun**—Quartz stockwork and breccia Au–Cu–As mineralization in a Late Cretaceous rhyolite (granite porphyry) stock. A preliminary, inferred Au resource of 980,000 oz (36.11 million tons at an average grade of 0.027 oz/ton Au) at a 0.016 oz/ton Au cut-off grade, with initial metallurgical tests indicating >90% Au recovery by cyanide leaching (fig. C-3).

132 **Illinois Creek**—Au–Ag–Cu–Pb–Zn–Bi–As-bearing, Fe–Mn oxide (gossan) shear zone crosscutting dolomitic quartzite localized near Cretaceous granitic pluton. Shear zone averaged 148 ft wide, with a drill-defined east-west strike length of 11,600 ft. Produced approximately 143,860 oz Au and 755,600 oz Ag from 1997 to 2004. Past ore grade of 0.076 oz/ton Au and 1.6 oz/ton Ag (figs. C-1, C-3).

133 **Calder Mine**—Seven recrystallized carbonate units exposed at the apex of a large regional antiform. Drilling has identified 13 million tons of chemically homogenous, high-brightness, high-whiteness marble with a purity of 98 to 99% calcium carbonate. Potential resource of 80 million tons of high-value calcium carbonate (fig. C-2).

134 **Vinasale Mountain**—Intrusion-hosted Au deposit. Au occurs as disseminated and veinlet mineralization, with

arsenopyrite and pyrite in quartz-dolomite hydrothermal breccias, magmatic breccias, and zones of phyllic and silicic alteration hosted within a 69 Ma quartz monzonite stock. Inferred resource of 14.35 million tons grading 0.067 oz/ton Au, with an 0.03 oz/ton cut-off grade was for the Central zone (fig. C-3).

135 **Nixon Fork**—Au–Cu skarn deposits; Historic Nixon Fork mine produced 59,500 oz Au from Late Cretaceous skarns associated with quartz monzonite-Devonian limestone contact zones. Underground mining resumed in October 1995, with 137,748 oz of Au, 1,050 tons of Cu, and significant Ag produced through mine closure in 1999 (fig. C-3). December 2004 ore reserves are 25,787 tons grading 1.07 oz/ton Au (measured), 74,936 tons grading 0.97 oz/ton (indicated), and 38,570 tons grading 0.77 oz/ton (inferred).

136 **Von Frank Mountain**—Au and very weak Cu mineralization are associated with chalcopyrite, pyrite, and rare molybdenite within a zone of quartz stockwork veining hosted in a 69 Ma quartz-diorite stock. The stock is a cupola of the larger Von Frank Pluton. Drill intercepts include up to 429 ft wide with an average grade of 0.013 oz/ton Au. Higher-grade intercepts include 0.035 oz/ton Au up to 135 ft (fig. C-3).

137 **Donlin Creek**—Au mineralization associated with disseminated pyrite and arsenopyrite, sulfide veinlets, and quartz-carbonate-sulfide veinlets in sericite-altered Late Cretaceous to early Tertiary rhyodacitic porphyry dikes and sills. Au mineralization is structurally controlled, refractory, and occurs along a 4–mile long, 1–mile wide zone. Measured and indicated resource on April 2003 estimated at 11.1 million oz of Au grading 0.102 oz/ton Au and an inferred resource of 14.3 million oz Au grading 0.102 oz/ton Au at a 0.044 oz/ton Au cut-off grade. Considered the 25th largest gold resource in the world (fig. C-3).

138 **Kaiyah**—Au–Ag epithermal prospect in silicified Koyukuk sedimentary rocks adjacent to Poison Creek caldera. Polymetallic sulfides in quartz veins, with some veins over 100 feet thick, and silicification are associated with pervasive advanced argillic, and sericite alteration (fig. C-3).

139 **Shulin Lake**—Micro-and macro-diamonds occur in interbedded volcaniclastic and tuffaceous rocks containing olivine and pyroxene. Discovered by tracing diamond indicator minerals in placer gravels. Possibly lamproitic intrusions with up to 1-mile diameter circular aeromagnetic anomalies (fig. C-3).

140 **Canwell and Nikolai Complex**—Ni–Cu–PGE semi-massive to massive sulfide prospects hosted in mafic and ultramafic rocks of the Nikolai intrusive/extrusive complex. Five mafic-ultramafic intrusions in the central Alaska Range are comagmatic with the Nikolai flood basalts (fig. C-3).

141 **Duke Island**—Cu–Ni–PGE disseminated, semi-massive, and massive sulfides associated with 2 zoned, Ural-Alaska type ultramafic bodies (fig. C-3).

APPENDIX D

State and federal agencies and private interest groups involved in mineral development activities, 2004

(The *Alaska Miners Association Directory* lists technical and professional consultants and companies available for work in Alaska. The report is published annually and is free to AMA members. The cost for non members is $15 plus shipping and handling.)

STATE OF ALASKA AGENCIES

OFFICE OF THE GOVERNOR
International Trade
550 West 7th Avenue, Suite 1700
Anchorage, Alaska 99501
(907) 269-7450
(907) 269-7461 (fax)
email: Margy_Johnson@gov.state.ak.us

Function: Primary state office for promotion of exports. Maintains overseas offices to increase Alaska's visibility in key markets.

DEPARTMENT OF COMMERCE, COMMUNITY & ECONOMIC DEVELOPMENT
State Office Building, 9th Fl.
P.O. Box 110800 (mailing)
Juneau, AK 99811-0800
(907) 465-2500
(907) 465-5442 (fax)
http://www.commerce.state.ak.us

Function: Promotes economic development in Alaska.

Office of Economic Development
State Office Building, 9th Fl.
P.O. Box 110801
Juneau, AK 99811-0801
(907) 465-5478
(907) 465-3767 (fax)

Office of Mineral Development
211 Cushman St.
Fairbanks, AK 99701-4639
(907) 451-2738
(907) 451-2742(fax)
email: rich_hughes@commerce.state.ak.us
http://www.commerce.state.ak.us/oed/minerals/mining.htm

Function: Primary state government advocacy agency for economic growth. Researches and publishes economic data on Alaska's mining industry. Attracts capital investment by advertising Alaska's resource potential. Provides research staff aid for the Alaska Minerals Commission. The Division also encourages the development of new markets for Alaska resources, increases the visibility of Alaska and its products in the international marketplace, and makes referrals and provides technical assistance to those interested in developing export markets for Alaska-produced or value-added goods and services.

Alaska Industrial Development & Export Authority (AIDEA)
813 W. Northern Lights Blvd.
Anchorage, AK 99503
(907) 269-3000
(907) 269-3044 (fax)
http://www.aidea.org

Function: AIDEA provides capital to finance economic growth throughout Alaska—from multi-million-dollar mining projects to small, family-owned businesses; from urban centers to small towns and rural villages. Regardless of project size, location, or business type, all AIDEA-financed projects must enhance the state's economy and provide or maintain jobs for Alaskans. AIDEA's financing assistance programs—the Credit Program and the Development Finance Program—have played an important role in Alaska's mineral development. The Credit Program includes the Loan Participation, Business and Export Assistance loan guarantee, and the Tax-Exempt Revenue Bond programs. AIDEA's Development Finance Program allows AIDEA to develop, own, and operate facilities within Alaska such as roads, ports, and utilities which are essential to the economic well-being of an area; are financially feasible; and are supported by the community in which they are located.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
410 Willoughby Ave., Ste. 303
Juneau, AK 99801-1795
(907) 465-5009 Public Information
(907) 465-5070 (fax)
(907) 465-5065 Commissioner's Office

Function: Issues permits for activities (including mining) that affect air or water quality or involve land disposal of wastes. Sets air- and water-quality standards. Inspects, monitors, and enforces environmental quality statutes, regulations, and permits. Reviews all federal permits.

Department of Environmental Conservation
Anchorage Office
555 Cordova St.
Anchorage, AK 99501-2617
(907) 269-7500
(907) 269-7600 (fax)
Permits/Compliance Assistance
1-800-510-2332 (inside Alaska only)
email: compass@dec.state.ak.us

Department of Environmental Conservation
Fairbanks Office
610 University Ave.
Fairbanks, AK 99709-3643
(907) 451-2360
(907) 451-2187(fax)
(907) 451-2184 TTY
http://www.dec.state.ak.us

DEPARTMENT OF FISH AND GAME
1255 W. 8th St.
P.O. Box 25526 (mailing)
Juneau, AK 99802-5526
(907) 465-4100
(907) 465-2332
http://www.state.ak.us/adfg

DEPARTMENT OF NATURAL RESOURCES
Office of the Commissioner
400 Willoughby Ave., Ste. 500
Juneau, AK 99801-1724
(907) 465-2400
http://www.dnr.state.ak.us

Alaska Coastal Management Program
302 Gold St., Ste. 202
Juneau, AK 99801

(907) 465-3562
(907) 465-3075 (fax)

Function: Conducts coordinated State review of permits for mining projects within Alaska's Coastal Management Zone. Provides project design information to applicants for consistency with the policies and standards of the Alaska Coastal Management Program. Coordinates State response to direct federal actions, including proposed regulations, that affect Alaska's mining industry.

Southcentral Regional Office
550 W. 7th Ave., Ste. 1660
Anchorage, AK 99501-3568
(907) 269-7470
(907) 269-3981 (fax)

Alaska Mental Health Trust Land Office
718 L St., Suite 202
Anchorage, AK 99501
(907) 269-8658
(907) 269-8905 (fax)
http://www.mhtrustland.org

Function: The Trust Land Office (TLO) manages the approximately 1 million acres of land that are included in the Alaska Mental Health Trust, which was created by Congress in 1956. Lands in the Trust are located throughout the state and are used to generate revenues to meet the expenses of mental health programs in Alaska. Management activities include all aspects of land use and resource development, including mineral and oil and gas leasing, exploration, and development; material sales (including gravel, sand, and rock); timber sales; surface leasing; land sales; and issuance of easements across Trust land.

Office of Habitat Management & Permitting
Headquarters & Juneau Area Office
400 Willoughby Ave., 4th Fl.
Juneau, AK 99801-1796
(907) 465-4105
(907) 465-4759(fax)

Function: The Office of Habitat Management and Permitting fulfills specific statutory responsibilities for (1) protecting freshwater and anadromous fish habitat under the Anadromous Fish Act (AS 41.14.870) and (2) providing free passage of anadromous and resident fish in fresh waterbodies (AS 41.14.840). It requires prior written authorizations for any work affecting the free movement of fish, for any use or activity that may affect designated anadromous fish waters, and for any disturbance-producing or habitat-altering activity.

Operations Manager & Fairbanks Area Office
1300 College Rd.
Fairbanks, AK 99701-1551
(907) 459-7289
(907) 456-3091 (fax)

Anchorage Area Office
550 W. 7th Ave., Ste. 1420
Anchorage, AK 99501
(907) 269-8690
(907) 269-5673 (fax)

Kenai Area Office
514 Funny River Rd.
Soldotna, AK 99669-8255
(907) 260-4882 ext. 222
(907) 260-5992 (fax)

Mat-Su Area Office
1800 Glenn Highway, Ste. 12
Palmer, AK 99645-6736
(907) 761-3855
(907) 745-7369 (fax)

Petersburg Area Office
P.O. Box 667
Petersburg, AK 99833-0667
(907) 772-5224
(907) 772-9336 (fax)

Prince of Wales Area Office
P.O. Box 668
Craig, AK 99921-0668
(907) 826-2560
(907) 826-2562 (fax)

Division of Forestry
550 W. 7th Ave., Ste. 1450
Anchorage, AK 99501-3566
(907) 269-8463
http://www.dnr.state.ak.us/forestry

Function: Establishes guidelines to manage mining in state forests.

Northern Region Office
3700 Airport Way
Fairbanks, AK 99709-4699
(907) 451-2660

Coastal Region Office
101 Airport Rd.
Palmer, AK 99645
(907) 761-6200

Division of Geological & Geophysical Surveys
3354 College Rd.
Fairbanks, AK 99709-3707
(907) 451-5000
(907) 451-5050 (fax)
email: dggs@dnr.state.ak.us
http://wwwdggs.dnr.state.ak.us

Function: Conducts geological and geophysical surveys to determine the potential of Alaska land for production of metals, minerals, fuels, and geothermal resources; locations and supplies of construction materials; potential geologic hazards to buildings, roads, bridges, and other installations and structures; and other surveys and investigations as will advance knowledge of the geology of Alaska (AS 41.08.020). Publishes a variety of reports and maintains a web site that contain the results of these investigations. Advises the public and government agencies on geologic issues. Maintains a library of geologic bulletins, reports, and periodicals. Maintains a Geologic Materials Center storage facility at Eagle River.

Geologic Materials Center
P.O. Box 772805
Eagle River, AK 99577-2805
(907) 696-0079
(907) 696-0078 (fax)
John_Reeder@dnr.state.ak.us

Division of Mining, Land & Water
550 W. 7th Ave., Ste. 1070
Anchorage, AK 99501
(907) 269-8600

(907) 269-8904 (fax)
http://www.dnr.state.ak.us/mlw

A. Mining

Function: Principal agency for management of mining and reclamation on state land in Alaska. Maintains offices in Anchorage and Fairbanks. Issues property rights to leasable minerals; manages locatable mineral filings. Also issues millsite leases and permits for hard rock and placer mining activity. Maintains records of mineral locations, permits and leases. Provides technical, legal, and land-status information. Administers the Alaska Surface Mining Control and Reclamation Act (ASMCRA), which includes permitting and inspection of coal mining activity and reclamation of abandoned mines.

B. Land

Function: Manages surface estate and resources, including materials (gravel, sand, and rock). Handles statewide and regional land-use planning. Issues leases, material-sale contracts, land-use permits, and easements for temporary use of State land and access roads. Administers land sales program.

C. Water Management

Function: Manages water resources of the State; issues water-rights permits and certificates; responsible for safety of all dams in Alaska.

Mining Information:
Anchorage (907) 269-8642
Fairbanks (907) 451-2793

All other Land & Water Information:
Northern Regional Office
3700 Airport Way
Fairbanks, AK 99709-4699
(907) 451-2740
(907) 451-2751 (fax)

Southcentral Regional Office
550 W. 7th Ave., Ste. 900C
Anchorage, AK 99501
(907) 269-8503
(907) 269-8913 (fax)

Southeast Regional Office
400 Willoughby Ave., Ste. 400
Juneau, AK 99801-1724
(907) 465-3400
(907) 586-2954 (fax)
E-mail: sero@dnr.state.ak.us

Division of Parks and Outdoor Recreation
550 W. 7th Ave., Ste.1310
Anchorage, AK 99501-3565
(907) 269-8700

Function: Manages approximately 3,000,000 acres of state park lands primarily for recreational uses, preservation of scenic values, and watershed. Responsible for overseeing mining access, recreational mining activity, and valid mining-claim holdings within state park lands. The Office of History and Archaeology reviews mining permit applications on all lands within the state for impacts to historic resources.

Northern Regional Office
3700 Airport Way
Fairbanks, AK 99709-4699
(907) 451-2695

Southeast Regional Office
400 Willoughby Ave., 5th Fl.
Juneau, AK 99801-1724
(907) 465-4563

Office of History and Archaeology
550 W. 7th Ave., #1310
Anchorage, AK 99501-3565
(907) 269-8721
(907) 269-8908 (fax)
email: stefaniel@dnr.state.ak.us
http://www/parks/oha

DEPARTMENT OF PUBLIC SAFETY
450 Whittier St.
P.O. Box 111200 (mailing)
Juneau, AK 99811-1200
(907) 465-4322
http://www.dps.state.ak.us

Alaska Bureau of Wildlife Enforcement
5700 East Tudor Rd.
Anchorage, AK 99507-1225
(907) 269-5509

Function: Enforces state laws, in particular AS Title 16. Protects Alaska's fish and wildlife resources through enforcement of laws and regulations governing use of natural resources within Alaska. These laws are in Alaska Statutes 8, 16, 46, and Alaska Administrative Codes 5, 12, and 20.

DEPARTMENT OF REVENUE
State Office Bldg.
11th Fl., Entrance A
P.O. Box 110400 (mailing)
Juneau, AK 99811-0400
(907) 465-2300
http://www.revenue.state.ak.us

Tax Division
State Office Bldg., 11th Fl., Entrance B
P.O. Box 110420 (mailing)
Juneau, AK 99811-0420
(907) 465-2320
(907) 465-2375 (fax)
email: fish_excise@revenue.state.ak.us
http://www.tax.state.ak.us

Function: Issues licenses for sand and gravel operations. Administers mining-license tax based on net income, including royalties. New mining operations—except sand and gravel mining—can apply for and receive certificates of tax exemption for the first 3½ years of operation. (Tax returns must be filed annually.)

UNIVERSITY OF ALASKA

College of Natural Science and Mathematics
Department of Geology & Geophysics
P.O. Box 755780
Natural Sciences Building, Room 308
University of Alaska Fairbanks
Fairbanks, AK 99775-5780
(907) 474-7565
(907) 474-5163 (fax)
email: geology@.uaf.edu
http://www.uaf.edu/geology

Function: Provides undergraduate and graduate education in geology and geophysics and conducts basic and applied research

in geologic sciences. For undergraduate studies, the department offers a B.A. program in Earth Science and a B.S. program in Geology (with emphasis options in general geology, economic geology, and petroleum geology). For graduate studies, the department offers M.S. and Ph.D. programs in Geology and Geophysics, with concentrations in: General geology; economic geology; petroleum geology; Quaternary geology; remote sensing; volcanology; solid-earth geophysics; and snow, ice, and permafrost geophysics.

College of Engineering and Mines
P.O. Box 755960
Duckering Building, Room 357
University of Alaska Fairbanks
Fairbanks, AK 99775-5960
(907) 474-7366
(907) 474-6994 (fax)
email: FYSME@uaf.edu
http://www.uaf.edu/sme

Function: Provides undergraduate and graduate education programs in geological engineering, mining engineering, mineral preparation engineering, and petroleum engineering. Through research programs conducts laboratory and field studies to promote mineral and energy development.

Mineral Industry Research Laboratory (MIRL)
College of Engineering and Mines
P.O. Box 757240
Duckering Building, Room 403
University of Alaska Fairbanks
Fairbanks, AK 99775-7240
(907) 474-6746
(907) 474-5400 (fax)

Function: Conducts applied and basic research in exploration, development, and utilization of Alaska's mineral and coal resources with emphasis on coal characterization, coal utilization, coal upgrading, coal preparation, mineral beneficiation, fine gold recovery, hydrometallurgy, and environmental concerns. Publishes reports on research results and provides general information and assistance to the mineral industry.

Dept. of Mining and Geological Engineering
College of Engineering and Mines
P.O. Box 755800
Duckering Building, Room 301
University of Alaska Fairbanks
Fairbanks, AK 99775-5800
(907) 474-7388
(907) 474-6635 (fax)
email: fnedw@uaf.edu
http://www.uaf.edu/ced

Function: Teaching research and public service; support of the mineral industry.

Mining and Petroleum Training Service
Kenai Peninsula College/UAA
155 Smith Way, Ste. 101
University of Alaska Anchorage
Kenai Peninsula College
Soldotna, AK 99669
(907) 262-2788
(907) 262-2812 (fax)
email: mapts@alaska.net
http://www.alaska.net/~mapts

Function: Provides direct training and assistance to mine operators, service and support companies, and governmental agencies in mine safety and health, mining extension, vocational mine training, and technical transfer. Specialized training services in hazardous materials, first aid and CPR, and industrial hygiene. Professional safety education and consulting are available on demand.

FEDERAL AGENCIES

U.S. DEPARTMENT OF THE INTERIOR
Office of the Secretary
1689 C St., Ste. 100
Anchorage, AK 99501-5151
(907) 271-5485
(907) 271-4102

Function: Coordinates the Department of the Interior's policy and stewardship with DOI bureaus for the management of more than 200 million acres of public land in Alaska.

Bureau of Land Management
Alaska State Office
Division of Lands, Minerals, and Resources
222 West 7th Ave., Ste. 13
Anchorage, AK 99513-7599

Public Information Center (907) 271-5960
Northern Field Office (907) 474-2252
Public Information Center
http://www.ak.blm.gov/

Energy Branch (907) 271-5608
Solid Minerals Branch (907) 271-5608

Division Functions:

BLM is the surface manager of federal public lands (except national parks, wildlife refuges, national monuments, national forests, and military withdrawals). The Division is responsible for developing and coordinating statewide and regional program management policies and strategies related to federal onshore energy and non-energy leasable minerals, mineral assessments, and locatable minerals. It provides technical assistance and coordinates activities relating to ANILCA 1010 mineral assessments. The Division provides the basis for economic analysis relating to energy and mineral development in the state. It also provides leadership and technical assistance on abandoned mine lands inventories and impacts on public lands.

Energy Branch Functions:
The Branch is responsible for the federal onshore mineral leasing programs and functions; including oil and gas, geothermal resources, coal, and other energy and non-energy minerals. The Branch prepares and conducts oil and gas lease sales and is responsible for preparing pre- and post-lease sale fair market value evaluations for National Petroleum Reserve–Alaska leasing, and issuing leases; adjudicates oil and gas leases, transfers, and bonds; approves oil and gas industry operations for federal onshore oil and gas leases; protects federal lands from drainage of oil and gas resources, and inspects industry operations for compliance; and coordinates with other federal surface management agencies for the leasing and monitoring of minerals operations under their jurisdictions.

Solid Minerals Branch Functions:

The Branch maintains mining claim and mineral patent case files and electronic public minerals records related to those files. It adjudicates federal mining claim recordation filings, annual assessment affidavits, and timely payment of annual claim holding

fees. It also adjudicates mineral survey and patent applications, and serves contest complaints for all federal lands in Alaska. The Branch conducts mineral assessments that aid environmentally sound development of a viable mineral industry in Alaska. Emphasis is on field programs that identify the type, amount, and distribution of mineral deposits in Alaska. Field information is augmented by studies of economic feasibility, and economic and environmental effects of mineral development. Information is provided to government agencies to aid land-planning and land-use decisions, and to the private sector to identify targets of opportunity for further exploration and/or development.

Anchorage Field Office
6881 Abbott Loop Rd.
Anchorage, AK 99507-2599
(907) 267-1246
(907) 267-1267 (fax)

Glennallen Field Office
P.O. Box 147
Glennallen, AK 99588
(907) 822-3217
(907) 822-3120 (fax)
http://www.glennallen.ak.blm.gov

Kotzebue Field Station
P.O. Box 1049
Kotzebue, AK 99752-1049
(907) 442-3430
(907) 442-2720 (fax)

Nome Field Station
P.O. Box 925
Nome, AK 99762-0925
(907) 443-2177
(907) 443-3611 (fax)

Northern Field Office
1150 University Ave.
Fairbanks, AK 99709-3899
(907) 474-2200
(907) 474-2251 Public Room
(907) 474-2282 (fax)
1-800-437-7021

Tok Field Station
P.O. Box 309
Tok, AK 99780
(907) 883-5121
(907) 883-5123 (fax)

Juneau Office
John Rishel Mineral Information Center
100 Savikko Rd.
Mayflower Island
Douglas, AK 99824
(907) 364-1553
(907) 364-1574 (fax)
email: cdewitt@ak.blm.gov
http://juneau.ak.blm.gov

Function: As a part of the minerals branch, in addition to the assessments and studies described above, the Mineral information Center has a special library which contains 20,000 geologic and minerals publications, and provides a variety of information services; plus displays of Alaskan rocks, minerals, and mining artifacts.

U.S. Fish and Wildlife Service
Region 7 Office
Mail Stop 361
1011 East Tudor Rd.
Anchorage, AK 99503
(907) 786-3542
http://www.r7.fws.gov/

Function: Administers the federal public lands in national wildlife refuges, issues special-use permits for activities on refuges, reviews permits and applications for various mining activities on all private and public lands and waters, and provides information to regulatory agencies on fish and wildlife and their habitat. Makes recommendations to regulatory agencies to mitigate adverse environmental impacts.

U.S. Fish and Wildlife Service
Fairbanks Fish and Wildlife Field Office
101 12th Ave.
Box No. 19
Fairbanks, AK 99701
(907) 456-0327
(907) 456-0208 (fax)

U.S. Fish and Wildlife Service
Juneau Fish and Wildlife Field Office
3000 Vintage Blvd., Ste. 201
Juneau, AK 99801-7100
(907) 586-7240
(907) 586- 7154 (fax)

U.S. Fish and Wildlife Service
Anchorage Fish and Wildlife Field Office
605 West 4th Ave., Rm. G-61
Anchorage, AK 99501
(907) 271-2888
(907) 271-2786 (fax)

U.S. Geological Survey
Alaska Science Center
Geological Science Office
4200 University Dr.
Anchorage, AK 99508-4667
(907) 786-7479

The mission of the USGS Alaska Science Center (ASC) is to provide scientific leadership and accurate, objective, and timely data, information, and research findings about the earth and its flora and fauna to Federal and State resource managers and policy makers, local government, and the public to support sound decision making regarding natural resources, natural hazards, and ecosystems in Alaska and circumpolar regions.

Geologic Discipline programs in the ASC are based on insightful monitoring, assessments, and research activities that address natural hazards, earth resources, and geologic processes. The Geologic Discipline provides comprehensive, high quality, and timely scientific information to decision makers at Federal, State, and local government levels, as well as the private sector. The Minerals Program investigates and reports on the occurrence, quality, quantity, and environmental characteristics of mineral resources in Alaska, the processes that create and modify them, models for assessing mineral endowment, and the potential impacts of mineral development.

U.S. Geological Survey
Alaska Science Center
Geographic Science Office
Earth Science Information Center

4230 University Dr., Suite 101
Anchorage, AK 99508-4664
(907) 786-7009

Function: Publishes and distributes all available topographic maps of Alaska, digital products, and aerial photography.

National Park Service
Alaska Regional Office
Natural Resources Science Team
240 W. 5th Ave.
Anchorage, AK 99501
(907) 644-3571
(907) 644-3809 (fax)

Function: Administers lands within the national park system in Alaska. Manages oil and gas operations and pre-existing valid mining claims in parklands through plans of operation under Mining in Parks Act, National Park Service regulations, and other applicable federal and state laws and regulations.

U.S. DEPARTMENT OF LABOR
Mine Safety and Health Administration
Physical Addres:
222 W. 8th Ave A-35
Anchorage, AK 99513
(907) 271-1250
(907) 271-1252 (fax)
email: bowen.ayers@dol.gov

Mailing Address:
Anchorage Federal Building
US Courthouse - Rm. A-35
222 West 7th Ave., Box 30
Anchorage, AK 99513
(907) 271-1250
(907) 271-1252 (fax)
email: bowen.ayers@dol.gov

Function: Administers health and safety standards to protect the health and safety of metal, nonmetal, and coal miners. Cooperates with the State to develop health and safety programs and develops training programs to help prevent mine accidents and occupationally caused diseases. Under agreement with the Coal Mine Safety and Health Office, the MSHA metal/nonmetal section has assumed responsibility for enforcement and training activities at coal mines in Alaska.

Mine Safety and Health Administration
Coal Mine Safety and Health, District 9
P.O. Box 25367
Denver, CO 80225
(303) 231-5458
(303) 231-5553 (fax)
http://www.msha.gov

Function: Administers health and safety standards according to the Code of Federal Regulations to protect the health and safety of coal miners; requires that each operator of a coal mine comply with these standards. Cooperates with the State to develop health and safety programs and develops training programs to help prevent coal or other mine accidents and occupationally caused diseases in the industry.

U.S. DEPARTMENT OF AGRICULTURE
Forest Service
Regional Office, R.L.M.
P.O. Box 21628
Juneau, AK 99802-1628
(907) 586-7869
(907) 586-7866 (fax)
email: jkato@fs.fed.us
http://www.fs.fed.us/
http://www.fs.fed.us/r10earth/

Function: With the Bureau of Land Management, provides joint administration of general mining laws on national forest system lands. Cooperates with Department of Interior agencies in the review and issuance of mineral leases. Issues permits for disposal of sand, gravel, and stone.

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 10 Regional Office
1200 6th Ave., MS OW-130
Seattle, WA 98101
(206) 553-1200
(206) 553-1746 (NPDES permits)
http://www.epa.gov/r10earth/

Function: Issues National Pollutant Discharge Elimination System (NPDES) permits under the Clean Water Act to regulate effluent discharges. Implements a compliance enforcement program. Maintains regulatory and review authority over wetland and NEPA/EIS-related issues.

Alaska Operations Office
222 West 7th Ave., Rm. 537
222 W. 7th Ave., Box 19 (mailing)
Anchorage, AK 99513-7588
(907) 271-5083

Alaska Operations Office
709 W 9th St., Rm. 223A
Box 20370 (mailing)
Juneau, AK 99802-0370
(907) 586-7619

U.S. DEPARTMENT OF THE ARMY
Corps of Engineers
Regulatory Branch
2204 3rd St.
P.O. Box 6898
Elmendorf Air Force Base, AK 99506-6898
(907) 753-2712
(907) 753-5567 (fax)
(800) 478-2712 (in Alaska only)
http://www.poa.usace.army.mil/reg

Function: Regulates structures or work in navigable waters of the U.S. and discharge of dredged or fill material into U.S. waters, including wetlands. Under Section 404 of the Clean Water Act, the Corps of Engineers issues dredge and fill permits for certain mining activities in waters of the United States. Examples of regulated mining activities include construction of berms, dikes, diversions, ponds, overburden stripping, stockpiling, and reclamation activities.

COOPERATIVE STATE–FEDERAL AGENCIES

Alaska Public Lands Information Center
250 Cushman St., Ste. 1A
Fairbanks, AK 99701
(907) 456-0527
(907) 456-0514 (fax)
(907) 456-0532 (TDD for hearing impaired)
http://www.nps.gov/aplic

Function: Clearinghouse for general information on outdoor recreation in Alaska. Information sources include U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Bureau of Land

Management, U.S. Geological Survey, National Park Service, Alaska Departments of Natural Resources, Fish and Game, and Community and Economic Development.

BOARDS AND COMMISSIONS

Alaska Minerals Commission
Irene Anderson, Chair
c/o Bering Straits Native Corp.
P.O. Box 1008
Nome, AK 99762
(907) 443-5252
(907) 443-4317
(907) 443-2985 (fax)
email: irene@beringstraits.com

Function: The Minerals Commission was created by the Alaska State Legislature in 1986 to make recommendations to the Governor and the Legislature on ways to mitigate constraints on the development of minerals in Alaska. The Commission has published annual reports since 1987.

CHAMBERS OF COMMERCE

Alaska State Chamber of Commerce
217 Second St., Ste. 201
Juneau, AK 99801
(907) 586-2323
(907) 463-5515 (fax)
http://www.alaskachamber.com

Function: The State Chamber of Commerce researches and formulates positions on Alaskan resource development. Recommendations for consideration are submitted to the State Chamber of Commerce board of directors.

Anchorage Chamber of Commerce
441 West 5th Ave., Ste. 300
Anchorage, AK 99501
(907) 272-2401
email: info@anchoragechamber.org
http://www.anchoragechamber.org

Function: To be effective as a business leader by supporting and focusing its broad-based membership in their efforts to grow Anchorage into a premier American city.

Greater Fairbanks Chamber of Commerce
800 Cushman St., Suite 114
Fairbanks, AK 99701-4665
(907) 452-1105
(907) 456-6968(fax)
email: staff@fairbankschamber.org
http://www.fairbankschamber.org

Juneau Chamber of Commerce
3100 Channel Dr., Ste. 300
Juneau, AK 99801
(907) 463-3488
(907) 463-3489 (fax)
email: juneauchamber@gci.net
http://www.juneauchamber.org

PUBLIC INTEREST GROUPS AND ASSOCIATIONS

Alaska Miners Association Inc.
Statewide Office
3305 Arctic Blvd., Ste. 105
Anchorage, AK 99503
(907) 563-9229
(907) 563-9225 (fax)
email: ama@alaskaminers.org
http://www.alaskaminers.org

Anchorage Branch of AMA
P.O. Box 771186
Ealge River, AK 99577-1186
(907) 269-3034
email: jwood@aidea.org

Denali Branch of AMA
P.O. Box 1000
Healy, AK 99743
(907) 683-2226
email: fredw@usibelli.com

Fairbanks Branch of AMA
P.O. Box 73069
Fairbanks, AK 99707-3069
(907) 479-9450
email: paulcmpy@alaska.net

Juneau Branch of AMA
P.O. Box 32199
Juneau AK 99803-2199
(907) 789-8135
email: mike.satre@greenscreek.com

Kenai Branch of AMA
155 Smithway, #101
Soldotna, AK 99669-3503
(907) 262-2788
email: mapts@alaska.net

Nome Branch of AMA
P.O. Box 536
Nome, AK 99762
(907) 443-2586

American Institute of Professional Geologists
1400 W. 122nd Ave., Ste. 250
Westminster, CO 80234
(303) 412-6205
(303) 253-9220 (fax)
email: aipg@aipg.org
http://www.aipg.org

Earthjustice
325 Fourth St.
Juneau, AK 99801
(907) 586-2751
(907) 463-5891 (fax)
email: eajusak@earthjustice.org
http://www.earthjustice.org

National Wildlife Federation
750 W. Second Ave., Ste. 200
Anchorage, AK 99501
(907) 339-3900
(907) 339-3980 (fax)

Northern Alaska Environmental Center
830 College Rd.
Fairbanks, AK 99701-1535
(907) 452-5021
(907) 452-3100 (fax)
email: info@northern.org
http://www.northern.org

Northwest Mining Association
10 North Post St., Ste. 220
Spokane, WA 99201
(509) 624-1158
(509) 623-1241 (fax)
email: nwma@nwma.org
http://www.nwma.org

Resource Development Council for Alaska, Inc.
121 W. Fireweed Ln., Ste. 250
Anchorage, AK 99503
(907) 276-0700
(907) 276-3887 (fax)
email: Resources@akrdc.org
http://www.akrdc.org

Society for Mining, Metallurgy, and Exploration Inc.
P.O. Box 277002
Littleton, CO 80127-7002
(303) 973-9550
(303) 973-3845 (fax)
email: sme@smenet.org
http://www.smenet.org

Southeast Alaska Conservation Council (SEACC)
419 6th St., Ste. 200
Juneau, AK 99801
(907) 586-6942
(907) 463-3312 (fax)
email: info@seacc.org
http://www.seacc.org

Trustees for Alaska
1026 W. 4th Ave., # 201
Anchorage, AK 99501-1980
(907) 276-4244
email: ecolaw@trustees.org
http://www.trustees.org

ORGANIZED MINING DISTRICTS

Circle Mining District
P.O. Box 30181
Central, AK 99730-0181
(907) 520-5419 (message)

Fairbanks Mining District
105 Dunbar
Fairbanks, AK 99701
(907) 456-7642

Haines Mining District
P.O. Box 149
Haines, AK 99827
(907) 766-2821

Iditarod Mining District
John A. Miscovich
P.O. Box 39
Cooked Creek, AK 99575

Livengood-Tolovana Mining District
Rose Rybachek
P.O. Box 55698
North Pole, AK 99705
(907) 488-6453

Yentna Mining District
Carol Young
P.O. Box 211
Talkeetna, AK 99676
(907) 733-2351

MINERAL EDUCATION PROGRAMS

ALASKA MINERAL AND ENERGY RESOURCE EDUCATION FUND (AMEREF)
121 W. Fireweed Ln., Ste. 250
Anchorage, AK 99503
(907) 276-0700
(907) 276-3887 (fax)
email: kits@ameref.org
http://www.ameref.org

Function: A 501(c)(3) educational non-profit whose mission is to provide Alaskan students with the knowledge and skills to make informed and objective decisions relating to mineral, energy, and forest resources.

NATIVE REGIONAL CORPORATIONS

AHTNA INC.
Land & Resource Group
P.O. Box 649
Glennallen, AK 99588-0649
(907) 822-8132
(907) 822-3495 (fax)
email: kmartin@ahtna-inc.com
http://www.ahtna-inc.com/

Anchorage Office
406 W. Fireweed, S uite 104
Anchorage, AK 99503
(907) 868-8235
(907) 868-8234 (fax)

THE ALEUT CORP.
4000 Old Seward Hwy., Ste. 300
Anchorage, AK 99503-6087
(907) 561-4300
(907) 563-4328 (fax)
email: MSmith@aleutcorp.com
http://www.aleutcorp.com

ARCTIC SLOPE REGIONAL CORP.
P.O. Box 129
Barrow, AK 99723-0129
(907) 852-8633
(907) 852-5733 (fax)
http://www.asrc.com/

Anchorage Office
3900 C St., Suite 801
Anchorage, AK 99503-5963
(907) 339-6000
(907) 339-6028 (fax)

BERING STRAITS NATIVE CORP.
Irene Anderson
Assistant Land Manager
P.O. Box 1008
Nome, AK 99762-1008
(907) 443-4317
(907) 443-2985 (fax)
email: irene@beringstraits.com
http://www.beringstraits.com/

Anchorage Office
Matt Ganley
10315 Main Tree Dr.
Anchorage, AK 99507
(907) 344-7121
(907) 344-0827 (fax)
email: matt@beringstraits.com

BRISTOL BAY NATIVE CORP.
111 West 16th Ave., Suite 400
Anchorage, AK 99501-5109
(907) 278-3602
(907) 276-3924 (fax)
http://www.bbnc.net

CALISTA CORP.
301 Calista Court, Ste. A
Anchorage, AK 99518-3028
(907) 279-5516
(907) 279-8430 (fax)
http://www.calistacorp.com/

CHUGACH ALASKA CORP.
560 E. 34th Ave.
Anchorage, AK 99503-4196
(907) 563-8866
(907) 561-6961 (fax)
email: rrogers@chugach-ak.com
http://www.chugach-ak.com/

COOK INLET REGION INC.
and its subsidary North Pacific Mining Corporation
2525 C St., Suite 500
Anchorage, AK 99503
(907) 274-8638
(907) 263-5190 (fax)
email: kmcgee@ciri.com
http://www.ciri.com/

DOYON LTD.
1 Doyon Place, Ste. 300
Fairbanks, AK 99701-2941
(907) 459-2030
(907) 459-2062 (fax)
email: lands@doyon.com
http://www.doyon.com

KONIAG INC.
4300 B St., Ste. 407
Anchorage, AK 99503
(907) 561-2668
(907) 562-5258 (fax)
http://www.koniag.com/

NANA REGIONAL CORP.
P.O. Box 49
Kotzebue, AK 99752
(907) 442-3301
(907) 442-2866 (fax)
http://www.nana.com

Anchorage Office
Nana Development Corp.
1001 E. Benson Blvd.
Anchorage, AK 99508
(907) 265-4100
(907) 265-4311 (fax)

SEALASKA CORP.
One Sealaska Plaza, Ste. 400
Juneau, AK 99801
(907) 586-1512
(907) 463-3897 (fax)
http://www.sealaska.com/

APPENDIX E
Alaska Mining Websites

Mining and Exploration Companies

Abacus Mining & Exploration Co.	http://www.amemining.com
Alaska Earth Sciences Inc.	http://www.aes.alaska.com
Anchorage Sand and Gravel Co. Inc.	http://www.anchsand.com
AngloGold Ltd.	http://www.anglogold.com
Avalon Development Corp.	http://www.avalonalaska.com
Bravo Venture Group Inc.	http://www.bravoventuregroup.com
Browns Hill Quarry	http://www.brownshill.com
CanAlaska Ventures Ltd.	http://www.canalaska.com
Century Mining Corp.	http://www.centurymining.com
Coeur d'Alene Mines Corp. (Coeur Alaska Inc.)	http://www.coeur.com
Continental Ridge Resources Inc. (now Nevada Geothermal Power Inc.)	http://www.nevadageothermal.com
Copper Ridge Explorations Inc.	http://www.copper-ridge.com
Engineer Mining Corp.	http://www.emcorp.yk.ca
Freegold Ventures Ltd.	http://www.freegoldventures.com
Full Metal Minerals Ltd.	http://www.fullmetalminerals.com
Geocom Resources Inc.	http://www.geocom-resources.com
Geoinformatics Exploration Inc	http://www.geoinformex.com
Geologix Explorations Inc.	http://www.geologix.ca
Golconda Resources Ltd.	http://www.golcondaresources.com
Grayd Resource Corp.	http://www.grayd.com
Hecla Mining Co.	http://www.hecla-mining.com
Inlet Resources Ltd.	http://www.inlet-resources.com
Kennecott Exploration Co.	http://www.kennecottexploration.com
Kennecott Minerals Co.	http://www.kennecottminerals.com
Kinross Gold Corp.	http://www.kinross.com
Liberty Star Gold Corp.	http://www.libertystargold.com
Linux Gold Corp.	http://www.linuxgoldcorp.com
Little Squaw Gold Mining Co.	http://www.littlesquawgold.com
Lonmin Plc	http://www.lonmin.com
Meridian Gold Inc.	http://www.meridiangold.com
Navigator Exploration Corp.	http://www.navigatorexploration.com
Nevada Star Resource Corp.	http://www.nevadastar.com
Northern Associates Inc.	http://www.alaskaexploration.com
Northern Dynasty Minerals Ltd.	http://www.northerndynastyminerals.com
NovaGold Resources Inc.	http://www.novagold.net
Pacific North West Capital Corp.	http://www.pfncapital.com
Placer Dome Inc.	http://www.placerdome.com
Quaterra Resources Inc.	http://www.manexresourcegroup.com/quaterra
Rimfire Minerals Corp.	http://www.rimfire.bc.ca
Rio Fortuna Exploration Corp.	http://www.manexresourcegroup.com/riofortuna
Rubicon Minerals Corp.	http://www.rubiconminerals.com
Santoy Resources Ltd.	http://www.santoy.ca
Shear Minerals Ltd.	http://www.shearminerals.com
Silverado Gold Mines Ltd.	http://www.silverado.com
Sisyphus Consulting	http://www.sisyphus-consulting.com
St. Andrew Goldfields Ltd.	http://www.standrewgoldfields.com
Teck Cominco Ltd.	http://www.teckcominco.com
Teryl Resources Corp.	http://www.terylresources.com
TNR Gold Corp.	http://www.tnrgoldcorp.com
Tri-Valley Corp.	http://www.tri-valleycorp.com
Usibelli Coal Mine Inc.	http://www.usibelli.com
Western Keltic Mines Inc.	http://www.keltic.com

Western Warrior Resources Inc.	http://www.westernwarrior.ca
WGM Inc.	http://www.wgm.com

Alaska Native Corporations

Ahtna Inc.	http://www.ahtna-inc.com
Aleut Corp.	http://www.aleutcorp.com
Arctic Slope Regional Corp.	http://www.asrc.com
Bering Straits Native Corp.	http://www.beringstraits.com
Bristol Bay Native Corp.	http://www.bbnc.net
Calista Corp.	http://www.calistacorp.com
Chugach Alaska Corp.	http://www.chugach-ak.com
Cook Inlet Region Inc.	http://www.ciri.com
Doyon Ltd.	http://www.doyon.com
Koniag Inc.	http://www.koniag.com
NANA Regional Corp.	http://www.nana.com
Sealaska Corp.	http://www.sealaska.com

General

Alaska Miners Association	http://www.alaskaminers.org
Alaska Division of Geological & Geophysical Surveys	http://www.dggs.dnr.state.ak.us
Alaska Division of Community & Business Development	http://www.commerce.state.ak.us/oed/home.htm

Alaska's Minerals Data and Information Rescue in Alaska (MDIRA) Project Websites

MDIRA Portal Home Page	http://akgeology.info
Alaska Geology Map Indexer	http://maps.akgeology.info
Alaska Mining Claims Information System	http://akmining.info
Alaska Resource Data Files	http://ardf.wr.usgs.gov
DGGS Publications On-Line	http://www.dggs.dnr.state.ak.us/pubs/pubs
Digital Index of Geological Information	http://imcg.wr.usgs.gov/digi.html
DNR Sites Related to Mining Applications and Forms	http://www.dnr.state.ak.us/mlw/forms
Guide to Alaska Geologic and Mineral Information	http://wwwdggs.dnr.state.ak.us/scan1/ic/text/IC44.PDF
Land Records Web Application	http://plats.landrecords.info/index.html
NURE Data	http://imcg.wr.usgs.gov/nuredata.html
On-Line Annual Payments	https://www.dnr.state.ak.us/cc_payment/LAS_Form.cfm
RASS, PLUTO Geochemistry Data	http://geopubs.wr.usgs.gov/open-file/of99-433
State Map Library	http://www.dnr.state.ak.us/lris/gis_maplib/maplib_start.cfm
State Recorder's Office Search	http://www.dnr.state.ak.us/ssd/recoff/search.cfm
State Uniform Commercial Code (UCC) Documents Search	http://www.dnr.state.ak.us/ssd/ucc/search.cfm

APPENDIX F

U.S. Customary Units/Metric Units Conversion Chart

To convert from:	To:	Multiply by:
Weight/Mass/Ore Content		
ounces (avoirdupois)	grams	28.350
ounces (troy)	grams	31.1035
pounds	kilograms	0.4536
short tons	metric tons	0.9072
grams	ounces (avoirdupois)	0.03527
	ounces (troy)	0.03215
kilograms	pounds	2.2046
metric tons	short tons	1.1023
parts per million (ppm)	parts per billion (ppb)	1,000
parts per million (ppm)	ounces per ton	0.0292
parts per million (ppm)	grams/metric tons (tonnes)	1.00
Length		
miles	kilometers	1.6093
yards	meters	0.9144
feet	meters	0.3048
	centimeters	30.48
	millimeters	304.80
inches	centimeters	2.54
	millimeters	25.4
kilometers	miles	0.6214
meters	yards	1.0936
	feet	3.2808
millimeters	feet	0.00328
	inches	0.03937
centimeters	inches	0.3937
Area		
square miles	square kilometers	2.590
acres	square meters	4,046.873
	hectares	0.4047
square yards	square meters	0.8361
square feet	square meters	0.0929
square inches	square centimeters	6.4516
	square millimeters	645.16
square kilometers	square miles	0.3861
square meters	acres	0.000247
	square feet	10.764
	square yards	1.196
hectares	acres	2.471
	square meters	10,000.00
square centimeters	square inches	0.155
square millimeters	square inches	0.00155
Volume		
cubic yards	cubic meters	0.7646
cubic feet	cubic meters	0.02832
cubic inches	cubic centimeter	16.3871
cubic meters	cubic yards	1.3079
	cubic feet	35.3145
cubic centimeters	cubic inches	0.06102
gallons (U.S.)	liters	3.7854
liters	gallons (U.S.)	0.2642
milliliters	ounces (fluid)	0.03381
ounces (fluid)	milliliters	29.5735

Temperature conversions:
From degrees Fahrenheit to degrees Celsius, subtract 32 and multiply by 5/9.
From degrees Celsius to degrees Fahrenheit, multiply by 9/5 and add 32.

SOURCE: *Minerals Today,* February 1993, U.S. Bureau of Mines.

APPENDIX G
Primary metals production in Alaska, 1880-2004

Year	Gold		Silver		Mercury		Antimony		Tin		Lead		Zinc		Platinum		Copper		Chromium	
	(oz)	(m$)	(oz)	(t$)	(flask[b])	(t$)	(lb)	(t$)	(lb)	(t$)	(tons)	(t$)	(tons)	(t$)	(oz)	(t$)	(lb)	(m$)	(tons)	(t$)
1880-1899	1,153,889	23.85	496,101	329.0	--	--	--	--	--	--	250	17.0	--	--	--	--	--	--	--	--
1900	395,030	8.17	73,300	45.5	--	--	--	--	--	--	40	3.4	--	--	--	--	--	--	--	--
1901	335,369	6.93	47,900	28.6	--	--	--	--	--	--	40	3.4	--	--	--	--	250,000	0.04	--	--
1902	400,709	8.28	92,000	48.5	--	--	--	--	30,000	8.0	30	2.5	--	--	--	--	360,000	0.04	--	--
1903	420,069	8.68	143,600	77.8	--	--	--	--	50,000	14.0	30	2.5	--	--	--	--	1,200,000	0.16	--	--
1904	443,115	9.16	198,700	114.9	--	--	--	--	28,000	8.0	30	2.5	--	--	--	--	2,043,586	0.28	--	--
1905	756,101	15.63	132,174	80.2	--	--	--	--	12,000	4.0	30	2.6	--	--	--	--	4,805,236	0.75	--	--
1906	1,066,030	22.04	203,500	136.4	--	--	--	--	68,000	38.6	30	3.4	--	--	--	--	5,871,811	1.13	--	--
1907	936,043	19.35	149,784	98.8	--	--	--	--	44,000	16.8	30	3.2	--	--	--	--	6,308,786	1.26	--	--
1908	933,290	19.29	135,672	71.9	--	--	--	--	50,000	15.2	40	3.4	--	--	--	--	4,585,362	0.61	--	--
1909	987,417	20.41	147,950	76.9	--	--	--	--	22,000	7.6	69	5.9	--	--	--	--	4,124,705	0.54	--	--
1910	780,131	16.13	157,850	85.2	--	--	--	--	20,000	8.3	75	6.6	--	--	--	--	4,241,689	0.54	--	--
1911	815,276	16.85	460,231	243.9	--	--	--	--	122,000	52.8	51	4.5	--	--	--	--	27,267,778	3.40	--	--
1912	829,436	17.14	515,186	316.8	--	--	--	--	260,000	119.6	45	4.1	--	--	--	--	29,230,491	4.82	--	--
1913	755,947	15.63	362,563	218.9	--	--	--	--	100,000[c]	44.1[c]	6	0.6	--	--	--	--	21,659,958	3.35	--	--
1914	762,596	15.76	394,805	218.3	--	--	--	--	208,000	66.6	28	1.3	--	--	--	--	21,450,628	2.85	--	--
1915	807,966	16.70	1,071,782	543.3	--	--	520,000	W	204,000	78.8	437	41.1	--	--	--	--	86,509,312	15.14	--	--
1916	834,068	17.24	1,379,171	907.4	--	--	1,200,000	W	278,000	121.0	820	113.2	--	--	8	0.7	119,654,839	29.50	--	--
1917	709,049	14.66	1,239,150	1,020.6	--	--	500,000	W	200,000	123.3	852	146.6	--	--	53	5.5	88,793,400	24.40	1,100	W
1918	458,641	9.48	847,789	847.8	--	--	540,000	W	136,000	118.0	564	80.1	--	--	284	36.6	69,224,951	17.10	1,100	W
1919	455,984	9.42	629,708	705.3	--	--	--	--	112,000	73.4	687	72.1	--	--	569	73.7	47,220,771	8.80	--	--
1920	404,683	8.37	953,546	1,039.7	--	--	--	--	32,000	16.1	875	140.0	--	--	1,478	160.1	70,435,363	13.00	--	--
1921	390,558	8.07	761,085	761.1	45	1.5	--	--	8,000	2.4	759	68.3	--	--	40	2.7	57,011,597	7.40	--	--
1922	359,057	7.42	729,945	729.9	--	--	--	--	2,800	0.9	377	41.5	--	--	29	2.8	77,967,819	10.50	--	--
1923	289,539	5.98	814,649	668.1	--	--	--	--	3,800	1.6	410	57.4	--	--	--	--	85,920,645	12.60	--	--
1924	304,072	6.29	669,641	448.6	2	0.3	--	--	14,000	7.1	631	100.9	--	--	28	2.6	74,074,207	9.70	--	--
1925	307,679	6.36	698,259	482.4	44	3.6	W	W	28,600	15.4	789	140.6	--	--	10	1.2	73,055,298	10.30	--	--
1926	324,450	6.70	605,190	377.0	22	1.7	W	W	16,000	10.4	778	124.4	--	--	3,570	274.5	67,778,000	9.49	--	--
1927	286,720	5.97	350,430	215.0	--	--	--	--	53,400	34.0	1,008	127.0	--	--	--	--	55,343,000	7.25	--	--
1928	331,140	6.85	351,730	187.0	--	--	--	--	82,000	41.0	1,019	118.0	--	--	120	9.0	41,421,000	5.96	--	--
1929	375,438	7.76	472,900	252.0	4	0.5	--	--	77,200	35.0	1,315	166.0	--	--	475	32.0	40,570,000	7.13	--	--
1930	408,983	8.47	408,570	157.3	--	--	--	--	29,400	9.3	1,365	136.5	--	--	--	--	32,651,000	4.24	--	--
1931	459,000	9.51	352,000	102.0	15	1.2	--	--	8,200	2.0	1,660	126.0	--	--	393	14.0	22,614,000	1.88	--	--
1932	493,860	10.20	234,050	66.0	8	0.5	--	--	--	--	1,260	75.6	--	--	--	--	8,738,500	0.55	--	--
1933	469,286	9.70	154,700	55.0	--	--	--	--	5,800	2.3	1,157	85.6	--	--	605	18.6	29,000	0.02	--	--
1934	537,281	8.78	154,700	100.0	--	--	--	--	8,200[c]	4.3	839	62.1	--	--	2,555	85.6	121,000	0.06	--	--
1935	469,495	16.43	286,600	206.0	--	--	--	--	98,800	49.8	815	65.2	--	--	8,685	259.6	15,056,000	1.25	--	--
1936	540,580	18.92	484,306	375.0	--	--	--	--	226,000	105.0	941	86.6	--	--	5,654	241.9	39,267,000	3.72	--	--
1937	627,940	21.98	494,340	382.0	--	--	962,000	147.6	372,000[c]	202.3[c]	823	97.1	--	--	9,823	313.4	36,007,000	4.74	--	--
1938	662,000	23.17	479,853	310.0	8	0.6	444,000	54.8	210,000	89.1	994	91.5	--	--	41,000	2,460.0	29,760,000	2.98	--	--
1939	676,780	23.68	201,054	136.5	--	--	210,000	25.9	66,000	38.0	937	88.1	--	--	33,900	2,034.0	278,500	0.04	--	--
1940	755,900	26.45	191,679	136.3	156[c]	130.9	306,000	42.8	92,000	52.0	840	72.0	--	--	28,886	1,093.0	110,000	0.02	--	--
1941	692,314	24.23	199,700	142.0	W	W	774,000	87.3	93,600[c]	61.0[c]	742	58.0	--	--	22,630	813.0	144,000	0.02	--	--
1942	487,657	17.07	135,200	96.0	W	W	316,000	41.0	5,600	2.5	523	44.0	--	--	22,000	779.0	48,000	0.01	--	--
1943	99,583	3.49	31,700	22.0	786	153.4	368,000	33.3	2,000[c]	1.0[c]	200	22.0	--	--	27,900	1,020.0	54,000	0.01	5,564	186.3
1944	49,296	1.73	15,240	10.8	841	165.0	70,080	30.0	--	--	44	5.8	--	--	33,616	2,017.0	4,000	0.01	1,845	64.6
1945	68,117	2.38	9,983	6.2	275	180.0	W	W	--	--	11	1.8	--	--	22,949	1,377.0	10,000	0.01	--	--
1946	226,781	7.93	41,793	26.3	699	68.7	W	W	--	--	115	25.0	--	--	22,882	1,418.7	4,000	0.01	--	--
1947	279,988	9.79	66,150	46.3	127	10.6	52,000	16.1	2,000	2.2	255	76.5	226	0.15	13,512	1,351.2	24,000	0.06	--	--
1948	248,395	8.69	67,341	58.7	108	7.8	88,000	29.3	10,000	10.8	317	88.9	226	0.15	13,741	1,209.2	28,000	0.07	--	--
1949	229,416	8.03	36,056	32.4	102	7.9	88,000	31.3	114,000	100.8	49	11.2	226	0.15	17,169	1,545.2	7,700	0.02	--	--

APPENDIX G, *cont'd*

Year	Gold (oz)	Gold (m$)	Silver (oz)	Silver (t$)	Mercury (flask[b])	Mercury (t$)	Antimony (lb)	Antimony (t$)	Tin (lb)	Tin (t$)	Lead (tons)	Lead (t$)	Zinc (tons)	Zinc (t$)	Platinum (oz)	Platinum (t$)	Copper (lb)	Copper (m$)	Chromium (tons)	Chromium (t$)
1950	289,285	10.13	52,638	48.0	W	W	W	W	158,000	170.3	144	27.5	--	--	W	W	12,000	0.03	--	--
1951	239,628	8.38	32,870	29.8	28	W	1,718,000	2,061.6	138,000	198.0	21	7.2	--	--	W	W	2,000	0.01	--	--
1952	240,571	8.42	31,825	28.7	40	W	740,000	1,406.0	180,000	243.9	1	0.3	--	--	W	W	--	--	W	W
1953	253,771	8.88	35,387	32.1	1,023	270.0	W	W	98,000	105.9	--	--	--	--	17,489	1,696.4	--	--	W	W
1954	248,511	8.70	33,694	31.8	1,046	276.0	--	--	398,000	409.9	--	--	--	--	18,790	1,615.9	8,000	0.02	2.953	208.0
1955	249,294	8.73	33,693	30.4	43	12.0	--	--	172,000	182.5	1	0.3	--	--	17,253	1,466.5	2,000	0.01	7,082	625.3
1956	204,300	7.33	26,700	24.1	3,414	837.0	134,400	150.0	--	--	1	0.3	--	--	17,934	1,829.3	--	--	7,200	711.5
1957	215,467	7.54	28,862	26.0	5,461	1,349.0	71,120	80.0	--	--	9	3.0	--	--	15,479	1,377.6	--	--	4,207	431.0
1958	186,000	6.53	24,000	22.0	3,380	774.0	--	--	--	--	--	--	--	--	10,284	647.9	10,000	0.03	--	--
1959	171,000	5.99	22,000	20.0	3,750	852.0	--	--	--	--	--	--	--	--	10,698	770.3	72,000	0.04	--	--
1960	180,000	6.30	23,000	21.0	4,450	938.0	W	W	--	--	--	--	--	--	13,352	1,054.8	82,000	0.04	--	--
1961	114,228	3.99	--	--	4,080	816.0	--	--	--	--	--	--	--	--	16,133	1,274.5	184,000	0.06	--	--
1962	165,142	5.78	--	--	3,843	711.0	--	--	--	--	--	--	--	--	12,520	951.5	--	--	--	--
1963	99,000	3.48	6,100	9.0	400	76.0	W	W	--	--	5	1.1	--	--	12,322	961.1	--	--	--	--
1964	58,000	2.05	7,200	6.0	303	95.0	46,400	60.3	--	--	--	--	--	--	13,010	1,522.2	22,000	0.01	--	--
1965	43,000	1.51	5,000	6.0	180	104.0	46,400	60.3	--	--	14	4.0	--	--	10,365	1,368.2	64,000	0.03	--	--
1966	27,325	0.96	7,000	9.0	185	101.0	16,000	19.2	--	--	19	4.3	--	--	9,033	1,273.7	--	--	--	--
1967	22,948	0.80	6,000	9.0	161	79.0	20,000	22.0	--	--	--	--	--	--	7,888	1,238.4	W	W	--	--
1968	21,000	0.81	3,000	6.5	156	78.0	6,000	6.0	--	--	--	--	--	--	8,433	1,652.9	--	--	--	--
1969	21,227	0.88	2,000	4.2	238	100.0	94,000	100.0	--	--	2	0.5	--	--	8,500	2,321.2	--	--	--	--
1970	38,400	1.38	4,000	7.0	3,100	1,260.0	365,000	410.0	--	--	--	--	--	--	6,015	925.1	W	W	--	--
1971	34,000	1.36	2,000	4.0	675	285.0	68,000	74.0	34,000	47.0	--	--	--	--	5,407	625.6	--	--	--	--
1972	8,639	0.56	1,000	2.0	125	44.0	160,000	185.0	W	W	--	--	--	--	6,478	985.5	--	--	--	--
1973	15,000	1.86	13,200	22.0	70	52.5	420,000	515.0	10,000	12.0	6	2.0	--	--	5,524	964.5	--	--	--	--
1974	16,000	2.56	1,500	3.5	70	52.5	80,000	95.0	W	W	--	--	--	--	4,351	1,067.0	--	--	--	--
1975	14,980	3.35	6,000	25.0	--	--	120,000	145.0	22,000	60.0	--	--	--	--	3,726	623.3	--	--	--	--
1976	22,887	6.90	6,500	24.0	--	--	160,000	165.0	W	W	14	6.0	--	--	3,212	515.2	--	--	8,000[c]	1,200.0[c]
1977	50,000	7.80	8,000	20.0	--	--	W	W	W	W	--	--	--	--	6,891	1,119.8	--	--	--	--
1978	60,000	12.00	6,000	50.0	--	--	W	W	W	W	--	--	--	--	--	--	--	--	--	--
1979	65,000	18.00	6,500	93.0	--	--	100,000	125.0	100,000	830.0	--	--	--	--	--	--	--	--	--	--
1980	75,000	32.00	7,500	111.0	--	--	--	--	120,000	984.0	31	29.0	--	--	--	--	--	--	--	--
1981	134,200	55.20	13,420	111.3	W	W	--	--	106,000	700.0	--	--	--	--	900	200.0	--	--	--	--
1982	175,000	69.90	22,000	198.0	--	--	--	--	198,000	1,365.0	--	--	--	--	W	W	--	--	--	--
1983	169,000	67.60	33,200	332.0	--	--	22,400	45.0	215,000	1,100.0	--	--	--	--	W	W	--	--	--	--
1984	175,000	62.13	20,000	159.0	5	1.5	135,000	225.8	225,000	400.0	--	--	--	--	W	W	--	--	--	--
1985	190,000	61.18	28,500	171.0	27	10.0	65,000	98.0	300,000	650.0	--	--	--	--	--	--	--	--	--	--
1986	160,000	60.80	24,000	134.4	12	2.8	45,000	67.5	340,000	890.0	--	--	--	--	W	W	--	--	--	--
1987	229,707	104.51	54,300	391.0	--	--	--	--	288,000	460.0	--	--	--	--	W	W	--	--	--	--
1988	265,500	112.84	47,790	282.0	W	W	--	--	300,000	950.0	--	--	--	--	25	13.8	--	--	--	--
1989	284,617	108.70	5,211,591	27,300.0	--	--	--	NR	194,000	672.0	9,585	7,700.0	19,843	29,400.0	--	--	--	--	--	--
1990	231,700	89.20	10,135,000	50,675.0	--	--	--	--	57,000	200.0	44,220	30,954.0	181,200	253,680.0	--	--	--	--	--	--
1991	243,900	88.29	9,076,854	39,110.0					6,800	22.1	69,591	33,403.7	278,221	278,221.0	15	5.3	--	--	--	--
1992	262,530	88.46	9,115,755	34,913.0	--	--	--	--	1,500	5.9	68,664	31,585.0	274,507	301,957.7	--	--	--	--	--	--
1993	191,265	68.64	5,658,958	24,333.0	--	--	--	--	21,000	50.6	38,221	13,759.6	268,769	236,516.7	3	1.2	--	--	--	--
1994	182,100	70.29	1,968,000	10,391.0	--	--	--	--	--	--	36,447	25,512.9	329,003	296,102.7	5	2.1	--	--	--	--
1995	141,882	56.04	1,225,730	6,655.0	--	--	--	--	--	--	58,098	34,428.6	359,950	345,552.0	1	0.4	--	--	--	--
1996	161,565	62.62	3,676,000	19,078.0	--	--	--	--	--	--	70,086	52,284.0	366,780	361,646.0	2	0.8	780,000	0.80	--	--
1997	590,516	207.29	14,401,165	70,710.0	--	--	--	--	--	--	88,560	49,593.0	419,097	494,888.0	--	--	3,440,000	3.54	--	--
1998	594,191	174.62	14,856,000	82,154.0	--	--	--	--	--	--	102,887	49,386.0	549,348	505,400.0	--	--	3,800,000	2.85	--	--
1999	517,890	144.26	16,467,000	85,628.0	--	--	--	--	--	--	125,208	57,596.0	643,642	630,769.0	--	--	4,200,000	3.00	--	--
2000	546,000	152.39	18,226,615	90,404.0	--	--	--	--	--	--	123,224	51,754.0	669,112	682,494.0	--	--	2,800,000	2.30	--	--
2001	550,644	149.25	16,798,000	73,408.0	--	--	--	--	--	--	127,385	56,049.0	634,883	507,907.0	--	--	2,800,000	1.99	--	--
2002	562,094	174.28	17,858,183	82,326.0	--	--	--	--	--	--	--	--	--	--	--	--	3,200,000	2.27	--	--
2003	528,191	191.93	18,589,100	95.3	--	--	--	--	--	--	162,479	64,279.0	714,769	536,348.0	--	--	--	--	--	--
2004	456,508	192.34	16,947,270	113.1	--	--	--	--	--	--	150,796	120,636.8	680,015	651,432.2	--	--	--	--	--	--
Other[c]	--	--	--	--	1,438	--	--	--	--	--	--	--	--	--	71,946	17,091.9	--	--	--	--
TOTAL	**37,885,747**	**3,448.92**	**200,228,906**	**713,640.8**	**40,945**	**9,910.5**	**11,070,800**	**6,655.1**	**7,287,700**	**12,523.5**	**1,448,213**	**743,444.7**	**7,107,923**	**6,614,988.8**	**668,548[d]**	**48,723.8**	**1,394,813,932**	**244.79**	**39,051**	**3,426.7**

[a]From published and unpublished state and federal documents.
[b]76-lb flask.
[c]Not traceable by year.
[d]Crude platinum; total production of refined metal is about 575,000 oz.
W = Withheld.
-- = Not reported.
t$ = Thousand dollars.
m$ = Million dollars.

APPENDIX H

Production of industrial minerals, coal, and other commodities in Alaska, 1880-2004

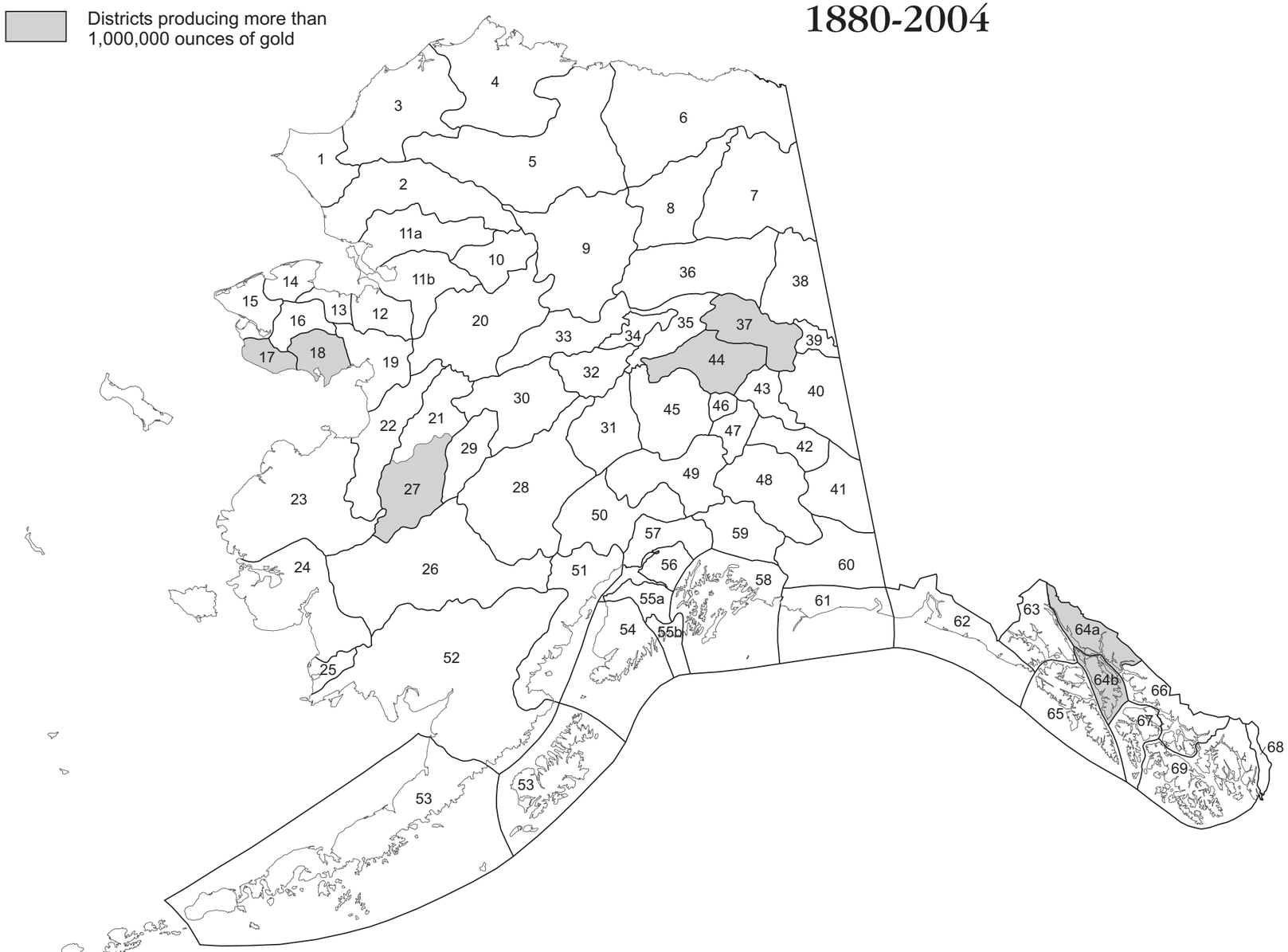
Year	Coal		Sand and gravel		Rock[a]		Barite		Other[b]
	s. tons	m$	s. tons	m$	s. tons	m$	s. tons	t$	$
1880-1899[c]	19,429	0.14	--	--	7,510	0.04	--	--	--
1900	1,200[d]	0.02[d]	--	--	510	0.01	--	--	--
1901	1,300[d]	0.02[d]	--	--	700	0.01	--	--	500
1902	2,212[d]	0.02[d]	--	--	800	0.01	--	--	255
1903	1,447	0.01	--	--	920	0.01	--	--	389
1904	1,694	0.01	--	--	1,080	0.02	--	--	2,710
1905	3,774	0.02	--	--	970	0.02	--	--	740
1906	5,541	0.02	--	--	2,863	0.03	--	--	19,965
1907	10,139	0.05		--	3,899	0.03	--	--	54,512
1908	3,107[d]	0.01[d]	--	--	2,176	0.03	--	--	81,305
1909	2,800	0.02	--	--	1,400	0.01	--	--	86,027
1910	1,000[d]	0.01[d]	--	--	W	W	--	--	96,408
1911	900[d]	0.01[d]	--	--	W	W	--	--	145,739
1912	355[d]	0.01[d]	--	--	W	W	--	--	165,342
1913	2,300	0.01	--	--	W	W	--	--	286,277
1914	1,190	0.01	--	--	W	W	--	--	199,767
1915	1,400	0.03	--	--	W	W	--	--	205,061
1916	12,676	0.05	--	--	W	W	--	--	326,731
1917	54,275	0.27	--	--	W	W	--	--	203,971
1918	75,816	0.41	--	--	W	W	--	--	171,452
1919	60,894	0.35	--	--	50,014	0.29	--	--	214,040
1920	61,111	0.36	--	--	37,044	0.27	--	--	372,599
1921	76,817	0.49	--	--	59,229	0.31	--	--	235,438
1922	79,275	0.43	--	--	54,251	0.30	--	--	266,296
1923	119,826	0.76	--	--	83,586	0.41	--	--	229,486
1924	99,663	0.56	--	--	35,294	0.26	--	--	348,728
1925	82,868	0.40	--	--	32,193	0.19	--	--	454,207
1926	87,300	0.46	--	--	33,283	0.20	--	--	423,000
1927	104,300	0.55	--	--	41,424	0.22	--	--	--
1928	126,100	0.66	--	--	63,347	0.31	--	--	--
1929	100,600	0.53	--	--	54,766	0.26	--	--	194,000
1930	120,100	0.63	--	--	66,234	0.33	--	--	157,300
1931	105,900	0.56	--	--	59,175	0.29	--	--	108,000
1932	102,700	0.53	--	--	54,167	0.27	--	--	223,400
1933	96,200	0.48	--	--	56,291	0.28	--	--	--
1934	107,500	0.45	--	--	64,234	0.36	--	--	46,155
1935	119,425	0.50	--	--	74,049	0.38	--	--	46,755
1936	136,593	0.57	--	--	76,379	0.38	--	--	45,807
1937	131,600	0.55	--	--	50,057	0.25	--	--	147,048
1938	159,230	0.62	--	--	189,090	0.21	--	--	125,302
1939	143,549	0.60	42,332	0.02	--	--	--	--	--
1940	170,174	0.88	515,011	0.10	--	--	--	--	--
1941	241,250	0.97	530,997	0.09	--	--	--	--	1,367,000
1942	246,600	0.99	W	W	--	--	--	--	1,124,000
1943	289,232	1.84	W	W	--	--	--	--	--
1944	352,000	2.37	712,496	0.50	--	--	--	--	2,350,309
1945	297,644	1.87	W	W	--	--	--	--	5,910,704
1946	368,000	2.36	W	W	--	--	--	--	2,005,241
1947	361,220	2.55	W	W	219,000	1.00	--	--	5,927,319
1948	407,906	2.79	W	W	67,341	0.33	--	--	1,257,699
1949	455,000	3.60	W	W	W	W	--	--	7,181,886
1950	421,455	3.03	3,050,020	2.38	W	W	--	--	2,100,000
1951	494,333	3.77	6,818,000	3.54	W	W	--	--	3,600,000
1952	648,000	5.77	6,817,800	3.54	W	W	--	--	9,052,000
1953	861,471	8.45	7,689,014	5.08	47,086	0.17	--	--	1,231,350
1954	666,618	6.44	6,639,638	6.30	283,734	0.47	--	--	1,572,150
1955	639,696	5.76	9,739,214	8.24	265,740	0.29	--	--	1,552,427
1956	697,730	6.37	9,100,000	8.30	50,000	0.02	--	--	1,551,500
1957	842,338	7.30	6,096,000	8.79	528,000	1.95	--	--	2,751,000
1958	759,000	6.93	4,255,000	3.87	615,000	2.07	--	--	695,000
1959	602,000[d]	5.88[d]	5,600,000	5.10	54,000	0.20	--	--	1,338,000

Year	Coal		Sand and gravel		Rock[a]		Barite		Other[b]
	s. tons	m$	s. tons	m$	s. tons	m$	s. tons	t$	$
1960	669,000[d]	5.95[d]	5,892,000	5.35	80,000	0.30	- -	- -	975,000
1961	650,000[d]	5.87[d]	5,241,000	4.19	- -	- -	- -	- -	- -
1962	675,000[d]	6.41[d]	5,731,000	5.36	- -	- -	- -	- -	- -
1963	853,000	5.91	16,926,000	22.01	W	W	W	W	2,589,000
1964	745,000	5.01	26,089,000	18.49	W	W	W	W	4,912,000
1965	860,000[d]	5.88[d]	29,959,000	33.93	W	W	W	W	5,296,000
1966	927,000	6.95	17,457,000	21.79	W	W	44,000	350.0	6,167,000
1967	930,000	7.18	22,300,000	26.25	W	W	W	W	4,924,000
1968	812,000[d]	5.03[d]	17,515,000	20.73	W	W	91,000	W	4,117,000
1969	728,000[d]	4.65[d]	16,205,000	18.62	1,954,000	3.90	90,000	850.0	5,163,000
1970	786,000[d]	5.28[d]	20,375,000[d]	26.07[d]	6,470,000	10.01	134,000[d]	1,875.0	7,994,000
1971	748,000[d]	5.05[d]	26,391,000	41.99	2,658,000	5.07	102,000[d]	1,075.0	- -
1972	720,000[d]	6.26[d]	14,187,000	15.21	652,000	3.01	W	W	- -
1973	700,000[d]	6.23[d]	19,350,000	19.01	5,967,000	12.00	112,000	1,792.0	12,846,000
1974	700,000	7.34	118,740,000[d]	240.94[d]	5,484,000	12.95	110,000	1,895.0	14,495,000
1975	766,000	7.81	48,145,000	95.78	8,877,000	26.65	2,000[d]	30.0	12,731,000
1976	705,000	8.00	74,208,000[d]	204.73[d]	6,727,000	20.09	W	W	14,019,000
1977	780,000[d]	12.00[d]	66,126,000	134.25	4,008,000	17.47	- -	- -	14,486,000
1978	750,000	15.00	51,100,000	122.00	3,437,000	14.65	22,000	750.0	- -
1979	750,000	16.00	50,900,000	104.90	3,650,000	15.45	20,000	800.0	930,000
1980	800,000	16.00	40,000,000	86.00	3,700,000	15.40	50,000	2,000.0	97,500
1981	800,000	17.60	46,000,000	88.20	4,200,000	19.30	- -	- -	256,000
1982	830,000	18.00	45,000,000	91.00	3,400,000	15.60	- -	- -	150,000
1983	830,000	18.00	50,000,000	105.00	5,270,000	25.00	- -	- -	242,000
1984	849,161	23.75	27,000,000	95.00	2,700,000	16.00	- -	- -	875,875
1985	1,370,000	39.73	28,184,080	112.06	2,500,000	12.00	- -	- -	559,000
1986	1,492,707	40.10	20,873,110	75.76	4,200,000	20.32	- -	- -	384,800
1987	1,508,927	42.35	16,696,374	42.66	1,805,000	11.62	- -	- -	388,400
1988	1,551,162	44.30	17,264,500	48.75	3,600,000	24.65	- -	- -	389,000
1989	1,452,353	41.46	14,418,000	39.88	2,914,000	20.34	- -	- -	1,492,000
1990	1,576,000	44.99	15,013,500	40.82	3,200,000	22.10	- -	- -	400,000
1991	1,540,000	39.00	14,160,011	45.45	3,000,000	22.50	- -	- -	462,000
1992	1,531,800	38.30	14,599,746	42.20	2,900,000	22.97	- -	- -	430,000
1993	1,586,545	38.10	13,162,402	40.64	3,561,324	26.21	- -	- -	465,000
1994	1,490,000	36.75	13,518,321	40.95	3,843,953	27.04	- -	- -	459,500
1995	1,640,000	41.30	9,847,550	30.89	2,811,152	22.13	- -	- -	182,500
1996	1,481,000	38.00	9,890,463	32.20	3,000,045	23.56	- -	- -	200,000
1997	1,446,000	38.05	13,800,000	51.91	3,200,000	20.00	- -	- -	217,000
1998	1,339,000	35.23	12,363,450	57.28	1,636,200	14.04	- -	- -	215,000
1999	1,560,000	41.05	10,600,000	52.42	1,640,000	18.01	- -	- -	- -
2000	1,473,355	38.77	10,600,000	49.86	5,200,000	36.59	- -	- -	- -
2001	1,537,000	48.11	10,360,000	55.22	3,091,000	27.18	- -	- -	- -
2002	1,158,000	37.40	22,412,000	120.70	3,152,000	31.44	- -	- -	- -
2003	1,088,000	38.08	11,868,001	64.14	861,382	10.41	- -	- -	175,000
2004	1,450,000	50.75	19,576,092	101.51	7,312,050	106.21	- -	- -	2,732,544
Other[d]	- -	- -	- -	- -	2,300,000[e]	W	79,000	W	- -
TOTAL	**60,880,783**	**1,145.09**	**1,227,650,112**	**2,847.95**	**138,348,942**	**764.66**	**856,000**	**11,417.0**	**180,669,426**

[a]Building stone production figures for 1880-1937 are for the southcentral and interior regions of Alaska only. Contains limestone 2004.
[b]Includes 2.4 million lb of U_3O_8 (1955-71); 505,000 tons gypsum (1905-26); 286,000 lbs WO_3 (intermittently 1916-80); 94,000 lbs asbestos (1924-44); 540,000 lbs graphite (1917-18 and 1942-50); and undistributed amounst of zinc, jade, peat, clay, soapstone, miscellaneous gemstones, and other commodities (1880-1993).
[c]Production not traceable to a specific year or period.
[d]When state (territorial) and federal figures differ significantly, state figures are used. Figures for sand and gravel production in 1974 show state estimates (118,740,000 short tons; $240.94m) and federal (421,614,000 short tons - $88.96m). The federal estimate was not added to total production.
[e]Marble quarried on Prince of Wales Island, southeastern Alaska (1900-41).
m$ - million of dollars.
t$ - thousands of dollars
— Not reported
W - Withheld.

	Mining districts[a]	Production (in refined troy ounces)		
		Total production	Placer	Lode
1	Lisburne district	0	0	0
2	Noatak district	7,800	7,800	0
3	Wainwright district	0	0	0
4	Barrow district	0	0	0
5	Colville district	0	0	0
6	Canning district	0	0	0
7	Sheenjek district	0	0	0
8	Chandalar district	65,860	48,460	17,400
9	Koyukuk-Nolan district	345,732	345,732	0
10	Shungnak district	15,000	15,000	0
11	Squirrel River district	40,600	40,600	0
12	Fairhaven-Inmachuk district	348,089	348,089	0
13	Candle district	253,720	253,720	0
14	Serpentine district	4,220	4,220	0
15	Port Clarence district	42,351	42,351	0
16	Kougarok district	177,535	177,535	0
17	Cape Nome district	4,991,256	4,991,256	0
18	Council-Solomon district	1,046,513	1,019,513	27,000
19	Koyuk district	84,132	84,132	0
20	Koyukuk-Hughes district	275,904	275,904	0
21	Kaiyuh district	149,703	5,400	144,303
22	Anvik district	7	7	0
23	Marshall district	124,506	124,506	0
24	Bethel district	42,945	42,945	0
25	Goodnews Bay district	29,700	29,700	0
26	Aniak-Tuluksak district	587,206	587,206	0
27	Iditarod district	1,562,722	1,559,792	2,930
28	McGrath-McKinley district	329,727	132,828	196,899
29	Innoko-Tolstoi-Ophir district	728,452	728,296	156
30	Ruby-Poorman district	477,526	477,526	0
31	Kantishna district	99,307	91,401	7,906
32	Hot Springs district	578,085	578,085	0
33	Gold Hill-Melozitna district	12,089	12,089	0
34	Rampart district	196,815	196,815	0
35	Tolovana-Livengood district	529,513	529,513	0
36	Yukon Flats district	0	0	0
37	Circle district	1,067,386	1,067,386	0
38	Black district	0	0	0
39	Eagle district	52,000	52,000	0
40	Fortymile district	552,405	552,405	0
41	Chisana-Nabesna district	144,500	78,000	66,500
42	Tok district	280	280	0
43	Goodpaster district	2,350	2,050	300
44	Fairbanks district	11,506,646	8,188,517	3,318,129
45	Bonnifield district	84,186	77,486	6,700
46	Richardson district	120,940	118,640	2,300
47	Delta River district	6,740	6,740	0
48	Chistochina district	182,074	182,074	0
49	Valdez Creek district	509,132	507,551	1,581
50	Yentna-Cache Creek district	197,694	197,694	0
51	Redoubt district	105	105	0
52	Iliamna-Bristol Bay district	1,570	1,570	0
53	Kodiak-Unga Island district	112,400	4,800	107,600
54	Homer district	16	16	0
55	Hope-Sunrise & Seward district	132,495	67,495	65,000
56	Anchorage district	167	167	0
57	Willow Creek-Hatcher Pass district	666,175	57,175	609,000
58	Prince William Sound district	137,715	15	137,700
59	Nelchina district	14,115	14,115	0
60	Nizina district	148,500	148,500	0
61	Yakataga district	18,040	18,040	0
62	Yakutat district	13,200	2,200	11,000
63	Porcupine district	81,851	81,851	0
64	Juneau & Admiralty districts	8,634,521	80,000	8,554,521
65	Chichagof district	770,000	0	770,000
66	Petersburg-Sumdum district	15,000	15,000	0
67	Kupreanof district	0	0	0
68	Hyder district	219	219	0
69	Ketchikan district	62,000	4,000	58,000
	SUBTOTAL	**38,381,435**	**24,276,510**	**14,104,925**
	Undistributed[g]	154,165		
	Total production (troy ounces)	**38,535,600**		

Total gold production in Alaska by mining district 1880-2004



[a]Mining district names and boundaries revised slightly from those defined by Ransome and Kerns (1954) and Cobb (1973). Sources of data: U.S. Geological Survey, U.S. Bureau of Mines, and Territorial Department of Mines records 1880–1930; U.S. Mint records 1930–1969; State of Alaska production records 1970–2002. Entries of "0" generally mean no specific records are available.
[b]Included in Marshall district.
[c]Includes Georgetown and Donlin districts.
[d]Includes Tanana area.
[e]Placer gold included in Willow Creek–Hatcher Pass district.
[f]Includes lode production from Glacier Bay and placer production from Lituya Bay district.
[g]Production that cannot be credited to individual districts due to lack of specific records or for reasons of confidentiality.

TOP. *Drilling at NovaGold's Rock Creek project. Photo courtesy of NovaGold Resources Inc.*

BOTTOM. *Overview of Ganes Creek drainage and Clark–Wiltz Mining Inc. camp facilities. More than 250,000 ounces of placer gold have been produced from Ganes Creek and its tributaries and much of the placer gold is very coarse. Clark–Wiltz controls 30 square miles of mining claims in the Ganes Creek area and Full Metal Minerals Ltd. conducted a lode exploration program on the property in 2004. Clark–Wiltz started allowing paying visitors to the mine in 2002 to search the tailing piles for gold nuggets lost in the old operations. So far, hundreds of ounces of gold have been found, including 20.1-ounce and 33.85-ounce nuggets and 23.5-ounce and 87.95-ounce gold-quartz specimens in 2004. Photo courtesy of Full Metal Minerals Ltd.*

RIGHT. *Jeff Foley, Calista Corp. geologist, operates an Earthquake power auger to ultramafic complex. Photo by W.I. (Tony) Van der Poel.*

LOWER RIGHT. *Construction of a cofferdam in the tailings facility at Red Dog Mine. Photo courtesy of DNR-ML&W.*