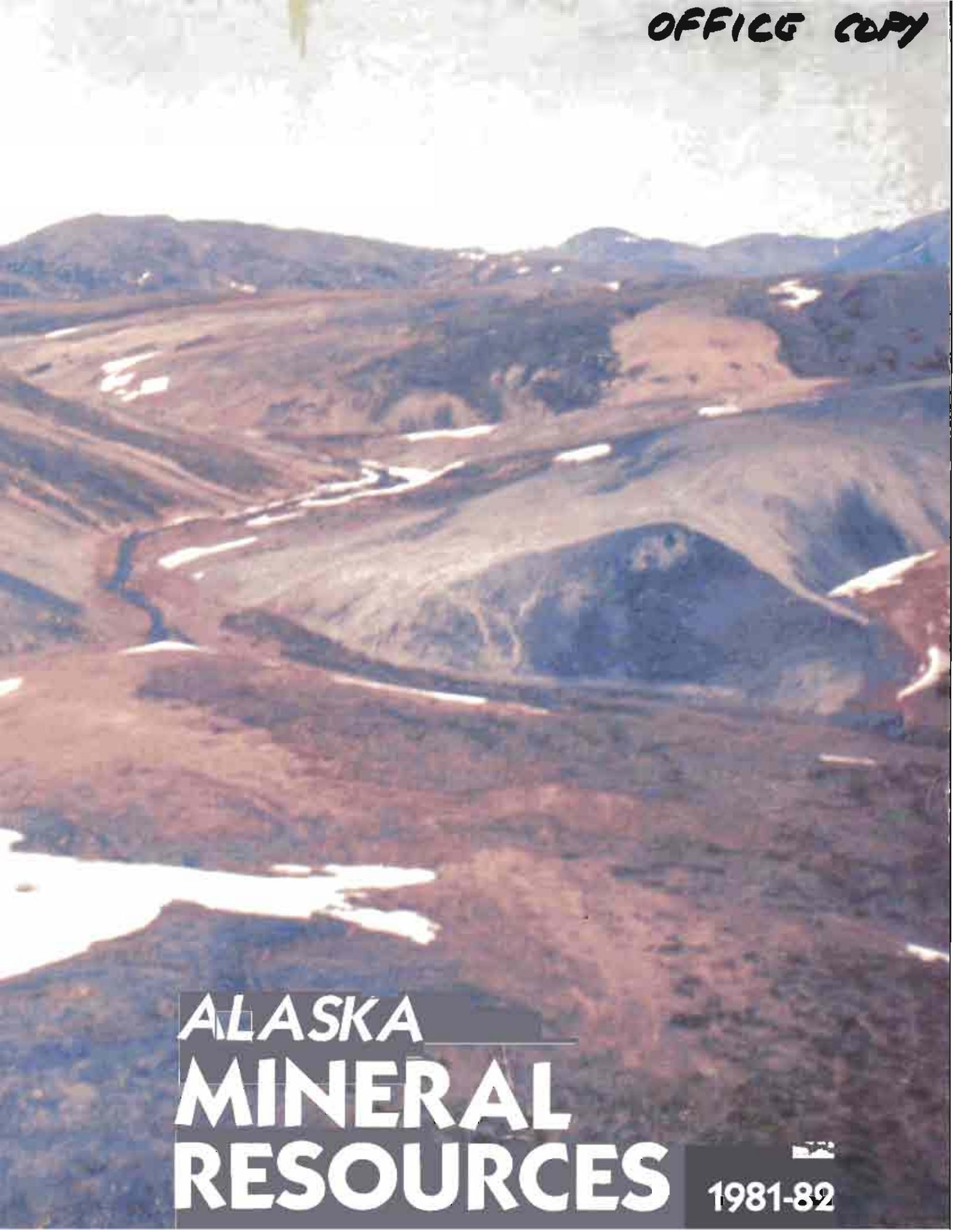


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**ALASKA
MINERAL
RESOURCES**


1981-82

Review of Alaska's Mineral Resources

By

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1982

FOREWARD

Shortly after the Office of Mineral Development was established in 1981 the first initiatives were taken to compile an authoritative and contemporary review of the mineral resources of the State. This volume, A REVIEW OF ALASKA'S MINERAL RESOURCES, was prepared by the professional staff of the Division of Geological and Geophysical Surveys (DGGs) in the Department of Natural Resources.

As a definitive volume, this review will be subject to periodic update as new information and developments warrant. The Office of Mineral Development will publish a summary version which will become the format for an Annual Review of Mining Activity.

It is absolutely vital that decision makers in the legislature, State and local government administrations, the private sector inclusive of industry and the native corporations as well as the public at large have access to a reliable data base and contemporary commentary of the mining industry — an industry with a rich heritage in Alaska and one which offers great promise as a vehicle to expand and diversify the economic base.

Preparation of a review of this type requires cooperation and effort on the part of industry in generating the information requested on the questionnaire which, in turn, is the very substance of the report. Hopefully, industry and the public sector will continue to collaborate in this project and support the efforts of the Office of Mineral Development to ensure that mining has an informed constituency in Alaska.

Our northern neighbors in the Yukon Territory have evolved a public agency reporting system for mining activity which is a model for us to adopt and adapt to suit our own particular conditions and needs.

Unlike the Canadian Yukon, we in Alaska do not have an economy dominated by mining activity, however, the share of mining in the economy of Alaska is growing and will dramatically increase in the years ahead. In 1981 the value of all goods and services purchased by exploration companies combined with the value of mineral commodities produced in Alaska was in excess of \$300 million. More specifically, exploration expenditures exceeded \$100 million while the value of gold produced was conservatively pegged at \$55 million. Sand and gravel accounted for \$88 million and coal a further \$17.6 million of the overall value.

Growth in all sectors and all phases of the mining industry is confidently predicted and the time may not be too far away when the industry will be second only in economic importance to the oil and gas industry.

John Sims
Office of Mineral Development

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SUMMARY

This report summarizes past and present mineral-industry activities (excluding oil and gas) in the 49th state, from levels of exploration and descriptions of development projects to actual mineral production. In current dollars, Alaska's mineral production from 1880 to 1980 amounted to over \$20 billion (table 1). Total value of 1981 mineral production in Alaska exceeded \$180 million, an increase of about 19 percent from 1980. The dramatic growth in gold production was responsible for most of this increase. At least 134,000 ounces of gold (about 12 percent of United States production) were recovered from several hundred small and a few medium-size placer- and lode-gold operations throughout the state.

Exploration and development expenditures during 1981 remained at the high levels established during the last 6 years, amounting to over \$75 million (table 2). Most of this was expended in property evaluations, but some companies continued grassroots exploration projects. Several properties have reached a development stage, and it is encouraging to see this despite the withdrawal of large land areas from mineral entry, rising costs, and the nation's economic slowdown. The latter will probably reduce short-term levels of activity.

Present modifications of federal and state policies toward mineral development may improve the position of minerals in Alaska. Some recent actions by government entities that indicate a concern for mineral development include:

- * The Alaska Department of Environmental Conservation (DEC) contracted an engineering firm to design an experimental settling pond in the Circle District to treat placer mine waters and evaluate its performance in relation to water quality standards.
- * DEC personnel actively search for constructive solutions to siltation problems associated with placer mines.
- * Three State of Alaska departments that require placer mining permits (Fish and Game, Natural Resources, and Environmental Conservation) have simplified the permitting procedure by combining their permit applications on a simple two-page form (appendix E).
- * The State of Alaska, Division of Geological and Geophysical Surveys (DGGs) and the University of Alaska Mineral Industry Research Laboratory (MIRL) are conducting detailed economic-geology surveys of mining districts in the east-central region of the state.
- * DGGs presented several reports on Alaska's strategic and critical minerals endowment at state and national meetings.
- * The Governor's Division of Policy Development and Planning contracted a private firm to assess the potential for developing Alaskan deposits of nickel, chromium, platinum group metals, cobalt and tin.
- * In 1981, the U.S. Bureau of Mines began an aggressive program to assess Alaska's strategic minerals.
- * In-holders in conservation units administered by the National Park Service are allowed to continue development of mineral properties.
- * A state loan fund for miners was established by the Legislature and is administered by the Division of Loans, Department of Commerce and Economic Development, with a \$5 million maximum for any single loan.
- * The state and industry contributed to the publication of 1:1,000,000- scale colored maps on the mineral terranes of Alaska. The seven-plate series, compiled by C. C. Hawley and Associates and published by the University of Alaska's Arctic Environmental Information and Data Center (AEIDC), contains abundant mineral-resource information.
- * A major focus of a Department of Transportation regional transportation study of western and northern Alaska is the extraction of mineral resources.

TABLE 1
ALASKAN MINERAL PRODUCTION, 1880-1980

Mineral	Production History	Physical Volume	Total Value - 1980 dollars - \$ × 10 ⁶
Gold	1880-1980	30,250,336 oz	13,612.50
Sand and gravel	1958-81	709,880,000 tons	3,755.60
Copper	1900-41; 1950-74*	1,380,000,000 lbs	1,242.00
Coal	1920-80	29.2 million tons	684.00
Platinum metals	1918-76, 1981	575,000 oz	213.78
Silver	1880-1980	20,084,510 oz	169.91
Uranium	1955-72	2,400,000 lbs U ₃ O ₈	46.00
Tin	1902-80	4,800,000 lbs	35.40
Lead	1906-73*	50,056,000 lbs	25.50
Marble-limestone	1905-44	2,300,000 tons	23.00
Barite	1915, 1963-79	750,000 tons (98% BaSO ₄)	18.00
Antimony	1915-79*	10,493,360 lbs	16.05
Mercury	1909-40*; 1942-74	3,160,000 lbs	14.20
Gypsum	1905-26; 1948-51	505,000 tons	3.90
Tungsten	1916-58, 1977-80*	286,000 lbs (WO ₃)	1.79
Chrome	1918, 1943-57, 1976	36,849 tons (42% Cr ₂ O ₃)	0.84
Asbestos	1942-44	94,000 lbs	0.20
Graphite	1917-18; 1942-50**	540,000 lbs.	0.15
			\$19,862.82

*Intermittent.

**Produced and shipped from mine site; not all was used commercially.

Sources: 1) Territorial Department of Mines Annual and Biennial Reports.

2) Mineral Resources of Alaska Series (USGS Bulletin) from 1912 to 1950.

3) Annual reports and Mines and Geology Bulletin of the Alaska Division of Geological & Geophysical Surveys)

4) Various private-sector sources.

In the late 1970s, SRI International conducted a study of the potential economic benefit and environmental impacts associated with the development of seven Alaskan mineral properties. Although their hypothetical mine modelling cannot accurately forecast production from specific deposits, results indicate that an Alaskan mineral industry could develop by the 1990s. Such an industry could:

- * Provide the nation with substantial quantities of nonfuel minerals (gold, silver, copper, nickel, lead, zinc, molybdenum, and asbestos) valued at \$900 million to \$1 billion annually (1977 dollars).
- * Provide the nation with 20,000 to 40,000 additional jobs.
- * Reduce the U.S. balance-of-payments deficit by \$700 million to \$1 billion annually (1977 dollars).

These conclusions are consistent with established production and development levels in similar areas, including the Yukon and Northwest Territories of

Canada, Scandinavia, and remote "Third World" entities.

This narrative contains a synopsis of historical mining activity and an examination of current work levels, including exploration, development, and production. Seven major regions of the state (fig. 1) are outlined and discussed in 1977, 1978, and 1979 reconnaissance surveys by Eakins and Daniels (1980a,b). Principal commodities examined include metals, industrial and structural materials, coal, and peat. Plates 1 and 2 are compilations of major mineral deposits and claim-development blocks respectively; mineral deposits discussed in this report are keyed to these plates. Plate 3 shows the location of mining-claim recording districts in Alaska.

Additional background material about historical levels of production of gold, copper, strategic and industrial minerals, and coal are provided in the final sections of the report. The ability to explore, develop, and produce minerals on private lands and the public domain involves complex interactions with federal and state agencies, local municipalities, and the private sector. Hence, Appendices A-D are included to summarize the functions of various government agencies and private groups.

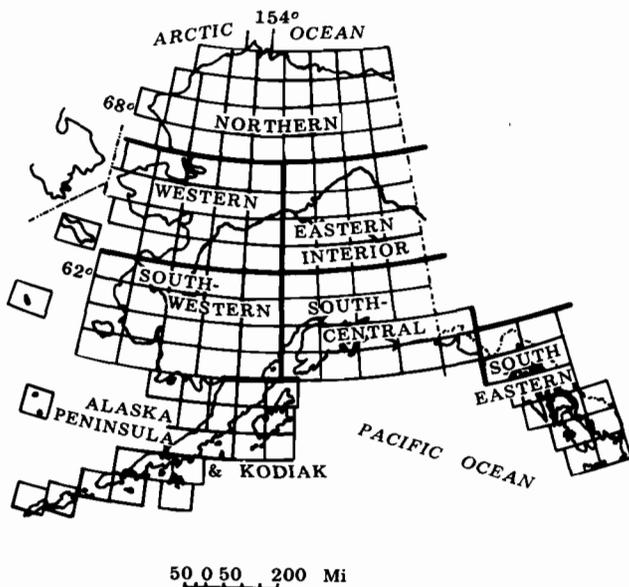


Figure 1. Regions of mineral activity in Alaska (from Eakins, 1978).

Sources for this study include reports by the U.S. Geological Survey, the U.S. Bureau of Mines, the Territorial Department of Mines, and Annual Reports of the Alaska Division of Geological and Geophysical Surveys and other state agencies. Other important sources of information include Alaskan newspapers and industry trade magazines. The results of 1,050 questionnaires sent to miners, exploration companies, and consultants constitute an important source for information on current activities. Company information concerning exploration results, development expenditures, and production and employment levels for specific projects are not reported unless these data have been previously released or with permission from property owners.

PRIVATE AND PUBLIC-AGENCY INVOLVEMENT IN THE ALASKAN MINERAL INDUSTRY

Many private, corporate, and government entities are interested in mineral resource exploration, development, and extraction. The functions of such agencies vary from promotion of the industry to regulation and control through various administrative codes. Appendixes B-D summarize the numerous agencies and their respective functions. The following narrative highlights the functional aspects of involved agencies.

Private-And Public-Sector Advocacy Groups

Generally, private sector organizations such as the Alaska Miners Association (AMA), Placer Miners of Alaska, Inc., Northwest Miners Association, and various industry trade magazines support the industry with information and advocacy programs. The most effective advocacy group in the state is the AMA, with over 1,500 members statewide. This organization circulates a monthly publication—the *Alaska Miner*—that reports on conferences, recent changes in mining regulations, and news topics that affect the industry. A variety of industry advertisements and a professional directory are also included in the publi-

cation. The annual AMA convention is always well attended by both industry representatives and the small miner. Other state, national, or international trade magazines (including *Western Miner*, *Mining Congress Journal*, *Engineering Mining Journal (EMJ)*, *World Mining*, *Alaska Industry*, and *Alaska Construction and Oil*) publish informed summaries of Alaskan mineral activities and are important sources of information about specific development or production projects.

Alaska Prospectors Supply (Fairbanks and Anchorage) offers a nearly complete assortment of supplies and equipment for all phases of mineral activity and has also republished several classic papers on Alaska's mineral resources.

In January 1981, the Department of Commerce and Economic Development created an Office of Mineral Development (OMD) to serve as an advocacy voice for mining in the 49th state. OMD informs local and state officials and industry representatives of the importance of mineral development in the state's economy, and is the first such advocacy group in state government with a mandate to actively promote mineral development.

HISTORICAL SKETCH OF MINING IN ALASKA

Mining and the Alaskan economy have been interrelated since the United States purchase of the territory in 1867. Total value of minerals produced since 1880, excluding oil and gas, amounts to almost \$20 billion in 1980 dollars (table 1).

The success of the Alaskan mining industry, like agriculture, commercial fishing, logging, or other resource operations, hinges on complex economic factors that include commodity prices, inflation, availability of manpower, energy, materials, technology, government policy, accessibility, and a changing economic infrastructure.

Centuries before Russian settlement, Tlingit and Athabascan Indians, Aleuts, and Eskimos utilized Alaskan marble, copper, jade, and materials such as obsidian for carved utensils, art ornaments, religious objects, and weapons of war. Copper ornaments from Alaska were objects of trade throughout the Pacific Northwest and as far south as California.

The arrival of European explorers did not initially stimulate mineral-resource development in Alaska. In 1838, Russian-American traders discovered the mercury sulfide, cinnabar, 21 miles east of Aniak in southwestern Alaska. Because they were primarily exploiting fur bearers in the territory, the traders opted not to develop this discovery. The first recorded mining venture was in 1848 on the Russian River, Kenai Peninsula (Berry, 1973). Peter Doroshin, a mining engineer, spent 2 years developing the prospect, but only recovered a few ounces of gold.

From 1854 to 1857, the Russians mined coal from thin seams near Port Graham and utilized this energy resource to fuel ocean steamers. A similar interest in coal was generated on Admiralty Island, but no deposits were mined. By the 1860s, Russian Americans finally began to view Alaska as a potential source of minerals. Unfortunately for the Russian Empire, Baron Edward Stoeckl, the Russian minister to the United States, completed the Treaty of Cession of Russian America on March 30, 1867 (Naske, 1973). Hence, the rugged and distant territory became the property of the United States for \$7.2 million.

Shortly after the purchase, Canadian and American prospectors from the Cassiar District in British Columbia floated down the Stikine River and prospected in Southeastern Alaska. The first recorded mineral location was a copper discovery on Prince of Wales Island west of Ketchikan in 1867. Placer deposits at Windham and Holkam Bays yielded over 2,000 ounces of gold from 1869 to 1871. Alaskan hard-rock mining commenced at the Stewart Mine near Sitka in the mid-1870s. In 1880, Joe Juneau and Richard Harris discovered placer gold near the present city of Juneau. These modest deposits were pathfinders to huge, low-grade gold lodes, and by 1882,

several mines were in production. Eventually, large mining complexes (including the Treadwell, Perseverance, and Alaska-Juneau Consortia, with 1,000-3,500 employees, maintained "the heartbeat of Juneau" (Stone and Stone, 1980) until the end of World War II.

Prospectors initially explored interior Alaska regions such as Fortymile (1886) and Circle (1893), but important coastal discoveries at Unga Island (1889) and Sunrise on the Kenai Peninsula (1893-94) also resulted in small gold rushes and gold production. The 1896 Klondike strike in the Yukon Territory captured the imagination of thousands of treasure seekers worldwide and triggered more than 34 placer-mining stampedes in Alaska, including the Nome (1898), Fairbanks (1902) Iditarod (1909), and Livengood (1914) rushes.

The gold boom was accompanied by other developments in the territory. Copper mining began in Southeastern Alaska around 1900, and by 1905, 10 mines employing almost 400 people were in operation west of Ketchikan. Copper from lodes in Prince William Sound was shipped as concentrates to west-coast smelters at about the same time. Production of the rich Kennicott deposits in Chitina Valley began after completion of the 186-mile-long Copper River and Northwestern Railroad in 1911. In 1902, tin was first mined on the Seward Peninsula; at the same time, shipments of marble, gypsum, and garnet left Southeastern Alaska mines for west coast markets.

Production of gold peaked in 1906 at 1,034,000 ounces and was maintained at high levels until World War I. Copper production peaked in 1916, when 59,927 tons of copper metal were produced from 30 mines in the Chitina Valley, Prince William Sound, and Ketchikan District. During the critical copper shortages of World War I, Alaska's copper contribution amounted to more than 10 percent of United States production. World War I demand for strategic minerals such as tungsten, antimony, tin, and chromium stimulated small-scale mining ventures. During this period, an all-time high of 8,300 workers were employed in Alaskan mines.

Production of many commodities, including gold and copper, declined after World War I. Rich, shallow placer gold deposits that built towns like Fairbanks and Nome were finally depleted of easily won deposits, and materials and manpower shortages caused by the war began to have their effect. The great 1917 Treadwell cave-in that eliminated three of five large mining ventures in the Juneau gold belt seriously affected the Juneau economy. By 1920, copper production was only half that of the peak war years, primarily because of declining market conditions. Nevertheless, positive developments conducive to

mineral development were on the horizon. Completion of the Alaska Railroad resulted in the first significant Alaskan coal exploitation in the Matanuska and Healy coal fields. The latter produced coal generated electricity for the large power plant that energized Fairbanks Exploration Company (F. E.) bucket-line gold dredges in the Fairbanks district. Larger companies throughout the territory acquired large tracts of ground and installed dredges in similar fashion. Successful development of the Alaska-Juneau Gold Mine stimulated gold production in the Panhandle.

Erratic high prices of strategic metals in the late 1920s stimulated mercury and antimony production. Platinum was discovered at Goodnews Bay in 1926. Eventually, a bucket-line dredge that operated continuously for 40 years was installed. Much of Alaska's silver production has been derived as a byproduct of copper and gold refining; however, high silver prices following World War I stimulated development of primary lodes in the Hyder, Kantishna, Kaiyuh Hills, and various interior Alaska mineral belts.

The effect of the worldwide depression of the 1930s on the Alaskan mineral industry was mixed. Many metals prices (including copper) declined so dramatically that even the rich Kennicott lodes in the Chitina Valley were out of production for much of 1932 and 1933. Most copper mines in Prince William Sound closed permanently. Tin, antimony, mercury, and industrial-minerals extraction also suffered. However, Franklin Roosevelt nearly doubled the price of gold in 1934 (to \$35/ounce), which resulted in an enormous increase in gold-mining activities. By 1940, numerous gold lodes and over 50 dredges recovered over \$25 million in gold; 7,500 people were employed by the mining industry throughout the territory.

World War II greatly affected the Alaskan mineral industry. Increasing costs, high defense priorities, and military needs for manpower caused gold production to slip dramatically. Executive order L-208 closed all gold mines in the United States, because gold extraction was considered nonessential to the war effort. Mines like the Alaska-Juneau were reopened on a permit basis because of their importance to local economies. Wartime needs led to modest production of antimony, mercury, tungsten, chromium, and asbestos. Platinum at Goodnews Bay was produced throughout the war. The military buildup stimulated the need for coal, sand, and gravel, and these industries expanded enormously.

After World War II, high operating costs and a changing Alaskan economy negatively affected the industry as a whole. By 1950, severe increases in the cost of metallic-lode production resulted in the clo-

sure of most operations. However, low-priced, military-surplus heavy equipment was readily adaptable to the small-scale placer mine, and resumption of dredging activities by larger companies resulted in a partial recovery of the placer industry by 1950. Strategic-mineral production declined after 1945, but increased with the onset of the Korean War. Coal production continued at high levels because of a large Alaskan military presence. Sand and gravel extraction reached new highs and by 1950, outstripped all other minerals in value. In 1951, 2,500 people were involved in the mineral industry.

Federal strategic-mineral stockpiling programs ceased in the late 1950s and with them, most Alaskan strategic minerals production. However, commodities such as platinum, mercury, and tin were mined because of their high unit value on the free market in 1955. In 1957, mercury production from southwest Alaska amounted to almost 20 percent of the United States requirements, and this high level of production continued until 1963. The need for uranium in nuclear weapons and for peaceful energy applications led to the discovery and development of the Bokan Mountain uranium-thorium mine near Ketchikan. This mine was operated intermittently from 1955 to 1971. From 1959-68, Fairbanks Exploration (FE) recovered gold with a dredge near Chicken. Likewise in 1957, FE commenced large-scale dredging activities near Hog River in western Alaska.

The fixed price of gold led to the eventual demise of the gold-mining industry, and a slow but steady fall off in activity was evident in the 1950s and 1960s. By 1964, most large-scale dredging activities of the FE and other companies had ceased. More resilient small mining companies continued operations, but at reduced scales.

Discovery of oil and gas on the Kenai Peninsula spurred sand and gravel production in the late 1950s and early 1960s; similar discoveries of petroleum at Prudhoe Bay and subsequent construction of the trans-Alaska Pipeline System had an even larger effect. In 1974, Alaska was second only to populous California in sand and gravel production. As Alaska's urban areas expanded, increasing amounts of sand, gravel, and building stone were quarried.

Needs for local sources of petroleum drilling muds resulted in the development of a barite mine near Petersburg. The Vietnam War caused prices of antimony, mercury, and tungsten to climb, and significant quantities of all three commodities were produced in Alaska during this period. However, changing industrial applications and environmental issues concerning mercury caused serious declines in their development in Alaska throughout most of the 1970s.

Gold production continued to decline and drop-

ped to 15,000 ounces in 1971—the lowest since 1880. Employees in Alaska's mines numbered less than 300. However, the gold price was decontrolled in 1972, and there has been a steady increase in production since that time. Several large floating bucket-line dredges have been reactivated, and many new operations have surfaced throughout the state. Production in 1981 is estimated at 134,200 ounces at a value of \$55.2 million.

Throughout the 1970s and early 1980s, the sand and gravel industry dominated mineral production. The platinum dredge at Goodnews Bay ceased operations in 1976, after 41 years of continuous operation, but resumed in 1981 under new ownership. Antimony and mercury were last produced in 1979 and 1974 respectively. Small amounts of silver, jade, copper, tungsten, and tin continue to be shipped from Alaskan mines.

FUTURE PERSPECTIVE OF MINING IN ALASKA

The Alaskan mineral industry has evolved from: 1) an early precious-metal oriented boom, to 2) a resource-extraction industry that provided outside markets with raw materials, to 3) a support role for urban growth and the oil and gas industry. Since World War II, the Alaskan mineral industry has generally been viewed as a decreasing contributor to the private sector. However, this decline in importance is intimately related to the state's substantial population increases and to the growing economic sophistication of other industries statewide.

As Alaskan urban growth continues, there will be a steady escalation in the demand for industrial minerals. A growing agricultural industry may require local mineral fertilizers; large-scale hydroelectric and other energy developments will need aggregate and concrete, perhaps providing the incentive for in-state cement production. The production of gold has again assumed an important role among Alaska's resource-extraction industries.

Mineral exploration in Alaska was dormant for many years after World War II, but began to pick up with substantial commitments by companies such as Bear Creek Mining, Mitsubishi, and others in the late 1950s and early 1960s. Discovery of large, high-grade, base-metal lodes in the eastern Brooks Range in the

late 1960s drew attention to the state's mineral wealth. Major mineral deposits were discovered annually, and by 1979 exploration expenditures exceeded \$75 million. During the last several years, Alaska's mining industry has been largely concerned with problems resulting from the confused land situation, access to mineral areas, and uncertainty of government policies related to mining. While problems still exist, the settlement of the D-2 issue and the recognition of the value of a strong United States mineral industry by the government have created more confidence in the future of mining in Alaska. Recently discovered world-class mineral deposits may become important sources for minerals in the United States and industrialized nations. Strategic minerals such as nickel, cobalt, chromium, and platinum can be produced in the 49th state. However, the current economic recession has depressed mineral commodity prices, and Alaskan exploration over the short term, may experience a reduced level of activity and expenditures.

EXPLORATION ACTIVITY IN 1981

INTRODUCTION

Levels of Alaskan mineral exploration are estimated from canvass-survey results and consultations with mining companies. The following summary is arranged by mineral commodity groupings for the seven regions of the state referenced in figure 1. Table 3 summarizes most data used in this analysis; individual figures generally remain confidential. Locations of major active claim blocks are shown on Plate 2 and referenced to Appendix F.

Mineral-exploration activities in 1981 remain at the high levels established in 1978, 1979, and 1980. A canvass survey of major operators indicates that at least \$76 million was spent in 1981. About the same amount was spent in 1979; expenditures were higher than the \$65 million spent in 1980 (table 2). Thirty-one companies spent over \$500,000; four spent over \$5 million, including two that spent over \$10 million each. Of the approximately 2,200 personnel seasonally employed in mineral exploration, a portion were involved in exploration in conjunction with placer gold production. The largest level of activity was recorded in the Eastern Interior (\$21,662,868; 552 employees), followed by the Southeastern (\$20,942,204; 227 employees), Southcentral (\$18,447,500; 421 employees), Southwestern (\$8,700,364; 159 employees), Northern (\$4,498,000; 228 employees), Alaska Peninsula (\$5,830,000; 40 employees), and Western (\$2,026,000; 78 employees) regions (fig. 1).

In previous years, the Southeastern and Northern regions of Alaska dominated mining activities, but Southcentral and Eastern Interior were dominant in 1981 because of increased precious-metal activity; important discoveries; and proximity to transportation, labor, and supply sources for the exploration

industry. The Southeastern region continued to be the focus of heavy industry commitment despite complex federal, state, and local restrictions and policies. The area's proximity to tidewater and other favorable economic conditions are conducive to development. The Northern region of Alaska suffers because of its remoteness and lack of economical transportation, but important deposits continue to be evaluated. The Alaska Peninsula, long the subject of energy-resource evaluations, achieved new highs in exploration mainly because of the discovery of important precious-metal deposits. High per-capita costs reflect the high costs of operation in this remote region.

Alaskan mineral exploration promises rewards to those diligent and fortunate companies that have discovered important deposits. However, for a variety of reasons, 11 companies broke their picks and left "the last frontier" in 1981.

In 1981, 27,400 new claims were staked; about 100,000 remain active statewide. The notable annual increase in number of claims staked and money spent in the last 10 years is shown in figures 2 and 3. Figure 3 delineates statewide exploration expenditures. Although this increase is often attributed to a profound increase in exploration in the 49th state, it also reflects a change in style of property evaluations. In past years, relatively small claim blocks covered important mineral deposits, but today several hundred to several thousand claims may cover a raw prospect until the initial phases of exploration are completed.

TABLE 2
EXPLORATION EXPENDITURES IN ALASKA
BY COMMODITY GROUPING,* 1979-81.

	1979	1980	1981
Base metals	\$10,277,966	\$ 6,775,000	\$28,262,204
Precious metals	4,612,400	5,086,500	35,273,204
Industrial and structural materials	150,000	1,250,000	10,300,000
Coal and peat	200,000	125,000	2,341,000
Miscellaneous**	250,000	— — —	127,000
Unspecified	61,000,000	52,000,000	— — —
TOTAL	\$76,490,366	\$65,236,500	\$76,303,404

* 1979-80 estimates from reconnaissance canvas surveys.

** Uranium, gemstone, etc.

— — — None reported.

**TABLE 3
EXPLORATION EXPENDITURES REPORTED FOR 1981,
BY REGION AND COMMODITY**

Commodity	Region						
	Northern	Western	Eastern Interior	South-western	South-central	South-eastern	Alaska Peninsula
Precious metals							
Placer	80,000	276,000	5,834,868	5,040,364	12,702,500	100,000	-- --
Lode	-- --	-- --	2,100,000	1,400,000	2,500,000	5,340,000	4,330,000
Base metals	4,050,000	1,750,000	5,300,000	2,260,000	1,500,000	13,402,204	1,500,000
Industrial and structural	-- --	-- --	8,200,000	-- --	-- --	2,100,000	-- --
Miscellaneous	-- --	-- --	-- --	-- --	-- --	-- --	-- --
Coal and peat	368,000	-- --	228,000	-- --	1,745,000	-- --	-- --
TOTAL	4,498,000	2,026,000	21,662,868	8,700,364	18,447,500	20,942,204	5,830,000
Employment levels (seasonal)	228	78	552	159	421	227	40

-- -- Not reported

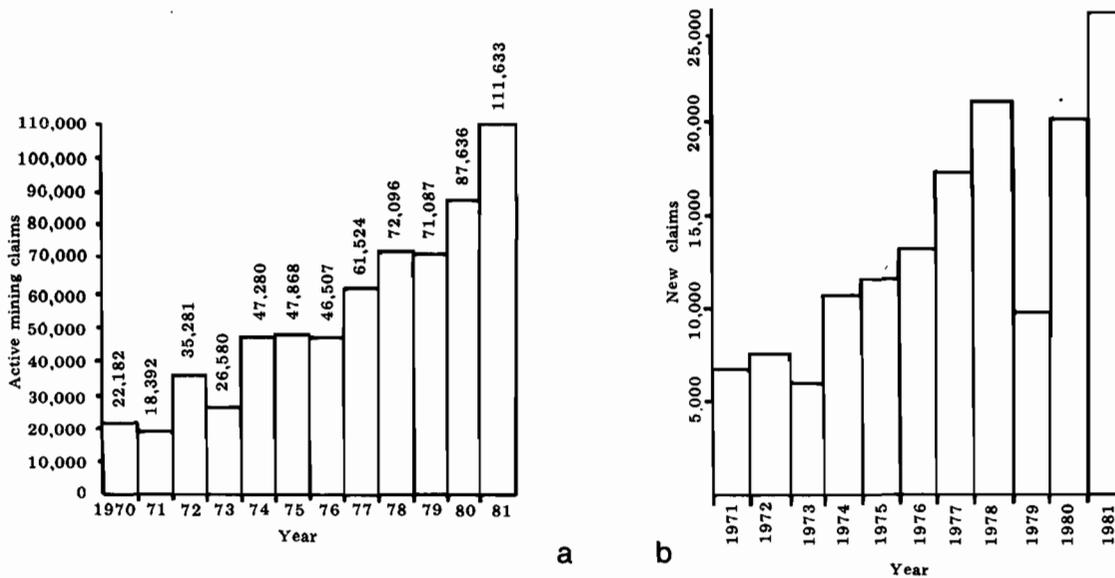


Figure 2. Claim-staking activity 1970-81; a) assessment work filed, b) new claims filed.

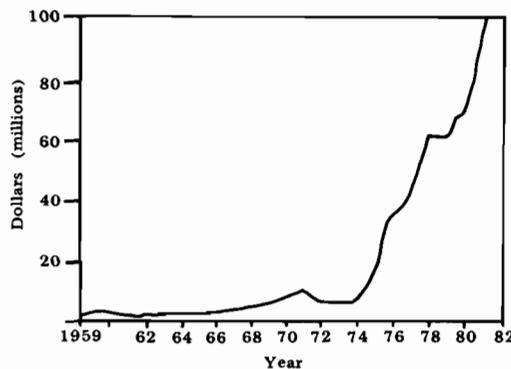


Figure 3. Mineral-exploration expenditures in Alaska, 1959-81.

SUMMARY OF MAJOR ACTIVE CLAIM BLOCKS

Data for Appendix F, which summarizes several hundred claim holdings in Alaska by region, and the map of major active claim blocks and development projects in Alaska (Pl. 2) were obtained from the State of Alaska Kardex file system. Data must have been entered in the kardex file system before December 31, 1981. Additionally, claim holders have 90 days after staking to file claim notices with the District Recording Offices. The DGGs Mining Information Office receives copies of the claim notices monthly from the statewide District Recording Offices; thus there is a possible four-month information lag. Therefore, claims staked after September 1981 may not be reflected in this table.

The Kardex file system provides a relatively accurate account of the number of active claims in each quadrangle. The word "active" however, must be qualified. For claims on state land, \$200 of annual labor (assessment or improvement work) per claim is required by the State. Federal regulations require \$100 per claim of annual labor for claims on federal land. Claim owners must submit an affidavit of annual labor for their claims by September 1 of each year. To determine the extent of mining activity on each claim or claim block, these affidavits must be researched and read individually. Appendix H shows the number of claims (40,755) in Alaska held by 31 major international corporations statewide.

COPPER, LEAD, ZINC

Despite poor market conditions, companies are actively engaged in exploration for and evaluation of massive- or disseminated-sulfide deposits containing significant copper, lead, and zinc; deposits that are enriched in gold and silver are especially interesting. In the following discussions, "base metal" refers to copper, lead, and zinc, unless otherwise specified.

Northern Region

General Crude Oil Minerals (GCO), WGM, Inc., Houston International Minerals Company, Anaconda Minerals Company, NANA Regional Corporation, Bear Creek Mining Company, and Sunshine Mining spent an estimated \$4,980,000 exploring for metal deposits in the Chandalar, Ambler, and Noatak Districts of the central and western Brooks Range (fig. 1).

The Lik Deposit (loc. 1, pl. 1) in the Noatak District was discovered in 1976, and by 1978, a private-sector consortium headed by GCO, Houston International Minerals Company, and NANA Regional Corporation announced preliminary reserve estimates of 18 million tons of ore grading 10 percent combined lead and zinc and 1-2.4 ounce/ton silver. The deposit is middle to late Paleozoic in age, and amenable to open-pit extraction.

In 1970, I.L. Tailleux of the U.S. Geological Survey release an open-file report describing analytical results and significance of a prominent sulfide gossan exposed in the Noatak River drainage of western Alaska. By 1975, this deposit was known as the "Red Dog" (loc. 2, pl. 1). Surface exposures were impressive, but the geology was obviously complex,

and many professionals were leery about making a reserve estimate without drilling. The Red Dog lode became embroiled in the D-2 lands debate because it was included in the Noatak National Preserve by authority of the 1906 Antiquities Act. Eventually, resolution of the Alaska Lands Act resulted in exclusion of the deposit from Noatak National Preserve. NANA Regional Corporation and their principal operator, Cominco American, have recently announced in-place reserves of 85 million tons of 17.1 percent zinc, 5.0 percent lead, and 2 ounce/ton silver (based on 13,600 feet of diamond drilling). The waste-to-ore ratio for most of the deposit is low, and it is amenable to open-pit extraction. The Red Dog deposit is roughly 60 percent larger and 50 percent higher in grade than the Faro deposit of Cyprus Anvil in the Yukon Territory. Gross in-place reserves amount to \$11-15 billion, depending on a fluctuating metals market. Cominco's experience at bringing into production the Polaris and other base-metal deposits in remote northern Canada is a big plus for this project.

Polymetamorphic schists of middle Paleozoic age along the southern Brooks Range host several world-class copper-zinc-silver ore deposits. This district was discovered in the mid-1960s by Bear Creek Mining Company during diamond drilling and underground exploration at their Bornite or Ruby Creek deposit in the Cosmos Hills to the south. In 1957, Bear Creek Mining purchased the Bornite lode from a small company. Reserves at Bornite (loc. 15, pl. 1), after 25 years of exploration, amount to approximately 40 million tons of "several percent copper and zinc" and a source of cobalt. A published 1962 estimate of 100 million tons of 1 percent copper is generally not

considered in ore reserve calculations. About 1 million tons of very high grade copper ore (4-12 percent copper) is exposed in underground development workings. Strong artesian-water flow, lack of transportation, and other economic factors have delayed development of this deposit.

"Schist belt" deposits include those at Arctic, Smucker, Horse Creek, BT, Ruby Ridge, Dead Creek, Sun, and Sinbad (locs. 16, 14, 21, 18; pl. 1). Bear Creek Mining Company's Arctic deposit north of Bornite is apparently the largest, with 35-40 million tons grading 4 percent copper, 5.5 percent zinc, and 1.5 ounce/ton silver. As of 1977, the Sun deposit west of Walker Lake contained in-place reserves of copper, lead, zinc, and precious metals valued at more than \$1 billion; however, specific grade and volume estimates have not been released by the owners, Anaconda Minerals Company. One company reports a reserve of 6.5 million tons of favorable mineralization at their property near Shungnak River. The Dead Creek deposit contains an estimated 1 million tons of high-grade copper, lead, zinc, and silver ores. Value of in-place reserves of all deposits has ranged from \$6-12 billion, depending on a fluctuating metals market. Weak metal prices and lack of surface transportation continue to hinder development of the district. Suggested transportation modes include road, railroad, slurry pipeline, and aircraft. Rail appears to be the most attractive (Rhoads and Berger, 1981).

In 1981, Kennicott Minerals received federal patent to 16 lode claims that include the Arctic and Bornite deposits. These patents were among the first issued in Alaska since resolution of the Alaska Lands Act.

Western Region

Further west, on the Seward Peninsula, Greatland Exploration explored for lead, zinc, and silver in the Darby Mountains near the old Omalik Silver Mine (loc. 50, pl. 1). Exploration continued in the Hanum Creek, Kougarok River, Sinuk Mountain, and Mt. Distin areas of the Seward Peninsula (locs. 39, 42, 43, 44; pl. 1), but results remain confidential.

Eastern Interior Region

Union Carbide, Phillips Minerals, Resource Associates of Alaska, Anaconda Minerals, Patino, WGM, Inc., and Northern Lights Exploration spent an estimated \$5.4 million exploring for base metals in Eastern Interior Alaska (fig. 1), primarily along the north flank of the Alaska Range and in the Yukon-Tanana Upland. Numerous massive-sulfide deposits occur in a belt of deformed tuff, metavolcanic, and exhalative units of probable Devonian age in the eastern Alaska Range between the Tok and Robertson Rivers (Delta District) (locs. 93, pl. 1). Geologists with Resource Associates of Alaska made the original discoveries in 1976 and 1977, and an exploration agreement was arranged with Anaconda Minerals in 1980. At least 35 prospects have been examined over the last few years, and over \$10 million have been expended in exploration. These fine-grained, pyritiferous, base-metal deposits have impressive strike lengths, contain high precious-metal values, and crop out in rugged terrane. Although Delta is a very promising district, no formal announcements have been made. One consultant suggested that several prospects could commence development by 1986.



Bear Creek mining
Arctic Deposit, at the discovery outcrop



Aerial view of Bornite, Ambler district
Showing head frame and camp facilities

Further to the west, work continues on stratiform, polymetallic deposits in the Bonnifield Mining District east of Healy. In 1975 and 1976, Getty Oil and Resource Associates of Alaska discovered deposits near Anderson Mountain, Virginia Creek, Dry Creek, and Sheep Creek (locs. 89, 92; pl. 1). Reconnaissance diamond drilling was completed on several of the properties by 1977. Exploration, at a cost of several hundred thousand dollars, was completed in 1981.

Southwest Region

AMAX Exploration, Phillips Minerals, Anaconda Minerals, Duval, and WGM, Inc., spent an undisclosed amount exploring for base metals throughout Southwestern Alaska. Exploration in this region of the state is in its infancy, and several types of ore targets are under consideration. Regional grass-roots exploration, including stream-sediment geochemistry and geophysics, are the principal exploration methods. Major areas of interest include the Farewell silver base metal province, the Kaiyuh Hills (a past producer of silver), and the carbonate terrane north of Medfra. A copper-precious metal discovery was reported in the Kaiyuh Hills. Exploration results remain at a proprietary stage for all projects.

Southcentral Region

Greatland Exploration, Bear Creek Mining, WGM, Inc., Geneva Pacific, and several other companies spent an estimated \$700,000 exploring and evaluating copper-rich, disseminated to massive sulfide deposits in the Wrangell Mountains and the Denali Highway-Talkeetna Mountains area.

The Denali deposit (loc. 90, pl. 1), in the central Clearwater Mountains, was first reported in 1964 by DGGS mining engineer M. A. Kaufman, who noted several copper occurrences near the head of Windy Creek. Subsequently, a private consultant and Cities Service Minerals began trenching, drilling, and underground development work. By 1971, after expenditures approaching \$2 million, a small but high-grade stratiform-copper reserve was delineated in six deposits. Official reserve estimates have not been announced, but ore reserves are said to be worth several hundred million dollars at prevailing copper prices. In 1980, more Denali-type lodes were discovered along strike.

The Kennicott copper-silver deposits (loc. 149a, pl. 1) in the Chitina Valley are world famous for their exceptionally rich chalcocite ores averaging 13 percent copper. The deposit was mined prior to World War II. Some sources suggest that approximately 7 years of reserves (at 500 TPD capacity) remain in the mine workings. The mine closed in 1938, pri-

marily because of an unresolved labor dispute, low copper prices, and declining ore quality.

The Binocular deposit (loc. 149, pl. 1), developed by Geneva Pacific in the last decade, is apparently a bona fide "Kennicott-type" copper-silver lode. Copper grades of 7-10 percent copper, with silver credits, are localized in both massive-sulfide pods along greenstone-limestone contact zones and wholly in the Chitistone Limestone Formation. No development plans have been announced.

Major mining concerns continue work on copper deposits with precious metal credits in Prince William Sound. Deposits of major interest include the old Beatson Mine and Rua Cove lode on Knight Island (locs. 142, 143, pl. 1).

Despite poor copper prices, Bear Creek Mining Company continued work on their large reserves of low-grade copper with byproduct molybdenum at Bond Creek (loc. 152, pl. 1), in the northern Wrangell Mountains. Published reserves indicate over 850 million tons of 0.35 percent copper and 0.03 percent molybdenum for the Bond Creek and nearby Orange Hill (loc. 153, pl. 1) stockwork systems. However, both lodes are included in Wrangell National Park Preserve, and despite assurances of prior existing rights, one major owner has ceased exploration work at Orange Hill and the property remains dormant.

Southeast Region

Base metal exploration in the Panhandle slowed somewhat from the previous 1978-80 high levels. Major operators in the region include Cominco American, Noranda Exploration, Exxon Minerals, St. Joe American Corporation, and Houston International Minerals Company. An estimate \$730,000 was expended. Companies continued to examine stratiform massive-sulfide deposits on Admiralty, Kupreanof, and Prince of Wales Islands. Deposits of several ages are known. Work continued on rich copper-lead-zinc precious metal enriched, volcanogenic massive sulfide deposits hosted in the Precambrian Wales Group on southern Prince of Wales Island. The Polymetal Lode on Cholmondeley Sound, the Copper City Mine on Hetta Inlet, and lodes at Niblack Anchorage (locs. 193, 197-99; pl. 1) have sustained continued exploration and examination for almost a decade.

Assessment work was performed on copper precious metal enriched skarn deposits near Copper Mountain and on Kasaan Peninsula (loc. 192, pl. 1). Prior to 1930, 12 of these deposits recovered more than 40 million pounds of copper and several hundred thousand ounces of bullion.

Exploration of a belt of Triassic-age exhalative and volcanogenic sediments on Kupreanof and

Admiralty Islands is in progress. Over 30 massive sulfide prospects containing copper, lead, and zinc have been examined since the mid-1970s, but no formal announcements have been made. Eichner and Hawkins Company continued exploration and prospecting in the Groundhog Basin east of Wrangell (loc. 194, pl. 1). Prior to the Korean War, the federal government drilled an inferred reserve of at least 450,000 tons of about 5 percent combined lead and zinc and 1 ounce/ton silver in three Groundhog Basin ore beds parallel to foliation of the host metamorphic lithology. An additional 1 million tons of lower grade ore with about 2.5 percent lead and zinc and 1 percent fluorite is contained in the nearby Glacier Basin lodes.

The most important base-metal exploratory effort in Southeastern Alaska is the Noranda Company program at Greens Creek on northern Admiralty Island (loc. 172, pl. 1). Major deposits discovered to date are Devonian(?) -age, stratiform massive sulfides apparently proximal to submarine exhalative vents. Several complex types of ores have been recognized. Drilled reserves in the Big Sore and other deposits

through 1981 amount to over 3 million tons of about 10 percent combined lead and zinc, 1 percent copper, 12 ounce/ton silver, and 0.12 ounce/ton gold, in what is clearly a composite base and precious metal deposit. Work in 1981 concentrated on logging core and cross-checking reserve estimates. This deposit will be further discussed in the section on development.

Alaska Peninsula

Previous efforts by Bear Creek Mining Company and native groups have located large, low-grade copper stockwork deposits on the Alaska Peninsula south of Katmai National Monument. The most important deposits discovered to date include those at Pyramid, Ivanof, Mike, and Rex (locs. 106, 107, 113, 114; pl. 1). Exploration activity in 1981 was not reported, but said to be at a low level.

TIN-TUNGSTEN (BYPRODUCTS FLUORITE, NIOBIUM, TANTALUM)

After years of dormancy, high prices during the past several years have resulted in extensive exploration efforts in the 49th state for tin, tungsten, and associated commodities. Principal areas of interest are the Seward Peninsula, Interior, Southcentral, and Southwestern regions of the state.

Northern Region

Scant activity was reported for tin and tungsten deposits in northern Alaska. An impressive tungsten-molybdenum stockwork system was discovered at Bear Mountain (loc. 33, pl. 1) in the east-central Brooks Range in the mid-1970s. This lode is now included in a southern extension of the William O. Douglas National Wildlife Refuge. In the Chandalar area (loc. 29, pl. 1), active claims containing bismuth and tin were trenched in 1981.

Western Region

Anaconda Minerals, Placid Oil, and Lost River Mining explored for tin and related commodities on the western Seward Peninsula. In past years, mines in the region have produced over 5 million pounds of tin



Lost River tin property, northwest of Nome

from lodes and placers. Greisen hosted tin-tungsten-fluorite lodes near Lost River (loc. 35, pl. 1) have been explored since the turn of the century. These deposits were the focus of strategic-mineral concerns during World War II and the Korean conflict. Between 1951 and 1956, 51,000 tons of ore grading about 1.1 percent tin were mined. In the 1950s and 1960s, USGS geologists and U.S. Bureau of Mines personnel proved up about 30,000 tons of tin in high- and low-grade ores, thus defining the largest domestic reserve of tin in the United States. By 1972, a total of 65,000 feet of diamond drilling roughly doubled this estimate. Almost 5 million tons of commercial-grade fluorite ore and byproduct tungsten and beryllium were also blocked out. A January 1981 *Mining Magazine* article listed the property among the world's most promising future mineral developments. Although seven of the ore deposits at Lost River are amenable to open-pit extraction, the relatively low-grade assays, complex mineralogy, and lack of economical transportation present a problem. Lost River Alaska Corporation controls the property and is seeking Japanese participation. Pilot-plant testing of ores is said to be underway, supported by a loan from Quebec Mattagama.

A significant tin discovery by Anaconda Minerals on Kougarok Mountain, 40 miles east of Lost River (loc. 37, pl. 1), occurs as a greisen-hosted contact deposit similar to those at Lost River, Ear Mountain, and other known tin-bearing systems. Results of exploration remain confidential.

Lost River Mining proved up additional placer-tin reserves at their tin mine near Cape Nome.

Eastern Interior Region

Resource Associates of Alaska, Union Carbide, Bear Creek Mining Company, Patino, Inc., and Houston International Minerals Company (HIMCO) explored deposits containing tungsten, tin, and byproducts in the Eastern Interior region of the state. HIMCO continued work on scheelite-bearing skarn mineralization north of Salcha River (loc. 69, pl. 1), and drilling results indicate encouraging amounts of mineralization. Resource Associates of Alaska conducted ground and airborne geophysical investigations near Fairbanks in search of scheelite deposits.

Bear Creek Mining continued work on a massive sulfide deposit, with anomalous tin zones, near Sheep Creek, 13 miles east of the railhead at Healy (loc. 89, pl. 1). This occurrence of tin constitutes a new type of target that is poorly documented in Alaska.

Patino, Inc., explored lode and placer tin and tungsten on Doyon Native Regional Corporation lands in the Yukon-Tanana Upland and the Kanuti-Sithylenkat Lake area north of the Yukon River.

Southeastern Region

Duval, WGM, Inc., Union Carbide, Phillips Minerals, AMAX Exploration, and Anaconda Minerals explored for tin and tungsten in Southwestern Alaska, but most information concerning levels of activity remains confidential. The most significant exploration has been drilling, trenching, and sampling of the Golden Horn tungsten, gold lode near Flat, Alaska (loc. 73, pl. 1). Since 1978, various operators have explored a large shear zone over 1 mile long and up to 100 feet wide adjacent to a Cretaceous monzonite pluton hornfels contact zone. In the 1930s, several hundred tons of hand-sorted Golden Horn ore yielded approximately 2,600 ounces of gold and byproduct silver. In addition to gold and tungsten, this deposit contains anomalous chromium, zirconium, hafnium, antimony, and mercury. Over 10,000 feet of diamond drilling was completed on the deposit in 1981.

Placer tin, tungsten, and potential byproducts, niobium and tantalum, are documented from the Ruby District (loc. 63, pl. 1), and exploration incidental to gold mining was performed on Long Creek.

A potentially viable scheelite placer was discovered 50 miles south of Sleetmute in the late 1950s by the late Russell Schaefer. Several million yards of reserves are contained in "47" Creek, and a small company continues assessment work incidental to placer-gold mining.

Southcentral Region

Past exploration for tin and tungsten in Southcentral Alaska has focused on granitic terrane of the southern Alaska Range in the Chulitna District and Lime Hills Quadrangle. One company reportedly made a significant tin discovery south of the Golden Zone Gold Mine. Mandatory assessment work was completed on the Purkypile tin-silver-uranium deposit (loc. 79, pl. 1) on the north flank of the Alaska Range; the inferred ore reserve estimate is about 1.5 million pounds of tin. Claims on known tin deposits near Chilligan River and Jimmy Lake (loc. 134, pl. 1) are presently inactive.

Southeastern Region and Alaska Peninsula

No large-scale exploration activities for tin and tungsten were reported from the Panhandle or Alaska Peninsula regions, despite the existence of a past-producing tungsten district north of Hyder (loc. 191, pl. 1). Assessment work was reported for the River-side precious metal-tungsten lode that produced several thousand units of tungsten during World War II.

MOLYBDENUM - COPPER-STOCKWORK EXPLORATION

Important exploration efforts specifically for molybdenum occurred in the southeastern and east-central sections of the Panhandle. U.S. Borax continued their substantial commitment of time, money, and personnel at their Quartz Hill deposit (loc. 195, pl. 1) east of Ketchikan, one of the world's largest molybdenum stockwork deposits. The deposit was discovered in 1972, and the exploration component of their 1981 budget was over \$2 million. Drilled reserves through 1981 amount to about 1.5 billion tons of 0.13 percent MoS_2 , with a 300 million ton higher grade zone averaging 0.2 percent MoS_2 . The deposit is amenable to open-pit extraction with low waste-to-ore ratios; it is discussed in more detail in the development chapter.

AMAX continued their drilling program on a large, low-grade molybdenum deposit in the Groundhog Basin east of Wrangell (loc. 189, pl. 1). Deep holes have been drilled to date, and underground extraction is envisioned if the project progresses to a development stage. No announcements have been made concerning economic viability.

Diamond drilling continued at assessment levels on the Taurus copper-molybdenum porphyry in the Fortymile country of eastern Interior Alaska (loc. 102, pl. 1). This deposit, unlike most Alaskan porphyry or stockwork systems, may have an oxidized or supergene zone of enrichment caused by long periods of secular erosion. No reserves have been reported, but they are believed to exceed 750 million tons of mineralization.

NICKEL-COBALT-CHROMIUM-PLATINUM METALS EXPLORATION

Nickel, cobalt, chromium, and the platinum group metals are combined because of strategic considerations, their common geologic association, and complimentary uses in many industrial applications. They also constitute the "big four" in terms of America's strategic minerals because of their importance to defense and consumer industries, their relative immunity to substitution, and the nation's lack of mineable reserves.

Southwestern Region

At Goodnews Bay (loc. 116, pl. 1), Hanson Properties and previous operators have drilled and proven approximately 60,000,000 cubic yards of gravel containing 500,000 ounces of platinum group metals. America's largest platinum group metals producer will be further discussed in the development chapter of this report.

Southcentral Region

Past productive chrome deposits near Seldovia (loc. 138, pl. 1) were drilled and assessed by Anaconda Minerals and Cook Inlet Region, Inc. Prior to 1958, approximately 30,000 tons of metallurgical



Diamond-drilling platform on Red Mountain Chrome Deposit, near Seldovia

grade chrome was extracted. Past production was largely subsidized by the Defense Minerals Exploration Administration. Ellis (1981) reported on Anacosta's work at the Alaska Miners Convention in Anchorage, and indicated that a huge resource of low-grade chrome occurs in specific stratigraphic intervals within the Red Mountain ultramafic complex. Exploitation seems possible if prices increase and other demands necessitate chrome production.

Southeastern Region

Because of the uncertain federal policy in Alaskan national conservation units, the Brady Glacier nickel-copper deposit in Glacier Bay National Park (loc. 162, pl. 1) was not assessed in 1981. It is discussed in the section on strategic minerals.

Inspiration Development Company continued drilling and bulk sampling nickel, copper, cobalt deposits in the Bohemia Basin on Yakobi Island (loc. 170, pl. 1). The deposits have been delineated since World War II, when federal geologists drilled reserves of over 20 million tons of ore for strategic considerations. These deposits are described in the development chapter. Inspiration also delineated significant reserves of nickel and copper at their

properties on Mirror Harbor (loc. 169, pl. 1); these were included in the Yakobi-Chichagof National Wilderness area in 1980.

Stevens Exploration consulted for Orbex Minerals at the Salt Chuck copper, platinum group metals mine (loc. 187, pl. 1) west of Ketchikan, one of the only mined platinum lodes in the United States. The deposit was operated intermittently as a copper mine from 1900 to 1918, when platinum metals were discovered in pyroxenite ores. From 1919 until 1941, the mine sporadically produced over 20,000 ounces of platinum group metals, several million pounds of copper, and gold and silver credits. Additional reserves remain.

GOLD AND SILVER

In 1981, exploration for precious metals in Alaska increased largely because of favorable market conditions for these commodities. Levels of activities were shared equally by large and small companies.

Northern Region

Twelve placer mining companies, including Tramway Bar Mines, Jan Drew Holding, Ltd., Tri-Con, Ltd., and Crevice Creek Mining spent an estimated \$400,000 on exploration in conjunction with development and production of placer gold from deposits in the Koyukuk-Nolan and Chandalar districts (locs. 24, 29; pl. 1). Little Squaw Mining continued exploration work and gold production from the Mikado vein deposit in the Chandalar District. Exploration was also conducted when the Alaska Gold Company reactivated their 7 cubic foot capacity gold dredge on Hog River in the Koyukuk Hughes District (loc. 60, pl. 1). The dredge was moved from Livengood in 1955 and worked at Hog River until 1975, when operations were last suspended.

Western Region

Alaska Gold Company and Greatland Exploration continued their evaluations of onshore beach placer deposits in the Nome District (loc. 45, pl. 1). Efforts are directed at blocking out reserves for large-scale dredging activities. ASARCO continued prospecting their offshore placer mining leases near Nome, but at a reduced level from 1980. Goldwinn Resources, Ltd., is testing 20,000 acres of offshore placer ground in Golovin Lagoon east of Nome.

Kougarok Mining, Gem Exploration, Kotzebue Sound Exploration, William Jones Company, and others reported exploration for placer gold in the Candle, Teller, and Kougarok mining areas of the Seward Peninsula.

Eastern Interior Region

Hard-rock gold exploration efforts in the eastern Interior region include those directed by Resource Associates of Alaska, St. Joe Minerals, Placid Oil, Houston International Minerals, and Getty Oil.

Since 1979, exploration efforts have focused on the Fairbanks District, which has produced 7.4 million ounces of placer gold, 240,000 of lode gold, about 4 million pounds of antimony, and several thousand units of tungsten concentrates (WO₃) since 1902 (loc. 67, pl. 1). The Fairbanks District has been the largest (in value) producer of metals in the 49th state and the seventh largest gold district in the United States, and interest in development of the area's numerous gold lodes has recently revived. Since 1979, St. Joe American has completed trenching, sampling, and 10,000 feet of diamond drilling on the Ryan Lode on Ester Dome. Past reserve estimates suggest that about 2 million tons of gold ore may exist on site, and St. Joe's efforts have confirmed the presence of a large reserve of undisclosed grade. Poor ground hampered underground bulk sampling efforts in 1981, and a 500 foot long decline was abandoned. The company plans further work on the Ryan deposit in 1982; both open-pit and underground options are being considered.

Tri-Con, Ltd. is exploring a large claim block on Ester Dome in conjunction with operation of the Grant Gold Mine. A 25-man crew was active in 1981. This company conceptually views the development of several auriferous veins and shears that would provide feed for a medium-sized mill (100-500 TPD).

Placid Oil drove a 1,500 foot long adit into the Kavalita vein system on Cleary Hill and began an underground sampling program.

L. M. Anthony continued work on the Gold Dollar and other silver lodes in the Kantishna District (loc. 81, pl. 1), an area which produced over 260,000 ounces of lode silver prior to 1973.

Twelve of an estimated 25 operators in the Fairbanks District spent \$400,000 improving their reserve base with drilling and geophysical investigations in 1981. Eight of 38 placer operators in the Circle District (loc. 70, pl. 1) spent over \$200,000 defining auriferous benches and modern stream gravels on Deadwood, Harrison, and Faith Creeks and tributaries. A flurry of activity occurred in the historic Fortymile District region (loc. 100, pl. 1), where 10 of 18 operators spent almost \$1 million defining reserves with drilling and other exploratory programs. Almost \$300,000 was expended for similar efforts in the Manley, Livengood, Rampart, and Tofty District (locs. 64, 65; pl. 1). Long a dormant region, the Bonfield District east of Healy was explored for placer gold by five companies.

Twelker, Fitch, and Associates and Sedcore, Ltd., conducted contract exploration activities using sonic drilling techniques regionwide. This technological advance in drilling appears to hold promise because, among other advantages, normally expensive placer drilling costs could be substantially reduced. A

number of the placer exploration efforts regionwide report success with proton magnetometer surveys in locating heavy mineral concentrations in placer paystreaks.

Southwest Region

Exploration for hard-rock and placer gold was conducted in the Innoko, Iditarod, Nyac, and Tolstoi Districts. Coronado Mining Corporation evaluated a large patented claim group covering bench gravels of the lower Innoko River below the gold rush town of Ophir (loc. 74, pl. 1). Northland Dredging conducted exploration in conjunction with dredging operations in the Nyak District (loc. 117, pl. 1). Phillips Minerals looked at the potential for large gold placers throughout the region. Small scale mine operators in all mineral districts continued exploration efforts as part of their ongoing development.

Alaska Silveinia Mines explored for gold and silver in the Kaiyuh Hills. Mespelt and Almasly Mining Company worked on the Nixon Fork contact-metasomatic gold deposits north of Medfra (loc. 75, pl. 1). Prior to World War II, almost 60,000 ounces of gold and unknown amounts of byproduct copper and silver concentrates were barged down the Kuskokwim River.

Southcentral Region

The Valdez Creek and Chulitna Cache Creek Districts were the most active in this region. In the Valdez Creek area (near loc. 91, pl. 1), Denali Mining Company and Aspen Exploration Company examined lode potential of the Timberline Creek area and placer potential of the nearby Denali bench gravels. Although large boulders hampered drilling programs, published reserve estimates of the district's bench gravels amount to more than 30 million cubic yards of auriferous gravels.

Ranchers Exploration conducted exploration in conjunction with their highly successful placer mine in the Chistochina District (loc. 95, pl. 1). Starkey Wilson, Enserch, and Coronado Mining Corporation continued exploration on the old Golden Zone and Independence lode mines in the Chulitna and Willow Creek mining areas. Past published reserves of the Golden Zone deposits (loc. 87, pl. 1) suggest a minimum of 150,000 ounces of recoverable gold. The Independence Mine (loc. 171, pl. 1) in the Willow Creek District will be discussed in the development chapter of this report. Dan Renshaw continued exploration efforts at the nearby Gold Cord Mine.

The Cache Creek District west of Talkeetna was again heavily explored for placer deposits. Six operators reported an estimated \$100,000 in expenditures

in conjunction with development activities. Finnbear Mining and Exploration conducted some work on a lode gold platinum prospect near Rainy Pass; encouraging results were reported.

The Hope and Sunrise areas of the Kenai Peninsula sustained exploration of placer gravels by at least 17 operators. Recently the U.S. Bureau of Mines announced that the results of bulk sampling of stream gravels in selected areas of Chugach National Forest showed encouraging amounts of gold. Of note are the activities on Cook Inlet by Aspen Exploration Company, which controls 550 acres of tideland claim on Cook Inlet. Their exploratory efforts indicate the presence of offshore placer gold and other heavy minerals near Point Woronzof in Cook Inlet. Aspen Exploration expects to retain several pounds of concentrate per ton of gravel and will use a large suction dredge mounted on a barge. The Old Nelchina District north of Eureka on the Glenn Highway was also explored extensively by several placer operators. The nearby Nelchina Glacier gold deposit was explored in 1981. Cusac Industries, Ltd., and Alaska Gold Mines, Inc., of Vancouver, B.C. (not to be confused with Alaska Gold of Fairbanks and Nome) are constructing a \$500,000 washing plant to mine auriferous strandlines near Yakataga.

Southeastern Region

Exploration for gold and silver in the Southeastern Panhandle was mainly confined to the Haines and Juneau areas. Conoco, Inc., Houston International Minerals, Occidental, Placid Oil, and other majors have been reevaluating lodes in the famous Juneau Gold Belt, where over 120 million tons of ore yielded 6 1/2 million ounces of gold prior to World War II (locs. 164, 165; pl. 1). Since 1980, 50 new claim blocks comprising several hundred claims have been staked by large companies and individuals on Douglas Island. Some claim holders in the Juneau area complain about zoning restrictions enacted by the borough government. Mapco looked at gold base metal lodes on Tracy Arm and in the Hollis area (loc. 125, pl. 1).

Hyak Mining continued geophysical and geochemical exploration of the Berners Bay Mines (gold producers prior to 1920) north of Juneau. A University of Alaska Mineral Industry Research Laboratory study on four deposits in the district (Metz and Pearson, 1977) suggests that more than 10 million tons of mineralization remain in the workings and extension of the lodes. Approximately 100,000 tons of good grade ore have been proven in the Jualin Mine.

Enserch worked in the old Hirst-Chichagof Mine north of Sitka (loc. 167, pl. 1) and in the Porcupine District (near loc. 158, pl. 1). Exploration by Delta Minerals and Marble Creek Mining in the Haines area consisted of proton magnetometer surveys, backhoe excavations, and drilling with a Nodwell mounted Capco drill. Encouraging results are reported from lode and placer investigations.

Aspen Exploration explored the K & D antimony-gold lode 70 miles south of Juneau and Mineral Basin Mining worked on gold-silver deposits near the old Riverside Mine near Hyder (loc. 191, pl. 1). Bud Charles of Ketchikan continued plans to develop the mines in the old Dolomi District west of Ketchikan, where over 15,000 ounces of gold were mined prior to World War I (near loc. 199, pl. 1). E. O. Bracken worked on gold deposits near Cobol on Chichagof Island.

Alaska Peninsula

Resource Associates of Alaska continued their substantial commitments in exploring for caldera hosted precious metal lodes in the Alaska Peninsula and Shumigan and Aleutian Island areas. Major claims are concentrated on Unga Island and north of Katmai National Monument. Apollo Alaska Gold Mine, Ltd., reopened the underground workings of the Apollo Gold Mine, a gold producer at the turn of the century.

INDUSTRIAL AND STRUCTURAL MATERIALS EXPLORATION

Exploration for barite, asbestos, and aggregate focused on demand by the oil and gas industry, urban growth, and on development of a major asbestos deposit in Interior Alaska.

Sand and gravel and quarry operators statewide continue to explore for reserves in conjunction with present production. The Anchorage and North Slope areas are chronically short of gravel and new sources are continuously examined.

Southeastern Region

Starkey Wilson worked on the Glacier Creek barite base metal deposits near Haines. Over 1 million tons of petroleum grade barite ore are reported in the deposit; past drilling was conducted by Anaconda Minerals.

Eastern Interior Region

The most significant Alaskan industrial mineral exploration is focused on the asbestos deposits owned

by Doyon, Ltd., in the Yukon-Tanana Upland. These deposits are at an advanced exploration stage and will be discussed in the development chapter of this report. In the Eastern Interior region, several companies are exploring for agricultural grade limestone suitable for use as a soil conditioner, under the pretext that the production of grain near Delta will eventually require a local source of mineral fertilizers. No figures of expenditures or results have been made available.

Southcentral Region

A Native corporation is continuing plans to develop the King River limestone deposits north of Palmer. These deposits may be a potential source for in-state cement production for proposed large-scale hydroelectric developments such as Susitna (in the southcentral part of the state) and other major construction projects.

COAL

The Alaskan coal resource is estimated to equal that of the lower 48. This resource is relatively unexplored because of accessibility. Most existing leases cover ground containing subbituminous coal; however, the resource base embraces all qualities—from lignite to anthracite. A large component of the resource remains essentially unexplored. Japan showed renewed interest in 1981 in Alaska coal and South Korea is investigating the possibility of importing coal.

Northern Region

Arctic Slope Technical Services, Inc., spent \$368,000 on drilling, geologic, and engineering investigations of the possibilities of mining coal reserves near Wainwright for use as an energy source for the village. A district wide power plant feasibility study is underway. Similar work is continuing on St. Lawrence Island.

Eastern Interior Region

Alaska's only producing coal mine, the Usibelli Mine near Healy, marketed over 800,000 tons of coal in 1981. Canadian Superior examined coal deposits

on the north flank of the Alaska Range. A Fairbanks firm continued an exploration program, including drilling and feasibility studies of the Jarvis Creek coal field. They plan to supply coal to the Delta Junction area for local power generations and for agricultural grain drying facilities. A lease from BLM for this project is pending.

Southcentral Region

Four South Korean firms formed a consortium with the Chugach Natives, Inc., and drilled 9,000 feet of core in the Bering River coal field, about 70 miles east of Cordova. While mining conditions in the field are less favorable than those of the Beluga area, the Bering River coals have high calorific values (12,000+/Btu) and are low in sulfur. Resource Associates of Alaska conducted a limited coal-exploration program with some drilling in the Chignik area on the Alaska Peninsula.

Diamond-Alaska Company of Delaware joined Hunt Energy Corporation to acquire the Bass-Hunt-Wilson coal leases in the Susitna Lowland. Diamond Alaska initiated a drilling program in November 1981 to determine the coal reserves. As of April 1982, they completed this phase and reported they had drilled

50,238 feet in 149 holes, 6,000 feet of which was cored. Bechtel was project manager. Diamond Alaska is moving ahead with mine planning and believes they could produce between 6 and 13 million tons per year, contingent on establishing a market. The Beluga Coal Company continued limited exploration drilling on its leases west of Anchorage. Placer-Amex (Beluga Coal Company) is optimistic about developing a market for Beluga coal, and is projecting an annual production of 10 million tons for export. Mobil Oil

has indicated plans to increase exploration on its leases in the Yentna basin. Several major coal producers from the lower 48 have expressed interest in acquiring a coal position in Alaska.

1981 MINERAL DEVELOPMENT AND PRODUCTION PROJECTS IN ALASKA

Of the 10 mineral properties described below that have reached a development stage, five are in a preliminary production mode. Table 4 summarizes development expenditures by commodity. Several hundred small scale placer operations in Alaska are in various stages of development or production, but will not be discussed.

Development activities are underway for a lode gold deposit in the northern region, a lode gold mine in the interior, and a placer operation near Liven-good. Three Alaska Gold Company dredges, two in the Nome fields and one at Hog River, are in stages of reactivation. Northland Dredging and R. A. Hanson company reactivated dredges in Southwestern Alaska during the 1980-81 seasons. A gold deposit north of Anchorage is being developed, as well as two major hard-rock deposits in Southeastern Alaska. Two important deposits that are at an advanced exploration stage are briefly described. Locations for all deposits are shown on plate 2 and referenced in Appendix F.

Notable mineral deposits such as the Lost River tin fluorite lodes and Bornite copper property (loc. 35, 15; pl. 2) were formerly considered at a development phase. However, complex economic factors have frustrated these projects for the time being.

LITTLE SQUAW MINING COMPANY, MIKADO VEIN, CHANDALAR DISTRICT, NORTHERN REGION (Loc. 10, pl. 2)

Hard-rock gold lodes currently under development in the Chandalar District were discovered by a Japanese prospector, Frank Yasuda, in 1909, several years after initial placer gold discovery. According to Chipp (1970), the Mikado, Star, Summit, and Little Squaw lodes are promising. These deposits are confined to hanging walls within N. 50°-60° W. trending, steeply dipping faults, and occur in a 2 1/2 mile by 1 mile zone between Tobin and Little Squaw Creeks. By 1913, a small stamp mill, shafts, and tunnels had been completed, but these early developments soon failed because of the high cost associated with the remoteness of the properties.

In 1960, Little Squaw Mining Company reopened underground workings on the Little Mikado vein and drove more than 600 feet of underground workings; activity was discontinued in 1963. In the late 1960s, Chandalar Gold Mining and Milling Company sub-leased the property from Little Squaw and for several years intermittently milled up to 100 tons/day at its mill on Tobin Creek. This development ended with the untimely death of Frank Birch, then president of the company.

In the late 1970s, Meadowlark Mining Company and Jan Drew, Ltd., operators for Little Squaw Mining, resumed development on the Mikado vein.

**TABLE 4
SUMMARY OF ALASKAN MINERAL-DEVELOPMENT
EXPENDITURES BY COMMODITY, 1979-82**

	1979	1980	1981
Base metals	\$3,600,000	\$ 5,000,000	\$ 5,945,000
Precious metals	3,140,000	5,750,000	11,400,000
Industrial and structural minerals	1,000,000	1,200,000	7,000,000
Coal and peat	- - -	- - -	345,000
TOTAL	\$7,740,000	\$10,950,000	\$24,690,000

and Tobin Creek placers. Underground development of the Mikado vein defines an average 6 foot thickness for a strike length of at least 500 feet. In 1979, proven reserves amounted to over 30,000 tons of 1 ounce/ton ore grade material with excellent potential for reserve base expansion. Chipp (1970) suggests the gold is derived from nearby greenstone lithologies, and some bulk sampling and exploration is being conducted with this theory in mind.

Currently 40-55 men are seasonally employed in underground extraction, milling, and support activities. Present mining methods consist of conventional slope-backfill techniques. The mill operates seasonally at a capacity of 100 tons/day. In 1981, flotation and cyanide-leach units were added to mill circuits to improve gold and silver recovery. New bunkhouses and dining facilities are also under construction. Lode and placer production in 1981 was approximately 5,000 ounces of gold, roughly double the 1980 output. Four thousand tons of ore worth \$1.6 million were processed in the mill; development expenditures totaled \$1.5 million. Production was curtailed in late August 1981 by near-surface thawing conditions that caused serious engineering problems underground.

Development plans for 1982 call for open-pit mining of the Mikado vein above the 100 foot level and putting several other auriferous veins in the district into production. This plan could substantially add to the total annual production level.

ALASKA GOLD COMPANY DREDGES, NOME AND HOG RIVER, WESTERN REGION (Locs. 22, 5b; pl. 2)

Alaska Gold Company and its predecessor, the USSR&M Company or Fairbanks Exploration (FE) Company operated 13 large bucket line dredges in four Alaskan mining districts since 1924 (Boswell, 1979). Prior to statehood, the FE Company was considered one of the most successful and technologically innovative dredging operations in the world. A continuous 58-year gold production history has been sustained since that time.

When the price of gold was decontrolled in 1972, Alaska Gold's parent company, UV Industries, began to reactivate two dredges at Nome, and by 1975, Dredge No. 5 was operational. Plans to reactivate Dredge No. 6 were delayed when a barge enroute to Nome sank with necessary supplies and equipment for the dredge. Since 1976, Dredge No. 6 has operated intermittently because of mechanical, engineering, and economic constraints. Dredges No. 5 and No. 6 are Yuba-type bucket-line dredges; No. 6 has a rebuilt, composite wood and steel hull and No. 5 is conventional steel construction. Dredges No. 5 and No. 6 have displacements of 3,400 and 2,060 tons

respectively, and total connected loads for both dredges are 1,520 kw.

Principal gold deposits are located on a series of Pleistocene strandlines; at least five ancient beach levels have been recognized in the Nome area. UV Industries has access to 17,500 acres in the Nome area. Of this, 1,200 acres are reported to contain over 1 million ounces of economically dredgeable gold. At a daily mining rate of 9,000 cubic yards for Dredge No. 5 and 7,000 cubic yards for Dredge No. 6, about 2.5 million cubic yards should be processed in a 160-day season. Production costs have soared since 1977, when the company exhausted the naturally thawed ground. Cold water thawing techniques utilizing expensive drilling programs have since been required. Up to two 120-day seasons may be necessary to thaw a one-year reserve for each dredge; this is a major reason the company has been unable to sustain desired production levels. Lack of experienced labor is also a serious problem. Annual output is lower than anticipated, averaging about 12,000 ounces of gold.

The operating season generally runs from May 15 to November 15, and the dredges are operated electrically by Alaska Gold's 5,000 kw power plant. The city of Nome is tied into the same power grid.

According to a February 1981 **Alaska Industry** article, Alaska Gold's payroll was approximately \$2.5 million with 30 permanent employees and 164 seasonal employees. No profit has been declared since the 1975-76 start up at Nome, but a 20 percent production increase is expected in 1982. Ultimately, with favorable economic conditions, four dredges may be reactivated. The present reserve could sustain such an operation for at least 25 years.



UV Industries
Dredge #5, near Nome

During the 1981 season, the Hog River dredge—inactive since 1975—in the Koyukuk River region was reactivated. The dredge was purchased from Livengood Placers at Livengood in 1953 and floated down the Tanana, Yukon, and Koyukuk Rivers to its present site. Between 1957 and 1975, about 210,000 ounces of gold were recovered from Alaska Gold's dredging activities near Hog River. A crew of 18 was employed during the 1981 reactivation phase. Although the dredge was operated for a portion of the 1981 season, no figures have been released.

GRANT MINE AND ESTER DOME DEVELOPMENT, TRI-CON, INC., EASTCENTRAL REGION (Loc. 39, pl. 2)

Tri-Con, Inc., operator for Silverado Mines, Ltd., of Vancouver, British Columbia, has been engaged in an aggressive development program on Ester Dome (8 miles west of Fairbanks) for the last 3 years. The focus of the development is the reopening of the old Grant Mine on Happy Road.

According to Bundtzen and Kline (1981):

"Exploration and development of the mine have been intermittent since the 1920s. Prior to 1950, about 6,000 tons of ore were selectively mined from the Irishman vein (Roger Burggraf, personal comun., 1981). Tri-Con, Inc., has been developing the property during the last several years and now has a gravity feed mill facility there.

Two structurally controlled, auriferous vein-fault deposits, the Irishman and O'Dea zones, are currently being evaluated by Tri-Con, Inc. Other deposits have been discovered during underground drifting, drilling and geophysical investigations.

Principal underground workings consist of over 3,600 feet of drifts, cross-cuts, and raises on the 100-, 150-, and 200-foot levels of the O'Dea breccia zone. Host rocks for all known deposits are polymetamorphic schist and quartzite of undetermined age."

R. C. Burggraf originally acquired the property in 1973 and began to open the old workings at and above the 150 foot level. With G. Dobbs, he sank the shaft to the 210 foot level and began drifting on the Irishman vein. In the course of sinking the shaft, a more auriferous structure, the O'Dea breccia zone, was discovered. In 1980, Silverado acquired a direct option from Burggraf to own 100 percent interest in the Grant Property for an up-front sum and percentage of net profits. Present underground development is restricted to levels above the water table, which is about 30 feet below the 210 foot level.

The mine plant includes a steel head frame, a 6,000 pound capacity shaft hoist, muckers on rails, a shop, and office and storage facilities for mine



Head frame and pilot mill, Grant Mine
Ester Dome, near Fairbanks

personnel. The pilot mill consists of a conveyor belt, primary jaw crusher, ball mill, and series of diester tables for gold recovery. During operation, two 10-hour shifts manned the pilot plant; the mill feed rate averaged about 1 ton of ore per hour. Ground water from both the underground workings and a 25-foot deep well is pumped to the gravity feed mill, which to date has not used chemicals for recovery. During 1980, 870 tons of ore, with an average grade of 0.45 ounce/ton gold, were milled through the pilot plant. In 1981, just under 1,000 ounces of gold were recovered from approximately 1,500 tons of ore. According to recent estimates the company had blocked out about 8,500 tons of mill-feed ore through October of 1981. Although a majority of the values are free milling, average gold recovery has been under 70 percent and the company is studying the feasibility of chemical recovery of gold. Conwell (1982, in press) suggested an 85 percent increase in recovery with the addition of a flotation circuit and cyanide leach unit.

Initial development phases have drawn attention to a series of en-echelon vein systems that cut Ester Dome. Under a late 1980 agreement with Range Minerals Corporation, 262 state mining claims immediately surrounding the Grant Property were brought under control so that Silverado now manages about 5 square miles on Ester Dome. The company hopes to bring several auriferous vein faults into production to collectively feed the mill at a rate of 100-500 TPD.

Underground development work continued from May 1980 to December 1981, but the Grant Mine plant is currently inoperative. Plans for 1982 include surface exploration on Ester Dome and resumption of underground development pending resolution of financing. A crew of 25, including exploration personnel, was employed during the year. Total 1981 development expenditures exceeded \$2 million.

ASAMERA PLACER OPERATIONS, LIVENGOOD DISTRICT, EASTCENTRAL REGION (Loc. 35, pl. 2)

Livengood Joint Ventures (LJV), a consortium of Asamera Minerals, Canadian Natural Resources, and Stanford Mines of Canada and the United States, is attempting to develop one of the largest unworked placer deposits in the United States. The Livengood gold camp was discovered in 1914, and has since produced about 400,000 ounces of gold. Much of the development and production has been confined to relatively shallow pay in tributaries of Livengood Creek and the Tolovana River. By 1939, a large auriferous bench that occupied the northwest limit of

Livengood Creek valley was defined. Previous placer mining companies were aware of the existence of this deposit that was covered by 80-110 feet of muck. Because the pay streaks were thawed, extensive drift mining of much of the ground was not possible. A chronic water shortage was also a problem. Thus, a larger company, Livengood Placers, was formed to develop these bench deposits, which vary from 100 to 1,000 feet in width and extend for a least 6 miles. Drilling confirmed the presence of over 1 million ounces of gold reserves, and in the 1940's a large dredge was moved into the area. Dredging activities failed despite construction of a unique permafrost dam in 1946 and the Reconstruction Finance Corporation (RFC) took over the dredge and all assets; and the plant was later sold to the FE Company and transported to Hog River in 1955.

The present LJV consortium has learned that all phases of the gold-mining process cannot be feasibly completed during the short summer seasons, especially because the thick overburden must be mechanical-



Asamera Churn — Drilling Livengood, near Fairbanks

ly moved by heavy equipment. Concern for nearby Tolovana River fisheries has increased the company's awareness of pollution-free operations. Heavy equipment has difficulty maneuvering the thawed muck, and expensive mechanical failures and downtime have hindered the project. In the winter of 1981, LJV contracted Doyon, Ltd., to strip overburden from the bench and construct a large settling pond; both projects were completed in June. In 1981, one of the first Caterpillar D-10 tractors ever used in Alaska began work on the project.

Annual production since 1978 varied from 800 to about 3,000 ounces, and a 10-million cubic yard block of ground has been classified by LJV as their current reserve base. A profit has not been recorded during the development phase of the project. The present washing plant consists of two standard sluice boxes arranged en-echelon and fed by a dozer or front-end loader. For the project to sustain desired production levels, additions to the present wash facility are planned. A large washing plant was acquired during the 1981 season.

LJV constructed a 200-man camp to serve their operation. Employment levels varied from 50 to 100 personnel throughout most of the mining season. Specific development figures have not been released for this study, but 1981 expenditures are believed to exceed \$3 million; 1982 plans are unknown.

GOODNEWS BAY DREDGE, HANSON PROPERTIES, SOUTHWESTERN REGION (Loc. 100, pl. 2)

The Goodnews Bay Platinum Mine has been the largest producer of platinum group metals in the United States. The district was discovered in 1926 by Walter Smith, an Eskimo prospector, and by 1934, several mining companies were operating on tributaries of the Salmon River. A large, 8-cubic foot capacity dredge was installed by the Goodnews Bay Mining Company in 1937, and by 1975, at least 545,000 ounces of native metals, mainly platinum, had been removed. The largest production year was 1938, when over 38,000 ounces of platinum-group metals were won from the district's gravel deposits. During productive years, about 65 employees worked on the Goodnews Bay Mining Company dredge and support facilities. The nearby Red Mountain dunite body is unquestionably the bedrock source, but hard-rock economic values have never been documented.

R.A. Hanson Mining Company recently purchased the equipment, campsite, and 3,380 acres of claims from an option holder of Goodnews Bay Mining at an undisclosed price. During 1980 and 1981, Hanson Mining expended most of their efforts in

refurbishing camps, machinery, and drilling equipment. The old Yuba Dredge was run for part of both seasons, but not at a profit. Hanson expects to move the dredge to richer ground in 1982. Digging capacity of the plant is about 7,000 cubic yards or about 1.25 million yards during a 260-day season. The relatively shallow 60-foot digging draft of the dredge has necessitated overburden removal by a dragline. Hanson Mining Company is predicting a 10,000 ounce/year platinum-group metals production level, about 1 percent of the United States consumption. Exploration results show that 62,900,000 cubic yards of gravel may contain at least 500,000 troy ounces of platinum-group metals. A primary effort is to rework clay-rich tailings, because up to 40 percent of the values may have been lost in previous years. In 1981, 200,066 cubic yards were processed by the dredge.

The camp is equipped for up to 100 people with dining facilities, recreational equipment (including a bowling alley), machine shops, bunkhouses, and electric-power generation for both camp and dredge. The camp is located 10 miles from the coast, but is not connected with any road network. The lack of experienced dredge personnel and problems related to sampling of the tailings for platinum content have been primary obstacles. The Hanson Mining Company is exploring the possibility of wind-generated electric power in this remote camp. Over \$4 million were spent in development and production phases of the operation in 1980 and 1981. A crew of 35 worked 266 days to support these activities.

NORTHLAND DREDGING OPERATION NYAC DISTRICT, SOUTHWESTERN REGION (Loc. 91, pl. 2)

A 6-cubic foot bucket-line dredge was completely rehabilitated and operated briefly by Northland Dredging Company during the 1981 season in the historic Nyac district southeast of Bethel, Alaska. Approximately 600,000 cubic yards of material were processed. The district was discovered in 1908, and the first dredge was activated in 1925. Dredges of the New York Alaska Dredging Corporation worked until the early 1960s recovering about 235,000 ounces of gold. The Tulaksak Dredging Company has operated a 4-cubic foot dredge in the district since 1973.

According to Joe Fisher, operator for Northland Dredging, development expenditures exceeded \$1.5 million in 1981, and another \$1.5 million is expected to be spent in 1982. The primary source of electricity for the Northland and Tulaksak dredges is a nearby small hydroelectric power site. Estimates of a 10-year reserve are reported.

INDEPENDENCE MINE, WILLOW CREEK DISTRICT, SOUTHCENTRAL ALASKA (Loc. 87, pl. 2)

The Independence Gold mine is located in the Hatcher Pass area, about 20 miles north of Palmer, on the largest of a series of vein faults developed and mined in the Willow Creek Mining District prior to

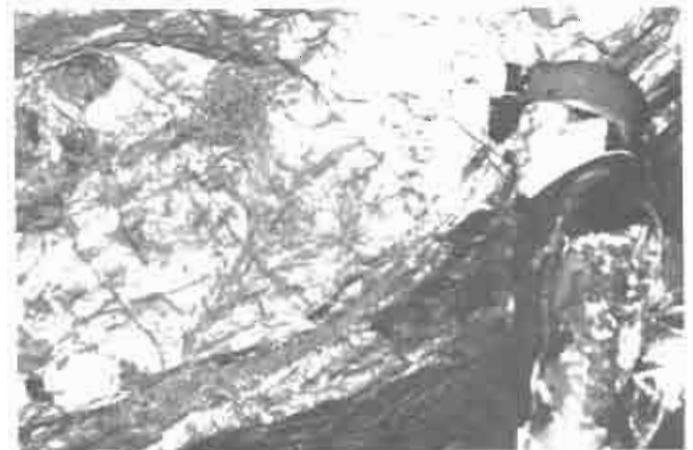
1950. From 1936 to 1943, about 165,510 ounces of gold were milled from approximately 240,000 tons of ore. The ore occurs as north-south striking veins intruding a diorite phase of the Talkeetna Batholith. About half the gold is free milling, but the remainder occurs as inclusions in pyrite, base-metal sulfides, and tellurides.

The mine was inoperative throughout the 1950s and 1960s. In the mid-1970s, the State of Alaska attempted to buy the property as part of a historic site, but the Legislature refused funding. In 1979, Starkey Wilson and Enserch Corporation obtained an option on the property and deeded 240 acres around the old portal and mine buildings to the State for historic interest. The mine will ultimately be serviced by another portal on the west side of the massif on Willow Creek. This portal will allow expansion of the mine's reserve base away from the older workings that were exhausted in the past years.

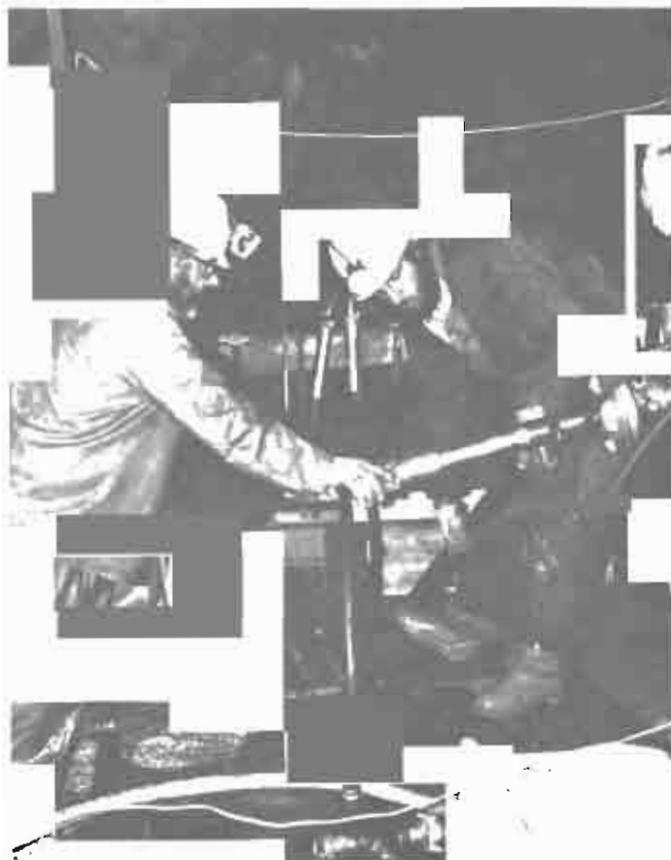
Coronado Mining Corporation is the present operator of the property for Enserch, Starkey Wilson,



Independence Mine Hatcher Pass, near Palmer State Historic site



Independence Mine vein 1,700 ft. level



Longyear 38 Underground in Independence Mine



Independence Mine Mill components Willow Creek Mill

and others. A mill that will include a flotation unit suitable for smelter-quality concentration is currently under construction. Operational level of the plant is expected to be 200 TPD. In 1981, 3,000 tons of ore assaying 0.5 ounces/ton gold were stockpiled for mill treatment. Several thousand feet of underground workings were completed in 1981. Work crews in 1981 included 20 underground miners, 15 employed in mill construction, and 15 office personnel, and development costs for 1981 are estimated at \$3 million. The 1982 forecast is for about the same level of expenditures and for evolution into a production mode.

GREENS CREEK DEPOSIT, ADMIRALTY ISLAND, SOUTHEASTERN REGION (Loc. 108, pl. 2)

In 1977, Pan Sound Joint Ventures announced the discovery of an important base metal - precious metal mineral deposit at Greens Creek on northern Admiralty Island, about 18 air miles southwest of Juneau. Initial drilling results indicated exceptionally high-grade massive sulfides apparently stratiform within host exhalative and metamorphosed tuff lithologies of Devonian age. By 1978, the consortium announced an in-place reserve of 2.1 million tons of ore with grades of approximately 10 percent combined copper, lead, and zinc, about 9 ounces/ton silver, and 0.10 ounces/ton gold. The deposit is unusually enriched in precious metals compared to most other stratiform massive-sulfide deposits and can be classified a bonanza. Revised 1982 reserve estimates boost the total to about 3.5 million tons of 10 percent base metals, 12 ounces/ton silver, and 0.16 ounces/ton gold.

The deposit became embroiled in the Alaska lands controversy when it was included in Admiralty Island National Monument by President Carter on December 1, 1978, under the authority of the Antiquities Act. In the final 1980 Congressional actions on the lands act, development under strict environmental observations and practices was permitted.

Noranda Exploration, Ltd., chief owner and operator at Greens Creek, announced plans to bring a mine producing base-metal and precious-metal concentrates into production no later than 1985. They report drilled reserves worth about \$800 million at present commodity prices, with a probable mine-operating life of at least 10 years. A 4,400-foot adit was completed in 1980, and bulk sampling and drilling are in progress.

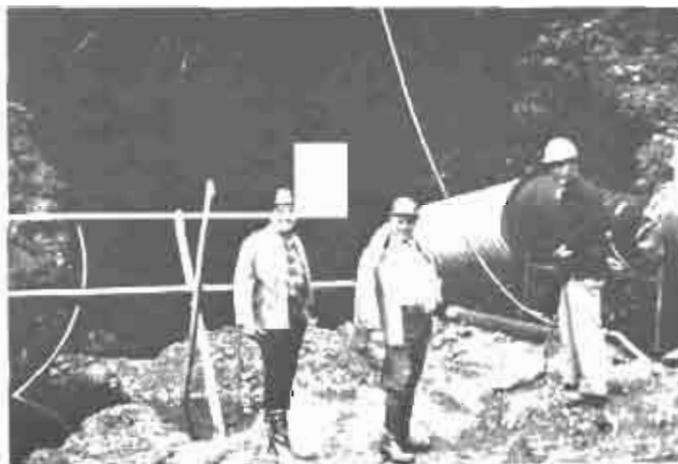
Cut and fill methods of underground mining will be employed and the ore concentrates will probably be trucked to Hawk Inlet, where they will be barged to a mill. Production rate is expected to be about 750 TPD, and about 250 employees will be employed.

Juneau may serve as the housing and supply center, and workers in mine, mill, and support facilities on Admiralty Island may commute daily from the capital city. However, no final decision has been made on the housing location.

The company has spent \$9 million in exploration and development since 1977, and expects to spend an additional \$22 million in mine and mill plant-designing phases during the next 2 years (ahead of the anticipated start-up date).



Noranda Exploration
Hawk Inlet on Admiralty Island



Greens Creek portal

**U.S. BORAX MOLYBDENUM MINE AT
QUARTZ HILL, SOUTHEASTERN REGION
(Loc. 133, pl. 2)**

The huge, low-grade porphyry molybdenum deposit discovered by U.S. Borax near Ketchikan constitutes the largest potential mining venture in the 49th state. The discovery occurred in 1974 during a stream sediment sampling program, and U.S. Borax announced in late 1975 that exploration by shallow drilling had proven a 100-million ton ore body in a quartz monzonite stock grading 0.20 percent MoS_2 near the head of Wilson Arm, 40 miles east of Ketchikan. During 1976, geological, geophysical, and geochemical surveys were conducted and 140 shallow drill holes were completed on a grid pattern. In 1977, larger drills were used and 30,000 feet of drilling completed to depths of over 1,000 feet at a cost of \$2 million. Indicated ore reserves were revised to 250 million tons of 0.18 percent MoS_2 through 1978. Since that time, another 45,000 feet of diamond drilling have been completed, and by late 1981, the company reported that the deposit contained 1.5 billion tons of 0.13 percent MoS_2 , with about 300 million tons of higher grade ore averaging 0.20 percent MoS_2 . This may represent the largest molybdenum deposit in the free world; the in-place molybdenum is worth more than \$20 billion. The deposit has been embroiled in controversy because, like Greens Creek, it was included in a national monument (Misty Fiords) by President Carter's invocation of the 1906 Antiquities Act, and because the streams draining into fiords in the mine area contain important salmon-spawning grounds. Hence, commercial fishermen have sided with environmentalists in the development issue. In the final lands act, U.S. Borax

was granted a 100,000-acre exemption to allow them to proceed with the project.

U.S. Borax has conducted some of the most detailed environmental investigations ever associated with Alaskan resource development. The U.S. Forest Service must annually review their plan of operations and will require modifications to eliminate harmful environmental effects. The University of Alaska Institute of Water Resources completed baseline studies of the ecosystem of Wilson Arm with respect to the proposed slurry pipeline that would transport mill waste to the bottom of the fiord. The U.S. Forest Service, under a third-party agreement with U.S. Borax, has retained Dames and Moore (engineering and environmental consultants) to prepare an analysis of the overall concepts of mining development. Specifically, environmental-impact documents for construction of the access road and bulk sampling phase of the project have been prepared and further action is pending.



U.S. Borax molybdenum deposit
Quartz Hill camp and Adit portal



Core logging at Quartz Hill

Current plans call for open-pit mining at a rate of 60,000 TPD. The \$850 million investment will yield 40 million pounds of molybdenum annually, equal to almost 20 percent of current "free-world" consumption. Seven to eight-hundred people will probably be employed over the 70-year operating life of the mine.

U.S. Borax spent \$5.7 million in the 1981 development phase, and plans to spend \$20 million in 1982, the company expects to be in production by 1987.

OTHER NOTABLE MINERAL-EXPLORATION DEVELOPMENT PROJECTS IN ALASKA

Two important Alaskan deposits that have reached an advanced exploration stage and may reach development and production in the next few years include the Yakobi Island nickel-copper-cobalt lode in Southeastern Alaska and the Slate Creek asbestos

deposit near Eagle in the Eastern Interior region (locs. 110b, 48b; pl. 2).

The nickel-copper-cobalt ores on Yakobi Island occur in a lopolithic, funnel-shaped, layered norite gabbro in Bohemia Basin north of Sitka. The main Takanis ore body is a steeply dipping, tabular, mineralized unit containing disseminated to massive sulfide zones up to 50 feet thick. The Yakobi Island deposit contains indicated reserves of 160 million pounds of nickel, 80 million pounds of copper, and 8 million pounds of cobalt from about 20 million tons of "open-pit reserves." Inspiration Development Company has drilled additional underground reserves that are not included in past feasibility studies. The deposits were included in West Chichagof-Yakobi wilderness area proposals, but an exemption was granted during resolution of the D-2 lands debate. Holdsworth (1978) assumed that a mill-feed rate of 4,800 TPD indicated a productive life of 25 years for the mine. Capital expenditures, including preproduction development, mine plant, and mill plant, were estimated by Holdsworth (1978) at about \$85 million. Employment will range from 250-400 personnel, with an annual payroll of \$10 million. The city of Pelican, located about 8 miles from the mine site, could serve as a supply center and perhaps house some of the mine employees. Despite 10 years of detailed grid drilling and extensive exploration, Inspiration Development Company has made no announcements concerning development of the ore body. They consider production potential fair to good, but are awaiting further developments in commodity trends, political policy, and additional exploration.

Helen Foster (USGS) released a 1968 open-file report summarizing the preliminary discovery of chrysotile fiber in the Yukon-Tanana Upland, about 35 miles southwest of Eagle, Alaska. Doyon Regional Corporation gained selection rights in the mid-1970s, and in 1980, WGM, the principal operator for Doyon, announced reserves of 55 million tons of 6.35 percent chrysotile fiber, all amenable to open-pit extraction. Fiber lengths are short but of superior strength and about equivalent in grade to the Clinton Creek deposit in the Yukon Territory. The Slate Creek deposits are the most important asbestos discovery in North America in over 30 years. Fiber evaluation with a 12 inch diameter diamond drill core stem was undertaken last summer. Recently, WGM applied for winter access from the Taylor Highway to conduct additional detailed investigations.



Diamond drill at Quartz Hill

Asbestos suffers from a declining market in the United States because of public health issues raised in the 1970s. Nevertheless, the country's net-import reliance exceeded 85 percent in 1981, and many friction-based and fireproof uses are still employed. Some asbestos substitutions (such as in brake-lining

applications) are considered inferior. Although the property is remote, asbestos fiber is a high-unit-value ore that can be economically hauled for long distances. Breaking into the market at 100,000 tons of fiber per year (or more) may spell success for this project.

1981 ALASKA MINERAL PRODUCTION

INTRODUCTION

The value of 1981 mineral production in Alaska, excluding petroleum and natural gas, was \$180 million, an increase of about 19 percent from the 1980 level. Leading the list was \$88.2 million in sand and gravel, followed by \$55.2 million in gold,

coal worth \$17.6 million (FOB Healy), \$19.3 million for building stone, and platinum, jade, tungsten, tin, and silver worth about \$4 million (table 5, fig. 4). The largest increment of increase was gold, which jumped about 70 percent from 1980 levels; coal and building-stone output remained at 1980 levels. Seven floating bucket-line gold dredges recorded production

TABLE 5
ALASKA MINERAL PRODUCTION, 1979-81*

	Volume			Value (\$)		
	1979	1980	1981	1979	1980	1981
Metals						
Antimony	W	None	None	150,000	None	None
Copper	W	W	None	W	W	None
Gold	65,000 oz	75,000 oz	134,200 oz	18,000,000	32,000,000	55,200,000
Lead	W	W	None	W	W	None
Platinum	None	W	900 oz	None	W	200,000
Silver	6,500 oz	7,500 oz	13,420 oz	92,950	111,000	111,360
Tin	100,000 lb	120,000 lb	106,000 lb	830,000	984,000	W
Tungsten	390 STU	250 STU	300 STU	76,800	37,500	56,000
			Subtotal	19,149,750	33,132,500	55,567,360
Industrial minerals						
Barite	20,000 tons	50,000 tons	None	800,000	2,000,000	None
Jade	W	W	W	60,000	60,000	200,000
Sand & gravel	50.9 M.T.	40.2 M.T.	42.4 M.T.	104,900,000	86,000,000	88,200,000
Stone	3.65 M.T.	3.70 M.T.	4.2 M.T.	15,450,000	15,400,000	19,300,000
			Subtotal	121,210,000	103,460,000	107,700,000
Coal	750,000 tons	750,000 tons	800,000 tons	15,000,000	16,000,000	17,600,000
Peat	W	W	W	W	W	W
			TOTAL	\$155,359,750	\$152,592,500	\$180,876,360

FOB — Freight on board

M.T. — Million tons

STU — Short-ton units

W — Withheld

* Based on canvass surveys of mine operators, results of DGGs questionnaires, and other confidential information; all values are estimates.

of precious metals, and several hundred mechanized placer mines were active in the state.

Metal mining seasonally employed about 1,250 individuals; 271 were employed in sand and gravel operations, about 100 for coal and peat, and 40 for building stone. The 1981 payroll probably exceeded \$31 million. Recreational placer-gold mining attracted an estimated 1,500 followers using suction-dredge and hand-sluicing techniques.

Production estimates in this report are primarily from several canvass surveys of mine operators completed in 1981. These surveys are incomplete and represent a minimum figure for mineral production in the 49th state. Because of uncertainties in metal-commodity price trends, activity levels, and other complex economic factors, we refrain from making a 1982 production forecast. The 1982 output of coal, sand and gravel, jade, and building stone will probably remain at about the same level as 1981.

Because of significant factors of uncertainty, some discussion on production statistics methodology is necessary. Statistics on gold production are the most difficult to determine. Gold production was estimated by contacting at least two operators in each of 23 major mining districts in the state. The results are summarized in table 6. About 134,400 ounces of gold were produced by 207 operators; 97 percent was derived from placers. DGGs previously estimated that about 120,000 ounces were produced in 1981, but the revised estimate takes into account additional new information. For the northern, western, and eastern Interior regions (fig. 1), DEC issued 328

water-use permits to placer mines. Almost all of the 415 permits issued statewide were to mechanized placer operations. The DGGs figures (from 207 operations) were from individuals in the field who should have accurate knowledge of the level of activities.

**TABLE 6
ALASKAN GOLD PRODUCTION BY REGION, 1981**

Region	No. of major operations*	Production (troy ounces)
NORTHERN Chandalar Koyukuk Nolan Ambler Districts	18	10,500
WESTERN Nome Kougarok Teller Fairhaven Candle Ruby Solomon Districts	40	21,000
EASTERN INTERIOR Circle Manley Rampart 40-Mile Fairbanks Richardson Bonnifield Districts	104	63,900
SOUTH-CENTRAL Cache Creek Nizina Chistochina Valdez Creek Kenai Peninsula Nelchina Districts	26	22,500
SOUTHWESTERN Innoko Tolstoi Iditarod NYAC Moore Creek Crooked Creek Districts	16	16,500
SOUTHEASTERN AND ALASKA PENINSULA	3	Unknown
TOTAL	207	134,400

* Total placer mines statewide exceeds 400.

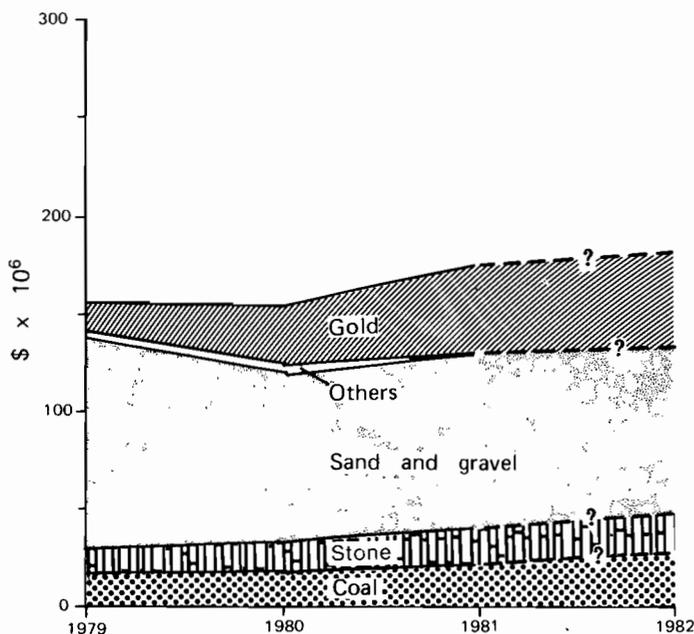


Figure 4. Value of Alaskan mineral production, 1979-81.

DGGS estimates that up to 40 percent of all mines statewide were economic or production failures.

The gold-production figures from this canvass were cross-checked with information from 1,050 questionnaires mailed to miners and explorationists throughout the state. Thirteen percent of Alaska's gold mines listed gold production in troy ounces, 27 percent reported the volume of material processed at a \$3-6 cubic yard value range but refrained from giving specific bullion figures, and 60 percent did not supply information concerning gold production. Extrapolating from these figures, gold production could range from 117,000 to about 185,000 ounces.

Alaskan-based, precious metal refiners indicated that about 160,000 ounces of bullion were processed during 1981. Some of this gold may have been mined in 1980 because declining market conditions encouraged operators who retained gold in previous years to ready their bullion for sale. The 134,200-ounce figure is probably conservative, because it reports production from only 207 of an estimated 400 operations and essentially excludes production estimates from recreational mining.

Silver production was obtained by assuming that approximately 10 percent of the precious metal bullion from placer mines was silver. This is a reasonable assumption as placers are the dominant source of precious metals.

Figures for tin, tungsten, jade, platinum, lead, copper, clay, antimony, and barite were voluntarily

given by individual mine operators and are relatively accurate. Estimates for sand and gravel, building stone, coal, and peat were derived from DGGS questionnaires, the Division of Land and Water Management, the State Department of Transportation, and U.S. Navy, NSHA, and the U.S. Bureau of Mines. The total figure for these commodities (table 5) is therefore a reliable production estimate.

During the 1981 season, placer-mining technology improved significantly. New techniques for placer-gold recovery are being employed offshore at Nome, and onshore in various Interior and Southcentral districts. High levels of mining activity have stimulated spin-off activities for the transportation sector and equipment distributors. Air transportation was more extensively used by miners working at sites inaccessible by road. In past years, helicopters have been used only by large exploration companies and governmental agencies, but recently the small miner has chartered these aircraft to move equipment, supplies, and crews. A substantial percentage of heavy-equipment sales in Alaska's urban areas has been to placer miners. Welders, grocers, and parts distributors also benefit from the gold boom.

METALS

Northern Region

All metallic mineral production from the northern sector was gold and byproduct silver. Approximately 18 placer mines produced 10,500 ounces of gold and about 1,000 ounces of silver. The principal placer operations include Tri-Con, Inc., on Nolan Creek, Koyukuk District, and Jan Drew, Ltd., operators for Little Squaw Mining on Tobin Creek in the Chandalar District. The latter company also milled 4,000 tons of ore from the Mikado vein. This operation was discussed in the development section.

Western Region

At least 40 placer mines were active in the western region, and although production levels were difficult to obtain, we estimate that 21,000 ounces of gold were recovered. The largest producer of precious metals continued to be the three Alaska Gold Company dredges, two at Nome and one at Hog River; all are in reactivation stages and were discussed in the development chapter. The Tweet family operated their floating bucket-line dredge in the Kougarok District on the Seward Peninsula. Bliss and Sons operated a small bucket-line dredge near Ungalik.

Operations in the Ruby, Candle, Solomon, Deering, and Teller areas also recovered substantial quantities of gold. A unique suction dredge was operated offshore from Nome by Lloyd Molby of Texas. Eight tires, each ten feet high and four feet wide, support the 24-foot-high excavator. Sluice boxes 39 feet long are fed by a suction dredge that minimally disturbs the ocean floor.

Lost River Mining Company continued production of cassiterite from their placer mine on Cape Creek west of Lost River; production was estimated at 100,000 pounds of tin concentrates. The Lee Brothers Tin Mine, active in past years, was dormant in 1981.

Eastern Interior Region

The Eastern Interior region accounted for about half of all the gold produced in Alaska. As in past years, about 40 placer mines in the Circle Mining District dominated activity at the district level, producing at least 20,000 ounces of gold. An estimated 500 miners operated in the district in 1980, and although activity dropped somewhat in 1981, actual bullion production increased.

Two operations in the Circle and Rampart areas produced over 5,000 ounces of gold each. Most other successful ventures recovered gold in the several hundred to several thousand ounce range. Other important areas of activity include Fairbanks (28 mines), Kantishna (15 operations), Manley (13+ mines.) Tri-Con, Inc., produced gold bullion from their pilot plant during development of the Grant Mine.

A new mineral district was opened in the Bitzshini Mountain area of the eastern Interior region where at least three placer mining ventures were active in 1981. Decomposed volcanic plutonic complexes similar to those in the Innoko, Flat, Candle Creek, and Moore Creek areas to the southwest appear to be the lode sources of gold at Bitzshini Mountain. Although previous geological investigations indicated the presence of gold in this district, there is no known past production.

Vincent Monzuella produced a few tons of tungsten concentrate (as scheelite) from the Yellow Pup lode on Gilmore Dome and stockpiled a larger amount of high-grade, unmilled ore for processing in 1982. Jack Neubauer recovered tin (as cassiterite) as a byproduct of gold mining in the Manley-Tofty area. Delta Smelting purchased concentrates from this operation to test the feasibility of smelting tin in Alaska. It is not known whether tin was shipped from the Ruby-Poorman area, which has produced modest amounts of cassiterite in past years.

Southwestern Region

Placer-mining activity in Southwestern Alaska continued at levels established in previous years. Mining districts are serviced only by aircraft and local roads unconnected to the State's sparse highway network. At least 25 well-established operators in the Tolstoi, Flat, Innoko, Crooked Creek, Nyac, and Dillingham areas produced more than 16,500 ounces of gold, or about 13 percent of the state total. Dormant districts such as George River have recently opened due to the rising interest in gold. In the last 20 years, scheelite concentrates have been shipped from a placer-gold operation in the Iditarod District. The 4-cubic foot bucket-line dredge (Tuluksak Dredging Company) continued operations in the Nyac district, and platinum was produced during the reactivation phase of mining at Goodnews Bay.

Several small-scale lode mining ventures in the region are notable. Alaska Silveinia Mines continued work on their primary silver-lead vein deposits in the Kaiyuh Hills. About 30 tons of hand picked, high-grade ore were mined in 1981. Prior to World War II, a small lode in the area produced over 30,000 ounces of silver from several hundred tons of ore. Almsey and Company worked the Nixon Fork lode gold deposits north of Medfra and mined about 100 tons of high-grade ore.

Southcentral Region

A large increase in gold production occurred in Southcentral Alaska, where at least 34 placer mines recovered 23,000 ounces of gold (15 percent of the state output) from the Cache Creek, Chistochina, Nizina, Nelchina, Valdez Creek, Kenai Peninsula, and Willow Creek Districts. No conventional bucket-line dredges operated in the region, but the Hall-Yentna Mining Company used two large, floating washing plants equipped with trommels that processed up to 10,000 cubic yards daily. At least one mine in the region, Ranchers Exploration (Chistochina District), produced more than 5,000 ounces of gold.

Production of other metals also occurred. Silver Star Mining (the Berry Brothers) continued development of the Silver Star and Pandora copper-gold-silver-barite-zinc lodes in the upper Kotsina drainage of the southern Wrangell Mountains. Since 1979, 50 to 100 tons of hand picked silver (tetrahedrite) ore was mined and shipped annually, and the owners believe significant reserves exist on the property. Several hundred tons of high-grade chalcocite ore have been stockpiled near the original Kennicott Mines in the Chitina Valley by Consolidated Wrangell, but no ores were shipped this year. Hand sorted chalcocite ore has been shipped by DC-3 aircraft since 1938;

DGGS records show shipment from the Chitina district to a west coast smelter in 1974. Placer mines in the Nizina district routinely collect byproduct native copper from placer-gold-recovery units; however, production is unknown from these sources.

Alaska Apex and Mining prospected an arsenopyrite-gold lode on Nugget Creek in the Cache Creek District, and the company secured a 3,500-pound bulk sample for mill testing and stockpiled about 500 tons of high-grade gold ore. Plans include assembling a 15-20-TPD mill near the mine site. Small amounts of hand sorted, high-grade gold ore were mined in the Nuka Bay District in Prince William Sound.

Southeastern Region

The Southeastern Panhandle showed the smallest level of actual metal production in 1981. Several placer mines recovered gold from the Haines, Juneau, Wrangell, and Chichagof Districts, but absolute levels of production are poorly documented. No other metals except byproduct silver from placer bullion were reported recovered in the southeastern area. No production of minerals was reported in the Alaska Peninsula region.

INDUSTRIAL MINERALS

INTRODUCTION

Over \$128 million in aggregate and \$17.6 million in building stone were produced from at least 50 pits and quarries statewide. Appendix J lists 71 gravel pits and 45 stone quarries that have drawn production in the last 5 years and are considered active.

Northern Region

Sand and gravel requirements for petroleum development on the North Slope constituted over 70 percent of all aggregate produced in the 49th state. Onshore demand for sand and gravel for the development of the Kuparuk Oil Field—now feeding the pipeline at a rate of 50,000 barrels per day—was the major consumer. Offshore-island construction and pad design throughout the oil field constituted the remaining consumption. Individual company statistics remain confidential. Jade is produced on the south flank of the Brooks Range near Kobuk for handicrafts by NANA Regional Corporation, and their workshop handled a reported \$200,000 worth of material.

Western Region

No industrial mineral activity was reported for the Western region. Routine road maintenance using local aggregate sources was performed by the Department of Transportation and subcontractors on limited road systems in the Ruby and Nome areas.

Southwestern Region

Sand and gravel were produced from at least 3 pits in gravel bars along the Kuskokwim River. Gravel is selling for up to \$90/cubic yard in Bethel. Absolute levels of production are unknown.

Eastern Interior Region

Seven sand and gravel operators in the Fairbanks area mined about 1 million tons for landfill, construction, and road-building projects; the leading producer was Fairbanks Sand and Gravel. Yutan Construction Company operated the Browns Hill basalt quarry on Badger Road near Fairbanks, and supplied the local area with about 340,000 cubic yards of high quality riprap, D-1 road metal, ballast material, and crushed fill for septic-leach field applications. About 25 men are seasonally employed at the operation. Mining methods include bench drilling and blasting, grizzly and crusher processing, and mine haulage similar to small-scale, open-pit mining methodology. Remaining reserves are estimated at 30 million cubic yards.

At least 20 Fairbanks-area studio and production potters use montmorillonite clays from the Healy coal field for making a variety of pots and handicrafts. Usibelli Mines has, in the past, supplied railroad carloads of clay to local users. As much as 40 tons of wet clay may be used in a single year. Value of the finished product is uncertain, but may approach \$75,000 annually.

Southcentral Region

Anchorage and Matanuska Valley pits supplied approximately 4 million tons of aggregate, chiefly for use in the Anchorage area. Anchorage Sand and Gravel's Palmer operation was the chief producer, followed by Brechan Enterprises, Inc. The Palmer deposits are contained in ice-marginal meltwater channels of Pleistocene age situated near the Alaska Railroad. A long conveyor-belt system transports the aggregate to waiting railroad cars that deliver it to users in the Anchorage metropolitan area.

Southeastern Region

Companies and municipalities including Dungen Redekopp, Inc., Madson Denver Company, and the City of Ketchikan used gravel for landfill and construction projects throughout the Panhandle. Less than 1 million tons were quarried. Of note is the cessation of the Chromalloy barite mining and milling operation in the Castle Islands near Petersburg, Alaska. This operation began in 1963 and produced at least 850,000 tons of high-grade barite ore through the end of 1980. During the 1960s and early 1970s,

up to 100,000 tons of raw barite were annually shipped to processing facilities in the lower 48. In 1974, a heavy media plant was constructed and a bagged drilling mud product was refined at the mill site. The deposit is unique because after the discovery island was mined away, extraction proceeded by underwater blasting, using a barge-mounted "clam-shell" for recovery. Chromalloy indicated that the venture has operated at a loss for several years. Ironically, the price of Alaskan barite (FOB Prudhoe Bay) recently hit an all-time high of \$600/ton, worth more, for example, than a high-grade gold ore. Millions of tons of barite ore remain underwater at the Castle Island Mine.

Alaska Peninsula

The United States Navy spent \$12 million excavating several hundred thousand tons of ledgerrock at Adak Naval Base. Twenty-five men employed 200 days per year completed the task. Fifty-thousand cubic yards of sand and gravel were excavated for road maintenance in the Naknek and Unalaska areas.

COAL

Usibelli Mines (Healy) was the only significant coal mine in the State. Production in 1981 was about 800,000 tons, worth \$17.6 million, a 6 percent increase over the previous year. Usibelli is involved in a significant expansion into the Pacific Rim export market.

A contract signed in 1981 calls for delivery of coal to Korea starting in 1982. The contract, which is for 200,000 tons in 1982 rising to 800,000 tons in 1984, covers a ten-year time span. There is some doubt concerning the completion of handling facilities to enable timely deliveries.

Coal seams are mined by open-pit methods using Alaska's largest piece of heavy equipment, a 33-cubic yard dragline, "Ace in the Hole," which strips overburden from minable sections. The coal is Miocene in age, subbituminous in rank, low in moisture, high in ash, and low in sulfur (\pm 0.5 percent). Land reclamation has been practiced voluntarily and successfully at Usibelli for over 12 years. Indigenous wildlife, including dall sheep, moose, and caribou, utilize artificial grains and protection habitat created by mining activities.

Tertiary coal seams have been mined for local heating use near Homer Spit and in the Palmer-Willow

area, a past producer of coal for the Anchorage area.

Horticultural peat is mined from 2 pits in the Fairbanks area and one near Willow. Volume estimates of production are not available, but production levels are limited to small local markets for these operations.



"Ace in the hole"
Dragline at Usibelli Coal Mine

HISTORICAL PRODUCTION STATISTICS AND PROJECTED RESERVES FOR SIGNIFICANT MINERAL COMMODITIES IN ALASKA

Past production of minerals and important strategic and industrial commodities are summarized in this section. Data for many base metals have been summarized in the activity sections of the report and in Appendix G.

METALS

Gold

Although there are records of gold discoveries and production during the Russian occupation, the

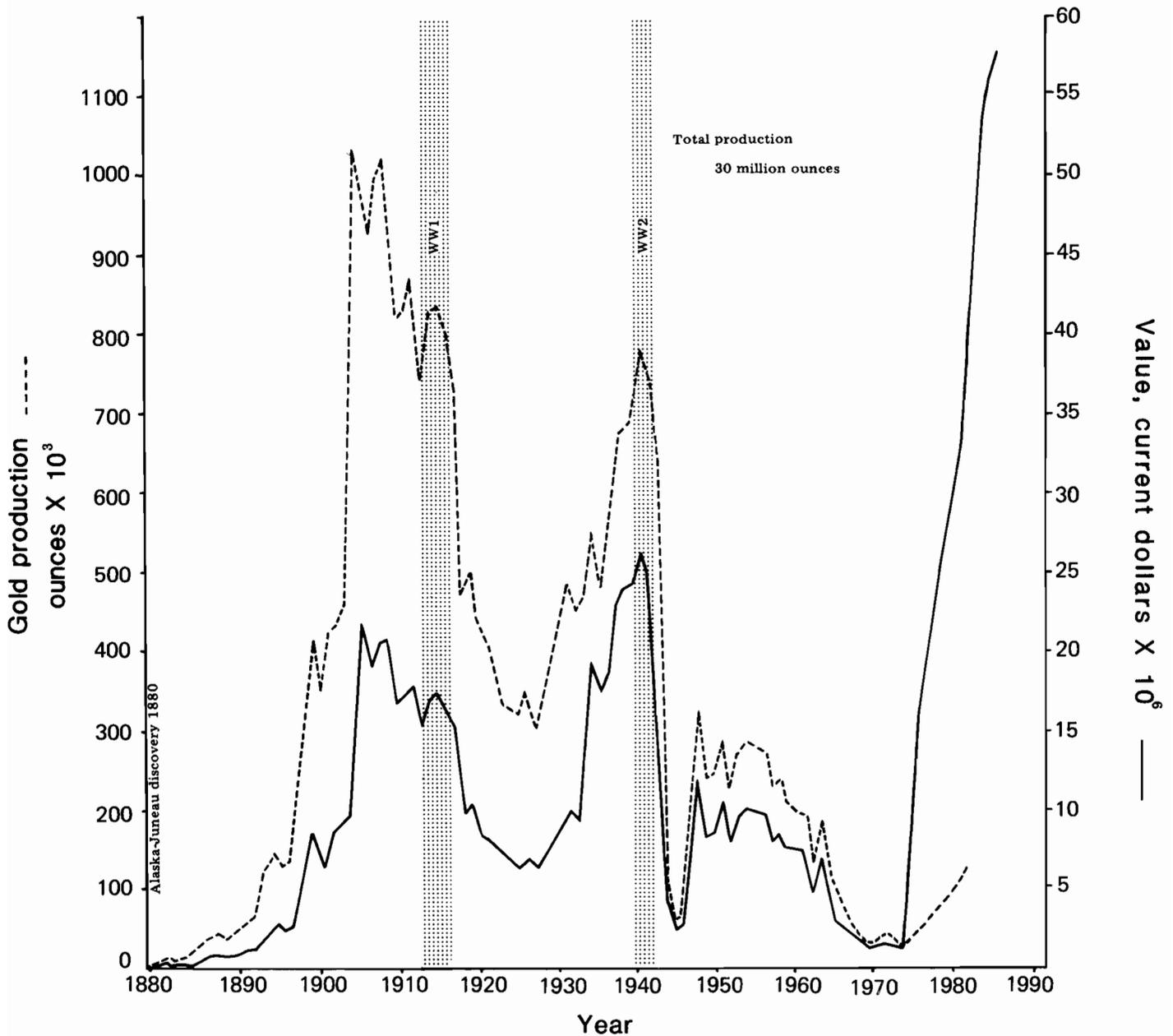


Figure 5. Gold production in Alaska, 1880-1980; dollar values not adjusted for inflation.

TABLE 7
GOLD PRODUCTION IN ALASKA, 1880-1981

Year	Production in thousands of fine ounces	Value in thousands of current dollars	Year	Production in thousands of fine ounces	Value in thousands of current dollars
1880	1	\$ 20	1930	407	\$ 8,413
1881	2	40	1931	466	9,632
1882	7	150	1932	433	8,950
1883	15	301	1933	457	9,466
1884	10	201	1934	537	18,795
1885	15	300	1935	462	16,170
1886	22	446	1936	517	18,095
1887	33	675	1937	629	22,015
1888	41	850	1938	660	23,100
1889	44	900	1939	671	23,485
1890	37	762	1940	757	26,495
1891	44	900	1941	696	24,360
1892	52	1,080	1942	503	17,605
1893	50	1,038	1943	110	3,850
1894	62	1,282	1944	51	1,785
1895	113	2,329	1945	60	2,100
1896	138	2,861	1946	192	6,720
1897	118	2,440	1947	320	11,200
1898	122	2,517	1948	221	7,735
1899	271	5,602	1949	227	7,945
1900	395	8,166	1950	276	9,660
1901	333	6,886	1951	208	7,280
1902	404	8,346	1952	250	8,750
1903	417	8,615	1953	265	9,275
1904	443	9,161	1954	260	9,100
1905	772	14,926	1955	253	8,855
1906	1,034	21,365	1956	209	7,315
1907	895	18,489	1957	216	7,560
1908	961	19,859	1958	188	6,580
1909	984	20,340	1959	177	6,195
1910	787	16,272	1960	173	6,055
1911	806	16,665	1961	117	4,095
1912	842	17,399	1962	165	5,775
1913	715	14,783	1963	99	3,465
1914	801	16,547	1964	63	2,188
1915	808	16,710	1965	42	1,479
1916	780	16,125	1966	27	956
1917	710	14,671	1967	23	803
1918	456	9,425	1968	24	835
1919	482	9,964	1969	25	881
1920	413	8,537	1970	24	835
1921	387	7,999	1971	15	537
1922	346	7,125	1972	26	910
1923	315	6,511	1973	54	1,875
1924	304	6,248	1974	45	2,560
1925	301	6,222	1975	40	3,349
1926	325	6,718	1976	45	2,686
1927	286	5,912	1977	50	2,812
1928	331	6,842	1978	60	14,700
1929	375	7,751	1979	65	18,600
			1980	75	32,100
			1981	134	55,200
			TOTAL	30,454	

significant production record begins with the discovery of gold near Juneau by Richard Harris and Joseph Juneau (near the present city of Juneau) in 1880. Carmack and his party proceeded up the Yukon River from a small placer-gold mining community near Circle to discover gold in the Klondike in 1896, starting the first big Interior stampede. By 1906, gold production peaked at 1,034,000 ounces. Production declined until 1925, when floating dredges replaced smaller operations. An increase in the price of gold from \$20.67/ounce to \$35.00/ounce in 1933 spurred activity. This increasing production ceased in 1942 with implementation of the Gold Mining Limitation Order L-208. Following World War II, a brief resurgence of gold mining occurred, but inflation took its toll and production declined to a low in 1971 of 13,012 ounces. From 1972 to 1975 a two-tier price system was in operation, and most gold was sold to speculators at more than the official price, thus inducing increased production. In 1972, gold was decontrolled and the price rose rapidly to \$195.00/ounce. Although this sudden price increase was followed by a slow decline to about \$102.00/ounce by August 30, 1976, steady price increases (topping \$800/ounce in the spring of 1980) spurred gold production to a 1981 total of 134,400 ounces representing a value of \$55.2 million. Table 7 records gold production since 1880, and figure 5 illustrates the fluctuation in gold production and value over the 101-year history of the industry in Alaska.

Copper

From 1910 to 1938, the Territory of Alaska was included among the top 10 copper producers in the United States. During the peak years of copper production (1916 to 1920) it was Alaska's major dollar-value product. Figure 6 graphically illustrates copper production in Alaska from 1880-1980.

Copper mining commenced in Alaska in 1900; from 1911 to 1930, three geographic areas contributed to the production. On Prince of Wales Island, the Jumbo mine produced 5,097 tons of copper from 1908 to 1919. Prior to 1930, at least 15 properties were in production in Prince William Sound. The richest and largest producers were the Kennicott Mines in the Chitina District.

According to Bundtzen (1978), productive ore deposits on Prince of Wales Island can be assigned to three major categories: 1) contact metasomatic magnetite-chalcopyrite (copper-iron) skarns and tectites containing significant amounts of molybdenum, silver, gold, zinc, and tungsten (Jumbo Mine on Hetta

Inlet); 2) massive sulfide pyrite-chalcopyrite-sphalerite (copper-iron-zinc) "shear zones" now regarded as stratiform deposits in Precambrian and early Paleozoic orogenic piles (Niblack, Khayyam-Mammoth group, and Copper City deposits); and 3) sulfide-rich (bornite) pods and disseminations containing gold, silver, and platinum-group metals in mafic intrusive complexes (Salt Chuck mine). Some deposits in the Kasaan Peninsula area (Mount Andres, Rich Hill, Rush, and Brown Mines) fall within the first two categories and are not easily classified.

During the early years, most of the ore was derived from shear-zone deposits. Later, about 1906, the magnetite-chalcopyrite deposits on the Kasaan Peninsula, particularly the Mount Andrews, Mamie, and Stevenstown Mines, were developed and soon dominated mining activities. Two copper smelters were constructed during 1905; a 400 ton/day plant at Hadley on the Kasaan Peninsula and a 250 ton/day installation at Coppermount on Hetta Inlet. The smelters operated intermittently for 3 years. By 1908, both smelters were closed because of declining ore quality, a declining copper market, and the difficulties in obtaining high-quality coking coals. Overall grade of the deposits was 3.1 percent copper, 0.038 ounce/ton gold, and 0.316 ounce/ton silver.

One of the first shipments of copper from Alaska may have come from Latouche Island in 1889. At the turn of the century, an extensive claimstaking period occurred, and at one time mining claims covered the island. The Beatson Mine was staked in 1897, and by 1904 ore was shipped to west-coast smelters. In 1917, the mill capacity was increased to 1,500 tons per day and in 1918, 435,826 tons of ore were mined. Two grades of ore were mined; one was selectively chosen for direct shipment to the smelter in Tacoma, Washington, and the balance was milled locally. The operation continuously employed nearly 400 men until operations ceased in 1930.

The most famous Alaskan copper mines were the Kennicott deposits. Four mines, the Jumbo, Bonanza, Erie, and Mother Lode, were served and operated under a single infrastructure near McCarthy. As a single unit they constituted one of the richest copper properties in the world; they probably would not be considered a world-class copper producer by today's standards. When abandoned in November of 1938, the total tonnage mined at Kennicott was 4,626,000 tons at an average grade of about 13 percent copper.

Total production was 591,535 tons of copper and about 9,000,000 ounces of silver. Applying a weighted average of each year's production to the average copper and silver prices for those years, total

value amounts to about \$200,000,000, with a net profit of about \$100,000,000. In essence, the profit at the Kennicott mines in Alaska was used by Kennicott to gain control or increase levels of activity of impor-

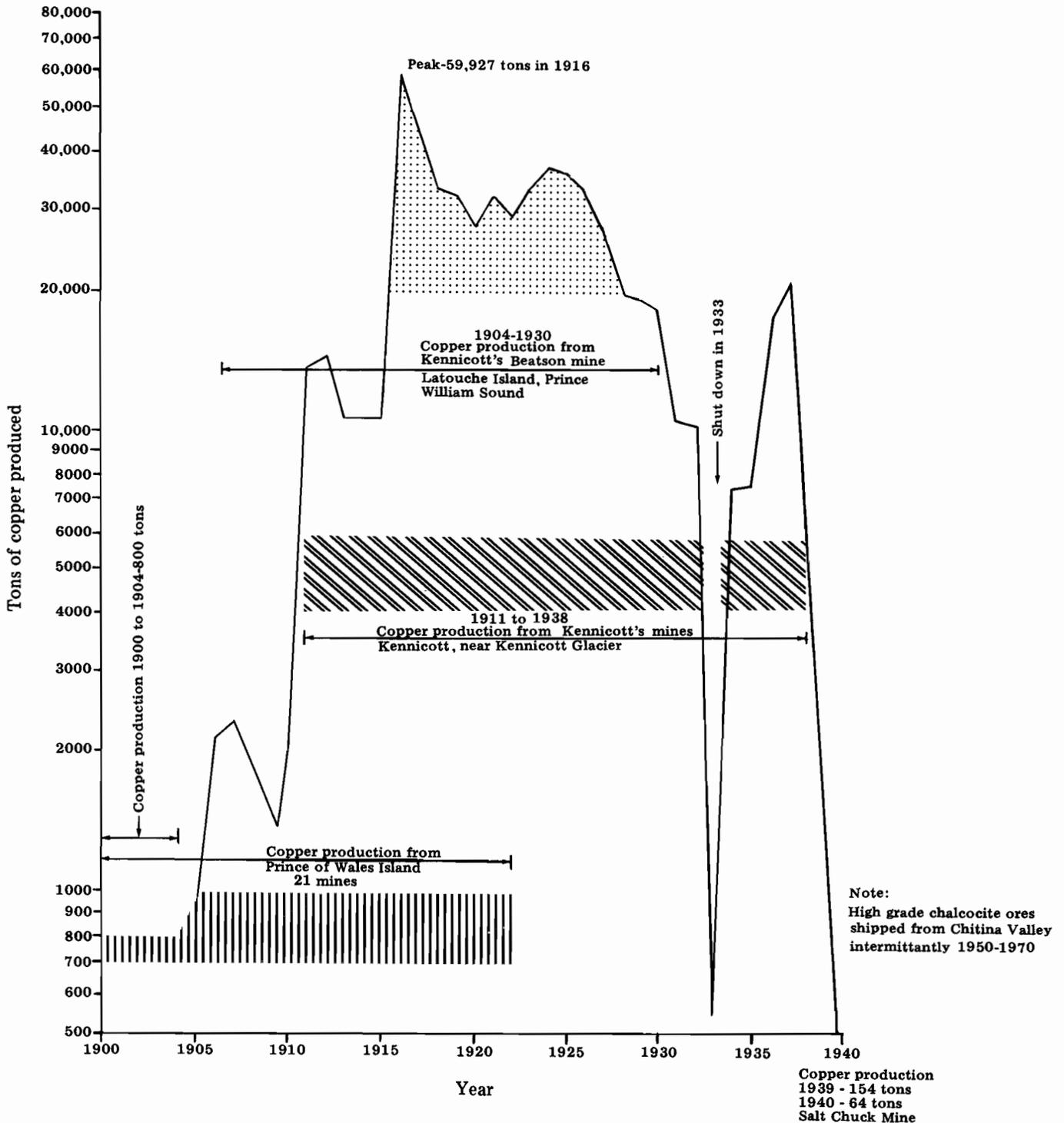


Figure 6. Copper production in Alaska, 1880-1980.

tant copper properties in the southwest, including the world-famous Bingham Canyon lode.

The history of copper mining began in 1885, when Lieutenant Henry T. Allen travelled to Dan Creek and met Chief Nikolai, who provided samples of ore that assayed greater than 60 percent copper. In 1898 and 1899, Captain W. R. Abercrombie of the U.S. Army surveyed and established a military road from Valdez to Copper Center. In 1889, the Nikolai Mine was located by the Chitina Mining and Exploration Company, and in 1900 the Bonanza claim was located. By 1908, the Kennicott Mines Company (Kennicott Copper Company) gained control of the properties, and the push for production began. A right-of-way along the Copper River from Cordova to Chitina and on to McCarthy was selected and a railroad was constructed by the Copper River and Northwest Railroad. The romanesque style of author Rex Beach describes the construction in his novel, *The Iron Horse*. In 1911, construction of the railroad and a 400-ton per day gravity concentrator was completed, and shipping of copper ore and concentrates started. In 1916, the aerial tramway at Kennicott transported 175 tons of crude ore per day (averaging 70 percent copper).

The Kennicott deposits occur in a limestone replacement-type deposit. Because acid leaching of dumps and tailings was not applicable, E. T. Stannard perfected an ammonia-leaching system, and in 1916 a 700-ton per day gravity concentrator was installed. However, fine material presented problems in the

leaching tank, and a flotation process was developed using sodium sulfide and calcium polysulfide to "sulfodize" the carbonate ores. After 1916, by a combination of gravity concentration, ammonia leaching, and froth flotation, 96 percent of the copper was recovered.

Several features unique to the Kennicott deposits include:

- * it was the richest and most profitable copper property in Alaska,
- * a 186-mile-long service railway was constructed in a harsh environment,
- * the creation of the ammonia-copper leach process,
- * the "sulfodizing" of a carbonate ore for froth flotation,
- * the 50 percent profit for the life of the mine.

After World War II, sporadic shipments of high-grade, hand picked chalcocite ores were shipped from the Chitina Valley. Our last record of production was 1974, when about 200 tons of ore were flown out of the remote area. Total production from these most recent sources is unknown, but probably under 1 million pounds.

Although the operation closed in 1938, the Kennicott Copper Company never lost interest in Alaska. In the 1960s, Kennecott explored and started to develop a copper deposit near Bornite, and in the 1970s discovered and explored the Arctic deposit (western Brooks Range).

STRATEGIC MINERALS

INTRODUCTION

Since the turn of the century, Alaska has added significant amounts of so-called "strategic" and "critical" materials to United States domestic mineral production, especially during the First, Second, Korean and Vietnam wars and during times of unusual shortages caused by technological change or disruption of critical foreign sources. Alaska's contribution includes tin, tungsten, platinum-group metals, antimony, mercury, chromium, and minor amounts of asbestos. This section, largely modified from Bundtzen (1982), summarizes Alaska's past strategic minerals contribution and known reserve base, and discusses strategic- and critical- minerals availability with respect to lands open or closed to mineral entry and development.

Since World War II, private industry and limited federally subsidized exploration have delineated economic or near-economic reserves of 10 of 15 strategic minerals, including cobalt, nickel, tin, platinum-group metals, asbestos, mercury, fluorine, tungsten, antimony, and chromite. Commercially viable reserves of bauxite (aluminum), manganese, niobium, graphite, tantalum, and mica are not presently known anywhere in Alaska, although some resources exist in mineralized regions of the state. Resource information on selected Alaskan strategic minerals is summarized in Appendix N.

Cobalt and Nickel

No cobalt or nickel has been produced in Alaska. Resources of cobalt metal contained within four

mafic-igneous hosted deposits in the Southeastern Panhandle (Brady Glacier, Yakobi Island, Mirror Harbor, and Funter Bay) amount to about 63 million pounds or about 3 years of annual United States cobalt consumption. Of this, 8 to 9 million pounds in the Yakobi Island deposits are considered proven reserves. No production schedules have been announced by the resource owner, Inspiration Development Company. Another important cobalt resource exists at the Bornite copper deposit in northern Alaska, but estimates of actual cobalt content in these rich copper lodes are lacking, partly because the cobalt content was only recently recognized. The four Southeastern Alaska deposits mentioned above contain an estimated 1.12-billion pound (561,000 ton) proven reserve of nickel, equal to 2.1 years of current United States consumption; adding the inferred reserve increases the total amounts to about 4 years of present domestic consumption.

Most cobalt and nickel resources and reserves are contained in the large Brady Glacier sulfide deposits in Glacier Bay National Park. Brew and others (1978) estimate that 100 million metric tons of ore with a grade of 0.53 percent nickel and 0.35 percent copper have been blocked out by a diamond-drilling program. The Brady Glacier deposit also contains from 24 to 54 million pounds of cobalt (Czamanske and others, 1981), but the metallurgy of the deposit has not been sufficiently studied to determine the effectiveness of cobalt recovery.

Platinum

Alaska has been the largest producer of platinum-group metals in the United States. More than 98 percent of the total production of 567,500 ounces has come from two regions - the Goodnews Bay District in Southwestern Alaska and the Salt Chuck copper-platinum mine near Ketchikan. Platinum at Goodnews Bay was discovered in 1926 by Walter Smith, an Eskimo prospector, 25 years after initial turn of century gold discoveries in the region. Although Smith hadn't recognized platinum before, he sent a concentrate sample of the suspicious steel-gray metal to the Territorial Department of Mines and his find was confirmed. By 1937, large-scale dredging operations commenced, and through 1981, 545,000 ounces of platinum metals were mined in the Salmon River drainage. The deposits are placers, i.e., eroded from a low-grade, hard-rock source and concentrated in stream gravels by the action of gravity at short distances from the dunite source rock.

The hard-rock platinum deposits at Salt Chuck near Ketchikan were originally mined for copper, but in 1918, government geologist John Mertie suggested that samples from various Southeastern lodes be run

for platinum-group metals and nickel. No nickel was found at Salt Chuck but platinum-group metals, mainly palladium, were discovered in the assays. By 1941, 19,000 ounces of palladium and 2,500 ounces of platinum were produced as a byproduct of the copper mining from the Kasaan Peninsula lode. Several thousand ounces of platinum-group metals have been recovered as a byproduct of extensive placer-gold mining activities in various Alaskan mineral districts since 1902, most notably in the Cache Creek, Chistochina, and eastern Seward Peninsula areas.

The largest resource of platinum-group metals in Alaska, about 1 million ounces, is found at Goodnews Bay and in the Brady Glacier nickel-copper deposits. The former are presently mined in complex placers. Successful recovery of the bulk of the remaining reserves will depend on modifications to the 8-cubic foot bucket-line dredge and improved recovery techniques in silt-laden paystreaks from which only 40 percent of the platinum-group metals were originally recovered. Metallurgical research by the U.S. Geological Survey, in cooperation with Newmont Mining Corporation, delineated a resource of approximately 580,000 ounces of platinum-group metals (Czamanske and others, 1981) in the Brady Glacier deposits previously described for their nickel, copper and cobalt potential. Specific metallurgical characteristics of this important nickel reserve have not been defined, and hence platinum recovery may or may not take place if nickel mining commences on the property. The U.S. Bureau of Mines has recently completed platinum-beneficiation studies of ore from four deposits in Southeastern Alaska (Dahlin and others, 1981) and concluded that the Salt Chuck deposit contains the most promising metallurgical characteristics for platinum-metal recovery.

Despite significant past production, platinum-group metals have been Alaskan "sleepers." Most important deposits were discovered by accident, and new occurrences continue to be discovered. Until the mid-1970s, accurate platinum assays were expensive and difficult to obtain. Prime targets for future prospecting will be mineral belts in Southwestern Alaska and exploration of zoned mafic-igneous complexes in Southeastern Alaska.

Chromium

Chrome mineralization is found in a variety of deposits in at least six major mineral belts in Alaska, but mining has occurred only on the Kenai Peninsula, where production was largely subsidized by the federal government.

During critical shortages of World War I, approximately 2,000 tons of metallurgical-grade chrome

were mined at Claim Point near Seldovia. During World War II and the Korean War, chrome shortages induced production from chrome deposits at Red Mountain, about 12 miles east of Claim Point. Between 1943 and 1957, 28,849 tons of ore ranging from 38 to 42 percent Cr_2O_3 were produced from numerous lenticular ore bodies within the Red Mountain dunite body. Production was subsidized under a Defense Minerals Exploration Administration price support arrangement that expired in 1958. Most United States domestic production ceased in 1961. During 1976, about 8,000 tons of stockpiled Red Mountain ore were sold to a Japanese buyer. According to the U.S. Bureau of Mines, reserves of chromite on the Kenai Peninsula amount to approximately 300,000 tons of 28 percent Cr_2O_3 , equivalent to about 6 weeks of United States consumption. The Red Mountain deposits may represent one of the largest low-grade chrome reserves in the nation, and may be exploitable in a national emergency (Ellis, 1981).

Other chromite belts in Alaska include deposits on the Kanuti River north of Fairbanks, Eklutna near Anchorage, Bernard Mountain near Chitina, eastern Chichagof Island, and in the De Long Mountains of Northwestern Alaska. Because chrome is a low unit value ore, only those deposits near existing transportation systems have economic potential. Geologically, all known Alaskan chrome deposits are podiform and associated with Phanerozoic oceanic crust and mantle. These contrast with the very large chrome deposits of southern Africa and Russia that are contained in layered mafic-igneous complexes in Precambrian shield areas. The former deposits, however, generally have higher quality ores with high chrome-to-iron ratios, and this tends to characterize many Alaskan deposits.

Tin

Unlike the rest of the United States, Alaska has been endowed with promising tin resources. As early as 1902, placer-tin deposits on the western Seward Peninsula were successfully mined. Although total state production of about 5,000,000 pounds has been modest compared to other world sources, Alaska is nevertheless America's largest primary source of the metal.

The strategic importance of tin in Alaska is well known (Lorain and others, 1958). Both lode and placer deposits in the Lost River area eventually became the focus of national concern. When United States entrance into World War II appeared imminent in 1941, a bill in the U.S. House of Representatives (HR 96, 1/3/41) was introduced to appropriate \$2 million to develop Alaskan tin deposits. However,

action on this bill was never taken. By late 1942, two-thirds of the tin resources and three-fourths of the world's tin-smelter capacity was taken over by the Japanese occupation of Malaysia. The War Production Board immediately approved government construction of a 500-ton per day mill at the Lost River tin deposit, but construction depended on the U.S. Navy's ability to maintain shipping lanes in the area. With the Japanese invasion of the Aleutian Islands, the U.S. military establishment decided that the Lost River mine was not important enough to justify a significant diversion of critically important cargo and naval strength in the area, and construction was cancelled. However, government exploration of the Lost River deposit commenced in 1942, and by the end of the war a significant tonnage of high-grade tin ore had been delineated.

With the onset of the Korean War, the United States government, under the 1950 Defense Production Act, advanced funds to the United States Tin Corporation for construction of mine infrastructure and production facilities at Lost River. By 1956, 51,000 short tons of ore averaging 1.13 percent tin had been mined from the deposits. When government participation ended after the Korean War, the mine closed and has not reopened.

Extensive exploratory diamond drilling of the Lost River Mine and nearby deposits continued, and by the mid-1970s, an inferred reserve of 124,000,000 pounds of tin had been blocked out, the largest single tin reserve in North America. This reserve equals about one year of present United States consumption.

Over 600,000 pounds of cassiterite have been recovered as a byproduct of gold mining in the Manley District northwest of Fairbanks. Today, Alaska produces about 120,000 pounds of tin concentrate annually from small placer operations on the western Seward Peninsula and in the Manley area; these are the only primary sources of tin in the United States.

Tungsten

Modest amounts of high-grade tungsten concentrate were shipped from Alaskan mines during World Wars I and II and the Korean War. Early Fairbanks area gold prospectors located tungsten deposits during their adventures, and the tungsten requirements of World War I spurred modest production from several small deposits on Gilmore Dome.

Likewise, the same pattern was followed during World War II in the Hyder District of Southwestern Alaska. Primarily a gold-silver-base-metal mine, the Riverside Mine reopened after several years of dormancy and shipped tungsten concentrates for the war

effort during 1941-45.

During the Korean War, the 1950 Defense Production Act essentially subsidized exploration and production of tungsten throughout Alaska, and resulted in tungsten mining on the western Seward Peninsula, in Southeastern Alaska, and in the Fairbanks area. Total WO_3 output of about 286,000 pounds is very modest compared to national requirements, but significant tungsten resources are delineated at the Lost River tin deposits, the Stepovitch Lode near Fairbanks, and at scattered sites throughout Alaska.

Antimony

Antimony is plentiful in Alaska and is often associated with gold mineralization. Antimony ores from at least 16 deposits were shipped to markets during 1905, 1914-16, 1926-27, 1936-44, 1951-53, 1969-72, and 1978-79, usually coincident with high demand created by war and related industrial use.

During the Korean War, some production was subsidized by the federal government in the Fairbanks, Livengood, and Kantishna Districts. Alaska's total yield of 10,493,360 pounds of antimony amounts to about 8 percent of domestic production through the early 1970s. During wartime, Alaska's contribution was even more important. For example, the Scrafford property in the Fairbanks area supplied a large percentage of United States antimony needs during World War I. Likewise, from 1936-42, the Stampede Mine in the Kantishna district contributed 75 percent of the United States' domestic production of the metal.

Although large resources remain in the Fairbanks and Kantishna areas, antimony mines in Idaho, Montana, and Nevada now overshadow Alaska's contributions. Moreover, the strategic value of the metal decreased with substitutions for past uses in tracer bullets, babbitt, hardening agents, in storage batteries, and paints. Increased usage of antimony-oxide based fire retardants suggests that antimony may again be mined in Alaska.

Mercury

Environmental restrictions caused by toxicity have decreased industrial use of mercury. However, there are few reliable substitutes for mercury's uses in scientific and industrial-control instruments, large-capacity storage batteries and some medical applications. Thus, demand is increasing, and mercury prices have climbed in the last few years.

A large mercury district in Southwestern Alaska extends from Marsh Mountain near Dillingham to the Cripple Mountains north of McGrath. A dozen mines have recovered over 40,000 76-pound flasks of mercury intermittently since World War I. The principal producer is the Red Devil Mine near Sleetmute; it was operated intermittently between 1942 and 1972 with a continuous period of mine operation from 1954 to 1963. During the 1950s when prices were high, Alaskan mines supplied the nation with between 10 and 20 percent of its mercury requirements. Reserves of mercury are difficult to block out. Development of Alaskan deposits is dependent on economic factors.

Other Strategic Minerals

Although niobium, tantalum, manganese, and titanium all occur in Alaska, no reserves have been published. Niobium and tantalum exist in small quantities in some Alaskan tin deposits, and byproduct production seems possible should lode-tin recovery commence. Large sedimentary manganese deposits similar to those mined in the USSR are

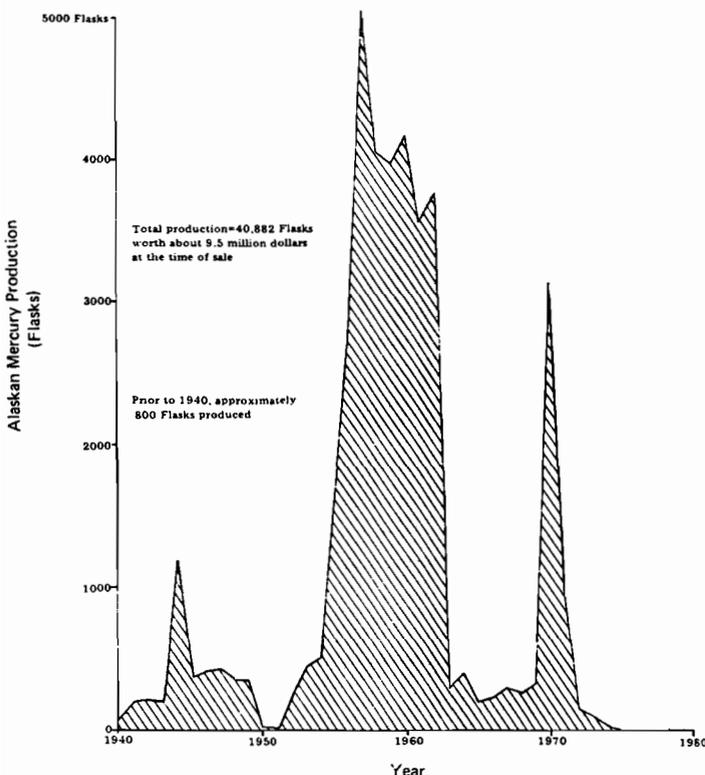


Figure 7. Mercury production in Alaska, 1940-1980.

unknown in Alaska, but smaller lodes exist in the Alaska Range and Yukon-Tanana Upland. Titanium occurs in enormous low-grade, magmatic iron deposits and in some rich beach placers in the southeastern Panhandle, but economic extraction of either metal has not been considered in recent years. There are no known indications of commercially viable bauxite (aluminum) deposits in Alaska.

Graphite was regarded as a strategic element and explored for in Alaska. Some production occurred on Uncle Sam Mountain near Nome during World War I. When German U-boats successfully blockaded our principal sources of graphite in Madagascar and southern Africa during World War II, the War Production Board instituted a policy of encouraging domestic graphite production. This resulted in further development and shipment of over 500,000 pounds of graphite from the high-quality deposits at Uncle Sam Mountain. Strategic needs of graphite are substantially reduced today, even though virtually all domestic needs are met by foreign imports.

Sheet mica and oscillator quality quartz crystals are crucially important in times of war. In fact, at times both were considered top strategic mineral procurement problems during World War II because of their unique electrical properties. The desire to develop domestic reserves spurred prospecting in Alaska during the 1940s, when a number of pegmatite deposits were examined, particularly in South-eastern Alaska and the Seward Peninsula. No production of either material occurred.

The Future of Strategic Minerals in Alaska

Past production of strategic minerals can be classified into two major categories: 1) those that required substantial government support (exploration and development funding and price guarantees) such as chromite, tungsten, asbestos, graphite, and lode tin, and 2) those that, for the most part, were successfully mined at a profit because of their high-unit worth on the free market during times of shortage, including platinum-group metals, mercury, antimony, and placer tin.

Major price trends of selected strategic minerals in the 1970s are shown in Table 8. In Alaska, those minerals that can compete effectively with other suppliers will probably be mined. Tin, tantalum, niobium, and cobalt have all enjoyed healthy price surges during the last few years. Tungsten, titanium, mercury, nickel, asbestos, and platinum-group metals have generally kept up with inflation, but chrome, fluorine, antimony, crude manganese, and titanium ores are currently depressed on the metals market.

Commodities with a strong and sustained demand projection are certainly more attractive and therefore likely to be exploited, but the outlook is complicated by other considerations. In Alaska, land status, minerals policy, transportation, labor, availability and cost of energy, climate, and proximity to urban areas all influence the economics and mining. Certain high-unit value concentrates such as tin, tungsten, and platinum could be shipped by aircraft, but materials

TABLE 8
MINERAL PRICE TRENDS OF SELECTED STRATEGIC MINERALS.

	1974	1978	1981	1981 net import reliance (%)
Asbestos	121/ton	247/ton	356/ton	85
Niobium	1.28/lb	3.18/lb	11.00/lb	100
Tantalum	1.88/lb	21.00/lb	104.00/lb	100
Cobalt	2.87/lb	5.60/lb	25.00/lb	90
Mica	1.66/lb	2.80/lb	7.30/lb	100
Chromium (SA)	34/mt	59/mt	55/mt	90
Platinum	150.00/oz	162.00/oz	439.00/oz	89
Tin	2.27/lb	5.29/lb	8.56/lb	81
Fluorine	85/mt	115/mt	150/mt	81
Nickel	1.53/lb	2.40/lb	3.45/lb	77
Tungsten	44.22/stu	157.21/stu	131.00/stu	59
Mercury	286/f	145/f	400/f	62
Antimony	68.5/lb	177.0/lb	200.0/lb	43
Titanium	1.42/lb	2.98/lb	6.75/lb	W

Source: Metals Week, U.S.B.M. Commodity summaries, *Engineering Mining Journal*; March 1981.

such as chrome or titanium need bulk-transportation facilities. With the exception of gold, it is understandable why most Alaskan large-scale mineral developments have occurred near railroads or the sea. Deposits near inexpensive energy sources will definitely have an advantage over other deposits. The length of shipping seasons will also play an important role along Alaska's northern coastline.

Land status has had a substantial effect on mineral exploration and development in Alaska. Prior to statehood, most of Alaska was in the federal public domain, and except for national park or military withdrawals, most of the territory was open to mineral entry and development under liberal mining laws. Since statehood, land ownership has become more complex. In 1971, the Alaska Native Claims Settlement Act (ANCSA) permanently changed land-use patterns. Native Alaskans as part of their aboriginal rights are receiving title to 40 million acres. Sec. 17(d)(2) of ANCSA mandated that up to 80 million acres be placed in conservation units of the National Park, Forest, Wildlife Refuge, and Wild and Scenic River Systems. Additionally, in December of 1980, the U.S. Congress placed approximately 100 million acres of Alaska into various conservation units, many of which are closed to further mineral entry.

Probably the most significant land use conflicts with respect to Alaskan strategic minerals are found in the nickel-copper-cobalt lodes of the Southeastern Panhandle. More than 90 percent of Alaska's known cobalt resources, almost 50 percent of Alaska's platinum resources, and 92 percent of Alaska's proven nickel reserves occur in deposits at Brady Glacier, Yakobi Island, Mirror Harbor, all currently within recently established national parks or wilderness areas. A small area in the Yakobi Island Wilderness Area is classified for restrictive mineral use, but according to an Inspiration Development official (Thornsberry, 1981), most of the potential mineralized area immediately adjacent to known deposits is not open to development. Significant resources of chrome, antimony, tungsten, and titanium are both in and out of restrictive use categories while tin, fluorite, and particularly mercury and asbestos reserves are largely excluded from federal conservation units and open to development.



Red Devil Mercury Mine, overlooking the Kuskokwim River

INDUSTRIAL MINERALS

INTRODUCTION

In 1948, territorial assayer Art Glover wrote, "Nonmetallic minerals can ill afford to be overlooked if there is to be an orderly development of Alaska. . . the very existence of new industry in the territory may well depend on local development of minerals previously deemed valueless."

This farsighted prophecy has come true. Surprisingly, while most Alaskans are aware of Alaska's contributions in supplying metals and energy, many take for granted the existence and importance of domestic suppliers of such commodities as building stone, sand, and gravel. Additionally, chemical- and structural-grade limestone, gypsum, garnet, graphite, asbestos, barite, pumice, and clay have all been mined in the 49th state. The largest single component of the mineral-extractive industry—excluding oil and gas—is the sand and gravel industry; over a dozen operations

are active statewide. Nationally, significant reserves of fluorite and asbestos have recently been discovered, and development is possible for both commodities. If Alaskan agriculture is to expand, the development of domestic lime and phosphate fertilizers may be necessary.

Sand and Gravel

Gravel is one of the most important commodities in Alaska, ranking third in value behind oil and gas. Since 1948, over 709 million tons of aggregate have been mined. Peak production occurred during military and pipeline construction periods (fig. 8).

More than 90 percent of total state production of sand and gravel is used in development of urban areas and in the Cook Inlet and North Slope petroleum

fields. In Anchorage, for example, a chronic shortage of gravel created by urban growth has necessitated importation of aggregate from the Matanuska Valley. Gravel-mine tailings from gold-dredging activities and modern flood-plain deposits are important local sources in the Fairbanks area.

Gravel deposits in Southcentral Alaska were deposited by melt-water streams on or adjacent to Pleistocene glaciers. In Interior Alaska, gravel deposits consist of ancient to modern river and stream deposits overlain by reworked and wind-blown silt.

Gravel is processed by washing and sizing for use as concrete aggregate, as road metal and petroleum-base paving, or as unprocessed fill and base material. Because gravel and sand are important building materials in urban areas, large amounts will continue to be mined. Additionally, proposed hydroelectric developments will require concrete aggregate for dam construction.

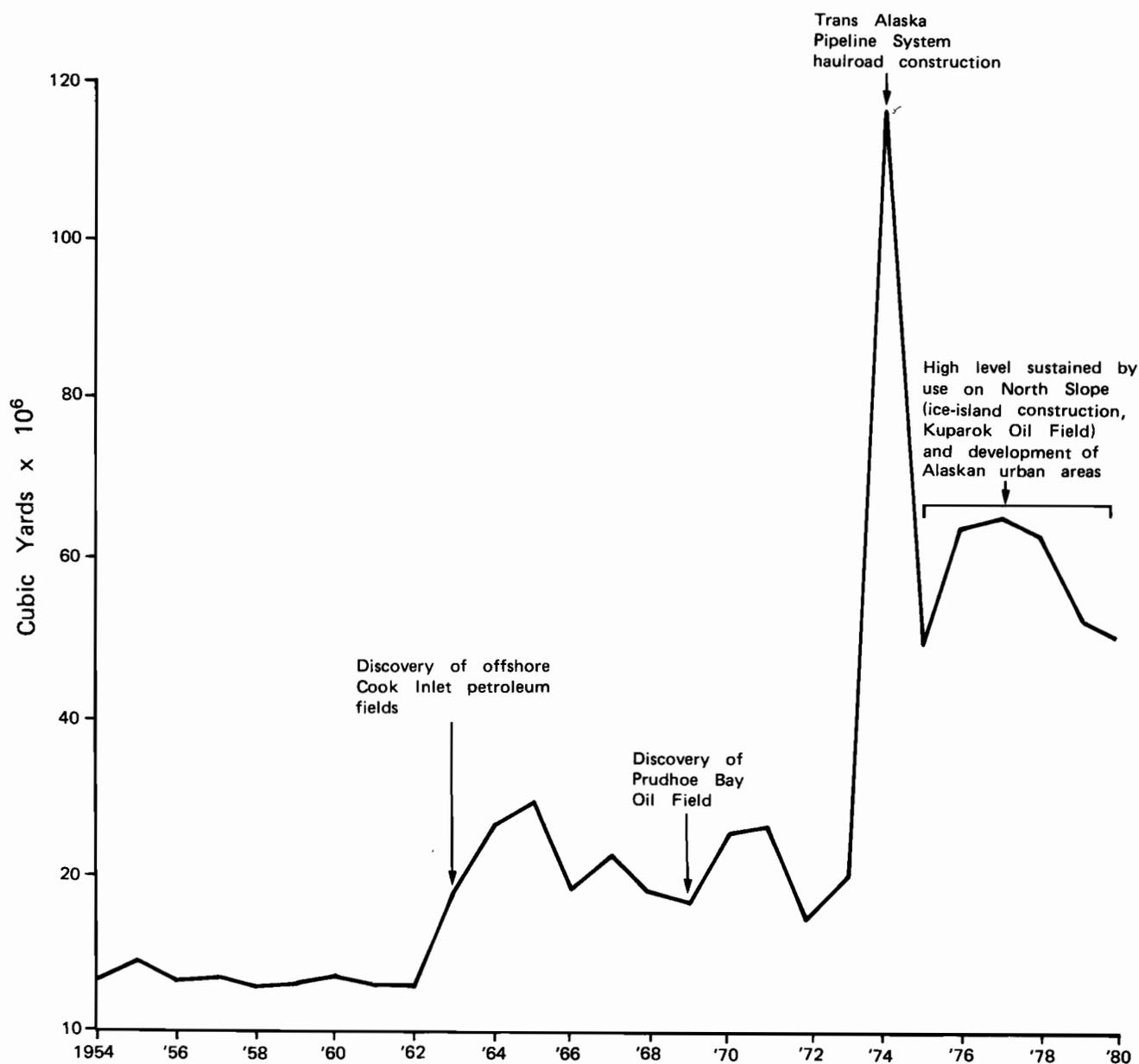


Figure 8. Gravel and sand production in Alaska, 1954-1980.

**BUILDINGS UTILIZING ORNAMENTAL MARBLE FROM SOUTHEAST ALASKA
(FROM BURCHARD, 1920)**

Seattle, Washington

Arctic Club
Hoge Building
Lyons Building
Haight Building
L.C. Smith Building
Bank of California Building
McCormick Hotel
King County Courthouse

Tacoma, Washington

National Realty Building
Perkins Building
Tacoma Building

Bellingham, Washington

United States Post Office

North Yakima, Washington

United States Post Office

Walla Walla, Washington

Walla Walla County Courthouse

Vancouver, B.C.

Pacific Building
Rogers Building

Victoria, B.C.

Sayward Building

Portland, Oregon

Spaulding Building
Wilcox Building
Yeon Building
Snelling Building
Littman-Wolfe Building
Oregon Journal Building
Multnomah Building
Stevens Building

The Dalles, Oregon

The Dalles County Courthouse

Oakland, California

Federal Realty Building
Bankers Investment Building
Realty Syndicate Building
Oakland Manual Training School
Harrison Hotel and Apartments

Sacramento, California

Capital National Bank Building
Forum Building
Travelers Hotel

Fresno, California

Griffith McKenzie Building
Rowell Building

Los Angeles, California

Black Building
Los Angeles Investment Building
Title Insurance and Trust Building
Van Nuys Building
Brockman Building
Community Mausoleum, Inglewood
Haas Building
Hollingworth Building
Merchants National Bank Building
Marsh-Strong Building
Southern Pacific Passenger Station

San Diego, California

Central Mortgage Building
Spreckels Theater
United States Post Office

Santa Rosa, California

Community Mausoleum

Presidio, California

United States General Hospital

Modesto, California

Community Mausoleum

San Francisco, California

Flatiron Building
Odd Fellows Building
Sharon Estate Building
Hobart Building

Moscow, Idaho

United States Post Office

Lewiston, Idaho

United States Post Office

Salt Lake City, Utah

Walker Building
National City Bank Building
Empress Theater
Newhouse Hotel

Ogden, Utah

Eccles Building

Honolulu, Hawaii

Pearl Harbor Naval Hospital

Boise, Idaho

State Capitol
Gem Building

Great Falls, Montana

Ford Commercial Building

Pittsburgh, Pennsylvania

City and County Building

Philadelphia, Pennsylvania

Finance Building

St. Paul, Minnesota

Great Northern Railway Building

Boston, Massachusetts

Orpheum Theater

Marble and Building Stone

Alaskan marble was used by the Tlingit Indians in Southeastern Alaska for carved utensils, art ornaments and religious objects. The Russians largely ignored this resource, but the potentially viable marble and limestone deposits on Prince of Wales Island were among the first mineral resources mentioned in late 19th-century reports of the U.S. Geological Survey.

Around 1900, rapid growth of urban areas along the west coast created a demand for ornamental and building stone. In 1902, shipments of high-quality ornamental marble commenced from quarries at

Token. By 1949, at least 2,150,000 tons of high-grade and 450,000 tons of structural-grade limestone were mined from a dozen quarries on Prince of Wales and Dall Islands; the principal workings remained in the Token-Calder area. Through 1920, over 72 buildings in Washington, Oregon, California, Idaho, Utah, Montana, Minnesota, Massachusetts, and Pennsylvania used Alaskan marble (principally from Token) for interior work. During and subsequent to World War II, inflation, changes in building style, marketing, exploitation of marbles in the western states, and other complex factors ended the Southeastern Alaska industry. Measured reserves of high-quality marble in Southeastern Alaska that should

warrant development amount to over 800 million tons (appendix K).

Small quantities of limestone have been quarried in other parts of the state. Marble was quarried by the U.S. Army Corps of Engineers at Gray Cliff, about two miles north of Seldovia, Alaska. The amount of rock quarried is unknown, but considerable quantities were used as riprap on a sea wall.

Limestone deposits suitable for use in cement manufacture have been investigated and drilled by the U.S. Bureau of Mines along the Alaska Railroad near Cantwell; several hundred million tons of reserves are known from three deposits. Such deposits may become important for large-scale hydroelectric power development. During the last several years, the Delta Barley Project has renewed interest in establishing domestic reserves of agricultural limestone and phosphate, and the search for deposits proximal to cheap transportation continues.

Basalt building and ornamental stone is mined statewide from 45 quarries (appendix J). One of the most successful has been the Yutan Construction basalt quarry near Fairbanks.

Barite

Barite ($BaSO_4$) has over 2,000 industrial uses, but more than 85 percent of world consumption is applied to oil well drilling and mud weighting properties, especially in hydrocarbon exploration efforts. Deposits of commercial significance occur in Southeastern Alaska, and minimal development of a lode on Prince of Wales Island resulted in a large 1915 bulk shipment that tested satisfactorily as a drilling agent. Since 1963, a lode cropping out in the Castle Islands near Petersburg has been exploited. Development initially took place onshore, but after 1967, mining has been offshore; the ore bodies were drilled, blasted, and excavated underwater with a barge-mounted "clam shell." Production reached highs of 100,000 tons annually in the 1960s but in 1974, a smaller tonnage of ore was processed and bagged as a drilling mud for Alaskan oil fields on the mine site. Chromalloy, the principal operator for the last decade, closed the operation in late 1980, and there has been no subsequent Alaskan barite production.

Pottery and Brick Quality Clays

Structural-grade clay deposits have been the subject of investigations in the Southcentral railbelt near Anchorage for many years. After World War II, Clay Products, Inc. established a kiln and brick plant in Anchorage utilizing the Bootlegger clay as their prime material source. Of the 200,000 bricks formed in the kiln, 25,000 were from clay mined at Sheep Mountain on the Glenn Highway. However, structural

imperfections such as exfoliation gave the company's bricks an inferior reputation and the project failed in late 1948. It is unclear whether the Bootlegger clay has unfavorable physical characteristics or if improper burning techniques caused the severe exfoliation in the product.

The feasibility of producing bricks, ceramic tile, sewer pipe, flue tile, and clay molding from clay horizons in the Healy coal field south of Fairbanks was tested by Sullivan (1978). A possible operation envisages the mining of clay under coal seams synchronously with coal mining. After preparation, Sullivan (1978) demonstrated that the clay fired adequately for structural-grade products. The primary constraint in exploitation of this resource is economics.

Present or projected consumption of brick and other clay products in the railbelt cannot sustain the Healy-based industry. Nevertheless, a future clay-based project seems possible in a state where bricks are imported at a minimum cost of \$150/ton.

Today Alaska's clay does not go unused, because the state's potters create functional containers and objects of beauty from clay deposits. One estimate places "wet clay" consumption in the Anchorage area at 150 tons annually. In the Fairbanks area, at least 20 studio and one production potter utilize roughly 40 tons of raw material a year. Appendix L summarizes the procedures used in this industry. Value of production is difficult to estimate because of the art value of the projects. Interior Alaska potters utilize montmorillonite and kaolinite from the coal-bearing section at Healy. Joe Usibelli of Usibelli Coal Mines has supplied carloads of clay for interior potters.

Beautiful porcelain containers have been created from kaolinitic clays near Tenderfoot, Alaska, but sample preparation time makes significant utilization of the resource prohibitive.

Gypsum

In 1902, the Pacific Coast Gypsum Company developed high-grade gypsum beds near Iyoukeen Cove on eastern Chichagof Island. By 1926, when the mines closed, over 500,000 tons of high-quality "blue" gypsum had been mined from folded and tilted beds of late Paleozoic age. During World War II, Kaiser Industries acquired the property for possible exploitation in war-industry construction, but the project did not develop beyond the initial feasibility study.

Asbestos

During World War II, the War Production Board declared chemical and friction grade asbestos fiber a

strategic mineral and recommended policies conducive to the development of domestic reserves. In 1942, bulk sampling of small, high-grade deposits of tremolite and chrysotile asbestos in the Kobuk Valley commenced, and by 1943 small shipments of selected ores were freighted to the coast via winter trails. One hundred thousand pounds of dominantly tremolite asbestos eventually found its way to a buyer. Indicated reserves of 2,600 tons of tremolite asbestos remain in the Kobuk deposits.

In 1980, Doyon Regional Corporation announced the discovery of a major asbestos deposit at Slate Creek in the Yukon-Tanana Upland southwest of Eagle, Alaska. According to drilling results (Rogers, 1980), indicated reserves amount to 55 million tons of 6.35 percent chrysotile fiber, making this one of the largest asbestos deposits in the United States. This deposit was discussed in the development section.

Other Industrial Minerals

From 1912 to 1920, high-quality almadine garnets were selectively mined from schist and migmatite near Wrangell, Alaska. E.S. Dana, the famous mineralogist, completed crystallographic studies on specimens from these deposits. In addition to their value as museum-quality specimens, the physical characteristics of hardness, specific gravity, and uniform and equidimensional fracturing make them suitable for high quality abrasive applications, which is what they were marketed for. Although over 11,000 tons of garnet are proven in the Wrangell deposits, there has been scant interest—except to the collector—in the resource. Even so, “Fort Wrangell” garnets are found on display in museums worldwide. Abrasive-quality garnets are

known in other regions of the state, particularly from placer deposits.

Zeolites, perlite, diatomaceous earth, sulfur, and pumice have been examined for production potential in Southcentral Alaska and on the Alaska Peninsula. Promising resources of these commodities are known, but only small amounts of pumice have been exploited for use in the Anchorage area.

The Future of Alaska's Industrial Minerals

Most industrial minerals are of low-unit value, and worth only a few tens of dollars per ton. Alaska's high-labor and operational costs make it difficult to envision exportation of these minerals to foreign or “lower 48” consumers. Exceptions include asbestos, fluorite (discussed in the section on strategic minerals) and possibly a limited market for abrasive quality garnet. In Southeast Alaska, shipping advantages may allow for exploitation of low-unit-value materials.

The primary importance of most of these commodities is in satisfying local needs. No matter how fast or slow Alaska grows, its people will need increasing amounts of these materials to sustain the in-state needs.

COAL

The Veechy expedition of 1826 and 1827 first reported the occurrence of coal in Alaska. Coal, oil shale, and crude-oil seeps were used when convenient in the Eskimo culture. During the early and latter parts of the 19th century, whaling ships used coal from Crown Bluff near Cape Beaufort. Thus, for over a century, intermittent coal mining has been conducted in Alaska.

The first coal mine in Alaska was opened by the Russians at Port Graham on the southwestern tip of the Kenai Peninsula, and operated from 1855 to 1867. Coal mining was carried on intermittently from 1880 to 1915 at places such as Unga Island, Harendeen Bay, Chignik Bay, Kachemak Bay and several points along the Yukon River.

In 1914, a coal-leasing law was passed, and the

bill authorizing construction of the Alaska Railroad became law. With these two developments, Alaska's coal industry began to expand.

When the Alaska Railroad extended into the Matanuska coal field in 1916, coal production in that area increased. By 1918, completion of the Alaska Railroad into the Nenana coal field supported coal production in that area. Production of coal in that field has been continuous to the present.

Coal production increased until 1953, when the oil and gas fields in Cook Inlet were developed. All coal mining was underground prior to 1943, but by the early 1960s, in order to reduce the cost of production, strip mining had taken over. Alaska coal production fluctuated until 1969-70, when demand for electrical power in the Fairbanks area caused



Waterfall coal seam, Beluga

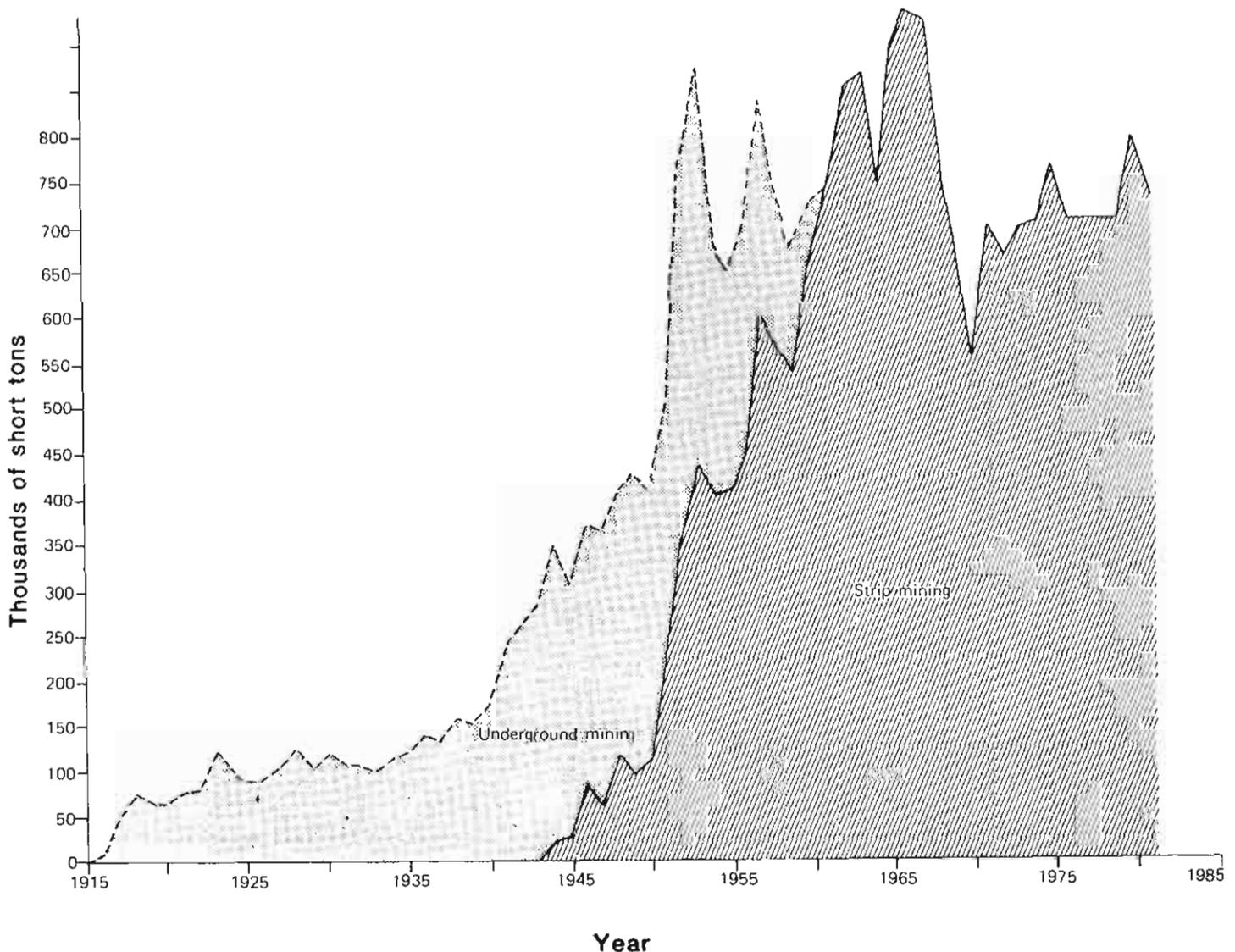


Figure 9. Coal production in Alaska, 1915-1981

an increase in coal production. Figure 9 summarizes Alaskan coal mining statistics.

Alaska's coal reserves and resources have been estimated to range from billions to trillions of tons. Regardless of which figures are used, Alaska's coal endowment is substantial. Data derived from tables presented by McGee and Emmel (1979) show that eight major Alaskan fields (fig. 10, table 9) contain 1.37 billion tons of proven reserves, 57.9 billion tons of indicated reserves, and 366 billion tons of hypothetical reserves. Conservative figures were used in all tabulations and several isolated fields were not added because of the lack of accurately measured sections. No attempt was made to differentiate coal qualities.

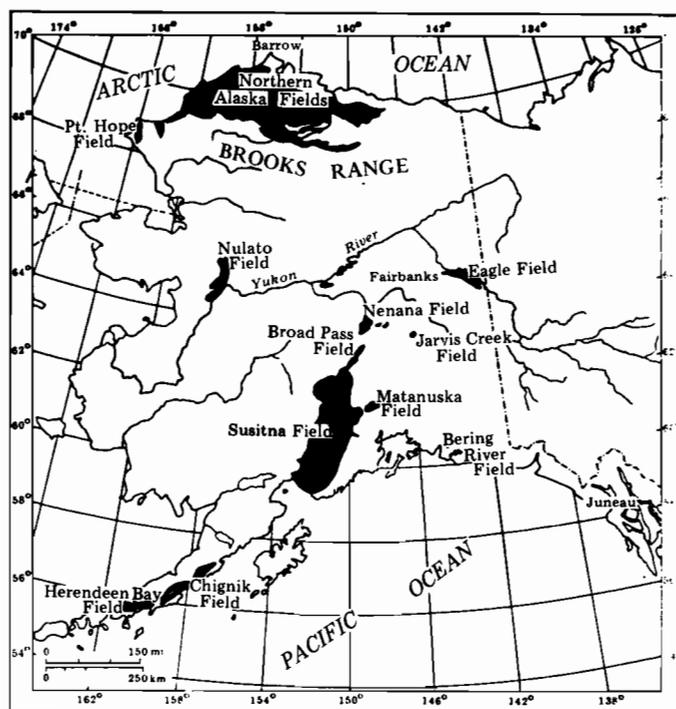


Figure 10. Location of major Alaskan coal fields.

TABLE 9
ALASKAN COAL RESERVES AND RESOURCES FROM EIGHT MAJOR
FIELDS IN MILLION OF TONS.
 (modified from McGee and Emmel, 1979)

	<u>Proven Reserves</u>	<u>Indicated Reserves</u>	<u>Hypothetical Reserves</u>
Northern fields	235	49,000—120,000	330,000
Nenana field	861.6	6,000	8,700
Jarvis Creek field	0.30	13—76	—
Susitna field	275	2,700—10,200	27,000
Matanuska field	6.6	108—130	149
Bering River field	—	—	36—1,000
Herendeen Bay field	—	10—100	300
Chignik field	—	100	300
TOTAL	1.37 billion	57.9 billion	366 billion

PEAT RESOURCE ESTIMATE

Alaska has a total area of approximately 365 million acres, much of which includes peat deposits. Estimates of potential fuel-grade peat in the state range from 27 million acres to over 100 million acres. A total of 741 quads (1 quad = 10^{15} Btu) of energy has been estimated as potentially available from peat resources in Alaska.

Utilizing soils maps of the Soil Conservation Service, Rawlinson and Hardy (1982) compiled data significantly at odds with previous estimates of peat resources in Alaska.

Early evaluations of Alaskan peatlands were conducted by Dachnowski-Stokes (1941). The U.S. Department of Energy (1979) estimated that 27 million acres of unfrozen peat representing 741 quads of energy, exist in Alaska; they assumed peat deposits with an average depth of 7 feet, a moisture content (when utilized) of 35 percent with a heating value of 6,000 Btu/pound, and a bulk density of 15 pound/foot. The 741 quads of energy represent 51 percent of the 1,443 quads of energy estimated by DOE as

potentially available from peat resources in the United States. Northern Technical Services and Ekono, Inc., (1980), in a report to the Alaska Division of Energy and Power Development, estimated potentially useful peat to exceed 100 million acres; 5.5 million acres of the Kenai Peninsula and Susitna Valley were reported to have high-probability areas of fuel peat.

Rawlinson and Hardy (1982) indicate approximately 25 million acres (pl. 4), of which 5 million acres are unfrozen fuel-grade peat (greater than 5 feet deep and 8,300 Btu/pound). Assuming a bulk density of 7 pounds per cubic feet, a depth of 5 feet, and a heating value of 8,300 Btu/pound, they estimate an energy value of approximately 63 quads for the unfrozen fuel-grade peat in Alaska, and speculate that if the frozen-peat deposits contain the same ratio of fuel-grade peat to peat as the unfrozen peat deposits, the total acres of fuel-grade peat will equal approximately 14 million, which represents a potential of 180 quads of energy.

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APPENDIX A

INFORMATION AND PERMITTING AGENCIES

Data-gathering groups

The U.S. Bureau of Mines and U.S. Geological Survey are the principal federal data-gathering agencies involved in mineral inventories. The former assesses mineral reserves and the latter deals in the broader concept of mineral resources. Both agencies provide geologic maps and prospect evaluations that aid in the recognition and development of the State's mineral resources.

The principal State data-gathering agency for minerals is the Alaska Division of Geological and Geophysical Surveys (DGGS), formerly the Territorial Department of Mines. Alaska Statute 41 defines the function of DGGS as "conducting geological and geophysical surveys to determine the potential of Alaska lands for production of minerals, fuels, and geothermal resources . . . and to locate supplies of ground water and construction materials . . ." Principal products of DGGS mineral inventories include 1:63,360-scale (or larger) geologic maps showing locations of known mineral deposits. Prospect examinations are sometimes made at the request of the private sector. The DGGS Geochemical Laboratory (Fairbanks) provides free assays and other services to the miner. DGGS also maintains mining-information offices and complete claim files in Ketchikan, Juneau, Anchorage, and Fairbanks.

Following statehood, DGGS published a comprehensive annual review of Alaska's mineral and energy resources; production and activity statistics were included. Because publication of this report was discontinued in 1975, a data gap exists from 1976 to 1982. This data gap was partially filled by the canvass surveys initiated by Eakins and Daniels (1980a,b) and by information provided by the U.S. Bureau of Mines. The DGGS quarterly publication entitled *Alaska Mines and Geology* also provides information about Alaskan mineral activities.

The University of Alaska Mineral Industry Research Laboratory (MIRL) undertakes metallurgical studies of mineral deposits and provides other professional consultation services to the industry. The University's Geology/Geophysics Program and the School of Mineral Engineering offer a variety of college-level courses in mining, mining engineering, and economic geology and a very popular short course that is taught statewide for Alaska's prospectors. The School of Mineral Industry and MIRL cosponsor an annual Placer Mining Conference; proceedings of this conference are published. Recently AEIDC published a seven-plate map in which Alaska's mineral resources are divided into commodity groupings and overlain by a township grid. This report is extensively utilized by agencies and private industry in legally locating deposits.

Permitting and regulations

As an individual familiar with Alaskan mineral resources knows, there is a complex maze of statutes that impact all aspects of exploration, development, and production. State agencies involved in regulatory functions on the public domain include the Department of Environment Conservation (DEC), the Division of Minerals and Energy Management (DMEM), and the Division of Land and Water Management (DLWM) (Appendix C). Federal-agency involvement is summarized in Appendix D.

To illustrate regulatory complexities, the State Attorney General's Office compiled a list of 54 laws and regulations that directly affect coal exploration, surface mining, and reclamation in Alaska (Appendix P).

Similar lists apply for other aspects that its management expends a burdensome amount of time ensuring that the mine is in compliance with various administrative codes.

Two guides to obtaining and holding mining claims or leases under Alaska statutes and regulations that are available from the Department of Natural Resources, Division of Land and Water Management include:

- * Regulations and statutes pertaining to mining rights on Alaskan lands as contained in Alaska Statutes and the Alaska Administrative Code.
- * State of Alaska mine-safety and conservation regulations from Alaska Administrative Codes, 11 AAC 44.011 - 46.550 (reprinted by DGGs, 1975).

DGGs also publishes Information Circular 14 which summarizes mining laws in Alaska; this pamphlet is updated periodically.

Unquestionably, the best information on administrative codes and statutes pertaining to mining in Alaska is the **Directory of Permits**, formerly printed by the State. The Printmore Corporation (920 E. Whitney Road, Anchorage 99501) presently distributes the volume on a subscription basis. Copies are available at a cost of \$45 per directory, and 4-year subscriptions are \$50. The latest edition uses a detailed cross-referencing scheme that includes a listing of necessary permits for specific types of projects. The directory is annually updated and new editions are published every five years. The Alaska Departments of Environmental Conservation and Commerce and Economic Development initially compiled the list of over 350 federal, state, and local permits reported in the document. In 1980, 1,500 copies were mailed to environmental groups, businesses, consultants, lawyers, and government agencies.

Permits and regulations related to placer mining are summarized in Appendix E, but these guides may not contain all listings necessary for legal compliance of a mineral development. A tri-agency permit that combines three forms (ADF&G, DEC, DNR) into a simplified two-page format is included in Appendix E.

APPENDIX B

PRIVATE GROUPS AFFECTING THE DEVELOPMENT OF MINING

NORTHWEST MINING ASSOCIATION

President - Keith Droste
633 Peyton Building
Spokane, Washington 99201
Puts out publications on mining activity in the Northwest

ALASKA MINERS ASSOCIATION

W. 509 Third Avenue, Suite 17
Anchorage, Alaska 99501
(907) 276-0347
President - Dave Heatwole
Secretary - Jean Majors
Membership - 1,500
Publications - Alaska Miner, published monthly.
Annual Meeting - Last weekend in October each year in Anchorage, Alaska.
Chief Interest: To foster within Alaska, the economic and political climate necessary to create and sustain a viable mining industry.

Anchorage Branch
E. 201 - 51st Avenue
Anchorage, Alaska 99503
Chairman - Paul Glavinovich

Nome Branch
Box 638
Nome, Alaska 99762
Chairman - Tom Frank

Fairbanks Branch
P.O. Box 81315
Fairbanks, Alaska 99708
Chairman - Donald Stein

Haines Branch
P.O. Box 222
Haines, Alaska 99708
Chairman - Merrill Palmer

Ketchikan Branch
P.O. Box 6305
Ketchikan, Alaska 99901
Chairman - Roger George

Sitka Branch
P.O. Box 2 55
Sitka, Alaska 99835
Chairman - Barton Southwick

Juneau Branch
192 Douglas Highway
Juneau, Alaska 99801
Chairman - Ray Renshaw

**AMERICAN INSTITUTE OF MINING, METALLURGICAL AND
PETROLEUM ENGINEERS (AIME)**

Caller Drive

Littleton, Colorado 81077

President - Alfred Weiss

Membership - 78,000.

Publications - Assorted texts available in the field listed under "Chief Interest," annually.
Mining Engineering, Journal of Metals, Iron, and Steelmakers Journal of Petroleum Technology, monthly.

Chief Interest: Exploration, extraction and refining of minerals - metallic and nonmetallic, metallurgy and materials science, iron and steel production, exploration and production of petroleum and natural gas.

AMERICAN MINING CONGRESS

1100 Ring Building

Washington, D.C. 20036

(202) 861-2800

President - J. Allen Overton, Jr.

Vice President - Keith R. Knoblock

Membership - 600 members, national.

Publications - Mining Congress Journal, monthly.

Chief Interest: National trade association representing the United States mining industry.

ALASKA NATIVE ORGANIZATIONS

(Most of the business dealings in land and resource matters the Alaska Native lands are handled at the regional level.)

ALASKA FEDERATION OF NATIVES

411 W. 4th Avenue, Suite 1A

Anchorage, Alaska 99501

(907) 274-3611

Cook Inlet Region, Inc.

P.O. Drawer 4-N

Anchorage, Alaska 99509

(907) 274-8638

AHTNA Minerals Corp.

Drawer G

Copper Center, Alaska 99573

(907) 822-3476

Doyon, Limited

First and Hall Street

Fairbanks, Alaska 99701

(907) 452-4755

Arctic Slope Regional Corporation

P.O. Box 129

Barrow, Alaska 99723

(907) 852-8633

Aleut Corporation

725 Christensen Drive

Anchorage, Alaska 99501

(907) 274-1506

Chugach Natives, Inc.

W. 903 Northern Lights Blvd. Ste. 201

Anchorage, Alaska 99503

(907) 276-1080

Bering Straits Native Corporation

P.O. Box 1008

Nome, Alaska 99762

(907) 443-5252

Bristol Bay Native Corporation
447 E. Fifth Avenue
Anchorage, Alaska 99501
(907) 278-3602

Calista Corporation
Anchorage Office
516 Denali Street
Anchorage, Alaska 99501
(907) 279-5516

Koniag, Inc.
P.O. Box 746
Kodiak, Alaska 99615
(907) 486-4147

NANA Regional Corporation, Inc.
NANA Building
P.O. Box 49
Kotzebue, Alaska 99752
(907) 442-3301

Sealaska Corporation
One Sealaska Plaza, Suite 200
Juneau, Alaska 99801
(907) 586-1512

APPENDIX C

STATE OF ALASKA AGENCIES AFFECTING MINING

- A. Department of Commerce and Economic Development
State Office Building, 9th Floor
Pouch D
Juneau, Alaska 99811
(907) 465-2500
Commissioner - Charles R. Webber

Function: To promote economic development in Alaska.

Divisions and offices:

1. Office of Mineral Development
675 7th Avenue, Station A
Fairbanks, Alaska 99701
(907) 452-7464
Director - John Sims

Function: An advocacy agency that provides a liaison between State Government and the private sector of the mining industry in Alaska. Provides assistance to the mining loan program; plays an active role in the development of mining in the State.

2. Alaska Transportation Commission
MacKay Building, 10th Floor
338 Denali Street
Anchorage, Alaska 99501
(907) 279-1451
Chairman/Commissioner - Keith Miller

3. Office of Special Industrial Projects
State Office Building, 9th Floor
Pouch D
Juneau, Alaska 99811
(907) 465-2018
Director - Richard H. Eakins

Function: To encourage private industry investment and expansion in Alaska.

4. Alaska Power Authority
334 W. 5th Avenue, 2nd Floor
Anchorage, Alaska 99501
(907) 277-7641
Director - Eric Yould

Function: to lower cost of power in Alaska; study feasibility of wind, hydro, and coal energy development.

5. Division of Energy and Power Development
MacKay Building, 7th Floor
338 Denali Street
Anchorage, Alaska 99501 /
(907) 276-0508
Director - Bill Beardsley

Function: To assist Alaskans meet their energy needs in the most efficient manner possible.

- B. Department of Environmental Conservation
3220 Hospital Drive
Pouch O
Juneau, Alaska 99811
(907) 465-2600
Commissioner - Ernst Mueller

Function: Habitat protection in salmon streams. A State game-refuge permit is required for any construction, exploration, or development work in a designated refuge. An applicant should submit plans for anticipated use.

- C. Department of Fish and Game
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4100
Commissioner - Ronald D. Skoog

Function: Sets regulations for water-quality standards in placer-mining areas and monitors these areas to see if the standards are being met.

Divisions:

- | | |
|---|--|
| <ol style="list-style-type: none">1. Habitat Protection
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4105
Director - E. Richard Logan | <ol style="list-style-type: none">4. Board of Fisheries and Game
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4110
Executive Director - M. C. Zahn |
| <ol style="list-style-type: none">2. Subsistence
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4147
Director - Dennis D. Kelso | <ol style="list-style-type: none">5. Commercial Fisheries
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4210
Director - Steven Pennoyer |
| <ol style="list-style-type: none">3. Public Communications
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4112
Chief - D. A. Moulton | <ol style="list-style-type: none">6. Fisheries Rehabilitation (FRED)
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4163 |

8. Game
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4190
Director - R. J. Somerville

9. Sport Fish
Capital Office Park
P.O. Box 3-2000
Juneau, Alaska 99802
(907) 465-4180

D. Department of Natural Resources
State Office Building, 11th Floor
Pouch M
Juneau, Alaska 99811
Commissioner - John W. Katz
Deputy Commissioner - Geoffrey Haynes

Divisions and offices:

1. Division of Geological and Geophysical Surveys (DGGs)
3001 Porcupine Drive
Anchorage, Alaska 99501
(907) 274-9681
State Geologist - Ross G. Schaff
Deputy State Geologist - Bill Barnwell (Anchorage)
Deputy State Geologist - Wyatt Gilbert (Fairbanks)

Function: Conducts geological studies statewide and inventories water, mineral, and energy resources. Maintains a file of all known mineral occurrences and prospects and of patented and unpatented claims staked in Alaska since 1953. Libraries of geological bulletins, other published reports, and periodicals are maintained. Conducts mineral analyses at DGGs research laboratory at the University of Alaska, Fairbanks.

DGGs Mining Information Offices located at:

794 University Avenue
P.O. Box 80007
College, Alaska 99708
(907) 474-7147

State Office Building, 11th Floor
Pouch M
Juneau, Alaska 99811
(907) 465-2414

3327 Fairbanks Street
Anchorage, Alaska 99503
(907) 279-7691

State Office Building, 2nd Floor
P.O. Box 2438
Ketchikan, Alaska 99801
(907) 225-4181

DGGS Mineral Laboratory and Assay Office
O'Neill Building, 2nd Floor
University of Alaska
P.O. Box 80007
College, Alaska 99708
(907) 474-7122

2. Division of Minerals and Energy Management (DMEM)
555 Cordova Street
Olympic Building
Pouch 7-005
Anchorage, Alaska 99510
(907) 276-2653
Director - Kay Brown
Deputy Director, Mining - David Hedderly-Smith

Function: State regulatory agency on mining claims and mineral (oil and coal) leases. Maintains a case file for each claim, which is available for public inspection at the division's office. It does not determine validity of claims or settle claim disputes.

3. Division of Land and Water Management
555 Cordova Street
Olympic Building
Pouch 7-005
Anchorage, Alaska 99510
(907) 276-2653
Director - J. W. Sedwick

Function: Manages State lands and determines their use. Maintains land-status maps. Issues leases on State leasable minerals such as coal. Regulates water use. Miscellaneous-use permit is required for use of explosives, hydraulic equipment, or heavy equipment drilling deeper than 300 feet in exploration.

Southeast District Land Office
Pouch M
Juneau, Alaska 99811
(907) 465-2415

Southcentral District Land Office
3327 Fairbanks Street
Anchorage, Alaska 99503
(907) 279-7696
Lawrence A. Dutton

Northcentral District Land Office
4420 Airport Way
Fairbanks, Alaska 99701
(907) 479-2243
Jerry Brossia

4. Division of Research and Development
555 Cordova Street
Pouch 7-005
Anchorage, Alaska 99510 /
(907) 276-2653
Director - Reed Stoops

Function: Conducts special studies, planning, and coordination on development and use of lands and natural resources.

5. Division of Forestry
555 Cordova Street
Pouch 7-005
Anchorage, Alaska 99510
(907) 276-2653
Director - Theodore Smith

Function: Regulates mining in State forests.

6. Commissioners Advisory Committee on Mining
c/o David Hedderly-Smith, Deputy Director
Division of Minerals and Energy Management
555 Cordova Street
Pouch 7-005
Anchorage, Alaska 99510

Function: Informal committee formed to help and advise the commissioner on mining activity in the State. Committee members include:

Commissioner John W. Katz
Director of the Office of Mineral Development, John Sims
AMA President, Dave Heatwole

7. Division of Technical Services
555 Cordova Street
Pouch 7-005
Anchorage, Alaska 99510
(907) 263-2200
Director - James Anderson

Function: Surveying State lands, compiling maps, conducting surveys of land characteristics for resources and uses.

E. Department of Community and Regional Affairs
Community Building, Room 215
Pouch B
Juneau, Alaska 99811
(907) 465-4700
Commissioner - Lee McAnerney

Division of Community Planning
225 Cordova, Building B
Anchorage, Alaska 99501
(907) 264-2255
Director - Lawrence H. Kimball, Jr.

Function: Administers and coordinates planning and development of communities.

F. Department of Health and Social Services
Alaska Office Building, Room 204
Pouch H-01
Juneau, Alaska 99811
(907) 465-3030
Commissioner - Helen D. Beirne

Function: Responsible for the provision of health care and social services.

G. Department of Revenue
State Office Building, 11th Floor
Pouch S
Juneau, Alaska 99811
(907) 465-2300
Commissioner - Thomas K. Williams

Function: Issues mining licenses and collects taxes on production.

H. Department of Labor
Sealaska Plaza, 3rd Floor
P.O. Box 1149
Juneau, Alaska 99811
(907) 465-2700
Commissioner - Edmund N. Orbeck

Division of Labor Standards and Safety
Sealaska Plaza, 3rd Floor
P.O. Box 630
Juneau, Alaska 99811
Director - Dale Cheek

I. University of Alaska
Fairbanks, Alaska 99701
(907) 474-7565

College of Environmental Sciences
Geology/Geophysics Program
Division of Geoscience (Bs., Ms., Ph.D.)
Department Head - Dr. Richard C. Allison

School of Mineral Industry
(907) 474-7366
Dean - Earl H. Beistline

Department of Mineral Engineering (Bs., Ms.)
Mining Engineering (Bs., Ms.)
Geological Engineering (Bs., Ms.)
Mineral Preparation Engineering (Ms.)
Petroleum Engineering Instruction
(907) 474-7388
Department Head - Dr. Chris A. Lambert

Arctic Environmental Information and Data Collection
Provides information and data dealing with the Arctic environment.
Director - David Hickok
707 A Street
Anchorage, Alaska 99501

Mineral Industries Research Laboratory
Laboratory and field-study reports are available for purchase.
General information concerning mining, tries to meet miners' needs and answer their questions.
Director - Earl H. Beistline
209 O'Neill Building
University of Alaska
Fairbanks, Alaska 99701

APPENDIX D

Federal agencies affecting mining

A. U.S. Department of the Interior

1. Bureau of Land Management (BLM)
State Director - Curtis McVee
Pouch 7-512
Anchorage, Alaska 99501

District Manager - Carl Johnson
Fort Wainwright
Fairbanks, Alaska 99701
(907) 356-2025

Function: Administers federal lands not otherwise designated. Records federal mining claims and annual assessment affidavits. Administers and records all leases on leasable minerals, i.e., oil, gas, and coal, phosphates, and oil shale. Arranges for sale of other than locatable and leasable minerals, i.e., sand, gravel, stone, etc. Issues right-of-way and special-use permits. Controls regulations to prevent surface damage. Maintains land-status plats and issues patents.

2. Outer Continental Shelf Office (OCS)
610 E. 10th Avenue
P.O. Box 1195
Anchorage, Alaska 99501
(907) 276-2955

Function: Oil and gas leasing on the outer continental shelf.

3. United States Geological Survey (USGS)
Chief - David Carneggie
218 East Street
Anchorage, Alaska 99501

Function: Concerned with physical resources, the configuration and character of the land surface, the composition and structure of the underlying rocks, and the quality, volume, and distribution of water and minerals.

4. Bureau of Mines (USBM)
Chief - John Mulligan
P.O. Box 550
Juneau, Alaska 99801
(907) 364-2111

Function: Research on mineral deposits and metallurgy. Handles data on minerals availability and has a record of mine names and locations of both past and present mines. Has a mine-map repository.

5. National Park Service
Pouch 7-512
Anchorage, Alaska 99501
Director - John Cook
Chief - Lands and Mining - Richard Stenmark

Function: Administers lands under jurisdiction of the National Park Service in Alaska; includes active mining districts in the Kantishna Hills, Wrangell Mountains, and other areas. Ensures compliance with laws in D-2 Lands Resolution.

B. U.S. Department of Labor

1. Mine Safety and Health Administration (MSHA)
117 107th Avenue N.E.
Bellevue, Washington 98004
(206) 442-5455
Director - Ken Russell

Function: Mine health, safety administration for mines other than coal. Conducts training and safety classes for federal and state mine inspectors and mining personnel. Research in mine safety. (There is no mine-safety inspector in Alaska. Periodically an inspector from Washington State inspects and enforces safety rules and regulations.)

2. Mine Safety and Health Administration
P.O. Box 25367
Denver Federal Center
Denver, Colorado 80225
Regional Manager - John Martin

Function: Mine safety and health administration for coal mines. The duties are the same as for mines other than coal, with additional responsibility in certifying permissible equipment for use in coal mines, dust inspection; cooperates with State mine inspectors who certify foremen and other coal workers. Mine inspectors come to Alaska from Price, Utah or Denver, Colorado.

C. U.S. Department of Agriculture

1. U.S. National Forest Service (USFS)
Federal Building
P.O. Box 1682
Juneau, Alaska 99802
Regional Forester - John Sandor

Function: Provides mineral-material permits for mining and prospecting in national forests. Because the USFS has responsibility for management and protection of surface resources, an "Intent to Operate" or a "Plan of Operations" must be completed in cases where substantial surface disturbances may occur.

2. Institute of Northern Forestry

Northern Forestry Research
308 Tanana Drive
Fairbanks, Alaska 99701
Director - C. Ted Dryness

Tongass National Forest
P.O. Box 1620
Juneau, Alaska 99801

D. U.S. Department of Environmental Protection (EPA)

Federal Building
Alaska Operations Office
701 C Street
Box 19
Anchorage, Alaska 99513
(907) 271-5083
Director - W. James Sweeney

1200 6th Avenue
Park Place Building
Seattle, Washington
Regional Administrator - John Spence

Function: Regulates effluent discharges and air quality. Issues general permits to placer miners.

E. Department of Defense

U.S. Army Corps of Engineers
Regulatory Functions Branch
Geology and Exploration Section - Peter Williamson
P.O. Box 7002
Anchorage, Alaska 99510
Chief - Colonel Lee R. Nunn

Function: Regulates discharge of dredge or fill material into U.S. Navigable waters. Issues Department of the Army permits. Reviews defense requirements for fuel, including certification of coal mines.

APPENDIX E

State and federal placer-mining-permit requirements

State placer permits (from Alaska Miner, Nov. 1980)

Listed here are all the State and federal requirements that may be needed for a placer mining operation. Not all of them are needed for every operation, however; Section A lists the State certificates that are required for all operations. Section B describes the State permits that might be required, depending on the size, type and location of the mining operation. Section C lists the federal certificates on the characteristics of the operation.

A. STATE REQUIREMENTS FOR ALL OPERATIONS

There are three forms that must be submitted for all placer mining operations every year, whether the mining is done on State land or federal land.

1. Alaska mining license.
(a) Required for anyone engaged in mining activities in Alaska; (b) the form can be obtained from the Department of Revenue, Pouch SA, Juneau, Alaska 99811; (c) issued for one year; (d) no fee; (e) if the form is complete, the license will be issued within one week.
2. Affidavit of Annual Labor Performed.
(a) Required to keep a mining claim valid. It gives proof that at least \$200 of improvement work was done on the claim during the previous year; (b) the form can be obtained from the Division of Minerals and Energy Management (DMEM), 703 W. Northern Lights, Anchorage, Alaska 99501; (c) issued for one year; (d) no fee is required by DMEM, but the State Recorder's Office charges a recording fee of \$8.00 for the first page and \$3.00 for each additional page; (e) the completed form must be taken to the State Recorder's Office for recording and then to DMEM for filing.
3. Triagency permit.
(a) One form applies for a Fish Protection Permit from Department of Fish and Game; a Wastewater Disposal Permit from Department of Environmental Conservation; and a Miscellaneous Land Use Permit and

a Water Rights Permit, both from Department of Natural Resources; (b) the form can be obtained from DMEM; (c) the application must be submitted once each year; (d) \$25.00 fee; (e) there used to be four different application forms to fill out and four different offices for a miner to go to. Now this one form, submitted to one office, applies to all four permits. You will still receive four separate permits.

B. STATE PERMITS THAT MAY BE REQUIRED

Depending on the size, type and location of the mining operation, one or more of the following permits may also be required by the State.

1. Discharge to Navigable Water certificate.
(a) Required for any discharge to navigable waters; (b) the form is available from Department of Environmental Conservation (DEC), Pouch O, Juneau, Alaska 99811; (c) issued for a maximum of five years; (d) no fee.
2. Solid-Waste Disposal permit.
(a) Required for disposal of all unwanted or discarded solid waste or hazardous material; (b) the form can be obtained from DEC, Pouch O, Juneau, Alaska 99811; (c) issued for a maximum of five years; (d) no fee.
3. Special Land Use permit.
(a) Required to place temporary improvements or equipment on special State-owned land. This permit is needed instead of the Miscellaneous Land Use Permit if the special land designation was made before the permit application; (b) the form is available from Division of Forest, Land and Water Management (DFLWM), 323 E. 4th, Anchorage, Alaska 99501; (c) issued for a maximum of five years; (d) \$10,000 fee; (e) this permit is issued at the discretion of the director of the DLFWM.
4. Tideland permit.
(a) Required for any temporary, short-term use of State owned tidelands or submerged lands; (b) the form is avail-

able from DFLWM; (c) issued for a maximum of five years; (d) \$20.00 fee; (e) this permit is used, when needed, in place of the Miscellaneous Land Use Permit and the Special Land Use Permit.

5. Offshore Locatable-Mineral Prospecting Permit.

(a) Required when prospecting for offshore locatable minerals on State land; (b) the form is available from the Department of Natural Resources, Pouch M, Juneau, Alaska 99811; (c) issued for a ten year period, not renewable; (d) \$20.00 fee.

C. FEDERAL PERMITS THAT MAY BE REQUIRED

The federal government also requires one or more permits, depending on the size, type, and location of the mining operation. Note: the NPDES permit (below) is required for all placer operations.

1. National Pollutant Discharge Elimination System (NPDES) permit.

(a) Required of all mining operations that discharge wastes into a waterway; (b) the form may be obtained from the U.S. Environmental Protection Agency (EPA), 701 C Street, Box 19, Anchorage, Alaska 99513; the State triagency form satisfies some of the information requirements; (c) issued for a maximum of five years. Apply 180 days before beginning to discharge; (d) no fee.

2. Dredge-and-Fill Disposal permit.

(a) Required to discharge dredged or fill material to U.S. waters or wetlands; (b) the form may be obtained from the Army Corps of Engineers, P.O. Box 7002, Anchorage, Alaska 99510; (c) issued for three years; (d) \$100,000 fee for commercial use; \$10.00 fee for noncommercial use.

3. Prospecting permit.

(a) Required to prospect on and explore specific federal lands; (b) the form is available from the Bureau of Land Management (BLM), Pouch 7-512, Anchorage, Alaska 99510; (c) issued for two years; (d) \$10.00 fee, plus 25 cents per acre but not less than \$20.00.

4. Recording of Mining Claims.

(a) Required of all holders of unpatented claims on federal land; (b) there is no specific form. Contact the BLM; (c) The recording is needed once only, but evidence of assessment work must be filed annually; (d) \$5.00 per claim.

5. Oil Spill Prevention, Control and Countermeasures (SPCC) plans.

(a) Required if above-ground storage of fuel will be provided for as much as 660 gallons in a single tank or 1,320 gallons in more than one tank; (b) no specific form. Contact the EPA; (c) the plan must be developed within six months after operation begins; (d) no fee.

6. Upland locatable mineral rights.

(a) To obtain rights to locatable minerals on State uplands, you must stake a prospecting site or mining claim and file a Location Notice with the District Recorder's Office in the area in which the site or claim is located and with DMEM; (b) the Location Notice form is available from a stationery store; (c) expires on September 1 of each year; (d) no fee.



STATE OF ALASKA
ANNUAL PLACER MINING APPLICATION
LAND USE AND WATER USE PERMITS AND MINING LICENSE

GENERAL INFORMATION

1. For most exploration and mining operations, the completion of this form should satisfy the application requirements for the following permits:
Wastewater Discharge Permit - Issued by the Department of Environmental Conservation
Habitat Protection Permit - Issued by the Department of Fish & Game
Miscellaneous Land Use Permit - Issued by the Department of Natural Resources
Water Use Permit - Issued by the Department of Natural Resources
Alaska Mining License - Issued by the Department of Revenue
This form also will be accepted by Federal Agencies for the following requirements:
Annual Notice or Plan of Operation - For the U.S. Bureau of Land Management
Annual Plan of Operation - For the U. S. Environmental Protection Agency
Notice of intent and Plan of Operation - For the U.S. Forest Service
If more detailed information is required, you will be contacted by the appropriate agency.
2. Applications should be submitted annually before February 15th to assure the issuance of permits before operations in the field begin. Under Alaska Statutes 16.05.870, Fish and Game, 46.03.100, Environmental Conservation, and 46.15.040, Natural Resources, only permitted operators should be working in the field.
3. The permits which are issued will authorize the work described in this application. Changes in your operation will require another application to describe the operation and may result in amended permits.
4. This application does not serve as the application for other permits which may be needed for your operation.
5. If you do not intend to perform exploration or mining work at the claim or transport equipment to the claim do not file this application.
6. If mining operations or access to the claims cross state park lands, please contact the Department of Natural Resources, Division of Parks, 619 Warehouse Avenue, Suite 210, Anchorage, Alaska 99501; Telephone 274-4676.
7. For lode mining, contact one of the offices listed below for appropriate forms. DO NOT USE THIS FORM.

INSTRUCTIONS

1. Please type or print responses in ink. Answers to all of the questions are necessary to expedite processing of your permits. If a question does not apply to your operation, indicate with N/A.
2. If space provided on the form is not enough for your written response, please use an additional sheet of paper. Identify this sheet as part of the application by putting your name and the 5 digit application number on the top of the sheet. (Additional space may be needed for listing claim names, ADL or BLM serial numbers.)
3. With this application form, attach a copy of the appropriate USGS 1:63360 Map. Please identify this map as part of your application by putting your name and the 5 digit application number on the top of the map.
4. On the USGS Map please provide the following information:
 - (a) The Claim name and the ADL or BLM serial number for all claims in this claim group. Each claim will be specifically named on the water permit or certificate so it is important that the list is complete.
 - (b) The location of all claims
 - (c) The identification of those claims which will be worked this year
 - (d) The location of your camp
 - (e) The location of the access routes to your claims
 - (f) The types of heavy equipment taken to the claims by cross country access routes
5. Please submit this application, as well as attachments, to the office of the Department of Natural Resources nearest to the claim.

SUBMIT COMPLETED APPLICATION TO THE OFFICE OF THE DEPARTMENT OF NATURAL RESOURCES, DIVISION OF LAND AND WATER MANAGEMENT, WHICH IS NEAREST TO THE CLAIM.

Southcentral District Office
323 East 4th
Pouch 7-005
Anchorage, Alaska 99510
Telephone: 276-2653

Northcentral District Office
4420 Airport Way
Fairbanks, Alaska 99701
Telephone: 479-2243

Southeastern District Office
230 South Franklin, Room 407
Juneau, Alaska 99801
Telephone: 465-3400

STATE OF ALASKA
ANNUAL PLACER MINING APPLICATION
LAND USE AND WATER USE PERMITS AND MINING LICENSE

APPLICANT AND SITE INFORMATION

DO NOT MARK IN THIS SPACE

Do you plan to do the following work on the claim(s)?

- Explore Mine Transport Equipment

Are the mining claims:

- Federal State

Check box(es) and list number(s) if you have had any of the following permits for these claims:

- DNR Land Use Permit No.:
- Fish & Game - Habitat Protection Permit No.:
- DNR - Water Use Permit ADL No.:
- DEC - Wastewater Discharge Permit No.:
- Revenue - Alaska Mining License No.:
- EPA-NPDES Wastewater Discharge Permit No.:

Check the mining district in which the claims are located:

- Fairbanks
 Seward Peninsula
 Circle
 Kuskokwim
 Iditarod
 Innoko
 Forty Mile
 Hot Springs
 Koyukuk-Chandalar
 Other (Specify):

Check the box to indicate who controls the land on which the claim(s) are located and which is crossed for access:

- U.S. National Park Service
 U.S. Military
 U.S. Forest Service
 U.S. Bureau of Land Management
 U.S. Fish & Wildlife Service
- State of Alaska
- City (Specify):
- Borough (Specify):
- Native Corporation (Specify):
- Other (Specify):

Claim Owner's Full Legal Name		Street Address or P.O. Box		
City	State	Zip Code	Home Telephone	Office Telephone
Name of Lease Holder (if rights to claim are leased)		Street Address or P.O. Box		
City	State	Zip Code	Home Telephone	Office Telephone
Name of Operating Company or Authorized Representative in Field		Street Address or P.O. Box (Specify if Summer Address is different from Winter)		
City	State	Zip Code	Home Telephone	Office Telephone
Employer I.D./Social Security Number	Month Start Up This Year	Month Shut Down This Year	Number of People Working Claim	
On what creek(s) are your claim(s) located?		Claim(s) Location: Section(s), Township(s), Range(s), Meridian:		

DESCRIPTION OF OPERATION

List type, size, purpose and number of pieces of equipment to be used on the claim.		
Which equipment listed above is used for the removal of overburden?		
Which equipment listed above will be used in the stream?		
Beginning and ending dates for transportation of equipment across country TO a claim:	If using a hydraulic giant, list nozzle size, number of nozzles, feet of head and total amount of water CFS or GPD:	
Beginning and ending dates for transportation of equipment across country FROM a claim:		
List type and amount of explosives to be used:	If explosives will be used in or near streams or other bodies of water, indicate when, where and why they will be used:	
Type of overburden: (O.K. to check more than one)	Depth of Overburden	Amount of Overburden to be removed:
<input type="checkbox"/> Rock <input type="checkbox"/> Sand <input type="checkbox"/> Silt <input type="checkbox"/> Clay <input type="checkbox"/> Organic Material <input type="checkbox"/> Other (Specify):		Number of acres: Average depth in feet:

PLACER MINING METHOD	
Check method of mining and processing: (O.K. to check more than one.)	
<input type="checkbox"/> Suction Dredge	Intake Size _____ (in.) Pump Capacity _____ (GPM)
<input type="checkbox"/> Sluice Pump	Intake Size _____ (in.) Pump Capacity _____ (GPM)
<input type="checkbox"/> Bucket Line Dredge	Size of Buckets _____ (cu. ft.)
<input type="checkbox"/> Washing Plant	Type _____ Vol. Material Processed/hr. _____ (cu. yd.)
<input type="checkbox"/> Sluice Box	Length _____ (ft.) Width _____ (in.) Depth of Water in Box _____ (in.) Slope _____ (in./ft.)
<input type="checkbox"/> Chemical Treatment	<input type="checkbox"/> Mercury <input type="checkbox"/> Cyanide <input type="checkbox"/> Other Describe process on a separate sheet.
Daily Volume of Material Processed: _____ (cu. yds.)	

WATER USAGE		
What % of a natural stream is diverted for any reason: _____ %	What % of diverted water is used for mining: _____ %	Of water used for mining what % is recycled: _____ %
Amt. of water required: Qty: <input type="checkbox"/> GPM <input type="checkbox"/> GPD <input type="checkbox"/> CFS	Usage: Hours/Day	Usage: Days/Week
Date commenced operations: Month _____ Year _____	Years needed to mine out claim: _____	
If water is not used for mining, is it routed around the treatment pond? <input type="checkbox"/> YES <input type="checkbox"/> NO	When wastewater is returned to a stream, is it treated? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Condition of stream above claim, prior to discharge of wastewater: <input type="checkbox"/> Clear <input type="checkbox"/> Murky <input type="checkbox"/> Muddy		
If "muddy", is it: <input type="checkbox"/> Natural <input type="checkbox"/> Manmade <input type="checkbox"/> Other: (Describe) _____		
Method of taking water: <input type="checkbox"/> Diversion Ditch <input type="checkbox"/> Headgate <input type="checkbox"/> Pump: Intake size _____ (in.)		

WATER SUPPLY	
Type of Dam (Exclude settling ponds):	
<input type="checkbox"/> Earthfill	<input type="checkbox"/> Timbercrib <input type="checkbox"/> Concrete <input type="checkbox"/> Other: _____
<input type="checkbox"/> Temporary	<input type="checkbox"/> On-stream
<input type="checkbox"/> Permanent	<input type="checkbox"/> Off-stream
Size of Dam	
Length _____	Width at Crest _____ Width at Base _____ Height _____
Storage Capacity: (Indicate Length and Width of Area and Depth of Water)	
Spillway Capacity: (CFS)	

WASTE WATER TREATMENT	
Capacity of Settling Pond(s): Indicate length and width of area and depth of water for each pond.	
1. _____	2. _____
3. _____	4. _____

FUEL	
Fuel Stored: (List type of fuel)	
Amount of fuel stored:	Distance from stored fuel to nearest body of water:
Method of transporting fuel:	Amount of fuel transported per trip:

ACCESS	
If access roads will be built to the claim, indicate:	
Length _____ (ft.)	Depth of Material _____ (ft.)
Width _____ (ft.)	Kind of Material Used _____

RECLAMATION	
Indicate method of reclaiming area of operation. (O.K. to check more than one)	
<input type="checkbox"/> Level tailings piles	<input type="checkbox"/> Reestablish stream channels
<input type="checkbox"/> Regrade contours	<input type="checkbox"/> Remove toxic materials
<input type="checkbox"/> Respread topsoil	<input type="checkbox"/> Other: (Specify) _____
<input type="checkbox"/> Revegetate or reseed	

DRILLING	
Estimated maximum depth: _____ (ft.)	Number of holes drilled: _____
Diameter of holes drilled: _____ (in.)	Type of drill used: _____

Signature of Applicant _____	Relationship to Claim(s): <input type="checkbox"/> Owner <input type="checkbox"/> Leasee <input type="checkbox"/> Operator	Date _____
------------------------------	--	------------

CLAIM LISTING					
Please list all claim names within this claim group. Each claim will be specifically named on your water permit or certificate. You may use the number of each claim on your sketch and USGS map for convenience.					
No.	CLAIM NAME	ADL/BLM No. if known	No.	CLAIM NAME	ADL/BLM No. if known
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

SKETCH SHEET In the area below sketch the area of operation; locate and label the following information.

- | | |
|--|---|
| 1. Camp site including all buildings and structures used for housing, operations, and storage. | 9. Settling ponds and water supply reservoirs. |
| 2. Access routes within area of claim(s). | 10. Where water is used. |
| 3. Natural waterways within claim(s). | 11. Sluice. |
| 4. Name of creek. | 12. Area to be mined this year. |
| 5. Water source. | 13. Overburden disposal site. |
| 6. Any stream diversion. | 14. Tailing disposal site. |
| 7. Point of withdrawal of water. | 15. Other disposal sites. (Solid waste or hazardous materials or sanitary waste.) |
| 8. Water ditches, pipelines, pumpsites, and discharge points. | 16. Fuel storage site. |

Name of USGS Map(s) Used:

SCALE: 1" = ¼ Mile

APPENDIX F
Major active claim blocks and development projects(*)

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
1	POINT HOPE	Jack Claims	548	F	lode	General Crude Oil
2	DE LONG MTNS.	Red Dog Area	4,832	F		Cominco
2	DE LONG MTNS.	BJ, Lina, Lisa, Phys	3,255	F&S		General Crude Oil
3	NOATAK	Ore (and others)	1,691	F	Pb, Zn, Cu, lode	Cominco
3	NOATAK	Katyaak	32		lode	Bear Creek Mining
3	NOATAK	Rat, Curse, Kik, Grey, Sot (and others)	2,109	S		General Crude Oil
4	NOATAK	Log	78	F	lode	General Crude Oil
5	AMBLER RIVER/SURVEY PASS	Smucker (and others)	1,246	F&S	lode	Anaconda
5	AMBLER RIVER/SURVEY PASS	Sunshine Creek (and others)	738	F	Cu, Au, Pb, lode	Bear Creek Mining
5	AMBLER RIVER/SURVEY PASS	Nora, Panda (and others)	704	F&S	lode	General Crude Oil
5	AMBLER RIVER/SURVEY PASS	Jade Queen	23	F	Jade, Asbestos	Nana Regional Corp.
5	AMBLER RIVER/SURVEY PASS	Lisa, Lin (and others)	1,051	F	lode	Noranda Exploration
5	AMBLER RIVER/SURVEY PASS	Ambler (and others)	349	F&S	lode	Sunshine Mining Co.
*5b	HUGHES	Hog River Area	60 + Ptd.	F	Au	Alaska Gold Co.
6	WISEMAN	Skroo	191	S		Anaconda
6	WISEMAN	ABO, Frog	339	S	lode	General Crude Oil

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
7	WISEMAN	Ipnek (and others)	131	F	placer	Maple Leaf Gold, Inc.
7	WISEMAN	White Dove, Bonanza	130	F	placer	J. D. Knight
7	WISEMAN	Sourdough	112		placer	B. Rathke, L. Collins
8	WISEMAN	New Hope Association Middle Fork Disc.	55	F	Au	A. Miscovich
9	CHANDALAR	Crown Claims	62		Au	Ottawa Mining & Minerals
10	CHANDALAR	Mowgli (and others)	265	F		Placid Oil
*10b	CHANDALAR	Cosine No.'s 1-2	2 + Ptd.	F	Au	Little Squaw Gold Mining Co.
11	PHILLIP SMITH MTNS.	Occasional, Beaucoup, Hungry	20			Placid Oil
12	BETTLES	Sharon Beauty 1-61	61		placer	S. Hatler, S. Silva
13	TELLER	Fox	240			Anaconda
14	TELLER	Horn, Boo, Foil, Can, Marc	762	S	lode	Anaconda
14	TELLER	Lynn 1-21	21		lode	Hunt Oil Co.
14	TELLER	Tin	54	S	lode	C. L. Sainsbury
14	TELLER	Tin Cup, Brass Cup	82	S	lode	Texas Gulf Inc.
14	BENDEL BEN	MFD	162	F	lode	Res. Assoc. of AK.
15	BENDLE BEN	Below Henry Creek	134	F	Au	Tweet & Sons
15	BENDLE BEN	PCA	548			Greatland Exploration

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
16	BENDLEBEN	Gayle	61	S	lode	Anaconda
16	BENDLEBEN	Confederate, Alpha, Pacer, Zebra	68	S		Gem Exploration Company
17	BENDLEBEN	BCU, GPB	397	F	lode	Greatland Exploration
17	BENDLEBEN	Sunshine, Catherine, Edith	84	F	Cu, Ag, Au	Helen Carlson
18	BENDLEBEN	Tiaga (and others)	1,536	S	lode	Greatland Exploration, Res. Assoc. of AK.
18	BENDLEBEN	LAVA, MMB	201	F	lode	Houston Oils & Min., Res. Assoc. of AK.
18	BENDLEBEN	Billiken, Jishaku	130	F		Placid Oil
19	CANDLE	Mud Creek (and others)	54	F	Au	Mud Creek Mining Co.
20	CANDLE	Winner Assoc. (and others)	94	F	Au	Tundra Explorations
20	CANDLE	Bod, Tris, GLX, Gin, DRN	215			Greatland Exploration
20	CANDLE	BM	100		lode	Houston Oil, Res. Assoc. of AK.
21	NOME	B. C. Discovery	107			C. Volkheimer (and others)
22	NOME	H. Rock Creek, Quint	58		placer	D. H. Hale

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
23	SOLOMON	Discovery Solomon (and others)	58		Au	J. Slager
23	SOLOMON	W. W. Bench (and others)	90		Au, W	C. Glass, G. Bowlin
24	SOLOMON	Bethel (and others)	377	F	Au, lode	Omega Energy Co.
25	NORTON BAY	Hopeful	92		Au	P. Bliss
26	NULATO	Okie (and others)	462			Anaconda
27	NULATO	Yuki	59		lode	C. C. Hawley & Assoc.
28	RUBY	Discovery (and others)	229		Au, Ag, Sn	Res. Assoc. of AK.
28	RUBY	Poorman Assn. (and others)	53		Au, Sn	Miscovich Bros Mining Co.
29	MELOZITNA	Sheri	84		lode	Cotter Corp.
30	MELOZITNA	MC, LM	142		lode	Res. Assoc. of AK., Houston Oil
30	TANANA	Discovery	84		Sn, Au	Haggland, Jr., (and others)
30	TANANA	Golden Eagle	309	S		W. & E. Gibson
31	TANANA	TOF	122		lode	Res. Assoc. of AK.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
31	TANANA	Boulder Creek Taxi (and others)	100	S		Boulder Creek Mining
32	KANTISHNA RIVER	Sis	98	F	lode	Exxon
33	KANTISHNA RIVER	Golden Spike, Good Hope	194		Au, placer	Cripple Creek Mining; R. Sumer
33	KANTISHNA RIVER	Jubilee	69	S		J. Hook, C. Woodruff
34	LIVENGOOD	Rainbow	67			P. Vadis
*35	LIVENGOOD	Livengood Bench	160	F	Au, placer	Livengood Joint Ventures (LJV)
36	LIVENGOOD	Udall, Mo	170	F	lode	Anaconda
36	LIVENGOOD	Bee Group, Y, Chee	262	F	lode	Mapco
37	LIVENGOOD	Little Jim, West Ridge	151	S	Au, Sb, Ag, Pb	Mohawk Resources Alaska, Inc.
37	LIVENGOOD	Wolfe, Grace, Eva, Fairbanks	8	F	Au	Placid Oil
37	LIVENGOOD	Silver Starlight (and others)	48	F	Au?, Sb?, W, Pb	J. Lundgren
37	LIVENGOOD	VM, Ginger, Alder, Walnut	157	F	lode	A. & R. Vetter, H. McKibben
38	FAIRBANKS	B. E. (and others)		F	Au	B. Blair
38	FAIRBANKS	U.G., A.B.	28	S	lode	Urangesellschaft USA
38	FAIRBANKS	Cod	4	S	lode	General Crude Oil

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
*39	FAIRBANKS	Grant Mine	21	F&S	Au	R. Burgaff, Tricon Paul Barelka, Silverado Mines, Ltd. Res. Assoc. of AK.
39	FAIRBANKS	Golden United Claims	120			
39	FAIRBANKS	Gil	99		lode, placer	
40	CIRCLE	Champ	43	F	U lode	Houston Oil & Min., Res. Assoc. of AK.
40	CIRCLE	Free, Free-b, Oh	759	F	U lode	MAPCO
40	CIRCLE	Melart	76	F	lode	F. Lardru (Melart)
40	CIRCLE	Bear (and others)	53	F	Au, placer	Emerson Exploration (and others)
<i>b/L</i> 41	CIRCLE	Kathy, E, C & J	50	F	Au	C&J Mining Co.
41	CIRCLE	P.C.	51	F	Au, placer	Golden Ram Mining
41	CIRCLE	Munson Creek Assn. (and others)	151	F	Au, placer	Executive Prof. Investors Capital Corp.
41	CIRCLE	Harrington, Era	28	S	Au, placer	F. Wilkinson, J. Ackels
42	CIRCLE	Shane, Janet, Pudding	60	F	Au	Ventures North Mining Co.
42	CIRCLE	KET	55	F	lode	Houston Oil & Min.
43	CIRCLE	Evergreen	131		placer	R. B. J. Mining, Inc.
43	CIRCLE	Ohio Creek (and others)	87			W. Largent, L. Peef, D. Backus

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
43	CIRCLE	You, Gap, Old, Jennie	93		placer	Chena Mining Group W.G.M.
43	CIRCLE	Ann	225		lode	
44	CIRCLE	GD, PZL, WIN, MILL	574	F	lode	Houston Oil & Min.
45	BIG DELTA	DFU, CJ	159		lode	Houston Oil & Min., Res. Assoc. of AK. Noranda J. Rice, F. Ensign Chena Mining Group Anaconda Amax Exploration Co.
45	BIG DELTA	Grit	34		lode	
45	BIG DELTA	L, P, DA, G, J. Diana	51		placer	
45	BIG DELTA	G. Chet, Hy	230		placer	
45	BIG DELTA	Hawg	264		lode	
45	BIG DELTA	LS	22			
46	BIG DELTA	KT, BD, CAB	270			W.G.M. J. Parry Res. Assoc. of AK. GLD Corp.
46	BIG DELTA	Discover	54		Au	
46	BIG DELTA	BLKSH	42		lode	
46	BIG DELTA	Below Gail, Donna	90			
47	CHARLEY RIVER	Jumbo Fraction, Upper Wood Chopper (and others)	146	F	Au, Pt	J. Volger
48	EAGLE	CCC	109	F	lode	Res. Assoc. of AK. Doyon, Ltd.
*48B	EAGLE	Crystolite	4	Native	Asbestos	
49	EAGLE	Buckshot	95		placer	Buckshot Mining Corp.
50	EAGLE	Discovery	52	F	Au	C. Heflinger

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
50	EAGLE	Walker Associate	56		placer	F. Miller, L. McMaster
51	OPHIR	Discovery	55			S. E. Bartel
51	OPHIR	Discovery (and others)	74		Au	O'Carroll lease to Innoko Joint Venture Res. Assoc. of AK.
51	OPHIR	TOL	53		lode	
52	OPHIR	Maki Gulch (and others)	90		Au	W. Magnusen
52	OPHIR	Gold Bar	68			L. McFarlund, R. Grife C. Scoggin
52	OPHIR	Jenny (and others)	71	S		
53	MEDFRA	Win, Won	97	S		Duval Corp.
54	MEDFRA	Nixon Fork Mine	73		Au, Ag, Cu, Bi	Mespelt & Almasy
54	MEDFRA	Soda Creek	20			Pafino, Inc.
55	MT. MCKINLEY	Liberty (and others)	63		Au, Ag, Sb	Northwest Exploration, Inc.
56	HEALY	Ohio Creek, Shotgun Creek, (and others)	956		Cu, Pb, Zn, Ag lode	Chulitan Mining Corp.
56	HEALY	Metal	60			McCallie Creek Mining
56	HEALY	AATSCO	189	F	lode	AATSCO Mining Co.
56	HEALY	Copper Kitty (and others)	125		lode	M. Denson
56	HEALY	Nimrod, Nimsick, Nim	162		lode	R. Swainbank
56	HEALY	Long	345	S	lode	Houston Oil & Min.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
57	HEALY	TSU	66	S	lode	Res. Assoc. of AK.
58	HEALY	SMOG (and others)	534		lode	Getty Minerals Res.
58	HEALY	Keeny	43		lode	Cominco
59	HEALY	C-D, Copper King	90		lode	C-D Development
59	HEALY	Heather	70		Au	Timberline Mining Co.
59	HEALY	Gold Hill	56		lode	Stevens Exploration Management Corp.
59	HEALY	Roosevelt Creek, Valdez Creek	82		placer	J. Davis, D. Pelky, R. Malesky
60	MT. HAYES	MEX	94			Mankomen Explor.
60	MT. HAYES	Zackly	133	F	lode	Res. Assoc. of AK.
60	MT. HAYES	Au	56		Au placer	Tammy Gold Mining Co.
61	MT. HAYES	Borealis	322		Au	T. Stoelting
61	MT. HAYES	Pet	101		lode	Res. Assoc. of AK.
61	MT. HAYES	AMP	99		lode	Hunt Oil Co.
62	MT. HAYES	PGW (and others)	1,093		lode	Anaconda, Res. Assoc. of AK.
62	MT. HAYES	POW	116			Res. Assoc. of AK.
62	MT. HAYES	Middle Fork Bench (and others)	73		Au, Pt	Ranchers Exploration & Dev. Corp., Res. Assoc. of AK.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
62	MT. HAYES	Ranchers, Elmer, Juniper	71			Ranchers Exploration & Development Corp.
62	MT. HAYES	Question Mark, Daisy (and others)	77		Au?, Pt	Alaska Petroleum Gulf Mineral Res.
62	MT. HAYES	Coppertone, Chisna	110		Cu	W. Appelt
62	MT. HAYES	SM	61		lode	Cook Inlet Region
62	MT. HAYES	Ace, Hill, Bud	102		lode	W. Vaux
63	TANACROSS	HD, HDN, HDS	108	S		Anaconda, Res. Assoc. of AK.
64	TANACROSS	Peternie	88			Res. Assoc. of AK.
65	TANACROSS	Ladue, Big Creek, Trident (and others)	394	F	lode	Pacific Coast Mines, Cities Serv.
65	TANACROSS	Dawg, Ty	99		lode	Noranda Exploration
65	TANACROSS	TP, TPN, AR	104	S	lode	Cook Inlet Region, Houston Oil & Min., Res. Assoc. of AK.
66	TANACROSS	Border, OM	50	F	placer	Northwest Survey Corp., Ltd., Y.T., R. Matthews
67	IDITAROD	MP	64	S		Union Carbide
67	IDITAROD	Flat	103	F	Au, Ag	J. A. Walper
68	IDITAROD	Julian	33	F	Au	R. & P Wilmarth T. Meining

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
68	IDITAROD	BVR	108	F	placer	Buckstock Mining Co.
69	MCGRATH	Big Sky, Big Jim, Sandi (and others)	352	S		Anaconda
69	MCGRATH	James, Ajax, Sigma	79		Ag, Pb, Zn	Valeska Corp.
69	MCGRATH	Peak	100			Seven A. M. Invest. Enterpr., E. Lowry
70	TALKEETNA	Gates Assn. (and others)	105	F	Au, placer	A. T. Van Dolah
70	TALKEETNA	Nakochna, Romas, PMX	51		Au, placer	J. Mattson, G. Johnson
71	TALKEETNA	Alberts Bench (and others)	136		Au, placer	Al-Von Mining Co.
71	TALKEETNA	Nex Yer	57	S	Au, Pt, Ag, placer	H. Ramsey, B. Johnson
71	TALKEETNA	Crown Triangle	50	S	Au, placer	L. McDaniel
72	TALKEETNA	Porcupine (and others)	62	F	Au, placer	M. Jacobsen
72	TALKEETNA	Maybelle (and others)	66	F	Au, placer	Nugget Creek Mining
72	TALKEETNA	Cam, Gena Bench	47	F	Au, placer	Dutch Creek Mining
72	TALKEETNA	United	119		Au, placer	United Assoc., Inc.
72	TALKEETNA	Hall Yentna	7		Au, placer	Hall Yentna Mining, B. Hall
73	TALKEETNA MTNS.	Molly	93		Mo, Zn, Cu. lode	Silver Dome Mining
73	TALKEETNA MTNS.	Coal, Gun	272	S	lode	Houston Oil & Minerals

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
74	TALKEETNA MTNS.	DWN, DES	74	S	Au, placer	Greatland Exploration
74	TALKEETNA MTNS.	How	51		Au, placer	Greatland Exploration, Ensearch Exploration
74	TALKEETNA MTNS.	Bacon Fork (and others)	69		Au, placer	H. McWilliams lease to Greatland Explor.
74	TALKEETNA MTNS.	Sometimes Lucky (and others)	46		Au, placer	H. Parker
75	TALKEETNA MTNS.	Falls Creek	85		Au, placer	D. Horvath
75	TALKEETNA MTNS.	Three Rivers	127			J. Voss
76	TALKEETNA MTNS.	Renegade	222	S	Au, placer	Hamilton Mining Enterprises
76	TALKEETNA MTNS.	Gold Claims (and others)	68		Au, placer	B. Swift, J. James, J. Bettis, J. Welch
76	TALKEETNA MTNS.	Shovel Creek (and others)	49	S	Au, placer	Consolidated Mining
76	TALKEETNA MTNS.	Willow, Cottonwood, Black Sands	52	S	Au, placer	D. Young
77	NABESNA	Taku (and others)	89		Cu	Bear Creek Mining
77	NABESNA	Nike (and others)	65			Bear Creek Mining, Inspirational Dev. Co.
77	NABESNA	FN (and others)	89		Cu, Au, Mo, Ag	Northwest Explor., Louisiana Land & Exploration
78	NABESNA	Big El (and others)	82	F		A. Dipple

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
78	NABESNA	CCCU	83	F	lode	CCCU, Inc.
79	RUSSIAN MISSION	White Bear, Hot Pink, Lewis Creek	44	F	placer	H. Faulkner
80	SLEETMUTE	Elah	62		Hg	R & H Mining
81	SLEETMUTE	Buck	164	S		Buckstock Mining Co., Inc.
81	SLEETMUTE	SA	356			Troy Resources Corp.
82	SLEETMUTE	Holo	558	S		Buckstock Mining Co., Inc.
82	SLEETMUTE	SA	84			Troy Resources Corp.
83	LIME HILLS	Gamo	30	S		Amax Exploration
84	TYONEK	Estelle	140			Seven A.M. Invest. Enterprise
85	TYONEK	Su	461		Au, placer	Su Mines, B. Taylor
85	TYONEK	Theodore	254		Au, placer	Sterling Mining Co.
85	TYONEK	Susitna Mtn. (and others)	1,209		Au, placer	Midnite Sun Explor., B. Bolstridge (and others)
86	ANCHORAGE	Mac, Doc, Cairn	36	S		Aspen Exploration Co.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
*87	ANCHORAGE	Independence Mine area	81	F	Au	Starkey Wilson, Enserch JJ Mining Co.
87	ANCHORAGE	Jr.	83			
88	ANCHORAGE	CC	68	S	Au, Cu, Pb, Ag	G. Fowler
89	VALDEZ	Magnet, Opal, Markup	84		Fe?	Amalgamated Bananas & Steel
90	MCCARTHY	Binocular Group, Peavine Group (and others)	453	F	Cu	Geneva-Pacific Corp.
90	MCCARTHY	Rhodes, OHL	136		lode	W. Wigger
91	BETHEL	Tuluksak River	415		Au, placer	Northland Gold Dredging, Tuluksak Dredging
92	TAYLOR MTNS.	Gemuk, Princess (and others)	72		Hg, Sb	P&C Roderick, Haday
93	TAYLOR MTNS.	Good, Kiknik	80	S	placer	C. C. Hawley & Assoc.
94	LAKE CLARK	Kody	51			Anaconda
95	LAKE CLARK	Rico	45		lode	Res. Assoc. of AK. T. & V. Gill lease to Azcon Corp.
95	LAKE CLARK	Terry Gil	51		Au	
96	KENAI	Kus	25	S		Aspen Exploration Co.
97	KENAI	Nil	19			Aspen Exploration Co.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
98	SEWARD	Homestake (and others)	42			D. Moore
99	BERING GLACIER	Yakataga Bench area	85		U, Th, Au?	Alaska Gold Mines
100*	HAGEMEISTER ISLAND	Salmon R. area (Goodnews Bay)	218	F	Pt, Au, Cr	Hanson Properties
100	HAGEMEISTER ISLAND	Big Hurrah	148	F	Pt, Au	C. Johnson, Goodnews Bay
101	SELDOVIA	Snake	51	S		C. C. Hawley & Assoc.
101	SELDOVIA	Snow	84	S		Anaconda
102	CHIGNIK	Pat	55		Pb, Mn, Zn, Ag, Cu, Mo, Au	J. Murphy, W. Gay
103	SKAGWAY	Marmot	61	F	Au, Ag, Cu, Pb	Marmot Mining Ex.
104	JUNEAU	KNS (and others)	66		Au	Placid Oil
105	JUNEAU	Molly (and others)	54		Cu	St. Joe American
106	JUNEAU	Golden Bear, Golden Beaver, Rex, Billy's Reward	145		Au	Noranda
106	JUNEAU	Eagle River	107		Cu, Au	Placid Oil
107	JUNEAU	Chs. Williams property	256		Au	Alaska Empire Gold Mining Co., S. & A. Pekovich, C. Herb

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
108*	JUNEAU	Big Sore (Greens Creek) (and others)	758		Ag, Pb, Zn, Cu, Au	Noranda lode
108	JUNEAU	Hi	518			Res. Assoc. of AK.
108	JUNEAU	High Lake	94			Horizon Explor. Co. lode
109	TAKU	Sue-Z-Q (and others)	75		placer	C. Norden
109	TAKU	AEK	202			B. Fulmer
109	TAKU	JLC	114		placer	J. Christie
109	TAKU/SITKA	P.N.	79		lode	Anaconda
109	TAKU/SITKA	Cook Group, Cars	105		Au, Pb	Mapco, Inc.
109	TAKU/SITKA	Sunny, Sweetheart	92		lode	E. Redman
110	SITKA	Peggy, Mary, Diann, Karen	107		lode	Res. Exploration Consultants
110b*	SITKA	Yakobi (and others)	376		Ni, Cu, Co	Inspiration Dev. Co.
111	SITKA	Petunia	705		Cu, Au, Ag, lode	General Crude Oil
112	SUMDUM	Endicott	57		lode	Placid Oil
112	SUMDUM	SumDum	122		lode	Houston Oil & Min.
113	PORT ALEXANDER	LCM (and others)	184		Au	Phillips Petroleum
114	PORT ALEXANDER	Peggie	138		lode	Mapco, Inc.
114	PORT ALEXANDER	Corn	50		placer	J. Fitzgerald
115	PETERSBURG	BJB	100		lode	Houston Oil & Min.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
116	PETERSBURG	RO	175		lode	Houston Oil
116	PETERSBURG	Chelsea (and others)	153		lode	Amoco Minerals
117	PETERSBURG	Hattie Group	1,044		Au, Ag, Cu, Pb, Zn	Houston Oil
117	PETERSBURG	Marguerite	224		lode	Mapco, Inc.
118	PETERSBURG	TB	90		lode	Houston Oil
119	PETERSBURG	Peggy E	54		lode	Mapco, Inc.
120	PETERSBURG	Frenchie	35			British Petroleum, Alaska Exploration
121	PETERSBURG	ZF	148		lode	Houston Oil
121	PETERSBURG	Hazel, Erica, Frances	387		lode	Mapco, Inc.
122	PETERSBURG	Whistlepig	295		Pb, Zn, Ag	Huffietal
123	CRAIG	Winnie (and others)	45		limestone	Ideal Cement Co.
124	CRAIG	GW	103		lode	Houston Oil
125	CRAIG	J.D., Cat, CM, Rat	67		Au	Mapco, Inc.
126	CRAIG	Gene	40		lode	Mapco, Inc.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
127	CRAIG	Ruby Tuesday	72		Zn, Pb	Noranda Exploration
127	CRAIG	Punk (and others)	209		lode	Mapco, Inc.
127	CRAIG	Chum, Witness post	56		lode	Houston Oil
127	CRAIG	CC, DV, T-M, F-R	387		lode	Exxon Corporation
127	CRAIG	Capricorn	96		Au, Ag, Pb, Zn	R. Hodder
128	CRAIG	Oswego	46		limestone	Ore. Portland Cement
129	CRAIG	Deana	119			Anaconda
129	CRAIG/DIXON ENTRANCE	Kot (and others)	28		U	Cotter Corp.
129	CRAIG/DIXON ENTRANCE	Cub, Cub Fraction	27		U	Kendrick Bay Mine
129	CRAIG/DIXON ENTRANCE	Bokan	118		U	Seraphin Eng. Co.
129	CRAIG/DIXON ENTRANCE	Bay Claims	23		lode	Houston Oil
129	CRAIG/DIXON ENTRANCE	Terry-Dick	324		U	R. Stough, T. Willis
130	KETCHIKAN	CAA (and others)	25		Sb	Duval Corporation
130	KETCHIKAN	Goldbelt	56		Au	J. Munoz
131	KETCHIKAN	Butte (and others)	71		Ag, Pb, Au, Cu	Mineral Basin Mining
132	KETCHIKAN	Eat Peat, Moss	205		lode	Res. Assoc. of AK.
133*	KETCHIKAN	Quartz Hill	1,077		Mo lode	U.S. Borax
134	DIXON ENTRANCE	Kaigani	60		lode	Noranda
134	DIXON ENTRANCE	Walper (and others)	30		Au, Cu, Pb, Zn	Whelan's Mining & Exploration
135	DIXON ENTRANCE	Mallard, Stone	34		Cu?, Fe	Exxon Corporation
135	DIXON ENTRANCE	Ard (and others)	318		Cu, Mo	U.S. Borax Corp.

**Where known

APPENDIX G

Significant mineral deposits in Alaska

Information from

Northwest Miners Association,
Alaska Miners Association,
DGGs,
University of Alaska
(AEIDC and MIRL),
and industry.

Unless otherwise noted in text, all reserve and resource estimates are unofficial.

(Numbers refer to locations on plate 1)

1. *Lik* - Major stratabound massive sulfide (ZnPbAgCdbarite) deposit in black shales and cherts; eastward extension of mineralized belt containing deposit/prospect at localities 1 and 2: inferred reserve estimate of 18 million tons of 10% combined Pb+Zn and 3 oz/ton Ag.
2. *Red Dog* - Stratabound massive sulfide occurrence similar to that at locality 3; grades of up to 30% Pb+Zn reported. Cominco release - Feb. '82. Red Dog = 85 million tons of 17.1% Zn, 5% Pb, 2.4 oz/ton Ag.
3. *Avon* - Unexplored chromite occurrences and Ni geochem anomalies in layered ultramafic complex.
4. *Drenchwater* - Major stratabound massive sulfide (Pb-Zn-Ag) occurrence associated with black shales, cherts, and felsic volcanics; 60' x 150' exposure averages 3.0% Pb, 17.4% Zn, and 3.3 oz/ton Ag; numerous sulfide occurrences and strong geochem anomalies between localities 1-4 and locality 7.
5. *Mishaguk Mountain* - Chromite occurrences in ultramafic complex; potential exists for similar occurrences in belt between localities 5 and 6.
6. Significant fluorite mineralization; grades of up to 78% fluorite reported.
7. *Porcupine Lake* - Stratiform fluorite occurrence; traced for approximately 2 miles; grades of up to 25-30% fluorite (CaF₂) reported.
8. Stratiform Cu mineralization in chert; stratabound massive sulfide potential similar to that at localities 1-4 and 7.
9. Phosphate deposits occur in two stratigraphic units (Lisburne and Shublik) which extend across the entire northern Brooks Range; grades of up to 35.8% P₂O₅ reported; huge inferred resources.
10. *Esotuk Glacier* - Mo-Sn-W-Pb-Zn potential in intrusive complex and associated skarns.
11. *Omar-Frost* - Copper replacement (Ruby Creek type, locality 26) and stratiform barite Zn-(Cu) occurrences in carbonates; resources of 1 to 10 million tons, barite at one occurrence.

12. *Klery Creek, Caribou Creek, Gold Run Creek, Joe Creek* - High-grade gold accumulations in placer gravels.
13. *Klery Creek* - Lode Au deposit; worked intermittently from 1909 through 1930's. Total production through 1931 estimated at about 31,320 oz; large reserves remain unmined.
14. *Smucker* - Massive sulfide deposit; significant tonnages of Zn-Ag ore; 3,000 ft. strike length; active exploration.
15. *Bornite* - Major stratiform copper-zinc deposit in carbonates; 1 million tons of copper in 25,000-150,000-ton-ore bodies grading 4-12% Cu. Larger reserve estimate of 40 million tons of about 2 percent copper, about the same zinc, and an undisclosed amount of cobalt.
16. *Arctic* - Major stratabound massive-sulfide deposit in sequence of metarhyolites, meta-tuffs, and graphitic schists; current drilling indicates reserves of 30-35 million tons of 4.0% Cu, 5.5% Zn, 1.0% oz/ton Ag.
17. Skarn deposit; 100 ft. by 300 ft. zone with approximately 1% WO₃-Sn.
18. *Sun* - Major stratabound massive-sulfide deposit in sequence of metarhyolites and schists; drilling through 1976 indicated gross metal value of approximately \$1,000,000,000.
19. *Ernie Lake* - Potential for major stratabound massive-sulfide deposit comparable in size to deposits and localities 25, 27, and 28; gossan zones found with strongly anomalous Cu-Pb-Zn-Ag values; not explored because of land status.
20. High-grade replacement (?) Pb-Zn-Ag prospects in carbonates; grades of up to 20% Pb + Zn reported; active claims.
21. Stratiform massive sulfide Cu-Pb-Zn-Ag prospects; gossans of massive sulfides common.
22. Stratiform Cu-Pb-Zn mineralization; grades of up to 3% Cu reported.
23. Stratiform (?) Cu mineralization in calcareous schist along 5-mile-long belt; grades of up to 1% Cu reported; active claims.
24. *Koyukuk-Nolan District* - Major placer Au-region; substantial production (295,000 oz) from 1900 to present; significant deep placers reserves remain unmined.
25. Porphyry-copper prospects with associated skarn deposits; potential for small deposits grading over several percent Cu.
26. High-grade Cu-Zn occurrences with values up to 10% Cu and 10% Zn.
27. High-grade Cu and Cu-Zn(Pb)-(Ag) skarn (?) prospects with potential for large tonnages; grades of up to 10% Cu and 5% Zn reported.
28. *Geroe Creek* - Porphyry Mo-Cu prospect; grades of up to 0.1% Mo reported; active claims.

29. *Chandalar District* - Major Au district; substantial production (greater than 30,000 oz Au) from both placer and vein deposits; active exploration, development, and minor production since early 1960's.
30. *Wind River, N. Fork Chandalar(?)* - Stratabound massive sulfide (Pb-Zn) prospects; grade of up to 5% Zn and 6% Pb reported.
31. Stratiform massive-sulfide Cu-Pb-Zn-Ag potential; grades of up to 5% Zn, 1% Cu, 1% Pb and 0.5 oz/ton Au reported; active claims.
32. Stratiform barite - (Cu-Pb-Zn-Ag) potential.
33. *Bear Mountain* - Major stockwork Mo-(W)-(Sn) occurrence in intrusive breccia pipe; strongly anomalous Mo-W geochem anomalies; potential exists for similar occurrences between localities 17 and 18.
34. Stratiform massive-sulfide potential; widespread galena (Pb) mineralization; grades of up to 30% Pb and 1% Cu reported; strongly anomalous Pb and Zn geochem values in stream sediments.
35. *Lost River* - Major tin, fluorite, tungsten, and beryllium deposits; potential resources over 200 million tons.
36. *Ear Mountain* - Placer Sn district and Sn-Cu-(Au-Ag-Pb-Zn) skarn deposits; mineralized zone 1,000 feet long and 65 feet wide contains 0.2% Sn and 0.3% Cu with values up to 2% Sn and 3% Cu; the area is also strongly anomalous in uranium.
37. *Kougarok Mountain* - Significant tin occurrence; new discovery.
38. Active uranium claims; uranium soil geochemical anomalies up to 0.05% U₃O₈.
39. *Hannum Pb-Zn Deposit* - Stratiform massive-sulfide Pb-Zn-Ag prospects; 30- to 150-foot thick zone of oxidized Pb-Zn-Ag ore with a potential strike length of over one mile; oxidized material assays up to 12% Pb + Zn and 2 oz/ton Ag.
40. Stratiform massive-sulfide Pb-Zn-Ag-Au prospects; strongly anomalous soils and gossans; potential for a very large mineralized horizon.
41. *Independence Creek* - Stratiform massive-sulfide Pb-Zn-Ag prospect; high grade shipped in 1921 contained 30% Pb, 5% Zn, and 33 oz/ton Ag.
42. Substantial placer Au reserves; active exploration.
43. *Aurora Creek* - Stratiform massive-sulfide Pb-Zn-Ag-barite-fluorite prospects; mineralization of large extent and moderate grade.
44. Tungsten-antimony-gold lodes with up to 3% WO₃, and stratiform (?) massive-sulfide Pb-An-Ag mineralization with up to 8% Pb + Zn.
45. *Nome* - Major placer-Au district; substantial production (4,155,000 oz Au) from some of the world's richest placer deposits.
46. Stratiform massive-sulfide Pb-Ag-(Zn) prospect in carbonates; grades of up to 23% Pb and 20 oz/ton Ag reported.

47. *Big Hurrah* - Major lode-Au deposit; contains significant W mineralization; produced over 10,000 oz Au.
48. *Solomon District* Placer-Au district; produced 250,000 oz Au from placers; vein deposits in area contain up to 8.5 oz/ton Au.
49. *Kachauik* Uranium prospect in intrusive rocks; highly anomalous Th (thorium) geochem values (1,000 ppm).
50. *Omalik* Stratiform (?) massive-sulfide Pb-Zn-Ag prospects in carbonates; produced Pb-Ag ore between 1181 and 1890 that averaged about 10% Pb and 40 oz/ton Ag; grades of oxidized zinc ore up to 34% Zn reported.
51. *Windy Creek* Significant Mo-F mineralization; values up to 0.15% Mo reported.
52. *BCU* The Darby pluton is known to be highly anomalous in U and Th; active exploration.
53. *Anzac Creek* Significant uranium geochemical anomalies occur in and around intrusive complex; active exploration.
54. *Quartz Creek* - Significant Pb-Zn-Ag mineralization; values up to 15% Pb + Zn and 10 oz/ton Ag; altered zone 18 miles long and 2 to 5 miles wide; active exploration.
55. Significant Pb-Zn-Ag mineralization; values greater than 3% Pb + Zn and 1 oz/ton Ag reported; active exploration.
56. *Placer River* Significant MoF mineralization disseminated in intrusive rock; values greater than 0.2% Mo reported; active exploration.
57. *Candle Creek* Placer Au deposits with significant reserves blocked out; uranium in placer concentrate assays up to 3.8% uranium.
58. Numerous uranium occurrences associated with alkaline intrusive complexes; active exploration.
59. Uranium occurrence; values up to 500 ppm uranium reported.
60. *Purcell Mountain* Uranium occurrences associated with alkaline-intrusive complex; active exploration.
61. Placer-Au deposit; substantial production from 1957 to 1975.
62. *Bonanza Creek* Recent discovery of significant tungsten mineralization along intrusive contact zone; similar to recent discoveries in Yukon Territory, Canada.
63. *Ruby District* - Placer-Au-Sn district; produced about 390,000 oz Au between 1931 and 1960 and undisclosed amount of tin; district also contains Pb-Ag prospect (92a) with up to 82 oz/ton Ag (potential for significant stratabound massive-sulfide deposits).
64. *Hot Springs District* - Placer-Au-Sn district; produced about 450,000 oz Au and over 600,000 pounds of tin through 1968.

65. *Tolovana District* - Active placer and lode Au district; produced 380,000 oz Au up to 1960; larger placer-gold reserves are unmined.
66. *Lime Peak* - Uranium mineralization.
67. *Fairbanks District* - Seventh largest gold district in the United States and largest gold producer in Alaska. Major lode-Au districts with significant tungsten and antimony mineralization; produced 239,247 oz of lode Au prior to 1960 and over 4 million pounds of antimony through 1970. 7,450,000 ounces of gold have been derived from placer deposits.
68. *Mt. Prindle* - Significant uranium/rare-earth mineralization; rock geochem values up to 0.1% U₃O₈ reported; active exploration.
69. *Twin Mountain* - Significant skarn-type tungsten deposit; new discovery.
70. *Circle Mining District* - District with numerous active placer-Au claims, uranium anomalies (up to 6.0% uranium in rock), and tungsten mineralization. District has produced over 750,000 ounces of gold since 1893.
71. *Three Castle Mountain, Pleasant Creek, Casca VABM* - Stratabound (?) massive-sulfide Pb-Zn mineralization; grades of up to 17% Zn and 2% Pb reported.
72. *Poovookpuk Mountain* - Porphyry-type Mo mineralization occurs at several localities within the Sevoukok Pluton; grades of up to 0.25% MoS₂ reported.
73. *Flat District* - Major placer-Au district; produced 1,350,000 oz Au; district is currently active with moderate placer reserves; potential for very large resource of lode Au and W at complex Golden Horn lode deposit (W-Au-Zr-Cr-Hf-Hg-Sb).
74. *Ophir District* - Placer-Au district with significant lode Au-Sb-Hg mineralization; produced more than 540,000 oz placer Au (includes Tolstoi and Candle Creek).
75. *Nixon Fork Deposits* - Major lode Au-Cu district; one mine produced between 40,000 and 60,000 oz Au.
76. Stratabound massive-sulfide Cu-Zn-Pb-Ag prospect with grades of about 2% Cu equivalent; active exploration.
77. Significant disseminated Cu-Ni-Au mineralization; discovered in 1976.
78. Significant massive-sulfide Cu-Ag-Au occurrence; discovered in 1976; grades of up to 33.5% Cu and 41 oz/ton Ag reported.
79. *Purkypile* - Significant Ag-Sn-Be mineralization associated with granitic intrusions; grades of up to 4.5 % Sn over mining widths; area also has uranium and tungsten potential.
80. Significant massive and disseminated chromite occurrences associated with ultramafic complexes; discovered in 1975 by USGS.
81. *Kantishna District* - Major placer-Au and lode-Ag-Au-Pb-Zn-Sb-W district; produced about 60,000 oz placer-Au, about 260,000 oz of lode silver and several million lbs antimony; lode deposits very high-grade (Ag grade averaged 157 oz/ton); potential for significant Ag-Au-Pb-An deposits; active claims.

82. *Stampede Mine* - Major antimony (Sb) deposit; produced about 3.5 million lbs Sb; resources of about 10 million lbs Sb; highly anomalous stream sediments in area (up to 1,900 ppm Zn, 2,200 ppm Pb, 500 ppm Cu, 3.0 ppm Ag) indicative of stratabound massive-sulfide deposits.
83. *Chitsia Mountain* - Significant stratabound massive-sulfide barite Pb-Zn-Ag occurrences; grades of up to 3% Pb, 1% Zn, and 1 oz/ton Ag reported in oxidized rock; low-grade mineralized zones up to 6 miles long and ¼ mile wide; a major stratabound massive-sulfide belt extends eastward from this locality across the entire northern Alaska Range.
84. Significant Sn-Ag-Zn skarn prospect; discovered in 1976.
85. Stratiform Cu-Au-Ag-Sb prospect; mineralized zone about 10,000 feet by 3,000 feet; grades of up to 0.7% Cu, 9 oz/ton Ag, 1.8 oz/ton Au, and 0.7% Sb reported.
86. Significant Sn-Ag-(Cu-Pb-Zn) mineralization; grades greater than 0.1% Sn, 15 oz/ton Ag, 2% Pb, and 1% Zn reported; veins exposed over 1.5-mile strike length.
87. *Golden Zone Mine* - Major Au-Cu-Ag deposit in breccia pipe; produced about 1,581 oz Au, 8,617 oz Ag, and 42,000 lbs Cu; proven reserves of about 10 million tons of 0.1 oz/ton Au and Cu and Ag.
88. *Nim Prospect* - Porphyry Cu-Ag prospect; grades of up to 0.5% Cu and 2 oz/ton Ag reported.
89. *Sheep Creek and Liberty Bell massive-sulfide deposits* - The latter is a stratiform gold-bismuth deposit with 100,000 tons of ore blocked out; the former contains stanniferous zones similar to Sullivan, B.C. and grades of up to 4% Cu, 14.5% Zn, 6% Pb, and 7.6 oz/ton Ag.
90. *Denali Prospect* - At least six small stratabound copper lodes contain almost \$200 million of copper at current prices.
91. *Lichen Prospect* - Copper-precious metal stratabound deposit.
92. *Anderson Mountain, Dry Creek, Virginia Creek* - Significant stratabound massive-sulfide Cu-Pb-Zn-Ag prospects; potential for large, high-grade deposits; active claims and exploration.
- 93-94. *Delta massive-sulfide belt* - Contains over 30 deposits and occurrences of precious-metal-enriched base-metal massive-sulfide lodes; active exploration.
95. *Chistochina* - Porphyry-Cu prospect and placer-Au district; substantial placer-Au production; large placer reserves. Platinum also recovered. District produced in excess of 141,000 ounces of gold.
96. Porphyry Cu-Mo prospects; potential for discovery of significant tonnages of supergene-enriched ore such as at locality 120; active claims and exploration.
97. *Mosquita, Peternie* - Porphyry-Mo prospects; grades of up to 0.17% MoS₂ reported in drill intercepts; active claims and exploration.

98. *Slate Creek* - 55 million tons of 6.35% chrysotile fiber; major asbestos deposit; potential for large reserves of mineable-grade material; active exploration.
99. Stratabound (?) massive-sulfide Cu-Pb-Zn-Ag mineralization; grades of up to 1% Cu, 5% Zn, 3% Pb, and 2 oz/ton Ag reported.
100. *Fortymile District* - Numerous active placer-Au deposits in area; lode-Au deposits and W mineralization also occurs in area. District has produced in excess of 415,000 ounces of gold from placer deposits.
101. Significant stratabound massive-sulfide prospect; values up to 0.52% Cu, 2.5% Pb, and 5 oz/ton Ag in oxidized rock reported; active claims and exploration.
102. *Taurus* - Major porphyry-Cu-Mo prospect; potential for large reserves of 0.5% Cu and 0.05% MoS₂; active exploration and claims.
103. *Big Creek or Ledue* - Stratabound massive-sulfide prospect; moderate- to high-grade Pb-Zn-Ag in drill intercepts.
104. *Red Devil* - Major mercury district; mine produced approximately 35,000 flasks of Hg intermittently between 1940 and 1972.
105. *Apollo Mine* - Major lode-Au deposit; produced about 107,900 oz Au from ore that averaged about 0.4 oz/ton Au. Inferred reserve, equal to about what was previously mined.
106. *Pyramid* - Porphyry-Cu-Mo deposit; reserves of 100 million tons of 0.5% Cu and 0.03% Mo; strong stream-sediment-geochemical anomalies (up to 500 ppm Cu, 700 ppm Pb, 20 ppm Ag, and 70 ppm Mo) several miles to the north suggest this area has similar potential for porphyry-Cu-Mo deposits.
107. *Ivanof* - Porphyry-Cu prospect; grades of up to 0.72% Cu reported; potential for large tonnages of low-grade Cu mineralization.
108. *Mallard Duck Bay* - Porphyry prospect.
109. *Cathedral Mountain, Braided Creek* - Stratabound deposit.
110. *Warner Bay* - Porphyry prospect.
111. *Weasel Mountain, Bee Creek* - Porphyry CuMo prospect; grades of up to 0.48% Cu and 0.035% Mo reported; potential for moderate tonnages of low-grade Cu mineralization.
112. Porphyry-Cu prospect; grades of up to 0.56% Cu reported; potential for moderate tonnages of similar grade material.
113. *Mike Deposit* - Porphyry-Mo prospect; grades of up to 0.21% MoS₂ in rocks and 350 ppm Mo in stream sediments reported; potential for large tonnages of low grade Mo mineralization.
114. *Rex Deposit* - Porphyry-Cu prospect; grades of up to 0.3% Cu reported; potential for moderate reserves of similar grade material; numerous stream sediment and color anomalies (gossans) indicative of porphyry-Cu-Mo mineralization occur between localities 104 and 110; the entire Gulf of Alaska side of the Alaska Peninsula is a

major porphyry Cu-Mo belt (province) that is continuous with a major porphyry Cu-Mo belt in the Alaska Range to the northeast.

115. Porphyry-Mo prospect associated with intrusive breccia pipe.
116. *Goodnews Bay* - Major platinum (Pt)-placer district; estimated to have produced over 540,000 oz of the platinum-group metals between 1934 and 1976; the largest commercial resource of Pt metals in the United States; reserves of approximately 60 million cubic yards.
117. *NYAC Gold District* - large yardages of auriferous gravel remain.
118. *Dutton* - Significant stratiform Cu occurrences; mineralization in basic volcanics occurs over several square miles with up to 2-5% Cu.
119. *Dureya* - Porphyry-type Cu-Mo mineralization in intrusive complex; up to 3.3% Cu in veinlets.
120. *Tak II* - Stratiform massive-sulfide Cu prospect; massive pyrite with several percent Cu; prospect similar to that of major deposit at locality 150.
121. Major stratabound massive-sulfide Pb-Zn-Ag-Au-barite mineralization in felsic volcanics and tuffs; consistent grade of 1% Cu, 2% Pb, 1-5% Zn, 0.75 oz/ton Ag, 0.03-0.09 oz/ton Au, and 15-30% barite reported; potential for major deposit.
122. *Kasna Creek* - Major stratiform massive-sulfide deposit; proven reserves of greater than 10 million tons of greater than 1% Cu; potential for greater than 30 million tons of greater than 1% Cu; other Cu, Pb, and Zn occurrences in areas have similar potential.
123. Significant porphyry-Cu-Ag prospects; strongly leached rocks contain up to 0.3% Cu, 14 oz/ton Ag, 0.15% Pb and 0.36% Zn over mineralization zones in excess of 500 feet wide and 2,000 feet long.
124. Significant porphyry Cu mineralization in volcanic-intrusive complex; stream-sediment samples over several square miles are strongly anomalous in copper (360-1,250 ppm).
125. *Magnetite Cove* - Massive iron-skarn deposits; grades of 10-30% Fe₃O₄ common; local rock samples contain up to 13% Zn, 6.6% Cu, and 10 ppm Ag.
126. Significantly porphyry-Cu-Mo mineralization; grades of 1-5% Cu reported.
127. Significant stratabound massive-sulfide Cu-Ag-Au deposits with 3-4% Cu; deposits are similar to those in the Ambler mineral belt in the Brooks Range (localities 25, 27, and 28).
128. Stratiform massive-sulfide Cu mineralization; grades of 1-3% Cu reported; mineralization similar to major deposit at locality 150.
129. Significant porphyry-Mo prospects; grades of up to 0.32% Mo in rocks and 200 ppm Mo in stream sediments reported; potential for large, low-grade Mo deposits.
130. Significant porphyry-Cu-Mo mineralization in intrusive complex; grades of up to 0.88% Cu and 0.33% Mo reported; potential for large, low-grade Cu-Mo deposit.

131. Major porphyry-Mo occurrences; assays of mineralized rocks range from 0.1 to 2% Mo; some occurrences have associated Cu, Pb (up to 2%), and Zn (up to 1.85%).
132. Porphyry-Cu mineralization in tourmalinized intrusion; grades of around 1% Cu common; potential for large low-grade deposit.
133. Porphyry-type Cu mineralization and stratiform massive-sulfide prospects; grade of 1 to 3% Cu reported in intrusions; massive-sulfide prospects contain up to 13% Zn and 5% Cu; active claims and drilling; potential for significant deposits.
134. *Jimmy Lake* - Complex Cu-Ag-Sn deposit; grades of up to 105 oz/ton Ag; grades in 30-foot-drill intercept up to 37 oz/ton Ag and 3% Cu.
135. Porphyry-Cu mineralization; average grade of about 0.6% Cu and 0.18 oz/ton Ag; skarn deposits adjacent to intrusion contain up to 22% Cu and 14 oz/ton Ag.
136. Porphyry-Cu mineralization; grades of around 1% Cu reported.
137. Porphyry-Mo prospect; grades of up to 3% Mo reported; active exploration.
138. *Red Mountain* - Past-producing chrome mine; 36,000 tons of metallurgical-grade ores shipped through 1976. Potential for millions of tons of lower grade ore.
139. Significant massive- and disseminated-chromite (Cr) occurrences in layered ultramafic complex; grades of up to 25.8% Cr₂O₃ reported.
140. *Willow Creek, Independence, Lucky Shot, War Baby Lodes* - Major lode-Au-(Ag-Cu-Pb-Zn-Mo) district; produced about 404,425 oz lode Au and about 204,000 oz placer Au; potential for porphyry-Cu-Mo deposits. Independence Mine presently under active development.
141. Massive and disseminated chromite (Cr) in ultramafic complex; rocks geochemically anomalous in Ni.
142. *Latouche - Beatson* - Major stratabound massive-sulfide Cu-Zn-Ag deposit; produced about 205 million lbs Cu from about 6 million tons ore (grade averaged about 1.7% Cu); inferred reserves about 5 million tons of 1% Cu, 1.5% Pb+Zn, and 1 oz/ton Ag; deposit occurs near southern end of major stratabound massive-sulfide belt that contains deposits at localities 173 through 176; numerous other occurrences in area have potential for large tonnages of similar grade ore; active claims and exploration.
143. *Rua Cove* - Major stratabound massive-sulfide Cu-Zn deposit similar to deposit at locality 169; published reserves at least 1.1 million tons of 1.25% Cu; potential for larger reserves; numerous similar massive-sulfide occurrences in area have similar potential; active claims and exploration.
144. *Ellemar* - Stratabound massive-sulfide Cu-Zn-Au deposit; produced about 16,000 tons that averaged about 10% Cu; active claims and exploration.
145. Stratabound massive-sulfide Cu-(Ag-Ag-Zn) prospect; active claims and exploration.
146. *Midas Mine* - Major stratabound massive-sulfide Cu-(Au-Ag-Pb-Zn) deposit; produced about one million lbs Cu; similar to deposits at localities 172 and 173; active claims and exploration.

147. *Spirit Mountain* - Significant massive and disseminated mineralization in ultramafic complex.
148. Porphyry Cu-Mo prospects; grades of up to 2% Cu reported; active claims and exploration.
149. *Binocular Deposit* - Significant stratiform massive-sulfide Cu-Ag deposits (Kennecott-type); contain drilled-out reserves; potential for large, high-grade deposits.
- 149a. *Kennecott Deposits* - Major stratiform massive-sulfide Cu-Ag deposits. Some of the highest grade copper lodes ever mined; produced approximately 1.2 billion lbs Cu and 9 million oz Ag. One report states that up to seven years of reserve (at 500 TPD) remain.
150. Significant stratiform massive-sulfide Cu-Ag deposits.
151. Cu-Pb-Zn-Ag mineralization in breccia pipe; potential for significant high-grade mineralization.
152. *Nabesna Mine* - 66,960 ounces of gold won from 88,224 tons of ore, 193041.
153. *Bond Creek-Orange Hill* - Two major porphyry Cu-Mo deposits; inferred reserves of 850 million tons of 0.3-0.5% Cu and 0.03% MoS₂.
154. *Carl Creek* - Porphyry-Cu deposit; inferred reserves of 16 million tons of 0.2% Cu.
155. *Baultoff* - Porphyry-Cu deposit; inferred reserves of 160 million tons of 0.2% Cu.
156. *Horsfeld* - Porphyry-Cu deposit; inferred reserves of 60 million tons of 0.2% Cu.
157. *Marmot* - Major stratiform barite-Pb-Zn-Cu-Ag deposit; 48-80 ft-thick unit of 60% barite w/Ag values, and a basal 2.8 ft thick unit of massive-sulfide (2% Pb, 3% Zn, 1% Cu, 2-4 oz/ton Ag and 0.12 oz/ton Au).
158. *Klukwan* - Major Fe-Ti deposit in ultramafic intrusion; inferred reserves of 1 to 5 billion tons of 11-20% Fe and 1.6 to 3.0% Ti.
159. *Nunatak Deposit* - Large, low-grade porphyry-Mo deposit; reserves of 8.5 million tons of 0.125% MoS₂; 2,247,000 tons averaging 0.067 MoS₂, 0.016% Cu, 129,530,250 tons averaging 0.026% MoS₂, 0.018% Cu.
160. Pb-Zn-Ag skarn mineralization.
161. *Endicott River* - Stratiform massive-sulfide Cu-Zn prospect; active claims.
162. *Brady Glacier* - Major Ni-Cu deposit in layered ultramafic intrusion; proven reserves of 100 million tons of 0.5% Ni (in sulfides) and 0.3% Cu; one of the top two nickel reserves in the United States; has platinum and cobalt credits.
163. *Mertie Lode and Funter Bay District* - Area contains substantial reserves of lode-Au mineralization (reserves containing 0.5 to 1 oz/ton Au partially blocked out); past production totaled 10,000 to 15,000 oz Au; area also contains significant Ni-Cu and Pb-Zn-Au occurrences (Ni-Cu deposit has reserves greater than 560,000 tons of 0.34% Ni and 0.35% Cu and about 0.15% cobalt).

164. *Alaska Juneau* - Major lode-Au deposit; produced 3.52×10^6 oz Au from 88.5 million tons between 1893 and 1944.
165. *Treadwell* - Major lode-Au produced 2.9×10^6 oz Au from 28.8 million tons ore between 1885 and 1922.
166. *Lemesurier Island* - Porphyry-Mo occurrence.
167. *Chichagof, Hirst Chichagof* - Major lode-Au district; two deposits produced about 770,000 oz Au; Chichagof mine produced about 700,000 oz Au and 200,000 oz Ag; Hirst Chichagof produced 67,980 oz Au and 20,000 oz Ag.
168. Stratiform massive-sulfide Cu-Zn deposit.
169. *Mirror Harbor* - Ni-Cu is layered ultramafic complex; probable reserves of 8,000 tons of 1.57% Ni and 0.88% Cu or inferred reserves of several million tons of 0.2% Ni and 0.1% Cu.
170. *Bohemia Basin* - Major Ni-Cu-Co deposit in layered ultramafic intrusion; reserves of 22 million tons of 0.33 to 0.51% Ni, 0.21 to 0.27% Cu, and 0.04% recoverable Co.
171. *Apex-El Nido* - Significant lode-Au-W deposits; produced between 10,000 and 50,000 oz Au.
172. *Greens Creek* - Major stratiform massive-sulfide Pb-Zn-Ag deposit; moderate tonnages of high-grade ore indicated; 95-ft intercept of 7.71% Zn, 1.94% Pb, 0.42% Cu, 5.4 oz/ton Ag, and 0.12 oz/ton Au in 1976; area also contains numerous other untested stratiform Pb-Zn-Ag prospects. Published reserves - 3.1 million tons of about 10% combination Pb-Zn-Cu, 12 oz/ton Ag, and about 0.12 oz/ton gold.
173. Area contains numerous occurrences of high-grade copper deposits; values up to 20% Cu and 2 oz/ton Ag reported; active claims.
174. *Snettisham* - Fe-Ti deposit in ultramafic intrusion; average grade about 18.9% Fe and 2.6% Ti; 500,000 tons containing 10.20% Fe.
175. *Tracy Arm* - Stratabound massive-sulfide prospect; over 1,140 feet long and 12 feet thick with grades averaging 1.5% Cu, 3.9% Zn, 0.013 oz/ton Au, and 0.76 oz/ton Ag; reserves of 40,000 tons/100 feet depth.
176. *Sumdum* - Stratabound massive-sulfide prospect in major north-south-trending stratabound massive-sulfide belt; potential strike length over 10,000 feet long and up to 50 feet thick. Inferred reserve 26,700,000 tons average 0.57% Cu, 0.37% Zn, and 0.3 oz/ton Ag.
177. Major stratabound massive-sulfide Cu-Zn prospects; stream-sediment anomalies up to 2% Zn; active claims and exploration; southward continuation of major stratabound massive-sulfide belt containing deposit at locality 17.
178. Stratabound massive-sulfide deposit; grades of up to 1% Cu, 0.3% Pb, 3.5% Zn, and 2 oz/ton Ag reported.
179. *Baranof, Warm Springs Bay* - Significant porphyry-Cu-Mo prospect; grades of 0.25% Cu and 0.07% MoS₂ reported.

180. *Red Bluff Bay* - Significant Cr mineralization in ultramafic complex; reserves of 570 tons of greater than 40% chrome or 29,000 tons of 18-35% chrome; numerous other Cr occurrences are exposed to the northwest.
181. *Cornwallis Peninsula* - Major stratabound massive-sulfide Cu-Pb-Zn-Ag barite prospects; grades of up to 20% Pb + Zn and 23 oz/ton Ag reported; active claims and exploration.
182. Stratiform massive-sulfide Cu-Pb-Zn-Ag-barite prospect; area contains numerous other stratabound sulfide-barite occurrences.
183. *Castle Island* - Stratiform barite deposit with about 850,000 tons of production (1963-1980); deposit contains Zn, Pb, and Cu sulfides; potential for stratabound massive-sulfides in area.
184. *Groundhog Basin* - Area contains several stratiform massive-sulfide prospects; grades of up to 8% Pb, 29 oz/ton Ag, and 0.5 oz/ton Au reported; active claims; area also contains porphyrytype Cu-Mo mineralization.
185. *Snipe Bay* - Ni-Cu deposit in layered ultramafic intrusions; inferred reserves of 430,000 tons of 0.3% Ni, and 0.3% Cu and 0.13 oz/ton Ag.
186. *San Juan Batista Island* - Porphyry-Mo prospect.
187. *Kasaan Peninsula* - Major massive-sulfide Cu-Fe-Au and Cu-Pd-Pt district; produced approximately 28 million tons of 50% Fe or 1.5 million tons of less than 2% Cu; reserves of 4 million tons of 50% Fe of 1.5 million tons of less than 3% Cu. Salt Chuck Mine produced over 20,000 ounces of platinum metals prior to World War II.
188. *Union Bay* - Significant Fe-Ti mineralization in ultramafic intrusion; contains concentrations of Pt and V.
189. *Borroughs Bay* - Porphyry-Mo prospect; grades of 0.06% MoS₂ reported.
190. Massive-sulfide deposit; potential for large tonnages of up to 10% Cu, 2% Zn, and 1.5 oz/ton Ag.
191. *Hyder District* - Past vein-fault mine produced 25,000 tons of high-grade W-Cu-Pb-Zn-Ag ores (1925-51). Porphyry Mo-W and massive-sulfide skarn Pb-An-Au-Ag and W prospects; grades of up to 10% Zn, 6% Pb, 5 oz/ton Ag, and 1 oz/ton Au reported for the massive-sulfide deposits; potential for very large tonnages of commercial-grade, porphyry-Mo-W mineralization.
192. *Jumbo* - Produced about 10 million lbs of copper. 280,000 ag, 7,000 oz Au, Cu from 150,000 tons ore; estimated reserves of over 650,000 tons grading 45.2% fe, 0.73% Cu, 0.01 oz/ton Au, and 0.08 oz/ton Ag.
193. *Copper City* - Stratiform massive-sulfide Cu-Zn prospects; grades of up to 12.7% Cu, 2.7% Zn, 2.5 oz/ton Ag and 0.2 oz/ton Au reported; potential strike length greater than 2 mile.
194. Massive-sulfide Cu-Pb-Zn occurrences.
195. *Quartz Hill* - Major porphyry-Mo deposit; active exploration and development since discovery in 1974; announced reserves of greater than 1.5 billion tons of 0.2 to 0.35%

MoS₂ make this deposit one of the largest Mo reserves in the world. \$18 billion gross-metal value.

196. Porphyry-Mo occurrence.
197. Significant stratabound (?) massive-sulfide Cu-Pb-Zn-Ag prospects; grades of up to 1% Cu; 8% Zn, 4% Pb, and 2 oz/ton Ag reported; active claims.
198. Stratabound (?) massive-sulfide Cu-Pb-Zn-Ag deposit; small tonnage, high-grade deposits with up to 20% Zn, 11% Pb, 1% Cu and 4 oz/ton Ag.
199. *Niblack* - Stratiform massive-sulfide Cu-(Pb-An-Ag) prospects; produced over 1.4 million lbs Cu, 11,000 oz Au, and 15,000 oz Ag; active claims and exploration.
200. *Bokan Mountain* - Numerous U-Th prospects associated with granitic intrusive complex; produced 120,000 tons of ore grading - 1.0% U₃O₈ from 1955-17; active claims and exploration; more reserves proven in late 1970's.
201. Stratiform massive-sulfide Cu-Pb-Zn-Ag-barite prospects.
202. Stratiform (?) massive-sulfide deposits; grades of up to 15% Pb + Zn and 5 oz/ton Ag reported; 70-foot-thick massive-sulfide intercept with 1% Cu, 4% Zn, 1% Pb, and 1.5 oz/ton Ag; active claims and exploration.
203. Stratiform massive-sulfide Cu-Zn prospect; active exploration.

APPENDIX H

Companies and individuals conducting exploration in Alaska
during 1981, by region¹

NORTHERN

WGM, Inc. (base, precious, alloy metals, expl./pros./devl.)
Wild River Ventures (Au, placer)
WAM mining (Au, placer)
2 R.H. & J.M. Assoc. (Au placer)
Tramway Bar Mine (Au placer)
NANA Development Corporation (Jade placer mining)
Sunshine Mining Co. (Cu, Pb, Zn, Ag, Au, expl./pros.)
NANA Regional Corporation (massive sulfide expl./pros.)
GCO (Lik deposit)
Jan Drew Holding, Ltd. (placer ore)
Bouton Enterprises (placer, expl./pros.)
Bear Creek Mining Co. (Cu, Pb, Zn, Agt, Au, expl./pros.)
Arctic Slope Regional Corporation (Hardrock exploration)
Anaconda Company (base and precious metals)
Cominco American (base metals; Red Dog Deposit)

WESTERN

Lost River Mining (Sn placer)
L & B Mining/DB Parent (placer)
Houston International Minerals Co. (Au, Ag, Pb, Zn, Cu, expl./pros.)
WGM, Inc. (base, precious, alloy metals, expl./pros./devel.)
Kotzebue Sound Exploration (placer)
William Jones (Au placer)
Jump Creek Placers (placer, expl./pros.)
Lomen Mining & Commercial Co. (Au, placer)
Kougarok Mining (Au, placer)
Griff Quinton & Greg Quinton (Au placer)
Mespelt & Almasy Mining Co. (Au, Ag, Cu, U, Sn, Bi, Pb-Zn, As, hardrock,
placer, expl./pros.)
Greatland Exploration (Au, Ag-Pb-Zn, placer, expl./pros.)
Bill Boucher (Au placer, expl./pros.)
Alaska Gold (Au placer)
ASARCO, Inc. (Au placer expl./pros.)
Alaska Silveinia Mines (Ag-Pb hardrock, expl./pros.)

¹Based on DGGS questionnaire and USBM data; incomplete and probably doesn't include many small companies.

EASTERN INTERIOR

Lucky Silver Mining Co. (Au placer)
Little Squaw Gold Mining Co. (Au lodes and placer)
Lester-Orbanski Mines, Inc. (Au placer)
Deadwood Mining Co. (exploration/prospecting)
Bottom Dollar Mining (Au placer)
J & M Mining & MK Jacobs (Au)
Houston International Minerals Co. (Au, Ag, Pb, Zn, Cu expl./pros.)
Herning Exploration & Mining Co. (Au hardrock, placer, expl./pros.)
Clifford Lloyd Haydon - Cascaden Mining Co. (placer)
Heflinger Mining & Equipment Co. (Au placer)
Mike Hartman, Timothy Larson (Au placer - gemstones)
GA Hanks & Sons (Au placer)
Union Carbide Corporation (Tungsten, Au, Cr, Molybdenum expl./pros.)
WGM, Inc. (base, precious, alloy metals, expl./pros./devel & asbestos)
T&K Mining (placer)
Yutan Construction Co. (rock quarry)
Ray Wolf (Au, Ag placer)
Starkey A. Wilson c/o John Ramsey (Cu, Ag, Pb, Au, Sb expl./pros.)
Wilber A. & Ann J. Williams (Au placer)
Waugaman Enterprises (Hardrock & placer)
Frank J. Vana (Au placer & Barite)
Usibelli Coal Mines, Inc. (coal mining)
Two Weeks Behind Mining Assoc. (Au placer)
Twelker, Fitch & Assoc. (Au placer, precious & base metals, hardrock)
Mark Thoennes & Ray DeMoss (Hardrock, expl./pros.)
Pipedream Mining & Mineral Exploration (placer, expl./pros.)
AOS Mining & Exploration (placer, expl./pros.)
Cook's Mining (Au placer)
Getty Oil Co. (Cu, Pb, Zn, Ag, Au expl.)
Frank A. Putnam dba Putnam Enterprises (Au placer)
Straight Cr. Mining Co. (Au, Ag, Cu placer, expl./pros.)
St. Joe American Corp. (Au, expl./pros.)
Savage Mining Co. (Au, tin, placer, expl./pros.)
Placid Oil (Au, Ag, hardrock exploration)
Tricon, Inc. (Au, Ag, expl.)
Patino, Inc. (Sn, W, Au, Ag, Pb, Zn, Mo, hardrock, placer, expl./pros.)
Enserch Exploration, Inc. (Au, placer, hardrock, expl./devel.)
Northern Ventures (Au, placer, expl./pros.)
Northern Lights Exploration (Cu, Au, Ag, Pb, Zn, expl./pros.)
Rhode Island Creek Mines (Au, placer)
Resource Exploration Consultants, Inc. (Au, Ag, expl./pros.)
Resource Associates of Alaska (Au-Wg, Au-Wo₃⁺, Wo₃, placer, expl./pros.)
Nelson Mining Co. (Au placer)
Moose Creek Mining Co. (placer)
Mike-Kilo Enterprises (Au placer)
Meadowlark Mining Co/CDC Partners (Au, Ag, hardrock)
Meadowlark Farms (coal expl./pros.)

EASTERN INTERIOR (continued)

R.S. McCombe (expl./placer)
Marble Creek Mining & Snow Lion Mining Co. (placer, hardrock, expl./pros.)
Gullycat Enterprises (Au placer)
Cripple Creek Mining & Dev. Co. (placer)
Golden Dragon Mining Co. (Au placer)
Fairbanks Sand & Gravel, Inc. (gravel pit)
Exxon Minerals Co. (base metals & uranium expl./pros.)
DNL Mining (Au placer, pros., dredging)
Delta Minerals (Au, Ag, hardrock, placer, expl./pros.)
Thomas Peter Delong & David Delong (hardrock, placer)
Davis Creek Mining Co. (Au placer)
Jeffrey Burton & Assoc. (Au hardrock - consulting)
Bear Creek Mining Co. (Cu, Pb, Zn, Au-Ag, expl./pros.)
William E. Bell (Au placer, expl./pros.)
Albett Mining Co. (placer)

SOUTHWESTERN

Houston International Minerals Co. (Au, Ag, Pb, Zn, Cu, expl./pros.)
Hanson Properties, Inc. (platinum placer)
WGM, Inc. (base, precious & alloy metals, expl./pros./devel.)
Misco-Walsh Mining Co. (Au/Ag placer)
Phillips Minerals (tungsten/moly, Au, Pb-Zn-Ag expl./pros.)
Northland Gold Dredging, J/V NyAc (Au placer)
Duval Exploration (Sn, Ag, Au, Mo hardrock)
Coronado Mining Co. (Au hardrock & placer)
Amax Exploration (Mo, W, Sn, precious metals, expl./pros.)
Anaconda Company (base and precious metals)

ALASKA PENINSULA & KODIAK

Resource Associates of Alaska (Au-Ag, Au-Wo₃ & Wo₃ placer, expl./pros.)
Apollo Mines, Ltd. (Au hardrock)

SOUTHCENTRAL

Alaska Apex & Mining
Jones & Co. (Au, Ag placer & expl./pros.)
Houston International Minerals Co. (Au, Ag, Pb, Zn, Cu expl./pros.)
Union Carbide Corp. (W, Au, Cr, Mo)
WGM, Inc. (base, precious, alloy metals expl./pros./devel.)
Willow Creek Cons. Gold Mines (hardrock Au)

SOUTHCENTRAL (continued)

Willow Cache Enterprises (placer)
Mapco Minerals Corporation (Au & Ag expl./pros.)
Silver Star Mining Co. (Ag, Wg, Pb, Zn, Pb, Cu, hardrock placer, expl./pros.)
Nelchina Mines J/V (Au/platinum placers)
Coronado Mining Corp. (Au hardrock)
WL Davis, Gaston, Belarde (Au placer)
Norm Stowers (Au placer)
Stevens Exploration
Enserch Exploration, Inc. (Au placer, hardrock, expl./devel.)
Ranchers Exploration & Dev. Program (Au placer, expl./pros.)
Placer Amex, Inc. (Sub-bituminous coal, expl./pros.)
Phelps Dodge Corp. (expl./pros.)
Northwest Explorations (Cu-Mo)
Clifford R. Nicholson (Au-platinum placer, expl./pros.)
Neal & Co., Inc. (gravel)
John Moore (Au placer)
Greatland Exploration (Au, Ag-Pb-Zn placer, expl./pros.)
Golden Fleece Mining (Au placer, expl./pros.)
Geneva Pacific Corp. (Au, Ag, Cu, Zn, Pb expl./pros.)
GEM Exploration (Au placer)
Finnbear Mining & Exploration (Au, Ag, Cu, Platinum hardrock, expl./pros.)
HA Faroe (coal expl./pros.)
"Double L" Enterprises (Au placer, expl./pros.)
Coronado Mining Co. (Au, hardrock & placer)
Crescent Gold Mines (Au placer, Au, Ag, Cu, Pb, Zn, Ni, expl./pros. lode)
Anaconda Company (base and strategic minerals expl.)
Coyle (gravel)
Jeffrey Burton & Assoc. (Au hardrock - consulting)
Copper Valley Prospectors Assoc. (Pb-Zn-Ag placer, expl./pros.)
Chugach Native, Inc./Korean Alaska Dev. Co. (coal exploration)
Francis R. Brittain (gravel)
Brechan Enterprises, Inc. (sand & gravel)
Bear Creek Mining Co. (Cu-Mo expl./pros.)
Alaska Apex and Mining (Arsenopyrite & Au hardrock, expl./pros.)
Alaska Gold Exchange (Au placer - hand pan)
Sidney Abbott (Cu placer, hardrock)

SOUTHEASTERN

Inspiration Development Co. (Ni-Cu ore)
Hyak Mining (Au, Cu, Pb, Zn expl./pros.)
Houston International Minerals Co. (Au, Ag, Pb, Zn, Cu expl./pros.)
Hildre Sand & Gravel Co. (sand & gravel)
U.S. Borax (porphyry Mo, hardrock)
Partnership-Hawkins, Lillie & Kenneth Eichner (Cu, Fe, Au, Scheelite, expl./pros.)

SOUTHEASTERN (continued)

Mineral Basin Mining Corporation (exploration)
 Stevens Exploration
 St. Joe American Corp. (Au expl./pros.)
 R.H. Seraphim Engineering, Ltd.
 Resource Associates of Alaska (Au-Ag, Au-Wo₃⁺, Wo₃, placer, expl./pros.)
 Rocky Mountain Energy (Ni, Cu expl./pros.)
 Newmont Exploration of Canada, Ltd. (base & precious metals expl./pros.)
 Moore Construction dba Ketchikan Ready Mix & Quarry (quarry)
 Madsen Dev. Co. (gravel)
 Exxon Minerals Co. (base metals & U, expl./pros.)
 Dwain Reddekopp, Inc. (gravel)
 Duval Corporation (Sn, Ag, Au, Mo hardrock)
 Conoco, Inc. (Au, Ag expl./pros.)
 City of Ketchikan (gravel & sand)
 E. O. Bracken (Au placer, hardrock, expl./pros.)
 Amax Exploration (Mo, W, Sn, precious metals, expl./pros.)
 AMOCO Minerals Co. (expl./pros.)
 Noranda Company (base and precious metals)

ACTIVE CLAIM HOLDINGS OF MAJOR CORPORATIONS

Amax Exploration	52	Hunt Oil Co. (Minerals)	120
Amoco Minerals	153	Mapco, Inc.	2245
Anaconda	5282	Mohawk Resource Alaska, Inc.	151
Bear Creek Mining	924	Nana Regional Corp.	23
B.P. Alaska Exploration	35	Noranda Exploration	2343
C.C. Hawley & Associates	190	Pacific Coast Mines,	
Cominco	6566	Cities Service	394
Cook Inlet Region, Inc.	165*	Phillips Petroleum	184
Duval Corporation	122	Placid Oil	653
Exxon	519	Resource Associates of Alaska	2283
General Crude Oil	8818	Starkey Wilson	74
Geneva-Pacific Corp.	280	Texas Gulf, Inc.	82
Getty Mineral Resources Co.	534	Union Carbide	64
Greatland Exploration	2764	Urangesellschaft	28
Gulf Mineral Resource	117	U.S. Borax	1395
Houston Oil & Minerals	3700	W.G.M.	495
		TOTAL	40,755

*104 claims to partnership with Houston Oil & Minerals, R.A.A.

APPENDIX I

1980 Mining licenses issued by the Alaska Department of Revenue

A & E MINING

Arthur J. Manginelli
P.O. Box 10-1156
Anchorage, Alaska 99511
(Placer - Gold)

A.B. PLACER

Richard "Red" Olson
P.O. Box 74528
Fairbanks, Alaska 99707
(Placer - Gold)

ALRCO

Anson L. Renshaw, Jr.
1850 Wickersham Dr.
Anchorage, Alaska 99507
(Various - gold - placer)

AOS MINING & ENGINEERING

Roy W. & Cheryl M. Ferrenbach
P.O. Box 74204
Fairbanks, Alaska 99706
(Placer drift - Any)

AU LIMITED MINING

Helen H. Warner
P.O. Box 80674
College, Alaska 99708
(Bulldozer - Gold/tin)

AU PLACER, INC.

D. E. Booth
P.O. Box 80255
Fairbanks, Alaska 99701
(Placer - Gold)

AIMLES

Colleen K. Ament/Leslie Ament
1731 Lake Otis Parkway
Anchorage, Alaska 99504
(Suction dredge - Gold)

ALAS-KAN MINING CO.

Richard K. and Delores E. Pralle
SR Box 5433
Wasilla, Alaska 99687
(Sluice w/bulldozer - Gold)

ALAS-KIN MINING & EXPLORATION CO.

R. David Kincaid
3835 W. 35th Avenue
Anchorage, Alaska 99503
(Placer/dragline - Gold)

ALASKA APEX AND MINING

James P. Conway
SR B Box 7660
Palmer, Alaska 99645
(Underground/Gold/Magnetite)

ALASKA APOLLO GOLD MINES, LTD.

c/o Keane, Harper, Pearlman & Copeland
420 L Street, Suite 302
Anchorage, Alaska 99501
(Gold - Lode - underground)

ALASKA BRIDGE & DOCK, INC.

P.O. Box 6525
Anchorage, Alaska 99502
(Bulldozer - Gold)

ALASKA CONSTRUCTION & MINING

Box 32
McGrath, Alaska 99627
(Placer - Gold)

ALASKA GOLD COMPANY

Box 640
Nome, Alaska 99762
(Bucket line dredge - Gold)

THE ALASKA GOLD EXCHANGE

John Meyer
511 South Bragaw St., Suite 2
Anchorage, Alaska 99504
(Hand panning - Gold)

ALASKA GOLD PARTNERS

Bobby S. Gammill
1360 Coring Place
Northglenn, Colorado 80233
(Hydraulic/backhoe - Gold)

ALASKA GOLD PLACER MINES

Thomas W. Bergman
RFD
Central, Alaska 99730
(Placer - Gold)

ALASKA HISTORICAL MEDALLION

R. J. Franke
737 "E" Street
Anchorage, Alaska 99501
(Placer - Gold)

ALASKA MINERALS

Thomas R. Hanna
2470 Mendenhall Peninsula
Juneau, Alaska 99801
(Hand - Epidote, quartz, magnetite)

ALASKA MINING CO.

Pelham L. Jackson & Dennis Stacey
5331 E. 26th Avenue No. 6
Anchorage, Alaska 99504
(Suction dredge/backhoe - Gold)

ALASKA "RANGER MINE"

Warren Michael Guenther
Box 112-283 Muldoon Road
Anchorage, Alaska 99504
(Dredge - Gold)

ALASKA SILVINIA MINES

Joseph C. Manga
P.O. Box 281
Galena, Alaska 99741
(Underground - Silver/lead)

ALASKAN PLACERS

Perry W. Carter
P.O. Box 10145
Fairbanks, Alaska 99701
(Dredge - Gold)

ALASKA MINING & PROCESSING CORP., LTD.

Cape Yakataga Division
Cape Yakataga, Alaska 99560
(Placer/backhoe - Gold, silver/platinum)

ALASKAN PLACERS

Robert M. Yothers
P.O. Box 10145
Fairbanks, Alaska 99701
(Dredge - Gold)

ALBETT MINING COMPANY

John H. Bayless
Drawer F
Copper Center, Alaska 99573
(Draglines - Gold)

ALMA GULCH CLAIM No. 1
ALMA GULCH CLAIM No. 2
Thomas T. Knudson
2201 3rd Avenue No. 1103
Seattle, Washington 98121
(Hand - Gold)

ALMARK MINE
Martin & Jean Herzog, Jr.
SRA Box 234
Anchorage, Alaska 99507
(Bulldozer/placer - Gold)

AMERICAN COPPER & NICKEL CO.
c/o Inco United States Inc.
One New York Plaza
New York, New York 10004
(All types)

AMERICAN CREEK MINING CORP.
James D. Sourant
425 "G" Street, Suite 630
Anchorage, Alaska 99501
(Bucket line dredge - Tin/gold)

AMERICAN CREEK PARTNERS
Don P. DeLima
Box 81467
College, Alaska 99708
(Bulldozer/hydraulic - Gold)

ANCALAGON MINING
Stephen Herschbach
4942 Knights Way
Anchorage, Alaska 99504
(Suction dredge - Gold)

**ANCHORAGE SAND & GRAVEL
COMPANY, INC.**
1813 East First Avenue
Anchorage, Alaska 99501
(Bucket loader - Open pit sand & gravel)

A.M. ANDLER
1566 Columbine
Anchorage, Alaska 99504
(Placer/dredge - Gold)

ANDY'S GOLD MINE
Andrew W. Miscovich
Box 1489
Fairbanks, Alaska 99707
(Placer - Gold)

ANNASANA ENTERPRISES

Colin W. Towse
P.O. Box 80541
College, Alaska 99708
(Bulldozer - Gold)

ARCTIC ASPHALT PAVING, INC.
P.O. Box 14
Soldotna, Alaska 99669
(Open pit - Bulldozer - Sand)

ARCTIC MINING, INC.
James K. Nannau
1940 Otter
Anchorage, Alaska 99504
(Placer - Gold)

**ARCTIC MINING, SALVAGE &
TREASURE**
1233 E. 76th Avenue
Anchorage, Alaska 99502
(Bulldozer - Gold)

ARNOLD, BRONELL & GLADYS
SR Box 1409
Eagle River, Alaska 99577
(Placer - Gold)

ARNOLD, WILLIAM S.
422 Aurora Drive
Anchorage, Alaska 99503
(Suction dredge/placer - Gold)

ASAMERA MINERALS (US), INC.
Willis A. White
1006 Smythe
P.O. Box 467
Fairbanks, Alaska 99707
(Placer - Gold)

ASGROW MINING CO.
Steven L. Olson
P.O. Box 805
Wasilla, Alaska 99687
(Placer - Gold)

ASPEN EXPLORATION CORP.
3525 South Tamarac St., Suite 350
Denver, Colorado 80237
(Bulldozer - Gold and other metals)

ATKINS, CHARLES
8511 Atkins Place
Anchorage, Alaska 99507
(Placer - Gold)

**AULT ENTERPRISES/MINING
VENTURES**
Robert Ault
Box 1596
Fairbanks, Alaska 99707
(Dozer/hydraulic - Gold)

AUNE, PATRICIA
Bettles, Alaska 99726
(Prospecting/placer - Gold)

B. B. KING COMPANY
Rick Manore & Tom Curry
P.O. Box 873
Eagle River, Alaska 99577
(Bulldozer - Gold)

B. H. K. MINING COMPANY
Alfred Kelley
General Delivery
Central, Alaska 99730
(Placer - Gold)

**BJS DIVING & UNDERWATER
MINING CO.**
Barry James Struempf
P.O. Box 10-1096
Anchorage, Alaska 99511
(Underwater scuba diving - Gold/silver)

B S MINING CO.
James T. Stone & William J. Stone
P.O. Box 10-1864
Anchorage, Alaska 99511
(Bulldozer - Gold)

B. & B. MINING
Bernard D. & Betty D. Wright
Wiseman, Alaska 99726
(Suction dredge - Gold)

B & B MINING
Dennis R. & Linda L. Bradbury
Box 124
Trapper Creek, Alaska 99688
(Placer - Gold)

B & E MINING
Robert D. & Edith Penrose
Box 175
Mile 8 Tok Road
Gakona, Alaska 99586
(Open - Sand)

BADGER MINING COMPANY
Daniel Coben, Sr.
P.O. Box 1393
Fairbanks, Alaska 99707
(Placer - Gold)

BATCHELOR ENTERPRISES
Harold E. & Patricia S. Batchelor
102 Steelhead Road
Fairbanks, Alaska 99701
(Dozer/loader - Gold)

BEACH RIVER CORP.
John E. Bergelin
P.O. Box 82009
Fairbanks, Alaska 99708
(Placer)

BEAVER ENTERPRISES
R. W. Hughes
P.O. Box 5364
North Pole, Alaska 99705
(Placer - Gold)

BEDROCK CORP.
SRA Box 1139
Anchorage, Alaska 99502
(Placer/dragline/tractor - Gold/tungsten)

BEISTLINE, EARL H.
P.O. Box 80148
Fairbanks, Alaska 99708
(Bulldozer - Gold)

BELL, WILLIAM E.
1428 Stacia
Fairbanks, Alaska 99701
(Placer - Gold)

BENCH CREEK MINING
Jerry A. Dunnell
2090 Lakeview Terrace
Fairbanks, Alaska 99701
(Placer - Bulldozer - Gold/silver)

BEVANS, RUSS
610 C Street, No. 214
Anchorage, Alaska 99501
(Placer - Gold)

BIG FOUR MINE - ALASKA
W. J. Beerman
210 S. 8th Avenue No. 1
Yakima, Washington 98902
(Placer - Gold)

BIG FOUR MINING COMPANY
1727 Talkeetna Street
Anchorage, Alaska 99504
(Hand - Gold)

BIG WINDY MINING CO.
Harold W. Shope
4332 College No. D4
Fairbanks, Alaska 99701
(Placer - Gold)

BIRD CREEK MINING CO, INC.
4691 Caravelle Drive
Anchorage, Alaska 99502
(Bulldozer/hydraulic - Gold)

BIRDSELL-STAATS-NEAL
Russell L. Birdsell
P.O. Box 1908
Cave Creek, Arizona 85331
(Placer - Gold)

BLACK SANDS MINING CO.
Philip D. Strange
P.O. Box 1478
Wasilla, Alaska 99687
(Placer - Gold)

BLISS & SONS
Patrick J. Bliss
Ungalic Via
Unalakleet, Alaska 99684
(Bucket dredge/hydraulics - Gold/silver)

BLUE BIRD ASSOCIATION, INC.
Gilbert A. Lamb
6661 S. 300 E
Midvale, Utah 84047
(Placer - Gold)

BLUE WATER MINING COMPANY
Harold A. Nevers
R 4, Box 4386
Juneau, Alaska 99803
(Placer - Gold)

**BOCK, BARRY W./DANIEL
UNDERSTAHL PARTNERSHIP**
General Delivery
Chicken, Alaska 99732
(Placer/bulldozer - Gold/silver)

BONANZA MINING CO.
P.O. Box 10023
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

BONANZA MINING CO.
Earl L. Jones
830 6th Street
Fairbanks, Alaska 99701
(Placer - Gold)

BONNFIELD MINING COMPANY
Timothy Loew & James Protzman
P.O. Box 668
Whittier, Alaska 99502
or
8017 Lloyd Drive
Anchorage, Alaska 99502
(Suction dredge/scuba - Gold)

BORDER GOLD
Ted Owen
Chicken, Alaska 99732
(Placer - Gold)

BOTTOM DOLLAR MINING CO.
Loren C. Hite
Central, Alaska 99705
(Placer - Gold)

BOUCHER, BILL
Box 60174
Fairbanks, Alaska 99706
(Placer/hand - Gold)

BOULDER CREEK MINING COMPANY
Frank & Jack Mize
Rt. 2, Box 932
Soldotna, Alaska 99669
(Hand - Gold)

BOULDER CREEK MINING CO.
Les Fickes & Dorothy Fickes
P.O. Box 2618
Fairbanks, Alaska 99707
(Placer - Gold/silver)

BOULDER CREEK PLACER CLAIMS
Frank M. Hall
Box 1073
Juneau, Alaska 99802
(Placer - Gold)

BOUTON ENTERPRISES
Glenn D. or Lela Bouton
Wiseman, Alaska 99726
(Placer - Gold)

BRACKEN, E. O.
P.O. Box 1098
Juneau, Alaska 99802
(Prospecting - Gold/silver/metallics)

BRANDL, PHILIP A.
SRA Box 246
Anchorage, Alaska 99507
(Prospecting - Gold)

BRASS MONKEY RANCH
Francis R. Brittain
SR Box 330
Copper Center, Alaska 99507
(Open pit/loader - Gravel)

BROBERG, CORTLAND A.
8429 Jupiter Drive
Anchorage, Alaska 99507
(Placer - Gold)

BRUCE, F. L.
General Delivery
Chicken, Alaska 99732
(Lode - Silver)

BRUNO, DAVID D./SCHLEISING,
HERMAN J.
P.O. Box 276
Glennallen, Alaska 99588
(Open pit - Gravel)

BURRIDGE, STEPHEN
9941 Tolsona Circle
Anchorage, Alaska 99502
(Suction dredge - Gold)

CDC PARTNERS
L. C. Hoffman
3701 Rainier Bank Tower
Seattle, Washington 98101
(Underground - Gold/silver)

CJ MINING
Craig Johnson
1205 Park Drive
Fairbanks, Alaska 99701
(Placer - Gold)

C. J.'S GRAVEL SALES & EQUIPMENT
SERVICES
Cal Schertenleib
SR Box 80822H Newby Road
Fairbanks, Alaska 99701
(Dragline - Gravel)

C R C COMPANY
George Gordon
219 Yale Way
Fairbanks, Alaska 99701
(Backhoe/dozer - Gold)

C-D DEVELOPMENT CORPORATION
Suite 600, 365 Bay Street
Toronto, Ontario, Canada M5H 2V9
(Exploration & Development -
Copper/etc.)

C & D SUPPORT SERVICES
Charles C. Hall
3243 College Road, C-6
Fairbanks, Alaska 99701
(Open pit - Heavy metal)

C & S MINING
Tom Cornwall
Box 80789
College, Alaska 99708
(Placer - Gold)

C & W MINING ASSOCIATION
Larry K. Wike
536 - 2nd Avenue
Fairbanks, Alaska 99701
(Placer - Gold)

CALERO MINING
Rodney G. Follett
Juanita Loop, Box 62
Eagle River, Alaska 99577
(Sluice - Gold)

CANYON CREEK MINE
Albert H. & Katherine Kramme
Aniak, Alaska 99552
(Dozer/hydraulic - Gold)

CARNELL, D. H.
P.O. Box 60435 F
Fairbanks, Alaska 99706
(Placer - Gold)

CARR, TERRY
2923 Lily
Anchorage, Alaska 99504
(Skin diving/suction dredge - Gold)

CARROLL, VONDRA
P.O. Box 1775
Fairbanks, Alaska 99707
(Bulldozer/hand - Basalt rock)

CARVER, BURTON
Box 40
Soldotna, Alaska 99669
(Placer/bulldozer - Gold)

CASSITERITE PLACERS, INC.
Jack Neubauer
Manley Hot Springs, Alaska 99756
(Placer - Gold/Tin)

CENTRAL ALASKA MINING CO., INC.
610 C Street, Suite 214
Anchorage, Alaska 99501
(Placer - Gold)

CHICKAMAN MINING COMPANY
Lou Schene
General Delivery
Chicken, Alaska 99732
(Bulldozer - Placer - Gold)

CHROMALLOY MINING & MILLING
William Devitt, V.P.
2620 Fountainview, Suite 400
Houston, Texas 77057
(Underwater - barite ore)

CIBOLO COMPANY
Arne N. Sundt
1333 West 11th Avenue
Anchorage, Alaska 99501
(Bulldozer - Gold)

CITIES SERVICE MINERALS CORP.
P.O. Box 300
Tulsa, Oklahoma 74105
(Various)

CLARKE, JAMES S.
P.O. Box 2102
Fairbanks, Alaska 99701
(Placer/shovel/pan/cat)

CLIFFS ENTERPRISES
Clifford D. Alexander
Box 602
Fairbanks, Alaska 99707
(Placer - Gold)

CLINT'S MINING COMPANY
Clenus W. Saathoff
1350 Osford Drive
Anchorage, Alaska 99503
(Prospecting/placer - Gold)

COBOL MINING CLAIMS
John T. Brockway
R 4, Box 4790-20
Juneau, Alaska 99803
(Hard rock/underground - Gold/silver)

COLE, ELVIS L.
741 Gum Street No. 2074
Anchorage, Alaska 99501
(Suction/dredge - Gold)

COLE, JOHN H.
SR Box 50715
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

COLLEDGE, LYLE
Colledge Ents
P.O. Box 60478
Fairbanks, Alaska 99706
(Placer - Gold)

COLLINSVILLE TWIN CREEK, INC.
c/o 310 K Street, Suite 408
Anchorage, Alaska 99501
(Bulldozer/dragline - Gold/silver)

COMPASS MINING COMPANY
John B. Hall
P.O. Box 2700
Fairbanks, Alaska 99707
(Hydraulic - Gold)

CONLEY, TIMOTHY L.
6 Mile Rich Highway
SR Box 60291
Fairbanks, Alaska 99701
(Placer - Gold)

**CONSOLIDATED WRANGELL
MINING CO.**

Jim Haraower
2606 C Street, Suite 4
Anchorage, Alaska 99503
(Placer/hand - Cu/Ag)

**COOK INLET EXPLORATION AND
DEVELOPMENT, INC.**

James R. W. Medina
521 East 45th Avenue
Anchorage, Alaska 99503
(Lode/placer - All minerals)

COOK, JACK P.

P.O. Box 393
Fairbanks, Alaska 99707
(Placer - Gold)

**COPPER RIVER MINERAL &
MINING COMPANY**

John Arthur Alexander
1210 H Street
Anchorage, Alaska 99501
(Placer - Gold)

CORAZZA, RICHARD

Box 1320
Homer, Alaska 99603
(Backhoe - Gold)

CORDTS-MITCHELL

as individuals
Robert A. Mitchell
Box 269
Galena, Alaska 99741
(Placer/dozer - Gold)

COX, DORMAN

610 C Street, No. 214
Anchorage, Alaska 99501
(Placer - Gold)

COYLE, WALDO E. OR RUBY S.

P.O. Box 466
Kenai, Alaska 99611
(Open pit - Gravel)

CRESCENT GOLD MINES

Edward E. & Jennie Ellis
P.O. Box 10-1461
Anchorage, Alaska 99511
(Backhoe - Gold)

CREVICE CREEK ENTERPRISES

Matt Fickus & William Fickus
Bettles, Alaska 99726
(Placer - Gold)

**CRIPPLE CREEK MINING &
DEVELOPMENT CO., INC.**

William J. Hennessey
General Delivery
Ester, Alaska 99725
(Placer - Gold)

CROUCH, TROY D.

SR Box 60897
Fairbanks, Alaska 99701
(Placer - Gold)

CURRY, MARK

General Delivery
Juneau, Alaska 99801
(Hand - Gold)

CUYKENDALL, PHILIP S.

1924 N.E. 14 St.
Renton, Washington 98055
(Placer/bulldozer - Gold)

**DONALD & EVELYN PROSPECTING
EXPLORATION & MINING**

COMPANY
(DEPEM)
Donald & Evelyn Stein
105 Dunbar Avenue
Fairbanks, Alaska 99701
(Underground - Gold/silver/copper/
lead/zinc)

DJW MINING COMPANY

Dennis Warth
6623 Lunar Drive
Anchorage, Alaska 99504
(Hand - Gold)

D & D EXPLORATION

Fred Distad - Jack Distad
P.O. Box 60201
Fairbanks, Alaska 99706
(Placer - Gold)

D & N ENTERPRISES

David William Abbott
Nancy R. Darity
General Delivery
Central, Alaska 99730
(Dozer - Gold)

D & O VENTURES

Clifford Driskel
Richard E. Olsen
235 East 9th Avenue
Anchorage, Alaska 99501
(Placer - Gold/silver)

D & R PLACER MINING

D. E. Holt - D. Keays
R. L. Phillips
SR Box 30777
Fairbanks, Alaska 99701
(Placer - Gold)

DAN CREEK VENTURES

P.O. Box 401
Gig Harbor, Washington 98335
(Bulldozer - Gold)

DANIELS CREEK MINING

Russell Foyle
P.O. Box 2624
Fairbanks, Alaska 99707
(Placer/bulldozer - Gold/silver)

DAVIS CREEK MINING COMPANY

John R. Burns
Chicken, Alaska 99732
(Bulldozer/hydraulic - Gold)

DAVIS MINING

John C. Davis
91.5 Taylor Highway (Gen. Del.)
Boundary, Alaska 99790
(Bulldozer/hydraulic - Gold)

DEADWOOD MINING COMPANY

James T. Morgan
Box 56
Hope, Alaska 99605
(Hand/dredge - Gold)

DENALI MINING COMPANY

John Dennis Stacey
SRA Box 8766
Indian, Alaska 99540
(Hand/dredge - Gold)

DENALI MINING COMPANY

1113 W. Fireweed Lane, Suite 203
Anchorage, Alaska 99503
(Bulldozer - Gold)

DEVENY MINE

Paul Ellis Deveny
218 6th Avenue
Fairbanks, Alaska 99701
(Placer - Gold)

DeWITT, HAROLD

P.O. Box 1374
Fairbanks, Alaska 99701
(Placer - Gold)

DIG DIG DIG

Louis J. Griermann
Box 3551
Anchorage, Alaska 99501
(Placer - Gold/silver)

DOLLAR CREEK MINES
George H. McCullough
Mile 3 Spur Road
Talkeetna, Alaska 99676
(Placer/bulldozer - Gold)

DOME CREEK MINING COMPANY
Betty L. Keppner & Gary J. Mudd
P.O. Box 4-905
Anchorage, Alaska 99509
(Dredge - Gold)

DOTTIE MAE
Joseph Paul Belegrin III
SR Box 50717
Fairbanks, Alaska 99701
(Placer - Gold)

DOUBLE D MINING CO.
Dell E. Johnson
2110 Broadmoor Acres
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

DOUBLE EAGLE MINING
Paul Rice
SR Box 20575-D
Fairbanks, Alaska 99701
(Placer - Gold)

DOUBLE "L" ENTERPRISES
Robert L. Edmands
P.O. Box 5
Kasilof, Alaska 99610
(Hand - All)

DREW, FRED JR.
1404 Alaska Highway
Delta Junction, Alaska 99737
(Hand - Gold)

E & E ENTERPRISES
Roger Evans
P.O. Box 74711
Fairbanks, Alaska 99701
(Suction dredge - Gold)

E & M INVESTMENTS
Andrew Eker
7101 DeBarr Road
Anchorage, Alaska 99504
(Gravel)

EAGLE MINING CO.
Ron Gibbens
P.O. Box 10-1732
Anchorage, Alaska 99511
(Placer - Gold)

EDGE CUMBE EXPLORATION CO.,
INC.
Glenn H. Morgan
P.O. Box 758
Sitka, Alaska 99835
(Underground - Gold/silver)

EIGHT STAR MINING
John Reeves
Box 81941
College, Alaska 99708
(Placer/bulldozer - Any)

EL BORRACHO MINES
William L. King
409 N. Park Street
Anchorage, Alaska 99504
(Dozer/dredge - Gold/silver)

ELLINGSON, HAROLD - DIRK VAN
VUREN
SR Box 20653
Gilmore Apts. No. 9
14 Mile Steese Highway
Fairbanks, Alaska 99701
(End loader/dozer - Gold)

ELLIS MINING
Bobby J. Ellis
3606 Jewell Lake Drive
Anchorage, Alaska 99502
(Dredge - Gold/platinum/molybdenum)

EMERSON EXPLORATION, INC.
Robert C. Emerson
Box 1201
Fairbanks, Alaska 99707
Bulldozer/hydraulic - Gold)

ERICO
Sven E. & Curtis A. Eriksson
2205 Boniface Parkway No. 46
Anchorage, Alaska 99504
(Placer - Gold/silver)

EUREKA CLAIMS
George Bailey
Box 2052
Fairbanks, Alaska 99707
(Placer - All)

EUREKA MINING & EXPLORATION
Herman Roelleka - Rick McMullen
SR Box 20030
Fairbanks, Alaska 99701
(Placer/hand-dozer - Gold)

F3 INC.
J. N. Fields
Box 2419
Fairbanks, Alaska 99707
(Scuba/dredge - Gold)

FABRIZIO, JERRY L.
4323 Bagley North
Seattle, Washington 98103
(Trackloader placer - Gold)

FAIRBANKS SAND & GRAVEL, INC.
P.O. Box 686
Fairbanks, Alaska 99707
(Floating clam dredge - Gravel)

FAIRMAN-MADISON MINING CO.
Edgar J. Curtis/Patricia C. Curtis
7716 Island Drive
Anchorage, Alaska 99504
Lode/placer - Gold/silver)

FALLS CREEK MINING COMPANY
Robert F. Harik - Marvin E. Mahrt
SR Box 1680H
Anchorage, Alaska 99507
(Backhoe/loader/suction - Gold)

FANNIN, WILLIAM J.
SR Box 50543
Fairbanks, Alaska 99701
(Hand - Gold/silver)

FAR NORTH EXCAVATORS
Don W. Fickes
SR Box 2618
Fairbanks, Alaska 99707
(Placer/bulldozer - Gold)

FEDERAL MINING COMPANY
William J. Hennessey
General Delivery
Ester, Alaska 99725
(Placer - Gold)

FERGUSON MINING ALASKA
Donald J. Ferguson, Sr.
Box 93
Kotzebue, Alaska 99752
(Lift - Gold)

FIGLENSKI, JACK
Box 74636
Fairbanks, Alaska 99707
(Placer - Gold)

FLAT CREEK PLACERS
J. E. & R. S. Fullerson - DBA
Flat, Alaska 99584
(Dragline/bulldozer - Gold)

FOREST OIL CORP.
Edwin Clemens
78 Main Street
Bradford, Pennsylvania 16701
(Oil & gas)

40-MILE MINING CO.
William H. Morris
Virginia Bench No. 1
Chicken, Alaska 99732
(Hand/placer/dredge - Gold)

45 PUP MINING COMPANY
Russell Hammond
2928 Columbia Street
Anchorage, Alaska 99502
(Placer/bulldozer - Gold)

49TH MINING
John E. Ritter
P.O. Box 73792
Fairbanks, Alaska 99707
(Placer - Gold)

FOSTER, EARLE
Box 44
Haines, Alaska 99827
(Placer/dozer/hoe - Gold)

FREEMAN, CURTIS J.
206 Nerland
University of Alaska
Fairbanks, Alaska 99701
(Placer/bulldozer/hand - Gold/scheelite)

FURBUSH, CLARENCE E.
SRA Box 1
Palmer, Alaska 99645
(Suction/dredge/hydraulic - Gold)

G.L.D. CORP.
Layne Gardner
RFD
Central, Alaska 99730
(Sluice/placer - Gold)

G.S.B. CO.
Glenn Scott Bracale
534 N. Bliss Street No. 4
Anchorage, Alaska 99504
(Placer - Gold)

G & G MINERALS
Fowler, Robert G. & Shadle,
Gene P.
4701 Kershner Avenue
Anchorage, Alaska 99503
(Excavation - Gold)

G & H SAND & GRAVEL
Garry A. Hess
705 Muldoon Road 75
Anchorage, Alaska 99504
(Loader - Sand/gravel)

GAUSS MINING CO.
Hagen Gauss
P.O. Box 960
Wasilla, Alaska 99687
(Hand/suction/dredge - An)

GERAGHTY, RICHARD W.
206 Kody Drive
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

GIANT ALASKA MINING CO.
Robert L. Craig
469 Jenni Street
Fairbanks, Alaska 99701
(Front-end loader - Gold)

GILL, TERRY
Port Alsworth, Alaska 99653
(Hydraulic/hand - Gold)

GIZA, EUGENE P.
P.O. Box 3-3905
Anchorage, Alaska 99501
(Suction dredge - Gold)

GLACIER DEVELOPMENT COMPANY
John J. Bowman
P.O. Box 2426
Soldotna, Alaska 99669
(Placer/diving - Gold)

GLENN MINING COMPANY
Rosalyn E. Stowell
Manley Hot Springs, Alaska 99756
(Sluice - Gold)

GOGGANS & WILLIAMS
Bill R. Williams
SR Box 20571
Fairbanks, Alaska 99701
(Small suction dredge - Gold)

GOLD DUST MINING
Jay Hodges
SR Box 60397
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

GOLDBUG MINING COMPANY
Arthur J. Vathke
2212 Glacier No. 202
Anchorage, Alaska 99504
(Placer - Gold)

GOLDEN FLEECE MINING
James P. Wheeler
6801 Mink Avenue
Anchorage, Alaska 99504
(Placer/bulldozer/hand/
skindiving - Gold)

GOLDEN FLEECE MINING CO.
E. B. Joiner
P.O. Box 1
Kotzebue, Alaska 99752
(Placer/lode - Gold)

GOLDEN ARK MINING
Noah Stewart
7600 Duben
Anchorage, Alaska 99504
(Dredging - Gold)

GOLDEN BOYS & COMPANY
Kevin Pickett
P.O. Box 195
Fairbanks, Alaska 99707
(Bulldozer - Gold)

GOLDEN DRAGON MINING
William Ernst Weiss
623 S.
Brighton, Colorado 80601
(Hand & suction dredge - Gold)

GOLDEN NUGGET MINING CO.
Donald Sanders
Box 773
Eagle River, Alaska 99577
(Placer - Gold)

GOODNEWS PLATINUM COMPANY
Hanson Properties, Inc.
West 601 Main Street, Suite 305
Spokane, Washington 99201
(Bucket-line dredge/dragline -
Platinum (Gold also recovered))

GRAY, KENNETH J. - ROBBINS,
RONALD L.
7016 Weimer No. 20
Anchorage, Alaska 99502
(Placer/scuba diving - Gold)

GREAT AMERICAN MINING
George R. Haskins
P.O. Box 1777
Fairbanks, Alaska 99707
(Dragline - Gold)

GREATLAND EXPLORATION, LTD.
R. C. Sheardown
3512 Campbell Airstrip Rd.
Anchorage, Alaska 99504
(All types - Any)

GREEN CONSTRUCTION COMPANY
2015 Grand Avenue
Des Moines, Iowa 50312
(Bulldozer - Aggregates)

GREEN MINING & EXPLORATION

Douglas Green
2130 Bel Aire Avenue
Duluth, Minnesota 55803
(Placer/bulldozer - Gold)

GREENHORN MINING

Stanley M. Gelvin
Central, Alaska 99730
(Bulldozer - Tin/gold)

GREENSTONE MINING

Clarence Zaiser
Ruby, Alaska 99768
(Placer - Gold)

GRIZZLY BEAR MINING

Mark Horstman
1312 20th Avenue
Fairbanks, Alaska 99701
(Dredge - Gold/silver)

GRIZZLY BIRCH

Bobby O. Phillips
P.O. Box 10147
Fairbanks, Alaska 99701
(Placer - Gold/silver)

GRIZZLY MINING

Ben Willi
General Delivery
Central, Alaska 99730
(Placer/bulldozer - Gold)

GRUBSTAKE MINE

Fred Deiser
Mile One Nabesna Road
Slana, Alaska 99586
(Cat - Gold/silver)

GULLYCAT ENTERPRISES

George A. Nelson
Box 80163
College, Alaska 99708
(Placer - Gold/silver)

H.K.R. MINING, INC.

SR Box 30306
Fairbanks, Alaska 99701
(Placer - Gold)

H & S MINING

George Hubbard
4106 Allen Place
Anchorage, Alaska 99504
(Dredge - Gold)

HADAY, INC.

Samuel S. Arentz
1720 Beneficial Life Tower
Salt Lake City, Utah 84111
(Open pit bulldozer - Cinnabar)

HALL YENTNA MINING CO.

William F. Hall
P.O. Box 8-9005
Anchorage, Alaska 99508
(Placer/floating washing plants -
Gold/silver)

HAMBLIN, MARKAY

2185 Arcadia Drive
Anchorage, Alaska 99503
(Placer - Gold)

HAMILTON MINING ENTS

Larry Hamilton
P.O. Box 155
Chugiak, Alaska 99567
(Placer/dragline - Gold)

HARTMAN, MICHAEL G.

P.O. Box 2535
Fairbanks, Alaska 99707
(Placer - Gold/gemstones)

HAVRILACK PLACER MINE

Harry F. Havrilack
Rampart, Ak 99767
(Nonfloat/bulldozer/hydraulic -
Gold)

HAYDEN'S EXPLORATION & MINING

Forest A. & Barbara Hayden
Box 495 East St. Route A
Anchorage, Alaska 99507
(Dredge/bulldozer/ placer - Gold)

HAYES MINING

Lester M. Hayes
1303 O'Connor Road No. 24
Fairbanks, Alaska 99701
(Scuba diving - All)

**HEFLINGER MINING & EQUIPMENT
CO.**

Carl F. Heflinger
409 Clara Street
Fairbanks, Alaska 99701
(Placer - Gold mechanized)

**HELEN MARIE PLACER
MINING CLAIM**

Kenneth D. Stahl/Jas. A. Bargiol
5817 Winding Way
Anchorage, Alaska 99504
(Hydraulic/hand - Gold)

HENDERSHOTT, THOMAS E.

1848 N. Salem Drive
Anchorage, Alaska 99504
(Placer - Gold)

**HENDRICKSON EXPLORATION &
MINING**

Bernhardt S. Hendrickson
3549 Dunkirk Drive
Anchorage, Alaska 99502
(Placer/lode - Au-Ag, etc.)

**HERNING EXPLORATION &
MINING CO.**

Bruce G. Herning
312 Well Street
Fairbanks, Alaska 99701
(Bulldozer/loader/suction/ dredging -
Gold)

HIGH BENCH PLACERS

Gilbert Monroe - Bruce Erickson
15 Eleanor Avenue
Fairbanks, Alaska 99701
(Lode - Gold/silver)

HILDRE SAND & GRAVEL CO.

P.O. Box 270
Juneau, Alaska 99802
(Loader/dragline - Gravel)

HOLDEM CREEK PLACERS

SR Box 20233
Fairbanks, Alaska 99701
(Placer - Any)

HOO DOO MINING CO.

Quinton Harris
Box 60102
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

HOOSIER CREEK MINING COMPANY

Donald L. Lucas
1803 Kepner Street
Anchorage, Alaska 99504
(Placer/bulldozer - Gold)

HOPE MINING CO.

A. P. Johnson
P.O. Box 1327
Anchorage, Alaska 99510
(Placer - Gold)

HOPEN, ALL

Box 162
Fairbanks, Alaska 99707
(Placer/bulldozer/hydraulic - Gold)

HORTON MINING COMPANY

John W. Horton
6911 E. 12th Avenue
Anchorage, Alaska 99514
(Lode - Gold)

HUNT OIL COMPANY

2900 First National Bank Building
Dallas, Texas 75202
(Underground - Oil/gas)

HUNTER CREEK MINE

Steve Losonsky
College, Alaska 99708
(Bulldozer - Gold)

HANKS, C. A. & SONS

Chicken, Alaska 99732
(Placer - Gold)

INGLE CREEK

Gordon L. Kukowski
828 East Street
Anchorage, Alaska 99501
(Placer/dragline/bulldozer -
Gold)

**INTERIOR ALASKANNA
ASSOCIATED**

Richard L. Loud
P.O. Box 10043
Curry's Corner
Fairbanks, Alaska 99701
(Bulldozer - Gold)

**INTERNATIONAL TRADE &
INVESTMENT, LTD.**

1815 S. State, Suite 440
Orem, Utah 84057
(Open pit - Gold)

INVADER MINING CO.

Dennis Falterman
Box 38
Kenai, Alaska 99611
(Hand/scuba - Gold)

IVY MINING CO.

Joseph V. Strunka
P.O. Box 550
Fairbanks, Alaska 99707
(Hydraulic - Gold)

J J MINING

James M. Wendt
5901 E. 6th, Box 100
Anchorage, Alaska 99504
(Placer - Gold/silver)

J. R. COMPANY

J. Reed
P.O. Box 60448
Fairbanks, Alaska 99706
(Placer - Gold)

J & G MINING

Richard L. Graham
P.O. Box 10243
Fairbanks, Alaska 99701
(Bulldozer/dredge - Gold)

JENSEN CONSTRUCTION

Daniel D. Jensen
Box 12
Delta Junction, Alaska 99737
Bulldozer - Gold)

JENSEN MINING COMPANY

Fred L. Ward
Rural Delivery
Candle, Alaska 99728
(Placer/bulldozer/loader -
Gold/silver)

JONES, DOUGLAS W.

P.O. Box 1461
Wasilla, Alaska 99687
(Placer/hand - Gold)

JONES IN CO.

W. Deering Jones
M.P. 49-3/4 Anchorage &
Seward Highway
Moose Pass, Alaska 99631
(Dredge/scuba/hand - Gold/other)

JONES MINING COMPANY

Robert Franklin Jones
General Delivery
Central, Alaska 99730
(Hand - Gold)

JONES, WILLIAM J., SR.

Box 173
Kotzebue, Alaska 99752
(Hand - Gold)

**K.D.T. MINING AND EXPLORATION
CO.**

Kevin Dale Thompson
P.O. Box 74156
Fairbanks, Alaska 99707
(Placer - Gold)

K.L.K., INC.

Samuel A. Koppenburg
SRD Box 9070
Palmer, Alaska 99645
(Dragline - Gold)

K-J INCORPORATED

James Dale Knight
3400 Araphaoe Route
Riverton, Wyoming 82501
(Suction/dredge - Gold)

K & E MINING COMPANY

Tim Kelly
1116 H Street
Anchorage, Alaska 99501
(Placer - Gold/silver)

KACHEMAK MINING CORPORATION

Emmalu Busby
SRA Box 50-D
Homer, Alaska 99603
(Placer/bulldozer - Gold)

KANTISHNA LODE

David D. Anstett
Box 4-2404
Anchorage, Alaska 99509
(Placer - Gold)

KANTISHNA LODE

Larry F. Goolsbey
Box 4-2404
Anchorage, Alaska 99509
(Placer - Gold)

KANTU MINERALS

D. Ashbrook
McKinley Park Box 397
Kantishna, Alaska 99755
(Exploration - Any)

KELLEY, SID

c/o NWASD
Box 51
Kotzebue, Alaska 99752
(Hand panning - Various)

KELLY, SAMUEL R.

6711 Weimer Street No. 2
Anchorage, Alaska 99502
(Placer - Gold)

KENDRICK BAY MINING COMPANY

c/o Standard Metals Corp.
645 Fifth Avenue
New York, New York 10022
(Exploration - Uranium)

KENNECOTT COPPER CORPORATION

161 East 42nd Street
New York, New York 10017
(Copper)

KILE, ALVIN L. & ERIC E.

P.O. Box 8-424
Anchorage, Alaska 99508
(Placer/bulldozer/hydraulic -
Gold)

KINYOUN, DON & SALLY

Box 484
Haines, Alaska 99827
(Track loader - Gold)

KIWALIK VENTURES

Edward P. Ashby, Jr.
Box 81470
Fairbanks, Alaska 99708
(Placer - Gold)

KNAACK, BRYON NORMAN
910 15th Avenue, Apt. 2
Fairbanks, Alaska 99701
(Suction dredge - Gold)

KOROBKO, JOHN
SR Box 60018
Fairbanks, Alaska 99701
(Bulldozer/hydraulic - Gold)

KRISTI-PHYLEE MINING
James M. Parry
P.O. Box 1656
Fairbanks, Alaska 99707
(Placer/hand - Gold)

L & B MINING & EQUIPMENT
Bruce Parent
1015 10th Avenue
Fairbanks, Alaska 99701
(Placer/backhoe/bulldozer -
Gold)

L & J MINING CO.
P.O. Box 8600
Anchorage, Alaska 99508
(Placer - Gold)

LAKE WOOD ASSOCIATES
Edmond Dugas
Central, Alaska 99730
(Sluice box - Gold)

LaPLANTE, JEFF A.
P.O. Box 8951
Anchorage, Alaska 99508
(Recreational - Gold)

LAST RUSH MINE, THE
Bernard C. Karl &
Constance M. Parks
P.O. Box 60408
Fairbanks, Alaska 99706
(Placer/backhoe/dozer - Gold)

LAWSON MINING COMPANY
Sylvester Lawson
8930 Elim
Anchorage, Alaska 99507
(Dredge/bucket/line/loader - Gold)

LAZY JANE NO. 1 VCP, HED NO. 1
HILLSIDE MINE & MILLSITE
Curtis, E. J., Griffith, R. L.,
Nakamura, H.
7716 Island Drive
Anchorage, Alaska 99504
(Hand/placer - Gold/silver)

LEE, CLIFFORD M.
208 Davis
Anchorage, Alaska 99504
(Placer/bulldozer - Gold)

LEONARD CO.
Leonard, Henry
via Bettles Field
Wiseman, Alaska 99726
(Placer - Gold)

LESTER-ORBANSKI MINES INC.
Michael J. Lester
Mile 99 Steese Highway
Central, Alaska 99730
(Placer/dozer - Gold)

LILLIAN CREEK MINE INC.
Ronald K. Tucker
P.O. Box 60334
Fairbanks, Alaska 99706
(Dragline/dozer - Gold)

LITTLE CREEK MINE
Philip Sayer
Box 2353
Homer, Alaska 99603
(Placer/hydraulic - Gold)

LITTLE GIRL MINING CO.
Joel B. Sims
P.O. Box 10526
Fairbanks, Alaska 99701
(Bulldozer/front-end loader -
Gold/silver)

LITTLE MOOSE CREEK MINING
Jessie M. Costa
Box 114
Usibelli, Alaska 99787
(Bulldozer - Gold/silver)

LIVENGOOD PLACERS, INC.
William A. Nickley
c/o Callahan Mining Corp.
1120 Post Road
Darien, Connecticut 06820
(Placer - Gold)

LIVERMORE, GEORGE
3302 Dorbrant No. 4
Anchorage, Alaska 99503
(Placer - Gold)

LONE STAR MINING COMPANY
Brett Reid
8630 Kusntaka Circle
Anchorage, Alaska 99504
(Placer/suction dredge - Gold)

LONESOME IV, INCORPORATED
Ronald J. McPherson
Box 1243
Sitka, Alaska 99835
(Hand/scuba diving - Gold)

LONNIE
Ronald Lee Harrod
308 Kody Drive
Fairbanks, Alaska 99701
(Placer - Gold/silver)

LOST CACHE MINE
Oscar L. Venable
P.O. Box 60538
Fairbanks, Alaska 99701
(Placer - Gold)

LOST CACHE MINE
Jeffrey A. Cornett
P.O. Box 60538
Fairbanks, Alaska 99701
(Placer - Gold/silver)

LOUNSBURY MINING CO.
James G. Lounsbury
220 Charles Street
Fairbanks, Alaska 99701
(Lode/underground - Gold)

LUCKY CREEK MINE
Lester A. Blair
5303 Cope Street
Anchorage, Alaska 99502
(Placer/loader/bulldozer - Gold)

LUCKY MOON SHOT MINES
Wesley G. Butler
Box 246 SRA
Anchorage, Alaska 99507
(Placer - Gold)

LUCKY SEVEN MINING CO.
Walter E. Romen
P.O. Box 141
Fairbanks, Alaska 99707
(Open cut placer - hydraulic stripping -
Gold)

LUKE'S GRAVEL COMPANY
Tony Neal
P.O. Box 393
Homer, Alaska 99603
(Bulldozer - Gravel)

LUMETTA, PETER
2529 Curlew Circle
Anchorage, Alaska 99502
(Placer - Gold)

M. G. LARSON MINING
Milnor G. Larson
171 7th Avenue
Fairbanks, Alaska 99701
(Bulldozer - Gold)

MNW MINE
Mark N. Wayson
1148 Sunset Drive
Fairbanks, Alaska 99701
(Bulldozer - Gold)

M-B-E GRAVEL
7101 DeBarr Road
Anchorage, Alaska 99504
(Open pit - Sand/gravel)

M-K ENTERPRISES
Mark K. Krenzke
P.O. Box 422
Nenana, Alaska 99760
(Placer - Gold)

M & M MINING
Rod Mitchell/Bruce Madden
SR Box 50718
Fairbanks, Alaska 99701
(Bulldozer/hydraulic - Gold)

M & M MINING COMPANY
Ron Manning & Kathie Marvin
8301 E. 3rd Avenue No. 4
Anchorage, Alaska 99504
(Placer - Gold)

MAMMOTH MINE
Rosalie A. Rybachek
P.O. Box 73069
Fairbanks, Alaska 99707
(Hydraulic/bulldozer/dragline -
Gold/silver)

MANIA MINING
Scott Thorngren
236 Farewell
Fairbanks, Alaska 99701
(Placer - Gold)

MANKOMEN EXPLORATION, INC.
Rodney A. Blakestad
P.O. Box 80747
Fairbanks, Alaska 99708
(Lode Minerals Exploration -
Cu/Ag/Pb/Sn/Au)

MARBLE CREEK MINING
Alan Schaaf
General Delivery
Haines, Alaska 99827
(Placer - Gold)

MARBLE CREEK MINING
Philip B. Lockerman
542 Aruett Boulevard
Rochester, New York 14619
(Front loader/backhoe)

MARBLE CREEK MINING
Elizabeth A. Heath
General Delivery
Haines, Alaska 99827
(Placer/backhoe/loader - Gold)

MARVEL CREEK MINING COMPANY
Charles J. Awe, Jr.
Nyac, Alaska 99642
(Bucket/dredge - Gold/silver -
Bucket-line)

MARY SUE MINES, INC.
No. 1 Susy Lane
Manley Hot Springs, Alaska 99756
(Bulldozer - Gold)

MAXWELL MINES & EXPLORATION
Leslie L. Maxwell
SRA Box 482
Anchorage, Alaska 99507
(Bulldozer/placer - Gold)

**MAXWELL'S MINING &
EXPLORATION**
Horace N. Maxwell, Jr.
P.O. Box 1221
Eagle River, Alaska 99574
(Suction dredge/skin diving -
Gold)

MCCARTHY MINING
John G. McCarthy
SRA 1453 W
Anchorage, Alaska 99502
(Placer -Gold)

MCKAY MINING
Tim McKay
478 Sprucewood Road
Fairbanks, Alaska 99701
(Placer - Gold)

MCKEEVER, DAVID E.
Marcus Street, Box 70
Eagle River, Alaska 99577
(Suction dredge - Gold)

MCKENZIE MINING CO.
Dean C. McKenzie
4211 Grape Pl.
Anchorage, Alaska 99504
(Dredge - Gold)

MCLAUGHLIN, KEN T.
610 C Street, Suite 214
Anchorage, Alaska 99501
(Placer - Gold)

MCWILLIAMS CONSTRUCTION CO.
William McWilliams
Box 435
Soldotna, Alaska 99669
(Open pit/bulldozer - Sand/gravel)

**MCWILLIAMS PLACER MINING
CLAIMS**
H. F. McWilliams
P.O. Box 1317
Anchorage, Alaska 99510
(Placer - Gold/other)

MEI-COFF MINES
Herman M. Meiners
P.O. Box 412
Juneau, Alaska 99802
(Lode - Gold/silver/lead/zinc)

**MESPELT & ALMASY MINING
COMPANY**
Theodore J. Almasy &
Margaret L. Mespelt
Nexon Fort Mine, M
McGrath, Alaska 99627
(Lode/placer - Precious & base metals)

MIDNIGHT MINING ASSOCIATION
Bob Aumiller
Wiseman
Bettles, Alaska 99627
(Skin diving/dozer/backhoe)

MILLER CREEK MINING COMPANY
Fred D. Wilkinson
P.O. Box 2702
Fairbanks, Alaska 99707
(Bulldozer/excavation/hydraulic -
Gold)

**MINERALS AND METALS MANAGEMENT
CORP.**
Joe Grindle
P.O. Box 82001
Fairbanks, Alaska 99708
(Placer/bulldozer - Gold)

MINEX ALASKA INC.
Tom Albanese
SR Box 10083
Fairbanks, Alaska 99701
(Tailings - Gold)

MINING RESEARCH DEVELOPMENT
Paul F. Cordasci
P.O. Box 174
Eagle River, Alaska 99577
(Quarry/bulldozer - Shale)

MISCOVICH, JOHN A.
Leo A. Walsh
Misco Walsh
P.O. Box 4-D
Anchorage, Alaska 99509
(Placer open pit - Gold)

MISCOVICH MINING CO.
Howard P. Miscovich
P.O. Box 262
Galena, Alaska 99741
(Dozer/hydraulic/dragline - Gold)

MONTGOMERY MINING COMPANY
Edward W. Montgomery
P.O. Box 60430
Fairbanks, Alaska 99701
(Placer - Gold/silver)

MOORE, JOHN
Box 4-604
Anchorage, Alaska 99509
(Placer - Gold)

MOOSE CREEK MINING CO.
Donald E. Young
P.O. Box 2469
Fairbanks, Alaska 99707
(Front loader/backhoe - Gold)

MORIN LUCIEN
P.O. Box 2662
Anchorage, Alaska 99510
(Placer - Gold)

MOSCOTT MINING, INC.
T. L. Bryant
P.O. Box 1408
Fairbanks, Alaska 99707
(Placer - Gold/silver)

MOSQUITO FORK MINING
R. S. McCombe
Chicken, Alaska 99732
(Bulldozer - Gold)

MRAK PLACER MINE
William Mrak
P.O. Box 1963
Palmer, Alaska 99645
(Placer - Gold/silver)

**MYTHRYL MINING & EXPLORATION
COMPANY**
Stephen J. Trickett
William R. Bangham
P.O. Box 81181
College, Alaska 99708
(Suction, hand/keene dredge -
Gold/silver)

N.B. TWEET & SONS
Harold Tweet
Box 503
Teller, Alaska 99778
(Hydraulic, bulldozer - Gold)

N.K.G. MINING
Norton Kelly Goff
P.O. Box 10-2122
Anchorage, Alaska 99511
(Placer - Gold)

NT ENTERPRISES
Paul I. Namtvedt
P.O. Box 73348
Fairbanks, Alaska 99701
(Bulldozer/shovel - Gold)

NELSON MINING COMPANY
Larry Nelson
413 Glacier
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

NELSON MINING CO.
Vernon T. Nelson
413 Glacier Avenue
Fairbanks, Alaska 99701
(Placer - Gold)

NOAH'S GOLDEN ARK
Noah Stewart
7600 Duben
Anchorage, Alaska 99504
(Dredging - Gold)

NORANDA EXPLORATION, INC.
Donald F. Alberts
P.O. Box 15638
Lakewood, Colorado 80215
(Lode and Placer)

NORCROSS-STONEBURG MINING CO.
James H. Norcross
SR Box 640
Chugiak, Alaska 99567
(Placer - Gold)

**NORTHERN ALASKA MINING &
EXPLORATION**
Errol J. & Michele K. Darling
1016 Kellum Street
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

NORTHERN VENTURES
Richard J. Anderson &
Walter T. Nielson
Beaver Blvd.
SR Box 80951
Fairbanks, Alaska 99701
(Hand - Gold)

**NORTHERLAND GOLD
DREDGING, LTD.**
8740 Hartzell Road
Anchorage, Alaska 99507
(Bucket/line dredge - Gold)

NOVA ASSOCIATES
Michael F. Pickett
2919 Wiley Post Avenue
Anchorage, Alaska 99503
(Hydraulic/hand/dredge - Gold)

NUGGET KNOCKERS
Bill Kiskan
General Delivery
College, Alaska 99701
(Placer - Gold)

NUGGET MINING COMPANY
Steve Pederson
Council, Alaska 99790
(Bucket/line dredge - Gold/silver)

O'BRIEN, STEPHEN F.
Manley Hot Springs, Alaska 99756
(Placer/bulldozer - Gold)

OHMAN VENTURES
Bill Ohman
P.O. Box 10094
Fairbanks, Alaska 99701
(Placer - Gold)

OLD GOLD FILTERERS
Vance Borden & David Broadstone
408 E. Fireweed Lane
Anchorage, Alaska 99503
(Placer - Gold)

OLSON, STEPHEN G.
Boundary, Alaska 99790
(Bulldozer - Gold)

OMEGA MINING CO.
Martin H. Ott
Manley Hot Springs, Alaska 99756
(Bulldozer/ground sluice - Gold)

ORCUTT, DONALD R.
General Delivery
Manley Hot Springs, Alaska 99756
(Placer - Gold)

ORO FIND MINING CO.
Richard A. McCullum
P.O. Box 5
Valdez, Alaska 99686
(Placer - Gold/silver/other)

OSSENBECK ELECT. CO.
Robert H. Ossenbeck
1321 Karen Avenue
Fairbanks, Alaska 99701
(Placer - Gold)

OTTAWA MINING & MINERALS INC.
Norman Stowers
P.O. Box 4-1158
Anchorage, Alaska 99509
(Placer/bulldozer - Gold/nonprecious)

OTTER DREDGING COMPANY
dba Miscovich Brothers
Flat, Alaska 99584
(Bulldozer - Gold/silver)

PMD VENTURES
T. A. McKeever/W. A. McKeever
SRA Box 1346
Anchorage, Alaska 99504
(Placer/sluice box w/backhoe)

PMX - PRECIOUS METALS
EXPLORATION
& MINING
Robert A. Flounders
SRA Box 4437
Anchorage, Alaska 99502
(Placer/hard rock - Precious metals)

P & L PROSPECTING
Patrick & Leslee Murray
P.O. Box 2661
Palmer, Alaska 99645
(Hand - Any)

P & M MINING AND EXPLORATION
Pete Evans - Mike McGlinchy
P.O. Box 81826
College, Alaska 99708
(Placer - Gold/other)

P & P MINING COMPANY
Paul W. White & Patrick D. Peede
SR Box 60995-A
Fairbanks, Alaska 99701
(Placer - Gold)

PAGE MINING
Maurice Page
General Delivery
Chicken, Alaska 99732
(Placer - Gold)

PAN CENTRAL EXPLORATION, LTD.
I. S. Lindzon
67 Richmond St., West, Suite 301
Toronto, Ontario, Canada M5H 1Z5
(Exploration - Tin/tungsten/fluorite)

PARKER MINING & EXPLORING
Bill J. Parker
4201 Florina Street No. 5
Anchorage, Alaska 99504
(Lode - Gold/silver)

PAULUN, FRED E.
P.O. Box 81992
College, Alaska 99708
(General/hand - General)

PAVEY CO.
M. A. and Bruce Pavey
1111 Lakeview Terrace
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

PAYCHECK MINING
Stella D. Lavender
General Delivery
Boundary, Alaska 99790
(Placer - Gold)

PAYSTREAK MINING CO.
Howard C. Lambert
P.O. Box 725
Cooper Landing, Alaska 99572
(Bulldozer/loader - Gold)

PET PETROLEUM MINING &
INVESTMENTS
Gary S. Hermes
P.O. Box 545
Chugiak, Alaska 99567
(Placer/lode - Precious metals and hydrocarbons)

PETERSEN, DONALD E.
P.O. Box 172
Haines, Alaska 99827
(Track loader/hand - Gold)

PETTIT, ARGILE E.
Box 216
Sutton, Alaska 99674
(Hand/sluice box/suction nozzle - Gold)

PHELPS DODGE CORPORATION
300 Park Avenue
New York, New York 10022
(Exploration - All)

PHILLIPS & SONS PLACER
MINING CO.
Milton R. Phillips
SR 70804-H
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

PIONEER AND VENTURES JOINT
VENTURE
George R. Horner
P.O. Box 6845
Anchorage, Alaska 99502
(Placer - Gold)

PLACID OIL COMPANY
G. H. Cambron
1600 First National Bank Building
Dallas, Texas 75202
(Prospecting/oil drilling/pet/nat gas)

POLAR CONSTRUCTION &
MINING CO.
Donald J. May
4545 Wood River Drive
Fairbanks, Alaska 99701
(Underground/hand/dozer)

PORTAGE PLACERS
Robert G. Huggins
330 3rd Avenue No. 14
Fairbanks, Alaska 99701
(Placer - Gold/silver)

PORTAL MINING COMPANY
Robley Spaulding
Manley, Alaska 99756
(Bulldozer/dredge - Gold)

PORTER MINING CO.
Don Porter
1901 Mary Ann No. 47
Fairbanks, Alaska 99701
(Placer/dozer - Gold/silver)

PREMIER MINE
Paul Omlin
Box 13
Palmer, Alaska 99645
(Strip/bulldozer - Gold)

PREWITT, CLAY
P.O. Box 785
Palmer, Alaska 99645
(Placer - Gold)

PROMMEX, INC.
Bond Taber
1733 Pepper Drive
Tallahassee, Florida 32304
(Placer - Gold)

PUTNAM ENTERPRISES
Frank A. Putnam
P.O. Box 426
Haines, Alaska 99827
(Placer/hand - Gold)

QUARTZ CREEK EXPLORATION CO.
Milo E. Flothe
Rt. 2 Box 242
Sterling, Alaska 99672
(Hydraulic/hand/dredge - Gold)

QUEENE ALLICE GOLD MINING CO.
W. W. McClintock
1166 Copper Street
Fairbanks, Alaska 99701
(Underground/hand/bulldozer - Gold)

R.G.U. MINING CO.
Bonanza Mining Co.
P.O. Box 1587
Fairbanks, Alaska 99707
(Placer - Gold)

R.L. MINING COMPANY
Robert L. Worthington
421 E. 15th Terrace
Anchorage, Alaska 99501
(Placer - Gold)

R & F MINING CO.
Tom Reardon - Dale A. Fosdick
Box 1001
Nome, Alaska 99762
(Bulldozer - Gold)

R & N ENTERPRISES
Roy M. & Imogene Thompson
4675 7th Street
Fairbanks, Alaska 99701
(Placer - Gold)

R & R MINING & PROSPECTING
Robin L. Randall
SR Box 30548
Fairbanks, Alaska 99701
(Placer - Gold)

RAINBOW MINES
Curwood & Betty Backsfetter
P.O. Box 10117
Fairbanks, Alaska 99701
(Bulldozer - Gold)

RAINBOW MINES
Frank H. Whaley
4220 Warwick Drive
Anchorage, Alaska 99504
(bulldozer/hydraulic - Gold)

RANCHERS EXPLORATION &
DEVELOPMENT CORP.
Double Eagle Mine
P.O. Box 6217
Albuquerque, New Mexico 87197
(Bulldozer - Gold)

RAY MINING
Bill Ray
SR Box 70853
Fairbanks, Alaska 99701
(Placer/dredge - Gold)

RECREATIONAL MINING
A. M. Andler
1566 Columbine
Anchorage, Alaska 99504
(Placer dredge - Gold)

RESOURCE ASSOCIATES OF
ALASKA, INC.
3230 Airport Way
Fairbanks, Alaska 99701
(Placer/loader/dozer - Gold)

RESOURCES DEVELOPMENT
COMPANY
P.O. Box 742
Cordova, Alaska 99574
(Open pit/beach sands/placer -
Gold/silver/base metals)

RHODE ISLAND CREEK MINES
A. W. Pringle
Manley Hot Springs, Alaska 99756
(Placer/bulldozer/hydraulics - Gold)

RISTOW ENTERPRISES
Wm. R. Ristow
SR Box 60727 A
Fairbanks, Alaska 99701
(Placer - Gold)

RIVERSIDE ENTERPRISES
Clyde C. Paustian
P.O. Box 126
Copper Center, Alaska 99573
(Dragline/dozer - Any)

ROCK & FLAKE MINING CO.
M. Gumaer, R. Gumaer, P. Brewster,
M. Gebhart & Randy Robinson
P.O. Box 60
Hope, Alaska 99605
(Placer - Gold)

ROCK BOTTOM MINE
B. & W. Krager
3612 Northpoint Drive
Anchorage, Alaska 99502
(Dozer - Gold)

ROCK PRODUCTS, INC.
4452 Business Park Blvd.
Anchorage, Alaska 99503
(Surface/bulldozer - Gold)

RODDY'S ROCKMINING CO.
Roddy C. Bachman
8521 Mentra Circle
Anchorage, Alaska 99502
(hand/scuba/dredge - Gold)

RODERICK, PAUL
Box 836
Homer, Alaska 99603
(Exploration - Scheelite)

ROHLOFF, FRANK R.
P.O. Box 10006
Fairbanks, Alaska 99701
(HD 5 w/bucket/hand - Gold)

ROSANDER MINING CO.
Box 84
McGrath, Alaska 99627
(Placer - Gold)

ROSECKY, PAUL
P.O. Box 673
Fairbanks, Alaska 99707
(Placer (hand) - Gold)

ROSS MINING COMPANY
Michael L. Ross
General Delivery
Central, Alaska 99730
(Placer - Gold/platinum)

ROSSIGNOL MINING
Roland R. Rossignol
1303 O'Connor Road No. 24
Fairbanks, Alaska 99701
(Hydraulic/hand - Various)

ROUGH TOP MINING CO., INC.
Al Hagen
General Delivery
Manley Hot Springs, Alaska 99756
(Placer - Gold)

ROYANN MINING & MINERALS

Edward R. Stugart
M.P. 84 - Taylor Highway
Chicken, Alaska 99732
(Bulldozer - Gold)

RUBEL, JOHN D.

SR Box 90574
26 Mile Richardson
Fairbanks, Alaska 99701
(Placer - Gold)

RUBY MINING COMPANY

Albert W. Kangas
P.O. Box 1
Ruby, Alaska 99726
(Placer/dragline - Gold)

S. E. PLACER MINE

Stanley E. Blake
5190 Amhurst Drive No. 19
Fairbanks, Alaska 99701
(Placer - Gold)

ST. JOE AMERICAN CORPORATION

2002 N. Forbes Blvd:
Tucson, Arizona 85705
(Exploration - nonferrous metals)

SALINAS, ANDRE

900 15th Avenue, Apt. 7
Fairbanks, Alaska 99701
(Hand/placer - Gold)

SALT WATER SLUICERS

Wesley P. Nason
P.O. Box 2550
Fairbanks, Alaska 99707
(Hand - Gold/silver)

JAN DREW HOLDINGS

James M. Nies
103 Evergreen Crescent
Wetaskiwin, Alberta, Canada
(Placer - Gold)

SANDERS, MARK E.

SR Box 70072 A
Fairbanks, Alaska 99701
(Hand/hydraulic/Sluice -
Cu/Hg/Au/Ag)

SANFORD RESOURCES, INC.

Trappers Creek, Alaska 99688
(Placer - Gold)

SAVAGE MINING CO.

Bruce D. Savage
Box 5381
North Pole, Alaska 99705
(Placer - Gold/tin)

SAWTOOTH MINING COMPANY

Maurice J. Killion
P.O. Box 195
Fairbanks, Alaska 99707
(Placer/open cut - Antimony)

SCHOOL OF MINERAL INDUSTRY

Earl H. Beistline, Dean, SMI
University of Alaska
Fairbanks, Alaska 99701
(Lode/underground/exploration -
Gold/silver)

**SCHULTZ PROSPECTING &
CONSULTING**

General Delivery
Manley Hot Springs, Alaska 99756
(Bulldozer/hand - Gold)

2nd VENTURE MINING CO.

D. E. Hansen - Leslie Arnett
SR 40454-Z
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

**SEWARD PENINSULA MINING
COMPANY**

P.O. Box 1012
Nome, Alaska 99762
(Placer/dragline - Gold/silver)

SHAG MINING CO.

J. P. Haggland/L. G. Shelver/
V. P. Guzzardi
P.O. Box 258
Fairbanks, Alaska 99707
(Placer - Gold/silver)

SHIMSKY MINING COMPANY

Lloyd D. Huggard
Manley Hot Springs, Alaska 99756
(Placer/bulldozer - Gold)

SHORT GULCH MINING CO., LTD.

Keith Tryck
Box 9
Ruby, Alaska 99768
(Bulldozer - Gold)

SHOVEL HEAD CONSTRUCTION CO.

Raymond D. Dille
1825 Southern Street
Fairbanks, Alaska 99701
(Dredge - Gold)

SILVER FOX MINE

Tury F. Anderson
820 Andrew Street
Fairbanks, Alaska 99701
(Lode - Au/Ag/Pb)

SILVER STAR MINING CO.

Melvin N. Barry
323 West Harvard
Anchorage, Alaska 99501
(Hard rock - Gold/silver)

SILVERADO MINES, LTD.

1066 West Hastings Street, Suite 2580
Box 12542
Vancouver, B.C., Canada V6E 3X2
(Underground - Gold)

SIMMEN, JAMES M.

P.O. Box 4-1857
Anchorage, Alaska 99503
(Placer - Gold)

SMITH ENTERPRISES

James L. Smith
1611 Kelly Circle
Anchorage, Alaska 99504
(Placer - Gold/silver)

SOREFOOT ENTERPRISES

Daniel D. Draper & Steve Shryne
Box 213
Gakona, Alaska 99586
(Placer - Gold)

SOULE, HAROLD

SRA Box 239
Anchorage, Alaska 99507
(Placer - Gold)

SPRUCE CREEK MINING COMPANY

Michael J. O'Carroll
OPHIR
McGrath, Alaska 99627
(Hydraulic - Gold)

STEFANOWSKI, JAMES W.

P.O. Box 161
Talkeetna, Alaska 99676
(Hand - Au)

STEPP-A-LONG MINING

James Vernon Stepp
SR Box 30114
1/2 mile Farmers Loop Road
Fairbanks, Alaska 99701
(Hand - Gold)

**STOCKMAN EXPLORATION &
DEVELOPMENT CO.**

Edward & Rhonda Schmidt
1960 Alaska Way
Fairbanks, Alaska 99701
(Placer - Gold/silver)

STRANGE, CHARLES E. JR.
Rt. 1 Box 167
Inverness, Florida 32650
(Placer/rock - Any)

SUMDUM DEVELOPMENT
CORPORATION
365 Bay Street, Suite 600
Toronto, Ontario, Canada M5H 2V9
(Exploration/development - All)

SUNNY HILLS MINING CO.
H. James Jordan - Glenn Straatoma
P.O. Box 1330
Fairbanks, Alaska 99707
(Hand/scuba/bulldozer - Gold)

SUNSHINE MINING COMPANY
M. E. Barnhart
P.O. Box 1080
Kellogg, Idaho 83837
(Exploration - Copper)

SUTER, JACK WALTON
610 C Street, Suite 214
Anchorage, Alaska 99501
(Placer - Gold)

SWAMP MINING
Robert A. Smith
SR Box 80669
Fairbanks, Alaska 99701
(Placer/bulldozer - Gold)

SWARTHOUT, RALPH
Box 8-9127
Anchorage, Alaska 99508
(Placer/backhoe - Gold)

SWAVELY, RONALD L.
P.O. Box 114
Eagle River, Alaska 99577
(Dredging - Gold)

SWEET MARIE PLACER
MINING CLAIM
Kenneth D. Stahl
5817 Winding Way
Anchorage, Alaska 99504
(Hand/hydraulic - Gold)

SWEETSIR, MICHAEL A.
Box 28
Ruby, Alaska 99768
(Drift/underground - Gold)

SALTER - SWENSON MINING
COMPANY
Swenson, Richard A.
General Delivery
Manley Hot Springs, Alaska 99756
(Placer/bulldozer - Gold)

SWIBOLD, CHARLES J.
1417 Gillam Way
Fairbanks, Alaska 99701
(Placer - Gold/silver)

SWIFT CREEK MINING CO.
Harold C. & Naomi R. Tilleson
P.O. Box 24
Ruby, Alaska 99768
(Placer - Gold)

2 RH, JM & ASSOC.
Richard Henderson
SR Box 20083
Fairbanks, Alaska 99701
(Placer - Gold)

T.C. MINING
Mike Palmquist - Gene O. Markle
P.O. Box 410
Wasilla, Alaska 99687
(Bulldozer/ placer - Gold)

T.J. MINING
T. J. Koppenberg
SR D Box 9068
Palmer, Alaska 99645
(Placer - Gold)

TARRK
Robert Harrison
P.O. Box 404
Nenana, Alaska 99760
(Placer - Gold)

TAYLOR, A. J.
1447 Noble
Fairbanks, Alaska 99701
(Placer - Gold/silver)

TECHNICAL SERVICES
Ken Keltner
SR Box 70894
Fairbanks, Alaska 99701
(Washing plant/backhoe - Gold)

TERRIFIC MINING COMPANY
Gery B. Currington
Box 466
Clear, Alaska 99704
(Hydraulic/bulldozer/hand - Gold)

THREE G. MINING
Jack LaCross
SR 211
Healy, Alaska 99743
(Placer - Gold)

THREE METALS MINES
1001 West 12th Avenue
Anchorage, Alaska 99501
(Placer - Gold)

THOENNES, MARK
P.O. Box 72971
Fairbanks, Alaska 99707
(Hand/prospecting - Gold)

THUNDER ROAD MINING COMPANY
Stanley G. Cook
2615 Porter Place
Anchorage, Alaska 99504
(Placer/backhoe/loader/suction dredge -
Gold)

TIMBERLINE MINING CO., INC.
Box 107
Cantwell, Alaska 99729
(Placer - Gold)

TRAIL MINING & DEVELOPMENT CO.
Sidney A. Abbott
SRA Box 100
Anchorage, Alaska 99502
(Underground dredge/placer - Gold)

TREESH, JAMES W.
Man O' War Road
Box 40
Eagle River, Alaska 99577
(Dredge - Gold)

TRI-COM MINING
Mark S. Funk
Box 74262
Fairbanks, Alaska 99707
(Strip - Gold/silver)

TRI-CON MINING INC.
P.O. Box 2357
Fairbanks, Alaska 99707
(Placer/hardrock - Gold)

THE TRINITY MINE
Charles E. McKee
P.O. Box 6306
Anchorage, Alaska 99502
(Hand/scuba diving - Gold)

TRIPLE "B" MINING
William S. Stock
Box 123 Foothill Avenue
Eagle River, Alaska 99577
(Placer/scuba/hydraulic - Gold)

TRIPLE "S" MINING
Ray Maleskey & Darrel Pelkey
General Delivery
Boundary, Alaska 99790
(Placer - Gold)

TULUKSAK DREDGING LTD.
Charles J. Awe, Jr.
Nyac, Alaska 99642
(Bucket line dredge - Gold/silver)

TUNDRA CONTRACTORS, INC.
Jules Wright
P.O. Box 60113
Fairbanks, Alaska 99706
(Placer/dozer - Gold)

TUNDRA EXPLORATIONS
Rhinehart Berg/Thorlief B. Wetlesen
Rt 1 Box 1349
Stoudsberg, Pennsylvania 18360
(Front-end loader)

TUNDRA MINING
Federick J. Wiedenbeck
SR Box 90307-R
Fairbanks, Alaska 99701
(Suction dredge - Gold)

TURNIPSEED, THOMAS
SR Box 60266
Fairbanks, Alaska 99701
(Hand/dredge - Gold)

TURY PLACER MINE LTD.
Tury G. Bailey
1325 6th Avenue
Fairbanks, Alaska 99701
(Ground sluicing - Gold)

TWEITEN, OSCAR
Box 162
Fairbanks, Alaska 99707
(Placer - Gold)

TWO BEAR MINING
Hank Mulligan
P.O. Box 2222
Fairbanks, Alaska 99707
(Underground/drift - Gold)

TYPONE MINING & MINERALS, INC.
8401 Sandalwood Place
Anchorage, Alaska 99507
(Placer - Gold)

UNDERWOOD MINING
Dave Underwood
560 Front Street
Fairbanks, Alaska 99701
(Placer/dozer/dragline - Gold)

UNION CARBIDE CORPORATION
270 Park Avenue
New York, New York 10017
(Prospecting exploration - All)

UNLUCKY-O-ENTERPRISES, INC.
Kenneth E. Dunshie
4579 Wood River Drive
Fairbanks, Alaska 99701
(Placer - Gold)

UNITED MINING & MINERAL
EXPLORATION CO.
Richard S. & M. Irene Onstott
3950 Gardner Apt. B
Anchorage, Alaska 99504
(Placer - Gold/any)

V.O. MINING & EXPLORATION CO.
Tom C. Van Ostrand
SR Box 60727-R
Fairbanks, Alaska 99701
(Placer - Gold)

V & J MINING CO.
John & Vicki Gately
SR Box 20980-A
Fairbanks, Alaska 99701
(Placer - Gold)

VANA, FRANK J.
7215 - 58th Avenue N.
Minneapolis, Minnesota 55428
(Placer - Gold)

WAM MINING
Mark W. Harriger
Box 81116
College, Alaska 99708
(Suction dredge - Gold)

WALKER CREEK MINING COMPANY
William J. Cook
Box 1674
Valdez, Alaska 99686
(Placer/hand/skin/scuba - Gold/silver)

WALKER MINING CO. (IVA No. 1)
Jewel Walker
Box 4-1819
Spennard, Alaska 99509
(Placer - Gold)

WALTER MINING COMPANY
Frank Walter
General Delivery Tolstoi via
McGrath, Alaska 99627
(Hand - Gold/platinum)

WALKER FORK MINING CO.
Frank Heflinger
409 Clara Street
Fairbanks, Alaska 99701
(Bulldozer/dragline - Gold)

ALVIN R. WALTON
727 Strawberry No. 3
Anchorage, Alaska 99502
(Suction dredge - Gold)

WALTON, ALVIN W.
9820 Tolsona Circle
Anchorage, Alaska 99502
(Suction dredge - Gold)

WARTH MINING COMPANY
Donald Warth
6623 Lunar Drive
Anchorage, Alaska 99504
(Hand - Gold)

WATERS MINING
Arnold A. Waters
P.O. Box 557-A
Chugiak, Alaska 99567
(Hand - Gold/other)

WEAVER, THOMAS F.
2920 Jones Avenue
Anchorage, Alaska 99503
(Suction dredge - Gold)

APPENDIX J

List of Sand, Gravel, and Stone-quarry Operators, by general location, 1981

SAND & GRAVEL

Central Construction Co., Inc.
411-024-1
2112 Third Avenue
Seattle, Washington 98121
Alaska Peninsula

City of Anchorage
Department of Public Works
P.O. Box 400
Anchorage, Alaska 99510
(Southcentral)

RCJ Enterprises
A&G Pit
Box 4-2577
Anchorage, Alaska 99509
(Southcentral)

Alaska Aggregate Corp.
Algaco Pit
7800 Lake Otis Parkway
Anchorage, Alaska 99502
(Southcentral)

Energy Co. of Alaska
Tudor Road Pit
4607 E. Tudor Road
Anchorage, Alaska 99507
(Southcentral)

Anchorage Sand & Gravel Co.
Lake Otis Pit
1813 1st Avenue
Anchorage, Alaska 99501
(Southcentral)

Associated Aggregate Co., Inc.
Valley Concrete Pit
Box 7, Star Route B
Palmer, Alaska 99645
(Southcentral)

Klondike Alaska, Inc.
Klondike Pit & Plant
Box 588A
Chugiak, Alaska 99567
(Southcentral)

Stephans & Sons, Inc.
Castle Pit
6957 Seward Highway
Anchorage, Alaska 99502
(Southcentral)

Northern Steel Corp.
Northern Steel Pit
Box 8001 NRB
Kenai, Alaska 99611
(Southcentral)

Rogers & Babler, Inc.
Moreley Pit
4607 E. Tudor Road
Anchorage, Alaska 99507
(Southcentral)

Anchorage Sand & Gravel Co.
Shackelton Pit
1813 E. 1st Avenue
Anchorage, Alaska 99501
(Southcentral)

Matanuska-Susitna Borough
Butte Pit No. 1
Box B
Palmer, Alaska 99645
(Southcentral)

Taku Construction & Engineering
Matanuska Pit
P.O. Box 4-1942
Anchorage, Alaska 99509
(Southcentral)

Douglas Moffitt Cont.
Moffitt Pit
Box 47
Palmer, Alaska 99645
(Southcentral)

Anchorage Sand & Gravel Co.
Gebhart Pit
1813 E. 1st Avenue
Anchorage, Alaska 99501
(Southcentral)

Stephan & Sons, Inc.
Sping Creek Pit
6957 Old Seward Highway
Anchorage, Alaska 99502
(Southcentral)

Anchorage Sand & Gravel Co.
Palmer Loading Station Pit
1813 1st Avenue
Anchorage, Alaska 99501
(Southcentral)

Anchorage Sand & Gravel Co.
Sand Lake West Pit
1813 1st Avenue
Anchorage, Alaska 99501
(Southcentral)

Hermon Bros. Construction Co.
Matanuska River Pit
Box Q
Palmer, Alaska 99645
(Southcentral)

Wilder Construction Co, Inc.
MS 42 10 41 1 Pit
2006 State Street
Bellingham, Washington 98225
(Southcentral)

Anchorage Sand & Gravel Co.
Klatt Pit
1813 1st Avenue
Anchorage, Alaska 99501
(Southcentral)

Matauska Redi Mix Concrete Co.
Fairview Loop Road Pit
Box B
Palmer, Alaska 99645
(Southcentral)

Cook Inlet Asphalt
Pioneer Plant
Box 4 1912
Anchorage, Alaska 99509
(Southcentral)

Conrock Co, Inc.
Conrock North
1301 E. 64th Avenue
Anchorage, Alaska 99502
(Southcentral)

Wilder Construction Co, Inc.
Wilder Sand Lake Pit
1813 E. 1st, Suite 203
Anchorage, Alaska 99501
(Southcentral)

Rogers & Babler
Chugiak Pit
1301 E. 64th Avenue
Anchorage, Alaska 99502
(Southcentral)

Federal Aviation Administration
Alaska Region
632 6th Street
Anchorage, Alaska 99501
(Southcentral)

City of Cordova
Box 1210
Cordova, Alaska 99574
(Southcentral)

Wasilla Aggregates
Sand & Gravel Operation
P.O. Box 110
Wasilla, Alaska 99687
(Southcentral)

Harris Sand & Gravel
Glacier Pit
P.O. Box 72
Valdez, Alaska 99686
(Southcentral)

H & H Contractors, Inc.
Material Site 30 0
Box 60610 - Phillips Field
Fairbanks, Alaska 99706
(Eastern Interior)

Joes Trucking Co.
Alaska Asphalt Pit
Box 10 1687
Anchorage, Alaska 99502
(Southcentral)

Earthmovers of Fairbanks
Glacier Stream Pit
P.O. Box 447
Valdez, Alaska 99686
(Southcentral)

H & H Contractors, Inc.
Slana Pit
Box 60610 - Phillips Field
Fairbanks, Alaska 99706
(Eastern Interior)

Better Concrete Products Corp.
Better Concrete Pit & Plant
P.O. Box 579
Kenai, Alaska 99611
(Southcentral)

Better Concrete Products Corp.
Sand & Gravel
P.O. Box 579
Kenai, Alaska 99611
(Southcentral)

Peninsula Aggregate
Stubblefield Pit
Box 271
Soldotna, Alaska 99669
(Southcentral)

Alaska Dept. of Highways
Naptowne Pit
Alaska 99669
(Southcentral)

Metco, Inc.
Metco River Bar
Box 895
Seward, Alaska 99664
(Southcentral)

Central Construction Co, Inc.
Nome Tailings Pit
2112 Third Avenue
Seattle, Washington 98121
(Western)

Bureau of Indian Affairs
Juneau Area OFC Br Rds
P.O. Box 3-8000
Juneau, Alaska 99801
(Southeastern)

Juneau Ready Mix, Inc.
Lemon Creek Pit and Plant
Box 270 - 6 Mile Glacier Highway
Juneau, Alaska 99801
(Southeastern)

Gastineau Contractors
Upper Mendenhall Rv Pit
Box 409
Juneau, Alaska 99801
(Southeastern)

Holin Horn & Shanks
Horns Pit
RR 3, Box 3223, No. 29
Juneau, Alaska 99801
(Southeastern)

Belardi & Schneider, Inc.
Switzer Creek Pit
RR3, Box 3720
Juneau, Alaska 99801
(Southeastern)

Herndon & Neal Gravel Co.
Herndon & Neal Pit
Box 393
Homer, Alaska 99603
(Southcentral)

Brechan Enterprises, Inc.
Bells Flat and Sand Beade Pits
Box 1275
Kodiak, Alaska 99615
(Southcentral)

Central Construction Co., Inc.
Sand & Gravel Operation
2112 Third Avenue
Seattle, Washington 98121
(Southwestern)

Federal Aviation Agency
Northern Alaska
701 C Street
P.O. Box 14
Anchorage, Alaska 99513
(Northern)

Federal Aviation Industry
Alaska Region
701 C Street, P3, Box 14
Anchorage, Alaska 99513
(Western)

Bruce Morley
Pete Ludwig Pit
RR 3, Box 3753A
Juneau, Alaska 99801
(Southeastern)

Gastineau Contractors
Lower Mendenhall River Pit
Box 409
Juneau, Alaska 99801
(Southeastern)

Channel Construction, Inc.
Landfill P2T
Box 1267
Juneau, Alaska 99802
(Southeastern)

A. N. Kaiser & Sons
River Road Pit
Box 66
Auke Bay, Alaska 99821
(Southeastern)

John Campbell Construction
Meadow Grove Pit
P.O. Box 474
Juneau, Alaska 99801
(Southeastern)

Red Samm Construction, Inc.
Erwin Pit
Box 68000, Rt. 6
Juneau, Alaska 99803
(Southeastern)

Alaska Electric Light & Power Co.
Mill Tailing and Salmon Creek Pits
Box 134, Franklin Street
Juneau, Alaska 99801
(Southeastern)

Dwain Reddenkopp, Inc.
Tee Harbor Sq Pit
Box 27
Auke Bay, Alaska 99821
(Southeastern)

Red Samm Construction, Inc.
Ludwig Pit
RR 6, Box 68000
Juneau, Alaska 99803
(Southeastern)

B & B Earth Movers
Ludwig Pit
RR 3, Box 3754
Juneau, Alaska 99801
(Southeastern)

Madsen Construction, Inc.
Erwin Pit No. 2
Box 338
Juneau, Alaska 99801
(Southeastern)

Dwain Reddenkopp, Inc.
Kodzof Pit
Box 27
Auke Bay, Alaska 99821
(Southeastern)

Federal Aviation Administration
Alaska Regional
701 C St., P.O. Box 14
Anchorage, Alaska 99513
(Eastern Interior)

Fairbanks Sand & Gravel, Inc.
Sand and Gravel
Box 686
Fairbanks, Alaska 99707
(Eastern Interior)

Ghemm Co., Inc.
Metro Pit
P.O. Box 507
Fairbanks, Alaska 99707
(Eastern Interior)

H & H Contractors
Bridgewater and H & H Pits
Box 1811
Fairbanks, Alaska 99707
(Eastern Interior)

Earthmovers of Fairbanks
Earthmovers Pit
925 Aurora Drive
Fairbanks, Alaska 99701
(Eastern Interior)

Rudys Sand & Gravel
Rudys Pit
General Delivery
Tok, Alaska 99780
(Eastern Interior)

Alaska Dept. of Highways
Soldotna Creek Pit
Soldotna, Alaska 99669
(Southcentral)

Harleys Trucking
David Block Pit & Plant
Box 1474
Soldotna, Alaska 99669
(Southcentral)

STONE - CONTRACTS & PURCHASES

U.S. Forest Service Region 10
Various Contractors
Chugach National Forest
Box 280
Cordova, Alaska 99570
(Statewide)

City of Wrangell
Various Contractors
P.O. Box 531
Wrangell, Alaska 99929
(Southeastern)

City of Juneau
Various Contractors
Juneau, Alaska 99801
(Southeastern)

Dept. of Transportation &
Public Facilities
Various Contractors
Division of Aviation
Pouch 6900
Anchorage, Alaska 99502
(Southcentral)

City of Petersburg
Various Contractors
P.O. Box 329
Petersburg, Alaska 99833
(Southeastern)

Municipality of Anchorage
Maintenance Operations Division
Various Contractors
Pouch 6-650
Anchorage, Alaska 99502
(Southcentral)

U.S. Dept. of Energy
Various Contractors
Alaska Power Administration
P.O. Box 50
Juneau, Alaska 99802
(Southeastern)

Katmai National Monument
Various Contractors
Katmai National Monument
King Salmon, Alaska 99613
(Alaska Peninsula)

City of Fairbanks
Various Contractors
Fairbanks, Alaska 99701
(Eastern Interior)

City of Ketchikan
Various Contractors
Ketchikan, Alaska 99901
(Southeastern)

U.S. Naval Station
Traprock Operation
U.S. Naval Station, Adak Area
Box 21
FPO Seattle, Washington 97891
(Alaska Peninsula)

City of Cordova
Various Contractors
P.O. Box 938
Cordova, Alaska 99574
(Southcentral)

U.S. Army Corps of Engineers
Construction Division - Alaska District
Various Contractors
P.O. Box 7002
Anchorage, Alaska 99510
(Southcentral)

Alaska Dept. of Transportation
Copper River
Box 507
Valdez, Alaska 99686
(Statewide)

STONE

Soderberg Logging & Construction Co.
Quarry No. 5 Station 79400
Box 460
Kake, Alaska 99830
(Southeastern)

Silver Bay Logging Co.
Quarry No. 3 Station 335 & 50
Box 398
Sitka, Alaska 99835
(Southeastern)

Dept. of Transportation
Various Contractors
Pouch 6900
Anchorage, Alaska 99502
(Eastern Interior)

Yutan Construction Co.
Browns Hill Quarry
Box 1775
Fairbanks, Alaska 99707
(Eastern Interior)

Kadin Corp.
Broome Quarry
Box 1348
Wrangell, Alaska 99928
(Southeastern)

Olsen and Sons, Ltd.
Dry Straight Quarry No. 2
Box 309
Petersburg, Alaska 99833
(Southeastern)

S & S General Contractors
Mitchell Tonka Quarry No. 5, 3, 2
Box 3,4026
Anchorage, Alaska 99501
(Southeastern)

Nealy Bros. Contracting
Comstat Quarry
Box 4 807
Anchorage, Alaska 99503
(Southeastern)

City of Wrangell
Cemetery Quarry
Wrangell, Alaska 99929
(Southeastern)

Panhandle Trailer Court
State Quarry 74179 ADL2
P.O. Box 492
Wrangell, Alaska 99929
(Southeastern)

Owens Drilling Co.
Port Alice
Box 842
Wrangell, Alaska 99929
(Southeastern)

Brand Construction Co.
Lighthouse Quarry
Rt. 1, Box 78
Ketchikan, Alaska 99901
(Southeastern)

Brand Construction Co.
L Heureau Quarry
Rt. 1, Box 78
Ketchikan, Alaska 99901
(Southeastern)

Hardrock Construction Co.
Hardrock Quarry
Box 6455
Ketchikan, Alaska 99901
(Southeastern)

Campbell Construction Co.
Little Naukati Bay Quarry
Box 1389
Ketchikan, Alaska 99901
(Southeastern)

U.S. Forest Service Region 10
Various Contractors
Box 1628
Juneau, Alaska 99801
(Southeastern)

Rock & Road Construction
Rock & Road Quarry
P.O. Box 585, Lumber St.
Petersburg, Alaska 99833
(Southeastern)

Dept. of Transportation
Division of Aviation -
Own Crews
Pouch 6900
Anchorage, Alaska 99502
(Southeastern)

Wayne Construction Co.
Smileys Cannery Quarry
4100 Tongass Avenue
Ketchikan, Alaska 99901
(Southeastern)

Dept. of Transportation
Various Contractors
Pouch 6900
Anchorage, Alaska 99502
(Southeastern)

City of Petersburg
Traprock Operation Airport Quarry
P.O. Box 329
Petersburg, Alaska 99833
(Southeastern)

City of Juneau
Various Contractors
155 S. Seward Street
Juneau, Alaska 99801
(Southeastern)

Moores Quarry
Box 8100
Ketchikan, Alaska 99901
(Southeastern)

Wayne Construction Co.
Carlanna Creek Quarry
4100 Tongass Avenue
Ketchikan, Alaska 99901
(Southeastern)

Dept. of Public Works
Division of Aviation
Various Contractors
P.O. Box 255
Mt. Edgecumbe, Alaska 99835
(Southeastern)

Dept. of Transportation
Various Contractors
Pouch 6900
Anchorage, Alaska 99502
(Eastern Interior)

U.S. Forest Service Region 10
Anchorage Area - Various Contractors
Box 1628
Juneau, Alaska 99801
(Southcentral)

City of Kodiak
Airport Quarry
Box 1397
Kodiak, Alaska 99615
(Southcentral)

Brechan Enterprises, Inc.
City Airport Pit
Box 1275
Kodiak, Alaska 99615
(Southcentral)

Alaska Dept. of Transportation
Seward Peninsula
P.O. Box 1467
Juneau, Alaska 99801
(Western)

The Alaska Railroad
Granite Operation
P.O. Box 7 2111
Anchorage, Alaska 99510
(Alaska Peninsula)

Aleutian Constructors
Lake Leon Rock Quarry
Box 4D
Anchorage, Alaska 99509
(Alaska Peninsula)

U.S. Forest Service Region 10
Cordova Work Center
Chugach National Forest
Box 280
Cordova, Alaska 99570
(Cook Inlet)

APPENDIX K

Cumulative Alaskan industrial-mineral production and reserve base

Past Production	Promising Prospect(s) or Mine Site(s)	Reserve Base	Reference
ASBESTOS			
tremolite asbestos 94,000 lbs	Cosmos Hills (Kobuk)	—	Coats (1944) Berg, et. al. (1964)
chrysotile, 2,000 lbs (1943-45)	Dahl Creek	—	Fritts (1970) Anderson (1942, 1945)
—	Slate Creek 40 mile area	55 million tons 6.35% chrysotile fiber	AMA Convention 1980 Foster (1969)
BARITE			
850,000 tons 94% BaSO ₄	Castle Island (SE)	—	Conwell (oral comm.)
—	Lime Point (SE)	5,000 tons 90% BaSO ₄	Bundtzen and Henning (1978)
—	Red Dog	—	Herreid, et. al. (1978)
—	Wulick	—	Lueck (oral comm.)
CLAY			
200,000 bricks (1947-48)	Point Wormzof	Large	Berg, et. al. (1964)
25,000 bricks (1948)	Sheep Mountain	6,000 cubic yds.	Eckhart (1953)
750 tons	Otto Lake; Healy Coal Field	Large	Sullivan (1978)
—	Homer area	Large	Berg, et. al. (1964)
FELDSPAR			
—	Baranof Island	1,000 tons	Brew, et. al. (1964)
FLOURITE			
—	Lost River	4.94 million tons	WGM, (1972)
—	Groundhog-Glacier Basin	10,000 tons (low grade)	Gault, et. al. (1953)

Past Production	Promising Prospect(s) or Mine Site(s)	Reserve Base	Reference
GARNET "intermittent 1910-22"	Fort Wrangell (SE Alaska)	16,500 tons (contained almandine)	Bressler (1950)
GRAPHITE (1) 540,000 lbs 1907-17 1942-50	Uncle Sam	65,000 tons 52% graphite 300,000 tons 10% graphite	Harrington (1919)
—	Cobblestone River (Seward Peninsula)	—	
GYPSUM 500,000 tons 1905-26 10,000 tons 1950's	Iyoukeen Cove (Chichagof Island) Sheep Mountain	— 650,000 tons 25-30% gypsum	Stewart (1931) Flint and Cobb (1953) Eckhart (1953)
—	Baultoff	—	Personal Obs.
LIMESTONE/MARBLE 2,150,000 tons 1928-1949	Prince of Wales & Dall Islands Foggy Pass (ARR)	25 million tons 96.6% CaCO ₃ 190 million tons 98% CaCO ₃ "200 feet thick"	
—	Kings River (SC) Heceta-Token (SE) area (8 quarries)	Huge	Burchard (1920)
—	450,000 tons (structural marble)		
MICA			
—	Seward Peninsula	Commercial grade 20" books	Moffit (1913) Joesting (1943)
—	Baranof Island	2" books	Sainsbury (1957)
—	Sitkan Island	8" books	Sainsbury (1957)
PHOSPHATE			
—	Lisbourne Group	38' thick zones 8-12% P ₂ O ₅	Patton (1959)
—	Shublick Fm.	1-3' thick zones 25-34% P ₂ O ₅	Detterman (1970)

(1) Not all graphite was utilized.

Past Production	Promising Prospect(s) or Mine Site(s)	Reserve Base	Reference
SULPHUR			
Considerable develop- ment;	Akun Island	24,000 tons	Eakins (1970)
No production	(Stepovak Bay)	200,000 tons	
—	Makushin Volcano	9,000 tons 60%S 24,000 tons 25%S	Madburn (1919)
—	Little Sitkin Island	200,000 tons	Snyder (1959)
—	Unalaska	—	Maddren (1919)
—	Horseshoe Bay	—	Steger (1956)
DIATOMACEOUS EARTH			
—	Kenai	200,000 yards 65-75% diatomite	Plafker (1958) McLaughlin (1972)
HAYDITE			
—	Kings River		Eckhart and Plafker (1958)
—	Sutton	Large unmeasured resources	
—	Lawing (Kenai P.)		
—	Millers Landing		
—	Indian River		
PERLITE			
—	Sugar Mountain	—	Plafker, et. al. (1963)
—	Polychrome Pass	—	
—	Calico Creek	—	
PUMICE			
Production; not measured	Geographic Harbor (Katmai)	Large	Moxham (1951)
Production; not measured 1946-49	Augustine Island	Large	
ZEOLITES			
—	Horn Mtns. Area	Very large mordenite deposits 14 km of strike length	Hawkins (1976)
—	Alaska Peninsula	Large heulandite and mordenite deposits	Madonna (1973)

APPENDIX L

Fairbanks area pottery industry's use of Healy-area clays

There are approximately 20 "serious" studio potters and at least one "production" potter currently active in the Fairbanks area.

These artists each use 1,000 to 6,000 pounds of clay annually; estimated total production, based on interviews with six people, is 40 tons a year.

The studio potters each gross between four and fifteen thousand dollars/year on their final end products and estimated total is 50-60,000 dollars/annually.

Processing steps:

1. Collection in canvas bags from Otto Lake or Healy coal bearing strata
2. Dry clay—oven or outside over large surface
3. Clay—slurry (H₂O) formed and stored in studio
4. Screening to remove impurities (mainly coal)
5. Dry again
6. Throw the pot
7. Initial low firing kiln (1700° C)
8. Glaze application
9. Hot firing kiln (2300° C)

APPENDIX M

Production, reserves, and resources of selected strategic minerals in Alaska

<u>Mineral</u>	<u>Production</u>	<u>Proven Reserve</u>	<u>Indicated Res.</u>	<u>Major Alaskan Deposits*</u>	<u>U.S.** Import Reliance</u>	<u>Source</u>
Niobium (columbium) and tantalum	---	---	---	Bokan Mtn., Rapid River, Ruby, Manley (13, 2, 5, 4, fig. 4)	96	Brazil, Canada Thailand, Malaysia
Manganese	---	---	---	Yukon-Charley, Sinuk, C. Ak. Range (3, 1, 6, fig. 4)	98	Gabon, Brazil, S. Africa, Australia
Cobalt	---	9 million lbs	63 million lbs	Brady Glacier, Yakobi Island, Mirror Harbor, Mertie Lode, Bornite (14, 16, 17, 15, 3, fig. 1)	90	Zaire, Zambia
Chromium	36,849 tons (38-42% Cr ₂ O ₃) 1917, 1944-58, 1976	300,000 tons 28% Cr ₂ O ₃	Millions of tons low grade "ore"	Seldovia, Eklutna, Bernard Mtn. Union Bay (9, 10, 11, 12, 1, 18, fig. 1)	90	S. Africa, USSR, Turkey
Platinum group metals	567,500 oz 1918-81	350,000 oz	600,000 oz	Goodnews Bay, Brady Glacier, Salt Chuck (8, 14, 19, fig. 1)	89	S. Africa, USSR,
Asbestos	94,000 lbs 1943-45	55 million tons 6.35% fiber grade	---	Slate Creek, Kobuk, Nyac (5, 2, 7, fig. 1)	85	Canada, S. Africa, Turkey
Tin	5 million lbs 1902-81***	125,973,000 lbs	5,046,000 lbs	Western Seward Pen., Manley, Rapid River, Sithylenkat (1, 2, 3, 9, 5, 7, fig. 2)	81	Canada, S. Africa, Malaysia, Bolivia
Flourine	---	4,94 million tons	---	Lost River	81	Mexico, S. Africa United K., Italy
Nickel	---	1.123 billion lbs	.950 billion lbs	Brady Glacier, Yakobi Is., Mirror Harbor, Mertie Lode, Emericka (14, 16, 17, 15, 6, fig. 1)	77	Canada, Norway, New Caledonia
Mercury	2,500,000 lbs	---	.25 million tons potential "ore" grade rock	Red Devil, Cinnabar Creek, DeCoursey Mtn., White Mtn., (10, 9, 8, fig. 3)	62	Algeria, Spain, Italy
Tungsten	286,000 lbs WO ₃	---	19,345,560 lbs WO ₃	Gilmore, Bear Mtn., Hodzana, Chulitna, Lost River, Hyder, Chichagof, Golden Horn (8, 4, 6, 10, 15, 14, 2, fig. 2)	59	Canada, Korea, Bolivia
Antimony	10,493,360 lbs 1915-79***	10,500,000 lbs	110 million lbs	Fairbanks, Kantishna, Wiseman, Nome, Tok, Red Devil (4, 5, 3, 1, 6, 10, fig. 3)	13	China, Bolivia,

* The numbered references and figures refer to source documents.

** U.S. net import reliance, expressed as a percentage, from U.S.B.M. Commodity Summary, 1981.

*** Intermittent

APPENDIX N

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APPENDIX P

Laws and Regulations Directly Affecting Coal Exploration and Surface Coal Mining and Reclamation in Alaska

1. Article VIII, Section 8, Constitution of the State of Alaska "leases"
2. Article VIII, Section 12, Constitution of the State of Alaska "Mineral leases and permits"
3. AS 01.10.020-.065 "Rules of Statutory Construction"
4. AS 01.10.080 "Computation of Time"
5. AS 03.05.010(c) "Powers and Duty of the Commissioner of the Department of Natural Resources" - with regard to regulation and control of entry of seeds, etc.
6. AS 03.22 et seq. "Plant Material Center"
7. AS 08.48 "Architects, Engineers, and Land Surveyors"
8. AS 08.52 "Explosive Handlers" - relating to storage and use of explosives.
9. AS 16.05.840 "Fish Way Required" - relating to free passage of fish.
10. AS 16.06.850 "Hatchery Required" - relating to alternatives to AS 16.05.840.
11. AS 16.05.860 "Penalty for Violation of .840 and .850".
12. AS 26.05.870 "Protection of Fish and Game" - relating to designation of rivers, lakes and streams important for spawning or migration of anadromous fish.
13. AS 26.05.880 "Violation of Sections .870 - .895".
14. AS 16.05.890 "Emergency Situations Exempted from Section .870"
15. AS 16.05.895 "Penalty for Causing Material Damage"
16. AS 16.05.900 "Penalty for Violations"
17. AS 16.10.010 "Interference with Salmon Spawning Streams and Waters"
18. AS 16.10.020 "Grounds for Permit or License" - relating to obtaining water for power or mining purposes.
19. AS 16.20 "Conservation and Protection of Alaskan Wildlife"
20. AS 18.60.057 - .105 "Occupational Safety and Health Review Board" relating to practices for safe employment.

21. AS 23. "Employment Practices and Working Conditions"
22. AS 27.20.150 - .335 "Coal Mines" - relating to conduct or operations in coal mines.
23. AS 38.05.005 - .040 - Administrative sections of the Alaska Lands Act.
24. AS 38.05.125 - .130 "Reservation of Rights to Alaska" - relating to reservation of certain mineral rights, including coal, to the State of Alaska.
25. AS 38.05.135 - .184 "Leasing of Mineral Lands"
26. AS 38.05.300 "Classification of Land"
27. AS 38.05.305 "Notice and Review" (to local communities affected by land disposals).
28. AS 38.05.310 "Notice and Appraisal" with regard to appraisal of lands disposed by the State.
29. AS 38.05.330 "Permits"
30. AS 38.05.340 "Assignment" - relating to assignment of leases.
31. AS 38.05.345 "Notice" (to public in general of a land disposal).
32. AS 38.05.360 "Waste and Injury to Land".
33. AS 41. "Public Resources".
34. AS 44.62 "Administrative Procedure Act".
35. AS 46.03.050 - .130 "Water Pollution Control Act".
36. AS 46.03.140 - .240 "Air Pollution Control Act"
37. AS 46.03.710 - .850 "Prohibited Acts and Penalties"
38. AS 46.15.030 - .185 "Appropriation of Water".
39. AS 46.35.010 - .210 "Environmental Procedures Coordination"
40. AS 46.40.010 - .210 "Alaska Coastal Management Program"
41. 5 AAC 95 "Protection of Anadromous Fish"
42. 6 AAC 80 and 85 "Alaska Coastal Policy Council"
43. 8 AAC 60 - 8 AAC 80 "Occupational Safety and Health Division"
44. 11 AAC 44 "Mine Safety"

45. 11 AAC 46 "Coal Conservation"
46. 11 AAC 82 "Mineral Leasing Procedure"
47. 11 AAC 84.100 -.170 "Coal Leasing"
48. 11 AAC 91 "Zoning"
49. 11 AAC 93 "Water Management"
50. 18 AAC 50.010 - .190 "Air Quality Control"
51. 18 AAC 60.010 - .130 "Solid Waste Management"
52. 18 AAC 60.010 - .110 "Water Quality Standards"
53. 18 AAC 72.010 -.100 "Waste Water Disposal"
54. 18 AAC 95.010 - .900 "Environmental Conservation Administrative Enforcement"

Proposed state laws and regulation:

1. Alaska State Surface Mining Act (required by the Federal Surface Mining Act.)
2. Corresponding regulations.
3. Proposed permit reform regulations.

FEDERAL LEGISLATION ENACTED SINCE 1970 AFFECTING THE COAL MINING INDUSTRY

1. Clean Air Act of 1970.
2. Federal Water Pollution Control Act Amendments of 1972.
3. Noise Control Act of 1972.
4. Energy Supply and Environmental Coordination Act of 1974.
5. Safe Drinking Water Act of 1974.
6. Resource Conservation and Recovery Act of 1976.
7. Toxic Substances Control Act of 1976.
8. Federal Mine Safety and Health Amendments Act of 1977.
9. Clean Air Act Amendments of 1977.
10. Surface Mining and Reclamation Act of 1977.
11. Black Lung Benefits Reform Act of 1977.