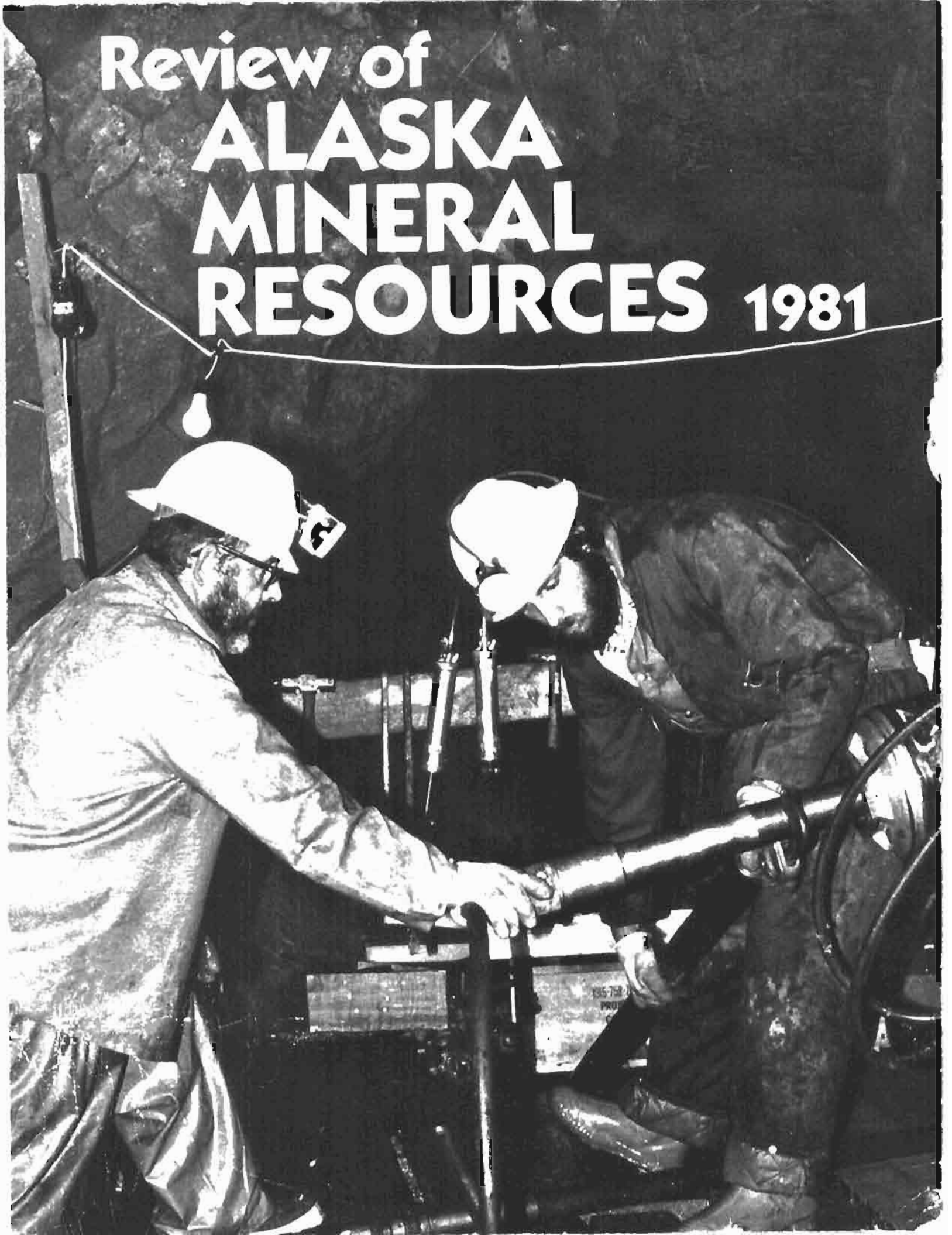
Review of ALASKA MINERAL RESOURCES 1981



Review of Alaska's Mineral Resources

SUMMARY REPORT

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. That publication, 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. In addition to reviewing mineral exploration, development and production in 1981, the review contained text and satistics on historical production, information on permitting agencies, directories of State and federal offices, and other useful information.

The intent of the Office is to continue publication of the review on an annual basis. This publication, Summary Review of Alaska's Mineral Resources 1981, utilizes the format of the future annual reports. Much of the material found in the original Review has been omitted as it would be unnecessarily repetitive in an annual publication. The format, therefore, provides a concise yearly summary of mineral activity in the State. It is intended to be a useful annual report for State policymakers, industry personnel and the public.

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 F. M. Sims
Office of Mineral Development

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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 A.

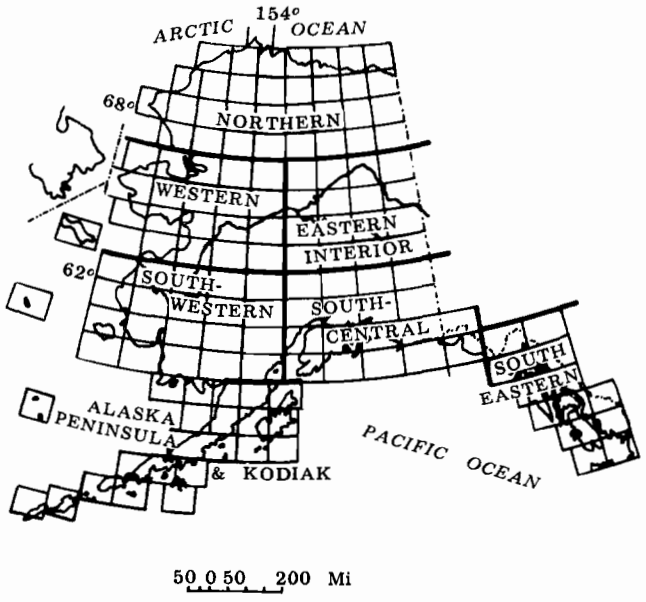


Figure 1. Regions of mineral activity in Alaska

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 1). 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).

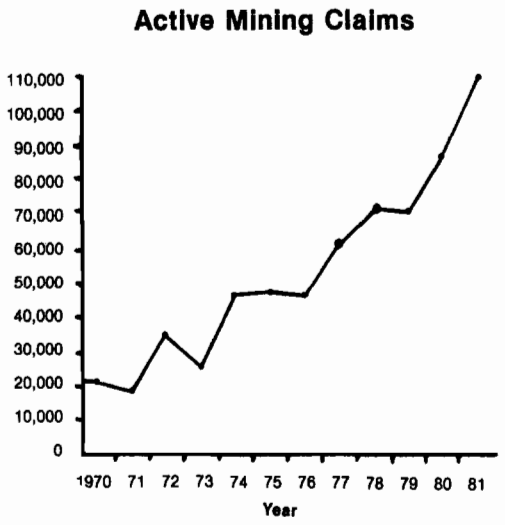
In previous years, the Southeastern and Northern regions of Alaska dominated mining activities, but Southcentral and Eastern Interior were dominant in 1981 because of increased precious-metal activity; important discoveries; and proximity to transportation, labor, and supply sources for the exploration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

TABLE 1
EXPLORATION EXPENDITURES IN ALASKA

BY COMMODITY GROUPING
(in thousands of dollars)

	1979•	1980•	1981
Base metals	$10,278.0	$ 6,775.0	$28,262.2
Precious metals	4,612.4	5,086.5	35,373.2
Industrial and structural materials	150.0	1,250.0	10,300.0
Coal and peat	200.0	125.0	2,341.0
Miscellaneous••	250.0	— —	127.0
Unspecified	61,000.0	52,000.0	— —
TOTAL	$76,490.4	$65,236.5	$76,303.4

• 1979-80 estimates from reconnaissance canvas survey.
•• Uranium, gemstone, etc.
— — None reported



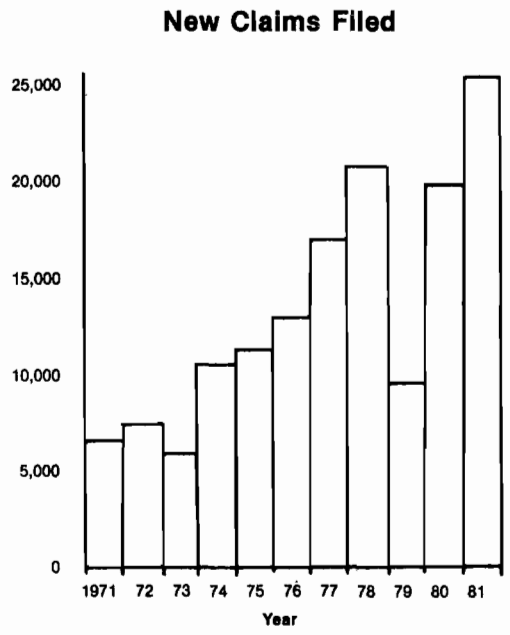


Figure 2. Claim-staking activity 1970-81

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.

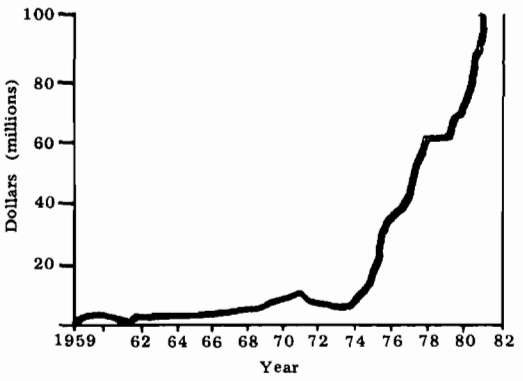


Figure 3. Mineral-exploration expenditures in Alaska, 1959-81.

TABLE 2
ACTIVE CLAIM HOLDINGS OF MAJOR CORPORATIONS

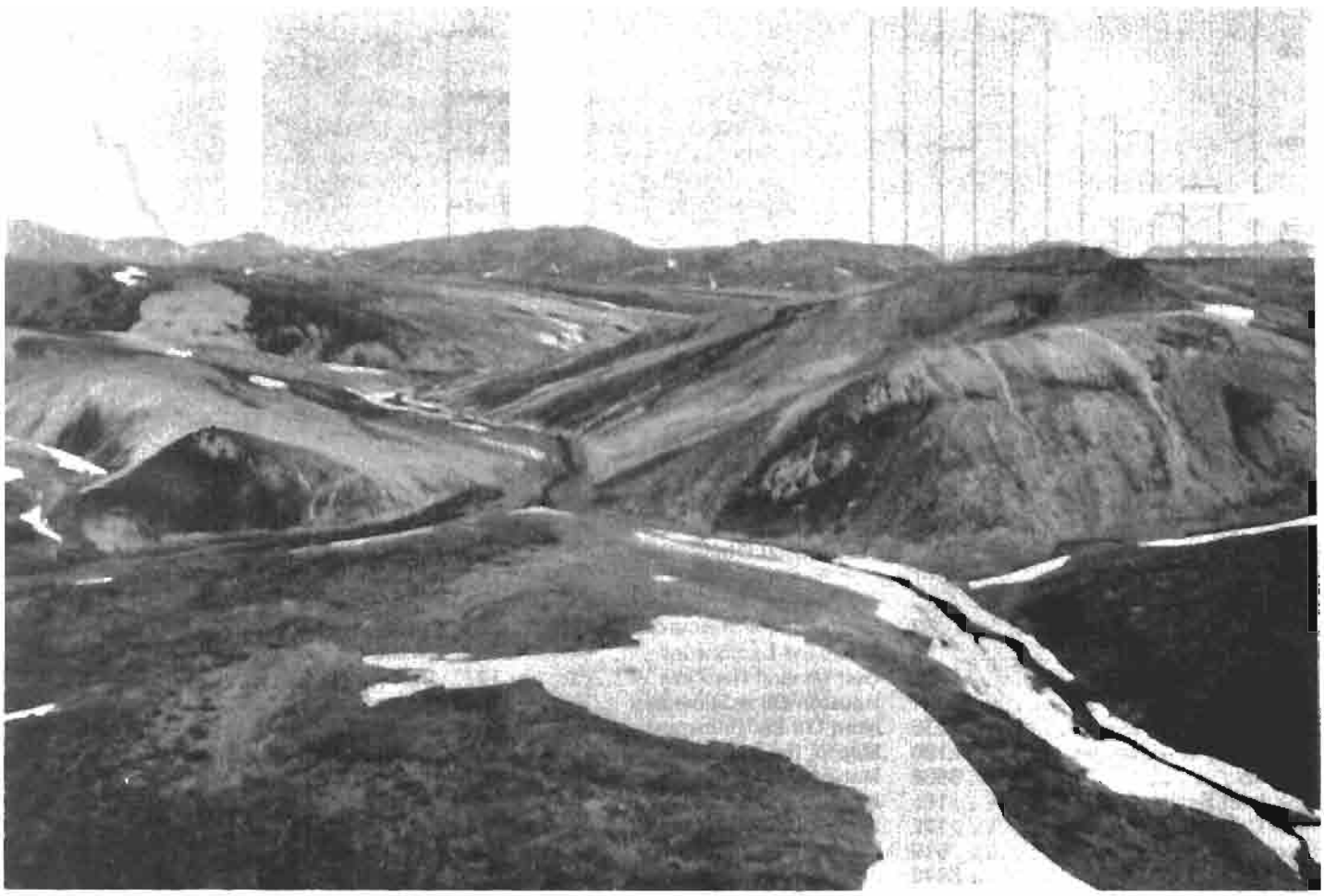
Amax Exploration 52	Getty Mineral Resources Co. 534	Placid Oil 653
Amoco Minerals 153	Greatland Exploration 2764	Resource Associates of Alaska 2283
Anaconda 5282	Gulf Mineral Resource 117	Starkey Wilson 74
Bear Creek Mining 924	Houston Oil & Minerals 3700	Texas Gulf, Inc. 82
B.P. Alaska Exploration 35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

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

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



Northwest Alaska — Red Dog Deposit — Exploration and development by NANA Inc. and Cominco Alaska

SUMMARY OF MAJOR ACTIVE CLAIM BLOCKS

Data for Appendix A. 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. Additonally, 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. Table 2 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. Tailleur of the U.S. Geological Survey release an open-file report describing analytical results and significance of a prominant 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 veiw 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, Virgina 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, primarily 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 additonal 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-Sithylemenkat 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 Riverside 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 Anaconda'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 Glacer 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 (WO_3) 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 undergound 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 Bonnifield 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 Almasy 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

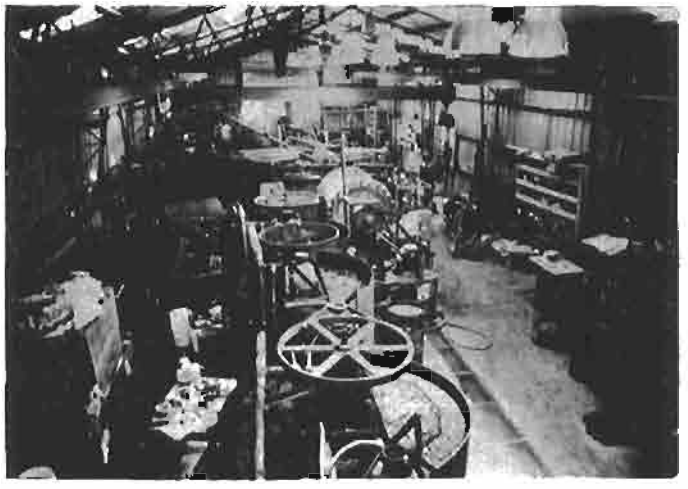
50,238 feet in 149 holes, 6,000 feet of which was cored. Bechtel was project manager. Diamond Alaska is moving ahead with mine planning and believes they could produce between 6 and 13 million tons per year, contingent on establishing a market. The Beluga Coal Company continued limited exploration drilling 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 Livengood. 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 A.

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.



Mill interior, Little Squaw Mining Operation

TABLE 4
SUMMARY OF ALASKAN MINERAL-DEVELOPMENT EXPENDITURES BY COMMODITY
(In thousands of dollars)

	1979	1980	1981
Base metals	$3,600.0	$ 5,000.0	$ 5,945.0
Precious metals	3,140.0	5,750.0	11,400.0
Industrial and structural minerals	1,000.0	1,200.0	7,000.0
Coal and peat	— —	— —	345.0
TOTAL	$7,740.0	$10,950.0	$24,690.0

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 subleased 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

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):

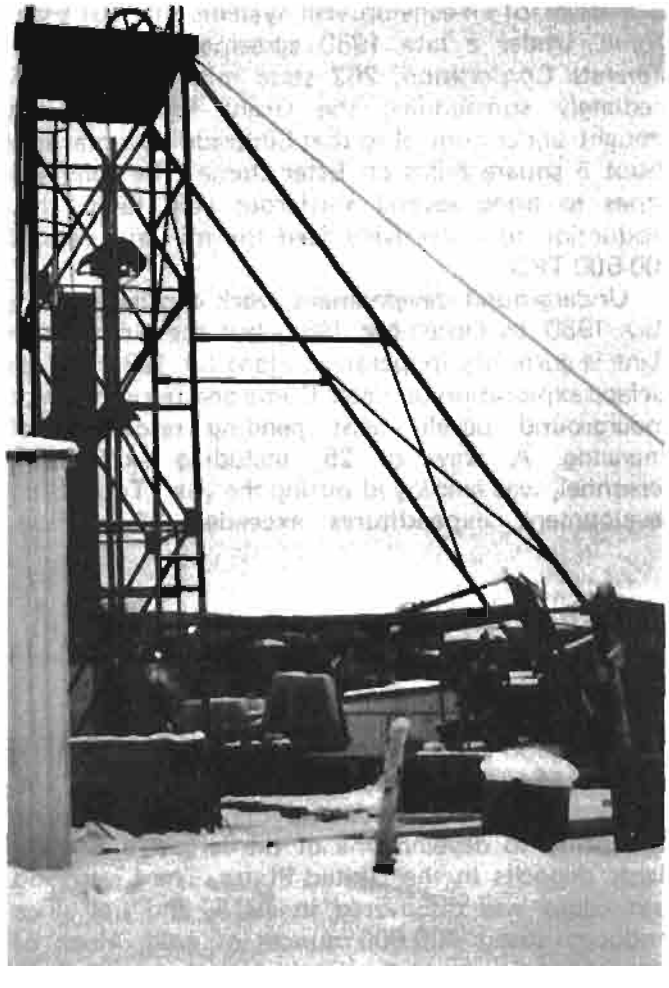
"Exploration and development of the mine have been intermittent since the 1920s. Prior to 1950, about 6,000 tons of ore were selectively mined from the Irishman vein (Roger Burggraf, personal comun., 1981). Tri-Con, Inc., has been developing the property during the last several years and now has a gravity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

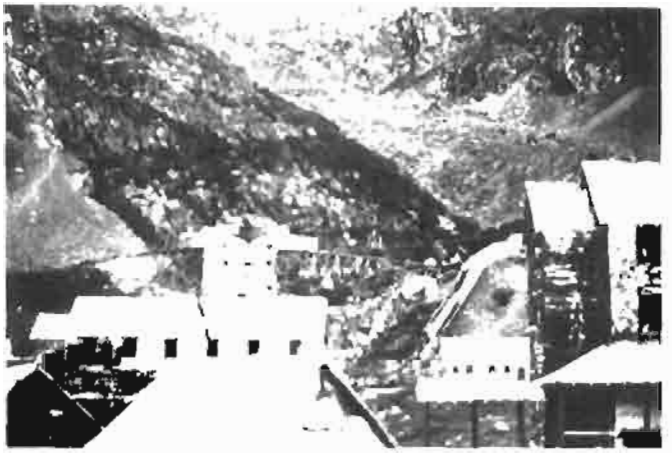
According to Joe Fisher, operator for Northland Dredging, development expenditures exceeded $1.5 million in 1981, and another $1.5 million is expected to be spent in 1982. The primary source of electricity for the Northland and Tuluksak dredges is a nearby small hydroelectric power site. Estimates of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

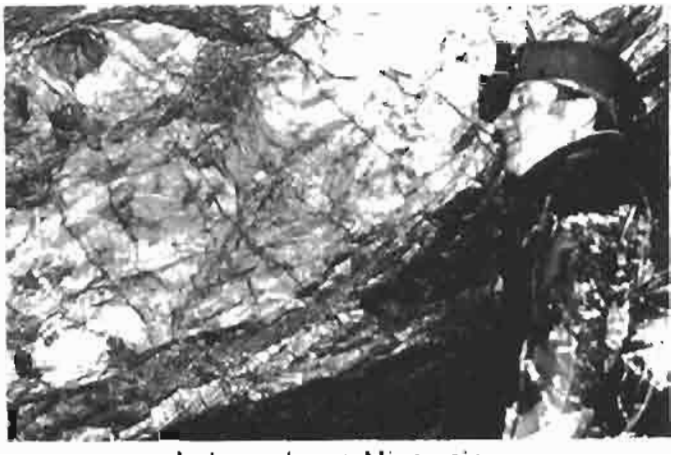
The mine was inoperative throughout the 1950s and 1960s. In the mid-1970s, the State of Alaska attempted to buy the property as part of a historic site, but the Legislature refused funding. In 1979, Starkey Wilson and Enserch Corporation obtained an option on the property and deeded 240 acres around 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

Longyear 38
Underground in Independence Mine



Independence Mine vein
1,700 ft. level

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).

Diamond drill at Quartz Hill

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.

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.

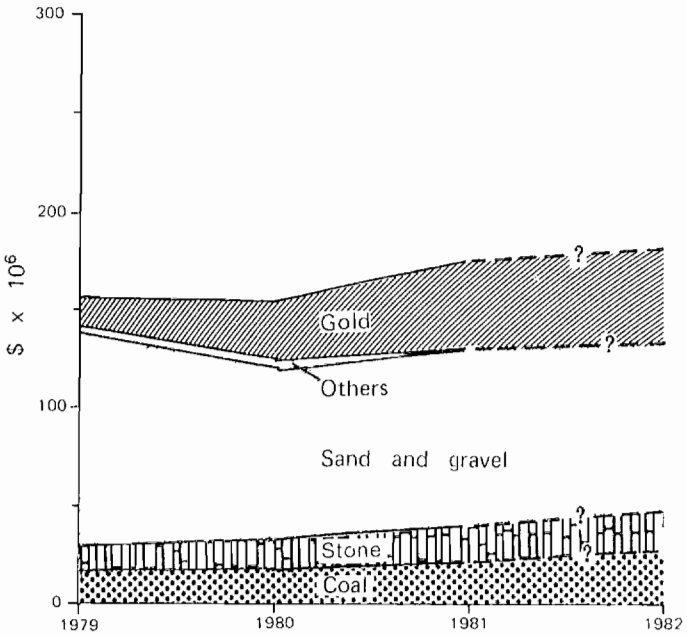


Figure 4. Value of Alaskan mineral production, 1979-81.

TABLE 6
ALASKAN GOLD PRODUCTION BY REGION, 1981

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

* Total placer mines statewide exceeds 400

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 Bitzshtini 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 Bitzshtini 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 in 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 Dungin 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 "clamshell" 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 ledgerock 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

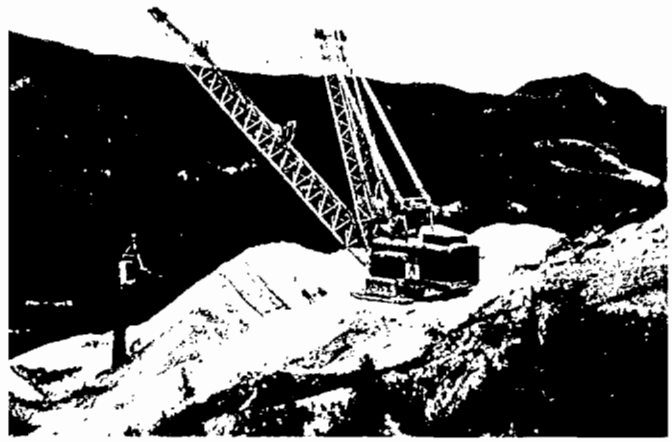
Usibelli Mines (Healy) was the only significant coal mine in the State. Production in 1981 was about 800,000 tons, worth $17.6 million, a 6 percent increase over the previous year. Usibelli is involved in a significant expansion into the Pacific Rim export market.

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 (± 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

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APPENDIX A
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
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.	Occassional, 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	BENDELBEN	MFD	162	F	lode	Res. Assoc. of AK.
15	BENDLEBEN	Below Henry Creek	134	F	Au	Tweet & Sons
15	BENDLEBEN	PCA	548			Greatland Exploration
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

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
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
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.
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

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
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
*39	FAIRBANKS	Grant Mine	21	F&S	Au	R. Burgaff, Tricon
39	FAIRBANKS	Golden United Claims	120			Paul Barelka, Silverado Mines, Ltd.
39	FAIRBANKS	Gil	99		lode, placer	Res. Assoc. of AK.
40	CIRCLE	Champ	43	F	U lode	Houston Oil & Min., Res. Assoc. of AK.
40	CIRCLE	Free, Free-b, Oh	759	F	U lode	MARCO
40	CIRCLE	Melart	76	F	lode	F. Lardru (Melart)
40	CIRCLE	Bear (and others)	53	F	Au, placer	Emerson Exploration (and others)
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
43	CIRCLE	You, Gap, Old, Jennie	93		placer	Chena Mining Group
43	CIRCLE	Ann	225		lode	W.G.M.
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.
45	BIG DELTA	Grit	34		lode	Noranda
45	BIG DELTA	L, P, DA, G, J. Diana	51		placer	J. Rice, F. Ensign
45	BIG DELTA	G. Chet, Hy	230		placer	Chena Mining Group
45	BIG DELTA	Hawg	264		lode	Anaconda
45	BIG DELTA	LS	22			Amax Exploration Co.
46	BIG DELTA	KT, BD, CAB	270			W.G.M.
46	BIG DELTA	Discover	54		Au	J. Parry
46	BIG DELTA	BLKSH	42		lode	Res. Assoc. of AK.
46	BIG DELTA	Below Gail, Donna	90			GLD Corp.
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.
*48B	EAGLE	Crystolite	4	Native	Asbestos	Doyon, Ltd.
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
51	OPHIR	TOL	53		lode	Res. Assoc. of AK.
52	OPHIR	Maki Gulch (and others)	90		Au	W. Magnusen
52	OPHIR	Gold Bar	68			L. McFarlund, R. Grife
52	OPHIR	Jenny (and others)	71	S		C. Scoggin
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			Patino, 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.
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	Tammay 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.
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.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
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
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
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. Swiff, 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

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
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
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.
*87	ANCHORAGE	Independence Mine area	81	F	Au	Starkey Wilson, Enserch
87	ANCHORAGE	Jr.	83			JJ Mining Co.
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.
95	LAKE CLARK	Terry Gil	51		Au	T. & V. Gill lease to Azcon Corp.

**Where known

Map No.	Quadrangle	Claim Group Name(s)	Approx. No. of Claims	Land Status** F-federal S-state	Commodities	Holding Company
96	KENAI	Kus	25	S		Aspen Exploration Co.
97	KENAI	Nil	19			Aspen Exploration Co.
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
108*	JUNEAU	Big Sore (Greens Creek) (and others)	758		Ag, Pb, Zn, Cu, Au lode	Noranda
108	JUNEAU	Hi	518		lode	Res. Assoc. of AK.
108	JUNEAU	High Lake	94		lode	Horizon Explor. Co.
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.
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 B

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 (Zn-Pb-Ag-Cd-barite) 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 1; 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 (CaF_2) 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% P_2O_5 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, metatuffs, 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% WO_3-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 placer 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% U_3O_8.

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 exent and moderate grade.

44. Tungsten-antimony-gold lodes with up to 3% WO_3, 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 1881 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 MoS_2 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 0.9-1.0% U_3O_8 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% MoS_2 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-sulifde 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 1.25-9% Cu and 2-9 oz/ton Ag + Au reported.

89. **Sheep Creek and Liberty Bell massive-sulfide deposits** - The latter is a stratiform gold-bismuth deposit with 100,000 tons or 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% MoS_2 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% MoS_2; active exploration and claims.

103. **Big Creek or Ladue** - 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 Cu-Mo 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 materal.

113. **Mike Deposit** - Porphyry-Mo prospect; grades of up to 0.21% MoS_2 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% Fe_3O_4 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% Cr_2O_3 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, 1930-41.

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% MoS_2.

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% MoS_2; 2,247,000 tons averaging 0.067% MoS_2, 0.016% Cu, 129,530,250 tons averaing 0.026% MoS_2, 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 x 10^6 oz Au from 88.5 million tons between 1893 and 1944.

165. **Treadwell** - Major lode-Au produced 2.9 x 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 178.

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% MoS_2 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 porphyry-type 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% MoS_2 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-Zn-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 0.14% MoS_2 with a 0.07% cutoff grade 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% U_3O_8 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 C

Companies and individuals conducting exploration in Alaska during 1981, by region.[1]

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, Ag, 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.)

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 (W, Au, Cr, Mo 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-Ag, Au-W, W placer, expl./pros.)
Nelson Mining Co. (Au placer)
Moose Creek Mining Co. (placer)
Mike-Kilo Enterprizes (Au placer)
Meadowlark Mining Co/CDC Partners (Au, Ag, hardrock)
Meadowlark Farms (coal expl./pros.)
R.S. McCombe (expl./placer)
Marble Creek Mining & Snow Lion Mining Co. (placer, hardrock, expl./pros.)
Gullycat Enterpises (Au placer)
Cripple Creek Mining & Dev. Co. (placer)

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

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 (W/Mo, 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-W, 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, Cn 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)
Willow Cache Enterprises (placer)
Mapco Minerals Corporation (Au & Ag expl./pros.)
Silver Star Mining Co. (Ag, Ag, 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.)
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-W, 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)