ALASKA'S MINERAL INDUSTRY, 1985

By T.K. Bundtzen, G.R. Eakins, C.B. Green, and L.L. Lueck

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
SPECIAL REPORT 39

STATE OF ALASKA
Bill Sheffield, Governor
Fairbanks, Alaska
1986
FOREWORD


The primary objective of this report is to provide current information on Alaska’s mineral industry. The report is wholly dependent on the cooperation of companies and individuals who provide information on their projects and activities.

The value of the mineral industry to the Alaska economy in 1985 was $269.9 million, a slight decrease from 1984. Increases in the production of sand and gravel and coal helped balance a significant drop in exploration expenditures, which declined from $75 million in 1981 to less than $10 million in 1985.

In 1985, Alaska’s mineral industry entered the international market by exporting 616,000 tons of steam coal from the port of Seward to the Republic of Korea. This venture involved the Seward shiploading facilities operated by the Suneel Alaska Corporation, the inaugural use of coal unit-trains by the Alaska Railroad, and a 60-percent increase in production by the Usibelli Coal Mine.

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ALASKA'S MINERAL INDUSTRY, 1985

By T.K. Bundtzen, G.R. Eakins, C.B. Green, and L.L. Lueck

EXECUTIVE SUMMARY

This report summarizes the exploration, development, and production activities of the mineral industry in Alaska, except for oil and gas, in 1985. The gross values of the principal minerals produced were 28.2 million tons of sand and gravel valued at $112.1 million, 190,000 oz. of gold valued at $61.2 million, and 1.4 million tons of coal valued at $89.7 million. Sand and gravel, gold, and coal account for 94 percent of the gross value of 1985 production. Building stone, mercury, antimony, tin, silver, jade, soapstone, and peat account for the remaining 6 percent. Although gold production in 1985 increased about 9 percent, the value was similar to that in 1981 due to a drop in average price from $360/oz in 1984 to $325/oz in 1985. Coal production and value increased more than 60 percent, and sand-and-gravel value increased 18 percent. Total mineral production amounted to $226.6 million, up 13 percent from 1981. At least 3,650 individuals were employed by the industry during the year.

Exploration expenditures in 1985 ($9.2 million) dropped 59 percent from the 1981 level, which had dropped 35 percent from 1983 (fig. 1). Decreased exploration activity reflects low base-metal prices and budget cuts by several major mining companies. The ANACONDA MINERALS COMPANY (ANACONDA), Alaska's most active exploration group for nearly a decade, was dissolved on April 30, 1985, by the owner ATLANTIC RICHFIELD COMPANY.

In contrast to Alaska's reduced exploration expenditures, those of neighboring Yukon Territory and British Columbia, where reported 1985 exploration costs were $26 and $79 million, respectively (Morin, 1985; British Columbia Ministry of Energy, Mines and Petroleum Resources, 1986).

Development expenditures totaled $34.1 million, a drop of about 36 percent from the record $53.3 million spent in 1984. However, most of the decrease is explained by the $21-million expenditure for construction of the Seward Coal Terminal in 1984. Overall, development expenditures have been relatively constant since 1982. Total combined expenditures for exploration, development, and production were $269.9 million, a 2-percent decrease from 1984.

In northwest Alaska, progress continued on the Red Dog project owned by NANA REGIONAL CORPORATION (NANA) and operated by COMINCO ALASKA, INC. (COMINCO). The State legislature passed a bill that authorizes the Alaska Industrial Development Authority (AIDA) to finance up to $175 million for construction of the road and port facilities. A November 1985 agreement between AIDA, COMINCO, and NANA specifies that the State-financed loan will be repaid at 6.5-percent interest. Construction of road and port facilities may begin in 1986 if all parties approve the language of the enabling contract. NANA petitioned the State Boundary Commission to remove land, including the Red Dog deposit, from the North Slope Borough for inclusion in the proposed NANA Borough. The North Slope Borough insisted on reimbursement for the loss; at the end of 1985, the issue remained unresolved.

In 1985, the Grant Gold Mine near Fairbanks was developed by owners SILVERADO MINES, LTD., TRICON MINING, INC., and AUREX, INC. (AUREX), a subsidiary of MARUBENI AMERICAN CORPORATION. Over $5 million was spent on the project during the year, and a shop, a tailings pond, and a 230 ton/day (tpd) mill and other facilities were completed. Production began in October, and over 5,000 tons of ore were milled by the end of the year. However, operations were suspended December 31, 1985, when the major financial backer, AUREX, withdrew from the project. About 60 employees were laid off. An agreement was reached between AUREX and the remaining partners whereby AUREX will retain a royalty interest, and a new partner(s) can be brought in to continue mine operation.

NORANDA MINING, INC., operator of the GREENS CREEK JOINT VENTURE, completed another encouraging drilling program at the silver-gold-zinc deposit at Greens Creek, 18 mi west of Juneau. The company completed geotechnical...
conducted to validate claims around the core discovery claims before the December 1985 exploration deadline mandated by the Alaska National Interest Lands Conservation Act of 1980. An agreement proposed in late 1985 between the joint venture, Native groups, and conservation interests involved a complex land exchange in which SEALASKA NATIVE CORPORATION would acquire rights to the peripheral claims. The joint venture was given a 1-yr extension by Congress to continue exploration on adjacent claims. Ironically, any new information gained during the extended exploration period may not be used to validate the claims.

In 1985, the USIBELLI COAL MINE (USIBELLI) exported 616,000 tons of steam coal to the Korean Electric Power Company. Total mine production exceeded 1.37 million tons, a record for the Alaska coal industry. Support facilities of the ALASKA RAILROAD were improved and upgraded, and more work at the SEWARD COAL TERMINAL is planned. The DIAMOND ALASKA COAL COMPANY (DIAMOND) continued with plans to market steam coal from the Beluga coal field west of Anchorage. Although no sales contracts were secured, up to 10 million ton/yr of coal could be mined for export. The Kenai Borough has authorized up to $250 million in revenue bonding to provide financing for construction of port facilities. PLACER U.S., INC. (also operating as BELUGA COAL COMPANY in the Beluga coal field); ROCKY MOUNTAIN ENERGY (operating at Wishbone Hill north of Palmer); BERING DEVELOPMENT CORPORATION (operating in the Bering River coal field near Cordova); and DELTA COAL COMPANY (operating near Delta Junction, interior Alaska) are also seeking local and foreign markets for coal.

The sand-and-gravel industry had another good year despite a 20-percent reduction in aggregate use in the Anchorage metropolitan area. Gravel production on the North Slope increased nearly 70 percent due to construction of two gravel islands, the Endicott causeway, and infrastructure for developing North Slope oil fields. The total value of aggregate production in the state increased to $112.4 million, 18 percent above that of 1984.

The placer-gold industry produced about 9 percent more gold in 1985 than in 1984, but the total value decreased due to lower average prices. DENALI MINES, INC., also referred to as the VALDEZ CREEK JOINT VENTURE (Eakins and others, 1985), produced nearly 31,000 oz of placer gold, which surpassed their 1984 output by 50 percent. This operation, located east of Cantwell, continues to be Alaska's largest gold producer.

Unresolved regulatory problems continued to plague the placer industry. In July, U.S. District Court Judge James von der Heydt ruled that the National Park Service failed to conduct adequate environmental studies of the effects of mining operations in national parks in Alaska and ordered that 30 mining companies cease operations by September 5, 1985. The deadline was extended to the end of the mining season in October. Most mines affected were placer operations in the Denali National Park and Preserve, the Wrangell - St. Elias National Park and Preserve, and the Yukon - Charley Rivers National Preserve. Mining companies are submitting detailed operating plans for 1986 and hope that the National Park Service will be able to comply with the court order while allowing miners to continue their activities during 1986.

To help resolve water-quality problems, the State legislature awarded $2.7 million to qualifying Alaska miners through the Placer Mining Demonstration Grant Project. The grants were awarded to placer-mine operators after their proposals and qualifications were reviewed. The project, which had its first field demonstrations in 1985, funds industry innovations in placer-mining technology that focus on fine-gold recovery, water-use reduction, water-pollution control, and waste disposal.

The role of placer mining in the Alaska economy: 1985 (Peterson and others, 1986) summarizes the results of an economic survey of the industry. The report, which was published by the Department of Commerce and Economic Development's Office of Mineral Development (OMD), estimates gross expenditures, income, and employment levels for the placer-mining industry in Alaska. Secondary effects on the statewide economy are also discussed.

Federal and state agencies conducted mineral-resource studies in Alaska under several cooperative programs. A 4-yr, $300,000 contract initiated in 1984 calls for geologic and mineral studies in the Skagway subdistrict of the Juneau mining district in southeastern Alaska. This cooperative program between the Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys (DGGS) and the U.S. Bureau of Mines (USBM) is funded by a special appropriation through the office of U.S. Senator Ted Stevens. DGGS will concentrate on geologic mapping, and the USBM will examine mineral prospects and mines. Preliminary reports on geologic and geochemical investigations in the Porcupine mining district near Haines were released by DGGS and the USBM (Redman and others, 1985; Still and others, 1985).

The USBM also released a series of inventory reports on Alaska's strategic-mineral resources, including chromium (Dahlin and others, 1985; Foley and Barker, 1985; Foley and others, 1985), tin, tantalum, and columbium (Warner, 1985). The reports contain important reserve-base information and discuss metallurgical characteristics and regional distributions of strategic minerals in Alaska.

The U.S. Geological Survey (USGS) and DGGS continued a cooperative geologic and mineral-resource investigation in the Iditarod Quadrangle of western Alaska, which includes the historic Innoko and Iditarod mining districts. DGGS is concentrating on detailed 1:63,360-scale geologic mapping and topical mineral studies; the USGS is conducting regional 1:250,000-scale mapping that emphasizes geology and geochemistry. A summary of the area's placer resources (Bundtzen and others, 1985) was recently produced as part of this cooperative effort.

To help stimulate trade with the Pacific Rim nations, 12 representatives from Japan's largest mineral and energy companies were invited by the state to tour several coal- and mineral-development projects in Alaska. The Office of Mineral
Development (OMD) coordinated visits with Native corporations, mining companies, and government agencies during the 9-day tour in late November.

The 'Alaska Resources Kit: Minerals,' an educational program designed for the state's public-school system, was distributed to schools in 1986. Development of the program was a joint effort of the Alaska Department of Education, which supervised preparation of the curriculum, and private industry, which provided financial support through the Alaska Mineral and Energy Resources Educational Fund (AMEREF).

This report includes five appendixes that contain information about mineral-industry activities and issues. Appendix A lists active claims and new claims staked on state and federal land in 1984 and 1985. Appendix B lists the functions, names of key personnel, and mailing addresses of state, federal, and private agencies involved in mineral-development activities in 1985. Appendix C lists selected significant mineral deposits in Alaska. Appendix D lists mining licenses issued by the Alaska Department of Revenue, 1985. Appendix E lists production estimates for nine metal commodities for Alaska from 1880 through 1985, and appendix F lists production estimates for industrial minerals and coal for the same period. Both reflect the diversity of the Alaska mineral industry.

ACKNOWLEDGMENTS

This report was designed, produced, and distributed by the Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys (DGGS) and Division of Mining (DOM) and the Department of Commerce and Economic Development's Office of Mineral Development (OMD). The success of this fifth annual report on Alaska's mineral industry continues to be dependent on information provided voluntarily by the private sector. We thank Alaska's miners, industry explorationists, consultants, sand-and-gravel companies, Native corporations, and federal agencies for their cooperation. Petroleum companies, including ARCO, SHELL, SOHIO, and CONOCO and their major contractor (AIC-Martin), supplied specific information on the use of sand and gravel on the North Slope.

L.L. Lueck and G.R. Eakins (DGGS) mailed over 900 questionnaires on mineral activity in Alaska, A.G. Sturmann, C.H. Stevenson, and M.E. Brown (DOM) compiled claim statistics shown in appendix A and figures 3 and 4. T.K. Bundtzen wrote the executive summary and the development and production sections and compiled the statistics used in those sections. Eakins wrote the exploration section. J.L. Gallagher and R.J. Peterson (DOM) provided data on offshore placer developments. Lueck compiled appendixes B and D, and Bundtzen, M.S. Robinson (DGGS), and Lueck compiled and modified the list of significant mineral deposits (app. C). Bundtzen compiled the historical minerals data shown in appendixes E and F, and R.D. Merritt (DGGS) described the Seward Coal Terminal. C.B. Green (OMD) designed the initial report format and wrote the drilling section. A.C. Scheff (DGGS) prepared the illustrations and Jim Deagen (OMD) oversaw cover design and printing of the report. Bundtzen, C.L. Daniels (DGGS), Deagen, Eakins, Gallagher, F.J. Rue (DLWM), Green, Lueck, V.L. Reger (DGGS), and J.F.M. Sims reviewed and edited the report.

EXPLORATION ACTIVITY

DURING 1985

INTRODUCTION

Mineral-exploration activity in Alaska declined sharply in 1985. Total reported expenditures for mineral exploration in 1985 were $9,150,000, compared to $22,283,650 in 1984, a decline of 59 percent. Mineral-exploration expenditures are listed by commodity and region in tables 1 and 2 and shown graphically in figures 1 and 2. The large drop in exploration can be attributed primarily to the dissolution of the ANACONDA MINERALS COMPANY (ANACONDA) in April 1985. Their withdrawal substantially impacted exploration expenditures because the company had, for nearly a decade, conducted the largest exploration program in Alaska. HECLA MINING COMPANY, PHILLIPS MINERALS DIVISION, TETON EXPLORATION, and ST. JOE AMERICAN CORPORATION also closed their Alaska operations during the last several years. In late 1985, KENNECOTT CORPORATION announced closure of its Anchorage office; its Alaska operations will be managed from KENNECOTT offices in Salt Lake City. The decline in exploration activity in 1985 is also indicated by the lower number of new claims staked; 6,700 compared to 8,400 in 1984 (fig. 3). Figure 4 shows the number of claims on which affidavits of annual assessment work were filed. Further details on claim staking and annual labor are listed by quadrangle in appendix A.

The lack of drilling on several coal projects now on hold or in the development stage also contributed to the sharp drop in reported exploration expenditures during 1985. Another contributing factor is the progression of several major projects.
Table 1. Reported exploration expenditures in Alaska by commodity groupings, 1981-85.

<table>
<thead>
<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>$63,555,400</td>
<td>$42,792,000</td>
<td>$30,656,315</td>
<td>$19,669,150</td>
<td>$8,880,000</td>
</tr>
<tr>
<td>Industrial</td>
<td>$19,300,000</td>
<td>-</td>
<td>$2,968,390</td>
<td>$270,000</td>
<td>-</td>
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<td>Materials</td>
<td>$2,341,000</td>
<td>$2,900,000</td>
<td>$1,338,354</td>
<td>$2,968,390</td>
<td>$270,000</td>
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<tr>
<td>Other*</td>
<td>$127,000</td>
<td>$15,300</td>
<td>$10,000</td>
<td>$279,000</td>
<td>-</td>
</tr>
<tr>
<td>Unspecified</td>
<td>-</td>
<td>-</td>
<td>$60,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$76,303,400</td>
<td>$45,617,300</td>
<td>$34,133,069</td>
<td>$22,283,650</td>
<td>$9,150,000</td>
</tr>
</tbody>
</table>

*Includes jade, soapstone, and uranium.

from the exploratory phase to the development phase. However, some new companies, including ECHO RAY MINES LTD., LONG LAC MINERALS, and EXVENCO, recently initiated precious-metal exploration programs in the southeastern region (fig. 5).

In recent years, activity has increasingly focused on precious metals while exploration for base metals has declined. Statistics compiled by the Metals Economic Group (1986) indicate that almost 90 percent of the currently active exploration projects in the United States involve precious-metal prospects, mostly gold. The greatest amount of activity occurred in Nevada with 178 exploration and development projects. Arizona is second with 101, followed by California (98), Colorado (75), Idaho (72), and Alaska (66). Selected mineral-exploration projects in Alaska are shown in figure 6.

NORTHERN REGION

Reported exploration expenditures for the northern region totaled $1,860,000 in 1985, compared to $2,557,500 in 1984. Major copper, lead, and zinc discoveries were made during the last 15 yr in the 100-mi-long Ambler sequence along the south flank of the Brooks Range and in the De Long Mountains. The most famous discovery, the Red Dog deposit, is located 80 mi north of Kotzebue. The deposit, which is in the development stage, is owned by NANA and operated by COMINCO. Interest in the nearby Noatak River drainage also continued, but exploration activity was primarily confined to assessment work on claims held by several major companies.

METALS

NORANDA EXPLORATION, INC. (NORANDA), and GENERAL CRUDE OIL MINERALS COMPANY (GCO) signed a $25-million, 20-yr agreement to jointly explore the Lik deposit located 12 mi west of the Red Dog deposit (loc. 15, fig. 5). Earlier announced reserves at Lik are 21 million tons that grade 9 percent zinc, 3.1 percent lead, and 2.3 oz/ton silver. During 1985, NORANDA drilled 17,000 ft at the deposit, but new reserve figures have not been released. The Lik project will probably use the proposed 57-mi-long haul road and port facility that will be constructed for the Red Dog property. HOUSTON OIL AND MINERALS, a former partner with GCO at Lik, is no longer active in the area but retains an interest in the property. GCO holds other large claim blocks in the region.

In addition to developing the Red Dog deposit, COMINCO maintained a strong exploration program in other parts of northern Alaska. With a crew of 10, they conducted 3,569 ft

Table 2. Reported exploration expenditures in Alaska by region and commodity, 1985.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Northern</th>
<th>Western</th>
<th>Eastern interior</th>
<th>Southwestern</th>
<th>Southcentral</th>
<th>South-eastern</th>
<th>Alaska Peninsula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>$1,860,000</td>
<td>$500,000</td>
<td>$1,699,000</td>
<td>$115,000</td>
<td>$1,211,000</td>
<td>$2,534,000</td>
<td>$961,000</td>
</tr>
<tr>
<td>Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>materials</td>
<td>-</td>
<td>-</td>
<td>$1,749,000</td>
<td>$115,000</td>
<td>$1,281,000</td>
<td>$2,534,000</td>
<td>$961,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$1,860,000</td>
<td>$500,000</td>
<td>$1,749,000</td>
<td>$115,000</td>
<td>$1,281,000</td>
<td>$2,534,000</td>
<td>$961,000</td>
</tr>
</tbody>
</table>
of diamond core drilling and geological, geochemical, and geophysical surveys in the Wulik Basin during 1985 (loc. 4a, fig. 6). Assessment work was performed on 2,283 claims. COMINCO also drilled 3,300 ft of diamond core in the Ambler mining district where a crew of eight spent 30 days testing copper, zinc, lead, and silver prospects and performing assessments on 1,100 claims (loc. 4b, fig. 6).

KENNEDCOTT CORPORATION (KENNEDCOTT) has a long history of exploration in northern Alaska, largely through its former subsidiary, the BEAR CREEK MINING COMPANY. KENNEDCOTT's holdings include the high-grade Ruby Creek copper deposit near Borne in the Cosmos Hills and the Arctic copper-zinc deposit in the Brooks Range. KENNEDCOTT, GCO, HOUSTON OIL AND MINERALS, and WGM retain varying interests in the Sunshine Creek, Horse Creek, 4-B Puzzle, Picnic Creek, DH, and Nora deposits, all located in the Ambler sequence. KENNEDCOTT reported diamond core drilling six holes (total 1,132 ft) in the region during 1985 (loc. 12a, fig. 6).

PARADISE VALLEY MINING (Bettles), operated by the Mikk Mans family, explored for precious metals, lead, and zinc on several creeks in the southcentral Wiseman Quadrangle. They tested lode and placer ground, staked 14 new claims, and performed assessment work on 86 other claims.

ALMINCO, INC., (Anchorage) explored for precious metals in the Wiseman area. They mapped, sampled, and performed assessment work on 36 claims. GREEN MINING AND EXPLORATION (Fairbanks) churn drilled and sunk shafts on Smalley Creek in the Bettles area.

SUNSHINE MINING COMPANY (SUNSHINE; Kellogg, Idaho) reported that they discontinued their Brooks Range activities and dropped 801 claims, including the Cliff, Bud, Kogo, Pipe, Cynbad, and Tom-Tom prospects in the Ambler mining district. Apparently this does not apply to SUNSHINE's interest in the AMBLER MINING COMPANY, which is a SUNSHINE - ANACONDA MINERALS COMPANY partnership.

Lode- and placer-gold deposits in the Chandalar mining district that are owned by the LITTLE SQUAW GOLD MINING COMPANY (Spokane) were explored (with intermittent production) during recent years by various operators. Owner Eskil Anderson reported that legal problems recently halted activity on the properties.

COAL

The extensive bituminous and subbituminous coal resources that underlie Alaska's North Slope may be greater than those of any single province in the world. During the late 1800s and early 1900s, a few scattered, small mines produced coal for whaling ships plying the Arctic Ocean and for several small villages. Because of the region's remoteness and sparse population, coal development has been minimal. However, renewed interest in alternative energy sources to replace expensive, imported fuel oil led to a state-funded program to evaluate coal resources in the Cape Beaufort area. The ARCTIC SLOPE REGIONAL CORPORATION reported that during 1985, the project advanced to a pre-development stage. Several consulting firms conducted additional drilling, geophysical surveys, and environmental and feasibility studies that concentrated primarily on the Deadfall syncline. Coal seams in the area are low in sulphur, near the surface, fairly flat-lying, and up to 16 ft thick.

WESTERN REGION

The western region includes several historic placer-gold districts and the mineral-rich Seward Peninsula. Exploration expenditures in the region declined dramatically in 1985.
with the dissolution of ANACONDA and termination of their Illinois Creek project. No activity was reported on the Kougarok tin deposit, which was intensely tested by ANACONDA during 1983. Reported exploration expenditures for the western region during 1985 were $650,000, compared to $4,938,000 for 1984.

METALS

CORNWALL PACIFIC ALASKA, INC., in a joint venture with NIGHT HAWK RESOURCES, LTD., drilled 6,500 ft of diamond core and trenched 2,000 ft at the historic Big Hurrah lode-gold mine during a 14-wk period (loc. 5, fig. 6). The HAWLEY RESOURCE GROUP, INC., is the consultant for the project. Last October, INSPIRATION MINES, INC., operated their 380-ft offshore gold dredge approximately 11 mi west of Nome (loc. 11, fig. 6). Although this project has progressed to the production stage, the operators indicated that some exploratory bulk sampling and metallurgical testing was done during the year. In late 1985, the Alaska Department of Natural Resources (DNR) released preliminary best-interest findings on the issuance of two offshore-mining leases, one to NOME CO at Nome, the other to AURIC at nearby Bluff.

GREATLAND EXPLORATION, LTD. (GREATLAND), remained active on the Seward Peninsula, where they drilled 6,600 ft on several placers in the Anvil River area near Nome (loc. 9, fig. 6), trenched at Granite Mountain, and assessed tin deposits at Lost River and in the Kougarok area. The offshore gold project in Norton Sound conducted by COASTAL EXPLORATION and GREATLAND during 1984 was suspended during 1985 because COASTAL EXPLORATION withdrew from the program. GREATLAND retains the offshore prospecting-permit applications.

Four people from SOLOMON MINES, INC., (Nome) evaluated placer-gold prospects on the Solomon River for 1 mo (loc. 19, fig. 6). They conducted drilling and magnetometer surveys and dug test pits on 52 leased claims. A block of ground suitable for large-scale dredging operations was reported, and tailings are being evaluated for fine-gold recovery.

The 100-day exploration program of BATTLE MOUNTAIN GOLD COMPANY, formerly DUVAL CORPORATION, consisted of drilling, mapping, and conducting geophysical surveys on the Nixon Fork gold deposit and several silver-tin prospects northwest of McGrath (loc. 3, fig. 6). About 5,000 ft of drilling was completed. The Nixon Fork deposit produced about 57,000 oz of gold and byproduct copper and silver from 1921 to 1941. Most members of the 16-person crew were residents of McGrath and other nearby villages.

The AU MINING COMPANY spent 6 mo on Candle Creek (Seward Peninsula) testing placer ground owned by long-time miners Rhinehart Berg and Thor Wetlesen. The company used an air drill to drill 44 holes.

STEVENS EXPLORATION MANAGEMENT CORPORATION (Anchorage) performed annual assessment work on LOST RIVER ALASKA CORPORATION'S tin property. Two people with MACKLIN PLACER MINES and ANVIL MINING COMPANY (Nome) made prospect cuts and collected samples on Anvil, Macklin, and Ruby Creeks. The COOK INLET REGION, INC., maintained their interest in the Kougarok prospect and Tonzona coal field near Farewell.

COAL

The state-supported assessment of the Chicago Creek coal resource continued during 1985. The purpose of the assessment is to determine if it is practical to develop coal for heat and power in the villages in northwestern Alaska, and possibly as a power source for future mines in the De Long Mountains. Under contract to DGGS, the HAWLEY RESOURCE GROUP, INC., (Anchorage) completed 7,709 ft of rotary drilling and 224 ft of core drilling at the site in 1985 (loc. 20, fig. 6). Demonstrated reserves at Chicago Creek are 4.5 million tons of lignite that average about 7,000 Btu/lb. A team of specialists is preparing a feasibility study on the possible uses of the Chicago Creek coal.

EASTERN INTERIOR REGION

The eastern interior region contains more placer mines than any other region in the state. In addition to the placer- and lode-gold deposits in the Yukon-Tanana Upland, tin, tungsten, and antimony have been mined. Exploration in the Alaska Range during the last 10 to 15 yr has resulted in the discovery of major stratiform base-metal deposits. Many small-scale miners and prospectors in the region reported spending from a few hundred to several thousand dollars, mostly for drilling or making cuts to test placer ground. As in other regions, large-scale exploration programs were reduced or terminated. Total expenditures for exploration in the eastern interior region during 1985 were $1,749,000, compared to $3,207,100 in 1984.

METALS

NERCO MINERALS COMPANY (NERCO) and its subsidiary, RESOURCE ASSOCIATES OF ALASKA (RAA), hold several promising mineral deposits in Alaska. Their
largest holdings are in the Delta mineral belt in the Tok mining district, eastern Alaska Range (loc. 14b, fig. 6). The company reported that at least 30 deposits in the district collectively contain over 40 million tons of lead, zinc, copper, silver, and gold ore. NERCO/RAA claims in the area exceed 225,000 acres. During 1985, an eight-person crew from NERCO/RAA spent 2 mo mapping, trenching, and performing geochemical and geophysical surveys on the claims (fig. 7). NERCO also continued its precious- and base-metals program in the Pedro Dome - Gilmore Dome area about 15 mi north of Fairbanks (loc. 14a, fig. 6), where a 10-person crew conducted geochemical and geophysical surveys, geologic mapping, drilling, and trenching. Although NERCO operates large silver and gold mines in Nevada, Idaho, and Colorado, it maintains its headquarters in Fairbanks. Ninety percent of the firm’s stock is owned by PACIFIC CORPORATION, a utility company with headquarters in Portland, Oregon.

AMAX EXPLORATION, INC., (Golden, Colorado) explored for precious metals by mapping and sampling during 90 days at Moose Creek in the Bonnfield mining district south of Fairbanks (loc. 2, fig. 6). They also conducted reconnaissance and exploration in other regions. According to a company spokesman, they will probably work in Nevada rather than Alaska in 1986.

DOYON, LTD. (DOYON), the regional Native corporation based in Fairbanks, has an ongoing program to assess the
region's metallic resources. The mineral assessments will help the corporation make final land selections that total 12 million acres under the Alaska Native Claims Settlement Act.

PATINO, INC., the United States subsidiary of NORTH-GATE EXPLORATION, LTD., (Toronto, Ontario) diamond drilled two 100-ft-deep holes at Step Mountain north of Eagle to test promising silver-lead-zinc deposits (loc. 16, fig. 6).

Operators of the BROKEN SHOVEL MINE sent four people to the Eagle Quadrangle for 3 mo to test placer ground on Bullion Creek for gold, silver, and platinum. They staked 17 claims and assessed 13 old claims. The ARCTIC KNIGHT MINING COMPANY (Fairbanks) reported a 90-day program of sampling, mapping, and digging test pits on St. George Creek in the Bonnifield mining district to evaluate placer-gold deposits. GREATLAND did some additional surveying on their Little Eldorado Creek claims north of Fairbanks near Olines and examined the feasibility of developing a drift mine to exploit the deep gold-bearing gravels.

ST. JOE AMERICAN CORPORATION (Seattle office) reported that they have suspended exploration activities in Alaska until the mining economy improves. Their lease on the Ryan Lode on Ester Dome near Fairbanks was released to CITIGOLD (Vancouver, British Columbia), which is conducting a 10,000-ton heap leach test. GOLD DUST MINES (Fairbanks) contracted ON-LINE EXPLORATION SERVICES to conduct geochemical and geophysical surveys, located drill-hole sites, and mapped geology on Spruce Creek in the Pedro Dome area to evaluate placer-gold deposits. GREATLAND did some additional surveying on their Little Eldorado Creek claims north of Fairbanks near Olines and examined the feasibility of developing a drift mine to exploit the deep gold-bearing gravels.

NORTHERN LIGHTS EXPLORATION COMPANY (Anchorage) performed assessment work on 814 claims south of the Bonnifield mining district in the Healy A-6 Quadrangle. The claims are being evaluated for precious metals. EXPLORATION GEO CONSULTANTS (Fairbanks) conducted various geophysical surveys, located drill-hole sites, and mapped geology on Spruce Creek in the Pedro Dome area to evaluate gold, silver, bismuth, and antimony occurrences. During 1985, GHD RESOURCES drilled and dug test pits on Eagle Creek in the Circle mining district. A large crew from POLAR MINES, INC. (Fairbanks) spent 5 mo trenching and drilling to test gravels on Crooked, Mastodon, and Portage Creeks in the Circle mining district (loc. 17, fig. 6). Three people with PLANETARY DATA (Fairbanks) prospected for precious metals east of St. George Creek in the Nenana mining district. A helicopter-supported crew mapped and dug test holes for HERNING EXPLORATION AND MINING (Fairbanks) on Wolverine, Ottertail, and Palmer Creeks (tributaries to the East Fork Chena River) looking for gold and silver.

INDUSTRIAL MINERALS

DOYON owns large asbestos deposits about 40 mi west of Eagle. Reported reserves are over 55 million tons that contain 6.3 percent fiber. The corporation continues to research safe mining and processing methods that would allow extraction and marketing of their high-quality asbestos reserves.

COAL

A reconnaissance study of the Nulato coal deposits (located downstream from Galena on the Yukon River) was conducted by geologists with DOYON, DGGS, USBM, and the University of Alaska MINERAL INDUSTRY RESEARCH LABORATORY. DGGS and USBM also examined a recently discovered coal occurrence on Preacher Creek in the White Mountains. DGGS geologists sampled and measured coal beds near Tramway Bar on the Middle Fork Koyukuk River. These deposits are located only a few miles from the North Slope haul road and not far from Bettles and Wiseman.

DIAMONDS

The recovery of two diamonds from widely separated placer-mining operations on Crooked Creek in the Circle mining district in 1982 and 1984 created considerable interest in the alluvial-diamond potential of the Crooked Creek gravels and in the location of the primary diamond sources.

No diamonds have been found by placer-mining operators on Crooked Creek since 1984. However, because the high-volume sluice plants currently used on Crooked Creek are designed for gold recovery, diamonds (specific gravity ~3.5) would generally not be retained in the riffles.

In 1985, R.B. Forbes (contracted by DGGS), J.T. Kline (DGGS), and Al Clough (USBM) conducted a reconnaissance study of the Crooked Creek gravels and investigated possible sources of primary diamonds in the surrounding region. Concentrates from sluice clean-ups, reprocessed tailings, pilot jig runs, and pan samples were examined for possible kimberlite indicator minerals (pyrope garnet, chrome diopside, and magnesium ilmenite) and diamonds (fig. 8). The lithology and depositional history of the Crooked Creek gravels are being analyzed to identify bedrock sources of the gravels and help define the depositional history of the diamonds.

SOUTHWESTERN REGION

The southwestern region includes the Kuskokwim and lower Yukon River basins, a large mercury province, and the
Iditarod, Nyac, Innoko, and Goodnews Bay placer-mining districts. Several major mineral companies that showed considerable interest in the region in 1983 and 1984 were absent during 1985. Although some claim holders performed assessment work, exploration in the region declined substantially. Total estimated exploration expenditures were $115,000, compared to $1,021,000 for 1984.

METALS

AMAX EXPLORATION, INC., (Golden, Colorado) mapped and sampled in the Aniak mining area. CLARENCE FRY of Homer worked on Fortyseven Creek in the Sleetmute Quadrangle for over 3 mo, mapping and hand-digging test pits on lode and placer prospects. HOWARD BOWMAN (Port Alsworth) conducted a magnetometer survey on the Bowman claims on Portage Creek near Lake Clark.

SOUTHCENTRAL REGION

The southcentral region covers portions of the Alaska Range and the Talkeetna, Wrangell, and Chugach Mountains. Nelchina, Willow Creek, and Kennecott are historic mining districts in the region. Mining activity is still widespread, but exploration expenditures were only $1,281,000 in 1985, compared to $6,490,350 in 1984. Most of the decline in exploration expenditures is attributed to the lack of drilling programs in the Beluga, Yentna, and Bering River coal fields and to the withdrawal of ANACONDA from the Johnson River project. The principal activities are described in the following summary; numerous small-scale operators who prospected and conducted assessment work are not included.

METALS

WGM, INC. (WGM), conducted exploration programs at two sites in southcentral Alaska. Work included underground and surface sampling, mapping, and road construction on the Cliff mine project and adjacent lode claims on the north shore of Valdez Arm near Shoup Bay (loc. 21a, fig. 6). WGM also conducted additional exploration for the DENALI MINING COMPANY, a five-member joint venture at Valdez Creek east of Cantwell on the south flank of the central Alaska Range. Also active on Valdez Creek was RUSS MILLER (Wasilla), assisted by consulting geologist JIM HALLORAN. Five people were employed for 26 days to dig test pits and collect bulk samples. ASPEN EXPLORATION CORPORATION performed assessment work on 50 claims in the AGR group on Valdez Creek.

NERCO/RAA, with TETON EXPLORATION (TETON), conducted a geochemistry, geophysics, mapping, and trenching program at the Zackly project in the easternmost Alaska Range near the headwaters of the Maclaren River (loc. 14c, fig. 6). The favorably situated skarn deposit contains high-grade copper-gold ore. Current reserve estimates are 1.25 million tons that average 0.17 oz/ton gold, 1.0 oz/ton silver, and 2.6 percent copper. TETON dropped its interest, which leaves NERCO/RAA as the sole participant in the venture. Three employees of BLACK SANDS MINING COMPANY (Wasilla) worked underground for about 3 mo driving a crosscut in the Arch gold-silver lode in the Anchorage A-6 Quadrangle.

COOK INLET REGION, INC., (Anchorage) a regional Native corporation in southcentral Alaska, reported assessment work on 3,500 claims that consisted of mapping and geophysical and geochemical studies as part of their 1985 statewide minerals program. They employed four people for 60 days to evaluate coal, base- and precious-metals, and sand-and-gravel resources.

In 1985, no exploration was conducted on the Johnson River prospect located 10 mi southwest of Twedini Bay on the west side of Cook Inlet. This area was explored by ANACONDA in 1983-84 when the presence of a significant gold-silver base-metal deposit at Johnson River was discovered. About 50 people were employed during 1984 to conduct 20,000 ft of drilling and geophysical and geochemical surveys. ANACONDA also discovered gold-silver-lead deposits at Difficult Creek 6 mi from the Johnson River deposit. As a result of ATLANTIC RICHFIELD COMPANY'S 1985 decision to dissolve ANACONDA, COOK INLET REGION, INC., owner of the properties, is reportedly negotiating with other firms to continue exploration.

The HAWLEY RESOURCE GROUP, INC., and NEW STRATEGIC MINERALS, LTD., drilled 3,000 ft at the historic Golden Zone Mine near Cantwell. Announced reserves are 5 million tons of proven, probable, and possible high-grade...
gold-silver-copper ore that could be mined by open-pit methods. HUNT OIL COMPANY (Denver) drilled for base and precious metals in the southern Alaska Range and performed annual labor on 320 claims (loc. 10, fig. 6). FINNBÉAR MINING COMPANY, INC., (Anchor Point) engaged three people in a drilling, mapping, and geophysical program at their precious-metal properties in the central Alaska Range.

A six-person crew employed by SONSHERINE MINING AND EXPLORATION (Palmer) made bench cuts and tested for gold, tungsten, and platinum at the Sonshine claim group on Metal Creek, Chugach Mountains. GOLD CORD DEVELOPMENT CORPORATION (Anchorage) drilled at the Gold Cord mine in the Willow Creek mining district and dug trenches on the Sheared claim.

ASPEN EXPLORATION CORPORATION (ASPEN; Denver) applied for an offshore prospecting permit to evaluate possible economic concentrations of gold in Cook Inlet. After the application was denied by the State, ASPEN filed a lawsuit seeking a reversal of the decision. The firm's president, R.V. Bailey, said that the company spent about $1 million over a 5-yr period sampling and surveying offshore material for gold. Fishermen and some local residents oppose the project. ASPEN hired DAMES AND MOORE to study benthic (bottom-dwelling) invertebrates in Cook Inlet, with special emphasis on the area between Anchor Point and Ninilchik. WAYNE BOLT and others continued their work on the Rambler and Nabeana gold deposits in the Wrangell Mountains. Promising gold values were encountered during diamond drilling.

GEMSTONES

Two respondents to the DGGS survey stated that they were specifically exploring for gemstones. EARLE FOSTER reported mapping, drilling, and conducting geophysical surveys in southeastern Alaska in his search for lode and placer gemstones, but offered no other information. A.L. RENSHAW (Anchorage) mapped and made dozer cuts while prospecting for gemstones in the Nelchina mining district.

COAL

ROCKY MOUNTAIN ENERGY and the HAWLEY RESOURCE GROUP, INC., continued exploratory and development work on coal resources at their Wishbone Hill coal project near Palmer (loc. 18, fig. 6). This is the third year for the joint venture, which is also studying the feasibility of constructing a mine-mouth power plant. PLACER U.S., INC. (PLACER; operating as BELUGA COAL COMPANY) contracted DOWI ENGINEERS to conduct reclamation work at their bulk-sampling site in the Lone Ridge area, where announced reserves are 100 million tons of subbituminous coal with moderate moisture and ash contents. DIAMOND, operating partner for DIAMOND SHAMROCK - CHUITNA COAL JOINT VENTURE, has applied for a coal-exploration permit to drill approximately 60 holes in the Beluga area during 1986.

ALASKA PENINSULA REGION

Little data are available for the few companies that are currently active in this region. Exploration expenditures totaled about $861,000 for 1985, compared to $1,010,000 for 1984. Several major companies withdrew from the area in 1985, but as a result of resumed exploration on Unga Island and on Aleut Corporation lands, expenditures almost equaled those of 1984.

METALS

ALASKA APOLLO GOLD MINES, LTD., (Vancouver, B.C.) conducted 1,827 ft. of shallow drilling and trenching on their Unga Island properties as part of their intensive program initiated in 1983 to evaluate the veins near the Apollo and Sitka gold mines (loc. 1, fig. 6). KENNECOTT and NERCO/RAA conducted induced-polarization surveys, geochemical sampling, and diamond core drilling to evaluate prospects on land owned by the Aleut Corporation (loc. 12b, fig. 6). NERCO/RAA also conducted some geochemical prospecting, mapping, and trenching on their BRISTOL BAY NATIVE CORPORATION project near Lake Iliamna.

SOUTHEASTERN REGION

The greatest mineral-exploration expenditures occurred in this region, which includes the southern Panhandle and islands in the Alexander Archipelago. Good base- and precious-metal prospects, a generally favorable location, and a relatively mild climate contributed to the level of activity. Reported exploration expenditures for 1985 were $2,534,000, compared to $2,886,000 in 1984.

METALS

LONG LAC MINERALS (Reno, Nevada) leased 12 people on Prince of Wales Island for 3 mo to conduct 4,000 ft of core drilling, geophysical surveys, and assessment work on about 260 claims (loc. 13, fig. 6). Prospect areas included Nilikack Anchorage (off Morris Sound), Ruby Tuesday on the south fork of Cholmondely Arm (Prince of Wales Island), and the Kaigani prospect (Dall Island).

A six-person field party employed by HOUSTON OIL AND MINERALS focused mostly on their drilling, mapping, and sampling work on southeastern Alaska. Details were not available. GALACTIC RESOURCES, LTD. (GALACTIC; Del Norte, Colorado), in a joint venture with TOUCHSTONE RESOURCES COMPANY, mapped for 50 days and core drilled 175 ft on 376 nickel-copper-cobalt claims on Yakobi and Chichagof Islands (loc. 8, fig. 6). SALISBURY AND DIETZ, INC., are consultants on the project. Released reserve figures for the Yakobi Island claims are 16.2 million tons that grade 0.31 percent nickel, 0.18 percent copper, and 0.02 percent recoverable cobalt. Platinum may also be recoverable.

KENNECOTT, in a joint venture with SOUTHEASTERN MINERALS COMPANY, MARMOT MINING EXPLORATION COMPANY, and ALGU MINING CORPORATION, worked at the Jarvis Glacier project near Haines (loc. 12c, fig. 6). A crew of 12 diamond drilled 3,730 ft of core, conducted geological mapping and geophysical surveys (radar), and performed assessment work on 343 federal claims. The Jarvis Glacier prospect contains copper and zinc with precious-metal credits.

ECHO BAY MINES, LTD., (ECHO BAY) acquired an option from BARRICK RESOURCES CORPORATION
(BARRICK) to explore the AJ Mine at Juneau and the Treadwell Mine on Douglas Island. ECHO BAY contracted with WGM, INC., (loc. 7, fig. 6) to conduct their reclamation program. Preliminary estimates of ore reserves were also made by WGM. BARRICK (Toronto) made arrangements with the Juneau City-Borough Assembly to lease 3,300 acres that span the Gastineau Channel. During 1985, the USBM mapped over 30,000 ft of drifts, declines, and raises as part of the federally funded Juneau gold-mining project.

WGM acquired the LCM lode-gold property (12 mi east of Sitka) from PHILLIPS PETROLEUM (loc. 21b, fig. 6). Their crew surveyed, mapped, and sampled the Baranof Island property for 40 days. WGM also reported examining prospects in the Juneau gold belt, on Baranof and Chichagof Islands, and at the Apex - El Nido claims near Pelican.

NERCO/RAA conducted geochemical and geophysical surveys, geological mapping, and trenching on 262 claims on the HI property near Hawk Inlet on Admiralty Island. ECHO BAY contracted WGM, the Gastineau Channel. Preliminary estimates of ore reserves were also made by WGM.

B.C.) at the Dawson mine on Prince of Wales Island. John WINK BROTHERS DRILLING drilled five holes (150 to 350 ft deep) that reportedly encountered rich gold veins on the Dawson Mine property (loc. 6, fig. 6). They also began work on a helipad and other access facilities.

A new venture in the southeastern region was initiated by DISCOVERY GOLD EXPLORATIONS, LTD., (Vancouver, B.C.) at the Dawson mine on Prince of Wales Island. John Mitchell, a consulting geologist from Fairbanks, managed the project. Work in 1985 included a diamond-drilling program. WINK BROTHERS DRILLING drilled five holes (150 to 350 ft deep) that reportedly encountered rich gold veins on the Dawson Mine property (loc. 6, fig. 6).

**MINERAL DEVELOPMENT IN 1985**

**INTRODUCTION**

Mineral-development expenditures in Alaska during 1985 totaled $34.1 million, compared to $33.3 million reported for 1984 (table 3). However, over half of the 1984 expenditures were made for construction of the multimillion dollar Seward Coal Terminal. Otherwise, the 1985 development figure compares favorably with those of the last 4 yr. About 38 percent, or $13 million, of the 1985 total was spent on early development phases for the Red Dog, Greens Creek, and Quartz Hill projects. The largest increase in development expenditures was for placer and lode gold-silver projects, which increased 11 percent, from $15.1 million in 1984 to $16.9 million in 1985.

Most projects and activities described in this section fit the fairly narrow definition of development—that is, activities preparatory to the actual mining process (fig. 9). Several intermediate-stage projects are included because industry announcements or activities placed them in this category. Some companies indicated that they do not distinguish between exploration, production, and development expenditures. A major mineral-development project initiated in 1985 by the CHICHAGOF JOINT VENTURE is the development of a high-grade gold property on Chichagof Island north of Sitka.

**RED DOG PROJECT, COMINCO/NANA**

**Northern region (loc. 1, fig. 9)**

World-class, black-shale-hosted, zinc-lead-silver-barite deposits at Red Dog Creek in the Wulik River drainage (northwest Alaska) continue to be developed by owner NANA REGIONAL CORPORATION (NANA) and operator COMINCO ALASKA, INC. (COMINCO). According to COMINCO geologists and Lueck (1986), the fine-grained, layered to coarse-grained vein sulfides of Mississippian to Pennsylvanian age were formed as submarine exhalations in a tensional tectonic environment. However, Lange and others (1985) compared the Red Dog deposit with that at Drenchwater Creek about 125 mi to the east and conclude that both deposits may have formed in an incipient island arc near an upper Paleozoic continental margin.

Tikkanen (1983) and Green (1983) summarized the exploration history of the deposit. By 1984, drilling of the Main deposit indicated reserves of 85 million tons that grade 17.1 percent zinc, 5.0 percent lead, and 2.4 oz/lton silver. The Main deposit is about 6,000 ft long, 1,500 ft wide, and 100 ft thick. The nearby Hilltop deposit is up to 95 ft thick and contains metal grades similar to those of the Main deposit.

On-site activity during 1985 included geotechnical drilling for the mine, mill, and port-facility sites and limited rotary

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**Table 3. Mineral-development expenditures in Alaska by commodity, 1981-85.**

<table>
<thead>
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<tr>
<td>Base metals</td>
<td>$5,945,000</td>
<td>$10,270,000</td>
<td>$19,500,000</td>
<td>$10,710,000</td>
<td>$13,000,000</td>
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<tr>
<td>Precious metals</td>
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<td>$16,890,775a</td>
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<td>Industrial and structural materials</td>
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<td>$4,251,000</td>
<td>$1,000,000</td>
<td>$579,000</td>
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<tr>
<td>Coal and peat</td>
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<td>$7,750,000</td>
<td>$250,000</td>
<td>$27,000,000</td>
<td>$2,400,000</td>
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<tr>
<td>TOTAL</td>
<td>$24,690,000</td>
<td>$11,391,000</td>
<td>$27,862,500</td>
<td>$53,348,055</td>
<td>$34,120,775</td>
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</tbody>
</table>

aIncludes $8,017,500 from seven lode-gold projects and $5,883,275 from 45 placer-gold developments.

bDoes not include coal-related development expenditures by the Alaska Railroad.
drilling of the Main deposit for metallurgical testing. The company also drilled to locate sources of road and foundation aggregate and rip-rap.

In 1985, COMINCO selected the RALPH M. PARSONS COMPANY (PARSONS) for engineering, procurement, construction management, and logistical planning during the development phase. Using technology developed for COMINCO'S Polaris Mine in Canada, components of the mill and support plants will be constructed and assembled in large prefabricated modules outside of Alaska—probably at Vancouver, B.C. After assembly, the units will be barged to a port that will be built near Cape Thompson on the Chukchi Sea. From there they will be moved inland 57 mi to the mine site. PARSONS will design and build the 6,400-tpd concentrator, the mine-support units that include living quarters, and a transportation network that includes the port facility. The plant is expected to begin production in 1989 or 1990 and will initially produce 560,000 ton/yr of zinc-lead-silver concentrate. Production will eventually increase to full capacity of 700,000 ton/yr (Giegerich and Parker, 1985). Concentrate from the Red Dog Mine will initially be shipped to COMINCO'S metallurgical complex in Trail, B.C., but Pacific Rim and European outlets are also being considered.

During 1985, the Red Dog project also made important progress on political, environmental, and regulatory issues. The State legislature passed a bill that allows the Alaska Industrial
Development Authority (AIDA) to arrange financing of up to $175 million to construct port facilities and a road. This legislative action recognized the enormous costs of building transportation facilities in remote areas of Alaska. In November 1985, a preliminary agreement was reached among AIDA, COMINCO, and NANA that includes repayment of the State loans at 6.5-percent interest.

Because the administrative procedures required to gain access to the Red Dog property through the Krusenstern National Monument were untested and could be challenged by special-interest groups, U.S. Senator Frank Murkowski sponsored a bill that was passed by Congress and signed by the President in October 1985. The measure provides for a 99-yr lease and clears the way for road construction.

Another important consideration in the development of the Red Dog property involves a land dispute between the North Slope Borough (NSB) and NANA. The Red Dog deposit is located in an area where the boundaries of the NANA region and the NSB overlap. NANA applied for detachment of 3,298 square miles from the NSB for inclusion in a new NANA-area borough. The application was submitted by the Alaska Department of Community and Regional Affairs and will be considered by the Local Boundary Commission. Last October, NSB voters rejected the transfer of their lands to the new borough. The Red Dog property is expected to generate $2 to $5 million in property taxes and may constitute the principal tax base of the proposed borough. In early 1986, public meetings will be held in various cities to present NANA's petition.

GRANT GOLD MINE
Eastern interior region
(loc. 2, fig. 9)

In 1985, a joint venture among SILVERADO MINES, LTD. (SILVERADO), TRICON MINING, INC., and AUREX, INC., a subsidiary of MARUBENI AMERICAN CORPORATION, began production at the Grant Gold Mine located on the flank of Ester Dome near Fairbanks. The principal ore systems consist of several northeast-trending, cross-cutting, quartz-sulfide-gold veins, including the Irishman and O'Dea vein-faults that are hosted in polymetamorphic schist of undetermined age. Fluid-inclusion studies suggest deposition of ore fluids in the mesothermal range (Bundtzen and Kline, 1981; Murton and Bundtzen, 1982). The original discovery was made in the 1920s when prospectors O.M. Grant and E.R. Pilgrim noticed rich, gold-bearing vein-quartz float at the bottom of a shaft that was originally sunk to explore a hillside placer deposit. Exploration and development have been intermittent, but before 1950, about 6,000 tons of ore that averaged 1 oz/ton gold were selectively mined from the Irishman vein.

The property was purchased in 1973 by ROGER BURGGRAF, a resident of Fairbanks. Burggraf and Gilbert Dobbs drove the shaft to the 220-ft level, where they discovered the O'Dea vein. This new vein system constitutes the major resource/reserve base for the property. In 1978, Burggraf signed an agreement with SILVERADO (Vancouver) to continue exploration. From 1978 to 1983, SILVERADO conducted an aggressive exploration and development program that involved constructing a pilot mill, shop facilities, head frame, and driving about 3,000 ft of drifts and raises, mainly on the O'Dea ore system. Pre-1981 mill tests on about 2,500 tons of development ore produced 1,425 oz of gold and 392 oz of silver. Initial precious-metal recovery from the pilot mill was under 70 percent, but metallurgical testing by Conwell (1982) and the company showed that recoveries in the 85- to 94-percent range are possible.

In early 1984, SILVERADO signed a joint-venture agreement with AUREX. Later during that year, a two-phase, $1.9-million exploration program was completed at the Grant Gold Mine. Phase 1, the drilling program, began in April and defined a substantial ore tonnage in the O'Dea system, which extends 4,000 ft along strike with a down-dip extension of at least 600 ft. Phase 2, completed in December 1984, consisted of additional drilling to confirm phase 1 findings.

A decision to begin construction of mill and mine facilities was made in February 1985. Foundations for the mill and mine were begun at place by mid-June (fig. 10). Mill machinery, including ball mills, a cyanide batch leach plant, and conveyor systems, were purchased at discount rates from auctions in the western United States. An extremely wet summer and fall complicated compaction of material for the tailings pond dam and resulted in added expense and a startup delay of several weeks.

On October 20, 1985, the mine and mill opened with three shifts of miners operating the mill and two shifts working underground. The mill is designed with two 115-tpd ball mills. Initially, a single mill processed ore. During 8 wk of production (October 20 to December 15), the mill increased capacity from 30 to 106 tpd and reached a peak of 136 tpd in the fifth week.

The head assays increased from 0.20 to 0.52 oz/ton during the production period and averaged 0.345 oz/ton for the 5,036 tons of ore milled. The first core bullion bar was poured in November, weighed 161 oz, and assayed 71.5 percent gold and 26.4 percent silver (fig. 11). In early December, SILVERADO announced that the property contained
drill-indicated reserves of 591,000 tons that average 0.61 oz/ton gold. Production costs for this reserve were estimated at $220/oz of gold.

On December 31, 1985, SILVERADO suspended all operations of the Grant Gold Mine because AUREX (the major financial backer) withdrew from the project. AUREX informed SILVERADO that they decided to withdraw because initial operating results did not meet their expectations. According to SILVERADO, an independent engineering study will support the viability of the mine. They expect to resume operations when new financing is arranged. During the 1984-85 development phase, the GRANT GOLD MINE JOINT VENTURE consisted of 55-percent participation by SILVERADO and TRICON and 45 percent by AUREX. Expenditures since inception of the project total $12 million.

MISCELLANEOUS PLACER PROJECTS (locs. 3a-e, fig. 9)

Placer-gold development expenditures reported by 45 mining companies during 1985 totaled $5,883,275, or about $131,000 per operation (table 4), compared to $85,000 per mine in 1984 and $55,000 per mine in 1983. Many respondents to the survey indicated that increased expenditures were made for water-recycling systems, redesigning pumps and mine layouts, and purchasing gold-recovery equipment, including spiral concentrators and jigs. Other development costs listed by miners included development drilling, road construction, camp maintenance, and modifications to existing mechanized units.

A major offshore gold-dredging operation began in 1985 about 12 mi west of Nome (loc. 3b, fig. 9). During 1984, POWERCO RESOURCES CORPORATION (POWERCO; Lakewood, Colorado) conducted production tests on their offshore leases near Nome. These tests involved sampling gold-bearing sediments dredged from submarine beaches and processing the material aboard a 10,000-ton converted naval vessel. INSPIRATION RESOURCES, INC. (INSPIRATION; Claypool, Arizona) optioned the mining rights from POWERCO and began test production in September 1985. The operation used a 5-yd³ clamshell to remove material in water up to 40 ft deep until November, when sea ice forced the operation to shut down for the winter. The clamshell discharged material through a deck-mounted grizzly to a sophisticated gold-separation plant below deck on the 380-ft-long barge 'Kokohad.' The concentrate was transported to Nome for final recovery where INSPIRATION has built processing facilities as well as an office and warehouse. The company employed 45 people.

In conjunction with this operation, INSPIRATION is required to conduct extensive biological and water-quality monitoring programs that include a detailed evaluation of the effects of mining on crab habitat. According to INSPIRATION officials, because most fine material was apparently washed away by wave and tidal action during and after deposition, little fine or silt-sized material remains in the auriferous offshore glacial deposits.

INSPIRATION applied to state and federal agencies for permits to increase production in 1986 from 1,200 to 6,000 yd³/day. To meet this increase, INSPIRATION will modify or replace its existing dredge and use a cutter-head suction dredge or a bucket-line system. No major permitting problems are expected because of this modification.

The USBM conducted a limited offshore sampling program in the Goodnews Bay area (loc. 3a, fig. 9). This study should provide much useful geologic information on the submarine placer-platinum concentrations that exist in the area. No individuals or private companies currently hold offshore-prospecting permits (OPPs) or leases in this area. The state has no plans to issue any OPPs at Goodnews Bay, but will review the results of this study to determine what action should be taken.

GOLD DUST MINES (GOLD DUST; Central, Alaska) continued to perfect their highly successful IHC jig recovery system (loc. 3c, fig. 9). After analyzing a variety of gravity-base gold-recovery systems, GOLD DUST decided to use jigs in conjunction with this operation, INSPIRATION is required to conduct extensive biological and water-quality monitoring programs that include a detailed evaluation of the effects of mining on crab habitat. According to INSPIRATION officials, because most fine material was apparently washed away by wave and tidal action during and after deposition, little fine or silt-sized material remains in the auriferous offshore glacial deposits.

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and purchased a customized plant in 1984 (Ackels, 1985). The efficiency of the mining unit, which was built in Holland by the IHC CORPORATION, exceeded company expectations: greater quantities of fines could be processed, and water use could be decreased by as much as 70 percent—a key to decreasing turbidity and siltation problems in settling ponds and streams. The extraordinary efficiency in recovery of fine gold in the 120- to 400-mesh range indicates that mining placer tailings with fine-gold content deserves reevaluation.

DENALI MINES, INC., completed 35,000 ft of reverse-air, churn, and rotary development drilling to prepare ground for mining in the 1986 and 1987 seasons (loc. 3d, fig. 9). Their existing reserve base of about 80,000 oz was increased to about 105,000 oz. Grades range from 0.05 to 2.0 oz/yd³. The company also continued to analyze their wash plant and settling-pond system in an attempt to comply with state and federal environmental regulations.

ALASKA GOLD COMPANY (Richmond, British Columbia) constructed a pilot plant in the Yakataga mining district near Cordova and processed about 500 yd³ of beach sands for feasibility estimates (loc. 3e, fig. 9). They indicated plans to operate a plant that would process 500 yd³/day for 100 days in 1986 or 1987; by 1988, they plan to process 5,000 yd³/day.

EXPLORATION VENTURES COMPANY (EXVENCO); also known as Chichagof Joint Venture
Southeastern region (loc. 4, fig. 9)

The Chichagof Gold Mine on Klag Bay, 45 mi north of Sitka, was formerly one of the richest hard-rock gold mines in Alaska. From 1918 to 1941, the mine produced 660,000 oz of gold and nearly 200,000 oz of silver from 596,487 tons of ore with an average head grade of 1.2 oz/ton gold. The ore deposit consists of near-vertical quartz-gold-sulfide veins that intrude Sitka graywacke of Jurassic to Early Cretaceous age. The ore was contained in a complex series of splays along a 3,800-ft-long section of the northwest-trending Chichagof shear zone. The deposits have been mined to a vertical depth of 4,100 ft; the deepest workings are about 2,800 ft below sea level.

The property has been evaluated since 1981 by EXVENCO, a limited United States partnership in Spokane, Washington. In 1983, QUEENSTAKE RESOURCES (QUEENSTAKE; Vancouver, B.C.) acquired a 25-percent interest in the project. The current (1985) CHICHAGOF JOINT VENTURE consists of QUEENSTAKE, VECTOR MINING COMPANY, and EXVENCO, the project manager.

Three major development targets are being evaluated: 1) reprocessing former mill tailings; 2) extensions of the Big Croppings vein; and 3) new gold-bearing structures, including the Aurum and Sitka shear zones. Five separate testing programs by various companies and government agencies from 1967 to 1981 identified a mill-tailings reserve that totals 450,000 tons and averages 0.11 oz/ton gold.

In 1985, exploration and development work of the CHICHAGOF JOINT VENTURE concentrated on a two-phase underground drifting and drilling program. Phase 1 consisted of surface drilling to evaluate the Big Croppings vein, driving the Golden Gate No. 1 tunnel, and excavating underground drill stations (fig. 12). The main level of the Chichagof Mine was evaluated by geologic mapping, sampling, and analysis for its suitability as an underground tailings-disposal site. Environmental studies were initiated concurrently with exploration. Phase 2 evaluated specific ore targets by drilling the Aurum, Aurum West, Sitka, Big Croppings, and Golden Gate structures. Metallurgical testing of ores began, environmental studies continued, and permit applications were submitted. During 1985, subsurface exploration included 2,000 ft of drifting and 2,500 ft of drilling. The underground crew consisted of eight miners.

In addition to the previously defined tailings reserve, indicated reserves are 60,000 tons of ore that grade approximately 0.6 oz/ton gold. An accelerated development schedule with a $10 million budget is expected in 1986.

GREENS CREEK JOINT VENTURE
Southeastern region (loc. 5, fig. 9)

High-grade, silver-gold-lead-zinc deposits at Greens Creek on northern Admiralty Island 18 mi west of Juneau have been explored and developed since their discovery in 1974 by the PAN-SOUND JOINT VENTURE, a group that was composed of MARIETTA RESOURCES INTERNATIONAL, EXALAS
RESOURCES CORPORATION, and NORANDA MINING, INC., the joint venture operator. According to Scherkenbach and others (1985), metamorphosed exhalative and carbonaceous clastic sedimentary rocks of middle Paleozoic or Triassic age host several trough-shaped orebodies along the limb of an overturned anticline. The geologic setting for the deposit may be a back-arc or strike-slip extensional basin with characteristics of polymetallic, volcanicogenic massive-sulfide and shale-hosted exhalative deposits. The deposit is similar to the Roseberry and Mount Isa deposits in Australia, but Greens Creek may represent a separate class of deposits.

By the end of 1985, over 132,000 ft of core drilling was completed on 180 surface and subsurface stations, including 47,000 ft drilled in 1985 (fig. 13). The drilling and about 5,500 ft of drifiting established reserves of over 4 million tons of ore that contain an average of 10.3 oz/ton silver, 0.09 oz/ton gold, 6.4 percent zinc, and 2.1 percent lead. Recent exploration included drilling (using two Longyear 38 rigs) and driving crosscuts into the hanging wall to establish drill stations.

About 1 3/4 mi of the 7-mi-long road from the mill site to the docking facilities at Hawk Inlet were completed during 1985 (fig. 14). Stone quarries and other material sites were investigated for possible use in completing construction of the road, slurry pipeline, tailings pond, and docking facilities (fig. 15).

Proposed mining and milling is expected to use open-stope methods to produce 300 and eventually 600 tpd. Depending on the scale of mining, 150 to 300 workers would be employed. Greens Creek appears to be one of the most promising hard-rock mining developments in Alaska.

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 placed the Greens Creek property in a nonwilderness area of Admiralty Island National Monument and mandated that all claims be perfected and declared valid by December 2, 1985. In 1983, a U.S. Forest Service (USFS) Environmental Impact Statement (EIS) confirmed the validity of eight mining claims in the core area, but did not confirm any others in the claim block. However, geologic inference, reconnaissance drilling, geochemistry, and geophysics attested to extensions of known mineralized areas. During 1984 and 1985, substantial subsurface exploration and drilling was conducted on additional claims held by NORANDA.

To eliminate the ANILCA time limitation, the U.S. Forest Service released a draft EIS in December 1983. In it, they proposed a land exchange that would exclude 17,225 acres from the Admiralty Island Monument (including Greens Creek) by moving the northern boundary about 3 mi. In exchange, 18,174 acres of the popular Young Lake area would be added to the monument. Although no action was taken on the land exchange, it was supported by the State of Alaska and the USFS. During the fall of 1985, the joint venture, Native groups, and conservation interests involved in the Greens Creek dispute and other land disputes on Admiralty Island made a proposal to the U.S. House Interior Committee: In return for forfeited timber and subsurface rights elsewhere on Admiralty Island, the SEALASKA NATIVE CORPORATION would acquire the lands around the core Greens Creek deposit.

In late December 1985, the U.S. Congress gave the joint venture an additional year to explore the company's peripheral claims, but an ironic provision precludes the use of information gained during the extension to validate peripheral claims. Previously, NORANDA MINING, INC., had to validate its claims by December 2, 1985.

In recent years, several partnership changes have occurred in the joint venture. ANACONDA, which purchased the interest share of MARIETTA RESOURCES INTERNATIONAL in 1983, was dissolved on April 30, 1985, by its parent company ATLANTIC RICHFIELD. ANACONDA'S interest in the project was offered for sale in 1985, and a new partner is expected to be announced in early 1986. NORANDA MINING, INC., remains the operator and holds controlling interest.

QUARTZ HILL MOLYBDENUM DEPOSIT
PACIFIC COAST MOLYBDENUM COMPANY
Southeastern region (loc. 6, fig. 9)

U.S. BORAX, an affiliate of the PACIFIC COAST MOLYBDENUM COMPANY, continued development work on the Quartz Hill molybdenum deposit during 1985. U.S. BORAX completed more than 250,000 ft of diamond core drilling from 1974 to 1982. Reserve estimates for the mineral deposit exceed 1.5 billion tons of ore that average 0.136 percent molybdenite. This figure includes 490 million tons of...
near-surface ore that grades approximately 0.219 percent molybdenite. Mineralization is hosted in a 25-m.y.-old composite felsite pluton that intrudes metamorphic and plutonic rocks of the Coast Range batholith.

The Quartz Hill deposit contains about 10 percent of the free world's known reserves of molybdenum, an alloy metal used as a hardening agent in the steel industry. Depending on the price of metals, the mine could annually add from $267 to $457 million to the nation's exports and up to $65 million to the personal income of Alaska residents—an amount equal to over 20 percent of the total personal income in the Ketchikan Borough. The company has invested over $100 million in the project, of which 25 percent was spent on environmental studies. In 1983, tests on a 5,000-ton bulk sample that was shipped to metallurgical facilities in Minnesota indicated that relatively inexpensive milling methods could yield high-grade concentrates.

At the time of discovery, Quartz Hill was within the Tongass National Forest. In December 1978, when the Misty Fiords National Monument was established and proposed as a wilderness area, Quartz Hill was included. In 1980, with the passage of ANILCA, 149,000 acres around Quartz Hill were excluded from the wilderness designation, and the project was allowed to proceed. Since 1975, data have been collected on meteorology, snow, hydrology, water quality, vegetation, wildlife, coastal-and-marine biology, physical-and-chemical oceanography, archaeology, and socioeconomic factors.

The timetable for issuing the Final Environmental Impact Statement (FEIS) was rescheduled in 1985 due to the presentation by U.S. BORAX of newly acquired information about alternative sites for the marine disposal of tailings (fig. 16). Wilson Arm was initially excluded as a tailings site because preliminary estimates indicated it was too small to contain the tailings that would be disposed of during the mine’s life. In 1981, a consultant for U.S. BORAX concluded that Wilson Arm is large enough to contain the tailings. State and federal officials are restudying the alternatives for tailings disposal. The present target date for issuance of the FEIS is June 1986.

The company also applied for a National Pollutant Discharge Elimination System (NPDES) permit to discharge treated mine waters from the Quartz Hill and Bear Meadow mine adits. Currently there are no mining activities in the adit, and the company is treating water seepage before it enters White and Beaver Creeks.

U.S. BORAX and Ketchikan officials recently met to make financial arrangements that will soften the impact on the city and borough once the project gets underway. Development and production schedules for the project will depend on an increase in molybdenum prices and development of export markets.

USIBELLI COAL MINE AND EASTERN INTERIOR COAL DEVELOPMENTS

The USIBELLI COAL MINE (Healy) continues to be one of the bright spots in Alaska's mineral industry (loc. 7a, fig. 9). When the Seward Coal Terminal was completed in 1984, Alaska's aspirations to export minerals became a reality. On January 26, 1985, the first ship loaded with 63,000 tons of

Figure 14. Dock facility for the Greens Creek project at Hawk Inlet, Admiralty Island, Alaska. Photograph courtesy of Noranda Mining, Inc., 1985.
In 1985, the Alaska Railroad's commitment to transporting coal included purchasing five 2,800-hp locomotives at $850,000 each, 60 new coal-hopper cars, rail anchors to restrain longitudinal rail movement caused by southbound traffic, and upgrading a difficult curve 14 mi north of Seward. An additional $5 million was spent upgrading five tunnels between Miles 51.8 and 52.7.

The DELTA COAL COMPANY continued feasibility studies on its 2,500-acre preference-right coal lease in the Jarvis Creek coal field near Delta Junction (loc. 7b, fig. 9). About 10,000 tons of subbituminous coal were mined for local use in the 1950s. About 1 million tons from an estimated resource base of 150 million tons can be mined by open-pit methods. Pit-run bulk samples average 8,750 Btu/lb, air-dried coal averages 9,570 Btu/lb, and moisture-free samples average 11,000 Btu/lb. The coal averages 1 percent sulfur, 10 percent ash, and 17 percent moisture. Mine feasibility studies show that a 10-ft-thick seam can be mined by truck-and-shovel methods at a stripping ratio of 1:1. The company anticipates producing 50,000 ton/yr of coal over the planned 20-yr mine life.

Of key importance to development is a 1984 announcement by the Federal Defense Agency (FDA) that the boiler system for the 7.5-megawatt power plant at Fort Greely would be converted from oil to coal. A study by EBASCO SERVICES and GEORGETOWN UNIVERSITY recommended a combined coal gasification-fuel cell power plant to supply power to Fort Greely and the Delta Junction area. The power plant is estimated to cost $40 million. Funding for the FDA plans has not been approved. The Copper Valley Cooperative Electric Association is also considering converting their power plant from oil to coal, which presents a second potential market for the DELTA COAL COMPANY.

COAL-FIELD DEVELOPMENTS
Southcentral region (locs. 8a-d, fig. 9)

The DIAMOND ALASKA COAL COMPANY (DIAMOND) is working on engineering and environmental designs, arranging financing, and seeking sales contracts for its coal-export project in the Beluga coal field (loc. 8a, fig. 8). DIAMOND initially plans to produce 2 million tons of coal annually with the potential for increasing production up to 10 million tons/yr, depending on market demand. The proposed open-pit mine would use two draglines for stripping. Production would be from five seams, each 6 to 20 ft thick. After the coal is initially crushed, it would travel on a 13,000-ft-long conveyor belt to a secondary crusher. The total length of the conveyor system from mine site to loading dock would be 11 mi. Plans include mining 330 million tons of coal during a 34-yr mine life.

Fieldwork during 1985 included geotechnical drilling for a 12,000-ft-long trestle foundation that will extend from Granite Point into Cook Inlet and provide docking and loading facilities (fig. 17). Nineteen holes (drilled an average of 75 ft deep) encountered sediments that will support pilings.
Financial support for the project was obtained through a $250 million revenue-bond authorization approved by residents of the Kenai Borough. This bond would provide for the construction of a 300-acre, on-shore port complex and a 2-mi-long coal-docking facility at Granite Point. Ships up to 120,000 dead-weight tons (dwt) could be loaded for Pacific Rim markets. The bond authorizes DIAMOND to lease the facility from the Borough.

The ELECTRIC POWER DEVELOPMENT CORPORATION (EPDC) of Japan and DIAMOND jointly completed a market feasibility study in 1985. Price cuts by South African, Australian, and Canadian producers have caused marketing problems for the project. However, the low sulfur content of the Beluga coal, a stable political climate, and lower transportation costs contribute to the attractiveness of the project. If sales contracts can be secured, construction could begin by 1987, and coal could be shipped by 1990.

PLACER U.S., INC. (PLACER) is also studying the feasibility of annually exporting 1 to 1.5 million tons/yr of coal from the Beluga field (loc. 8b, fig. 9). PLACER'S coal lands (17,886 acres of state leases and 9,210 acres owned by the COOK INLET REGION, INC.) are divided into the Chuitna, Chuitna, and Three-mile deposits that are located 25, 15, and 8 mi northwest of Tyonek, respectively. During 1985, the project obtained right-of-way, stream-crossing, and wetlands permits from various federal and state regulatory agencies. Coal reserves of 1 billion tons average 7,500 Btu/lb, 25 percent moisture, and 0.2 percent sulfur. Development plans include using an existing 1,475-ft-long pier at North Foreland near Tyonek, where 40,000 dwt ships could be loaded. Coal production of 1 million tons/yr will require $33 million in startup capital. PLACER met with EPDC of Japan to examine marketing aspects of the operation.

ROCKY MOUNTAIN ENERGY (ROCKY MOUNTAIN), a Wyoming-based subsidiary of UNION PACIFIC RAILROAD and HAWLEY RESOURCE GROUP, INC., continued feasibility and development studies on a 2,000-acre state lease near Wishbone Hill in the Matanuska coal field, 60 mi northeast of Anchorage (loc. 8c, fig. 9). In late 1984 and early 1985, ROCKY MOUNTAIN acquired three competitive leases (State Coal Lease Sale No. 6) that total 3,200 acres and conducted detailed geologic mapping during the 1985 field season. The company has 64-percent controlling interest in the properties. Drilling confirmed the presence of 14 million tons of subbituminous coal amenable to surface-mining methods. The deposit, which contains some coking-quality coal, averages 12,460 Btu/lb. The sulfur content is 0.1 percent, and the ash content is low.

During 1985, SIGNAL ENERGY SYSTEMS, contracted by ROCKY MOUNTAIN and HAWLEY RESOURCE GROUP, INC., performed preliminary mine-feasibility studies. They suggest that truck-and-shovel methods be used to feed a 150-megawatt mine-mouth power plant at a production cost of $1.40 million Btu. The mine complex would also include a crusher-conveyor system (to process and deliver coal to the power plant) and environmental safeguards, such as stack scrubbers and water-treatment facilities. Similar studies by the MATANUSKA POWER PROJECT suggest that coal may compete with local oil and gas by the year 2000.

Figure 16. Location map showing proposed development elements of the Quartz Hill molybdenum deposit near Ketchikan, Alaska. Alternative tailings-disposal sites on (A) Wilson Arm and (B) Boca de Quada are shown. Modified from U.S. Bureau data.

During the last 4 yr, the BERING DEVELOPMENT CORPORATION tested deposits at the Bering River coal field near Cordova (loc. 8d, fig. 9) and initiated mine-design and feasibility studies based on exporting 500,000 to 1,500,000 tons/yr. No fieldwork was done in 1985.

MINERAL PRODUCTION IN 1985

INTRODUCTION

The value of Alaska's mineral production in 1985 is estimated at $226.6 million, up 14 percent from the 1984 estimate of $199.4 million (table 5). The leading minerals were sand and gravel ($112.1 million), coal ($39.7 million), and gold ($61.2 million). Collectively, they accounted for 94 percent of the total reported mineral production in Alaska. The value of silver, tin, antimony, and mercury production collectively increased 18 percent in 1985 to $929,000, even though the price for each commodity decreased. Production of building stone decreased 24 percent, and no platinum was produced in 1985. Principal gold, coal, and industrial-mineral mines and quarries are shown in figure 18.

This section reports the production statistics computed from 174 DGGS questionnaires returned by private companies.
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Figure 17. A crew conducts geotechnical foundation drilling for Diamond Alaska Coal Company’s proposed ship-loading facility in Cook Inlet, southcentral Alaska. Photograph courtesy of Diamond Alaska Coal Company, 1985.

The sand-and-gravel production increased about 4 percent in volume and 18 percent in value (from $95.0 to $112.1 million). This increase is attributed to a demand for sand and gravel on the North Slope, where aggregate costs are much higher than in most urban areas. Peat, stone, jade, and soapstone production decreased because of lower demand.

Gold production is always difficult to estimate. Several information sources for gold production are used in this report: 1) completed questionnaires with production estimates from 78 mechanized operations (up from 48 in 1984); 2) company news releases and annual reports to stockholders; 3) information from DGGS and DOM personnel working in three of the seven regions shown in figure 5; and 4) estimates by precious-metal refiners and others.

An estimated 188,500 oz of gold and 27,100 oz of silver were produced by 266 placer mines in 1985, an 8-percent increase over 1984 estimates (tables 5 and 6). The survey indicates that gold production increased even though the number of operators decreased. Virtually all of this increase is due to stepped-up-production from four large mines that collectively produced nearly 65,000 oz of gold, 34 percent of statewide production. Gold production by other operators decreased slightly due to difficulties in procuring permits, court-ordered shutdowns, low metal prices, water shortages, and exhaustion of reserves. Many miners said that an abnormally cool, wet fall caused them to stop work at their mines several weeks early.

Average gold and silver prices declined 10 percent from 1984 to 1985 ($360 to $325/oz for gold and $7.60 to 6.00/oz for silver). The decline also contributed to a decrease in production value. Less than 1 percent of gold production was from lode mines. The major lode-gold contributor was the Grant Gold Mine near Fairbanks.

Results from the DGGS survey indicate that 266 placer-gold mines operated in 1985, 15 less than in 1984. Employees per mine varied from one to 103, with an average of five people per mine. A total of 1,540 miners were employed in mechanized mines statewide, and another 190 participated in recreational mining. The average placer mine produced 720 oz of gold, or 124 oz/employee.

The results of an independent survey of the placer industry made in 1985 were published in ‘The role of placer mining in the Alaska economy - 1985’ (Peterson and others, 1986). Responses to 228 detailed questionnaires indicate that 319 active mechanized placer mines operated in 1985. Total employees in the industry, including those involved in recreational and assessment activities, were estimated at 2,226. An estimated $63.4 million was expended by the placer industry within the state, and the total impact of these expenditures on sales and income was $127.4 million.

The sand-and-gravel industry (table 7) employed 1,435 people statewide, according to firms contacted in a telephone survey. About 355 people were employed in stone, antimony, tin, and jade-soapstone extraction; the USIBELLI COAL MINE employed 125 people.

About 3,650 people were employed in Alaska’s mineral-production industry in 1985. This figure does not include...
employees of secondary-support industries, such as trucking companies, the Alaska Railroad, or mineral-industry exploration and development personnel.

The placer-mining industry continues to deal with the problems of satisfying the turbidity and settleable-solids standards required by the Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (DEC). During 1985, 26 mines examined by EPA were cited for noncompliance, and some mines were issued violation notices by regulatory agencies. New technology for decreasing water usage, water recycling, and flocculent treatment were tested by a growing number of mine operators.

In response to the controversial issues concerning water use and the placer-mining industry, the State established the Placer Mining Demonstration Grant Project in May 1984. The project promotes innovative design and implementation of mining techniques that involve fine-gold recovery, water-use reduction, and water-pollution and waste-disposal control (fig. 22). Of 82 applications received, 16 grants totaling $1,415,000 are administered by DOM; 14 grants totaling $1,287,260 are administered by DEC. The maximum limit for an individual grant is $100,000, but miners may obtain a grant from each agency. The mining community and regulatory agencies are currently analyzing the results of the project (Alaska Division of Mining, 1985).

**METALS**

### NORTHERN REGION

An estimated 18 operations in the Koyukuk-Nolan (Wisman Quadrangle), Shungnak, and Chandalar areas produced 14,420 oz of gold and 2,000 oz of silver, about the same as in 1984. About 85 percent of the production was from Emma, Linda, Archibald, and Nolan Creeks near Coldfoot and Davis and Grubstake Creeks near Bettles. TIMBER CREEK MINING again produced gold on Weise and Timber Creeks near Kley Creek in the Shungnak-Kobuk mining district. ALMINCO, INC., mined gold from their Eldorado claim group in the Koyukuk-Nolan area and reportedly had a good season. PARADISE VALLEY MINING mined on Birch Creek, and GREEN MINING AND EXPLORATION mined on their...
Discovery Group off the Dalton Highway near Bettles, WILD RIVER VENTURES again operated their underground drift mines on Lake Creek in the Chandalar mining district with mechanized hoisting equipment. During the winter, they brought over 5,000 tons of high-grade gravel and loose bedrock to the surface, where they stockpiled it for summer sluicing. The DGGS survey indicates that WILD RIVER VENTURES continues to be the only producing drift-mining operation in Alaska.

WESTERN REGION

About 40 mechanized operations produced 40,000 oz of gold, an 11-percent increase from 1984 production of 36,000 oz. About 80 percent of the production was derived from various mining districts on the Seward Peninsula, the remainder was from the Ruby and Tolstoi mining districts in the Yukon River drainage.

The Nome operation of the ALASKA GOLD COMPANY (ALASKA GOLD) continued to be the largest mine in the region. In 1985, Dredge No. 6 operated 160 days (from late May to early November) and processed 5,300 yd³/day for a season total of just over 850,000 yd³. Dredge No. 5 did not operate during 1985 because of a lack of thawed ground. An intensive thaw-field drilling program for both dredges will begin in 1986. Lessee WINDFALL GOLD MINING COMPANY mined ALASKA GOLD'S property using scrapers and loaders. They fed their sluice box 4,000 yd³/day for a total
of 600,000 yd³ during the season. ALASKA GOLD'S Hogatz-Dredge has not operated since 1983. INSPIRATION RESOURCES, INC., produced gold from their offshore dredging operation just off the coast near Nome (fig. 23).

The ENGSTROM, TWEET, and PETERSON families operated floating bucket-line dredges (1½ to 3 ft³ capacity) on Quartz and Henry Creeks in the Kougarok and Council mining districts, respectively. MACKLIN PLACER MINES tested and mined ground on Ruby and Anvil Creeks near Mt. Distin, and

<table>
<thead>
<tr>
<th>Region and mining district</th>
<th>Mechanized operators</th>
<th>Production (troy oz)</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>18</td>
<td>14,400</td>
<td>70</td>
</tr>
<tr>
<td>Chugach</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Shungnak</td>
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<td></td>
<td></td>
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<tr>
<td>Koyukuk-Nolan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western</td>
<td>40</td>
<td>-10,000</td>
<td>310</td>
</tr>
<tr>
<td>Nome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kougarok</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koyukuk-Hughes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Port Clarence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairhaven</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruby</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solomon</td>
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<td></td>
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<tr>
<td>Koyuk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern interior</td>
<td>135</td>
<td>66,000</td>
<td>710</td>
</tr>
<tr>
<td>Circle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livengood-Tolovana</td>
<td></td>
<td></td>
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<tr>
<td>Fairbanks</td>
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<td></td>
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<tr>
<td>Fortymile</td>
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<tr>
<td>Manley-Eureka</td>
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<td>Richardson</td>
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<tr>
<td>Bonnifield</td>
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<tr>
<td>Kantisina</td>
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<td></td>
<td></td>
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<tr>
<td>Rampart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southcentral</td>
<td>38</td>
<td>52,500</td>
<td>263</td>
</tr>
<tr>
<td>Cache Creek</td>
<td></td>
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<td></td>
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<td>Nizina</td>
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<tr>
<td>Chestochnina</td>
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<td>Valdez Creek</td>
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<tr>
<td>Kena Peninsula</td>
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<tr>
<td>Nelchina</td>
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<tr>
<td>Southwestern</td>
<td>32</td>
<td>17,000</td>
<td>125</td>
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<tr>
<td>Innoko-Tolstoi</td>
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<tr>
<td>Iditarod</td>
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<td>George River</td>
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<tr>
<td>Nyac</td>
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<td></td>
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<tr>
<td>Crooked Creek</td>
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<td></td>
<td></td>
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<tr>
<td>Lake Clark</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mulchatna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southeastern and Alaska Peninsula</td>
<td>3</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>266</td>
<td>190,000</td>
<td>1,540</td>
</tr>
</tbody>
</table>

*Surveys by Peterson and others (1986) indicate that 319 small, medium, and large placer-gold mines and 91 recreational ventures are active statewide.

TACHICK MINING COMPANY mined the Curra Lee Bench near Nome. AU MINING COMPANY and CLARA BEATRICE, INC., completed successful placer-mining seasons in the Candle mining district on the eastern Seward Peninsula; sonic drilling substantially improved their reserve base. Other nonfloat mining activities on the Seward Peninsula include...
D.B. PARENT on Bear Creek and BERG AND WETLESEN on Jump Creek and Bull Hill. ALASKA PLACER COMPANY (formerly LOST RIVER MINING) produced nearly 400,000 lb of high-grade cassiterite concentrate from Cape Creek on the western Seward Peninsula. This mine has produced since 1902 and is presently the largest primary source of tin in the United States.

At least six operations produced in the Ruby mining district and five in the Tolstoi mining district. SWIFT CREEK MINING worked in the Basin Creek drainage of Ruby Creek, but had difficulty obtaining permits for the operation. ROSANDER MINING COMPANY employed a crew of eight on Colorado Creek in the Tolstoi mining district. ALAMIN MINING worked Bear Creek, PETE SNOW sluiced upper Colorado Creek gravels, and DEGNAN MINING took another cut from their ground on Madison Creek. The SHERRER/LACROSS partnership continued to develop a

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**Table 7.** Reported sand-and-gravel production and industry employment by region, 1985.

<table>
<thead>
<tr>
<th>Region</th>
<th>Volume (short tons)</th>
<th>Number of respondents</th>
<th>Stated valuea</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>16,735,000</td>
<td>7</td>
<td>$4.12/ton</td>
<td>700</td>
</tr>
<tr>
<td>Western</td>
<td>17,900</td>
<td>12</td>
<td>3.25/ton</td>
<td>25</td>
</tr>
<tr>
<td>Eastern interior</td>
<td>1,662,000</td>
<td>10</td>
<td>3.88/ton</td>
<td>185</td>
</tr>
<tr>
<td>Southcentral</td>
<td>7,979,500</td>
<td>22</td>
<td>3.75/ton</td>
<td>325</td>
</tr>
<tr>
<td>Southeastern</td>
<td>613,600</td>
<td>8</td>
<td>3.70/ton</td>
<td>165</td>
</tr>
<tr>
<td>Southwestern</td>
<td>28,070</td>
<td>2</td>
<td>46.00/ton</td>
<td>15</td>
</tr>
<tr>
<td>Alaska Peninsula</td>
<td>300,000</td>
<td>3</td>
<td>2.50/ton</td>
<td>20</td>
</tr>
<tr>
<td>Other statewide DOTPFb contracts</td>
<td>850,000</td>
<td>-</td>
<td>2.50/ton</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>28,184,080</td>
<td>64</td>
<td></td>
<td>1,435</td>
</tr>
</tbody>
</table>

aThe stated value for each region is the weighted average values given either in questionnaires or from a telephone survey of private gravel operators, oil companies, and the Alaska Department of Transportation and Public Facilities (DOTPF). Northern region production value includes only costs incurred by raw extraction; lease and transportation expenses are not included.

bBecause the DOTPF figures for the northern and southern regions were not completely compiled by the January report deadline, the stated volume is conservative.
drift mine on Boob Creek and recovered gold from pre-World War I drift-mine tailings piles.

EASTERN INTERIOR REGION

About 135 mechanized mines in this region produced 66,000 oz of gold, a 6-percent decrease from 1984 production. This amounts to about 34 percent of the statewide bullion production, down from 40 percent in 1984. Lower gold prices, exhaustion of easy-to-mine reserves, and water-quality regulations affected the 1985 production. Alaska's largest placer camp is located in the Circle mining district and borders, or is part of, the Steese National Conservation Area, the Yukon-Charley Rivers National Preserve, and the Birch Creek Wild and Scenic River System.

Several of the 40 mining companies that operated in the Circle mining district are listed here: EAGLE ROCK BURNS operation on Bottom Dollar Creek, UNDERWOOD MINING on Porcupine Creek, THE MINING COMPANY on Faith Creek, DOXAUCO on Half Dollar Creek, BATTEST MINING on Birch Creek, LESTER MINES on Butte Creek, the ECHOLA operation on Wickersham Creek, PAVEY MINING COMPANY on Nome Creek, JOHNSON MINING COMPANY and HOT CLAIMS COMPANY on Ketchum Creek near Central, STAN GELVIN on Crooked Creek, GHD RESOURCES on Eagle Creek, LAKEWOOD MINING on Mammoth Creek, and POLAR MINING on Crooked and Mastodon Creeks. These companies (and others) contribute significantly to the economy of the Circle City, Central, and Steese Highway areas.

Results of the DGGS survey showed a decrease in the number of operators in the Fortymile mining district in 1985. AURUM PHILOPHORUM again mined on Chicken Creek, but indicated that difficulty in obtaining permits substantially shortened their work season. Several past producers who responded to DGGS questionnaires, including ROYANN MINING and KAVIC MINING on Jack Wade Creek, indicated that they did not produce in 1985.

Placer mining continued at relatively low levels in the Manley and Rampart mining districts. Those active in 1985 included JOHN SCHILLING in the Rampart mining district and SHIMSKY MINING on Eureka Creek near Manley. In late fall, BURGESS MINING began to develop a drift mine on Sullivan Bench near Tofly. WAYNE GIBSON mined placer deposits of cassiterite in the Tozimoran area north of Tanana.

The Livengood mining district maintained previous production levels, but experienced regulatory difficulties. Long-time producer MAMMOTH MINES on Wilbur Creek was cited for noncompliance with water-quality regulations and faced court action. NELSON MINING approached the end of their paystreak on Amy Creek. The KNAEBEL/HANNEMAN partnership mined on the Livengood Bench.

Gold producers in the Fairbanks mining district included LUCKY SEVEN MINING on Fish Creek; SMITH BROTHERS MINING on Nugget Creek, a tributary of Smallwood Creek; and COOK'S MINING on Fairbanks Creek. Production reportedly dropped by 15 percent from previous years.

After several years of dormancy, there was some renewed activity in the Tenderfoot or Richardson mining district.


ANDERSON MINING and KEN BEVARD conducted small-scale gold recovery on Tenderfoot Creek, where they exploited former drift-mine tailings piles.

Placer-gold mining was the dominant economic enterprise in the Kantishna mining district in the central Alaska Range. About 17 operations mined gold during the May to October season. However, on July 22, 1985, Kantishna-area miners received a preliminary injunction by the U.S. District Court of Alaska that prevented the National Park Service (NPS) from approving plans of operation in national parks until individual environmental analyses and a cumulative environmental-impact statement were completed. Existing NPS approvals were declared void. Later court decisions rescinded an earlier action that would have closed the mines on September 5, at least a month before normal seasonal shutdowns. Thus the miners were allowed to complete the 1985 season. This severe action affects 30 mines that employ at least 175 people in the Denali National Park and Preserve (Kantishna mining district), the Yukon-Charley Rivers National Preserve (Coal Creek and the Circle mining district), and the Wrangell - St. Elias National Park and Preserve (Chitina, Shushana, and Nizina mining districts). The NPS strongly recommended that miners in the Kantishna mining district submit a detailed plan of operation by December 31, 1985. The NPS might then be able to conduct appropriate environmental reviews before the plan is approved, and the miners might be allowed to operate in 1986. Unfortunately, the NPS memorandum suggests that more stringent reviews are required for the Yukon-Charley Rivers National Preserve and Wrangell - St. Elias National Park and Preserve. Hence, 1986 mining activities in these units are more doubtful.

The Bonnifield mining district east of Healy continued to support eight mining operations: three on Moose Creek, two on California Creek, and one each on the Totatlanika River,
St. George, Rex, and Tatlanika Creek drainages. As suggested by Metz (1985), this mining district may contain very large, low-grade gold placers hosted in Tertiary gravels. Many placer deposits in the eastern part of the mining district apparently represent very large bench placers that do not correspond to present drainage patterns. Preliminary work tends to confirm this hypothesis.

Metals were produced from at least three hard-rock mines in the eastern interior region. JOHN MILLHOUSE shipped stibnite (antimony) ore from his mine in the Kantishna mining district, and another operator shipped small amounts of stibnite ore from his mine in the Fairbanks mining district. Stibnite ores were also recovered from deposits on Sawtooth Mountain west of Livengood. The GRANT GOLD MINE JOINT VENTURE recovered 1,563 oz of gold and 1,178 oz of silver from 5,036 tons of ore milled from October 20 to December 17. Recovery was about 90 percent for both metals.

SOUTHWESTERN REGION

About 32 mining operations produced 17,000 oz of gold and approximately 2,190 oz of silver in the southwestern region during 1985, a 6-percent increase from the previous year. Regional mines employed more than 125 people and represented a significant percentage of private-sector jobs in the sparsely populated area. About 70 percent of all employees are from local communities. Some of the larger operations in the Innoko, Iditarod, and Nyac mining districts had good seasons, and production was increased at a new operation in the remote George River drainage east of the Iditarod mining district. In the Innoko mining district, the MAGNUSON MINE had a good year on Ganes Creek. SMOKEY STOVER and BABE and EEP ANDERSON reactivated the Yankee Creek placers that were dormant for many years after the ROSANDER/REED shutdown in 1968. O’CARROLL mined the Spruce Creek deposits, and PAUL SAYER operated on nearby Little and Ester Creeks. JOHN WORTMAN produced a small amount of gold on Ophir Creek, and the NORCROSS/STONBERG partnership continued their long-time venture on Anvil Creek. An 8-in.-diam suction dredge recovered gold from the Innoko River near the town of Ophir.

In the Iditarod mining district, the MISCO-WALSH COMPANY (the John Miscovich family operation) again mined old dredge tailings of the RILEY CREEK DREDGE COMPANY on Otter Creek, where they recovered pay with a backhoe and front-end loader. Evidently the earlier dredging operations ‘bounced’ over bedrock paystreaks and left areas with good pay (fig. 24). Miscovich indicated that in 1986 he will use hydraulic-mining methods and recycling technology to mine hard-rock and residual deposits rich in tungsten, gold, silver, and zirconium in the Golden Horn shear zone (fig. 25). FLAT CREEK PLACERS stripped overburden and mined part of the Willow Bench after a year of development work in 1984. The ALVIN AGHOFF family made a cut on Prince Creek, and ANN WILLIAMS mined on Granite Creek. KEN DAHL mined a unique residual placer deposit on the Idaho Claim near the summit of Chicken Mountain south of Flat; this gold-bearing quartz veins directly underneath the paystreak are probably the source of the placer gold. ALASKA CONSTRUCTION AND MINING (Don Harris) continued work on Deadwood Creek, and L.E. WYRICK had another successful year on Granite Creek at the headwaters of George River (fig. 26).

GLENN BASS mined a small bench that overlooks Michigan Creek, also a tributary of George River. The WILMARTH BROTHERS did not mine on nearby Julian Creek because of difficulties with water-quality requirements. They hope to operate the mine in 1986 after the regulatory problems are solved. The LYMAN BROTHERS again mined the Donlin Bench at Snow Gulch, a tributary of Crooked Creek; this
ground is leased from the CALISTA NATIVE CORPORATION. Other Native groups, including DOYON, LTD., which holds placer ground in the Iditarod-Fiat and Innoko-Candle mining districts, have expressed interest in leasing properties to mining companies.

The NORTHLAND DREDGING COMPANY (NORTHLAND) did not resume production with their rebuilt 3-ft³ dredge on the Tuluksaq River, but federal action in 1985 may clear the way for future operation. In July, the Interior Board of Land Appeals (IBLA) upheld a February decision by the U.S. Bureau of Land Management (BLM) to allow NORTHLAND to proceed with operations in the historic Nyac mining district near Bethel. Earlier, various interest groups opposed the BLM decision because it did not include an environmental-impact statement. Twice BLM has granted NORTHLAND permission to mine, and both times local conservation groups and residents appealed to IBLA. The nearby TULUKSAK DREDGING COMPANY operated their floating dredge for the 13th consecutive year.

HOWARD BOWMAN developed and mined the Bowman Group on Portage Creek on the north side of Lake Clark using magnetometer surveys to delineate placer pay zones. FORTY-SEVEN CREEK MINES worked ground on Fortyseven and Taylor Creeks in the uplands south of the Kuskokwim River. Part of their work included road building, stripping, and placer and lode sampling to prepare for larger scale mining in 1986.

JAMES R. WYLIE again operated the Mountain Top Mercury Mine southwest of Sleetmute. His primary obstacle in increasing the scale of mining is the low price of mercury. HANSON PROPERTIES, owners of the Goodnews Bay Platinum Mine, did not operate in 1985; they are seeking a buyer for the property.

SOUTHCENTRAL REGION

Gold production from 38 mine operators in the southcentral region totaled 52,500 oz, a 41-percent increase from 1984. The 1985 estimate indicates the region is responsible for 28 percent of total statewide production, compared with about 20 percent last year. The increased gold output is primarily due to the activities of two highly successful nonfloat, mechanized placer-gold mines in the Denali and Chistochina mining districts on the southern flank of the Alaska Range.

DENALI MINES, INC. (DENALI), 51 percent of which is owned by CAMINDEX MINES, INC., (Canada) continued to be Alaska’s largest gold producer. In 1986, about 31,000 oz of placer gold with an average fineness of 852 was recovered from 355,000 yd³ of gravel. Stripping operations moved about 1,700,000 yd³; the waste/or ratio was about 5:1. The average grade of sluiced material was approximately 0.085 oz/yd³ gold and 0.016 oz/yd³ silver, for an average value of $31/yd³ at 1985 prices. The mine site includes a complete shop, bunkhouse, mess hall, library, office complexes, and security offices, as well as a washing plant and gold-recovery system of jigs, slurry pipeline, and gold wheels. A suction-dredge that tested the grade of material left in the channel after mining demonstrated that recoveries by DENALI exceed 90 percent (fig. 27). The number of employees on the property ranged from 53 to 105 during the April to November mining season, with peak employment during drilling programs conducted by WGM, INC., (Anchorage). Geophysical surveys and over 30,000 ft of drilling extended the paleochannel upstream for 8,000 ft, which assures continued production. Mine employees include residents of Glennallen, Cantwell, Paxson, Talkeetna, Healy, and Gakona. Consequently, the operation is probably the most important private-sector employer in this part of the southcentral region.

In response to environmental regulations, DENALI uses a system of five terraced settling ponds and recycles as much mine water as possible. In addition, various grasses and pioneer
plant communities are being tested on tailings for seeding programs. The company has a production goal of 45,000 oz of placer gold for the 1986 season.

ALASKA MINERAL RESOURCES COMPANY mined on Slate and Ruby Creeks in the Chistochina mining district in the eastern Alaska Range on ground formerly worked by RANCHERS EXPLORATION AND DEVELOPMENT, INC. Partners in this joint venture include HARRISON WESTERN CORPORATION and NORTHERN MINERALS COMPANY. In addition to mining, the company extensively modified the washing plant and conducted a $1.2 million sonic-drilling program. They anticipate nearly $4 million in additional development expenditures in 1986. Cash-flow estimates for 1985 exceeded $2.5 million.

The formerly successful NELCHINA MINES, INC., did not mine on Yako Creek in the Nelchina mining district north of the Glenn Highway in 1985, reportedly because of state turbidity standards. The company did some development drilling and anticipates production in 1986, pending resolution of the water-quality permitting problems and acquisition of an additional partner. Six other small-scale mechanized mine operators in the region also indicated that water-quality permitting requirements prevented gold production in 1985. These miners hope to mine in 1986 with improved washing plants and mining methods.

Three mine operators reported production in the Cache Creek - Talkeenta Mountains area. HOWARD McWILLIAMS mined for 133 days on Chunilna and Johns Creeks. MIKE McDANIELS and ALASKA PLACK AND PLACK each processed gravels in the Little Susitna River east of Willow; the latter used a dozer and dredge.

In the Wrangell - St. Elias National Park and Preserve, HOFFMAN MINING (HOFFMAN) mined on patented ground at Rex Creek in the historic Nizina mining district near the Kennecott Copper Mine. At present production rates, HOFFMAN'S reserve base will provide for at least 7 yr of mining.

On the Kenai Peninsula, production is predominantly from small suction dredges and small-scale dozer/backhoe operations. Those who reported details of their 1985 operations include JONES AND COMPANY near Moose Pass, GAEDE AND LINDMAN DREDGING at Heaven's Gate and Canyon Creek, and ROBERT TITCHEVAL on Busch Creek.

Hard-rock mining was confined to gold and silver properties. LIGHTFOOT MINING COMPANY (LIGHTFOOT) mined and processed selected high-grade ore from their gold-carbonate-quartz lode on Black Creek about 7 mi east of the Denali Mine. The LIGHTFOOT operation uses a small, 5-tpd gravity mill to process the ore (fig. 28). Based on subsurface drilling and drifting, they reported an inferred reserve of 140,000 tons of mineralized rock. The geology of the area is summarized by Smith (1981). SILVER STAR MINING (the Barry Brothers) continued work at their Silver Star and Pandora tetrahedrite-rich (silver) lode system on Mill Creek in the Wrangell - St. Elias National Park and Preserve. Low silver prices and environmental restrictions limited production in recent years, including the 1985 season. The company reportedly produced about 30,000 oz of silver during past mining seasons. GOLD CORD DEVELOPMENT CORPORATION again worked the Gold Cord Mine in the Hatcher Pass area, but no production was reported.

Figure 28. This hard-rock gold mill owned by the Lightfoot Mining Company is located on Black Creek, Valdez mining district, Alaska. Photograph by Arne Bakke, 1985.

SOUTHEASTERN AND ALASKA PENINSULA REGIONS

Very little metal production was reported in these two widely separated regions. LORENA and KNOX CHRISTIE worked on Shuyak Island west of Kodiak on lode and placer deposits. JAMES McGLAUGHLIN used a suction dredge to recover gold on McKinley Creek, a tributary of Porcupine Creek near Haines. No other metal production was reported.

INDUSTRIAL MINERALS

The value of industrial-mineral production in 1985 totaled over $124 million, a 12-percent increase from 1984 and about the same level as 1983 (table 5). The volume increased only about 4 percent in contrast to the 12-percent increase in value because of stepped-up construction on the North Slope, where aggregate has a higher monetary value (table 7).

In addition to petroleum companies on the North Slope, other users of sand and gravel and building stone are Alaska's four largest urban areas: Anchorage, Fairbanks, Juneau, and Ketchikan. State-funded capital-improvement projects in Bethel and on the Kenai Peninsula used substantial amounts of sand and gravel, as did road-improvement projects funded by the Department of Transportation and Public Facilities in the eastern interior and southcentral regions. However, sand-and-gravel production in urban areas leveled off as state funding for capital projects decreased due to a drop in oil-royalty revenues.

By volume, fill was the primary use of gravel in 1985 (74 percent), followed by concrete aggregate (15 percent), asphaltic concrete (5 percent), road base and covering (3 percent), and snow-and-ice control (3 percent). Increased production
of concrete aggregate amounted to nearly 35 percent of total aggregate volume used in the Fairbanks and Anchorage areas. The importance of this commodity to Alaska's development is evident in the following regional summaries.

Continued import of clinker (for grinding in Anchorage) contributed to the supply of Portland cement. Agricultural limestone was mined on the Kenai Peninsula. Building stone was quarried for rip-rap, ornamental uses, and various construction projects statewide.

NORTHERN REGION

Oil-field-development projects on the North Slope continued to be the major consumers of sand-and-gravel in Alaska. From 1974 to 1979, 107.4 million tons of gravel were used for causeway, pad, and haul-road construction. In 1985, six major corporate users and the North Slope Borough indicated that 16.7 million tons of sand and gravel were used on the North Slope. This represents an increase of nearly 35 percent from 1981. The principal need for sand and gravel is for infrastructure development associated with satellite oil fields near the Prudhoe Bay oil field. More than 700 employees were directly involved in sand-and-gravel operations on the North Slope.

ALASKA INTERNATIONAL CONSTRUCTION-MARTIN JOINT VENTURE, INC. (AIC-MARTIN), a subsidiary of the ENSERCH CORPORATION, was the contractor for the largest single earthmoving project in North Slope history, the construction of SOHIO'S Endicott Causeway in 1985. The causeway extends about 6.5 mi offshore in water up to 12 ft deep and permits development of the Endicott oil field. Two other components of the project, the main production island and the satellite drill station, were completed in September 1985. The causeway features two breaches that allow passage of coastal currents important to movement of marine life. About 9.5 million tons of gravel were hauled by a fleet of 14 B-70 dump trucks from an existing materials site 11.5 mi inland on the flood plain of the Sagavanirktok River (fig. 29). Excavation required drilling and blasting the frozen aggregate. Up to 80,000 tons of gravel were moved daily. SOHIO plans to drill 50 wells from the causeway and islands and install a full-flow manifold and separation tank facility.

Gravel-island technology advanced significantly with construction of the $25 million Northstar Island (AMERADA HESS) by AIC-MARTIN (fig. 30). Numerous manned gravel islands in the Beaufort Sea have been effectively used as bases for petroleum drilling operations. To protect the slopes of these islands from erosion, builders have traditionally used gravel-filled bags. However, maintenance costs can be high—-as many as 20 percent of the bags may require replacement annually. On Northstar Island, AIC-MARTIN used large concrete blocks to protect the island against erosion from moving pack ice and wind-driven summer waves. The contractor produced several hundred 4-ft² by 9-in.-thick concrete blocks per day from their North Slope plant, with six-person crews working two 12-hr shifts. About 12,000 blocks were needed for the project. Project designer MccLELLAND-EBA, INC. (Anchorage and Calgary) worked in conjunction with California consultant TAKMARINE to design a hexagonal shape for the island that allowed square concrete blocks to be used for slope armoring. Other North Slope gravel islands are round and require trapezoidal concrete blocks, which are more expensive.

Northstar Island was constructed in the Beaufort Sea 3 mi north of Long Island in 49 ft of water. Nearly 1.4 million tons of gravel were trucked directly to the site over manmade ice roads. The extremely wide roads allowed hauling to continue on half of the road while repairs and maintenance were performed on the other half. Northstar Island hosts a drill rig and support facilities, including a camp, boat dock, and heliport. Located nearly 8 mi from shore, the island will be supplied by boat and helicopter during the summer and by trucks via an ice road during the winter.

SHELL OIL COMPANY contracted AIC-MARTIN to construct the Sandpiper gravel island northwest of Northstar Island in 50 ft of water, a record depth for gravel-island construction in the Beaufort Sea. The project used 1.4 million tons of gravel. ARCO used an estimated 3.8 million tons of gravel for various construction projects, including drill sites and road construction.

In the near term, gravel islands are preferred over the more expensive concrete or steel structures used by Canadian operators in the Beaufort Sea. However, tests conducted by SOHIO in 1985 using sprayed seawater to create ice islands suggest this technology may eventually be used in water that is greater than 40 ft deep.

Gravel production continued in 1985 from five hydraulic floating dredges owned and operated by the North Slope Borough. The dredge fleet includes the Arctic Star at Point Lay with a 12-in. suction head, the Innamin in Wainwright with a 16-in. suction head (fig. 31), the Nivakti at Atkasuk with a 16-in. suction head, a 12-in. dredge at Kaktovik, and the Savakti or 'worker' dredge at Barrow. Each dredge mined 150,000 to 300,000 tons of aggregate per season since 1982. The dredges operate similarly to the historic floating bucket-line gold dredges and have crews of four to 10 people. A sliding-square spud design, light-weight hulls, and modern cutting heads are characteristic (fig. 32). The sand and gravel are used to construct roads, runways, and other facilities throughout the borough. The 1985 projects included a runway for Atkasuk and sanitary landfill at Wainwright.

WESTERN REGION

Most of the 17,900 tons of sand and gravel produced in western Alaska was used to repair roads on the Seward Peninsula. These include culvert and washout repairs along the Nome Council Road, the Nome Kougarok Highway, and streets and roads within the Municipality of Nome. Gravel usage in other areas in the region, including Kotzebue, is unknown. Aggregate production in the region will increase significantly in 1986 and 1987 if the anticipated 57-mi-long road associated with the Red Dog project is constructed. The region's major stone project was rip-rap armoring at the Port of Nome.
EASTERN INTERIOR REGION

About 1.7 million tons of sand and gravel were produced in the eastern interior region, a 5-percent increase from the previous year. The increase was due to numerous building projects by the private sector to prepare for the arrival of a new U.S. Army Light Infantry Division at Fort Wainwright near Fairbanks. Production of sand and gravel for state-funded capital-construction projects generally fell below 1984 levels. Considerable aggregate was used to construct clover-leaf intersections at North Pole and at the confluence of Airport Road and the Parks Highway in Fairbanks. FOUNTAINHEAD CONSTRUCTION, INC., has a large suction-dredge operation at a pit near North Pole and smaller production units throughout the Fairbanks North Star Borough. The dredge operation significantly lowered sand-and-gravel production costs for this company. FAIRBANKS SAND AND GRAVEL operated their Tanana Gravel Pit with a 4½-ft³ clamshell dredge on a state lease on the Tanana River flood plain.

EARTHMOVERS, INC., mined from pits throughout the Fairbanks area and extracted pit-run flood-plain aggregate from the Tanana River and from placer-mine tailings at Ester, just outside of Fairbanks. H AND H CONTRACTORS primarily mined with draglines near the Chena River. Other interior-region companies active in 1985 include EVECO, INC., which processes placer-mine tailings at Fox, INTERIOR EXCAVATION, WARREN TRUCK AND TRACTOR, McPEAK SAND AND GRAVEL, KNIK CONSTRUCTION COMPANY, and YUTAN CONSTRUCTION COMPANY.

Department of Transportation and Public Facilities (DOTPF) projects that used aggregate and building stone in the eastern interior region included the Delta Erosion Project, an extensive rerouting and rebuilding of the Alaska Highway between Delta and Tok, and work on the Taylor and Steese Highways. Sand, gravel, and building-stone industries throughout the eastern interior region reportedly employed 185 people, excluding DOTPF-contracted work.

YUTAN CONSTRUCTION COMPANY (Carroll-Vondra partnership) mined about 400,000 tons of basalt from their Browns Hill quarry off Badger Road. The material was used as rip-rap, road metal, crushed fill for leach fields, and ornamental stone. About 20 people were employed at the quarry.
SOUTHWESTERN REGION

Production of 26,080 tons of sand and gravel was reported for the southwestern region. Almost 95 percent of the total was used for a bulkhead and channel-armoring project in Bethel. The GALLIETT COMPANY and GEORGE SILIDES completed part of a $15-million contract to control erosion along the Kuskokwim River, which threatens the town. In 1981, the U.S. Army Corps of Engineers estimated that shoreline erosion along the river bank at Bethel averaged 10 ft/yr, and by the year 2030, this erosion would affect about half the townsie. The project used 6,950 ft of steel piling backfilled with sand and gravel that cost nearly $46/ton. Most sand and gravel for the project was extracted from channel lag deposits at Birch Creek Crossway and other sites on the Kuskokwim River near Aniak, 100 mi upriver from Bethel. Gravel is mined from state leases and Native corporation land. Native groups near Aniak oppose the mining of channel lag deposits because they believe it disrupts fish runs. They are asking the State and gravel users from Bethel to find upland sources of aggregate. In response to their request, DNR will examine the region for upland gravel sources as part of a resource assessment and planning effort for the Kuskokwim area, DGGS will conduct this investigation for the Division of Land and Water Management.

Another materials problem for the Kuskokwim Delta is the absence of rock quarries for rip-rap. In 1985, about 8,000 tons of granite from Valdez were barged to Bethel to armor and stabilize the banks of the Kuskokwim River. Barges were exposed to the open sea on this long haul, and a Calista Corporation barge sank enroute to Bethel in October, with $140,000 of building stone on board. CALISTA CORPORATION is developing a rock quarry at Goodnews Bay and has constructed a 2-mi-long access road. A four-person crew is currently developing the property, which is owned by KUTSARAH VILLAGE CORPORATION. Other potential building-stone sites include Unalaska Island and Seldovia.

Because of its concern about erosion, the City of McGrath contracted LUNDELL AND ASSOCIATES (LUNDELL) to study the feasibility of armoring banks of the Kuskokwim River upstream from a potential oxbow cutoff. The LUNDELL study suggests using about 40,000 tons of rip-rap.
SOUTHCENTRAL REGION

Use of sand-and-gravel in the southcentral region has decreased as the number of state-funded projects diminishes due to lower oil prices. Nevertheless, nearly 8 million tons of gravel were quarried in 1985, about 20 percent less than in 1984.

About 3.94 million tons, or 49 percent of the production, were hauled from pits in the Palmer-Wasilla area to Anchorage on the Alaska Railroad. This is a 40-percent decrease from the record 6.54 million tons hauled by the railroad in 1984 (table 8). About 60 percent of the rail haul originates from ANCHORAGE SAND AND GRAVEL; the remainder is from ALASKA GRAVEL SALES, BIG LAKE SAND AND GRAVEL, INC., STEPHEN AND SONS, WASILLA AGGREGATE, CENTRAL PAVING PRODUCTS, and KLONDIKE ALASKA, INC. The Alaska Railroad operated six 80-car unit-trains daily to haul gravel during the 1985 construction season; eight trains per day were used in 1984. SUMMIT PAVING AND CONSTRUCTION completed an expansion of the Port of Anchorage by diverting ANCHORAGE SAND AND GRAVEL unit-trains directly to the port site, thus avoiding an expensive haul by dump truck. The project turned a 9-acre tidal flat into a parking area now leased to TOTEM OCEAN EXPRESS, INC., by the Municipality of Anchorage.

Increased amounts of gravel were produced within the Municipality of Anchorage in 1985. LAKE OTIS GRAVEL SALES, INC., ROGERS AND BABEL, and CENTRAL SAND AND GRAVEL all produced gravel in 1985.

EAGLE DOME AGGREGATE, INC., mined gravel from their pit at Eagle River and trucked it to construction projects in north Anchorage. Smaller producers in the southcentral region are HAWLEY'S TRUCKING, OTECO, INC., WILSON CONSTRUCTION, WILDER CONSTRUCTION, and KNIK CONSTRUCTION COMPANY.

N.R. ENTERPRISES produced gravel for local projects in Glennallen. GRAVEL, INC., mined glacial-outwash gravels near Valdez. SUNRISE EXPLORATION SERVICES mined building stone from their quarry on Hope Road off the Seward Highway. Over 8,000 tons of granite were quarried near Valdez and shipped to Bethel by barge for flood-control and river-engineering projects.

ALASKA PENINSULA REGION

KONIAG, INC., and KODIAK CONTRACTORS, INC., mined gravel on Kodiak Island for road repair and construction projects. DOTPF subcontracted projects in several communities in the Alaska Peninsula region, including Naknek and Unalaska. Long-time gravel operator ALEUTIAN AGGREGATE VENTURES reportedly shut down in 1985.

SOUTHEASTERN REGION

A total of eight sand-and-gravel companies and federal and municipal governments reported producing 616,600 tons of gravel worth $2.28 million, about a 300-percent increase above the 220,000 tons reported in 1984. The 1985 telephone survey indicated that production was significantly understated in previous annual reports, and most southeastern operators felt that their 1984 activities decreased by 5 to 10 percent in 1985.

The largest single producer of sand and gravel continued to be JUNEAU RED MIX, INC., which produces gravel for concrete, plaster, gunnite, and fill from their Lemon Creek pits in Juneau. RED-SAMM CONSTRUCTION, INC., produced sand and gravel from pits throughout the Panhandle, and CHANNEL CONSTRUCTION, INC., (Juneau) mined gravel...
and loose rock for asphalt concrete. ISLAND CONSTRUCTION, INC., used minor amounts of sand and gravel to repair roads at Klawock. Government users of aggregate for landfill and road repairs in the Panhandle include DOTPF, the U.S. Bureau of Indian Affairs, the U.S. Forest Service, and the City of Ketchikan. KETCHikan RED MIX AND QUARY mined about 50,000 tons of basalt for blacktop and shot-rock applications in the Ketchikan Gateway Borough.

COAL AND PEAT

Coal mining had a milestone year in 1985, and numerous employment, production, and output records were broken. The USIBELLI COAL MINE (USIBELLI), the only major operating coal mine in Alaska, produced an estimated 6,389,000 tons of coal. This is about a 18-percent increase over the previous state record set in 1986, when 926,000 tons were produced by several mines in the Matanuska and Healy coal fields. Table 9 summarizes the 1985 market breakdown for USIBELLI. In December, a monthly production record of 1,016,000 tons of coal was set despite a fire that severely damaged the conveyer system that transported coal from the crushers across the Nenana River to the automated unit-train loading facility. During 1985, 138 unit-trains that each carried 5,100 to 5,500 tons of coal arrived at Seward, where the coal was loaded onto 60,000- to 120,000-dwt ships bound for South Korea (fig. 33).

In 1985, concern was voiced over the status of the KOREAN ELECTRIC POWER COMPANY'S (KEPCO) contract for USIBELLI coal. The contract allows for some fluctuation of annual coal shipments above or below the base amount, depending on several market factors. KEPCO also purchases coal from Canadian and Australian mines and will import Alaska coal at a base level of 800,000 tons yr.

Spontaneous combustion has not been a problem during transport of Alaska coal. The performance of USIBELLI coal has demonstrated that the coal is suitable for boilers, and its coal-ash handling properties are generally favorable compared to Canadian coal. However, Alaska coal produces 210 megawatts/ton compared to 270 megawatts/ton for coal from Crownest, British Columbia.

A telephone survey of peat producers indicated that 85,000 yd$^3$ of peat valued at $850,000 were produced in 1985, a 42-percent decrease in volume from 1981 levels. Most peat producers were disappointed that the high level of construction in Anchorage and Fairbanks during 1984 did not produce a greater demand for peat use in landscaping and building trim in 1985. Also, heavy rains in both areas during the summer and fall limited production. Chief producers in the Anchorage area—which accounted for 50 percent of statewide peat production—were GORDER EXCAVATING; A & A SERVICES; NORTHWEST LANDSCAPING; COX ENTERPRISES; McKINLEY LANDSCAPING; APE, INC.; SHAMROCK EXCAVATING; and JEFF’S TOPSOIL.

Pecans producers in the Anchorage area sell a raw-peat product valued at $3.50 to $4.50 yd$^3$ and a refined horticultural peat blended with sand and red loam (a distinctive Anchorage area soil) valued at $7 to $10 yd$^3$. The red loam is a high-quality agricultural soil that is becoming scarce in the Anchorage area and is in high demand for use in blended peat products.

Table 8. Major commodity tonnages hauled by the Alaska Railroad, 1975-85 (thousands of tons).

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a Figures for 1975-85 modified from Secretary of Transportation (1984); figures for 1984-85 from W. P. Coghill, Alaska Railroad.

b Includes forest and agriculture products and manufactured goods.

c Indicates years that line operated at a profit.

One large and three small companies continue to produce horticultural peat in the Fairbanks area. Their products and prices are similar to those in the Anchorage area. GREAT NORTHWEST LANDSCAPING and COX ENTERPRISES are the interior's largest producers. Peat also continues to be evaluated as a potential energy or horticultural resource in several villages, including McGrath and Dillingham.

Table 9. Market breakdown for 1985, Usibelli Coal Mine, Healy, Alaska.a

<table>
<thead>
<tr>
<th>Site location</th>
<th>Coal (tons)</th>
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<tr>
<td>Military power plants along rail belt:</td>
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<td>(Clear and Eielson Air Force Bases and Ft. Wainwright)</td>
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<td>GVEA power plant:</td>
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<td>(mine mouth, Healy)</td>
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<tr>
<td>Municipal Utilities System</td>
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<td>(power plant, Fairbanks)</td>
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<tr>
<td>University of Alaska</td>
<td>52,500</td>
</tr>
<tr>
<td>Local home heating and Alaska Railroad</td>
<td>11,500</td>
</tr>
<tr>
<td>Suned shipments to Korea</td>
<td>616,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,370,000</td>
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a Information provided by the Alaska Railroad, Fairbanks Municipal Utilities System, Golden Valley Electric Association, University of Alaska (Fairbanks) Physical Plant, and Usibelli Mines, Inc.
THE SEWARD COAL TERMINAL

The Seward Coal Terminal was completed with public and private funding in late 1984 at a cost of $21 million. The facility, which occupies about 34 acres at Resurrection Bay on the southeast coast of Kenai Peninsula (fig. 34), is Alaska's first deep-water coal port. The facility handled about 616,000 tons from USIBELLI in 1985. The terminal is owned and operated by SUNEEL ALASKA CORPORATION, a subsidiary of SUNEEL SHIPPING COMPANY, LTD.

Coal from the Usibelli Coal Mine is loaded on the Alaska Railroad at Healy. From there, it is transported to the Seward Coal Terminal and loaded on 60,000-ton ships (fig. 33) owned by the HYUNDAI MERCHANT MARINE for transport to Pohang, Republic of Korea, where it is unloaded and barged to Honam. The coal is used in the 1,000-megawatt power plant owned by KOREAN ELECTRIC POWER COMPANY (KEPCO). The Honam plant is located on the southern tip of South Korea (Usibelli Coal Mine, 1984).

The terminal facility at Seward includes 12 major components: 1) a new railroad spur; 2) a receiving hopper system; 3) a 6,590-ft-long belt conveyor system; 4) junction towers; 5) rail shakers; 6) a stacker-reclaimer named the 'Big Dipper'; 7) a dust-collection system; 8) a waterspray stockpile firefighting system; 9) an operations-control building; 10) a 1,800-ft-long dock trestle system; 11) a dock to support an elevated shiploader; and 12) various marine breasting and mooring dolphins (Suneel Alaska Corporation, 1985).

The port can accommodate vessels up to 120,000 dwt with a maximum draft of 58 ft. The facility is capable of loading 1,100 ton/hr of coal, or a 60,000-ton ship in 3 days; annual capacity is rated at 3.3 million tons. The on-site coal stockpile has a capacity of 130,000 tons. The 'Big Dipper' has a stacking capacity of 3,300 ton/hr and a reclaiming capacity of 1,100 ton/hr.

The capabilities of the port facility have not been fully realized. The facility may eventually be used to export other Alaska products, such as grain, minerals, and forest products. The port's favorable location is an advantage in trading with Pacific Rim countries. The round-trip voyage between Alaska and the Republic of Korea is 36 days (26 days cruising) vs. 45 days between Australia and the Republic of Korea. However, Alaska coal was less competitive in 1985 because of lower Canadian and Australian prices. Although the value of the United States dollar fell respective to the currencies of several nations, it did not drop substantially relative to the Canadian and Australian dollars in 1985.

DRILLING ACTIVITY IN 1985

INTRODUCTION

Contract drilling of placer, coal, and hard-rock deposits totaled 220,400 ft in 1985, which represents a 33-percent decrease in mineral drilling activity from the 1984 total of 330,700 ft. This is the lowest footage recorded in the 4 yr that drilling statistics have been compiled. Between 1984 and 1985, contract placer drilling decreased from 129,000 to 80,000 ft; coal drilling decreased from 25,700 to 8,700 ft; and hard-rock drilling decreased from 176,000 to 131,700 ft (table 10).
Although the total footage for 1985 was far below that of 1984, the number of companies that conducted major drilling programs in Alaska increased from 17 to 19 (Table 11). Table 12 lists drilling contractors who were active in Alaska in 1985.

**PLACER DRILLING**

Contract placer drilling totaled 80,000 ft in 1985. Exploration drilling accounted for 16,000 ft and consisted primarily of reverse-circulation rotary drilling with some sonic or resonant drilling. Because placer exploration often involves in-house drilling programs, this figure does not fully express total placer-exploration footage.

The remaining footage (34,000 ft) consisted of thaw-field drilling in which frozen placer gravels were drilled for water injection to thaw and prepare the ground for dredging.

A significant increase in thaw-field drilling is planned for 1986 and will increase total placer footage above 1985 levels. A sustained increase in gold prices in early 1986 could also stimulate additional exploration drilling.

**COAL DRILLING**

The only major coal-drilling program in 1985 was at Chicago Creek on the Seward Peninsula. The project, operated by HAWLEY RESOURCE GROUP, INC., under contract to DGGS, consisted of 7,800 ft of rotary drilling and 250 ft of core drilling. A minor program of over 600 ft of shallow auger drilling accompanied a geophysical survey and ongoing feasibility studies to develop coal beds at Cape Beaufort for the western Arctic coal project.

As in 1984, no coal exploration drilling occurred in the Beluga coal field. However, geotechnical drilling (not included in the total) was conducted by the DIAMOND ALASKA COAL COMPANY (DIAMOND) to evaluate offshore foundation conditions for a proposed coal-loading facility at Granite Point. Although 17,000 ft of exploration drilling by the BERING DEVELOPMENT CORPORATION was anticipated in the Bering River coal field, none was done in 1985.

DIAMOND plans to drill additional footage on their Beluga coal leases in February 1986. The company estimates that 11,000 ft of drilling will be done to further analyze the quality of their coal reserves. This program will increase 1986

---


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<tr>
<td>Hard rock</td>
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<td>180,500</td>
<td>176,000</td>
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<td>245,500</td>
<td>330,700</td>
<td>220,100</td>
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Table 11. Companies that conducted major drilling programs, 1985.

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<td>Alaska Gold Company</td>
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<td>Alaska Minerals Company</td>
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<td>Chichagof Joint Venture</td>
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<td>Golden Zone, Inc.</td>
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<td>Noranda Exploration, Inc.</td>
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<td>Noranda Mining, Inc.</td>
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<td>Placid Oil Company</td>
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<td>Silverado Mines, Ltd.</td>
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<tr>
<td>SUM Resources</td>
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<table>
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<td>Anchorage, Alaska</td>
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<td>Alsineco</td>
<td>Fairbanks, Alaska</td>
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<td>Ambler Explorations</td>
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<td>NANA-Coates Diamond Drilling, Inc.</td>
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<td>Anchorage, Alaska</td>
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<td>Salishbury &amp; Dietz, Inc.</td>
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<td>Skidmore Machine &amp; Tool Company</td>
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<td>Southeast Drilling Company, Inc.</td>
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<td>Thibideau Drilling Contractors</td>
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<td>Thrasher &amp; Associates, Inc.</td>
<td>Nome, Alaska</td>
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<tr>
<td>Wink Brothers Drilling Inc.</td>
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</table>
coal-drilling footage over 1985 levels. Other possible drilling projects could take place on state coal leases in the Matanuska field, at the Bering River deposit of the CHUGACH ALASKA CORPORATION, and on state-supported projects at Chicago Creek on the Seward Peninsula and at Cape Beaufort.

**HARD-ROCK DRILLING**

In 1986, total hard-rock drilling totaled 131,700 ft. 25 percent below the 1981 total of 176,000 ft. Over 80 percent of the 1985 footage was associated with exploration of precious-metal deposits, up 5 percent from the 1981 figure. Additional footage included annual assessment work or fill-in drilling on base-metal projects. Not included in the hard-rock totals were 4,100 ft of geotechnical drilling for the mill, road, and port sites at the Red Dog project in northwest Alaska.

Over one-third of the statewide hard-rock drilling was conducted at the Greens Creek project (NURANDA MINING, INC) near Juneau. The company was mandated by ANILCA to complete the exploration of its claims by December 1986. To meet that deadline, an extraordinary drilling program was conducted.

As in 1984 and 1985, most hard-rock exploration drilling in 1986 will be associated with the evaluation of precious-metal properties. Stable or rising gold prices in early 1986 will maintain the high level of interest in precious-metal properties in Alaska and may increase the number of exploration drilling programs. However, this may be offset by a decline in drilling on several major projects as their exploration phases are completed.

**REFERENCES CITED**


### APPENDIX A

Total active claims and new claims staked in 1984 and 1985
(listed by quadrangle)\(^1\)

<table>
<thead>
<tr>
<th>Quadrangle</th>
<th>Active claims assessment work</th>
<th>New claims staked</th>
<th>Total active claims</th>
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1. Data based on 1984 and 1985 assessment affidavits and location notices received by Division of Mining Information Offices by December 31, 1985.
2. Quadrangle numbered northwest to southeast according to DGGS-DOM numbering and Kardex systems.
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TOTAL  78,612  76,009  3,111  2,554  5,236  4,219  86,959  81,782
APPENDIX B

State, federal, and private agencies involved in mineral-development activities, 1985

STATE OF ALASKA AGENCIES

A. Department of Commerce and Economic Development (DCED)
   State Office Building, 9th Fl.
   P.O. Box D (mailing)
   Juneau, AK 99811
   (907) 465-2500
   Commissioner - Loren H. Lounsberry
   Function: Promotes economic development in Alaska.

   Office of Mineral Development (OMD)
   675 7th Ave., Sta. A
   Fairbanks, AK 99701
   (907) 472-7464
   Acting Director - Charles B. Green
   Function: Primary advocacy agency in state government for mining industry. Provides liaison between state government and private sector. Researches and publishes economic data on Alaska mining industry.

B. Department of Environmental Conservation (DEC)
   3223 Hospital Dr.
   P.O. Box 0 (mailing)
   Juneau, AK 99811
   (907) 465-2600
   Public Information (907) 465-2600
   Commissioner - William R. Ross
   Function: Issues permits for activities, including mining, that affect air or water quality or involve land disposal of wastes. Sets air- and water-quality standards. Inspects, monitors, and enforces environmental-quality statutes, regulations, and permits. Reviews all federal permits.

   Northern Regional Office
   675 7th Ave., Sta. K
   P.O. Box 1601 (mailing)
   Fairbanks, AK 99707
   (907) 452-1714
   Permit Information (907) 452-2340

   Southcentral Regional Office
   437 E St., Ste. 200
   Anchorage, AK 99501
   (907) 274-2533
   Permit Information (907) 279-0251

   Southeastern Regional Office
   9000 Old Glacier Hwy.
   P.O. Box 2420 (mailing)
   Juneau, AK 99803
   (907) 789-3151
   Permit Information (907) 465-2615

C. Department of Fish and Game (ADF&G)
   Capital Office Park
   P.O. Box 32000 (mailing)
   Juneau, AK 99802
   (907) 465-4100
   Commissioner - Don W. Collinsworth
   Director, Habitat Division - Norman A. Cohen
   Function: Protects habitat in fish streams and manages refuges, sanctuaries, and critical habitats. Requires permits for any work involving the blockage of fish passage; equipment crossings or operation in streams with anadromous fish; use, diversion, or pollution of streams containing anadromous fish; construction, exploration, or development work in state game refuges, game sanctuaries, and critical habitat areas.

   Also advises land-management agencies by preparing compilations of fish, wildlife and habitat, and public-use information; assessing habitat requirements and potential impacts; setting guidelines and recommendations for preventing, reducing, or mitigating fish, wildlife, habitat, and human harvest losses.

   Central Regional Office
   Habitat Division
   585 University Ave.
   Fairbanks, AK 99709
   (907) 479-0881

   Southcentral Regional Office
   Habitat Division
   333 Raspberry Rd.
   Anchorage, AK 99502
   (907) 267-2283

   Southeastern Regional Office
   Habitat Division
   803 3rd St., 1st Fl.
   P.O. Box 20 (mailing)
   Douglas, AK 99824
   (907) 465-4290

   Southwestern and Western Regional Office
   Habitat Division
   333 Raspberry Rd.
   Anchorage, AK 99502
   (907) 344-0641

D. Department of Natural Resources (DNR)
   400 Willoughby Center, 5th Fl.
   P.O. Box M (mailing)
   Juneau, AK 99811
   Commissioner - Esther C. Wunnnicke
   Deputy Commissioner - Robert D. Arnold
   Deputy Commissioner - James K. Barnett
   (907) 465-2400
Northern Regional Director - Jerry L. Brossia
4420 Airport Way
Fairbanks, AK 99709
(907) 479-2243

1. Division of Geological and Geophysical Surveys (DGGS)
3601 C St., Frontier Bldg., 8th Fl.
P.O. Box 7028 (mailing)
Anchorage, AK 99510
(907) 561-2020
Director and State Geologist - Ross G. Schaff
Deputy Director - William W. Barnwell
Function: Conducts investigations of Alaska mineral, fuel, and geothermal potential; geologic hazards; construction materials; underground, surface, and coastal waters of the state; archaeological and cultural resources; and general geologic inventories. Publishes Professional and Special Reports, Reports of Investigations, Public-data Files, and Information Circulars that contain the results of these investigations. Advises the public and government agencies on geologic questions. Maintains a library of geologic bulletins, reports, and periodicals.

Eagle River Office
P.O. Box 772116 (mailing)
Fish Hatchery Rd.
Eagle River, AK 99577
(907) 688-3555

Fairbanks Office
794 University Ave., 2nd Fl.
794 University Ave., Basement (mailing)
Fairbanks, AK 99709
(907) 474-7147

Juneau Office
400 Willoughby Center, 3rd Fl.
P.O. Box MA (mailing)
Juneau, AK 99801
(907) 465-3400

Geologic Materials Center
Fish Hatchery Rd.
Eagle River, AK 99577

2. Division of Mining (DOM)
3601 C St., Frontier Bldg., Ste. 1360
P.O. Box 7016 (mailing)
Anchorage, AK 99510
(907) 561-2020
Director - Pedro Denton

Mining Information Offices are located at the DGGS Fairbanks office (above) and at:
3601 C St., Frontier Bldg., 10th Fl.
P.O. Box 7028 (mailing)
Anchorage, AK 99510
(907) 786-2205
400 Willoughby Center, 3rd Fl.
P.O. Box M (mailing)
Juneau, AK 99811
(907) 465-3400

State Office Building, 2nd Fl.
P.O. Box 7438 (mailing)
Ketchikan, AK 99901
(907) 225-4181

3. Division of Land and Water Management (DL&WM)
555 Cordova St., Olympic Bldg.
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-4355
Director - Thomas J. Hawkins
Function: Manages surface estate and resources, including materials (gravel, sand, and rock) and water. Handles statewide and regional land-use planning issues. Issues water-appropriation permits and certifies, leases, material-sale contracts, mill-site permits, land-use permits, and easements for temporary use of state land and access roads. Responsible for safety of all dams in Alaska.

Northern Regional Office
4420 Airport Way
Fairbanks, AK 99709
(907) 479-2243
Regional Manager - Richard Thompson

Southeastern Office
3601 C St., Frontier Bldg.
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-2221
Regional Manager - Margaret J. Hayes

Southeastern Regional Office
400 Willoughby Center, Ste. 400
P.O. Box MA (mailing)
Juneau, AK 99801
(907) 465-3400
Regional Manager - Paula T. Burgess

4. Division of Forestry
3601 C St., Frontier Bldg., Ste. 1324
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-4465
State Forester - John L. Sturgeon
Function: Establishes guidelines to manage mining in state forests.

Northcentral Regional Office
3726 Airport Way
Fairbanks, AK 99709
(907) 479-2243
Regional Forester - Lester Fortune

Southcentral Regional Office
3601 C St., Frontier Bldg., Ste. 1008
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-2117
Regional Forester - Joseph Wehrman

Southeastern Regional Office
400 Willoughby Center, 5th Fl.
400 Willoughby Ave. (mailing)
Juneau, AK 99801
(907) 465-2491
Regional Forester - Paul Maki

E. Department of Public Safety
450 Whittier St.
P.O. Box N (mailing)
Juneau, AK 99811
(907) 465-4322
Commissioner - Robert J. Sundberg

1. Division of Fish and Wildlife Protection
5700 East Tudor Rd.
Anchorage, AK 99507
(907) 269-5509
Director - Col. Robert M. Henderson

Function: Enforce state laws, in particular AS Title 16. Acts as enforcement arm for Alaska Department of Fish and Game.

F. Department of Revenue
11th Fl., Entrance A
State Office Bldg.
P.O. Box S (mailing)
Juneau, AK 99811
(907) 465-2390
Commissioner - Mary A. Nordale

1. Public Services Division
1111 West 8th St., Rm. 108
Juneau, AK 99801
(907) 465-2392
Director - Sally Smith

Function: Issues licenses (including mining, for production and sale of minerals, and Alaska Business Licenses) and may require filing of nonresident affidavits and bonding.

2. Audit Division
11th Fl., Entrance B
State Office Bldg.,
P.O. Box SA (mailing)
Juneau, AK 99811
(907) 465-2320
Director - Martin J. Richard
Chief of Audit Services - Steven E. Kettel

Function: Administers mining-license tax, which is based on net income, including royalties. On application, will grant certificate of tax exemption for first 3½ yr of new mining operations, except for mining of sand and gravel. Tax returns must be filed annually.

G. University of Alaska
Fairbanks, AK 99775-0780

1. College of Natural Sciences
Department of Geology & Geophysics (B.S., M.S., Ph.D.)
Brooks Bldg., Rm. 408
(907) 474-7565
Department Head - Don M. Triplehorn

Function: Provides undergraduate and graduate education in geology and geophysics and conducts basic and applied research in geologic sciences. Offers program options in general geology, economic geology, petroleum geology, geophysics, and ice-snow-permafrost geophysics.

2. School of Mineral Engineering
Brooks Bldg., Rm. 209
(907) 474-7366
Dean - Donald J. Cook

Function: Conducts laboratory and field studies related to mining and mining. Publishes reports and general information concerning mining and offers assistance to miners.

Mineral Industry Research Laboratory (MIRL)
210 O'Nei1 Resource Bldg.
(907) 474-7135 or 7136
Director - Donald J. Cook
Associate Director - P.D. Rao

Function: Conducts applied and basic research on location, development, and use of Alaska's minerals and coal resources. Conducts studies on exploration, mine and mill development, coal preparation and use, mineral beneficiation, and environmental concerns of mineral industry.

3. Arctic Environmental Information and Data Center (AEIDC)
707 A St.
Anchorage, AK 99501
(907) 279-4523
Director - David Hickok

Function: Engages in information management, transfer, and dissemination; applied research and investigation into resource development and environmental problems. Provides information and data on Alaska and circumpolar arctic environments and natural resources.

FEDERAL AGENCIES

A. U.S. Department of the Interior
1. Bureau of Land Management (BLM)
   Alaska State Office
   701 C St.
   P.O. Box 13 (mailing)
   Anchorage, AK 99513
   State Director - Michael Penfold
   (907) 271-9550 - Public Room

   Function: Administers federal public lands (except National Parks, Wildlife Refuges, National Monuments, National Forests, and military withdrawals). Issues leases for all federal lesurable minerals including oil and gas, coal, phosphates, or oil shale. Arranges for sale of minerals other than leasable or salable materials, including sand, gravel, or stone. Issues right-of-way and special-use permits. Monitors mining operations to insure protection of surface resources. Maintains land-status plats and issues patents. Records federal mining claims and annual-assessment affidavits.

   Anchorage District Office
   4700 East 72nd Ave.
   Anchorage, AK 99507
   (907) 267-1200
   District Manager - Wayne Boden

   Fairbanks District Office
   North Post, Fort Wainwright
   P.O. Box 1150 (mailing)
   Fairbanks, AK 99703
   (907) 306-5345
   Acting District Manager - Donald E. Runberg

2. U.S. Bureau of Mines
   Alaska Field Operations Center
   201 East 9th Ave., Ste. 101
   Anchorage, AK 99501
   (907) 261-2455
   Chief - Donald P. Blasko
   Anchorage Supervisor - Robert Hoekzema

   Function: The Alaska Field Operations Center programs are designed to help develop a nationally viable mineral industry in Alaska. The programs have two main thrusts. The first is to provide data on mineral reserves needed by government agencies at all levels, but particularly by Congress and land managers. The second is to generate, accumulate, and supply mineral data to the mining industry. All Alaska projects are parts of mutually supportive programs: Mineral Land Assessment, Mining and Metallurgical Research, Minerals Availability, Minerals Policy Analysis, and State Activities.

   Juneau Field Office
   P.O. Box 566
   Juneau, AK 99802
   (907) 364-2111
   Assistant Chief - David Carnes
   State Mineral Officer - Tom Pittman

   Fairbanks Field Office
   206 O'Neill Resource Bldg.
   905 Koyukuk Ave., North
   University of Alaska
   Fairbanks, AK 99775-5140
   (907) 479-4277
   Supervisor - James Barker

3. Fish and Wildlife Service
   1011 East Tudor Rd.
   Anchorage, AK 99503
   (907) 766-3522
   Regional Director - Robert Gilmore
   Assistant Regional Director - (Habitat Resources) - Robert Jacobsen

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

   Northern Alaska Ecological Services
   Federal Bldg. and Courthouse, Rm. 266
   Box No. 20 (mailing)
   101 12th Ave.
   Fairbanks, AK 99701
   (907) 465-0203
   Field Supervisor - Tony W. Booth

   Southeastern Alaska Ecological Services
   Federal Bldg., Rm. 417
   P.O. Box 1287 (mailing)
   Juneau, AK 99802
   (907) 586-7240
   Field Supervisor - Waine Oien

   Western Alaska Ecological Services
   Sunshine Plaza
   411 West 4th Ave., No. 2B
   Anchorage, AK 99501
   (907) 271-4575
   Field Supervisor - Robert Bowker

   4230 University Dr.
   Anchorage, AK 99508
   (907) 271-1338
   Chief - Branch of Alaskan Geology -
   Donald L. Grybeck
   Director's Representative for Alaska -
   Philip A. Emery

   Function: Investigates and reports on physical resources; composition and character of land surface; composition and structure of underlying rocks; and quality, volume, and distribution of water and minerals.
Alaska Distribution Center (for maps and brochures)
Federal Bldg.
101 12th Ave.
Fairbanks, AK 99701
(907) 456-0214

Public Inquiries Office (for information and publications)
4230 University Dr., Rm. 101
Anchorage, AK 99508-4664
(907) 561-5555

5. National Park Service (NPS)
Alaska Regional Office
2525 Gambell St.
Anchorage, AK 99503-2892
(907) 261-2643
Regional Director - Boyd Evison
Chief, Mining and Minerals - Lynn S. Griffiths

Function: Administers lands within the National Park System in Alaska. Manages valid prior-right mining claims in parklands through plans of operation under Mining in Parks Act, National Park Service regulations, and other applicable federal and state laws and regulations.

B. U.S. Department of Labor

1. Mine Safety and Health Administration (MSHA)
117 107th Ave. NE., Rm. 100
Bellevue, WA 98004
(206) 442-7037
Western District, Subdistrict Manager - Martin Rosta

Function: Administers mine-health and safety programs for mines other than coal. Conducts training and safety classes for federal and state mine inspectors and mining personnel. Conducts research in mine safety.

2. Mine Safety and Health Administration
Coal Mine Safety and Health, District 9
P.O. Box 25367, DFC
Denver, CO 80225
(303) 236-2740
District Manager - John W. Barton

Function: Administers health and safety standards according to the Code of Federal Regulations to protect the health and safety of coal miners; requires that each operator of a coal mine comply with these standards. Cooperates with the State to develop health and safety programs and develops training programs aimed to prevent coal or other mine accidents and occupationally caused diseases in the industry. Coal Mine Inspectors travel from Denver, Colorado, or Price, Utah, to inspect mines in Alaska because no field offices are located here.

C. U.S. Department of Agriculture

U.S. Forest Service (USFS) Regional Office
Federal Bldg.
P.O. Box 1628 (mailing)
Juneau, AK 99802
(907) 566-7647
Regional Forester - Michael A. Barton

Function: Helps meet national mineral and energy needs by encouraging and supporting environmentally sound mineral enterprises on National Forest System lands. Provides joint administration of general mining laws on National Forest System lands with the Bureau of Land Management. Cooperates with Department of Interior agencies in the review and issuance of mineral leases. Issues permits for disposal of sand, gravel, and stone.

D. U.S. Environmental Protection Agency (EPA)

Alaska Operations Office
701 C St.
Box 19 (mailing)
Anchorage, AK 99503
(907) 271-5083
Assistant Regional Administrator - Alvin L. Ewing

Regional Headquarters
1200 6th Ave.
Park Place Bldg.
Seattle, WA 98101
(206) 442-1205
Regional Administrator - Ernesta Barnes


Fairbanks Headquarters (mining season only)
101 12th Ave.
Federal Bldg., Box 19 (mailing)
Fairbanks, AK 99701
(907) 456-0366
Placer Mining Coordinator - Willis Ulmholtz

E. Department of the Army

U.S. Army Corps of Engineers
Regulatory Branch
Pouch 898
Anchorage, AK 99506
District Engineer - Colonel William T. Gregory, Jr.
Write: Attention: NPACO-R-S, or Call: Carol Gorbics (907) 753-2724 or (800) 478-2712

Function: Regulates work in navigable waters of United States and discharge of dredged or fill material into United States waters, including wetlands. Examples of regulated mining activities include construction of roads, bridges, docks, pads, stockpiles, diversions, and causeways.
NONGOVERNMENTAL GROUPS AND ASSOCIATIONS

Alaska Miners Association, Inc.
Rose Rybachev, Chairman
Curt McVee, Executive Director
Statewide Office
599 West 3rd Ave., Ste. 17
Anchorage, AK 99501
(907) 276-0317

Anchorage Branch
Jim Williams, Chairman
P.O. Box 101260
Anchorage, AK 99510
(907) 561-3127

Fairbanks Branch
Roger Burggraf, Chairman
P.O. Box 73069
Fairbanks, AK 99707
(907) 451-6600

Haines Branch
Merrill Palmer, Chairman
P.O. Box 222
Haines, AK 99827
(907) 766-2567

Juneau Branch
Ray Ronshaw, Chairman
P.O. Box 2311
Juneau, AK 99805
(907) 789-7577

Ketchikan Branch
Ralph Yetka, Chairman
P.O. Box 928
Ward Cove, AK 99928
(907) 247-2449

Nome Branch
Ron England, President
P.O. Box 636
Nome, AK 99762
(907) 443-2596

Sitka Branch
Barton Southwick
P.O. Box 255
Sitka, AK 99835
(907) 747-8194

Alaska Women in Mining
Leah Madonna, President
P.O. Box 83743
Fairbanks, AK 99708
(907) 452-7398

American Institute of Mining Engineering (AIME)
Collector No. D
Littleton, CO 80213
(303) 975-9500

Sukumar Bandopadhyay, Chairman
Alaska Branch
School of Mineral Engineering
Brooks Bldg., Rm. 106
University of Alaska
Fairbanks, AK 99775

American Institute of Professional Geologists
7828 Vance Dr., Ste. 103
Arvada, CO 80003
(303) 431-0831

Alan Krause, President
Alaska Section
Box 12032
Anchorage, AK 99509
(Golder Associates)
(907) 276-2678

Miners Advocacy Council
Robert Almiller
P.O. Box 83909
College, AK 99708
(907) 488-2102

Miners Rights Action Group
Ken Manning
P.O. Box 80325
College, AK 99708
(907) 479-1899

Northwest Mining Association
633 Peyton Bldg.
Spokane, WA 99201
(509) 624-1158

Placer Miners of Alaska
Rosalyn Stowell
P.O. Box 73756
Fairbanks, AK 99707
(907) 456-6632

Resource Development Council for Alaska, Inc.
Paula Easley, Director
Chuck Webber, President
897 G St., Ste. 200
P.O. Box 100516 (mailing)
Anchorage, AK 99501
(907) 276-0700

Western Mining Council
Kenai Peninsula Chapter
Oscar H. Bailey, President
Old Nash Rd.
Seward, AK 99664
(907) 221-5963

ORGANIZED MINING DISTRICTS

Circle Mining and Recording District
Bob Cay, President
General Delivery
Central, AK 99730
Fairbanks Mining District
Don Stein, President
105 Dunbar
Fairbanks, AK 99701

Forty-Mile Miners Association
David Kukowski, President
General Delivery
Chicken, AK 99732

Kantishna Mining District
Sam Koppenburg, President
SRD Box 9070
Palmer, AK 99645

Koyukuk Mining District
Robert Aumiller, President
871 Faultline Dr.
North Pole, AK 99706

Livengood-Tolovana Mining District
Rose Rybachek, President
P.O. Box 73069
Fairbanks, AK 99707

Seward Mining District
Tom Williams, President
Box 66
Hope, AK 99605

Valdez Creek Mining District
Dave Clark, President
General Delivery
Talkeetna, AK 99676
APPENDIX C
Selected significant mineral deposits in Alaska
(locations shown in figs. 35 through 37)

1 Lik, SU - Major stratiform massive-sulfide (Zn-Pb-Ag-Cd-Ba) deposits in black shale and chert. Proven reserve (Lik) estimate of 24 million tons of 9 percent Zn, 3.1 percent Pb, and 1.4 oz/ton Ag.

2 Red Dog - At least two major stratiform massive-sulfide deposits hosted in Pennsylvanian or Mississippian shale; similar to locality 1. According to COMINCO (February 1982), Main deposit at Red Dog contains at least 85 million tons of 17.1 percent Zn, 5 percent Pb, 2.1 oz/ton Ag; nearby Hilltop deposit contains significant undiscovered reserves.

3 Drenchwater - Stratiform massive-sulfide occurrence associated with black shale, chert, and felsic volcanic rocks; 60- by 120-ft exposure averages 17.4 percent Zn, 3.0 percent Pb, and 3.3 oz/ton Ag; numerous sulfide occurrences and strong geochemical anomalies between localities 1 through 4 and locality 7.

4 Ginny Creek - Epigenetic, disseminated Zn-Pb-Ag deposits with barite in sandstone and shale of Noatak Sandstone of Upper Devonian through Lower Mississippian age. Random grab samples of surface float contain 0.3 to 3.0 percent Zn and highly variable amounts of Pb and Ag.

5 Story Creek - Epigenetic replacement deposits of Zn-Pb-Ag-Cu-Au hosted in brecciated zones in Devonian Kanayut Conglomerate or Lower Mississippian Kayak Shale. Grab samples of high-grade material contain up to 0.43 percent Cu, 34 percent Pb, 28.8 percent Zn, 0.04 oz/ton Au, and 30 oz/ton Ag.

6 Whoopoe Creek - Epigenetic replacement deposits of Zn-Pb-Cu-Ag-Au-Cd in breccia zones in Devonian Kanayut Conglomerate or Lower Mississippian Kayak Shale. Random grab samples of mineralized material contain 0.24 percent Cu, 0.37 percent Cd, 44 percent Zn, 0.14 oz/ton Au, and 14.8 oz/ton Ag.

7 Omar, Frost - Epigenetic replacement deposits of Paleozoic age include bedded-barite occurrences. Grab samples contain 15.3 percent Cu, 0.15 percent Pb, 0.95 percent Zn, 0.05 percent Co, and 0.3 oz/ton Au.

8 Borinite - Major stratiform Cu-Zn deposit in carbonate rock of Devonian age; 4.56 million-ton ore body contains 4.0 percent Cu and accessory Zn and Co. Larger reserve estimate of 36.2 million tons of about 2 percent Cu and undisclosed amount of Zn and Co.

9 Arctic - Major volcanicogenic (Cu-Zn) massive-sulfide deposit hosted in sequence of metarhyolite, meta-tuff, and graphitic schist of Devonian age; indicated reserves of 35 to 40 million tons grade 4.0 percent Cu, 5.5 percent Zn, 0.8 percent Pb, 1.6 oz/ton Ag, and 0.02 oz/ton Au.

10 Sun - Major (Cu-Pb-Zn-Ag) massive-sulfide deposit in sequence of middle Paleozoic metarhyolite and metabasalt; indicated 1976 gross-metal value of Cu, Pb, Zn, and Ag was over $1 billion.

11 Smucker - Middle Paleozoic volcanogenic massive-sulfide deposit; contains significant tonnage of Cu-Pb-Zn ore that grades 1.5 percent Pb, 5 to 10 percent Zn, 3 to 10 oz/ton Ag, with minor Au.

12 Avan Hills - Disseminated chromite in layered ultramafic rocks; grab samples contain up to 2.5 percent Cr.

13 Misheguk Mountain - Chromite occurrences similar to those in Avan Hills.

14 Klery Creek - Lode- and placer-Au deposits worked intermittently from 1909 through 1930s. Total production through 1931, mostly from placer deposits, estimated at 31,320 oz.

15 Ernie Lake - (Ann Creek) Stratiform massive-sulfide occurrence in metarhyolite, metatuff, and marl. Gossan zones strongly anomalous in Cu-Pb-Zn and Ag.

16 Koyukuk-Nolan mining district - Major placer-Au district; from 1893 to present, produced more than 300,000 oz Au. Significant, deep placer reserves remain.

17 Chandalar mining district - Major Au-producing district; substantial production in excess of 30,000 oz Au from lode and placer sources; lode gold found in crosscutting quartz veins that intrude schist and greenstone. Active development of placer deposits and lodes in progress.

18 Porepine Lake - Stratiform fluorite occurrences associated with felsic volcanic rocks of late Paleozoic age. Reported grades of up to 25 to 30 percent fluorite reported.

19 Wind River - Stratiform massive-sulfide prospect; reported grades of up to 5 percent Pb.

20 Esotuk Glacier - Disseminated Mo-Sn-W-Pb-Zn mineralization in skarns associated with Devonian(? ) schistose quartz monzonite. Grab samples contain up to 0.08 percent Sn and 0.15 percent W.

21 Bear Mountain - Major stockwork Mo-W-Sn occurrence in intrusive breccia. Grab samples contain up to 1 percent Cu, 0.16 percent Zn, and 0.002 percent Mo.

22 Cape Creek - Major placer-Sn producer. More than 500 tons Sn produced from 1935 to 1941, at least 500 tons produced in last 10 yr.

23 Buck Creek - Major placer-Sn producer. More than 1,100 tons Sn produced from 1902 to 1953.

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

25 Ear Mountain - Placer-Sn district and Sn-Cu-Au-Ag-Pb-Zn skarn mineralization of Cretaceous age. Area also anomalous in uranium.

26 Rougaro Mountain - Sn deposit hosted in quartz-tourmaline-topaz greisen of Cretaceous age. Grades may average 0.5 percent Sn and 0.01 percent Ta and Nb.

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1 This list is not a definitive summary of Alaska's significant mineral deposits or mineral belts; numerous state and federal summaries provide more detailed information about individual deposits.
27 Hannum - Stratiform, carbonate-hosted Pb-Zn-Ag massive-sulfide deposit of middle Paleozoic age in heavily oxidized zone that ranges from 30 to 150 ft thick. Mineralized zone reported to vary up to 10 percent Pb, 2.2 percent Zn, 0.04 oz/ton Au, and 1.76 oz/ton Ag.

28 Independence Creek - Pb-Zn-Ag massive-sulfide deposit; high-grade ore shipped in 1921 contained 30 percent Pb, 5 percent Zn, and 150 oz/ton Ag. Mineralization restricted to shear zone in carbonates.

29 Sinuk River - Stratiform Pb-Zn-Ag-Ba-F massive-sulfide deposits and layered iron deposits of Precambrian or Paleozoic age. Mineralized zones extend over 8,000 ft along strike.


31 Big Hurrah - Epigenetic vein deposit in black slate and metasediments of York Slate. Deposit contains some W mineralization and has produced over 20,000 oz Au from nearly 50,000 tons milled ore. Proven, inferred and indicated reserves total 104,000 tons that grade 0.61 oz/ton Au, 0.55 oz/ton Ag, and credits of W.

32 Solomon mining district - Major placer-Au district; produced over 250,000 oz Au.

33 Kachauk - Uranium prospect in Cretaceous alkalic intrusive rocks. Highly anomalous geochemical values and U concentrations of 1,000 ppm reported.

34 Onalik - Stratiform vein-type Pb-Zn-Ag massive-sulfide prospect in Paleozoic carbonate rocks; from 1881 to 1900, produced 300 to 400 tons of Pb-Zn ore that averaged about 10 percent Pb and 40 oz/ton Ag. Grades of oxidized Zn ore reported to be up to 34 percent Zn.

35 Windy Creek - Disseminated Mo-Pb-Zn mineralization in quartz veins and skarns with reported values as high as 0.15 percent Mo.

36 Quartz Creek - Significant Pb-Zn-Ag mineralization; reported grades of 15 percent combined Pb-Zn and 10 oz/ton Ag.

37 Placer River - Significant Mo-F mineralization disseminated in intrusive rocks. Reported values of 0.2 percent Mo.

38 Candle Creek - Placer-Au deposits with significant reserves. Placer concentrates reported to have significant U and galena concentrations.

39 Porovookpuk Mountain - Porphyry-Mo mineralization. Reported grades of up to 0.25 percent Mo.

40 PurellMountain - Mo and Ag occurrences associated with Cretaceous alkaline igneous plutons, alaskite, and bostonite dikes.

41 Koyukuk-Hughes mining district - Production of 230,000 oz Au from 1930 to 1975, mainly from Alaska Gold dredging operation at Hogatts; dredge reactivated in 1981, but deactivated in 1984. Nonfloat mechanized operation on Utopia Creek produced significant amount of placer Au from 1930 to 1962.

42 Flat mining district - Major placer-Au district; produced at least 1,374,404 oz Au through 1984. Potential exists for occurrence of significant lode-Au and W reserves at Golden Horn deposit and other known lodes in region associated with shear zones and monzonite intrusive rocks of Late Cretaceous age.

43 Innoko-Tolstoi mining district - Major placer-Au district with significant lode Au-Sb-Hg potential. Lode sources for placers are volcanic-plutonic complexes of Late Cretaceous age and dikes that intrude Mesozoic flysch; mining district produced more than 540,000 oz Au from placer deposits.

44 Nixon Fork - Promising Au-Cu deposits. Nixon Fork Mine produced 37,000 oz Au from Late Cretaceous skarns associated with quartz monzonite - Devonian limestone contact zones.

45 Bonanza Creek - Skarn-type W mineralization along intrusive contact; no published information available.

46 Ruby mining district - Placer Au-Sn district; produced more than 420,000 oz Au from 1931 to 1960; mining district also contains Pb-Ag prospects with grades reportedly as high as 82 oz/ton Ag.

47 Hot Springs mining district - Placer Au-Sn district; produced more than 450,000 oz Au and over 720,000 lb cassiterite through 1981. Includes Bureka and Tofty subdistricts.

48 Livengood-Tolovana mining district - Placer-Au district; produced more than 425,000 oz Au since discovery in 1914. Substantial reserves remain.

49 Fairbanks mining district - Seventh largest Au-producing district in United States; largest producer in Alaska. Produced more than 7,750,000 oz Au from placer deposits. Major lode-Au and Sb producer; produced more than 250,000 oz Au and over 4 million lb Sb from veins and shear zones through 1970. Production of W exceeded 4,000 tons since 1915, all derived from tectite and skarn near Cretaceous quartz monzonite.

50 Mt. Prindle - Significant uranium-rare earth mineralization in Mesozoic alkaline igneous rocks. Rock geochemical values of up to 0.1 percent U_3O_8; up to 15 percent rare-earth elements reported.

51 Twin Mountain - Significant W mineralization associated with skarn development along contact zone of quartz monzonite stock of Cretaceous age.

52 Circle mining district - Currently Alaska's largest producing placer-Au district; produced 900,000 oz Au since discovery in 1893. Has significant potential for Sn, W, and Au mineralization from variety of lode sources.

53 Three Castle Mountain, Pleasant Creek, Casa VABM - Strata-bound Pb-Zn massive-sulfide mineralization. Reported grades of up to 17 percent Zn and 2 percent Pb.

54 Totallana River lode zone, Anderson Mountain, Dry Creek, Virginia Creek - Significant volcanogenic Cu-Pb-Zn-Ag massive-sulfide deposits of Devonian-Mississippian age in Bonnfield mining district. Potential for high-grade deposits reported. Includes Liberty Bell strata-bound Au deposit and Sheep Creek; latter contains Sn and base metals.

55 Delta massive-sulfide belt - Contains at least 30 known volcanogenic massive-sulfide deposits and occurrences. Grade ranges are 0.3 to 1.1 percent Cu,
1.7 to 5.7 percent Zn, 0.5 to 2.3 percent Pb, 0.7 to 2.0 oz/ton Ag, and 0.018 to 0.061 oz/ton Au; estimated potential reserve tonnage of 40 million tons for all deposits.

56 Mosquito Pete River - Porphyry-Mo prospects of early Tertiary age; reported grades of up to 0.17 percent Mo.

57 Taurus - Major porphyry Cu-Mo prospect of Paleocene age with at least 500 million tons of mineralization. Reported potential for large tonnage of 0.5 percent Cu and 0.05 percent Mo.

58 Big Creek, Ladue - Strata-bound Pb-Zn-Ag massive-sulfide prospects in metavolcanic rocks.

59 Slate Creek - At least 55 million tons of 6.3 percent high-quality chrysotile asbestos in serpentinitized ultramafic rocks of Precambrian age.

60 Forty Mile mining district - Major placer-Au district. Produced over 417,000 oz Au since discovery in 1886.

61 Kantishna mining district - Major placer-Au and lode Ag-Au-Pb-Zn-Sb-Ag deposit of Mesozoic age. Produced over 92,000 oz placer Au, about 260,000 oz lode Ag, and several million lb Sb from shear zones and vein deposits hosted in Precambrian metamorphic units. Potential exists for significant Ag-Au-Pb-Zn deposits. Metalliferous strata-bound deposits occur in schist and quartzite.

62 Stampede Mine - Major Sb deposit; produced more than 3.5 million lb Sb from large shear zone in Precambrian metamorphic rocks.

63 Parkydale - Significant Ag-Sn-Be mineralization associated with 'McKinley' pluton (55 m.y. old). Grades of up to 4.5 percent Sn reported. Potential exists for U and W mineralization.

64 Golden Zone Mine - Major Au-Cu-Ag deposits in Late Cretaceous breccia pipe. Produced more than 1,581 oz Au, 8,617 oz Ag, and 42,000 lb Cu. Proven reserves of about 10 million tons of 0.1-0.3 percent Cu and Ag.

65 Nim Prospect - Porphyry Cu-Ag-Au deposit of Late Cretaceous age. Reported grades of up to 5.0 percent Cu and 0.9 oz/ton Ag.

66 Coal Creek - Greisen-hosted Sn-Cu-W deposit in 'McKinley' age pluton (55 m.y. old). Reported reserves of 5 million tons of ore that grade 0.26 percent Sn, 0.3 percent Cu, with credits of W, Ag, and Zn.

67 Denali Prospect - At least six small, strata-bound Cu-Ag deposits in volcanic-sedimentary rocks of Triassic age that may contain 5 million tons ore that grade about 2 percent Cu with credits of Ag.

68 Chitistone - Porphyry-Cu prospects of Tertiary age and placer-Au district; produced over 177,000 oz Au and small amount Pt from placer deposits.

69 Nabesna Mine - Classic high-grade Au skarn that envelopes quartz diorite of Jurassic(? age; produced over 66,960 oz Au from about 88,000 tons of ore from 1929 to 1941.

70 Spirit Mountain - Massive and disseminated Cu-Ni mineralization in mafic-ultramafic complex.

71 Kennebog formations - Major stratiform Cu-Ag massive-sulfide deposits localized near contact between Chitistone Limestone and Nikolai Greenstone of Triassic age; contained some of highest grade Cu-Ag deposits mined in North America. From 1911-38, produced more than 1.2 billion lb Cu and 10 million oz Ag from ore that averaged about 0.82 oz/ton. inferred reserves remain.

72 Binocular and other prospects - Kennebog-type Cu-Ag massive-sulfide deposits.

73 Bond Creek - Orange Hill - Two major porphyry Cu-Mo deposits of Late Cretaceous age; inferred reserves of 850 million tons ore that grade 0.3 to 0.5 percent Cu and 0.03 percent Mo reported.

74 Carl Creek - Porphyry-Cu prospect in altered intrusive complex; similar to locality 73.

75 Bultoff - Porphyry-Cu prospect in altered intrusive rocks; inferred reserves of 145.1 million tons of 0.20 percent Cu similar to locality 73.

76 Horsfeld - Porphyry-Cu prospect, similar to locality 73.

77 Midas Mine - Significant strata-bound Cu-(Ag-Au-Pb-Zn)-massive-sulfide deposit in volcanic-sedimentary rocks of Tertiary age; contained some of highest grade ore. More than 348,082 oz Au from about 260,000 oz lode Ag, and several million lb Sb from shear zones and vein deposits hosted in Precambrian metamorphic units. Potential exists for significant Ag-Au-Pb-Zn deposits. Metalliferous strata-bound deposits occur in schist and quartzite.

78 Stampede Mine - Major Sb deposit; produced more than 3.5 million lb Sb from large shear zone in Precambrian metamorphic rocks.

79 Golden Zone Mine - Major Au-Cu-Ag deposits in Late Cretaceous breccia pipe. Produced more than 1,581 oz Au, 8,617 oz Ag, and 42,000 lb Cu. Proven reserves of about 10 million tons of 0.1-0.3 percent Cu and Ag.

80 Nim Prospect - Porphyry Cu-Ag-Au deposit of Late Cretaceous age. Reported grades of up to 5.0 percent Cu and 0.9 oz/ton Ag.

81 Coal Creek - Greisen-hosted Sn-Cu-W deposit in 'McKinley' age pluton (55 m.y. old). Reported reserves of 5 million tons of ore that grade 0.26 percent Sn, 0.3 percent Cu, with credits of W, Ag, and Zn.

82 Denali Prospect - At least six small, strata-bound Cu-Ag deposits in volcanic-sedimentary rocks of Triassic age that may contain 5 million tons ore that grade about 2 percent Cu with credits of Ag.

83 Chitistone - Porphyry-Cu prospects of Tertiary age and placer-Au district; produced over 177,000 oz Au and small amount Pt from placer deposits.

84 Nabesna Mine - Classic high-grade Au skarn that envelopes quartz diorite of Jurassic(? age; produced over 66,960 oz Au from about 88,000 tons of ore from 1929 to 1941.

85 Spirit Mountain - Massive and disseminated Cu-Ni mineralization in mafic-ultramafic complex.

86 Kennebog formations - Major stratiform Cu-Ag massive-sulfide deposits localized near contact between Chitistone Limestone and Nikolai Greenstone of Triassic age; contained some of highest grade Cu-Ag deposits mined in North America. From 1911-38, produced more than 1.2 billion lb Cu and 10 million oz Ag from ore that averaged about 0.82 oz/tan. inferred reserves remain.
amount to 453,600 tons that grade 0.30 oz/ton Au, 1.0 oz Ag, and several percent base metals.

87 Pyramid - Late Tertiary porphyry Cu-Mo deposit; inferred reserves of 125 million tons ore that grade 0.4 percent Cu and 0.03 percent Mo reported.

88 Ivanof - Late Tertiary porphyry-Cu prospect: grades of up to 0.72 percent Cu reported. Potential for large tonnages.

89 Usuk Pocket, Bee Creek - Porphyry Cu-Mo prospect of late Tertiary to Quaternary age; grades of up to 0.18 percent Cu and 0.035 percent Mo reported. Potential for moderate tonnages of low-grade mineralization.

90 Mike deposit - Porphyry-Mo prospect of late Tertiary age; grades of up to 0.21 percent Mo reported. Potential for large tonnages of low-grade mineralization.

91 Rex deposit - Porphyry-Cu prospect similar to locality 90; grades of up to 0.3 percent Cu reported. Potential for moderate reserves of low-grade mineralization.

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

93 Magnetite Cove - Massive magnetite-skarn deposit; grades of up to 30 percent Fe reported; also contains Zn-Cu-Ag mineralization.

94 Jimmy Lake - Complex Cu-Ag-Sn mineralization of late Tertiary(?) age; reported grades of up to 105 oz/ton Ag and 3 percent Cu.

95 Haines Barite - Major stratiform Ba-Pb-Zn-Cu-Ag deposit in pillow-basalt-dominated section of Paleozoic or Triassic age; consists of 48- to 60-ft-thick zone of 60 percent barite with upper zone (2 to 8 ft thick) of massive sulfides that contain 2 percent Pb, 3 percent Zn, 1 percent Cu, 2 to 4 oz/ton Ag, and 0.12 oz/ton Au.

96 Khulksa - Major Cu-Ti deposits in zoned ultramafic complex of Mesozoic age; reported to contain 1 to 5 billion tons of material that contain 11 to 20 percent Fe and 1.6 to 3.0 percent Ti.

97 Nunatak - Porphyry-Mo deposit; reported reserves of 8.5 million tons ore that grade 0.125 percent Mo and 129 million tons of 0.026 percent Mo.

98 Brady Glacier - Major Ni-Cu deposit in layered gabbro-pyroxenite complex of Tertiary age. Proven reserves of 100 million tons ore that grade 0.5 percent Ni and 0.3 percent Cu reported; also contains significant Co and Pt concentrations.

99 Mertie Lode and Funter Bay mining district - Contains substantial reserves of lode-Au mineralization. Past production totaled 10,000 to 15,000 oz Au. Deposits also contain significant Ni-Cu and Pb-Zn-Au mineralization. Funter Bay deposit contains reported reserves of 560,000 tons that grade 0.34 percent Ni, 0.35 percent Cu, and 0.15 percent Co in gabbro-pipe system.

100 Alaska-Juneau - Major lode-Au deposit that consists of 100- to 300-ft-wide zone that contains en echelon, gold-bearing quartz veins in metamorphic rocks; produced more than 3.52 million oz Au from 88.5 million tons ore from 1893 to 1944.

101 Chichagof and Hirst Chichagof - Major lode-Au deposits in quartz veins that cut Mesozoic graywacke; produced more than 770,000 oz Au. Chichagof Mine produced about 700,000 oz Au and 200,000 oz Ag; Hirst Chichagof Mine produced about 67,980 oz Au and 20,000 oz Ag.

102 Mirror Harbor - Ni-Cu mineralization in layered gabbro complex of Mesozoic age; probable reserves of 8,000 tons of 1.57 percent Ni and 0.88 percent Cu and inferred reserves of several million tons ore that grade 0.2 percent Ni and 0.1 percent Cu reported.

103 Bohemia Basin - Major Ni-Cu-Cu mineralization in layered mafic complex similar to locality 102; reported reserves of 22 million tons ore that grade 0.33 to 0.51 percent Ni, 0.21 to 0.27 percent Cu, and 0.04 percent Co.

104 Apex - El Nido - Significant lode-Au-W deposit that occurs as crosscutting veins in graywacke; produced more than 50,000 oz Au.

105 Greens Creek - Major sediment-hosted Pb-Zn-Cu-Ag deposit of Devonian or Triassic age; proven reserves of 4.0 million tons that grade 10 percent combined Pb-Zn-Cu, 10 oz/ton Ag, and 0.10 oz/ton Au.

106 Snettisham - Volcanogenic Cu-Pb-Zn massive-sulfide deposit in Mesozoic metavolcanic complex with potential strike length of over 10,000 ft. Inferred reserves of 28.7 million tons ore that grade 0.57 percent Cu, 0.37 percent Zn, and 0.3 oz/ton Ag reported.

107 Snettisham - Fe-Ti deposit in mafic zoned-intrusive complex; reported grades of about 18.9 percent Fe and 2.6 percent Ti.

108 Tracy Arm - Strata-bound Cu-Zn-Pb massive-sulfide deposit in Mesozoic schist; over 1,100 ft long and up to 12 ft thick. Reported grades of 1.5 percent Cu, 3.9 percent Zn, 0.76 oz/ton Ag, and 0.013 oz/ton Au.

109 Red Bluff Bay - Significant chrome mineralization in Mesozoic ultramafic complex (probably ophiolite); reported reserves of 370 tons of material that grade 40 percent Cr and 29,000 tons that grade 18 to 35 percent Cr.

110 Cornwallis Peninsula - Volcanogenic Cu-Pb-Zn-Ag-Au massive-sulfide deposit of Triassic(?) age; reported grades of up to 20 percent Pb-Zn and 23 oz/ton Ag.

111 Castle Island - Stratiform barite deposit of Triassic age hosted in carbonate and pillow basalt; about 850,000 tons produced from 1963 to 1980; contains Zn, Pb, and Cu sulfides. Reported to be mined out.

112 Ground Hog Basin - Area contains several stratiform massive-sulfide prospects in Mesozoic schist and gneiss whose origins are unknown. Reported grades of up to 8 percent Pb, 29 oz/ton Ag, and 0.5 oz/ton Au. Area also contains potential for porphyry-Mo deposits.

113 Slate Bay - Ni-Cu deposit in zoned mafic-ultramafic complex; inferred reserves of 430,000 tons of 0.3 percent Ni, 0.3 percent Cu, and 0.13 oz/ton Ag reported.

114 Kasaan Peninsula - Major skarn-type Cu-Fe-Au massive-sulfide deposit of Jurassic age; area has produced over 28 million lb Cu and 5,000 oz Ag. Reported reserves of 4 million tons ore that grade 50 percent Fe and less than 2 percent Cu.

115 Salt Chuck - Cu-PGM-Ag-Au deposit in contact zone between pyroxenite and gabbro within Alaskan-type zoned mafic-ultramafic pluton. From 1900 to 1941, 5 million lb Cu, over 20,000 oz PGM, and Au and
Ag credits were produced from 325,000 tons ore.

116 Union Bay - Significant Fe-Ti mineralization in ultramafic complex; area also contains Pt and V concentrations.

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

118 Jumbo - Cu-Fe-Mo-Ag skarn deposit; produced more than 10 million lb Cu, 280,000 oz Ag, and 7,000 oz Au from 125,000 tons ore from classic, zoned magnetite-Cu skarns associated with epizonal granodiorite pluton of Cretaceous age. Reported reserves of 656,000 tons ore that grade 15.2 percent Fe, 0.75 percent Cu, 0.01 oz/ton Au, and 0.08 oz/ton Ag.

119 Copper City - Stratiform Cu-Zn-Ag-Au massive-sulfide deposit hosted in late Precambrian Wales Group. Reported grades of up to 12.7 percent Cu, 2.7 percent Zn, 2.5 oz/ton Ag, and 0.2 oz/ton Au.

120 Quartz Hill - World-class porphyry Mo deposit in composite felsic pluton (25 m.y. old); proven reserves of 1.5 billion tons ore that grade 0.136 percent Mo, which includes 190 million tons with grades that exceed 0.2 percent MoS₂.

121 Niblack - Volcanogenic Cu-Pb-Au-Ag massive-sulfide deposit hosted in Precambrian(?) Wales Group or Ordovician-Silurian Descent Formation; produced more than 1.1 million lb Cu, 11,000 oz Au, and 15,000 oz Ag.

122 Bokan Mountain - Numerous U-Th prospects associated with Jurassic peralkaline intrusive complex; from 1955 to 1971, produced more than 120,000 tons ore that graded about 1 percent U₃O₈.

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

124 McLeod - Porphyry-Mo deposit that contains quartz-molybdenite fissure veins in quartz-feldspar porphyry. Chip samples contain up to 0.09 percent Mo.

125 Illinois Creek - Epigenetic(?) and replacement deposits that contain Cu-Pb-Zn-Ag-Au possibly associated with altered quartz monzonite porphyry and schist.

126 Johnson River - Epigenetic(?) quartz-sulfide stockwork or massive-sulfide deposit hosted in volcaniclastic, pyroclastic, and volcanic rocks of Jurassic Tuktutna Formation. Average grades of 9.4 to 24.8 percent Zn, 2.8 percent Pb, 1.7 percent Cu, and 0.6 to 1.2 oz/ton Au reported.

127 Nimuktuk River - Small hill of massive, high-grade barite estimated to contain at least 1.5 million tons barite. Widespread stream-sediment Ba anomalies in area indicate further barite potential.

Figure 25. Significant copper, lead, zinc, silver, gold, and barite deposits in Alaska. See appendix C for deposit descriptions.
Figure 36. Significant molybdenum or copper and tin, tungsten + fluorine, + beryllium deposits in Alaska. See appendix C for deposit descriptions.

Figure 37. Significant gold, silver, platinum, and strategic-mineral deposits in Alaska. See appendix C for deposit descriptions.
APPENDIX D
Mining licenses issued by the Alaska Department of Revenue, 1985

(placer gold = silver unless otherwise noted)

1Only licenses received by the Division of Mining, Fairbanks, as of January 15, 1986, are listed.
2Numbers in parentheses indicate number of separate mining licenses issued to a single individual, partnership, or company, if more than one. In 1985, 848 licenses were issued to 638 different licensees; in 1984, there were 804 licenses and 621 licensees. Usually one mining license is issued for every Annual Placer Mining Application submitted, which accounts for most of the multiple licenses.
BAILEY, GEORGE D.
Box 2652
Fairbanks, AK 99707

BALDWIN, FRANK
1051 Chena River Loop West
Fairbanks, AK 99707

BARELKA, PAUL I. (3)
1215 3rd Ave,
Fairbanks, AK 99701

BARTLING, ROGER
P.O. Box 1762
Fairbanks, AK 99708

BATTEST, HAROLD
912 6th Ave.
Fairbanks, AK 99701

BEGG, JOSEPH CHRISTIAN
306 Bentley Dr. East
Fairbanks, AK 99707

BEERMAN, WILLIAM J.
2416 3rd St.
Yakima, WA 98901

BEISTLINE, EARL H. (4)
P.O. Box 7643
Fairbanks, AK 99708

BELFORD, JAMES W. &
ROBERT HENDRICKS
P.O. Box 1934
Fairbanks, AK 99701

BELL, ALBERT LEE
P.O. Box 353
Sterling, AK 99772

BELL, ROBERT
Box 353
Sterling, AK 99772

BEN CREEK PLACERS (5)
James Robert Layman
Box 44
Eagle, AK 99740

BERG, RHINEHART
Candle, AK 99728

BETTISWORTH, ROBERT H.
924 Kellum, No. 303
Fairbanks, AK 99701

BEVARD, KEITH EUGENE
P.O. Box 912
Delta Junction, AK 99737

BEYER, DAVID WESTLEY
P.O. Box 103874
Anchorage, AK 99510

BICKFORD, SHERMAN DALE
1358 Noble St.
Fairbanks, AK 99701

BIG LAKE SAND & GRAVEL, INC.
P.O. Box 17-304
Big Lake, AK 99652 (gravel)

BIRDSELL, RUSSELL L.
P.O. Box 1908
Cave Creek, AK 95331

BOTTENGMAIER, KURT (2)
3900 Arctic Blvd.
Anchorage, AK 99503

BLACK SANDS MINING CO. (2)
Philip D. Strange
P.O. Box 1578
Wasilla, AK 99667

BLACKWELL, GEORGE B. &
JOHN F. KNUDSON
1841 Greendale Dr.
Anchorage, AK 99504

BLAKELY, DONALD BRUCE &
AMY ALICE (2)
1725 University Ave., No. 7-D
Fairbanks, AK 99701

BLOSS, PATRICK J. (2)
715 2nd St., No. 6
Anchorage, AK 99501

BLODGETT, ROBERT WAYNE
Box 602
Valdez, AK 99686

BLUEBIRD ASSOCIATES, INC.
6661 South 300 East
Midvale, UT 84047

BOULDER CREEK MINING CO.
Les & Dorothy Flickr
P.O. Box 1218
Fairbanks, AK 99707

BOUTON, GLENN D.
&
LEILA M. (4)
660 Farmers Loop Rd.
SR Box 30608
Fairbanks, AK 99701

BOWEN, CHARLES R.
SR Box 119-A
Copper Center, AK 99573

BOWLAND, JOE S.
Box 670883
Chugiak, AK 99567

BOWMAN, HOWARD N.
Box 7
Haines, AK 99806

BOYLY, VALE F. (4)
629 West 13th Ave.
Anchorage, AK 99501

BRADLEY, BILLY
289 Marydale Ct.
Soldotna, AK 99669

BRAME, LARRY B.
3000 Arctic Blvd., No. 228
Anchorage, AK 99503

BRANDT, PHILIP A. (2)
14250 Sabine St.
Anchorage, AK 99516

BRIDES, ROGER F.
SR Box 784
Palmer, AK 99645

BROOKS CO.
Clyde Holbrook
P.O. Box 334
Cooper Landing, AK 99572

BROWN, LAWRENCE E.
1107 Farmers Loop Rd.
Fairbanks, AK 99701

BRUCE, F.L.
Chicken, AK 99732
(lode gold)

BUCKE, ROBERT
P.O. Box 1069
Fairbanks, AK 99707

BURTON, RICHARD D.
P.O. Box 265
Fairbanks, AK 99707

BUSEY, RICHARD J. &
SANDRA L.
8877 Haines, No. A
Anchorage, AK 99502

BYRD, DICKIE L. (2)
P.O. Box 10084
Fairbanks, AK 99709

C.P.S. EQUIPMENT SERVICES
Calif, Schertenleib
2333 Newby Rd.
North Pole, AK 99705
(gravel)

C & S MINING
Thomas L. Cernwell & June Baird
P.O. Box 95786
College, AK 99708

CAY, ROBERT J., JR. (2)
Box 100
Central, AK 99730

CALIFORNIA OIL INDEPENDENTS, INC.
77 South Main St.
Orange, CA 92868

CAMERON, KARL B.
P.O. Box 10-429
Anchorage, AK 99504
CHARLEY GRAVEL CO.
Ernie Charley
SR Box 226
Gakona, AK 99586
(gravel)
CHASE MINING CO. (2)
Leonard G. Chase
220 Kody Dr.
Fairbanks, AK 99701
CHENA MINING CO.
8540 Wiliwa Ave.
Anchorage, AK 99504
CHRISTIE, KNOX N. & LORENA N.
413 Koyukuk Dr. East
Kodiak, AK 99615
CIRCLE MINING CO.
Frank R. Warren
P.O. Box 11
Central, AK 99730
CITIES SERVICE MINERALS CORP.
P.O. Box 300
Tuba, OK 74102
(copper & others)
CLAIRE BEA, INC. (3)
David B. Vial
P.O. Box 833
Ketchikan, AK 99702
CLAY, BARRY LLOYD
P.O. Box 25
Ruby, AK 99768
CLARK, J.D.
Boundary, AK 99790
CLEVELAND, CHARLES W.
Old Highway 99
Box 8
Glendale, OR 97442
COASTAL EXPLORATION
James L. Lawler
Box 186
Kasilof, AK 99610
COLBETH, PERLEY
Box 77
Palmer, AK 99645
COLDFOOT EXPLORATION
1170 Farmers Loop Rd.
Fairbanks, AK 99701
COLE, JOHN H.
P.O. Box 10139
Fairbanks, AK 99770
COLLINS, JESSE T.
P.O. Box 74760
Fairbanks, AK 99707
COLLINSVILLE-TWIN CREEKS, INC.
CJC Assoc. & James A. Holman
717 M St.
Anchorage, AK 99501
COMPASS MINING CO.
John B. Hall
P.O. Box 2700
Fairbanks, AK 99707
CONGDON, CARL J.
925 Commerce St.
Fairbanks, AK 99701
CONLIN, MICHAEL M. (2)
P.O. Box 102976
Anchorage, AK 99510
COOK, ALFRED GLENN
Box 94
Central, AK 99730
COOK'S MINING (2)
John & Mary Cook
P.O. Box 393
Fairbanks, AK 99707
COPPER VALLEY CONSTRUCTION CO.
P.O. Box 165
Girumilen, AK 99588
(gravel)
CORK, DENNIS
P.O. Box 871001
Wasilla, AK 99687
COYLE, WALDO E. OR RUBY S.
1412 Barbara Dr.
Kenai, AK 99611
(gravel)
CRAIG GRAVEL CO.
Jack Craig
Box 133
Gakona, AK 99582
(sand, gravel)
CRAIGEN, ALBERTON W. (2)
633 Pleasure Dr.
North Pole, AK 99705
CRAZY HORSE MINING CO.
Bryan L. Stoll
P.O. Box 10426
Fairbanks, AK 99710
CRESHAW, DENNIS GENE & GEORGE ZELLER
2205 East 3rd St., No. 11-F
Anchorage, AK 99501
CROLEY, BILL
Box 191
Tok, AK 99780
CRUM, CONNIE
2440 East Tudor Rd., No. 419
Anchorage, AK 99504
CURTIS, EDGAR J.
7716 Island Dr.
Anchorage, AK 99504
(palcer & lode gold, silver)
DAHL, KENNETH C.
P.O. Box 681
Bethel, AK 99515
DAN CREEK VENTURES
P.O. Box 401
Gig Harbor, WA 98335
DEGNAH, JOSEPH A. & CAROLINE H.
Box 2045
McGrath, AK 99627
DELONG, THOMAS & DAVID
P.O. Box 80508
Fairbanks, AK 99708
(lode & placer, precious & base metals)
DENALI MINING LTD.
6421 Winchester
Anchorage, AK 99507
DENARDO, ROBERT MICHAEL
6776 Gage Ave.
Bell Gardens, CA 90201
DEWANE, DENNIS
P.O. Box 91
Moose Pass, AK 99631
DIAMOND LAKE GRAVEL
Everett R. Brown
P.O. Box 520563
Big Lake, AK 99652
(gravel)
DINGMAN, CLIFFORD CARL
3401 Kachemak Cir.
Anchorage, AK 99515
DIONNE, PAUL HENRY
Wiseman, AK 99726
HILL, KENNETH EARL
2682 Gold Hill Rd.
Fairbanks, AK 99701

HODGES, RONALD D. & REGINALD D. KRIKOVICH
Box 557
Juneau, AK 99801

HOLLAND, HOWARD R.
P.O. Box 5587
Juneau, AK 99801

HOLLYWOOD ROAD SAND & GRAVEL
William E. & Grace T. Elkins
Saskia, AK 99987

HOMAN, RANDOLPH WILLIAM
Mile 260, Parks Hwy.
Healy, AK 99743

HOOGENDORN, HOMER E.
P.O. Box 84
Nome, AK 99762

HOPES MINING CO.
P.O. Box 101827
Anchorage, AK 99510

HOPF, ALF
Box 74246
Fairbanks, AK 99707

HORTHORER, ROBERT DALE
P.O. Box 97
Central, AK 99730

HOUSE, CONRAD H.
3911 Tilacon Way
SR Box 80384
North Pole, AK 99705

HOUSE, LEE & RUDY KRIZAK
General Delivery
Nome, AK 99762

HOWELL, FLOYD
12521 Hulse St.
Anchorage, AK 99515

HUBBARD, LLOYD DEWEY
General Delivery
Mat-Su Hot Springs, AK 99756

HUNT OIL CO.
1125 17th St., No. 2400
Denver, CO 80202

HUNTER MACHINE, INC. (3)
Gene A. Granath
Box 574
Keni, AK 99961

INTERIOR ALASKANA ASSOC.
Richard L. Laud
722 Bennet Rd.
Fairbanks, AK 99701

INTERIOR MINERALS INC. (2)
T. Vlamakis & Bawhorsky Homes
1656 Market
Fairbanks, AK 99701

IVY MINING CO. (2)
Joseph V. Strunka
Box 550
Fairbanks, AK 99707-0550

JKB MINING
Keith Higley
Box 8 Willow St.
Eagle River, AK 99577

J & J MINING
Jim Dale
3454 Edd Rd.
Fairbanks, AK 99705

JFM & ASSOC. (2)
John F. Malone
Box 1052
Bethel, AK 99559

J & S MINING (2)
Jesse G. Smith
Box 11
Cantwell, AK 99729

JACKSON, CHARLES T.
SR Box 2893GG
Wasilla, AK 99687

JAQUER, DARRIE S.
308 6th Ave.
Fairbanks, AK 99701

JENSEN, DANIEL D. (3)
Box 12
Deia Junction, AK 99737

JENSEN, ROBERT L.
Box 364
Nenana, AK 99760

JIM-MAR MINING VENTURES (2)
James Luhrs, Jr. & Mark Dejong
3333 Lake Shore Dr., No. 8
Anchorage, AK 99503

JOHNSON, BELL EUGENE
Box 9154
Fairbanks, AK 99706

JOHNSON MINING
Brian C. Johnson
Box 104
Central, AK 99730

JONES & CO. (2)
West Deering Jones
430 East 4th Ave.
Anchorage, AK 99504

JONES, MURRAY
4300 East 4th Ave.
Anchorage, AK 99504

JORGENSON, MARK TORR
2332 Cordes Way
Fairbanks, AK 99701

JULIAN CREEK MINING (3)
Richard C. Wilmarth
Red Devil, AK 99766

JUNEAU MINING CO., INC.
Rollin J. Peters
Box 1006
Juneau, AK 99802

JUNG, HENRY
P.O. Box 506
Bethel, AK 99559

K & K MINING CO.
Keith R. Mitchell
4800 Alpha Cir.
Anchorage, AK 99516

KLK, INC.
SRB Box 9070
Palmer, AK 99645

KACHEMAK MINING CORP. (2)
Robert C. Busby
SRB Box 50-D
Homer, AK 99603

KALBERGER, PETER (2)
Box 1067
Willow, AK 99688

KANTISHNA MINES, LTD.
Lawrence Anthony
2020 Lake Otis Pkwy.
Anchorage, AK 99504

(2)

KANTISHNA MINING CO.
Leonard Knapp
Box 100466
Anchorage, AK 99510

KELLER, MAURICE (2)
Box 216
Nome, AK 99762

KELLY, TIMOTHY J. & FRED ERIKSON
116 H St.
Anchorage, AK 99501

KENDRICK RAY MINING CO.
(c/o Standard Metals Corp.
445 5th Ave.
New York, NY 10022

(uranium exploration)

KENNECOTT CORP. (3)
Brian K. Jones
1111 East Dowling Rd.
Anchorage, AK 99502

KILE, ALVIN L. & ERICA E.
Box 8424
Anchorage, AK 99508

KIMBALL, JAMES ROBERT
2440 South Fairway Dr.
Coeur D'Alene, ID 83814

KIMSHAN CORP.
234 Seward St.
Juneau, AK 99302

KINARD, DON
Box 60702
Fairbanks, AK 99706

KINTBLADE, STANLEY JOE
General Delivery
Central, AK 99730

KNOWLTON, CLIFFORD E.
SR Box 20393
11 Mile Steese Hwy.
Fairbanks, AK 99701

KOITZSCH, BILL LEE
645 Crazy Horse Way
Fairbanks, AK 99701

KOhots, DOROTHY NORMA
P.O. Box 137
Kottne, AK 99752

KRAGER, WILLIAM R. (2)
3612 Northpoint Dr.
Anchorage, AK 99515

KRAH. WILLIAM R. (2)
3612 Northpoint Dr.
Anchorage, AK 99515
McGrath.

ROSANDER MINING CO
Ronald Rosander
Box 129
McGrath, AK 99927

ROSS, EDWARD T.
Box 61017
Fairbanks, AK 99706

ROUGHTOP MINING CO., INC.
Albert M. Hagen
General Delivery
Manley Hot Springs, AK 99756

ROYANN MINING (2)
Edward R. Stagert
SR Box 70241
Fairbanks, AK 99706

RUBEL, JOHN D. (2)
8183 Richardson Hwy.
North Pole, AK 99705

RUBBY MINING CO. (2)
Al Kangas
Box 1
North Pole, AK 99705

SAM 2 MINING
Michael Allen Sweetser
Box 28
Ruby, AK 99768

SACKETT, LLOYD
10 Mile Fishhook Willow Rd.
Eagle, AK 99964

SALTER ASSOC.
Edward Salter
General Delivery
Manley Hot Springs, AK 99756

SAUNDERS, DONALD
2831 Baxter, No. 20
Anchorage, AK 99504

SAVAGE, DWAYNE
P.O. Box 10613
Fairbanks, AK 99710

SAVAGE MINING
Floyd D. Savage
Box 10611
Fairbanks, AK 99710

SAYERS, PHILIP & PAUL
Box 10
Homer, AK 99903

SCHENNE, EARL L.
Box 60
Chickaloon, AK 99732

SCHIMMEL, PATRICK E. & MARIE C. MEAD
Battles Field
Wiseman, AK 99726

SCHROCK, ARTHUR J.
P.O. Box 343
Nenana, AK 99760

SCHNABEL LUMBER & MINING CO. (2)
John Joseph Schnabel
Box 149
Haines, AK 99827

SCHURR, JOHN
10 Mile Fishhook Willow Rd.
Clear, AK 99703

SCYMANSKI, PETE & TOM WILLIAMS
SK 3, Box 3904
Prospect, AK 99753

SELF, MARVIN D.
P.O. Box 728
Cooper Landing, AK 99972

SEPA MINING CO. (2)
Sidney R. Reed
3100 Seawind Dr.
Anchorage, AK 99516

SEWARD PENINSULA MINING CO.
Edwin L. Hatch
Box 1801
Nome, AK 99762

SHEER, SHAWN
4935 Dartmouth
Fairbanks, AK 99701

SHEPHERD, RICHARD D.
P.O. Box 6-304
Anchorage, AK 99502

SHOPP, HAROLD W.
300 2nd Ave.
Fairbanks, AK 99701

SILENT ISLAND MINING (2)
Adam Armanik
Box 95
Togiak, AK 99976

SILVER STAR MINING CO.
Melvin N. Barry
223 West Harvard Dr.
Anchorage, AK 99501
(jode silver, zinc, copper, antimony)

SIMONSON, RALPH E. & MICHAEL A. SHORT (2)
P.O. Box 608
Eglin, OK 97827

SINCLAIR, DANNY J.
P.O. Box 12
Homer, AK 99605

SIPES, JOHN
Box 55254
North Pole, AK 99705

SMITH BENCH MINING PARTNERS, LTD.
2165 5th St. NW.
Grand Rapids, MI 49544

SMITH, PHILIP N. (2)
356 Louise Ln.
Fairbanks, AK 99701

SMITH, RONALD E.
P.O. Box 1801
Anchorage, AK 99516

SMITH, DONALD
531 West 4th Ave.
Anchorage, AK 99501

SMITH, STEVEN
2840 East 142nd St.
Hartnell, CA 95310

SPADE, MARVIN D.
P.O. Box 1801
Anchorage, AK 99516

SPARK, MICHAEL D.
P.O. Box 56
Delta Junction, AK 99737

SPARKS, DAVID (2)
P.O. Box 12
Haines, AK 99827

SPEARSTRA, HARRY FRED & JEAN D.
P.O. Box 186
Glennallen, AK 99588

SPENCER, DORAN J.
Box 74351
Fagwanks, AK 99707

SPRINTLE, DAVID L. & DELIGHT
8123 Hartnell Rd.
Anchorage, AK 99503

SPRUCE CREEK MINING CO.
John Joseph O'Carroll
Ophir
McGrath, AK 99627

STERNE, RICHARD
531 West 4th Ave.
Anchorage, AK 99501

STEWART, HERNET IVAN
531 West 4th Ave.
Anchorage, AK 99501

STEWART, HERNET IVAN
2840 East 142nd St.
Hartnell, CA 95310

STEWART, JACK J.
2420 Jack Warren Rd.
Delta Junction, AK 99737

STICKMAN, DONALD J. & SONS & DAUGHTERS (2)
Box 114
Galena, AK 99741
(jode gold, silver)

STEWELL, CHARLES WARNER
308 Haines Ave.
Fairbanks, AK 99701

STILL, ROBERT T.
5838 Rowan St.
Anchorage, AK 99507

STRICKLER, WILLIAM R. & GEORGE R.
16730 Stoneridge Rd.
Anchorage, AK 99515

STUBBLEFIELD, Y.R.
Box 10615
Soldotna, AK 99669
WARNER, DAREN H.
SR 4, Box 4
Franklin, WV 26060

WASILLA AGGREGATE, INC.
Dave Smith
Box 110
Wasilla, AK 99687
(sand, gravel)

WATERFIELD, HENRY W.
P.O. Box 41A
Anchorage, AK 99509

WATTS, DONALD L. (1)
P.O. Box 8115
College, AK 99708

WAYSON, MARK N.
1148 Sunset Dr.
Fairbanks, AK 99701

WEAVER, VERNON
General Delivery
Chicken, AK 99732

WENTZ, JAMES GARY &
JOHN BRUCE (2)
4048 Tea Ave.
Fairbanks, AK 99701

WESCOTT, ANDREW G.
1132 Lakeway Terrace
Fairbanks, AK 99701

WESTERN CONSTRUCTION &
MINING
P.O. Box 5604
North Pole, AK 99705

WESTLAKE, LAWRENCE
Kiana, AK 99749

WEST'S SAND & GRAVEL
William W. West
SRB Box 7672
Palmer, AK 99645
(sand, gravel)

WHEELER, JAMES P.
6801 Mink Ave.
Anchorage, AK 99504

WHEELOCK, HAROLD L. &
JIM A. GRUBB (2)
Box 5544
North Pole, AK 99705

WHITE, HARRY ORR &
CARL F. THOMAS
Box 671404
Chugiak, AK 99567

WHITE MINING CO. (2)
Michael F. White
P.O. Box 2744
Fairbanks, AK 99707

WIECHKY, DANIEL MATTHEW &
JIM MINSELL
Box 81159
College, AK 99708

WILDE, JAMES
P.O. Box 503
Fairbanks, AK 99707

WILKES, FRED
1013 East Dimond Blvd.
Anchorage, AK 99515

WILKINSON, FRED D. (5)
P.O. Box 2702
Fairbanks, AK 99707

WILLIAMS, BILL R.
P.O. Box 10324
Fairbanks, AK 99709

WILLIAMS, BILL R.
P.O. Box 10324
Fairbanks, AK 99709

WILLIAMS, BILL R.
P.O. Box 10324
Fairbanks, AK 99709

WILLIAMS, RUSSEL H.
P.O. Box 1505
Fairbanks, AK 99707

WILLIAMS, W.A. & ANN J.
Flat, AK 99784

WILMOTH, MICHAEL ROBERT
821 N St., No. 202
Anchorage, AK 99501

WILSON, DONALD LEWIS
General Delivery
Bettles, AK 99726

WILSON, HARRY H. (2)
P.O. Box 47
Chicken, AK 99732

WINDFALL GOLD MINING CORP.
P.O. Box 1958
Nome, AK 99762

WINDY CREEK TIMBERLINE
MINING
Roy J. Tangy
P.O. Box 231
Copper Center, AK 99773

WITHROW, ALFRED L.
General Delivery
Bettles, AK 99726

WOLF, ROBERT V.
General Delivery
Bettles, AK 99726

WOLFKER, ROBERT
General Delivery
Bettles, AK 99726

WOLVERINE MINING CO.
2410 East Tudor Rd., No. 288
Anchorage, AK 99507

WOODS, FERREL L.
P.O. Box 81419
College, AK 99708

WORD, J.B.
SR 1, Box 83
Iredell, TX 76649

WREDE, RON
P.O. Box 71
Central, AK 99730

WRIGHT, BERNARD D. &
BETTY D.
137 Gold Rush Estates
Fairbanks, AK 99701

WRIGHT P.M., INC.
P.O. Box 60793
Fairbanks, AK 99706

WYLIE, JAMES R.
P.O. Box 208
Aptos, CA 95001-0208

WYRICK, L.F. & MARILYN
General Delivery
Red Devil, AK 99656

YATSKO, THOMAS DANIEL (3)
732 23rd Ave., No. 2
Fairbanks, AK 99701

YOUNG, ROBERT V. (2)
P.O. Box 211
Talkeetna, AK 99676

YUKON MINING CO., INC. (2)
Phillip J. & Joe S. Ramstad
P.O. Box 101454
Anchorage, AK 99510

YUKON MINING CO. OF
ALASKA (2)
Ken Manning & George Seuffert, Jr.
P.O. Box 80325
Fairbanks, AK 99708

ZIMMER, GEORGE W. (2)
200 East 3rd, No. 18E
Anchorage, AK 99501

ZIMMERMAN, JOSEPH DWIGHT
General Delivery
Manley Hot Springs, AK 99756
### APPENDIX E


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<th>Year</th>
<th>Gold (oz)</th>
<th>Silver (oz)</th>
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<th>Lead (lb)</th>
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### APPENDIX F

Production of industrial minerals, coal, and other commodities in Alaska, 1880-1985.\(^1\)

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal (s. tons)</th>
<th>Sand and gravel (s. tons)</th>
<th>Building stone(^2) (s. tons)</th>
<th>Barite (s. tons)</th>
<th>Other(^3) (dollars)</th>
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<tr>
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<td>(md)</td>
<td>(md)</td>
<td>(md)</td>
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<td>(dollars)</td>
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<td>700</td>
<td>0.01</td>
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1 References are listed in DGGIS Public-data File 86-19. Production histories for most commodities are summarized in Bundtzen (1982), Bundtzen and Smith (1982), and Bundtzen and others (1982).

2 Building-stone-production figures for 1880-1937 are for the southeasterAlaska and interior regions of Alaska only.

3 Includes 2.4 million lb U\(_3\)O\(_6\) (1955-71); 500,000 tons gypsum (1900-26); 266,000 lb WC\(_2\) (intermittently 1916-80); 84,000 lb asbestos (1942-44); 540,000 lb graphite (1917-38, and 1942-50); and undistributed amounts of zinc, jade, peat, clay, soapstone, miscellaneous gemstones, and other commodities (1880-1985).

4 When state (territorial) and federal figures differ significantly, state figures are used. Figures for sand-and-gravel production in 1974 show state estimates (318,749,864 s. tons; 249,344 md) and federal (42,019,660 s. tons; 38,886 md). The federal estimate was not added to total production.

5 Production not traceable by year.

6 Marble quarried on Prince of Wales Island, southeastern Alaska (1900-41).

\(W\) = Withheld.

\(-\) = Not reported.

\(\text{td} = \text{Thousand dollars.}\)

\(\text{md} = \text{Million dollars.}\)
<table>
<thead>
<tr>
<th>Year</th>
<th>Coal (s. tons)</th>
<th>Sand and gravel (s. tons)</th>
<th>Building stone² (s. tons)</th>
<th>Barite (s. tons)</th>
<th>Other³ (dollars)</th>
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① Sand and gravel (5. tons) (mtl) ② Building stone (s. tons) ③ Other (dollars) ④ Barite (s. tons) (td) ⑤ Other


Lower left - Clynt Nauman (Exploration Manager, Resource Associates of Alaska) works on a geologic map at the Delta project base camp. Photograph by Bruce Forster, courtesy of Norco Minerals Company, 1985.

Lower right - Unit-train emerges from loading facility at the Usibelli Coal Mine, Healy, Alaska. Photograph by Malcolm Roberts, 1984.