STATE OF ALASKA

William A. Egan - Governor

Department of Natural Resources

Phil R. Holdsworth - Commissioner

DIVISION OF MINES AND MINERALS

James A. Williams, Director

REPORT FOR THE YEAR 1962

Juneau, Alaska

Mr. Phil R. Holdsworth, Commissioner
Department of Natural Resources
Juneau, Alaska

Sir:

I have the honor to transmit herewith the Annual Report of the Division of Mines and Minerals for the year ending December 31, 1962. In this report the activities and accomplishments of the Division of Mines and Minerals are outlined. Summaries of mineral production, exploration, and developments, and data in other fields over which this Division exercises supervision are included. Geological reports are also included for permanent record of investigations of properties and areas.

Respectfully submitted,

James A. Williams

James A. Williams, Director
Division of Mines and Minerals
Box 1391, Juneau, Alaska
December 31, 1962

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December 31, 1962

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Center Piece: Better-Known Mineral Deposits, Petroleum Privinces, and Existing Roads

Foreward

Alaska is good ore-hunting country for the company or prospecting syndicate with up-to-date methods and good financial backing. In an area as large and as widely mineralized as this huge State, it is not reasonable to believe that all the major economic mineral deposits have been found. Dr. Thomas Nolan, Director of the U. S. Geological Survey, has estimated that in the U. S. at least three times as many ore deposits lie hidden as have been found thus far. The ratio is undoubtedly higher in Alaska, for Alaska occupies the same geological belt as the western states, but is more heavily covered with vegetation and alluvial materials. One publication referred to Alaska as a gigantic geologic punchboard, but said also that there are an unknown number of substantial winning numbers.

With constantly improving methods of finding ore deposits, the rate of discoveries depends on the rate and intensity at which favorable regions are covered by effective prospecting methods. The rate of effective prospecting depends on several factors, among which are markets, transportation, international conditions, local economics, business and political climate, tax levels, and other means by which this State can facilitate exploration.

Alaska's petroleum industry has given the State a large economic boost within the last few years. Mining could and should be playing a similar part in our economy. Needed are incentives to encourage the search for hardrock materials. Those concerned with Alaska resource development should be considering ways and means of encouraging prospectors and prospecting companies and of promoting economic conditions which will allow profitable production of new and old discoveries alike.

James A. Williams

Introduction

The Division of Mines and Minerals is dedicated to greater development and utilization of Alaska's mineral resources, including hardrock, nonmetallic, coal, and petroleum products. Alaska's need for basic industry is extreme, and as pointed out on the foregoing page, mining could and should be fulfilling a fair share of that need. This report is intended to help create interest in Alaska's minerals by disseminating information on the present status of the mineral industries, the possibilities of further developments, and the activities of the Division of Mines and Minerals in its efforts to assist and encourage new mineral developments.

As pointed out in the A.D. Little report, more basic information is needed on Alaska's mineral resources. The DM&M is the only State agency doing the field work necessary to obtain this basic information. It is apparent that the Division can most effectively encourage new mining industry by increasing its activity of gathering and interpreting data and issuing reports designed to aid in the exploration and discovery of new deposits. This in turn requires more money and time spent in the field by competant technical men investigating in detail areas or districts of known mineralization. A start in this direction has been made by the addition of a small geology branch which has begun to make detailed studies of mineral districts. A planned program of collecting oil well samples and making them available for detailed study (after 2 years of confidentiality) to the petroleum industry will be of definite value in accelerating petroleum developments.

The DM&M aims to assist the mining and petroleum industries by means of technical support in carefully selected ways that will be most useful and at the same time not involve unjustified expenditures of State funds. Any comments on present or possible programs that will help us achieve this aim will be welcome.

THE MINING INDUSTRY

Precious Metals

General interest in gold mining and acquisition of gold properties was on a definite increase during the year, and of further interest is the fact that placer gold production showed an increase.

Lode gold mining again consisted mainly of very small scale hand operations and development work. The Little Squaw Mining Company built seven miles of road, bulldozed about 3,000 feet of trenches, and extended their underground works 950 feet on the Mikado Lode in the Chandalar District. This was primarily done as a result of obtaining an OME participating loan. Additional gold-quartz ore was exposed. Tury Anderson mined and milled gold, silver and lead ore from the Silvertone group of claims near Fox. There were about 10 gold lodes being prospected in various regions of the State.

Although placer mining recovery increased during the year, the size and number of operations remained about the same as in 1961. The U.S.S.R.& M. Co. ceased dredging in the Nome area at the close of the season, and indicated that the Fairbanks dredges would also be finished this coming season. Its Hog River and Chicken dredges will continue to dig for several more years.

There were approximately 500 men employed in placer mining or placer mine development. Many of those included in the above figure worked their claims part time only, either as a side line or to complete the assessment work requirements.

The Goodnews Bay Mining Co. operated its eight-foot dredge the full season and processed approximately 1,000,000 cubic yards of gravel.

A few gold operations noted during the season were as follows:

New York-Alaska Gold Dredging Corporation ran its six-and-a-half foot dredge on the Tuluksak River in the lower Kuskokwim region.

John and George Miscovich operated their dredge near Flat. The Fullerton Brothers mined in the same area, using a dragline and an elevated sluice on rubber-tired wheels.

Ted Mathews was dredging on Coal Creek with a dredge constructed from two idle dredges. Coal Creek is a tributary to the upper Yukon.

Doug Colp dredged on Cleary Creek near Kiana in northwest Alaska.

Grant Nelson ran one dredge at Inmachuck on Seward Peninsula.

Joe and Jules Stuver sluiced on Moore Creek, tributary to the Takotna River.

Lee Brothers postponed their proposed tin dredging operation and continued to dredge gold near Solomon. Richard Lee reports the Solomon River operation is now finished.

Pat Bliss mined at Ungalik.

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF MINES AND MINERALS

REPORT FOR THE YEAR

1962

JUNEAU, ALASKA

Alluvial Golds, Inc., dredged again this year on Woodchopper Creek.

Carl Parker mined on Olive Creek in the Livengood District north of Fairbanks.

The U.S.S.R.& M. Co. ran two dredges in the Fairbanks area, two at Nome, one on the Hogatza River, and one on Mosquito Fork, tributary to the Fortymile.

Manny Olson was again mining actively on Fish Creek in the Fairbanks District.

Base Metals

Base Metal production was limited to the production of mercury from the Red Devil Mine. Lee Brothers are planning to mine placer tin on Cape Creek, Seward Peninsula, in 1963.

Radioactives

Bay West, Inc., produced 6,000 tons of high grade uranium ore from the Kendrick Bay Mine, Prince of Wales Island, southeastern Alaska. The company is hopeful that its allotment will be increased next year, for it could have easily produced a larger tonnage during the year past. A crew is diamond drilling through the winter in preparation for further production.

Nonmetallics

The Moa Brothers of Hyder produced about 1,000 pounds of high grade silica which was shipped to the Pacific Coast for analysis. Sand and gravel production declined somewhat from last year. The Corps of Engineers, U.S. Army, U.S. Bureau of Public Roads, and State Department of Highways were the principal producers.

Coal

Coal produced under military contracts this year amounted to 579,120 tons compared to 577,000 tons for the fiscal year 1961. Total coal production for the military and domestic market amounted to 830,000 tons or an increase of 12.6% over last year. Domestic coal is consumed mostly in Fairbanks. Military installations which use coal are Eielson AFB, Fort Wainwright and Clear, BMEWS installation near Fairbanks,and Elmendorf AFB and Fort Richardson near Anchorage.

The Usibelli Coal Co. received the largest single contract ever to be let in Alaska of 359,120 tons, and was planning a total production of 500,000 tons. Evan Jones Coal Company's contract amounted to 160,000 tons, and Mrak Coal Co. received a contract for 60,000 tons. The former is in the Healy River Coal Field and the latter two mines are in the Matanuska Field.

The Cripple Creek Coal Co. did not bid on a military contract in 1962. Arctic Coal Co. produced some coal on Lignite Creek. Fires and other circumstances have finally closed the original Suntrana mine, once the major producer of Alaska, and recently purchased by Usibelli as an addition to its other properties. These operations are all in the Healy River Field.

Castle Mountain Coal Co. (Paul Omlin) maintained a small production at the old Premier property on Moose Creek in the Matanuska Field.

A small production was also obtained from the Ed Reid mine near Donnely Dome south of Big Delta.

Mineral Production

Value of the 1962 mineral production in Alaska increased approximately 36 percent. Crude oil production increased 59 percent and now amounts to more than half of the State's entire mineral production. Gold production is estimated by the USBM to have increased 40 percent and replaced sand and gravel in third place. Coal production increased 11 percent. The undistributed production of platinum, uranium, stone, gems and copper increased as a result of increased uranium production.

Table I - Mineral Production in Alaska

	1961 Quantity	1961 Value (Thousands)	1962(1) Quantity	1962(1) Value (Thousands)
Coal------------thousand short tons	737	$ 5,868	830	$ 6,608
Gold-----------thousand troy ounces	114	3,998	160	5,600
Mercury-------------76 pound flasks	4,129	816	3,700	710
Natural Gas------million cubic feet	631	129	1,600	344
Petroleum, crude---thousand barrels	6,325	17,647	10,211	28,080
Sand & Gravel---thousand short tons	5,241	4,185	5,000	3,497
Silver---------thousand troy ounces	18	17	25	26
Undistributed (2)------------------	-----	2,073	-----	2,397
Total------------------------	-----	$34,733	-----	$47,262

(1) All figures for 1962 except petroleum are preliminary and subject to revision.
(2) Undistributed includes gem stones, platinum group metals, uranium ore, clay and copper.

Note: Above statistics prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Division of Mines and Minerals, Department of Natural Resources, State of Alaska. Figures for coal, petroleum, natural gas, and undistributed commodities are presented on authority of the Division of Mines and Minerals only.

Figure 1 and Table II indicate an estimated gold production increase during the year. This was apparently caused by better values per cubic yard being recovered. It is anticipated, however, that gold production this coming year will reach its lowest level since the war years. This forecast is made because the largest producer, the U.S.S.R.& M. Co., closed its Nome operation completely at the close of 1962, and will further curtail dredging in the Fairbanks District during 1963. In the event a realistic value for gold is obtained, this trend will be reversed.

The value of mercury also declined as a result of further limited production by the Red Devil Mine and lower market value.

Figure 1 - Annual Value All Mineral Production - Alaska 1880 - 1962

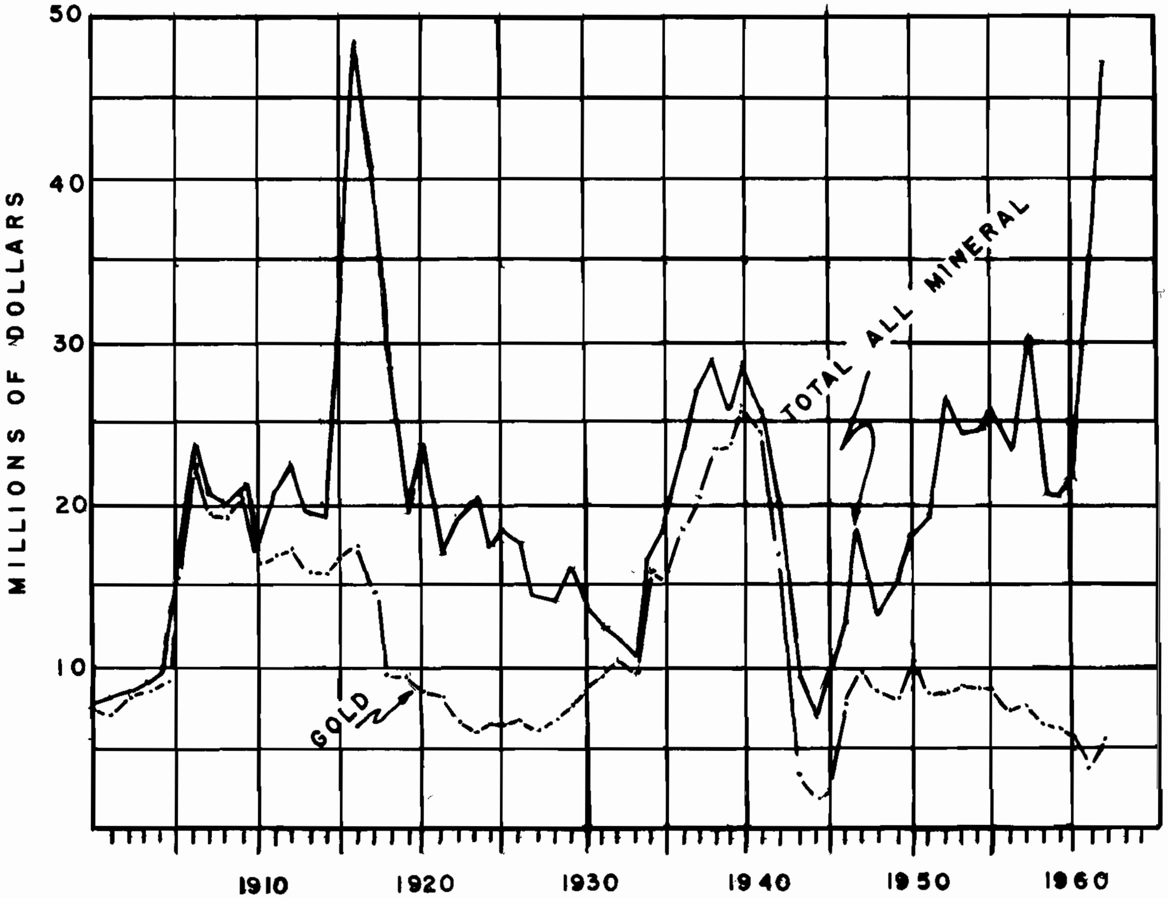


Table II - Production Major Commodities
Dollar Value (Thousands)

Year	Gold	Mercury	Coal	Oil and Gas	Sand and Gravel
1950	$10,125	$	$ 3,033	$	$ 2,377
1951	8,387		3,767		3,538
1952	8,420	6	5,779		8,651
1953	8,882	8	8,452		5,080
1954	8,699	277	6,442		6,302
1955	8,725	12	5,759		8,242
1956	7,325	853	6,374		5,880
1957	7,541	1,349	7,296		8,799
1958	6,525	774	6,931		3,871
1959	6,262	851	6,869	311	5,265
1960	5,887	940	6,318	1,496	5,483
1961	3,998	816	5,868	17,776	4,185
1962	5,600	710	6,608	28,424	3,497
	$96,376	$6,596	$79,496	$48,007	$71,170

The increase in coal production of 12.6% apparently was mainly a result of increased domestic demand in the Fairbanks area. This conclusion is based on the fact that military contracts increased only 3.7% over 1962.

Petroleum and natural gas production increased the anticipated 50 percent. However, unless additional transportation facilities are added, new fields are brought into production, or the Standard Oil Refinery now under construction indirectly increases delivery, production for the coming year will not increase so spectacularly.

Prospecting and Exploration

Mining exploration in the State decreased during 1962. It is estimated that $1,300,000 was spent in exploration and prospecting during the year exclusive of expenditures by the petroleum industry. This is a decrease of about $400,000 from the previous year. The most noteworthy result of this development was the estimated tonnage of Kennicott's Ruby Creek deposit which was reportedly increased to over 100,000,000 tons of copper ore. The Little Squaw Mining Co. also increased its estimated tonnage of gold ore in the Chandalar. Columbia Iron increased its knowledge and reserves of coal in the Beluga Lake area. Other companies and individuals were also busily prospecting on State coal prospecting permits in the Beluga Field. Beryllium was found on the Seward Peninsula by the USGS, and several individuals and companies were staking claims and prospecting the area.

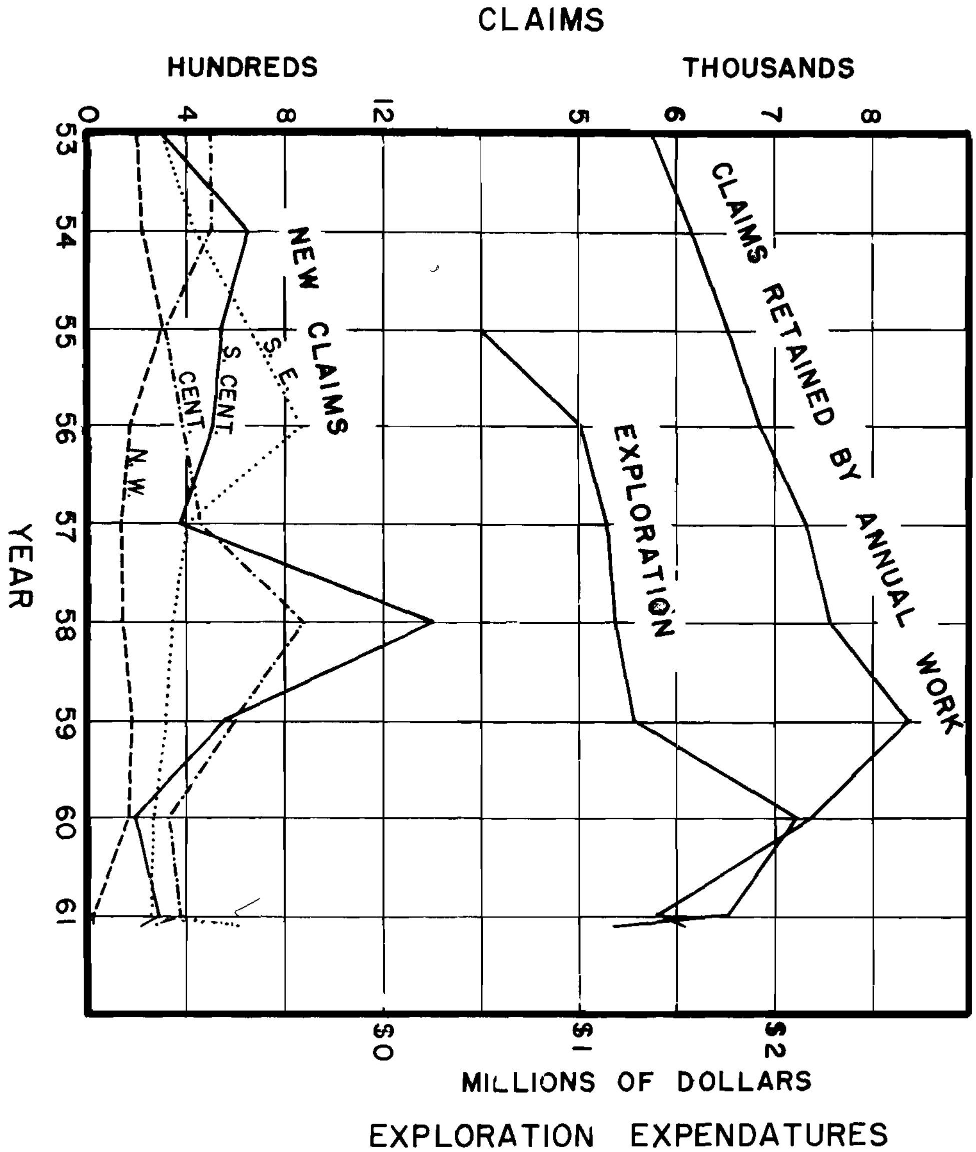
Newmont Mining Co. continued work on a large nickel prospect in Southeast Alaska and did exploratory work on a nickel-mineralized area near Rainbow Mountain on the Richardson Highway. The prospecting syndicate of Moneta Porcupine Ltd., Sunshine Mining Co., and others carried out a bulldozer and geochemical exploration project in the Kantishna District. Deep drilling and geophysical work were performed in the McCarthy country.

Additional nickel mineralization was discovered in the Rainbow Mountain area by University of Alaska geologists working on a cooperative U of A-DM&M economic geologic mapping program financed by the Division of Mines and Minerals. The new find was promptly staked by prospectors.

A Canadian group optioned nickel claims on Spirit Mountain in the Copper River region. Dynamics, Inc. were busily prospecting the placer potential of Slate Creek in the Chistochina District with two new-type drills (trade name Klam) which excavate down to depths of 100 feet by means of a small clam shell on the end of a boom. Leonard Grothe and Tom Pearson (owners of the former U.S. Tin Corp. Lost River lode tin mine) prospected for tin and beryllium in the Lost River area. Iron sand possibilities in the area of McArthur River on the northwest side of Cook Inlet were thoroughly investigated by a helicopter prospecting party. The Hayes Glacier molybdenum prospect received little attention during 1962, but is still considered by some to be a favorable showing.

The U.S. Geological Survey spent nearly $3,000,000 in Alaska during 1962. The Survey maintains offices in Anchorage, Palmer, Fairbanks, and Juneau. The Fairbanks office, at 520 Illinois Street, sells maps and map-related publications of Alaska by mail and over the counter. The office also supplies maps to the three other Survey offices which distribute over the counter but not by mail. The USGS during the year carried on its topographic mapping program; water resource investigations including streamflow measurements; conservation supervision of

Figure 2 - Barometer of Exploration Activity



fuels including oil, gas, and coal; and about 19 various geological investigations and geological mapping programs.

The USGS announced two discoveries of beryllium in the Lost River area on the Seward Peninsula during 1962. Both of these announcements resulted in an increase of exploration and claim staking. They also announced the finding of mercury and antimony, though not of commercial grade, in the Holy Cross Quadrangle on Little Lockwood Creek.

The U.S. Bureau of Mines spent approximately $400,000 in mineral investigations, benefication studies, coal mine safety inspections, and mineral resource activities. It investigated mines and mineral deposits in various parts of the State, including: Tracy Arm, Gypsum-Camel, Seward Peninsula, Kigluaik, Sinuk River, Kukpowruk, Sitkinak, White Mountain, Kantishna, Rainbow Mountain, Valdez Creek, and Dot Lake. Studies of economic factors affecting the mineral industry of Alaska were continued. Annual statistics on production were compiled in cooperation with the State Division of Mines and Minerals, and released to the public. Special mineral economic studies were prepared.

The Division of Mines and Minerals spent about $15,000 in mineral investigations and geological studies of ore deposits and prospects. This amount was spent as a result of the completion of the first full year of geological and geochemical investigation programmed by the Division. It does not include money spent for investigation of properties made at the request of miners and prospectors, which is an historical function of the Division.

During the year, a total of 1172 claims were staked as compared to 923 last year. Included were a total of 286 placer gold claims, 158 iron claims, 82 limestone claims, and 81 copper claims. The balance were claims for various other metallic and nonmetallic minerals. Affidavits of annual assessment for 6,133 claims were filed.

An interesting new development during the year was the rush of applications for hundreds of offshore prospecting permits. A total of 181 were granted. This was made possible by new State mining laws. Submerged lands out to the 3-mile limit are owned by the State. Arrangements by law and regulations were made for prospecting and mining such lands. The rush for these permits was apparently started when Shell Oil Co. applied for 5,120 acres off Nome. The permits will allow the prospector two years in which to determine if there are sufficient quantities of gold or other precious metals or minerals present to warrant mining. If minable deposits can be proven, production leases are awarded to the permit holders. Permits were granted along the Coast from Cape Prince of Wales to Shaktoolik, the Goodnews Bay area, Shelikof Strait, Cook Inlet, Lynn Canal, Stephens Passage, and various other isolated locations.

Shell Oil Co. completed large-scale marine investigations on its permit off the Nome beach. Milton Morgan, John Novak, and Fred Pankrantz drilled from the ice or used small suction outfits to prospect their areas, also in the vicinity of Nome. Fremont Mining Co. has been investigating various offshore possibilities and devising ways and means of offshore prospecting. To date there has been no reported exploration by permit holders in Southeastern Alaska.

A few of the more notable exploration programs in the various districts are tabulated as follows:

Southeastern

1. Utah Construction and Mining Co. - iron and copper drilling and mapping on the Mt. Andrew property on Kasaan Peninsula - 8 men.

2. Newmont Mining Co. - Brady Glacier nickel deposit - 6 men.

3. Columbia Iron Mining Co. - drilling iron deposit near Union Bay - 6 men.

4. Chicago-Alaska Mining Co. - Magnetometer and self-potential surveys at Brockway's Baker Peak copper prospect - 4 men.

5. W. S. Pekovich - development work at Funter Bay nickel deposit and the Snettisham iron deposit. A permit for investigation of the development of nearby Sweetheart Lake Hydro Project was granted by the Federal Power Commission.

Southcentral

1. Permanente Cement Co. - building road to its limestone deposit in Kings River area - 3 men.

2. Aage Hansen has been doing exploratory work in the Willow Creek district-1 man.

3. The Red Devil Mine is starting their exploration and development program under a contract with the OME - 10 men.

4. Spirit Mountain Mining Co. had 7 men on their property on Canyon Creek.

Northwest

1. Bear Creek Mining Co. again had a large crew diamond drilling the Ruby Creek copper deposit. They also had a small crew investigating their beryllium claims - 45 men.

2. Shell Oil Co. had a boat and crew doing geophysical work offshore of Nome - 14 men.

Central

1. Little Squaw Mining Co. developing their Chandalar property - 4 men.

2. Moneta Porcupine Mines, Ltd. - mineral investigation in the Kantishna district - 5 men.

3. I. W. Purkeypile and Associates prospected in the Tonzona district - 3 men.

4. Richard W. Rowe obtained OME assistance in developing Van Curlers Bar placer - 2 men.

Needs of the Industry

Gold

One of the most obvious necessities for an increase of mining in Alaska is a realistic gold price. Alaska would benefit more by an increase in the price of gold than the other states because of the large number of small placer mines that would again be profitable to work. This year has seen a great deal of effort exerted in Congress to alleviate the plight of the gold miner. S.J. Res. 44 was actively supported by industry and Congressional representatives of the western states. Public hearings were held at which time the bill was presented as a means of paying the miner a higher price for gold without influencing the monetary system. However, the Treasury Department held the opposite view, and a veto seemed likely if the bill were passed by Congress.

President Kennedy appointed a committee of business men to make a study of the balance of payment problem that has resulted in the depletion of this country's gold reserves. Our federal gold reserves are now below 16 billion dollars. This is insufficient to cover the 25% gold backing of the dollar and our foreign obligations.

During this period the price of gold on the free market increased to nearly $36, and gold shares rapidly increased in value. Speculation stopped abruptly when President Kennedy made his television broadcast via the Telstar satellite, and pledged himself against devaluing the dollar. As a result, the free market value of gold returned to normal, and nearly $16 million was lost by market speculators.

In September Senate Bill 3385 was introduced to create a Gold Procurement and Sales agency within the Department of Interior. This agency would supply the domestic market at an annually adjusted gold value, but continue to sell to the Treasury at $35 per fine ounce. The mining industry now appears to favor this approach.

The House Interior Committee this fall asked the Treasury Department to join with them in making a study of the gold supply and demand in the U.S. so that this information will be available for Congress. Domestic consumption in 1960 was 3 million ounces, and production was 1.6 million ounces. In 1961, domestic consumption and production dropped to 2.8 and 1.5 million ounces, respectively.

It is hoped that an increase in the price of gold will be as actively sought after this year in Congress and that the efforts will be rewarded since increased gold production in Alaska is urgently needed.

Multiple Use for Lands

The report of the Federally appointed Outdoor Recreation Review Commission was published in January of 1962. This very comprehensive report found that the majority of people wanted parks, roads, trails, and picnic grounds that were accessible by automobile and in the proximity of the metropolitan areas. The report also states that Alaska had at that time 31% of the lands in the National Park System, 65% of the Wildlife Refuge grounds and 11% of the National Forest acreage. It also pointed out that 64% of the public domain was found in Alaska. This however will decrease as the State selects more land.

It is apparent that the State is well endowed with recreational lands. It is therefore of utmost importance that the balance of the lands be maintained on a multiple use basis if there is to be a mineral industry developed in the State. As the economy of the world changes some of our known mineral deposits are becoming more competitive and will in the future become mines. However, other of our deposits are becoming less competitive as new discoveries are made in developing countries like Canada and Australia. If we are to develop a mineral industry now, we must find new deposits. These new deposits necessarily will be on either State or Federal lands, so free entry must prevail. On the other hand, the mining industry must make its operations compatible with other or more important desired uses of the lands. This definitely can be done with some effort.

Coal

Natural gas is now competing directly with coal from the Matanuska coal field. The city of Anchorage recently completed installation of a new gas turbine. A recent report made by the municipal Light & Power Department to the City Manager of Anchorage recommends the addition of another turbine in 1964 of 15,000 kilowatts. Additional power snould be generated either by gas or coal depending on firm bids of either fuel. The military also is considering conversion to gas. Military power plants in the Anchorage area consumed over 200,000 tons of coal this past year. This coal is purchased on annual bid, whereas gas suppliers may bid on a ten-year basis. The coal industry feels that if it is allowed to bid on a ten-year basis they could compete easily with gas producers. A three-year contract let by the Chugach Electric Association to Mrak Coal Co. calls for about 140,000 tons of coal over a three-year period at $7 per ton. This is $3 per ton less than was paid on a single year contract.

The Ralph M. Parsons Co. reviewed the power needs of Anchorage and Fairbanks this year, and again concluded that mine-mouth power plants at Healy and Sutton linked by high voltage transmission lines would be the most economical way of supplying the area with power.

Geology and Exploration

Another need of prospective mining enterprises in Alaska is more basic information on geology and mineral deposits than is now known or available. This is emphasized in the recommendations and conclusions of the portion of the A.D. Little report entitled Alaska's Mineral Resources as a Base for Industrial Development. This same report also points out that geological mapping to the scale of 1 inch=1 mile is a valuable tool to mining exploration operations and that there is far too little of it in Alaska. The only way that this needed basic information and detailed economic geology can be obtained is by sending good economic geologists into the field after it. Further discoveries and developments in Alaska definitely will depend mostly upon regional prospecting and exploration by well-financed companies with modern equipment and up-to-date knowhow. Since these companies are sending their geologists mostly to competing states and countries, the need in Alaska is for State and/or Federal geologists to provide the information to encourage exploration companies to carry on effective programs of prospecting and exploration in the hopes of developing mines.

THE PETROLEUM INDUSTRY

Development and Production

Swanson River Field

The Swanson River Field has completed its first year of full scale oil production. Oil production for 1962 totaled 10,259,110 barrels as compared to 6,326,501 barrels for 1961. It has joined the ranks of the 100 million (plus) barrels of oil reserve class, a distinction reserved for only an elite few of the oil fields in the United States. (See Oil and Gas Journal, January 28,1963 pages 168-171). Only 241 oil fields are listed to be of this size. There are even fewer fields producing more than ten million barrels per year (only 26.) None of these fields produce as much as Swanson River Field on a barrel per day per well basis. Oil production for 1962 averaged 560 barrels per day per well. Details of oil production are shown in Tables III and IV, and graphically in Figure 2. Figure 1 is a map of the field showing development to December 31, 1962.

Development - 1962

Seven oil wells and three gas wells were completed during 1962. These gas wells bring the total of six wells which will be used for the gas injection project initiated in November, 1962. Two development oil wells, SCU 21-8 and SRU 14-22 were drilling at the end of the year. Two more permits have been issued for further development oil wells. This may complete the development for some time, however, two field extension wells are presently being drilled. These are SRU 14-9, one mile to the northwest and SCU 22-32, located approximately four miles south of the field.

Producing Mechanism

To date the principal source of energy has been expansion of reservoir fluids. A limited water drive may be effective in some parts of the field. Reservoir withdrawals are closely watched and are on a reservoir volume basis, with adjustments made as warranted by periodic bottom hole pressure measurements.

Production Problems

These have been very few to date. Forty-eight of the wells are still flowing, two are on gas lift. Only nine of the wells produce more than 1% water and only one well produces as much as 50% water-cut. Total water production is less than 3% of gross production. The wells that do produce water are mostly low-capacity wells completed near the edge of the field and near the oil-water contact. Average produced gas-oil ratio is 180 cu. ft. per barrel which is approximately the solution ratio. No well produces at over 1,000 GOR. With the low temperature experienced during the winter months, some paraffin is deposited in the upper part of the tubing and oil gathering lines, especially on the low capacity wells. Some difficulty is experienced in treating the oil for BS&W since the produced water is relatively fresh (25,000 ppm chlorides). Heater treaters and a small amount of de-emulsifying chemical treat the oil to satisfy pipeline requirements. The produced salt water is disposed of in a shallow sand in a recompleted dry hole.

The produced oil is gathered to 8 separate tank batteries where the oil, gas, and water, if any, are separated. Individual well tests are performed at these batteries. Swanson River well production flows to the gathering stations through 3-inch tape-wrapped flow lines buried 3½ feet, at which depth production can be handled without pipeline heating. Flow lines and gathering lines are equipped with high-low pressure shut-down controls so that lease operators can shut in any group of wells from the trap inlet header. Special hot oil circulating connections are being used to provide for wax removal in gathering headers and separators. Gas metering facilities are housed to prevent freeze-ups.

The gas is dehydrated and sent to the gas injection plant where a small amount of natural gasoline is made and the gas pressured to 6,000 psi for injection. The oil is transferred to two LACT units, one for the Swanson River Unit and one for the Soldotna Creek Unit, which transfers the oil to the pipeline which takes the oil to Nikiski-Marine Terminal, 19 miles away.

During the past year a preventative remedial work program has been performed on most of the oil wells. This generally has consisted of killing the well with oil base mud, pulling tubing, scraping the casing, running the tubing back with a packer and gas lift valves, re-circulating the well with produced oil and putting back into production. Most of these jobs are performed in three or four days.

Gas Injection

The gas injection project was initiated during November, 1962, by conversion of one well, SCU 12-9. Another well, SCU 41-4, was added during December. Plans call for a total of 6 injection wells taking a total of 25 million cubic feet per day. Later, it may require up to 75 million feet per day.

All of the produced gas and the shallow gas wells in the field provide the injection gas. The gas is compressed by four 1,100 HP compressors to 6,500 psi. Up to seven stages of compression may be used.

This gas injection project may provide sufficient added energy to the undersaturated oil so that a major part of the oil production may be flowed without artificial lift.

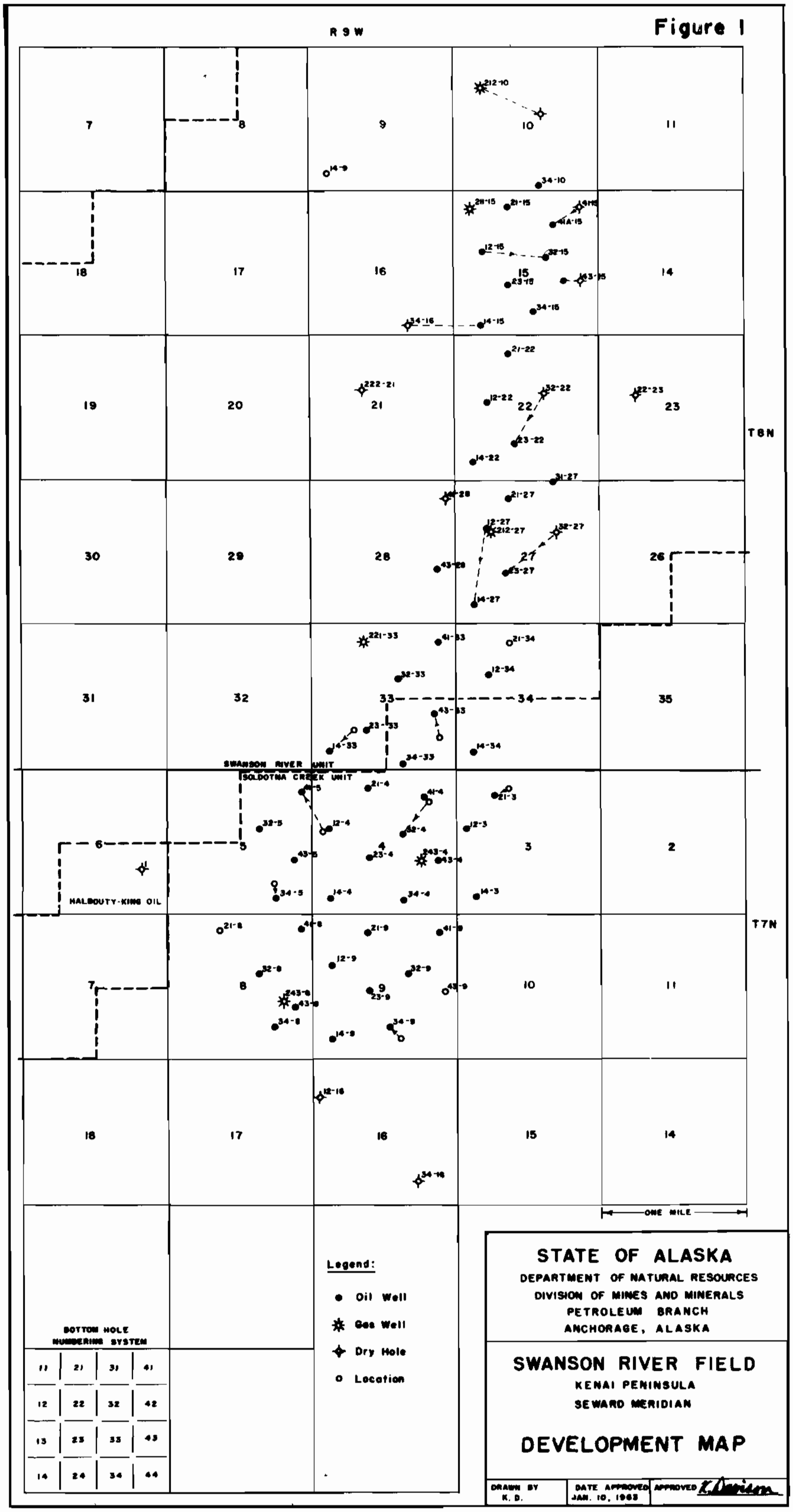


Figure I
R 9 W
T8N
T7N
SWANSON RIVER UNIT
SOLDOTNA CREEK UNIT
HALBOUTY-KING OIL
ONE MILE
Legend:
Oil Well
Gas Well
Dry Hole
Location
BOTTOM HOLE NUMBERING SYSTEM
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINERALS
PETROLEUM BRANCH
ANCHORAGE, ALASKA
SWANSON RIVER FIELD
KENAI PENINSULA
SEWARD MERIDIAN
DEVELOPMENT MAP
DRAWN BY K. D.
DATE APPROVED JAN. 10, 1963
APPROVED

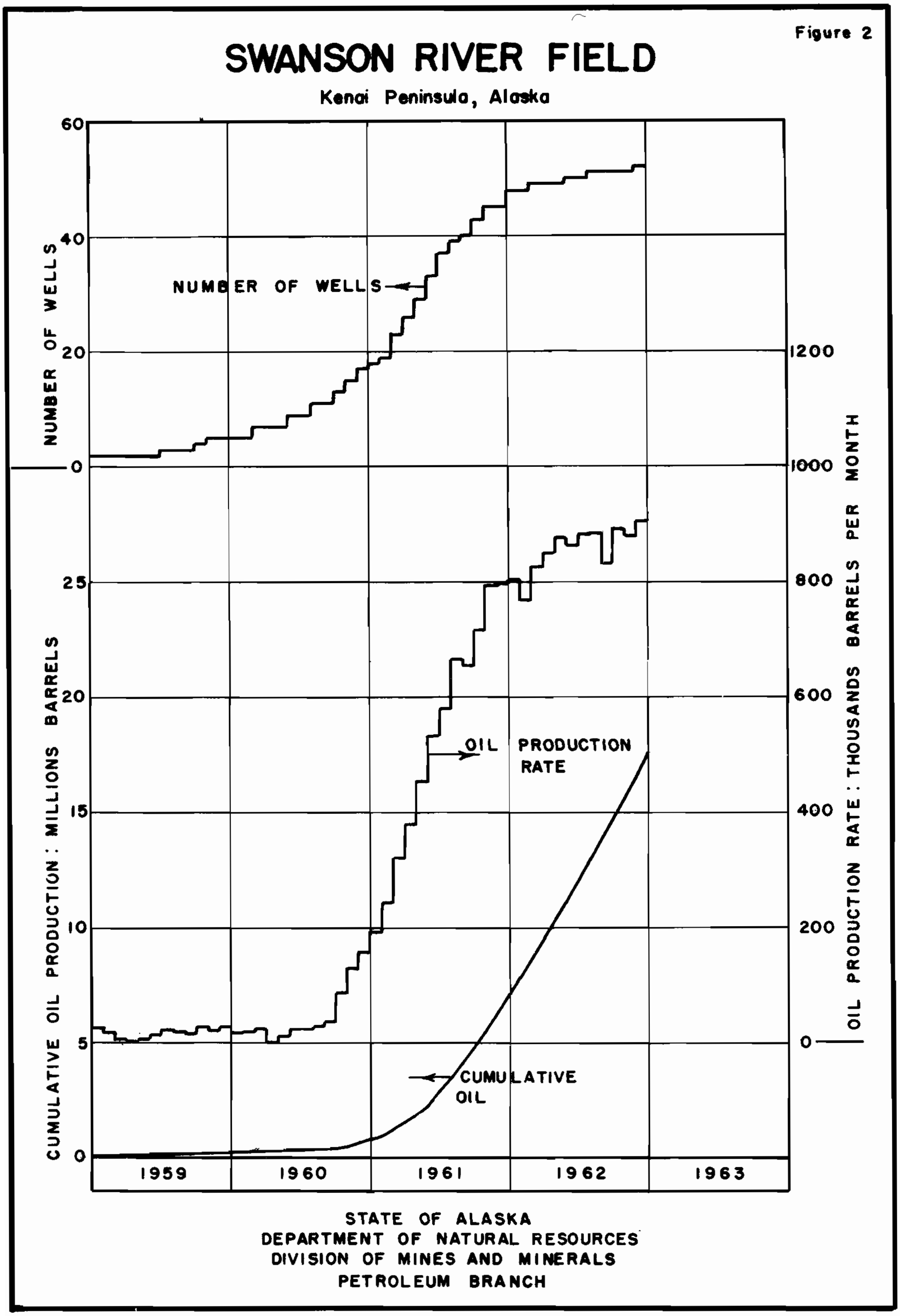


Figure 2
SWANSON RIVER FIELD
Kenai Peninsula, Alaska
NUMBER OF WELLS
60
40
20
0
NUMBER OF WELLS
CUMULATIVE OIL PRODUCTION : MILLIONS BARRELS
25
20
15
10
5
0
OIL PRODUCTION RATE : THOUSANDS BARRELS PER MONTH
1200
1000
800
600
400
200
0
OIL PRODUCTION RATE
CUMULATIVE OIL
1959
1960
1961
1962
1963
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINERALS
PETROLEUM BRANCH

Table III

Swanson River Field
Kenai Peninsula, Alaska
Oil Production by Months

Year	Month	Oil Prod. Month Bbls.	Oil Prod. Year Bbls.	Cumulative Oil Prod. Bbls.	Number of Wells
Oil Production Prior to 1959				35754	
1959	Jan.	25755			2
	Feb.	14874			2
	Mar.	2038			2
	Apr.	200			2
	May	4122			2
	June	16275			2
	July	20984			3
	Aug.	18470			3
	Sept.	16928			3
	Oct.	22294			4
	Nov.	20831			5
	Dec.	23819	186590	222344	5
1960	Jan.	18282			5
	Feb.	19662			5
	Mar.	23059			7
	Apr.	1227			7
	May	9790			7
	June	23062			9
	July	23684			9
	Aug.	27182			11
	Sept.	36933			11
	Oct.	88557			13
	Nov.	127113			15
	Dec.	159448	557999	780343	17
1961	Jan.	191601			18
	Feb.	242799			19
	Mar.	319593			23
	Apr.	378605			26
	May	456386			29
	June	531910			33
	July	578548			37
	Aug.	664326			39
	Sept.	654979			40
	Oct.	715466			43
	Nov.	795266			45
	Dec.	797422	6326501	7106844	45
1962	Jan.	808752			48
	Feb.	768203			48
	Mar.	824760			49
	Apr.	848253			49
	May	877642			49
	June	860969			50
	July	882674			50
	Aug.	883754			51
	Sept.	830246			51
	Oct.	890016			51
	Nov.	878220			51
	Dec.	905621	10,259,110	17,365,954	52

Table IV

Individual Well Oil Production Statistics
Swanson River Unit

Well No.	Comp. Date	Oil Prod. 1960 Bbls	Cumulative Oil Prod. 12-31-60	Oil Prod. 1961 Bbls	Cumulative Oil Prod. 12-31-61	Oil Prod. 1962 Bbls	Cumulative Oil Prod. 12-31-62
SRU 34-10*	10- 1-57	21264	124671	59933	184604	29227	213831
12-15	10- 5-60	21387	21387	34327	55714	45426	101140
14-15*	7-25-59	0	3235	7232	10567	3636	14203
21-15	6- 7-61			79545	79545	167236	246781
23-15	4- 5-61			107040	107040	146300	253340
32-15*	10-24-59	108308	122672	186776	309448	162708	472156
34-15	8- 4-61			66800	66800	123776	190576
43-15	11- 1-61			2675	2675	19182	21857
12-22	8-11-62					75395	75395
21-22	1- 3-62					135195	135195
23-22	3- 9-60	32581	32581	120145	152726	86685	239411
12-27*	11-30-59	62540	69823	183713	253536	164195	417731
14-27	6-14-60	6582	6582	238272	244854	312415	557269
21-27	5- 5-61			119571	119571	232324	351895
23-27	2- 5-61			98751	98751	66458	165209
31-27*	10-26-58	9231	103286	40032	143318	16666	159984
43-28	7-22-61			83914	83914	173245	257159
14-33	6-11-62					65473	65473
23-33	6-10-61			37452	37452	44818	82270
32-33	8-25-60	36655	36655	195087	231742	294175	525917
41-33	3-12-61			182225	182225	363453	545678
12-34	10-21-60			142787	142787	160764	303551
41-15A	12- 9-62					6646	6646
Totals SRU		298548	520892	1,986377	2,507269	2,895398	5,402667

* Produced Oil Prior to 1960 - Total 222,344

Table IV
cont.

Individual Well Oil Production Statistics
Soldotna Creek Unit

Well No.	Comp. Date	Oil Prod. 1960 Bbls	Cumulative Oil Prod. 12-31-60	Oil Prod. 1961 Bbls	Cumulative Oil Prod. 12-31-61	Oil Prod. 1962 Bbls	Cumulative Oil Prod. 12-31-62
SCU 12-3	3-23-61			201829	201829	241286	443115
14-3	8- 2-61			66962	66962	127862	194824
21-3	1-10-62					253580	253580
12-4	4- 8-61			206870	206870	315308	522178
14-4	8-13-60	83768	83768	305632	389400	406899	796299
21-4	11- 5-61			29605	29605	215841	245446
23-4	6- 1-61			175004	175004	370771	545781
32-4	6- 5-60	74003	74003	317492	391495	398596	790091
34-4	11-26-60			246747	246747	355595	602342
41-4	3-21-60	97543	97543	301962	399505	280253	679758
43-4	5-14-61			181890	181890	330931	512821
32-5	3-16-62					29846	29846
34-5	10- 9-61			30817	30817	262993	293810
41-5	9-20-61			41594	41594	116075	157669
43-5	5-28-61			91504	91504	127021	218525
32-8	3-22-61			130883	130883	194030	324913
34-8	1-28-62					76666	76666
41-8	7-14-61			119506	119506	355493	474999
43-8	7-24-61			161965	161965	154901	316866
12-9	10- 9-60			275247	275247	236586	511833
14-9	12-26-60			181998	181998	195332	377330
21-9	7-19-61			137997	137997	353681	491676
23-9	7-17-61			115333	115333	331927	447260
32-9	1-16-61			185766	185766	282033	467799
34-9	11- 8-61			26014	26014	194171	220185
41-9	6-11-61			118240	118240	260815	379055
34-33	11-12-60	4137	4137	281661	285798	243842	529640
43-33	3- 8-61			164602	164602	290258	454860
14-34	12-23-60			243004	243004	361114	604118
	Totals SCU	259451	259451	4,340124	4,599575	7,363712	11,963287
	Totals SRU	298548	520892	1,986377	2,507269	2,895398	5,402667
Field Totals-Year		557999		6,326501		10,259110	
Field Totals-Cumulative			780343		7,106844		17,365954

Swanson River Field
Kenai Peninsula, Alaska

Standard Oil Company of California, Western Operations, Inc., Operator

Location	T7N & 8N, R9W, Seward Meridian
Discovery Well	SRU 34-10
Discovery Date	August 24, 1957
Producing Formation - Oil	Hemlock Zone - 10150'-11700'
Gas	Kenai - 3000'- 5800'
Deepest Test	SRU 12-16 - 12,759'
Wells - Oil-Flowing	48
Gas Lift	2
Gas-Producing	2
Shut-in	4
Salt Water Disposal	1
Gas Injection	2
Production Data - 1962	
Oil Production	10,259,110 Barrels
Water Production	294,568 Barrels
Gas Production - with oil	1,866,276 MCF
Gas Production - gas wells	153,212 MCF
Accumulative Production 12-31-62	
Oil	17,365,954 Barrels
Water	498,196 Barrels
Gas - with oil	3,258,196 MCF
Gas - gas wells	153,212 MCF
Reservoir Data - Hemlock Zone	
Initial Reservoir Pressure	5650
Reservoir Pressure 12-31	4600-5250
Saturation Pressure	1000-1400
Oil Gravity	30°-38° API
Temperature	180°F
Net Pay Thickness	8'-300'
Porosity	18-26%
Permeability	0-3275 Mds.
Connate Water	40%
Formation Volume Factor	1.12
Gas-Oil Ratio	116-200 SCF/STB
Developed Area	4720 Acres

Price of Oil

Effective December 15, 1961 for Swanson River Field
Kenai Peninsula, Alaska

Gravity	Price per barrel
25-25.9 - degree	$2.41
26-26.9	2.49
27-27.9	2.56
28-28.9	2.62
29-29.9	2.68
30-30.9	2.74
31-31.9	2.80
32-32.9	2.86
33-33.9	2.92
34-34.9	2.98
35-35.9	3.04
36-36.9	3.09
37-37.9	3.14
38-38.9	3.19
39-39.9	3.24
40-40.9	3.29

Gas Production - 1962

The Kenai Gas Field produced 1,460 million cubic feet of gas during 1962, as compared to 231 million cubic feet during 1961. Gas sales during 1962 were made to Anchorage Natural Gas Company for electric power generation and sales for heating fuel.

The Sterling Gas Field produced 25 million cubic feet during the year. First production was during May. Gas sales are made to Consolidated Utilities, Ltd., which generated electric power for the City of Kenai and community.

The Swanson River Gas Field produced 153 million cubic feet during the last two months of 1962. All of this gas was used in the gas injection project for the oil zone of the field.

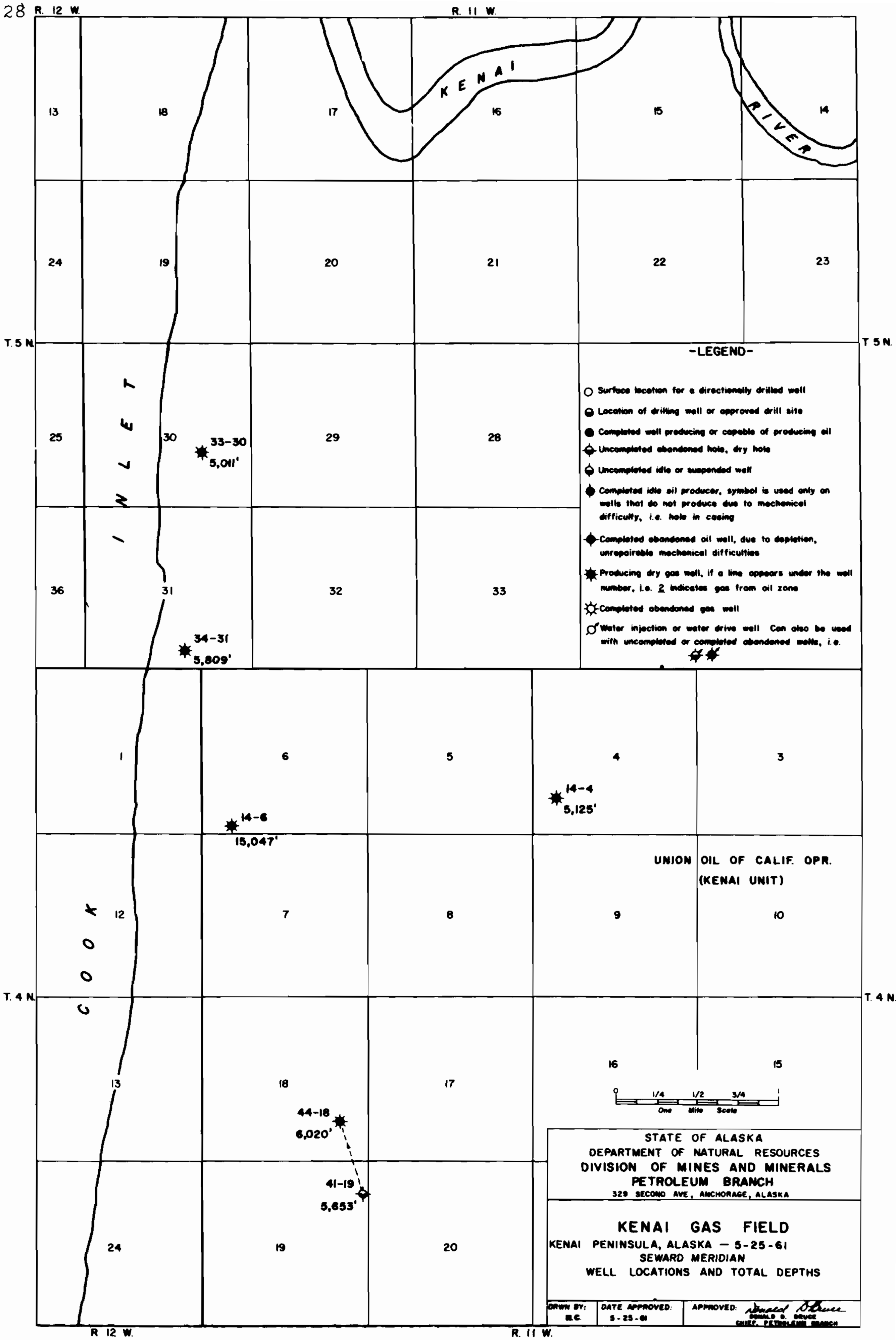
Kenai Gas Field
Kenai Peninsula, Alaska

Union Oil Company of California, Operator

Location	T4 & 5N, R11W & 12W, Seward Meridian
Discovery Well	Kenai Unit 14-6
Discovery Date	10-11-59
Producing Formation	Kenai 4240'-5728'
Deepest Test	14-6 - 15,047'
Wells	
Producing	3
Shut-in	2
Production Data - 1962	
Gas Production	1,459,819 MCF
Water Production	0
Accumulative Production Data 12-31-1962	
Gas Production	1,691,113
Water Production	0
Reservoir Data	
Initial Reservoir Pressure	1900 - 2400
Average Reservoir Pressure	
Gas Gravity	.556
Temperature	
Net Pay Thickness	9' - 135'
Porosity	15 - 35%
Permeability	350 - 3000 Mds.
Connate Water	18 - 35%
Developed Area	11,000 Acres

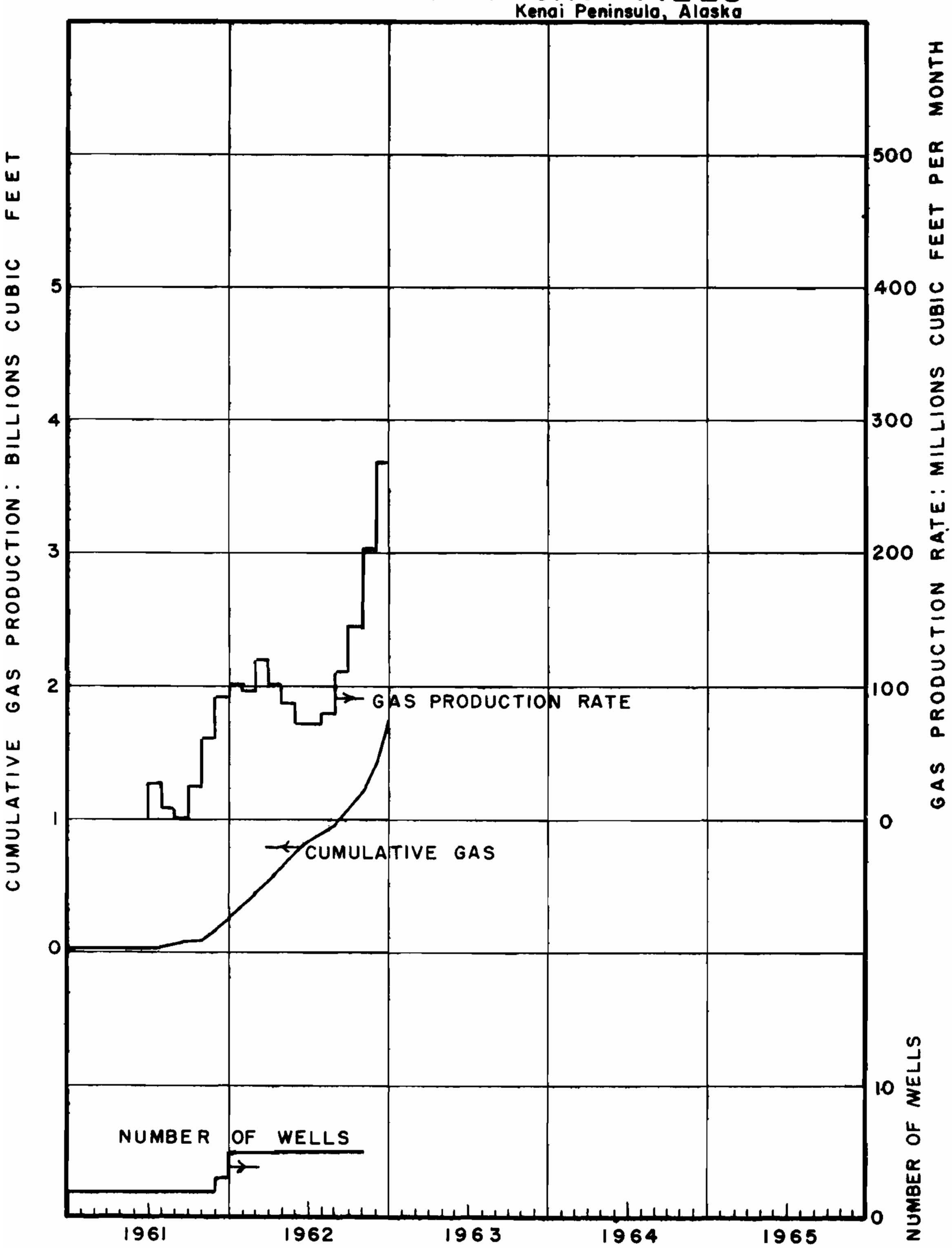
Production Statistics
Cumulative Production

Date	Wells Producing	Wells Shut in	Oil (Bbls)	Water (Bbls)	Gas MCF
1- 1-61	2	0	0	0	16,576
12-31-61	3	2	0	0	231,294
12-31-62	3	2	0	0	1,691,113


R. 12 W.
R. 11 W.
T. 5 N.
T. 4 N.
KENAI RIVER
COOK INLET
13
18
17
16
15
14
24
19
20
21
22
23
25
30
29
28
36
31
32
33
1
6
5
4
3
12
7
8
9
10
13
18
17
16
15
24
19
20
33-30
5,011'
34-31
5,809'
14-6
15,047'
14-4
5,125'
44-18
6,020'
41-19
5,853'
UNION OIL OF CALIF. OPR.
(KENAI UNIT)
-LEGEND-
Surface location for a directionally drilled well
Location of drilling well or approved drill site
Completed well producing or capable of producing oil
Uncompleted abandoned hole, dry hole
Uncompleted idle or suspended well
Completed idle oil producer, symbol is used only on wells that do not produce due to mechanical difficulty, i.e. hole in casing
Completed abandoned oil well, due to depletion, unrepairable mechanical difficulties
Producing dry gas well, if a line appears under the well number, i.e. 2 indicates gas from oil zone
Completed abandoned gas well
Water injection or water drive well. Can also be used with uncompleted or completed abandoned wells, i.e.
0
1/4
1/2
3/4
1
One Mile Scale
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINERALS
PETROLEUM BRANCH
329 SECOND AVE, ANCHORAGE, ALASKA
KENAI GAS FIELD
KENAI PENINSULA, ALASKA — 5-25-61
SEWARD MERIDIAN
WELL LOCATIONS AND TOTAL DEPTHS
DRWN BY: R.C.
DATE APPROVED: 5-25-61
APPROVED: Donald D. Bruce
DONALD D. BRUCE
CHIEF, PETROLEUM BRANCH

KENAI GAS FIELD

Kenai Peninsula, Alaska



STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINERALS
PETROLEUM BRANCH

Sterling Gas Field
Kenai Peninsula, Alaska

Union Oil Company of California, Operator

Location	Section 15, T5N, R10W, Seward Meridian
Discovery Well	23-15
Discovery Date	8-4-61
Producing Formation	Kenai 5250-54 (Perforations)
Deepest Test	23-15 - 14832'
Wells	
Currently being produced	
Flowing	1
Production Data 1962	
Gas Production	25,186 MCF
Water Production	0
Accumulative Production 12-31-62	
Gas Production	25,186 MCF
Water Production	0
Reservoir Data	
Initial Reservoir Pressure	
Average Reservoir Pressure	
Gas Gravity	.569
Temperature	
Net Pay Thickness	
Porosity	
Permeability	
Connate Water	
Developed Area	

Production Statistics
Cumulative Production
First Production May 1962

Date	Wells	Oil (Bbls)	Water (Bbls)	Gas MCF
12-31-62	1	0	0	25,186

Swanson River Field Injection Project

Injection Statistics
Cumulative Injection

Gas Injection started November, 1962

Date	Injection Wells	Cumulative Injection
12-31-62	2	252,160 MCF

Swanson River and Beluga River Field Development Wells Spudded and/or Completed - 1962

Well Number	¼ Sec.	Twp.	Rge.	M	Spud Date	Completion Date	TD	Feet Drilled 1962	Status 12-31-62
SCU- 34- 8	SE 8	7N	9W	S	11- 7-61	1-28-62	11,175	0	POW
SCU- 21- 3	NW 3	7N	9W	S	11- 9-61	1- 4-62	11,100	0	POW
SRU- 21-22	NW22	8N	9W	S	11-14-61	1- 3-62	11,012	0	POW
SCU- 32- 5	NE 5	7N	9W	S	1- 9-62	3-11-62	11,152	11,152	POW
SCU-243- 8	SE 8	7N	9W	S	2- 3-62	2-24-62	6,143	6,143	GSI
SRU-221-33	NW33	8N	9W	S	4-22-62	5- 6-62	3,805	3,805	GSI
SRU-211-15	NW11	8N	9W	S	3-17-62	4-12-62	5,709	5,709	GSI
SRU- 12-22	NW22	8N	9W	S	6-15-62	8-11-62	11,000	11,000	POW
SRU- 14-33	SW33	8N	9W	S	4-16-62	6-11-62	11,125	11,125	POW
SRU-41A-15	NE15	8N	9W	S	10- 5-62	12- 9-62	11,291	11,291	POW
						Redrill	3,986	3,986	
SCU- 21- 8	NW 8	7N	9W	S	12-16-62			6,550	Drlg.
SRU- 14-22	SW14	8N	9W	S	12-14-62			7,860	Drlg.
BRU-212-25	NW25	13N	10W	S	11-12-62	12-28-62	5,800	5,800	GSI
					Total Footage Drilled 1962			84,421	

Exploration Activity

A substantial increase has occurred in the oil and gas exploration effort during 1962. This growth is reflected statistically by a 47% increase in exploratory footage drilled, and an 18% increase in the months spent in the field by seismic crews.

The use of offshore drilling equipment for the first time in Alaskan waters, highlighted the year's exploration activity. Three offshore rigs operated in Cook Inlet during the ice free season with encouraging exploration results, despite operating conditions which are generally considered to be the most difficult in the world today.

It is of interest to note the effect of increased state ownership and responsibility in mineral lands as indicated by the fact that out of 27 exploratory wells drilled in 1962, 11 were bottomed under lands owned by the State of Alaska. No wells had been drilled on state owned lands previous to 1962.

The termination of large amounts of Federal oil and gas lease acreage in the Bethel Basin, and in the Kandik-Porcupine River area, for the most part accounted for the substantial decrease in the Federal oil and gas leaseholds in the State in 1962, despite a sharp upturn in Federal leasing on the North Arctic Slope east of the Naval Petroleum Reserve.

Oil and gas exploration in 1962 resulted in four gas discoveries and revealed encouraging subsurface geological information, which, coupled with heavy exploration commitments of approved development contracts, increased geophysical prospecting activity, and availability of new lease areas could accelerate next year's exploratory drilling to even higher levels.

Exploration activity in 1962 was divided among the following areas. (Also see well charts and summaries following narrative.)

Cook Inlet Area

The emergence of the Swanson River Oil Field as a giant oil field and the continued construction of transportation and refining facilities, resulted in a stimulation of exploration in the Cook Inlet Basin with the result that 2/3 of the exploratory wells and all of the development wells centered in this area.

All four of Alaska's 1962 gas discoveries were made in the Cook Inlet Basin and a massive effort is being made by the holders of Cook Inlet gas reserves to develop markets with particular emphasis on exporting this product to a world market in the liquified state. Commercial and residential use of natural gas continued to expand in the Anchorage and Kenai areas. Standard Oil Company of California set a new depth record for Alaska drilling at their Beluga River Unit #1 on the west side of Cook Inlet. The well went to 16,428 feet, but was plugged back for a shallower gas discovery completion near 4,800 feet, testing 4.3 million cubic feet per day through a ¼" bean. Pan American Petroleum

Note: Although all oil and gas operators in Alaska are required to furnish full operational reports to the Petroleum Branch, by law this information is kept confidential for a 2 year period, unless released by the operator.

Corporation's West Forelands completed gas discovery on the west side of Cook Inlet tested 16.5 million cubic feet per day absolute open flow guage. Four offshore drilling operations centered in the upper Cook Inlet area where Shell-Standard-Richfield drilled a well to 14,041 feet and suspended the operation because of the oncoming winter. The well was drilled by a floating drilling ship, the Cuss II, owned by Global Marine Exploration Company. It sailed under its own power to Alaska from Madisonville, Louisiana, via the Panama Canal.

Pan American Petroleum, as operator for itself, Sinclair, Phillips and Skelly Oil Companies, used Western Offshore Drilling and Exploration Company's tender-platform arrangement to drill in the shallow waters near Middle Ground Shoal, because water depths of approximately 10 feet at low tide did not allow the use of a floating drilling vessel. The tender-platform was towed from the Gulf Coast through the Panama Canal to Alaska. Pan Am., the first operator to get under way drilling, found unexpectedly high pressures which resulted in several gas blowouts culminating in the plugging of the well when it became apparent that deteriorating well conditions would not allow deeper drilling. In addition to lost circulation materials, over 1,000,000 gallons of weighted drilling mud, and 18,000 sacks of cement were pumped into the well before gaining control. The drilling platform was left in place as a base for future operations and to experiment with the type of structure needed to withstand the ice conditions in Cook Inlet.

Using the drilling barge, WODECO II, which had been towed to Cook Inlet from California, the Pan Am. group spudded another offshore well in Cook Inlet, lying approximately halfway between the north tip of the Kenai Peninsula and the village of Tyonek on the west shore of Cook Inlet. After drilling below 12,000 feet, a mechanical failure in the connections below the blowout preventers resulted in a blowout at the ocean floor flowing an indeterminate volume of gas and condensate. Every effort to bring the well under control from the barge at this location was unsuccessful, and the blowout was ignited to prevent pollution of Cook Inlet waters. The barge was then relocated 1500 feet northeast of the blowout and a relief well directionally drilled towards the total depth of the wild well in an effort to bring it under control. Pan Am. was within a short distance of intersecting the wild well but was forced to temporarily plug, and move off the relief hole, when an ice floe hit the drilling barge, snapping two anchor lines.

In the spring of 1963, Pan Am. will return to the relief well and continue efforts to control the burning well.

Although 10 producing development wells were completed in 1962 in the giant Swanson River Field, exploratory efforts in 1962 to extend production laterally south and west and to deeper horizons, were unsuccessful, although at year's end SCU 22-32, a suspended hole 3½ miles south of production, was being re-entered for a directional redrill with older and deeper pre-tertiary rocks as an objective. Present oil production from the field is produced from the "Hemlock sands" near the base of the Tertiary rocks.

It is considered likely that during 1963, the Federal Bureau of Indian Affairs will open for leasing the Moquawkie Indian Reservation on the west shore of Cook Inlet. Portions of the former Susitna Bombing Range, on the north shore of Cook Inlet will probably be made available for leasing by the State, in addition to other nominated or opened lands.

Gulf of Alaska

A total of six wells were drilled in this area near Alaska's largest glaciers. All were plugged and abandoned without encountering commercial shows, and at year's end, Socal's St. Elias development contract and Richfield's Katalla-Yakataga development contract terminated. Exploration by Colorado Oil and Gas Company is expected to continue on the Icy Bay-Cape Fairweather development contract area and additional wells are expected to be drilled in unitized areas.

Copper River Basin

During 1962, exploratory drilling resumed after a 5 year period of inactivity. Union Oil Company drilled the Tazlina #1 south of Lake Louise, and Aledo Oil Company, at year's end, was drilling the Eureka #2 near the old Eureka Roadhouse. Slow penetration was necessary on both operations because of the tendency of the holes to deviate from vertical when normal drilling weight was applied to the bit. Early in 1963, Pan American Petroleum Corporation is expected to move in on a location near Moose Creek in their Tolsona Development Contract area about 10 miles west of Glennallen.

Bristol Bay and Alaska Peninsula

An expected test in the Upper Bristol Bay did not materialize during 1962, and the Nushagak Bay contract on which it was to be drilled was dropped by the Pure Oil Company at the end of the year. A dry hole was drilled by Pure on their Canoe Bay Unit on the south side of the Alaska Peninsula near Pavlof Bay, and Richfield spudded a well in Wide Bay near Kanatak on the south side of the Alaska Peninsula. This Richfield operation is unique in that the hole is being drilled from a platform placed on wooden piles connected to the mainland by a ½ mile long wooden pile causeway. The timber and piles were barged to the location from Ketchikan.

Approval was given to the Gulf Oil Corporation for the 592,000 acre Port Moller development contract in the lower Bristol Bay area. The 11 crew months of seismic work done in the Bristol Bay-Alaska Peninsula area were done mainly in the area of Gulf Oil Corporation's Port Moller development contract and Mobil Oil Company's Ugashik development contract.

North Arctic Slope

Although no wells were drilled in this area in 1962, leasing activity increased markedly. Approval was given to B.P. Exploration Company (Alaska) Inc. for the 654,135a. Outpost development contract and to Sinclair and B.P. for the 611,725a. Chandler River development contract. No exploratory drilling is required on these contracts during 1963 but preliminary exploratory work, including seismic surveys, is expected. Atlantic Refining Company, Texaco Inc., and others, acquired large blocks of acreage during the year and considerable (12 crew months) geological surface work was done. Exploratory commitments promise continued long range interest in the North Arctic Slope and existence of the oil and gas fields discovered by the Navy during its 1945-1955 program should continue to spur exploration efforts in this remote area.

Other Areas

Generally speaking, 1962 was not a year when oil companies did large scale statewide reconnaissance geological work as in 1958-1959, but instead concentrated with somewhat more detail on selected areas where existing production and known potential resulting from previous reconnaissance indicated that closer attention was warranted.

However, reconnaissance mapping was done by one company by floating down the Yukon River or its tributaries from virtually one side of the state to the other. In addition to the areas already mentioned in this report, several companies used geologic field parties in the Porcupine River area, the Yukon Flats, and Kandik River area.

To save on moving and footage costs, a slim hole rig was brought to Alaska in 1962 to drill small diameter holes in remote areas. A dry hole was drilled in the Middle Tanana Basin for Union, Marathon, Sinclair and Pure Oil Companies by Santa Fe Drilling Company's slim hole rig. In some cases, a slim hole can be drilled for less cost than that of a seismic survey of the prospective area, and can possibly result in the discovery of oil and gas, or reveal subsurface information which would determine the advisability of future exploration.

EXPLORATORY WELLS SPUDDED AND/OR COMPLETED IN 1962
(Includes Stepout Wells one mile or more from production)

State Permit	Company	Well Name	Well No.	Location ¼ Sec. T.R.M.	Date Spud	Date Complete	Footage TD	Footage in '62	Status	Remarks
48-61	Pan. Am.	Stedatna Cr. S.	1	SW30 12N 12W S.	11- 2-61	2- 9-62	7,459	2,280	P&A	
49-61	Pan. Am.	West Forelands	1	SE21 8N 14W S.	10-27-61	3-29-62	13,500	1,537	GSI	New Gas Discovery
50-61	Superior	Chuit S.	1	SW 8 12N 11W S.	12-26-61	5- 9-62	*	*	P&A	
51-61	Richfield	Bering R.	2	SW22 19S 7E CR	11-19-61	1-20-62	6,019	1,184	P&A	
52-61	SoCal	Chaix Hills	1A	SE32 22S 25E CR	11-11-61	3- 3-62	10,121	4,689	P&A	
55-61	SoCal	S.C.U.	34-16	SE16 7N 9W S.	1- 9-62	3-25-62	11,881	11,881	P&A	Stepout, 1 mi. South
3-62	Union	Nenana	1	SW 7 4S 10W F.	2-23-62	3- 6-62	3,062	3,062	P&A	In Middle Tanana Basin
4-62	SoCal	SRU	222-21	NW21 8N 9W S.	3-20-62	4-19-62	9,002	9,002	P&A	Over 1 mi.W.of SRU Field production when spudded
5-62	B.A.	Bell Island	1	SW12 5N 7W S.	3-16-62	5-31-62	11,364	11,364	P&A	Near Big Susitna R.
7-62	Pan. Am.	Middle Gr. Shoal	S.1	SW19 9N 12W S.	5-15-62	7-26-62	*	*	P&A	New Gas discovery.
8-62	Pan. Am.	Cook Inlet S.	1	SW 6 11N 9W S.	5-31-62		*	*	Blowout	
9-62	SoCal	Riou Bay	1	NE26 23S 23E CR	3-23-62	8-31-62	14,107	14,107	P&A	
10-62	Union	Pittman	1	SE36 18N 2W S.	3-15-62	5-27-62	6,136	6,136	P&A	
11-62	Shell	State S.	1	SE24 10N 11W S.	5-30-62	9-14-62	14,041	14,041	Susp.	Offshore
12-62	Richfield	White R.	2	NE27 21S 19E CR	5-24-62	10-25-62	12,417	12,417	P&A	
13-62	Colo. O&G	Malaspina	1	NE31 24S 32E CR	5- 7-62	6- 2-62	1,802	1,802	P&A	
15-62	Pan. Am.	Tyonek S.	1	SW17 11N 11W S.	4- 6-62		*	*	Testing	
16-62	SoCal	W. Fork	233-16	SE33 6N 9W S.	3-29-62	4-26-62	9,150	9,150	P&A	
18-62	SoCal	Beluga R.	1	NW35 13N 10W S.	4-19-62	12-18-62	16,428	16,428	GSI	New Gas discovery.
20-62	SoCal	SCU	22-32	NW32 7N 9W S.	4-29-62	9-21-62	14,550	14,550	Susp.	Stepout 3½ mi. South
21-62	SoCal	Anchor Pt.	1	SW10 5S 15W S.	6- 7-62	12- 9-62	14,704	14,704	P&A	
22-62	Colo, O&G	Malaspina	1A	NE31 24S 32E CR	6-16-62	10-22-62	13,823	13,823	P&A	
23-62	Occidental	S. Diamond Gulch	S.1	NE 6 6S 14W S.	7-12-62	10-25-62	10,568	10,568	P&A	
24-62	Union	Ninilchik S.	1	SW 6 1S 13W S.	7-20-62	12- 1-62	14,940	14,940	P&A	
25-62	Union	Sterling U.	43-28	SE28 6N 9W S.	6-26-62	7- 7-62	5,634	5,634	P&A	
26-62	Superior	Chuit S.	2	SE 7 12N 11W S.	6-21-62	9- 4-62	*	*	P&A	
27-62	Union	Tazlina	1	SW10 4N 7W S.	7- 3-62	10-24-62	8,837	8,837	P&A	
28-62	Pan Am.	Cook Inlet S.	1A	SW 6 11N 9W S.	8-29-62	11-29-62	11,419	11,419	Susp.	
29-62	SoCal	SRU	14-9	SW 9 8N 7W S.	9-29-62			12,809	Drlg.	Stepout 1 mi. West
32-62	Aledo	Eureka	2	SW18 2N 10W CR	10-31-62			6,390	Drlg.	
35-62	Richfield	Wide Bay S.	1	NW 5 33S 44W S.	12-13-62			1,215	Drlg.	Wood piling platform-causeway

Abbreviations: TD - total depth; P&A - plugged & abandoned; GSI - gas well shut in; susp. - suspended; U - Unit; R. - river; Drlg. - drilling; loc.- location; test. - testing; blow - blowing wild; S. - bottomed in State owned land;
* - T.D. not officially released.

General

Hearings

Order #8: On April 30, 1962, at a public hearing, the Standard Oil Company of California petitioned the Committee to declare as permanent, the temporary 80 acre well spacing pattern provided for in Order #5 in the Swanson River Field. The petition was granted by Order dated May 11, 1962.

Order #9: In a request dated April 19, 1962, the Standard Oil Company of California submitted a request to conduct a pressure maintenance program in the Hemlock Zone at the Swanson River Field. At a public hearing in Anchorage, Alaska, on April 30, 1962, testimony in support of the request was given. Permission to conduct the pressure maintenance program by injection of natural gas was granted by Order dated May 11, 1962.

Order #10: Pan American Petroleum Corporation requested an exception to the provision of the Alaska Oil and Gas Conservation Regulations which required that the subsurface location of any well not be nearer than 500' to any boundary line of any governmental quarter-section or lot survey. The request was confined to one offshore location lying near Middle Ground Shoal where a location 336.13' from a survey line was necessary in order that at least 10 feet of water would remain at minus tides so that the support tender would not be grounded. After a public hearing held May 28, 1962, the requested permission was granted by Order dated May 31, 1962.

Order #11: On June 6, 1962, the Pan American Petroleum Corporation submitted a request for an exception to the 500' governmental quarter-section boundary offset provision for the exploratory well Cook Inlet State 1, an offshore well in Cook Inlet. To avoid a very expensive repositioning in these tidal waters and because of the fact that there were no other lessees within one mile, the request was granted by Order #11 dated June 21, 1962.

State of Alaska Lease Sales

Special Sealed bid Competitive Sale #8 was held July 11, 1962, on 89 tracts representing 317,668.93 acres. Bids ranged from less than $1.00 per acre to $805.31 per acre to produce an average of $52.93 per acre. The State rejected those bids which were less than $1.00 per acre. A total bonus income of $15,714,112.60 was derived from this sale making the total competitive lease bonus for 1962 of $15,719,222.60. In addition to this bonus income, the State receives 50¢ per acre per year rental on all noncompetitive acreage, and $1.00 per acre per year on all competitive acreage.

Noncompetitive Sale #2 held on March 6, 1962, offered 144 tracts representing 341,020 acres. Applicants filing on these tracts totaled 12,093.

Noncompetitive Sale #3 held on October 5, 1962, offered 228 tracts totaling 542,785.02 acres. Applicants filing on these tracts totaled 1853.

Pursuant to Section 2008.1 of the Alaska Oil and Gas Conservation regulations, well records for the following wells drilled in Alaska were released to the public during 1962 through local scouting services and reproduction firms in Anchorage:

Well Name and Number	Operator
Kenai Unit 33-30	Union Oil Co. of California
Swanson River Unit 32-22	Standard Oil Co. of California
Swanson River Unit 23-22	Standard Oil Co. of California
Soldotna Creek Unit 41-4	Standard Oil Co. of California
Nulato No. 1	Benedum & Associates
Swanson River Unit 212-10	Standard Oil Co. of California
Soldotna Creek Unit 32-4	Standard Oil Co. of California
Kaliakh River Unit No. 1	Richfield Oil Corporation
Swanson River Unit 14-27	Standard Oil Co. of California
Soldotna Creek Unit 14-4	Standard Oil Co. of California
Swanson River Unit 41-33 (WI)	Standard Oil Co. of California
Swanson River Unit 32-33	Standard Oil Co. of California
Kaliakh River Unit No. 2	Richfield Oil Corporation
Bishop Creek Unit 11-11	Halbouty Alaska Oil Co.
Alaska O & M-King Oil 1-B	Halbouty Alaska Oil Co.
Swanson River Unit 12-15	Standard Oil Co. of California
Knik Arm No. 1	Union Oil Co. of California
Soldotna Creek Unit 12-9	Standard Oil Co. of California
Swanson River Unit 12-34	Standard Oil Co. of California
Knik Arm No. 2	Union Oil Co. of California
Soldotna Creek Unit 34-33	Standard Oil Co. of California
Dangerous River Unit No. 1	Colorado Oil & Gas Corporation
Kenai Unit 14-4	Union Oil Co. of California
Swanson River Unit 32-27	Standard Oil Co. of California
Soldotna Creek Unit 34-4	Standard Oil Co. of California

Well records to be released during 1963 and their release dates:

Well Name and Number	Operator	Release Date
Soldotna Creek Unit 14-34	Standard Oil Co. of Cal.	1-23-63
Soldotna Creek Unit 14-9	Standard Oil Co. of Cal.	1-26-63
Kenai Unit 41-19	Union Oil Co. of Cal.	2- 9-63
Kaliakh River 2RD	Richfield Oil Corp.	2-24-63
Kenai Unit 44-18	Union Oil Co. of Cal.	3- 1-63
Soldotna Creek Unit 32-9	Standard Oil Co. of Cal.	2-16-63
Swanson River Unit 23-27	Standard Oil Co. of Cal.	3- 5-63
Soldotna Creek Unit 32-8	Standard Oil Co. of Cal.	3-26-63
Soldotna Creek Unit 43-33	Standard Oil Co. of Cal.	4- 8-63
Swanson River Unit 41-33	Standard Oil Co. of Cal.	4-12-63
Soldotna Creek Unit 12-3	Standard Oil Co. of Cal.	4-23-63
Swanson River Unit 23-15	Standard Oil Co. of Cal.	5- 5-63
Soldotna Creek Unit 12-4	Standard Oil Co. of Cal.	5- 8-63
Falls Creek Unit No. 1	Standard Oil Co. of Cal.	5-24-63
Soldotna Creek Unit 43-8	Standard Oil Co. of Cal.	5-24-63
Soldotna Creek Unit 12-16	Standard Oil Co. of Cal.	5-29-63
Swanson River Unit 21-27	Standard Oil Co. of Cal.	6- 5-63
Soldotna Creek Unit 43-4	Standard Oil Co. of Cal.	6-14-63

Soldotna Creek Unit 43-5	Standard Oil Co. of Cal.	6-28-63
Soldotna Creek Unit 23-4	Standard Oil Co. of Cal.	7- 1-63
"Core Hole" No. 1	Colorado Oil & Gas Corp.	7- 3-63
Swanson River Unit 21-15	Standard Oil Co. of Cal.	7- 7-63
Swanson River Unit 23-33	Standard Oil Co. of Cal.	7-10-63
Soldotna Creek Unit 41-9	Standard Oil Co. of Cal.	7-11-63
Soldotna Creek Unit 23-9	Standard Oil Co. of Cal.	8-17-63
Soldotna Creek Unit 21-9	Standard Oil Co. of Cal.	8-19-63
Soldotna Creek Unit 41-8	Standard Oil Co. of Cal.	8-14-63
"Core Hole" No. 2	Colorado Oil & Gas Corp.	8-21-63
Swanson River Unit 43-28	Standard Oil Co. of Cal.	8-22-63
Soldotna Creek Unit 14-3	Standard Oil Co. of Cal.	9- 2-63
Swanson River Unit 34-15	Standard Oil Co. of Cal.	9- 4-63
Sterling Unit 23-15	Union Oil Co. of Cal.	9- 4-63
Soldotna Creek Unit 243-4	Standard Oil Co. of Cal.	9-17-63
Duktoth River Unit No. 1	Richfield Oil Corp.	9-18-63
Swanson River Unit 43-15	Standard Oil Co. of Cal.	10- 8-63
"Core Hole" No. 3	Colorado Oil & Gas Corp.	10-14-63
Soldotna Creek Unit 41-5	Standard Oil Co. of Cal.	10-20-63
Swan Lake Unit 34-27	Standard Oil Co. of Cal.	10-25-63
Fish Creek Unit 12-8	Union Oil Co. of Cal.	11- 2-63
Swanson River Unit 212-27	Standard Oil Co. of Cal.	11- 6-63
Rosetta 4-A	Hackathorn Drilling Co.	11- 7-63
Napatuk Creek Unit No. 1	Pan American Pet. Corp.	11- 8-63 Released July 20, 1962 by letter from operator
Soldotna Creek Unit 34-5	Standard Oil Co. of Cal.	11- 9-63
Canoe Bay Unit No. 1	Pure Oil Co.	11-26-63
White River Unit No. 1	Richfield Oil Corp.	11-30-63
Swanson River Unit 43-15RD	Standard Oil Co. of Cal.	12- 1-63
Bering River Unit No. 1	Richfield Oil Corp.	12- 2-63
Soldotna Creek Unit 21-4	Standard Oil Co. of Cal.	12- 5-63
"Core Hole" No. 4	Colorado Oil & Gas Corp.	12- 5-63
Soldotna Creek Unit 34-9	Standard Oil Co. of Cal.	12- 8-63
Chaix Hills Unit No. 1	Standard Oil Co. of Cal.	12-10-63

Summary of Statistics

Years 1959 - 1962

	1959	1960	1961	1962
Permits Approved	16	30	55	38
Exploratory Wells Spudded	8	10	25	31
Development Wells Spudded	8	16	29	10
Wells Completed (Oil)	3	13	27	7
Wells Completed (Gas)	3	3	5	5
Wells Abandoned	4	9	19	21
Footage Drilled, Exploratory	75,705	93,749	197,499	290,976
Footage Drilled, Development	62,197	166,592	302,989	78,619
Total Footage Drilled	137,902	260,341	500,488	369,595
Average No. Active Rotary Rigs/Wk	5	7	9	10
Average Daily Oil Production (Bbls)	510	1,529	17,333	28,107
Geologic Field Party Months	129	57.5	57.6	43
Seismic Crew Months	92.0	40.0	73.4	86.23
Gravity Crew Months	7.5	4.9	14.5	9.5
Estimated Industry Expenditure Exploration, Production and Development including refinery construction*	$30,654,000	$37,805,000	$42,405,000	$65,500,000
State O&G lease acreage in effect at year's end.		117,203	501,065	1,370,652
Federal O&G lease acreage in effect at year's end.		33,287,120	26,807,695	19,550,312
State O&G lease acreage issued in 1962 (does not include transferred Federal leases)				622,852
Federal O&G lease acreage issued in 1962				683,246
Full time year round employees of oil industry, excluding marketing				613
Cumulative mileage heavy duty roads built by oil industry				331
Cumulative mileage low grade roads & seismic trails built by oil industry				885

*Does not include money spent for O&G leases acquired from individuals or other companies. Does not include any marketing activity.

Development contracts for which the Petroleum Branch approved technical data during 1962 and general location of areas:

Chandler River 611,725a. Sinclair Oil and Gas, operator. South and east of Umiat on North Arctic Slope.

Chedatna Lakes 167,525a. Standard Oil Company of California and Richfield Oil Company, operators. Near northwest shore of Cook Inlet.

Crosswinds Lake 542,720a. Union Oil Company, operator. Copper River Basin northwest of Glennallen.

Nenana 197,316a. Sinclair Oil and Gas Company, operator. Southwest of Fairbanks near Nenana.

Outpost 564,135a. B.P. Exploration Company (Alaska), Inc., operator. East of Umiat on North Arctic Slope.

Port Moller 592,000a. Gulf Oil Corporation, operator. Southern Bristol Bay area.

Unit agreements for which the Petroleum Branch approved technical data during 1962 and general location of areas:

Anchor Point 9,441.35a. Standard Oil Company of California, operator. West of Homer on Kenai Peninsula.

Beluga River 20,810a. Standard Oil Company of California, operator. West side of Cook Inlet.

Fish Creek 25,167.5a. Union Oil Company, operator. Lower Matanuska Valley near Big Lake.

Malaspina 21,713a. Colorado Oil and Gas Corporation, operator. Gulf of Alaska area on west shore of Yakutat Bay.

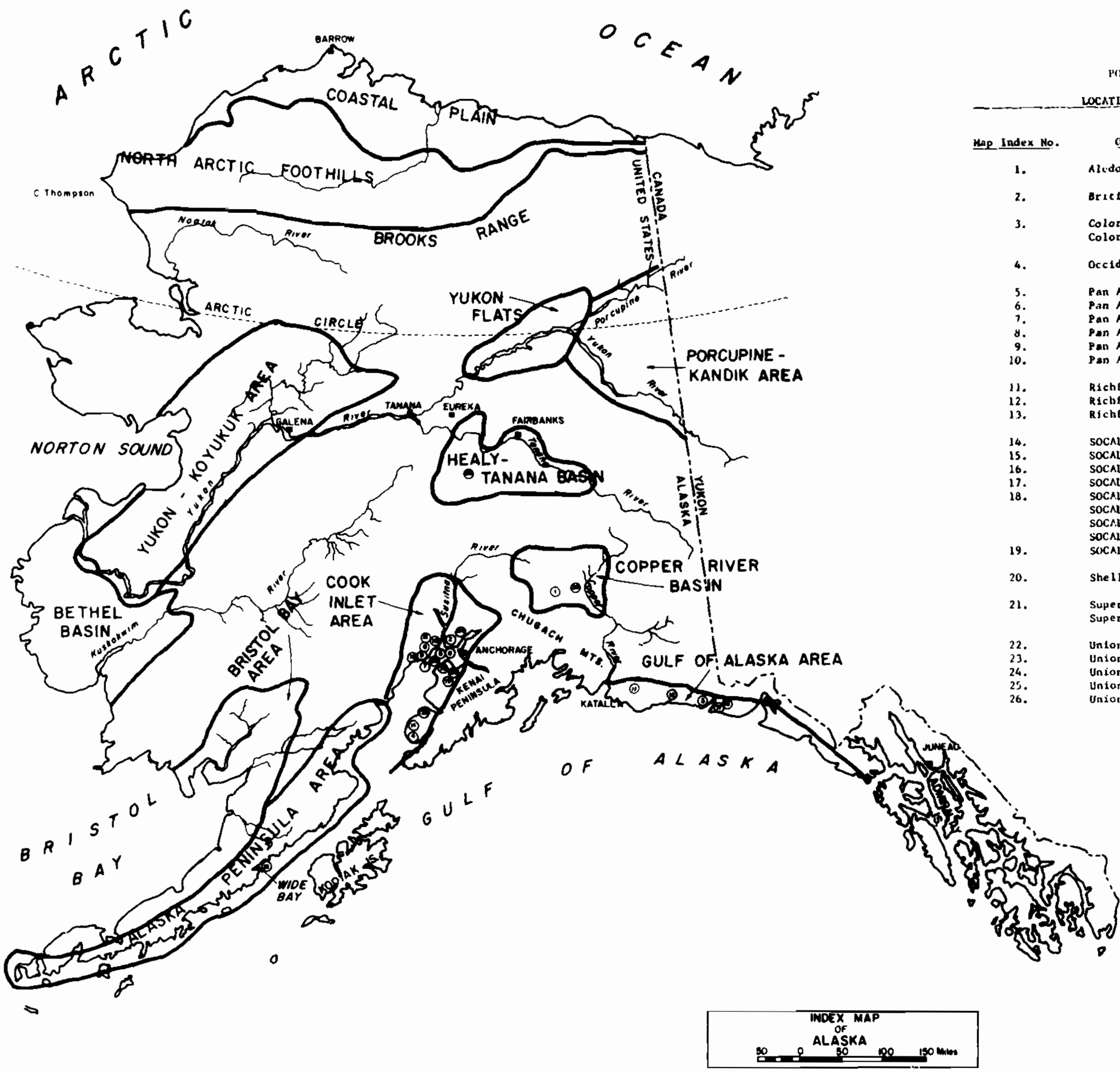
Pittman 46,659.48a. Union Oil Company, operator. Matanuska Valley, northwest of Wasilla.

Riou Bay 37,849a. Standard Oil Company of California, operator. Gulf of Alaska area on east shore of Icy Bay.

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND MINERALS
PETROLEUM BRANCH
329 SECOND AVE ANCHORAGE, ALASKA

POSSIBLE FUTURE PETROLEUM PROVINCES
and
LOCATION OF EXPLORATORY WELLS DRILLED IN 1962

Map Index No.	Operator	Well Name & No.
1.	Aledo	Eureka 1
2.	British American	Bell Island
3.	Colorado Oil & Gas	Malaspina 1
	Colorado Oil & Gas	Malaspina 1-A
4.	Occidental	S. Diamond Gulch 1
5.	Pan American	Cook Inlet #1 State
6.	Pan American	Cook Inlet #1A State
7.	Pan American	Middle Ground Shoal 1
8.	Pan American	Stedatna Creek 1
9.	Pan American	Tyonek 1 State
10.	Pan American	West Forelands 1
11.	Richfield	Bering River 1
12.	Richfield	White River 2
13.	Richfield	Wide Bay 1
14.	SOCAL	Anchor Point 1
15.	SOCAL	Beluga River 1
16.	SOCAL	Chaix Hills 1-A
17.	SOCAL	Riou Bay 1
18.	SOCAL	SCU 22-32
	SOCAL	SRU 14-9
	SOCAL	SRU 222-21
	SOCAL	SCU 34-16
19.	SOCAL	West Fork 233-16
20.	Shell	State 1
21.	Superior	Chuit State 1
	Superior	Chuit State 2
22.	Union	Nenana 1
23.	Union	Ninilchik 1
24.	Union	Pittman 1
25.	Union	Sterling Unit 43-28
26.	Union	Tazlina 1



EMPLOYMENT AND ACCIDENTS

Statistics

In order to prevent duplication of effort, this chapter is presented in summary. The figures available at this time for 1962 are approximate only. The U. S. Bureau of Mines and the Safety Division of the Department of Labor, State of Alaska, publish a detailed account of the accident rate in respect to employment and the accident severity rate at a later date when complete information is available.

	No. of Mines(1)		No. of men Employed (1)		No. of Accidents			
					1961		1962	
	1961	1962	1961	1962	Fatal	Nonfatal	Fatal	Nonfatal
Placer Mines								
Dredges	21	21	260	296		29		16
Nonfloat	72	72	216	188		2		1
Hydraulic	10	18	21	13		0		0
Coal Mines								
Underground	1	1	13	18	1	12		1
Strip	4	3	279	233		34		22
Lode Mines								
Metal (2)	4	4	50	56		8		11
Nonmetal	3	3	24	25		1		1
Petroleum Production & exploration	(?)	(?)	598	658		98	4	109
Exploration Metal	91	78	243	279	1	4	___	6
TOTALS	206	200	1695	1766	2	188	4	167

(1) Estimated from various reports
(2) Lode mines in 1961 included lode, prospector & intermittent operation and exploration projects, excluding sand, gravel and stone operations

NOTE: Estimated average monthly insured employment in the Alaska Mining Industry for 1962 is 1239.

PROPERTY AND AREAL REPORTS

Preliminary Report on Geologic Mapping in the Coast Range Mineral Belt = Geol. Report #1

by Gordon Herreid, Mining Geologist

Introduction

Southeast Alaska is an area of great geological regularity because of the strong control by NW trending geosynclines of rock types, folds and ore deposits. This regularity is particularly well shown along the SW margin of the Coast Range batholith. Here, deformation and metamorphism of NW trending belts have taken place at great depths to produce an elongated belt of metamorphic rock whose style of structure shows little change along the belt, but regular changes across the belt. This marginal belt is the site of numerous ore showings and a few profitable mines. The elongation of the mineral province parallel to the structural features indicates a close relation between the regional geology and ore deposition. It seems probable that unexploited mineral deposits of economic grade remain to be found along this narrow belt, and that these deposits are related to the structural and other geologic features of the region. It is the object of the DM&M program in this area to study the deposits, the regional geology, and their interrelations.

The classical explanation for the close spatial relationship of the ore deposits of the Coast Range mineral belt (Juneau gold belt and extensions NW and SE) is that the ore is related in some way to the granitic intrusions in or along the Coast Range batholith. Recently, Forbes (1959) has shown that the Coast Range mineral belt at Juneau lies in a belt of progressive metamorphism and that the SW contact of the Coast Range batholith is gradational with these metamorphic rocks. Forbes has suggested (personal communication to the author) that the origin of the ore deposits in the area may be related to the development of the metamorphic belt itself. At the present time the low grade gold deposits mined formerly are no longer profitable and the main ore targets along the belt are base metal sulfide deposits which have long been known in the area.

Previous Investigations

The foundation, and still the most complete report on the geology of the Juneau gold belt, is A.C. Spencer's "The Juneau Gold Belt, Alaska," U.S.G.S. Bull. 287, published in 1906. Here, Spencer described with admirable simplicity the metamorphic and igneous rocks and the mineral deposits. His somewhat generalized geologic map of the Juneau area is the only one published to date. Spencer described the rock succession SW across the belt as diorite, a band of crystalline schist, and a band composed mainly of alternating slates and greenstones. He recognized that tilting and development of the schistosity took place before intrusion of the diorite. He noted that "wherever observed" diorite contacts, in both the main mass and outlying "dikes", are nearly always parallel to the "strike" of the enclosing rocks. He recognized no major folding, but suggested that it might be present. Concerning the ore deposits, he notes "the linear distribution of the mines of this part of southeastern Alaska has been recognized for many years." He subdivided the ore deposits into veins, sulfide disseminations ("impregnated masses of rock"), and gradations between the two. The disseminated deposits carry little gold, and Spencer devoted little attention to them for this reason. The veins "quartz, calcite, one or both", carry varying amounts of sulfides along with gold and silver, are discontinuous and in many areas are aggregated along certain lines "so that the combination of many veins, each unimportant in itself, is traceable with considerable distinctness for long distances". These he termed "stringer leads". The mines on Gold and Sheep Creeks in the Juneau area are on extensive vein complexes of this nature and similar complexes "may be observed.....in the Windham Bay and Sumdum districts".

Spencer believed that the amphibolite bodies and layers which occur in the slate in the Gold Creek area are intrusive "gabbros" which have been metamorphosed. These were termed 'metagabbros' by later writers. These metagabbros are an important ore control: "one finds typical stringer leads composed of numerous nearly parallel veinlets occupyingirregular openings in the slates adjacent to the contact" or "gash-like"stringer leads may form in the metagabbro near the contact. Spencer believed that the vein openings were probably due to later vertical movements during uplift long after the period of folding. Because diorite is the country rock of gold deposits at Berners Bay and at the Treadwell deposits, and because the fissure veins must have been emplaced in solid rocks, Spencer places the date of mineralization as long after emplacement of the diorite. He believed that the veins were deposited from hot aqueous solutions given off during crystallization of a buried body of magma.

Spencer's ideas on the regional geology and ore deposits have been accepted with slight modifications and additions by all later workers who published reports on the area until 1959 when Forbes' work appeared.

Buddington and Chapin (1929) mapped the regional geology of SE Alaska on a 1:500,000 scale and summed up much of the early work. These authors recognized that the rocks in the Juneau area and all along the SW margin of the Coast Range batholith have been isoclinally overturned to the SW. In general, they did not attempt to work out the details of the structure, but where they did, they reported that minor folds were "themselves acutely folded and in places pitch almost vertically". They also noted the increase in intensity of metamorphism from west to east as the batholith is approached.

Livingston Wernecke, consulting geologist for the Alaska Juneau Gold Mining Company, described (1932) some of the outstanding features of the north and south ore bodies and presented a geologic map of the north ore body. Mixed in with an account of the formation of the deposit is much descriptive information on the ore and wall rocks. He accepted Spencer's intrusive origin for the metagabbros which he believed are surrounded by contact metamorphic aureoles of spotted schist. He believed that the metamorphism has obliterated the evidence of folding in the wall rocks and that the ore was derived from a cooling magma at depth long after the period of metamorphism.

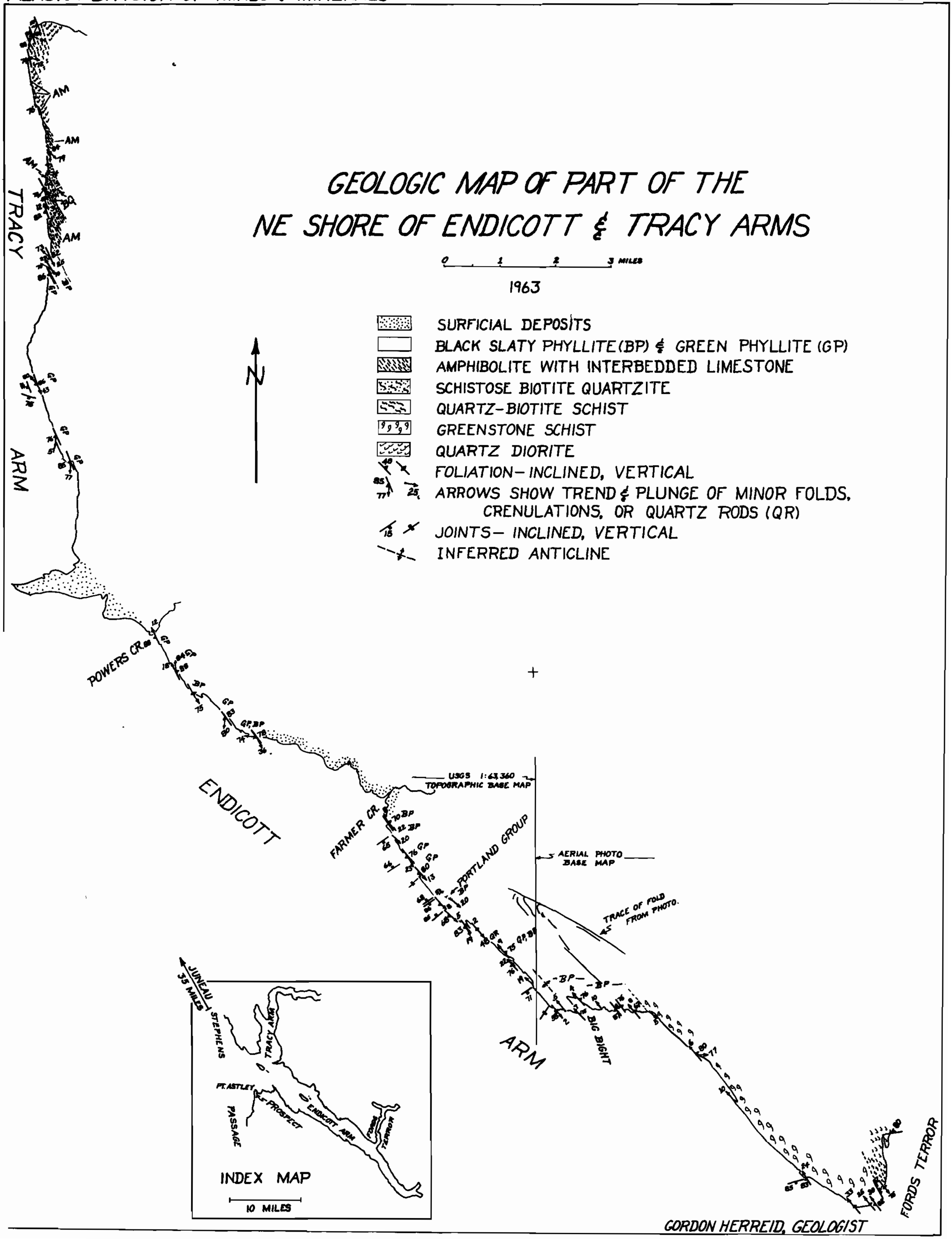
Recently, Wayland (1960) has published a paper on the Alaska Juneau mine based on thesis work done in 1937. This paper provides a good summary of the mineralogic and structural features of the deposit. Wayland mentions folding of the rocks and considered that "folding of some early quartz veins in phyllites is due to selective replacement by quartz of shear-folded beds". He notes that the "longer dimensions of a group of quartz stringers seems as a rule to follow the regional plunge of major structures (apparently metagabbro intrusives -GH) to the southeast". Wayland follows Wernecke in describing the metagabbro as intrusive because of its "occasional branching" but notes that the spots of the spotted schists are augen formed during shearing.

The Neglected Prize, a zinc-copper deposit, and the surrounding area along Tracy Arm, fifty miles SE of Juneau, are described by Gault and Fellows (1953). They present detailed maps of the deposit and the surrounding region and a short descriptive report.

These reports and a number of unpublished reports written during the same period provide a good picture of the distribution of the rocks and ore deposits along the Juneau gold belt and a fairly coherent mass of data and structure, mineralogy, and wall rock alteration in the ore deposits. The possibility of any genetic relation between the wall rock and the ore deposits has been considered and dismissed. No serious attention has been given to minor structures of the deformed rocks as a guide to their history. This is surprising, because one of the most striking features of the whole district, especially around the Alaska Juneau mine, is the presence of numerous folded quartz veins, quartz rods, boudined* quartz veins, and minor folds and crenulations in black phyllite. Around the Alaska Juneau these features are, with occasional exceptions, approximately parallel to one another, plunging SE 25 to 60 degrees. In addition, the outcrops of metagabbro, as mapped by Wernecke (1932 fig. 1) have a synclinal pattern except for isolated lenses and numerous interfingered contacts with black phyllite. This syncline, as exposed in mining operations, plunges about 41 degrees SE. The minor complexities of structure are typical of plastically deformed rocks mapped elsewhere in the world. The mine area is an excellent example of plastically deformed major folds with minor structures and ore paralleling the major folds.

In the extension of the Juneau Gold Belt north of Juneau in the Eagle River district, Knopf (1912) in describing the gneiss, which he considered to be a deformed igneous rock, states: "On the east side of Berners Bay, where the exposures are good and easily accessible, the gneiss encloses, for thousands of feet from the contact, vast numbers of rock fragments and detached masses of stratified sediments. It is worthy of note that all such detached masses of original country rock, wherever found in the gneiss, are oriented parallel to the prevailing structure, and that where they show crumpling, the crumpling is conformable to the wrinkled foliation of the enclosing gneiss". Just north of Juneau, Forbes (1959) has mapped a section across the Coast Range which shows progressively increasing grades of metamorphism eastward. Layers of gneiss occur in the medium grade schist and increase in amount eastward. Compositional layering and schistosity in the gneiss and enclosing schist are parallel, and contacts are gradational. Forbes believes that this gneiss is schist which has been tranformed as a result of introduction of Na, SiO_2 and minor K during late and post-kinematic time. Forbes found two directions of folding. The dominant folds trend NW or N, overturned to the SW and their plunge varies from NW to SE in different areas, indicating major culminations and depressions of the fold axes. Only minor folds were seen in the second set. These folds are open and upright with their axes trending NE to E down the dip of the major folds. Forbes correlates these folds with the major culminations and depressions of the NE fold axes and for this reason considers the NE folds to be the older of the two.

* boudin - a sausage shaped structure often present in quartz and other competent beds caused by stretching. In cross section, boudined bed resembles a string of lenticular beads.


GEOLOGIC MAP OF PART OF THE
NE SHORE OF ENDICOTT & TRACY ARMS
0 1 2 3 MILES
1963
SURFICIAL DEPOSITS
BLACK SLATY PHYLLITE (BP) & GREEN PHYLLITE (GP)
AMPHIBOLITE WITH INTERBEDDED LIMESTONE
SCHISTOSE BIOTITE QUARTZITE
QUARTZ-BIOTITE SCHIST
GREENSTONE SCHIST
QUARTZ DIORITE
FOLIATION- INCLINED, VERTICAL
ARROWS SHOW TREND & PLUNGE OF MINOR FOLDS, CRENULATIONS, OR QUARTZ RODS (QR)
JOINTS- INCLINED, VERTICAL
INFERRED ANTICLINE
N
TRACY
ARM
POWERS CR.
ENDICOTT
ARM
FARMER CR.
PORTLAND GROUP
USGS 1:63,360 TOPOGRAPHIC BASE MAP
AERIAL PHOTO BASE MAP
TRACE OF FOLD FROM PHOTO
BIG BIGHT
FORDS TERROR
JUNEAU 35 MILES
STEPHENS
TRACY ARM
PT. ASTLEY
PASSAGE
PROSPECT
ENDICOTT ARM
FORDS TERROR
INDEX MAP
10 MILES
GORDON HERREID, GEOLOGIST

Scope of This Report

Field work done during the summer of 1962 consisted of traverses along the shore line in three accessible areas which crosscut the Coast Range mineral belt: Tracy Arm, Endicott Arm, and the north shore of Taku Inlet. In addition, a traverse was mapped in less detail along the Gastineau Peak-Mt. Roberts ridge and several days were spent in the vicinity of the old Perseverance shaft at the head of Gold Creek. The object of these scattered traverses was to investigate and map the structure and metamorphism of the marginal belt as a background for mine and areal mapping. Two known but unmapped prospects in the Endicott Arm-Tracy Arm area were mapped and assayed. The somewhat scattered observations on the Alaska Juneau property were hampered by snow cover until late in the season and lack of an adequate base map, but some conclusions were drawn. This is a preliminary report, mainly on the structural aspects of the field mapping. A later report will incorporate the results of further compilation and microscope work.

Large fold structures can only occasionally be mapped in the area due to cover, lack of distinctive rock types, and shearing of the fold hinges. For this reason, minor folds assume a great importance when they parallel the major folds as they do in the Coast Range mineral belt. My emphasis in areal mapping has been on rock type and matamorphic grade, minor structures, the behavior of quartz veins, and assay or geochemical sampling for Au, Ag, Cu, Pb and Zn. The latter was mainly done by William Race, State Mining Engineer.

Endicott Arm-Tracy Arm Area

General Statement

Rocks exposed in the tidal zone were mapped along the NE shore in Endicott Arm and Tracy Arm. (Map 1 and fig. 2 and 3) The terrain crossed by this traverse is a belt of metamorphosed sediments whose metamorphism increases from phyllite on the SW to quartz biotite gneiss on the NE, in contact with the slightly foliated quartz diorite of the Coast Range batholith. This area contains two known copper-zinc sulfide ore bodies: the Neglected Prize, which was visited, and the Sumdum Chief, which was not visited. The Portland Group property was visited and mapped, but turned out to be devoid of economic metal values.

The rocks, at distances of about one and one-quarter miles SW of the quartz diorite, are all phyllitic except for limy amphibolite on Tracy Arm and scattered beds of recrystallized limestone. Unoriented (i.e. post-kinematic) plates of biotite are present in a restricted area west of the Big Bight but otherwise biotite occurs only as oriented (syn-kinematic) plates which increase irregularly in amount as the quartz diorite is approached. Similarly, banding of the rock gradually becomes more prominent due to the increase in quartz layering parallel to the foliation. With this increasing segregation of the minerals into dark, biotite-rich and light, quartz-rich bands, the phyllite grades, via quartz biotite schist, into quartz biotite gneiss. The foliation of the gneiss is parallel to that of the phyllite.

The phyllitic rocks contain cremulations and minor folds (L-1), with shallow to moderate plunges, which were formed during the major deformation in the region. In the biotite zone,particularly near the intrusives, these moderately plunging minor folds are missing, and steeply plunging, more highly contorted, minor folds (L-2) are present. No folded folds that would conclusively date one of the fold directions as earlier than the other were found. This steep L-2 fold direction usually shows up as crenulations or minor folds only, which may be present in the same outcrop with moderately plunging folds. The L-2 folds mainly occur in the gneissic areas, and increase in intensity near the gneiss-quartz diorite contacts. They are cut off sharply without deformation at the contact of the folded gneiss with the massive more-or-less directionless quartz diorite. L-2 folding must be pre-quartz diorite in age. I consider L-2 folds to have developed during the formation of the gneiss. They are older than the moderately plunging (L-1) folds which formed during the primary folding of the region. In the phyllite, particularly as the biotite zone is approached, both L-1 folds and L-2 crenulations may be present in the same outcrop.

Quartz veins are fairly common in the map area, particularly in the quartz-biotite schist and gneiss areas near the quartz diorite. Quartz veins occur sporadically in the phyllite, mainly parallel or nearly parallel to the foliation as lenses, folded veins, and rods, whose long axes are mostly parallel to L-1 folds and crenulations. However, in several areas, rather steep quartz rods occur. All of the rocks in the area are cut by nearly vertical NE striking cross joints, which in many places carry quartz veins up to a few 10's of feet long and a few inches wide. Sparse pyrite was associated with some of the quartz veins, but for the most part they appear quite barren of sulfides to the eye.

Rock Types

The metamorphic rocks in the area are of sedimentary origin except for a few pre-tectonic basic dikes. Most of the phyllite is black slaty, green chloritic, or banded limy fine grained rock with lustrous foliation surfaces, which, in many localities are crenulated. The limy phyllite commonly has intricate folds of a few inches amplitude. It is often associated with massive limestone layers which may be up to 50 feet wide, but due to deformation, have little continuity along the strike. On Tracy Arm, amphibolite associated with folded limestone layers appears to be a metamorphosed impure limy rock. Phyllitic quartzite is also interbedded with the phyllite and amphibolite.

The original sediments were aluminous, tuffaceous, and limy shale interbedded with limestone and argillaceous quartzite. No fossils were found, nor could they be expected in these deformed rocks. Buddington and Chapin (1929 pl.1) mapped the area as "probably Ordovician to Jurassic or later". Dutro and Paine (1957) show it as Triassic to Lower Cretaceous on the Geologic map of Alaska.

Quartz biotite schist and gneiss have formed by metamorphic segregation of the phyllite into quartzose and biotite layers up to ½ inch thick. Garnet is sporadically present in this rock, its first appearance corresponding roughly with that of biotite. Whether the formation of the gneiss was due to additions and subtractions of material on a significant scale from an original phyllite is unknown. Layering is more prominent and the grain size is larger in the gneiss along the borders of the massive quartz diorite, but the contacts between the two rocks are sharp with no deformation of minor structures in the gneiss. Lenticular inclusions and septa of metamorphic rock are common in the quartz diorite. Their orientations are parallel with the regional trend of foliation in the gneiss.

Fold Structures

The foliated metasediments which underlie the map area contain no extensive changes in strike and dip which would indicate clearly that large folds are present. In most of the map area, the foliation, which is due to the alignment of platy minerals, parallels the compositional layering which represents the bedding of the original sediments. The beds strike NW and dip steeply NE or SW. Sporadically throughout the area, isoclinal folds, with amplitudes from a few inches to a few feet, are present in the otherwise planar foliation. Small crenulations in phyllitic surfaces are more widespread. These folds on various scales are, for the most part, approximately parallel to one another, or can be subdivided into two mutually parallel groups. Over a distance of several miles the moderately plunging folds (L-1) gradually change their plunges. This is best illustrated in the area from Farmer Creek to Fords Terror. In the area on either side of Big Bight, the sense of minor folding is S-shaped on NE-dipping beds from the greenstone to just west of the Big Bight contact, and Z-shaped further west on SW-dipping beds indicating "up-east" and "up-west" movements. The area of change from Z to S contains beds much folded on a small scale, whose overall attitude is nearly flat with a slight NW dip. These relations indicate that these are "drag folds" on the flanks of an upright, appressed anticline. This is further confirmed by the presence of gray limestone on the NE limb in the Big Bight and on the SW limb on the point ½ mile to the west. At the Perseverance mine on the Alaska Juneau property, the large fold that is exposed is likewise a mass of small folds in the hinge area and quite planar on the flanks.

This consistency of minor structures on the "Big Bight" "Anticline" and the regional consistency of L-1 folds are the only evidence in the map area that minor folding mirrors major structures. The only direct evidence that major structures exist at all is the clear outline of a fold visible on the air photo 2 miles north of Big Bight. This has been traced on the map. (Map 1) The area has not been visited. Folds have been reported by Sainsbury (1957) and Forbes (1959) in the same belt in the Juneau area and, as mentioned above, a well-exposed fold is visible on the Alaska Juneau property, with well-exposed minor structures paralleling the large fold.

The minor folds in phyllitic rocks are commonly local "kinks" of a few inches amplitude in the beds. The micaceous surfaces of the phyllite are crenulated with small wrinkles of an amplitude of less than 1 mm. Thin (less than 1 mm. thick) white quartz layers, parallel to the foliation, are very often present in the folded beds and are folded along with them. The quartz is recrystallized to a granular aggregate and generally thickens in fold hinges. Cleavage usually does not cut through the hinges, indicating that folding is by bedding plane slip rather than differential shear along cleavage planes. The hinges of major folds are areas of much minor folding. The principal style of folding in the phyllite zone appears to be appressed folds accompanied by bedding plane slips which are upright or slightly overturned to the SW. However, in some areas the cleavage parallel to the axial planes of the L-1 folds does cut through the fold hinges, cutting the composition (bedding) layers into thin slices. It is possible that unrecognized shearing of fold hinges has obliterated many of the folds in the map area.

The steep (L-2) folding occurs most prominently on either side of the quartz diorite sill on Tracy Arm. The gneiss is made up of a mosaic of quartz grains with only scattered oriented platy minerals. Continuous layers of platy minerals are not present as in the phyllite and oriented trains of biotite take the place of crenulations as the chief linear element where minor folds are absent. This L-2 lineation is ubiquitous between the batholith and the quartz diorite sill on Tracy Arm. Cleavage has not played a role in the minor folding present in these rocks. The L-2 minor folds present in the gneiss on Tracy Arm and on Taku Inlet give the appearance of having formed under more plastic conditions than the L-1 folds in the phyllite. Entire areas are made up of a mass of tight steeply-plunging folds with no axial plane cleavage present.

The only L-2 folds found outside the gneiss occur in rather massive phyllitic quartzite on Tracy Arm. These folds plunge 79 degrees SE and have an amplitude of several 10's of feet. In another band of similar rock ¼ mile to the south, L-2 lineations occur. This quartzite occurs as layers in amphibolite, and it is quite possible that microscopic investigation will indicate that this area is of higher metamorphic grade than the phyllite. In other areas the L-2 folding occurs nearer the quartz diorite in rocks of higher metamorphic grade than the phyllite.

Quartz Veins

The quartz veins in all of the Endicott Arm-Tracy Arm area can be subdivided into three distinct classes: 1. Exsolution quartz veins: sugar quartz veinlets from a fraction of an inch to a few inches long and a fraction of an inch wide which are strictly parallel to the foliation and probably originated by exsolution from the adjacent country rock. 2. Tectonized veins of sugar quartz consisting of bunches of quartz lenses, rodded and boudined quartz, and folded quartz veins: most of these quartz bodies cut the foliation, often at only a slight angle. 3. Quartz veins occupying cross joints.

Exsolution Quartz Veins. Glassy crystalline quartz veinlets are common in the quartz-biotite gneiss area on Tracy Arm. These veins are lenticular, generally ½ inch or less wide and from a fraction of an inch to several feet long, and they invariably parallel the banding of the rock. They may occur in either the biotitic or the quartz-rich layers. It seems likely that the quartz in these veins has exsolved from the country rock into open spaces.

Tectonized Quartz Veins. Tabular quartz veins which crosscut the phyllite at high angles may contain a few or many simple folds. Often much-deformed quartz veins which occur as crests and troughs of fold hinges, with their limbs sheared out, are present in the rock, along with later less-folded crosscutting veins in the same horizon, indicating differential deformation of quartz veins of different ages. At one locality on Tracy Arm, an isolated quartz lens parallel to the foliation of the phyllite is on strike with a folded quartz vein, like a question mark with a lenticular period. In a nearby area, a quartz vein that parallels the foliation of the phyllite is pulled out into a series of lenses (boudins) like a string of beads. Most of the quartz veins in the Tracy Arm - Endicott Arm area are lenticular and parallel or nearly parallel to the foliation of the country rock. Often a series of such lenses are arranged en echelon, each parallel to the phyllite and slightly offset from the one beyond as if the group had originally been a single crosscutting vein which had been sheared into lenticular segments. Lenticular quartz and folded quartz veins are commonly surrounded by crenulations, and less commonly minor folds, in the adjacent phyllite, which often is planar and devoid of such structures at a distance from the quartz. These deformed quartz veins, where seen in three dimensions are elongated, with their long axes generally parallel to the associated fold structures in the phyllite. The deformed appearance of the quartz and its close association with minor fold structures in the phyllite is the result of post-quartz vein slip or stretching along the phyllite layers.

Another indication of the tectonic origin of deformed-looking quartz is given by its mode of occurrence in relatively unmineralized areas. Along the coast of Endicott Arm, south of Powers Creek, the phyllite mostly contains little visible quartz. At intervals of a few hundred feet, there are areas several feet across which contain veins, lenses, disconnected hinges and irregular crosscutting bodies of white quartz. This quartz does not occur rather evenly scattered in layers as in the gneiss zone, nor is it restricted to fold hinges, where it could be due to exsolution. The quartz appears to be due to the deformation of scattered quartz veins which were emplaced before or during folding of the phyllite. In many areas, particularly around the Alaska Juneau deposit, it was noted that quartz and deformation appear to be linked in origin. The vein quartz bearing areas have been deformed while others have not, as if the quartz acted as a lubricant. Possibly, deformation of the veins was facilitated by recrystallization into sugar quartz at the time of folding.

Often more-or-less tabular quartz veins are folded back on themselves so as to make a knot. Examples of different stages of this type of deformation show that the fold becomes compressed and the limbs sheared out to form an irregular lens, often containing swirls of phyllite. The long axes of these quartz rods are parallel to the original fold. It is not always possible to discriminate between these structures and the boudins, which are due to stretching, but they are both syntectonic structures with their long axes approximately parallel to the minor fold axes and crenulations in the enclosing rocks. Both structures indicate deformation after vein emplacement.

Study of these structures is hampered by the difficulty of determining the plunges of the folds and lenticular structures in the quartz veins. For the most part, the long axes of quartz structures are approximately parallel to L-1 folds, but in a few phyllite areas, steeply plunging quartz rods and lenses are present. These steep structures are intermediate in plunge between L-1 folding of the phyllite and L-2 folding of the gneiss.

There can be little doubt that sinusoidal folds in a tabular crosscutting vein are due to folding of pre-existing veins. In the more deformed quartz which occurs as boudins, rods, and complexly folded veins, selective replacement of early tectonic structures by later quartz has been suggested. Wayland (1960, p. 272) states that "The apparent folding of some early quartz veins in phyllites is due to selective replacement of shear folded beds." However, many of these folded beds lie in phyllite whose folding has been obliterated so that only axial plane cleavage remains. There has been nothing left to guide replacement into these complex fold forms. In addition, the axes of these folded quartz veins are commonly parallel to the crenulations in the enclosing phyllite and to the major and minor folds.

In any one deformed-looking quartz body replacement may be ruled out, but the general relations of folded, rodded and boudined quartz with folds and crenulations in adjacent quartz and wall rock indicates a tectonic origin.

Quartz Filled Cross Joints. The sketch shows a typical quartz filled cross joint. These veins are generally near vertical and strike NE, and typically crosscut a relatively competent bed. The slight "sucking in" of the bedding at the ends is very common and indicates a stretching of the country rock perpendicular to the vein. The joints usually extend beyond the ends of the quartz filling. Occasionally they change to kink bands beyond the end of the quartz. These quartz veins are post-tectonic and younger than the tectonized quartz lenses which they cut with sharp contacts. These crosscutting veins are invariably flat-lenticular in shape and range in length from less than an inch to 20 or 30 feet in strike length. In one exposure, quartz veinlets 3/4" long x 3/16" wide crosscut a 3" quartzite layer with streaked phyllite on either side. The quartz veins do not extend into the phyllite, and at their ends grade out into the quartzite. These veinlets appear to be exsolved from the quartzite. It seems likely that the larger crosscutting quartz veins have a similar origin.

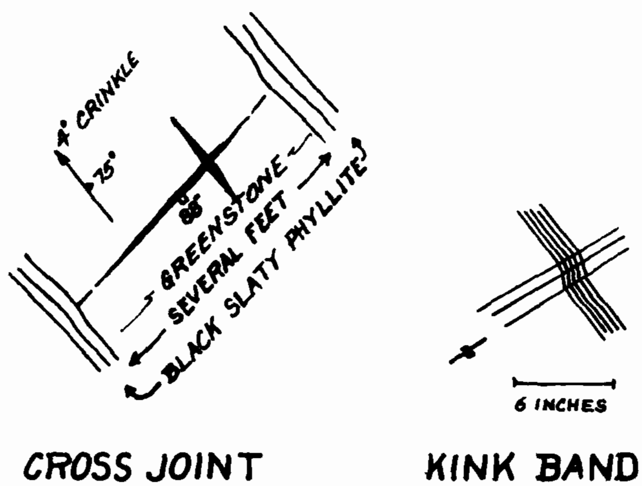


FIGURE 1

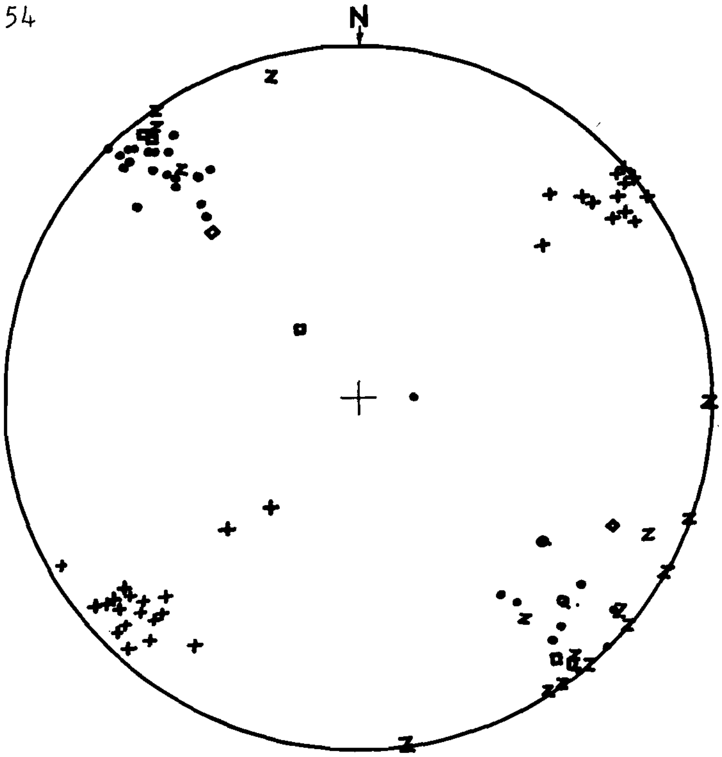


FIGURE 2

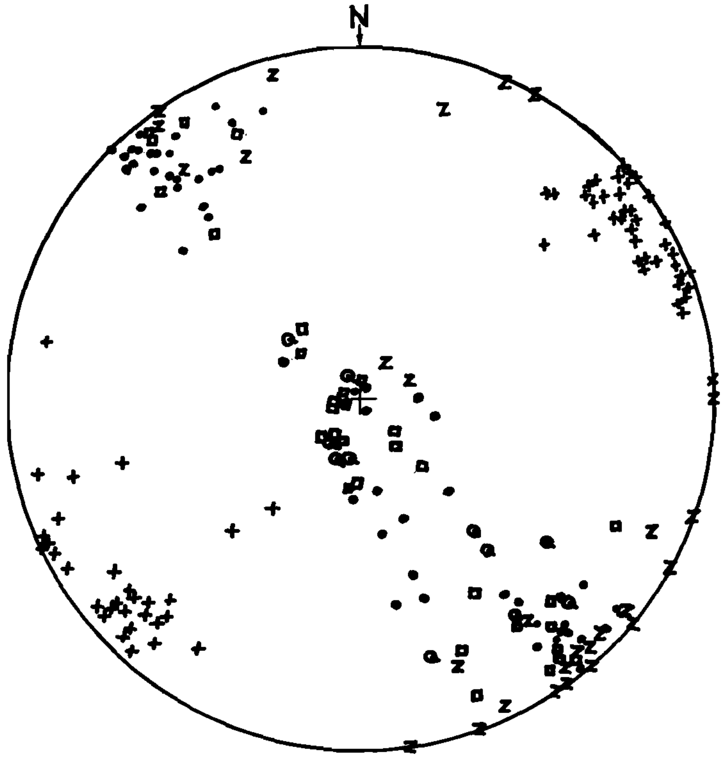


FIGURE 3

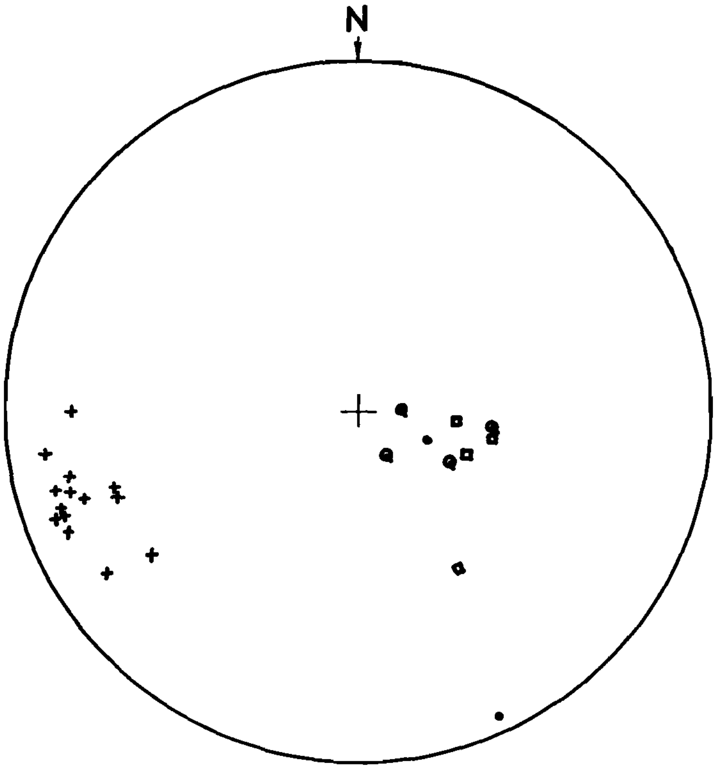


FIGURE 4

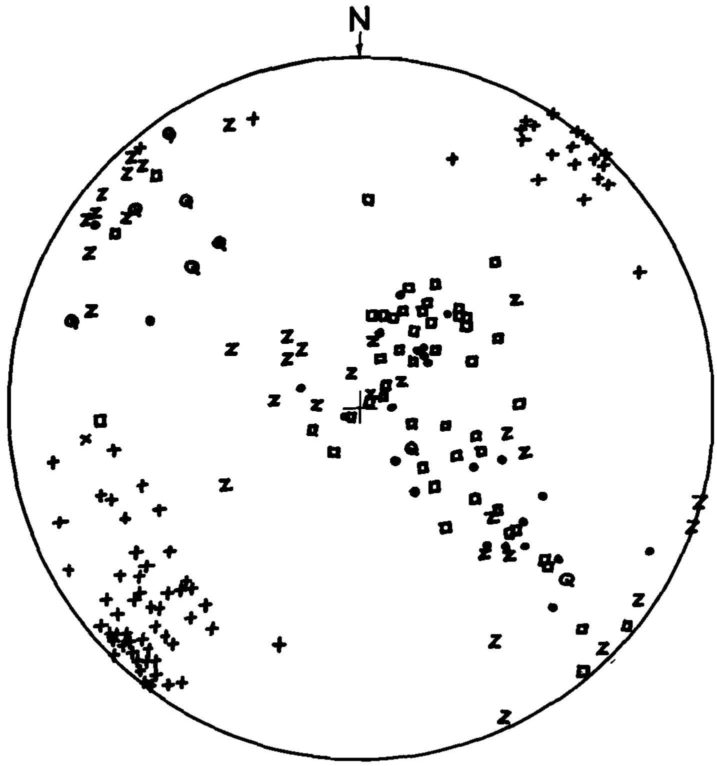


FIGURE 5

EQUAL AREA STEREOGRAPHIC PLOTS OF STRUCTURAL DATA

- • MINOR FOLD
- ▫ CRENULATION
- Q QUARTZ BOUDIN OR ROD
- + POLE OF FOLIATION OR BEDDING
- Z POLE OF JOINT

FIGURE 2 BIG BIGHT AREA OF ENDICOTT ARM
FIGURE 3 ENDICOTT-TRACY ARM MAP AREA
FIGURE 4 POINT ASTLEY PROSPECT AREA
FIGURE 5 TAKU INLET MAP AREA

Structural Synthesis

Evidence has been given to show that two general orientations of minor folds are present--early moderately plunging folds (L-1) which parallel the major folds and later steeply plunging folds (L-2). These relations can be graphically shown by plotting the structural data on a stereographic net. The plot of lineations and the poles of foliations mapped in the vicinity of Big Bight on Endicott Arm (Fig. 2) shows that fold and crenulation axes trend N40W with plunges averaging about horizontal. Foliation averages about N40W strike with vertical dip. The pattern of fold orientations on the geologic map (Map 1) suggests that the scatter of fold axes along their line of trend on the plot is due to culminations and depressions of the major fold axes along their strike. Because of the isoclinal nature of the folding most foliation attitudes in the map area are steep and the foliation poles are concentrated at the edges of the plot, with only slight scatter across the plot. The rare fold hinge areas where flat dips occur contain numerous minor folds which make meaningful foliation attitudes difficult to measure.

On Figure 3, all the structural data taken in the Endicott Arm-Tracy Arm area are plotted. This plot is much like Figure 2 except for the scattering of fold and crenulation axes across the center of the plot, due to the L-2 and intermediate axes. This pattern could be caused by folding of pre-existing NE-trending fold axes and quartz rods and boudins about a later NW-trending axis. Or the pattern could be the result of steep folding in the near vertical limbs of NW-trending folds. The second explanation is favored because the steep folding occurs mainly in rocks of higher metamorphic grade and not in the easily folded phyllite. Figure 3 indicates that the dominant joint orientation is N45E with a steep NW dip. This is in agreement with the finding of Gault and Fellows (1953, Fig. 2).

Tectonic Analysis

The NW trending folds are the dominant structure in the map area. This deformation was the result of a NE directed stress and was accompanied by metamorphism as shown by the preferred orientation, relative to the fold structure, of syn-kinematic biotite and other minerals. These NW folds are vertical, isoclinal, and are accompanied by minor drag folds with axes parallel to the major fold axes.

Along the NE side of the metamorphic belt, adjacent to the not yet intruded quartz diorite, the metamorphic grade was higher and gneiss formed and was folded on a small scale about steep axes. There is no sign of large steep folds and the minor folds and biotite lineations may be the result of a couple, sense unknown, acting in a horizontal direction (i.e. wrench movement) to produce a zone of shear movement when the rocks were plastic due to their high temperature. After the formation of these minor structures the quartz diorite was emplaced in some manner that produced sharp contacts without deformation of the lineation and lamination of the gneiss.

Subsequently, a dominant joint set formed, which is statistically approximately perpendicular to the NW fold axes but does not change with the oscillation of the minor folds, NW and SE. These joints represent planes of low pressure, as is shown by their quartz fillings, and according to the theory of the strain ellipsoid should be parallel to the direction of maximum stress. Thus, they may be a product of stress oriented in the same direction as that responsible for the NW folding. The change of structure from major folds to joints would be caused by the stiffening of the rocks due to steep folding and lowering of temperature. These joints are late, as they cut quartz diorite, gneiss, and phyllite, but the temperature was still high enough for quartz mobility and consequent vein formation.

The steep plunging (L-2) minor folds formed after the main period of folding and before formation of the cross joints. They may represent the response of the steep dipping plastic gneiss to the same SW-directed stress that formed the major folds. Once the folded beds of the metamorphic belt beds were nearly perpendicular to the deforming stress, they would resist further folding. If the direction of deforming stress were not exactly perpendicular to the near vertical hot plastic zone in the interior of the metamorphic belt, a couple might result which could fold the rocks of the plastic zone about steep axes. Other linear zones of weakness along the Coast Range belt could behave in the same manner. Point Astley may represent such a zone.

Copper Zinc Prospect at Point Astley

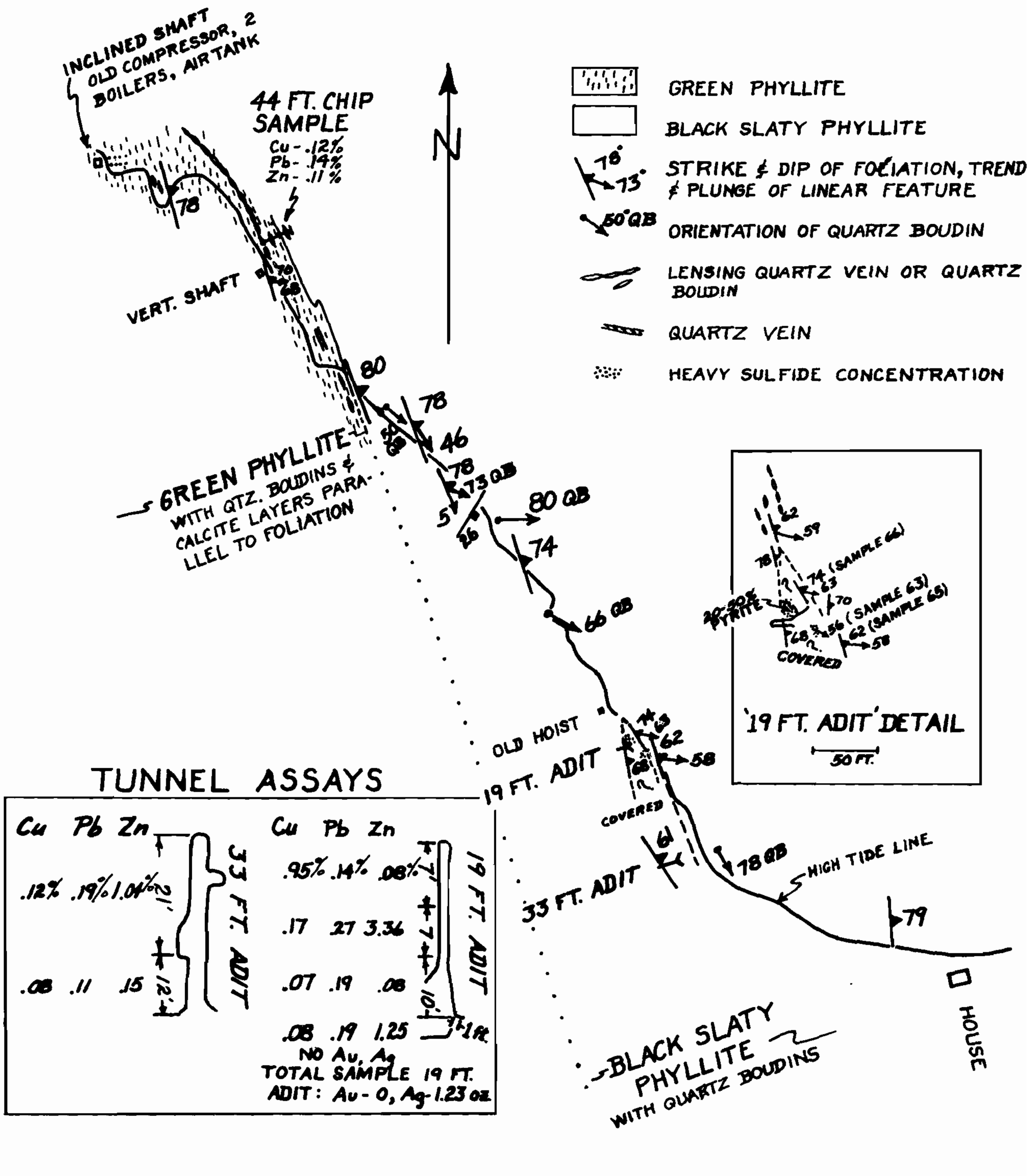
This property is the same as described by Spencer (1906, p. 45) as the Oceanic Group of claims. The prospect is shown on the U.S.G.S. Sumdum C-5 1:63,360 quadrangle map on the beach one mile SE of Point Astley. (See also index map on Map 1) Two adits, two flooded shafts, some old mining machinery, and a habitable building remain from the early work. Concerning the geology, Spencer states that "irregularly distributed along the schistosity of this country rock there has been an introduction of sulfides,accompanied by quartz and calcite, with no apparent channels to which the metalliferous solutions were confined. This sort of filling has produced a mineral belt a few hundred feet in width and several hundred feet in length, within which occasional seams rich in silver and copper are encountered."

The mineralized zone was mapped and sampled in two adits and along the tidal zone where it is well exposed. (Map 2 & Fig. 4) William Race, State Mining Engineer, did the assay sampling and took geochemical samples in the area. (See following report) The deposits occur in the vicinity of a contact between green chloritic phyllite and black slaty phyllite. The chloritic phyllite contains quartz and carbonate boudins and rods. It is strongly lineated by this rodding and by crenulations on the phyllitic surface. The black slaty phyllite contains faint, moderately plunging, crenulations and numerous rodded and boudined quartz veins. All or almost all of the quartz veining is pre-tectonic, as shown by lenticular outcrops. Where exposures allow a look at the third dimension, this quartz proved to be elongated into rods and boudins whose long axes are parallel to one another and to many of the crenulations in the wall rocks. The sulfides appear to take part in these structures and, therefore, are probably pre-tectonic also. Pyrite and ore minerals are concentrated in two localities. The northern-most lies in the hangingwall of a 2 foot wide zone consisting of about 70% irregular masses and lenses of quartz in greenstone schist. Fibrous amphibole subparallel with the lineation of the wall rock is disseminated along this zone. A chip sample taken over the entire width (44 feet) of the disseminated pyrite zone in the hangingwall of the quartz assayed 0.37% total Cu, Pb, Zn. This is the most mineralized zone in the northern area.

The southern-most ore zone is exposed on the shore and in two short adits. This area was strongly lineated with an average easterly plunge of 59°. Lineations consist mainly of prominent crenulations, but one irregular fold, made up of quartz and sulfide, plunges SE 56°. There are no crosscutting sulfide or quartz veins. The whole sulfide-quartz zone (outlined on the map) has the appearance of a large tectonic lens. It seems likely that this lens is actually a tectonic prism that plunges steeply eastward, parallel to its minor structures.

ALASKA DIVISION OF MINES & MINERALS

MAP 2



POINT ASTLEY ZN-CU PROSPECT

0 100 200 FEET

G.H. & W.R. 1963

A large amount of deformed quartz is visible in the country rock exposed along the shore just east of the old building, but little sulfide is present. With this exception, the area mapped contains the only observed significant amount of quartz and indications of mineralization between Point Astley (proper) and the next point, about a mile to the east. At V.A. Bench Mark "Holk" shown on the quadrangle map ½ mile east of Point Astley, a sheared conglomerate with ellipsoidal clasts occurs. The long dimensions of the ellipsoids plunge steeply.

The following statement is made by Buddington and Chapin (1929 p. 291): "A highly mashed overthrust fault zone is indicated by the cataclastic texture of the rocks in a belt on the mainland adjacent to Stephens Passage from Point Houghton north to Point Astley and to the northwest.....". The authors may be referring to this conglomerate or to the Point Astley prospect.

It seems likely that the structure at the Point Astley prospect may be the result of sub-horizontal shear movements similar to those that formed the steep lineation along the edge of the batholith in the Tracy Arm-Endicott Arm area. The extensions of this zone along the strike may be a structure favorable for ore deposits.

Portland Group Prospect

Early work on the Portland Group is briefly mentioned by Spencer (1906, p.45) as follows:

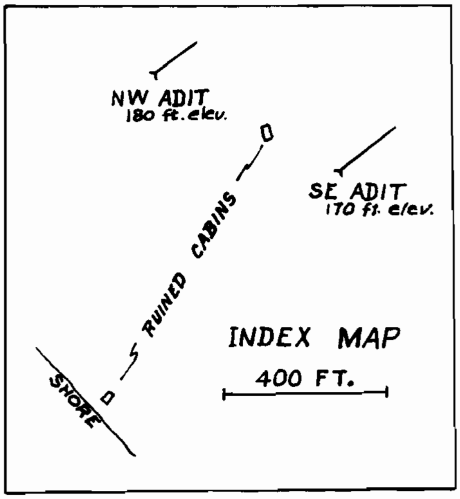
"Close to the shore on the north side of Endicott Arm opposite Sumdum, numerous claims have been located upon a wide belt of mineralized rock belonging to the schist belt which lies adjacent to the Coast Range diorite. The ore bodies consist of siliceous schists carrying disseminated sulfides and stringers of quartz and calcite which fill openings along the schistosity. The zone of mineralization follows the strike of the schists and with an average width of nearly 1,000 feet is traceable for a mile or more along their outcrop. The ores are gold-bearing pyrite, galena, and sphalerite and are reported to assay from $0.50 to $3 per ton. A crosscut tunnel 180 feet in length and a few open cuts expose the mineralized rock, but how much of this will eventually prove to be minable can be determined only by more development work and careful sampling."

Two adits of the Portland Group were mapped (Map 3) and chip samples were taken for the full length of the workings by William Race, State Mining Engineer. The results of this examination are shown on the accompanying map. The bedrock in the adits consisted of dark slaty phyllite with numerous lenticular quartz veins and light colored quartzose phyllite with quartz layers. No crosscutting quartz veins are present and visible mineralization is restricted to sporadic cubes and a few seams of pyrite. All of the quartz is pre-tectonic and it seems likely that this area has little more mineralization than the average bedrock in the region. The assays give a useful sample of the trace metal content of unweathered country rock.

Neglected Prize Prospect

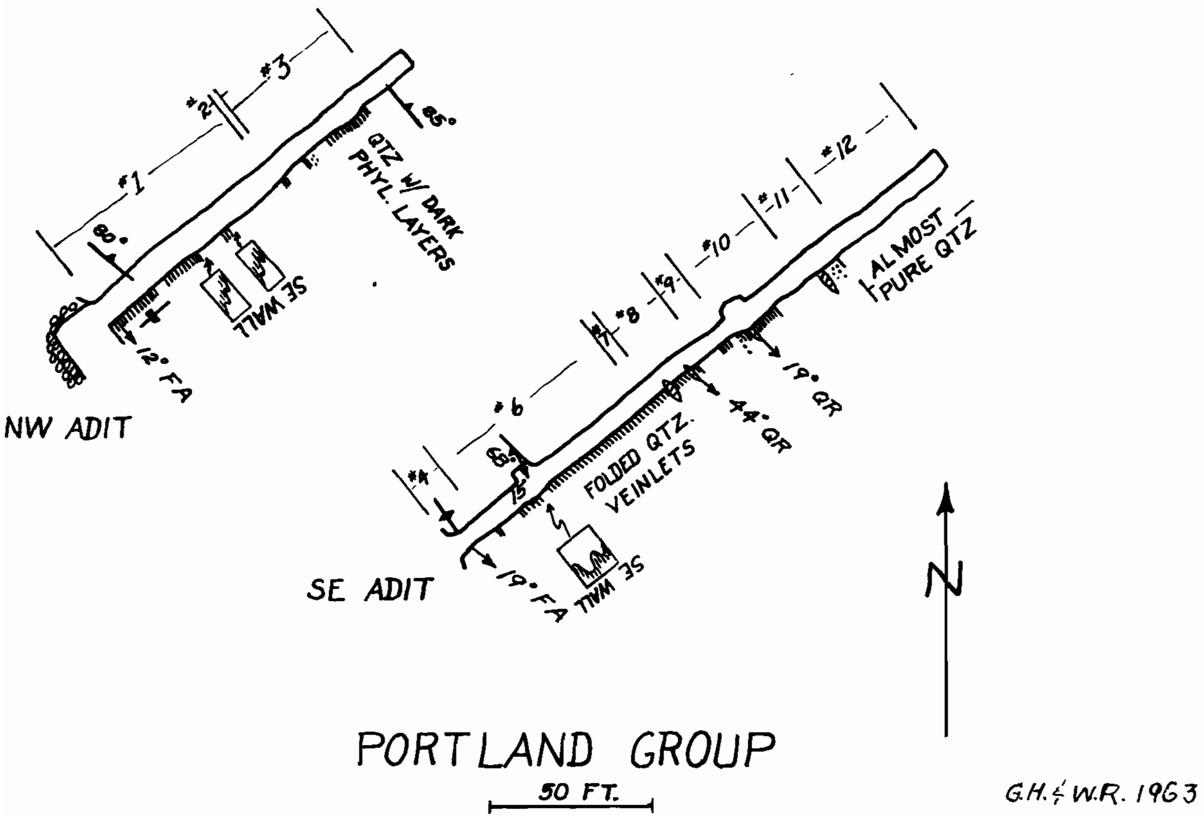
A U.S. Geological Survey report on this property by Gault and Fellows (1953) gives detailed and regional geologic maps and assays. These authors estimate the reserves to be 400 tons per vertical foot for a vein 4.8 feet wide and 830 feet long carrying 3.2% Zn, 1.5% Cu, 0.013 oz. Au and 0.75 oz. Ag. Other lower grade veins are reported in the vicinity. The deposit was visited for one day, but not

ALASKA DIVISION OF MINES & MINERALS — MAP 3

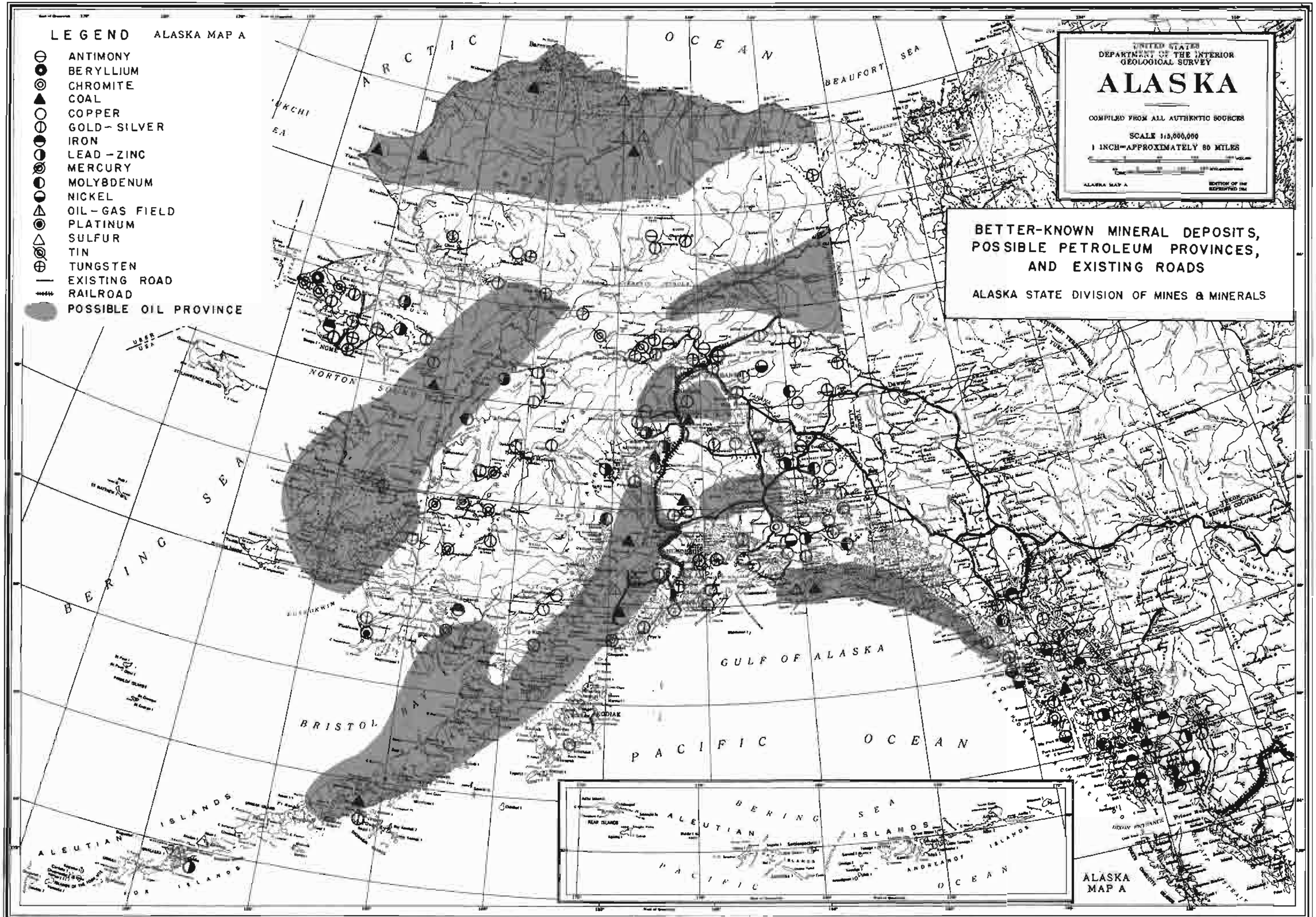


ASSAYS

	Au	Ag	Cu	Pb	Zn
#1	T	0	.22%	.15%	.17%
#2	0	0	T	.18	.10
#3	T	T	0	.11	.13
#4	T	0	0	.23	.16
#6	T	0	0	.21	.14
#7	T	0	.07	.19	.09
#8	T	0	.09	.21	.15
#9	T	0	T	.17	.22
#10	T	0	.12	.16	.52
#11	T	0	.37	.16	.23
#12	T	0	.40	.18	.23



DARK PHYLLITE WITH QUARTZ LAYERS
QUARTZOSE PHYLLITE
PYRITE
FOLIATION
PLUNGE OF FOLD AXIS (FA) OR QUARTZ ROD (QR)


LEGEND
ALASKA MAP A
ANTIMONY
BERYLLIUM
CHROMITE
COAL
COPPER
GOLD-SILVER
IRON
LEAD-ZINC
MERCURY
MOLYBDENUM
NICKEL
OIL-GAS FIELD
PLATINUM
SULFUR
TIN
TUNGSTEN
EXISTING ROAD
RAILROAD
POSSIBLE OIL PROVINCE
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ALASKA
COMPILED FROM ALL AUTHENTIC SOURCES
SCALE 1:5,000,000
1 INCH=APPROXIMATELY 80 MILES
ALASKA MAP A
BETTER-KNOWN MINERAL DEPOSITS, POSSIBLE PETROLEUM PROVINCES, AND EXISTING ROADS
ALASKA STATE DIVISION OF MINES & MINERALS
ARCTIC OCEAN
BEAUFORT SEA
BERING SEA
NORTON SOUND
GULF OF ALASKA
BRISTOL BAY
PACIFIC OCEAN
KODIAK
NOME
ALEUTIAN ISLANDS
BERING SEA
ALEUTIAN ISLANDS
PACIFIC OCEAN
ALASKA MAP A

remapped. It is evident from the maps and from outcrops along the vein that steep lineations predominate in this area, just as they do along the shoreline on strike to the NW. The deposit appears to have formed during the period of L-2 folding and shearing of the gneiss, as the sulfides appear to conform to the rock structures. It seems likely that the long axes of this deposit is steep, parallel to the minor structures.

Taku Inlet

A section across the metamorphic belt was mapped along the north shore of Taku Inlet (Map 4 & Fig. 5). This work will be described only briefly as the main features of the geology are similar to those in the Endicott Arm-Tracy Arm area. The rocks at Point Bishop are andesitic volcanics with amygdaloidal flow tops facing NE. These are interbedded with the overlying dark phyllites of the Perseverance slate. No large structures have been detected in this slate, but moderately plunging L-1 minor folds and crenulations are common. These are more erratic than in the Endicott-Tracy Arm area, but mainly plunge SE. In some rocks, minor structures plunge both SE and NW in the same outcrop. As the quartz diorite is approached across the phyllite, first biotite and then red garnet occurs, indicating an increase in the metamorphic grade. Some of these garnets have been rolled, indicating that folding with consequent bedding plane slip has continued after the formation of the garnet. The biotite is oriented parallel to the foliation of the schist and is therefore syn-tectonic also.

Toward the NE, the biotite schist grades into gneiss with the gradual increase in metamorphic differentiation of the rocks into quartz and biotite rich layers. Steep plunging (L-2) minor folds predominate in the gneiss, but are also found locally in the biotite schist. The quartz diorite contains quartz hinges, basic inclusions and lineations formed of trains of biotite crystals that parallel the structures of the metamorphic rocks. In some areas in the quartz diorite, lenticular quartz augen contains red garnets.

Folded, boudined, and rodded quartz veins similar to those described in the Endicott-Tracy Arm area occur in the phyllite, schist, gneiss and locally as relict structures in the quartz diorite. In addition two quartz stringer zones, about 150 feet apart, occur in the phyllite; these veins are surrounded by biotite hornfels. At one of the localities, the zone is about 20 feet wide; the main stringers strike about parallel to the foliation of the phyllite but dip 60° SE, across it; between the main stringers, the hornfels is cut by numerous irregular quartz veinlets, many of which are bordered by biotite. A chip sample across the zone gave nil Au and Ag. Crenulations in the wall rocks plunge moderately SE. Typical steep NE striking joints cut the veins and do not contain quartz. The stringer zones represent quartz emplaced after folding and before formation of joints.

Three conspicuously rusty stained zones, totaling over ½ mile in width occur at and on either side of Cooper Point. The bedrock in these areas is pyrrhotite-bearing quartzose schist. One-fifth of a mile north of Cooper Point, the schist is cut by parallel and crosscutting quartz veins with greater than average amounts of disseminated pyrrhotite in the adjacent country rock. A sample of the sulfide-bearing rock ran 0.02 oz. Au, nil Ag, per ton. This rock appears to be a metamorphosed impure quartz sandstone, similar in original rock type to the quartz-biotite rock 1½ miles SW of Cooper Point and to the phyllitic quartzite in the core of the fold near the old Perseverance shaft at the Alaska Juneau mine. The rock between these quartzose areas is derived from black slate.

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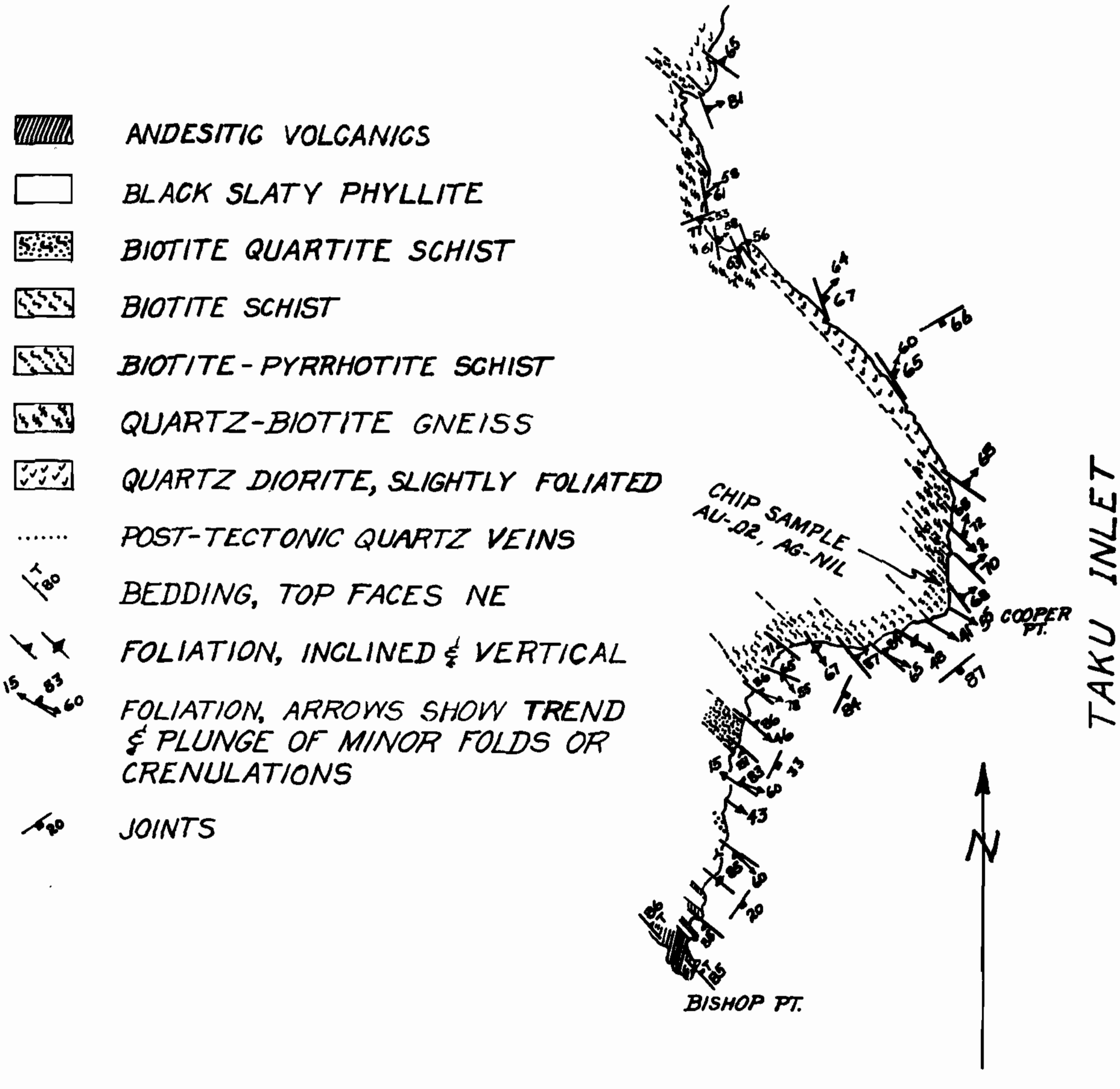
MAP 4



GEOLOGIC MAP OF PART OF NORTWEST SHORE OF TAKU INLET

1 MILE

G.H. 1965

Alaska Juneau Mine

The Alaska Juneau mine offers the most favorable opportunity to study the relation between mineralization and the geology of the Coast Range region. The surface area of the old Perseverance Mine is well exposed, fairly accessible, and contains what is by Alaska Juneau standards, fairly good ore. This ground is now part of the Alaska Juneau property. About 10 days was spent in the area in mapping and reconnaissance. Because of the short time spent in the area, the complexity of the geology, and lack of a satisfactory base map, no map is included in this preliminary report. Possibly for similar reasons, no comprehensive report has ever been published on the mine.

Thanks are due to Mr. Gene Nelson, Juneau manager of the Alaska Juneau Gold Mining Company, for furnishing maps, reports and survey data and some of the flavor of the old AJ.

The ore bodies of the Alaska Juneau mine are merely the richest portions of a larger area described by Wernecke (1932) as 1-2,000 feet wide and 3½ miles long. In this area, vein quartz occurs in abundance greater than average for the region. Most of this vein quartz occurs in folded, boudined and rodded veins, usually a fraction of an inch in width which, because they carry little or no gold, have been given little study. These veins are similar in structure to the deformed quartz veins elsewhere in the Coast Range mineral belt. They were deformed along with the enclosing wall rocks. The evidence for the pre- or syn-tectonic age of these deformed quartz veins is similar to that given earlier in the description of structures in the Endicott-Tracy Arm area. In addition, there are many veins of several inches to a few feet in width which crosscut the foliation of the country rock, usually at small angles. These are the ore-bearing veins. These are not of great strike length, are irregular in cross section, occasionally boudined, often end bluntly with the foliation wrapped around the end of the vein, and may hook around at the end as though folded. See Figure by Wernecke (1932, Fig. 7). This is also shown by Bateman (1950, Fig. 12-6). No great amount of slip has occurred on the foliation surfaces of the enclosing phyllite since these veins were emplaced, but their irregularities seem to be indicative of some post-vein deformation. I would tentatively place them as late tectonic. This is contrary to the opinion of earlier workers, all who have considered them to be much later than the period of folding.

Earlier workers have regarded the amphibolites as intrusive. I found that the contacts between amphibolite and quartzose phyllite are gradational, and it appears that the amphibolite represents tuff layers in the original sediments. It seems likely that crosscutting relationships which have led to the conclusion of an intrusive relationship were due to mistaking axial plane cleavage in black slate for bedding where it strikes into fold hinges of amphibolite. This same relationship is present on a small scale in many of the quartz veinlets where folded veins crosscut the cleavage of the enclosing slate.

Whatever their origin, the amphibolites were emplaced before folding and metamorphism, apparently parallel to the bedding of the sediments. They have an important role in the formation of the ore structures as the openings are localized along contacts of amphibolite with black phyllite. The deformed condition of some, or possibly all, of the veins indicates that at least some of these openings were formed and filled with quartz before the end of folding. Mining has shown that the late veins, which carry the ore, are closely controlled by these folds and plunge about 40° SE, parallel to the major amphibolite fold hinges.

Wernecke (1932, p. 495) states that the ore-bearing quartz stringers occur "in more or less continuous pipe-tine groups along fracture ridges or tongues of brown gabbro". These ridges and tongues are irregular folds in the hinge areas of altered amphibolite (brown gabbro). The ore zones occur mainly along the axial plane zone of the major fold, localized along favorable contacts.

Thus, the analysis of minor and major structures shows that the early quartz veinlets were emplaced and deformed before the end of the period of folding, and that the location of the later, ore-bearing quartz veins was closely controlled by the fold structures. The vein structures indicate that these are not simple, undeformed fissure veins. This ore control may be the result of more brittle behavior of the rocks near the end of folding.

The Alaska Juneau deposit occurs approximately a mile SW of the biotite zone of metamorphism, but brown biotite is closely associated with the ore zone and commonly occurs along the margins of the amphibolite bodies in the area. Elsewhere along the Coast Range mineral belt, isolated areas of biotite bearing phyllite have been found SW of the main biotite zone.

The amphibolite bodies were deposited or emplaced before folding and metamorphism and have been folded with the enclosing phyllite into major folds. Minor folds parallel these major folds. Minor quartz veins were emplaced before or during metamorphism and folding, and have been much deformed. Larger, ore-bearing, quartz veins were emplaced later, apparently near the end of the period of folding. The ore shoots, made up of large numbers of these quartz veins, occur near black slate-amphibolite contacts along the axial plane zone of the major fold. Openings formed during folding along the contacts localized the ore. Localization of mineralization along the hinges of folds plunging downward at 40° provided access to deeper levels. The ore was deposited during the period of metamorphism about a mile outside the biotite zone.

It is suggested that water and other volatiles boiled off from the metamorphic zone below the deposit and traveled up the plunging structures bringing in quartz, ore minerals and the heat necessary to raise the ore zone to biotite grade temperature. The formation of the deposit was a function of structure, metamorphism, trace element content of the rock and timing--all elements that can be mapped.

General Summary

Geologic mapping was done in selected cross sections of the metamorphic belt SW of the margin of the Coast Range batholith, over a width of up to 4 miles in the Endicott-Tracy Arm and Juneau-Taku Inlet areas.

The rock types, metamorphism, and structure in the two areas are similar. The metamorphic rocks consist of phyllite on the SW side, grading into biotite schist and then quartz biotite gneiss as a result of the appearance and growth of biotite and the increasing differentiation of the rocks into biotite-rich and quartz-rich layers as the metamorphic grade increases with the approach to the batholith. The contact of the quartz diorite of the batholith with the gneiss is gradational to sharp, and oriented inclusions of metamorphic rocks are present in the quartz diorite. The quartz diorite post-dates the formation of gneiss and appears to be of replacement origin.

NW trending folds dominate the structure of the region. These folds are best preserved in the phyllites as swarms of parallel NW-trending minor folds plunging moderately NW and SE. In favorable localities, large NW-trending folds are detectable parallel to the NW-trending minor folds. The major folds are isoclinal, bedding plane slip folds which are either vertical or overturned slightly to the SW.

Along the NE side of the metamorphic belt, mainly in the gneiss, minor folds and lineations plunge steeply down the near vertical beds. This second direction of folding is later than the first, and is thought to represent horizontal (wrench) movements along a plastic heated zone pre-dating the quartz diorite, which appears to be restricted to the same zone.

Later NE-striking, near-vertical cross joints cut phyllite, gneiss and quartz diorite.

Quartz veins in the map area can be categorized as: 1. Veinlets parallel to the foliation which exsolved from the country rock; 2. Pre- or syn-tectonic quartz veins which have been deformed by later slip along foliations of the enclosing rock and, 3. Tabular veins in cross joints which post date folding. The quartz veins at the Alaska Juneau mine are thought to be pre- or syn-tectonic in age.

The NW-trending folds and NE-striking cross joints resulted from a SW directed stress. Possibly the steep folds, which are intermediate between the two in age, represent a response under different conditions to stress from the same direction.

Mineral deposits in the area are controlled by openings associated with NW-trending folds and with NW-striking zones of wrench movement. The deposits appear to date from the time of deformation and metamorphism and may be related to metamorphic temperature gradients.

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Preliminary Geochemical Investigation
Tracy and Endicott Arm Area

by William H. Race, Mining Engineer

Introduction

The Tracy and Endicott Arm area was chosen for geological and geochemical investigation because it is a continuation of the famous Juneau gold belt, contains several base metal prospects, and is readily accessible to ocean transportation. It therefore appeared to be a good area to investigate the regional geology of the Coast Range mineral belt.

The old known prospects and mines in the area were investigated as time permitted. The stream sediments and water-shed soils were sampled in the course of the investigation.

Mines and Prospects in the Area

The Jingle-Jangle, or old Neglected Prize deposit on Tracy Arm has been prospected by trenching and a shaft 16 feet deep. The U. S. Geological Survey Bulletin 998-A estimates 40,000 tons of ore present for every 100 feet of depth. Assays taken by various engineers average 3.2 percent zinc, 1.5 percent copper, 0.013 ounces of gold, and 0.75 ounces of silver per ton.

The Sumdum Deposit on Endicott Arm has been drilled and mapped by one of the large mining companies. Their report is still confidential but it is understood that this deposit is similar to the Jingle-Jangle but somewhat larger and of lower grade.

The Portland Group on Endicott Arm was evidently an old gold prospect.

The Sumdum Chief mine produced about $500,000 worth of gold before the deposit was exhausted.

The Pt. Astley deposit has been prospected for gold, lead, and zinc by two tunnels and two shafts. The deposit is at high tide level so the shafts are flooded. The extent of underground development is unknown.

Physical Features

The mountains of Tracy and Endicott Arms rise abruptly from sea level in most places. Timberline attains an altitude of about 2500 feet and glaciers occupy most of the valleys above 4500 feet. The valleys and streams are fed by melting snow, glaciers, or rain. The stream flow fluctuates widely with variances of rainfall and temperatures that affect the rate of melt.

The overburden consists of sand or sandy clay on bedrock, very little gravel, sandy soil, and top soil. It was found that the soil cover in Endicott Arm was thicker than that in Tracy Arm where in places it was difficult to find a sample adjacent to a stream.

Method

Geochemical samples were dug by shovel, placed in marked plastic freezer bags and sent to Mr. Denny, Assayer at the Division of Mines and Minerals office in Ketchikan. Mr. Denny determined the amount of metal by two methods. He used the cold extraction method developed by the University of Alaska and the fusion method perfected by the Geological Survey of Canada. The results compared favorably, though the fusion method seemed to show wider variations. However, either method would detect the presence of an anomaly.

U.S.G.S. Bulletin 1000-F designates the sequence of soil horizons as follows:

"A" - the uppermost horizon or topsoil containing the humus.
"B" - the middle layer or subsoil containing no humus.
"C" - the lower layer composed of residual weathered bedrock.

The "B" zone was used in this investigation because in some places there were only the "A" and "B" zones available, so it was concluded that the samples would be more consistent by taking them all from the same horizon.

Samples were taken of the sandy "B" zone adjacent to streams. In some instances samples were dug from a depth of 3 or more feet in order to reach the "B" zone underlying muskeg. Some stream sediment samples were dug adjacent to "B" zone samples and compared.

Because of the large fluctuation in stream flow, no attempt was made to determine the metal content of water samples.

The results of the assays were plotted on an overlay of aerial photos of the area that were pinpointed at the time of sampling. In this manner, all sample points could be returned to for further investigation.

A total of 139 soil samples were taken and analyzed. These are presented in the Appendix with sample maps of the area investigated.

Observations

1. The Jingle-Jangle and Sumdum deposits were not discernible from samples taken near sea level.

2. The Sumdum deposit was not discernible from samples taken a mile from the beach.

3. The Jingle-Jangle deposit was discernible when sampled within a few hundred feet of the outcrop.

4. The highest zinc values, other than on the Jingle-Jangle, were found on the west side of Tracy Arm opposite the Jingle-Jangle; on the west side of Endicott Arm near the Sumdum Chief; and near Pt. Astley.

5. The highest copper values were found on the west side of Tracy Arm.

6. The highest lead values were found south of the Portland Group.

Conclusions

1. The Jingle-Jangle deposit likely extends several hundred feet further south than is indicated by trenching.

2. It is apparent that orebodies cannot be detected at any great distance by geochemical sampling in this particular area. An interval of more than 800 feet is unreliable for systematic prospecting in this area.

3. Stream sediment samples did not vary greatly from "B" zone samples taken adjacent to streams.

Explanation of Appendix

The list of samples is presented for those readers who may wish to compare them with other geochemical samples. Sample numbers prefixed with C1, C2, and C3 were taken in the Endicott Arm area. C4 prefixed samples were from Pt. Astley, C5 and C6 from Tracy Arm and the Jingle-Jangle deposit. C7 samples were taken in the Sanford Cove area.

Sample Number C2-28 was taken near the Portland Group and assumed to be contaminated since rock samples did not indicate the presence of a great deal of mineralization.

Sample C5-5 was taken about three hundred feet below the outcrop of the Jingle-Jangle and is indicative of results obtainable near a deposit of this type. It is interesting to note that Sample 10 is quantitatively nearly the same as Sample 9 which was taken from on top of the deposit, and both are higher in ppm than Sample 12 which was also taken on top of the deposit.

Sample C6-11 may have been contaminated but more sampling should be done in the immediate vicinity.

The background mineral content apparently varied from 0 to 50 parts per million for copper, 0 to 20 ppm for lead, and 10 to 90 ppm for zinc. Background determined by Chapman and Shacklette, U.S.G.S. Professional Paper 400-B, varied from 20 to 100 ppm for copper, 20 to 50 ppm for lead, and 20 to 50 ppm for zinc on samples taken of the "C" horizon at Mahoney Creek and Yakobi Island. That background is easily discernible from an anomaly as apparent from sample C5-5, i.e., 150 ppm copper, 40 ppm lead, and 1300 ppm zinc.

Map I indicates graphically the approximate amounts (ppm) of copper, lead, and zinc found during the course of this investigation. Not all the samples are shown because of lack of space.

Map II is a copy of a U.S. Geological Survey map of the Jingle-Jangle deposit on which some of the geochemical samples are shown. Samples prefixed with a 6 are C6 samples and those without prefixes are C5 samples. Many more samples would be necessary to delineate the orebody. This investigation was primarily done to determine what could be accomplished aerially by geochemical samples and no attempt was made to delineate the orebody.

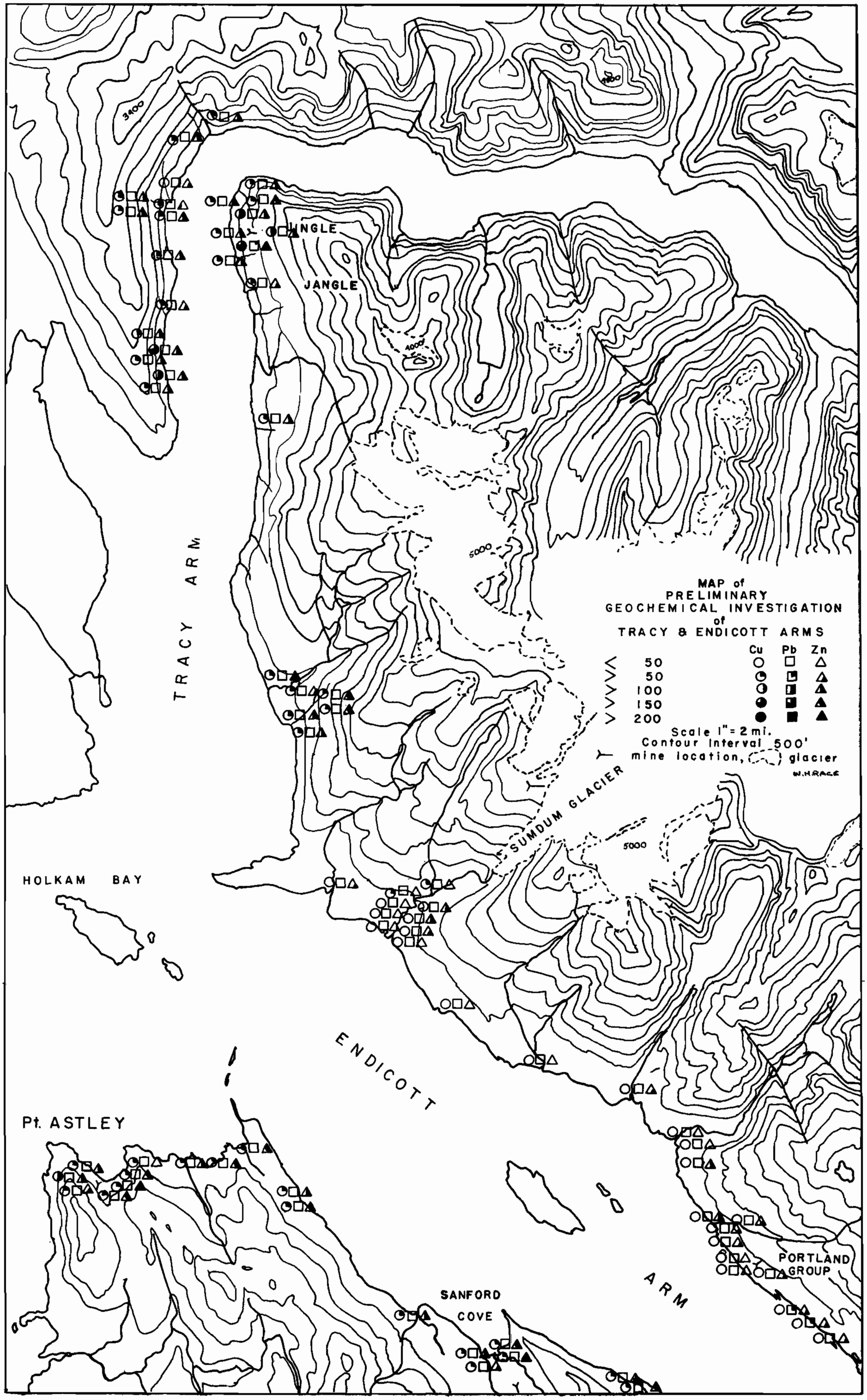
Soil Samples

	PPM		
	Cu	Pb	Zn
C1-1	3	1	100
C1-2	27	nil	50
C1-3	7	1	85
C1-4	nil	nil	65
C1-5	5	3	70
C2-1	nil	3	30
C2-2	nil	nil	10
C2-3	nil	64	150
C2-4	3	2	40
C2-5	nil	nil	30
C2-6	nil	1	25
C2-7	nil	1	25
C2-8	2	47	150
C2-9	nil	nil	50
C2-10	2	2	40
C2-11	nil	nil	25
C2-12	1	nil	50
C2-13	1	1	35
C2-14	2	nil	40
C2-15	2	nil	25
C2-16	1	2	35
C2-18	nil	1	40
C2-19	2	5	25
C2-20	nil	2	40
C2-21	nil	24	110
C2-22	nil	6	35
C2-23	2	27	75
C2-24	2	62	80
C2-25	1	58	50
C2-26	nil	11	35
C2-27	nil	14	25
C2-28	3	185	3000
C2-29	2	nil	100
C2-30	nil	2	40
C2-31	1	5	40
C2-32	nil	9	60
C2-33	2	3	50
C2-34	1	2	35
C2-35	16	1	45
C3-1	15	2	50
C3-2	5	nil	115
C3-3	25	2	125
C3-4	8	1	50
C3-5	2	nil	25
C3-6	nil	nil	40
C3-7	nil	6	25
C3-8	3	1	60
C4-1	42	8	33
C4-2	20	6	42

	PPM		
	Cu	Pb	Zn
C4-3	55	5	40
C4-4	65	10	27
C4-5	50	11	30
C4-6	90	3	21
C4-7	13	13	11
C4-8	45	7	38
C4-9	87	6	37
C4-10	75	3	134
C4-11	45	15	47
C4-12	75	6	250
C4-13	72	nil	150
C4-14	52	5	80
C4-15	47	3	72
C4-16	100	17	100
C4-17	40	14	62
C4-18	57	13	48
C4-27	91	nil	57
C5-1	60	10	145
C5-2	51	12	130
C5-3	95	9	87
C5-4	97	12	250
C5-5	150	40	1300
C5-6	89	10	52
C5-7	100	17	70
C5-8	43	13	38
C5-9	97	21	72
C5-10	92	22	30
C5-11	55	15	48
C5-12	73	13	42
C5-13	43	16	35
C5-14	40	21	40
C5-15	21	18	32
C5-16	55	12	125
C5-17	60	13	125
C5-18	40	1	78
C5-19	83	nil	35
C5-20	93	nil	118
C5-21	52	2	50
C5-22	92	nil	100
C5-23	57	nil	95
C5-24	180	nil	138
C5-25	94	nil	142
C5-26	50	nil	58
C5-30	33	nil	20
C5-31	55	nil	38
C5-32	88	nil	140
C5-33	97	6	100
C5-34	88	nil	122

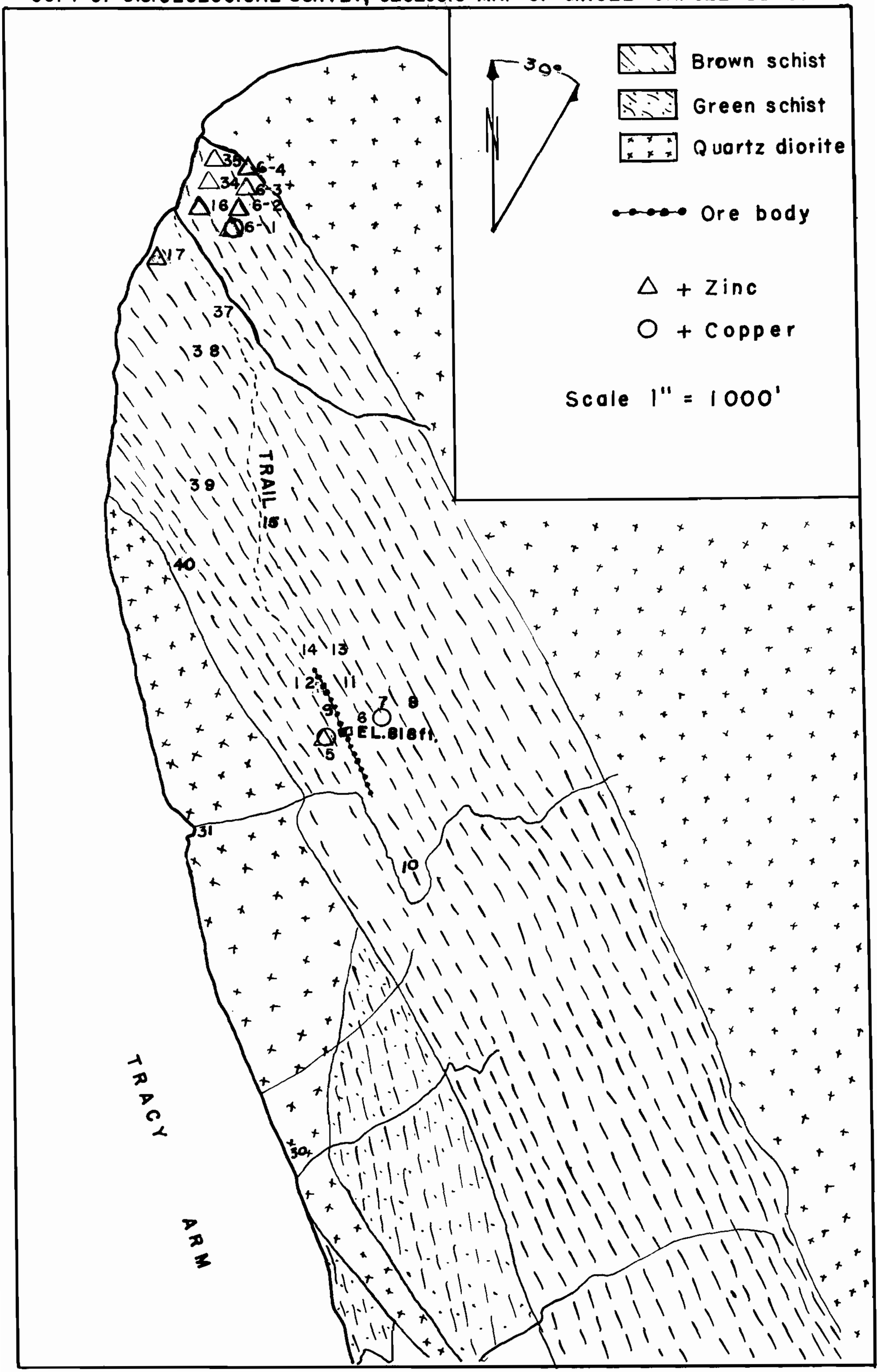
	PPM		
	Cu	Pb	Zn
C5-35	57	nil	118
C5-37	38	nil	52
C5-38	90	nil	50
C5-39	85	2	45
C5-40	60	40	50
C6-1	100	16	125
C6-2	85	nil	60
C6-3	50	nil	65
C6-4	55	nil	55
C6-5	50	nil	75
C6-6	55	nil	75
C6-7	60	nil	70
C6-8	55	nil	100
C6-9	90	nil	95
C6-10	85	nil	80
C6-11	55	nil	5200
C6-12	50	1	100

	PPM		
	Cu	Pb	Zn
C6-13	55	4	125
C6-14	75	4	85
C6-15	55	nil	75
C7-1	80	nil	45
C7-2	90	nil	50
C7-3	75	8	105
C7-4	57	14	150
C7-5	50	1	35
C7-6	67	4	40
C7-7	45	40	55
C7-8	62	20	95
C7-9	55	20	80
C7-10	55	6	65
C7-11	57	8	75
C7-12	55	8	20
C7-13	62	12	35
C7-14	57	4	125
C7-15	60	6	80


MAP of
PRELIMINARY
GEOCHEMICAL INVESTIGATION
of
TRACY & ENDICOTT ARMS
Cu Pb Zn
< 50
> 50
> 100
> 150
> 200
Scale 1" = 2 mi.
Contour Interval 500'
mine location, glacier
W.H.RACE
TRACY ARM
ENDICOTT ARM
HOLKAM BAY
Pt. ASTLEY
SANFORD COVE
PORTLAND GROUP
SUMDUM GLACIER
JINGLE
JANGLE
3400
4000
5000
5000

Map II

COPY OF U.S. GEOLOGICAL SURVEY, GEOLOGIC MAP OF JINGLE-JANGLE DEPOSIT



Willow Creek Gold District Activity
Anchorage Quadrangle
by Martin W. Jasper, Mining Engineer

During the past five years there has been a gradually increasing interest in this formerly important gold producing district in prospecting and development work by individuals and partnerships. This interest has largely been confined to undeveloped gold-quartz prospects originally discovered and located 50 to 60 years ago. The recent activity has also included re-examination and testing of the old placer sections with results of possible economic interest. A few of these properties will be discussed in some detail and others briefly mentioned.

Wolverine Group - Aage Hanson, Owner

History

This group of three mineral claims - Wolverine No.'s 1, 2, and 3 - was discovered and located by Mr. Hanson and held by him for over 35 years. During this period, 323 feet of cross-cuts, 56 feet of drifts, a 75 foot raise, and a 20 foot surface winze were completed; all of this work was done with hand steel by the owner. In addition, he excavated a number of open-cuts and trenches by hand or "sluiced" by using a small "boomer" or "shooter" dam. 1/ Map 2.

Location and Accessibility

Situated on the steep mountain slopes on the northwest side of Craigie Creek and the Gold Bullion road, the small area in which development has been concentrated is approximately 1.5 miles northeasterly from the Willow Creek Mines (Lucky Shot) camp and millsite. The Lower Adit Level is 680 feet above the Gold Bullion road at the 3680 elevation. 2/ Map 1.

The Willow Creek Mining District is accessible over two good roads. The original route was from Wasilla via Little Susitna Lodge and thence over Hatcher Pass. The other route from Wasilla parallels the Alaska Railway to Willow where a branch road swings easterly and follows the Willow Creek Valley 25 miles to the Lucky Shot camp where it joins the old road. 2/ In recent years neither route has been kept open to the mining district during winter and spring months.

The west endlines of the Wolverine group are reported to adjoin east endlines of the Willow Creek Mines property; the Wolverine No. 2 mineral claim is said to be located on easterly extension of the Lucky Shot-Panhandle shear zone.

Geology

The district has had excellent coverage by the U.S. Geological Survey, with results of their numerous investigations and studies published periodically from 1907 to 1954. 3/

Past profitable gold-quartz mining operations, limited to the area of the quartz-diorite intrusive, have shown that the productive quartz veins are confined to the easterly-westerly striking and northerly dipping major shear-zones. Those veins along the southwesterly dipping joint planes have so far been unproductive. 4/ The Wolverine shear-zones exposed to date have two general trends, one striking easterly-westerly with 30° to 60° north dips, and those striking northerly and dipping from a few degrees to 45° east. 1/

The 40 foot granite dike, intersected by the lower adit, is coarse grained, has slickensided walls and a strong water course along a 2 inch hanging-wall open fissure. The 75 foot raise was driven at about 50° slope angle along the hanging-wall with objective of intersecting the Upper Adit vein but failed to do so.

Short exposures of two narrow parallel dikes are shown in southwest corner of Map 2. Six feet apart, one is granite to 6 foot width and the other a lamprophyre of four foot width. Their strike is N40E, but dips were not determined. The dikes were not noted in area to the northeast.

Faulting

Work in the area to date consisting of trenching, open-cuts, adit cross-cuts and short drifts have exposed: (a) four faults, with Gulch Creek entrenched along the major one, (b) seven shear-zones of N65° to 75°W strikes and 40° to 47° north dips on southwest side of the Gulch Creek fault, (c) seven shear-zones on north-east side of the major fault with N65° to 87°W strikes and 40° to 55° north dips, and (d) two shear-zones of N20° to 22°E strike and 35° to 55° east dips near and west of the Intermediate Adit Level.

The Gulch Creek fault has an apparent (surface) strike of N40° to 60°W and dip of 50° to 60° southwest, with quartz "drag ore" observed and sampled in the two feet of yellow fault gouge. Its horizontal displacement of the seven easterly-westerly shear-zones is considered to be within limits of 70 to 80 feet. Dip of this fault may be greater than 60°, as surface "slump" is evident at base of the steep southwest slope of the gulch. 1/

Of the three other faults, the one in southwest section, between Traverse Stations 12 and 13, having a N20° to 25°E strike and steep easterly dip, shows a 6 foot horizontal displacement of the several veins. This minor fault is probably the same as the one at the Upper Adit portal, where a vein has had a similar displacement. 1/

The Lower Adit cross-cut was driven 242 feet along a fault of varying N5° to 25°W strike and steep (60° to 75°?) dip to west, to intersection of a vein considered to be same as the vein at Upper Adit portal. With only a narrow gouge seam and no appreciable horizontal displacement of the 40 foot granite dike cross-cut at right angles 129 to 169 feet from portal, or any noticeable displacement of the two shear-zones outcrops - one traced 100 feet easterly from Upper Adit to surface winze, and the other between traverse Stations 1 and 3 - shows the dike preceeded this fault and the two shear-zones are probably younger (?). In the Lower Adit, however, the three shear-zones drifted upon for short distances westerly were not definitely noted on the east side of the fault; more detailed study may show them to be present in the east wall of cross-cut where they are possibly obscured due to lack of silicification and mineralization, or may be covered by "slime". 1/

The Intermediate Adit was driven 20 feet on a vertical fault of N22W strike, and parallels the general strike of the Lower Adit fault. Lack of appreciable gouge along this fault, or noticeable displacement of the winze shear-zone, suggests this fault is older than the winze shear-zone and probably occurred during the same period as the one in the Lower Adit cross-cut. 1/

The vertical displacements of the four faults were not determined.

Shear Zones and Mineralization

The easterly-westerly quartz veins, stringers, small lenses, and/or quartz bodies, appear to be confined to well defined shear-zones; they have filled fissures up to 16 inch widths. Silicification of the quartz-diorite have siliceous widths up to 22 inches, with additional narrow stringers within the limits of the short, narrow drifts on the three zones drifted upon. In these short drifts there are quartz stringers on both hanging-wall and foot-wall "slips" with thin gouge seams usually on both walls. Widths shown in the narrow drifts are not necessarily the limits of the individual shear zone; in drifting westerly on the Lower Adit level, a narrow vein 250 feet from the portal should be considered part of the shear zone followed 25 feet to the drift face at 285 feet from the portal, giving a total width of 10 to 12 feet.

On the surface, the widths of the critical easterly-westerly shears are not necessarily limited to those shown on Map 2. For true widths and limits of each shear-zone, the crumbly, crushed, oxidized, quartz-diorite - in some cases silicified to a certain degree - should be included. As an example, the section in the southwest area of Map 2 between Station 12 and 13, and for at least 10 feet southwest of Station 13, show this condition, and should be considered one shear-zone of at least 20 foot width.

No work has been done on the two shear-zones of N20° to 22°E strike and 55° to 36° easterly dip in vicinity of the Intermediate Adit. The short exposure of the one 48 feet to the northwest has several quartz stringers, but none were noted in the other.

Several generations of quartz occur in the shear zones, with a blue-gray (cryptocrystalline) banded quartz fairly common.

Mineralization noted in the favored easterly-westerly shear zones is predominately fine grained pyrite, with lesser amounts of fine arsenopyrite, and occasional grains of chalcopyrite; total sulfides are estimated at less than 2% of the vein material. On the surface, limonite is more plentiful than the vein sulfides would suggest it should be. Malachite and azurite stain on quartz outcrops was observed at a number of points; a small "pod" of bornite was found by the owner in the quartz-diorite close to a quartz stringer on west side of the gulch.

The sulfides favor the "walls" of narrow stringers, but are more disseminated in the wider quartz sections. No molybdenite, stibnite, or scheelite were noted. An occasional particle of gold was observed in the gossan developed along the side of the narrow stringers in the shear zone east of the Upper Adit portal.

Sampling

Eight of 45 samples taken at surface and drift locations carried appreciable gold values; of these No.'s 190, 192, and 378 were taken underground. 1/ The balance of the samples were Nil to Trace. List of the eight samples showing values is as follows:

Assay Report

Sample No.	Width inches	Au oz.	Value $	Description
190	10	0.201	7.03	Quartz vein in Lower Adit cross-cut, 260 feet from portal.
192	5	0.387	13.54	Footwall stringer & silicified qtz-diorite 5 feet from drift face, & 277 feet from Lower Adit portal.
204	7	0.161	5.69	Quartz vein at Upper Adit portal.
213	Grab	0.292	10.16	Blue-gray quartz "drag ore" in Gulch fault gouge.
216	6	0.312	10.85	Quartz vein in creek bed - full width not exposed.
221	16	0.416	14.70	Quartz vein 6 feet south of Sta.13, southwest side of gulch.
223	9½	0.289	10.26	Quartz vein near Sta. 13
378	8½	0.10	3.50	Footwall quartz vein 2 feet from drift face. Drift 35 feet from Lower Adit portal.
1-AH	2	3.60	126.00	Taken by owner 2 feet below No.379. Eight inch length taken of the 2 inch stringer. Some very fine Au and very fine sulfides visible on both sides of sample.

On August 8, 1938, Assay Report of 10 samples taken by owner and submitted to Willow Creek Mines office showed that all carried some gold, with values ranging from $2.80 to $70.00 for an average of $17.57. Widths and locations are lost, as well as those for other samples submitted to same company by owner.

Future Development Program

Although a "healthy climate" for the gold mining industry has not been re-established and prospects for improvement in immediate future remain in doubt, suggestions for development of the Wolverine Property are offered.

The Lower Adit Level is considered the logical location for an initial future exploration and development program, as it is in center of area prospected to date and is free from the snow slide hazard; shear zone surface exposures on west side of the Gulch are more difficult of access.

With most exposures being located west of the Lower Adit cross-cut, development work should first be limited to drifting westerly on the mineralized shear zone followed 23 feet in No. 1 Drift, and situated 35 feet from the cross-cut portal. "Slashing" of both walls and roof will first be required to enlarge the cross-cut and drift for tramming and placement of air and water lines and drainage ditch.

Distance along this shear zone from present face of No. 1 Drift to projected Gulch fault location on the cross-cut (3680 elevation) level is estimated to be 115 to 130 feet. The projected (down dip) location of shear zone exposed between surface Traverse Stations 12 and 13 (believed to be same zone as that in No. 1 Drift) to the 3680 level indicates its fault displacement to be around 70 feet north of No. 1 Drift's projection. From a safe distance (10 to 20 feet) beyond the fault, a cross-cut driven northwesterly paralleling it should intersect the faulted segment within limits of 80 to 100 feet, and this structure should then be followed westerly 150 to 200 feet.

During period of drifting on the above shear zone, the cross-cut should be contined northwesterly to intersect the displaced section of shear zone drifted on for 25 feet from north end of Lower Adit cross-cut. Distance to that intersection is estimated to be within limits of 175 to 200 feet. Before reaching this objective, at least three additional easterly-westerly shear zones should be intersected on west side of the Gulch fault. All these shear zones should be followed westerly at least 100 feet to determine values, persistence and habits of the individual structure.

Favorable results from above suggested exploration program will encourage (1) extending the more promising drifts westerly, and (2) search for and drifting on the easterly extension of the favored shear zones for distance of 100 feet or more.

The overall results of this work will determine whether exploration at lower levels is warranted, and whether mining and milling preparations should be considered.

Robert Bronson and Jack France Property

This property, a group of three mineral claims, is a recent relocation of ground covering part of the old Holland property. It is situated above and to the south-east of the old Holland Adit on the east side of the Craigie Creek-Purches Creek divide area at about the 4600 foot elevations. 2/ It is reported to have a number of small"stringer" veins in a shear zone of easterly strike and 50° to 60°N dip.

During the past season Bronson and France have purchased drilling equipment, a small compressor, aluminum pipe (Dressler coupled) for air and water lines, and other supplies. A "jig back" aerial tramline is to be installed to deliver the ore to a small "prospecting" mill, which they plan to set up next season below the old Brassell cabin on the west side of the pass, an airline distance of about 3/4 mile. Their mining, as now planned, will be limited to trenching and open-cuts along the outcrops.

Wheeler, Betts & Dimmick

Vernon Wheeler, Clyde Dimmick and William Betts continuedtheir gold-quartz prospecting in the upper Grubstake Gulch area during the summer months of 1962. Their interest and activity was largely confined to the right limit (northeast) slopes of the main southeasterly headwaters of this short drainage system, where they have located a number of mineral claims.

The formation in this area of interest is limited to graphitic mica schist, and is considered much older than the (Jurassic?) quartz-diorite within which latter formation the past lode gold production has been obtained. 5/ The graphitic schist-quartz-diorite contact is obscured by a glacial drift "cover"; the nearest known quartz-diorite is 1.75 miles to the northeast, on the upper side of the original road into the district. 2/ No dikes have been reported in the schist but will probably be found present as more exploration is done in this area.

A soil testing auger, commonly employed in geochemical field work, was used in tracing the gold in the weathered schist soil-cover that is gradually "creeping" down the steep slope. Beginning near the creek bed at the approximate 3,000 foot elevation and proceeding northeasterly, auger samples were taken at more or less regular intervals from the surface to the schist bedrock, and the "cuttings" were panned from each hole. The prospectors reported finding steadily increasing gold values up the slope until reaching a point just below the vein's covered location at about the 3,600 elevation; several samples taken above the latter point showed only a fine color or two.

The first auger cross-section line led to "rediscovery" of a 17 inch quartz vein reported to have been originally found by Mr. Clyde Thorpe 20 to 30 years ago, and upon which he had two open-cuts spaced 20 feet apart at this point. Both of these open-cuts were sloughed in; one of them was cleaned out at time of visit to the property for sampling, and the other open-cut was cleaned out and a trench excavated along the vein between the two cuts a few days later.

A sample taken across the full width of the 17 inch vein exposed in the open-cut carried high gold values, although no free gold was noted. Mineralization appeared to be limited to a small amount of pyrite, and fairly abundant crypto-crystalline hematite in several short, narrow, and irregular lenses up to 2 inch widths. The quartz has a crushed, sugary, and oxidized appearance at surface; the vein "filling" as exposed at this point includes two bands of the graphitic schist, each averaging about two inches in width. Due to relatively rapid weathering of the schist and the "creeping" of the weathered material down the slope, the vein at its outcrop is "slumped over" in an arc of 90 degrees from its dip before losing its identity in the "creeping" soil cover.

Since some former miners and present prospectors in the district believe that hematite is a "marker" for presence of higher gold values, separate samples of the vein components were taken. These were 9 inches of quartz, 4 inches of graphitic schist, and 4 inches of hematite; values in the three sections show them to be about equal in the quartz and hematite, and four times greater in the schist bands than in either the quartz or hematite. Value of the 17 inch sample across the vein width exposed in the open-cut was 5.5 times greater than the sample of the schist section, and 75 times greater than values shown in either the quartz or hematite vein sections. The above results are not especially significant as they represent only one cross-section of the vein; gold distribution in vein systems is normally found to be very erratic in any sampling program, especially those of higher grade.

At the base of the above open-cut, the vein strike (below the depth of "slump" and soil cover) appears to be N30W and dip S55W. At the same location, the strike of the schist was taken as N70E and its dip 50° to 55° northwesterly. This suggests the vein cuts the schist's foliation and strike at angles favorable to persistence of the vein structure for a long distance, probably along a strong fissure or shear zone.

Following the visit to the property, Mr. Wheeler reported the vein was traced northwesterly down and at a tangent to the mountain slope for several thousand feet. This work also was done by auger sampling along cross sections at right angles to the projected course of the vein with similar encouraging results reported. Lateness of season prevented trenching to the indicated vein location except at two or three points. Slight depressions at a number of points on the mountain slopes along strike of the vein were observed, and later reported good "markers" in tracing the vein. "Earmarks" obtained from the limited work done indicate this vein is the most encouraging one found in this schist area to date, and that normally "pinching" and "swelling" along its strike and dip will show greater vein widths from time to time. Greater widths, however, may have lower values.

Wheeler and associates' rewarding use of geochemical soil testing auger shows it can be a satisfactory tool for gold-quartz prospecting in other sections of the Willow Creek graphitic mica-schist belt as well as in other similar areas.

Mrak Placer Property; Grubstake Gulch Area

The discovery of placer gold occurrences in 1897 by M. J. Morris and L. H. Herndon, resulting in their locating two claims on Willow Creek above and below the mouth of Grubstake Gulch, were the first reported mineral discoveries in the Willow Creek mining district. This was followed by staking of placer claims by others along Grubstake Gulch. The Klondike and Boston Company acquired most of the ground in 1900, installed a hydraulic plant and operated for several years. The venture was unprofitable, and the property was dropped by the company and relocated by O. G. Herning in 1908, who held 33 claims on Grubstake and Willow Creeks for a number of years. 6/

Interest in the placers declined with the 1907 gold-quartz discoveries several miles to the northeast along Craigie Creek Valley. Up to 1913 placer gold production is said to have been about $25,000.00 6/ Total placer gold production to date is believed to be less than $75,000.00. Mining activity from 1913 to about 1950 was largely limited to individuals carrying on small scale hydraulic operations from time to time. The Alaska Hoosier Company held 32 placer claims on Willow Creek below Wet Gulch for several years around 1950, with development limited to annual assessment work. 7/

Lloyd Hill of Sutton, Alaska, held 18 placer claims in the area from 1950 to 1959; Mr. William Mrak, Sutton, Alaska, acquired the property in 1959. This group of claims extended upstream from the bridge over Willow Creek, approximately 3/4 miles to the mouth of and continuing up Grubstake Gulch. 7/ Mr. Hill's prospecting of the ground resulted in finding very encouraging prospects along the left limit (south side) benches in the area west of the old camp and below Grubstake Gulch.

During the late summer and fall of 1959, Mr. Mrak drilled 5 or 6 exploration holes in an area from the bridge upstream. These scattered prospect holes are reported to have shown very good values throughout the vertical sections. Depth of holes ranged from 85 to 105 feet, with several abandoned before reaching bedrock.

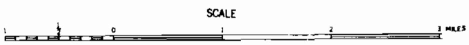
During 1960, a calculated 2,000 cubic yards was mined and run through a sluice box from a cut on the left limit side of the narrow valley, about 1,000 feet upstream from the bridge. Its depth ranged from 12 to 20 feet, with the south side face of the cut composed entirely of unusually well stratified graphitic mica-schist gravels of local and nearby origin. The bulk sample values equaled the reported drilling results.

During the 1961 season, work was largely confined to fabricating a washing plant in the Mrak coal washing plant at Eska, assembling the equipment at the property, and washing a small yardage of gravel to determine its efficiency and correct the weaknesses found. Work done during the 1962 season was limited to drilling several additional holes. A systematic drilling and evaluation program on the property will no doubt be completed before final preparations for mining the property are undertaken. Although it was reported that no boulders were encountered in drill holes and none found in the "bulk sampling" test cut, coarse granitic boulders are present in the Willow Creek bed, and can be anticipated in the older and deeper channel section.

All of the gold recovered in the test pit is the same type and its source is the local schist belt in the Grubstake Gulch drainage area. U.S.G.S. Bulletin 592 reports the gold in this area was valued at $16.60 per ounce, indicating its fineness to be 824 (gold price $20.67 prior to 1934). 8/ An appreciable percentage of gold recovered by Mr. Mrak was observed to have either small fragments of, or are embedded in, graphitic schist scales. All of it was noted to be bright and untarnished, rough and angular; it is fairly coarse and size ranges up to $4.00 nuggets, with one nugget reported to have had a $14.00 value (1913).

References:

1/ Map 2
2/ Map 1
3/ U.S.G.S. Bulletins 327, 480-F, 500, 592-H, 607, 755-C, 824, 849-C, 864-B, 933-C, and 1004
4/ U.S.G.S. Bulletin 1004, page 37
5/ U.S.G.S. Bulletin 1004, page 26
6/ U.S.G.S. Bulletin 592, pages 250-253
7/ U.S.G.S. Bulletin 1004, page 83
8/ U.S.G.S. Bulletin 592, page 252

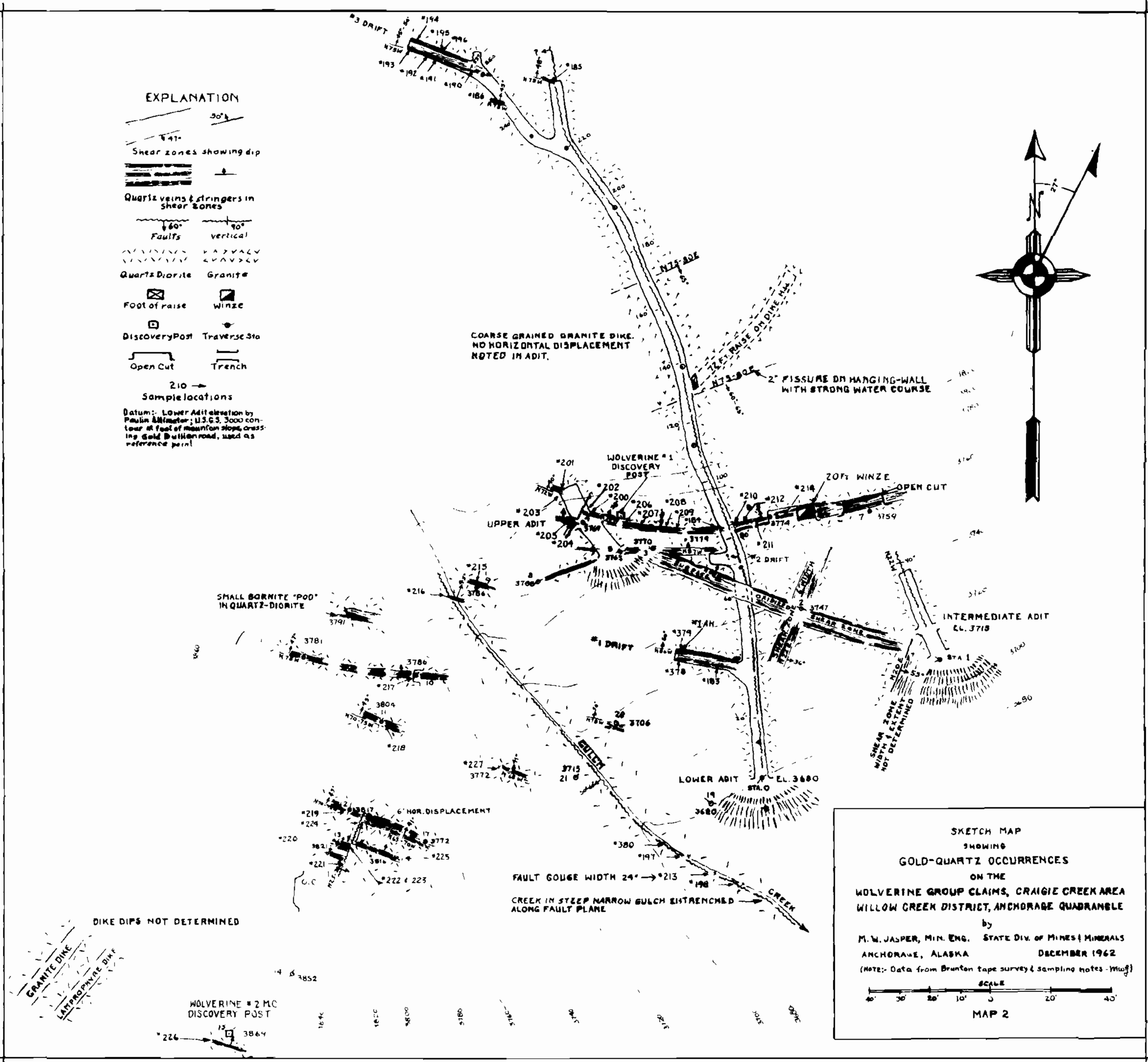


MAP OF WILLOW CREEK DISTRICT
Showing
LOCATION OF MOST GOLD-QUARTZ & PLACER PROPERTIES
Adapted from USGS Maps C-7 & D-7
Anchorage Quadrangle
by
M. W. Jasper, Min. Eng. State Div. of M. & M.
Anchorage, Alaska December 1962

MAP I

ROAD CLASSIFICATION

ALL WEATHER ROADS		DRY WEATHER ROADS	
Hard-surface	None	Improved dirt	
Other		Unimproved dirt	
	Trails		


SKETCH MAP
SHOWING
GOLD-QUARTZ OCCURRENCES
ON THE
WOLVERINE GROUP CLAIMS, CRAIGIE CREEK AREA
WILLOW CREEK DISTRICT, ANCHORAGE QUADRANGLE
by
M. W. JASPER, MIN. ENG. STATE DIV. OF MINES & MINERALS
ANCHORAGE, ALASKA DECEMBER 1962
(NOTE:- Data from Brunton tape survey & sampling notes - MWJ)
SCALE
MAP 2
EXPLANATION
Shear zones showing dip
Quartz veins & stringers in shear zones
Faults
vertical
Quartz Diorite
Granite
Foot of raise
Winze
Discovery Post
Traverse Sta
Open Cut
Trench
210 →
Sample locations
Datum:- Lower Adit elevation by Paulin Altimeter; U.S.G.S. 3000 contour at foot of mountain slope, crossing Gold Bullion road, used as reference point
N
27°
#3 DRIFT
COARSE GRAINED GRANITE DIKE.
NO HORIZONTAL DISPLACEMENT
NOTED IN ADIT.
2" FISSURE ON HANGING-WALL
WITH STRONG WATER COURSE
WOLVERINE #1
DISCOVERY
POST
20 Ft WINZE
OPEN CUT
UPPER ADIT
#2 DRIFT
SHEAR ZONE
INTERMEDIATE ADIT
EL. 3718
SHEAR ZONE
WIDTH & EXTENT
NOT DETERMINED
#1 DRIFT
LOWER ADIT
EL. 3680
STA. 0
SMALL BORNITE "POD"
IN QUARTZ-DIORITE
GULCH
6' HOR. DISPLACEMENT
FAULT GOUGE WIDTH 24" → #213
CREEK IN STEEP NARROW GULCH ENTRENCHED
ALONG FAULT PLANE
CREEK
DIKE DIPS NOT DETERMINED
GRANITE DIKE
LAMPROPHYRE DIKE
WOLVERINE #2 M.C.
DISCOVERY POST

Mitchell Copper Prospect
Eagle Quadrangle

by Robert H. Saunders, Mining Engineer

Introduction

The Mitchell copper prospect is in the southwestern part of the Eagle Quadrangle at 64°06'N latitude and 143°02'W longitude. It is at 4200 feet altitude on the end of the ridge on the west side of Copper Creek, tributary to Kechumstuk Creek, tributary to Mosquito Fork of Fortymile River. The nearest road and nearest airstrip are at Chicken, 30 airline miles east of the prospect. Plate I is a map of the vicinity. The prospect is covered by a group of unpatented claims that are owned by Mr. John Hajdukovich, Delta Junction, Alaska; the claims are recorded at Fairbanks.

The prospect was examined on August 5, 1961, by George Moerlein, Geologist, Bear Creek Mining Co., and Robert H. Saunders, State Mining Engineer, Division of Mines and Minerals.

Geology

The geology of the region in which the prospect lies has been described in U.S. Geological Survey Bulletin 872, THE YUKON-TANANA REGION, ALASKA, By J.B. Mertie, Jr. The rock underlying most of the area drained by Copper Creek and the other headwater tributaries to Kechumstuk Creek is part of a large batholith of granitic rock considered to be of Mesozoic age. The rocks surrounding the batholith are members of the Birch Creek schist formation, a metamorphic complex considered to be of pre-Cambrian age. The prospect lies within what appears to be a roof pendant of Birch Creek schist within the batholith. Bedrock exposures in pits, trenches, and outcrops indicate that the body of schist is at least 2400 feet long in its longest dimension, which is parallel to the trend of the vein.

Mineral Deposits

Several bulldozer trenches and a few small pits that have been dug on the claims are shown on Plate II. Around the pits much of the bedrock is covered by soil and vegetation, but, in some places, rock rubble or coarse, blocky talus provides a clue to the character of the underlying bedrock.

The mineral deposit is a quartz-bornite-chalcopyrite vein. The best exposure of the vein is in the pit where Sample 9 was taken. At that place, the vein is 5 feet wide, and it strikes N 75°E and dips 55°S. In the bulldozer trench 20 feet west of the pit where Sample 9 was taken and in the trench where Sample 8 was taken, the vein is not exposed in place, but several pieces of vein material are scattered over the bottoms of the trenches as though they had been pushed along by a bulldozer blade. In a bulldozer trench 225 feet northeast of the pit where Sample 9 was taken, a one-foot-wide band of earthy material composed largely of malachite is exposed. The band of malachite lies north of the projected line of strike of the vein, but a bend in the vein or a fault could account for its location. The trench extends to the south well beyond the projected line of strike of the vein, but no other signs of mineralization are evident in the trench.

Sample 10 was taken to check the gold and silver content of an iron-stained quartz vein that is exposed in a hand-dug trench northeast of the copper showings.

This vein strikes approximately north; its dip is apparently nearly vertical. No copper minerals are visible in the vein material.

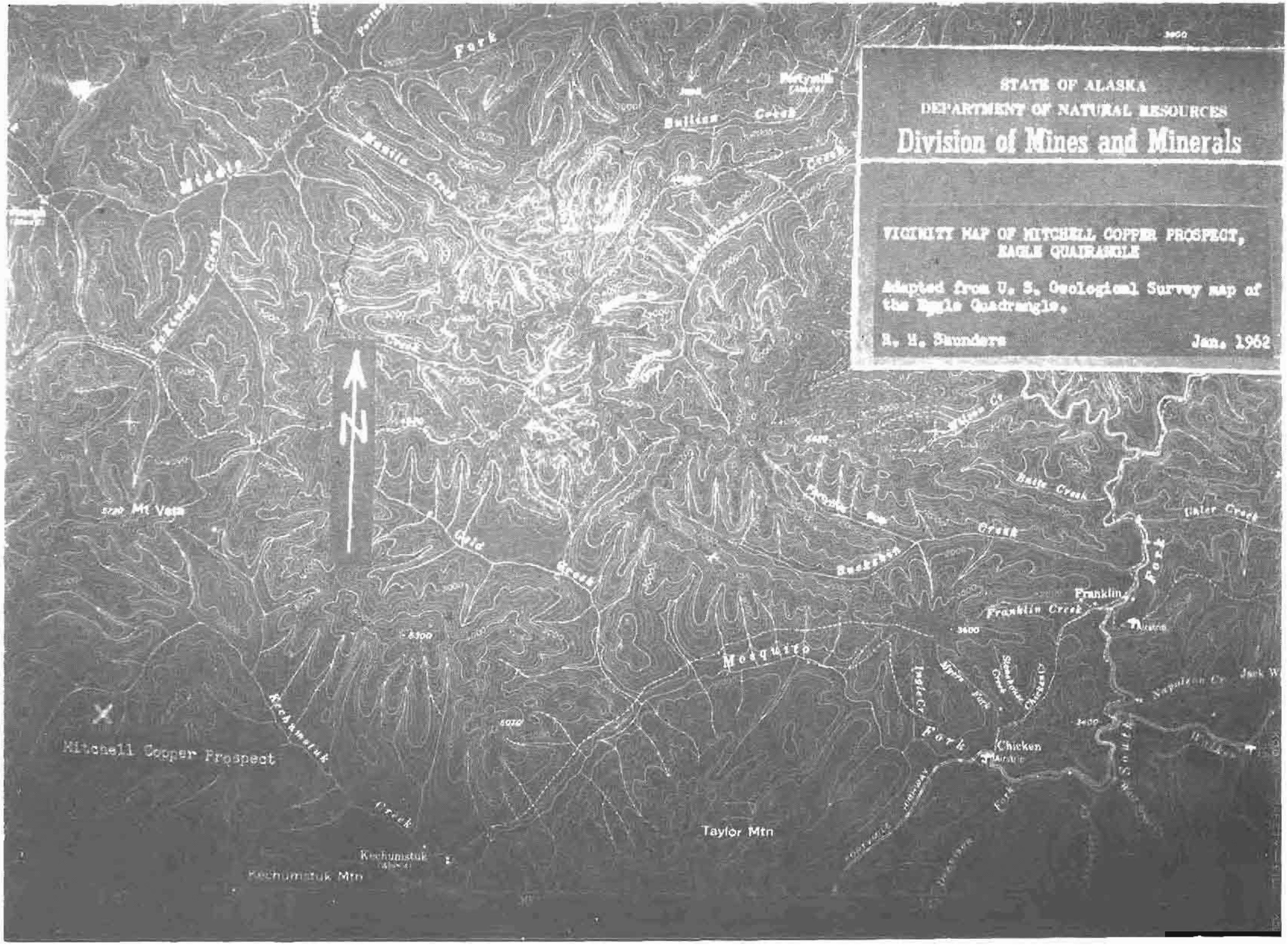
Table 1 shows the assay results of three samples that were taken during the examination, and Table 2 shows the results of spectroscopic analyses of Samples 8 and 9. The assays and analyses were made by Donald R. Stein, Assayer, Division of Mines and Minerals, College.

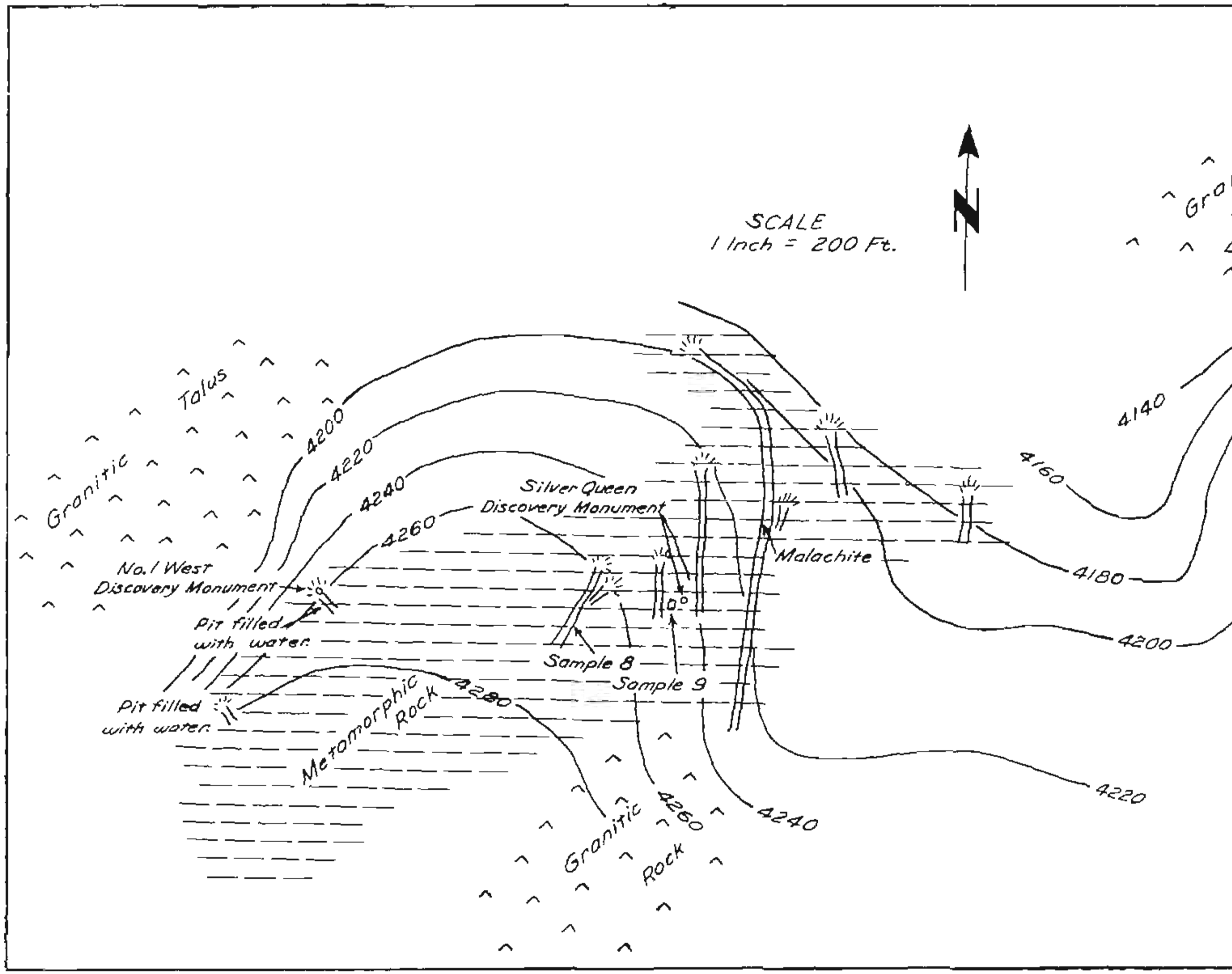
Table 1. Assays of Samples

Sample Number	Length of Channel	Ounces per Ton Gold	Ounces per Ton Silver	Per Cent Copper
8	Grab	0.04	79.98	19.61
9	5 feet	trace	0.84	1.93
10	Grab	trace	0.60	Not run

Table 2. Spectroscopic Analyses

Over 10 Per Cent	1 to 10 Per Cent	Under 1 Per Cent
	Sample 8	
copper iron silica	calcium sodium magnesium zinc 1% lead	molybdenum 0.2 to 0.3% nickel? silver
	Sample 9	
calcium silica	iron copper sodium magnesium	zinc manganese chromium


STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Mines and Minerals
VICINITY MAP OF MITCHELL COPPER PROSPECT, EAGLE QUADRANGLE
Adapted from U. S. Geological Survey map of the Eagle Quadrangle.
R. H. Saunders
Jan. 1962
N
Mt Veta
Mitchell Copper Prospect
Kechumstuk Creek
Kechumstuk
Kechumstuk Mtn
Taylor Mtn
Mosquito
Gold Creek
Buckskin Creek
Franklin
Franklin Creek
Ingle Cr
Fork
Chicken
Napoleon Cr
Walker
Bullion Creek
Fork
Middle
Mastic Creek
Uhler Creek
Baltic Creek



STATE OF ALASKA
DIVISION OF MINES & MINERALS

Mitchell Copper Prospect
Eagle Quadrangle

From compass-oneroid survey.

R.H. Saunders

Jan. 1962

Operations at the Ross-Adams Uranium Deposit
Dixon Entrance Quadrangle

by Richard L. Denny, Assayer

Introduction

Developments of the last two years at the Ross-Adams uranium deposit in Southeastern Alaska are affording an increasingly brighter picture for that property. Diamond drilling has revealed an extension of the original orebody which was previously considered to be a small isolated pocket of highgrade uranium ore. The government allotment for this property is 6000 tons per year independent of grade. Operations during 1962 produced 5200 tons grading in excess of 1% U_3O_8. Following cessation of mining in October, a diamond drilling and development program was initiated employing seven men; this is still in effect and will continue until mining resumes in the spring. The orebody is still open to the south, and were it not for marketing restrictions, the mine in all probability would be operated on a year-round basis.

The factors affecting ore control are still unknown, but it is hoped that the current operations underground will reveal the keys to the geology of the deposit. There are several radiometric anomalies in the area, although none are as large as the discovery nor have they been investigated at depth. In addition, a pegmatite, genetically associated with the alkali granite, was found to contain encouraging amounts of rare earth elements. With an active company in the area and the implications inherent to the expanding reserves of the discovery, these additional occurrences could possibly take on greater meaning in the future.

Location and Accessibility

The Ross-Adams uranium deposit, the only presently known commercial occurrence of that commodity in Alaska, is located in Southeastern Alaska in the southern part of Prince of Wales Island. It is some 35 miles southwest of Ketchikan and has the approximate geographic coordinates of 54°54'N. Latitude and 132°09'W. Longitude. The mine site, at an altitude of 716 feet on the S.E. flank of Bokan Mountain, is reached by a 2-mile road leading from the head of the West Arm of Kendrick Bay, which offers a well protected deep water port. In addition to water transportation, Kendrick Bay is regularly serviced by the scheduled airline based in Ketchikan.

Topography, Climate and Vegetation

The topography of the area is typical of Southeastern Alaska, being quite rugged and mountainous although less so than the mainland. The shoreline has many fiord-like embayments and is almost continuously rocky. Dense forests cover the region with the exception of occasional small open tracts of muskeg. At higher elevations, these open muskegs become more extensive and the timber is very sparse and stunted. The alkali granite stock in the immediate area provides the exception and the slopes are bare and rocky to as low as 700 feet. The climate is quite mild throughout the year although wet. The annual rainfall is in the vicinity of 150 inches.

History and Production

The Bokan Mountain deposit was discovered early in 1955 by Don and Jan Ross of Ketchikan, who were flying aerial reconnaissance in a small plane using a Nucliometer. Another husband and wife team associated in the venture, Kelly and Judy Adams, were flown into the property and the anomaly was staked. The prospectors were successful in interesting Climax Molybdenum (American Metals Climax) in the prospect and a contract was negotiated. Test drilling started later in the year and continued on a larger scale into 1956. A barge-loading dock and a road from tidewater to the deposit were also built during 1956 and early 1957. In 1957, the company started open pit mining operations at the outcrop and shipped 15,000 tons of ore before shutting down the mine in October of the same year. The shipment was estimated to average 0.80%. (MacKevett)

Climax did not return to the property in 1958 and it lay idle until the following year when Jott Mining Co. obtained a lease and resumed mining operations. No ore was shipped that year although a small amount was stockpiled. Little activity marked 1960; the stockpiled ore was shipped, but no new production took place. In 1961 the current leaseholder, Bay West, Inc., mined the property by underground methods drifting south from the open pit. A diamond drilling program confirmed a southerly extension of the orebody while a total of 2500 tons were shipped during the year from the underground operations. Early in 1962, the company opened up the newly blocked-out ore by driving an adit north starting approximately 600 feet south and 230 feet below the open pit. Mining operations, employing a 10 to 12 man crew, continued steadily throughout the year until October, when they were stopped due to marketing restrictions. A total of 5200 tons grading better than 1% were shipped during the season. As the orebody is still open to the south, a diamond drill program was set up in the late fall and will continue into next spring when mining operations will be resumed.

Geology

The geology of the deposit is evidently quite complex and the manner and control of emplacement are still open to question. The general geology of the region has been reported on by Buddington and Chapin in the USGS Bulletin 800 and the geology of the deposit and the immediate area is the subject of a report by E.M. MacKevett, Jr., a geologist with the USGS. Much of the following information has been abstracted from the latter source.

The Ross-Adams deposit lies within a small stock of alkali granite roughly 3 square miles in area. Surrounding the stock are intrusive rocks of intermediate composition which are in turn underlain by metamorphosed layered volcanics. The deposit is assumed to be in direct genetic relationship with the stock as the granite was found to carry abnormal amounts of uranium, thorium, and rare earth elements, most of which are found in greater concentration in the deposit. In addition, there are several other radiometric anomalies in the area, most either in or near the stock.

The open pit orebody measured 40 feet wide, 50 feet deep and 350 feet in length with the longest dimension trending in a general north-south direction. It plunged gently to the south until reaching the southern part of the orebody where two intersecting E-W faults cut the ore and threw the south block to the west and down, increasing the plunge to 35° through drag effect. The chief ore minerals are uranothorite and uranoan thorianite, which occur as veinlets within the granite less than 1 mm in thickness. These minerals are accompanied by hematite, which serves to differentiate the ore from the country rock as it imparts a reddish hue to the ore. Other than the hematite and the U-Th content, the ore is almost identical with the country rock. The orebody is very irregular in outline and has no definite physical limits of enrichment. It consists of a core of highgrade ore enveloped by a transition zone 2 to 20 feet thick wherein the values gradually decrease to trace amounts, found throughout the remainder of the granite stock.

South of the proven ore at the time of this report, Mr. MacKevett felt the existing diamond drill holes to be too few in number and too scattered to delineate the orebody thoroughly. Since that time, Bay West has developed the previously mentioned extension which at present exceeds the open pit orebody in size and is still open to the south. This extension has a configuration similar to the open pit body with the exception of greater variations in the plunge and trend. In moving south from the open pit, the orebody, as outlined by diamond drill data, plunges steeply a short distance and then abruptly shallows out to approximately 15° for about 150 feet. Still maintaining a southerly trend, the plunge again steepens to about 35° and continues for roughly another 150 feet to where the adit intersects the ore. At this point, two intersecting faults appear to have altered the trend to a southwest direction in which, after being almost level for 100 feet at the adit intersection, the plunge falls off to 45°. Diamond drilling has not progressed beyond this point,but the program currently underway is to extend the orebody in that direction.

The faults which cut through the orebody do so at nearly right angles, and the absence of any recognized structural feature along the length of the body appears to rule out the possibility of their having acted as channelways for mineralizing solutions. Mr. Tak Matsumoto, Engineer-Geologist for Bay West, Inc., believes the faults to be post-ore and postulates that the deposit is a type of primary segregation, rather than of hydrothermal origin. The end result of the uncertainty attached to the geology of the deposit is to compound the always persistent problem of exploration. The inability to project the orebody for any distance necessitates a closer spacing of drill holes, raising exploration costs considerably.

Mining and Development

The current mining operations were started in the early spring of 1962 when an adit, at 716' elevation, was collared some 600 feet south and 230 feet below the open pit and driven north. Intersection with the ore took place approximately the first of June and the initial shipment was barged south soon after. Mining and development work were carried on simultaneously with three working faces kept current, two of which were always in ore.

Mining initially removed the ore first encountered and then moved southwest, the direction in which the trend had been offset by faulting; and north, stoping upwards from the haulageway and following the 35° plunge of the ore. The development heading extended the haulageway underneath the orebody. As stoping progressed to the point where ore removal became a problem, an orechute and manway were raised from the end of the haulageway to intersect with the southern-most end of the 15° plunging section of the orebody. From this point, a slusher drift was driven in the ore to the end of the section and will handle all the ore to the north. Concurrent with the exploration work planned for this winter, a ventilation raise will be driven to the surface from the end of the slusher drift, a vertical rise of 70 feet.

With the exception of the ventilation raise, the development work for the ore above the adit level appears to be all but completed. The remaining ore to the south can be developed from the present workings only by sinking. It is more probable that when the time comes, the company will drive a new adit from a lower elevation.

The wall rock is strong and stands well, requiring no timbering and allowing the stopes to be left open. Mining was carried on during two shifts, blasting at the end of each. The swing shift consisted of two miners only; mucking and other operations were handled by the day crew. The rate of mining averaged 80 tpd. Drilling equipment consists of airlegs and stopers; drill water is piped down from a small pond above the portal, and air is provided by two portable compressors stationed outside the portal, an air-cooled 325 cfm Atlas Copco and an auxilliary 365 cfm Gardner-Denver. Integral steel with TC inserts are used and resharpened periodically. All blasting is done electrically with the exception of occasional secondary breaking.

Mining control at the face is provided through the use of a radiometric drill hole probe calibrated to read per cent eU. Despite the presence of abundant thorium, the U-Th daughter products combine to give an effect of apparent equilibrium and the eU and U analyses are very near equal in most samples taken from the deposit.

Safety and Ventilation

In addition to the occupational hazards found in all mines, uranium mines present an additional problem. The decay products of radon and her daughters subject mining personnel to radioactivity which can be controlled only through adequate ventilation. At present, and until the ventilation raise is completed this winter, the ventilation into the Ross-Adams workings is provided by a squirrel cage blower fan driven by a small Lister diesel engine stationed just outside the portal. The air is ducted into the mine and, with proper manipulation of the ducts, provides adequate ventilation during this initial development stage.

Loading and Hauling

The broken ore is loaded by a Caterpillar D-4 loader with a side-dump mechanism into a small rubber-mounted shuttle car of 4 to 5 tons capacity. These two underground units are both diesel and are equipped with scrubbers. The shuttle car trams the muck to the portal where it is transferred to one of two 10-ton dump trucks by another loader. The ore is then trucked to tidewater and stockpiled to await barge loading operations. It is then barged south and transferred to rail and then to trucks again prior to reaching the Texas Zinc recovery plant at Mexican Hat, Utah. There it is blended into the lower grade ores of the Southwest before milling.

Exploration

The diamond drilling to date has been confined to the area around the workings, with the drilling sites located underground. During the months of October, November and December, 1500 feet of core were taken and ore reserves increased beyond the amount mined during the summer. More drilling is planned from underground which will keep the crew busy until early spring, when surface sites will be set up.

Campsite

Rather than invest in a shore-based camp, the cost of which would be largely unrecoverable, the company elected to have a floating one. For that purpose, they purchased an old Coast Guard lighthouse tender and made minor modifications to suit their own needs. The result is a compact camp arrangement with ample room for office, quarters, mess hall, storage, etc. Buildings on shore consist of a garage, storehouse, and powder magazine, all located at the mine site.

References

1. Geology and Mineral Deposits of Southeastern Alaska: USGS Bulletin 800, A.F. Buddington and T. Chapin; 1929

2. Geology of the Ross-Adams Uranium-Thorium Deposit, Alaska; E.M. MacKevett, Jr.: Mining Engineering, September, 1959

3. Publications of the Division of Mines and Minerals, Annual Reports and Monthly Bulletins

4. Personal communications with Bay West, Inc. personnel: Marion Caspar, Superintendent; Jack Pursley*, Engineer-Geologist; Tak Matsumoto, Engineer-Geologist.
   * No longer with the company.

THE DIVISION OF MINES AND MINERALS

Mining in Alaska received its first official attention when the provisions of the Act for the Protection of the Lives of Miners in the Territories were extended to Alaska by an Act of Congress on May 22, 1903. On April 19, 1911, under authority given by the Act making appropriation of the sundry civil expenses of the Government for Fiscal Year 1912, the President appointed a mine inspector for the Territory of Alaska to serve under the direction of the U.S. Bureau of Mines. The appointment became effective July 1, 1911. Juneau, Capital of the Territory of Alaska, was named as the headquarters of the mine inspector, and a temporary office was provided in the courthouse through the courtesy of the Department of Justice.

On April 30, 1913, the Governor approved Senate Bill No. 52 (passed by the First Territorial Legislature), which created the office of Territorial mine inspector, responsible to the Federal mine inspector and the Governor. The Territorial mine inspector was responsible for the safety of miners and given the authority to inspect all mines employing six or more people.

Sumner S. Smith, Federal mine inspector, in his report of Fiscal Year 1914, announced that William Maloney of Nome was appointed Territorial mine inspector. Maloney was assigned the Second and Fourth Judicial Divisions, under the general supervision of Smith. It is interesting to note that gold production for that year amounted to over 15 million dollars, and 21 million pounds of copper were produced.

The first Territorial mine inspector's report was dated February 8, 1916. Mr. Maloney reported to Governor Strong that mineral production amounted to 31 million dollars for the calendar year 1915. He reported inauguration of a "Safety First" competitive program composed of teams of men from the various Treadwell Mines. Maloney also inspected 168 placer mines, 31 underground gold mines, and 30 dredges. These mines employed approximately 3,000 men.

Mr. Maloney's Report to the Governor for the calendar year 1917 reports that mineral production amounted to 42 million dollars. This was also the first year of chromite production in the State. He noted that the Third Session of the Legislature had provided for the establishment of the Alaska Agricultural College and School of Mines. That year the Bureau of Mines opened a mine experiment station in Fairbanks. The Third Legislature also added to the mine safety regulations.

The next Report of the Territorial mine inspector was submitted by B. D. Stewart, February 26, 1921. The report was for the calendar year 1920, but also covered data for the years 1918 and 1919 for which there were no reports submitted. During this period the Federal mine inspector was transferred to the Matanuska coal field and the Territorial mine inspector was assigned the additional duties of Labor Commissioner - without added compensation.

In July of 1922 the Territorial office of mine inspector was made part of the U. S. Bureau of Mines by an agreement between the Territorial Legislature and the Bureau. Its function was expanded to include coal mine inspection, metal mine inspection, and a placer mining engineer. This agreement continued satisfactorily until 1925 when the Bureau decided that the cooperative agreement was illegal. Washington reorganized the Bureau of Mines, placing part of its function under the Department of Commerce and assigning the rest to the U.S. Geological

Survey. As a consequence, very little of the field work was written up. Mr. Stewart became Supervising Mining Engineer, and the department, heretofore sponsored by the Territory and the Bureau of Mines, came under the sponsorship of the Territory and the Geological Survey.

This cooperative agreement was becoming rather strained by 1931 when the Federal Government granted only $4,500 to the organization, and the Territory authorized $20,000. The Federal portion was for salaries and the Territorial portion was for other expenses. The result of the decrease in Federal money appropriated was that the staff of 3 or 4 engineers had to be taken off of the investigation and inspection of Alaska's mines. Owing to the condition of the Territorial treasury, the funds available for investigation, inspections, and assistance to prospectors, were withdrawn from use by the Governor in the month of May, 1932.

The Territorial Department of Mines was established by the Territorial Legislature in 1935. The Department was at that time composed of the Commissioner, an Associate Mining Engineer, and 4 Assayers. The State Division of Mines and Minerals is the successor to the Territorial Department of Mines, and it still performs the same functions as set forth in 1935 with the addition of many new ones.

This report is made on an annual basis, not so much to recount the DM&M accomplishments, but more to provide a reference for the benefit of those who wish to be informed on the status and possibilities of Alaska's mineral resources and industry. It is used by this and other State agencies to acquaint people and commercial firms in other states and countries, as well as Alaska, of some of the possibilities in the State of Alaska. To better accomplish this, the contents have been increased again this year to include several reports of interesting mineralized areas investigated by the Division's staff.

The State Division of Mines and Minerals has charge of matters affecting mining and minerals exploration, development, and production in Alaska. It collects and disseminates official information relative to the mineral resources, production, mining, and petroleum projects in the State. It administers the laws with respect to all kinds of mineral exploration, mining, mine safety, petroleum safety, and conservation of oil and gas.

The Division conducts a continuing survey of the mineral resources and operations in the State and disseminates information in regard thereto with a view toward assisting prospectors, miners, and petroleum operators. It protects investors in the mineral industries. It fosters and promotes the best interests of the mining, mineral, and related industries of the State toward greater mineral production, increased stability of the economy, and protection of the welfare of mineral industry workers. In short, the DM&M is dedicated to the over-all improvement of Alaska's mineral economy.

For the purpose of directly and personally aiding miners and prospectors and stimulating mineral discoveries, the Division maintains four public assay laboratories at district offices in the State located at Ketchikan, College, Anchorage, and Nome. Mining engineers travel "into the bush" to give advice and help to miners and prospectors who desire it. Assistance is also rendered to mining people and others at the Juneau office through the use of claim records and library of maps and reports. Smaller libraries are maintained at the various district offices. Chief assistance to those wishing information on oil and gas matters is given by the Petroleum Branch at the Anchorage district office.

Administration

The Division of Mines and Minerals is one of three Divisions of the State Department of Natural Resources. Headquarters of the Division is at Juneau, Alaska, and the Division is administered by James A. Williams, Director. The headquarters office is staffed by a Mining Engineer, an Administrative Assistant, a Mineral Analyst, and a Secretary.

The Division maintains District offices in Anchorage, College, Nome and Ketchikan. The Anchorage office is staffed by a Mining Engineer, Mining Geologist, Coal Mine Inspector, Petroleum Engineer, Petroleum Geologist, Assayer, Secretary, and a Clerk-Typist. The College office is staffed by a Mining Engineer and an Assayer. The Nome office is staffed by an Engineer-Assayer. The Ketchikan office is staffed by an Assayer. The Petroleum Branch, Mineral Analyst, Mine Geologist and Clerk-Typist are the only additions to the staff since 1953.

The headquarters office maintains a library of all Alaskan publications issued by the U.S. Geological Survey, U.S. Bureau of Mines and the Atomic Energy Commission. The office also maintains a collection of classified rocks and minerals, a complete set of U.S. Geological Survey topographic maps of Alaska, the many maps and reports by the Division's engineers, and numerous reports by private engineers and geologists.

The Division's Mineral Analyst maintains the bibliography and inventory of Alaskan mineral deposits and the central recording files of mining documents. These have been of great assistance to many individuals and mining company representatives who are searching for various kinds of information on Alaska mineral properties and prospects. The Central Recording of up-to-date claim location and assessment work affidavits from all parts of Alaska is a service unique to Alaska, and is praised highly by miners and exploration men. At the close of 1962 there were a total of 25,468 documents filed, 2,306 of them having been received during 1962. This function has also been particularly helpful to the various State and Federal agencies in determining ownership of various properties and in State land selections.

A monthly Mines and Petroleum Bulletin is published and given wide circulation to keep the minerals industries and interested persons informed on Alaskan affairs and developments.

The other DM&M offices maintain similar publication libraries and mineral collections for the public. The Anchorage office is the location of the Petroleum Branch, which supervises and inspects the development of oil and gas deposits, and provides petroleum information to the industry and technical advice and help to the State Division of Lands in the administration of lands within possible petroleum provinces.

All offices of the Division give professional advice in the way of consultations, reports and field examinations to prospectors and miners who so request it.

Public Services and Functions

In addition to administering and supervising the functions of the Division, the Director has otherwise served the State and the industry in various ways. In 1962 he was Chairman of the Western Governors Mining Advisory Committee, and as such presented the status and problems of the Western States' mining industry to the annual Western Governors Conference in May. He is a member of the Board of Governors of the American Mining Congress, a national organization dedicated to the progress of mining in the United States, and also serves on the AMC Public Lands Committee, dealing with land problems as they affect mining on a national level. He is Chairman of the Alaska Map Advisory Committee, appointed by Governor Egan to advise Federal agencies on Alaska's mapping needs and coordinate mapping activities. In addition to other duties, he constantly contacts mining companies, in person when possible, regarding exploration and mining possibilities in Alaska.

Arrangements were made for a tour of mining properties by a party of Japanese geologists sponsored by the Imperial Japanese government. These geologists were accompanied and guided in the field by mining engineers of the DM&M staff.

Nome

Willow M. Burand, Assayer-Engineer, made field trips to Kleary Creek, Inmachuk Creek, Hannum Creek, Cunningham Creek, Candle, Lost River, Unalakleet, Solomon, Bluff, and other mining locations in the Nome area. He completed a total of 32 assays and sent an additional 16 samples to other assay offices from the area. He had a total of 394 visitors in the Nome office. A great deal of time was spent in determining the location of offshore prospecting permits and approving of the permits if no conflict existed. Individuals involved in the new offshore prospecting developments expressed gratitude for the help and advice received from Mr. Burand. The beryllium discoveries west of Nome brought increased requests for mining and geological information on the entire northwestern Alaska region. In summary, the Nome district office had its busiest season since the war, and possibly since its creation.

College

Robert H. Saunders, Mining Engineer, completed reports of the previous season's investigations. He spent a large part of his time in preparing new proposed State mining regulations, which will be known as the "Mine Safety Regulations" when adopted and will be a part of the Alaska Administrative Code. He participated in public hearings in Anchorage and Fairbanks concerning the new regulations. Mr. Saunders carried on field examinations in the Fairbanks, Kantishna, Chandalar, Ruby Creek, and Rampart areas, and spent about two weeks assisting the Department of Highways in obtaining access road easements over mining claims along the route of the proposed Eureka-Rampart road. He had 167 visitors.

Donald R. Stein, Assayer, completed a total of 846 assays and identifications. He assisted 773 visitors during the year. The College assay office as well as the office of Mr. Saunders will move into the new State Office building in Fairbanks in April 1963. This will make both facilities more accessible to the public, and should result in better service to the mining public as well as providing a more modern lab in which more and better work can be done.

Anchorage

Martin W. Jasper, Mining Engineer, completed reports on the previous season's field investigations. He made field trips and investigations to Seldovia, Denali, Slate Creek, Kuskokwim River, Sheep Mountain. He accompanied three of the Japanese geologists mentioned earlier on a tour of several of the better known mineral deposits in southcentral and central Alaska. Mr. Jasper accompanied Mr. Siebenthal, U. S. Bureau of Mines Metal Mine Safety and Health Inspector, on an inspection of the Red Devil Mine. He also spent considerable time in approving offshore prospecting permits. Mr. Jasper interviewed and assisted a large part of the 1840 visitors to the Anchorage office.

Irwin W. Mitchell, Assayer, completed a total of 1635 identifications and spectroanalyses during the year. Dr. Carl Hiltrop, of Colorado School of Mines, spent several weeks in the Anchorage office at his own expense assisting in efforts to develop a method of assaying for gold with the new x-ray spectrograph and lending help and advice on geochemical methods and problems. He was also instrumental in interesting Mr. Nick Saum, a graduate geology student from the University of Missouri, in spending the summer assisting full time in the laboratory, also at his own expense except for transportation. Mr. Saum worked with clays in Missouri and collected samples of Alaskan clays for study on his return to Missouri.

The acquisition of the x-ray spectrograph made possible the analyses of many more samples and was obviously needed in view of an increase of 1126 samples over last year processed in the Anchorage office. During the peak month, July, more samples were assayed than during all of 1961.

Wiley D. Robinson, Coal Mine Inspector, carried on his duties as shown under "Safety Inspections." He also helped a large number of the visitors to the Anchorage office and assisted in preparing the coal mine section of the proposed State mining regulations.

The primary function of the Petroleum Branch is the administration of Chapter 40, SLA 1955, Alaska Oil and Gas Conservation Act, and the operating rules and regulations created pursuant to Section 4.3 of said Act. Duties of the Branch include advance approval of drilling permits, specifying equipment and materials to be used; periodic inspections of drilling operations to assure orderly and efficient development of oil and gas fields; maintenance of classified records; accumulation of stratigraphic, geologic and production information for use in engineering studies; assistance to the Alaskan petroleum industry in the employment of general engineering practices peculiar to northern climates; and safety inspection and regulation of all petroleum exploration, development, and production operations.

The Petroleum Branch cooperates closely with the State Division of Lands, giving it technical advice on oil operations and information on land areas with petroleum-favorable geologic conditions, enabling the Division of Lands to effectively classify lands and determine how to offer them for the greatest financial benefit of the State.

Mrs. Bobby Jo Brasch, Secretary, and Kathryn Stephan, Clerk-Typist, assist in interviewing visitors, answering correspondence, and take care of the clerical work of the entire office.

Juneau

James A. Williams, Director, in addition to the Public Service activities mentioned earlier, visited the other offices for administrative purposes. He directed the compilation of the proposed mining regulations and visited several mining exploration sites in southcentral, central and northwestern Alaska.

William H. Race, Mining Engineer, completed the annual report and the report of "The Mineral Industry of the Kenai-Cook Inlet-Susitna Region." He edited the monthly Mines and Petroleum Bulletin and assisted with the proposed State mining regulations. Mr. Race assisted Mr. Herreid with geological studies of the southern extension of the Juneau gold belt and took samples for geochemical analyses in the area. He made field examination trips to Bokan Mountain, Devilfish Bay, and accompanied three of the Japanese geologists mentioned earlier to Funter Bay, Snettisham, Hyder, and Mt. Andrews. The Japanese were particularly interested in the Sumdum deposit but were unable to visit the deposit due to inclement weather. Mr. Race, together with Mr. Denny, Ketchikan Assayer, has provided help and advice on prospect development and ore sales to an active group of Ketchikan prospectors.

Gordon Herreid, Mining Geologist, made field trips to Iyoukeen, Red Devil, Rainbow Mountain, and started a detailed geologic investigation of the mineralized belt from Juneau to the south. He completed reports on last season's field trips, assisted in writing the annual report and the Kenai-Cook Inlet-Susitna report. Mr. Herreid transferred to the Anchorage office in September.

Jean L. Crosby, Administrative Assistant, does the filing, bookkeeping, purchasing, and other administrative details of the entire division. She also assists visitors and answers inquiries.

Dorothy C. Mihelich, Mineral Analyst, processes all claim notices, affidavits of assessment work, maps, reports, thereby keeping the mineral inventory and bibliography up-to-date. She answers all inquiries with regards to claim ownership. In addition, she assists with the general stenographic work.

Judith L. Endell, Secretary, assisted with interviewing visitors, answered much of the correspondence, and ably carried on her regular clerical and stenographic duties. Mrs. Endell left Juneau the eleventh of December and was replaced by Miss Anna Mueller.

Ketchikan

Richard L. Denny, Assayer, completed 610 analyses and identifications of samples during the year. He made field trips to Bokan Mountain, Devilfish Bay, Shakan, and other prospects in the area. Mr. Denny had 463 visitors to the Ketchikan office, which once again is a popular meeting place for the many local people interested in prospecting and mining.

Safety Inspections

The Division of Mines and Minerals is required by law to safeguard the lives and health of miners and workers in the petroleum exploration and production industry. This is accomplished by safety inspections by the mining engineers, Coal Mine Inspector and Petroleum Engineer. The engineers inspect all operations in the vicinity of their field trips and on occasion make special safety investigations.

Mr. Robinson, the Division's Coal Mine Inspector, visits all operating mines on a monthly schedule and the lesser mines and prospects as frequently as time permits. The Division shares equal responsibility with the U. S. Bureau of Mines, Safety Division, for coal mine inspection, but is in effect the actual enforcement agency. Mr. Robinson inspected the following mines many times during the past year: Evan Jones, Mrak, Moose Creek, Buffalo, Premier, Homer, Omlin, Donnely, Houston, Usibelli, and Cripple Creek.

Mr. Davison, Petroleum Engineer, makes safety inspections on his regular periodic visits to the oil and gas fields and drilling operations.

There were no fatalities in Alaska's coal mines during the year. The four fatalities credited to the mineral industries were a result of two accidents in seismic exploration operations and one on an oil well drill rig.

Field Investigations

The mining engineers of the Division made 30 field trips during the year. Some of these were property examinations made at the request of miners and prospectors. Some were routine inspections and assistance trips, and some were for the purpose of investigating mineralized areas by means of geology, geophysics, or geochemistry.

<u>Reports completed of 1961 field trips by Division Engineers and Geologists</u>

Geology of the Fossil Creek Area, Richard E. Church and M. Charles Durfee

Sampling and Geochemical Prospecting at Steamboat Creek, R. H. Saunders

P and P Mining Company, R. H. Saunders

Silvertone Prospect, R. H. Saunders

Manske and Purdy Silver Prospects, R. H. Saunders

Mitchell Copper Prospect, R. H. Saunders

Rainbow Mountain-Gulkana Area Report, R. B. Forbes

Morey-Quinlan-Tengs Limestone Property, G. H. Herreid

Lillie, Hawkins and Eichner Moly Prospect, R. L. Denny and W. M. Burand

LIST OF ALASKA MINING OPERATIONS ACTIVE DURING 1962

Name and Address of Operator	Location of Mine & Recording District	Approx. Crew	Type of Operation*
Admiralty Alaska Gold Mining Co., Box 2642, Juneau	Funter Bay Juneau	3	Nickel-copper lode development
Alaska Exploration & Mining Co., Talkeetna	Bird Creek Talkeetna	1	Hydraulic
Alaska Horizons Co. Vic Fondy & Ray Jones	Treasure Creek Talkeetna	2	Testing ground with caisson
Alaska Mines & Minerals, Inc. Box 422, Anchorage	Red Devil Mine Kuskokwim	38	Mercury production
Alaska Nickel Co. Fred Jenkins Box 913, Fairbanks	Flume Creek Fairbanks	2	Development work
Alaska Portland Cement Co.,Ltd. 136 Kentucky Street Petaluma, California	Foggy Pass Nenana	3	Limestone exploration
Alaska Resources, Inc. Fairbanks	Goldstream Creek Fairbanks	2	Limestone & peat
Alluvial Golds, Inc. 4732 - 46th N.E. Seattle 5, or Coal Creek	Woodchopper Creek Fairbanks	15	Gold dredge
Amero, A. W. Chandalar	E. Fork Chandalar R. Fairbanks	1	Prospecting
Anderson, Ellis Chandalar	Tobin Creek Fairbanks	1	Small scale hand
Anderson, Tury & Associates Fairbanks	Fairbanks Fairbanks	2	Lode prospecting & mill construction
Atlas Mines George J. Waldhelm Box 755, Nome	Dahl Creek Cape Nome	1	Nonfloat
Basin Creek Mining Co. Herbert Engstrom Box 554, Nome	Basin Creek Cape Nome	2	Dredge

*Types of operations are explained at end of list.

Bay West, Inc. 317 Main Street Grand Junction, Colorado	Kendrick Bay Ketchikan	18	Uranium mine
Bear Creek Mining Co. 917 Mallon Spokane, Washington	Ruby Creek Noatak-Kobuk	40	Copper lode development
Beckwith, Rea Box 119, Anchorage	Alaska General Several	1	Mineral investigations
Berg, L. C. Box 58, Sitka	Chichagof District Sitka	1	Prospecting
Beshores, Paul & Associates Box 1161, Mollala, Oregon	Kugruk River Fairhaven	1	Nonfloat
Bierman, William Yakima, Washington	Slate Creek Copper Center	2	Nonfloat
Bittner, Paul Central	Circle District Fairbanks	1	Prospecting
Bliss, Patrick & Son 129 East 11th, Anchorage	Ungalik Creek Cape Nome	3	Nonfloat
Bodis, George Nome	Macklin Creek Cape Nome	2	Hydraulic
Boedecker, Bill & Joines, Evert Hollis	Hollis Ketchikan	2	Prospecting
Brandl, P. & R. Box 4042, Star Route, Spenard	Nugget Creek Talkeetna	1	Nonfloat
Breseman, John W. Box 796, Pelican	Chichagof District Sitka	1	Prospecting
Brockway, John T. & Ellis, Sid 2500 E. Street, Bellingham, Washington	Chichagof District Sitka	3	Gold lode development
Bronson, Robert; France, Jack & Wilbur; Johnson, William Palmer	Craigie Creek Palmer	3	Development work
Brown, Erwin General Delivery, Petersburg	SE Alaska Several	1	Prospecting
Burnette, Dewey & Hunter, Martha Box 1995, Fairbanks	Crooked Creek Fairbanks	2	Nonfloat
Carr, G. W. Miller House	Miller Creek Fairbanks	2	Nonfloat

Carstens, Heine C. Central	Portage Creek Fairbanks	2	Nonfloat
Casanoff, Jack Kiana	Klery Creek Noatak-Kobuk	1	Small scale hand
Casto, Steve 33 Mile, Haines	Porcupine Creek Haines	1	Small scale hand
Coffield, Lawrence Fairbanks	Black Creek Talkeetna	1	Gold lode prospecting
Coffield, Lawrence Fairbanks	Black Creek Talkeetna	2	Nonfloat
Coleman Palmer	Independence Mine Wasilla	1	Caretaking & mainten- ance
Colp, Douglas	Klery Creek Noatak-Kobuk	10	Dredge
Columbia Iron Mining Co. 525 William Penn Place Pittsburgh 30, Penna.	SE Alaska Several	8	Mineral investigations, aerial recon., drill- ing
Cordero Mining Co. 131 University Avenue, Palo Alto, California	White Mountain Kuskokwim	1	Mercury lode explora- tions
Crane, Fred and Associates Kotzebue	NW & N Alaska Regions Several	2	Prospecting
Cushman Brothers Fairbanks	College Road Fairbanks	2	Peat
Davis, Bon Box 45, Nome	Gold Run Cape Nome	1	Nonfloat
Davis Mines, Inc. Talbert E. Davis, 1511 Mary Ann Fairbanks	Shovel Creek Noatak-Kobuk	2	Nonfloat
Degnan, Joseph A. Ophir	Mastodon Creek Innoko	1	Nonfloat
Dickman, O. J. Teller	Kigluaik Mountains Cape Nome	3	Nonfloat
Eckers, Theron Kasaan	Kasaan Peninsula Ketchikan	2	Prospecting
Edgecumbe Exploration Co. C. T. & G. H. Morgan Box 758, Sitka	Silver Bay Sitka	2	Gold lode maintenance

Edwards, Herk & Miller, Vern Nome	Nome Area Cape Nome	2	Prospecting
Emerick, Rollie Delta Junction	Alaska General Several	1	Prospecting
Empire Jade Co. Gene Joiner, Kotzebue	Jade Creek Noatak-Kobuk	1	Jade recovery and cutting
Falls, Bentley Box 33, Livengood	Wilbur Creek Fairbanks	1	Nonfloat
Farrell, Ed & Higgens, Bert	Porcupine Creek Fairbanks	2	Nonfloat
Fennimore, George & Associates Talkeetna	Yakataga Beach Cordova	4	Placer exploration
Ferguson, Archie & Belobraidich, John, Kotzebue	Candle Area Fairhaven	6	Nonfloat
Fern Gold Mining Co. G. F. Kalmbach	Willow Creek Palmer	2	Gold lode development
Flat Creek Placers Fullerton Brothers, Flat	Flat Creek & Willow Creek Mt. McKinley	3	Nonfloat
Foreman	Hollis Ketchikan	1	Development & Drilling
Foster, Neal W. Box 279, Nome	Seward Peninsula Several	2	Lode prospecting
Foster, Neal W. Box 279, Nome	Hannum Creek Fairhaven	3	Nonfloat
Fremont Mining Co. Box 125, Forest Grove, Oregon	Alaska General Several	2	Mineral explorations & drilling
Gagnon Placers Talkeetna	Cottonwood & Willow Creeks Talkeetna	2	Placer testing
Ghezzi, Alfred, Sr. Box 1857, Fairbanks	Third & Fourth Division Several	1	Prospecting
Gilbertson, George	Canyon Creek Fortymile	2	Nonfloat
Glacier Mining Co. Anchorage	Hays River Anchorage	2	Molybdenite exploration
Goodnews Bay Mining Co. 422 White Bldg., Seattle 1, or Platinum	Salmon R. and tribs. Bethel	40	Platinum dredge

Grant Mining Co. Frank C. Edgington Box 53, Tanana	Grant Creek Ft. Gibbon	2	Nonfloat
Hancock, K. S. Haines	Porcupine Creek Haines	1	Small scale hand
Hansen, Burnett F. Eagle	Ben Creek Fairbanks	2	Nonfloat
Hanson, Aage 1108 - 10th Avenue N Seattle 2, Washington	Craigie Creek Wasilla	1	Development work
Hassel Mining Co. Harold Hassel Box 1071, Fairbanks	Ready Bullion Creek Fairbanks	2	Nonfloat
Havrilack, Harry Rampart	Ruby Creek Rampart	1	Nonfloat
Hawkins, W. A.; Eichner, Ken; Lillie, Angus Ketchikan	SE Alaska Several	1	Prospecting
Heiner, Larry Petersburg	SE Alaska Several	1	Prospecting
Henton, Fred Mile 42, Seward Highway	Slate Creek Seward	1	Gold lode development
Hickok, Clara Talkeetna	Thunder Creek Talkeetna	2	Hydraulic
Hofstad, Richard Petersburg	Petersburg District Several	1	Prospecting
Hogendorn, Jack Deering	Inmachuck River Fairhaven	1	Hydraulic
Holloway, Dorr & Juancorena, Mariano	Sleetmute Kuskokwim	3	Exploration
Huff, J. W. Route 1, Box 567B Ketchikan	Gravina Island Ketchikan	1	Prospecting
Humble Oil & Refining Co. 1829 E. 5th Avenue, Anchorage	Bristol Bay District Bristol Bay	10	Iron lode exploration
Hyder Mines, Inc. 904 4th Avenue, Seattle, or Hyder	Riverside Mine Hyder	2	Silver-lead-tungsten lode preparations

Idaho Bar Mining Co. Rampart	Idaho Bar Rampart	2	Nonfloat
Inmachuck Mining Co. Grant H. Nelson, Nome	Inmachuck River Fairhaven	6	Gold dredge
Johansen, Engbret Chicken	Ingle Creek Fairbanks	2	Small scale hand
Johnson, Iver M. Fairbanks	Chisana District Fairbanks	2	Nonfloat
Kawolsky, Ignacey Nome	Charley Creek Cape Nome	1	Prospecting
Kloss, Herman; Davis, Jack (K & D Lode) Sunset Cove	Sunset Cove Juneau	2	Gold-antimony lode development & prospecting
Knaack, William & Associates Seward	Beauty Bay Seward	2	Gold lode
Kodiak Exploration Co. Box 448, Kodiak	Kodiak Island Kodiak	3	Tungsten & copper prospecting
Kopanski, Max Skagway	Juneau District Skagway	1	Prospecting
Kupoff, Nick Box 630, Fairbanks	Pedro Creek Fairbanks	1	Nonfloat
Ladybird Mining Co. Anchorage	Valdez Creek Talkeetna	4	Placer preparations
Lake Creek Placers E. H. Pitts, Big Lake Bettles Field	Lake Creek Fairbanks	1	Hydraulic
Langlow, Jens Central	Switch Creek Fairbanks	1	Hydraulic
Lanning, Tony Manley Hot Springs	Shirley Bar & Eureka Creek Manley Hot Springs	1	Nonfloat
Lee Brothers Dredging Co. Box 208, Nome	Solomon River Cape Nome	9	Gold dredge
Leonard, Harry B. Wiseman	Smith Creek Fairbanks	1	Small scale hand
Leslie, Robert Box 1838, Fairbanks	Granite Creek Fairbanks	1	Placer development
Lie, Harold Kotzebue	Bear Creek Cape Nome	2	Nonfloat

Lindquist, Hjalmer 133 N. Marion, Bremerton, Washington, or Ophir	Bedrock & Ester Creeks Innoko	1	Nonfloat
Lindsay, George c/o R. E. Baumgartner Seward	Oracle Property Seward	1	Development work
Little Creek Mine Ivor C. Carlson Ophir	Little Creek Innoko	2	Nonfloat
Little Squaw Mining Co. 309 Radio Central Bldg., Spokane, Washington	Chandalar District Fairbanks	4	Gold lode development
Locke, Barney Anchorage	Third Division Several	1	Prospecting
Long Creek Mining Co. "Ash" Richardson, Ruby	Long Creek Nulato	4	Nonfloat
Lucky Seven Mining Co. Walter E. Roman Miller House	Portage Creek Fairbanks	3	Nonfloat
McReynolds, Warren; Williams, E. C., Box 292, Ketchikan	Kasaan Peninsula Ketchikan	2	Prospecting
McWilliams, Howard F. Box 1317, Anchorage	Third Division Several	1	Prospecting
Magnuson, Warren Ophir	Fourth Division Several	1	Prospecting
Martinson Brothers Nome	Kougarok River Cape Nome	8	Gold dredge
Marvel Creek Mining Co. Awe, Charles, Aniak	Marvel Creek Bethel	3	Nonfloat
Mathews Mining Co. Fairbanks	Woodchopper Creek Fairbanks	5	Gold dredge
Meldrum, William Chicken	Stonehouse & Chicken Creeks Fairbanks	2	Stripping only
Mendenhal, Roy Deering	Milroy Creek Fairhaven	1	Nonfloat
Miller, James; Lindgrin, Earl; Atwood, M. J.	Sheep Creek Fairbanks	3	Nonfloat

Minalaska, Inc. Magnuson Brothers Ophir	Gaines Creek Mt. McKinley	2	Gold dredge
Mineral Basin Mining Corp. Arthur Moa, Box 126, Hyder	Mt. View Property Ketchikan	4	Exploration (lode)
Minerals, Inc., W. W. Gilkey Box 1211, Juneau	Yakutat District Juneau	2	Beach placer investigations
Miscovich, Andrew Flat	Porcupine Creek Fairbanks	1	Placer development
Moneta Porcupine Mines, Ltd. 408-402 W. Pender Street Vancouver 2, B. C.	Kantishna District Fairbanks	5	Mineral investigations & reconnaissance
Monte Cristo Mining Co. R. W. Beck, Gakona	Slate Creek Chitina	7	Nonfloat
Morgan, Milton F. 5115 El Cajon Blvd., San Diego, California	Bering Sea Cape Nome	3	Offshore prospecting
Mrak, William, Sutton	Grubstake Gulch Palmer	2	Churn drilling
Mt. Andrew Mining Co. Box 358, Ketchikan or 1011-1030 W Georgia Street Vancouver 5, B. C.	Kasaan Peninsula Ketchikan	8	Iron & copper exploration, drilling & geophysical
Mt. Parker Mining Co. A. F. Parker Box 2127, Juneau	Mt. Parker Mine Juneau	1	Gold lode maintenance
Newlun, O. H.	Pr. of Wales Island Ketchikan	1	Prospecting
Newmont Mining Corp. of Canada, Ltd., Room 604-749 W. Hastings Vancouver, B. C.	Alaska General Several	10	Nickel lode exploration
New York-Alaska Gold Dredging Corp., 2503 Smith Tower Seattle, or Nyac	Tuluksak R., Calif. Cr., Rock Cr. Bethel	18	Gold dredge
Novak, John 1780 Ocean Blvd. Coos Bay, Oregon	Bering Sea & Others Cape Nome	2	Offshore prospecting
Nugget Mining Co. Steven Petersen, Nome	Niukluk River Cape Nome	2	Gold dredge

O'Brien, Jim; Dunsmire, Jim Cooper Landing	Surprise Creek Seward	2	Placer drift
O'Carroll, Michael Fairbanks	Spruce Creek Innoko	3	Nonfloat
Olive Creek Mines Carl Parker Box 552, Fairbanks	Olive Creek Fairbanks	4	Nonfloat
Olson, Henry T. "Tiger" Taku Harbor	Juneau & Admiralty Districts Juneau	1	Prospecting
O'Neill Ventures William O'Neill 505 8th Avenue, Anchorage	Dan Creek McCarthy	2	Development work
Operators Unknown (2) Anchorage	Friday Creek Fairbanks	2	Nonfloat
Pade, Otto Skagway	Skagway Skagway	1	Prospecting
Palmer, R. B. Fairbanks	Sourdough Creek Fairbanks	1	Prospecting
Pankratz, Fred; Doyle, Al Nome	Bering Sea & Beaches Cape Nome	4	Beach and offshore prospecting
Pannick, Harry	Flume Creek Fairbanks	1	Nonfloat
Pekovich, W. S. Box 2642, Juneau	Port Snettisham Juneau	1	Iron lode development
Permanente Cement Co. Oakland, California	Kings River Palmer	3	Limestone exploration
Pettyjohn, Fred S. 4 Eleanor Street, Fairbanks	S.Slope Alaska Range Talkeetna	1	Lode prospecting
Pieper, Paul Ketchikan	Kasaan Ketchikan	1	Prospecting
Pilgrim, E. R. Box 1896, Fairbanks	Stampede Creek Fairbanks	2	Antimony lode development
Pratt, Jack; Dube, Tony Suntrana	No Grub Creek Fairbanks	2	Nonfloat
Price, Stanton c/o Dean Goodwin Box 1262, Juneau	Windfall Harbor Juneau	1	Prospecting

Prince Creek Mining Co. S. E. Agoff, Flat	Prince Creek Mt. McKinley	4	Nonfloat
Purdy Brothers Chicken	Myers Fork Fairbanks	2	Nonfloat
Purkeypile, I. W. & Associates Fairbanks	Tonzona District Mt. McKinley	3	Lode prospecting
Quail Creek Mining Co. Rampart	Quail Creek Rampart	2	Nonfloat
Quitsch, William Valdez	Mineral Creek Valdez	1	Gold lode prospecting
Radovan, Martin McCarthy	Glacier Creek McCarthy	1	Copper lode prospect-ing
Redstone Mining Co. Carl Heflinger, Fairbanks	Livengood Creek Fairbanks	2	Nonfloat
Rhode Island Creek Mines A. W. Pringle Manley Hot Springs	Rhode Island Creek Manley Hot Springs	3	Nonfloat
Ricks, Dean Fairbanks	Fairbanks District Fairbanks	1	Prospecting
Robinson, George F. Boundary	Wade Creek Fairbanks	1	Nonfloat
Rosander & Gates Ophir	Bear Creek Mt. McKinley	3	Nonfloat
Rosander & Reed Ophir	Yankee Creek Mt. McKinley	4	Nonfloat
Ross, Donald Ketchikan	SE Alaska Several	1	Prospecting
Rowe, Richard W. 707 E. 9th, Anchorage	Van Curlers Bar Fairbanks	2	Placer development
Schaefer, Norman J. 62 Copeland Avenue La Crosse, Wisconsin	Cinnabar Creek Kuskokwim	2	Caretaking & main-tenance
Sheldon, Charlie Shungnak	Shungnak River Noatak-Kobuk	1	Jade placer
Shell Oil Co. Shell Bldg., 100 Bush Street San Francisco, California	Bering Sea Cape Nome	14	Offshore prospecting
Sinclair Oil Co. Box 584, Anchorage	Alaska General Several	6	Prospecting

Sirilo, Julius Box 625, Bethel	Aniak District Kuskokwim	1	Prospecting
Smith, Pete & Associates	Steamboat Creek Fairbanks	2	Nonfloat
Spirit Mountain Mining Co. Joe Boothby Room 124, Administration Bldg. Boeing Field, Seattle	Canyon Creek Chitina	7	Nickel-copper prospecting
Squaw Creek Mining Co. Jack Wilke, Boundary	Canyon Creek Fairbanks	1	Nonfloat
Steears, Al Box 826, Ketchikan	SE Alaska Several	2	Prospecting
Stelting, H. W. Box 19, Haines	Haines Haines	1	Prospecting
Strandberg Mines, Inc. 926 - 4th Ave., or Box 2099, Anchorage	Alaska General Several	2	Mineral investigations
Strandberg Mines, Inc. Box 2099, Anchorage	Eureka Creek Manley Hot Springs	4	Nonfloat
Strandberg Mines, Inc. Box 2099, Anchorage	Indian River Fort Gibbon	4	Ground preparation
Stuver, Joe Flat	Flat District Mt. McKinley	2	Nonfloat
Stuver, Jules Flat	Moore Creek Mt. McKinley	2	Hydraulic
Sultan Sawmill & Mining Co. Ray Trotachau Sultan, Washington	Kennecott Mine McCarthy	10	Building road
Sweepstakes Mine Charles Moon & Baldwin Box 371, Nome	Sweepstakes Creek Cape Nome	1	Nonfloat
T and T Mining Co. William Thomas 503 - 7th Ave., Fairbanks or Rampart	Hunter Creek Rampart	1	Nonfloat, stripping
Taylor, Arley & Associates c/o Snitely Brothers Wenatchee, Washington	Eureka Creek Fairbanks	4	Prospecting
Titus, Jack; Cook, Fred Solomon	Shovel Creek Cape Nome	2	Small scale hand

Totem Exploration Co. Joe Blazek 317 Dock Street, Ketchikan	SE Alaska Several	2	Prospecting, exploration & diamond drilling
Toussaint, Ed Fort Yukon	Big Creek Fairbanks	1	Gold lode development
Tweet, N. B. & Sons Teller	Kougarok River Cape Nome	5	Nonfloat & hydraulic
Ulrich, Henry Nome	Rock Creek Cape Nome	1	Small scale hand
Uotila, Gus Ophir	Birch Creek Nulato	2	Stripping
U.S.S.R.& M. Co. Box 438, Nome	Nome District Cape Nome	74	Gold dredges
U.S.S.R.& M. Co. Box 1170, Fairbanks	Fairbanks District Fairbanks	71	2 Gold dredges
U.S.S.R.& M. Co. Box 1170, Fairbanks	Hogatza River Ft. Gibbon	34	Gold dredge
U.S.S.R.& M. Co. Box 1170, Fairbanks	Mosquito Fork Fairbanks	15	Dredge
Wackwitz, Charles & Fred Box 1595, Fairbanks	Bedrock Creek Fairbanks	2	Nonfloat
Wall, Melvin c/o Robert Hoedel, Homer	Valdez Creek Talkeetna	4	Placer & lode prospecting
Watson, Mrs. Ben Cape Yakataga	Yakataga Beach Cordova	2	Small scale hand
Weinard, Fred; Erickson, Fred Candle	Mud Cr. & Jump Cr. Fairhaven	2	Nonfloat
Weisner Trading Co. Ira Weisner, Rampart	Little Minook & Hoosier Creeks Rampart	4	Nonfloat
Wheeler, Vernon & Associates Box 14A, Wasilla	Grubstake Gulch Palmer	1	Prospecting
Williams, Burton A. May Creek via Cordova	Rex Gulch McCarthy	1	Small scale hand
Willis, George Red Devil	Parks Property Kuskokwim	1	Development work
Withrow, Alfred W. Bettles Field	Koyukuk River Fairbanks	1	Small scale hand

Wolf Creek Mining Co. Box 141, Fairbanks	Fish Creek Fairbanks	8	Nonfloat
Woodman, I. N. Valdez	Tonsina Lake Area Valdez	1	Prospecting
Worthington, John	Pr. of Wales Island Ketchikan	2	Prospecting
Yelinore, Inc. Paul Fretz 947 Orcas St., Anchorage	Yellow Band Property McCarthy	4	Development work
Young, Frank R. Haines	Haines District Haines	1	Prospecting
Zaiser, Clarence Ruby	Greenstone Creek Nulato	2	Nonfloat
Zimin, Nick South Naknek	Alaska Peninsula & Bristol Bay District Several	1	Prospecting
Zukoev, James	Bonnifield District Nenana	1	Nonfloat

* "Nonfloat" indicates mechanical placer gold operation using draglines and/or bulldozers to transport gravel to nonfloating washing plant, bedrock sluiceboxes, or elevated sluices.

"Hydraulic" indicates placer gold operation in which gravel is excavated and transported to sluiceboxes solely by water jets from hydraulic nozzles.

"Small scale hand" indicates placer gold operation in which gravel excavation and transportation is accomplished by hand or ground sluicing.

ACTIVE COAL MINES, 1962

Name and Address of Operator	Location of Mines & Coal Field	Type of Operation	Approx. Crew
Arctic Coal Co., Inc. Lignite	Lignite Nenana Field	Strip	4
Evan Jones Coal Co. Box 619, Anchorage, or Jonesville	Jonesville Matanuska Field	Strip	50
Mrak Coal Co. Box 16, Sutton	Near Eska Matanuska Field	Strip	35
Paul Omlin	Premier Mine Matanuska Field	Strip	2
Usibelli Coal Mines, Inc. Usibelli	Healy Creek Nenana Field	Strip and underground	95

Note: Above data from DM&M records.

OIL AND GAS COMPANIES ACTIVE DURING 1962

Name and Alaskan Address of Company	Home or Regional Office	Type of Activity
Bass Drilling Co.	905 San Jacinto Bldg., Houston	Geophysical, drilling
British American Oil Producing Co. 426 Eagle St., Anchorage	Mercantile-Dallas Bldg., Box 749, Dallas 21	Geophysical, drilling
British Petroleum Exploration Co. (Alaska), Inc. 308 B St., Anchorage	620 5th Avenue New York City 20	Geologic field party, geophysical, drilling
Cities Service Oil Co.	Bartlesville, Okla.	Geologic field party
Colorado Oil and Gas Corp. Yakutat	Box 749, Denver	Drilling, geophysical
Franco-Western Oil Co.	3132 18th St., Bakersfield, Calif.	Drilling
Hackathorn Drilling Co. 134 E. 2nd, Anchorage	715 Midland Savings Bldg. Denver 2, Colorado	Drilling
Honolulu Oil Corp.	215 Market St., San Francisco 5	Geophysical, drilling
Mobil Oil Co. Box 1734, Anchorage	612 S. Flower St., Los Angeles 54	Geophysical
Occidental Petroleum Corp.	5000 Stockdale Highway Bakersfield, Calif.	Drilling
Ohio Oil Co. 520 K St., Anchorage	550 S. Flower St., Los Angeles 17	Geophysical, drilling
Pan American Petroleum Corp. 333 B St., Anchorage	Box 591, Tulsa 2	Geophysical, geologic field party, drilling
Phillips Petroleum Corp. Box 419, Anchorage	Bartlesville, Okla.	Geologic field party, geophysical, drilling
Pure Oil Co. Box 1651, Anchorage	35 East Wacker Drive Chicago	Geologic field party, geophysical, drilling
Richfield Oil Corp. Box 2241, Anchorage	555 S. Flower St., Los Angeles 17	Drilling, geophysical, geologic field party
Skelly Oil Co. Box 1314, Anchorage	Box 1650 Tulsa 2, Okla.	Geophysical, drilling

James H. Snowden	750 W. 5th St., Fort Worth, Texas	Drilling
Shell Oil Co.	Suite 1055 Dexter Horton Bldg., Seattle 4	Geologic field party, geophysical, drilling
Sinclair Oil and Gas Co. Box 584, Anchorage	Box 521, Tulsa, Okla.	Geologic field party, geophysical, drilling
Standard Oil Co. of California Box 7-839, Anchorage	225 Bush St.,Standard Oil Building San Francisco, 20	Production, drilling, geologic field party, geophysical
Superior Oil Co. Box 1167, Anchorage	550 S. Flower St., or Box 3015 Terminal Annex, Los Angeles	Geologic field party, geophysical, drilling
Texaco, Inc. Box 664, Anchorage	3350 Wilshire Blvd., Los Angeles 5	Geophysical, geologic field party
Union Oil Co. of California 2805 Denali, Anchorage	Union Oil Center Los Angeles	Drilling, geophysical, production

LIST OF REPORTS ISSUED BY THE DIVISION OF MINES AND MINERALS AND CORRESPONDING PRECEDING AGENCIES

*Report of the Mine Inspector for the Territory of Alaska to the Secretary of the Interior, fiscal year ended June 30, 1912.

*Report of the Mine Inspector for the Territory of Alaska to the Secretary of the Interior, fiscal year ended June 30, 1913.

*Report of the Mine Inspector for the Territory of Alaska to the Secretary of the Interior, fiscal year ended June 30, 1914.

*Report of the Territorial Mine Inspector to the Governor of Alaska for the year 1915.

*Report of William Maloney, Territorial Mine Inspector, to the Governor of Alaska for the year 1916.

*Report of the Territorial Mine Inspector to the Governor of Alaska for the year 1917.

*Annual Report of the Territorial Mine Inspector to the Governor of Alaska, 1920.

*Annual Report of the Territorial Mine Inspector to the Governor of Alaska, 1921.

*Annual Report of the Mine Inspector to the Governor of Alaska, 1922.

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*Report upon industrial accidents, compensation and insurance in Alaska for the biennium ending December 31, 1924.

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