ALASKA'S MINERAL POTENTIAL

1978

A Situation Report by the
Alaska Field Operations Center
U. S. Bureau of Mines
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by

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INTRODUCTION

In December 1971, the U. S. Congress passed the Alaska Native Claims Settlement Act (Public Law 92-203). Section 17 of that Act provides for a joint Federal-State Land Use Planning Commission for Alaska. The Bureau of Mines Alaska Field Operations Center has worked with the Commission since its inception. The role of the Commission has been that of counselor to the Federal and State governments, the native villages, and the native regional corporations on matters of land-use planning and land selections. The Bureau of Mines has been requested to supply mineral data. This report summarizes currently available data on the mineral and fuel potential of Alaska.

This report contains seven desk-size maps and a translucent overlay. Figures 1 through 3 show areas of petroleum and natural gas, coal, and geothermal energy potential color coded to indicate the relative importance for development. The term "importance" is based upon potential economic viability, accessibility and national or local need. Map 4 shows metallic mineral areas color coded in order of potential productivity. Map 5 shows sedimentary basins considered to have potential for uranium, but data are too scanty to make any estimate of relative importance. Map 6 outlines the metallogenic areas upon which Maps 4 and 5 are based. Map 7 shows the present transportation corridors recently proposed by the State of Alaska.

Under Section 17, D-2 of Public Law 92-203, up to 80 million acres would be set aside in one of four classifications: national parks, wild and scenic rivers, national forests, and national wildlife refuges. Recent amendments to the law have sought to increase the withdrawals substantially. The withdrawal proposals made under Public Law 92-203 and those proposed in H.R.-39 are included in a translucent overlay (Figure 8) which can be laid over the printed maps.

1/ Mining Engineer.

ACKNOWLEDGMENTS

The maps showing metallic mineral occurrences, sedimentary basins favorable for uranium, and the metallogenic provinces were compiled by Charles C. Hawley of C. C. Hawley and Associates, consulting geologists, located in Anchorage, Alaska, under contract to the Bureau of Mines. An evaluation of coal potential for each coal field was performed by Robert Warfield, Mining Engineer, Alaska Field Operations Center, Juneau, Alaska. Marilynne Lawson handled all phases of the map preparation.

OIL AND GAS

Quality

The quality of the crude oil and natural gas in Alaska is good. The low sulfur content (average less than .09%) and moderate to high gravity (average 29° API) of Cook Inlet oils makes the oils desirable for normal refining purposes. Prudhoe Bay oil has moderate sulfur content (average .8%) and average gravity of 25° API. Natural gas found so far in Alaska fields is high in methane content with no sulfur and has a heating value averaging over 950 Btu's/cu. ft.

Productive Areas

There are two areas in Alaska where significant commercial production is taking place. One is the Upper Cook Inlet area which includes the Kenai Peninsula, offshore Cook Inlet and the west shore of Cook Inet. The first well that produced commercial quantities of oil in the Cook Inlet Basin was completed in 1957. Since that time five major oil fields have been developed. Estimated reserves of recoverable oil by primary and secondary recovery methods total 2.7 billion barrels, or 36 percent of the estimated oil originally in place (3).

Sixteen natural gas fields have been discovered in the Cook Inlet Basin area, but only five fields are being actively produced. Most of the remaining fields are one-well fields which have never been developed or linked to transmission facilities, mainly because of a lack of market. Total combined remaining reserves of all natural gas fields in the Cook Inlet Basin are estimated to be nearly 6.7 trillion cubic feet of gas (2).

In June of 1977, oil from the Prudhoe Bay began flowing, making this area the second in the State with significant commercial production. This giant oil field was discovered in 1968 following five years of drilling on the North Slope ranging from the northern foothills of the Brooks Range to the Arctic Coast. The discovery of Prudhoe Bay started a new rush of exploratory drilling in the Arctic, resulting in the discovery of additional gas fields having an, as yet, unknown potential.

Prudhoe Bay reserves are thought to be near 9.4 billion barrels of oil and 27 trillion cubic feet of gas (5). Reserves of the undeveloped fields are unknown.

Areas With Potential

More than 20 sedimentary basins and provinces are known in Alaska. Only seven have had any serious drilling; of these, two have proven production capability. Figure 1 shows the areal extent of the various basins and provinces. Color coding indicates those areas which seem to have a high potential for development. Uncolored areas within a basin or province may also have oil and gas but present knowledge suggests that the likelihood is low.

COAL

Quality

Alaskan coals are characterized by low sulfur content, large resource tonnages, and predominately subbituminous grades. In general, most subbituminous coals have high moisture and ash contents. However, some potentially important deposits of bituminous coals having coking characteristics do occur on the North Slope of the Brooks Range.

Productive Areas

The two coal fields that have produced the greatest quantities of coal are the Matanuska field north of Anchorage and the Nenana field, south of Fairbanks. From 1916 to 1969, approximately 7.5 million tons of coal were produced from the Matanuska field. Most of this was high volatile bituminous coal from the Wishbone Hill district near Jonesville. Original resources of bituminous coals in the Wishbone Hill district totaled 112 million tons (1). Nearly all activity ceased in 1969 when the power plants at Anchorage were converted from coal to natural gas.

The Nenana field came into production in 1918 and is productive today. Approximately 18.0 million tons of subbituminous coal have been produced. Annual production is about 700,000 tons (4). The principal markets are electric generating plants at Fairbanks and at the military bases near Fairbanks, and a mine-mouth electric generating plant. Original resource estimates for this field totaled approximately 6.9 billion tons (1). The coal-bearing formations contain a large number of coal beds ranging in thickness from a few inches to 60 feet.

Areas With Potential

Estimated coal resources of Alaska total 130 billion tons, roughly the energy equivalent of 350 billion barrels of crude oil. About 85

percent of these resources are subbituminous and lignite coals, and over 90 percent occur north of the Brooks Range and west of the Colville River (1). Figure 2 shows the distribution of coal-bearing rocks in Alaska and the estimated relative importance for development. The area considered to have the greatest potential for immediate development is the Beluga-Chuitna area of the Susitna field west of Anchorage. Other areas of high potential are the Matanuska field north of Anchorage and the Nenana field south of Fairbanks. The close proximity of these deposits to tidewater or rail transportation is a major factor favoring their utilization.

GEOTHERMAL AREAS

Quality

Most of the known hot springs in Alaska have been characterized as water dominant with relatively low temperatures and limited reservoir capacities. Those geothermal resources located in the Wrangell Mountains or along the Pacific Ocean and, in particular, the Aleutian Island chain, may produce steam when brought to the surface.

Productive Areas

Geothermal water has been used on a small scale for space heating, bathing and growing vegetables at many places including Circle, Chena and Manley north of Fairbanks, Baranof and Tenakee in Southeastern Alaska, and at Pilgrim Springs on the Seward Peninsula north of Nome.

Areas With Potential

Figure 3 shows the distribution of geothermal sites in Alaska with an assessment of the relative importance for development indicated by color coding. Under the Geothermal Steam Act of 1970, 492,572 acres have been classified as known geothermal resource areas: Pilgrim Springs on the Seward Peninsula and Geyser Spring Basin and Okmok Caldera on Umnak Island in the Aleutian Island chain (7). An additional 10.8 million acres have been classified as geothermal resources provinces (7).

METALLIC MINERALS

Productive Areas

Historically, the metallic minerals that have been most important in Alaska economically, have been gold, copper, silver, mercury, tin, and platinum. The Fairbanks and Nome regions have been the most productive of the placer gold areas, accounting for 60 percent of the 21 million

ounces produced. The Juneau region produced 75 percent of Alaska's lode gold production of 9 million ounces. The Copper River area, including Prince William Sound, provided 97 percent of Alaska's total copper production of 690,000 tons. Nearly 86 percent of the State's total came from the Kennecott mines near McCarthy. These mines also accounted for nearly one-half of Alaska's total silver production of 20 million ounces. The primary area for mercury has been the Kuskokwim River region; for tin, the Seward Peninsula; and for platinum, Goodnews Bay.

Metallic mineral production in 1977 was principally placer gold produced in many of the historic mining regions. The gold belt north of the Alaska Range was the scene of most activity. In the Nome area, two dredges were operating. The Goodnews Bay Mining Company, the only primary producer of platinum in the United States, was shut down in 1976 following 42 years of operation.

Areas With Potential

Figure 4 shows areas in Alaska having metallic mineral potential as well as historic mining regions. Potential productivity is denoted by color coding. Historical mining regions are shown in yellow. The most widespread of the mining regions are those having produced gold.

Mineral exploration has been increasing throughout Alaska in recent years. In 1977 the Brooks Range and Southeastern areas were the scenes of the greatest activity. The Kennecott Copper Corporation has two high-grade copper deposits near Kobuk. Anaconda Copper Company, which bought a part interest in the Sunshine Mining Company claims located nearby, announced discovery of a potentially major high-grade copper ore body. The Bureau of Mines announced discovery of a deposit containing barite, lead, zinc, and silver 35 miles north of Noatak in the proposed Noatak National Arctic Range. Inspiration Copper Company and U.S. Borax Company announced the discovery of major deposits, the former company for copper-nickel west of Juneau, and the latter for molybdenum east of Ketchikan. The Alyu Mining Corporation is planning to commence producing barite north of Haines in 1978. Many other companies were actively exploring in the State during 1977.

URANIUM

Productive Areas

The only uranium produced in Alaska was from the Kendrick Bay deposit 35 miles southwest of Ketchikan. Discovered in May 1955, the mine produced approximately 39,000 tons of ore averaging 1 percent

U_3O_8 between 1957 and 1964 (5). In 1971, an additional 55,000 tons of ore were mined and shipped to a mill near Spokane, Washington for concentrating (6).

Areas With Potential

Figure 5 depicts the sedimentary basins in the State which may have uranium potential. Information on uranium concentrations in these sedimentary basins is scarce. Therefore, no attempt was made to rank the various basins as to their relative importance of favorability for development. Sedimentary-type uranium deposits are usually formed by the dissolving of uranium from a source and its being concentrated in a host rock. In the Western United States the source rocks are generally acidic volcanics or granites and the host rocks are sandstones. The resulting mines and concentrating mills are large installations requiring ground access to supply the needs of the mining complex and accompanying town.

METALLOGENIC PROVINCES

Figure 6 is a metallogenic province map of Alaska. This map provides additional data for those readers who need detailed information that could not be shown on Figures 4 and 5. Many of Alaska's recognized mineral deposits show a close spatial and inferred genetic relation to igneous rocks; others appear to have formed as unusual varieties of sedimentary rocks--in both cases the deposits are syngenetic, having formed at or about the same time as their associated rocks. Another large class of deposits cut across sedimentary-igneous-metamorphic rock boundaries having formed epigenetically or after the enclosing rocks. In these epigenetic deposits, there is evidence in most cases that hot watery solutions had a major part in their formation, and therefore these are referred to as hydrothermal deposits. Within each group of deposits there are many subdivisions, and there are also gradations between the main groups igneous, sedimentary, and hydrothermal. Only a few of the igneous deposits are truly dominated by magmatic processes, but even if hydrothermal, the affinity of deposits with certain types of igneous rocks is common enough to indicate a genetic relation.

Most of the ultramafic units of Alaska south of Koyukuk basin and Circle volcanics seem to be dominantly of plutonic character. These ultramafic rocks give Alaska a very wide distribution of potential hosts for deposits of chromium, nickel, copper, and asbestos. At the opposite end of the igneous spectrum, the acidic granties, host for tin, tungsten, and molybdenum deposits, are widely distributed, with major belts in the southern Alaska Range, Kokrines Hills, Brooks Range, Seward Peninsula, and Kuskokwim Mountains.

CORRIDORS

Figure 7 shows the present transportation corridors in Alaska plus recent State recommendations for additional corridors.

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