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This report is preliminary and has not been edited or reviewed for conformity with Alaska Geological and Geophysical Survey's standards.

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Geologic and Mineral Evaluation of the Ambler River Drainage
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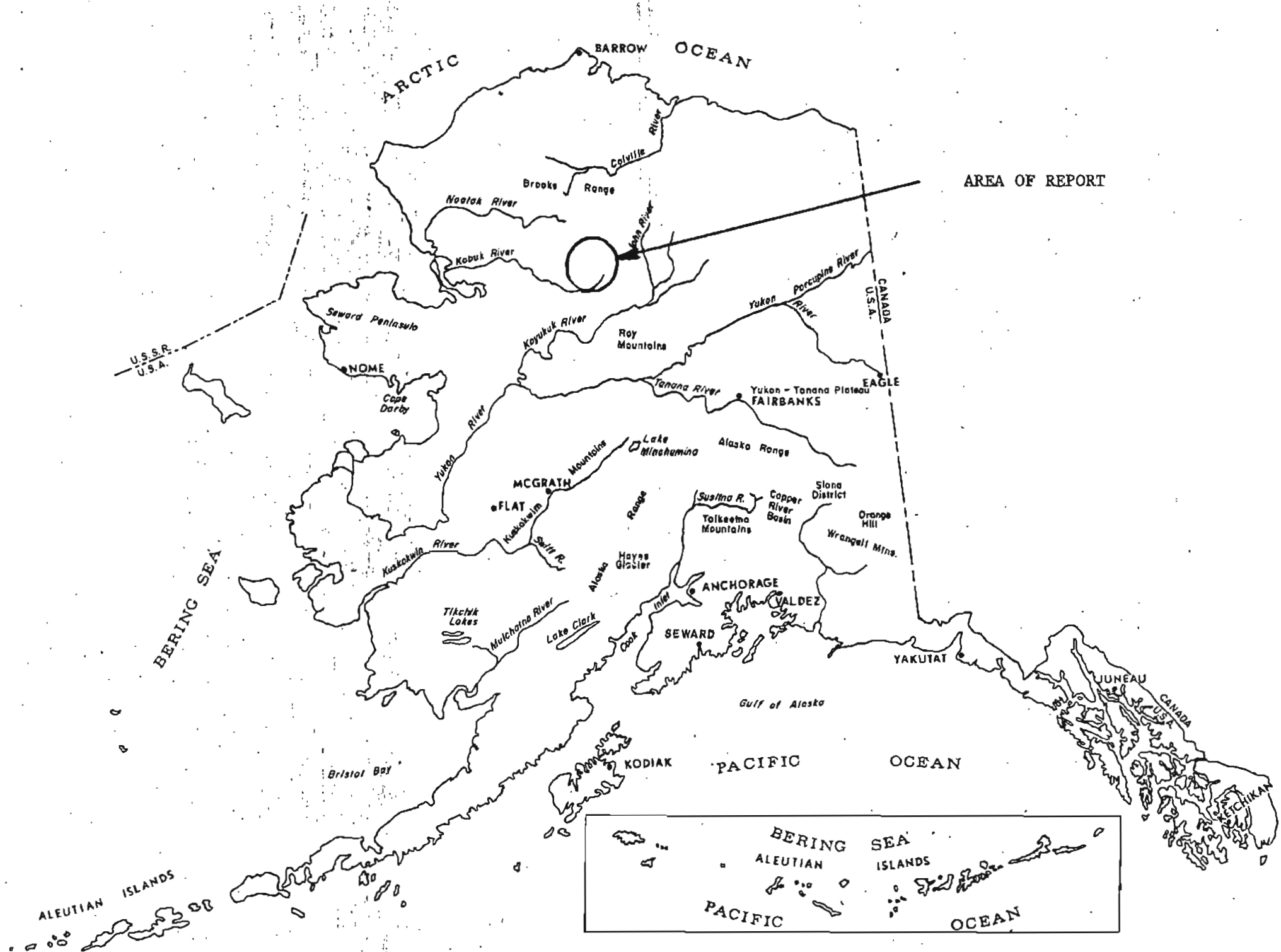
ARCTIC OCEAN
BARROW
AREA OF REPORT
Colville River
Brooks Range
Noatak River
John River
Kobuk River
Seward Peninsula
U.S.S.R.
U.S.A.
NOME
Cape Darby
Koyukuk River
Roy Mountains
Yukon River
Porcupine River
CANADA
U.S.A.
EAGLE
Tanana River
Yukon - Tanana Plateau
FAIRBANKS
Yukon River
Lake Minchumina
Alaska Range
MCGRATH
Mountains
FLAT
Kuskokwim
Range
Susitna R.
Copper River Basin
Talkeetna Mountains
Slana District
Orange Hill
Wrangell Mts.
Kuskokwim River
Swift R.
Alaska
Hayes Glacier
BERING SEA
ANCHORAGE
VALDEZ
Tikchik Lakes
Mulchatna River
Lake Clark
Inlet
Cook
SEWARD
YAKUTAT
JUNEAU
CANADA
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ALEUTIAN ISLANDS
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INTRODUCTION

This report has been written to assist the Wild and Scenic River task force of the U. S. Bureau of Outdoor Recreation in considering the suitability of certain priority Alaskan rivers for inclusion in the national system.

CONCLUSIONS

The Ambler River drains an area with an important potential for the production of minerals. Large reserves of copper, lead, zinc, silver, and cadmium have been found in the southern Brooks Range, in a belt of metamorphic rocks that trends across the Ambler River. There are numerous indications of mineralization elsewhere in the Ambler River drainage, and the mineral resource potential of the area must be regarded as very high.

GENERAL GEOLOGY

The geology of the Ambler River region consists of a series of structural and stratigraphic belts trending approximately NW-SE. Most of the rocks are metamorphosed clastic sedimentary rocks, and the northern part of the region contains thick sequences of carbonate rocks, including marbles, limestones, and dolomites, as well as meta-sedimentary rocks and granite intrusions. The geology of part of the Ambler River region is shown in Appendix I.

The southern part of the Brooks Range, in the vicinity of the Ambler River, includes a belt of metamorphic rocks consisting mostly of quartz-mica schists and schistose quartzites, and also includes greenstones, granites, felsitic schists, glaucophane-bearing rocks, and a few thin beds of carbonate rocks. These rocks are generally highly deformed and the structure is quite complex. This trend is the site of the known reserves of copper, zinc, lead, silver and cadmium in the Ambler River region.

In the central part of the area, a complex series of meta-sediments and carbonates is intruded by a belt of plutonic granites. The granites are highly acidic, and are sheared and deformed locally. Altered zones of contact metamorphic rocks around the granites vary considerably in apparent extent.

North of the plutonic rocks, the geology is characterized by imbricate thrust sheets of carbonate and meta-sedimentary rocks. Thrust fault zones are typically brecciated, and quartz veining and hematitic staining are common in such zones. The thrust sequence is known to exist north of the map area (Appendix I) and the headwaters of the Ambler River are within this geologic province.

MINERALIZATION

The most significant mineralization in the Ambler River region is in the belt of metamorphic rocks at the southern edge of the Brooks Range. Minerals include chalcopyrite, malachite, azurite, sphalerite, and galena with significant amounts of silver and cadmium as trace elements. The ore zones are stratiform in character, and mining geologists seem to agree that the deposits are massive sulphides of volcanic origin. The origin of the ores, however, is open to question, and the extensive intrusions of granitic rocks and the complex structural history may also have had an influence on the mineralization. These zones are in a trend many tens of miles long, and numerous claims have been staked in the area. The value of known copper and silver reserves in this part of the Brooks Range has been estimated at more than $2 billion (C. C. Hawley, 1973). Exploration and staking of claims is continuing, and the ultimate resources of the area are probably much greater than this figure.

Numerous shows of metallic minerals are associated with the granite plutons and the altered zones around the plutons. Minerals include chalcopyrite, malachite, galena, fluorite, and the uranium mineral, meta-torbernite.

The thrust plate sequence in the northern part of the Ambler River drainage has a number of mineral shows apparently associated with the thrust fault zones. Minerals include chalcopyrite, malachite, azurite, and traces of silver, lead, nickel, and zinc. About two miles down from the head of the Ambler River, there is a thick (25 ft.) vein of quartz with some chalcopyrite. Many of the rocks in the vicinity are abundantly stained with malachite and azurite. The assayed values of these rocks are significantly high, and prospecting is warranted in the vicinity. (See sample no. 38, 39, and 40, Appendix II) The nature and extent of this zone is not known, but it appears to be part of a thrust fault zone.

The discovery of large deposits of metallic minerals in this part of the Brooks Range is relatively recent. The general area has a long history of various types of mining and prospecting, particularly in the nearby Cosmos Hills and Jade Mountains. In the mid-1950's, a major copper deposit was found in the Cosmos Hills on Ruby Creek, the present site of Bronite. Bear Creek Mining Co. conducted some underground mining in this location, but the shaft is currently flooded. Discoveries in the adjacent part of the Brooks Range were not made until the late 1960's. These discoveries were apparently the result of modern prospecting, notably geochemical sampling.

The ore zones in the southern Brooks Range are very difficult to see at the surface. Typically, most of the sulphides are leached out of the rocks at the surface, and all that remains is a gossan and some minor staining. Trenching or core drilling is necessary to obtain unweathered

rock and to see the ores. Geochemical sampling of stream sediments and soils is a valuable tool for locating areas of interest for detailed prospecting.

Geochemical sampling in the Ambler River region has been done on a reconnaissance basis by the State Division of Geological Survey as part of a mapping project in 1972 and 1973. The upper part of the Ambler River, however, has only a minimal amount of sampling. A summary of these results is shown in Appendix II. The geochemical values decrease in a very short distance downstream from anomalies, and the sampling density, especially in the upper part of the Ambler River drainage, is insufficient to give a realistic idea of the number of anomalies in the area.

Prospecting in the area north of the known reserves has been minimal, especially prospecting with modern techniques. Mining geologists have apparently concentrated their efforts in the southern part of the Brooks Range because of the obvious transportation advantages, and the fact that the trend of mineralization is quite extensive along the southern mountain front. Nevertheless, the general geologic setting, the mineral shows, and the geochemical anomalies in the more central part of the Brooks Range indicate that it should be considered as part of the same metallogenic province as the zones of very rich ore known to exist to the south. The lack of existing claims and known reserves reflects the fact that the area is unexplored and that modern prospecting is yet to be done, not any lack of mineral resource potential.

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