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Upper Triassic Volcanogenic Zn-Pb-Ag(-Cu-Au)-Barite Mineral Deposits Near Petersburg, Alaska

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Introduction

This report describes a newly-defined belt of Upper Triassic Zn-Pb-Ag(-Cu-Au) massive sulfide and related barite deposits that extends at least from Zarembo Island to the Duncan Canal area of Kupreanof Island, near Petersburg in southeastern Alaska (fig. 1). The belt includes many of the scattered), long-known but poorly defined mineral deposits in the area (Buddington, 1923), and several key deposits discovered by the U.S. Geological Survey in 1979 that provide significant new data about their genesis and age. Our investigations are part of a continuing U.S.G.S. geological mapping and mineral resource appraisal project in the Petersburg and eastern Port Alexander quadrangles.

Our field studies to date have been mainly brief reconnaissances of the deposits: our data thus are limited and our interpretations are based on information composited from several similar deposits, rather than on a lengthy investigation of an individual deposit or district. Despite the reconnaissance nature of our work, poor exposures, and thick vegetation, the fact that we discovered at least two previously unknown mineral deposits strongly suggests to us that additional deposits occur in the area. The rocks in the Kupreanof-Zarembo area are complexly folded and faulted, and the deposits are probably dismembered fragments of what once were more extensive Upper Triassic stratabound volcanogenic massive sulfide and related barite deposits[1/].

The geology of the Kupreanof Island area near Duncan Canal is poorly known, complicated, and largely obscured by water and thick vegetation. The area is underlain by diverse, more or less regionally metamorphosed Paleozoic and Mesozoic marine sedimentary and volcanic rocks that are unconformably overlain by Cenozoic nonmarine sedimentary and volcanic rocks (Buddington and Chapin, 1929). The stratified rocks are complexly folded and faulted and are intruded and locally contact metamorphosed by several generations of stocks, dikes, and sills that range in composition from granite to peridotite.

Zarembo Island also comprises a structurally complex assemblage of Paleozoic(?) and Mesozoic marine metasedimentary and metavolcanic rocks unconformably overlain by Tertiary nonmarine clastic and volcanic rocks. The older bedded rocks are intruded by stocks and smaller bodies of upper(?) Mesozoic quartz diorite, granodiorite, and peridotite; these rocks in turn are intruded by a stock of Cenozoic granite porphyry, and by swarms of Cenozoic basalt, andesite, and rhyolite dikes (Buddington and Chapin, 1929; H. C. Berg, unpublished field data).

1/ We interpret massive or disseminated sulfide deposits that mainly coincide with the stratification of marine volcanic or volcaniclastic hostrocks to be syngenetic stratabound mineral deposits of submarine volcanic origin. All of these deposits have subsequently undergone more or less regional or contact metamorphism that has resulted in variable amounts of remobilization or reconcentration of sulfide and gangue minerals.

only minor sulfides (Burchard, 1914; Buddington and Chapin, 1929, p. 72-73). Analyses of numerous "grab" samples of the deposits (table 1) show a pronounced geochemical association of Au, Ag, Ba, Cu, Pb, and Zn. The deposits commonly occur in muscovite-bearing felsic metatuff (phyllite) or in thinly layered to laminated metarhyolite that commonly are intercalated with distinctive black carbonaceous mudstone, siltstone, and limestone of known or inferred Late Triassic age. The rocks hosting the deposits have undergone regional metamorphism and generally are penetratively deformed to phyllite showing one or more well-defined lineations. Mafic igneous rocks often occur near the deposits: some probably are Tertiary volcanic and intrusive rocks that postdate the mineral deposits, but at least some probably are Upper Triassic marine pillow flows and breccia.

Several auriferous quartz veins occur with or near the stratabound volcanogenic deposits; the veins may be related to these deposits, but there is no evidence for this other than their spatial association. We feel that the veins most likely have formed by selective remobilization and reconcentration from the older syngenetic mineral deposits during subsequent deformation and regional metamorphism.

Descriptions of the deposits

A short description of each of the Upper Triassic volcanogenic deposits that we examined in the belt follows. Their locations are shown on figure 1; sample analyses, lithologies, and outcrop data are summarized in table 1. These descriptions do not include all of the data contained in many of the earlier descriptions of the deposits; instead, they briefly summarize our new data and interpretations based on our work, with appropriate references to the earlier studies.

Kupreanof Island west of Castle Islands.--A potentially significant deposit of massive sulfides, discovered during our reconnaissance in 1979, occurs in the bed of a small creek at about the high tide level at the northwest corner of a large bay off Duncan Canal on Kupreanof Island west-northwest of the Castle Islands (loc. 1, figure 1 and table 1). The massive sulfides occur as lenses and layers up to 10 cm thick and a meter or so long in complexly folded and faulted rusty-weathering, light greenish gray muscovite-rich siliceous phyllite and chertlike felsic metatuff. These phyllitic and chertlike rocks adjoin pyritic black carbonaceous mudstone, siltstone, and limestone that are prominently exposed in a small landslide on the west bank of the creek. The exposed width of the carbonaceous unit is about 35 meters; locally, the limestone contains sparse fossil clams of Late Triassic age (see footnote 2). The rusty-weathering siliceous phyllite, along with the chertlike felsic metatuff, crop out for an undetermined distance upstream, and are common elsewhere on the northwest shore of the bay. The massive sulfide lenses consist almost entirely of pyrite, sphalerite, and galena, in decreasing order of abundance. Analyses of samples (table 1) also show up to 100 ppm Ag and 1,000 ppm As, but only minor Cu and Ba.

Nearby, on the northwest shore of the same bay about 400 meters south of locality 1, Buddington (1923, p. 70) described a 2-meter thick bed of pyrite that we also examined (loc. 7, figure 1 and table 1). The rocks in the

A short adit was driven on the deposit by early prospectors, and it has recently been restaked, probably for its obvious massive sulfide potential. Except for the prominent exposures along the walls of the creek, the extent of the deposit is unknown and the area adjacent to it is almost entirely a tundra- or tree-covered flat.

Woewodski Island.--Gold has been mined from at least three gold-quartz vein systems on Woewodski Island (Wright and Wright, 1908, p. 182-184; Buddington, 1923, p. 67-68). We examined these in 1979 and found that although quartz veins are prominent, they commonly occur in country rocks similar to those that host the massive sulfide deposits elsewhere in the belt, and massive sulfides are associated with one of the vein systems.

The Helen S. group of claims (loc. 4, figure 1 and table 1) was developed before World War I; an ambitious mine plant was built but little production resulted (Wright and Wright, 1908, p. 184). Most of the work was on the auriferous quartz veins that cut carbonaceous black slate and schistose felsic(?) metavolcanic rocks that formerly were considered to be of Devonian age, based on tentative correlations with lithically similar Devonian rocks elsewhere in southeastern Alaska (Buddington and Chapin, 1929). Our own interpretation, also based on lithology, is that these rocks are Late Triassic in age. Our examination identified numerous pits and shafts on auriferous quartz veins. However, rocks containing massive sulfides are abundant in a small dump near a water-filled shaft perhaps 30 meters deep, that occurs about 150 meters inland from the high tide line along a small creek that flows near the old mill foundation. The massive sulfide minerals consist mainly of pyrite accompanied by major sphalerite and minor galena and chalcopyrite. Analyses of the massive sulfide samples (table 1) also show that they contain up to 30 ppm Ag, but little Ba or Cu. The older descriptions of the deposits are ambiguous because they do not distinguish the gold-quartz veins from the massive sulfides, but the latter may be the 40 ft. by 1,000 ft. lode described by Buddington (1923, p. 67).

The Maid of Mexico mine (loc. 6, figure 1 and table 1) is on a gold-quartz vein that has been known since 1908; it is still active but has had little recorded production since before World War II (Buddington, 1923, p. 67-68). Our brief examination confirmed early descriptions of a persistent auriferous quartz vein about 1.3 meter thick. However, the country rocks consist primarily of black carbonaceous limestone and calcareous phyllite and light-gray felsic metatuff--rocks that commonly host the known and inferred Upper Triassic massive sulfide deposits elsewhere in the belt. An unpublished airborne EM survey by private mining interests suggests that the carbonaceous rocks underly a large elliptical area on northern Woewodski Island (figure 1).

Castle Island.--One of the Castle Islands is the site of an intermittently active barite mine (loc. 5, figure 1 and table 1); the barite occurs as a large pod or lens that once formed most of a small island. The barite originally was interpreted as a penecontemporaneous replacement of Devonian limestone (Burchard, 1914; Buddington, 1923, p. 72). However, the island has been totally mined, and operations now are being conducted underwater; thus we could not observe the geologic relations of the deposit.

The Castle Islands include rocks that vary from fossiliferous Devonian limestone on the southernmost island to Tertiary columnar basalt on the northern-

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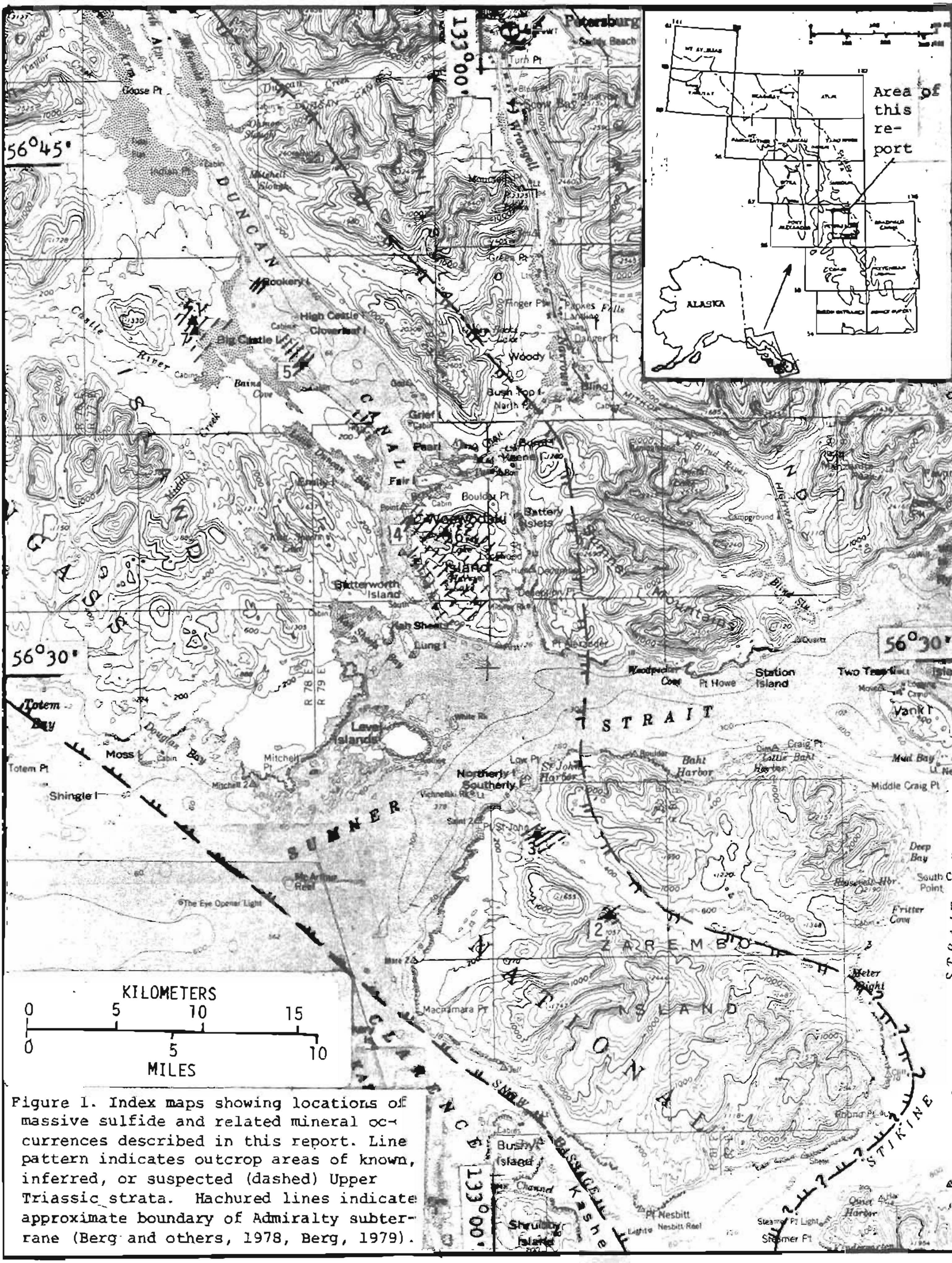

Figure 1. Index maps showing locations of massive sulfide and related mineral occurrences described in this report. Line pattern indicates outcrop areas of known, inferred, or suspected (dashed) Upper Triassic strata. Hachured lines indicate approximate boundary of Admiralty subterrane (Berg and others, 1978, Berg, 1979).