STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

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February 26, 1980

This is a preliminary publication of the Alaska Division of Geological and Geophysical Surveys and as such has not received final editing and review. The author will appreciate candid comments on the accuracy of the data, and welcome suggestions that will improve the report.

Alaska Open-File Report 126

RECONNAISSANCE GEOLOGY OF THE NELCHINA GLACIER DEPOSIT, NORTH-CENTRAL CHUGACH MOUNTAINS

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Reconnaissance geology of the Nelchina Glacier gold-silver-copper-lead deposit, north-central Chugach Mountains, Alaska

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INTRODUCTION

Gold, silver, copper, and lead sulfides were discovered in massive pyrititic outcrops during a 1979 reconnaissance geologic mapping program in the north-central Chugach Mountains. Parts of two days were spent examining the 'Nelchina deposit' by the authors and assistant Laurel Burns. Because the deposit has received only superficial study, the purpose of this report is to release a generalized geologic map, a regional geologic framework, and the analytical results of geochemical sampling from the area around the deposit.

LOCATION AND GEOGRAPHY

The 'Nelchina deposit' is located about 21 miles south of the Glenn Highway and about 1/2 miles south of the terminus of the Nelchina Glacier (fig. 1). The surrounding terrane consists of high rugged mountains, with relief in excess of 7,000 feet. The deposit comprises part of an extensive iron gossan in ice-polished bedrock near the western edge of the Nelchina Glacier within the valley bottom.

GEOLOGIC SETTING

The complex relationships between rock units in the Anchorage C-1 and D-1 Quadrangles can be best understood if they are grouped in distinct lithologic sequences and discussed from north to south toward the Border Ranges fault zone.

The Talkeetna Formation (JTu on fig. 2), which is exposed for about 10 miles south of the mountain front, consists of fine- to coarse-grained ignimbrite and welded, lapilli, and aquagene tuff that have locally undergone low-temperature hydrothermal alteration, producing large pyritic zones. Marine sandstone, mudstone, conglomerate, and calcareous sandstone are interbedded throughout the volcanic rocks, which are predominantly andesite, but contain minor amounts of basic flow rocks.

South of the Talkeetna Formation volcanics is a sequence of layered gabbro (KJg) intruding an older amphibolite gneiss (Pma) (fig. 2). The gabbro has an aerial extent within the map area of about 20 square miles and is reported to extend eastward into the Valdez Quadrangle to Tonsina (G.R. Winkler, USGS, pers. comm.). The unit ranges from basic to ultrabasic, is medium to very coarse grained, and is partly layered with well-developed cumulate textures. The rocks typically include Ca-plagioclase and traceable amounts of pyroxene or hornblende. Petrographic analysis has not been completed, but norite is thought to occur within this complex.

The amphibolite gneiss (Pma) consists of high-grade metasedimentary rocks that were probably originally mudstone, conglomerate, siltstone, argillaceous marble, and metaplutonic rocks. Field relationships suggest that the gneiss

hosts the ultrabasic complex (KJa). The sulfide mineralization discovered near Nelchina Glacier occurs within the amphibolite gneiss.

A sequence of plutonic rocks (Jqd), primarily tonalite, intrudes both the Talkeetna Formation (JTu) and the ultrabasic sequence. The tonalite forms a 2-mile-wide belt of plutonic rocks that trends east-west. Medium- to coarse-grained quartz diorite is the most common Jqd composition, but more basic varieties are common. K-feldspar content is variable and beta-quartz is common; pink K-feldspar veins occur locally. This plutonic sequence is commonly intruded by dike swarms of fine-grained diabase.

A sequence of cataclastic rocks (TKm) forms a tectonic melange exposed as a window within the ultrabasic complex. The unit is composed of cataclastic igneous rocks of intermediate to basic composition, and some felsic rocks. Exotic blocks within the melange include basalt, metasedimentary rocks, and pyroclastic rocks. The matrix material is mostly mylonitic, but serpentine locally forms the matrix. The melange unit is also exposed south of the ultrabasic-amphibolite gneiss complex.

A greenstone melange (TKgm) with minor amounts of black chert crops out south of the cataclastic TKm unit along the southern edge of the Border Ranges fault zone (shown on detailed map). The unit is composed mostly of basic igneous and metaigneous rocks, including greenstone and pyroclastic, and is in tectonic contact with pelitic schist of the Valdez Group (Mv) to the south. The textures throughout this unit are primarily cataclastic.

STRUCTURE

The most dominant structure within the map area is the Border Ranges fault zone (MacKevett and Plafker, 1974), which is represented in the map area by a 2-mile-wide zone of brittle cataclastic rocks composed of ultrabasic plutonic rocks (KJg), a plutonic-volcanic melange (TKm), and a greenstone-chert melange (TKgm). Contacts observed between the major units described above are dominantly tectonic except for the tonalite, which clearly intrudes both JTu and KJg.

MINERALOGY

The known exposures of mineralization occur mainly in gossans associated with breccia zones, and as dissiminated sulfides. Bedrock within the mineralized area consists of gneissic amphibolite(?) facies metasedimentary rocks and hornblende gabbro. Sulfides are preserved only in the least-weathered surface rocks and are usually visible as small disseminated grains in the argillaceous marble and siltstone. Massive sulfides were observed within the breccia zones only after several inches of gossan material were removed. Outcrops in which gold-silver-copper-lead minerals have been found are shown in figure 2. The main mineralization is found within several gossans in a 600-foot-wide zone that trends westward for about 2 miles.

Grab samples were collected from the breccias on a traverse across the mineralized zone and submitted for geochemical analysis (table 1). All the

samples that were analyzed contained from 0.16 to 0.59 percent copper. Lead content ranged from 0.0022 to 2.7 percent. The samples gave gold values ranging from trace amounts to 14 ppm and silver from 2 to 150 ppm.

Table 1. Geochemical analyses from selected grab samples, Nelchina deposit, south-central Alaska[a] (ppm).

Sample	Gold	Silver	Copper	Molybdenum	Nickel	Lead	Zinc
79a	14	20	1,900	< 10	50	8,600	170
79b	1.2	150	3,600	< 10	38	27,000	150
79c	1.6	5	1,600	< 10	31	30	130
79d	1.2	7	4,500	< 10	110	140	100
79e	0.78	3	1,600	< 10	45	35	160
79f	< 0.1	6	1,400	< 10	45	320	140
79g	< 0.1	3	1,500	< 10	58	39	130
79h	< 0.1	3	2,000	< 10	100	52	140
79i	< 0.1	3	2,800	< 10	88	15	150
79j	< 0.1	2	5,900	< 10	24	22	110

[a]Atomic absorption spectrophotometric analyses by Chemical and Geological Laboratories of Alaska, Inc.; Anchorage, AK 99507.

The mineralogy of the deposit seems to be fairly simple. The only sulfide minerals observed were pyrite, chalcopyrite, and galena. The source of the silver and gold values in the samples have not been determined.

Although there are insufficient data to give conclusive details on the way this deposit was formed, initial impressions and field data suggest that the sulfides may have originally been stratabound within the metasedimentary sequence. During intrusion of the ultrabasic rocks, sulfides were remobilized and deposited within breccia zones. Because of the association with the metasediments, it is thought the sulfides are syngenetic.

ACKNOWLEDGMENTS

The authors thank T.K. Bundtzen and W.G. Gilbert for their review of the report and for their helpful comments. We also thank L.C. Schell for the cartography.

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MacKevett, E.M., Jr., and Plafker, George, 1974, The Border Ranges Fault in south-central Alaska: U.S. Geol. Survey Jour. Research, v. 2, no. 3, p. 323-329.

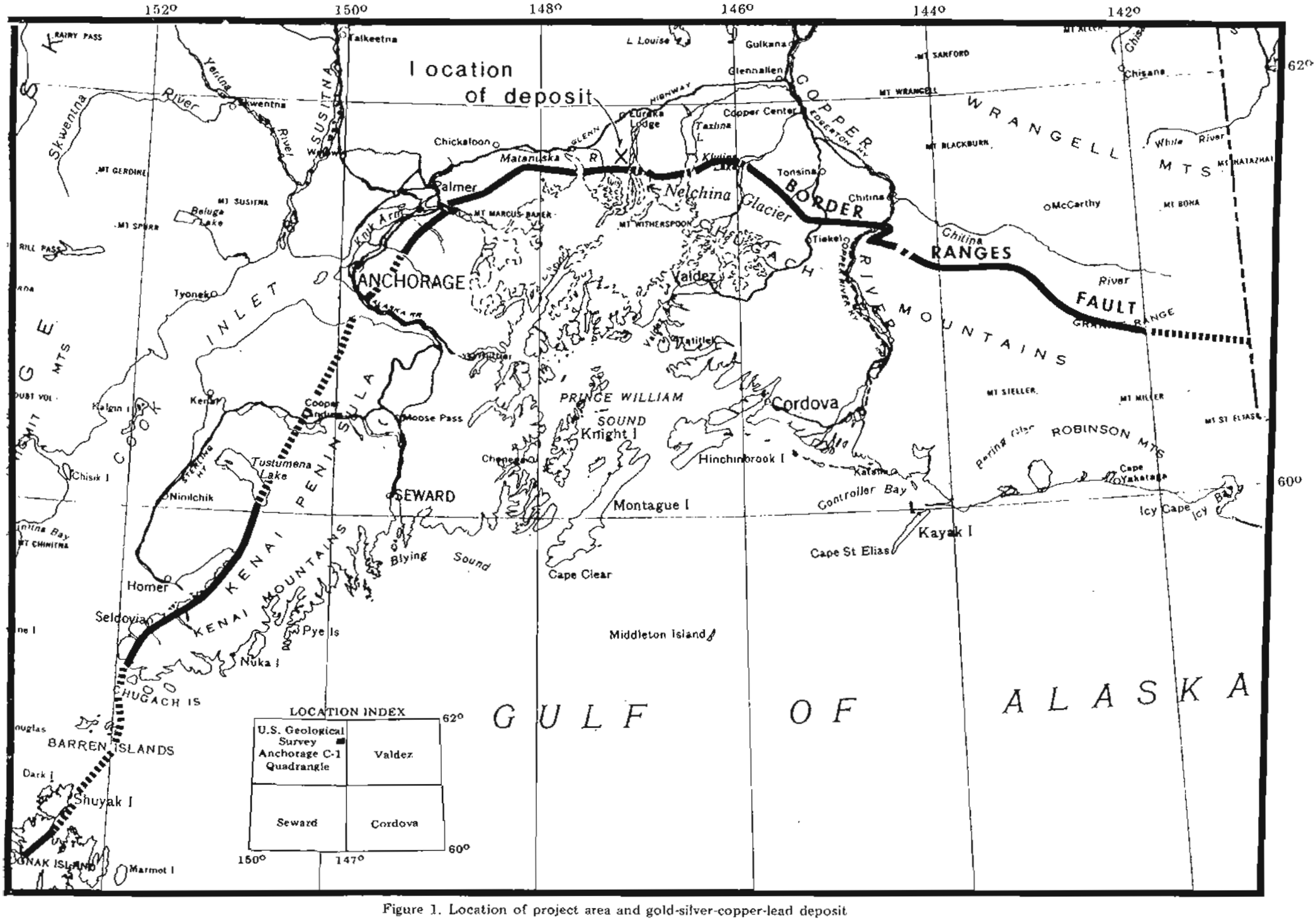

Figure 1. Location of project area and gold-silver-copper-lead deposit

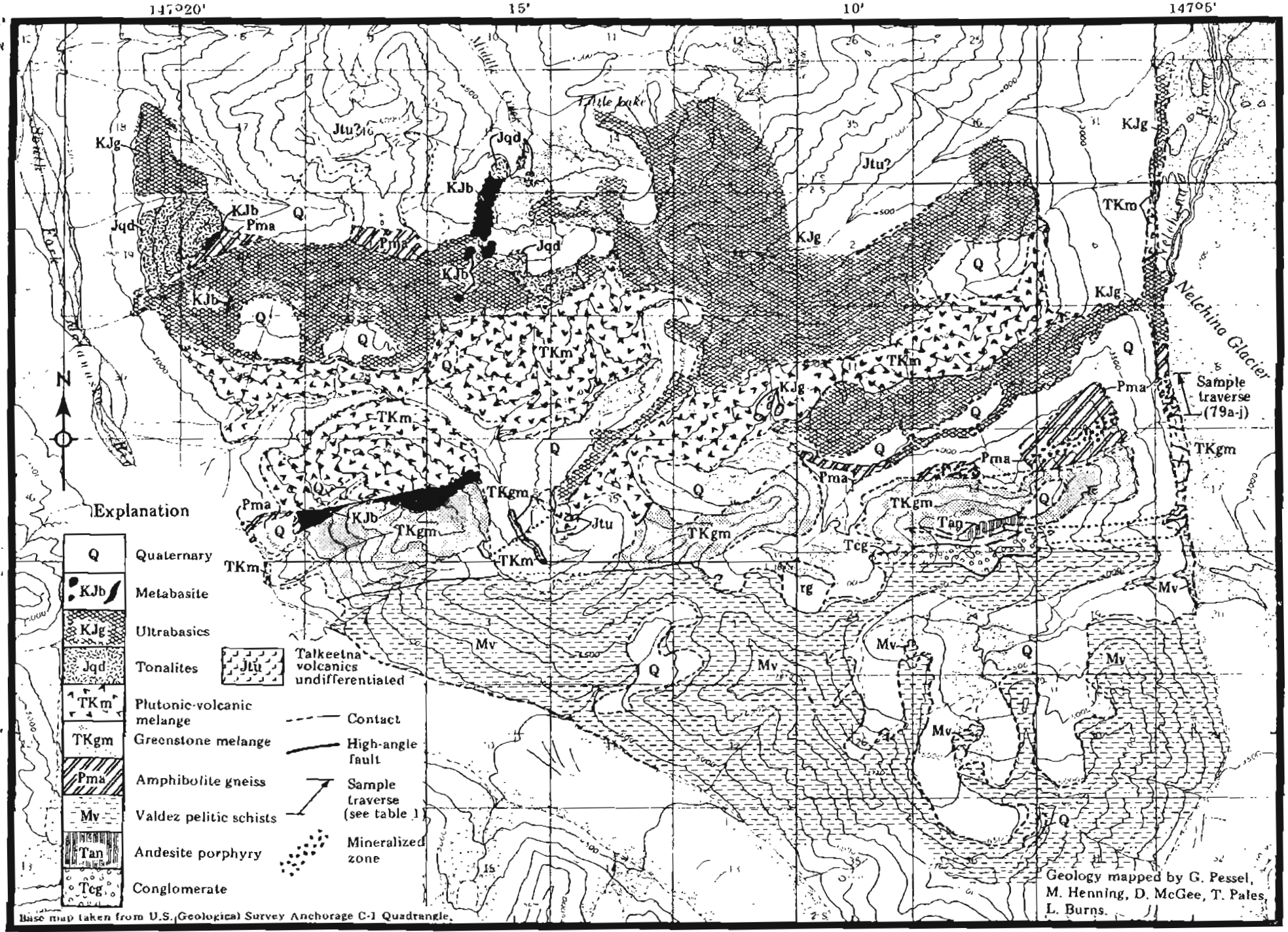

Fig. 2 Generalized geology, Nelchina Glacier area, north-central Chugach Mountains.