NBMG OFR 83-11
See also 83-12 for geochemical results

(91)

Item 37

2160 0037

GOLDFIELD DISTRICT

The Goldfield district is centered on the town of Goldfield in eastern Esmeralda County about 40 km south of Tonopah. Diamondfield, to the northeast of the town of Goldfield, is also included in the district. The workings in the district consist of hundreds of shafts with thousands of meters of underground workings. Although most of the ore was mined within a few kilometers of the town, minor properties are located up to 18 km east of Goldfield.

The Goldfield district has produced more than 4.2 million ounces of gold, 1.5 million ounces of silver, and 7.7 million pounds of copper since its discovery in 1902. Ransome(1909) gives a concise account of the discovery of the district and of mining in the early years. Some later developments are described by Locke (1912) and Searls (1948), but no comprehensive account of later mining developments is available. Following the original discovery, development in the main productive part of the district immediately northeast of the townsite was very rapid, and 539,000 ounces of gold were produced in 1910. After that time, as the mining progressed to deeper levels, production declined. During the 1930's, production included much gold reprocessed from mill tailings (Ashley and Keith, 1976), a procedure that has been reactivated recently in the main mill tailings areas north of Goldfield. Noranda Exploration, Inc. did a considerable amount of exploration in the main part of the district in 1981-82, and there are unconfirmed reports that they did block out some ore-grade material (possibly 0.5 million tons of 0.07 oz./ton gold).

The geology of the Goldfield district is described in Ashley (1974) and Ashley and Keith (1976). Albers and Stewart (1972, p. 67-69)give a summary of the geology and ore deposits of the district, much of the following is adapted from that summary.

The principal rocks in the Goldfield district are Miocene volcanic rocks that overlie a basement of Ordovician shale and chert (Palmetto Formation) and Mesozoic granitic rock. The principal host rocks in which ore shoots occur are the Milltown Andesite and an overlying rhyodacite. These units give isotopic ages of about 22 m.y. They are highly bleached and altered generally in a large eastward elongated elliptical belt that includes the principal productive part of the district. Elsewhere they have undergone only fairly weak propylitic alteration. The bleached rocks are argillized, alunitized, and silicified. Typically the most silicified and alunitized rock forms more or less linear ledges enclosed in soft argillized rock. The individual ledges range from a few feet to hundreds and locally to thousands of feet in length and from a few feet to many tens of feet wide. They occur mainly within and parallel to the margins of an eastward elongate elliptical area which measures about 8 to 11 km. long east-west and 5 to 6.5 km. north-south. It can be demonstrated that the major faulting in the district occurred prior to alteration and mineralization, and it is apparent that the ledges, which dip mostly at angles steeper than 40^{o}, reflect an elliptical fracture system probably the rim fracture zone of a caldera.

The principal mineralized belt is a quartz-alunite ledge system that trends generally about north and dips 30^{o} to 40^{o}E, but which in detail has many irregularities. The dip generally flattens with increasing depth. Individual ore bodies contained in the ledge system were typically rather small, extremely irregular in shape, and often very high in grade. According to Locke (1912), p. 845) the ore bodies were much like plums in a pudding and only 6 percent of the aggregate lode areas revealed in all the levels of the Goldfield Consolidated was occupied by ore. However, in certain areas there was more or less an alinement of ore bodies downdip so that their distribution was not completely haphazard. Nevertheless, prediction of the location and (or) grade of ore bodies was virtually impossible. Very little ore was found as deep as 1,000 feet.

The high-grade sulfide-sulfosalt-native gold ores usually thought of in connection with Goldfield came entirely from the main part of the district. They formed open cavity fillings in fractured and brecciated parts of the unoxidized ore bodies. Many ore bodies had an approximately medial seam of high-grade ore termed a 'stope streak'. Spectacular high-grade ore consisted of breccia fragments coated with several layers containing quartz, pyrite, famatinite, tetrahedrite-tennantite, bismuthinite, goldfieldite, and native gold in various combinations and proportions. Sphalerite or tellurides also occurred in the crusts of some high-grade ores. Native gold was often clearly visible in one or more of the layers. In more typical ore, pyrite was the most abundant sulfur-bearing mineral, and famatinite was second in abundance. The famatinite often enclosed subordinate tetrahedrite-tennantite, sometimes minor bismuthinite, and at most only a very few tiny specks of native gold (Ashley, 1974). The gold/silver ratio was about 3:1. The depth of oxidation throughout the altered area is at least 10 m and oxidation extends to at least 300 m along fractures.

There are two other productive areas in addition to the main area: the Sandstorm area about 1.6 km to the north, and Diamondfield about 5 km to the northeast. The mineralized ledges in the Sandstorm area are in Oligocene rhyolitic rocks that are older than the Milltown Andesite. The mineralization at Diamondfield occurs in the Milltown Andesite; ore bodies in the eastern part of the Diamondfield area are considerably higher in silver than other Goldfield ores (Albers and Stewart, 1972).

Direct dating of hydrothermal minerals (alunite and sericite), dating of pre- and post-mineralization units, and fission-track dating of rocks with thermally annealed apatite yield an age range of 21-20 m.y. for the hydrothermal alteration (Ashley and Silverman, 1976). Ore deposition occurred late in this hydrothermal episode (Ashley, 1979).

The trace element geochemistry of the Goldfield district is described by Ashley and Keith (1976) and Ashley and Albers (1969, 1973a-f). Gold, silver, lead, bismuth and arsenic all show similar distribution patterns in silicified rocks (Ashley and Keith, 1976). Gold, silver, and lead are potentially useful guides to ore for geochemical prospecting (Ashley and Albers, 1975).

Selected References:

Albers, J. P. and Stewart,J.H. (1972), Geology and mineral deposits of Esmeralda County, Nevada: NBMG Bulletin 78.

Ashley, R. P. and Albers, J. P. (1969) Elements associated with gold in the oxidized zone at Goldfield, Nevada, (abs.): Geol. Soc. America Spec. Paper 121, p. 480.

Ashley, R. P. and Albers, J. P. (1973a) Distribution of gold and other ore-related elements near ore bodies in the oxidized zone at Goldfield, Nevada: U. S. Geol. Survey open-file rept., 210 p. 13 pl.; also U.S. Geol. Survey Prof. Paper 843-A, 48 p.

Ashley, R. P. and Albers, J. P. (1973b) Geochemical map showing distribution and abundance of copper in silicified rocks, Goldfield mining district, Esmeralda and Nye Counties, Nevada: U.S. Geol. Survey Misc. Field Studies Map MF-474.

Ashley, R. P. and Albers, J. P. (1973c) Geochemical map showing distribution and abundance of lead in silicified rocks, Goldfield mining district, Esmeralda and Nye Counties, Nevada: U.S . Geol. Survey Misc. Field Studies Map MF-476.

Ashley, R. P. and Albers, J. P. (1973d) Geochemistry of the altered area at Goldfield including anomalous and background values for gold and other metals: U. S. Geol. Survey open-file rept., 117 p., 1 pl.

Ashley, R. P. and Albers, J. P. (1973e) Geochemical map showing distribution and abundance of molybdenum in silicified rocks, Goldfield Mining District, Esmeralda and Nye Counties, Nevada: U. S. Geol. Survey Misc. Field Studies Map MF-478.

Ashley, R. P. and Albers, J. P. (1973f) Geochemical map showing distribution and abundance of silver in silicified rocks, Goldfield mining district, Esmeralda and Nye Counties, Nevada: U.S. Geol. Survey Misc. Field Studies Map MF-479.

Ashley, R. P. (1974) Goldfield mining district, in Guidebook to the geology of four Tertiary volcanic centers in central Nevada: NBMG Repoart 19, p. 49-66.

Ashley, R. P. and Albers, J. P. (1975) Distribution of gold and other ore-related elements near ore bodies in the oxidized zone at Goldfield, Nevada: U.S. GS Professional Paper 843-A, 47 p.

Ashley, R. P. and Keith, W. J. (1976) Distribution of gold and silver metals in silicified rocks of the Goldfield mining district, Nevada: U.S. GS Professional Paper 843-B.

Ashley, R. P., and Silberman, M. L.(1976) Direct dating of mineralization at Goldfield, Nevada, by potassium-argon and fission-track methods: Econ. Geology, v. 71, no. 5, p. 904-925.

Ashley, R. P. (1979) Relation between volcanism and ore deposition at Goldfield, Nevada, in Ridge, J. D. (ed.) Papers on mineral deposits of western North America: NBMG Report 33, p. 77-84.

Locke, Augustus (1912) The ore deposits of Goldfield - I: Engineering and mining journal, v. 94, no. 17, p. 797-802.

Ransome, F. L. (1907) Preliminary account of Goldfield, Bullfrog, and other mining districts of southern Nevada: USGS Bulletin 303.

Ransome, F. L. (1909) The geology and ore deposits of Goldfield, Nevada: USGS Professional Paper 66.

Searls, Fred, Jr. (1948) A contribution to the published information on the geology and ore deposits of Goldfield,Nevada: NBMG Bull 48.

Spurr, J.E. (1904) Notes on the geology of the Goldfields district, Nevada: USGS Bulletin 225.

Spurr, J. E. (1905) The ores of Goldfield, Nevada: USGS Bulletin 260.