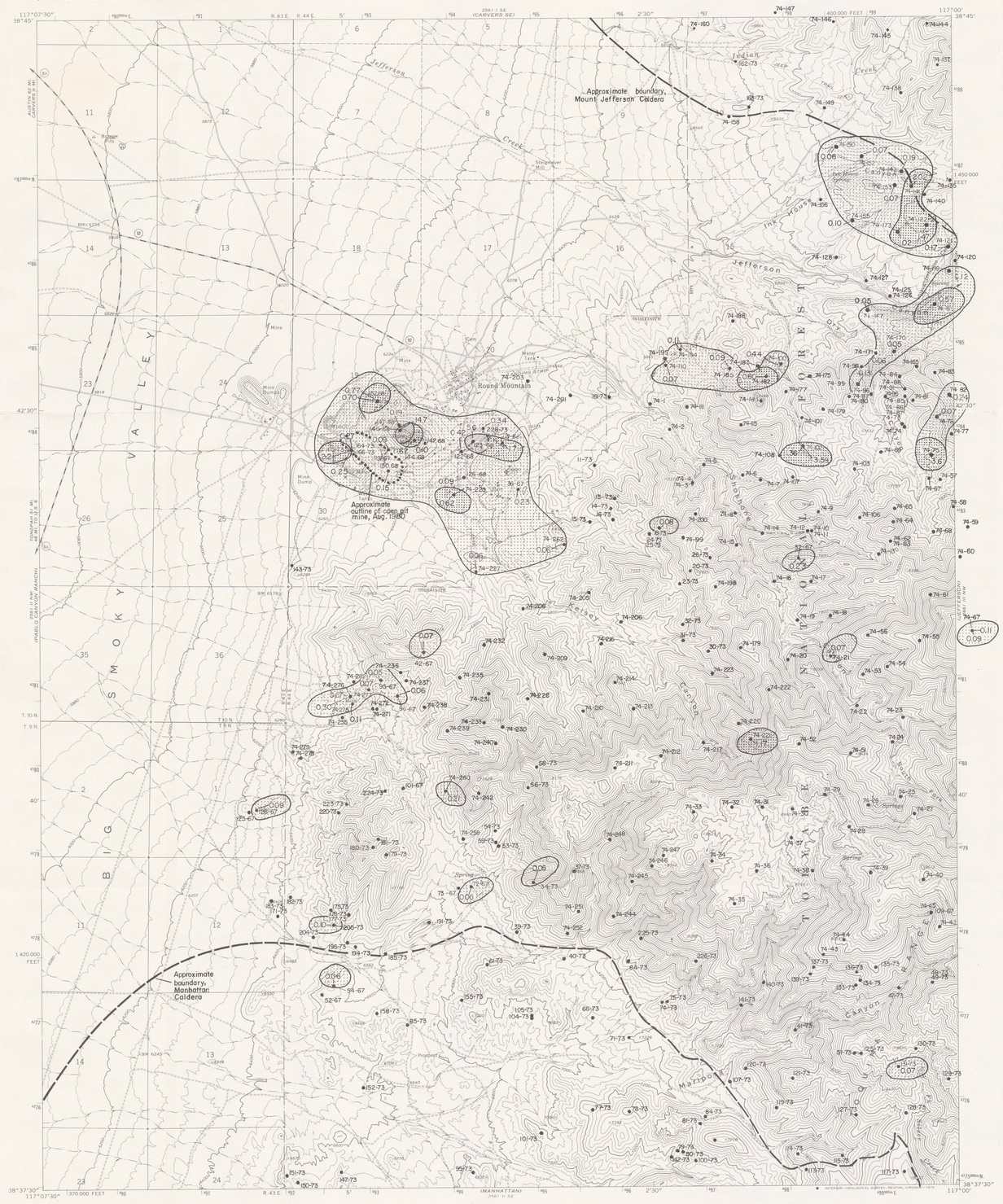
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1467



Base from U.S. Geological Survey, 1971

MAP A.-MAP SHOWING DISTRIBUTION OF GOLD IN THE ROUND MOUNTAIN QUADRANGLE

Base from U.S. Geological Survey, 1971

MAP B.-MAP SHOWING DISTRIBUTION OF GOLD IN THE MANHATTAN QUADRANGLE

Base from U.S. Geological Survey, 1971

MAP C.-MAP SHOWING DISTRIBUTION OF SILVER IN THE MANHATTAN QUADRANGLE

SCALE 1:24 000
1 0 1 2 3 KILOMETRES
1 0 1 MILE

EXPLANATION "A"

74-121 / 1.17 SAMPLE LOCALITY--Showing field number and reported element concentration for gold in parts per million

ISOPLETHS--Separate areas characterized by the reported element concentration in parts per million

- Not detected or <0.05
- 0.05-0.49
- 0.5-4.9
- >5.0

EXPLANATION "B"

78-94 / 0.07 SAMPLE LOCALITY--Showing field number and reported element concentration for gold in parts per million

ISOPLETHS--Separate areas characterized by the reported element concentration in parts per million

- Not detected or <0.05
- 0.05-0.99
- 1.00-9.99
- >10.0

EXPLANATION "C"

77-172 / 50 SAMPLE LOCALITY--Showing field number and reported element concentration for silver in parts per million. L, detected but below the limits of determination

ISOPLETHS--Separate areas characterized by the reported element concentration in parts per million

- Not detected or <0.10
- L-1.0
- 1.5-10
- 15-100
- 150-1,000

DISCUSSION

Geologic mapping and geochemical studies in the Round Mountain and Manhattan 7 1/2-minute quadrangles have revealed several zones that may have potential for the development of new gold and silver ores. Large new reserves of gold recently have been discovered and are now being developed at Round Mountain, and the surrounding area merits careful evaluation for additional gold resources as well as for possibly substantial silver resources.

Gold was discovered at Manhattan in 1905, and through 1959 the district had produced about 1/2 million oz of gold. The district was revitalized in 1979 by Houston International Minerals Co. (HIMCO) which up to August 1981 had been producing from low-grade ores (0.04-0.07 oz/ton gold) at a rate of about 800 tons ore/day (Turner and Outzen, 1981; Martin and others, 1980). Gold-silver ratio of ore mined during early days was about 70:30 (Ferguson, 1924). Host rock for the gold ore is the Cambrian Gold Hill Formation that consists of phyllitic argillite, siltstone, and quartzite. Ore is present where this rock is intensely fractured along generally north-trending fault swarms and extensively mineralized by quartz and iron.

Gold was discovered at Round Mountain in 1906, and through 1959 this district also had produced about 1/2 million oz of gold. The district was revitalized in 1976 by Copper Range Co. which presently is producing from low-grade ores (0.06 oz/ton gold) at a rate of about 7,000 tons ore/day. Initially announced reserves were 11,000,000 tons and annual production is about 55,000 oz gold. (Leone, 1978; Simpson, 1981). Present reserves in the new discovery (1979) by Copper Range Co. of another ore body just southeast of the presently mined ore body, are 193,000,000 tons that contain 8.4 million oz of gold (0.043 oz/ton) and 15.7 million oz of silver (The Wall Street Journal, Jan. 5, 1982). Gold-silver ratio of the presently mined ore is about 65:35 (Simpson, 1981). Host rock for the presently mined gold ore at Round Mountain is dominantly a rhyolite welded ash-flow tuff, the Oligocene-Miocene Diamond King Member of the Esmeralda Formation of Ferguson (1924). Ore is present where the rock is intensely fractured along generally northwest-trending fault swarms and is strongly mineralized by quartz and iron. Host rock for the recently discovered large ore deposit at Round Mountain is porous quartz latitic to rhyolitic tuff underlying rhyolite welded ash-flow tuff of the Diamond King.

Geologic maps of the Round Mountain and Manhattan quadrangles (Shawe, 1981a, 1981b) show the distribution of geologic formations and of fault swarms that were principal controls for gold and silver mineralization in both districts. These geologic maps are useful in understanding this report.

Three maps accompanying this report show gold distribution in the Round Mountain quadrangle (map A), gold distribution in the Manhattan quadrangle (map B), and silver distribution in the Manhattan quadrangle (map C). A previously published map (Shawe, 1977) shows silver distribution in the Round Mountain quadrangle.

Several hundred samples were collected from bedrock throughout each quadrangle and analyzed for gold and silver. Values shown on the gold anomaly maps were determined by fire assay and atomic absorption methods by A. W. Haubert, J. Haffy, L. B. Riley, J. G. Crock, W. D. Goss, G. D. Shipley, and L. Lee (Round Mountain quadrangle) and by J. G. Crock, J. Haffy, A. W. Haubert, and J. Thomas (Manhattan quadrangle). Values shown on the silver anomaly maps were determined by the semiquantitative spectrographic method by H. G. Neiman, M. W. Solt, and J. C. Hamilton (Round Mountain quadrangle) and by M. J. Malcolm, L. Mei, J. C. Hamilton, and M. W. Solt (Manhattan quadrangle). The samples were collected from the most intensely mineralized rock in any given locality, and are from shear or fault zones, fractures, jasperoid bodies, veins, and altered rocks. Iron-oxide staining and quartz veining are the most conspicuous effects of mineralization in the rocks of the two quadrangles, and most of the geochemical samples were collected because of the presence of iron-oxide and (or) quartz. The iron oxide is largely the result of weathering of pyrite in mineralized rocks. None of the samples collected necessarily represents a body of rock large enough to be mined economically.

Zones of highly anomalous values as well as zones of probably anomalous values of gold and silver are outlined on the maps of the two quadrangles (maps A, B, and C; Shawe, 1977). It should be emphasized that the isopleth lines on the maps surround zones in which the collected samples show the indicated values; much rock adjacent to and between sample localities may contain much lower elemental values than do the collected samples.

Most of the geochemical samples collected in the Round Mountain and Manhattan quadrangles contain less than 0.05 ppm gold. On the Round Mountain quadrangle (map A) are shown zones that contain 0.05-0.49, 0.5-4.9, and greater than 5.0 ppm gold. On the Manhattan quadrangle (map B) are shown zones that contain 0.05-0.99, 1.00-9.99, and greater than 10.0 ppm gold. Not surprisingly the largest zone of anomalously high gold values on the Round Mountain quadrangle (map A) includes the area of the presently mined ore body and the newly discovered but not yet developed ore body immediately southeast. All of the samples collected within this zone showed anomalous gold, ranging from 0.06 to 14.7 ppm (about 0.002 to 0.4 oz/ton) gold. Imperfect sampling, however, resulted in a distribution of gold values within the anomalous zone that is not indicative of the locations of the known ore deposits.

Other zones of anomalously high gold values are about 2-4 mi east and east-northeast of Round Mountain, clustered around a small Oligocene granodiorite stock. Perhaps the most important of these zones is centered on a swarm of northwest-striking faults that may be part of the ring-fracture zone of the Oligocene-Miocene Mount Jefferson caldera in the northeast corner of the Manhattan quadrangle mostly in Paleozoic carbonate rocks and jasperized carbonate rocks. Here gold values in veins and jasperoid range from 0.06 to 2.02 ppm (about 0.002 to 0.06 oz/ton) gold. The geologic setting and anomalous gold values of this zone suggest that it should be evaluated further for possible minable gold deposits, particularly disseminated, carbonate-hosted deposits associated with jasperoid. A small disseminated, carbonate-hosted gold deposit occurs at the Shale Pit mine 2 mi south of the Round Mountain gold mine; it is surrounded by a small zone of anomalously high gold values.

Several zones of anomalous gold values occur in the Manhattan quadrangle (map B). The largest zone lies along the south margin of the Manhattan caldera (compare map B and the geologic map of the Manhattan quadrangle; Shawe, 1981b). Much of this zone coincides with the western part of exposed Gold Hill Formation from the vicinity of the White Caps Mine, where thin carbonate units in the Gold Hill were mineralized, westward to the vicinity of Gold Hill, and farther west in the Ordovician(?) Zanzibar Limestone and Ordovician Toquima Formation, where carbonate rocks and limy shale are jasperized. A "dogleg" of the east part of the zone lies mostly in the Round Rock Member. Samples collected within the zone of anomalous gold values range from 0.06 to 31.6 ppm (about 0.002 to 1 oz/ton) gold. As in the Round Mountain district, the distribution of gold values in the anomalous zone at the Manhattan district is not indicative of the locations of the known ore deposits. Fault swarms on Gold Hill, however, define the positions of the known deposits within the zone of anomalous gold values. Some samples from north-trending fault swarms in the vicinity of the Manhattan Consolidated and White Caps mines are exceptionally rich in gold (16.8 to 31.6 ppm, or about 0.5 to 1 oz/ton gold). These areas seem to warrant additional careful study for possible minable gold deposits related to intensely fractured rock.

In addition, exploration of the belt of anomalous gold values that appears related to the south margin of the Manhattan caldera perhaps should be focused on the interpreted ring-fracture zone of the caldera, where deep-penetrating vertical structures may have localized mineralization in a variety of environments, on porous tuffs of the Round Rock Member adjacent to the ring-fracture zone 1-2 mi northeast of the White Caps Mine, and on jasperized Paleozoic carbonate rocks 1-3 mi west of Gold Hill.

Several other zones of anomalous gold values in the Manhattan quadrangle may warrant careful study for the presence of possibly minable gold deposits. South of Manhattan in the vicinity of the Jumbo Mine an anomalous zone centered on a small area of Gold Hill Formation contains gold values that range from 0.30 to 68.8 ppm (about 0.01 to 2 oz/ton). North-trending fault swarms occur both near the Jumbo Mine and near the Summit Mine (old Wall Mine) about 0.4 mi southeast of the Jumbo Mine. Two zones of anomalous gold values north of Manhattan, one west and south of the site of North Manhattan and one on and near Buckeye Hill, and both mostly in Diamond King and younger rocks, yielded samples that ranged from 0.06 to 22.3 ppm (about 0.002 to 0.6 oz/ton) gold. These zones are marked by northwest-trending faults, but the rocks in the zones are not intensely fractured and may not have as high a potential for gold deposits as those to the south. However, intense and widespread gold mineralization may have occurred near the base of the volcanic rocks, perhaps 1,000-2,000 ft beneath the surface, in porous tuffs equivalent to the Round Rock Member or in the upper part of the Paleozoic sedimentary rocks that underlie the Manhattan caldera.

Zones of high silver values in the Round Mountain quadrangle have been described previously (Shawe, 1977). Silver values in the range of 100 to 1,500 ppm (about 3 to 40 oz/ton) were detected mostly in small quartz veins that are not likely to offer much potential. Silver-bearing minerals recognized in the veins are zincian tetrahedrite-tennantite, galena, and lead-bismuth sulfosalts (identified by E. E. Foord of the U.S. Geological Survey). Some of the higher silver values in the quadrangle are associated with the gold deposit at Round Mountain where silver occurs with gold in electrum. The deposit currently produces about 35,000 oz silver per year (Simpson, 1981). High values of silver associated with gold in the vicinity of the fault swarms in the northeast corner of the Round Mountain quadrangle, probably along the ring-fracture zone of the Mount Jefferson caldera, suggest the possibility of minable deposits.

A number of zones of anomalously high silver values were detected in the Manhattan quadrangle (map C). Most of these are associated with gold anomalies along the south margin of the Manhattan caldera in the belt of previously mined gold deposits at Gold Hill and eastward to the White Caps Mine, and near North Manhattan and on Buckeye Hill. Some of this silver resides in minerals such as zincian tetrahedrite-tennantite, galena, and lead-bismuth sulfosalts in quartz veins, although much of it likely is alloyed with gold in electrum. A large zone of anomalous silver in the southwest part of the Manhattan quadrangle, where gold is not widespread, may offer substantial potential for large low-grade silver deposits. Samples from the zone range from 1 to 1,000 ppm (about 0.03 to 30 oz/ton) silver, and include the gold-rich samples collected in the vicinity of the Jumbo Mine. Highest concentrations (15-1,000 ppm or about 0.4-30 oz/ton silver in the vicinity of the Jumbo Mine, and 15-200 ppm or about 0.4-6 oz/ton silver on Timber Hill) are associated with north-trending fault swarms, and are in iron-rich quartz-vein material on both high- and low-angle faults. Both these zones should be examined carefully for silver potential. Silver-bearing minerals in this southwestern area include zincian tetrahedrite-tennantite and possibly other of those identified farther north; Ferguson (1924, p. 138) reported the presence of cerargyrite at the old Wall Mine southeast of the Jumbo Mine. The area of anomalous silver contains two small plugs of hydrothermally altered flow-layered rhyolite, a small plug of shonkinite-syenite, and several small breccia dikes (see Shawe, 1981b) to which the silver mineralization may have been related.

A possible gold potential exists in the tailings piles near the White Caps Mine. Four grab samples (DRS-79-57, -75, -77, and -78) of tailings collected from the piles (localities shown on map B) contained 3.89, 12.0, 4.30, and 6.13 ppm gold respectively, or about 0.1 to 0.3 oz/ton gold. The average gold content of the four samples is about 6.6 ppm or about 0.2 oz/ton gold. The grab samples do not adequately test the gold content of the tailings, although their consistently high values suggest that the tailings may contain economically recoverable gold.

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MAPS SHOWING GOLD AND SILVER POTENTIAL OF THE ROUND MOUNTAIN AND MANHATTAN QUADRANGLES, NYE COUNTY, NEVADA

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