Preliminary report of geochemical sampling

at the Brewer Gold Mine, Chesterfield Co., South Carolina

by Arthur R. Kinkel, Jr.

The Brewer mine, which is one of the largest in the southern Piedmont, is described in U.S.G.S. Prof. Paper 213, Gold deposits of the southern Piedmont, by Pardee and Park, and in earlier publications. A brief study made in 1967-8 in connection with the Heavy Metals program included a reconnaissance of the geology as shown on maps in Prof. Paper 213, review of previous published reports, a few character samples in several of the large pits, and extensive samples along roads south and west of the mine to locate possible extensions of the mineralized area (fig. 1).

Figure 1 near here.

The ore body or bodies are in strongly silicified rhyolite, part of which is tectonic breccia, part pyroclastic breccia, and part tuff. Bedding is well shown in tuff layers outside the area of strongest silicification. Some float of pyritized granite pegmatite (?) was found in the Tanyard pit, but none was located in place. Nitze (1896, p. 765) indicates that this rock occurs in the Brewer pit, but none was found. Much of the ore zone contains disseminated and massive topaz (Fries, 1942; Peyton and Lynch, 1953). Outside of, but adjoining the mined areas, radial clusters of pyrophyllite as much as 2 inches across are common, and smaller grains of pyrophyllite and kyanite occur in the ore. Ore consists of silicified, topazized, pyritized rhyolite in which local areas several inches across consist entirely of fine-grained granular pyrite. Enargite in crystals several millimeters to 1 centimeter long is common in certain areas in the pits but is absent in others. I found gold in flakes several millimeters across both in the granular pyrite and on joints. Surface placers were extremely rich (Lieber, 1857, p. 66). Nitze (1896, p. 763) reports, "Better grade ores [10 to 30 feet thick] will run from $5 to $7 per ton assay value while the average run of the mine is in the vicinity of $3." At $35.00 per ounce gold these values would be $8.75 to $12.25 and $5.25 respectively. This ore was treated in stamp mills and recovery was by amalgamation. It is doubtful if the mine was operated for gold since 1896, and we have no data on production or recovery. During 1950 and 1951 when the mine was being investigated as a source of topaz, the Bureau of Mines put in 10 diamond drill holes (2344 feet) but did not assay the core for gold (Peyton and Lynch, 1953).

The principal problem at this mine is the control of ore deposition. The mine appears to have been developed in a north-northwesterly direction by a series of pits and shallow shafts that were probably located where panning indicated gold. Areas that contain much topaz seem to have the same trend, although this is not certain as the topaz is difficult to recognize. Silicification is pervasive, but it appears to be strongest along a north-northwest trend. The high ridge on which the mine is located also has this trend in part, as do the rivers to the east and west of the ridge. On the other hand, there is no indication whatever in the well-exposed large pits of any type of structure with a north-northwest trend. Further, the well-marked bedding (outside of the highly silicified area, where bedding is obscured) trends north 70° + 80° east, at right angles to the elongation of the ridge and alinement of pits. The north-northwest trends of gossan on plate 30 of Prof. Paper 213 appear to me to be doubtful; they may be equidimensional or trend east-west.

Nitze (1896, p. 765) gives a map of the Brewer pit. On it he shows the general alinement of lenses of high grade ore as running east-west parallel to bedding as exposed outside the pit. I could see no direction of prevailing mineralization in any of the pits, nor is there any indication that the limits of mineralization have been reached in the pits. All of the pit walls were equally mineralized and to about the same degree as the few exposures in the bottom of the pits. Mining has certainly not reached the limits of the deposit in any of the pits, and there may be a considerable amount of low grade mineralized [redacted] horizontally as well as in depth.

It may be that major north-northwest structures, possibly faults, formed channels for mineralization and alteration where they crossed "favorable" beds in the rhyolite in the Brewer mine area. I can see no obvious reason why these beds should be "favorable," however, as similar rocks occur in many nearby areas.

Another possibility is that the Brewer mine may be at a volcanic center. The presence of fairly coarse pyroclastic and coarse tuff, shatter brecciation of diatreme type, very strong silicification in a limited area, and the presence of unusually large amounts of fluorine in topaz suggest that the mine might be in an explosion vent.

Nitze and Lieber both emphasize the surface richness of the deposit and the fact that the soft decomposed rock contained the highest values in gold. Bands of decomposed rock extend to a depth of almost 100 feet--almost to the bottom of the Brewer Pit--and much limonite staining is present to the bottom of the pit. It thus seems probable that mineralized rock below the present pit bottom would be of lower grade than the average mine run ore reported by Nitze as $5.25 (35.00 Au).

The following character samples were taken of hard rock with fresh pyrite in the different pits:

	Field No.	Lab No.	Au	Cu (in ppm 1/)	As
Brewer Pit	SCJM 261	ABV 667	12.0	400	
	K 289	ABP 310	4.5	800	700
Topaz pit	K 356	ABX 023	3.9	20	20
Topaz pit	K 1458	ABX 972	0.56	500	200
Hartman pit	K 358	ABX 025	.64	<10	20
Hartman pit	359	ABX 026	1.9	<10	<10
Hartman pit	361	ABX 028	0.22	<10	<10

A little tin and bismuth is present in a few samples.

Samples along roads shown on figure 1 are lower than normal for this part of the Piedmont. They were taken mainly in the "B" soil zone, but some saprolite was exposed and sampled. Many zones that I interpret as hydrothermally altered rock are present along the roads, but these contained essentially no gold, copper, or arsenic. Saprolite along road No. 110 from samples K 910 to about K 1020 locally was silicified and contained much pyrite. This projects toward the Tanyard placer where no bedrock mining was done and where there is no indication of strong silicification or pyritization. Samples along the road west of the Brewer contained no gold; and the area, although mostly soil, appeared to be sheared and sericitized rather than silicified.

1/ ppm = parts per million (1 ppm = about 0.03 ounce per ton; for gold at $35.00 per ounce, 1 ppm = about $1.00 per ton)

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