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ELKO CO. - GENERAL - OR 379-A

Geology of the Big Springs Gold Deposits
Elko County, Nevada

79-A

ITEM .31

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The Big Springs Gold Mine is located in the northernmost portion of the Independence Mountains, Elko County, Nevada, about 65 miles north of Elko, and 10 miles north of Freeport's mine at Jerritt Canyon. The project is a joint venture between Freeport-McMoRan Gold Company and Bull Run Gold Mines, Ltd. Three separate ore bodies have been defined within the project area: North Sammy Creek, South Sammy Creek, and Mac Ridge. Gold mineralization was first discovered at Mac Ridge in 1976 by Superior Oil Company. Freeport undertook a regional reconnaissance program in the area in 1981 and recognized the potential of the Sammy Creek area. An agreement was reached with Bull Run in 1982, and the North and South Sammy Creek ore bodies were discovered late in the same year.

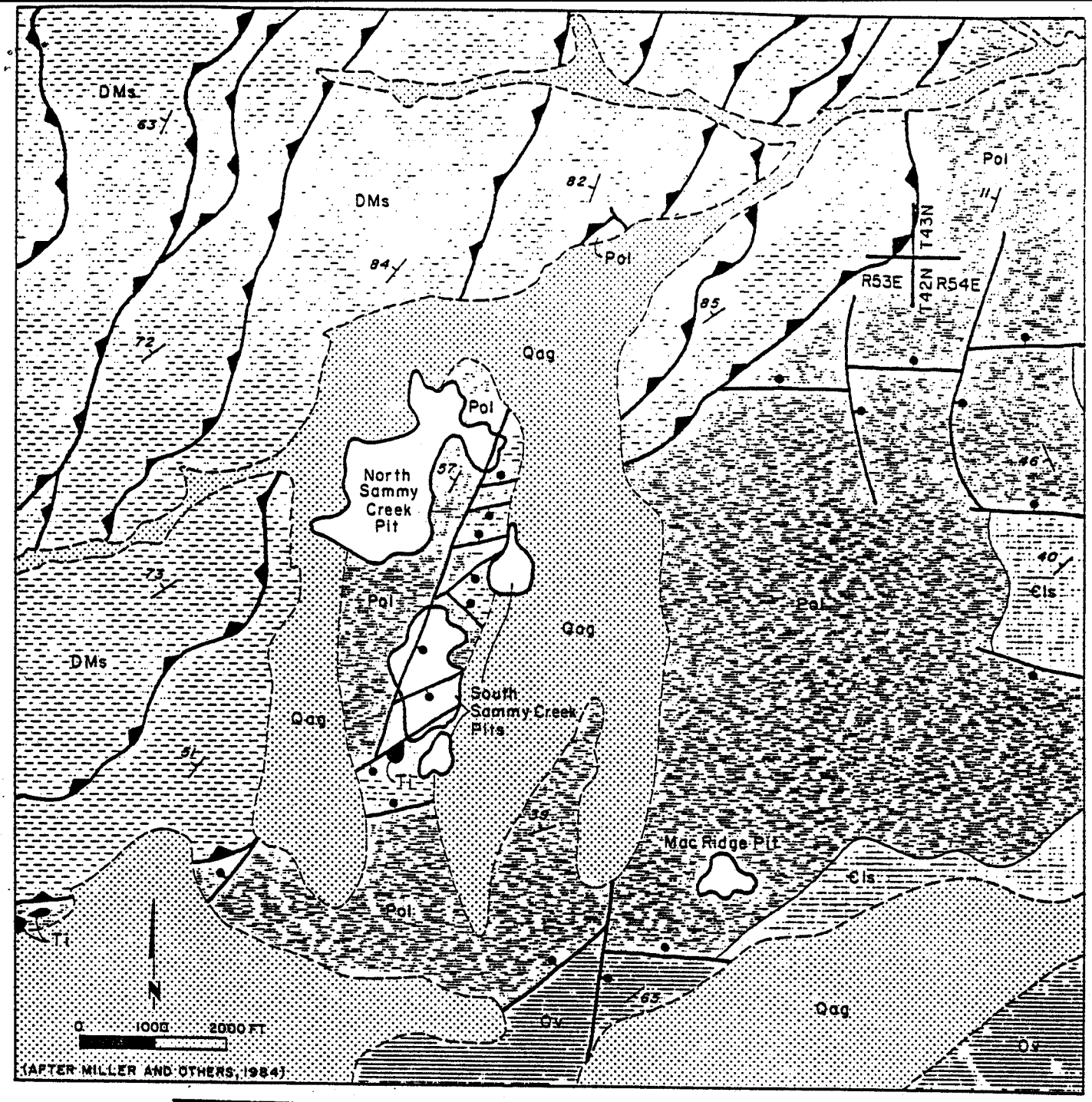
A production decision was made in 1986 and a heap leach facility was constructed in 1987, with the first gold being poured in September. A 1000-tpd mill and fluid-bed roaster became operational in May of 1989. The current (January 1990) minable reserve (mill and leach) is 2.31 million tons, grading 0.135 Oz./Ton gold with a stripping ratio of 13.4:1. Mining is conducted by conventional open pit methods at a rate of about 33,000 tpd.

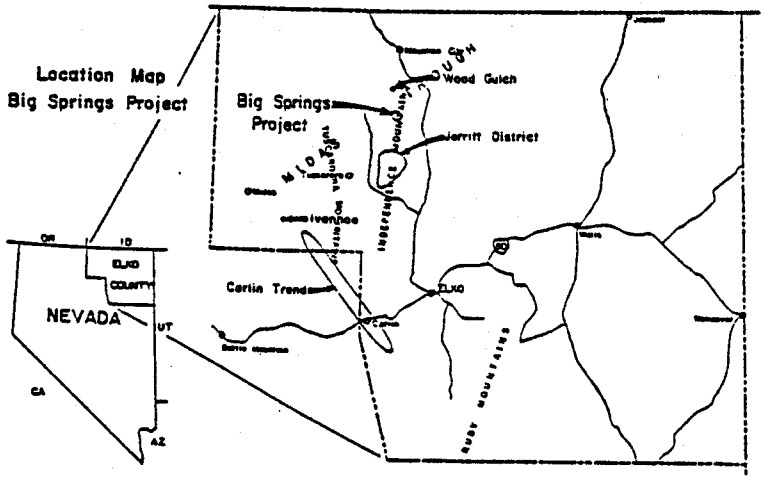
Gold mineralization is hosted mainly in flaser-bedded siltstone of the Permian Overlap sequence (Pol). The Pol was deposited unconformably on rocks of both the upper and lower plates of the Roberts Mountains thrust in a near shore to slope-facies environment. The Mississippian-to-Permian age Schoonover sequence, consisting of chert, siliclastic sediments, and greenstone, was thrust over the Pol in the Sonoma orogeny. Greenstone and carbonaceous siltstone of the Schoonover sequence host minor economic mineralization in the North and South Sammy Creek ore bodies.

The Big Springs ore bodies exhibit strong structural control. Faults of several orientations localize mineralization within receptive host lithologies. These are, in approximate order of importance to the deposits: east-west, north-south, N30°- 50°E thrusts and normal faults (northwest-dipping), and bedding faults. The oldest faults are the northeast thrusts and related faults which developed during the Permo-Triassic Sonoma orogeny. East-west faults and some north-south faults probably developed during the late Mesozoic along with broad north-south axial folds. Some northeast striking normal faults may have developed in the early middle Tertiary, but most are related to the Midas trough of post-middle Tertiary age. Late Cenozoic Basin and Range extension resulted mainly in north-south striking faults and possible reactivation of older faults.

Mineralization within the project area is associated with mid-Tertiary hydrothermal alteration whose distribution is influenced by all older structures and the stratigraphic setting. Pervasive silicification with quartz veining is the most conspicuous type of alteration. It has resulted in the development of jasperoid adjacent to faults,

particularly along a thrust fault in the footwall of the North Sammy Creek ore body. Mineralized rocks are characterized by partial matrix silicification, strong quartz veining, and sericitization. Alteration peripheral to mineralization consists of varying degrees of decarbonatization, calcite veining, dolomitization, silicification and quartz veining, and argillization. Other introduced minerals of local importance include barite, limonite, sulfides (arsenical pyrite, arsenopyrite, and very rare stibnite), clays, and carbon. Gold occurs as grains of less than four microns in size as inclusions in and bordering pyrite, enclosed by goethitic oxidation aggregates after pyrite, as inclusions in introduced quartz, and free in the host rock matrix.





Qag QUATERNARY ALLUVIUM/GLACIAL DEPOSITS

Ti TERTIARY INTRUSIVES

DMs DEVONIAN-MISS. SCHOONOVER SEQUENCE

SCHOONOVER THRUST

Pol PERMIAN OVERLAP SEQUENCE

UNCONFORMITY

Ov ORDOVICIAN VALMY GROUP

ROBERTS MOUNTAINS THRUST

Cls CAMBRIAN LIMESTONE

Figure ___. GENERAL GEOLOGY OF THE BIG SPRINGS PROJECT AREA, ~~ELKO CO., NEVADA~~ Independence Mountains.