MILL CITY MINING DISTRICT

Location and Access. The tungsten deposits of the Mill City mining district are on the east flank of the Eugene Mountains in Secs. 26, 27, 34, and 35, T. 34 N., R. 34 E., in the north central part of Pershing County (see U. S. Geological Survey, Eugene Mountains Area topographic quadrangle map). The deposits are accessible by a 8-mile paved road extending north from Mill City on U. S. Highway 40-95.

History and Production. The tungsten deposits were discovered in 1917. In 1918, the Nevada-Humboldt Tungsten Mines Co. and the Pacific Tungsten Co. each built mills. In 1926, the present owners, the Nevada-Massachusetts Co. acquired the property of both companies. Production has been almost continuous from 1932 through 1957; the district has been one of the largest tungsten producers in the United States, both in terms of total and yearly production.

Mines. There are two tungsten-bearing zones. The western belt includes, from south to north, the Codd, Stank, Yellow Scheelite, Keyes, Hard Luck George, Springer, and Humboldt workings. In recent years, mining operations along this belt have been conducted as one unit through the Stank and Humboldt shafts. There are many thousands of feet of underground workings, as well as extensive open pits.

A second belt 2,000 feet to the east, including the Sutton, North Sutton, Baker, and Uncle Sam workings, parallels the Stank-Humboldt belt. Workings along this eastern belt are less extensive. Kerr (1934) contains geologic maps of the workings.

Previous Work. Kerr (1934 and 1946) described the geology of the deposits in some detail, including maps of the workings and surface.

The Rocks. Triassic hornfels and interbedded limestone, generally striking N. 0°-20° E. and dipping 70° W. east of the Stank thrust fault and 65° E. west of the fault, were intruded by granodiorite and later aplite and pegmatite dikes and quartz veins. Dikes of hornblende andesite cut the sedimentary and other intrusive rocks.

A stock of granodiorite underlies the area, croping out mainly north and east of the tungsten deposits, but also is exposed to a more limited extent elsewhere. Dikes and small masses of granodiorite, and end-stage aplite and pegmatite, extend out from the stock. Mining operations have shown that the shape of the stock is irregular, and that the sedimentary cover is much thicker than the outcrop pattern would suggest. The granite contact commonly dips steeply in the vicinity of the tungsten deposits.

The granodiorite is even-grained, holocrystalline, and composed principally of quartz, andesine, and albite, lesser hornblende and biotite, and some epidote, chlorite, calcite, titanite, magnetite, apatite, zircon, leucoxene, and pyrite.

<u>Structures</u>. The post-depositional Stank thrust fault, which cuts diagonally northwest across the south part of the area, is the most prominent structural feature. A wide zone of brecciation follows the fault.

Other smaller faults cut and offset the rocks. Many of these were formed by the intrusion of the granodiorite before the deposition of the tungsten. Most of the other faults have been formed by regional deformation after the tungsten had been deposited.

<u>Contact Metamorphism</u>. The hornfels apparently was formed by metamorphic action of the granodiorite. The hornfels is olive-green to light gray, hard, and dense, and consists of a fine mosaic of quartz and actinolite or locally biotite, with minor cordierite, apatite, zircon, rutile, and pyrite. Black bands in the hornfels consist of hornblende crystals in quartz.

The limestone beds commonly were altered to tactite consisting of garnet (andradite and grossularite), quartz, calcite, and epidote, varying amounts of scheelite, some idocrase, actinolite, tremolite, and wollastonite, minor pyrite, and traces of chalcopyrite, pyrrhotite, and molybdenite. Late quartz veins fill tension fractures in the tactite and adjoining hornfels.

Ore Bodies. Scheelite occurs in varying amounts in the tactized limestone beds, locally being abundant enough to form ore bodies. The most productive area has been west of the granodiorite stock where several, north-trending, 1- to 8-foot beds of limestone, separated by up to 200 feet of hornfels, form the Stank-Humboldt belt. A second less-productive zone consisting of two, 3- to 5-foot limestone beds 30 to 50 feet apart, occurs east of the Stank-Humboldt belt, and is known as the Sutton belt.

Kerr (1946, p. 187) states that:

> Locally, over a few feet, the ore distribution . . . . . is often extremely erratic. Where stratum is not completely replaced [tactized] the ore may have accumulated along the footwall . . . . . while elsewhere ore may occur along the hanging wall. Even . . . . . in the vicinity of high-grade scheelite deposition, blocks of unreplaced limestone as much as 20 feet across are found.

Mineralogy. The scheelite occurs in the tactite as white, anhedral to subhedral crystals, from less than a millimeter to several centimeters in diameter, disseminated through a matrix of quartz, calcite, epidote, and/or garnet. Some scheelite is present in quartz veins which fill tension fractures in the tactite and extend up to several hundred feet out into the surrounding hornfels. The scheelite in the tactite and veins fluoresces bluish-white.

In the tactite, calcite is present as fine to coarse white marble, finely-crystalline veinlets, and crystals in vugs. Several varieties of garnet occur in the tactite: pale pink garnet is associated with wollastonite but not with scheelite; reddish-brown grossularite is common throughout the tactite; and very dark brown andradite (?) is present in the Stank mine. Quartz is common throughout the tactite and in later crosscutting veinlets. Crystals of epidote are enclosed in quartz and line vugs. Radial aggregates of wollastonite and tremolite occur together, and were formed before the garnet, epidote, and scheelite.

Small cubes of pyrite are disseminated through quartz and the other contact-metamorphic minerals making up the tactite. Traces of pyrrhotite, chalcopyrite, stibnite, and bismuthinite (?) are present.

Molybdenite Minerals. Kerr (1934) states that:

> Molybdenite is found in a small concentration a few feet long and about six inches in width occurring on the 300 level in the Stank mine just north of the shaft. In addition it is widely distributed in small amounts in the lower levels of both the Stank and the Humboldt ore bodies.
>
> Molybdenite fills fractures, cutting the earlier generations of garnet, epidote and scheelite.

On the 300 level in the Stank mine, molybdenite is associated with very dark brown andradite (?) garnet which is not common elsewhere in the district.

Mill City

see USGS. PP. 318 p. 78

good map

Kerr, 1934, fig. 25 shows microphoto of molybdenite in garnet and epidote

Middlebrook, John
Geology of Tungsten, Nevada, emphasizing structural aspects: M.S. thesis, Nevada University, 1957.

from John Schillings Notes (1968)