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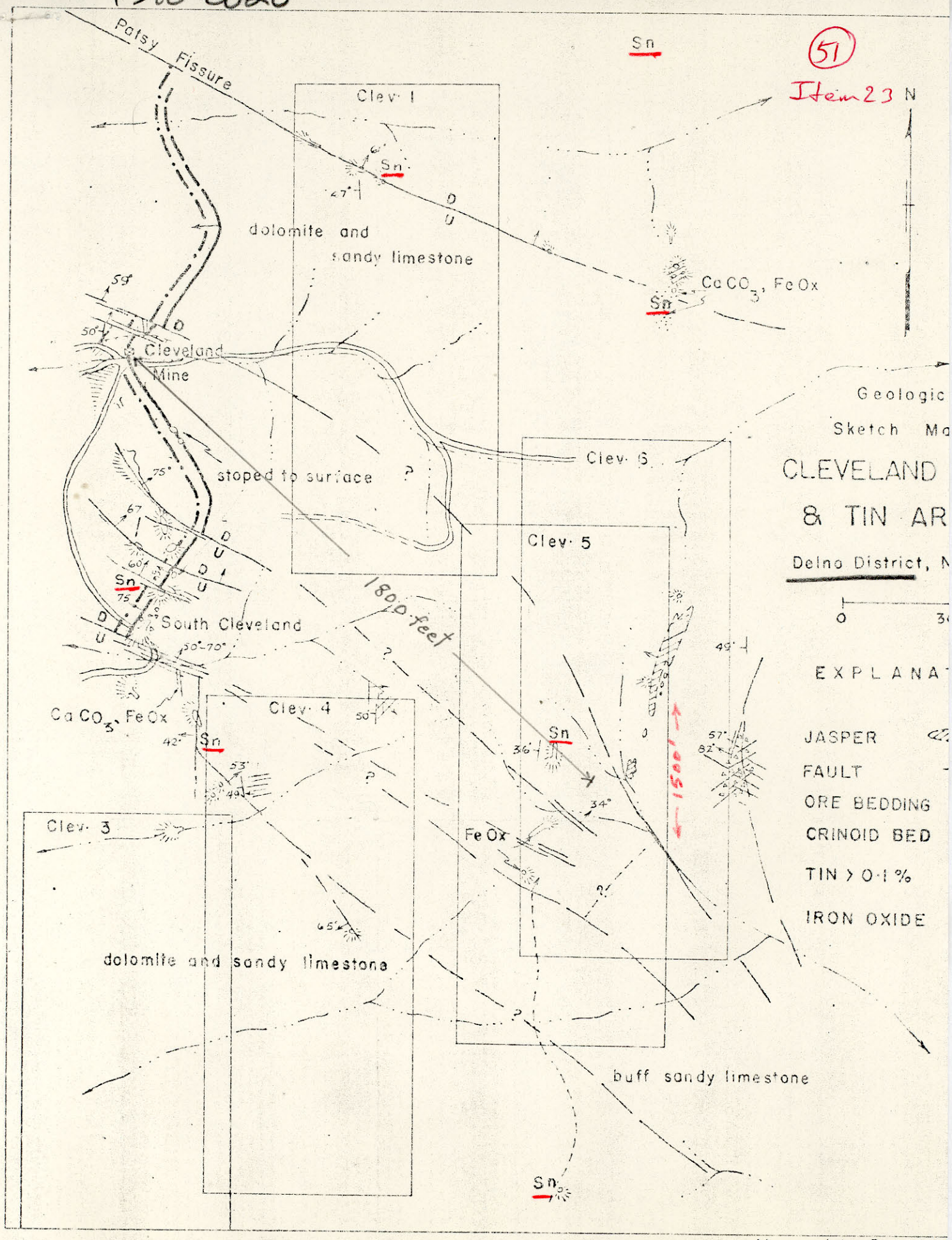
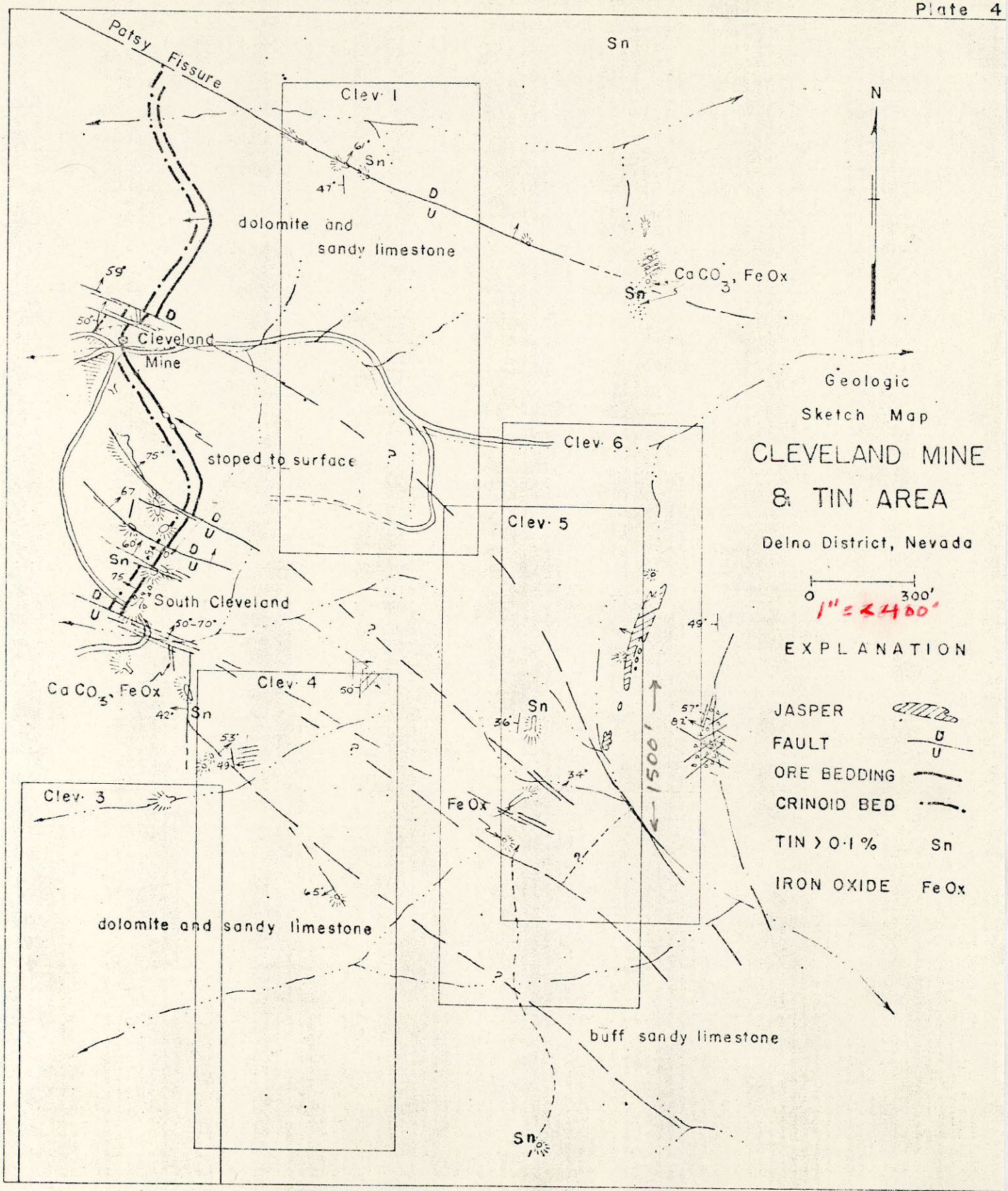
Item 23



Mapped by Donald



Mapped by Donald R. Olsen, 19

There has been considerable post-mineral movement on some of the faults, as evidenced by drag ore in the fault plane. The faults have therefore had a threefold effect on the ore bodies. They controlled the original location of the ore by acting as limiting agents in the lateral movement of mineralizing solutions. They acted as channels for the ascending solutions to follow. They have displaced the ore after its deposition.

Relation to igneous rocks

Comparison of mineralization in the south and north parts of the district suggests two sources of mineralization. In the southern part of the district tungsten has developed in the tactite areas which formed as a result of emplacement of the granite. Copper, zinc, and silver have developed in quartz veins seemingly related in both space and time to the granite. Quartz veins around the granite contain or are enclosed in silicate minerals common to the alteration zone around the granite. This is in contrast with the area north of the Cotton Thomas fault where alteration is mainly siliceous. The gangue minerals in the north part of the district seem to be more closely related to the rhyolite porphyry and its strong silicification than to the granite. The tin occurrence in the north resembles other tin occurrences in Nevada associated with rhyolite rather than granite, such as those at Majuba Hill and near Battle Mountain described by Knopf (1916), Smith and Gianella (1942), and Fries (1942).

Mineralization in the Granite Creek area is very much like that in the Cleveland and Delno area in that the gangue minerals in the mines are represented mainly by varieties of silica found also in the rocks surrounding the porphyry. The resemblance is carried still further by the occurrence of tin in the silicified sedimentary rocks

north of the porphyry. On this basis it appears that the porphyry and not the granite is the source of mineralization in the Delno district. This is in accord with conclusions regarding ore and igneous rock associations reached by Stringham (1958) in his statistical analysis of Basin and Range ore deposits.

Tin

Occurrence. According to the popular local story, tin was accidentally discovered in the district when a prospector making a test for uranium tipped some metallic zinc into an acid solution containing fragments of yellow-stained quartz. Metallic tin was deposited on the yellow material in the rock fragments. The author was unable to verify this by his own experiments on tin concentrates from the district and cannot vouch for its authenticity.

Tin was first found in a highly silicified bedding cropping out as a rounded knob about 1,800 feet southeast of the Cleveland shaft (Plate 4), between 800 and 1,000 feet stratigraphically below the "ore bedding" in the Cleveland mine. The bedding which contains the tin consists of an irregular iron-stained quartz breccia about 2 feet thick enclosed in layers of iron oxide 6 to 18 inches thick. The fractured quartz has been healed with chalcedony and opal, is highly jasperoid in part, and contains the tin-bearing mineral scattered randomly in thin yellow stringers and irregular yellow earthy spots. A channel cut across the 2-foot bedding contained 0.66 percent tin. The upper iron oxide layer contained 0.33 percent tin. Hand-picked samples have contained as much as 2 percent tin. The hanging wall of the bedding consists of yellow-stained, shaly limestone. A cut sample 4 feet long and 2 inches wide in the hanging wall contained

less than 0.01 percent tin, the lower limit of the analytical method used. Across the iron oxide footwall a cut sample 1 foot long contained 0.66 percent tin.

Identification. One of the original problems encountered in the district was identification of the tin mineral. The United States Bureau of Mines at Salt Lake City, Utah reported that the tin occurred as the mineral arandisite, a tin silicate. Studies made at the Kennecott Research Center in Salt Lake City suggested that the tin occurred in a mixture of cassiterite and quartz. In September, 1958 a sample of the tin-bearing rock was submitted to Dr. W. F. Bradley of the Illinois State Geological Survey. Dr. Bradley (1958) suggested that the major constituent tin mineral should be considered cassiterite according to its x-ray diffraction pattern.

X-ray diffraction studies of the mineral do show cassiterite diffraction peaks at 2θ angles of 33.92 and 51.60 degrees using copper k alpha radiation, corresponding to d spacing values of 2.640 Å and 1.769 Å. The strongest cassiterite diffraction peak is at a 2θ of 26.60 degrees, or a d spacing of 3.348 Å. This line is masked in the sample by a strong quartz line. The two peaks shown are very low and broad, indicating perhaps only an incipient cassiterite crystallization in the sample, or perhaps a sample of cassiterite so fine that the x-ray pattern is partially destroyed.

Thus it appears that x-ray data are not sufficient to completely identify the tin-bearing material, and must be supplemented by other means. Palache, et al, (1944) indicate that artificial gels and sols of stannic oxide on aging give the x-ray diffraction pattern of cassiterite. This perhaps gives us some direction in searching for the mineral source of tin in the Delno district.

mineral present is found as a very few small, highly corroded crystals of augite (?).

The groundmass consists of a mass of irregularly oriented crystals of quartz and feldspar from about 0.01 to 0.1 millimeter in diameter. The feldspar crystals, mainly orthoclase, are commonly enclosed in larger masses of quartz crystals. The groundmass has an overall turbid appearance because of clay developed from alteration of the feldspar. The fine iron oxide scattered throughout adds to this murky appearance and imparts a slight pinkish brown cast to the rock in thin section.

Throughout much of the porphyry body there has been considerable opal and chalcedony added to the rock, filling vugs and cracks. In more highly opalized areas near the intrusive contact the original feldspars are entirely replaced by an open network of opal and quartz veinlets. The cleavage planes of the feldspar have been preserved in the opal and quartz. This and the crystal outline are the only indication of the original nature of the phenocrysts.

Near the contact in several localities, especially at the northeastern contact the rock appears to have been mashed. Larger quartz crystals are badly broken and are surrounded by a growth of smaller quartz crystals as a narrow band. The groundmass consists of fine quartz and clay commonly stained with iron oxide. Several quartz phenocrysts present a rough zonal structure, giving the appearence of a second period of growth associated with the alteration of the rock.

Material which closely resembles the tin-bearing mineral found in the Delno district and in the sedimentary rocks about the contact area is found in thin sections of porphyry near the northern contact of the porphyry and sedimentary rocks. No analysis has been made of these rocks to date to demonstrate the validity of the identification.