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GEOLOGY AND MINERALIZATION OF THE LENORA-TYEE MINE

(Preliminary notes only)

INTRODUCTION

The following brief notes have been prepared previous to any thin-section study of rock types or to any polished-section study of the ores. For the writer's conception of the general structure please refer to the accompanying block-diagram.

The Lenora-Tyee deposit consists of 2 westerly striking veins which are referred to respectively as the "North" vein and the "South" vein. These represent narrow shear-zones that have been completely replaced or mineralized mainly by quartz, barite, sphalerite and chalcopyrite. They are not filled fissure-veins.

The rocks consist of cherty tuffs and black, phyllitic slates that have been intruded and largely replaced by feldspar-porphyry and diorite. Both the tuffs and feldspar-porphyry are schistose and in places it is difficult to distinguish between the two rocks in the resulting sericite schist. Usually 1/8- to 1/2-inch layers of chert are found in the schist that has been derived from cherty tuff; such layers are absent in sericite schist derived from feldspar-porphyry. Some of the feldspar-porphyry contains quartz "eyes" and these are often dis-

cernible in the sericite schist.

STRUCTURE

a. General.

The structure is very complex. In order to clarify it, the writer discusses the sediments as they occurred previous to being intruded and largely replaced by the intrusives. These sediments may be considered as once having formed a single band, 300 feet wide, striking northwesterly and dipping approximately 45 degrees southwestward. Although a 300-foot width of sediments, uninterrupted by feldspar-porphyry or diorite has not been found either on the surface or underground, 300 feet is the approximate distance across the strike from the farthest northeast occurrence of sediments to the farthest southwest occurrence.

The sediments, in general, strike 110 degrees (north 70 degrees west) and dip 45 degrees southwestward. As judged by the general trend of the drifts, both "North" and "South" veins strike from north 75 degrees west to north 80 degrees west. The line of intersection of the sediments with both veins plunges approximately 15 degrees westward down the dip of the veins. Local variations in attitude of both the veins and the sediments account for slight local variations in the plunge of this line of intersection.

Neither the feldspar-porphyry nor the diorite occur in uniform bodies such as sills or tabular dykes. Their form is very irregular and it is therefore difficult to project contacts beyond those visible either on the surface or underground.

b. Folding.

Owing to inaccessibility of certain workings the writer was able to study the faulting and folding only in the vicinity of the "North" vein.

The sediments on both walls of the "North" vein have been intensely drag-folded. The folds are small, crest to crest distances ranging from a few inches to 10 feet and crest to trough distances from a few inches to 3 feet. The axial planes are either vertical or may dip steeply southward. The plunge of the crest lines ranges from 0 degrees to 15 degrees northwesterly, depending on the local attitude of the vein.

c. Faulting.

Although faulting with considerable movement has occurred along both veins, details could only be procured along the "North" vein. Because of the many recurring movements along the vein-shear both before and after mineralization, it is possible to measure only the net displacement along the vein-shear. As indicated by the distribution of the sediments both on the surface and

underground, the south side of the "North" vein has moved westerly and upwards, the horizontal component being within the range 400-470 feet and the vertical component being approximately 120 feet.

ORE-BODIES

a. General

Mineralization processes in both veins have resulted in two types of ore-bodies which differ both in mineralogy and occurrence. The one type consists mainly of barite and sphalerite and may be referred to briefly as "barite ore", and the other consists mainly of quartz and chalcopyrite and may be referred to as "quartz ore". These two types of ore-bodies are co-extensive within both veins but the operators (1904-07) were interested mainly in the "quartz ore" because of its copper content, and therefore more or less selectively mined this type.

Because of inaccessibility of most of the "South" vein, the following discussion of the ore-bodies refers chiefly to those of the "North" vein. Parts of the "South" vein that could be examined indicate that the ore-bodies are similar to those of the "North" vein; however, the "barite ore" may be somewhat more abundant in the "North" vein.

b. "Barite ore"

The "barite ore" is a fine-grained mixture

of quartz, barite, and sphalerite. Although the writer has not many estimates of the relative amounts of these minerals, calculations based on Ned Nelson's figures for the average grade of ore (see Nelson's report on the Lenora-Tyee) indicate that the minerals are present in approximately the following amounts: quartz, 30 per cent; barite, 55 per cent; sphalerite, 10 per cent; and chalcopyrite, 5 per cent. In texture the "barite ore" is very massive and breaks with a blocky fracture which simulates that of an igneous rock. Much of the ore has a finely laminated or banded appearance which undoubtedly has resulted from the replacement of banded sediments. Lenses of unreplaced rock occasionally occur within such ore.

The "barite ore" occurs as lenses that lie within the main vein-shear and as lenses that extend from the vein-shear up the dip of preferred beds of cherty tuff. The lenses within the vein-shear tend to occur singly. Lengths of most lenses range from a few feet to (several tens of feet, less than 100 feet) and widths range from a few inches up to two feet, although occasional lenses up to 20 feet wide have been observed. The lenses have the same strike and dip as the vein-shear, and probably owe their existence to replacement of sheared rock within the break, rather than to any filling of a gaping vein-fissure.

"Barite ore" also extends from the vein-shear as replacement lenses that follow up the dip of the sediments. These lenses are usually associated with beds of cherty tuff and chert. Some of them include long irregular areas of barren chert. Lengths of most lenses range from a few feet to (several tens of feet, less than 100 feet), and in width from a few inches to a maximum of 10 feet. Across any one stope-back only one lens of barite is usually present; however across some backs several are present, for example in the Tregear stope three separate lenses occur which aggregate about 18 feet.

The distance that the lenses may extend from the vein-shear up the dip of the sediments depends upon how much drag-folding has locally developed. Where drag-folding is pronounced the lenses lie along the crests of the folds and extend only a few feet from the vein. These lenses are usually thicker on the crests of drag-folds or on the tops of inverted canoe-shaped folds, and thinner on the limbs of these folds. The crests of these folds, and therefore, the barite lenses plunge from 0 degrees to 15 degrees northwestward. However, where drag-folding is only slight or absent, a lens may extend for a considerably greater distance up the dip of the sediments. In the incline from No. 2 Lenora up to the 200-foot Tyee level, the dip length of the barite lens is approximately 80 feet. This is the

maximum dip length observed on any one lens. In the backs of some stopes a lens will commonly extend up the dip of the sediments for a maximum observed distance of 30 feet.

c. "Quartz ore"

Quartz occurs as small veinlets and clusters in the "barite ore", but the largest quantities are found as discontinuous lenses up to 5 feet wide along the vein-shear and constitute quartz ore. The quartz of these lenses is fairly uniformly mineralized with chalcopyrite, and constitutes the gold-copper ore mined in the early days. These quartz lenses are restricted to the vein-shear, and they do not extend up the dip of the sediments as do many of the barite lenses. The quartz of these lenses, plus contained chalcopyrite, represents a phase of mineralization that is distinctly later than that of barite.

TONNAGES

Although many of the drifts and stopes are inaccessible, the writer has made an estimate of the approximate tonnage of ore in the "North" vein that might be considered available for immediate mining without further development. Some ore still remains in the "South" vein, but unless the vein is made more accessible for examination it is impossible to say how much.

For purposes of calculation, the writer divided the "North" vein, as exposed in the No. 2 Lenora

drift and stopes therefrom, into eight blocks. For each block an approximate average width of ore was determined from measurements made on the ore lens or lenses in the backs of the drift and stopes. A figure of 60 feet was arbitrarily chosen for the vertical dimension of all the blocks. This is a conservative figure and although some lenses do not have that vertical dimension, others exceed it. Many of the barite lenses contain considerable chert that of course would not be sampled, but which must be considered in using an average assay-width for any unsampled length of a lens. Accordingly an estimate of the percentage of "ore" as opposed to percentage of chert in any block was made, "ore" being considered to be material of a grade as given by the average assay. The term is not used in the restricted sense of vein-matter that is only of a profitable mining grade.

In lieu of his own sampling or of analyses of collected specimens, the writer has used Ned Nelson's figures for average grade of ore, viz: copper, 1.7 per cent; zinc, 6.7 per cent; (baryta or BaO, 37. per cent barite, 3.7 per cent.) The 37.' calculations gave a gross tonnage of 31,540 tons of the above grade of ore.

The details of these calculations are given in the appended sheets.

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British Columbia Dept. of Mines