for Prospectors and Developers Association Convention, Mar 5/56 (6)

THE GRANDUC AREA*

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Introduction

The Granduc copper deposit is 25 miles northwest of the Canadian port of Stewart at the head of Portland Canal, and 4 miles east of the border of southeastern Alaska. The subject to be discussed is the area in which this deposit is located.

Access is the main problem to be overcome in the successful development of the Granduc. After establishing the probability that the deposit contains a large tonnage of milling ore, Granduc Mines, Limited carefully considered possible railway routes through Alaskan territory to the Pacific Ocean. In addition to customs regulations, the physical difficulties involved in building and maintaining a railway at least 45 miles in length through mountainous terrain would be quite formidable. As a result, the company abandoned the idea of a railway, deciding in favour of a long tunnel that would provide ready access to Stewart.

Because geologic information was lacking for much of the area surrounding the Granduc, the British Columbia Department of mines was requested by the company to make a survey that would aid in determining the best possible tunnel route.

* Published by permission of the Chief, Mineralogical Branch, British Columbia Department of Mines.

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As a result, the writer, with two assistants, spent two months of the 1955 field season mapping the 148-square-mile Granduc area.

The following account is based on notes prepared for an illustrated lecture.

History

In 1931 two American prospectors, Wendell Dawson and the late W. Fromholz, ascended the Leduc River, crossed the border into Canadian territory, and located three claims at the head of the valley. From the brief account that appeared in the Annual Report of the Minister of Mines of British Columbia for that year, it seems clear that the Mineral Lode claim covered certain of the copper showings on the property now owned by Granduc Mines, Limited.

The showings were rediscovered by another prospector, E. Kvale, in 1948 and subsequently located by Kvale and T. McQuillan in 1951 for Helicopter Exploration Co. Ltd. Additional claims were located in 1952, and in August and September of that year the showings were examined by engineers of The Granby Mining Smelting and Power Company Limited. Later, Granby assumed direction of the property through a newly formed company, Granduc Mines, Limited. In December, 1953, Newmont Mining Corporation joined Granby as an equal partner in financing the development of the Granduc.

In 1953 Granduc Mines, Limited made an impressive start on exploration of the ore occurrences, and by the fall of 1954 it was clear that, after an interval of fifty years, a fourth* important copper-bearing sulphide deposit had been discovered in the Coast Range.

Physical Features

The Granduc area is more or less typical of the rugged northern Coast Range. An already imposing terrain is rendered more so by the presence of numerous valley glaciers extending in all directions from a central area of ice accumulation. One hundred and fourteen square miles, or 77 per cent, of the Granduc area is covered by ice and minor snowfields. The retreating valley glaciers contribute substantially to the flow of the Nass, Chickamin, Leduc and Unuk Rivers.

During the winter months deep snow covers the rough surface of the glaciers and this has facilitated the transportation of men and equipment by plane and tractor. The snow disappears from the valley glaciers during August and September, but not from the central icefield.

The only vegetation in the area is in the Leduc River valley. It consists of buckbrush, tag alder, alpine fir, heather, and various alpine flowers.

Geology

The Granduc area straddles the eastern contact of the Coast Range batholith which here is composed of various rock types ranging in composition from quartz diorite to granite.

* The others: Britannia, 1888; Ecstall River, 1900; Hidden Creek (Anyox), 1901.

These rocks intrude volcanic and sediments belonging to the Hazelton Group of Jurassic (and Triassic ?) age.

The volcanics are mainly dark green to greyish green rocks of intermediate to basic composition. They consist of breccias, which in places appear to grade into pillow lava, greenstone, porphyritic and non-porphyritic lavas, tuff and agglomerate.

The sediments are a heterogeneous assemblage of materials that have been derived, in the main, from a volcanic terrain. In certain places these rocks are so wholly volcanic in appearance that, were it not for the presence of bedding and the intercalation of argillite, they might be taken for such. Greywacke, tuff, impure quartzite and their sheared equivalents are most common in the vicinity of the Granduc; whereas, on the eastern slope of the central icefield, black argillite predominates. Limestone is not common except in the hangingwall of the Granduc ore zone where it occurs in narrow persistent bands separated by bands of argillaceous and quartzitic material.

In general the sediments and volcanics dip steeply. Close folding on a minor scale is fairly common in the sediments.

Some faulting was recognized in the area, on the west shore of Summit Lake, and in the hangingwall of the Granduc ore zone. The latter is essentially a bedded fault and, as such, presents the usual difficulties with respect to determining movement. The presence of what are almost certainly segments of the same granitic dyke on either side of this fault, however, establishes it as a right-hand fault of some magnitude. If this fault is projected along strike to the south, across the south fork of Leduc glacier, its assumed prolongation in this direction coincides with a pronounced valley occupied by a hanging glacier.

South of the Granduc fault, another right-hand fault has been assumed to account for the sharp offset in the eastern margin of the granitic rocks.

Although the writer has examined the Granduc in considerable detail, anything but the briefest reference to the deposit itself is beyond the purpose of these notes. The mineralization consists of chalcopyrite, pyrrhotite, pyrite, some magnetite, and a minor amount of sphalerite. Galena and arsenopyrite are very rare. The main zone is in siliceous sediments and is made up of several bands of mineralized material of sufficient grade to constitute a large body of milling ore that has by no means been completely outlined, particularly in depth and to the south, beneath the glacier. The company has recently reported that, at the end of 1955, 25,600,000 tons of ore averaging 1.62 per cent copper had been outlined.

Proposed Tunnel Routes

Figure 3 shows the tunnel routes that the company has considered as a means of access to its deposit. It need hardly be added that, whichever the route, the driving of such a tunnel constitutes an undertaking unique in the mining world.

Route No. 3 has been fairly definitely selected as the probable route for a variety of reasons. The writer intends only to point out that this choice is wise from a geological and engineering standpoint. The distribution of granitic rocks in the southeastern part of the area, immediately west of Salmon glacier, strongly suggests that here the margin of the batholith dips northward. Whether or not this condition persists in depth, there can be no doubt that, from the surface geology, the Route No. 3 tunnel would have the best chance of remaining in granitic rocks for the greatest distance. It is true that, in selecting this route, the company is discounting the remote possibility of encountering at depth another deposit in the geologically favourable rocks of the Hazelton Group. The decision is nevertheless sound, based on the reasonable assumption that the granitic rock will prove to be a superior tunnel rock. Here a logical comparison can be made with the 10-mile Kemano tunnel* for the geological settings are similar. Approximately half this tunnel is in Coast Range 'granite' and half in older rocks. In the part of the tunnel driven in 'granite' only a minor amount of support was necessary, but, in the part that penetrates the older rocks, steel support during excavation was necessary for nearly 50 per cent of its length and gunite was required for most of the remainder.

It will be noted that the second section of Route No. 3 passes beneath two considerable expanses of ice. Although

* Mapped by R. A. Stuart while employed by the B.C. Dept. of Mines. (Stuart, R. A. (1955): Geological Setting of the Alcan Tunnel, Kemano, B.C.; Proceedings of The Geological Society of Canada, Vol. 7, Pt. 1, pp. 103-112.)

it is probable that, in places, this ice is at least 1,000 feet in thickness, the proposed tunnel would be several thousand feet below the surface in the critical sections. The thickness of the ice in these sections is presently being determined by drilling, using a "hot point".

March 1, 1956,
Victoria, B.C.