THE NEWMAN PROJECT

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The Newman mine is located on Newman Peninsula on Babine Lake, north of Houston and east of Smithers in Central British Columbia. The Granisle Copper mine is on an island off the south tip of the Newman Peninsula and 5 miles to the south of Newman. Access to both is by a 38-mile road from Topley to Topley Landing where Granisle has established a townsite. A road to Newman is being extended along the west side of Babine to connect with a two-mile ferry crossing to the mine site. This crossing will be kept operating in the winter by a bubbler system similar to that used by Granisle. The location of a hydro line from Topley Landing hasn't been finalized but a two-mile crossing of the lake by submarine cable is a possibility. The townsite will be north of Topley Landing.

Topley on the C.N.R. is 220 miles from the shipping point of Kitimat and slightly more to Prince Rupert. As our concentrate has not been committed on any foreign smelting contract, it will initially move by ship or rail to eastern Canada for smelting and refining in Noranda plants within the country. This

An address to a joint-meeting of the Vancouver Branch, C. I. M., and the M. E. G., Vancouver, October 8, 1970.

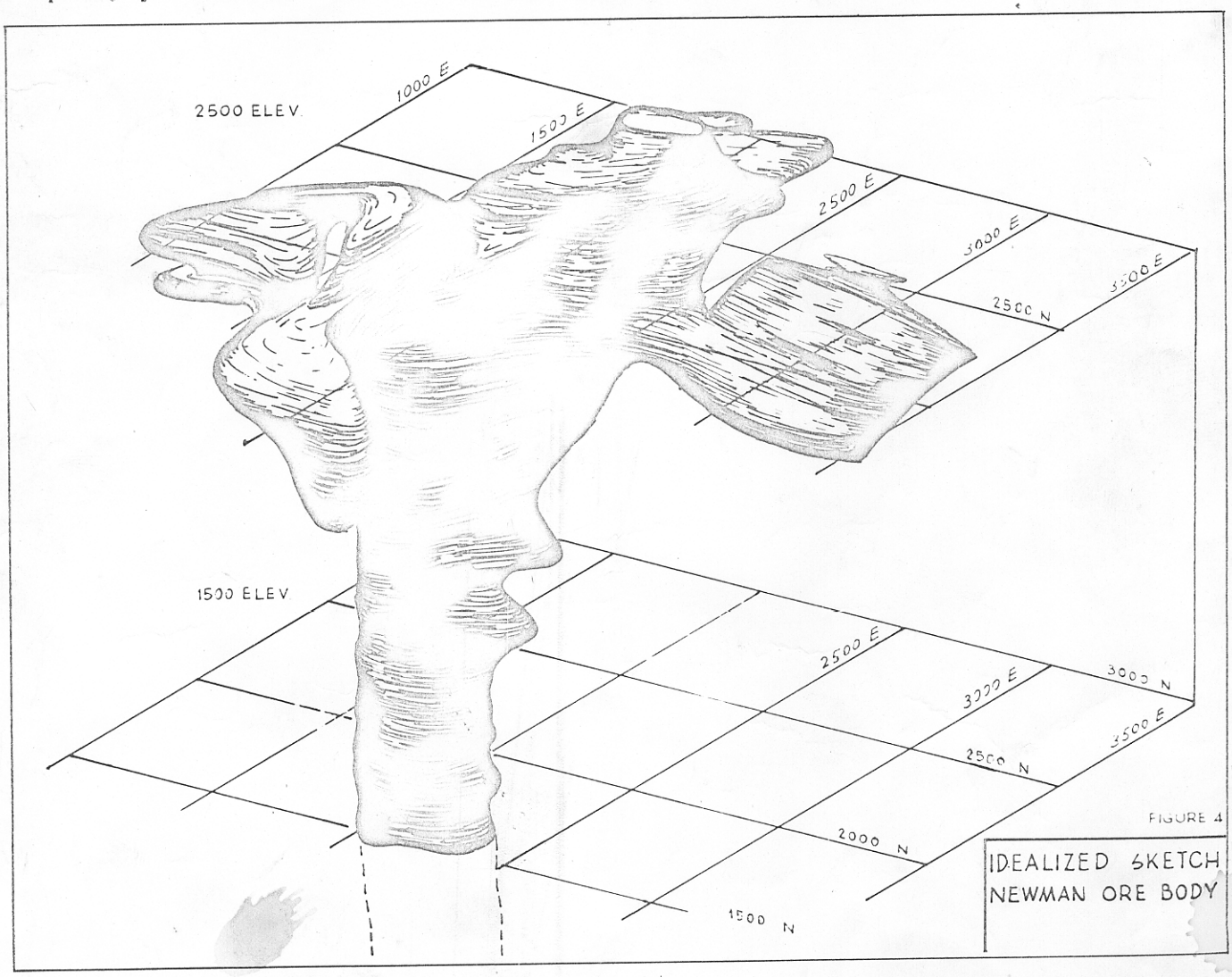


FIGURE 4
IDEALIZED SKETCH
NEWMAN ORE BODY

File: Bell Copper

means the production would remain available should treatment plants be established in British Columbia. Two hundred tons of concentrate per day will have to be shipped.

THE DEPOSIT

The ore is a typical porphyry copper deposit of Tertiary Age. Fundamentally, we must distinguish two classes of deposits that are commonly called porphyry copper. One group, represented by the Highland Valley ores and by Brenda in British Columbia and the Butte deposit in the United States, occurs in large granitic batholiths. Age determinations place the formation of these British Columbia ores generally around 170 million years.

In contrast, the second type of porphry copper is ore associated with small stocks of porphyry with copper minerals disseminated in the intrusive or in the adjacent rocks. Characteristically, a halo of pyrite surrounds the intrusive. Granisle and Newman belong to this type as do deposits at Cat Face Mountain on Vancouver Island and the Utah Construction deposits near Coal Harbour. In Chile, Peru, and the southwest States, deposits of this type account for the greater part of the copper production of the hemisphere. Interestingly enough, age determinations place all this group, from Arizona to British Columbia, in the Tertiary period with an age of 40 to 80 million years. While most of the big producers in the south had similar geological characteristics to these unweathered B.C. porphyries, they were off to an early production start by virtue of deep weathering having created a zone of enriched copper. Changing economics involving cheap open-pit costs and better copper prices, have now enhanced the potential of the unweathered ores.

British Columbia and Yukon jointly have a geological potential for Tertiary porphyry ores generally equal to that of the United States. Predictably then this Canadian area should account for a good part of the world expansion of copper production in the 1970's.

As these deposits are typically low grade, the margin of profit per ton of ore is low, making them only viable at a large-tonnage production and making them at the same time very susceptible to changing copper prices, taxation, and operating costs. The Newman itself is a relatively small deposit.

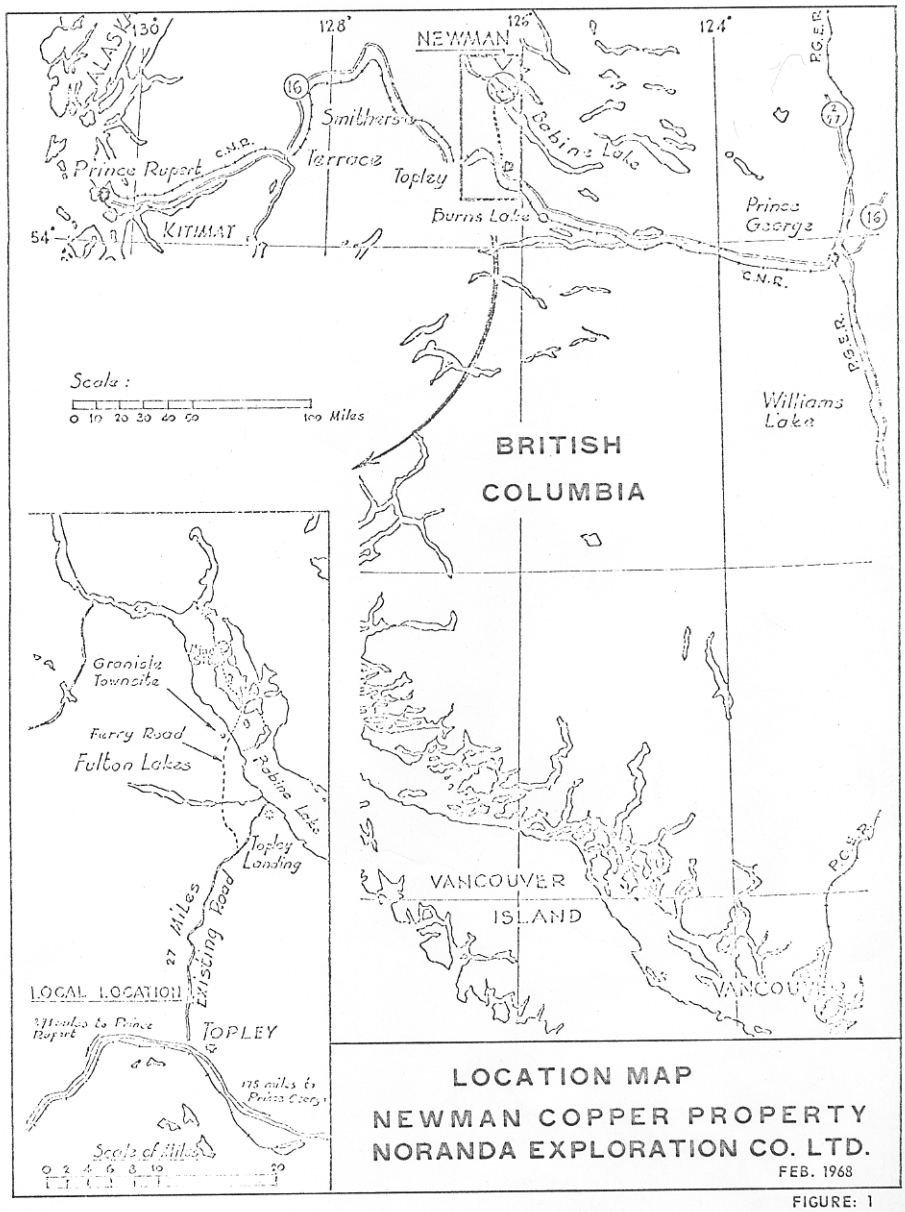
In the Babine area, there are three known porphyry mineralizations. Granisle is the southerly occurrence, Newman is 5 miles to the north and a deposit at Morrison Lake also found by Noranda, is 14 miles north of this again. There are other porphyry intrusives in the area of the same general type, but others as now known carry weaker mineralization. All three deposits intrude volcanic rocks and sedimentary siltstones.

Dr. A. M. Bell

Noranda Mines Limited recently honoured Dr. Archibald Macdonald Bell, general manager of the company's exploration arm, by establishing the new Bell Copper Division, which is equipping the Newman property, Babine Lake area, for production of copper concentrate in 1972 at an estimated cost of $33 million. He has been with Noranda since 1934 and guides the company's $10 million exploration programme in Canada, the United States, and in other countries. He has supervised exploration of the Newman property since it was located in 1963.

Dr. Bell was born in Australia in 1906. After moving to Canada with his parents as an infant, he received his early education at Chatham, Ontario. He won a B.A. degree in 1928 and an M.A. degree in 1929, both in Honours Geology from the University of Toronto. In 1933 he received his Ph.D. degree from the University of Wisconsin. He was employed by the Quebec Department of Mines before joining Noranda.

The main ore at Newman is at the western nose of the porphyry. The dimensions of the stock are 1500 feet by 3000 feet. The best mineralization is in a vertical pipe of highly fractured rock 500 feet in diameter that extends to a depth of at least 2500 feet. The ore in this pipe grades about 0.7% copper while a perimeter area for some 400 feet outside of this, largely in altered siltstone, is of lower grade.



LOCATION MAP
NEWMAN COPPER PROPERTY
NORANDA EXPLORATION CO. LTD.
FEB. 1968

FIGURE: 1

At the east side of the pipe, a projection of better-grade ore capped by barren rock, juts out into the intrusive. The pipe of better mineralization has sharp and regular walls and within it fracturing is intense with the fractures filled by small quartz veinlets. The ore zone is covered by 20 to 50 feet of overburden. The ore at surface is generally leached of values to a depth of 25 feet with sulphides coming in sharply below this. Sulphide minerals within the ore pipe are pyrite and chalcopyrite in equal proportions. Minor bornite occurs where pyrite is absent.

The Newman deposit has a textbook alteration pattern around it, as now worked out by Dave Carson. Around the porphyry intrusive, there is a general silicification of the rocks extending 4000 feet in all directions. An inner zone of chlorite alteration is recognized and within this, in turn, a zone of biotite alteration lies close to the ore. The rock to the limits of the silicified zone is highly pyritized forming a broad outer rim around the copper.

As I have mentioned another copper occurrence at Morrison Lake, a few words about it would be appropriate. This is a stock similar in type to Newman and Granisle. We actually found ore here before we did at Newman, as a result of a regional silt sampling. The mineralized area is larger than at Newman, but it is more complex and overall lower in grade. The apparently low grade initially discouraged close exploration. We are, however, currently doing more drilling here. It may one way or another prove a backup for the Newman operation.

OPERATION

According to computer calculations, the most profitable method of extraction at Newman was to take a pit encompassing the central core to a depth of 800 feet. This would yield overall 46,000,000 tons grading close to 0.5% copper using a cut-off grade at 0.3% copper. There are some gold and silver benefits. This would require removal of 23,000,000 tons of waste and 6,000,000 tons of overburden. The remainder of the better-grade ore pipe from 800 feet to 2500 feet that has been drilled, plus several million tons in the east wall of the pit, would require some form of underground extraction. It will require 13 years operation at 10,000 tons per day to extract the pit ore. By then, it is hoped metal prices and underground mining techniques will permit extraction of the deeper ore and the eastern limb.

The pit selected, has a diameter of 1800 feet and a depth of 800 feet. To get started, some 25 feet of overburden and 25 feet of oxidized capping will have to be removed. The pit is designed with 40-foot benches and will be operated with 6-yard electric shovels and 65-ton trucks.

HISTORY

The area was staked by Noranda in 1962 as a geological bet based on the relationship of the ground to Granisle and the knowledge that there were porphyry dikes in the area and old workings on the shore that showed some zinc mineralization. As zinc often occurs in an outer zone around porphyry copper ore, its presence was thought significant. The claims proved to be largely overburdened.

A systematic exploration in 1963 using geochemistry and geophysics proved initially discouraging as the soil within a few feet of surface was leached of copper values, and geophysics just showed a huge conductor over the pyrite zone and provided no specific targets for drilling. Regional stream geochemistry also failed to show anomalies in the area. The only encouragement came when a small stream was found paralleling the shore line that had a short 1200-foot train of high copper values in the silt. Based on these silt values, we decided to drill 3 short holes through the overburden. These holes were unlucky in that it was later found one was only a few feet off the ore on the south side and another was located within the orebody, but went down a freak horse of waste. If it had gone 3 feet further, it would have been in good ore. In any case, we felt intrigued about the alteration in the hole and were sufficiently encouraged to come

back in the spring of 1964 to do more drilling. The first hole of this programme, 200 feet from the old hole, proved to be well mineralized throughout. From then on, it was just a matter of drilling off a grid pattern.

The discovery was the result of systematic grass-roots exploration using geological deduction, geochemistry, and geophysics with proper interpretation of all the data. Effective work of this nature requires a fair-sized organization. In it, one man's work is just as critical as that of any of the others. Like a chain, one weak link can queer everything. Luck of course, has to enter into any find and a few hunches always help. The Vancouver staff, under Bern Brynelsen, jointly came up with this one when it could very easily have been passed over. Gavin Dirom, especially did critical early work on Newman as did Dave Lowrey at Morrison Lake.

Following the drill period, feasibilities were worked out by John Hall and Jim Kraft. Several years elapsed after the drilling before prospects for a higher metal price and taxation stability made the production look at all attractive.

The construction phase is under the direction of John Hall who headed the Brenda project and he has the same team as at Brenda with Frank Koch as project engineer and Bill Allen, mine manager. Engineering is being done in Vancouver by Wright Engineers working with Bruce Wallace on the mill design.

Road construction has started this summer with clearing on the mine site completed and a start made on overburden removal in the pit area. The orebody is half a mile from the lake shore on a flat plateau 200 feet above the lake. The plant site will be back from the shore and tailing will be stored in a low wet area in the centre of the peninsula well away from the lake.

ECONOMICS

In terms of economics, we would expect the present pit to provide some 390,000,000 lb. of copper. This will amount to around 15,000 tons per year. The capital cost of the project is expected to approach $40,000,000. Some $6,000,000 annually in operating expenses will go into the local economy in the form of wages and supplies.

Copper production in British Columbia has so far been essentially from deposits associated with large granites. Granisle is the pioneer of the Tertiary porphyry-stock mines. In the next 5 or 6 years, given a favourable economic and political climate, large-scale production should be attained from several more of these deposits. This development comes at a time when the traditional copper-producing countries of Africa and South America have production restricted by political development, a condition which will permit new Canadian production to meet the growth of copper demand. This should spark the orderly development of the Islands and the interior plateau area.