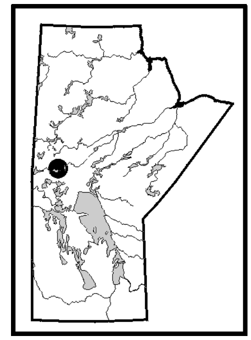
GS-10 GEOLOGY OF THE NEW BRITANNIA MINE, SNOW LAKE (NTS 63K16), MANITOBA

by G.H. Gale



Gale, G.H. 2002: Geology of the New Britannia mine, Snow Lake (NTS 63K16), Manitoba; *in* Report of Activities 2002, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 83-86.

SUMMARY

Investigations of the New Britannia mine at Snow Lake indicate that the gold mineralization predates the formation of quartz veins and deformation events recognized to date. The quartz-carbonate-mica schist (QCMS), the main host to the gold mineralization, contains the early particle and mineral lineation that is prevalent in the felsic and mafic country rocks. Deformation events affecting the ores include premetamorphic shear, postmetamorphic boudinage and several late brittle-ductile events that accompanied introduction of carbonate, mobilization of arsenopyrite and gold into late shear foliations, and dissection of the orebody by the very late 'Howe Sound' Fault.

INTRODUCTION

The New Britannia mine has not been studied in detail, although the deposit was discovered in 1927 and production started in 1949. Early studies, including those of Hogg (1957) and Ebbutt (1944), emphasized the relationship between mineralization and the Howe Sound Fault, a late brittle-ductile zone of deformation that is prevalent throughout all orebodies in the mine (Fig. GS-10-1). More recent structural studies have also emphasized the relationship between the ore deposit and faults in the area (Galley et al., 1986; Fieldhouse, 1999). A mineralogical study of the deposit showed that gold generally occurs proximal to acicular arsenopyrite (Fulton, 1999).

The absence of a relationship between mineralization and quartz veins was noted by Wright (1931, p. 95), who was able to examine the original trenches on the property and described the mineralization as follows: "No definite vein or

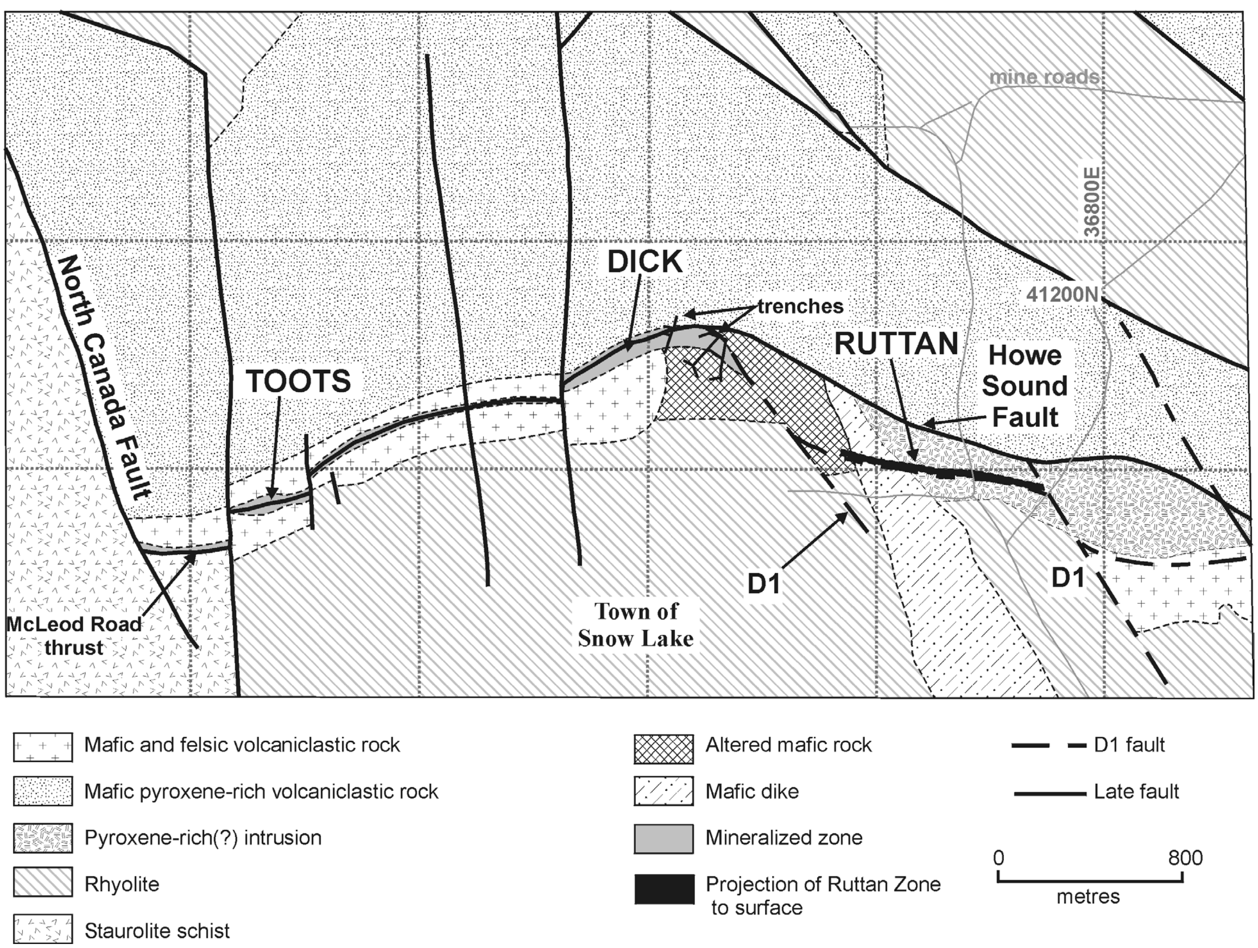


Figure GS-10-1: Location and general geology of the New Britannia mine.

single large body of quartz has been uncovered in the workings on the property. The quartz on this property is markedly different in appearance from the characteristic gold-bearing quartz of the district." Similar observations were made by Ebbutt (1944), but appear to have been overlooked by later workers.

Detailed mapping of the surface exposures at the New Britannia mine and mineral occurrences in the area indicated to the author that gold occurrences in this area predated deformation of the hostrocks. Studies of the New Britannia underground workings were undertaken on an 'as available' basis, because the mining method provides only a short time interval for geological observations to be undertaken. This ongoing project has provided new insights into the early nature of the deposit and indicates an early pre–Howe Sound and premetamorphism age for the mineralized rocks. This insight may assist further exploration both at the mine and in the area.

GEOLOGICAL SETTING

The orebodies of this deposit are associated mainly with volcaniclastic rocks that include basalt-rhyolite and basalt debris flows with variable amounts of euhedral pyroxene phenoclasts altered to amphibole. These rocks stratigraphically overlie a thick sequence of rhyolite flows and volcaniclastic rocks, and are themselves overlain by a thick sequence of volcaniclastic basalt, pyroxene-phyric basalt and related tuff. Pyroxene-bearing mafic dikes and sills, which appear to be feeders to the overlying pyroxene-bearing rocks, cut both the rhyolite and the enclosing volcaniclastic rocks, but none have been identified to date within the orebodies. The immediate country rock to the orebodies varies throughout the mine and includes layered volcaniclastic rocks, massive pyroxene-bearing basalt flows or intrusions, altered basalt and rhyolite.

MINERALIZATION

The main ore type in the mine is 'quartz-carbonate-mica schist' (QCMS) that varies from fine-grained sucrose and massive where mica contents are low, to weakly to moderately foliated where lineated reddish brown mica (phlogopite) is abundant. Several ages of quartz veins are present throughout the mine and are especially thick at the edges of, and between, boudinaged lenses of QCMS. Quartz veins are barren unless they contain angular fragments of QCMS, and gold grades within them correlate directly with the quantity of QCMS present. Arsenopyrite in the QCMS occurs mainly as acicular crystals, typically 0.5 mm in diameter and 2 to 3 mm in length, with a preferred orientation that parallels particle and mineral lineation in the surrounding host rocks.

Locally, mineralized mafic schist, developed from sheared mafic country rocks, contains up to 5% arsenopyrite and significant gold. This mineralization is quite different from the QCMS, in that the mafic rock has a strong foliation and the arsenopyrite crystals are equant, 1 mm in size and commonly concentrated along foliation planes in the mafic schist. This mineralization postdates the fabric in the mafic schist, and the formation of the mafic schist postdates the mineral lineation in the QCMS.

Although carbonate alteration has long been considered an original feature of the QCMS ore, it is apparent that the honey-coloured carbonate veins postdate the development of early quartz veins but predate development of the Howe Sound Fault, because both carbonate veins and faults cut the QCMS and the Howe Sound Fault also clearly cuts carbonate veins. The carbonate also replaces lineated mafic rocks (Fig. GS-10-2) and produces a nonlineated, massive, beige-coloured rock, in some parts of the mine, that is barren of gold but cut by late veinlets of pyrite; pyrite occurs as a coating on one set of faults related to the Howe Sound Fault. Some of the deformational events affecting the QCMS and ore are illustrated in Figure GS-10-3.

The relative age of mineralization in the New Britannia mine is consistent with the age of mineral deposits and occurrences examined on surface (Gale, 1997). Specifically, the arsenopyrite and gold predate the dominant particle and mineral lineation (L>>S) observed in the country rocks and definitely predate the formation of tensional quartz veins.

EXPLORATION CONSIDERATIONS

Although the origin of the deposit is uncertain, it can be demonstrated that the Howe Sound Fault follows the mineralization and is not, as previously envisaged, the locus for mineralizing fluids. In addition, deformation at the ends of orebodies illustrates that the mineralization was dragged and/or rotated into the plane of the North Canada Fault and related structures, and therefore predates the latest, if not all, movements on that structure.

The author contends that the New Britannia, 3 Zone and Birch orebodies are all early mineralized features. These orebodies can be expected to continue along strike, independent of the position of late brittle features, such as the Howe

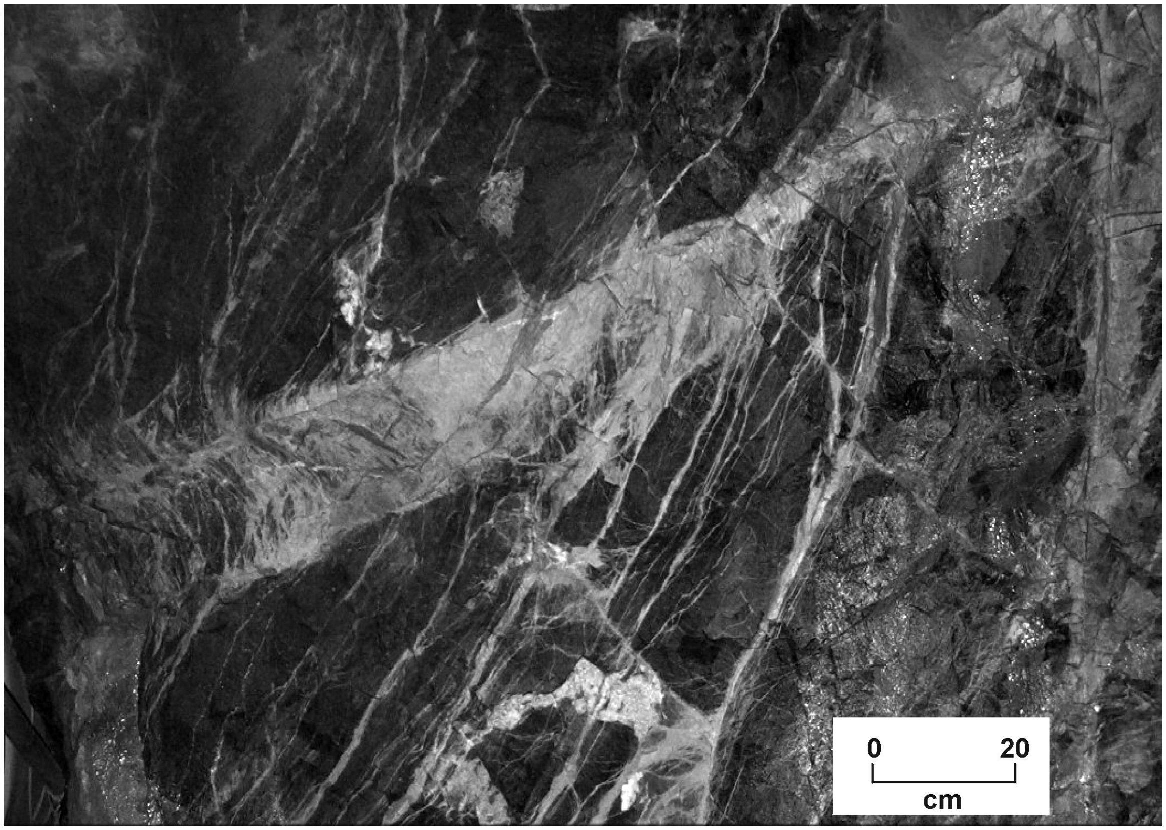


Figure GS-10-2: Iron-magnesium carbonate replacement accompanying Riedel shear in mafic volcaniclastic rocks adjacent to ore, New Britannia mine.

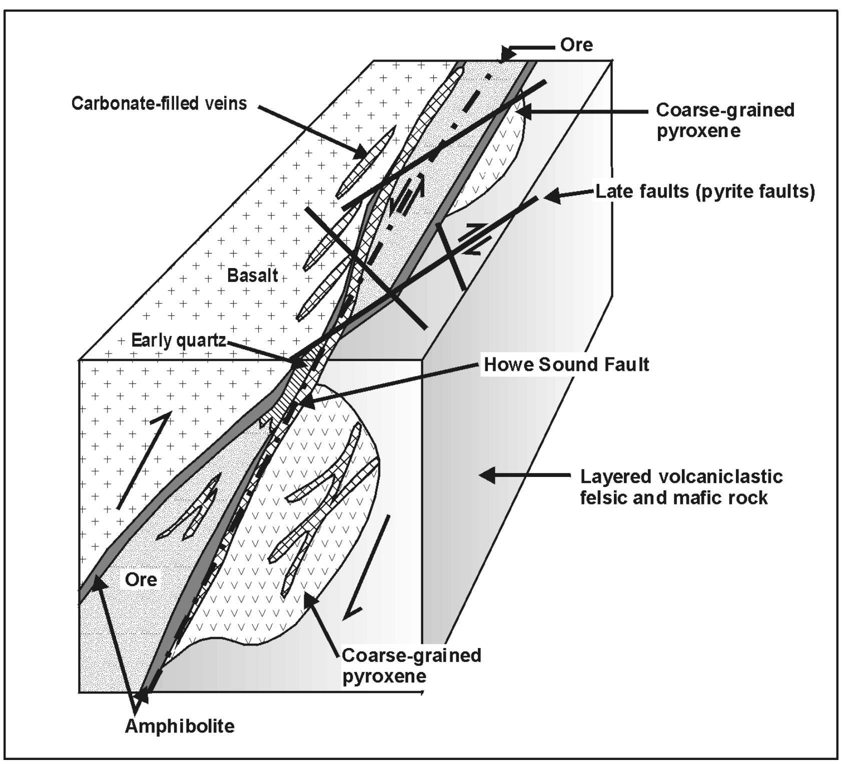


Figure GS-10-3: Schematic block diagram illustrating deformation of quartz-carbonate-mica schist and ore. 'Amphibolite' represents lineated hornblende in recrystallized mylonitized mafic rocks along the margin of the orebodies.

Sound Fault. Location of the extensions of these deposits will require careful mapping and reconstruction of the local geology.

ACKNOWLEDGMENTS

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REFERENCES

Ebbutt, F. 1944: The Nor-Acme property of the Howe Sound Exploration Company Ltd; Precambrian, v. 17, no. 7, p. 7–12.

Fieldhouse, I. 1999: Geological setting of gold mineralization in the vicinity of the New Britannia Mine, Snow Lake, Manitoba; M.Sc. thesis, University of Manitoba, Winnipeg, Manitoba, 136 p.

Fulton, P.J. 1999: Distribution of gold mineralization at the New Britannia Mine in Snow Lake, Manitoba; M.Sc. thesis, University of Manitoba, Winnipeg, Manitoba, 209 p.

Gale, G.H. 1997: Geological settings and genesis of gold mineralization in the Snow Lake area (NTS 63K/16); *in* Report of Activities 1997, Manitoba Energy and Mines, Geological Services, p. 73–78.

Galley, A.G., Ziehlke, D.V., Franklin, J.M., Ames, D.E. and Gordon, T.M. 1986: Gold mineralization in the Snow Lake–Wekusko Lake region, Manitoba; *in* Gold in the Western Shield, L.A. Clark (ed.), Canadian Institute of Mining and Metallurgy, Special Volume 38, p. 379–98.

Hogg, N. 1957: Nor-Acme mine; *in* Structural Geology of Canadian Ore Deposits, Canadian Institute of Mining and Metallurgy, Congress Volume, p. 262–275.

Wright, J.F. 1931: Geology and mineral deposits of a part of northwest Manitoba; Geological Survey of Canada, Summary Report, 1930, Part C, p. 93C–95C.