

Gold Mineralization at the Renabie Mine: The Importance of an Early Hydrothermal Vein Anisotropy on Shear Zone Localization

J. A. McDivitt^{1,2}, B. Lafrance^{1,2}, D. J. Kontak^{1,2}

¹Department of Earth Sciences, Laurentian University, Sudbury, Ontario, ²Mineral Exploration Research Centre

Gold mineralization in metamorphic terranes records the structural focussing of hydrothermal fluids of either magmatic or metamorphic affinity. The term “orogenic” emphasizes quartz-carbonate veins that are syn- to post-peak regional metamorphism in timing. Detailed outcrop-scale mapping and sampling at the former Renabie mine (~1.1 Moz Au) within the Wawa subprovince of Ontario suggests that the shear zone-hosted, sericite-banded quartz veins predate deformation. These gold bearing-banded veins are enriched in Ag, Bi, Mo, Pb and Te, and are hosted by ca. 2741 granitoids of the Wawa terrane directly marginal to volcanic units of the Michipicoten greenstone belt. Three deformation events (D₁-D₃) account for the observed vein geometries along the main east-striking mineralized structure. The early sericite-banded quartz veins occupy the centers of east-east southeast trending, reverse-sinistral D₂ shear zones. Although there is a spatial association between the banded veins and D₂ shear zones, the veins are overprinted by F₁ and F₂ folds, suggesting that they were emplaced early with respect to both deformation events. Gold-bearing pyrite veins were generated late relative to the D₂ event possibly during D₃ reactivation of the shear zones as dextral transcurrent fault zones. The intimate spatial association between the sericite-banded veins and D₂ shear zones suggests that the veins acted as a pre-existing anisotropy, which facilitated the initiation and propagation of the shear zones that then acted as conduits for the migration of hydrothermal fluids. The results of this study have implications for genetic models regarding gold deposits in metamorphic terranes by illustrating that the presence of early veins and altered domains, mineralized or barren, can subsequently focus strain and localize later vein generation. Thus, the Renabie mine exemplifies how composite veins can form during multiple events in a shear-zone hosted gold deposit.