

Roberto Gold Deposit, Eleonore Project Superior Province, James Bay, Quebec: Relationships between Tectono-Metamorphic Settings and Ore Bodies Diversity

A. Fontaine¹, B. Dubé², M. Malo¹, V. McNicoll³, T. Brisson⁴

¹Institut national de la recherche scientifique, Centre Eau Terre Environnement, Quebec, QC, Canada ; ² Geological Survey of Canada, Quebec, QC, Canada ; ³ Geological Survey of Canada, Ottawa, ON, Canada ; ⁴ Goldcorp Inc., Projet Eléonore, Rouyn-Noranda, QC, Canada

Abstract

The Roberto gold deposit is the main gold discovery in James Bay area with 3.03 Moz at 7.56 g/t (proven and probable reserves) and 4.17 Moz at 10.60 g/t (inferred resources) with production scheduled to start in 2014. Located a few km south of the boundary between the volcano-plutonic La Grande sub-province and the migmatites and intrusions of the Opinaca sub-province, the main orebody is hosted by <2675 Ma Timiskaming age clastic sediment enclosed within a structurally complex ≤ 10 m wide «N-S» trending mineralized envelope that hosts various styles of mineralization. Associated with potassic alteration and an Au-As-B signature, the main ore body are characterized by quartz-dravite-microcline-phlogopite-arsenopyrite stockwork and associated replacement zones and by quartz-diopside-arsenopyrite laminated veins. The bulk of the gold mineralization is pre-peak metamorphism and confined within a steeply plunging ore shoot coaxial with F_2 fold hinge. Gold deposition is interpreted as pre- to syn- D_2 . However, the complexity of several ore zones needs to be integrated in the complex tectono-metamorphic history and the timing of the deposition of the bulk of the ore remains to be better defined. New mapping reveals that en-echelon veins compatible with D_3 deformation are often associated with main ore bodies while some of them show boudinaged and sinistral shearing in response to layering-parallel extension during D_2 . In the north part of the deposit, four types of ore zones are present: (i) quartz-dravite-arsenopyrite veins, (ii) calcium-bearing breccia, (iii) quartz-feldspar-arsenopyrite veins, and (iv) arsenopyrite-bearing pegmatites (up to 19.5 g/t Au). Type (i) and (ii) are stratigraphically controlled by sandstone layers while (iii) and (iv) are strongly transposed by S_2 . Paragneiss (<2685Ma) exposed 1km east of the main ore zone illustrate the steep metamorphic gradient towards the Opinaca sub-province to the north. Those have recorded complex D_2 deformation characterized by the S_2 regional E-W schistosity axial planar to F_2 folds. D_3 is characterized by F_3 folds deforming the pegmatites injected parallel to S_2 (1-2 interference pattern) and S_3 crenulation cleavage. Although complex and metamorphosed, the deposit is hosted by Timiskaming-age sediments, near the boundary between two sub-provinces and as such share analogies with most Archean gold deposits.