

Geology of the Austin Brook Iron Formation

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Re-examination of the Austin Brook Iron Formation (known since 1898) in 1950-52 led to the discovery of the Brunswick No. 6 (Zn-Pb-Cu-Ag) massive sulphide deposit, the first of many sulphide deposits subsequently discovered in the Bathurst-Newcastle district, New Brunswick.

The Austin Brook Iron Formation, similar in many respects to "Algo-man" type iron formation, is sandwiched between two eruptive cycles of regionally metamorphosed, predominantly rhyolitic pyroclastic rocks of the Tetagouche Group. Secondary structures and textures indicate perhaps three main deformation phases (D_1 , D_2 , D_3). The dominant structure in the Austin Brook area is an F_1 isoclinal anticline.

The rhyolite pyroclastic rocks are intensely altered as indicated by low Na+K and high K/Na ratios. It is thought that these features are the result of hydrothermal alteration shortly after extrusion.

The Austin Brook Iron Formation comprises (1) an oxide facies, consisting of laminated magnetite-hematite, and quartz-siderite-calcite intercalated with (2) a chlorite (silicate) facies, consisting of laminated chlorite-quartz magnetite-biotite-stilpnomelane-carbonate schist and poorly laminated chloritic clastic sediment (oxide and chlorite facies originally up to 12.2 m thick), and (3) a basal sulphide facies comprising massive pyrite (up to 4.3 m thick) with variable amounts of sphalerite and galena, and chalcopyrite, and pyritic sericite-quartz (chlorite) schist (up to 24 m thick). Simi-

lar facies relations occur in the Brunswick No. 6 area, though the sulphide facies is much thicker.

The Austin Brook Iron Formation represents a siliceous iron-rich sedimentary rock deposited in a marine environment during a quiet period separating eruptions of rhyolitic pyroclastic rocks. The oxide facies is a chemical precipitate of either (1) mixed hydrous ferrous-ferric oxides and silica under fluctuating Eh (slightly reducing to slightly oxidizing) or (2) dominantly hydrous ferric oxides under positive Eh (oxidizing conditions) and present Fe^{+2}/Fe^{+3} ratios are products of diagenesis and hydrothermal metamorphism. Enrichment of Mn and lack of evidence of original ferrous silicates support (2) above. The source of the silica was probably that released by hydrothermal alteration of glass, pumice, ash and feldspars of associated rhyolitic pyroclastic rocks. Anomalous amounts of An, Pb and other elements are attributed to absorption in hydrous Fe and Mn oxides. A strong positive correlation exists between Zn and Mn in the oxide facies.

A chlorite facies represents layers of turbidite that sporadically entered the basin, which is otherwise free of clastic sediments during the period of quiet chemical sedimentation.

Massive pyrite and the underlying pyritic schist are thought to be the result of sulphate reducing bacteria and perhaps hydrothermal replacement of oxide facies iron formation after burial under conditions favouring high Pb_2S .