

D. The Exploration Frontier: Ideas Worth Exploring

Nicholson Bay Uranium-Gold-PGE Deposits

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ABSTRACT

Between 1953 and 1982, the Beaverlodge uranium district produced some 25 000 t of uranium metal from 17 main mines. The producing deposits, as well as numerous other radioactive showings in the area, are predominantly classical epigenetic vein-type pitchblende occurrences. Most are hosted by rocks of the metamorphic basement although veins are also present in rift-deposited immature clastics and alkalic basalts of the unconformably overlying Paleoproterozoic (1700 to 1800 Ma) Martin Group. Mineralization is also known in the younger Mesoproterozoic (1450 to 1700 Ma) mature sandstones of the Athabasca Group.

The epigenetic deposits can be divided into two groups, respectively showing simple and complex mineralogy. In the former, pitchblende is accompanied by brannerite, chalcopyrite, pyrite, galena and nolanite, and uranium by a simple suite of elements (Cu, Pb, Fe, V, and S). In the latter, pitchblende and thucolite are accompanied by arsenides, sulphides, selenides and native metals, and uranium by a diverse group of elements (Cu, Ni, Co, As, Pb, Fe, V, Y, Se, Ag, Au, and PGEs).

The association of uranium, gold, and platinum group metals was first described in 1955, but only more recently has exploration interest for the precious metals gained importance. Impetus was provided by: 1) discovery of a potentially economic zone of gold-platinum group metal mineralization, adjacent to the historically mined Coronation Hill uranium-gold deposit, in the South Alligator River Uranium Field (SARUF) in the Northern Territory of Australia, and 2) recognition that Coronation Hill and other deposits in the SARUF show many similarities of mineralogy and geological setting to complex pitchblende veins in the Beaverlodge district. The regional geological analogy is further enhanced by the undoubted resemblance of the nearby world-class unconformity-type uranium deposits of the Alligator River Uranium Field to those within the Athabasca Basin of Saskatchewan. Exploration around Nicholson has identified, adjacent to historic uranium prospects, more extensive zones of gold and platinum group metal mineralization than previously recognized (Nicholson #2 zone) and has also resulted in new discoveries (Quartzite Ridge).

Cryptic gold and platinum group metal mineralization occurs within alteration zones commonly adjacent to uranium veins of complex mineralogy. These zones are characterized by: 1) hematization, silicification, and calcification of host dolomitic marbles, diopside calc-silicates, and quartzites; 2) extensive fracturing; and 3) development of vugs containing euhedral quartz, specular hematite, and carbonates. There is a close spatial relationship to the sub-Martin Group and/or sub-Athabasca Group unconformities, and detailed field relationships and U/Pb (pitchblende) age data suggest mineralization after deposition of the Athabasca Group. Preliminary fluid inclusion studies from secondary euhedral quartz and carbonates from the altered/mineralized zones indicate fluids with temperatures in the range 150° to 200°C and high salinities. Similar fluids characterize the unconformity-type uranium mineralization of the Athabasca Basin.

The uranium-gold-platinum group metal deposits of the Beaverlodge district and SARUF represent a new type of low-temperature, hydrothermal precious metal mineralization. Their economic potential is as yet unknown, as is the exploration potential of the Paleo- to Mesoproterozoic sandstone basins to which they appear related.