BEAVERLODGE URANIUM DISTRICT

E.A.G. (Ted) Trueman, Pitchstone Exploration Ltd.

Pitchblende was discovered at Nicholson on the north shore of Lake Athabasca in 1935. Philip St. Louis and Einar Larum found the Ace uranium deposit north of Beaverlodge Lake in 1946 and production by Eldorado commenced in 1953. Uranium deposits in the Beaverlodge district are spatially related to the Proterozoic Martin Group sediments, which were unconformably deposited on highly deformed Lower Proterozoic and Archean metamorphic and granitic rocks of the Tazin Group.

The Martin Basin is up to 10 km thick and is partly fault bounded by the regional Black Bay and St. Louis faults. Martin Group sediments are a poorly sorted, red-bed, molasse sequence of conglomerate, sandstone and siltstone. Igneous rocks within the Martin Group are andesite-basalt flows and gabbroic sills that total a few hundred meters in thickness.

Total production from the Beaverlodge district was about 51 million pounds U_3O_8 at an average grade of 0.26% U_3O_8. This excludes Gunnar, which perhaps is more logically classed as an Athabasca Basin deposit. The Ace-Fay-Verna-Bolger deposit (Fay-Verna) accounted for 90% of the uranium produced at Beaverlodge. Smaller but significant producers included Hab, Rix Smitty, Cinch Lake, Cayzor and Dubyna Lake.

The Fay-Verna deposit is in proximity to the regional, curvi-linear St. Louis Fault and a mafic meta-sedimentary sequence known as the Fay Mine complex. Fay-Verna ore shoots were aligned in dilatant zones sub-parallel to, or splays off of, the St. Louis Fault; ore shoots raked steeply southwest. The St. Louis Fault was not mineralized. Uranium was deposited as veins, breccia fillings and disseminations.

The Fay Mine complex was host to most of the Fay-Verna ore. The complex is a mylonitic mica schist with units of phyllite, amphibolite, impure quartzite and calc-silicate. The Fay Mine complex is enclosed within an extensive sequence of granitic gneiss termed the Donaldson Lake gneiss. The Donaldson Lake gneiss ranges from coarse grained granite to quartz-feldspar-biotite gneiss to finely laminated mylonite.

Individual ore zones at Fay-Verna were irregular, branching and lenticular. Those comprising Ace-Fay occurred in the footwall of the St. Louis Fault and displayed a significant rake extent sub-parallel to the 50° southerly dip of the fault. The Verna ore shoots were situated in the hangingwall of the fault, were more irregular that those at Ace-Fay, and had a shallower dip. Fay-Verna orebodies persisted to a

vertical depth of more than 1,600 m. Mine closure in 1982 was an economic decision and not a result of termination of mineralization at depth.

The Hab deposit averaged 0.43% U_3O_8 and was the highest grade deposit in the district. There were two distinct ore zones at Hab. The 38 Zone contained disseminated pitchblende in the matrix of a porous, stockwork breccia within hematitized, leucocratic, quartz-feldspar gneiss. Pitchblende in the 39 Zone occurred in discontinuous, vuggy, quartz veins within locally graphitic, hematitized, mylonitic mica schist.

Pitchblende is the dominant metallic mineral at Beaverlodge although brannerite, coffinite, pyrite, chalcopyrite, clausthalite, nolanite and galena are common. Alteration minerals in host rocks are dominantly hematite, calcite, albite, chlorite, quartz and epidote.

Most uranium deposits at Beaverlodge, in particular those of Fay-Verna are spatially related to Martin Group sediments. Martin sediments are extensive throughout Fay-Verna mine workings and exist at the deepest production levels. A sub-basin of Martin Group in the West Fay area, south of the St. Louis Fault, hosted three intriguing uranium ore zones. These occurred as irregular, saucer shaped lenses at the Martin Group basal unconformity, largely within Martin conglomerate; these were not large orebodies although they produced 800,000 pounds of U_3O_8.

From 1955 to 1963 Gunnar produced more than 19 million pounds U_3O_8. The ore averaged 0.18% U_3O_8. Pitchblende and uranophane were deposited in open spaces in vuggy, brecciated syenite, which is an altered portion of a larger gneissic granite body. Syenite is about 65% albite with the remainder being carbonate (dominantly calcite), quartz, chlorite and kaolinite. The deposit was controlled by dilatancy and had the form of a 45° south-plunging, carrot-shaped body. Most of the pitchblende was finely disseminated in syenite. About 10% of the uranium occurred as uranophane, which persisted to the deepest levels of the mine, more than 400 m vertically.

Many geologists who worked at Beaverlodge feel that uranium mineralization was genetically related to the Martin Group sediments. The difference in size and grade of uranium deposits associated with various Proterozoic basins, such as the Martin, Athabasca, Thelon or Kombolgie basins, may simply reflect variables of the individual basins, such as:

1. uranium content of the source area,
2. composition (uranium content) and maturity of the sediments,
3. porosity, permeability and diagenetic maturity of the sediments,
4. longevity of fluid flow through the basin,
5. stratigraphic complexity of the basin,
6. size of the basin.

This of course presumes that the mineralizing fluids carrying uranium moved downward through the Proterozoic sediments. The low grade and relatively small size of Beaverlodge deposits, in contrast to many deposits related to the Athabasca Group, is perhaps a reflection of the lack of a particularly fertile source area, relatively low porosity and permeability, diagenetic immaturity, stratigraphic complexity and the limited extent of the Martin Group.

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