

From the Mineral Inventory Files

A Little-Known Ni-Co-Bi-Sb-Pb-Ag-Au Association in the Annapolis Valley

The map below shows the location of three mineral occurrences featuring various combinations of the elements Co-Ni-As-Sb-Pb-Zn-Cu-Bi-Ag-Au in the Annapolis Valley - Digby County region. There has yet to be a concerted exploration effort directed at the potential for deposits of this unique elemental association. Perhaps the following discussion could change that.

Some of these occurrences have characteristics that suggest they belong to the 'five-element association'. Five-element veins are a distinctive Ni-Co-Ag ore type best represented in the Cobalt - Gowganda district of Ontario. Their name results from a distinctive mineralogy of arsenides and sulphides of the five elements Ni-Co-As-Bi-Ag. Some spectacular specimens of native silver have been recovered from Cobalt, Ontario.

Most five-element districts are spatially associated with mafic plugs, dykes and sills. The genesis of these deposits is a controversial issue, but currently a non-magmatic model centering on their occurrence in rifted continental settings is favoured. Wisdom has it that ore fluids were generated near the crust-mantle boundary from highly saline formational brines under high temperature (400°C) and low sulphur conditions, conducive to mobilizing Ni-Co-Bi and precious metals. The fluids then rose from these great depths along the active shears and faults typical in rifted

environments. This also explains the association of the deposits with mafic intrusions, which exploit the same structural breaks.

Our best known example of what may be a five-element vein is found at Nictaux Falls where quartz veins and vein stockworks intrude slates of the White Rock Formation. The veins are typically epithermal and contain cobaltite, arsenopyrite and native gold. Concentrations of up to 1.6% Co, 0.28% Ni, 2.22 oz./ton Au and 88 ppm Bi have been found. It should be noted that the presence of native gold is not common in five-element veins. On its own this occurrence at Nictaux Falls may be little more than an interesting site for collecting minerals. But during their exploration program for uranium in the region during the 1970s, Shell Canada Resources defined several large Co soil anomalies. Perhaps these indicate additional deposits.

In the Cape St. Marys area of Digby County several occurrences of Sb-Pb-Cu-Ni-Co-Zn-Bi-Ag±Au are found in slates of the Halifax Formation. The occurrences are hosted by quartz-carbonate

veins, ankerite breccia and stringer zones intruding along the margin of a major zone of ductile shear. Also of note is the proximity of these occurrences to small mafic dykes and plugs. Specimens containing several percent Sb and Pb have been found with associated Ni (0.43%), Co (728 ppm), Bi (365 ppm), Ag (181 ppm) and Au (3.5 ppm).

At Landsdowne, near Digby, veins of quartz-carbonate with Sb-Pb-Zn-As-Ag-Au (jamiesonite-arsenopyrite) intrude a mafic dyke and adjacent Halifax Formation slates. Samples from mineralized veins range from 2-10% Pb, 1-4% Sb, 0.5-2% Zn, and up to 640 ppm Co and 821 ppb Au, but with Ni in only background concentrations.

These mineral occurrences have an elemental assemblage consistent with a primitive, deep crustal source. This is further supported by their spatial association with mafic intrusions. Given that mafic intrusions abound throughout the Annapolis Valley, it follows that the deep-seated structures along which they rose also persist. These structures would also have been available to any

mineralizing fluids, thus greatly extending the target area beyond the known occurrences.

George O'Reilly

