file: BEAUDOIN.DOC
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Report on visit to New Denver area and Silvana Mine, May 24-25, 1990

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PURPOSE:
The visit was to review progress made by PhD student Georges Beaudoin and his work in the mine and district.

MINE VISIT:
I went underground with Georges, then we discussed geology and exploration in the area with Mine Manager Steve Phillips and Rolli Trenaman, President of Treminco Resources, the new owners of the mine. The mine has less than a year of reserves remaining and a new exploration program was being planned.

GEOLOGY:

Host rocks for the Slocan silver-lead-zinc ores are Slocan Group black shales, graphitic shales, siltstones and fine impure sandstones.

Dykes underground are locally sheared and imbricated (Plate 1). Ore veins cut some dykes (Plate 2).

Ore veins show excellent open space-filling character and several generations; many are bi-laterally symmetrical. Often terminations of siderite crystals growing in from the vein walls are in-filled by sphalerite with or without galena, then the veins are cored by coarsely crystalline galena (Plate 3).

Quartz, calcite and pyrrhotite veins generally post-date the ore veins.

Strain during shearing of the veins tends to be concentrated in the galena-rich core zones; thus galena 'mylonite' zones occur in veins with undisturbed open space-filling textures at their edges (Plate 4). This has economic importance because the highest silver grades are in the sheared galena and the large cubes are relatively low grade. This may result from mechanical concentration, leaching or diffusion.

Locally, silver grades relate to sphalerite content. Georges Beaudoin reports that local tetrahedrite and sulphosalts lie along growth zones in the zoned sphalerite, which may account for this correlation.

Locally cleavage cuts the veins at a shallow angle.

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Mesoscopic sub-isoclinal folds are visible locally in the country rock. One fold we saw underground seemed to be cut by an ore vein.

Veins pinch and swell, and split and rejoin down the dip (Plate 5). Much of this variability relates to shearing. At Silvana, ore zones have been persistent along strike but have relatively short dip lengths. Most ore mined has been along the 'Main Lode' structure, but locally there is more than one ore lense. The shearing complicates mining; one ore lense, for example, is 's-shaped' in both plan and section.

One model (Stan Pedley?) holds that ore shoots are localized at fold culminations. Some argue that mineralization and initiation of the Main Lode structure occurred at the end of the main pulse of dyke intrusion and after emplacement of the Nelson batholith. It is tempting, when looking at generalized sections along the Main Lode structure near Silvana Mine, to relate mineralized veins to detachment faulting or listric normal faulting along splays off the Slocan Lake Fault zone (see Figure 1). Are the granitic rocks under Silvana intrusive, or is the contact a thrust? The SLF was active between 55 and 60 million years ago.

Figure 1
SECTION

Georges Beaudoin's work indicates that there are three lead isotope signatures in the area: the Slocan, Kokanee and Ainsworth types (Figure 2). Lead distribution patterns seem to be superimposed on the Nelson intrusives, that is they seem to post-date the granite. At the Enterprise showing for example, veins that cut the Nelson megacrystic quartz monzonite consist of quartz, siderite, dolomite and sphalerite; sericitic alteration halos are developed. Georges will do Ar-Ar step heating analyses to date mica from veins and alteration halos to try to resolve the age of mineralization. He also plans carbon and oxygen isotope analyses. Sulphur isotopes are light (-10 to -12 along the 'Main Lode') in the Slocan area and heavier to the north and south, the "light zone" apparently trends northwest-southeast and includes both the Slocan host rocks and Nelson granitic rocks within the trend. In June, Georges phoned; he had found a quartz-galena vein in the Slocan Lake Fault (SLF) zone. Disseminate sulphides occur in the country rock and the vein is cut by fault gouge.

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The quartz is ribboned (deformed?) and the vein resembles those at the Alpine showing. The latest movement on the SLF is Eocene, so mineralization is post-Nelson, pre-Eocene.

The lead isotopes are derived as follows: Pb^{207} from Th^{242}, Pb^{207} from U^{235}, and Pb^{206} from U^{238}. Pb^{204} is non-radiogenic. Patterns emerge here when Pb^{208} is involved in the plot. The data suggest that Thorium for the Slocan and Ainsworth leads are from the same source, but Kokanee samples show upper crustal contamination. Plots of Pb/Zn and Pb/Ag also form consistent patterns. Georges thinks that district scale processes were involved in formation of the ores. If gold is considered, Ag versus Au plots suggest 2 populations or 2 mineralizing events.

Georges is plotting various elements to attempt to determine parameters that will indicate exploration potential. For example, historically, replacement deposits have been larger than vein deposits. These deposits have log (Ag/Au) between 3.2 and 4.3; values for veins are more scattered. Logged silver to lead ratios define 2 populations. Deposits larger than 100,000 tonnes have ratios between o.19 and 0.23. Silver/gold versus Pb^{206}/Pb^{204} indicate that Kokanee deposits are generally more gold-rich and more radiogenic. Ainsworth deposits are the least radiogenic and have the lowest gold values. Kokanee samples show evidence of upper crustal contamination, Ainsworth samples have lower crustal signatures. We discussed other avenues of research that might produce exploration guidelines in the area.

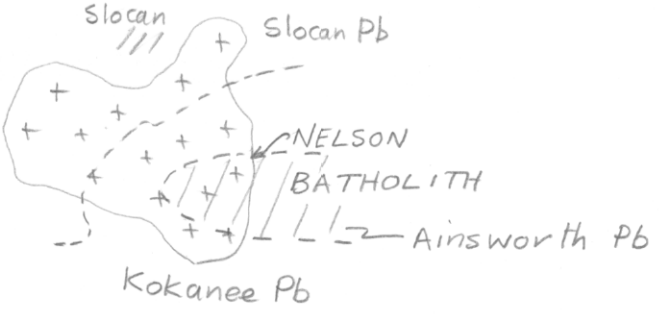

Figure 2: Pb Isotopes