British Columbia Geological Survey
Geological Fieldwork 1989

PRELIMINARY REPORT OF RESEARCH IN THE SHEEP CREEK CAMP, SALMO, BRITISH COLUMBIA (82F/3, 6)

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KEYWORDS: Economic geology, Sheep Creek, quartz veins, mesothermal gold, stable isotopes.

INTRODUCTION

The Sheep Creek gold camp is situated at latitude 117°09′W, longitude 49°08′N within the Nelson Range of the Selkirk Mountains in southeastern British Columbia (Figure 2-2-1). The camp consists of ten significant mining properties and is located within the Nelson (West Half) map area, where more than 300 mining properties have been documented (Little, 1960, 1963, 1964) of which many have produced considerable amounts of base and precious metals in concentrates.

Interest in the lode gold deposits in the area was aroused as early as 1885 when the Hall brothers staked claims near the headwaters of Ymir Creek. The Yellowstone and Queen veins of the Sheep Creek camp, located about 18 kilometres south of Ymir Creek, were staked in 1896 and since that time the camp has produced approximately 28.9 million grams of gold, 15.5 million grams of silver and modest amounts of lead and zinc (Schroeter *et al.*, 1986; Mathews, 1953). Mining activity was intense from the turn of the century until the outbreak of World War I, began again in 1928 and reached its peak in 1937. There was little activity in the camp from about 1942 until recently, when interest was renewed by Gunsteel Resources Incorporated.

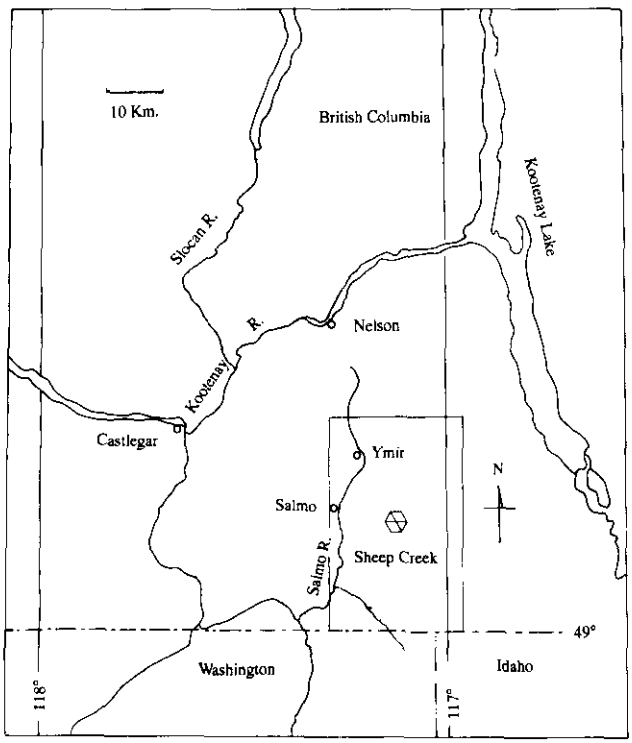

Figure 2-2-1. Location map for Sheep Creek Camp.

In 1986 the camp was ranked seventh of British Columbia's gold camps in terms of total historic production (Schroeter, 1986); this significant rank, in conjunction with interest by Gunsteel Resources and the camp's geological and geochemical similarities with other lode gold deposits in the Canadian Cordillera, prompted this research project.

The principal objective of this study is to investigate the geochemical nature of the gold mineralization. To accomplish this a sampling program was designed and executed to investigate the lateral and vertical zoning in fluid composition, hostrock and vein alteration, and temperature of mineralization.

Significant work at the Sheep Creek camp has been done by private and public interests over a period now approaching a century and surrounding districts have also been well documented. The principal studies are: Mathews, 1953 Fyles and Hewlett, 1959, and Little, 1960. These papers have proved indispensible in understanding the geology of the region.

GEOLOGY OF THE SHEEP CREEK CAMP

The Sheep Creek camp straddles the eastern boundary of the Kootenay arc. This arcuate belt of deformed and metamorphosed rocks has had a complex history of Mesozoic and Paleocene compressional and transpressional deformation overprinted by Eocene extensional tectonics. The rocks are believed to represent both a distal continental margin and part of a late Paleozoic to early Mesozoic back-arc basin (Klepacki, 1986; Parrish *et al.*, 1988).

The Quartzite Range Formation is comprised of massive white quartzites intercalated with minor argillites and argillaceous quartzites. It overlies the Three Sisters Formation of the Proterozoic Windermere Supergroup and consists principally of grey grit and lesser amounts of white grit and blue-white quartzite. Most of the gold production has been from the Quartzite Range Formation; no gold-bearing veins are known in the Three Sisters Formation.

Overlying the Quartzite Range Formation is the Reno Formation. These argillites, grading to argillaceous quartzites and dark bluish or greenish quartzites, are complexly folded and show extreme variations of thickness. The Reno Formation is hostrock for extensive mineralization in the Reno vein and two mineralized veins in the upper part of the Gold Belt mine.

The Laib Group in the Sheep Creek area is a moderately thick (300 metres) succession of six argillite and limestone members overlying the noncalcareous rocks of the Reno Formation. Other sediments in the region are the Nelway and Active formations which are black to dark grey to grey limestones, calcareous argillites, slates and phyllites, and minor quartzites.

This apparently conformable miogeoclinal succession is folded into a sequence of north-northeast trending, overturned anticlines and synclines which are considered significant structural controls in the camp. The Windermere Supergroup is exposed to the east of the camp and Mesozoic eugeosynclinal rocks of the Rossland Formation outcrop to the west. The geology of the district is further complicated by a host of intrusive bodies including: granites, quartz monzonites, quartz porphyry sills and dikes and lamprophyre dikes (Mathews, 1953; Fyles *et al.*, 1959).

Four well-defined sets of faults are recognized in the camp but only the northeasterly trending, dextral strike-slip faults have significant associated mineralization. Quartz veins of variable thickness (less than 1 centimetre to more than 2 metres) and extensive vertical and lateral continuity are the source of all production to date. Gold occurs as small (<30 microns) isolated particles within the veins and is most often associated with sphalerite, pyrite or galena. As a generalization, ore-grade gold mineralization is confined to veins with quartzite forming either or both footwall and hangingwall. Significant pyrite is present in the wallrocks and in some areas, particularly the Reno mine, extends for many metres away from any known veins. Galena and sphalerite are usually associated with carbonates or calcareous argillites.

Metamorphism in the region is for the most part low-grade greenschist facies. Sericite is the most common accessory mineral in the quartzites; local chlorite alteration is associated with veining in more argillaceous rocks. Silicification is widespread throughout the region. Mathews (1953) describes argillic alteration, in the form of kaolinite-rich zones and pseudomorphs of feldspars.

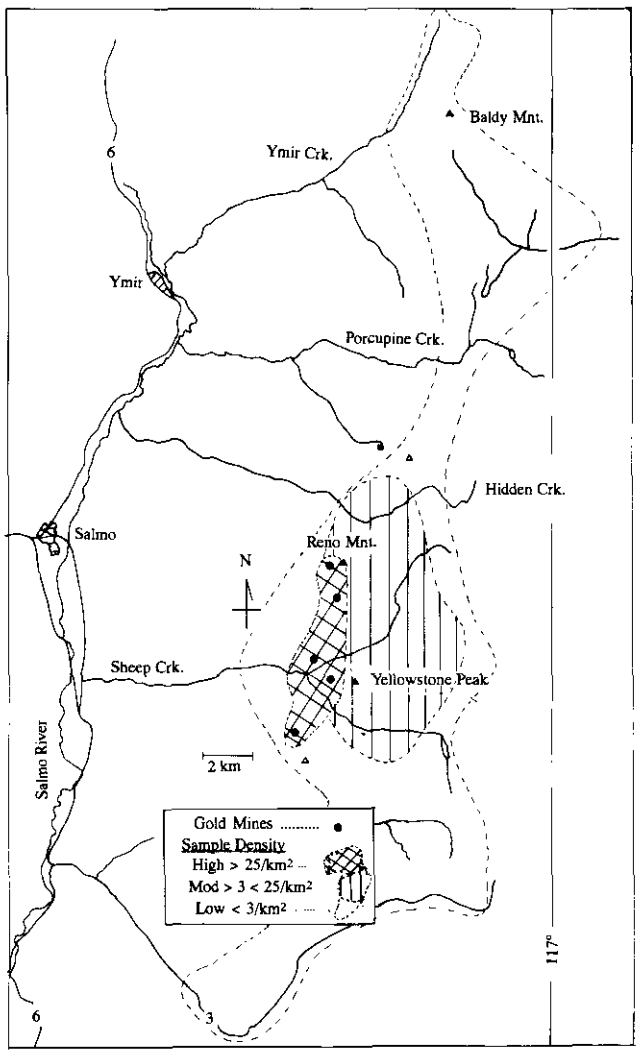

Figure 2-2-2. Sample Density map for Sheep Creek Camp.

SAMPLING

In keeping with the principal objective of the study, an attempt was made to recover as many representative examples of vein material as possible and to make complete observations of the vein characteristics and relationships with the country rock. The observed geological characteristics will provide a framework for interpretation of fluid inclusion data and stable isotope signatures.

A suite of 353 samples was collected (Figure 2-2-2) comprised of: 78 mineralized (defined as "anomalous concentrations of sulphides") and 102 apparently barren quartz veins; 31 mineralized and 79 apparently barren quartzite samples; 17 mineralized and 24 apparently barren argillites and phyllites; 4 mineralized and 10 apparently barren carbonate samples and 18 miscellaneous rocks.

OBSERVATIONS

The active workings of Gunsteel Resources provided an opportunity to examine and sample highly mineralized (pyrite, oxidized sulphides and gold) veins and adjacent host-rocks underground. Vein characteristics range from massive, milky white quartz with disseminated pyrite through semi-regularly fractured blue-grey quartz veins and irregularly fractured sulphide-rich (disseminated and stringer mineralization) veins to highly comminuted gouge material. The majority of these veins strike east-northeast, crosscutting the northeast-trending beds.

Surface outcrops of quartz veins are generally unmineralized (minor to no observable sulphides) and if they have continuity, are oriented parallel to bedding strike or are crosscutting the beds in a northwesterly orientation. Veins in massive bedded quartzite in the eastern parts of the camp are generally massive, milky white quartz. Veins in argillaceous hostrocks are often very irregular in thickness and orientation and may bifurcate locally to incorporate wallrock lenses in the veins. Quartz veins throughout the region vary in size from extremely fine, hair-like fracture fillings as observed in an outcrop of en echelon fractures on the west side of Yellowstone Peak, to huge (3 metres wide) massive outcrops on the east slope of Reno Mountain. Both of these examples are hosted by quartzites.

RESEARCH PLAN

The sample suite is presently being prepared for fluid inclusion studies, which will be performed using a USGS heating/freezing stage apparatus. Data from the fluid inclusion study will contribute to the understanding of the compositions and temperature of the ore-forming fluids. The suite is also being prepared for oxygen, hydrogen and carbon stable isotope analyses. Relevant samples are being prepared as thin sections, polished mounts and polished thin sections. Assay data supplied by Gunsteel Resources Incorporated will be supplemented where necessary by additional analyses.

It is anticipated that data from fluid inclusion and isotope work, as well as petrographic observation, will aid in relating the Sheep Creek camp to other Phanerozoic mesothermal lode gold deposits in ancient, tectonically active continental margins (Nesbitt, in press).

Preliminary $\delta^{18}O$ values for a group of five samples average 14.3‰, which is similar to other mesothermal vein deposits in the Canadian Cordillera (Nesbitt, in press) but it is inappropriate to draw further conclusions until a more complete representation of the sample suite has been analysed and data from fluid inclusions have been ascertained.

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