



**GOLDSTREAM MASSIVE SULPHIDE DEPOSIT
(82M/9W)**

By Trygve Höy

INTRODUCTION

The Goldstream deposit is a stratiform massive sulphide deposit located in the Selkirk Mountains of southeastern British Columbia. Mineral claims were located in 1973 by Gordon and Bruce Bried and Frank E. King. Development work by these prospectors included trenching and drilling of 22 X-ray holes. Noranda Exploration Company, Limited optioned the property in December 1974 and in 1975 drilled 50 holes outlining a deposit with announced reserves of approximately 3.175 million metric tons grading 4.49 per cent copper, 3.124 per cent zinc, and 0.68 ounces silver per ton. Work during 1976 included approximately 1 200 metres of underground development and 3 500 metres of underground drilling.

The property is located 70 kilometres north of Revelstoke, on the south side of Goldstream River. It is accessible from the Big Bend Highway by a dirt road that follows the southern tributary of Goldstream River crossing Brewster Creek just west of the exploration camp.

The deposit is in an area of relatively deep glacial till overburden. The only exposures are restricted to a number of weathered pits where the south end of the deposit subcrops.

GEOLOGY

The Goldstream deposit occurs as a massive sulphide layer in metasedimentary rocks of probable Lower Cambrian age. These rocks strike east-west and dip approximately 30 degrees north. The sulphide layer averages 3 to 5 metres in thickness, has a strike length of at least 500 metres, and a trend length of at least 1 200 metres (Fig. 6). Only its western and truncated southern boundaries are defined. Its northern boundary is open, although at 30 000 N is approximately 350 metres below Goldstream River. Its eastern boundary is only restricted by the one barren hole (at 25 + 62 N, 59 + 04 E) approximately 300 metres east of the last known sulphide mineralization. Hence the eastern boundary, as shown on Figure 6, will doubtless be modified by further work.

Rock Units

The north-south section (Fig. 7) illustrates the sequence of metasedimentary rocks above and below the sulphide layer. The structurally highest rocks are described first. It is not known for certain whether or not these are the oldest or youngest rocks in the succession but, as described later, they are probably stratigraphic footwall rocks, that is, the succession may be overturned in the immediate vicinity of the deposit.

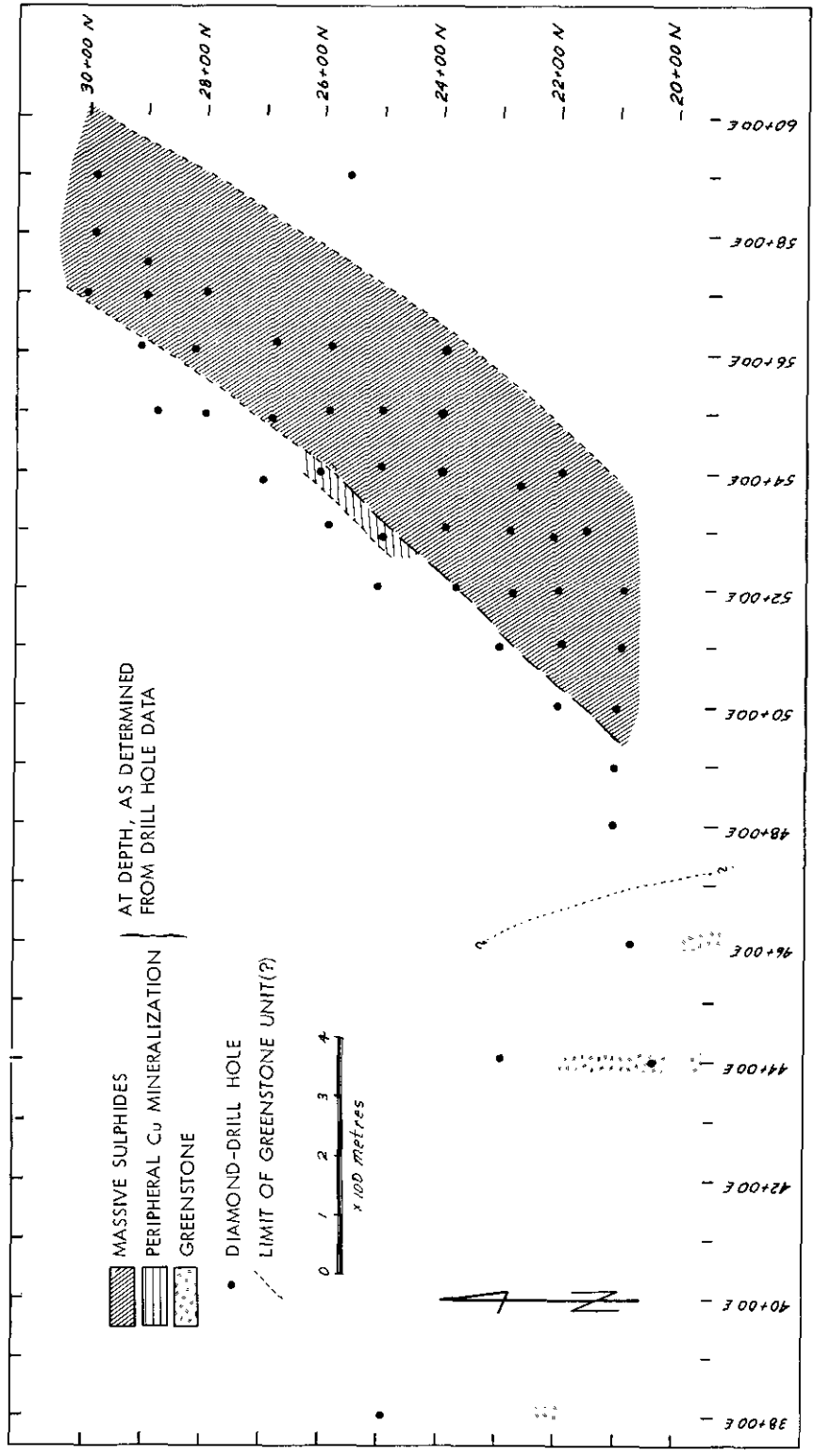


Figure 6. Plan view of Goldstream, showing drill-hole locations, outline of deposit, and greenstone drill intersections.

The structurally highest rocks, unit 1 (not shown on Fig. 7), are only intersected in the top part of the drill holes north of 28 + 00 N. They include approximately 30 metres of siliceous sericite-chlorite-biotite phyllite and phyllitic quartzite, underlain by 15 metres of dark grey calcareous graphitic phyllite, a 3-metre layer of grey-green siliceous chlorite-phyllite, and 10 metres of biotite and chlorite-phyllite that contains thin calcareous and limy layers.

Unit 2 includes approximately 220 metres of dark carbonaceous phyllite interlayered with thin grey limestone layers. Calcite and biotite are common within this unit, and pyrrhotite is ubiquitous. Quartz and carbonate augens and the abundant limy partings give this rock a distinctive layered appearance.

The 'garnet zone,' unit 3, coincides with a pronounced fault zone. It is generally medium to dark green in colour and contains abundant spessartine garnets. In part, it consists of dark banded 'cherty' layers, medium green chlorite-phyllite layers, and dark greasy lustered talc (?) - chlorite-graphite layers. Pyrrhotite may be very abundant, concentrated in layers or in discontinuous streaks.

The garnet zone is sheared and broken, and cut by numerous quartz-carbonate veins. The garnets pre-date this deformation and probably an earlier deformation which produced the prominent mineral foliation in the metasedimentary rocks. This early foliation is bent and warped around the garnet porphyroblasts.

The garnet-rich layer is a metamorphosed manganiferous iron-rich cherty horizon. It is areally restricted, dying out to the west away from the massive sulphide layer (Fig. 8).

The massive sulphide layer is enclosed within light green to brown, very siliceous chlorite and sericite-phyllite (unit 4). These grade to fine-grained quartzites. A grey limestone layer, 1 to 2 metres thick, occurs within unit 4 above the sulphide layer. Pyrrhotite, chalcopryrite, and minor sphalerite, generally uncommon within the unit, increase substantially just above the sulphide layer. Here they occur as fine disseminations, discontinuous blebs, and as layer-parallel streaks. Below the massive sulphide layer, sulphides are less common occurring primarily as discontinuous layers in a dark-layered siliceous rock.

A light grey banded limestone (unit 6), averaging 10 to 20 metres in thickness, occurs below the phyllites of unit 4. The limestone is underlain by siliceous sericite-biotite-chlorite phyllite, schist, minor quartzite, and limestone of unit 7.

The massive sulphide layer (unit 5) averages from 2 to 5 metres in thickness. It consists of pyrrhotite and chalcopryrite with varying amounts of sphalerite. Galena, although uncommon and not identified in core, was observed in a number of specimens from the adit dump. Rounded clear quartz fragments, darker 'chert' fragments, and dark chlorite-phyllite fragments are common within the massive sulphide layer. The sulphides

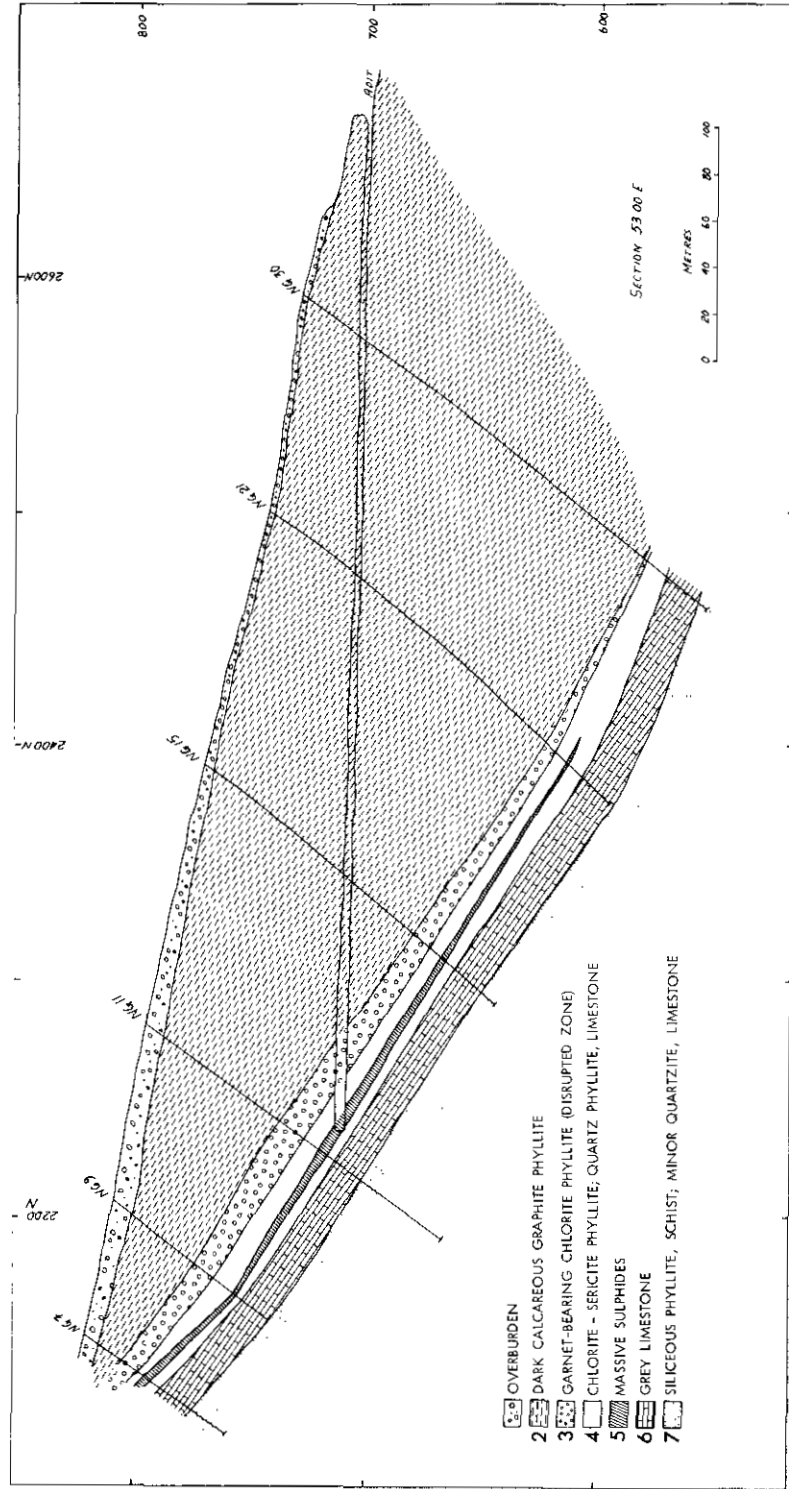


Figure 7. North-south vertical section (53 + 00 E) through Goldstream deposit.

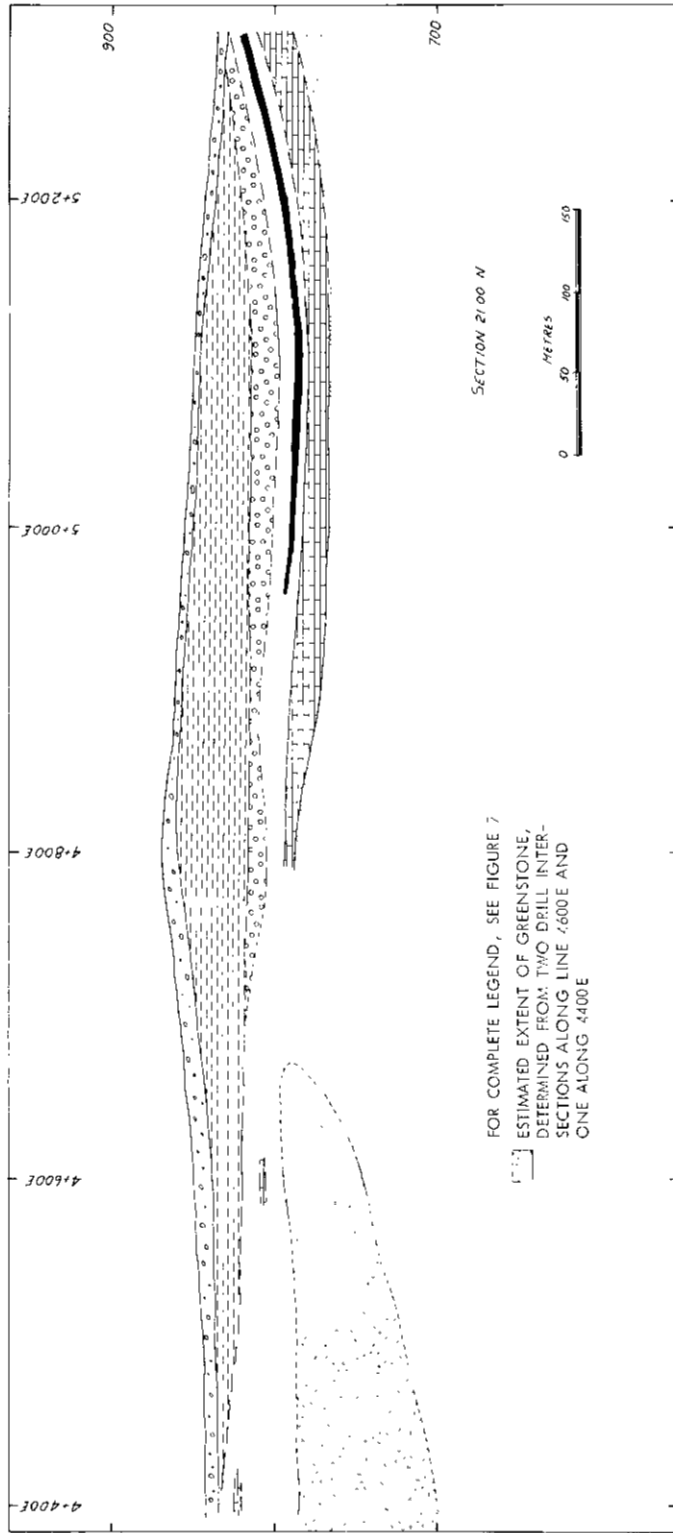


Figure 8. East-west vertical section (21 + 00 N) through Goldstream deposit.

are commonly sheared and mylonitized, particularly toward the boundaries of the sulphide layer, and are generally coarser grained and massive toward the centre. Layering, defined by alternations of the various sulphides, is not present (or at best, very rare). In general, the lower contact is very sharp whereas the upper contact **may** be more gradational over a few feet with the disseminated sulphides in the overlying phyllitic quartzite. There is not a consistent variation in the Zn/Zn + Cu ratio within the sulphide layer or in the immediate country rock; Zn appears to be higher when the gangue is more calcareous.

CONCLUSIONS

A number of features within the massive sulphide layer and in the immediately surrounding country rocks suggest that the deposit and host rocks may be inverted. These features include the sharp lower contact as opposed to the generally more gradational upper contact, the more common disseminated nature of sulphides in the structural hangingwall contrasted with their layered nature in the footwall, and the relatively higher abundance of sulphides in the structural hangingwall metasediments (including the garnet zone). As well, the 'greasy' lustered dark talc(?) - chlorite alteration, common in units above the sulphide layer (particularly in the garnet zone), is more typical of altered footwall sediments in other massive sulphide deposits. An attempt to recognize an alteration 'pipe' may be futile due to the intense regional deformation in the Goldstream area. An alteration pipe, if it existed in the deposit, may be so attenuated as to no longer be recognized.

Consideration of regional structures in the Goldstream area (*see* preceding paper on regional geology) also suggests that the sequence of rocks in the immediate vicinity of the deposit may be inverted. At Downie Peak, 10 kilometres to the southeast, graded grit beds indicate that rocks young toward the core of the 'Downie Peak' antiform. The axial trace of this antiform swings east-west just northwest of Downie Peak and is probably located south of the deposit in the Goldstream area.

The Goldstream deposit is one of a number of massive sulphide deposits south of Goldstream River. 'Standard,' drilled by Noranda in August and September, and 'Montgomery,' on a steep southern slope of Downie Peak, are massive sulphide deposits both traceable for more than a kilometre along strike. Standard is within a thick greenstone unit, Montgomery is in 'siliceous, vitreous rocks which probably varied originally from quartzite to calcareous sediments' (Gunning, 1928A, p. 160A).

These deposits compare favourably with the 'bedded cupriferous iron sulphide' or 'Besshi' type deposits in Japan (Kanehira and Tatsumi, 1970). They are both bed-like or lenticular in form, are composed primarily of massive compact pyrite - (pyrrhotite at Goldstream) chalcopyrite ore, and occur in geosynclinal crystalline schists associated with submarine basic volcanism. In contrast, some of the typical features of Kuroko deposits are absent: the association with acid volcanism, the common metal and ore-type zoning, and the association with sulphates (barite, gypsum, and anhydrite).

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