

COPY

P. M. Kavanagh

W. M. Sirola

Liard Copper Mine - Summary Report
for 1969 Exploration.

Feb. 5/70

Seraphim now gives the east zone the following drill indicated ore reserves:

a) 242-million tons averaging 0.418% Cu and 0.036 MoS₂;
strip ratio 1:1; cut-off grade 0.30% Cu equivalent.

or:

b) 159-million tons of 0.492% Cu and 0.041 MoS₂; strip ratio 2:1;
cut-off grade 0.4% Cu equivalent.

These results are interesting if they can be confirmed by fill-in drilling.

Silver Standard, not to be outdone, calculated inferred reserves of 330-million tons of slightly below 0.50% Cu equivalent. A copy of Seraphim's report is enclosed in case they neglected to send you one.

W. M. Sirola.

WMS/1k
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SILVER STANDARD MINES LIMITED
(NON-PERSONAL LIABILITY)

February 2, 1970

Mr. W.M. Sirola
Kerr Addison Mines Ltd.
402 - 1112 West Pender Street
VANCOUVER, B.C.

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KERR ADDISON MINES LTD.


Per.....

Dear Bill:

I enclose for your information two copies of a short report by Dr. R.H. Seraphim which gives his assessment of the work carried out to date at Liard Copper Mines. One of Silver Standard's engineers has taken a slightly different approach in calculating inferred reserves, and came up with 330 million tons of a grade slightly below 0.50% combined.

Yours very truly,

SILVER STANDARD MINES LTD. (N.P.L.)


A.C. Ritchie
Executive Vice-President

ACR:dn
Encl.

Telephone: Office 685-2914
Res. 224-7309

R. H. SERAPHIM ENGINEERING LIMITED
Geological Engineering

427 -- 470 GRANVILLE STREET
VANCOUVER 2, B.C.

SUMMARY REPORT for 1969

LIARD COPPER MINES

SCHAFT CREEK PROPERTY

by

R.H. Seraphim, Ph.D. P.Eng.

January, 1970.

R. H. SERAPHIM ENGINEERING LIMITED
Geological Engineering

427 — 470 GRANVILLE STREET
VANCOUVER 2, B.C.

INTRODUCTION

This report summarizes the results of Hecla's work for the 1969 season. The author visited the property on September 9, 10, and 11, and has obtained the 1969 engineering information from Hecla. The readers are assumed to be familiar with the property, or are referred to a complete report of August, 1967 and a summary report of January, 1969.

CLAIM HOLDINGS

The claims controlled by Hecla were increased to 324. Liard Copper owns 94, Paramount Mining 39, and Hecla has staked 191. The boundary problem between Liard and Paramount was resolved during the year, and the Paramount claims are now all under option.

WORK COMPLETED and COSTS

The major expenditure continued to be for diamond drilling; 13,334 feet were completed on Liard ground and 2,167 feet on Paramount ground for a total of 15,501 feet. Bulldozer trenching totalled 2,500 lineal feet. The mineralized area and its environment were mapped geologically at 400 feet to the inch; the map area is approximately 10 miles by 10 miles. The costs for the season are reported to be \$410,000, of which \$341,000 were spent on Liard ground and \$69,000 on Paramount ground.

GENERAL GEOLOGY

The V shaped configuration of the mineralization, discussed in the summary of 1968's results, continues to appear valid. The V is open to the north. A north to northwest trending breccia zone, containing higher grade mineralization, and located 500 to 1000 feet west of the west limb of the V, was also described in this previous report, and has now been explored further. The east limb of the V has been called the East zone, the west limb the Central zone, and the breccia the West zone.

The Central and East zones are both very irregular; the zone boundaries are gradational and masses with less than 0.2% copper are found within the zones. The East zone continued to maintain its width of approximately 1000 feet, but is of course wider where it merges with the

Central zone at the south end of the V. This East limb is now cross-sectioned by diamond drilling at 500 foot intervals from 1500 feet north (near the cap rock) to the junction area at 1000 feet south. Mineralization in three old (Asarco) and short holes at 2000 feet south is encouraging enough to suggest that the 1500 foot south section line should be drilled. The East zone is thus 3000 to 3500 feet long.

The Central zone (west limb of the V) is not as well exposed or as well drilled. Little or no drilling has been completed on the 500 foot south and 500 foot north section lines. The mineralization is probably even more irregular than that in the East zone, and in fact, it may well prove to be a series of en echelon lenses rather than a continuous structure. It appears to be 2500 to 3000 feet long, merging with the East zone at the south end, and is either cut off by or swings around highly feldspathized but barren rocks in two short holes drilled on the northern projection. *

The West, or Breccia zone was cut by two new holes in 1969, but neither of these gave intersections comparable to those obtained in previous drilling. The southmost new hole (500 feet south of 1968 drilling) intercepted only 20 feet of the zone (2.89% Cu - 0.19% MoS₂) before coring a long section of fault gouge. The northmost

new hole (500 feet north of 1968 drilling) cut a good width of breccia, but the contained mineralization is predominantly pyrite. However, similar breccia with copper mineralization was intercepted in the Paramount drilling 2800 feet north of, and on trend of, the northmost exposure on Liard ground. The intervening ground is without outcrop or drill holes.

TONS and GRADE

Now that the continuity of mineralization in the East zone is fairly well established by the drilling on 500 foot section intervals, an estimate of the indicated reserves has been completed. A pro forma pit was laid out to encompass both the East and Central zones (i.e.) the 'V'. The pit is roughly oval shaped, 4800 feet in longest dimension (north-south) and 3800 feet in maximum width. The pit walls are assumed to average 45 degrees on slope. The floor elevation varies from section to section, depending on the depth of drilling or intersection of sub-ore material but was kept close to 2200 feet. The highest 'ore' known, near the north end of the East zone, is at 3900 feet elevation in surface trenches. Parts of the pit could be deepened without stripping back the walls if good grade material is found to carry below the postulated pit floor.

The reserves were calculated by assuming that the 'ore' drilled on each section plan would continue half

way to the next plane on each side (i.e.) a total of 500 feet. The tonnage factor used was 12 cu ft per ton. Hecla staff compiled all their assay results using a 'copper equivalent', which added $3 \times \% \text{MoS}_2$ to the copper assay. The following tonnages are calculated assuming a cut-off of 0.3% copper equivalent, and also a cut-off at 0.4% copper equivalent. The percentage of 'ore' to 'waste' within the mineralized zone in each section interval is taken as the percentage intersected in the drill holes on the pertinent section plane.

	Tons	%Cu	%MoS ₂
(1) Total tons within pit perimeter	520,000,000		
(2) Waste which could be (but does not necessarily have to be) stripped pre-ore	118,000,000		
(3) Tons 'ore' at 0.3% cut-off	242,000,000	0.418	0.036
Waste to ore ratio (including possible pre-ore stripping) 1 to 1			

Note - Approximately 45,000,000 tons are within the Central ore zone, but have no drill holes completed on the section planes 500 S and 500 N. This tonnage is thus excluded from calculations of stripping ratios on the premise that it should contain similar waste-ore ratios if and when it is drilled.

(4) Tons ore at 0.4% cut-off	159,000,000	0.492	0.041
Waste to ore ratio 2 to 1			

(5) The West or Breccia zone is calculated on a similar basis, but using no cut-off, since it is a fairly well defined zone without gradational boundaries. The tonnage amenable to open pitting to 600 ft depth, i.e. the currently drilled depth, is 7,100,000 tons of 0.68% Cu - 0.017% MoS₂ at a waste to ore ratio of 2.3 to 1.

EXPLORATION POSSIBILITIES

The 1969 years work has again determined several areas where further work is necessary to confirm the indicated tonnages and add new reserves, these are:

(1) A drill hole on the Paramount ground intercepted 380 feet of 0.43% Cu, 0.078% MoS₂. Further drilling on the trend of the breccia zone containing this mineralization has an excellent chance of proving up tonnage. As discussed above, 2800 feet of ground towards the drilled area on Liard is 'open' and favorable.

(2) The east and west limits of the East and Central zones are relatively well established, but the south limit of the V, and the north limit of the west limb (Central zone) remain to be determined.

(3) Much short hole drilling, perhaps by percussion, is needed to 'fill-in' the diamond drilled sections of all the zones.

January 30, 1970.

R. H. Seraphim
R.H. Seraphim.