



Vancouver Petrographics Ltd.

JAMES VINNELL, Manager
JOHN G. PAYNE, Ph. D. Geologist

826093
Chalice

P.O. BOX 39
8887 NASH STREET
FORT LANGLEY B.C.
V6X 1J0

PHONE (604) 888-1323

Report for: Dieter Schindelhower,
Chalice Mining Inc.,
Sechelt, B.C.

February 12, 1983

EDS study of Ag-Au inclusions in marcasite - sample NL-1M-A

The study was carried out at Bacon-Donaldson and Associates Ltd., Vancouver using a Kevex 5100 Energy-Dispersive Spectrometer attached to an SEM. Attached are SEM images, photomicrographs and EDS spectra of the phases occurring as inclusions in the marcasite.

All the inclusions were found to be tellurides, excluding native Au. The photomicrographs illustrate the form and occurrence of these minerals. The commonest is a Ag-Au telluride and was identified as a possible Ag-sulphosalt (bluish grey mineral) in my previous report. Less common and forming smaller inclusions are Au-Ag-Bi-Pb minerals (white and yellowish cream minerals). Native Ag was not found; grains previously identified as silver were found to be Ag-rich tellurides.

In the EDS spectra all elements (above 0.01%) are indicated by their positions on the energy spectrum. The intensity of the element peaks is roughly proportional to the amount present. In some cases, depending on the elements, the mineral can be identified. In most cases identification is narrowed down to two or three possible minerals. Some spectra indicate mineral mixtures - all the Fe in the spectra comes from the surrounding marcasite; the S peak is buried under the Pb, Bi and Ag peaks.

Four chemical types of inclusion were found:

Au telluride
Ag-Au tellurides
Au-Ag-Bi telluride
Pb-Bi telluride

The commonest are Ag-Au tellurides. Ag and Au are variable in their proportions from grain to grain and within a grain. There are probably mixtures of minerals and in some cases native Au can be seen. However in most cases the Au is an essential part of the mineral. Possible minerals are:

Petzite Ag_3AuTe_2
Sylvanite AgAuTe_4
Empressite AgTe
Hessite Ag_2Te

Ag - Te minerals without Au were not found although Au is minor in some cases. These could be empressite or hessite with minor Au. No doubt solid solutions of these phases occur.

(cont.)

Au tellurides are less common than Ag-Au tellurides and may in some cases be intergrown. Grains that were found were only a few microns in size. Possible minerals are:

Calaverite AuTe
Krennerite AuTe₂
Muthmannite (Au,Ag)Te

Two types of Au-Ag-Bi tellurides were found - one is Ag rich, the other is Au rich. Only one Ag-Bi telluride is known. Au-Bi telluride is unknown, as far as I can tell from the literature that I have available. The Ag-Bi-Te-Au phase is possibly Volynskite (AgBiTe₂) with minor Au. The Au-Bi-Te-Ag phase is possibly the Au end member of a solid solution series, with volynskite the Ag end member.

Pb-Bi telluride occurs associated with the Au-Ag-Bi tellurides (see SEM images). A possible mineral is:

Rucklidgeite (Bi,Pb)₃Te₄

The Bi-bearing inclusions are white or cream in colour and are the least common. I suspect that other Bi-Te phases could be found by a more exhaustive examination. (tsomoite BiTe; wherlite BiTe; tellurobismuthite Bi₂Te₃; hedlyite Bi₇Te₃).

A. L. Littlejohn
A.L.Littlejohn, M.Sc.

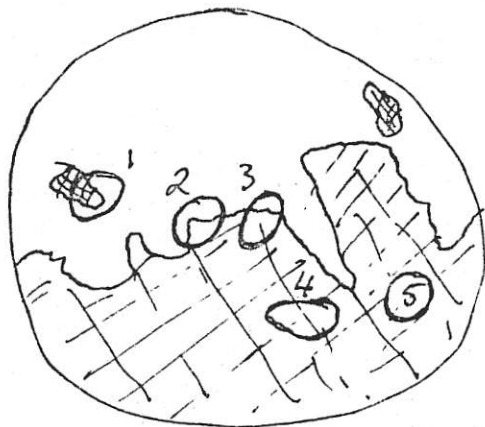


Vancouver Petrographics Ltd.

JAMES VINNELL, Manager
JOHN G. PAYNE, Ph. D. Geologist

P.O. BOX 39
8887 NASH STREET
FORT LANGLEY, B.C.
VOX 1J0

PHONE (604) 888-1323

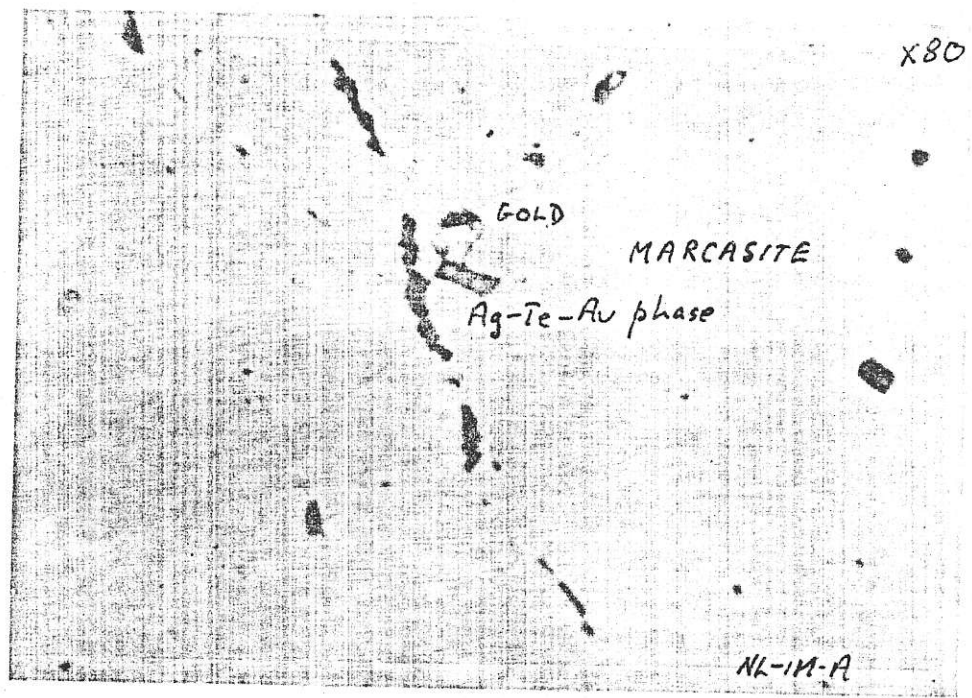
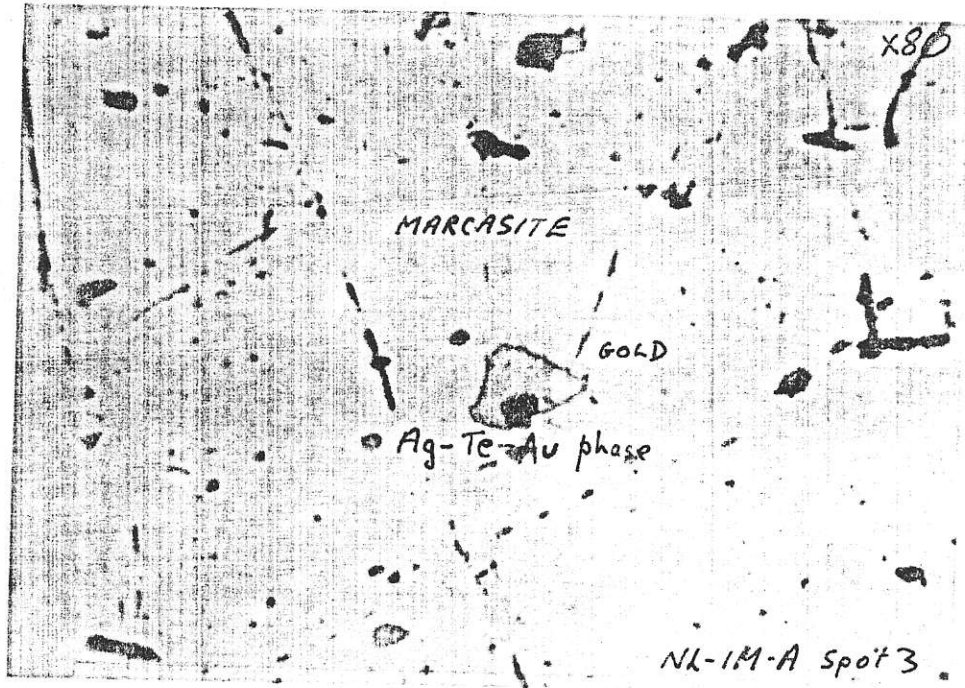


Sketch of spot locations
Sample NK-1M-A.

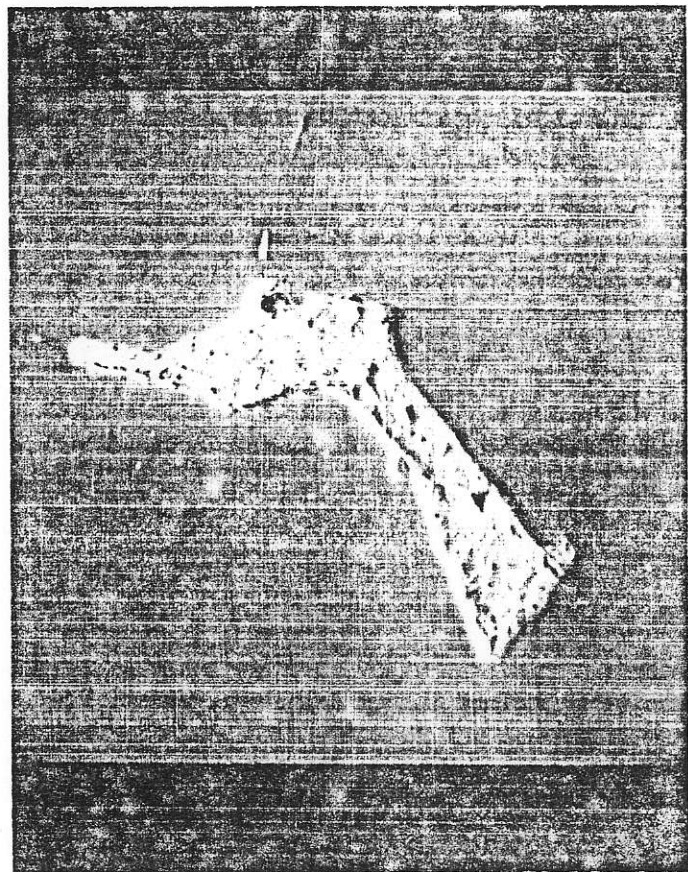
Number on EDS spectra
indicates spot from which
it was taken.

Unless indicated, photomicrographs
were taken elsewhere on the
section.

This sample should be carefully preserved - it
represents a very unusual mineral assemblage.
Proper characterisation (i.e. mineral compositions) could be
carried out at the GSC or perhaps at a university.
I have no doubt that other, perhaps unique, minerals
could be found in this deposit.



SEM Images - Ag-Te-Au phases

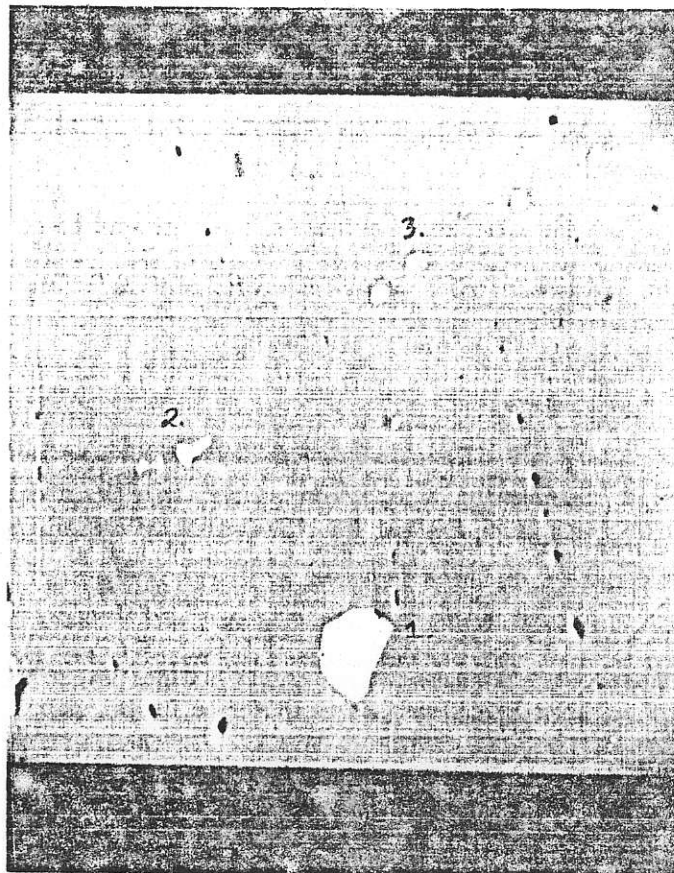


Ag-Te-(Au)

X1600

Ag-Te, minor Au

NL-IM-A spot 2



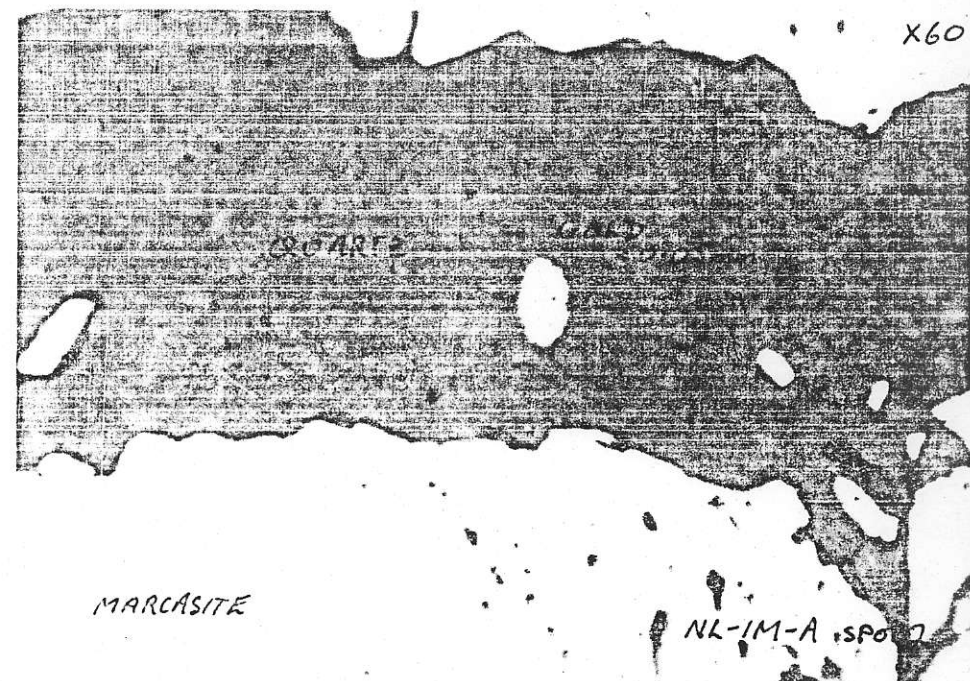
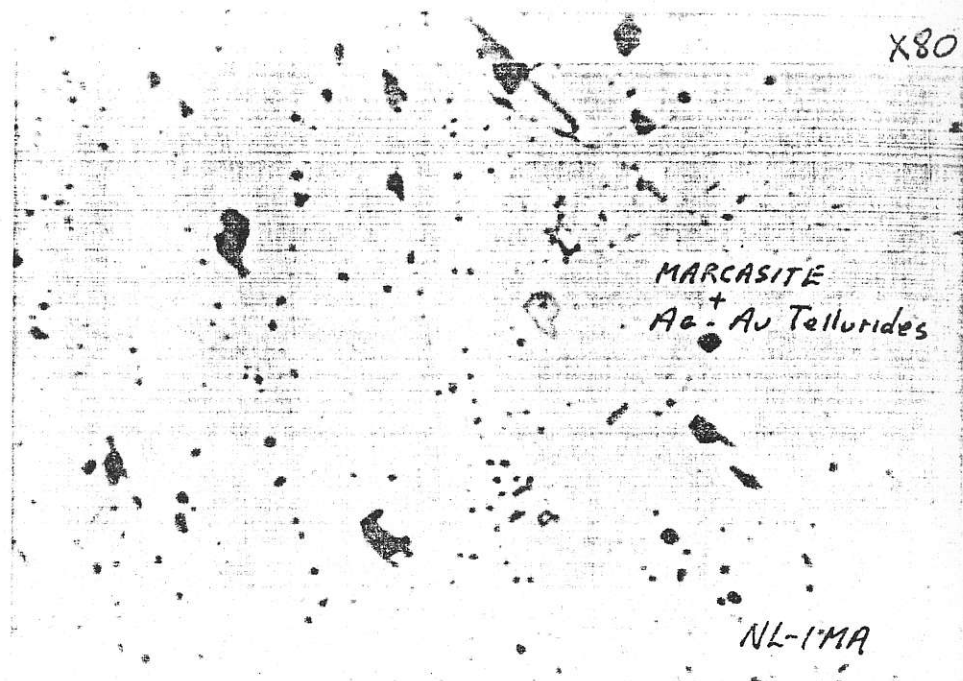
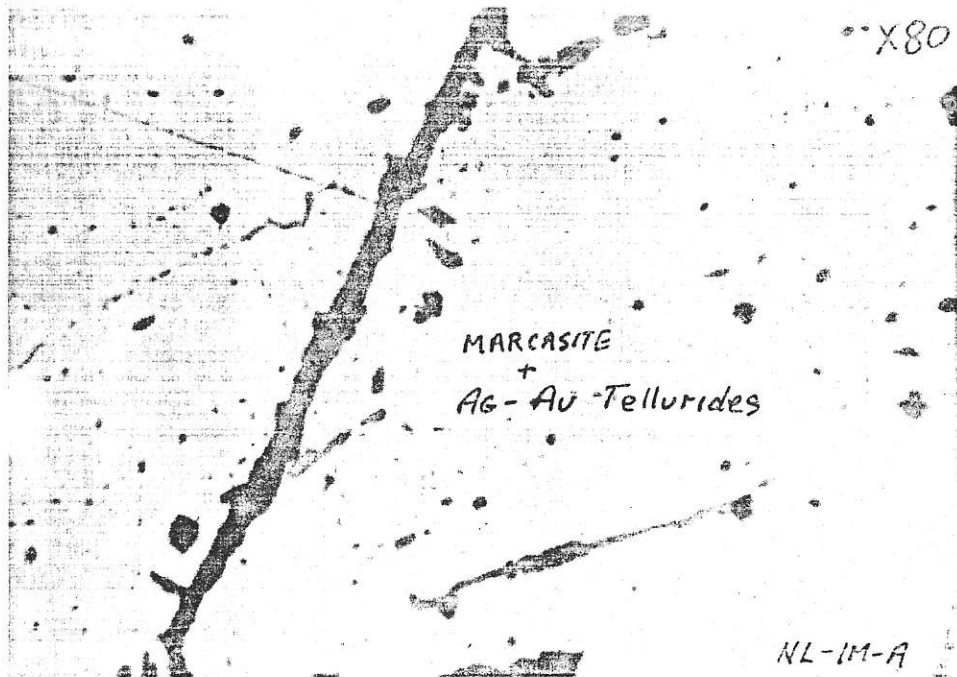
X750

1. Pb-Bi-Te, trace Ag

2. Ag-Te, minor Au

3. Te-Au-Ag-Bi

NL-IM-A spot 5



(1)

-Ag-

Ag-Te-Au phase

Petzite Ag_3AuTe_2

Sylvanite $AgAuTe_4$

Muthmannite $(Ag,Au)Te$

Au
-5-

}-Te

-Fe
-Fe

-Au

-Au

②

- Au

Au phase

Native Gold

trace Ag

- Au

- Ag

- Au

- Au

- Au

3

}-Te

Te-Au-Bi-Ag phase

unknown

-Au

-Bi

-Ag

-Fe

-Fe

-Au

-Bi

-Au

-Bi

5

- Au
- Bi
- Ag } Te

Te-Ag-Bi-Au phase

Volynskite AgBiTe_2 minor Au

- Fe

- Fe

- Au

- Bi

- Au

- Bi

(5)

Pb, Bi
—
— Bi

Pb-Bi-Te phase

Kucklidgeite (Pb,Bi)₃Te₄ trace Ag

3 Te

— Ag

— Te
— Fe

— Pb
— Bi

— Pb
— Bi

(4)

}-Te

- Au

Au-Te phase

Krennerite AuTe₂

Calaverite AuTe

- Au

- Ag

- Fe

- Au

- Au

- Au