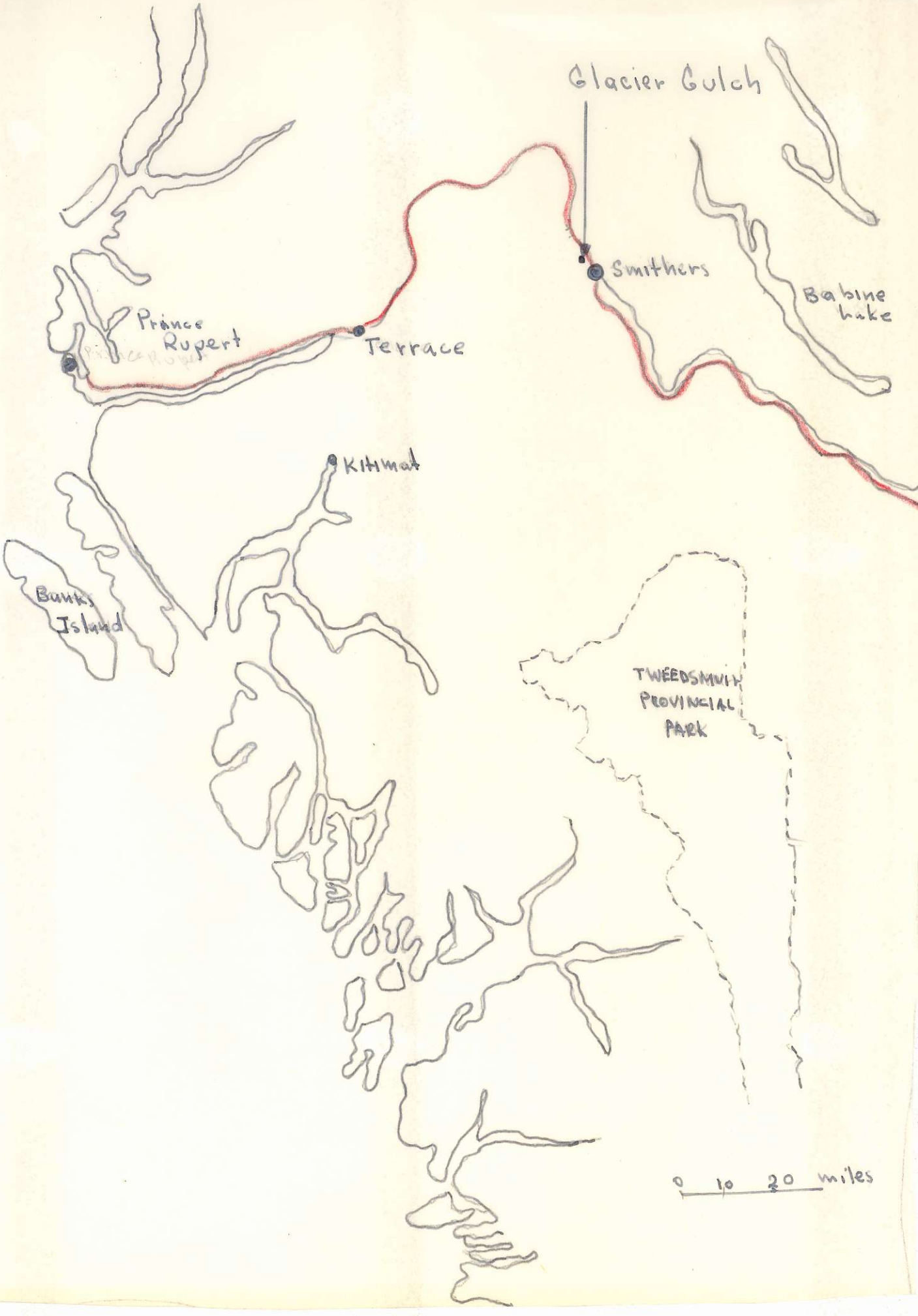
Eduardo Noriega ✓

Glacier Gulch, B.C.

Omineca

Glacier Gulch
B. C.


Glacier Gulch
Smithers
Babine Lake
Prince Rupert
Terrace
Kitimat
Banks Island
TWEEDSMUIR PROVINCIAL PARK
0 10 20 miles

- Glacier Gulch Gold Group -

The Glacier Gulch Gold property is on the south side of Glacier Gulch 5 miles northwest of Smithers, on the east slope of Hudson Bay Mountain. The claims belonged to Stewart F Campbell, Grover Bowles and Wesley Banta of Smithers when visited by the Geological Survey of Canada, 1933)

Glacier Gulch is a narrow V shaped steep-walled ravine nearly a mile long and trending northeasterly. Rock outcrops are plentiful on both sides. Gold associated with bismuth minerals was discovered on this property in 1929. The gold-bismuth occur along sheared and altered zones in massive finely crystalline tuffs with which some beds of argillite are interstratified. Most of the sheared zones lie parallel to bedding planes and appear to have formed as a result of relatively small movements produced when these rocks were folded. The productive zones are confined to the crest of an anticlinal fold. A silver-lead-zinc vein occurs along a fault fissure about 700 feet northeast of the gold-bismuth deposits. The sheared and altered zone of the gold-bismuth commonly exceed 100 feet in lenght and have a width of from 1 to 2 feet. The ore occur in the most altered parts of the sheared zones where the tuff is bleached to a dull white colour. A number of samples of the less altered rock were assayed for gold with negative results. In some cases the altered rock is replaced by considerable qtz.
The high-grade ore is a white, silicified tuff holding bismuth tellurides. The mineral occur as very thin seams along planes of shearing and as irregular replacements

The altered rock consists of albite and quartz with calcium carbonate, talc and sericite. Rock alteration was followed or accompanied in many places by introduction of veins of quartz. The quartz is present as veins, veinlets and pockets.

Object

The object of this report is the megascopic and microscopic examination of specimens from the Glacier Gulch Mine near Smithers B.C. The megascopic examination included the study of more than 30 hand specimens of different sizes and the identification of all visible minerals plus the description of megascopic structures The microscopic required the identification of the individual minerals, petrographic study, account of the technique used in the identification of minerals, main properties, list of the minerals in decreasing order of abundance, description of textures, paragenetic sequence of deposition and thermal classification of the deposit.

Megascopic

The hand specimens consist in the main of partially or completely altered white-grey, yellowish and brown tuffs which are now lime-kaolin-silicates. Some of the specimens have been strongly silicified, others consist almost entirely of calcium carbonate, Quartz has almost completely replaced some of the specimens but by far the greatest alteration has been kaolinization of the feldspars that were in the original tuffs.

Alteration -

Most of the specimens show alteration to a certain degree. The products of alteration seen in the hand-specimen were mainly:

a) Carbonitization : partial. The carbonates were mainly calcium carbonate. The product of this alteration had probable source from the emanation of CO_2 that acted on calcium rich feldspars producing calcium carbonates.

b) Sericite : product of hydrothermal alteration of feldspars

c) Talc and white micas formed from the feldspars

d) Chloritization : formed from some of the mafics present in original tuff.

e) Kaolinization = extensive due to hydrothermal alteration

f) silicification : extensive

Some of the specimens show one or more particular alteration in excess, but most have altered extensively. Some brown garnets were interpreted as "indigenous" due to the presence of altered iron sulphides, but no pyrite was observed at all in the specimens examined.

Description

The hand-specimens contain perfectly crystallized quartz in druses, attached to the silicified rock. This

Bismuth has replaced Bismuthinite.

Scale 5x

Bismuth replaced Bismuthinite.
(sharp projections of Bismuth into BiS_2

Scale 5x

quartz shows a light yellow tinge. Massive quartz of white colour but with indications of having filled fractures are also seen. Some of the specimens show chlorite and epidote. Some flaky spots of green light colored were found to consist of talc. The mineralization consists of patchy grayish seams introduced along fractures and fissures and intimately associated with quartz. The minerals present are in the main massive but some specimens had perfectly crystallized specimens. One of them with euhedral outlines and greyish color plus some tarnished surface had a lenght of of more than 1 inch. Others well crystallized were platy, tarnished and with very good basal cleavage. Tiny yellow specks were seen with the grey minerals but also isolated, to a lesser extent.

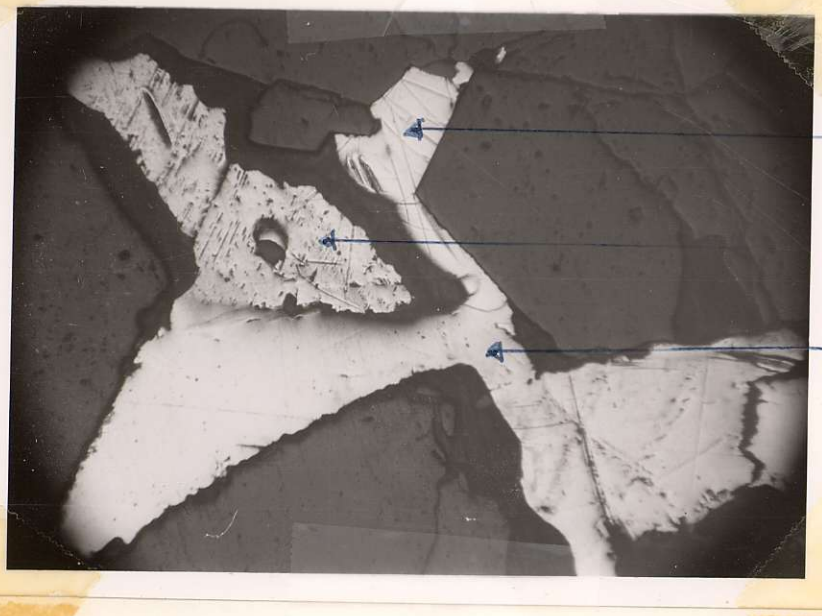
Minerals. The minerals observed were determined as:

1.) Sample crystal of bismuthinite with grey white color and low hardness.

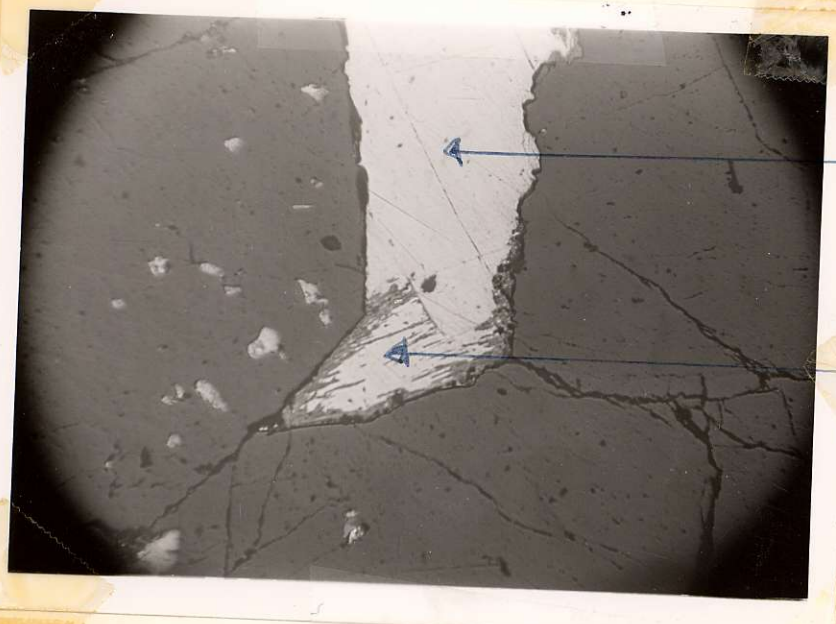
2.) Gold = yellow tiny specs with the mineral seams.

3.) Seams of minerals of grayish colour impossible to identify in hand specimen.

4.) Some black tarnished very sectile masses were presumed to be Bismuth.



Gold has replaced Joseite.
Bismuth and Joseite show partial mutual Boundary. Scale 5x



Joseite has replaced Bismuthinite
Scale 5x

Microscopic

The microscopic examination was performed in 10 polish sections. The minerals found were.

1) Bismuthinite

Colour: white
hardness: B
anisotropism: strong: colors: bright olive to grayish violet
reflection : fairly high
association : joseite, bismuth, gold
etch tests : HCl : tarnished.

microchemical : Bi present
Te absent

2) Joseite

Colour : white
polish : good
reflectivity : high
anisotropism : very weak
etch tests : $FeCl_3$: brown color
HCl : weak tarnish
HNO_3 & aqua regia : black
others negative.

microchemical : Bi } present
Te }

3) Bismuth

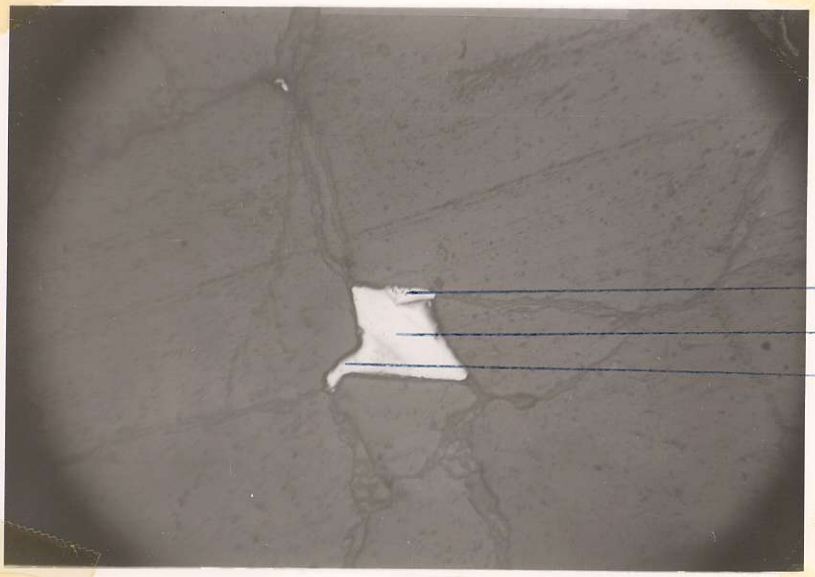
Colour = pale pink
hardness = low sectile
anisotropism = distinct
tarnish = iridescent tarnish
etch tests : HCl = tarnished
$FeCl_3$ = tarnished
$HgCl_2$
KOH
$HgCl_2$
} negative

microchemical : Bi present.

4) Gold

colour = yellow
hardness = low - sectile
anisotropism = isotropic
polish = good
etch : aqua regia = positive
others negative
microchemical = Au present.

Bismuth replaced Joseite and Bismuthinite Scale x5



Gold has replaced Joseite.
Joseite and Bismuth show mutual boundaries texture
Scale 5x

Petrographical analysis

The petrographic study was made in 4 thin sections from the hand-specimens.
The minerals present in the rocks examined were:

1) orthoclase:

color = colorless, some cloudiness)
relief: low $n <$ balsam
birefringence = weak
interference figure: biaxial –

2) microcline

color = colorless
relief = low $n <$ balsam
twinning = polysynthetic in two direction (grindiron)

3) Plagioclase - Albite -

colourless
relief = $n <$ balsam
twinning = albite twinning
extinction = 13°

4) Calcite

Colour = cloudy
cleavage: two at oblique angles
birefringence = very high

5) Sericite

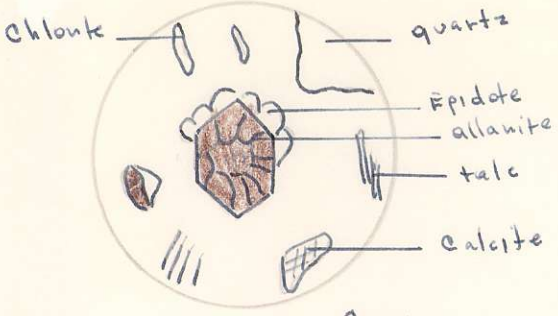
Colour = thin colorless
cleavage = some show it
form = minute crystalline aggregates
birefringence = strong

6) Quartz

colorless
cleavage = none
figure = uniaxial positive

7) Talc

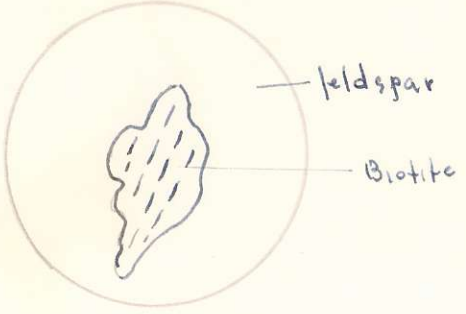
Colorless
form = fine platy aggregate
birefringence = very strong
axial angle = 15° —



Scale

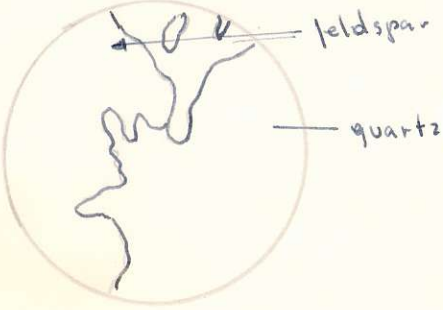
5X

Crystal of allanite nucleiting epidote.



Scale 5X

Crystal of biotite. Corroded outline may indicate secondary origin



Scale 5X

Quartz has replaced feldspar

8) Chlorite

Color = colorless
form = same form shaped
birefringence = weak

9) Allanite

Color = brown
form = hexagonal prism
relief = high n > balsam
birefringence = brown (masked by this color)
pleochroism = present
association = epidote

10) Epidote

Color = colorless
form = replaces allanite - anhedral.
birefringence = moderate - (yellow)
association = allanite.

11) Biotite !

Color = brown
birefringence = strong
extinction = parallel
cleavage = {001} perfect.

Mineral abundance

The abundance of minerals was determined from both the hand-specimens and the polish section. The specimens contained approximately 97% of gangue material and 3% minerals.

The mineral distribution with respect to abundance was:

1) Joseite (A and B) = 40%
2) Bismuthinite = 30%
3) Bismuth 15%
4) Gold 15%

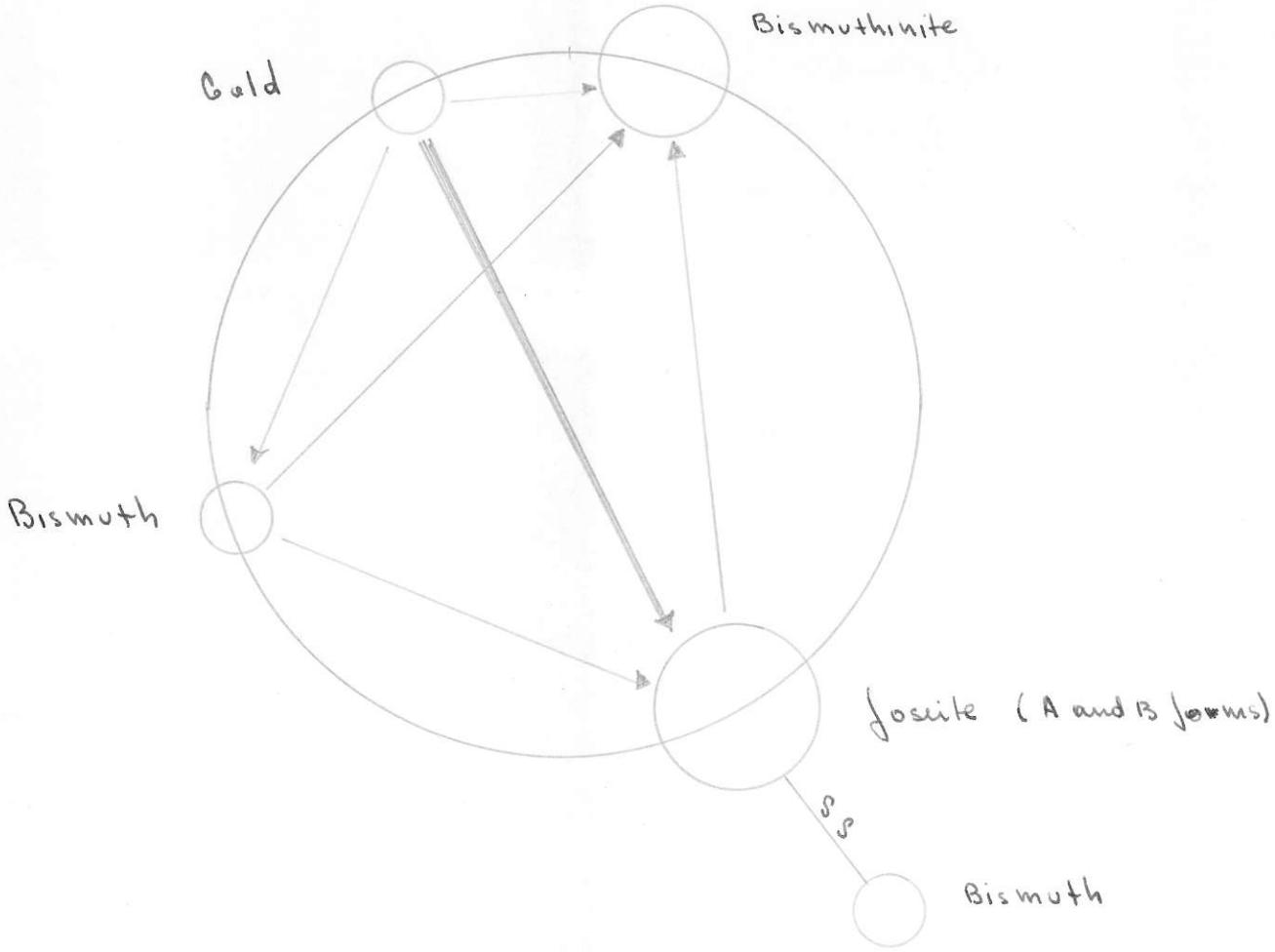
The gangue minerals were also calculated.

Feldspar and kaolin = 60%
Carbonate 10%
Quartz 20%

Talc
sericite
chlorite
allanite
epidote
biotite

} 10%

Paragenetic sequence.



Classification

From the study of the temperature of ore deposition, the textures found in the sections examined, the alteration produced and the presence of low temperature minerals like bismuthinite and telluride the mineral deposit may be classified as epithermal that is formed at low temperature.

Conclusion

The mineral deposit seems to have started mineralization around 250°C and formed at low temperature. The presence of orthoclase and microcline plus albite somehow indicate that the original composition of the intruded tuffs was more on the acid side. There is definite evidence for fracturing in the deposits and we can indicate that the mineralizing solutions filled the fractures in the rock. In the history of the deposit there was early faulting and fracturing and gaseous emanations allowed to go out and carbonatized the tuffs. On account of the high porosity of tuffs the process of silicification was rather easily achieved when solutions reach in silica intruded the fractures. The open space facilitated formation of well crystallized

quartz while some other portions of the silica silicified the porous tuff. Additional milky quartz came after bringing the bulk of the minerals. The hydrothermal solutions acting on the feldspars started sericite formation and alteration of feldspars to kaolin. There seems to be accumulation of minerals in the more kaolinized portions, indicating that these parts were more heavily acted by solutions. The presence of chlorite is due to alteration of the mafics probably present in the original rock. The presence of allanite could be interpreted as the crystallization of a late magmatic mineral. The well crystallized forms shown in one thin section examined could support this idea but it may be also form like any of the other members of the epidote group. In fact epidote surrounds allanite in the specimen examined. Epidote and talc are products of alteration of the feldspars. In the paragenetic sequence there is good textural evidence to think that bismuthinite formed first. Gold seems to be associated with joseite, but also there is some that replaced bismuthinite. The relation bismuth-joseite is not a well defined one. Mutual boundary textures seems to be the usual but somehow it looks like bismuth is the youngest mineral formed as a residue. The presence of biotite is unexpected but it is probably secundary.