A MINERAGRAPHIC EXAMINATION OF SOME ORES FROM BRITISH COLUMBIA MINES

by

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GEOLOGY 24

A report of work carried on in the laboratory in fulfillment of the course.

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A MINERAGRAPHIC EXAMINATION OF SOME ORES FROM FOUR BRITISH COLUMBIA MINES

INTRODUCTION

The ores treated in the following paper were collected from the following mines:

(1) Windpass Mine - North Thompson River

(2) Vidette Mine - North of Savona

(3) Savona Mine - North of Savona

(4) Glacier Gulch Mine - Hudson's Bay Mountain, Smithers

The Windpass and Glacier Gulch mines are treated separately.

The Vidette and Savona mines are treated collectively because of their geographical proximity and geological similarity.

There is some similarity in the ores from the Glacier Gulch and Windpass mines, both mines contain bismuth minerals and these bismuth minerals have a direct relationship to the gold.

A treatment of tailings from Chelan, Washington, on the infra-sizer and super-panner is described. This work was carried out by the writer and J. W. McCammon.

A MINERAGRAPHIC EXAMINATION OF THE ORE FROM THE WINDPASS MINE.

A MINERAGRAPHIC EXAMINATION OF ORE FROM THE WINDPASS MINE

LOCATION

The Windpass mine is situated five miles up the North Thompson River from Boulder, a village on the Canadian National Railway line. The mine is at an elevation of 5340 feet and transportation to the mill, which is two and a half miles away at an elevation of 1828 feet, is affected by means of an aerial tram.

GEOLOGY

The following table of formations and brief description of the geology of the mine are taken from W. L. Uglow's Geology of the North Thompson Valley Map Area. (1)

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(1) G. S. C. Summary Rept. 1921 - Part A

AGE	PERIOD	FORMATION	LITHOLOGY
Quaternary	Recent Pleistocene		Lava River gravels, sands, silts Glacial drift
	Unconformity		
	Miocene	Skull Hill	Hornblende andesite Augite andesite Andesitic breccias Amygdaloidal andesite and Basalt
	Unconformity		
	(Middle Eocene(or (Upper	Chu Chua	Sandy shale Coal seams Arkosic sandstone Intraformational conglomerate Basal conglomerate
	Unconformity		
		Peterson Cr. Stock Baldic Batholith Sills Sills Darlingtonstocks	Porphyritic aklali syenite Granite, Porphyritic, Granodiorite Biotite granodiorite, quartz diorite Micropegmatite - pyroxenite Hornblende grandiorite, hornblende granite, orthogneiss
	INTRUSIVE CONTACT		
Palaeozoic or Pre-Cambrian		Barrière	Quartzite, sericitic quartzite, sericite schist, quartz pebble conglomerate Argillite, crystalline limestone, chlorite schist, schistose amygdaloidal lava
		Fennell	Ellipsoidal (Pillow) greenstone, gabbro and diorite sills, chert, volcanic breccia
		Badger	Slaty quartzite, quartz slate, biotite schist, dolomite, hornblende schist

The country rock of the vein at the Windpass Mine is the upper micropegmatite facies of the micropegmatite-pyronenite sill. This sill trends in a north-south direction just east of the boundary of the Fennell formation.

The deposit consists of a quartz vein with an east-west strike and a northerly dip. The vein pinches and swells vertically and laterally.

The west end of the vein is mineralized with quartz, pyrite, pyrrhotite, chalcopyrite, bismuth and gold. The east end of the vein is mineralized with nearly solid magnetite which contains, (from microscopic examination), bismuth, bismuthinite, and gold. The intermediate part of the vein consists of a gradation between the west end type and the east end type of mineralization.

In 1921 the vein had been traced on the surface for a distance of about 200'. Since 1933, extensive underground work has been carried on.

Uglow thinks that the mineralization took place under deep seated conditions and was the result of contributions from the Baldic Granite. The Baldic Granite outcrops 1¼ miles to the east and has a shallow plungs westerly so that it may not be very deep below the Windpass outcrop.

LABORATORY EXAMINATION OF THE ORES.

INTRODUCTION

The following is a short account of the findings of a microscopic examination of six polished sections of ore from the mine.

The number of each section and its general location in the mine is given below.

Section #1 from #6 stope

Section #2 from #6 stope

Section #3 from #675 level east

Section #4 from # 675 level east

Section #5 from # 675 level east

Section #6 from #1 level

Sections Nos. 1, 2 and 6 contain predominant magnetite. Nos. 1 and 2 contain gold, bismuth and bismuthinite. Section No. 6 is barren.

Sections 4, 5 and 6 contain predominant pyrhotite and pyrite, chalcopyrite, bismuth, gold, quartz and calcite.

MINERALOGY

The following minerals were noted in the sections examined.

Ore Minerals	Gangue Minerals
Pyrrhotite	Quartz
Magnetite	Calcite
Pyrite	
Chalcopyrite	
Gold	
Bismuthinite	
Bismuth	

In sections 1, 2 and 6 containing magnetite, no pyrite was noted while in sections 3, 4 and 5 there is abundant pyrite veining through the pyrrhotite. The same relationship seems to hold for chalcopyrite. In those sections containing pyrrhotite and pyrite, there is abundant chalcopyrite while in the sections containing magnetite, chalcopyrite is absent.

Gold is found in sections 1, 2 and 3 usually in association with bismuth or bismuthinite.

PARAGENESIS

The paragenesis in relation to elements rathen than mineral compounds was worked out by the writer as follows:

The iron element seems to be first and there appears to be two generations of iron (pyrite is found veining pyrrhotite).

The iron minerals were closely followed by iron-copper (chalcopyrite) and later by gold, bismuth, silica, and calcium which seem to have been deposited contemporaneously.

THE MINERALS

The ore in this mine is divided into two types, ore containing predominant magnetite and the other containing predominant pyrrhotite.

(1) MAGNETITE

In those sections containing magnetite, the magnetite itself composes from 90 to 98% of the specimen. The magnetite is massive, black and heavily fractured and the quartz, calcite, bismuth, bismuthinite and gold are found in association with these fractures. Only one small bleb of magnetite was found in a section containing pyrrhotite.

(2) PYRRHOTITE

In the sections containing pyrrhotite, the pyrrhotite comprises approximately 60% plus of the total mineral content.

The pyrrhotite is massive with a smooth creamy surface, it has been strongly fractured and the fractures healed with pyrite and chalcopyrite. The pyrite fills strong fractures which run through the whole section and form an intricate criss-cross pattern. The pyrrhotite-pyrite boundaries are fairly smooth but not intimate, in some places they have an almost sutured appearance. The pyrrhotite-chalcopyrite boundaries are smoother and more intimate but chalcopyrite is found veining

the pyrrhotite which would suggest a later deposition of the chalcopyrite.

(3) PYRITE

Pyrite is found in those sections containing pyrrhotite. It is fairly abundant and occurs as veins throughout the pyrrhotite. The pyrrhotite-pyrite boundaries are not intimate, nor are the pyrite-chalcopyrite boundaries.

(4) CHALCOPYRITE

Chalcopyrite is found in those sections from #675 level east but not in sections 1, 2 or 6 (i.e. not with magnetite).

The chalcopyrite is found mostly as blebs and irregular masses with fairly smooth boundaries against the pyrrhotite. In the one instance where gold and bismuth were found adjacent to the chalcopyrite, the boundaries were smooth, straight and very intimate.

The chalcopyrite is thought to be later than the pyrrhotite and contemporaneous with the gold and bismuth.

(5) GOLD

Gold was noted in sections 1, 2 and 3. The gold occurs in three ways:

(a) With quartz alone, as rounded blebs in fairly open fractures in the magnetite.

(b) Intimately associated with bismuth and bismuthinite. This relationship was represented in one spot by a type of

structure resembling graphic structure in granites.(See view 1, section 1).

(c) Where the gold is found filling minute fractures in the magnetite, the gold may or may not be associated with bismuth minerals in this occurrence.(See view 2, section 1).

(6) BISMUTHINITE

Bismuthinite is a bismuth sulfide. It is pale grey and occurs in sections #1 and #2 as small irregular blebs and in minute fractures in the magnetite. In addition to the usual etch tests, microchemical tests were made to confirm the identity of this mineral.

Where bismuthinite was found in association with gold, the boundaries are very smooth and intimate, suggesting contemporaneous deposition.

(7) BISMUTH

Bismuth was found in sections 1, 2 and 3, usually but not always associated with gold. See view 1, section 3 and view 1, section 4.

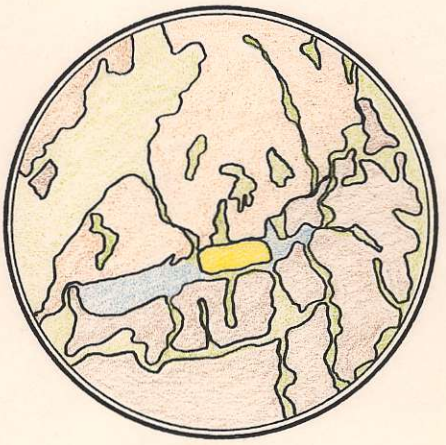
The bismuth occurs in irregular masses and blebs, but also in euhedral crystals in the pyrrhotite and chalcopyrite. The crystals have hexagonal outline. View 1, Section 4 is extremely interesting because it shows the very intimate relationship between the gold and bismuth.

CONCLUSION

From the reports of geological examinations of the mine, and from examination of the ore in the laboratory it would appear that there are two types of mineralization: high and low grade magnetite and high and low grade sulfide ores.

The low grade magnetite specimen examined contained no other mineral except quartz. Wherever gold was found in the sections bismuth or bismuthinite was found either intimately associated with the gold or nearby. There appears to be a definite relationship between the gold values and the presence of bismuth minerals.

Windpass. View 1. Section 3.



Quartz (SiO_2)

Pyrrhotite (Fe_7S_8)

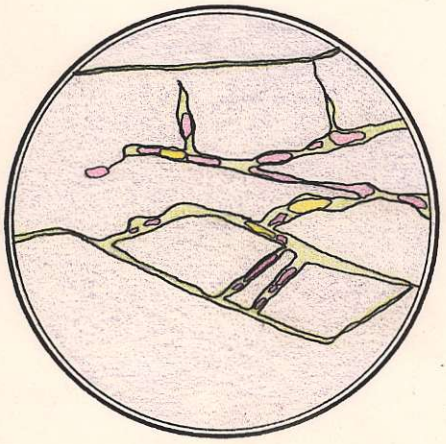
Bismuth (Bi)

Chalcopyrite ($CuFeS_2$)

Gold (Au)

Showing the relationship between gold, bismuth, phrrhotite, chalcopyrite and quartz.

Windpass. View 2. Section 1.



Gold (Au)

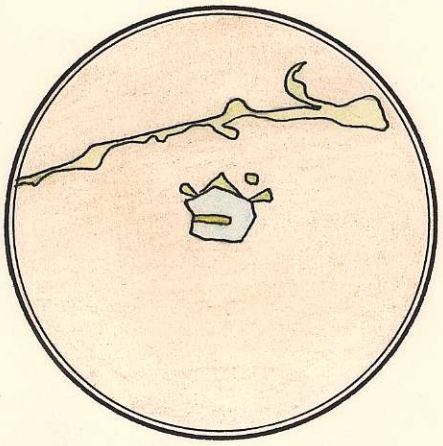
Quartz (SiO_2)

Magnetite ($FeO.Fe_2O_3$)

Bismuthinite (Bi_2S_3)

Showing veining type of gold with quartz and bismuthinite in magnetite.

Windpass. View 1. Section 4.



Gold (Au)

Bismuth (Bi)

Quartz (SiO_2)

Pyrrhotite (Fe_7S_8)

Showing the relationship between gold, bismuth and pyrrhotite. There is no chalcopyrite in this section. The bismuth shows euhedral outline.

Windpass View 1. Section 1.

Gold (Au)

Quartz (SiO_2)

Magnetite ($FeO.Fe_2O_3$)

Bismuthinite (Bi_2S_3)

Showing contemporaneous deposition of gold and bismuthinite, in quartz and magnetite.

A MINERAGRAPHIC EXAMINATION OF ORE FROM VIDETTE AND SAVONA MINES

VIDETTE AND SAVONA MINES.

INTRODUCTION

The following paper is an account of a mineragraphic examination of ores from the Vidette and Savona mines in the Ashcroft mining district.

The general statements as to access, geology, etc., are taken from W. E. Cockfield's paper on Lode Gold Deposits Geological Survey Memoir 179 - 1935.

I am indebted to Dr. H. V. Warren for his help and advice in the laboratory during this work.

LOCATION & ACCESS

The Vidette area is situated approximately 45 miles north of Savona, a village on the west end of Kamloops Lake, The Thompson Valley is here served by both the Canadian National and Canadian Pacific Railways and also by the Provincial highway from Vancouver to Kamloops. The mines themselves are reached by a road leading up Deadman River, a distance of 45 -50 miles.

TOPOGRAPHY

The area consists of a lava plateau with gently rolling surface. There is a main drainage valley which is occupied by Deadman River, Vidette Lake, and Hamilton Creek respectively. This main valley is a narrow, deep trench with

steep and sometimes precipitous walls. It is on these walls that most of the mineral exposures show. The tributaries to the main stream enter by means of narrow canyons.

GENERAL GEOLOGY

There are three main geological formations in this area.

(a) Nicola Formation

The oldest rocks belong to the Nicola formation, and consist mainly of greenstones. These rocks are partly Jurassic and partly Triassic in age.

The greenstones are generally find-grained, massive, greenish rocks, but show in places a porphyritic texture, with phenocrysts of augite or hornblende and feldspar. In places they have been highly sheared and might be termed chlorite or mica schists. The shear zones are almost invariably accompanied by the development of ankeritic carbonates and some quartz.

There are also some dikes of granitic material found in the area. These dikes are intrusive into the greenstone.

(b) Tranquille Beds

This is a thin formation which overlies the Nicola rocks and is itself overlain by Basalts. Dawson (1) refers

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(1) Dawson, G.M. - Rept. on the Area of the Kamloops Map Sheet - G.S.C. Ann. Rept. Vol. VII pt. B. (1896)

these beds to the Miocene.

These beds consist of five slightly coherent, thinly bedded sandstones, find sandy conglomerates containing only a few small, well-rounded pebbles and a considerable amount of tufaceous material. The beds are about 100 feet thick and are prevailingly light colored, yellow to white.

(c) Basalts.

The basalts do not cover the entire area under consideration, but seem to leave an island of older rocks in the centre. The basal ts are flat lying and consist of several flows which comprise a total thickness of about 100 feet. These basalts are fine grained dark rocks and in places show flow structures.

It is believed by Cockfield (opp.ref.) that these basalts are younger than the period of mineralization represented by the gold quartz veins.

VIDETTE MINE

Mineralogy

The mineralogy in these specimens is quite simple. The minerals identified are:

Ore Minerals	Gangue Minerals
Pyrite	Quartz
Chalcopyrite	Calcite
Gold	

The pyrite is heavily shattered and veined through with quartz, calcite and chalcopyrite.

Paragenesis

The pyrite is obviously the first mineral to be deposited, it was closely followed by quartz. The quartz and pyrite were almost simultaneous in deposition. After the pyrite had solidified, shattering took place and the fractures in the pyrite healed with calcite and chalcopyrite. Gold is found closely associated with the calcite and chalcopyrite. The gold, calcite and chalcopyrite are simultaneous in deposition.

Sections - 1a and 1b

These sections contain most gold. Assays run on rejects from these specimens ran 2.54 oz. of gold per ton.

Upon examination of the polished sections, it was found that the gold was intimately associated with the calcite

and where chalcopyrite is associated with calcite, gold is often found with the chalcopyrite.

Pyrite is the most abundant sulfide and quartz the most abundant gangue.

Sections - 2a and 2b

Assays run on rejects from these specimens showed values of 1.84 oz. of gold per ton.

These specimens consist of massive pyrite shattered and veined through with calcite and quartz. Small blebs of chalcopyrite were noted in the fractures in the pyrite. No gold was seen in these sections.

CONCLUSION

The gold noted in the sections from the Vidette Mine was dark and reacted instantly to KCN and not at all to $HgCl_2$, from this it is inferred that if there is any silver alloyed with the gold, it is in subordinate amounts, i.e. less than 10% silver by weight.

The gold is late and associated with calcite which suggests a second, low temperature period of mineralization.

SAVONA MINE.

Mineralogy

The mineralogy in the Savona property is similar to that on the Vidette property, except that there is less calcite and chalcopyrite and some galena.

Minerals noted in the sections are:

Ore Minerals	Gangue Minerals
Pyrite	Quartz
Galena	Calcite
Chalcopyrite	Sericite

Paragenesis

Section 1 is the only section containing any quantity of galena. In this section the galean, quartz, and chalcopyrite appear to be contemporaneous in deposition and to have been followed by calcite.

In the other sections, pyrite is the primary mineral closely followed or perhaps accompanied by quartz. A later mineralization healed fractures in the quartz and pyrite with chalcopyrite and calcite and, although not seen in the sections, probably gold.

SECTIONS

Section 1

This section consists of galena, chalcopyrite, quartz and calcite.

The galena is the predominant sulfide and quartz the predominant gangue.

Assays of rejects from this section showed values of 0.06 oz. of gold per ton. No gold was seen under the microscope but it is possible that the gold is late in occurrence and will be associated with the calcite as it is in the Vidette Mine.

Section 2a

This section consists of quartz, calcite and mineralized wall rock. The mineralization consists of pyrite. No chalcopyrite or gold were noted in this section. Assays of rejects ran 0.02 oz. of gold per ton.

Section 2b

This section is almost identical to section 2a except that chalcopyrite was noted in a fracture in the wall rock which was healed by calcite.

The fractures containing calcite cross the rather definite boundary between the wall rock and the quartz indicating that the calcite is much later than the formation of the quartz veins.

Assays run on the rejects ran 0.02 oz. of gold per ton and it is probable that the gold is associated with the calcite and therefore of later origin than the quartz or pyrite.

Section 3

This is a section of the mineralized wall rock, contains disseminated particles of pyrite, chalcopyrite and galena.

CONCLUSION

This ore is similar to that of the Vidette Mine but the samples examined are lower in grade than those from the above mentioned mine.

Although no gold was seen in the sections, it is probable that the gold is associated with the calcite and therefore later in deposition than the quartz or pyrite and in this respect follows the occurrence in the Vidette Mine.

A MINERAGRAPHIC EXAMINATION OF THE ORE FROM THE GLACIER GULCH PROPERTY

GLACIER GULCH PROPERTY

LOCATION & GEOLOGY

The property is situated in Glacier Gulch on Hudson's Bay Mountain near Smithers, B. C.

The following discussion of the geology and occurrence in the Glacier Gulch district is taken from F. A. Kerr's "Report on the Mineral Resources along the Canadian National Railway, between Prince Rupert and Prince George, B. C." Geol. Sur. Can. Paper 36-20

The deposits occur in the volcanics within a short distance of the volcanic-sediment contact. The sediments have been only slightly mineralized. The sediments in this region consist of argillites, conglomerates, greywackes and tuffs and are believed to be part of the Skeena formation.

Attention has been drawn to the area because of a small production from a number of pockets of high-grade gold-bismuth ore of a unique type. There are other deposits in the vicinity of the more or less common gold, silver, lead, zinc types. The two types of deposits are thought to be related but do not grade into each other.

The high grade bismuth-gold ore occurs in fractures and open spaces in massive granites. The ore is pockety and is probably confined to the crest of a minor fold. The material of the pockets in places grades into the country

rock. Consequently the pockets tend to be connected either by narrow bands of the pocket material or by material similar in character. There pockets are very irregular in size, shape and occurrence so that except for the indefinite limits of the whole zone there is no good criterion that would suggest where pockets are most likely to occur.

MINERALOGY

The ore in this mine is of three types.

Type 1 consists of fairly clear sometimes crystalline quartz containing isolated blebs and crystals of tetradymite, a bismuth telluride.

Type 2 a heavy massive low grade sulfide ore consisting mainly of galena and (or) sphalerite. In places the sphalerite predominates and in other places galena. Even when they appear massive and clean, these sulfides each contain certain amounts of the other. When examined under the microscope it is seen that the galena, and sometimes the sphalerite, contains considerable amounts of tetrahedrite.

Type 3 The high grade ore consists of a micaceous quartz-calcite gangue containing disseminated sulfides and tellurides. Minerals identified in this ore are -- galena, gold (electrum), galena-bismutite, tetradium, tetrahedrite, quartz, calcite and sericite. Sphalerite is probably present

in this ore but was not identified by the writer.

The minerals identified by the writer in the sections examined were:

Ore Minerals	Gangue Minerals
Gold	Quartz
Galena	Calcite
Sphalerite	Sericite
Chalcopyrite	
Tetrahedrite	
Galena Bismutite	

Two polished sections of low grade ore from the mine were examined, one containing predominant galena with lesser amounts of sphalerite, tetrahedrite and chalcopyrite and the other containing predominant sphalerite with lesser amounts of galena and tetrahedrite. The section containing predominant galena (Section #3) contained most tetrahedrite. The tetrahedrite-galena boundaries are smooth and extremely intimate. Some tetrahedrite was also found in the sphalerite in this section. Very small blebs of chalcopyrite were found in the tetrahedrite associated with the galena.

The chalcopryite-tetrahedrite and chalcopyrite-galena boundaries are extremely smooth and intimate. There is some quartz in this section associated with the sphalerite and tetrahedrite and contained in the galena. The quartz is found entering into the galena and the relationships would

suggest a contemporaneous deposition of quartz, sphalerite, tetrahedrite and chalcopyrite.

In Section #2 containing predominant sphalerite, there was found quite a lot of galena. The galena occurs in irregular tongues and masses and also as small rounded blebs in the sphalerite. Sphalerite is found veining galena and galena is found veining sphalerite. The galena shows in places straight boundaries against the sphalerite. Small blebs and masses of tetrahedrite were noted in the galena but none in the sphalerite. Extremely small blebs of chalcopyrite were noted. These blebs always occured in the galena but on the contact with the sphalerite; i.e. three sides of the chalcopyrite are surrounded by galena and the fourth by sphalerite. The galena-chalcopyrite boundaries are extremely intimate but the sphalerite-chalcopyrite boundaries are less intimate. The relationships would suggest that the galena, tetrahedrite and chalcopyrite were contemporaneous in deposition and the sphalerite lagged behind, but not very far behind.

No gold was noted in these sections.

Section 4 consists of almost clear quartz containing a large crystal of tetradymite. This mineral exhibits perfect basal cleavage. These were the only two minerals in the section.

The Sections of high grade ore examined are distinctive because there is more quartz and the ore minerals

are disseminated throughout the quartz while the low grade ore minerals are massive with little quartz.

Section #7 is a typical representative of this ore. The minerals contained in this section consist of galena-bismutite, tetradymite, gold (electrum), quartz, calcite, sericite and an undetermined mineral which may be tetrahedrite.

The mineral described here as galena-bismutite was examined in some detail. Because the etch reactions did not agree with those given by M. N. Short, tests were run on known samples of cosalite and repeated tests run on the galena-bismutite, the results of these tests are listed below.

Galena-bismutite

Reagent	Reaction
HNO_3	Brown stain. Slight eff. and slight etch
HCL	Nil
$FeCl_3$	Dark grey to black stain and deeply etched
KOH	Brown tarnish will buff off
KCN	Nil
$HgCl_2$	Nil

Cosalite

Reagent	Reaction
HNO_3	Irridescent tarnish
HCl	Nil
$FeCl_3$	Nil
KOH	Nil
KCN	Nil
$HgCl_2$	Nil

Microchemical tests were run on the galena-bismutite to confirm this mineral. Good tests were obtained for lead and bismuth. The occurrence in massive blebs and pieces distinguishes it from cosalite which occurs in needles.

The cosalite sectioned here does not occur in the ore but is a picked specimen loaned to the writer by Dr. H. V. Warren.

The tetradymite occurs in the section as flat lamillae and irregular plates.

The gold occurs in intimate association with the galena-bismutite and it seems that the presence of the bismuth minerals is an indication that high gold values will be found.

A sample of the high grade ore was crushed to -120 mesh and screened, then panned. A separation of gold, galena and tetradymite was obtained.

Assays were run on the gold and it was found that 14.28% by weight of the material was silver. This establishes the fact that what appears to be gold under the microscope is really electrum, a gold-silver alloy with a composition 14.28% silver and 85.72% gold.

The undetermined mineral in this ore is intimately associated with the galena-bismutite. It is a grey mineral with hardness three to four. This mineral is negative to all the reagents used in the etch tests and no positive results

were obtained from the microchemical tests. It is thought that this mineral may be tetrahedrite which in some cases gives negative reactions to all etch reagents and is very difficult to get into solution when performing microchemical tests.

There appears to have been a contemporaneous deposition of the galena-bismutite, gold and the undetermined mineral.

CONCLUSION

There is considerable gold in the high grade ore from the Glacier Gulch property and, as in the Windpass mine, the gold is associated directly with the bismuth minerals.

EXAMINATION OF TAILINGS FROM

CHELAN MINE

A STUDY OF TAILINGS FROM CHELAN.

INTRODUCTION

The following paper is a report of preliminary work carried out by A.F. Killin and J.W. McCammon on rougher tailings from the Chelan Mine by means of the Infra-Sizer and super-panner to determine the distribution of the gold. Due to lack of material the tables could not be completed in detail. The work has since been completed in detail by Messrs. Davis and White.

PROCEDURE

1200 gms. of the tailings were taken and put through the Bell mechanical screening machine. Five products were obtained and assays run on each. The results of these assays will be found in Table 1.

500 gms. of the -200 mesh product were put through the infra-sizer and seven products obtained. Each product was assayed with results as shown in Table 2.

Each product from the infra-sizer was run over the super-panner and three products obtained - pyrite, middling, and gangue. Assays were run on each of these products. The results are listed in Table 3.

CONCLUSIONS

The results obtained, as is shown in the tables, indicate that 46% of the gold is contained in the -200 mesh

product of this, assays showed that most of the gold was contained in the pyrite and gangue of the No. 1 product from the infra-sizer

REPORT ON CHELAN POLISHED SECTIONS.

INTRODUCTION

16 polished sections of ore from 6 parts of the mine were examined. Assays of rejects from polished sections gave gold values of significance in 2 sections from the 1500' haulage crosscut and in 3 from the contact specimens. Careful examination of these sections was made but no free gold was seen. The remaining sections were given a quick examination to ascertain the general mineralogical relations.

RESULTS

The following sulfides and gangues were found in the sections:

Sulfides	Gangues
Sphalerite	Quartz
Pyrrhotite	Sericite
Chalcopyrite	
Pyrite	

Quartz and sericite were the most abundant minerals in the sections. Sphalerite was the most abundant sulfide with pyrrhotite and chalcopyrite in equal quantities, running second. Pyrite is not abundant in most sections.

Quartz usually forms the bulk of the sections but occasionally occurs as euhedral crystals surrounded by sphalerite or chalcopyrite. There are some indications of two generations of quartz.

The sphalerite, chalcopyrite and pyrrhotite are of almost simultaneous deposition showing usually mutually smooth boundaries. A few irregularities show that the sphalerite probably began to solidify first - then chalcopyrite and finally pyrrhotite.

The paragenesis is roughly as follows

Pyrite
Quartz
Sphalerite
Chalcopyrite
Pyrrhotite

ADDENDA

Recent work on these sections by E.P. Davis and W. White using a super-polished and extremely high power has revealed minute specks of gold in the quartz gangue.

TABLE NO. 1.

CHELAN

Rough Tails - Screen Sizing

Wt. in Gms.	Wt. %	Based on 15g. Assay	Content	% Total Gold	Size
29.52	2.46%	0.01 mg	0.0197	2.46	+65
132.11	11.10%	0.01 mg	0.0881	11.01	+100
219.23	18.26%	0.01 mg	0.1461	18.26	+150
251.52	20.85%	0.01 mg	0.1675	20.94	+200
552.35	46.10%	0.01 mg	0.3680	46.06	-200
1184.73	98.77%		0.7894	98.73%	Actual Total
1200	100%	0.01 mg	.800	100%	Theor. Total

Note in many of these assays 15 gram samples were used instead of $\frac{1}{2}$ assay . This was solely for convenience of calculation in estimating total gold content of sample

TABLE NO. 2.

Rough Tails.

INFRASIZER

Wt. in Gms.	Wt. %	15 grams Assay	Content	% Total Gold	Size
83.85	16.77%	0.01	0.056	16.8%	1
106.80	21.36%	0.01	0.071	21.4%	2
99.27	19.85%	Tr			3
60.57	12.12%	Tr			4
43.92	8.78%	Tr			5
33.63	6.73%	Tr			6
67.46	13.49%	Tr			7
495.50	99.10%				
500	100%	0.01	.333		Total

TABLE NO. 3.

PANNING OF ROUGH TAILS.

SIZE From Infrasizer (No. 1 is coarest)	Total Wt. panned on Super-Panner	PYRITE Wt.in gms. Recovered	PYRITE % of Total Wt. Panned	PYRITE Assay Mg /15 gms.	MIDDLING Wt.in gms recovered	MIDDLING % of Total Wt. Panned	MIDDLING Assay Mg /15 gms	GANGUE Wt.in gms recovered	GANGUE % of total Wt. panned	GANGUE Assay Mg /15 gms
No. 1+60	50 gm	16.99	33.98	0.04				30.84	61.68	0.03
No. 2 +	60 gm	8.04	13.40	Tr	4.59	7.65	Tr	46.77	77.95	Tr
No. 3 +	60 gm	6.07	10.11	Tr	2.60	4.33	Tr	49.37	82.28	Tr
No. 4 +	50 gm	5.70	11.40	Tr	1.93	3.86	Tr	41.75	83.50	Tr
No. 5 +	30 gm	1.45	4.83	Tr	1.61	5.36	Nil	25.48	84.93	Tr
No. 6 +	20 gm	0.92	4.60	Tr				18.36	91.80	Tr
No. 7 +										