

MINERALOGRAHY OF THE OREGON MINERAL
CLAIM, OSOYOOS MINING DIVISION, B. C.

669553

A report submitted as partial fulfillment of geology 409,
during the fourth year of the course in Applied Science
at the University of British Columbia.

KENNETH JAMES DRUMMOND

April 16, 1956

4359 W. 11th Ave.,
Vancouver, B.C.

April 10, 1956

Dr. R. M. Thompson,
Department of Geology,
University of British Columbia,
Vancouver, British Columbia.

Dear Sir:

I submit herewith my Geology 409 report, Minerallography of
the Oregon Mineral Claim, Osoyoos Mining Division, B.C., in compliance
with the Calendar regulations governing the fourth year of the course
in Applied Science at the University of British Columbia.

Yours truly,

Ken Drummond.
Ken Drummond

ACKNOWLEDGEMENTS

The writer would like to express his appreciation for the assistance given him by Dr. R. M. Thompson during the preparation of this report.

The writer would also like to express thanks to Mr. J. J. McGraw for the use of his camera in taking the photographs used in this report.

C O N T E N T S

Summary	1
Introduction	1
Location of the Property	2
History of the Property	3
General Geology of the Area	4
Minerallography of the Oregon Property	5
A. Megascopic Examination of the Hand Specimens	5
B. Microscopic Examination of the Polished Sections	6
1. Description of the Minerals and Textures	
(a) Safflorite	6
(b) Cobaltite	8
(c) Arsenopyrite	9
(d) Niccolite	10
(e) Bornite	11
(f) Chalcopyrite	12
(g) Covellite	14
(h) Molybdenite	14
(j) Native Bismuth	15
(k) Bismuth-Tellurides	16
(l) Native Gold	19
(m) Tetrahedrite	20
2. Paragenesis and Origin	20
Bibliography	24

I L L U S T R A T I O N S

Fig. 1:	Bornite Replacing Safflorite . . .	8
Fig. 2:	Arsenopyrite in Bismuth Telluride . . .	9
Fig. 3:	Bornite Replacing Arsenopyrite . . .	10
Fig. 4:	Chalcopyrite and Tetrahedrite Exsolved in Bornite	11
Fig. 5:	Chalcopyrite and Unknown Exsolved in Bornite .	12
Fig. 6:	Molybdenite Replacing Chalcopyrite . . .	13
Fig. 7:	Chalcopyrite Cutting Cobaltite . . .	13
Fig. 8:	Covellite, Alteration Product of Bornite .	14
Fig. 9:	Molybdenite and Native Bismuth . . .	15
Fig.10:	Native Gold, Associated with Native Bismuth, Joseite B, Hedleyite and Tetrahedrite . . .	16
Fig.11:	Intergrowth of Native Gold and Native Bismuth, Associated with Bismuth Tellurides . . .	17
Fig.12:	Bismuth and Bismuth-Telluride Surrounding Garnet	18
Fig.13:	Sequence of Deposition of Minerals . . .	21
Fig.14:	Paragenetic Relationship of the Sulfides .	22
Table I:	Distribution of Minerals in Polished Sections	7
Map 568A:	. . . . . (In Pocket)	

SUMMARY

The Oregon Mineral Claim is situated in the Osoyoos Mining District, 4 miles southeast of Hedley. The deposit is of the contact metamorphic type, situated in a garnet-epidote skarn.

There are probably 4 stages of deposition in the deposit, as follows:

1. Safflorite, niccolite, cobaltite, arsenopyrite, and quartz (the quartz continuing).
2. Bornite, chalcopyrite, tetrahedrite and molybdenite.
3. Hedleyite, joseite B, native bismuth, native gold, and tetrahedrite.
4. Carbonates.

Exsolution of chalcopyrite in bornite and the presence of many high temperature minerals, suggest that this is a high temperature deposit.

MINERALOG~~Y~~GRAPHY OF THE OREGON MINERAL
CLAIM, OSOYOOS MINING DIVISION, B. C.

INTRODUCTION

The object of this report is to give an account of the mineralogy and paragenesis of ore deposition of the Oregon Property, situated in the Hedley district of the Osoyoos mining division. Hand specimens from the Property were examined and polished sections were made from some of these. Microscopic and microchemical methods were used to determine the minerals present in the sections and their paragenetic relationships.

L O C A T I O N O F T H E P R O P E R T Y

The Oregon mineral claim is located in the Hedley district of the Osoyoos mining division (Map 568A). The Hedley district is situated 210 miles due east of Vancouver and 27 miles north of the international boundary. It is situated in the Okanagan Range of southern British Columbia, which is essentially part of the Interior Plateau although adjacent to the easterly elements of the Coast Range.

The Oregon Property lies on the northeast side of the Similkameen River, about 4 miles southeast of Hedley and 4,000 feet from the Grand National Railway. The mine is about 8 miles by road from the company's mill at Hedley and one and a half miles east of the Hedley - Nickel Plate road.

H I S T O R Y O F T H E P R O P E R T Y

Prior to 1917 development work consisted of an upper tunnel 35 feet long, and an 8 foot cross-cut. Also two tunnels were driven about 70 feet down the hill to establish the downward extension of the ore body. An open-cut sample along the side of the upper tunnel assayed: 0.06 ounces of Gold, 0.9 ounces of Silver, and 1% Copper. Another sample assayed 0.12 ounces of Gold, 3.4 ounces of Silver, and 3.9% Copper.

Very little work was done on the property from 1917 to 1951. In 1951 the Oregon mineral claim was purchased by Kelowna Mines, Hedley limited. In the period 1951 to 1954 a total of 26,293 tons of ore was mined.

G E N E R A L G E O L O G Y O F T H E A R E A

"The oldest rocks of the Hedley area are sedimentary rocks, presumably of Carboniferous age, and correlated with the Cache Creek group of Dawson's Kamloops Map Sheet. These are the only consolidated sediments in the area, and they include, besides the true sedimentary rocks, a great thickness of contemporaneous volcanic materials, generally of explosive volcanic origin. They have been tilted in a general direction toward the west, and they now dip at angles varying from 15° to 90° .

Eruptive rocks have been intruded through these rocks in the following order: (1) quartz diorite and gabbro; (2) granodiorite. These igneous rocks have been accompanied or followed by many dikes of different compositions, porphyries, lamprophyres, andesites, and rhyolites."¹

1. Cansell, C., G.S.C. memoir 2, (1910), P.42.

MINERALOGY OF THE OREGON PROPERTY

A. Megascopic Examination of the Hand Specimens.

The ore minerals occur in a garnet - epidote - diopside skarn. The rock was originally calcite, which has been metamorphosed and replaced to a greater or less extent by gangue and ore minerals. The gangue minerals are generally garnet, epidote, pyroxene, hornblende, and quartz.

The ore minerals generally occur in the fractures of the skarn, more or less replacing the gangue minerals. The ore minerals commonly occur with the calcite, which they probably replace more easily. The minerals identifiable in the hand specimens were:

Bornite:

Chalcopyrite:

Molybdenite:

Covellite: occurs as an alteration product of bornite.

Cobaltite: Brittle; hardness of 5; silver - white in color; metallic lustre; black streak.

Niccolite: Pale copper - red in color; brownish black streak; hardness of 5; metallic lustre.

Bismuth-Tellurides: Flexible and inelastic folia; occasionally showing a hexagonal crystal form; perfect basal cleavage; hardness of 2; tin-white in color tarnishing an iron black.

Native Gold: Soft and sectile; occurs as a foliated mass in the cleavage plates of the bismuth tellurides.

B. Microscopic Examination of the Polished Sections.

Eight polished sections were examined, from which the minerals were identified and their structural and textural relations determined. The distribution and the percentages of the minerals in the various sections is shown in table I.

1. Descriptions of the Minerals and Textures.

(a) safflorite

Safflorite occurs in sections A2, A5, A6 and A8. It is generally massive, but occasionally shows crystal outlines against niccolite (section A8) or bornite (section A2). It does not, however, exhibit crystal form as often as cobaltite or arsenopyrite.

Optical Properties:

Color: White with a bluish tint

Hardness: E

Anisotropism: strong, dark blue to dark brown.

Etch Reactions:

HNO_3 : etches deeply, except in contact with niccolite

FeCl_3 , H_2Cl_2 , HCl , KCN , and KOH are all negative.

The safflorite and the niccolite show mutual boundaries with no evidence of replacement and are probably contemporaneous. The crystal boundaries of the safflorite with the niccolite is due to the greater crystal forming habit of the safflorite.

Safflorite is probably the earliest of the sulfides to be deposited. It is shown replacing the gangue, particularly the calcite, but does not replace the other ore minerals. The safflorite is being replaced by

TABLE I

SPECIMEN NO.	A1	A2	A3	A4	A5	A6	A7	A8
% Mineralized	45%	20%	25%	5%	3%	3%	10%	75%
Safflorite	-	25%	-	-	35%	45%	-	40%
Cobaltite	-	7%	55%	5%	-	30%	-	20%
Arsenopyrite	70%	10%	-	2%	20%	-	7%	10%
Niccolite	-	-	-	-	-	-	-	30%
Bornite	25%	55%	-	-	-	20%	-	-
Chalcopyrite	3%	2%	40%	40%	15%	5%	6%	-
Covellite	-	Trace	-	-	-	-	-	-
Molybdenite	-	-	5%	2%	20%	-	3%	-
Bismuth	-	-	-	10%	10%	-	4%	-
Bismuth-Tellurides	-	-	-	35%	-	-	80%	-
Gold	-	-	-	2%	-	-	-	-
Tetrahedrite	2%	1%	-	4%	-	-	-	-

Distribution of Minerals in the Polished Sections.

bornite (fig.1) and cobaltite. Only a slight indication of arsenopyrite replacing safflorite was shown.



X 180

Fig.1: Bornite Replacing Safflorite

(b) Cobaltite.

Cobaltite occurs massive or well crystallized in sections A2, A3, A4, A6 , and A8.

Optical Properties:

Color: White with a pinkish tint

Hardness: G

Anisotropism: very weak

Etch Tests:

Negative to all standard reagents. The cobaltite replaces both safflorite and niccolite and is replaced by molybdenite, chalcopyrite, bornite and possibly arsenopyrite.

(c) Arsenopyrite

Arsenopyrite generally occurs as well-formed crystals (fig.2) in sections A2, A4, and A7. It also occurs in sections A1, A5, and A8 more or less crystallized.

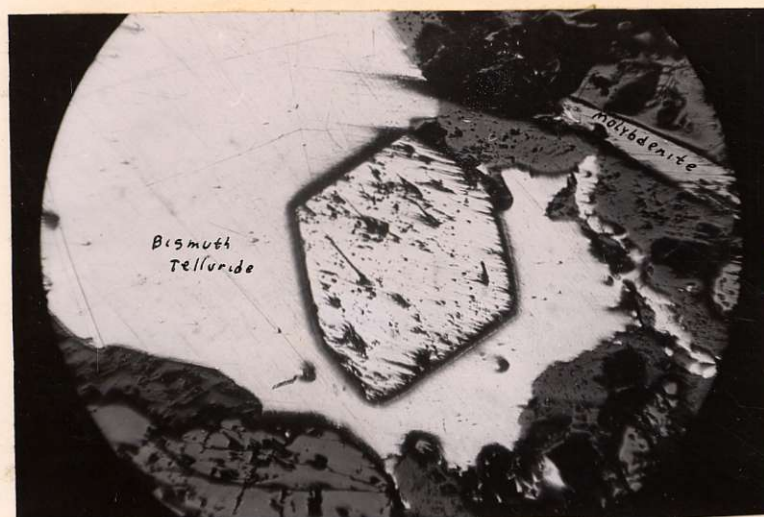
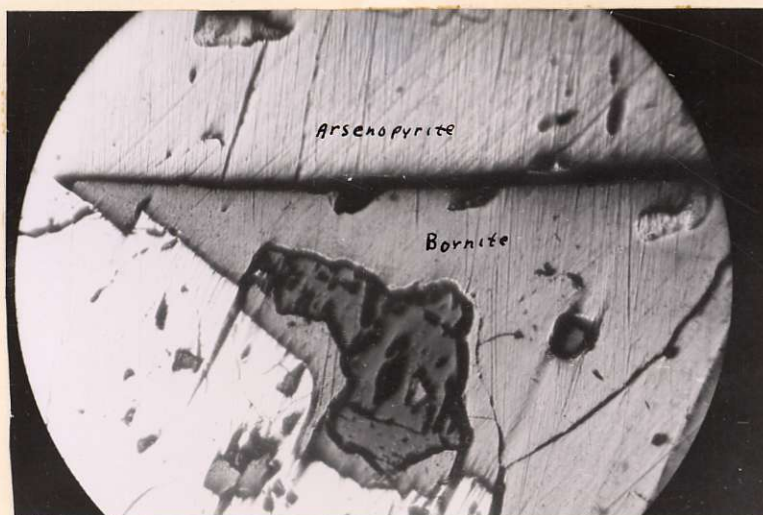


Fig.2: Arsenopyrite in Bismuth Telluride

Arsenopyrite was distinguished from safflorite by its diamond-shaped crystal outline and by the degree of HNO_3 etch. HNO_3 etches deeply on safflorite and stains brown to irid on arsenopyrite.

No definite evidence of arsenopyrite replacing either safflorite or niccolite could be obtained. Good evidence of bornite replacing arsenopyrite along crystallographic directions is shown in figure 3.



X180

Fig.3: Bornite Replacing Arsenopyrite.

Cobaltite and arsenopyrite may have been deposited simultaneously. It may be that safflorite, niccolite, cobaltite and arsenopyrite were formed almost contemporaneously. They, at least, represent the first stage in the deposition of the sulfides.

(d) Niccolite

Niccolite was found in only one of the hand specimens and in the corresponding polished section, A8.

Optical Properties:

Color: light pink

Pleochrism: distinct

Anisotropism: strong, brown to dark blue

Hardness: B

Etch tests:

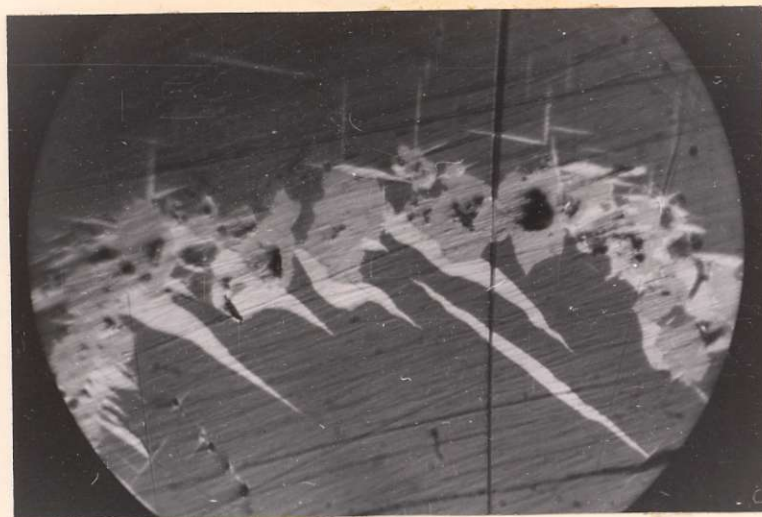
HNO₃: strong attack

All other reagents negative.

The relationships of niccolite to cobaltite, safflorite, and arsenopyrite have been already described.

(e) Bornite

Bornite occurs in sections A1, A2, and A6, where it occurs replacing cobaltite, safflorite (fig.1) and arsenopyrite (fig.3). Bornite and niccolite were not found in contact and no paragenetic relationship could be established. Exsolved in the bornite are lamellae of chalcopyrite and veinlets and lamellae of tetrahedrite. The tetrahedrite generally



X 1000

Fig.4: Chalcopyrite (white) and Tetrahedrite (light grey) Exsolved in Bornite (dark grey).

occurs as segregation veins through the bornite, with the lamellae of chalcopyrite extending out from it (fig.4). The presence of chalcopyrite exsolved along the (111) planes of the bornite establishes a temperature of deposition in excess of 475°C.

Also contained as exsolution or replacement bodies in the bornite is an unknown mineral. This mineral could be seen clearly only under oil

immersion. It was greyish-white in color with a rough surface. It occurred as crystals about 10 microns in length, which were aligned

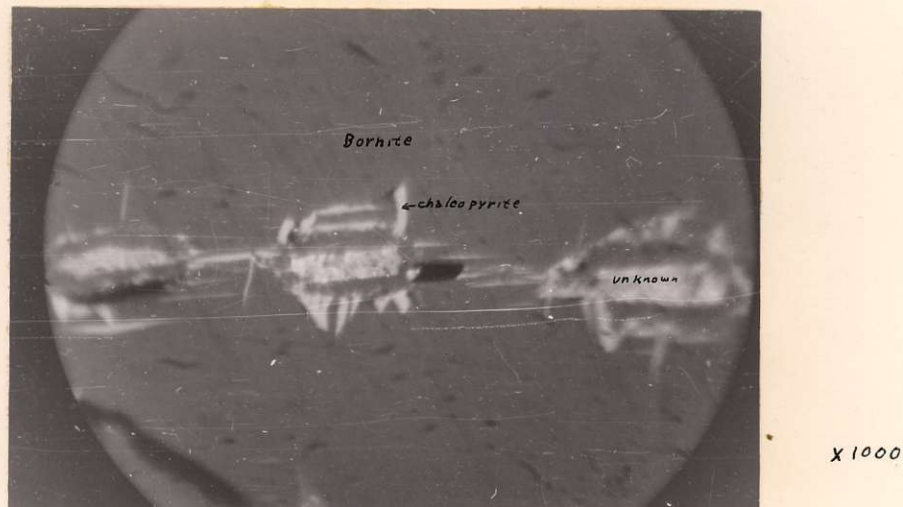


Fig.5: Chalcopyrite and Unknown Exsolved in Bornite.

along some directional structure of the bornite (fig.5). Exsolved around these bodies, but not in contact, were lamellae of chalcopyrite. This mineral might possibly be tetrahedrite.

(f) Chalcopyrite

Chalcopyrite, which is the most abundant mineral, occurs in Sections A1 to A7. In Sections A1, A2, and A7 it occurs with and exsolved in the bornite. There is apparently no replacement between chalcopyrite and bornite. The chalcopyrite exsolved from the bornite with some of the chalcopyrite collecting at the edges of the bornite.

In section A3, the chalcopyrite is replacing the cobaltite. The age relationship of the chalcopyrite and cobaltite is shown in fig.6, where the chalcopyrite cuts both the gangue and the cobaltite.

In section A5, the chalcopyrite is being replaced by molybdenite, as shown in fig. 7.

In section A6, the chalcopyrite is associated with bornite, with very little exsolution. The chalcopyrite and bornite appear to be contemporaneous.



X 880

Fig.6: Molybdenite (dark grey) Replacing Chalcopyrite (white)



X 180

Fig.7: Chalcopyrite Cutting Cobaltite.

(g) Covellite

Covellite occurs in only one section, A2, as an alteration. It occurs as very thin seams along fractures in the bornite (fig.8). The distinctive blue pleochrism was not observed, as the seams were too narrow,

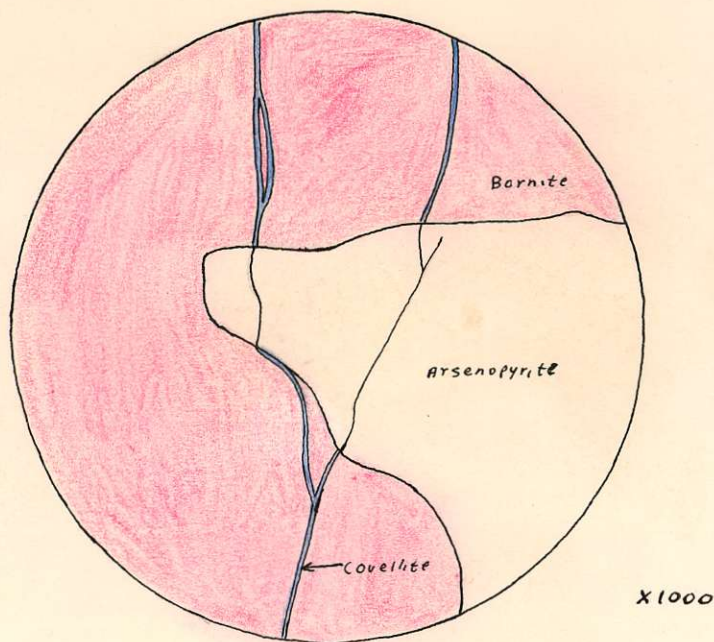


Fig.8: Covellite, Alteration Product of Bornite

only showing up under oil immersion with power of $\times 1000$. These seams are generally less than 2 microns in width. Secondary alteration, therefore, is very insignificant.

(h) Molybdenite

Molybdenite was readily identified by its strong anisotropism in sections A3, A4, A5, and A7.

The molybdenite replaces chalcopyrite in sections A3 and A5 (fig.6). In section A3, molybdenite cuts both chalcopyrite and cobaltite.

Molybdenite occurs as only small laths in the gangue and ore minerals in section A4.

Section A4 shows molybdenite occurring along the boundaries between the gangue and native bismuth (fig.9).

Molybdenite contains inclusions of laths of bismuth along the cleavage in many of the sections. This bismuth is probably replacing the molybdenite.



X 440

Fig.9: Molybdenite and Native Bismuth

(j) Native Bismuth

Native bismuth is quite common, occurring in sections A4, A5, and A7.

Optical properties:

Color: Creamy-white, quickly tarnishing to a pinkish-brown.

Hardness: A

Pleochrism: weak

Anisotropism: Distinct

Etch tests:

HNO_3 : Etches deeply and develops texture

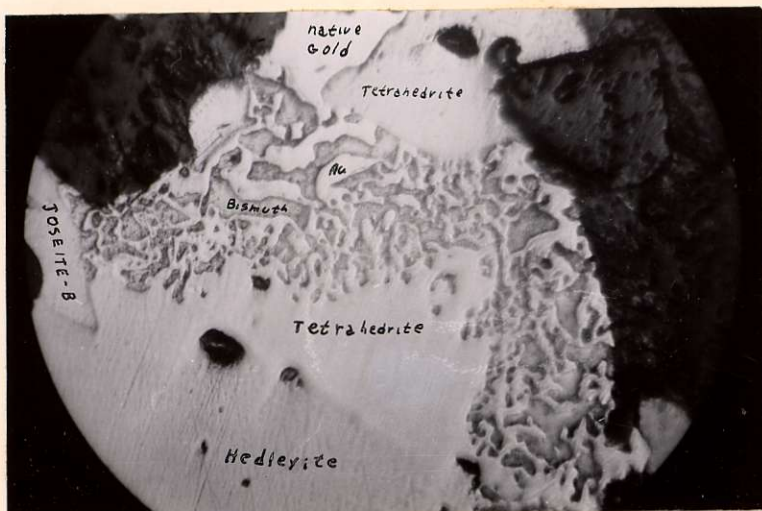
FeCl_3 : Quickly stains black

KCN , KOH , HgCl_2 are all negative.

Native bismuth occurs closely intergrown with native gold (figs.10 and 11) in section A4, associated with bismuth tellurides. It is quite common as irregular eutectic-like inclusions in the bismuth tellurides. It also occurs as inclusions in the sulfides; arsenopyrite, chalcopyrite, and molybdenite. This may represent replacement of these minerals by native bismuth. In molybdenite, bismuth occurs as lath-like inclusions replacing the molybdenite along cleavage.

(k) Bismuth Tellurides.

The bismuth tellurides occur in sections A4 and A7. The two tellurides, Hedleyite and Joseite B, could not be distinguished one from the other, except when in contact, under the microscope.



X180

Fig.10: Native Gold, Associated with Native Bismuth, Joseite-B, Hedleyite and Tetrahedrite.



Fig.11: Intergrowth of Native Gold and Native Bismuth,
Associated with Bismuth Tellurides.

Optical Properties:

Color: White; hedleyite is slightly whiter than joseite B.

Hardness: A

Polish: Polishes easily, but with fine scratches.

Anisotropism: Light grey to dark grey; joseite B is slightly more anisotropic than hedleyite.

Etch reactions:

HNO₃: Effervescence; hedleyite stains dark grey and joseite B light grey

FeCl₃: Hedleyite stains brown, and joseite B stains blue-grey.

KCN, KOH, HCl, HgCl₂ are all negative.

The two tellurides could thus be distinguished when in contact by slight differences in color and anisotropism and by differential rates of etching with HNO₃ and FeCl₃.

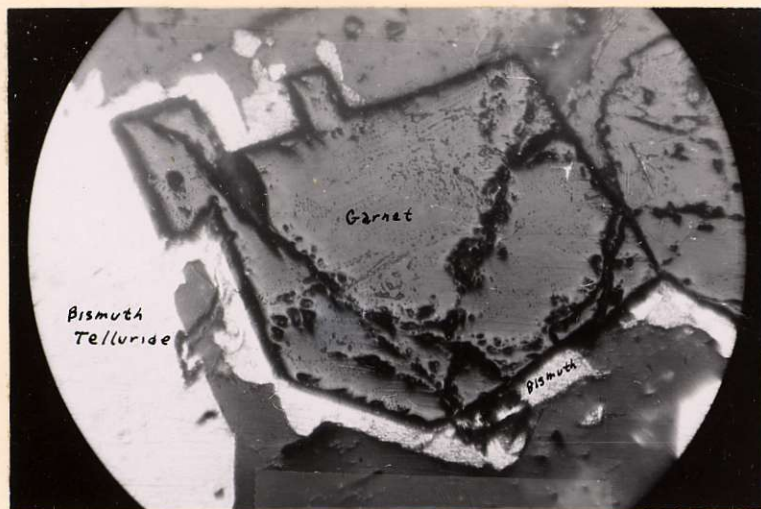
The specific gravity of two small pieces was measured on the

berman balance. The specimens, as far as could be told under the binocular microscope were free from impurities. The values for the specific gravity obtained were 8.58 and 8.61. The specific gravity of joesite B is 8.3 and of hedleyite is 8.91. Therefore, it may be assumed that the specimens measured were intercalations of joesite B and hedleyite.

one assumption

The tellurides occur in the fractures of the skarn and in places, as shown, in the hand specimen, in calcite crystals. The tellurides, as much of the mineralization, occurs in fractures that contain much carbonate. The tellurides usually have included bismuth and are associated with native gold and tetrahedrite (figs. 10 and 11).

Although no textural or age relations of the tellurides to the sulfides were observed, the tellurides probably represent a later stage of deposition. The relationships of the gold, bismuth, tetrahedrite and tellurides suggest contemporaneity of deposition as no replacement textures were observed to suggest otherwise. Well formed crystals of tetrahedrite (fig. 2) are included within the tellurides. No replacement of such crystals by tellurides could be seen.



X 180

Fig. 12: Bismuth and Bismuth-Telluride surrounding Garnet.

Figure 12 shows the bismuth and bismuth tellurides later than the metamorphism. The garnets were developed during metamorphism and the tellurides and bismuth were deposited in fractures and replaced the other gangue minerals.

(1) Native Gold

Native gold was found in only one polished section, A4.

Optical Properties:

Color: Golden yellow; chalcopyrite in contact appeared greenish-yellow.

Polish: Good, with very fine scratches.

Hardness: B, sectile

Anisotropism: Distinct anomalous anisotropism, probably due to minute scratches on the surface of the gold.

Etch Tests:

KCN: Etches black

Aqua Regia: Stains brown

HNO_3 , HCl , FeCl_3 , KOH , and HgCl_2 are all negative.

The native gold observed occurs almost entirely as a wormy intergrowth with bismuth, associated with joesite B, Hedleyite, and arsenopyrite (figs. 10 and 11). In a few places it was found disseminated through the gangue.

(m) Tetrahedrite

Tetrahedrite occurs in sections A1, A2, and A4. It occurs in sections A1 and A2 as exsolved seams in bornite (fig.4), associated with exsolution lamellae of chalcopyrite. Also small rods of tetrahedrite are exsolved in the bornite, which often cross with chalcopyrite lamellae, producing star shapes. Tetrahedrite is also segregated around the edges of the bornite.

Tetrahedrite occurs in section A4, associated with native bismuth, bismuth tellurides, and gold (fig.10). The tetrahedrite appears to be contemporaneous with these minerals, as no evidence of replacement was obtained.

These two occurrences of tetrahedrite probably represent two stages of deposition.

2. Paragenesis and Origin

There are probably 4 stages of deposition represented in this deposit. These are as follows:

1. Safflorite, niccolite, cobaltite, arsenopyrite, and quartz (the quartz continuing).
2. Bornite, chalcopyrite, tetrahedrite, and molybdenite.
3. Hedleyite, joseite B, native bismuth, native gold, and tetrahedrite.
4. Carbonates.

The sequence of deposition of these minerals is shown in figure 13.

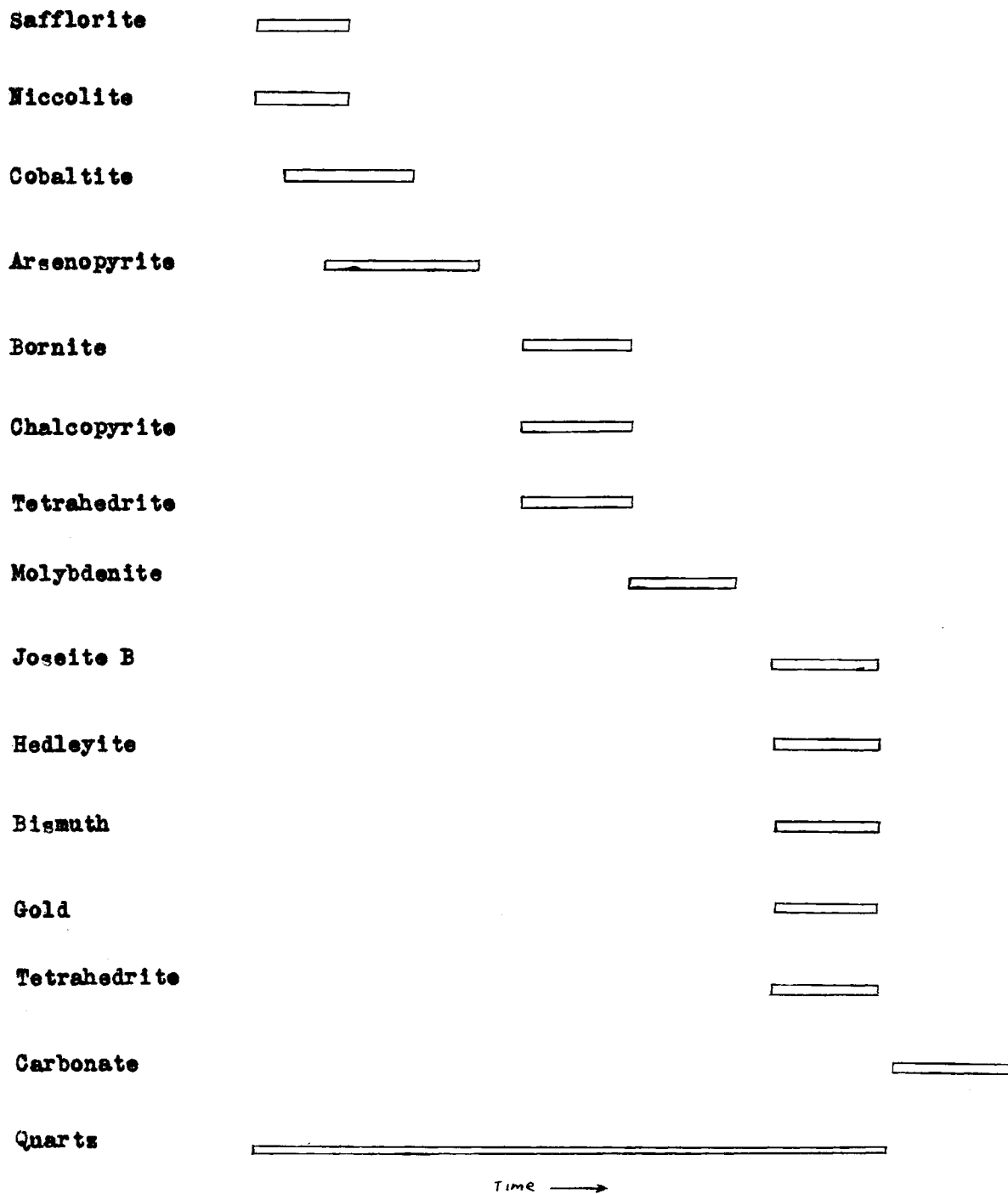


Fig.13: Sequence of Deposition of Minerals

The first stage of mineralization is probably closely related to the metamorphism, occurring just after metamorphism. The first minerals to be deposited were the cobalt, nickel, and iron arsenides; safflorite, niccolite, cobaltite and arsenopyrite. These were probably deposited contemporaneously, with some overlapping and replacement as shown in figure 13 and 14. These minerals are all high temperature, being deposited above 500°C.

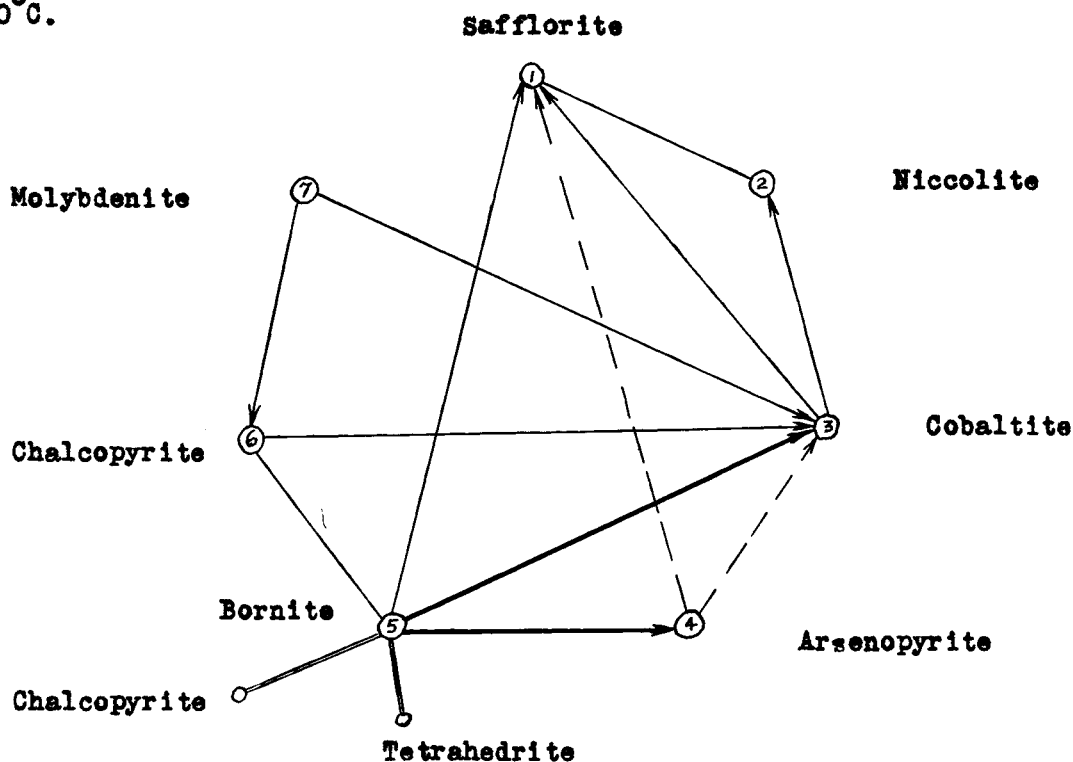


Fig.14: Paragenetic Relationship of the Sulfides.

The cobalt, nickel, iron arsenides were followed by the deposition of chalcopyrite, bornite, tetrahedrite and molybdenite. The chalcopyrite and bornite were deposited contemporaneously with exsolution of chalcopyrite and tetrahedrite along the (111) planes of bornite. The chalcopyrite-bornite exsolution indicates a temperature of deposition in excess of 475°C. Molybdenite was deposited slightly later and replaces the chalcopyrite.

The occurrence of molybdenite later than the chalcopyrite suggests that this stage of ore deposition was at a temperature of at least 500°C. The paragenetic relationship of the sulfides is shown in figure 14.

The deposition of the sulfides was followed by the simultaneous deposition of native bismuth, native gold, hedleyite, joseite B and tetrahedrite. There appears to be no overlapping of deposition in these minerals. The graphic intergrowth of native gold and native bismuth is suggestive of unmixing. The gold and bismuth were probably in solid solution and unmixed on cooling.

Quartz was probably introduced with the first stage of mineralization and continued throughout. Much of the mineralization is closely associated with the carbonates, which is replaced by the various ore minerals. The final mineralization was the introduction of a later stage of carbonates. In many places, stringers of carbonate are shown cutting both the ore minerals and the other gangue minerals.

The first two stages of mineralization took place at temperatures in excess of 500°C. Since all the minerals in the third stage can also be high temperature, it seems likely that this is a high temperature deposit. The mineralization occurs in a skarn closely associated to igneous intrusions. The deposit is, thus, a high temperature contact metamorphic deposit, closely associated with the carbonates, which is replaced by the various ore minerals. ~~The final mineralization was the introduction of a later stage of carbonates. In many places, stringers of carbonate are shown cutting both the ore minerals and the other gangue minerals.~~

~~The first two stages of mineralization took place at temperatures in excess of 500°C. Since all the minerals in the third stage can also be high temperature, it seems quite likely that this is a hypothermal type of deposit.~~

B I B L I O G R A P H Y

1. Camsell, C., G.S.C. Memoir 2, 1910.
2. Freeland, D.F., British Columbia, Minister of Mines, Annual Reports, 1917, P.205, 1928, P.257.
3. Hughes, E.R., British Columbia, Minister of Mines, Annual Reports, 1950-51-52-53-54.
4. Short, M.N., Microscopic Determination of the ore minerals, V.S.G.S., Bull 914.
5. Thompson, R.M., The telluride Minerals and their Occurrence in Canada, Am. Mineral., vol. 34, P.342-382, 1949.
6. Uytendogaardt, W., Tables for microscopic Identification of Ore Minerals, Princeton, Princeton University Press, 1951.
7. Warren, H.V. and Peacock, M.A., Hedleyite, a new bismuth telluride from B.C., with notes on wehrlite and some bismuth-tellurium alloys, Univ. Toronto Studies, Geol. Ser., 49, P.55-69. (1945).

LEGEND

- | | | |
|----------|--|--|
| CENOZOIC | 14 | Alluvium |
| | 13 | Chiefly basalt and andesite; breccia and tuff |
| | 12 | Conglomerate, sandstone |
| | JURASSIC AND (OR) YOUNGER | |
| 11 | Granite | |
| 10 | Granodiorite | |
| 9 | Diorite, gabbro | |
| MESOZOIC | TRIASSIC (?) | |
| | 7 | WOLFE CREEK FORMATION: andesite and basalt; breccia and tuff; minor sediments |
| | TRIASSIC | |
| | 6 | HENRY FORMATION: black argillite, tuff, impure limestone |
| | 5 | HEDLEY FORMATION: limestone, quartzite, cherty quartzite, argillite, conglomerate, breccia, tuff |
| | 4 | SUNNYSIDE FORMATION: limestone |
| | 3 | REDTOP FORMATION: limestone, cherty quartzite, siliceous argillite, tuff, some breccia |
| | TRIASSIC AND (OR) OLDER | |
| 2 | INDEPENDENCE FORMATION: chert, chert breccia, cherty quartzite, cherty argillite, basalt and andesite flows and breccias | |
| 1 | BRADSHAW FORMATION: black argillite, tuff, quartzite, breccia; some andesite and limestone | |

- | | |
|---|-------------|
| Area of continuous overburden | ..... |
| Geological boundary (defined, approximate, assumed) | ..... |
| Fault (defined, approximate) | ..... |
| Glacial striae | ..... |
| Fossil locality | ..... |
| Mine tunnel | ..... |
| Road well travelled | ..... |
| Road not well travelled | ..... |
| Trail | ..... |
| Power transmission line | ..... |
| Power transmission line along road | ..... |
| Land District boundary | ..... |
| Indian Reserve boundary | ..... |
| Stream (position approximate) | ..... |
| Intermittent stream | ..... |
| Sand bar | ..... |
| Marsh | ..... |
| Contours (interval 100 feet) | ..... |
| Contours (position approximate) | ..... |
| Height in feet above Mean sea-level | 5764' |

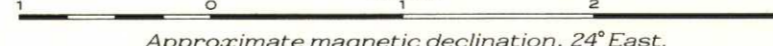
Geology by H. S. Bostock, 1926-1930; and by D. A. McNaughton, 1937

Base-map prepared by the Topographical Survey, 1937, from maps supplied by the British Columbia Department of Lands, Cartography by the Drafting and Reproducing Division, 1940.

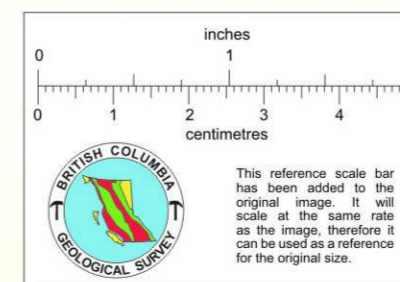


MAP 568A
HEDLEY
SIMILKAMEEN AND KAMLOOPS DISTRICTS
BRITISH COLUMBIA

Scale, 63,360 or 1 Inch to 1 Mile



Approximate magnetic declination, 24° East.



DESCRIPTIVE NOTES

The gold deposits of Nickel Plate mountain commenced production in 1904. For several years thereafter they included, in the Nickel Plate mine, the single largest gold producer in Canada. Total gold production to 1927 was valued at over \$11,500,000. Silver and arsenic were also recovered. In recent years the Nickel Plate and Hedley Mascot mines have each produced between 20,000 and 30,000 ounces of gold.

The Nickel Plate mountain deposits have been generally described as of the contact-metamorphic type. The ore occurs mainly in sediments near the contacts of gabbro and diorite. Gold values are associated chiefly with abundant arsenopyrite and to a lesser extent with other sulphides of which chalcopyrite and pyrrhotite are most conspicuous. The gangue consists mainly of metamorphic, lime-silicate minerals including garnet, pyroxene, amphibole and a little axinite. The position, shape, and size of the ore bodies are controlled partly by structural features. Partly too, calcareous argillite and quartzite have proved more susceptible to mineralization than other strata. The producing ore bodies and most of the prospects are associated with bodies of diorite and gabbro strongly suggesting that they owe their origin to them but similar deposits are associated with granodiorite and veins carrying similar minerals cut granodiorite dykes. Areas containing diorite and gabbro bodies are believed to offer most promise but the areas adjacent to the granodiorite should not be ignored. Gold prospects having the same minerals have been found in Mesozoic strata along the borders of Similkameen valley. Mineral deposits were also noted in the vicinity of the mouth of Whistle creek; near the diorite stock on the east fork of Whistle creek; in the sediments on both sides of the granodiorite south of Johns creek; and in areas of Mesozoic strata north of Winters creek. The areas of undivided Mesozoic formations southwest of Hedley, between Henry creek and the granodiorite, and the area on the west side of the upper part of Hedley creek contain strata similar to those of the Hedley formation which have proved receptive to mineralization.

An area of Mesozoic and earlier stratified rocks extends from east of Okanagan valley west to Princeton. It is cut by intrusives and partly covered by Tertiary rocks but as a whole forms a nearly continuous belt. It is divisible into four irregular segments each composed of a group of rocks that on the whole is younger than that forming the adjoining segment to the east of it. Gneissic rocks of Palaeozoic age lie along Okanagan valley and form the easternmost segment. To the west of this, between the Okanagan and Similkameen valleys near the International Boundary is a segment occupied by a group of rocks of late Palaeozoic age. To the west of this and extending northwesterly along Similkameen valley to Winters creek in the present map-area, is a third segment underlain by a group of several closely folded formations forming a complex synclinal structure. A fossiliferous Permian limestone near Blind creek is believed to be the lowest member of this group on the east side of the structure; on the west side the lowest members are the Bradshaw and Independence formations. Some fossils of doubtfully Mesozoic age were found in the Independence formation. The strata of this third segment are thus believed to be either of Permian age or Permian and younger. To the westward of these rocks is the fourth segment occupied by another group of formations including the Redtop, Sunnyside, Hedley, Henry and Wolfe Creek formations. The rocks of this, the fourth segment are separated from those of the third segment by faults and bodies of intrusive rocks lying along a northeast line passing through Winters creek. Triassic fossils have been found in the Hedley and Henry formations of this group and all the strata are presumably Triassic or younger. They are closely folded but dip mainly west while the Bradshaw and Independence formations and those directly east of them dip mainly east so that the line through Winters creek seemingly follows the axis of a large broken anticline the eastern limb of which has been lifted up relatively to the western limb.

The formations of the third segment, with the exception of the Bradshaw and Barslow formations which may be the same, contain a great deal of chert and cherty quartzite. This is true of even those members mainly composed of greenstones. Most of the chert beds are bounded by irregular, undulating surfaces and are separated by thin beds of argillite. There is relatively little fine-grained tuffaceous material among them and most of the volcanic rocks of this group of formations are greenstones consisting of flows and of flow breccias in which the matrix shows flow structures and the fragments are conspicuous. A few massive limestone lenses or patches of limestone breccia are among them. The Bradshaw formation contains much argillite and fine tuff and little chert. Its beds are bounded by even surfaces and in general it resembles the formations to the west but it definitely underlies the Independence formation. To the west of the anticline in the fourth segment, fine tuffaceous and argillaceous material is present in all the formations and all except the Wolfe Creek formation contain calcareous beds. The sediments characteristically are evenly and thinly bedded. The volcanic rocks as a whole appear to be slightly more acid and feldspathic than those to the east and much tuff and coarse fragmental material is present. In the breccias flow structure is not a common feature and the fragments are often difficult to distinguish. The formations of the fourth segment are not so closely folded as the strata to the east.