ANOMALUS DRY ORES IN THE SLOCAN SERIES

geology 409
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Table of Contents

ANOMALOUS DRY ORES IN THE SLOCAN GROUP

Abstract:

This report deals with five properties, (Arlington, Ottawa, McAllister, Capello, Panama) in the Slocan, Ainsworth mining division. The first two are classed as typical dry ore deposits in the Slocan city area. The last three are also dry ore deposits, but they are found in what is considered a wet ore environment in Slocan sediments, any rock, and are mostly surrounded by mines of a wet ore nature. The paper examines the five and attempts to determine what differences exist between the "type" dry ore deposits and the anomalous ones and what could account for the anomalous deposits existing and their differences.

Summary:

"Dry ores" are ores in which silver or silver and gold are of chief importance, but lead and zinc are also present. Quartz is the abundant gangue mineral and exceeds the metaliferous content by far. Deposits tend to be confined to the Nelson granite and small stocks. "Wet ores" are deposits in which lead and zinc dominates, and the gold silver values are low. The Capello was found not to be anomalous and is a typical dry ore situation. The McAllister was found to resemble a dry ore but in a strict sense is not. It appears to be a later stage of mineralization related to the Valhalla granite. The Panama also resembles a dry ore, yet it too is a variation. It appears to have been a wet ore situation modified by a second period of mineralization.

Introduction:

The Slocan mining camp is situated in southeastern British Columbia (see fig. 1) bounded on the west by the Lower Arrow Lake and on the east by Kootenay Lake.

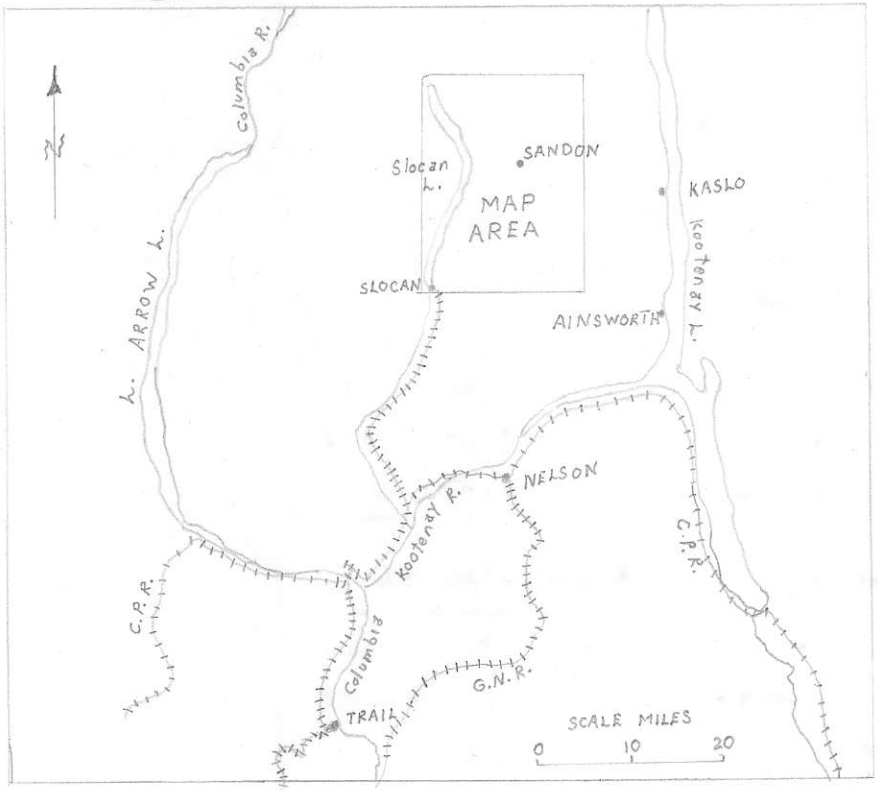


Fig 1.

The area has had an extensive period of production from the late 1800's until the present. Peak production was in the late 1920's falling off until this day when there is only sporadic production.

General Geology:

The general geology of this area is summarized in table (1). A geologic map of the area showing locations of the deposits and geology is represented by figure (2).

TABLE 1.

ERA	PERIOD	FORMATION	LITHOLOGY
Quaternary	Recent		Streams alluvium and delta deposits; glacial debris etc.
	Pleistocene		Fluvioglacial terrace deposits
Mesozoic & Tertiary	Post-Triassic		Mafic dykes: lamprophyres, Salic stocks, dykes, & sills, granite, syenite, diorite.
		Nelson pegmatite-gneiss complex.	A complex of coarse pegm't. granite, fine to medium gneissic granite.
		Gradational contact	
		Nelson non-porphyritic granite & granodiorite.	Medium grained, equigranular, biotite-hrnbld. granite & granodiorite.
		Gradational & intrusive contacts	
	NELSON GRANITE	Nelson porphyritic granite.	Coarse grained hornbld. or hornbld.-biotite granite with phenocrysts of potash feldspar.
		Gradational contact	
		Nelson granite-gneiss	Coarse-grained, crushed & foliated, porphyritic granite with phenos. of microcline.
		Gradational contact	
		Nelson gneiss	Crushed, foliated, & banded granite-gneiss with inclusions of older rocks.
		Intrusive contact	

ERA	PERIOD	FORMATION	LITHOLOGY
Mesozoic	Triassic	Slocan series	Slate, argillite, quartzite, limestone conglomerate, & tuffaceous sediments.
		Disconformity	
		Kaslo series	Andesitic volcanic rcks. & related basic intrusives (greenstones); serpentine rcks., intercalcated tuffaceous rcks.
		Unconformity	
Mesozoic & Palaeozoic	Triassic & Carboniferis.	Milford group	Chiefly chert, massive & banded Slate, fissile argillite, cherty grnstone, lst., andesite & porphyrite.
		Unconformity	
Late Precam-brian	Windermere	Lardeau series	Crystalline schists, greenstns. green schists, & crystalline limestone.
		Undivided	Crystalline schists, limestone and paragneiss.

Only those formations that contained properties found in this report are discussed in detail.

Slocan Group:

This series occurs throughout the Sandon and Slocan area and contains the bulk of the silver-lead and zinc deposits. This series consists of six rock types:

1. Slates
2. Argillites
3. Limestones
4. Quartzites
5. Conglomerates
6. Tuffs

1. Slates: these are five-grained rocks varying from grey to green to black. Bedding is indicated by narrow bands of alternating shades due to differences in composition. Most show change parallel to the bedding or at a small angle.

2. Argillites: these are distributed throughout the western half of the area. This rock type is the member in which fissure veins are best developed. They tend to be fine grained but massive, ranging from a limey composition to a quartzitic composition.

3. Limestone: forms a small portion of the series. The beds pinch and swell along their length with those in the west being of a calcareous quartzite or argillitic nature and those in the east being relatively pure.

4. Quartzite: this varies from white through grey, brown and black. It is generally a massive compact, fine to medium-grained rock. Quartzite is commonly interbedded with argillite and may range up to several hundred feet in thickness. The last two members, tuff and conglomerate will not be dealt with as

they are not important in the immediate study area. The entire Slocan series rests disconformably on the Kaslo series. The contact trends north to northwesterly dipping southwesterly to westerly at roughly 60°.

Nelson Batholith:

The batholith occupies much of the western part of the Kootenay area and in the Slocan area it has been divided into three types:

1) Nelson gneiss
2) Nelson granite
3) Nelson prematite-gneiss

2. Nelson granite

This is usually a distinctly foliated rock whose structure has been produced by deformation. This unit has been produced by deformation. This unit has a composition of feldspar and quartz with minor amount of biotite and hornblende. The feldspars being orthoclase and microcline. ~~There is~~ A sub-unit of the Nelson granite, ~~and this is~~ the Porphyritic Granite member, ~~This member~~ is important as many of the mineral occurances are confined to it. It is determined by the abundance of Carlsbad twins of potash feldspar. The rock also contains 5 to 10% hornblende and biotite with orthoclase being the dominant feldspar. The quartz shows strain effects and crushing which may have been useful as a plumbing system for ore solutions.

This member grades into the crushed granite member and the Nelson pegmatite-gneiss member that are part of the Nelson Batholith but are not described in this paper.

Stocks:

The Slocan series is cut by many stocks and plugs from a fraction of a mile to several square miles in area. Although conforming to the typical stock or plug shape on surface, they tend to dip beneath the surface at a low angle. They range in composition from granite, to syenite, to granodiorite, to quartz diorite and porphyritic and felsic equivalents. The stocks are somewhat deformed, are premineral and in some cases contain important ore deposits.

Structure:

The structure is very complex with two major periods of folding being recognized, (Fyles 1955). The oldest deformation is referred to as a phase 1, and consists of isoclinal folds that plunge about 10° in a northerly direction. (See cross sections 1 & 2). Phase 2 consists of a large recumbent fold, involving overturning of ore limb and having moderate to isoclinal curvature. The structure appears to be one of a dragfold with the top moving southwest and the bottom northeastward. This structure can be seen between Idaho Peak and Carpenter Creek.

direction?

Faults and Lodes

Tangential and crosscutting faults are the two main fault types recognized.

Tangential faults follow the formational strike. These normal faults, formed during the last stages of folding, are due to the inability of rocks to entirely relieve the compressive forces by folding.

The crosscutting faults, so named because of their relation to the structural trend, strike northeast and, "with rare exception dip southeast" (Hedley, 1952, p. 46). These are normal faults with maximum lateral movements in the possible order of several hundred feet. There are also smaller crosscutting faults with neither the displacement or length of the larger faults. Hedley (1952, p. 49), suggest that the crosscutting faults may have started as bedded shears in the northeast striking sediments close to the batholith. On passing into the northwest striking sediments these shears become crosscutting, mutual disection of tangential and crosscutting faults suggest that they are contemporaneous.

Lodes are those crosscutting faults that are mineralized. Hedley (1952, p. 47), states:

> Mineralization is not continuous in them but is localized in favourable situations along the zone of faulting, from wall to wall in some instances in smaller faults and across part of the width in the larger faults.

The lodes are recognized as channelways for mineral-bearing solutions; when conditions were favourable ore was deposited. Large lodes are zones of fracturing and shearing 500 feet or more wide which often extend relatively free from offset for a mile or more. These lodes are noted for their branching character and often merge to form lode systems.

In a lode generally only one major break accompanied by several subsidiary breaks is noted. However, changes in width and number of fissures along with the degree of rock shattering between fissures as it passes from one rock type to another, are noted. The bedding attitude influences lode attitude and where the angle between these planar features is small the lode may pass into bedding. Small lodes are seldom deflected by bedding and follow relatively straight courses. They are believed to be related to crosscutting lodes. Hedley (1952, p.55), found that ore occurs in those parts of the lode that are shattered rather than sheared. He outlined the following relations that are apt to produce shattering:

(1) Intersection of fissures;

(2) Bedded lode jumping across fissures;

(3) Lode cutting rock of favourable competency;

(4) A rolling or bending lode passing from softer to harder rocks;

(5) Lode crossing bedding at a large angle with direction of movement across rather than with the bedding;

(6) Component of tension in lode movement.

This section on lodes and fissures trending northeasterly, although long and seemingly incidental, was found to be very important with regards to veins and brecciation in the polished sections. Its implications will be borne out in the section under conclusions.

Geology of the Deposits.

In all, there were five deposits examined:

1. Arlington
2. Ottawa
3. McAllister
4. Capello
5. Panama

The first two represent the typical dry ore deposits of the Slocan while the last three are examples of anomalous situations where dry ores occur in Slocan sediments that are generally a wet ore environment. eg: high lead and zinc values as compared to gold and silver.

1. Arlington

The property is situated at the junction of Springer Creek and Speculator Creek. It consists of a mineralized crushed zone in coarse-grained hornblende granite or granodiorite of the Nelson batholith. The mineralized zone lies in a number of parallel fissures with a strike of N 34°E and a dip of 65°E.

2. Ottawa

The property lies at the headwaters of Algiers Creek, a tributary on Springer Creek. The workings explore a wide, sheared, and brecciated zone in coarse grained porphyritic granite. The zone trends north and dips easterly between 25 and 45 degrees. The zone consists of crushed and broken granite containing quartz and barite as lenses and veins. The mineralization is found as disseminations and veins.

3. McAllister

The McAllister is situated on ~~Kone~~ seen Creek at the top of London Ridge. The rocks underlying the property are chiefly Slocan sediments/ any rocks consisting of massive quartzites, argillites, slates and some linestones. Strike varies from the northwest to north and dips are to the southwest at 40 degrees. The sediments are intersected by a number of prominent quartz porphyry dykes that are parallel to the strike. The workings are developed on a fissure that consists of quartz and crushed wall-rock. The quartz carries high grade silver minerals, pyrite and in local areas a little galena and sphalerite zinc. The width of the fissure is from three to nine feet and the ore is somewhat regulated by the position of cross-fractures, which are at an angle of 30 degrees.

4. Capello

The property is on Carpenter Creek northeast of Denver Canyon. The property is in highly weathered or "rotten" granite. The mineralization follows a crude joint pattern in a zone of breccia that has been cemented by quartz.

5. Panama

The property is found at the headwaters of Seaton Creek. The mineralization is in a large single quartz vein amongst grey argillites and phyllites. The vein strikes N10°W and dips 56°E and shows considerable leaching, resulting in limonite structures.

10 successive sentences beginning with "the"

DESCRIPTION OF SPECIMENS

I. Arlington Mine

(a) Hand Specimens - the specimens seem to show multiple stages of veining and brecciation. Alteration took several forms and is quite extensive in the gangue. Seem to have:

1. Sericitization of felspars
2. Chloritization of mafics.
3. Extensive sericitization in the gangue.

Several assemblages of gangue are present and some of these represent different stages of mineralization.

1. Quartz, ~~uriate~~ sericite? + chlorite, no sulfides.
2. Quartz + calcite + much of the ore minerals
3. Massive bull quartz. These appear to be older than (2)
4. Colloform banding of aragonite and silica around breccia fragments.

Mode:

The mineralogy of the veins was found to be approximately 80% gangue and alteration and 20% sulfides.

Gangue:

medial (mineralized) quartz	35%
bull quartz	15%
sericite and chlorite	30%
Calcite & aragonite & others	20%

Intergrown and mixed!

Sulfides:

66%	sphalerite
33%	galena
½%	chalcopyrite
½%	pyrite
½%	tetrahedrite & Ag minerals

Total percentage:

25%	sphalerite
8%	galena
½%	chalcopyrite
40%	quartz
15%	carbonate
11%	sericite & chlorite
½%	Ag minerals

(b) Polished Sections

Textures: (1) galena shows a dominate "spatter" type of replacement especially into sphalerite (slide no. 1.)
(2) replacement along fractures and clearage fragments. eg: galena into calcite (slide no. 2.)
(3) cochade colloform banding of quartz and carbonate around breccia fragments.

Mineralogy & Mode: (1) in the breccia, both tennantite and tetrahedrite were found. The tennantite being associated with the chalcopyrite and tetrahedrite as inclusions in sphalerite.

(2) Chalcopyrite was found as minute inclusions in the sphalerite and with the tennantite.

(3) Stephanite was thought to have been found as replacement grains in the sphalerite.

(4) Pyrargyrite was also found in very minor quantities.

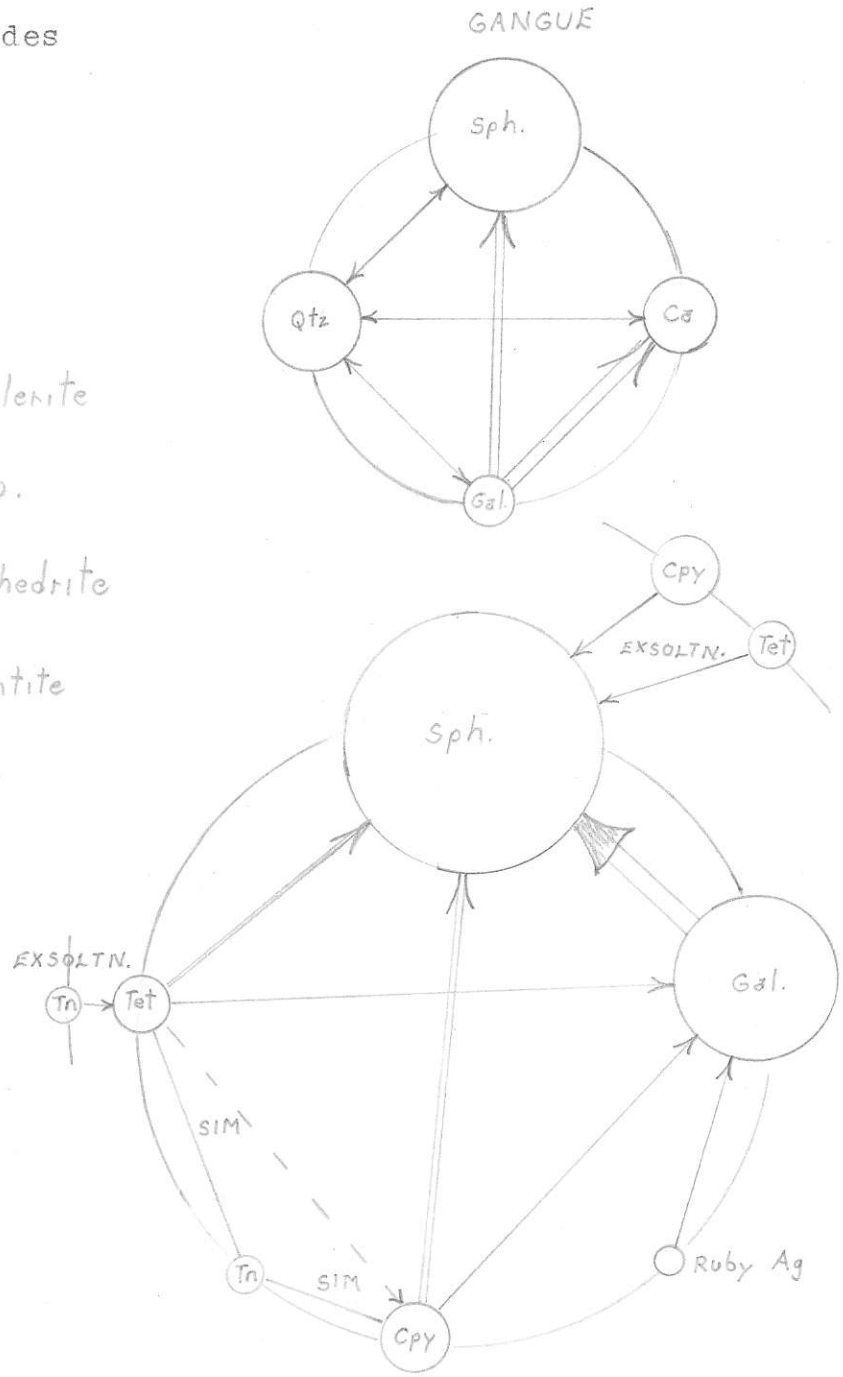
70% sphalerite	(50% chalcopyrite
24% galena	(48% tetrahedrite & tennantite
6% other	(1% stiphannite
	(1% pyrargyrite

(c) Paragenesis

Since more than one stage of quartz exists, it replaces and is replaced by all minerals. The areas of brecciation however, are confusing. The sulfides seem to show:

1. Sphalerite as earliest and being replaced extensively by galena and by minor amounts of the others. (SLIDE NO. 3)
2. Chalcopyrite and tetrahedrite as exsolution, and also as a replacement of sphalerite.
3. Stephanite and possibly galena replacing sphalerite.
4. Pyrargyrite seems to be associated with stephanite. (SLIDE NO. 4.)
5. Tennantite as exsolution from tetrahedrite. — most unusual as there is complete solid sol^{n}?
6. Galena replacing sphalerite.

Gangue - sulfides



Paragenesis

Sph	Sphalerite
Cpy	Chalco.
Tet	Tetrahedrite
Tn	Tennantite
Gal	Galena
Ruby Ag.	

II Ottawa Mine

(A) Hand Specimens

There were no distinctive alteration minerals present, but several gangue assemblages exist. 1. quartz and calcite

2. calcite and barite

3. barite.

Mode:

The mineralogy of the veins was found to be approximately 94% gangue and 6% sulfides.

Gangue:	50%	quartz
	16%	calcite
	28%	barite
Sulfides:	3%	pyrite
	1%	galena
	2%	chalcopyrite

(B) Polished Sections

Textures (1) Quartz veins being cut by later calcite veins.

(2) Replacement texture of chalcopyrite replacing galena.

Mineralogy and Mode: (1) Have sphalerite and galena localized | sentence as blebs in the carbonate. (SLIDE NO. 5)

(2) Argentite and in some cores chalcopyrite replace the galena. Argentite replaces chalcopyrite as well.

(3) Possibly gold electrum replacing argentite near galena, sphalerite contact.

45%	chalcopyrite
35%	galena
10%	pyrite
8%	sphalerite
2%	argêntite

(C) Paragenisis:

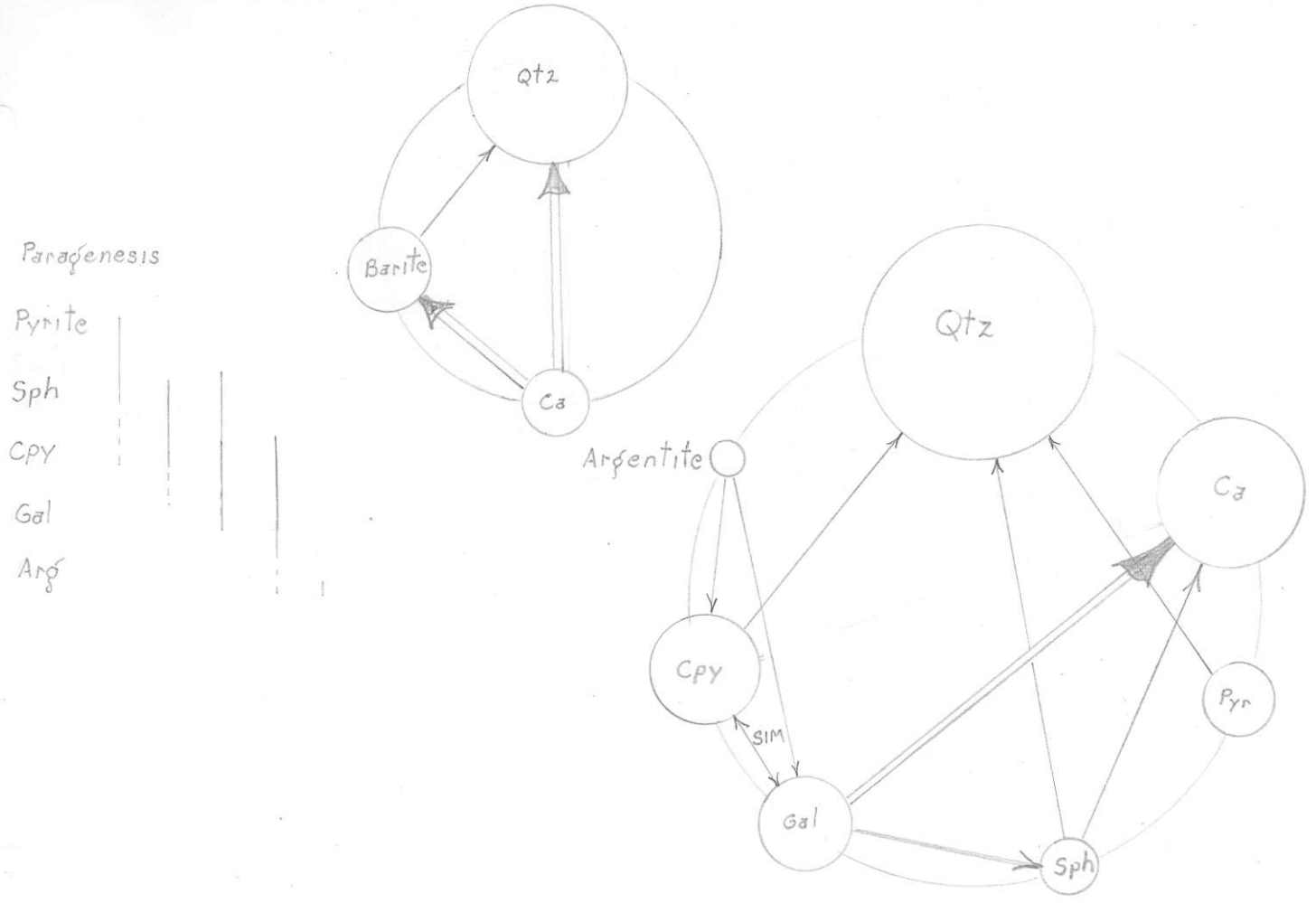
The gangue minerals show quartz being first and then calcite later, crosscutting it. Barite overlaps the two. The sulfides show: (1) intially pyrite and chalcopyrite. (SLIDE NO. OF PYR IN GANGUE)

(2) sphalerite next, being replaced by galena. (SLIDE NO. 6)

(3) have a second stage of chalcopyrite replacing galena.

(4) the galena and chalcopyrite are both replaced by argentite which appears to contain some electrum.

GANGUE



III McAllister Mine

(A) Hand Specimens - the specimens consist of many quartz veins in highly silicified argillite. Alteration took the form of sericite and kaolinization, the kaolinization being found in fractures. Several specimens were of country rock and consisted of phyllite and slate. These were highly slicified and contained a network of hairline fractures.

Mode:

The rocks contain 90% gangue and 10% sulfides.

Gangue: 70% bull quartz
20% calcite
10% siderite

Sulfides: 40% sphalerite
20% tetrahedrite
39% galena
1% pyrite

Total Percentage: 55% quartz
10% carbonates
20% galena
12% sphalerite
3% tetrahedrite

(B) Polished Sections:

Textures: (1) replacement along fractures is the dominate type. eg: galena replacing sphalerite.

(2) have bournonite as a spatter texture in the galena. \ Sentence

(3) there seems to be rudimentary coloform banding along fractures where tetrahedrite replaces sphalerite.

Mineralogy & Mode: (1) in the larger veins have tetrahedrite showing extensive replacement of sphalerite and then galena replacing tetrahedrite. In some areas have exclusively tetra- \ sentence hedrite and galena. (SLIDE NO. Mc. 3.)

(2) bournonite replaces galena.

(3) pyrargyrite is seen associated with sphalerite as small hackly forms. (slide no. Mc. 1.)

48% sphalerite
48% tetrahedrite
8% galena
½% pyrite
½% pyrargyrite

(C) Paragenesis

1. Pyrite is one of the earliest and has had a long period of deposition. what?

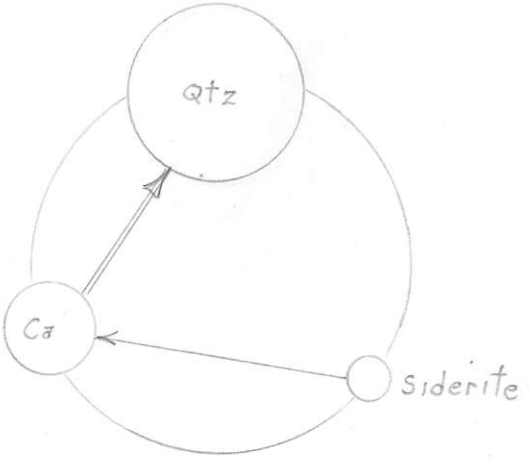
2. Sphalerite is the first economic mineral to be deposited and is extensively replaced by tetrahedrite and much later by galena. (SLIDE NO. McA. 2.)

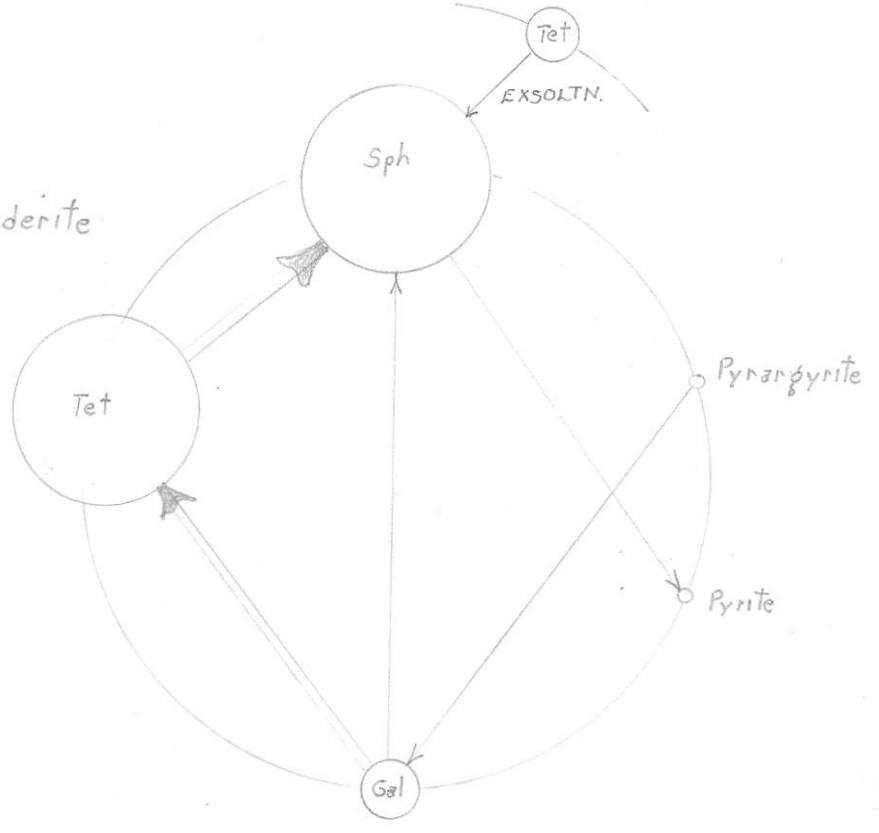
3. Tetrahedrite replaces sphalerite and occurs as reticular

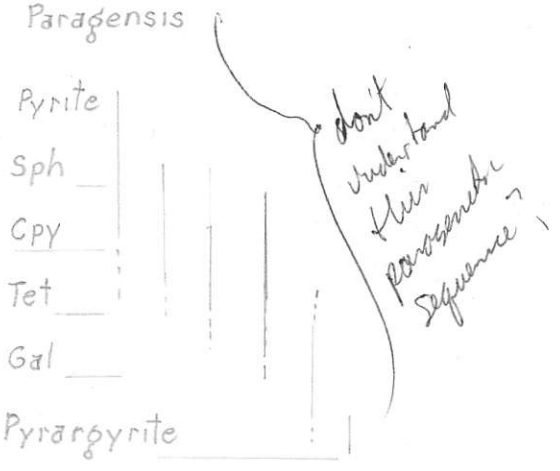
veinlets. (slide no.)

4. Galena is late stage and replaces both sphalerite and tetrahedrite.

5. Pyrargyrite is of secondary origin following cleavage outlines and the like. (SLIDE NO. McA. 4.)







IV Capello Mine

(A) Hand Specimens - several specimens of host rock were present of a granitic composition. They are so extensively kaolinized and sericitized that identification of mafics is next to impossible. The mineralized veins contain two types of gangue; quartz and calcite. The quartz and calcite are not intermingled but rather two separate entities.

Mode:

The mineralization only accounted for 10% of the mineralogy while gangue made up 90% of the vein.

Gangue: 55% quartz
45% calcite

Sulfides: 60% sphalerite
40% galena

Total percentage: 50% quartz
40% calcite
7% sphalerite
3% galena

(B) Polished Sections

Textures: (1) have colloform banding of quartz and calcite around brecciated grains.

(2) have a reversed Caries texture where galena replaces sphalerite. (SLIDE NO. Cap. 2.)

(3) argentite exists as tiny exsolution particles in the sphalerite. (slide no. /.)

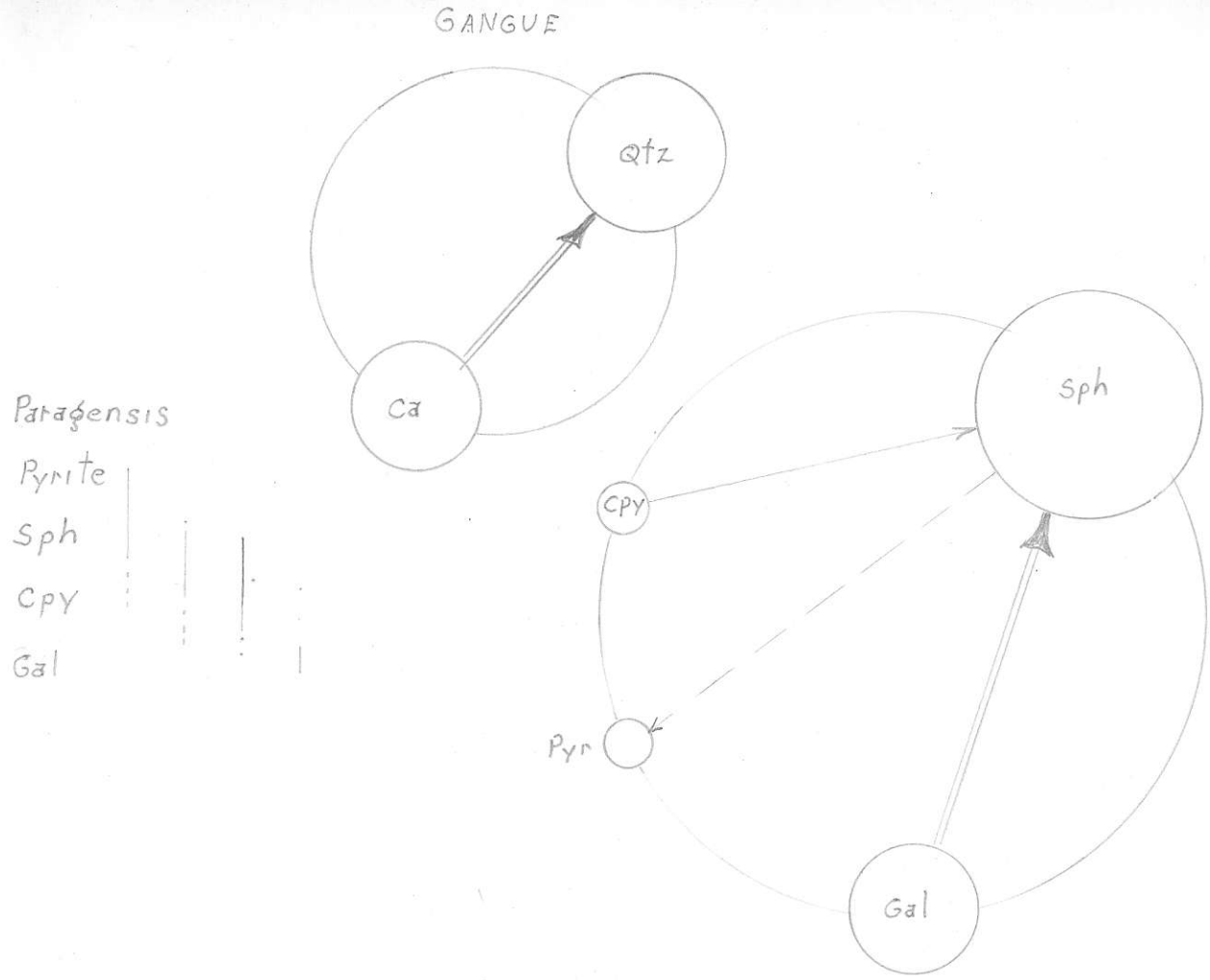
Mineralogy and Mode:

1. chalcopyrite occurs as inclusiions in the sphalerite.
2. galena replaces the sphalerite (SLIDE NO. Cap. 4, MOSTLY Gal.)

63% sphalerite
30% galena
4% chalcopyrite
3% phrite

(C) Pargenesis

The paragenesis of both gangue and sulfides is quite straight forward. The first gangue mineral was quartz followed by calcite. The first sulfide was pyrite followed by sphalerite and then chalcopyrite. This order is generally reversed, but both are nearly simultaneous and can show overlap. (SLIDE NO. Cap. 3 SHOWS ALL 3.) Galena is late stage followed by secondary argentite.



V Panama Mine

(A) Hand Specimens - large quartz veins enclosed by phyllites. The areas of phyllite tend to be fractured and laced with quartz veins. The hand specimens show extensive alteration with smithsonite and cerussite crusts forming. One specimen showed faint limonite cleavage boxwork derived from galena. (Slide no.) The two gangue minerals present were quartz and siderite.

Mode:

65% quartz
10% siderite
25% sulfides

(37% galena
(55% sphalerite
(8% tetrahedrite

(B) Polished Sections:

Textures: (1) tetrahedrite shows brecciation. (SLIDE NO. P.1.)

(2) pyrite cubes developed along the margins of fractures and then were surrounded by sphalerite.

Mineralogy and Mode:

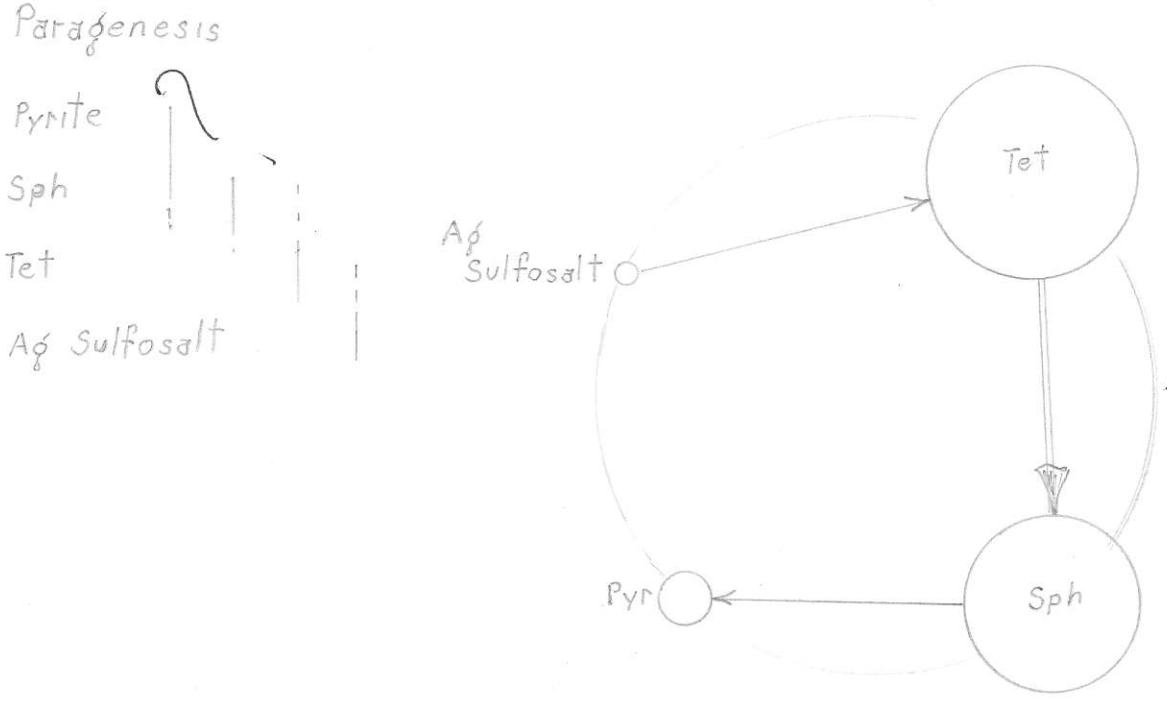
(1) sphalerite occurs as blebs along the edge of fractures and is replaced by tetrahedrite. (SLIDE NO. P.2)

(2) a silver sulfosalt possibly sternbergite or argyropyrite is present as small inclusions in the tetrahedrite (slide no. P3).

40% sphalerite
5% pyrite
55% tetrahedrite
< silver sulphosalt

(C) Pargenesis

Again it is quite straight forward with pyrite being the initial sulfide followed by sphalerite, tetrahedrite and then a silver sulphosalt. The latter two representing a second stage of mineralization.



Probe Annalysis

Electron probe work was carried out on samples from the Arlington, McAllister, and Panama. This work was done in an attempt to determine what minerals carried gold and silver values and what the relationships are. A silver and gold standard were run giving a background of 12000 counts for silver and 5000 radiation counts for gold.

Arlington results:

Gold was found to be associated with the pyrite giving counts of 1200-2000. Silver values were generally low, counts of 900-1000 were recorded, and these were received from the galena.

So how much over background are these?

McAllister:

Gold values could not be found in the two samples that were run. Assay results do show gold present; hence this may reflect sporadic values or a poor choice of samples. Good silver values were obtained though, with 3720 counts from tetrahedrite. Low sporadic counts were obtained from the galena.

Panama:

Here too, no gold values could be found. Silver values of 7547 counts were found in the tetrahedrite and 9340 counts in a grain of what appeard to be pyragyrite.

Conclusions:

Having seen the results I feel that my choice samples do not necessarily represent a true evaluation of the area. Also, the number of samples run in the probe were not adequate to be representative of the entire population. However, if one does

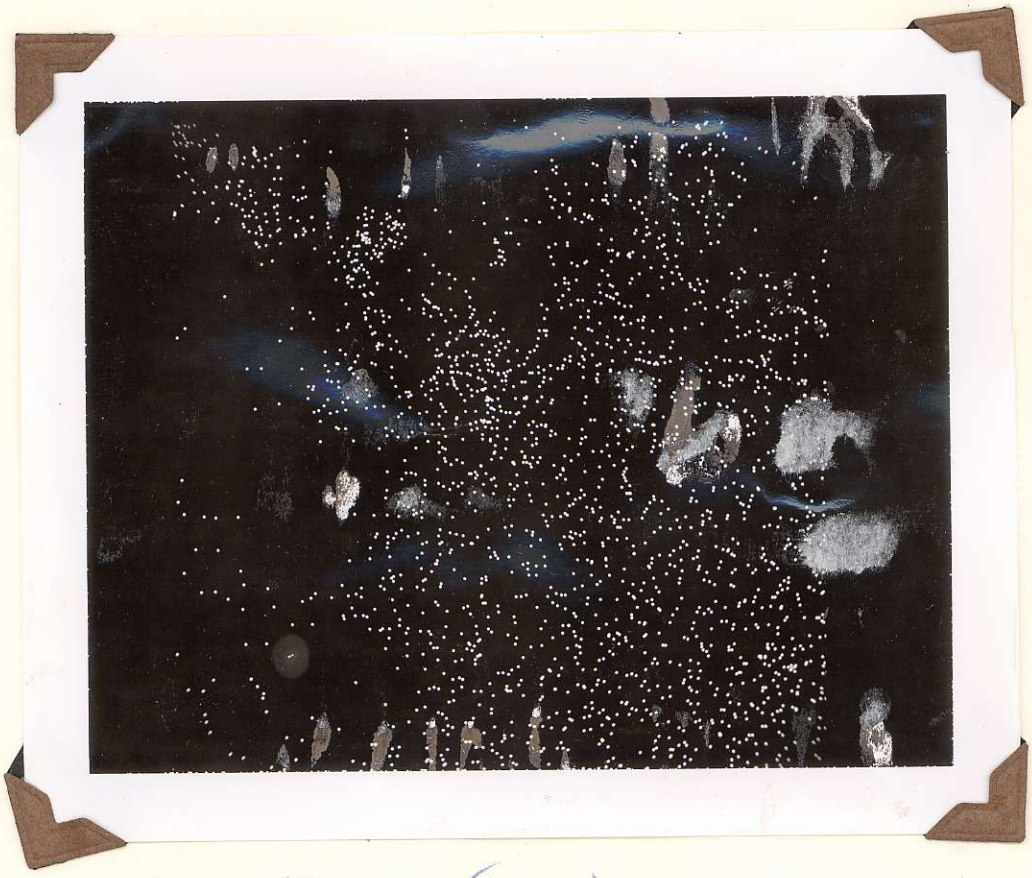
accept these results as representative then it would appear that (1) gold values are very sporadic but where they do occur they are very high. Values in the "type" deposits are fairly evenly distributed, being associated with pyrite.

(2) silver values in the "type" deposits are low but evenly scattered through galena.

(3) silver values in the McAllister were slightly lower and more erratic in the galena as compared to the Arlington. The values in the tetrahedrite were high and very evenly distributed. (see print).

(4) silver values in the Panama were restricted to the tetrahedrite where they ran about 7000 counts in an even distribution. Small grains of what appeared to the pyragyrite give very high counts of 9000 or more.

I think these results would help to indicate that the anamolous deposits are not the same as the typical dry ore deposits.



40 KV (X 150)

Mc Allister property.

Shows silver counts in tetrahedrite.

Counts of 3720 were obtained and the

picture shows their uniform distribution.

40KV (X150)

Silver counts in grain in tetrahedrite.
A count of 9340 was recieved, possibly pyrargyrite.

Panama property.

40 KV (x150)

Panama property.

Print of grain outline.

Classification:

The Arlington is a "type" deposit representing a typical dry ore situation. Have high silver values ( ) with low lead and zinc and the gangue, chiefly quartz, is in far greater proportion (80/20) relative to the ore. The deposit is situated in porphyritic granite and consists of a lode of the breccia - vein type. Paragenesis is typical with quartz and pyrite being early followed by chalcopyrite, sphalerite, tetrahedrite, galena, argentite, and pyrargyrite.

The Ottawa is naturally the same and it will also be used as a "type" deposit for comparison with the other three.

The McAllister is very anomalous as it contains dry ore in an area whose mines generally contain wet ore and where host rocks are noted for their being wet ore bearing. Unfortunately the data did not reveal too much as to why this is so. However, it appears that the quartz veins are different and later than those of the surrounding area. Support for this lies in the fact that they are:

1. not deformed as are the others.
2. their mineralization is not only different from the wet ores but is decidedly different from those in the Nelson granodiorite. ie: tetrahedrite is dominant.
3. the veins are quite large as compared to the two type deposits.

Other factors that make the McAllister different from the "type" dry ore deposits is the metal values.

Slocan City

	Geometric Mean	Arithmetic Mean
Tons	44.06	1192.0
Silver	38.99 oz. /ton	88.9 oz./ton
Gold	.1954 oz./ton	.628 oz./ton
Lead	2.11 %	5.98 %
Zinc	1.05%	3.76 %

McAllister	Average
Silver	45.25 oz./ton
Gold	.004 oz./ton
Lead	.066 %
Zinc	.012 %

anthentic or geometric ?

A possible reason to the McAllister being anamolous lies in its origin. The veins could be of later age than the Slocan as they are not fractured and are of a different texture. They could be associated with the Valhalla granite four miles to the north. The Valhalla is considered in some cases to be younger than the Nelson, (Little, H.W.) (1960) but in this case it would appear to be older as it is not fractured. The small stocks on either side are part of or associated with the Valhalla granite and have exerted influence.

very speculative!

The Capello property was at first thought to have been an anomalous situation, as the lode consisted of only one vein and early production figures showed high lead and zinc values. Further work and data proved this incorrect, it falls into the typical dry ore environment. The mineralogy is correct with argentite accounting for so high a silver production.

Capello	Average
Silver	414.16 oz./ton
Gold	.225 oz. /ton
Lead	.20 %
Zinc	.03 %

Slocan City

Tons	44.06
Silver	38.99 oz./ton
Gold	.1954 oz./ton
Lead	2.11%
Zinc	1.05%

The strike and dip of the vein conforms to that of the other dry ores. (see fig.), and the gangue mineralogy is conformable. Vaguely The host rock is the same as that of the dry ore type but the lode only consists of one single vein, whereas there are normally several within a shear or crushed zone. Not so, The only other feature is that a dry ore, and its correct environment, exist in a virtually wet ore camp. The porphyritic stock is not that far away from the main body that it could not be an off-shoot or subsurface extension. Hence its presence is reasonable. backward

The Panama is very unusual and is similar to the McAllister in this respect. The gangue minerals and their abundance are typical of a wet ore situation. ie: Have both quartz and siderite and the gangue sulfide ratio has increased extensively, (3/1). Normally in dry ore situation the ratio is (4/1) - (5/1). The mineralogy is different from the normal dry ores, as tetrahedrite is very abundant as it was in the McAllister.

Panama

Silver	126.0 oz./ton
Gold	
Lead	.548 %
Zinc	

Slocan City

Tons	44.06
Silver	38.99 oz./ton
Gold	.1954 oz./ton
Lead	2.11%
Zinc	1.05%

Also, the lode is developed on a single quartz vein that is not heavily brecciated or branching. The vein width is variable which is not consistent with either the single vein wet ores or dry ores. In the latter two the vein is usually narrow and

fairly uniform. The origin of all these features could be due to this deposit being related to the Valhalla as the McAllister. This could have iniated a second period of mineralization in which tetrahedrites and secondary enrichment took place. Here sulphosalts and limonite exist as evidence. This secondary enrichment did not completely eliminate the features of the first stage of mineralization. eg: vein directions, presence of lead and zinc, zoning features, and the gangue minerals were not changed appreciably.

Conclusions:

1. The Capello property is not anomalous except in the sense that it occurs in a prophyritic granite that is situated in a principally wet ore district. This is satisfactorally explained by the stock being treated as a satellite body.

2. The McAllister and Panama do not have all the typical characteristics of dry ore deposits and may have their own separate classification.

3. They may not be associated with the same period of mineralization as the Slocan City dry ores. They appear to be associated with a later stage.

4. The McAllister is a late stage of mineralization associated with the Valhalla granite and hence ressembles the dry ores to the south. highly speculative!

5. The Panama has also been affected by the Valhalla but in the sense that it only resulted inaa second major stage of mineralization to an already existing ore body.

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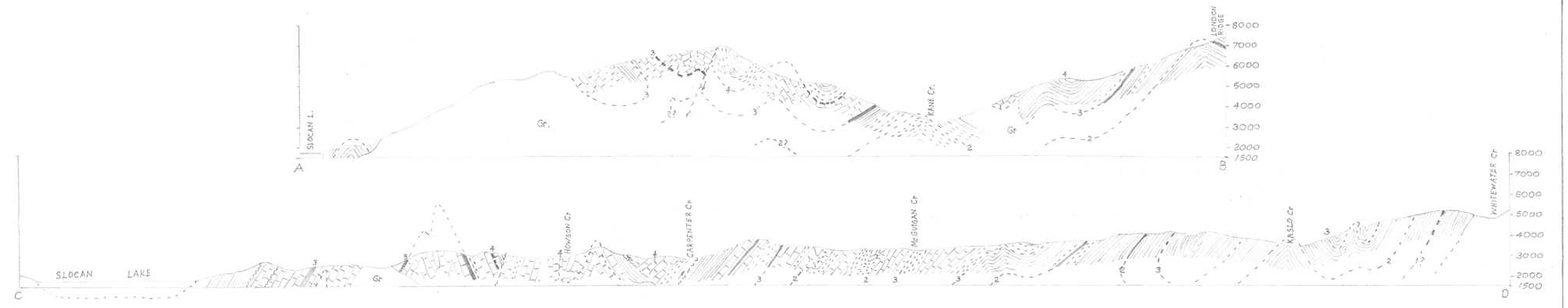


LEGEND

- Gr — GRANITE
- LSTN. — LSTN.
- LSTN. (approx. position) — LSTN. (approx. position)
- FISSILE SLATE + ARG.
- Fissile slate + argillite interbedded with more massive phases
- QUARTZITE + ARG.
- ~~~ FAULT
- 1,2,3,4 { SUCCESSIVE HORIZONS

SCALE 1:48000 1 INCH : 4000'

STRUCTURE SECTIONS

LEGEND

RECENT

Delta and stream deposits

POST TRIASSIC

Granite, syenite, granodiorite, quartz and their porphyritic and felsitic equivalents zones of dykes or sills are represented by dots

Porphyritic granite

Crushed, mostly porphyritic, granite

Gneiss (granitized pre-batholithic rocks)

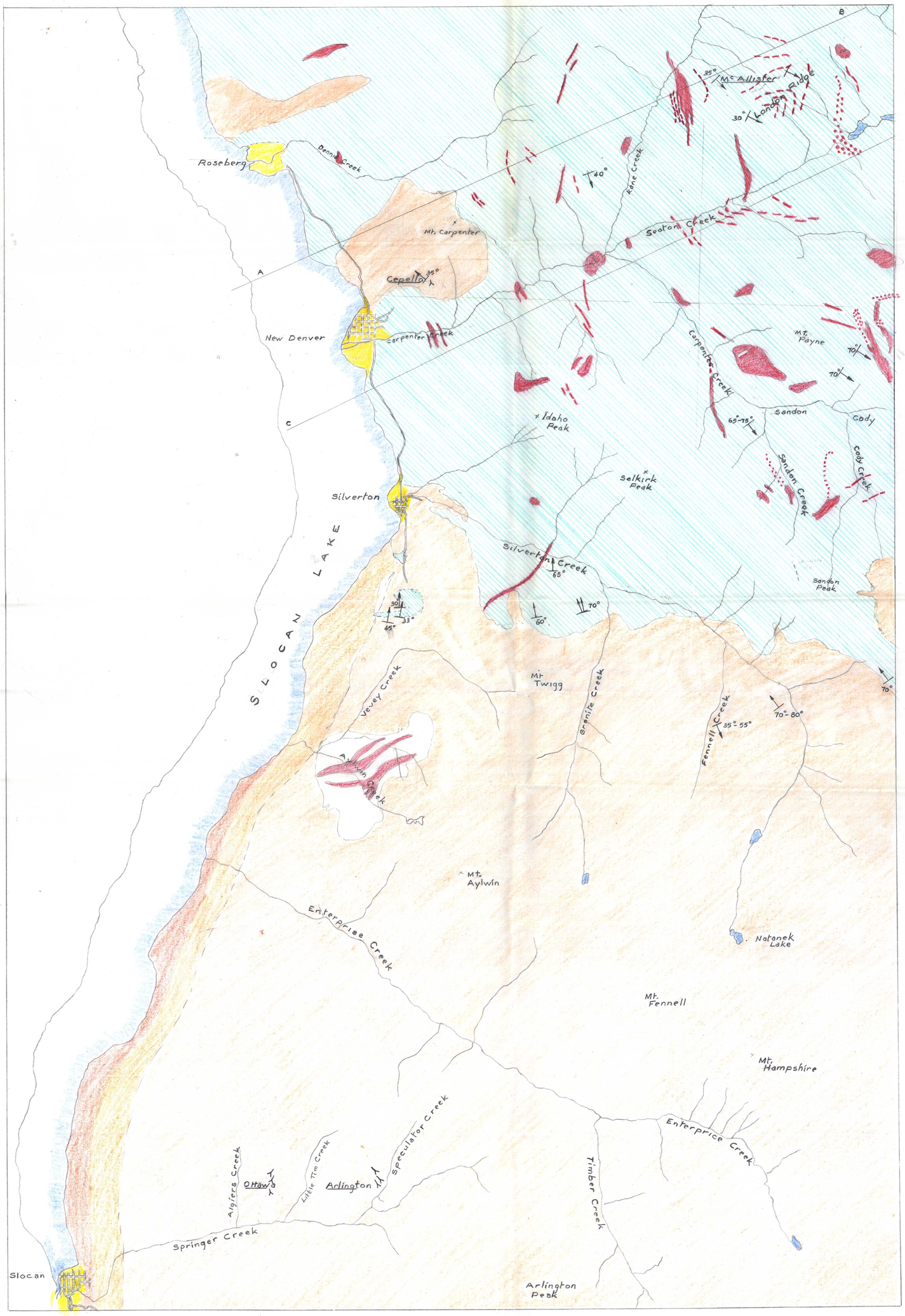
TRIASSIC

Slate, argillite, limestone, quartzite and Tuffaceous sediments

60° Silver lead zinc veins

Mine

Towns



SLOCAN MINING AREA

Scale 1/50,000