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THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED

H. B. MINE

GEOLOGICAL INVESTIGATIONS AT THE SALMO MALARTIC PROPERTY

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INDEX

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SALMO MALARTIC

SUMMARY:

The Salmo Malartic property was mapped during the summer of 1952, and the accompanying map made. The rocks are two main types:

1. Sediments belonging to the Laib group, block argillites of the Upper Laib and interbedded limestones and grey argillites of the Lower Laib which correspond with the three limestone and argillite bands at the H.B. Mine.

2. Granites intrude all the sediments as dikes, sills and stocks.

The sedimentary rocks are folded into northwesterly trending isoclinal fold which produced thickening and thinning of the limestones and a repetition of beds. Later an open cross fold striking 115° was superimposed on the primary folding.

The granite intrusion followed the folding period. Limestones were extensively recrystallized during the folding. Contact metamorphism of the Lower Laib argillites has produced a rock similar to the "leopard rock" at the H.B. Mine. This altered rock contains some scheelite.

Some sphalerite and galena mineralization occurs in the limestones.

RECOMMENDATIONS:

1. Option the property.

2. Carry out sufficient diamond drilling to thoroughly Prospect the mine and lower mine limestone for sulphide bodies of ore grade.

3. Lamp the altered lower Laib argillites for scheelite.

4. Explore the Garnet limestone band in Aspen valley in order to determine whether or not it is of sufficient width to contain commercial mineralization.

5. Re-examination of the lower Laib-upper Laib contact to establish definitely the structural relationships which are needed for regional prospecting.

INTRODUCTION:

The Salmo Malartic property, located three miles by road north of the H.B. Mine, consists of the Aspen, Caroline, International, Mohawk and Silverton fractional claims. In the hope of finding some favourable structures in the limestone for ore deposition, the surface was mapped during July, August and September, 1952, by J. Richardson and F.C. Taylor. The mapping was done on a scale of 1 inch = 200 feet using a plane table. A. Hester was instrument man. The contours were taken from a B.C. Department of Mines topographic map. This report and accompanying map and sections are the result of this work.

A brief examination was made of the underground workings.

HISTORY:

The Salmo Malartic property, sometimes called the Aspen group, has been prospected intermittently since 1912. The largest part of the work now accessible was done during 1927, 1928 and 1929 by Salmo Malartic Mines Limited. Over 600 feet of lateral workings and two raises were driven during these years. No ore bodies were located, but low grade sphalerite and galena mineralization was found in several places.

In 1950, Sheep Creek Gold Mines Limited optioned the property, drilling eleven holes, four from surface and seven from underground. These holes did not intersect very much mineralization. The existence of granite at depth was established by the underground drilling. Upon completion of the drilling, the option was dropped.

STRATIGRAPHY:

The sedimentary rocks all belong to the Laib group as defined by Little (1950). They consist of two formations, the black argillites and silstones of the upper Laib and the brown grey, sometimes black, argillites and limestones of the lower Laib.

(a) Lower Laib

The lower Laib is mostly limestone with some interbedded argillite. The limestone is a grey to white, medium to coarse grained rock. Much of the limestone has been recrystallized and in some places crystals of calcite up to 2" long ar present. The bedding planes are frequently obscured only appearing as streaks through the rock. There are many indications of flowage and some drag folding is present.

The thickness of the limestone varies from band to band and also within each band because of folding, flowage and probably different original thickness.

The argillites of the lower Laib are very fine-grained rocks, usually grey or brown, but occasionally black. The bedding planes are well-defined but no other primary structures are present. Secondary structures are very rare; only the occasional drag fold being present. These rocks are sometimes represented by relects within the limestone. A well defined band may peter out into an argillaceous limestone that shows on the weathered surface as limestone ribbed with narrow bands of argillite, usually less than 1" wide.

Some of the lighter coloured argillites are very rich in quartz, being very hard with quartz particles visible to the naked eye. The quartzose horizons peter out laterally passing into the normal argillite. Some of the quartz may have been introduced from the granite, particularly, in those rocks close to intrusive bodies.

The total thickness of the lower Laib is not known because the lower member or members are drift covered, but thickness is about 1000 feet. Thickening and thinning of the limestone makes calculations unreliable.

(b) Upper Laib

The upper Laib overlies the lower Laib limestone conformably at the H.B. Mine, but at Salmo Malartic, the evidence for a conformity is not indisputable. Where the limestone-black argillite contact is exposed, it appears conformable, especially in the width. In the south, the dip is in the opposite direction, to the east. There is much distortion along the contact. The status of this contact is discussed

more fully under Structural Geology.

In one area north of the limestone-black argillite contact, the lower and upper Laib argillites appeared to grade into one another. This relationship had not been found previously, and therefore, should be examined in more detail. Alternative solutions to a gradational contact are that the limestone may have been squeezed out during folding, or there may be a fault which was not recognized. The limestone has a minimum thickness of 100 feet in the map area and only a short distance away, it is much thicker. Whereas, squeezing out of the limestone is possible, it is not likely in such a short distance. A fault may exist in the crumpled argillites so that the limestone was depressed. The most probable type of fault would be a dip slip one striking northerly and dipping eastward. Further examination of the area is justified in order to clarify the overall stratigraphy in the Salmo area.

The upper Laib rocks are very thinly bedded, black and rarely grey carbonaceous argillites and silty argillites. They are closely folded and crenulated with varying altitudes. However, in general, the bedding planes strike north and dip eastward. Primary structures, other than bedding, do not exist and secondary structures are of little help in solving the structure because of the deversity of orientations. The black argillites extend eastward from the map area where they are intruded by many small stocks and dikes of granite. These are the same type of rocks which outcrop to the south on the Deer Group. A granite stock, just south of the map area, breaks the continuity with the Deer Group exposures. Two narrow bands of grey limestone occur within the black argillites. These are probably small lenses.

The thickness of the black argillite is not known because the top of the Laib is much farther east.

(c) <u>Comparison of Lower Laib stratigraphy at the H.B. Mine and Salmo Malartic</u>

The lower Laib rocks at Salmo Malartic can be compared with those at the H.B. Mine where the limestone bands have been studied for several years. The first band of limestone below the black argillite at the H.B. Mine, the Mine Lime, varies in thickness from 30 feet to 700 feet. The corresponding limestone at Salmo Malartic has an apparent thickness varying from 100 feet to 800 feet. There is a remarkably close similarity in lithology and the stratigraphic position is the same. It seems reasonable, therefore, to assume that the two limestones are one and the same band.

The largest exposure of limestone west of Aspen Creek may be part of the Mine Lime also. The absence of the black argillite of the upper Laib overlying it, prevents a definite establishment as the Mine Lime.

The argillite band below the Mine Lime at the H.B. Mine varies from 50 to 100 feet in thickness, whereas, the corresponding member at Salmo Malartic, measures 45 feet to 400 feet thick. The argillite on the west side of Aspen Creek varies from 60 feet to 170 feet thick. Folding within the argillites, a greater original thickness, or a combination of the two, may account for the greater thickness of the argillite below the Mine Lime at Salmo Malartic.

The next band of limestone at the H.B. Mine, the lower Mine Lime, is very thin, only 10 feet to 50 feet. A band so narrow, it may or may not be persistent. The next lime band at Salmo Malartic, the second, varies from 200 feet to 400 feet, but possibly narrows to as little as 50 feet. Whether these two bands, which correspond stratigraphically, are the same or not cannot definitely be stated. The second band at Salmo Malartic may correspond to the thick garnet band at the H.B. Mine, which is in places 1000 feet thick.

The second argillite band at the H.B. Mine is 150 feet thick, whereas, the corresponding band at Salmo Malartic is less than 20 feet thick.

The third limestone band at Salmo Malartic is only exposed in five small outcrops. The thickness is at least 100 feet and may be much greater as the area is all drift covered at least as far as Aspen Creek. This band may be the Garnet limestone.

Summary of lower Laib Stratigraphy
at H.B. Mine & Salmo Malartic

H.B. Mine	Thickness	Sal.Mal.	Thickness
Upper Laib	-	Upper Laib	-
1. Mine Lime	30'-700'	Limestone	100'-800'
2. Argillite	50'-100'	Argillite	45'-400'
3. Lower Mine Lime	10'- 50'	Limestone	200'-400'
4. Argillite	150'	Argillite	20'
5. Garnet Limestone	up to 1000'	Limestone	over 100'

The limestone bands as henceforth referred to by the same names as applied at the H.B. Mine.

STRUCTURAL GEOLOGY:

The only primary structures present in the sedimentary rocks at the Salmo Malartic property are bedding planes. The interpretation of the structure is, therefore, made difficult because there was no positive method of determining "tops".

Secondary structures, such as drag folds and fracture cleavage were useful in obtaining fold patterns and direction and degree of plunging. The secondary structures in the limestone were not found to be reliable because of much flowage and recrystallization. W.T. Irvine recognized stylolitic banding in the limestone underground similar to that with which the ore at the H.B. Mine is closely related. This structure is not present on the surface.

(a) Folding

The folding is of two types, primary and secondary. The primary folding is generally in a northwesterly direction and the secondary folding is at 145° to the primary folding and in an easterly direction.

The primary folding is best seen in the south-central part of the map area where the limestones and argillites of the lower Laib have been isoclinally folded. The isoclinal folding has caused much flowage of the limestone, both thickening and thinning it, and it has also caused some of the thin argillite bands to be thinned or squeezed out. The isoclinal fold axes strike ~~southwest~~ northwest and the axial surface dips eastward at about 60°. The folds plunge southeasterly at a low angle.

In the northwest corner of the map sheet, the primary folding is not as intense. The limestone and argillite form a syncline plunging northeasterly at about 50°. The fold is an asymmetrical open fold. The relationship of this fold with the isoclinal fold to the southeast is not clear because of granite intrusions and possible faulting along Aspen Creek. The second-

ary folding, which is best shown in the northeast corner of the map area, plunges 23° at 115° azimuth. The granite to the west of the fold makes projection of known contacts difficult, but it is most probable that the limbs of the cross fold would extend westward to join the easterly trending argillite and limestone in the central portion of the map sheet.

All the folding appears to have been completed prior to the granite entrusions, although, the secondary folding may have been produced just before or during the intrusive period.

(b) Faulting

Faulting is not a prominent feature at Salmo Malartic. All the faults recognized, with one exception, are of little significance. A steeply dipping right-hand fault, with a strike separation of 20 feet, strikes N 07° E across the centre of the map-area and is exposed for 650 feet. It may extend northward to the granite.

The possible existence of a fault along the upper Laib limestone contact on the east side of the map area was recognized. The contact dips to the southwest in the north and to the northeast in the south. However, the arillite and the limestone are very contorted and crumpled so that dips cannot be relied upon especially in the south. Slickensides, randomly oriented, are very common in the argillite. The contact is probably, in part, a bedding plane fault.

Another fault was recognized on the west side of Aspen Creek where a 50 foot wide band of limestone on the west side of a small gully fails to appear on the east side. The displacement is probably very small as there is no disturbance shown in the limestone which lies along the projected strike of the fault. The dip is not known. This fault may be subsidiary to a major fault along Aspen Creek.

W.T. Irvine suggested that a regional fault existed which extended across the Deer Group and up Aspen Creek through the Salmo Malartic property. With this in mind, the exposures in the valley of Aspen Creek were examined closely for any positive evidence of faulting. The few outcrops on the east side of the creek were in part contorted, especially the limestone. The outcrop on the west side is impregnated with granite. However, where the argillite is preserved, it is strongly contorted. The altitudes of the bedding on either side of the creek do not conform so that it is probable there has been some movement in the area of the creek bed. An examination of available maps shows the limestone exposed at the H.B. Mine thins and is dragged in the area of Aspen Creek north of the mine. The shape of the limestone band indicates a left hand movement of an oblique or strike slip fault.

INTRUSIVE ROCKS:

The intrusive rocks exposed at the Salmo Malartic property are believed to be part of the Nelson intrusives of Cretaceous age. They consist of granite, quartz, porphyry and lamprophyres. The granite, which is primarily a light coloured brotite granite with much quartz, is the most abundant. In some places, hornblende is the commonest ferromagnesian mineral, particularly in the southern exposures east of Aspen Creek.

The granite occurs as dikes, sills and stocks of varying size. The intrusions of granite are not confined to any particular rock type nor is there any structural control that is outstanding.

Xenoliths of grey and brown argillite are common in most of the granite stocks. All stages of decomposition are represented. Some of the largest xenoliths are shown on the

map.

An irregular, northerly trending, quartz porphyry dike, not more than three feet wide, outcrops east of the most southern adit in the main outcrop area.

On the west side of Aspen Creek, a few lamprophyre dikes, the largest, ten feet wide, are present in the limestone; one of them extending into the granite. All are hornblende lamprophyres and, except for the widest, are fine grained. They all strike in a northerly direction and where seen, dip easterly at 40° to 50°.

A lamprophyre with brotite books up to 1/2 inch in diameter in a fine grained pyroxene matrix is present in the northernmost adit on the east side of Aspen Creek. Another brotite lamprophyre, only two feet wide, occurs as a sill in the black argillite on the eastern edge of the map area.

All the lamprophyre intrusives are probably younger than the granite, although, cutting relationships were seen in one place only.

In a few places where the granite intrudes the argillites of the lower Laib, there is notable granitization of the sediments. The most outstanding example is in the lower Laib black argillite exposed on the west side of Aspen Creek. Here the argillite is impregnated with granite and has the appearance of a megmatite.

At the contact of the granite stock above the most southern adit in the main outcrop area, a three foot wide irregular dike of serpentinized peridotite was traced for fifty feet. No other exposures of this type of rock were found.

METAMORPHISM:

Metamorphism is generally of two types at Salmo Malartic, contact and dynamic.

(a) Dynamic metamorphism is primarily confined to the limestones almost all of which have been recrystallized to some extent. In parts of the Mine Lime band, calcite crystals up to 2" long occur.

In a few places in the limestone, well developed brown garnet crystals up to 1/2" in diameter are present. The locus of this garnet development is along the contacts of the brown and grey argillites, or in those places where the argillite has been squeezed out. Either place under the correct conditions of temperature and pressure could supply the necessary silica and alumina for garnet formation.

(b) Contact Metamorphism

The intrusion of granite has not produced any great degree of metamorphism, particularly in the limestone. Practically all the granite-limestone contacts show no metamorphism whatsoever. In a few places, garnet has been extensively developed and a band of garnet-rich silicate rock four feet wide was formed. For the most part, the garnet grains were large, 2" in diameter and anhedral.

The effect of the granite intursion is much more marked in the brown and grey argillites. The argillites are frequently spotted with lens-shaped alteration zones composed primarily of green pyroxene which are oriented parallel to the bedding plane. The colour is slightly different usually slightly browner. This rock is very similar to the altered argillite at the H.B. Mine, where it has been call "leopard rock". A specimen of altered argillite was lamped for scheelite, and a few specks were observed. Lamping of the surface exposures of altered argillite should be considered to see if there is an appreciable amount of scheelite.

Whereas, the alteration of the argillites is no doubt due to the granite intrusion, the degree of metamorphism does not increase as the granite is approached. The hairline contacts the granite makes with the limestone continues through the argillite bands.

In one place, tremolite was developed along the contact of a narrow granite sill in the limestone. The tremolite grains averaged 1/2 inch in length. Nowhere in the limestone is tremolite developed like it is at the H.B. Mine.

Where two narrow granite dikes occur in the upper Laib black argillites, the black argillite has been bleached until it is a very pale grey colour. The bleached zone is 3" wide, the same size as the dikes. Where stocks of granite intrude the black argillite, the bleaching did not occur. Possibly, the flow of magma through the dike removed the carbon which is believed to cause the black colour in the argillite.

ECONOMIC GEOLOGY:

The existence of low grade zinc and lead in a few places has been established by a brief examination of the underground workings. Higher grade material was seen on some of the dumps, but not in place. The presence of some sphalerite and galena increased the possibility of finding more mineralization and possibly in commercial quantities.

The brief examination of the mineralized zones does not permit any more than a few general statements. The low grade mineralization was associated with stylolitic banding similar to that at the H.B. Mine. The extent of the stylolitic zone should be determined to ascertain whether the possibilies of ore existing have been exhausted or not.

The present underground workings and drill holes have been almost entirely confined to the lower Mine Lime, very little exploration being caused out in the Mine Lime band. A volume roughly 700 feet in each dimension has not as yet received much exploration. Although, the surface exposure is unmineralized, a volume of limestone such as this should be explored.

The garnet Lime band is well mineralized along the bedding plane and in fractures across the bedding plane by sphalerite and galena in the two south portals. The existence of granite east of and within the portals eliminates the occurrence of an ore body in that vicinity. However, further north, the width of the garnet band is unknown. Because this band is known to contain some mineralization, it should be explored first to determine its width and, if it is wide enough for an orebody, to continue the exploration. The cost of drilling could be kept to the minimum by drilling from the argillite outcrops to the west.

The occurrence of scheelite in the lower Laib altered argillites should receive further investigation. A preliminary survey could be made by lamping the exposed surfaces for scheelite.

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