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NOTES ON THE ALDERMAC MINE

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Énergie et Ressources naturelles
Québec

Aldermac Mine

Geol. of T. S. Blair.

Beauchastel Twp

Range VI
Block 63

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NOTES ON THE ALDERMAC MINE

ROUYN DISTRICT, QUEBEC

By

ALAN M. BATEMAN

1930

QUEBEC DEPARTMENT OF MINES

MINERAL DEPOSITS BRANCH

No G M- 6068 -D

ALAN M. BATEMAN

MINING GEOLOGIST

New Haven, Conn.
September 11th, 1930.

Alderson & MacKay,
Mr. A. A. MacKay,
Dominion Square Building,
Montreal, Quebec.

Dear Sirs:-

As requested by you, I made a preliminary geological examintion of the Aldermac Mine, Rouyn District, Quebec. The following notes are based on this examination, supplemented by previous consultations and microscopic examinations of suites of ores and rocks.

My chief conclusions may be briefly summarized as follows:-

1. In my opinion there is now developed a sufficient tonnage of low-grade ore to justify mining operations on a scale of 200 to 600 tons a day, provided contracts for the sale of sulphur ore may be obtained.

2. With such a scale of operations the ore at present disclosed should have a life of around ten years.

3. As far as I can see, the mining and milling of the ore appears practicable and operations could be started as soon as a market for the sale of pyrite is assured.

4. A study of the figures and data available leads me to conclude that with initial production of 200 tons per day, copper at 11 cents, and pyrite at $4.50 per ton of ore at the mine, a profit can be made, and that there is reasonable justification for the assumption that this profit might be considerably increased later.

5. I think that mining should be started on the No. 3 ore body on the 250 level.

6. I consider that the ground holds promise for the finding of additional ore bodies.

7. I recommend that an electro-magnetic survey be made of the Aldermac ground this coming winter.

8. I think that any large program of underground exploration is not justified at the present time in view of existing conditions. Sufficient ore is already indicated for present needs. Systematic exploration, however, should be initiated when the mine reaches a production of around 500 tons daily or is making a nice profit.

9. Some suggestions for future exploration are given in the text of the report.

10. I believe that the metallization and the syenite-porphyry are genetically connected and both emanated from the same magmatic reservoir. Consequently, the environs of the intruded area should be favorable for ore.

11. I consider that the acid lavas, particularly the fragmental varieties, are the favorable host rocks for ore and that these have been differentially replaced to the exclusion of the dikes of diabase and syenite porphyry.

12. In my opinion, the sulphides were formed during a single period of metallization with the usual sequence of mineral deposition, chalcopyrite being last. All were deposited later than the dikes. Consequently, the disposition of the dikes should not control explorations.

13. The control of the immediate localization of the ore is vague. Apparently the intersection of the east-west shear or fracture zones with the congenial acid lavas constitutes the favorable loci.

14. The alteration of the acid lavas appears to be clearly connected with the metallization. Therefore, zones of pronounced alteration should be favorable locations for ore.

Details are to be found in the body of the report and my unabridged conclusions on page 10 to 12.

Respectfully submitted.

Alan Bateman.

NOTES ON THE ALDERMAC MINE

ROUYN DISTRICT, QUEBEC.

The writer, in company with Mr. A. A. MacKay, spent a few days during the latter part of August in a preliminary examination of the surface and of the underground workings at the Aldermac Mine. The purpose of the examination was to check the geology; to study the character and occurrence of the ore bodies, to consider a program of future exploration and development; and to see if the exploitation of the present ore bodies appears feasible. Prior to this the writer spent three days with Mr. A. A. MacKay and Mr. Fritzsche, in an office examination of geological maps and ore and rock specimens. This was followed by a microscopic study of suites of ores and rocks by means of both the petrographic and reflecting microscopes. The following brief remarks are based on these examinations.

Familiarity is assumed with the location, and the general physical features of the region and the property; hence such descriptions will be omitted. Remarks will be confined to pertinent data, new interpretations and conclusions.

ROCK FORMATIONS AND GEOLOGICAL MAPPING

General:- I agree with the major features of sub-division and mapping as carried on by Mr. Fritzsche. I check with him on the identification of most of the rocks as disclosed on the areal map, and on the structure as depicted.

I note also that the geology at the Noranda Mine and at the Aldermac is essentially similar, save for the absence of a large mass of syenite-porphyry at the former. Also there is much more "older diabase" disclosed at Noranda than at the Aldermac.

Acid-Lavas:- The acid lavas, of Keewatin age, appear to be a series of extrusives, of slightly variable composition, but predominantly rhyolite. Five different types were detected (there may be more) (1) a normal dense rhyolite of flow origin; (2) a porphyritic rhyolitic rock with few, but distinct phenocrysts of quartz (not examined microscopically) (3) a dense, slightly more basic flow rock; (4) fragmental rhyolites, breccias apparently both of explosive and flow origin; (5) fine-grained tuffs with distinct bedding.

Some of the flow lavas may prove to be dense silicified tuffs.

The fragmental lavas consist of several varieties; Mr. Fritzsche has clearly distinguished one group woth large angular fragments from another with small angular fragments. In addition, there appears

to be still another with very rounded fragments (1125 level).

These acid lavas are essentially identical with those at Noranda and are the host rocks of ore at both places.

Within this group of lavas there have been included, I think, some small dark, dense intrusives of more basic character, presumably related to the "older diabase" (1125 level NW). Numerous inclusions of similar character occur in the acid lavas at Noranda also.

Altered Lavas:- This term is used by Mr. Fritzsche to designate a group of altered lavas. They are characterized chiefly by chloritic alterations and may readily be separated from the acid lavas although they grade into them in places. I detected two varieties - one with chloritic alteration, the other somewhat silicified. I regard the two varieties of alteration as being gradational, the silicious representing a more intense phase. The chloritic is the common type.

In my opinion the lateration signifies two things:- one, an effect of metallizing solutions; and two, an effect of the syenite-porphyry intrusions. An aureole of chloritic alteration surrounds parts of the syenite-porphyry intrusion. Likewise, the chloritic alteration is prevalent around the ore bodies and envelopes them.

I regard the chloritized areas as indicationd that metallizing solutions have passed through them and, therefore, favorable areas for the finding of ore.

Some of the rocks designated asaltered lavas, in the drill hole cores below the 1125 level, appear to me to be dense basic intrusives.

Older Diabase:

Although this field name may not correctly designate this rock, it is clearly a district unit. It is an altered basic rock (no thin section) younger than the lavas and older than later intrusives. It is considerably altered. It is distinctly older than the metallization but it is uncongenial host rock for ore, since the massive sulphides terminate abruptly against it. Sulphides have, however, penetrated it showing that it did not come in later than the ore.

Grandiorite Dikes:- The small intrusions of so-called grandiorite appear to be an aphite. Some of the red rock on the 1125 level is pagmatitic. It is later than "older diabase" and apparently later than some of the syenite-porphyry dikes. I suspect it is genetically related to the syenite-porphyry intrusive.

Syenite Porphyry:- This amazing rock with its large feldspar phenocrysts appears to be intimately connected with the metallization. It clearly intrudes the lavas and "older diabase". From the larger mass are innumerable offshoots in the form of dikes, large and small and coarse and fine grained. In my opinion the main mass and all the dikes are clearly earlier than the metallization and in this ~~xxxxxxxx~~ conclusion I differ from Cooke.

The main mass is a porphyritic syenite rather than a syenite-porphyry. It consists chiefly of albite, orthoclase, some quartz, biotite, amphibole, apatite and titanite. The dikes vary only slightly in composition. They contain orthoclase, albite, microline, hornblende, biotite, apatite, titanite, magnetite and carbonates. A striking feature of the syenite-porphyry intrusives is that they are highly sodic; in some sections the unusual soda-amphibole crocidilite, is present. The rock is nearer a quartz monzonite than a syenite. Some of the dike rocks are altered beyond recognition. It is an unusual and interesting rock.

Its relationship to the ore will be discussed later.

Altered Basic Rocks: In places about the margin of the syenite porphyry mass are bodies of granular dark basic rocks (N.E. of shaft). This rock is highly altered and now consists chiefly of augite, biotite, plagioclase, orthoclase, titanite, apatite, epidote, chlorite, magnetite, and the rare crocidolite. In places it consists of 30 to 50 per cent magnetite.

Its field relations are not clear; it may represent a separate basic intrusion that has been highly altered or it may be a marginal basic differentiate of the main mass of syenite-porphyry".

Younger Diabase:"Prominent large dikes of "younger Diabase" called gabbro by Cooke, cut all the other rocks and appear to be the youngest rocks of the region. Earlier, they were supposed to have a magic influence on the deposition and localization of the ore. Personally, I think they have a little direct influence. I do not know their age relationship to the ore.

ORE DEPOSITS

The ore deposits consist of irregularly shaped lens-like bodies of massive sulphides flanked by disseminated sulphides. Three important bodies have been developed. Several smaller ones have been cut whose possibilities have not yet been throughly tested. The values lie in copper, sulphur, gold and silver.

Mineralogy: The ore is chiefly pyrite, with enough chalcopyrite to make it a low grade copper ore. Considerable pyrrhotite is present and there is some sphalerite and a trace of galena. All the minerals appear to me to have been formed in a single period of metallization. However, as is the case with other similar deposits, the indvidual sulphides show a definite sequence of deposition. Pyrite was deposited first, this was followed by pyrrhotite, which cuts and replaces pyrite. The chalcopyrite, as is usual, is later than the pyrite and in part later than the pyrrhotite. It replaces both of them. Some of it was deposited contemporeneously with the pyrrhotite. The sphalerite apparently was contemporaneous with the chalcpyrite.

The sulphides have clearly formed by replacement of the inclosing rocks.

To the eye the ore appears to be massive sulphide. The refelcting miscroscope, however, reveals that there are numerous minute unreplaced residuals of rock matter scattered throughout the sulphides. Consequently fine grinding will be necessary to liberate sulphides from gangue.

RELATION OF ORE TO ROCKS.

To Acid Lavas:- The ore has clearly been formed by Preferential replacement of the acid lagas. For some reason these rocks have been so much more susceptible to attack by the metallizing solutions that all the important bodies are enclosed by them. The fragmental lavas seem to be much more favorable seat of deposition than the massive ones, presumably due to their greater permeability. There seems no question but that the acid lavas are the most favorable rocks for ore.

To Older Diabase:- Although the "older diabase" existed prior to metallization and is itself penetrated and slightly replaced by sulphides, it is clearly not a favorable rock to ore replacement. Massive sulphide terminates against it (1125 level). The readily replaceable adjacent acid lavas have been entirely changed over to sulphides but the ore solutions were balked by the uncongenial older diabase; it effectively resisted complete replacement. This differentiated replacement of acid lavas in preference to "older diabase" has also a bearing on the relation of the ore to the syenite-porphyry dikes.

To Syenite-Porphyry:- Numerous instances were observed on all the levels Where sulphides (chiefly pyrite, but also pyrrhotite and chalcopyrite) penetrate and replace parts of the syenite porphyry main intrusive and dikes. Some of the dikes are almost free from sulphides; in others the sulphides can be obserged, upon close inspection, as numerous minute pin points; in a few , the dikes have been 30 per cent replaced. I suspect that in some places the dikes have been almost entirely replaced. I observed some residual feldspar phenocrysts in almost massive sulphides.

The tongue of porphyry on the 1125 is well impregnated by sulphides; it resembles the disseminated "porphyry coppers".

It is my opinion that the metallization was later than the main-syenite porphyry intrusion and later than all the syenite porphyry dikes, and that those like the older diabase, resisted replacement more than the acid lavas. Therefore, they represent just another case of differential replacement. I do not believe, based on my brief examination, that they intruded the sulphides and brought chalcopyrite enrichment along with them. I cannot agree with Dr. Cooke's earlier or later conclusions.

It is true that upon casual observation these dikes do appear to cut sharply across the massive sulphide bodies and it does appear that there is more chalcopyrite near them than in more distant parts of the pyrite bodies. However, close inspection leadsme to the conclusion that this obvious interpretation is not correct. I think that the syenite poprhyry dikes originally cut the acid lavas and when metallization took place, they resisted complete replacement in exactly the same way as did the "older diabase", and remained as great unreplaced inclusions inclosed in massive sulphide. In places where metallization was intense, they partially succumbed to the attack of metallizing solutions. I think that the period of metallization was a single one, as in most other examples of massive sulphide replacement, and that there was no series of expulsions of metallizing solutions alternating with dike intrusions, as believed by Cooke. It is quite possible that the proximity of the dike influenced sulphide depositions to bring about greater precipitation of chalcopyrite adjacent to them, thus accounting for chalcopyrite enrichment alongside of them.

Consequently, I believe that the dikes themselves play no profound part in the localization of the ore as a whole. Therefore, I would not consider any exploration for ore based on trying to locate and follow such dikes.

To Younger Diabase:- I can see no connection whatever between ore occurrences and the "younger diabase" dikes. In my opinion, they have not influenced ore deposition and I would not outline exploration to be carried on simply because of their presence.

RELATION TO ORE STRUCTURE,

If the cause of the localization of ore in a given place can be determined, there is then formulated a basis for exploration for other ore bodies. At the Aldermac this is not clear as yet. There appears to be a general easterly-westerly shearing that has localized the ore where it intersects the favorable acid lavas. The evidence for this is admittedly small; it is shown in the general areal arrangement of the formations, and in shatter zones within the acid lavas.

The relation of the flat fault disclosed on the 750 and 1125 levels to ore localization is not clear. I tend to agree with Mr. Fritzsche that it is pre-mineral. I think the large amount of quartz associated with it represents a replacement by quartz from solutions that travelled along it. Possibly it may have acted as a channelway for metallizing solutions.

ORIGIN OF ORE DEPOSITS.

It is my tentative belief, based on the data at present available to me, that the ores were formed by replacement of acid lavas (and to a lesser extent of the porphyry) from metallizing solutions that emanated from the same magmatic reservoirs that gave rise to the syenite-porphyry. I believe that the syenite-porphyry and its related dikes were consolidated before metallization took place. The intrusion and the cooling probably formed fractures that allowed ready escape of the metallizing solutions. These solutions were not canninal-istic towards their kindred dikes but attacked vigorously the alien acid lavas to produce the large sulphide bodies by preferential replacement. Probably wide shear zones in the lavas conducted the solutions along their paths, giving an easterly-westerly trend to the ore bodies.

Thus I would conclude, tentatively, that the most favorable location for ore on the Aldermac would be where the favorable acid lavas, particularly the fragmental varieties, lie in the general vicinity of the syenite porphyry. It does not follow, however, that immediately adjacent is more favorable than at some little distance away.

EXPLORATION AND DEVELOPMENT.

General:- In my opinion, ore of sufficient tonnage and grade (provided sulphur is salable) to justify mining operations of from 200 to 600 tons per day has already been proven and partially developed. On this basis, a life of at least ten years is assured. Consequently, I believe, under the conditions that pertain, that any large program of exploration should be deferred until the mine is placed on a paying basis. In the meantime, efforts should be bent towards development for immediate production, provided contracts are secured for the sale of sulphur.

Development: I agree with the general plans for development and mining as outlined to me. Based on the experience of many similar types of copper deposits, they appear to be sound.

In connection with the intitial development and mining, however, I would recommend that operations be

started on the No. 3 ore body on the 250 level, instead of on the No. 4 ore body on the 500 level as planned. This change would: (1) enable operations to be started from a shallower depth with consequent lower cost (2) yield an ore with somewhat higher copper content, which should prove of considerable advantage in the early stage of small production and the present low price on copper; (3) enable the mining method to be tried out on a smaller ore body and thus have the advantage of experience gained before the larger 500 level ore body is cut up; (4) eliminate the necessity of providing a second exit below the 250 level, during the opening up period when all available men and machines should be concentrated upon preparations for stoping.

Future Underground Exploration: As stated previously, I believe any large program of underground exploration should be deferred until a later date. However, I think that when the mine attains a production of say 500 tons per day, vigorous underground exploration should be prosecuted. Suggestion for specific pieces of exploration might better be deferred until that date when advantage can be taken of the new workings available and new information yielded during operations.

However, my examination of the ground disclosed no reason why the preliminary exploration program decided upon during our consultation in New Haven last Fall should not be completed when it is time to start up exploration once more.

I think, also, that when such work is started, the 750 level should be opened up - particularly to the north; at the same time drifting might well be done on the "Macalder" fault* Likewise, I think more work might well be done on the 1125 level to the N.W. where the new smaller showings have recently been cut. Also, a raise should be put up on the porphyry ore on the 500 level.

Geophysical Prospecting:- As mentioned verbally, I strongly recommended making an electro magnetic geophysical survey of the Aldermac ground, utilizing the method and equipment already at your command. I feel that entirely new deposits might be found in this region. Geologically, there are other parts that appear just as favorable for ore occurrence as the site of the present ore bodies. It is not at all impossible that deposits of the Noranda type might be found; the finding of the Noranda H ore body was largely accidental.

I make this recommendation fully cognizant of the failures that have attended geophysical prospecting in the Rouyn District in the past. I think, however, that you are unusually well situated to carry on such work, because (1) you control a method yourselves and therefore you can carry it on at about one eighth to one tenth the cost of employing a commercial company;

* Name here applied to the large fault cut on the 750 station.

(2) your method has been demonstrated to be practicable on the Aldermac, Waite, and Horne properties; (3) you already have men in your employ, not fully occupied, who can be utilized for such work; (4) the ground holds possibilities for the finding of other ore deposits; (5) most of the failures in geophysical work in your region have been due to inability to interpret the results obtained by the geophysical survey. You are able to eliminate the greater proportion of such inability of interpretation because you have a good and carefully made surface geological map on a large scale. The superimposition of geophysical results upon such a map will enable you to determine with high probability to what such results are due, i.e. faults, previous strata, igneous dikes, rock contacts, or probable ore bodies.

Consequently, in view of the demonstrated practicability of your process, the stake that you have in the property, the small cost at which it can be done, and the geologically favorable conditions, I favor such a survey. Moreover, I would recommend that it be done this coming winter, taking advantage of the snow covered ground, in order that if another ore body be revealed you would know about it before you proceed too far with your present plans. If another ore body be found, it might alter your plans for mill site, mill treatment, or scale of operations, etc.

SUMMARIZED CONCLUSIONS

1. I have examined the ore in the ground and conclude that there is already indicated sufficient tonnage of ore to justify mining operations on a scale of 200 to 600 tons per day provided a market for sulphur is obtained.

2. I believe the mining and milling of this ore on a commercial scale is practicable.

3. I have examined the figures and data and conclude that with a production of 200 tons per day, copper at 11¢ per lb, and sale of pyrite to yield $4.50 per ton of ore at the mine, that the property can be operated at a small profit. This profit would of course, be increased with greater production, advanced price of copper, experience in operation, and better smelting rates, factors which with reasonable expectation, may, in my opinion, be attained.

4. I can see no reason why steps cannot be taken toward immediate production just as soon as contracts for the sale of sulphur ore obtained.

5. The shape, size, and character of the orebodies should lend themselves to fairly cheap mining. It is to be expected, however, that mining will disclose considerable irregularity in the outline of the ore bodies. Also, horses of low grade or barren rock matter may be inclosed within the solid sulphide bodies. I do not think, however, that

these would be detrimental to mining or milling; if large they can be left as desirable pillars, if small, they can be sorted out on a picking belt.

6. I consider that the geological work already done is careful and sound and I agree, in general, with the areal mapping.

7. I believe the ground holds good possibilities for the finding of additional ore bodies.

8. I think that with the amount of ore already developed, further immediate underground prospecting is not justified under the conditions that pertain.

9. I believe that any large-scaled program of underground exploration should be deferred until the mine is placed upon a paying basis. When production reaches around 500 tons a day such exploration should be initiated.

10. I recommend that the firstmining operations be started on the No. 3 ore body on the 250 level instead of on No. 4 ore body on the 500 level.

11. I recommend that an electro-magnetic survey be made of the Aldermac ground this coming winter.

12. I think that when exploration is started the program outlined in my office last winter should be completed. Also, that the 750 level be opened up, particularly to the North and along the Macalder fault. Likewise some work should be done to the northwest on the 1125 level and a raise run from the 500 on the ore in the porphyry and ultimately be made to connect with the 250 level and serve for a second exit.

13. Other specific suggestions for exploration should be deferred until exploration starts in order to take advantage of the workings opened and the knowledge gained of ore occurrence and behavior.

14. I believe that the metallization, and the syenite porphyry mass and dikes are genetically connected and that all originated from the same magmatic reservoir. Consequently, the region in the vicinity of the intrusions should be favorable for ore.

15 I consider that the metallization was subsequent to the intrusions of syenite porphyry and that they are not so completely metallized because they are less congenial to replacement than the adjacent acid lavas. I think the syenite porphyry dikes represent replacement residuals and not intrusions later than the main sulphide masses. Consequently, I do not believe the dikes should be followed in the hope of finding hew ore bodies.

16. I think the copper enrichment near some of the

dikes may either be accidental or be due to the influence of the dikes upon selective deposition of copper sulphides.

17. I think the metallization took place in one period and not that the pyrite was first formed and then there were later injections of chalcopyrite following intrusions of syenite porphyry dikes. The chalcopyrite is later in sequence than the pyrite, as it almost invariably is in copper sulphide deposits, but in the same sense that the quartz grains in a granite are later than the ferric minerals or feldspars. All were formed during one period but in a definite sequence.

18. I consider the rock alteration an indication of the action of the metallizing solutions. Therefore, places of intense rock alteration should be the most favorable places for the finding of ore.

Respectfully submitted,

Alan Bateman.