THE GEOLOGY AND MINERALOGY OF THE BROWN MCDADE MINE

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ABSTRACT

The Brown McDade Mine is a recent gold-silver discovery in the Yukon Territory, halfway between Whitehorse and Dawson. It lies in the area unglaciated during the Pleistocene Period. Diamond drilling and stripping in 1946 indicated commercial values across a width of 10 feet and over a length of 1000 ft. The geologic structure is that of a Late Tertiary, dyke-like body of quartz feldspar porphyry cutting quartz diorite of Jurassic or later age. This body has a Northwest strike and dips steeply west. The ore zone lies in the porphyry and is believed genetically related to it. The mineralization consists of a cherty-like fine grained blue quartz, with disseminated sulphides comprising less than 5% of the mass. Metallic minerals are pyrite, arsenopyrite and sphalerite, with lesser amounts of galena, chalcopyrite, tetrahedrite, stibnite, bournonite, jamesonite and gold. The gold is associated with the pyrite in fine particles, the majority less than 150 microns in size. The gold-silver ratio is about one to ten. Sericitization and carbonatization are the chief forms of hydrothermal alteration, while considerable limonite, and around the ore zone, jarosite, have been produced by weathering. On the basis of comparisons with known deposits, the Brown McDade is considered to belong to the deeper epithermal type. It should continue to reasonable depths although the ore shoots are likely to be erratic. The area south of the main ore zone, underlain by schistose rocks will probably be unfavorable for the occurrence of ore.

ACKNOWLEDGMENTS

The writer worked as resident engineer at the Brown McDade property in 1946, under the management of Dr. W.V. Smitheringale, to whom he is indebted for many helpful suggestions, and for permission to use the maps and data contained herein.

The laboratory investigations and compilation of the report were carried out under the personal direction and guidance of Dr. H.C. Gunning of the Department of Geology and Geography, whose advice was greatly appreciated. Dr. H.V. Warren of the same department, though not associated directly with the work, assisted the writer in the determination of some of the metallic minerals, and in taking photographs of polished sections of ore. Dr. K.D. Watson was consulted on several petrographic problems.

Of great assistance in completing the study were the X-ray powder analyses of two minerals by Dr. R.M. Thompson of the University of Toronto, and spectrographic analyses by Mr. L.O. Gouin, assistant in the department of Geology. Mr. J.A. Donnan, technician, supervised the preparation of thin sections and polished sections.

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INTRODUCTION

PART 1

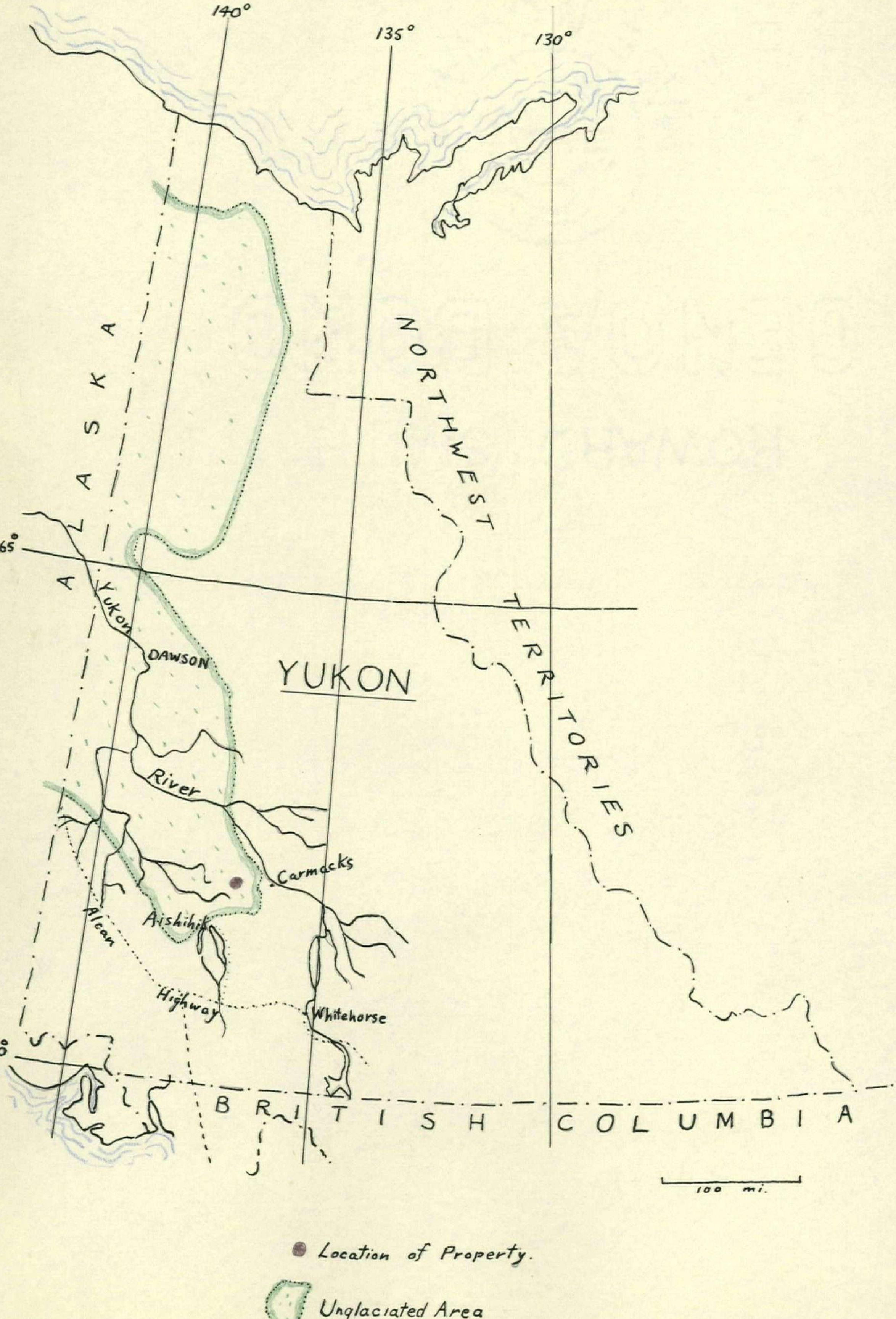
Although the Carmacks district has been known to prospectors and geologists since the Klondike gold rush, it did not receive much attention until the past few years. The early gold-seekers noticed that there was placer gold in parts of the district but they were interested in the richer fields to the north. Between 1910 and 1920 some intensive placer prospecting was carried out in the area around Nansen and Victoria creeks, but this proved to be unprofitable. About 15 years ago the Freegold Mountain lode prospects revived interest temporarily but this did not last long. The current activity in the district was started in 1945 with the discovery of gold near Victoria Creek by George McDade.

From the foregoing statements one can see that the area is virtually virgin ground for prospecting.

At present there are no producing lode gold mines in the Yukon. The successful development of the Brown McDade property into a producing mine would therefore be of great value to the whole territory. It would stimulate the search for similar occurrences in the belt of country extending to the northwest for 40 or 50 miles.

The writer spent five months in 1946 at the Brown McDade property where a diamond drilling program was in progress.

FIGURE 1.



140°
135°
130°
65°
60°
ALASKA
NORTHWEST TERRITORIES
YUKON
Yukon
River
DAWSON
Carmacks
Aishihik
Alcan
Highway
Whitehorse
BRITISH COLUMBIA
100 mi.
Location of Property.
Unglaciated Area

GENERAL INFORMATION

PART 11

1. Location:

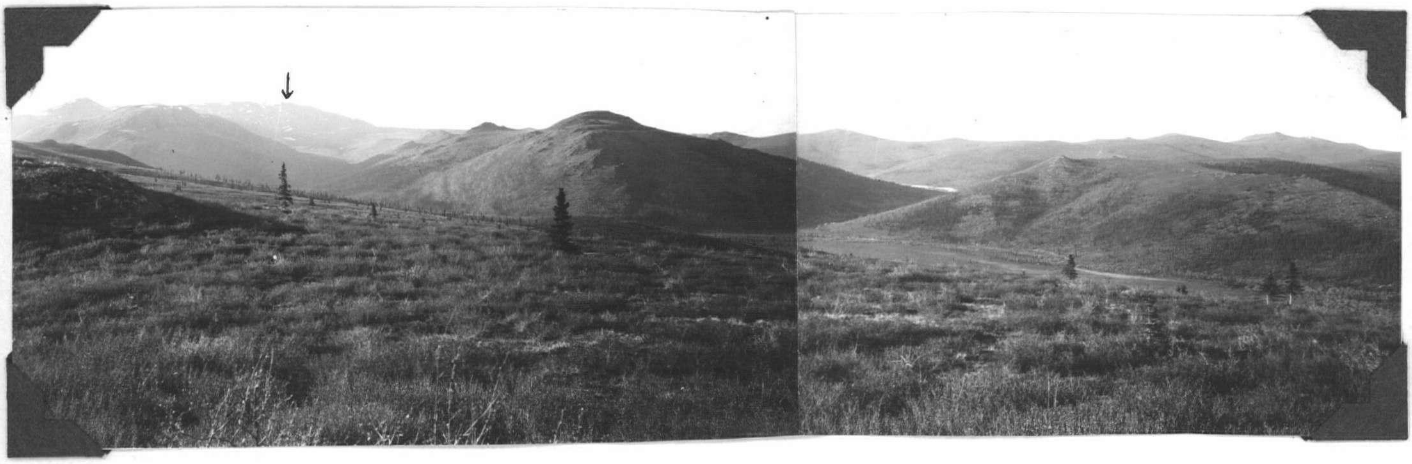
The Brown McDade Mine is in the Dawson Mining Division near the southern boundary of the Carmacks Map Area. It is at an elevation of 4000 feet on Pony Creek, a tributary of Victoria Creek. Carmacks, on the Lewes River, lies 35 miles to the east.

From the town of Whitehorse, access may be obtained to the property in three ways. The most direct route is by airplane 115 miles northwest. Planes land either on Victoria Lake or on an airfield, both within six miles of the camp. The route over which supplies are brought in, is by motor road, 150 miles to Aishihik, thence by tractor trail 40 miles northward. A third route, seldom used, is by river boat to Carmacks and by pack trail the remaining distance.

2. Physiography and Glaciation:

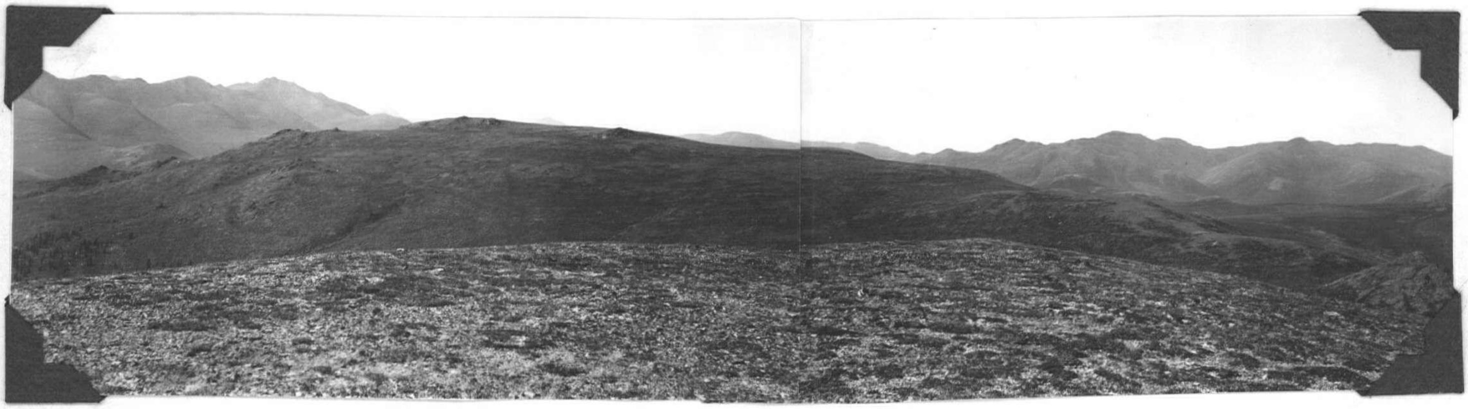
The Nansen-Victoria Creek area is situated entirely within the Yukon Plateau physiographic province, which corresponds in a general way with the Interior Plateau running northwesterly through British Columbia. The term plateau does not imply that the land surface is flat. To the observer the district presents the appearance of a rounded, gently rolling country with a remarkably even skyline. Especially is this true, looking from the mine anywhere south of an east-west line. The average elevation of the hills and ridges is approximately 4200 feet. To the north and north-

FIGURE 2



Headwaters of Victoria Creek - looking north.
Mt. Victoria on skyline - elevation 6200 feet.

FIGURE 3



The Dawson Range, looking northwest.

Left: - Headwaters of Nansen Creek.
Right:- Headwaters of Victoria Creek.

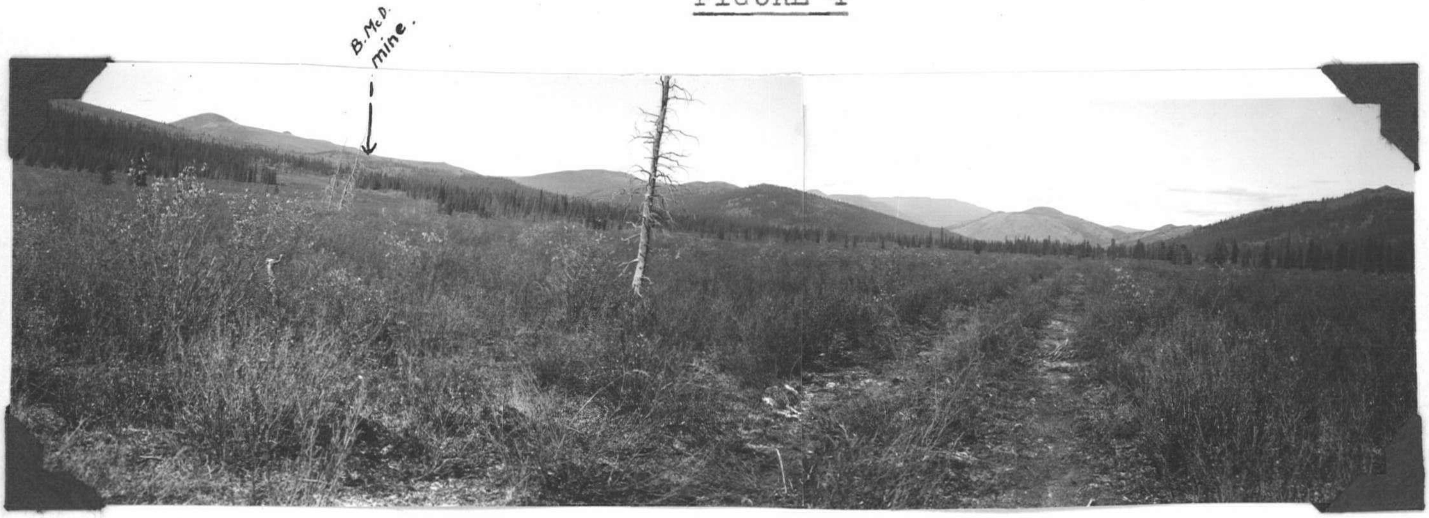
west the mountains of the Dawson Range rising to heights of 6400 feet, interrupt the plateau surface. Smaller ranges or even individual mountains standing above the general level, are noticeable in other directions.

It is believed by Bostock (1) that the physiographic history is that of a mature gently rolling upland surface, uplifted before the close of the Miocene period and subsequently dissected by valleys cut well below it. He does not consider that it represented a peneplain or even a condition of old age because there is a relief of over 500 feet in the surface. The present streams have cut down about 1000 feet below this, giving ~~to the country~~ a total relief of more than 3000 feet. The stream valleys are broad and except in the upper reaches of the smaller tributaries, have smooth profiles.

From the air the impression gained is that the prevailing drainage pattern trends northwest-southeast. This is probably the pattern that was set up during early Tertiary times but it has been complicated since, by the uplift and possibly by glacial action. Some large streams cutting across the general trend, seem to interrupt the early pattern. The Nisling and Klaza Rivers are examples of such streams.

The Brown McDade Mine is just within the unglaciated part of the Yukon. On the Carmacks map sheet Bostock (1) indicates the western boundary of the last extensive Pleistocene ice sheet. According to him it extends irregularly northward, passing about 20 miles to the east of the mine. Of this

FIGURE 4



The valley of Victoria Creek, looking North.
Flat area in foreground composed of alluvial sands filling the valley bottom.

FIGURE 5

Camp of Brown McDade Mines - June 1946, looking northwest.
Ore zone indicated by arrow.
Note: (a) sparse vegetation
(b) overburden
(c) few rock outcrops.

boundary he says, "The position of the edge of the glaciated area as shown on the accompanying map of the district could be accurately determined in a few places, but for the most part its position is largely a matter of conjecture. It approximately marks the boundary of the country in which glacial phenomena due to the last main glaciation are fresh and widespread".

Bostock (1) believes that certain phenomena such as a boulder clay found in Nansen Creek, belong to an earlier glaciation. Although this formation was not seen by the writer, he doesn't believe that it is due to a widespread ice sheet but rather to a local glaciation of limited extent. The area for several miles around the mine shows no visible evidence of any glaciation. There is an absence of drift, or glacial erratics. Instead, the surface is covered by a thick mantle of weathered material containing loose angular fragments of rock, similar in composition to the underlying or nearby formations. This mantle, exposed in bulldozer cuts, exhibits the usual characteristics of residual weathered material, being well oxidized and showing a gradual consolidation downward into the bed-rock. Depths of mantle up to 10 feet are common. Supporting this belief that glaciation was not widespread in the area is the lack of any glacial modifications of the mature topography of the area.

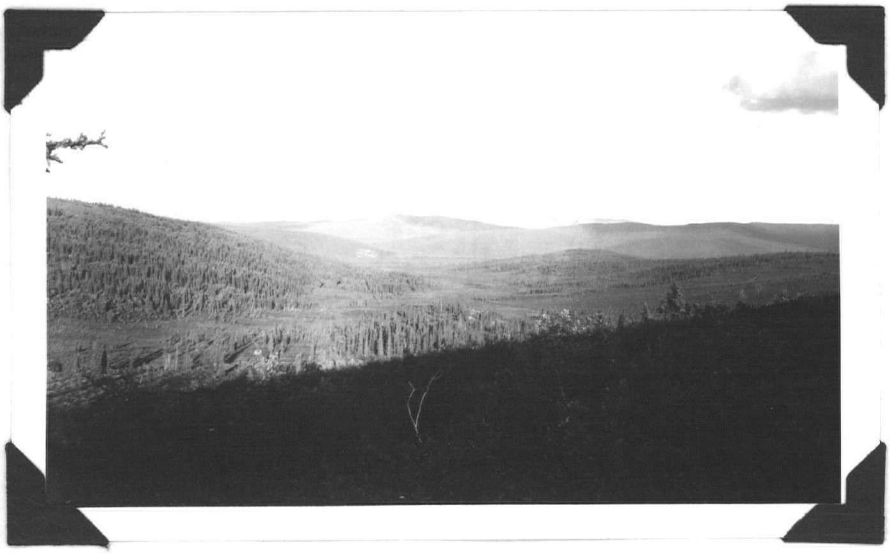
The valleys of Victoria and Nansen Creeks and that of the Nisling River, into which they flow, are filled with fine alluvial sands and minor amounts of gravel. These form

FIGURE 6

Looking southwest from Brown McDade Mine, Arrow indicates ore zone.

Skyline of Yukon Plateau in background.

FIGURE 7



Looking southeast across the Yukon Plateau wide flat terraces in the bottoms of the valleys, through which the present streams have cut to depths of 75 feet. The Nisling River has eroded its terraces so that only remnants are left, but in the tributary creeks they are very well developed and extensive. The origin of these deposits is not clear. One suggestion is that they originated during the Pleistocene period when damming of river valleys by ice tongues, formed lakes in which the sediments were deposited.

(3) Climate and Vegetation:

The climate is typical of the whole interior plateau region. It is characterized by a medium to low annual precipitation and due to its northern latitude, a low mean temperature. The lakes and streams freeze over in late October or November while the Spring breakup occurs in May or June. Snowfall is not heavy, usually being not over three feet deep at any time. During the Summer there is a wet period in July and early August.

The chief forms of vegetation are mosses and low brush. These cover almost the whole land surface like a thick carpet. The trees are stunted and grow in groves, usually on the well drained southern slopes. Spruce is the main tree and has been seen up to 40 feet in height, with an 18 inch butt. The average size is considerably less than this. Sparse stands of cottonwood trees grow in the sheltered valley bottoms.

REGIONAL GEOLOGY

PART 111

(1) Summary

The geology is that of a series of folded, highly metamorphosed sedimentary and volcanic rocks, the Yukon group, overlain by sediments and volcanics of Mesozoic age. Intruding these are numerous bodies of Upper Mesozoic and Tertiary plutonic and volcanic rocks with a wide variety of compositions. Tertiary volcanic flows are extensive in the Carmacks area although not locally present in the vicinity of the Brown McDade Mine. Allied to these are intrusive plugs, dykes and irregular bodies of porphyritic rocks, which are presumed to be of Late Tertiary age. Recent alluvium fills most of the valleys and a layer of volcanic ash covers the present land surface.

(2) Formations:

TABLE OF FORMATIONS

Recent		Alluvium, ash, etc.
Late Tertiary		Quartz prophyry, granite porphyry, granophyre, rhyolite.
Miocene or Older	Carmacks Volcanics	Basalt, andesite, dacite, breccia, tuffs.
Upper Jurassic or Later		Granite, granodiorite, etc Syenite, monzonite, etc. Diorite, gabbro, etc.
Upper Jurassic or Lower Cretaceous	Mt.Nansen Group	Andesite, basalt, dacite, breccias, tuffs, and some sediments.
Paleozoic or Pre-Cambrian	Yukon Group	quartz-mica schist, hornblende schist, quartzite, gneiss and limestone.

NANSEN & VICTORIA CREEKS
CARMACKS AREA
YUKON

SCALE 1 IN. = 1 MI.

GEOLOGY after CAIRNES D.D.

LEGEND

RECENT alluvium, ash etc	MODERN	
porphyry, rhyolites	TERTIARY	
IGNEOUS ROCKS granodiorites etc.		MESOZOIC
MT. NANSEN GP. andesite, basalt, breccias		MESOZOIC
YUKON GP. schists, quartzites, gneisses limestone	PRE-CAMB. & LATER	

BROWN McDADE ORE ZONE

The foregoing table is derived from that given by Bostock (1). It has been shortened to include only the rocks shown on the accompanying maps.

(a) Yukon Group

This group consists of crystalline rocks of sedimentary and volcanic origin. The majority are schistose and gneissic, although in the Victoria Creek area there is some quartzite. The total thickness of the formations is very great but is not known.

The structure is that of a series of anticlinal and synclinal folds with a general trend to the northeast. The dips observed are variable, up to 35 degrees.

These rocks are the oldest in the district being overlain unconformably or intruded by all other formations. The exact age is unknown, except that it is Pre-Triassic. Some of the members of the group are locally considered to be Pre-Cambrian rocks although 60 miles to the north a few Paleozoic fossils have been found.

(b) Mount Nansen Group

These rocks include varieties of andesites and basalts which to some extent are porphyritic, breccias, tuffs and associated intrusives. The predominant color is a dark greenish gray. The rocks are not regionally metamorphosed like the Yukon group,upon which they lie unconformably with a low angle of dip.

The age of the group has been determined by Bostock (1) as being not older than Upper Jurassic. This is based on relations between the Mount Nansen group and the fossiliferous sedimentary formations in the region of Carmacks.

(c) Mesozoic Intrusives

Included in this group are many rock types, ranging from basic to acidic. In the Victoria-Nansen Creek area, they have the composition of granites, granodiorites and quartz diorites, are grayish white in color, and contain feldspars, quartz, biotite, hornblende and minor accessory minerals.

The age of these intrusives is known to be younger than the Mt. Nansen group. Bostock (1) correlates them with the intrusives of the main Coast Range Batholith, probably of Jurassic or later age.

(d) Tertiary Acid Intrusives

Numerous small bodies and dykes of acidic, intrusive, porphyritic rocks outcrop in the district and northwest along the Dawson Range. They include types ranging from granite porphyries to ryholites and intrusive breccias. Locally the rocks are cherty looking buff colored rhyolites with conspicuous phenocrysts of quartz and feldspars. The quartz is hard and glassy but the feldspars are altered, often leaving only casts in the rock. It is believed that these are the intrusives to which the mineralization of the Brown McDade ore body is genetically related.

Relations between these intrusives and the Carmacks volcanics, which are not found in the immediate map area, are such that they are considered to be of Late Tertiary age.

(e) Recent Deposits:

Unconsolidated deposits of alluvial origin are found in the valley bottoms as the products of erosion of the older rocks.

Covering the whole country for many miles is a thin layer of volcanic ash, lying just below the moss. It has been noticed by the writer 60 miles to the south. It is light gray in color and averages about six inches thick. In some places two layers may be seen, separated by a few inches of earth. A thin black compact layer of carbonaceous matter lies immediately below the ash, probably the remains of organic material buried by the fall of the ash. Bostock (1) estimates that it originated within the past 2000 years from a volcano to the west or southwest.

LOCAL GEOLOGY

PART IV

1. Introduction:

Until the time the writer left the Brown McDade property, the only geological information available was obtained from rock outcrops, bulldozer trenches and about 13 short diamond drill holes. The surface of the ground is almost totally covered by a thick mantle of overburden, with very few outcrops. As a result of these conditions, some of the opinions expressed on the following pages are put forth tentatively, until more complete information becomes available.

The fieldwork was confined to two mineral claims, the Big Thing and part of the Glouser, hence the discussion will centre around these areas. The Big Thing is situated across a low saddle-like ridge between Pony Creek, and Dome Creek to the south, both of which are tributary to Victoria Creek. It is near the southern end of the Brown McDade group of claims, which extends two miles north, beyond Pony Creek.

2. General Description:

In a pocket on the inside rear cover of the report is a map of the working Areas (scale 40 feet = 1 inch), which will be of value in clarifying the following discussion.

Outcropping on the claims and presumably underlying most of the area is quartz diorite. Near the southern boundary of the Big Thing M.C., there is a small area underlain by schists of the Yukon Group. The contact between the quartz diorite and the schists is not visible but appears to run east-west. Cutting the quartz diorite and possibly the schists, is an irregular dyke-like body of quartz-feldspar porphyry, striking N25° W and dipping 55 to 70° westward. A well defined ore zone, 10 to 15 feet in width is associated closely with this body, apparently conforming in strike and dip with the porphyry. Subsidiary zones of mineralization occur parallel to and branching from the main zone.

3. Rock Types:

(a) Quartz Diorite:

The typical quartz diorite in the hand specimen is a gray, medium grained rock of a granitic texture. It is composed of white feldspar and dark green lath-like crystals of hornblende. Quartz is visible but not abundant. Minor amounts of epidote and pyrite are noticeable, scattered widely through the rock. The pyrite is in the form of small masses or tiny cubes, seldom over two millimetres in size. Local variations in texture, color and composition are common. These are probably due, either to inclusions of country rock, or segregation of certain masses within the magma before its final solidification.

Thin section study of the quartz diorite identifies the feldspars as oligoclase-andesine. The feldspars as the chief mineral constituents of the rock, together with the hornblende which is of the common green variety, compose 90 per cent or more of the mass. Quartz is found in anhedral grains, usually much smaller than the two major minerals. It is not evenly distributed, occurring rather as interstitial masses of small grains between the feldspars. A few rounded grains of early primary quartz lie as inclusions in the hornblende. Epidote is present as a secondary mineral formed by the alteration of feldspars and hornblende, and is often seen around the margins of or within the latter. Epidote is commonly intimately associated with chlorite. Certain irregular areas of chlorite around the hornblende are formed as an alteration product of that mineral. Streaks of an opaque mineral probably magnetite appear in parallel arrangement within the chlorite. This may be the result of alteration of a hornblende with a high content of iron. Accessory minerals, seen in the section in minor amounts are zircon and apatite, usually in the form of small euhedral grains scattered through the rock.

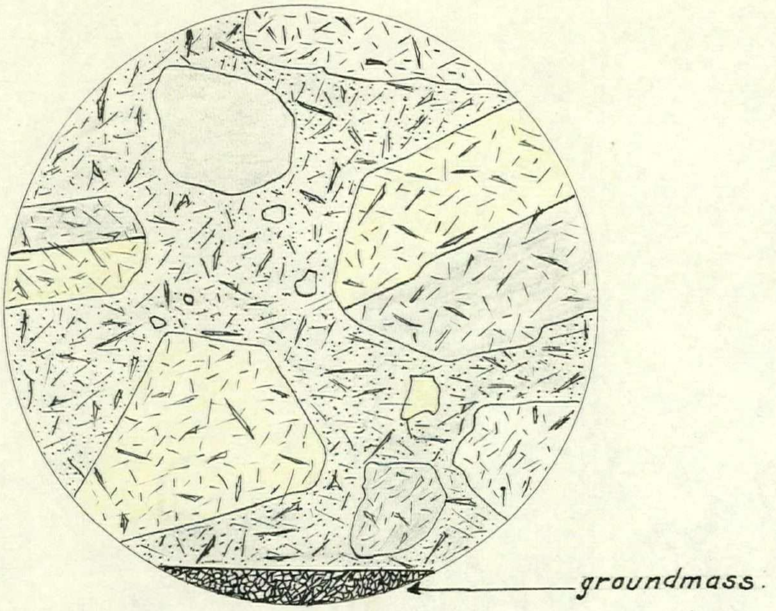


FIGURE 8

Thin section of quartz feldspar porphyry, taken from diamond drill core, near the ore zone.
Camera lucida drawing
Magnified 20 diameters.

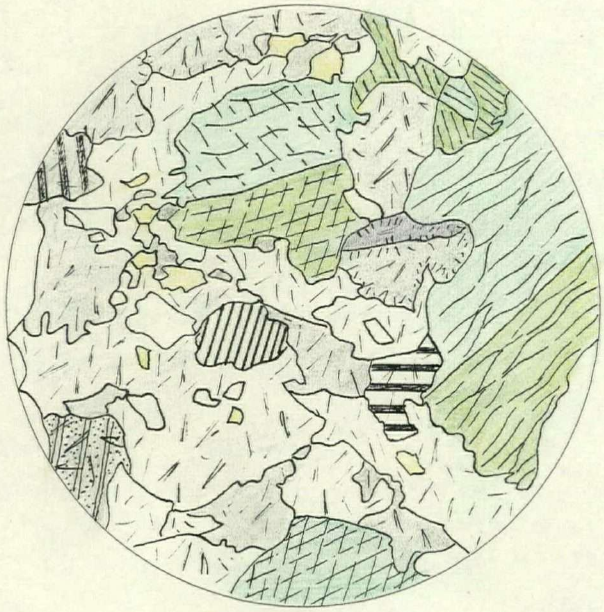


FIGURE 9

Thin section of quartz diorite, taken from diamond drill core.
Camera lucida drawing
Magnified 20 diameters.

There is cloudiness in the feldspars in thin section, caused by the development of sericite in tiny scattered shreds or in larger masses. All the feldspars show more or less alteration to sericite.

The quartz diorites underlying the Big Thing M.C. are mapped by Bostock (1) as a part of one formation that includes several granitic types. Two distinct types other than that just described have been noticed by the writer within a mile of the property. The one is a slightly finer grained grayish rock, probably a diorite. The other has the composition of a true granite with feldspar, quartz, and biotite as the chief constituents. These rocks were not studied in detail.

Figure 9 (facing page), illustrates the quartz diorite.

(b) <u>Quartz Feldspar Porphyry:</u>

The composition of this rock is variable insofar as the numbers and the types of phenocrysts are concerned. It contains widely scattered quartz as the only type of phenocrysts, or contains both quartz and feldspars. In places it seems to have a predominance of feldspars and where this occurs the phenocrysts are abundant and closely packed.

The typical porphyry is a gray to buff colored aphanitic rock containing scattered euhedral phenocrysts of quartz and white feldspars, to an approximate size of one eighth of an inch. It is dense and hard with a sub-conchoidal cherty fracture. Weathering has reduced the feldspars to soft gray powdery masses or else has removed them completely, leaving only their crystal outlines in the matrix. The quartz in the phenocrysts is fresh and glassy in appearance.

Under the microscope the groundmass of the porphyry is seen to be composed of a cryptocrystalline mosaic of quartz and very highly sericitized, cloudy feldspar. The average grain size is 0.05 mm. The quartz was easily identified but the cloudiness of the feldspar grains together with the small size, made their identification difficult. However, index-of-refraction measurements on grains at the edge of the thin section showed them to be less than that of balsam. Dr. Watson obtained several negative interference figures on a few grains. From these results it was deduced that the feldspar is probably orthoclase.

The quartz phenocrysts show some interesting features. In most of them the original euhedral outline has been modified by the corroding effect of the magma in which the phenocrysts formed. The corrosion takes the form of an irregular outline on the quartz grains, showing deep indentations where they are embayed by the groundmass. Figure No. 10 opposite page 14 illustrates this point. Some of the crystals show a partial solution of quartz around the boundaries, followed by, recrystallization under conditions of less pressure, or addition of quartz. This process has formed narrow rings of fine grained quartz around the phenocrysts.

The feldspar phenocrysts are composed largely of oligoclase-andesine. They are all more or less altered to sericite and some carbonate, being quite cloudy in thin section. In places the alteration has left only clusters of sericite in

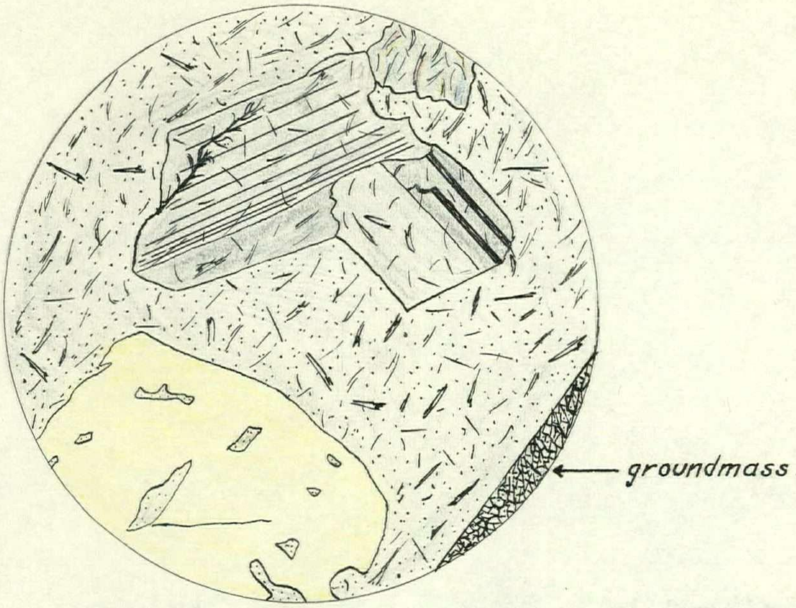


FIGURE 10

Thin section of quartz feldspar porphyry taken from "The Dome", outcropping 1 mile west of the ore zone.
Camera lucida drawing
Magnified 20 diameters.

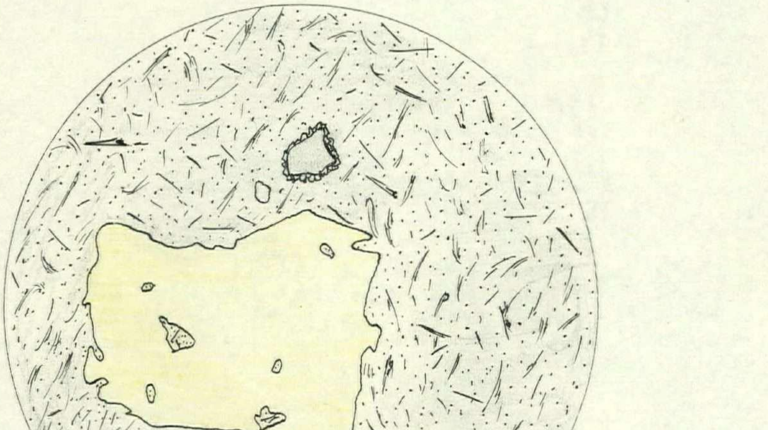


FIGURE 11

Thin section of quartz feldspar porphyry, taken from a diamond drill hole near the ore zone.
Camera lucida drawing
Magnified 20 diameters.

the matrix, some with vague outlines suggestive of original feldspar crystals. Some feldspars have thin bands of intense alteration around their rims while the interiors of the crystals are comparatively fresh.

Specimens of quartz feldspar porphyry taken near the ore zone contain considerable epidote in the groundmass and to a lesser extent in the feldspar phenocrysts. It has formed probably as the metamorphic product of alteration of feldspars and possibly ferromagnesian minerals. There is often an association of chlorite and epidote in such a way as to suggest an original ferromagnesian mineral which has been completely altered. In some places the chlorite is quite noticeable in the rock. Scattered sparsely through the porphyry are tiny euhedral crystals of pyrite, most of which have been altered to limonite. Apatite is present in small euhedral crystals disseminated through the matrix. Locally there is an abundance of carbonate in the form of small shreds and flakes and sometimes in veinlets.

A study was made of the quartz feldspar porphyry, outcropping as a dome-shaped body on the mountain top midway between Nansen and Victoria valleys and a mile west of the mine. Both in the hand specimens and in thin sections it is almost identical to the porphyrytic rock located in the drill holes. The similarity between these rocks is such as to suggest they originated from the same source. Figure No. 10 and No. 11 facing Page 14 show thin sections of both rocks. The field relations between the two will be discussed in detail in Part VI.

(c) Yukon Schists:

The following description applies only to those rocks of the Yukon group which are exposed in trench No. 8 near the southern boundary of the Big Thing claim. No thin sections of this rock were studied.

The typical schist is a soft, fine-grained gray rock with an abundance of muscovite throughout. It feels slightly greasy and has well developed schistosity along several planes. This schistosity causes it to break into splintery fragments. In the field this rock might be classified as a soft mica schist.

4. Weathering:

The rocks adjacent to the ore zone and at least several hundred feet of the quartz diorite on the hanging wall side, are partially weathered from 100 to 200 feet deep. On the footwall side of the zone, the quartz diorite is fresh in appearance and not highly fractured. The lack of glacial scouring has allowed the residual weathered materials to remain undisturbed, probably since Tertiary time,for it is likely that the greatest part of the weathering took place prior to the Pleistocene Period, before there was a permanent frost layer in the ground. The weathering has resulted in a breaking down of the essential rock forming minerals except quartz which remains unaltered. The products formed are limonite, kaolinite, some carbonate, and jarosite, all of which have changed the colors of the rocks to a rusty brown or buff shade. While the original textures of both the porphyry and the quartz diorite are often visible, the ferromagnesian minerals, feldspars, and pyrite have only irregular brown outlines.

The overburden is oxidized to an orange-brown color with limonite. On the surface of the bedrock a black stain is often present as a thin film. In tiny fractures it has a dendritic pattern suggestive of secondary manganese accumulation. Immediately above the ore zone the overburden has a peculiar lemon-yellow to brown color quite distinct from the brown limonitic stain in the surrounding material. It is formed as a thin coating over the fragments of ore and also as irregular areas within fractures. Chemical analysis revealed the presence of a considerable amount of sulphate, while a spectrographic analysis showed lead and arsenic. It is believed that this is a secondary mineral formed by weathering of the ore minerals, with the possible composition similar to a jarosite. A further discussion of the properties and means used to identify the mineral will be found in Part V, 2 of this paper.

The ore zone, composed of so much resistant silica is not weathered to the same extent as the wall rocks. In fact the ore appears quite fresh at the surface. In places, however, the pyrite has been leached away leaving only a honeycomb mass of quartz. The comparative scarcity of sulphide and its disseminated nature may account for the apparent lack of weathering in much of the ore.

5. Hydrothermal Alteration:

Sericitization is the main form of wall rock alteration. It is present both in the quartz feldspar porphyry and the quartz diorite. Even in the few samples of fresh-looking footwall quartz diorite there is a strong development of sericite in the feldspars. The sericite is in small dispersed shreds, giving to the feldspars a very clouded appearance. It is also in confused masses of minute flakes, completely replacing the original minerals. In the porphyritic rocks the sericitization is strong in the groundmass and the phenocrysts.

A more detailed discussion of the field occurrence of a porphyritic rock outcropping a mile west of the mine,is found in Part VI , 1. It is worth noting at this point, however, the alteration in the rock. Like the porphyry found on the property, it is intensely sericitized throughout its mass, As the porphyritic rocks of this type are considered to be the youngest intrusives in the region, it is believed by the writer that the alteration was caused by late hydrothermal solutions associated with the period of intrusion.

It is thought, after a study of several thin sections that there is a decrease in the intensity of sericitization away from the ore zone. When a more complete picture of the structure becomes available, the effects of the alteration will be better understood.

There is some development of carbonate in the rocks, but it is not as wide-spread as the sericite. It is found in

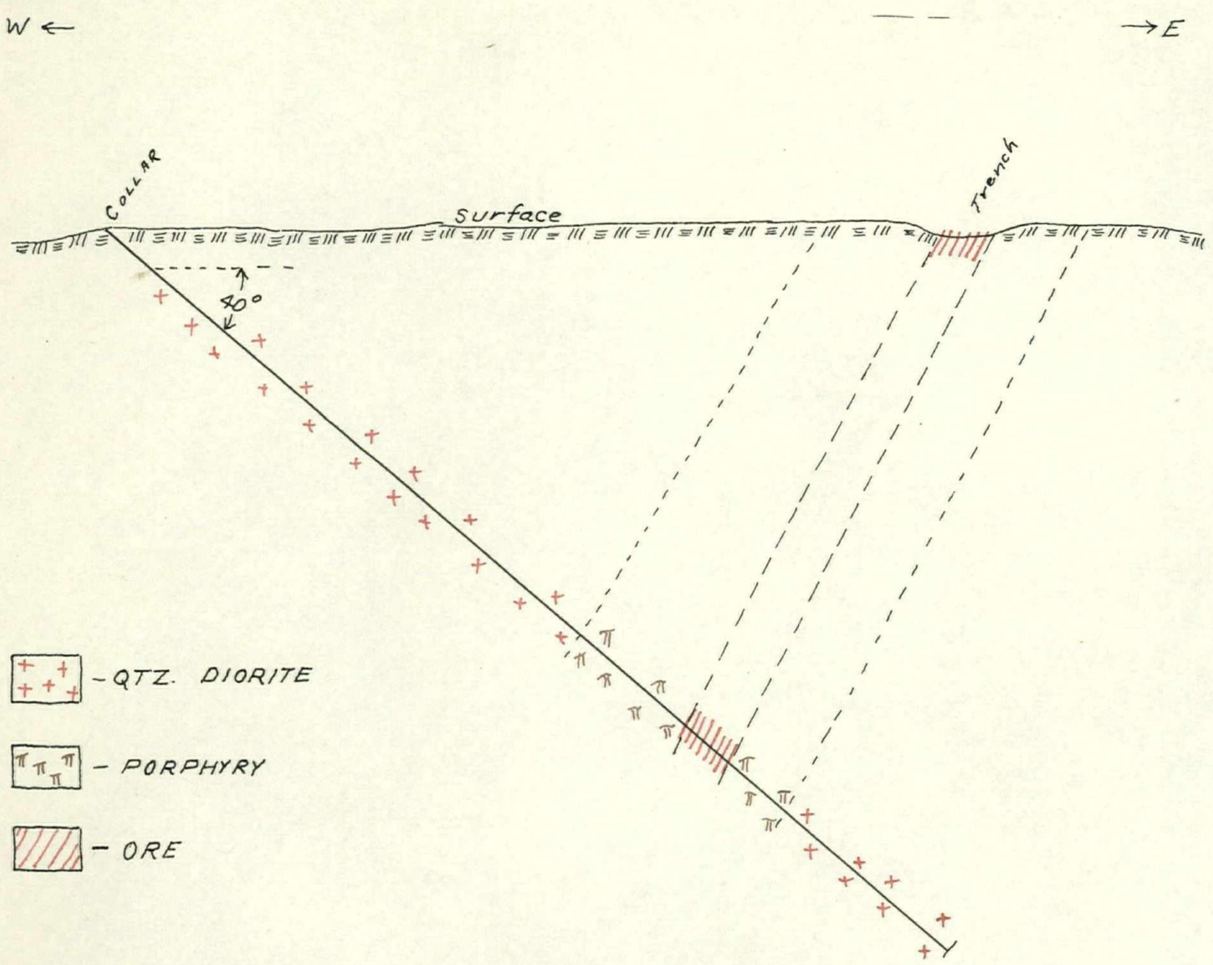


FIGURE 12

Generalized Cross Section of a Diamond Drill Hole, illustrating the Structure of the Brown McDade Ore Zone.

Scale 1 inch = 40 feet.

flakes, shreds or small veinlets through the rock.

Silicification doesn't seem to be a major alteration except in contact with the ore zone, where wall rocks sometimes show replacement by fine grained quartz.

No adularia could be found in any thin sections of the ore zone.

Pyrite and epidote are common in many of the igneous rocks in the Carmacks Area, as described by Bostock (1). The writer confirms this statement from personal observations. There is also no evidence to show that they increase in abundance near the ore zone. Therefore it is believed that these minerals are the result of regional metamorphism and are not connected with the hydrothermal solutions that deposited the Brown McDade ore body.

6. Structure of the Ore Body:

Figure No. 12 facing this page represents a generalized cross-section of any one of the diamond drill holes, 2a to 12a inclusive. It is given to show the reader how the knowledge of the structure was obtained. Knowing the position of the ore on the surface, the position of the hole, and the points at which the hole intersects the porphyritic rock and the ore zone, it was possible to calculate the dip of the ore in that hole, and the relationships between ore, porphyry and quartz diorite. This procedure was repeated in all the holes. The facts enumerated below are results of the work:

(a) The ore zone has an average width of 10 to 15 feet and dips 55 to 70° westward.

(b) Smaller veins exist, parallel to and branching from the main ore zone.

(c) The ore zone lies within a quartz feldspar porphyry rock in every hole that intersects it.

(d) The fine grained altered gray rock in the bulldozer trenches, that lies on either side of the ore zone, is probably a surface phase of the quartz feldspar porphyry.

(e) The intersections, by a number of holes, of the quartz feldspar porphyry, vary from 30 to 100 feet wide and seem to indicate a tabular body cutting the quartz diorite.

(f) The presence of sticky clay gouge near the ore zone in trenches No. 5 and 2, and the brecciated appearance of much of the ore, suggest considerable movement and shearing.

Summing up the above facts gives an approximate picture of the structure as follows:

The Brown McDade ore body is a mineralized zone, lying within a dyke-like body of quartz feldspar porphyry which strikes N. 25 degrees W and dips about 60° westward. The porphyritic rock is younger than, and cuts the country rock, a quartz diorite. Movement and shearing have taken place along the ore zone. Post mineral faulting is known to exist in the vicinity of trench No. 2 and drill holes 6a and 7a, where slight offsets in the vein, predicted by Smitheringale, were located later by drilling. No trace of the ore, or of the porphyry was found in hole No. 1a. It is believed that a fault cutting across between this hole and hole 2a may explain this discrepancy. Such a fault might also explain the apparent offset in the ore zone between trenches No. 4 and No. 5.

In trench No. 8 near the southern boundary of the Big Thing claim the porphyry may be seen cutting the schists, but it does not contain any visible mineralization. It is not yet known whether the ore zone will continue from the quartz diorite into the schists or whether it will die out near the contact.

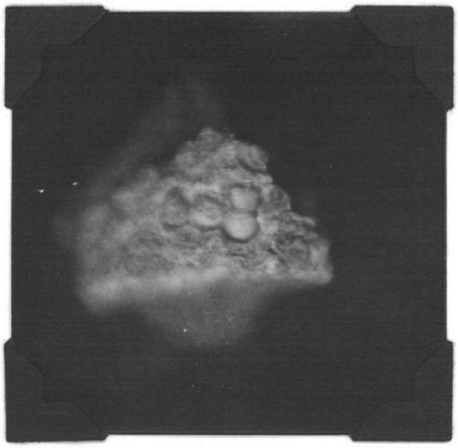
PART V MINERALOGY

1. Introduction:

The vein material is a bluish-gray cryptocrystalline quartz containing finely disseminated sulphides. Locally the sulphide content is relatively high, but on the average it is less than 5 per cent of the total (mass of the ore). Pyrite is the principal sulphide with arsenopyrite in lesser quantities and only minor amounts of other metallic minerals.

The ore commonly has a brecciated appearance, with small angular white fragments cemented in a groundmass of siliceous material. These fragments resemble some of the bleached gray rock in close proximity to the ore zone and are thought to have been originally of the composition of the quartz feldspar porphyry. Studies of thin and polished sections of vein material reveal much brecciation of pyrite, arsenopyrite and sphalerite. Many of the small vugs and drusy cavities in the ore are filled with inwardpointing quartz crystals and some are filled with yellow masses of a jarosite mineral. Comb structure

FIGURE 13



Botryoidal silica taken from drill core in the ore zone. Magnified. x 2.

FIGURE 14

Botryoidal silica taken from drill core in the ore zone. Magnified. x 2½.

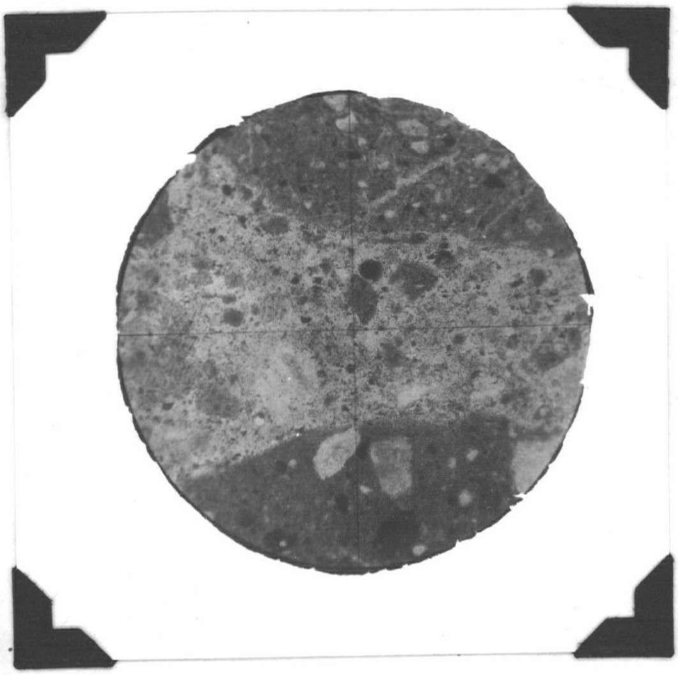
is noticeable occasionally in hand specimens, with interlocking crystals of quartz up to one quarter inch in length. On a microscopic scale, comb structure is common, in tiny veinlets cutting the cryptocrystalline groundmass. Some banding in the vein has been seen, parallel to contacts, but this feature is not often observed. Where the ore zone was cut by one of the drill holes at 125 feet vertical depth, botryoidal structure was present in the quartz. It assumed the form of several rounded masses clustered together, which in cross section showed a concentric layering effect parallel to the surfaces.

2. Texture and Composition of Vein Material:

The quartz in the matrix of the ore is exceedingly fine grained. Under the highest magnification available, it appears as a mosaic of tiny interlocking grains, averaging about 12 microns in size. The matrix is cut by veinlets and masses of crystalline fine grained quartz. In comparison to the groundmass it is much coarser in texture. The grain size of this later quartz is variable depending on the width of the veinlet but it may be said to average 10 or 15 times the size of that in the groundmass.

Large masses of minute lemon yellow crystals are commonly seen in thin section filling vugs, and interstices between comb quartz in the veinlets. They have the following characteristics.

FIGURE 15



Photomicrograph of a thin section of vein material

Illustrates the brecciated character of the ore and the grain size of the groundmass (12 microns)

Magnified 31 diameters.

(a) index of refraction ....very high

(b) birefringence (interference color)..fourth order or higher

(c) pleochroism ....slight, yellow to light yellow

(d) extinction ....parallel

(e) optical sign ....uniaxial negative.

Some of the earthy yellow coating over surface sections of the ore zone (see under "Weathering" in Part IV) was studied microscopically by oil immersion methods. The properties of this material are

(a) color .... lemon yellow crystals

(b) form .... hexagonal prisms and rhombohedrons

(c) pleochroism .... yellow to pale yellow

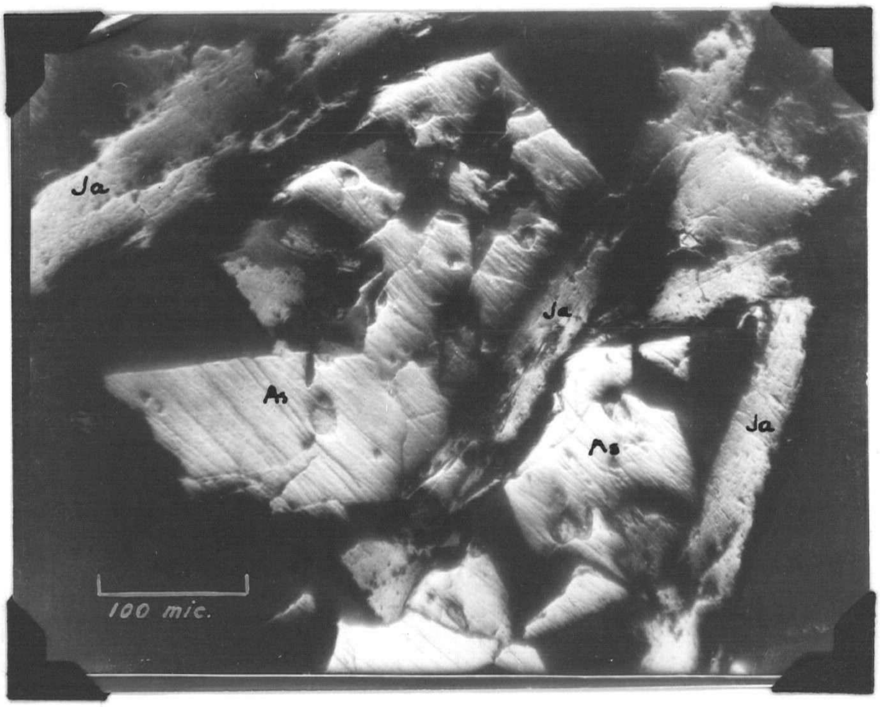
(d) index of refraction .... 1.76 - 1.78 +

It is believed that the yellow crystals seen in thin section are the same as those studied under oil immersion. The lower index of refraction is found to be about 1.75 while the upper one is well above 1.78.

All the above properties suggest that the mineral belongs to the family of jarosites. The jarosites are complex secondary hydrous sulphates formed by the weathering of sulphide ores. They are common in the deeply oxidized deposits of the southwestern United States and many other places.

A crystal of zircon was seen in the ore under the microscope as well as much minute euhedral apatite. These are probably of hypogene origin.

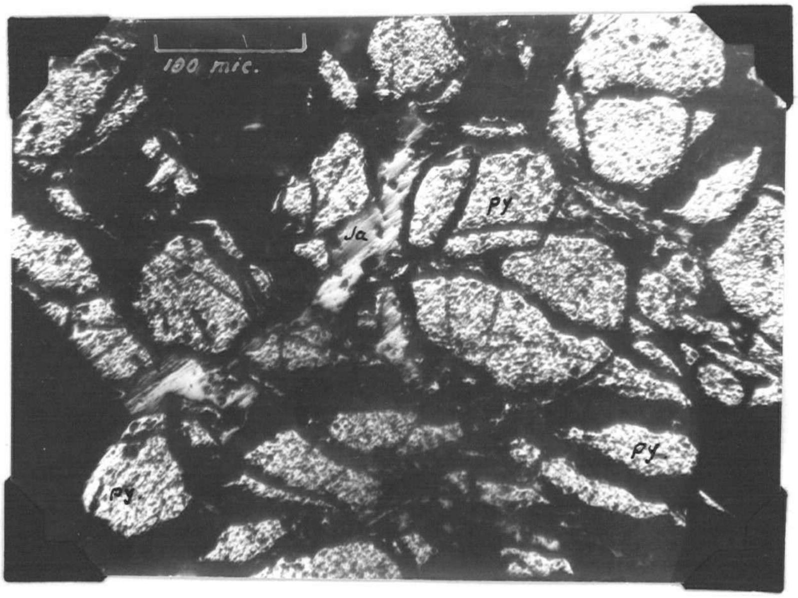
FIGURE 16



Photomicrograph, showing jamesonite (ja) and arsenopyrite (as) in quartz.

X 200

FIGURE 17



Photomicrograph showing jamesonite (ja) in brecciated pyrite (py)
X 200

3. Metallic Minerals:

A study of hand specimens and polished sections of ore from the Brown McDade mine shows the presence of pyrite, arsenopyrite, sphalerite, chalcopyrite, covellite, galena, stibnite, tetrahedrite, jamesonite, bournonite and gold.

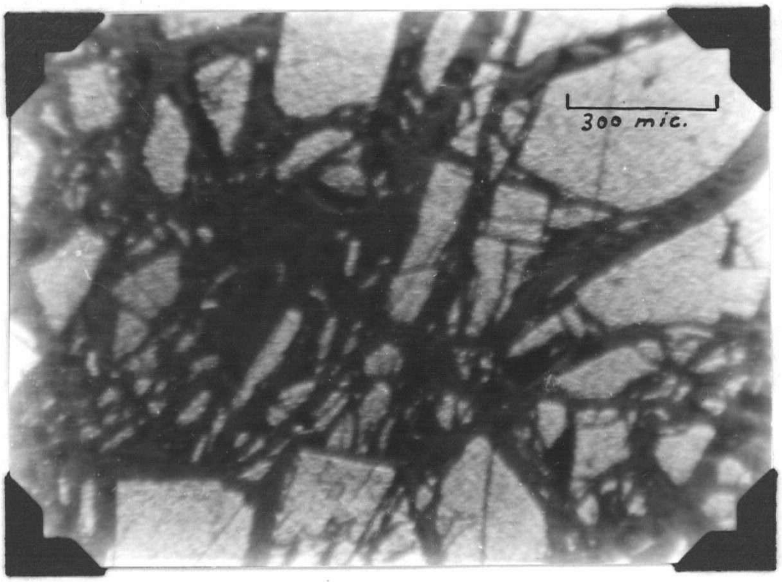
(a) Pyrite: FeS_2

Pyrite is the main metallic mineral in the ore. It is finely disseminated in subhedral to anhedral grains ranging from sub-microscopic fragments to crystals and masses a few millimetres across. Cubes and pyritohedra are common forms of the crystals. Fracturing and brecciation of the larger masses of pyrite has reduced them to finer fragments, which are cemented together by later quartz. Much of the pyrite in the surface showing has been partially or wholly removed by weathering, leaving only residual limonite or a mass of honeycombed quartz with only the casts of the original crystals to indicate their composition.

(b) Arsenopyrite: FeAsS

This mineral seems to be the second most abundant sulphide in the ore. Like the pyrite it occurs finely disseminated, rhombs and prisms being the commonest crystal forms. In hand specimens it is recognized as elongated silvery white crystals up to a few millimeters in length. It has undergone much brecciation into very fine splintery fragments, and where observed in surface ore it has been partly altered to limonite. It seems that arsenopyrite is not as evenly distributed throughout the ore as is the pyrite.

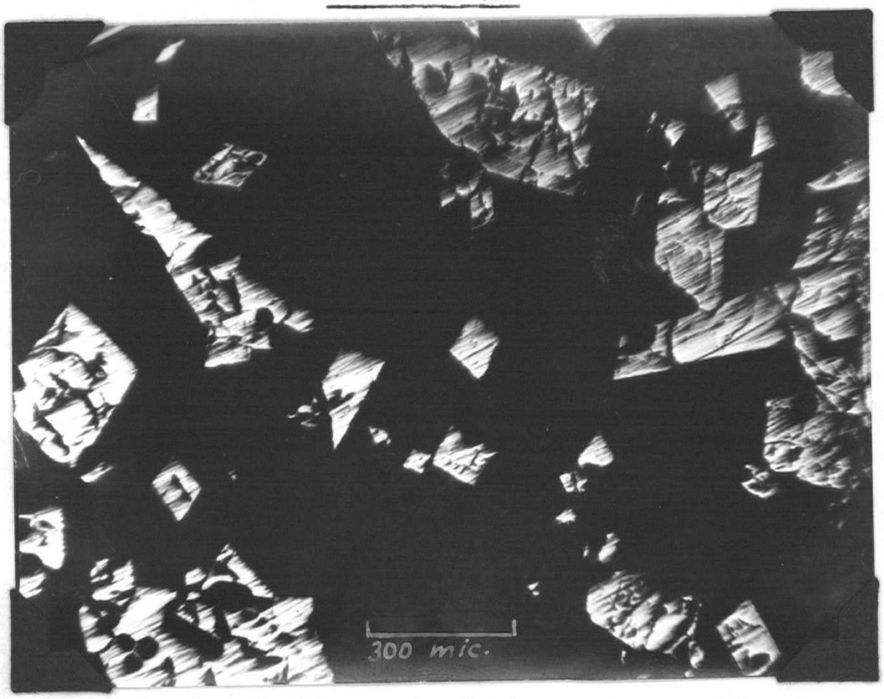
FIGURE 18



Photomicrograph of brecciated pyrite cemented by quartz

X 65

FIGURE 19



Photomicrograph of disseminated arsenopyrite in quartz

X 65

(c) Sphalerite: ZnS

Seen rarely in the field, the sphalerite is very dark brown with a highly resinous luster. It appears to be locally concentrated rather than evenly dispersed in the vein. Small veinlets of sphalerite one quarter of an inch wide have been observed.

As studied in polished section the sphalerite is in anhedral masses with rounded irregular outlines. It contains tiny inclusions of chalcopyrite, while covellite is common as a replacement mineral. A certain amount of brecciation of sphalerite has taken place in a similar manner to that of pyrite and arsenopyrite.

(d) Chalcopyrite: $CuFeS_2$

This mineral has been observed only as minute blebs in sphalerite, visible under medium or high magnification. Its determination is based on its brassy color, smooth polish, and low relief which being about the same as the surrounding sphalerite, indicates a mineral of similar hardness.

(e) Covellite: CuS

Much of the sphalerite is partially replaced by covellite which has the appearance of a deep blue irregular tarnish on its surface. Under polarized light the covellite is strongly anisotropic showing several good extinctions per revolution, with bright red and purple colours.

(f) Galena: PbS

None of the polished sections showed any galena, but it was seen a few times in the drill cores, usually in small veinlets near the ore zone.

(g) Stibnite: Sb_2S_3

This mineral was identified in hand specimens as slender silvery prismatic aggregates. In polished section it is recognizable by its needle-like form, its very strong anisotropism in polarized light and the yellow tarnish produced on its surface by etching with potassium hydroxide.

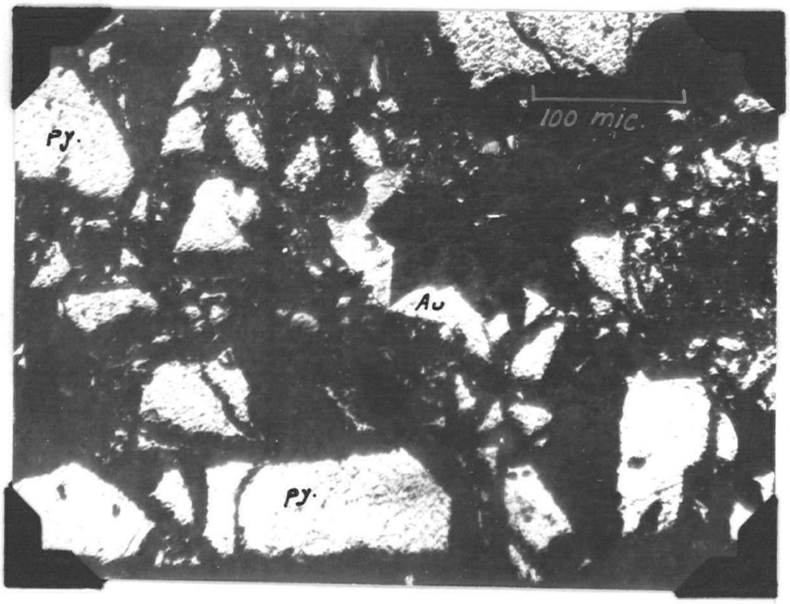
In the ore it is usually associated with the other sulpho-salts, tetrahedrite and jamesonite. It is not of common occurrence in the Brown McDade ore.

(h) Tetrahedrite: $3Cu_2S. Sb_2S_3$

Only in one polished section was any tetrahedrite found, where it was associated with arsenopyrite, stibnite, jamesonite and sphalerite. Identification was made on the basis of the standard etch reactions described by Short[13] and satisfactory microchemical tests for copper and antimony.

The tetrahedrite studied, comes from a small vein of heavy sulphide ore a few inches in width, located in diamond drill hole No. 1 close to the main zone. Samples of this ore showed much higher-than-average values in silver. Since no other important silver-bearing minerals have been found it is possible that the silver values in the ore come from tetrahedrite and possibly also from galena. Samples of ore from a property in the same area, optioned by the Conwest Exploration Co., seem to show a higher silver-gold ratio than those of the Brown McDade ore. A short polished section study of these samples shows comparatively greater amounts of

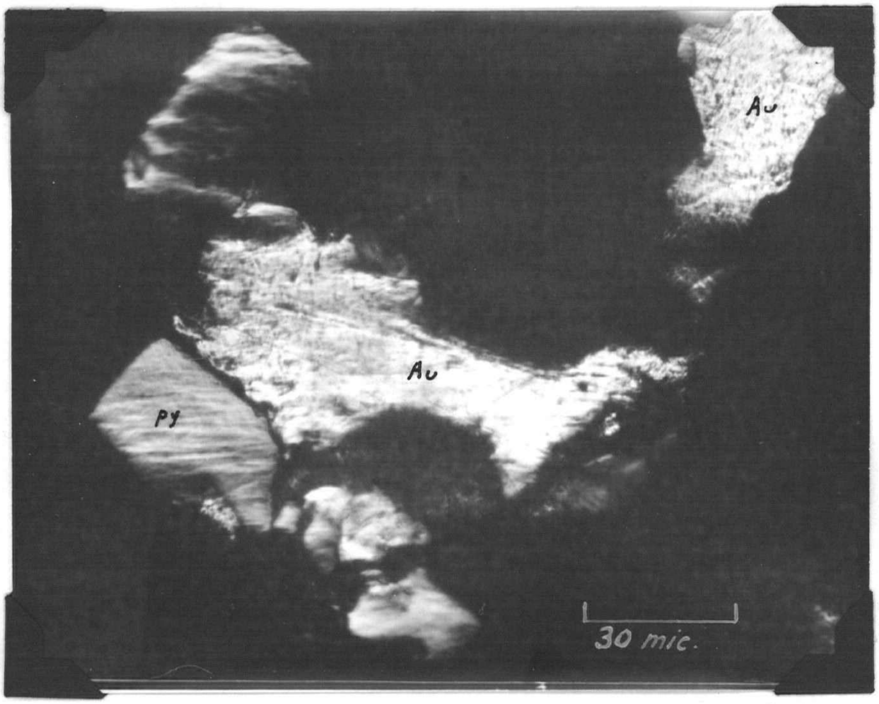
FIGURE 20



Photomicrograph of gold (Au) associated with pyrite (py) in quartz.

X 200

FIGURE 21



Photomicrograph of gold (Au) associated with pyrite (py) in quartz.

X 700

tetrahedrite and the other sulpho-salts.

(i) <u>Jamesonite:</u> 2 PbS. Sb_2S_3

Although it has not been seen in the field, jamesonite was discovered in minor amounts in polished sections of ore from three drill holes. It was identified by Dr. R.M. Thompson who analyzed the mineral by X-ray powder methods. The writer had identified it tentatively as a complex sulpho-salt on the basis of etch reactions only. At the time of its discovery the amount was too small to give any reliable microchemical tests. The etch reactions do, however, check with those given by Short (13) for Jemesonite. He observes a slight efferve-scence in the reaction with nitric acid, but this was not seen by the writer.

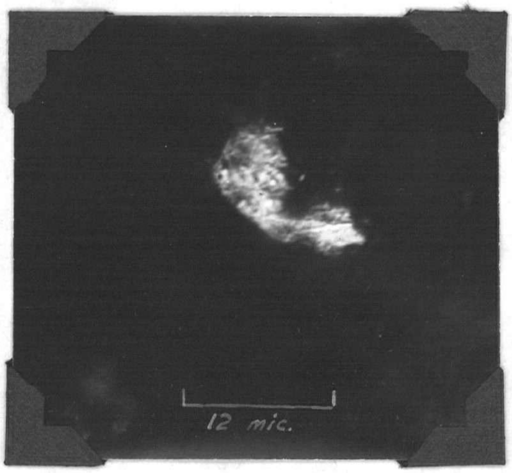
The jamesonite is closely associated with tetrahedrite and sphalerite but has also been noticed lying in fractures in brecciated masses of pyrite and arsenopyrite. Its characteristic form is in long fibrous crystals, sometimes slightly bent, with cross fractures representing the basal cleavage.

(j) <u>Bournonite:</u> Cu_2S. 2PbS. Sb_2S_3

Bournonite is found in ore from a small zone in trench No. 3 about 40 feet west of the main zone and parallel to it. The sample from which the polished section is cut, contains stibnite, identified as such in the field. Associated with the bournonite in the section although not in contact with it, are pyrite and sphalerite.

The mineral is soft, and almost white compared with

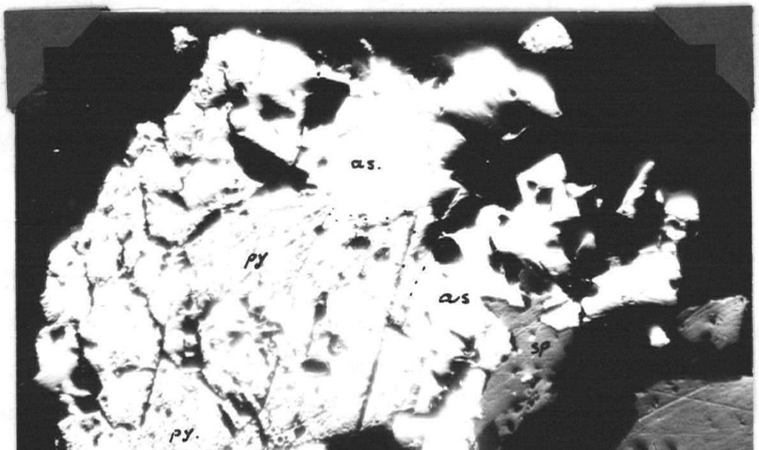
FIGURE 22



Photomicrograph of a particle of gold (12.5 microns) in quartz.

X 1634

FIGURE 23



Photomicrograph of pyrite (py), arsenopyrite (as) and sphalerite (sp) in quartz.

X 200

sphalerite. Its color as recorded by Short (13) is gray, like that of tetrahedrite. It is distinctly anistropic, showing light brown and dark brown colors when rotated in polarized light.

The identification of bournonite was made by Dr. Thompson in an X-ray powder analysis. On the basis of etch reactions, microchemical tests for tellurium, and the anisotropism, the writer thought it might be the telluride mineral, nagyagite. The etch reactions, given by Short[13] for both minerals, are practically identical. There must have been an error in the microchemical tests for tellurium, which were repeated twice, with apparently satisfactory results. It is now believed that the test, reliable as it may be, is interfered with by the presence of iron.

(k) Gold: Au

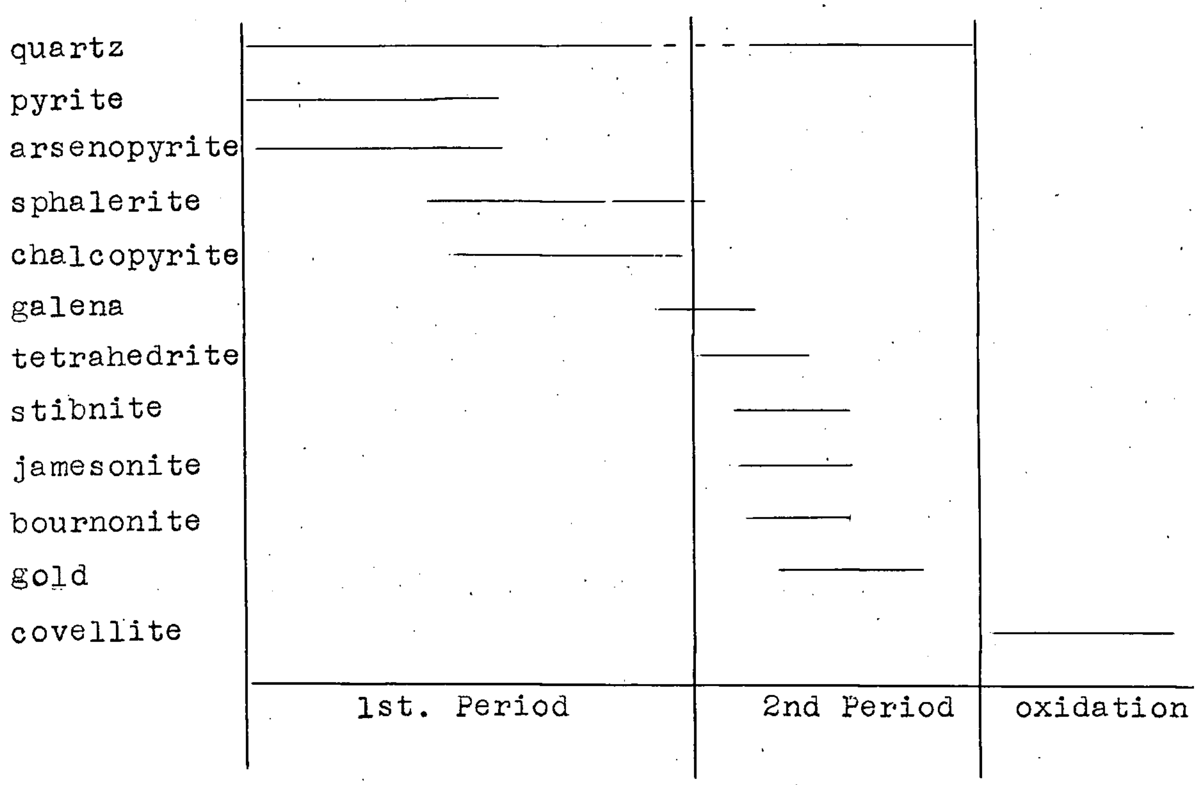
No visible gold has been found in any hand specimens, although fine colors may be obtained by panning the overburden above the ore zone. In polished sections from diamond drill holes No. 8a and 11a and from bulldozer trench No.3 a few small pieces of gold were seen.

The gold is a bright yellow in color and has the characteristic relief common to it, in polished section. The size of the gold ranges from 3 to 150 microns. It is associated closely with the sulphide in the ore, usually lying in fractures between grains of pyrite and in contact with them. A few tiny particles of gold are found in quartz isolated from any sulphides.

4. Paragenesis of The Ores:

It is realized that more laboratory work will be required to determine the exact paragenesis of the Brown McDade ore. This will be facilitated when underground development progresses further. The disseminated nature of the sulphides makes it difficult to solve their order of deposition. Some contacts between minerals have been observed and used to determine age relationships. The degree of brecciation of some of the sulphides makes it possible to separate the earlier formed ones from those which were deposited later. The experience of others who have solved such problems in well known deposits of a similar character, has been used as a guide.

The table below, illustrates the paragenesis as determined by the writer:



Quartz, pyrite, arsenopyrite and sphalerite are all fractured and cemented by later quartz. Any of the other metallic minerals may appear in these fractures, but are not fractured themselves. It is concluded from these facts that there were at least two periods of metallic mineralization, separated by movement along the vein, with consequent fracturing and brecciation of the early minerals. During the first period, pyrite, arsenopyrite, sphalerite and possibly some galena were introduced with quartz. In the second period stibnite and the sulpho-salts and gold were deposited with later quartz. Following the close of the hypogene mineralization, supergene covellite began to form by the oxidation of the sphalerite and chalcopyrite.

It is the writer's opinion that the two periods of mineralization referred to, in the last paragraph, do not represent widely separated periods of time. They may be included in one long period of hydrothermal activity during which a short period of deformation took place, followed by the deposition of sulpho-salts and gold.

5. Conclusions:

The commercial values of the Brown McDade ores come from free gold, and silver-bearing minerals like tetrahedrite and possibly jamesonite. The intensity of sulphide mineralization and the grain size of the sulphides are usually indicative of gold values. As a rule the heavier the mineralization and the finer the grain size of the pyrite, the higher will be the amount of gold in the sample. The gold is closely associated with the pyrite, lying along boundaries of the grains or in fractures between them. The very wide variations in the gold-silver ratio as seen from the assay results, may possibly be explained by the erratic distribution of gold and the silver-bearing sulpho-salts in the ore.

ORIGIN OF THE ORE DEPOSIT

PART VI

1. Source of The Ore Solutions:

The mountain known locally as "The Dome", on the summit between Victoria and Nansen Creeks is about one mile west of the mine. The composition of the rounded top of the mountain is quartz feldspar porphyry. Field relations between this mass and the surrounding area suggest that it is an intrusive neck cutting through the older surrounding rocks. Other bodies of similar rock are common in the region for 40 miles northwestward. They are considered to be of late Tertiary age.

The mineralization at the Brown McDade Mine is believed to be genetically related to these intrusions of quartz feldspar porphyry. The following points support this belief.

(a) The composition of "the Dome" is almost identical to that of the dyke-like porphyritic body around the ore zone.

(b) The structure at the mine dips towards the Dome, indicating that it may be an offshoot of the larger mass.

(c) Dykes of quartz feldspar porphyry outcrop about a mile west of the Dome and are probably related to it.

The writer believes that an intrusion of quartz feldspar porphyry (now represented by "The Dome") fractured the surrounding rocks and sent out dykes to fill the fractures. These became zones of weakness along which movement took place, allowing the entrance of late mineralizing solutions.

Since the period of primary mineralization, supergene processes have been in action to a limited extent. As evidence of these processes there is the partial replacement of sphalerite by secondary covellite, as well as the formation of limonite and jarosite in the ore. Most of the vein material is fresh, even at the surface where gold is found in hard quartz associated with unaltered pyrite, and where stibnite and bournonite show no signs of alteration. It is thought that such supergene processes that have been in operation are very minor and have not affected the gold and silver values of the ore.

2. Comparisons With Other Deposits:

(a) Introduction:

It is the purpose of the following discussion, to compare the Brown McDade Mine with well known similar deposits, in order to assess its possibilities. The comparisons are based on mineralogy, age of deposition, structure and wall rock alteration.

The writer was unable to find any reference to deposits, where all the above features corresponded to those of the Brown McDade. Sufficient information was obtained, however, from the references, to draw a few conclusions regarding its possibilities.

(b) Mineralogical Comparisons:

The main characteristics of the Brown McDade ore are the blue color, fine texture of quartz, brecciation, dissemination of the sparse sulphide mineralization, vugs and drusy cavities some botryoidal structure, comb structure and occasional banding. On the basis of this information it appears to belong to the epithermal group of mineral deposits. Certain features of the famous, typical epithermal deposits have not been seen in the Brown McDade. Of these, the most prominent and widespread is the presence of adularia, which is a diagnostic mineral in this class. Of the metallic minerals in the ore, only the arsenopyrite is usually rare in epithermal deposits.

Ferguson's (19) classification of the precious metal epithermal ores, is determined on the ratio of gold to silver. He recognizes two divisions, the silver-gold class with a ratio of one to one or less, and the gold-silver class where gold exceeds silver by weight. These classes vary considerably in mineralogy and structure.

The gold-silver ratio of the Brown McDade ore lies between 1 to 5 and 1 to 15, which would make it, considering the figures alone, a silver-gold deposit. The mineralogy, however, is such, that the gold-silver group seems the better choice of the two. None of the characteristic metallic minerals of the silver-gold class are present in the Brown McDade. These minerals are argentite and the silver sulpho-salts, which are said by Nolan (12) to be lacking in gold-silver deposits. It is thought that in this case the gold-silver ratio is too close to the borderline between the two groups to be a diagnostic feature.

(c) Age of Deposition:

The Brown McDade ore body, formed during Late Tertiary time, belongs geologically to region of the Pacific Rim. This region has the shape of a great arc, running from New Zealand through the Phillipines, Japan and Western North America, to the South American Continent. It was the scene of intense volcanic activity in the Tertiary Period, during which time the great epithermal deposits, for which it is well known, were formed. Considering this fact in the light of the other characteristics of the Brown McDade, it seems logical to associate it with the epithermal group.

(d) Structural Comparisons:

Speaking of the gold-silver class of epithermal deposits, T.B. Nolan (12) says, "The ores of this group are commonly localized by fractures which in many places appear to be genetically connected with the emplacement of the igneous rocks with which they are associated. These fractures are generally discontinuous and rarely have measureable displacements. As a result ore shoots are in many places of rather small extent and the discovery of new ones is difficult."

Of the silver-gold deposits he states, "The ore deposits of this class are commonly found in well defined fault fissures that may be followed for considerable distances both horizontally and vertically. In most localities the faults appear to be of tectonic origin and to have no direct connection with the extrusion of the associated volcanics."

The structure of the Brown McDade property is that of an intrusive body of quartz feldspar porphyry with which the ore zone is closely associated and to which it is believed to be gentically related. From the evidence shown in bulldozer trenches Nos. 4 and 8, which are 200 feet apart, it is thought that there is no large horizontal displacement along this zone of porphyry. If this had happened, the contact between the quartz diorite and the Yukon schists would be expected to show signs of this displacement on either side of the zone. There is no sign of such a displacement.

Considering then, the structural evidence at the Brown McDade Mine and Nolan's (12) structural comparisons between the two groups of epithermal groups,the gold-silver group is the one to which it is most similar.

(e) <u>Wall Rock Alteration:</u>

The main alteration at the Brown McDade Mine is sericitization and carbonatization, with minor silicification. It is not confined to the rocks adjacent to the ore zone but is of rather widespread occurrence. Such alteration is more characteristic of the epithermal class of ore deposit than it is of those formed at greater depths.

3. <u>Conclusions</u>:

(a) The Brown McDade ore deposit is probably of the epithermal class, although certain characteristics indicate that it is not one of those formed at very shallow depths.

(b) A study of the structural features suggests that the ore should continue to moderate depths, but that ore shoots will be erratic in distribution and the width of the ore zone will be variable.

(c) The area to the south of the ore zone, which is underlain by schists of the Yukon Group, will probably not contain much ore. The facts that placer gold is absent in those streams located in the schistose areas, and that the schists in the immediate vicinity of the property do not appear competent to maintain open fractures, tend to support this statement.

(d) Blue siliceous float,identical in appearance with the ore has been found in the streams draining the Northward extension of the Brown McDade Group. In addition, some placer gold has been taken from the streams and much of the overburden yields gold colors in the pan. These facts indicate that this ground should be favorable for exploration.

(e) Numerous subsidiary zones of mineralization will be found in the vicinity of the main ore zone, some of them possibly extending outward into the quartz diorite.

(f) From the information available about known deposits, the character and intensity of wall rock alteration will probably have some bearing on the control of ore deposition.

(g) The occurrence of the gold in the free state in association with pyrite suggest that the problems of extraction should not be too difficult. A more detailed study of the metallic and gangue minerals will be necessary to prove this point. However,the small size of the gold indicates that the ore will have to be finely ground.

PART VII DEVELOPMENT OF THE MINE

1. Discovery:

The property was discovered by George McDade of Carmacks, in 1943. After many years of prospecting in the area, during which time he was working small placer holdings on Back Creek and Pony Creek, McDade became interested in finding the lode from which the placer gold had come. He noticed that the gold appeared rough, often containing pieces of quartz attached to it, and deduced from this that it had not travelled far. The next step he took, was to pan systematically, upstream from the workings, not only along the creeks but also up the hillsides. The work progressed slowly, owing to the heavy overburden. He found, however, that most of the ground yielded colors in the pan, and by following these leads was able to trace the gold to its approximate source.

After staking claims, McDade and his partner, Brown dug a series of trenches across the ore zone on the Big Thing claim. The looseness and depth of overburden prevented them from reaching bedrock. Panning of the loose material in the trenches produced good colors in gold and samples of solid fragments when assayed, gave satisfactory results.

The claims were optioned to Yukon Northwest Explorations Limited, after an examination by Smitheringale in Sept. 1945.

Subsequent work has proved the accuracy of McDade's calculations.

2. Diamond Drilling:

(a) Plan:

Originally there was no evidence to indicate the dip of the ore zone but for diamond drilling purposes it was assumed to be vertical. The first two holes proved that the zone was dipping westward about 70 degrees, consequently a new plan was started. This consisted of drilling a series of short holes inclined at 40 degrees, 100 feet apart, to intersect the zone approximately at right angles.

(b) Drilling Problems:

The northern latitude of the mine with its consequent late Spring and early Winter, limits the time available for surface drilling. The four months from May to September constitute the average drilling season.

The problem of permanently frozen ground is difficult. The degree of freezing depends on slope of ground, amount of overburden and nature of vegetative cover. Usually the northern sides of the hills are completely frozen below the moss roots whereas the southern exposures are often free of frost for a considerable depth. Steeply sloping ground, with little overburden and plant cover is not frozen to the same extent as the more gentle slopes with a heavy blanket of moss and brush. The problem of drilling in such ground is best solved by keeping the drill in operation continuously, while a hole is being drilled. Even the two, ten-hour shifts per day that were used, did not prevent the formation of ice, during the early part of the season. Drilling 50 or 100 feet

FIGURE 24.

Bulldozer trench No. 3 on the "Big Thing" claim, looking west.

Depth of overburden approximately 8 feet.

"The Dome" in the background is an intrusive body of quartz feldspar porphyry.

of ice wastes several hours time. A program using three, eight-hour shifts would have been more efficient. Drill rods standing in the hole for over an hour would freeze solidly in position, preventing their further use.

The source of water for drilling was Pony Creek. The supply was sufficient during the Spring runoff but a few weeks dry weather reduced the flow to a trickle. On several occasions work was halted for lack of water. This problem was solved by the construction of a large sump in the creek to conserve the supply for dry weather.

The rocks on the hanging wall of the ore zone through which most of the drilling was done are badly shattered and oxidized to a depth of at least 200 feet. This condition gives rise to many problems such as, low core recovery, caving holes, undue abrasion of drill rods, rapid gauge loss in bits, and loss of return water and sludge from the holes. Because these conditions were unforseen, some time was lost and some drilling equipment became worn out sooner than was anticipated. The solution of these difficulties would involve the use of two sizes of drill equipment, a large size casing inside of which standard size drill rods would be used. The casing would be drilled first, to seal the hole.

3. Surface Stripping:

A bulldozer was used to dig eight large cuts across the ore zone over a length of approximately 1500 feet. This method is quick and less expensive than trenching by hand. As in drilling, the problem of frozen ground presented difficulties.

In some trenches several days had to elapse between successive cuttings to allow the ground to thaw. By keeping several cuts in operation at once, the maximum use was made of the bulldozer.

4. Present Development:

An underground program of development is now underway. It consists of a crosscut 700 feet long, running from Pony Creek into the ore zone, which it will intersect under diamond drill hole No. 8a, about 100 feet below the surface. Lateral development of the ore zone will follow upon completion of the crosscut.

5. Transportation Problems:

The factors to be considered in transportation are, distance, type of transportation and year-round availability of such transportation. Production costs will depend largely on these factors.

There are four possible transportation routes. The first route is via the Aishihik cut-off road, the Alaska Highway and the Haines cut-off road to the town of Haines on the coast of Alaska, near Skagway. It would require the construction of 40 miles of new road from the mine to Aishihik, making in all, 300 miles of haulage by motor vehicles. This route has the advantage of being independent of other forms of transportation from the mine to tidewater. In the Winter months there is a possibility that the Haines cut-off, which runs through the rugged Coast Range mountains, could not be kept open continuously.

The second route runs over the Aishihik cut-off road and the Alaska Highway to Whitehorse, where it goes by the White Pass and Yukon Railway to Skagway. The length of this route is about 300 miles. It too, would require the construction of the new road mentioned in the last paragraph.

The third and fourth routes go through Whitehorse via Carmacks. They both require construction of 35 or 40 miles of new road from the mine to Carmacks, the cost of which would be similar to the new Aishihik road. At Carmacks the two routes separate, one using the Dawson-Whitehorse road, and the other being the steamer route up the Lewes River. The former is not in condition for wheeled vehicles yet, but the Government may open it up soon. The disadvantages of the river route are, extra freight handling, the possibility of high freight rates, and a period of seven months from October to May when the river is frozen.

6. Power Problems:

There is no immediate source of water power in the district, while the timber is too sparse to be considered as a source of power. Two possibilities remain. The first would require the use of diesel oil, hauled in from Whitehorse and the second would be to use coal from the deposits on the Lewes River near Carmacks. The possibilities of the latter are worth investigating.

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GLOUSER M.C.
TUB M.C.
BIG THING M.C.
PROPOSED XCUT 685 FT.
TRENCH #1
TRENCH #2
TRENCH #3
TRENCH #4
TRENCH #5
TRENCH #6
TRENCH #7
APPROXIMATE CONTACT FOOTWALL GRANODIORITE
BIG THING M.C.
HUB M.C.
AMALEE M.C.
GEOLOGY
GRANODIORITE (QTZ. DIORITE)
PORPHYRY
SCHISTS
VEIN
FAULT
ASSUMED TRACE OF PORPHYRY IN DRILL HOLES
LEGEND
CONTOUR
DIAMOND D. HOLE
TRENCH
CLAIM BNDY.
TUB MC
RUB MC
MAP OF
BROWN McDADE GROUP
WORKINGS & GEOLOGY
CARMACKS YUKON TY.
SCALE 1 IN. = 40 FT.
1946