ENGINEERING REPORT - YEAR 1968

ON THE MAMMOTH COPPER PROPERTY

BONNET PLUME RIVER AREA,

MAYO MINING DISTRICT, YUKON.

MAMMOTH MINERAL CLAIMS 201 to 250

GLACIER LAKE. CLAIM SHEETS 106C-13
AND 106C-14

Report By:

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EXPLORATION PROGRAM CONDUCTED

BETWEEN JUNE 9TH and SEPTEMBER 7th

1968

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BONNET PLUME RIVER MINES LIMITED

ENGINEERING REPORT FOR YEAR 1968

A B S T R A C T

Development and exploration programs conducted during the year 1968 include the construction of a winter road connection to the property, the construction of an aircraft landing strip on the property, and a geochemical stream silt sampling survey of the Bonnet Plume River area, culminating in a program of geological prospecting and mapping of the most favourable areas. The latter program resulted in the staking of fifty more mineral claims north of Dolores Creek and west of the area staked during 1967.

The Mammoth Copper Property now consists of 158 mineral claims recorded in the name of Bonnet Plume River Mines Limited. The mineral findings during the season of 1968 include the location of a widespread area of disseminated copper-cobalt mineralization near Glacier Lake, about seven miles west of the initial discoveries made in the Vault Mountain area during 1967 and in the same favourable stratigraphic environment.

The mineralization consists of various degrees of copper concentration. There are some localized beds of massive copper-cobalt replacement ore with associated silver in sedimentary formations with variations down to comparatively lowgrade disseminated copper and iron minerals in carbonates, volcanics and intrusive rocks containing low but persistent accessory silver values and trace only of cobalt.

It is believed that further geological prospecting and mapping, assisted by diamond drilling and trenching, in and around the known mineral occurrencies on the property will disclose sufficiently large tonnages of mineralized material containing a high enough ratio of copper to iron to be

classed as ore. Overburden in this area is negligible. Large-scale surface mining operations at comparatively low cost are therefore possible, and it is believed that the profit potential from such operations will be excellent.

Archer, Cathro and Associates, Geological Consultants, have recommended continued geological exploration assisted by diamond drilling to cost $220,000.00 during the season of 1969. The Directors of Bonnet Plume River Mines Limited are presently taking steps to finance this and all future exploration expenditures through an approved listing with the Vancouver Stock Exchange and the subsequent sale of stock certificates to the general public.

INTRODUCTION

The original discoveries of copper-cobalt mineralization in this area were made during 1967. An active season of geological prospecting, assisted by geophysical and geochemical surveys, led to the staking and recording of 108 mineral claims. The area of interest lies to the south of Vault Mountain and to the north of Dolores Creek, a tributary to the Bonnet Plume River.

At the end of the first season's exploration work the geological consultants recommended a further expenditure of $165,000.00 for the following programs to be completed during 1968:

1. The construction of a winter road to the property.
2. The construction of an aircraft landing strip on the property.
3. Camp construction at the property.
4. Continued exploration by a Geologist and two prospectors.
5. A helicopter-borne magnetic and electromagnetic survey followed by photo-interpretation of the area surrounding the property.
6. The diamond drilling of two known geomagnetic anomalies and of new target areas developed during the season.

In order to finance this and future exploration expense, the owners of the property, Mr. L. J. Brown and Mr. L. I. Proctor, decided to form a public exploration company to be registered in British Columbia and the Yukon. The name of this company is 'Bonnet Plume River Mines Limited'. An application to list this company with the Vancouver Stock Exchange is in process. Funds for the 1968 exploration season were provided in the meantime by Mr. L. I. Proctor and by Nordex Exploration Limited who supplied the equipment and undertook to accomplish the work under the direction of Bonnet Plume River Mines Limited.

Thus, during the spring of 1968, the winter road to the property was built. Fuel, supplies, diamond drilling equipment and a portable camp were hauled to the property prior to spring 'breakup'. The aircraft landing strip was constructed by June 1968, when it was in almost daily use

by wheeled aircraft servicing the helicopter-borne geochemical stream silt sampling survey and the prospecting programs throughout the balance of the season (see Plate I).

Two crews were employed during the early part of the summer on the geochemical survey. This was followed later in the season by geological prospecting and mapping of the areas of interest. Follow-up bulldozer trenching was conducted in two of the areas. The diamond drilling program was postponed until more funds could be made available through an approved listing and public subscription through the Vancouver Stock Exchange.

The following report relates as to the results of this exploration program which involved the expenditure of $83,994.16 during 1968. Of this amount, at least $16,000.00 was expended on geological prospecting and mapping of a favourable area newly staked into fifty mineral claims, Mammoth Nos. 201 to 250 as per the accompanying Geological Reports by F. Marshall Smith and Alan R. Archer. These two reports and this Engineering Report for 1968 are being submitted to the Mining Recorder with an application to record Assessment Work on the above fifty Mineral Claims under the Yukon Quartz Mining Act - Section 53(4).

PLATE I.
Looking Westerly on the New Aircraft Landing Strip.

PROPERTY AND OWNERSHIP

The Mammoth Copper Property now consists of 158 mineral claims recorded in the name of Bonnet Plume River Mines Limited. The claims are registered in the Mayo Mining District, Yukon.

The property list of claims is as follows:

Claim Names:	Recorded Date:	Number:	Expiry Date:
Mammoth 1- 56	June 28, 1967	Y6719-Y6774 inclusive	August 18, 1971
Mammoth 57- 76	July 12, 1967	Y6791-Y6810 "	" "
Mammoth 77- 84	Aug. 18, 1967	Y6843-Y6850 "	" "
Mammoth 85- 92	Aug. 1, 1967	Y6827-Y6834 "	" "
Mammoth 93-100	Aug. 1, 1967	Y6835-Y6842 "	" "
Mammoth 101-108	Aug. 18, 1967	Y6851-Y6858 "	" "
	- and this year's recordings -		
Mammoth 201-216	April 30, 1968	Y14667-Y14682 "	April 30, 1969
Mammoth 217-232	April 30, 1968	Y14683-Y14698 "	April 30, 1969
Mammoth 233-250	Aug. 8, 1968	Y26783-Y26800 "	August 8, 1969

The attached Report for the Year 1968 concerns itself with the last three groups comprising fifty mineral claims (Mammoth 201 to 250 inclusive). Application is herewith made to the Mining Recorder to record this year's representation work to a common anniversary expiry date, August 18, 1971.

LOCATION AND ACCESS

Access to the property was improved this year by the construction of fifty miles of winter road to connect with the Wind River Trail, also by the construction of an aircraft landing strip on the property at the base camp. The airstrip is built on a ridge of glacial moraine on the North Fork of Dolores Creek at the mouth of Cobalt Creek. This is at Latitude 64°54' and longitude 133°20', a distance of 110 airmiles from the airport at Mayo, Yukon.

The distance to the all-weather highway at Elsa, Yukon by way of the newly-built winter road is 125 miles. A preliminary reconnaissance by the Department of Public Works in Whitehorse indicates that there will be no difficulty in constructing an all-weather road to the property by a somewhat shorter route of 105 miles to the Elsa-Whitehorse highway. The new Glacier Lake copper showings described in this report are located seven road miles closer to the Elsa highway than the original copper showings on Vault Mountain.

TOPOGRAPHY AND WATER SUPPLY

The topography of the Glacier Lake showings is extremely rugged (see Plate II). The relief varies from 3500' elevation at Glacier Lake to 6500' elevation on the ridge east of Glacier Lake in less than 3/4 of a mile, then back to 4000' at a creek and major fault which marks the north-east boundary of the property. The ridges run generally slightly west of north and they are sharp and precipitous. The ridges are cut at right angles by a series of steep-walled gullies thought to be evidence of faulting. The rock formations are predominantly exposed on the ridges but are obscured by talus and rockslides in the gullies and valley-bottoms below the ridges.

The water supply below the Glacier Lake copper showings on Dolores Creek is ample for milling and townsite purposes on a year round basis. There is at least double the amount of water here than was reported last year at the base camp on the North Fork of Dolores Creek seven miles upstream.

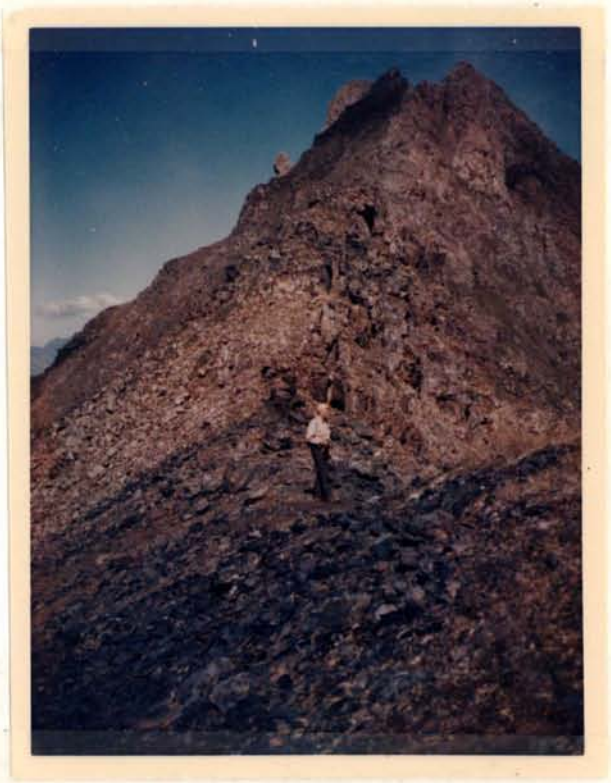


PLATE II
Topography at ridge top east of Glacier Lake. Note light-coloured Quartzites contacting darker dolomite in foreground and brown Volcanics in background.

DEVELOPMENT AND EXPLORATION DURING 1968

Exploration during 1968 was facilitated by the construction of the winter road and airport. The winter road was built with the assistance of the Yukon Territorial Government.

A. Winter Road Construction: The winter road was built during February, March and April, 1968 using two Caterpillar D-8 Tractors and a Motor Grader rented from Nordex Exploration Limited. Prior to the construction of the winter road connection, seventy-five miles of the Wind River Trail between the highway at Elsa and the mouth of Nash Creek had to be reconditioned.

The fifty miles of winter road construction was located via the McLusky Lakes Pass to Gillespie Creek, north up the Bonnet Plume River

and easterly up Dolores Creek to the property. One of the tractors was returned to Elsa prior to 'breakup', leaving the other tractor and the motor grader at the base camp on the property for airstrip construction and exploration trenching.

B. Airstrip Construction: The airstrip site was cleared during the winter and was roughed out and graded during May and June. Grading continued on an intermittent basis after rainfalls during the first two weeks of July. The airstrip has a graded gravel runway 2100' in length by 150' wide. The roughed out area is 2766' long by an average of 260' in width. The new airstrip was in almost daily use from June 10th until the end of the season. The surface of the airstrip is now quite hard and is well drained.

C. Geochemical Silt Sampling Survey: A helicopter-borne geochemical stream silt sampling survey was started on June 9th and was completed by mid-July. Two 2-man crews were employed on this survey. In all, 730 silt samples were taken from streams draining a 670 square mile area. Assay determinations were made at the base camp by the Biquinoline method; every fifth sample being check-assayed in the Whitehorse Assay Laboratory by the hot acid method of extraction. A detailed report of the sampling and assaying procedures used in this program is appended hereto. This report of August 12th, 1968 is by F. Marshall Smith, B.Sc. Geology. Mr. Smith was in charge also of the preliminary geological mapping of the entire area, followed by close geological prospecting and mapping of the most favourable areas which were staked into claims.

D. Geological Prospecting and Mapping: The results of the above program outlined strongly anomalous copper-bearing areas east of Glacier Lake, on the east wall of Glacier Pass, in the two main valleys east of

Glacier Pass and along the north side of the Dolores Creek Valley. These areas were given a program of geological prospecting and mapping followed by some bulldozer trenching. The geology will be described later in this report under 'Geology'.

E. Claim Staking: The areas containing the most mineralization, as indicated by the Geological mapping and follow-up trenching, were staked into two claim groupings: Mammoth Nos. 201 to 216 which adjoin the Vault Mountain Claims recorded last year (see Claim Sheet 106C-14), and Mammoth Nos. 217 to 250 in the Glacier Lake area which is seven miles to the west of Vault Mountain (see Claim Sheets 106C-13 and 14).

F. Exploration Expenditure for the Year 1968: (See Appendix II for list of expenditures and affidavit). A summary of expenditure for the year 1968 is as follows:

Winter Road Construction as per Audit -	$25,678.28	
Less: Territorial Government Grant -	10,000.00	$15,678.28
Airport Construction		18,541.29
Geochemical and Geological Surveys and Prospecting Expense: Mammoth Claims 201 to 250	$16,000.00	
Other Areas in Bonnet Plume District	24,240.19	$40,240.19
Claim Staking and Recording		6,744.99
Administration Expense as per Audit Statement		2,789.42
Total Exploration Expenditure for Year 1968 -		$83,994.17

G. Names and Addresses of Personnel: The following took part in the development and exploration programs on the property of the Bonnet Plume River Mines Limited during the year 1968:

Names:	Addresses:
A.R.Archer, B.A.Sc., P. Eng.	Casca Building, Whitehorse, Yukon
F. Marshall Smith, B.Sc.	32 Pheasant Lane, Islington, Ontario
P. Boulton (University)	1000 Petrelew Place, Victoria, B. C.
N. Okerstrom (University)	999 Gilford Street, Vancouver, B. C.
B. Davidson (University)	36 Overland Avenue, Scarborough, Ontario
Louis J. Brown	P.O. Box 146, Mayo, Yukon
L. I. Proctor	P.O. Box 827, Whitehorse, Yukon
C. D. N. Taylor, P. Eng.	2420 Queenswood Drive, Victoria, B. C.
C. E. Ford	P.O. Box 2080, Whitehorse, Yukon
R. Van Wyck	P.O. Box 2080, Whitehorse, Yukon
R. LeDuc	General Delivery, Calgary, Alberta
Alex Jonny	General Delivery, Mayo, Yukon
Norman Moses	General Delivery, Mayo, Yukon
John Moses	General Delivery, Mayo, Yukon
D. Pastro	P.O. Box 130, Whitehorse, Yukon

HISTORY OF EXPLORATION

The Geological Survey of Canada has not mapped the areas north of Pinguicula Creek and east of Fairchild Lake in the Bonnet Plume River Area, hence there are no published Geological Reports available.

Mr. L. J. Brown, of Mayo, Yukon made the initial discovery of highgrade copper replacement mineralization on Discovery Creek, a tributary to the north fork of Dolores Creek in the Bonnet Plume River area of the Yukon. In the spring of 1967 Mr. Brown went into joint partnership with Mr. L. I. Proctor, President of Nordex Exploration Limited. Further prospecting of the area, using Mr. Proctor's fixed wing and rotary wing aircraft, led to other discoveries of copper and cobalt replacement mineralization in the cirque at the head of Cobalt Creek. Mammoth Claims Nos. 1 to 56 were then staked and recorded in the name of the partnership to cover these showings as at June 28th, 1967.

Continued prospecting during the rest of the 1967 season assisted by a geological mapping program conducted by Archer, Cathro and Associates of Whitehorse, also a ground magnetometer survey conducted by Cana Exploration Consultants Limited of Toronto, followed by a geochemical soil sampling survey along the picket lines, led to the staking and recording of Mammoth Claims Nos. 57 to 108.

Reports by the above named Geological and Geophysical Consultants were submitted to the Mining Recorder in Mayo to be filed as representation work to keep the 108 mineral claims in good standing until August 18th, 1971.

These reports included recommendations to construct a winter road and an aircraft landing strip, to explore the area surrounding the claims and to continue the geological prospecting and mapping on the property assisted by bulldozer trenching and diamond drilling during the season of 1968.

A public company, Bonnet Plume River Mines Limited, was formed to finance this exploration program. The winter road and the aircraft landing strip were built during the winter and early summer. Two helicopter-borne field crews completed a preliminary exploration program of the surrounding area assisted by geochemical stream silt sampling surveys. Follow-up geological prospecting and mapping of the most promising areas led to the staking and recording of fifty additional mineral claims, Mammoth Nos. 201 to 250 inclusive. The property now consists of 158 Mineral Claims recorded in the name of Bonnet Plume River Mines Limited. This company is in process of application for listing on the Vancouver Stock Exchange in order to finance a $220,000.00 exploration program as recommended by Mr. Archer in the appended report dated September 7th, 1968.

GEOLOGY - TABLE OF FORMATIONS

A. R. Archer, P. Eng., of Archer, Cathro & Associates, Geological Consultants, in collaboration with Dr. D. C. Findlay, Resident Federal Geologist in Whitehorse, arrived at the following Table of Formations. This Table conforms with Geological Survey of Canada Maps 10-1963 and 57-7-1954 of the areas 8 miles to the north and 16 miles to the south of the Mammoth Property, as follows:

Unit Number:	Age:	Period:	Name:
1	Precambrian	Proterozoic	Katherine Group
2	Cambrian	Paleozoic ~~Mesozoic~~	Rapitan Group
3	Cambrian and Younger	Tertiary	Unnamed

F. Marshall Smith, B.Sc., Geology, accomplished most of the geological prospecting and mapping on the property during 1967 and 1968. In his report of August 12th, 1968 (appended), he breaks Unit 1 into sections "1(a), 1(b), 1(c) and A" in an effort to pinpoint the most favourable precambrian sequence containing mineralization; also, to distinguish one mineralized formation from another, whether it be a sedimentary, volcanic or intrusive rock formation.

Each of the above named geologists agrees that the Katherine Group (Unit 1), consisting of interbedded slates, phyllites, quartzites, dolomite and interbedded limestone, is the most important 'host' formation as far as mineralization is concerned; that it is found in the north-western part of Mammoth Nos. 1 to 108 Claims, and that it is folded into a broad anticline the axis of which strikes north across the cirque at the head of Cobalt Creek. They agree also that the same sequence of rock formations occur on Mammoth Nos. 217 to 250 Claims, some seven miles to the east of this, near Glacier Lake.

A younger sequence, the Rapitan Group of volcanic and sedimentary formations (Unit 2), overlies Unit 1 and trends north-easterly across the property in both claim areas, east of Glacier Lake and east of Cobalt Creek on Vault Mountain. This unit is important in that most of the mineral occurrencies are in or near its contact with Unit 1. Granitic intrusive dykes, stocks and sills of syenite and quartz-diorite invade both of the above units and are in themselves mineralized to various degrees with hematite, magnetite and chalcopyrite. One of these, a quartz-diorite stock

located just west of Discovery Creek is classed as a 'porphyry-copper' deposit.

Unit 3, a thick sequence of younger carbonate rocks, lies unconformably over Unit 2. The aforementioned granitic intrusive rocks do not penetrate the formations of Unit 3. In areas where Units 1 and 2 are mineralized, Unit 3 formations are regarded as a 'capping' which may inhibit the concentration of strata-bound mineral deposits in the older formations beneath.

With further regard to the above paragraph, I quote from Marshall Smith's Report on the Geology of the Bonnet Plume Area (see report of August 12th, 1968, attached): "The intersections or contacts of intrusive dikes with Unit 3 were proved to contain the best mineralization of all the mineralized areas except those areas on the Mammoth Copper Property which lie entirely in the oldest precambrian formations 1(a), 1(b) & 1(c)."

With regard to intrusive dikes in general, Smith notes as follows: "Some dikes are very narrow, e.g. one just south of Glacier Pass and on its west wall is less than 200 feet in width. On the other hand, the main Kohse Creek dike is about 2000 feet wide near its junction with Rubble Creek and has a proven length of two and one-half miles. This particular dike shows much internal variation and is characterized as well by much swelling and constricting over its entire length. This dike assumes the characteristics of a porphyry in some areas; in others it is extremely basic and a few sections of it are definitely diabasic with characteristic texture and minerals."

I regard the above observation of Smith's to be very important in that further investigations of these areas containing 'basic and diabasic dikes' may result in the discovery of nickel or copper-nickel mineral deposits similar to those found in precambrian formations cut by granitic intrusives in Manitoba and Ontario.

Other Geological Factors of Interest:

Marshall Smith has noted the following Geological Factors of interest in his Report of August 12th, 1968:

1. Unit 4 consists of the younger sequencies of shales, slates and quartzites with common basal conglomerate all overlying the cambrian and precambrian rocks. This unit has a wide variation in geophysical characteristics: for instance, at locations east of the Bonnet Plume River and south of Dolores Creek this unit consists of alternating red and green slates of only 200 feet in thickness, whereas at locations west of the Bonnet Plume River and north of Gillespie Creek it was seen to be more than 2000 feet thick with the middle and lower sections consisting of white quartzites and a conglomerate made up of boulders of the older cambrian and precambrian rocks consisting of quartzite, dolomite and, most importantly, boulders of diorite. (Suggests long periods of volcanism?)
2. Unit 'A', intrusive dikes of Diorite and Quartz Monzonite, has a wide variation in its geochemical characteristics: for instance, the diorite dike or sill found crossing the Cobalt Cirque is very high in potassium feldspars (K-Feldspars) and is barren in copper mineralization, whereas at locations due south and over the divide from the Cobalt Cirque all the diorite dikes and sills discovered to date are found to be much more basic; these intrusions contain sodium feldspars (Na-feldspars) and are mineralized within themselves to various degrees with hematite, magnetite and chalcopyrite.
3. The Dolstone formations (Limey Dolomites) in latitudes north of Gillespie Creek are quite different from those found in latitudes south of this creek. They consist of relatively pure Dolomite with no interbedded Limestone or Quartzite.

4. Unit 1(b), the oldest precambrian formation, is the most favourable 'host' rock for mineralization in the area. It is noted that there is a great variation in lithology in the mineralized areas of this unit. The mineralization in this unit occurs in quartzites, slates, carbonates, sedimentary clastics, lava flows, sills and intrusive dikes. The intrusives and the extrusive formations occur haphazardly in no definite pattern. Some of them belong to the Hapitan Group of volcanics and some are much younger as evidenced by the sharp, angular fragments of granitic rocks included in the matrix with the older carbonate rocks. The cataclastic fragments of rock are bonded together with a fine-grained, red-coloured volcanic flow rock. The variety of clastic rock fragments, and the difference in ages of the various components, suggest long, sustained periods of volcanism. It is suggested that the resultant heat and pressure of this volcanism might have inhibited the formation of high-temperature, pyrometasomatic contact deposits and would assist, perhaps, in the replacement of magnetite by chalcopyrite during the recrystallization of the intrusive diorites. This would result in a higher copper to iron ratio in the porphyry-copper deposits in some areas.

MINERALIZATION AND MINERAL SHOWINGS

(Please refer to Plates V, VI and VII in the map folder)

Copper and iron minerals are the main constituents of the various deposits. The mineralization occurs in various concentrations from finely disseminated sulphides in the sediments, the volcanics and the granitic intrusives, to massive replacement-type ore interbedded in limestones and dolomites. There are also vein and fracture fillings in the quartzites. Cobalt mineralization occurs in concentrations at the higher elevations and as a trace accessory mineral in some of the intrusive dikes or sills at the

lower elevations. Silver mineralization occurs in minor amounts with the copper and iron mineralization; however, its presence after ore concentration will be of economic importance. Nickel mineralization in the form of Niccolite (Nickel Arsenide) has been recognized at the higher elevations, associated with Cobaltite mineralization.

Plate V, a Photo Mosaic of the Mammoth Property, locates and briefly describes all the mineral showings discovered to date (see map folder attached); the mineral showings discovered during the 1968 season are described as follows:

Glacier Lake Showings - Mammoth Claims Nos. 217 - 250 inclusive:

No. 21. A large area of jointed, well-fractured quartzite invaded by minor greenstone dikes was discovered just above Glacier Lake on the sidehill at elevations between 4000' and 5000'. This area is well mineralized with chalcopyrite and siderite veinlets occurring mainly along the joint planes and fractures. The rocks are heavily stained and the chalcopyrite is very fine-grained and not readily visible without magnification. Sample No. 7954 taken across an 8' x 50' outcropping of this fractured rock assayed 0.44% Copper: a more heavily-stained sample taken just above this, Sample No. 7955, assayed 1.43% Copper. Mr. A. R. Archer, P. Eng., describes this discovery showing as follows:

"This showing consists of a large area of Unit 1 (almost a square mile) containing fine fractures filled with siderite and chalcopyrite. The best mineralization is found in dolomites and quartzites near their contacts with Unit 2 rocks. A chip sample taken over a 60-foot width from a fresh bulldozer cut in dolomite near an andesite dyke assayed 0.15% Copper and 0.12 ounces Silver per ton."

No. 20. This is known as the Glacier Ridge Showing in Cobalt Cirque No. 2 which is on the east side of the ridge from Glacier Lake between 5800' and 6000' in elevation. It consists of a narrow quartz vein with adjacent wallrock alteration in limey slates. The quartz vein is mineralized with small crystals of cobaltite and is stained with malachite.

It is important in that it has virtually the same stratigraphic position as copper-cobalt showing No. 1-A in Cobalt Cirque No. 1 some seven miles to the east of this, (see Archer Report of October 14th, 1967). The only apparent difference in the two showings is a lack of siderite in Showing No. 20, (see Plate III below). Sample No. 7958, a character sample of the cobalt-bearing quartz strata taken near the ridgetop at 6000' elevation, assays 0.33% Copper and 1.02% Cobalt. Sample No. 7961, a cut chip sample of a 14" width of Quartz vein at the 5800' elevation of the same showing, assays 0.43% Copper, 0.14% Nickel and 3.85% Cobalt. Further prospecting in this area located a disseminated type of copper mineralization in fractured quartzite and dolomite underlying the above quartz vein. Character sample No. 7959 taken over a 40' width of rock exposure of this fractured formation assays 1.10% Copper and 0.04 ounces Silver per ton, (see Plate IV below).

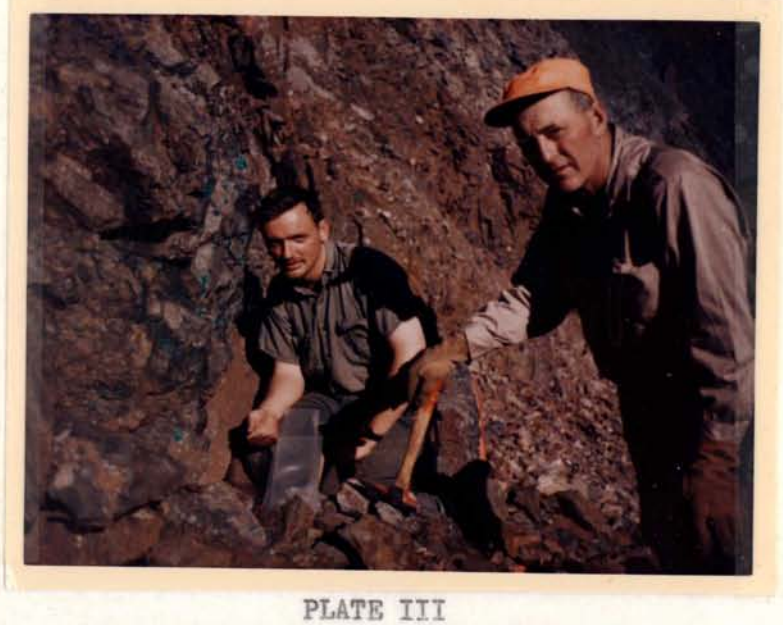


PLATE III
Sampling 14" Quartz Vein in Cobalt Cirque No. 2.
Glacier Lake Showing No. 20 at 5800' elevation.

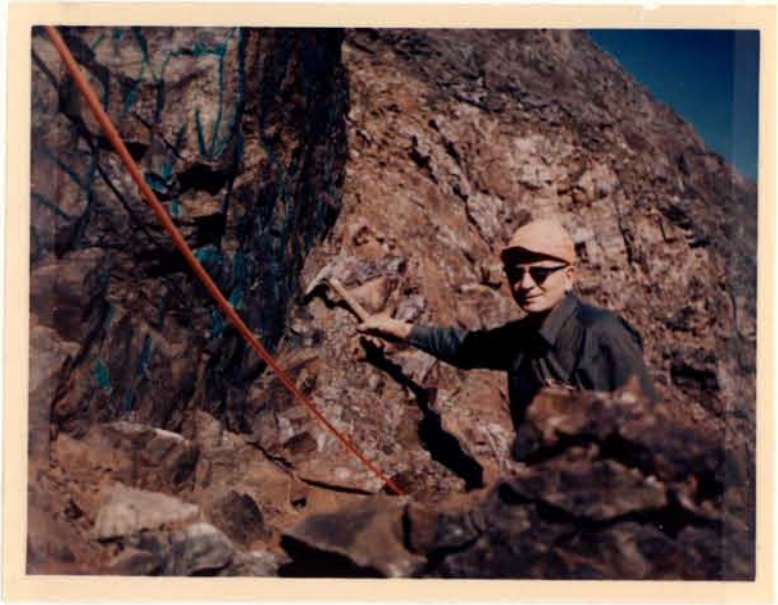


PLATE IV
Sampling a 40' rock exposure of fractured quartzite and dolomite mineralized with malachite. Part of the Glacier Lake Showing No. 20, Sample No. 7959 (above).

No. 22. High geochemical stream silt sample anomalies below this area. An outcrop of basaltic greenstone with finely disseminated chalcopyrite over a width of 100 feet. Sample No. 7964 assays 0.12% Copper.

No. 23. High anomalous stream silt samples in this area. Dark, basic rock formation heavily stained with iron; Sample No. 7962 assays Trace Nickel and 0.10% Copper.

Porphyry-copper Extensions:

No. 7A. Mammoth Claim No. 202 on Vault Mountain. A bulldozer trench 20 feet deep on a geophysical anomaly located 4000 feet south-west of last year's porphyry-copper discovery No. 3. The cut was mostly in glacial moraine; however, several large boulders of mineralized diorite were excavated from near the bottom of the trench and are thought to be at or near bedrock. A character sample No. 7965 of this 'float' assayed 0.45% Copper.

No. 16. Mammoth Claim No. 24. At about the 4500' elevation in a draw north of No. 3 discovery (see Plates V and VI) is a 75' width of syenite

talus underlying a cliff of dolomite. A chip sample across this talus No. 7853 assays 0.20% Copper.

No. 17. Mammoth Claim No. 21. At about 4620' elevation at the foot of a small cirque located due north of last year's No. 3 discovery of porphyry-copper, there are two outcrops of mineralized quartz-diorite underlying dolomite. Each outcrop is about 25' wide and they are separated by 150' of overburden. The outcrop on the west side, Sample No. 7851, assays 0.66% Copper. That of the rock outcrop on the east side of the overburden, Sample No. 7852, assays 0.84% Copper.

These newly discovered porphyry-copper extensions may have economic importance in that this mineralized intrusive stock is now indicated to have a length of over 2000 feet, open under the overburden at the lower end to the south-west, and open under the dolomite formation at the higher elevations to the north. A diamond drilling program to determine true grade and dimensions of this porphyry-copper deposit is proposed.

Other Mineral Showings: The Marshall Smith Report of August 12th, 1968 (attached herewith), describes six other mineral showings of interest. These require more prospecting to determine their potential prior to possible acquisition by staking. They are described briefly as follows:

1. The south side of Dolores Creek opposite Glacier Pass. An intrusive dyke has caused copper mineralization in quartzite.

2. The south side of the North Fork of Dolores Creek, due south of the Mammoth Claims. There is copper mineralization in a basaltic flow rock of Unit 1(c).

3. South of Gillespie Creek at the 6000' elevation there is some copper mineralization in metasediments caused by granitic dyke intrusions.

4. The whole length of Kohse Creek where basic and ultrabasic dykes intrude the precambrian formations.

5. Due south of Gillespie Creek and west of Algae Mountain there is a mineralized dyke (see map in Smith Report).

6. South of the junction of Cobalt Creek with the North Fork of Dolores Creek at the 5500' elevation there is disseminated mineralization assaying 0.28% Copper over an outcropping 10' wide by 200' long of precambrian quartzite invaded by volcanics.

CONCLUSIONS

The new mineral showings in the Glacier Lake Area are important in that they occur in the same stratigraphic sequence of precambrian and cambrian sediments and volcanics as last year's discoveries of mineralization seven miles to the east. These mineral showings occur generally at or near the contacts between the older sediments, the volcanics and the intrusions by stocks, dykes or sills of granitic rocks.

Mineralization consists of various degrees of copper concentration. At one extreme are localized beds of massive copper and/or cobalt replacement ore with associated silver in sedimentary formations. At the other extreme are mineralized sediments, volcanics and intrusive rocks containing lowgrade disseminated iron and copper mineralization with associated silver in minor quantities and cobalt in trace amounts. By reason of their extremely large size and the generally shallow depths of overburden (which makes for comparatively lowcost open-pit mining methods) the disseminated type of copper deposit possibly has the greatest economic potential. All of the disseminated or porphyry-copper deposits found on the property to date have had too low a ratio of copper tp iron content to be of commercial significance. However, all of the prerequisites to inhibit the enrichment of these deposits, by the replacement of the hematite and magnetite mineralization with chalcopyrite during recrystallization with accompanying heat and pressure from repeated and sustained volcanism, are present on this property. It is believed, therefore, that a continued program of geological mapping, assisted by bulldozer trenching and diamond drilling between and around the known areas of mineralization, will disclose enriched mineralization having a sufficiently high copper to iron ratio to be classed as commercial ore.

RECOMMENDATIONS

Recommendations by Archer, Cathro and Associates, Geological Consultants, call for a total exploration expenditure on this property of $220,000.00 during 1969. This program will include continued geological mapping assisted by bulldozer trenching, diamond drilling, geochemistry and a magnetometer survey.

In order to finance such a program, application is in process to list the company's shares for trading on the Vancouver Stock Exchange.

I believe that this property warrants the expenditure of $220,000.00 at this time for continued exploration, and would recommend a program for the 1969 season about as follows:

1.	Bulldozer trenching, road preparation and drill site excavation, Caterpillar D-8, 1000 hours @ $40.00 ...	$ 40,000
2.	The employment of two geological crews, each with a field geologist and two experienced prospectors, working from each end of the property and despatched by helicopter..	$ 20,000
3.	Diamond Drilling, 5000 Lineal Feet @ $20.00 ...	$100,000
4.	Aircraft support, fixed-wing and helicopter ...	$ 20,000
5.	Camp costs and general overhead ...	$ 10,000
6.	Miscellaneous Engineering and Assaying Expense.	$ 10,000
		$200,000
	Plus Contingencies @ 10% ...	20,000
	Total Recommended Expenditure, 1969 ...	$220,000

Respectfully submitted:

C. D. N. Taylor, P.Eng.
Director.

APPENDIX I

(1) CERTIFICATE

I, C. D. N. Taylor, of the City of Victoria, in the Province of British Columbia, do certify that:

(1) I am a Mining Engineer, residing at 2420 Queenswood Drive, Victoria, British Columbia.

(2) I am a Registered Professional Engineer of the Province of British Columbia, also a Professional Engineer of the Territory of Yukon, and that I have been practising my profession continuously since the year 1932.

(3) I personally planned and directed the exploration program undertaken by Bonnet Plume River Mines Limited during the past season. I employed F. Marshall Smith, B.Sc., Geology, as Field Geologist during this program, and also employed A. R. Archer, P. Eng. as Consulting Geologist.
I have known these two gentlemen for the past two years and can vouch as to their certificates of competency in regard to the Geological Reports attached herewith.
Neither of these men have any direct or indirect interest in the mining property of Bonnet Plume River Mines Limited or in any associated companies or securities pertaining thereto.

(4) I am a Director of Bonnet Plume River Mines Limited.

Respectfully submitted:

C. D. N. Taylor

C. D. N. Taylor, B.Sc., P.Eng.

BONNET PLUME RIVER MINES LIMITED

EVIDENCE OF EXPLORATION EXPENDITURE - 1968

The following list represents invoiced expenditures paid for by Bonnet Plume River Mines Limited for the exploration program conducted in the Bonnet Plume River area during the period March 20th., 1968 to September 30th., 1968 :

Date of Invoice: 1968	Suppliers of Goods & Services:	Description:	Amount:
March 20	Carlon's Garage, Carmacks	Fuel	$99.54
"	Gordie's Trucking, Whitehorse	Haulage of Equipment	3504.15
March 28	Elsa Market, Elsa, Yukon	Camp Supplies	131.78
"	Needham's, Whitehorse	Camp Supplies	13.74
"	Nelson's Limited, Whitehorse	Camp Supplies	2.75
"	C. Ford re Allan Critch, Elsa	Casual Labour	35.55
"	Sourdough Cafe, Keno, Y.T.	Meals during mobiliżt'n	78.05
"	Keno City Hotel, Keno Y.T.	Housing " "	243.00
			$4,108.56
April 2	White Pass & Yukon Route	Diesel Fuel	4,127.80
April 7	Great Northern Airways, Mayo	Air Transportation	370.00
"	N.C. Company, Whitehorse	Camp Supplies	16.62
"	C. D. N. Taylor, P,Eng.	Engineering Expense	392.00
April 8	Chateau Mayo Hotel, Mayo	Meals in Transit	6.30
"	Alex Jonny,, Mayo, Yukon	Casual Labour	17.50
"	Norman Moses, Mayo Yukon	Casual Labour	17.50
"	John Moses, Mayo, Yukon	Casual Labour	45.00
"	R. Van Wyck, Whitehorse, Y.T.	Cash for meals in transit	6.60
April 21	Taku Hotel, Whitehorse, Y.T.	Travel Expense	36.06
April 25	Ainsworth, Hensen, Norby et al	Legal Expense	2,671.73
"	Hutton's Service, Mayo, Y.T.	Fuel	308.22
"	Receiver General of Canada	Claim Expense	320.00
"	L. J. Brown, Mayo, Y.T.	Claim Expense	545.90
"	Tourist Services, Whitehorse	Camp Supplies	171.60
April 26	Georgia Hotel, Vancouver	Administration - travel	193.95
April 29	Hutton's Service, Mayo, Y.T.	Fuel	42.04
"	Great Northern, Mayo, Y.T.	Fuel	149.25
April 30	Nordex Exploration, Whitehorse	Equipment Rental etc.	19,076.90
			$28,514.97
May 4th	Burns Limited, Whitehorse	Camp Supplies	101.93
May 6th	Jens Morgensen Ltd. Toronto	Assaying Supplies	74.00
"	Ewing Transport, Mayo, Y.T.	Lumber	30.27
May 25	Loiselle Transport, Whitehorse	C.O.D. on Assay Supplies	96.37
"	Carlon's Service, Carmacks	Fuel	19.20
May 27	Georgia Hotel, Vancouver	Mobilization housing	95.15
"	Petty Cash	Misc. Camp Supplies	18.95
"	Alcan Service, Whitehorse	Fuel	38.43
"	Seely's Limited, Whitehorse	Camp Supplies	29.25
May 29th	Petty Cash	C.O.D. on Assay Supplies	56.42
"	Nelson's Limited, Whitehorse	Camp Supplese	9.27

CWP 1.8.11.07.

EXPNDITURES (Continued)

Date of Invoice: 1968	Suppliers of Goods & Services:		Description:	Amount:
				$487.20
May 31	F. M. Smith,	Whitehorse	Geological Salary & Expense	
"	R. Van Wyck,	Whitehorse	Exploration Salary	264.00
"	L. I. Proctor,	Whitehorse	Mobilization & Travel	521.13
"	Keno City Hotel,	Keno City	Mobilization Housing	85.00
"	Sourdough Cafe,	Keno City	Meals	63.75
"	C. D. N. Taylor,	Victoria	Engineering Expense	477.42
"	Nordex Exploration,	Whitehorse	Equipment Rental etc.	4,128.05
				$6,555.79
June 3	Carmacks Hotel,	Carmacks	Fuel	8.90
June 8	Hougen's Limited,	Whitehorse	Camp Supplies	20.82
"	Auto Marine Elect.	Whitehorse	Camp Supplies	8.63
"	Alpine Hotel,	Whitehorse	Housing during mobilizat.	130.00
June 9	Hutton's Service,	Mayo, Y.T.	Fuels	15.95
"	Pelly River Lodge,	Pelly R.	Fuels	19.15
June 17	Cambells Limited	Whitehorse	Camp Supplies	24.00
"	Burns Limited,	Whitehorse	Camp Sullies	145.96
June 18	B.C. Stamp Works,	Vancouver	Camp Supplies	14.10
June 19	Tourist Services,	Whitehorse	Camp Supplies	306.21
June 26	Alcan Tire Co.,	Whitehorse	Fuels	33.96
June 30	Tim 'o Lou Motel,	Mayo, Y.T.	Room Rentals	284.00
"	Chateau Mayo Hotel,	Mayo	Mobilization meals	120.20
"	L.J. Brown,	Mayo	Prospecting Expense	700.00
"	U.K.H.M. Ltd.,	Elsa, Y.T.	Camp Supplies	148.84
"	B. C. Telephone,	Vancouver	Long Distance account	59.20
"	Sourdough Cafe,	Keno City	Camp Supplies	19.95
"	F. M. Smith,	Whitehorse	Geological Expense	7.80
"	Nordex Exploration,	Whitehorse	Equipment Rentals	18,052.00
			Exploration Salaries	3,598.84
			Travel Expense	245.50
				$23,955.01
July 1	Chateau Mayo Hotel,	Mayo, Y.T.	Meals and Lunches	143.75
July 5	Hutton's Service,	Mayo. Y.T.	Fuels	40.92
July 8	Hougen's Limited,	Whitehorse	Camp Supplies	15.01
July 9th	C. D. N. Taylor,	Victoria	Engineering Expense	1,118.43
July 22	Nelson's Limited,	Whitehorse	Camp Supplies	16.70
"	N. C. Company,	Mayo, Y.T.	Camp Supplies	30.00
"	Alcan Service,	Whitehorse	Fuels	25.10
July 30	Tourist Services,	Whitehorse	Camp Supplies	166.81
"	Tim'o Lou Motel,	Mayo, Y.T.	Room Rentals	372.00
July 31	B. Y. N. Company,	Mayo, Y.T.	Fuels	12.28
"	Archer, Cathro & Associates		Geological Report	250.00
"	Jacob's Industries	Whitehorse	Camp Supplies	23.55
"	N. C. Company,	Whitehorse	Camp Supplies	513.47
"	Nordex Exploration,	Whitehorse	Equipment Rentals etc.	16,611.55
				$19,339.57

EXPENDITURES: (Continued)

Date of Invoice: 1968	Suppliers of Goods & Services:		Description:	Amount:
Aug.1st	Tim'o Lou Motel,	Mayo	Room Rentals	$343.00
Aug.3rd	Tourist Services,	Whitehorse	Camp Supplies	60.45
Aug.4th	Burns Limited,	Whitehorse	Camp Supplies	141.54
Aug.5th	Huttons Service,	Mayo	Fuels	40.35
Aug. 20	Receiver General,	Mayo	Claims Recording	276.00
Aug. 31	F. Marshall Smith,	Whitehorse	Geological Expense	57.65
"	Petty Cash,	Whitehorse	Geological Supplies	12.48
"	Alpine Hotel,	Whitehorse	Room Rentals	112.00
"	CN Telegraph,	Whitehorse	Telephone Account	279.90
"	N.C. Company,	Whitehorse	Camp Supplies	735.18
"	Taylor & Drury,	Whitehorse	Camp Supplies	38.30
"	Hougen's Limited,	Whitehorse	Camp Supplies	73.74
"	TSL Laboratories,	Vancouver	Assaying Expense	29.00
"	Whitehorse Assay Laboratory		Assaying Expense	168.63
"	Nordex Exploration,	Whitehorse	Equipment Rentals	5426.00
			Exploration Salaries	1665.00
			Travel Expense, Demob.	274.00
				$9,733.22
Sept 10	C. D. N. Taylor,	Victoria	Engineering Expense	560.00
Sept 15	Chateau Mayo Hotel,	Mayo	Meals - demobilization	56.05
"	Tim'o Lou Motel	Mayo	Room Rentals	110.00
Sept 30	L. I. Proctor	Whitehorse	Expense Account	15.00
"	Nordex Exploration,	Whitehorse	Equipment Rentals	1,046.00
				$1,787.05

Total Expenditure, March 20th to September 30th, 1968 $93,994.17

Less: Government Grant on Winter Road Construction 10,000.00

Net Expenditure $83,994.17

Distribution of Expenditure:

Winter Road, as per Audit, Construction	$25,678.28	
Less Government Grant	10,000.00	$15,678.28
Airport Construction		18,541.29
Geological Exploration and Prospecting Expense		40,240.19
Claim Staking and Recording Mineral Claims		6,744.99
Administration and Legal Expense as per Audit		2,789.42
Distributed Expenditure		$83,994.17

Certification of Expenditure:

I hereby swear that I have examined all of the above-listed invoices and that these invoices represent expenditures incurred by Bonnet Plume River Mines Limited between March 20th and September 30th., 1968, in conducting a planned exploration program under my direction in the Bonnet Plume River area.

A. E. McD.

Certification of Expenditure (Continued)

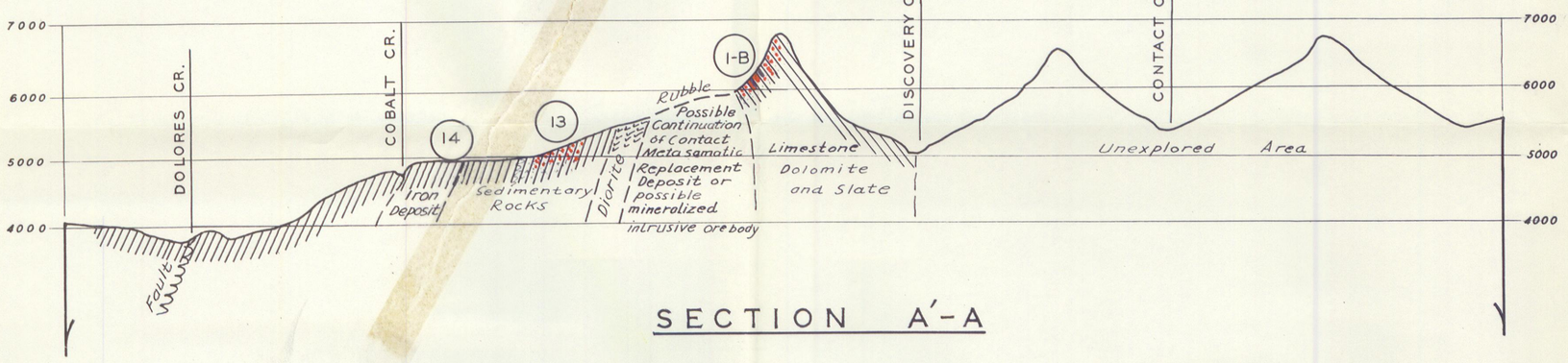
Included in the above geological and prospecting expenditure of $40,240.19 is an amount of at least $16,000.00 expended on close geological mapping and follow-up bulldozer trenching on Mammoth Mineral Claims Nos. 201 to 250 inclusive as described in the attached Geological Reports by F. Marshall Smith, B.Sc. Geology, and Alan Archer, P.Eng. Geological Consultant.

Association of Professional Engineers of the Yukon Territory
C. D. N. TAYLOR
ENGINEER

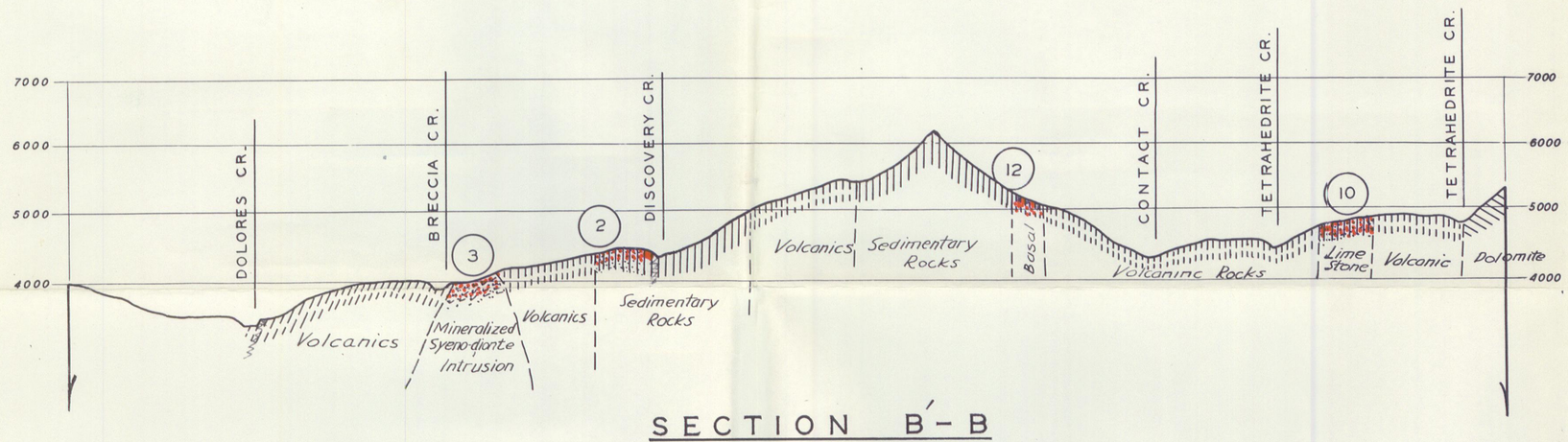
C. D. N. Taylor, P.Eng.

Sworn before me in Victoria, British Columbia, this 29th day of August, 1969.

A Notary Public in and for the Province of British Columbia.



SECTION A'-A



SECTION B'-B

DESCRIPTION OF MINERAL SHOWINGS

1-A & B. Cirque Showing. Disseminated and massive Chalcopyrite and Cobaltite mineralization in dolomitic limestones & slates. Replacement type mineralization in bedding up to 36 inches in width has an assay value of 18.2% Copper and trace cobalt. The overlying strata is stained with cobalt bloom and contains lenses of massive cobaltite up to 4" in width assaying 15.8% Cobalt, 0.18 Oz. Silver per ton and trace Copper and Nickel.

2. Discovery Showing. Chalcopyrite replacement mineralization in dolomitic limestone assaying 5.9% Copper and 0.2 Oz. Ag/T over a 20' width of bedding. A character sample of massive mineralization assays 32.4% Copper and 1.20 Oz. Silver per ton.

3. Syenite Porphyry-Copper Showing. This is an intrusive mass of syeno-diorite containing evenly disseminated mineralization by chalcopyrite, magnetite and hematite assaying from a low of 0.28 to a high of 0.52% Copper with trace values in Cobalt.

4. Tetrahedrite Showing. Sedimentary hematite in limestone partially replaced by chalcopyrite and tetrahedrite on the bedding planes. A 12' width assayed 6.38% Cu. & 12.1 Oz. Ag/T.

5 & 6. Oxidized siderite vein zones weakly mineralized with pyrite, chalcopyrite and tetrahedrite over widths of 30 and 50 feet.

7. Airstrip Showing. A geophysical survey magnetometer anomaly under overburden. The nearest rock outcrop is a fine-grained gabbro-diorite containing low values in chalcopyrite.

8. An outcrop of fine-grained diorite weakly mineralized.

9. An impure limestone remnant in a fine-grained diorite formation containing disseminated chalcopyrite assaying 0.9% Copper over a ten foot width of bedding.

10. Tetrahedrite mineralization in thin veinlets & disseminations in a 208' width of sheared dolomite bordered by volcanic rocks in a 'skarn' area. The full width assayed 0.27% Copper and 0.04 Oz. Silver /Ton. Much secondary copper stain.

11. An outcrop of dolomite mineralized with chrysocalla at a contact between carbonate rocks and volcanic rocks. No chalcopyrite in evidence.

12. Contact Showing. Disseminated chalcopyrite and magnetite in a 300' width of sheared basalt. The best looking section of this assayed 1.39% Copper over a ten foot width.

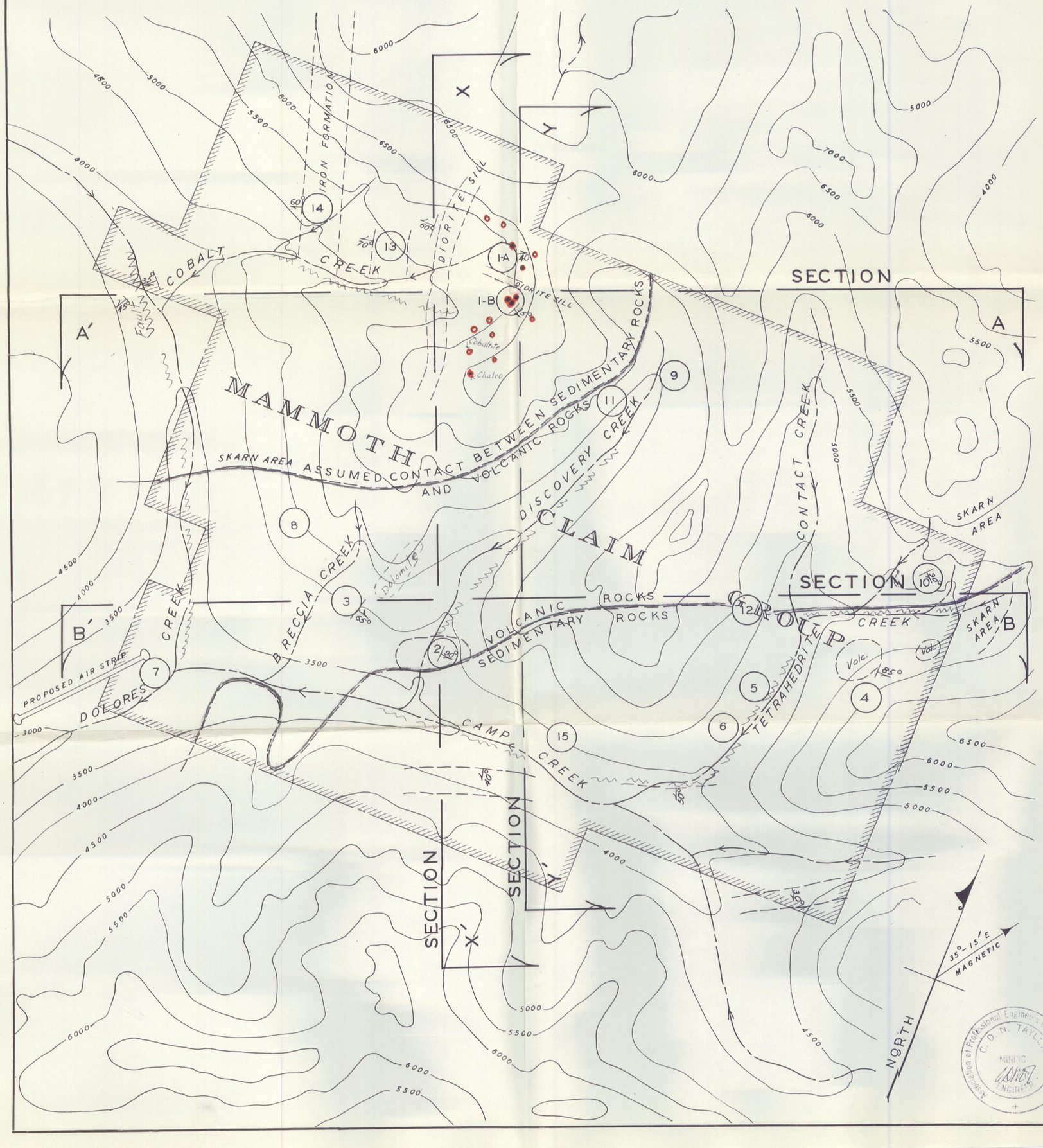
13. A sheared dolomite formation containing disseminated chalcopyrite and siderite mineralization over a 120' width. A sample cut over a 13' width assayed 0.82% Copper.

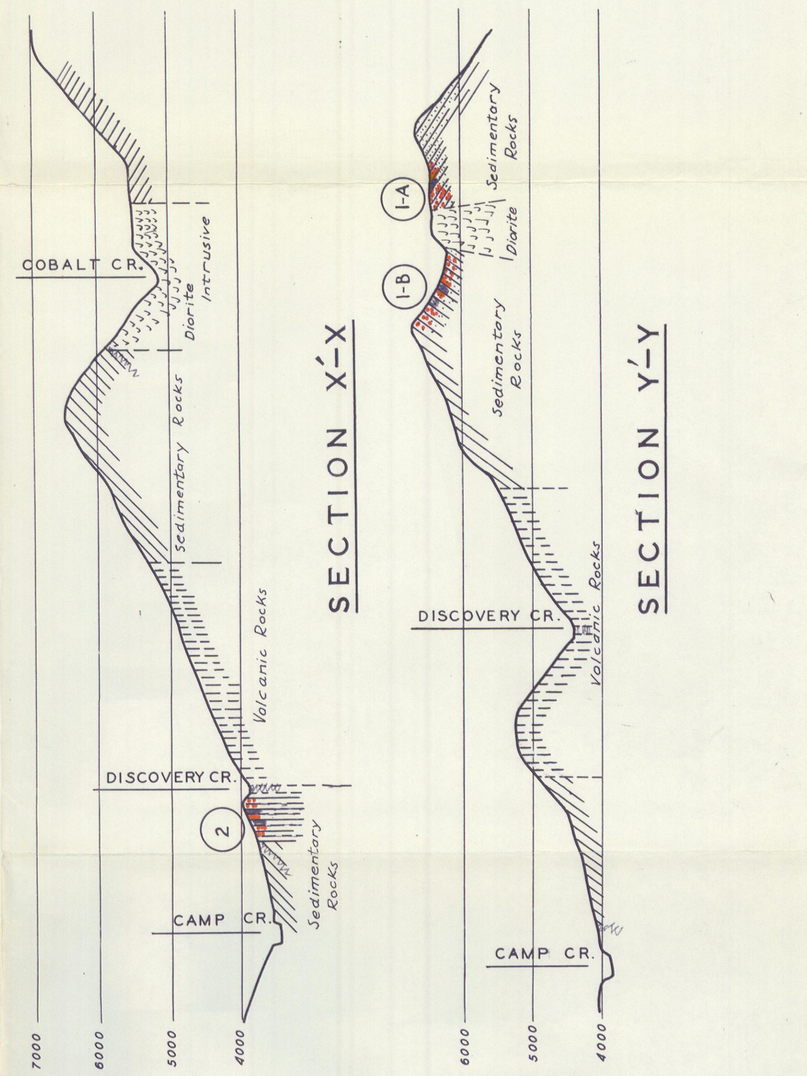
14. Iron Showing. An outcrop about 700' wide and striking north-westerly extends from Cobalt Creek NW for several miles. It consists of hematite, jasper and iron-stained quartzite with a few specks only of chalcopyrite.

15. An overburdened location where a non-magnetic, mineralized diorite 'float' rock can be found. This diorite assays 0.87% Copper and trace Cobalt.

LEGEND

- BEDDED SEDIMENTARY ROCKS, DIRECTION OF DIP INDICATED
- INTRUSIVE DIORITE, SYENITE & GRANITIC ROCK
- VOLCANIC EXTRUSIVE ROCKS AND FORMATIONS
- MASSIVE MINERALIZATION
- DISSEMINATED MINERALIZATION





MAMMOTH • COPPER • PROPERTY

BONNET PLUME RIVER AREA

PLAN AND SECTIONS SHOWING THE LOCATIONS OF THE MINERAL SHOWINGS WITH RESPECT TO THE SEDIMENTARY FORMATIONS AND INTRUSIVE ROCKS

SCALE: 1320 FEET TO 1 INCH JANUARY, 1968

DRAWN BY: C.H.SMITH

TO ACCOMPANY REPORT BY C.D.N. TAYLOR P. ENG.

Association of Professional Engineers of the Province of Ontario — C. D. N. TAYLOR — MINING ENGINEER

GLACIER LAKE

2C 2B 3C 3B NORTH 36° Mag.

LEGEND

A	Diorite, Quartz Monzonite, Intrusive Dykes.
1a	Reddish brown-weathering Dolstone, sandy Dolstone, some algae concretions, interbedded Limestone and Quartzite.
$1b_1$	Slates, Quartzites, Conglomerates, Dolstones & various mixtures of these rocks in discontinuous beds in some areas.
$1b_2$	Grey to white Quartzite with some greywacke, interbedded tuffaceous Slates, Limestones & Dolstones sometimes intruded by 1(c). Some Copper and/or Cobalt mineralization.
$1b_3$	A major series of black Slates, Siderite iron formation and other clastic and argillaceous sediments.

BONNET PLUME RIVER MINES LIMITED

GEOLOGY OF THE GLACIER LAKE PASS AREA

TRACED FROM GEOLOGIGAL PLAN
DRAWN AUGUST 13TH., 1968 BY:

F. MARSHALL SMITH, B.Sc.

SCALE: 1" = 600' OR 1 = 1/8 OF A MILE

C.H.S.

LEGEND OF COLOURS

Cambrian and Precambrian Rocks	1b₁	Slates, quartzites, conglomerates, dolostones and mixtures of these rocks in discontinuous beds.
	1b₂	Grey to white quartzites with some greywacke sections, interbedded tuffaceous slates, limestones and dolstones sometimes intruded by 1(c) (below).
	1b₃	A major series of black slates, siderite iron formation and other clastic and argillaceous sediments.
	1c	Found within 1(b) and in some large areas consisting of basalt, diorite and various greenstones as flows and intrusives other than dikes such as Unit A.
		Denotes Copper Mineralization in the above Units.
		Denotes Faulting.

Silurian or Devonian Rocks	10	Grey-weathering and fresh-surfaced Limestone.
	7	Yellow and brown-weathering grey Limestone, thin-bedded, grading from Unit 4 (below) to Unit 10.
	4	Grey, green and maroon-coloured shales, slates and quartzites with common basal conglomerate.
Unconformity		
	A	Diorite and Quartz-monzonite dikes. Intrusives.
Cambrian and Precambrian Rocks.	3	Dark slates and quartzites with occasional inter-bedded phyllitic and calcareous zones.
	2	Lighter-weathering upper phase of Unit 1 (below)
	1a	Reddish-brown-weathering Dolstone, sandy Dolstone, some algae concretions, occasional phyllitic zones and inter-bedded light Limestone and Quartzite.

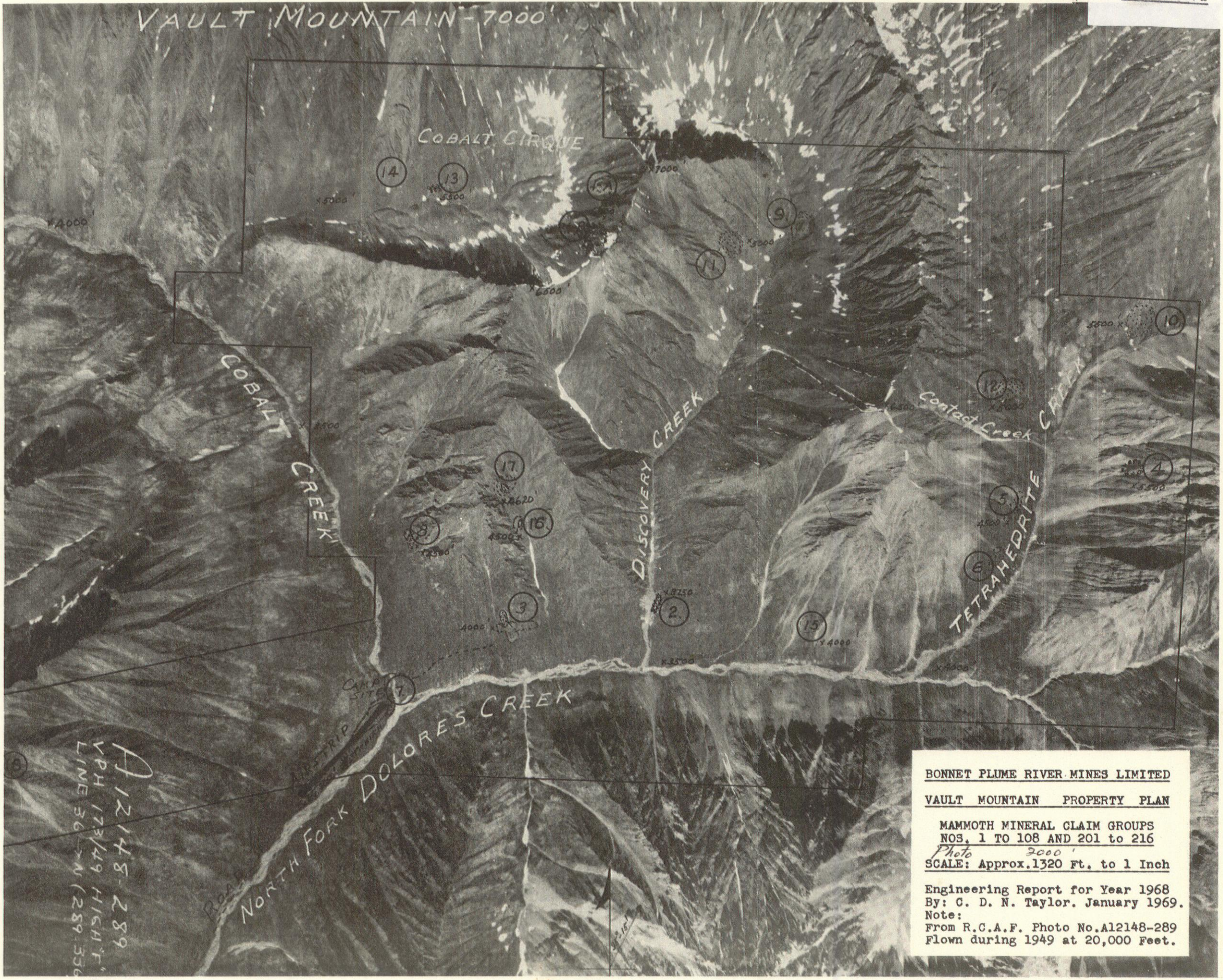
BONNET PLUME RIVER MINES LTD.
GEOLOGICAL PLAN OF THE BONNET PLUME RIVER AREA

SCALE: 1 INCH = 1 MILE AUGUST 12 TH. 1968

GEOLOGY BY: F. MARSHALL SMITH B.Sc.

CARTOGRAPHY BY C.H. Smith

PLATE VI



BONNET PLUME RIVER MINES LIMITED

VAULT MOUNTAIN PROPERTY PLAN

MAMMOTH MINERAL CLAIM GROUPS
NOS. 1 TO 108 AND 201 to 216

Photo 7000'
SCALE: Approx.1320 Ft. to 1 Inch

Engineering Report for Year 1968
By: C. D. N. Taylor. January 1969.
Note:
From R.C.A.F. Photo No.A12148-289
Flown during 1949 at 20,000 Feet.

BONNET PLUME RIVER MINES LIMITED

GLACIER LAKE PROPERTY PLAN

MAMMOTH CLAIMS NOS. 217 to 250

Photo 2000'
SCALE: Approx.1320 Ft. to 1 Inch

Engineering Report for Year 1968
By: C. D. N. Taylor. January 1969
Note:
From R.C.A.F. Photo No.A12328-145
Flown during 1949 at 20,000 Feet.

PLATE VII

BONNET PLUME RIVER MINES LIMITED.

GEOLOGY AND GEOCHEMISTRY REPORT

ON THE BONNET PLUME RIVER AREA FROM THE BONNET PLUME PASS TO FAIRCHILD LAKE, YUKON.

By:

F. Marshall Smith, B.Sc., Geology.

August 12, 1968.

CONTENTS

SUMMARY

During the summer field season of 1968, the writer was engaged by Bonnet Plume River Mines Limited to conduct a geochemical stream silt survey followed by geological prospecting and mapping of all areas having indications of copper mineralization between the Mammoth Copper Property and Fairchild Lake southwards to Rusty Mountain and the Bonnet Plume Pass area in the Mayo Mining District of the Yukon.

A few small copper anomalies were discovered and mapped in areas of favourable geology for mineralization. One large area of lowgrade copper mineralization was discovered, geologically mapped and staked into mineral claims. This prospect is characterized by generally widespread showings of disseminated copper minerals with some cobalt mineralization in a predominantly quartzitic formation intruded by dioritic and volcanic dikes or sills. This area is located north of Dolores Creek and east of Glacier Lake. The location is within seven miles of the original discovery of copper-cobalt mineralization covered by Mammoth Mineral Claims Nos. 1 to 108 which were staked and recorded last year.

Most of the area surveyed this season is over previously unexplored ground on which no geological reports have been published. The new geological information on the area, obtained this year and last, suggests that several revisions can be made in the geology and lithology as described by the Geological Survey of Canada in their preliminary reports on areas to the north and south.

On the basis of this new geological information, it is recommended that the geochemical silt survey and geological prospecting program be continued over the geologically favourable formations which appear to extend for appreciable distances to the north and northwest of the area examined this year.

I N T R O D U C T I O N

An important copper-bearing formation was discovered and staked last year in an area near the headwaters of Dolores Creek, a tributary to the Bonnet Plume River. Later that year, another copper-bearing formation was discovered at Fairchild Lake, about fifteen miles west of the first discovery.

This year, during 1968, the Directors of Bonnet Plume River Mines Limited initiated a prospecting and geological mapping program to cover an 850 square mile area lying between the above two discoveries and southwards for approximately fifty miles. The southern portion of this area has been reported on briefly by Dr. J. O. Wheeler, Geological Survey of Canada Paper 1953-7.

The north-east corner of the area, covered by Mammoth Mineral Claims Nos. 1 to 108, was geologically mapped by the writer during 1967 while I was in the employment of Archer, Cathro & Associates, Geological Consultants. It follows, therefore, due to my previous knowledge of the district, that I was engaged to conduct this season's exploratory program to the south and west of the area mapped last year.

Thus the Directors of Bonnet Plume River Mines Limited employed me to head up two 2-man crews for the preliminary silt sampling survey, to be serviced by helicopter; also, to run up-to-date analyses of the silt samples at the base camp. At my suggestion, the Biquinoline method of cold acid extraction was used to determine the copper content of the silt samples. As a check on this method, about one-fifth of the samples were sent to the Whitehorse Assay Laboratory for re-run using hot acid extraction followed by atomic adsorption determinations for copper content.

Early in the season it became apparent that interesting copper-bearing formations extended further west of the Bonnet Plume River than estimated originally. Therefore it was decided to add an eight mile strip to the area,

increasing the total area to be surveyed to about 900 square miles. However, some areas on the east side of the map sheet were proved to be non-copper-bearing by preliminary stream silt assay results. These areas were found to be overlain by younger sequencies of carbonate rocks which, due to little or no indications of copper mineralization, could be excluded from the preliminary prospecting program.

In all, preliminary stream silt geochemistry and follow-up geological prospecting surveys were conducted over a total area of 670 square miles, of which nearly 400 square miles comprised a previously unexplored area to the north of Dr. Wheeler's survey, G. S. C. Map 1953-7. Due to the large area to be surveyed a helicopter was employed to facilitate the delivery and pickup of field crews.

HISTORY OF EXPLORATION

According to Dr. Wheeler's report (G.S.C. 1953-7) the Fairchild and Pinguicula Lake areas had been explored by prospectors prior to his survey but no geological survey had been attempted. Dr. Wheeler's survey covered an immense area in one summer and hence some of the published geology is quite sketchy. His work did not extend north beyond Pinguicula Creek. This left a huge unexplored area between this creek and the Mammoth property to the north-east and Fairchild Lake to the north-west.

The undersigned geologically mapped the 'Cobalt Cirque', the 'Discovery', and the 'Porphyry' showings on the Mammoth Copper Property during early July and late August of 1967.

G E O L O G Y

Since Dr. Wheeler's report is very comprehensive on the Palaeozoic Rocks, the section described below will pertain to the copper-rich rocks and to changes from previous geological interpretations. For younger formations please refer to G.S.C. Paper 53-7 by Dr. J. O. Wheeler.

Table of Formations

Era	Period or Epoch	Map-Unit : Thickness	Lithology
Palaeozoic	Silurian or Devonian	10 : 300' plus	Grey-weathering and fresh surfaced limestone
		7 : 400' plus	Yellow and brown-weathering grey limestone, thin-banded, grading into 10 and from 4
		4 : 200' to 2400'	Grey, green, maroon shales, slates and quartzites with common basal conglomerate
		Unconformity	
Proterozoic?	Cambrian and earlier	A :	Diorite and Quartz Monzonite Dikes
		3 : to 3000'	Dark slates, quartzites with occasional inter-banded phyllitic, calcareous zones
		2 : ?	Lighter weathering upper phase of Unit 1
		1(a) : ?	Reddish brown-weathering Dolstone, sandy Dolstone, some algae concretions, occasional phyllitic zones and interbedded light limestone and quartzite
		1(b) :	Slates, quartzites, conglomerates, dolstone and various mixtures of these rocks in discontinuous beds in some areas
		1(c) :	Within 1(b) some large areas of basalt, diorite and greenstones as flows and intrusives

Description of Formations

(Please refer to Geological Plans in Map Folder)

Units 4 to 10 inclusive are described thoroughly by Dr. Wheeler. Very little investigation of their outcroppings was attempted after it was determined for sure that dikes of diorite mineralized with copper do not penetrate through the formations comprised of these younger sequencies.

The only interesting fact about this series of formations is the wide variation in Unit 4. On the south side of Dolores Creek it was seen to consist only of alternating red and green slates of only 200' thickness and grading into Unit 7, whereas, north of Gillespie Creek it was seen to be 2000' plus in thickness with the middle and lower sections consisting of white quartzites and a conglomerate made up of boulders of underlying quartzites (Unit 3), dolomite (Units 2 and 1(a)), and, most importantly, of diorite.

Unit A was listed by Dr. Wheeler as Unit 24 in his 1954 report. Due to the aforementioned findings on the diorites of this area, I have listed Unit A in my report as the youngest unit (since it intrudes Unit 3) of the possibly pre-Palaeozoic Units. It is characterized by a wide variation in geochemistry. For instance, in the 'Cobalt Cirque' area on the Mammoth Copper Property there is a diorite dike (or sill) which is very high in Potassium feldspars (K-feldspars - personal communication with Dr. D. C. Findlay, G.S.C.), but which is barren in copper mineralization. Yet some three miles south of this, on the sidehill adjacent to the 'Discovery' showing, all the diorite dikes (or sills) located to date are found to be much more basic. They contain all Sodium feldspars (Na-feldspars) and they are mineralized with what is described as 'porphyritic chalcopyrite'. The above two types of dioritic intrusive differ in that the latter type is high in magnetite content whereas the former is devoid of magnetite.

Some dikes are very narrow, e.g. one just south of Glacier Pass and on the west wall is less than 200 feet in width. The Kohse Creek dike, on the other hand, is about 2000 feet wide near its junction with Bubble Creek and has a proven length of two and one-half miles. This particular dike shows much internal variation and is characterized as well by much swelling and constricting over its entire length. This dike assumes the characteristics of a porphyry in some areas; in others it is extremely basic and a few sections of it are definitely diabasic with characteristic texture and minerals.

No scarn was observed in any area except for a small reaction in the slates of Unit 3 in the area just north of Rusty Mountain where some diopside asbestos has been formed in a few areas and some of the high-iron slates have been altered to a chloritic green, blocky, rock.

Unit 3 was found in two main areas. This Unit covers a large area to the south and east of Kohse Creek and can also be located in the Bonnet Plume River valley from about Pinguicula Creek (on the west side) south to about the mouth of Kohse Creek. The extent of Unit 3 on the east side of the Bonnet Plume River was not determined precisely; however, many of the canyons near the Bonnet Plume River were traversed by the survey and Unit 3 was observed in all of these canyons. The intersections or contacts of the intrusive dikes labelled 'A' with Unit 3 were proved to contain the best mineralization of all of the mineralized areas with the exception of the mineralized areas on the Mammoth Copper Property, which contains no evidence of the Unit 3 formation and lies entirely in the oldest pre-Cambrian formations 1(a), 1(b), and 1(c).

Unit 2 was not seen except from afar. No thicknesses nor additional information on the fresh, grey limestones described in Dr. Wheeler's report were obtained this season, due to the fact that they are expected to be unmineralized and therefore of no importance to my principals, the Directors of Bonnet Plume River Mines Limited.

Unit 1(a), Dolstone with interbedded Limestones and Quartzites, underlies most of the traversed areas, especially to the west of the Bonnet Plume River. East of this river it becomes clear that the carbonates lying to the south-east of the Mammoth Copper Property are of this type after the lithology of Unit 4 (basal conglomerates) is understood more fully. The Dolstone in latitudes north of Gillespie Creek is quite different to that found south of this creek. It is virtually pure Dolomite with no interbedded Limestones or Quartzites. It has been observed in three places lying conformably over Unit 1(b) and without any grading from the uppermost slates and quartzites. Commonly, it is intruded by dikes of Unit A but it does not produce any skarn at the contact zones. There are many small, scattered occurrencies of copper mineralization within Unit 1(a); however, no significant concentrations of copper have been discovered in this lithological horizon to date.

Unit 1(b), the oldest pre-Cambrian formation to be found in the Bonnet Plume River area, appears to be the most important Unit as far as copper mineralization is concerned. It has an indefinite thickness; some areas covered mainly with slate were seen to be upwards of 4000 feet thick. It has a great variation in lithology over very short distances in those areas where copper mineralization occurs. These complex areas, consisting of quartzites, slates, carbonates, sedimentary clastics, lava flows, sills, and what could be knob-like intrusives, occur in no set pattern or array. Some of the formations within Unit 1(b) appear to consist of volcanic cones with associated flow-rock and conglomerates made up of limestone, quartzite and slates. Volcanic fragments (and minor agglomerates) consist of black, iron-rich slates and blackish grey-wacke-like quartzites. The carbonates in this formation are comparatively thin-bedded and tend to lie in small patches among the more predominant quartzites. The main importance of Unit

1(b) derives from occurrencies of cobalt and copper mineral concentrations and disseminations within it. This will be discussed further in this report under 'Anomalous Areas'. A very general lithological sequence, used in the geological mapping accompanying this report in order to outline the mineralized areas, is described as follows:

Unit 1(b)-1	20' to 1000'	Black slates with black quartzites interbedded, virtually no carbonates
Unit 1(b)-2	500' plus	Grey to white quartzites with some greywacke sections, interbanded tuffaceous slates, limestones, dolstones. Note: Unit 1(c) has been noticed to intrude (sill or plug-like) into this bedded formation. A conglomerate and agglomerate complex usually overlies Unit 1(c). Mineralization occurs in Unit 1(b)-2 as disseminations and concentrations of cobalt and/or copper minerals within the sedimentary bedding and as disseminated copper and iron minerals throughout some of the intrusive and extrusive rocks.
Unit 1(b)-3	?	A major series of black slates, siderite iron formation and other clastic and argillaceous sediments have been noted in several areas and are included here within a Unit separately. The situation is not clear at this time. Unit 1(b)-3 may be found to be Unit 1(b)-1 opened up to many thousand feet in thickness.

Unit 1(c) consists of intrusive rocks other than the original 'A' type of intrusive. This Unit is definitely a melting-pot designated to include any non-sedimentary rock formations found in the Unit 1 series, other than Unit A. Many of the intrusive dikes and sills appear to be of this category. They have been included within Map Unit 1(c) rather than within Map Unit A because they belong to a well-crystallized group of rocks commonly surrounded by agglomerate and sedimentary conglomerate. This classification of intrusive rocks occurs mostly in the 'Glacier Pass' area,

also on the south side of Dolores Creek. Other rocks within Unit 1(c) include basaltic to diabasic flows, sills and dikes. Barite veins, containing occasional speckled disseminations of bornite and chalcocite, occur quite often in the formations included within Unit 1(c).

G E O C H E M I S T R Y

The purpose of the geochemistry survey was to carry out reconnaissance stream silt sampling in order to delimit favourable areas of mineralization for the follow-up program of geological prospecting and mapping. The geochemical stream silt sampling survey last year successfully outlined the areas of interest on the Mammoth Copper Property with a sample density of only one silt sample per two square miles (see A. R. Archer Report dated October 14th, 1967). This season (1968) some 730 stream silt samples were taken over an area of approximately 670 square miles.

Sampling Method:

The basic system was to utilize the helicopter to despatch 2-man crews to the headwaters of all drainages from the area. The crews were trained to take regularly spaced silt samples from all the tributaries and major glaciers heading these drainages down to a pre-designated helicopter pick-up point, usually on one of the larger creeks or on the Bonnet Plume River. Float geology and simple reconnaissance-type geological mapping was accomplished at the same time. Each crew averaged twenty miles of walking traverse per day during the first part of the season when the helicopter was available only for early morning despatch and late afternoon pick-up.

Late in the season, when the helicopter became available all day, the machine was used in traverses over long sections of canyons and lowlands in order to minimize the mileages to be walked. Short streams were sampled

in this manner by landing with the helicopter and taking one sample only before flying the crew elsewhere for further silt sampling. Walking traverses averaged about fifteen miles per day, dependent on the terrain being sampled and examined, during this latter period.

Area Covered:

Whereas the total area of reconnaissance for the season amounts to 900 square miles, it became apparent quite early in the program that it would not be necessary to conduct the silt sampling survey over the southeast portion of the area which was contained in a younger sequence of carbonate rocks of great thickness and containing little or no mineralization.

Consequently, only three traverses were made to silt sample the rock formations younger than Unit 4. These were in the area south of the mouth of Gillespie Creek and on the east side of the Bonnet Plume River, namely, on Hematite Creek, part of Corn Creek, a branch of Pinguicula Creek and the creek directly north of Pinguicula Creek. The remaining drainage to be stream silt sampled amounted to 670 square miles. This area was sampled on a density pattern of approximately 1 silt sample determination per square mile of area drained.

Determinations:

Samples consisting of from $\frac{1}{4}$ to $\frac{1}{2}$ pounds of silt were taken in 'Kraft' brown paper envelopes. The samples were split at base camp, about one-half being left in the envelope for checking purposes and the other one-half portion being dried and sieved to minus 80-mesh before analysis or storage for analysis at the first opportunity, usually during a day when bad weather postponed field work.

The silt sample analyses, accomplished in the base camp at the aircraft landing strip, were as follows:

1. An approximate 0.2 gram sample is taken from each silt sample envelope and is placed in a culture-type tube.

2. Digest each sample with 6-normal, cold, hydrochloric acid.

3. Buffer each solution with Sodium Acetate, Sodium Tartrate and Hydroxylamine Hydrochloride.

4. Add a 2 c.c. aloquot of a dilute solution of 2-2' Biquinoline in Isoamyl Alcohol.

5. Shake the mixture well and measure the resultant colour in the organic phase against pre-made standards.

In order to serve as a check on the cold method of Biquinoline silt sample analyses, and in order to avoid any compounding of errors or problems during the season, about one-fifth of the silt samples were sent periodically to the Whitehorse Assay Laboratory. Here each sample was re-checked by Mr. George Spalding, Provincial Assayer, using the hot acid method of metal extraction prior to determining the copper content by the use of the Atomic Adsorption machine.

Only three problems arose in the base camp analyses of silt samples by the Biquinoline cold acid extraction method, as follows:

1. In any of the silt samples which happened to contain high lead and/or zinc values as well as copper values, the Biquinoline test results in a purple hue which interferes with the normal red hues of the organic layer from which the copper determination is made (see Ref. Canney & Hawkins).

2. In a few areas, some of the more rapid streams carry grains of sulfide with the silt. These grains of sulfide are not digested readily with the cold hydrochloric acid used in the Biquinoline test and this results in generally low to fair readings for copper. The check analyses on this type of silt sample by the hot acid method of extraction followed by Atomic Adsorption result in very high copper determinations.

3. It was found that if the copper in any given silt sample was in the form of a carbonate, the Biquinoline technique gave an anomalous high reading while the Atomic Adsorption check resulted in only a moderate copper value.

On the basis of a series of tests run during the first few days of the season, background readings for copper were established at 9 for the

Biquinoline method of analysis and at 99 for the Atomic Adsorption method. The readings of the two methods of analysis for copper were equated as follows:

Biquinoline Test Readings:		Atomic Adsorption Equivalent Readings:
10	Approximate	100
15	"	200
20	"	300
25	"	400

Of the total 730 silt samples taken over the entire area, 116 had anomalous copper values. Of the 116 anomalous copper values the average reading by the Biquinoline method of testing was 21 as compared to an average reading of 336 by the Atomic Adsorption method. This serves as a fair check on the test work by which the two methods of determination were equated.

Anomalous Areas:

As a general rule it was found that all of the anomalous areas occurred where dikes of 'A' Unit occurred or within and downstream from areas consisting of formation Units 1(b) and 1(c).

The strongest anomalous areas, as determined by the silt sampling program, lie just east of Glacier Lake and on the east wall of Glacier Pass; also, along the north wall of the Dolores Creek valley and in the two main valleys east of the ridge running along the east side of Glacier Pass (see map). This area has been staked to become part of the Mammoth Group of Mineral Claims.

The remaining anomalous areas contain generally lower copper values in the silt samples. They are listed below as follows:

1. Along the south side of the Dolores Creek valley opposite the Glacier Lake Pass, within Units 1(a), 1(b) and 1(c). The intrusion of a dike through formation Units 1(a) and 1(b) causes some copper mineralization.

2. Along the south side of the Dolores Creek valley opposite Camp Creek and due south of the Mammoth Copper Property. There is copper mineralization

in the basaltic flows of Unit 1(c). Character Sample No. 7956 of a basalt flow rock lightly mineralized with bornite assays 0.20% Copper. A cut chip sample No. 7953 of a 14" width of vein material outcropping in the creek opposite Camp Creek assays 2.61% Copper. This vein carries chalcopyrite mineralization in quartz accompanied by barite and calcite.

3. South of Gillespie Creek at about the 6000' elevation there is some copper mineralization caused by dikes of Unit A invading formation Unit 1(a) (see Geology Map).

4. The whole length of Kohse Creek, especially on the north-east side where dikes of 'A' invade Units 1(a) and 3 causing copper mineralization.

5. Due south of Gillespie Creek and west of Algae Mountain there is a mineralized dike of type 'A' containing fair copper values but there is no sign of any mineralization in Unit 1(a) which it invades.

6. There is some disseminated copper mineralization south of the junction of Camp Creek with Cobalt Creek. At about the 5500' elevation a 10' x 200' outcrop consisting of Units 1(b) and 1(c) assays 0.28% Copper, Sample No. 7957.

The Glacier Lake Anomalous Areas:

The geochemistry of the stream silt sampling in the Glacier Lake and Glacier Lake Pass areas has resulted in the location of several strongly anomalous copper-bearing areas. Subsequent prospecting and geological mapping discloses three different types of mineralization which are described as follows (please refer to Geological Plan):

1. This is a mineralized quartz vein outcropping near the ridgetop in the westwall of the cirque east of Glacier Lake and between the 5800 and 6000' elevations. It is a narrow quartz vein with adjacent wallrock alteration in limy slates of Unit 1(b)-2 near the contact of Unit 1(b)-1. The vein is mineralized with small crystals of cobaltite and is stained with malachite. This mineral showing is significant in that it has virtually the same stratigraphic position as the copper-cobalt showing in the 'Cobalt Cirque' area, discovered last year at a location some seven miles to the east, (see Archer Report of October 14th, 1967). The only apparent difference in the two cobalt-bearing quartz veins is the lack of siderite mineralization in this year's discovery. Sample No. 7958, a character sample of the cobalt-bearing quartz taken near the top of the ridge at 6000' elevation assays 0.33% Copper and 1.02% Cobalt. Sample No. 7961, a cut chip sample taken over a 14" width of quartz vein at the 5800' elevation of the same showing, assays 0.43% Copper, 0.14% Nickel, and 3.85% Cobalt.

2. A disseminated type of copper mineralization occurs in the bedding overlying the quartz vein to the north of Sample locations Nos. 7958 and 7961.

Sample No. 7959 was taken over altered quartzite wallrock containing disseminated chalcopyrite mineralization. This mineralized wallrock assayed 1.10% Copper and is almost the same as that found all over the headwall of the aforementioned 'Cobalt Cirque' as it is in the same sort of formation, Unit 1(b)-2, and is patchy and discontinuous in the same manner.

3. A large area of jointed, well fractured quartzite of Unit 1(b)-2 formation was discovered just above Glacier Lake on the sidehill at elevations between 4000 and 5500'. This area of blocky, jointed quartzites has been invaded by minor greenstones of Unit 1(c) and is fairly well mineralized with chalcopyrite and siderite veinlets mainly along the joint planes and fractures. Sample No. 7954, taken over an exposure of this material measuring 8' x 50', assayed 0.44% Copper. Sample No. 7955, taken over an exposure of quartzite just above this and heavily stained with copper minerals, assayed 1.43% Copper.

Mineral claims have been staked to cover the above discoveries of mineralization in the Glacier Lake and Glacier Pass areas. These claims are recorded in the name of Bonnet Plume River Mines Limited.

CONCLUSIONS AND RECOMMENDATIONS

This summer's field work in the Bonnet Plume River area has been successful in that it demonstrates the feasibility of prospecting a very large area in a remote district with a small field crew in a necessarily short season. The use of rotary-wing air transport and modern methods of geochemistry in the field result in obtaining rapid returns from the preliminary stream silt survey. Thus, all favourable areas of mineralization are delimited quickly, permitting the field crews to devote more of their time to follow-up soil geochemistry, prospecting and geological mapping, in the areas of interest only. The advantages of this technique are obvious, especially for previously unexplored areas on which there are no geological reports and maps available for reference.

The main area of interest this season lies north of the Dolores Creek valley in the Glacier Lake area. Here a large area of lowgrade, copper-cobalt mineralization in jointed fractured quartzites and associated greenstones was discovered, geologically mapped and staked into Mineral Claims. Six other copper anomalies have been delimited south of Dolores Creek and at widely spaced intervals on the west side of the Bonnet Plume River. The geology on some of these has been mapped partially.

On the basis of this season's geological mapping, it is now obvious that the slates, quartzites and associated greenstones are the most important host rocks for copper mineralization in the Bonnet Plume River area.

This type of formation extends further to the north and to the north-west of this season's survey. It is recommended, therefore, that the geochemical stream silt survey and geological prospecting program be continued to cover the geologically favourable formations to their western limits and north-western limits.

Submitted to:

The Board of Directors,
BONNET PLUME RIVER MINES LIMITED

By: F. Marshall Smith

F. Marshall Smith, B.Sc.

REFERENCES

1. Geological Survey of Canada Paper 53-7, "A Geological Reconnaissance of the Northern Selwyn Mountains Region, Yukon and Northwest Territories". By Dr. J. O. Wheeler.

2. Bonnet Plume Copper Property, Yukon Territory. By Alan R. Archer, P. Eng., Geological Engineer.

3. Economic Geology, Volume 53, 1958, pages 877 to 886, "Cold Acid Extraction of Copper from Soils and Sediments - a Proposed Field Method". By Messrs. F. C. Canney and D. B. Hawkins.

A U T H O R I Z A T I O N

1. The undersigned is a graduate geologist of the University of Toronto in 1967.

2. I have practised my profession as a geologist in mapping and geochemical exploration for the last four summers.

3. My home address is: 32 Pheasant Lane, Islington, Ontario.

4. I am familiar with the geology and geochemistry of the Bonnet Plume River area since the commencement of geological mapping in July, 1967.

5. I was in the Bonnet Plume River area from June 9th to August 9th, 1968.

6. I have no direct or indirect interest in Bonnet Plume River Mines Limited, or in the mining claims recorded in their name in the area.

Signed: F. Marshall Smith

F. Marshall Smith, B.Sc.
August 12th, 1968.

REPORT

ON

MAMMOTH I - 108 AND 201 - 250 CLAIMS, YUKON

FOR

BONNET PLUME RIVER MINES LIMITED

September 7, 1968

Alan R. Archer Consultant Vancouver, B.C.

INDEX

INTRODUCTION

The Mammoth I - I08 claims were staked during I967 to cover copper showings discovered by Mr. L.J. Brown of Mayo, Yukon. The Mammoth 20I - 250 claims were staked over new showings located in I968.

The writer is fully familiar with the property, having supervised portions of the I967 field exploration program and having personally examined all significant mineral showings. Other sources of information used are; reports by C.D.N. Taylor, mining engineer, dated July I and August I5, I967 and January 3I, I968; a report by Dr. S.S. Szetu, of Cana Exploration Consultants Ltd., dated October 26, I967; discussions with D.C. Findlay, Resident Geologist, G.S.C., Whitehorse; and G.S.C. mapping of nearby areas (Map I0 - I963 and Map 53 - 7).

PROPERTY

The property consists of I58 unpatented mineral claims in two contiguous groups recorded in the name of Bonnet Plume River Mines Limited. They are registered in the Mayo Mining District, Yukon as follows:

Claim Name	Grant Number	Expiry Date
Group I		
Mammoth I - 56	Y67I9 - Y6774 incl.	Aug. I8, I97I
Mammoth 57 - 76	Y679I - Y68I0	Aug. I8, I97I
Mammoth 77 - 84	Y6843 - Y6850	Aug. I8, I97I

Mammoth 85 - 92	Y6827 - Y6834	Aug. I8, I97I
Mammoth 93 - I00	Y6835 - Y6842	Aug. I8, I97I
Mammoth I0I - I08	Y685I - Y6858	Aug. I8, I97I
Mammoth 20I - 2I6	YI4667- YI4682	April 30, I969

Group 2

Mammoth 2I7 - 232	YI4683- YI4698	April 30, I969
Mammoth 233 - 250	Y26783- Y26800	Aug. 8, I969

LOCATION AND ACCESS

The claims are located 98 airmiles north of Elsa, Yukon, at latitude 64° 57' and longitude I33° I7'.

Present access is by aircraft from Mayo Landing to a bush airstrip on the north fork of Dolores Creek, a distance of II6 miles. The Wind River Trail, a winter trucking route from Elsa to the Peel Plateau oil and gas fields, passes within 56 miles of the claims and was used to move heavy equipment, fuel and supplies to the property for the I968 exploration program and for construction of the Dolores Creek airstrip.

Preliminary investigation indicates that the most feasible all-weather highway route between Elsa and the property is approximately I05 miles long. Construction of this highway would provide a 400 mile truck route to railhead at Whitehorse, Yukon, a distance comparable to the present truck haul by Cassiar Asbestos Corp. from their

Clinton Creek property west of Dawson.

HISTORY

The Mammoth I to 56 claims were staked in the spring of I967 following examination by C.D.N. Taylor, mining consultant, of copper showings discovered by L. Brown of Mayo. Further prospecting led to additional discoveries and the property was increased to I08 claims during July and August, I967 and to I58 claims by August I968.

GEOLOGICAL SETTING

The first group of claims is located in the rugged Selwyn Mountains between the north and east fork of Dolores Creek. It is crossed by three northerly trending ridges within a lateral distance of four miles that are separated, from east to west by the south flowing Tetrahedrite, Discovery and Cobalt Creeks. Outcrop is fairly abundant in the higher areas and is more or less obscured on the lower slopes by talus and glacial moraines. The second group of claims is located about 8 miles to the west on the north side of Dolores Creek near Glacier Lake.

There are three basic formations on the claims and a tentative correlation with G.S.C. mapping some I0 miles to the north is:

Unit Number	Age	Name
3	Cambrian or younger	unnamed

2	Cambrian	Rapitan Group
I	Proterozoic	Katherine Group

A short description of each unit is as follows:

Unit I - is found in the northwestern part of the Mammoth I - I08 claims along Cobalt Creek and consists of interbedded slates, phyllites, quartzites, dolomites and iron formation. It is folded into a broad anticline, the axis of which strikes north across the cirque at the head of Cobalt Creek. Most of the Mammoth 2I7 - 250 claims are underlain by this unit.

Unit 2 - is composed of coarse breccia fragments of rock types similar to Unit I and contains numerous randomly distributed volcanics flows and intrusions that occur as lenticular sills, dykes and small stocks. Thin section work by Dr. P.A. Peach of Toronto University has shown the intrusives to range in composition from diorite to gabbro.

The unit averages 3,000 feet in width, bisects the Mammoth I - I08 claims at N. 45° E., and contacts both Unit I and 3 unconformably. It is also found in the higher areas on the Mammoth 233 - 250 claims.

Unit 3 - is a thick carbonate sequence crossing the southeast part of the Mammoth I - I08 claims at N. 60° E. and dipping 20° to 40° southeast. The base of the unit is a buff coarsely crystalline dolomite with numerous veinlets of calcite, quartz and siderite. Above this is less pure, grey

dolomite with interbedded silty and cherty grey limestone.

MINERALIZATION

General

Copper and iron mineralization is widespread throughout the area and cobalt mineralization is found mainly along the headwall of Cobalt Creek cirque. The minerals observed are hematite, magnetite, siderite, pyrite, chalcopyrite, tetrahedrite, cobaltite and copper and cobalt oxides. The general mode of occurence of each is -

Hematite - Occurs in a distinct iron formation about 200 feet thick cutting Unit I. Specular hematite is disseminated throughout all units, particularly Unit 2, and is often concentrated along joints and fault planes.

Magnetite - Occurs mainly as an accessory mineral (up to 5% to I0%) in the intrusives. The greatest concentrations are usually found where chalcopyrite is present.

Siderite - Occurs as vein fillings and, along with quartz, is the most common gangue mineral associated with the copper and cobalt minerals in Units I and 3.

Pyrite - Occurs as a gangue mineral in most showings, as disseminations in Unit I and 3 and as accessory mineral within the intrusives.

Chalcopyrite - This mineral is the main constituent of

the various showings. It occurs as massive replacements and disseminations within siderite veins, as an accessory mineral in the intrusives and as fine disseminations in the sediments near the intrusives.

Tetrahedrite - Occurs as a very minor accessory mineral associated with chalcopyrite. It is most abundant in siderite veinlets in Unit 3, usually immediately above Unit 2.

Cobaltite - This mineral is only seen on the headwall of Cobalt Creek cirque where it occurs as masses of fine grained mineralization in siderite veins, as well defined crystals disseminated in siderite and as minor fine disseminations near the siderite veins in Unit I. The distinctive pink cobalt oxide, erythrite, is seen wherever cobaltite is exposed to weathering.

Mineral Showings

Mineral showings are of two distinct types (I) fracture fillings in the sedimentary rocks and (2) disseminations in intrusives or "porphyry-like". The best of each is described as follows:

Cobalt Cirque Showing - Copper and cobalt mineralization is found along the headwall of Cobalt Creek cirque near the crest of the major fold in Unit I. The best zone is an area about 400' long and I30' high where there is a well developed box work of siderite-quartz fracture fillings immediately

above the talus slide at the base of the cirque wall. Individual fractures seldom exceed 50 feet in length and exhibit radical changes in width and attitude along strike. The width of chalcopyrite in the fractures varies from I inch to 48 inches and probably averages less than I2 inches while the cobaltite mineralization occurs in lenses less than 4 inches in width. Any particular fracture usually contains either cobaltite or chalcopyrite but not both. Minor amounts of cobaltite and chalcopyrite are disseminated throughout the sediments between the various fractures.

Sampling or close examination of the mineralized zone was made impossible due to the steepness of the cliff face and a continual rain of falling rock. Even under the best of conditions, the irregularity of the fractures would make sampling difficult. A character sample of massive chalcopyrite assayed I8.2% copper, 0.5 ounces silver per ton and 0.02% cobalt while a character sample of cobaltite assayed I5.8% cobalt, 0.20 ounces silver per ton and 0.3% copper. The writer estimates that the area of best mineralization (400 feet by I30 feet) could average up to I% copper and 0.2% cobalt but this extremely crude visual estimate might be in error by a large factor.

Porphyry Showing - This showing is a mineralized intrusive that forms an outcropping bluff about I50 feet long and 30 feet high on the Mammoth 44 claim along the steep hillside on the north side of the right fork of Dolores Creek.

Outcrop mapping indicates that the intrusive is probably a lens-like sill or dyke not much larger than exposed on the bluff. However, a ground magnetometer survey conducted by Cana Exploration Consultants Ltd. indicates that it may be more extensive than thought (up to 800 feet long and 300 feet wide) or may swell down dip. The intrusive was identified by Dr. Peach as a partially sheared and altered diorite or quartz-diorite.

The diorite contains about I% chalcopyrite almost equally distributed in finely disseminated particles. It is weakly jointed and chalcopyrite is occasionally more abundant near the joints. Magnetite, hematite and minor pyrite are similarly distributed throughout and make up about 4% of the mass. A bulk sample was obtained by randomly chipping fragments from approximately I00 blocks of float immediately below the outcrop. This sample was split into two samples that assayed 0.28% copper and 0.305% copper respectivelly. A semi-quantitative spectrographic analysis indicated no other metals of interest.

Glacier Lake Showing - This showing consists of a large area of Unit I (almost a square mile) containing fine fractures filled with siderite and chalcopyrite. The best mineralization is found in dolomites and quartzites near their contact with Unit 2 rocks. A chip sample taken over a 60 foot width from a fresh bulldozer cut in dolomite near an andesite dyke assayed 0.I5% copper and 0.I2

ounces silver per ton.

Other Showings - A sample of a "blow-out" of chalcopyrite of very limited extent, found near the mouth of Discovery Creek, assayed I4.7% copper and 0.4 ounces silver per ton over an 8 foot width. A chip sample over a I2 foot width of tetrahedrite veinlets in dolomite near the head of Tetrahedrite Creek assayed 0.24% copper and 0.30 ounces silver per ton. A chip sample of an outcrop of greenstone near Tetrahedrite Creek assayed 0.I3% copper.

Two specimens of mineralized diorite float found in the glacial moraine near the mouth of Tetrahedrite Creek assayed 0.87% copper and I.72% copper respectivelly. The source of this material has not yet been located and is probably several thousand feet further up the creek.

EXPLORATION DURING I967 AND I968

Prospecting and Mapping

Prospecting during I967 was generally limited to the Cobalt cirque area, the lower slopes of the mountains, and creek valleys. Areas mapped in detail were the ridge around Cobalt cirque and an area of about I2 claims immediately east and west of the porphyry showing. During I968 regional exploration resulted in discovery of the Glacier Lake showing which was subsequently mapped on a scale of I inch to I/8th mile and examined in part by two bulldozer trenches.

Geophysical Surveys

In September I967 a grid was cut over the porphyry showing and extended I.5 Miles east and 0.5 miles west. Lines were cut at 400 foot intervals over the showing and to the west and at 800 foot intervals to the east over the area of porphyry float near the mouth of Tetrahedrite Creek. A ground magnetometer survey by Cana Exploration Consultants Ltd. located a strong magnetic anomaly (up to 2,000 gammas above background) 800 feet long and 300 feet wide over the porphyry showing and several lesser anomalies to the west where less mineralized diorites are known to occur.

Geochemical Surveys

The cut grid was soil sampled at 200 foot intervals on each line and the baseline. Soil samples were dug from the B horizon and assayed for copper using a standard hot acid extraction technique.

A strong anomaly was found downhill from the porphyry showing and a lesser anomaly was found associated with the magnetic anomaly on the western part of the grid.

CONCLUSIONS AND RECOMMENDATIONS

The most significant features of the property are the widespread extent of copper mineralization and its occurence in the intrusive rocks. This suggests that the potential is good for a large relatively low-grade deposit in either an intrusive or sedimentary enviroment.

The limited work done to date has located three mineral showings that have tonnage potential and are worthy of further work. Additional undiscovered showings of interest are indicated by the presence of well mineralized float and a coincident geochemical and magnetic anomaly west of the porphyry showing.

An integrated exploration program is recommended, to be directed, in order of priority, toward (a) evaluation of the Cobalt Cirgue, Porphyry and Glacier Lake showings and (b) exploration of the claims for additional showings. The Cobalt Cirque and Porphyry showings and the coincident magnetic and geochemical anomaly can be best explored and evaluated by diamond drilling. The outcrop areas of the Glacier Lake showing should be mapped and sampled in detail to locate the best mineralized portion which can then be evaluated by bulldozing and/or diamond drilling. The remainder of the claims should be systematically prospected and mapped in detail. New discoveries can be further evaluated by soil sampling, magnetometer surveys, bulldozing or drilling depending on their location and overburden conditions.

Estimated costs are as follows:

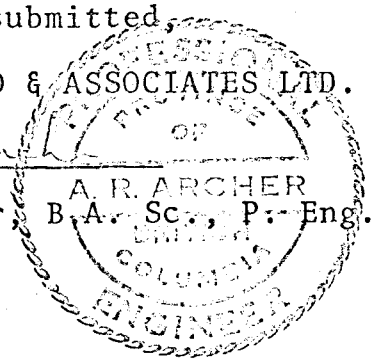
Bulldozer - D8 with rippers for
preparation of roads, drill
sites and trenching.
1,000 hours at $40./hr.----------$40,000.00

Diamond drilling - 5,000 feet at $20./ft.	I00,000.00
Aircraft support - fixed wing and helicopter	I5,000.00
Camp costs and general overhead	I0,000.00
Prospecting and mapping - one geologist and two helpers	8,000.00
Reserve for linecutting, geochemical and magnetometer surveys	20,000.00
Miscellaneous expenses - assaying, engineering reports	7,000.00
	$200,000.00
Plus contingencies	20,000.00
Total	$220,000.00

Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES LTD.

Alan R. Archer, B.A. Sc., P. Eng.



A.R.A:m.a.

ARCHER, CATHRO
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770 ONE BENTALL CENTRE
505 BURRARD ST.
VANCOUVER 1, B.C.

September 7, I968.

CERTIFICATE

I, Alan R. Archer, with business and residential address in Vancouver, B.C., do hereby certify that:

(I) I am a consulting geological engineer.

(2) I graduated from the University of British Columbia with a B.A.Sc. in Geological Engineering in I957.

(3) I am a registered Professional Engineer in British Columbia and Yukon Territory.

(4) From I957 to I966 I was engaged in mineral exploration in Canada as a geologist for a number of companies, I was Chief Geologist for United Keno Hill Mines Ltd. when I retired to private practice in I966.

(5) I have personally examined all reports, data, and mineral showings referred to in this report.

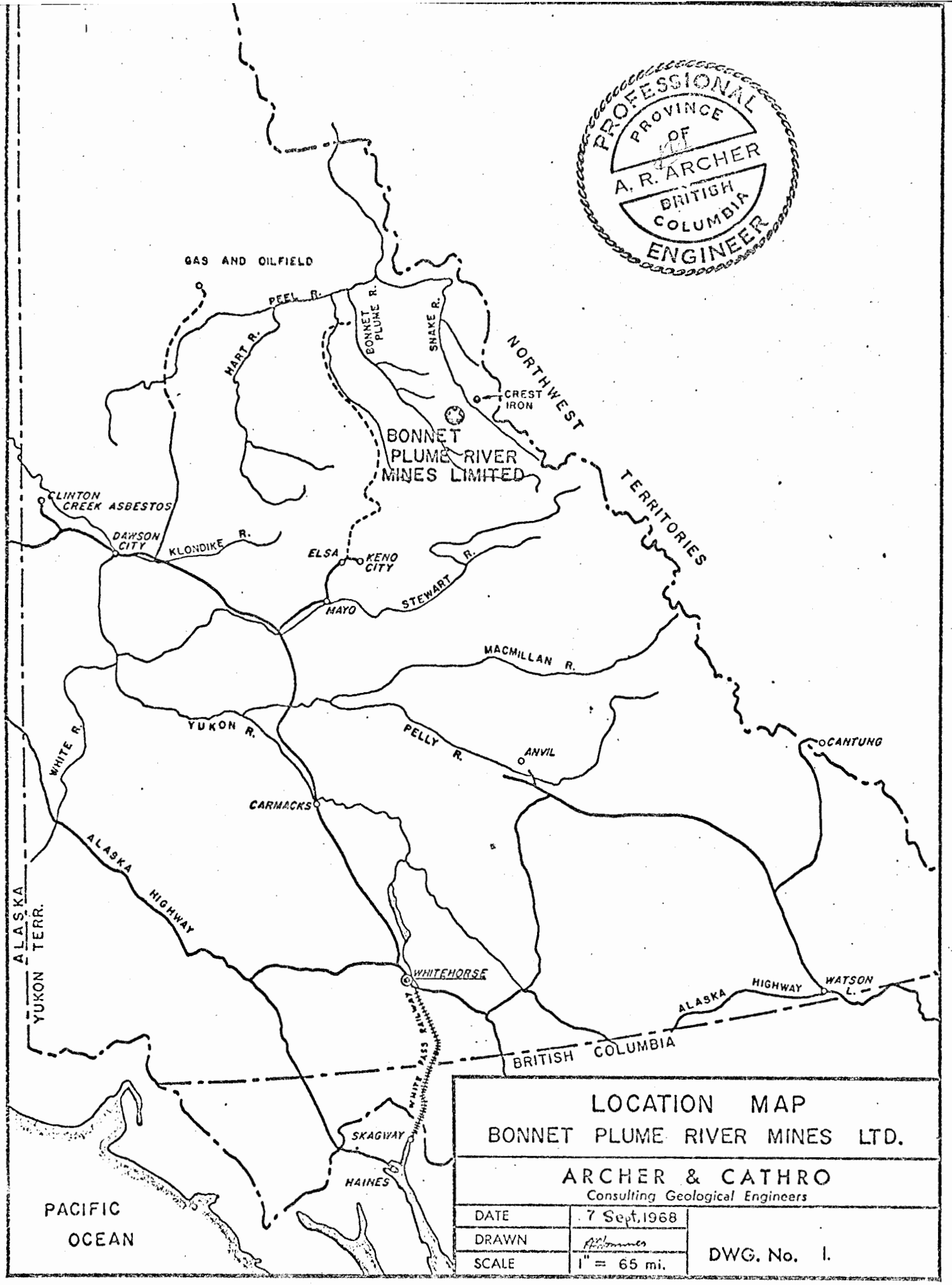
(6) I have not received, nor do I expect to receive, any interest, directly or indirectly, in the properties or securities of Bonnet Plume River Mines Limited.

Respectfully submitted,

A. R. Archer

Alan R. Archer, B.A.Sc., P.Eng.

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — A. R. ARCHER



LOCATION MAP
BONNET PLUME RIVER MINES LTD.

ARCHER & CATHRO
Consulting Geological Engineers

DATE	7 Sept. 1968	DWG. No. 1.
DRAWN	[illegible]	
SCALE	1" = 65 mi.	