

812679

92-G-11

MINEX DEVELOPMENT LTD

Vancouver, B. C.

MINEX/MT. DONALDSON

B. W. W. McDOUGALL, B.A., B.Sc.
CONSULTING MINING ENGINEER
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

TELEPHONES:
OFFICE, PACIFIC 1631
RESIDENCE, NORTH 2830-Y

MINE
EXAMINATIONS
REPORTS
APPRAISALS
CONSULTATIONS
MANAGEMENT

416 BANK OF NOVA SCOTIA BUILDING
VANCOUVER 2, B. C.

March 1st, 1956,

Minex Development Limited,
208 Pemberton Building,
Vancouver, B.C.;

Dear Sirs:

As requested by Mr. John A. Hallberg I have prepared a general summary of information descriptive of certain copper-bearing territory situated at and near the summit of Mt. Donaldson and not far distant from the Salmon Arm reach of Sechelt Inlet, B.C.. This summary report is attached hereto. I trust that the information here presented will afford a reasonably-clear understanding of the principal known characteristics of this interesting copper-bearing region.

Yours very truly,

B. W. W. McDougall P. Eng.
Consulting Mining Engineer.

A REPORT ON
MOUNT DONALDSON COPPER AND SILVER
MINING PROPERTY
VICINITY OF SALMON ARM REACH OF
SEECHELT INLET
COASTAL AREA OF BRITISH COLUMBIA

Compiled from Sundry Sources

416 Bank of Nova Scotia Bldg.,
Vancouver, B.C.,
March 1st, 1956.

B. W. W. McDougall, P. Eng.,
Consulting Mining Engineer.

MOUNT DONALDSON COPPER AND SILVER MINING PROPERTY

VICINITY OF SEECHELT INLET, - BRITISH COLUMBIA

INTRODUCTION

The particular area with which this report is concerned aroused considerable interest among those who were interested in British Columbia mining affairs, eighty years ago. For various reasons, which will be given and discussed in later pages, the mineral-bearing occurrences - veins, shear zones and other geologic structures - have received no exploration attention of important consequence since the turn of the century. This is in spite of the fact that the area is close to ocean-going transport and that the available descriptions of the ore-mineral showings must be considered quite as economically interesting in these post-war years as was the case back in the '70s.

The purpose of this report is to present a summary of the existing information descriptive of the area, to attempt an interpretation of the probable economic importance of the described mineral showings and, generally, to compile a reasonably modernized report from the considerable amount of fragmentary information that is available. I have had some experience in the Jervis and Seechelt Inlet regions but have not visited the Mt. Donaldson area in which the Mineral Claim Group is located. I do, however, have some first-hand information concerning the region generally.

Copies of the Official and other reports from which the subject matter of the present report has been, largely, obtained are included as appendices. Other descriptive matter has been obtained from verbal descriptions given the writer by Mr. L. G. Sutherland by whom the present mineral claim locations were made in 1955. Mr. Sutherland is a timber cruiser with extensive experience in this area.

REPORTS STUDIED

The Official Dominion, Provincial and other reports which have been studied and from which most of the descriptive matter of the present report has been obtained are listed as follows:

1. Department of Mines, - Geological Survey Branch - Report by O. E. Leroy for the year 1908; page 36.
2. Minister of Mines, B.C., Report for the year 1876; page 429.
3. Minister of Mines, B.C., Report for the year 1877; page 413 by R. B. Harper, Govt. Mining Engineer.
4. Minister of Mines, B.C., Report for the year 1917; page 281, by Wm M. Brewer, Govt. Resident Mining Engineer.
5. Minister of Mines, B.C., Report for the year 1922; page 251 by Wm. M. Brewer, Govt. Resident Mining Engineer.

B.W.D. m.c.

6. Minister of Mines, B.C., Report for the year 1924; page 244 by Wm. M. Brewer Govt. Resident Mining Engineer.
7. Minister of Mines, B.C., Report for the year 1928; page 389 By G. A. Clothier, Govt. Mining Engineer.
8. Report by Josiah Jaques, - February 1881.
9. Report by R. C. Campbell-Johnson, M.E., - October, 1916.

NOTE: These reports are given under the names of Howe Mining Company, Howe Sound Copper and Silver Mines, Howe Copper Mining Company and Mount Donaldson Copper and Silver Mining property.

MINING PROPERTY

MINERAL CLAIMS: I am informed that the Mineral Claim Group with which this report is chiefly concerned comprizes six claims which were staked by Mr. I. G. Sutherland in 1955 and which are now held under option agreement by Minex Development Limited. These claims are named Bornite Nos. 1 to 6, inclusive. I have also been informed, by Mr. Sutherland the locator, that these mineral claims are staked two abreast in a general E - W direction and in such manner as to include the known ore-mineral showings and the old mine workings of the Mt. Donaldson area.

SITUATION: The Mineral Claim Group is located at and near the summit of Mt. Donaldson approximately between two and three miles nearly due East of the Salmon Arm branch of Seechelt inlet. The locality is approximately about twelve miles nearly due West from the head of Howe Sound and about the same distance WNW from Britannia Beach. The locality, also, is in the Vancouver Mining Division and about 32 miles NNW from the City of Vancouver.

TOPOGRAPHY: The British Columbia coastline extending northwesterly from Vancouver and Burrard Inlet is extremely irregular. Howe Sound, Jervis and Seechelt Inlets and numerous other waterways farther to the northwest extend inland northeasterly from the Strait of Georgia. The extreme geographic intricacy of the coastline can best be appreciated by referring to maps. A portion of an aeronautical chart is attached to this report for convenience of reference. Mt. Donaldson - elevation 5,100 feet - is shown on this chart.

The entire coastline of the Province, and extending inland for 100 miles or more, is extremely rugged. The topography of the Jervis-Seechelt Inlet areas and particularly of the region between the Salmon Arm branch of Seechelt Inlet and Howe Sound, in which region the claims are located, is reasonably typical of hundreds of square miles of coast range topography. It is a region of multitudes of peaks extending to altitudes of well upwards of 5,000 feet - and of deeply eroded valleys extending inland from arms of the sea and fading out in innumerable tributary valleys and gulches reaching high up the flanks of the peaks and ridges.

Mt. Donaldson and its immediate topographic environment is typical of hundreds of such peaks. Its summit attains an altitude of

B. W. A. 7-61

5,100 feet at a distance of 3 miles east from the northerly end of Salmon Arm. The slopes, for the most part, are fairly uniform but some of the terrain on the southerly slopes above the 4,000-foot contour is, in places precipitous.

Siwash creek flows westerly across the southerly slopes of Donaldson and Copper creek flows northerly to Clowham lake across the north-easterly section of the area. Both these creeks flow through deeply-cut valleys. I am told that Copper creek flows through decidedly rugged terrain. This has the advantage, however, of exposing the rock formations and structures of the region for examination. The valley of Siwash creek is deeper and has a substantially lower gradient.

The principal influence of topography to a mining area is in its relation to matters pertaining to access and transportation. It is of importance to note, at this point, that the circumstances of topography are, to a very large extent, responsible for deferring exploration of this locality for so long a time. The area has, however, been completely covered by timber cruisers and considerable portions of the area have been surveyed for the precise locations of timber limits. Mineral Reference and timber maps covering this area are available. I believe that this and adjacent localities have been surveyed photographically.

ECONOMICS

CLIMATE: For all practical purposes climatic conditions in the Salmon Arm - Mt. Donaldson area may be considered as identical to those prevailing at Britannia Beach and the upper mine workings where large-scale copper mining and production operations have been continuously under way for half a century. To an established operation climatic conditions are quite as favorable in areas adjacent to Salmon Arm as at almost any other locality in the Province.

TIMBER: The whole Mt. Donaldson area was originally densely forested with the finest of commercial timber up to an altitude of about 3,500 feet. Above this horizon most of the tree growth is more or less scattered and dwarfed. Logging operations have been conducted in areas immediately adjacent to Salmon Arm, Clowham lake and in Siwash creek valley to a distance of about four miles from the sea. In earlier years, also, fires ravaged portions of the area. While, presumably, much of the area is forested it is probable that most of the valuable timber areas are now owned by logging concerns. Mineral Claims staked over such privately-owned terrain would have ownership only of the mineral rights. However there is sufficient timber in the area for all mining and construction requirements which, one way or another, can be made immediately and cheaply available to a mining operation. Furthermore all sizes of sawn timber and lumber for construction purposes can be landed on Salmon Arm at rock bottom prices.

WATER: There are two small lakes on the high, terraced slopes of Mt. Donaldson. These are Slippery Lake at elevation of 4,150 feet and Smithe Lake at elevation of 4,300 feet. Copper creek and its upper tributaries drain the NE slopes of Mt. Donaldson and Slippery creek, a tributary of Siwash creek, drains the southerly slopes of the mountain. Siwash creek has its origin in a small lake two or three miles to the east of the mouth of its tributary Slippery creek and both Siwash and Copper creeks have good

B. J. J. J.

all-year-round stream flows. From inspection of the maps and, particularly from verbal descriptions, it is obvious that there will be found abundant and conveniently accessible water for all possible requirements.

POWER: The writer has been informed that the B. C. Power Commission operates a hydro-electric plant which is situated at the head of Salmon Arm. This plant operates under a head of about 150 feet from the waters of Clowhom lake. Presumably power from this source is transmitted to the towns and settlements extending along the coast northwesterly from the entrance to Howe Sound. The writer is without information, at this time, as to whether there is available power from this source for a mine development operation.

In any event the larger matter of power is a problem for the future. At this time it seems reasonably clear that the preliminary exploratory work should be largely in the nature of diamond drilling. Equipment, fuel and other supplies for this work would be transported from Salmon Arm to the outcrop sites by helicopter. Should it later be found necessary to conduct extensive underground development through adits it may be found to be economical to install a diesel-driven compressor at the 4,000-foot horizon on or near Slippery creek, and to extend compressed air plastic pipe line to the adit sites. It would be idle to attempt to discuss this matter further at this time. It is sufficient to make it plain that relatively cheap power can be made available for the operation of this property either by diesel-electric plants on the shore of Salmon Arm or from hydro sources in the reasonable vicinity.

TRANSPORTATION: Steamers of the Union Steamship Co's fleet maintain regular service between Vancouver and Seechelt, a resort town about 45 miles distant. Here a mile-wide isthmus separates the strait of Georgia and Seechelt Inlet. From the northerly side of the portage the gas-boat distance to the head of Salmon Arm is about 25 miles. It is at this point that the hydro-electric plant of the B. C. Power Commission is located. The additional gas-boat distance from here to the mouth of Copper creek on Clowhom lake is between three and four miles.

If an important development and production operation should be established in this Mt. Donaldson area it, most likely, would radiate from the mouth of Siwash creek or some near-by location along the NE shore of Salmon Arm. Tug and barge service from Vancouver is readily available for the freighting of machinery and supplies to this shoreline and of mine and (or) mill products from the mine to the smelter at Tacoma. Transportation for a sizable operation would be reasonably comparable to that pertaining to Britannia Mines at Britannia Beach near the head of Howe Sound.

The most convenient and quickest method of transport between Vancouver and Salmon Arm is by sea-plane. The travelling time from Sea Island Air Port to the mouth of Siwash creek would be about one-half hour. For conducting preliminary exploratory work, including diamond drilling, helicopter transport between a base camp on the shore of Salmon Arm and the drill sites on the summit of Mt. Donaldson can be employed to considerable time and money saving advantage over any other available type of transport.

Transportation for freight to a suitable operating base on Salmon Arm can be made available almost immediately. Transportation on

B.W. Jones

the property can, in all probability, be arranged or provided for reasonable capital outlay.

There is a logging road of sorts which extends from Salmon Arm, following the course of Siwash creek, for a distance of four miles and to an altitude of 1,500 feet. I am told that this road can readily be extended up the tributary Slippery creek to about the 4,000-foot horizon. The earlier access route to the copper showings on Mt. Donaldson was by way of Clowhom lake and Copper creek. This route, though shorter, is much steeper and more rugged than the Siwash-Slippery creek one. Aerial photographs of this region can be obtained and it may be that a tractor route to the vicinity of Smithe and Slippery lakes will be found to be practical. Assuming the existence of really important orebodies there would appear to be nothing particularly difficult in regard to establishing transport facilities.

GENERAL: The proximity of Vancouver and the established transportation services between that City and Sechelt greatly simplifies the matter of transport to Salmon Arm vicinity. In some respects the matter of conducting exploration and development work - and, eventually, production operations - adjacent to the shore of Salmon Arm seem simpler and easier and, on the whole, less costly than was the case for corresponding facilities at Britannia Mines in the years prior to the first World War.

HISTORY

The first recorded discovery of copper-bearing outcrops on the higher slopes of Mt. Donaldson was made by Alexander Donaldson in 1874. News of this discovery - probably partly due to the exceptionally high-grade nature of the outcrop ores - appears to have occasioned some stir in mining circles. A brief general description of the discovery and the locality - presumably from second-hand information - is given by Dr. G. M. Dawson in the Reports of Progress for the year 1876-77. At this point it is interesting to note that this is the earliest recorded copper discovery on the B.C. coast. The Britannia deposits were not discovered until 1888 and little if any effort was made to explore these showings until 1898. The present operating organization, Britannia Mining and Smelting Company, came into existence as recently as 1908.

Even in the early '70s the Mt. Donaldson area was not a difficult region to penetrate; access to the head of Salmon Arm was probably almost as easy then as now. But the copper showings, though only three or four miles distant from the shoreline, are a mile high. Assuming a fair trail a man can readily make the climb to the summit and return the same day. If he carried only a light pack he would also be able to spend several hours at the summit doing prospecting work. However over a difficult trail and with a 60-pound pack to lug along this would not be possible for most men.

Dr. Dawson records that during the years 1877-83 the Mt. Donaldson claims were worked somewhat spasmodically with a view of developing the property rather than for the actual recovery of ore by hand-mining methods for shipment. In the late '70s the claims were acquired by the Howe Copper Mining Company of Victoria. Adits were driven at three levels by hand-mining methods. Excellent values in copper and silver are reported but the available descriptions are, for the most part, inadequate for

B. W. Dawson

imparting knowledge of average ore values and lode widths. A number of the claims were surveyed and Crown Granted and a surface lot, located at the mouth of Siwash creek, was acquired by the Company. It is stated in certain of the available records that a small quantity of bornite ore was shipped to Swansea during the mid or later '70s. Activities appear to have languished during the '80s and '90s. It is apparent that it had become plain to those who had intimate knowledge of the area that its development and exploitation was a major undertaking and would require really important capital. The region was not forgotten by a group of prospectors who had gained first-hand knowledge of the mineral showings. The Crown Granted claims were apparently kept in good standing through the payment of the annual taxes until, at least, after the year 1916. Doubtless numbers of locations owned by parties other than the Howe Copper Company were also kept in good standing for a time by the recording of assessment work.

In 1916 the property once owned by the Howe Copper organization was examined by R. C. Campbell-Johnson, M.E. of Vancouver. His report contains much useful general and geological information concerning the area but not a great deal concerning the earlier history of the locality.

In the Minister of Mines Report for 1922 Mr. Wm. M. Brewer, Gov't Resident Engineer, briefly reviews the earlier history of the property and operations. He lists the lot numbers of the Crown Granted claims from which it is inferred that the claims were still in good legal standing. He also mentions that the Cuprite Mining Company of North Yakima, Washington was the owner of six location mineral claims on which prospecting work had been conducted.

In the Minister of Mines Report for 1924 Mr. Brewer states that the prospector claim owners were doing little if any exploratory work but that they had, largely, adopted the habit of re-staking the claims each year. Mr. Brewer complained that, on this account, it was impossible for the authorities to keep track of either the claims or their ownership. He also comments on the difficulties which the claim owners have experienced in trying to interest capital in their holdings.

In the Minister of Mines Report for 1928, Mr. G. A. Clothier, M.E., who had succeeded Mr. Wm. M. Brewer as Resident Engineer for the District, mentions that a Company known as Pacific Copper Mines Ltd. was incorporated in October, 1928, with a capitalization of 4,000,000 shares of 25¢ par value. It is not clear whether this is a re-organization of the old Howe Copper Company or an entirely new organization. In any event, at this time the Crown Granted claims and surface lots appear to have been in good legal standing. Mr. Clothier did not personally visit the area but merely reviewed some of the older history and information.

At this time the writer of the present report or compilation has no further information concerning exploration activities in the Mt. Donaldson area. There appears to be no further mention of Pacific Copper Mines in subsequent Minister of Mines Reports. Once again it would appear to have been demonstrated that the proper exploration of the region would require important risk capital expenditure before there could be any certainty of a profitable production operation.

B.W.W. mcd

Meantime - since the original Alexander Donaldson discovery, many decades have slipped away. The first and second generations of prospectors have come and, for the most part, gone. Those who remain are no longer young. Throughout the years fishing and lumbering have flourished in the area. These industries, now, are, probably, at an all time high. But fishermen and loggers only infrequently have aptitude and liking for serious prospecting. Meantime, also, from quite lowly beginnings, Britannia has grown to be one of the important copper producers of the world with underground workings extending through some thousands of feet of length and depth and reaching far below sealevel. But the copper-bearing outcrops of Mt. Donaldson - the first recorded copper discovery on the B. C. Coast - remain practically as they were found in 1874 and, now, entirely outside the knowledge of all but a few of the older generation of prospectors.

GEOLOGY

GENERAL: This particular area of mountainous terrain has not yet been mapped geologically. It lies in the midst, and possibly along the main WNW-trending axis, of the great Coast Range batholith. Mt. Donaldson is about 16 miles northwesterly from the Britannia ore deposits and is in a relatively similar position geologically to that of the famous mine. But this statement, however, does not infer that identical formations and structural conditions characterize both areas. Reference is here made to Canadian Geological Survey Memoir 158 by Dr. H. T. James; also to the geological map of the Britannia area which accompanies this publication. In this Memoir the geological conditions of the Britannia area are described and discussed in detail. It is important to an understanding of the Mt. Donaldson region, however, that one have at least a general knowledge of the Britannia area and of certain similarities which may be common to both localities.

Very briefly - the Britannia deposits occur in a broad shear zone which traverses, largely, a roof-pendant of volcanic and sedimentary formations which have been up-turned and engulfed to great depth. Orebodies, for the most part, occur in the roof-pendant rocks but also, to a lesser extent, in the granitic host rocks.

The general geology of the Coast regions is described in numerous C.G.S. reports. The formations are considered to include varying types of Triassic volcanics and sedimentaries which have been very extensively intruded by granitic rocks of the Coast Range batholith. This great intrusion resulted in the up-lift of the entire west coast of the continent and the ore deposits throughout the length and breadth of the west coast mountains are considered to be related to the closing phases of the plutonic activity. It is a characteristic of the westerly slopes of the great up-lift that copper-bearing and magnetic iron deposits predominate.

LOCAL: Of the several engineers who have left written descriptions of the ore and vein occurrences of the Mt. Donaldson area, R. B. Harper, mining engineer for the B.C. Government, Josiah Jacques and R. C. Campbell-Johnson appear to have been the only ones who made first-hand or personal examinations of the region. We may be reasonably assured, however, that

R. W. D. M. C.

the information presented by the others was based on reliably-obtained reports. It is important also, I think, that mention should here be made that the 'roof-pendant' type of ore deposition was probably quite unrecognized at the time when the earlier reports were written. The most recent of these reports is that by Mr. Campbell-Johnson in 1916. This being the case it is reasonable to assume that the 'possible' favorable importance of volcanic and sedimentary rock occurring with the granitic rocks would not have been recognized. All three of the earlier engineers report the formation at the copper-bearing veins as 'granite'.

Campbell-Johnson, however, in his long rambling report, besides introducing considerable surprising geological comment, gives some descriptions which I think are of very considerable interest.

He states that within a width of 1,600 feet there are nine distinct and separate veins, presumably more or less parallel and varying in width from mere stringers to perhaps upwards of three feet. They appear to carry similar copper-bearing mineralization and can be traced considerable distances. It can be inferred, I think, that the intervening country or host rock is in part, or perhaps entirely, granodiorite.

He also describes the occurrence of pegmatite veins carrying muscovite and suggests that this mineral acted as a precipitant and as such was, in some degree, responsible for the mineralization. The occurrence of pegmatite is, of course, reasonable but it is not so easy to understand why both vein walls should be lined with muscovite. Perhaps shearing occurred in the pegmatites, along planes which were marked by heavy mica concentrations and the copper-bearing mineralization was introduced later.

Elsewhere in this report mention is made of granitic rocks having been altered to syenite and this, in turn, to quartzite. This is the only mention made of a sedimentary rock being in the neighborhood. It is reasonably obvious, I think, that this was a mistaken identification and that the quartzite was more likely really an aplite dyke. I think it is quite possible that volcanics and sedimentaries occur in this region and that they were not observed or identified partly because the possible significance of their presence was not realized.

Mr. Campbell-Johnson's report also indicates that there is fairly wide-spread disseminated copper mineralization, - this seems to occur over important areas and through at least 2,000 feet of vertical distance or altitude range. He states, for instance, that mineralization possibly continues from the 5,200-foot horizon to the 3,000-foot level. He also mentions a 100-foot quartz vein occurring in the steep wall of a high cliff with bornite-bearing talus strewn below.

The ore minerals mentioned by Campbell-Johnson are Bornite, covellite, Cuprite, molybdenite and cobalt bloom (erthrite, - a hydrated arsenide of cobalt) and possibly pyrite. The bornite ore apparently carries about 0.02 oz/t in gold and from 8.0 to 25.0 oz/t in silver. Doubtless there is also some malachite, azurite, chalcopyrite and possibly other copper minerals.

Although some of the foregoing discussion has emphasized the

B. W. W. M. J.

importance of roof-pendant structures involving the partial engulfing of Triassic and Lower Jurassic volcanics and sediments, accompanied by the development of shear structures as particularly 'favorable' conditions for the occurrence of orebodies it is, of course, quite obvious that these are not always essential attending circumstances for the deposition or occurrence of copper-bearing orebodies. Many of the large copper mines of the continent occur in granodiorite formations and associated with varying types of structures.

DISCUSSION

The early descriptions record that adits were driven on one or more of the several veins at three horizons. One of these is near the shore of Smithe lake. This has been driven as a drift on a vein for a distance of 80 feet. Mr. Sutherland informs me that he entered and fully inspected this adit during 1955. He describes the vein as being about the width of the drift; bornite occurs in irregular lenses and steaks more or less continuously for the full length of the working. He also confirms the micaceous walls and the host or enclosing rock as granitic or granodiorite. The walls and back of the working are plentifully stained with the green malachite and the details of structure somewhat masked by the oxide accumulations throughout the years since the drift was first opened. Campbell-Johnson refers to a 4-foot-wide open cut on a vein - doubtless there are numerous prospect workings most of which will likely be hidden by sloughing and vegetation.

It would be idle to attempt any discussion of possible or anticipated average metal values here. Such assay results as are available are given as appendices accompanying the present report. There appears to be no record or mention of any attempt to sample for the average metal content even of the 80-foot adit.

Pure bornite contains 63.3% of copper, chalcocite 79.8%, cuprite 88.9% and chalcopyrite only 34.5%. Obviously some of the samples the assays of which are quoted in old reports were of selected high-grade or pure copper minerals. The occurrence of these high-copper minerals in veins and veinlets enclosed either in granodiorite or pegmatite would seem to be unusual. It would be of interest to speculate as to whether this bornite is primary or secondary. It to be remembered, however, that when these ore deposits were formed there were many hundreds of feet of cover rocks which have since been eroded. The reported occurrence of a cobalt mineral - also of molybdenite - are matters of geological interest and may have commercial significance.

SUGGESTED PROCEEDURE

It is the firm belief of the writer that the information concerning the Mt. Donaldson area is such as to warrant confirmation by means of careful examination and preliminary exploration. To accomplish this effectively will require something in the nature of a small but carefully planned expedition. Probably the most effective and economical way of conducting this work would be to set up a small canvas base camp at the mouth of either Copper or Siwash creek. Probably this could best be effected by flying in a couple of men with the necessary equipment for establishing

C. W. Johnson

the base camp. There would then be assembled at this place light camping equipment adequate for the accomodation of three or four men for a period of a week or ten days. This would then be air-lifted to a site, possibly in the vicinity of Smithe lake, by helicopter. An engineer with from two to four assistants would then be flown in. If the preliminary impressions appeared favorable two of these men would be employed in staking additional claims to blanket as much of the area as might seem necessary. The examination would be conducted by the engineer with one or two assistants. The actual preliminary examination would probably require about one week's time. There could, of course, be variations from this procedure; the important thing to keep in mind is that the interested parties who are conducting the examination must be prepared to stake such additional claims as may seem desirable or warranted, quickly, else risk having considerable undesirable company rather promptly.

SUMMARY AND CONCLUSION

The area with which this report is concerned and which is described in numbers of old reports, is within a half-hour's flying time by sea-plane from Vancouver's Sea Island airport. External circumstances attending the effecting of the necessary exploration and early development work are, in many ways, similar to those attending similar operations conducted at Britannia Mines shortly before the first World War. Assuming that important ore deposits are proved to occur in this area, development, construction and operating procedures can be conducted with very favorable economy.

The Mt. Donaldson area is known to be largely underlain by granodiorite or its variants. Probably the plutonic rocks here, as in many other Coast Range localities, are of a composite character and, in age, date through much of the Middle Jurassic period. Supporting this thought are the described occurrences of pegmatites. High-grade copper minerals carrying low gold and fair silver values occur and accompanying them are unknown amounts of molybdenite and, possibly, some cobalt minerals. The old reports also suggest that copper mineralization occurs over a substantial area - possibly as much as two square miles or more. The earlier operators were interested particularly, if not exclusively, in the high-grade nature of certain of the outcrop ores. There was then little interest in low-grade or more or less disseminated mineralization. Because of the favorable economics which would attend the establishment of a good-sized copper-production operation at this place, the general known geology of the region, and particularly, from that which has been written by observers who we must believe were competent in their time, I think the area well warrants careful examination and preliminary exploration attention.

In respect to the amount of capital required, it should, I believe, be expected that preliminary investigations, including examination and initial diamond drilling, would require a minimum of \$25,000. In the event that the results of such operations proved 'favorable' an additional \$25,000 should be made available to confirm and extend the earlier work. The larger work program would be expected to not only provide an idea as to the possible magnitude of the deposits but the type of development seemingly most desirable, the probable or precise locations for the mine entries, the routes and destinations of vehicular transport on claims and the most suitable for camps on the sites

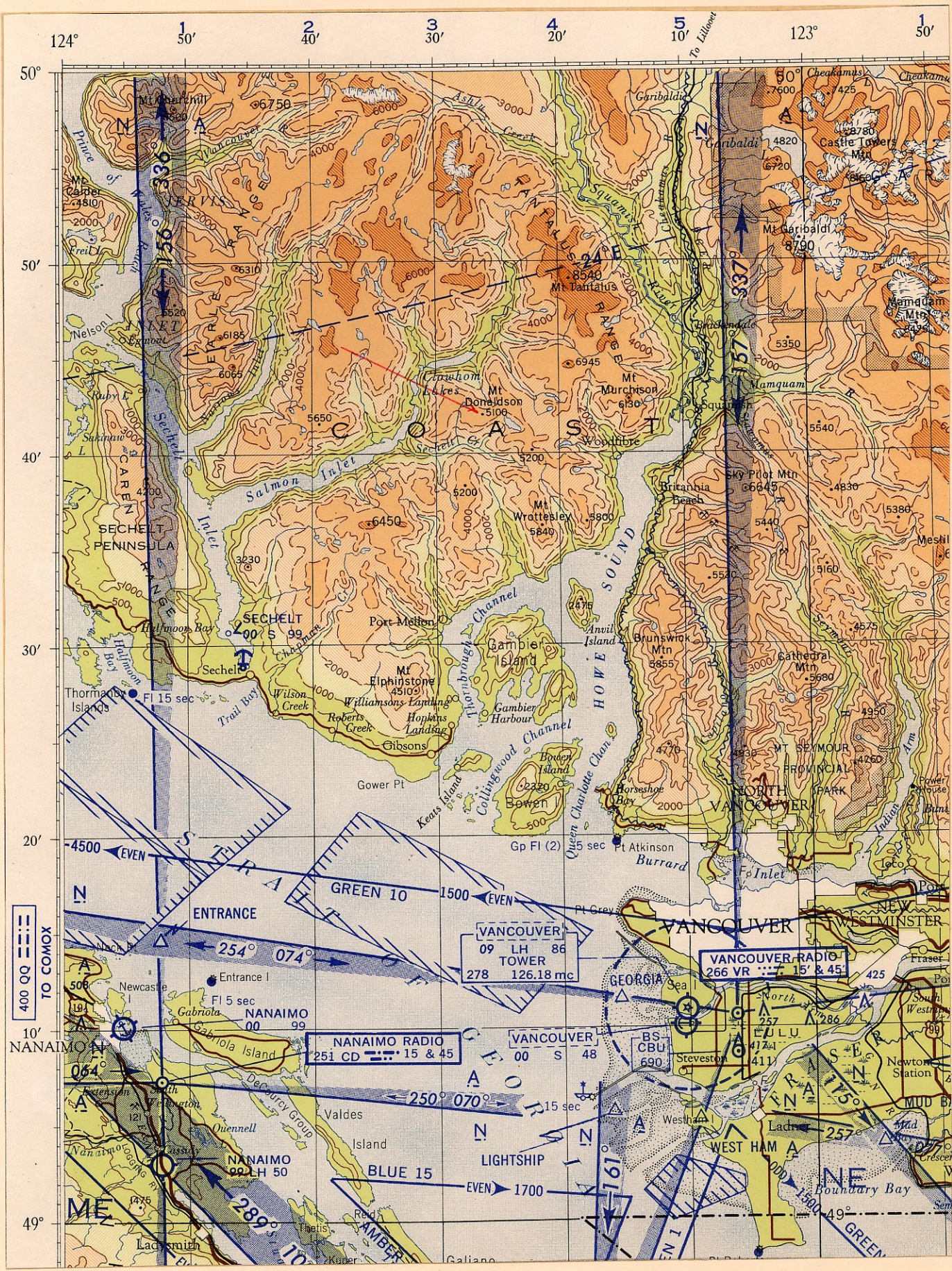
B. W. J. 370

property. It is, of course, obvious that the whole set-up including base camp, truck roads, power source and installations, mine openings, extent of known or suspected ore masses and their locations, and a host of other related details must be known or decided upon before the larger plans for a possible important mining operation can be properly made.

Respectfully Submitted

B.W.W. Jorgall P. Eng.,
Consulting Mining Engineer.

416 Bank of Nova Scotia Bldg.,
Vancouver, B.C.,
March 1st, 1956.



APPENDICES

PRELIMINARY REPORT
on a
PORTION OF THE MAIN COAST
of
BRITISH COLUMBIA AND ADJACENT ISLANDS
Included by
NEW WESTMINSTER AND NANAIMO DISTRICTS
By O. E. Leroy
OTTAWA 1908

SEECHELT INLET

GRANITE MOUNTAIN COPPER COMPANY:

This property is situated about three miles inland from the east side of the head of Salmon Arm and is at an elevation of 4,500 feet above the sea. It was first located in 1878, and was reported on about that time by Mr. R. B. Harper for the Provincial Government. The original locations have recently been increased to eighteen, which cover all the known outcrops on and around Mount Donaldson.

The country rock is granite, and the ore occurs in fissure veins. They are nine in number, one of which has been traced along the strike for 300 feet. The veins are parallel, and strike east and west with a dip of 65° to the north. On the surface they vary in width from three to twenty-five inches. The extreme veins are 1,600 feet from each other. Five hundred feet below the main outcrops a tunnel was driven on the main vein for thirty feet. The vein is three and three-quarter feet wide on the roof and four and a sixth feet on the floor. The ore is massive bornite with a little chalcocite and cuprite in quartz gangue. An assay of massive ore made by Mr. J. O'Sullivan gave 0.4 oz of gold, 35 oz of silver and 53% (wet) of copper.

The property is about sixty-four miles from Vancouver by way of Seechelt. The country is very rugged, but if the veins on development prove extensive ore bodies, an aerial tram line could be built from the mine to Salmon Arm whence the transportation to the smelter offers no difficulties.

From
MINISTER OF MINES FOR BRITISH COLUMBIA
REPORT FOR YEAR 1876

A discovery of silver and copper has been made on Salmon Arm, Jervis Inlet which, to judge from the report hereto annexed, promises to be of considerable value to the Province. Veins of great richness have been discovered in this vicinity.

An important discovery of copper was made about two years ago on Salmon Arm, a branch of Jervis Inlet, by Mr. Alexander Donaldson. Competent judges have declared the lode to be a true fissure vein for the following reasons: First the veinstone does not lie parallel to the cleavage of the surrounding rocks. Second - the blossom of quartz on the surface or hat of the lode indicates that the matter has been injected into the fissure, and not separated from the mass of adjacent formation by chemical action as in the case of a separated vein; also the smoothness of the walls showing attrition by injection of quartz. The profile of the lode can be examined to a depth of 200 feet from the surface, as it crops out in the face of a cliff, having doubtless been laid bare by some convulsion of nature. The lead is thus clearly defined from the base of the precipice to the top and may still farther traced along the surface of the ground for at least a mile from where it first makes its appearance. The vein is wedge-shaped, being thickest at its base, where the ore is also the richest. A Company has been organized for the purpose of working this extensive deposit, and a test tunnel has been run into the hill for about 80 feet on the vein. At the end of the tunnel the seam or vein of mineral is 3 feet 9 inches at the roof and 4 feet 2 inches at the base. Assays of the ore show that it contains 61% copper and 91 ounces silver to the ton.

The mine is situated about two and one-half miles from the shore of the inlet, and the facilities for shipping the ore are excellent. The water is deep enough along side the rocks to float a vessel of 4,000 tons.

Experienced quartz miners from California, Nevada and Cornwall have pronounced the mine to be the richest they have ever seen, the ore being so easily got out, and wood for smelting purposes being plentiful and convenient.

There is also good water power on the ground, sufficient to run a mill of any capacity.

From
MINISTER OF MINES FOR BRITISH COLUMBIA
REPORT FOR YEAR 1877

To The Honorable,
The Minister of Mines:

Sir:

I have the honor to inform you that, in pursuance of instructions received by me, I proceeded to visit and inspect the Howe Sound Copper and Silver Mine, and beg to report as follows:

In consequence of a considerable depth of snow on the summit of the mountain where the mine is situated, I was not able to follow the lode continuously for any great distance, but on the south-east side there was about 300 feet of the lode exposed. I examined it and found it to be about two and a half feet wide, running nearly east and west. The lode, which I pronounce to be a true fissure vein, has a perpendicular footwall. There are stringers farther south which, at a lower level, will run into the lode.

The ore is of a rich character, made up of what are known as peacock and grey ore and oxide of copper. It carries also a large percentage of silver. It is the richest ore of this character I have seen on this coast or in England.

The formation is granite. In Cornwall, England, the richest copper mines are in granite. In Nevada the richest silver mines, with the exception of the Comstock, are in granite. I firmly believe that the lode will, at great depth from the surface, prove to be richer in silver than in copper. I can, with confidence, recommend it to mining capitalists.

I beg to inform you that there is no road to this mine, which, is in consequence, at present difficult of access. I would recommend that a competent person be sent to examine the country between the mine and the salt water, with a view of laying out a road in the most eligible location. Not only may the mine I have made particular reference to be thus opened but the ground on the east and west may be worked in time. I believe, in time, the country between Howe Sound and Jervis Inlet will be a great mining district.

I have etc. etc.

(Signed) R. B. Harper,
Government Mining Engineer.

The accompanying report to the Minister of Mines received from Mr. Harper, the Gov't M.E. after a personal inspection of the Howe Sound Copper and Silver Mine not only pronounces the lode to be a true fissure vein but states that it is the richest ore of its character which he has ever seen on this Coast or in England. Mr Harper's belief that the country between Howe Sound and Jervis Inlet will in time become a great mining district is well worthy of attentive consideration.

From
MINISTER OF MINES FOR BRITISH COLUMBIA
REPORT FOR YEAR 1917
By Wm. M. Brewer, - Gov't Resident Mining Engineer

Dr. G. M. Dawson, in Reports of Progress for 1876-77, refers to discovery of copper in the mountains: "The most promising locality at present known is situated in the mountains between Howe Sound and Jervis Inlet at a height of 3,000 feet above the sea. Very fine specimens of purple copper ore associated with mica and molybdenite and brought from this place which is now in course of development. The country rock is granite or diorite of the Cascade crystalline series".

In Annual Report Vol. lll, Part ll, of the Geological Survey for 1877-78, Dr Dawson again refers to the occurrence of copper in this area as follows: "In the vicinity of the Coast the copper deposit which has received most notice is situated near the head of Salmon Arm or Jervis Inlet and between that Inlet and Howe Sound. This is owned by the Howe Copper Company. The ore is chiefly bornite or purple copper ore and the deposit is not far from the coast but at an elevation of 3,000 feet above sea level. It was discovered about 1874 and was worked at intervals between 1877 and 1883 though rather with the view of developing the property than the actual extraction of the ore for shipment. Three levels have been driven on veins which are reported to be from 2' 6" to 3' 6" in width. Assays have shown 50 ozs. silver and 58% copper. An assay of an average specimen in the laboratory of the Geological Survey showed 40% copper. The veins traverse granitic rocks like those generally met with in the Coast Ranges".

The above is taken from Mr. Brewer's 1917 report. Mr. Brewer states that being unable to find a guide he did not, himself, visit the property.

From
MINISTER OF MINES FOR BRITISH COLUMBIA
REPORT FOR YEAR 1922
By Wm. M. Brewer,- Gov't Resident Mining Engineer

The Salmon Arm section of Seechelt Inlet has been receiving some attention from prospectors during the last year but all attempts to extend development work were badly handicapped because of forest fires and the high elevation at which the mineral has been found. In the early '70s a Group of eight mineral claims was staked by old-time prospectors and later acquired by the Howe Mining Company Ltd.. These mineral claims were Crown Granted and are known today as Lots 353, 421, 422, 423, 424, 452 and 454.

In the same vicinity the Cuprite Mining Company of North Yakima, Washington, owns six mineral claims on which some prospecting work has been done

From
MINISTER OF MINES FOR BRITISH COLUMBIA
REPORT FOR YEAR 1924
By Wm. M. Brewer,- Gov't Resident Mining Engineer

The only activity in the mining industry in the Jervis and Seechelt Inlet sections during 1924 has been assessment work done by Sauson and Associates near the head of Narrows Arm and some surveying in the vicinity of Clowhom lake where the old Howe Mining Company operated a prospect from which a limited quantity of bornite-copper ore was shipped to Swansea about 1875.

The territory near the heads of Inlets in this section of the Vancouver Mining Division is so difficult for prospectors to explore that but very few have attempted the task and most of these have been discouraged because they could not interest the representatives of capital in the location. Consequently the temptation to re-stake mineral claims every year instead of doing annual assessment work has been too great to be withstood with the result that stagnation is the order of the day and the names of mineral claims being changed annually makes it very difficult to keep track of either the claims or the owners.

From
MINISTER OF MINES FOR BRITISH COLUMBIA
REPORT FOR YEAR 1928
By Geo. A. Clothier, - Gov't Resident Mining Engineer

PACIFIC COPPER MINES LIMITED:

This Company was incorporated in October 1928 with a capitalization of \$1,000,000 divided into 4,000,000 shares at 25¢ each. The holdings consist of two old Crown Granted Lots of land, - No. 353 containing 320 acres and 354 containing 40 acres granted to Alexander Donaldson in 1877. The remainder of 36 full claims are 3 fractional claims were staked in 1928 around the old Crown Grant. The original land was the property of Howe Mining Company registered in British Columbia in 1877.

The claims are situated at the head of Salmon Arm at an elevation of about 4,500 feet and about $2\frac{1}{2}$ miles from tidewater. I have not examined the property yet but I gather from old reports that the minerals are chalcopyrite and high-grade copper carrying good silver values in quartz veins up to $2\frac{1}{2}$ feet in width in Coast Range granodiorite. The only definite work mentioned is a X-cut tunnel 30 feet long which cuts a vein showing it to be nearly 4 feet wide at that point. No widths of ore sampled are given in any of the old reports and recent stock advertizing matter, though giving a number of high assays, are equally obscure regarding the widths of any of the ore. One is left to conclude that there may not be appreciable width or length of ore and that the samples should probably be called specimens.

The property no doubt is a fair prospect, requiring a trail, equipment and much development before it can be classed as a possible shipper.

REPORT BY JOSIAH JAUQUES
February 27th, 1881

The mine is situated between Howe Sound and Jervis Inlet at an altitude of 4,500 feet. The distance to Howe Sound by way of the valley shown on the chart is about 12 miles, easy grade - to Salmon Arm $2\frac{1}{2}$ or 3 miles, very steep, but covered with earth and well timbered. This I think will be the proper outlet for the mine by means of wire rope. It can be carried in a straight line - from No. 7 vein to divide it would rise about 1,000 feet - descent to Salmon Arm 4,800 feet. A brake would be all the machinery required to operate the mine. Standing by the N.W. stake, 4,700 feet, and looking around, it looks like an immense quarry mostly bare granite, very much decomposed, - in places a patch of heather and scrubby hemlock here and there. There is plenty of good timber below No. 7 tunnel. All along the mountain there are a number of small veins crossing ridges running east and west, dipping north about 65 degrees. There are also a number of elvans from two to forty feet wide running parallel with the veins but have a little more dip. I should say they were formed a little before the mineral veins, for where No. 5 vein, 27 inches wide, has come in contact with elvan (2 feet wide) it has burnt it into cement. The side of the mountain, looking southeast is very steep, - it is cut up by 9 or 10 ravines each of them containing one or more mineral veins, from one to twenty-seven inches wide, each one having a selvage of mica from one-half inch to three inches thick on each wall. There does not appear to have been any sliding motion on the walls although they are very smooth. If there is a hump on one wall there is a depression on opposite wall to correspond with it. In No. 5 and No. 7 tunnels we have found several balls as smooth and round as cannon balls the inside being full of fine yellow crystals. The 3' 6" vein cannot be traced on opposite side of lake although it is only 150 yards across. There is a belt of porphyry 600 feet wide on north side of vein which does not show itself on opposite side of lake. I think it is an overlaying bed of granite having slid off where small veins are exposed. There are large bodies of quartz - 200 feet across - on north side of vein - also on top 200 feet above tunnel. This vein can be reached 500 feet lower by driving from No. 7 tunnel toward which it is dipping where I think a large body of ore will be found. The lowest level that can be driven without pumping is 2,300 feet below the present tunnel. The direction of mineral belt is NW and SE in which direction ore has been picked up over a distance of from 2 to 3 miles. The country rock from Burrard Inlet is granite of different kinds. On the mountain it is very friable but toward the north of Salmon Arm it is hard and solid with dykes of trap rock running through it, which increases in numbers as you near Texada Island which is principally trap rock. Slate rock commences at head of Narrows Arm 12 miles northwest of the mine.

----- COPY -----

NOTES RE ABOVE REPORT: by B. W. W. McD., - The report by Josiah Jaques is one of the most interesting available. Its writer may have been a foreman. Details are given which are not mentioned elsewhere. The geological descriptions may be somewhat unrealistic but, in general, he has noted unusual facts. The Trap rock of Texada Island is, however, limestone. The burnt contact between vein and dyke is probably a chilled dyke margin and so on but this report is considered to be of unusual descriptive interest.

Report by
RONALD CAMPBELL CAMPBELL-JOHNSON
MINING AND METALLURGICAL ENGINEER
Vancouver, British Columbia,
October 27th, 1916

COPY

COPY

To - Messrs. Martin & Shannon,
Flack Block, Hastings Street,
Vancouver, B.C.;

Sirs:

Herewith I beg to hand you the following Mining Report upon your Group of Mineral Claims, situated on both opposite slopes of the mountain Ranges forming Copper valley. down whose center flows Copper creek, passing into Clowhom lake.

This portion of the country lies in the Vancouver Mining Division of the Province of British Columbia, in the Dominion of Canada.

PREAMBLE: Mr. William Shannon of your firm with myself left Vancouver on September 30th, ultimo by steamer Santa Maria for Seechelt, a settlement about forty (40) miles away westerly on the Strait of Georgia, near the south end of Jervis Inlet. From this village is a portage by wagon road or (1,100 yards) from the strait of Georgia across the neck of Seechelt Peninsula to Porpoise Bay on Seechelt Inlet, a southern continuation of Jervis Inlet. This portage saves a detour by sea around the coast of nearly sixty (60) miles. From Porpoise Bay we went by boat twenty-two (22) miles in a northeasterly course up Salmon Arm to its farthest limit. Here at the head of the Arm is a direct waterfall on one hundred and fifty (150) feet, pouring from lower Clowhom Lake, a body of deep water extending for over a mile in length down to sea level. This lower lake is connected with the main Clowhom through a shallow river having rapids in its course, in all, a mile long. Clowhom lake itself is a noble body of deep water stretching nearly five miles in length. Bear creek from the west comes into Clowhom river below the main lake. The Upper Clowhom river enters at the head of the lake, while Copper creek from the east empties itself about a mile lower down.

Passing up Copper creek is an embryo trail, consuming in a comparatively short distance an elevation of 3,750 feet, to a cabin on the mountain side, which we made our headquarters, while working around at that level and all higher points. Later we dropped back to the creek bed at an elevation of 1,300 feet. Along Copper creek were plainly exposed the rocks in their nakedness, due to precipitous slopes, and offering splendid cross sections of the geology of the mountain sides forming the south bank of the creek, except for a talus of broken rock debris toward the foot of the bluffs.

Ultimately we returned to Vancouver, arriving on October 11th instant, having been absent twelve (12) days in all.

Copious photographs of the actual ground being reported on, and the environment of the claims described, accompany this report to make plainer the topography of the land. A key map of this district, with a plan of the property are also attached to this report to explain clearly the extent of the mineral ground held.

DESCRIPTION OF MINERAL GROUP EXAMINED:

Between Mounts Donaldson and Sayward, both soaring in height to 6,000 feet above sea level, passing partly over the dividing ridge facing south towards Siwash creek, but for the most part going down the slope facing north toward Copper creek, where lies several surveyed and Crown Granted lots of land, carrying certain mineral rights from the Provincial Government, now held by Howe Mining Company Limited.

The official recorded numbers of these Government Lots are as follows: L 353, 421, 422, 423, 485, 452, 453, 454 and another lot 354, covering the mouth of Siwash creek, where it enters Salmon Arm, reported to contain forty (40) acres in extent.

The area and titles of these lots, though assured to be in good standing, have not yet been looked into the Government records or confirmed. Vide attached plan showing the connection of one and all lots to each other with also the adjoining mineral claims, lately located to hold the extended deep levels of ore in great depth. These necessary legal details of titles and acreages will shortly be obtained in full.

adjoining these surveyed lots to the north were staked on this trip twelve (12) mineral claims (vide map), supposed to carry the full sized area of fifty-two (52) acres approximately each. The object in view was to secure at great depth, namely 4,900 feet below the outcrop on the ridge, without the necessity of sinking expensive shafts to the exposed deeper levels of all ore exposed, and to cover all these exposures and tunnel sites, not already held by the surveyed lots. If a favorable bond or lease could be agreed on over the "Howe Mining Company's", in conjunction with these deep levels secured as well, then a very extensive mineral area of many thousand acres, permitting a long working life ahead, would be secured as a most valuable asset.

Without such a bond, on the other hand, a large extra area of mineral ground across Copper creek, completely holding advantageously all of both slopes a long way up in a north direction, could be held in any case, to allow of successful mining for the next fifty years or more to come. The areas and titles of claims already staked are now being consummated, and a survey next year will demonstrate their superficial and component elevations.

CHARACTER OF THE ORE:

The character of the ore so far exposed is bornite in lenses, a variety of copper ore. Its chemical formula is $Cu_5 Fe S_4$. By reading the attached certificates of assays of the five hand samples taken of shipping ore, but representing no tonnage in any way as yet blocked out, from the different locations marked on the map, yet proving mineralization from the dividing ridges between Mts. Donaldson and Sayward, by aneroid readings 5,200 feet here above sea level to 3,000 feet down the slope to Copper creek, by a shown width of area amounting to at least a mile across laterally, fissured by already opened eight known veins. The samples vary in copper contents from 51% to 64%, an abnormally rich tenor of copper averaging, from the five assays given, 59%. The gold content of 40¢ per ton is constant, corresponding to surrounding mines, while in bulk when concentrated in the furnace into blister copper anodes of 99% copper tenor, will help towards

defraying the fixed charges to be deducted from the cost of production.

The silver contents vary from 9.7 oz/ton to 27.75 oz/ton, averaging among the five samples taken nearly 20 ounces per ton.

The pro rata between copper and silver percentages in ounces cannot yet be correctly ascertained, till the real carrier of the silver becomes known, and the effects in weathering or surface influences are overcome by driving the tunnels deeper into the mountain.

The exact commercial value of the ore is carried out in extenso from the assay certificates under the heading of "Average Values". Near Mt. Donaldson, high up on the ridge, the metal molybdenum occurs as a sulphide (molybdenite) among the ore; cuprite, oxidized from metallic copper shows extensively over the surface of the rocks; some rose cobalt bloom (oxide) is in evidence also. Large quartz prismatic crystals, small tourmalines, black muscovite (potash mica) and other forms of crystallization occur. The general characteristics of the pegmatite dykes in this granite and other accompanying signs so much resemble the occurrence of tin in Cornwall and elsewhere, that a constant watch should be kept for it here, by frequent testing in the assay laboratory. Only more work will prove whether molybdenum exists in commercial quantities on this property. The occurrence of copper ore is a replacement of muscovite by copper, since both the hanging and foot walls carry a considerable seam of small plates of mica along the flanks of the pegmatite dykes, cutting the normal country rock, this consisting of micaceous granite. These pegmatite dykes are from a few inches as bands to over a hundred (100) feet in width. The ore occurrence will again be technically discussed under the heading of geology.

TREATMENT OF THE ORE:

The present lenses of ore exposed are so rich in tenor in copper, that poorer ore carrying more quartz, iron or lime, will have to be used to flux the pure bornite in reverberatory furnaces, burning pulverized coal dust as fuel, in the up-to-date economical manner. It seems hardly probable that chalcopyrite, the lower grade of usual copper ore will show itself here in the granite, so that siliceous and less concentrated ores will be simple to lay down, when ore in bulk is later blocked out in quantity to justify the erection of a metallurgical plant to treat, on the spot, the ore from this mine. Custom smelters will always offer very advantageous terms of treatment, in order to obtain rich bornite ores, and obtain blister copper high in gold and silver, to offset the cost of electrical refining per lb. on the copper.

SITUATION OF MINE AND TRANSPORTATION:

The property lies in longitude 123-30', west of Greenwich, by latitude 49-45' north of the equator. The magnetic variation of the compass is 25-15' east of astronomical true north. As the mine is near deep-sea water, carriage of ore or refined metals out from the mine, and supplies in, present no difficulties to interfere with the individual control of freight rates to all parts. As shown on the key map, when travelling by the round-about route traversed, the mine is only seventy (70) miles westerly from Vancouver City, while much less as the crow flies. Heavy material can be brought to the head of Salmon Arm without breaking bulk by ship or scow through Jervis inlet and down Seechelt inlet and up to the head of Salmon Arm. From the mine to the lake, and from the lake to salt water offers no

engineering or expensive difficulties to overcome, the distance from the mouth of Copper creek down the lakes being, roughly, six miles.

ACREAGE: By the map the following appears to be the acreage of the Lots held by Howe Mining Company Limited:

Lot	353	-----	320 Acres
"	422	-----	320 "
"	421	-----	80 "
"	454	-----	40 "
"	423	-----	120 "
"	453	-----	200 "
"	425	-----	240 "
"	452	-----	160 "
"	354	-----	40
Total Acres			1,520 "

Twelve claims located represent 600 acres with more ground that ought to be secured to cover strikes and dips or ore-bearing fissures exposed.

CLIMATE: According to the elevations above sea level will snow remain the longest. By deep-level tunnels from Copper creek the mine can be worked and shipments made throughout the entire year. Surface prospecting on the higher levels has to be carried out within certain summer months. The snow-fall in British Columbia is always heavy around the 4,000-foot horizon.

TIMBER: Timber licenses surveyed and shown on the Government maps cover some of the mineral claims located. These circumstances, however, do not tie up immediate mining facilities, for all the mineral claims in the Province have prior rights, and can force arbitration over timber and pasture land, now too close to habitation. The lots surveyed acquired all base-metal rights, timber and farm over all at the period of their particular issue. Dimension timbers, where required, can be brought in from local sawmills. Cedar, both yellow and red, is plentiful, and mining timbers cover much of the ground.

WATER SUPPLY AND POWER: Government owned and controlled hydro power is now available at Clowhom Falls at the head of Salmon Arm, three miles distant from the mine.

SMELTER SITE: There are level sites that at present can be secured on the delta of Copper creek, close to where it enters Clowhom lake, an extensive are at the head of Clowhom lake, which is the most suitable location; and others also on tidewater at Paddy Hatt's ranch, or near the mouth of Siwash creek. That both upper and lower sites should be secured in readiness, is essential to the future of this proposed large mining enterprise. For on such, not only to erect concentrators, smelting and refining works required to convert the ore mined into commercial products, but also for safety's sake, where to place a healthy dwelling community for all the mine workers as well as their families. In a short time only deep-level working tunnels will be driven in from near the shore of the lake, which will tap and bring out the entire mineral bodies held, but furthermore will be necessary to protect any bunkhouses high up in the mountains from snowslides, and to save

the unnecessary expense of transporting large amounts of supplies up the adverse mountain grades to feed the large bodies of workers.

COMMUNICATION AND TRANSPORTATION: As to facilities generally in vogue to work mines in most districts, these surrounding this property to aid cheap communication and transportation are certainly comparatively favorable. The one fact of being able to navigate ocean-going steamer to the head of Salmon Arm, and to be able to regulate one's own freight rates with outside points, is in itself an important item of procuring cheap working costs. Ultimately some narrow-gauged railway, tramway or motor service or a well-built wagon road will be constructed to avoid the present six miles of lake portage from tidewater to the smelter site. As the whole distance is not so far, the expense of installing such a means of conveyance will not be excessive.

The mine itself from the smelter site, as mentioned above, will be tapped by tunnels. For the present, temporary trails, roads and wire-rope tramways are not too costly an outlay, as to stop a payment of large dividends.

TOPOGRAPHY: Topography or the lie of the surface conditions surrounding any mine, dictates principally the system of mining to be installed and aid or otherwise very seriously the cheapness of production. In this case the country between the head of Salmon Arm and Howe Sound is a series of precipitous mountain peaks, mostly snow-capped, stretching one behind the other at high elevations all the way across. The photos given with this report make their description very evident. In the immediate neighborhood of this mine especially the creek beds at great depths of perhaps five thousand feet towards their outlets, intersect the mountain chains and spurs of the Coast Range whose general trend follows the shoreline of the Pacific Coast, here namely N 20° W. The fissures, now constituting the mineral zones when sheared through the contraction of the batholiths in cooling, occupy the cleavage planes going easterly and westerly along the lines of weakness created. The creeks radiate from the summit of the high peaks on their several ways, forming the watersheds, to the ocean, and so afford splendid geological cross-section to view the incident of the ore occurrences, while offering great opportunity to drive in tunnels directly in pay material all the way. From the summits of Mts. Donaldson and Sayward reaching about 6,000 feet high, and the bed of Copper Creek 5,000 feet lower are persistently exposed the quartz fissure veins carrying the ore at frequent intervals apart laterally, while closing in gradually to the main trunk vein, one seam on the June and Mary claims being over 100 feet across. This outcropping allows tunnels to be started on the veins direct at depth and the ore therefrom to be conveyed down the creek beds by ropeway haulage. The topography here by its natural conditions obviates the outlay of immense sums of capital to obtain the same results in deep development already accomplished naturally.

GEOLOGY: To intelligently grasp the successful possibilities of any prospective mine, then the science of geology must be minutely applied, especially as to how the actual ore itself came into the place it occurs today. After piecing these self-evident facts together, the future development becomes questions of an economic nature and its success is sure, waiting to be proven only by steady mining. The granites in this case belong to the batholiths (deep seated eruptive rocks) of the Jurassic period in geology, which have uplifted the massive Coast Range, forming the Cordillera of these two great American continents. These plutonic magmas (residium froma fluid) were very extensive,

and while forcing their way up from their original sphere deep down, by their violent action upcast the formerly stratified sedimentary layers, till then forming locally the earth's crust. These older strata belonged to the submarine Devonian - Carboniferous era, consisting of argillites, sandstone, limestones and umbro slates. The physical reaction of the heated rocks as they pressed against the cold ones, caused the condensation of minerals and quartz-bearing fluids all along the contact of these two formations, at the same time transmuting into schistose structure the older rocks along the juncture, namely the superimposed sedimentaries. As the granites slowly cooled, so contracting, they cracked and fissured along constant inclined planes, these fissures acting as open channels to accumulate and concentrate the individual constituents of the whole granite masses, as first bands of feldspar, then crystallized mica, and finally as at present the quartz, each one in succession substituting itself for the other along the crevices, and increasing the size of the fissure by replacement of the granite hanging and foot walls with its own composition, to permit the copper and other ores to precipitate as mineral zones, contemporary with the cooling processes, keeping the solutions at a lower specific gravity. These minerals were derived partly by segregation from the magma, and mostly through their ascension in solution along these open channels. The vegetable and carbonaceous matter, contained in the sedimentary rocks, actively aided sulphur with iron and copper, as chalcopyrite ($Cu Fe S_2$) to especially precipitate along the contacts. In the lower granites, in this case principally of a micaceous kind, the copper ore shows less sulphur and iron in their composition, having deposited as bornite ($Cu_5 Fe S_4$). Here the foot and hanging walls of the pegmatite dyke fillings, the seat of the ore lenses, are both indiscriminately lined with a substantial thickness of muscovite (potash mica), which again succeeded in dislodging other different mineral solutions in priority as the stored up magnetism of the earth's crust varied in intensity to aid in dissolving the separate chemical ingredients.

The siliceous solutions condensed into irregular masses of quartz dipping in all ways, and without normal trend, as seen around the summit of Mt. Donaldson, and along the shores under the blacksmith's forge of the small lake close by, where an eighty-foot tunnel has been driven as a prospect hole, without convincing results should the deeper levels on Copper creek exposing the normal northerly dip, with easterly and westerly strike being ignored.

Under the apex of the mountain, having only a downward course left to it to pursue, the excess of quartz solution has turned the micaceous granite into a siliceous syenite, shading into a quartzite, and spotted throughout indiscriminately with splashes of minerals. As a descent down the mountain is made the contacts of the two periods of rocks, then the granite remains normal, as a micaceous variety.

These glaciers cut out deep valleys for creek beds and fjords such as Salmon Arm, Jervis Inlet and many others. These deep gullies have conveniently exposed the quartz fissure veins in the granite to a depth of over 5,000 feet, thereby saving the expenditure of a large outlay of money in sinking prospect shafts. The slopes of these exposed valleys show no change in the granite formation down below sea level, nor any termination of the fissure veins in their normal regular courses, but rather plainly demonstrates how these same fissures lower down must come together, and unite, several into one larger one below the mountain peaks.

The outcrops of these fissures having been so long exposed to

the weather, as ice, snow or rain, with expansion and contraction owing to heat and cold in succession, have had the minerals leached out from them on the surface, and also underground where decomposition has penetrated, but tunnels driven in have soon exposed ore while the fissures widened, with, however, no decrease in copper tenor as depth increases. The assay sheets show that the deepest point already reached in the No. 5 sample, is higher in copper contents, being over 3,000 feet below outcrops on the divide exemplified by samples 2 and 4.

At Khutze Inlet, Gribble Island, Texada Island and along the Coast in continuation of similar granite formation, large extensive bodies of ore have been blocked out by steady development. The fissures in this locality are very persistent in length laterally extending in unbroken lines from valley to valley.

The pro rata proportions between the copper contents compared with the gold and silver values alone so far determined from only outcrops is not yet discernable. However, it appears that it is not the copper that carries these precious metals but that they rather depend on the amount of iron and sulphur present. The further exploration work, deep into the quartz fissures by means of tunnels will open bodies of commercial ore is a justifiable conclusion from local evidence acquired over depth and lateral distances, which show the existence of copper freely at points far from one another, and also because development along the Coast has absolutely demonstrated the truth of this surmise.

WORK ALREADY ACCOMPLISHED: As active mining development is intelligently continued by skilled mining engineers in any district, the geological results ascertained by their individual work is pro bono publico, and the conclusions arrived at gives their conferes an intimate insight into the peculiarities of the rock and mineral formation of that district, concerning fissure veins and their mineral contents, normal strikes and trends, dips, spurs and necessary details, which have to be learnt to plan the future development and commercial workings of a mine, and to obtain such knowledge at first hand requires hard cash put into the property. The engineers who first opened the ground held by "Howe Mining Company", - (now Mt. Donaldson Copper and Silver) were pioneers in this country. So it is in no criticizing spirit that their work is now mentioned, but only as accessories after the fact to aid our proper conception of the ore occurrences ruling here. Their work was first concentrated in a tunnel now eighty feet long started from the shore of a small lake about 4,500 feet above sealevel. The reported sounded depth of this is over 200 feet to the bottom and then only pellets of anchor ice were brought up from below. The water of the whole lake is certainly coppery, and unfit for drinking purposes. This lake (vide photos of ore exposures) (b) lies close up under the frowning brows of Mount Donaldson, on its east side, as also shown on the plan of the property.

The whole cap, for many hundreds of feet down, of Mt. Donaldson is closely speckled with spots and splashes, in green and brown stains of copper ore, although the granite altered and silicified into syenite and other forms, and further into a quartzite through the excessive solutions caused in cooling of the molten magma, focussing to this outlet at the summit under extreme pressure and therefore pouring over under the cap rock of the overlying, up-lifted sedimentary strata. For this reason at this particular point the mineral-bearing quartz gives the examining engineer no direct clue as to the normal strike and dip of the mineral-bearing fissure veins.

This same tunnel shows copper as bornite and also chalcopyrites: molybdenite; copper oxide as cuprite; cobalt bloom as a rose oxide and crystals of quartz, spar and tourmalines. The outside of the copper and other lenses are heavily coated to cover an inch thick mostly with crystallized flakes of muscovite (potash mica), leading to the conclusion that the ore in its deposition replaced the mica solution. The strike of the tunnel is east and west along the fissure with a low dip to the south. Sample one, representing shipping ore, as a hand sample from the tunnel, but not typical of any commercial ore properly blocked out into definite tonnage, gave as under:- copper 51.11% - gold 0.02 oz/t - silver 9.7 oz/t -- gross value \$293.21.

VALUES: The real values are worked out under the heading of Average Values, and their market equivalent discussed.

It is not deemed wise, for the reasons here given, to do any more work on the summit until deeper development exposes large commercial ore bodies below, nearer to their origin, and then follow up from there these deeper ore-bodies. The lesson learnt from this tunnel is that indications of copper, with green copper stains on the surface rocks, have been opened out into considerable ore lenses beneath the outcrop, when free from the leaching action of the changeful weathering. At an elevation still higher up than this tunnel, of 5,200 feet above sea level, a long open cut four feet wide, in a direction along the true trend of the fissure of N 80° E and S 80° W and sloping down on the true dip, namely to the north, at an angle here of 30° from the horizon, has been dug for 150 feet along its course, and for six feet on the dip. This cut lies on the dividing ridge between Siwash creek basin and that of Copper creek, half-way between Mount Donaldson and Sayward.

Sample two (2) taken from here, typical however of only a lens of bornite, and not of any considerable tonnage of commercial ore blocked out gave as under:- copper 62.15% - gold 0.02 oz/t - silver 15.75 oz/t -- gross value \$359.15-for commercial returns vide (Average Values).

This opening shows a strong independent fissure vein running persistently, both east into Siwash valley and also west across Copper Creek valley, as well as two more valleys through the country marked out in all basins over considerable distance in miles by its heavy mineral stains covering the outside rocks, and the true tract of its known course, heavily painting the formation to be plainly seen by all.

Again another open cut is started on a similar vein on the same dividing ridge, only a few hundred feet to the northwest of the first one, and nearer to Mount Sayward. Just the strong outcrop less than a foot wide as yet, of well-mineralized rock, is shown up running parallel to the first one being NE - SW, a variation of 20° in strike and a steeper pitch of 55°. Sample four (4) taken from here as a hand sample only gave as follows:- copper 61.90%, - gold 0.02 oz/t - silver 27.7 oz/t, -- gross value \$375.87.

Yet another strike nearby NE - SW, dip 32° north, showing lenses of bornite.

Returning now easterly down the mountain side toward the head of Copper Creek valley, directly below the lake having the 80-foot tunnel, but at an elevation of 1,000 feet lower, is a tunnel driven 160 feet into the mountain easterly along a fissure running east and west, with a dip to the

north. This vein is narrow being only some inches wide, and as the tunnel progresses another small fissure joins the first. The decomposed character of the ore matter and the fact that the containing walls are practically leached into kaolin clay, shows that the first unaltered vein stuff has not yet been reached, nor the formation normal in its solidness.

Sample three (3) taken from this tunnel as a hand sample gave as follows:- copper 55.57%, - gold 0.02 oz/t, - silver 27.75 oz/t, -- gross value \$330.46.

Out of the eight fissure veins already uncovered, this one does not happen to be among the strongest appearing on the surface; but the point in question as all these being only branches of a parent stem, will be discussed later in this report.

Next at an elevation of 3,000 feet below the outcrops uncovered along the divide, on one of these identical fissures mentioned as being opened there, or on a similar one close by and parallel, an opening has been made to prove ore at depth, and that the characteristics have not changed as they descend. The fissure outcropping on the surface is reduced, as in all cases, due to the leaching out of the gangue; so causing the contraction of the enclosing by the collapsing together of the rock walls, comprizing country rock, creating narrow veins everywhere on the mountain side to start work in, but prove by experience in a short way to widen to their size in feet where inched at first ruled. The strike and dip in this working resembles the big cut above giving N 80° E - S 80° W and dip N 30°.

Sample five (5), a hand sample, gave results as follows:- copper 64.20%, of a higher percentage than any other found so far beneath the top of the mountain. The gold content at 0.02 Oz/t, - silver 18.0 oz/t, -- gross value \$372.16.

The similarity of assays and the general characteristics of the features, lead to the expectation that this one is identical to the fissure of sample two (2).

All the workings now mentioned represent those points where the most active attack has been made in the way of development work. However eight (8) distinct parallel fissures were carefully examined along the mountain side, both on the lower part and also below Lot 353.

To the northwest in a precipitous gully traversing the Mary and other mineral claims, passing down the whole mountain side to Copper creek (vide photo) is exposed an immense quartz fissure vein, measuring across more than 100 feet between foot and hanging walls, while still dipping northerly. The pegmatite mica lenses are plentifully lying all along the gully as float rock, clearly indicating the same characteristic in features as belong to the smaller veins; and bornite float as well has been found along the gully. Standing in the bed of Copper creek while looking up along the bare cliffs comprizing the property, as shown in the photos, the certain tale of the ore is plainly revealed to those who study such matters. These large quartz veins are parent stems, while the little ones are branching shooting out, beginning at very deep levels. Their angles of dip are different in each case, and the cliffs show their general conjunction, so that their common origin is unmistakable.

To open this property to its best advantage, an attack should first be made on the big quartz vein, as near Copper creek as possible but above the talus, preferably on the Lucky Jack claim. Active development by tunnelling for several hundred feet with occasional crosscutting inside the tunnel, should tell the tale of the ore practically, and amply justify the careful comparison made and the sifting of the evidence completed, which now compel a justly favorable judgement concerning the future success of its development. The biggest objectives are the ones to go for direct when large tonnage for marketing is the aim.

AVERAGE VALUES OF ORE: The average value of the ore to be met with later in this mine, as the work progresses, should not be a difficult matter to be certain about. The gold and silver probably follow the sulphides of iron as a carrier, combined in the bornite. This is the case at Khutze Inlet, Surf Inlet and along the Coast generally in Jurassic granite formation.

Bornite comes from below, ascending toward the outside, keeping below waterlevel in mines, since descending waters decompose bornite and impoverish it into chalcopyrite and other forms of copper ores.

Therefore, bornite should remain here the character of the copper ore to be expected, and its concentration, as mixed or otherwise with quartz and mica is the only regulating feature, which depends on the individual size of each bornite lens. The original assay certificates of the samples so far taken by the writer are attached to this report, giving, as is the rule, to engineers the bare results, leaving him to fill out the details. The market value, therefore, by carrying these results into extendo are worked out, so that the reader need not be deceived between gross and net values at present day prices. The present day prices of copper, however, taken at 28¢ gross per lb. are abnormal for further calculations and are comparison, therefore, at 14¢ per lb. is given.

CONCLUSIONS & DEDUCTIONS: This report is only intended as a preliminary statement of details gathered carefully, regarding a most promising prospect. Many headings, therefore, have been left out as premature yet, such as working capital required, equipment, details of costs, treatment and other essential matters to be discussed later.

To make plain to the reader, that there is a large area of mineral ground awaiting development, is the main object of this report. The evidence in hand has been carefully collected, and is now fully put forward. This same evidence can only be considered as convincingly favorable regarding the possibilities of converting this same area into an extensive shipping mine by activating mining work under the supervision of a trained mining engineer.

SIGNED

RONALD CAMPBELL CAMPBELL-JOHNSON
VANCOUVER, B.C.,
OCTOBER 27TH, 1916.

- COPY -