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Mount Donaldson

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COPY OF A MINING REPORT ON THE MOUNT
DONALDSON COPPER & SILVER MINING PRO-
PERTY SITUATED AT THE HEAD OF SALMON
ARM, SECHELT INLET, BRITISH COLUMBIA

BY

RONALD CAMPBELL CAMPBELL - JOHNSON,
MINING AND METALLURGICAL ENGINEER.

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COPPER & SILVER MINING PROPERTY SITUATED AT THE
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BY

RONALD CAMPBELL CAMPBELL - JOHNSON.
MINING AND METALLURGICAL ENGINEER,
VANCOUVER, B. C.

OCTOBER 27th, 1916.

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 centre 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 Sechelt, a settlement about (40) miles away westerly on the Strait of Georgia, near the south end of Jervis Inlet. From this village is a portage by waggon road or (1100) yards from the Strait of Georgia across the neck of Sechelt Peninsula to Porpoise Bay on Sechelt 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 north-easterly course up Salmon Arm to its farthest limit. Here at the head of the Arm is a direct water-fall of 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 (5) miles in length. Bear Creek from the west comes into the 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 3750 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 1300 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 six thousand (6000) feet above sea level, passing partly over the dividing ridge facing south toward 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 the Howe Mining Company Limited.

The official recorded numbers of these Government Lots are as follows:- Lot 353 - 421 - 422 - 423 - 425 - 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 acreage 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 4900 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 favourable bond or lease could be agreed on over the "Howe Mining Company's lands, 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 or more years to come. The areas and titles of claims already staked are now being consummated, and a survey next year will demonstrate their superficial areas and component elevations.

CHARACTER OF THE ORE.

The character of the ore so far exposed is bor-nite in lenses, a variety of copper ore. Its chemical formula is $\text{Cu } 5/3$. $\text{Fe. } 3/3$. By reading the attached certificates of assays of the five (5) 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 Mount Donaldson and Mount Sayward, by aneroid reading 5200 feet here above sea level to 3000 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. These samples vary in copper contents from 51 to 64 percent, an abnormally rich tenor of copper averaging from the five (5) assays given, nearly fifty-nine per cent (59.%). The gold contents of forty cents (.40%) per ton are constant, corresponding to surrounding mines, while in bulk when concentrated in the furnace into blister copper anodes of ninety-nine percent (99%) copper tenor, will help towards defraying the fixed charges to be deducted from the cost of production.

The Silver contents vary from nine and seven tenths ($9-7/10$) ounces per ton of ore to twenty-seven and three quarters ($27-75/100$) ounces per ton, averaging among the five samples taken nearly twenty (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 of 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 form 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 in 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 the copper ore is a replacement of muscovite (potash mica) 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 dykes of pegmatite quartz dykes are from a few inches as bands to over a

hundred (100) feet in width. The ore occurrences will be again technically discussed under the heading of "geology".

TREATMENT OF 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 most up-to-date economical manner. It seems hardly probable that chalcopyrites, the lower grade of usual copper ore will show itself here in the granite, so that siliceous and less concentrated ores will be used without preliminary mechanical concentration by the oil flotation process. However, the necessary treatment mechanically and chemically 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 to fatten their leaner 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 or 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 Sechelt Inlet 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 (6) miles.

ACREAGE.

By the map still confirmed by the records, the following appears to be the acreage of the lots held by the Howe Mining Company Limited.

Lot	353	Acres	320
-	422	-	320
-	421	-	80
-	454	-	40
-	423	-	120
-	453	-	200
-	425	-	240
-	452	-	160
-	354 on sea shore	-	<u>40</u>
	Total Acres		<u>1520</u>

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

CLIMATE.

According to the elevations above sea level will

the depth of the snow remain 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 four thousand (4000) feet above sea level.

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 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 saw-mills. 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 Clowholm Falls at the head of Salmon Arm, three (3) miles distance 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 now enters Clowhom Lake, an extensive area at the head of Clowhom Lake,

which is the most suitable location; and others also on tide-water at Paddy Hatts, 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 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 favourable. The one fact of being able to navigate any 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 in procuring cheap working costs. Ultimately some narrow gauged railway, tramway or motor service on a well built waggon road

will be constructed to avoid the present six (6) miles of lake portage from tide-water to 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 deep level 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 neighbourhood of this mine especially the creek beds at great depths of perhaps five thousand (5000) 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 opportunities to drive in tunnels directly in pay material all the way. From the summits of Mts. Donaldson and Sayward, reaching about 6000 feet high, and the bed of Copper Creek 5000 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 one hundred 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 magma (residuum from a fluid) were very extensive, and while forcing their way up from their original sphere deep down, by their violent action upheast the formerly stratified sedimentary layers, till then forming locally the earth's crust. These older stratas 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 feldspa 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 process, keeping solutions at a lower

specific density. 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 Chalcopyrites (Cu. Fe. S₂.) to especially precipitate along the contacts. In the lower granites, in this case principally of a micaceous kind, the copper ores show less sulphur and iron in their composition, having deposited as Bornite (Cu₃.Fe.S₃.) 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 in its turn replaced the fluo-spars and feldspars, 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 (80) 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 be 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 granit into a siliceous syenite, shading into a quartzite, and spotted throughout indiscriminately with splashes of minerals. As a descent down the mountain is made from the contact 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 five thousand (5000) feet, thereby saving the expenditure of a large outlay of money in sinking prospecting 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 and 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 No. 5 sample, is higher in copper contents, being over 3000 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 discernible. 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 confreres 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 the "Howe Mining Co.", (now the Mount Donaldson Copper & Silver) were pioneers in this Country. So it is in no criticising spirit that their work is now mentioned, but only as accessories after the fact to aid in our proper conception of the ore occurrences ruling here. Their work was first concentrated in a tunnel now eighty (80) feet long started from the shore of a small lake, 4500 feet about in elevation above sea level. The reported sounded depth of this is over 200 feet to 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 hundred feet down, of Mount 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 caprock of the overlying uplifted sedimentary strata. For this reason at this particular point the mineral bearing quartz gives the examining engineer no direct clue as to 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, spa, and tourmalines. The outside of the copper and other lenses are havily coated to over 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 (1) 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 .02 oz; - Silver 9-7/10 oz.; 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 morework 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 change-ful weathering. At an elevation still higher up than this tunnel, of 5200 feet above sea level, a long open cut four (4) feet wide, in a direction along the true trend of the fissure of N.- 80 E. and south 80 W. and sloping down on the true dip, namely to the north, at an angle here of thirty (30) degrees from the horizon, has been dug for 150 feet along its course, and for six (6) feet on the dip. This out lies on the dividing ridge between Siwash Creek basin and that of Copper Creek, halfway between Mount Donaldson and Sayward.

Sample two (2) taken from here, typical however of only lense of bornite, and not of any considerable tonnage

of commercial ore blocked out gave as under:-

Copper 62.15 % - Gold .02 ozs. Silver 15.75 oz. Gross Value \$359.15 For commercial returns, vide (average values).

This opening shows a strong independent fissure vein running persistently, both east into the 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 north-west 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 nearly parallel to the first one being N. 100', E. by S. 100' W. a variation of twenty (20) degrees in strike, and a steeper pitch of N. 55'.

Sample Four (4) taken from here as a hand sample only gave as follows:-

Copper 61.90%; - Gold .02 ozs; - Silver 27.70 ozs.

Gross Value \$375.87.

Yet another nearby strike N. 95' E. by S. 95' W. dip N. 32', showing lenses of bornite.

Returning now easterly down the mountain side toward the head of Copper Creek Valley, directly below the lake having the eighty (80) tunnel, but at an elevation of one thousand (1000) 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 .02 ozs; Silver 27.75 ozs. Gross Value \$330.46.

Out of the eight (8) fissure veins already uncovered, this one does not happen to be among the strongest appearing on the surface; but the point in question of all these being only branches of a parent stem, will be discussed later in this report.

Next at an elevation of 3000 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 descent. 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, comprising 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 inches at first ruled. The strike and dip in this working resembles the big cut above giving N. 80' E. by 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 .02 oz. Silver 18 ozs; 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 north-west 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 one hundred 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 bear cliffs comprising this 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 branches 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 tunneling for several hundred feet with occasional cross-cutting inside the tunnel, should tell the tale of the ore practically, and amply justify the careful comparison made and the sifting of evidence completed, which now compel a justly favourable judgment 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 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, (Cu. Fe. S. 3.). This is the case at Khutze Inlet, Serf Inlet, and along the Coast generally in Jurassic Granite formation.

Bornite comes from below, ascending toward the outside, keeping belowwater level in mines, since descending waters decompose bornite and impoverish it into chalcopyrites 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 extento 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¢) twenty-eight cents gross per lb. are abnormal for further calculations, and are comparison therefore at fourteen (14¢) is given.

<u>Certificates of Assays</u> ----- 5 -----			<u>Sample of Ore.</u>	
<u>SAMPLE.</u>	<u>GOLD.</u>	<u>SILVER.</u>	<u>COPIER.</u>	
1.	0.02 oz.	9.70 oz.	51.11	per cent.
2.	0.02 oz.	15.75 oz.	62.15	- -
3.	0.02 oz.	27.75 oz.	55.57	- -
4.	0.02 oz.	27.70 oz.	61.90	- -
5.	0.02 oz.	18.00 oz.	64.20	- -

For Mr. R. C. Campbell Johnson,
October, 14th, 1916.

P. W. Thomas, For Estate of
J. O'SULLIVAN, F. C. S.
London.

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 favourable 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.
