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BLUE GROUSE
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COWICHAN COPPER CO. LTD.
BLUE GROUSE MINE
D.C. MALCOLM, P. ENG.
PROPERTY FILE

SUMMARY

In 1964 a mineral agreement was made with Canadian Pacific Oil and Gas on ground south of the mine area. Mapping, prospecting and geochemical work was started on this ground in the summer and the mine area was re-examined and tested geochemically. The geology is complicated and additional detailed geological work together with detailed prospecting of the favorable areas is necessary.

LOCATION

Latitude 48°50' Long. 124°20'. The area lies south of Cowichan Lake in the Victoria Mining Division and is reached by paved highway from Duncan and Honeymoon Bay.

PROPERTY

The permit covers 7087 acres in Lots, 12, 13, 22, 178, 303, 740, 765, 856, 882, 886, 888, 897, 898, 952, 969, 1071, 1144 and 1165.

GEOLOGY

The area is underlain by tightly folded Triassic limestones and volcanics cut by a series of overthrust faults and intruded by irregular bodies of feldspar porphyry. These rocks are overlain unconformably by patches of Cretaceous conglomerates and sandstones and are underlain by Permian volcanics and sediments.

(a) Topography

The land lots are bounded ^{by} valleys at Cowichan Lake, Sutton Creek and Gordon River at elevations of 500 to 1000 feet above sea level. They extend from these valleys over a series of steep sided logged-off ridges 2000 to 3000 feet in elevation. Main highways follow the valleys and steep logging roads switchback up the ridges.

(b) General Geology

The rocks are a series of interbedded sediments and volcanics as follows:

Upper Cretaceous sandstone and conglomerate.

Unconformity

- | | | |
|----------|-----------------------|----------|
| Triassic | Porphyritic flows | |
| | Argillites | |
| | Sutton Limestone | 100' |
| | Amygdaloidal basalt | 100-200' |
| | Red Beds | 100-300' |
| | Amygdaloidal basalt | 100' |
| | Tuffs and agglomerate | 100-300' |
| | Basalt and andesite | 200' |
| | Tuffs and agglomerate | 100' |
| | Basalt | 500' |

see Hazard

PROPERTY FILE

Permian limestones, cherty sediments and volcanics underlie the Triassic Rocks.

The following is a more detailed description of the rocks:

Porphyritic flows:

These are a thick uniform series of dark brown or black vesicular rocks with square crystals of feldspar. They weather to an earthy brown color and are readily recognized in the field. They are over 500' in thickness.

Argillites:

These are finely bedded black and dark brown soft rocks generally crushed and they contain numerous fossil casts. At the base of the series they contain narrow continuous limestone bands, and grade into the Sutton limestones. At the Sunnyside road they contain volcanic bombs. It is difficult to measure the thickness of the beds as they are crumpled but they are believed to be about 500'.

Sutton Limestone:

These are grey crystalline limestones, argillaceous limestones and in some places a black limestone basaltic mixture. The beds were evidently laid down in a shallow sea and are continuous. In some areas on the claims up to 100 feet of fairly pure grey to white limestone exists. In others there are interbeds of argillite, tuff and basalt and in some sections the rock is black and is difficult to distinguish from basalt. Areas of this black limestone and limy basalts often contain intermixed volcanic bombs.

Generally, the horizon is about 100 feet in thickness.

Basalt:

Black amygdaloidal flows underlie the Sutton horizon. The rocks are dense fine grained basalts with amygdules of feldspar, epidote or quartz. Feldspar fillings are most common and often they are grouped on rosettes or concentric circles. In some places these lavas are vesicular and in other sections they grade to a basaltic agglomerate. They sometimes contain hematite or chlorite filled vesicles. The flows vary from 150 to 350 feet in thickness.

Hematitic Tuffs or Red Beds:

Limy hematitic tuffs underlie the black basalt horizon on the claims. These are variable and grade from iron ore with 50% to 70% hematite to limestone or to bedded tuffs. There is often a 30 to 40 foot impure limestone or limestone agglomerate at the base of the formation. The thickness of the red beds vary from 100 to over 300 feet.

Basalt:

A 100 foot thickness of black chloritic amygdaloidal basalt. This is often graphitic and is often quite soft. Sometimes it is agglomeritic.

7. Below the basalt or agglomerates a 100 to 150 foot thickness of limy tuff occurs. This has narrow beds of limestone in it at some horizons.

8. Thick beds of basalt or andesite pillow lavas underlie the tuffs and except for narrow beds of tuff and agglomerate extends to the base of the series with thicknesses of at least 500 feet.

Permian rocks with similar appearances and composition underlie these Triassic volcanics and irregular feldspar porphyry dikes, sills and plugs intrude all the rocks.

STRUCTURAL GEOLOGY

The structural geology of the area is complex. The rocks are tightly folded into a series of overturned folds whose axes strike northwest, dip from 20 to 50 degrees to the southwest and plunge 20 to 40 degrees to the southeast. The changes in plunge are due to a second series of horizontal open folds with a northeast strike.

These rocks are cut by east striking thrust faults dipping 15 to 30 degrees to the south and having displacements of up to 1000 feet at a bearing of northeast on the plane of the faults.

A second series of reverse faults strike northeast and dip southwest from 30 to 45 degrees. Movements are northeast of 100 to 150 feet.

Numerous northwest striking faults with steep dips and small displacements are adjustment faults associated with the overturned folds.

The results of these movements and the irregularity of the feldspar porphyry intrusions make the geology obscure but the Sutton limestone, the overlying porphyritic flows, the argillites and the red beds are excellent markers.

ALTERATION

Generally, the rocks are not highly altered but locally, near the porphyry intrusives, they are extensively altered to siliceous epidote rocks and to magnetite garnet actinolite skarns. In areas where the faults follow the beds the rocks are mylonitized with large areas of chlorite and graphite.

MINERALIZATION

The sulphide mineralization occurs in the limy rocks which have been altered and fractured. It is a high temperature replacement and varies in appearance. At the mine the main ore body occurs in the middle limy tuffs (see 7 above) at the crest and along the overturned limb of an anticline. The rocks are fractured and altered to epidote-actinolite skarn beneath irregular feldspar porphyry dikes. Chalcopyrite and pyrrhotite replace the limy silicates and the unaltered tuffaceous material. A second ore body occurs in the same horizon on the upper limb of the anticline. Here epidote rocks adjacent to porphyry dikes has been involved in the folding and bedded sulphides (pyrrhotite and chalcopyrite) replace the altered rocks. Other ore bodies occur as magnetite pyrrhotite-chalcopyrite-pyrite-sphalerite replacements in mylonitized red beds or in the tuff horizon. One deposit occurs in a actinolite skarn area at the nose of a fold in Sutton Limestone near porphyry dikes.

CLAIM GEOLOGY

Prospecting and reconnaissance geology was done over the area from Sutton Creek to Gordon River to Millar Creek to Cowichan Lake but at the time this work was done the geology was not understood in detail. Work was not concentrated on the favorable areas and additional detailed mapping is required.

The following is a description of the geology on the claims:

Lot 12:

This lot is below the Caycuse Road along Cowichan Lake and is underlain by Cretaceous formations.

Lot 13:

The Sutton Limestone argillite contact outcrops on the Cowichan Lake on Lot 13 in a deep syncline overturned to the west. The ground is heavily overburden covered and mostly underlain by argillites. No mineralization has been found on the claims.

Block 22:

All in 13

This is a very long block which starts at Cowichan Lake follows Millar Creek and then Sutton Creek almost to Gordon River. It covers all the formations but the ground is heavily overburden covered and many of the valley bottoms were eroded in the softer argillites which overlie the Sutton Limestones. In most cases, the favorable horizons are deeply buried beneath overburden or argillites.

Blocks 952 and 303: *All in 13*

These are on the north slope of Millar Creek and cover the steep rocky ridge and slides south of the valley. The rocks are faulted segments of the Sutton and the beds beneath them are on the limb of anticline similar to that in the mine area.

Mineralization was found in the middle tuff beds and high grade flot was found on the Millar Creek slope.

Detailed mapping and prospecting need to be done over the lot.

Block 293:

All in 13

Block 293 covers the south slope of Sutton Creek. The formations cross Sutton Creek and outcrop across the lot. It has good prospecting possibilities.

Lots 969, 882, 898, 1071, 897 and 888

All in 13

These lots cover the crest of the Sutton Creek anticline and are largely underlain by the middle tuff horizon (7) and by limy members. Several skarn areas outcrop and the blocks appear favorable. Further detailed mapping and prospecting is warranted.

Lots 886, 740, 856 and 65

All in 13

The lots lie on the slope to Gordon River and contain one limb of the Sutton limestones and the underlying amygdaloidal flows. Little work has been done as yet on the ground.

mine mine
Lots 1144, 1165:

These lots are on the Summit between the Cowichan and Gordon Rivers. They have not been examined.

Lot 178: ?

This is an area north and east of the mine along the shore of Cowichan Lake. It is partly covered by Cretaceous sandstone. Part of it is covered by thick second growth and part by overburden. The Sutton limestone is under a shallow cover of sandstone north of Gordon Bay and some copper mineralization has been exposed in trenches. A diamond drill hole failed to locate an orebody. West of Gordon Bay the lot is underlain by an overturned syncline with the top volcanic horizon, and the favorable tuff horizon below this exposed. A member of limy tuff beds mineralized by pyrite with some chalcopyrite outcrop and the lot appears favorable for further detailed work.

GEOCHEMICAL

Reconnaissance soil sampling was done over much of the claim area and some detailed work was done in some anomalous areas. Samples were taken by four men at 100 foot intervals along claim and compass traverses and tested using rubeanic acid in a field laboratory at the mine. The enclosed map shows the distribution of most of the samples. Some work was done along Sutton Creek and at the Gordon River and although these showed some areas of copper bearing soil additional work is needed to properly show the geochemical picture.

The results of the soil work were gratifying. The anomalous areas were well defined and could be confirmed with the following exceptions: (1) Some of the roads and areas near the mill and workings were contaminated but this does not extend into the bush areas. (2) The Cretaceous rocks gave negative results.

The anomalies have not been prospected but in a number of areas copper mineralization has been found in them and in others they are underlain by the favorable horizons near porphyry intrusives and detailed prospecting should give positive results.

Magnetic Anomalies

While soil sample lines were being made two areas of high magnetics were outlined. These are shown on the attached geochemical plan.

Self Potential

Self Potential Surveys have been made over the Blue Grouse Mountain over the south slopes on Lot 22 and over the northwest slopes on Lot 22 and 13. In general, readings were well below 100 millivolts except for the anomalous areas of 200 and 500 millivolts outlined on the map. The interpretation is difficult although they probably represent buried sulphide concentrations at very variable depths.

At the mine the anomalies generally correspond closely with the orebodies. And represent sulphides at a shallow depth. Underground self potential results were comparable with this. In contrast other surface anomalies represented relatively deeply buried sulphides covered with unfavorable rocks. For example, the largest anomaly at 20000 N and 18500 E represents the tuff and red bed horizon on

the upper limb of the Blue Grouse overturned anticline beneath at least a 300 foot thickness of overlying rocks. The sulphides are disseminated magnetite, pyrite, chalcopyrite and sphalerite in a bed dipping 30 degrees south and striking northwest. The anomalies on Lot 22 probably represent the faulted buried extension of this same horizon.

CONCLUSION

Preliminary exploration work over the lots has shown many places where ore bodies should occur and in which detailed mapping, soil sampling, self potential surveying, prospecting and trenching are warranted. This work needs close geological supervision as the favorable blocks of ground are intricately dispersed due to the complexity of the geology.

Report by *D. C. Malcolm.*

D. C. Malcolm, P. Eng.

COMICHAN COPPER CO. LTD. (N.P.L.)

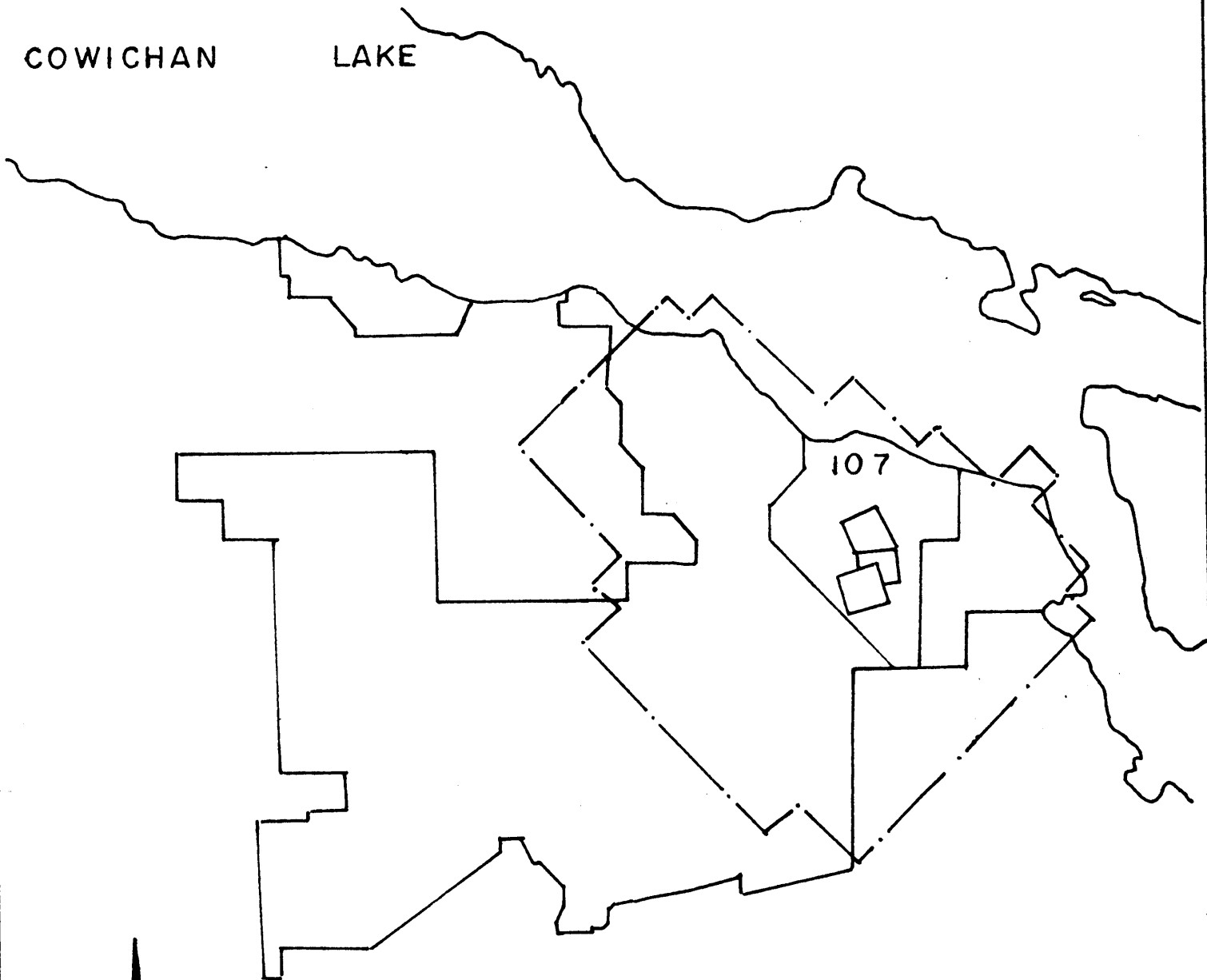
STATEMENT OF EXPENDITURES ON THE BLUE GROUSE AREA - LAKE COMICHAN

FOR THE TWO YEARS ENDED 31 MAY, 1966

Prospecting	\$ 1,231.65
Trenching	5,204.33
Soil sampling	568.93
Geological	<u>6,107.00</u>
TOTAL	<u>\$ 13,111.91</u>

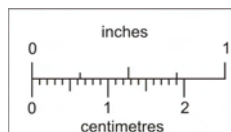
COWICHAN

LAKE



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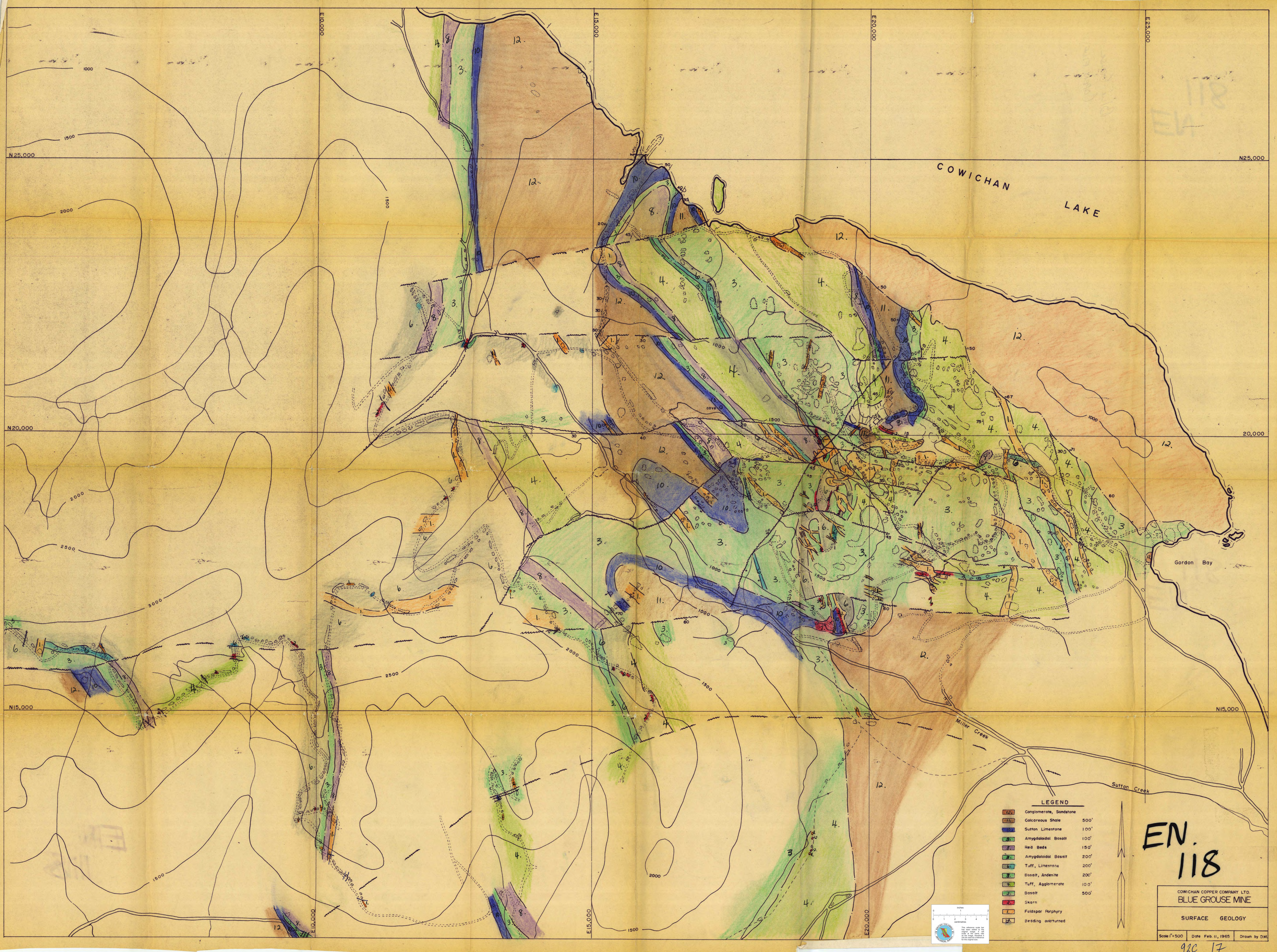
Staked claims — · —
Land lots — — —



This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

COWICHAN COPPER CO.
BLUE GROUSE

Scale 1" = 1 Mi. Date 1, 10, 64



COWICHAN LAKE

Gordon Bay

Miller Creek

Sutton Creek

LEGEND

12	Conglomerate, Sandstone	500'
11	Calcareous Shale	100'
10	Sutton Limestone	100'
9	Amygdaloidal Basalt	150'
8	Red Beds	150'
7	Amygdaloidal Basalt	200'
6	Tuff, Limestone	200'
5	Basalt, Andesite	200'
4	Tuff, Agglomerate	100'
3	Basalt	500'
2	Skarn	
1	Feldspar Perphyry	
0	Bedding overturned	

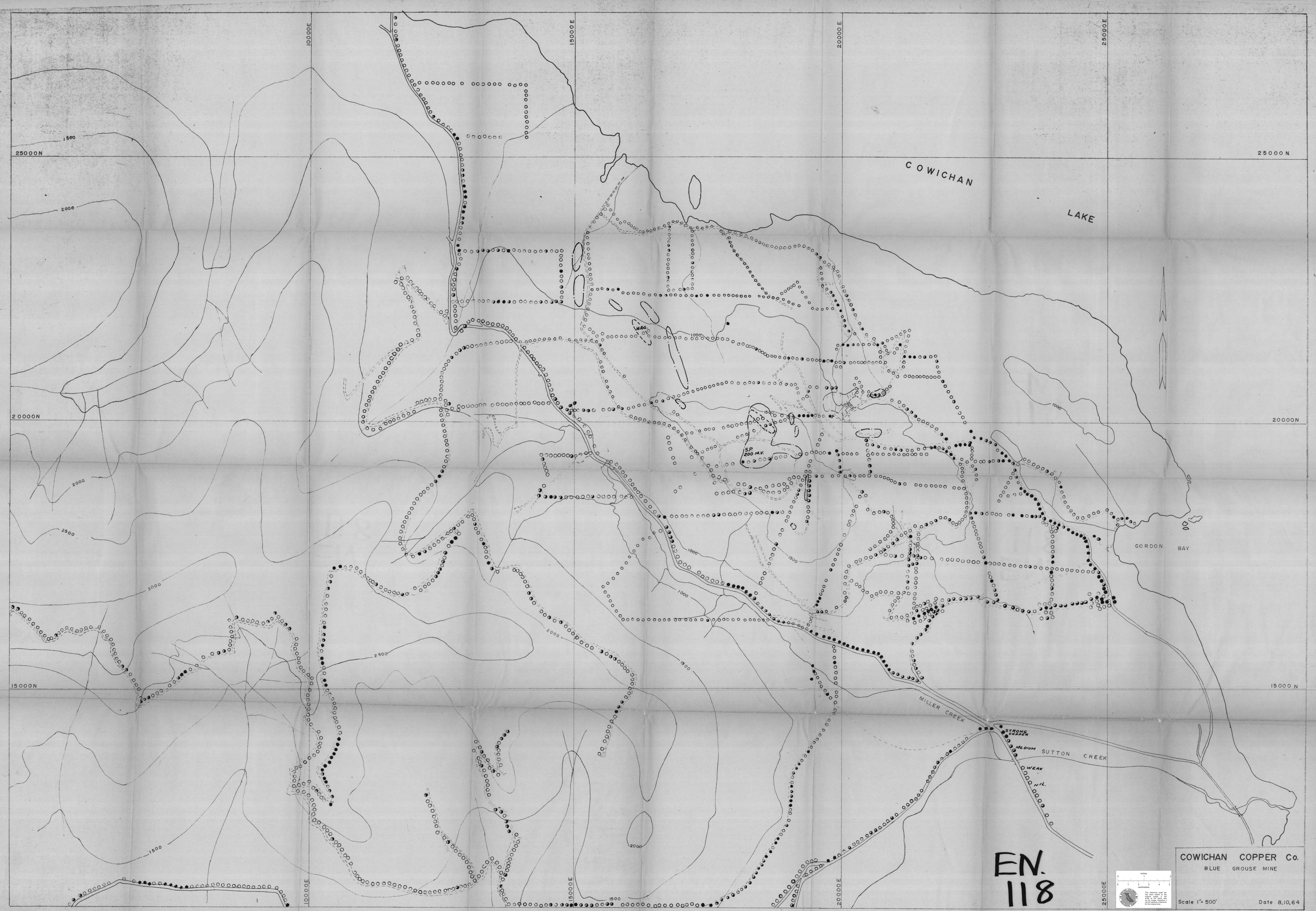
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COWICHAN COPPER COMPANY LTD.
BLUE GROUSE MINE

SURFACE GEOLOGY

Scale 1"=500' Date Feb. 11, 1965 Drawn by D.M.

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COWICHAN
LAKE

GORDON BAY

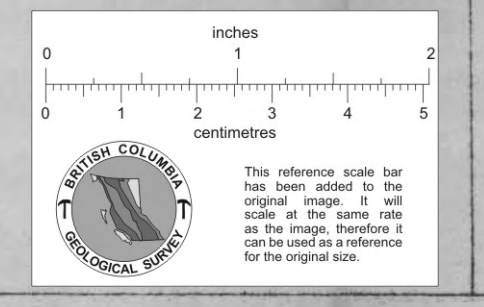
MILLER CREEK

STRONG
MEDIUM
WEAK
NIL
SUTTON CREEK

SP
200 M.V.

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COWICHAN COPPER Co.
BLUE GROUSE MINE



Scale 1" = 500' Date 8,10,64